

Appendix 8



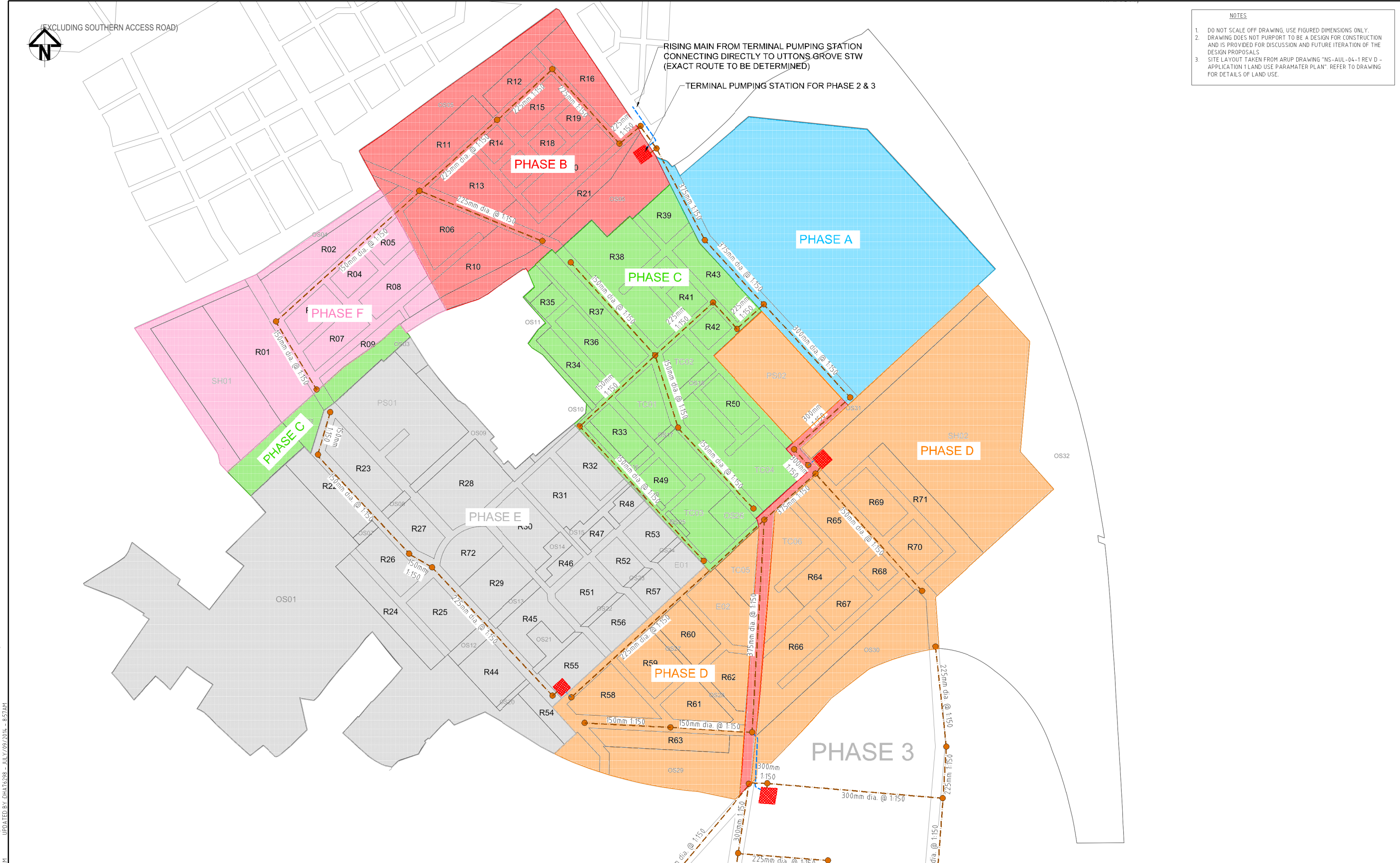
FW Drainage Strategy



- NOTES**
1. DO NOT SCALE OFF DRAWING, USE FIGURED DIMENSIONS ONLY.
 2. DRAWING DOES NOT PURPORT TO BE A DESIGN FOR CONSTRUCTION AND IS PROVIDED FOR DISCUSSION AND FUTURE ITERATION OF THE DESIGN PROPOSALS.
 3. SITE LAYOUT TAKEN FROM ARUP DRAWING "NS-AUL-04-1 REV D - APPLICATION 1 LAND USE PARAMETER PLAN". REFER TO DRAWING FOR DETAILS OF LAND USE.

RISING MAIN FROM TERMINAL PUMPING STATION CONNECTING DIRECTLY TO UTTONS GROVE STW (EXACT ROUTE TO BE DETERMINED)

TERMINAL PUMPING STATION FOR PHASE 2 & 3



CAD FILE: K:\UA006156-Northstowe-E-Drawings\Current Drawings\028-UA006156-UP3D-01-PHASE 2 FOUL WATER STRATEGY V2.dwg
 PRINTED BY: D:\A006156-UP3D-01-PRINT-01-8-57AM
 UPDATED BY: D:\A006156-UP3D-01-8-57AM

KEY

- - - - FOUL DRAINAGE PIPE (SIZE & GRADIENT SHOWN)
- FOUL DRAINAGE NODE
- PUMPING STATION (TYPICALLY 25M X 25M)
- - - - RISING MAIN

Issue	Description	Date
01	FIRST ISSUE	JUN 14

Client

Homes & Communities Agency

Status	PRELIMINARY	
Scales	1:3,000	
Original Size	A1	
Height Datum	A.O.D.	
Grid	O.S. GRID	
Current Issue Signatures	Author: D. HUGHES Checker: S. A. DAVIES Approver: S. A. DAVIES	
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Project

NORTHSTOWE

Title

NORTHSTOWE - PHASE 2 FOUL WATER DRAINAGE STRATEGY

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Drawing No. **C028** - Project No. **UA006156** - Issue **01**



CALCULATIONS

DOCUMENT No

4003-UA006156-UP3C-02

OFFICE

Cardiff

PROJECT TITLE

Northstowe

SUBJECT

Foul Pumping Station Calculation (Phase 2)

SHEET No

1 OF 1

ISSUE	TOTAL SHEETS	AUTHOR	DATE	CHECKED BY	DATE	APPROVED BY	DATE	COMMENTS
1	1	DH	06/06/14	SD	06/06/14	SD	06/06/14	
2	1	DH	27/08/14	SD	27/08/14	SD	27/08/14	Development Phase Added
3								
4								
5								

SUPERSEDES DOC No

DATE

02/06/14


DESIGN BASIS STATEMENT (Inc. sources of info/data, assumptions made, standards, etc.)

1. Pumping station sizes calculated in accordance with Sewers for Adoption (SfA) 7th Edition

24 hr storage required 160 l / dwelling
 Peak discharge based on 4,000 l / dwelling / day + Additional Flow

SfA (D4.6) - design flow rate of pump should be at least the maximum of half the peak design flow rate.

Drainage Network	Peak Discharge (l/s)	No. of Dwelling	Development Phase	Additional Flow (l/s)	24 hr Storage Req. (m ³)	Pumping Rate (1/2 Peak)	Discharge to Network	Max. Discharge (l/s)
1	33	713	2	0.0	114	16.5	Ph. 1	69.1
2	35.8	699	2	3.4	124	17.9	1	59.2
3	92.4	1,305	2	32.0	324	46.2	2	9.4
4	105.7	2,227	2 / 3	2.7	366	52.9	2	86.2
5	83.6	1,450	3	16.5	291	41.8	4	41.8
6	49.7	1,075	3	2.7	182	24.9	4	24.9
Total	400.2	7,469		57.3	1,401			

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HCL House Forttran Road St Mellons Business Park Cardiff CF3 0EY	NORTHSTOWE PHASE 2 FOUL NETWORK 1	
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FOUL SEWERAGE DESIGN











Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	15.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	150


Designed with Level Soffits

Network Design Table for Foul - Main













PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	312.000	2.080	150.0	0.000	282	0.0	1.500	o	150	
F1.001	177.000	1.180	150.0	0.000	0	0.0	1.500	o	150	
F2.000	189.000	1.260	150.0	0.000	0	3.9	1.500	o	150	
F2.001	129.000	0.860	150.0	0.000	0	1.5	1.500	o	150	
F3.000	213.000	1.420	150.0	0.000	266	0.0	1.500	o	150	
F1.002	134.000	0.893	150.0	0.000	0	0.0	1.500	o	225	
F1.003	61.000	0.407	150.0	0.000	18	0.0	1.500	o	225	
F1.004	62.000	0.413	150.0	0.000	0	0.0	1.500	o	225	
F4.000	36.000	0.240	150.0	0.000	29	59.2	1.500	o	300	
F4.001	130.000	0.867	150.0	0.000	0	0.0	1.500	o	300	

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)
F1.000	7.950	0.000	0.0	282	0.0	92	0.77	0.71	12.6	8.8
F1.001	5.870	0.000	0.0	282	0.0	92	0.77	0.71	12.6	8.8
F2.000	7.850	0.000	3.9	0	0.0	57	0.63	0.71	12.6	3.9
F2.001	6.590	0.000	5.4	0	0.0	69	0.69	0.71	12.6	5.4
F3.000	7.100	0.000	0.0	266	0.0	89	0.76	0.71	12.6	8.3
F1.002	4.615	0.000	5.4	548	0.0	126	0.98	0.94	37.2	22.5
F1.003	3.722	0.000	5.4	566	0.0	128	0.99	0.94	37.2	23.1
F1.004	3.315	0.000	5.4	566	0.0	128	0.99	0.94	37.2	23.1
F4.000	7.650	0.000	59.2	29	0.0	194	1.24	1.13	80.0	60.1
F4.001	7.410	0.000	59.2	29	0.0	194	1.24	1.13	80.0	60.1

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Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F4.002	216.000	1.440	150.0	0.000	0	3.1	1.500	o	300	
F1.005	149.000	0.993	150.1	0.000	76	19.7	1.500	o	375	
F1.006	177.000	1.180	150.0	0.000	30	0.0	1.500	o	375	
F5.000	135.000	0.900	150.0	0.000	174	0.0	1.500	o	150	
F5.001	330.000	2.200	150.0	0.000	202	0.0	1.500	o	150	
F6.000	225.000	1.500	150.0	0.000	182	0.0	1.500	o	150	
F5.002	180.000	1.200	150.0	0.000	148	0.0	1.500	o	225	
F5.003	128.000	0.853	150.0	0.000	65	0.0	1.500	o	225	
F5.004	171.000	1.140	150.0	0.000	154	0.0	1.500	o	225	
F5.005	47.000	0.313	150.0	0.000	0	0.0	1.500	o	225	
F5.006	47.000	0.313	150.0	0.000	0	0.0	1.500	o	225	
F1.007	5.000	0.033	150.0	0.000	0	0.0	1.500	o	375	

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)
F4.002	6.543	0.000	62.3	29	0.0	201	1.25	1.13	80.0	63.2
F1.005	2.752	0.000	87.4	671	0.0	243	1.43	1.31	144.5	108.4
F1.006	1.759	0.000	87.4	701	0.0	244	1.44	1.31	144.5	109.3
F5.000	7.750	0.000	0.0	174	0.0	69	0.69	0.71	12.6	5.4
F5.001	6.850	0.000	0.0	376	0.0	115	0.81	0.71	12.6	11.8
F6.000	7.400	0.000	0.0	182	0.0	71	0.70	0.71	12.6	5.7
F5.002	4.575	0.000	0.0	706	0.0	125	0.98	0.94	37.2	22.1
F5.003	3.375	0.000	0.0	771	0.0	132	1.00	0.94	37.2	24.1
F5.004	2.522	0.000	0.0	925	0.0	149	1.03	0.94	37.2	28.9
F5.005	1.382	0.000	0.0	925	0.0	149	1.03	0.94	37.2	28.9
F5.006	1.068	0.000	0.0	925	0.0	149	1.03	0.94	37.2	28.9
F1.007	0.579	0.000	87.4	1626	0.0	295	1.48	1.31	144.5	138.2

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PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	150	F1	9.300	7.950	1.200	Open Manhole	1200
F1.001	o	150	F2	9.200	5.870	3.180	Open Manhole	1200
F2.000	o	150	F3	9.200	7.850	1.200	Open Manhole	1200
F2.001	o	150	F4	9.200	6.590	2.460	Open Manhole	1200
F3.000	o	150	F5	8.500	7.100	1.250	Open Manhole	1200
F1.002	o	225	F6	8.500	4.615	3.660	Open Manhole	1200
F1.003	o	225	F7	8.500	3.722	4.553	Open Manhole	1200
F1.004	o	225	F8	8.500	3.315	4.960	Open Manhole	1200
F4.000	o	300	F9	9.000	7.650	1.050	Open Manhole	1200
F4.001	o	300	F10	8.500	7.410	0.790	Open Manhole	1200
F4.002	o	300	F11	8.500	6.543	1.657	Open Manhole	1200
F1.005	o	375	F12	8.500	2.752	5.373	Open Manhole	1350
F1.006	o	375	F13	8.300	1.759	6.166	Open Manhole	1350
F5.000	o	150	F14	9.100	7.750	1.200	Open Manhole	1200
F5.001	o	150	F15	8.900	6.850	1.900	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	312.000	150.0	F2	9.200	5.870	3.180	Open Manhole	1200
F1.001	177.000	150.0	F6	8.500	4.690	3.660	Open Manhole	1200
F2.000	189.000	150.0	F4	9.200	6.590	2.460	Open Manhole	1200
F2.001	129.000	150.0	F6	8.500	5.730	2.620	Open Manhole	1200
F3.000	213.000	150.0	F6	8.500	5.680	2.670	Open Manhole	1200
F1.002	134.000	150.0	F7	8.500	3.722	4.553	Open Manhole	1200
F1.003	61.000	150.0	F8	8.500	3.315	4.960	Open Manhole	1200
F1.004	62.000	150.0	F12	8.500	2.902	5.373	Open Manhole	1350
F4.000	36.000	150.0	F10	8.500	7.410	0.790	Open Manhole	1200
F4.001	130.000	150.0	F11	8.500	6.543	1.657	Open Manhole	1200
F4.002	216.000	150.0	F12	8.500	5.103	3.097	Open Manhole	1350
F1.005	149.000	150.1	F13	8.300	1.759	6.166	Open Manhole	1350
F1.006	177.000	150.0	F22	8.000	0.579	7.046	Open Manhole	1350
F5.000	135.000	150.0	F15	8.900	6.850	1.900	Open Manhole	1200
F5.001	330.000	150.0	F16	8.500	4.650	3.700	Open Manhole	1200

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PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.000	o	150	F16	8.800	7.400	1.250	Open Manhole	1200
F5.002	o	225	F16	8.500	4.575	3.700	Open Manhole	1200
F5.003	o	225	F17	8.400	3.375	4.800	Open Manhole	1200
F5.004	o	225	F18	8.200	2.522	5.453	Open Manhole	1200
F5.005	o	225	F20	8.100	1.382	6.493	Open Manhole	1200
F5.006	o	225	F21	8.000	1.068	6.707	Open Manhole	1200
F1.007	o	375	F22	8.000	0.579	7.046	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.000	225.000	150.0	F16	8.500	5.900	2.450	Open Manhole	1200
F5.002	180.000	150.0	F17	8.400	3.375	4.800	Open Manhole	1200
F5.003	128.000	150.0	F18	8.200	2.522	5.453	Open Manhole	1200
F5.004	171.000	150.0	F20	8.100	1.382	6.493	Open Manhole	1200
F5.005	47.000	150.0	F21	8.000	1.068	6.707	Open Manhole	1200
F5.006	47.000	150.0	F22	8.000	0.755	7.020	Open Manhole	1350
F1.007	5.000	150.0	F	0.000	0.545		Open Manhole	0

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HCL House Forttran Road St Mellons Business Park Cardiff CF3 0EY	NORTHSTOWE PHASE 2 FOUL NETWORK 2	
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File NETWORK 2 (06-06-2014).MDX	Checked by S DAVIES	
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FOUL SEWERAGE DESIGN








Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	15.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	150

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	147.000	0.980	150.0	0.000	94	0.0	1.500	o	150	
F1.001	140.000	0.933	150.0	0.000	37	0.0	1.500	o	150	
F1.002	365.000	2.433	150.0	0.000	145	89.5	1.500	o	375	
F2.000	448.000	2.987	150.0	0.000	181	9.9	1.500	o	225	
F1.003	117.000	0.780	150.0	0.000	0	0.0	1.500	o	375	
F3.000	268.000	1.787	150.0	0.000	147	0.0	1.500	o	150	
F1.004	5.000	0.033	150.0	0.000	0	0.0	1.500	o	375	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse (l/s)	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	8.200	0.000	0.0	94	0.0	49	0.58	0.71	12.6	2.9
F1.001	7.220	0.000	0.0	131	0.0	59	0.64	0.71	12.6	4.1
F1.002	6.062	0.000	89.5	276	0.0	227	1.40	1.31	144.5	98.1
F2.000	8.200	0.000	9.9	181	0.0	101	0.89	0.94	37.2	15.6
F1.003	3.628	0.000	99.4	457	0.0	251	1.45	1.31	144.5	113.7
F3.000	6.687	0.000	0.0	147	0.0	63	0.66	0.71	12.6	4.6
F1.004	2.848	0.000	99.4	604	0.0	259	1.46	1.31	144.5	118.3

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PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	150	F1	9.600	8.200	1.250	Open Manhole	1200
F1.001	o	150	F2	9.450	7.220	2.080	Open Manhole	1200
F1.002	o	375	F3	9.300	6.062	2.863	Open Manhole	1350
F2.000	o	225	F4	9.600	8.200	1.175	Open Manhole	1200
F1.003	o	375	F5	9.100	3.628	5.097	Open Manhole	1350
F3.000	o	150	F6	9.000	6.687	2.163	Open Manhole	1200
F1.004	o	375	F7	9.000	2.848	5.777	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	147.000	150.0	F2	9.450	7.220	2.080	Open Manhole	1200
F1.001	140.000	150.0	F3	9.300	6.287	2.863	Open Manhole	1350
F1.002	365.000	150.0	F5	9.100	3.628	5.097	Open Manhole	1350
F2.000	448.000	150.0	F5	9.100	5.213	3.662	Open Manhole	1350
F1.003	117.000	150.0	F7	9.000	2.848	5.777	Open Manhole	1350
F3.000	268.000	150.0	F7	9.000	4.900	3.950	Open Manhole	1350
F1.004	5.000	150.0	F	0.000	2.815		Open Manhole	0

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HCL House Forttran Road St Mellons Business Park Cardiff CF3 0EY	NORTHSTOWE PHASE 2 FOUL NETWORK 3	
Date 06-06-14 File NETWORK 3 (06-06-2014).MDX	Designed by D HUGHES Checked by S DAVIES	
XP Solutions	Network 2014.1	

FOUL SEWERAGE DESIGN





Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	150.00	Maximum Backdrop Height (m)	15.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	150

Designed with Level Soffits

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	74.000	0.493	150.1	0.000	0	0.0	1.500	o	150	
F1.001	227.000	1.513	150.0	0.000	229	3.4	1.500	o	150	
F1.002	45.000	0.300	150.0	0.000	0	0.0	1.500	o	150	
F1.003	298.000	1.987	150.0	0.000	265	0.0	1.500	o	225	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse (l/s)	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	7.850	0.000	0.0	0	0.0	0	0.00	0.71	12.6	0.0
F1.001	7.357	0.000	3.4	229	0.0	105	0.80	0.71	12.6	10.6
F1.002	5.844	0.000	3.4	229	0.0	105	0.80	0.71	12.6	10.6
F1.003	5.469	0.000	3.4	494	0.0	113	0.94	0.94	37.2	18.8

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Date 06-06-14 File NETWORK 3 (06-06-2014).MDX		Designed by D HUGHES Checked by S DAVIES
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PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	150	F1	9.200	7.850	1.200	Open Manhole	1200
F1.001	o	150	F2	9.200	7.357	1.693	Open Manhole	1200
F1.002	o	150	F3	9.200	5.844	3.206	Open Manhole	1200
F1.003	o	225	F4	9.200	5.469	3.506	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	74.000	150.1	F2	9.200	7.357	1.693	Open Manhole	1200
F1.001	227.000	150.0	F3	9.200	5.844	3.206	Open Manhole	1200
F1.002	45.000	150.0	F4	9.200	5.544	3.506	Open Manhole	1200
F1.003	298.000	150.0	F	0.000	3.482		Open Manhole	0

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HCL House Forttran Road St Mellons Business Park Cardiff CF3 0EY		
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FOUL SEWERAGE DESIGN










Design Criteria for Foul Drainage Net 3 2013-10-16.fws

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	10.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	2.100
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	150


Designed with Level Soffits

Network Design Table for Foul Drainage Net 3 2013-10-16.fws









PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	111.523	0.743	150.1	0.000	286	0.0	0.600	o	150	
F1.001	96.252	0.642	150.0	0.000	0	0.0	0.600	o	150	
F2.000	300.000	2.000	150.0	0.000	613	0.0	0.600	o	225	
F1.002	247.000	1.647	150.0	0.000	0	0.0	0.600	o	225	
F1.003	38.000	0.253	150.0	0.000	0	0.0	0.600	o	225	
F3.000	165.709	1.105	150.0	0.000	91	2.7	0.600	o	150	
F3.001	83.000	0.553	150.0	0.000	91	0.0	0.600	o	150	
F3.002	150.000	1.000	150.0	0.000	92	0.0	0.600	o	225	
F4.000	212.515	1.417	150.0	0.000	93	24.9	0.600	o	225	

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)
F1.000	7.131	0.000	0.0	286	0.0	113	0.93	0.82	14.5	13.2
F1.001	6.388	0.000	0.0	286	0.0	113	0.93	0.82	14.5	13.2
F2.000	9.192	0.000	0.0	613	0.0	135	1.14	1.07	42.4	28.4
F1.002	5.671	0.000	0.0	899	0.0	182	1.21	1.07	42.4	41.6
F1.003	4.024	0.000	0.0	899	0.0	182	1.21	1.07	42.4	41.6
F3.000	8.313	0.000	2.7	91	0.0	73	0.81	0.82	14.5	6.9
F3.001	7.208	0.000	2.7	182	0.0	99	0.90	0.82	14.5	11.1
F3.002	6.580	0.000	2.7	274	0.0	94	0.98	1.07	42.4	15.4
F4.000	9.750	0.000	24.9	93	0.0	137	1.15	1.07	42.4	29.2

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Network Design Table for Foul Drainage Net 3 2013-10-16.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F3.003	110.000	0.733	150.0	0.000	0	0.0	0.600	o	300	
F1.004	31.789	0.212	150.0	0.000	0	0.0	0.600	o	300	
F5.000	95.452	0.636	150.0	0.000	114	41.8	0.600	o	300	
F5.001	188.725	1.258	150.0	0.000	326	0.0	0.600	o	300	
F6.000	172.000	1.147	150.0	0.000	387	0.0	0.600	o	225	
F6.001	94.631	0.631	150.0	0.000	0	0.0	0.600	o	225	
F5.002	296.609	1.977	150.0	0.000	134	0.0	0.600	o	300	
F1.005	1.000	0.007	150.0	0.000	0	0.0	0.600	o	450	

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)
F3.003	5.505	0.000	27.6	367	0.0	149	1.28	90.6	44.6
F1.004	3.696	0.000	27.6	1266	0.0	235	1.45	90.6	86.2
F5.000	9.221	0.000	41.8	114	0.0	153	1.29	90.6	47.1
F5.001	8.585	0.000	41.8	440	0.0	183	1.38	90.6	62.2
F6.000	7.175	0.000	0.0	387	0.0	102	1.02	42.4	17.9
F6.001	6.028	0.000	0.0	387	0.0	102	1.02	42.4	17.9
F5.002	5.322	0.000	41.8	961	0.0	235	1.45	90.6	86.2
F1.005	3.195	0.000	69.4	2227	0.0	266	1.76	263.6	172.4


PIPELINE SCHEDULES for Foul Drainage Net 3 2013-10-16.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	150	FMH44	9.381	7.131	2.100	Open Manhole	1200
F1.001	o	150	FMH45	9.458	6.388	2.920	Open Manhole	1200
F2.000	o	225	FMH41	11.517	9.192	2.100	Open Manhole	1200
F1.002	o	225	FMH42	9.761	5.671	3.865	Open Manhole	1200
F1.003	o	225	FMH43	9.537	4.024	5.288	Open Manhole	1200
F3.000	o	150	FMH38	10.563	8.313	2.100	Open Manhole	1200
F3.001	o	150	FMH39	11.319	7.208	3.961	Open Manhole	1200
F3.002	o	225	FMH40	10.222	6.580	3.417	Open Manhole	1200
F4.000	o	225	FMH35	11.950	9.750	1.975	Open Manhole	1200
F3.003	o	300	FMH36	10.048	5.505	4.243	Open Manhole	1200
F1.004	o	300	FMH37	9.711	3.696	5.715	Open Manhole	1200
F5.000	o	300	FMH33	11.471	9.221	1.950	Open Manhole	1200
F5.001	o	300	FMH34	10.400	8.585	1.515	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	111.523	150.1	FMH45	9.458	6.388	2.920	Open Manhole	1200
F1.001	96.252	150.0	FMH42	9.761	5.746	3.865	Open Manhole	1200
F2.000	300.000	150.0	FMH42	9.761	7.192	2.344	Open Manhole	1200
F1.002	247.000	150.0	FMH43	9.537	4.024	5.288	Open Manhole	1200
F1.003	38.000	150.0	FMH37	9.711	3.771	5.715	Open Manhole	1200
F3.000	165.709	150.0	FMH39	11.319	7.208	3.961	Open Manhole	1200
F3.001	83.000	150.0	FMH40	10.222	6.655	3.417	Open Manhole	1200
F3.002	150.000	150.0	FMH36	10.048	5.580	4.243	Open Manhole	1200
F4.000	212.515	150.0	FMH36	10.048	8.333	1.490	Open Manhole	1200
F3.003	110.000	150.0	FMH37	9.711	4.772	4.639	Open Manhole	1200
F1.004	31.789	150.0	F17	10.000	3.484	6.216	Open Manhole	1500
F5.000	95.452	150.0	FMH34	10.400	8.585	1.515	Open Manhole	1200
F5.001	188.725	150.0	FMH31	9.790	7.326	2.164	Open Manhole	1200

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PIPELINE SCHEDULES for Foul Drainage Net 3 2013-10-16.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.000	o	225	FMH29	9.500	7.175	2.100	Open Manhole	1200
F6.001	o	225	FMH30	9.436	6.028	3.183	Open Manhole	1200
F5.002	o	300	FMH31	9.790	5.322	4.168	Open Manhole	1200
F1.005	o	450	F17	10.000	3.195	6.355	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F6.000	172.000	150.0	FMH30	9.436	6.028	3.183	Open Manhole	1200
F6.001	94.631	150.0	FMH31	9.790	5.397	4.168	Open Manhole	1200
F5.002	296.609	150.0	F17	10.000	3.345	6.355	Open Manhole	1500
F1.005	1.000	150.0	FMH32	9.715	3.189	6.076	Open Manhole	1200

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FOUL SEWERAGE DESIGN









Design Criteria for Foul Drainage Net 4 2013-10-16.fws

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	10.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	2.100
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	150


Designed with Level Soffits

Network Design Table for Foul Drainage Net 4 2013-10-16.fws








PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	233.586	1.557	150.0	0.000	312	0.0	0.600	o	150	
F1.001	182.604	1.217	150.0	0.000	0	6.3	0.600	o	225	
F2.000	82.000	0.547	150.0	0.000	45	0.0	0.600	o	150	
F2.001	110.622	0.737	150.0	0.000	0	1.1	0.600	o	150	
F3.000	135.206	0.901	150.0	0.000	0	6.7	0.600	o	150	
F2.002	221.597	1.477	150.0	0.000	0	2.4	0.600	o	150	
F4.000	279.251	1.862	150.0	0.000	118	0.0	0.600	o	150	
F1.002	172.064	1.147	150.0	0.000	0	0.0	0.600	o	225	

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)
F1.000	9.363	0.000	0.0	312	0.0	123	0.93	0.82	14.5	14.4
F1.001	7.731	0.000	6.3	312	0.0	111	1.06	1.07	42.4	20.7
F2.000	9.764	0.000	0.0	45	0.0	38	0.58	0.82	14.5	2.1
F2.001	9.217	0.000	1.1	45	0.0	48	0.66	0.82	14.5	3.2
F3.000	10.033	0.000	6.7	0	0.0	72	0.80	0.82	14.5	6.7
F2.002	8.480	0.000	10.2	45	0.0	106	0.92	0.82	14.5	12.3
F4.000	10.502	0.000	0.0	118	0.0	64	0.76	0.82	14.5	5.5
F1.002	6.513	0.000	16.5	475	0.0	169	1.20	1.07	42.4	38.5


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Network Design Table for Foul Drainage Net 4 2013-10-16.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F5.000	139.788	0.932	150.0	0.000	144	0.0	0.600	o	150	
F5.001	83.383	0.556	150.0	0.000	144	0.0	0.600	o	150	
F5.002	235.437	1.570	150.0	0.000	0	0.0	0.600	o	150	
F6.000	247.198	1.648	150.0	0.000	166	0.0	0.600	o	150	
F6.001	211.926	1.413	150.0	0.000	98	0.0	0.600	o	150	
F5.003	127.000	0.847	150.0	0.000	423	0.0	0.600	o	300	
F1.003	27.641	0.184	150.0	0.000	0	0.0	0.600	o	300	

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)
F5.000	8.750	0.000	0.0	144	0.0	71	0.80	0.82	14.5	6.7
F5.001	7.818	0.000	0.0	288	0.0	114	0.93	0.82	14.5	13.3
F5.002	7.262	0.000	0.0	288	0.0	114	0.93	0.82	14.5	13.3
F6.000	9.750	0.000	0.0	166	0.0	78	0.83	0.82	14.5	7.7
F6.001	8.102	0.000	0.0	264	0.0	106	0.92	0.82	14.5	12.2
F5.003	5.543	0.000	0.0	975	0.0	150	1.28	1.28	90.6	45.1
F1.003	4.696	0.000	16.5	1450	0.0	229	1.45	1.28	90.6	83.6

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PIPELINE SCHEDULES for Foul Drainage Net 4 2013-10-16.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	150	FMH50	11.613	9.363	2.100	Open Manhole	1200
F1.001	o	225	FMH51	14.645	7.731	6.689	Open Manhole	1500
F2.000	o	150	FMH52	11.964	9.764	2.050	Open Manhole	1200
F2.001	o	150	FMH53	13.000	9.217	3.633	Open Manhole	1200
F3.000	o	150	FMH55	12.283	10.033	2.100	Open Manhole	1200
F2.002	o	150	FMH54	13.622	8.480	4.992	Open Manhole	1200
F4.000	o	150	FMH46	12.752	10.502	2.100	Open Manhole	1200
F1.002	o	225	FMH47	14.706	6.513	7.968	Open Manhole	1500
F5.000	o	150	FMH56	11.000	8.750	2.100	Open Manhole	1200
F5.001	o	150	FMH57	11.068	7.818	3.100	Open Manhole	1200
F5.002	o	150	FMH58	11.854	7.262	4.442	Open Manhole	1200
F6.000	o	150	FMH60	12.000	9.750	2.100	Open Manhole	1200
F6.001	o	150	FMH61	12.100	8.102	3.848	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	233.586	150.0	FMH51	14.645	7.806	6.689	Open Manhole	1500
F1.001	182.604	150.0	FMH47	14.706	6.513	7.968	Open Manhole	1500
F2.000	82.000	150.0	FMH53	13.000	9.217	3.633	Open Manhole	1200
F2.001	110.622	150.0	FMH54	13.622	8.480	4.992	Open Manhole	1200
F3.000	135.206	150.0	FMH54	13.622	9.132	4.340	Open Manhole	1200
F2.002	221.597	150.0	FMH47	14.706	7.003	7.553	Open Manhole	1500
F4.000	279.251	150.0	FMH47	14.706	8.640	5.916	Open Manhole	1500
F1.002	172.064	150.0	FMH48	11.500	5.366	5.909	Open Manhole	1500
F5.000	139.788	150.0	FMH57	11.068	7.818	3.100	Open Manhole	1200
F5.001	83.383	150.0	FMH58	11.854	7.262	4.442	Open Manhole	1200
F5.002	235.437	150.0	FMH59	12.000	5.693	6.157	Open Manhole	1500
F6.000	247.198	150.0	FMH61	12.100	8.102	3.848	Open Manhole	1200
F6.001	211.926	150.0	FMH59	12.000	6.689	5.161	Open Manhole	1500

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PIPELINE SCHEDULES for Foul Drainage Net 4 2013-10-16.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.003	o	300	FMH59	12.000	5.543	6.157	Open Manhole	1500
F1.003	o	300	FMH48	11.500	4.696	6.504	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.003	127.000	150.0	FMH48	11.500	4.696	6.504	Open Manhole	1500
F1.003	27.641	150.0	FMH49	11.000	4.512	6.188	Open Manhole	1200

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XP Solutions	Network 2014.1	

FOUL SEWERAGE DESIGN











Design Criteria for Foul Drainage Net 5 2013-10-16.fws

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	10.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	2.100
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	150


Designed with Level Soffits

Network Design Table for Foul Drainage Net 5 2013-10-16.fws



PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	62.674	0.418	150.0	0.000	79	0.0	0.600	o	150	
F1.001	52.600	0.351	150.0	0.000	79	0.0	0.600	o	150	
F1.002	65.597	0.437	150.0	0.000	79	0.0	0.600	o	150	
F1.003	62.978	0.420	150.0	0.000	68	0.0	0.600	o	150	
F1.004	51.231	0.342	150.0	0.000	68	0.0	0.600	o	225	
F1.005	46.348	0.309	150.0	0.000	0	0.0	0.600	o	225	
F2.000	366.377	2.443	150.0	0.000	335	2.7	0.600	o	225	
F1.006	190.144	1.268	150.0	0.000	0	0.0	0.600	o	225	
F3.000	357.806	2.385	150.0	0.000	267	0.0	0.600	o	150	
F4.000	89.538	0.597	150.0	0.000	100	0.0	0.600	o	150	

Network Results Table

PN	US/IL (m)	E Area (ha)	E Base Flow (l/s)	E Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	10.250	0.000	0.0	79	0.0	51	0.68	0.82	14.5	3.7
F1.001	9.832	0.000	0.0	158	0.0	75	0.82	0.82	14.5	7.3
F1.002	9.482	0.000	0.0	237	0.0	98	0.90	0.82	14.5	11.0
F1.003	9.044	0.000	0.0	305	0.0	120	0.93	0.82	14.5	14.1
F1.004	8.549	0.000	0.0	373	0.0	100	1.01	1.07	42.4	17.3
F1.005	8.208	0.000	0.0	373	0.0	100	1.01	1.07	42.4	17.3
F2.000	11.075	0.000	2.7	335	0.0	103	1.03	1.07	42.4	18.2
F1.006	7.899	0.000	2.7	708	0.0	158	1.19	1.07	42.4	35.4
F3.000	10.650	0.000	0.0	267	0.0	107	0.92	0.82	14.5	12.3
F4.000	11.750	0.000	0.0	100	0.0	58	0.73	0.82	14.5	4.6


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Network Design Table for Foul Drainage Net 5 2013-10-16.fws

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F3.001	30.823	0.205	150.0	0.000	0	0.0	0.600	o	225	
F1.007	17.307	0.115	150.0	0.000	0	0.0	0.600	o	300	

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)	
F3.001	8.190	0.000	0.0	367	0.0	99	1.01	1.07	42.4	17.0
F1.007	6.556	0.000	2.7	1075	0.0	164	1.33	1.28	90.6	52.4

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PIPELINE SCHEDULES for Foul Drainage Net 5 2013-10-16.fws

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	o	150	FMH138	12.500	10.250	2.100	Open Manhole	1200
F1.001	o	150	FMH139	12.400	9.832	2.418	Open Manhole	1200
F1.002	o	150	FMH140	12.000	9.482	2.368	Open Manhole	1200
F1.003	o	150	FMH141	12.000	9.044	2.806	Open Manhole	1200
F1.004	o	225	FMH142	12.349	8.549	3.575	Open Manhole	1200
F1.005	o	225	FMH143	13.044	8.208	4.611	Open Manhole	1200
F2.000	o	225	FMH147	12.500	11.075	1.200	Open Manhole	1200
F1.006	o	225	FMH144	13.274	7.899	5.150	Open Manhole	1200
F3.000	o	150	FMH148	12.000	10.650	1.200	Open Manhole	1200
F4.000	o	150	FMH150	14.000	11.750	2.100	Open Manhole	1200
F3.001	o	225	FMH149	13.083	8.190	4.668	Open Manhole	1200
F1.007	o	300	FMH145	13.287	6.556	6.431	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	62.674	150.0	FMH139	12.400	9.832	2.418	Open Manhole	1200
F1.001	52.600	150.0	FMH140	12.000	9.482	2.368	Open Manhole	1200
F1.002	65.597	150.0	FMH141	12.000	9.044	2.806	Open Manhole	1200
F1.003	62.978	150.0	FMH142	12.349	8.624	3.575	Open Manhole	1200
F1.004	51.231	150.0	FMH143	13.044	8.208	4.611	Open Manhole	1200
F1.005	46.348	150.0	FMH144	13.274	7.899	5.150	Open Manhole	1200
F2.000	366.377	150.0	FMH144	13.274	8.632	4.417	Open Manhole	1200
F1.006	190.144	150.0	FMH145	13.287	6.631	6.431	Open Manhole	1500
F3.000	357.806	150.0	FMH149	13.083	8.265	4.668	Open Manhole	1200
F4.000	89.538	150.0	FMH149	13.083	11.153	1.780	Open Manhole	1200
F3.001	30.823	150.0	FMH145	13.287	7.985	5.078	Open Manhole	1500
F1.007	17.307	150.0	FMH146	13.000	6.441	6.259	Open Manhole	1200