BBSRC
bioscience for the future

Former Roslin Institute

Drainage Strategy

DTZ
a UGL company

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FORMER ROSLIN INSTITUTE

DRAINAGE STRATEGY

1.0 Introduction

1.1 Background

BBSRC intends to secure a Planning Permission in Principle (PPP) for a residential development on an approximate 16.52 ha site located off Main Street (B7006), Roslin. Ironside Farrar Limited has been commissioned by BBSRC via DTZ to prepare a Drainage Strategy that will be used in support of the planning application for the development.

Reference should also be made to the separate Flood Risk Assessment that provides a detailed assessment of the potential flood risks of the proposed development from all sources.

1.2 Consultation and Data Sources

The following sources have been used in the compilation of this Drainage Strategy: -

- Proposed Site Plan.
- Topographical Survey Data.
- Walkover Survey.
- Scottish Environment Protection Agency
- Scottish Water Sewer Record Plans.
- Midlothian Council.

2.0 Existing Site Description

2.1 Site Location

The former Roslin Institute is located to the east of Main Street, Roslin; the City centre of Edinburgh is some 10km to the north; the location of the site is indicated in Appendix 2a.

2.2 Detailed Site Description

The total site area extends to approximately 16.52 ha (40.80 acres) and is presently occupied by the Roslin Institute, a poultry research centre; together with more recent buildings that formed the basis of the Roslin Biocentre.

Vehicular access to the site can be gained directly from the B7006, Main Street. Access roads run through the site to the northern area and also along the southern boundary to a secondary site access in the south east corner of the site. This access gives vehicular access to an unclassified road that runs to the north east; to the west vehicular access is excluded at the eastern extremity of Roslin.

The northern boundary of the site is formed by an established hedge beyond which is a surfaced track and beyond that Killburn Wood; through which the Kill Burn runs.

The remaining site boundaries all have significant woodland, either on the boundary or immediately beyond.

At the existing site entrance there is a security gate and adjacent to Main Street a nursery with associated car parking. The site access continues to a roundabout where the road divides to run to the north and south. Following the northern access road to the east the first building encountered is the Wallace building, a relatively modern office building with associated car parking located between the road and the northern boundary. To the north of the road there is open land to the east of the Wallace building until the Logan building, another modern, single storey office building is encountered at the northern end of the access road.

Towards the centre of the site are the main Poultry Research Centre buildings that consist of the wooden poultry sheds, the poultry unit and the main Roslin Institute office buildings. There are car park areas to the south east of the main office buildings that are served from the southern access road. Between the Roslin Institute and Wallace buildings there is generally open grass land; the southern access road is lined with existing trees.

The Existing Site Plan is included in Appendix 2b.

Generally the site falls to the northern corner of the site and the North West corner adjacent to the Main Street boundary.

2.3 Topography

As detailed previously, the topography of the site is generally a fall to the northern corner of the site; the Topographical Survey is included as Appendix 2c.

The northern boundary of the site falls from the northwest corner where the level is 148.20m to a level of 143.64 at the hedge in the north. Beyond the hedge on the northern boundary, Kill Burn falls from a level of 144.84m at Main Street to 134.53m at the northern corner of the site. It can be seen, therefore, that Kill Burn is located a minimum of 3.36m and a maximum of 9.11m below the lowest levels of the site. The Main Street boundary rises from 148.20m close to the point where it crosses Kill Burn to a level of 156.00m at the southern corner of the site.

The southern boundary falls gradually from west to east from the level of 156.00m to 152.00m at the south east access. Within the site the Roslin Institute building is generally at a level of 150.00m and the poultry sheds at 150.20m. The Wallace and Logan Buildings have not been surveyed but the Wallace Building is estimated as approximately 148.00m and the Logan Building as 145.00m.

2.4 Existing Watercourses and Drainage

There are no watercourses crossing the site but the Kill Burn runs to the north of the site; at the closest point Kill Burn is some 20m north of the site. Farther afield, the site is located approximately 500m north of the River North Esk and 1km south of the Bilston Burn.

The location of existing watercourses is indicated on Appendix 2b.

The record of Public Sewers was obtained from Scottish Water and is included in Appendix 2d. From these records it can be seen there is a combined sewer running across the site from the Bowling Green Pavilion on Main Street to the Scottish Water Kill Burn Wastewater Pumping Station located to the north west corner of the site on the west side of Main Street. The sewer runs from the pavilion to a point very close to

the south west corner of the Wallace Building before turning to run to the pumping station.

Within the site there is a well established, private drainage system; an investigation has been undertaken that indicates the presence of separate foul and surface water drainage on the site but it is not clear if the systems combine before connecting to the public system. A total of three pumping stations have been identified on the site, the first immediately to the west of the Roslin Institute buildings, the second to the north of the poultry sheds and the third in the open land to the west of the Logan Building.

The full extent of the existing drainage should be investigated, together with the degree of separation, to determine the potential existing flows to the public sewerage system and the adjacent watercourses.

3.0 Proposed Development

Details of the final layout have still to be agreed but the form of the layout is illustrated in Appendix 3a.

The main aspects of the proposed development include:-

- Of the total site area of 16.52ha, the area for development is 11.90ha; the balance of the site is allocated for retained woodland, Greenspace and SUDS.
- The proposed access roads follow the pattern of the existing and are supplemented where necessary. Footpath links are provided to adjacent paths.
- SUDS facilities are indicated to be located within the greenspace on the site.

4.0 Proposed Drainage Layout

The site will be served on a completely separate system of drainage with the foul flows connected to the existing public sewerage system and surface water discharging to the nearby Kill Burn via a SUDS based surface water drainage system.

Drainage shall comply with CIRIA C697 The SUDS Manual, SUDS for Roads, Sewers for Scotland 2 and the SEPA guidance, Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems (SUDS or SUD Systems), while safety issues relating to SUDS retention ponds shall comply with RoSPA guidance.

The discharge of surface water will be limited to the mean annual flood flow for all events up to the 200 year return period event.

4.1 SEPA Guidelines for Drainage Design

SEPA has policies and guidelines which are to be followed when preparing a drainage design, an overview of these policies is included below;

Surface Water
The treatment of surface water run-off by sustainable drainage systems (SUDs) is a legal requirement for most forms of development however; the location, design and types of SUDs are largely controlled through planning. Surface water run-off from all developments is to be treated by SUDs, in line with Scottish Planning Policy (Paragraph 2009), PAN 61 "Planning and Sustainable Urban Drainage Systems" and PAN 79 "Water and Drainage".

It is important to ensure that adequate space to accommodate SUDs is incorporated within the site layout and the opportunity to use such features as wildlife corridors linking green spaces, is maximised. Each individual type of SUDs facility, such as a filter drain, detention basin, permeable paving or swale, provides one level of surface water treatment.

Residential developments of 50 houses or less and retail/commercial/business parks with car parks of 50 spaces or less require one level of treatment for all hardstanding areas including roads. We encourage this first level of SUDs to be source controlled.

All roads schemes typically require two levels of treatment, except for residential developments of 50 houses or less and retail/commercial/business parks of 50 spaces or less. For technical guidance on SUDs techniques and treatment for roads, please refer to the SUDs for Roads Manual.

For all developments, run-off from areas subject to particularly high pollution risk (e.g. yard areas, service bays, fuelling areas, pressure washing areas, oil or chemical storage, handling and delivery areas) should be i.) minimised and ii.) directed to the foul sewer. Where run-off from high risk areas cannot be directed to the foul sewer SEPA can, on request, provide further site specific advice on what would be the best environmental solution.

Comments should be sought from the local authority roads department and the local authority flood prevention unit on the acceptability of post-development runoff rates for flood control.

Foul Drainage

Details of the waste water provision for the development should be provided within any future planning submission, including consideration of options for wastewater treatment facilities.

Where there is a public sewage system, wastewater drainage from the development within and close to the settlement envelope should be directed to that system. If the system has insufficient capacity, then early dialogue with Scottish Water will be required to determine if works are planned to overcome this problem, or what developer pro-rata contributions will be necessary to remove the constraint.

If there is no or limited public sewage infrastructure, it would still be expected that the development of strategic infrastructure to adoptable standards be achieved. Contact should be made with Scottish Water to determine the standards required to ensure adoption of new infrastructure.

SEPA would not support proposals for private foul drainage systems for significant development (e.g. more than 25 houses) where we consider that development of public infrastructure is the sustainable long-term solution. An interim solution may be acceptable provided an appropriate upgrade has been agreed with Scottish Water and there will be no unacceptable impact on the water environment. For further guidance please refer to SEPA's Policy and Supporting Guidance on Provision of Waste Water Drainage in Settlements.

4.2 Sewage Network Design

The proposed foul network should be designed as a separate system in accordance with Sewers for Scotland, 2nd edition, and modelled using the Microdrainage software package, with design flows based on the Wallingford Procedure.
The surface water pipes should be designed with a minimum velocity of 1m/s at pipe full flow and with a roughness of 0.6mm. The pipe should provide enough capacity to convey all the surface runoff flows to attenuation and treatment facilities.

The foul pipes should be designed to provide a self-cleansing regime with a minimum flow velocity of 0.75m/s at one-third design flow. Gradients should be restricted to no steeper than 1:10 to comply with safety standards. The foul sewer should provide enough capacity to convey the flows from the site to a discharge point on the existing public sewer network.

Both surface water and foul sewers should preferably be laid with a minimum cover of 1.5m to avoid interference with other underground utility pipes and cables, and have a minimum diameter of 150mm.

4.3 Surface Water Drainage

The Institute of Hydrology Report 124 was used to calculate the mean annual flood flow rate, the 100 year return period flow and the 200 year return period flow for the existing site. The detailed micro drainage calculations are included in Appendix 3c; as detailed above, the mean annual flood flow rate will be utilised for the development areas and the discharge will be restricted in all events up to the 200 year event. An allowance for climate change of 20% has been made in the attenuation calculations.

The existing overall site area is estimated to be approximately 16.52ha and the resulting mean annual flood flow calculated as 92.5l/s; the equivalent run-off rate is therefore 5.59l/s/ha.

A detailed hydraulic network was compiled, based on the drainage network indicated on the Indicative Drainage Layout included in Appendix 3b; the impermeable areas for the masterplan were assessed on the basis of 55% of the gross development areas and the detailed micro drainage hydraulic calculations included in Appendix 3c. These calculations indicate that to achieve the flow from the proposed development of 92.5l/s; a detention pond with a standing area of 640m^2 will be required. The flows will be controlled using a vortex flow control and the water level will rise by some 1.881m in the 200 year event plus 20% climate change allowance. A location for the detention pond is shown on the Indicative Drainage Layout and sufficient space should be allowed within the development layout to accommodate the upper surface area of the pond of approximately 2200m^2.

Allowance should also be made to accommodate the ancillary works associated with a detention pond such as the maintenance track, forebay, control manhole and draw-down facility. Detailed guidance on the arrangement of a detention pond to the standards required by Scottish Water is contained in Sewers for Scotland 2nd Edition.

4.4 Foul Drainage

Scottish Water has stated (Appendix 4a) that there is sufficient capacity in the Edinburgh PFI Waste Water Treatment Works to service the demands from the development.

There are currently network issues in this area and a Drainage Impact Assessment will be required to establish if there is sufficient capacity within the existing infrastructure to accommodate the demands from the development.

Further detailed discussions with Scottish Water are required to determine the extent of any improvements and a Drainage Impact Assessment will need to be commissioned.

Within the site itself, the topography is such that a new foul water pumping station will be required to drain the whole of the site. This station will be designed to Sewers for Scotland 2nd edition and will be situated in a suitable location in relation to the residential development. The sewer records indicate an existing public sewer crossing the site and connecting to the Scottish Water Kill Burn Wastewater Pumping

Station. This sewer will be located on site and connected to the proposed drainage network.

5.0 Legislation & Guidance

5.1 The Water Environment (Controlled Activities, Scotland) Regulations 2005

The regulations implement the obligations of Section 20 of the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act). The WEWS transposed the requirements of the Water Framework Directive into Scots Law. A section of this Act refers exclusively to activities occurring in or around a watercourse which could affect the watercourse. This is known as the Water Environment (Controlled Activities) (Scotland) Act 2005 (CAR). It is referred to as the CAR Regulations and enforces controls over the following activities:

- Activities liable to cause pollution of the water environment
- Abstraction of water from the water environment
- Discharge of water from the urban or rural areas into the water environment
- The construction, alteration or operations of impounding works in surface water or wetlands
- Carrying out of building works, engineering, or other works
    - In inland water other than ground water or wetlands or
    - In the vicinity of inland water or wetlands, and likely to have a significant adverse effect on the water environment
- In the Artificial recharge or augmentation of groundwater

Three types of authorisation under CAR allow for proportionate and risk-based regulation; namely:

a) General Binding Rules (GBRs)
b) Registration
c) Licence

GBRs represent the lowest level of control and cover specific low-risk activity.

Registration is intended to cover low risk activities which cumulatively pose a risk to the water environment.

If site specific controls are required; and in particular, if constraints upon the activity are to be imposed, then the activity should be authorised using a licence.

Collectively, the above three forms of regulations are known as authorisations.

The Water Environment (Controlled Activities) (Scotland) Regulations 2005 state that it is an offence to discharge to any wetlands, surface water systems and ground systems without a CAR authorisation.

Surface water discharges require a licence under WEWS CAR regulations if they are draining:
- >1000 residential house
- >1000 car parking spaces
- Industrial areas
- Major roads/motorways

Discharge consent may specify conditions, which can include limits on the quantity and quality that must be met.

Since the proposals are for a residential development with less that 1000 residential houses or car parking spaces, it is expected that the runoff from the development will fall under the General Binding Rules and no licence be required under the Water Environment (Controlled Activities Regulations) (Scotland) Regulations 2005.

5.2 SUDs Drainage

The Water Environmental (Controlled Activities) (Scotland) Regulations 2005 General Binding Rule 10, required sites constructed after April 2007 to be drained via Sustainable Urban Drainage Systems (SUDs).

Sustainable Drainage Systems are an alternative to conventional urban drainage systems and are developed in line with the ideals of sustainable development. The primary aim of SUDs is to mimic the natural drainage system of a site, and they are therefore, designed to minimise the impact of the development on the quality and quantity of runoff and to maximise amenity and biodiversity on the site.

The CIRIA C697 SUDs Manual (2007) states that natural drainage patterns should be followed and original ditches and streams should be retained and integrated within the design, wherever possible.

Private SUDs, connecting to the Scottish Water drainage system, should have the ownership and maintenance responsibility of the developer discussed with Scottish Water.

5.3 Above Ground SUDs

Above ground SUDs provide a natural means of treating and attenuating runoff which encourage biodiversity and potential for landscaping. Although the required maintenance is frequent, it is more accessible than underground systems however, there is a potential for flytipping and misuse. Site topography and conditions can often limit the functionality of above ground systems which require a high land take. Example systems include:

- Rainwater harvesting – limited use unless filtered, is not always considered as adequate storage due to variation in usage volumes therefore, an overflow into an attenuation structure is required.
- Green Roofs – provide one level of treatment and limited attenuation storage, will require overflow and irrigation for extremes in weather to ensure vegetation survives.
- Swales – provide one level of treatment and potential attenuation, and will require check dams on steep slopes.
- Wetlands – provide one level of treatment and potentially large volumes of storage
- Ponds – depending on design, they can provide one to two levels of treatment and large volumes of storage.

5.4 Underground SUDs

Underground systems can protect from misuse or vandalism, but require a greater level of maintenance and are not as easily accessed as above ground systems. The land above these systems can be used for other functions however; their use can be limited in areas of high groundwater.

- Permeable paving – provides one level of treatment and attenuation
- Filter drains – provide one level of treatment and potential attenuation, difficult to implement on steep slopes.

6.0 Summary and Recommendations

6.1 Summary

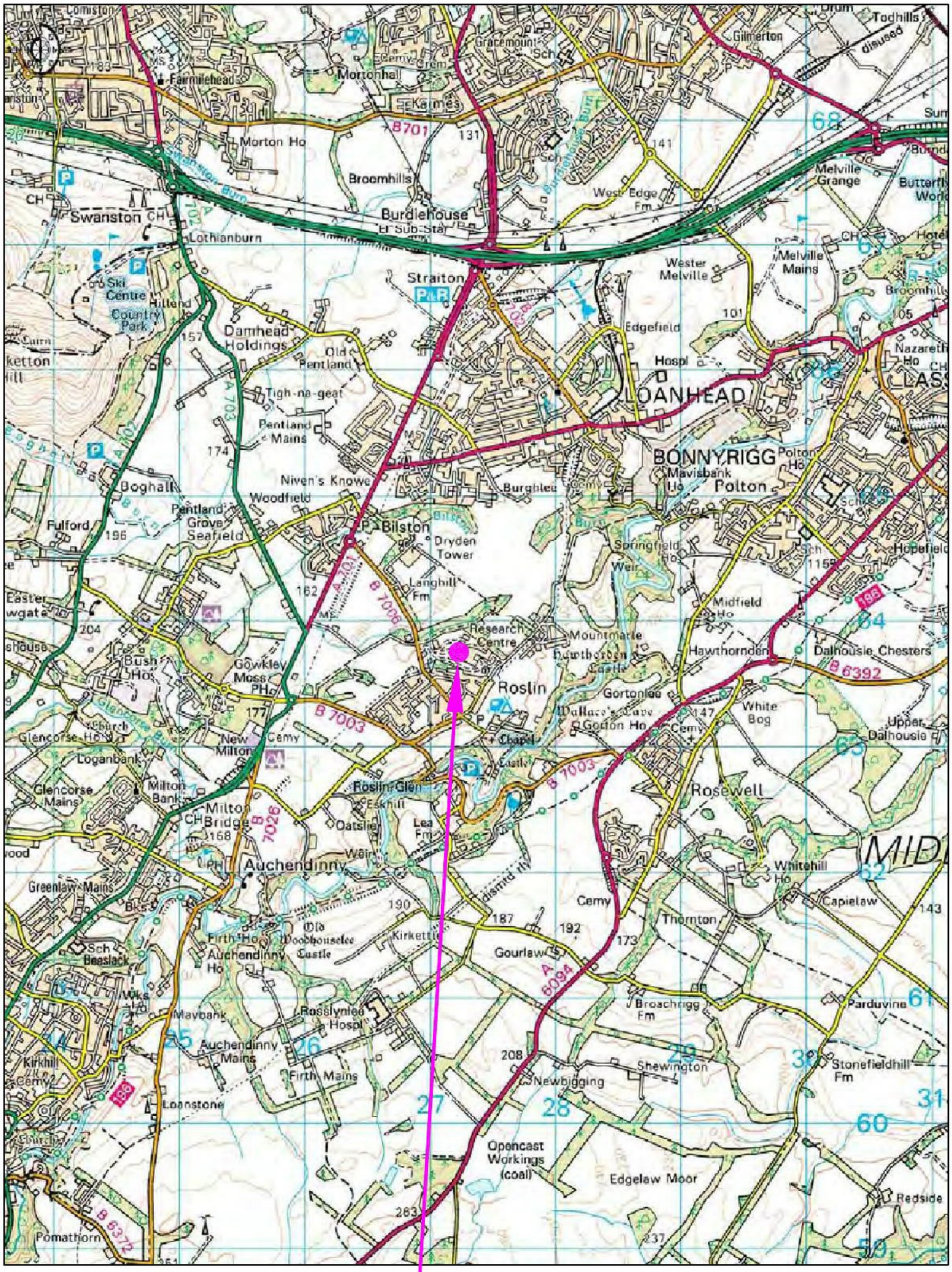
- The Surface water drainage layout has been developed to comply with SEPA, Local Authority and Scottish Water policies and guidelines.
- SUDs should be implemented throughout the site and should be designed to provide storage for a 1 in 200 year return period storm and attenuate flow to the equivalent greenfield runoff rate, estimated to be around 5.59 l/s/ha.
- The Surface water drainage layout assumes 55% of the total area is developed as impermeable area for the storage calculations. An indicative location for the main SUDS feature is shown but the exact size and location will be incorporated into the development proposals.
- Source Control will be implemented where the topography allows which will minimise the need for a large storage structure at the downstream end of the site.
- The connection into the Kill Burn will require approval.
- Scottish Water has confirmed there is sufficient capacity in the Edinburgh PFI Waste Water Treatment Works to service the demands from the development but there are network issues in the area and a Drainage Impact Assessment will be required to establish if there is sufficient capacity within the existing infrastructure to accommodate the demands from the development.
- Within the development a foul pumping station will be required to serve low lying areas of the site.
- An existing public combined sewer crosses the site and will require a connection to the proposed foul sewer network.

6.2 Recommendations

- Soil porosity testing should be carried out to determine the soakage and infiltration rates throughout the site.
- An investigation should be undertaken to determine the extent of the existing drainage and the areas contributing to the public sewers and watercourses.
- The location of the existing public combined sewer should be determined.
- The final impermeable areas should be determined for the design of the surface water network and SUDS features.
- Further discussions with Scottish Water will be required to commission a Drainage Impact Assessment.

APPENDIX 2a

Site Location Plan



North Point

Quality Ass.

Original Size
A4

Project
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Client
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Title
Site Location
Plan

Drawn: NB
Checked By: SRG
Date: Nov 12
Scale: 1:50,000

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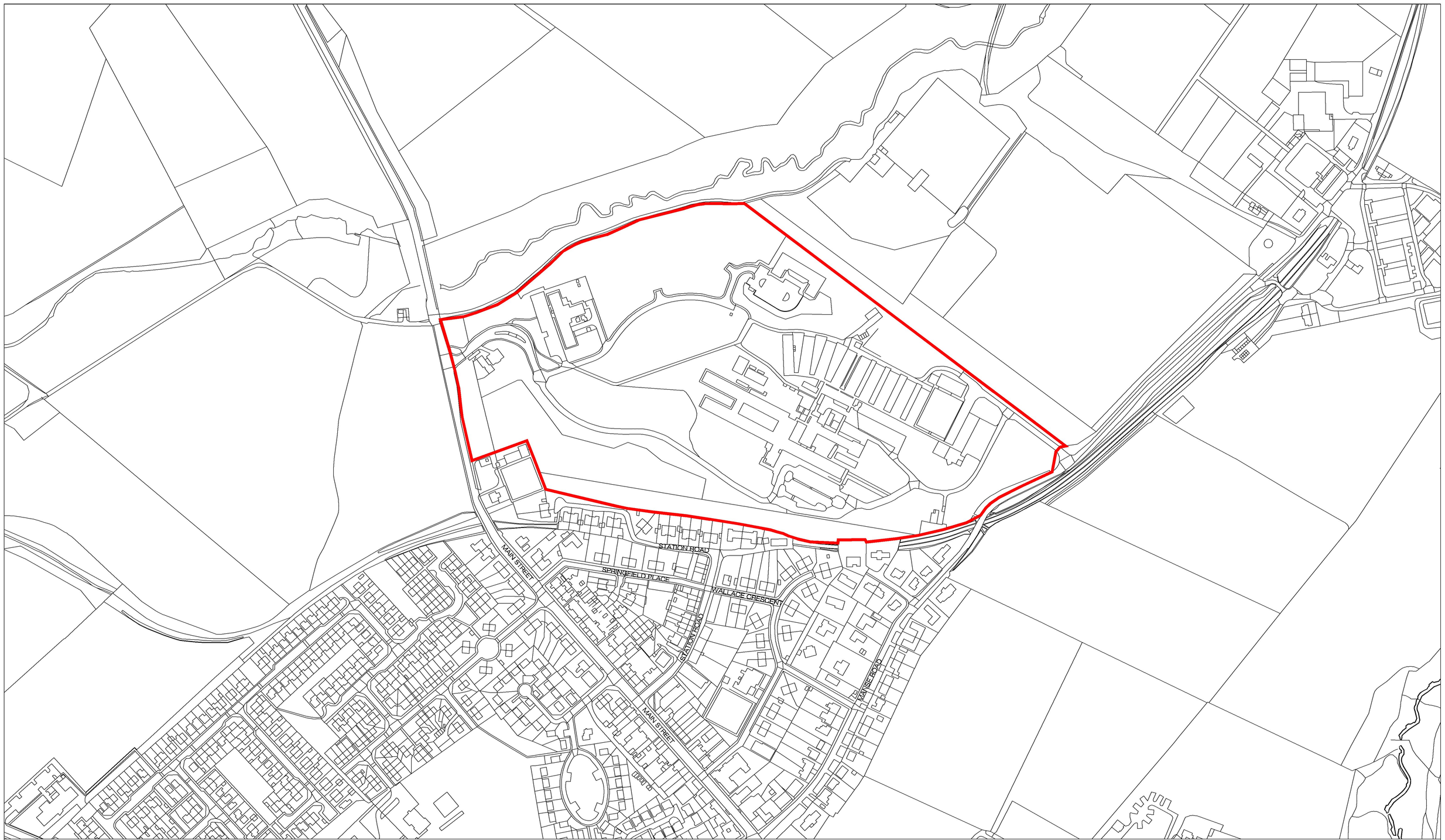
Drawing No.: 3932/App 2a
Revision:

APPENDIX 2b

Existing Site Plan



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Original Size
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Existing
Site Plan

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APPENDIX 2c

Topographical Survey

North Point

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Original Size
A1

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Title
Topographical
Survey

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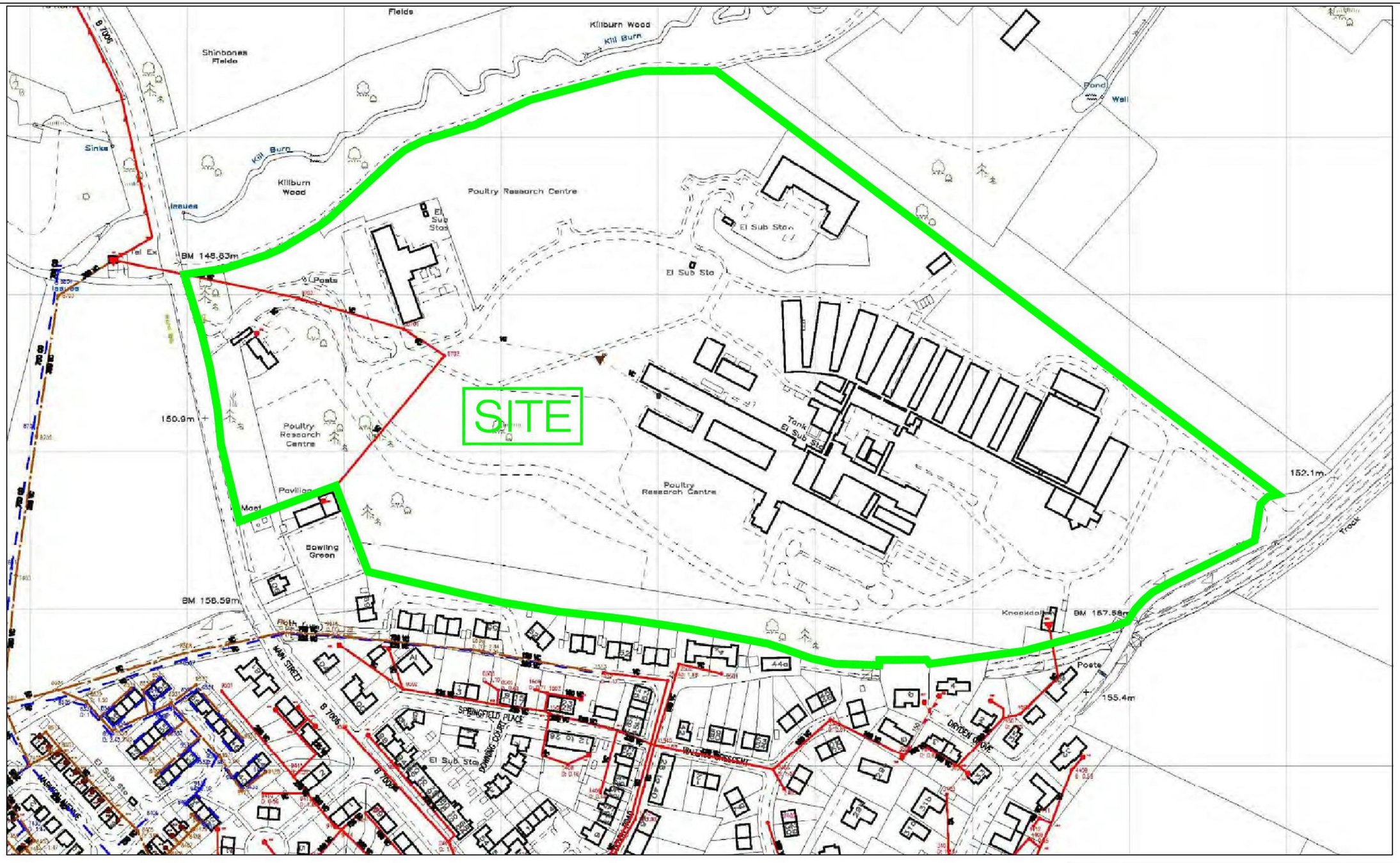
APPENDIX 2d

Existing Drainage Records



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APPENDIX 3a

Indicative Development Layout

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Indicative Development Layout

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APPENDIX 3b

Indicative Drainage Layout

KEY

149.40	Indicative Road Level
	Proposed Foul Sewer
	Proposed S.W. Sewer
⊠	Proposed Foul Pumping station to Sewers for Scotland 2nd Edition.

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		Date: May13	Scale: 1:1000		

APPENDIX 3c

Surface Water Calculations

Ironside Farrar Ltd		Page 1
3 Worsley Court High Street Worsley Manchester	Roslin Institute Site Existing Site Run off	
Date September 2012 File	Designed by srg Checked by	
Micro Drainage	Source Control W.12.6	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	200	Soil	0.450
Area (ha)	16.640	Urban	0.000
SAAR (mm)	856	Region Number	Region 2

Results l/s

QBAR Rural	92.5
QBAR Urban	92.5
Q200 years	275.7
Q1 year	80.5
Q30 years	175.5
Q100 years	243.3

Ironside Farrar Ltd		Page 1
3 Worsley Court High Street Worsley Manchester	Roslin Institute Proposed SW Network	
Date May 2013 File ROSLIN 130515.MDX	Designed by srg Checked by	
Micro Drainage	Network 2013.1	

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)	2	Add Flow / Climate Change (%)	0
M5-60 (mm)	14.600	Minimum Backdrop Height (m)	0.000
Ratio R	0.250	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

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)
1.000	18.280	0.183	99.9	0.155	5.00	0.0	0.600	o	150
1.001	19.400	0.129	150.4	0.000	0.00	0.0	0.600	o	225
1.002	39.960	0.266	150.0	0.000	0.00	0.0	0.600	o	225
1.003	52.090	0.347	150.0	0.534	0.00	0.0	0.600	o	300
1.004	67.810	0.339	200.0	0.000	0.00	0.0	0.600	o	300
1.005	30.530	0.153	200.0	0.000	0.00	0.0	0.600	o	300
1.006	26.270	0.131	200.5	0.236	0.00	0.0	0.600	o	375
2.000	65.720	0.657	100.0	0.254	5.00	0.0	0.600	o	225
1.007	46.010	0.230	200.0	0.000	0.00	0.0	0.600	o	375
1.008	23.780	0.119	199.8	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	40.92	5.30	149.800	0.155	0.0	0.0	0.0	1.01	17.8	17.2
1.001	40.09	5.61	149.542	0.155	0.0	0.0	0.0	1.06	42.3	17.2
1.002	38.51	6.23	149.413	0.155	0.0	0.0	0.0	1.07	42.4	17.2
1.003	36.97	6.91	149.072	0.689	0.0	0.0	0.0	1.28	90.6	69.0
1.004	34.92	7.93	148.724	0.689	0.0	0.0	0.0	1.11	78.3	69.0
1.005	34.09	8.39	148.385	0.689	0.0	0.0	0.0	1.11	78.3	69.0
1.006	33.50	8.73	148.158	0.925	0.0	0.0	0.0	1.28	140.9	83.9
2.000	39.48	5.84	149.700	0.254	0.0	0.0	0.0	1.31	52.0	27.2
1.007	32.53	9.33	148.027	1.179	0.0	0.0	0.0	1.28	141.1	103.9
1.008	32.06	9.64	147.797	1.179	0.0	0.0	0.0	1.28	141.2	103.9

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)
3.000	34.830	0.348	100.1	0.155	5.00	0.0	0.600	o	150
1.009	33.040	0.165	200.2	0.156	0.00	0.0	0.600	o	375
1.010	25.870	0.103	251.2	0.000	0.00	0.0	0.600	o	450
1.011	16.070	0.064	251.1	0.022	0.00	0.0	0.600	o	450
4.000	27.150	0.272	99.8	0.148	5.00	0.0	0.600	o	150
4.001	47.860	0.479	99.9	0.000	0.00	0.0	0.600	o	150
5.000	18.100	0.350	51.7	0.204	5.00	0.0	0.600	o	150
4.002	56.130	0.374	150.1	0.000	0.00	0.0	0.600	o	225
4.003	34.930	0.233	150.0	0.231	0.00	0.0	0.600	o	300
4.004	23.650	0.158	149.7	0.000	0.00	0.0	0.600	o	300
4.005	28.760	0.192	150.0	0.000	0.00	0.0	0.600	o	300
4.006	27.310	0.182	150.1	0.425	0.00	0.0	0.600	o	375
4.007	18.930	0.126	150.2	0.000	0.00	0.0	0.600	o	375
4.008	24.540	0.164	149.6	0.000	0.00	0.0	0.600	o	375
4.009	29.470	0.147	200.5	0.000	0.00	0.0	0.600	o	375
4.010	20.190	0.101	199.9	0.040	0.00	0.0	0.600	o	375
4.011	19.110	0.096	199.1	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
3.000	40.16	5.58	148.500	0.155	0.0	0.0	0.0	1.00	17.7	16.9
1.009	31.43	10.07	147.678	1.490	0.0	0.0	0.0	1.28	141.0	126.8
1.010	30.96	10.41	147.438	1.490	0.0	0.0	0.0	1.28	203.3	126.8
1.011	30.67	10.62	147.335	1.512	0.0	0.0	0.0	1.28	203.3	126.8
4.000	40.51	5.45	149.700	0.148	0.0	0.0	0.0	1.01	17.8	16.2
4.001	38.48	6.24	149.428	0.148	0.0	0.0	0.0	1.01	17.8	16.2
5.000	41.16	5.22	149.350	0.204	0.0	0.0	0.0	1.40	24.8	22.7
4.002	36.51	7.12	148.874	0.352	0.0	0.0	0.0	1.06	42.3	34.8
4.003	35.60	7.58	148.425	0.583	0.0	0.0	0.0	1.28	90.6	56.2
4.004	35.01	7.88	148.192	0.583	0.0	0.0	0.0	1.28	90.7	56.2
4.005	34.32	8.26	148.034	0.583	0.0	0.0	0.0	1.28	90.6	56.2
4.006	33.78	8.57	147.767	1.008	0.0	0.0	0.0	1.48	163.1	92.2
4.007	33.42	8.78	147.585	1.008	0.0	0.0	0.0	1.48	163.0	92.2
4.008	32.97	9.06	147.459	1.008	0.0	0.0	0.0	1.48	163.3	92.2
4.009	32.36	9.44	147.295	1.008	0.0	0.0	0.0	1.28	140.9	92.2
4.010	31.97	9.70	147.148	1.048	0.0	0.0	0.0	1.28	141.1	92.2
4.011	31.60	9.95	147.047	1.048	0.0	0.0	0.0	1.28	141.4	92.2

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)
6.000	43.860	0.292	150.2	0.288	5.00	0.0	0.600	o	225
6.001	44.250	0.295	150.0	0.000	0.00	0.0	0.600	o	225
6.002	22.090	0.147	150.0	0.388	0.00	0.0	0.600	o	300
6.003	22.730	0.152	150.0	0.000	0.00	0.0	0.600	o	300
7.000	35.170	0.352	99.9	0.218	5.00	0.0	0.600	o	225
7.001	20.680	0.207	99.9	0.000	0.00	0.0	0.600	o	225
6.004	31.100	0.156	199.4	0.000	0.00	0.0	0.600	o	375
6.005	53.970	0.270	199.9	0.000	0.00	0.0	0.600	o	375
1.012	36.780	1.226	30.0	0.000	0.00	0.0	0.600	o	450
1.013	23.320	0.777	30.0	0.000	0.00	0.0	0.600	o	450
1.014	26.240	0.656	40.0	0.174	0.00	0.0	0.600	o	450
8.000	27.290	0.182	149.9	0.209	5.00	0.0	0.600	o	225
8.001	14.800	0.099	149.5	0.000	0.00	0.0	0.600	o	225
8.002	17.440	0.116	150.0	0.000	0.00	0.0	0.600	o	225
8.003	16.500	0.110	150.0	0.000	0.00	0.0	0.600	o	225
8.004	41.270	0.275	150.0	0.150	0.00	0.0	0.600	o	225
9.000	32.180	0.322	99.9	0.096	5.00	0.0	0.600	o	150

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)
6.000	39.88	5.69	148.800	0.288	0.0	0.0	0.0	1.06	42.3	31.1
6.001	38.16	6.38	148.508	0.288	0.0	0.0	0.0	1.07	42.4	31.1
6.002	37.50	6.67	148.138	0.676	0.0	0.0	0.0	1.28	90.6	68.7
6.003	36.85	6.96	147.991	0.676	0.0	0.0	0.0	1.28	90.6	68.7
7.000	40.51	5.45	148.900	0.218	0.0	0.0	0.0	1.31	52.0	23.9
7.001	39.81	5.71	148.548	0.218	0.0	0.0	0.0	1.31	52.0	23.9
6.004	36.01	7.37	147.764	0.894	0.0	0.0	0.0	1.28	141.3	87.2
6.005	34.66	8.07	147.608	0.894	0.0	0.0	0.0	1.28	141.1	87.2
1.012	30.46	10.79	146.876	3.454	0.0	0.0	0.0	3.72	592.1	284.9
1.013	30.32	10.89	145.650	3.454	0.0	0.0	0.0	3.72	591.9	284.9
1.014	30.15	11.03	144.873	3.628	0.0	0.0	0.0	3.22	512.5	296.2
8.000	40.57	5.43	148.000	0.209	0.0	0.0	0.0	1.07	42.4	23.0
8.001	39.95	5.66	147.818	0.209	0.0	0.0	0.0	1.07	42.4	23.0
8.002	39.25	5.93	147.719	0.209	0.0	0.0	0.0	1.07	42.4	23.0
8.003	38.61	6.19	147.603	0.209	0.0	0.0	0.0	1.07	42.4	23.0
8.004	37.13	6.83	147.493	0.359	0.0	0.0	0.0	1.07	42.4	36.1
9.000	40.28	5.53	148.300	0.096	0.0	0.0	0.0	1.01	17.8	10.5

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)
9.001	19.170	0.192	99.8	0.000	0.00	0.0	0.600	o	150
9.002	15.950	0.160	100.0	0.000	0.00	0.0	0.600	o	150
10.000	31.280	0.209	149.7	0.318	5.00	0.0	0.600	o	225
10.001	44.100	0.294	150.0	0.000	0.00	0.0	0.600	o	225
10.002	25.970	0.173	150.0	0.027	0.00	0.0	0.600	o	225
10.003	15.890	0.106	149.9	0.000	0.00	0.0	0.600	o	225
8.005	65.430	0.327	200.0	0.048	0.00	0.0	0.600	o	375
8.006	23.080	0.115	200.0	0.000	0.00	0.0	0.600	o	375
8.007	29.730	0.496	60.0	0.000	0.00	0.0	0.600	o	375
11.000	28.650	0.478	59.9	0.302	5.00	0.0	0.600	o	225
11.001	56.800	0.874	65.0	0.000	0.00	0.0	0.600	o	225
11.002	39.950	0.666	60.0	0.000	0.00	0.0	0.600	o	225
8.008	19.320	0.322	60.0	0.000	0.00	0.0	0.600	o	375
8.009	23.070	0.385	60.0	0.229	0.00	0.0	0.600	o	375
8.010	21.120	0.352	60.0	0.000	0.00	0.0	0.600	o	375
8.011	24.230	0.404	60.0	0.000	0.00	0.0	0.600	o	375
8.012	21.830	0.364	60.0	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.001	39.45	5.85	147.978	0.096	0.0	0.0	0.0	1.01	17.8	10.5
9.002	38.79	6.12	147.786	0.096	0.0	0.0	0.0	1.00	17.8	10.5
10.000	40.40	5.49	149.900	0.318	0.0	0.0	0.0	1.07	42.4	34.8
10.001	38.64	6.18	149.691	0.318	0.0	0.0	0.0	1.07	42.4	34.8
10.002	37.68	6.59	149.397	0.345	0.0	0.0	0.0	1.07	42.4	35.2
10.003	37.13	6.83	149.224	0.345	0.0	0.0	0.0	1.07	42.4	35.2
8.005	35.38	7.69	147.068	0.848	0.0	0.0	0.0	1.28	141.1	81.2
8.006	34.81	7.99	146.740	0.848	0.0	0.0	0.0	1.28	141.1	81.2
8.007	34.42	8.20	146.625	0.848	0.0	0.0	0.0	2.34	258.8	81.2
11.000	40.97	5.28	148.500	0.302	0.0	0.0	0.0	1.69	67.3	33.5
11.001	39.42	5.86	148.022	0.302	0.0	0.0	0.0	1.62	64.6	33.5
11.002	38.44	6.26	147.148	0.302	0.0	0.0	0.0	1.69	67.3	33.5
8.008	34.18	8.34	146.130	1.150	0.0	0.0	0.0	2.34	258.8	106.4
8.009	33.89	8.50	145.808	1.379	0.0	0.0	0.0	2.34	258.8	126.6
8.010	33.63	8.65	145.423	1.379	0.0	0.0	0.0	2.34	258.8	126.6
8.011	33.35	8.83	145.071	1.379	0.0	0.0	0.0	2.34	258.8	126.6
8.012	33.09	8.98	144.667	1.379	0.0	0.0	0.0	2.34	258.8	126.6

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)
1.015	26.200	0.131	200.0	0.000	0.00	0.0	0.600	o	600
1.016	50.400	0.252	200.0	0.210	0.00	0.0	0.600	o	600
12.000	71.480	3.000	23.8	0.355	5.00	0.0	0.600	o	225
1.017	31.060	0.124	250.5	0.000	0.00	0.0	0.600	o	675
13.000	20.780	0.416	50.0	0.382	5.00	0.0	0.600	o	225
13.001	23.410	0.468	50.0	0.000	0.00	0.0	0.600	o	225
13.002	17.620	0.352	50.1	0.000	0.00	0.0	0.600	o	225
13.003	16.640	0.416	40.0	0.000	0.00	0.0	0.600	o	225
13.004	30.620	0.766	40.0	0.000	0.00	0.0	0.600	o	225
13.005	35.760	0.596	60.0	0.000	0.00	0.0	0.600	o	225
13.006	28.120	0.402	70.0	0.450	0.00	0.0	0.600	o	300
13.007	27.560	0.276	100.0	0.000	0.00	0.0	0.600	o	300
13.008	42.390	0.212	200.0	0.000	0.00	0.0	0.600	o	375
13.009	21.720	0.109	200.0	0.000	0.00	0.0	0.600	o	375
1.018	8.250	0.033	250.0	0.000	0.00	0.0	0.600	o	675
1.019	20.000	0.133	150.4	0.000	0.00	0.0	0.600	o	675

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)
1.015	29.82	11.28	144.067	5.007	0.0	0.0	0.0	1.72	485.8	404.4
1.016	29.23	11.77	143.936	5.217	0.0	0.0	0.0	1.72	485.8	413.0
12.000	40.53	5.44	147.000	0.355	0.0	0.0	0.0	2.69	107.0	39.0
1.017	28.87	12.08	143.550	5.572	0.0	0.0	0.0	1.65	591.0	435.6
13.000	41.25	5.19	147.500	0.382	0.0	0.0	0.0	1.86	73.8	42.7
13.001	40.65	5.40	147.084	0.382	0.0	0.0	0.0	1.85	73.7	42.7
13.002	40.22	5.56	146.616	0.382	0.0	0.0	0.0	1.85	73.7	42.7
13.003	39.87	5.69	146.264	0.382	0.0	0.0	0.0	2.07	82.5	42.7
13.004	39.24	5.94	145.848	0.382	0.0	0.0	0.0	2.07	82.5	42.7
13.005	38.37	6.29	145.083	0.382	0.0	0.0	0.0	1.69	67.3	42.7
13.006	37.79	6.54	144.412	0.832	0.0	0.0	0.0	1.88	133.0	85.2
13.007	37.14	6.83	144.010	0.832	0.0	0.0	0.0	1.57	111.1	85.2
13.008	35.98	7.38	143.659	0.832	0.0	0.0	0.0	1.28	141.1	85.2
13.009	35.42	7.67	143.447	0.832	0.0	0.0	0.0	1.28	141.1	85.2
1.018	28.77	12.16	143.039	6.404	0.0	0.0	0.0	1.65	591.5	499.0
1.019	28.60	12.32	142.000	6.404	0.0	0.0	0.0	2.14	764.0	499.0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	3.000
Hot Start (mins)	0	Inlet Coeffiecient	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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	200	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	14.600	Storm Duration (mins)	30
Ratio R	0.250		

Online Controls for Storm

Hydro-Brake® Manhole: 70, DS/PN: 1.019, Volume (m³): 6.2

Design Head (m) 2.000 Hydro-Brake® Type Md2 Invert Level (m) 142.000
Design Flow (l/s) 91.0 Diameter (mm) 248

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.9	1.200	70.3	3.000	111.2	7.000	169.8
0.200	27.2	1.400	76.0	3.500	120.1	7.500	175.8
0.300	46.3	1.600	81.2	4.000	128.4	8.000	181.6
0.400	56.2	1.800	86.1	4.500	136.2	8.500	187.1
0.500	57.9	2.000	90.8	5.000	143.5	9.000	192.6
0.600	55.0	2.200	95.2	5.500	150.5	9.500	197.8
0.800	57.8	2.400	99.4	6.000	157.2		
1.000	64.2	2.600	103.5	6.500	163.7		

Storage Structures for Storm

Tank or Pond Manhole: 70, DS/PN: 1.019

Invert Level (m) 142.200

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	636.0	1.400	1680.0	2.800	2200.0	4.200	2200.0
0.200	770.0	1.600	1850.0	3.000	2200.0	4.400	2200.0
0.400	908.0	1.800	2020.0	3.200	2200.0	4.600	2200.0
0.600	1053.0	2.000	2200.0	3.400	2200.0	4.800	2200.0
0.800	1203.0	2.200	2200.0	3.600	2200.0	5.000	2200.0
1.000	1360.0	2.400	2200.0	3.800	2200.0		
1.200	1520.0	2.600	2200.0	4.000	2200.0		

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	3.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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	0.250
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	14.600	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
Return Period(s) (years)	1, 30, 200
Climate Change (%)	0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%	30/15 Summer	200/15 Summer			6
1.001	15 Winter	1	0%	30/15 Winter				
1.002	15 Winter	1	0%	30/15 Winter				
1.003	15 Winter	1	0%	30/15 Summer	200/15 Summer			6
1.004	15 Winter	1	0%	30/15 Summer				
1.005	15 Winter	1	0%	30/15 Summer				
1.006	15 Winter	1	0%	30/15 Summer				
2.000	15 Winter	1	0%	30/15 Winter				
1.007	15 Winter	1	0%	30/15 Summer				
1.008	15 Winter	1	0%	30/15 Summer				
3.000	15 Winter	1	0%	30/15 Summer	200/15 Summer			5
1.009	30 Winter	1	0%	30/15 Summer				
1.010	30 Winter	1	0%	30/30 Winter				
1.011	30 Winter	1	0%	30/30 Winter				
4.000	15 Winter	1	0%	30/15 Summer	200/15 Summer			6
4.001	15 Winter	1	0%	30/15 Summer	200/15 Summer			6
5.000	15 Winter	1	0%	30/15 Summer	200/15 Summer			6
4.002	15 Winter	1	0%	30/15 Summer	200/30 Winter			1
4.003	15 Winter	1	0%	30/15 Summer				
4.004	15 Winter	1	0%	30/15 Winter				
4.005	15 Winter	1	0%	30/15 Winter				
4.006	15 Winter	1	0%	30/15 Summer				
4.007	15 Winter	1	0%	30/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
4.008	15 Winter	1	0%	30/15 Summer				
4.009	15 Winter	1	0%	30/15 Summer				
4.010	15 Winter	1	0%	30/15 Summer				
4.011	15 Winter	1	0%	30/15 Summer				
6.000	15 Winter	1	0%	30/15 Summer	200/15 Summer			6
6.001	15 Winter	1	0%	30/15 Summer				
6.002	15 Winter	1	0%	30/15 Summer				
6.003	15 Winter	1	0%	30/15 Summer				
7.000	15 Winter	1	0%	200/15 Summer				
7.001	15 Winter	1	0%	200/15 Summer				
6.004	15 Winter	1	0%	30/15 Summer				
6.005	15 Winter	1	0%	30/15 Winter				
1.012	15 Winter	1	0%	200/15 Summer				
1.013	15 Winter	1	0%	30/15 Summer				
1.014	15 Winter	1	0%	30/15 Summer				
8.000	15 Winter	1	0%	30/15 Summer	200/15 Winter			3
8.001	15 Winter	1	0%	30/15 Summer				
8.002	15 Winter	1	0%	30/15 Summer				
8.003	15 Winter	1	0%	30/15 Summer				
8.004	15 Winter	1	0%	30/15 Summer				
9.000	15 Winter	1	0%	30/15 Summer				
9.001	15 Winter	1	0%	30/15 Summer				
9.002	15 Winter	1	0%	30/15 Summer				
10.000	15 Winter	1	0%	30/15 Summer	200/15 Summer			4
10.001	15 Winter	1	0%	30/15 Summer				
10.002	15 Winter	1	0%	30/15 Summer				
10.003	15 Winter	1	0%	30/15 Summer				
8.005	15 Winter	1	0%	200/15 Summer				
8.006	15 Winter	1	0%	200/15 Summer				
8.007	15 Winter	1	0%	200/15 Summer				
11.000	15 Winter	1	0%	200/15 Summer				
11.001	15 Winter	1	0%	200/15 Summer				
11.002	15 Winter	1	0%	200/15 Summer				
8.008	15 Winter	1	0%	200/15 Summer				
8.009	15 Winter	1	0%	200/15 Summer				
8.010	15 Winter	1	0%	30/15 Winter	200/30 Winter			2
8.011	15 Winter	1	0%	30/15 Summer				
8.012	15 Winter	1	0%	30/15 Summer				
1.015	15 Winter	1	0%	30/15 Summer				
1.016	15 Winter	1	0%	30/15 Summer				
12.000	15 Winter	1	0%	200/15 Summer				
1.017	15 Winter	1	0%	30/15 Summer				
13.000	15 Winter	1	0%	30/15 Summer	200/15 Winter			3
13.001	15 Winter	1	0%	30/15 Summer				
13.002	15 Winter	1	0%	30/15 Summer				
13.003	15 Winter	1	0%	30/15 Winter				
13.004	15 Winter	1	0%	30/15 Summer				
13.005	15 Winter	1	0%	30/15 Summer	200/15 Winter			3
13.006	15 Winter	1	0%	30/15 Summer	200/15 Summer			5
13.007	15 Winter	1	0%	30/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
13.008	15 Winter	1	0%	30/15 Summer				
13.009	30 Winter	1	0%	30/15 Summer				
1.018	30 Winter	1	0%	30/15 Summer				
1.019	180 Winter	1	0%	1/120 Winter				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	149.911	-0.039	0.000	0.88	0.0	14.7	OK
1.001	2	149.639	-0.128	0.000	0.38	0.0	14.6	OK
1.002	3	149.507	-0.131	0.000	0.36	0.0	14.4	OK
1.003	4	149.246	-0.125	0.000	0.63	0.0	54.0	OK
1.004	5	148.913	-0.111	0.000	0.70	0.0	52.6	OK
1.005	6	148.578	-0.108	0.000	0.73	0.0	52.1	OK
1.006	7	148.351	-0.182	0.000	0.52	0.0	63.3	OK
2.000	8	149.811	-0.114	0.000	0.48	0.0	24.4	OK
1.007	8	148.239	-0.162	0.000	0.61	0.0	78.6	OK
1.008	9	148.016	-0.155	0.000	0.64	0.0	78.1	OK
3.000	11	148.609	-0.041	0.000	0.86	0.0	14.8	OK
1.009	10	147.923	-0.130	0.000	0.75	0.0	95.0	OK
1.010	14	147.677	-0.210	0.000	0.55	0.0	94.8	OK
1.011	15	147.588	-0.197	0.000	0.61	0.0	95.6	OK
4.000	15	149.806	-0.044	0.000	0.82	0.0	14.0	OK
4.001	16	149.530	-0.048	0.000	0.78	0.0	13.5	OK
5.000	17	149.457	-0.043	0.000	0.83	0.0	19.3	OK
4.002	18	149.026	-0.073	0.000	0.77	0.0	31.4	OK
4.003	19	148.591	-0.134	0.000	0.58	0.0	48.1	OK
4.004	20	148.359	-0.133	0.000	0.59	0.0	47.8	OK
4.005	21	148.198	-0.136	0.000	0.58	0.0	47.4	OK
4.006	22	147.962	-0.180	0.000	0.53	0.0	75.0	OK
4.007	23	147.784	-0.176	0.000	0.55	0.0	74.8	OK
4.008	24	147.654	-0.180	0.000	0.53	0.0	74.7	OK
4.009	25	147.505	-0.166	0.000	0.60	0.0	74.0	OK
4.010	26	147.368	-0.156	0.000	0.64	0.0	76.1	OK
4.011	27	147.267	-0.155	0.000	0.64	0.0	75.5	OK
6.000	28	148.938	-0.087	0.000	0.67	0.0	26.8	OK
6.001	29	148.642	-0.091	0.000	0.65	0.0	26.1	OK
6.002	30	148.324	-0.114	0.000	0.69	0.0	55.0	OK
6.003	31	148.173	-0.118	0.000	0.68	0.0	54.6	OK
7.000	32	149.003	-0.122	0.000	0.42	0.0	20.6	OK
7.001	33	148.652	-0.121	0.000	0.44	0.0	20.7	OK
6.004	34	147.971	-0.168	0.000	0.58	0.0	73.2	OK
6.005	35	147.809	-0.174	0.000	0.56	0.0	73.0	OK
1.012	16	147.089	-0.237	0.000	0.45	0.0	237.2	OK
1.013	17	145.871	-0.229	0.000	0.48	0.0	237.2	OK
1.014	19	145.116	-0.207	0.000	0.57	0.0	244.7	OK
8.000	39	148.114	-0.111	0.000	0.50	0.0	19.7	OK
8.001	40	147.934	-0.109	0.000	0.53	0.0	19.7	OK
8.002	41	147.834	-0.110	0.000	0.52	0.0	19.6	OK

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
8.003	42	147.717	-0.110	0.000	0.52	0.0	19.4	OK
8.004	43	147.639	-0.079	0.000	0.74	0.0	29.8	OK
9.000	44	148.379	-0.071	0.000	0.53	0.0	9.1	OK
9.001	45	148.057	-0.071	0.000	0.54	0.0	9.0	OK
9.002	46	147.865	-0.071	0.000	0.55	0.0	9.0	OK
10.000	47	150.049	-0.076	0.000	0.75	0.0	29.9	OK
10.001	48	149.835	-0.081	0.000	0.72	0.0	29.1	OK
10.002	49	149.549	-0.073	0.000	0.78	0.0	30.5	OK
10.003	50	149.379	-0.070	0.000	0.82	0.0	30.6	OK
8.005	51	147.265	-0.178	0.000	0.52	0.0	69.6	OK
8.006	52	146.945	-0.171	0.000	0.58	0.0	69.4	OK
8.007	53	146.767	-0.234	0.000	0.30	0.0	69.0	OK
11.000	54	148.608	-0.117	0.000	0.46	0.0	28.5	OK
11.001	55	148.130	-0.117	0.000	0.45	0.0	28.3	OK
11.002	56	147.253	-0.120	0.000	0.44	0.0	28.2	OK
8.008	57	146.299	-0.206	0.000	0.42	0.0	90.2	OK
8.009	58	145.989	-0.194	0.000	0.47	0.0	103.4	OK
8.010	59	145.605	-0.193	0.000	0.47	0.0	103.7	OK
8.011	60	145.250	-0.196	0.000	0.47	0.0	103.7	OK
8.012	61	144.848	-0.194	0.000	0.47	0.0	103.4	OK
1.015	20	144.531	-0.136	0.000	0.95	0.0	345.0	OK
1.016	21	144.357	-0.180	0.000	0.83	0.0	351.8	OK
12.000	22	147.089	-0.136	0.000	0.33	0.0	33.8	OK
1.017	37	143.997	-0.228	0.000	0.77	0.0	357.2	OK
13.000	63	147.620	-0.105	0.000	0.54	0.0	36.2	OK
13.001	64	147.203	-0.106	0.000	0.54	0.0	36.5	OK
13.002	65	146.737	-0.104	0.000	0.56	0.0	36.7	OK
13.003	66	146.376	-0.113	0.000	0.50	0.0	36.7	OK
13.004	67	145.957	-0.116	0.000	0.47	0.0	36.4	OK
13.005	68	145.206	-0.102	0.000	0.57	0.0	36.3	OK
13.006	72	144.579	-0.133	0.000	0.59	0.0	70.4	OK
13.007	73	144.197	-0.113	0.000	0.71	0.0	70.6	OK
13.008	74	143.857	-0.178	0.000	0.54	0.0	69.5	OK
13.009	75	143.749	-0.074	0.000	0.51	0.0	60.6	OK
1.018	69	143.714	0.000	0.000	1.22	0.0	406.3	OK
1.019	70	142.707	0.032	0.000	0.12	0.0	57.7	SURCHARGED

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	3.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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	0.250
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	14.600	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
Return Period(s) (years)	1, 30, 200
Climate Change (%)	0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%	30/15 Summer	200/15 Summer			6
1.001	15 Winter	30	0%	30/15 Winter				
1.002	15 Winter	30	0%	30/15 Winter				
1.003	30 Winter	30	0%	30/15 Summer	200/15 Summer			6
1.004	30 Winter	30	0%	30/15 Summer				
1.005	30 Winter	30	0%	30/15 Summer				
1.006	30 Winter	30	0%	30/15 Summer				
2.000	15 Winter	30	0%	30/15 Winter				
1.007	30 Winter	30	0%	30/15 Summer				
1.008	30 Winter	30	0%	30/15 Summer				
3.000	15 Winter	30	0%	30/15 Summer	200/15 Summer			5
1.009	30 Winter	30	0%	30/15 Summer				
1.010	30 Winter	30	0%	30/30 Winter				
1.011	30 Winter	30	0%	30/30 Winter				
4.000	15 Winter	30	0%	30/15 Summer	200/15 Summer			6
4.001	15 Winter	30	0%	30/15 Summer	200/15 Summer			6
5.000	15 Winter	30	0%	30/15 Summer	200/15 Summer			6
4.002	15 Winter	30	0%	30/15 Summer	200/30 Winter			1
4.003	15 Winter	30	0%	30/15 Summer				
4.004	15 Winter	30	0%	30/15 Winter				
4.005	15 Winter	30	0%	30/15 Winter				
4.006	15 Winter	30	0%	30/15 Summer				
4.007	15 Winter	30	0%	30/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
4.008	15 Winter	30	0%	30/15 Summer				
4.009	15 Winter	30	0%	30/15 Summer				
4.010	15 Winter	30	0%	30/15 Summer				
4.011	15 Winter	30	0%	30/15 Summer				
6.000	15 Winter	30	0%	30/15 Summer	200/15 Summer			6
6.001	15 Winter	30	0%	30/15 Summer				
6.002	15 Winter	30	0%	30/15 Summer				
6.003	15 Winter	30	0%	30/15 Summer				
7.000	15 Winter	30	0%	200/15 Summer				
7.001	15 Winter	30	0%	200/15 Summer				
6.004	15 Winter	30	0%	30/15 Summer				
6.005	15 Winter	30	0%	30/15 Winter				
1.012	30 Winter	30	0%	200/15 Summer				
1.013	30 Winter	30	0%	30/15 Summer				
1.014	30 Winter	30	0%	30/15 Summer				
8.000	15 Winter	30	0%	30/15 Summer	200/15 Winter			3
8.001	15 Winter	30	0%	30/15 Summer				
8.002	15 Winter	30	0%	30/15 Summer				
8.003	15 Winter	30	0%	30/15 Summer				
8.004	15 Winter	30	0%	30/15 Summer				
9.000	15 Winter	30	0%	30/15 Summer				
9.001	15 Winter	30	0%	30/15 Summer				
9.002	15 Winter	30	0%	30/15 Summer				
10.000	15 Winter	30	0%	30/15 Summer	200/15 Summer			4
10.001	15 Winter	30	0%	30/15 Summer				
10.002	15 Winter	30	0%	30/15 Summer				
10.003	15 Winter	30	0%	30/15 Summer				
8.005	15 Winter	30	0%	200/15 Summer				
8.006	15 Winter	30	0%	200/15 Summer				
8.007	15 Winter	30	0%	200/15 Summer				
11.000	15 Winter	30	0%	200/15 Summer				
11.001	15 Winter	30	0%	200/15 Summer				
11.002	15 Winter	30	0%	200/15 Summer				
8.008	15 Winter	30	0%	200/15 Summer				
8.009	30 Winter	30	0%	200/15 Summer				
8.010	30 Winter	30	0%	30/15 Winter	200/30 Winter			2
8.011	30 Winter	30	0%	30/15 Summer				
8.012	30 Winter	30	0%	30/15 Summer				
1.015	30 Winter	30	0%	30/15 Summer				
1.016	30 Winter	30	0%	30/15 Summer				
12.000	15 Winter	30	0%	200/15 Summer				
1.017	30 Winter	30	0%	30/15 Summer				
13.000	15 Winter	30	0%	30/15 Summer	200/15 Winter			3
13.001	15 Winter	30	0%	30/15 Summer				
13.002	15 Winter	30	0%	30/15 Summer				
13.003	15 Winter	30	0%	30/15 Winter				
13.004	15 Winter	30	0%	30/15 Summer				
13.005	15 Winter	30	0%	30/15 Summer	200/15 Winter			3
13.006	15 Winter	30	0%	30/15 Summer	200/15 Summer			5
13.007	30 Winter	30	0%	30/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
13.008	30 Winter	30	0%	30/15 Summer				
13.009	30 Winter	30	0%	30/15 Summer				
1.018	30 Winter	30	0%	30/15 Summer				
1.019	240 Winter	30	0%	1/120 Winter				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	150.282	0.332	0.000	1.67	0.0	27.8	SURCHARGED
1.001	2	149.795	0.028	0.000	0.68	0.0	25.9	SURCHARGED
1.002	3	149.750	0.112	0.000	0.61	0.0	24.4	SURCHARGED
1.003	4	149.662	0.290	0.000	1.07	0.0	91.9	SURCHARGED
1.004	5	149.319	0.295	0.000	1.13	0.0	84.8	SURCHARGED
1.005	6	148.881	0.195	0.000	1.26	0.0	89.9	SURCHARGED
1.006	7	148.682	0.149	0.000	0.87	0.0	106.2	SURCHARGED
2.000	8	149.928	0.003	0.000	1.01	0.0	50.7	SURCHARGED
1.007	8	148.593	0.192	0.000	1.04	0.0	135.0	SURCHARGED
1.008	9	148.345	0.174	0.000	1.11	0.0	134.5	SURCHARGED
3.000	11	149.083	0.433	0.000	1.49	0.0	25.5	SURCHARGED
1.009	10	148.201	0.148	0.000	1.39	0.0	175.3	SURCHARGED
1.010	14	147.896	0.008	0.000	1.00	0.0	171.0	SURCHARGED
1.011	15	147.792	0.008	0.000	1.09	0.0	172.7	SURCHARGED
4.000	15	150.311	0.461	0.000	1.32	0.0	22.4	SURCHARGED
4.001	16	149.936	0.358	0.000	1.14	0.0	19.8	SURCHARGED
5.000	17	149.965	0.465	0.000	1.41	0.0	32.6	SURCHARGED
4.002	18	149.295	0.196	0.000	1.23	0.0	50.0	SURCHARGED
4.003	19	148.746	0.021	0.000	1.04	0.0	86.4	SURCHARGED
4.004	20	148.521	0.029	0.000	1.01	0.0	81.7	SURCHARGED
4.005	21	148.360	0.026	0.000	1.01	0.0	83.0	SURCHARGED
4.006	22	148.185	0.043	0.000	1.06	0.0	151.4	SURCHARGED
4.007	23	148.004	0.043	0.000	1.06	0.0	144.2	SURCHARGED
4.008	24	147.882	0.048	0.000	0.98	0.0	138.8	SURCHARGED
4.009	25	147.740	0.069	0.000	1.08	0.0	134.6	SURCHARGED
4.010	26	147.570	0.047	0.000	1.15	0.0	136.4	SURCHARGED
4.011	27	147.436	0.013	0.000	1.15	0.0	135.8	SURCHARGED
6.000	28	149.379	0.354	0.000	1.14	0.0	46.0	SURCHARGED
6.001	29	149.015	0.282	0.000	1.16	0.0	46.9	SURCHARGED
6.002	30	148.689	0.251	0.000	1.30	0.0	104.1	SURCHARGED
6.003	31	148.433	0.143	0.000	1.28	0.0	102.6	SURCHARGED
7.000	32	149.074	-0.051	0.000	0.93	0.0	45.6	OK
7.001	33	148.724	-0.049	0.000	0.97	0.0	45.7	OK
6.004	34	148.195	0.056	0.000	1.16	0.0	145.6	SURCHARGED
6.005	35	148.001	0.018	0.000	1.07	0.0	140.2	SURCHARGED
1.012	16	147.304	-0.022	0.000	0.82	0.0	429.9	OK
1.013	17	146.485	0.384	0.000	0.87	0.0	427.3	SURCHARGED
1.014	19	145.895	0.571	0.000	1.01	0.0	436.8	SURCHARGED
8.000	39	148.325	0.100	0.000	0.99	0.0	38.9	SURCHARGED
8.001	40	148.186	0.143	0.000	0.92	0.0	34.4	SURCHARGED
8.002	41	148.104	0.160	0.000	0.93	0.0	35.0	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
8.003	42	148.012	0.185	0.000	0.97	0.0	36.4	SURCHARGED
8.004	43	147.944	0.227	0.000	1.34	0.0	53.8	SURCHARGED
9.000	44	148.519	0.069	0.000	1.07	0.0	18.4	SURCHARGED
9.001	45	148.154	0.026	0.000	1.06	0.0	17.6	SURCHARGED
9.002	46	147.946	0.010	0.000	1.05	0.0	17.3	SURCHARGED
10.000	47	150.498	0.373	0.000	1.32	0.0	52.4	SURCHARGED
10.001	48	150.176	0.260	0.000	1.21	0.0	48.7	SURCHARGED
10.002	49	149.775	0.153	0.000	1.24	0.0	48.7	SURCHARGED
10.003	50	149.509	0.060	0.000	1.29	0.0	48.5	SURCHARGED
8.005	51	147.348	-0.095	0.000	0.90	0.0	119.7	OK
8.006	52	147.038	-0.078	0.000	0.99	0.0	119.2	OK
8.007	53	146.817	-0.183	0.000	0.52	0.0	119.2	OK
11.000	54	148.695	-0.030	0.000	1.00	0.0	62.6	OK
11.001	55	148.213	-0.034	0.000	0.99	0.0	61.3	OK
11.002	56	147.324	-0.049	0.000	0.97	0.0	61.8	OK
8.008	57	146.383	-0.121	0.000	0.80	0.0	171.8	OK
8.009	58	146.131	-0.051	0.000	0.87	0.0	193.5	OK
8.010	59	145.896	0.098	0.000	0.86	0.0	187.3	SURCHARGED
8.011	60	145.679	0.233	0.000	0.78	0.0	174.8	SURCHARGED
8.012	61	145.441	0.398	0.000	0.79	0.0	172.6	SURCHARGED
1.015	20	145.222	0.555	0.000	1.67	0.0	607.2	SURCHARGED
1.016	21	144.855	0.318	0.000	1.45	0.0	617.2	SURCHARGED
12.000	22	147.144	-0.081	0.000	0.72	0.0	74.4	OK
1.017	37	144.324	0.099	0.000	1.38	0.0	642.0	SURCHARGED
13.000	63	147.841	0.116	0.000	1.07	0.0	71.6	SURCHARGED
13.001	64	147.373	0.064	0.000	1.04	0.0	70.0	SURCHARGED
13.002	65	146.890	0.049	0.000	1.05	0.0	69.3	SURCHARGED
13.003	66	146.523	0.034	0.000	0.91	0.0	67.0	SURCHARGED
13.004	67	146.176	0.103	0.000	0.87	0.0	67.0	SURCHARGED
13.005	68	145.603	0.295	0.000	1.08	0.0	68.8	SURCHARGED
13.006	72	145.004	0.292	0.000	1.11	0.0	132.8	SURCHARGED
13.007	73	144.601	0.291	0.000	1.18	0.0	117.8	SURCHARGED
13.008	74	144.252	0.218	0.000	0.88	0.0	113.6	SURCHARGED
13.009	75	144.093	0.271	0.000	0.94	0.0	113.1	SURCHARGED
1.018	69	143.999	0.286	0.000	2.26	0.0	752.9	SURCHARGED
1.019	70	143.343	0.668	0.000	0.16	0.0	74.4	SURCHARGED

200 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	3.000
Hot Start Level (mm)	0	Inlet Coeffiecient	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	0.250
Region	Scotland and Ireland	Cv (Summer)	0.750
M5-60 (mm)	14.600	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
Return Period(s) (years)	1, 30, 200
Climate Change (%)	0, 0, 20

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	30 Winter	200	+20%	30/15 Summer	200/15 Summer			6
1.001	30 Winter	200	+20%	30/15 Winter				
1.002	30 Winter	200	+20%	30/15 Winter				
1.003	30 Winter	200	+20%	30/15 Summer	200/15 Summer			6
1.004	30 Winter	200	+20%	30/15 Summer				
1.005	30 Winter	200	+20%	30/15 Summer				
1.006	30 Winter	200	+20%	30/15 Summer				
2.000	30 Winter	200	+20%	30/15 Winter				
1.007	30 Winter	200	+20%	30/15 Summer				
1.008	30 Winter	200	+20%	30/15 Summer				
3.000	30 Winter	200	+20%	30/15 Summer	200/15 Summer			5
1.009	30 Winter	200	+20%	30/15 Summer				
1.010	30 Winter	200	+20%	30/30 Winter				
1.011	30 Winter	200	+20%	30/30 Winter				
4.000	30 Winter	200	+20%	30/15 Summer	200/15 Summer			6
4.001	30 Winter	200	+20%	30/15 Summer	200/15 Summer			6
5.000	30 Winter	200	+20%	30/15 Summer	200/15 Summer			6
4.002	30 Winter	200	+20%	30/15 Summer	200/30 Winter			1
4.003	30 Winter	200	+20%	30/15 Summer				
4.004	30 Winter	200	+20%	30/15 Winter				
4.005	30 Winter	200	+20%	30/15 Winter				
4.006	30 Winter	200	+20%	30/15 Summer				
4.007	30 Winter	200	+20%	30/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
4.008	30 Winter	200	+20%	30/15 Summer				
4.009	30 Winter	200	+20%	30/15 Summer				
4.010	30 Winter	200	+20%	30/15 Summer				
4.011	30 Winter	200	+20%	30/15 Summer				
6.000	30 Winter	200	+20%	30/15 Summer	200/15 Summer			6
6.001	30 Winter	200	+20%	30/15 Summer				
6.002	30 Winter	200	+20%	30/15 Summer				
6.003	30 Winter	200	+20%	30/15 Summer				
7.000	30 Winter	200	+20%	200/15 Summer				
7.001	30 Winter	200	+20%	200/15 Summer				
6.004	30 Winter	200	+20%	30/15 Summer				
6.005	30 Winter	200	+20%	30/15 Winter				
1.012	30 Winter	200	+20%	200/15 Summer				
1.013	30 Winter	200	+20%	30/15 Summer				
1.014	30 Winter	200	+20%	30/15 Summer				
8.000	30 Winter	200	+20%	30/15 Summer	200/15 Winter			3
8.001	30 Winter	200	+20%	30/15 Summer				
8.002	30 Winter	200	+20%	30/15 Summer				
8.003	30 Winter	200	+20%	30/15 Summer				
8.004	30 Winter	200	+20%	30/15 Summer				
9.000	15 Winter	200	+20%	30/15 Summer				
9.001	30 Winter	200	+20%	30/15 Summer				
9.002	30 Winter	200	+20%	30/15 Summer				
10.000	15 Winter	200	+20%	30/15 Summer	200/15 Summer			4
10.001	15 Winter	200	+20%	30/15 Summer				
10.002	30 Winter	200	+20%	30/15 Summer				
10.003	30 Winter	200	+20%	30/15 Summer				
8.005	30 Winter	200	+20%	200/15 Summer				
8.006	30 Winter	200	+20%	200/15 Summer				
8.007	30 Winter	200	+20%	200/15 Summer				
11.000	15 Winter	200	+20%	200/15 Summer				
11.001	30 Winter	200	+20%	200/15 Summer				
11.002	30 Winter	200	+20%	200/15 Summer				
8.008	30 Winter	200	+20%	200/15 Summer				
8.009	30 Winter	200	+20%	200/15 Summer				
8.010	30 Winter	200	+20%	30/15 Winter	200/30 Winter			2
8.011	30 Winter	200	+20%	30/15 Summer				
8.012	30 Winter	200	+20%	30/15 Summer				
1.015	30 Winter	200	+20%	30/15 Summer				
1.016	30 Winter	200	+20%	30/15 Summer				
12.000	15 Winter	200	+20%	200/15 Summer				
1.017	30 Winter	200	+20%	30/15 Summer				
13.000	15 Winter	200	+20%	30/15 Summer	200/15 Winter			3
13.001	30 Winter	200	+20%	30/15 Summer				
13.002	30 Winter	200	+20%	30/15 Summer				
13.003	30 Winter	200	+20%	30/15 Winter				
13.004	30 Winter	200	+20%	30/15 Summer				
13.005	30 Winter	200	+20%	30/15 Summer	200/15 Winter			3
13.006	30 Winter	200	+20%	30/15 Summer	200/15 Summer			5
13.007	30 Winter	200	+20%	30/15 Summer				

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

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
13.008	30 Winter	200	+20%	30/15 Summer				
13.009	30 Winter	200	+20%	30/15 Summer				
1.018	30 Winter	200	+20%	30/15 Summer				
1.019	360 Winter	200	+20%	1/120 Winter				

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	1	151.207	1.257	7.188	2.07	0.0	34.4	FLOOD
1.001	2	151.086	1.319	0.000	0.99	0.0	37.9	SURCHARGED
1.002	3	151.058	1.420	0.000	1.03	0.0	41.5	SURCHARGED
1.003	4	151.019	1.648	19.526	1.26	0.0	107.8	FLOOD
1.004	5	150.792	1.768	0.000	1.44	0.0	108.2	FLOOD RISK
1.005	6	150.492	1.807	0.000	1.56	0.0	111.0	FLOOD RISK
1.006	7	150.323	1.791	0.000	1.13	0.0	138.2	SURCHARGED
2.000	8	150.798	0.873	0.000	1.32	0.0	66.3	SURCHARGED
1.007	8	150.205	1.804	0.000	1.39	0.0	180.2	SURCHARGED
1.008	9	149.825	1.653	0.000	1.41	0.0	170.4	SURCHARGED
3.000	11	150.003	1.353	3.376	1.88	0.0	32.1	FLOOD
1.009	10	149.604	1.551	0.000	1.83	0.0	230.2	SURCHARGED
1.010	14	149.157	1.270	0.000	1.28	0.0	219.1	SURCHARGED
1.011	15	149.005	1.220	0.000	1.35	0.0	212.6	SURCHARGED
4.000	15	151.204	1.354	4.132	1.45	0.0	24.5	FLOOD
4.001	16	150.755	1.177	4.690	1.57	0.0	27.2	FLOOD
5.000	17	150.858	1.358	7.618	1.54	0.0	35.6	FLOOD
4.002	18	150.500	1.401	0.268	1.41	0.0	57.3	FLOOD
4.003	19	150.250	1.525	0.000	1.12	0.0	93.5	FLOOD RISK
4.004	20	150.070	1.578	0.000	1.10	0.0	88.5	FLOOD RISK
4.005	21	149.934	1.600	0.000	1.04	0.0	85.6	SURCHARGED
4.006	22	149.773	1.630	0.000	1.28	0.0	183.2	SURCHARGED
4.007	23	149.603	1.642	0.000	1.30	0.0	175.9	SURCHARGED
4.008	24	149.479	1.645	0.000	1.20	0.0	168.5	SURCHARGED
4.009	25	149.329	1.658	0.000	1.29	0.0	160.0	SURCHARGED
4.010	26	149.152	1.628	0.000	1.36	0.0	161.2	SURCHARGED
4.011	27	149.005	1.582	0.000	1.28	0.0	150.9	SURCHARGED
6.000	28	150.311	1.286	11.004	1.41	0.0	56.7	FLOOD
6.001	29	150.127	1.394	0.000	1.44	0.0	58.0	FLOOD RISK
6.002	30	149.933	1.495	0.000	1.79	0.0	143.2	FLOOD RISK
6.003	31	149.654	1.363	0.000	1.75	0.0	140.0	SURCHARGED
7.000	32	149.782	0.657	0.000	1.27	0.0	62.0	SURCHARGED
7.001	33	149.547	0.774	0.000	1.20	0.0	56.9	SURCHARGED
6.004	34	149.397	1.258	0.000	1.46	0.0	182.6	SURCHARGED
6.005	35	149.188	1.205	0.000	1.33	0.0	174.7	SURCHARGED
1.012	16	148.864	1.538	0.000	0.96	0.0	501.3	SURCHARGED
1.013	17	147.732	1.632	0.000	1.02	0.0	502.2	SURCHARGED
1.014	19	146.930	1.607	0.000	1.21	0.0	523.5	SURCHARGED
8.000	39	149.301	1.076	1.520	1.16	0.0	45.7	FLOOD
8.001	40	149.181	1.138	0.000	1.17	0.0	43.6	FLOOD RISK
8.002	41	149.105	1.161	0.000	1.08	0.0	41.0	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
8.003	42	149.019	1.191	0.000	1.02	0.0	38.4	SURCHARGED
8.004	43	148.935	1.217	0.000	1.81	0.0	72.9	SURCHARGED
9.000	44	149.243	0.793	0.000	1.56	0.0	26.7	SURCHARGED
9.001	45	148.800	0.672	0.000	1.38	0.0	23.0	SURCHARGED
9.002	46	148.597	0.661	0.000	1.25	0.0	20.6	SURCHARGED
10.000	47	151.405	1.280	4.543	1.72	0.0	68.5	FLOOD
10.001	48	150.906	0.990	0.000	1.57	0.0	63.4	SURCHARGED
10.002	49	150.220	0.598	0.000	1.75	0.0	68.4	SURCHARGED
10.003	50	149.686	0.237	0.000	1.83	0.0	68.5	SURCHARGED
8.005	51	148.419	0.976	0.000	1.19	0.0	158.5	SURCHARGED
8.006	52	148.025	0.909	0.000	1.23	0.0	148.0	SURCHARGED
8.007	53	147.853	0.853	0.000	0.68	0.0	156.2	SURCHARGED
11.000	54	149.684	0.959	0.000	1.31	0.0	81.9	SURCHARGED
11.001	55	149.049	0.802	0.000	1.15	0.0	71.3	SURCHARGED
11.002	56	148.251	0.878	0.000	1.00	0.0	64.0	SURCHARGED
8.008	57	147.647	1.143	0.000	0.97	0.0	208.9	SURCHARGED
8.009	58	147.347	1.165	0.000	1.06	0.0	235.5	FLOOD RISK
8.010	59	146.907	1.109	7.088	1.04	0.0	227.7	FLOOD
8.011	60	146.606	1.160	0.000	1.03	0.0	229.7	FLOOD RISK
8.012	61	146.279	1.237	0.000	1.05	0.0	231.1	SURCHARGED
1.015	20	145.977	1.309	0.000	2.01	0.0	729.6	SURCHARGED
1.016	21	145.460	0.923	0.000	1.77	0.0	753.3	SURCHARGED
12.000	22	147.783	0.558	0.000	1.06	0.0	109.9	SURCHARGED
1.017	37	144.672	0.447	0.000	1.78	0.0	830.0	SURCHARGED
13.000	63	149.002	1.277	2.108	1.34	0.0	90.1	FLOOD
13.001	64	148.520	1.211	0.000	1.17	0.0	79.2	FLOOD RISK
13.002	65	147.990	1.149	0.000	1.11	0.0	73.2	SURCHARGED
13.003	66	147.569	1.080	0.000	0.98	0.0	72.0	SURCHARGED
13.004	67	147.168	1.095	0.000	0.93	0.0	72.0	FLOOD RISK
13.005	68	146.500	1.193	0.229	1.13	0.0	71.9	FLOOD
13.006	72	145.758	1.047	8.439	1.25	0.0	150.2	FLOOD
13.007	73	145.201	0.891	0.000	1.47	0.0	147.6	FLOOD RISK
13.008	74	144.650	0.616	0.000	1.13	0.0	145.4	SURCHARGED
13.009	75	144.393	0.571	0.000	1.21	0.0	144.4	SURCHARGED
1.018	69	144.241	0.527	0.000	2.92	0.0	973.8	SURCHARGED
1.019	70	144.081	1.406	0.000	0.20	0.0	92.6	FLOOD RISK

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APPENDIX 4a

Scottish Water Consultation

IronsideFarrar
EnvironmentalConsultants
LandscapeArchitects
EnvironmentalPlanners
CivilEngineers
GraphicDesign

Scottish Water
Planning & Development Services
419 Balmore Road
Possilpark
Glasgow
G22 6NU

Our Ref: 7893/SRG

11th May 2013

For the Attention of Customer Connections

Dear Sirs,

PROPOSED RESIDENTIAL DEVELOPMENT
FORMER ROSLIN INSTITUTE, ROSLIN
DEVELOPMENT IMPACT ASSESSMENT

We are currently preparing design proposals for new infrastructure at the above site which will require both water supply and surface water/foul drainage infrastructure.

We enclose an application for a development impact assessment enquiry with supporting drawings and calculations for the site; please note the site is currently occupied by a business park and poultry research centre that will be cleared to facilitate the residential development.

We would be grateful for confirmation of capacity of both the sewer network and water supply network and the need or otherwise for DIA/WIA for the site.

We look forward to hearing from you.

Yours faithfully,

[redacted]

Simon R. Gough
Director

IRONSIDE FARRAR LIMITED
simon.gough@ironsidefarrar.com

Enc.

3 Worsley Court
High Street, Worsley
Manchester, M28 3NJ
T: 0161 703 8801
F: 0161 703 8279
www.ironsidefarrar.com
Edinburgh, Manchester, Motherwell

Registered in Scotland No. 109330
Constructionline Register No. 45848

Application for development impact assessment
DIA Form

SCOTTISH WATER

When completing this form please refer to Your New Connections Guide. Please ensure you complete the tick list on the back page and sign the declaration before returning your form.

■ **FOR OFFICIAL USE ONLY**

DATE RECEIVED:

1 Application details

Developer details

Please indicate whether it is the Developer or the Agent/Consultant who should receive future correspondence and communication.
(please tick appropriate box)

Developer ☐
Agent/Consultant ☑

Developer name
(company name where appropriate)
BBSRC

Contact name (if company name entered above):

Address:
Polaris House North Star Avenue
Swindon Wiltshire

Postcode: SN2 1UH

Phone number:

Mobile phone number:

Fax number:

Email address:

Project title:
Former Roslin Institute

Location of development:
Roslin
Midlothian
EH25 9PS

Ordnance Survey Ref (10fig):

2	7	0	6	2	6	3	7	9	9

Agent/Consultant

Agent/Consultant name where appropriate:
Ironside Farrar Limited

Contact name (if Agent/Consultant name entered above):
Simon Gough

Address:
3 Worsley Court, High Street
Walkden, Manchester

Postcode: M28 3NJ

Phone number: 01617038801

Mobile phone number:

Fax number: 01617038279

Email address: simon.gough@ironsidefarrar.com

2 Development details

Please indicate type of development
(Please tick appropriate box)

Residential	☑
Industrial	☐
Commercial	☐
School	☐
Hospital	☐
Hotel	☐
Other	☐

If other please state type of development:

Please complete the following

No. of residential units	300	
No. of hectares	16.4	m^2
Litres/head/day	180	l/day

If flatted development, how many storeys high?
N/A

For residential, please indicate your programme of development

Year	Nos. of units
06-07	
07-08	
08-09	
09-10	
10-11	
11-12	
12-13	
13-14	

For all other developments please indicate start date of development:
2013

3 Planning information

In which local authority area will the development take place?
Midlothian Council

1	Is the development included in the current local plan? (please tick appropriate box)	Yes ☐	No	☑
2	Has outline planning permission been granted? (please tick appropriate box)	Yes ☐	No	☑
3	Has detailed planning permission been granted? (please tick appropriate box)	Yes ☐	No	☑

If you have answered yes to questions 2 or 3 please indicate your planning reference no:
Noted in Main Issues Report of the emerging Local Development Plan and does have in principle support for development as a brownfield site.

4 Site servicing details

The following information is required to assess the impact of your development on our existing assets:

Please complete the additional fields marked * if the site is brownfield.

*Date previous building was last occupied:
Currently business park and Poultry research centre

Water details

*Pre-development water demand 18.04 litres/sec

Post-development water demand 13.9 litres/sec

Proposed highest water fitting on site (to ordnance datum) 160 metres

Waste water details

*Pre-development waste water design:
(Please tick one of the following boxes)

*Totally separate foul and surface water ☐

*Combined ☐

*Partially combined ☑

If partially combined or combined, please indicate quantity of surface water draining to combined system unknown litres/sec

If your site is identified as being constrained, please tick the box to indicate if you wish a quotation for the investigation work to be provided to you. ☑

Post-development foul flows 13.9 litres/sec

Post-development surface water flows 0 litres/sec

Pre-development foul flows 18.04 litres/sec

Pre-development surface water flows unknown litres/sec

Please provide plans and calculations to support the information in this section.

Post-development design (please tick appropriate boxes)

Totally separate foul and surface water ☑

Do you propose to utilise a sustainable urban drainage system (SUDS)? ☑

Totally separate surface water on site draining to combined sewer via attenuation ☐

What is the lowest ground level on site (to ordnance datum)? 145.00 metres

What is the lowest road level on site (to ordnance datum)? 145.50 metres

What is the lowest floor level on site (to ordnance datum)? 145.30 metres

Receiving water courses

Where is the surface water discharging?
Kill Burn to the north of the site.

5 Special requirements

For applicants with special or medical needs, let us know your specific service and date requirement.

6 Declaration

I/We understand that any alteration made to this application must be declared to Scottish Water.

I/We have filled in all the relevant sections of this form. The details I/we have given with this application are accurate.

I/We have read and understood the supporting guidance notes.

I/We have enclosed all the necessary supporting documentation (tick appropriate boxes below).

Location plan	☑
Drawings (if available)	☑
Calculations (where applicable)	☑

Your details

Signature : [redacted] Date: 10/05/2013

Your full name (in capitals): SIMON GOUGH

Your role or job title in the company: DIRECTOR

Company name: IRONSIDE FARRAR LIMITED

Please send your completed application form to Planning and Development Services at: Scottish Water, 419 Balmore Road, Glasgow, G22 6NU.

For further information call **0845 601 8855** or email connections@scottishwater.co.uk

SCOTTISH WATER
Development Connections Team
Customer Connections
419 Balmore Road
Glasgow
G22 6NU

Central Support Team
T: 0141 355 5511
F: 0141 355 5386 / 5366
W: www.scottishwater.co.uk
E: DCT@scottishwater.co.uk

18/06/2013

Ironside Farrar
3 Worsley Court
High Street
Walkden
Manchester
M28 3NJ

Dear Simon Gough

DIA Midlothian Former Roslin
Development Enquiry Application – incomplete application
Our Ref: 626674

Please quote our reference in all future correspondence

Thank you for your DIA Form regarding the above proposed development.

Following an assessment of our assets I can now confirm that at this time:

Water: There is currently sufficient capacity in the Glencorse Water Treatment Works to service the demands from your development.

There are currently network issues in this area and a Water Impact Assessment will be required to establish if there is sufficient capacity within the existing infrastructure to accommodate the demands from your development.

Wastewater: There is sufficient capacity in the Edinburgh PFI Waste Water Treatment Works to service the demands from your development.

There are currently network issues in this area and a Drainage Impact Assessment will be r equired to establish if there is sufficient capacity within the existing infrastructure to accommodate the demands from your development.

Scottish Water is committed to assisting development in Scotland and has funding under our current investment period to upgrade our water and waste water treatment works however our regulations from the Scottish Executive for our current investment programme (2006-2014) state that should your development require Scottish Water networks to be upgraded this cost will have to be met by the developer.

If you wish Scottish Water to undertake the Water and Drainage Impact Assessments a quotation for these works can be provided on request.

It is important to note that Scottish Water is unable to reserve capacity and connections to the water & wastewater networks can only be granted on a first come first served basis. For this reason we may have to review our ability to serve the development on receipt of an application to connect.

I trust that the above is acceptable. If you have any questions, please do not hesitate to contact me directly to discuss.

Yours sincerely

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