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Comhairle Chontae na Gaillimhe
Galway County Council

Gort Uí Lochlainn, Proposed Residential Development, Mountain Road, Moycullen

Engineering Report Planning Stage

Gort Uí Lochlainn – Proposed Residential Development

Engineering Planning Report

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1.0 INTRODUCTION

1.1 GENERAL

Galway County Council intend to develop a new residential development at their lands located at Mountain Road, Moycullen, Co Galway. The development will consist of the clearance of the existing greenfield site and construction of 31 No. Houses including access roads & parking spaces, bin store, landscaping, open space and all ancillary site development works.

Tobin Consulting Engineers are the consultants appointed to provide civil engineering design and flood risk assessment services for the planning stage of the project. This report discusses the civil engineering aspects of the project while the Flood Risk Assessment is documented in a separate report included with the planning application submission.

1.2 ENGINEERING INFORMATION

As part of the planning submission for the above proposed development, Tobin Consulting Engineers have prepared this Engineering Report addressing the following design aspects of the proposed development.

- ✓ Storm Water Drainage
- ✓ Wastewater Drainage
- ✓ Water Supply
- ✓ Road Layout
- ✓ Traffic Management

The following drawings are included outlining the design proposals and a Drawing Register is included in **Appendix 1**:

- ✓ Drawing 10578-2100 Rev P1 – Proposed Foul Sewer, Storm Sewer and Watermain Layout
- ✓ Drawing 10578-2101 Rev P1 – Standard Watermain Details
- ✓ Drawing 10578-2102 Rev P1 – Standard Manhole Details (Sheet 1 of 2)
- ✓ Drawing 10578-2103 Rev P1 – Standard Manhole Details (Sheet 2 of 2)
- ✓ Drawing 10578-2104 Rev P1 – Standard Pipe Bedding Details
- ✓ Drawing 10578-2105 Rev P1 – Site Development Details
- ✓ Drawing 10578-2106 Rev P1 – Proposed Roads Layout
- ✓ Drawing 10578-2107 Rev P1 – Proposed Road Longsection
- ✓ Drawing 10578-2108 Rev P1 – Vehicle Swept Path Analysis – Fire Tender
- ✓ Drawing 10578-2109 Rev P1 – Vehicle Swept Path Analysis – Refuse Vehicle & Large Car

2.0 STORM WATER DRAINAGE

Storm water drainage services for the proposed development are considered to include the following:

- ✓ Storm Water Network for footpaths, external paved areas and roofs
- ✓ Flow restriction and soakaway within site
- ✓ Removal of hydrocarbon pollutants

The storm water drainage services have been designed to take account of the requirements of the Department of Environment "Recommendations for Site Development Works for Housing Areas", 1998 and "Sewers for Adoption" published by WRC, UK.

The storm water drainage network was designed using Innovyze MicroDrainage Design software and the following parameters formed the basis of the design:

The surface water run-off is calculated using the Modified Rational Method (Wallingford Procedure),

$$Q = 2.78 \times Cv \times Cr \times I \times A$$

Where,

Q	=	rate of run-off, l/s
Cv	=	Volumetric run-off coefficient
Cr	=	Routing coefficient
I	=	Intensity of rainfall, mm/hr
A	=	Impermeable Area, ha

- A design return period of 1 year has been adopted for the sewer network in accordance with good design practice.
- The rainfall intensity is based on rainfall data for Galway City
- Minimum self cleansing velocity of 0.75m/s
- An allowable discharge of 0.1l/s has been used in the model purely for simulation purposes. Additional storage capacity has been provided for in the soakaways to cater for this.

The following impermeability factors were adopted in accordance with good design practice:

- Macadam Roadways = 0.95
- Roof Areas = 0.90
- Concrete Areas = 0.85

2.1 STORM NETWORK

There is an existing storm water drainage network Mountain Road flowing in a north rest direction which then travels through private lands to the north of the proposed site. This existing storm sewer is a 450mm diameter concrete sewer and discharges to an open drain further down stream. Periodic ponding at Mountain rd. outside site area is acknowledged for action via separate proposals underway by Galway Co. Co. Infrastructure & Operations Unit. No surface water discharge from the

development will be permitted to this existing storm sewer. All surface water runoff generated on site will be slowly discharged back to groundwater by means of an infiltration tank.

As noted above, the storm drainage for the entire development has been designed using the Innovyze MicroDrainage Design Software in accordance with the Recommendations for Site Development Works for Housing Areas and also some of the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The details of the Micro Drainage Outputs for the pipe design, attenuation design and associated long sections are outlined at **Appendix 2** of this report.

There is an existing open drain running along the western boundary of the site which is culverted under the existing yard area and connects into the storm network on Mountain Road. Due to the proposed playground car park and bottle bank it will be necessary to increase the length of culvert. This will be in the form of a new 300mm dia concrete sewer and will include replacement of the existing culvert. As the impermeable areas on the site will have its own dedicated storm drainage network the catchment area of this drain discharging to the public sewer will be decreased and hence will not apply any additional loading.

Please refer to drawing 10578 – 2100 Rev A for details of the existing storm drainage network.

2.2 ATTENUATION/INFILTRATION

As noted above, the existing public storm network is not capable receiving any additional loading therefore it is proposed to infiltrate all stormwater run-off generated on site

An infiltration rate of 0.0104m/hr has been used in sizing the attenuation/infiltration tanks as calculated based on the result of a percolation test carried out on site in accordance with BRE DIGEST 365 .

It is proposed to infiltrate all roof-run via individual infiltration tanks located in the rear garden of each unit. Surface water run-off from roads and footways will discharge to one of two main infiltration tanks, run-of generated in the upper portion of the site will flow into an infiltration tank providing 168m^3 of equivalent storage, while run-off generated on the lower portion of the site will discharge to an infiltration tank providing an equivalent storage volume of 245m^3. It should be noted that for modelling purposes a an outflow of 0.1L/sec was included, to cater for this volume and additional 8.64m^3 (0.1L/sec for a 24hr storm event) of storage is provided in addition to the volumes calculated from modelling. All infiltration tanks have been designed to cater for a 100 year rainfall event with a 20% factor for climate change).

Refer to Drawings 10578-2100 Rev A, for details of the proposed storm drainage network. Please refer to **Appendix 2** for details of storm water attenuation / infiltration calculations.

2.3 PETROL INTERCEPTOR

It is proposed to install 2 No. Class 1 Bypass Petrol Interceptor upstream of the connection into the existing open drain. The reasoning for this is that the storm water entering the system will include run-off from the roadways and parking areas throughout the site and therefore may have hydrocarbons within their flow. These hydrocarbon pollutants require removal and are not to be discharged back

into the environment. The separator has been sized to cater for roads, footways and driveway areas of the site.

From the selection tables in the separator product brochure, the NSBP004 & NSBP006 models or similar interceptor size are required to cater for the hydrocarbons which may be present in the storm water.

3.0 WASTEWATER DRAINAGE

3.1 GENERAL

It is proposed to discharge wastewater generated by the proposed development to the existing foul sewer network which runs on the public road to the west of the proposed development. There is currently 2 No. foul sewers running along the Mountain Road outside the proposed site. These existing foul sewers are a 300mm diameter concrete and 150mm uPVC. It is proposed to discharge to this network via gravity via a 225mm dia sewer in accordance with Section 3.6 of The Irish Water Code of Practice for Wastewater Infrastructure.

A Pre-Connection Enquiry for the development has been submitted to Irish Water based on this approach and on the envisaged wastewater discharge volumes from the development. Refer to drawing ref, 10578-2100 Rev A – Proposed Storm, Foul Sewer & Watermain Layout for proposed foul drainage layout.

The drainage systems including all pipe sizes and gradients have been designed in accordance with the Irish Water Code of Practice for Wastewater Infrastructure using Innovyze MicroDrainage Design Software. The details of the Micro Drainage Outputs for the pipe designs and associated long sections are outlined at Appendix 4 of this report. The pipework for the drainage system has been designed to provide for six times the dry weather flow (DWF) in accordance with the recommendations of the Irish Water Code of Practice for Wastewater Infrastructure.

A confirmation of Feasibility for this development has been received from Irish Water – Reference No CDS19007640

3.2 OCCUPANCY FIGURES AND WASTEWATER FLOW RATES

The foul loadings for the sewers have been evaluated in accordance with the Irish Water Code of Practice for Wastewater Supply.
The foul loading for the sewers has been evaluated in accordance with the Irish Water Code of Practice for Wastewater Infrastructure. The occupancy per house type is based on Section 3.6 of the IW Code of Practice for Wastewater Infrastructure, a summary of the total Hydraulic and Organic loadings based on these figures is outlined as follows:

Table 3-1 Summary of Hydraulic and Organic Loadings

Source		Hydraulic Loading (Litres/Day)		BOD_5 Load (Grams/Day)		P.E.
Description	Total Occupancy	Per Occupancy	Total	Per Occupancy	Total	
Total Occupancy based on Table No. 1	83.7	150	12555	60	5022	84
Total	208		12555		5022	84

Table 3-2 Summary of Total Occupancy

House Type	Number of House Type	Average Occupancy Per House*	Total Occupancy
House Type A - 3 Bed	1	2.7	2.7
House Type B - 2 Bed	27	2.7	72.9
House Type C - 3 Bed	3	2.7	8.1
Total	**31**		**83.7**

* Average Occupancy taken from the IW Code of Practice for Wastewater

Therefore, the total Hydraulic load for the proposed development is 12,555 Litres per day and the proposed PE is 84.

4.0 WATER SUPPLY

4.1 GENERAL OVERVIEW

The proposed water supply main has been designed in accordance with the Irish Water Code of Practice for Water Supply and Recommendations for Site Development Works for Housing Areas published by the Department of the Environment and Local Government. There is an existing 250mm & 200mm uPVC public watermain which run along the Mountain road. It is proposed to extend this line to the north along the Ballinruan Road and turn it into the proposed development, as shown in Dwg. 10578-2100 Rev A. The proposed pipe will consist of 100mm dia PE100 SDR17 pipe.

In accordance with Irish Water and Local Authority standards individual boundary boxes with stopcock and meter will be installed on connection pipework to each unit. All water mains are to be commissioned and pressure tested to Irish Water Standards. The typical construction details are shown on Dwg. No. 10537-2005.

A Pre-Connection Enquiry for the proposed development has been submitted to Irish Water based on this approach and on the envisaged water demand volumes.

The "National Guidance Document on the Provision of Water for Fire Fighting", Water UK, Local Government Association, (3rd Edition, Jan 2007), states that housing developments with units of detached or semidetached houses of not more than two floors should have a water supply capable of delivering a minimum of 8l/s through any single hydrant.

A confirmation of Feasibility for this development has been received from Irish Water – Reference No CDS19007640

5.0 TRAFFIC IMPACT

A Traffic Report is submitted as part of this application. The Report assesses the impact the proposed development will have on the existing signalised junction within Moycullen as agreed with Galway County Council. The Report includes a review of the committed development currently granted for the Moycullen. Analysis was carried out with and without the Moycullen By-pass scenarios. The resulting assessment is summarised as follows:

<u>Junction 1 - Signalised Junction at L1313 Church Road/Clifden Road/L1320 Mountain Road/Clifden Road</u>
The LinSig analysis for the design year 2023 without the Bypass (including the base traffic with growth indices applied and inclusion of current Committed Development traffic) indicates that in the morning peak hour scenarios, Arm 1 is forecast to approach capacity. A slight decrease was recorded for Arm 3 in the morning peak, however, this is a result of the analysis software optimising the delays for all of the Traffic Streams within the junction.

The inclusion of the proposed Development traffic will result in a slight increase in the Degree of Saturation (DoS) for the majority of Traffic Streams and a slight increase in the MMQ for the majority of Traffic Streams (i.e., for Arm 4, Traffic Stream1/2 the DoS increases from 93.7% to 96.3% and the MMQ from 23.8 PCU to 26.1 PCU). The evening peak hour is similar with Arms 1 and 2 forecast to operate above capacity. Again, the inclusion of the proposed development traffic will result in an increase in the DoS and MMQ for these Traffic Streams.
The LinSig analysis for the design year 2023 with the inclusion of the Bypass (including the base traffic with growth indices applied and inclusion of current Committed Development traffic) indicates that for both the morning and evening peak hour scenarios, the junction is forecast to operate within capacity.

The inclusion of the proposed Development traffic will result in a slight increase in the Degree of Saturation (DoS) for each Stream and a slight increase in the MMQ for each Stream for the morning and evening peak hour scenarios, however the inclusion of the proposed Development traffic is forecast to have minimal effect on the operation of the signalised junction.

The inclusion of the proposed Development traffic will result in a slight increase in the Degree of Saturation (DoS) for each Stream and a slight increase in the MMQ for each Stream for the morning and evening peak hour scenarios, (the largest impact forecast is for Arm 1, Traffic Stream1/2 for which the Dos increases from 94.0% to 96.8% and the MMQ from 20.9 PCU to 23.1 PCU in the morning peak hour). A slight decrease was recorded for Arm 3 in the morning peak; however, this is a result of the analysis software optimising the delays for all of the traffic Streams within the junction.
Note that the above analysis was carried out with a cycle time of 120 seconds. An increase in the cycle time to 150 seconds results in as increase in the Practical Reserve Capacity for the junction from -7.5% to 5.3% in the morning peak hour and -3.7% to 0.1% in the evening peak hour. The MMQ is also reduced for all Traffic Streams for both scenarios.

It should also be noted a new pedestrian crossing on Mountain Road is proposed under a separate works contract by Galway Co. Co. Infrastructure & Operations Unit, the location of this has been shown indicatively on drawing 10578-2106.

5.1 TRAFFIC CONCLUSION

It should be noted that the inclusion of the proposed development traffic (this application) has minimal impact on the existing signalised junction. The project trip numbers generated in the morning and evening peaks are small and have little to no change in the performance of the junction for the With Development Scenarios.

A Stage 1/2 Road Safety Audit has been carried out and is submitted as part of this application.

Appendix 1 – Drawing Register

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10578 Gort Uí Lochlainn, Moycullen, Co. Galway

Document Issue Sheet

Issue No: 5
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Issued By: Shane Byrne

Copy For Galway County Council Planning Department
Issue Notes: Issue for Planning

Drawings

Drawing No.	Title	Revision	Renditions	Issue Reason
10578-2100	Proposed Services	P1	pdf	For Information
10578-2101	Watermain Details	P1	pdf	For Information
10578-2102	Manhole Details Sht 1	P1	pdf	For Information
10578-2103	Manhole Details Sht 2	P1	pdf	For Information
10578-2104	Pipe bedding Details	P1	pdf	For Information
10578-2105	Site Development Details Sht 1	P1	pdf	For Information
10578-2106	Proposed Roads Layout	P1	pdf	For Information
10578-2107	Proposed Road Longsection	P1	pdf	For Information
10578-2108	Vehicle Swept Path Analysis - Fire Tender	P1	pdf	For Information
10578-2109	Vehicle Swept Path Analysis - Refuse & Car	P1	pdf	For Information

Recipients

Recipient Name	Role	Media	Copies
Galway County Council Planning Department (Galway County Council Planning Section)		Hardcopy	10

Appendix 2 – Microdrainage – Proposed Storm Water Network

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	16.300	Volumetric Runoff Coeff.	0.850	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.224	PIMP (%)	100	Min Vel for Auto Design only (m/s)	0.75
Maximum Rainfall (mm/hr)	55	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	250
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Inverts

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	75.000	0.333	225.2	0.087	5.00	0.0	0.600	o	225	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	32.94	6.44	37.770	0.087	0.0	0.0	0.0	0.87	34.5	8.8

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
1.001	50.000	0.222	225.2	0.118	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	5.000	0.022	227.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	5.000	0.022	227.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	65.000	0.464	140.0	0.138	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	47.000	0.940	50.0	0.061	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	20.000	0.400	50.0	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	10.000	0.044	225.0	0.031	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.004	3.000	0.013	230.8	0.000	0.00	0.0	0.600	o	225	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)
1.001	31.53	7.24	37.437	0.205	0.0	0.0	0.0	1.04	73.8	19.8
1.002	31.40	7.32	37.215	0.205	0.0	0.0	0.0	1.04	73.4	19.8
1.003	31.27	7.40	37.090	0.205	0.0	0.0	0.0	1.04	73.4	19.8
2.000	33.83	5.98	38.080	0.138	0.0	0.0	0.0	1.10	43.9	14.3
2.001	33.01	6.40	37.616	0.199	0.0	0.0	0.0	1.85	73.7	20.2
2.002	32.67	6.58	36.676	0.249	0.0	0.0	0.0	1.85	73.7	25.0
2.003	32.33	6.78	36.276	0.280	0.0	0.0	0.0	0.87	34.5	27.8
2.004	32.22	6.83	36.132	0.280	0.0	0.0	0.0	0.86	34.1	27.8

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	39.000	1.230	Open Manhole	1200	1.000	37.770	225				
2	39.430	1.993	Open Manhole	1200	1.001	37.437	300	1.000	37.437	225	
3	39.400	2.185	Open Manhole	1200	1.002	37.215	300	1.001	37.215	300	
4	39.400	2.310	Open Manhole	1200	1.003	37.090	300	1.002	37.193	300	103
Soakaway 1	38.800	1.732	Open Manhole	0		OUTFALL		1.003	37.068	300	
5	39.550	1.470	Open Manhole	1200	2.000	38.080	225				
6	39.100	1.484	Open Manhole	1200	2.001	37.616	225	2.000	37.616	225	
7	37.950	1.274	Open Manhole	1200	2.002	36.676	225	2.001	36.676	225	
8	37.700	1.424	Open Manhole	1200	2.003	36.276	225	2.002	36.276	225	
9	37.500	1.368	Open Manhole	1200	2.004	36.132	225	2.003	36.232	225	100
Soakaway 2	37.400	1.281	Open Manhole	0		OUTFALL		2.004	36.119	225	

PIPELINE SCHEDULES for Storm

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)
1.000	o	225	1	39.000	37.770	1.005	Open Manhole	1200
1.001	o	300	2	39.430	37.437	1.693	Open Manhole	1200
1.002	o	300	3	39.400	37.215	1.885	Open Manhole	1200
1.003	o	300	4	39.400	37.090	2.010	Open Manhole	1200
2.000	o	225	5	39.550	38.080	1.245	Open Manhole	1200
2.001	o	225	6	39.100	37.616	1.259	Open Manhole	1200
2.002	o	225	7	37.950	36.676	1.049	Open Manhole	1200
2.003	o	225	8	37.700	36.276	1.199	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)
1.000	75.000	225.2	2	39.430	37.437	1.768	Open Manhole	1200
1.001	50.000	225.2	3	39.400	37.215	1.885	Open Manhole	1200
1.002	5.000	227.3	4	39.400	37.193	1.907	Open Manhole	1200
1.003	5.000	227.3	Soakaway 1	38.800	37.068	1.432	Open Manhole	0
2.000	65.000	140.0	6	39.100	37.616	1.259	Open Manhole	1200
2.001	47.000	50.0	7	37.950	36.676	1.049	Open Manhole	1200
2.002	20.000	50.0	8	37.700	36.276	1.199	Open Manhole	1200
2.003	10.000	225.0	9	37.500	36.232	1.043	Open Manhole	1200

PIPELINE SCHEDULES for Storm

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)
2.004	o	225	9	37.500	36.132	1.143	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)
2.004	3.000	230.8	Soakaway 2	37.400	36.119	1.056	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.087	0.087	0.087
1.001	-	-	100	0.118	0.118	0.118
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.138	0.138	0.138
2.001	-	-	100	0.061	0.061	0.061
2.002	-	-	100	0.050	0.050	0.050
2.003	-	-	100	0.031	0.031	0.031
2.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.485	0.485	0.485

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)
1.003	Soakaway 1	38.800	37.068	0.000	0	0

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)
2.004	Soakaway 2	37.400	36.119	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.850	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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)	16.300	Cv (Summer)	0.850
Return Period (years)	1	Ratio R	0.224	Cv (Winter)	0.840
Region	Scotland and Ireland	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 4, DS/PN: 1.003, Volume (m³): 2.9

Unit Reference	MD-SHE-0013-1000-1200-1000	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	13
Design Flow (l/s)	0.1	Invert Level (m)	37.090
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	0.1	Kick-Flo®	0.115	0.0
Flush-Flo™	0.050	0.0	Mean Flow over Head Range	-	0.1

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	0.0	0.600	0.1	1.600	0.1	2.600	0.1	5.000	0.2	7.500	0.2
0.200	0.0	0.800	0.1	1.800	0.1	3.000	0.1	5.500	0.2	8.000	0.2
0.300	0.1	1.000	0.1	2.000	0.1	3.500	0.2	6.000	0.2	8.500	0.2
0.400	0.1	1.200	0.1	2.200	0.1	4.000	0.2	6.500	0.2	9.000	0.2
0.500	0.1	1.400	0.1	2.400	0.1	4.500	0.2	7.000	0.2	9.500	0.2

Hydro-Brake® Optimum Manhole: 9, DS/PN: 2.004, Volume (m³): 1.9

Unit Reference	MD-SHE-0013-1000-1200-1000	Sump Available	Yes
Design Head (m)	1.200	Diameter (mm)	13
Design Flow (l/s)	0.1	Invert Level (m)	36.132
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	75
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	0.1	Kick-Flo®	0.115	0.0
Flush-Flo™	0.050	0.0	Mean Flow over Head Range	-	0.1

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	0.0	0.600	0.1	1.600	0.1	2.600	0.1	5.000	0.2	7.500	0.2
0.200	0.0	0.800	0.1	1.800	0.1	3.000	0.1	5.500	0.2	8.000	0.2
0.300	0.1	1.000	0.1	2.000	0.1	3.500	0.2	6.000	0.2	8.500	0.2
0.400	0.1	1.200	0.1	2.200	0.1	4.000	0.2	6.500	0.2	9.000	0.2
0.500	0.1	1.400	0.1	2.400	0.1	4.500	0.2	7.000	0.2	9.500	0.2

Storage Structures for Storm

Cellular Storage Manhole: 4, DS/PN: 1.003

Invert Level (m) 37.350 Infiltration Coefficient Side (m/hr) 0.01020 Porosity 0.60
Infiltration Coefficient Base (m/hr) 0.01020 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	220.0	220.0	1.200	220.0	296.8	1.300	0.0	296.8

Cellular Storage Manhole: 9, DS/PN: 2.004

Invert Level (m) 36.132 Infiltration Coefficient Side (m/hr) 0.01020 Porosity 0.60
Infiltration Coefficient Base (m/hr) 0.01020 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	315.0	315.0	1.200	315.0	401.4	1.300	0.0	401.4

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) 16.300 Cv (Summer) 0.750
Region Scotland and Ireland Ratio R 0.224 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 30, 240, 480, 720, 1440
Return Period(s) (years) 30, 100
Climate Change (%) 10, 20

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.000	1	1440 Winter	100	+20%	30/720 Winter				38.517	0.522	0.000	0.07		2.4
1.001	2	1440 Winter	100	+20%	30/240 Summer				38.517	0.780	0.000	0.08		5.7
1.002	3	1440 Winter	100	+20%	30/30 Summer				38.516	1.001	0.000	0.12		5.7

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

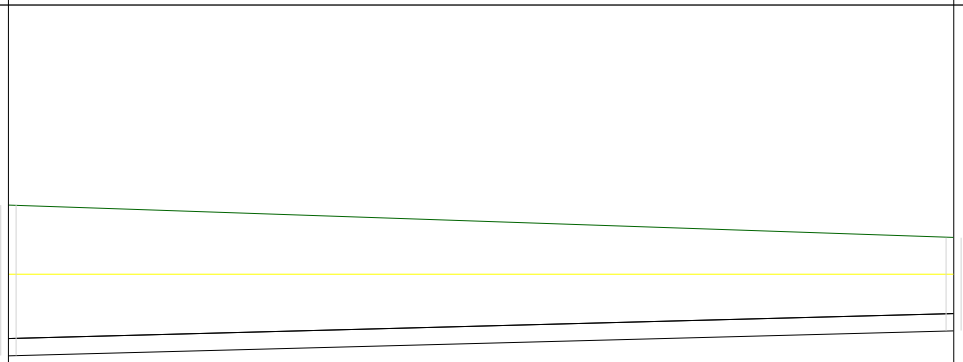
PN	US/MH Name	Status	Level Exceeded
1.000	1	SURCHARGED	
1.001	2	SURCHARGED	
1.002	3	SURCHARGED	

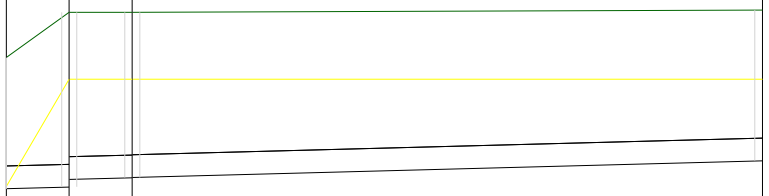
Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.003	4	1440 Winter	100	+20%	30/30 Summer				38.516	1.126	0.000	0.00		0.1
2.000	5	30 Summer	100	+20%	100/30 Summer				38.364	0.059	0.000	1.03		43.6
2.001	6	30 Summer	100	+20%	100/30 Summer				37.877	0.036	0.000	0.82		58.0
2.002	7	1440 Winter	100	+20%	30/30 Summer				37.333	0.432	0.000	0.11		7.1
2.003	8	1440 Winter	100	+20%	30/30 Summer				37.332	0.831	0.000	0.27		7.9
2.004	9	1440 Winter	100	+20%	30/30 Winter				37.331	0.974	0.000	0.00		0.1

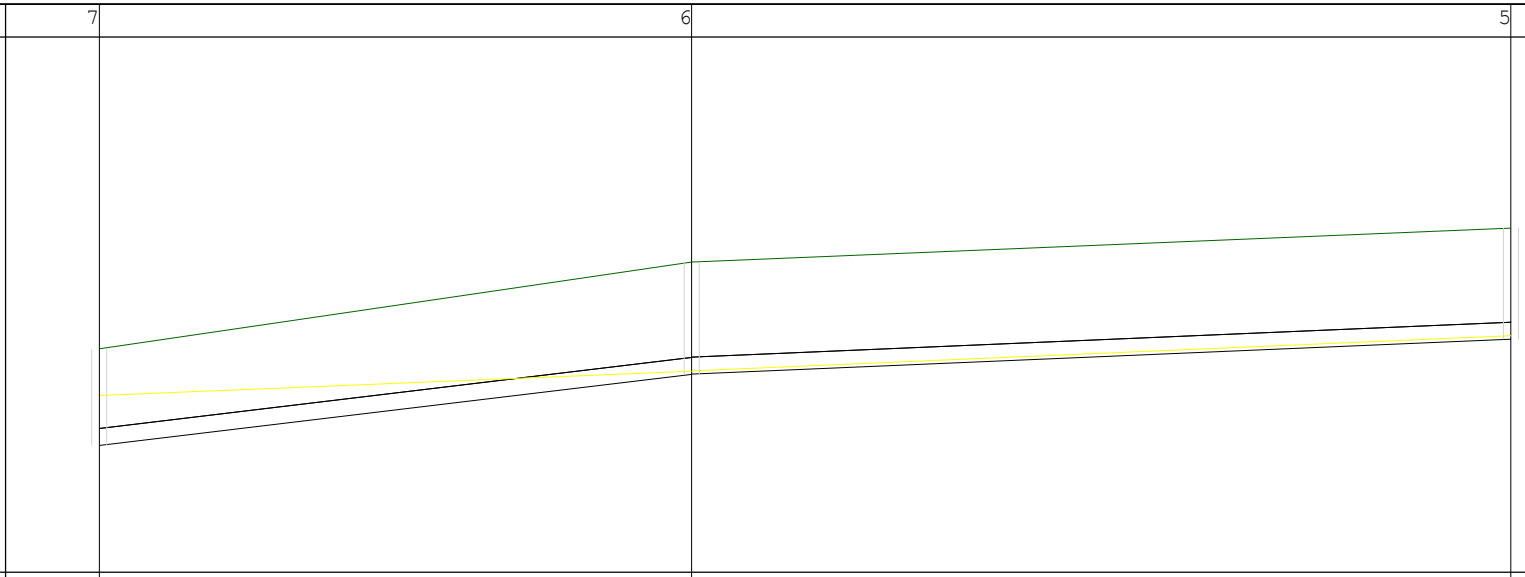
PN	US/MH Name	Status	Level Exceeded
1.003	4	SURCHARGED	
2.000	5	SURCHARGED	
2.001	6	SURCHARGED	
2.002	7	SURCHARGED	
2.003	8	SURCHARGED	
2.004	9	FLOOD RISK	

TOBIN Consulting Engineers		Page 1
Fairgreen House Fairgreen Road Galway	10578 Moycullen Housing Development Rev C	
Date 13/05/2021 09:36 File Microdrainage Storm - Rev C.MDX	Designed by SB Checked by MG	
Micro Drainage	Network 2018.1.1	

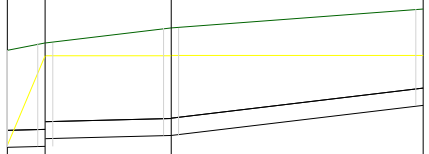
MH Name	2	1	
Hor Scale 600 Ver Scale 100 Datum (m) 35.000			
PN		1.000	
Dia (mm)		225	
Slope (1:X)		225.2	
Cover Level (m)	39.430	39.000	
Invert Level (m)	37.437	37.770	
Length (m)		75.000	

MH Name	Soakaway 1			2	
Hor Scale 600 Ver Scale 100 Datum (m) 35.000					
PN				1.001	
Dia (mm)				300	
Slope (1:X)				225.2	
Cover Level (m)	38.800	39.400	39.400	39.430	
Invert Level (m)		37.068 37.090	37.193 37.215	37.215 37.437	
Length (m)				50.000	

Fairgreen House Fairgreen Road Galway	10578 Moycullen Housing Development Rev C
Date 13/05/2021 09:36 File Microdrainage Storm - Rev C.MDX	Designed by SB Checked by MG
Micro Drainage	Network 2018.1.1



MH Name	7	6	5
PN		2.001	2.000
Dia (mm)		225	225
Slope (1:X)		50.0	140.0
Cover Level (m)	37.950	39.100	39.550
Invert Level (m)	36.676	37.616	37.616 38.080
Length (m)		47.000	65.000

MH Name	Soakaway 2		8	7	
Hor Scale 600 Ver Scale 100 Datum (m) 33.000					
PN			2.003	2.002	
Dia (mm)			225	225	
Slope (1:X)			225.0	50.0	
Cover Level (m)	37.400	37.500	37.700	37.950	
Invert Level (m)		36.132	36.232 36.276	36.276 36.676	
Length (m)			10.000	20.000	

Appendix 3 – Microdrainage – Proposed Foul Drainage Network

FOUL SEWERAGE DESIGN

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

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)	1.200
Flow Per Person (l/per/day)	150.00	Add Flow / Climate Change (%)	0	Min Vel for Auto Design only (m/s)	0.75
Persons per House	2.70	Minimum Backdrop Height (m)	0.200	Min Slope for Optimisation (1:X)	250

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)	Section Type	Auto Design
1.000	72.000	0.720	100.0	0.000	10	0.0	1.500	o	150	Pipe/Conduit	
1.001	52.000	0.350	148.6	0.000	6	0.0	1.500	o	150	Pipe/Conduit	

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	37.930	0.000	0.0	10	0.0	14	0.33	0.88	15.5	0.3
1.001	37.210	0.000	0.0	16	0.0	20	0.33	0.72	12.7	0.5

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)	Section Type	Auto Design
2.000	32.000	0.640	50.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
1.002	22.000	0.147	149.7	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.003	65.000	0.433	150.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
3.000	27.000	0.450	60.0	0.000	5	0.0	1.500	o	150	Pipe/Conduit	
3.001	21.000	0.350	60.0	0.000	3	0.0	1.500	o	150	Pipe/Conduit	
3.002	11.000	0.220	50.0	0.000	4	0.0	1.500	o	150	Pipe/Conduit	

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	37.500	0.000	0.0	4	0.0	8	0.31	1.24	21.9	0.1
1.002	36.785	0.000	0.0	20	0.0	20	0.33	0.94	37.3	0.6
1.003	36.638	0.000	0.0	20	0.0	20	0.33	0.94	37.2	0.6
3.000	37.210	0.000	0.0	5	0.0	9	0.31	1.13	20.0	0.1
3.001	36.760	0.000	0.0	8	0.0	12	0.36	1.13	20.0	0.2
3.002	36.410	0.000	0.0	12	0.0	13	0.44	1.24	21.9	0.3

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)	Section Type	Auto Design
1.004	40.000	0.276	144.9	0.000	0	0.0	1.500	o	225	Pipe/Conduit	
1.005	46.000	0.317	145.1	0.000	0	0.0	1.500	o	225	Pipe/Conduit	

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)
1.004	36.115	0.000	0.0	32	0.0	24	0.39	0.95	37.9	0.9
1.005	35.839	0.000	0.0	32	0.0	24	0.39	0.95	37.9	0.9

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F7	39.000	1.070	Open Manhole	1200	1.000	37.930	150				
F6	39.430	2.220	Open Manhole	1200	1.001	37.210	150	1.000	37.210	150	
F9	38.800	1.300	Open Manhole	1200	2.000	37.500	150				
F5	39.450	2.665	Open Manhole	1200	1.002	36.785	225	1.001	36.860	150	
								2.000	36.860	150	
F4	39.500	2.862	Open Manhole	1200	1.003	36.638	225	1.002	36.638	225	
F10	39.550	2.340	Open Manhole	1200	3.000	37.210	150				
F9a	39.250	2.490	Open Manhole	1200	3.001	36.760	150	3.000	36.760	150	
F8	39.100	2.690	Open Manhole	1200	3.002	36.410	150	3.001	36.410	150	
F3	39.100	2.985	Open Manhole	1200	1.004	36.115	225	1.003	36.205	225	90
								3.002	36.190	150	
F2	38.050	2.211	Open Manhole	1200	1.005	35.839	225	1.004	35.839	225	
	37.150	1.628	Open Manhole	0		OUTFALL		1.005	35.522	225	

PIPELINE SCHEDULES for Storm

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)
1.000	o	150	F7	39.000	37.930	0.920	Open Manhole	1200
1.001	o	150	F6	39.430	37.210	2.070	Open Manhole	1200
2.000	o	150	F9	38.800	37.500	1.150	Open Manhole	1200
1.002	o	225	F5	39.450	36.785	2.440	Open Manhole	1200
1.003	o	225	F4	39.500	36.638	2.637	Open Manhole	1200
3.000	o	150	F10	39.550	37.210	2.190	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)
1.000	72.000	100.0	F6	39.430	37.210	2.070	Open Manhole	1200
1.001	52.000	148.6	F5	39.450	36.860	2.440	Open Manhole	1200
2.000	32.000	50.0	F5	39.450	36.860	2.440	Open Manhole	1200
1.002	22.000	149.7	F4	39.500	36.638	2.637	Open Manhole	1200
1.003	65.000	150.1	F3	39.100	36.205	2.670	Open Manhole	1200
3.000	27.000	60.0	F9a	39.250	36.760	2.340	Open Manhole	1200

PIPELINE SCHEDULES for Storm

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)
3.001	o	150	F9a	39.250	36.760	2.340	Open Manhole	1200
3.002	o	150	F8	39.100	36.410	2.540	Open Manhole	1200
1.004	o	225	F3	39.100	36.115	2.760	Open Manhole	1200
1.005	o	225	F2	38.050	35.839	1.986	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)
3.001	21.000	60.0	F8	39.100	36.410	2.540	Open Manhole	1200
3.002	11.000	50.0	F3	39.100	36.190	2.760	Open Manhole	1200
1.004	40.000	144.9	F2	38.050	35.839	1.986	Open Manhole	1200
1.005	46.000	145.1		37.150	35.522	1.403	Open Manhole	0

Area Summary for Storm

Pipe Number	Gross Area (ha)	Pipe Total (ha)
1.000	0.000	0.000
1.001	0.000	0.000
2.000	0.000	0.000
1.002	0.000	0.000
1.003	0.000	0.000
3.000	0.000	0.000
3.001	0.000	0.000
3.002	0.000	0.000
1.004	0.000	0.000
1.005	0.000	0.000
	Total	Total
	0.000	0.000

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)
1.005		37.150	35.522	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model		FSR	M5-60 (mm) 0.000	Cv (Summer)	0.750
Return Period (years)		0	Ratio R 0.000	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

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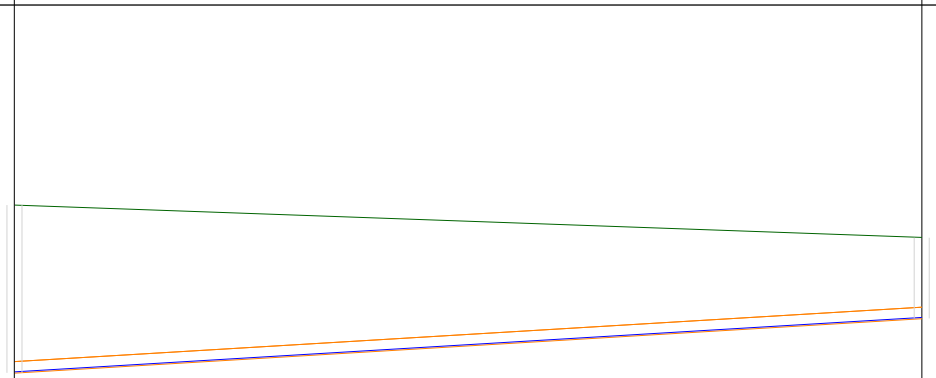
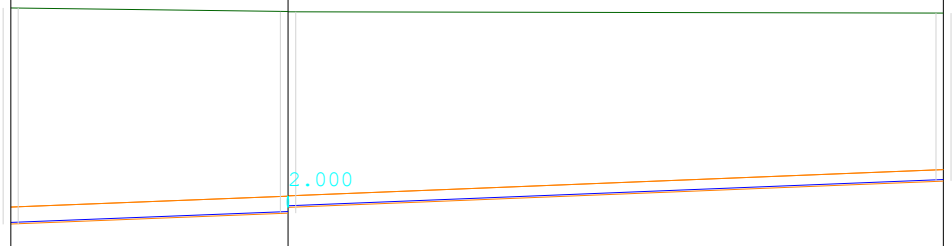
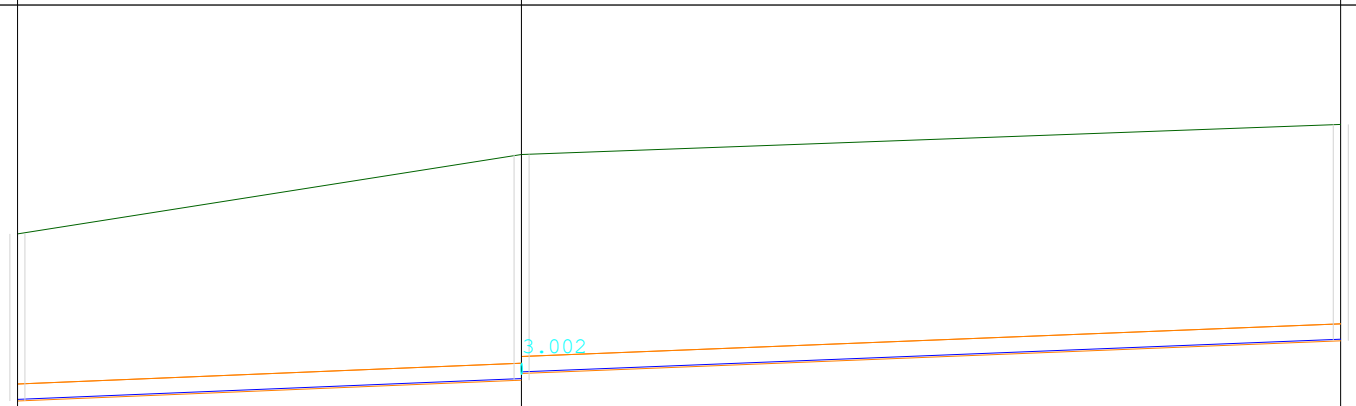
Fairgreen House Fairgreen Road Galway	10578 - Gort Ui Lochlainn Mountain Road, Moycullen Foul Drainage	
Date 13/05/2021 09:50 File 10578 - Microdrainage Foul Rev B.MDX	Designed by SB Checked by MG	
Micro Drainage	Network 2018.1.1	

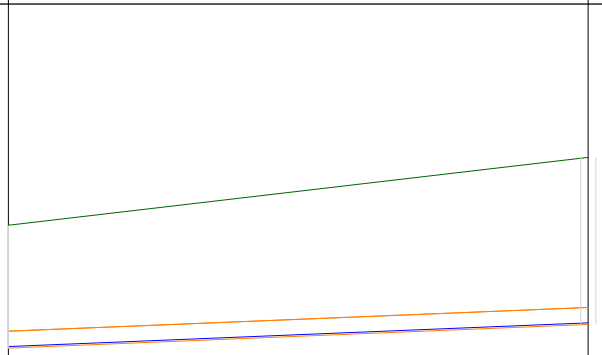
MH Name	F6	F7	
Hor Scale 600 Ver Scale 100 Datum (m) 35.000			
PN		1.000	
Dia (mm)		150	
Slope (1:X)		100.0	
Cover Level (m)	39.430	39.000	
Invert Level (m)	37.210	37.930	
Length (m)		72.000	

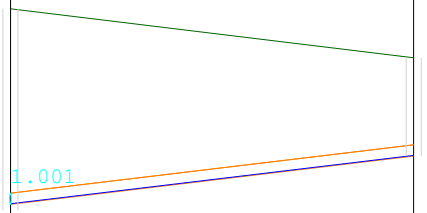
Fairgreen House Fairgreen Road Galway	10578 - Gort Ui Lochlainn Mountain Road, Moycullen Foul Drainage
Date 13/05/2021 09:50 File 10578 - Microdrainage Foul Rev B.MDX	Designed by SB Checked by MG
Micro Drainage	Network 2018.1.1

MH Name	F4	F5	F6	
Hor Scale 600 Ver Scale 100 Datum (m) 35.000				
PN		1.002	1.001	
Dia (mm)		225	150	
Slope (1:X)		149.7	148.6	
Cover Level (m)	39.500	39.450	39.430	
Invert Level (m)	36.638	36.785	36.860 37.210	
Length (m)		22.000	52.000	

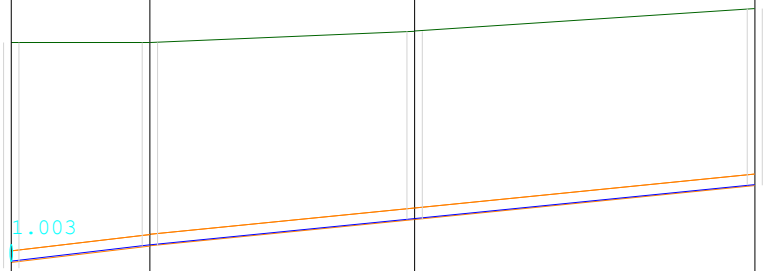
Fairgreen House Fairgreen Road Galway	10578 - Gort Ui Lochlainn Mountain Road, Moycullen Foul Drainage
Date 13/05/2021 09:50 File 10578 - Microdrainage Foul Rev B.MDX	Designed by SB Checked by MG
Micro Drainage	Network 2018.1.1

MH Name	F2	F3	F4
Hor Scale 600 Ver Scale 100 Datum (m) 34.000			
PN		1.004	1.003
Dia (mm)		225	225
Slope (1:X)		144.9	150.1
Cover Level (m)	38.050	39.100	39.500
Invert Level (m)	35.839	36.115	36.205 36.638
Length (m)		40.000	65.000

MH Name		F2	
Hor Scale 600 Ver Scale 100 Datum (m) 33.000			
PN		1.005	
Dia (mm)		225	
Slope (1:X)		145.1	
Cover Level (m)	37.150	38.050	
Invert Level (m)	35.522	35.839	
Length (m)		46.000	

MH Name	F5	F9	
Hor Scale 600 Ver Scale 100 Datum (m) 35.000			
PN		2.000	
Dia (mm)		150	
Slope (1:X)		50.0	
Cover Level (m)	39.450	38.800	
Invert Level (m)	36.860	37.500	
Length (m)		32.000	

Fairgreen House Fairgreen Road Galway	10578 - Gort Ui Lochlainn Mountain Road, Moycullen Foul Drainage
Date 13/05/2021 09:50 File 10578 - Microdrainage Foul Rev B.MDX	Designed by SB Checked by MG
Micro Drainage	Network 2018.1.1

MH Name	F3	F8	F9a	F10
Hor Scale 600 Ver Scale 100 Datum (m) 34.000				
PN		3.002	3.001	3.000
Dia (mm)		150	150	150
Slope (1:X)		50.0	60.0	60.0
Cover Level (m)	39.100	39.100	39.250	39.550
Invert Level (m)		36.190 36.410	36.410 36.760	36.760 37.210
Length (m)		11.000	21.000	27.000

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