

Diamond Wood & Shaw Limited

The Old School · Blaby Road · Enderby · Leicester · LE19 4AR
Tel: 0116 284 8989 · Email: mail@dwsd.co.uk

Drainage Calculations

Client: S & S Contracting Ltd

Architect: Mair Land & Planning Consultants Ltd

Project: Little India Restaurant, 7 Main Street, Peckleton

Project No: 23-20082

Document No: 0-010

Issue: Rev P1: October 2023

Status: Preliminary

Date: 16/10/2023

Engineer: LM

Issue Status:
A=Approval
B=Building Regulations
C=Construction
D=Draft
P=Preliminary
R=Review
T=Tender
Z=Final Construction

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	17.890	0.170	105.2	0.007	4.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	16.680	0.150	111.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	5.760	0.080	72.0	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	18.070	0.180	100.4	0.018	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	14.590	0.070	208.4	0.027	4.00	0.0	0.600	o	150	Pipe/Conduit	
3.001	5.510	0.030	183.7	0.006	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	0.750	0.050	15.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	2.920	0.050	58.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.30	102.000	0.007	0.0	0.0	0.0	0.98	17.3	0.9
1.001	50.00	4.60	101.830	0.007	0.0	0.0	0.0	0.95	16.8	0.9
1.002	50.00	4.68	101.680	0.027	0.0	0.0	0.0	1.19	21.0	3.7
2.000	50.00	4.30	101.780	0.018	0.0	0.0	0.0	1.00	17.7	2.4
3.000	50.00	4.35	101.700	0.027	0.0	0.0	0.0	0.69	12.2	3.7
3.001	50.00	4.48	101.630	0.033	0.0	0.0	0.0	0.74	13.0	4.5
1.003	50.00	4.68	101.600	0.078	0.0	0.0	0.0	2.61	46.2	10.6
1.004	50.00	4.72	101.550	0.078	0.0	0.0	0.0	1.32	23.3	10.6

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	103.550	1.550	Open Manhole	450	1.000	102.000	150				
S2	103.550	1.720	Open Manhole	450	1.001	101.830	150	1.000	101.830	150	
S3	103.000	1.320	Open Manhole	450	1.002	101.680	150	1.001	101.680	150	
S4	102.500	0.720	Open Manhole	450	2.000	101.780	150				
S5	102.250	0.550	Open Manhole	450	3.000	101.700	150				
S6	102.500	0.870	Open Manhole	450	3.001	101.630	150	3.000	101.630	150	
CS1	102.300	0.700	Open Manhole	1200	1.003	101.600	150	1.002	101.600	150	
								2.000	101.600	150	
								3.001	101.600	150	
S7	102.300	0.750	Open Manhole	450	1.004	101.550	150	1.003	101.550	150	
Outfall	102.000	0.500	Open Manhole	0		OUTFALL		1.004	101.500	150	

No coordinates have been specified, layout information cannot be produced.

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	150	S1	103.550	102.000	1.400	Open Manhole	450
1.001	o	150	S2	103.550	101.830	1.570	Open Manhole	450
1.002	o	150	S3	103.000	101.680	1.170	Open Manhole	450
2.000	o	150	S4	102.500	101.780	0.570	Open Manhole	450
3.000	o	150	S5	102.250	101.700	0.400	Open Manhole	450
3.001	o	150	S6	102.500	101.630	0.720	Open Manhole	450
1.003	o	150	CS1	102.300	101.600	0.550	Open Manhole	1200
1.004	o	150	S7	102.300	101.550	0.600	Open Manhole	450

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	17.890	105.2	S2	103.550	101.830	1.570	Open Manhole	450
1.001	16.680	111.2	S3	103.000	101.680	1.170	Open Manhole	450
1.002	5.760	72.0	CS1	102.300	101.600	0.550	Open Manhole	1200
2.000	18.070	100.4	CS1	102.300	101.600	0.550	Open Manhole	1200
3.000	14.590	208.4	S6	102.500	101.630	0.720	Open Manhole	450
3.001	5.510	183.7	CS1	102.300	101.600	0.550	Open Manhole	1200
1.003	0.750	15.0	S7	102.300	101.550	0.600	Open Manhole	450
1.004	2.920	58.4	Outfall	102.000	101.500	0.350	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004	Outfall	102.000	101.500	0.000	0	0

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<u>Online Controls for Storm</u> <u>Orifice Manhole: S7, DS/PN: 1.004, Volume (m³): 0.1</u> Diameter (m) 0.061 Discharge Coefficient 0.600 Invert Level (m) 101.550		
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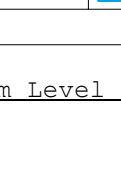
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Storage Structures for Storm

Cellular Storage Manhole: CS1, DS/PN: 1.003

Invert Level (m) 101.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	65.0	65.0	0.401	0.0	79.4
0.400	65.0	79.4			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	19.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	1	+0%					102.025
1.001	S2	15 Winter	1	+0%	100/60 Winter				101.855
1.002	S3	15 Winter	1	+0%	100/15 Summer				101.725
2.000	S4	15 Winter	1	+0%	100/30 Winter				101.820
3.000	S5	15 Winter	1	+0%	100/15 Summer				101.761
3.001	S6	15 Winter	1	+0%	30/30 Winter				101.699
1.003	CS1	60 Winter	1	+0%	30/15 Winter				101.670
1.004	S7	30 Winter	1	+0%	30/15 Summer				101.696

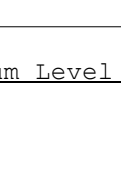
Surcharged Flooded					Half Drain		Pipe		Level
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Exceeded	
1.000	S1	-0.125	0.000	0.06		1.0	OK		
1.001	S2	-0.125	0.000	0.07		1.0	OK		
1.002	S3	-0.105	0.000	0.19		3.3	OK		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Half Drain	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	Time (mins)	Flow (l/s)		
2.000	S4	-0.110	0.000	0.16			2.7	OK	
3.000	S5	-0.089	0.000	0.35			4.0	OK	
3.001	S6	-0.081	0.000	0.43			4.6	OK	
1.003	CS1	-0.080	0.000	0.17		30	2.4	OK	
1.004	S7	-0.004	0.000	0.16			2.3	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.800	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	30	+0%					102.039
1.001	S2	15 Winter	30	+0%	100/60 Winter				101.870
1.002	S3	60 Winter	30	+0%	100/15 Summer				101.795
2.000	S4	15 Winter	30	+0%	100/30 Winter				101.845
3.000	S5	15 Winter	30	+0%	100/15 Summer				101.832
3.001	S6	60 Winter	30	+0%	30/30 Winter				101.796
1.003	CS1	60 Winter	30	+0%	30/15 Winter				101.793
1.004	S7	60 Winter	30	+0%	30/15 Summer				101.892

Surcharged Flooded					Half Drain	Pipe		Level
PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Exceeded
1.000	S1	-0.111	0.000	0.16		2.5	OK	
1.001	S2	-0.110	0.000	0.16		2.5	OK	
1.002	S3	-0.035	0.000	0.27		4.7	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow		
2.000	S4	-0.085	0.000	0.39			6.5			OK
3.000	S5	-0.018	0.000	0.83			9.3			OK
3.001	S6	0.016	0.000	0.52			5.6		SURCHARGED	
1.003	CS1	0.043	0.000	0.28		48	3.9		SURCHARGED	
1.004	S7	0.192	0.000	0.24			3.3		SURCHARGED	

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Micro Drainage

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000

Hot Start (mins) 0

Hot Start Level (mm) 0

Manhole Headloss Coeff (Global) 0.500

Foul Sewage per hectare (l/s) 0.000

Additional Flow - % of Total Flow 0.000

MADD Factor * 10m³/ha Storage 2.000

Inlet Coeffiecient 0.800

Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0

Number of Online Controls 1

Number of Offline Controls 0

Number of Storage Structures 1

Number of Time/Area Diagrams 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model

Region England and Wales Cv (Summer)

M5-60 (mm)

FSR

Cv (Summer) 0.750

19.800 Cv (Winter)

Ratio R 0.400

0.840

Margin for Flood Risk Warning (mm)

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status

DVD Status

Inertia Status

300.0

ON

OFF

OFF

Profile(s)

Duration(s) (mins)

Return Period(s) (years)

Climate Change (%)

Summer and Winter

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

1, 30, 100

0, 0, 40

									Water
PN	US/MH	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
1.000	S1	15 Winter	100	+40%					102.054
1.001	S2	60 Winter	100	+40%	100/60 Winter				101.989
1.002	S3	60 Winter	100	+40%	100/15 Summer				101.987
2.000	S4	60 Winter	100	+40%	100/30 Winter				101.989
3.000	S5	15 Winter	100	+40%	100/15 Summer				102.041
3.001	S6	60 Winter	100	+40%	30/30 Winter				101.988
1.003	CS1	60 Winter	100	+40%	30/15 Winter				101.984
1.004	S7	120 Winter	100	+40%	30/15 Summer				102.064

Surcharged Flooded					Half Drain	Pipe		
PN	US/MH	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded
1.000	S1	-0.096	0.000	0.28		4.6	OK	
1.001	S2	0.009	0.000	0.14		2.2	SURCHARGED	
1.002	S3	0.157	0.000	0.46		8.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Flow		
2.000	S4	0.059	0.000	0.35			5.8		SURCHARGED	
3.000	S5	0.191	0.000	1.49			16.8		FLOOD RISK	
3.001	S6	0.208	0.000	0.94			10.1		SURCHARGED	
1.003	CS1	0.234	0.000	0.38		64	5.3		SURCHARGED	
1.004	S7	0.364	0.000	0.33			4.7		FLOOD RISK	