

SURFACE WATER DRAINAGE CALCULATIONS

BARLOW MOOR CENTRE

BOS2 MANCHESTER LIMITED

Project No.: 10607				
Issue Date	Revision	Status	Issued By	Checked By
01.03.2022	01		S Dop	E Jones

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Reid Jones partnership Consulting Civil & Structural Engineers	Project		Project No. 10607	
	BARLOW MOOR CENTRE		Sheet No. 1	Rev. P1
	Calculations By S Dop	Checked By E Jones	Date 01.03.2022	

1.0 PREAMBLE

Reid Jones Partnership has been appointed to design the drainage scheme for the proposed development of the Barlow Moor Centre, 485 Barlow Moor Road, Manchester.

Initial design, based on desktop study, assumed the underlying strata would be suitable for infiltration drainage from paving, but not for point discharge of surface water at discrete soakaways.

Following ground investigation and soakaway tests, infiltration to ground has been proven feasible.

Responses to the planning application by the Flood Risk Management Team were as follows:

The following information is required:

- Details of how the scheme complies with Non-Statutory Technical Standards for SuDS. This should account for the 30 year and 100 year storms (see S7, S8, S9 of the standards) and will need hydraulic calculations to support this.*
- Details of how the proposed discharge rate achieves compliance with the Local Flood Risk Management Strategy: "A 50% runoff rate reduction for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year storm event, including consideration of climate change".*
- Please present evidence of acceptance of rate/connection point from United Utilities.*
- Permeable paving is acceptable due to the statement that soil and groundwater sampling of the sub-strata indicated no impact on human health and controlled waters.*

Responses to the planning application by United Utilities (UU) were as follows:

- Further to our review of the submitted documents, DRAINAGE STATEMENT, Ref 10607 Barlow Moor Centre - Dated 16 November 2021, United Utilities recommends that condition 16 is not discharged. This is because although infiltration has been proven to be feasible, soakaways have not been utilised in the drainage plan. The drainage strategy does not confirm whether or not soakaways would be allowed by the EA in made grade. We would request confirmation of this.*
- Finally, the drainage strategy does not state the cover and invert levels of the manholes on site. We request an amended plan detailing these in metres AOD in order to determine the risk of surcharge or whether it is at risk of creating a new hydraulic low in our sewer network.*

These calculations and the updated drawing 10607-401 P5, seek to address the above issues.

2.0 AMENDED DESIGN

The surface water design has been amended to discharge all rainwater falling on the site to ground. It is proposed that rainwater pipes discharge into the permeable pavement sub-base, with a depth of sub-base provided to cater for storage for the 30 year and 100 year storms. This is in compliance with Non-Statutory Technical Standards for SuDS.

This design therefore reduces runoff to Greenfield rates.

There is presumed to be an existing connection to the UU sewer serving the existing site. Two gulleys are present in the yard; the existing building is served by foul drains. The proposal is to re-use the existing foul connection(s) for the new foul amenities in the Barlow Moor Centre. Notwithstanding this, a Section 106 application may be required due to the proposed changes.

3.0 CALCULATIONS

A notional drainage network has been analysed, with roof runoff from an area of 0.02 ha fed into the permeably paved car park area. Larger proposed planted areas and minor areas of remote permeable paving have been excluded (indicated on 10607-SK01). Calculations have been undertaken for a 30 year storm with 20% climate change applied and a 100 year storm with 40% climate change. The previously established infiltration rate of 2.2×10^{-5} m/s has been applied.

Reid Jones partnership Consulting Civil & Structural Engineers	Project		Project No. 10607	
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4.0 RESULTS AND CONCLUSIONS

The analysis shows that a 1:30 year rainfall event with climate change of 20% and a 1:100 year rainfall event with a climate change of 40% can be accommodated in the sub-base of the car park, allowing infiltration to ground.

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	0.75
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	0.300
CV	0.750	Include Intermediate Ground	x
Time of Entry (mins)	4.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
IC1	0.010	4.00	28.620	225	275.002	89.811	0.450
IC2	0.010	4.00	28.620	225	303.612	89.725	0.450
IC3			28.620	450	284.459	91.650	0.578
car park	0.034		28.620	1	283.757	95.257	0.602

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)
1.001	IC2	IC3	19.249	0.600	28.170	28.042	0.128	150.0	150	4.39	49.3
2.001	IC1	IC3	9.634	0.600	28.170	28.042	0.128	75.3	150	4.14	50.0
1.002	IC3	car park	3.675	0.600	28.042	28.018	0.024	150.0	150	4.47	49.0

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)
1.001	0.818	14.5	1.3	0.300	0.428	0.010	0.0	31	0.511
2.001	1.160	20.5	1.4	0.300	0.428	0.010	0.0	26	0.656
1.002	0.818	14.5	2.7	0.428	0.452	0.020	0.0	44	0.626

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	0.0
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
30	20	0	0
100	40	0	0

Node car park Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.07920	Invert Level (m)	28.018	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	69	Depth (m)	0.350
Safety Factor	2.0	Width (m)	14.000	Inf Depth (m)	
Porosity	0.30	Length (m)	20.000		

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute winter	IC1	10	28.196	0.026	1.3	0.0010	0.0000	OK
15 minute winter	IC2	10	28.200	0.030	1.3	0.0012	0.0000	OK
15 minute winter	IC3	10	28.087	0.045	2.6	0.0071	0.0000	OK
30 minute winter	car park	24	28.051	0.033	5.0	1.9036	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)
15 minute winter	IC1	2.001	IC3	1.3	0.438	0.063	0.0306
15 minute winter	IC2	1.001	IC3	1.3	0.378	0.089	0.0664
15 minute winter	IC3	1.002	car park	2.5	0.846	0.176	0.0118
30 minute winter	car park	Infiltration		2.0			

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

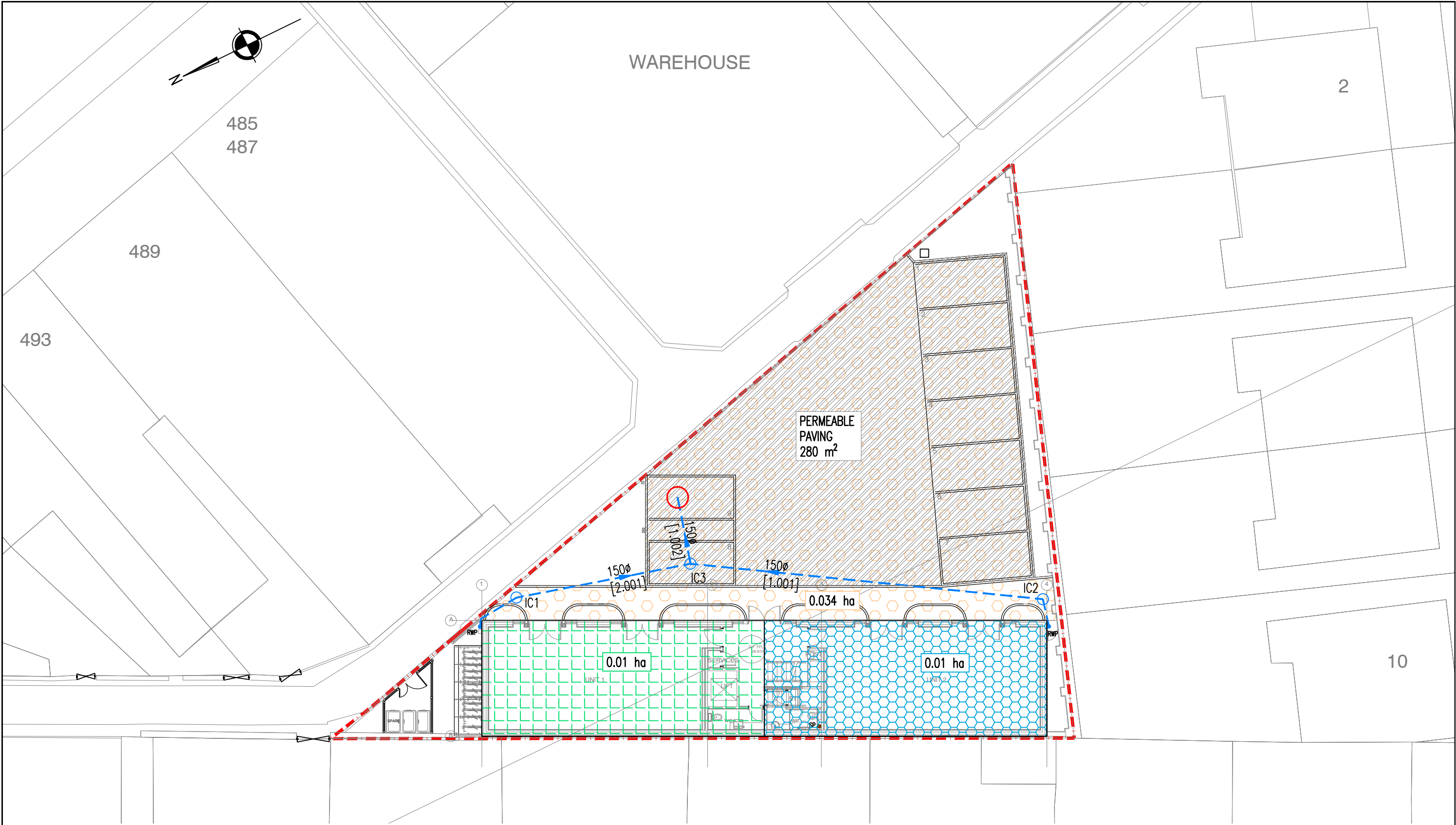
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC1	10	28.213	0.043	3.7	0.0017	0.0000	OK
15 minute winter	IC2	10	28.222	0.052	3.7	0.0021	0.0000	OK
15 minute winter	IC3	10	28.120	0.078	7.4	0.0124	0.0000	OK
30 minute winter	car park	27	28.115	0.097	14.8	7.3061	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	IC1	2.001	IC3	3.7	0.571	0.181	0.0647
15 minute winter	IC2	1.001	IC3	3.7	0.513	0.256	0.1406
15 minute summer	IC3	1.002	car park	7.3	1.100	0.505	0.0293
15 minute summer	car park	Infiltration		3.1			

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	IC1	10	28.223	0.053	5.6	0.0021	0.0000	OK
15 minute winter	IC2	10	28.235	0.065	5.6	0.0026	0.0000	OK
60 minute winter	IC3	49	28.184	0.142	5.6	0.0225	0.0000	OK
60 minute winter	car park	49	28.183	0.165	14.6	13.0462	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	IC1	2.001	IC3	5.6	0.637	0.273	0.0888
15 minute winter	IC2	1.001	IC3	5.6	0.573	0.387	0.1929
15 minute summer	IC3	1.002	car park	10.9	1.159	0.755	0.0490
15 minute summer	car park	Infiltration		3.1			



PRELIMINARY DRAWING.
NOT FOR CONSTRUCTION.

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		BOS2 MANCHESTER LIMITED		BARLOW MOOR CENTRE		NOTIONAL SW DRAINAGE NETWORK FOR CALCULATIONS				INFORMATION	
										Scale: 1:200 @ A3	
										Project No:	Drawing No:
P1		ISSUED FOR INFORMATION		SD		EJ		01.03.22		10607	SK01
Rev		Details		Drawn By		Ckd/App By		Date		Issue:	
										P1	