Intended for
Vantage Data Centers DUB11 Limited

Date
August 2021

Project Number
1620012232

VANTAGE DUBLIN DATA CENTER
VOLUME 3: TECHNICAL APPENDICIES

RAMBØLL

Volume 3: Technical Appendices
Table of Contents

Technical Appendix 1.1: IEMA Quality Mark Checklist

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
EIA Commitment 1: Regulatory Compliance[1]	
a) Does the ES, in the light of the project being assessed, identify, describe and assess effects on:	√
- Human Beings	√
- Fauna & Flora	√
- Soil	√
- Water	√
- Air	√
- Climate	√
- Landscape	√
- Cultural Heritage	√
- Material Assets	√
b) Does the ES attempt to set out the interaction between the factors set out under criteria 1.a)?	√
c) Does the ES contain a clear section, or sections, providing a description of the project comprising information on the site, design and size of the project?	√
d) Does the ES contain a section, or sections, that describe the likely significant effects of the proposed project on the environment?	√
e) Does the ES contain a clear section, or sections, that provide a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects?	√
f) Does the ES contain a clear section, or sections, that provides the data required to identify and assess the main effects which the project is likely to have on the environment?	√
g) Does the ES contain a section, or sections, that outline the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects?	√
h) Has a Non-Technical Summary been produced containing an outline of the information mentioned in 1c) to 1h)?	√
EIA Commitment 4: EIA Context	
A) Scoping	
i) Has the ES clearly stated what effects will be addressed and how this decision was reached?	√
ii) Are the main environmental concerns and their locations, where relevant, clearly identified with an explanation of the risks posed from the project? Including relevant environmental issues beyond the boundary of the proposal?	√
iii) Does the ES identify the environmental issues that will not be assessed and explain why they are not being considered further?	√

[1] A number of the criteria under this Commitment cover similar issues to criteria set out in the other three Commitments, below. Where this occurs IEMA recognise that there will inevitably be some overlap between the criteria. However, the assessment of the criteria under this Commitment is focussed on the presence or absence of the issue, whereas the assessment of similar criteria, within the other three Commitments, will focus on the quality of the consideration of the issue in question.

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
iv) Is the sub-topic scope undertaken in relation to each of the topics included in the EIA appropriate and focussed	√
B) Alternatives, including iterative design	
i) Does the ES set out the main alternatives that were considered at different points during the development of the proposal?	√
ii) Are the main reasons for the selection of the proposal over distinct alternatives and design iterations easily identifiable?	√
iii) Does the ES clearly indicate how the EIA process, environmental issues and consultee responses influenced the iterative design process that led to the proposed project?	√
EIA Commitment 5: EIA Content	
A) Baseline	
i) Does the ES describe the current condition of those aspects of the environment that are likely to be significantly affected by the development?	√
ii) Is the sensitivity / importance of the baseline environment clearly evaluated?	√
iii) Are limitations in the baseline information identified and clearly set out?	√
B) Assessment	
i) Are the methods for establishing the magnitude of impacts on the receiving environment clearly defined?	√
ii) Does the ES set out a generic methodology for the assessment and evaluation of significance OR clearly explain and justify a specific method for each environmental issue?	√
iii) Does the assessment of significance consider the impact's deviation from the established baseline condition? (e.g. the sensitivity of the environment, the extent to which the impact is reversible, etc.).	√
iv) Does the ES identify the significance of impacts that would be anticipated to remain following the successful implementation of any mitigation set out in the ES?	√
vii) Does the ES give appropriate prominence to both positive and negative effects relative to their significance?	√
C) Environmental Management	
i) Does the ES describe the measures proposed to be implemented to avoid, reduce, and if possible, remedy significant adverse impacts of the proposed development?	√
ii) Is an indication of the effectiveness of the stated mitigation measures provided?	√
iii) Are details provided related to any management plans that the ES indicates should be implemented to deliver the mitigation measures and/or monitor the environmental impact of the project?	√
iv) Does the ES identify the general groups who will be responsible for the follow-up programme?	√

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
EIA Commitment 6: EIA Communication	
A) Consultation	
i) Does the description of any consultation include details of those who were contacted, including statutory and non-statutory consultees, and the public?	√
ii) Does the main text of the ES provide a summary of the main issues raised by consultees?	√
iii) Does the ES set out if any of the issues raised by consultees will not be dealt with in the ES?	√
If so is clear justification set out as to why the issue has been scoped out?	√
B) ES Quality	
i) Does the ES provide appropriate illustrations through the use of maps and/or diagrams? In particular this should cover:	
- the location of the site, site layout and boundary,	√
- operational appearance,	√
- main environmental receptors and	√
- impacts displayed in a visual format where appropriate.	√
ii) Is the area of proposed land clearly described and indicated on an appropriate map or diagram?	√
iii) Are the anticipated timescales of construction, operation and (where appropriate) decommissioning of the proposal clearly set out in the main text?	√
iv) Is the information in the ES presented in a manner in which a non-specialist would be able to logically identify information they were seeking?	√
v) Are technical terms kept to a minimum, with a glossary provided?	√
C) Non-Technical Summary (NTS)	
i) Does the NTS provide sufficient information for the non-specialist reader to understand the main environmental impacts of the proposal without reference to the main ES?	√
ii) Are maps and diagrams included in the NTS that, at a minimum, illustrate the location of the application site, the footprint of the proposed development, and the location of relevant key features?	√
iii) Is it clear that the NTS was made available as a separate, stand-alone document to facilitate a wider readership?	√

EIA Quality Mark

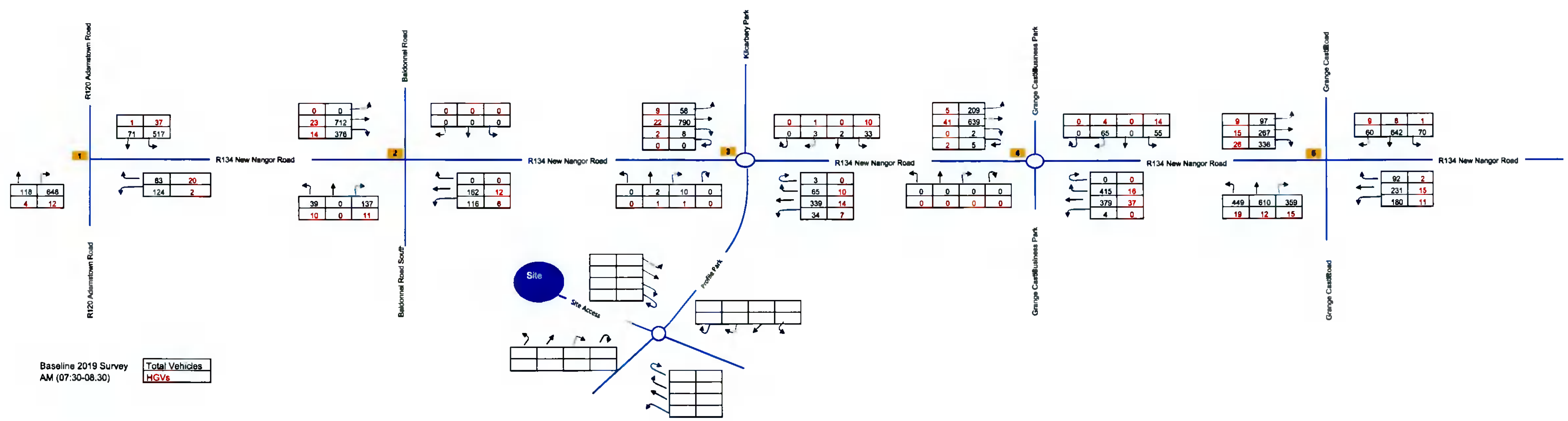
This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by the Institute of Environmental Management and Assessment (IEMA), through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

EIA Management
EIA Team Capabilities
EIA Regulatory Compliance
EIA Context & Influence
EIA Content
EIA Presentation
Improving EIA practice

To find out more about the EIA Quality Mark please visit:
www.iema.net/qmark

Technical Appendix 7.1: Traffic Flow and Distribution Diagrams



KEY

Client

Vantage Data Centers Dub11 Limited

Project Title

VDC DUB 1

Project Number

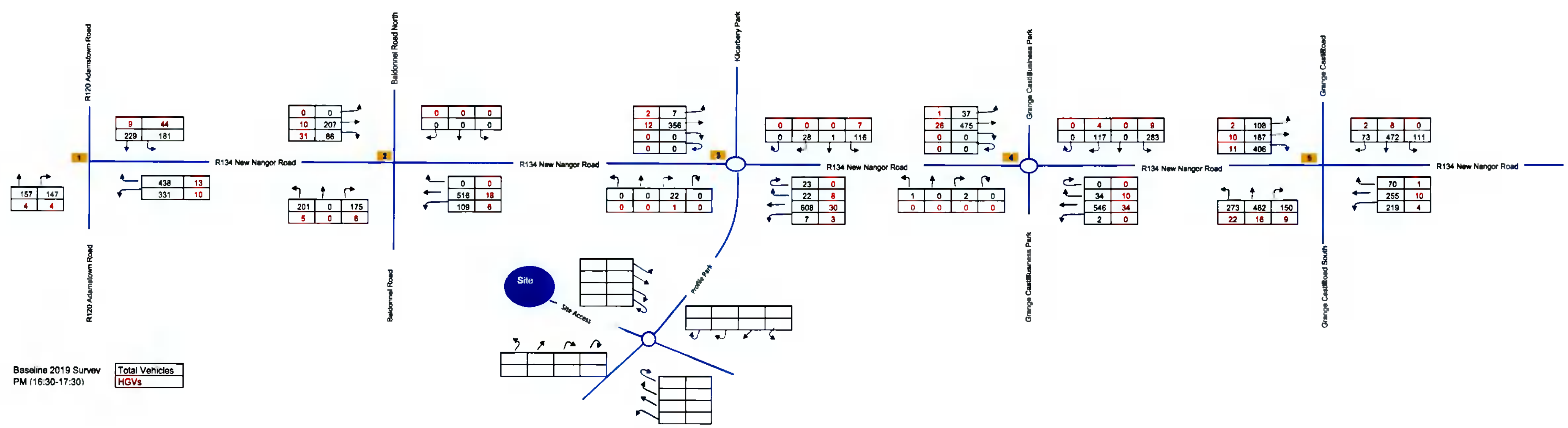
1620012232-001

Figure Title

Baseline 2019 Traffic Flows AM Peak

RAMBOLL

Date	Prepared By
28/07/2021	BVK
Figure No.	Revision
1620012232-001/EIAR/7.11	1

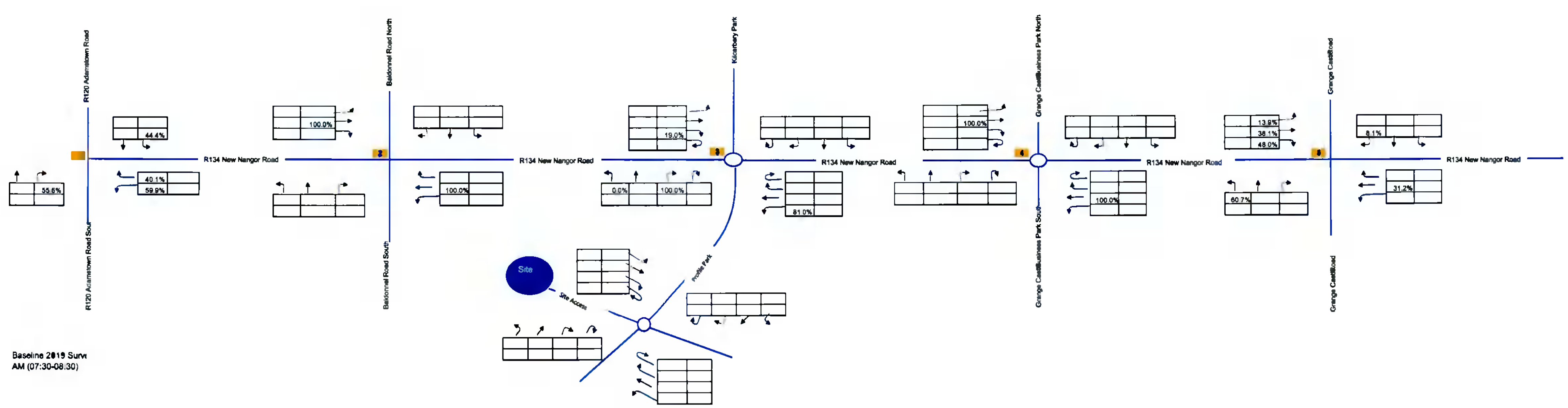


KEY

Client	Vantage Data Centers Dub11 Limited
Project Title	VDC DUB 1
Project Number	1620012232-001
Figure Title	Baseline 2019 Traffic Flows PM Peak

RAMBOLL

Date: 28/07/2021	Prepared By: BVK
Figure No.: 1620012232-001/EIAR/7.12	Revision: 1



KEY

Client

Vantage Data Centers Dub11 Limited

Project Title

VDC DUB 1

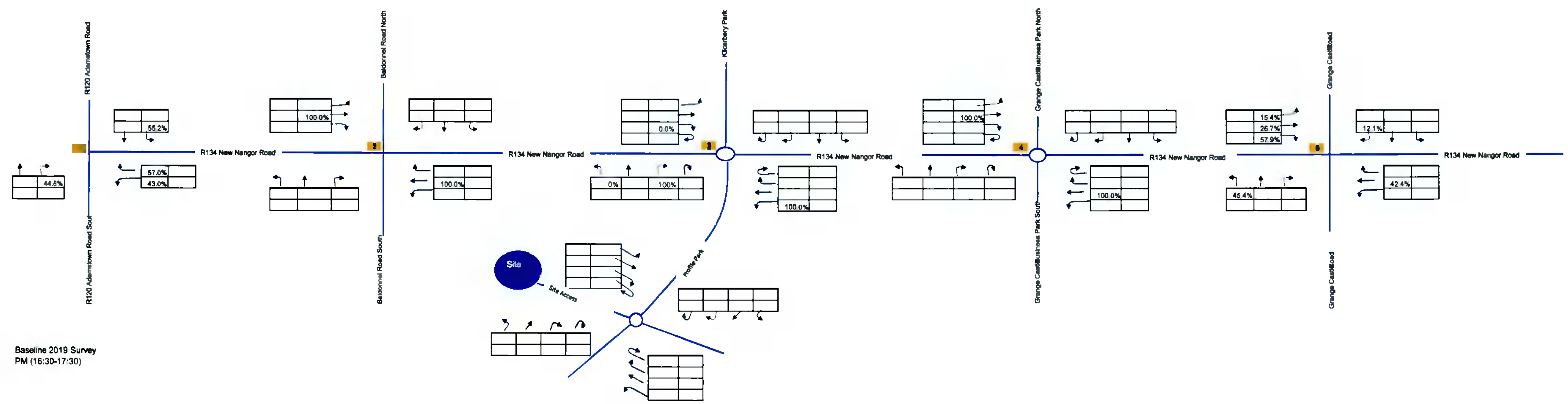
Project Number

1620012232-001

Figure Title

Baseline 2019 Trip Distribution AM Peak

Date	28/07/2021	Prepared By	BVK
Figure No.	1620012232-001/EIAR/7.13	Revision	1



KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 1

Project Number
1620012232-001

Figure Title
Baseline 2019 Trip Distribution PM Peak

RAMBOLL

Date	Prepared By
28/07/2021	BVK
Figure No. 1620012232-001/EIAR/7.14	Revision 1

Technical Appendix 7.2: Accident Data

KEY

- Site
- 'Slight' Accident
- 'Serious' Accident
- 'Fatal' Accident
- ACCIDENT DATA 2012
- ACCIDENT DATA 2013
- ACCIDENT DATA 2014
- ACCIDENT DATA 2015
- ACCIDENT DATA 2016

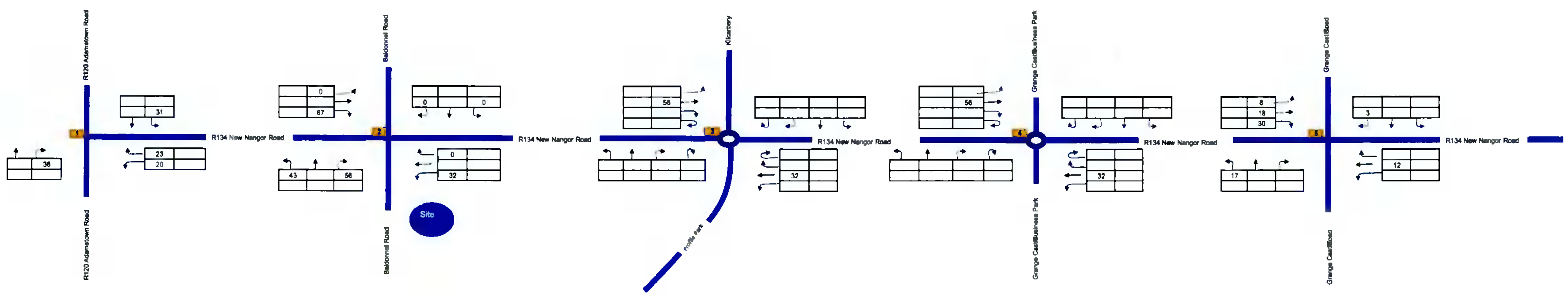
Client	Vantage Data Centers Dub11 Limited
Project Title	VDC DUB 1
Project Number	1620012232-001
Figure Title	Accident Data

RAMBOLL

Date	Prepared By
28/07/2021	BVK
Figure No.	Revision
1620012232-001/EIAR/7.21	1

Technical Appendix 7.3: Cumulative Schemes Daily Traffic Flow Diagrams

KEY



Cumulative Development: SD18A/(
Operation Stage

Daily

Trip Generation

	Daily	
	Arriv	Dep
Total Vehicles	142	142

Trip Distribution:
As per the supporting EIAR, traffic accessing/egressing the site has been taken to have a 70/30 split with 70% of traffic heading north towards the Baldonnel Road/R134 junction and 30% heading south towards the Baldonnel Road / Aylmer Road junction. Trip distribution on the other junctions will be the same with the 2019 tra

Client
Vantage Data Centers Dub11 Limited

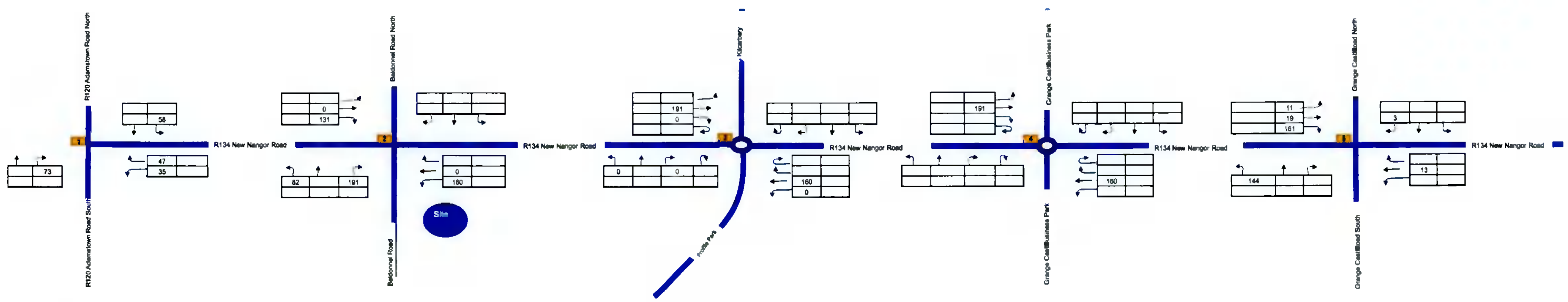
Project Title
VDC DUB 1

Project Number
1620012232-001

Figure Title
Cumulative Scheme "SD18A/0134" Traffic Flows Daily

RAMBOLL

Date	28/07/2021	Prepared By BVK
Figure No.	1620012232-001/EIAR/7.31	Revision 1



Cumulative Development: SD20A/0121
Demolition and Construction Stage

Daily

Trip Generation

	Daily	
	Arrv	Dep
Total Vehicles	420	420

SD20A/0121 (80,269sqm)
10 HGVs per hour
up to 300 vehicles per direction for commuting

Working hours: 07:00-19:00
12 hours

Trip Distribution:
Demolition and Construction traffic is distributed onto the network based upon the SD20A/0121 TIA
Light vehicle construction has been distributed across the surrounding road network in the same manner as the 2019 traffic surveys (57% of LGV arrivals to Grange Castle Busines Park are heading from Baldonnel Road South (North))
All heavy contruction traffic travels to the site from the N7 National Road and from the M50 arbital motorway via the R134 and R136 and departs along the same routes.

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 1

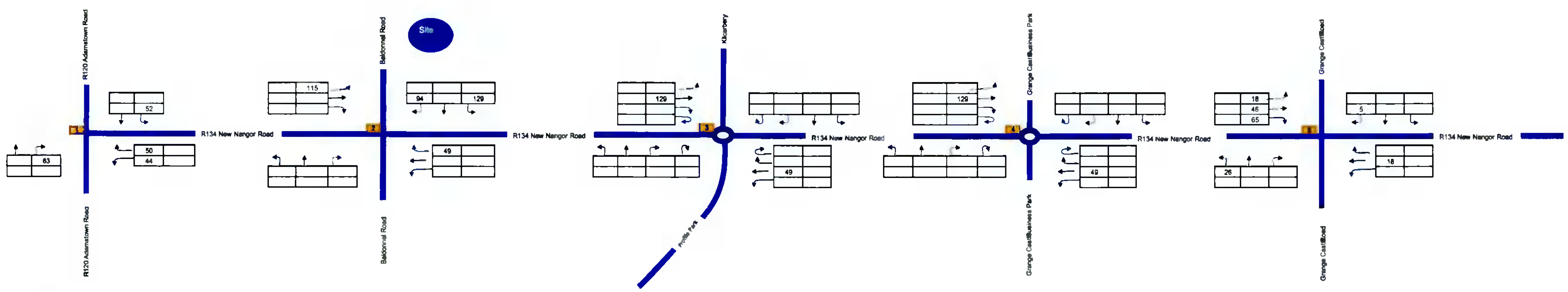
Project Number
1620012232-001

Figure Title
Cumulative Scheme "SD20A/0121" Traffic Flows Daily

RAMBOLL

Date	Prepared By
28/07/2021	BVK
Figure No.	Revision
1620012232-001/EIAR/7.32	1

KEY



Cumulative Development: SD20A/0283
Operation Stage

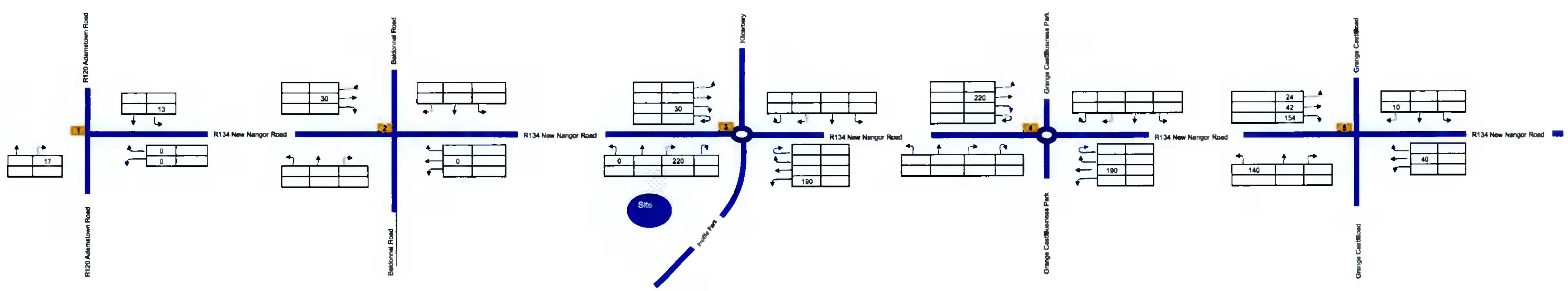
Daily

Trip Generation Based on the "SD20A_0283" EIAR

		Daily	
		Arriv	Dep
Total Vehicles		128	123

Trip Distribution:
Development traffic is distributed onto the network according to the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

Client	
Vantage Data Centers Dub11 Limited	
Project Title	
VDC DUB 1	
Project Number	
1620012232-001	
Figure Title	
Cumulative Scheme "SD20A/0283" Traffic Flows Daily	
RAMBOLL	
Date 28/07/2021	Prepared By BVK
Figure No. 1620012232-001/EIAR/7.33	Revision 1



Proposed Development
Demolition and Construction Stage

Daily

Trip Generation

	Daily	
	Arriv	Dep
Total Vehicles	220	220

SD20A/0121 (80,269sqm)
10 HGVs per hour
up to 300 vehicles per direction for commuting

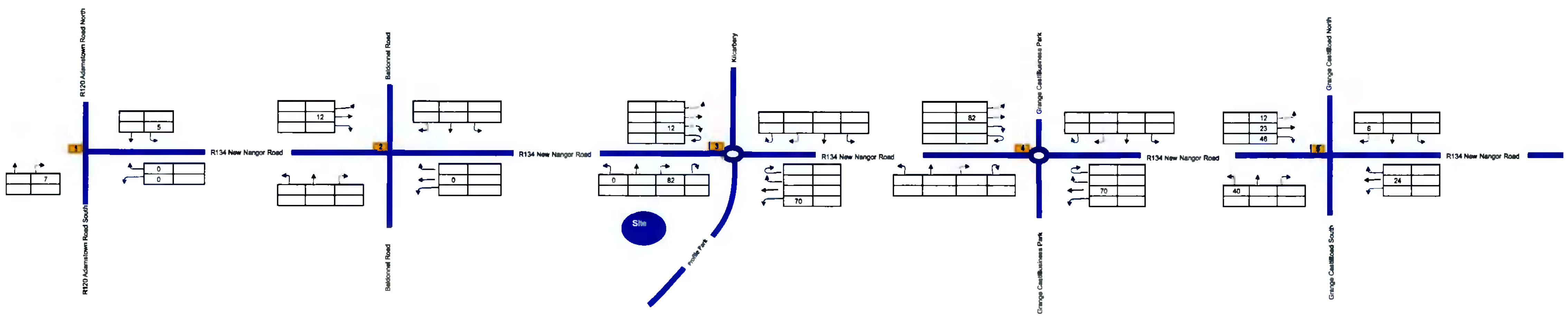
Proposed Development (42,017sqm)
5 HGVs per hour
157 vehicles per direction for commuting

Working hours 07:00-19:00
12 hours

Demolition and Construction traffic is distributed onto the network based upon the SD20A/0121 TIA
Light vehicle construction has been distributed across the surrounding road network in the same manner as the 2019 traffic surveys
All heavy contruction traffic travels to the site from the N7 National Road and from the M50 arbital motorway via the R134 and R136 and departs along the same routes

KEY

Client	Vantage Data Centers Dub11 Limited
Project Title	VDC DUB 1
Project Number	1620012232-001
Figure Title	Proposed Development Construction Traffic Flows Daily
	RAMBOLL
Date	28/07/2021
Prepared By	BVK
Figure No.	1620012232-001/EIAR/7.34
Revision	1



Proposed Development
Operation Stage

Daily

Trip Generation

	Daily	
	Arrv	Dep
Total Vehicles	82	82

Trip Distribution:
Development traffic is distributed onto the network based upon the SD20A/0121 TIA and the directional splits recorded by the 2019 traffic survey. Traffic continues straight along Nangor Road (R134).

KEY

Client
Vantage Data Centers Dub11 Limited

Project Title
VDC DUB 1

Project Number
1620012232-001

Figure Title
Proposed Development Operational Traffic Flows Daily

RAMBOLL

Date	28/07/2021	Prepared By	BVK
Figure No.	1620012232-001/EIAR/7.35	Revision	1

Technical Appendix 7.4: Proposed Development Trip Generation

VEHICLE MOVEMENTS

	Arrivals		Departures		Two-Way	
	Total Vehicles	Deliveries	Total Vehicles	Deliveries	Total Vehicles	Deliveries
00:00-01:00	0	0	0	0	0	0
01:00-02:00	0	0	0	0	0	0
02:00-03:00	0	0	0	0	0	0
03:00-04:00	0	0	0	0	0	0
04:00-05:00	0	0	0	0	0	0
05:00-06:00	0	0	0	0	0	0
06:00-07:00	4	0	4	0	8	0
07:00-08:00	0	0	0	0	0	0
08:00-09:00	60	0	10	0	70	0
09:00-10:00	0	1	0	0	0	1
10:00-11:00	0	1	0	1	0	2
11:00-12:00	0	1	0	1	0	2
12:00-13:00	0	0	0	1	0	1
13:00-14:00	0	1	0	0	0	1
14:00-15:00	4	1	4	1	8	2
15:00-16:00	0	1	0	1	0	2
16:00-17:00	0	0	0	1	0	1
17:00-18:00	10	0	60	0	70	0
18:00-19:00	0	0	0	0	0	0
19:00-20:00	0	0	0	0	0	0
20:00-21:00	0	0	0	0	0	0
21:00-22:00	0	0	0	0	0	0
22:00-23:00	4	0	4	0	8	0
23:00-24:00	0	0	0	0	0	0
Total	**82**	**6**	**82**	**6**	**164**	**12**

Worst Case Assumptions

Based on 132 FTE
Based on 27 Part-time employees
Based on 6 deliveries per day
Based on 3 shifts x 4 people

Technical Appendix 8.1: Air Quality Detailed Methodology, Modelling Approach and Data

1. DUST RISK ASSESSMENT METHODOLOGY

Table 1.1: Determining Dust Emission Magnitude

Large	Medium	Small
Demolition		
• total building volume >50,000 m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20 m above ground level	• total building volume 20,000m^3 – 50,000 m^3 • potentially dusty construction • demolition activities 10-20 m above ground level	• total building volume <20,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10 m above ground • during wetter months
Earthworks		
• total site area >10,000 m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8 m in height • total material moved >100,000 tonnes	• total site area 2,500 m^2 - 10,000 m^2 • moderately dusty soil type (e.g. silt) • 5-10 heavy earth moving vehicles active at any one time • formation of bunds 4 m – 8 m in height • total material moved 20,000 - 100,000 tonnes	• total site area <2,500 m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4 m in height • total material moved <20,000 tonnes • earthworks during wetter months
Construction		
• total building volume >100,000 m^3 • piling • on-site concrete batching • sandblasting	• total building volume 25,000 m^3 - 100,000 m^3 • potentially dusty construction material (e.g. concrete) • piling • on-site concrete batching	• total building volume <25,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout		
• >50 HGV (>3.5t) movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100 m	• 10-50 HGV (>3.5t) movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 m – 100 m	• <10 HGV (>3.5t) movements in any one day • surface material with low potential for dust release • unpaved road length <50 m

Table 1.2: Determining Receptor Sensitivity

High	Medium	Low
Sensitivities of People to Dust Soiling Effects		
• users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property would not reasonably be expected to be present continuously or regularly for extended periods as part of the normal pattern of use of the land. • indicative examples include parks and places of work.	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
Sensitivities of People to the Health Effects of PM_{10}		
• locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where human exposure is transient. • indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to Ecological Effects		

Table 1.2: Determining Receptor Sensitivity

• locations with an international or national designation *and* the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	• locations with a local designation where the features may be affected by dust deposition. • indicative example is a local Nature Reserve with dust sensitive features.

Table 1.3: Determining Sensitivity of the Area - Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	**<50**	**<100**	**<350**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 1.4: Determining Sensitivity of the Area – Human Health Impacts

	Annual Mean PM_{10} concentration	Number of Receptors	Distance from the Source (m)				
			<20	**<50**	**<100**	**<200**	**<350**
High	>32 µg/m³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	>28-32 µg/m³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	>24-28 µg/m³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium		>1	High	Medium	Low	Low	Low
Low		>1	Medium	Low	Low	Low	Low

Table 1.5: Determining Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 1.6: Determining Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 1.7: Determining Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 1.8: Determining Risk of Dust Impacts –Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

2. MODEL INPUTS AND RESULTS PROCESSING TOOLS

2.1 ADMS 5

2.1.1 The predicted impacts on local air quality associated with point source emissions associated with the operation of the scheme was assessed using Cambridge Environmental Research Consultants (CERC) atmospheric dispersion modelling system for roads (ADMS-Roads v5.2)[1]. ADMS 5 is used by a number of consultancies in the UK and across the world for air quality management and assessment studies of complex situations in large industrial areas.

2.1.2 The ADMS suite of models have been developed and validated by CERC. CERC was established in 1985 and has a leading position in environmental software development by encapsulating advanced scientific research into a number of computer models, providing user-friendly front-ends on PC based Windows platforms.

2.1.3 ADMS 5 model is an advanced dispersion model used to model the air quality impact of existing and proposed industrial installations. It was originally developed for regulatory authorities in the UK. Its many features include allowance for the impacts of buildings, complex terrain, coastlines and variations in surface roughness; dry and wet deposition; NOx chemistry schemes; short term releases (puffs); calculation of fluctuations of concentration on short timescales, odours and condensed plume visibility; and allowance for radioactive decay including γ-ray dose. It can predict long-term and short-term concentrations, as well as calculations of percentile concentrations. The science of ADMS 5 is significantly more advanced than that of most other air dispersion models in that it incorporates the latest understanding of the boundary layer structure and goes beyond the simplistic Pasquill-Gifford stability categories method with explicit calculation of important parameters.

2.1.4 The ADMS 5 model validation process includes comparisons against available measured data obtained from real world situations, field campaigns and wind tunnel experiments, with the results being published on CERC's model validation page[2]. Validation of the ADMS dispersion models has been performed using many experimental datasets that test different aspects of the models, for instance: ground/high level sources, passive and buoyant releases, buildings, complex terrain, chemistry, deposition and plume visibility. CERC is also involved in European programmes on model harmonisation, and their models were compared favourably against other EU and U.S. EPA systems. Further information in relation to this is available from the CERC web site at http://www.cerc.co.uk/environmental-software/modelvalidation.html.

2.2 Point Sources

2.2.1 The operation of the emergency generators has been assessed according to the methodology published by the UK Environmental Agency guidance[3, 4]. The UK guidance is a conservative probabilistic approach which uses the emergency generators maximum hourly emissions to determine the number of hours that all the generators could operate simultaneously in any one year with a 1% chance of exceeding the 1-hour mean objective based on the worst modelled meteorological year.

2.2.2 Following the UK Environmental Agency methodology, the hourly emissions and the allowable operating hours for emergency operation were estimated from a statistical analysis of the likelihood of breaching the 1-hour objective for NO_2 concentrations by using the hypergeometric distribution function. The allowable operating hours were calculated for a 1% probability of exceeding the one-hour mean objective at the most impacted receptor location. In accordance with the emissions from specified generators guidance, in an emergency when the operating period is greater than one hour, the calculated probability has been multiplied by 2.5. For compliance with the annual mean objectives, the predicted concentrations were scaled to the total annual operating hours that the generators were determined to run for the 1% probability of exceeding the one-hour mean objective.

2.2.3 The likelihood of exceeding the 1-hour mean objective also considers the baseline pollutant concentrations in the vicinity of the site. For the short-term assessment, the background concentration is assumed to be twice the annual mean background concentration. As the dispersion modelling was undertaken for NOx emissions, for estimating the number of exceedances of the hourly mean NO_2 objective, the exceedance concentration in the model was set as follows:

- Model exceedance concentration = (200 – twice annual mean background)/0.35.

2.2.4 For this assessment, the conversion of NOx to NO_2 has been estimated using the worst-case assumptions set out in the UK Environment Agency guidance:

- For the assessment of long term (annual mean) impacts at receptors 70% of NOx is converted to NO_2; and
- For the assessment of short term (hourly mean) impacts at receptors 35% of NOx is converted to NO_2.

2.2.5 For the annual average the PC is added to the baseline concentrations (process environmental contribution- PEC) and for the short-term assessment, the baseline concentrations are assumed to be twice the annual mean determined from the roads modelling assessment.

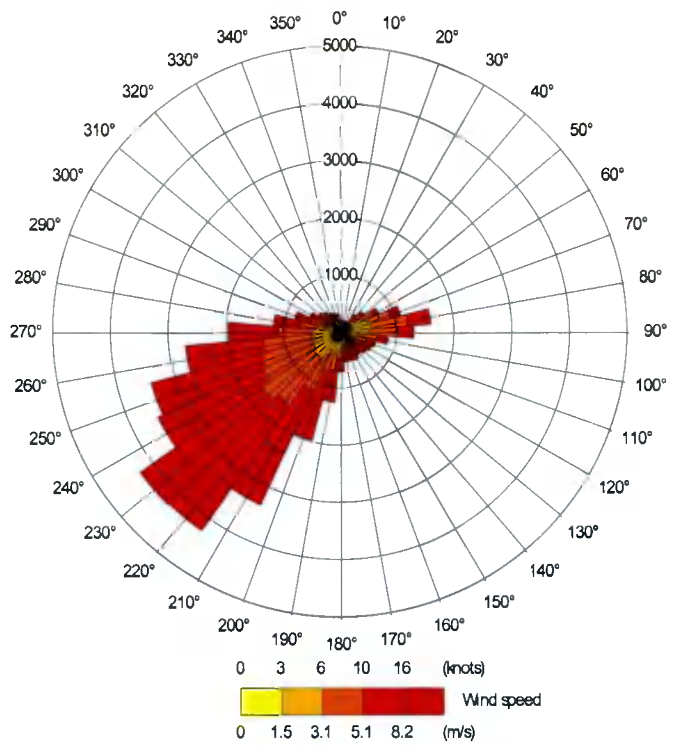
2.2.6 The dispersion modelling has been undertaken with five years of hourly sequenced meteorology data for the years 2015 to 2019 inclusive, from Casement Aerodrome which is approximately 1 km to the south of the site. The Casement Aerodrome windroses are presented in Table 2.1.

2.2.7 To undertake the assessment, each generator of the Aggreko temporary plant was allocated its own flue. The emergency generators and permanent plant engines were allocated its own flues and the flues combined in ADMS in pairs or triples when adjacent, according to the plans configuration. The location and flues parameters used in the model are shown are shown in Technical Appendix 8.1 in the EIAR Volume 3.

2.2.8 Further information on the model set up is provided in Table 2.1 and shown in Figure 2.1 and Figure 2.2.

[1] http://www.cerc.co.uk/environmental-software/ADMS-model.html
[2] http://www.cerc.co.uk/environmental-software/model-validation.html
[3] Guidance Specified generators: dispersion modelling assessment. Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment [Accessed on 04/08/2021]
[4] UK Environmental Agency. Guidance Specified generators: dispersion modelling assessment. Available at: https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf [Accessed on 04/08/2021]

Table 2.1: Roads Emissions Model Inputs

Meteorological Data	2015-2019 Hourly meteorological data from Casement Aerodrome Station has been used in the model. The 2015-2019 combined wind rose is shown below. 
ADMS	ADMS Roads version 5, ADMS5 version 5.2
Latitude	53.3
Surface Roughness	Topographic features, buildings or vegetation increase the ground's surface roughness which impact son the vertical mixing of a plume and changes the wind-speed profile at elevated heights due to mechanical turbulence generated as the air moves over the ground. Given the rural setting of the study area, a value of 0.3 m for Agricultural areas was used to represent the modelled area and the meteorological station site.
Minimum Monin-Obukhov length	The Minimum Monin-Obukhov provides a measure of the stability of the atmosphere and allows for the effect of heat production in cities, which is not represented by the meteorological data. The minimum standard value of 10 for small towns was used to represent the modelled area and the meteorological station site.

2.3 Terrain

2.3.1 The terrain in the vicinity of the site is flat with no slopes more than 10% and no large changes in surface roughness are expected. Following ADMS 5 manual recommendation, the terrain effects have not been included within the modelling.

2.4 Buildings

2.4.1 Tall buildings can have a substantial impact on the dispersion of pollutants from stacks, as a result of building downwash i.e., pollutants being drawn down in the wake of a building, giving rise to high concentrations close to the base of the buildings. Buildings within five times the stacks height have been considered in the assessment. The nearby buildings may also have an impact on the dispersion, and therefore these have also been included. The buildings set out in Table 2.2 and shown in Figure 2.1 and Figures 2.2 have been included within the ADMS 5 model.

Table 2.2: Buildings Dimensions

Name	X (m)	Y (m)	Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
Phase 1A						
DUB 11.1 & 11.2	703672	730732	14.2	85.4	62.6	85.8
DUB11 Vent Shaft	703609	730727	15.9	61.4	3.5	175.7
DUB11 dock area	703645	730771	7.0	17.1	20.5	355.8
DUB11 B	703678	730755	14.2	82.0	42.1	85.5
DUB11.1 Pump Room	703659	730767	21.5	12.9	8.3	85.7
DUB11.1 ChillerA	703675	730749	18.5	53.0	21.2	85.5
DUB11.1 ChillerB	703668	730727	18.5	22.7	36.4	176.2
DUB11 Elc Stor	703644	730731	19.1	9.3	60.0	85.5
Aggreko Plant Box	703580	730695	6.0	32.1	133.7	85.7
Kilcarbery Park	703773	730990	19.0	291.7	84.6	280.6
Kilcarbery BP A	703995	730955	12.0	26.5	87.0	93.1
Google DC	703206	730497	12.0	138.5	123.6	115.0
Kilcarbery PBP B	704038	730943	12.0	19.4	76.0	93.1
AWS	702910	730677	12.0	258.3	68.2	104.0
Phase 2B						
DUB 11.1 & 11.2	703674	730701	14.2	85.4	125.1	85.8
DUB 12 A	703662	730843	14.2	83.0	62.0	85.5
DUB11 Vent Shaft	703612	730697	15.9	122.5	3.2	175.7
DUB12 Vent Shaft	703601	730838	15.9	3.2	59.0	86.0
DUB11 dock area	703645	730771	7.0	17.1	20.5	355.8

Table 2.2: Buildings Dimensions

DUB11 B	703678	730762	14.2	82.0	27.6	85.5
DUB12 dock area	703643	730801	7.0	16.1	21.1	178.3
DUB12 B	703669	730806	14.2	74.1	13.0	85.5
DUB11.1 Pump Room	703659	730767	21.5	12.9	8.3	85.7
DUB12 Pump Room	703655	730806	21.5	12.9	8.3	85.7
DUB11.1 ChillerA	703675	730749	18.5	53.0	21.2	85.5
DUB11.1 ChillerB	703668	730727	18.5	22.7	36.4	176.2
DUB11 Elc Stor	703646	730699	19.1	9.3	123.1	85.5
Power Plant	703583	730691	14.0	23.0	118.0	85.5
DUB11.2 ChillerA	703680	730687	18.5	53.0	21.2	85.5
DUB11.2 ChillerB	703674	730665	18.5	22.7	36.4	176.2
DUB12 Chiller A	703669	730828	18.5	53.0	21.2	85.5
DUB12 ChillerB	703659	730849	18.5	22.7	36.4	176.2
DUB12 Elc Stor	703636	730841	19.1	8.7	63.1	85.7
Kilcarbery Park	703773	730990	19.0	291.7	84.6	280.6
Kilcarbery BP A	703995	730955	12.0	26.5	87.0	93.1
Kilcarbery BP B	704038	730943	12.0	19.4	76.0	93.1
Google DC	703206	730497	12.0	138.5	123.6	115.1
AWS	702910	730677	12.0	258.3	68.2	104.5
Phase2B EIRgrid	703683	730515	6.0	103.9	33.2	66.5

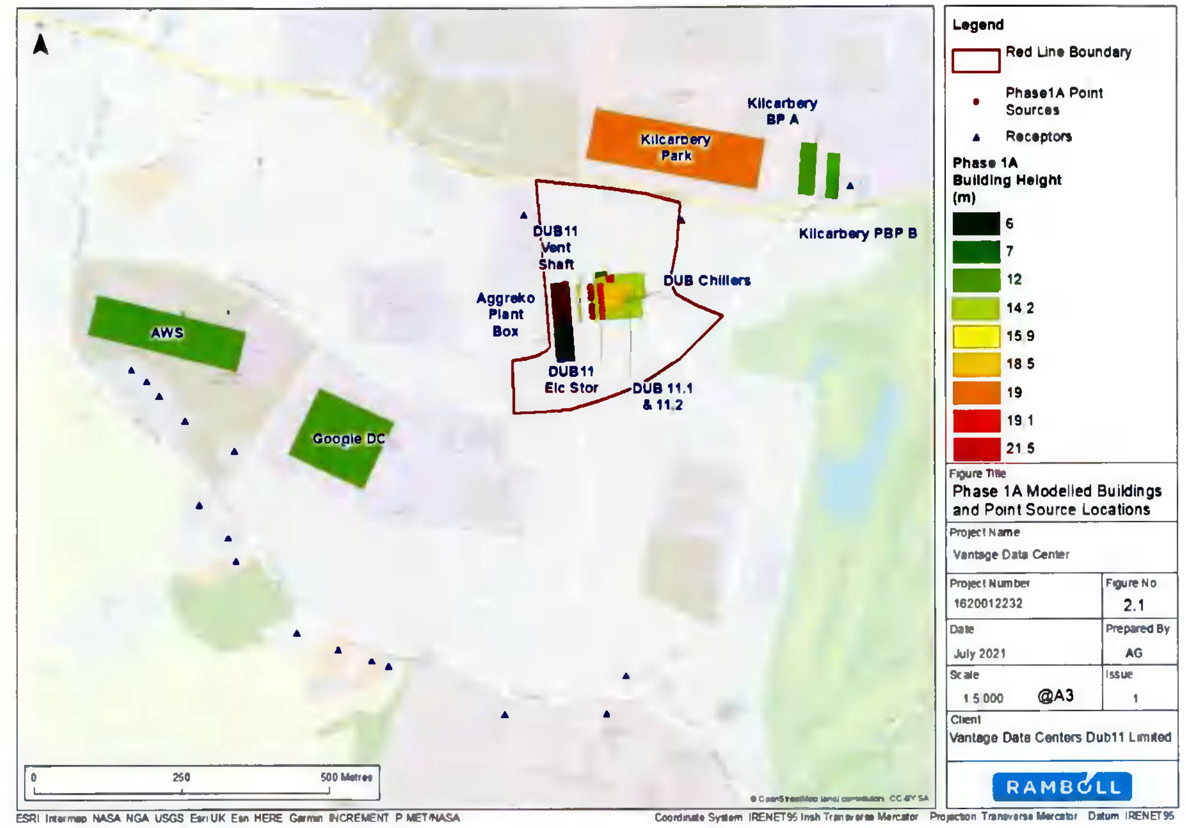


Figure 2.1: Phase 1A Modelled Buildings and Point Source Locations

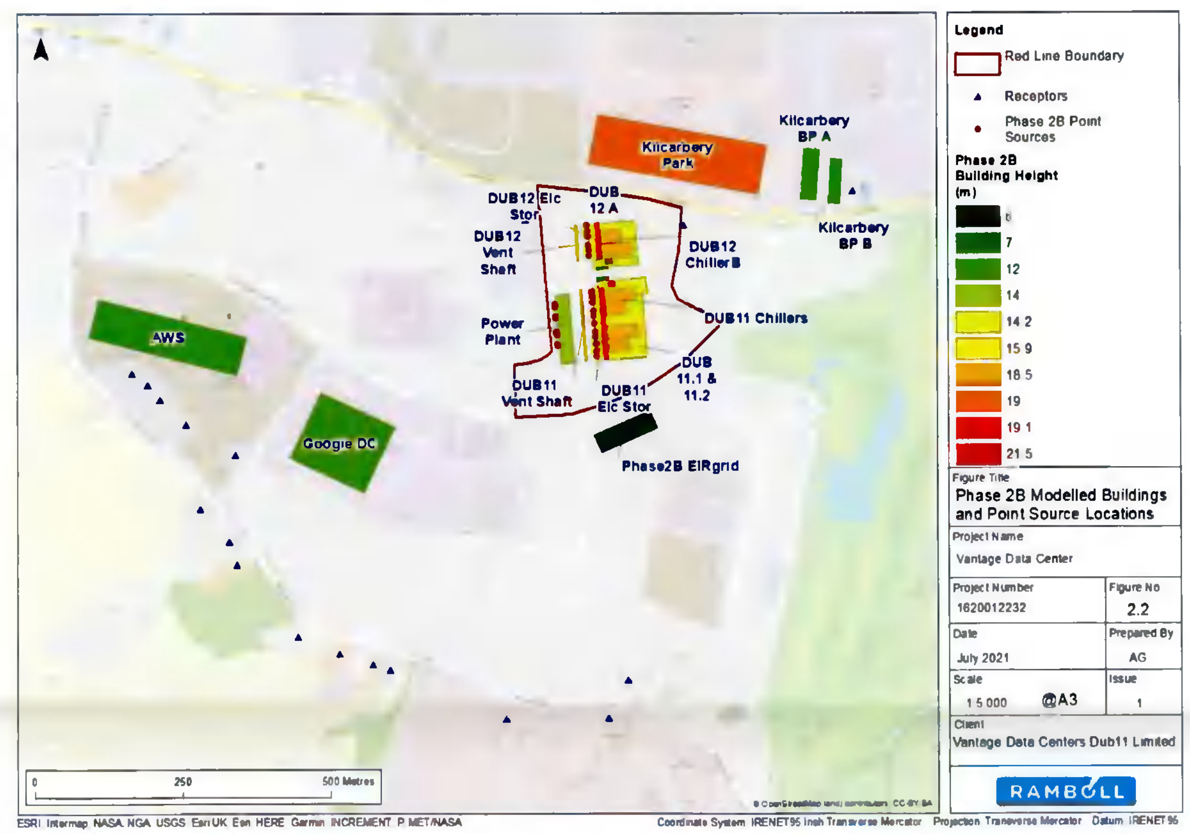


Figure 2.2: Phase 2B Modelled Buildings and Point Source Locations

2.5 Grid

2.5.1 Concentrations were predicted at three grids of receptors at 4.5m height for the contour plots centred at the coordinates 703610, 730726 with the spacing as defined in Table 2.4. Contours were modelled at 4.5m height to represent the worst case receptors results as per Appendix 8.2 in Volume 3.

Table 2.3: Modelled Grids

Ref	Start	Finish	No. points	Spacing (m)
Outer Grid 5x5 km				
x	708610	698610	21	500
y	735726	725726	21	500
z	4.5	4.5	1	
Middle Grid 3x3 km				
x	706610	700610	61	100
y	733726	727726	61	100
z	4.5	4.5	1	
Outer Grid 500x500m				
x	708610	698610	500	20
y	735726	725726	500	20
z	4.5	4.5	1	

2.6 Hypergeometric Distribution Function

Specified generators: air dispersion modelling example short term statistical analysis

2.6.1 The applicant applies for an environmental permit to operate:

- an aggregated diesel specified generator site with a capacity of 40 MWth
- any time of the year for up to a maximum of 400 hours per year

2.6.2 Operations are expected to last up to 4 hours when needed.

Therefore, the operating envelope is all 8760 hours in the year. There are 400 operational hours within the operating envelope.

2.6.3 Dispersion modelling over the full year shows that the Predicted Environmental Concentration (PEC) exceeds the hourly mean limit value of 200mg/m^3 for 300 hours at a sensitive receptor over the worst modelled meteorological year.

2.6.4 This gives:

- 400 operational hours - the sample size denoted by 'N'
- an 8760 hour operating envelope - the population size denoted by 'M'
- 300 exceedance hours - or the number of failures in the population denoted by 'e'
- 8460 non-exceedance hours - the number of successes in the population denoted by 'K', where K = M - e = 8760 - 300 = 8460

2.6.5 The probability of randomly selecting 19 or more exceedance hours (failures) in 400 sample trials, is the same as selecting at most 'N' minus 19 non-exceedance hours (successes) in 400 sample trials (N - 19 = 400 - 19 = 381). So you can calculate the probability of an exceedance, 'P' by using the cumulative hypergeometric distribution.

$$P = \sum_{i=0}^{N-19} \frac{\binom{K}{i}\binom{M-K}{N-i}}{\binom{M}{N}}$$

2.6.6 Based on these data the cumulative hypergeometric distribution is 9.3%. As the continuous operations can be up to 4 hours, you multiply this probability by 2.5, giving a probability of exceedance of 23.25%. This indicates there is potential for an exceedance of the hourly standard.

2.6.7 The cumulative hypergeometric distribution calculates the probability to be less than 1.8% when there are 330 operational hours. Again multiplying this by the 2.5 factor gives a probability of 4.6%, indicating short term exceedances are unlikely.

2.6.8 Therefore we would propose to permit the generator and restrict the operational hours to 330 hours per year.

2.7 Cumulative Impacts

2.7.1 Figure 2.3 and 2.4 represent a reproduction of the Microsoft - Grange Castle Business Park, Nangor Road, Clondalkin, Dublin 22, Planning Application reference SD20A/0283[5] contours.

Figure 9.4: Cumulative Operations – 99.8th%ile of 1-Hour NO_2 Concentrations (µg/m^3) (Year 2018)

Figure 2.3: Microsoft application 99.8th %ile NO_2 cumulative geographical variations (contours)

[5] South Dublin County Council, 2021. Microsoft, 2020. Microsoft Operations Ireland Ltd Grange Castle Business Park Dub14 & Dub15 Data Centres & Central Administration Building Environmental Impact Assessment Report Volume I Written Statement.
Available at: http://www.sdublincoco.ie/Planning/Details?p=1&r=SD20A%2F0283&regref=SD20A%2F0283 [Accessed on 04/08/2021]

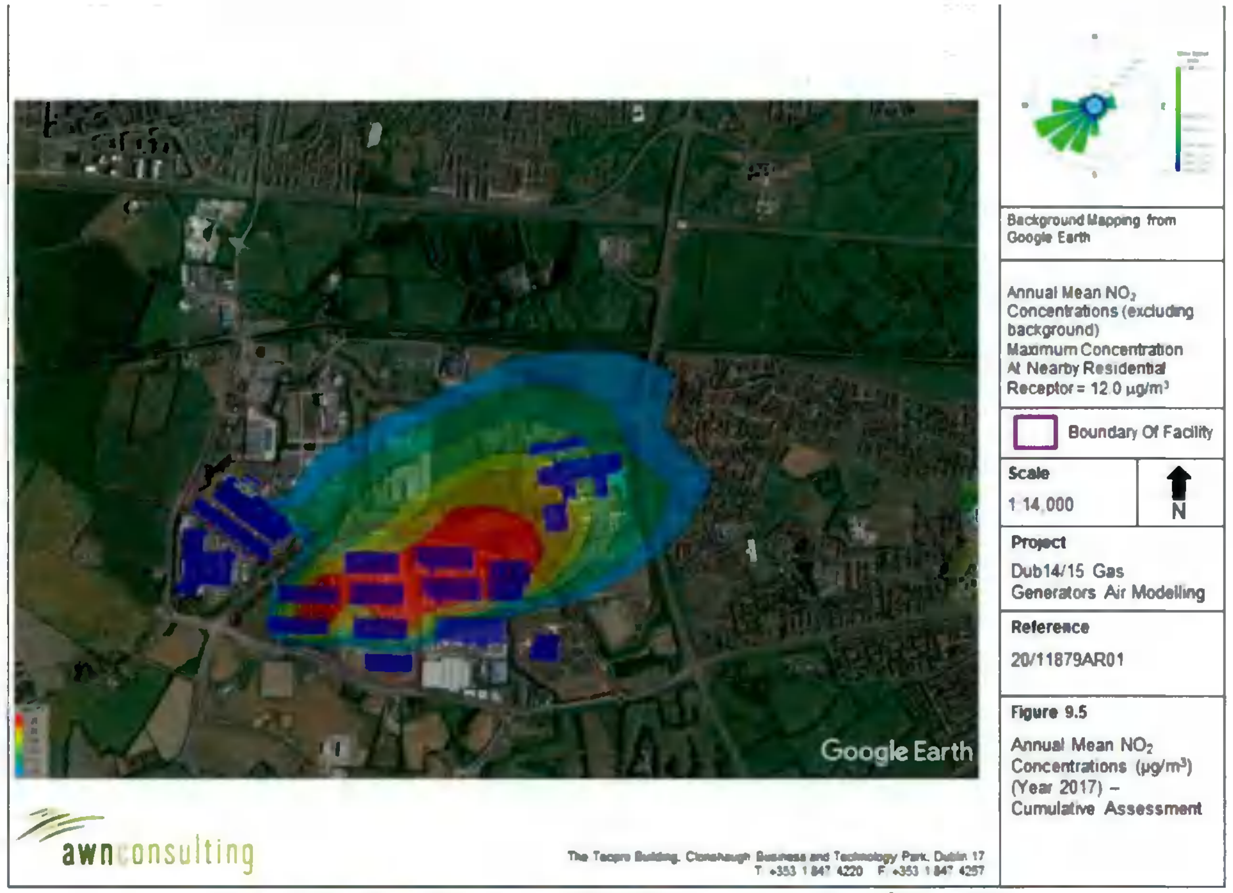


Figure 9.5: Gas Generators – Annual Mean NO_2 Concentrations (µg/m³) (Year 2017)

Figure 2.4: Microsoft application annual average NO_2 cumulative geographical variations (contours)

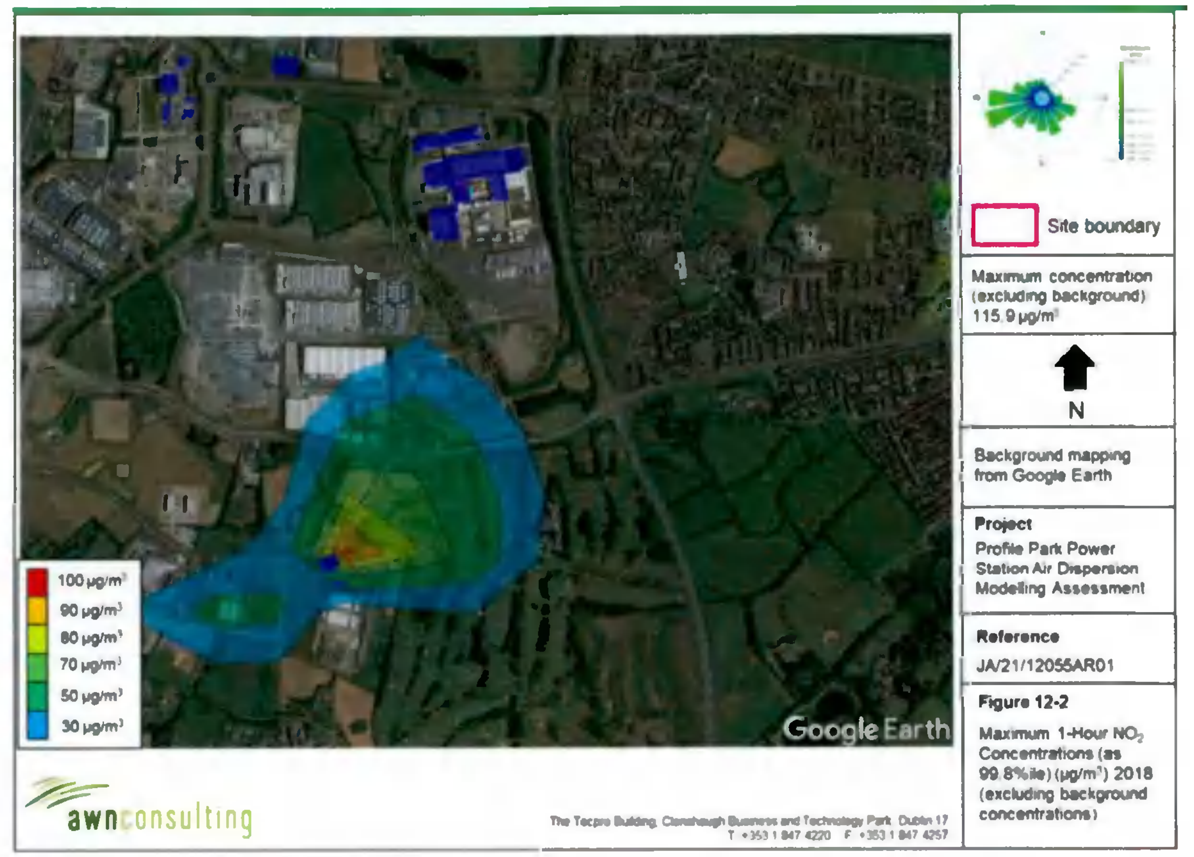


Figure 10-2: Profile Park Power Plant: Predicted NO_2 99.8th Percentile of Hourly Concentrations (2018)

Figure 2.3: Microsoft application 99.8th %ile NO_2 cumulative geographical variations (contours)

2.7.2 Figure 2.5 and 2.6 represent a reproduction of the Centrica Business Solutions Profile Park, Baldonnel, Dublin 22 planning application reference SD21A/0167[6] contours.

[6] South Dublin County Council, 2021. Tobin Consulting Engineers, 2021. Profile Park Power Plant Environmental Impact Assessment report (EIAAR). Available at: http://www.sdublincoco.ie/Planning/Details?p=1&r=SD21A%2F0167&regref=SD21A%2F0167 [Accessed on 04/08/2021

Figure 10-3: Profile Park Power Plant: Predicted Annual Mean NO_2 Concentrations (2020)

Figure 2.4: Microsoft application annual average NO_2 cumulative geographical variations (contours)

Technical Appendix 8.2: Air Quality Detailed Results

1. PHASE 1A MODEL RESULTS

1.1 Aggreko Temporary Plant

Table 8.12: Aggreko Temporary Plant Maximum Annual Mean Concentrations

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS
R1	1.5	14.3	36	17	31.7	79
R2	1.5	2.0	5	17	19.4	48
R3	1.5	7.5	19	17	24.9	62
R4	1.5	2.2	5	17	19.6	49
R5	1.5	2.4	6	17	19.8	50
R6	1.5	2.4	6	17	19.8	50
R7	1.5	0.5	1	17	17.9	45
R8	1.5	0.5	1	17	17.9	45
R9	1.5	0.4	1	17	17.8	44
R10	1.5	0.4	1	17	17.8	44
R11	1.5	0.4	1	17	17.8	44
R12	1.5	0.5	1	17	17.9	45
R13	1.5	0.6	1	17	18.0	45
R14	1.5	1.0	2	17	18.4	46
R15	1.5	1.1	3	17	18.5	46
R16	1.5	1.4	3	17	18.8	47
R17	1.5	2.1	5	17	19.5	49
R18	1.5	2.2	6	17	19.6	49
R19	1.5	2.2	5	17	19.6	49
R20	1.5	2.1	5	17	19.5	49
R21	1.5	2.0	5	17	19.4	49
R1	4.5	14.7	37	17	32.1	80
R2	4.5	2.1	5	17	19.5	49
R3	4.5	7.5	19	17	24.9	62
R4	4.5	2.2	5	17	19.6	49
R5	4.5	2.4	6	17	19.8	49
R6	4.5	2.4	6	17	19.8	50
R7	4.5	0.5	1	17	17.9	45
R8	4.5	0.5	1	17	17.9	45
R9	4.5	0.4	1	17	17.8	44
R10	4.5	0.4	1	17	17.8	44
R11	4.5	0.4	1	17	17.8	44
R12	4.5	0.5	1	17	17.9	45
R13	4.5	0.6	1	17	18.0	45
R14	4.5	1.0	2	17	18.4	46
R15	4.5	1.1	3	17	18.5	46
R16	4.5	1.4	3	17	18.8	47
R17	4.5	2.1	5	17	19.5	49
R18	4.5	2.2	6	17	19.6	49
R19	4.5	2.2	5	17	19.6	49
R20	4.5	2.1	5	17	19.5	49
R21	4.5	2.0	5	17	19.4	49
AQS		**40**				

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

Table 8.13: Aggreko Temporary Plant Maximum 1-Hour Mean (99.8th Percentile) Concentrations

Receptor	Height (m)	NO_2 99.8th %ile PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS
R1	1.5	34.3	17	35	69.1	35
R2	1.5	31.3	16	35	66.1	33
R3	1.5	24.9	12	35	59.7	30
R4	1.5	11.3	6	35	46.1	23
R5	1.5	11.7	6	35	46.5	23
R6	1.5	11.5	6	35	46.3	23
R7	1.5	16.5	8	35	51.3	26
R8	1.5	15.0	7	35	49.8	25
R9	1.5	13.9	7	35	48.7	24
R10	1.5	14.0	7	35	48.8	24
R11	1.5	13.7	7	35	48.5	24
R12	1.5	14.1	7	35	48.9	24
R13	1.5	14.7	7	35	49.5	25
R14	1.5	15.3	8	35	50.1	25
R15	1.5	15.9	8	35	50.7	25
R16	1.5	16.5	8	35	51.3	26
R17	1.5	20.9	10	35	55.7	28

Table 8.13: Aggreko Temporary Plant Maximum 1-Hour Mean (99.8th Percentile) Concentrations

Receptor	Height (m)	NO_2 99.8th %ile PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS
R18	1.5	19.6	10	35	54.4	27
R19	1.5	18.8	9	35	53.6	27
R20	1.5	18.8	9	35	53.6	27
R21	1.5	18.4	9	35	53.2	27
R1	4.5	34.7	17	35	69.5	35
R2	4.5	32.8	16	35	67.6	34
R3	4.5	24.9	12	35	59.7	30
R4	4.5	11.4	6	35	46.2	23
R5	4.5	11.7	6	35	46.5	23
R6	4.5	11.5	6	35	46.3	23
R7	4.5	16.6	8	35	51.4	26
R8	4.5	15.0	8	35	49.8	25
R9	4.5	13.9	7	35	48.7	24
R10	4.5	14.0	7	35	48.8	24
R11	4.5	13.7	7	35	48.5	24
R12	4.5	14.1	7	35	48.9	24
R13	4.5	14.9	7	35	49.7	25
R14	4.5	15.4	8	35	50.2	25
R15	4.5	15.9	8	35	50.7	25
R16	4.5	16.5	8	35	51.3	26
R17	4.5	21.0	10	35	55.8	28
R18	4.5	19.6	10	35	54.4	27
R19	4.5	18.8	9	35	53.6	27
R20	4.5	18.9	9	35	53.7	27
R21	4.5	18.5	9	35	53.3	27
AQS		**200**				

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

1.2 DUB11.1 Emergency Generators

Table 8.13: DUB11.1 Emergency Generators Maximum Annual Mean Concentrations for 106 hours Operation

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS	Number Exceeding Hours*	Probability Exceedance for 106h operation
R1	1.5	1.0	3	17	18.4	46	774.5	0.6%
R2	1.5	0.2	0	17	17.6	44	171.0	0.0%
R3	1.5	0.5	1	17	17.9	45	0.0	0.0%
R4	1.5	0.1	0	17	17.5	44	0.0	0.0%
R5	1.5	0.1	0	17	17.5	44	0.0	0.0%
R6	1.5	0.1	0	17	17.5	44	0.0	0.0%
R7	1.5	0.0	0	17	17.4	44	0.0	0.0%
R8	1.5	0.0	0	17	17.4	44	0.0	0.0%
R9	1.5	0.0	0	17	17.4	44	0.0	0.0%
R10	1.5	0.0	0	17	17.4	44	0.0	0.0%
R11	1.5	0.0	0	17	17.4	44	0.0	0.0%
R12	1.5	0.0	0	17	17.4	44	0.0	0.0%
R13	1.5	0.0	0	17	17.4	44	0.0	0.0%
R14	1.5	0.0	0	17	17.4	44	0.0	0.0%
R15	1.5	0.1	0	17	17.5	44	0.0	0.0%
R16	1.5	0.1	0	17	17.5	44	0.0	0.0%
R17	1.5	0.1	0	17	17.5	44	0.0	0.0%
R18	1.5	0.1	0	17	17.5	44	0.0	0.0%
R19	1.5	0.1	0	17	17.5	44	0.0	0.0%
R20	1.5	0.1	0	17	17.5	44	0.0	0.0%
R21	1.5	0.1	0	17	17.5	44	0.0	0.0%
R1	4.5	1.1	3	17	18.5	46	814.6	1.0%
R2	4.5	0.2	0	17	17.6	44	172.1	0.0%
R3	4.5	0.5	1	17	17.9	45	0.0	0.0%
R4	4.5	0.1	0	17	17.5	44	0.0	0.0%
R5	4.5	0.1	0	17	17.5	44	0.0	0.0%
R6	4.5	0.1	0	17	17.5	44	0.0	0.0%
R7	4.5	0.0	0	17	17.4	44	0.0	0.0%
R8	4.5	0.0	0	17	17.4	44	0.0	0.0%
R9	4.5	0.0	0	17	17.4	44	0.0	0.0%
R10	4.5	0.0	0	17	17.4	44	0.0	0.0%
R11	4.5	0.0	0	17	17.4	44	0.0	0.0%
R12	4.5	0.0	0	17	17.4	44	0.0	0.0%
R13	4.5	0.0	0	17	17.4	44	0.0	0.0%

Table 8.13: DUB11.1 Emergency Generators Maximum Annual Mean Concentrations for 106 hours Operation

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS	Number Exceeding Hours*	Probability Exceedance for 106h operation
R14	4.5	0.0	0	17	17.4	44	0.0	0.0%
R15	4.5	0.1	0	17	17.5	44	0.0	0.0%
R16	4.5	0.1	0	17	17.5	44	0.0	0.0%
R17	4.5	0.1	0	17	17.5	44	0.0	0.0%
R18	4.5	0.1	0	17	17.5	44	0.0	0.0%
R19	4.5	0.1	0	17	17.5	44	0.0	0.0%
R20	4.5	0.1	0	17	17.5	44	0.0	0.0%
R21	4.5	0.1	0	17	17.5	44	0.0	0.0%
AQS		**200**					-	

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

1.3 Permanent Power Plant

Table 8.12: Permanent Power Plant Maximum Annual Mean Concentrations

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS
R1	1.5	0.9	2.2	17	18.3	46
R2	1.5	0.1	0.2	17	17.5	44
R3	1.5	0.6	1.4	17	18.0	45
R4	1.5	0.2	0.5	17	17.6	44
R5	1.5	0.2	0.6	17	17.6	44
R6	1.5	0.2	0.6	17	17.6	44
R7	1.5	0.0	0.1	17	17.4	44
R8	1.5	0.0	0.1	17	17.4	44
R9	1.5	0.0	0.1	17	17.4	44
R10	1.5	0.0	0.1	17	17.4	44
R11	1.5	0.0	0.1	17	17.4	44
R12	1.5	0.0	0.1	17	17.4	44
R13	1.5	0.0	0.1	17	17.4	44
R14	1.5	0.1	0.2	17	17.5	44
R15	1.5	0.1	0.2	17	17.5	44
R16	1.5	0.1	0.3	17	17.5	44
R17	1.5	0.2	0.4	17	17.6	44
R18	1.5	0.2	0.4	17	17.6	44
R19	1.5	0.2	0.4	17	17.6	44
R20	1.5	0.2	0.4	17	17.6	44
R21	1.5	0.2	0.4	17	17.6	44
R1	4.5	0.9	2	17	18.3	46
R2	4.5	0.1	0	17	17.5	44
R3	4.5	0.6	1	17	18.0	45
R4	4.5	0.2	1	17	17.6	44
R5	4.5	0.2	1	17	17.6	44
R6	4.5	0.2	1	17	17.6	44
R7	4.5	0.0	0	17	17.4	44
R8	4.5	0.0	0	17	17.4	44
R9	4.5	0.0	0	17	17.4	44
R10	4.5	0.0	0	17	17.4	44
R11	4.5	0.0	0	17	17.4	44
R12	4.5	0.0	0	17	17.4	44
R13	4.5	0.0	0	17	17.4	44
R14	4.5	0.1	0	17	17.5	44
R15	4.5	0.1	0	17	17.5	44
R16	4.5	0.1	0	17	17.5	44
R17	4.5	0.2	0	17	17.6	44
R18	4.5	0.2	0	17	17.6	44
R19	4.5	0.2	0	17	17.6	44
R20	4.5	0.2	0	17	17.6	44
R21	4.5	0.2	0	17	17.6	44
AQS		**40**				

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

Table 8.13: Permanent Power Plant Maximum 1-Hour Mean (99.8th Percentile) Concentrations

Receptor	Height (m)	NO_2 99.8th %ile PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS
R1	1.5	2.8	1	35	37.6	19
R2	1.5	4.5	2	35	39.3	20
R3	1.5	1.9	1	35	36.7	18

Table 8.13: Permanent Power Plant Maximum 1-Hour Mean (99.8th Percentile) Concentrations

Receptor	Height (m)	NO_2 99.8th %ile PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS
R4	1.5	0.8	0	35	35.6	18
R5	1.5	0.8	0	35	35.6	18
R6	1.5	0.8	0	35	35.6	18
R7	1.5	1.4	1	35	36.2	18
R8	1.5	1.3	1	35	36.1	18
R9	1.5	1.2	1	35	36.0	18
R10	1.5	1.2	1	35	36.0	18
R11	1.5	1.2	1	35	36.0	18
R12	1.5	1.3	1	35	36.1	18
R13	1.5	1.3	1	35	36.1	18
R14	1.5	1.4	1	35	36.2	18
R15	1.5	1.4	1	35	36.2	18
R16	1.5	1.5	1	35	36.3	18
R17	1.5	1.8	1	35	36.6	18
R18	1.5	1.7	1	35	36.5	18
R19	1.5	1.6	1	35	36.4	18
R20	1.5	1.5	1	35	36.3	18
R21	1.5	1.5	1	35	36.3	18
R1	4.5	2.8	1	35	37.6	19
R2	4.5	4.5	2	35	39.3	20
R3	4.5	1.9	1	35	36.7	18
R4	4.5	0.8	0	35	35.6	18
R5	4.5	0.8	0	35	35.6	18
R6	4.5	0.8	0	35	35.6	18
R7	4.5	1.4	1	35	36.2	18
R8	4.5	1.3	1	35	36.1	18
R9	4.5	1.2	1	35	36.0	18
R10	4.5	1.2	1	35	36.0	18
R11	4.5	1.3	1	35	36.1	18
R12	4.5	1.3	1	35	36.1	18
R13	4.5	1.3	1	35	36.1	18
R14	4.5	1.4	1	35	36.2	18
R15	4.5	1.4	1	35	36.2	18
R16	4.5	1.4	1	35	36.2	18
R17	4.5	1.8	1	35	36.6	18
R18	4.5	1.7	1	35	36.5	18
R19	4.5	1.6	1	35	36.4	18
R20	4.5	1.5	1	35	36.3	18
R21	4.5	1.5	1	35	36.3	18
AQS		**200**				

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

1.4 DUB11.1, DUB11.2 and DUB12 Emergency Generators

Table 8.13: DUB11.1, DUB11.2 and DUB12 Emergency Generators Maximum Annual Mean Concentrations for 53 hours Operation

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS	Number Exceeding Hours*	Probability Exceedance for 53h operation
R1	1.5	0.9	2.2	17	18.3	46	1626.1	0.5%
R2	1.5	0.2	0.4	17	17.6	44	285.1	0.0%
R3	1.5	0.6	1.6	17	18.0	45	1158.3	0.0%
R4	1.5	0.2	0.5	17	17.6	44	0.0	0.0%
R5	1.5	0.2	0.5	17	17.6	44	0.0	0.0%
R6	1.5	0.2	0.5	17	17.6	44	0.0	0.0%
R7	1.5	0.0	0.1	17	17.4	44	62.4	0.0%
R8	1.5	0.0	0.1	17	17.4	44	39.2	0.0%
R9	1.5	0.0	0.1	17	17.4	44	27.2	0.0%
R10	1.5	0.0	0.1	17	17.4	44	15.1	0.0%
R11	1.5	0.0	0.1	17	17.4	44	11.1	0.0%
R12	1.5	0.0	0.1	17	17.4	44	9.1	0.0%
R13	1.5	0.0	0.1	17	17.4	44	4.0	0.0%
R14	1.5	0.1	0.2	17	17.5	44	4.0	0.0%
R15	1.5	0.1	0.2	17	17.5	44	6.1	0.0%
R16	1.5	0.1	0.2	17	17.5	44	2.0	0.0%
R17	1.5	0.1	0.3	17	17.5	44	81.4	0.0%
R18	1.5	0.1	0.3	17	17.5	44	7.1	0.0%
R19	1.5	0.1	0.3	17	17.5	44	4.0	0.0%
R20	1.5	0.1	0.3	17	17.5	44	1.0	0.0%
R21	1.5	0.1	0.3	17	17.5	44	0.0	0.0%
R1	4.5	0.9	2.3	17	18.3	46	1712.5	1.0%

Table 8.13: DUB11.1, DUB11.2 and DUB12 Emergency Generators Maximum Annual Mean Concentrations for 53 hours Operation

Receptor	Height (m)	NO_2 PC (µg/m³)	PC % AQS	NO_2 Average Background (µg/m³)	Annual Mean PEC (µg/m³)	PEC % AQS	Number Exceeding Hours*	Probability Exceedance for 53h operation
R2	4.5	0.2	0.4	17	17.6	44	292.2	0.0%
R3	4.5	0.6	1.6	17	18.0	45	1161.3	0.0%
R4	4.5	0.2	0.5	17	17.6	44	0.0	0.0%
R5	4.5	0.2	0.5	17	17.6	44	0.0	0.0%
R6	4.5	0.2	0.5	17	17.6	44	0.0	0.0%
R7	4.5	0.0	0.1	17	17.4	44	62.4	0.0%
R8	4.5	0.0	0.1	17	17.4	44	39.2	0.0%
R9	4.5	0.0	0.1	17	17.4	44	27.2	0.0%
R10	4.5	0.0	0.1	17	17.4	44	15.1	0.0%
R11	4.5	0.0	0.1	17	17.4	44	12.1	0.0%
R12	4.5	0.0	0.1	17	17.4	44	9.2	0.0%
R13	4.5	0.0	0.1	17	17.4	44	4.0	0.0%
R14	4.5	0.1	0.2	17	17.5	44	4.0	0.0%
R15	4.5	0.1	0.2	17	17.5	44	6.1	0.0%
R16	4.5	0.1	0.2	17	17.5	44	2.0	0.0%
R17	4.5	0.1	0.3	17	17.5	44	80.4	0.0%
R18	4.5	0.1	0.3	17	17.5	44	7.1	0.0%
R19	4.5	0.1	0.3	17	17.5	44	4.0	0.0%
R20	4.5	0.1	0.3	17	17.5	44	1.0	0.0%
R21	4.5	0.1	0.3	17	17.5	44	0.0	0.0%
AQS		**200**					-	

PC: process contribution
PEC: predicted environmental concentration (i.e. including background)

Technical Appendix 9.1: Glossary of Noise and Vibration Terminology

1. TERMINOLOGY RELATING TO NOISE

Table 1.1: Noise Terminology

Term	Definition
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa (20x10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 ($_{s1}/_{s2}$). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the time period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$ or Background Noise Level	A noise level index defined as the noise level exceeded for 90% of the time over the time period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
ree-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS5969.
BNL	The Basic Noise Level is the road traffic noise at a reference distance of 10 m from the road edge, expressed in terms of the L_{A10} statistical level (18-hour or one-hour), and calculated according by Calculation of Road Traffic Noise (CRTN) based on the traffic flow.
AAWT	Annual Average Weekday Traffic is the total number of vehicles annually (on Monday – Fridays) divided by the total number of weekdays in this period.
Rating Level ($L_{Ar,Tr}$)	To BS 4142:2014+A1:2019, the rating level is defined as the equivalent continuous A-weighted sound pressure level produced by the specific sound source over a given reference time interval, Tr plus any adjustment for the characteristic features of the sound (tonality, impulsivitys, etc).
NSR	A Noise Sensitive Receiver is any receiver that is classed as being sensitive to noise sources, (residential properties, churches, music studios etc).

Table 1.1: Noise Terminology

Term	Definition
$R_w + C_{tr}$	Weighted Sound Reduction index (R_w) with low frequency sound correction factor (C_{tr}). $R_w + C_{tr}$ is used when increased control of low frequency sound sources is required such as amplified music, and traffic or aircraft noise

2. TERMINOLOGY RELATING TO VIBRATION

Table 2.1: Noise Terminology

Term	Definition
VDV	Vibration Dose Value
Displacement, Acceleration and Velocity Root Mean Square (r.m.s.) and Peak Values Peak Particle Velocity (PPV)	Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values are used (i.e. the maximum displacement or maximum velocity) or r.m.s. / r.m.q. values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV), whilst human response to vibration is often described in terms of r.m.s. or r.m.q. acceleration.

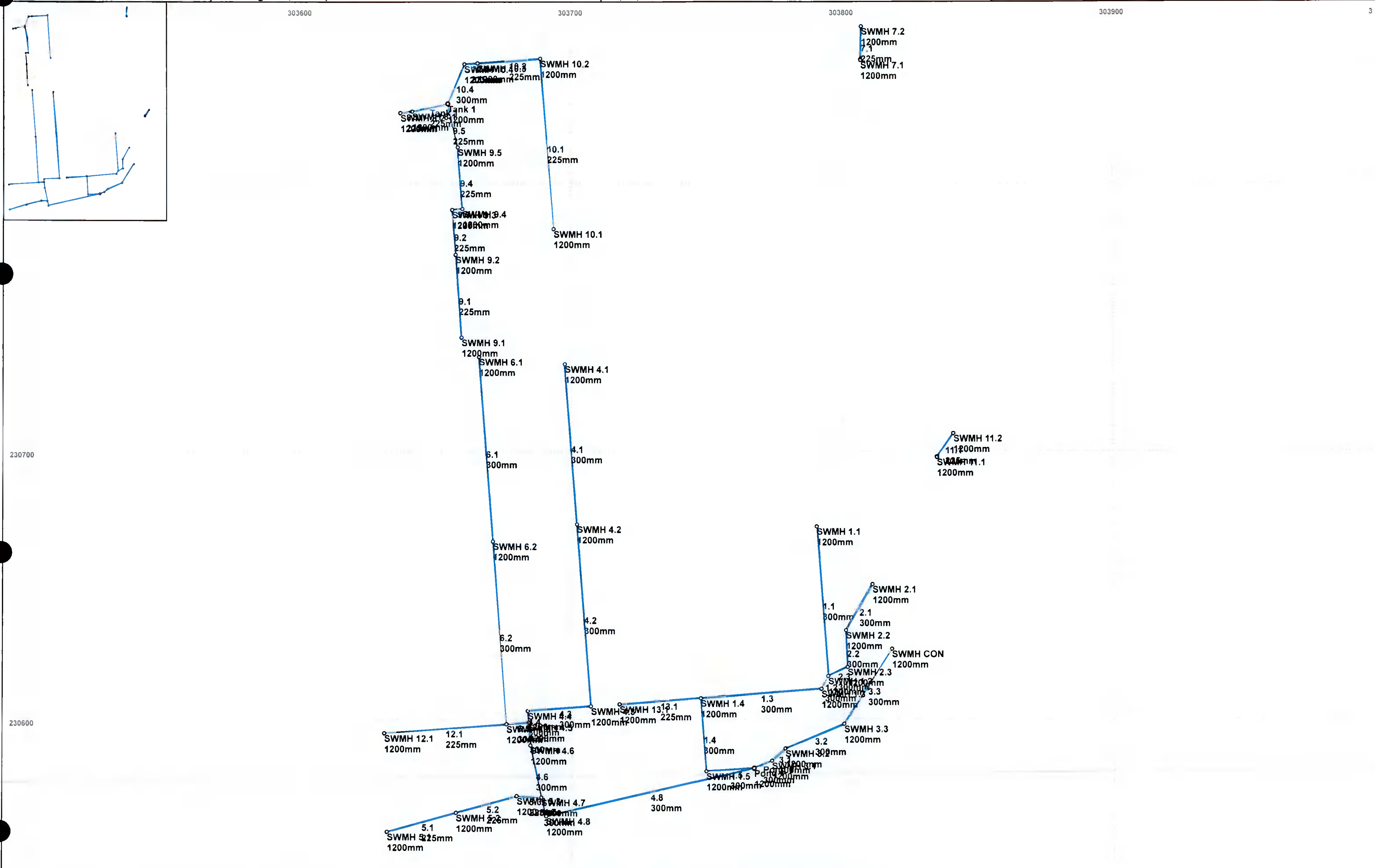
Technical Appendix 9.2: Preliminary Construction Noise Assessment

1. PLANT ITEMS AND NOISE LEVELS USED IN THE ASSESSMENT

Table 1.1: Construction Noise Plant and Sound Power Levels Used in Assessment

Activity	Plant	Sound Power Level L_{WA} dB	No. of plant	Overall L_{WA} dB	On-time (% of hour)	Reference
Site enabling works	Wheeled excavator	94	2	97	50	BS 5228 Table C4.no.10
	Dumper	111	2	114	20	BS 5228 Table C.2 ave no.s 30-31
	Loading lorries	106	2	109	10	BS 5228 Table C1. no.7
	Scaffold erection	108	1	108	20	BS 5228 Table C.2 ave no.s 26-28
	Generator	102	1	102	100	BS 5228 Table D.7 no.1
	Electric drills	104	2	107	10	BS 5228 Table C.4 no. 32
	Metal cutter	107	2	110	5	BS 5228 Table D.6 no.54
	Electric bolter	104	2	107	10	BS 5228 Table C.1 no.18
	Road sweeper	104	1	104	10	BS 5228 Table D.6 no.54
	Telescopic handler	102	1	102	20	BS 5228 Table C.4 no.45
Demolition	Dozer	106	1	106	20	BS 5228 Table C.8 no. 6
	Pneumatic breaker	116	2	119	50	BS 5228 Table D.2 ave 7-10
	Excavator (tracked)	110	2	113	50	BS 5228 Table D.3 ave no.s 34-40
	Dumper	101	2	104	33	BS 5228 Table D.7 ave no.s 81-92
	Generator	102	1	102	10	BS 5228 Table C.4 no. 32
Substructure	Excavator (tracked)	110	2	113	50	BS 5228 Table D.3 ave no.s 34-40
	Lorry mounted concrete pump	107	2	110	80	BS 5228 Table D.6 ave no.s 34 & 36
	Dumper	101	2	104	50	BS 5228 Table D.7 ave no.s 81-92
	Road sweeper	104	2	107	30	BS 5228 Table C.4 no.90
	Generator	102	1	102	10	BS 5228 Table C.4 no. 32
	Crane	97	1	97	100	BS 5228 Table C.3 ave no.s 28-30
Superstructure	Lorry mounted concrete pump	107	2	110	50	BS 5228 Table D.6 ave no.s 34 & 36
	Crane	106	1	106	50	BS 5228 Table C.4 no. 38
	Generator	102	1	102	100	BS 5228 Table C.4 no. 32
	Electric drills	104	2	107	30	BS 5228 Table D.6 no.54
	Metal cutter	107	2	110	20	BS 5228 Table C.1 no.18
	Electric bolter	104	2	107	20	BS 5228 Table D.6 no.54
	Hydraulic access platforms	95	2	98	70	BS 5228 Table C.4 no. 57
	Road sweeper	104	2	107	10	BS 5228 Table C.4 no.90
Internal works / Fit-out	Generator	102	1	102	100	BS 5228 Table C.4 no. 32
	Welding plant	102	2	105	30	BS 5228 Table C.3 no. 31
	Electric drills	104	3	109	10	BS 5228 Table D.6 no. 54
External works	Generator	102	1	102	100	BS 5228 Table C.4 no. 32
	Excavator (tracked)	110	2	113	50	BS 5228 Table D.3 ave no.s 34-40
	Road sweeper	104	2	107	10	BS 5228 Table C.4 no.90
	Dumper	101	2	104	33	BS 5228 Table D.7 ave no.s 81-92
	Cement mixer truck	105	2	108	10	BS 5228 Table C.4 ave no.s 18 & 20

PINNACLE CONSULTING ENGINEERS	Pinnacle Engineering Grosvenor Court 67a Patrick Street Dun Laoghaire, County Dublin	File: Apollo Hydraulic Model.pfd Network: Storm Network Francois Jansen van Rensburg 16/08/2021	Page 1 Apollo Hydraulic Model Rev 1



Technical Appendix 10.1: Engineering Planning Strategy

PINNACLE
CONSULTING ENGINEERS

DB11.1, Profile Park, Grange Castle, Lucan, Co. Dublin

Engineering Planning Report

July 2021

P210501

VANTAGE™ DATA CENTERS

Document No.: DUB11.1-RP-00-C001-V0-WS3-PIN

STRUCTURAL · CIVIL · DUE DILIGENCE · ENGINEERING MASTERPLANNING
FLOOD MANAGEMENT · INFRASTRUCTURE DESIGN
PRE-DEVELOPMENT ENGINEERING · BIM · TRANSPORTATION

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APPROVALS

	Name	Signature	Position	Date
Prepared by	S. O'Reilly		Associate	10/07/2021
Reviewed by	J. Mayer		Director	11/07/2021
Approved by	J. Mayer		Director	12/07/2021

REVISIONS

Revision By	Date	Context

VERSIONS

Number	By	Date	Context
0	S. O'Reilly	15/07/2021	WS3 Submission

SOURCES OF DATA

Burns McDonnell	Land Survey Services Ltd.
Google	Marston Planning

REPORT CONTENTS

Executive Summary

This report was prepared for South Dublin County Council in connection with the planning application for a data centre development and addresses the existing and proposed civil infrastructure, for the proposed development, located in Profile Park, Grange Castle Business Park, Lucan, Co. Dublin.

Vantage Data Centers Dub 11 Ltd. are applying for permission for development at this site that includes an abandoned single storey residential property on the New Nangor Road (R134), Dublin 22; and on land within the townlands of Ballybane and Kilbride within Profile Park, Clondalkin, Dublin 22 on an overall site of 8.7 hectares.

The development will consist of the demolition of the abandoned single storey dwelling and associated building (206sqm); and the construction of 2 no. two storey data centres with plant at roof level of each facility and associated ancillary development that will have a gross floor area of 40,589sqm; that will consist of the following:

- 1 no. two storey data center (Building 11) that will be located to the south of the site and will have a gross floor area of 24,667sqm. It will include 22 no. emergency generators located at ground floor level within a compound to the western side of the data center with associated flues that will be 22.3m in height;
- 1 no. two storey data center (Building 12) that will be located to the north of the site, and to the immediate north of Building 11 and will have a gross floor area of 12,915sqm. It will include 11 no. emergency generators located at ground floor level within a compound to the western side of the data center with associated flues that will be 22.3m in height;
- Each of the two data centers will includes data storage rooms, associated electrical and mechanical plant rooms, loading bays, maintenance and storage spaces, office administration areas, and plant including PV panels at roof level as well as a separate house generator for each facility that will provide emergency power to the admin and ancillary spaces. Each generator will also include a diesel tank and there will be a re-fuelling area to serve the proposed emergency generators;
- The overall height of each data center apart from the flues and plant at roof level is c. 14.23m above the finished floor level;
- Construction of internal road network and circulation areas, with main entrance off Falcon Avenue to the south, as well as a secondary vehicular access off Legacy Drive to the south-west, both from within Profile Park; footpaths, provision of 144 no. car parking spaces, and 66 no. cycle parking spaces;
- single storey step-up substation (38sqm) as well as switch substation (121sqm);
- AGI Gas Regulator compound that includes 3 no. single storey buildings (134sqm);
- construction of a gas powered generation plant in the form of a 13m high single storey building with a gross floor area of 2,714sqm that will contain 10 gas generators with associated flues that will be 25m in height, and grouped in pairs and threes. The Gas Plant will be located to the west of Building 11;
- Ancillary site development works, that will include reorientation of the Baldonnel Stream, biodiversity management initiatives, attenuation ponds and the installation and connection to the underground foul and storm water drainage network, and installation of utility ducts and cables, that will include the drilling and laying of ducts

and cables under the internal road network within Profile Park. Other ancillary site development works will include hard and soft landscaping, lighting, fencing, signage, services road, entrance gates, sprinkler tanks and pump room; and

- A temporary gas powered generation plant within a walled yard containing 22no. generator units in containers, each with associated flues (each 25m high), 12 transformers and 10 containers of controls with a total area of 731sqm that will increase the overall gross floor area to 41,186sqm overall, and is to be located to the west of, and associated with the first phase of Building 11, and will be required for a period of up to 2 years if connection to the national grid is delayed. This temporary plant will not be built if the connection to the national grid is in place prior to the operation of Building 11.

The development will be accessed from Falcon Avenue and Legacy Drive from within the Profile Park Business Park that contains an access from the New Nangor Road (R134).

The site is bounded to the south by an estate road known as Falcon Avenue, to the north by Nangor Road (R134), to the east by existing greenfield and to the west by existing commercial units and greenfield.

The report should be read in conjunction with our engineering planning drawings, and deals with existing foul, surface water and water mains present within the surrounding area, and the proposals for the site with regards to these services.

The report also discusses the ground conditions present on the site, the current proposals for achieving the development plateau and sustainability measures incorporated with the development.

1 Introduction

The applicant proposes to construct 2No. two-storey data centres and associated office areas, which will be accessed off Falcon Avenue to the south. The purpose of this report is to address the civil infrastructural aspects of the proposed data centre development, located in Profile Park, Grange Castle Business Park, Lucan, Co. Dublin.

The total subject site area extends to circa 21.49 acres (8.7 ha) and is currently a greenfield site. The site is bounded to the north by the New Nangor Road, to the south by Falcon Avenue and to the east by existing greenfield and to the west by existing commercial units and greenfield.

There are no known public sewer drainage pipes or watermains, presently located on the subject site.

This report has been prepared to outline the existing and proposed drainage, pollution control measures and water main infrastructure, in order to support the proposed development application.

The location of the site is indicated on the map extract below - Figure 1.

FIGURE 1 - Site Location (Source Google Maps)

2 Existing Drainage & Watermain Services

2.1 Existing Foul Drainage Networks

South Dublin County Council record drawings have identified 3 No. 150mm / 225mm Ø spur connections, located adjacent to the southern boundary of the property & Profile Park. These spur connections were left out to facilitate development of these lands. These spur connections are joined into the reticulation netwrok for Profile Park.

The existing foul sewer reticulation network has adequate capacity to cater for the proposed effluent discharge from the subject site and there are no known issues noted with the sewer reticulation network.

2.2 Existing Surface Water Drainage Networks

The topographical survey as carried out has identified an open channel / stream which runs along a portion of the eastern boundary, up to the north, prior to discharging to the west into a culverted system beneath Grange Castle Motor Company. This ditch network then runs in a westerly direction via a tributary into the Camac River.

The aforementioned open ditch network has been identified as having capacity to accommodate the proposed discharge from the subject site.

2.3 Existing Water Main Network

South Dublin County Council record drawings have identified an existing 6" (160mm) Ø main located along the southern boundary of the property, within Falcon Avenue adjacent to the subject site. 2No. 160mm Ø capped connections with sluice valves, have been left off the aforementioned water main, in order to facilitate development of these lands.

There is also an existing 700mm Ø trunk water main running parallel to the New Nangor Road adjacent to the northern boundary of the subject site.

From discussions with the South Dublin County Council, it is understood that there is adequate capacity within the existing watermain network to supply the proposed development.

3 Proposed Site Drainage & Water Supply

3.1 Proposed Foul Water Drainage

It is proposed to discharge foul water from the proposed development, via a 225mm Ø gravity foul sewer outfall, laid from MH's FWMH 1.1 & 2.1 and discharge into the existing 225mm Ø spur connection laid across Falcon Avenue, which is connected to the existing foul sewer network laid along the western edge of Falcon Avenue.

The office building contains 6 No. WC's, with a predicted maximum number of daily staff being in the region of circa 144 people, over a 24hr period. Based on Irish Water's Code of Practice of 150ltr/hd/day, the peak wastewater flow will not be in excess of circa 0.25l/s (@1DWF) & a peak discharge of 1.5l/s (@6DWF).

The proposed network connects into the EX MH FW11, with an invert level of 70.405m, prior to the ultimate outfall discharging into the Profile Park reticulation network, - refer Drawing No. DB11.1-DR-UG-C128-V0-WS3-PIN.

All on-site foul sewers have been designed to be a minimum 225mm Ø diameter pipes, with gradients designed to achieve self-cleansing velocities.

3.2 Proposed Surface Water Drainage

Storm water from the proposed development has been designed in accordance with the GDSDS and ensures that Best Management Practice has been incorporated into the design.

It should be noted that the subject site currently comprises a greenfield site and the proposed surface water measures are aimed at improving the general surface water management of the site, by introducing interceptors, attenuation measures and by restricting the ultimate discharge, etc.

Storm water from the rear roof areas of the proposed building units, will be directed via rain water pipes into an on-site reticulation system. The outflow from this system will be connected into the surface water drainage network collecting run-off from the road areas and will be ultimately discharged into a stormwater storage pond / below ground Stormtech tanks (or similar approved) - refer Drawing No. DB11.1-DR-UG-C128-V0-WS3-PIN.

The front roof areas of the buildings drain into the permeable paving sub-base, prior to the ultimate discharge into the ditch / stream to the east.

Based on the contributing area for this current application, i.e. circa 22,400m^2 (2.24Ha), the total attenuation volume required has been calculated as being circa 1,204m^3, which will be provided for as mentioned above, in a storage pond, permeable paving and a below ground storage tank - Refer Appendix B for Surface Water Calculations.

The following volumes have been provided for within the storage elements:-

- Tank 1 provides a storage volume of 500m^3
- Permeable paving sub-base
- The attenuation pond comprises a storage volume of circa 1,600m^3

It should be noted that Tanks 1 discharges into the aforementioned ditch / stream to the west.

Storm water from all car park areas and access roads / delivery areas will be drained as follows:-

- A series of on-site gullies and channels draining into a separate system of below ground gravity storm water sewers
- Permeable Paving

Prior to discharging into the proposed pond, the storm water from the car park and access roads, which is drained via the methods as described above, will be directed through an appropriately sized Conder Separators (or similar approved) petrol interceptor - refer Appendix A for Interceptor Details.

Site investigations have been carried out and the results have shown that the existing sub-soil would provide inadequate soil infiltration rates and thus it is not practical to install a soakaway system. The storm water drainage within the entire development has been designed to accommodate a 1:2 year storm frequency. The pond, attenuation tank and permeable paving sub-base areas have been designed to accommodate a 1:100 year storm event + 20% climate change.

The outflow from the proposed development, will be restricted by way of a Hydrobrake facility, which will limit the total discharge to 4.4l/s, which is the calculated QBAR greenfield run-off rate - refer Appendix B for Surface Water Calculations.

The surface water discharge for this application will incorporate the road areas, parking, service yard area and the roof water from the proposed data halls, which then ultimately feeds into the existing network as previously mentioned. Refer Dwg. No. DB11.1-DR-XX-C130-V0-WS3-PIN (External Works Plan), for a drawing indicating the various surface areas of this application; all areas are hardstanding of various types, with the respective coefficients detailed below:-

- Access Road – Tarmac (2,504m^2) / c = 0.80
- Data Hall Roof Area (5,414m^2) / c = 1.00
- Yard Slab Area – Concrete (2,032m^2) / c = 0.80
- Open Space / Landscaping (5,214m^2) / c = 0.30
- Permeable Paving & Parking Areas (5,989m^2) / c = 0.60
- Concrete Footpath (1,953m^2) / c = 0.8
- Standard Road Tarmac (1,103m^2) / c = 0.8

3.3 Proposed Water Mains

It is intended to serve the proposed development via connection off the 150mm Ø network, as located in Falcon Avenue - Refer Drawing No. DB11.1-DR-SP-C123-V0-WS3-PIN.

Hydrants will be installed in accordance with the Requirements of the Building Regulations and in accordance with the recommendations contained in the Technical Guidance Documents, Section B – Fire Safety, dated 2006, and these are detailed on our engineering drawings.

Water demand for the development has been based on Irish Water's criteria, i.e. 150 litres/hd/day = 21,600 litres/hd/day (based on 144 PE) = 0.250 litres/second.

Avg. Demand = 0.250 l/s x 1.25 = 0.312 litres/second

Peak Demand = 0.312 l/s x 5 = 1.560 litres/second

Water meters, sluice valves and hydrants, in line with Irish Water requirements and specifications, will be installed at the connections onto the aforementioned existing water mains, as required. A Pre-Connection Enquiry application has been submitted to Irish Water in respect of the water supply and we are still awaiting a response to same.

3.4 Standard Drainage Details

All standard drainage details including manhole details, pipe bedding, channels, hydrants etc. have been included within the planning pack. Details of the types and construction methods will be agreed with the local authority prior to construction.

Drains generally will consist of PVC (to IS 123) or concrete spigot and socket pipes to (IS 6).

Drains shall be laid to comply with the Requirements of the Building Regulations 1997 and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

Strict separation of surface water and foul sewerage will be imposed on the development. Drains will be laid out to minimise the risk of inadvertent connections of sinks, dishwashers etc. to the surface water system.

In order to minimise the risk of floating contamination of the surface water system, road gullies will be precast trapped gullies to BS5911:Part2:1982.

Concrete bed and surround to the pipe runs will be used where the cover to the pipes is less than 900mm, where the pipes are sufficiently close to the building, or where the pipe runs are below the ground floor slab.

All works are to be carried out in accordance with Irish Water's Code of Practice for Water Infrastructure, dated July 2020 : Document IW-CDS-5020-03 and any subsequent revisions thereof.

4 Surface & Groundwater Impacts

4.1 Construction Phase

Water pollution will be minimised by the implementation of good construction practices. Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on site roads, and regular plant maintenance. The Construction Industry Research and Information Association provides guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors – C532 CIRIA Report (Masters-Williams *et al*, 2001), which provides information on these issues.

Pollutants can commonly include suspended solids, oil, chemicals, cement, cleaning materials and paints. These can enter controlled waters in various ways:

- directly into a watercourse
- via drains or public sewers
- via otherwise dry ditches
- in old field drains
- by seepage into groundwater systems
- through excavations into underlying aquifers
- by disturbance of an already contaminated site

The proximity of the site to streams, aquifers and water abstractions; potential sources, pathways and impacts of pollution; and the historical uses of the site and nearby areas should be examined early in project planning and design, to ensure that suitable redesign and mitigation measures are undertaken as necessary.

During construction, careful management and planning will help minimise water pollution. This may include adequate bunding of all oil tanks, wheel washers and dust suppression on haul roads, particular care to be taken near watercourses, and regular plant maintenance.

A contingency plan for pollution emergencies should also be developed and regularly updated, which would identify the actions to be taken in the event of a pollution incident.

The CIRIA document (2001), recommends that a contingency plan for pollution emergencies should address the following:

- containment measures
- emergency discharge routes
- list of appropriate equipment and clean-up materials
- maintenance schedule for equipment
- details of trained staff, location, and provision for 24-hour cover
- details of staff responsibilities
- notification procedures to inform the relevant environmental protection authority
- audit and review schedule

- telephone numbers of statutory water undertakers and local water company
- list of specialist pollution clean-up companies and their telephone numbers

4.2 Operational Phase

The sources of pollution that could potentially have an effect on surface or groundwater during the operational phase of the development will be oil and fuel leaks from parked cars, service vehicles, HGV delivery's etc. Hydrocarbon interceptors will be provided on storm water drainage sewers from car parking areas as required.

Storm water attenuation measures will be incorporated into the scheme as mentioned previously.

It is not anticipated that flooding of the site will occur, due to the fact that there is no historical data, which refers to any past flooding on this site.

4.3 Mitigation Measures

The construction management of the building project will incorporate protection measures to minimise as far as possible the risk of spillage that could lead to surface and groundwater contamination.

All appropriate methods will be utilised to ensure that surface water arising during the course of construction activities will contain minimum sediment, prior to the ultimate discharge to the proposed attenuation pond / tanks and the existing stream.

Storm water attenuation measures will be incorporated into the scheme as mentioned previously. Hydrocarbon interceptors will be provided on storm water drainage sewers from service yard areas as necessary. Grease traps will be installed on foul sewers where necessary.

Best practice in design and construction will be employed for the installation of surface water and sanitary drainage.

5 Sustainability

5.1 Site Development

In order to minimize material export and import to the site and the impact of this on the surrounding road network, we are proposing to maintain existing on-site levels as far as is practical. Where this is not feasible, a terrain model has been produced, which will indicate the volumes of cut/fill material, based on the proposed levels and a levels balance will be struck across the site, thereby mitigating any import/export of material for site development.

5.2 Site Drainage

Storm water drainage proposals for the site have been designed in accordance with the GDSDS and incorporate on site storm water attenuation in order to limit discharge of storm water from the developed site to the equivalent Q-bar run-off rates.

The attenuation system proposed is in keeping with other developments within Grange Castle Business Park. The pond area not only provides flood storage, but also provides ecological benefits as well.

6 Conclusion

In conclusion, the proposed development of the site by the applicant, for use as a Data Centre development, is considered a suitable use of the site. Local infrastructure has the capacity to serve the proposed development.

The site will be developed in a sustainable manner, in order to minimise the impact of the development during construction and throughout the lifespan of the proposed development.

Accordingly, there are no reasons in relation to the drainage elements as to why this scheme should not be granted planning permission, and with this in mind, the Planning Authority is respectfully requested to recommend a grant of planning permission.

Appendix A

Conder Petrol Interceptor Details

Conder® OIL/WATER SEPARATORS

40 years OF PASSION

CONDER AQUA SOLUTIONS
A PREMIER TECH AND EPS JOINT COMPANY

THE PARTNER OF CHOICE

The Conder Range of Oil Separators are for installation on surface water drainage systems and are designed to prevent hydrocarbons (e.g. diesel, petrol, engine oil) from mixing with surface water and entering our drainage systems.

Pollution prevention is a critical part of sustainable drainage systems and statutory regulations are in force to control the discharge of hydrocarbons, with severe penalties imposed for non-compliance.

Compliance

The Conder Range of Oil Separators fully conform to both the Environment Agency's latest PPG guidelines and European standard BSEN-858-1-2 and are proven to effectively separate oil and water. Under test, the Conder Bypass performed to less than 1 mg/l and in doing so guarantees minimal environmental impact and ensures public safety.

Classes of Separator

There are two classes of separator which are defined by performance.

Class 1

Class 1 Separators are designed to achieve a concentration of less than 5mg/l of oil under standard test conditions. These conditions are required for discharges to surface water drains and the water environment.

Class 2*

Class 2 Separators are designed to achieve a concentration of less than 100mg/l oil under standard test conditions and are suitable for dealing with discharges where a lower quality requirement applies such as discharges to the foul sewer.

*Class 2 available in forecourt separators only.

Selecting the Right Separator

Conder offers a full range of Separators for varying use and application:

- Bypass Separator
- Full Retention Separator
- Forecourt Separator
- Wash Down and Silt Separators

If you're unsure of what type of Conder Oil Separator you require please use the below chart to help you identify the most suitable product for your project.

The guidance given is for the use of separators in surface water drainage systems that discharge to rivers and soakways.

Is there a risk of oil contaminating the drainage from the site?

- YES → Risk of infrequent light contamination and potential for small spills only e.g. car park. → YES → Source control SUDS must be considered and incorporated where suitable. → IF NOT SUITABLE → By-pass separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.
- YES → Risk of regular contamination of surface water run off with oil and/ or risk of larger spills e.g. vehicle maintenance area, goods vehicle parking or vehicle manoeuvring. → YES → Full retention separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.
- YES → Risk of regular Drainage will also contain dissolved oils, detergents or degreasers such as vehicle wash water and trade effluents e.g. industrial sites. → YES → Trade effluents must be directed to the foul sewer. It may need to pass through a separator before discharge to sewer to remove.
- YES → Fuel oils are delivered to and dispensed on site e.g. retail fuel forecourts. → YES → Full retention 'forecourt' separator with alarm required. Class 1 if discharge to surface water. Class 2 if discharge to foul sewer.
- NO → Very low risk of oil contamination e.g. roofwater. → YES → Separator not required. → Clean water should not be passed through the separator unless the size of the unit increased accordingly.

The use of SUDS should be considered at all sites and they should be incorporated where suitable. SUDS can be used to polish the effluent from these separators before it enters the environment.

Source control SUDS should be considered where possible.

Separator Alarms

All oil separators are required by legislation to be fitted with an oil level alarm system with recommendations that the alarm is installed, tested, commissioned and regularly serviced by a qualified technician.

The alarm indicates when the separator is in need of immediate maintenance in order for it to continue to work effectively. Conder Aqua Solutions can offer a full technical and service package for a variety of alarm options.

The Conder Range of Bypass Separators

The Conder Range of Bypass Separators are used to fully treat all flows generated by rainfall rates of up to 6.5mm/hr. Bypass Separators are used when it is considered an acceptable risk not to provide full treatment for high flows, for example where only small spillages occur and the risk of spillage is small.

Typical Application

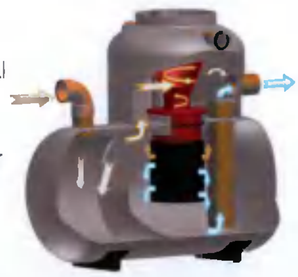
- Car parks
- Roadways and major trunk roads
- Light industrial and goods yards

Features and Benefits

- Innovative design
- Compact and easy to handle/install
- Fully compliant to the Environment Agency's PPG3 guidelines
- Low product and install costs
- Full BSI certification
- Exceeds industry standards
- Easy to service
- Fully tested and verified with a range from CNSB 3 to CNSB 1000 (Class 1)

Performance

Conder Bypass Separators have been designed to treat all flow up to the designed nominal size. Any flow in excess of the nominal size is allowed to bypass the separation chamber thereby keeping the separated and trapped oil safe.



How it Works

Step 1

During the early part of a rain storm, which is a time of high oil contamination, all of the contaminated water flow passes through the sediment collection chamber and enters the separation chamber through a patented oil skimming and filter device.

Step 2

All of the oil then proceeds to the separation chamber where it is separated to the Class 1 standard of 5 mg/l and safely trapped.

Step 3

As the rainstorm builds up to its maximum and the level of oil contamination reduces significantly, the nominal size flow continues to pass through the separation chamber and any excess flow of virtually clean water is allowed to bypass directly to the outlet.

Specification

Larger models up to CNSB 1000 are available.

Area Drained (m²)	Tank Code including Silt	Length including Silt (mm)	Silt Capacity (L)	Oil Storage Capacity (L)	Diameter (mm)	Height (mm)	Base to inlet Invert (mm)	Base to outlet Invert (mm)	Access (mm)
1667	CNSB3s/21	1400	300	45	1026	2200	1730	1680	750
2500	CNSB4.5s/21	1785	450	67.5	1026	1875	1270	1220	600
3333	CNSB6s/21	1975	600	90	1026	1875	1270	1220	600
4444	CNSB8s/21	2165	800	120	1026	1875	1270	1220	600
5555	CNSB10s/21	2485	1000	150	1026	1875	1270	1220	600
8333	CNSB15s/21	2670	1500	225	1210	2150	1450	1400	600
11111	CNSB20s/21	3115	2000	300	1210	2150	1450	1400	600
13889	CNSB25s/21	3555	2500	375	1210	2150	1450	1400	600
16667	CNSB30s/21	3470	3000	450	1510	2690	1770	1720	750
22222	CNSB40s/21	4040	4000	600	1510	2690	1770	1720	750
27778	CNSB50s/21	4655	5000	750	1510	2690	1770	1720	750
33333	CNSB60s/21	4415	6000	900	1880	3300	2025	1975	2 x 600
44444	CNSB80s/21	5225	8000	1200	1880	3300	2025	1975	2 x 600
55556	CNSB100s/21	6010	10,000	1500	1880	3300	2025	1975	2 x 600

Note: It is a requirement of PPG3 that you have a silt capacity either in your tank or in an upstream catch pit.

The Conder Range of Full Retention Separators

The Conder Range of Full Retention Separators are designed to treat the full flow that can be delivered by a drainage system, which is normally equivalent to the flow generated by a rainfall intensity of 65mm/hr. Full Retention Separators are used where there is a risk of regular contamination with oil and a foreseeable risk of significant spillages.

Typical Application

- Sites with hi-risk of oil contamination
- Fuel storage depots
- Refuelling facilities
- Petrol forecourts
- Vehicle maintenance areas/workshops
- Where discharge is to a sensitive environment

Features and Benefits

- All surface water is treated
- Automatic closure device (ACD) fitted as standard

Performance

All Conder Full Retention Separators have an automatic closure device (ACD) fitted as standard. This is compulsory for all PPG3 compliant Full Retention Separators and prevents accumulated pollutants flowing through the unit when maximum storage level is reached.

How it Works

Step 1

Contaminated water enters the separator where the liquid is retained for a sufficient period to ensure that the lighter than water pollutants (such as oil, petrol) separate and rise to the surface of the water.

Step 2

The decontaminated water then passes through the coalescing filter before it is safely discharged from the separator, with the remaining pollutants being retained in the separator.

Step 3

Retained pollutants must be emptied from the separator once the level of oil is reached, or the oil level alarm is activated. This waste should be removed from the separator under the terms of The Waste Management Code of Practice.

Specification

Larger models available upon request.

Area Drained (m^2)	Tank code Incl. Silt	Length including Silt (mm)	Slit Capacity (L)	Oil Storage Capacity	Diameter (mm)	Height (mm)	Base to inlet Invert (mm)	Base to outlet Invert (mm)
222	CNS4s/11	2319	400	40	1026	1655	1295	1245
333	CNS6s/11	3414	600	60	1026	1655	1295	1245
444	CNS8s/11	3197	800	80	1210	1855	1480	1430
556	CNS10s/11	3957	1000	100	1210	1855	1480	1430
833	CNS15s/11	3870	1500	150	1510	2180	1780	1730
1111	CNS20s/11	5060	2000	200	1510	2180	1780	1730
1667	CNS30s/11	5369	3000	300	1880	2560	2030	1980
2222	CNS40s/11	7059	4000	400	1880	2560	2030	1980
2778	CNS50s/11	4080	5000	500	2600	3315	2730	2680
3333	CNS60s/11	4805	6000	600	2600	3315	2730	2680
3889	CNS70s/11	5529	7000	700	2600	3315	2730	2680
4444	CNS80s/11	6254	8000	800	2600	3315	2730	2680
5556	CNS100s/11	6751	10,000	1,000	2600	3315	2730	2680

Note: It is a requirement of PPG3 that you have a silt capacity either in your tank or in an upstream catch pit.

Conder Range of Forecourt Separators

Conder Forecourt Separators have been designed for specific use in petrol filling stations and other similar applications. The size of this separator has been specifically increased in order to retain the possible loss of the contents from one compartment of a road tanker, which could be up to 7,600 litres.

Forecourt separators are an essential infrastructure requirement for all forecourts so as to ensure compliance with both health and safety and environmental legislation.

Application Areas

- Petrol forecourts
- Refuelling facilities
- Fuel storage depot

Features and Benefits

- All surface water is treated
- Available in Class 1 and Class 2
- Automatic Closure Device (ACD) fitted as standard
- Includes 2000L silt capacity

Performance

All Conder Forecourt Separators have an automatic closure device (ACD) fitted as standard. This is compulsory for all PPG3 compliant Full Retention Separators and prevents accumulated pollutants flowing through the unit when maximum storage level is reached.

How it Works

Step 1

Contaminated water enters the separator where the liquid is retained for a sufficient period to ensure that the lighter than water pollutants (such as oil, petrol) separate and rise to the surface of the water.

Step 2

The decontaminated water then passes through the coalescing filter before it is safely discharged from the separator, with the remaining pollutants being retained in the separator.

Step 3

Retained pollutants must be emptied from the separator once the level of oil is reached, or the oil level alarm is activated. This waste should be removed from the separator under the terms of The Waste Management Code of Practice.

Specification

Tank Code	Volume (L)	Length (mm)	Diameter (mm)	Height (mm)	Base to inlet (mm)	Base to outlet (mm)	Access (mm)
ANO/11*	10000	4250	1800	2100	1600	1550	750
ANT/12**	10000	4250	1800	2100	1600	1550	750
LNO/11***	10000	4250	1800	2100	1600	1550	750

*Class 1 Forecourt Separator suitable for discharging to surface water drains

**Class 2 Forecourt Separator suitable for discharging to foul drains only

*** Class 1 Forecourt Separator suitable for installation in granular materials

Conder Range of Washdown and Silt Separators

Conder Washdown and Silt Separators are for use in areas such as car washes, pressure wash facilities or other cleaning facilities and must be discharged to the foul water drainage system in accordance with PPG13.

Application Areas

- Car wash facilities
- Tool hire depots
- Pressure washer facilities

Features and Benefits

- Available in 1,2 and 3 stage options
- Efficient silt and hydrocarbon removal

Performance

The Environment Agency's PPG13 requires that discharge from pressure washers must discharge to a foul drainage system. Where there is no foul drainage available, the effluent must be contained within a sealed drainage system or catchpit for disposal by a licenced waste contractor.

Silt build-up is the primary concern with washdown facilities and so the Conder range of washdown and silt separators are used to remove the silt and will allow some separation of hydrocarbons.

Detergents that are used in wash down areas will break down and disperse hydrocarbons (hindering the separation process). Therefore it is important to remember the main function of wash down separators is to remove silt.

How it Works

Step 1

Contaminated wash down water enters the unit where the heavier solids, silts, settle to the bottom of the tank.

Step 2

The lighter liquids, hydrocarbons, will rise to the surface and be retained within the tank.

Step 3

Treated water will exit the separator via the dipped outlet.

Specification

Although it is recognised that single stage separators give the most efficient separation, 2 and 3 chamber Conder Washdown and Silt Separators are available on request.

Tank Code	Capacity (L)	Silt Storage	Diameter (mm)	Length (mm)	Access Diameter (mm)	Base to Inlet Invert (mm)	Base to Outlet Invert (mm)
CWS2/12	2000	1000	1000	2713	600	1290	1240
CWS3/12	3000	1500	1200	2853	600	1475	1425
CWS4/12	4000	2000	1200	3737	600	1475	1425
CWS6/12	6000	3000	1500	3636	600	1775	1725
CWS8/12	8000	4000	1800	3443	600	2030	1980
CWS10/12	10000	5000	1800	4250	600	2030	1980

FST Silt Trap

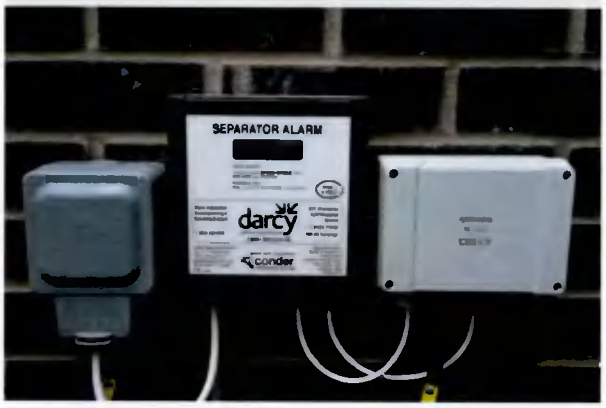
Large quantities of silt can be associated with washdown areas. The Conder FST silt trap is ideal for easy removal of silt either manually or by a waste disposal contractor.

The FST range of silt traps are available with varying grades of covers from B125 up to E600 to allow installation in all types of vehicle or plant washdown facilities.

Conder Range of Alarm Systems

All separators must be fitted with an alarm in order to provide visual and audible warning when the level of oil reaches 90% of its storage volume, as required by The Environment Agency's PPG3.

The alarm system will then be triggered to indicate that the separator is in need of immediate emptying, in order to continue effective operation.



Features and Benefits

- Option for installation at a remote supervisory point
- Audible and visual
- Eliminates unnecessary waste management visits
- Easy installation
- Audible, visual and text message alert alarm systems available

Mains Powered System

Mains powered alarm systems are best suited to new build situations or sites where installation of the necessary cabling and ducting is straight forward and economical. The probe located in the separator will, when surrounded by floating hydrocarbons, activate an alarm condition on the remote panel to advise that the unit requires emptying.

Solar Powered System (Flashing Beacon)

This option requires no mains power supply or any significant cabling and ducting, making it extremely economical for large sites and retro fitting alarms to existing oil separators. A High Intensity Beacon will flash when a problem is detected.

Solar GSM Alarm

The Solar GSM alarm sends a status report on your separator to a mobile phone number of your choice. The status of the GSM alarm can also be tested at any time by simply sending a pre-recorded text message, via your directed mobile phone, for added peace of mind.

Peripherals

Coalescing Filters

The Conder Coalescing Filter is designed to separate residual oil in already separated oil/water and ensures a discharge quality of less than 5mg/litre of oil in water.

Features and Benefits

- Handle for easy removal and cleaning
- Flashing beacons (with option of siren kit)
- Kiosks
- Probe brackets
- Bas 1000 intrinsically safe junction box
- High level probe
- Silt level probe
- Oil level probe

Servicing

The Environmental Agency's PPG3 guidelines stipulate that every 6 months, and in accordance with manufacturer's instructions, experienced personnel should carry out maintenance to both the separator and alarm.

Conder and our service partners can offer a full technical and service package including separator and alarm installation, commissioning, oil and silt removal and route service contracts.

Appendix B

Surface Water Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	40.0
Additional Flow (%)	20	Minimum Velocity (m/s)	0.70
FSR Region	Scotland and Ireland	Connection Type	Level Inverts
M5-60 (mm)	16.800	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	0.800
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	15.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWMH 1.1	0.238	5.00	74.060	1200	303790.379	230671.764	1.256
SWMH 1.2			74.060	1200	303794.420	230615.963	1.472
SWMH 1.3			74.070	1200	303791.945	230611.205	1.500
SWMH 1.4			74.080	1200	303747.389	230607.876	1.682
SWMH 1.5			73.800	1200	303749.412	230580.792	1.500
SWMH 2.1	0.207	5.00	73.630	1200	303810.851	230650.189	0.888
SWMH 2.2			73.830	1200	303801.029	230633.031	1.164
SWMH 2.3			73.880	1200	303801.612	230619.333	1.265
SWMH 3.1			73.800	1200	303773.730	230584.554	1.650
SWMH 3.2			73.800	1200	303778.663	230589.105	1.700
SWMH 3.3			74.480	1200	303800.291	230598.193	2.500
SWMH CON			74.090	1200	303817.961	230626.100	2.270
SWMH 4.1	0.644	5.00	74.090	1200	303697.666	230732.518	0.950
SWMH 4.2			74.080	1200	303702.022	230672.672	1.175
SWMH 4.3			74.170	1200	303706.969	230604.856	1.532
SWMH 4.4			73.770	1200	303683.675	230603.116	1.230
SWMH 4.5			73.770	1200	303683.995	230598.861	1.270
SWMH 4.6			73.690	1200	303684.630	230590.321	1.240
SWMH 4.7			73.600	1200	303688.671	230570.937	1.260
SWMH 4.8			73.600	1200	303690.454	230563.967	1.300
SWMH 5.1	0.173	5.00	74.560	1200	303631.952	230558.259	1.200
SWMH 5.2			74.050	1200	303657.223	230565.296	1.200
SWMH 5.3			73.600	1200	303679.571	230571.518	1.064
SWMH 6.1	0.924	5.00	74.050	1200	303665.939	230735.265	0.946
SWMH 6.2			74.050	1200	303670.917	230666.328	1.218
SWMH 6.3	0.164	5.00	73.980	1200	303675.828	230598.251	1.416
SWMH 7.1	0.636	5.00	73.360	1200	303807.107	230845.748	1.160
SWMH 7.2			73.000	1200	303807.382	230858.280	1.300
SWMH 8.1			73.500	1200	303641.484	230826.729	1.600
SWMH 8.2			73.000	1200	303637.185	230826.204	1.200
SWMH 9.1	0.731	5.00	73.940	1200	303659.509	230742.509	1.300
SWMH 9.2			73.930	1200	303657.356	230773.390	1.480
SWMH 9.3			73.930	1200	303656.119	230790.126	1.580

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWMH 9.4			73.900	1200	303659.893	230790.470	1.590
SWMH 9.5			73.950	1200	303658.225	230813.431	1.950
SWMH 10.1	0.310	5.00	74.090	1200	303693.616	230782.956	1.430
SWMH 10.2			74.080	1200	303688.862	230846.379	1.840
SWMH 10.3			73.840	1200	303665.592	230844.699	1.740
SWMH 10.4			73.950	1200	303660.748	230844.335	1.950
SWMH 11.1	0.556	5.00	73.190	1200	303834.725	230697.653	1.190
SWMH 11.2			73.000	1200	303840.774	230706.535	1.200
SWMH 12.1	0.087	5.00	74.280	1200	303630.983	230594.900	1.280
SWMH 13.1		15.00	74.090	1200	303717.484	230605.642	1.470
Tank 1			73.950	1200	303654.576	230829.617	1.999
Pond 1			73.600	1200	303767.139	230581.821	1.400
Cat 4	0.302		73.710	1200			0.600
Cat 7	0.148		73.770	1200			0.600
Cat 9	0.080		73.710	1200			0.600
Cat 15	0.143		73.750	1200			0.600

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)
1.1	SWMH 1.1	SWMH 1.2	55.947	0.600	72.804	72.588	0.216	259.0	300	6.33	50.0
1.2	SWMH 1.2	SWMH 1.3	5.363	0.600	72.588	72.570	0.018	297.9	300	6.38	50.0
1.3	SWMH 1.3	SWMH 1.4	44.680	0.600	72.570	72.398	0.172	259.8	300	7.18	50.0
1.4	SWMH 1.4	SWMH 1.5	27.159	0.600	72.398	72.300	0.098	277.1	300	7.55	50.0
1.5	SWMH 1.5	Pond 1	17.757	0.600	72.300	72.200	0.100	177.6	300	7.97	50.0
2.1	SWMH 2.1	SWMH 2.2	19.770	0.600	72.742	72.666	0.076	260.1	300	5.47	50.0
2.2	SWMH 2.2	SWMH 2.3	13.710	0.600	72.666	72.615	0.051	268.8	300	5.79	50.0

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)
1.1	0.972	68.7	38.7	0.956	1.172	0.238	0.0	161	1.000
1.2	0.905	64.0	72.4	1.172	1.200	0.445	0.0	300	0.917
1.3	0.971	68.6	72.4	1.200	1.382	0.445	0.0	267	1.089
1.4	0.939	66.4	72.4	1.382	1.200	0.445	0.0	300	0.951
1.5	1.177	83.2	72.4	1.200	1.100	0.445	0.0	217	1.319
2.1	0.970	68.6	33.7	0.588	0.864	0.207	0.0	149	0.966
2.2	0.954	67.4	33.7	0.864	0.965	0.207	0.0	150	0.953

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)
2.3	SWMH 2.3	SWMH 1.2	7.942	0.600	72.615	72.588	0.027	294.1	300	5.94	50.0
Pond 1	Pond 1	SWMH 3.1	7.135	0.600	72.200	72.150	0.050	142.7	300	11.59	50.0
3.1	SWMH 3.1	SWMH 3.2	6.712	0.600	72.150	72.100	0.050	134.2	300	11.75	50.0
3.2	SWMH 3.2	SWMH 3.3	23.460	0.600	72.100	71.980	0.120	195.5	300	12.31	50.0
3.3	SWMH 3.3	SWMH CON	33.031	0.600	71.980	71.820	0.160	206.4	300	13.09	50.0
4.1	SWMH 4.1	SWMH 4.2	60.004	0.600	73.140	72.905	0.235	255.3	300	6.43	50.0
4.2	SWMH 4.2	SWMH 4.3	67.996	0.600	72.905	72.638	0.267	254.7	300	8.05	50.0
4.3	SWMH 4.3	SWMH 4.4	23.359	0.600	72.638	72.540	0.098	238.4	300	8.60	50.0
4.4	SWMH 4.4	SWMH 4.5	4.267	0.600	72.540	72.500	0.040	106.7	300	8.70	50.0
4.5	SWMH 4.5	SWMH 4.6	8.564	0.600	72.500	72.450	0.050	171.3	300	8.90	50.0
4.6	SWMH 4.6	SWMH 4.7	19.801	0.600	72.450	72.340	0.110	180.0	300	9.38	50.0
4.7	SWMH 4.7	SWMH 4.8	7.194	0.600	72.340	72.300	0.040	179.9	300	9.55	50.0
4.8	SWMH 4.8	Pond 1	78.736	0.600	72.300	72.200	0.100	787.4	300	11.42	50.0
5.1	SWMH 5.1	SWMH 5.2	26.232	0.600	73.360	72.850	0.510	51.4	225	5.62	50.0
5.2	SWMH 5.2	SWMH 5.3	23.198	0.600	72.850	72.536	0.314	73.9	225	6.18	50.0
5.3	SWMH 5.3	SWMH 4.7	9.119	0.600	72.536	72.424	0.112	81.4	225	6.39	50.0
6.1	SWMH 6.1	SWMH 6.2	69.116	0.600	73.104	72.832	0.272	254.1	300	6.65	50.0
6.2	SWMH 6.2	SWMH 6.3	68.254	0.600	72.832	72.564	0.268	254.7	300	8.27	50.0
6.3	SWMH 6.3	SWMH 4.5	8.190	0.600	72.564	72.528	0.036	227.5	300	8.42	50.0

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)
2.3	0.911	64.4	33.7	0.965	1.172	0.207	0.0	154	0.921
Pond 1	1.314	92.9	396.3	1.100	1.350	2.437	0.0	300	1.331
3.1	1.355	95.8	396.3	1.350	1.400	2.437	0.0	300	1.372
3.2	1.121	79.2	396.3	1.400	2.200	2.437	0.0	300	1.135
3.3	1.090	77.1	396.3	2.200	1.970	2.437	0.0	300	1.104
4.1	0.979	69.2	104.7	0.650	0.875	0.644	0.0	300	0.992
4.2	0.980	69.3	104.7	0.875	1.232	0.644	0.0	300	0.993
4.3	1.014	71.7	104.7	1.232	0.930	0.644	0.0	300	1.027
4.4	1.522	107.6	104.7	0.930	0.970	0.644	0.0	241	1.724
4.5	1.198	84.7	295.8	0.970	0.940	1.819	0.0	300	1.214
4.6	1.168	82.6	295.8	0.940	0.960	1.819	0.0	300	1.184
4.7	1.169	82.6	324.0	0.960	1.000	1.992	0.0	300	1.184
4.8	0.552	39.1	324.0	1.000	1.100	1.992	0.0	300	0.560
5.1	1.828	72.7	28.1	0.975	0.975	0.173	0.0	97	1.715
5.2	1.523	60.5	28.1	0.975	0.839	0.173	0.0	108	1.495
5.3	1.450	57.7	28.1	0.839	0.951	0.173	0.0	111	1.443
6.1	0.981	69.4	150.3	0.646	0.918	0.924	0.0	300	0.994
6.2	0.980	69.3	150.3	0.918	1.116	0.924	0.0	300	0.993
6.3	1.038	73.4	191.1	1.116	0.942	1.175	0.0	300	1.051

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)
7.1	SWMH 7.1	SWMH 7.2	12.535	0.600	72.200	71.700	0.500	25.1	225	5.30	50.0
Tank 1	Tank 1	SWMH 8.1	13.407	0.600	72.000	71.900	0.100	134.1	225	7.79	50.0
8.1	SWMH 8.1	SWMH 8.2	4.331	0.600	71.900	71.800	0.100	43.3	225	7.90	50.0
9.1	SWMH 9.1	SWMH 9.2	30.956	0.600	72.640	72.450	0.190	162.9	225	5.74	50.0
9.2	SWMH 9.2	SWMH 9.3	16.782	0.600	72.450	72.350	0.100	167.8	225	6.14	50.0
9.3	SWMH 9.3	SWMH 9.4	3.790	0.600	72.350	72.310	0.040	94.8	225	6.22	50.0
9.4	SWMH 9.4	SWMH 9.5	39.506	0.600	72.310	72.000	0.310	127.4	225	7.16	50.0
9.5	SWMH 9.5	Tank 1	16.592	0.600	72.000	71.951	0.049	338.6	225	7.55	40.0
10.1	SWMH 10.1	SWMH 10.2	63.601	0.600	72.660	72.240	0.420	151.4	225	6.51	50.0
10.2	SWMH 10.2	SWMH 10.3	23.331	0.600	72.240	72.100	0.140	166.7	225	7.07	50.0
10.3	SWMH 10.3	SWMH 10.4	18.677	0.600	72.100	72.000	0.100	186.8	225	7.48	50.0
10.4	SWMH 10.4	Tank 1	15.960	0.600	72.000	71.953	0.047	339.6	300	7.79	40.0
11.1	SWMH 11.1	SWMH 11.2	10.746	0.600	72.000	71.800	0.200	53.7	225	5.25	50.0
12.1	SWMH 12.1	SWMH 6.3	44.970	0.600	73.000	72.564	0.436	103.1	225	6.07	50.0
13.1	SWMH 13.1	SWMH 1.4	29.988	0.600	72.620	72.398	0.222	135.1	225	5.71	50.0

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)
7.1	2.623	104.3	103.4	0.935	1.075	0.636	0.0	184	2.975
Tank 1	1.127	44.8	169.3	1.725	1.375	1.041	0.0	225	1.148
8.1	1.993	79.2	169.3	1.375	0.975	1.041	0.0	225	2.030
9.1	1.021	40.6	118.9	1.075	1.255	0.731	0.0	225	1.040
9.2	1.006	40.0	118.9	1.255	1.355	0.731	0.0	225	1.025
9.3	1.343	53.4	118.9	1.355	1.365	0.731	0.0	225	1.368
9.4	1.156	46.0	118.9	1.365	1.725	0.731	0.0	225	1.178
9.5	0.705	28.0	95.1	1.725	1.774	0.731	0.0	225	0.718
10.1	1.060	42.1	50.4	1.205	1.615	0.310	0.0	225	1.080
10.2	1.010	40.1	50.4	1.615	1.515	0.310	0.0	225	1.028
10.3	0.953	37.9	50.4	1.515	1.725	0.310	0.0	225	0.971
10.4	0.847	59.9	40.3	1.650	1.697	0.310	0.0	181	0.908
11.1	1.788	71.1	90.4	0.965	0.975	0.556	0.0	225	1.821
12.1	1.287	51.2	14.1	1.055	1.191	0.087	0.0	80	1.102
13.1	1.123	44.6	0.0	1.245	1.457	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.1	55.947	259.0	300	Circular	74.060	72.804	0.956	74.060	72.588	1.172
1.2	5.363	297.9	300	Circular	74.060	72.588	1.172	74.070	72.570	1.200
1.3	44.680	259.8	300	Circular	74.070	72.570	1.200	74.080	72.398	1.382
1.4	27.159	277.1	300	Circular	74.080	72.398	1.382	73.800	72.300	1.200
1.5	17.757	177.6	300	Circular	73.800	72.300	1.200	73.600	72.200	1.100
2.1	19.770	260.1	300	Circular	73.630	72.742	0.588	73.830	72.666	0.864
2.2	13.710	268.8	300	Circular	73.830	72.666	0.864	73.880	72.615	0.965
2.3	7.942	294.1	300	Circular	73.880	72.615	0.965	74.060	72.588	1.172
Pond 1	7.135	142.7	300	Circular	73.600	72.200	1.100	73.800	72.150	1.350
3.1	6.712	134.2	300	Circular	73.800	72.150	1.350	73.800	72.100	1.400
3.2	23.460	195.5	300	Circular	73.800	72.100	1.400	74.480	71.980	2.200
3.3	33.031	206.4	300	Circular	74.480	71.980	2.200	74.090	71.820	1.970
4.1	60.004	255.3	300	Circular	74.090	73.140	0.650	74.080	72.905	0.875
4.2	67.996	254.7	300	Circular	74.080	72.905	0.875	74.170	72.638	1.232
4.3	23.359	238.4	300	Circular	74.170	72.638	1.232	73.770	72.540	0.930
4.4	4.267	106.7	300	Circular	73.770	72.540	0.930	73.770	72.500	0.970
4.5	8.564	171.3	300	Circular	73.770	72.500	0.970	73.690	72.450	0.940
4.6	19.801	180.0	300	Circular	73.690	72.450	0.940	73.600	72.340	0.960
4.7	7.194	179.9	300	Circular	73.600	72.340	0.960	73.600	72.300	1.000
4.8	78.736	787.4	300	Circular	73.600	72.300	1.000	73.600	72.200	1.100
5.1	26.232	51.4	225	Circular	74.560	73.360	0.975	74.050	72.850	0.975

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.1	SWMH 1.1	1200	Manhole	Adoptable	SWMH 1.2	1200	Manhole	Adoptable
1.2	SWMH 1.2	1200	Manhole	Adoptable	SWMH 1.3	1200	Manhole	Adoptable
1.3	SWMH 1.3	1200	Manhole	Adoptable	SWMH 1.4	1200	Manhole	Adoptable
1.4	SWMH 1.4	1200	Manhole	Adoptable	SWMH 1.5	1200	Manhole	Adoptable
1.5	SWMH 1.5	1200	Manhole	Adoptable	Pond 1	1200	Manhole	Adoptable
2.1	SWMH 2.1	1200	Manhole	Adoptable	SWMH 2.2	1200	Manhole	Adoptable
2.2	SWMH 2.2	1200	Manhole	Adoptable	SWMH 2.3	1200	Manhole	Adoptable
2.3	SWMH 2.3	1200	Manhole	Adoptable	SWMH 1.2	1200	Manhole	Adoptable
Pond 1	Pond 1	1200	Manhole	Adoptable	SWMH 3.1	1200	Manhole	Adoptable
3.1	SWMH 3.1	1200	Manhole	Adoptable	SWMH 3.2	1200	Manhole	Adoptable
3.2	SWMH 3.2	1200	Manhole	Adoptable	SWMH 3.3	1200	Manhole	Adoptable
3.3	SWMH 3.3	1200	Manhole	Adoptable	SWMH CON	1200	Manhole	Adoptable
4.1	SWMH 4.1	1200	Manhole	Adoptable	SWMH 4.2	1200	Manhole	Adoptable
4.2	SWMH 4.2	1200	Manhole	Adoptable	SWMH 4.3	1200	Manhole	Adoptable
4.3	SWMH 4.3	1200	Manhole	Adoptable	SWMH 4.4	1200	Manhole	Adoptable
4.4	SWMH 4.4	1200	Manhole	Adoptable	SWMH 4.5	1200	Manhole	Adoptable
4.5	SWMH 4.5	1200	Manhole	Adoptable	SWMH 4.6	1200	Manhole	Adoptable
4.6	SWMH 4.6	1200	Manhole	Adoptable	SWMH 4.7	1200	Manhole	Adoptable
4.7	SWMH 4.7	1200	Manhole	Adoptable	SWMH 4.8	1200	Manhole	Adoptable
4.8	SWMH 4.8	1200	Manhole	Adoptable	Pond 1	1200	Manhole	Adoptable
5.1	SWMH 5.1	1200	Manhole	Adoptable	SWMH 5.2	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.2	23.198	73.9	225	Circular	74.050	72.850	0.975	73.600	72.536	0.839
5.3	9.119	81.4	225	Circular	73.600	72.536	0.839	73.600	72.424	0.951
6.1	69.116	254.1	300	Circular	74.050	73.104	0.646	74.050	72.832	0.918
6.2	68.254	254.7	300	Circular	74.050	72.832	0.918	73.980	72.564	1.116
6.3	8.190	227.5	300	Circular	73.980	72.564	1.116	73.770	72.528	0.942
7.1	12.535	25.1	225	Circular	73.360	72.200	0.935	73.000	71.700	1.075
Tank 1	13.407	134.1	225	Circular	73.950	72.000	1.725	73.500	71.900	1.375
8.1	4.331	43.3	225	Circular	73.500	71.900	1.375	73.000	71.800	0.975
9.1	30.956	162.9	225	Circular	73.940	72.640	1.075	73.930	72.450	1.255
9.2	16.782	167.8	225	Circular	73.930	72.450	1.255	73.930	72.350	1.355
9.3	3.790	94.8	225	Circular	73.930	72.350	1.355	73.900	72.310	1.365
9.4	39.506	127.4	225	Circular	73.900	72.310	1.365	73.950	72.000	1.725
9.5	16.592	338.6	225	Circular	73.950	72.000	1.725	73.950	71.951	1.774
10.1	63.601	151.4	225	Circular	74.090	72.660	1.205	74.080	72.240	1.615
10.2	23.331	166.7	225	Circular	74.080	72.240	1.615	73.840	72.100	1.515
10.3	18.677	186.8	225	Circular	73.840	72.100	1.515	73.950	72.000	1.725
10.4	15.960	339.6	300	Circular	73.950	72.000	1.650	73.950	71.953	1.697
11.1	10.746	53.7	225	Circular	73.190	72.000	0.965	73.000	71.800	0.975

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.2	SWMH 5.2	1200	Manhole	Adoptable	SWMH 5.3	1200	Manhole	Adoptable
5.3	SWMH 5.3	1200	Manhole	Adoptable	SWMH 4.7	1200	Manhole	Adoptable
6.1	SWMH 6.1	1200	Manhole	Adoptable	SWMH 6.2	1200	Manhole	Adoptable
6.2	SWMH 6.2	1200	Manhole	Adoptable	SWMH 6.3	1200	Manhole	Adoptable
6.3	SWMH 6.3	1200	Manhole	Adoptable	SWMH 4.5	1200	Manhole	Adoptable
7.1	SWMH 7.1	1200	Manhole	Adoptable	SWMH 7.2	1200	Manhole	Adoptable
Tank 1	Tank 1	1200	Manhole	Adoptable	SWMH 8.1	1200	Manhole	Adoptable
8.1	SWMH 8.1	1200	Manhole	Adoptable	SWMH 8.2	1200	Manhole	Adoptable
9.1	SWMH 9.1	1200	Manhole	Adoptable	SWMH 9.2	1200	Manhole	Adoptable
9.2	SWMH 9.2	1200	Manhole	Adoptable	SWMH 9.3	1200	Manhole	Adoptable
9.3	SWMH 9.3	1200	Manhole	Adoptable	SWMH 9.4	1200	Manhole	Adoptable
9.4	SWMH 9.4	1200	Manhole	Adoptable	SWMH 9.5	1200	Manhole	Adoptable
9.5	SWMH 9.5	1200	Manhole	Adoptable	Tank 1	1200	Manhole	Adoptable
10.1	SWMH 10.1	1200	Manhole	Adoptable	SWMH 10.2	1200	Manhole	Adoptable
10.2	SWMH 10.2	1200	Manhole	Adoptable	SWMH 10.3	1200	Manhole	Adoptable
10.3	SWMH 10.3	1200	Manhole	Adoptable	SWMH 10.4	1200	Manhole	Adoptable
10.4	SWMH 10.4	1200	Manhole	Adoptable	Tank 1	1200	Manhole	Adoptable
11.1	SWMH 11.1	1200	Manhole	Adoptable	SWMH 11.2	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
12.1	44.970	103.1	225	Circular	74.280	73.000	1.055	73.980	72.564	1.191
13.1	29.988	135.1	225	Circular	74.090	72.620	1.245	74.080	72.398	1.457

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
12.1	SWMH 12.1	1200	Manhole	Adoptable	SWMH 6.3	1200	Manhole	Adoptable
13.1	SWMH 13.1	1200	Manhole	Adoptable	SWMH 1.4	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWMH 1.1	303790.379	230671.764	74.060	1.256	1200	0	1.1	72.804	300
SWMH 1.2	303794.420	230615.963	74.060	1.472	1200	1	2.3	72.588	300
						2	1.1	72.588	300
						0	1.2	72.588	300
SWMH 1.3	303791.945	230611.205	74.070	1.500	1200	1	1.2	72.570	300
						0	1.3	72.570	300
SWMH 1.4	303747.389	230607.876	74.080	1.682	1200	1	13.1	72.398	225
						2	1.3	72.398	300
						0	1.4	72.398	300
SWMH 1.5	303749.412	230580.792	73.800	1.500	1200	1	1.4	72.300	300
						0	1.5	72.300	300
SWMH 2.1	303810.851	230650.189	73.630	0.888	1200	0	2.1	72.742	300
SWMH 2.2	303801.029	230633.031	73.830	1.164	1200	1	2.1	72.666	300
						0	2.2	72.666	300
SWMH 2.3	303801.612	230619.333	73.880	1.265	1200	1	2.2	72.615	300
						0	2.3	72.615	300
SWMH 3.1	303773.730	230584.554	73.800	1.650	1200	1	Pond 1	72.150	300
						0	3.1	72.150	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
SWMH 3.2	303778.663	230589.105	73.800	1.700	1200		1	3.1	72.100	300
							0	3.2	72.100	300
SWMH 3.3	303800.291	230598.193	74.480	2.500	1200		1	3.2	71.980	300
							0	3.3	71.980	300
SWMH CON	303817.961	230626.100	74.090	2.270	1200		1	3.3	71.820	300
SWMH 4.1	303697.666	230732.518	74.090	0.950	1200					
							0	4.1	73.140	300
SWMH 4.2	303702.022	230672.672	74.080	1.175	1200		1	4.1	72.905	300
							0	4.2	72.905	300
SWMH 4.3	303706.969	230604.856	74.170	1.532	1200		1	4.2	72.638	300
							0	4.3	72.638	300
SWMH 4.4	303683.675	230603.116	73.770	1.230	1200		1	4.3	72.540	300
							0	4.4	72.540	300
SWMH 4.5	303683.995	230598.861	73.770	1.270	1200		1	6.3	72.528	300
							2	4.4	72.500	300
							0	4.5	72.500	300
SWMH 4.6	303684.630	230590.321	73.690	1.240	1200		1	4.5	72.450	300
							0	4.6	72.450	300
SWMH 4.7	303688.671	230570.937	73.600	1.260	1200		1	5.3	72.424	225
							2	4.6	72.340	300
							0	4.7	72.340	300
SWMH 4.8	303690.454	230563.967	73.600	1.300	1200		1	4.7	72.300	300
							0	4.8	72.300	300
SWMH 5.1	303631.952	230558.259	74.560	1.200	1200					
							0	5.1	73.360	225
SWMH 5.2	303657.223	230565.296	74.050	1.200	1200		1	5.1	72.850	225
							0	5.2	72.850	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWMH 5.3	303679.571	230571.518	73.600	1.064	1200	1	5.2	72.536	225
						0	5.3	72.536	225
SWMH 6.1	303665.939	230735.265	74.050	0.946	1200	0	6.1	73.104	300
SWMH 6.2	303670.917	230666.328	74.050	1.218	1200	1	6.1	72.832	300
						0	6.2	72.832	300
SWMH 6.3	303675.828	230598.251	73.980	1.416	1200	1	12.1	72.564	225
						2	6.2	72.564	300
						0	6.3	72.564	300
SWMH 7.1	303807.107	230845.748	73.360	1.160	1200	0	7.1	72.200	225
SWMH 7.2	303807.382	230858.280	73.000	1.300	1200	1	7.1	71.700	225
SWMH 8.1	303641.484	230826.729	73.500	1.600	1200	1	Tank 1	71.900	225
						0	8.1	71.900	225
SWMH 8.2	303637.185	230826.204	73.000	1.200	1200	1	8.1	71.800	225
SWMH 9.1	303659.509	230742.509	73.940	1.300	1200	0	9.1	72.640	225
SWMH 9.2	303657.356	230773.390	73.930	1.480	1200	1	9.1	72.450	225
						0	9.2	72.450	225
SWMH 9.3	303656.119	230790.126	73.930	1.580	1200	1	9.2	72.350	225
						0	9.3	72.350	225
SWMH 9.4	303659.893	230790.470	73.900	1.590	1200	1	9.3	72.310	225
						0	9.4	72.310	225
SWMH 9.5	303658.225	230813.431	73.950	1.950	1200	1	9.4	72.000	225
						0	9.5	72.000	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWMH 10.1	303693.616	230782.956	74.090	1.430	1200	0	10.1	72.660	225
SWMH 10.2	303688.862	230846.379	74.080	1.840	1200	1	10.1	72.240	225
						0	10.2	72.240	225
SWMH 10.3	303665.592	230844.699	73.840	1.740	1200	1	10.2	72.100	225
						0	10.3	72.100	225
SWMH 10.4	303660.748	230844.335	73.950	1.950	1200	1	10.3	72.000	225
						0	10.4	72.000	300
SWMH 11.1	303834.725	230697.653	73.190	1.190	1200	0	11.1	72.000	225
SWMH 11.2	303840.774	230706.535	73.000	1.200	1200	1	11.1	71.800	225
SWMH 12.1	303630.983	230594.900	74.280	1.280	1200	0	12.1	73.000	225
SWMH 13.1	303717.484	230605.642	74.090	1.470	1200	0	13.1	72.620	225
Tank 1	303654.576	230829.617	73.950	1.999	1200	1	9.5	71.951	225
						2	10.4	71.953	300
						0	Tank 1	72.000	225
Pond 1	303767.139	230581.821	73.600	1.400	1200	1	1.5	72.200	300
						2	4.8	72.200	300
						0	Pond 1	72.200	300
Cat 4			73.710	0.600	1200				
Cat 7			73.770	0.600	1200				
Cat 9			73.710	0.600	1200				

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Cat 15			73.750	0.600	1200				

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m^3/ha)	20.0
M5-60 (mm)	16.800	Check Discharge Rate(s)	✓
Ratio-R	0.300	1 year (l/s)	9.0
Summer CV	0.750	30 year (l/s)	20.7
Winter CV	0.840	100 year (l/s)	26.3
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year 1440 minute (m^3)	1469

Storm Durations

15	60	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	20	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	5.340	Betterment (%)	0
SAAR (mm)	754	QBar	10.6
Soil Index	3	Q 1 year (l/s)	9.0
SPR	0.30	Q 30 year (l/s)	20.7
Region	11	Q 100 year (l/s)	26.3
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	5.340	Storm Duration (mins)	1440
Soil Index	3	Betterment (%)	0
SPR	0.30	PR	0.333
CWI	113.185	Runoff Volume (m^3)	1469

Node Cat 4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	73.110	Product Number	CTL-SHE-0015-1000-0600-1000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.1	Min Node Diameter (mm)	1200

Node Cat 7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	73.170	Product Number	CTL-SHE-0015-1000-0600-1000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.1	Min Node Diameter (mm)	1200

Node Cat 9 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	73.110	Product Number	CTL-SHE-0015-1000-0600-1000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.1	Min Node Diameter (mm)	1200

Node Cat 15 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	73.150	Product Number	CTL-SHE-0015-1000-0600-1000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.1	Min Node Diameter (mm)	1200

Node SWMH 3.2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	72.100	Product Number	CTL-SHE-0123-7900-1500-7900
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	7.9	Min Node Diameter (mm)	1200

Node SWMH 7.1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	0.000	Product Number	CTL-SHE-0022-2000-0600-2000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.2	Min Node Diameter (mm)	1200

Node SWMH 8.1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	71.900	Product Number	CTL-SHE-0065-2200-1400-2200
Design Depth (m)	1.400	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.2	Min Node Diameter (mm)	1200

Node SWMH 11.1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	72.000	Product Number	CTL-SHE-0022-2000-0600-2000
Design Depth (m)	0.600	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.2	Min Node Diameter (mm)	1200

Node Pond 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	72.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.80	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1000.0	0.0	1.600	1564.0	0.0

Node Tank 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	71.951
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	500.0	0.0	1.500	500.0	0.0	1.501	0.0	0.0

Node Cat 4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.05000	Invert Level (m)	73.110	Slope (1:X)	100.0
Side Inf Coefficient (m/hr)	0.05000	Time to half empty (mins)	0	Depth (m)	0.350
Safety Factor	2.0	Width (m)	120.000	Inf Depth (m)	0.350
Porosity	0.33	Length (m)	25.000		

Node Cat 7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.05000	Invert Level (m)	73.170	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.05000	Time to half empty (mins)	51	Depth (m)	0.350
Safety Factor	2.0	Width (m)	22.000	Inf Depth (m)	0.350
Porosity	0.33	Length (m)	75.000		

Node Cat 9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.05000	Invert Level (m)	73.110	Slope (1:X)	150.0
Side Inf Coefficient (m/hr)	0.05000	Time to half empty (mins)	0	Depth (m)	0.350
Safety Factor	2.0	Width (m)	82.000	Inf Depth (m)	0.350
Porosity	0.33	Length (m)	10.000		

Node Cat 15 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.05000	Invert Level (m)	73.150	Slope (1:X)	300.0
Side Inf Coefficient (m/hr)	0.05000	Time to half empty (mins)	98	Depth (m)	0.350
Safety Factor	2.0	Width (m)	6.200	Inf Depth (m)	0.350
Porosity	0.33	Length (m)	225.000		

Node SWMH 7.1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.05000	Invert Level (m)	72.200	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.05000	Time to half empty (mins)	108	Depth (m)	0.350
Safety Factor	2.0	Width (m)	32.000	Inf Depth (m)	0.350
Porosity	0.33	Length (m)	102.000		

Node SWMH 11.1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.05000	Invert Level (m)	72.000	Slope (1:X)	60.0
Side Inf Coefficient (m/hr)	0.05000	Time to half empty (mins)	75	Depth (m)	0.350
Safety Factor	2.0	Width (m)	46.000	Inf Depth (m)	0.350
Porosity	0.33	Length (m)	50.000		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	92.680	26.225	30 year 60 minute winter	63.813	25.383
1 year 15 minute winter	65.039	26.225	30 year 1440 minute summer	10.381	2.782
1 year 60 minute summer	44.093	11.652	30 year 1440 minute winter	6.977	2.782
1 year 60 minute winter	29.294	11.652	100 year +20% CC 15 minute summer	320.990	90.829
1 year 1440 minute summer	5.542	1.485	100 year +20% CC 15 minute winter	225.256	90.829
1 year 1440 minute winter	3.724	1.485	100 year +20% CC 60 minute summer	149.687	39.558
30 year 15 minute summer	206.036	58.301	100 year +20% CC 60 minute winter	99.449	39.558
30 year 15 minute winter	144.587	58.301	100 year +20% CC 1440 minute summer	15.421	4.133
30 year 60 minute summer	96.050	25.383	100 year +20% CC 1440 minute winter	10.364	4.133

Results for 1 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 88.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 1.1	11	72.931	0.127	27.0	0.6232	0.0000	OK
15 minute summer	SWMH 1.2	13	72.820	0.232	47.8	0.2622	0.0000	OK
15 minute summer	SWMH 1.3	13	72.808	0.238	46.9	0.2695	0.0000	OK
15 minute summer	SWMH 1.4	13	72.761	0.363	49.8	0.4107	0.0000	SURCHARGED
15 minute summer	SWMH 1.5	12	72.734	0.434	57.9	0.4909	0.0000	SURCHARGED
15 minute summer	SWMH 2.1	10	72.869	0.127	23.5	0.7353	0.0000	OK
15 minute summer	SWMH 2.2	13	72.825	0.159	22.9	0.1794	0.0000	OK
15 minute summer	SWMH 2.3	13	72.823	0.208	22.1	0.2350	0.0000	OK
15 minute summer	SWMH 3.1	37	72.332	0.182	8.2	0.2053	0.0000	OK
15 minute summer	SWMH 3.2	37	72.331	0.231	7.3	0.2618	0.0000	OK
15 minute summer	SWMH 3.3	36	72.041	0.061	6.8	0.0689	0.0000	OK
15 minute summer	SWMH CON	39	71.880	0.060	6.8	0.0000	0.0000	OK
15 minute summer	SWMH 4.1	14	73.674	0.534	73.1	7.8428	0.0000	SURCHARGED
15 minute summer	SWMH 4.2	14	73.645	0.740	64.8	0.8372	0.0000	SURCHARGED
15 minute summer	SWMH 4.3	14	73.617	0.979	73.1	1.1071	0.0000	SURCHARGED
15 minute summer	SWMH 4.4	14	73.605	1.065	30.4	1.2049	0.0000	FLOOD RISK
15 minute summer	SWMH 4.5	14	73.601	1.101	71.5	1.2456	0.0000	FLOOD RISK
15 minute summer	SWMH 4.6	14	73.546	1.096	72.1	1.2396	0.0000	FLOOD RISK
15 minute summer	SWMH 4.7	13	73.462	1.122	82.2	1.2689	0.0000	FLOOD RISK
15 minute summer	SWMH 4.8	13	73.417	1.117	83.2	1.2632	0.0000	FLOOD RISK
15 minute summer	SWMH 5.1	14	73.475	0.115	19.6	0.4600	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 1.1	1.1	SWMH 1.2	26.2	0.712	0.381	2.2624	
15 minute summer	SWMH 1.2	1.2	SWMH 1.3	46.9	0.986	0.732	0.3176	
15 minute summer	SWMH 1.3	1.3	SWMH 1.4	45.9	0.978	0.669	2.9139	
15 minute summer	SWMH 1.4	1.4	SWMH 1.5	57.9	0.909	0.872	1.9125	
15 minute summer	SWMH 1.5	1.5	Pond 1	60.8	2.001	0.731	0.6459	
15 minute summer	SWMH 2.1	2.1	SWMH 2.2	22.9	0.781	0.334	0.6251	
15 minute summer	SWMH 2.2	2.2	SWMH 2.3	22.1	0.628	0.328	0.6160	
15 minute summer	SWMH 2.3	2.3	SWMH 1.2	21.7	0.444	0.336	0.4388	
15 minute summer	SWMH 3.1	3.1	SWMH 3.2	7.3	0.478	0.076	0.3454	
15 minute summer	SWMH 3.2	3.2	SWMH 3.3	6.8	0.673	0.086	0.2388	
15 minute summer	SWMH 3.3	3.3	SWMH CON	6.8	0.677	0.089	0.3333	82.5
15 minute summer	SWMH 4.1	4.1	SWMH 4.2	64.8	1.131	0.937	4.2254	
15 minute summer	SWMH 4.2	4.2	SWMH 4.3	59.6	1.057	0.860	4.7882	
15 minute summer	SWMH 4.3	4.3	SWMH 4.4	30.4	0.673	0.424	1.6449	
15 minute summer	SWMH 4.4	4.4	SWMH 4.5	28.7	0.408	0.267	0.3005	
15 minute summer	SWMH 4.5	4.5	SWMH 4.6	72.1	1.057	0.851	0.6031	
15 minute summer	SWMH 4.6	4.6	SWMH 4.7	73.4	1.042	0.889	1.3944	
15 minute summer	SWMH 4.7	4.7	SWMH 4.8	83.2	1.181	1.007	0.5066	
15 minute summer	SWMH 4.8	4.8	Pond 1	89.1	1.929	2.282	3.8239	
15 minute summer	SWMH 5.1	5.1	SWMH 5.2	19.4	1.445	0.266	0.7880	

Results for 1 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 88.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 5.2	14	73.460	0.610	25.3	0.6894	0.0000	SURCHARGED
15 minute summer	SWMH 5.3	13	73.458	0.922	20.0	1.0428	0.0000	FLOOD RISK
15 minute summer	SWMH 6.1	14	73.788	0.684	104.9	14.1454	0.0000	FLOOD RISK
15 minute summer	SWMH 6.2	14	73.709	0.877	79.5	0.9921	0.0000	SURCHARGED
15 minute summer	SWMH 6.3	14	73.626	1.062	79.6	3.6605	0.0000	SURCHARGED
15 minute summer	SWMH 7.1	20	31.208	-40.992	72.2	0.0000	0.0000	OK
15 minute summer	SWMH 7.2	1	71.700	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SWMH 8.1	46	72.068	0.168	4.9	0.1901	0.0000	OK
15 minute summer	SWMH 8.2	37	71.823	0.023	1.7	0.0000	0.0000	OK
15 minute summer	SWMH 9.1	13	73.552	0.912	83.0	11.2878	0.0000	SURCHARGED
15 minute summer	SWMH 9.2	13	73.209	0.759	50.4	0.8579	0.0000	SURCHARGED
15 minute summer	SWMH 9.3	13	72.999	0.649	50.8	0.7339	0.0000	SURCHARGED
15 minute summer	SWMH 9.4	12	72.923	0.613	51.2	0.6936	0.0000	SURCHARGED
15 minute summer	SWMH 9.5	9	72.668	0.668	52.0	0.7556	0.0000	SURCHARGED
15 minute summer	SWMH 10.1	10	72.816	0.156	35.2	0.8552	0.0000	OK
15 minute summer	SWMH 10.2	11	72.412	0.172	34.6	0.1942	0.0000	OK
15 minute summer	SWMH 10.3	12	72.281	0.181	33.9	0.2042	0.0000	OK
15 minute summer	SWMH 10.4	12	72.167	0.167	33.8	0.1886	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 5.2	5.2	SWMH 5.3	18.8	1.119	0.310	0.9226	
15 minute summer	SWMH 5.3	5.3	SWMH 4.7	-12.8	0.898	-0.221	0.3627	
15 minute summer	SWMH 6.1	6.1	SWMH 6.2	79.5	1.176	1.146	4.8671	
15 minute summer	SWMH 6.2	6.2	SWMH 6.3	52.3	0.966	0.754	4.8064	
15 minute summer	SWMH 6.3	6.3	SWMH 4.5	60.2	0.941	0.821	0.5767	
15 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.0	0.000	0.000	0.0000	0.0
15 minute summer	SWMH 7.1	Infiltration		0.0				
15 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.7	0.785	0.021	0.0093	18.8
15 minute summer	SWMH 9.1	9.1	SWMH 9.2	50.4	1.267	1.241	1.2312	
15 minute summer	SWMH 9.2	9.2	SWMH 9.3	50.8	1.278	1.271	0.6674	
15 minute summer	SWMH 9.3	9.3	SWMH 9.4	51.2	1.288	0.959	0.1507	
15 minute summer	SWMH 9.4	9.4	SWMH 9.5	52.0	1.308	1.131	1.5712	
15 minute summer	SWMH 9.5	9.5	Tank 1	53.6	1.968	1.911	0.4523	
15 minute summer	SWMH 10.1	10.1	SWMH 10.2	34.6	1.135	0.822	1.9661	
15 minute summer	SWMH 10.2	10.2	SWMH 10.3	33.9	1.025	0.843	0.7704	
15 minute summer	SWMH 10.3	10.3	SWMH 10.4	33.8	1.029	0.893	0.6137	
15 minute summer	SWMH 10.4	10.4	Tank 1	33.8	0.928	0.565	0.5813	

Results for 1 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 88.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	SWMH 11.1	17	72.321	0.321	63.1	23.1408	0.0000	SURCHARGED
15 minute summer	SWMH 11.2	18	71.808	0.008	0.2	0.0000	0.0000	OK
15 minute summer	SWMH 12.1	13	73.628	0.628	31.4	1.5644	0.0000	SURCHARGED
15 minute summer	SWMH 13.1	12	72.781	0.161	9.2	0.1820	0.0000	OK
15 minute summer	Tank 1	27	72.052	0.101	85.5	48.1415	0.0000	OK
15 minute summer	Pond 1	36	72.331	0.131	146.0	107.2983	0.0000	OK
15 minute summer	Cat 4	23	73.178	0.068	16.5	9.8827	0.0000	OK
15 minute summer	Cat 7	23	73.277	0.107	8.1	5.0577	0.0000	OK
15 minute summer	Cat 9	22	73.139	0.029	4.4	1.8290	0.0000	OK
15 minute summer	Cat 15	24	73.318	0.168	7.8	5.0239	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.366	0.002	0.0045	1.1
15 minute summer	SWMH 11.1	Infiltration		6.3				
15 minute summer	SWMH 12.1	12.1	SWMH 6.3	-22.0	-0.574	-0.430	1.7885	
15 minute summer	SWMH 13.1	13.1	SWMH 1.4	-9.2	-0.242	-0.206	1.0516	
15 minute summer	Tank 1	Tank 1	SWMH 8.1	4.9	0.465	0.110	0.2562	
15 minute summer	Pond 1	Pond 1	SWMH 3.1	8.2	0.650	0.088	0.2643	
15 minute summer	Cat 4	Hydro-Brake®		0.1				0.2
15 minute summer	Cat 4	Infiltration		5.7				
15 minute summer	Cat 7	Hydro-Brake®		0.1				0.3
15 minute summer	Cat 7	Infiltration		2.5				
15 minute summer	Cat 9	Hydro-Brake®		0.0				0.1
15 minute summer	Cat 9	Infiltration		2.5				
15 minute summer	Cat 15	Hydro-Brake®		0.1				0.3
15 minute summer	Cat 15	Infiltration		2.3				

Results for 1 year 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 88.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 1.1	11	72.934	0.130	28.4	0.6377	0.0000	OK
15 minute winter	SWMH 1.2	13	72.841	0.253	50.2	0.2860	0.0000	OK
15 minute winter	SWMH 1.3	13	72.821	0.251	48.3	0.2843	0.0000	OK
15 minute winter	SWMH 1.4	12	72.786	0.388	52.5	0.4383	0.0000	SURCHARGED
15 minute winter	SWMH 1.5	12	72.741	0.441	61.3	0.4983	0.0000	SURCHARGED
15 minute winter	SWMH 2.1	10	72.873	0.131	24.7	0.7565	0.0000	OK
15 minute winter	SWMH 2.2	13	72.850	0.184	24.0	0.2079	0.0000	OK
15 minute winter	SWMH 2.3	13	72.846	0.231	23.5	0.2613	0.0000	OK
15 minute winter	SWMH 3.1	39	72.346	0.196	8.7	0.2219	0.0000	OK
15 minute winter	SWMH 3.2	40	72.346	0.246	7.5	0.2782	0.0000	OK
15 minute winter	SWMH 3.3	38	72.042	0.062	7.0	0.0697	0.0000	OK
15 minute winter	SWMH CON	39	71.880	0.060	7.0	0.0000	0.0000	OK
15 minute winter	SWMH 4.1	14	73.811	0.671	76.8	9.8611	0.0000	FLOOD RISK
15 minute winter	SWMH 4.2	15	73.773	0.868	69.0	0.9823	0.0000	SURCHARGED
15 minute winter	SWMH 4.3	15	73.731	1.093	45.9	1.2360	0.0000	SURCHARGED
15 minute winter	SWMH 4.4	15	73.713	1.173	33.3	1.3265	0.0000	FLOOD RISK
15 minute winter	SWMH 4.5	15	73.706	1.206	76.6	1.3644	0.0000	FLOOD RISK
15 minute winter	SWMH 4.6	14	73.634	1.184	77.4	1.3394	0.0000	FLOOD RISK
15 minute winter	SWMH 4.7	14	73.515	1.175	88.4	1.3285	0.0000	FLOOD RISK
15 minute winter	SWMH 4.8	13	73.437	1.137	89.4	1.2864	0.0000	FLOOD RISK
15 minute winter	SWMH 5.1	14	73.540	0.180	20.6	0.7240	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 1.1	1.1	SWMH 1.2	27.3	0.697	0.397	2.4467	
15 minute winter	SWMH 1.2	1.2	SWMH 1.3	48.3	0.966	0.755	0.3390	
15 minute winter	SWMH 1.3	1.3	SWMH 1.4	48.9	0.984	0.712	2.9814	
15 minute winter	SWMH 1.4	1.4	SWMH 1.5	61.3	0.954	0.923	1.9125	
15 minute winter	SWMH 1.5	1.5	Pond 1	65.5	2.061	0.787	0.6411	
15 minute winter	SWMH 2.1	2.1	SWMH 2.2	24.0	0.778	0.350	0.6695	
15 minute winter	SWMH 2.2	2.2	SWMH 2.3	23.5	0.613	0.348	0.7093	
15 minute winter	SWMH 2.3	2.3	SWMH 1.2	22.9	0.451	0.356	0.4828	
15 minute winter	SWMH 3.1	3.1	SWMH 3.2	7.5	0.460	0.079	0.3713	
15 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.0	0.677	0.088	0.2427	
15 minute winter	SWMH 3.3	3.3	SWMH CON	7.0	0.682	0.091	0.3387	87.7
15 minute winter	SWMH 4.1	4.1	SWMH 4.2	69.0	1.116	0.997	4.2254	
15 minute winter	SWMH 4.2	4.2	SWMH 4.3	45.9	1.057	0.663	4.7882	
15 minute winter	SWMH 4.3	4.3	SWMH 4.4	33.3	0.692	0.465	1.6449	
15 minute winter	SWMH 4.4	4.4	SWMH 4.5	29.2	0.415	0.271	0.3005	
15 minute winter	SWMH 4.5	4.5	SWMH 4.6	77.4	1.100	0.914	0.6031	
15 minute winter	SWMH 4.6	4.6	SWMH 4.7	78.2	1.111	0.947	1.3944	
15 minute winter	SWMH 4.7	4.7	SWMH 4.8	89.4	1.270	1.082	0.5066	
15 minute winter	SWMH 4.8	4.8	Pond 1	94.9	2.010	2.431	4.0212	
15 minute winter	SWMH 5.1	5.1	SWMH 5.2	20.9	1.427	0.287	0.9692	

Results for 1 year 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 88.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 5.2	14	73.534	0.684	20.9	0.7741	0.0000	SURCHARGED
15 minute winter	SWMH 5.3	14	73.522	0.986	18.8	1.1147	0.0000	FLOOD RISK
15 minute winter	SWMH 6.1	14	73.937	0.833	110.2	17.2166	0.0000	FLOOD RISK
15 minute winter	SWMH 6.2	15	73.833	1.001	74.0	1.1320	0.0000	FLOOD RISK
15 minute winter	SWMH 6.3	15	73.736	1.172	89.6	4.0395	0.0000	FLOOD RISK
15 minute winter	SWMH 7.1	20	34.981	-37.219	75.9	0.0000	0.0000	OK
15 minute winter	SWMH 7.2	1	71.700	0.000	0.0	0.0000	0.0000	OK
15 minute winter	SWMH 8.1	29	72.081	0.181	5.1	0.2049	0.0000	OK
15 minute winter	SWMH 8.2	25	71.823	0.023	1.7	0.0000	0.0000	OK
15 minute winter	SWMH 9.1	13	73.664	1.024	87.1	12.6715	0.0000	FLOOD RISK
15 minute winter	SWMH 9.2	13	73.276	0.826	53.4	0.9347	0.0000	SURCHARGED
15 minute winter	SWMH 9.3	13	73.044	0.694	53.5	0.7850	0.0000	SURCHARGED
15 minute winter	SWMH 9.4	13	72.956	0.646	53.7	0.7302	0.0000	SURCHARGED
15 minute winter	SWMH 9.5	9	72.684	0.684	54.4	0.7733	0.0000	SURCHARGED
15 minute winter	SWMH 10.1	10	72.822	0.161	37.0	0.8829	0.0000	OK
15 minute winter	SWMH 10.2	11	72.419	0.179	36.2	0.2020	0.0000	OK
15 minute winter	SWMH 10.3	12	72.288	0.188	35.3	0.2122	0.0000	OK
15 minute winter	SWMH 10.4	12	72.171	0.171	35.2	0.1934	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 5.2	5.2	SWMH 5.3	18.0	1.148	0.297	0.9226	
15 minute winter	SWMH 5.3	5.3	SWMH 4.7	13.8	0.981	0.239	0.3627	
15 minute winter	SWMH 6.1	6.1	SWMH 6.2	74.0	1.163	1.067	4.8671	
15 minute winter	SWMH 6.2	6.2	SWMH 6.3	62.2	0.971	0.898	4.8064	
15 minute winter	SWMH 6.3	6.3	SWMH 4.5	52.2	0.945	0.711	0.5767	
15 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.0	0.000	0.000	0.0000	0.0
15 minute winter	SWMH 7.1	Infiltration		0.0				
15 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.7	0.789	0.022	0.0094	22.3
15 minute winter	SWMH 9.1	9.1	SWMH 9.2	53.4	1.343	1.315	1.2312	
15 minute winter	SWMH 9.2	9.2	SWMH 9.3	53.5	1.344	1.336	0.6674	
15 minute winter	SWMH 9.3	9.3	SWMH 9.4	53.7	1.350	1.005	0.1507	
15 minute winter	SWMH 9.4	9.4	SWMH 9.5	54.4	1.368	1.183	1.5712	
15 minute winter	SWMH 9.5	9.5	Tank 1	55.5	1.995	1.981	0.4780	
15 minute winter	SWMH 10.1	10.1	SWMH 10.2	36.2	1.139	0.858	2.0398	
15 minute winter	SWMH 10.2	10.2	SWMH 10.3	35.3	1.030	0.879	0.8000	
15 minute winter	SWMH 10.3	10.3	SWMH 10.4	35.2	1.039	0.930	0.6327	
15 minute winter	SWMH 10.4	10.4	Tank 1	35.2	0.939	0.588	0.5987	

Results for 1 year 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 88.16%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 11.1	17	72.343	0.343	66.3	26.1742	0.0000	SURCHARGED
15 minute winter	SWMH 11.2	18	71.808	0.008	0.2	0.0000	0.0000	OK
15 minute winter	SWMH 12.1	15	73.736	0.736	23.1	1.8339	0.0000	SURCHARGED
15 minute winter	SWMH 13.1	12	72.818	0.198	11.8	0.2236	0.0000	OK
15 minute winter	Tank 1	27	72.064	0.113	88.6	53.9166	0.0000	OK
15 minute winter	Pond 1	38	72.346	0.146	152.1	120.2727	0.0000	OK
15 minute winter	Cat 4	24	73.182	0.072	18.5	11.2067	0.0000	OK
15 minute winter	Cat 7	24	73.285	0.115	9.1	5.7546	0.0000	OK
15 minute winter	Cat 9	22	73.141	0.031	4.9	2.0805	0.0000	OK
15 minute winter	Cat 15	24	73.330	0.180	8.8	5.7062	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.369	0.002	0.0046	1.2
15 minute winter	SWMH 11.1	Infiltration		6.7				
15 minute winter	SWMH 12.1	12.1	SWMH 6.3	-13.3	0.416	-0.261	1.7885	
15 minute winter	SWMH 13.1	13.1	SWMH 1.4	-11.8	-0.412	-0.265	1.1508	
15 minute winter	Tank 1	Tank 1	SWMH 8.1	5.1	0.492	0.114	0.2918	
15 minute winter	Pond 1	Pond 1	SWMH 3.1	8.7	0.647	0.093	0.2958	
15 minute winter	Cat 4	Hydro-Brake®		0.1				0.2
15 minute winter	Cat 4	Infiltration		6.1				
15 minute winter	Cat 7	Hydro-Brake®		0.1				0.3
15 minute winter	Cat 7	Infiltration		2.7				
15 minute winter	Cat 9	Hydro-Brake®		0.1				0.1
15 minute winter	Cat 9	Infiltration		2.7				
15 minute winter	Cat 15	Hydro-Brake®		0.1				0.3
15 minute winter	Cat 15	Infiltration		2.4				

Results for 1 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 88.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 1.1	33	72.912	0.108	19.6	0.5303	0.0000	OK
60 minute summer	SWMH 1.2	34	72.766	0.178	35.7	0.2008	0.0000	OK
60 minute summer	SWMH 1.3	34	72.727	0.157	35.6	0.1778	0.0000	OK
60 minute summer	SWMH 1.4	35	72.560	0.162	35.4	0.1827	0.0000	OK
60 minute summer	SWMH 1.5	35	72.442	0.142	35.3	0.1607	0.0000	OK
60 minute summer	SWMH 2.1	33	72.849	0.107	17.1	0.6174	0.0000	OK
60 minute summer	SWMH 2.2	34	72.785	0.119	17.1	0.1350	0.0000	OK
60 minute summer	SWMH 2.3	34	72.772	0.157	16.7	0.1776	0.0000	OK
60 minute summer	SWMH 3.1	69	72.423	0.273	8.4	0.3090	0.0000	OK
60 minute summer	SWMH 3.2	69	72.423	0.323	7.6	0.3650	0.0000	SURCHARGED
60 minute summer	SWMH 3.3	70	72.044	0.064	7.5	0.0724	0.0000	OK
60 minute summer	SWMH CON	70	71.883	0.063	7.5	0.0000	0.0000	OK
60 minute summer	SWMH 4.1	38	73.487	0.347	53.1	5.0916	0.0000	SURCHARGED
60 minute summer	SWMH 4.2	38	73.444	0.539	54.3	0.6100	0.0000	SURCHARGED
60 minute summer	SWMH 4.3	38	73.397	0.759	40.5	0.8581	0.0000	SURCHARGED
60 minute summer	SWMH 4.4	38	73.378	0.838	35.2	0.9475	0.0000	SURCHARGED
60 minute summer	SWMH 4.5	38	73.371	0.871	83.4	0.9853	0.0000	SURCHARGED
60 minute summer	SWMH 4.6	38	73.290	0.840	82.3	0.9504	0.0000	SURCHARGED
60 minute summer	SWMH 4.7	38	73.148	0.808	88.9	0.9134	0.0000	SURCHARGED
60 minute summer	SWMH 4.8	38	73.060	0.760	88.5	0.8593	0.0000	SURCHARGED
60 minute summer	SWMH 5.1	32	73.428	0.068	14.3	0.2729	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 1.1	1.1	SWMH 1.2	19.4	0.608	0.283	1.8421	
60 minute summer	SWMH 1.2	1.2	SWMH 1.3	35.6	0.880	0.555	0.2167	
60 minute summer	SWMH 1.3	1.3	SWMH 1.4	35.4	0.940	0.516	1.6928	
60 minute summer	SWMH 1.4	1.4	SWMH 1.5	35.3	0.988	0.532	0.9711	
60 minute summer	SWMH 1.5	1.5	Pond 1	35.2	1.522	0.423	0.7435	
60 minute summer	SWMH 2.1	2.1	SWMH 2.2	17.1	0.723	0.249	0.4745	
60 minute summer	SWMH 2.2	2.2	SWMH 2.3	16.7	0.561	0.248	0.4348	
60 minute summer	SWMH 2.3	2.3	SWMH 1.2	16.7	0.414	0.259	0.3206	
60 minute summer	SWMH 3.1	3.1	SWMH 3.2	7.6	0.322	0.079	0.4623	
60 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.5	0.690	0.095	0.2560	
60 minute summer	SWMH 3.3	3.3	SWMH CON	7.5	0.696	0.098	0.3572	115.3
60 minute summer	SWMH 4.1	4.1	SWMH 4.2	54.3	1.060	0.784	4.2254	
60 minute summer	SWMH 4.2	4.2	SWMH 4.3	40.5	0.947	0.584	4.7882	
60 minute summer	SWMH 4.3	4.3	SWMH 4.4	35.2	0.641	0.492	1.6449	
60 minute summer	SWMH 4.4	4.4	SWMH 4.5	33.0	0.468	0.306	0.3005	
60 minute summer	SWMH 4.5	4.5	SWMH 4.6	82.3	1.169	0.972	0.6031	
60 minute summer	SWMH 4.6	4.6	SWMH 4.7	81.3	1.155	0.984	1.3944	
60 minute summer	SWMH 4.7	4.7	SWMH 4.8	88.5	1.257	1.071	0.5066	
60 minute summer	SWMH 4.8	4.8	Pond 1	88.8	1.626	2.273	4.8127	
60 minute summer	SWMH 5.1	5.1	SWMH 5.2	14.5	1.330	0.199	0.6401	

Results for 1 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 88.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 5.2	38	73.156	0.306	14.5	0.3466	0.0000	SURCHARGED
60 minute summer	SWMH 5.3	38	73.151	0.615	13.8	0.6951	0.0000	SURCHARGED
60 minute summer	SWMH 6.1	38	73.633	0.529	76.2	10.9335	0.0000	SURCHARGED
60 minute summer	SWMH 6.2	38	73.519	0.687	70.1	0.7769	0.0000	SURCHARGED
60 minute summer	SWMH 6.3	38	73.405	0.841	68.4	2.9002	0.0000	SURCHARGED
60 minute summer	SWMH 7.1	66	55.568	-16.632	52.4	0.0000	0.0000	OK
60 minute summer	SWMH 7.2	1	71.700	0.000	0.0	0.0000	0.0000	OK
60 minute summer	SWMH 8.1	63	72.138	0.238	6.0	0.2689	0.0000	SURCHARGED
60 minute summer	SWMH 8.2	65	71.823	0.023	1.8	0.0000	0.0000	OK
60 minute summer	SWMH 9.1	36	73.154	0.514	60.3	6.3590	0.0000	SURCHARGED
60 minute summer	SWMH 9.2	36	72.865	0.415	47.2	0.4698	0.0000	SURCHARGED
60 minute summer	SWMH 9.3	36	72.693	0.343	46.3	0.3881	0.0000	SURCHARGED
60 minute summer	SWMH 9.4	36	72.628	0.318	46.0	0.3597	0.0000	SURCHARGED
60 minute summer	SWMH 9.5	37	72.271	0.271	45.9	0.3065	0.0000	SURCHARGED
60 minute summer	SWMH 10.1	33	72.787	0.127	25.6	0.6962	0.0000	OK
60 minute summer	SWMH 10.2	34	72.377	0.137	25.5	0.1548	0.0000	OK
60 minute summer	SWMH 10.3	34	72.244	0.144	25.3	0.1630	0.0000	OK
60 minute summer	SWMH 10.4	34	72.140	0.140	25.3	0.1587	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 5.2	5.2	SWMH 5.3	13.8	0.991	0.228	0.9226	
60 minute summer	SWMH 5.3	5.3	SWMH 4.7	9.9	0.626	0.172	0.3627	
60 minute summer	SWMH 6.1	6.1	SWMH 6.2	70.1	1.128	1.010	4.8671	
60 minute summer	SWMH 6.2	6.2	SWMH 6.3	49.1	0.852	0.709	4.8064	
60 minute summer	SWMH 6.3	6.3	SWMH 4.5	55.6	0.826	0.758	0.5767	
60 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.0	0.000	0.000	0.0000	0.0
60 minute summer	SWMH 7.1	Infiltration		0.0				
60 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.798	0.023	0.0097	27.9
60 minute summer	SWMH 9.1	9.1	SWMH 9.2	47.2	1.188	1.163	1.2312	
60 minute summer	SWMH 9.2	9.2	SWMH 9.3	46.3	1.164	1.157	0.6674	
60 minute summer	SWMH 9.3	9.3	SWMH 9.4	46.0	1.221	0.861	0.1507	
60 minute summer	SWMH 9.4	9.4	SWMH 9.5	45.9	1.154	0.998	1.5712	
60 minute summer	SWMH 9.5	9.5	Tank 1	45.9	1.606	1.637	0.5439	
60 minute summer	SWMH 10.1	10.1	SWMH 10.2	25.5	1.058	0.606	1.5335	
60 minute summer	SWMH 10.2	10.2	SWMH 10.3	25.3	0.973	0.631	0.6083	
60 minute summer	SWMH 10.3	10.3	SWMH 10.4	25.3	0.956	0.667	0.4940	
60 minute summer	SWMH 10.4	10.4	Tank 1	25.2	0.854	0.420	0.5672	

Results for 1 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 88.15%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 11.1	47	72.386	0.386	45.8	32.5005	0.0000	SURCHARGED
60 minute summer	SWMH 11.2	47	71.808	0.008	0.2	0.0000	0.0000	OK
60 minute summer	SWMH 12.1	38	73.408	0.408	16.1	1.0161	0.0000	SURCHARGED
60 minute summer	SWMH 13.1	1	72.620	0.000	0.0	0.0000	0.0000	OK
60 minute summer	Tank 1	68	72.128	0.177	70.2	84.0403	0.0000	OK
60 minute summer	Pond 1	69	72.424	0.224	120.2	186.2111	0.0000	OK
60 minute summer	Cat 4	49	73.190	0.080	17.8	13.5662	0.0000	OK
60 minute summer	Cat 7	50	73.298	0.128	8.7	7.0610	0.0000	OK
60 minute summer	Cat 9	46	73.143	0.033	4.7	2.3008	0.0000	OK
60 minute summer	Cat 15	50	73.352	0.202	8.4	7.0655	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.374	0.002	0.0048	1.6
60 minute summer	SWMH 11.1	Infiltration		7.6				
60 minute summer	SWMH 12.1	12.1	SWMH 6.3	-8.9	0.306	-0.174	1.7885	
60 minute summer	SWMH 13.1	13.1	SWMH 1.4	0.0	0.000	0.000	0.4576	
60 minute summer	Tank 1	Tank 1	SWMH 8.1	6.0	0.453	0.134	0.4218	
60 minute summer	Pond 1	Pond 1	SWMH 3.1	8.4	0.548	0.090	0.4412	
60 minute summer	Cat 4	Hydro-Brake®		0.1				0.3
60 minute summer	Cat 4	Infiltration		6.7				
60 minute summer	Cat 7	Hydro-Brake®		0.1				0.4
60 minute summer	Cat 7	Infiltration		3.0				
60 minute summer	Cat 9	Hydro-Brake®		0.1				0.1
60 minute summer	Cat 9	Infiltration		2.8				
60 minute summer	Cat 15	Hydro-Brake®		0.1				0.5
60 minute summer	Cat 15	Infiltration		2.8				

Results for 1 year 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 88.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWMH 1.1	33	72.901	0.097	15.9	0.4763	0.0000	OK
60 minute winter	SWMH 1.2	34	72.746	0.158	29.4	0.1782	0.0000	OK
60 minute winter	SWMH 1.3	34	72.710	0.140	29.3	0.1582	0.0000	OK
60 minute winter	SWMH 1.4	35	72.542	0.144	29.3	0.1629	0.0000	OK
60 minute winter	SWMH 1.5	67	72.451	0.151	29.2	0.1704	0.0000	OK
60 minute winter	SWMH 2.1	33	72.837	0.095	13.8	0.5482	0.0000	OK
60 minute winter	SWMH 2.2	34	72.768	0.102	13.8	0.1153	0.0000	OK
60 minute winter	SWMH 2.3	34	72.752	0.137	13.7	0.1545	0.0000	OK
60 minute winter	SWMH 3.1	68	72.450	0.300	8.6	0.3393	0.0000	SURCHARGED
60 minute winter	SWMH 3.2	68	72.449	0.349	7.7	0.3952	0.0000	SURCHARGED
60 minute winter	SWMH 3.3	69	72.045	0.065	7.6	0.0730	0.0000	OK
60 minute winter	SWMH CON	69	71.883	0.063	7.6	0.0000	0.0000	OK
60 minute winter	SWMH 4.1	40	73.493	0.353	43.0	5.1861	0.0000	SURCHARGED
60 minute winter	SWMH 4.2	40	73.448	0.543	42.4	0.6144	0.0000	SURCHARGED
60 minute winter	SWMH 4.3	40	73.398	0.760	32.8	0.8591	0.0000	SURCHARGED
60 minute winter	SWMH 4.4	40	73.377	0.837	31.9	0.9470	0.0000	SURCHARGED
60 minute winter	SWMH 4.5	40	73.370	0.870	81.7	0.9842	0.0000	SURCHARGED
60 minute winter	SWMH 4.6	40	73.288	0.838	81.7	0.9474	0.0000	SURCHARGED
60 minute winter	SWMH 4.7	40	73.142	0.802	89.6	0.9066	0.0000	SURCHARGED
60 minute winter	SWMH 4.8	40	73.052	0.752	89.5	0.8501	0.0000	SURCHARGED
60 minute winter	SWMH 5.1	33	73.420	0.060	11.5	0.2418	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWMH 1.1	1.1	SWMH 1.2	15.8	0.565	0.231	1.5949	
60 minute winter	SWMH 1.2	1.2	SWMH 1.3	29.3	0.842	0.458	0.1868	
60 minute winter	SWMH 1.3	1.3	SWMH 1.4	29.3	0.896	0.427	1.4646	
60 minute winter	SWMH 1.4	1.4	SWMH 1.5	29.2	0.944	0.440	0.8416	
60 minute winter	SWMH 1.5	1.5	Pond 1	29.2	1.380	0.351	0.8723	
60 minute winter	SWMH 2.1	2.1	SWMH 2.2	13.8	0.693	0.201	0.3955	
60 minute winter	SWMH 2.2	2.2	SWMH 2.3	13.7	0.540	0.203	0.3585	
60 minute winter	SWMH 2.3	2.3	SWMH 1.2	13.7	0.399	0.212	0.2727	
60 minute winter	SWMH 3.1	3.1	SWMH 3.2	7.7	0.340	0.080	0.4725	
60 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.6	0.693	0.096	0.2588	
60 minute winter	SWMH 3.3	3.3	SWMH CON	7.6	0.699	0.099	0.3611	118.6
60 minute winter	SWMH 4.1	4.1	SWMH 4.2	42.4	1.003	0.613	4.2254	
60 minute winter	SWMH 4.2	4.2	SWMH 4.3	32.8	0.798	0.474	4.7882	
60 minute winter	SWMH 4.3	4.3	SWMH 4.4	31.9	0.660	0.445	1.6449	
60 minute winter	SWMH 4.4	4.4	SWMH 4.5	31.0	0.440	0.288	0.3005	
60 minute winter	SWMH 4.5	4.5	SWMH 4.6	81.7	1.160	0.964	0.6031	
60 minute winter	SWMH 4.6	4.6	SWMH 4.7	81.7	1.160	0.989	1.3944	
60 minute winter	SWMH 4.7	4.7	SWMH 4.8	89.5	1.271	1.083	0.5066	
60 minute winter	SWMH 4.8	4.8	Pond 1	89.8	1.579	2.300	5.1331	
60 minute winter	SWMH 5.1	5.1	SWMH 5.2	11.5	1.235	0.158	0.6301	

Results for 1 year 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 88.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
60 minute winter	SWMH 5.2	40	73.150	0.300	11.5	0.3398	0.0000	SURCHARGED
60 minute winter	SWMH 5.3	40	73.145	0.609	10.5	0.6883	0.0000	SURCHARGED
60 minute winter	SWMH 6.1	39	73.629	0.525	61.6	10.8407	0.0000	SURCHARGED
60 minute winter	SWMH 6.2	40	73.515	0.683	56.2	0.7729	0.0000	SURCHARGED
60 minute winter	SWMH 6.3	40	73.404	0.840	56.7	2.8961	0.0000	SURCHARGED
60 minute winter	SWMH 7.1	65	62.250	-9.950	42.4	0.0000	0.0000	OK
60 minute winter	SWMH 7.2	1	71.700	0.000	0.0	0.0000	0.0000	OK
60 minute winter	SWMH 8.1	66	72.154	0.254	6.0	0.2870	0.0000	SURCHARGED
60 minute winter	SWMH 8.2	62	71.824	0.024	1.8	0.0000	0.0000	OK
60 minute winter	SWMH 9.1	36	72.982	0.342	48.8	4.2354	0.0000	SURCHARGED
60 minute winter	SWMH 9.2	38	72.727	0.277	44.1	0.3135	0.0000	SURCHARGED
60 minute winter	SWMH 9.3	38	72.589	0.239	44.0	0.2698	0.0000	SURCHARGED
60 minute winter	SWMH 9.4	38	72.536	0.226	43.8	0.2560	0.0000	SURCHARGED
60 minute winter	SWMH 9.5	41	72.260	0.260	43.3	0.2944	0.0000	SURCHARGED
60 minute winter	SWMH 10.1	33	72.772	0.112	20.7	0.6103	0.0000	OK
60 minute winter	SWMH 10.2	34	72.360	0.120	20.7	0.1353	0.0000	OK
60 minute winter	SWMH 10.3	34	72.226	0.126	20.6	0.1421	0.0000	OK
60 minute winter	SWMH 10.4	68	72.149	0.149	20.6	0.1684	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
60 minute winter	SWMH 5.2	5.2	SWMH 5.3	10.5	0.715	0.174	0.9226	
60 minute winter	SWMH 5.3	5.3	SWMH 4.7	9.0	0.675	0.156	0.3627	
60 minute winter	SWMH 6.1	6.1	SWMH 6.2	56.2	1.068	0.810	4.8671	
60 minute winter	SWMH 6.2	6.2	SWMH 6.3	46.0	0.697	0.664	4.8064	
60 minute winter	SWMH 6.3	6.3	SWMH 4.5	54.1	0.768	0.737	0.5767	
60 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.0	0.000	0.000	0.0000	0.0
60 minute winter	SWMH 7.1	Infiltration		0.0				
60 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.800	0.023	0.0098	28.6
60 minute winter	SWMH 9.1	9.1	SWMH 9.2	44.1	1.110	1.087	1.2312	
60 minute winter	SWMH 9.2	9.2	SWMH 9.3	44.0	1.107	1.100	0.6674	
60 minute winter	SWMH 9.3	9.3	SWMH 9.4	43.8	1.213	0.821	0.1507	
60 minute winter	SWMH 9.4	9.4	SWMH 9.5	43.3	1.153	0.942	1.5708	
60 minute winter	SWMH 9.5	9.5	Tank 1	43.1	1.591	1.539	0.5745	
60 minute winter	SWMH 10.1	10.1	SWMH 10.2	20.7	1.008	0.491	1.3044	
60 minute winter	SWMH 10.2	10.2	SWMH 10.3	20.6	0.933	0.514	0.5160	
60 minute winter	SWMH 10.3	10.3	SWMH 10.4	20.6	0.905	0.544	0.4251	
60 minute winter	SWMH 10.4	10.4	Tank 1	20.6	0.807	0.344	0.6675	

Results for 1 year 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 88.06%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWMH 11.1	49	72.412	0.412	37.1	36.8203	0.0000	SURCHARGED
60 minute winter	SWMH 11.2	50	71.808	0.008	0.2	0.0000	0.0000	OK
60 minute winter	SWMH 12.1	40	73.407	0.407	9.8	1.0134	0.0000	SURCHARGED
60 minute winter	SWMH 13.1	1	72.620	0.000	0.0	0.0000	0.0000	OK
60 minute winter	Tank 1	67	72.149	0.198	63.7	94.2872	0.0000	OK
60 minute winter	Pond 1	68	72.450	0.250	115.6	209.5236	0.0000	OK
60 minute winter	Cat 4	51	73.195	0.085	17.5	15.1335	0.0000	OK
60 minute winter	Cat 7	52	73.306	0.136	8.6	7.9152	0.0000	OK
60 minute winter	Cat 9	47	73.144	0.034	4.6	2.4627	0.0000	OK
60 minute winter	Cat 15	52	73.365	0.215	8.3	7.9294	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.377	0.002	0.0048	1.7
60 minute winter	SWMH 11.1	Infiltration		8.1				
60 minute winter	SWMH 12.1	12.1	SWMH 6.3	6.6	0.315	0.128	1.7885	
60 minute winter	SWMH 13.1	13.1	SWMH 1.4	0.0	0.000	0.000	0.4025	
60 minute winter	Tank 1	Tank 1	SWMH 8.1	6.0	0.434	0.133	0.4537	
60 minute winter	Pond 1	Pond 1	SWMH 3.1	8.6	0.566	0.092	0.4753	
60 minute winter	Cat 4	Hydro-Brake®		0.1				0.4
60 minute winter	Cat 4	Infiltration		7.1				
60 minute winter	Cat 7	Hydro-Brake®		0.1				0.4
60 minute winter	Cat 7	Infiltration		3.2				
60 minute winter	Cat 9	Hydro-Brake®		0.1				0.1
60 minute winter	Cat 9	Infiltration		2.9				
60 minute winter	Cat 15	Hydro-Brake®		0.1				0.5
60 minute winter	Cat 15	Infiltration		2.9				

Results for 1 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 94.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 1.1	750	72.844	0.040	2.7	0.1981	0.0000	OK
1440 minute summer	SWMH 1.2	750	72.649	0.061	5.1	0.0685	0.0000	OK
1440 minute summer	SWMH 1.3	750	72.625	0.055	5.1	0.0627	0.0000	OK
1440 minute summer	SWMH 1.4	960	72.534	0.136	5.1	0.1535	0.0000	OK
1440 minute summer	SWMH 1.5	960	72.534	0.234	5.1	0.2643	0.0000	OK
1440 minute summer	SWMH 2.1	750	72.781	0.039	2.4	0.2240	0.0000	OK
1440 minute summer	SWMH 2.2	750	72.705	0.039	2.4	0.0443	0.0000	OK
1440 minute summer	SWMH 2.3	750	72.656	0.041	2.4	0.0459	0.0000	OK
1440 minute summer	SWMH 3.1	960	72.533	0.383	8.0	0.4332	0.0000	SURCHARGED
1440 minute summer	SWMH 3.2	960	72.532	0.432	8.2	0.4890	0.0000	SURCHARGED
1440 minute summer	SWMH 3.3	960	72.045	0.065	7.8	0.0739	0.0000	OK
1440 minute summer	SWMH CON	960	71.884	0.064	7.8	0.0000	0.0000	OK
1440 minute summer	SWMH 4.1	750	73.206	0.066	7.4	0.9737	0.0000	OK
1440 minute summer	SWMH 4.2	750	72.971	0.066	7.4	0.0749	0.0000	OK
1440 minute summer	SWMH 4.3	750	72.704	0.066	7.4	0.0745	0.0000	OK
1440 minute summer	SWMH 4.4	750	72.610	0.070	7.4	0.0793	0.0000	OK
1440 minute summer	SWMH 4.5	750	72.611	0.111	21.0	0.1258	0.0000	OK
1440 minute summer	SWMH 4.6	750	72.555	0.105	21.0	0.1186	0.0000	OK
1440 minute summer	SWMH 4.7	930	72.537	0.197	23.0	0.2225	0.0000	OK
1440 minute summer	SWMH 4.8	930	72.536	0.236	23.0	0.2672	0.0000	OK
1440 minute summer	SWMH 5.1	750	73.386	0.026	2.0	0.1031	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 1.1	1.1	SWMH 1.2	2.7	0.347	0.039	0.4406	
1440 minute summer	SWMH 1.2	1.2	SWMH 1.3	5.1	0.535	0.080	0.0511	
1440 minute summer	SWMH 1.3	1.3	SWMH 1.4	5.1	0.569	0.074	0.7770	
1440 minute summer	SWMH 1.4	1.4	SWMH 1.5	5.1	0.566	0.077	1.2201	
1440 minute summer	SWMH 1.5	1.5	Pond 1	4.9	0.559	0.059	1.1481	
1440 minute summer	SWMH 2.1	2.1	SWMH 2.2	2.4	0.450	0.035	0.1056	
1440 minute summer	SWMH 2.2	2.2	SWMH 2.3	2.4	0.434	0.036	0.0758	
1440 minute summer	SWMH 2.3	2.3	SWMH 1.2	2.4	0.307	0.037	0.0628	
1440 minute summer	SWMH 3.1	3.1	SWMH 3.2	8.2	0.173	0.086	0.4727	
1440 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.8	0.698	0.099	0.2637	
1440 minute summer	SWMH 3.3	3.3	SWMH CON	7.8	0.705	0.102	0.3678	566.2
1440 minute summer	SWMH 4.1	4.1	SWMH 4.2	7.4	0.643	0.107	0.6912	
1440 minute summer	SWMH 4.2	4.2	SWMH 4.3	7.4	0.646	0.107	0.7796	
1440 minute summer	SWMH 4.3	4.3	SWMH 4.4	7.4	0.621	0.103	0.2792	
1440 minute summer	SWMH 4.4	4.4	SWMH 4.5	7.4	0.417	0.069	0.0773	
1440 minute summer	SWMH 4.5	4.5	SWMH 4.6	21.0	0.920	0.248	0.1956	
1440 minute summer	SWMH 4.6	4.6	SWMH 4.7	21.0	0.771	0.254	0.6532	
1440 minute summer	SWMH 4.7	4.7	SWMH 4.8	23.0	0.637	0.278	0.3903	
1440 minute summer	SWMH 4.8	4.8	Pond 1	22.8	0.575	0.585	5.1158	
1440 minute summer	SWMH 5.1	5.1	SWMH 5.2	2.0	0.749	0.028	0.0701	

Results for 1 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 94.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 5.2	750	72.878	0.028	2.0	0.0318	0.0000	OK
1440 minute summer	SWMH 5.3	750	72.565	0.029	2.0	0.0324	0.0000	OK
1440 minute summer	SWMH 6.1	750	73.184	0.080	10.7	1.6506	0.0000	OK
1440 minute summer	SWMH 6.2	750	72.911	0.079	10.7	0.0891	0.0000	OK
1440 minute summer	SWMH 6.3	750	72.658	0.094	13.6	0.3223	0.0000	OK
1440 minute summer	SWMH 7.1	810	72.582	0.382	7.3	14.1752	0.0000	SURCHARGED
1440 minute summer	SWMH 7.2	810	71.707	0.007	0.2	0.0000	0.0000	OK
1440 minute summer	SWMH 8.1	1080	72.319	0.419	4.7	0.4735	0.0000	SURCHARGED
1440 minute summer	SWMH 8.2	780	71.824	0.024	1.8	0.0000	0.0000	OK
1440 minute summer	SWMH 9.1	750	72.710	0.070	8.4	0.8702	0.0000	OK
1440 minute summer	SWMH 9.2	750	72.522	0.072	8.4	0.0819	0.0000	OK
1440 minute summer	SWMH 9.3	750	72.418	0.068	8.4	0.0770	0.0000	OK
1440 minute summer	SWMH 9.4	750	72.375	0.065	8.4	0.0731	0.0000	OK
1440 minute summer	SWMH 9.5	1080	72.319	0.319	8.4	0.3608	0.0000	SURCHARGED
1440 minute summer	SWMH 10.1	750	72.704	0.044	3.6	0.2423	0.0000	OK
1440 minute summer	SWMH 10.2	1080	72.319	0.079	3.6	0.0893	0.0000	OK
1440 minute summer	SWMH 10.3	1080	72.319	0.219	3.6	0.2476	0.0000	OK
1440 minute summer	SWMH 10.4	1080	72.319	0.319	3.5	0.3607	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 5.2	5.2	SWMH 5.3	2.0	0.693	0.033	0.0670	
1440 minute summer	SWMH 5.3	5.3	SWMH 4.7	2.0	0.602	0.035	0.0965	
1440 minute summer	SWMH 6.1	6.1	SWMH 6.2	10.7	0.719	0.154	1.0281	
1440 minute summer	SWMH 6.2	6.2	SWMH 6.3	10.7	0.641	0.154	1.1415	
1440 minute summer	SWMH 6.3	6.3	SWMH 4.5	13.6	0.766	0.185	0.1454	
1440 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.2	0.488	0.002	0.0042	6.2
1440 minute summer	SWMH 7.1	Infiltration		5.3				
1440 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0098	130.3
1440 minute summer	SWMH 9.1	9.1	SWMH 9.2	8.4	0.778	0.207	0.3342	
1440 minute summer	SWMH 9.2	9.2	SWMH 9.3	8.4	0.795	0.210	0.1773	
1440 minute summer	SWMH 9.3	9.3	SWMH 9.4	8.4	0.860	0.157	0.0370	
1440 minute summer	SWMH 9.4	9.4	SWMH 9.5	8.4	0.543	0.183	0.9501	
1440 minute summer	SWMH 9.5	9.5	Tank 1	8.3	0.560	0.295	0.6599	
1440 minute summer	SWMH 10.1	10.1	SWMH 10.2	3.6	0.644	0.085	0.4422	
1440 minute summer	SWMH 10.2	10.2	SWMH 10.3	3.6	0.581	0.090	0.6050	
1440 minute summer	SWMH 10.3	10.3	SWMH 10.4	3.5	0.337	0.092	0.7398	
1440 minute summer	SWMH 10.4	10.4	Tank 1	3.4	0.259	0.057	1.1239	

Results for 1 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 94.95%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 11.1	780	72.262	0.262	6.4	15.9173	0.0000	SURCHARGED
1440 minute summer	SWMH 11.2	600	71.808	0.008	0.1	0.0000	0.0000	OK
1440 minute summer	SWMH 12.1	750	73.022	0.022	1.0	0.0543	0.0000	OK
1440 minute summer	SWMH 13.1	30	72.620	0.000	0.0	0.0000	0.0000	OK
1440 minute summer	Tank 1	1080	72.319	0.368	11.7	175.1759	0.0000	SURCHARGED
1440 minute summer	Pond 1	960	72.534	0.334	27.8	283.0243	0.0000	SURCHARGED
1440 minute summer	Cat 4	750	73.149	0.039	3.5	3.4002	0.0000	OK
1440 minute summer	Cat 7	750	73.235	0.065	1.7	2.0244	0.0000	OK
1440 minute summer	Cat 9	750	73.120	0.010	0.9	0.2524	0.0000	OK
1440 minute summer	Cat 15	750	73.260	0.110	1.7	2.3785	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.1	0.359	0.002	0.0043	9.2
1440 minute summer	SWMH 11.1	Infiltration		5.1				
1440 minute summer	SWMH 12.1	12.1	SWMH 6.3	1.0	0.126	0.020	0.3945	
1440 minute summer	SWMH 13.1	13.1	SWMH 1.4	0.0	0.000	0.000	0.3753	
1440 minute summer	Tank 1	Tank 1	SWMH 8.1	4.7	0.270	0.105	0.5332	
1440 minute summer	Pond 1	Pond 1	SWMH 3.1	8.0	0.472	0.086	0.5024	
1440 minute summer	Cat 4	Hydro-Brake®		0.1				1.5
1440 minute summer	Cat 4	Infiltration		3.3				
1440 minute summer	Cat 7	Hydro-Brake®		0.1				2.3
1440 minute summer	Cat 7	Infiltration		1.5				
1440 minute summer	Cat 9	Hydro-Brake®		0.0				0.4
1440 minute summer	Cat 9	Infiltration		0.9				
1440 minute summer	Cat 15	Hydro-Brake®		0.1				3.0
1440 minute summer	Cat 15	Infiltration		1.5				

Results for 1 year 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 95.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 1.1	750	72.840	0.036	2.1	0.1758	0.0000	OK
1440 minute winter	SWMH 1.2	750	72.641	0.053	3.9	0.0598	0.0000	OK
1440 minute winter	SWMH 1.3	750	72.619	0.049	3.9	0.0549	0.0000	OK
1440 minute winter	SWMH 1.4	1020	72.566	0.168	3.9	0.1903	0.0000	OK
1440 minute winter	SWMH 1.5	1020	72.566	0.266	3.9	0.3011	0.0000	OK
1440 minute winter	SWMH 2.1	750	72.776	0.034	1.8	0.1949	0.0000	OK
1440 minute winter	SWMH 2.2	750	72.700	0.034	1.8	0.0387	0.0000	OK
1440 minute winter	SWMH 2.3	750	72.649	0.034	1.8	0.0387	0.0000	OK
1440 minute winter	SWMH 3.1	1020	72.566	0.416	8.0	0.4700	0.0000	SURCHARGED
1440 minute winter	SWMH 3.2	1020	72.565	0.465	8.1	0.5257	0.0000	SURCHARGED
1440 minute winter	SWMH 3.3	1020	72.046	0.066	7.9	0.0741	0.0000	OK
1440 minute winter	SWMH CON	1020	71.884	0.064	7.9	0.0000	0.0000	OK
1440 minute winter	SWMH 4.1	750	73.198	0.058	5.6	0.8472	0.0000	OK
1440 minute winter	SWMH 4.2	750	72.963	0.058	5.6	0.0651	0.0000	OK
1440 minute winter	SWMH 4.3	750	72.696	0.058	5.6	0.0652	0.0000	OK
1440 minute winter	SWMH 4.4	750	72.594	0.054	5.6	0.0610	0.0000	OK
1440 minute winter	SWMH 4.5	720	72.595	0.095	15.8	0.1070	0.0000	OK
1440 minute winter	SWMH 4.6	1020	72.570	0.120	15.8	0.1355	0.0000	OK
1440 minute winter	SWMH 4.7	1020	72.569	0.229	17.3	0.2594	0.0000	OK
1440 minute winter	SWMH 4.8	1020	72.569	0.269	17.2	0.3042	0.0000	OK
1440 minute winter	SWMH 5.1	750	73.382	0.022	1.5	0.0899	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 1.1	1.1	SWMH 1.2	2.1	0.326	0.031	0.3649	
1440 minute winter	SWMH 1.2	1.2	SWMH 1.3	3.9	0.497	0.061	0.0421	
1440 minute winter	SWMH 1.3	1.3	SWMH 1.4	3.9	0.527	0.057	0.9932	
1440 minute winter	SWMH 1.4	1.4	SWMH 1.5	3.9	0.520	0.059	1.4498	
1440 minute winter	SWMH 1.5	1.5	Pond 1	3.8	0.547	0.046	1.2120	
1440 minute winter	SWMH 2.1	2.1	SWMH 2.2	1.8	0.413	0.026	0.0862	
1440 minute winter	SWMH 2.2	2.2	SWMH 2.3	1.8	0.407	0.027	0.0606	
1440 minute winter	SWMH 2.3	2.3	SWMH 1.2	1.8	0.286	0.028	0.0506	
1440 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.1	0.174	0.084	0.4727	
1440 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.099	0.2645	
1440 minute winter	SWMH 3.3	3.3	SWMH CON	7.9	0.705	0.102	0.3688	599.4
1440 minute winter	SWMH 4.1	4.1	SWMH 4.2	5.6	0.593	0.081	0.5663	
1440 minute winter	SWMH 4.2	4.2	SWMH 4.3	5.6	0.594	0.081	0.6414	
1440 minute winter	SWMH 4.3	4.3	SWMH 4.4	5.6	0.621	0.078	0.2106	
1440 minute winter	SWMH 4.4	4.4	SWMH 4.5	5.6	0.414	0.052	0.0589	
1440 minute winter	SWMH 4.5	4.5	SWMH 4.6	15.8	0.874	0.187	0.1663	
1440 minute winter	SWMH 4.6	4.6	SWMH 4.7	15.8	0.738	0.191	0.8319	
1440 minute winter	SWMH 4.7	4.7	SWMH 4.8	17.2	0.608	0.209	0.4474	
1440 minute winter	SWMH 4.8	4.8	Pond 1	17.1	0.585	0.438	5.3941	
1440 minute winter	SWMH 5.1	5.1	SWMH 5.2	1.5	0.687	0.021	0.0573	

Results for 1 year 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 95.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute winter	SWMH 5.2	750	72.875	0.025	1.5	0.0278	0.0000	OK
1440 minute winter	SWMH 5.3	1020	72.569	0.033	1.5	0.0376	0.0000	OK
1440 minute winter	SWMH 6.1	750	73.173	0.069	8.0	1.4230	0.0000	OK
1440 minute winter	SWMH 6.2	750	72.900	0.068	8.0	0.0770	0.0000	OK
1440 minute winter	SWMH 6.3	750	72.644	0.080	10.2	0.2763	0.0000	OK
1440 minute winter	SWMH 7.1	810	72.551	0.351	5.5	12.3210	0.0000	SURCHARGED
1440 minute winter	SWMH 7.2	810	71.707	0.007	0.2	0.0000	0.0000	OK
1440 minute winter	SWMH 8.1	1170	72.370	0.470	4.0	0.5315	0.0000	SURCHARGED
1440 minute winter	SWMH 8.2	750	71.824	0.024	1.8	0.0000	0.0000	OK
1440 minute winter	SWMH 9.1	750	72.701	0.061	6.4	0.7542	0.0000	OK
1440 minute winter	SWMH 9.2	750	72.513	0.063	6.4	0.0709	0.0000	OK
1440 minute winter	SWMH 9.3	750	72.409	0.059	6.4	0.0662	0.0000	OK
1440 minute winter	SWMH 9.4	1170	72.370	0.060	6.4	0.0684	0.0000	OK
1440 minute winter	SWMH 9.5	1170	72.370	0.370	6.4	0.4188	0.0000	SURCHARGED
1440 minute winter	SWMH 10.1	750	72.698	0.038	2.7	0.2103	0.0000	OK
1440 minute winter	SWMH 10.2	1170	72.370	0.130	2.7	0.1472	0.0000	OK
1440 minute winter	SWMH 10.3	1170	72.370	0.270	2.7	0.3055	0.0000	SURCHARGED
1440 minute winter	SWMH 10.4	1170	72.370	0.370	2.6	0.4186	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
1440 minute winter	SWMH 5.2	5.2	SWMH 5.3	1.5	0.636	0.025	0.0565	
1440 minute winter	SWMH 5.3	5.3	SWMH 4.7	1.5	0.603	0.026	0.1402	
1440 minute winter	SWMH 6.1	6.1	SWMH 6.2	8.0	0.662	0.115	0.8348	
1440 minute winter	SWMH 6.2	6.2	SWMH 6.3	8.0	0.592	0.115	0.9240	
1440 minute winter	SWMH 6.3	6.3	SWMH 4.5	10.2	0.709	0.139	0.1178	
1440 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.2	0.483	0.002	0.0041	6.5
1440 minute winter	SWMH 7.1	Infiltration		4.8				
1440 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0099	133.9
1440 minute winter	SWMH 9.1	9.1	SWMH 9.2	6.4	0.724	0.158	0.2736	
1440 minute winter	SWMH 9.2	9.2	SWMH 9.3	6.4	0.744	0.160	0.1444	
1440 minute winter	SWMH 9.3	9.3	SWMH 9.4	6.4	0.803	0.120	0.0302	
1440 minute winter	SWMH 9.4	9.4	SWMH 9.5	6.4	0.537	0.139	0.9549	
1440 minute winter	SWMH 9.5	9.5	Tank 1	6.3	0.582	0.226	0.6599	
1440 minute winter	SWMH 10.1	10.1	SWMH 10.2	2.7	0.591	0.064	0.8048	
1440 minute winter	SWMH 10.2	10.2	SWMH 10.3	2.7	0.546	0.067	0.7415	
1440 minute winter	SWMH 10.3	10.3	SWMH 10.4	2.6	0.377	0.069	0.7428	
1440 minute winter	SWMH 10.4	10.4	Tank 1	2.5	0.282	0.043	1.1239	

Results for 1 year 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 95.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 11.1	810	72.222	0.222	4.8	11.7761	0.0000	OK
1440 minute winter	SWMH 11.2	540	71.808	0.008	0.1	0.0000	0.0000	OK
1440 minute winter	SWMH 12.1	750	73.020	0.020	0.8	0.0489	0.0000	OK
1440 minute winter	SWMH 13.1	30	72.620	0.000	0.0	0.0000	0.0000	OK
1440 minute winter	Tank 1	1170	72.370	0.419	8.9	199.5629	0.0000	SURCHARGED
1440 minute winter	Pond 1	1020	72.566	0.366	20.9	312.2939	0.0000	SURCHARGED
1440 minute winter	Cat 4	750	73.140	0.030	2.6	2.1194	0.0000	OK
1440 minute winter	Cat 7	750	73.222	0.052	1.3	1.3639	0.0000	OK
1440 minute winter	Cat 9	780	73.118	0.008	0.7	0.1599	0.0000	OK
1440 minute winter	Cat 15	780	73.235	0.085	1.2	1.5347	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.1	0.359	0.002	0.0043	10.0
1440 minute winter	SWMH 11.1	Infiltration		4.4				
1440 minute winter	SWMH 12.1	12.1	SWMH 6.3	0.8	0.123	0.016	0.3225	
1440 minute winter	SWMH 13.1	13.1	SWMH 1.4	0.0	0.000	0.000	0.4777	
1440 minute winter	Tank 1	Tank 1	SWMH 8.1	4.0	0.226	0.089	0.5332	
1440 minute winter	Pond 1	Pond 1	SWMH 3.1	8.0	0.454	0.086	0.5024	
1440 minute winter	Cat 4	Hydro-Brake®		0.0				1.8
1440 minute winter	Cat 4	Infiltration		2.5				
1440 minute winter	Cat 7	Hydro-Brake®		0.1				2.6
1440 minute winter	Cat 7	Infiltration		1.2				
1440 minute winter	Cat 9	Hydro-Brake®		0.0				0.4
1440 minute winter	Cat 9	Infiltration		0.7				
1440 minute winter	Cat 15	Hydro-Brake®		0.1				3.4
1440 minute winter	Cat 15	Infiltration		1.1				

Results for 30 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 88.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 1.1	12	73.469	0.665	60.1	3.2727	0.0000	SURCHARGED
15 minute summer	SWMH 1.2	12	73.364	0.776	83.1	0.8777	0.0000	SURCHARGED
15 minute summer	SWMH 1.3	12	73.304	0.734	81.5	0.8304	0.0000	SURCHARGED
15 minute summer	SWMH 1.4	12	73.040	0.642	85.5	0.7263	0.0000	SURCHARGED
15 minute summer	SWMH 1.5	11	72.907	0.607	87.3	0.6863	0.0000	SURCHARGED
15 minute summer	SWMH 2.1	12	73.434	0.692	52.2	4.0065	0.0000	FLOOD RISK
15 minute summer	SWMH 2.2	12	73.402	0.736	44.4	0.8327	0.0000	SURCHARGED
15 minute summer	SWMH 2.3	12	73.379	0.764	37.6	0.8644	0.0000	SURCHARGED
15 minute summer	SWMH 3.1	39	72.397	0.247	10.3	0.2794	0.0000	OK
15 minute summer	SWMH 3.2	39	72.397	0.297	8.6	0.3356	0.0000	OK
15 minute summer	SWMH 3.3	40	72.043	0.063	7.4	0.0717	0.0000	OK
15 minute summer	SWMH CON	39	71.882	0.062	7.4	0.0000	0.0000	OK
15 minute summer	SWMH 4.1	10	74.090	0.950	162.4	13.9546	20.2261	FLOOD
15 minute summer	SWMH 4.2	10	74.011	1.106	78.8	1.2507	0.0000	FLOOD RISK
15 minute summer	SWMH 4.3	10	73.842	1.204	77.0	1.3621	0.0000	SURCHARGED
15 minute summer	SWMH 4.4	10	73.770	1.230	48.2	1.3911	13.8131	FLOOD
15 minute summer	SWMH 4.5	10	73.770	1.270	115.7	1.4364	4.5022	FLOOD
15 minute summer	SWMH 4.6	10	73.690	1.240	88.8	1.4024	3.4628	FLOOD
15 minute summer	SWMH 4.7	10	73.600	1.260	99.5	1.4251	1.0485	FLOOD
15 minute summer	SWMH 4.8	10	73.588	1.288	100.0	1.4571	0.0000	FLOOD RISK
15 minute summer	SWMH 5.1	12	73.910	0.550	43.7	2.2079	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 1.1	1.1	SWMH 1.2	51.4	0.849	0.748	3.9397	
15 minute summer	SWMH 1.2	1.2	SWMH 1.3	81.5	1.158	1.274	0.3777	
15 minute summer	SWMH 1.3	1.3	SWMH 1.4	83.3	1.182	1.213	3.1463	
15 minute summer	SWMH 1.4	1.4	SWMH 1.5	87.3	1.240	1.315	1.9125	
15 minute summer	SWMH 1.5	1.5	Pond 1	91.5	2.179	1.100	0.6957	
15 minute summer	SWMH 2.1	2.1	SWMH 2.2	44.4	0.860	0.647	1.3922	
15 minute summer	SWMH 2.2	2.2	SWMH 2.3	37.6	0.642	0.558	0.9654	
15 minute summer	SWMH 2.3	2.3	SWMH 1.2	40.7	0.578	0.632	0.5593	
15 minute summer	SWMH 3.1	3.1	SWMH 3.2	8.6	0.499	0.090	0.4442	
15 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.4	0.686	0.093	0.2524	
15 minute summer	SWMH 3.3	3.3	SWMH CON	7.4	0.692	0.096	0.3522	99.9
15 minute summer	SWMH 4.1	4.1	SWMH 4.2	78.8	1.162	1.139	4.2254	
15 minute summer	SWMH 4.2	4.2	SWMH 4.3	62.5	1.045	0.902	4.7882	
15 minute summer	SWMH 4.3	4.3	SWMH 4.4	48.2	0.693	0.673	1.6449	
15 minute summer	SWMH 4.4	4.4	SWMH 4.5	40.2	0.571	0.374	0.3005	
15 minute summer	SWMH 4.5	4.5	SWMH 4.6	88.8	1.262	1.049	0.6031	
15 minute summer	SWMH 4.6	4.6	SWMH 4.7	89.1	1.265	1.079	1.3944	
15 minute summer	SWMH 4.7	4.7	SWMH 4.8	100.0	1.420	1.210	0.5066	
15 minute summer	SWMH 4.8	4.8	Pond 1	103.0	2.084	2.638	4.6113	
15 minute summer	SWMH 5.1	5.1	SWMH 5.2	37.3	1.588	0.514	1.0433	

Results for 30 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 88.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 5.2	12	73.749	0.899	37.3	1.0166	0.0000	SURCHARGED
15 minute summer	SWMH 5.3	10	73.600	1.064	37.7	1.2034	4.6899	FLOOD
15 minute summer	SWMH 6.1	10	74.050	0.946	233.1	19.5500	37.8019	FLOOD
15 minute summer	SWMH 6.2	10	73.993	1.161	86.1	1.3127	0.0000	FLOOD RISK
15 minute summer	SWMH 6.3	10	73.898	1.334	99.6	4.5992	0.0000	FLOOD RISK
15 minute summer	SWMH 7.1	21	69.364	-2.836	160.4	0.0000	0.0000	OK
15 minute summer	SWMH 7.2	1	71.700	0.000	0.0	0.0000	0.0000	OK
15 minute summer	SWMH 8.1	28	72.142	0.242	7.0	0.2731	0.0000	SURCHARGED
15 minute summer	SWMH 8.2	30	71.823	0.023	1.8	0.0000	0.0000	OK
15 minute summer	SWMH 9.1	10	73.940	1.300	184.4	16.0901	21.9633	FLOOD
15 minute summer	SWMH 9.2	10	73.520	1.070	59.9	1.2103	0.0000	SURCHARGED
15 minute summer	SWMH 9.3	10	73.271	0.921	59.6	1.0415	0.0000	SURCHARGED
15 minute summer	SWMH 9.4	10	73.177	0.867	59.8	0.9803	0.0000	SURCHARGED
15 minute summer	SWMH 9.5	8	72.710	0.710	60.1	0.8027	0.0000	SURCHARGED
15 minute summer	SWMH 10.1	12	73.760	1.100	78.2	6.0126	0.0000	SURCHARGED
15 minute summer	SWMH 10.2	12	72.868	0.628	58.3	0.7099	0.0000	SURCHARGED
15 minute summer	SWMH 10.3	13	72.519	0.419	57.5	0.4737	0.0000	SURCHARGED
15 minute summer	SWMH 10.4	13	72.234	0.234	57.4	0.2646	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 5.2	5.2	SWMH 5.3	37.7	1.239	0.622	0.9226	
15 minute summer	SWMH 5.3	5.3	SWMH 4.7	22.9	1.031	0.397	0.3627	
15 minute summer	SWMH 6.1	6.1	SWMH 6.2	86.1	1.223	1.241	4.8671	
15 minute summer	SWMH 6.2	6.2	SWMH 6.3	56.1	0.963	0.809	4.8064	
15 minute summer	SWMH 6.3	6.3	SWMH 4.5	99.9	1.418	1.361	0.5767	
15 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.0	0.000	0.000	0.0000	0.0
15 minute summer	SWMH 7.1	Infiltration		0.0				
15 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.799	0.023	0.0098	25.3
15 minute summer	SWMH 9.1	9.1	SWMH 9.2	59.9	1.507	1.475	1.2312	
15 minute summer	SWMH 9.2	9.2	SWMH 9.3	59.6	1.498	1.489	0.6674	
15 minute summer	SWMH 9.3	9.3	SWMH 9.4	59.8	1.505	1.120	0.1507	
15 minute summer	SWMH 9.4	9.4	SWMH 9.5	60.1	1.512	1.307	1.5712	
15 minute summer	SWMH 9.5	9.5	Tank 1	61.0	2.215	2.177	0.5903	
15 minute summer	SWMH 10.1	10.1	SWMH 10.2	58.3	1.465	1.382	2.5295	
15 minute summer	SWMH 10.2	10.2	SWMH 10.3	57.5	1.446	1.432	0.9279	
15 minute summer	SWMH 10.3	10.3	SWMH 10.4	57.4	1.444	1.516	0.7428	
15 minute summer	SWMH 10.4	10.4	Tank 1	57.6	1.092	0.962	0.8384	

Results for 30 year 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 88.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 11.1	18	72.504	0.504	140.2	53.8950	0.0000	SURCHARGED
15 minute summer	SWMH 11.2	18	71.809	0.009	0.2	0.0000	0.0000	OK
15 minute summer	SWMH 12.1	10	73.982	0.982	45.9	2.4457	0.0000	FLOOD RISK
15 minute summer	SWMH 13.1	10	73.076	0.456	6.0	0.5157	0.0000	SURCHARGED
15 minute summer	Tank 1	29	72.126	0.175	118.5	83.3373	0.0000	OK
15 minute summer	Pond 1	39	72.397	0.197	189.2	163.4086	0.0000	OK
15 minute summer	Cat 4	24	73.219	0.109	36.7	24.7296	0.0000	OK
15 minute summer	Cat 7	24	73.343	0.173	18.0	12.4712	0.0000	OK
15 minute summer	Cat 9	23	73.159	0.049	9.7	5.1015	0.0000	OK
15 minute summer	Cat 15	24	73.422	0.272	17.4	12.2535	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.386	0.003	0.0051	1.7
15 minute summer	SWMH 11.1	Infiltration		9.9				
15 minute summer	SWMH 12.1	12.1	SWMH 6.3	-25.0	-0.630	-0.490	1.7885	
15 minute summer	SWMH 13.1	13.1	SWMH 1.4	6.5	-0.249	0.146	1.1927	
15 minute summer	Tank 1	Tank 1	SWMH 8.1	7.0	0.548	0.157	0.4199	
15 minute summer	Pond 1	Pond 1	SWMH 3.1	10.3	0.702	0.111	0.3965	
15 minute summer	Cat 4	Hydro-Brake®		0.1				0.3
15 minute summer	Cat 4	Infiltration		9.2				
15 minute summer	Cat 7	Hydro-Brake®		0.1				0.4
15 minute summer	Cat 7	Infiltration		4.0				
15 minute summer	Cat 9	Hydro-Brake®		0.1				0.1
15 minute summer	Cat 9	Infiltration		4.2				
15 minute summer	Cat 15	Hydro-Brake®		0.1				0.5
15 minute summer	Cat 15	Infiltration		3.7				

Results for 30 year 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 89.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 1.1	12	73.569	0.765	63.0	3.7656	0.0000	SURCHARGED
15 minute winter	SWMH 1.2	12	73.455	0.867	86.6	0.9803	0.0000	SURCHARGED
15 minute winter	SWMH 1.3	12	73.385	0.815	88.1	0.9221	0.0000	SURCHARGED
15 minute winter	SWMH 1.4	11	73.075	0.677	91.1	0.7652	0.0000	SURCHARGED
15 minute winter	SWMH 1.5	10	73.001	0.701	92.8	0.7923	0.0000	SURCHARGED
15 minute winter	SWMH 2.1	12	73.531	0.789	54.9	4.5719	0.0000	FLOOD RISK
15 minute winter	SWMH 2.2	12	73.498	0.832	43.9	0.9409	0.0000	SURCHARGED
15 minute winter	SWMH 2.3	12	73.473	0.858	40.5	0.9700	0.0000	SURCHARGED
15 minute winter	SWMH 3.1	37	72.407	0.257	9.6	0.2904	0.0000	OK
15 minute winter	SWMH 3.2	37	72.406	0.306	8.6	0.3466	0.0000	SURCHARGED
15 minute winter	SWMH 3.3	39	72.044	0.064	7.4	0.0720	0.0000	OK
15 minute winter	SWMH CON	40	71.882	0.062	7.4	0.0000	0.0000	OK
15 minute winter	SWMH 4.1	10	74.090	0.950	170.7	13.9546	23.7205	FLOOD
15 minute winter	SWMH 4.2	13	73.965	1.060	73.1	1.1992	0.0000	FLOOD RISK
15 minute winter	SWMH 4.3	14	73.826	1.188	50.1	1.3431	0.0000	SURCHARGED
15 minute winter	SWMH 4.4	10	73.770	1.230	47.6	1.3911	15.7274	FLOOD
15 minute winter	SWMH 4.5	10	73.770	1.270	112.4	1.4364	4.5501	FLOOD
15 minute winter	SWMH 4.6	10	73.690	1.240	89.2	1.4024	3.4280	FLOOD
15 minute winter	SWMH 4.7	10	73.600	1.260	100.3	1.4251	1.5568	FLOOD
15 minute winter	SWMH 4.8	10	73.564	1.264	100.8	1.4293	0.0000	FLOOD RISK
15 minute winter	SWMH 5.1	11	73.963	0.603	45.9	2.4212	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 1.1	1.1	SWMH 1.2	48.2	0.819	0.702	3.9397	
15 minute winter	SWMH 1.2	1.2	SWMH 1.3	88.1	1.251	1.377	0.3777	
15 minute winter	SWMH 1.3	1.3	SWMH 1.4	89.7	1.274	1.307	3.1463	
15 minute winter	SWMH 1.4	1.4	SWMH 1.5	92.8	1.318	1.397	1.9125	
15 minute winter	SWMH 1.5	1.5	Pond 1	96.8	2.139	1.165	0.7258	
15 minute winter	SWMH 2.1	2.1	SWMH 2.2	43.9	0.830	0.641	1.3922	
15 minute winter	SWMH 2.2	2.2	SWMH 2.3	40.5	0.641	0.600	0.9654	
15 minute winter	SWMH 2.3	2.3	SWMH 1.2	43.3	0.615	0.672	0.5593	
15 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.6	0.493	0.090	0.4518	
15 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.4	0.688	0.094	0.2538	
15 minute winter	SWMH 3.3	3.3	SWMH CON	7.4	0.694	0.097	0.3542	101.4
15 minute winter	SWMH 4.1	4.1	SWMH 4.2	73.1	1.152	1.056	4.2254	
15 minute winter	SWMH 4.2	4.2	SWMH 4.3	50.1	1.099	0.723	4.7882	
15 minute winter	SWMH 4.3	4.3	SWMH 4.4	47.6	0.676	0.665	1.6449	
15 minute winter	SWMH 4.4	4.4	SWMH 4.5	37.0	0.526	0.344	0.3005	
15 minute winter	SWMH 4.5	4.5	SWMH 4.6	89.2	1.266	1.053	0.6031	
15 minute winter	SWMH 4.6	4.6	SWMH 4.7	90.1	1.280	1.091	1.3944	
15 minute winter	SWMH 4.7	4.7	SWMH 4.8	100.8	1.432	1.220	0.5066	
15 minute winter	SWMH 4.8	4.8	Pond 1	104.2	2.081	2.667	4.7227	
15 minute winter	SWMH 5.1	5.1	SWMH 5.2	40.0	1.507	0.551	1.0433	

Results for 30 year 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 89.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 5.2	11	73.770	0.920	40.0	1.0410	0.0000	FLOOD RISK
15 minute winter	SWMH 5.3	10	73.600	1.064	40.1	1.2034	5.9899	FLOOD
15 minute winter	SWMH 6.1	9	74.050	0.946	244.9	19.5500	54.5102	FLOOD
15 minute winter	SWMH 6.2	11	73.968	1.136	81.2	1.2852	0.0000	FLOOD RISK
15 minute winter	SWMH 6.3	10	73.900	1.336	103.5	4.6038	0.0000	FLOOD RISK
15 minute winter	SWMH 7.1	19	72.403	0.203	168.6	5.1793	0.0000	OK
15 minute winter	SWMH 7.2	45	71.706	0.006	0.1	0.0000	0.0000	OK
15 minute winter	SWMH 8.1	26	72.152	0.252	6.4	0.2851	0.0000	SURCHARGED
15 minute winter	SWMH 8.2	28	71.823	0.023	1.8	0.0000	0.0000	OK
15 minute winter	SWMH 9.1	9	73.940	1.300	193.7	16.0901	33.2523	FLOOD
15 minute winter	SWMH 9.2	10	73.527	1.077	59.8	1.2186	0.0000	SURCHARGED
15 minute winter	SWMH 9.3	10	73.279	0.928	60.0	1.0501	0.0000	SURCHARGED
15 minute winter	SWMH 9.4	10	73.182	0.872	60.2	0.9865	0.0000	SURCHARGED
15 minute winter	SWMH 9.5	7	72.750	0.750	60.3	0.8478	0.0000	SURCHARGED
15 minute winter	SWMH 10.1	12	73.892	1.232	82.1	6.7378	0.0000	FLOOD RISK
15 minute winter	SWMH 10.2	13	72.934	0.694	60.6	0.7849	0.0000	SURCHARGED
15 minute winter	SWMH 10.3	13	72.555	0.455	59.8	0.5148	0.0000	SURCHARGED
15 minute winter	SWMH 10.4	13	72.241	0.241	59.9	0.2725	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 5.2	5.2	SWMH 5.3	40.1	1.184	0.663	0.9226	
15 minute winter	SWMH 5.3	5.3	SWMH 4.7	24.1	1.090	0.418	0.3627	
15 minute winter	SWMH 6.1	6.1	SWMH 6.2	81.2	1.186	1.170	4.8671	
15 minute winter	SWMH 6.2	6.2	SWMH 6.3	64.5	0.996	0.931	4.8064	
15 minute winter	SWMH 6.3	6.3	SWMH 4.5	102.9	1.461	1.402	0.5767	
15 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.1	0.468	0.001	0.0039	0.5
15 minute winter	SWMH 7.1	Infiltration		2.8				
15 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.800	0.023	0.0098	25.7
15 minute winter	SWMH 9.1	9.1	SWMH 9.2	59.8	1.504	1.473	1.2312	
15 minute winter	SWMH 9.2	9.2	SWMH 9.3	60.0	1.510	1.500	0.6674	
15 minute winter	SWMH 9.3	9.3	SWMH 9.4	60.2	1.513	1.127	0.1507	
15 minute winter	SWMH 9.4	9.4	SWMH 9.5	60.3	1.516	1.311	1.5712	
15 minute winter	SWMH 9.5	9.5	Tank 1	61.0	2.252	2.178	0.6166	
15 minute winter	SWMH 10.1	10.1	SWMH 10.2	60.6	1.524	1.438	2.5295	
15 minute winter	SWMH 10.2	10.2	SWMH 10.3	59.8	1.503	1.488	0.9279	
15 minute winter	SWMH 10.3	10.3	SWMH 10.4	59.9	1.507	1.582	0.7428	
15 minute winter	SWMH 10.4	10.4	Tank 1	60.0	1.106	1.002	0.8609	

Results for 30 year 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 89.07%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 11.1	18	72.537	0.537	147.4	60.8560	0.0000	SURCHARGED
15 minute winter	SWMH 11.2	18	71.809	0.009	0.2	0.0000	0.0000	OK
15 minute winter	SWMH 12.1	10	74.019	1.019	24.6	2.5369	0.0000	FLOOD RISK
15 minute winter	SWMH 13.1	12	73.066	0.446	20.5	0.5047	0.0000	SURCHARGED
15 minute winter	Tank 1	29	72.139	0.188	120.8	89.6945	0.0000	OK
15 minute winter	Pond 1	39	72.407	0.207	196.2	171.9861	0.0000	OK
15 minute winter	Cat 4	24	73.226	0.116	41.1	27.9576	0.0000	OK
15 minute winter	Cat 7	25	73.354	0.184	20.1	14.0885	0.0000	OK
15 minute winter	Cat 9	23	73.163	0.053	10.9	5.8125	0.0000	OK
15 minute winter	Cat 15	25	73.440	0.290	19.5	13.8196	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.389	0.003	0.0052	1.9
15 minute winter	SWMH 11.1	Infiltration		10.6				
15 minute winter	SWMH 12.1	12.1	SWMH 6.3	23.0	0.577	0.449	1.7885	
15 minute winter	SWMH 13.1	13.1	SWMH 1.4	-20.5	-0.597	-0.459	1.1927	
15 minute winter	Tank 1	Tank 1	SWMH 8.1	6.4	0.531	0.142	0.4397	
15 minute winter	Pond 1	Pond 1	SWMH 3.1	9.6	0.644	0.104	0.4140	
15 minute winter	Cat 4	Hydro-Brake®		0.1				0.4
15 minute winter	Cat 4	Infiltration		9.8				
15 minute winter	Cat 7	Hydro-Brake®		0.1				0.4
15 minute winter	Cat 7	Infiltration		4.3				
15 minute winter	Cat 9	Hydro-Brake®		0.1				0.2
15 minute winter	Cat 9	Infiltration		4.5				
15 minute winter	Cat 15	Hydro-Brake®		0.1				0.5
15 minute winter	Cat 15	Infiltration		4.0				

Results for 30 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 92.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 1.1	33	72.972	0.168	42.7	0.8274	0.0000	OK
60 minute summer	SWMH 1.2	35	72.912	0.324	74.3	0.3667	0.0000	SURCHARGED
60 minute summer	SWMH 1.3	35	72.863	0.293	73.3	0.3311	0.0000	OK
60 minute summer	SWMH 1.4	35	72.674	0.276	72.8	0.3122	0.0000	OK
60 minute summer	SWMH 1.5	74	72.586	0.286	72.0	0.3231	0.0000	OK
60 minute summer	SWMH 2.1	34	72.959	0.217	37.2	1.2578	0.0000	OK
60 minute summer	SWMH 2.2	34	72.941	0.275	34.6	0.3109	0.0000	OK
60 minute summer	SWMH 2.3	35	72.925	0.310	33.4	0.3510	0.0000	SURCHARGED
60 minute summer	SWMH 3.1	74	72.585	0.435	9.2	0.4919	0.0000	SURCHARGED
60 minute summer	SWMH 3.2	74	72.584	0.484	8.8	0.5477	0.0000	SURCHARGED
60 minute summer	SWMH 3.3	75	72.046	0.066	7.9	0.0741	0.0000	OK
60 minute summer	SWMH CON	75	71.884	0.064	7.9	0.0000	0.0000	OK
60 minute summer	SWMH 4.1	32	74.090	0.950	115.7	13.9546	19.8094	FLOOD
60 minute summer	SWMH 4.2	33	73.965	1.060	55.1	1.1994	0.0000	FLOOD RISK
60 minute summer	SWMH 4.3	34	73.826	1.188	47.2	1.3432	0.0000	SURCHARGED
60 minute summer	SWMH 4.4	32	73.770	1.230	47.2	1.3911	18.9113	FLOOD
60 minute summer	SWMH 4.5	32	73.770	1.270	104.4	1.4364	0.5349	FLOOD
60 minute summer	SWMH 4.6	35	73.686	1.236	101.1	1.3981	0.0000	FLOOD RISK
60 minute summer	SWMH 4.7	35	73.538	1.198	114.4	1.3547	0.0000	FLOOD RISK
60 minute summer	SWMH 4.8	35	73.401	1.101	111.9	1.2453	0.0000	FLOOD RISK
60 minute summer	SWMH 5.1	34	73.751	0.391	31.1	1.5681	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 1.1	1.1	SWMH 1.2	42.5	0.727	0.619	3.1063	
60 minute summer	SWMH 1.2	1.2	SWMH 1.3	73.3	1.041	1.146	0.3765	
60 minute summer	SWMH 1.3	1.3	SWMH 1.4	72.8	1.080	1.061	3.0781	
60 minute summer	SWMH 1.4	1.4	SWMH 1.5	72.0	1.161	1.084	1.6676	
60 minute summer	SWMH 1.5	1.5	Pond 1	71.7	1.665	0.863	1.2397	
60 minute summer	SWMH 2.1	2.1	SWMH 2.2	34.6	0.758	0.505	1.2083	
60 minute summer	SWMH 2.2	2.2	SWMH 2.3	33.4	0.567	0.496	0.9463	
60 minute summer	SWMH 2.3	2.3	SWMH 1.2	33.6	0.477	0.522	0.5593	
60 minute summer	SWMH 3.1	3.1	SWMH 3.2	8.8	0.361	0.092	0.4727	
60 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
60 minute summer	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3691	128.1
60 minute summer	SWMH 4.1	4.1	SWMH 4.2	55.1	1.018	0.796	4.2254	
60 minute summer	SWMH 4.2	4.2	SWMH 4.3	47.2	0.770	0.682	4.7882	
60 minute summer	SWMH 4.3	4.3	SWMH 4.4	47.2	0.675	0.659	1.6449	
60 minute summer	SWMH 4.4	4.4	SWMH 4.5	40.7	0.578	0.378	0.3005	
60 minute summer	SWMH 4.5	4.5	SWMH 4.6	101.1	1.436	1.194	0.6031	
60 minute summer	SWMH 4.6	4.6	SWMH 4.7	99.2	1.409	1.201	1.3944	
60 minute summer	SWMH 4.7	4.7	SWMH 4.8	111.9	1.590	1.355	0.5066	
60 minute summer	SWMH 4.8	4.8	Pond 1	112.1	1.883	2.870	5.5445	
60 minute summer	SWMH 5.1	5.1	SWMH 5.2	28.0	1.317	0.386	1.0433	

Results for 30 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 92.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 5.2	35	73.660	0.810	28.0	0.9162	0.0000	SURCHARGED
60 minute summer	SWMH 5.3	35	73.578	1.042	27.9	1.1785	0.0000	FLOOD RISK
60 minute summer	SWMH 6.1	31	74.050	0.946	165.9	19.5500	49.5829	FLOOD
60 minute summer	SWMH 6.2	32	73.953	1.121	56.4	1.2676	0.0000	FLOOD RISK
60 minute summer	SWMH 6.3	32	73.859	1.295	85.6	4.4636	0.0000	FLOOD RISK
60 minute summer	SWMH 7.1	61	72.853	0.653	114.2	35.7834	0.0000	SURCHARGED
60 minute summer	SWMH 7.2	61	71.708	0.008	0.2	0.0000	0.0000	OK
60 minute summer	SWMH 8.1	69	72.302	0.402	4.9	0.4549	0.0000	SURCHARGED
60 minute summer	SWMH 8.2	44	71.824	0.024	1.8	0.0000	0.0000	OK
60 minute summer	SWMH 9.1	32	73.940	1.300	131.3	16.0901	19.2035	FLOOD
60 minute summer	SWMH 9.2	39	73.448	0.998	63.7	1.1291	0.0000	SURCHARGED
60 minute summer	SWMH 9.3	40	73.157	0.807	61.8	0.9127	0.0000	SURCHARGED
60 minute summer	SWMH 9.4	40	73.048	0.738	60.3	0.8352	0.0000	SURCHARGED
60 minute summer	SWMH 9.5	42	72.461	0.461	60.3	0.5213	0.0000	SURCHARGED
60 minute summer	SWMH 10.1	35	73.254	0.594	55.7	3.2459	0.0000	SURCHARGED
60 minute summer	SWMH 10.2	35	72.647	0.407	48.1	0.4607	0.0000	SURCHARGED
60 minute summer	SWMH 10.3	35	72.402	0.302	48.0	0.3413	0.0000	SURCHARGED
60 minute summer	SWMH 10.4	68	72.303	0.303	47.9	0.3422	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 5.2	5.2	SWMH 5.3	27.9	0.810	0.461	0.9226	
60 minute summer	SWMH 5.3	5.3	SWMH 4.7	28.0	0.770	0.486	0.3627	
60 minute summer	SWMH 6.1	6.1	SWMH 6.2	56.4	1.038	0.813	4.8671	
60 minute summer	SWMH 6.2	6.2	SWMH 6.3	49.5	0.753	0.714	4.8064	
60 minute summer	SWMH 6.3	6.3	SWMH 4.5	85.5	1.215	1.166	0.5767	
60 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.2	0.523	0.002	0.0050	1.7
60 minute summer	SWMH 7.1	Infiltration		9.2				
60 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0099	29.5
60 minute summer	SWMH 9.1	9.1	SWMH 9.2	63.7	1.601	1.568	1.2312	
60 minute summer	SWMH 9.2	9.2	SWMH 9.3	61.8	1.553	1.544	0.6674	
60 minute summer	SWMH 9.3	9.3	SWMH 9.4	60.3	1.517	1.130	0.1507	
60 minute summer	SWMH 9.4	9.4	SWMH 9.5	60.3	1.516	1.311	1.5712	
60 minute summer	SWMH 9.5	9.5	Tank 1	60.3	1.656	2.153	0.6599	
60 minute summer	SWMH 10.1	10.1	SWMH 10.2	48.1	1.209	1.141	2.5295	
60 minute summer	SWMH 10.2	10.2	SWMH 10.3	48.0	1.207	1.195	0.9279	
60 minute summer	SWMH 10.3	10.3	SWMH 10.4	47.9	1.204	1.263	0.7297	
60 minute summer	SWMH 10.4	10.4	Tank 1	47.7	1.029	0.796	1.1238	

Results for 30 year 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 92.74%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 11.1	53	72.611	0.611	99.8	77.9414	0.0000	SURCHARGED
60 minute summer	SWMH 11.2	53	71.809	0.009	0.2	0.0000	0.0000	OK
60 minute summer	SWMH 12.1	32	73.918	0.918	15.6	2.2852	0.0000	SURCHARGED
60 minute summer	SWMH 13.1	35	72.676	0.056	1.6	0.0630	0.0000	OK
60 minute summer	Tank 1	69	72.302	0.351	108.1	167.3262	0.0000	SURCHARGED
60 minute summer	Pond 1	74	72.586	0.386	183.0	329.9309	0.0000	SURCHARGED
60 minute summer	Cat 4	51	73.240	0.130	38.9	34.7997	0.0000	OK
60 minute summer	Cat 7	52	73.378	0.208	19.0	17.7706	0.0000	OK
60 minute summer	Cat 9	47	73.166	0.056	10.3	6.5822	0.0000	OK
60 minute summer	Cat 15	53	73.480	0.330	18.4	17.5602	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.395	0.003	0.0055	2.6
60 minute summer	SWMH 11.1	Infiltration		12.1				
60 minute summer	SWMH 12.1	12.1	SWMH 6.3	16.8	0.421	0.328	1.7885	
60 minute summer	SWMH 13.1	13.1	SWMH 1.4	-1.6	-0.062	-0.037	0.7107	
60 minute summer	Tank 1	Tank 1	SWMH 8.1	4.9	0.423	0.109	0.5332	
60 minute summer	Pond 1	Pond 1	SWMH 3.1	9.2	0.572	0.100	0.5024	
60 minute summer	Cat 4	Hydro-Brake®		0.1				0.5
60 minute summer	Cat 4	Infiltration		10.9				
60 minute summer	Cat 7	Hydro-Brake®		0.1				0.6
60 minute summer	Cat 7	Infiltration		4.9				
60 minute summer	Cat 9	Hydro-Brake®		0.1				0.2
60 minute summer	Cat 9	Infiltration		4.8				
60 minute summer	Cat 15	Hydro-Brake®		0.1				0.7
60 minute summer	Cat 15	Infiltration		4.5				

Results for 30 year 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 93.44%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
60 minute winter	SWMH 1.1	33	72.952	0.148	34.6	0.7298	0.0000	OK
60 minute winter	SWMH 1.2	34	72.859	0.271	63.4	0.3066	0.0000	OK
60 minute winter	SWMH 1.3	35	72.810	0.240	63.2	0.2717	0.0000	OK
60 minute winter	SWMH 1.4	36	72.641	0.243	63.1	0.2746	0.0000	OK
60 minute winter	SWMH 1.5	78	72.621	0.321	62.6	0.3634	0.0000	SURCHARGED
60 minute winter	SWMH 2.1	34	72.903	0.161	30.1	0.9339	0.0000	OK
60 minute winter	SWMH 2.2	34	72.880	0.214	29.7	0.2423	0.0000	OK
60 minute winter	SWMH 2.3	34	72.868	0.253	29.3	0.2860	0.0000	OK
60 minute winter	SWMH 3.1	76	72.620	0.470	8.7	0.5321	0.0000	SURCHARGED
60 minute winter	SWMH 3.2	77	72.620	0.520	8.6	0.5878	0.0000	SURCHARGED
60 minute winter	SWMH 3.3	67	72.046	0.066	7.9	0.0741	0.0000	OK
60 minute winter	SWMH CON	67	71.884	0.064	7.9	0.0000	0.0000	OK
60 minute winter	SWMH 4.1	30	74.090	0.950	93.6	13.9546	23.9420	FLOOD
60 minute winter	SWMH 4.2	30	73.967	1.062	47.2	1.2006	0.0000	FLOOD RISK
60 minute winter	SWMH 4.3	35	73.826	1.188	47.2	1.3431	0.0000	SURCHARGED
60 minute winter	SWMH 4.4	30	73.770	1.230	47.3	1.3911	24.7457	FLOOD
60 minute winter	SWMH 4.5	32	73.769	1.269	100.5	1.4357	0.0000	FLOOD RISK
60 minute winter	SWMH 4.6	34	73.679	1.229	99.9	1.3900	0.0000	FLOOD RISK
60 minute winter	SWMH 4.7	34	73.519	1.179	113.3	1.3340	0.0000	FLOOD RISK
60 minute winter	SWMH 4.8	33	73.384	1.084	113.5	1.2258	0.0000	FLOOD RISK
60 minute winter	SWMH 5.1	34	73.687	0.327	25.1	1.3122	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
60 minute winter	SWMH 1.1	1.1	SWMH 1.2	34.5	0.673	0.503	2.8375	
60 minute winter	SWMH 1.2	1.2	SWMH 1.3	63.2	0.990	0.988	0.3416	
60 minute winter	SWMH 1.3	1.3	SWMH 1.4	63.1	1.046	0.919	2.7136	
60 minute winter	SWMH 1.4	1.4	SWMH 1.5	62.6	1.121	0.943	1.7232	
60 minute winter	SWMH 1.5	1.5	Pond 1	62.3	1.541	0.749	1.2504	
60 minute winter	SWMH 2.1	2.1	SWMH 2.2	29.7	0.734	0.433	0.9132	
60 minute winter	SWMH 2.2	2.2	SWMH 2.3	29.3	0.554	0.435	0.8033	
60 minute winter	SWMH 2.3	2.3	SWMH 1.2	29.2	0.448	0.454	0.5176	
60 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.6	0.392	0.090	0.4727	
60 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
60 minute winter	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3692	129.1
60 minute winter	SWMH 4.1	4.1	SWMH 4.2	47.2	0.954	0.683	4.2254	
60 minute winter	SWMH 4.2	4.2	SWMH 4.3	47.2	0.824	0.682	4.7882	
60 minute winter	SWMH 4.3	4.3	SWMH 4.4	47.3	0.672	0.660	1.6449	
60 minute winter	SWMH 4.4	4.4	SWMH 4.5	41.7	0.592	0.387	0.3005	
60 minute winter	SWMH 4.5	4.5	SWMH 4.6	99.9	1.418	1.179	0.6031	
60 minute winter	SWMH 4.6	4.6	SWMH 4.7	99.9	1.418	1.209	1.3944	
60 minute winter	SWMH 4.7	4.7	SWMH 4.8	113.5	1.612	1.374	0.5066	
60 minute winter	SWMH 4.8	4.8	Pond 1	114.2	1.884	2.925	5.5445	
60 minute winter	SWMH 5.1	5.1	SWMH 5.2	24.6	1.209	0.339	1.0433	

Results for 30 year 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 93.44%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWMH 5.2	34	73.615	0.765	24.6	0.8655	0.0000	SURCHARGED
60 minute winter	SWMH 5.3	34	73.551	1.015	24.6	1.1477	0.0000	FLOOD RISK
60 minute winter	SWMH 6.1	29	74.050	0.946	134.3	19.5500	60.8652	FLOOD
60 minute winter	SWMH 6.2	33	73.945	1.113	51.7	1.2587	0.0000	FLOOD RISK
60 minute winter	SWMH 6.3	32	73.841	1.277	77.1	4.4021	0.0000	FLOOD RISK
60 minute winter	SWMH 7.1	60	72.970	0.770	92.4	48.1036	0.0000	SURCHARGED
60 minute winter	SWMH 7.2	60	71.708	0.008	0.2	0.0000	0.0000	OK
60 minute winter	SWMH 8.1	67	72.350	0.450	5.5	0.5095	0.0000	SURCHARGED
60 minute winter	SWMH 8.2	41	71.824	0.024	1.8	0.0000	0.0000	OK
60 minute winter	SWMH 9.1	31	73.940	1.300	106.2	16.0901	19.8073	FLOOD
60 minute winter	SWMH 9.2	42	73.466	1.016	62.7	1.1487	0.0000	SURCHARGED
60 minute winter	SWMH 9.3	42	73.185	0.835	61.7	0.9447	0.0000	SURCHARGED
60 minute winter	SWMH 9.4	42	73.079	0.769	60.3	0.8697	0.0000	SURCHARGED
60 minute winter	SWMH 9.5	44	72.507	0.507	60.3	0.5735	0.0000	SURCHARGED
60 minute winter	SWMH 10.1	35	72.977	0.317	45.0	1.7308	0.0000	SURCHARGED
60 minute winter	SWMH 10.2	36	72.521	0.281	42.8	0.3178	0.0000	SURCHARGED
60 minute winter	SWMH 10.3	66	72.351	0.250	41.7	0.2833	0.0000	SURCHARGED
60 minute winter	SWMH 10.4	67	72.351	0.351	41.5	0.3965	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWMH 5.2	5.2	SWMH 5.3	24.6	0.871	0.406	0.9226	
60 minute winter	SWMH 5.3	5.3	SWMH 4.7	24.6	0.826	0.427	0.3627	
60 minute winter	SWMH 6.1	6.1	SWMH 6.2	51.7	0.951	0.746	4.8671	
60 minute winter	SWMH 6.2	6.2	SWMH 6.3	48.7	0.804	0.703	4.8064	
60 minute winter	SWMH 6.3	6.3	SWMH 4.5	77.1	1.095	1.051	0.5767	
60 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.2	0.533	0.002	0.0052	1.9
60 minute winter	SWMH 7.1	Infiltration		10.9				
60 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0099	29.3
60 minute winter	SWMH 9.1	9.1	SWMH 9.2	62.7	1.577	1.544	1.2312	
60 minute winter	SWMH 9.2	9.2	SWMH 9.3	61.7	1.552	1.543	0.6674	
60 minute winter	SWMH 9.3	9.3	SWMH 9.4	60.3	1.517	1.129	0.1507	
60 minute winter	SWMH 9.4	9.4	SWMH 9.5	60.3	1.516	1.311	1.5712	
60 minute winter	SWMH 9.5	9.5	Tank 1	60.3	1.609	2.152	0.6599	
60 minute winter	SWMH 10.1	10.1	SWMH 10.2	42.8	1.138	1.015	2.5295	
60 minute winter	SWMH 10.2	10.2	SWMH 10.3	41.7	1.047	1.037	0.9279	
60 minute winter	SWMH 10.3	10.3	SWMH 10.4	41.5	1.070	1.096	0.7428	
60 minute winter	SWMH 10.4	10.4	Tank 1	41.2	0.977	0.688	1.1239	

Results for 30 year 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 93.44%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
60 minute winter	SWMH 11.1	58	72.655	0.655	80.8	88.9578	0.0000	SURCHARGED
60 minute winter	SWMH 11.2	58	71.809	0.009	0.2	0.0000	0.0000	OK
60 minute winter	SWMH 12.1	30	73.873	0.873	12.6	2.1744	0.0000	SURCHARGED
60 minute winter	SWMH 13.1	35	72.641	0.021	0.6	0.0239	0.0000	OK
60 minute winter	Tank 1	67	72.351	0.400	102.3	190.2832	0.0000	SURCHARGED
60 minute winter	Pond 1	76	72.621	0.421	173.5	362.3916	0.0000	SURCHARGED
60 minute winter	Cat 4	54	73.248	0.138	38.2	39.2997	0.0000	OK
60 minute winter	Cat 7	55	73.392	0.222	18.7	20.1280	0.0000	OK
60 minute winter	Cat 9	49	73.169	0.059	10.1	7.1991	0.0000	OK
60 minute winter	Cat 15	56	73.502	0.352	18.1	19.8788	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
60 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.399	0.003	0.0056	2.8
60 minute winter	SWMH 11.1	Infiltration		13.0				
60 minute winter	SWMH 12.1	12.1	SWMH 6.3	13.0	0.384	0.254	1.7885	
60 minute winter	SWMH 13.1	13.1	SWMH 1.4	-0.6	-0.029	-0.014	0.6243	
60 minute winter	Tank 1	Tank 1	SWMH 8.1	5.5	0.436	0.123	0.5332	
60 minute winter	Pond 1	Pond 1	SWMH 3.1	8.7	0.587	0.093	0.5024	
60 minute winter	Cat 4	Hydro-Brake®		0.1				0.5
60 minute winter	Cat 4	Infiltration		11.6				
60 minute winter	Cat 7	Hydro-Brake®		0.1				0.6
60 minute winter	Cat 7	Infiltration		5.2				
60 minute winter	Cat 9	Hydro-Brake®		0.1				0.3
60 minute winter	Cat 9	Infiltration		5.0				
60 minute winter	Cat 15	Hydro-Brake®		0.1				0.8
60 minute winter	Cat 15	Infiltration		4.8				

Results for 30 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 1.1	1140	72.949	0.145	5.1	0.7139	0.0000	OK
1440 minute summer	SWMH 1.2	1110	72.950	0.362	9.5	0.4091	0.0000	SURCHARGED
1440 minute summer	SWMH 1.3	1170	72.950	0.380	9.5	0.4296	0.0000	SURCHARGED
1440 minute summer	SWMH 1.4	1110	72.949	0.551	9.5	0.6237	0.0000	SURCHARGED
1440 minute summer	SWMH 1.5	1110	72.949	0.649	8.8	0.7342	0.0000	SURCHARGED
1440 minute summer	SWMH 2.1	1140	72.950	0.208	4.5	1.2065	0.0000	OK
1440 minute summer	SWMH 2.2	1140	72.950	0.284	4.5	0.3216	0.0000	OK
1440 minute summer	SWMH 2.3	1170	72.949	0.334	4.5	0.3783	0.0000	SURCHARGED
1440 minute summer	SWMH 3.1	1140	72.949	0.799	8.0	0.9041	0.0000	SURCHARGED
1440 minute summer	SWMH 3.2	1110	72.948	0.848	7.9	0.9593	0.0000	SURCHARGED
1440 minute summer	SWMH 3.3	720	72.046	0.066	7.9	0.0741	0.0000	OK
1440 minute summer	SWMH CON	720	71.884	0.064	7.9	0.0000	0.0000	OK
1440 minute summer	SWMH 4.1	750	73.232	0.092	13.9	1.3491	0.0000	OK
1440 minute summer	SWMH 4.2	750	72.995	0.090	13.9	0.1018	0.0000	OK
1440 minute summer	SWMH 4.3	1110	72.953	0.315	13.9	0.3565	0.0000	SURCHARGED
1440 minute summer	SWMH 4.4	1110	72.953	0.413	13.2	0.4669	0.0000	SURCHARGED
1440 minute summer	SWMH 4.5	1080	72.954	0.454	37.9	0.5131	0.0000	SURCHARGED
1440 minute summer	SWMH 4.6	1110	72.953	0.503	37.9	0.5687	0.0000	SURCHARGED
1440 minute summer	SWMH 4.7	1050	72.951	0.611	41.4	0.6914	0.0000	SURCHARGED
1440 minute summer	SWMH 4.8	1110	72.952	0.652	41.3	0.7378	0.0000	SURCHARGED
1440 minute summer	SWMH 5.1	750	73.394	0.034	3.7	0.1382	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 1.1	1.1	SWMH 1.2	5.1	0.417	0.074	2.9137	
1440 minute summer	SWMH 1.2	1.2	SWMH 1.3	9.5	0.644	0.148	0.3777	
1440 minute summer	SWMH 1.3	1.3	SWMH 1.4	9.5	0.611	0.138	3.1463	
1440 minute summer	SWMH 1.4	1.4	SWMH 1.5	8.8	0.532	0.133	1.9125	
1440 minute summer	SWMH 1.5	1.5	Pond 1	8.6	0.678	0.104	1.2504	
1440 minute summer	SWMH 2.1	2.1	SWMH 2.2	4.5	0.546	0.066	1.1987	
1440 minute summer	SWMH 2.2	2.2	SWMH 2.3	4.5	0.478	0.067	0.9562	
1440 minute summer	SWMH 2.3	2.3	SWMH 1.2	4.5	0.340	0.069	0.5593	
1440 minute summer	SWMH 3.1	3.1	SWMH 3.2	7.9	0.181	0.083	0.4727	
1440 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
1440 minute summer	SWMH 3.3	3.3	SWMH CON	7.9	0.705	0.102	0.3691	621.9
1440 minute summer	SWMH 4.1	4.1	SWMH 4.2	13.9	0.772	0.201	1.0805	
1440 minute summer	SWMH 4.2	4.2	SWMH 4.3	13.9	0.741	0.201	2.6994	
1440 minute summer	SWMH 4.3	4.3	SWMH 4.4	13.2	0.623	0.185	1.6449	
1440 minute summer	SWMH 4.4	4.4	SWMH 4.5	13.1	0.415	0.122	0.3005	
1440 minute summer	SWMH 4.5	4.5	SWMH 4.6	37.9	0.969	0.447	0.6031	
1440 minute summer	SWMH 4.6	4.6	SWMH 4.7	37.8	0.772	0.458	1.3944	
1440 minute summer	SWMH 4.7	4.7	SWMH 4.8	41.3	0.632	0.500	0.5066	
1440 minute summer	SWMH 4.8	4.8	Pond 1	41.3	0.655	1.057	5.5445	
1440 minute summer	SWMH 5.1	5.1	SWMH 5.2	3.7	0.907	0.051	0.2428	

Results for 30 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 5.2	1110	72.952	0.102	3.7	0.1153	0.0000	OK
1440 minute summer	SWMH 5.3	1110	72.952	0.416	3.7	0.4706	0.0000	SURCHARGED
1440 minute summer	SWMH 6.1	750	73.215	0.111	20.0	2.2968	0.0000	OK
1440 minute summer	SWMH 6.2	1080	72.953	0.121	20.0	0.1373	0.0000	OK
1440 minute summer	SWMH 6.3	1110	72.953	0.389	25.4	1.3419	0.0000	SURCHARGED
1440 minute summer	SWMH 7.1	780	72.930	0.730	13.8	43.6664	0.0000	SURCHARGED
1440 minute summer	SWMH 7.2	780	71.708	0.008	0.2	0.0000	0.0000	OK
1440 minute summer	SWMH 8.1	1440	72.756	0.856	4.8	0.9677	0.0000	SURCHARGED
1440 minute summer	SWMH 8.2	660	71.824	0.024	1.8	0.0000	0.0000	OK
1440 minute summer	SWMH 9.1	1440	72.759	0.119	15.8	1.4676	0.0000	OK
1440 minute summer	SWMH 9.2	1440	72.758	0.308	15.8	0.3482	0.0000	SURCHARGED
1440 minute summer	SWMH 9.3	1440	72.757	0.407	15.8	0.4605	0.0000	SURCHARGED
1440 minute summer	SWMH 9.4	1440	72.757	0.447	15.7	0.5059	0.0000	SURCHARGED
1440 minute summer	SWMH 9.5	1440	72.756	0.756	15.6	0.8554	0.0000	SURCHARGED
1440 minute summer	SWMH 10.1	1440	72.756	0.096	6.7	0.5237	0.0000	OK
1440 minute summer	SWMH 10.2	1440	72.756	0.516	6.7	0.5834	0.0000	SURCHARGED
1440 minute summer	SWMH 10.3	1440	72.756	0.656	6.3	0.7417	0.0000	SURCHARGED
1440 minute summer	SWMH 10.4	1440	72.756	0.756	6.2	0.8549	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 5.2	5.2	SWMH 5.3	3.7	0.748	0.061	0.6640	
1440 minute summer	SWMH 5.3	5.3	SWMH 4.7	3.6	0.602	0.062	0.3627	
1440 minute summer	SWMH 6.1	6.1	SWMH 6.2	20.0	0.855	0.288	1.6175	
1440 minute summer	SWMH 6.2	6.2	SWMH 6.3	20.0	0.696	0.289	3.3146	
1440 minute summer	SWMH 6.3	6.3	SWMH 4.5	24.8	0.800	0.338	0.5767	
1440 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.2	0.530	0.002	0.0051	8.8
1440 minute summer	SWMH 7.1	Infiltration		10.3				
1440 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0099	141.1
1440 minute summer	SWMH 9.1	9.1	SWMH 9.2	15.8	0.910	0.389	0.9437	
1440 minute summer	SWMH 9.2	9.2	SWMH 9.3	15.8	0.920	0.395	0.6674	
1440 minute summer	SWMH 9.3	9.3	SWMH 9.4	15.7	1.004	0.294	0.1507	
1440 minute summer	SWMH 9.4	9.4	SWMH 9.5	15.6	0.501	0.340	1.5712	
1440 minute summer	SWMH 9.5	9.5	Tank 1	15.5	0.687	0.553	0.6599	
1440 minute summer	SWMH 10.1	10.1	SWMH 10.2	6.7	0.731	0.159	1.7766	
1440 minute summer	SWMH 10.2	10.2	SWMH 10.3	6.3	0.587	0.157	0.9279	
1440 minute summer	SWMH 10.3	10.3	SWMH 10.4	6.2	0.369	0.165	0.7428	
1440 minute summer	SWMH 10.4	10.4	Tank 1	6.2	0.307	0.103	1.1239	

Results for 30 year 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 97.20%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 11.1	810	72.443	0.443	12.0	42.1514	0.0000	SURCHARGED
1440 minute summer	SWMH 11.2	810	71.808	0.008	0.2	0.0000	0.0000	OK
1440 minute summer	SWMH 12.1	750	73.030	0.030	1.9	0.0736	0.0000	OK
1440 minute summer	SWMH 13.1	1110	72.950	0.330	0.2	0.3731	0.0000	SURCHARGED
1440 minute summer	Tank 1	1440	72.756	0.805	21.6	383.2130	0.0000	SURCHARGED
1440 minute summer	Pond 1	1110	72.949	0.749	49.6	679.2112	0.0000	SURCHARGED
1440 minute summer	Cat 4	780	73.178	0.068	6.5	9.9979	0.0000	OK
1440 minute summer	Cat 7	780	73.288	0.118	3.2	6.0095	0.0000	OK
1440 minute summer	Cat 9	750	73.129	0.019	1.7	0.8152	0.0000	OK
1440 minute summer	Cat 15	780	73.342	0.192	3.1	6.4496	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.380	0.002	0.0049	12.1
1440 minute summer	SWMH 11.1	Infiltration		8.7				
1440 minute summer	SWMH 12.1	12.1	SWMH 6.3	1.9	0.138	0.037	0.9630	
1440 minute summer	SWMH 13.1	13.1	SWMH 1.4	-0.2	-0.007	-0.006	1.1927	
1440 minute summer	Tank 1	Tank 1	SWMH 8.1	4.8	0.247	0.106	0.5332	
1440 minute summer	Pond 1	Pond 1	SWMH 3.1	8.0	0.457	0.086	0.5024	
1440 minute summer	Cat 4	Hydro-Brake®		0.1				2.4
1440 minute summer	Cat 4	Infiltration		5.8				
1440 minute summer	Cat 7	Hydro-Brake®		0.1				3.3
1440 minute summer	Cat 7	Infiltration		2.7				
1440 minute summer	Cat 9	Hydro-Brake®		0.0				0.8
1440 minute summer	Cat 9	Infiltration		1.6				
1440 minute summer	Cat 15	Hydro-Brake®		0.1				4.2
1440 minute summer	Cat 15	Infiltration		2.6				

Results for 30 year 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 97.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute winter	SWMH 1.1	1350	73.072	0.268	3.9	1.3212	0.0000	OK
1440 minute winter	SWMH 1.2	1380	73.073	0.485	7.2	0.5490	0.0000	SURCHARGED
1440 minute winter	SWMH 1.3	1350	73.071	0.501	7.0	0.5667	0.0000	SURCHARGED
1440 minute winter	SWMH 1.4	1320	73.072	0.674	6.9	0.7625	0.0000	SURCHARGED
1440 minute winter	SWMH 1.5	1320	73.071	0.771	6.4	0.8722	0.0000	SURCHARGED
1440 minute winter	SWMH 2.1	1350	73.073	0.331	3.4	1.9195	0.0000	SURCHARGED
1440 minute winter	SWMH 2.2	1350	73.074	0.408	3.4	0.4615	0.0000	SURCHARGED
1440 minute winter	SWMH 2.3	1380	73.072	0.457	3.4	0.5169	0.0000	SURCHARGED
1440 minute winter	SWMH 3.1	1320	73.072	0.922	8.0	1.0428	0.0000	SURCHARGED
1440 minute winter	SWMH 3.2	1380	73.070	0.970	8.0	1.0969	0.0000	SURCHARGED
1440 minute winter	SWMH 3.3	690	72.046	0.066	7.9	0.0741	0.0000	OK
1440 minute winter	SWMH CON	690	71.884	0.064	7.9	0.0000	0.0000	OK
1440 minute winter	SWMH 4.1	750	73.219	0.079	10.5	1.1658	0.0000	OK
1440 minute winter	SWMH 4.2	1320	73.074	0.169	10.5	0.1914	0.0000	OK
1440 minute winter	SWMH 4.3	1320	73.074	0.436	10.5	0.4934	0.0000	SURCHARGED
1440 minute winter	SWMH 4.4	1350	73.075	0.535	10.0	0.6047	0.0000	SURCHARGED
1440 minute winter	SWMH 4.5	1290	73.073	0.573	28.5	0.6484	0.0000	SURCHARGED
1440 minute winter	SWMH 4.6	1320	73.074	0.624	28.5	0.7057	0.0000	SURCHARGED
1440 minute winter	SWMH 4.7	1320	73.075	0.735	31.2	0.8309	0.0000	SURCHARGED
1440 minute winter	SWMH 4.8	1350	73.072	0.772	31.1	0.8736	0.0000	SURCHARGED
1440 minute winter	SWMH 5.1	750	73.390	0.030	2.8	0.1209	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
1440 minute winter	SWMH 1.1	1.1	SWMH 1.2	3.9	0.382	0.057	3.8304	
1440 minute winter	SWMH 1.2	1.2	SWMH 1.3	7.0	0.589	0.110	0.3777	
1440 minute winter	SWMH 1.3	1.3	SWMH 1.4	6.9	0.561	0.100	3.1463	
1440 minute winter	SWMH 1.4	1.4	SWMH 1.5	6.4	0.518	0.097	1.9125	
1440 minute winter	SWMH 1.5	1.5	Pond 1	6.4	0.573	0.077	1.2504	
1440 minute winter	SWMH 2.1	2.1	SWMH 2.2	3.4	0.504	0.050	1.3922	
1440 minute winter	SWMH 2.2	2.2	SWMH 2.3	3.4	0.455	0.050	0.9654	
1440 minute winter	SWMH 2.3	2.3	SWMH 1.2	3.3	0.321	0.052	0.5593	
1440 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.0	0.176	0.084	0.4727	
1440 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
1440 minute winter	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3692	605.3
1440 minute winter	SWMH 4.1	4.1	SWMH 4.2	10.5	0.714	0.152	1.3554	
1440 minute winter	SWMH 4.2	4.2	SWMH 4.3	10.5	0.714	0.152	3.7864	
1440 minute winter	SWMH 4.3	4.3	SWMH 4.4	10.0	0.624	0.140	1.6449	
1440 minute winter	SWMH 4.4	4.4	SWMH 4.5	9.9	0.418	0.092	0.3005	
1440 minute winter	SWMH 4.5	4.5	SWMH 4.6	28.5	0.952	0.336	0.6031	
1440 minute winter	SWMH 4.6	4.6	SWMH 4.7	28.5	0.753	0.344	1.3944	
1440 minute winter	SWMH 4.7	4.7	SWMH 4.8	31.1	0.624	0.377	0.5066	
1440 minute winter	SWMH 4.8	4.8	Pond 1	31.1	0.701	0.797	5.5445	
1440 minute winter	SWMH 5.1	5.1	SWMH 5.2	2.8	0.834	0.039	0.5335	

Results for 30 year 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 97.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 5.2	1320	73.073	0.223	2.8	0.2528	0.0000	OK
1440 minute winter	SWMH 5.3	1320	73.073	0.537	2.8	0.6072	0.0000	SURCHARGED
1440 minute winter	SWMH 6.1	750	73.199	0.095	15.0	1.9686	0.0000	OK
1440 minute winter	SWMH 6.2	1320	73.074	0.242	15.0	0.2742	0.0000	OK
1440 minute winter	SWMH 6.3	1320	73.074	0.510	19.1	1.7586	0.0000	SURCHARGED
1440 minute winter	SWMH 7.1	810	72.850	0.650	10.4	35.5221	0.0000	SURCHARGED
1440 minute winter	SWMH 7.2	810	71.708	0.008	0.2	0.0000	0.0000	OK
1440 minute winter	SWMH 8.1	1410	72.875	0.975	4.1	1.1022	0.0000	SURCHARGED
1440 minute winter	SWMH 8.2	1410	71.824	0.024	1.8	0.0000	0.0000	OK
1440 minute winter	SWMH 9.1	1410	72.877	0.237	11.9	2.9308	0.0000	SURCHARGED
1440 minute winter	SWMH 9.2	1410	72.877	0.427	11.9	0.4834	0.0000	SURCHARGED
1440 minute winter	SWMH 9.3	1410	72.877	0.527	11.9	0.5962	0.0000	SURCHARGED
1440 minute winter	SWMH 9.4	1380	72.874	0.564	11.8	0.6384	0.0000	SURCHARGED
1440 minute winter	SWMH 9.5	1380	72.875	0.875	11.7	0.9895	0.0000	SURCHARGED
1440 minute winter	SWMH 10.1	1410	72.875	0.215	5.0	1.1750	0.0000	OK
1440 minute winter	SWMH 10.2	1410	72.875	0.635	5.0	0.7180	0.0000	SURCHARGED
1440 minute winter	SWMH 10.3	1410	72.875	0.775	4.9	0.8763	0.0000	SURCHARGED
1440 minute winter	SWMH 10.4	1410	72.875	0.875	4.8	0.9894	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 5.2	5.2	SWMH 5.3	2.8	0.722	0.046	0.9220	
1440 minute winter	SWMH 5.3	5.3	SWMH 4.7	2.7	0.595	0.047	0.3627	
1440 minute winter	SWMH 6.1	6.1	SWMH 6.2	15.0	0.790	0.216	2.2962	
1440 minute winter	SWMH 6.2	6.2	SWMH 6.3	15.0	0.666	0.216	4.4851	
1440 minute winter	SWMH 6.3	6.3	SWMH 4.5	18.6	0.796	0.254	0.5767	
1440 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.2	0.522	0.002	0.0050	9.3
1440 minute winter	SWMH 7.1	Infiltration		9.1				
1440 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.805	0.023	0.0099	149.2
1440 minute winter	SWMH 9.1	9.1	SWMH 9.2	11.9	0.878	0.293	1.2312	
1440 minute winter	SWMH 9.2	9.2	SWMH 9.3	11.9	0.854	0.297	0.6674	
1440 minute winter	SWMH 9.3	9.3	SWMH 9.4	11.8	0.927	0.221	0.1507	
1440 minute winter	SWMH 9.4	9.4	SWMH 9.5	11.7	0.521	0.254	1.5712	
1440 minute winter	SWMH 9.5	9.5	Tank 1	11.6	0.685	0.414	0.6599	
1440 minute winter	SWMH 10.1	10.1	SWMH 10.2	5.0	0.673	0.119	2.5085	
1440 minute winter	SWMH 10.2	10.2	SWMH 10.3	4.9	0.558	0.121	0.9279	
1440 minute winter	SWMH 10.3	10.3	SWMH 10.4	4.8	0.383	0.127	0.7428	
1440 minute winter	SWMH 10.4	10.4	Tank 1	4.8	0.329	0.080	1.1239	

Results for 30 year 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 97.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 11.1	810	72.398	0.398	9.1	34.5031	0.0000	SURCHARGED
1440 minute winter	SWMH 11.2	810	71.808	0.008	0.2	0.0000	0.0000	OK
1440 minute winter	SWMH 12.1	1350	73.074	0.074	1.4	0.1847	0.0000	OK
1440 minute winter	SWMH 13.1	1320	73.075	0.455	0.4	0.5141	0.0000	SURCHARGED
1440 minute winter	Tank 1	1410	72.875	0.924	16.4	439.8485	0.0000	SURCHARGED
1440 minute winter	Pond 1	1350	73.071	0.871	37.2	804.7692	0.0000	SURCHARGED
1440 minute winter	Cat 4	780	73.166	0.056	4.9	6.7837	0.0000	OK
1440 minute winter	Cat 7	780	73.266	0.096	2.4	4.1422	0.0000	OK
1440 minute winter	Cat 9	780	73.125	0.015	1.3	0.5006	0.0000	OK
1440 minute winter	Cat 15	780	73.308	0.158	2.3	4.5113	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.376	0.002	0.0048	12.0
1440 minute winter	SWMH 11.1	Infiltration		7.8				
1440 minute winter	SWMH 12.1	12.1	SWMH 6.3	1.4	0.133	0.027	1.1503	
1440 minute winter	SWMH 13.1	13.1	SWMH 1.4	-0.4	-0.010	-0.009	1.1927	
1440 minute winter	Tank 1	Tank 1	SWMH 8.1	4.1	0.232	0.092	0.5332	
1440 minute winter	Pond 1	Pond 1	SWMH 3.1	8.0	0.427	0.086	0.5024	
1440 minute winter	Cat 4	Hydro-Brake®		0.1				2.8
1440 minute winter	Cat 4	Infiltration		4.7				
1440 minute winter	Cat 7	Hydro-Brake®		0.1				3.7
1440 minute winter	Cat 7	Infiltration		2.2				
1440 minute winter	Cat 9	Hydro-Brake®		0.0				0.8
1440 minute winter	Cat 9	Infiltration		1.3				
1440 minute winter	Cat 15	Hydro-Brake®		0.1				4.3
1440 minute winter	Cat 15	Infiltration		2.1				

Results for 100 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 92.43%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 1.1	11	74.054	1.250	93.5	6.1521	0.0000	FLOOD RISK
15 minute summer	SWMH 1.2	11	73.647	1.059	95.9	1.1975	0.0000	SURCHARGED
15 minute summer	SWMH 1.3	11	73.582	1.012	97.2	1.1449	0.0000	SURCHARGED
15 minute summer	SWMH 1.4	11	73.285	0.887	100.1	1.0030	0.0000	SURCHARGED
15 minute summer	SWMH 1.5	10	73.114	0.814	101.5	0.9203	0.0000	SURCHARGED
15 minute summer	SWMH 2.1	10	73.630	0.888	83.3	5.1442	11.8909	FLOOD
15 minute summer	SWMH 2.2	11	73.637	0.971	51.9	1.0981	0.0000	FLOOD RISK
15 minute summer	SWMH 2.3	11	73.643	1.028	44.3	1.1628	0.0000	FLOOD RISK
15 minute summer	SWMH 3.1	38	72.426	0.276	10.4	0.3118	0.0000	OK
15 minute summer	SWMH 3.2	38	72.425	0.325	7.9	0.3678	0.0000	SURCHARGED
15 minute summer	SWMH 3.3	39	72.044	0.064	7.5	0.0725	0.0000	OK
15 minute summer	SWMH CON	39	71.883	0.063	7.5	0.0000	0.0000	OK
15 minute summer	SWMH 4.1	9	74.090	0.950	252.9	13.9546	51.5665	FLOOD
15 minute summer	SWMH 4.2	9	73.967	1.062	78.0	1.2016	0.0000	FLOOD RISK
15 minute summer	SWMH 4.3	15	73.826	1.188	71.6	1.3431	0.0000	SURCHARGED
15 minute summer	SWMH 4.4	9	73.770	1.230	50.5	1.3911	19.6708	FLOOD
15 minute summer	SWMH 4.5	9	73.770	1.270	132.9	1.4364	12.1163	FLOOD
15 minute summer	SWMH 4.6	9	73.690	1.240	91.0	1.4024	4.0310	FLOOD
15 minute summer	SWMH 4.7	9	73.600	1.260	103.5	1.4251	2.3474	FLOOD
15 minute summer	SWMH 4.8	9	73.600	1.300	103.7	1.4700	0.0000	FLOOD RISK
15 minute summer	SWMH 5.1	11	74.376	1.016	67.9	4.0766	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 1.1	1.1	SWMH 1.2	86.0	1.222	1.252	3.9397	
15 minute summer	SWMH 1.2	1.2	SWMH 1.3	97.2	1.380	1.518	0.3777	
15 minute summer	SWMH 1.3	1.3	SWMH 1.4	98.5	1.399	1.436	3.1463	
15 minute summer	SWMH 1.4	1.4	SWMH 1.5	101.5	1.442	1.529	1.9125	
15 minute summer	SWMH 1.5	1.5	Pond 1	104.8	2.265	1.260	0.7623	
15 minute summer	SWMH 2.1	2.1	SWMH 2.2	51.9	0.851	0.757	1.3922	
15 minute summer	SWMH 2.2	2.2	SWMH 2.3	44.3	0.645	0.656	0.9654	
15 minute summer	SWMH 2.3	2.3	SWMH 1.2	47.4	0.673	0.735	0.5593	
15 minute summer	SWMH 3.1	3.1	SWMH 3.2	7.9	0.510	0.082	0.4637	
15 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.5	0.690	0.095	0.2562	
15 minute summer	SWMH 3.3	3.3	SWMH CON	7.5	0.696	0.098	0.3575	103.8
15 minute summer	SWMH 4.1	4.1	SWMH 4.2	78.0	1.153	1.127	4.2254	
15 minute summer	SWMH 4.2	4.2	SWMH 4.3	64.2	1.084	0.926	4.7882	
15 minute summer	SWMH 4.3	4.3	SWMH 4.4	50.5	0.717	0.705	1.6449	
15 minute summer	SWMH 4.4	4.4	SWMH 4.5	39.2	0.556	0.364	0.3005	
15 minute summer	SWMH 4.5	4.5	SWMH 4.6	91.0	1.292	1.074	0.6031	
15 minute summer	SWMH 4.6	4.6	SWMH 4.7	91.2	1.296	1.105	1.3944	
15 minute summer	SWMH 4.7	4.7	SWMH 4.8	103.7	1.473	1.255	0.5066	
15 minute summer	SWMH 4.8	4.8	Pond 1	105.9	2.083	2.711	4.9235	
15 minute summer	SWMH 5.1	5.1	SWMH 5.2	58.9	1.584	0.811	1.0433	

Results for 100 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 92.43%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 5.2	12	73.970	1.120	58.9	1.2670	0.0000	FLOOD RISK
15 minute summer	SWMH 5.3	9	73.600	1.064	59.3	1.2034	11.9563	FLOOD
15 minute summer	SWMH 6.1	9	74.050	0.946	362.9	19.5500	88.6014	FLOOD
15 minute summer	SWMH 6.2	9	74.024	1.192	81.5	1.3486	0.0000	FLOOD RISK
15 minute summer	SWMH 6.3	10	73.962	1.398	126.2	4.8197	0.0000	FLOOD RISK
15 minute summer	SWMH 7.1	19	72.843	0.643	249.8	34.7667	0.0000	SURCHARGED
15 minute summer	SWMH 7.2	19	71.707	0.007	0.2	0.0000	0.0000	OK
15 minute summer	SWMH 8.1	24	72.171	0.271	6.3	0.3061	0.0000	SURCHARGED
15 minute summer	SWMH 8.2	25	71.824	0.024	1.8	0.0000	0.0000	OK
15 minute summer	SWMH 9.1	8	73.940	1.300	287.1	16.0901	66.2766	FLOOD
15 minute summer	SWMH 9.2	9	73.534	1.084	60.7	1.2255	0.0000	SURCHARGED
15 minute summer	SWMH 9.3	9	73.291	0.941	60.2	1.0640	0.0000	SURCHARGED
15 minute summer	SWMH 9.4	9	73.198	0.888	60.3	1.0045	0.0000	SURCHARGED
15 minute summer	SWMH 9.5	7	72.755	0.755	60.3	0.8541	0.0000	SURCHARGED
15 minute summer	SWMH 10.1	10	74.090	1.430	121.8	7.8178	8.5128	FLOOD
15 minute summer	SWMH 10.2	12	73.035	0.795	64.5	0.8986	0.0000	SURCHARGED
15 minute summer	SWMH 10.3	13	72.606	0.506	63.4	0.5728	0.0000	SURCHARGED
15 minute summer	SWMH 10.4	13	72.251	0.251	63.4	0.2837	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 5.2	5.2	SWMH 5.3	59.3	1.490	0.979	0.9226	
15 minute summer	SWMH 5.3	5.3	SWMH 4.7	27.0	1.061	0.468	0.3627	
15 minute summer	SWMH 6.1	6.1	SWMH 6.2	81.5	1.194	1.175	4.8671	
15 minute summer	SWMH 6.2	6.2	SWMH 6.3	57.4	0.988	0.828	4.8064	
15 minute summer	SWMH 6.3	6.3	SWMH 4.5	126.0	1.789	1.717	0.5767	
15 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.2	0.521	0.002	0.0049	1.4
15 minute summer	SWMH 7.1	Infiltration		9.0				
15 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.801	0.023	0.0098	26.0
15 minute summer	SWMH 9.1	9.1	SWMH 9.2	60.7	1.527	1.495	1.2312	
15 minute summer	SWMH 9.2	9.2	SWMH 9.3	60.2	1.514	1.505	0.6674	
15 minute summer	SWMH 9.3	9.3	SWMH 9.4	60.3	1.516	1.128	0.1507	
15 minute summer	SWMH 9.4	9.4	SWMH 9.5	60.3	1.518	1.312	1.5712	
15 minute summer	SWMH 9.5	9.5	Tank 1	61.2	2.238	2.185	0.6454	
15 minute summer	SWMH 10.1	10.1	SWMH 10.2	64.5	1.621	1.530	2.5295	
15 minute summer	SWMH 10.2	10.2	SWMH 10.3	63.4	1.594	1.578	0.9279	
15 minute summer	SWMH 10.3	10.3	SWMH 10.4	63.4	1.594	1.672	0.7428	
15 minute summer	SWMH 10.4	10.4	Tank 1	63.4	1.125	1.058	0.8920	

Results for 100 year +20% CC 15 minute summer. 255 minute analysis at 1 minute timestep. Mass balance: 92.43%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SWMH 11.1	18	72.643	0.643	218.4	85.7334	0.0000	SURCHARGED
15 minute summer	SWMH 11.2	19	71.809	0.009	0.2	0.0000	0.0000	OK
15 minute summer	SWMH 12.1	10	74.178	1.178	49.8	2.9333	0.0000	FLOOD RISK
15 minute summer	SWMH 13.1	10	73.301	0.681	7.2	0.7703	0.0000	SURCHARGED
15 minute summer	Tank 1	29	72.161	0.210	124.4	99.8087	0.0000	OK
15 minute summer	Pond 1	39	72.426	0.226	206.0	188.1886	0.0000	OK
15 minute summer	Cat 4	24	73.250	0.140	57.1	40.4923	0.0000	OK
15 minute summer	Cat 7	25	73.393	0.223	28.0	20.3189	0.0000	OK
15 minute summer	Cat 9	23	73.175	0.065	15.1	8.7610	0.0000	OK
15 minute summer	Cat 15	25	73.502	0.352	27.1	19.8311	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.398	0.003	0.0055	2.3
15 minute summer	SWMH 11.1	Infiltration		12.7				
15 minute summer	SWMH 12.1	12.1	SWMH 6.3	33.7	0.848	0.659	1.7885	
15 minute summer	SWMH 13.1	13.1	SWMH 1.4	-7.2	-0.297	-0.161	1.1927	
15 minute summer	Tank 1	Tank 1	SWMH 8.1	6.3	0.553	0.140	0.4699	
15 minute summer	Pond 1	Pond 1	SWMH 3.1	10.4	0.710	0.112	0.4447	
15 minute summer	Cat 4	Hydro-Brake®		0.1				0.4
15 minute summer	Cat 4	Infiltration		11.8				
15 minute summer	Cat 7	Hydro-Brake®		0.1				0.5
15 minute summer	Cat 7	Infiltration		5.2				
15 minute summer	Cat 9	Hydro-Brake®		0.1				0.2
15 minute summer	Cat 9	Infiltration		5.6				
15 minute summer	Cat 15	Hydro-Brake®		0.1				0.6
15 minute summer	Cat 15	Infiltration		4.8				

Results for 100 year +20% CC 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 93.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute winter	SWMH 1.1	11	74.060	1.256	98.3	6.1808	0.0868	FLOOD
15 minute winter	SWMH 1.2	10	73.681	1.093	98.6	1.2366	0.0000	SURCHARGED
15 minute winter	SWMH 1.3	10	73.620	1.050	99.6	1.1872	0.0000	SURCHARGED
15 minute winter	SWMH 1.4	10	73.342	0.944	102.0	1.0671	0.0000	SURCHARGED
15 minute winter	SWMH 1.5	10	73.175	0.875	103.1	0.9895	0.0000	SURCHARGED
15 minute winter	SWMH 2.1	10	73.630	0.888	90.9	5.1442	15.0996	FLOOD
15 minute winter	SWMH 2.2	10	73.660	0.994	42.2	1.1237	0.0000	FLOOD RISK
15 minute winter	SWMH 2.3	10	73.675	1.060	44.5	1.1986	0.0000	FLOOD RISK
15 minute winter	SWMH 3.1	39	72.433	0.283	10.5	0.3202	0.0000	OK
15 minute winter	SWMH 3.2	39	72.433	0.333	8.4	0.3761	0.0000	SURCHARGED
15 minute winter	SWMH 3.3	39	72.044	0.064	7.6	0.0726	0.0000	OK
15 minute winter	SWMH CON	39	71.883	0.063	7.6	0.0000	0.0000	OK
15 minute winter	SWMH 4.1	8	74.090	0.950	265.9	13.9546	67.4503	FLOOD
15 minute winter	SWMH 4.2	10	73.967	1.062	74.3	1.2008	0.0000	FLOOD RISK
15 minute winter	SWMH 4.3	10	73.826	1.188	51.4	1.3439	0.0000	SURCHARGED
15 minute winter	SWMH 4.4	9	73.770	1.230	49.9	1.3911	21.0748	FLOOD
15 minute winter	SWMH 4.5	9	73.770	1.270	133.7	1.4364	13.3617	FLOOD
15 minute winter	SWMH 4.6	9	73.690	1.240	90.1	1.4024	3.9533	FLOOD
15 minute winter	SWMH 4.7	9	73.600	1.260	104.4	1.4251	1.5913	FLOOD
15 minute winter	SWMH 4.8	9	73.567	1.267	104.4	1.4332	0.0000	FLOOD RISK
15 minute winter	SWMH 5.1	11	74.463	1.103	71.5	4.4281	0.0000	FLOOD RISK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute winter	SWMH 1.1	1.1	SWMH 1.2	90.6	1.286	1.318	3.9397	
15 minute winter	SWMH 1.2	1.2	SWMH 1.3	99.6	1.414	1.556	0.3777	
15 minute winter	SWMH 1.3	1.3	SWMH 1.4	100.9	1.432	1.470	3.1463	
15 minute winter	SWMH 1.4	1.4	SWMH 1.5	103.1	1.464	1.552	1.9125	
15 minute winter	SWMH 1.5	1.5	Pond 1	105.6	2.255	1.270	0.7960	
15 minute winter	SWMH 2.1	2.1	SWMH 2.2	42.2	0.843	0.615	1.3922	
15 minute winter	SWMH 2.2	2.2	SWMH 2.3	44.5	0.668	0.660	0.9654	
15 minute winter	SWMH 2.3	2.3	SWMH 1.2	47.7	0.678	0.741	0.5593	
15 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.4	0.516	0.087	0.4675	
15 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.6	0.691	0.096	0.2571	
15 minute winter	SWMH 3.3	3.3	SWMH CON	7.6	0.697	0.098	0.3587	104.7
15 minute winter	SWMH 4.1	4.1	SWMH 4.2	74.3	1.161	1.073	4.2254	
15 minute winter	SWMH 4.2	4.2	SWMH 4.3	51.4	1.124	0.741	4.7882	
15 minute winter	SWMH 4.3	4.3	SWMH 4.4	49.9	0.708	0.696	1.6449	
15 minute winter	SWMH 4.4	4.4	SWMH 4.5	39.7	0.563	0.369	0.3005	
15 minute winter	SWMH 4.5	4.5	SWMH 4.6	90.1	1.279	1.063	0.6031	
15 minute winter	SWMH 4.6	4.6	SWMH 4.7	91.2	1.295	1.104	1.3944	
15 minute winter	SWMH 4.7	4.7	SWMH 4.8	104.4	1.483	1.264	0.5066	
15 minute winter	SWMH 4.8	4.8	Pond 1	107.1	2.081	2.742	5.0052	
15 minute winter	SWMH 5.1	5.1	SWMH 5.2	62.2	1.564	0.856	1.0433	

Results for 100 year +20% CC 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 93.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH 5.2	12	74.008	1.158	62.2	1.3098	0.0000	FLOOD RISK
15 minute winter	SWMH 5.3	9	73.600	1.064	62.2	1.2034	14.1903	FLOOD
15 minute winter	SWMH 6.1	8	74.050	0.946	381.7	19.5500	114.8996	FLOOD
15 minute winter	SWMH 6.2	10	74.011	1.179	82.8	1.3339	0.0000	FLOOD RISK
15 minute winter	SWMH 6.3	10	73.968	1.404	128.7	4.8396	0.0000	FLOOD RISK
15 minute winter	SWMH 7.1	19	72.962	0.762	262.7	47.2022	0.0000	SURCHARGED
15 minute winter	SWMH 7.2	19	71.708	0.008	0.2	0.0000	0.0000	OK
15 minute winter	SWMH 8.1	25	72.179	0.279	6.2	0.3150	0.0000	SURCHARGED
15 minute winter	SWMH 8.2	26	71.824	0.024	1.8	0.0000	0.0000	OK
15 minute winter	SWMH 9.1	8	73.940	1.300	301.9	16.0901	75.5728	FLOOD
15 minute winter	SWMH 9.2	8	73.547	1.097	60.2	1.2413	0.0000	SURCHARGED
15 minute winter	SWMH 9.3	8	73.319	0.969	60.3	1.0959	0.0000	SURCHARGED
15 minute winter	SWMH 9.4	8	73.234	0.924	60.3	1.0455	0.0000	SURCHARGED
15 minute winter	SWMH 9.5	7	72.811	0.811	60.4	0.9169	0.0000	SURCHARGED
15 minute winter	SWMH 10.1	10	74.090	1.430	128.0	7.8178	10.1029	FLOOD
15 minute winter	SWMH 10.2	13	73.035	0.795	63.9	0.8987	0.0000	SURCHARGED
15 minute winter	SWMH 10.3	13	72.607	0.506	63.4	0.5728	0.0000	SURCHARGED
15 minute winter	SWMH 10.4	13	72.251	0.251	63.4	0.2837	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH 5.2	5.2	SWMH 5.3	62.2	1.564	1.027	0.9226	
15 minute winter	SWMH 5.3	5.3	SWMH 4.7	27.6	1.108	0.478	0.3627	
15 minute winter	SWMH 6.1	6.1	SWMH 6.2	82.8	1.221	1.194	4.8671	
15 minute winter	SWMH 6.2	6.2	SWMH 6.3	65.2	1.008	0.941	4.8064	
15 minute winter	SWMH 6.3	6.3	SWMH 4.5	127.9	1.817	1.744	0.5767	
15 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.2	0.533	0.002	0.0052	1.7
15 minute winter	SWMH 7.1	Infiltration		10.7				
15 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.801	0.023	0.0098	26.2
15 minute winter	SWMH 9.1	9.1	SWMH 9.2	60.2	1.514	1.482	1.2312	
15 minute winter	SWMH 9.2	9.2	SWMH 9.3	60.3	1.516	1.507	0.6674	
15 minute winter	SWMH 9.3	9.3	SWMH 9.4	60.3	1.517	1.129	0.1507	
15 minute winter	SWMH 9.4	9.4	SWMH 9.5	60.4	1.518	1.313	1.5712	
15 minute winter	SWMH 9.5	9.5	Tank 1	61.5	2.294	2.195	0.6547	
15 minute winter	SWMH 10.1	10.1	SWMH 10.2	63.9	1.607	1.516	2.5295	
15 minute winter	SWMH 10.2	10.2	SWMH 10.3	63.4	1.594	1.578	0.9279	
15 minute winter	SWMH 10.3	10.3	SWMH 10.4	63.4	1.594	1.672	0.7428	
15 minute winter	SWMH 10.4	10.4	Tank 1	63.4	1.125	1.058	0.8920	

Results for 100 year +20% CC 15 minute winter. 255 minute analysis at 1 minute timestep. Mass balance: 93.26%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute winter	SWMH 11.1	18	72.684	0.684	229.7	96.6879	0.0000	SURCHARGED
15 minute winter	SWMH 11.2	19	71.809	0.009	0.2	0.0000	0.0000	OK
15 minute winter	SWMH 12.1	10	74.200	1.200	36.0	2.9882	0.0000	FLOOD RISK
15 minute winter	SWMH 13.1	10	73.340	0.720	23.1	0.8147	0.0000	SURCHARGED
15 minute winter	Tank 1	28	72.171	0.220	124.6	104.8064	0.0000	OK
15 minute winter	Pond 1	38	72.434	0.234	208.2	194.7868	0.0000	OK
15 minute winter	Cat 4	25	73.259	0.149	64.0	45.8083	0.0000	OK
15 minute winter	Cat 7	25	73.408	0.238	31.4	22.9691	0.0000	OK
15 minute winter	Cat 9	24	73.179	0.069	17.0	9.9745	0.0000	OK
15 minute winter	Cat 15	25	73.525	0.375	30.3	22.4027	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.401	0.003	0.0056	2.4
15 minute winter	SWMH 11.1	Infiltration		13.5				
15 minute winter	SWMH 12.1	12.1	SWMH 6.3	35.2	0.885	0.688	1.7885	
15 minute winter	SWMH 13.1	13.1	SWMH 1.4	-23.1	-0.665	-0.517	1.1927	
15 minute winter	Tank 1	Tank 1	SWMH 8.1	6.2	0.532	0.139	0.4838	
15 minute winter	Pond 1	Pond 1	SWMH 3.1	10.5	0.645	0.113	0.4557	
15 minute winter	Cat 4	Hydro-Brake®		0.1				0.5
15 minute winter	Cat 4	Infiltration		12.6				
15 minute winter	Cat 7	Hydro-Brake®		0.1				0.6
15 minute winter	Cat 7	Infiltration		5.6				
15 minute winter	Cat 9	Hydro-Brake®		0.1				0.2
15 minute winter	Cat 9	Infiltration		5.7				
15 minute winter	Cat 15	Hydro-Brake®		0.1				0.7
15 minute winter	Cat 15	Infiltration		5.2				

Results for 100 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 1.1	35	73.562	0.758	66.6	3.7308	0.0000	SURCHARGED
60 minute summer	SWMH 1.2	36	73.406	0.818	102.4	0.9257	0.0000	SURCHARGED
60 minute summer	SWMH 1.3	36	73.314	0.744	101.1	0.8414	0.0000	SURCHARGED
60 minute summer	SWMH 1.4	36	72.902	0.504	100.7	0.5699	0.0000	SURCHARGED
60 minute summer	SWMH 1.5	78	72.687	0.387	99.8	0.4372	0.0000	SURCHARGED
60 minute summer	SWMH 2.1	35	73.511	0.769	57.9	4.4558	0.0000	FLOOD RISK
60 minute summer	SWMH 2.2	36	73.465	0.799	47.6	0.9035	0.0000	SURCHARGED
60 minute summer	SWMH 2.3	36	73.431	0.816	46.3	0.9229	0.0000	SURCHARGED
60 minute summer	SWMH 3.1	80	72.686	0.536	9.2	0.6061	0.0000	SURCHARGED
60 minute summer	SWMH 3.2	80	72.685	0.585	8.4	0.6619	0.0000	SURCHARGED
60 minute summer	SWMH 3.3	264	72.046	0.066	7.9	0.0741	0.0000	OK
60 minute summer	SWMH CON	264	71.884	0.064	7.9	0.0000	0.0000	OK
60 minute summer	SWMH 4.1	28	74.090	0.950	180.1	13.9546	68.2467	FLOOD
60 minute summer	SWMH 4.2	28	73.982	1.077	47.2	1.2181	0.0000	FLOOD RISK
60 minute summer	SWMH 4.3	29	73.827	1.189	47.3	1.3445	0.0000	SURCHARGED
60 minute summer	SWMH 4.4	28	73.770	1.230	47.4	1.3911	35.9606	FLOOD
60 minute summer	SWMH 4.5	28	73.770	1.270	106.6	1.4364	9.2694	FLOOD
60 minute summer	SWMH 4.6	31	73.690	1.240	97.6	1.4024	0.0525	FLOOD
60 minute summer	SWMH 4.7	31	73.551	1.211	116.4	1.3694	0.0000	FLOOD RISK
60 minute summer	SWMH 4.8	31	73.413	1.113	116.9	1.2590	0.0000	FLOOD RISK
60 minute summer	SWMH 5.1	34	74.087	0.727	48.4	2.9178	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 1.1	1.1	SWMH 1.2	57.6	0.818	0.838	3.9397	
60 minute summer	SWMH 1.2	1.2	SWMH 1.3	101.1	1.436	1.580	0.3777	
60 minute summer	SWMH 1.3	1.3	SWMH 1.4	100.7	1.430	1.468	3.1463	
60 minute summer	SWMH 1.4	1.4	SWMH 1.5	99.8	1.417	1.503	1.9125	
60 minute summer	SWMH 1.5	1.5	Pond 1	98.2	1.660	1.181	1.2504	
60 minute summer	SWMH 2.1	2.1	SWMH 2.2	47.6	0.758	0.695	1.3922	
60 minute summer	SWMH 2.2	2.2	SWMH 2.3	46.3	0.657	0.686	0.9654	
60 minute summer	SWMH 2.3	2.3	SWMH 1.2	45.8	0.651	0.711	0.5593	
60 minute summer	SWMH 3.1	3.1	SWMH 3.2	8.4	0.409	0.088	0.4727	
60 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
60 minute summer	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3692	130.3
60 minute summer	SWMH 4.1	4.1	SWMH 4.2	47.2	0.886	0.683	4.2254	
60 minute summer	SWMH 4.2	4.2	SWMH 4.3	47.3	0.857	0.682	4.7882	
60 minute summer	SWMH 4.3	4.3	SWMH 4.4	47.4	0.681	0.662	1.6449	
60 minute summer	SWMH 4.4	4.4	SWMH 4.5	38.4	0.545	0.357	0.3005	
60 minute summer	SWMH 4.5	4.5	SWMH 4.6	97.6	1.387	1.153	0.6031	
60 minute summer	SWMH 4.6	4.6	SWMH 4.7	97.1	1.380	1.176	1.3944	
60 minute summer	SWMH 4.7	4.7	SWMH 4.8	116.9	1.660	1.415	0.5066	
60 minute summer	SWMH 4.8	4.8	Pond 1	118.3	1.879	3.028	5.5445	
60 minute summer	SWMH 5.1	5.1	SWMH 5.2	46.6	1.173	0.642	1.0433	

Results for 100 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 5.2	34	73.831	0.981	46.6	1.1097	0.0000	FLOOD RISK
60 minute summer	SWMH 5.3	31	73.600	1.064	46.7	1.2034	4.2676	FLOOD
60 minute summer	SWMH 6.1	27	74.050	0.946	258.5	19.5500	130.9328	FLOOD
60 minute summer	SWMH 6.2	33	73.976	1.144	53.4	1.2933	0.0000	FLOOD RISK
60 minute summer	SWMH 6.3	33	73.902	1.338	104.5	4.6112	0.0000	FLOOD RISK
60 minute summer	SWMH 7.1	61	73.284	1.084	177.9	89.8237	0.0000	FLOOD RISK
60 minute summer	SWMH 7.2	61	71.708	0.008	0.3	0.0000	0.0000	OK
60 minute summer	SWMH 8.1	70	72.422	0.522	6.3	0.5905	0.0000	SURCHARGED
60 minute summer	SWMH 8.2	38	71.824	0.024	1.8	0.0000	0.0000	OK
60 minute summer	SWMH 9.1	29	73.940	1.300	204.5	16.0901	67.8153	FLOOD
60 minute summer	SWMH 9.2	42	73.480	1.030	63.7	1.1648	0.0000	SURCHARGED
60 minute summer	SWMH 9.3	43	73.206	0.856	62.3	0.9686	0.0000	SURCHARGED
60 minute summer	SWMH 9.4	43	73.105	0.795	60.3	0.8991	0.0000	SURCHARGED
60 minute summer	SWMH 9.5	45	72.552	0.552	60.3	0.6244	0.0000	SURCHARGED
60 minute summer	SWMH 10.1	33	74.090	1.430	86.8	7.8178	3.0836	FLOOD
60 minute summer	SWMH 10.2	36	73.042	0.802	64.4	0.9068	0.0000	SURCHARGED
60 minute summer	SWMH 10.3	37	72.620	0.520	63.3	0.5883	0.0000	SURCHARGED
60 minute summer	SWMH 10.4	71	72.422	0.422	63.2	0.4777	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 5.2	5.2	SWMH 5.3	46.7	1.175	0.771	0.9226	
60 minute summer	SWMH 5.3	5.3	SWMH 4.7	34.3	0.867	0.595	0.3627	
60 minute summer	SWMH 6.1	6.1	SWMH 6.2	53.4	0.969	0.769	4.8671	
60 minute summer	SWMH 6.2	6.2	SWMH 6.3	49.5	0.835	0.714	4.8064	
60 minute summer	SWMH 6.3	6.3	SWMH 4.5	104.5	1.484	1.424	0.5767	
60 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.3	0.556	0.002	0.0058	2.8
60 minute summer	SWMH 7.1	Infiltration		15.4				
60 minute summer	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0099	28.5
60 minute summer	SWMH 9.1	9.1	SWMH 9.2	63.7	1.602	1.568	1.2312	
60 minute summer	SWMH 9.2	9.2	SWMH 9.3	62.3	1.566	1.557	0.6674	
60 minute summer	SWMH 9.3	9.3	SWMH 9.4	60.3	1.517	1.129	0.1507	
60 minute summer	SWMH 9.4	9.4	SWMH 9.5	60.3	1.516	1.311	1.5712	
60 minute summer	SWMH 9.5	9.5	Tank 1	60.3	1.611	2.153	0.6599	
60 minute summer	SWMH 10.1	10.1	SWMH 10.2	64.4	1.619	1.528	2.5295	
60 minute summer	SWMH 10.2	10.2	SWMH 10.3	63.3	1.593	1.577	0.9279	
60 minute summer	SWMH 10.3	10.3	SWMH 10.4	63.2	1.590	1.668	0.7428	
60 minute summer	SWMH 10.4	10.4	Tank 1	62.9	1.106	1.049	1.1239	

Results for 100 year +20% CC 60 minute summer. 300 minute analysis at 1 minute timestep. Mass balance: 95.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	SWMH 11.1	59	72.791	0.791	155.5	127.8990	0.0000	SURCHARGED
60 minute summer	SWMH 11.2	60	71.809	0.009	0.2	0.0000	0.0000	OK
60 minute summer	SWMH 12.1	33	74.015	1.015	24.3	2.5264	0.0000	FLOOD RISK
60 minute summer	SWMH 13.1	36	72.902	0.282	4.1	0.3192	0.0000	SURCHARGED
60 minute summer	Tank 1	67	72.422	0.471	122.5	224.4138	0.0000	SURCHARGED
60 minute summer	Pond 1	80	72.687	0.487	213.8	423.1800	0.0000	SURCHARGED
60 minute summer	Cat 4	53	73.279	0.169	60.6	58.4633	0.0000	OK
60 minute summer	Cat 7	54	73.441	0.271	29.7	29.7114	0.0000	OK
60 minute summer	Cat 9	49	73.186	0.076	16.0	11.8645	0.0000	OK
60 minute summer	Cat 15	54	73.580	0.430	28.7	29.0544	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.407	0.003	0.0059	3.1
60 minute summer	SWMH 11.1	Infiltration		15.7				
60 minute summer	SWMH 12.1	12.1	SWMH 6.3	24.3	0.612	0.475	1.7885	
60 minute summer	SWMH 13.1	13.1	SWMH 1.4	-4.1	-0.123	-0.091	1.1927	
60 minute summer	Tank 1	Tank 1	SWMH 8.1	6.3	0.416	0.139	0.5332	
60 minute summer	Pond 1	Pond 1	SWMH 3.1	9.2	0.578	0.099	0.5024	
60 minute summer	Cat 4	Hydro-Brake®		0.1				0.6
60 minute summer	Cat 4	Infiltration		14.3				
60 minute summer	Cat 7	Hydro-Brake®		0.1				0.8
60 minute summer	Cat 7	Infiltration		6.4				
60 minute summer	Cat 9	Hydro-Brake®		0.1				0.3
60 minute summer	Cat 9	Infiltration		5.7				
60 minute summer	Cat 15	Hydro-Brake®		0.1				0.9
60 minute summer	Cat 15	Infiltration		6.0				

Results for 100 year +20% CC 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 95.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWMH 1.1	36	73.343	0.539	53.9	2.6501	0.0000	SURCHARGED
60 minute winter	SWMH 1.2	36	73.222	0.634	90.9	0.7165	0.0000	SURCHARGED
60 minute winter	SWMH 1.3	36	73.144	0.574	90.5	0.6489	0.0000	SURCHARGED
60 minute winter	SWMH 1.4	37	72.809	0.411	90.1	0.4643	0.0000	SURCHARGED
60 minute winter	SWMH 1.5	81	72.719	0.419	88.5	0.4742	0.0000	SURCHARGED
60 minute winter	SWMH 2.1	36	73.308	0.566	46.9	3.2802	0.0000	SURCHARGED
60 minute winter	SWMH 2.2	36	73.271	0.605	42.2	0.6838	0.0000	SURCHARGED
60 minute winter	SWMH 2.3	36	73.242	0.627	41.8	0.7090	0.0000	SURCHARGED
60 minute winter	SWMH 3.1	80	72.718	0.568	9.1	0.6427	0.0000	SURCHARGED
60 minute winter	SWMH 3.2	80	72.718	0.618	8.5	0.6986	0.0000	SURCHARGED
60 minute winter	SWMH 3.3	53	72.046	0.066	7.9	0.0741	0.0000	OK
60 minute winter	SWMH CON	53	71.884	0.064	7.9	0.0000	0.0000	OK
60 minute winter	SWMH 4.1	25	74.090	0.950	145.8	13.9546	79.7340	FLOOD
60 minute winter	SWMH 4.2	25	73.970	1.065	47.2	1.2046	0.0000	FLOOD RISK
60 minute winter	SWMH 4.3	25	73.829	1.191	47.3	1.3465	0.0000	SURCHARGED
60 minute winter	SWMH 4.4	25	73.770	1.230	47.3	1.3911	53.1461	FLOOD
60 minute winter	SWMH 4.5	27	73.770	1.270	98.6	1.4364	7.0024	FLOOD
60 minute winter	SWMH 4.6	29	73.690	1.240	95.9	1.4024	0.0419	FLOOD
60 minute winter	SWMH 4.7	29	73.550	1.210	118.5	1.3686	0.0000	FLOOD RISK
60 minute winter	SWMH 4.8	29	73.412	1.112	118.7	1.2576	0.0000	FLOOD RISK
60 minute winter	SWMH 5.1	34	73.936	0.576	39.2	2.3126	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWMH 1.1	1.1	SWMH 1.2	49.8	0.723	0.725	3.9397	
60 minute winter	SWMH 1.2	1.2	SWMH 1.3	90.5	1.285	1.414	0.3777	
60 minute winter	SWMH 1.3	1.3	SWMH 1.4	90.1	1.279	1.313	3.1463	
60 minute winter	SWMH 1.4	1.4	SWMH 1.5	88.5	1.257	1.333	1.9125	
60 minute winter	SWMH 1.5	1.5	Pond 1	88.0	1.676	1.058	1.2504	
60 minute winter	SWMH 2.1	2.1	SWMH 2.2	42.2	0.743	0.616	1.3922	
60 minute winter	SWMH 2.2	2.2	SWMH 2.3	41.8	0.594	0.620	0.9654	
60 minute winter	SWMH 2.3	2.3	SWMH 1.2	41.5	0.589	0.644	0.5593	
60 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.5	0.423	0.089	0.4727	
60 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
60 minute winter	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3692	130.3
60 minute winter	SWMH 4.1	4.1	SWMH 4.2	47.2	0.917	0.683	4.2254	
60 minute winter	SWMH 4.2	4.2	SWMH 4.3	47.3	0.913	0.682	4.7882	
60 minute winter	SWMH 4.3	4.3	SWMH 4.4	47.3	0.690	0.659	1.6449	
60 minute winter	SWMH 4.4	4.4	SWMH 4.5	36.7	0.521	0.341	0.3005	
60 minute winter	SWMH 4.5	4.5	SWMH 4.6	95.9	1.362	1.132	0.6031	
60 minute winter	SWMH 4.6	4.6	SWMH 4.7	94.0	1.334	1.138	1.3944	
60 minute winter	SWMH 4.7	4.7	SWMH 4.8	118.7	1.686	1.437	0.5066	
60 minute winter	SWMH 4.8	4.8	Pond 1	119.3	1.922	3.056	5.5445	
60 minute winter	SWMH 5.1	5.1	SWMH 5.2	38.8	1.101	0.533	1.0433	

Results for 100 year +20% CC 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 95.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWMH 5.2	34	73.759	0.909	38.8	1.0286	0.0000	FLOOD RISK
60 minute winter	SWMH 5.3	30	73.600	1.064	38.8	1.2034	2.0090	FLOOD
60 minute winter	SWMH 6.1	24	74.050	0.946	209.3	19.5500	156.9955	FLOOD
60 minute winter	SWMH 6.2	33	73.963	1.131	49.5	1.2788	0.0000	FLOOD RISK
60 minute winter	SWMH 6.3	33	73.876	1.312	93.9	4.5236	0.0000	FLOOD RISK
60 minute winter	SWMH 7.1	47	73.360	1.160	144.0	101.8790	8.8776	FLOOD
60 minute winter	SWMH 7.2	50	71.708	0.008	0.3	0.0000	0.0000	OK
60 minute winter	SWMH 8.1	67	72.481	0.581	6.2	0.6566	0.0000	SURCHARGED
60 minute winter	SWMH 8.2	36	71.824	0.024	1.8	0.0000	0.0000	OK
60 minute winter	SWMH 9.1	27	73.940	1.300	165.6	16.0901	77.1208	FLOOD
60 minute winter	SWMH 9.2	46	73.500	1.050	64.7	1.1875	0.0000	SURCHARGED
60 minute winter	SWMH 9.3	46	73.241	0.891	61.4	1.0076	0.0000	SURCHARGED
60 minute winter	SWMH 9.4	46	73.143	0.833	60.3	0.9416	0.0000	SURCHARGED
60 minute winter	SWMH 9.5	48	72.614	0.614	60.3	0.6945	0.0000	SURCHARGED
60 minute winter	SWMH 10.1	36	74.045	1.385	70.2	7.5699	0.0000	FLOOD RISK
60 minute winter	SWMH 10.2	37	73.033	0.793	62.2	0.8965	0.0000	SURCHARGED
60 minute winter	SWMH 10.3	38	72.629	0.529	62.0	0.5988	0.0000	SURCHARGED
60 minute winter	SWMH 10.4	67	72.481	0.481	61.7	0.5437	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWMH 5.2	5.2	SWMH 5.3	38.8	0.982	0.641	0.9226	
60 minute winter	SWMH 5.3	5.3	SWMH 4.7	35.4	0.917	0.614	0.3627	
60 minute winter	SWMH 6.1	6.1	SWMH 6.2	49.5	1.010	0.713	4.8671	
60 minute winter	SWMH 6.2	6.2	SWMH 6.3	48.6	0.876	0.701	4.8064	
60 minute winter	SWMH 6.3	6.3	SWMH 4.5	93.9	1.334	1.280	0.5767	
60 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.3	0.561	0.003	0.0059	3.0
60 minute winter	SWMH 7.1	Infiltration		16.5				
60 minute winter	SWMH 8.1	8.1	SWMH 8.2	1.8	0.802	0.023	0.0099	27.1
60 minute winter	SWMH 9.1	9.1	SWMH 9.2	64.7	1.627	1.593	1.2312	
60 minute winter	SWMH 9.2	9.2	SWMH 9.3	61.4	1.545	1.536	0.6674	
60 minute winter	SWMH 9.3	9.3	SWMH 9.4	60.3	1.517	1.130	0.1507	
60 minute winter	SWMH 9.4	9.4	SWMH 9.5	60.3	1.516	1.311	1.5712	
60 minute winter	SWMH 9.5	9.5	Tank 1	60.3	1.635	2.152	0.6599	
60 minute winter	SWMH 10.1	10.1	SWMH 10.2	62.2	1.565	1.477	2.5295	
60 minute winter	SWMH 10.2	10.2	SWMH 10.3	62.0	1.559	1.544	0.9279	
60 minute winter	SWMH 10.3	10.3	SWMH 10.4	61.7	1.553	1.629	0.7428	
60 minute winter	SWMH 10.4	10.4	Tank 1	61.3	1.028	1.024	1.1239	

Results for 100 year +20% CC 60 minute winter. 300 minute analysis at 1 minute timestep. Mass balance: 95.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWMH 11.1	59	72.848	0.848	125.9	146.3180	0.0000	SURCHARGED
60 minute winter	SWMH 11.2	60	71.809	0.009	0.2	0.0000	0.0000	OK
60 minute winter	SWMH 12.1	33	73.950	0.950	19.7	2.3665	0.0000	SURCHARGED
60 minute winter	SWMH 13.1	37	72.809	0.189	1.9	0.2140	0.0000	OK
60 minute winter	Tank 1	67	72.481	0.530	119.9	252.2107	0.0000	SURCHARGED
60 minute winter	Pond 1	80	72.719	0.519	206.5	453.7480	0.0000	SURCHARGED
60 minute winter	Cat 4	56	73.290	0.180	59.6	66.3986	0.0000	OK
60 minute winter	Cat 7	57	73.460	0.290	29.2	33.7657	0.0000	OK
60 minute winter	Cat 9	52	73.192	0.082	15.8	13.4700	0.0000	OK
60 minute winter	Cat 15	58	73.610	0.460	28.2	33.0147	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.411	0.003	0.0060	3.2
60 minute winter	SWMH 11.1	Infiltration		16.5				
60 minute winter	SWMH 12.1	12.1	SWMH 6.3	19.7	0.496	0.385	1.7885	
60 minute winter	SWMH 13.1	13.1	SWMH 1.4	2.1	0.079	0.048	1.1309	
60 minute winter	Tank 1	Tank 1	SWMH 8.1	6.2	0.432	0.138	0.5332	
60 minute winter	Pond 1	Pond 1	SWMH 3.1	9.1	0.592	0.098	0.5024	
60 minute winter	Cat 4	Hydro-Brake®		0.1				0.7
60 minute winter	Cat 4	Infiltration		15.2				
60 minute winter	Cat 7	Hydro-Brake®		0.1				0.8
60 minute winter	Cat 7	Infiltration		6.8				
60 minute winter	Cat 9	Hydro-Brake®		0.1				0.3
60 minute winter	Cat 9	Infiltration		5.8				
60 minute winter	Cat 15	Hydro-Brake®		0.1				1.0
60 minute winter	Cat 15	Infiltration		6.5				

Results for 100 year +20% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute summer	SWMH 1.1	1320	73.405	0.601	7.6	2.9594	0.0000	SURCHARGED
1440 minute summer	SWMH 1.2	1320	73.405	0.817	13.0	0.9238	0.0000	SURCHARGED
1440 minute summer	SWMH 1.3	1350	73.404	0.834	12.3	0.9434	0.0000	SURCHARGED
1440 minute summer	SWMH 1.4	1350	73.403	1.005	12.2	1.1369	0.0000	SURCHARGED
1440 minute summer	SWMH 1.5	1350	73.403	1.103	12.1	1.2478	0.0000	SURCHARGED
1440 minute summer	SWMH 2.1	1350	73.405	0.663	6.7	3.8410	0.0000	FLOOD RISK
1440 minute summer	SWMH 2.2	1350	73.405	0.739	6.2	0.8353	0.0000	SURCHARGED
1440 minute summer	SWMH 2.3	1350	73.406	0.791	5.9	0.8942	0.0000	SURCHARGED
1440 minute summer	SWMH 3.1	1410	73.404	1.254	8.0	1.4187	0.0000	SURCHARGED
1440 minute summer	SWMH 3.2	1320	73.403	1.303	7.9	1.4734	0.0000	SURCHARGED
1440 minute summer	SWMH 3.3	660	72.046	0.066	7.9	0.0741	0.0000	OK
1440 minute summer	SWMH CON	660	71.884	0.064	7.9	0.0000	0.0000	OK
1440 minute summer	SWMH 4.1	1410	73.408	0.268	20.7	3.9346	0.0000	OK
1440 minute summer	SWMH 4.2	1350	73.408	0.503	20.6	0.5689	0.0000	SURCHARGED
1440 minute summer	SWMH 4.3	1380	73.408	0.770	19.3	0.8707	0.0000	SURCHARGED
1440 minute summer	SWMH 4.4	1410	73.409	0.869	19.2	0.9825	0.0000	SURCHARGED
1440 minute summer	SWMH 4.5	1350	73.408	0.908	53.8	1.0269	0.0000	SURCHARGED
1440 minute summer	SWMH 4.6	1380	73.407	0.957	54.0	1.0822	0.0000	FLOOD RISK
1440 minute summer	SWMH 4.7	1350	73.408	1.068	59.2	1.2077	0.0000	FLOOD RISK
1440 minute summer	SWMH 4.8	1410	73.405	1.105	59.1	1.2503	0.0000	FLOOD RISK
1440 minute summer	SWMH 5.1	1350	73.406	0.046	5.6	0.1863	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
1440 minute summer	SWMH 1.1	1.1	SWMH 1.2	7.6	0.423	0.110	3.9397	
1440 minute summer	SWMH 1.2	1.2	SWMH 1.3	12.3	0.650	0.193	0.3777	
1440 minute summer	SWMH 1.3	1.3	SWMH 1.4	12.2	0.570	0.178	3.1463	
1440 minute summer	SWMH 1.4	1.4	SWMH 1.5	12.1	0.488	0.182	1.9125	
1440 minute summer	SWMH 1.5	1.5	Pond 1	12.0	0.708	0.144	1.2504	
1440 minute summer	SWMH 2.1	2.1	SWMH 2.2	6.2	0.578	0.090	1.3922	
1440 minute summer	SWMH 2.2	2.2	SWMH 2.3	5.9	0.479	0.087	0.9654	
1440 minute summer	SWMH 2.3	2.3	SWMH 1.2	5.8	0.340	0.090	0.5593	
1440 minute summer	SWMH 3.1	3.1	SWMH 3.2	7.9	0.230	0.083	0.4727	
1440 minute summer	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
1440 minute summer	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3692	643.2
1440 minute summer	SWMH 4.1	4.1	SWMH 4.2	20.6	0.818	0.297	4.1046	
1440 minute summer	SWMH 4.2	4.2	SWMH 4.3	19.3	0.744	0.279	4.7882	
1440 minute summer	SWMH 4.3	4.3	SWMH 4.4	19.2	0.624	0.267	1.6449	
1440 minute summer	SWMH 4.4	4.4	SWMH 4.5	19.0	0.415	0.177	0.3005	
1440 minute summer	SWMH 4.5	4.5	SWMH 4.6	54.0	0.972	0.638	0.6031	
1440 minute summer	SWMH 4.6	4.6	SWMH 4.7	53.9	0.765	0.652	1.3944	
1440 minute summer	SWMH 4.7	4.7	SWMH 4.8	59.1	0.840	0.715	0.5066	
1440 minute summer	SWMH 4.8	4.8	Pond 1	59.0	0.870	1.512	5.5445	
1440 minute summer	SWMH 5.1	5.1	SWMH 5.2	5.6	0.920	0.077	0.5989	

Results for 100 year +20% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	SWMH 5.2	1410	73.406	0.556	5.6	0.6293	0.0000	SURCHARGED
1440 minute summer	SWMH 5.3	1410	73.406	0.870	5.4	0.9843	0.0000	FLOOD RISK
1440 minute summer	SWMH 6.1	780	73.441	0.337	29.7	6.9550	0.0000	SURCHARGED
1440 minute summer	SWMH 6.2	1380	73.408	0.576	27.9	0.6519	0.0000	SURCHARGED
1440 minute summer	SWMH 6.3	1350	73.407	0.843	35.8	2.9070	0.0000	SURCHARGED
1440 minute summer	SWMH 7.1	810	73.217	1.017	20.4	79.8750	0.0000	FLOOD RISK
1440 minute summer	SWMH 7.2	810	71.708	0.008	0.2	0.0000	0.0000	OK
1440 minute summer	SWMH 8.1	1440	73.210	1.310	5.1	1.4815	0.0000	FLOOD RISK
1440 minute summer	SWMH 8.2	1440	71.825	0.025	2.1	0.0000	0.0000	OK
1440 minute summer	SWMH 9.1	1440	73.212	0.572	23.5	7.0849	0.0000	SURCHARGED
1440 minute summer	SWMH 9.2	1440	73.211	0.761	22.7	0.8608	0.0000	SURCHARGED
1440 minute summer	SWMH 9.3	1440	73.212	0.862	22.6	0.9744	0.0000	SURCHARGED
1440 minute summer	SWMH 9.4	1440	73.211	0.901	22.5	1.0196	0.0000	SURCHARGED
1440 minute summer	SWMH 9.5	1440	73.210	1.210	22.4	1.3688	0.0000	SURCHARGED
1440 minute summer	SWMH 10.1	1440	73.211	0.551	10.0	3.0099	0.0000	SURCHARGED
1440 minute summer	SWMH 10.2	1440	73.210	0.970	10.0	1.0975	0.0000	SURCHARGED
1440 minute summer	SWMH 10.3	1440	73.210	1.110	9.7	1.2557	0.0000	SURCHARGED
1440 minute summer	SWMH 10.4	1440	73.210	1.210	9.7	1.3687	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	SWMH 5.2	5.2	SWMH 5.3	5.4	0.748	0.089	0.9226	
1440 minute summer	SWMH 5.3	5.3	SWMH 4.7	5.3	0.589	0.092	0.3627	
1440 minute summer	SWMH 6.1	6.1	SWMH 6.2	27.9	0.858	0.402	4.8671	
1440 minute summer	SWMH 6.2	6.2	SWMH 6.3	27.8	0.680	0.402	4.8064	
1440 minute summer	SWMH 6.3	6.3	SWMH 4.5	35.4	0.803	0.482	0.5767	
1440 minute summer	SWMH 7.1	7.1	SWMH 7.2	0.2	0.552	0.002	0.0057	10.7
1440 minute summer	SWMH 7.1	Infiltration		14.4				
1440 minute summer	SWMH 8.1	8.1	SWMH 8.2	2.1	0.836	0.027	0.0110	168.6
1440 minute summer	SWMH 9.1	9.1	SWMH 9.2	22.7	0.944	0.558	1.2312	
1440 minute summer	SWMH 9.2	9.2	SWMH 9.3	22.6	0.897	0.565	0.6674	
1440 minute summer	SWMH 9.3	9.3	SWMH 9.4	22.5	0.962	0.422	0.1507	
1440 minute summer	SWMH 9.4	9.4	SWMH 9.5	22.4	0.564	0.488	1.5712	
1440 minute summer	SWMH 9.5	9.5	Tank 1	22.4	0.768	0.798	0.6599	
1440 minute summer	SWMH 10.1	10.1	SWMH 10.2	10.0	0.722	0.237	2.5295	
1440 minute summer	SWMH 10.2	10.2	SWMH 10.3	9.7	0.535	0.242	0.9279	
1440 minute summer	SWMH 10.3	10.3	SWMH 10.4	9.7	0.395	0.255	0.7428	
1440 minute summer	SWMH 10.4	10.4	Tank 1	9.6	0.341	0.160	1.1239	

Results for 100 year +20% CC 1440 minute summer. 1680 minute analysis at 30 minute timestep. Mass balance: 98.02%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute summer	SWMH 11.1	810	72.608	0.608	17.9	77.0358	0.0000	SURCHARGED
1440 minute summer	SWMH 11.2	810	71.809	0.009	0.2	0.0000	0.0000	OK
1440 minute summer	SWMH 12.1	1350	73.408	0.408	2.8	1.0165	0.0000	SURCHARGED
1440 minute summer	SWMH 13.1	1290	73.404	0.784	0.2	0.8862	0.0000	SURCHARGED
1440 minute summer	Tank 1	1440	73.210	1.259	32.0	599.5289	0.0000	SURCHARGED
1440 minute summer	Pond 1	1380	73.403	1.203	71.0	1168.1630	0.0000	FLOOD RISK
1440 minute summer	Cat 4	780	73.208	0.098	9.7	20.0694	0.0000	OK
1440 minute summer	Cat 7	780	73.337	0.167	4.8	11.6863	0.0000	OK
1440 minute summer	Cat 9	750	73.139	0.029	2.6	1.7852	0.0000	OK
1440 minute summer	Cat 15	780	73.419	0.269	4.6	11.9987	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
1440 minute summer	SWMH 11.1	11.1	SWMH 11.2	0.2	0.395	0.003	0.0054	13.2
1440 minute summer	SWMH 11.1	Infiltration		12.0				
1440 minute summer	SWMH 12.1	12.1	SWMH 6.3	2.6	0.135	0.051	1.7885	
1440 minute summer	SWMH 13.1	13.1	SWMH 1.4	-0.2	-0.007	-0.005	1.1927	
1440 minute summer	Tank 1	Tank 1	SWMH 8.1	5.1	0.250	0.114	0.5332	
1440 minute summer	Pond 1	Pond 1	SWMH 3.1	8.0	0.447	0.086	0.5024	
1440 minute summer	Cat 4	Hydro-Brake®		0.1				3.0
1440 minute summer	Cat 4	Infiltration		8.2				
1440 minute summer	Cat 7	Hydro-Brake®		0.1				4.0
1440 minute summer	Cat 7	Infiltration		3.9				
1440 minute summer	Cat 9	Hydro-Brake®		0.0				1.1
1440 minute summer	Cat 9	Infiltration		2.5				
1440 minute summer	Cat 15	Hydro-Brake®		0.1				4.9
1440 minute summer	Cat 15	Infiltration		3.7				

Results for 100 year +20% CC 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 98.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 1.1	1410	73.578	0.774	5.8	3.8067	0.0000	SURCHARGED
1440 minute winter	SWMH 1.2	1410	73.580	0.992	9.9	1.1215	0.0000	SURCHARGED
1440 minute winter	SWMH 1.3	1380	73.575	1.005	9.7	1.1364	0.0000	SURCHARGED
1440 minute winter	SWMH 1.4	1410	73.576	1.178	9.6	1.3318	0.0000	SURCHARGED
1440 minute winter	SWMH 1.5	1380	73.575	1.275	9.5	1.4416	0.0000	FLOOD RISK
1440 minute winter	SWMH 2.1	1410	73.577	0.835	5.0	4.8359	0.0000	FLOOD RISK
1440 minute winter	SWMH 2.2	1410	73.577	0.911	4.7	1.0302	0.0000	FLOOD RISK
1440 minute winter	SWMH 2.3	1350	73.575	0.960	4.6	1.0862	0.0000	SURCHARGED
1440 minute winter	SWMH 3.1	1410	73.574	1.424	8.0	1.6103	0.0000	FLOOD RISK
1440 minute winter	SWMH 3.2	1380	73.574	1.474	8.0	1.6667	0.0000	FLOOD RISK
1440 minute winter	SWMH 3.3	600	72.046	0.066	7.9	0.0741	0.0000	OK
1440 minute winter	SWMH CON	600	71.884	0.064	7.9	0.0000	0.0000	OK
1440 minute winter	SWMH 4.1	1380	73.580	0.440	15.6	6.4661	0.0000	SURCHARGED
1440 minute winter	SWMH 4.2	1380	73.580	0.675	15.6	0.7632	0.0000	SURCHARGED
1440 minute winter	SWMH 4.3	1380	73.580	0.942	14.6	1.0649	0.0000	SURCHARGED
1440 minute winter	SWMH 4.4	1380	73.579	1.039	14.6	1.1755	0.0000	FLOOD RISK
1440 minute winter	SWMH 4.5	1380	73.579	1.079	41.8	1.2209	0.0000	FLOOD RISK
1440 minute winter	SWMH 4.6	1380	73.579	1.129	41.6	1.2767	0.0000	FLOOD RISK
1440 minute winter	SWMH 4.7	1380	73.579	1.239	45.5	1.4008	0.0000	FLOOD RISK
1440 minute winter	SWMH 4.8	1380	73.578	1.278	45.4	1.4450	0.0000	FLOOD RISK
1440 minute winter	SWMH 5.1	1380	73.579	0.219	4.2	0.8773	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 1.1	1.1	SWMH 1.2	5.5	0.397	0.080	3.9397	
1440 minute winter	SWMH 1.2	1.2	SWMH 1.3	9.7	0.615	0.151	0.3777	
1440 minute winter	SWMH 1.3	1.3	SWMH 1.4	9.6	0.556	0.140	3.1463	
1440 minute winter	SWMH 1.4	1.4	SWMH 1.5	9.5	0.497	0.143	1.9125	
1440 minute winter	SWMH 1.5	1.5	Pond 1	9.5	0.681	0.114	1.2504	
1440 minute winter	SWMH 2.1	2.1	SWMH 2.2	4.7	0.535	0.068	1.3922	
1440 minute winter	SWMH 2.2	2.2	SWMH 2.3	4.6	0.467	0.069	0.9654	
1440 minute winter	SWMH 2.3	2.3	SWMH 1.2	4.6	0.332	0.071	0.5593	
1440 minute winter	SWMH 3.1	3.1	SWMH 3.2	8.0	0.171	0.084	0.4727	
1440 minute winter	SWMH 3.2	3.2	SWMH 3.3	7.9	0.699	0.100	0.2647	
1440 minute winter	SWMH 3.3	3.3	SWMH CON	7.9	0.706	0.102	0.3692	669.8
1440 minute winter	SWMH 4.1	4.1	SWMH 4.2	15.6	0.775	0.225	4.2254	
1440 minute winter	SWMH 4.2	4.2	SWMH 4.3	14.6	0.721	0.211	4.7882	
1440 minute winter	SWMH 4.3	4.3	SWMH 4.4	14.6	0.626	0.203	1.6449	
1440 minute winter	SWMH 4.4	4.4	SWMH 4.5	14.6	0.420	0.136	0.3005	
1440 minute winter	SWMH 4.5	4.5	SWMH 4.6	41.6	0.949	0.491	0.6031	
1440 minute winter	SWMH 4.6	4.6	SWMH 4.7	41.5	0.744	0.503	1.3944	
1440 minute winter	SWMH 4.7	4.7	SWMH 4.8	45.4	0.645	0.550	0.5066	
1440 minute winter	SWMH 4.8	4.8	Pond 1	45.4	0.773	1.162	5.5445	
1440 minute winter	SWMH 5.1	5.1	SWMH 5.2	4.2	0.893	0.058	1.0388	

Results for 100 year +20% CC 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 98.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 5.2	1380	73.578	0.728	4.2	0.8236	0.0000	SURCHARGED
1440 minute winter	SWMH 5.3	1380	73.578	1.042	4.1	1.1786	0.0000	FLOOD RISK
1440 minute winter	SWMH 6.1	1350	73.581	0.477	22.3	9.8558	0.0000	SURCHARGED
1440 minute winter	SWMH 6.2	1350	73.580	0.748	22.3	0.8460	0.0000	SURCHARGED
1440 minute winter	SWMH 6.3	1380	73.580	1.016	27.6	3.5006	0.0000	SURCHARGED
1440 minute winter	SWMH 7.1	840	73.122	0.922	15.4	66.7147	0.0000	FLOOD RISK
1440 minute winter	SWMH 7.2	840	71.708	0.008	0.2	0.0000	0.0000	OK
1440 minute winter	SWMH 8.1	1410	73.390	1.490	4.8	1.6854	0.0000	FLOOD RISK
1440 minute winter	SWMH 8.2	1410	71.826	0.026	2.2	0.0000	0.0000	OK
1440 minute winter	SWMH 9.1	1410	73.394	0.754	17.7	9.3357	0.0000	SURCHARGED
1440 minute winter	SWMH 9.2	1410	73.395	0.945	17.1	1.0683	0.0000	SURCHARGED
1440 minute winter	SWMH 9.3	1410	73.398	1.048	17.0	1.1853	0.0000	SURCHARGED
1440 minute winter	SWMH 9.4	1440	73.389	1.079	17.0	1.2204	0.0000	SURCHARGED
1440 minute winter	SWMH 9.5	1410	73.390	1.390	16.9	1.5717	0.0000	SURCHARGED
1440 minute winter	SWMH 10.1	1410	73.391	0.731	7.5	3.9947	0.0000	SURCHARGED
1440 minute winter	SWMH 10.2	1410	73.391	1.151	7.5	1.3013	0.0000	SURCHARGED
1440 minute winter	SWMH 10.3	1410	73.391	1.291	7.3	1.4596	0.0000	SURCHARGED
1440 minute winter	SWMH 10.4	1410	73.391	1.391	7.2	1.5727	0.0000	SURCHARGED

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 5.2	5.2	SWMH 5.3	4.1	0.739	0.068	0.9226	
1440 minute winter	SWMH 5.3	5.3	SWMH 4.7	4.0	0.589	0.070	0.3627	
1440 minute winter	SWMH 6.1	6.1	SWMH 6.2	22.3	0.838	0.321	4.8671	
1440 minute winter	SWMH 6.2	6.2	SWMH 6.3	21.9	0.675	0.316	4.8064	
1440 minute winter	SWMH 6.3	6.3	SWMH 4.5	27.2	0.794	0.371	0.5767	
1440 minute winter	SWMH 7.1	7.1	SWMH 7.2	0.2	0.546	0.002	0.0055	11.5
1440 minute winter	SWMH 7.1	Infiltration		13.0				
1440 minute winter	SWMH 8.1	8.1	SWMH 8.2	2.2	0.850	0.028	0.0114	176.1
1440 minute winter	SWMH 9.1	9.1	SWMH 9.2	17.1	0.899	0.421	1.2312	
1440 minute winter	SWMH 9.2	9.2	SWMH 9.3	17.0	0.875	0.426	0.6674	
1440 minute winter	SWMH 9.3	9.3	SWMH 9.4	17.0	0.937	0.318	0.1507	
1440 minute winter	SWMH 9.4	9.4	SWMH 9.5	16.9	0.560	0.368	1.5712	
1440 minute winter	SWMH 9.5	9.5	Tank 1	16.9	0.738	0.602	0.6599	
1440 minute winter	SWMH 10.1	10.1	SWMH 10.2	7.5	0.682	0.178	2.5295	
1440 minute winter	SWMH 10.2	10.2	SWMH 10.3	7.3	0.545	0.181	0.9279	
1440 minute winter	SWMH 10.3	10.3	SWMH 10.4	7.2	0.427	0.191	0.7428	
1440 minute winter	SWMH 10.4	10.4	Tank 1	7.2	0.356	0.120	1.1239	

Results for 100 year +20% CC 1440 minute winter. 1680 minute analysis at 30 minute timestep. Mass balance: 98.22%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWMH 11.1	840	72.559	0.559	13.4	65.5827	0.0000	SURCHARGED
1440 minute winter	SWMH 11.2	840	71.809	0.009	0.2	0.0000	0.0000	OK
1440 minute winter	SWMH 12.1	1380	73.580	0.580	2.1	1.4432	0.0000	SURCHARGED
1440 minute winter	SWMH 13.1	1380	73.576	0.956	0.2	1.0815	0.0000	SURCHARGED
1440 minute winter	Tank 1	1410	73.391	1.440	23.8	685.4142	0.0000	SURCHARGED
1440 minute winter	Pond 1	1380	73.574	1.374	54.5	1367.2770	0.0000	FLOOD RISK
1440 minute winter	Cat 4	780	73.192	0.082	7.3	14.1473	0.0000	OK
1440 minute winter	Cat 7	780	73.311	0.141	3.6	8.4159	0.0000	OK
1440 minute winter	Cat 9	780	73.132	0.022	1.9	1.0291	0.0000	OK
1440 minute winter	Cat 15	780	73.381	0.231	3.5	9.0315	0.0000	OK

Link Event	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWMH 11.1	11.1	SWMH 11.2	0.2	0.391	0.003	0.0053	13.1
1440 minute winter	SWMH 11.1	Infiltration		11.0				
1440 minute winter	SWMH 12.1	12.1	SWMH 6.3	2.0	0.131	0.039	1.7885	
1440 minute winter	SWMH 13.1	13.1	SWMH 1.4	-0.2	-0.006	-0.005	1.1927	
1440 minute winter	Tank 1	Tank 1	SWMH 8.1	4.8	0.216	0.108	0.5332	
1440 minute winter	Pond 1	Pond 1	SWMH 3.1	8.0	0.419	0.086	0.5024	
1440 minute winter	Cat 4	Hydro-Brake®		0.1				3.5
1440 minute winter	Cat 4	Infiltration		6.9				
1440 minute winter	Cat 7	Hydro-Brake®		0.1				4.2
1440 minute winter	Cat 7	Infiltration		3.3				
1440 minute winter	Cat 9	Hydro-Brake®		0.0				1.3
1440 minute winter	Cat 9	Infiltration		1.9				
1440 minute winter	Cat 15	Hydro-Brake®		0.1				5.0
1440 minute winter	Cat 15	Infiltration		3.2				

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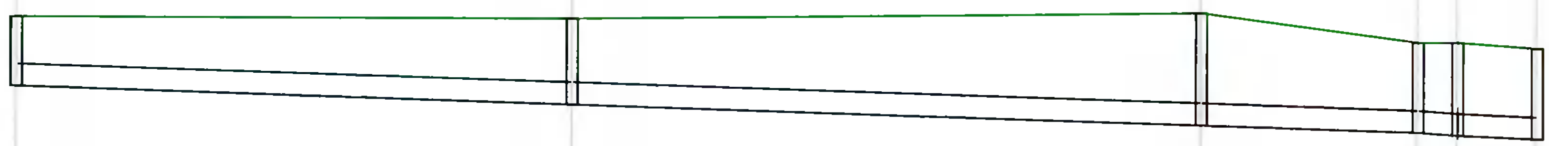

A4 drawing

Hor Scale 800
Ver Scale 100

Datum (m) 68.000

Node Name	SWMH 4.1		SWMH 4.2		SWMH 4.3		SWMH 4.4		SWMH 4.5		SWMH 4.6
Link Name		4.1		4.2		4.3		4.4		4.5	
Section Type		300mm		300mm		300mm		300		300mm	
Slope (1:X)		255.3		254.7		238.4		106		171.3	
Cover Level (m)	74.090		74.080		74.170		73.770		73.770		73.690
Invert Level (m)	73.140		72.905 72.905		72.638 72.638		72.540 [illegible]		72.500		72.450
Length (m)		60.004		67.996		23.359		4.2		8.564	

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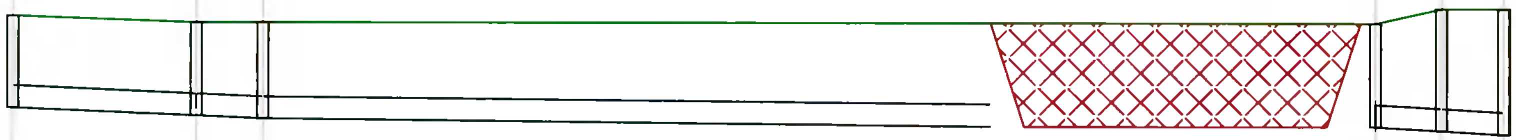
Node Name: SWMH 4.6 | SWMH 4.7 / SWMH 4.8 | Pond 1 / SWMH 3.1 / SWMH 3.2



A4 drawing

Hor Scale 800
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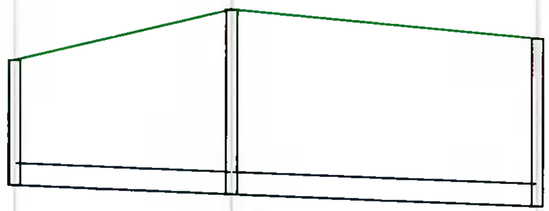
Datum (m) 67.000

Link Name	4.6	4.7	4.8	Pond 1	3.1
Section Type	300mm	300mı	300mm	300mı	300m
Slope (1:X)	180.0	179.9	787.4	142.7	134.2
Cover Level (m)	73.690	73.600	73.600	73.600	73.800 / 73.800
Invert Level (m)	72.450 / 72.340	72.340 / 72.300	72.300 / 72.200	72.200 / 72.150	72.150 / 72.100
Length (m)	19.801	7.194	78.736	7.135	6.712

Node Name	SWMH 3.2		SWMH 3.3		SWMH CON



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Datum (m) 67.000

Link Name	3.2		3.3		
Section Type	300mm		300mm		
Slope (1:X)	195.5		206.4		
Cover Level (m)	73.800		74.480		74.090
Invert Level (m)	72.100	71.980	71.980	71.820	
Length (m)	23.460		33.031		

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Node Name	SWMH 6.1		SWMH 6.2		SWMH 6.3	SWMH 4.5

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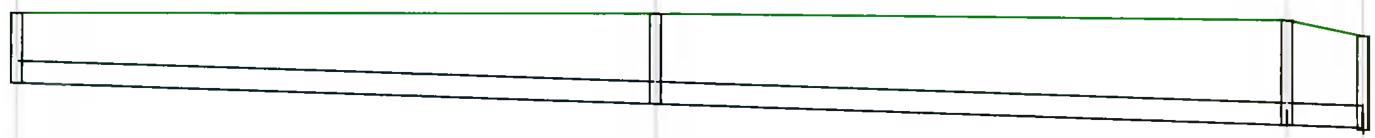
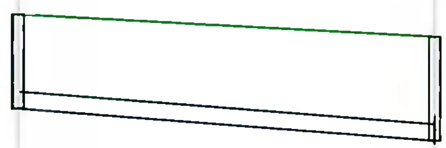
Datum (m) 68.000



Link Name	6.1		6.2		6.3	
Section Type	300mm		300mm		300mm	
Slope (1:X)	254.1		254.7		227.5	
Cover Level (m)	74.050		74.050		73.980	73.770
Invert Level (m)	73.104	72.832	72.832	72.564	72.564	72.528
Length (m)	69.116		68.254		8.190	

Node Name	SWMH 12.1	SWMH 6.3



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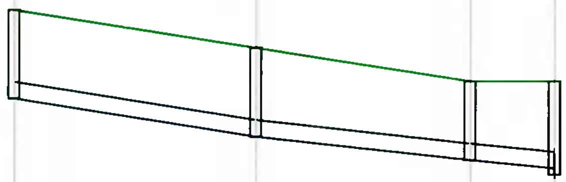
Datum (m) 68.000

	SWMH 12.1	SWMH 6.3
Link Name	12.1	
Section Type	225mm	
Slope (1:X)	103.1	
Cover Level (m)	74.280	73.980
Invert Level (m)	73.000	72.564
Length (m)	44.970	

PINNACLE CONSULTING ENGINEERS	Pinnacle Engineering Grosvenor Court 67a Patrick Street Dun Laoghaire, County Dublin	File: Apollo Hydraulic Model.pfd Network: Storm Network Francois Jansen van Rensburg 16/08/2021	Page 6 Apollo Hydraulic Model Rev 1



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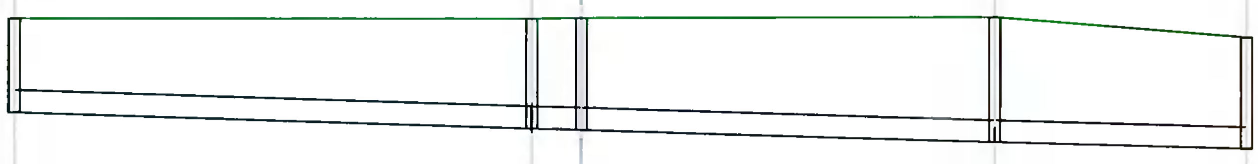
Ver Scale 100

Datum (m) 68.000

Node Name	SWMH 5.1	SWMH 5.2	SWMH 5.3	SWMH 4.7
Link Name	5.1	5.2	5.3	
Section Type	225mm	225mm	225mm	
Slope (1:X)	51.4	73.9	81.4	
Cover Level (m)	74.560	74.050	73.600	73.600
Invert Level (m)	73.360	72.850 / 72.850	72.536 / 72.536	72.424
Length (m)	26.232	23.198	9.119	

Node Name	SWMH 1.1	SWMH 1.2	SWMH 1.3	SWMH 1.4	SWMH 1.5



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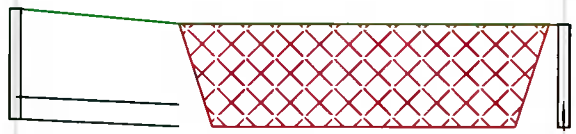
Datum (m) 67.000

Link Name		1.1		1.2		1.3		1.4	
Section Type		300mm		300r		300mm		300mm	
Slope (1:X)		259.0		297.		259.8		277.1	
Cover Level (m)	74.060		74.060		74.070		74.080		73.800
Invert Level (m)	72.804		72.588 / 72.588		72.570 / 72.570		72.398 / 72.398		72.300
Length (m)		55.947		5.36		44.680		27.159	

PINNACLE CONSULTING ENGINEERS	Pinnacle Engineering Grosvenor Court 67a Patrick Street Dun Laoghaire, County Dublin	File: Apollo Hydraulic Model.pfd Network: Storm Network Francois Jansen van Rensburg 16/08/2021	Page 8 Apollo Hydraulic Model Rev 1

Node Name	SWMH 1.5 Pond 1



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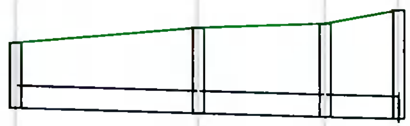
Datum (m) 67.000

Link Name	1.5	
Section Type	300mm	
Slope (1:X)	177.6	
Cover Level (m)	73.800	73.600
Invert Level (m)	72.300	72.200
Length (m)	17.757	

Node Name: SWMH 2.1 | SWMH 2.2 | SWMH 2.3 | SWMH 1.2



A4 drawing

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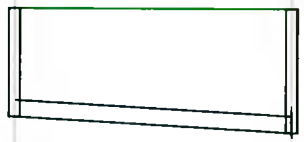
Ver Scale 100

Datum (m) 68.000

	SWMH 2.1 → SWMH 2.2	SWMH 2.2 → SWMH 2.3	SWMH 2.3 → SWMH 1.2
Link Name	2.1	2.2	2.3
Section Type	300mm	300mm	300mm
Slope (1:X)	260.1	268.8	294.1
Cover Level (m)	73.630 / 73.830	73.830 / 73.880	73.880 / 74.060
Invert Level (m)	72.742 / 72.666	72.666 / 72.615	72.615 / 72.588
Length (m)	19.770	13.710	7.942

Node Name	SWMH 13.1	SWMH 1.4



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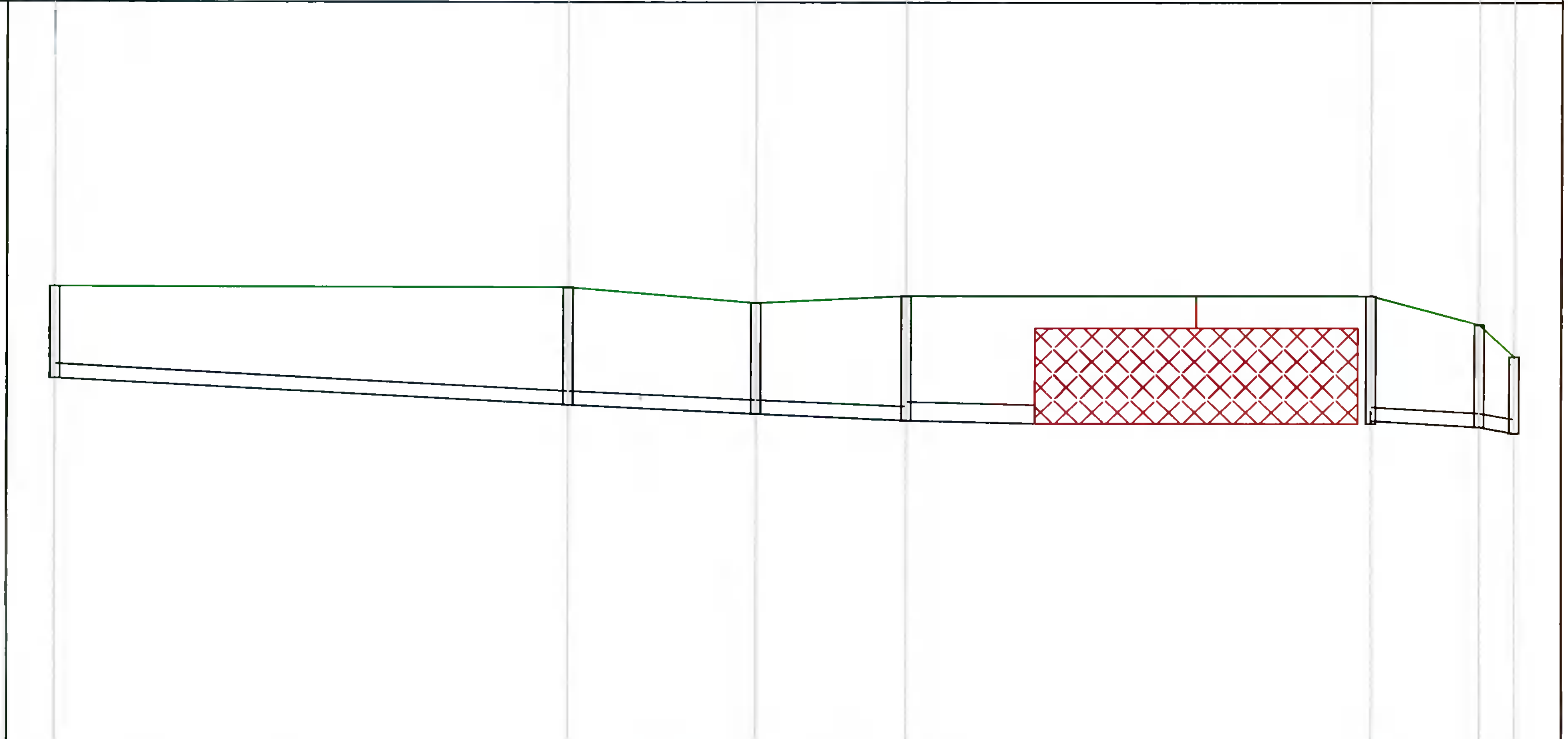
Ver Scale 100

Datum (m) 67.000

Link Name	13.1	
Section Type	225mm	
Slope (1:X)	135.1	
Cover Level (m)	74.090	74.080
Invert Level (m)	72.620	72.398
Length (m)	29.988	

PINNACLE CONSULTING ENGINEERS	Pinnacle Engineering Grosvenor Court 67a Patrick Street Dun Laoghaire, County Dublin	File: Apollo Hydraulic Model.pfd Network: Storm Network Francois Jansen van Rensburg 16/08/2021	Page 11 Apollo Hydraulic Model Rev 1

Node Name	SWMH 10.1	SWMH 10.2	SWMH 10.3	SWMH 10.4	Tank 1	SWMH 8.1	SWMH 8.2



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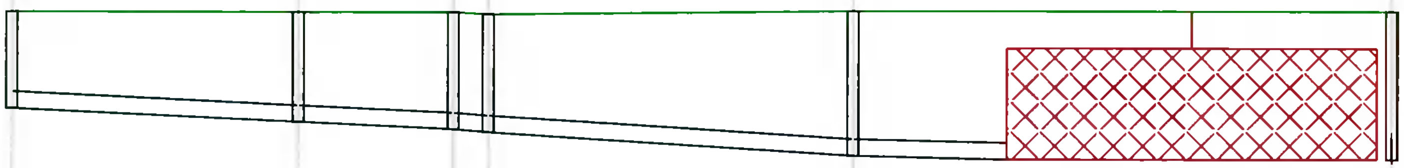
Ver Scale 100

Datum (m) 67.000

Link Name	10.1	10.2	10.3	10.4	Tank 1	8.1
Section Type	225mm	225mm	225mm	300mm	225mm	225
Slope (1:X)	151.4	166.7	186.8	339.6	134.1	43.3
Cover Level (m)	74.090	74.080	73.840	73.950	73.950	73.500 / 73.000
Invert Level (m)	72.660 / 72.240	72.240 / 72.100	72.100 / 72.000	72.000 / 71.953	72.000 / 71.900	71.800 / 71.800
Length (m)	63.601	23.331	18.677	15.960	13.407	4.33

PINNACLE CONSULTING ENGINEERS	Pinnacle Engineering Grosvenor Court 67a Patrick Street Dun Laoghaire, County Dublin	File: Apollo Hydraulic Model.pfd Network: Storm Network Francois Jansen van Rensburg 16/08/2021	Page 12 Apollo Hydraulic Model Rev 1

Node Name: SWMH 9.1 | SWMH 9.2 | SWMH 9.3 SWMH 9.4 | SWMH 9.5 | Tank 1



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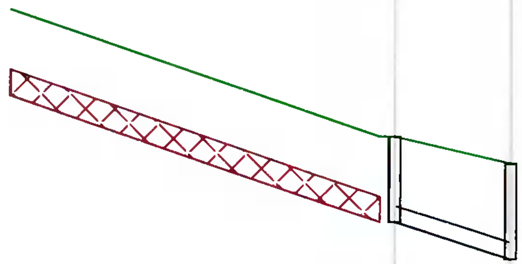
Hor Scale 800
Ver Scale 100

Datum (m) 67.000

Link Name	Section Type	Slope (1:X)	Cover Level (m)	Invert Level (m)	Length (m)
9.1	225mm	162.9	73.940	72.640 / 72.450	30.956
9.2	225mm	167.8	73.930	72.450 / 72.350	16.782
9.3	225	94.	73.930	72.350 / 72.310	3.7
9.4	225mm	127.4	73.900	72.310 / 72.000	39.506
9.5	225mm	338.6	73.950 / 73.950	72.000 / 71.951	16.592

Node Name	SWMH 7.1	SWMH 7.2



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Ver Scale 100

Datum (m) 67.000

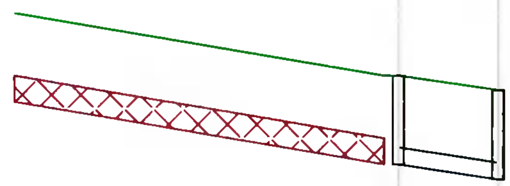
Link Name	7.1	
Section Type	225mm	
Slope (1:X)	25.1	
Cover Level (m)	73.360	73.000
Invert Level (m)	72.200	71.700
Length (m)	12.535	

Node Name	SWMH 11.1	SWMH 11.2

A4 drawing

Hor Scale 800
Ver Scale 100

Datum (m) 67.000



Link Name	11.1	
Section Type	225mm	
Slope (1:X)	53.7	
Cover Level (m)	73.190	73.000
Invert Level (m)	72.000	71.800
Length (m)	10.746	

Appendix C

Stormtech Details

Product Catalog

Underground Stormwater Chambers

Save Valuable Land and Protect Water Resources℠

StormTech®

Detention • Retention • Recharge

Subsurface Stormwater Management℠

StormTech® Subsurface Stormwater Management

The advanced design of StormTech's chambers allows stormwater professionals to create more profitable, environmentally sound installations. Compared with other subsurface systems, StormTech's innovative chambers offer lower overall installed costs, superior design flexibility and enhanced long-term performance.

Superior Design Flexibility for Optimal Land Use

StormTech chambers are ideal for commercial, municipal and residential applications. One of the key advantages of the StormTech chamber system is design flexibility. StormTech chambers can be configured into beds or trenches, in centralized or decentralized layouts to fit on nearly any site.

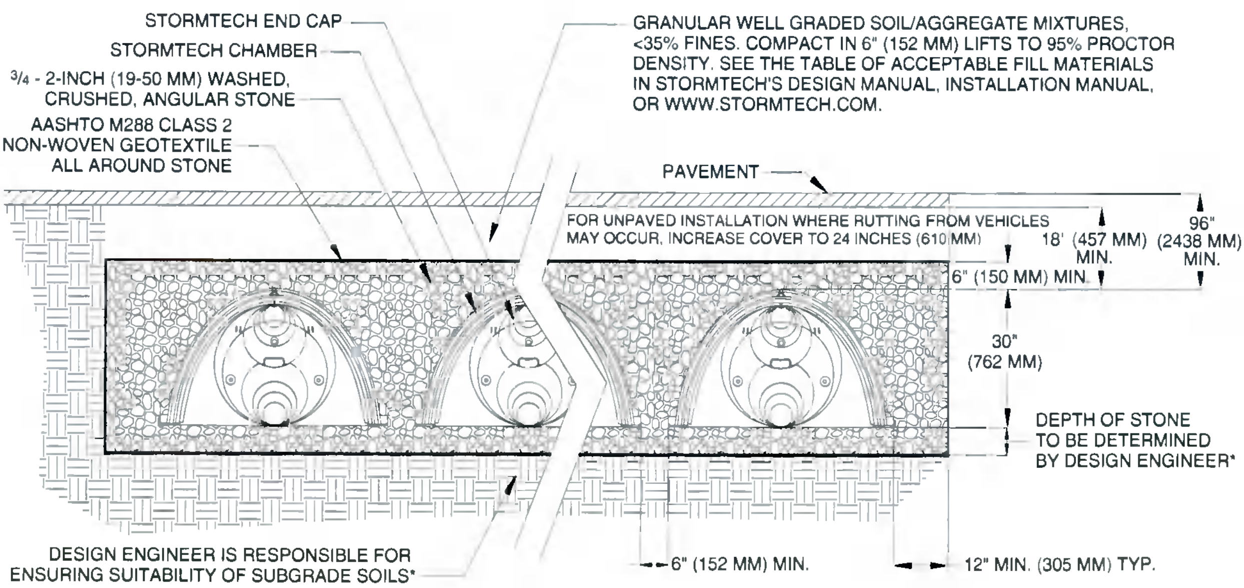
L to R: SC-310 chamber and SC-740 chamber

Product Features and Benefits

The advanced features and innovative technology of StormTech chambers streamline installations while lowering overall installed costs. StormTech chambers offer these unique advantages:

- Lightweight, two people can install chambers quickly and easily, saving time and money
- Extensive product research & development and rigorous testing ensure long term reliability and performance
- Versatile product design accommodates a wide range of site constraints with cost-effective system designs
- The chamber length can be cut in 6.5' (165 mm) increments – reducing waste and optimizing the use of available space
- Injection molded polypropylene ensures precise control of wall thickness and product consistency
- Isolator Row – a patent pending technique to inexpensively enhance total suspended solids (TSS) removal and provide easy access for inspection and maintenance
- Corrugated Arch Design – a proven geometry for structural integrity under H-20 live loads and deep burial loads, also provides high storage capacity

Typical Cross Section Detail (not to scale)



Detention-Retention-Recharge

The StormTech SC-740 chamber optimizes storage volumes in relatively small footprints by providing 2.2 ft^3/ft^2 (0.67 m^3/m^2) (minimum) of storage. This can decrease excavation, backfill and associated costs. The StormTech SC-310 chamber is ideal for systems requiring low-rise and wide-span solutions. The chamber allows the storage of large volumes, 1.3 ft^3/ft^2 (0.4 m^3/m^2) (minimum), at minimum depths.

StormTech SC-740 Chamber
(not to scale)

Nominal Chamber Specifications

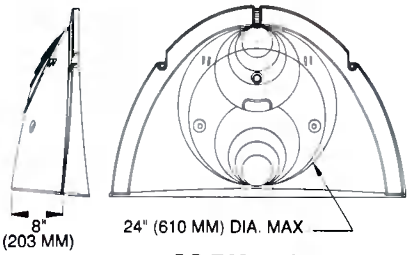
Size (L x W x H)
85.4" x 51.0" x 30.0"
(2169 x 1295 x 762 mm)

Chamber Storage
45.9 ft^3 (1.30 m^3)

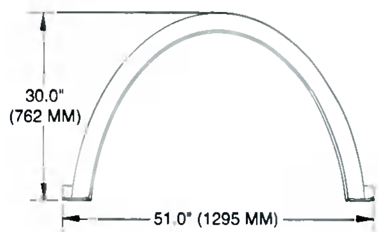
Minimum Installed Storage*
74.9 ft^3 (2.12 m^3)

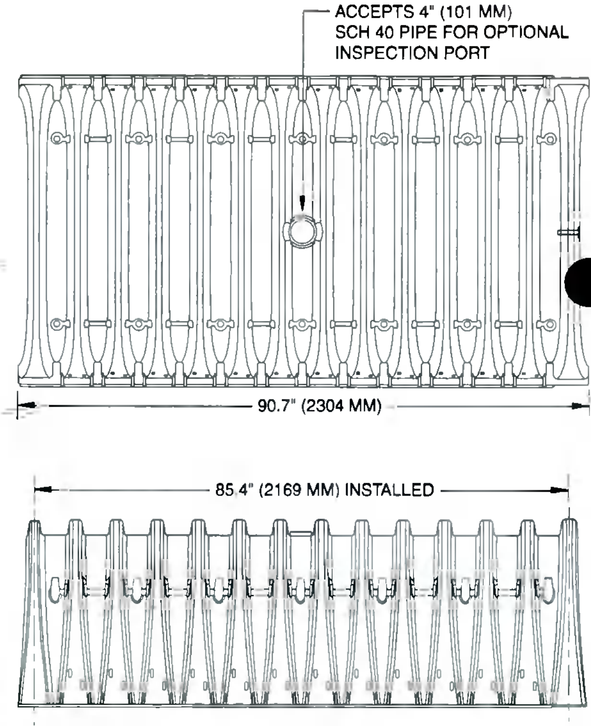
Weight
74.0 lbs (33.6 kg)

Shipping
30 chambers/pallet
60 end caps/pallet
12 pallets/truck



SC-740 end cap





SC-740 chamber

StormTech SC-310 Chamber
(not to scale)

Nominal Chamber Specifications

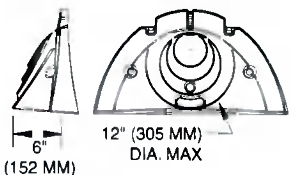
Size (L x W x H)
85.4" x 34.0" x 16.0"
(2169 x 864 x 406 mm)

Chamber Storage
14.7 ft^3 (0.42 m^3)

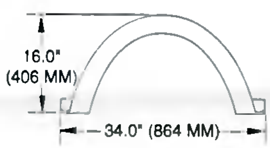
Minimum Installed Storage*
31.0 ft^3 (0.88 m^3)

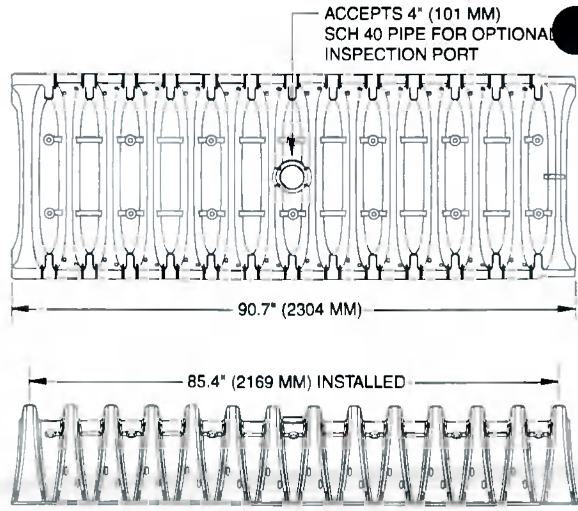
Weight
37.0 lbs (16.8 kg)

Shipping
41 chambers/pallet
108 end caps/pallet
18 pallets/truck



SC-310 end cap





SC-310 chamber

*This assumes a minimum of 6 inches (152 mm) of stone below, above and between chamber rows.

Advanced Structural Performance for Greater Long-Term Reliability

StormTech developed a state of the art chamber design through:

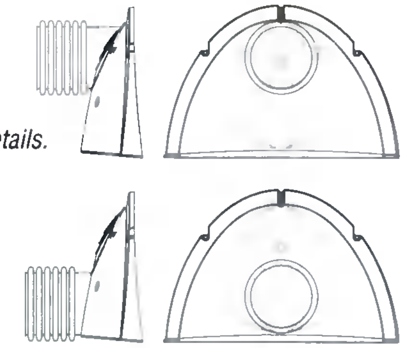
- Collaboration with world-renowned experts of buried drainage structures to develop and evaluate the structural testing program and product design
- Designing chambers to exceed AASHTO LRFD design specifications for HS-20 live loads and deep burial earth loads
- Subjecting the chambers to rigorous full scale testing, under severe loading conditions to verify the AASHTO safety factors for live load and deep burial applications

StormTech continues to conduct research and consult with outside experts to meet customer needs for alternative backfill materials, designs for special loadings and other technical solutions.

Technical Assistance

StormTech's technical support staff is available to provide assistance to engineers, contractors and developers. Please contact one of our engineers or product managers to discuss your particular application. A wide variety of technical support material is available in print, electronic media or from our website at www.stormtech.com. For any questions, please call StormTech at 888-892-2694.

Fabricated End Caps
Contact StormTech for details.



StormTech®
Detention • Retention • Recharge
Subsurface Stormwater Management℠

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Appendix D

Permeable Paving

Clima-Pave™

Permeable Paving Solutions

Kilsaran

ideas taking shape


Carrickmacross Civic Offices & Library, Co. Monaghan

The rapid development of previously green-field sites and the associated creation of impermeable areas such as roofs, car parks and footpaths will mean that at project conception stage there will be potentially large volumes of surface water to be dealt with. Traditionally this has been done by piping the surface water into storage tanks or discharging it into nearby streams or surface water drainage. This method of drainage is not currently favoured by planners and designers, as it simply moves the surface water downstream where it still has to be dealt with. This is especially important where large volumes of water need to be dealt with during heavy rainfall events. Piping large volumes of water into streams and rivers increases the risk of flooding and also allows for the potential pollution of local water courses and drinking water supplies.

Sustainable Urban Drainage Systems (SUDS) and Water Source Control

Planners are encouraging the use of Sustainable Urban Drainage Systems (SUDS) in all new developments, in particular the use of appropriate source control techniques is important as this allows for the containment of the surface water collected on the site and for this surface water to be dealt with on-site as opposed to traditionally draining it off-site. SUDS, as a sustainable development approach to Surface Water Design Techniques, has the aim of balancing the following:

1. **To manage water run-off from developed areas to similar quantities prior to development (Source Control)**
2. **Reduce and avoid incidences of downstream flooding**
3. **To protect or enhance water quality of the run-off**
4. **To improve or enhance the amenity where possible**

Advantages of Permeable Paving

- Permeable Paving is a 'source control' method. Water is managed and dealt with on-site without piping off to storage tanks or surface water treatment systems
- The Water Framework Directive (Directive 2000/60/EC) requires that surface water discharges are managed to ensure that risk of contamination or pollution are mitigated. Permeable paving systems filter contaminants by microbial action. There is no requirement for additional filtering/polishing with Permeable Paving in normal use
- Separate attenuation tank systems are not required
- No need for gullies or channels or conventional drainage
- Recharges ground water
- Roofs, roads and other non-permeable areas can be discharged into permeable paving (No gullies required)
- No ponding or surface water
- Collected water can potentially be re-used for non-potable purposes
- Improves water quality

Clima-Pave™, the permeable paving solution from Kilsaran, offers an advantage over traditional SUDS techniques, such as storm water attenuation tanks. This is because the stone based sub-base, which needs to be installed for any type of surfacing material, is adapted to an open graded material in permeable paving systems. This allows the water collected from the site to be stored in the pavement and either infiltrated back into the ground or discharged at a controlled rate into the surface water drainage system.

Clima-Pave™
Permeable Paving Solutions

The Clima-Pave™ system is constructed using our specially engineered permeable paving block, which has enlarged joints on all sides, typically 4-8mm in width. When the blocks have been laid, a corresponding slot is formed between the paving blocks which are then filled with a clean 3mm aggregate. This allows water to rapidly drain from the surface down into the pavement.

Traditional block paving is laid on a sand bedding layer and a Type 1/CL. 804 sub-base. To allow for storage and infiltration of the surface water percolating through the block, permeable block paving is laid on a grit laying course instead of sand and an open-graded stone sub-base instead of Type 1/CL. 804.

Advantages of Clima-Pave™ for your project

Clima-Pave™ from Kilsaran offers the widest range of permeable paving products for use in commercial, retail and civic projects.

Kilsaran can also offer a full site-specific permeable paving design for your project, taking into account the site ground conditions, drainage requirements and structural and traffic loading requirements for the site. This is a chargeable service and Kilsaran will provide an indemnified design provided by our nominated Consulting Engineer who will visit the site if required to appraise the installation.

Clima-Pave™
Technical Information

- Design Guidance
- Permeable Paving Aggregates
- Materials for HGV Trafficked Pavements
- Typical Design Diagrams
- Construction & Maintenance Guidelines

Design Guidance

Clima-Pave™ permeable paving provides a structural pavement suitable for both pedestrian and vehicular traffic depending on design. The water management and permeable functionality of the pavement is largely dependent on the correct specification and design of the pavement to meet the unique requirements of the individual site. The correct specification, testing and installation of aggregates is of paramount importance with any permeable paving system to ensure the finished pavement meets both initial and long term design requirements.

We advise that all permeable pavements require a site-specific design which should be carried out in accordance with BS 7533-13:2009 'Pavements constructed with clay, natural stone of concrete pavers. Part 13 Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay pavers'.

We can provide a design service to customers who require a site specific design to be carried out for their project. In order to carry out this, we require a completed Clima-Pave™ Permeable Paving Design form available to download from our website, from our Sales team or can be requested by emailing technical@kilsaran.ie. This form should be returned via email with the supporting information about the site to enable a design to be carried out.

The information required includes:

- **Drawings of proposed site layout in AutoCad**
- **Full existing and proposed site levels for the pavement**
- **Full site investigation report to establish ground conditions and soaked CBR values of the sub-grade at formation level**
- **Infiltration values from soak-pit testing to BRE 365**
- **Overall drainage design strategy for the site**
- **Planning requirements or conditions for the site relating to paving and drainage (e.g. discharge limits)**
- **Any other pertinent site specific information or client / contractor requirements**

Design Guidance Basics

The below information is provided for guidance purposes only at project conception stage to allow appraisal of a permeable pavement system. Full independent advice should be sought from both the Consulting Engineer and the Contractor prior to the commencement of works. A full site-specific design will always be required in accordance with the above guidelines and BS 7533-13:2009.

The design information below is based on BS 7533-13:2009 which should also be consulted at project appraisal stage.

Types of Permeable Pavement

There are three main types of permeable pavement commonly used on sites:

System A – Full Infiltration: All water from the pavement is infiltrated to the ground

Suitable for sites with good ground conditions, higher CBR values and soils which will readily allow water to dissipate through the ground. These favourable conditions are rarely encountered on larger sites.

System B – Partial Infiltration: Most water infiltrated to ground with excess water piped off

Suitable for sites with medium ground conditions. The soil will infiltrate some of the water in the system. When storm events occur and water builds up in the system due to the soil being at capacity for drainage, perforated pipes are laid in the bottom of the sub-base to deal with the excess, taking it to the surface water drainage system. This is the most commonly used type of permeable pavement.

System C – Fully Tanked System: No water is allowed to infiltrate to ground

This type of system is used where poor sub-grade drainage conditions exist (heavy clays), where the stability of the sub-grade would diminish if extra surface water was introduced, or where ground water levels are within 1 metre of the formation level (system could gain water). In this system the sub-base acts essentially as an attenuation tank, wrapped in an impermeable polythene membrane and all water is piped out.

Selection of Pavement Type

The type of permeable pavement system to be adapted is based primarily on site ground conditions, site suitability and the permeability values of the sub-grade encountered on site from infiltration soak-pit testing. Table 1 gives guidance on the suitability of the three types of permeable pavement system.

Table 1: Guidance on selection of a pavement system

		System A - total infiltration	System B - partial infiltration	System C - no infiltration
Permeability of subgrade defined by coefficient of permeability, k (m/s)	10^{-6} to 10^{-3}	✓	✓	✓
	10^{-8} to 10^{-6}	✗	✓	✓
	10^{-10} to 10^{-8}	✗	✗	✓
Highest recorded water table within 1000mm of formation level		✗	✗	✓
Pollutants present in subgrade		✗	✗	✓

Selection of Pavement Sub-Base Thickness

The design of the sub-base for the permeable pavement should take into account the traffic loadings likely to use the pavement. It is essential to take into account any future increase in traffic volume and any HGV traffic which may use the pavement irrespective of how frequent. The correct loading category should be then selected from Table 2 taking into account the above considerations. It should be noted that no layers of the permeable pavement are designed for site traffic to use them and when finished the permeable pavement surface should not be trafficked by site traffic vehicles which are heavier than that for which the pavement was designed. It is advisable to complete paving works after all other work in the vicinity has been completed.

Typical build up details for each traffic category are illustrated on page 20 and 21 for guidance purposes.

Table 2: Loading Categories

1 DOMESTIC PARKING	2 CAR	3 PEDESTRIAN	4 SHOPPING	5 COMMERCIAL	6 HEAVY TRAFFIC
No Large Goods Vehicles	Emergency Large Goods Vehicles only	One Large Goods Vehicles per week	Ten Large Goods Vehicles per week	100 Large Goods Vehicles per week	1000 Large Goods Vehicles per week
Zero standard axles	**100 standard axles**	**0.015msa**	**0.15msa**	**1.5msa**	**15msa**
Patio	Car Parking Bays and Aisles	Town/city Pedestrian Street	Retail development delivery access route	Industrial Premises	Main road
Private Drive	Railway Station platform	Nursery Access	School/college access road	Lightly Trafficked Public Road	Distribution Centre
Decorative feature	External Car Showroom	Parking area to residential development	Office block delivery route	Light Industrial development	Bus Station (bus every 5 minutes)
Enclosed Playground	Sports Stadium Pedestrian route	Garden centre external display area	Deliveries to small residential development	Mixed retail/ industrial development	Motorway Truck Stop
Footway with zero vehicle overrun	Footway with occasional overrun	Cemetery Crematorium	Garden centre delivery route	Town Square	Bus Stop
	Private drive/ footway crossover	Hotel Parking	Fire Station Yard	Footway with regular overrun	Roundabout
		Airport Car Park with no bus pickup	Airport Car Park with bus to terminal	Airport landside roads	Bus Lane
		Sports Centre	Sports Stadium access route/ forecourt		

msa = millions of standard 8,000 kg axles

Sub-Base Thickness For Water Storage

The sub base depth must also take into consideration the water storage requirements for the site. The depth of sub-base may have to be adjusted to allow for increased site specific water storage. Further guidance on hydraulic factors can be found in BS 7533-13:2009 section 5.4.

Adjustment To Pavement Design For Low CBR Sub-Grade

In the case of CBR values below 5%, either ground improvement work will be required for the site, or the thickness of the coarse graded aggregate sub-base will have to be adjusted in accordance with 5.6.3 and table 9 of BS 7533-13:2009

Permeable Paving Aggregates

All materials used as permeable paving aggregate must comply to the grading and physical requirements below, as well at the general requirements of BS EN 12620 and BS EN 13242. Sub-base laying course materials should be clean, sound, non-friable and sound crushed rock material. Rounded gravel materials are not recommended for sub-base layers. The jointing material may be either clean crushed material or clean gravel material. The materials should be tested to confirm that it meets the requirements below.

The contractor shall also ensure that on-going deliveries to site are checked frequently for grading, shape and inspected to ensure cleanliness.

During installation on site, great care and attention must be paid to ensure that the aggregates are kept free of contamination and deleterious matter. Construction traffic cannot be allowed to traverse the layers of permeable paving aggregates during installation.

4/40mm Coarse Graded Permeable Paving Aggregate

Sieve Size (mm)	Percentage Passing
80	100
63	98-100
40	90-99
31,5	-
20	25-70
10	-
4	0-15
2	0-5

4/20mm Coarse Graded Permeable Paving Aggregate

Sieve Size (mm)	Percentage Passing
40	100
31,5	98-100
20	90-99
10	25-70
4	0-15
2	0-5

2/6.3mm Laying Course Paving Aggregate

Sieve Size (mm)	Percentage Passing
14	100
10	98-100
6.3	80-99
2	0-20
1	0-5

3mm Jointing Grit

Sieve Size (mm)	Percentage Passing
40	100
8	100
6.3	95-100
4	85-99
2	15-35
1	0-10
0.063	0.0-1.5

Property	Category to BS EN 13242 or BS EN 12620
Grading	4/20 (preferred) or 4/40 as per table above
Fines Content	F4
Shape	FI20
Resistance to Fragmentation	LA30
Water Absorption to BS EN 1097-6:2000	WA2
For water absorption > 2% Magnesium Sulfate Soundness	MS18
Resistance to Wear	MDE20
Acid Soluble Sulfate Content	AS0.2
Total Sulfur	≤1% by mass
Recycled Aggregates	Seek guidance from Kilsaran Technical Department

Materials for HGV Trafficked Areas

For loading category 3 and above as detailed in Table 2 page 17, these pavement types are designed to accommodate HGV traffic either on an occasional or more frequent basis. The pavement structure therefore requires a 'stiffening layer' to accommodate the HGV traffic which exerts significantly increased loading on the pavement. This stiffening layer can be either a hydraulically-bound coarse graded aggregate (porous no fines concrete) as detailed below and shown on the section details on pages 20 and 21 or alternatively a 80mm thick layer of DBM macadam as detailed below.

DBM Macadam Material

The DBM material should be an AC 32 Dense Base complying with the requirements of BS EN 13108-1 and should be supplied and installed to meet the requirements of BS 594987:2010. The DBM should be punctured after installation at 750mm centres with 100mm diameter holes. The holes should be fully filled and compacted with the appropriate coarse graded permeable paving aggregate as used in the layer underneath.

Hydraulically-Bound Coarse Graded Aggregate (Porous No Fines Concrete)

Porous concrete provides a stiffening transfer layer in concrete block permeable pavements which are to receive heavier traffic loads. The lack of sand (fines) in the mixture allows the material to act as a transfer drainage layer, whereby the open-graded matrix of the material allows for 20%-30% voids within the compacted volume of the material. Special measures are to be taken in the production, installation and curing of this material. Kilsaran can provide information and guidance on this upon request.

Product Standard	BS EN 14227-1
Material Compositon	Hydraulically Bound Coarse Graded Aggregate is a mixture of a coarse aggregate (usually 20mm nominal size), cement and water.
Typical Compressive Strength	Class C5/6 in accordance with IS EN 14227-1,Table 2 Line 4. Other strength classes available upon request from supplier.

Typical Design Diagrams

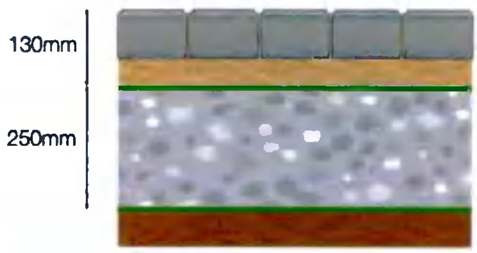
Below are typical build-up details for permeable pavement systems based on BS 7533-13:2009. These diagrams are based on ideal site conditions for drainage and CBR values of 5% or greater. The diagrams are for project appraisal purposes only and in all cases a site specific design in accordance with BS 7533-13:2009 will be required.

Key:

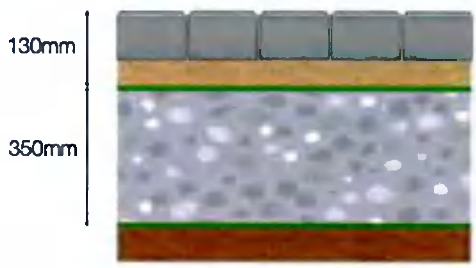
- 2 / 6.3mm Laying Course
- Hydraulically-Bound Coarse Graded Aggregate or 80mm of DBM Macadam
- 4 / 20mm Coarse Graded Aggregate and /or 4/40mm Coarse Graded Aggregate
- Capping Material
- Approved Geotextile
- Approved Impermeable Membrane

System A & B (Infiltrating & Partial Infiltration Systems)

LOAD CATEGORY 1



LOAD CATEGORY 2



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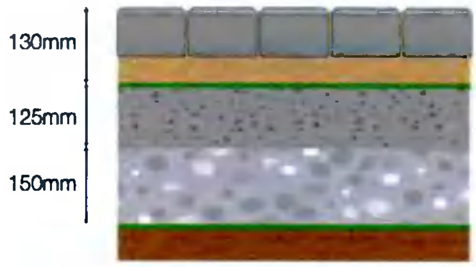

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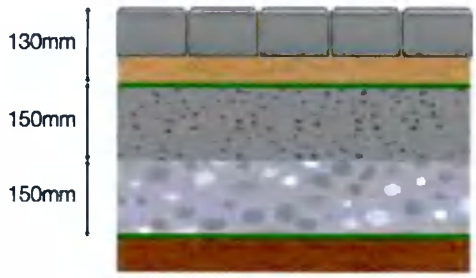

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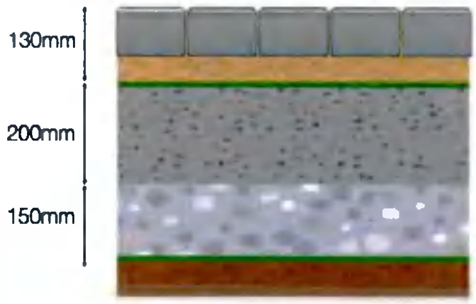
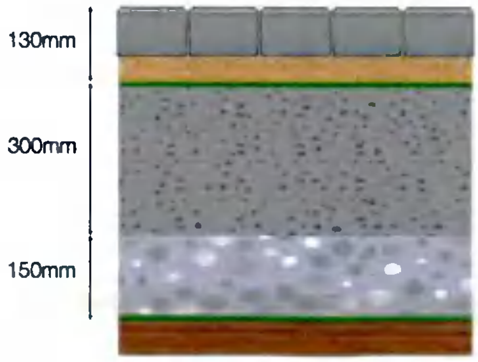


LOAD CATEGORY 6



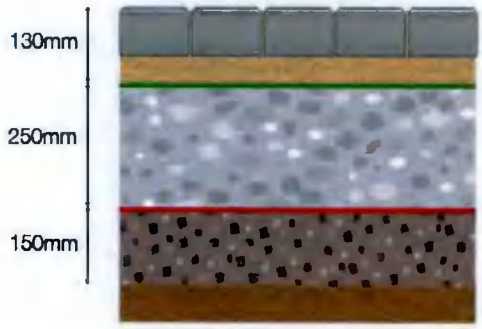
Alternative build up / materials may be used depending on project specific details.

For load categories 3-6 the hydraulically-bound coarse graded aggregate (porous no fines concrete) layer may be replaced with 80mm depth of DBM Macadam to act as a stiffening layer. The macadam layer should be punctured at 750mm centres on grid. Further details on the DBM macadam layer are given on page 19.

Where the depth of aggregate sub-base is in excess of 350mm for the given loading category, it may be possible to reduce the depth of aggregate required and provide a more cost effective design with the use of an appropriate and approved geo-grid. This can be appraised at design stage.

System C (Fully Tanked/Bunded)

LOAD CATEGORY 1



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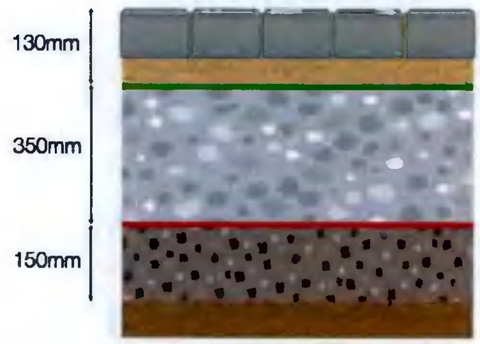

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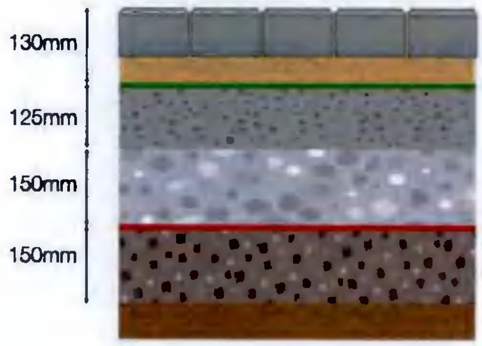

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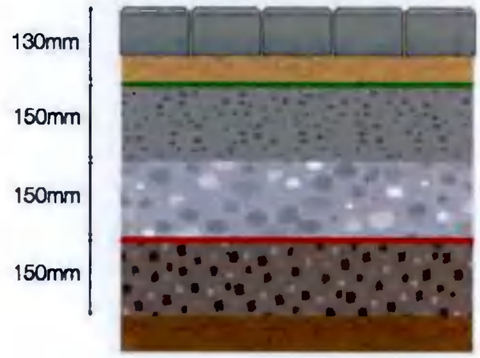

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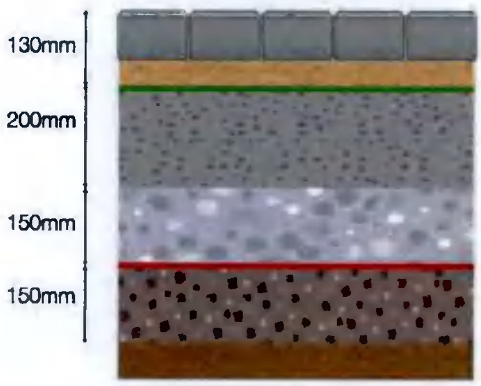

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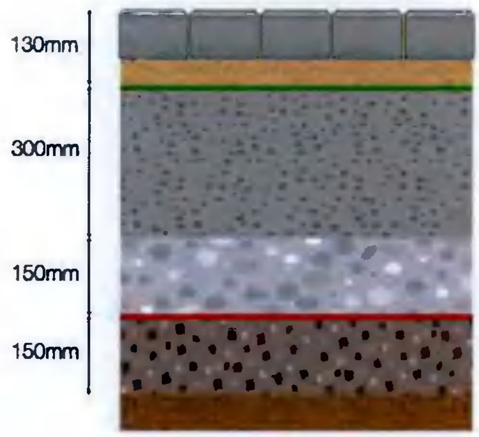
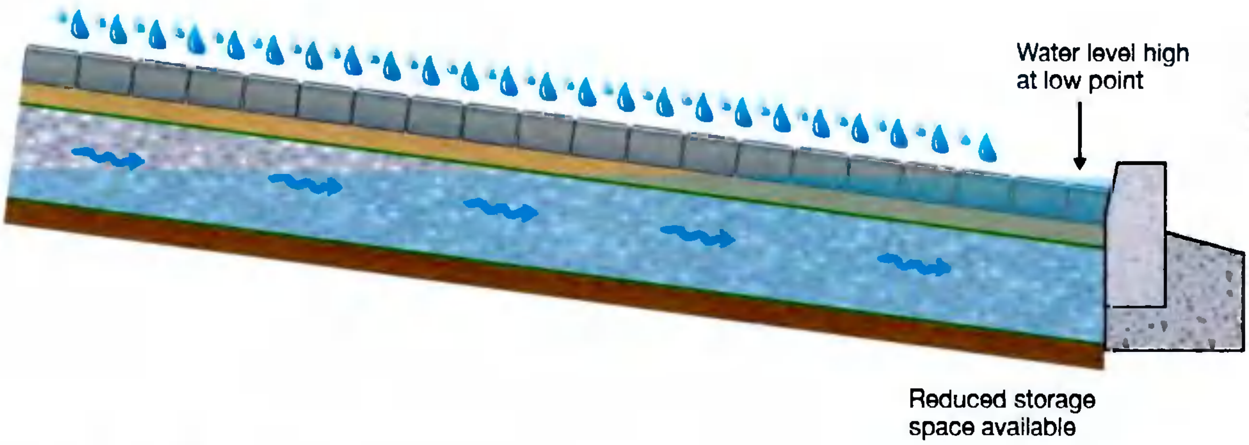


In the case of System C (fully tanked permeable pavements) there is always a requirement for 150mm depth of capping to be used beneath the impermeable membrane as shown above. The capping material should be approved by the Engineer and should comply with either the NRA Specification for Roadworks Series 600 or the Specification for Highway Works Series 600. The material should be tested before and during supply for full compliance, and should be compacted in accordance with the series 600 requirements. The capping layer should be blinded immediately before laying the impermeable membrane to prevent puncturing the membrane.

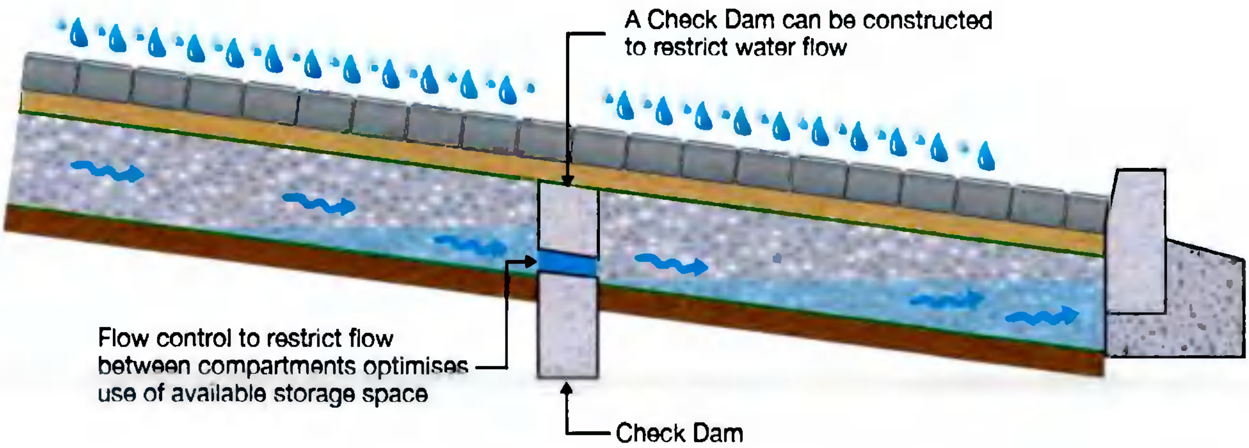
The requirement for using capping material may be eliminated by carrying out a design using an appropriate geo-grid which would negate the requirement for both the capping material and may also reduce the total depth of sub-base stone required.

Sloping Sites

On sloping sites water will naturally collect at the lowest point of the pavement. If sharp falls are allowed on site this will reduce the effective water storage capacity of the sub-base aggregate. In order to minimise this effect, gradients should be at a maximum 1 in 20 and preferably 1 in 30 or better.



Where sloping sites are unavoidable due to site layout, it will be necessary to reduce any sharp falls to maintain the water attenuation capacity of the system. This can be achieved by creating 'dams' in the sub-base of the pavement which will 'step' the pavement sub-base and reduce the overall falls. On extreme slopes, the pavement can be terraced with a step down and a dam between the two levels to restrict water flow.



Construction & Maintenance Guidelines

Construction

To ensure correct performance and durability of a permeable pavement, a fully detailed design should be carried out in accordance with BS 7533-13:2009 taking into account all site specific requirements for the project. Construction should be carried out strictly in accordance with BS 7533-13:2009 and BS 7533-3. All materials to be used shall be tested for full compliance to the above standard both before supply and during construction. It is also advised not to use any of the layers of permeable pavement construction for site traffic unless the build-up has been specifically designed to accommodate this. Additionally site equipment such as tele-handlers and forklifts should not be used on the paving surface after construction has been completed unless the pavement has been designed to accommodate this.

Maintenance

Permeable pavements should not be contaminated with soft landscaping materials, soil, detritus or general dirt as this may wash into the pavement. Also the pavement should not be trafficked by construction traffic or unsuitably heavy vehicles above that for which the pavement was designed.

To keep any growths or weeds to a minimum it is advised that the installed permeable paving be sealed with an appropriate sealer. Where the paved area is beneath overhanging trees or in a very damp area, an annual treatment of an environmentally friendly weed killer can be applied. Note the weed killer should be applied as directed by the supplier and only in very dry weather where rain is not expected, active weed killer could be washed into the sub-system otherwise. The manufacturer's instructions for all treatment products should be followed in detail.

The pavement should be inspected on a routine basis and carefully swept as required using a mechanical sweeper or by hand for smaller areas. The sweeping action may remove some of the jointing grit from the surface, the joints must be topped up after sweeping if required.

Should silting or blocking of the joints occur after a period of years, the use of a suitable jet wash and suction sweeper should be used to remove the defective material. It is likely that the jetting of the pavement will remove some grit. This grit should be replaced as required.

As with conventional block pavements, depressions, rutting and cracked or broken blocks which may be a structural concern or a hazard to users should be remedied as soon as possible. All joints must be maintained full at all times.

Permeable pavements will drain relatively quickly compared with other types of surfacing, and are not as liable to freezing over of standing water, hoar frosts may occur which can cause surface slip on any material. The use of de-icing salts on permeable pavements, as with any other concrete surface, should be kept to a minimum as the chlorides in the salt will penetrate the concrete and excessive use will damage the surface. Any de-icing material applied should not cause blockage or clogging of the permeable pavement joints (if blockage occurs in localised areas this will need to be removed by suction sweeper and joints topped up with appropriate jointing grit). It should also be considered that any de-icing material used will drain into either the sub-grade or the drainage system through the permeable pavement. Care should be taken to ensure no contamination of water courses or drainage systems. De-icing materials should be applied to the paving surface before ice or snow covers the surface to prevent damage.

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Technical Appendix 10.2: Site-Specific Flood Risk Assessment

KILGALLEN & PARTNERS
CONSULTING ENGINEERS

Pinnacle Consulting Engineers Ltd.

Proposed Industrial Development, Profile Park, Grangecastle, Co. Dublin

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Report on Site-Specific Flood Risk Assessment

Pinnacle Consulting Engineers Ltd.	Document Ref. No.	Kilgallen & Partners Consulting Engineers Well Road, Portlaoise Co. Laois
	21054-R-SSFRA Issue PL1	

REVISION HISTORY

Client	Pinnacle Consulting Engineers Ltd.
Project	Proposed Industrial Development, Profile Park, Grangecastle, Co. Dublin
Title	Report on Site-Specific Flood Risk Assessment

Date	Detail of Issue	Issue No.	Origin	Checked	Approved
13.08.21	Initial issue	PL1	CP	PB	PB

TABLE OF CONTENTS

1. INTRODUCTION

Pinnacle Consulting Engineers Ltd. ['the Applicant'] intends to apply to South Dublin County Council for planning permission for an industrial development ['the proposed Development'] on an 8.72 hectare site at Profile Park, Grangecastle ['the Site'].

The Applicant has appointed Kilgallen and Partners Consulting Engineers to carry out a Site-Specific Flood Risk Assessment ['SSFRA'] for the proposed development in accordance with the 'Planning System and Flood Risk Management – Guidelines for Planning Authorities' ['the Guidelines'].

This report presents the findings of that SSFRA.

2. PROCESS FOR SITE-SPECIFIC FLOOD RISK ASSESSMENT

The initial stage of the SSFRA comprises an assessment of available flood risk data to identify flood risk indicators in the Study Area. If the Site is identified to be at risk of flooding, the SSFRA will proceed to a detailed assessment.

2.1 Potential Sources of Flood Risk

Potential flood risk mechanisms are summarised in Table 2-1.

Source	Mechanism
Fluvial:	Overtopping of Rivers and Streams
Pluvial:	The intensity of rainfall events is such that the ground cannot absorb rainfall run-off effectively or urban drainage systems cannot carry the run-off generated.
Groundwater:	Rising water table
Coastal:	Tidal levels and / or wave action
Infrastructure	Failure of flood protection or drainage infrastructure

Table 2-1 Flood Risk Mechanisms

As an inland site upstream of tidal influences and possible wave action, the Site is not subject to coastal flood risk and so this mechanism does not need to be considered further in this assessment.

The assessment will therefore consider the following mechanisms:

- Fluvial;
- Pluvial;
- Groundwater;
- Drainage Infrastructure *(considered under Section 9 – Residual Flood Risk)*

2.2 Flood Risk Indicators

Indicators of flood risk are identified using available data, most of which is historically derived. Typically, this data is not prescriptive in relation to flood return periods and neither predictive nor inclusive of climate change analysis.

Flood risk indicators include:

- Records available on the OPW's National Flood Risk Website. As part of the National Flood Risk Management Policy, the OPW developed the www.floodinfo.ie web-based data set, which contains information concerning historical flood data and displays related mapped information and provides tools to search for and display information about selected flood events;

- PFRA & CFRAM mapping produced under the CFRAM programme;
- The Strategic Flood Risk Assessment carried out to inform the making of the Local Area Plan;
- Geological Survey of Ireland (GSI) mapping - Hydrogeological mapping maintained by the GSI and made available through its website www.gsi.ie;
- Ordnance Survey mapping - Ordnance Survey maps include areas which are marked as being "Liable to Floods". Generally, these areas are only shown identified indicatively and suggest historical flooding, usually recurrent. In addition, the maps indicate areas of wet or hummocky ground, bog, marsh, springs, rises and wells as well as surface water features including rivers, streams, bridges, weirs and dams;
- Topographical survey information;
- Records of previous floods from other sources;
- Flood Studies, Reports and Flood Relief Schemes carried out in the vicinity of the Study Area;
- Site Walkover.

2.3 Identification of the Presence and Extent of Fluvial Flood Risk

Where the initial process of examining flood risk indicators demonstrates the existence of a risk of fluvial flooding, the study progresses to the next stage, which is a detailed flood risk assessment. This is based on field measurements and hydrological modelling and enables mapping of the zones of Flood Risk within the Site to be established.

In accordance with the Guidelines, flood risk zones are categorized as follows:

Flood Zone A where the probability of flooding in any year is greater than 1% (i.e. Flood Zone in respect of a flood with a return period of 100years);

Flood Zone B where the probability of flooding in any year is between 0.1% and 1% (i.e. Flood Zone in respect of a flood with a return period of between 100years and 1,000years);

Flood Zone C where the probability of flooding in any year is less than 0.1% (i.e. Flood Zone in respect of a flood with a return period of greater than 1,000years).

2.4 Identification of the Presence and Extent of Pluvial Flood Risk

Where the initial process of examining flood risk indicators demonstrates the existence of a risk of pluvial flooding, the study progresses to the next stage, which is a detailed assessment to establish the extent of pluvial flood risk at the Site.

2.5 Identification of the Presence and Extent of Groundwater Flood Risk

Where the initial process of examining flood risk indicators demonstrates the existence of a risk of flooding from groundwater, the assessment progresses to the next stage, which is a detailed assessment to establish the extent of groundwater flood risk at the Site.

2.6 Assessment of Proposed Development

As described in the previous paragraphs, the first stages of the assessment process are concerned with identifying whether the Site is at risk of pluvial, fluvial or groundwater flooding and establishing the extent of any such flood risks.

The next steps in the assessment process are:

- Determination of the impact that any of the identified flood risks will have on the proposed Development;

- Determination of any impact that the Development itself might have in terms of increasing the level of flood risk elsewhere outside the Site;
- Identification of mitigation measures in respect of any such impacts and identification of any residual risks after those mitigation measures are put in place;
- Applying the Development Management Justification Test if appropriate;
- Providing a conclusion as to the appropriateness of the proposed development in terms of flood risk.

3. SITE DESCRIPTION

Figure 3-1 shows the Site in the context of its immediate surroundings and Figure 3-2 shows the main drainage features and site topography indicatively.

The Site is located in Profile Park Business Park. It is bounded:

- to the north by the R134 New Nangor Roadl
- to the south by a distributor road through Profile Park;
- to the west by commercial / industrial development;
- to the east by undeveloped land within Profile Park.

The Site is undeveloped and does not seem to be used for any purpose.

Main Drainage Features

A small stream enters the Site at its eastern boundary corner, crosses through the Site and exits at the western boundary where it discharges to a twin-pipe culvert.

There is a 600mm dia. culvert on the stream midway through the Site.

There is no evidence of pluvial drainage entering the Site.

The vegetation is suggestive of poorly draining upper soils but there is no evidence of standing groundwater.

Topography

The Site can be described as relatively flat with no substantial changes in elevation and a general shallow fall towards the stream.

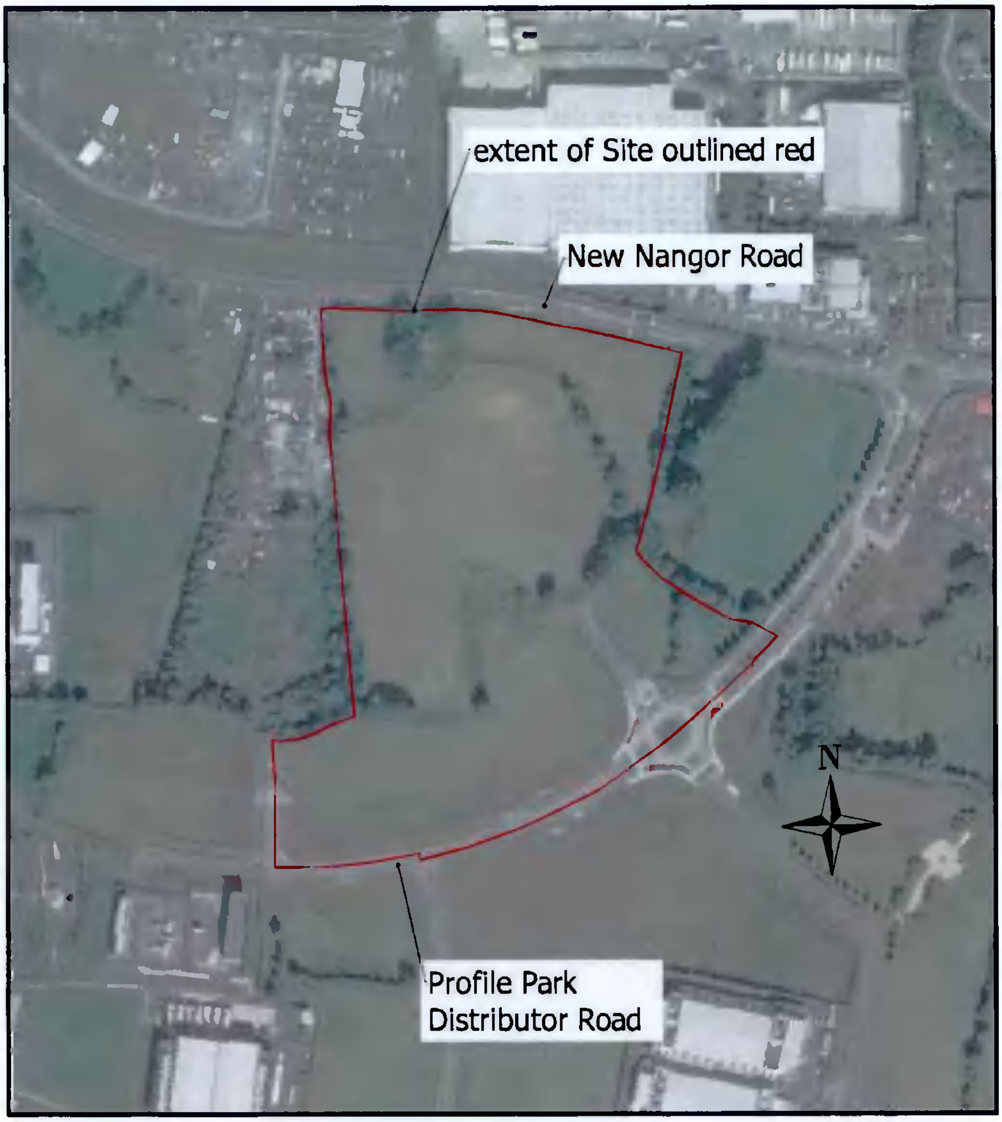


Figure 3-1 Site Context

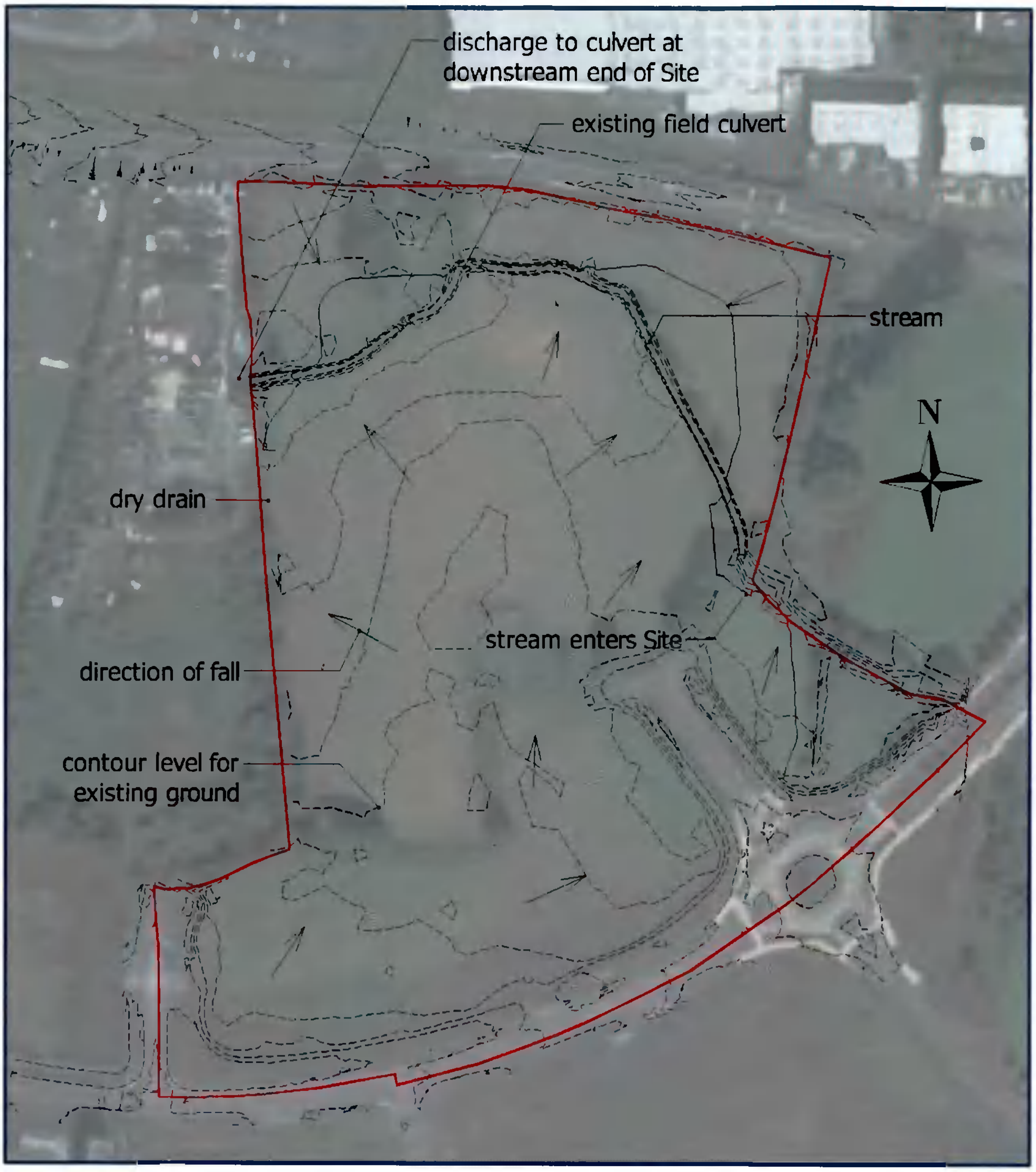


Figure 3-2 Site Topography / Main Drainage Features

4. PROPOSED DEVELOPMENT

4.1 Description

The development comprises industrial buildings, parking areas, circulation roads and ancillary landscaping. A schematic layout is shown in Figure 4-1.

A general layout showing surface water drainage for the proposed development is provided in Appendix A.

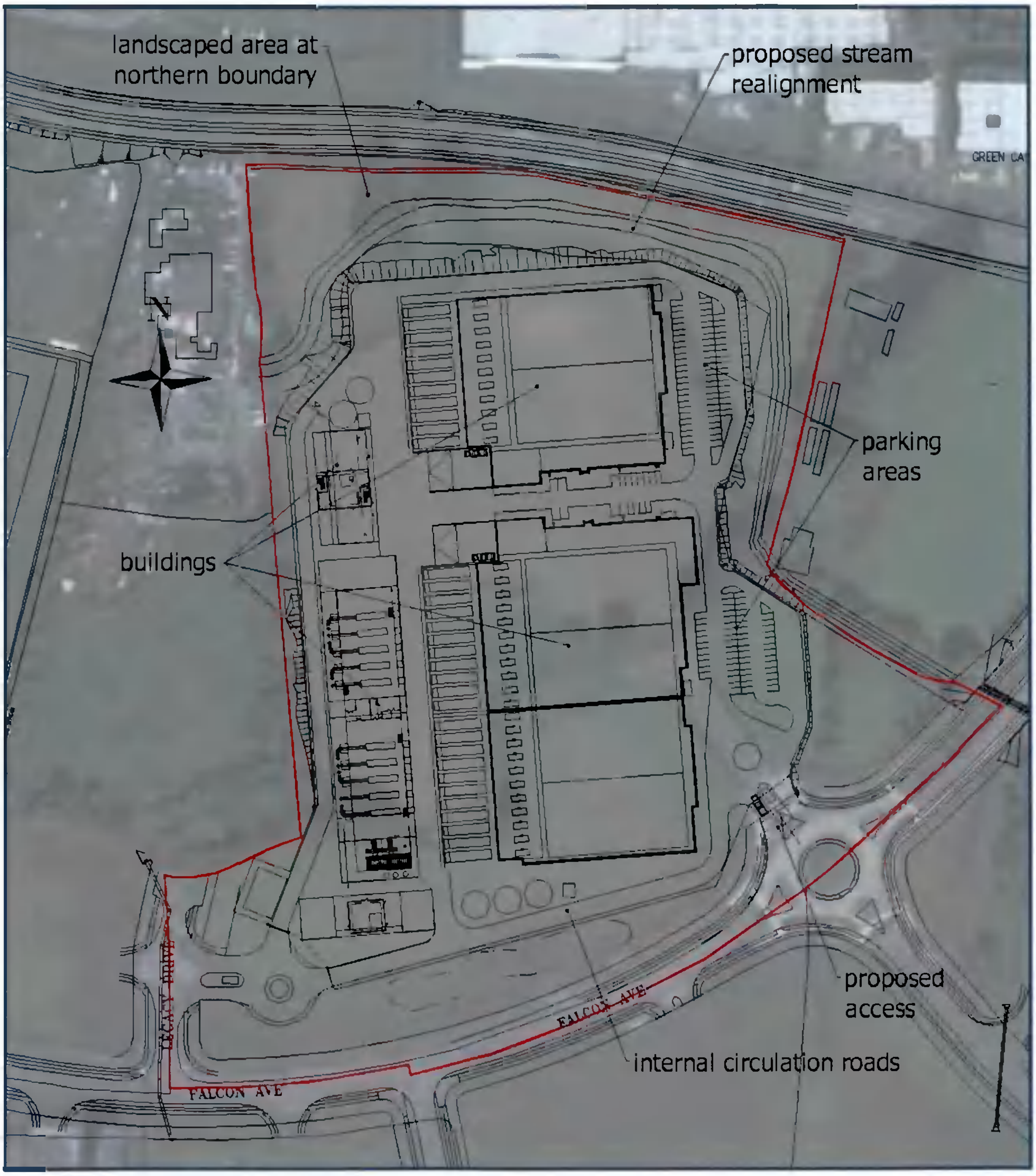


Figure 4-1 Schematic Layout of Proposed Development

4.2 Vulnerability

Table 3.1 of the Guidelines classifies different types of development in terms of their vulnerability to flooding. Figure 4-2 contains an extract from this table which shows industrial development classified as Less Vulnerable. The proposed development is an industrial development and so falls under this classification.

Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.

Figure 4-2 Classification of development type by vulnerability to flooding

Table 3.2 of the Guidelines provides a matrix of development vulnerability versus Flood Zone which illustrates the appropriateness of a development type for each Flood Zone. This table is reproduced in Figure 4-3 and shows the Guidelines regards Less Vulnerable development as being appropriate for Sites in Flood Zone B and requiring the Justification Test for Sites in Flood Zone A

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 6-4 Matrix of vulnerability versus Flood Zone

5. FLUVIAL FLOOD RISK – INITIAL ASSESSMENT

5.1 Flood Risk Indicators - Desktop

A number of datasets were interrogated for indicators of fluvial flood risk:

(i) SFRA

Mapping prepared as part of the Strategic Flood Risk Assessment for the South Dublin County Development Plan indicates the Site is affected by the 0.1% AEP and 1.0% AEP flood events. An extract from this mapping is shown in Figure 5-1.

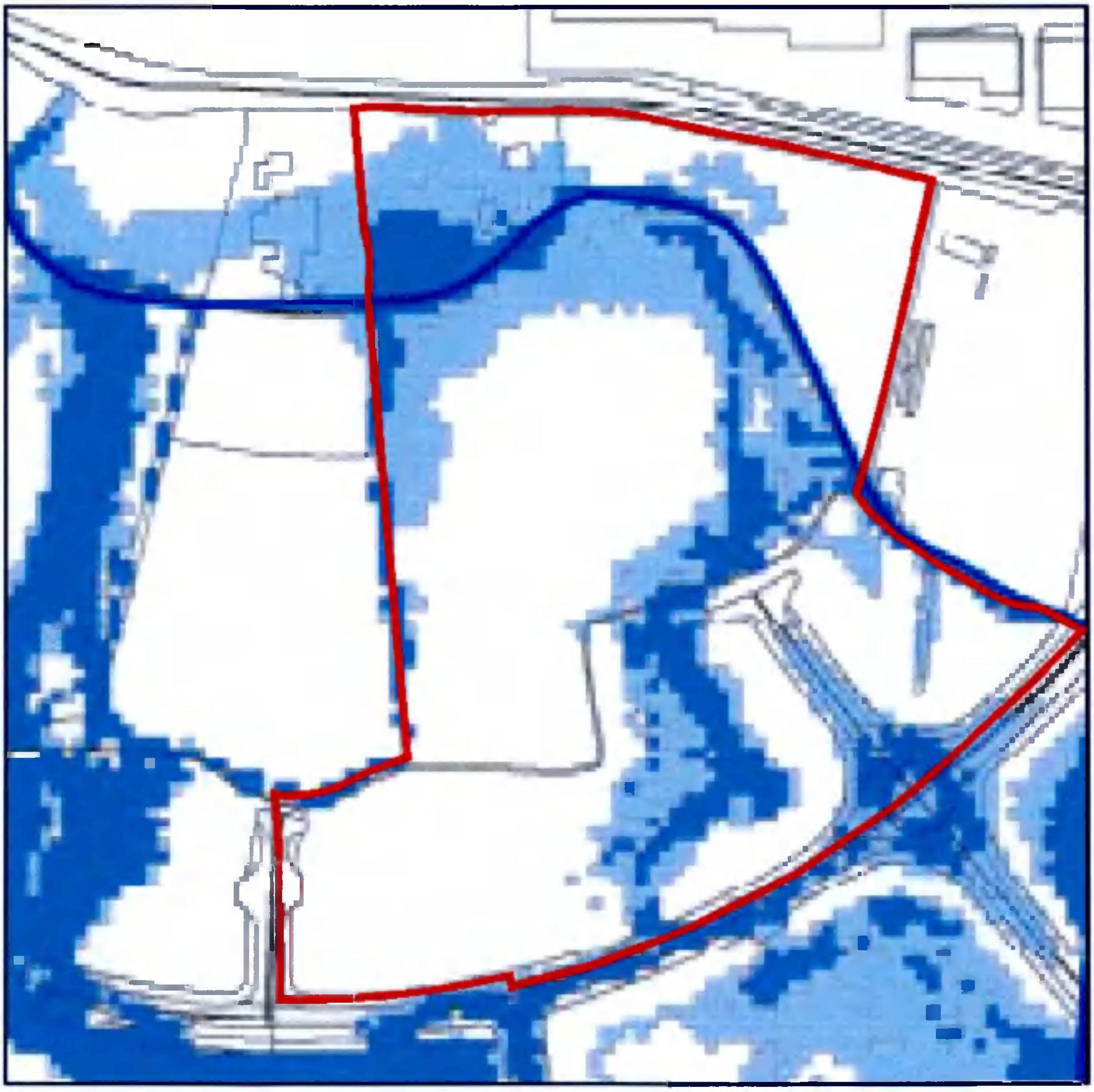


Figure 5-1 Extract from SFRA showing flood risk at the Site

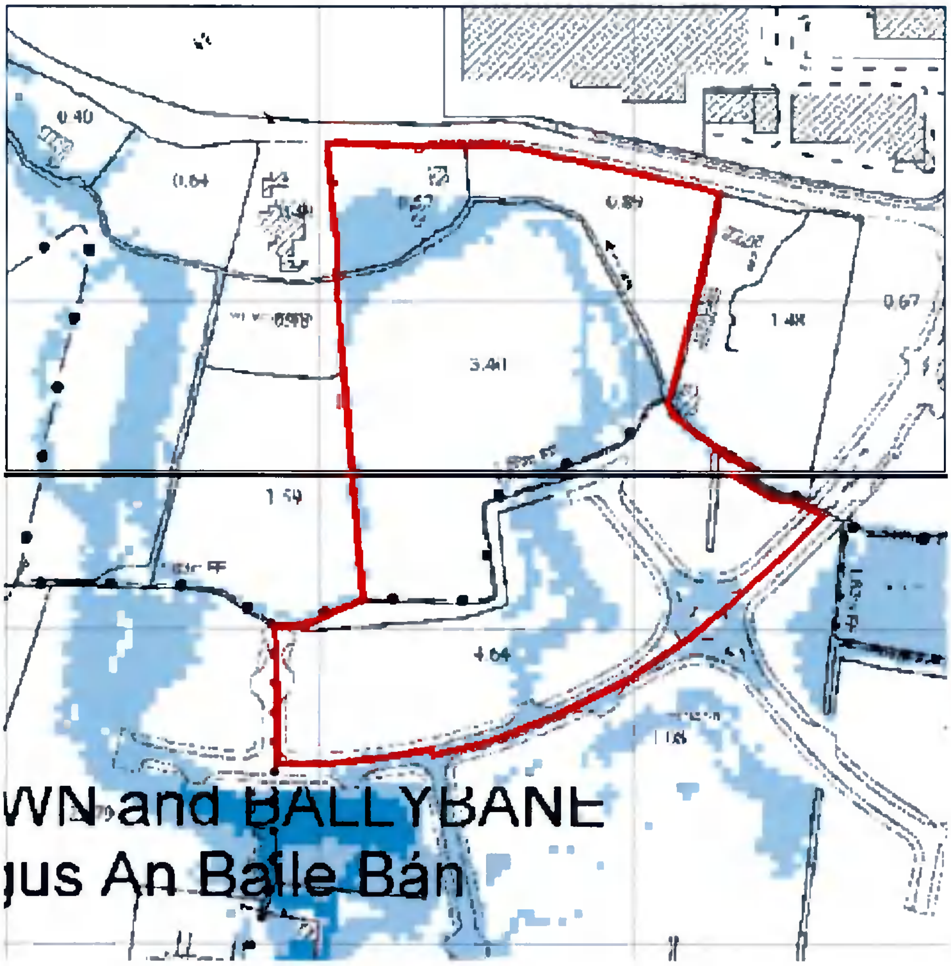
(ii) OPW National Flood Hazard Mapping Website

The OPW maintains the National Flood Hazard Mapping website (floodinfo.ie) which contains information about locations that may be at risk from flooding. The source of this information includes Local Authorities and other historic records such as newspaper articles and other documentation about reported floods.

The website does not have any records of flooding at this location.

(iii) CFRAM

Mapping prepared as part of the CFRAM programme indicates the Site is affected by the 0.1% AEP flood event but not the 1.0% AEP event.



(iv) Ordnance Survey Mapping

Figure 5-2 shows the historic 25" OS mapping for the Site and its immediate surroundings. There is no indication of flood risk at the Site.

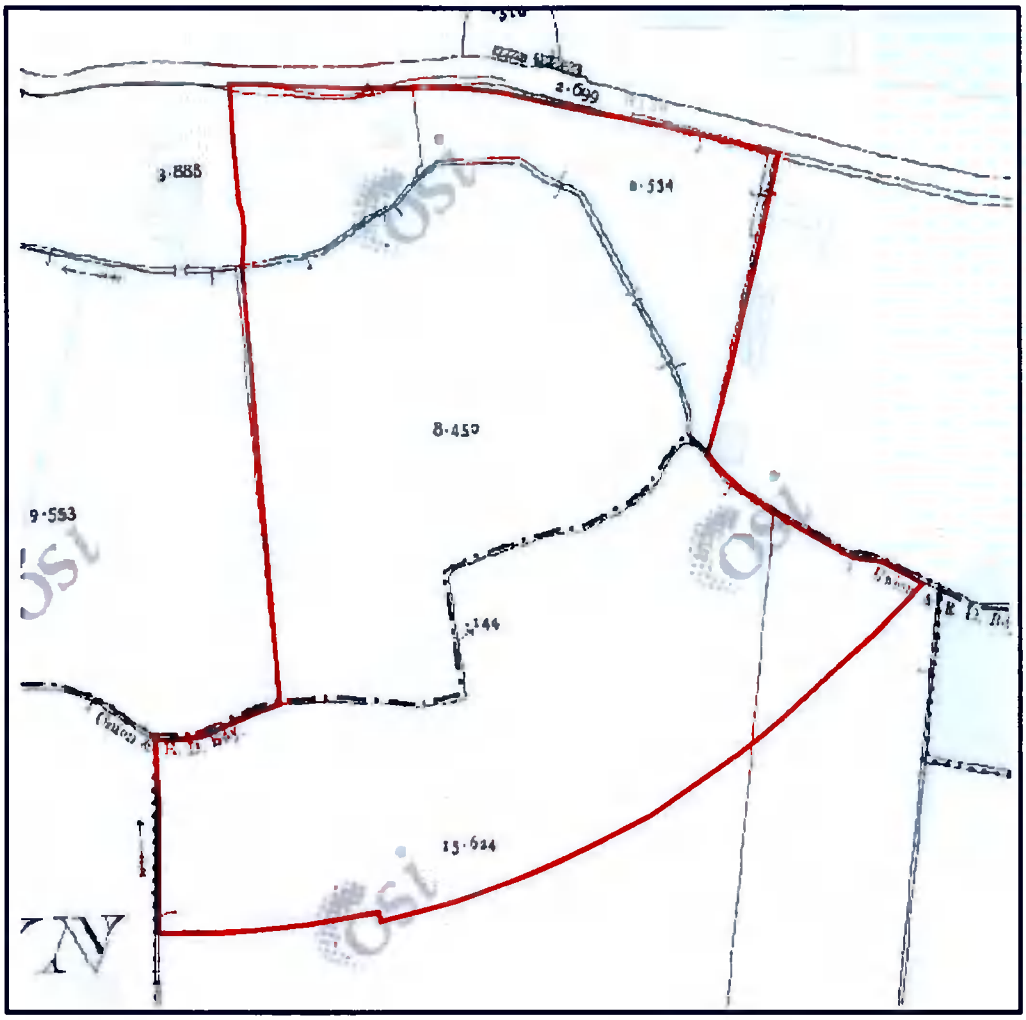


Figure 5-2 Historic OS Map

5.2 Flood Risk Indicators - Site Walkover

An unnamed stream enters the Site at its eastern boundary, crosses the Site and exits the Site via a twin-pipe culvert at its western boundary. The inlet to this culvert is poorly constructed and hydraulically inefficient; it was observed that in addition to the pipes, the gaps between the pipes also provides a flow path for the stream to discharge to.

There is a 600mm dia. culvert on the stream midway through the Site.

The vegetation is suggestive of poorly draining upper soils.

A visual assessment of the channel of the stream and the culverts suggests that the culverts will have a significantly lower hydraulic capacity than the channel.

Figure 5-3
Typical Section of Stream Channel and Site Vegetation

Figure 5-4
Inlet to culvert at downstream boundary

Figure 5-5
Inlet to culvert midway through the Site

5.3 Initial Assessment

The indicators described in Section 5.1 and the Site walkover described in Section 5.2 suggest that the Site is at risk from fluvial flooding. Accordingly, it is the conclusion of this SSFRA that detailed assessment of fluvial flood risk is appropriate.

6. FLUVIAL FLOOD RISK – DETAILED ASSESSMENT

6.1 Estimating Peak Flood Flows

The catchment area for the stream, shown on Figure 6-1, measures 1.0 km^2.

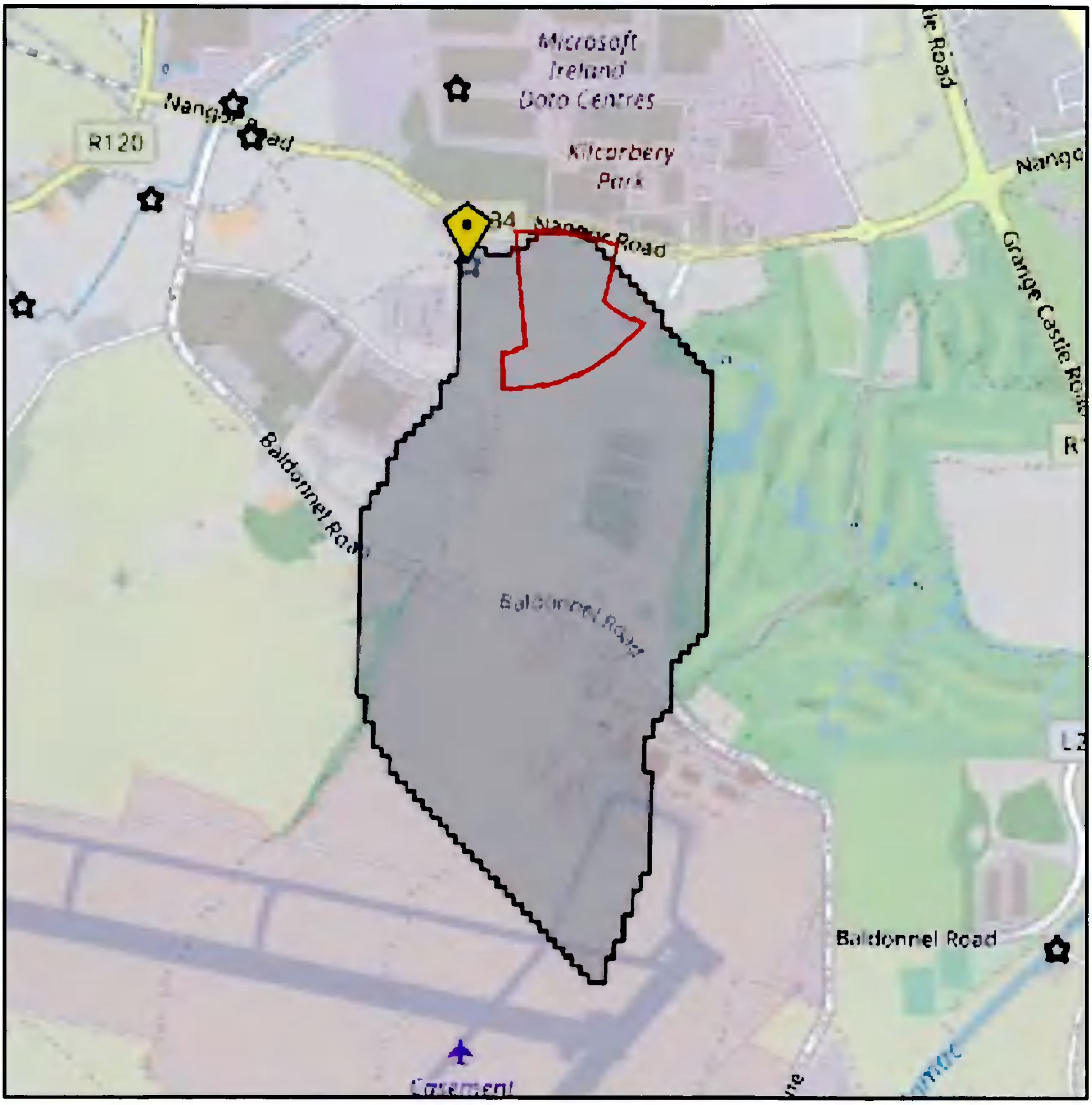


Figure 6-1 Catchment Area for Stream

The OPW provides a Web Portal for estimating peak flood flows in natural catchments (Flood Studies Update (FSU) Web Portal). While the use of this portal is generally considered best practice for the estimation of flood flows, the portal advises particular caution where peak flows are being estimated for catchments of less than 25km^2. Accordingly, peak flood flows were estimated using statistical methods for ungauged small catchments.

Table 6-1 shows a number of Physical Catchment Descriptors taken from the FSU portal that were used to estimate peak flood flows.

PCD	Value	
BFISOIL	0.5199	
SAAR	714.82	mm
FARL	1	
DRAIND	0.721	km/km^2
S1085	0.1	m/km
ARTDRAIN2	0	
ARTDRAIN2	0	
URBEXT	0.3589	

Table 6-1 Physical Catchment Descriptors from FSU Web Portal

Initially, a number of alternative statistical methods were used and the results of these are reproduced in Table 6-2 (details of these calculations are included in Appendix C). All flow estimates include a climate change factor of 20%.

Typically peak flow estimates for the 1% AEP flood event are are below $1.0m^3/s$. The only exception is the flow estimate given by IH124 which is over three times the next greatest estimate and not consistent with the size of the catchment and the drainage infrastructure in the area. IH124 it generally considered to over-estimate peak flood flows *{WP4.2 Flood Estimation in Small and Urbanised Catchments – OPW 2012}*. Therefore the IH124 flow estimate will not be used and instead the flow estimates used will be the next greatest; i.e. those given by the FEH-Statistical method.

Method	1% AEP	0.1% AEP
	m^3/s	m^3/s
IH124	2.79	3.69
FSU Update	0.47	0.64
FSU-3V	0.14	0.18
FSU_7V	0.37	0.51
FEH-Statistical	0.89	1.20

Table 6-2 Estimates for Peak Flood Flows

6.2 Pre-development Hydrological Model

A hydrological model was prepared to simulate flow patterns during the 1% and 0.1% AEP rainfall events. This model was developed using the River and Flood Analysis module of the industry standard package Infrastructure Ultimate Design Suite produced by Autodesk. The hydrological modelling within this module is itself based on the HEC-RAS modelling software produced by the US Army Corps of Engineers.

The module calculates flood risk zones for the catchment based on the peak flood flows and the following:

- a terrain model created using topographical survey data;
- dimensions of culverts and other drainage structures;
- appropriate values for the roughness coefficient 'Manning's n' as determined from visual inspection of the Site.

<u>Culvert downstream of SIte</u>

As described above, the stream is culverted as it leaves the Site. This culvert comprises two 600mm diameter pipes at its inlet. A CCTV survey of the culvert revealed that one of these pipes changes to 450mm diameter approximately 20m from the inlet. Furthermore the both pipes show significant blockages that greatly reduce the capacity of the culvert; the extent of these blockages was such that the survey could not be completed for the full length of the culvert.

In regard to this culvert, the hydraulic models assumes:

- the culvert comprises a 600mm dia. pipe and 450mm dia. pipe for its entire length;
- the culvert will be cleared of all obstructions and maintained free of debris / deposition throughout the operational life of the proposed development;
- the maximum depth of deposition in the culvert will be 100mm.

<u>Pre-Development Fluvial Flood Risk Zones at the Development Site</u>

The map in Figure 6-2 shows the existing fluvial flood risk zones determined using the hydrological model described above. Peak water levels are as follows:

- 1.0% AEP Flood Event 72.07 m;
- 0.1% AEP Flood Event 72.53 m.

The Site was found to be affected by both 1% AEP flood risk and 0.1% AEP flood risk.

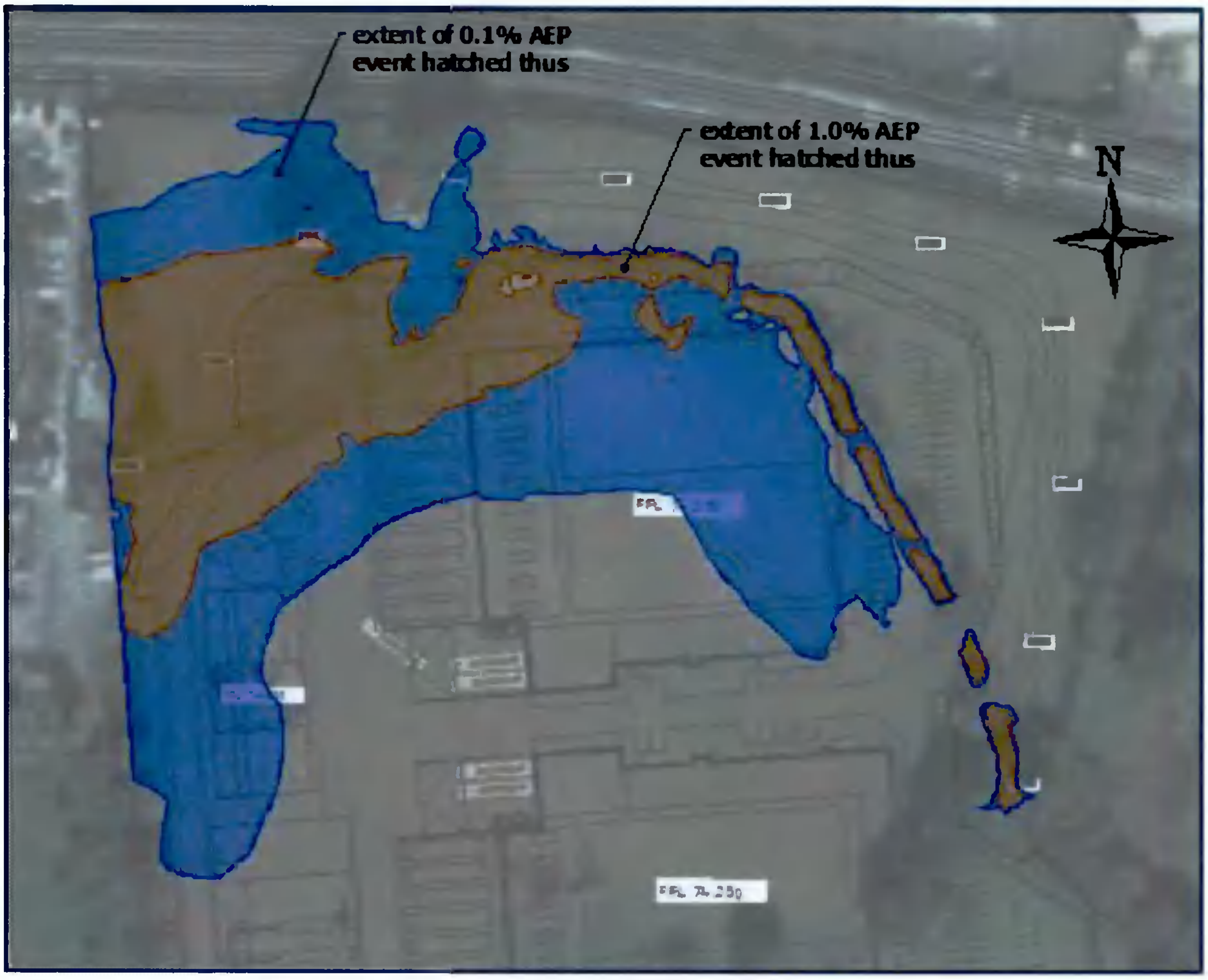


Figure 6-2 Fluvial Flood Risk Zones - Pre-Development

6.3 Development Proposals

Compensatory Storage

As described above, elements of the proposed development encroach on the flood risk zones. This creates the potential for the proposed development to displace floodplain storage and thereby increase flood risk elsewhere. To prevent this, it is necessary to provide compensatory storage within the Site.

Compensatory storage is provided by reducing the ground level in the landscape area adjoining the northern boundary. Figure 6-3 shows the location and extent of the basin and Figure 6-4 shows a typical cross-section through the basin.

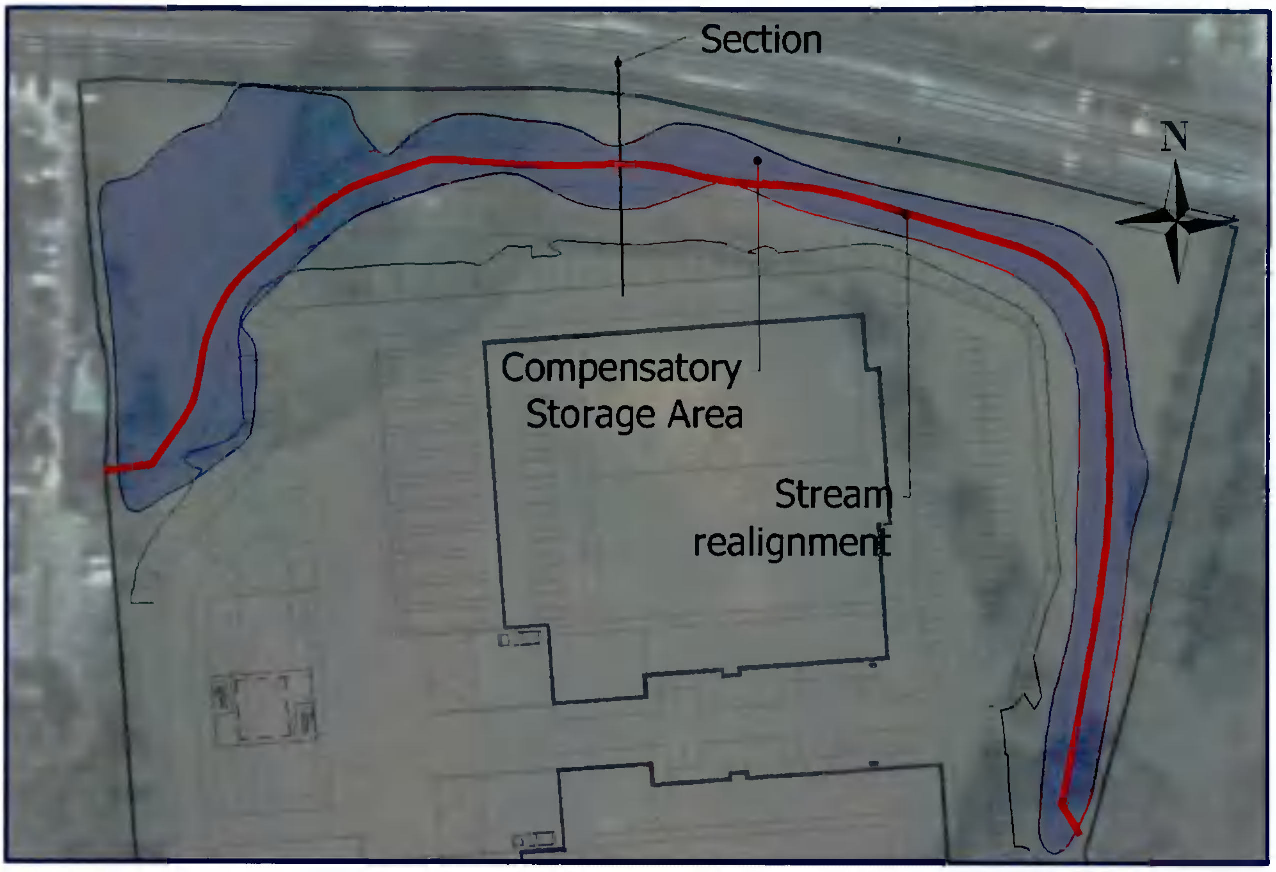


Figure 6-3 Compensatory Storage Basin and Stream Realignment

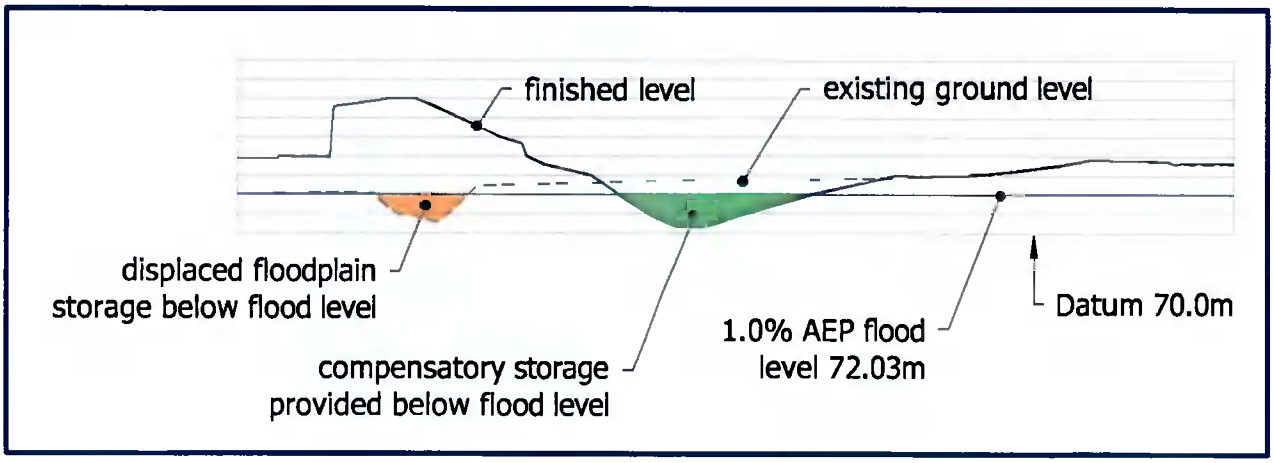


Figure 6-4
Typical Section showing displaced and compensatory floodplain storage at 1% AEP Flood Level

The Guidelines require 'level for level' compensation for floodplain storage in Flood Risk Zone A (i.e the 1% EP flood event). This means the same surface area is provided at the same elevation before and after development. This is be assessed using increments or slices of approximately 0.1m thickness.

Table 6-3 shows the volume of floodplain storage available in the pre-development and post-development scenarios between the lowest point of the Site and the peak water level during the 1% AEP flood event, broken down to 100mm intervals in accordance with the Guidelines. At every interval the volume of compensatory storage provided is greater than the floodplain storage being displaced. Cumulatively, the proposed development will increase floodplain storage by 7,660 m^3 and so the proposed development will lead to a slight reduction in flood risk. The proposed development therefore meets the requirements of the Guidelines for Compensatory Storage.

Elevation		Floodplain Storage		
lower	upper	pre-development	post-development	change
m	m	m^3	m^3	m^3
70.2	70.3	86	508	422
70.3	70.4	111	539	428
70.4	70.5	136	572	435
70.5	70.6	159	605	446
70.6	70.7	184	644	460
70.7	70.8	209	671	463
70.8	70.9	234	699	466
70.9	71.0	260	733	473
71.0	71.1	288	767	479
71.1	71.2	314	800	486
71.2	71.3	345	828	482
71.3	71.4	394	856	461
71.4	71.5	448	889	440
71.5	71.6	528	934	405
71.6	71.7	611	974	363
71.7	71.8	694	1,012	318
71.8	71.9	790	1,067	277
71.9	72.0	907	1,124	217
72.0	72.1	1,062	1,199	137
			Cumulative	**7,660**

Table 6-3 Compensatory Storage Provision

Proposed Realignment of Stream

The current route of the stream crosses through the built area of the proposed development. Culverting the stream as it crosses through this area is not a sustainable solution on the grounds of environmental impact or future maintenance requirements. It is instead proposed to realign the stream towards the northern boundary of the Site through the proposed landscape area. The stream will be realigned across the full width of the Site, only tying into the existing stream as it enters and leaves the Site.

Figure 6-5 shows the minimum cross-section dimensions for the realigned stream. The gradient of the realigned stream will be 0.2%. Figure 6-5 shows the depth of water in the stream during then 1.0% flood event is 0.52m and the available freeboard will be 0.57m.

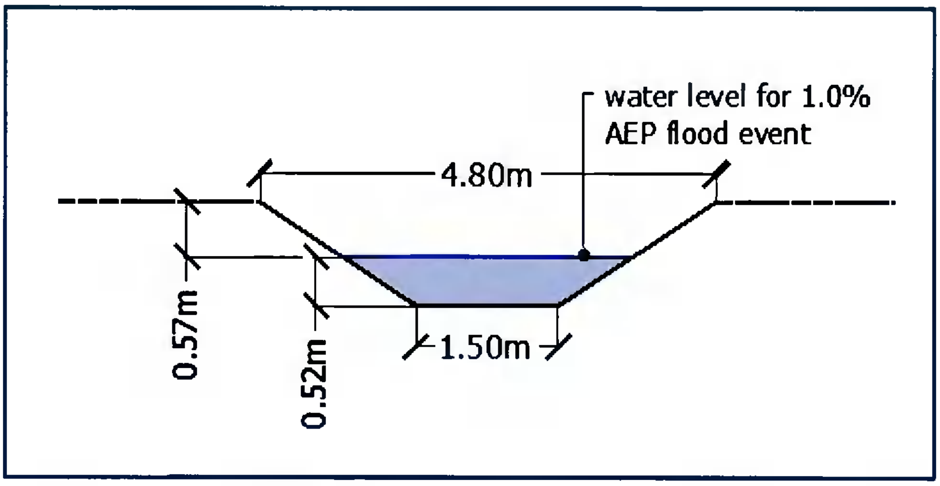


Figure 6-5 Typical Section through Relief Road and Realigned Stream

6.4 Post-development Hydrological Model

A model was prepared to simulate flow patterns during the 1% and 0.1% AEP rainfall events in the post-development scenario. This model is similar to that described in Section 6.2 but the terrain model was amended to include the finished levels for the proposed development and the realigned stream.

Peak Water Levels in the Post-Development Scenario

Figure 6-6 contains a map showing the post-development fluvial flood risk zones determined using the hydrological model described above. Peak water levels in the post-development scenario re as follows:

- 1.0% AEP Flood Event 72.02 m;
- 0.1% AEP Flood Event 72.51 m.

The proposed development will slightly reduce peak flood levels in both the 1% AEP and 0.1% AEP scenarios.

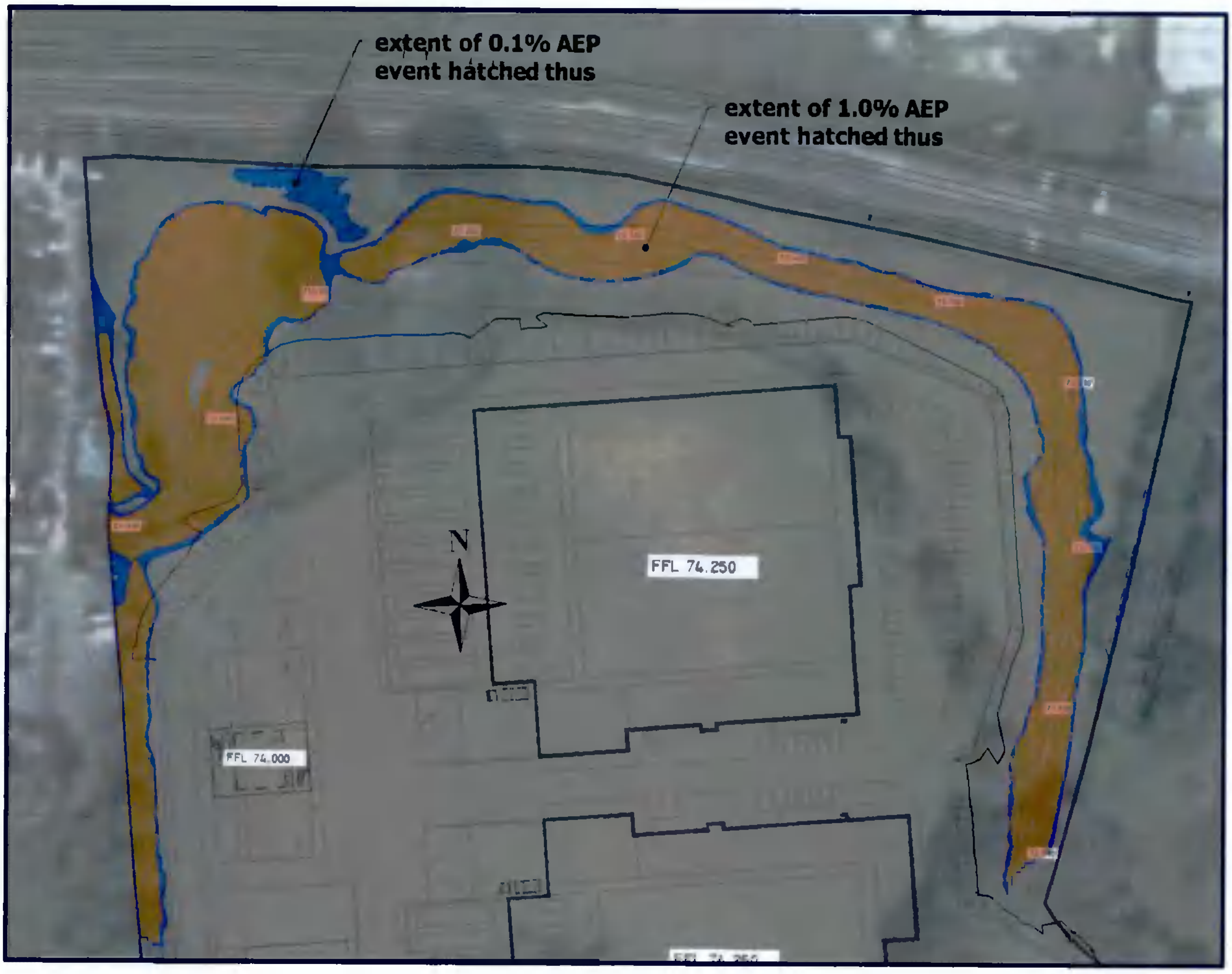


Figure 6-6 Flood Risk Zones Associated with Stream - Post-Development

6.5 Surface Water Drainage for Proposed Development

The surface water drainage system for the proposed development has been designed by Pinnacle Consulting Engineers who have provided confirmation that the design complies with the Greater Dublin Strategic Drainage Study.

Full compliance with GDSDS ensures the drainage system ensures the flood regime in the receiving stream will not be affected, thus not giving rise to flood risk elsewhere.

6.6 Conclusion of Detailed Assessment of Fluvial Flood Risk

The proposed development will not be at risk of flooding from fluvial sources and will not give rise to fluvial flood risk elsewhere.

7. FLOOD RISK FROM GROUNDWATER

7.1 Flood Risk Indicators - Desktop

Various datasets were interrogated for indicators of flood risk from Ground Water. These comprise:

(i) *OPW National Flood Hazard Mapping*

Records from the National Flood Hazard Mapping website maintained by the OPW do not contain any evidence of flood events at the Site associated with fluctuations in groundwater level;

(ii) *Geological Survey of Ireland (GSI)*

The GSI maintains a web portal that provides data for Groundwater (https://www.gsi.ie), including groundwater flooding data.

The portal does not show any groundwater flooding at or in the vicinity of the Site.

The portal indicates the Site to be in an area of high groundwater vulnerability with subsoils of low permeability.

(iii) *Historical Ordnance Survey Mapping*

Historical OS maps shows a well immediately northwest of the Site. No other information is available for this well. There is no indication of springs at the Site.

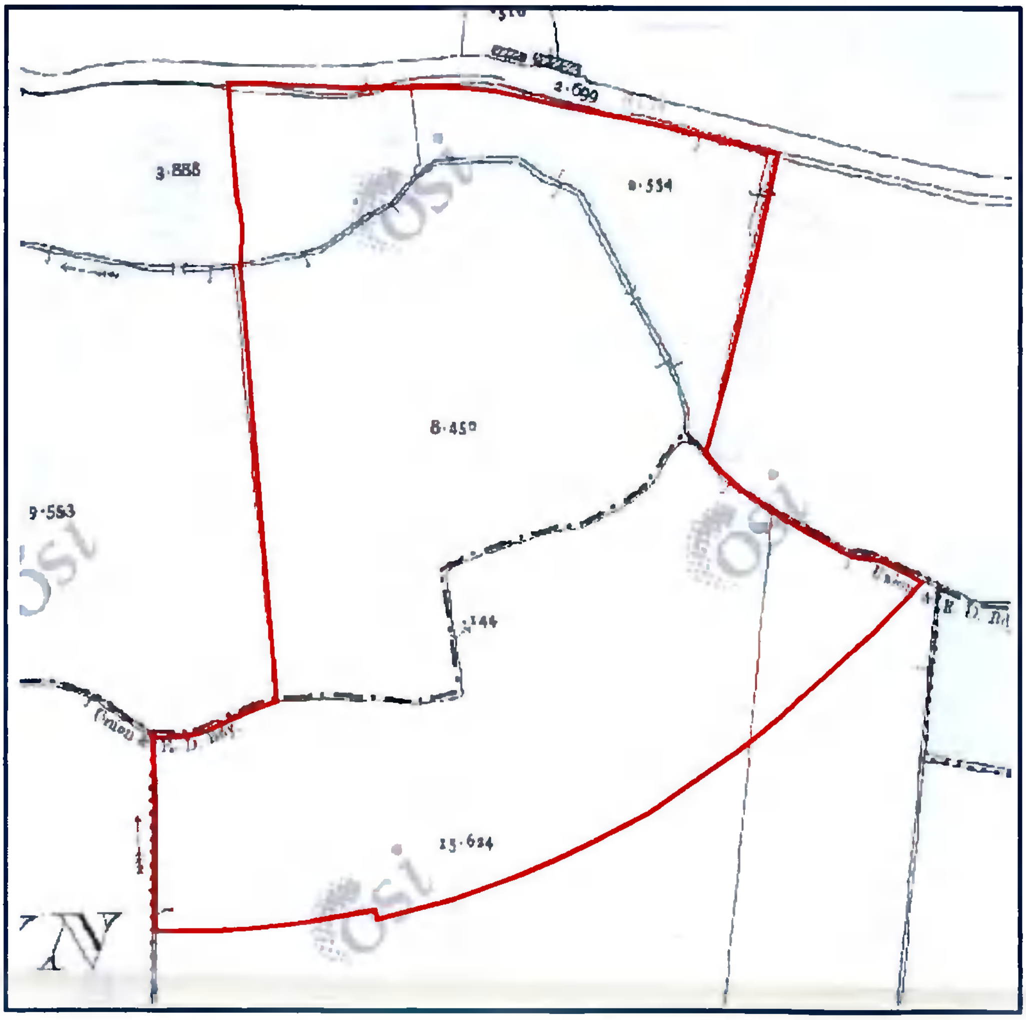


Figure 7-1 Historic OS Mapping