

DRAINAGE STRATEGY

SURFACE WATER

Read in conjunction with drawing 5116-01

The design has been prepared with consideration being given firstly to discharge into soak-away or infiltration system, then watercourse and lastly available sewer system.

Infiltration/Soak-away - The site is located approximately 0.75m above the adjacent playground and close to the end of a residential street, 1.0m lower than the site. Also given the tight proximity of the surrounding buildings it is not possible to achieve a minimum 5m clear distance to a soak-away location. Therefore the site is considered unsuitable for infiltration disposal of the surface water run-off.

Watercourse - No existing watercourse is available on or adjacent to the site to discharge surface water.

Sewer Sysyem -

It is proposed to discharge the surface water run-off from the development using a gravity system, connecting into the existing private surface water system, via an attenuation system.

The allowable flow rate has been calculated based on 30% reduction in the existing run-off rate from the existing roof and paved area which is to be replaced.
See attached sheet for calculation of relevant impermeable area = 201m²

1:30yr 30min duration

max rainfall intensity, $i = 50.0\text{mm/hr}$

$Q = 201 \times \frac{50.0}{3600}$

$= 2.80 \text{ l/s peak flow}$

restricted flow rate = 2.0 l/s

$\frac{2.0}{2.80} \times 100\% = 70\%$ ie 30% reduction

2.80

Revision A
flow rate = 2.0 l/s
as planning comments

Attenuation will limit the discharge from the storage to a flow not exceeding 2.0 litres/second, by use of a proprietary flow control chamber and provide adequate storage volume to accommodate a 1:100 year storm event plus 40% increase allowance for climate change.

SURFACE WATER CALCULATION

The surface water calculations have been carried out assuming 100% run-off from the impermeable roof and adjacent re-surfaced external paved area.

Impermeable Paved Area = 38m²

New Roof Area drained Area = 72m²

Existing hipped end roof drained = 91m²

Total Impermeable Area = 201m²

Rainfall intensities have been calculated for the following :

1:30yr return period

1:100yr return period

1:100yr return period + 40% climate change factor,

with durations of 15mins, 30mins, 60mins, 2hrs,4hrs,

The storage volume required for each storm duration has been calculated for each return period based on an impermeable area of 201m², in combination with a 2.0l/s outflow to determine the maximum storage volume.

(max= 4.52cu.m for the 1:100yr +40% 30min storm duration)

It is proposed to provide below ground storage for all design return periods up to the 1 in 100yr +40% return period storms due to the lack of suitable above ground landscaping availability. The system is designed to back up from the flow restriction chamber and utilise the proprietary crate system for storage.

Assuming 95% voids crate volume = 4.8 cu.m

DESIGN RAINFALL INTENSITY (1:100yr + 40% cc)

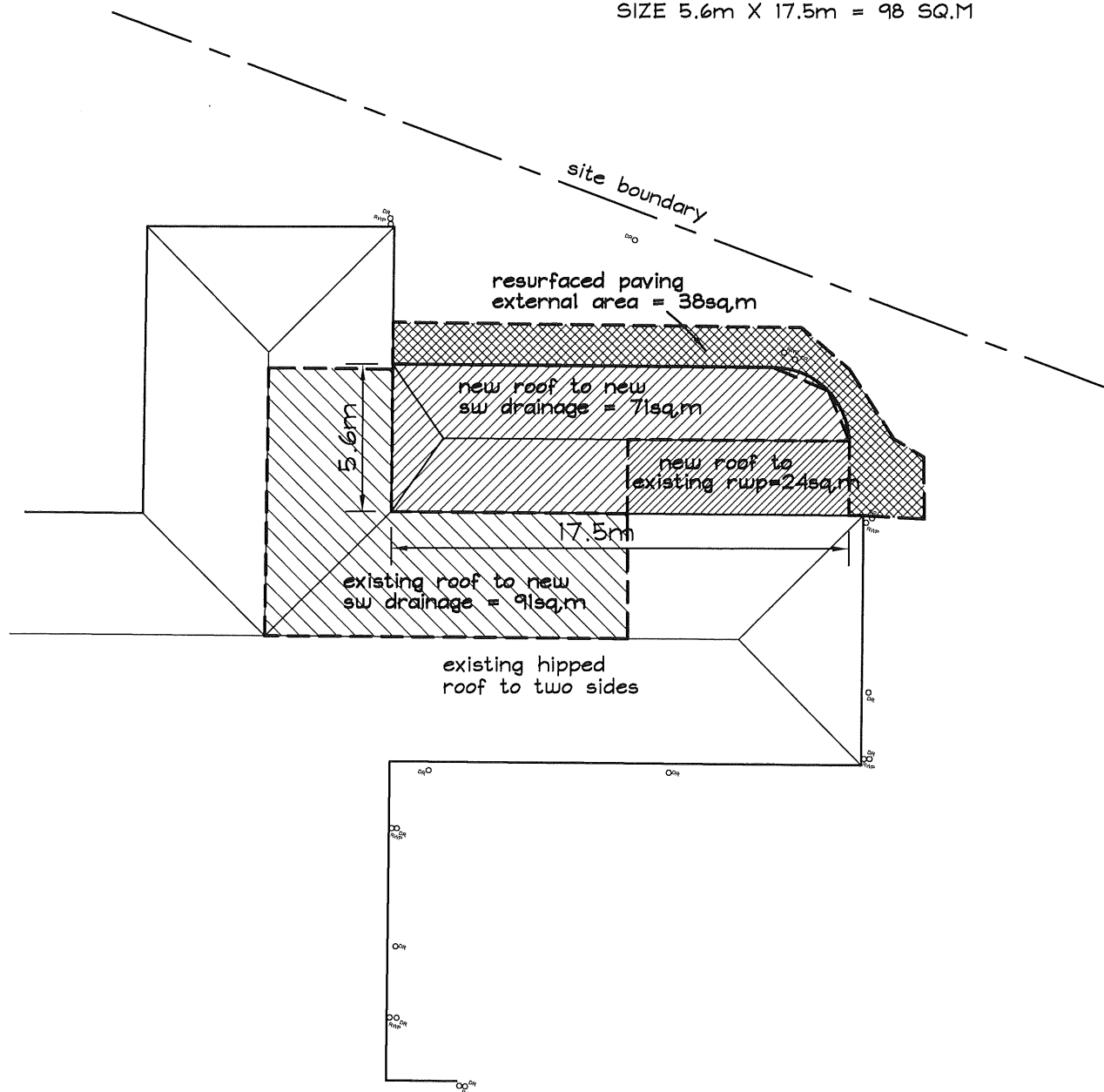
See attached sheets for site rainfall intensity calculation

<u>Duration</u>	<u>Intensity</u>
4hr	i=17.8mm/hr
2hr	i= 30.2mm/hr
60mins	i= 50.6mm/hr
30mins	i= 80.8mm/hr
15mins	i= 124.7mm/hr

ROOF PLAN - INDICATING DRAINED AREAS TO NEW SW PIPEWORK

1:50

2 CLASSROOM EXTENSION
SIZE 5.6m X 17.5m = 98 SQ.M



Civil & Structural Engineering Consultants

5A Chevin Mill . Leeds Road . Otley .
West Yorkshire . LS21 1BT
Tel: 01943 466 921 Fax: 01943 468 638
e-mail: mail@sharpandscarffe.co.uk

SURFACE WATER DRAINAGE

Impermeable Area = 201m²

For each of the storm durations and associated peak flow the storage required is calculated below.

1:100yr + 40% c.c : 15min duration

i = 124.7mm/hr

$$Q = 201 \times \frac{124.7}{3600} = 7.0 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(7.0 \times 900) - (2.0 \times 900)}{1000} = 4.50 \text{ cu.m}$$

1:100yr + 40% c.c : 30min duration

i = 80.8mm/hr

$$Q = 201 \times \frac{80.8}{3600} = 4.5 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(4.5 \times 1800) - (2.0 \times 1800)}{1000} = 4.52 \text{ cu.m}$$

1:100yr + 40% c.c : 60min duration

i = 50.6mm/hr

$$Q = 201 \times \frac{50.6}{3600} = 2.83 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(2.83 \times 3600) - (2.0 \times 3600)}{1000} = 2.97 \text{ cu.m}$$

1:100yr + 40% c.c : 120min duration

i = 30.2mm/hr

$$Q = 201 \times \frac{30.2}{3600} = 1.7 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(1.7 \times 7200) - (2.0 \times 7200)}{1000} = 0.0 \text{ cu.m}$$

1:100yr + 40% c.c : 240min duration

i = 17.8mm/hr

$$Q = 201 \times \frac{17.8}{3600} = 1.0 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(1.0 \times 14400) - (2.0 \times 14400)}{1000} = 0.0 \text{ cu.m}$$

PIPE CAPACITY

MAX PEAK FLOW = 7.0 l/s (1:100yr + 40% c.c & i=124.7mm/hr)
FOR 100mm Ø SW PIPE running full @ 1:40 Q=9.4 l/s - Satisfactory

CLASSROOM EXTENSION
CRAVENWOOD PRIMARY, M8 5AE

CALCULATION TITLE:

DRAINAGE STRATEGY

MADE BY:

CB

DATE:

JAN 2021

DRAWING NO.

5116

DRAWING NO.

- D04

Civil & Structural Engineering Consultants

5A Chevin Mill . Leeds Road . Otley .
West Yorkshire . LS21 1BT
Tel: 01943 466 921 Fax: 01943 468 638
e-mail: mail@sharpandscarffe.co.uk

CLASSROOM EXTENSION
CRAVENWOOD PRIMARY, M8 5AE

CALCULATION TITLE:

DRAINAGE STRATEGY

MADE BY:

CB

DATE:

JAN 2021

DRAWING NO.

5116

DRAWING NO.

D05

SURFACE WATER DRAINAGE

Impermeable Area = 201m²

For each of the storm durations and associated peak flow the storage required is calculated below.

1:100yr + 0% c.c : 15min duration

i = 86.1mm/hr

$$Q = 201 \times \frac{86.1}{3600} = 4.81 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(4.81 \times 900) - (2.0 \times 900)}{1000} = 2.52 \text{ cu.m}$$

1:100yr + 0% c.c : 30min duration

i = 56.2mm/hr

$$Q = 201 \times \frac{56.2}{3600} = 3.1 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(3.1 \times 1800) - (2.0 \times 1800)}{1000} = 2.0 \text{ cu.m}$$

1:100yr + 0% c.c : 60min duration

i = 36.3mm/hr

$$Q = 201 \times \frac{36.3}{3600} = 2.0 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(2.0 \times 3600) - (0.0 \times 3600)}{1000} = 0.0 \text{ cu.m}$$

1:100yr + 0% c.c : 120min duration

i = 22.2mm/hr

$$Q = 201 \times \frac{22.2}{3600} = 1.24 \text{ l/s peak flow}$$

$$\text{Storage Req'd} = \frac{(1.24 \times 7200) - (0.0 \times 7200)}{1000} = 0.0 \text{ cu.m}$$

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5A Chevin Mill . Leeds Road . Otley .
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Tel: 01943 466 921 Fax: 01943 468 638
e-mail: mail@sharpandscarffe.co.uk

CLASSROOM EXTENSION
CRAVENWOOD PRIMARY, M8 5AE

CALCULATION TITLE:

DRAINAGE STRATEGY

MADE BY:

CB

DATE:

JAN 2021

DRAWING NO.

DRAWING NO.

5116 - D06

SURFACE WATER DRAINAGE

Impermeable Area = 201m²

For each of the storm durations and associated peak flow the storage required is calculated below.

1:30yr + 0% c.c : 15min duration

i = 66.9mm/hr

Q = $201 \times \frac{66.9}{3600}$ = 3.8 l/s peak flow

Storage Req'd = $\frac{(3.8 \times 900) - (2.0 \times 900)}{1000}$ = 1.62cu.m

1:30yr + 0% c.c : 30min duration

i = 43.3mm/hr

Q = $201 \times \frac{43.3}{3600}$ = 2.4 l/s peak flow

Storage Req'd = $\frac{(2.4 \times 1800) - (2.0 \times 1800)}{1000}$ = 0.72cu.m

1:30yr + 0% c.c : 60min duration

i = 27.7mm/hr

Q = $201 \times \frac{27.7}{3600}$ = 1.55 l/s peak flow

Storage Req'd = $\frac{(1.55 \times 3600) - (2.0 \times 3600)}{1000}$ = 0.0cu.m

Project Cravenwood Primary Classroom Extension				Job no. 5116	
Calcs for Surface Water Drainage				Start page no./Revision 007	
Calcs by CB	Calcs date				

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area Manchester
 Storm duration $D = 15$ min
 Return period Period = **100** yr
 Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.360$
 5-year return period rainfall of 60 minutes duration $M5_60min = 18.0$ mm
 Increase of rainfall intensity due to global warming $p_{climate} = 40$ %
 Factor Z1 (Wallingford procedure) $Z1 = 0.62$
 Rainfall for 15min storm with 5 year return period $M5_15min_i = Z1 * M5_60min * (1 + p_{climate}) = 15.6$ mm
 Factor Z2 (Wallingford procedure) $Z2 = 1.99$
 Rainfall for 15min storm with 100 year return period $M100_15min = Z2 * M5_15min_i = 31.2$ mm
 Design rainfall intensity $I_{max} = M100_15min / D = 124.7$ mm/hr

Maximum surface water runoff

Catchment area $A_{catch} = 201$ m²
 Percentage of area that is impermeable $p = 100$ %
 Maximum surface water runoff $Q_{max} = A_{catch} * p * I_{max} = 7.0$ l/s

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5A Chevin Mill

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OTLEY

Project

Cravenwood Primary Classroom Extension

Job no.

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Calcs for

Surface Water Drainage

Start page no./Revision

108

Calcs by

CB

Calcs date

DESIGN RAINFALL**In accordance with the Wallingford Procedure**

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area

Manchester

Storm duration

D = **30** min

Return period

Period = **100** yr

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

r = **0.360**

5-year return period rainfall of 60 minutes duration

M5_60min = **18.0** mm

Increase of rainfall intensity due to global warming

p_{climate} = **40** %

Factor Z1 (Wallingford procedure)

Z1 = **0.79**

Rainfall for 30min storm with 5 year return period

M5_30min_i = Z1 * M5_60min * (1 + p_{climate}) = **19.9** mm

Factor Z2 (Wallingford procedure)

Z2 = **2.03**

Rainfall for 30min storm with 100 year return period

M100_30min = Z2 * M5_30min_i = **40.4** mm

Design rainfall intensity

I_{max} = M100_30min / D = **80.8** mm/hr**Maximum surface water runoff**

Catchment area

A_{catch} = **201** m²

Percentage of area that is impermeable

p = **100** %

Maximum surface water runoff

Q_{max} = A_{catch} * p * I_{max} = **4.5** l/s

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Sharp & Scarffe Ltd

5A Chevin Mill

Leeds Road

OTLEY

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DESIGN RAINFALL**In accordance with the Wallingford Procedure**

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 1 hr
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 1.00
Rainfall for 1hr storm with 5 year return period	M5_1hr _i = Z1 * M5_60min * (1 + p _{climate}) = 25.2 mm
Factor Z2 (Wallingford procedure)	Z2 = 2.01
Rainfall for 1hr storm with 100 year return period	M100_1hr = Z2 * M5_1hr _i = 50.6 mm
Design rainfall intensity	I _{max} = M100_1hr / D = 50.6 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 201 m ²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} * p * I _{max} = 2.8 l/s

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5A Chevin Mill

Leeds Road

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DESIGN RAINFALL**In accordance with the Wallingford Procedure**

Tedds calculation version 2.0.01

Design rainfall intensity

Location of catchment area	Manchester
Storm duration	D = 2 hr
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 18.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 40 %
Factor Z1 (Wallingford procedure)	Z1 = 1.22
Rainfall for 2hr storm with 5 year return period	M5_2hr _i = Z1 * M5_60min * (1 + p _{climate}) = 30.7 mm
Factor Z2 (Wallingford procedure)	Z2 = 1.96
Rainfall for 2hr storm with 100 year return period	M100_2hr = Z2 * M5_2hr _i = 60.4 mm
Design rainfall intensity	I _{max} = M100_2hr / D = 30.2 mm/hr

Maximum surface water runoff

Catchment area	A _{catch} = 201 m ²
Percentage of area that is impermeable	p = 100 %
Maximum surface water runoff	Q _{max} = A _{catch} * p * I _{max} = 1.7 l/s