



WESTAR INVESTMENTS LTD

PROPOSED DEVELOPMENT AT CAPDOO & ABBEYLANDS,

DUBLIN ROAD, CLANE, CO. KILDARE

SITE SPECIFIC FLOOD RISK ASSESSMENT



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1 Introduction

IE Consulting was requested by Westar Investments Ltd to undertake a Site Specific Flood Risk Assessment (SSFRA) for an area of lands at Capdoo, Clane, Co Kildare.

This project consists of an application for a Strategic Housing Development by Westar Investments Limited (the applicant) for a new residential development on lands measuring approximately 10.36 hectares at Capdoo & Abbeylands, Celbridge Road, Clane, Co. Kildare. The application is for a development that includes 333 dwellings consisting of: 121 no. 2, 3 & 4 bedroom housing units, 144 no. 1, 2 & 3 bedroom apartments, 68 no. 1, 2 & 3 bedroom duplex & maisonette type units, a crèche and a public park adjacent to the River Liffey with 3 no. vehicular/pedestrian accesses and site, landscaping and associated infrastructural works. The subject site is situated on the eastern side of Regional Road R403 in the eastern environs of Clane Town, c. 650m from the Town Centre'

The purpose of this SSFRA is to assess the potential flood risk to the proposed development site and to assess the impact that development of the site may or may not have on the hydrological regime of the area.

Quoted ground levels or estimated flood levels relate to ordnance datum Malin unless stated otherwise.

This flood risk assessment study has been undertaken in consideration of the following guidance document:-

'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' DOEHLG 2009.

2 Proposed Site Description

2.1 General

The proposed development site is located approximately 660m east of Clane town centre, Co Kildare.

The site is bounded to the north and north-west by agricultural lands, to the east by the River Liffey, to the south-east by a drainage channel and to south by an existing residential development. The total area of the proposed development site is approximately 10.36 hectares.

The location of the proposed development site is illustrated on *Figure 1* below and shown on *Drawing Number IE2181-001-A in Appendix A*.

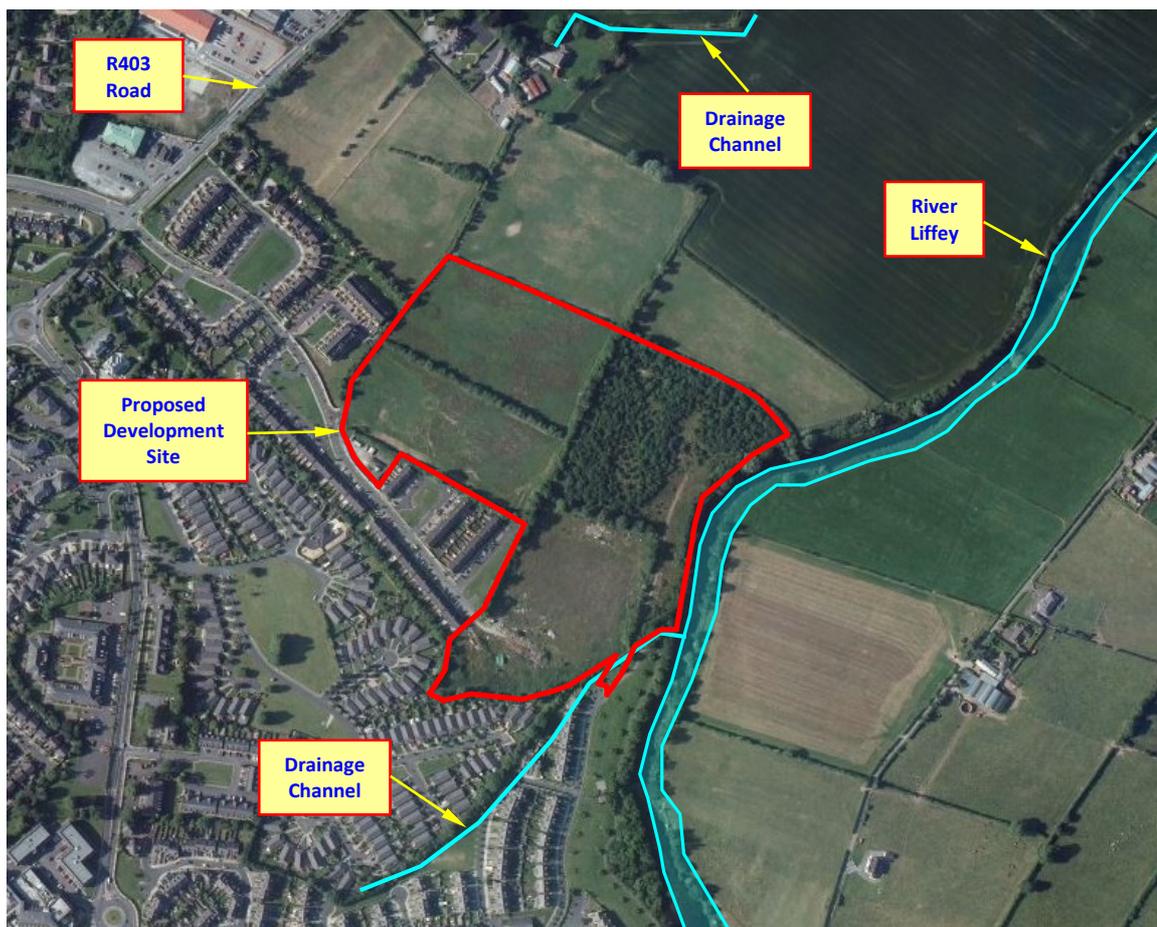


Figure 1 - Site Location

2.2 Existing Topography Levels at Site

The north-west part of the proposed site slopes moderately from a high point at the centre of the site towards the north, north-west and north-east site boundaries at an average gradient of approximately 1.23% (1 in 81). The southern half of the proposed site slopes moderately from a high point at the centre of the site towards the south, south-west and south-east site boundaries at an average gradient of approximately 0.81% (1 in 123). The north-east part of the proposed site slopes moderately from a high point at the centre of the site towards the north and east site boundaries at average gradients of approximately 0.77% (1 in 129) and 4.54% (1 in 22) respectively.

Existing ground elevations within the site boundary range from approximately 67.56 mOD (Malin) at the centre of the site to 63.408mOD (Malin) at the eastern boundary of the site.

2.3 Local Hydrology, Landuse & Existing Drainage

The most significant hydrological feature in the vicinity of the proposed development site is the River Liffey located adjacent to the eastern site boundary. The River Liffey is a controlled watercourse along the reach upstream and downstream of Clane. Discharge volumes in the River Liffey along this reach are controlled and monitored by the ESB and are dependent on inflows to Pollaphuca and Golden Falls dams. These dams have a significant beneficial effect in attenuating flood flows in the River Liffey.

At the location of the proposed development site the River Liffey generally flows in a south to north direction. Utilising the OPW Flood Studies Update (FSU) Portal software, the catchment area of the River Liffey was delineated. As illustrated in *Figure 2* below, the total catchment area of the River Liffey was found to be approximately **647.32 km²** to a point downstream of the site. Assessment of the River Liffey upstream catchment area indicates that the catchment is predominantly rural in nature with urban development accounting for approximately 3.03% of the total catchment area.

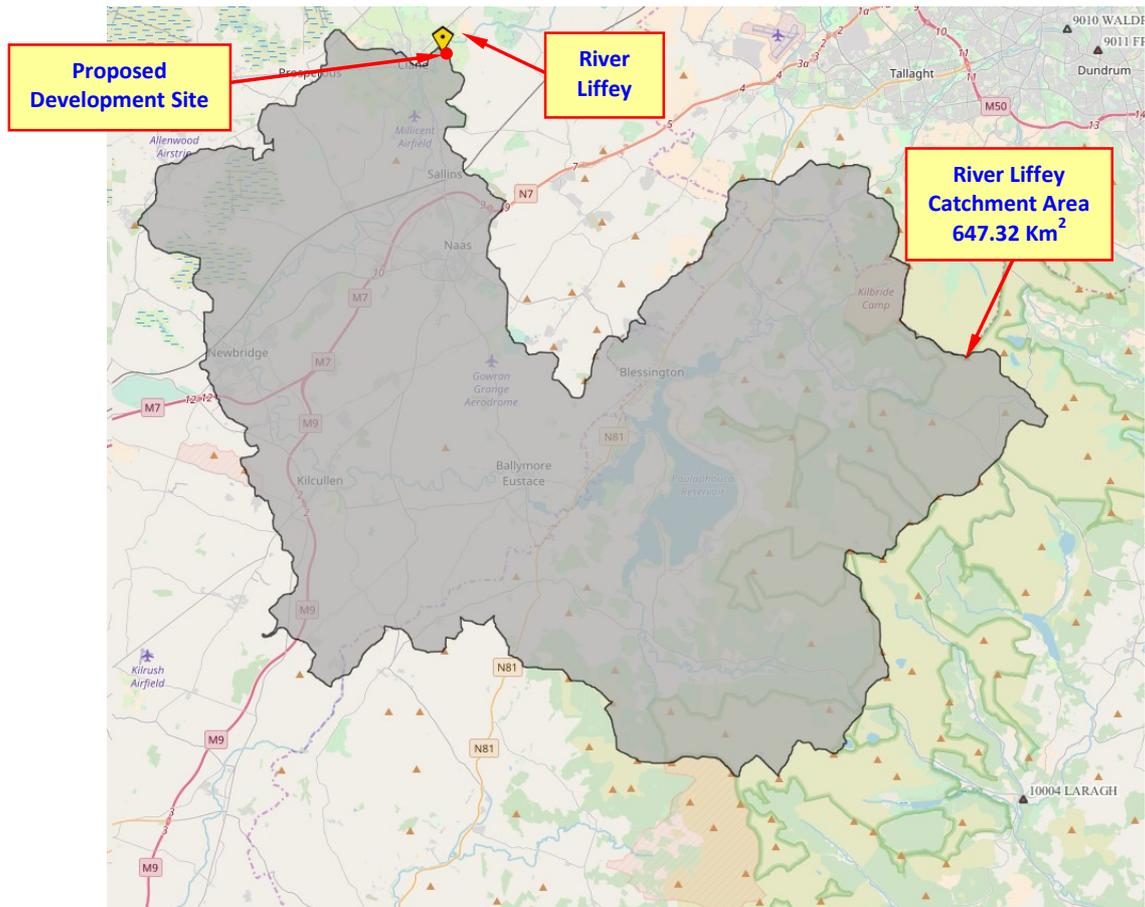


Figure 2 – River Liffey Upstream Catchment Area

3 Initial Flood Risk Assessment

The flood risk assessment for the proposed development site is undertaken in three principle stages, these being ‘Step 1 – Screening’, ‘Step 2 – Scoping’ and ‘Step 3 – Assessing’.

3.1 Possible Flooding Mechanisms

Table 1 below summarises the possible flooding mechanisms in consideration of the proposed development site:-

Source/Pathway	Significant?	Comment/Reason
Tidal/Coastal	No	The site is not located in a coastal or tidally influenced region
Fluvial	Yes	The River Liffey is located adjacent to the eastern site boundary
Pluvial (urban drainage)	No	There is no significant urban drainage infrastructure in the vicinity of the site
Pluvial (overland flow)	No	There site is not surrounded by significantly elevated lands and does not provide an important discharge location to runoff from surrounding lands
Blockage	No	There are no significant hydraulic structures in the vicinity of the site
Groundwater	No	There are no significant springs or groundwater discharges recorded in the immediate vicinity of the site

Table 1

The primary potential flood risk to the proposed development site can be attributed to an extreme fluvial flood event in the River Liffey located adjacent to the eastern site boundary.

In accordance with ‘The Planning System and Flood Risk Management – Guidelines for Planning Authorities - DOEHLG 2009’ the potential flood risk to the proposed development site is analysed in the subsequent ‘Screening Assessment’ and “Scoping Assessment” section of this study report.

4 Screening Assessment

The purpose of the screening assessment is to establish the level of flooding risk that may or may not exist for a particular site and to collate and assess existing current or historical information and data which may indicate the level or extent of any flood risk.

If there is a potential flood risk issue then the flood risk assessment procedure should move to 'Step 2 – Scoping Assessment' or if no potential flood risk is identified from the screening stage then the overall flood risk assessment can end at 'Step 1'.

The following information and data was collated as part of the flood risk screening assessment for the proposed development site:-

4.1 OPW/EPA/Local Authority Hydrometric Data

Existing sources of OPW, EPA and local authority hydrometric data were investigated. As illustrated in *Figure 3* below, this assessment has determined that there are three hydrometric gauging stations located on the River Liffey in the general regional area of the proposed development site.

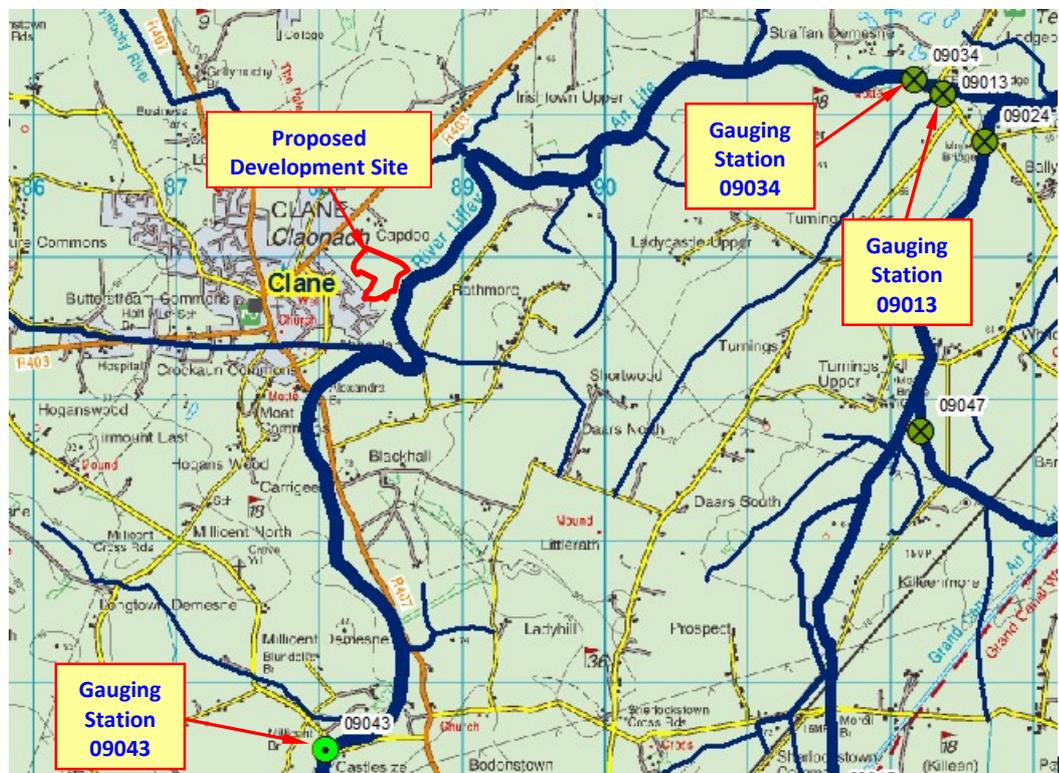


Figure 3 – Hydrometric Gauging Stations

Gauging Station 09043 (Millicent Bridge) is entered in the Register of Hydrometric Stations of Ireland as an inactive staff gauge station with flow measurements recorded for hydrometric years 2000 to 2003. Gauging Station 09034 (Straffan Upstream) is entered into the Register of Hydrometric Stations in Ireland as a data logger station. Gauging Station 09013 (Straffan Downstream) is entered in the Register of Hydrometric Stations of Ireland as an active recorder station.

4.2 OPW PFRA Indicative Flood Mapping

Preliminary Flood Risk Assessment (PFRA) Mapping for Ireland was produced by the OPW in 2011. OPW PFRA flood map number 2019/MAP/236/A illustrates indicative flood zones within this area of County Kildare.

Figure 4 below illustrates an extract from the above predictive flood map in the vicinity of the proposed development site.

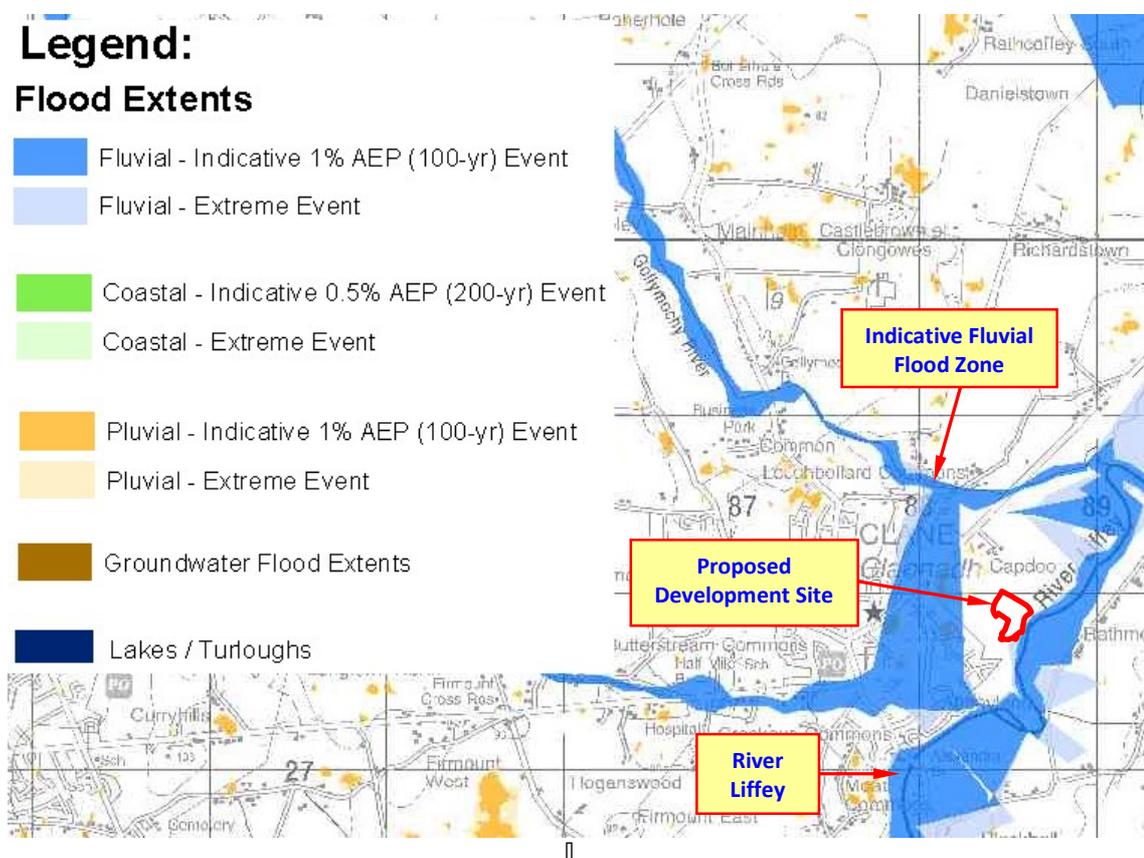


Figure 4 – PFRA Mapping

The PFRA flood mapping indicates an indicative fluvial flood zones adjacent to the east site boundary.

No pluvial or groundwater flood zones are mapped within the boundary of the proposed development site.

Figure 5 below illustrates the PFRA predictive flood zones from Figure 4 overlaid onto higher resolution background mapping.

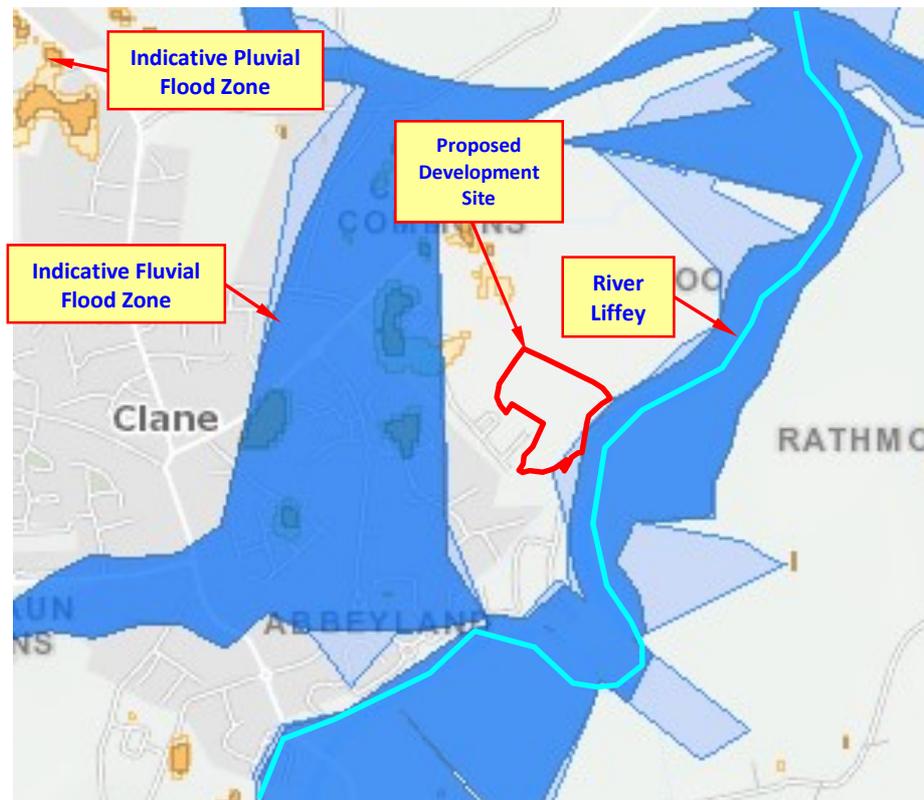


Figure 5 – PFRA Indicative Fluvial Flood Mapping

It should be noted that the predicted extent of flooding illustrated on these maps was developed using a low resolution digital terrain model (DTM) and illustrated flood extents are intended to be indicative only. The flood extents mapped on the PFRA maps are not intended to be used on a site specific basis.

4.3 OPW Flood Maps Website

The OPW Flood Maps Website (www.floodmaps.ie) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrences in the vicinity of the proposed development site. *Figure 6* below illustrates mapping from the Flood Maps website in the vicinity of the site.

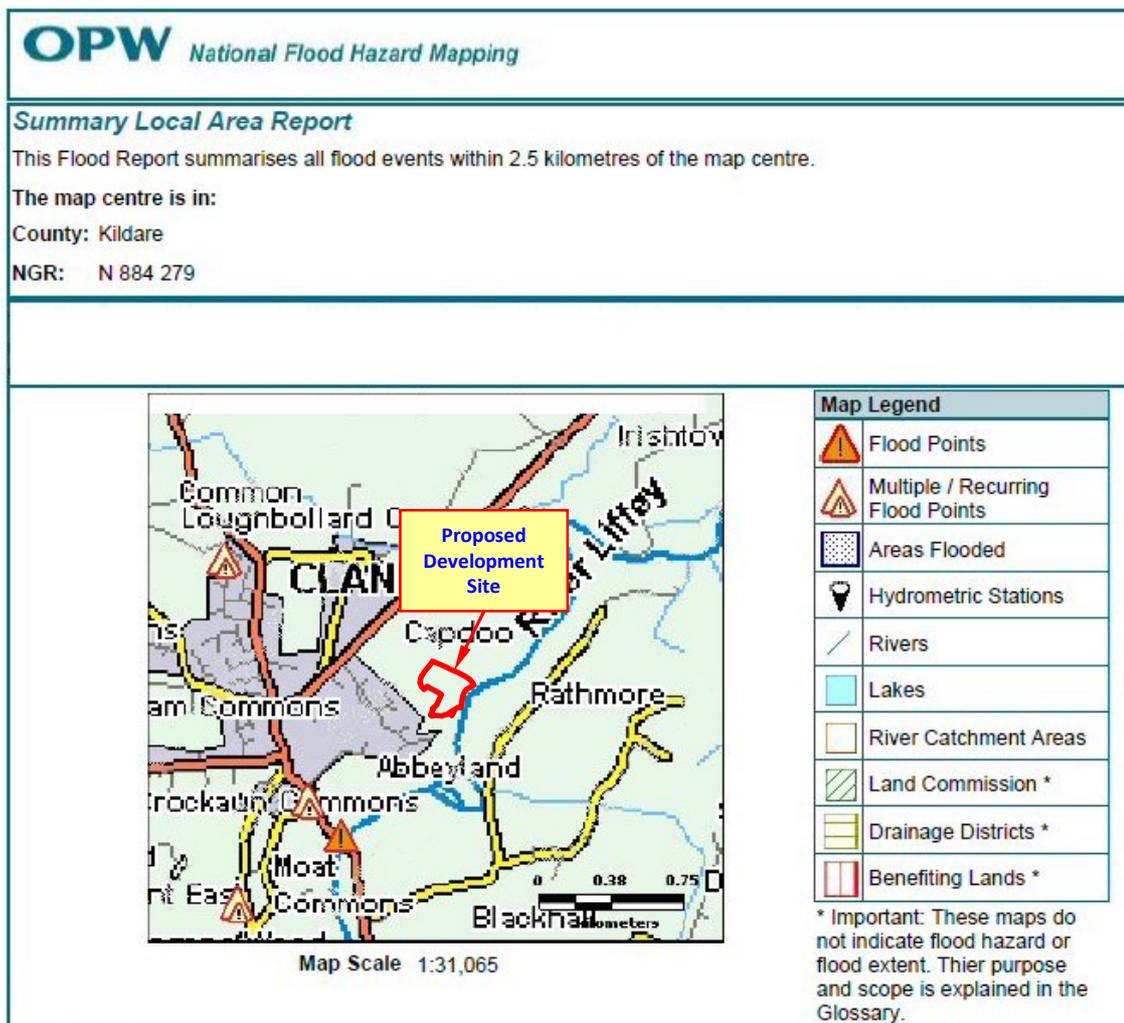


Figure 6 – OPW Flood Maps

Figure 6 above indicates no historic instances of flooding recorded within or adjacent to the proposed development site. A number of historical or anecdotal instances of flooding which have occurred in Clane are indicated, most notably at Loughbollard, in the vicinity of Alexander Bridge, Millicent Road and Commons.

The OPW Flood Maps website also contains a number of ESB maps that illustrate recorded flood levels during the flood of 1954. This has been documented as a significant flood event in the middle catchment of the River Liffey. *Figure 6A* below illustrates an extract of recorded flood levels at Alexandra Bridge, Clane, which is approximately 1360m upstream of the proposed development site.

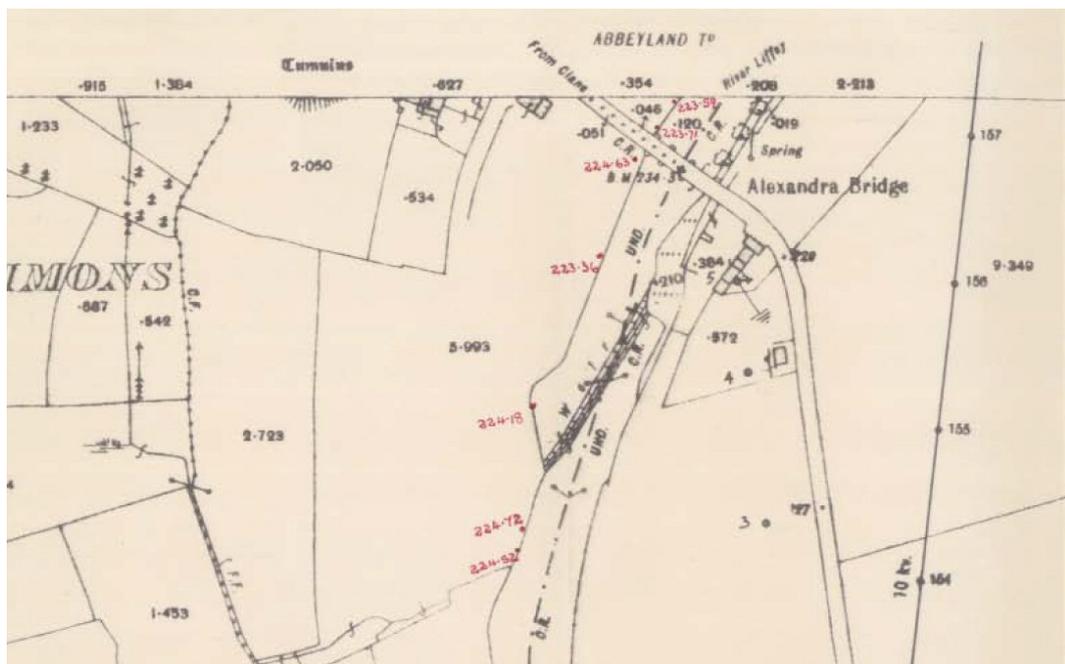


Figure 6A

The levels illustrated in *Figure 6A* above are in feet and reduced to Poolbeg datum. Converting to metres and reducing to Malin datum the recorded flood levels range from 65.49m (OD) to 65.38m (OD) in the vicinity of Alexandra Bridge. The flood event of 1954 has an estimated return period of 1 in 75 years.

None of the historic flood events listed above are indicated as having impacted the area of the proposed development site.

4.4 Ordnance Survey Historic Mapping

Available historic mapping for the area was consulted, as this can provide evidence of historical flooding incidences or occurrences. The maps that were consulted were the historical 6-inch maps (pre-1900), and the historic 25-inch map series.

Figures 7 and 8 below show the historic mapping for the area of the proposed development site.

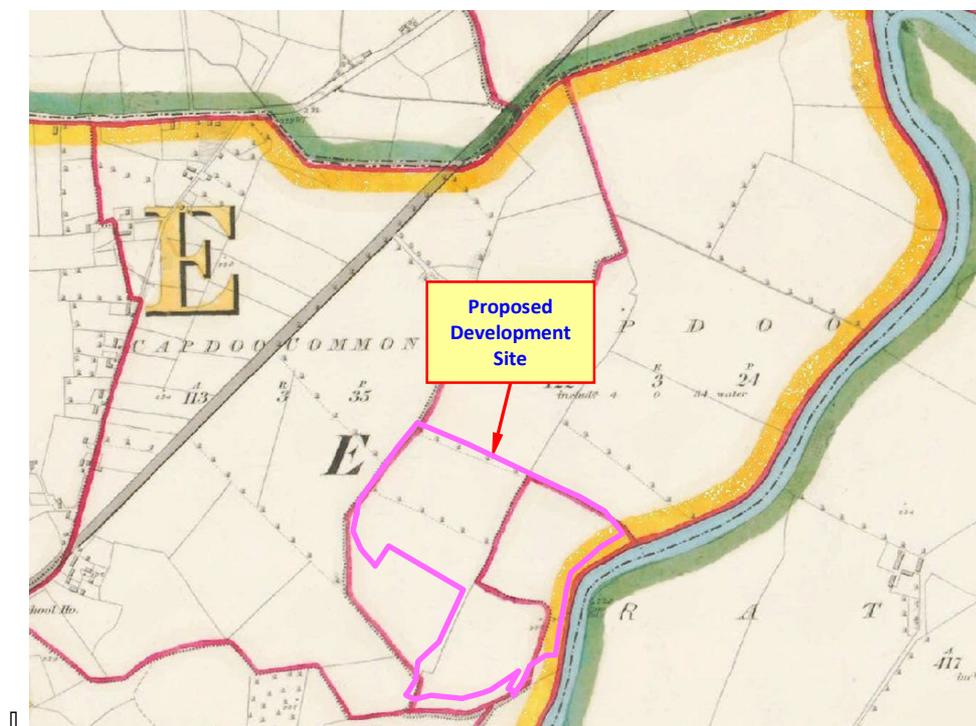


Figure 7 – Historic 6-Inch Mapping

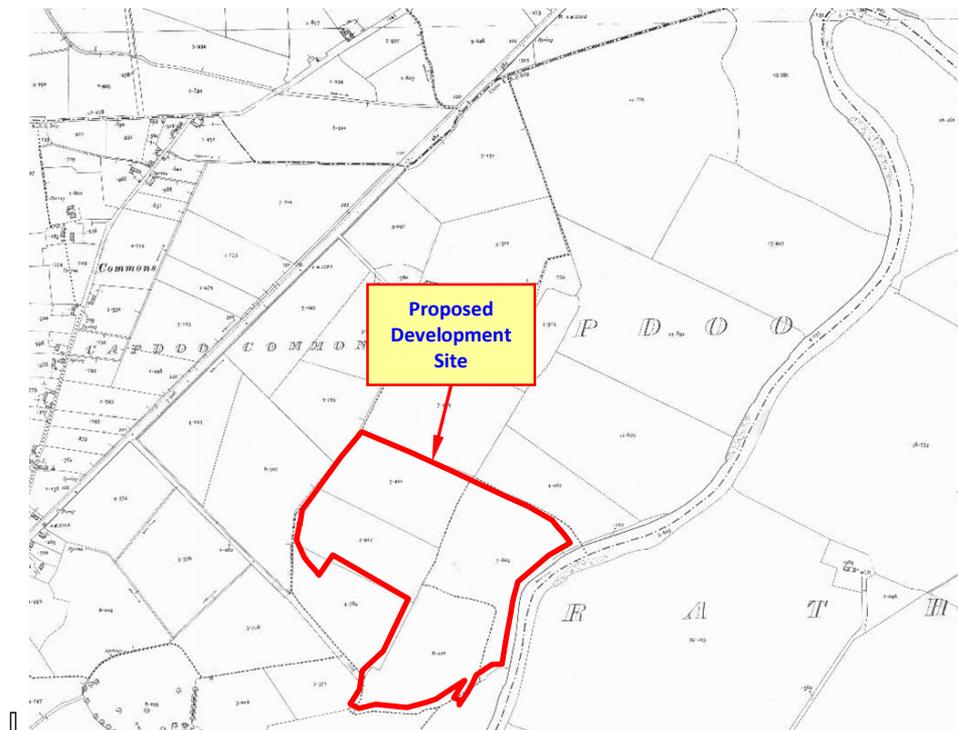


Figure 8 – Historic 25-Inch Mapping

The historic 6 inch and 25 inch mapping does not indicate any historical or anecdotal instances of flooding within or adjacent to the boundary of the proposed development site.

4.5 Geological Survey of Ireland Mapping

The alluvial deposit maps of the Geological Survey of Ireland (GSI) were consulted to assess the extent of any alluvial deposits in the vicinity of the proposed development site. Alluvium deposits can be indicative of areas that have flooded in the recent geological past.

Figure 9 below illustrates the sub-soils mapping for the general area of the proposed development site.

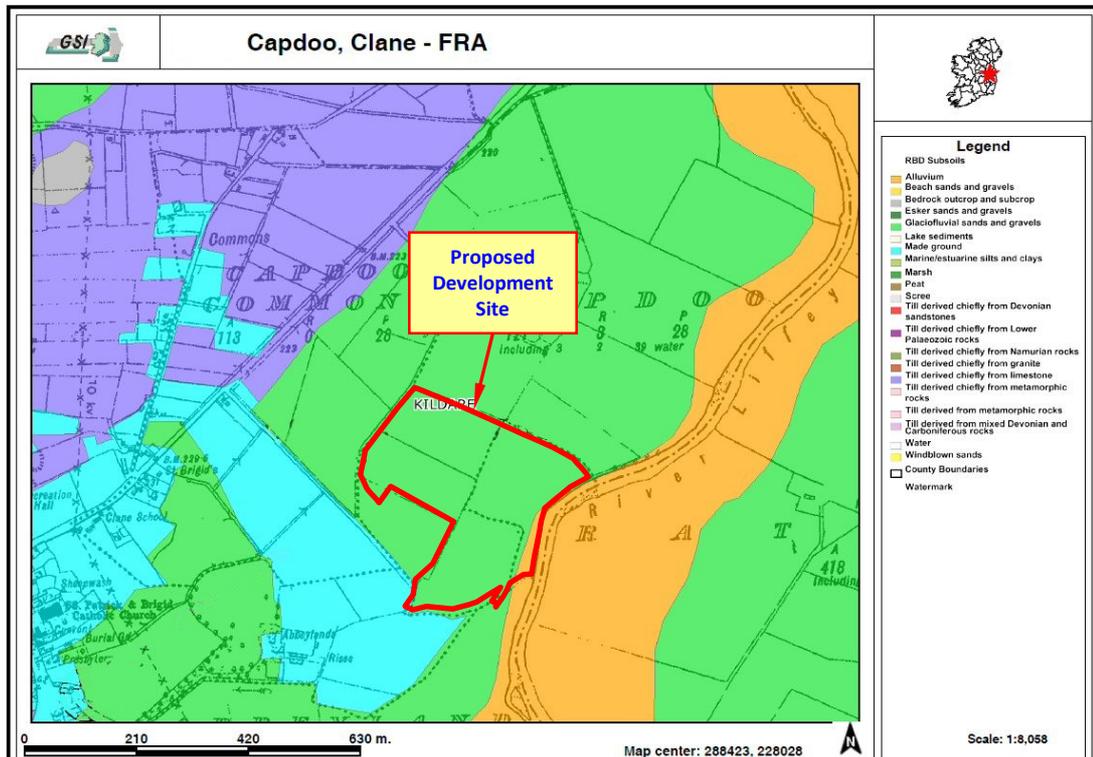


Figure 9 – GSI Subsoil Mapping

Figure 9 above indicates that the sub-soil conditions at the proposed development site consist mostly of Glaciofluvial sands and gravel. A small area of Alluvium deposits is mapped adjacent to the eastern boundary of the site.

4.6 Eastern CFRAM Study

The Eastern Region Catchment Flood Risk & Management Study (CFRAMS) has been undertaken by the OPW and the Final version of the flood maps were issued in June 2016. Flood risk extent and depth maps for further assessment areas within Co Kildare have also been produced. OPW CFRAMS predictive flood map number *E09LA_EXFCD_F1_10* illustrates predictive extreme fluvial flood extent zones associated with the River Liffey in the vicinity of the proposed development site.

Figure 10 below (extracted from CFRAMS flood map E09CAM_EXFCD_F1_24), illustrates the predicted extreme 10% AEP (1 in 10 year), 1% AEP (1 in 100 year) or 0.1% AEP (1 in 1000 year) fluvial flood extents in the vicinity of the proposed development site.

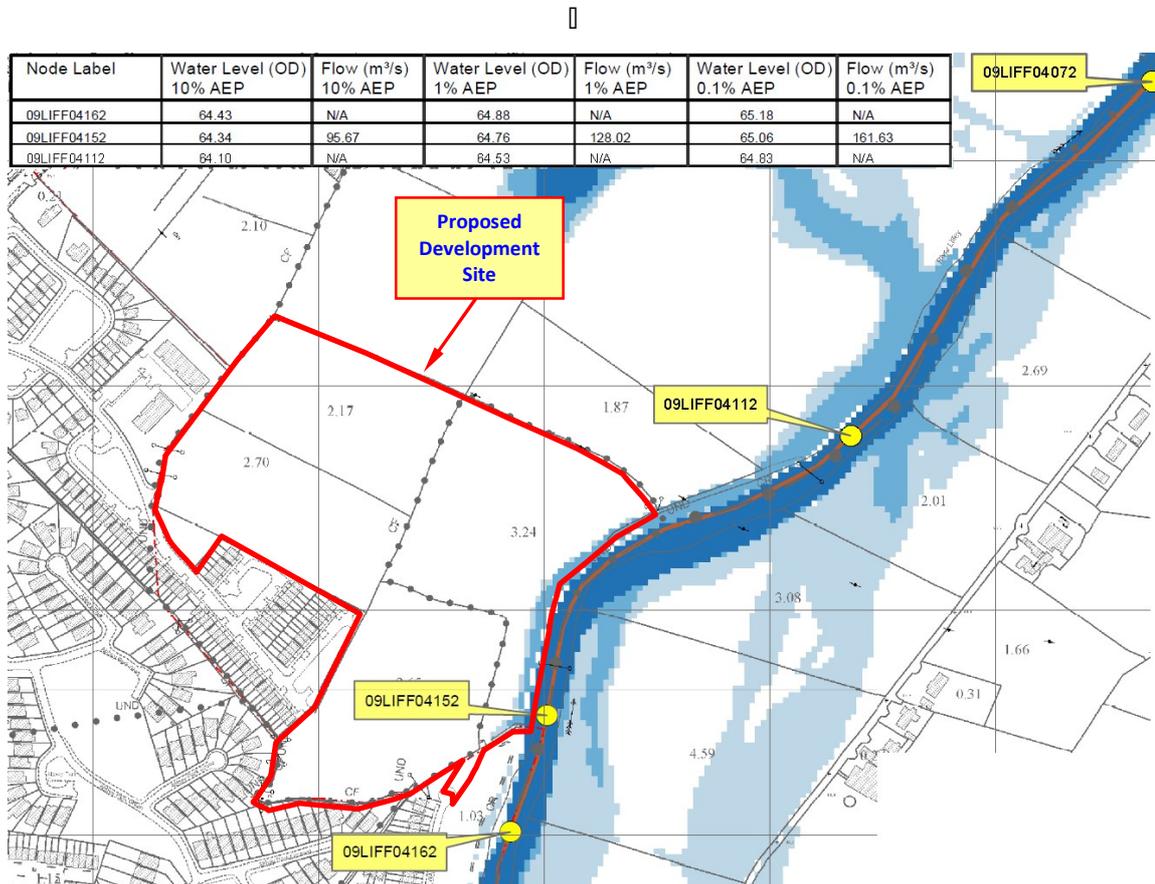


Figure 10 – Eastern CFRAMS Fluvial Flood Maps

Figure 10 above indicates that a limited area adjacent to the eastern boundary of the proposed development site falls within a predictive 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) fluvial flood zone.

The CFRAMS flood map also provides information on predictive water levels & flows for the 10% AEP, 1% AEP and 0.1% AEP fluvial flood events at various node points along the River Liffey.

The node points closest to the proposed development site are referenced as node point 09LIFF04162 located upstream of the proposed site, node point 09LIFF04152 located adjacent to the proposed site and node point 09LIFF04112 located beyond the downstream boundary of the proposed site. Details of the predicted extreme fluvial flood levels & flood volumes for the CFRAMS node points in the general vicinity of the proposed development site are listed in *Table 2* below, which has been extracted from CFRAMS flood map reference E09CAM_EXFCD_F1_24.

Node Label	Water Level (mOD) 10% AEP	Flow (m3/s) 10% AEP	Water Level (mOD) 1% AEP	Flow (m3/s) 1% AEP	Water Level (mOD) 0.1% AEP	Flow (m3/s) 0.1% AEP
09LIFF04162	64.43	-	64.88	-	65.18	-
09LIFF04152	64.34	95.67	64.76	128.02	65.06	161.63
09LIFF04112	64.10	-	64.53	-	64.83	-

Table 2 –CFRAMS Fluvial Map - Predicted Flood Volumes & Levels

Predictive fluvial flood depth maps have also been produced as part of the Eastern CFRAM Study.

Figure 11 and *Figure 12* below, duplicated from the Eastern CFRAM Study, illustrate the predictive flood depths for the area of the proposed development for the 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) fluvial flood events respectively.

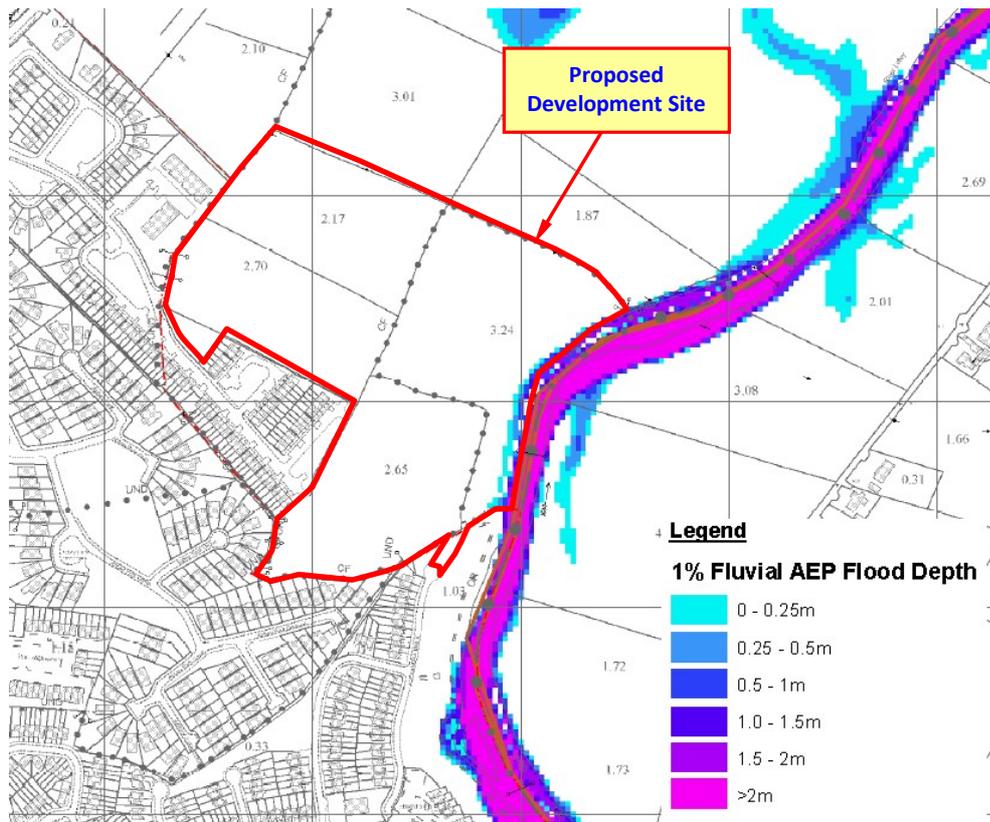


Figure 11 – Eastern CFRAMS 1% AEP Fluvial Flood Depth Map

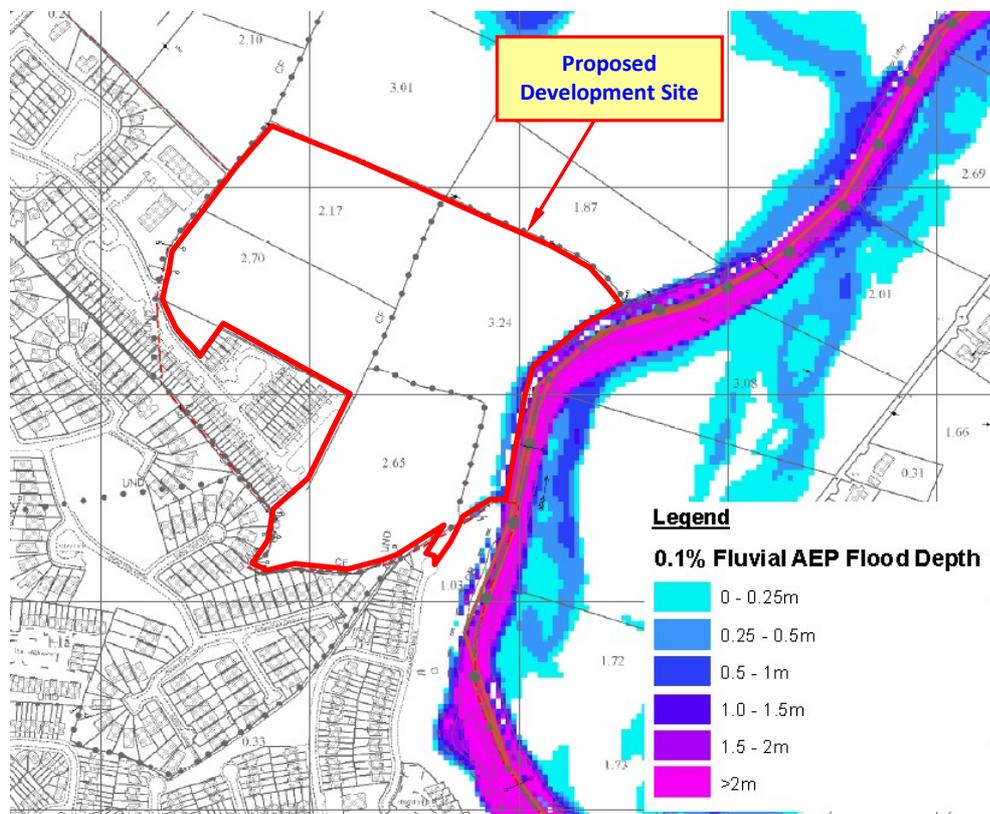


Figure 12 – Eastern CFRAMS 0.1% AEP Fluvial Flood Depth Map

Figure 11 and Figure 12 above indicate predicted 1% AEP and 0.1% AEP fluvial flood depths of 0.25m-1.0m within a limited area adjacent to the eastern boundary of the proposed development site.

The Eastern CFRAM flood maps are predictive flood maps, in that they provide predicted flood extent and depth information for a ‘design’ flood event that has an estimated probability of occurrence (e.g., the 1% AEP event), rather than information for floods that have occurred in the past.

4.7 Kildare County Development Plan

Reference to Map 9.1 (Drawing Number 200/16/1000) of the Kildare County Development Plan 2017-2023 indicates a limited area of Strategic fluvial ‘Flood Zone A’ and ‘Flood Zone B’ adjacent to the eastern site boundary. An extract from the above map is illustrated in Figure 13 below:-

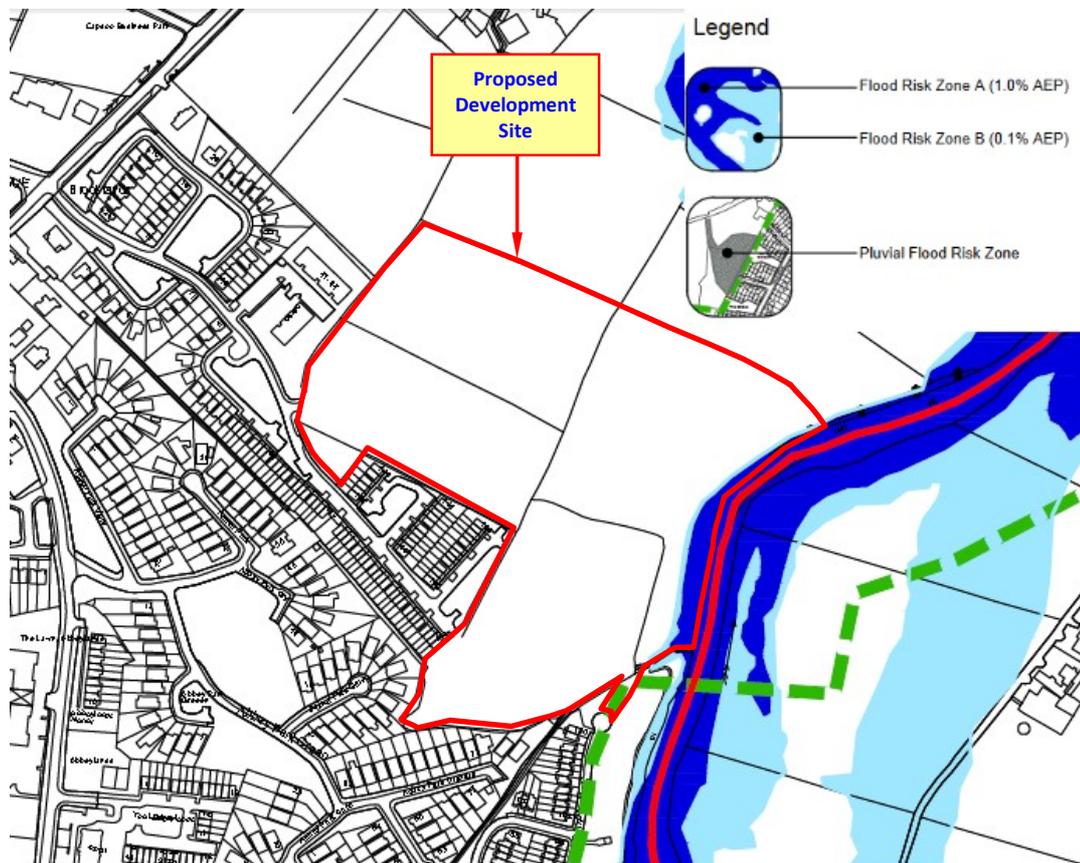


Figure 13 – Kildare County Development Plan Map

Figure 13 above indicates that the proposed development site would not be significantly impacted by a 1% AEP (1 in 100 year) or 0.1% AEP (1 in 1000 year) fluvial flood event.

5 Scoping Assessment

The purpose of the scoping stage is to identify possible flood risks and to implement the necessary level of detail and assessment to assess these possible risks, and to ensure these can be adequately addressed in the flood risk assessment. The scoping exercise should also identify that sufficient quantitative information is already available to complete a flood risk assessment appropriate to the scale and nature of the development proposed.

The above screening assessment indicates that a limited area of proposed development site adjacent to the eastern boundary may be at risk from fluvial flooding but that the area of the site is not at significant risk from pluvial or groundwater flooding.

In consideration of the information collated as part of the screening exercise, and the availability of other information and data specific to the area of the proposed development site, it is considered that sufficient quantitative information to complete an appropriate flood risk assessment for the proposed development site cannot be derived from the information collated as part of the screening exercise alone.

While the current flood extent maps for the area produced as part of the Eastern CFRAM study are based on the results of detailed hydraulic modelling undertaken along the River Liffey and do provide a reasonably accurate delineation of flood zones and prediction of flood depths in the general vicinity of the proposed development site, this mapping is based on a localised digital terrain model (DTM) of the general Clane area and can be subject to local DTM errors or variations. It is therefore necessary to undertake a more accurate site specific delineation of the predictive 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) fluvial flood extents at the location of the proposed development site.

The potential flood risk to the proposed development site is assessed in the subsequent 'Assessing Flood Risk' stage of this study report.

6 Assessment of Flood Risk

Flood risk from a particular watercourse is normally assessed for a 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) flood event, in accordance with the Kildare County Council development plan and with the DOEHLG guidelines '*The Planning System and Flood Risk Management Guidelines*'.

The following sections present an analysis and assessment of the estimated 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) extreme flood events in the River Liffey adjacent to the proposed development site.

6.1 Estimation of Extreme Flood Levels in the River Liffey

Extreme flood levels at the location of the proposed development site have been derived as part of the Eastern CFRAM Study. The most relevant node points in respect of the proposed development site are Node Point 09LIFF04162, 09LIFF04152 and 09LIFF04112 that are located just upstream, adjacent to the east site boundary and 185m downstream of the site respectively. Predicted 1% AEP (1 in 100 year) and 0.1% AEP (1 in 1000 year) flood levels at these node points are applicable for the purpose of assessing fluvial flood risk to the proposed development site.

Table 2 above lists the predicted extreme flood levels for these node points.

6.2 Climate Change

In general, it is a requirement of Kildare County Council that the required Design Flow to be used for flood extent delineation is the 1 in 100 year flood flow event plus 20% in order to allow for climate change'.

'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' DOEHLG 2009 Technical Appendix A, Section 1.6 recommends that, where mathematical models are not available climate change flood extents can be assessed by using the Flood Zone B outline as a surrogate for Flood Zone A with allowance for the possible impacts of climate change. Therefore, in accordance with the above guidelines, the predicted 0.1% AEP (1 in 1000 year) flood levels listed in Table 2 above are considered to be representative of the mid-range future climate change scenario 1% AEP (1 in 100 year) plus climate change food levels.

6.3 Topographical Survey & Contour Mapping

In order to assist in the assessment of any potential flood inundation in the general location of the proposed development site, topographical survey information was used to develop a detailed Digital Terrain Model (DTM) of the existing site area. Development of a DTM allows the predicted extreme flood levels listed in *Table 2* above to be analysed in more detail at the specific location of the proposed development site.

The DTM and contour mapping was developed utilising digital survey information of the proposed development site and the Autodesk Civil 3D 2019 software package. The DTM and contour mapping developed for the proposed development site is illustrated in *Figure 14* and *Figure 15* below.



Figure 14 – Contour Mapping

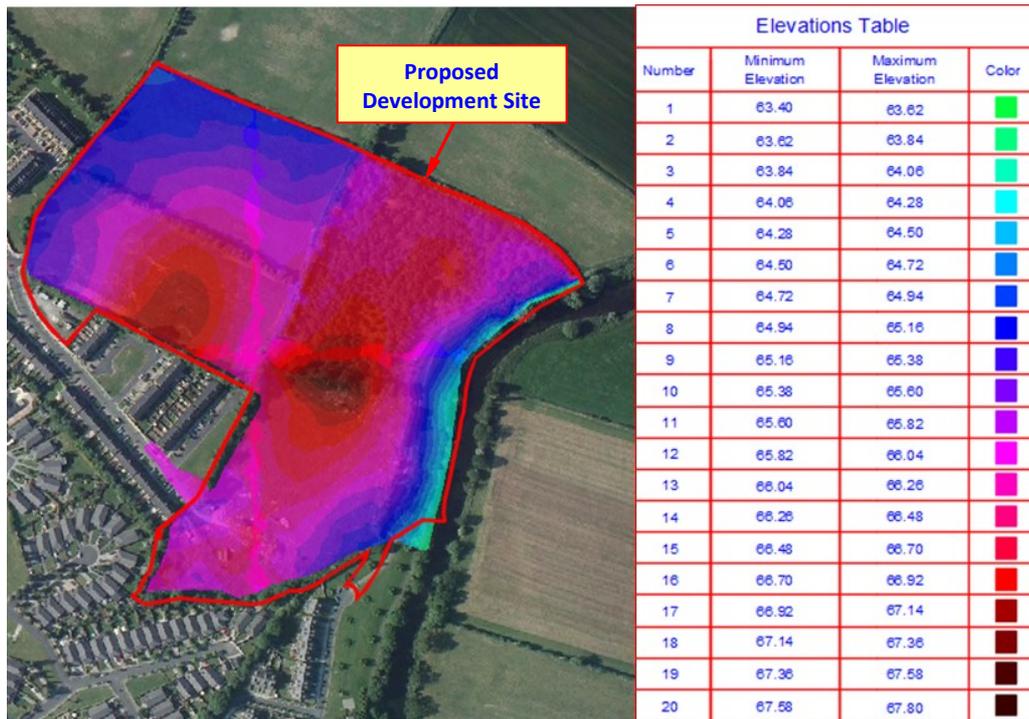


Figure 15 – Topographical Survey Derived DTM

6.4 Flood Zone Mapping & Delineation

Utilising the DTM illustrated in *Figure 14* and *Figure 15* above, and the 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) extreme flood levels for the River Liffey along the reach adjacent to the proposed development site, the Site Specific 1% AEP and 0.1% AEP flood zones were delineated using the hydrology module of an appropriate software package. The software enables a user defined flood level to be mapped and modelled onto a DTM over the full extent of the area being assessed.

Drawing Number IE2181-002-A, Appendix A illustrates the delineated 1 in 100 year flood extent (Flood Zone ‘A’) and 1 in 1000 year flood extent (Flood Zone ‘B’) over the full area of the proposed development site.

Drawing Number IE2181-003-A, Appendix A illustrates representative cross-sectional elevations through the site, illustrating existing and proposed ground levels and finished floor levels relative to predictive 1% AEP and 0.1% AEP flood levels in the River Liffey.

The above analysis and flood zone delineation undertaken as part of this Site Specific Flood Risk Assessment (SSFRA) indicates that the area of the site where development is proposed does not fall within a delineated flood zone. The area of the site where development is proposed is therefore not susceptible to flood risk during the occurrence of an extreme fluvial event in the River Liffey.

In order to ensure sustainable development of this particular site the following is recommended:-

- *Proposed finished ground levels (road levels, etc) should be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.15m = **65.33m OD.***
- *Proposed finished floor levels should be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level – i.e. 65.18m + 0.30m = **65.48m OD.***
- *The proposed development site should incorporate an appropriately designed stormwater management system that should limited stormwater runoff from the site to existing pre-development runoff rates.*

In consideration of the assessment and analysis undertaken as part of this Site Specific Flood Risk Assessment, and the recommendations presented above, the development as proposed is not at significant risk due to the occurrence of an extreme fluvial flood event in the River Liffey. The development as proposed would not result in an adverse impact to the existing hydrological regime of the area and would not result in an increased flood risk elsewhere.

6.5 Assessment of Potential Residual Pluvial Flood Risk

As illustrated on the Proposed Foul & Surface Water Drainage layout drawing prepared by BCA Consulting Engineers, the stormwater management system to serve the proposed development has been designed in general consideration of the Kildare County Council drainage policy and the GSDSDS guidelines.

In order to assess any potential residual pluvial flood risk associated with the stormwater drainage network to serve the proposed development the network has been subject to an additional hydraulic simulation analysis utilising the Micro-Drainage software package in order to demonstrate the following:-

- Analysis to demonstrate that the proposed development storm water drainage and management system has been designed not to flood any part of the site in a 1 in 30 year return design storm and to ensure a free-board of 300mm below each manhole cover level & inclusive of climate change allowance and inclusive of allowance for urban creep (GSDSDS Level of Service – Site Flooding criteria)

- Analysis to check for exceedence up to the 1 in 100 year return design storm and inclusive of climate change allowance and inclusive of allowance for urban creep (GSDS Level of Service – Site Flooding criteria)
- Additional simulation analysis in consideration of 1 in 1 year and 1 in 2 year return design storm event (inclusive of climate change allowance).

The output of the Micro-Drainage hydraulic simulation analysis is presented in *Appendix B*.

As presented in the hydraulic simulation analysis output in *Appendix B*, under ‘Summary of Critical Results by Maximum Level (Rank 1) for Storm’, the simulation criteria for each simulated return period (1 in 1 year, 1 in 2 year, 1 in 30 year & 1 in 100 year) has applied a ‘Margin of Flood Risk Warning’ of 300m. This criteria has been set in order to ensure that in the event of an extreme rainfall event, and where surcharging of the storm water drainage pipes and manholes is predicted to occur during these events, then a freeboard of 300mm is maintained between each manhole cover level and the surcharged water level in each manhole.

As summarised in the Micro-Drainage hydraulic simulation output analysis presented in *Appendix B*, in consideration of a 1 in 30 year return period design storm, inclusive of climate change, a minimum freeboard of 300mm is maintained within the storm water drainage system (Page 32-35 of Micro-Drainage calculations).

In consideration of a 1 in 100 year return period design storm, inclusive of climate change, maximum water levels within the storm water drainage system would not exceed proposed manhole cover levels and would therefore not present a residual pluvial flood risk to the proposed development site (Page 37-40 of Micro-Drainage calculations).

In summary the storm water drainage and management system to serve the proposed strategic housing development is not predicted to present a residual pluvial flood risk to the development and is considered to comply with the GSDS Level of Service – Site Flooding Criteria.

7 Proposed Development in the Context of the Guidelines

In the context of the *'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009'* three flood zones are designated in consideration of flood risk to a particular development site.

Flood Zone 'A' – where the probability of flooding from rivers and watercourses is the highest (greater than 1% or 1 in 100 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone 'B' – where the probability of flooding from rivers and watercourses is moderate (between 0.1% or 1 in 1000 year for river and watercourse flooding and 0.5% or 1 on 200 for coastal or tidal flooding).

Flood Zone 'C' – where the probability of flooding from rivers and watercourses is low or negligible (less than 0.1% of 1 in 1000 year for both river and watercourse and coastal flooding). *Flood Zone 'C'* covers all areas that are not in *Zones 'A'* or *'B'*.

The *'Planning System and Flood Risk Management Guidelines'* list the planning implications for each flood zone, as summarised below:-

Zone A – High Probability of Flooding. Most types of development would not be considered in this zone. Development in this zone should be only be considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the *'Planning System and Flood Risk Management Guidelines'* justification test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space and outdoor sports and reaction would be considered appropriate in this zone.

Zone B – Moderate Probability of Flooding. Highly vulnerable development such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses, strategic transport and essential utilities infrastructure would generally be considered inappropriate in this zone, unless the requirements of the justification test can be met. Less vulnerable development such as retail, commercial and industrial uses and recreational facilities might be considered appropriate in this zone.

In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in *Zone 'C'* and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to the development can be adequately managed and that development in this zone will not adversely affect adjacent lands and properties.

Zone C – Low to Negligible Probability of Flooding. Development in this zone is appropriate from a flood risk perspective. Developments in this zone are generally not considered at risk of fluvial flooding and would not adversely affect adjacent lands and properties from a flood risk perspective.

In the context of the *'Planning System and Flood Risk Management Guidelines, DOEHLG, 2009'* this flood risk assessment has determined that the area of the proposed development site where development is proposed (residential units, roads, site access/egress, etc) works is not at risk of direct fluvial, pluvial or groundwater flooding and therefore falls within Flood Zone 'C'.

Development of the site as proposed is therefore not subject to the requirements of The Justification Test.

8 Summary Conclusions

In consideration of the findings of this site specific flood risk assessment and analysis the following conclusions and recommendations are made in respect of the proposed development site:-

- *A Site Specific Flood Risk (SSFRA) assessment, appropriate to the type and scale of development proposed, and in accordance with 'The Planning System and Flood Risk Management Guidelines – DoEHLG-2009' has been undertaken.*
- *The area of the proposed development site has been screened, scoped and assessed for flood risk in accordance with the above guidelines.*
- *The primary flood risk to the proposed development site can be attributed to potential fluvial flooding from the River Liffey.*
- *The proposed development site is not at risk from pluvial or groundwater flooding.*
- *Utilising the Eastern CFRAM study estimated extreme flood water levels and a detailed DTM developed utilising topographical survey data of the existing site, the 1 in 100 year (1% AEP) and 1 in 1000 (1% AEP) flood extents were delineated.*
- *The analysis and flood zone delineation undertaken as part of this Site Specific Flood Risk Assessment (SSFRA) indicates that the area of the site where development is proposed does not fall within a delineated flood zone. The area of the site where development is proposed is not susceptible to flood risk during the occurrence of an extreme fluvial event in the River Liffey and therefore falls within Flood Zone 'C'.*
- *Development proposals for the site are therefore not subject to the requirements of the Justification Test.*
- *The storm water drainage and management system to serve the proposed strategic housing development is not predicted to present a residual pluvial flood risk to the development and is considered to comply with the GSDSDS Level of Service – Site Flooding Criteria.*
- *In summary, and in consideration of the findings and recommendations of this Site Specific Flood Risk Assessment, development of the site as proposed would not result in an adverse impact to the existing hydrological regime of the area and would not result in an increased flood risk elsewhere.*
- *The development as proposed is therefore considered to be appropriate from a flood risk perspective.*

9 Summary Recommendations

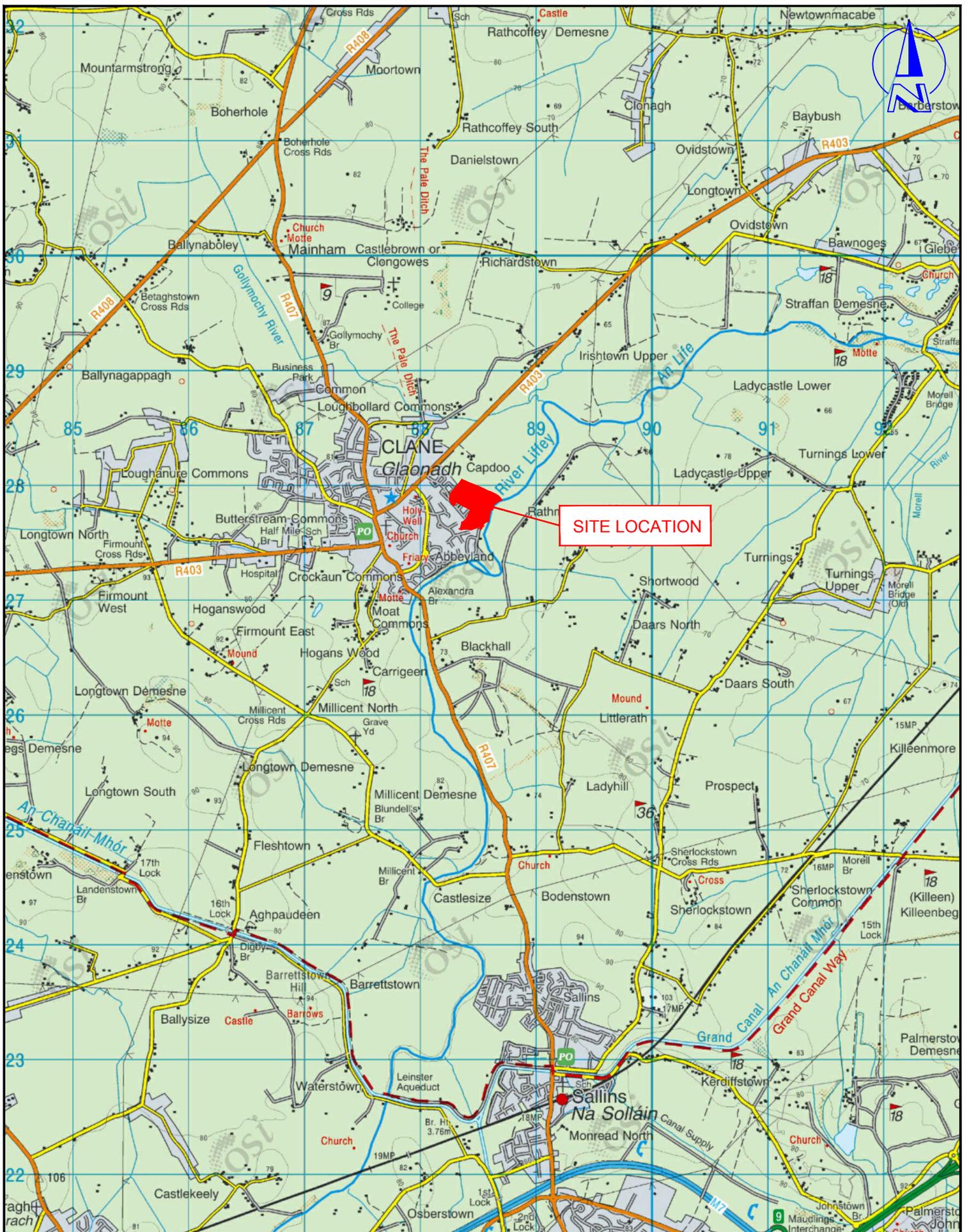
- *It is recommended that proposed finished ground levels (road levels, etc) should be constructed to a minimum level of 0.15m above the maximum predicted 0.1% AEP flood level upstream of the site – i.e. $65.18m + 0.15m = \underline{65.33m OD}$.*
- *It is recommended that proposed finished floor levels should be constructed to a minimum level of 0.30m above the maximum predicted 0.1% AEP flood level upstream of the site – i.e. $65.18m + 0.30m = \underline{65.48m OD}$.*

APPENDIX A

Drawing Number IE2181-001-A

Drawing Number IE2181-002-A

Drawing Number IE2181-003-A



IE Consulting Innovation
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 Carlow, R93 W248.
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Project Title:		FLOOD RISK ASSESSMENT			
Project Address:		Capdoo & Abbeylands, Dublin Road, Clane Co. Kildare			
Client:		WESTAR INVESTMENTS LTD.			
Drg. Title:		SITE LOCATION MAP			
Dwg. Scale:	Date:	Dwg.No:	Job No:	Revision:	Dwg.By:
NTS	29/11/20	IE2181-001	IE2181	A	LMC

- LEGEND**
- SITE BOUNDARY
 - 100 YEAR FLOOD EXTENT (1% AEP) FLOOD ZONE 'A'
 - 1000 YEARS FLOOD EXTENT (0.1% AEP) FLOOD ZONE 'B'
 - FLOOD ZONE 'C'
 - LAND OWNERSHIP



1 IN 1000 YEAR
FLOOD EXTENT
FLOOD ZONE 'B'

1 IN 100 YEAR
FLOOD EXTENT
FLOOD ZONE 'A'

PROPOSED DEVELOPMENT
SITE BOUNDARY

LAND OWNERSHIP

rev.	date	description	des	chk
B	14.12.20	PLANNING	Ude	PMS
A	20.11.20	PLANNING	Ude	PMS

PROPOSED DEVELOPMENT AT
CAPDOO & ABBEYLANDS, DUBLIN ROAD,
CLANE, CO. KILDARE.

SITE SPECIFIC FLOOD
RISK ASSESSMENT

1 IN 100 YEAR (1% AEP) &
1 IN 1000 YEAR (0.1% AEP)
FLUVIAL FLOOD EXTENTS



ie CONSULTING
WATER-ENVIRONMENTAL-CIVIL
NEWRY OFFICE:
KINGSDOWN ROAD
GREEN ROAD
CARLOW, RB3 W248

REV	DATE	DESCRIPTION	BY	CHECKED
000		ISSUE		
001		ISSUE		
002		ISSUE		
003		ISSUE		
004		ISSUE		
005		ISSUE		

drawing no. **IE2181-002** rev. **B**

checked: **Ude**
approved: **PMS**
date: **20.11.2020**

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APPENDIX B

Residual Pluvial Flood Assessment Summary Hydraulic Simulation Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - Scotland and Ireland

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	10
Ratio R	0.200	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall S (pipe S1.008)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.001	4-8	1.603	8-12	0.834

Total Area Contributing (ha) = 2.439

Total Pipe Volume (m³) = 118.462

Time Area Diagram at outfall S (pipe S10.006)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.199	4-8	2.006	8-12	0.426

Total Area Contributing (ha) = 2.631

Total Pipe Volume (m³) = 205.266

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length	Fall	Slope	I.Area	T.E.	Base	k	HYD	DIA	Section	Type	Auto
(m)	(m)	(1:X)	(ha)	(mins)	Flow	(l/s)	(mm)	SECT	(mm)			Design

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	47.891	0.479	100.0	0.182	4.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	44.572	0.371	120.0	0.136	4.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	27.099	0.165	164.2	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	36.349	0.481	75.6	0.129	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	45.814	0.306	149.7	0.152	4.00	0.0	0.600	o	300	Pipe/Conduit	
S3.001	46.218	0.206	224.4	0.123	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.002	67.267	0.117	574.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.000	37.726	0.400	94.3	0.118	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	38.653	0.155	249.4	0.042	0.00	0.0	0.600	o	225	Pipe/Conduit	
S5.002	70.035	0.575	121.8	0.118	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	33.520	0.230	145.7	0.108	4.00	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)
S1.000	50.00	4.51	64.904	0.182	0.0	0.0	2.5	1.57	111.1	27.1
S2.000	50.00	4.52	64.425	0.136	0.0	0.0	1.8	1.43	101.4	20.2
S1.001	50.00	4.89	64.053	0.378	0.0	0.0	5.1	1.22	86.5	56.3
S3.000	50.00	4.40	64.575	0.129	0.0	0.0	1.7	1.51	59.9	19.2
S4.000	50.00	4.60	64.400	0.152	0.0	0.0	2.1	1.28	90.7	22.6
S3.001	50.00	5.23	64.019	0.404	0.0	0.0	5.5	1.21	133.1	60.2
S1.002	50.00	6.73	63.813	0.782	0.0	0.0	10.6	0.75	82.7	116.5
S5.000	50.00	4.47	65.325	0.118	0.0	0.0	1.6	1.35	53.5	17.6
S5.001	50.00	5.25	64.925	0.160	0.0	0.0	2.2	0.82	32.7	23.9
S5.002	50.00	6.07	64.695	0.278	0.0	0.0	3.8	1.42	100.6	41.5
S6.000	50.00	4.52	64.425	0.108	0.0	0.0	1.5	1.08	43.0	16.0

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
S5.003	43.075	0.186	231.6	0.096	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.004	55.087	0.238	231.5	0.181	0.00	0.0	0.600	o	600	Pipe/Conduit	
S7.000	105.943	0.610	173.7	0.288	4.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	53.499	0.225	237.8	0.286	4.00	0.0	0.600	o	375	Pipe/Conduit	
S8.001	20.097	0.085	236.4	0.022	0.00	0.0	0.600	o	375	Pipe/Conduit	
S7.001	78.729	0.530	148.5	0.161	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.000	76.216	1.296	58.8	0.236	4.00	0.0	0.600	o	225	Pipe/Conduit	
S7.002	20.805	0.134	155.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.003	5.902	0.024	245.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.004	60.709	0.067	906.1	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.005	6.764	0.023	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	39.086	0.130	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	48.491	0.162	300.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.008	6.236	0.021	300.0	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)
S5.003	50.00	6.67	64.120	0.482	0.0	0.0	6.5	1.19	131.0	71.9
S5.004	50.00	7.25	63.934	0.664	0.0	0.0	9.0	1.60	451.4	98.9
S7.000	50.00	5.48	64.990	0.288	0.0	0.0	3.9	1.19	84.1	42.9
S8.000	50.00	4.76	64.670	0.286	0.0	0.0	3.9	1.17	129.3	42.6
S8.001	50.00	5.05	64.445	0.308	0.0	0.0	4.2	1.17	129.7	45.9
S7.001	50.00	6.37	64.360	0.757	0.0	0.0	10.2	1.48	164.0	112.7
S9.000	50.00	4.74	65.125	0.236	0.0	0.0	3.2	1.71	67.9	35.1
S7.002	50.00	6.58	63.830	0.993	0.0	0.0	13.4	1.63	259.1	147.9
S1.003	50.00	7.31	63.696	2.439	0.0	0.0	33.0	1.55	437.8	363.3
S1.004	50.00	8.41	63.672	2.439	0.0	0.0	33.0	0.92	407.1	363.3
S1.005	50.00	8.56	63.605	2.439	0.0	0.0	33.0	0.75	29.8	363.3
S1.006	50.00	9.43	63.582	2.439	0.0	0.0	33.0	0.75	29.8	363.3
S1.007	50.00	10.51	63.452	2.439	0.0	0.0	33.0	0.75	29.8	363.3
S1.008	50.00	10.65	63.291	2.439	0.0	0.0	33.0	0.75	29.8	363.3

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.000	47.647	0.210	226.9	0.355	4.00	0.0	0.600	o	300	Pipe/Conduit	
S10.001	76.508	0.340	225.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.000	50.741	0.230	220.6	0.095	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.000	55.287	0.240	230.4	0.183	4.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	26.083	0.120	217.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S13.000	35.184	0.160	219.9	0.052	4.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	28.457	0.120	237.1	0.098	0.00	0.0	0.600	o	225	Pipe/Conduit	
S13.002	10.027	0.040	250.7	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.003	11.539	0.060	192.3	0.011	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.004	51.717	0.230	224.9	0.054	0.00	0.0	0.600	o	300	Pipe/Conduit	
S14.000	21.348	0.070	305.0	0.049	4.00	0.0	0.600	o	225	Pipe/Conduit	
S13.005	70.828	0.310	228.5	0.264	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.006	8.146	0.040	203.7	0.017	0.00	0.0	0.600	o	375	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)
S10.000	50.00	4.76	64.060	0.355	0.0	0.0	4.8	1.04	73.5	52.8
S10.001	50.00	5.99	63.850	0.355	0.0	0.0	4.8	1.04	73.8	52.8
S11.000	50.00	4.97	64.200	0.095	0.0	0.0	1.3	0.88	34.8	14.1
S12.000	50.00	5.07	64.210	0.183	0.0	0.0	2.5	0.86	34.1	27.2
S11.001	50.00	5.57	63.970	0.278	0.0	0.0	3.8	0.88	35.1	41.3
S13.000	50.00	4.67	64.810	0.052	0.0	0.0	0.7	0.88	34.9	7.7
S13.001	50.00	5.23	64.650	0.150	0.0	0.0	2.0	0.84	33.6	22.3
S13.002	50.00	5.40	64.530	0.182	0.0	0.0	2.5	0.99	69.9	27.1
S13.003	50.00	5.57	64.490	0.193	0.0	0.0	2.6	1.13	79.9	28.8
S13.004	50.00	6.39	64.430	0.248	0.0	0.0	3.4	1.04	73.8	36.9
S14.000	50.00	4.48	64.270	0.049	0.0	0.0	0.7	0.74	29.6	7.3
S13.005	50.00	7.38	64.200	0.561	0.0	0.0	7.6	1.19	131.9	83.5
S13.006	50.00	7.49	63.890	0.578	0.0	0.0	7.8	1.27	139.8	86.1

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.002	11.294	0.050	225.9	0.016	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.003	66.102	0.290	227.9	0.252	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.002	32.104	0.190	169.0	0.068	0.00	0.0	0.600	o	450	Pipe/Conduit	
S15.000	26.075	0.030	869.2	0.039	4.00	0.0	0.600	o	750	Pipe/Conduit	
S15.001	50.212	0.070	717.3	0.135	0.00	0.0	0.600	o	750	Pipe/Conduit	
S16.000	50.617	0.230	220.1	0.136	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.001	19.635	0.090	218.2	0.029	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.002	9.341	0.040	233.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.000	12.814	0.060	213.6	0.027	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.003	50.011	0.200	250.1	0.049	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.002	51.920	0.070	741.7	0.131	0.00	0.0	0.600	o	750	Pipe/Conduit	
S18.000	20.049	0.340	59.0	0.039	4.00	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)
S11.002	50.00	7.65	63.850	0.872	0.0	0.0	11.8	1.20	132.7	129.9
S11.003	50.00	8.47	63.800	1.124	0.0	0.0	15.2	1.34	213.5	167.5
S10.002	50.00	8.81	63.510	1.547	0.0	0.0	21.0	1.56	248.3	230.5
S15.000	50.00	4.46	63.670	0.039	0.0	0.0	0.5	0.94	415.7	5.8
S15.001	50.00	5.27	63.640	0.174	0.0	0.0	2.4	1.04	458.2	25.9
S16.000	50.00	4.96	64.640	0.136	0.0	0.0	1.8	0.88	34.9	20.2
S16.001	50.00	5.33	64.410	0.165	0.0	0.0	2.2	0.88	35.0	24.5
S16.002	50.00	5.52	64.320	0.165	0.0	0.0	2.2	0.85	33.8	24.5
S17.000	50.00	4.24	64.340	0.027	0.0	0.0	0.4	0.89	35.4	4.0
S16.003	50.00	6.36	64.280	0.240	0.0	0.0	3.2	0.99	70.0	35.7
S15.002	50.00	7.21	63.570	0.545	0.0	0.0	7.4	1.02	450.5	81.1
S18.000	50.00	4.20	64.200	0.039	0.0	0.0	0.5	1.71	67.8	5.8

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
S15.003	65.202	0.090	724.5	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit		
S19.000	26.689	0.120	222.4	0.043	4.00	0.0	0.600	o	225	Pipe/Conduit		
S20.000	41.030	0.103	398.3	0.058	4.00	0.0	0.600	o	300	Pipe/Conduit		
S19.001	79.656	0.370	215.3	0.209	0.00	0.0	0.600	o	300	Pipe/Conduit		
S15.004	30.318	0.080	379.0	0.125	0.00	0.0	0.600	o	750	Pipe/Conduit		
S15.005	4.016	0.010	401.6	0.066	0.00	0.0	0.600	o	750	Pipe/Conduit		
S10.003	20.653	0.031	666.2	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit		
S10.004	16.333	0.027	604.9	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit		
S10.005	49.089	0.082	598.6	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit		
S10.006	21.382	0.036	598.6	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)
S15.003	50.00	8.26	63.500	0.584	0.0	0.0	7.9	1.03	455.9	86.9
S19.000	50.00	4.51	63.900	0.043	0.0	0.0	0.6	0.87	34.7	6.5
S20.000	50.00	4.87	63.882	0.058	0.0	0.0	0.8	0.78	55.3	8.6
S19.001	50.00	6.12	63.780	0.310	0.0	0.0	4.2	1.07	75.5	46.2
S15.004	50.00	8.61	63.410	1.019	0.0	0.0	13.8	1.43	632.4	151.7
S15.005	50.00	8.66	63.330	1.084	0.0	0.0	14.7	1.39	614.2	161.5
S10.003	50.00	9.13	63.320	2.631	0.0	0.0	35.6	1.08	475.6	391.9
S10.004	50.00	9.37	63.289	2.631	0.0	0.0	35.6	1.13	499.4	391.9
S10.005	50.00	10.09	63.262	2.631	0.0	0.0	35.6	1.14	502.1	391.9
S10.006	50.00	10.77	63.180	2.631	0.0	0.0	35.6	0.53	21.0«	391.9

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SS110	65.950	1.046	Open Manhole	1200	S1.000	64.904	300				
SS111	65.850	1.425	Open Manhole	1200	S2.000	64.425	300				
SS112	66.100	2.047	Open Manhole	1200	S1.001	64.053	300	S1.000	64.425	300	372
								S2.000	64.054	300	1
SS108	66.000	1.425	Open Manhole	1200	S3.000	64.575	225				
SS107	65.900	1.500	Open Manhole	1200	S4.000	64.400	300				
SS109	65.770	1.751	Open Manhole	1350	S3.001	64.019	375	S3.000	64.094	225	
								S4.000	64.094	300	
SS113	66.300	2.487	Open Manhole	1350	S1.002	63.813	375	S1.001	63.888	300	
								S3.001	63.813	375	
SS101	66.750	1.425	Open Manhole	1200	S5.000	65.325	225				
SS102	66.350	1.425	Open Manhole	1200	S5.001	64.925	225	S5.000	64.925	225	
SS103	66.100	1.405	Open Manhole	1200	S5.002	64.695	300	S5.001	64.770	225	
SS104	65.850	1.425	Open Manhole	1200	S6.000	64.425	225				
SS105	65.740	1.620	Open Manhole	1350	S5.003	64.120	375	S5.002	64.120	300	
								S6.000	64.195	225	
SS106	65.900	1.966	Open Manhole	1500	S5.004	63.934	600	S5.003	63.934	375	
SS116	66.600	1.610	Open Manhole	1200	S7.000	64.990	300				
SS114	66.150	1.480	Open Manhole	1350	S8.000	64.670	375				
SS115	66.600	2.155	Open Manhole	1350	S8.001	64.445	375	S8.000	64.445	375	
SS116	66.650	2.290	Open Manhole	1350	S7.001	64.360	375	S7.000	64.380	300	
								S8.001	64.360	375	
SS118	66.550	1.425	Open Manhole	1200	S9.000	65.125	225				
SS119	66.750	2.921	Open Manhole	1350	S7.002	63.830	450	S7.001	63.830	375	
								S9.000	63.829	225	
SS120	66.200	2.504	Open Manhole	1500	S1.003	63.696	600	S1.002	63.696	375	
								S5.004	63.696	600	
								S7.002	63.696	450	
SS121	66.200	2.528	Open Manhole	1800	S1.004	63.672	750	S1.003	63.672	600	
SS122	66.750	3.145	Open Manhole	1800	S1.005	63.605	225	S1.004	63.605	750	
SS123	66.800	3.218	Open Manhole	1200	S1.006	63.582	225	S1.005	63.582	225	
SS124	66.350	2.898	Open Manhole	1200	S1.007	63.452	225	S1.006	63.452	225	
SS125	66.100	2.810	Open Manhole	1200	S1.008	63.291	225	S1.007	63.290	225	
S	66.100	2.830	Open Manhole	0		OUTFALL		S1.008	63.270	225	

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SS214	67.100	3.040	Open Manhole	1200	S10.000	64.060	300				
SS215	67.500	3.650	Open Manhole	1200	S10.001	63.850	300	S10.000	63.850	300	
SS210	66.700	2.500	Open Manhole	1200	S11.000	64.200	225				
SS209	66.750	2.540	Open Manhole	1200	S12.000	64.210	225				
SS211	66.800	2.830	Open Manhole	1200	S11.001	63.970	225	S11.000	63.970	225	
								S12.000	63.970	225	
SS201	66.750	1.940	Open Manhole	1200	S13.000	64.810	225				
SS202	66.850	2.200	Open Manhole	1200	S13.001	64.650	225	S13.000	64.650	225	
SS203	66.900	2.370	Open Manhole	1200	S13.002	64.530	300	S13.001	64.530	225	
SS204	66.850	2.360	Open Manhole	1200	S13.003	64.490	300	S13.002	64.490	300	
SS205	66.800	2.370	Open Manhole	1200	S13.004	64.430	300	S13.003	64.430	300	
SS206	66.950	2.680	Open Manhole	1200	S14.000	64.270	225				
SS207	66.700	2.500	Open Manhole	1350	S13.005	64.200	375	S13.004	64.200	300	
								S14.000	64.200	225	
SS208	66.800	2.910	Open Manhole	1350	S13.006	63.890	375	S13.005	63.890	375	
SS212	66.900	3.050	Open Manhole	1350	S11.002	63.850	375	S11.001	63.850	225	
								S13.006	63.850	375	
SS213	67.000	3.200	Open Manhole	1350	S11.003	63.800	450	S11.002	63.800	375	
SS216	67.250	3.740	Open Manhole	1350	S10.002	63.510	450	S10.001	63.510	300	
								S11.003	63.510	450	
SS222	65.900	2.230	Open Manhole	1800	S15.000	63.670	750				
SS223	66.200	2.560	Open Manhole	1800	S15.001	63.640	750	S15.000	63.640	750	
SS217	66.000	1.360	Open Manhole	1200	S16.000	64.640	225				
SS218	66.200	1.790	Open Manhole	1200	S16.001	64.410	225	S16.000	64.410	225	
SS219	66.350	2.030	Open Manhole	1200	S16.002	64.320	225	S16.001	64.320	225	
SS220	66.100	1.760	Open Manhole	1200	S17.000	64.340	225				
SS221	66.150	1.870	Open Manhole	1200	S16.003	64.280	300	S16.002	64.280	225	
								S17.000	64.280	225	
SS224	66.100	2.530	Open Manhole	1800	S15.002	63.570	750	S15.001	63.570	750	
								S16.003	64.080	300	
SS225	66.000	1.800	Open Manhole	1200	S18.000	64.200	225				
SS220	65.850	2.350	Open Manhole	1800	S15.003	63.500	750	S15.002	63.500	750	
								S18.000	63.860	225	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SS229	67.000	3.100	Open Manhole	1200	S19.000	63.900	225				
SS228	66.500	2.618	Open Manhole	1200	S20.000	63.882	300				
SS230	66.500	2.721	Open Manhole	1200	S19.001	63.780	300	S19.000	63.780	225	
								S20.000	63.779	300	
SS227	66.450	3.040	Open Manhole	1800	S15.004	63.410	750	S15.003	63.410	750	
								S19.001	63.410	300	
SS231	66.450	3.120	Open Manhole	1800	S15.005	63.330	750	S15.004	63.330	750	
SS232	66.750	3.430	Open Manhole	1800	S10.003	63.320	750	S10.002	63.320	450	
								S15.005	63.320	750	
SS233	66.000	2.711	Open Manhole	1800	S10.004	63.289	750	S10.003	63.289	750	
SS234	65.500	2.238	Open Manhole	1800	S10.005	63.262	750	S10.004	63.262	750	
SS235	65.350	2.170	Open Manhole	1800	S10.006	63.180	225	S10.005	63.180	750	
s	64.700	1.556	Open Manhole	0		OUTFALL		S10.006	63.144	225	

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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., (mm)	L*W
S1.000	o	300	SS110	65.950	64.904	0.746	Open Manhole		1200
S2.000	o	300	SS111	65.850	64.425	1.125	Open Manhole		1200
S1.001	o	300	SS112	66.100	64.053	1.747	Open Manhole		1200
S3.000	o	225	SS108	66.000	64.575	1.200	Open Manhole		1200
S4.000	o	300	SS107	65.900	64.400	1.200	Open Manhole		1200
S3.001	o	375	SS109	65.770	64.019	1.376	Open Manhole		1350
S1.002	o	375	SS113	66.300	63.813	2.112	Open Manhole		1350
S5.000	o	225	SS101	66.750	65.325	1.200	Open Manhole		1200
S5.001	o	225	SS102	66.350	64.925	1.200	Open Manhole		1200
S5.002	o	300	SS103	66.100	64.695	1.105	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., (mm)	L*W
S1.000	47.891	100.0	SS112	66.100	64.425	1.375	Open Manhole		1200
S2.000	44.572	120.0	SS112	66.100	64.054	1.746	Open Manhole		1200
S1.001	27.099	164.2	SS113	66.300	63.888	2.112	Open Manhole		1350
S3.000	36.349	75.6	SS109	65.770	64.094	1.451	Open Manhole		1350
S4.000	45.814	149.7	SS109	65.770	64.094	1.376	Open Manhole		1350
S3.001	46.218	224.4	SS113	66.300	63.813	2.112	Open Manhole		1350
S1.002	67.267	574.9	SS120	66.200	63.696	2.129	Open Manhole		1500
S5.000	37.726	94.3	SS102	66.350	64.925	1.200	Open Manhole		1200
S5.001	38.653	249.4	SS103	66.100	64.770	1.105	Open Manhole		1200
S5.002	70.035	121.8	SS105	65.740	64.120	1.320	Open Manhole		1350

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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., (mm)	L*W
S6.000	o	225	SS104	65.850	64.425	1.200	Open Manhole		1200
S5.003	o	375	SS105	65.740	64.120	1.245	Open Manhole		1350
S5.004	o	600	SS106	65.900	63.934	1.366	Open Manhole		1500
S7.000	o	300	SS116	66.600	64.990	1.310	Open Manhole		1200
S8.000	o	375	SS114	66.150	64.670	1.105	Open Manhole		1350
S8.001	o	375	SS115	66.600	64.445	1.780	Open Manhole		1350
S7.001	o	375	SS116	66.650	64.360	1.915	Open Manhole		1350
S9.000	o	225	SS118	66.550	65.125	1.200	Open Manhole		1200
S7.002	o	450	SS119	66.750	63.830	2.470	Open Manhole		1350
S1.003	o	600	SS120	66.200	63.696	1.904	Open Manhole		1500
S1.004	o	750	SS121	66.200	63.672	1.778	Open Manhole		1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., (mm)	L*W
S6.000	33.520	145.7	SS105	65.740	64.195	1.320	Open Manhole		1350
S5.003	43.075	231.6	SS106	65.900	63.934	1.591	Open Manhole		1500
S5.004	55.087	231.5	SS120	66.200	63.696	1.904	Open Manhole		1500
S7.000	105.943	173.7	SS116	66.650	64.380	1.970	Open Manhole		1350
S8.000	53.499	237.8	SS115	66.600	64.445	1.780	Open Manhole		1350
S8.001	20.097	236.4	SS116	66.650	64.360	1.915	Open Manhole		1350
S7.001	78.729	148.5	SS119	66.750	63.830	2.545	Open Manhole		1350
S9.000	76.216	58.8	SS119	66.750	63.829	2.696	Open Manhole		1350
S7.002	20.805	155.3	SS120	66.200	63.696	2.054	Open Manhole		1500
S1.003	5.902	245.9	SS121	66.200	63.672	1.928	Open Manhole		1800
S1.004	60.709	906.1	SS122	66.750	63.605	2.395	Open Manhole		1800

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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)
S1.005	o	225	SS122	66.750	63.605	2.920	Open Manhole	1800
S1.006	o	225	SS123	66.800	63.582	2.993	Open Manhole	1200
S1.007	o	225	SS124	66.350	63.452	2.673	Open Manhole	1200
S1.008	o	225	SS125	66.100	63.291	2.584	Open Manhole	1200
S10.000	o	300	SS214	67.100	64.060	2.740	Open Manhole	1200
S10.001	o	300	SS215	67.500	63.850	3.350	Open Manhole	1200
S11.000	o	225	SS210	66.700	64.200	2.275	Open Manhole	1200
S12.000	o	225	SS209	66.750	64.210	2.315	Open Manhole	1200
S11.001	o	225	SS211	66.800	63.970	2.605	Open Manhole	1200
S13.000	o	225	SS201	66.750	64.810	1.715	Open Manhole	1200
S13.001	o	225	SS202	66.850	64.650	1.975	Open Manhole	1200
S13.002	o	300	SS203	66.900	64.530	2.070	Open Manhole	1200
S13.003	o	300	SS204	66.850	64.490	2.060	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)
S1.005	6.764	300.0	SS123	66.800	63.582	2.993	Open Manhole	1200
S1.006	39.086	300.0	SS124	66.350	63.452	2.673	Open Manhole	1200
S1.007	48.491	300.0	SS125	66.100	63.290	2.585	Open Manhole	1200
S1.008	6.236	300.0	S	66.100	63.270	2.605	Open Manhole	0
S10.000	47.647	226.9	SS215	67.500	63.850	3.350	Open Manhole	1200
S10.001	76.508	225.0	SS216	67.250	63.510	3.440	Open Manhole	1350
S11.000	50.741	220.6	SS211	66.800	63.970	2.605	Open Manhole	1200
S12.000	55.287	230.4	SS211	66.800	63.970	2.605	Open Manhole	1200
S11.001	26.083	217.4	SS212	66.900	63.850	2.825	Open Manhole	1350
S13.000	35.184	219.9	SS202	66.850	64.650	1.975	Open Manhole	1200
S13.001	28.457	237.1	SS203	66.900	64.530	2.145	Open Manhole	1200
S13.002	10.027	250.7	SS204	66.850	64.490	2.060	Open Manhole	1200
S13.003	11.539	192.3	SS205	66.800	64.430	2.070	Open Manhole	1200

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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)
S13.004	o	300	SS205	66.800	64.430	2.070	Open Manhole	1200
S14.000	o	225	SS206	66.950	64.270	2.455	Open Manhole	1200
S13.005	o	375	SS207	66.700	64.200	2.125	Open Manhole	1350
S13.006	o	375	SS208	66.800	63.890	2.535	Open Manhole	1350
S11.002	o	375	SS212	66.900	63.850	2.675	Open Manhole	1350
S11.003	o	450	SS213	67.000	63.800	2.750	Open Manhole	1350
S10.002	o	450	SS216	67.250	63.510	3.290	Open Manhole	1350
S15.000	o	750	SS222	65.900	63.670	1.480	Open Manhole	1800
S15.001	o	750	SS223	66.200	63.640	1.810	Open Manhole	1800
S16.000	o	225	SS217	66.000	64.640	1.135	Open Manhole	1200
S16.001	o	225	SS218	66.200	64.410	1.565	Open Manhole	1200
S16.002	o	225	SS219	66.350	64.320	1.805	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)
S13.004	51.717	224.9	SS207	66.700	64.200	2.200	Open Manhole	1350
S14.000	21.348	305.0	SS207	66.700	64.200	2.275	Open Manhole	1350
S13.005	70.828	228.5	SS208	66.800	63.890	2.535	Open Manhole	1350
S13.006	8.146	203.7	SS212	66.900	63.850	2.675	Open Manhole	1350
S11.002	11.294	225.9	SS213	67.000	63.800	2.825	Open Manhole	1350
S11.003	66.102	227.9	SS216	67.250	63.510	3.290	Open Manhole	1350
S10.002	32.104	169.0	SS232	66.750	63.320	2.980	Open Manhole	1800
S15.000	26.075	869.2	SS223	66.200	63.640	1.810	Open Manhole	1800
S15.001	50.212	717.3	SS224	66.100	63.570	1.780	Open Manhole	1800
S16.000	50.617	220.1	SS218	66.200	64.410	1.565	Open Manhole	1200
S16.001	19.635	218.2	SS219	66.350	64.320	1.805	Open Manhole	1200
S16.002	9.341	233.5	SS221	66.150	64.280	1.645	Open Manhole	1200

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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)
S17.000	o	225	SS220	66.100	64.340	1.535	Open Manhole	1200
S16.003	o	300	SS221	66.150	64.280	1.570	Open Manhole	1200
S15.002	o	750	SS224	66.100	63.570	1.780	Open Manhole	1800
S18.000	o	225	SS225	66.000	64.200	1.575	Open Manhole	1200
S15.003	o	750	SS220	65.850	63.500	1.600	Open Manhole	1800
S19.000	o	225	SS229	67.000	63.900	2.875	Open Manhole	1200
S20.000	o	300	SS228	66.500	63.882	2.318	Open Manhole	1200
S19.001	o	300	SS230	66.500	63.780	2.420	Open Manhole	1200
S15.004	o	750	SS227	66.450	63.410	2.290	Open Manhole	1800

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)
S17.000	12.814	213.6	SS221	66.150	64.280	1.645	Open Manhole	1200
S16.003	50.011	250.1	SS224	66.100	64.080	1.720	Open Manhole	1800
S15.002	51.920	741.7	SS220	65.850	63.500	1.600	Open Manhole	1800
S18.000	20.049	59.0	SS220	65.850	63.860	1.765	Open Manhole	1800
S15.003	65.202	724.5	SS227	66.450	63.410	2.290	Open Manhole	1800
S19.000	26.689	222.4	SS230	66.500	63.780	2.495	Open Manhole	1200
S20.000	41.030	398.3	SS230	66.500	63.779	2.421	Open Manhole	1200
S19.001	79.656	215.3	SS227	66.450	63.410	2.740	Open Manhole	1800
S15.004	30.318	379.0	SS231	66.450	63.330	2.370	Open Manhole	1800

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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)
S15.005	o	750	SS231	66.450	63.330	2.370	Open Manhole	1800
S10.003	o	750	SS232	66.750	63.320	2.680	Open Manhole	1800
S10.004	o	750	SS233	66.000	63.289	1.961	Open Manhole	1800
S10.005	o	750	SS234	65.500	63.262	1.488	Open Manhole	1800
S10.006	o	225	SS235	65.350	63.180	1.945	Open Manhole	1800

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)
S15.005	4.016	401.6	SS232	66.750	63.320	2.680	Open Manhole	1800
S10.003	20.653	666.2	SS233	66.000	63.289	1.961	Open Manhole	1800
S10.004	16.333	604.9	SS234	65.500	63.262	1.488	Open Manhole	1800
S10.005	49.089	598.6	SS235	65.350	63.180	1.420	Open Manhole	1800
S10.006	21.382	598.6	S	64.700	63.144	1.331	Open Manhole	0

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.182	0.182	0.182
2.000	User	-	100	0.136	0.136	0.136
1.001	User	-	100	0.061	0.061	0.061
3.000	User	-	100	0.129	0.129	0.129
4.000	User	-	100	0.152	0.152	0.152
3.001	User	-	100	0.123	0.123	0.123
1.002	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.118	0.118	0.118
5.001	User	-	100	0.042	0.042	0.042
5.002	User	-	100	0.118	0.118	0.118
6.000	User	-	100	0.108	0.108	0.108
5.003	User	-	100	0.096	0.096	0.096
5.004	User	-	100	0.181	0.181	0.181
7.000	User	-	100	0.288	0.288	0.288
8.000	User	-	100	0.286	0.286	0.286
8.001	User	-	100	0.022	0.022	0.022
7.001	User	-	100	0.161	0.161	0.161
9.000	User	-	100	0.236	0.236	0.236
7.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.355	0.355	0.355
10.001	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.095	0.095	0.095
12.000	User	-	100	0.183	0.183	0.183
11.001	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.052	0.052	0.052
13.001	User	-	100	0.098	0.098	0.098
13.002	User	-	100	0.032	0.032	0.032
13.003	User	-	100	0.011	0.011	0.011
13.004	User	-	100	0.054	0.054	0.054
14.000	User	-	100	0.049	0.049	0.049
13.005	User	-	100	0.264	0.264	0.264
13.006	User	-	100	0.017	0.017	0.017
11.002	User	-	100	0.016	0.016	0.016
11.003	User	-	100	0.252	0.252	0.252
10.002	User	-	100	0.068	0.068	0.068
15.000	User	-	100	0.039	0.039	0.039
15.001	User	-	100	0.135	0.135	0.135
16.000	User	-	100	0.136	0.136	0.136
16.001	User	-	100	0.029	0.029	0.029
16.002	-	-	100	0.000	0.000	0.000

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
17.000	User	-	100	0.027	0.027	0.027
16.003	User	-	100	0.049	0.049	0.049
15.002	User	-	100	0.131	0.131	0.131
18.000	User	-	100	0.039	0.039	0.039
15.003	-	-	100	0.000	0.000	0.000
19.000	User	-	100	0.043	0.043	0.043
20.000	User	-	100	0.058	0.058	0.058
19.001	User	-	100	0.209	0.209	0.209
15.004	User	-	100	0.125	0.125	0.125
15.005	User	-	100	0.066	0.066	0.066
10.003	-	-	100	0.000	0.000	0.000
10.004	-	-	100	0.000	0.000	0.000
10.005	-	-	100	0.000	0.000	0.000
10.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				5.070	5.070	5.070

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.008	S	66.100	63.270	0.000	0	0
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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S10.006	S	64.700	63.144	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
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 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	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	Scotland and Ireland	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.200		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: SS121, DS/PN: S1.004, Volume (m³): 7.6

Unit Reference MD-SHE-0206-2430-1700-2430
 Design Head (m) 1.700
 Design Flow (l/s) 24.3
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface Sump Available
 Yes Diameter (mm) 206
 Invert Level (m) 63.672
 Minimum Outlet Pipe Diameter (mm) 225
 Suggested Manhole Diameter (mm) 1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	24.3	Kick-Flo®	1.100	19.7
Flush-Flo™	0.506	24.3	Mean Flow over Head Range	-	21.0

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

Depth (m)	Flow (l/s)						
0.100	7.1	1.200	20.6	3.000	31.9	7.000	48.0
0.200	19.8	1.400	22.1	3.500	34.3	7.500	49.6
0.300	23.2	1.600	23.6	4.000	36.6	8.000	51.2
0.400	24.1	1.800	25.0	4.500	38.7	8.500	52.7
0.500	24.3	2.000	26.2	5.000	40.8	9.000	54.2
0.600	24.2	2.200	27.5	5.500	42.7	9.500	55.6
0.800	23.4	2.400	28.6	6.000	44.5		
1.000	21.6	2.600	29.8	6.500	46.3		

Hydro-Brake® Optimum Manhole: SS234, DS/PN: S10.005, Volume (m³): 12.1

Unit Reference MD-SHE-0290-5100-1600-5100
 Design Head (m) 1.600
 Design Flow (l/s) 51.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface Sump Available
 Yes Diameter (mm) 290
 Invert Level (m) 63.262
 Minimum Outlet Pipe Diameter (mm) 375

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Hydro-Brake® Optimum Manhole: SS234, DS/PN: S10.005, Volume (m³): 12.1

Suggested Manhole Diameter (mm) 2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	51.0	Kick-Flo®	1.119	42.9
Flush-Flo™	0.520	50.9	Mean Flow over Head Range	-	43.2

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)						
0.100	9.0	1.200	44.4	3.000	69.1	7.000	104.3
0.200	29.8	1.400	47.8	3.500	74.5	7.500	107.9
0.300	48.4	1.600	51.0	4.000	79.5	8.000	111.4
0.400	50.3	1.800	54.0	4.500	84.1	8.500	114.7
0.500	50.9	2.000	56.8	5.000	88.6	9.000	118.0
0.600	50.8	2.200	59.5	5.500	92.8	9.500	121.1
0.800	49.5	2.400	62.0	6.000	96.8		
1.000	46.8	2.600	64.5	6.500	100.6		

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Storage Structures for Storm

Cellular Storage Manhole: SS121, DS/PN: S1.004

Invert Level (m) 63.672 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1133.0	0.0	0.400	1133.0	0.0
0.100	1133.0	0.0	0.500	1133.0	0.0
0.200	1133.0	0.0	0.700	1133.0	0.0
0.300	1133.0	0.0	0.885	1133.0	0.0

Cellular Storage Manhole: SS234, DS/PN: S10.005

Invert Level (m) 63.262 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.60
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	871.0	0.0	0.600	871.0	0.0
0.100	871.0	0.0	0.700	871.0	0.0
0.200	871.0	0.0	0.717	871.0	0.0
0.300	871.0	0.0	1.000	871.0	0.0
0.400	871.0	0.0	1.200	871.0	0.0
0.500	871.0	0.0			

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years) 1
Climate Change (%) 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	1	+10%					65.006
S2.000	SS111	15 Winter	1	+10%					64.518
S1.001	SS112	30 Winter	1	+10%	1/15 Winter				64.367
S3.000	SS108	15 Winter	1	+10%					64.664
S4.000	SS107	15 Winter	1	+10%					64.504
S3.001	SS109	30 Winter	1	+10%					64.352
S1.002	SS113	30 Winter	1	+10%	1/15 Summer				64.322
S5.000	SS101	15 Winter	1	+10%					65.415
S5.001	SS102	15 Winter	1	+10%					65.068
S5.002	SS103	15 Winter	1	+10%					64.819
S6.000	SS104	15 Winter	1	+10%					64.522
S5.003	SS105	720 Winter	1	+10%					64.316
S5.004	SS106	720 Winter	1	+10%					64.312
S7.000	SS116	15 Winter	1	+10%					65.144
S8.000	SS114	15 Winter	1	+10%					64.823
S8.001	SS115	15 Winter	1	+10%					64.653

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

PN	US/MH Name	Surcharged		Flooded	Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
S1.000	SS110	-0.198	0.000	0.26		26.7	OK	
S2.000	SS111	-0.207	0.000	0.21		20.0	OK	
S1.001	SS112	0.014	0.000	0.54		42.0	SURCHARGED	
S3.000	SS108	-0.136	0.000	0.34		19.0	OK	
S4.000	SS107	-0.196	0.000	0.26		22.1	OK	
S3.001	SS109	-0.042	0.000	0.34		42.0	OK	
S1.002	SS113	0.134	0.000	0.89		69.7	SURCHARGED	
S5.000	SS101	-0.135	0.000	0.34		17.4	OK	
S5.001	SS102	-0.082	0.000	0.71		22.1	OK	
S5.002	SS103	-0.176	0.000	0.36		34.8	OK	
S6.000	SS104	-0.128	0.000	0.39		15.9	OK	
S5.003	SS105	-0.179	0.000	0.10		11.7	OK	
S5.004	SS106	-0.222	0.000	0.04		15.5	OK	
S7.000	SS116	-0.146	0.000	0.48		39.6	OK	
S8.000	SS114	-0.222	0.000	0.34		41.2	OK	
S8.001	SS115	-0.167	0.000	0.38		41.5	OK	

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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)
S7.001	SS116	15	Winter	1	+10%				64.579
S9.000	SS118	15	Winter	1	+10%				65.242
S7.002	SS119	720	Winter	1	+10%	1/480	Winter		64.314
S1.003	SS120	480	Winter	1	+10%	1/480	Winter		64.319
S1.004	SS121	480	Winter	1	+10%				64.330
S1.005	SS122	480	Winter	1	+10%	1/180	Winter		63.884
S1.006	SS123	480	Winter	1	+10%				63.793
S1.007	SS124	480	Winter	1	+10%				63.651
S1.008	SS125	600	Summer	1	+10%				63.516
S10.000	SS214	15	Winter	1	+10%				64.260
S10.001	SS215	15	Winter	1	+10%				64.040
S11.000	SS210	15	Winter	1	+10%				64.310
S12.000	SS209	15	Winter	1	+10%				64.391
S11.001	SS211	15	Winter	1	+10%	1/15	Summer		64.268
S13.000	SS201	15	Winter	1	+10%				64.883
S13.001	SS202	15	Winter	1	+10%				64.776
S13.002	SS203	15	Winter	1	+10%				64.670
S13.003	SS204	15	Winter	1	+10%				64.626
S13.004	SS205	15	Winter	1	+10%				64.565
S14.000	SS206	15	Winter	1	+10%				64.383
S13.005	SS207	15	Winter	1	+10%				64.387
S13.006	SS208	15	Winter	1	+10%				64.212
S11.002	SS212	15	Winter	1	+10%				64.170
S11.003	SS213	30	Winter	1	+10%				64.061
S10.002	SS216	30	Winter	1	+10%	1/30	Winter		63.962
S15.000	SS222	30	Winter	1	+10%				63.891
S15.001	SS223	30	Winter	1	+10%				63.879
S16.000	SS217	15	Winter	1	+10%				64.767
S16.001	SS218	15	Winter	1	+10%				64.554
S16.002	SS219	15	Winter	1	+10%				64.475
S17.000	SS220	15	Winter	1	+10%				64.424
S16.003	SS221	15	Winter	1	+10%				64.423
S15.002	SS224	30	Winter	1	+10%				63.872
S18.000	SS225	15	Winter	1	+10%				64.241
S15.003	SS220	30	Winter	1	+10%				63.857
S19.000	SS229	15	Winter	1	+10%				63.972
S20.000	SS228	15	Winter	1	+10%				63.975
S19.001	SS230	15	Winter	1	+10%				63.935
S15.004	SS227	30	Winter	1	+10%				63.865
S15.005	SS231	360	Winter	1	+10%				63.888
S10.003	SS232	360	Winter	1	+10%				63.889
S10.004	SS233	360	Winter	1	+10%				63.879
S10.005	SS234	360	Winter	1	+10%				63.884
S10.006	SS235	600	Winter	1	+10%	1/30	Summer		63.554

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

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)					
S7.001	SS116	-0.156	0.000	0.61		95.0		OK	
S9.000	SS118	-0.108	0.000	0.52		34.2		OK	
S7.002	SS119	0.034	0.000	0.11		23.4		SURCHARGED	
S1.003	SS120	0.023	0.000	0.31		70.9		SURCHARGED	
S1.004	SS121	-0.092	0.000	0.07		23.9		OK	
S1.005	SS122	0.054	0.000	1.03		23.9		SURCHARGED	
S1.006	SS123	-0.014	0.000	0.84		23.9		OK	
S1.007	SS124	-0.026	0.000	0.84		23.9		OK	
S1.008	SS125	0.000	0.000	1.05		24.0		OK	
S10.000	SS214	-0.100	0.000	0.74		51.3		OK	
S10.001	SS215	-0.110	0.000	0.69		49.0		OK	
S11.000	SS210	-0.115	0.000	0.40		13.3		OK	
S12.000	SS209	-0.044	0.000	0.78		25.5		OK	
S11.001	SS211	0.073	0.000	0.91		29.5		SURCHARGED	
S13.000	SS201	-0.152	0.000	0.23		7.6		OK	
S13.001	SS202	-0.099	0.000	0.60		18.7		OK	
S13.002	SS203	-0.160	0.000	0.40		22.0		OK	
S13.003	SS204	-0.164	0.000	0.38		23.5		OK	
S13.004	SS205	-0.165	0.000	0.41		28.9		OK	
S14.000	SS206	-0.112	0.000	0.26		7.0		OK	
S13.005	SS207	-0.188	0.000	0.48		60.0		OK	
S13.006	SS208	-0.053	0.000	0.61		60.0		OK	
S11.002	SS212	-0.055	0.000	0.87		87.5		OK	
S11.003	SS213	-0.189	0.000	0.54		107.2		OK	
S10.002	SS216	0.002	0.000	0.61		131.0		SURCHARGED	
S15.000	SS222	-0.529	0.000	0.02		4.3		OK	
S15.001	SS223	-0.511	0.000	0.03		13.5		OK	
S16.000	SS217	-0.098	0.000	0.58		19.4		OK	
S16.001	SS218	-0.081	0.000	0.69		22.0		OK	
S16.002	SS219	-0.070	0.000	0.79		22.1		OK	
S17.000	SS220	-0.141	0.000	0.13		3.9		OK	
S16.003	SS221	-0.157	0.000	0.46		30.3		OK	
S15.002	SS224	-0.448	0.000	0.12		45.4		OK	
S18.000	SS225	-0.184	0.000	0.09		5.7		OK	
S15.003	SS220	-0.393	0.000	0.10		38.7		OK	
S19.000	SS229	-0.153	0.000	0.20		6.4		OK	
S20.000	SS228	-0.207	0.000	0.16		8.1		OK	
S19.001	SS230	-0.145	0.000	0.50		36.6		OK	
S15.004	SS227	-0.295	0.000	0.13		65.9		OK	
S15.005	SS231	-0.192	0.000	0.09		33.4		OK	
S10.003	SS232	-0.181	0.000	0.32		86.5		OK	
S10.004	SS233	-0.160	0.000	0.35		85.4		OK	
S10.005	SS234	-0.128	0.000	0.10		43.4		OK	

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S10.006	SS235	0.149	0.000	2.69		44.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years) 2
Climate Change (%) 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	2	+10%					65.017
S2.000	SS111	15 Winter	2	+10%					64.528
S1.001	SS112	30 Winter	2	+10%	2/15 Summer				64.490
S3.000	SS108	15 Winter	2	+10%					64.674
S4.000	SS107	30 Winter	2	+10%					64.530
S3.001	SS109	30 Winter	2	+10%	2/15 Summer				64.477
S1.002	SS113	720 Winter	2	+10%	2/15 Summer				64.460
S5.000	SS101	15 Winter	2	+10%					65.426
S5.001	SS102	15 Winter	2	+10%					65.091
S5.002	SS103	15 Winter	2	+10%					64.834
S6.000	SS104	15 Winter	2	+10%					64.534
S5.003	SS105	720 Winter	2	+10%					64.458
S5.004	SS106	720 Winter	2	+10%					64.454
S7.000	SS116	15 Winter	2	+10%					65.164
S8.000	SS114	15 Winter	2	+10%					64.841
S8.001	SS115	15 Winter	2	+10%					64.674

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

PN	US/MH Name	Surcharged		Flooded	Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
S1.000	SS110	-0.187	0.000	0.31		32.3	OK	
S2.000	SS111	-0.197	0.000	0.25		24.1	OK	
S1.001	SS112	0.137	0.000	0.58		45.3	SURCHARGED	
S3.000	SS108	-0.126	0.000	0.40		22.9	OK	
S4.000	SS107	-0.170	0.000	0.26		22.2	OK	
S3.001	SS109	0.083	0.000	0.39		48.1	SURCHARGED	
S1.002	SS113	0.272	0.000	0.26		20.1	SURCHARGED	
S5.000	SS101	-0.124	0.000	0.41		21.0	OK	
S5.001	SS102	-0.059	0.000	0.85		26.5	OK	
S5.002	SS103	-0.161	0.000	0.43		41.8	OK	
S6.000	SS104	-0.116	0.000	0.47		19.1	OK	
S5.003	SS105	-0.037	0.000	0.11		13.4	OK	
S5.004	SS106	-0.080	0.000	0.04		17.5	OK	
S7.000	SS116	-0.126	0.000	0.58		47.7	OK	
S8.000	SS114	-0.204	0.000	0.41		49.8	OK	
S8.001	SS115	-0.146	0.000	0.46		50.4	OK	

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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)
S7.001	SS116	15	Winter	2	+10%				64.613
S9.000	SS118	15	Winter	2	+10%				65.257
S7.002	SS119	720	Winter	2	+10%	2/15	Summer		64.456
S1.003	SS120	480	Winter	2	+10%	2/180	Winter		64.453
S1.004	SS121	480	Winter	2	+10%	2/480	Winter		64.460
S1.005	SS122	480	Winter	2	+10%	2/120	Summer		63.886
S1.006	SS123	480	Winter	2	+10%				63.796
S1.007	SS124	480	Winter	2	+10%				63.652
S1.008	SS125	600	Summer	2	+10%				63.516
S10.000	SS214	15	Winter	2	+10%				64.309
S10.001	SS215	30	Winter	2	+10%				64.103
S11.000	SS210	15	Winter	2	+10%				64.382
S12.000	SS209	15	Winter	2	+10%	2/15	Summer		64.473
S11.001	SS211	15	Winter	2	+10%	2/15	Summer		64.348
S13.000	SS201	15	Winter	2	+10%				64.891
S13.001	SS202	15	Winter	2	+10%				64.793
S13.002	SS203	15	Winter	2	+10%				64.680
S13.003	SS204	15	Winter	2	+10%				64.636
S13.004	SS205	15	Winter	2	+10%				64.581
S14.000	SS206	15	Winter	2	+10%				64.412
S13.005	SS207	15	Winter	2	+10%				64.417
S13.006	SS208	30	Winter	2	+10%	2/15	Winter		64.317
S11.002	SS212	30	Winter	2	+10%	2/30	Winter		64.240
S11.003	SS213	30	Winter	2	+10%				64.143
S10.002	SS216	30	Winter	2	+10%	2/15	Winter		64.021
S15.000	SS222	600	Winter	2	+10%				63.935
S15.001	SS223	30	Winter	2	+10%				63.948
S16.000	SS217	15	Winter	2	+10%				64.784
S16.001	SS218	15	Winter	2	+10%				64.598
S16.002	SS219	15	Winter	2	+10%				64.497
S17.000	SS220	15	Winter	2	+10%				64.429
S16.003	SS221	15	Winter	2	+10%				64.434
S15.002	SS224	30	Winter	2	+10%				63.954
S18.000	SS225	15	Winter	2	+10%				64.246
S15.003	SS220	600	Winter	2	+10%				63.933
S19.000	SS229	15	Winter	2	+10%				63.986
S20.000	SS228	15	Winter	2	+10%				63.993
S19.001	SS230	30	Winter	2	+10%				63.989
S15.004	SS227	360	Winter	2	+10%				63.943
S15.005	SS231	360	Winter	2	+10%				63.966
S10.003	SS232	360	Winter	2	+10%				63.979
S10.004	SS233	360	Winter	2	+10%				63.975
S10.005	SS234	360	Winter	2	+10%				63.975
S10.006	SS235	600	Winter	2	+10%	2/15	Winter		63.592

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

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)					
S7.001	SS116	-0.122	0.000	0.73		113.6		OK	
S9.000	SS118	-0.093	0.000	0.62		41.2		OK	
S7.002	SS119	0.176	0.000	0.13		26.8		SURCHARGED	
S1.003	SS120	0.157	0.000	0.35		80.5		SURCHARGED	
S1.004	SS121	0.038	0.000	0.07		24.0		SURCHARGED	
S1.005	SS122	0.056	0.000	1.03		24.0		SURCHARGED	
S1.006	SS123	-0.011	0.000	0.85		24.0		OK	
S1.007	SS124	-0.025	0.000	0.84		24.0		OK	
S1.008	SS125	0.000	0.000	1.06		24.2		OK	
S10.000	SS214	-0.051	0.000	0.88		61.1		OK	
S10.001	SS215	-0.047	0.000	0.69		48.7		OK	
S11.000	SS210	-0.043	0.000	0.48		15.9		OK	
S12.000	SS209	0.038	0.000	0.91		29.9		SURCHARGED	
S11.001	SS211	0.153	0.000	1.07		34.8		SURCHARGED	
S13.000	SS201	-0.144	0.000	0.28		9.1		OK	
S13.001	SS202	-0.082	0.000	0.72		22.6		OK	
S13.002	SS203	-0.150	0.000	0.49		26.6		OK	
S13.003	SS204	-0.154	0.000	0.46		28.3		OK	
S13.004	SS205	-0.149	0.000	0.50		34.8		OK	
S14.000	SS206	-0.083	0.000	0.31		8.3		OK	
S13.005	SS207	-0.158	0.000	0.57		70.9		OK	
S13.006	SS208	0.052	0.000	0.66		64.9		SURCHARGED	
S11.002	SS212	0.015	0.000	0.97		97.5		SURCHARGED	
S11.003	SS213	-0.107	0.000	0.62		123.6		OK	
S10.002	SS216	0.061	0.000	0.74		158.5		SURCHARGED	
S15.000	SS222	-0.485	0.000	0.00		1.1		OK	
S15.001	SS223	-0.442	0.000	0.05		18.3		OK	
S16.000	SS217	-0.081	0.000	0.69		23.3		OK	
S16.001	SS218	-0.037	0.000	0.77		24.5		OK	
S16.002	SS219	-0.048	0.000	0.89		24.7		OK	
S17.000	SS220	-0.136	0.000	0.15		4.6		OK	
S16.003	SS221	-0.146	0.000	0.52		34.0		OK	
S15.002	SS224	-0.366	0.000	0.14		54.3		OK	
S18.000	SS225	-0.179	0.000	0.11		6.9		OK	
S15.003	SS220	-0.317	0.000	0.04		14.4		OK	
S19.000	SS229	-0.139	0.000	0.23		7.5		OK	
S20.000	SS228	-0.189	0.000	0.19		9.7		OK	
S19.001	SS230	-0.091	0.000	0.54		39.5		OK	
S15.004	SS227	-0.217	0.000	0.07		34.0		OK	
S15.005	SS231	-0.114	0.000	0.10		35.8		OK	
S10.003	SS232	-0.091	0.000	0.36		96.4		OK	
S10.004	SS233	-0.064	0.000	0.39		94.7		OK	
S10.005	SS234	-0.037	0.000	0.11		48.3		OK	

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S10.006	SS235	0.187	0.000	2.94		48.9	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years) 30
Climate Change (%) 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	30	+10%	30/15 Winter				65.305
S2.000	SS111	15 Winter	30	+10%	30/15 Summer				65.278
S1.001	SS112	960 Winter	30	+10%	30/15 Summer				65.191
S3.000	SS108	15 Winter	30	+10%	30/15 Summer				65.292
S4.000	SS107	30 Winter	30	+10%	30/15 Summer				65.232
S3.001	SS109	960 Winter	30	+10%	30/15 Summer				65.190
S1.002	SS113	960 Winter	30	+10%	30/15 Summer				65.187
S5.000	SS101	15 Winter	30	+10%	30/15 Winter				65.552
S5.001	SS102	15 Winter	30	+10%	30/15 Summer				65.355
S5.002	SS103	960 Winter	30	+10%	30/15 Winter				65.190
S6.000	SS104	960 Winter	30	+10%	30/15 Summer				65.188
S5.003	SS105	960 Winter	30	+10%	30/15 Summer				65.185
S5.004	SS106	960 Winter	30	+10%	30/15 Winter				65.181
S7.000	SS116	15 Winter	30	+10%	30/15 Summer				65.566
S8.000	SS114	15 Winter	30	+10%	30/15 Summer				65.346
S8.001	SS115	15 Winter	30	+10%	30/15 Summer				65.267

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

PN	US/MH Name	Surcharged		Flooded	Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (1/s)	Flow (1/s)		
S1.000	SS110	0.101	0.000	0.55		57.6	SURCHARGED	
S2.000	SS111	0.553	0.000	0.36		33.8	SURCHARGED	
S1.001	SS112	0.838	0.000	0.17		12.9	SURCHARGED	
S3.000	SS108	0.492	0.000	0.64		36.2	SURCHARGED	
S4.000	SS107	0.532	0.000	0.39		33.3	SURCHARGED	
S3.001	SS109	0.796	0.000	0.11		13.7	SURCHARGED	
S1.002	SS113	0.999	0.000	0.34		26.4	SURCHARGED	
S5.000	SS101	0.002	0.000	0.71		36.0	SURCHARGED	
S5.001	SS102	0.205	0.000	1.48		45.9	SURCHARGED	
S5.002	SS103	0.195	0.000	0.11		10.3	SURCHARGED	
S6.000	SS104	0.538	0.000	0.10		3.8	SURCHARGED	
S5.003	SS105	0.690	0.000	0.14		16.6	SURCHARGED	
S5.004	SS106	0.647	0.000	0.06		22.8	SURCHARGED	
S7.000	SS116	0.276	0.000	0.96		78.2	SURCHARGED	
S8.000	SS114	0.301	0.000	0.72		86.5	SURCHARGED	
S8.001	SS115	0.447	0.000	0.60		65.5	SURCHARGED	

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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)
S7.001	SS116	15 Winter	30	+10%	30/15 Summer				65.239
S9.000	SS118	15 Winter	30	+10%	30/15 Summer				65.725
S7.002	SS119	960 Winter	30	+10%	30/15 Summer				65.183
S1.003	SS120	960 Winter	30	+10%	30/15 Summer				65.179
S1.004	SS121	960 Winter	30	+10%	30/60 Winter				65.177
S1.005	SS122	240 Summer	30	+10%	30/30 Summer				63.886
S1.006	SS123	60 Winter	30	+10%					63.797
S1.007	SS124	240 Summer	30	+10%					63.652
S1.008	SS125	720 Summer	30	+10%					63.516
S10.000	SS214	30 Summer	30	+10%	30/15 Summer				65.148
S10.001	SS215	30 Winter	30	+10%	30/15 Summer				64.871
S11.000	SS210	30 Winter	30	+10%	30/15 Summer				65.398
S12.000	SS209	30 Winter	30	+10%	30/15 Summer				65.595
S11.001	SS211	30 Winter	30	+10%	30/15 Summer				65.296
S13.000	SS201	30 Winter	30	+10%	30/15 Summer				65.563
S13.001	SS202	30 Winter	30	+10%	30/15 Summer				65.521
S13.002	SS203	30 Winter	30	+10%	30/15 Summer				65.423
S13.003	SS204	30 Winter	30	+10%	30/15 Summer				65.393
S13.004	SS205	30 Winter	30	+10%	30/15 Summer				65.362
S14.000	SS206	30 Winter	30	+10%	30/15 Summer				65.285
S13.005	SS207	30 Winter	30	+10%	30/15 Summer				65.266
S13.006	SS208	30 Winter	30	+10%	30/15 Summer				65.061
S11.002	SS212	30 Winter	30	+10%	30/15 Summer				64.960
S11.003	SS213	30 Winter	30	+10%	30/15 Summer				64.771
S10.002	SS216	360 Winter	30	+10%	30/15 Summer				64.550
S15.000	SS222	600 Winter	30	+10%	30/240 Winter				64.520
S15.001	SS223	600 Winter	30	+10%	30/180 Winter				64.520
S16.000	SS217	15 Winter	30	+10%	30/15 Summer				65.129
S16.001	SS218	15 Winter	30	+10%	30/15 Summer				64.866
S16.002	SS219	15 Winter	30	+10%	30/15 Summer				64.671
S17.000	SS220	600 Winter	30	+10%					64.528
S16.003	SS221	600 Winter	30	+10%					64.527
S15.002	SS224	600 Winter	30	+10%	30/180 Winter				64.520
S18.000	SS225	360 Winter	30	+10%	30/240 Winter				64.520
S15.003	SS220	360 Winter	30	+10%	30/120 Winter				64.521
S19.000	SS229	600 Winter	30	+10%	30/15 Summer				64.530
S20.000	SS228	360 Winter	30	+10%	30/15 Summer				64.535
S19.001	SS230	360 Winter	30	+10%	30/15 Summer				64.536
S15.004	SS227	360 Winter	30	+10%	30/60 Winter				64.536
S15.005	SS231	360 Winter	30	+10%	30/15 Winter				64.537
S10.003	SS232	360 Winter	30	+10%	30/15 Winter				64.551
S10.004	SS233	360 Winter	30	+10%	30/60 Summer				64.560
S10.005	SS234	360 Winter	30	+10%	30/60 Summer				64.562
S10.006	SS235	360 Summer	30	+10%	30/15 Summer				63.614

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

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)					
S7.001	SS116	0.504	0.000	1.01	156.7	SURCHARGED			
S9.000	SS118	0.375	0.000	0.94	62.2	SURCHARGED			
S7.002	SS119	0.903	0.000	0.17	34.2	SURCHARGED			
S1.003	SS120	0.883	0.000	0.36	82.6	SURCHARGED			
S1.004	SS121	0.755	0.000	0.07	24.3	SURCHARGED			
S1.005	SS122	0.056	0.000	1.03	24.0	SURCHARGED			
S1.006	SS123	-0.010	0.000	0.83	23.6	OK			
S1.007	SS124	-0.025	0.000	0.84	24.0	OK			
S1.008	SS125	0.000	0.000	1.06	24.3	OK			
S10.000	SS214	0.788	0.000	1.36	94.0	SURCHARGED			
S10.001	SS215	0.721	0.000	1.10	78.0	SURCHARGED			
S11.000	SS210	0.973	0.000	0.54	18.0	SURCHARGED			
S12.000	SS209	1.160	0.000	1.14	37.5	SURCHARGED			
S11.001	SS211	1.101	0.000	1.67	54.1	SURCHARGED			
S13.000	SS201	0.528	0.000	0.37	12.3	SURCHARGED			
S13.001	SS202	0.646	0.000	0.99	30.8	SURCHARGED			
S13.002	SS203	0.593	0.000	0.60	33.0	SURCHARGED			
S13.003	SS204	0.603	0.000	0.57	34.8	SURCHARGED			
S13.004	SS205	0.632	0.000	0.64	44.3	SURCHARGED			
S14.000	SS206	0.790	0.000	0.39	10.4	SURCHARGED			
S13.005	SS207	0.691	0.000	0.79	98.3	SURCHARGED			
S13.006	SS208	0.796	0.000	1.04	101.6	SURCHARGED			
S11.002	SS212	0.735	0.000	1.58	159.0	SURCHARGED			
S11.003	SS213	0.521	0.000	1.02	201.9	SURCHARGED			
S10.002	SS216	0.590	0.000	0.45	96.6	SURCHARGED			
S15.000	SS222	0.100	0.000	0.01	1.6	SURCHARGED			
S15.001	SS223	0.130	0.000	0.02	6.2	SURCHARGED			
S16.000	SS217	0.264	0.000	1.14	38.2	SURCHARGED			
S16.001	SS218	0.231	0.000	1.38	43.7	SURCHARGED			
S16.002	SS219	0.126	0.000	1.57	43.7	SURCHARGED			
S17.000	SS220	-0.037	0.000	0.04	1.3	OK			
S16.003	SS221	-0.053	0.000	0.18	11.8	OK			
S15.002	SS224	0.200	0.000	0.05	20.5	SURCHARGED			
S18.000	SS225	0.095	0.000	0.04	2.6	SURCHARGED			
S15.003	SS220	0.271	0.000	0.08	32.1	SURCHARGED			
S19.000	SS229	0.405	0.000	0.06	2.0	SURCHARGED			
S20.000	SS228	0.353	0.000	0.07	3.8	SURCHARGED			
S19.001	SS230	0.456	0.000	0.27	19.6	SURCHARGED			
S15.004	SS227	0.376	0.000	0.12	57.0	SURCHARGED			
S15.005	SS231	0.457	0.000	0.17	61.6	SURCHARGED			
S10.003	SS232	0.481	0.000	0.59	157.9	SURCHARGED			
S10.004	SS233	0.521	0.000	0.63	154.4	SURCHARGED			
S10.005	SS234	0.550	0.000	0.12	50.8	SURCHARGED			

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S10.006	SS235	0.209	0.000	3.06		50.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years) 100
Climate Change (%) 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS110	15 Winter	100	+10%	100/15 Summer				65.845
S2.000	SS111	15 Winter	100	+10%	100/15 Summer				65.819
S1.001	SS112	30 Winter	100	+10%	100/15 Summer				65.893
S3.000	SS108	15 Winter	100	+10%	100/15 Summer				65.830
S4.000	SS107	15 Winter	100	+10%	100/15 Summer				65.728
S3.001	SS109	15 Winter	100	+10%	100/15 Summer				65.675
S1.002	SS113	960 Winter	100	+10%	100/15 Summer				65.646
S5.000	SS101	15 Winter	100	+10%	100/15 Summer				65.988
S5.001	SS102	15 Winter	100	+10%	100/15 Summer				65.771
S5.002	SS103	960 Winter	100	+10%	100/15 Summer				65.649
S6.000	SS104	960 Winter	100	+10%	100/15 Summer				65.647
S5.003	SS105	960 Winter	100	+10%	100/15 Summer				65.644
S5.004	SS106	960 Winter	100	+10%	100/15 Summer				65.640
S7.000	SS116	15 Winter	100	+10%	100/15 Summer				66.379
S8.000	SS114	15 Winter	100	+10%	100/15 Summer				65.971
S8.001	SS115	15 Winter	100	+10%	100/15 Summer				65.876

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

PN	US/MH Name	Surcharged		Flooded	Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
S1.000	SS110	0.641	0.000	0.65		68.0	SURCHARGED	
S2.000	SS111	1.094	0.000	0.41		39.2	SURCHARGED	
S1.001	SS112	1.540	0.000	1.16		90.3	SURCHARGED	
S3.000	SS108	1.030	0.000	0.67		38.0	SURCHARGED	
S4.000	SS107	1.028	0.000	0.51		43.0	SURCHARGED	
S3.001	SS109	1.281	0.000	0.89		108.6	SURCHARGED	
S1.002	SS113	1.458	0.000	0.42		32.4	SURCHARGED	
S5.000	SS101	0.438	0.000	0.83		41.9	SURCHARGED	
S5.001	SS102	0.621	0.000	1.63		50.6	SURCHARGED	
S5.002	SS103	0.654	0.000	0.13		12.4	SURCHARGED	
S6.000	SS104	0.997	0.000	0.11		4.5	SURCHARGED	
S5.003	SS105	1.149	0.000	0.17		20.0	SURCHARGED	
S5.004	SS106	1.106	0.000	0.07		27.6	SURCHARGED	
S7.000	SS116	1.089	0.000	1.05		86.0	SURCHARGED	
S8.000	SS114	0.926	0.000	0.82		98.7	SURCHARGED	
S8.001	SS115	1.056	0.000	0.76		82.8	SURCHARGED	

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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)
S7.001	SS116	15 Winter	100	+10%	100/15 Summer				65.807
S9.000	SS118	15 Winter	100	+10%	100/15 Summer				66.401
S7.002	SS119	960 Winter	100	+10%	100/15 Summer				65.642
S1.003	SS120	960 Winter	100	+10%	100/15 Summer				65.638
S1.004	SS121	960 Winter	100	+10%	100/30 Winter				65.636
S1.005	SS122	60 Summer	100	+10%	100/15 Summer				63.891
S1.006	SS123	480 Winter	100	+10%					63.796
S1.007	SS124	60 Summer	100	+10%					63.657
S1.008	SS125	2160 Winter	100	+10%					63.516
S10.000	SS214	15 Winter	100	+10%	100/15 Summer				66.057
S10.001	SS215	15 Winter	100	+10%	100/15 Summer				65.518
S11.000	SS210	30 Winter	100	+10%	100/15 Summer				66.214
S12.000	SS209	30 Winter	100	+10%	100/15 Summer				66.551
S11.001	SS211	30 Winter	100	+10%	100/15 Summer				66.085
S13.000	SS201	30 Winter	100	+10%	100/15 Summer				66.440
S13.001	SS202	30 Winter	100	+10%	100/15 Summer				66.388
S13.002	SS203	30 Winter	100	+10%	100/15 Summer				66.240
S13.003	SS204	30 Winter	100	+10%	100/15 Summer				66.194
S13.004	SS205	30 Winter	100	+10%	100/15 Summer				66.138
S14.000	SS206	30 Winter	100	+10%	100/15 Summer				66.023
S13.005	SS207	30 Winter	100	+10%	100/15 Summer				65.996
S13.006	SS208	30 Winter	100	+10%	100/15 Summer				65.696
S11.002	SS212	30 Winter	100	+10%	100/15 Summer				65.555
S11.003	SS213	30 Winter	100	+10%	100/15 Summer				65.287
S10.002	SS216	480 Winter	100	+10%	100/15 Summer				65.079
S15.000	SS222	600 Winter	100	+10%	100/120 Summer				65.051
S15.001	SS223	600 Winter	100	+10%	100/60 Winter				65.051
S16.000	SS217	15 Winter	100	+10%	100/15 Summer				65.532
S16.001	SS218	15 Winter	100	+10%	100/15 Summer				65.105
S16.002	SS219	600 Winter	100	+10%	100/15 Summer				65.062
S17.000	SS220	600 Winter	100	+10%	100/15 Summer				65.059
S16.003	SS221	600 Winter	100	+10%	100/15 Summer				65.058
S15.002	SS224	600 Winter	100	+10%	100/30 Winter				65.051
S18.000	SS225	480 Winter	100	+10%	100/60 Winter				65.056
S15.003	SS220	480 Winter	100	+10%	100/15 Winter				65.054
S19.000	SS229	600 Winter	100	+10%	100/15 Summer				65.061
S20.000	SS228	480 Winter	100	+10%	100/15 Summer				65.065
S19.001	SS230	480 Winter	100	+10%	100/15 Summer				65.070
S15.004	SS227	480 Winter	100	+10%	100/15 Winter				65.067
S15.005	SS231	480 Winter	100	+10%	100/15 Summer				65.072
S10.003	SS232	480 Winter	100	+10%	100/15 Summer				65.072
S10.004	SS233	480 Winter	100	+10%	100/15 Summer				65.071
S10.005	SS234	480 Winter	100	+10%	100/30 Summer				65.075
S10.006	SS235	60 Summer	100	+10%	100/15 Summer				63.614

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

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)					
S7.001	SS116	1.072	0.000	1.28	199.1	SURCHARGED			
S9.000	SS118	1.051	0.000	1.09	72.3	SURCHARGED			
S7.002	SS119	1.362	0.000	0.19	39.8	SURCHARGED			
S1.003	SS120	1.342	0.000	0.43	99.5	SURCHARGED			
S1.004	SS121	1.214	0.000	0.07	24.9	SURCHARGED			
S1.005	SS122	0.061	0.000	1.01	23.5	SURCHARGED			
S1.006	SS123	-0.011	0.000	0.85	24.0	OK			
S1.007	SS124	-0.020	0.000	0.86	24.5	OK			
S1.008	SS125	0.000	0.000	1.07	24.4	OK			
S10.000	SS214	1.697	0.000	1.71	118.3	SURCHARGED			
S10.001	SS215	1.368	0.000	1.54	108.9	SURCHARGED			
S11.000	SS210	1.789	0.000	0.68	22.6	SURCHARGED			
S12.000	SS209	2.116	0.000	1.45	47.7	SURCHARGED			
S11.001	SS211	1.890	0.000	2.12	68.8	SURCHARGED			
S13.000	SS201	1.405	0.000	0.40	13.0	SURCHARGED			
S13.001	SS202	1.513	0.000	1.06	33.2	SURCHARGED			
S13.002	SS203	1.410	0.000	0.74	40.4	SURCHARGED			
S13.003	SS204	1.404	0.000	0.73	44.7	SURCHARGED			
S13.004	SS205	1.408	0.000	0.80	55.8	SURCHARGED			
S14.000	SS206	1.528	0.000	0.42	11.3	SURCHARGED			
S13.005	SS207	1.421	0.000	1.00	124.2	SURCHARGED			
S13.006	SS208	1.431	0.000	1.30	127.7	SURCHARGED			
S11.002	SS212	1.330	0.000	2.00	200.4	SURCHARGED			
S11.003	SS213	1.037	0.000	1.29	255.8	SURCHARGED			
S10.002	SS216	1.119	0.000	0.45	97.8	SURCHARGED			
S15.000	SS222	0.631	0.000	0.01	2.0	SURCHARGED			
S15.001	SS223	0.661	0.000	0.02	8.3	SURCHARGED			
S16.000	SS217	0.667	0.000	1.36	45.6	SURCHARGED			
S16.001	SS218	0.470	0.000	1.72	54.3	SURCHARGED			
S16.002	SS219	0.517	0.000	0.36	10.0	SURCHARGED			
S17.000	SS220	0.494	0.000	0.05	1.6	SURCHARGED			
S16.003	SS221	0.478	0.000	0.22	14.4	SURCHARGED			
S15.002	SS224	0.731	0.000	0.07	25.7	SURCHARGED			
S18.000	SS225	0.631	0.000	0.04	2.7	SURCHARGED			
S15.003	SS220	0.804	0.000	0.08	31.6	SURCHARGED			
S19.000	SS229	0.936	0.000	0.08	2.4	SURCHARGED			
S20.000	SS228	0.883	0.000	0.07	3.8	SURCHARGED			
S19.001	SS230	0.990	0.000	0.28	20.5	SURCHARGED			
S15.004	SS227	0.907	0.000	0.12	56.8	SURCHARGED			
S15.005	SS231	0.992	0.000	0.17	59.8	SURCHARGED			
S10.003	SS232	1.002	0.000	0.57	153.2	SURCHARGED			
S10.004	SS233	1.032	0.000	0.61	151.1	SURCHARGED			
S10.005	SS234	1.063	0.000	0.12	50.8	SURCHARGED			

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

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S10.006	SS235	0.209	0.000	3.06		50.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of 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 Ratio R 0.200
Region Scotland and Ireland Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.850
Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Coarse Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720,
960, 1440, 2160, 2880, 4320, 5760, 7200, 8640,
10080
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 10, 10, 10, 10

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Water Level (m)
S1.000	SS110	15 Winter	100	+10%	30/15 Winter			65.845
S2.000	SS111	15 Winter	100	+10%	30/15 Summer			65.819
S1.001	SS112	30 Winter	100	+10%	1/15 Winter			65.893
S3.000	SS108	15 Winter	100	+10%	30/15 Summer			65.830
S4.000	SS107	15 Winter	100	+10%	30/15 Summer			65.728
S3.001	SS109	15 Winter	100	+10%	2/15 Summer			65.675
S1.002	SS113	960 Winter	100	+10%	1/15 Summer			65.646
S5.000	SS101	15 Winter	100	+10%	30/15 Winter			65.988
S5.001	SS102	15 Winter	100	+10%	30/15 Summer			65.771
S5.002	SS103	960 Winter	100	+10%	30/15 Winter			65.649
S6.000	SS104	960 Winter	100	+10%	30/15 Summer			65.647
S5.003	SS105	960 Winter	100	+10%	30/15 Summer			65.644
S5.004	SS106	960 Winter	100	+10%	30/15 Winter			65.640
S7.000	SS116	15 Winter	100	+10%	30/15 Summer			66.379
S8.000	SS114	15 Winter	100	+10%	30/15 Summer			65.971
S8.001	SS115	15 Winter	100	+10%	30/15 Summer			65.876

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

PN	US/MH Name	Surcharged		Flooded	Pipe		Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
S1.000	SS110	0.641	0.000	0.65		68.0	SURCHARGED	
S2.000	SS111	1.094	0.000	0.41		39.2	SURCHARGED	
S1.001	SS112	1.540	0.000	1.16		90.3	SURCHARGED	
S3.000	SS108	1.030	0.000	0.67		38.0	SURCHARGED	
S4.000	SS107	1.028	0.000	0.51		43.0	SURCHARGED	
S3.001	SS109	1.281	0.000	0.89		108.6	SURCHARGED	
S1.002	SS113	1.458	0.000	0.42		32.4	SURCHARGED	
S5.000	SS101	0.438	0.000	0.83		41.9	SURCHARGED	
S5.001	SS102	0.621	0.000	1.63		50.6	SURCHARGED	
S5.002	SS103	0.654	0.000	0.13		12.4	SURCHARGED	
S6.000	SS104	0.997	0.000	0.11		4.5	SURCHARGED	
S5.003	SS105	1.149	0.000	0.17		20.0	SURCHARGED	
S5.004	SS106	1.106	0.000	0.07		27.6	SURCHARGED	
S7.000	SS116	1.089	0.000	1.05		86.0	SURCHARGED	
S8.000	SS114	0.926	0.000	0.82		98.7	SURCHARGED	
S8.001	SS115	1.056	0.000	0.76		82.8	SURCHARGED	



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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S7.001	SS116	15 Winter	100	+10%	30/15 Summer				65.807
S9.000	SS118	15 Winter	100	+10%	30/15 Summer				66.401
S7.002	SS119	960 Winter	100	+10%	1/480 Winter				65.642
S1.003	SS120	960 Winter	100	+10%	1/480 Winter				65.638
S1.004	SS121	960 Winter	100	+10%	2/480 Winter				65.636
S1.005	SS122	60 Summer	100	+10%	1/180 Winter				63.891
S1.006	SS123	60 Winter	30	+10%					63.797
S1.007	SS124	60 Summer	100	+10%					63.657
S1.008	SS125	2160 Winter	100	+10%					63.516
S10.000	SS214	15 Winter	100	+10%	30/15 Summer				66.057
S10.001	SS215	15 Winter	100	+10%	30/15 Summer				65.518
S11.000	SS210	30 Winter	100	+10%	30/15 Summer				66.214
S12.000	SS209	30 Winter	100	+10%	2/15 Summer				66.551
S11.001	SS211	30 Winter	100	+10%	1/15 Summer				66.085
S13.000	SS201	30 Winter	100	+10%	30/15 Summer				66.440
S13.001	SS202	30 Winter	100	+10%	30/15 Summer				66.388
S13.002	SS203	30 Winter	100	+10%	30/15 Summer				66.240
S13.003	SS204	30 Winter	100	+10%	30/15 Summer				66.194
S13.004	SS205	30 Winter	100	+10%	30/15 Summer				66.138
S14.000	SS206	30 Winter	100	+10%	30/15 Summer				66.023
S13.005	SS207	30 Winter	100	+10%	30/15 Summer				65.996
S13.006	SS208	30 Winter	100	+10%	2/15 Winter				65.696
S11.002	SS212	30 Winter	100	+10%	2/30 Winter				65.555
S11.003	SS213	30 Winter	100	+10%	30/15 Summer				65.287
S10.002	SS216	480 Winter	100	+10%	1/30 Winter				65.079
S15.000	SS222	600 Winter	100	+10%	30/240 Winter				65.051
S15.001	SS223	600 Winter	100	+10%	30/180 Winter				65.051
S16.000	SS217	15 Winter	100	+10%	30/15 Summer				65.532
S16.001	SS218	15 Winter	100	+10%	30/15 Summer				65.105
S16.002	SS219	600 Winter	100	+10%	30/15 Summer				65.062
S17.000	SS220	600 Winter	100	+10%	100/15 Summer				65.059
S16.003	SS221	600 Winter	100	+10%	100/15 Summer				65.058
S15.002	SS224	600 Winter	100	+10%	30/180 Winter				65.051
S18.000	SS225	480 Winter	100	+10%	30/240 Winter				65.056
S15.003	SS220	480 Winter	100	+10%	30/120 Winter				65.054
S19.000	SS229	600 Winter	100	+10%	30/15 Summer				65.061
S20.000	SS228	480 Winter	100	+10%	30/15 Summer				65.065
S19.001	SS230	480 Winter	100	+10%	30/15 Summer				65.070
S15.004	SS227	480 Winter	100	+10%	30/60 Winter				65.067
S15.005	SS231	480 Winter	100	+10%	30/15 Winter				65.072
S10.003	SS232	480 Winter	100	+10%	30/15 Winter				65.072
S10.004	SS233	480 Winter	100	+10%	30/60 Summer				65.071
S10.005	SS234	480 Winter	100	+10%	30/60 Summer				65.075
S10.006	SS235	360 Summer	30	+10%	1/30 Summer				63.614

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

PN	US/MH Name	Surcharged		Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow (l/s)					
S7.001	SS116	1.072	0.000	1.28	199.1	SURCHARGED			
S9.000	SS118	1.051	0.000	1.09	72.3	SURCHARGED			
S7.002	SS119	1.362	0.000	0.19	39.8	SURCHARGED			
S1.003	SS120	1.342	0.000	0.43	99.5	SURCHARGED			
S1.004	SS121	1.214	0.000	0.07	24.9	SURCHARGED			
S1.005	SS122	0.061	0.000	1.01	23.5	SURCHARGED			
S1.006	SS123	-0.010	0.000	0.83	23.6	OK			
S1.007	SS124	-0.020	0.000	0.86	24.5	OK			
S1.008	SS125	0.000	0.000	1.07	24.4	OK			
S10.000	SS214	1.697	0.000	1.71	118.3	SURCHARGED			
S10.001	SS215	1.368	0.000	1.54	108.9	SURCHARGED			
S11.000	SS210	1.789	0.000	0.68	22.6	SURCHARGED			
S12.000	SS209	2.116	0.000	1.45	47.7	SURCHARGED			
S11.001	SS211	1.890	0.000	2.12	68.8	SURCHARGED			
S13.000	SS201	1.405	0.000	0.40	13.0	SURCHARGED			
S13.001	SS202	1.513	0.000	1.06	33.2	SURCHARGED			
S13.002	SS203	1.410	0.000	0.74	40.4	SURCHARGED			
S13.003	SS204	1.404	0.000	0.73	44.7	SURCHARGED			
S13.004	SS205	1.408	0.000	0.80	55.8	SURCHARGED			
S14.000	SS206	1.528	0.000	0.42	11.3	SURCHARGED			
S13.005	SS207	1.421	0.000	1.00	124.2	SURCHARGED			
S13.006	SS208	1.431	0.000	1.30	127.7	SURCHARGED			
S11.002	SS212	1.330	0.000	2.00	200.4	SURCHARGED			
S11.003	SS213	1.037	0.000	1.29	255.8	SURCHARGED			
S10.002	SS216	1.119	0.000	0.45	97.8	SURCHARGED			
S15.000	SS222	0.631	0.000	0.01	2.0	SURCHARGED			
S15.001	SS223	0.661	0.000	0.02	8.3	SURCHARGED			
S16.000	SS217	0.667	0.000	1.36	45.6	SURCHARGED			
S16.001	SS218	0.470	0.000	1.72	54.3	SURCHARGED			
S16.002	SS219	0.517	0.000	0.36	10.0	SURCHARGED			
S17.000	SS220	0.494	0.000	0.05	1.6	SURCHARGED			
S16.003	SS221	0.478	0.000	0.22	14.4	SURCHARGED			
S15.002	SS224	0.731	0.000	0.07	25.7	SURCHARGED			
S18.000	SS225	0.631	0.000	0.04	2.7	SURCHARGED			
S15.003	SS220	0.804	0.000	0.08	31.6	SURCHARGED			
S19.000	SS229	0.936	0.000	0.08	2.4	SURCHARGED			
S20.000	SS228	0.883	0.000	0.07	3.8	SURCHARGED			
S19.001	SS230	0.990	0.000	0.28	20.5	SURCHARGED			
S15.004	SS227	0.907	0.000	0.12	56.8	SURCHARGED			
S15.005	SS231	0.992	0.000	0.17	59.8	SURCHARGED			
S10.003	SS232	1.002	0.000	0.57	153.2	SURCHARGED			
S10.004	SS233	1.032	0.000	0.61	151.1	SURCHARGED			
S10.005	SS234	1.063	0.000	0.12	50.8	SURCHARGED			

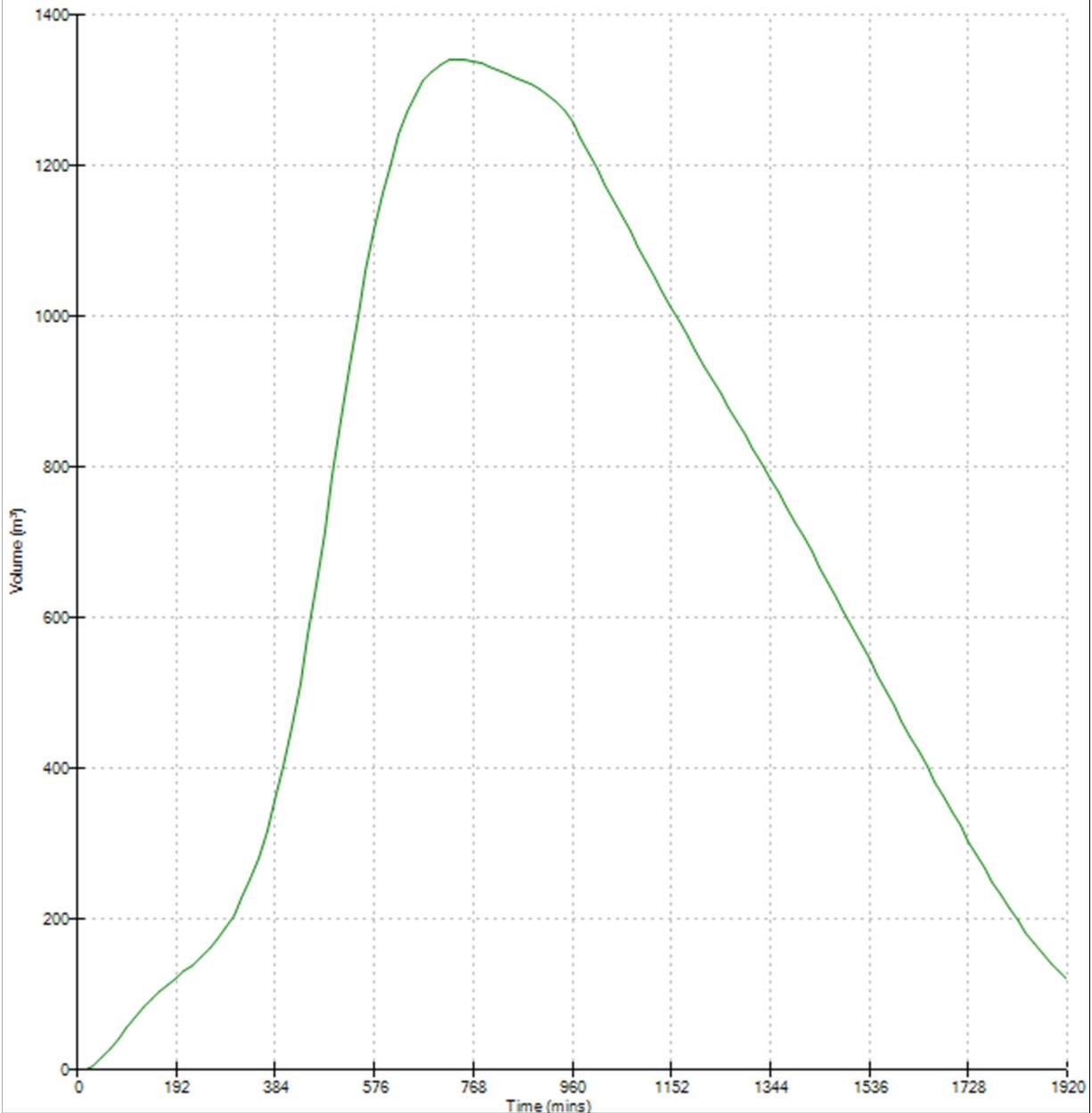
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Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)			
S10.006	SS235	0.209	0.000	3.06		50.8	SURCHARGED	

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Graphs for Pipe S1.004 US/MH SS121 (Storm)
960 minute 100 year Winter I+0%
Status: SURCHARGED



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Graphs for Pipe S10.005 US/MH SS234 (Storm)
480 minute 100 year Winter I+0%
Status: SURCHARGED

