

Our Ref: TRS/RPL/E4832/17519

07th October 2019

Havant Borough
Council
Development Control
Civic Offices
Civic Centre Road
Havant
Hampshire
PO9 2AX

Dear Sirs

DEVELOPMENT AT WELLINGTON WAY (APP/18/00234)

RE: RESPONSE TO HAMPSHIRE COUNTY COUNCIL SURFACE WATER DRAINAGE LETTER DATED 20TH JUNE 2018 (SWM/2018/0247)

We have been appointed on behalf of CPI Wellington Way 2 Ltd to prepare an updated surface water drainage strategy in response to the comments provided by Hampshire County Council (HCC) per their letter of the 29th June 2018.

The revised surface water drainage strategy follows the principles of the previously submitted site specific flood risk assessment (FRA) but has been developed further to incorporate the findings of a drainage survey as well as implementing a SuDS hierarchal approach to the selection of the SuDS features on this site to ensure a required levels of treatment of surface water are provided in accordance with the recommendation of the SuDS Manual (Ciria 753).

In response to the first item raised by HCC relating to the use of infiltration systems being considered for this site. The BGS geological maps indicate that the site overlies the London Clay Formation with no designated Superficial Deposit. A historical borehole log from a nearby location to the site indicates the presence of MADE GROUND overlaying the clay strata with shallow groundwater being encountered. The combination of shallow groundwater and MADE GROUND deem that the use of SuDS infiltration systems are not suitable for this site. A copy of the historical borehole is appended to this letter.

Notwithstanding the above the revised surface water drainage strategy does now seek to include provisions for lined permeable paving to provide the necessary level of SuDS treatment in accordance with Ciria 753. Rainwater from the roof water outlets will discharge directly into the lined permeable sub-base via diffuser units to provide the level of treatment

to roof water run off as well. The details of the SuDS are provided on the revised surface water drainage strategy layout drawing RPL/E4832/002.

The updated strategy is supported by a survey of the existing surface water drainage strategy which proves the existing regime and brownfield discharge the Southern Water surface water network within Wellington Way. The revised strategy seeks to retain the existing lateral connections to the existing system; however, to ensure a betterment to the downstream network the proposed discharge from the site will be restricted to the calculated existing 1-year brownfield run off rate. This provides a significant betterment when comparing to the 30 year and 100-year design storm events.

The Brownfield run off rates for the varies storm events from the existing site for a net existing impermeable area of 0.212ha is tabled below:

Storm Event	Discharge Rate (l/s)
1 in 1 year	27.4
1 in 30 year	49.5
1 in 100 year	52.0

Table 1: Brownfield Discharge Rates

The proposed revised surface water drainage strategy seeks to restrict the peak discharge from the redevelopment site to 27.4l/s for all storm events up to and including the 1 in 100 year plus 40% event with an additional 10% allowance for future urban creep. The proposals seek to attenuate the surface water within lined permeable paving and below ground storage tanks. Details of the hydraulic simulations are appended to this letter.

Catchment	Impermeable Development Area (Ha)	Q1 Year (L/sec)	Q30 Year (L/Sec)	Q100 Year Plus Climate (L/Sec)
1	0.1517	5.2	9.8	12.9
2	0.604	6.8	6.9	7.0

Table 2: Summary of Post Development Runoff with mitigation measures

In terms of water quality, the provision of permeable paving for the external hardstanding surfaces and treatment of the roof water provides the treatment of surface water in accordance with Ciria 753.

The onsite system will remain private and maintenance to be carried out by the management company. Details of the Maintenance Schedule will be provided as part of the detailed design and as expected as a reasonable planning condition.

A strategy for directing overland flows for the site will be confirmed as part of the detailed design, though it should be noted that based on the existing sites surrounding drainage network and proposed usage the residual risk to future users from exceedance flows is considered low.



T: 01256 769269
E: mail@rcpconsultants.co.uk
w: www.rcpconsultants.co.uk

We trust the above addresses the items raised in the comments per the HCC letter. Should you require any further information then please do not hesitate to contact the undersigned

Yours sincerely

TERRY SEYMOUR
ENGINEERING DIRECTOR

Rogers Cory Partnership Limited
The Old School, Old School Road
Hook, Hampshire, RG27 9NJ

Registered in England & Wales No. 6222947
Registered office & business address as above



TERRESEARCH LIMITED

BOREHOLE NO. **2**

SU60NE 232

Contract Name **Waterlooville** Report No. **S. 696/14**
 Client **J.C. Bianco** Site Address **Wadhams Coach Works**
 Address **239-241, Shaftesbury Avenue, London Road,**
London, W.C.2. Waterlooville,
Hants.

Standing Water Level **2'0"** Diameter **8"**
 Water Struck **2'0"** Method of Boring **18" 11/16" auger**
 Ground Level _____ Start **10.7.64** Finish **11.7.64**

Remarks:

PRELIMINARY SHEET

Description of Strata	Thickness	Depth	Disturbed Samples	'U' Cores and 'N' P. Test
Bedrock	0'9"	0'9"	J1983 6"	
Brown & Blue sandy clay	9'3"	10'0"	J1984 2'6" J1985 5'0" J1986 7'6"	5'0" N = 21
Blue sandy clay	25'0"	35'0"	J1987 10'0" J1988 12'6" J1989 15'0" J1990 17'6" J1991 20'0" J1992 22'0" J1993 25'0" J1994 27'6" J1995 30'0" J1996 32'6" J1999 35'0"	10'0" N = 20 15'0" N = 27 20'0" N = 31 25'0" N = 31 30'0" N = 37 35'0" N = 34
			W2500	
TOTALS	35'0"	35'0"		



*Sewer Inspection,
Cleaning and Repair*

Project ref:TV190924

20th September 2019

CCTV Survey Report

CLIENT : CPI WELLINGTON WAY 2 LIMITED

SITE: Wellington Way

Waterlooville

Hampshire

PO7 7ED

www.insewer.co.uk

Tel : 01634 861 768



InSewer Surveys
 16a Revenge Road
 Lordwood Industrial Estate
 Tel: 01634 861 768
 Fax: 01634 201 376
 Email: liam@insewer.co.uk

Project-information

Project name :
TV190924

Contract Number :

Contact :

Date :
20/09/2019

Client: **CPI Wellington Way 2 Limited**
 Contact Name: **c/o Terry Seymour**
 Department: **Rogers Cory Partnership Ltd**
 Road: **The Old School, Old School Road**
 Town: **Hook**
 County: **Hampshire RG27 9NJ**
 Telephone: **01256 769 269**
 Fax:
 Mobile: **07462 134 576**
 E-mail:

Site:
 Contact Name:
 Department:
 Road: **Wellington Way**
 Town: **Waterlooville**
 County: **Hampshire, PO7 7ED**
 Telephone:
 Fax:
 Mobile:
 E-mail:

Contractor **InSewer Surveys**
 Contact Name: **Liam Sellar**
 Department:
 Road: **16a Revenge Road**
 Town: **Lordwood Industrial Estate**
 County: **Chatham, Kent ME5 8UD**
 Telephone: **01634 861 768**
 Fax: **01634 201 376**
 Mobile: **07802 660 752**
 E-mail: **liam@insewer.co.uk**



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Site Photos

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IC1



LOCATION OF IC1



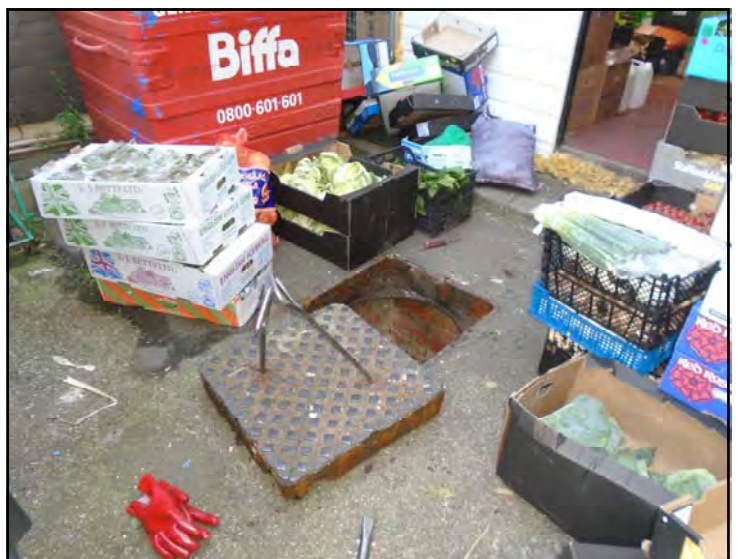
IC2



LOCATION OF IC2



IC3



LOCATION OF IC3



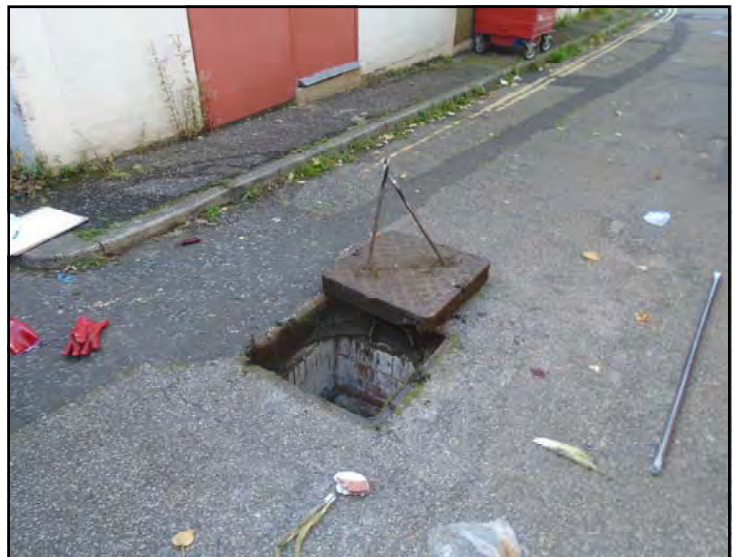
IC4



LOCATION OF IC4



IC5



LOCATION OF IC5



IC6



LOCATION OF IC6



IC7



LOCATION OF IC7



IC8 (1303)



LOCATION OF IC8



IC9 (1360)



LOCATION OF IC9



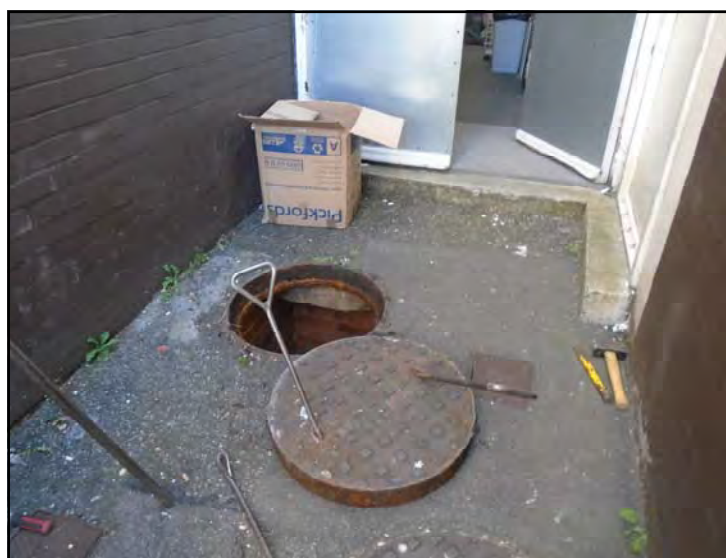
IC10 (1356)



LOCATION OF IC10



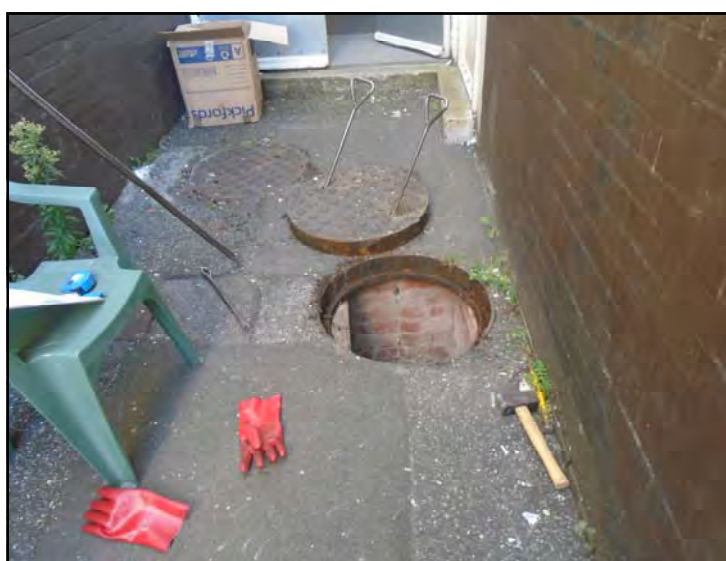
IC11



LOCATION OF IC11



IC12



LOCATION OF IC12



IC13



LOCATION OF IC13



IC14



LOCATION OF IC14



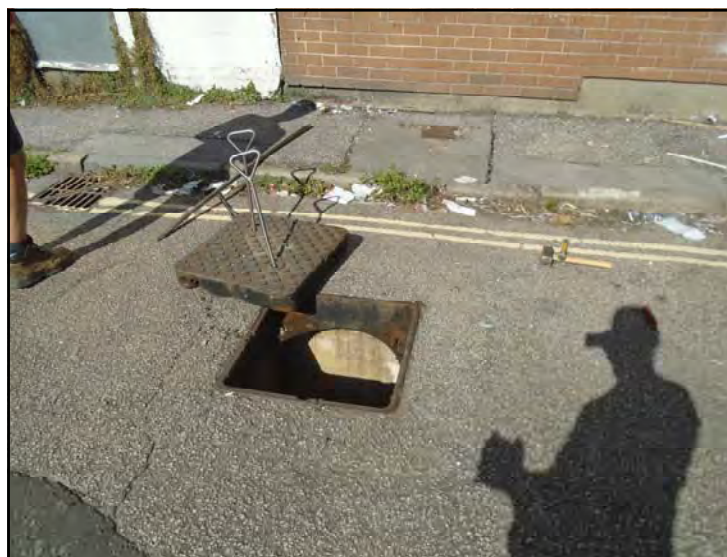
IC15



LOCATION OF IC15



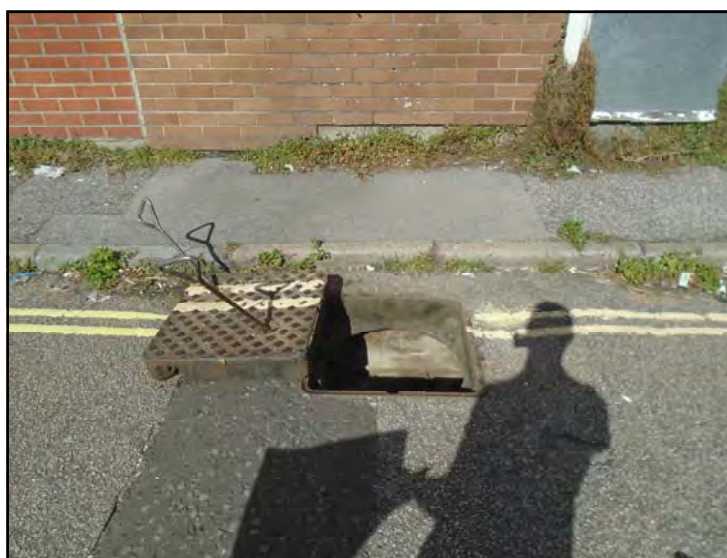
IC16



LOCATION OF IC16



IC17



LOCATION OF IC17



IC18



LOCATION OF IC18



IC19



LOCATION OF IC19



IC20 (1301)



LOCATION OF IC20



IC21



LOCATION OF IC21



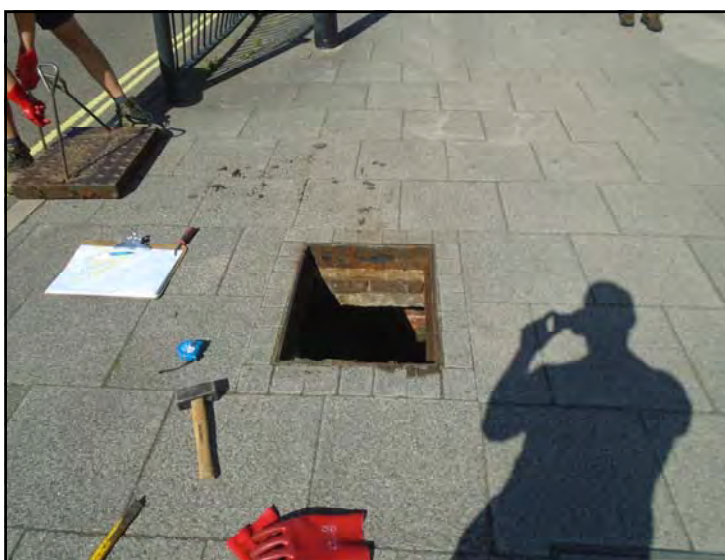
IC22(1354)



LOCATION OF IC22



IC23 (1355)



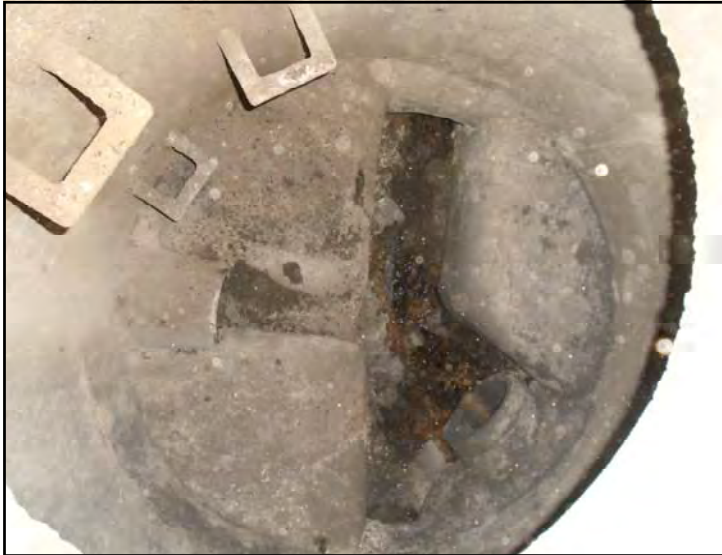
LOCATION OF IC23



IC24



LOCATION OF IC24



IC25



LOCATION OF IC25



GULLY 1



GULLY 2



GULLY 3



GULLY 4



GULLY 5



GULLY 7



GULLY 8



GULLY 9 UNABLE TO LIFT



GULLY 10



GULLY 11



GULLY 12



GULLY 13



GULLY 14



GULLY 15



GULLY 16



GULLY 17



GULLY 18



GULLY 19



GULLY 20



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Site Plan

www.insewer.co.uk

Tel : 01634 861 768



NOTES

Survey Brief

1. existing foul and survey connections to be prove demonstrate positive con
2. final lateral connections surface water network to
3. Existing depths of cham sewers to be recorded
4. Any traffic management Surveyors
5. The Drainage Surveyors access existing Southern

Extent o
drainage

Rev. Date Details

Client:-

radcliff

Site:-

Wellington
Way
Havant

Date: September 2019

Drawn: IRS Cher

Drawing No.

FOR INFO

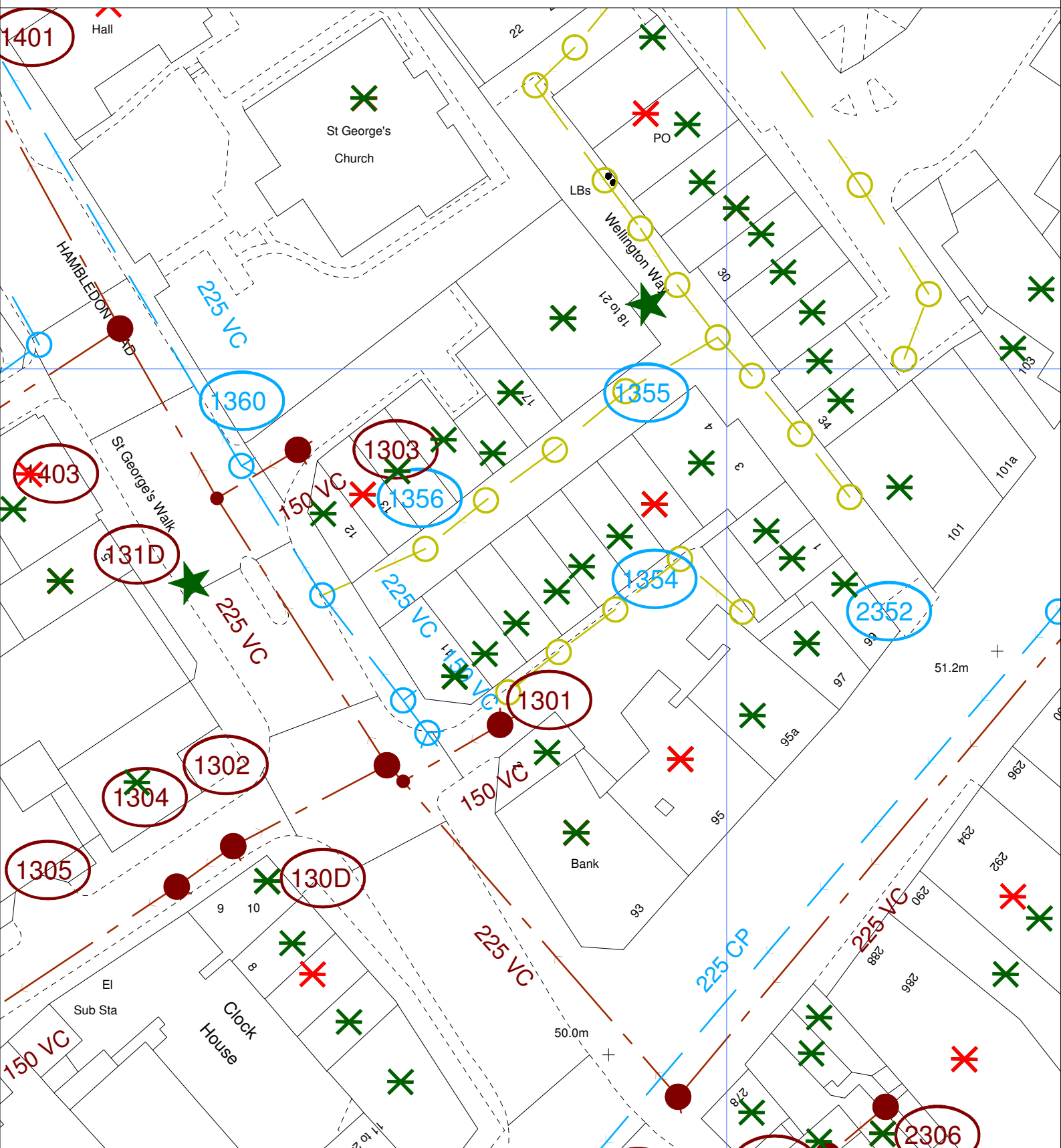
.Logos



Disclaimer

Detail shown on this plan is for reference only.
The positions of the pipes have been traced electronically and their route and location are believed to be correct.
InSewer Surveys accept no responsibility in the event of inaccuracy.
Before mechanical plant is used the actual position and route of the drainage system should be verified on site.

SOUTHERN WATER



The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site.

Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530

O.S. REF: SU6809SW

Scale: 1:625

Screen Print

WARNING: BAC pipes are constructed of Bonded Asbestos Cement

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement



Printed By: NadigaJ

Date: 27-6-2018

Southern Water MapGuide Browser

Requested By:





*Sewer Inspection,
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Report

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InSewer Surveys
 16a Revenge Road
 Lordwood Industrial Estate
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Inspection report

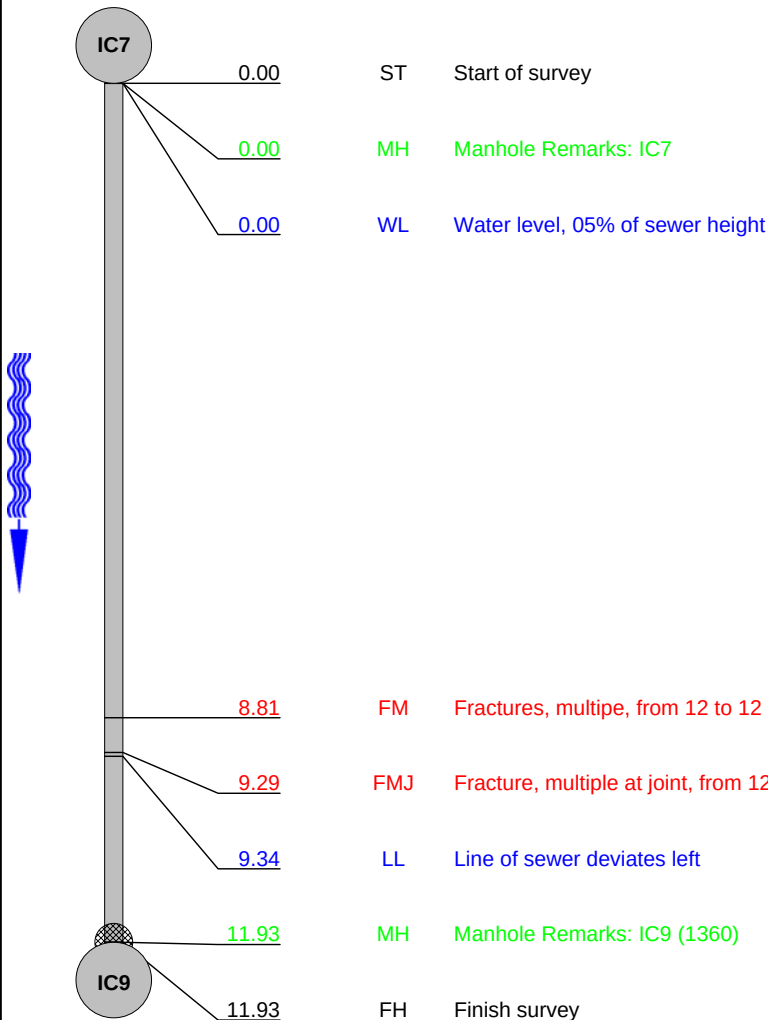
Date : 20/09/2019	Job number : TV190924	Weather : Dry	Sewer category:	Section number : 1	PLR suffix : X
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : InSewer DW

Place : Road : Location Inspection	WATERLOOVILLE WELLINGTON WAY IC7 (D/S) IC9	Location details: Catchment: Tape number : Pipe length :	U/S MH : U/S Depth : D/S MH : D/S Depth :	IC7 1.17 IC9 1.62
---	---	---	--	--

Use: Year laid : Purpose : Total length :	Surface water Condition and location	Pipe shape : Pipe size : Pipe material : Lining :	Circular 150 mm Vitrified clay
--	---	--	---

Comment :

1:105 Position
Depth: 1.17



8.81 m



9.29 m

Depth: 1.62

Structural Defects					Constructional Features				
Service Defects					Miscellaneous Features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	80	6.71	80	4	0	0	0	0	1



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Inspection pictures

Client :	Road :	Date :	Section number :	PLR suffix :
CPI Wellington Way 2 Limited	WELLINGTON WAY	20/09/2019	1	X



Photo: 001.JPG, VCR No.: 00001
 8.81m, Fractures, multiple, from 12 to 12 o'clock



Photo: 002.JPG, VCR No.: 00001
 9.29m, Fracture, multiple at joint, from 12 to 12 o'clock



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Inspection report

Date : 20/09/2019	Job number : TV190924	Weather : Dry	Sewer category:	Section number : 2	PLR suffix : X
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : InSewer DW

Place : Road : Location Inspection	WATERLOOVILLE WELLINGTON WAY IC8 (D/S) 131D	Location details: Catchment: Tape number : Pipe length :	U/S MH : U/S Depth : D/S MH : D/S Depth :	IC8 1.23 131D
Use: Year laid : Purpose : Total length :	Foul Condition and location	Pipe shape : Pipe size : Pipe material : Lining :	Circular 150 mm Vitrified clay	

Comment :

1:105	Position	Code	Observation						
Depth: 1.23									
	0.00	ST	Start of survey						
IC8	0.00	MH	Manhole Remarks: IC8 (1303)						
	0.00	WL	Water level, 05% of sewer height						
	1.62	CM	Cracks, multiple, from 12 to 12 o'clock	1.62 m					
	4.92	FM	Fractures, multiple, from 12 to 12 o'clock						
	4.92	JX	Junction, defective, at 12 o'clock, 150mm diameter Remarks: Fractured						
	5.60	JN	Junction, at 12 o'clock, 150mm diameter	4.92 m					
	5.60	CC	Crack, circumferential, from 12 to 12 o'clock						
	6.91	WL	Water level, 15% of sewer height						
	7.42	DE	Debris, 20% cross-sectional area loss	4.92 m					
	10.17	WL	Water level, 05% of sewer height						
	10.17	LD	Line of sewer deviates down						
	11.09	LR	Line of sewer deviates right	5.6 m					
	11.09	LD	Line of sewer deviates down						
131D	11.91	FH	Finish survey Remarks: At saddle connection (131D - dummy manhole)						
Structural Defects			Constructional Features	7.42 m					
Service Defects			Miscellaneous Features						
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
3	80	10.92	130	4	1	5	0.42	5	4



Inspection pictures

Client :	Road :	Date :	Section number :	PLR suffix :
CPI Wellington Way 2 Limited	WELLINGTON WAY	20/09/2019	2	X



Photo: 003.JPG, VCR No.: 00002
 1.62m, Cracks, multiple, from 12 to 12 o'clock



Photo: 004.JPG, VCR No.: 00002
 4.92m, Fractures, multiple, from 12 to 12 o'clock



Photo: 005.JPG, VCR No.: 00002
 4.92m, Junction, defective, at 12 o'clock, 150mm diameter



Photo: 006.JPG, VCR No.: 00002
 5.6m, Crack, circumferential, from 12 to 12 o'clock



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Email: liam@insewer.co.uk

Inspection pictures

Client :	Road :	Date :	Section number :	PLR suffix :
CPI Wellington Way 2 Limited	WELLINGTON WAY	20/09/2019	2	X

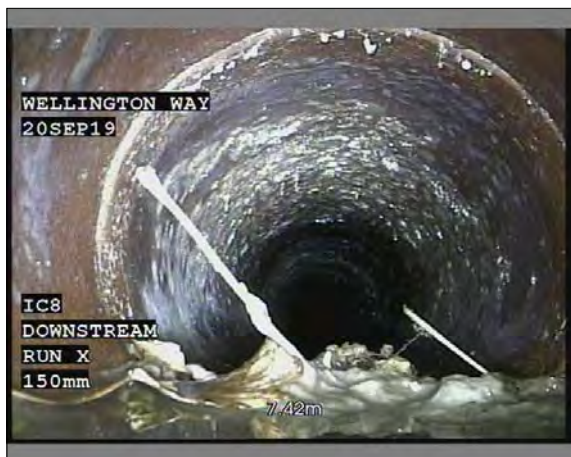


Photo: 007.JPG, VCR No.: 00002
7.42m, Debris, 20% cross-sectional area loss



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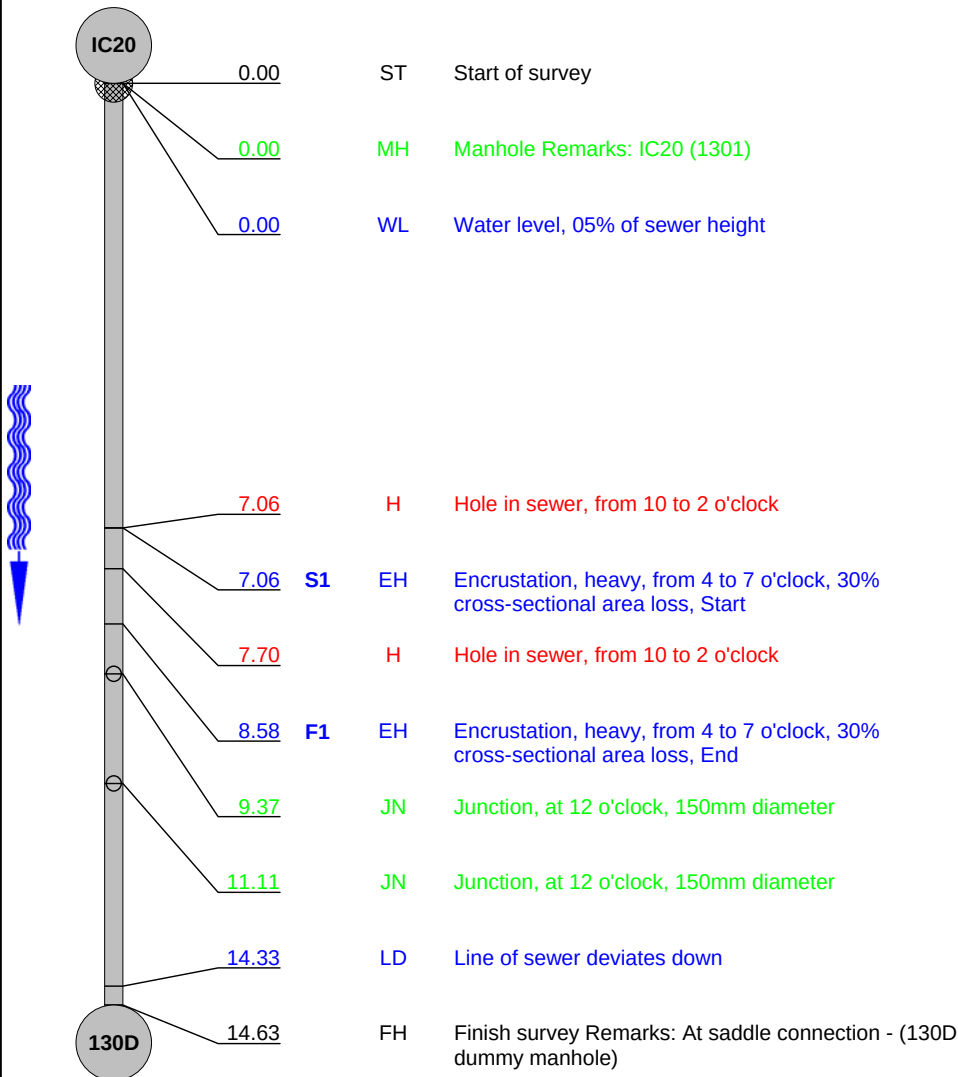
Inspection report

Date : 20/09/2019	Job number : TV190924	Weather : Dry	Sewer category:	Section number : 3	PLR suffix : X
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : InSewer DW

Place : Road : Location Inspection	WATERLOOVILLE WELLINGTON WAY IC20 (D/S) 130D	Location details: Catchment: Tape number : Pipe length :	U/S MH : U/S Depth : D/S MH : D/S Depth :	IC20 1.54 130D
Use: Year laid : Purpose : Total length :	Foul Condition and location	Pipe shape : Pipe size : Pipe material : Lining :	Circular 150 mm Vitrified clay	

Comment :

1:120 Position
Depth: 1.54



Structural Defects					Constructional Features				
Service Defects					Miscellaneous Features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
2	165	22.56	330	5	2	10	0.85	12.5	5



Inspection pictures

Client :	Road :	Date :	Section number :	PLR suffix :
CPI Wellington Way 2 Limited	WELLINGTON WAY	20/09/2019	3	X



Photo: 008.JPG, VCR No.: 00003
 7.06m, Hole in sewer, from 10 to 2 o'clock



Photo: 009.JPG, VCR No.: 00003
 7.06m, Encrustation, heavy, from 4 to 7 o'clock, 30% cross-sectional area loss, Start



Photo: 010.JPG, VCR No.: 00003
 7.7m, Hole in sewer, from 10 to 2 o'clock



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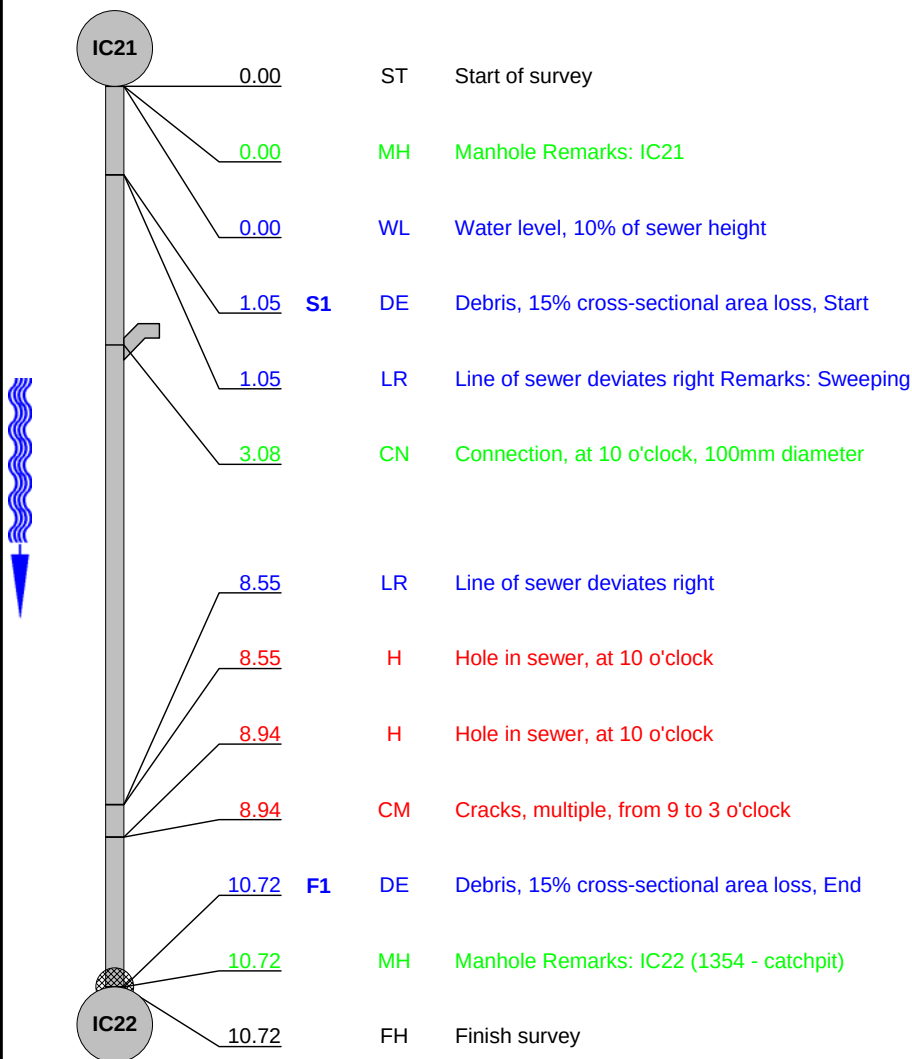
Inspection report

Date : 20/09/2019	Job number : TV190924	Weather : Dry	Sewer category:	Section number : 4	PLR suffix : X
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : InSewer DW

Place : Road : Location Inspection	WATERLOOVILLE WELLINGTON WAY IC21 (D/S) IC22	Location details: Catchment: Tape number : Pipe length :	U/S MH : U/S Depth : D/S MH : D/S Depth :	IC21 1.00 IC22 1.13
Use: Year laid : Purpose : Total length :	Surface water Condition and location	Pipe shape : Pipe size : Pipe material : Lining :	Circular 150 mm Vitrified clay	

Comment :

1:90 Position Code Observation
Depth: 1.00



8.55 m



8.94 m



8.94 m

Depth: 1.13

Structural Defects					Constructional Features				
Service Defects					Miscellaneous Features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
3	120	18.66	200	4	1	2	1.81	19.4	3



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Inspection pictures

Client :	Road :	Date :	Section number :	PLR suffix :
CPI Wellington Way 2 Limited	WELLINGTON WAY	20/09/2019	4	X



Photo: 011.JPG, VCR No.: 00004
 8.55m, Hole in sewer, at 10 o'clock



Photo: 012.JPG, VCR No.: 00004
 8.94m, Hole in sewer, at 10 o'clock



Photo: 013.JPG, VCR No.: 00004
 8.94m, Cracks, multiple, from 9 to 3 o'clock



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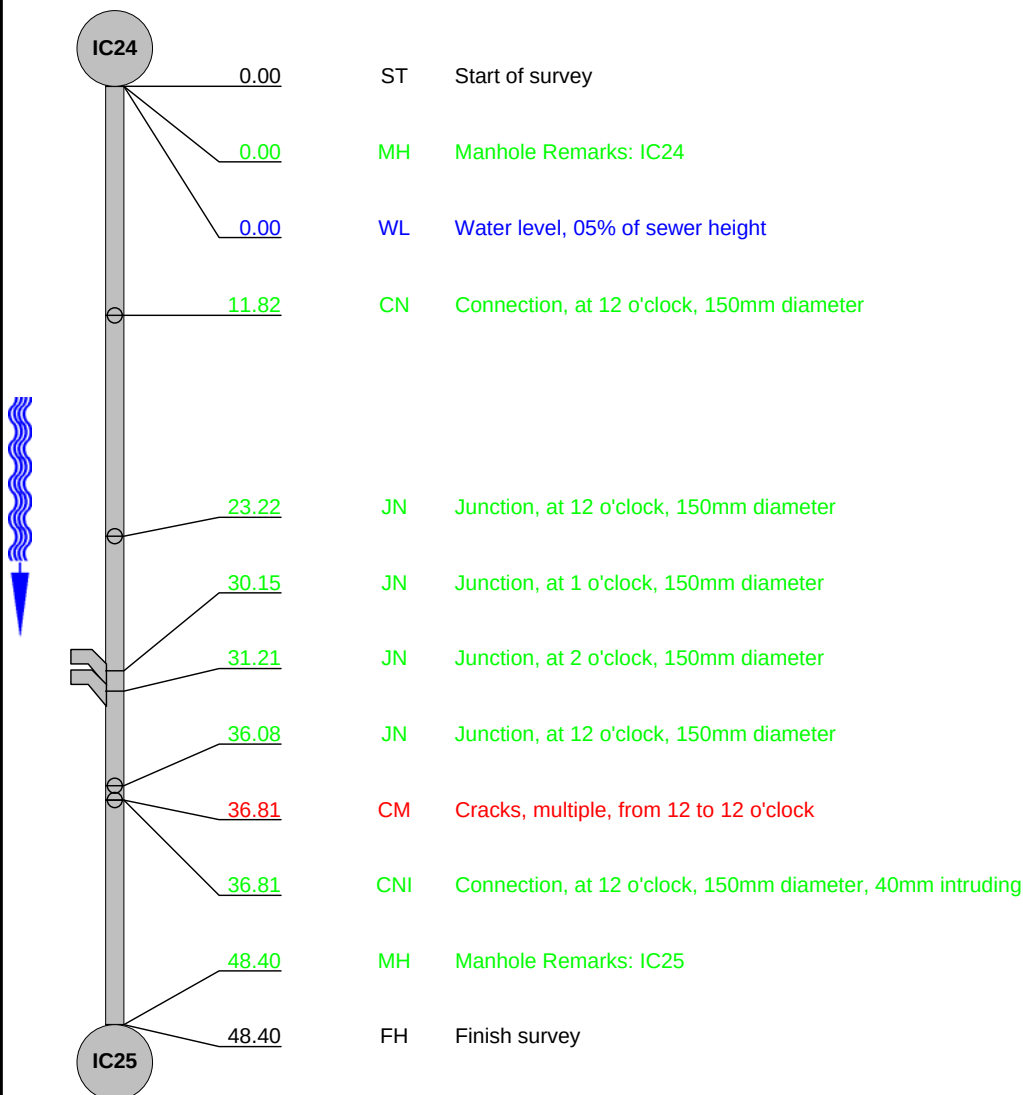
Inspection report

Date : 20/09/2019	Job number : TV190924	Weather : Dry	Sewer category:	Section number : 5	PLR suffix : X
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : InSewer DW

Place : Road : Location Inspection	WATERLOOVILLE WELLINGTON WAY IC24 (D/S) IC25	Location details: Catchment: Tape number : Pipe length :	U/S MH : U/S Depth : D/S MH : D/S Depth :	IC24 1.59 IC25 2.08
Use: Year laid : Purpose : Total length :	Surface water Condition and location	Pipe shape : Pipe size : Pipe material : Lining :	Circular 150 mm Concrete	

Comment :

1:390 Position
Depth: 1.59



36.81 m



36.81 m

Depth: 2.08

Structural Defects					Constructional Features				
Service Defects					Miscellaneous Features				
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	40	0.83	40	3	1	5	0.1	5	4



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Inspection pictures

Client :	Road :	Date :	Section number :	PLR suffix :
CPI Wellington Way 2 Limited	WELLINGTON WAY	20/09/2019	5	X



Photo: 014.JPG, VCR No.: 00005
 36.81m, Cracks, multiple, from 12 to 12 o'clock



Photo: 015.JPG, VCR No.: 00005
 36.81m, Connection, at 12 o'clock, 150mm diameter, 40mm intruding



*Sewer Inspection,
Cleaning and Repair*

Recommendations

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	No.	Inspection direction	Recommendations
1	1	IC7 (D/S) IC9	Repair defect/s by lining
2	2	IC8 (D/S) 131D	Repair defect/s by lining
3	3	IC20 (D/S) 130D	Repair defect/s by lining
4	4	IC21 (D/S) IC22	Repair defect/s by lining
5	5	IC24 (D/S) IC25	Repair defect/s by lining



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- *Cesspool Emptying*
- *Interceptor Cleaning*
- *Pump Station Cleaning*
- *Root and Scale Cutting*
- *Pipe Lining*
- *Trenchless Technology*
- *Confined Space Entry*

Call : 01634 861768

CCTV Sewer Inspection • Electronic Location • Cleaning and Repair

Registered Office Address:
Hydro Descaling Limited
16a Revenge Rd, Lordswood Ind. Est.
Chatham, Kent ME5 8UD
Company Reg No: 1304128
VAT No. 573 7537 09



"A Family Run Business Since 1977"

Rogers Cory Partnership		Page 1
The Old School Old School Road Hook Hampshire RG27 9NJ		
Date 10/10/2019 13:06 File Existing.MDX	Designed by Terry Checked by	
Innovyze	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.500	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	25.000	2.000	12.5	0.212	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.086	58.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.15	50.000	0.212	0.0	0.0	0.0	2.87	50.6	28.7
1.001	50.00	5.21	47.925	0.212	0.0	0.0	0.0	1.32	23.4«	28.7

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		49.000	47.839	0.000	0	0

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<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000 Hot Start (mins) 0 Inlet Coefficient 0.800 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Storage Structures 0 Number of Online Controls 0 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Summer Return Period (years) 2 Cv (Summer) 0.750 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 19.500 Storm Duration (mins) 30 Ratio R 0.350		
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500 Cv (Winter)		0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%	30/15 Summer	100/15 Summer			50.738
1.001	2	15 Winter	30	+0%	1/15 Summer				48.606

PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level
							Exceeded
1.000	1	0.588	0.000	1.03	49.5	FLOOD RISK	4
1.001	2	0.531	0.000	2.69	49.5	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	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500 Cv (Winter)		0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)
1.000	1	15 Winter	100	+0%	30/15 Summer	100/15 Summer		51.003
1.001	2	15 Winter	100	+0%	1/15 Summer			48.671

PN	US/MH Name	Depth (m)	Surcharged Volume (m³)	Flooded Flow / Cap. (l/s)	Pipe Flow (l/s)	Status	Level
							Exceeded
1.000	1	0.853	3.223	1.08	52.1	FLOOD	4
1.001	2	0.596	0.000	2.83	52.0	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.500	Add Flow / Climate Change (%)	10
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	25.000	0.500	50.0	0.152	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.086	58.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.29	50.000	0.152	0.0	0.0	2.1	1.43	25.2	22.6
1.001	50.00	5.36	49.500	0.152	0.0	0.0	2.1	1.32	23.4	22.6

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001		51.000	49.414	0.000	0	0
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The Old School Old School Road Hook Hampshire RG27 9NJ																						
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<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000 Hot Start (mins) 0 Inlet Coefficient 0.800 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Storage Structures 2 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Profile Type</td> <td>Summer</td> </tr> <tr> <td>Return Period (years)</td> <td>2</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.500</td> <td>Storm Duration (mins)</td> <td>30</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td></td> <td></td> </tr> </table>			Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	2	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.500	Storm Duration (mins)	30	Ratio R	0.350		
Rainfall Model	FSR	Profile Type	Summer																			
Return Period (years)	2	Cv (Summer)	0.750																			
Region	England and Wales	Cv (Winter)	0.840																			
M5-60 (mm)	19.500	Storm Duration (mins)	30																			
Ratio R	0.350																					
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 2, DS/PN: 1.001, Volume (m³): 2.1

Unit Reference	MD-SCU-0141-2000-1000-2000
Design Head (m)	1.000
Design Flow (l/s)	20.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	141
Invert Level (m)	49.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	20.0
Flush-Flo™	0.173	9.8
Kick-Flo®	0.211	9.6
Mean Flow over Head Range	-	13.4

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)
0.100	5.6	1.200	21.8	3.000	33.9	7.000	51.1
0.200	9.7	1.400	23.5	3.500	36.5	7.500	52.8
0.300	11.3	1.600	25.0	4.000	38.9	8.000	54.5
0.400	13.0	1.800	26.5	4.500	41.2	8.500	56.1
0.500	14.4	2.000	27.9	5.000	43.4	9.000	57.7
0.600	15.7	2.200	29.2	5.500	45.4	9.500	59.3
0.800	18.0	2.400	30.4	6.000	47.4		
1.000	20.0	2.600	31.6	6.500	49.3		

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Storage Structures for Storm

Tank or Pond Manhole: 1, DS/PN: 1.000

Invert Level (m) 50.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	45.0	0.400	45.0	0.401	0.0

Complex Manhole: 2, DS/PN: 1.001

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	47.0
Max Percolation (l/s)	91.4	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.500	Cap Volume Depth (m)	0.800

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

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

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

US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Level
						Overflow	Act.
1.000	1 15 Winter	1	+0%	30/15	Summer		50.084
1.001	2 60 Winter	1	+0%	30/15	Summer		49.595

Surcharged Flooded				Pipe			
US/MH	Depth	Volume	Flow /	Overflow	Pipe	Level	
PN	Name	(m)	(m³)	Cap.	(l/s)	(l/s)	Status Exceeded
1.000	1	-0.066	0.000	0.59		14.0	OK
1.001	2	-0.055	0.000	0.28		5.2	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	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

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

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

US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow
1.000	1 30 Winter	100	+40%	30/15	Summer		50.895
1.001	2 60 Winter	100	+40%	30/15	Summer		49.899

US/MH	Depth	Volume	Flow /	Overflow	Pipe	Level
PN	Name	(m)	(m³)	Cap.	(l/s)	(l/s)
1.000	1	0.745	0.000	1.54	37.0	FLOOD RISK
1.001	2	0.249	0.000	0.70	12.9	SURCHARGED

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.500	Add Flow / Climate Change (%)	10
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	25.000	0.500	50.0	0.060	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.086	58.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.29	50.000	0.060	0.0	0.0	0.8	1.43	25.2	8.9
1.001	50.00	5.36	49.500	0.060	0.0	0.0	0.8	1.32	23.4	8.9

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001		51.000	49.414	0.000	0	0
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<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000 Hot Start (mins) 0 Inlet Coefficient 0.800 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Storage Structures 1 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR Profile Type Summer Return Period (years) 2 Cv (Summer) 0.750 Region England and Wales Cv (Winter) 0.840 M5-60 (mm) 19.500 Storm Duration (mins) 30 Ratio R 0.350		
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 2, DS/PN: 1.001, Volume (m³): 2.1

Unit Reference	MD-SHE-0124-7000-1000-7000
Design Head (m)	1.000
Design Flow (l/s)	7.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	124
Invert Level (m)	49.500
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	7.0
Flush-Flo™	0.296	7.0
Kick-Flo®	0.653	5.7
Mean Flow over Head Range	-	6.0

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)
0.100	4.4	1.200	7.6	3.000	11.7	7.000	17.6
0.200	6.8	1.400	8.2	3.500	12.6	7.500	18.2
0.300	7.0	1.600	8.7	4.000	13.5	8.000	18.8
0.400	6.9	1.800	9.2	4.500	14.2	8.500	19.3
0.500	6.7	2.000	9.7	5.000	15.0	9.000	19.9
0.600	6.2	2.200	10.1	5.500	15.7	9.500	20.4
0.800	6.3	2.400	10.6	6.000	16.3		
1.000	7.0	2.600	11.0	6.500	17.0		

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<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: 2, DS/PN: 1.001</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00000</td> <td>Width (m)</td> <td>4.8</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>30.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>40.0</td> <td>Slope (1:X)</td> <td>1000.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>50.000</td> <td>Cap Volume Depth (m)</td> <td>0.800</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8	Membrane Percolation (mm/hr)	1000	Length (m)	30.0	Max Percolation (l/s)	40.0	Slope (1:X)	1000.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	50.000	Cap Volume Depth (m)	0.800
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.8																							
Membrane Percolation (mm/hr)	1000	Length (m)	30.0																							
Max Percolation (l/s)	40.0	Slope (1:X)	1000.0																							
Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	50.000	Cap Volume Depth (m)	0.800																							
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

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

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

US/MH	Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow
1.000	1	15 Winter	30	+0%	30/15 Summer		50.305
1.001	2	15 Winter	30	+0%	1/15 Summer		50.079

US/MH	Depth	Volume	Flow /	Overflow	Pipe	Level
PN	Name	(m)	(m³)	Cap.	(l/s)	(l/s)
1.000	1	0.155	0.000	0.71	16.9	SURCHARGED
1.001	2	0.429	0.000	0.38	6.9	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	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales	Cv (Summer)		0.750
M5-60 (mm)	19.500	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)
1.000	1	15 Winter	100	+40%	30/15 Summer			50.880
1.001	2	30 Winter	100	+40%	1/15 Summer			50.245

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.730	0.000	1.22		29.3	FLOOD RISK	
1.001	2	0.595	0.000	0.38		7.0	SURCHARGED	

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