Welsh Ambulance Service Trust

WAST AFSRC

Proposed Drainage Strategy

14-9227 P030-ARU-RP-ARC-C011

Issue 2 | 26 August 2014

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 213833

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ARUP

Document Verification

ARUP

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Document title		Proposed Drainage Strategy			**File reference** 4-50
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Revision	**Date**	**Filename**	Proposed Drainage Strategy - Issue.docx		
Issue	18 Jun 2014	**Description**	Issue for planning		
			Prepared by	Checked by	Approved by
		Name	David Leak	Poorav Chheda	Kambiz Ayoubkhani
		Signature			
Issue 2	26 Aug 2014	**Filename**	Proposed Drainage Strategy - Issue.docx		
		Description	Reissued to Natural Resources Wales with Revised Drainage Layout		
			Prepared by	Checked by	Approved by
		Name	David Leak	Poorav Chheda	Kambiz Ayoubkhani
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
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		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

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1 Introduction

Arup has been commissioned by the Welsh Ambulance Service Trust (WAST) to provide engineering services for the proposed Ambulance and Fire Service Resource Centre (AFSRC) in Wrexham. It is understood that the proposed development is intended to replace the existing fire station at Bradley Road and the existing ambulance station at Chirk in Wrexham.

This report describes the proposed drainage strategy for the development.

2 The Site

The site is an area of grassed undeveloped land immediately south of the Wrexham Maelor Hospital and is located at approximate National Grid Reference SJ 320 502.

The site is bound by a car park associated with the hospital to the north, the River Gwenfro to the east and the south, and Croesnewydd Road to the west which provides access to the site.

The site has natural watershed from north east to south west. The elevation across the site varies from approximately 93m AOD in the north east to approximately 88m AOD in the south west. The site is an area of greenfield comprising of rough grass and scrub. There are a number of trees within the site boundary, typically along the site perimeter.

3 Proposed Development

It is proposed to redevelop the site as a combined facility consisting of an Ambulance Resource Centre for WAST and a multi-bay Fire Station for the North Wales Fire Rescue Service (NWFRS).

The development will include an ambulance and fire station which can accommodate up to eight fire vehicles and six ambulances, as well as a cleaning and maintenance area which can accommodate another nine vehicles. In addition, the facility will consist of temporary accommodation, rest rooms, administration offices, staff car park, vehicle wash and refuelling area, and a training area to simulate road traffic collisions situations.

4 Storm Drainage

4.1 Existing Network

There is no existing storm drainage within the site. Storm water runoff generated by the site either infiltrates into the ground or drains into the Afon Gwenfro.

4.2 Proposed Strategy

The proposed storm drainage strategy for the site is shown on the drawing P030-ARU-C-A00-BG-GA-100 included in Appendix A.

The storm water drainage from the proposed development will be discharged to the Afon Gwenfro to the south at a restricted discharge rate at two locations.

Natural Resources Wales (NRW), previously the Environment Agency Wales, has agreed that the storm water discharge rate from the proposed development should be restricted to the equivalent Greenfield Runoff Rate (GRR) for the storm return period (see correspondence included in Appendix A). Typically, this involves restricting the runoff from the 1 in 1 year storm event to the 1 in 1 year GRR, the 1 in 30 year storm event to the 1 in 30 year GRR and the 1 in 100 year storm event (including 30% allowance for climate change) to the 1 in 100 year GRR. The estimated GRR and the maximum allowable discharge for the various return periods are shown in Table 1 below.

Table 1 – Summary of Estimated Greenfield Runoff Rates and Maximum Allowable Discharge

Storm Return Period	Greenfield Runoff Rate (litres/second/hectare)	Maximum Discharge Outfall 1 (litres/second)	Maximum Discharge Outfall 2 (litres/second)
1 in 1 year	4.8	7.8	0.7
1 in 30 year	9.6	15.6	1.5
1 in 100 year	11.9	19.3	1.8

In order to allow for different discharge rates for different storm events, storm water flows from the proposed development will be attenuated.

For Outfall 1 this will be done using a flow control device consisting of a dual orifice plates. The orifice plates will be 80mm and 70mm in diameter. Two storage tanks accommodate the attenuated storm water runoff with a combined total storage volume of 810m³.

For Outfall 2 this will be done using a flow device consisting of a vortex control chamber. A storage tank will accommodate the attenuated storm water runoff with a storage volume of 90m³.

The proposed storm drainage network will be capable of accommodating storm events up to and including the 1 in 100 year return period with 30% allowance for climate change.

Storm water petrol interceptors are included within the design. These will be Type 1 bypass separators, in accordance with Environment Agency Pollution Prevention Guidelines PPG3.

Overland flow within the site has been considered. As flooding is contained within the drainage network for a 1 in 100 year return period storm event (including 30% allowance for climate change), a 15 minute duration 1 in 1000 year return period storm event with a summer profile was simulated to determine the overland flow routes. The result of this analysis indicates that during extreme events beyond the capacity of the proposed drainage network, storm water will collect in localised areas away from the buildings. The results of the overland flow route analysis are shown in Appendix B.

The storm manhole schedule (P030-ARU-C-A00-C-BG-SH-110) and the MicroDrainage calculations for the proposed storm drainage strategy are included in Appendix B.

5 Foul Drainage

5.1 Existing Network

A public combined sewer is located in the vicinity of the northern site boundary. This sewer is owned and maintained by Dwr Cymru Welsh Water (DCWW) and gravitates from west to east. A foul pumping station also exists to the east of the site. It is understood that this pumping station is also owned and maintained by DCWW and accepts flows from the developments to the south of the site.

5.2 Proposed Strategy

The proposed foul drainage strategy is shown on drawing P030-ARU-C-A00-BG-GA-100 included in Appendix A.

DCWW has confirmed that the foul sewage likely to be generated from the proposed development can be accommodated within the public combined sewer in the vicinity of the northern site boundary. Due to the topography of the site, the proposed foul drainage system will consists of two separate networks. The foul sewage from the development located in the western half of the site will be conveyed by gravity to the existing DCWW combined sewer, and the foul sewage from the development in the eastern half of the site will discharge by gravity to the same public combined sewer further downstream.

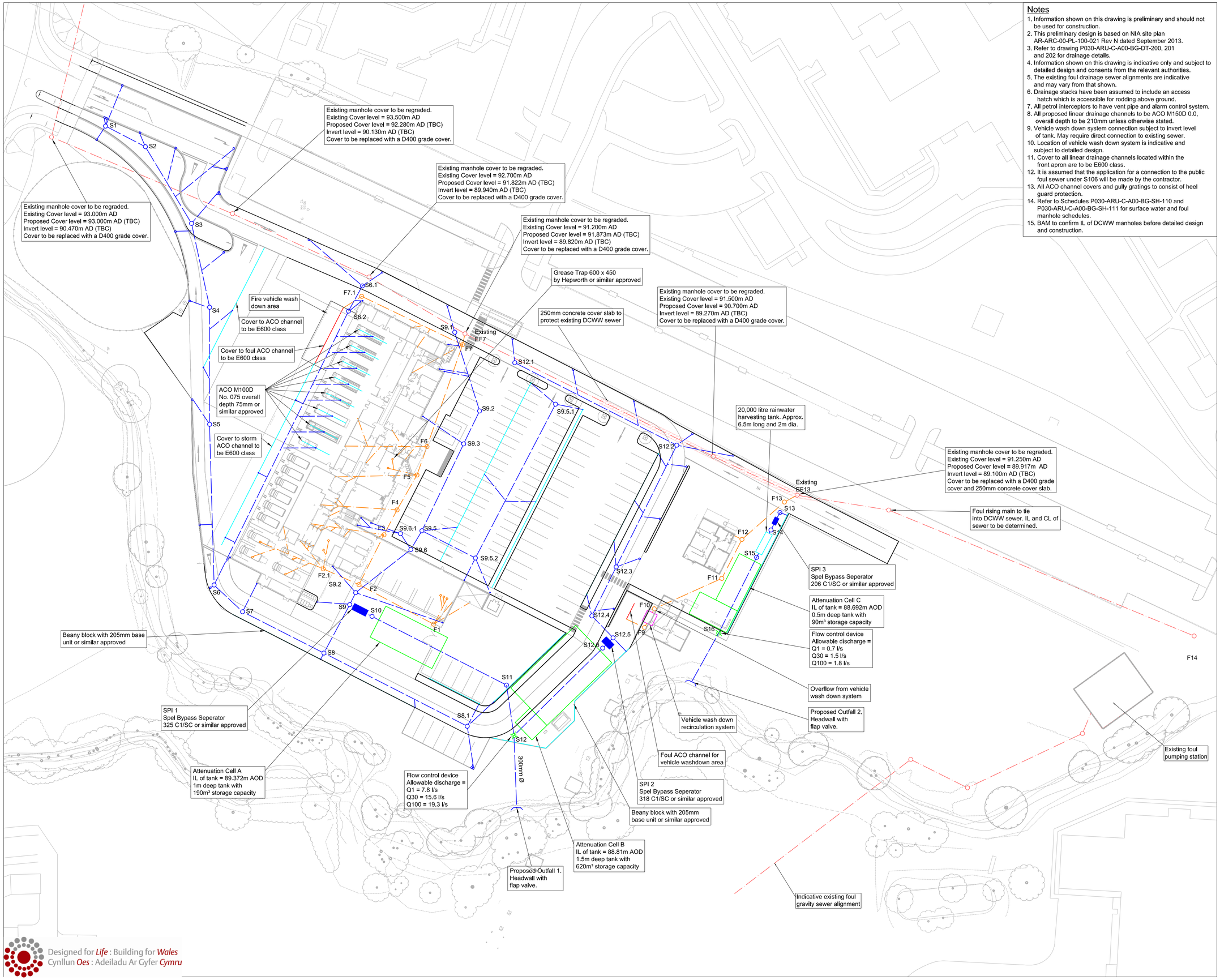
Calculations for the proposed foul drainage strategy, including the manhole schedule are included in Appendix C, along with a DCWW letter confirming that the public combined sewer on the northern site boundary has capacity for the foul flows from the site.

6 Ownership and Maintenance

The proposed storm and foul drainage systems, including the proposed foul pumping station, will be maintained and operated by the estates management team of WAST and NWFRS. The systems will be subjected to regular maintenance and inspection to allow them to operate efficiently minimise flood risk.

Appendix A

Storm Drainage Layout and Documents



Notes

1. Information shown on this drawing is preliminary and should not be used for construction.
2. This preliminary design is based on NIA site plan AR-ARC-00-PL-100-021 Rev N dated September 2013.
3. Refer to drawing P030-ARU-C-A00-BG-DT-200, 201 and 202 for drainage details.
4. Information shown on this drawing is indicative only and subject to detailed design and consents from the relevant authorities.
5. The existing foul drainage sewer alignments are indicative and may vary from that shown.
6. Drainage stacks have been assumed to include an access hatch which is accessible for rodding above ground.
7. All petrol interceptors to have vent pipe and alarm control system.
8. All proposed linear drainage channels to be ACO M150D 0.0, overall depth to be 210mm unless otherwise stated.
9. Vehicle wash down system connection subject to invert level of tank. May require direct connection to existing sewer.
10. Location of vehicle wash down system is indicative and subject to detailed design.
11. Cover to all linear drainage channels located within the front apron are to be E600 class.
12. It is assumed that the application for a connection to the public foul sewer under S106 will be made by the contractor.
13. All ACO channel covers and gully gratings to consist of heel guard protection.
14. Refer to Schedules P030-ARU-C-A00-BG-SH-110 and P030-ARU-C-A00-BG-SH-111 for surface water and foul manhole schedules.
15. BAM to confirm IL of DCWW manholes before detailed design and construction.

Legend

- Proposed foul sewer
- Proposed storm sewer
- Proposed foul manhole
- Proposed storm manhole
- Existing foul sewer
- Existing foul manhole
- Proposed road gully
- Proposed attenuation cell
- Proposed storm manhole with flow control device
- Proposed petrol interceptor
- Proposed outfall headwall
- Proposed storm linear drainage channel
- Proposed foul linear drainage channel
- Proposed foul and storm stack / sump locations
- Proposed rainwater harvesting tank
- Proposed kerb drainage
- Concrete slab

Mark	Date	Details	By	Rvd
T7	26/08/14	Pumping Station removed	DS	DL
T6	10/07/14	Updated junction layout for planning condition 38	DS	DL
T5	12/06/14	Amended for planning conditions	DL	PC
T4	16/01/14	Lower Car Park removed	DS	MOC
T3	04/10/13	Reissued with amended site layout	DO	MOC
T2	19/02/13	Reissued with new site layout	DL	MOC
T1	20/09/12	Issued for FBC	LW	MOC

REVISIONS

Trust:
Welsh Ambulance Services NHS Trust
North Wales Fire and Rescue Services

Supply Chain Partner:
bam

Project Title:
WAST AFSRC
Wrexham

Key Plan:

Scales: 1:500 for the Original Drawing Size: A1

Drn By: DS | Chkd By: PC | Passed By: GD | Date: APR '12

Drawing Status:
Preliminary

Drawing Originator:
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Drawing Title:
Proposed Drainage Layout

Job No:	Drawing No:	Revision:
213833	P030-ARU-C-A00-BG-GA-100	T7

Do NOT scale this drawing.
Refer to Architects for details of current building layouts

Designed for *Life* : Building for *Wales*
Cynllun *Oes* : Adeiladu Ar Gyfer *Cymru*

David Leak

From: Barry, Ruairi <ruairi.barry@environment-agency.wales.gov.uk>
Sent: 28 March 2012 09:23
To: Sion Williams
Cc: Hemsworth, Deborah
Subject: FW: WAST ARC: Greenfield Run-off Rate
Attachments: WinDES Calcs (Submitted to EA).pdf

Hi Sion,

Just a quick follow up e-mail. Would it be possible to provide me with a grid reference or location map of the site in question. We can then record this correspondance as a pre-app enquiry on our database allowing me or a colleague to retrive the agreed rates quickly (without the need to go through the exercise again) should a future planning application be submitted.

Regards

Ruairí

From: Barry, Ruairi
Sent: 26 March 2012 15:26
To: 'Sion Williams'
Subject: RE: WAST ARC: Greenfield Run-off Rate

Thanks Sion

Those figures are pretty much typical of what I would expect.

Regards

Ruairí

From: Sion Williams [mailto:sion.williams@arup.com]
Sent: 23 March 2012 14:35
To: Barry, Ruairi
Subject: WAST ARC: Greenfield Run-off Rate

Click here to report this email as spam.

Ruairi,

Thanks for the information below. We've reviewed the information and decided to use our own software to calculate the greenfield run-off rate. Please find attached a summary of our results.

If you have any comments on the attached then please let us know.

Regards,

Siôn

Siôn Williams
Engineer | Infrastructure

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From: Barry, Ruairi [mailto:ruairi.barry@environment-agency.wales.gov.uk]
Sent: 21 March 2012 12:30
To: Sion Williams
Subject: FW: http://www.uksuds.com/uksd/sudsguidancedocument.htm

Hi Sion,

As discussed.

I just remembered that there is now some guidance and tools relating to greenfield runoff on the above website (link provided above).

The second tool on the left (Greenfield Runoff Estimation Tool) is just what you are after. Unfortunately it doesn't appear to be working for me at the moment. Possibly due to our IT system? Perhaps you could try it and let me know if you have any joy. The only requirements needed are the site size and location. Note there are additional useful tools relating to estimating storage requirements etc.

The formula's and methodology behind the tools can be found within the SUDS Guidance (R&D Technical Report W5-074/A/TR/1 Revision E). This can be downloaded from the link on the right hand side of the website.

Regards

Ruairí

Ruairí Barry

Development & Flood Risk Engineer
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CH7 3AJ

Phone: 01244 894582
e-mail: Ruairi.Barry@environment-agency.gov.uk

From: Huws, Iwan
Sent: 21 March 2012 11:42
To: Barry, Ruairi
Subject: http://www.uksuds.com/uksd/sudsguidancedocument.htm

http://www.uksuds.com/uksd/sudsguidancedocument.htm

Iwan Huws
Development and Flood Risk Engineer
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Parc Menai
Bangor
Gwynedd
LL57 4DE

☎ 01248 484027
🖷 01248 670561
✉iwan.huws@environment-agency.gov.uk

Gall yr wybodaeth yn y neges hon fod yn gyfrinachol, ac yn gyfreithiol freiniol. Os ydych wedi derbyn y neges hon trwy gamgymeriad, rhoddwch wybod ar unwaith i'r sawl a'i gyrrodd, os gwelwch yn dda. Yna dilëwch hi, a pheidiwch â gyrru copi at neb arall.
Bu inni fwrw golwg ar yr e-bost hwn a'i atodiadau, rhag bod feirysau ynddo. Serch hynny, dylech chwilio unrhyw atodiad cyn ei agor.
Efallai bydd rhaid inni ryddhau'r neges hon, ac unrhyw ateb iddi, i sylw'r cyhoedd pe gofynnid inni tan y Ddeddf Rhyddid Gwybodaeth, y Ddeddf Gwarchod Data neu at ddibenion ymgyfreithio. Y mae'n bosib hefyd y darllenir negesau ac atodiadau e-bost a yrrir at unrhyw gyfeiriad Asiantaeth yr Amgylchedd, neu a dderbynnir oddi yno, gan rywun arall na'r gyrrwr a'r derbynnydd. Hynny at ddibenion busnes.
Os ydym wedi gyrru gwybodaeth atoch, a chithau'n dymuno'i defnyddio, yna ddarllenwch ein telerau a'n hamodau, os gwelwch yn dda. Gellir eu cael trwy ein galw ar 08708 506 506. Am ragor o wybodaeth ynghylch Asiantaeth yr Amgylchedd Cymru, ewch at www.asiantaeth-amgylchedd.cymru.gov.uk.
****
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IH 124 Mean Annual Flood

Input

Return Period (years)	1	Soil	0.450
Area (ha)	50.000	Urban	0.000
SAAR (mm)	840	Region Number	Region 9

Results	l/s	DEVELOPMENT RESULTS (2.3HA)
QBAR Rural	271.9	
QBAR Urban	271.9	
Q1 year	239.3	
Q1 year	239.3	$Q_{1YR} \times (A/50) = 11.0$ l/s
Q2 years	252.5	
Q5 years	329.0	
Q10 years	386.1	
Q20 years	443.4	
Q25 years	463.3	
Q30 years	479.4	$Q_{30YR} \times (A/50) = 22.1$ l/s
Q50 years	526.4	
Q100 years	592.7	$Q_{100YR} \times (A/50) = 27.3$ l/s
Q200 years	671.6	
Q250 years	698.7	
Q1000 years	867.3	

DEVELOPMENT AREA EXC. PUBLIC OPEN SPACE (A) = 2.3 HA

PEAK DISCHARGE RATE OF RUN-OFF PER UNIT AREA:

- $Q_{1YR} = 4.8$ l/s/HA
- $Q_{30YR} = 9.6$ l/s/HA
- $Q_{100YR} = 11.9$ l/s/HA

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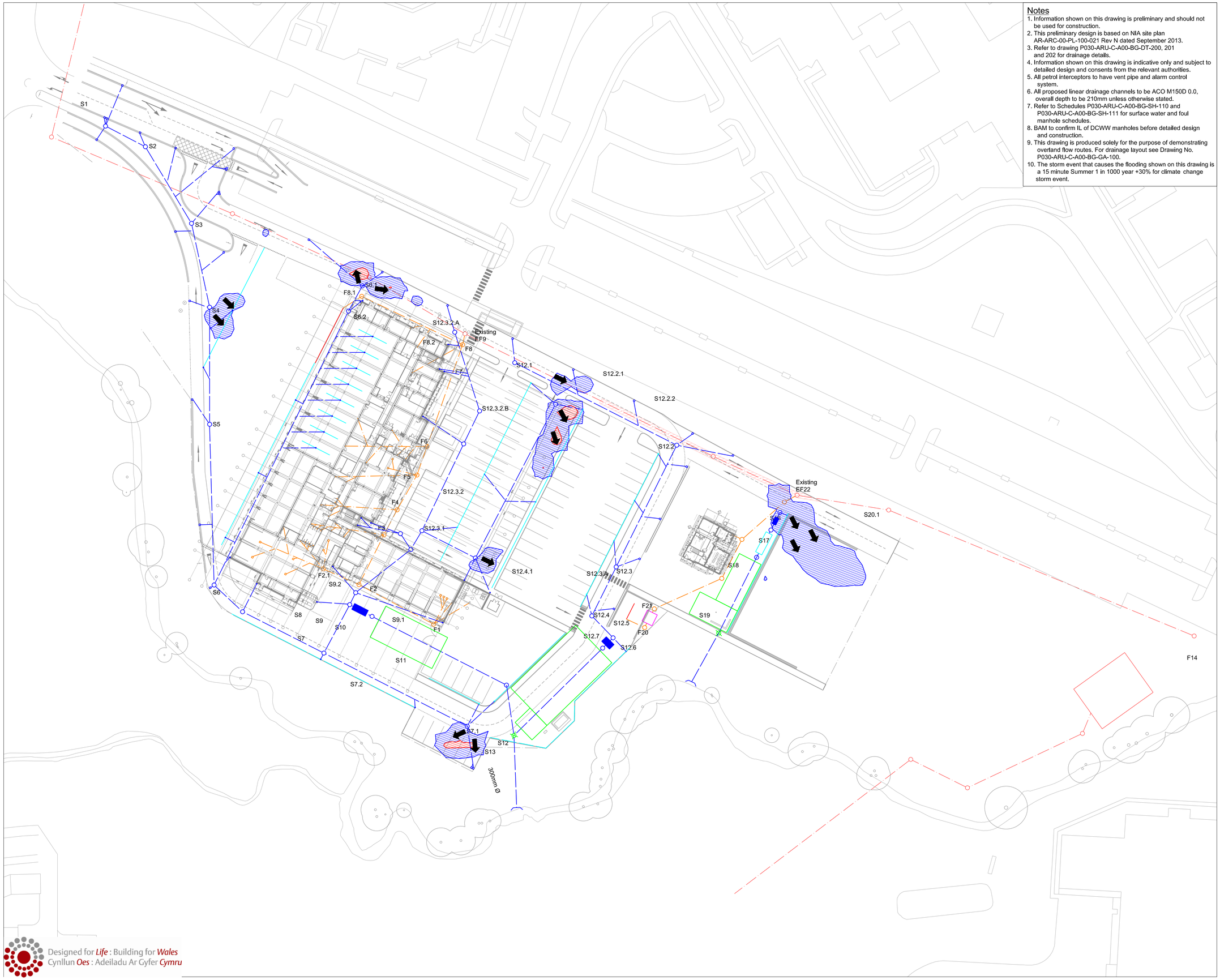
Appendix B

Storm Drainage Calculations



Notes

1. Information shown on this drawing is preliminary and should not be used for construction.
2. This preliminary design is based on NIA site plan AR-ARC-00-PL-100-021 Rev N dated September 2013.
3. Refer to drawing P030-ARU-C-A00-BG-DT-200, 201 and 202 for drainage details.
4. Information shown on this drawing is indicative only and subject to detailed design and consents from the relevant authorities.
5. All petrol interceptors to have vent pipe and alarm control system.
6. All proposed linear drainage channels to be ACO M150D 0.0, overall depth to be 210mm unless otherwise stated.
7. Refer to Schedules P030-ARU-C-A00-BG-SH-110 and P030-ARU-C-A00-BG-SH-111 for surface water and foul manhole schedules.
8. BAM to confirm IL of DCWW manholes before detailed design and construction.
9. This drawing is produced solely for the purpose of demonstrating overland flow routes. For drainage layout see Drawing No. P030-ARU-C-A00-BG-GA-100.
10. The storm event that causes the flooding shown on this drawing is a 15 minute Summer 1 in 1000 year +30% for climate change storm event.

Legend

- Proposed foul sewer
- Proposed storm sewer
- Proposed foul manhole
- Proposed storm manhole
- Existing foul sewer
- Existing foul manhole
- Proposed road gully
- Proposed attenuation cell
- Proposed storm manhole with flow control device
- Proposed petrol interceptor
- Proposed outfall headwall
- Proposed storm linear drainage channel
- Proposed foul linear drainage channel
- Proposed foul and storm stack / sump locations
- Proposed rainwater harvesting tank
- Proposed kerb drainage
- Proposed filter drain
- Proposed storm pumping station
- Proposed storm rising main 80mm diameter HDPE
- Proposed foul rising main 80mm diameter HDPE
- Concrete slab
- Extent of Flooded Area <50mm
- Extent of flooding 50 - 100mm
- Direction of flow

Mark	Date	Details	By	Rvd
P1	27/08/14	Flood Areas Amended	RL	DL
P0	12/06/14	Preliminary Issue	DS	DL

REVISIONS

Trust:
Welsh Ambulance Services NHS Trust
North Wales Fire and Rescue Services

Supply Chain Partner:
bam

Project Title:
WAST AFSRC
Wrexham

Key Plan:

Scales: 1:500 for the Original Drawing Size: A1

Drn By: DS | Chkd By: DO | Passed By: GD | Date: JUN'14

Drawing Status:
Preliminary

Drawing Originator:
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Drawing Title:
Overland Flow Routes

Job No:	Drawing No:	Revision:
213833	P030-ARU-C-A00-BG-SK-150	P1

Do NOT scale this drawing.
Refer to Architects for details of current building layouts

Designed for *Life* : Building for *Wales*
Cynllun *Oes* : Adeiladu Ar Gyfer *Cymru*

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WAST
AFSRC
Wrexham

SURFACE WATER DRAINAGE MANHOLE SCHEDULE

Plan Ref. P030-ARU-C-A00-BG-GA-100 T6

Sheet No.	Job No.	Made by	Date	Chkd	Approved
1	213833	RM	27-Aug-14	DL	KA

Drg. No. P030-ARU-C-A00-C-BG-SH-110 Rev T6

MH No.	Manhole Details							Cover Details		Pipe Details					Remarks	Revision	
	Size	Types			Levels		Depth to IL	BS EN 124	Cover Size clear opening	Size in	Size out	Invert level in	Backdrop	Invert level out			
		Poly	Brick	Conc.	App.Cover	Invert											
															GENERAL NOTES:		
S1	1200			X	94.349	92.849	1.500	D400	675x675		225			92.844			
S2	1200			X	93.528	92.028	1.500	D400	675x675	225	225	92.033		92.023			
S3	1200			X	92.690	91.115	1.575	D400	675x675	225	300	91.195		91.110			
S4	1200			X	92.540	90.965	1.575	D400	675x675	300	300	90.970		90.960			
S5	1200			X	92.441	90.866	1.575	D400	675x675	300	300	90.871		90.861			
S6.1	1350			X	92.016	90.366	1.650	D400	675x675		375			90.361			
S6.2	1350			X	92.178	90.349	1.829	D400	675x675	375	375	90.354		90.344			
S6	1350			X	92.025	90.173	1.852	D400	675x675	300	375	90.253		90.168			
										375		90.178					
S7	1350			X	91.948	90.150	1.798	D400	675x675	375	375	90.155		90.145			
S8.1	1350			X	91.360	89.860	1.500	D400	675x675		375			89.855			
S8	1350			X	91.737	89.630	2.107	D400	675x675	375	450	90.059	0.349	89.625			
								D400		375		89.710					
S9.1	1200			X	91.913	90.563	1.350	D400	675x675		150			90.558			
S9.2	1200			X	91.638	90.213	1.425	D400	675x675	150	225	90.293		90.208			
S9.3	1350			X	91.634	90.021	1.613	D400	675x675	225	375	90.176		90.016			
S9.4	1350			X	91.628	89.983	1.645	D400	675x675	375	375	89.988		89.978			
S9.5.1	1350			X	91.332	89.753	1.579	D400	675x675		375			89.748			
S9.5.2	1350			X	91.356	89.610	1.746	D400	675x675	375	375	89.615		89.605			
S9.5	1350			X	91.623	89.575	2.048	D400	675x675	375	375	89.580		89.570			
										375		89.580					
S9.6.1	1200			X	91.709	90.359	1.350	D400	675x675		150			90.354			
S9.6	1350			X	92.182	89.562	2.620	D400	675x675	375	375	89.567		89.557			
										150		90.333	0.541				
S9.7	1350			X	92.101	89.522	2.579	D400	675x675	375	375	89.527		89.517			
S9	1350			X	92.035	89.414	2.621	D400	675x675	450	450	89.479	0.060	89.409			
										375		89.494					
SPI 1	1350			X	92.024	89.304	2.720	D400	675x675	450	450	89.409	0.100	89.299	Spel Bypass Seperator 325 C1/SC or similar approved		
S10	1350			X	91.989	89.294	2.695	D400	675x675	450	450	89.299		89.289	Attenuation cell A. Storage capacity 190m3.		
S11	1350			X	91.381	89.212	2.169	D400	675x675	450	450	89.217		89.207			
S12.1	1200			X	91.588	89.938	1.650	D400	675x675		150			89.933			
S12.2	1200			X	90.672	88.947	1.725	D400	675x675	150	225	89.027		88.942			
S12.3	1200			X	90.755	88.869	1.886	D400	675x675	225	225	88.874		88.864			
S12.4	1200			X	90.802	88.762	2.040	D400	675x675	225	300	88.842		88.757			
S12.5	1200			X	90.659	88.744	1.915	D400	675x675	300	300	88.749		88.739			
SPI 2	1200			X	90.697	88.640	2.057	D400	675x675	300	300	88.745	0.100	88.635	Spel Bypass Seperator 318 C1/SC or similar approved		
S12.6	1200			X	90.741	88.636	2.105	D400	675x675	300	300	88.641		88.631	Attenuation Cell B. Storage capacity 620m3		
S12	1500			X	91.194	88.414	2.780	D400	675x675	450	300	89.188	0.769	88.409	Flow control chamber with dual orifice plate as shown on details drawing DT-202. Chamber to be 1500mm		
										300		88.569					
Outfall 1										300	-	88.349			Precast concrete headwall. Althon H3C or similar approved		
S13	1200			X	90.127	89.002	1.125	D400	675x675		225			88.997			
SPI 3	1200			X	90.134	88.908	1.226	D400	675x675	225	225	88.963	0.050	88.903	SPEL Bypass separator 206 C1/SC or similar approved.		
S14	1200			X	90.140	88.914	1.226	D400	675x675	225	225	88.869		88.909			
S15	1200			X	90.213	88.856	1.357	D400	675x675	225	225	88.861		88.851	Attenuation Cell C. Storage capacity 90m3.		
S16	See note 2				90.148	88.692	1.456	D400		225	225	88.697		88.687	Flow control chamber with hydrobrake MD-SHE-0050-7000-0100-7000 or similar approved (Design Head - 0.1m)		
Outfall 2										225	-	88.590			Precast concrete headwall. Althon H3C or similar approved		

Notes:

1. Where depth to cover from soffit of pipe is less than 1.2m, DMRB SHW 150mm thick Class Z bedding and surround to be used.
2. Chamber S16 to be sized by vortex control manufacturer.

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes Storm Pl Manhole Sizes SfA 7

FSR Rainfall Model - England and Wales

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Min Design Depth for Optimisation (m)	1.200
M5-60 (mm)	18.000	Volumetric Runoff Coeff.	0.750	Min Vel for Auto Design only (m/s)	0.75
Ratio R	0.327	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Rainfall (mm/hr)	50	Minimum Backdrop Height (m)	0.200		
Maximum Time of Concentration (mins)	30	Maximum Backdrop Height (m)	1.500		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	12.946	0.821	15.8	0.050	5.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	44.35	5.07	92.849	0.050	0.0	0.0	0.0	3.31	131.7	6.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.001	25.789	0.838	30.8	0.051	0.00	0.0	0.600	o	225	
1.002	24.727	0.150	164.8	0.043	0.00	0.0	0.600	o	300	
1.003	33.732	0.099	340.7	0.088	0.00	0.0	0.600	o	300	
1.004	46.335	0.618	75.0	0.013	0.00	0.0	0.600	o	300	
2.000	8.272	0.017	486.6	0.086	5.00	0.0	0.600	o	375	
2.001	87.940	0.176	499.7	0.063	0.00	0.0	0.600	o	375	
1.005	11.262	0.023	489.7	0.201	0.00	0.0	0.600	o	375	
1.006	26.298	0.096	273.9	0.004	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.001	43.72	5.25	92.028	0.100	0.0	0.0	0.0	2.37	94.1	11.9
1.002	42.59	5.58	91.115	0.144	0.0	0.0	0.0	1.22	86.4	16.6
1.003	40.56	6.25	90.965	0.231	0.0	0.0	0.0	0.85	59.8	25.4
1.004	39.38	6.67	90.866	0.244	0.0	0.0	0.0	1.82	128.5	26.0
2.000	43.98	5.17	90.366	0.086	0.0	0.0	0.0	0.81	90.0	10.2
2.001	38.54	6.99	90.349	0.149	0.0	0.0	0.0	0.80	88.8	15.5
1.005	37.96	7.22	90.173	0.593	0.0	0.0	0.0	0.81	89.7	61.0
1.006	37.00	7.63	90.150	0.597	0.0	0.0	0.0	1.09	120.4	61.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
3.000	46.407	0.155	299.4	0.114	5.00	0.0	0.600	o	375	
1.007	15.813	0.156	101.4	0.125	0.00	0.0	0.600	o	450	
4.000	23.795	0.275	86.5	0.017	5.00	0.0	0.600	o	150	
4.001	10.546	0.042	251.1	0.042	0.00	0.0	0.600	o	225	
4.002	13.150	0.038	346.1	0.005	0.00	0.0	0.600	o	375	
4.003	14.635	0.408	35.9	0.000	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	42.08	5.74	89.860	0.114	0.0	0.0	0.0	1.04	115.1	13.0
1.007	36.70	7.76	89.630	0.836	0.0	0.0	0.0	2.02	321.2	83.1
4.000	43.31	5.37	90.563	0.017	0.0	0.0	0.0	1.08	19.1	2.0
4.001	42.60	5.58	90.213	0.059	0.0	0.0	0.0	0.82	32.6	6.7
4.002	41.88	5.81	90.021	0.064	0.0	0.0	0.0	0.97	106.9	7.2
4.003	41.63	5.89	89.983	0.064	0.0	0.0	0.0	3.03	335.0	7.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
5.000	50.009	0.143	350.0	0.201	5.00	0.0	0.600	o	375	
5.001	17.312	0.035	494.6	0.019	0.00	0.0	0.600	o	375	
4.004	6.505	0.013	500.4	0.035	0.00	0.0	0.600	o	375	
6.000	5.581	0.031	180.0	0.066	5.00	0.0	0.600	o	150	
4.005	19.983	0.040	499.6	0.000	0.00	0.0	0.600	o	375	
4.006	3.864	0.033	117.1	0.033	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	41.70	5.87	89.753	0.201	0.0	0.0	0.0	0.96	106.3	22.7
5.001	40.63	6.22	89.610	0.220	0.0	0.0	0.0	0.81	89.2	24.2
4.004	40.25	6.36	89.575	0.319	0.0	0.0	0.0	0.80	88.7	34.8
6.000	44.14	5.12	90.359	0.066	0.0	0.0	0.0	0.75	13.2	7.8
4.005	39.11	6.77	89.562	0.385	0.0	0.0	0.0	0.80	88.8	40.8
4.006	39.01	6.81	89.522	0.418	0.0	0.0	0.0	1.67	184.8	44.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.008	3.636	0.010	363.6	0.017	0.00	0.0	0.600	o	450	
1.009	3.636	0.010	363.6	0.000	0.00	0.0	0.600	o	450	
1.010	43.529	0.082	530.8	0.000	0.00	0.0	0.600	o	450	
1.011	14.681	0.029	506.2	0.000	0.00	0.0	0.600	o	450	
7.000	52.418	0.916	57.2	0.045	5.00	0.0	0.600	o	150	
7.001	39.200	0.078	502.6	0.024	0.00	0.0	0.600	o	225	
7.002	15.764	0.032	492.6	0.109	0.00	0.0	0.600	o	225	
7.003	8.795	0.018	488.6	0.094	0.00	0.0	0.600	o	300	
7.004	2.113	0.004	528.3	0.083	0.00	0.0	0.600	o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.008	36.57	7.81	89.414	1.271	0.0	0.0	0.0	1.06	168.6	125.9
1.009	36.44	7.87	89.304	1.271	0.0	0.0	0.0	1.06	168.6	125.9
1.010	34.70	8.70	89.294	1.271	0.0	0.0	0.0	0.88	139.2	125.9
1.011	34.16	8.97	89.212	1.271	0.0	0.0	0.0	0.90	142.6	125.9
7.000	42.36	5.66	89.938	0.045	0.0	0.0	0.0	1.33	23.5	5.2
7.001	39.07	6.79	88.947	0.069	0.0	0.0	0.0	0.58	22.9	7.3
7.002	37.92	7.24	88.869	0.178	0.0	0.0	0.0	0.58	23.2	18.3
7.003	37.42	7.45	88.762	0.272	0.0	0.0	0.0	0.70	49.8	27.6
7.004	37.29	7.50	88.744	0.355	0.0	0.0	0.0	0.68	47.9	35.9

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
7.005	2.113	0.004	528.3	0.000	0.00	0.0	0.600	o	300	
7.006	35.870	0.072	498.2	0.000	0.00	0.0	0.600	o	300	
1.012	10.398	0.035	297.1	0.000	0.00	0.0	0.600	o	450	
1.013	10.398	0.035	297.1	0.000	0.00	0.0	0.600	o	450	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
7.005	37.17	7.55	88.640	0.355	0.0	0.0	0.0	0.68	47.9	35.9
7.006	35.29	8.41	88.636	0.355	0.0	0.0	0.0	0.70	49.3	35.9
1.012	33.88	9.12	88.414	1.626	0.0	0.0	0.0	1.17	186.8	149.2
1.013	33.61	9.27	88.379	1.626	0.0	0.0	0.0	1.17	186.8	149.2

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.013	S	89.978	88.344	0.000	0	0

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Surcharged Outfall Details for Storm

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2000	89.022	4000	89.022	6000	89.022

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Online Controls for Storm

Complex Manhole: S12, DS/PN: 1.012, Volume (m³): 8.5

Orifice

Diameter (m) 0.080 Discharge Coefficient 0.600 Invert Level (m) 88.564

Orifice

Diameter (m) 0.070 Discharge Coefficient 0.600 Invert Level (m) 89.564

Non Return Valve Manhole: S13, DS/PN: 1.013, Volume (m³): 1.5

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Storage Structures for Storm

Cellular Storage Manhole: S11, DS/PN: 1.011

Invert Level (m) 89.321 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Cellular Storage Manhole: S12, DS/PN: 1.012

Invert Level (m) 88.614 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	432.0	0.0	1.500	432.0	0.0	1.501	0.0	0.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.327 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%					
1.001	15 Winter	1	0%	100/15 Winter				
1.002	15 Winter	1	0%	100/15 Summer				
1.003	15 Winter	1	0%	30/15 Summer				
1.004	15 Winter	1	0%	100/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
2.000	15 Winter	1	0%	30/15 Winter				
2.001	15 Winter	1	0%	30/15 Winter				
1.005	15 Winter	1	0%	30/15 Summer				
1.006	15 Winter	1	0%	30/15 Summer				
3.000	15 Winter	1	0%	30/15 Summer				
1.007	15 Winter	1	0%	30/15 Summer				
4.000	15 Winter	1	0%	100/15 Summer				
4.001	15 Winter	1	0%	100/15 Summer				
4.002	15 Winter	1	0%	100/15 Summer				
4.003	15 Winter	1	0%	100/15 Summer				
5.000	15 Winter	1	0%	30/15 Summer				
5.001	15 Winter	1	0%	30/15 Summer				
4.004	15 Winter	1	0%	30/15 Summer				
6.000	15 Winter	1	0%	30/15 Summer				
4.005	15 Winter	1	0%	30/15 Summer				
4.006	15 Winter	1	0%	30/15 Summer				
1.008	15 Winter	1	0%	30/15 Summer				
1.009	15 Winter	1	0%	30/15 Summer				
1.010	15 Winter	1	0%	30/15 Summer				
1.011	30 Winter	1	0%	30/15 Summer				
7.000	15 Winter	1	0%	100/15 Summer				
7.001	15 Winter	1	0%	30/15 Summer				
7.002	360 Winter	1	0%	30/15 Summer				
7.003	360 Winter	1	0%	30/15 Summer				
7.004	360 Winter	1	0%	1/360 Winter				
7.005	360 Winter	1	0%	1/120 Summer				
7.006	360 Winter	1	0%	1/120 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.012	360 Winter	1	0%	1/60 Summer				
1.013	360 Winter	1	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	S1	92.882	-0.192	0.000	0.05	0.0	5.8	OK
1.001	S2	92.081	-0.172	0.000	0.12	0.0	10.7	OK
1.002	S3	91.205	-0.210	0.000	0.20	0.0	15.1	OK
1.003	S4	91.102	-0.163	0.000	0.42	0.0	23.1	OK
1.004	S5	90.957	-0.209	0.000	0.20	0.0	24.2	OK
2.000	S6.1	90.491	-0.250	0.000	0.16	0.0	9.6	OK
2.001	S6.2	90.482	-0.242	0.000	0.16	0.0	13.7	OK
1.005	S6	90.454	-0.094	0.000	0.92	0.0	48.6	OK
1.006	S7	90.330	-0.195	0.000	0.46	0.0	48.7	OK
3.000	S8.1	89.948	-0.287	0.000	0.12	0.0	13.0	OK
1.007	S8	89.797	-0.283	0.000	0.30	0.0	65.7	OK
4.000	S9.1	90.596	-0.117	0.000	0.11	0.0	1.9	OK
4.001	S9.2	90.285	-0.153	0.000	0.22	0.0	6.1	OK
4.002	S9.3	90.094	-0.302	0.000	0.09	0.0	6.6	OK
4.003	S9.4	90.023	-0.335	0.000	0.03	0.0	6.6	OK
5.000	S9.5.1	89.877	-0.251	0.000	0.23	0.0	22.6	OK
5.001	S9.5.2	89.810	-0.175	0.000	0.34	0.0	20.8	OK
4.004	S9.5	89.791	-0.159	0.000	0.41	0.0	28.8	OK
6.000	S9.6.1	90.453	-0.056	0.000	0.69	0.0	7.5	OK
4.005	S9.6	89.782	-0.155	0.000	0.51	0.0	34.2	OK

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.006	S9.7	89.742	-0.155	0.000	0.35	0.0	35.7	OK
1.008	S9	89.735	-0.129	0.000	0.85	0.0	102.8	OK
1.009	SPI 1	89.624	-0.130	0.000	0.85	0.0	102.8	OK
1.010	S10	89.606	-0.138	0.000	0.81	0.0	101.3	OK
1.011	S11	89.493	-0.169	0.000	0.71	0.0	59.4	OK
7.000	S12.1	89.987	-0.101	0.000	0.23	0.0	5.2	OK
7.001	S12.2	89.064	-0.108	0.000	0.33	0.0	7.1	OK
7.002	S12.3	89.051	-0.043	0.000	0.22	0.0	3.8	OK
7.003	S12.4	89.049	-0.013	0.000	0.17	0.0	5.7	OK
7.004	S12.5	89.049	0.005	0.000	0.13	0.0	7.2	SURCHARGED
7.005	SPI 2	89.048	0.108	0.000	0.13	0.0	7.1	SURCHARGED
7.006	S12.6	89.048	0.112	0.000	0.16	0.0	7.1	SURCHARGED
1.012	S12	89.046	0.182	0.000	0.07	0.0	8.9	SURCHARGED
1.013	S13	88.445	-0.384	0.000	0.05	0.0	8.9	OK*

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.327 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%					
1.001	15 Winter	30	0%	100/15 Winter				
1.002	15 Winter	30	0%	100/15 Summer				
1.003	15 Winter	30	0%	30/15 Summer				
1.004	15 Winter	30	0%	100/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
2.000	15 Winter	30	0%	30/15 Winter				
2.001	15 Winter	30	0%	30/15 Winter				
1.005	15 Winter	30	0%	30/15 Summer				
1.006	15 Winter	30	0%	30/15 Summer				
3.000	15 Winter	30	0%	30/15 Summer				
1.007	15 Winter	30	0%	30/15 Summer				
4.000	15 Winter	30	0%	100/15 Summer				
4.001	15 Winter	30	0%	100/15 Summer				
4.002	15 Winter	30	0%	100/15 Summer				
4.003	15 Winter	30	0%	100/15 Summer				
5.000	15 Winter	30	0%	30/15 Summer				
5.001	15 Winter	30	0%	30/15 Summer				
4.004	15 Winter	30	0%	30/15 Summer				
6.000	15 Winter	30	0%	30/15 Summer				
4.005	15 Winter	30	0%	30/15 Summer				
4.006	15 Winter	30	0%	30/15 Summer				
1.008	15 Winter	30	0%	30/15 Summer				
1.009	15 Winter	30	0%	30/15 Summer				
1.010	15 Winter	30	0%	30/15 Summer				
1.011	30 Winter	30	0%	30/15 Summer				
7.000	15 Winter	30	0%	100/15 Summer				
7.001	15 Winter	30	0%	30/15 Summer				
7.002	480 Winter	30	0%	30/15 Summer				
7.003	480 Winter	30	0%	30/15 Summer				
7.004	480 Winter	30	0%	1/360 Winter				
7.005	480 Winter	30	0%	1/120 Summer				
7.006	480 Winter	30	0%	1/120 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.012	480 Winter	30	0%	1/60 Summer				
1.013	1440 Winter	30	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	S1	92.902	-0.172	0.000	0.12	0.0	14.2	OK
1.001	S2	92.119	-0.134	0.000	0.34	0.0	29.5	OK
1.002	S3	91.345	-0.070	0.000	0.53	0.0	40.7	OK
1.003	S4	91.297	0.032	0.000	1.16	0.0	63.6	SURCHARGED
1.004	S5	91.027	-0.139	0.000	0.55	0.0	66.4	OK
2.000	S6.1	90.757	0.016	0.000	0.37	0.0	21.5	SURCHARGED
2.001	S6.2	90.750	0.026	0.000	0.38	0.0	32.5	SURCHARGED
1.005	S6	90.713	0.165	0.000	2.63	0.0	139.5	SURCHARGED
1.006	S7	90.581	0.056	0.000	1.32	0.0	137.9	SURCHARGED
3.000	S8.1	90.352	0.117	0.000	0.28	0.0	29.4	SURCHARGED
1.007	S8	90.336	0.256	0.000	0.75	0.0	167.5	SURCHARGED
4.000	S9.1	90.616	-0.097	0.000	0.26	0.0	4.7	OK
4.001	S9.2	90.346	-0.092	0.000	0.63	0.0	17.3	OK
4.002	S9.3	90.335	-0.061	0.000	0.24	0.0	18.8	OK
4.003	S9.4	90.331	-0.027	0.000	0.07	0.0	18.3	OK
5.000	S9.5.1	90.377	0.249	0.000	0.49	0.0	48.5	SURCHARGED
5.001	S9.5.2	90.349	0.364	0.000	0.71	0.0	43.6	SURCHARGED
4.004	S9.5	90.328	0.378	0.000	0.71	0.0	49.8	SURCHARGED
6.000	S9.6.1	90.564	0.055	0.000	1.69	0.0	18.4	SURCHARGED
4.005	S9.6	90.314	0.377	0.000	0.90	0.0	59.9	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.006	S9.7	90.278	0.381	0.000	0.61	0.0	63.4	SURCHARGED
1.008	S9	90.266	0.402	0.000	1.92	0.0	231.7	SURCHARGED
1.009	SPI 1	90.094	0.340	0.000	1.92	0.0	231.7	SURCHARGED
1.010	S10	89.923	0.179	0.000	1.83	0.0	228.3	SURCHARGED
1.011	S11	89.702	0.040	0.000	2.03	0.0	169.8	SURCHARGED
7.000	S12.1	90.019	-0.069	0.000	0.55	0.0	12.7	OK
7.001	S12.2	89.595	0.423	0.000	0.86	0.0	18.8	SURCHARGED
7.002	S12.3	89.588	0.494	0.000	0.36	0.0	6.1	SURCHARGED
7.003	S12.4	89.585	0.523	0.000	0.28	0.0	9.4	SURCHARGED
7.004	S12.5	89.584	0.540	0.000	0.23	0.0	12.3	SURCHARGED
7.005	SPI 2	89.583	0.643	0.000	0.22	0.0	12.1	SURCHARGED
7.006	S12.6	89.583	0.647	0.000	0.26	0.0	11.9	SURCHARGED
1.012	S12	89.579	0.715	0.000	0.10	0.0	13.3	SURCHARGED
1.013	S13	88.670	-0.159	0.000	0.07	0.0	12.4	OK*

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 2 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.327 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 30

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+30%					
1.001	15 Winter	100	+30%	100/15 Winter				
1.002	15 Winter	100	+30%	100/15 Summer				
1.003	15 Winter	100	+30%	30/15 Summer				
1.004	15 Winter	100	+30%	100/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
2.000	15 Winter	100	+30%	30/15 Winter				
2.001	15 Winter	100	+30%	30/15 Winter				
1.005	15 Winter	100	+30%	30/15 Summer				
1.006	15 Winter	100	+30%	30/15 Summer				
3.000	15 Winter	100	+30%	30/15 Summer				
1.007	15 Winter	100	+30%	30/15 Summer				
4.000	15 Winter	100	+30%	100/15 Summer				
4.001	15 Winter	100	+30%	100/15 Summer				
4.002	15 Winter	100	+30%	100/15 Summer				
4.003	15 Winter	100	+30%	100/15 Summer				
5.000	15 Winter	100	+30%	30/15 Summer				
5.001	15 Winter	100	+30%	30/15 Summer				
4.004	15 Winter	100	+30%	30/15 Summer				
6.000	15 Winter	100	+30%	30/15 Summer				
4.005	15 Winter	100	+30%	30/15 Summer				
4.006	15 Winter	100	+30%	30/15 Summer				
1.008	15 Winter	100	+30%	30/15 Summer				
1.009	30 Winter	100	+30%	30/15 Summer				
1.010	30 Winter	100	+30%	30/15 Summer				
1.011	480 Winter	100	+30%	30/15 Summer				
7.000	15 Winter	100	+30%	100/15 Summer				
7.001	15 Winter	100	+30%	30/15 Summer				
7.002	15 Winter	100	+30%	30/15 Summer				
7.003	15 Winter	100	+30%	30/15 Summer				
7.004	480 Winter	100	+30%	1/360 Winter				
7.005	480 Winter	100	+30%	1/120 Summer				
7.006	480 Winter	100	+30%	1/120 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.012	480 Winter	100	+30%	1/60 Summer				
1.013	1440 Winter	100	+30%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	S1	92.919	-0.155	0.000	0.21	0.0	23.8	OK
1.001	S2	92.337	0.084	0.000	0.57	0.0	49.4	SURCHARGED
1.002	S3	92.213	0.798	0.000	0.80	0.0	61.6	SURCHARGED
1.003	S4	92.159	0.894	0.000	1.73	0.0	94.7	SURCHARGED
1.004	S5	91.986	0.820	0.000	0.69	0.0	83.1	SURCHARGED
2.000	S6.1	91.792	1.051	0.000	0.50	0.0	29.2	FLOOD RISK
2.001	S6.2	91.783	1.059	0.000	0.51	0.0	43.3	SURCHARGED
1.005	S6	91.733	1.185	0.000	3.53	0.0	187.6	FLOOD RISK
1.006	S7	91.525	1.000	0.000	1.74	0.0	182.8	SURCHARGED
3.000	S8.1	91.281	1.046	0.000	0.35	0.0	37.1	FLOOD RISK
1.007	S8	91.249	1.169	0.000	1.14	0.0	253.3	SURCHARGED
4.000	S9.1	91.255	0.542	0.000	0.41	0.0	7.4	SURCHARGED
4.001	S9.2	91.233	0.795	0.000	0.96	0.0	26.2	SURCHARGED
4.002	S9.3	91.217	0.821	0.000	0.32	0.0	25.1	SURCHARGED
4.003	S9.4	91.211	0.853	0.000	0.10	0.0	25.1	SURCHARGED
5.000	S9.5.1	91.286	1.158	0.000	0.68	0.0	67.4	FLOOD RISK
5.001	S9.5.2	91.240	1.255	0.000	1.12	0.0	68.7	FLOOD RISK
4.004	S9.5	91.205	1.254	0.000	1.19	0.0	83.1	SURCHARGED
6.000	S9.6.1	91.256	0.747	0.000	2.54	0.0	27.6	SURCHARGED
4.005	S9.6	91.179	1.242	0.000	1.51	0.0	100.5	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
4.006	S9.7	91.106	1.209	0.000	1.04	0.0	107.1	SURCHARGED
1.008	S9	91.053	1.189	0.000	2.91	0.0	350.6	SURCHARGED
1.009	SPI 1	90.697	0.943	0.000	2.79	0.0	335.9	SURCHARGED
1.010	S10	90.358	0.614	0.000	2.66	0.0	332.6	SURCHARGED
1.011	S11	90.094	0.432	0.000	0.81	0.0	67.8	SURCHARGED
7.000	S12.1	90.942	0.854	0.000	0.77	0.0	17.8	SURCHARGED
7.001	S12.2	90.521	1.349	0.000	1.33	0.0	28.8	FLOOD RISK
7.002	S12.3	90.449	1.355	0.000	3.58	0.0	61.1	SURCHARGED
7.003	S12.4	90.157	1.095	0.000	2.95	0.0	97.7	SURCHARGED
7.004	S12.5	90.097	1.053	0.000	0.39	0.0	21.1	SURCHARGED
7.005	SPI 2	90.096	1.156	0.000	0.39	0.0	21.0	SURCHARGED
7.006	S12.6	90.094	1.158	0.000	0.46	0.0	20.7	SURCHARGED
1.012	S12	90.088	1.224	0.000	0.18	0.0	23.4	SURCHARGED
1.013	S13	88.829	0.000	0.000	0.13	0.0	21.4	SURCHARGED*

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes Storm Pl Manhole Sizes SfA 7

FSR Rainfall Model - England and Wales

Return Period (years)	100	Foul Sewage (l/s/ha)	0.000	Min Design Depth for Optimisation (m)	1.200
M5-60 (mm)	18.000	Volumetric Runoff Coeff.	0.750	Min Vel for Auto Design only (m/s)	1.00
Ratio R	0.327	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Rainfall (mm/hr)	50	Minimum Backdrop Height (m)	0.100		
Maximum Time of Concentration (mins)	30	Maximum Backdrop Height (m)	1.500		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.000	2.840	0.044	64.5	0.151	5.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.03	89.002	0.151	0.0	0.0	0.0	1.63	64.8	20.5

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.001	2.840	0.044	64.5	0.000	0.00	0.0	0.600	o	225	
S1.002	8.708	0.058	150.1	0.000	0.00	0.0	0.600	o	225	
S1.003	24.588	0.164	149.9	0.000	0.00	0.0	0.600	o	225	
S1.004	16.064	0.107	150.1	0.000	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.001	50.00	5.06	88.908	0.151	0.0	0.0	0.0	1.63	64.8	20.5
S1.002	50.00	5.19	88.914	0.151	0.0	0.0	0.0	1.06	42.3	20.5
S1.003	50.00	5.58	88.856	0.151	0.0	0.0	0.0	1.07	42.4	20.5
S1.004	50.00	5.83	88.692	0.151	0.0	0.0	0.0	1.06	42.3	20.5

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.004	S	89.247	88.585	88.000	0	0

Datum (m) 0.000 Offset (mins) 0

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
4	88.789	108	88.789	212	88.789	316	88.789	420	88.789	524	88.789	628	88.789	732	88.789	836	88.789
8	88.789	112	88.789	216	88.789	320	88.789	424	88.789	528	88.789	632	88.789	736	88.789	840	88.789
12	88.789	116	88.789	220	88.789	324	88.789	428	88.789	532	88.789	636	88.789	740	88.789	844	88.789
16	88.789	120	88.789	224	88.789	328	88.789	432	88.789	536	88.789	640	88.789	744	88.789	848	88.789
20	88.789	124	88.789	228	88.789	332	88.789	436	88.789	540	88.789	644	88.789	748	88.789	852	88.789
24	88.789	128	88.789	232	88.789	336	88.789	440	88.789	544	88.789	648	88.789	752	88.789	856	88.789
28	88.789	132	88.789	236	88.789	340	88.789	444	88.789	548	88.789	652	88.789	756	88.789	860	88.789
32	88.789	136	88.789	240	88.789	344	88.789	448	88.789	552	88.789	656	88.789	760	88.789	864	88.789
36	88.789	140	88.789	244	88.789	348	88.789	452	88.789	556	88.789	660	88.789	764	88.789	868	88.789
40	88.789	144	88.789	248	88.789	352	88.789	456	88.789	560	88.789	664	88.789	768	88.789	872	88.789
44	88.789	148	88.789	252	88.789	356	88.789	460	88.789	564	88.789	668	88.789	772	88.789	876	88.789
48	88.789	152	88.789	256	88.789	360	88.789	464	88.789	568	88.789	672	88.789	776	88.789	880	88.789
52	88.789	156	88.789	260	88.789	364	88.789	468	88.789	572	88.789	676	88.789	780	88.789	884	88.789
56	88.789	160	88.789	264	88.789	368	88.789	472	88.789	576	88.789	680	88.789	784	88.789	888	88.789
60	88.789	164	88.789	268	88.789	372	88.789	476	88.789	580	88.789	684	88.789	788	88.789	892	88.789
64	88.789	168	88.789	272	88.789	376	88.789	480	88.789	584	88.789	688	88.789	792	88.789	896	88.789
68	88.789	172	88.789	276	88.789	380	88.789	484	88.789	588	88.789	692	88.789	796	88.789	900	88.789
72	88.789	176	88.789	280	88.789	384	88.789	488	88.789	592	88.789	696	88.789	800	88.789	904	88.789
76	88.789	180	88.789	284	88.789	388	88.789	492	88.789	596	88.789	700	88.789	804	88.789	908	88.789
80	88.789	184	88.789	288	88.789	392	88.789	496	88.789	600	88.789	704	88.789	808	88.789	912	88.789
84	88.789	188	88.789	292	88.789	396	88.789	500	88.789	604	88.789	708	88.789	812	88.789	916	88.789
88	88.789	192	88.789	296	88.789	400	88.789	504	88.789	608	88.789	712	88.789	816	88.789	920	88.789
92	88.789	196	88.789	300	88.789	404	88.789	508	88.789	612	88.789	716	88.789	820	88.789	924	88.789
96	88.789	200	88.789	304	88.789	408	88.789	512	88.789	616	88.789	720	88.789	824	88.789	928	88.789
100	88.789	204	88.789	308	88.789	412	88.789	516	88.789	620	88.789	724	88.789	828	88.789	932	88.789
104	88.789	208	88.789	312	88.789	416	88.789	520	88.789	624	88.789	728	88.789	832	88.789	936	88.789

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
940	88.789	1044	88.789	1148	88.789	1252	88.789	1356	88.789	1460	88.789	1564	88.789	1668	88.789	1772	88.789
944	88.789	1048	88.789	1152	88.789	1256	88.789	1360	88.789	1464	88.789	1568	88.789	1672	88.789	1776	88.789
948	88.789	1052	88.789	1156	88.789	1260	88.789	1364	88.789	1468	88.789	1572	88.789	1676	88.789	1780	88.789
952	88.789	1056	88.789	1160	88.789	1264	88.789	1368	88.789	1472	88.789	1576	88.789	1680	88.789	1784	88.789
956	88.789	1060	88.789	1164	88.789	1268	88.789	1372	88.789	1476	88.789	1580	88.789	1684	88.789	1788	88.789
960	88.789	1064	88.789	1168	88.789	1272	88.789	1376	88.789	1480	88.789	1584	88.789	1688	88.789	1792	88.789
964	88.789	1068	88.789	1172	88.789	1276	88.789	1380	88.789	1484	88.789	1588	88.789	1692	88.789	1796	88.789
968	88.789	1072	88.789	1176	88.789	1280	88.789	1384	88.789	1488	88.789	1592	88.789	1696	88.789	1800	88.789
972	88.789	1076	88.789	1180	88.789	1284	88.789	1388	88.789	1492	88.789	1596	88.789	1700	88.789	1804	88.789
976	88.789	1080	88.789	1184	88.789	1288	88.789	1392	88.789	1496	88.789	1600	88.789	1704	88.789	1808	88.789
980	88.789	1084	88.789	1188	88.789	1292	88.789	1396	88.789	1500	88.789	1604	88.789	1708	88.789	1812	88.789
984	88.789	1088	88.789	1192	88.789	1296	88.789	1400	88.789	1504	88.789	1608	88.789	1712	88.789	1816	88.789
988	88.789	1092	88.789	1196	88.789	1300	88.789	1404	88.789	1508	88.789	1612	88.789	1716	88.789	1820	88.789
992	88.789	1096	88.789	1200	88.789	1304	88.789	1408	88.789	1512	88.789	1616	88.789	1720	88.789	1824	88.789
996	88.789	1100	88.789	1204	88.789	1308	88.789	1412	88.789	1516	88.789	1620	88.789	1724	88.789	1828	88.789
1000	88.789	1104	88.789	1208	88.789	1312	88.789	1416	88.789	1520	88.789	1624	88.789	1728	88.789	1832	88.789
1004	88.789	1108	88.789	1212	88.789	1316	88.789	1420	88.789	1524	88.789	1628	88.789	1732	88.789	1836	88.789
1008	88.789	1112	88.789	1216	88.789	1320	88.789	1424	88.789	1528	88.789	1632	88.789	1736	88.789	1840	88.789
1012	88.789	1116	88.789	1220	88.789	1324	88.789	1428	88.789	1532	88.789	1636	88.789	1740	88.789	1844	88.789
1016	88.789	1120	88.789	1224	88.789	1328	88.789	1432	88.789	1536	88.789	1640	88.789	1744	88.789	1848	88.789
1020	88.789	1124	88.789	1228	88.789	1332	88.789	1436	88.789	1540	88.789	1644	88.789	1748	88.789	1852	88.789
1024	88.789	1128	88.789	1232	88.789	1336	88.789	1440	88.789	1544	88.789	1648	88.789	1752	88.789	1856	88.789
1028	88.789	1132	88.789	1236	88.789	1340	88.789	1444	88.789	1548	88.789	1652	88.789	1756	88.789	1860	88.789
1032	88.789	1136	88.789	1240	88.789	1344	88.789	1448	88.789	1552	88.789	1656	88.789	1760	88.789	1864	88.789
1036	88.789	1140	88.789	1244	88.789	1348	88.789	1452	88.789	1556	88.789	1660	88.789	1764	88.789	1868	88.789
1040	88.789	1144	88.789	1248	88.789	1352	88.789	1456	88.789	1560	88.789	1664	88.789	1768	88.789	1872	88.789

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1876	88.789	1980	88.789	2084	88.789	2188	88.789	2292	88.789	2396	88.789	2500	88.789	2604	88.789	2708	88.789
1880	88.789	1984	88.789	2088	88.789	2192	88.789	2296	88.789	2400	88.789	2504	88.789	2608	88.789	2712	88.789
1884	88.789	1988	88.789	2092	88.789	2196	88.789	2300	88.789	2404	88.789	2508	88.789	2612	88.789	2716	88.789
1888	88.789	1992	88.789	2096	88.789	2200	88.789	2304	88.789	2408	88.789	2512	88.789	2616	88.789	2720	88.789
1892	88.789	1996	88.789	2100	88.789	2204	88.789	2308	88.789	2412	88.789	2516	88.789	2620	88.789	2724	88.789
1896	88.789	2000	88.789	2104	88.789	2208	88.789	2312	88.789	2416	88.789	2520	88.789	2624	88.789	2728	88.789
1900	88.789	2004	88.789	2108	88.789	2212	88.789	2316	88.789	2420	88.789	2524	88.789	2628	88.789	2732	88.789
1904	88.789	2008	88.789	2112	88.789	2216	88.789	2320	88.789	2424	88.789	2528	88.789	2632	88.789	2736	88.789
1908	88.789	2012	88.789	2116	88.789	2220	88.789	2324	88.789	2428	88.789	2532	88.789	2636	88.789	2740	88.789
1912	88.789	2016	88.789	2120	88.789	2224	88.789	2328	88.789	2432	88.789	2536	88.789	2640	88.789	2744	88.789
1916	88.789	2020	88.789	2124	88.789	2228	88.789	2332	88.789	2436	88.789	2540	88.789	2644	88.789	2748	88.789
1920	88.789	2024	88.789	2128	88.789	2232	88.789	2336	88.789	2440	88.789	2544	88.789	2648	88.789	2752	88.789
1924	88.789	2028	88.789	2132	88.789	2236	88.789	2340	88.789	2444	88.789	2548	88.789	2652	88.789	2756	88.789
1928	88.789	2032	88.789	2136	88.789	2240	88.789	2344	88.789	2448	88.789	2552	88.789	2656	88.789	2760	88.789
1932	88.789	2036	88.789	2140	88.789	2244	88.789	2348	88.789	2452	88.789	2556	88.789	2660	88.789	2764	88.789
1936	88.789	2040	88.789	2144	88.789	2248	88.789	2352	88.789	2456	88.789	2560	88.789	2664	88.789	2768	88.789
1940	88.789	2044	88.789	2148	88.789	2252	88.789	2356	88.789	2460	88.789	2564	88.789	2668	88.789	2772	88.789
1944	88.789	2048	88.789	2152	88.789	2256	88.789	2360	88.789	2464	88.789	2568	88.789	2672	88.789	2776	88.789
1948	88.789	2052	88.789	2156	88.789	2260	88.789	2364	88.789	2468	88.789	2572	88.789	2676	88.789	2780	88.789
1952	88.789	2056	88.789	2160	88.789	2264	88.789	2368	88.789	2472	88.789	2576	88.789	2680	88.789	2784	88.789
1956	88.789	2060	88.789	2164	88.789	2268	88.789	2372	88.789	2476	88.789	2580	88.789	2684	88.789	2788	88.789
1960	88.789	2064	88.789	2168	88.789	2272	88.789	2376	88.789	2480	88.789	2584	88.789	2688	88.789	2792	88.789
1964	88.789	2068	88.789	2172	88.789	2276	88.789	2380	88.789	2484	88.789	2588	88.789	2692	88.789	2796	88.789
1968	88.789	2072	88.789	2176	88.789	2280	88.789	2384	88.789	2488	88.789	2592	88.789	2696	88.789	2800	88.789
1972	88.789	2076	88.789	2180	88.789	2284	88.789	2388	88.789	2492	88.789	2596	88.789	2700	88.789	2804	88.789
1976	88.789	2080	88.789	2184	88.789	2288	88.789	2392	88.789	2496	88.789	2600	88.789	2704	88.789	2808	88.789

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
2812	88.789	2916	88.789	3020	88.789	3124	88.789	3228	88.789	3332	88.789	3436	88.789	3540	88.789	3644	88.789
2816	88.789	2920	88.789	3024	88.789	3128	88.789	3232	88.789	3336	88.789	3440	88.789	3544	88.789	3648	88.789
2820	88.789	2924	88.789	3028	88.789	3132	88.789	3236	88.789	3340	88.789	3444	88.789	3548	88.789	3652	88.789
2824	88.789	2928	88.789	3032	88.789	3136	88.789	3240	88.789	3344	88.789	3448	88.789	3552	88.789	3656	88.789
2828	88.789	2932	88.789	3036	88.789	3140	88.789	3244	88.789	3348	88.789	3452	88.789	3556	88.789	3660	88.789
2832	88.789	2936	88.789	3040	88.789	3144	88.789	3248	88.789	3352	88.789	3456	88.789	3560	88.789	3664	88.789
2836	88.789	2940	88.789	3044	88.789	3148	88.789	3252	88.789	3356	88.789	3460	88.789	3564	88.789	3668	88.789
2840	88.789	2944	88.789	3048	88.789	3152	88.789	3256	88.789	3360	88.789	3464	88.789	3568	88.789	3672	88.789
2844	88.789	2948	88.789	3052	88.789	3156	88.789	3260	88.789	3364	88.789	3468	88.789	3572	88.789	3676	88.789
2848	88.789	2952	88.789	3056	88.789	3160	88.789	3264	88.789	3368	88.789	3472	88.789	3576	88.789	3680	88.789
2852	88.789	2956	88.789	3060	88.789	3164	88.789	3268	88.789	3372	88.789	3476	88.789	3580	88.789	3684	88.789
2856	88.789	2960	88.789	3064	88.789	3168	88.789	3272	88.789	3376	88.789	3480	88.789	3584	88.789	3688	88.789
2860	88.789	2964	88.789	3068	88.789	3172	88.789	3276	88.789	3380	88.789	3484	88.789	3588	88.789	3692	88.789
2864	88.789	2968	88.789	3072	88.789	3176	88.789	3280	88.789	3384	88.789	3488	88.789	3592	88.789	3696	88.789
2868	88.789	2972	88.789	3076	88.789	3180	88.789	3284	88.789	3388	88.789	3492	88.789	3596	88.789	3700	88.789
2872	88.789	2976	88.789	3080	88.789	3184	88.789	3288	88.789	3392	88.789	3496	88.789	3600	88.789	3704	88.789
2876	88.789	2980	88.789	3084	88.789	3188	88.789	3292	88.789	3396	88.789	3500	88.789	3604	88.789	3708	88.789
2880	88.789	2984	88.789	3088	88.789	3192	88.789	3296	88.789	3400	88.789	3504	88.789	3608	88.789	3712	88.789
2884	88.789	2988	88.789	3092	88.789	3196	88.789	3300	88.789	3404	88.789	3508	88.789	3612	88.789	3716	88.789
2888	88.789	2992	88.789	3096	88.789	3200	88.789	3304	88.789	3408	88.789	3512	88.789	3616	88.789	3720	88.789
2892	88.789	2996	88.789	3100	88.789	3204	88.789	3308	88.789	3412	88.789	3516	88.789	3620	88.789	3724	88.789
2896	88.789	3000	88.789	3104	88.789	3208	88.789	3312	88.789	3416	88.789	3520	88.789	3624	88.789	3728	88.789
2900	88.789	3004	88.789	3108	88.789	3212	88.789	3316	88.789	3420	88.789	3524	88.789	3628	88.789	3732	88.789
2904	88.789	3008	88.789	3112	88.789	3216	88.789	3320	88.789	3424	88.789	3528	88.789	3632	88.789	3736	88.789
2908	88.789	3012	88.789	3116	88.789	3220	88.789	3324	88.789	3428	88.789	3532	88.789	3636	88.789	3740	88.789
2912	88.789	3016	88.789	3120	88.789	3224	88.789	3328	88.789	3432	88.789	3536	88.789	3640	88.789	3744	88.789

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Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
3748	88.789	3780	88.789	3812	88.789	3844	88.789	3876	88.789	3908	88.789	3940	88.789	3972	88.789		
3752	88.789	3784	88.789	3816	88.789	3848	88.789	3880	88.789	3912	88.789	3944	88.789	3976	88.789		
3756	88.789	3788	88.789	3820	88.789	3852	88.789	3884	88.789	3916	88.789	3948	88.789	3980	88.789		
3760	88.789	3792	88.789	3824	88.789	3856	88.789	3888	88.789	3920	88.789	3952	88.789	3984	88.789		
3764	88.789	3796	88.789	3828	88.789	3860	88.789	3892	88.789	3924	88.789	3956	88.789	3988	88.789		
3768	88.789	3800	88.789	3832	88.789	3864	88.789	3896	88.789	3928	88.789	3960	88.789	3992	88.789		
3772	88.789	3804	88.789	3836	88.789	3868	88.789	3900	88.789	3932	88.789	3964	88.789	3996	88.789		
3776	88.789	3808	88.789	3840	88.789	3872	88.789	3904	88.789	3936	88.789	3968	88.789	4000	88.789		

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Online Controls for Storm

Hydro-Brake Optimum® Manhole: S16, DS/PN: S1.004, Volume (m³): 2.6

Unit Reference	MD-SHE-0050-7000-0100-7000	Diameter (mm)	50
Design Head (m)	0.100	Invert Level (m)	88.692
Design Flow (l/s)	0.7	Minimum Outlet Pipe Diameter (mm)	75
Flush-Flo™	Calculated	Suggested Manhole Diameter (mm)	1200
Objective	Minimise upstream storage		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.100	0.7	Kick-Flo®	0.089	0.7
Flush-Flo™	0.063	0.7	Mean Flow over Head Range	-	0.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.7	0.600	1.5	1.600	2.4	2.600	3.1	5.000	4.3	7.500	5.3
0.200	0.9	0.800	1.7	1.800	2.6	3.000	3.3	5.500	4.5	8.000	5.5
0.300	1.1	1.000	1.9	2.000	2.7	3.500	3.6	6.000	4.7	8.500	5.6
0.400	1.3	1.200	2.1	2.200	2.9	4.000	3.9	6.500	4.9	9.000	5.8
0.500	1.4	1.400	2.3	2.400	3.0	4.500	4.1	7.000	5.1	9.500	6.0

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Storage Structures for Storm

Cellular Storage Manhole: S16, DS/PN: S1.004

Invert Level (m) 88.742 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	180.0	0.0	0.500	180.0	0.0	0.501	0.0	0.0

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.327 Cv (Winter) 0.840

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

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	1	0%	30/15 Summer				
S1.001	15 Winter	1	0%	30/15 Summer				
S1.002	15 Winter	1	0%	30/15 Summer				
S1.003	15 Winter	1	0%	100/15 Summer				
S1.004	1440 Winter	1	0%	30/60 Winter				

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S13	89.128	-0.099	0.000	0.58	0.0	17.4	OK
S1.001	SPI 3	89.038	-0.095	0.000	0.59	0.0	17.5	OK
S1.002	S14	89.029	-0.110	0.000	0.52	0.0	17.6	OK
S1.003	S15	88.961	-0.120	0.000	0.44	0.0	17.2	OK
S1.004	S16	88.892	-0.025	0.000	0.01	0.0	0.6	OK

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.327 Cv (Winter) 0.840

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

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	30	0%	30/15 Summer				
S1.001	15 Winter	30	0%	30/15 Summer				
S1.002	15 Winter	30	0%	30/15 Summer				
S1.003	15 Winter	30	0%	100/15 Summer				
S1.004	960 Winter	30	0%	30/60 Winter				

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S13	89.326	0.099	0.000	1.38	0.0	41.1	SURCHARGED
S1.001	SPI 3	89.243	0.110	0.000	1.37	0.0	41.0	SURCHARGED
S1.002	S14	89.161	0.022	0.000	1.20	0.0	40.7	SURCHARGED
S1.003	S15	89.078	-0.003	0.000	1.02	0.0	39.6	OK
S1.004	S16	89.036	0.119	0.000	0.03	0.0	1.0	SURCHARGED

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.327 Cv (Winter) 0.840

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

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+30%	30/15 Summer				
S1.001	15 Winter	100	+30%	30/15 Summer				
S1.002	15 Winter	100	+30%	30/15 Summer				
S1.003	960 Winter	100	+30%	100/15 Summer				
S1.004	960 Winter	100	+30%	30/60 Winter				

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S13	89.868	0.641	0.000	2.09	0.0	62.4	FLOOD RISK
S1.001	SPI 3	89.666	0.533	0.000	2.04	0.0	60.9	SURCHARGED
S1.002	S14	89.483	0.344	0.000	1.79	0.0	60.8	SURCHARGED
S1.003	S15	89.515	0.434	0.000	0.14	0.0	5.5	SURCHARGED
S1.004	S16	89.564	0.647	0.000	0.04	0.0	1.5	SURCHARGED

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Appendix C

Foul Drainage Calculations

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

ARUP CARDIFF
REC'D 06 JUN 2012
JOB No. 213833 FILE No. 6-10
PROJ MAN DB INTL PROJ DIR. DP GRP LDR
ACTION Saved under 6-10
RESPONSE

Sion Williams
ARUP
4 Pierhead Street
Capital Waterside
Cardiff
CF10 4QP

Date: 28/05/2012
Enquiries Tel.: 08009172652
Our Ref.: 2012/DCWW/78322
Your Ref.:
Grid Ref.: SJ3216250276

Dear Sir/Madam

Re: Welsh Ambulance Services NHS Trust to undertake the foul water drainage design for a proposed development located to the east of, Croesnewydd Road, Wrexham

Further to the above consultation we would provide the following comments:-

SEWERAGE

In relation to capacity to accept sewage flows from the proposed development we would confirm the following:

As you may observe from the attached public sewer record plan, the public sewerage system in the vicinity of the proposed development is generally of a combined type.

The foul only discharge from the proposed development can be accommodated within the public sewerage system.

In relation to the surface water flows from the proposed development, these will have to be disposed of separately by other means, such as using soakaways or discharging directly to a watercourse in liaison with the Land Drainage Authority and / or Environment Agency.

Please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

If any onsite or offsite sewers are to be offered for adoption they must be constructed to conform with the publication "Sewers for Adoption"- 6th Edition.

If a connection is required to the public sewerage system, the developer is advised to contact us on Tel: 0800 917 2652.

A 150mm public combined sewer crosses the development site. Under the Water Industry Act 1991, we have the rights of access to our apparatus at all times. Please note that no development (including the raising or lowering of ground levels) will be permitted within the safety zone of the public sewer, which is measured 3 metres either side of the centreline of these pipes.

SEWAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

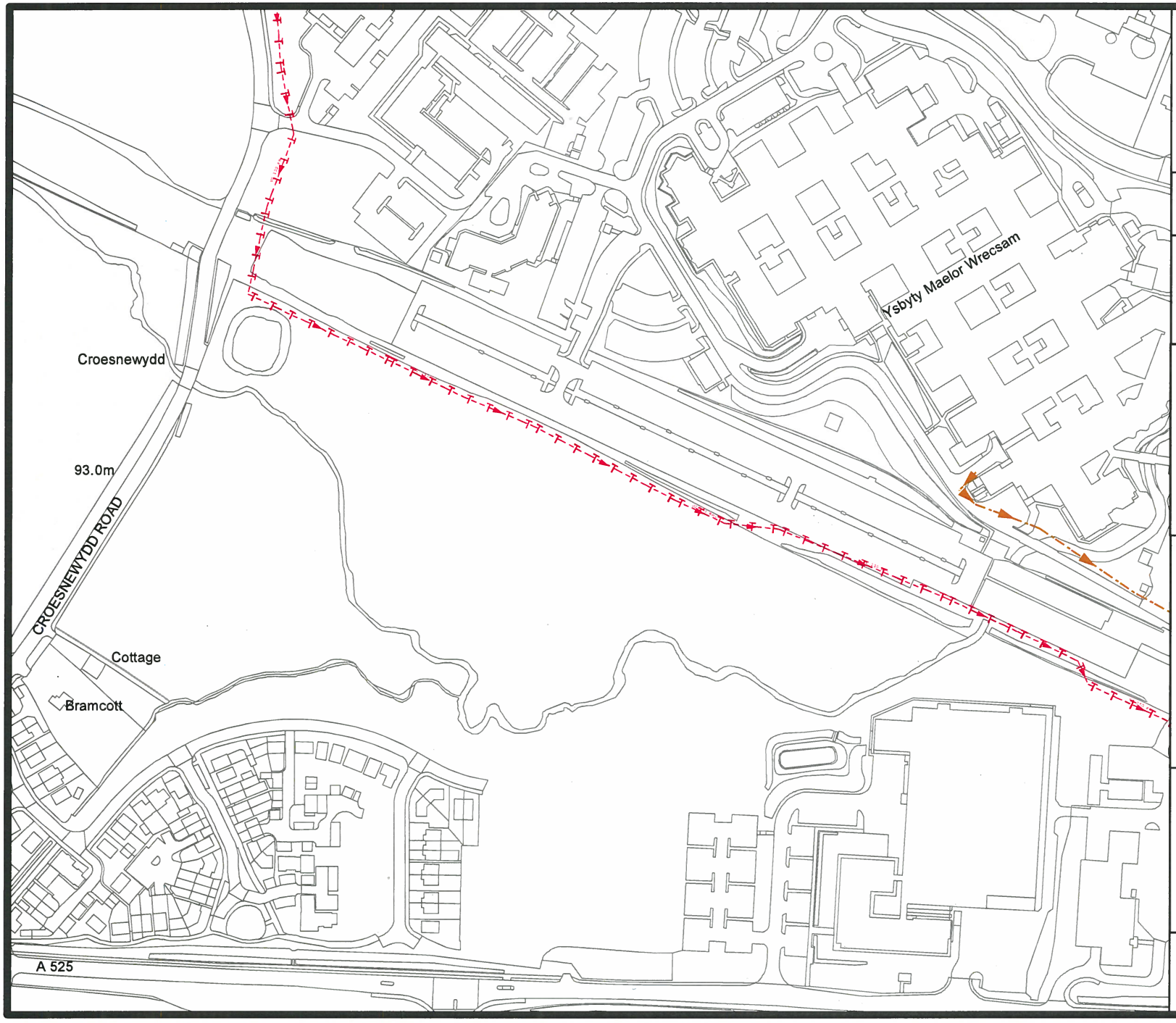
We hope the above is satisfactory. However, should you require further assistance please contact us on the above telephone number, quoting our reference.

Yours faithfully,

Rhidian Clement
Principal Planner

Demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.

Enc- Sewer Plan
Receipt



Dŵr Cymru
Welsh Water

, Croesnewydd Road, Wrexham

N
W E
S

LEGEND

Clean network:

- Sluice valve
- Pressure reducing valve
- Meter
- Bulk meter
- Hydrant
- Cap end
- Air valve
- Stop tap
- Water Treatment Works
- Water Pumping Station
- Existing main
- Non-operational main
- Raw Water

NB: Water main symbol colour indicates the type.

LIGHT BLUE - Trunk
DARK BLUE - Distribution
YELLOW - Raw Water

Notes:

Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the Company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. It must be understood that the furnishing of the information is entirely without prejudice to the provision of the New Roads and Streetworks Act 1991 and of the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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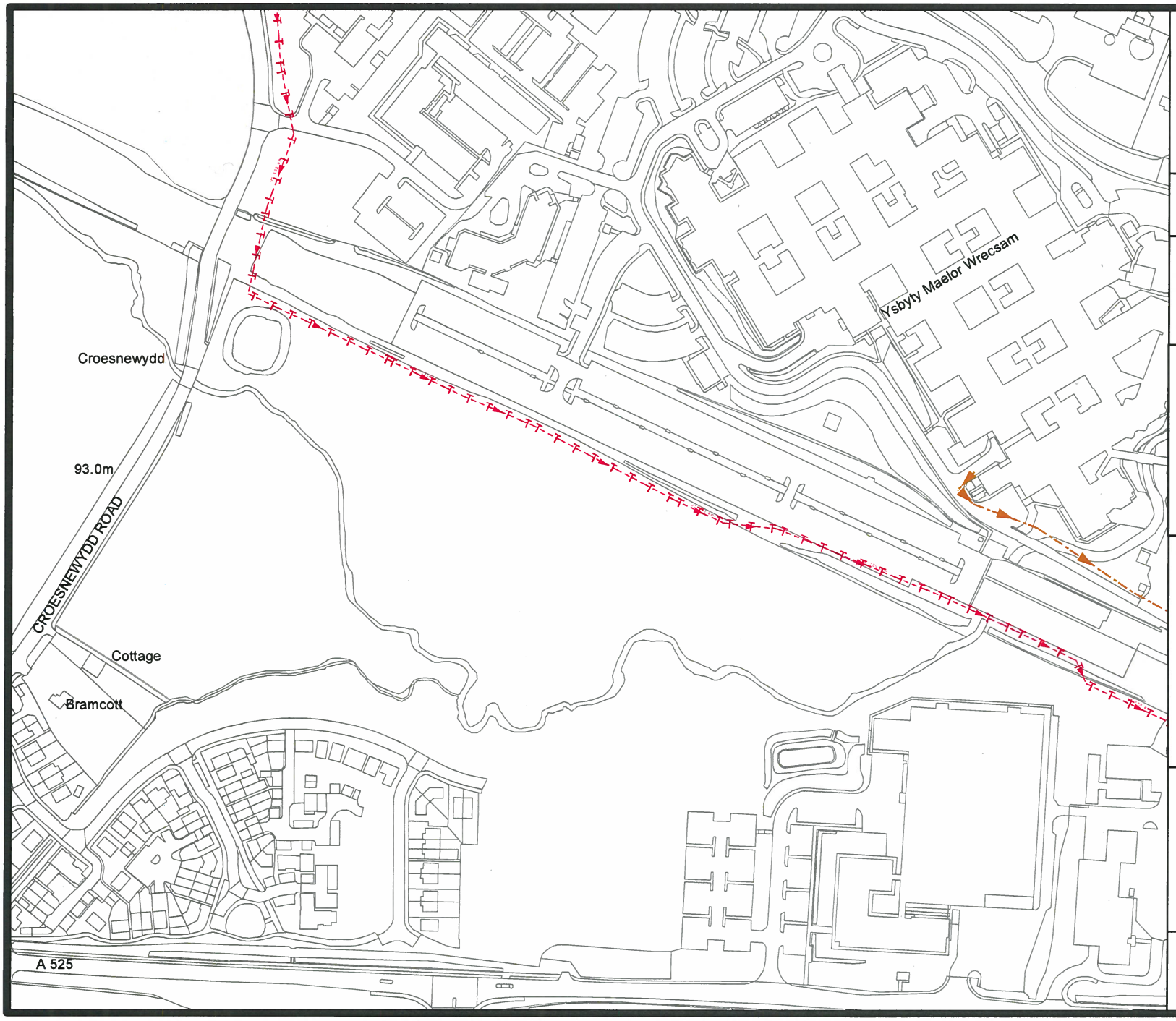

Dŵr Cymru
Welsh Water

, Croesnewydd Road, Wrexham

N
W E
S

LEGEND

Clean network:

- Sluice valve
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Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

VAT Registration Number : GB771 1231 59

To: Arup
4 Pierhead Street
Capital Waterside
Cardiff
CF10 4QP

Date : 21 March 2012

VAT Receipt Number : RFP/DS001

Quantity	Details	Unit Price	VAT	Amount
	Your Reference: 218833/SW			
1	Pre-Planning Enquiry East Of Croesnewydd Road, Wrexham	71.50	14.30	85.80
	Payment Received With Thanks			
			Total	85.80

glas
Glas Cymru Cyfyngedig

Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dŵr Cymru yn eiddo i Glas Cymru - cwmni 'nid-er-elw'.

We welcome correspondence in Welsh and English.

Dŵr Cymru Cyf, a limited company registered in Wales no. 2366777. Registered office: Pentwyn Road, Nelson, Treharris, Mid Glamorgan CF46 6LY.

Rydym yn croesawu gohebiaeth yn y Gymraeg neu yn Saesneg.

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn, Nelson, Treharris, Morgannwg Ganol CF46 6LY.

ARUP

Ove Arup & Partners
4 Pierhead street
Capital Waterside
Cardiff
CF1 5QP
Tel - 01222 473727

WAST - AFSRC

FOUL DRAINAGE MANHOLE SCHEDULE

Plan Ref. P030-ARU-C-A00-BG-GA-100

Sheet No.	Job No.	Made by	Date	Chkd	Approved
1	213833	RM	27-Aug-14	DL	MOC

Drg. No. P030-ARU-C-A00-BG-SH111 Rev T4

MH No.	Manhole Details							Cover Details		Pipe Details					Remarks	Revision	
	Size	Types			Levels		Depth to IL	BS EN 124	Cover Size clear opening	Size in	Size out	Invert level in	Backdrop	Invert level out			
		Poly	Brick	Conc.	App.Cover	Invert											
															GENERAL NOTES:		
F1	1200			X	92.144	90.797	1.347	D400	600x600		100			90.792			
F2.1	1200			X	92.156	90.686	1.470	D400	600x600		100			90.681			
F2	1200			X	92.154	90.521	1.633	D400	600x600	100	100	90.526		90.516			
										100		90.526					
F3	1200			X	92.174	90.267	1.907	D400	600x600	100	150	90.322		90.262			
F4	1200			X	92.161	90.209	1.952	D400	600x600	150	150	90.214		90.204			
F5	1200			X	92.119	90.129	1.990	D400	600x600	150	150	90.134		90.124			
F6	1200			X	92.155	90.066	2.089	D400	600x600	150	150	90.071		90.061			
F7.1	1200			X	92.132	90.830	1.302	D400	600x600		100			90.825			
F7	1200			X	92.019	89.843	2.176	D400	600x600	150	150	89.848		89.838			
										100		89.898					
Existing EF8	1200			X	91.822	89.820	2.002	D400	600x600	150	-	89.825			Tie invert to invert to existing foul drainage MH, IL= 89.820		
F8	475	X			90.582	89.532	1.050	D400	440		150			89.527			
F9	475	X			90.493	89.492	1.001	D400	440	150	150	89.497		89.487			
F10	475	X			90.317	89.349	0.968	D400	440	150	150	89.354		89.344			
F11	475	X			90.298	89.265	1.033	D400	440	150	150	89.270		89.260			
F12	475	X			90.067	89.156	0.911	D400	440	150	150	89.161		89.151			
Existing EF13	1200			X	89.945	89.100	0.845	D400	600x600	150	-	89.105			Tie invert to invert to existing foul drainage MH, IL= 89.100		

Notes:

1. Where depth to cover from soffit of pipe is less than 1.2m, DMRB SHW 150mm thick Class Z bedding and surround to be used

FOUL SEWERAGE DESIGN

Design Criteria for Storm

Pipe Sizes Foul Manhole Sizes Concrete

Industrial Flow (l/s/ha)	0.00	Domestic (l/s/ha)	0.00	Maximum Backdrop Height (m)	1.500
Industrial Peak Flow Factor	0.00	Domestic Peak Flow Factor	6.00	Min Design Depth for Optimisation (m)	0.750
Flow Per Person (l/per/day)	222.00	Add Flow / Climate Change (%)	0	Min Vel for Auto Design only (m/s)	0.74
Persons per House	3.00	Minimum Backdrop Height (m)	0.200	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.000	24.364	0.276	88.3	0.000	0	0.1	1.500	o	100	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	90.797	0.000	0.1	0	0.0	10	0.26	0.71	5.6	0.1

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
2.000	11.259	0.165	68.2	0.000	0	1.1	1.500	o	100	
1.001	16.085	0.204	78.8	0.000	0	0.0	1.500	o	100	
1.002	8.111	0.058	141.0	0.000	0	1.4	1.500	o	150	
1.003	11.560	0.081	143.3	0.000	0	1.1	1.500	o	150	
1.004	8.693	0.063	137.8	0.000	0	0.4	1.500	o	150	
1.005	31.114	0.223	139.7	0.000	0	1.2	1.500	o	150	
3.000	32.251	0.937	34.4	0.000	0	0.3	1.500	o	100	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	90.686	0.000	1.1	0	0.0	28	0.60	0.81	6.3	1.1
1.001	90.521	0.000	1.2	0	0.0	31	0.58	0.75	5.9	1.2
1.002	90.267	0.000	2.6	0	0.0	46	0.57	0.74	13.0	2.6
1.003	90.209	0.000	3.7	0	0.0	55	0.63	0.73	12.9	3.7
1.004	90.129	0.000	4.1	0	0.0	58	0.66	0.75	13.2	4.1
1.005	90.066	0.000	5.3	0	0.0	66	0.70	0.74	13.1	5.3
3.000	90.830	0.000	0.3	0	0.0	13	0.51	1.14	8.9	0.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
1.006	3.233	0.023	140.6	0.000	0	0.0	1.500	o	150	
4.000	6.073	0.040	150.0	0.000	0	0.0	1.500	o	150	
4.001	21.336	0.142	150.0	0.000	0	0.0	1.500	o	150	
4.002	12.647	0.084	150.0	0.000	0	0.0	1.500	o	150	
4.003	16.312	0.109	150.0	0.000	0	0.0	1.500	o	150	
4.004	4.172	0.056	74.5	0.000	0	0.0	1.500	o	150	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	89.843	0.000	5.6	0	0.0	69	0.71	0.74	13.0	5.6
4.000	89.532	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
4.001	89.492	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
4.002	89.349	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
4.003	89.265	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
4.004	89.156	0.000	0.0	0	0.0	0	0.00	1.02	17.9	0.0

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