



Clifton Scannell Emerson
Associates

Drainage and Water Services Report

Building B Development

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CONSULTING ENGINEERS

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1 Introduction

Clifton Scannell Emerson Associates have prepared this report on behalf of Amazon Data Services Ireland Ltd (ADSIL) of 1 Burlington Plaza, Burlington Road, Dublin 4 to accompany a planning application in respect of a proposed development at Belgard Road, Tallaght, Dublin 24.

The proposed development comprises:

- (1) The construction of a new two storey c.23,283sq.m. building for use as data storage facilities containing; data storage rooms, electrical & mechanical plant rooms and support areas including offices and welfare facilities, loading bays, back-up generators and water storage tanks; mechanical plant at roof level is screened from view on all sides by permanent screens;
- (2) 27 no. car parking spaces,
- (3) amendment to previously permitted site landscaping, boundary treatment and associated site infrastructure – Planning Permission Reg. Ref. SD16A/0093; and,
- (4) the demolition of a single storey building (floor area of 310sq.m.).

This report outlines the surface water, foul drainage and water requirements for the proposed development.

Clifton Scannell Emerson Associates representatives, Peter Fagan and Conor Doherty, have previously met with Brian Harkin (Senior Executive Engineer of South Dublin County Council) on 29th January 2018 at a preplanning meeting to discuss the development proposals.

1.1 Site Location

The site for the proposed building (Building B) is located in the southwest section of the former Jacob's Factory site on Airtown Road. The site is approximately 8.12 hectares in size and approximately 6 hectares of the site have already been developed as part of the Building A development (Planning Register Reference Number SD16A/0093). The remaining 2 hectares of the site form part of the proposed Building B development.

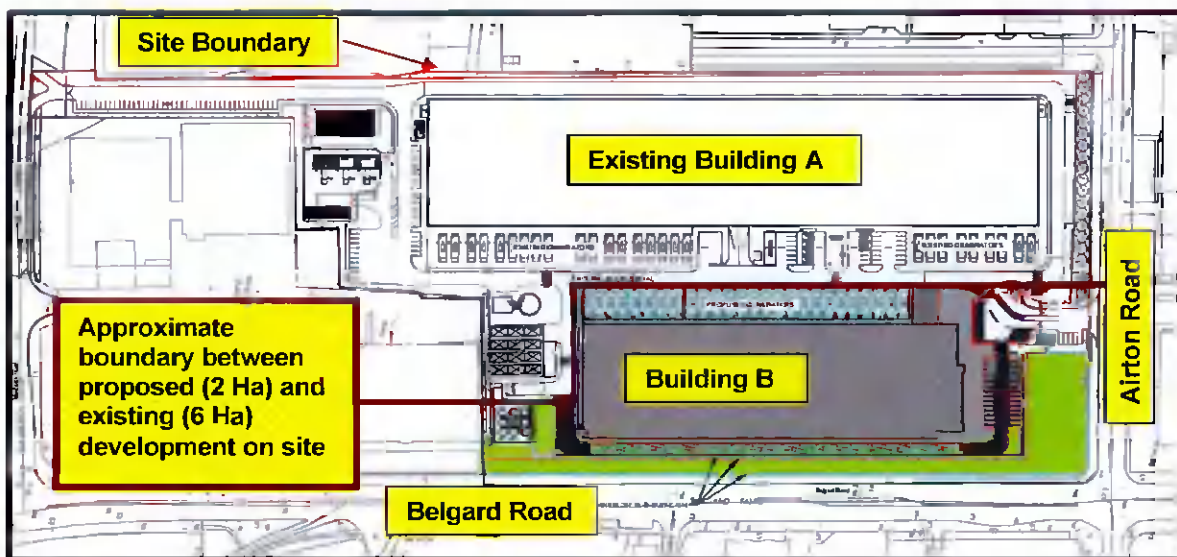


Figure 1 – Site Map

The site is bounded to the north and east by industrial units, to the west by Belgard Road and to the south by Airton Road. The primary access road to the site is off the Airton Road to the south. To the north east of the site there is an emergency access onto Mayberry Road.

1.2 Existing Land Use

As noted above, part of the site was redeveloped under Planning Register Reference No. SD16A/0093 and is now in use as a Data Storage Facility (Building A). This facility also includes a sprinkler, water humidifier, fuel tank compound and an ESB 110kV GIS substation in the north western corner of the site. The surrounding areas to the buildings on site are currently hard standing in nature with some grass areas.

The Building B site area previously housed a number of structures associated with the former Jacobs Biscuit Factory, these structures were demolished and removed under Planning Register Reference No. SD16A/0093 – this part of the site is now largely vacant however for the purposes of calculations it has been assumed that the site area associated with the subject application is hardstanding / impermeable in nature (i.e. worst case).

The location of the proposed development is currently partially occupied by a Temporary Gas Powered Generation Structure permitted under Planning Register Reference No. SD17A/0177. This structure is due to be removed in the coming months and due to its temporary nature has not been considered as part of this report.

2 Surface Water Drainage

2.1 General

The surface water drainage design for the proposed development has been informed by the following:-

- South Dublin County Council Development Plan 2016-2022 Infrastructure and Environmental Quality (IE) Policy 2- 'Surface Water & Groundwater' of the South Dublin County states that it is the policy of the Council to manage surface water and to protect and enhance ground and surface water quality to meet the requirements of the EU Water Framework Directive to limit surface water run-off from new developments through the use of Sustainable Urban Drainage Systems (SUDS).
- Section 11.6.1 (ii) South Dublin County Council Development Plan 2016-2022 which states development proposals should provide suitable design measures in compliance with the Greater Dublin Strategic Drainage Study (GSDSDS) and Greater Dublin Code of Practice for Drainage Works.
- Section 11.6.1 (iii) of South Dublin County Council Development Plan 2016-2022 which states that where SUDS devices are not feasible, approval may be given to install underground attenuation tanks in conjunction with other devices to achieve the required water quality. This issue is discussed further in Section 2.3 of this report.
- Pre-planning meeting with Mr. Brian Harkin (Senior Executive Engineer – Water Services) held on 29th January 2018 at which it was agreed to limit the runoff rate from the proposed development to 6 litres/second/hectare in line with the run-off rate adopted for the existing development on the site.

It will be illustrated that, with the area of hardstanding decreasing as part of the development and the proposed hard standing areas being attenuated in accordance with the flow rates described above, the surface water outflow will substantially decrease as a result of the proposed development.

2.2 Existing Surface Water Drainage Network

The existing surface water drainage network which serves the Building 'A' development falls in a southerly direction from the Mayberry Road end of the site towards Airton Road. The drainage network discharges to an attenuation system, solid separator and petrol interceptor before outfalling to the local South Dublin County Council network on Airton Road at the agreed post-development run-off rate of 6 litres/second/hectare.

It is proposed to connect the drainage network serving the proposed Building B development to the existing manhole located immediately upstream of the outfall to the South Dublin County Council drainage network.

2.3 Proposed Surface Water

2.3.1 General

The proposed development of the Building B site will result in a decrease in the overall surface water run-off from the proposed development. As agreed at the South Dublin County Council pre-planning meeting, the runoff from the entire site will be attenuated and the discharge will be limited to a runoff rate of 6 litres/second/hectare. The decrease in site runoff is outlined in Table 1 below.

Approximate Existing Hardstanding Area (A) for Building B	Pre-Development run-off* (Q _{EXT})	Agreed post development run-off** rate – (See above and Section 2.1)	Post-development surface water runoff from Site (Q _{PROP})	Post-development surface water runoff from Site as a % of pre-development runoff (1-(Q _{PROP} /Q _{EXT}) x100)
2 ha	278 l/s	6 l/s/ha	12 l/s	96%
*Based on Modified Rational Method = $Q_{EXT} = 2.78 \cdot C \cdot I \cdot A$ ➤ Where C=1, I = 50mm/hour and A = 2 hectares ** Q _{PROP} = Agreed post-development runoff rate x Area (A)				

Table 1 Proposed Building B Site Runoff.

The reduction in the discharge rate due to the attenuation of surface water, represents a significant improvement on the existing system in terms of the surface water load to the external drainage system. The MicroDrainage calculations for the proposed development are included within Appendix A.

The proposed Surface Water Drainage Layout is indicated on drawing no. BLDB-CSE-00-XX-DR-C-4101.

2.3.2 Assessment of Proposed Network

A design assessment was carried out on the proposed surface water design network to determine the required and existing capacity within the network.

According to the Greater Dublin Strategic Drainage Study (GDSDS), Regional Drainage Policies – Vol 2, §6.2. *“Current design criteria normally require that no flooding occurs up to 30 year return period, and properties are protected against flooding for the 100 year return period. The level of service for existing systems is usually a lower standard, with 5 years being considered a minimum requirement”*. The policies also include a commitment to the use of Sustainable Urban Drainage Systems (SuDS) on all new developments.

2.3.3 SuDS Measures

The proposed overall drainage system for the Building B site was investigated with a view to options within the Greater Dublin Strategic Drainage Study (GDSDS) being implemented.

Retention/Detention ponds and basins require significant areas of land and accordingly these are not viable for use on this development due to space constraints occasioned by the significant number of underground services required to facilitate the operation of the development. Similarly swales are deemed to be too onerous with regard land area requirements as are Infiltration and bioretention systems. Infiltration planters, dry wells, open swales, bioretention areas are similarly not practicable to the site.

Permeable grassed access roads have been incorporated where practicable as part of the design proposal as means of reducing the impermeable area of the site.

A surface water attenuation system combined with a hydrocarbon and solid separator is the most appropriate surface water management solution for this site. The measures in question are the same as those provided for the existing Building A development ensuring a consistent design approach across the site.

2.3.4 Surface Water Attenuation

The GDSDS guidelines state that new developments require attenuation and where possible improvements be made to existing drainage systems. The introduction of a new flow control

device at the outfall of the surface water network to the public network on Airton Road from the Building B site, will restrict flow from the Building B catchment to 12 l/sec.

As a means of attenuating the storm water, Stormtech MC4500 chamber cells will be connected to the drainage system as outlined on drawing no. BLDB-CSE-00-XX-DR-C-4101. The arrangement of cells was designed for the worst flow conditions within a 1 in 100 year event. Refer to MicroDrainage calculations within Appendix A. An overall attenuation volume of 900m³ is required (allowance of 10% increase in rainfall intensity to allow for the effects of Climate Change in accordance with Table 6.2 of Volume 2 and Volume 5 of the GDSDS).

The proposed attenuation system, inclusive of drainage network to the entire site, has been modelled within MicroDrainage and the required attenuation volume calculated is contained within the aforementioned calculations.

The proposed works will offer a substantial benefit to the overall catchment area in that the rates of discharge of surface water will be attenuated and controlled to levels which are a considerable improvement on the existing system.

2.3.5 Pollution Control Measures

It is proposed to provide a hydrocarbon interceptor on the proposed drainage network. This interceptor is intended to be a Klargestor NSBE 0040 model and will be located upstream of the attenuation system as agreed with Mr. Brian Harkin of South Dublin County Council. A solid separator is also proposed to be installed on the surface water network.

2.3.6 Conclusion of the Proposed Surface Water Drainage Network

The proposed development will not result in any increase to peak flows from the site. As stated above, the proposed critical discharge is calculated to be less than the discharge from the site pre-development. This is due to the fact that the proposed hardstanding site drainage has its runoff now attenuated and discharging at a rate of 12 l/sec into the existing drainage system as opposed to 278 l/s pre-development. This is a **96% reduction** in surface water discharge levels pre-development from the site.

2.4 1050mm \varnothing Surface Water Diversion

As part of the proposed development it is necessary to divert the existing 1050mm \varnothing Surface Water drain which traverses the site between the Belgard Road and Airton Road. The proposed diversion has been designed in order to maintain the equivalent capacity to the existing pipe. Following liaison with Mr. Brian Harkin of South Dublin County Council the downstream tie-in of the surface water diversion is to be located at an existing manhole at the south east corner of the Belgard Road / Airton Road junction.

The proposed 1050mm \varnothing Surface Water Drainage Layout is indicated on drawing no. BLDB-CSE-00-XX-DR-C-4104.

3 Foul Water Drainage

3.1 Existing Network

As part of the development of Building 'A' a new foul drainage network was installed on site. This network drains in a southerly direction and outfalls to the existing South Dublin County Council foul network on Airton Road. The Building 'A' foul drainage network is located to the east of the proposed Building B development.

3.2 Proposed Foul Drainage Network

3.2.1 General

The proposed foul drainage network serving the Building 'B' development serves domestic demand from the proposed offices within Building 'B'. It is estimated that there will be approximately 30 staff based on the office building on an ongoing basis. The office development includes a canteen. No commercial scale cooking activities will take place within the canteen and, as such, no grease removal systems are required.

3.2.2 Assessment of Foul Water Network

The proposed daily flows from the proposed development are estimated based on the Irish Water Code of Practice for Wastewater Infrastructure (Document No. IW-CDS-5030-03).

Flow per person per day (Office with Canteen) = 100 litres

Number of staff = 30 persons

Average Daily Demand = 3,000 litres per day

Average Day / Peak Week Demand = 1.25 x Average Daily Demand = 3,750 litres per day

Peak Demand = 5.0 x Average Day / Peak Week Demand = 18,750 litre per day = > 0.2 l/s

Peak Design Flow = 0.2 l/s

From the flow discharge tables a 150mm \varnothing pipe at a gradient of 1:108 has a capacity of 15 l/s and a velocity of 0.86 m/s when flowing full. Thus the pipe network has adequate capacity to convey the design peak flows and has a self-cleansing velocity in excess of 0.75 m/s.

4 Water Supply

4.1 Existing Water Supply Network

As part of the development of Building A, a completely new internal watermain system was constructed. Two new connections were provided to the site inclusive of kiosk for water meters, power and telecoms for these connections. The second connection provides redundancy for the proposed development.


4.2 Proposed Water Supply Network

The proposed water demand for the development comprises humidifier water demand and domestic water demand. The mechanical engineering design team have estimated humidifier water demand to be 3.5 l/s while peak water demand is estimated to be 0.2 l/s (refer Section 3.2.2 for calculations) resulting in a total water demand of 3.7 l/s.

Liaison has taken place with Mr. Conor McCarey of Irish Water in respect of available capacity. Irish Water have confirmed that 11.1 l/s of capacity is available to serve both the Building A and Building B Developments.


Fire hydrants will be provided at appropriate locations to service the development. The fire hydrant main will be constructed in line with South Dublin County Council requirements.

Appendix A – Surface Water Drainage Calculations

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Seefort Lodge Castledawson ... Blackrock County Dublin	BUILDING B	
Date 06/02/2018 File BUILDING B SWS 06022018...	Designed by CD Checked by HF	
Micro Drainage	Network 2017.1.2	

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)
S100	94.505	1.805	Open Manhole	1350	1.000	92.700	375				
S101	94.505	2.243	Open Manhole	1350	1.001	92.262	375	1.000	92.262	375	
S102	94.505	2.665	Open Manhole	1350	1.002	91.840	375	1.001	91.840	375	
S103	94.505	2.788	Open Manhole	1350	1.003	91.717	375	1.002	91.717	375	
S105	94.600	1.900	Open Manhole	1350	2.000	92.700	375				
S106	94.600	2.283	Open Manhole	1350	2.001	92.317	375	2.000	92.317	375	
S107	94.600	2.716	Open Manhole	1350	2.002	91.884	375	2.001	91.884	375	
S108	94.600	2.872	Open Manhole	1350	2.003	91.728	375	2.002	91.728	375	
S104	94.600	3.202	Open Manhole	1350	1.004	91.398	450	1.003	91.473	375	
								2.003	91.473	375	
S111	95.000	3.902	Open Manhole	1350	1.005	91.098	450	1.004	91.098	450	
TANK	95.300	4.267	Open Manhole	1350	1.006	91.033	450	1.005	91.033	450	
S112	95.800	4.832	Open Manhole	1350	1.007	90.968	225	1.006	90.968	450	
S113	94.900	4.132	Open Manhole	1200	1.008	90.768	225	1.007	90.943	225	175
S114	95.240	4.647	Open Manhole	1200	1.009	90.693	225	1.008	90.593	225	
MH0001	95.240	4.622	Open Manhole	. 0		OUTFALL		1.009	90.618	225	

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Seefort Lodge Castledawson ... Blackrock County Dublin	BUILDING B	
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Micro Drainage	Network 2017.1.2	


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	375	S100	94.505	92.700	1.430	Open Manhole	1350
1.001	o	375	S101	94.505	92.262	1.868	Open Manhole	1350
1.002	o	375	S102	94.505	91.840	2.290	Open Manhole	1350
1.003	o	375	S103	94.505	91.717	2.413	Open Manhole	1350
2.000	o	375	S105	94.600	92.700	1.525	Open Manhole	1350
2.001	o	375	S106	94.600	92.317	1.908	Open Manhole	1350
2.002	o	375	S107	94.600	91.884	2.341	Open Manhole	1350
2.003	o	375	S108	94.600	91.728	2.497	Open Manhole	1350
1.004	o	450	S104	94.600	91.398	2.752	Open Manhole	1350
1.005	o	450	S111	95.000	91.098	3.452	Open Manhole	1350
1.006	o	450	TANK	95.300	91.033	3.817	Open Manhole	1350
1.007	o	225	S112	95.800	90.968	4.607	Open Manhole	1350
1.008	o	225	S113	94.900	90.768	3.907	Open Manhole	1200
1.009	o	225	S114	95.240	90.693	4.322	Open Manhole	1200


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	87.500	199.8	S101	94.505	92.262	1.868	Open Manhole	1350
1.001	84.500	200.0	S102	94.505	91.840	2.290	Open Manhole	1350
1.002	24.500	200.0	S103	94.505	91.717	2.413	Open Manhole	1350
1.003	30.500	125.0	S104	94.600	91.473	2.752	Open Manhole	1350
2.000	76.600	200.0	S106	94.600	92.317	1.908	Open Manhole	1350
2.001	86.600	200.0	S107	94.600	91.884	2.341	Open Manhole	1350
2.002	31.200	200.0	S108	94.600	91.728	2.497	Open Manhole	1350
2.003	36.000	141.2	S104	94.600	91.473	2.752	Open Manhole	1350
1.004	15.000	50.0	S111	95.000	91.098	3.452	Open Manhole	1350
1.005	13.000	200.0	TANK	95.300	91.033	3.817	Open Manhole	1350
1.006	13.000	200.0	S112	95.800	90.968	4.382	Open Manhole	1350
1.007	5.000	200.0	S113	94.900	90.943	3.732	Open Manhole	1200
1.008	35.000	200.0	S114	95.240	90.593	4.422	Open Manhole	1200
1.009	15.000	200.0	MH0001	95.240	90.618	4.397	Open Manhole	0

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Seefort Lodge Castledawson ... Blackrock County Dublin	BUILDING B	
Date 06/02/2018	Designed by CD	
File BUILDING B SWS 06022018...	Checked by HF	
Micro Drainage	Network 2017.1.2	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.429	0.429	0.429
1.001	-	-	100	0.400	0.400	0.400
1.002	-	-	100	0.104	0.104	0.104
1.003	-	-	100	0.176	0.176	0.176
2.000	-	-	100	0.320	0.320	0.320
2.001	-	-	100	0.348	0.348	0.348
2.002	-	-	100	0.124	0.124	0.124
2.003	-	-	100	0.156	0.156	0.156
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.057	2.057	2.057

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Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	S100	375	1.430	1.868	Unclassified	1350	0	1.430	Unclassified
1.001	S101	375	1.868	2.290	Unclassified	1350	0	1.868	Unclassified
1.002	S102	375	2.290	2.413	Unclassified	1350	0	2.290	Unclassified
1.003	S103	375	2.413	2.752	Unclassified	1350	0	2.413	Unclassified
2.000	S105	375	1.525	1.908	Unclassified	1350	0	1.525	Unclassified
2.001	S106	375	1.908	2.341	Unclassified	1350	0	1.908	Unclassified
2.002	S107	375	2.341	2.497	Unclassified	1350	0	2.341	Unclassified
2.003	S108	375	2.497	2.752	Unclassified	1350	0	2.497	Unclassified
1.004	S104	450	2.752	3.452	Unclassified	1350	0	2.752	Unclassified
1.005	S111	450	3.452	3.817	Unclassified	1350	0	3.452	Unclassified
1.006	TANK	450	3.817	4.382	Unclassified	1350	0	3.817	Unclassified
1.007	S112	225	3.732	4.607	Unclassified	1350	0	4.607	Unclassified
1.008	S113	225	3.907	4.422	Unclassified	1200	0	3.907	Unclassified
1.009	S114	225	4.322	4.397	Unclassified	1200	0	4.322	Unclassified

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)
1.009	MH0001	95.240	90.618	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	1
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	15.600	Storm Duration (mins)	30
Ratio R	0.261		

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Online Controls for Storm


Hydro-Brake® Optimum Manhole: TANK, DS/PN: 1.006, Volume (m³): 8.0

Unit Reference	MD-SHE-0145-1100-1500-1100
Design Head (m)	1.500
Design Flow (l/s)	11.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	145
Invert Level (m)	91.033
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	11.0	Kick-Flo®	0.939	8.8
Flush-Flo™	0.442	11.0	Mean Flow over Head Range	-	9.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	0.800	10.1	2.000	12.6	4.000	17.5	7.000	22.9
0.200	9.9	1.000	9.1	2.200	13.2	4.500	18.5	7.500	23.7
0.300	10.7	1.200	9.9	2.400	13.7	5.000	19.5	8.000	24.4
0.400	11.0	1.400	10.6	2.600	14.3	5.500	20.4	8.500	25.2
0.500	10.9	1.600	11.3	3.000	15.3	6.000	21.3	9.000	25.9
0.600	10.8	1.800	12.0	3.500	16.4	6.500	22.1	9.500	26.5

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


Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 15.600 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.261 Cv (Winter) 0.840
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S100	15 Winter	1	+10%	30/15 Summer				92.862	-0.213
1.001	S101	15 Winter	1	+10%	30/15 Summer				92.481	-0.156
1.002	S102	15 Winter	1	+10%	30/15 Summer				92.082	-0.132
1.003	S103	15 Winter	1	+10%	30/15 Summer				91.939	-0.153
2.000	S105	15 Winter	1	+10%	100/15 Summer				92.838	-0.237
2.001	S106	15 Winter	1	+10%	30/15 Summer				92.510	-0.182
2.002	S107	15 Winter	1	+10%	30/15 Summer				92.097	-0.162
2.003	S108	15 Winter	1	+10%	30/15 Summer				91.935	-0.168
1.004	S104	15 Winter	1	+10%	30/15 Summer				91.685	-0.163
1.005	S111	15 Winter	1	+10%	1/15 Summer				91.577	0.004
1.006	TANK	480 Winter	1	+10%	1/360 Winter				91.512	0.029
1.007	S112	240 Winter	1	+10%					91.068	-0.125
1.008	S113	240 Winter	1	+10%					90.855	-0.138
1.009	S114	240 Winter	1	+10%					90.783	-0.135

PN	US/MH Name	Flooded		Pipe		Status	Level Exceeded
		Volume (m ³)	Flow / Cap. (l/s)	Flow (l/s)	Overflow (l/s)		
1.000	S100	0.000	0.36	48.8		OK	
1.001	S101	0.000	0.61	82.6		OK	
1.002	S102	0.000	0.74	90.1		OK	
1.003	S103	0.000	0.65	103.4		OK	
2.000	S105	0.000	0.27	36.8		OK	
2.001	S106	0.000	0.49	66.5		OK	
2.002	S107	0.000	0.61	75.9		OK	
2.003	S108	0.000	0.58	88.5		OK	
1.004	S104	0.000	0.61	188.8		OK	
1.005	S111	0.000	1.17	188.6		SURCHARGED	
1.006	TANK	0.000	0.06	11.0		SURCHARGED	
1.007	S112	0.000	0.41	11.0		OK	
1.008	S113	0.000	0.32	11.0		OK	
1.009	S114	0.000	0.34	11.0		OK	


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Seefort Lodge Castledawson ... Blackrock County Dublin	BUILDING B	
Date 06/02/2018	Designed by CD	
File BUILDING B SWS 06022018...	Checked by HF	
Micro Drainage	Network 2017.1.2	

Storage Structures for Storm

Tank or Pond Manhole: TANK, DS/PN: 1.006

Invert Level (m) 91.033

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	582.0	1.500	582.0	1.530	0.0

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Seefort Lodge Castledawson ... Blackrock County Dublin	BUILDING B	
Date 06/02/2018 File BUILDING B SWS 06022018...	Designed by CD Checked by HF	
Micro Drainage		Network 2017.1.2

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 15.600 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.261 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S100	15 Winter	30	+10%	30/15 Summer				93.194	0.119
1.001	S101	15 Winter	30	+10%	30/15 Summer				93.076	0.439
1.002	S102	15 Winter	30	+10%	30/15 Summer				92.614	0.400
1.003	S103	15 Winter	30	+10%	30/15 Summer				92.420	0.328
2.000	S105	15 Winter	30	+10%	100/15 Summer				92.937	-0.138
2.001	S106	15 Winter	30	+10%	30/15 Summer				92.853	0.161
2.002	S107	15 Winter	30	+10%	30/15 Summer				92.541	0.282
2.003	S108	15 Winter	30	+10%	30/15 Summer				92.369	0.266
1.004	S104	960 Winter	30	+10%	30/15 Summer				92.215	0.367
1.005	S111	960 Winter	30	+10%	1/15 Summer				92.211	0.663
1.006	TANK	960 Winter	30	+10%	1/360 Winter				92.208	0.725
1.007	S112	1440 Summer	30	+10%					91.068	-0.125
1.008	S113	1440 Summer	30	+10%					90.855	-0.138
1.009	S114	1440 Summer	30	+10%					90.783	-0.135

PN	US/MH Name	Flooded		Pipe		Level Exceeded
		Volume (m ³)	Flow / Cap. (l/s)	Flow (l/s)	Status	
1.000	S100	0.000	0.74	99.1	SURCHARGED	
1.001	S101	0.000	1.13	152.3	SURCHARGED	
1.002	S102	0.000	1.28	156.4	SURCHARGED	
1.003	S103	0.000	1.10	173.6	SURCHARGED	
2.000	S105	0.000	0.60	80.8	OK	
2.001	S106	0.000	0.98	132.0	SURCHARGED	
2.002	S107	0.000	1.06	132.3	SURCHARGED	
2.003	S108	0.000	0.98	148.8	SURCHARGED	
1.004	S104	0.000	0.16	49.1	SURCHARGED	
1.005	S111	0.000	0.29	48.8	SURCHARGED	
1.006	TANK	0.000	0.06	11.0	SURCHARGED	
1.007	S112	0.000	0.41	11.0	OK	
1.008	S113	0.000	0.32	11.0	OK	
1.009	S114	0.000	0.34	11.0	OK	

100 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 * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR M5-60 (mm)	15.600	Cv (Summer)	0.750	
Region	Scotland and Ireland	Ratio R	0.261	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Surcharged	
									Level (m)	Depth (m)
1.000	S100	15 Winter	100	+10%	30/15 Summer				94.162	1.087
1.001	S101	15 Winter	100	+10%	30/15 Summer				93.994	1.357
1.002	S102	15 Winter	100	+10%	30/15 Summer				93.340	1.125
1.003	S103	960 Winter	100	+10%	30/15 Summer				93.305	1.213
2.000	S105	15 Winter	100	+10%	100/15 Summer				93.751	0.676
2.001	S106	15 Winter	100	+10%	30/15 Summer				93.673	0.981
2.002	S107	15 Winter	100	+10%	30/15 Summer				93.243	0.984
2.003	S108	960 Winter	100	+10%	30/15 Summer				93.288	1.185
1.004	S104	960 Winter	100	+10%	30/15 Summer				93.396	1.548
1.005	S111	960 Winter	100	+10%	1/15 Summer				93.466	1.918
1.006	TANK	960 Winter	100	+10%	1/360 Winter				93.478	1.995
1.007	S112	960 Winter	100	+10%					91.080	-0.113
1.008	S113	960 Winter	100	+10%					90.864	-0.129
1.009	S114	960 Winter	100	+10%					90.790	-0.128

PN	US/MH Name	Flooded		Pipe		Level Exceeded
		Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status	
1.000	S100	0.000	0.79	106.2	SURCHARGED	
1.001	S101	0.000	1.32	177.0	SURCHARGED	
1.002	S102	0.000	1.58	192.3	SURCHARGED	
1.003	S103	0.000	0.21	32.7	SURCHARGED	
2.000	S105	0.000	0.69	92.0	SURCHARGED	
2.001	S106	0.000	1.13	151.0	SURCHARGED	
2.002	S107	0.000	1.55	166.5	SURCHARGED	
2.003	S108	0.000	0.18	27.9	SURCHARGED	
1.004	S104	0.000	0.19	59.0	SURCHARGED	
1.005	S111	0.000	0.35	58.9	SURCHARGED	
1.006	TANK	0.000	0.07	11.8	SURCHARGED	
1.007	S112	0.000	0.44	11.7	OK	
1.008	S113	0.000	0.34	11.8	OK	
1.009	S114	0.000	0.37	11.8	OK	