Reid Jones partnership

Consulting Civil & Structural Engineers

FLOOD RISK ASSESSMENT AND DRAINAGE STATEMENT

PROPOSED DEVELOPMENT AT SHACKLETONS GARDEN CENTRE, CHATBURN, CLITHEROE

SHACKLETONS GARDEN CENTRE LIMITED

Project No.: 10301							
Issue Date	Revision	Status	Issued By	Checked By			
18.03.20	01		S Dop	SJ Reid			
02.11.21	02		S Dop	SJ Reid			
24.11.21	03		S Dop	SJ Reid			

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1.0 INTRODUCTION

1.0.1 Reld Jones Partnership has been commissioned by Shackletons Garden Centre Limited to prepare a Flood Risk Assessment and Drainage Statement for a proposed expansion of the retail development at Clitheroe Road, Chatburn, Clitheroe, BB7 4JY.

1.0.2 The site lies within the civil parish of Chatburn, within the district of Ribble Valley Borough Council, in Lancashire County Council.

1.0.3 The Flood Risk Assessment and Drainage Statement is in support of the planning application submission for the development.

1.1 Site Context

1.1.1 The site comprises approximately 2.4 hectares of land, housing the existing Shackletons Home and Garden store, with associated car parks, storage areas and an area of agricultural land to the south-east.

1.2 Legislative Context

1.2.1 Planning requirements for the development require a flood risk assessment and site specific drainage strategy or statement to demonstrate that the drainage scheme proposed is in compliance with both the NPPF/NPPG and Non-Statutory Technical Standards.

1.2.2 As the site is located within Flood Zone 1, this report will focus on the drainage strategy of the site and outline the appropriate mitigation measures to ensure there will be no significant increase in flood risk to the site or surrounding area as a result of the development.

1.3 Site Description and Location

1.3.1 The development location is shown on Figure 1 below.



Figure 1 - Site Location Plan

1.3.2 The site covers an area of 2.4 hectares and houses the existing Shackletons Garden Centre building, storage areas, car parks and access roads and an area of agricultural land to the south-east.

1.3.3 The site lies between Clitheroe Road to the north-west, Worston Road to the south-west and agricultural land to the north-east and south-east. The main site entrance is off Clitheroe Road, while service access is provided off Worston Road.

1.3.4 The site is centred at Ordnance Survey reference 376567 E, 443518 N.

1.3.5 The nearest main rivers are Heys Brook, approximately 650m to the north-east of the site and Worston Brook, approximately 1km to the south.

1.3.6 British Geological Survey (BGS) maps indicate superficial deposits of till (Devensian – Diamicton) overlying bedrock of Limestone and Mudstone (Clitheroe Limestone Formation And Hodder Mudstone Formation (undifferentiated) - Mudstone).

1.3.7 The site is steeply sloping, falling towards the north-west. The existing site topography is shown on Reid Jones Partnership drawing No. 10301-100 (Appendix A).

1.4 Development Proposals

1.4.1 Planning permission is sought for an extension to the retail building, and associated car parking and landscaping to suit. Customer access will remain off Clitheroe Road, but the entrance will be moved to the east approximately 11 metres. Service access is also proposed further up Worston Road, to allow for the building expansion. The proposed layout of the site is shown on Stanton Andrews Architects drawing No. 1859/PL01 A (Appendix B).

1.5 Sequential Test and Exception Test

1.5.1 NPPG describes the principles of the Sequential Test, which aims to steer new development to areas with the lowest probability of flooding. The Sequential Test is a decision-making tool designed to ensure that sites at little or no risk of flooding are developed in preference to areas at higher risk.

1.5.2 As the site is within Flood Zone 1, the lowest risk zone, the development is considered 'appropriate'. Therefore, the Sequential Test is passed and the Exception Test is not required.

2.0 THIRD PARTY CONSULTANTS

2.1 Statutory Authorities

2.1.1 Information from the following Statutory Authorities has been examined to inform the flood risk assessment and provide a drainage strategy:

- Lancashire County Council (LCC)
- Ribble Valley Borough Council
- Environment Agency (EA)
- United Utilities (UU)

2.1.2 Some of the information and records received are contained within Appendix C (flood maps) and Appendix D (sewer record plan).

3.0 FLOOD RISK TO THE SITE

3.1 Fluvial and Tidal Flooding

3.1.1 The site is not located in proximity to a coastline or tidally influenced river therefore flood risk from tidal sources is considered to be low.

3.1.2 The site is entirely within Flood Zone 1, therefore fluvial flood risk is considered to be low.

3.2 Groundwater Flooding

3.2.1 Ribble Valley Borough Council's SFRA notes:

"Following consultation with the BA, no evidence of groundwater flooding in the area has been identified. While no risk has been demonstrated, this is not to say that unrecorded groundwater flooding events may have taken place or that groundwater flooding may not occur in the future, but using the best available information they are not considered to be a significant risk at this time."

3.2.2 There are no historic records of groundwater flooding to the site.

3.2.3 Any groundwater strikes will be noted when on-site borehole/site investigations are carried out.

3.2.4 As there are no records of groundwater flooding on the site, the groundwater flood risk is considered to be low.

3.3 Surface Water Flooding

3.3.1 The Environment Agency's long term flood risk map shows areas to the south-east and north-east of the existing building to be at medium to low risk of flooding due to surface water.

3.3.2 Flooding to the building has been experienced due to inadequate surface drainage points allowing surface water runoff from existing hard standings to pond against the building.

3.3.3 Assessment of the site topography shows all ground levels fail towards the existing building.

3.3.4 The existing pluvial flood risk is therefore considered to be medium.

3.3.5 The proposal is to extend the retail building and provide car parking and landscaped areas, that will allow for re-modelling of site levels and provision of adequate surface water drainage points and subsurface attenuation.

3.4 Flooding from Public Sewers

3.4.1 With reference to the United Utilities sewer record drawing, Appendix D, the area is not served by any public sewers draining by gravity. There is a rising main located within Clitheroe Road. There are no public sewers located on the site and flooding from public sewers is therefore considered to be low.

3.5 Flooding from Artificial Sources

3.5.1 There are no canals or reservoirs in proximity to the site. Therefore, flooding from artificial sources is considered to be low.

3.6 Summary of Potential Sources

3.6.1 The site is located within Flood Zone 1 and is at low risk from sources of flooding including tidal, fluvial, groundwater, sewer related and from artificial sources. However, there is an existing, up to medium risk, of flooding from surface water. It is proposed that the risk of surface water flooding to the building is reduced to "very low" by appropriate design of the new extension, external levels and surface water drainage.

3.6.2 Information to support this statement has been gathered from online EA flood maps, Lancashire and Blackpool Local Flood Risk Management Strategy, Ribble Valley Borough Council's Strategic Flood Risk Assessment (SRFA) and UU sewer records.

4.0 FLOOD RISK FROM THE SITE

4.0.1 There is an existing flood risk from the site, as noted in LCC's letter of 13 September 2019 (Appendix E).

4.0.2 One cause is surface water flooding as described in 3.3. In addition to the on-site risk, surface water is not being captured adequately from the car park and this water is flowing down the access road and off-site onto the public highway.

4.0.3 A second cause is the drainage of the existing roof, at the south-western boundary, where gutters discharge rainwater into chutes which discharge onto the rear of the grass verge. This rainwater crosses the verge and onto the footway and therefore discharges onto the highway.

4.0.4 It is proposed that the risk of surface water flooding from the site is reduced by re-design of the access road, external levels, surface water drainage points and below ground drainage.

4.0.5 The flood risk from the site will also be reduced by limiting runoff from the proposed development to a greenfield runoff rate.

5.0 HYDRAULIC ASSESSMENT

5.1 Existing Drainage

5.1.1 The garden centre is served by an existing private drainage network, with separate systems for foul and surface water.

5.1.2 Foul drainage from existing WCs and the kitchen is treated by on-site package sewage treatment plants, sited adjacent to the main building entrance.

5.1.3 The treated effluent combines with the on-site surface water system before discharging into a private sewer in the footway (termed the "suff" (sic) by site employees) at an existing manhole (denoted EX2).

5.1.4 Investigations have been carried out into both the on-site surface water drainage and the private sewer. The findings are indicated on RJP drawing No. 101 and Stanton Andrews drawing No. SK.05 (Appendix F).

5.1.5 The on-site surface water system was largely silted up or manholes were inaccessible at the time, leading to limited data.

5.1.6 However, the sewer in the footway was recorded as 150mm diameter and was able to be traced upstream from manhole EX2, to the north-east of the site entrance, to an existing manhole (denoted EX3). The incoming pipe to EX3 crossed under the highway from the north and was noted to be "collapsed" by the drainage company carrying out the investigation.

5.1.7 It was also traced in the footway from EX2 towards the corner of Worston Road to an existing manhole (denoted EX1).

5.1.8 At least one road gulley was noted to be connected into the sewer.

5.1.9 The outlet from EX2 crossed under the highway in a north-westerly direction to an existing manhole in the highway, adjacent to the kerb (EX4).

5.1.10 From EX4, the pipe size was recorded to be 225mm diameter, and the outlet was indicated to head in a westerly direction.

5.1.11 Following the initial investigation detailed above, further work was undertaken to determine the route of the sough and the surface water discharge off-site at the at north end of the site.

5.1.12 The results of the further investigation are indicated on Stanton Andrews drawing No. SK.05 (Appendix F), and show via dye tracing that the on-site drainage system discharges to the watercourse on the Pendle Trading Estate via the sough.

5.1.13 An estimate has been made of the runoff from the existing site. RJP drawing No. 100 shows the areas of impermeable and permeable areas on which the estimate is based.

5.1.14 Firstly, a calculation of the existing greenfield runoff has been made for the undeveloped and soft paved areas of the site (an area of 1.08 ha), yielding a runoff of 9 l/s for a 1 in 1 year return period.

5.1.15 Secondly, due to limited data for the existing on-site surface water network, runoff from the existing impermeable areas (1.27 ha) has been estimated for a flat rate rainfall of 50mm/hr, yielding a value of 177 l/s.

5.1.16 Thus a pre-development whole site runoff rate can be estimated to be 186 l/s for a flat rate rainfall of 50mm/hr or 1 in 1 year event.

5.1.17 As noted, the only known discharge point for this existing runoff and runoff from the highways is the sough which discharges to an open watercourse.

6.0 PROPOSED DRAINAGE

6.0.1 The proposed development is to be drained on a separate system of drainage.

6.1 Foul Water

6.1.1 Due to the external works improvements to the existing building entrance, is it proposed that the existing foul treatment plants are replaced with a modern packaged wastewater treatment plant, sized to treat all foul flows from the site.

6.1.2 It is anticipated that the treated effluent from the proposed packaged treatment works may be connected into the existing network at an unrestricted rate.

6.2 Surface Water

6.2.1 The design of the surface water drainage has been considered in line with the SUDS hierarchy:

- Infiltration to ground
- Discharge to a watercourse
- Discharge to public sewer

6.2.2 Following ground investigation by Sub Surface Consultants Ltd, it has been demonstrated that the underlying strata renders the site unsuitable for soakaway drainage (see letter report reference TP/7256, 6 July 2021).

6.2.3 The site is not in proximity to any main rivers. The nearest open watercourse is approximately 200m away across Clitheroe Road, within Pendle Trading Estate. There is an existing private sewer (the sough as described in 5.1, and Stanton Andrews drawing No. SK.05, Appendix F), which serves the site and discharges to this watercourse.

6.2.4 The only public sewer in proximity to the site, is the rising main within Clitheroe Road.

6.2.5 As the existing surface water from the site discharges to a watercourse, it is proposed that the surface water discharge from the development is limited to a greenfield runoff and discharged into the same watercourse via the existing sough.

6.2.6 This follows the SUDS hierarchy and will provide an improvement to existing situation, as detailed below.

6.2.7 Greenfield runoffs have been calculated for the proposed development area, as shaded grey on RJP drawing No. 10301-101 (Appendix F) and are given in Appendix G. The 1 in 1 year greenfield runoff is calculated to be 10.4 I/s and the 1 in 100 year greenfield runoff is 24.9 I/s. Q_{BAR} is calculated to be 12.0 I/s.

6.2.8 To mitigate off-site flooding, it is recommended that the proposed surface water system is designed to contain a 1 in 100 year rainfall event, with an increase of 40% allowed for climate change. For ease of preliminary calculation, a discharge limit of QBAR has been set, in order to calculate preliminary attenuation requirements.

6.2.9 As indicated on drawing No. 10301-101 and 102 (Appendix F), a preliminary total volume of storage of 1425m³ is required to contain flows from a 1 in 100 year event (plus 40% climate change), with flow controls on outlets as appropriate to limit off-site discharge. The storage may be provided in the form of attenuation crates, as indicated in blue. Alternatively, at design stage, other SUDS measures such as permeable paving may be considered, with an open graded sub-base providing water storage volume. However, it should be noted that the site is steeply sloping and use of permeable paving as attenuation will require baffle details to prevent flooding out of the paving at the lower end of the site.

6.2.10 Preliminary surface water network calculations are provided in Appendix H. Due to site levels it has been assumed that the north and south sides of the site will drain separately around the existing building, and therefore each network has been limited to a discharge of 6 l/s.

6.2.11 An estimate of the runoff from the existing roof has been made (based on a measured area of 4874 m2 for the existing building which is to remain unchanged). A figure of 65 l/s is calculated for a flat rate rainfall of 50 mm/hr.

6.2.12 When added to the 1 in 1 year greenfield runoff from the areas to be redeveloped (10.4 l/s), it can be estimated that the post-development site runoff is in the order of 75 l/s, for a flat rate rainfall of 50mm/hr or 1 in 1 year event. This is however a lower bound figure, as some areas of the site are to remain greenfield/soft paved, and have not been taken into consideration when calculating the greenfield runoff for the proposed development areas. By inspection, allowing 10 l/s for additional greenfield areas, the post-development total runoff rate for the site may be estimated to be approximately 85 l/s (again for a flat rate rainfall of 50mm/hr or 1:1 year event).

6.2.13 When compared to the existing pre-development whole site runoff rate of 186 l/s (for a flat rate rainfall of 50mm/hr or 1 in 1 year event, see 5.1.16) the betterment for the whole site can be calculated to be in the order of 45%. This betterment will be achieved by limiting all re-developed areas to greenfield runoff rates.

6.2.14 As previously stated, the pre-development runoff is carried to the watercourse in Pendle Trading Estate via the sough – a private culvert/pipe system passing under third party land. It should be noted that riparlan owners are responsible for the maintenance of drainage capacity on their land, and the proposed scheme reduces the maximum off-site surface water discharge to the sough.

APPENDIX A

Reid Jones Partnership drawing No. 10301-100



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APPENDIX B

Stanton Andrews Architects drawing No. 1859/PL01 A







'as axisting' drawings based on information provided by others - no measured survey of the property has been undertaken by the architect.

This charwing is to be read in conjunction with all relevant consultants and specialist drawings. The architect is to be notified of any discrepancies before proceeding. do not scale from this drawing. all dimensions are to be checked on site. this drawing is subject to copyright.



A issued for pre-app

19.07.2019

stanton andrews architects

44 york street clitheroe BB7 2DL

- t 01200 444490
- e mail@stantonandrews.co.uk w stantonandrews.co.uk

shackletons home & garden chatburn

proposed site plan

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APPENDIX C

Flood Maps



Flood map for planning

Your reference shackletons

Location (easting/northing) 376563/443533

Created 4 Mar 2020 12:23

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/



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Flooding Due to Surface Water

APPENDIX D

United Utilities Sewer Records



How to contact us:

United Utilities Water Limited Property Searches Haweswater House Lingley Mere Business Park Great Sankey Warrington WA5 3LP

E-mail: propertysearches@uupic.co.uk

Your Ref: Shackleton's Garden Centre Our Ref: UUPS-ORD-150980 Date: 13/02/2020

Dear Sirs

Reid Jones Partnership

9 Orrell Road

9 Orrell Road, Orrell, Lancaahire

WN5 8EY

FAO:

Location: SHACKLETONS GARDEN CENTRE CLITHEROE ROAD, CHATBURN, CLITHEROE, BB7 4JY

I acknowledge with thanks your request dated 12/02/2020 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx.

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us.

Yours Faithfully,





TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly
 recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise
 location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any
 damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from
 those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



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	GRO	Glass Reinfore	cd Plastic		
	PVC	Polyvinyl Chlor	de		
	CI	Cast Iron			
	SI	Spun Iron Steel			
	VC	Vitrified Clay			
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APPENDIX E

Lancashire County Council Letter Ref LHS/GC/2019/RV12/HH/MC



Shackletons Garden Centre Clitheroe Road Chatburn Clitheroe BB7 4JY

Phone: 0300 123 6780

Email: highways@lancashire.gov.uk Your ref:

Our ref: LHS/GC/2019/RV12/HH/MC

Date: 13 September 2019

Dear Sir/Madam

R.A

HIGHWAYS ACT 1980, SECTION 151/SECTION 163 WATER FLOWING ONTO THE HIGHWAY - WORSTON ROAD, CHATBURN

It has been brought to my attention that water is flowing off your land and onto the highway at the following location, contrary to the Highways Act 1980:

Worston Road, Chatburn

I understand that the land in question is in your ownership or lease.

Water flowing off your land and onto the highway will pose a hazard to highway users, especially during the winter period.

Consequently this may result in emergency visits by the gritter or the gully emptier to deal with highway hazards and the cost of any emergency visits made will be recharged to you. Also, if there are any claims made by highway users as a consequence of your water on the highway, they will be redirected to you.

Therefore, in the interest of public safety, I must insist that you make urgent arrangements for the drainage issue to be resolved and to prevent water from your land flowing onto the highway.

Please keep me updated with your plan of action or if you wish to discuss the situation further please do not hesitate to contact me via the above number, or in writing quoting the above reference.

Yours faithfully

Hilary J Hargreaves EngTech MICE Highways Operational Engineer Highways and Transport Lancashire County Council

Phil Barrett

Director of Highways and Transport Cuerden Way • Bamber Bridge • Preston • PR5 6BS

APPENDIX F

Stanton Andrews drawing No. SK.05 Reid Jones Partnership drawing No. 10301-101 and 10301-102







KEY:
P1 ISSUED FOR INFORMATION SD SJR 29.10.21 Rev Details Drawn By By Data
SHACKLETONS GARDEN CENTRE LIMITED
PROPOSED DEVELOPMENT AT SHACKLETONS GARDEN CENTRE, CHATBURN
PROPOSED DRAINAGE GENERAL ARRANGEMENT SHEET 2 OF 2
INFORMATION
Reid Jones partnership Consulting Civil & Structural Engineers
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Scale: 1:250 @ (A1) Project No: Drewing No: Isaue: 10.301 10.2 D1
DO NOT SCALE - USE FIGURED DIMENSIONS ONLY. This drawing is confidential and is the property of Reid Jones Partnership. It must not be disclosed to any third party, copied or lent without prior written consent. The contractur is to check all dimensions on site prior to commencement of works.

APPENDIX G

Greenfield Runoff Rate Estimations

Pre-development (1.08 ha) Post-development (1.25 ha)

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

alculated by: Sarah Dop				1		Site Details		
Site name:	SHAC		JC		1	Latitude:		53.88729° N
			10			L	Longitude:	2.35824° W
Site location:	СПІН	EROE						
This is an estimation in line with Environm SC030219 (2013), t (Defra, 2015). This in the drainage of surfa	of the gree ent Agency he SuDS M formation (ce water n	enfield run / guidanci /anuai C7 on greenfi unoff from	off rates th e "Rainfall r 63 (Ciria, 2 eld runoff r sites.	et are used unoff mans 1016) and t ates may b	i to meet norm agement for de he non-statuto he the basis for	al best practice criteria velopments", ry standards for SuDS setting consents for	Reference:	2352222987 Oct 28 2021 10:44
Runoff estimat	ion app	roach	IH124					
Site characteri	stics					Notes		
Total elte area (he	1.08					(1) IS QBAR < 2.	0 l/s/ha?	
Methodology							- 18 - 18	
QBAR estimation method: Calculate from SPR and S				d SAAR	When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set			
SPR estimation method: Calculate from SOIL type				œ	at 2.0 Vs/ha.			
Soll characteris	stics	Defau	lt	Edited				
SOL type:		4		4		(2) Are flow rates < 5.0 l/s?		
HOST class:		N/A	N/A			When flow man are less than 5.0 ½ assess the discharge is		
SPR/SPRHOST:		0.47		0.47		usually set at 5.0 Vs if blockage from vegetation and other		
Hydrological ci	naracte	istics	Defa	wlt	Edited	materials is po	ssible. Lower con kage risk is addre	sent flow rates may be set
SAAR (mm):			1258		1258	drainage elements.		
Hydrological regio	ж:		10		10			
Growth curve fac	tor 1 yea	r.	0.87		0.87			
Growth curve fac	tor 30 ye	ers:	1.7	1.7 1		Where groundwater levels are low enough th		w enough the use of
Growth curve fac	tor 100 y	ears:	2.08		2.08	soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.		water runoff.
Growth curve factor 200 years:		2.37 2.37		2.37				

Greenfield runoff rates	Default	Edited
Q _{BAR} (1/8):	10.35	10.35
1 in 1 year (i/s):	9.01	9.01
1 in 30 years (Vs):	17.6	17.6
1 in 100 year (/s):	21.53	21.53
1 in 200 years (i/a):	24.54	24.54

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/termsand-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sarah Dop
Site name:	Shackletons
Site location:	Chatburn

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfail runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Cirla, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be

the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

IH124

1.25

Site characteristics

Total site area (ha):

Notes

2.0 l/s/ha.

(1) Is Q_{BAR} < 2.0 l/s/ha?

Methodology

Q_{BAR} estimation method: SPR estimation method:

Calculate from SPR and SAAR
 Calculate from SOIL type

Soli characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1258	1258
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

When Q_{BAR} is < 2.0 Vs/ha then limiting discharge rates are set at

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (I/s):	11.98	11.98
1 in 1 year (l/s):	10.42	10.42
1 in 30 years (l/s):	20.37	20.37
1 in 100 year (l/s):	24.92	24.92
1 in 200 years (l/s):	28.4	28.4

This report was produced using the greenfield runoff tool developed by HR Wellingford and evaluable at www.ukaude.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.ukaude.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff raise. The use of these results is the meponsibility of the users of this tool. No liability will be accepted by HR Wellingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage echeme.

Site Details

Latitude:	53.88722° N
Longitude:	2.35818° W
Reference:	1620177058
Date:	Mar 06 2020 17:11

APPENDIX H

Reid Jones Partnership Surface Water Network Calculations

AUSE	W	Y	*********************************		een finn an dein 240 pille – 13	,	Netw Sarah 18/03	ork: S Dop 3/2020	torm Ne	etwork			
						Design	Setting	<u>s</u>					
R	ainfall I	Methodol	ogy F	FSR		Ma	ximum	Time	of Con	centratio	on (mins	30.00	
R	eturn f	Period (yea	ars) 2	2				Ma	aximum	Rainfall	(mm/hr) 50.0	
	Additio	onal Flow	(%) (2		80			Minim	im Velo	city (m/s) 1.00	
		FSK Keg	ion t	England	and wales		,	linim	um Dae	Lonnec Idean H	oight (m	e Levels	somes
		Rati	0-R (0.200				Pr	eferred	Cover D	eight (m	0.900	
			CV (0.750				Inclu	ide Inter	mediate	e Groun	d 🗸	
	Time of	f Entry (mi	ins) 2	2.00			Enf	orce b	oest prac	ctice des	sign rule	s√	
						No	<u>des</u>						
		Name	Area	T of E	Cover	Diam	neter	Eas	sting	Nort	hing	Depth	
			(ha)	(mins)	Level	(m	m)	(m)	{n	n}	(m)	
		51	0.011	2.00	(m) 105 904	n	450	3765	93 154	44250	5 625	1 125	
		52	0.150	2.00	105.50	a	450	3765	67.516	44347	7.584	1.439	
		S3	0.110	2.00	105.10	0	450	3765	40.007	44344	7.495	1.724	
		S4	0.089	2.00	104.45	a	450	3765	27.698	44345	8.749	1.355	
		ATT	0.192	2.00	102,15	0	1	3765	18.044	44347	2.515	1.200	
					102.15	0	1200	3765	04.818	44346	8.4/8	1.433	
					101.30	u s	1200	5704	J 4.J10		1.332	1.200	
						Lir	<u>nks</u>						
Name	US	DS	Len	igth ka	; (mm) /	US IL	DS	5 IL	Fall	Slope	Dia	T of C	Rain
4 001	Nod	e Node	(n	n)	n	(m)	(r	n)	(m)	(1:X)	(m m)	(mins)	(mm/hr)
1.001	52	52	37. 40	993 769	0.600	104.775	104	130	0.639	59.5 50 5	300	2.37	50.0
1.003	53	54	16.	678	0.600	103.376	; 103	.095	0.281	59.4	300	2.84	50.0
1.004	S4	ATT	16.	814	0.600	103.095	5 100	.950	2.145	7.8	300	2.89	50.0
1.005	ATT	FC1	13,	828	0.600	100.950) 100	.717	0.233	59.3	300	3.00	50.0
1.006	FC1	EX MH	14.	023	0.600	100.717	100	.180	0.537	26.1	300	3.08	50.0
			Name	Vel	Cap	Flow	US	D	5 Σ/	Area 2	Add		
				(m/s)	{I/s}	(I/s)	Depth (m)	Dep (m	nth (l 1)	ha) li	nflow (I/s)		
			1.001	1.699	67.6	1.5	0.900	1.1	39 0.	.011	0.0		
			1.002	2.041	144.3	21.8	1.139	1,4	24 0.	.161	0.0		
			1.003	2.044	144.5	36.7	1.424	1.0	55 O.	.271	0.0		
			1.004	2.048	399.Z	48.8	1.055	0.9	00 0. 22 0	552	0.0		
			1.005	3.088	218.3	74.8	1.133	0.9	00 0.	.552	0.0		

SEV	MAY	3	Reid Jones	Partnershi	ip	File: 10301 SW - network south Network: Storm Network Sarah Dop 18/03/2020			ti Pa	age 2	
					<u>Pipeline</u>	<u>Schedule</u>					
Link	Length	Slope	Dia	Unk	US CL	US IL	US Depth	DS CL	. 1	DS IL	DS Depth
4 004	(m)	(1:X)	(mm)	Type	(m)	(m)	(m)	(m)	• • •	(m)	(m) 4 4 2 0
1.001	37.995	59.5 59.5	225	Circular	105.900	104.775	1.120	105.50	0 10 0 10	14.130	1.139
1.002	40.705	59.5 59.4	200	Circular	105.300	103 276	1.137	103.10	0 10	12 005	1.929
1.003	16 814	7.8	300	Circular	103.100	103.370	1.424	102.15	0 10	30.050 30.950	0.900
1.004	13 928	50 3	300	Circular	107.150	100.035	0.900	102.15	0 10	0.330	1 133
1.006	14.023	26.1	300	Circular	102.150	100.717	1.133	101.38	0 10	0.180	0.900
	Unk	us	Dia	Node	мн	DS	Dia	Node		мн	
		Node	• (mm)	Type	Type	Node	(mm)	Type		Type	
	1.001	S1	450	Manhole	Adoptat	ole S2	450	Manhol	e Ac	loptable	
	1.002	52	450	Manhole	Adoptal	ole S3	450	Manhol	e Ad	optable	
	1.003	53	450	Manhole	Adoptal	ole 54	450	Manhol	e Ad	loptable	
	1.004	S4	450	Manhole	Adoptal	ole ATT	1	Manhol	e Ad	loptable	
	1.005	ATT	1	Manhole	Adoptat	ole FC1	1200	Manhol	e Ad	loptable	
	1.006	FC1	1200	Manhole	Adoptal	e EX M	H 1200	Manhol	e Ad	loptable	
					<u>Manhole</u>	<u>Schedule</u>		2			
Node	Eastir (m)	ıg	Northing (m)	K CL	Depti (m)	n Dia (mm)	Connect	ions	Unk	IL (m)	Dia (mm)
\$1	376593	154	443505.6	25 105.90	00 1.12	5 450				7.1.4	<i>(</i>)
2000							\cap				
							P				
							•	0	1.001	104.77	5 225
S2	376567.	.516	443477.5	84 105.50	00 1.439	9 450	-1	1	1.001	104.13	i 6 225
							Ø				
							0	0	1.002	104.06	i1 300
S 3	376540	.007	443447.4	95 105.10	00 1.724	450	·* 1	1	1.002	103.37	6 300
							Ø				
								0	1.003	103.37	6 300
S 4	376527	.698	443458.74	49 104.4	50 1.355	o 450	'S	1	1.003	103.09	15 300
							X		1 004	103.00	15 200
ATT	376518	.044	443472 5	15 102 1	50 1 200	1		1	1.004	100.95	io 300
80	070020					•	.6	-		800100	
							iny	۵	1.005	100.95	0 300
FC1	376504	818	443468.4	78 102.1	50 1.433	1200		1	1.005	100.71	7 300
1000083575	a road 998 (* 1821)	entration i			and 90090000	a anatatistico	°O	•			
							070		1 006	100 71	7 200
								<u> </u>	T.000	100.11	./ 300
EX MH	376494	.516	443477.9	92 101.3	80 1. 20 0	1200		1	1.006	100.18	10 300

CAUSEWAY	File: 10301 SW - network soutl Network: Storm Network Sarah Dop 18/03/2020	Page 3
Simulatio	n Settings	
Rainfall Methodology FSR FSR Region England and Wale M5-60 (mm) 20.000 Ratio-R 0.200 Summer CV 0.750 Winter CV 0.840	Analysis Speed Skip Steady State Drain Down Time (mins) Additional Storage (mỹ/ha) Check Discharge Rate(s) Check Discharge Volume	Normal x 240 0.0 x x
Storm D 15 30 60 120 180 240	Ourations 360 480 600 720	960 1440
Return Period Climate Change (years) (CC %) 2 0 100 40	Additional Area Additional Flov (A %) (Q %) 0 0	# 0 0
Node FC1 Online H	ydro-Brake [®] Control	
Flap Valve x Replaces Downstream Link √ Invert Level (m) 100.717 Design Depth (m) 1.000 Min Ou Design Flow (I/s) 6.0 Min Nod	Objective (HE) Minimise Sump Available √ Product Number CTL-SHE-0115- tlet Diameter (m) 0.150 le Diameter (mm) 1200	upstream storage -6000-1000-6000
Node ATT Depth/Ar	ea Storage Structure	
Base Inf Coefficient (m/hr) 0.00000 Safety Fac Side Inf Coefficient (m/hr) 0.00000 Poro	ctor 2.0 Invert Le sity 0.95 Time to half empty	evel (m) 100.950 y (mins)
Depth Area Inf Area Depth Area (m) (m²) (m²) (m) (m 0.000 625.0 0.0 0.800 625	ea Inf Area Depth Area 1 ²) (m²) (m) (m²) 5.0 0.0 0.801 0.0	Inf Area (m²) 0.0

File: 10301 SW - network soutl Network: Storm Network Sarah Dop 18/03/2020

Page 4

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow {I/s}	Node Vol (m³)	Flood (m³)	Status
15 minute summer	\$1	9	104.802	0.027	2.1	0.0042	0.0000	OK
15 minute summer	S2	9	104.155	0.093	30.9	0.0149	0.0000	OK
15 minute summer	S 3	9	103.512	0.136	52.0	0.0216	0.0000	OK
15 minute summer	S4	9	103.207	0.112	69.0	0.0179	0.0000	OK
480 minute winter	ATT	344	101.105	0.155	17.2	92.1328	0.0000	OK
480 minute winter	FC1	352	101.126	0.409	14.1	0.4624	0.0000	SURCHARGED
15 minute summer	EX MH	1	100.180	0.000	6.0	0.0000	0.0000	OK

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Outflow)	Node		Node	(I/s)	(m/s)		Vol (m ^a)	Vol (m ³)
15 minute summer	S1	1.001	S2	2.0	0.755	0.029	0.0990	
15 minute summer	52	1.002	S3	30.9	1.250	0.214	1.0124	
15 minute summer	S 3	1.003	S4	51.9	1.899	0.359	0.4591	
15 minute summer	S4	1.004	ATT	70.0	5.542	0.175	0.2316	
60 minute summer	ATT	1.005	FC1	19.3	0.409	0.133	0.6086	
480 minute winter	FC1	Hydro-Brake®	EX MH	6.0				185.9

Flow v9.0 Copyright © 1988-2020 Causeway Software Solutions Limited

CAUSEWAY

File: 10301 SW - network soutl Network: Storm Network Sarah Dop 18/03/2020

Page 5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.71%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	inflow (l/s)	Node Vol (m³)	Flood (m ^s)	Status
15 minute summer	\$1	9	104.824	0.049	7.2	0.0078	0.0000	OK
15 minute summer	S2	9	104.277	0.216	105.3	0.0343	0.0000	OK
15 minute summer	S3	9	103.915	0.539	173.5	0.0857	0.0000	SURCHARGED
15 minute summer	S4	9	103.308	0.213	228.7	0.0339	0.0000	OK
720 minute winter	ATT	675	101.704	0.754	38.9	447.7263	0.0000	SURCHARGED
720 minute winter	FC1	675	101.704	0.986	12.6	1.1157	0.0000	SURCHARGED
15 minute summer	EX MH	1	100.180	0.000	6.0	0.0000	0.0000	ОК

Link Event (Outflow)	US Node	Unk	DS Node	Outflow (I/s)	Velocity (m/s)	Flow/Cap	Link Vol (m²)	Discharge Vol (m³)
15 minute summer	S1	1.001	52	7.2	0.866	0.106	0.6192	
15 minute summer	52	1.002	S3	101.5	1.526	0.703	2.5424	
15 minute summer	53	1.003	S4	170.5	2.543	1.180	1.0333	
15 minute summer	S4	1.004	ATT	230.3	6.299	0.577	0.6173	
60 minute summer	ATT	1.005	FC1	23.7	0.427	0.164	0.9738	
15 minute summer	FC1	Hydro-Brake®	EX MH	6.0				88.7

Design Settings Rainfall Methodology FSR 30.00 Return Period (years) 2 Maximum Time of Concentration (mins) 30.00 Additional Flow (%) 0 Source Maximum Rainfall (mm/hr) 50.0 M5-60 (nm) 20.000 Maximum Sainfall (mm/hr) 50.0 Minimum Velocity (m/s) 1.00 Ratio-R 0.200 CV 0.750 Time of Entry (mins) 2.00 Northing 0.900 Time of Entry (mins) 2.00 100 100 3765622.499 443528.752 1.125 N2 0.289 2.00 103.00 1200 37656456.443578.500 1.225 N2 0.289 2.00 103.00 1200 3765456.50 1.225 N3 0.260 2.00 103.00 1200 3765456.50 1.275 N3 0.260 10.00 1200 376546.50 443578.50 1.275 N2 0.285 2.00 193.000 1202.575 2.00 1.275 N2	USEV	MY	0	No.u	2011C3 I	9 VICI3III	H .	Netw Sarah 18/0	ork: S Dop 3/202	Storm Ne	twork		alle T	
Name US Diameter Construction Maximum Rainfall (mm/hr) 50.0 Macintum Period (years) 2 Additional Row (%) 0 Solid (mm/hr) 50.0 MS-60 (rmm) 20.000 Ratio-R Ratio-R Connection Type Level Soffits Maximum Bainfall (mm/hr) 0.200 CV 0.750 The of Entry (mins) 2.00 Time of Entry (mins) 2.00 Diameter Eaters Northing Depth N1 0.005 2.00 103.00 1200 376562.495 443528.752 1.125 N2 0.280 2.00 103.00 1200 376564.55 443528.752 1.125 N2 0.280 2.00 13.00 1200 376564.65 443598.076 1.275 N3 0.260 10.03 1200 376564.55 443578.50 1.275 N4 0.032 2.00 93.000 1200 37654.56 1.275 1.275 N4 0.032 2.00 93.000 1200 3							Design	Setting	5					
Nature Maximum Time of Concentration (mins) 30.00 Additional Flow (%) 0 Maximum Time of Concentration (mins) 30.00 Additional Flow (%) 0 Maximum Time of Concentration (mins) 50.0 Return 20000 Ratine Bigland and Wales Minimum Velocity (m/s) 1.00 Maximum Time of Entry (mins) 2.00 Concentration (mins) 50.0 CV 0.750 Time of Entry (mins) 2.00 Time of Entry (mins) 2.00 Name Area Toff Cover Diametar Earting Northing Depth N1 0.055 2.00 103.00 1200 376551.49 443552.92 1.125 N3 0.260 2.00 103.00 1200 376551.49 443559.156 1.275 RCturn 98.640 1200 376551.49 44359.156 1.275 RCturn 98.640 1200 376551.49 44359.156 1.275 Nate Nate Nate Nate 5.225 2.145 5.00 Node<	1 <u></u> 50	c		585553 M						. -				-
Name US Disk Paid Mainten Biology (M) (M) Dudy Name VI 0.200 CV 0.750 Connection Type Level Softis Name CV 0.750 Connection Type Level Softis Northing 0.200 Name Area T of E Cover Diametar Easting Northing Depth Name Area T of E Cover Diametar Easting Northing Depth N1 0.095 2.00 106.000 450 376608.732 44355.925 1.125 N2 0.280 2.00 103.700 1200 376530.114 443558.916 1.125 N3 0.262 2.00 99.800 1200 376530.114 443559.166 1.275 KMH 0.822 2.00 99.800 1200 376530.114 443559.166 1.275 Name US DS Length Ke(mn)/ US IL DS IL Fail Sope Dil	Rain	ntali Met um Peris	nodole	ogy i	-SR 2		M	laximun	n Time	e of Conc	entration Relation	on (min /mm/h	s) 30.00	U
FSR Region England and Wales MS-80 (mm) Connection Type Level Sofflis Uninuum Backforg Meight (m) C.200 (m) Ratice R 0.200 CV 0.750 Time of Entry (mins) 2.00 Image: Connection Type Image: Connection Type Image: Connection Type Image: Connection Type Name of Entry (mins) 2.00 Image: Connection Type Image: Connection Type Image: Connection Type Image: Connection Type Name of Entry (mins) 2.00 Image: Connection Type Image: Connection Type Image: Connection Type Image: Connection Type Name of Entry (mins) 2.00 Image: Connection Type Image: Connection Type Image: Connection Type Image: Connection Type N2 0.095 2.00 Image: Connection Type N2 0.095 2.00 Image: Connection Type Image: Connection Type <td>A</td> <td>dditional</td> <td>I Flow</td> <td>(%)</td> <td>5</td> <td></td> <td></td> <td></td> <td>(M)</td> <td>Minimu</td> <td>m Velo</td> <td>city (m/</td> <td>s) 1.00</td> <td></td>	A	dditional	I Flow	(%)	5				(M)	Minimu	m Velo	city (m/	s) 1.00	
MS-60 (mm) 20.000 (V) Minimum Backdrop Height (m) 0.200 0.000 Time of Entry (mins) 2.00 Mane (m) Mane (m) Area (m) Tof E Cover (m) Diameter (m) Easting (m) Northing Depth (m) Openth (m) N1 0.095 2.00 106.000 450 376608.732 443528.752 1.125 N2 0.289 2.00 106.000 450 376608.732 443528.752 1.125 N3 0.260 2.00 106.000 450 376508.132 443528.752 1.125 N4 0.032 2.00 93.800 1.200 376536.610 443595.076 1.275 N4 0.032 2.00 93.800 1.200 376530.101 443556.076 1.275 Node (m) n (m) (m) <t< td=""><td>507</td><td>F</td><td>SR Reg</td><td>ion I</td><td>England</td><td>d and Wale</td><td>es</td><td></td><td></td><td>(</td><td>Connec</td><td>tion Typ</td><td>e Leve</td><td>Soffits</td></t<>	507	F	SR Reg	ion I	England	d and Wale	es			(Connec	tion Typ	e Leve	Soffits
Ratio-R 0.200 Preferred Cover Depth (m) 0.300 Time of Entry (mins) 2.00 Include Intermediate actional 4 Enforce best practice design rules 4 Name Area T of E Cover Diametar Easting (mm) Northing (m) Depth (m) N1 0.095 2.00 103.700 1200 376502.6732 443552.8752 1.125 N2 0.289 2.00 103.700 1200 376536.610 443559.576 1.275 N2 0.289 2.00 99.800 1 376530.610 443559.576 1.275 R22 0.025 2.00 99.800 1200 376530.114 443528.168 1.205 R22 0.025 2.00 99.800 1200 376530.114 443588.168 1.205 R22 0.025 2.00 99.800 1200 376530.114 443588.168 1.205 R23 0.600 100.175 100.175 2.400 15.5 2.225 2.48 50.0 <t< td=""><td></td><td>M5</td><td>-60 (m</td><td>im) 2</td><td>20.000</td><td></td><td></td><td>ļ</td><td>Minim</td><td>num Back</td><td>drop H</td><td>eight (n</td><td>n) 0.200</td><td>D</td></t<>		M5	-60 (m	im) 2	20.000			ļ	Minim	num Back	drop H	eight (n	n) 0.200	D
Incude micromeanic of Entry (mins) 2.00 Incude micromeanic design rules J Incude micromean			Rati	0-R (0.200				Pi	referred (Cover D	epth (n	n) 0.900	D
Name Area Tof E Cover Diametar Easting Northing Depth N1 0.095 2.00 106.000 450 376608.732 443528.752 1.125 N2 0.289 2.00 100.3070 1200 376554.656 443578.580 1.125 N3 0.260 2.00 101.300 1200 376554.656 443578.580 1.125 N3 0.260 2.00 99.800 1 376536.610 443595.076 1.275 EX PC2 0.032 2.00 99.800 100 376530.114 443588.168 1.305 EX MH 98.640 1200 37651.1857 443571.364 1.275 1.001 N1 N2 35.672 0.600 104.875 102.575 2.300 15.5 225 2.43 50.0 1.001 N1 N2 35.672 0.600 102.575 1.003 16.3 225 2.44 50.0 1.004 N4 F24 94.83 0.600 96.257 1.100 1.63 <td< td=""><td>The</td><td>ne of En</td><td>trv (mi</td><td>ns) 3</td><td>2.00</td><td></td><td></td><td>Enf</td><td>orce l</td><td>best prac</td><td>tice de</td><td>sign rule</td><td>u v ≥s √</td><td></td></td<>	The	ne of En	trv (mi	ns) 3	2.00			Enf	orce l	best prac	tice de	sign rule	u v ≥s √	
Name Area T of E Cover (m) Diameter (mn) Easting (mn) Northing Depth (m) N1 0.095 2.00 105.000 450 376608.732 443528.752 1.125 N2 0.289 2.00 103.700 1200 376582.456 443578.580 1.25 N3 0.260 2.00 103.700 1200 376534.650 443578.580 1.25 N4 0.032 2.00 99.800 1200 376534.656 443578.580 1.25 N4 0.032 2.00 99.800 1200 376530.114 443589.076 1.275 FC2 0.025 2.00 99.800 1200 376511.857 443571.364 1.275 1.001 N N 35.672 0.600 102.575 1.001 1.8 225 2.37 50.0 1.002 N2 N3 37.680 0.600 102.575 1.500 16.3 225 2.49 50.0 1.002	Brooker				1999 - 1997 -		N	odes					ust 5575	
(ha) (mins) Lavel (mm) (m) (m) (m) N1 0.095 2.00 106.000 450 376608.732 443528.752 1.125 N2 0.289 2.00 101.300 1200 376582.499 443528.752 1.125 N3 0.260 2.00 101.300 1200 376536.610 443578.580 1.125 N4 0.032 2.00 99.800 1200 376536.610 443578.580 1.125 RC2 0.025 2.00 99.800 1200 376530.114 443588.168 1.305 EX.MH 98.640 1200 375511.857 443571.364 1.275 1.001 N1 N2 35.672 0.600 104.875 102.75 1.001 15.8 225 2.48 50.0 1.002 N3 N4 24.49 0.600 102.575 1.500 15.3 225 2.49 50.0 1.005 FC2 EX.MH 24.813		Na	me	Area	Tof	E Cove	r Dia	meter	Ea	sting	Nort	hing	Depth	
N1 0.095 2.00 103.700 1200 376508.732 443528.752 1.125 N3 0.260 2.00 103.700 1200 376582.499 443528.752 1.125 N4 0.032 2.00 99.800 1 376536.610 443595.7076 1.275 FC2 0.022 2.00 99.800 1200 376530.114 443595.7076 1.275 FC2 0.032 2.00 99.800 1200 376530.114 443595.7076 1.275 FC2 0.025 2.00 99.800 1020 376530.114 443591.364 1.275 Node Node fm) n (m) (m) (m) (u) 1.4 443591.364 1.275 1.001 N1 N2 37.657 0.001 10.487 fm) (u) fm) (mm) (mm) (mm/n) 1.001 N1 N2 37.657 0.001 102.575 2.001 15.8 225 2.49 50.0 1.001 N1 N2 37.655 1.030 36.51				(ha)	(min	s) Leve	n) le	nm)	((m)	(n	n}	(m)	
N2 0.289 2.00 100.000 1200 376552.49 44355.292 1.125 N3 0.260 2.00 99.800 1 376536.456 44355.2925 1.125 N4 0.032 2.00 99.800 1 376530.14 443557.076 1.275 FC2 0.025 2.00 99.800 1200 376530.14 4435571.364 1.275 EX.MH 98.640 1200 37651.1857 443571.364 1.275 Links Node (m) n (m)		B11		0.005	2.0	(m) 105.0	00	450	3755	NS 727	44257	8 757	1 175	
N3 0.260 2.00 101.300 1200 376554.656 443578.580 1.125 N4 0.032 2.00 99.800 1 376536.610 4435978.576 1.275 FC2 0.025 2.00 99.800 1200 376536.610 443598.168 1.305 EX.MH 95.640 1200 376536.610 443578.3075 1.275 Name US D5 Length Is (mm) (m) (N2		0.289	2.0	0 103.7	00	1200	3765	82,499	44355	2.925	1.125	
N4 0.032 2.00 99.800 1 376536.610 443558.765 1.275 FC2 0.025 2.00 99.800 1200 376530.114 443558.168 1.305 EX.MH 98.640 1200 376531.857 443571.364 1.275 Link Name US D5 Length ks (mm) / (m) (m) <td></td> <td>N3</td> <td></td> <td>0.260</td> <td>2.0</td> <td>0 101.3</td> <td>00</td> <td>1200</td> <td>3765</td> <td>54.656</td> <td>44357</td> <td>8.580</td> <td>1.125</td> <td></td>		N3		0.260	2.0	0 101.3	00	1200	3765	54.656	44357	8.580	1.125	
FCZ 0.025 2.00 99.800 1200 376530.114 443588.168 1.305 EX.M.H 98.640 1200 376531.857 443571.364 1.275 Links Name US DS Length ks (mm) / (m) US IL DS IL Fail Slope Dia Tof C Rain (mm/hr) 1.001 N1 N2 35.672 0.600 104.875 102.575 2.300 15.5 225 2.43 50.0 1.002 N2 N3 37.680 0.600 100.175 98.675 1.500 16.3 225 2.37 50.0 1.003 N3 N4 24.449 0.600 100.175 98.675 1.500 16.3 225 2.37 50.0 1.004 N4 FC2 PA33 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 1.001 3.339 132.8 12.9 0.900 0.900 0.395 0.0 1.003 1.001 1.002 3.311 131.6 52.0 0.9		N4		0.032	2.0	99.8	00	1	3765	36.610	44359	5.076	1.275	
Link Biolo Link Disk Disk Fail Slope Dia Tof C Rain Node Node (m) n (m) <		FC2	2 I MH	0.025	2.0	N 99.8	00 40	1200	3765	30,114	44358	8.168	1,305	
Name US DS Length Iss (mm) / (m) US IL (m) DS IL (m) Fail Slope (m) Dia (m) Tof C (m) Rain (mm/hr) 1.001 N1 N2 35.672 0.600 104.875 102.575 2.300 15.5 225 2.13 50.0 1.002 N2 N3 37.850 0.600 102.575 1.500 16.3 225 2.43 50.0 1.003 N3 N4 24.449 0.600 98.525 98.495 0.303 316.1 375 2.65 50.0 1.004 N4 FC2 9.483 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 1.001 3.339 132.8 12.9 0.900 0.900 0.395 0.0 1.003 1.001 3.339 132.8 12.9 0.900 0.390 0.676 0.0 1.003 1.001 3.111 131.6 52.0 0.900 0.390 0.676 0.0 </td <td></td> <td>EA</td> <td></td> <td></td> <td></td> <td>JO.0</td> <td></td> <td></td> <td>3703</td> <td></td> <td></td> <td>1.001</td> <td>A16/ J</td> <td></td>		EA				JO.0			3703			1.001	A16/ J	
Node Node (m) (m)<	Name	116	N	1		ke (mana) /	LIE 14	<u>111KS</u>	2.00	[all	Class	Die	Tel	• Dala
1.001 N1 N2 35.772 0.600 104.875 102.575 2.300 15.5 225 2.18 50.0 1.002 N2 N3 37.860 0.600 102.575 100.175 2.400 15.8 225 2.37 50.0 1.003 N3 N4 24.449 0.600 100.175 98.675 1.500 16.3 225 2.49 50.0 1.004 N4 FC2 9.483 0.600 98.525 98.495 0.030 316.1 375 2.65 50.0 1.005 FC2 EXMH 24.813 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 1.001 3.339 132.8 12.9 0.900 0.900 0.394 0.0 10.03 3.257 12.95 87.3 0.900 0.394 0.0 1.00 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Indix Length Slope Dia Link US CL US IL US Depth 0.900	RAIIIE	Node	Node	lien (r	vsori i n)	n n	(m)	- D3 (1	n)	(m)	(1:X)	(mm)) (mins	, nain) (mm/hr)
1.002 N2 N3 37.860 0.600 102.575 100.175 2.400 15.8 225 2.37 50.0 1.003 N3 N4 24.449 0.600 100.175 98.675 1.500 16.3 225 2.49 50.0 1.004 N4 FC2 9.483 0.600 98.525 98.495 0.030 316.1 375 2.65 50.0 1.005 FC2 EX.MH 24.813 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 1.001 3.339 132.8 12.9 0.900 0.900 0.035 0.0 1.002 3.311 131.6 52.0 0.900 0.900 0.644 0.0 1.001 1.004 1.013 111.9 91.6 0.900 0.930 0.676 0.0 1.002 3.11 131.6 52.0 0.701 0.0 1.001 1.002 3.11 131.6 52.0 0.900 0.676 0.0 1.002 1.001 1.002 1.005 2.158 38.1 95.0 1.155 </td <td>1.001</td> <td>N1</td> <td>N2</td> <td>35.</td> <td>672</td> <td>0.600</td> <td>104.87</td> <td>5 102</td> <td>.575</td> <td>2.300</td> <td>15.5</td> <td>225</td> <td>2.18</td> <td>3 50.0</td>	1.001	N1	N2	35.	672	0.600	104.87	5 102	.575	2.300	15.5	225	2.18	3 50.0
1.003 N3 N4 24.449 0.600 100.175 98.675 1.500 16.3 225 2.49 50.0 1.004 N4 FC2 9.483 0.600 98.525 98.495 0.030 316.1 375 2.65 50.0 1.005 FC2 EX.MH 24.813 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 1.005 FC2 EX.MH 24.813 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 1.001 3.339 132.8 12.9 0.900 0.900 0.095 0.0 1.001 3.339 132.8 12.9 0.900 0.900 0.644 0.0 1.003 3.257 129.5 87.3 0.900 0.900 0.644 0.0 1.004 1.013 111.9 91.6 0.900 0.644 0.0 1.002 2.158 38.1 95.0 1.155 1.125 0.701 0.0 1.001 35.672 15.8 225 Circular 106.000	1.002	N2	N3	37.	860	0.600	102.57	5 100	.175	2.400	15.8	225	5 2.37	7 50.0
1.004 N4 FC2 9.483 0.600 98.525 98.495 0.030 316.1 37.5 2.65 50.0 1.005 FC2 EX.MH 24.813 0.600 98.495 97.365 1.130 22.0 150 2.84 50.0 Name Vel Cap Flow US DS E Area E Add 50.0 1.001 3.339 132.8 12.9 0.900 0.900 0.095 0.0 1.002 3.311 131.6 52.0 0.900 0.384 0.0 1.003 3.257 129.5 87.3 0.900 0.900 0.6644 0.0 1.005 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Ink Length Slope Dia Link US CL US IL US Depth DS CL DS IL DS Depth (m)	1.003	N3	N4	24.	449	0.600	100.17	5 98	.675	1.500	16.3	225	2.49	50.0
Name Vel Cap (m/s) Even US DS X Area X Add	1.004	FC2	FUZ EX MH	9. 24	483 813	0.600	98.52 98.49	-> 98 5 97	.365	1.130	316.1 22 N	375	2.55 2.92	50.0 50.0
Name Vel Cap Flow US DS E Area E Add (na) E Add Inflow (n) 1.001 3.339 132.8 12.9 0.900 0.900 0.095 0.0 1.002 3.311 131.6 52.0 0.900 0.900 0.6644 0.0 1.003 3.257 129.5 87.3 0.900 0.900 0.676 0.0 1.004 1.013 111.9 91.6 0.900 0.930 0.676 0.0 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Initial Initia	2.000			. m ⁻ Tr	or and the		Sector and the		1999	and all we we have	and the to W			
(m/s) {l/s} (l/s) Depth Depth (ha) Inflow (m) (m) (m) (m) (l/s) 1.004 3.339 132.8 12.9 0.900 0.900 0.095 0.0 1.002 3.311 131.6 52.0 0.900 0.900 0.644 0.0 1.003 3.257 129.5 87.3 0.900 0.900 0.644 0.0 1.004 1.013 111.9 91.6 0.900 0.930 0.676 0.0 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Pipeline Schedule Link Length Slope Dia Link US CL US IL US Depth DS CL DS IL DS Depth 1.001 35.672 15.5 225 Circular 106.000 104.875 0.900 103.700 102.575 0.900 1.002 37.860 15.8 225 Circular 103.700 102.575 0.900 10.300 100.175 0.900 <td< td=""><td></td><td></td><td></td><td>Name</td><td>Vel</td><td>Сар</td><td>Flow</td><td>US</td><td>D</td><td>ς ΣΑ</td><td>rea 2</td><td>Add</td><td></td><td></td></td<>				Name	Vel	Сар	Flow	US	D	ς ΣΑ	rea 2	Add		
(m) (m) (m) (V*) 1.001 3.339 132.8 12.9 0.900 0.900 0.095 0.0 1.002 3.311 131.6 52.0 0.900 0.900 0.384 0.0 1.003 3.257 129.5 87.3 0.900 0.900 0.644 0.0 1.004 1.013 111.9 91.6 0.900 0.930 0.676 0.0 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Elpeline Schedule Link Length Slope Dla Link US CL US IL US Depth DS CL DS IL DS Depth (m) (1:2X) (mm) Type (m)					(m/s	s) {I/s}	(l/s)	Depth	Dep	oth (h	a) li	nflow (1/c)		
Link US Dia Link Dia Link Dia Link Dia Dia Link US Dia Link US Cl DS Dia Dia Dia Link US Cl DS Cl DS IL DS Dia Dia Link US Cl US DS Dia Dia Link US Cl US DS Cl DS IL DS Dia Dia Link US Cl US Dia Dia Link US Cl US Dia Dia Dia Us Cl US Dia Dia Dia Us Cl US Dia Dia Dia Dia Dia Us Dia Us Dia				1.001	3.33	9 132.8	12.9	0.900	(n 0.9	10 100 00	095	0.0		
1.003 3.257 129.5 87.3 0.900 0.900 0.644 0.0 1.004 1.013 111.9 91.6 0.900 0.930 0.676 0.0 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Pipeline Schedule Link Length (m) Slope (1:3X) Dia (mm) Link US CL (m) US IL (m) US Depth (m) DS CL (m) DS IL (m) DS Depth (m) OS CL (m) DS IL (m) OS Depth (m) OS CL (m) DS IL (m) DS Depth (m) OS CL (m) DS IL (m) DS Depth (m) OS CL (m) DS IL (m) DS Depth (m) OS OD 102.575 0.900 102.575 0.900 1.001 35.672 15.8 225 Circular 103.700 102.575 0.900 103.300 100.175 0.900 103.300 100.175 0.900 103.675 0.900 103.675 0.900 103.675 0.900 103.675 0.900 103.675 0.900 103.675 0.900 103.675 0.930 1.004 9.483 316.1 375<				1.002	3.31	1 131.6	52.0	0.900	0.9	00 0.3	384	0.0		
1.004 1.013 111.9 91.6 0.900 0.930 0.676 0.0 1.005 2.158 38.1 95.0 1.155 1.125 0.701 0.0 Pipeline Schedule Link Length Slope Dia Link US CL US IL US Depth DS CL DS IL DS Depth (m) (1:X) (mm) Type (m) <				1.003	3.25	7 129.5	87.3	0.900	0.9	00 0.	644	0.0		
Link Length Slope Dia Link US CL US IL US Depth DS CL DS IL DS Depth 1.001 35.672 15.5 225 Circular 106.000 104.875 0.900 103.700 102.575 0.900 1.002 37.860 15.8 225 Circular 106.000 104.875 0.900 101.300 100.175 0.900 1.003 24.449 16.3 225 Circular 101.300 100.175 0.900 98.675 0.900 1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.495 0.930 1.004 Node (mm) Type Type Node (mm) Type Type 1.001 N1 450 Manhole Adoptable N2 1200 Manhole Adoptable Nahole Adoptable Nahole Adoptable Nahole Adoptable Nahole Adoptable Nahole Adoptable Manhole Adoptable Manhole Adoptable Manhole Adoptabl				1.004	1.01	3 111.9	91.6	0.900	0.9	30 0.0	576 701	0.0		
Link Length Slope Dia Link US CL US IL US Depth DS CL DS IL DS Depth 1.001 35.672 15.5 225 Circular 106.000 104.875 0.900 103.700 102.575 0.900 1.002 37.860 15.8 225 Circular 103.700 102.575 0.900 101.300 100.175 0.900 1.003 24.449 16.3 225 Circular 101.300 100.175 0.900 98.675 0.900 1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.495 0.930 1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.495 0.930 1.004 Node (mm) Type Node (mm) Type Type Node MH 1.001 N1 450 Manhole Adoptable N2 120				1.005	2.15	o 58,1	95.0	1.122	1.1 1	23 U.	101	0.0		
Link Length Slope Dia Link US CL US IL US Depth DS CL DS IL DS Depth (m) (1:X) (mm) Type (m) 0.900 101.300 100.175 0.900 101.300 100.175 0.900 103.700 102.575 0.900 103.675 0.900 103.675 0.900 103.675 0.900 103.675 0.900 10.01.75 0.900 10.01.75 0.900 10.02 1.002 Na Nade MH DS Dia Node		6 <u>9</u> 5 282		12		1 20020	Pipeline	<u>schedi</u>			<u>.</u>	-		10000000 ADV
Unit	Link	Length	Slop	ne [n	uw <i>j</i> Na	Link	US CL	USI	L	US Depth (m)	DS //	a N	DS IL (m)	US Depth
1.002 37.860 15.8 225 Circular 103.700 102.575 0.900 101.300 100.175 0.900 1.003 24.449 16.3 225 Circular 101.300 100.175 0.900 99.800 98.675 0.900 1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.675 0.900 1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.495 0.930 Link US Dia Node MH DS Dia Node MH 1.001 N1 450 Manhole Adoptable N2 1200 Manhole Adoptable 1.002 N2 1200 Manhole Adoptable N3 1200 Manhole Adoptable 1.003 N3 1200 Manhole Adoptable N4 1 Manhole Adoptable 1.004 N4 1 Manhole Adoptable 502 1300 Manhole Ad	1.001	35.672	15	այու .5	225 (Circular	105.000	104.8	75	0.900	103.	. 700 1	102.575	0.900
1.003 24.449 16.3 225 Circular 101.300 100.175 0.900 99.800 98.675 0.900 1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.495 0.930 Link US Dia Node MH DS Dia Node MH Node (mm) Type Type Node (mm) Type Type 1.001 N1 450 Manhole Adoptable N2 1200 Manhole Adoptable 1.002 N2 1200 Manhole Adoptable N3 1200 Manhole Adoptable 1.003 N3 1200 Manhole Adoptable N4 1 Manhole Adoptable 1.004 N4 1 Manhole Adoptable 502 1300 Manhole Adoptable	1.002	37.860	15	.8	225 (Circular	103.700	102.5	75	0.900	101.	.300 1	LOO.175	0.900
1.004 9.483 316.1 375 Circular 99.800 98.525 0.900 99.800 98.495 0.930 Link US Dia Node MH DS Dia Node MH Node (mm) Type Type Node (mm) Type Type 1,001 N1 450 Manhole Adoptable N2 1200 Manhole Adoptable 1,002 N2 1200 Manhole Adoptable N3 1200 Manhole Adoptable 1,003 N3 1200 Manhole Adoptable N4 1 Manhole Adoptable 1,004 N4 1 Manhole Adoptable 502 1200 Manhole Adoptable	1.003	24.449	16	.3	225	Circular	101.300	100.1	75	0.900	99.	800	98.675	0.900
LinkUSDiaNodeMHDSDiaNodeMHNode(mm)TypaTypaTypaNode(mm)TypaTypa1.001N1450ManholeAdoptableN21200ManholeAdoptable1.002N21200ManholeAdoptableN31200ManholeAdoptable1.003N31200ManholeAdoptableN41ManholeAdoptable1.004N41ManholeAdoptable5021200ManholeAdoptable	1.004	9.483	316	.1	375 (Circular	99.800	98.5	25	0.900	99.	800	98.495	0.930
Node(mm)TypeTypeNode(mm)TypeType1.001N1450ManholeAdoptableN21200ManholeAdoptable1.002N21200ManholeAdoptableN31200ManholeAdoptable1.003N31200ManholeAdoptableN41ManholeAdoptable1.004N41ManholeAdoptableEC21200ManholeAdoptable		Uni	i L	IS	Dia	Node	Mł	ł	DS	Dia	Nod	e	MH	
1.001 N1 450 Manhole Adoptable N2 1200 Manhole Adoptable 1.002 N2 1200 Manhole Adoptable N3 1200 Manhole Adoptable 1.003 N3 1200 Manhole Adoptable N4 1 Manhole Adoptable 1.004 N4 1 Manhole Adoptable 502 1200 Manhole Adoptable		4.00	No.	xde (mm)	Type	Тур	e P	lode	(mm)	Тур	e ala é	Type	
1.003 N3 1200 Manhole Adoptable N4 1 Manhole Adoptable 1.004 N4 1 Manhole Adoptable FC3 1200 Manhole Adoptable		1.00	1 N] 7 N2		450 1200	Manhole	Adopt	able M	12 13	1200	Manh	ole Al	dontable	
1004 NA 1 Manhale Adaptable EC2 1200 Manhala Adaptable		2.00	- 114 2 N/2	r E	1200	Manhole	Adopt	able M	4	1	Manh	ole A	doptable	
TOTA ILA T MELLIOIE MUDIENIE LET TTO MELLIOIE MUDIEDIE		1.00	5 Ma	Q		the second se	and the second se							

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			P	Pipeline S	<u>chedule</u>					
Link 1.005	Length (m) 5 24.813	Slope Dia (1:X) (mm) 22.0 150	Link Type Circular	US CL (m) 99.800	US IL (m) 98.495	US Depth (m) 1.155	DS CL (m) 98.640	DS (m) 97.3	IL DS D) (n 65 1	epth 1) .125
	Link (N 1.005 FC	US Dia ode (mm) C2 1200 P	Noda Type Manhole	MH Type Adoptabl	DS Node EX Mi	Dia e (mm) H 1200	Node Type Manhole	T Ado	MH Ype optable	
			N	Aanhole S	<u>ichedule</u>					
Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connectio	ons L	ínk	IL (m)	Dia (mm)
N1	376608.732	443528.752	106.000	1.125	450	°*0				
N2	376587 499	443552 925	103 700	1 1 2 5	1200		0 1.	001	104.875	225
1.1.1.1.						°Q		••		
NO	276554 656		101 200	1 1 2 5	1200	1	0 1.	002	102.575	225
NJ	370334.030	9 443376.36U	101.300	1,125	1200	°Q	1 1.	002	100.175	~223
							0 1.	003	100.175	225
N4	376536.610) 443595.076	99.800	1.275	1	R	1 1.	003	98.675	225
FC2	376530.114	443588.168	99.800	1.305	1200	ø	1 1.	004	98.495	375
r V a at l	120514-052	443574 364	00.040	4 075	1200	0	0 1.	005	98.495	150
	570511.857		30.040	1.275	1200	Q		005	37,303	J.J.
			S	mulation	Settings					
	Rainfall	Methodology FSR Region M5-60 (mm) Ratlo-R Summer CV Winter CV	FSR England ar 20.000 0.200 0.750 0.840	nd Wales	Dr Addi Ch Ch	Analy Skip Ste aln Down Th Itional Storag neck Discharg eck Discharg	rsis Speed ady State me (mins) ge (m∛ha) ge Rate(s) ge Volume	No X 240 0.0 X X	rmal D)	
15	30 0	50 120	180 2	Storm Du 240 3	i rations 360 4	80 600	720	9	60 14	40
		Return Period (years)	Climate Cl (CC %	hange /	Additiona (A %	l Area Ado)	litional Flo (Q %)	w		
		2		0		0		0		
		30 100		40		0		0		
		trigonos Afril		Planarasa.		1.3740		0000055		
	F	low v9 0 Copyri	oht @ 1988	-7070 (-2		oftware Solu	tions Limi	ted		

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	Noc	ie FC2 Online Hyd	ro-Brake® Con	trol		
F Replaces Downstr Invert Design D Design	lap Valve x ream Link √ Level (m) 98.49 Depth (m) 1.000 Flow (1/s) 5.0	5 Pr Min Outle Min Node I	Objective Sump Available oduct Number t Diameter (m) Diameter (mm)	(HE) Minimise ✓ CTL-SHE-0115- 0.150 1200	upstream st -6000-1000-	orage 6000
	Na	de N3 Online Hyd	ro-Brake ^e Cont	trol		
Fi Replaces Downstry Invert I Design D Design F	ap Valve x eam Link √ Level (m) 100.1 epth (m) 1.000 Flow (l/s) 5.5	75 P Min Outle Mín Node	Objective Sump Available roduct Number t Dlameter (mm Dlameter (mm	e (HE) Minimise e √ r CTL-SHE-0110 } 0.150) 1200	e upstream s -5500-1000	torage -5500
	No	de N2 Online Hyd	ro-Brake® Cont	trol		
F Replaces Downstry Invert I Design D Design F	ap Valve x eam Link √ Level (m) 102.53 epth (m) 1.000 Flow (l/s) 8.0	75 P Min Outle Min Node	Objective Sump Available roduct Numbe et Diameter (mm Diameter (mm)	e (HE) Minimise e √ r CTL-SHE-0132) 0.150) 1200	e upstream s -8000-1000	torage -8000
	Noc	ie N2 Depth/Area	Storage Struct	<u>ture</u>		
Base Inf Coefficien Side Inf Coefficien	t (m/hr) 0.0000 t (m/hr) 0.0000	0 Safety Facto 0 Porosit	or 2.0 Ty 0.95 T	Invert L Fime to half empt	evel (m) 1 y (mins)	02.575
Depth (m) 0.000 :	Area Inf Area (m²) (m²) 324.0 0.0	Depth Area (m) (m²) 0.800 324.0	Inf Area (m²)) 0.0	Depth Area (m) (m²) 0.801 0.0	inf Area (m²) 0.0	
	Not	ie N3 Depth/Area	Storage Struct	ture		
Base Inf Coefficien Side Inf Coefficien	t (m/hr) 0.0000 t (m/hr) 0.0000	0 Safety Facto 0 Porosi	or 2.0 εγ 0.95 Τ	Invert L Ime to half empt	evel (m) 1 y (mins)	00.175
Depth (m) 0.000	Area Inf Area (m²) (m²) 756.5 0.0	Depth Area (m) (m ²) 0.800 756.5	Inf Area (m²) 5 0.0	Depth Area (m) (m²) 0.801 0.0	Inf Area (m²) 0.0	
	Noc	le N4 Depth/Area	Storage Struct	ture		
Base Inf Coefficier Side Inf Coefficier	it (m/hr) 0.0000 it (m/hr) 0.0000	00 Safety Fact 00 Porosi	or 2.0 ity 0.95	invert i Time to half emp	Level (m) S ty (mins)	98.525
Depth (m) 0.000	Area Inf Area (m²) (m²) 72.0 0.0	Depth Area (m) (m²) 0.800 72.0	inf Area (m²) 0.0	Depth Area (m) (m²) 0.801 0.0	inf Area (m²) 0.0	

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File: 10301 SW - network northPage 4Network: Storm NetworkSarah Dop18/03/202018/03/2020

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	N1	8	104.939	0.063	18.3	0.0101	0.0000	OK
240 minute winter	N2	164	102.748	0.173	17.4	53.3716	0.0000	OK
1440 minute winter	N3	1020	100.382	0.207	10.2	148.7618	0.0000	OK
1440 minute winter	N4	990	98.688	0.163	5.7	11.1167	0.0000	OK
1440 minute winter	FC2	990	98.687	0.192	5.8	0.2173	0.0000	SURCHARGED
15 minute summer	EX MH	1	97.365	0.000	2.7	0.0000	0.0000	OK

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Outflow)	Node		Node	(l/s)	(m/s)		Vol (m ^s)	Vol (m³)
15 minute summer	N1	1.001	N2	18.7	3.015	0.141	0.2487	
240 minute winter	N2	Hydro-Brake®	N3	7.6				
1440 minute winter	N3	Hydro-Brake®	N4	5.4				
1440 minute winter	N4	1.004	FC2	5.7	0.229	0.051	0.4863	
1440 minute winter	FC2	Hydro-Brake®	EX MH	5.8				351.6

Reid	Jones	Partnership
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CAUSEWAY

File: 10301 SW - network north Network: Storm Network Sarah Dop 18/03/2020

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	inflow (i/s)	Node Vol (m³)	Flood (m³)	Sta	itus
15 minute summer	N1	8	104.960	0.085	34.5	0.0136	0.0000) OK	
360 minute winter	N2	264	102.932	0.357	24.2	110.3133	0.0000	SURCH	IARGED
1440 minute winter	· N3	1140	100.569	0.394	14.4	283.8755	0.0000	SURCH	IARGED
960 minute winter	N4	735	98.847	0.322	6.5	22.0186	0.0000	ок	
960 minute winter	FC2	735	98.847	0.352	6.0	0.3979	0.0000	SURCH	IARGED
15 minute summer	EX MH	1	97.365	0.000	4.0	0.0000	0.0000	OK OK	
Link Event (Outflow)	US Node	Unk	DS Node	Outflo (I/s)	w Vel (n	ocity Flow n/s)	v/Cap	Link Vol (m³)	Discharge Vol (m³)

(Outflow)	Node		Node	(l/s)	(m/s)		Vol (m³)	Vol (m ^s)
15 minute summer	N1	1.001	N2	35.0	3.200	0.264	0.4627	
360 minute summer	N2	Hydro-Brake®	N3	8.0				
480 minute winter	N3	Hydro-Brake®	N4	5.5				
600 minute winter	N4	1.004	FC2	6.0	0.179	0.053	0.9166	
1440 minute summer	FC2	Hydro-Brake*	EX MH	6.0				413.1

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	inflow (i/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	N1	8	104.989	0.114	62.1	0.0182	0.0000	OK
480 minute winter	N2	368	103.623	1.048	35.5	247.5792	0.0000	FLOOD RISK
1440 minute winter	N3	1560	100.970	0.795	19.4	572.2593	0.0000	SURCHARGED
720 minute winter	N4	690	99.385	0.860	7.8	54.7542	0.0000	SURCHARGED
720 minute winter	FC2	690	99.383	0.888	6.1	1.0049	0.0000	SURCHARGED
15 minute summer	EX MH	1	97.365	0.000	5.6	0.0000	0.0000	OK

Link Event	US	Link	DS	Outflow	Velocity	Flow/Cap	Link	Discharge
(Outflow)	Node		Node	(l/s)	(m/s)		Vol (m³)	Vol (m³)
15 minute summer	N1	1.001	N2	62.2	3.303	0.468	0.8446	
480 minute winter	N2	Hydro-Brake®	N3	8.2				
120 minute winter	N3	Hydro-Brake®	N4	5.5				
15 minute summer	N4	1.004	FC2	-10.8	-0.500	-0.097	0.3501	
60 minute winter	FC2	Hydro-Brake®	EX MH	6.0				100.6