IMMINGHAM EASTERN RO-RO TERMINAL

Drainage Plan

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Immingham Eastern Ro-Ro Terminal
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Drainage Strategy

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Executive summary

Jacobs Engineering has been commissioned by Associated British Ports (ABP) to compile a Drainage Strategy to support the DCO application associated with the proposal to construct a new roll-on/roll-off facility within the Port of Immingham.

A strategy has been developed considering both the existing and proposed infrastructure, together with the logistics associated with operating the terminal, and in accordance with relevant design and constructions guidance and regulations. This has involved the development of three separate surface water drainage networks, corresponding to the three landside development areas, and separated foul provisions.

As per guidance from the local operating authorities, existing drainage outfalls and associated infrastructure, such as the lift and pumping stations, have been reused. It is proposed that any redundant drainage infrastructure, generally comprising conveyance pipework, is to be abandoned. Due to the increased size of the impermeable catchment area within each development site, the existing conveyance networks do not have adequate capacity to sufficiently drain the developments.

Three new surface water drainage networks comprising:

- appropriate diameter conveyance pipework,
- catchpits,
- gullies,
- channel drainage,
- extensive geocellular storage,
- and control structures,

are proposed to serve the numerous identified catchment areas. The structure and location of the components within these networks have been located considering the operational activities of the facility.

Separate foul water provisions are being promoted; the layout and functionality of these shall be subject to development during further design stages.

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Acronyms and abbreviations

ABP	Associated British Ports
AEP	Annual Exceedance Probability
BGS	British Geological Survey
CC	Climate Change
DCG	Design and Construction Guidance
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
FRMS	Flood Risk Management Strategy
IDB	Internal Drainage Board (North East Lindsey Drainage Board)
IL	Invert Level
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
m AOD	Metres Above Ordnance Datum Newlyn
NPPF	National Planning and Policy Framework
PEIR	Preliminary Environmental Information Report
PPG	Pollution Prevention Guidance
SuDS	Sustainable urban Drainage Systems
UKBF	UK Border Force

Introduction

1.1 Background

1.1.1 Jacobs Engineering was commissioned by Associated British Ports to compile a Drainage Strategy to support the DCO application associated with the proposal to construct a new roll-on/roll-off facility within the Port of Immingham, which is located on the south bank of the Humber Estuary.

The facility will comprise:

- on the marine side:
  - a new jetty infrastructure with up to three berths,
- on the land side:
  - improved hardstanding,
  - a Terminal Building and associated Workshops,
  - a Fuel Station and Gatehouses,
  - UK Border Force Facilities
  - and an internal site bridge which will cross over existing port infrastructure, including an ABP controlled railway track and Robinson Road.

1.1.2 The terminal will be designed to service the embarkation and disembarkation of principally commercial and automotive traffic, and thus the improved areas of hardstanding will be designated waiting and storage areas associated with the facility operations. The site of the new terminal falls within the eastern part of the Port which is located entirely within the administrative boundary of North-East Lincolnshire.

1.2 Objective of the Report

1.2.1 This report has been compiled to describe the surface and foul water drainage strategies associated with the landside development of a concept design. The strategies have been sufficiently developed to support the DCO application and consider the existing and proposed infrastructure, together with the logistics associated with operating the terminal. This report details the applicable design standards and policies, and key design criteria that have been applied in developing a technically viable and compliant concept drainage strategy.

1.3 National Planning Policy

1.3.1 In accordance with the National Planning Statement for Ports (NPSfP) and the National Planning and Policy Framework (NPPF), which encompasses various Planning Practice Guidance (PPG) documents, surface water runoff shall be managed using sustainable drainage systems, unless there is clear evidence that these are inappropriate and shall give consideration to the treatment of pollutants and silt to protect contaminants within surface water runoff from entering surrounding watercourses.

1.4 Design Standards, Reference & Policy

1.4.1 The following design standards, technical guidance and policy documentation were referenced during the development of this drainage strategy:

[Ref. 1] CIRIA C753 – The SUDS Manual, 2015

[Ref. 2] National Planning Statement for Ports, 2012

[Ref. 3] National Planning Policy Framework, 2021

[Ref. 4] Planning Practice Guidance: Flood Risk and Coastal Change, 2022

[Ref. 5] Design and Construction Guidance, Version 2.0, 2020

[Ref. 6] National Highways 'Design Manual for Roads and Bridges' (DMRB)

[Ref. 7] BS EN 752:2017, Drain and sewer systems outside buildings, BSI

[Ref. 8] Guidance: Flood Risk Assessments, Climate Change Allowances – HM Government, 2016 (updated May 2022).

[Ref. 9] CIRIA C737 – Guide to Designing Geocellular Drainage System, 2018

[Ref. 10] Pollution Prevention Guidance (PPG3), 2006 *(Withdrawn)*

[Ref. 11] BS EN 858-1:2002 - Separator systems for light liquids (e.g. oil and petrol)

[Ref. 12] Environment Agency Flood Risk Standing Advice

[Ref. 13] The Flood and Water Management Act, 2010

1.5 Sources of Information

1.5.1 Environment Agency

1.5.1.1 The Environment Agency is the statutory consultee with regards to flood risk and planning. The Flood and Water Management Act 2010 ([Ref. 13) gives the Environment Agency a strategic overview role for all forms of flooding and coastal erosion, and they have a direct responsibility for the prevention, mitigation, and remediation of flood damage for main rivers and coastal areas. The Humber Flood Risk Management Strategy (FRMS) has been prepared by the Environment Agency and outlines their flood risk management strategy for the Humber Estuary. It makes recommendations aimed at ensuring that flood risk is managed in a sustainable way around the estuary and aims to ensure a good standard of protection from tidal flooding is maintained.

1.5.1.2 The Environment Agency has been consulted by ABP in relation to the Preliminary Environmental Information Report (PEIR) and advised with respect to Flood Defence and Drainage in February 2022. In principle the proposed development shall not compromise the flood defences, and any future works necessary to adapt to climate change, and access to and along the flood defences is required to be maintained.

1.5.1.3 Habrough Marsh Drain Outfall is maintained by the Environment Agency and access and working space is to be maintained to facilitate both maintenance and removal of the tidal flood gates. These flood gates protect the Habrough Marsh Drain against tidal inundation and form part of the coastal flood defence. The Habrough Marsh Drain is classified as an Ordinary Watercourse and thus the North East Lincolnshire Council (LLFA) is responsible for the overall management of local flood risk within the catchment; however, as the watercourse has been Scheduled, the Internal Drainage Board (IDB) is responsible for the maintenance and hydraulic performance of the Habrough Marsh Drain and its associated flood risk. The Environment Agency is also responsible for the issuance and subsequent compliance of Environmental Permits associated with the discharge of treated effluent / storm water via sea outfalls.

1.5.2 North East Lincolnshire Council

1.5.2.1 North East Lincolnshire Council is the Local Planning Authority (LPA) and Lead Local Flood authority (LLFA) and thus has responsibility for local flood risk, which includes surface water runoff, groundwater and Ordinary Watercourses. The North East Lincolnshire Strategic Flood Risk Assessment (SFRA), 2010 was produced to provide the information needed by the planning authority to take flood risk into account when making land use allocations and determining planning applications in accordance with the NPPF ([Ref. 3).

1.5.3 Internal Drainage Board (North East Lindsey Drainage Board)

1.5.3.1 Habrough Marsh Drain is classified as an Ordinary Watercourse but has been Scheduled by the Board which uses its permissing powers to maintain it. The IDB has been consulted by ABP in relation to the Preliminary Environmental Information Report (PEIR) and they subsequently advised with respect to functionality of Habrough Marsh Drain and its associated flood risk in February 2022.

1.5.3.2 The IDB advised that the Habrough Marsh Drain is a gravity system with a defended outfall structure which discharges into the Humber Estuary within the bounds of the Port. The Drain is impounded during periods of high tide; however, to facilitate in the control of the water levels, a sluice enables water to be transferred to the drainage channel located to the south of the Port. The sluice links the Habrough Marsh Drain to the Immingham Pumped Drainage System enabling the transfers of flows during periods when pumping capacity is not fully optimised (Appendix C2). The IDB, however, emphasised that high water levels within the Habrough Marsh Drain are considered a potential flood risk, and the operational water levels are observed to be nearing capacity when the runoff associated with high order rainfall events coincides with high tide levels in the Humber Estuary; it is acknowledged that this situation will only be exacerbated through the impact of climate change.

1.5.3.3 The IDB is also responsible for the issuance and subsequent compliance of Land Drainage Consent associated with the discharge of treated effluent / storm water into the drain, and hence is aware that elements of the proposed development site are served by existing surface water drainage infrastructure which discharges directly into the Habrough Marsh Drain. The IDB has advised that as the development is located on a brownfield site, the surface water discharge that is associated with any re-development will be expected to be reduced to 70% of the existing “actual” discharge rate.

1.5.4 Anglian Water

1.5.4.1 Anglian Water are responsible for the disposal of wastewater and the supply of potable water in North East Lincolnshire, and thus the town of Immingham and the wider area. The Port’s wastewater infrastructure within the development site is known to include several Package Treatment Plants, and a dedicated Treated Effluent Pumped Sea Outfall which discharges into the Humber Estuary. These assets are not adopted by Anglian Water and are maintained directly by the Port of Immingham.

Site Overview

2.1 Location

2.1.1 The proposed roll-on/roll-off facility is to be constructed within the Port of Immingham, which is located on the south bank of the Humber Estuary.

2.1.2 The roll-on/roll-off terminal is to be located within the eastern extent of the Port, approximately 2.4 km north-east of the town of Immingham, and will be served by a new jetty, pontoons, and associated finger piers to be constructed in open waters adjacent to the existing jetties within the Humber Estuary.

2.1.3 The Ordnance Survey National Grid Reference for the centre of the site is TA 19976 16154. Refer to DCO drawing B2429400-JAC-00-ZZ-DR-ZZ-0101 for the Site Location Plan.

2.2 Existing Landside Development

2.2.1 The proposed roll-on/roll-off terminal is to be constructed within areas of the Port which are currently used to store bulk commodities such as solid fuels and ores, as well as ro-ro freight being handled from in river jetties. The storage areas are accessed via established infrastructure within the Port and are subdivided by ABP controlled railway sidings. These areas are typically located adjacent to Operational Sheds and Engineering Workshops which complement the operations within the Port.

2.2.2 The existing storage areas are partially paved, and to ensure serviceability these sub-catchments are served by positive drainage systems which either discharge to the Habrough Marsh Drain or directly to the Humber Estuary or Immingham Dock via dedicated pumped outfalls.

2.2.3 Strategic infrastructure is present in the development site including package treatment plants and associated treated effluent pumping stations, as well as dedicated storm water pumping stations.

2.3 Proposed Landside Development

2.3.1 The proposal comprises an operational terminal designed to service the embarkation and disembarkation of principally commercial and automotive traffic associated with the proposed roll-on/roll-off facility, together with a limited designated area to store shipping containers. The terminal will comprise extensive areas of paved hardstanding which will be delineated to create designated waiting and storage areas and marshalling lanes; the storage areas will be accessed via controlled gated access points located adjacent to existing port infrastructure.

2.3.2 The terminal will be developed within the bounds of the existing port, thus will be spilt into three areas, namely the Northern, Southern and Western operational yards. To facilitate traffic movements between the terminal, and the marine side ro-ro approach jetty, it is proposed to construct an overbridge over Robinson Road and the ABP controlled railway sidings.

2.3.3 The existing cargo handling areas will be regraded to facilitate surface water drainage; the site grading shall consider the levels of the existing infrastructure located around the perimeter of the site and the safe working parameters of any operating plant or equipment. The operations within the yards will be facilitated through the provision of the following buildings which will be constructed within the bounds of the development site:

- Terminal Building (Southern Yard)
- Customer Welfare Building (accompanied freight marshalling area, Southern Yard)
- Workshop and Fuel Station / Gatehouse (Southern Yard)
- UK Border Force Customs Building and supporting infrastructure, including Immigration PCP Booths and Marshalling Lanes, Cyclamen Portal, Secondary Examination Building, Holding Facility, and Inspection Areas (Southern Yard)

2.3.4 The total development site is approximately 36.4 Ha which is subdivided as follows:

- Northern Yard – 6.0 Ha

- Southern Yard – 20.8 Ha
- Western Yard – 9.6 Ha

2.3.5 Refer to DCO drawings B2429400-JAC-00-ZZ-DR-ZZ-0202 to 0206 for the proposed development General Arrangements.

2.4 Topography

2.4.1 Site ground levels used to develop the drainage strategy have been based on resolution, open source Lidar data from https://environment.data.gov.uk/DefraDataDownload/?Mode=survey; the site is relatively flat with typical levels varying between +4 and +6 m AOD, which is predominately associated with historic development, including the interlinking railways, and its associated utilisation.

2.42 The site is classified as low-lying in relation to tidal water levels. The banks of the Habrough Marsh Drain, which is located to the east of the Port, are similar to the operational level of the cargo handling areas within the Port, however, the drain is protected against tidal inundation through the provision of tidal gates.

2.5 Geology & Hydrogeology

2.5.1 Open-source data from the British Geological Survey (BGS) shows that the geology underlying Immingham Port typically comprises a bedrock of Cretaceous shallow-marine Chalk which is overlain by superficial Tidal Flat Deposits, formed of shallow-marine Clay and Silt from the Quaternary period. The wider Port site straddles Chalk from two Formations, the Burnham Chalk Formation and the Flamborough Chalk Formation; the development site is located within the Flamborough Formation.

2.5.2 Borehole data from the BGS (trial borehole 17, 1948) suggests that the site stratigraphy consists of topsoil and muds to a depth of around 30 ft (9 m), after which a relatively shallow layer of Peat, Sand and Pebbles may be found, and below which several layers of varying Clays extend to a depth of almost 200 ft (60 m).

2.5.3 Geotechnical investigations undertaken within the bounds of the development site, by GD Pickles Ltd in 2020, confirm that the site is underlain by Made Ground, appearing to typically comprise imported construction or industrial waste consistent with historic land reclamation. Beneath the Made Ground are Tidal Flat Deposits, comprising cohesive clay soils and silt to a depth of approximately 10 m below ground level. The Tidal Flat Deposits overlie Boulder Clay comprising stiff brown sandy clay. Moreover, the nature of the underlying substrata appears to influence the groundwater regime; perched water bodies were observed in the southern area of the site within the Made Ground, at a depth of between 1-2 m below ground level. Groundwater was also observed below the Boulder Clay within a layer of dense Sands and Gravels at an approximate depth of 30 m.

2.5.4 The general ground conditions suggest that the permeability of the substrata will be low, which when combined with the presence of a high groundwater table, limits the opportunity to discharge surface water runoff from areas of hardstanding to the underlying groundwater regime using drainage structures that promote infiltration.. Further geotechnical investigation will be undertaken to facilitate the development of the design.

2.6 Environmental, Archaeological & Contamination

2.6.1 In accordance with Planning Policy, potential sources of contamination and items of historical reference which could affect the underlying groundwater regime are required to be considered when developing the drainage strategy to support the requirements of the proposed developed. The historic use of the site would suggest that there is risk of contamination within the underlying Made Ground and subsoils.

2.6.2 Due to the nature of the underlying substrata and associated groundwater regime a full appraisal of the historic use of the site has not been undertaken on the basis that drainage structures that promote infiltration are not deemed appropriate.

2.7 Catchment Hydrology

2.7.1 The area adjacent to the development site features a network of drainage ditches which aid in the conveyance of surface water runoff and pluvial flows into the Humber Estuary; the extent of the drainage ditch network is presented in Appendix A.

2.7.2 The Habrough Marsh Drain is located adjacent to the Port and bounds the development site to the south and east. The drain is classified by the Environment Agency as an Ordinary Watercourse and flows in an easterly direction before discharging into the Humber Estuary. The drain is defended from tidal inundation through the provision of flood gates which are integral to the flood defence structure constructed along the Humber Estuary.

2.7.3 There is a drainage channel located to the south of the Port linking the Habrough Marsh Drain to the Immingham Pumped Drainage System, via a sluice. This can be opened when there is spare pump capacity, enabling the transfer of fluvial flows to enter the pumped catchment and providing relief to the Habrough Marsh Drain.

2.7.4 The Habrough Marsh Drain historically aids in the drainage of elements of the Port and there are several outfalls located along the length of the drain directly to the east of the port's boundary and immediately upstream of the defended outfall into the Humber Estuary. These outfalls currently serve several positive drainage systems installed within the Port to drain areas of impermeable hardstanding which form the Cargo Handling Areas.

2.7.5 Based on a high-level review of topographical mapping, and drainage records provided by ABP, it is clear that an open ditch passed through the southeast corner of the Port which was culverted under the railway and Robinson Road before it discharged into a tributary of the Habrough Marsh Drain. This open ditch has been backfilled and subsequently replaced with a dedicated pipe network serving the site. The network conveys runoff from a surface water drainage system serving an area of semi-impermeable hardstanding located in the southeast corner of the Port, as well as roof drainage from Shed 26.

Surface Water Drainage

3.1 Surface Water Management Overview

3.1.1 An appropriately developed drainage strategy is a principal planning consideration to ensure developments are effectively and sustainably drained; surface water runoff is captured, and its quantity and quality controlled in a manner that ensures any alteration of natural surface water flow patterns through the development site do not result in an increased flood or pollution risk elsewhere in the catchment.

3.1.2 The strategy shall consider the transfer of flood risk associated with pluvial flooding and where appropriate fluvial flooding within the downstream receiving catchment and will thus be developed with respect to the satisfactory collection, control, treatment and discharge of surface water runoff as reflected in the guidance and non-statutory technical standards for SuDS.

3.1.3 The development is to be undertaken on a brownfield site and the IDB has been consulted and agreed to permit a discharge rate that is limited to 70% of the actual runoff from the predeveloped catchment; this approach will aid in the management of flood risk in the receiving watercourse catchment.

3.2 Design Criteria

3.2.1 Overview

3.2.1.1 The design criteria detailed below follow best practice as stipulated under Planning Policy and align with the redevelopment of predeveloped sites.

3.2.1.2 The design standard relating to the surface water drainage for the areas of hardstanding and associated buildings is the Design and Construction Guidance (2020) ([Ref. 5) and BS EN 752:2017 ([Ref. 7), whilst for the surface water drainage associated with the highway bridge the design standard is the National Highways 'Design Manual for Roads and Bridges' (DMRB) ([Ref. 6).

3.2.2 Discharge Hierarchy

3.2.2.1 The SuDS Manual (2015) ([Ref. 1) specifies a hierarchy of techniques that should be considered for drainage discharge and has been consulted to establish the most suitable approach for the proposed site. Surface water runoff should be discharged to a source that is as high up the following hierarchy as possible:

1. Re-use (rainwater harvesting / greywater recycling)
2. Infiltration
3. To a surface water body (e.g. ordinary watercourse)
4. To a surface water sewer, highway drain, or other drainage system
5. To a combined sewer.

3.2.2.2 To inform the development of an appropriate drainage strategy and enable an assessment of all potential discharge options, as required by both the NPSfP ([Ref. 2) and NPPF ([Ref. 3), reference has been made to British Geological Mapping, the existing surface water drainage systems and associated outfalls, and the proximity of watercourses and drains. The following sections assess the hierarchy in order of priority:

Re-use

3.2.2.3 The vast majority of the development site is to be paved for vehicular trafficking purposes. The quality of the runoff would therefore be inappropriate for re-use on the site due to the risk of hydrocarbon and suspended sediment contamination. It is therefore not proposed to re-use surface water runoff from the development site.

Infiltration

3.2.2.4 Due to the cohesive nature of the underlying sub-strata and high perched groundwater levels (see Section 2.5), infiltration drainage is not considered appropriate and has thus not been promoted, in part, or as a main means of discharging the rainfall induced runoff from the development site. It is intended that attenuation storage features are lined to prevent the ingress of perched groundwater, which would otherwise render the storage provision ineffective.

<u>To a surface water body</u>

3.2.2.5 Where positively drained, all surface water runoff within the site boundary is discharged to an existing surface water body, either to the Habrough Marsh Drain, the Humber Estuary or to Immingham Dock. It is therefore proposed to discharge runoff from the development site to the same water bodies. The positive drainage networks serving the existing site are privately maintained and are located entirely within the Immingham Port boundary prior to their outfall to the associated water body. It is proposed to discharge via existing outfalls and surface water drainage infrastructure, therefore achieving an indirect discharge to a surface water body, without increasing flood risk from sewers outside of the site boundary.

3.2.2.6 The existing drainage located within the bounds of the development site itself is deemed to be hydraulic deficient in relation to the requirements of the proposed development, and thus will largely be abandoned and replaced with new to align with the proposed pavement grading.

3.2.2.7 The existing outfall configurations are as detailed below:

- Habrough Marsh Drain:
  - The surface water runoff from the northeast and southeast sections of the Cargo Handling Areas (Catchments A and D, see drawing B2357300 - 01 - 05 - 11) currently discharge under gravity to headwall structures located on the west bank of the Habrough Marsh Drain; these headwalls and the associated upstream pipework located outside of the Port boundary could be retained for reuse subject to:
    - A full structural CCTV of the pipework.
    - A non-destructive assessment of the headwall structure.
    - A topographical Survey of the outfall pipework and associated headwall structure.
    - The consent of the IDB – Ordinary Watercourse.
- Combined Effluent / Storm Water Pumping Station:
  - The surface water runoff from the southwest section of the Cargo Handling Area (Catchment A, see drawing B2357300 - 01 - 05 - 12) currently discharges under gravity to the Pumping Station which has been designed to accommodate both the treated effluent from an adjacent biodisc package treatment plant and stormwater runoff collected within the Cargo Handling Area, and the catchment located to the north of Robinson Road. Subject to the following, the pumping station could be used to aid in the discharge of surface water collected within the development site directly to the Humber Estuary:
    - The spare capacity within the pumping station and associated rising main.
    - The consent of the Environment Agency with respect to the Environmental Permit.
    - Availability of space within the proposed Yard to accommodate attenuation facilities.
- Storm Water Pumping Station:
  - The surface water runoff from the western section of the Cargo Handling Area (Catchment A, see drawing B2357300 - 01 - 05 - 19) currently discharges under gravity to a relatively new surface water lift station that discharges into a dedicated surface water pumping station which aids in the conveyance of storm water into Immingham Dock. Subject to the following, the surface water pumping station could be used to aid in the conveyance of surface water collected within the development site directly to Immingham Dock and associated Humber Estuary:

- The spare capacity within the lift station and associated rising main.
- The consent of the Environment Agency with respect to the Environmental Permit.
- Availability of space within the proposed Yard to accommodate attenuation facilities.

To a surface water sewer, highway drain, or other drainage system or to a combined sewer.

3.2.2.8 As it is possible to discharge to a surface water body, which is preferable with respect to the discharge hierarchy, discharging to a surface water sewer, highway drain, other drainage system or a combined sewer do not need to be considered.

3.2.3 Discharge Criteria

3.2.3.1 To inform the planning of the development proposal and in particular the development of an associated drainage strategy, the IDB was consulted in relation to the Preliminary Environmental Information Report (PEIR) in February 2022. The consultation acknowledged that the Habrough Marsh Drain serves areas of hardstanding in the Port, however, due to the potential high water levels within the Habrough Marsh Drain, which will only be exacerbated through the impact of climate change, it was stipulated by the IDB that existing surface water outfalls shall only be permitted to discharge up to 70% of the actual runoff from the associated catchment.

3.2.3.2 The discharge methodology promoted within this strategy will thus mimic the existing arrangements for an appropriate range of rainfall events, including an allowance for climate change, whereby the runoff will be discharged at the specified controlled rate to the Habrough Marsh Drain, or into the Humber Estuary or Immingham Dock via existing pumped sea outfalls.

3.2.3.3 The proposed discharge criteria are based on pre-development baseline assessments; these shall be subject to an appropriate climate change allowance and are outlined in Table 1.

Table 1: ***Proposed Discharge Criteria***

Discharge rate limits

Outfall Location	1 in 1 year discharge	1 in 30 year discharge	1 in 100 year discharge
Habrough Marsh Drain	70% of existing modelled 1 in 1 year rate	70% of existing modelled 1 in 30 year rate	70% of existing modelled 1 in 100 year rate
Immingham Dock	No greater than existing	No greater than existing	No greater than existing
Humber Estuary	No discharge restrictions	No discharge restrictions	No discharge restrictions

3.2.4 Hydraulic Performance

3.2.4.1 The hydraulic design parameters applied in the development of the surface water drainage strategy are outlined as follows:

3.2.4.1 Collector systems

3.2.4.1.1 The collector system is to comprise gullies located in the valleys within the pavement; these gullies will be placed at an appropriate spacing, which will align with the serviceable catchment. The spacing of gullies shall ensure a negligible surface water profile on the pavement during low order rainfall events.

3.2.4.1.2 Due to the proposed utilisation of the site, it is considered acceptable to permit short term ponding in the vicinity of the gullies during high intensity rainfall events, however, the spacing shall be sufficient to not result in flooding outside of the site boundary during short-duration and high-intensity 1 in 100-year (+CC) design storm events.

3.2.4.2 Carrier systems

3.2.4.2.1 The surface water drainage system is designed in accordance with DCG (2020) ([Ref. 5), and thus is in compliance with the following criteria:

- No surcharge for the 1 year (+CC) return period.

- No flooding for the 30 year (+CC) return period.

3.2.4.2.2 The building roof drainage shall align with the Building Regulations and thus be in compliance with the following criteria:

- The gutter and rainwater downpipes, which shall be positively connected with the carrier drainage pipework, shall accommodate the runoff associated with a 1 in 10 year (+CC) design storm event.
- Any exceedance flows shall be permitted to cascade down the building's envelope onto the hardstanding where it will be intercepted by the surface water drainage system.

3.2.4.3 On-Site Flood Risk

3.2.4.3.1 The surface water drainage system shall be designed to comply with the following criteria in accordance with site-specific design criteria required by the Port Operator:

- No flooding from the carrier drainage system for events up to the 1 in 30 year (+CC) return period.
- Any flooding during the 1 in 100 year (+CC) design storm event shall be retained within the site in appropriate surface storage areas, not pose a risk to people or property, and be able to quickly drain away after the peak of the design storm event has passed.
- The collector system shall be designed to ensure standing water is contained within the pavement channel; standing water depths up to 100 mm, or an acceptable level for operational activities, are permitted for limited periods.
- No flooding in the vicinity of the Terminal and UK Border Force Buildings will be permitted for events up to 1 in 100 year (+CC) design storm event.

3.2.4.4 Off-Site Flood Risk

3.2.4.4.1 To ensure compliance of Planning Policy the design shall comply with the following criteria:

- Pluvial flows up to the 1 in 100 year (+CC) design storm event shall be retained on site.

3.2.5 Climate Change

3.2.5.1 Projections of future climate change in the UK indicate more frequent, short duration, high intensity rainfall and frequent periods of long duration rainfall. The guidance included in the NPPF ([Ref. 3) and PPG ([Ref. 4) recommends the effects of climate change are considered when developing drainage strategies for new development or redevelopment; the recommended precautionary sensitivity ranges for peak rainfall intensities are outlined in the Flood Risk Assessments: Climate change allowance guidance published by HM Government, May 2022 ([Ref. 8)

3.2.5.2 The development proposal comprises an operational terminal designed to service the embarkation and disembarkation of principally commercial and automotive traffic associated with the proposed roll-on/roll-off facility; this facility is to promote an engineered design standard of 75 years to align with the lifetime of a non-residential development as per PPG ([Ref. 4), thus the recommended national precautionary sensitivity ranges for peak rainfall intensities will be applied accordingly.

3.2.5.3 To account for the potential effects of climate change, a climate change allowance has been included for design storms in accordance with "Flood risk assessments: climate change allowances", HM Government, 2022 ([Ref. 8). The Guidance states that for assets with a development design lifetime of between 2061 and 2100, the central allowance of the 2070s Epoch should be used. The central allowances for the 2070s Epoch for the Louth Grimsby and Ancholme Management Catchment are as follows:

- 3.3% AEP (1 in 30-year return period) **25%**
- 1% AEP (1 in 100-year return period) **25%**

3.2.6 Surcharged Outfall Conditions

3.2.6.1 The drainage strategy has been developed based on the following outfall conditions:

- Discharge into the Humber Estuary via existing Combined Effluent / Storm Water Pumping Station:
    - The performance of the pumping station has not been assessed; a free discharge into the pumping station's wetwell has been assumed. It is assumed that the pumping station has been designed to operate under surcharged outfall conditions and therefore will not impact on the gravity-driven elements of the network. This approach shall be further developed in the next stage of design.
- Discharge into Immingham Dock via existing Surface Water Pumping Station:
    - The performance of the pumping station has not been assessed; a free discharge into the associated lift station's wetwell has been assumed. It is assumed that the pumping station has been designed to operate under surcharged outfall conditions and therefore will not impact on the gravity-driven elements of the network. This approach shall be further developed in the next stage of design.
- Discharge into the Habrough Marsh Drain via existing gravity outfalls:
    - The Habrough Marsh Drain is subject to tidal interaction and during high tides the down stream flood gates are closed to prevent fluvial flooding. The water levels in the drain are monitored by the IDB, and although levels increase during the tidal cycle it is understood that the water remains within the banks. The drainage strategy has been developed to allow for the tidal cycle and application of surcharged conditions.

3.2.6.2 Sensitivity testing has been carried out to assess the hydraulic performance of the drainage networks with a gravity outfall, namely Northern Catchment A and Southern Catchment B and C (drawings B2357300 - 01 - 05 – 01 and 02 respectively), in periods of high water levels in the receiving watercourse (Habrough Marsh Drain). In lieu of a detailed understanding of the range of water levels or tidal influence within the Habrough Marsh Drain, the following sensitivity tests have been carried out:

- Test against a surcharged outfall of +3.7 mAOD (equivalent to bank full with 300 mm freeboard)
- Test against a surcharged outfall of +1.9 mAOD (equivalent to MHWN level in the Humber Estuary)

3.2.6.3 For each sensitivity test, the hydraulic models were run for a range of return periods up to and including the 1 in 30-year +CC event, for durations up to and including 1440 mins (24 hours), and on the assumption that water levels are unlikely to be this high for longer than 24 hours. The networks were not altered from the proposed case with no additional outfall structures, such as a flap valve, added; only the outfall conditions (i.e. water level) were changed. To ascertain if additional outfall structures (overflows) are needed in order to negate the inundation of the drainage system and ensure functionality of control structures, the interaction between the drainage system and fluvial flows in the Habrough Marsh Drain will be fully assessed during future design stages.

3.2.7 Sustainable Drainage Systems (SuDS)

3.2.7.1 The utilisation of sustainable drainage features should be used where possible to provide the required levels of treatment in accordance with policy and best practice. However, for the following reasons, it is proposed to utilise a traditional gully inlet and piped positive drainage network in combination with underground storage facilities and proprietary treatment units:

- The requirement to keep the drainage system as shallow as possible to negate surcharged conditions,
- The lack of infiltration potential due to the underlying ground conditions, which comprise Clay and Made Ground, some of which may be contaminated such that infiltration could cause contaminant migration.

- The potential for high groundwater levels below the finished pavement levels and perched groundwater which could contain contaminants such that infiltration could cause contaminant migration.

3.2.8 Pollution and Water Quality

3.2.8.1 In accordance with NPPF consideration is to be given to pollution control measures to mitigate the risk posed by potential contaminants within surface water runoff from entering local watercourses. Although withdrawn, PPG3 (2006) ([Ref. 10) has been referred to for the selection of appropriate pollution prevention measures in lieu of updated guidance.

3.2.8.2 Potential pollution sources include:

- Motorised vehicles, such as Heavy Goods Vehicles, Tugs and Reachstackers trafficking the site.
- Refuelling activities within the dedicated fuel station.

3.2.8.3 The proposed development site has been subdivided into two areas for the purposes of pollution control:

- Operational Yards:
  - These areas fall under the PPG3 ([Ref. 10) category of "vehicle maintenance area, Goods Vehicle parking or vehicle manoeuvring and therefore shall be treated to Class 1 Full Retention Separator standards to BS EN 858 ([Ref. **11**).
- Fuel Station:
  - This area falls under the PPG3 ([Ref. 10) category of "retail fuel forecourts" and shall therefore be treated via a Full Retention Forecourt Separator designed in accordance with BS EN 858 ([Ref. **11**). The designated refuelling area is required to be contained to capture any significant spillage. The form of containment shall be through the installation of a perimeter channel drain which will enable the storm runoff to drain under normal conditions.

3.3 Existing Surface Water Drainage

3.3.1 Northern Development Site

3.3.1.1 Drainage Catchment

3.3.1.1.1 The northern development site comprises two distinct development areas, a northern area and a southern area as shown in Drawing B2357300-01-05-11. These areas have been subdivided into four drainage catchments within the site boundary, three in the north and one in the south. Further details on these drainage catchments are provided in Table 2.

Table 2: ***Development area drainage catchment information (from geotechnical survey information)***

Northern Development Site

Development Area	Drainage Catchment	Size (Ha)	Comments
Northern Area	Catchment N-A	0.813	Lean-mix concrete surface, graded towards an existing gully and pipe system, which discharges by gravity to the Habrough Marsh Drain
	Catchment N-B	-	Lean-mix concrete surface. Existing grading falls away from existing drainage systems and results in surface ponding. Considered not to

Development Area	Drainage Catchment	Size (Ha)	Comments
			contribute to any existing drainage system
	Catchment N-C	-	-
Drury Ltd. Area	Catchment N-D	-	Catchment consists of building roof and impermeable hardstanding areas, which are collected by gullies and linear channels. Flows discharge to the Habrough Marsh Drain.

3.3.1.2 Drainage System

3.3.1.2.1 Of the four drainage catchments identified in Table 2, available records show that only two include positive drainage systems, namely, Catchment N-A and Catchment N-D.

3.3.1.2.2 Catchment N-A is served by numerous drainage branches which connect into a carrier pipe. Although specific collector systems are not shown within the available records, it may be assumed runoff is intercepted by gullies. The collected runoff is then conveyed via a 525 mm diameter outfall which discharges into the Habrough Marsh Drain. This outfall is relatively close to the tidal flood gates, denoted by a headwall within the bank of the watercourse, and with an assumed invert level of approximately +0.879 mAOD.

3.3.1.2.3 Catchment N-D contains a number of buildings and is served by a combination of gullies, linear drainage channels, and building roof drainage. The building roof drainage comprises down pipes which appear to outfall to the ground surface, where runoff is then intercepted by the collector systems within the pavements. Some of the collected runoff is conveyed via a carrier drain that discharges into a local pumping station located in the vicinity of the south-western corner of Shed 6; the pumping station lifts the flows via a short section of rising main into a section of pipework that conveys the flows under gravity to an outfall structure constructed on the west bank of Habrough Marsh Drain.

3.3.1.3 Proprietary Treatment Facilities and SuDS

3.3.1.3.1 Other than a separator located at the head of a drainage branch which joins the main carrier pipework in Catchment N-D, as detailed on drawing no. B2357300-01-05-11, there is no evidence in the provided drainage records of other proprietary or sustainable urban treatment facilities serving the existing surface water drainage system installed in Catchment N-A.

3.3.1.4 Runoff Assessment

3.3.1.4.1 The performance of the existing drainage serving the predeveloped site has been assessed in relation to the contributing areas; this assessment will inform the allowable discharge rates for the proposed drainage strategy in accordance with the criteria outlined in Sections 3.2.3 and 3.2.4. As this network is to discharge to the Habrough Marsh Drain, the brownfield runoff rates as derived via hydraulic modelling shall be factored to comply with the requirement to reduce discharge rates by 30%. The assessment will not consider an allowance for climate change as the assessment is based on the current "actual" discharge rates.

3.3.1.4.2 As only enabling works are being proposed within the southern catchment area to facilitate the construction of the overbridge, and the existing paving is not being revised, it was not deemed necessary to assess the hydraulic performance of the existing surface water drainage system in Catchment N-D.

3.3.1.5 Hydraulic Performance – Network Modelling

3.3.1.5.1 An assessment of the hydraulic performance of the existing surface water drainage system serving Catchment N-A was undertaken to quantify the actual runoff that discharges into Habrough Marsh Drain. The drainage assessment was conducted by simulating the existing surface water drainage system within the latest version of Innovyze's MicroDrainage suite of software. The simulations were run for the design storm events and input information as detailed below for both summer and winter rainfall profiles.

3.3.1.5.1 Existing Surface Topography

3.3.1.5.1.1 The ground levels incorporated into the network model were based on record topographic survey data (drawing B2429400-JAC-00-ZZ-M2-ZZ-0001), where available; where topographic survey data was not available, LiDAR data was used.

3.3.1.5.2 Existing Surface Permeability

3.3.1.5.2.1 For the purposes of assessing surface water runoff, all buildings and areas of impermeable hardstanding within the bounds of the redevelopment site that are contributing to the network have been assumed to be 100% impermeable. Based on the LiDAR data, the topography of areas adjacent to the network's catchment fall away from the area and have therefore been excluded from this assessment.

Table 3: ***Contributing surface areas used to model the existing surface water drainage system within the redevelopment site***

Northern Development Area

Contributing Surface	PIMP	Area (Ha)
Roofs	100	0.000
Hardstanding (Surfaced)	100	0.813
Total	-	0.813

3.3.1.5.3 Model Input Values

3.3.1.5.3.1 The input values applied to the model are detailed in Table 4. The values are consistent across the development site and therefore apply to each development area.

Table 4: ***Notes on the design criteria and input values used to model the pre-development surface water drainage network in MicroDrainage***

Northern, Southern and Western Development Areas

Model Design Criteria	Value(s)	Notes
Climate change	CC: 0%	Brownfield Runoff Assessment (does not consider an allowance for climate change as the assessment is based on the current "actual" discharge rates).
Design event	1, 30, and 100 years	Design events for 1 in 1, 30, 100 years have been used for modelling to determine allowable discharge rates.
Rainfall data	M5-60: 17 mm Ratio (R): 0.400	Rainfall data for the site location was obtained from the Flood Studies Report (FSR) and through the HR Wallingford online tool.
Volumetric Run-off Coefficient	Summer: 0.75 Winter: 0.84	Standard volumetric runoff coefficients of 0.75 and 0.84 were applied for the summer and winter respectively.
Global manhole headloss	0.5	Default software value
Pipe roughness	0.6 mm	Standard Colebrook-White roughness coefficient for surface water drainage design
MADD factor	2 m^3/ha	Standard MADD factor for surface water drainage design for permeable areas.

Model Design Criteria	Notes
Existing Surface Topography	The ground levels incorporated into the network model were based on record topographic survey data where it was available; where topographic survey data was not available, open source LiDAR data was used (https://environment.data.gov.uk/DefraDataDownload/?Mode=survey).`

Model Design Criteria	Notes
Outfall	All models were conducted with an assumed free discharge (hot start 0 mins and hot start level 0 mm). For sensitivity testing, surcharged conditions were tested as described in Sections 3.4.3.3.1 (North) and 3.4.4.3.1 (South).

3.3.1.5.4 Model Output Files

3.3.1.5.4.1 The MicroDrainage model for the brownfield runoff assessment suggested that the existing peak discharge rates range between 83 and 228 l/s depending on the design storm return period. The simulation results are presented in Appendix B.

3.3.1.5.4.2 Three return periods were tested to correspond with the design criteria associated with the proposed redevelopment; the simulation results are shown in Table 5.

Table 5: *Modelled existing surface water discharge rates*

Northern Development Site – Catchment N-A (model pipe reference S1.006)

Design Storm Event (1: xx)	1 year	30 year	100 year
Modelled Discharge Rate (l/s)	83	193	228

3.3.1.6 Allowable Discharge Rates

3.3.1.6.1 The allowable discharge rate promoted for the brownfield development site, which have been derived in accordance with the IDB's requirements as outlined in Sections 3.2.3 are shown in Table 6:

Table 6: *Allowable discharge rates (30% betterment)*

Northern Development Site – Catchment N-A

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	58.0	134.7	159.7

3.3.1.6.2 The allowable discharges rates are based on the evaluation of the limited site records; however, they are considered to be conservative and appropriate to form the basis of the drainage strategy.

3.3.2 Southern Development Site

3.3.2.1 Drainage Catchment

3.3.2.1.1 The southern development site comprises three distinct development areas as shown on drawing no B2357300-01-05-12; these areas have been subdivided into six drainage catchments. Further details of these drainage catchments are provided in Table 7.

Table 7: *Development area drainage catchment information (from survey information)*

Southern Development Site

Development Area	Drainage Catchment	Size (Ha)	Surfacing
Main Area	Catchment S-A	2.082	Deteriorated asphalt with a thin subbase over made ground. A proportion of this area appears to drain to the Combined Treated Effluent / Storm Water Pumping Station
	Catchment S-B	4.326	Mixture of: cement-stabilised Type 1 over made ground; 100-150 mm stone cover over a geotextile over made ground; soil heaps. Land drainage outfalls to Habrough Marsh Drain.

Development Area	Drainage Catchment	Size (Ha)	Surfacing
	Catchment S-C	1.952	Impermeable hardstanding and roof areas associated with Shed 26, positively drained to the Habrough Marsh Drain
Eastern Satellite Area	Catchment S-D	Not positively drained	n/a
	Catchment S-E	Not positively drained	n/a
Northern Satellite Area	Catchment S-F	Not positively drained	n/a

3.3.2.2 Drainage System

3.3.2.2.1 Of the six drainage catchments identified in Table 7, records suggest that only three include positive drainage systems, namely Catchment S-A, Catchment S-B and Catchment S-C.

3.3.2.2.2 Catchment S-A comprises sporadic yard gullies, which convey a proportion of this catchment to the Combined Treated Effluent / Storm Water Pumping Station. Outside of the proposed site boundary the gravity network is 450 mm diameter. Inside the proposed site boundary, the gravity system increases to 600 mm diameter suggesting that this section of pipework has been upsized to accommodate the runoff from within the existing site that is to be developed.

3.3.2.2.3 The pumping station comprises two pumps connected via a 300 mm delivery manifold. This delivery manifold discharges to an existing 600 mm rising main which discharges directly into the Humber Estuary via an in-river outfall structure. The outfall is subject to an Environmental Permit and is permitted to convey both treated wastewater effluent and treated or uncontaminated surface water runoff. The volume of treated effluent discharged into the Humber Estuary is restricted under the terms of the permit, though there is no restriction regarding the discharge of surface water runoff.

3.3.2.2.4 Catchment S-B is served by a surface water drainage system that has been installed along the length of an historic open drain that subdivided the site; the limited records show that the collector system comprises gullies which have been installed at heads of runs within the Cargo Storage Area. Site observations suggest that this network may also acts as a land drain, with evidence of filter media placed along the line of the pipework.

3.3.2.2.5 Catchment S-C serves the building footprint and an area of hardstanding adjacent to Shed 26 and discharges to the downstream end of Catchment S-B. The collected runoff is then conveyed via a 525 mm diameter outfall which passes under the road and railway network that serves the Port, prior to discharging into the Habrough Marsh Drain. This outfall is denoted by a headwall within the bank of the watercourse and has an assumed invert level of approximately +0.4 mAOD.

3.3.2.3 Proprietary Treatment Facilities and SuDS

3.3.2.3.1 There is a requirement within the Environmental Permit that all surface water runoff that discharges into the Humber Estuary via the Combined Treated Effluent / Storm Water Pumping Station is treated or is uncontaminated, however, the provided records show no evidence of proprietary or sustainable drainage treatment facilities serving the existing surface water drainage system installed in the catchment. This is with exception to the runoff generated by Shed 26 in Catchment S-C; there is a separator serving runoff generated within the Shed 26 area.

3.3.2.4 Runoff Assessment

3.3.2.4.1 The performance of the existing drainage serving the predeveloped site has been assessed in relation to the contributing areas; this assessment will inform the allowable discharge rates for the proposed drainage strategy in accordance with the criteria outlined in Sections 3.2.3 and 3.2.4.

Catchment S-A

3.3.2.4.2 The drainage within Catchment S-A discharges to the Humber Estuary and therefore is not subject to a post-development discharge rate restriction (see Section 3.2.3). It is proposed to utilise the existing drainage system and pumping station to drain flows from the proposed development. The existing network has been assessed based on a high-level review of the spare network capacity, however ,in lieu of undertaking a full assessment of the surface water network, the available capacity has been derived based on the difference between the full-bore capacity of the 450 mm diameter pipework immediately outside of the site boundary and the 600 mm diameter outfall pipe within the site boundary and that discharges into the pumping station's wetwell from the contributing catchment. The flows potentially discharged from the existing drainage system via the full bore 450 mm and 600 mm pipes were then compared to the pumping rates based on the pumps systems curves that are available within the records. The calculations are presented in Appendix B.

Catchments S-B and S-C

3.3.2.4.3 The drainage within Catchments S-B and S-C, that discharges via a common outfall into the Habrough Marsh Drain, has been assessed in a similar manner to the assessment undertaken for the northern catchment as detailed in Section 3.3.1.4. The brownfield runoff rates as derived via hydraulic modelling shall be factored to comply with the requirement to reduce discharge rates by 30%., The assessment will not consider an allowance for climate change as the assessment is based on the current "actual" discharge rates.

3.3.2.5 Hydraulic Performance – Network Modelling

3.3.2.5.1 An assessment of the hydraulic performance of the existing surface water drainage system serving Catchments S-B and S-C was undertaken to quantify the actual runoff that discharges into Habrough Marsh Drain.

3.3.2.5.2 The drainage assessment was conducted by simulating the existing surface water drainage system within the latest version of Innovyze's MicroDrainage suite of software. The simulations were run for the design storm events with the following input information for both summer and winter rainfall profiles.

3.3.2.5.1 Existing Surface Permeability

3.3.2.5.1.1 For the purposes of assessing surface water runoff, all buildings and areas of impermeable hardstanding within the bounds of the redevelopment site that are contributing to the network have been assumed to be 100% impermeable. Areas of cement-stabilised Type 1 over made ground, and areas of 100-150 mm stone cover over a geotextile over made ground have been assumed to be 30% impermeable.

Table 8: ***Contributing surface areas used to model the existing surface water drainage system within the redevelopment site***

Southern Development Area

Contributing Surface	PIMP	Area (Ha)
Roofs	100	1.952
Hardstanding (Surfaced)	100	
Hardstanding (Unbound Surfacing)	30	4.326
Total	-	6.278

3.3.2.5.2 Model Input Values

3.3.2.5.2.1 The input values applied to the model are detailed in Table 4, found in Section 3.3.1.5.3. The values are consistent across the development site and therefore apply to each development area.

3.3.2.5.3 Model Output Files

3.3.2.5.3.1 The MicroDrainage model for the brownfield runoff assessment suggested that existing peak discharge rates range between 153 and 283 l/s depending on the design storm return period. The simulation results are presented in Appendix B.

3.3.2.5.3.2 Three return periods were tested to correspond with the design criteria associated with the proposed redevelopment and the simulation results are shown in Table 9.

Table 9: ***Modelled existing surface water discharge rates***

Southern Development Site – Catchment S-A (model pipe reference S1.007)

Design Storm Event (1: xx)	1 year	30 year	100 year
Modelled Discharge Rate (l/s)	153	238	283

3.3.2.6 Allowable Discharge Rates

3.3.2.6.1 The allowable discharge rates promoted for the brownfield development proposal derived in accordance with the IDB's requirements as outlined in Section 3.2.3 are shown in Table 10:

Table 10: ***Allowable discharge rates (30% betterment)***

Southern Development Site – Catchment S-B and S-C

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	106.4	165.9	198.1

3.3.2.6.2 The allowable discharges rates are based on the evaluation of the limited site records, however, are considered to be conservative and appropriate to form the basis of the drainage strategy. The available capacity within the Combined Treated Effluent / Storm Water Pumping Station, as detailed within the calculation presented with Appendix B, is summarised below in Table 11:

Table 11: ***Capacity Assessment***

Southern Development Area – Catchment S-A

		Flow rate (l/s)	Velocity (m/s)
Incoming Network	450 mm dia (full bore)	142	-
	600 mm dia (full bore)	302	-
	Available Capacity	160	
Outgoing Network	Pump Capacity (Duty)	75	
	Manifold Pipe (300mm dia – Duty-assist pumping)	150	2

3.3.2.6.3 Considering the information in Table 11, it is possible to draw two conclusions in terms of limiting discharge rates:

- The pipe-full flow from the external catchment is 142 l/s, with a pumping station capacity of 150 l/s. In order to retain the existing pumping station, discharge should be limited to 8 l/s.
- The available capacity within the existing 600 mm diameter pipework on the gravity network is 160 l/s; in order to retain the existing gravity outfall into the existing wet well, discharge should be limited to 160 l/s. This philosophy would risk overloading the existing pumping station, which would necessitate the pumps to be upsized to accommodate the additional flow.

3.3.2.6.4 Restricting the discharge to 8 l/s would result in a significant volume of water needing to be stored within the network. Restricting discharge to 160 l/s would potentially require the existing Combined Treated Effluent / Storm Water Pumping Station to be upgraded to deliver a greater flow rate. The outfall is to the Humber Estuary and therefore increasing the pumping station's discharge flow rate will not affect flood risk in the receiving watercourse (Humber Estuary).

3.3.2.6.5 The existing pumping station delivers flows via a 300 mm diameter manifold pipe, which connects to a 600 mm rising main discharging into the Humber Estuary. It is therefore assumed that this 600 mm diameter rising main would have spare capacity to acceptable increased flows, which may additionally aid in the hydraulic performance of the existing main as flows, and therefore velocities, will be higher and help to mitigate the risk of solids settling out in the main over time.

3.3.2.6.6 It is therefore proposed to limit discharge to the existing wet well to 160 l/s.

3.3.3 Western Development Site

3.3.3.1 Drainage Catchment

3.3.3.1.1 The western development site comprises one development area historically used for vehicle storage and parking, as shown on drawing no B2357300-01-05-19. This area can be subdivided into two drainage catchments. Unlike the other development areas, though, these catchments are not defined by physical features, boundaries, or topography, and are instead defined by the nature of the surfacing. Further details of these drainage catchments are provided in Table 12.

Table 12: ***Development area drainage catchment information (from geotechnical survey information)***
Western Development Site

Development Area	Drainage Catchment	Size (Ha)	Surfacing
Main Area	Catchment W-A	4.216	A mixture of impermeable asphalt surfacing and semi-permeable compacted fill. For the purposes of this assessment, only the impermeable asphalt surface area is reported. Area drains via a gravity drainage network to a pumping station discharging to Immingham Dock.
	Catchment W-B	0.364	A mixture of impermeable asphalt surfacing and semi-permeable compacted fill. For the purposes of this assessment, only the impermeable asphalt surface area is reported. Area is assumed to permit a degree of infiltration into the adjacent ground.

3.3.3.2 Drainage System

3.3.3.2.1 Catchment W-A comprises a daisy-chained pipe and gully arrangement running along the south-western side of the plot. The gullies collect runoff from the catchment and flows are conveyed through the piped system, via and existing separator, to a recently constructed surface water lift station on the north-eastern boundary of the site. The lift station conveys flows to the adjacent Storm Water Pumping Station which is served by a rising main which discharges directly into Immingham Dock.

3.3.3.3 Proprietary Treatment Facilities and SuDS

3.3.3.3.1 The surface water drainage system serving the western development site has recently been updated and incorporates proprietary treatment facilities in the form of a separator upstream of the recently constructed surface water lift station. The location of this separator can be found in drawing B2357300-01-05-19.

3.3.3.4 Runoff Assessment

3.3.3.4.1 The drainage within Catchment W-A discharges to Immingham Dock and therefore is not subject to a post-development discharge rate restriction (see Section 3.2.3). It is proposed to utilise the existing drainage system and pumping station to drain flows from the proposed development, subsequently maintaining the existing peak discharge rate via the existing pumping station. It is proposed to control the flows into the pumping station by replacing the existing lift station with a deeper lift station of equivalent discharge rate.

3.3.3.4.2 In lieu of details of the existing lift station, an assessment has been made with regards to the capacity of the upstream gravity network that feeds it. The assessment has been made on the basis that the existing lift station's pump rate is expected to be approximately equivalent to the peak 1 in 1-year discharge rate from its contributing network. The assessment will not consider an allowance for climate change as the assessment is based on the current "actual" discharge rates.

3.3.3.5 Hydraulic Performance – Network Modelling

3.3.3.5.1 An assessment of the hydraulic performance of the existing surface water drainage system serving Catchment W-A was undertaken to quantify the actual runoff that discharges into the lift station. The drainage assessment was conducted by simulating the existing surface water drainage system within the latest version of Innovyze's MicroDrainage suite of software. The simulations were run for the design storm events with the input values detailed below for both summer and winter rainfall profiles.

3.3.3.5.1 Existing Surface Permeability

3.3.3.5.1.1 For the purposes of assessing surface water runoff, all buildings and areas of impermeable hardstanding within the bounds of the redevelopment site that are contributing to the network have been assumed to be 100% impermeable. In addition, all contributing permeable areas have been conservatively discounted from this assessment. In reality, the existing case flows will be greater as additional flows will contribute from these permeable areas.

Table 13: ***Contributing surface areas used to model the existing surface water drainage system within the redevelopment site***

Western Development Area

Contributing Surface	PIMP	Area (Ha)
Roofs	100	0.000
Hardstanding (Surfaced)	100	4.216
Total	-	4.216

3.3.3.5.2 Model Input Values

3.3.3.5.2.1 The input values applied to the model are detailed in Table 4, found in Section 3.3.1.5.3. The values are consistent across the development site and therefore apply to each development area.

3.3.3.5.3 Model Output Files

3.3.3.5.3.1 The MicroDrainage model for the brownfield runoff assessment suggested that the existing peak discharge rates range between 129.7 and 138.1 l/s depending on the design storm return period. The simulation results are presented in Appendix B.

3.3.3.5.3.2 Three return periods were tested to correspond with the design criteria associated with the proposed redevelopment; the simulation results are shown in Table 14.

Table 14: ***Modelled existing surface water discharge rates***

Western Development Site – Catchment W-A (model pipe reference S1.009)

Design Storm Event (1: xx)	1 year	30 year	100 year
Modelled Discharge Rate (l/s)	129.7	137.9	138.1

3.3.3.6 Allowable Discharge Rates

The assessment has been made on the basis that the existing lift station's pump rate is expected to be approximately equivalent to the peak 1 in 1-year discharge rate from its contributing network. From Table 14, which shows a 1 in 1-year discharge rate of 129.7 l/s, it is proposed to limit the discharge from this catchment to a slightly lower value of 120 l/s, as summarised below in Table 15:

Table 15: ***Allowable discharge rates (30% betterment)***
Western Development Site – Catchment W-A

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	120	120	120

The allowable discharges rates are based on the evaluation of the limited site records, however, are considered to be conservative and appropriate to form the basis of the drainage strategy.

3.4 Surface Water Drainage Strategy

3.4.1 Introduction

3.4.1.1 A drainage strategy has been developed to support the proposed terminal development, giving consideration to the legislative requirements, operational layout, existing site drainage and associated outfall arrangements, pollution risk, and the allowable discharge rates as advised by the IDB.

3.4.1.2 The development site has been subdivided into the following areas due the complexities of the existing Port layout, and thus independent drainage strategies have been developed accordingly:

- Site-Wide Activities
- Northern Development Area
- Southern Development Area
- Western Development Area

3.4.1.3 The strategy encompasses the grading of the pavement within the development areas, flood risk mitigation and quality improvements to ensure the transfer of flows into the receptor do not have a negative impact on the environment.

3.4.1.4 The provision of suitable storage on site to mitigate the flood risk resulting from the development of the site will be a key component of the evolution of the site development layout. The provision of large volumes of attenuation within an operational port is challenging, and thus storage options which comprise buried structures is favoured to surface storage features such as detention basins.

3.4.2 Site-Wide Activities

3.4.2.1 Site Grading

3.4.2.1.1 The existing Cargo Handling Areas shall be regraded to ensure the new terminal areas are effectively drained and that surface water runoff, generated through the creation of significant areas of impermeable hardstanding, is retained within the bounds of the development during all design storm events prior to being treated and discharged appropriately.

3.4.2.1.2 The grading of the areas of hardstanding supporting the facility has been undertaken with due regard to the functionality of the facility and has aided in the positioning of drainage collection facilities within the various sub-catchments. The gradients promoted align with the finished surfacing materials to ensure the effective runoff of surface water to negate ponding, and the potential for ice forming on the surface during the colder winter months.

3.4.2.1.3 The grading layout ensures that all areas of hardstanding in general fall away from the envelope of any buildings and that the new pavement levels tie-in with existing topography to negate the transfer of surface water runoff outside the development boundary. Due to the level of the infrastructure located around the perimeter of the site, which is in general at a level of approximately +5 mAOD, and the intent to discharge the runoff generated within the area via existing infrastructure, it is envisaged that ground levels will be raised. The pavement grading has been aligned to suit the allocated trailer parking and container stacking layout, whilst the proposed gradients typically range between 1 in 60 and 1 in 100 in accordance with BS EN

752:2017 ([Ref. 7). The grading typically promotes a ridge and valley arrangement, with both the ridges and the valleys located away from vehicle parking spaces.

3.4.2.1.4 The UK Border Force Examination Buildings incorporate flush thresholds to enable free access to vehicles subject to examination.

3.4.2.1.5 The ABP controlled railway tracks are typically lower than the proposed areas of hardstanding which have been graded to fall away from the tracks to ensure the paving is effectively drained. A new level crossing will facilitate vehicular movements and the grading layout promotes appropriate approach alignments.

3.4.2.1.6The site grading across the Development Area is detailed on drawing no B2357300 - 01 - 05 - 08.

3.4.2.2 Collector systems

3.4.2.2.1 The collector system is to comprise gullies located in the valleys within the pavement; these gullies will be placed at an appropriate spacing, which will align with the serviceable catchment. The spacing of gullies shall ensure a negligible surface water profile on the pavement during low order rainfall events.

3.4.2.2.2 Due to the proposed utilisation of the site, it is considered acceptable to permit short term ponding in the vicinity of the gullies during high intensity rainfall events, however, the spacing shall be sufficient to not result in flooding outside of the site boundary during short-duration and high-intensity 1 in 100-year (+CC) storm events. The spacing of gullies will be carried out during detailed design and have been shown indicatively on drawings B2357300 - 01 - 05 – 01, 02 and 09. The gullies will be connected to a number of lateral branches, typically comprising 225 mm diameter pipework; these shall have a minimum cover of 900 mm.

3.4.2.3 3.4.2.2.3 Channel drains will be placed in remote areas of hardstanding to facilitate connectivity with the main conveyance drainage, and across level building thresholds which have been provided to enable free access to vehicles subject to UK Border Force examination. Storage Structures

3.4.2.3.1 To accommodate the extensive storage volumes with the networks, which are required to balance the flows within the drainage systems during the design events, the strategy includes for the provision of geocellular storage crates. Where feasible, these shall be constructed under the trailer parking areas and be of sufficient long term strength to withstand the anticipated loading. The position of these crates has been selected to ensure that the capacity offered by the 95% void ratio is maximised, whilst chambers shall be constructed either side of the geocellular crates to enable the central distribution pipe to be efficiently maintained. To prevent infiltration and minimise the potential of groundwater mixing, the crates will additionally be lined with an impermeable membrane.

3.4.2.3.2 Development specific details for the promoted storage structures are provided in the following area specific strategies with their indicative locations shown in drawings B2357300 - 01 - 05 – 01, 02 and 09 for the northern, southern, and western areas respectively. The crate configurations will be further developed during detailed design.

3.4.2.4 Hydraulic Performance – Network Modelling

3.4.2.4.1 The surface water drainage system serving the areas of hardstanding within each development were modelled using the latest version of Innovyze's MicroDrainage suite of software. Input values used in the MicroDrainage models are shown in Table 16 for the design criteria. Input values regarding the contributing surfaces for the individual development areas are detailed within the following area specific sections.

3.4.2.4.1 Proposed Surface Topography

3.4.2.4.1.1 Ground levels used for the development of the network models were based on the proposed pavement levels for the new development areas and existing topographical survey data, as represented by Lidar for areas outside of the development sites.

3.4.2.4.1.2 A general arrangement of the proposed site grading for all development areas is detailed in Drawing No B2357300 - 01 - 05 – 08, which is presented in Appendix A.

3.4.2.4.2 Proposed Surface Permeability

3.4.2.4.2.1 For the purposes of assessing surface water runoff, all buildings and areas of impermeable hardstanding within the bounds of the redevelopment site have been assumed to be 100% impermeable.

3.4.2.4.3 Model Input Values

3.4.2.4.3.1 The input values applied to the model are detailed in Table 16.

Table 16: ***Notes on the design criteria and input values used to model the post-development surface water drainage network in MicroDrainage***

Northern Catchment

Model Design Criteria	Value(s)	Notes
Discharge rate and attenuation	North: See Table 18 South: See Table 21Table 23 West: See Table 26	North: 30% betterment on current "actual" peak discharge rates. South: Catchment S-A – Control to not exceed available capacity within existing gravity inlet to wetwell South: Catchments S-B and S-C – 30% betterment on current "actual" peak discharge rates West: Limit flows to pump rate from existing lift station
Climate change	CC: 25%	See section 3.2.5, 'Climate Change'
Design event	1, 30, and 100 years	-
Rainfall data	M5-60: 17 mm Ratio (R): 0.400	Rainfall data for the site location was obtained from the Flood Studies Report (FSR) and through the HR Wallingford online tool.
Volumetric Run-off Coefficient	Summer: 0.75 Winter: 0.84	Standard volumetric runoff coefficients of 0.75 and 0.84 were applied for the summer and winter respectively.
Minimum velocities	0.8 m/s	The gradients specified typically promote a minimum velocity at full bore of 0.8 m/s to ensure self-cleansing, whilst maintaining a positive connection to outfalls.
Pipe size	150 mm (Minimum)	A minimum pipe size of 150 mm diameter has been used for conveyance within carrier pipework.
Depth of cover and pipe depths	1.2 m (minimum)	A minimum cover depth of 1.2 m has been maintained where possible to provide adequate protection to the pipes and avoid any clashes with existing and proposed utilities. Where this is not possible, an absolute minimum depth of cover of 0.9 m has been applied.
Chambers	1200 mm diameter	Access chambers have been sized in accordance with Design and Construction Guidance (2020) ([Ref. 5]) to facilitate maintenance.
Global manhole headloss	0.5	Default software value
Pipe roughness	0.6 mm	Standard Colebrook-White roughness coefficient for surface water drainage design

3.4.2.5 Proprietary Pollution Prevention Facilities

3.4.2.5.1 Due to the operational nature of the development sites, it is proposed to install Class 1 Full Retention Separators; these separators are designed to achieve a discharge concentration of less than 5 mg/litre of oil under standard test conditions prior to discharge to a watercourse, and thus meet the legislative requirements.

3.4.2.5.2 The separators will be installed in the downstream sections of the drainage systems to ensure the entirety of the development sites are effectively treated. Due to capacity limitations of the proprietary separators, a number of separators have been specified across the network. The location of the separators will facilitate access for regular maintenance and thus ensure the long term performance of the proprietary treatment facilities. Indicative locations are shown on drawings in drawings B2357300 - 01 - 05 – 01, 02 and 09 for the northern, southern, and western areas respectively.

3.4.2.5.3 In addition, the fuel station, located within the southern network, is proposed to be protected by the inclusion of a perimeter drain discharging via a Class 1 Full Retention Forecourt Separator, which has 7600 litres capacity to deal with a significant spillage.

3.4.3 Northern Development Area

3.4.3.1 Main Conveyance Drainage System

3.4.3.1.1 The drainage conveyance system is to comprise pipework ranging between 225 to 900 mm diameter. The downstream section of the conveyance drain shall connect into the existing 525 mm diameter outfall pipework within the bounds of the development site. This outfall discharges via an existing headwall structure located on the west bank of the Habrough Marsh Drain; the invert level is assumed to be +0.879 mAOD.

3.4.3.1.2 The pipework is typically installed with a depth of cover of between 1.2 and 2.7 m and is supported by appropriately sized catchpits installed at intervals no greater than 90 m in accordance with the DCG, Version 2.0, 2020 ([Ref. 5).

<u>Flow Control</u>

3.4.3.1.3 To ensure compliance of the allowable discharge rates for the assessed design storm events, as discussed with the Internal Drainage Board, it is proposed to construct a Flow Control Chamber upstream of the point of connection with the existing outfall. This chamber will incorporate two orifice plates at different levels, designed to limit the varying pass forward flows for all storm events. The diameters of the orifice plates were established through an iterative process within MicroDrainage:

- 170 mm diameter orifice plate at +1.400 mAOD (utilised for all storm events)
- 208 mm diameter orifice plate at +2.565 mAOD (utilised during the 1 in 30 year and higher order design storm events)

3.4.3.1.4 The flow control chamber will be in an accessible location to facilitate maintenance; the provision of a bypass arrangement shall be assessed during detailed design as the risk of exceedance flows being transferred to the Habrough Marsh Drain in relation to the upstream catchment should a blockage occur will be required to be evaluated.

<u>Storage Structures</u>

3.4.3.1.5 To accommodate the extensive storage volumes with the network, the strategy includes for the provision of geocellular storage crates as detailed in Section 3.4.2.3. Quick storage estimate calculations using the Source Control module of MicroDrainage show that up to 3000 m^3 of storage would be required to accommodate rainfall during a 1 in 100 year storm event within the northern development area.

3.4.3.1.6 Within the model, approximately 1300 m^3 of storage has been provided via geocellular crating, with additional storage provided within the network pipework. This extensive volume of crating has been located throughout the network to create ten separate storage areas and ensure the individual storage volumes are fully utilised. A minimum cover depth of 1.5 m to the top of the geocellular crating has been maintained throughout, with the height of the crate volumes therefore ranging between 0.3 and 1.5 m dependent on the depth of the drainage network at their location. Accordingly, the base level of the separate storage volumes also varies between +3.2 and +1.8 mAOD.

3.4.3.1.7 A general arrangement of the proposed drainage system is detailed in Drawing No B2357300 - 01 - 05 – 01, which is presented in Appendix A.

3.4.3.2 Contributing Areas & Runoff Assessment

3.4.3.2.1 It is standard practice to assess both existing and proposed runoff from the contribution areas within a brownfield development site to inform the drainage design with regards to the application of SuDS and the management of discharged flow rates; this may be as a result of a change in land designation, change in catchment area where the site is currently positively drained, or the inclusion of climate change.

3.4.3.2.2 The development site is in part currently served by a positive drainage system which discharges to the Habrough Marsh Drain; it is proposed to retain the outfall, and thus the runoff from the existing drainage system has been assessed and the allowable discharge rates for all design storm events are detailed in Section 3.2.3. The runoff assessment associated with the proposed catchment area and permeable sub-catchments is detailed below.

Proposed Catchment Area

3.4.3.2.3 The proposed development site covers an area of approximately 4.735 ha, which is to be paved with an impermeable material; there are no buildings within this catchment.

3.4.3.2.4 Details of the contributing areas is summarised in Table 17 and detailed in Drawing B2357300 - 01 - 05 - 11.

Table 17: ***Contributing surface areas used to model the proposed surface water drainage system within the redevelopment site***

Northern Development Area

Contributing Surface	PIMP	Area (Ha)
Impermeable	100	4.735
Semi-permeable	30	0.0
Permeable	20	0.0

Runoff Rate Assessment

3.4.3.2.5 An assessment of pre and post development discharge rates has been undertaken based on the requirements of the Internal Drainage Board; the derived allowable discharge rate are detailed in Section 3.3.1.6 and are replicated in Table 18 below.

Table 18: ***Allowable discharge rates (30% betterment)***

Northern Development Site – Catchment N-A

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	58.0	134.7	159.7

3.4.3.3 Hydraulic Performance - Model Output

3.4.3.3.1 The drainage networks have been modelled using the latest version of Innovyze's MicroDrainage suite of software. The simulation results are presented in Appendix B with a summary of the modelled discharge rates presented in Table 19.

Table 19: ***Hydraulic performance compared with respect to the design criteria***

Northern Development Site – Catchment N-A

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	58.0	134.7	159.7
Model Output (l/s)	57.1	127.2	154.9

3.4.3.3.2 The simulation results demonstrate that the drainage system adequately meets the hydraulic design criteria outlined in Sections 3.2.3 and 3.2.4. The results show no surcharging within the network with the exception of immediately upstream of the flow control, for the 1 in 1 year return period event, including a 25% allowance for climate change. The results also show no flooding resulting from a 1 in 30 year return period event, including a 25% (Central) allowance for climate change. The system has also been checked against the 1 in 100 year return period event, including a 25% (Central) allowance for climate change, and has been found to fulfil the requirements of the stipulated design criteria. No flooding is observed for this event and therefore no further calculation is required to determine the extent of surface flooding.

3.4.3.3.1 Sensitivity Testing

3.4.3.3.3.1 Sensitivity testing has been carried out to assess the hydraulic performance of the drainage networks with a gravity outfall in periods of high water levels in the receiving watercourse (Habrough Marsh Drain). For each sensitivity test, the model was run for a range of return periods up to and including the 1 in 30-year +CC event, for durations up to and including 1440 mins (24 hours), on the assumption that water levels are unlikely to be this high for longer than 24 hours. The sensitivity testing showed:

- +3.7 mAOD surcharged outfall level (head from IL of 2.821 m)
  - Northern Catchment N-A showed no flooding for events up to and including the 1 in 25-year event. Flooding began to appear for the 30-year event.
- +1.9 mAOD surcharged outfall level (head from IL of 1.021 m)
  - Northern Catchment N-A showed no flooding for all events up to and including the 30-year event

3.4.3.4 Exceedance Flows

3.4.3.4.1 The surface water network is designed to ensure that the development is free from flooding for all events up to the 1 in 30 year event, +25% climate change allowance in accordance with the requirements of Design and Construction Guidance, Version 2.0, 2020 ([Ref. 5). The model has also been used to assess the flood extents for all events up to the 1 in 100 year event, +25% climate change to inform flood depths within the compound to ensure operations are not impaired; no flooding occurs for the 1 in 100 year event, +25% climate change.

3.4.3.2.2 In the event of a storm event in excess of the design return period, or in the event or a blockage in the network, flood waters will be retained within the bounds of the development site due to the pavement grading. Once this storage volume is exceeded, flood water will overtop the envelope of the catchment and be intercepted by adjacent surface water drainage networks, or the Habrough Marsh Drain. A full appraisal shall be undertaken during detailed design using the digital terrain mode; this is required to satisfy the requirements of PPG ([Ref. 4) where surface water flooding is deemed to be a Design Flood Event.

3.4.4 Southern Development Area

3.4.4.1 Main Conveyance Drainage System

3.4.4.1.1 The conveyance drainage system is sub-divided into two drainage systems due to the extent of the catchment.

Drainage Catchment S-A

3.4.4.1.2 The drainage system serving the western sub-catchment is to discharge into the existing Combined Treated Effluent / Storm Water Pumping Station and is to comprise a positive drainage conveyance system comprising 225 to 600 mm diameter pipework. The downstream section of the conveyance drain shall connect into the existing 600 mm diameter main inlet pipe located to the north of the pumping station’s wetwell.

Flow Control

3.4.4.1.3 As outlined in Section 3.3.2.6, it is proposed to restrict the discharge from Catchment S-A into the existing gravity wetwell inlet pipework to a combined 160 l/s, for all return periods. This is on the basis that the available capacity within the existing 600 mm diameter pipework on the gravity network is 160 l/s. This philosophy would risk overloading the existing pumping station. It is therefore proposed to upsize the existing Combined Treated Effluent / Storm Water Pumping Station to accommodate the additional flow. Since the outfall is to the Humber Estuary, increasing the pumping station's discharge flow rate will not affect flood risk in the receiving watercourse (Humber Estuary). The existing pumping station delivers flows via a 300 mm diameter manifold pipe, which is assumed to connect to a 600 mm rising main discharging into the Humber Estuary. It is therefore assumed that this 600 mm diameter rising main would have spare capacity to acceptable increased flows, which may additionally aid in the hydraulic performance of the existing main as flows and therefore velocities will be higher, helping to mitigate the risk of solids settling out in the main over time.

3.4.4.1.4 To ensure the inflow does not exceed the capacity of the existing gravity inlet pipe to the pumping station it is proposed to install two Flow Control Chambers upstream and either side of the point of connection with the existing inlet pipe. These chambers will incorporate hydrobrakes designed to limit pass forward flows for all storm events, the combined flow not exceeding the allowable discharge rate determined in Section 3.3.2.6:

- Hydrobrake at +2.421 mAOD, limiting flows to 110 l/s, for the eastern side of the Catchment S-A network
- Hydrobrake at +2.666 mAOD, limiting flows to 50 l/s, for the western side of the Catchment S-A network

3.4.4.1.5 The chambers will be in accessible locations to facilitate maintenance. The provision of a bypass arrangement shall be assessed during detailed design as the risk of flooding the wetwell in relation to the upstream catchment should a blockage occur will be required to be evaluated.

3.4.4.1.6 The pipework installed within each catchment is typically installed with a depth of cover of between 0.9 and 2.4 m and is supported by appropriately sized catchpits installed at intervals no greater than 90 m in accordance with the Design and Construction Guidance, Version 2.0, 2020 ([Ref. 5).

Drainage Catchments S-B and S-C

3.4.4.1.7 The drainage system serving the eastern sub-catchment is to discharge into the Habrough Marsh Drain and is to comprise a positive drainage conveyance system comprising 225 to 900 mm diameter pipework. The downstream section of the conveyance drain shall connect into the existing 525 mm diameter outfall pipework within the bounds of the development site. This outfall discharges via an existing headwall structure located on the west bank of the Habrough Marsh Drain; the invert level is assumed to be +0.4 mAOD.

Flow Control

3.4.4.1.8 To ensure compliance of the allowable discharge rate as discussed with the Internal Drainage Board it is proposed to construct a Flow Control Chamber upstream of the point of connection with the existing outfall. This chamber will incorporate a 300 mm diameter orifice plate at +0.575 mAOD that is designed to limit pass forward flows for all storm events. The chamber will be in an accessible location to facilitate maintenance; the provision of a bypass arrangement shall be assessed during detailed design as the risk of exceedance flows being transferred to the Habrough Marsh Drain in relation to the upstream catchment should a blockage occur will be required to be evaluated.

3.4.4.1.9 Due to space constraints, two intermediate flow control chambers have been added at strategic points within the network. Both control chambers incorporate a single hydrobrake to limit flows to the downstream network and to reduce the surcharging within the network where the existing Shed 26 drainage converges, to avoid detrimentally affecting the performance of the Shed 26 drainage network. Upstream of each intermediate control chamber, the balance of flow is proposed to be stored within buried geocellular storage crates. The hydrobrakes have been detailed as follows:

- Hydrobrake at +1.530 mAOD, limiting flows to 50 l/s from the proposed network serving south of Shed 26
- Hydrobrake at +3.004 mAOD, limiting flows to 5 l/s from the proposed network serving the fuelling station area north of Shed 26

3.4.4.1.10 The pipework installed within each catchment is typically installed with a depth of cover of between 1.2 and 3.2 m and is supported by appropriately sized catchpits installed at intervals no greater than 90 m in accordance with the Design and Construction Guidance, Version 2.0, 2020 ([Ref. 5).

Storage

3.4.4.1.11 To accommodate the storage volumes with the two catchment networks, the strategy includes for the provision of geocellular storage crates as detailed in Section 3.4.2.3. Quick storage estimate calculations using the Source Control module of MicroDrainage suggest that around 3500 m^3 of storage would be required within the Catchments to accommodate rainfall during a 1 in 100 year storm event.

3.4.4.1.12 This volume of storage has been provided through five individual geocellular crate structures, located across the two networks and separated to ensure their volumes are fully utilised. Of these structures, two are in Catchment S-A, one is in Catchment S-B, and two are in Catchment S-C.

3.4.4.1.13 Within Catchment S-A, a minimum cover depth of 1.3 m to the top of the crating has been maintained with the height of the crate volumes at 0.9 m to suit the comparatively shallow depth of the pumped drainage network; the base level of the two structures does not go below +2.4 mAOD.

3.4.4.1.14 The gravity network within Catchments S-B and S-C is however generally deeper, allowing for deeper crate heights from 0.3 to 1.8 m. Accordingly, a minimum cover depth of 1.5 m to the top of the geocellular crating could be maintained whilst the base levels of the structures ranging from +3.0 to +0.5 mAOD.

3.4.4.2 Contributing Areas & Runoff Assessment

3.4.4.2.1 It is standard practice to assess both existing and proposed runoff from the contribution areas within a brownfield development site to inform the drainage design with regards to the application of SuDS and the management of discharged flow rates; this may be as a result of a change in land designation, change in catchment area where the site is currently positively drained, or the inclusion of climate change.

3.4.4.2.2 The conveyance drainage system is sub-divided into two drainage systems due to the extent of the catchment as outlined in Section 3.4.4.1.

Drainage Catchment S-A

3.4.4.2.3 The development site is in part currently served by a positive drainage system. However, due to the extent of the catchment, limited drainage has been installed and none currently discharges into the Combined Pumping Station.

3.4.4.2.4 It is proposed to upgrade the pump sets serving the Combined Pumping Station, and thus the allowable discharge rates for all design storm events are detailed in Section 3.3.2.6. The runoff assessment associated with the proposed catchment area and the associated impermeable and permeable sub-catchments is detailed below.

Proposed Catchment Area

3.4.4.2.5 The proposed development site covers an area of approximately 3.588 ha, which is to be paved with an impermeable material; there are a number of buildings within this catchment, which will also be impermeable.

3.4.4.2.6 Details of the contributing areas is summarised in Table 20 and detailed in Drawing B2357300 - 01 - 05 - 02.

Table 20: *Contributing surface areas used to model the proposed surface water drainage system within the redevelopment site*

Southern Development Area – Catchment S-A

Contributing Surface	PIMP	Area (Ha)
Impermeable	100	3.588
Semi-permeable	30	0.0
Permeable	20	0.0

Runoff Rate Assessment

3.4.4.2.7 An assessment of pre and post development discharge rates has been undertaken based on the spare capacity within the existing gravity inlet to the Combined Treated Effluent / Storm Water Pumping Station; the derived allowable discharge rate are detailed in Section 3.3.2.6.

Table 21: ***Allowable discharge rates***

Southern Development Site – Catchment S-A

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	160	160	160

Drainage Catchments S-B and S-C

3.4.4.2.8 The development site is in part currently served by a positive drainage system which discharges to the Habrough Marsh Drain; it is proposed to retain the outfall, and thus the runoff from the existing drainage system has been assessed and the allowable discharge rates for all design storm events are detailed in Section 3.3.2.6.

3.4.4.2.9 The runoff assessment associated with the proposed catchment area and the associated impermeable and permeable sub-catchments is detailed below.

Proposed Catchment Area

3.4.4.2.10 The proposed development site covers an area of approximately 12.850 ha, which is to be paved with an impermeable material; there are a number of buildings within this catchment, which will also be impermeable.

3.4.4.2.11 Details of the contributing areas is summarised in Table 22 and detailed in Drawing B2357300 - 01 - 05 - 11.

Table 22: ***Contributing surface areas used to model the proposed surface water drainage system within the redevelopment site***

Southern Development Area – Catchments S-B and S-C

Contributing Surface	PIMP	Area (Ha)
Impermeable	100	12.850
Semi-permeable	30	0.0
Permeable	20	0.0

Runoff Rate Assessment

3.4.4.2.12 An assessment of pre and post development discharge rates has been undertaken based on the requirements of the Internal Drainage Board; the derived allowable discharge rate are detailed in Section 3.3.2.6 and are replicated in Table 23 below.

Table 23: ***Allowable discharge rates (30% betterment)***

Southern Development Site – Catchments S-B and S-C

Design Storm Event (1: xx)	1 year	30 year	100 year
Permitted Discharge Rate (l/s)	106.4	165.9	198.1

3.4.4.3 Hydraulic Performance - Model Output

3.4.4.3.1 The drainage networks have been modelled using the latest version of Innovyze's MicroDrainage suite of software. The simulation results are presented in Appendix B with a summary of the modelled discharge rates presented in Table 24.

Table 24: ***Hydraulic performance compared with respect to the design criteria***

Southern Development Site – Catchments S-B and S-C

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	106.4	165.9	198.1
Model Output (l/s)	93.0	165.3	189.4

Catchment S-A

3.4.4.3.2 The simulation results demonstrate that the drainage system adequately meets the hydraulic design criteria outlined in Sections 3.2.3 and 3.2.4. The results show no surcharging within the proposed network for the 1 in 1 year return period event, including a 25% allowance for climate change. The results also show no flooding resulting from a 1 in 30 year return period event, including a 25% (Central) allowance for climate change.

3.4.4.3.3 The system has also been checked against the 1 in 100 year return period event, including a 25% (Central) allowance for climate change and has been found to fulfil the requirements of the stipulated design criteria. Small volumes of flooding are observed for this event at various locations predominantly at heads of runs. The largest volume of flooding within the proposed network is 5.272 m^3 in pipe 8.000. This volume of flooding corresponds to a depth of flooding of 34 mm across the 46 m length of valley. At a 1 in 100 pavement gradient, this flooded area would have a total width of 6.8 m. Flooding is predominantly reported during short duration, high intensity storm events as a direct result of conveyance capacity restrictions in the pipework. As such, this flooding will quickly drain down after the storm's peak has passed.

Catchments S-B and S-C

3.4.4.3.4 The simulation results demonstrate that the drainage system adequately meets the hydraulic design criteria outlined in Sections 3.2.3 and 3.2.4. The results show no surcharging within the proposed network for the 1 in 1 year return period event, including a 25% allowance for climate change. Flooding is noted in pipe 26.000, which is the existing connection from Shed 26, which is not to be modified as part of the works. The flow controls within the network have been strategically located such that the hydraulic performance of pipe 26.000 is not detrimentally impacted by the works. The results also show no flooding resulting from a 1 in 30 year return period event, including a 25% (Central) allowance for climate change. As with the 1 in 1 year results, flooding is noted in pipe 26.000.

3.4.4.3.5 The system has also been checked against the 1 in 100 year return period event, including a 25% (Central) allowance for climate change and has been found to fulfil the requirements of the stipulated design criteria. Small volumes of flooding are observed for this event at various locations predominantly at heads of runs. The largest volume of flooding within the proposed network is 8.144 m^3 in pipe 11.000. This volume of flooding corresponds to a depth of flooding of 36 mm across the 62 m length of valley. At a 1 in 100 pavement gradient, this flooded area would have a total width of 7.25 m. Flooding is predominantly reported during short duration, high intensity storm events as a direct result of conveyance capacity restrictions in the pipework. As such, this flooding will quickly drain down after the storm's peak has passed. Flooding is again noted in pipe 26.000 during this event, which is the existing connection from Shed 26, which is not to be modified as part of the works.

3.4.4.3.1 Sensitivity Testing

3.4.4.3.1.1 Sensitivity testing has been carried out to assess the hydraulic performance of the drainage networks with a gravity outfall in periods of high water levels in the receiving watercourse (Habrough Marsh Drain). For each sensitivity test, the model was run for a range of return periods up to and including the 1 in 30-year +CC event, for durations up to and including 1440 mins (24 hours), on the assumption that water levels are unlikely to be this high for longer than 24 hours. The sensitivity testing showed:

- +3.7 mAOD surcharged outfall level (head from IL of 3.292 m)
  - Southern Catchments S-B and S-C showed no flooding for all events up to and including the 30-year event
- +1.9 mAOD surcharged outfall level (head from IL of 1.592 m)
  - Southern Catchments S-B and S-C showed no flooding for all events up to and including the 30-year event

3.4.4.4 Exceedance Flows

3.4.4.4.1 The surface water network is designed to ensure that the development is free from flooding for all events up to the 1 in 30 year event, +25% climate change allowance in accordance with the requirements of DCG, Version 2.0, 2020 ([Ref. 5). The model has also been used to assess the flood extents for all design storm events up to the 1 in 100 year event, +25% climate change to inform flood depths within the compound to ensure operations are not impaired; small volumes of flooding occur for the 1 in 100 year event, +25% climate change, all of which are contained within the pavement valleys as intended.

3.4.4.4.2 In the event of a storm event in excess of the design return period, or in the event or a blockage in the network, flood waters will be retained within the bounds of the development site due to the pavement grading. Once this storage volume is exceeded, flood water will overtop the envelope of the catchment and be intercepted by adjacent surface water drainage networks, or the adjacent railway track. A full appraisal shall be undertaken during detailed design using the digital terrain model; this is required to satisfy the requirements of PPG ([Ref. 4) where surface water flooding is deemed to be a Design Flood Event.

3.4.5 Western Development Area

3.4.5.1 Main Conveyance Drainage System

3.4.5.1.1 The drainage system serving the catchment is to discharge into the existing Stormwater Pumping Station and is to comprise a positive drainage conveyance system comprising 225 to 1200 mm diameter pipework. The downstream section of the conveyance drain shall discharge into the inlet to a proposed lift station which is served by a small section of rising main that lifts the flows into the storm water pumping station. The proposed lift station is to replace the existing lift station on a like-for-like basis in terms of pumping rates on the basis that the downstream stormwater pumping station is capable of dealing with this inflow. The lift station is required to be replaced due to the vertical alignment of the proposed conveyance drainage which is deeper than the existing drainage arrangement.

Flow Control

3.4.5.1.2 To ensure the inflow does not exceed the capacity of the like-for-like replacement lift station, the pumping capacity has been estimated and used as the allowable discharge rate (see Section 3.3.3.6). To control flows to the allowable discharge rate it is proposed to construct a Flow Control Chamber upstream of the lift station. This chamber will incorporate a hydrobrake at +0.792 mAOD and limit the pass forward flow to 120 l/s. Excess flows conveyed in the drainage system are required to be stored within the network.

Storage

3.4.5.1.3 To accommodate the extensive storage volumes with the network, the strategy includes for the provision of geocellular storage crates as detailed in Section 3.4.2.3. Quick storage estimate calculations using the Source Control module of MicroDrainage show that up to around 4000 m^3 of storage would be required to accommodate rainfall during a 1 in 100 year storm event within the northern development area.

3.4.5.1.4 Within the model, approximately 3000 m^3 of storage has been provided via geocellular crating. This extensive volume of crating has been located throughout the network to create three separate storage areas and ensure the individual storage volumes are fully utilised. A minimum cover depth of 1.4 m to the top of the geocellular crating has been maintained throughout, with the height of the crate volumes therefore ranging between 0.3 and 1.2 m dependent on the depth of the drainage network at their location. Accordingly, the base level of the separate storage volumes also varies between +3.0 and +2.0 mAOD.

3.4.5.1.5 The pipework installed within the catchment is typically installed with a depth of cover of between 1.2 and 3.8 m and is supported by appropriately sized catchpits installed at intervals of no greater than 90 m in accordance with the DCG, Version 2.0, 2020 ([Ref. 5).

3.4.5.1.6 A general arrangement of the proposed drainage systems is detailed in Drawing No B2357300 - 01 - 05 – 09, which is presented in Appendix A.

3.4.5.2 Contributing Areas & Runoff Assessment

3.4.5.2.1 It is standard practice to assess both existing and proposed runoff from the contribution areas within a brownfield development site to inform the drainage design with regards to the application of SuDS and the management of discharged flow rates; this may be as a result of a change in land designation, change in catchment area where the site is currently positively drained, or the inclusion of climate change.

3.4.5.2.2 The development site is in part currently served by a positive drainage system, however, due to the extent of the catchment limited drainage has been installed; all runoff is discharged to the stormwater lift station.

3.4.5.2.3 It is proposed to maintain the flows rate from the lift station; the allowable discharge rates for all design storm events are detailed in Section 3.3.3.6. The runoff assessment associated with the proposed catchment area and the associated impermeable and permeable sub-catchments is detailed below.

Proposed Catchment Area

3.4.5.2.4 The proposed development site covers an area of approximately 9.570 ha, which is to be paved with an impermeable material; there are no buildings within this catchment. Details of the contributing areas is summarised in Table 25 and detailed in B2357300 - 01 - 05 - 09.

Table 25: ***Contributing surface areas used to model the proposed surface water drainage system within the redevelopment site***

Western Development Area

Contributing Surface	PIMP	Area (Ha)
Impermeable	100	9.570
Semi-permeable	30	0.0
Permeable	20	0.0

Runoff Rate Assessment

3.4.5.2.5 An assessment of pre and post development discharge rates has been undertaken based on maintaining the existing pump rate for the replacement lift station; the derived allowable discharge rate are detailed in Section 3.3.3.6.

Table 26: ***Allowable discharge rates***

Western Development Site

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	120	120	120

3.4.5.3 Hydraulic Performance - Model Output

3.4.5.3.1 The drainage networks have been modelled using the latest version of Innovyze's MicroDrainage suite of software. The simulation results are presented in Appendix B with a summary of the modelled discharge rates presented in Table 27

Table 27: ***Hydraulic performance compared with respect to the design criteria***

Western Development Site

Design Storm Event (1: xx)	1 year	30 year	100 year
Allowable Discharge Rate (l/s)	120	120	120
Model Output (l/s)	119.5	119.5	119.5

3.4.5.3.2 The simulation results demonstrate that the drainage system adequately meets the hydraulic design criteria outlined in Sections 3.2.3 and 3.2.4. The results show no surcharging within the network with the exception of immediately upstream of the flow control, for the 1 in 1 year return period event, including a 25% allowance for climate change. The results also show no flooding resulting from a 1 in 30 year return period event, including a 25% (Central) allowance for climate change.

3.4.5.3.3 The system has also been checked against the 1 in 100 year return period event, including a 25% (Central) allowance for climate change and has been found to fulfil the requirements of the stipulated design criteria. Small volumes of flooding are observed for this event at various locations predominantly at heads of runs. The largest volume of flooding within the proposed network is 7.766 m^3 in pipe 7.000. This volume of flooding corresponds to a depth of flooding of 60 mm across the 22.378 m length of valley. At a 1 in 100 pavement gradient, this flooded area would have a total width of 12 m. Flooding is predominantly reported during short duration, high intensity storm events as a direct result of conveyance capacity restrictions in the pipework. As such, this flooding will quickly drain down after the storm's peak has passed.

3.4.5.4 Exceedance Flows

3.4.5.4.1 The surface water network is designed to ensure that the development is free from flooding for all events up to the 1 in 30 year event, +25% climate change allowance in accordance with the requirements of DCG, Version 2.0, 2020 ([Ref. 5). The model has also been used to assess the flood extents for all events up to the 1 in 100 year event, +25% climate change to inform flood depths within the compound to ensure operations are not impaired; small volumes of flooding occur for the 1 in 100 year event, +25% climate change, all of which are contained within the pavement valleys as intended.

3.4.5.4.2 In the event of a storm event in excess of the design return period, or in the event or a blockage in the network, flood waters will be retained within the bounds of the development site due to the pavement grading. Once this storage volume is exceeded, flood water will overtop the envelope of the catchment and be intercepted by adjacent surface water drainage networks, or the adjacent railway track. A full appraisal shall be undertaken during detailed design using the digital terrain model; this is required to satisfy the requirements of PPG ([Ref. 4) where surface water flooding is deemed to be a Design Flood Event.

3.5 Enabling Works

3.5.1 The existing Drury Ltd. site does not fall under the development scope. However, although no new drainage infrastructure is being proposed, to enable the construction of the proposed overbridge foundations, two sections of the existing surface water drainage network will need relocating. These sections are located at either end of the bridge structure.

3.5.2 For the northern end of the bridge structure, enabling works are to include:

- The abandonment and demolition of one existing manhole;
- The abandonment and demolition of one existing surface water pumping station (pumped manhole);
- The abandonment and demolition of a section of existing pipework, including some carrier pipework and portions of multiple connections;
- The construction of new pipework, providing connection between the remaining existing pipework and continuing the conveyance of collected runoff within the wider network;
- The construction of four new manholes, to connect the new pipework into the existing network, continue the conveyance of collected runoff within the wider network, and provide maintenance access;
- The construction of a new like-for-like pumping station (pumped manhole), to replace and replicate the existing station;
- The construction of a new rising main, to replace and replicate the existing rising main connection.

3.5.3 For the southern end of the bridge structure, enabling works are to include:

- The abandonment and demolition of one existing manhole;
- The abandonment and demolition of a section of existing pipework, including some carrier pipework and an existing connection;
- The construction of new pipework, to replicate an existing connection and continue the conveyance of collected runoff within the wider network;
- The construction of two new manholes, to connect the new pipework into the existing network and continue the conveyance of collected runoff within the wider network;
- The construction of one new inspection chamber, to provide maintenance access.

3.5.4 These works are detailed in Drawing B2357300 01 - 05 – 07, which is presented in Appendix A.

Foul Water Drainage Strategy

4.1 The development proposal includes for the construction of buildings and facilities as detailed below:

- Terminal Building
- Customer Welfare Building
- Workshop and Fuel Station
- UK Border Force Customs Building and supporting infrastructure, including Immigration PCP Booths and Marshalling Lanes, Cyclamen Portal, Secondary Examination Building, Holding Facility, and Inspection Areas
- Workshop and Office buildings for Malcom West Forklifts
- Substation
- Frequency Converter Building for Shore Power System

4.2 There are numerous buildings within the Port and it is assumed that these are served by dedicated wastewater drainage systems which are not adopted or served by a public sewerage system, and thus are the responsibility of the Port. Based on available records the wastewater drainage systems discharge to package treatment plants or cesspits. The treated effluent is conveyed to Pumping Stations that discharge to the Humber Estuary whilst the cesspits will require emptying via tanker. The Combined Treated Effluent / Stormwater Pumping Station in the bounds of the development site is subject to an Environmental Permit which limits the daily volume of treated effluent that is discharged into the Humber Estuary.

4.3 It is proposed to provide wastewater infrastructure to support the buildings; however, the layout and functionality shall be subject to development during detailed design. The proposed strategy is to treat the wastewater local to the building via a package treatment plant and convey the treated effluent to one of the combined pumping stations that discharge the treated effluent directly to the Humber Estuary, or to the Habrough Marsh Drain via the proposed surface water drainage networks. The increase in the volume of treated effluent discharged into the Humber Estuary will be subject to the agreement of the Environment Agency, and similarly any discharge into the Habrough Marsh Drain shall be subject to the consent of the IDB.

4.4 Indicative drainage arrangements associated with the buildings or facilities that incorporate welfare facilities are shown on Drawing No. B2357300 - 01 - 05 – 04 which is presented in Appendix A.

Conclusion

5.1 Jacobs has been commissioned to compile a Drainage Strategy associated with the construction of a new roll-on/roll-off facility within the Port of Immingham, located on the south bank of the Humber Estuary. A strategy comprising the following elements has therefore been developed to support the DCO application and considers the existing and proposed infrastructure, together with the logistics associated with operating the terminal:

- **Design**: The surface water drainage network has been developed in accordance with Design and Construction Guidance (2020) ([Ref. 5), Building Regulations, Planning Policy and Climate change guidance published by HM Government in May 2022 ([Ref. 8). Additional site-specific criteria relating to the allowable presence and impact of flooding have also been considered.
- **SuDS**: Due to the underlying ground conditions, potentially high groundwaters, and potential presence of contaminants, SuDS features have not been deemed appropriate for the development.
- **Grading**: Grading of the development Yards has been undertaken with due regard to the functionality of the facilities and ensures the effective runoff and collection of surface water. Additionally, the layout ensures that new pavement levels tie-in with existing topography and the railway level crossing is retained. The grading typically promotes a ridge and valley arrangement.
- **Collector systems**: The collector system is to comprise highway gullies located in the valleys within the pavement, the spacings of which will be carried out during detailed design with due consideration for flow widths and ponding depth in relation to the functionality of the facility. Channel drains will be placed in remote areas of hardstanding to facilitate connectivity with the main conveyance drainage, and across level building thresholds which have been provided to enable free access to vehicles subject to UK Border Force examination.
- **Conveyance**: A positive drainage conveyance system comprising 225 to 900 mm diameter pipework is being promoted, typically installed with a minimum cover depth of 0.9 m and supported by appropriately sized catchpits.
- **Discharge rates and flow control**: The existing discharge arrangements are to be mimicked for an appropriate range of rainfall events (1, 30 and 100 years), including an allowance for climate change. For outfalls into the Habrough Marsh Drain, the IDB have stipulated a 30% betterment in relation to the 'actual' existing discharge. To ensure compliance, the construction of a Flow Control Chamber upstream of each network's outfall is being promoted. Flows are being controlled using hydrobrakes and orifice plates as deemed appropriate.
- **Outfalls**: As per guidance form the IDB, existing surface water outfalls have been utilised for all development areas. All of these ultimately discharge into the Humber Estuary, via either the Habrough Marsh Drain or Immingham Dock.
- **Proprietary pollution prevention**: Due to the operational nature of the development sites, it is proposed to install a number of Class 1 Full Retention Separators across the surface water drainage network to ensure appropriate and effective treatment. In addition, the Fuel Station is proposed to be contained by the inclusion of a perimeter drain and Class 1 Forecourt Separator.
- **Storage**: To accommodate the extensive storage volumes required with the network, the strategy includes for the provision of geocellular storage crates located to facilitate full utilisation and constructability. The geocellular storage crates shall be of sufficient long term strength to withstand the anticipated loads and be lined to prevent groundwater interaction.
- **Exceedance flows**: The northern catchment remains free from flooding during the 1:100 year design storm event, +25% CC. Small volumes of flooding have however been shown to occur within the Southern and Western catchments. These flood volumes are contained within the catchment, within the pavement valleys, as per design. During extreme events in excess of the design period, runoff will overtop the catchment envelope and be intercepted by adjacent drainage infrastructure.
- **Foul water**: The development proposal includes for the construction of a number of General and Operational Buildings. It is proposed to provide wastewater infrastructure to support the buildings

incorporating welfare facilities, however, their layout and functionality shall be subject to development during detailed design.

5.2 The hydraulic performance of the promoted drainage proposals has been computationally modelled and demonstrate that the drainage system adequately meets the hydraulic design criteria as detailed.

Appendix A. Drawings

A1 Site Location Plan - B2357400 - JAC - 00 - ZZ - 0101

General Arrangements

A2 Enabling Works - B2357300 - 01 - 05 – 07

A3 Grading Plan - B2357300 - 01 - 05 – 08

A4 Foul Water - B2357300 - 01 - 05 – 04

A5 Northern Yard: Existing - B2357300 - 01 - 05 – 011

A6 Southern Yard: Existing - B2357300 - 01 - 05 – 012

A7 Western Yard: Existing - B2357300 - 01 - 05 – 019

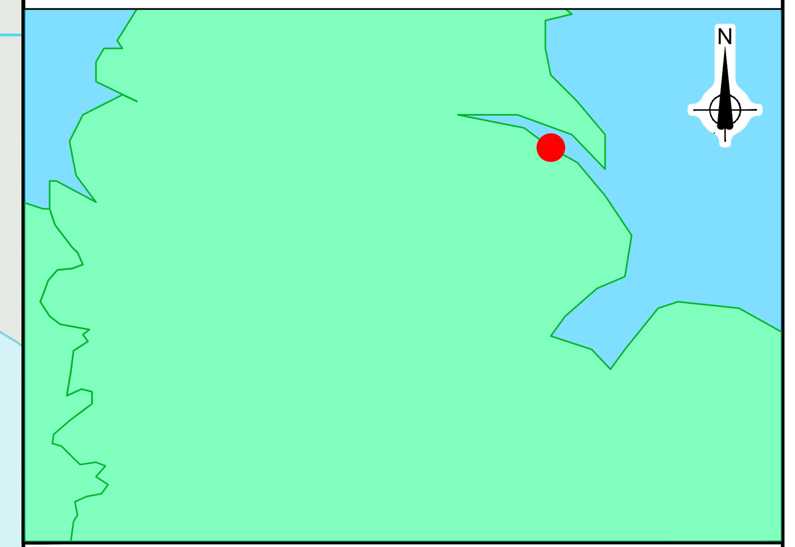
A8 Northern Yard: Proposed - B2357300 - 01 - 05 – 01

A9 Southern Yard: Proposed – B2357300 – 01 – 05 – 02

A10 Western Yard: Proposed - B2357300 - 01 - 05 – 09

\\ukfpp02\Maritime\PROJECTS\Ports\VT\B2429400 ABP Project Suga\1100 Design & Engineering\1102 Drawings\01 Preliminary\02 DCO Drawings\B2429400-JAC-00-ZZ-DR-ZZ-0101 P02.dwg - 09/02/2023 15:18:47 - 0101 - HillsRJ

Key Plan



General Notes

1. This plan should be read alongside other plans and documents in the development consent order application.
2. All dimensions are in metres unless noted otherwise.

Key

Order limits

0 100 200 300 400 500 600 700 800 900 1000

SCALE 1:10000 (A1) METRES

SCALE 1:20000 (A3)

Rev	Rev. Date	Purpose of revision	Orig	Check	Rev	Apprv
P02	February 2023	Submission Version	TH	RH	RH	CN
P01	January 2023	Submission Version	AJM	RH	RH	CN

Jacobs

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www.jacobs.com

Client

ASSOCIATED BRITISH PORTS

Project

IMMINGHAM EASTERN
RO-RO TERMINAL

Drawing title

LOCATION PLAN
REGULATION 5(2)(o)

Drawing status	SUBMISSION VERSION	Suitability S4
Scale	1:10000 @ A1	
Jacobs No.	B2429400	Rev P02
Client No.		

Drawing number

B2429400-JAC-00-ZZ-DR-ZZ-0101

\\ukfsfp02Maritime\PROJECTS\Ports(VT)\B2429400 ABP Project Sugar\1100 Design & Engineering\1102 Drawings\01 Preliminary\01 Concept Design 2019\2022 Update - Drainage\B2357300 - 01 - 05 - 07 Enabling Works.dwg - 17/08/2022 08:24:23 - Layout1 - MidwinterAJ

NOTES:

1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
5. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.
6. WORKS REQUIRED PRIOR TO CONSTRUCTION WORKS OF DRAINAGE, SURFACING AND POTABLE WATER SYSTEMS.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP
0	2019-07-19	FIRST ISSUE	AJM	---	---	----

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Client

ASSOCIATED BRITISH PORTS

Project

PROJECT SUGAR
CONCEPT DESIGN

Drawing title

FOUL AND SURFACE WATER DRAINAGE ENABLING WORKS

Drawing status: CONCEPT DESIGN

Suitability: S3

Scale: AS SHOWN @ A1 — DO NOT SCALE

Jacobs No.: B2357300 - 01

Rev: P01

Client no.:

Drawing number: B2357300 - 01 - 05 - 07

NOTES:

1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
5. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.
6. THE PAVEMENT SHALL BE ARRANGED IN A RIDGE AND VALLEY ARRANGEMENT AND GRADIENTS SHALL TYPICALLY BE BETWEEN 1 IN 60 AND 1 IN 100.
7. EXISTING LEVELS TAKEN FROM ENVIRONMENT AGENCY OPEN SOURCE LIDAR DATA.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P02	2023-02-10	CONCEPT DESIGN - UPDATED SITE LAYOUT	HHS	TCW	DRK	GP
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP
0	2019-07-19	FIRST ISSUE	AJM	---	---	----

\\uksfpp02\Maritime\PROJECTS\Ports(VT)\B2429400 ABP Project Sugar\1100 Design & Engineering\1102 Drawings\01 Preliminary\01 Concept Design 2019\2022 Update - Drainage\B2357300 - 01 - 05 - 08 Grading Plan.dwg - 10/02/2023 10:56:05 - Layout1 - HEATHEHJ

JACOBS

Client: ABP ASSOCIATED BRITISH PORTS

Project: PROJECT SUGAR CONCEPT DESIGN

Drawing title: SITE-WIDE PAVEMENT GRADING PLAN

Drawing status: CONCEPT DESIGN

Suitability: S3

Scale: 1:2500 @ A1 — DO NOT SCALE

Jacobs No.: B2357300 - 01

Rev: P02

Client no.:

Drawing number: B2357300 - 01 - 05 - 08

LEGEND:

- EXISTING CESS PITS / PACKAGE TREATMENT PLANTS
- EXISTING FOUL WATER MANHOLE
- EXISTING FOUL WATER PIPELINE
- EXISTING FOUL WATER RISING MAIN
- EXISTING SURFACE WATER MANHOLE
- EXISTING SURFACE WATER PIPELINE
- EXISTING SURFACE WATER GULLY
- EXISTING SURFACE WATER RISING MAIN
- EXISTING SURFACE WATER OUTFALL
- WATERCOURSE
- SITE DEVELOPMENT BOUNDARY
- OPERATIONAL BUILDINGS
- GENERAL BUILDINGS
- NEW UKBF BUILDINGS
- PROPOSED FOUL MANHOLE
- PROPOSED FOUL WATER PIPELINE
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED TREATED EFFLUENT PIPE
- PROPOSED FOUL WATER PACKAGE TREATMENT PLANT
- PROPOSED ABANDONMENT
- PROPOSED SURFACE WATER RISING MAIN
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER PIPELINE
- PROPOSED GULLY (INDICATIVE)
- PROPOSED HEADWALL
- PROPOSED ATTENUATION TANK

NOTES:

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3. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
5. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P02	2023-02-10	CONCEPT DESIGN - UPDATED SITE LAYOUT	HHS	TCW	DRK	GP
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP
0	2019-07-19	FIRST ISSUE	AJM	---	---	----

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Client: ABP ASSOCIATED BRITISH PORTS

Project: PROJECT SUGAR CONCEPT DESIGN

Drawing title: FOUL WATER DRAINAGE GENERAL ARRANGEMENT SOUTHERN YARD

Drawing status: CONCEPT DESIGN

Suitability: S3

Scale: 1:1250 A1 — DO NOT SCALE

Jacobs No.: B2357300 - 01

Client no.:

Rev: P02

Drawing number: B2357300 - 01 - 05 - 04

LEGEND:

- EXISTING CESS PITS / PACKAGE TREATMENT PLANTS
- EXISTING FOUL WATER MANHOLE
- EXISTING FOUL WATER PIPELINE
- EXISTING FOUL WATER RISING MAIN
- EXISTING SURFACE WATER MANHOLE
- EXISTING SURFACE WATER PIPELINE
- EXISTING SURFACE WATER GULLY
- EXISTING SURFACE WATER RISING MAIN
- EXISTING SURFACE WATER OUTFALL
- WATERCOURSE
- SITE DEVELOPMENT BOUNDARY
- CONTRIBUTING AREA DETERIORATED ASPHALT SURFACE
- CONTRIBUTING AREA IMPERMEABLE SURFACE
- CONTRIBUTING AREA COMPACTED HARDCORE SURFACE
- DN225 PIPE DIAMETER FROM RECORDS
- DN225 PIPE DIAMETER ASSUMED

NOTES:

1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. CATCHMENT INFORMATION CAN BE FOUND IN THE DRAINAGE STRATEGY.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
5. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
6. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP

JACOBS

Client: ASSOCIATED BRITISH PORTS

Project: PROJECT SUGAR CONCEPT DESIGN

Drawing title: SURFACE WATER EXISTING DRAINAGE GENERAL ARRANGEMENT NORTHERN YARD

Drawing status: CONCEPT DESIGN

Suitability: S3

Scale: 1:1250 A1 — DO NOT SCALE

Jacobs No.: B2357300 - 01

Client no.:

Rev: P01

Drawing number: B2357300 - 01 - 05 - 11

LEGEND:

- EXISTING CESS PITS / PACKAGE TREATMENT PLANTS
- EXISTING FOUL WATER MANHOLE
- EXISTING FOUL WATER PIPELINE
- EXISTING FOUL WATER RISING MAIN
- EXISTING SURFACE WATER MANHOLE
- EXISTING SURFACE WATER PIPELINE
- EXISTING SURFACE WATER GULLY
- EXISTING SURFACE WATER RISING MAIN
- EXISTING SURFACE WATER OUTFALL
- WATERCOURSE
- SITE DEVELOPMENT BOUNDARY
- CONTRIBUTING AREA DETERIORATED ASPHALT SURFACE
- CONTRIBUTING AREA IMPERMEABLE SURFACE
- CONTRIBUTING AREA COMPACTED HARDCORE SURFACE
- DN225 PIPE DIAMETER FROM RECORDS
- DN225 PIPE DIAMETER ASSUMED
- INDICATIVE LIMIT OF SUB-CATCHMENTS

NOTES:

1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. CATCHMENT INFORMATION CAN BE FOUND IN THE DRAINAGE STRATEGY.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
5. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
6. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP

JACOBS

Client
ASSOCIATED BRITISH PORTS

Project
PROJECT SUGAR
CONCEPT DESIGN

Drawing title
SURFACE WATER
EXISTING DRAINAGE GENERAL ARRANGEMENT SOUTHERN YARD

Drawing status: CONCEPT DESIGN
Suitability: S3
Scale: 1:1250 A1 — DO NOT SCALE
Jacobs No.: B2357300 - 01
Client no.:
Rev: P01
Drawing number: B2357300 - 01 - 05 - 12

\\uksfpp02\Maritime\PROJECTS\Ports(VT)\B2429400 ABP Project Sugar\1100 Design & Engineering\1102 Drawings\01 Preliminary\01 Concept Design 2019\2022 Update - Drainage\B2357300 - 01 - 05 - 12 Existing Surface Water GA - South.dwg - 17/08/2022 09:30:11 - Layout1 - MidwinterAJ

NOTES:

1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. CATCHMENT INFORMATION CAN BE FOUND IN THE DRAINAGE STRATEGY.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
5. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
6. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP

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Client

ASSOCIATED BRITISH PORTS

Project

PROJECT SUGAR
CONCEPT DESIGN

Drawing title

SURFACE WATER EXISTING DRAINAGE GENERAL ARRANGEMENT WESTERN YARD

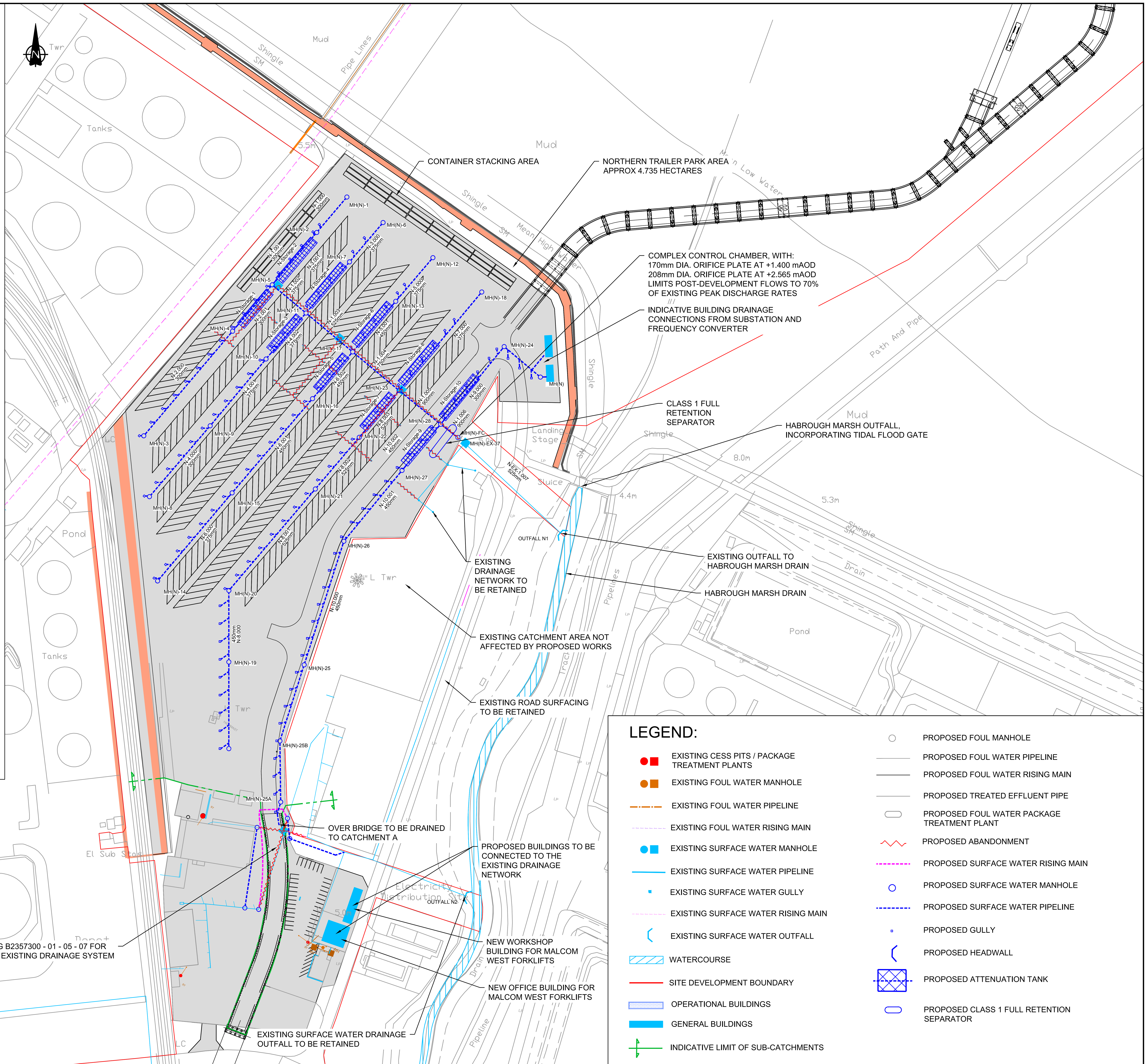
Drawing status	CONCEPT DESIGN
Suitability	S3
Scale	1:1250 A1
	DO NOT SCALE
Jacobs No.	B2357300 - 01
Rev	P01
Client no.	
Drawing number	B2357300 - 01 - 05 - 19

PIPE SCHEDULE

PIPE NO.	DIA. (mm)	GRADIENT (1 in X)	UPSTREAM			DOWNSTREAM		
			USCL (mAOD)	USIL (mAOD)	US COVER DEPTH (m)	DSCL (mAOD)	DSIL (mAOD)	DS COVER DEPTH (m)
1.000	300	167	5.000	3.500	1.200	5.000	3.307	1.393
1.001	300	95	5.000	3.307	1.393	5.000	2.967	1.733
2.000	300	167	5.000	3.575	1.125	5.000	3.092	1.608
2.001	300	242	5.000	3.092	1.608	5.000	2.967	1.733
1.002	375	321	5.000	2.892	1.733	5.000	2.815	1.810
3.000	375	167	5.000	3.425	1.200	5.000	3.226	1.399
3.001	375	53	5.000	3.151	1.474	5.000	2.525	2.100
4.000	300	164	5.000	3.500	1.200	5.000	3.181	1.519
4.001	375	242	5.000	3.106	1.519	5.000	2.889	1.736
4.002	375	83	5.000	2.889	1.736	5.000	2.525	2.100
1.003	450	225	5.000	2.300	2.250	5.000	2.150	2.400
5.000	375	167	5.000	3.425	1.200	5.000	3.218	1.407
5.001	450	41	5.000	3.068	1.482	5.000	2.225	2.325
6.000	375	145	5.000	3.425	1.200	5.000	2.980	1.645
6.001	450	321	5.000	2.905	1.645	5.000	2.676	1.874
6.002	450	58	5.000	2.676	1.874	5.000	2.150	2.400
1.004	750	387	5.000	1.850	2.400	5.000	1.761	2.489
7.000	375	60	5.000	3.209	1.416	5.000	2.300	2.325
8.000	450	167	5.000	3.350	1.200	5.000	3.093	1.457
8.001	525	241	5.000	3.018	1.457	5.000	2.718	1.757
8.002	525	169	5.000	2.718	1.757	5.000	2.468	2.007
8.003	525	95	5.000	2.468	2.007	5.000	2.150	2.325
1.005	900	499	5.000	1.611	2.489	5.000	1.554	2.546
9.000	300	26	5.000	3.385	1.315	5.000	2.000	2.700
10.000	450	164	5.000	3.350	1.200	5.000	2.908	1.642
10.001	450	200	5.000	2.908	1.642	5.000	2.629	1.921
10.002	450	39	5.000	2.629	1.921	5.000	1.850	2.700
1.006	900	TO SUIT	5.000	1.400	2.700	4.000	1.360	1.740
EX-1.007	525	Existing	4.000	1.086	2.389	5.000	0.879	3.596

STORAGE SCHEDULE

Reference	Base Level (mAOD)	Plan Area (m2)	Storage Depth (m)	Effective Volume (m3)	Depth of Cover (m)
N-Storage-1	3.200	125	0.300	36	1.500
N-Storage-2	3.200	150	0.300	43	1.500
N-Storage-3	2.600	125	0.900	107	1.500
N-Storage-4	2.600	150	0.900	128	1.500
N-Storage-5	2.100	125	1.200	143	1.700
N-Storage-6	2.100	150	1.200	171	1.700
N-Storage-7	2.000	125	1.200	143	1.800
N-Storage-8	2.000	150	1.200	171	1.800
N-Storage-9	1.800	125	1.500	178	1.700
N-Storage-10	1.800	150	1.500	214	1.700



0 10 20 30 40 50 60 70 80 90 100
SCALE 1:1250 (A1) METRES

NOTES:
1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
5. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.
6. ALL PAVED AREAS TO BE DRAINED VIA TRAPPED GULLIES; THE ARRANGEMENT IS INDICATIVE.
7. THE SURFACE WATER RUNOFF FROM AREAS OF HARDSTANDING SUBJECT TO VEHICULAR MOVEMENTS SHALL BE TREATED VIA A CLASS 1 FULL RETENTION SEPARATOR.
8. THE TRAILER PARKING AREAS SHALL BE GRADED TO ENSURE THE SURFACE WATER RUNOFF IS DIRECTED TO DRAINAGE CHANNELS.

Rev	Rev. Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP
0	2019-07-19	FIRST ISSUE	AJM	---	---	----

JACOBS

Client
ASSOCIATED BRITISH PORTS

Project
PROJECT SUGAR
CONCEPT DESIGN

Drawing title
SURFACE WATER DRAINAGE GENERAL ARRANGEMENT NORTHERN YARD

Drawing status: CONCEPT DESIGN
Suitability: S3
Scale: 1:1250 A1 — DO NOT SCALE
Jacobs No.: B2357300 - 01
Client no.:
Rev: P01
Drawing number: B2357300 - 01 - 05 - 01

\\uksfpp02\Maritime\PROJECTS\Ports(VT)\B2429400 ABP Project Sugar\1100 Design & Engineering\1102 Drawings\01 Preliminary\01 Concept Design 2019\2022 Update - Drainage\B2357300 - 01 - 05 - 02 Surface Water GA - South.dwg - 10/02/2023 11:18:35 - Layout1 - HEATHEHJ

NOTES:

1. THIS GENERAL ARRANGEMENT SHOULD BE READ ALONGSIDE OTHER PLANS AND DOCUMENTS IN THE DEVELOPMENT CONSENT ORDER APPLICATION.
2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
5. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.
6. ALL PAVED AREAS TO BE DRAINED VIA TRAPPED GULLIES; THE ARRANGEMENT IS INDICATIVE.
7. THE SURFACE WATER RUNOFF FROM AREAS OF HARDSTANDING SUBJECT TO VEHICULAR MOVEMENTS SHALL BE TREATED VIA A CLASS 1 FULL RETENTION SEPARATOR.
8. THE TRAILER PARKING AREAS SHALL BE GRADED TO ENSURE THE SURFACE WATER RUNOFF IS DIRECTED TO DRAINAGE CHANNELS.
9. REFER TO DRAWING B2357300 - 01 - 05 - 10 FOR THE PROPOSED SURFACE WATER DRAINAGE NETWORK PIPE SCHEDULE.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P02	2023-02-10	CONCEPT DESIGN - UPDATED SITE LAYOUT	HHS	TCW	DRK	GP
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP
0	2019-07-19	FIRST ISSUE	AJM	---	---	----

JACOBS

Client: ASSOCIATED BRITISH PORTS

Project: PROJECT SUGAR CONCEPT DESIGN

Drawing title: SURFACE WATER DRAINAGE GENERAL ARRANGEMENT SOUTHERN YARD

Drawing status	CONCEPT DESIGN
Suitability	S3
Scale	1:1250 A1 — DO NOT SCALE
Jacobs No.	B2357300 - 01
Client no.	
Rev	P02
Drawing number	B2357300 - 01 - 05 - 02

PIPE SCHEDULE

PIPE NO.	DIA. (mm)	GRADIENT (1 in X)	UPSTREAM			DOWNSTREAM		
			USCL (mAOD)	USIL (mAOD)	US COVER DEPTH (m)	DSCL (mAOD)	DSIL (mAOD)	DS Cover Depth (m)
1.000	375	321	4.770	3.195	1.200	4.770	3.001	1.394
1.001	450	500	4.770	2.926	1.394	4.770	2.802	1.518
1.002	525	502	4.770	2.727	1.518	4.770	2.603	1.642
1.003	525	500	4.770	2.603	1.642	4.770	2.465	1.780
1.004	600	492	4.770	2.390	1.780	4.770	2.239	1.931
1.005	600	506	4.770	2.239	1.931	4.770	2.108	2.062
1.006	600	501	4.770	2.108	2.062	4.770	1.973	2.197
1.007	675	502	4.770	1.898	2.197	4.770	1.762	2.333
1.008	675	500	4.770	1.762	2.333	4.770	1.580	2.515
2.000	300	231	4.760	3.260	1.200	4.760	2.821	1.639
2.001	300	200	4.760	2.821	1.639	4.770	2.650	1.820
1.009	750	547	4.770	1.505	2.515	4.770	1.304	2.716
3.000	375	200	4.730	3.155	1.200	4.730	2.807	1.548
3.001	525	501	4.730	2.657	1.548	4.730	2.518	1.687
3.002	600	278	4.730	2.442	1.688	4.730	2.191	1.939
4.000	375	300	5.300	3.725	1.200	5.000	3.398	1.227
4.001	375	300	5.000	3.398	1.227	5.000	3.298	1.327
4.002	450	300	5.000	3.223	1.327	4.730	2.901	1.379
4.003	600	116	4.730	2.751	1.379	4.730	2.191	1.939
3.003	750	247	4.730	2.041	1.939	4.790	1.893	2.147
5.000	375	335	5.950	3.290	2.285	5.500	3.095	2.030
5.001	450	444	5.500	3.020	2.030	4.790	2.874	1.466
5.002	450	500	4.790	2.874	1.466	4.790	2.743	1.597
5.003	600	220	4.790	2.593	1.597	4.790	2.297	1.893
6.000	300	335	4.790	3.290	1.200	4.790	3.084	1.406
6.001	375	444	4.790	3.009	1.406	4.790	2.854	1.561
6.002	450	500	4.790	2.779	1.561	4.790	2.641	1.699
6.003	600	154	4.790	2.491	1.699	4.790	2.043	2.147
3.004	900	300	4.790	1.743	2.147	4.970	1.685	2.385
3.005	900	502	4.970	1.685	2.385	4.970	1.555	2.515
3.006	900	502	4.970	1.550	2.520	4.970	1.420	2.650
3.007	900	381	4.970	1.420	2.650	4.770	1.369	2.501
7.000	300	231	4.760	3.260	1.200	5.350	3.163	1.887
7.001	300	230	5.350	3.163	1.887	5.100	3.078	1.722
7.002	300	204	5.100	3.078	1.722	5.400	2.853	2.247
7.003	375	235	5.400	2.778	2.247	5.700	2.553	2.772
7.004	450	337	5.700	2.478	2.772	6.500	2.320	3.730
7.005	450	311	6.500	2.320	3.730	5.950	2.111	3.389
7.006	450	311	5.950	2.111	3.389	4.770	1.902	2.418
1.010	1200	502	4.770	0.854	2.716	4.760	0.792	2.768
1.011	450	503	4.760	0.792	3.518	5.000	0.742	3.808

STORAGE SCHEDULE

REFERENCE	BASE LEVEL (mAOD)	PLAN AREA (m2)	STORAGE DEPTH (m)	EFFECTIVE VOLUME (m3)	DEPTH OF COVER (m)
W-Storage-1	2.000	1285	1.200	1465	1.560
W-Storage-2	2.000	1280	1.200	1459	1.560
W-Storage-3	3.000	200	0.300	57	1.470

LEGEND:

- EXISTING FOUL WATER MANHOLE
- EXISTING FOUL WATER PIPELINE
- EXISTING FOUL WATER RISING MAIN
- EXISTING SURFACE WATER MANHOLE
- EXISTING SURFACE WATER PIPELINE
- EXISTING SURFACE WATER GULLY
- EXISTING SURFACE WATER RISING MAIN
- EXISTING SURFACE WATER OUTFALL
- WATERCOURSE
- SITE DEVELOPMENT BOUNDARY
- OPERATIONAL BUILDINGS
- GENERAL BUILDINGS
- PROPOSED FOUL MANHOLE
- PROPOSED FOUL WATER PIPELINE
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED TREATED EFFLUENT PIPE
- PROPOSED FOUL WATER PACKAGE TREATMENT PLANT
- PROPOSED ABANDONMENT
- PROPOSED SURFACE WATER RISING MAIN
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED SURFACE WATER PIPELINE
- PROPOSED GULLY
- PROPOSED HEADWALL
- PROPOSED ATTENUATION TANK
- PROPOSED CLASS 1 FULL RETENTION SEPARATOR

NOTES:

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2. DO NOT SCALE FROM THIS DRAWING.
3. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
4. ALL LEVELS TO ORDNANCE DATUM UNLESS NOTED OTHERWISE.
5. EXISTING FOUL AND SURFACE WATER DRAINAGE INFORMATION EXTRACTED FROM RECORDS HELD BY ABP.
6. ALL PAVED AREAS TO BE DRAINED VIA TRAPPED GULLIES; THE ARRANGEMENT IS INDICATIVE.
7. THE SURFACE WATER RUNOFF FROM AREAS OF HARDSTANDING SUBJECT TO VEHICULAR MOVEMENTS SHALL BE TREATED VIA A CLASS 1 FULL RETENTION SEPARATOR.
8. THE TRAILER PARKING AREAS SHALL BE GRADED TO ENSURE THE SURFACE WATER RUNOFF IS DIRECTED TO DRAINAGE CHANNELS

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP

JACOBS

Client: ASSOCIATED BRITISH PORTS

Project: PROJECT SUGAR CONCEPT DESIGN

Drawing title: SURFACE WATER DRAINAGE GENERAL ARRANGEMENT WESTERN YARD

Drawing status: CONCEPT DESIGN — Suitability: S3

Scale: 1:1250 @ A1 — DO NOT SCALE

Jacobs No.: B2357300 - 01 — Rev: P01

Client no.:

Drawing number: B2357300 - 01 - 05 - 09

PIPE No.	DIA. (mm)	GRADIENT (1 IN X)	UPSTREAM			DOWNSTREAM		
			USCL (mAOD)	USIL (mAOD)	US COVER DEPTH (m)	DSCL (mAOD)	DSIL (mAOD)	DS COVER DEPTH (m)
1.000	300	379	4.740	3.240	1.200	4.740	3.148	1.292
1.001	375	343	4.740	3.073	1.292	4.740	2.975	1.390
1.002	600	434	4.740	2.750	1.390	4.830	2.602	1.628
2.000	300	213	4.830	3.330	1.200	4.830	3.047	1.483
2.001	375	273	4.830	2.972	1.483	4.830	2.752	1.703
1.003	600	499	4.830	2.602	1.628	4.830	2.520	1.710
3.000	300	301	4.830	3.330	1.200	4.830	3.207	1.323
3.001	450	500	4.830	3.057	1.323	4.830	2.946	1.434
3.002	525	500	4.830	2.871	1.434	4.830	2.760	1.545
1.004	750	500	4.830	2.370	1.710	5.000	2.320	1.930
4.000	300	301	4.830	3.330	1.200	4.830	3.211	1.319
4.001	450	500	4.830	3.061	1.319	4.830	2.954	1.426
4.002	525	502	4.830	2.879	1.426	4.830	2.772	1.533
4.003	525	295	4.830	2.772	1.533	4.915	2.700	1.691
5.000	300	250	4.400	3.100	1.000	4.700	3.037	1.363
5.001	300	250	4.700	3.037	1.363	4.915	2.976	1.639
4.004	525	204	4.915	2.700	1.690	5.000	2.628	1.848
1.005	750	504	5.000	2.320	1.930	4.830	2.252	1.828
6.000	225	261	4.930	3.505	1.200	4.930	3.351	1.354
7.000	225	183	4.930	3.505	1.200	4.930	3.351	1.354
6.001	225	188	4.930	3.351	1.354	4.820	3.240	1.355
8.000	225	260	4.820	3.395	1.200	4.820	3.240	1.355
9.000	225	173	4.820	3.395	1.200	4.820	3.240	1.355
6.002	300	95	4.820	3.165	1.355	4.970	3.079	1.591
6.003	375	500	4.970	3.004	1.591	4.985	2.943	1.667
6.004	375	500	4.985	2.943	1.667	5.000	2.876	1.749
10.000	225	200	4.970	3.545	1.200	5.000	3.448	1.327
6.005	375	500	5.000	2.876	1.749	5.000	2.742	1.883
6.006	375	500	5.000	2.742	1.883	4.580	2.617	1.588
11.000	375	397	4.450	2.875	1.200	4.450	2.715	1.360
11.001	450	369	4.450	2.640	1.360	4.450	2.502	1.498
12.000	300	262	4.450	2.950	1.200	4.450	2.783	1.367
12.001	375	329	4.450	2.708	1.367	4.450	2.577	1.498
11.002	525	252	4.450	2.427	1.498	4.580	2.286	1.769
13.000	375	219	4.550	2.975	1.200	4.580	2.675	1.530
13.001	375	298	4.580	2.675	1.530	4.580	2.605	1.600
13.002	450	300	4.580	2.530	1.600	4.580	2.363	1.767
14.000	225	261	4.580	3.155	1.200	4.580	2.988	1.367
14.001	300	376	4.580	2.913	1.367	4.580	2.797	1.483
11.003	675	503	4.580	2.136	1.769	4.580	2.069	1.836
15.000	225	261	4.580	3.155	1.200	4.580	2.988	1.367
15.001	300	376	4.580	2.913	1.367	4.580	2.797	1.483
16.000	300	371	4.580	2.947	1.333	4.580	2.781	1.499
11.004	825	495	4.580	1.919	1.836	4.750	1.883	2.042
11.005	825	499	4.750	1.883	2.042	4.750	1.708	2.217
11.006	825	500	4.750	1.708	2.217	4.650	1.589	2.236
17.000	225	200	4.580	2.600	1.755	4.580	2.272	2.083
18.000	225	200	4.580	3.155	1.200	4.580	3.106	1.249
17.001	225	200	4.580	2.272	2.083	4.650	2.228	2.197
11.007	825	504	4.650	1.589	2.236	4.615	1.530	2.260
19.000	225	261	4.580	3.155	1.200	4.580	3.062	1.293
19.001	300	261	4.580	2.987	1.293	4.580	2.820	1.460
19.002	300	379	4.580	2.820	1.460	4.580	2.705	1.575
20.000	225	194	4.580	3.155	1.200	4.580	3.012	1.343
20.001	300	266	4.580	2.937	1.343	4.580	2.797	1.483
19.003	300	178	4.580	2.705	1.575	4.580	2.512	1.768
21.000	525	313	4.550	2.745	1.280	4.680	2.636	1.519
21.001	525	103	4.680	2.636	1.519	4.580	2.287	1.768
19.004	600	500	4.580	2.212	1.768	4.580	2.080	1.900
19.005	750	500	4.580	1.930	1.900	4.580	1.798	2.032
19.006	750	351	4.580	1.798	2.032	4.750	1.714	2.286
22.000	300	300	4.550	3.050	1.200	4.550	2.925	1.325
22.001	375	350	4.550	2.850	1.325	4.550	2.749	1.426
22.002	450	504	4.550	2.674	1.426	4.550	2.613	1.488
23.000	375	301	4.550	2.975	1.200	4.550	2.805	1.370
23.001	375	300	4.550	2.805	1.370	4.550	2.665	1.510
23.002	450	500	4.550	2.590	1.510	4.550	2.477	1.623
22.003	450	500	4.550	2.477	1.623	4.565	2.397	1.718
22.004	525	499	4.565	2.322	1.718	4.580	2.246	1.809
22.005	525	501	4.580	2.246	1.809	4.580	2.128	1.927
22.006	600	501	4.580	2.053	1.927	4.580	1.935	2.045
24.000	225	200	4.550	3.125	1.200	4.550	2.949	1.376
24.001	300	275	4.550	2.874	1.376	4.700	2.664	1.736
24.002	375	502	4.700	2.589	1.736	4.580	2.445	1.760
25.000	300	250	4.400	3.100	1.000	4.580	2.963	1.317
22.007	675	500	4.580	1.860	2.045	4.750	1.810	2.265
19.007	750	500	4.750	1.714	2.286	4.615	1.634	2.231
11.008	450	496	4.615	1.530	2.635	4.580	1.470	2.660
EX-6.007	525	407	4.580	1.471	2.584	4.830	1.395	2.910
6.008	525	499	4.830	1.395	2.910	4.830	1.255	3.050
6.009	525	413	4.830	1.255	3.050	4.830	1.215	3.091
6.010	525	400	4.830	1.215	3.09	4.830	1.152	3.153
1.006	900	501	4.830	0.799	3.131	4.830	0.697	3.233
1.007	900	499	4.830	0.697	3.233	4.740	0.575	3.265
27.000	300	200	4.830	3.330	1.200	4.830	3.102	1.428
27.001	300	150	4.830	3.102	1.428	4.740	3.025	1.415
EX-1.008	525	300	4.740	0.575	3.640	3.000	0.408	2.067

PIPE SCHEDULE - SOUTH EAST

STORAGE SCHEDULE - SOUTH EAST

REFERENCE	BASE LEVEL (mAOD)	PLAN AREA (m2)	STORAGE DEPTH (m)	EFFECTIVE VOLUME (m3)	DEPTH OF COVER (m)
SE-Storage-1	1.53	2500	1.5	3563	1.585
SE-Storage-2	3	500	0.3	143	1.67
SE-Storage-3	0.575	1250	1.8	2138	2.365

STORAGE SCHEDULE - SOUTH WEST

REFERENCE	BASE LEVEL (mAOD)	PLAN AREA (m2)	STORAGE DEPTH (m)	EFFECTIVE VOLUME (m3)	DEPTH OF COVER (m)
SW-Storage-1	2.666	500	0.9	428	1.334
SW-Storage-2	2.421	700	0.9	599	1.579

PIPE SCHEDULE - SOUTH WEST

PIPE No.	DIA. (mm)	GRADIENT (1 IN X)	UPSTREAM			DOWNSTREAM		
			USCL (mAOD)	USIL (mAOD)	US COVER DEPTH (m)	DSCL (mAOD)	DSIL (mAOD)	DS COVER DEPTH (m)
EX-1.002	600	321	5.240	2.505	2.135	5.240	2.392	2.248
2.000	300	250	4.900	3.603	0.997	4.900	3.404	1.196
3.000	300	251	4.750	3.550	0.900	4.750	3.461	0.989
3.001	300	250	4.750	3.461	0.989	4.900	3.289	1.311
3.002	300	251	4.900	3.289	1.311	4.900	3.179	1.421
3.003	300	251	4.900	3.179	1.421	4.900	3.122	1.478
2.001	300	250	4.900	3.122	1.478	4.900	2.95	1.650
4.000	300	249	4.900	3.700	0.900	4.900	3.56	1.040
2.002	450	352	4.900	2.800	1.650	4.900	2.666	1.784
5.000	225	209	4.750	3.625	0.900	4.900	3.376	1.299
6.000	225	209	4.900	3.775	0.900	4.900	3.644	1.031
5.001	300	280	4.900	3.301	1.299	4.900	3.098	1.502
7.000	300	157	4.900	3.700	0.900	4.900	3.53	1.070
2.003	525	518	4.900	2.666	1.709	5.240	2.64	2.075
8.000	225	209	4.750	3.625	0.900	4.900	3.319	1.356
9.000	225	209	4.900	3.700	0.900	4.900	3.489	1.111
8.001	300	296	4.900	3.244	1.356	4.900	3.051	1.549
10.000	300	250	4.700	3.352	1.048	4.900	3.073	1.527
11.000	300	250	4.750	3.511	0.939	4.750	3.284	1.166
11.001	300	251	4.750	3.284	1.166	4.750	3.2	1.250
11.002	450	404	4.750	3.050	1.250	4.750	3.003	1.297
11.003	450	402	4.750	3.003	1.297	4.900	2.923	1.527
12.000	225	170	4.900	3.475	1.200	4.900	3.241	1.434
10.001	525	494	4.900	2.848	1.527	4.900	2.821	1.554
13.000	225	170	4.900	3.475	1.200	4.900	3.345	1.330
10.002	525	498	4.900	2.821	1.554	4.900	2.747	1.628
14.000	300	209	4.900	3.700	0.900	4.900	3.575	1.025
15.000	225	209	4.900	3.775	0.900	4.900	3.715	0.960
10.003	525	500	4.900	2.747	1.628	4.900	2.642	1.733
16.000	225	209	4.700	3.575	0.900	4.700	3.264	1.211
17.000	225	88	4.700	3.575	0.900	4.700	3.264	1.211
16.001	225	129	4.700	3.264	1.211	4.900	2.942	1.733
10.004	600	500	4.900	2.567	1.733	4.900	2.516	1.784
8.002	600	459	4.900	2.421	1.879	5.240	2.392	2.248
EX-1.003	600	315	5.240	2.392	2.248	5.240	2.26	2.380

NOTES:

1. DRAWING TO BE READ IN CONJUNCTION WITH DRAWING B2357300 - 01 - 05 - 02.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P02	2023-02-10	CONCEPT DESIGN - UPDATED SITE LAYOUT	HHS	TCW	DRK	GP
P01	2022-08-17	CONCEPT DESIGN	AJM	TCW	DRK	GP

JACOBS

Client

ASSOCIATED BRITISH PORTS

Project

PROJECT SUGAR
CONCEPT DESIGN

Drawing title

SURFACE WATER DRAINAGE SCHEDULES SOUTHERN YARD

Drawing status: CONCEPT DESIGN

Suitability: S3

Scale: 1:1250 A1

DO NOT SCALE

Jacobs No.: B2357300 - 01

Rev: P02

Client no.

Drawing number: B2357300 - 01 - 05 - 10

Appendix B. Calculations

B1 Combined Effluent Pumping Station Capacity Assessment

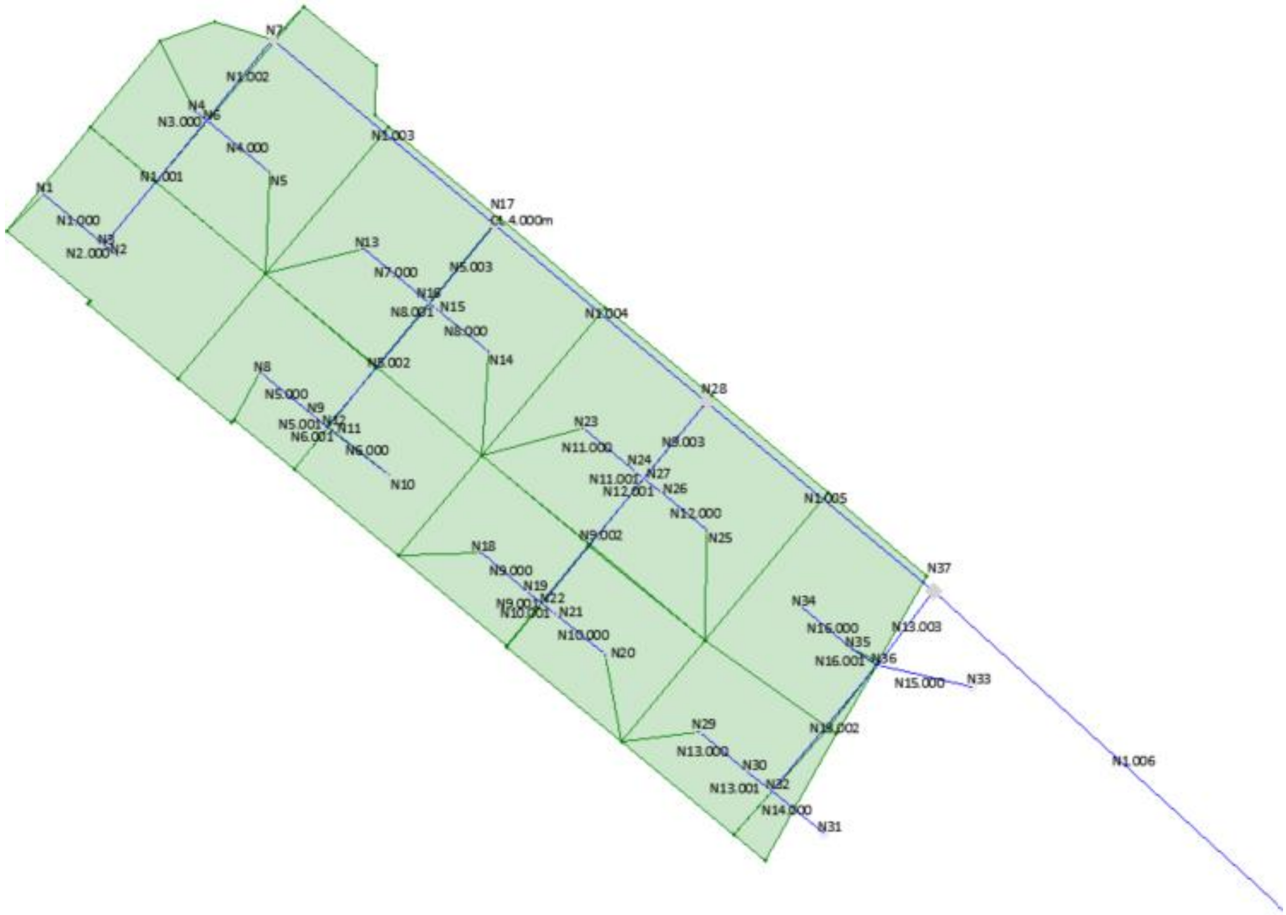
450mm diameter incoming gravity pipework

600mm diameter incoming gravity pipework

MicroDrainage Model Outputs

B2 Northern Yard: Existing

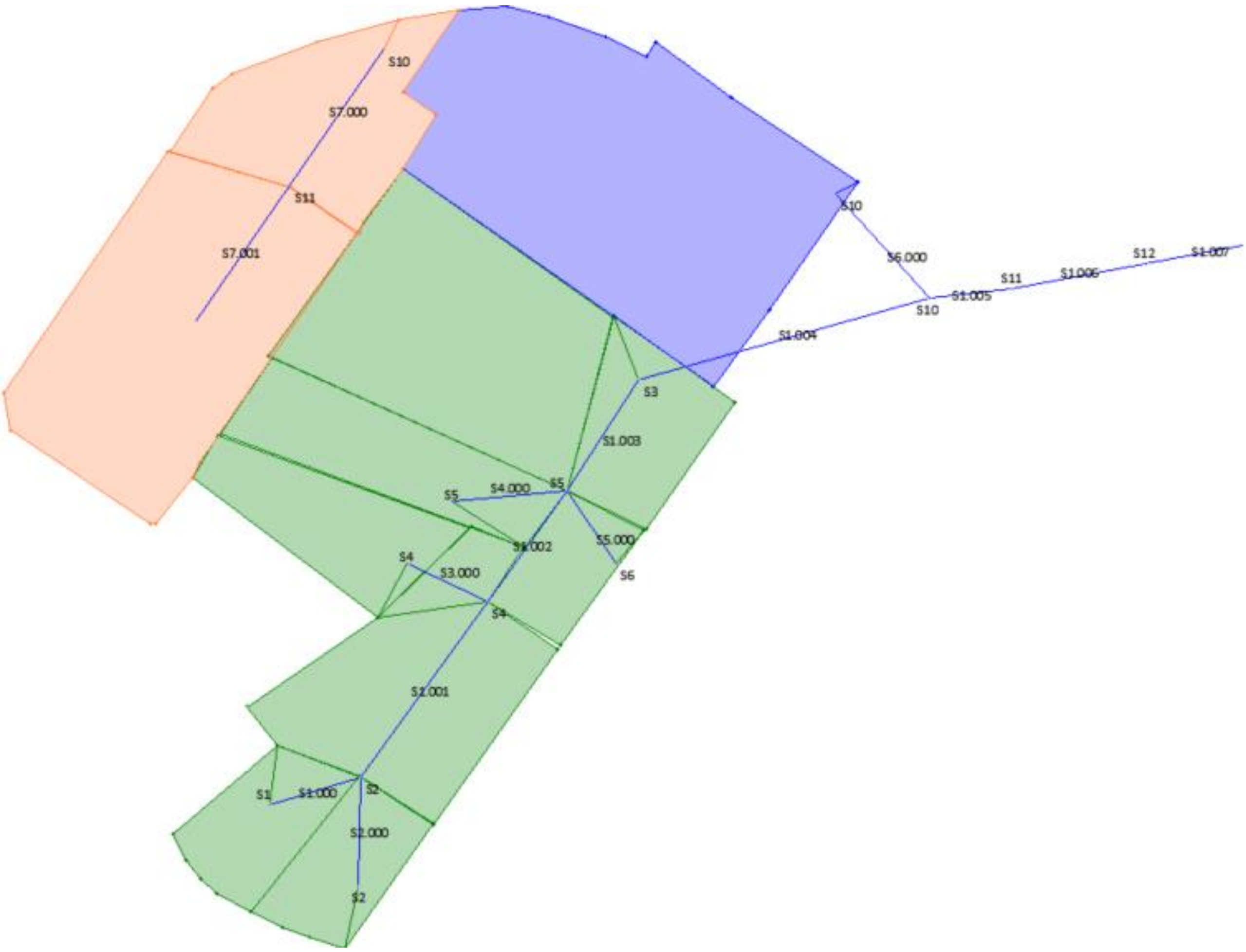
Network Schematic



Output Simulation Files

B3 Southern Yard: Existing

Network Schematic

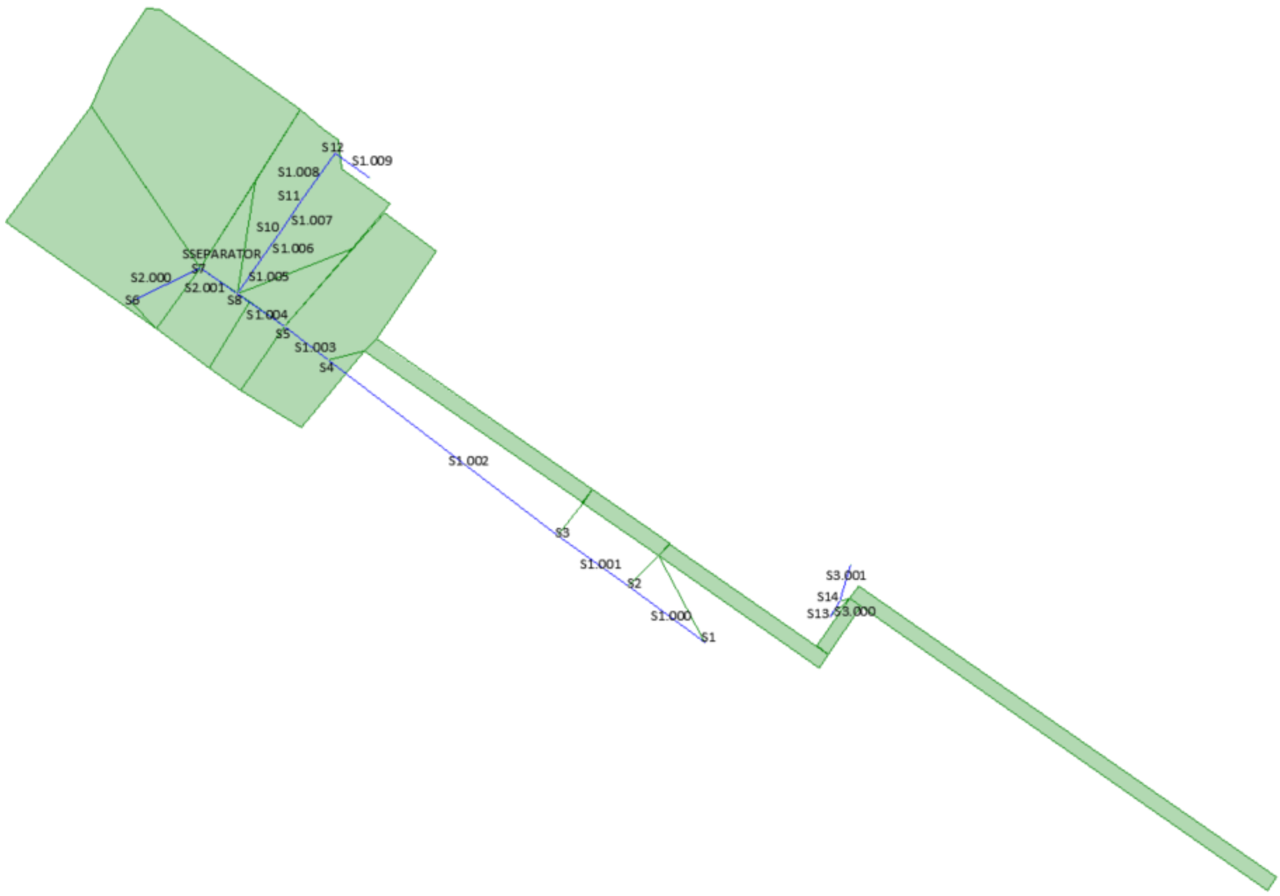


Output Simulation Files: Gravity (Catchments S-B and S-C)

Output Simulation Files: Pumped (Catchment S-A)

B4 Western Yard: Existing

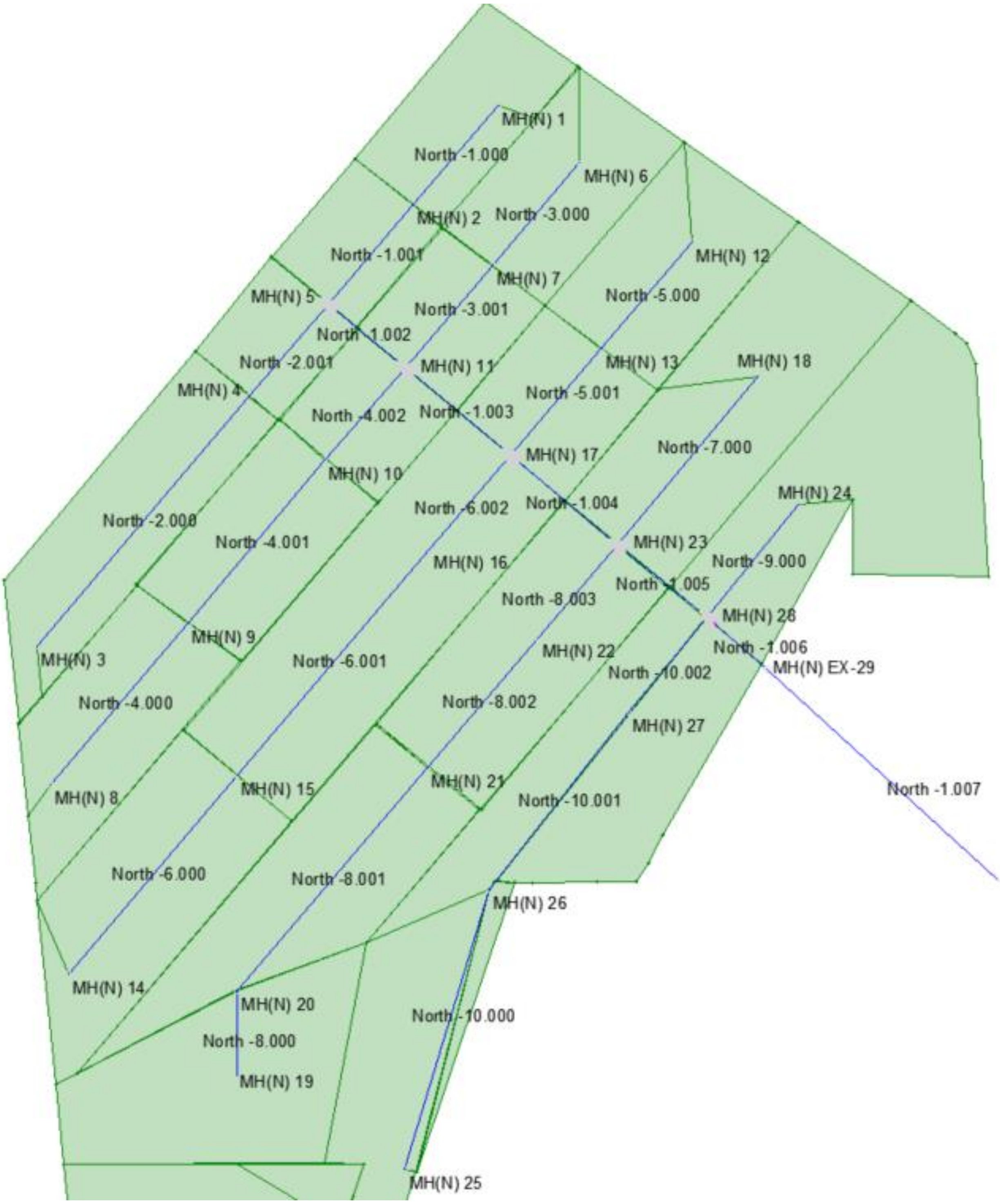
Network Schematic



Output Simulation Files

B5 Northern Yard: Proposed

Network Schematic



Output Simulation Files

Sensitivity Testing: Surcharged Outfall at +1.9 mAOD

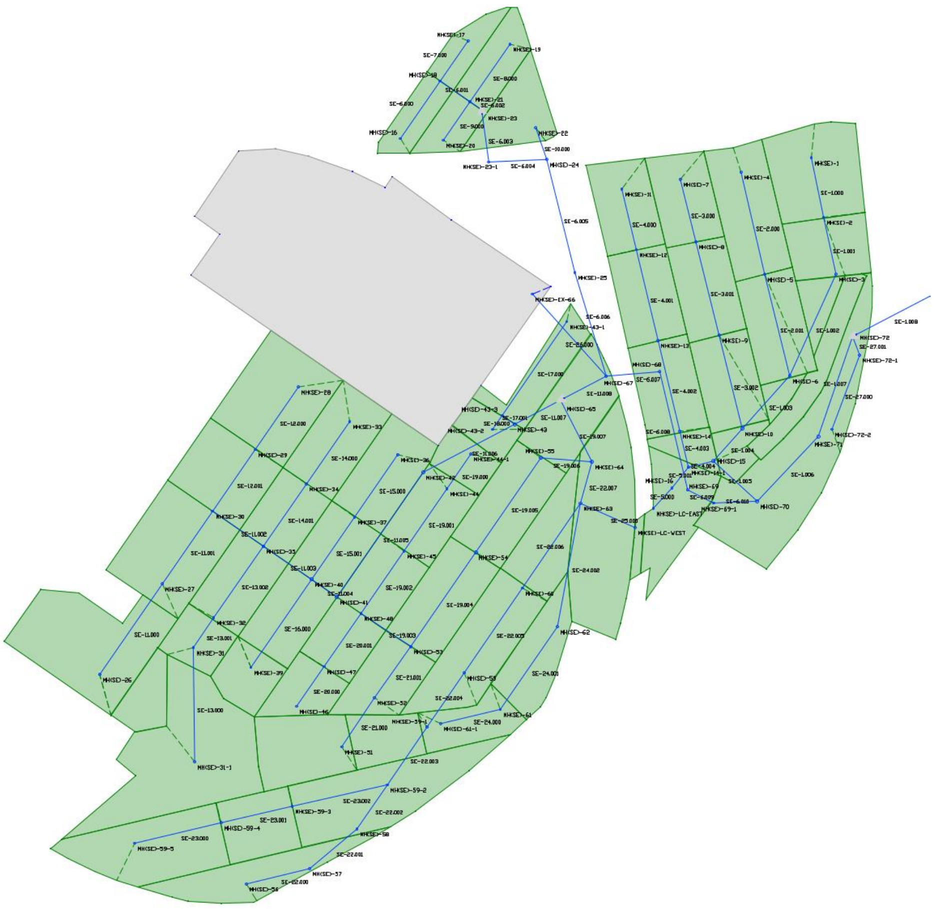
Sensitivity Testing: Surcharged Outfall at +3.7 mAOD

B6 Southern Yard: Proposed

Network Schematic: Pumped Catchment (S-A)

Output Simulation Files

Network Schematic: Pumped Catchment (S-B&C)



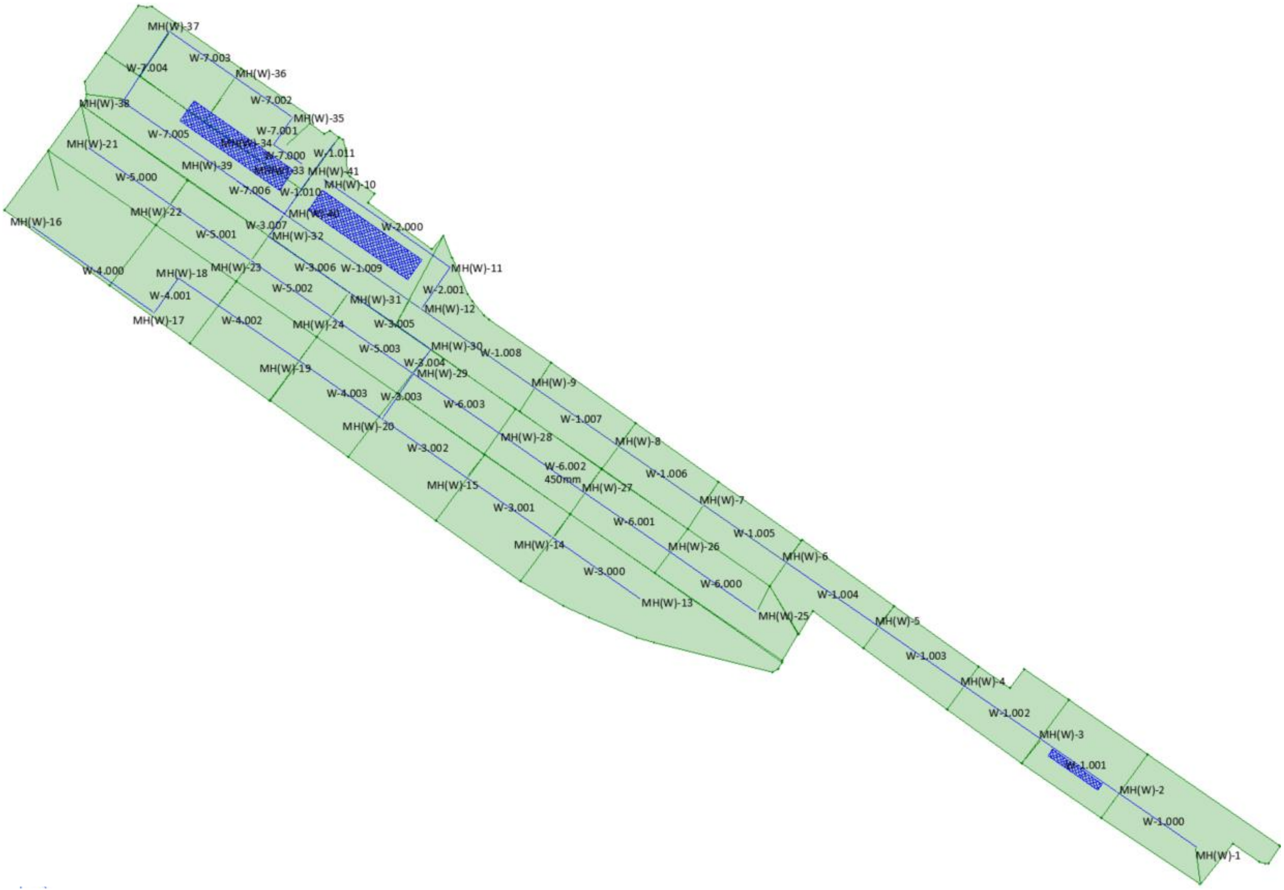
Output Simulation Files

Sensitivity Testing: Surcharged Outfall at +1.9 mAOD

Sensitivity Testing: Surcharged Outfall at +3.7 mAOD

B7 Western Yard: Proposed

<u>Network Schematic</u>



<u>Output Simulation Files</u>

JACOBS — **Calculation title sheet**

Project title:	**Immingham Eastern Ro-Ro Terminal**	**Project code:**	**B2429300**
Calculation title:	**Combined Effluent Pumping Station Capacity Assessment**	**Serial no:**	
Project manager:	**Claire Nicolson**	**No. of sheets:**	**1**

Status:

Schematic		Preliminary		**Created by:**	**HHS**
Tender		Other (state)	**Concept Design**	**Date:**	**5-Aug-22**
Final for Construction				**Verified by:**	**TCW**
				Date:	**5-Aug-22**
				Approved by:	**DRK**
				Date:	**17-Aug-22**

Levels of verification:

1	Self-check and approval	☐	3B	Comparison with similar proven designs and approval	☐
2	Review and approval	☑	4	External check and internal approval	☐
3	Detailed check and approval	☐	5	Other verification as stated in the Management Plan	☐
3A	Alternative calculations and approval	☐		**Numerical Check**	

Computer analysis:

Yes: ☐ No: ☑

Program(s):

Hardware:

Contents (continue on calculation sheet if necessary)

NB: Calculations should state or refer to design input data and methodology

CONTENTS AMENDMENT RECORD

Sheet(s)	Rev.	Date	Description	Created	Verified	Approved

File Name: Southern Catchment 450 Pipe Flow.xlsx
Path: \\uksfpp02\Water\we\Urban Water Market Sectors\Urban Water UK\Projects\ABP Nordic\Working Folder\Drainage Strategy\MicroDrainage

JACOBS — Calculation sheet

Calculation title:	Combined Effluent Pumping Station Capacity Assessment	Created by:	HHS	Project code:	B2429300
		Date:	05/08/2022	Serial no:	
Subject:	450mm diameter incoming gravity pipework	Verified by:	TCW	Sheet no:	1
		Date:	05/08/2022	Revision:	P01

References/Results

This calculation sheet uses the Colebrook - White formula to calculate pipe flows for full and partially full pipes assuming that there are no affects of downstream controls

Colebrook-White Formula -

$$V = -2\sqrt{(2gDS)}Log\left(\frac{K_s}{3.70} + \frac{2.51v}{D\sqrt{(2gDS)}}\right)$$

V = Velocity (m/s)
g = Gravitational acceleration (9.81m/s²)
D = Pipe Diameter (mm)
S = Hydraulic Gradient
Ks = Effective pipe roughness (0.6 for surface sewers and 1.5 for foul sewers typically)
v = Kinematic Viscosity of fluid

Data inputs -

Pipe Diameter	450	mm
Gradient	523	
Pipe Roughness	0.6	

Gradient from existing drainage record invert levels around pipework

Results -

Percent Depth	Depth of flow (mm)	Proportional Depth	Hydraulic Radius	Velocity (m/s)	Flow (l/s)	Pipe full Velocity (m/s)	Pipe Full Capacity (l/s)
5%	23	0.05	0.014966	0.2433	0.7473	0.8943	142.2323
10%	45	0.1	0.028584	0.373	3.0874	0.8943	142.2323
15%	68	0.15	0.04208	0.4793	7.2473	0.8943	142.2323
20%	90	0.2	0.054266	0.5643	12.7782	0.8943	142.2323
25%	113	0.25	0.066233	0.6406	20.0432	0.8943	142.2323
30%	135	0.3	0.076923	0.7044	28.2669	0.8943	142.2323
35%	158	0.35	0.087288	0.7629	38.0102	0.8943	142.2323
40%	180	0.4	0.096402	0.8121	48.2447	0.8943	142.2323
45%	203	0.45	0.105067	0.8572	59.6931	0.8943	142.2323
50%	225	0.5	0.1125	0.8947	71.1479	0.8943	142.2323
55%	248	0.55	0.119337	0.9284	83.42	0.8943	142.2323
60%	270	0.6	0.12494	0.9554	95.192	0.8943	142.2323
65%	293	0.65	0.129759	0.9782	107.2588	0.8943	142.2323
70%	315	0.7	0.133306	0.9948	118.2957	0.8943	142.2323
75%	338	0.75	0.135799	1.0064	128.9649	0.8943	142.2323
80%	360	0.8	0.136887	1.0114	137.9538	0.8943	142.2323
85%	383	0.85	0.136441	1.0093	145.5854	0.8943	142.2323
90%	405	0.9	0.134117	0.9986	150.5548	0.8943	142.2323
95%	428	0.95	0.128739	0.9734	152.0136	0.8943	142.2323
100%	450	1	0.1125	0.8947	142.2959	0.8943	142.2323

JACOBS — Calculation title sheet

Project title:	**Immingham Eastern Ro-Ro Terminal**	**Project code:**	**B2429400**
Calculation title:	**Combined Effluent Pumping Station Capacity Assessment**	**Serial no:**	
Project manager:	**Claire Nicolson**	**No. of sheets:**	**1**
Status:		**Created by:**	**HHS**

Schematic		Preliminary		**Date:**	**5-Aug-22**
Tender		Other (state)	**Concept Design**	**Verified by:**	**TCW**
Final for Construction				**Date:**	**5-Aug-22**

Levels of verification:

1	Self-check and approval	☐	3B	Comparison with similar proven designs and approval	☐
2	Review and approval	☑	4	External check and internal approval	☐
3	Detailed check and approval	☐	5	Other verification as stated in the Management Plan	☐
3A	Alternative calculations and approval	☐		**Numerical Check**	

Approved by:	**DRK**
Date:	**17-Aug-22**
Computer analysis:	
Yes: ☐	No: ☑
Program(s):	
Hardware:	

Contents (continue on calculation sheet if necessary)

NB: Calculations should state or refer to design input data and methodology

CONTENTS AMENDMENT RECORD

Sheet(s)	Rev.	Date	Description	Created	Verified	Approved

File Name: Southern Catchment 600 Pipe Flow.xlsx
Path: \\uksfpp02\Water\we\Urban Water Market Sectors\Urban Water UK\Projects\ABP Nordic\Working Folder\Drainage Strategy\MicroDrainage

JACOBS Calculation sheet

Calculation title:	Combined Effluent Pumping Station Capacity Assessment	Created by:	HHS	Project code:	B2429300
		Date:	05/08/2022	Serial no:	
Subject:	600mm diameter incoming gravity pipework	Verified by:	TCW	Sheet no:	1
		Date:	05/08/2022	Revision:	P01

References/Results

This calculation sheet uses the Colebrook - White formula to calculate pipe flows for full and partially full pipes assuming that there are no affects of downstream controls

Colebrook-White Formula -

$$V = -2\sqrt{(2gDS)}Log\left(\frac{K_s}{3.70} + \frac{2.51v}{D\sqrt{(2gDS)}}\right)$$

V = Velocity (m/s)
g = Gravitational acceleration (9.81m/s²)
D = Pipe Diameter (mm)
S = Hydraulic Gradient
Ks = Effective pipe roughness (0.6 for surface sewers and 1.5 for foul sewers typically)
v = Kinematic Viscosity of fluid

Data inputs -

Pipe Diameter	600	mm
Gradient	523	
Pipe Roughness	0.6	

Results -

Percent Depth	Depth of flow (mm)	Proportional Depth	Hydraulic Radius	Velocity (m/s)	Flow (l/s)	Pipe full Velocity (m/s)	Pipe Full Capacity (l/s)
5%	30	0.05	0.019531	0.2904	1.5349	1.0701	302.5636
10%	60	0.1	0.038112	0.4497	6.6174	1.0701	302.5636
15%	90	0.15	0.055727	0.5739	15.2628	1.0701	302.5636
20%	120	0.2	0.072355	0.6776	27.2779	1.0701	302.5636
25%	150	0.25	0.087975	0.7667	42.3806	1.0701	302.5636
30%	180	0.3	0.102565	0.8443	60.2329	1.0701	302.5636
35%	210	0.35	0.116095	0.9125	80.4761	1.0701	302.5636
40%	240	0.4	0.128536	0.9724	102.6982	1.0701	302.5636
45%	270	0.45	0.139851	1.025	126.4868	1.0701	302.5636
50%	300	0.5	0.15	1.0706	151.3525	1.0701	302.5636
55%	330	0.55	0.158932	1.1098	176.8373	1.0701	302.5636
60%	360	0.6	0.166587	1.1427	202.4067	1.0701	302.5636
65%	390	0.65	0.172889	1.1693	227.4877	1.0701	302.5636
70%	420	0.7	0.177741	1.1895	251.4635	1.0701	302.5636
75%	450	0.75	0.181012	1.203	273.6424	1.0701	302.5636
80%	480	0.8	0.182516	1.2092	293.215	1.0701	302.5636
85%	510	0.85	0.18196	1.2069	309.1456	1.0701	302.5636
90%	540	0.9	0.178822	1.194	320.0257	1.0701	302.5636
95%	570	0.95	0.171871	1.165	323.2386	1.0701	302.5636
100%	600	1	0.15	1.0706	302.705	1.0701	302.5636

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Northern

Pipe Sizes STANDARD Manhole Sizes ECC

FSR Rainfall Model - England and Wales

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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

Simulation Criteria for Northern

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.400		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
N1.000	N1	15 Winter	1	+0%					2.645
N2.000	N2	15 Summer	1	+0%					2.575
N1.001	N3	15 Winter	1	+0%					2.508
N3.000	N4	15 Winter	1	+0%	100/15 Summer				2.236
N4.000	N5	15 Winter	1	+0%	30/15 Summer				2.268
N1.002	N6	15 Winter	1	+0%					2.230
N1.003	N7	15 Winter	1	+0%					2.050
N5.000	N8	15 Winter	1	+0%					2.639
N5.001	N9	15 Winter	1	+0%					2.586
N6.000	N10	15 Winter	1	+0%					2.636
N6.001	N11	15 Winter	1	+0%					2.580
N5.002	N12	15 Winter	1	+0%					2.576
N7.000	N13	15 Winter	1	+0%					2.351
N8.000	N14	15 Winter	1	+0%	30/15 Summer				2.122
N8.001	N15	15 Winter	1	+0%	30/15 Summer				2.091
N5.003	N16	15 Winter	1	+0%	30/15 Summer				2.088
N1.004	N17	15 Winter	1	+0%	100/15 Summer				1.814
N9.000	N18	15 Winter	1	+0%					2.637

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
N1.000	N1	-0.155	0.000	0.21			9.3	OK	
N2.000	N2	-0.225	0.000	0.00			0.0	OK	
N1.001	N3	-0.165	0.000	0.16			9.3	OK*	
N3.000	N4	-0.174	0.000	0.11			4.3	OK	
N4.000	N5	-0.142	0.000	0.27			9.4	OK	
N1.002	N6	-0.102	0.000	0.57			23.0	OK*	
N1.003	N7	-0.182	0.000	0.32			22.4	OK	
N5.000	N8	-0.161	0.000	0.18			6.0	OK	
N5.001	N9	-0.150	0.000	0.22			5.9	OK	
N6.000	N10	-0.164	0.000	0.16			5.4	OK	
N6.001	N11	-0.155	0.000	0.18			5.4	OK	
N5.002	N12	-0.140	0.000	0.31			11.3	OK	
N7.000	N13	-0.149	0.000	0.24			8.5	OK	
N8.000	N14	-0.148	0.000	0.24			8.0	OK	
N8.001	N15	-0.116	0.000	0.27			7.9	OK	
N5.003	N16	-0.110	0.000	0.52			27.5	OK*	
N1.004	N17	-0.211	0.000	0.39			48.5	OK	
N9.000	N18	-0.163	0.000	0.17			5.6	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
N9.001	N19	15 Winter	1	+0%					2.584
N10.000	N20	15 Winter	1	+0%					2.639
N10.001	N21	15 Winter	1	+0%					2.586
N9.002	N22	15 Winter	1	+0%					2.577
N11.000	N23	15 Winter	1	+0%	100/15 Summer				2.250
N11.001	N24	15 Winter	1	+0%	100/15 Summer				2.168
N12.000	N25	15 Winter	1	+0%	100/15 Summer				2.254
N12.001	N26	15 Winter	1	+0%	100/15 Summer				2.173
N9.003	N27	15 Winter	1	+0%	30/15 Summer				2.081
N1.005	N28	15 Winter	1	+0%	100/15 Winter				1.563
N13.000	N29	15 Winter	1	+0%					2.640
N13.001	N30	15 Winter	1	+0%					2.584
N14.000	N31	15 Winter	1	+0%					2.265
N13.002	N32	15 Winter	1	+0%					2.266
N15.000	N33	15 Summer	1	+0%					2.605
N16.000	N34	15 Winter	1	+0%					2.158
N16.001	N35	15 Winter	1	+0%	100/15 Summer				2.164
N13.003	N36	15 Winter	1	+0%	100/15 Summer				2.139
N1.006	N37	15 Winter	1	+0%					1.309

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
N9.001	N19	-0.155	0.000	0.20			5.5	OK	
N10.000	N20	-0.161	0.000	0.18			5.9	OK	
N10.001	N21	-0.152	0.000	0.22			5.9	OK	
N9.002	N22	-0.143	0.000	0.29			11.5	OK*	
N11.000	N23	-0.150	0.000	0.24			8.1	OK	
N11.001	N24	-0.169	0.000	0.14			8.1	OK	
N12.000	N25	-0.146	0.000	0.26			8.8	OK	
N12.001	N26	-0.167	0.000	0.15			8.8	OK	
N9.003	N27	-0.084	0.000	0.71			28.5	OK*	
N1.005	N28	-0.255	0.000	0.38			73.7	OK	
N13.000	N29	-0.160	0.000	0.18			6.1	OK	
N13.001	N30	-0.154	0.000	0.21			6.2	OK	
N14.000	N31	-0.225	0.000	0.00			0.0	OK	
N13.002	N32	-0.159	0.000	0.19			7.0	OK	
N15.000	N33	-0.225	0.000	0.00			0.0	OK	
N16.000	N34	-0.222	0.000	0.00			0.0	OK	
N16.001	N35	-0.154	0.000	0.22			7.0	OK	
N13.003	N36	-0.127	0.000	0.39			13.8	OK	
N1.006	N37	-0.302	0.000	0.36			82.9	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
N1.000	N1	15 Winter	30	+0%					2.690
N2.000	N2	15 Summer	30	+0%					2.575
N1.001	N3	15 Winter	30	+0%					2.545
N3.000	N4	15 Winter	30	+0%	100/15 Summer				2.406
N4.000	N5	15 Winter	30	+0%	30/15 Summer				2.439
N1.002	N6	15 Summer	30	+0%					2.332
N1.003	N7	15 Winter	30	+0%					2.131
N5.000	N8	15 Winter	30	+0%					2.679
N5.001	N9	15 Winter	30	+0%					2.644
N6.000	N10	15 Winter	30	+0%					2.675
N6.001	N11	15 Winter	30	+0%					2.641
N5.002	N12	15 Winter	30	+0%					2.636
N7.000	N13	15 Winter	30	+0%					2.402
N8.000	N14	15 Winter	30	+0%	30/15 Summer				2.309
N8.001	N15	15 Winter	30	+0%	30/15 Summer				2.283
N5.003	N16	15 Winter	30	+0%	30/15 Summer				2.275
N1.004	N17	15 Winter	30	+0%	100/15 Summer				1.934
N9.000	N18	15 Winter	30	+0%					2.676

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
N1.000	N1	-0.110	0.000	0.51			22.8	OK	
N2.000	N2	-0.225	0.000	0.00			0.0	OK	
N1.001	N3	-0.128	0.000	0.38			22.6	OK*	
N3.000	N4	-0.004	0.000	0.25			9.8	OK	
N4.000	N5	0.029	0.000	0.63			22.0	SURCHARGED	
N1.002	N6	0.000	0.000	1.27			50.7	SURCHARGED*	
N1.003	N7	-0.101	0.000	0.75			51.9	OK	
N5.000	N8	-0.121	0.000	0.43			14.6	OK	
N5.001	N9	-0.092	0.000	0.54			14.3	OK	
N6.000	N10	-0.125	0.000	0.39			13.3	OK	
N6.001	N11	-0.094	0.000	0.44			13.1	OK	
N5.002	N12	-0.080	0.000	0.74			27.4	OK	
N7.000	N13	-0.098	0.000	0.60			20.7	OK	
N8.000	N14	0.039	0.000	0.54			18.2	SURCHARGED	
N8.001	N15	0.076	0.000	0.62			18.5	SURCHARGED	
N5.003	N16	0.077	0.000	1.21			64.3	SURCHARGED*	
N1.004	N17	-0.091	0.000	0.91			113.7	OK	
N9.000	N18	-0.124	0.000	0.41			13.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
N9.001	N19	15 Winter	30	+0%					2.640
N10.000	N20	15 Winter	30	+0%					2.680
N10.001	N21	15 Winter	30	+0%					2.641
N9.002	N22	15 Winter	30	+0%					2.634
N11.000	N23	15 Winter	30	+0%	100/15 Summer				2.347
N11.001	N24	15 Winter	30	+0%	100/15 Summer				2.321
N12.000	N25	15 Winter	30	+0%	100/15 Summer				2.351
N12.001	N26	15 Winter	30	+0%	100/15 Summer				2.323
N9.003	N27	15 Winter	30	+0%	30/15 Summer				2.312
N1.005	N28	15 Winter	30	+0%	100/15 Winter				1.703
N13.000	N29	15 Winter	30	+0%					2.682
N13.001	N30	15 Winter	30	+0%					2.630
N14.000	N31	15 Winter	30	+0%					2.303
N13.002	N32	15 Winter	30	+0%					2.309
N15.000	N33	15 Summer	30	+0%					2.605
N16.000	N34	15 Winter	30	+0%					2.250
N16.001	N35	15 Winter	30	+0%	100/15 Summer				2.250
N13.003	N36	15 Winter	30	+0%	100/15 Summer				2.236
N1.006	N37	15 Winter	30	+0%					1.466

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
N9.001	N19	-0.099	0.000	0.48			13.5	OK	
N10.000	N20	-0.120	0.000	0.44			14.6	OK	
N10.001	N21	-0.097	0.000	0.53			14.4	OK	
N9.002	N22	-0.086	0.000	0.70			27.9	OK*	
N11.000	N23	-0.053	0.000	0.56			18.9	OK	
N11.001	N24	-0.016	0.000	0.30			17.8	OK	
N12.000	N25	-0.049	0.000	0.62			20.8	OK	
N12.001	N26	-0.017	0.000	0.33			19.3	OK	
N9.003	N27	0.147	0.000	1.62			64.8	SURCHARGED*	
N1.005	N28	-0.115	0.000	0.89			171.5	OK	
N13.000	N29	-0.118	0.000	0.45			15.1	OK	
N13.001	N30	-0.108	0.000	0.52			15.1	OK	
N14.000	N31	-0.187	0.000	0.01			0.2	OK	
N13.002	N32	-0.116	0.000	0.47			17.4	OK	
N15.000	N33	-0.225	0.000	0.00			0.0	OK	
N16.000	N34	-0.130	0.000	0.02			0.6	OK	
N16.001	N35	-0.068	0.000	0.63			20.1	OK	
N13.003	N36	-0.030	0.000	1.00			35.2	OK	
N1.006	N37	-0.145	0.000	0.83			192.5	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
N1.000	N1	15 Winter	100	+0%					2.710
N2.000	N2	15 Winter	100	+0%					2.576
N1.001	N3	15 Winter	100	+0%					2.586
N3.000	N4	15 Winter	100	+0%	100/15 Summer				2.519
N4.000	N5	15 Winter	100	+0%	30/15 Summer				2.566
N1.002	N6	15 Summer	100	+0%					2.332
N1.003	N7	15 Winter	100	+0%					2.229
N5.000	N8	15 Winter	100	+0%					2.703
N5.001	N9	15 Winter	100	+0%					2.674
N6.000	N10	15 Winter	100	+0%					2.698
N6.001	N11	15 Winter	100	+0%					2.670
N5.002	N12	15 Winter	100	+0%					2.664
N7.000	N13	15 Winter	100	+0%					2.460
N8.000	N14	15 Winter	100	+0%	30/15 Summer				2.461
N8.001	N15	15 Winter	100	+0%	30/15 Summer				2.428
N5.003	N16	15 Winter	100	+0%	30/15 Summer				2.416
N1.004	N17	15 Winter	100	+0%	100/15 Summer				2.067
N9.000	N18	15 Winter	100	+0%					2.697

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
N1.000	N1	-0.090	0.000	0.66			29.4	OK	
N2.000	N2	-0.224	0.000	0.00			0.0	OK	
N1.001	N3	-0.087	0.000	0.48			28.5	OK*	
N3.000	N4	0.109	0.000	0.32			12.6	SURCHARGED	
N4.000	N5	0.156	0.000	0.82			28.4	SURCHARGED	
N1.002	N6	0.000	0.000	1.63			65.2	SURCHARGED*	
N1.003	N7	-0.003	0.000	0.92			63.5	OK	
N5.000	N8	-0.097	0.000	0.55			18.7	OK	
N5.001	N9	-0.062	0.000	0.69			18.4	OK	
N6.000	N10	-0.102	0.000	0.50			17.0	OK	
N6.001	N11	-0.065	0.000	0.57			16.8	OK	
N5.002	N12	-0.052	0.000	0.94			34.8	OK	
N7.000	N13	-0.040	0.000	0.76			26.6	OK	
N8.000	N14	0.191	0.000	0.69			23.3	SURCHARGED	
N8.001	N15	0.221	0.000	0.76			22.6	SURCHARGED	
N5.003	N16	0.218	0.000	1.49			79.7	SURCHARGED*	
N1.004	N17	0.042	0.000	1.07			133.0	SURCHARGED	
N9.000	N18	-0.103	0.000	0.52			17.5	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
N9.001	N19	15 Winter	100	+0%					2.669
N10.000	N20	15 Winter	100	+0%					2.701
N10.001	N21	15 Winter	100	+0%					2.670
N9.002	N22	15 Winter	100	+0%					2.660
N11.000	N23	15 Winter	100	+0%	100/15 Summer				2.499
N11.001	N24	15 Winter	100	+0%	100/15 Summer				2.466
N12.000	N25	15 Winter	100	+0%	100/15 Summer				2.506
N12.001	N26	15 Winter	100	+0%	100/15 Summer				2.470
N9.003	N27	15 Winter	100	+0%	30/15 Summer				2.453
N1.005	N28	15 Winter	100	+0%	100/15 Winter				1.829
N13.000	N29	15 Winter	100	+0%					2.699
N13.001	N30	15 Winter	100	+0%					2.650
N14.000	N31	15 Winter	100	+0%					2.364
N13.002	N32	15 Winter	100	+0%					2.364
N15.000	N33	15 Summer	100	+0%					2.605
N16.000	N34	15 Winter	100	+0%					2.329
N16.001	N35	15 Winter	100	+0%	100/15 Summer				2.329
N13.003	N36	15 Winter	100	+0%	100/15 Summer				2.310
N1.006	N37	15 Winter	100	+0%					1.531

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
N9.001	N19	-0.070	0.000	0.62			17.2	OK	
N10.000	N20	-0.099	0.000	0.56			18.7	OK	
N10.001	N21	-0.068	0.000	0.68			18.4	OK	
N9.002	N22	-0.060	0.000	0.89			35.5	OK*	
N11.000	N23	0.099	0.000	0.68			22.9	SURCHARGED	
N11.001	N24	0.129	0.000	0.37			21.9	SURCHARGED	
N12.000	N25	0.106	0.000	0.75			25.0	SURCHARGED	
N12.001	N26	0.130	0.000	0.41			24.0	SURCHARGED	
N9.003	N27	0.288	0.000	2.04			81.4	SURCHARGED*	
N1.005	N28	0.011	0.000	1.06			203.2	SURCHARGED	
N13.000	N29	-0.101	0.000	0.58			19.5	OK	
N13.001	N30	-0.088	0.000	0.67			19.4	OK	
N14.000	N31	-0.126	0.000	0.02			0.7	OK	
N13.002	N32	-0.061	0.000	0.58			21.7	OK	
N15.000	N33	-0.225	0.000	0.00			0.0	OK	
N16.000	N34	-0.051	0.000	0.03			1.0	OK	
N16.001	N35	0.011	0.000	0.76			24.4	SURCHARGED	
N13.003	N36	0.044	0.000	1.25			44.2	SURCHARGED	
N1.006	N37	-0.080	0.000	0.99			228.2	OK	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	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 Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.400		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	1	+0%	30/15 Summer	30/15 Summer		
S2.000	S2	15 Winter	1	+0%	30/15 Summer	30/15 Summer		
S1.001	S2	15 Winter	1	+0%	1/15 Summer	30/15 Summer		
S3.000	S4	15 Winter	1	+0%	30/15 Summer	30/15 Winter		
S1.002	S4	15 Winter	1	+0%	1/15 Summer			
S4.000	S5	15 Winter	1	+0%	100/15 Summer			
S5.000	S6	15 Winter	1	+0%				
S1.003	S5	15 Winter	1	+0%	30/15 Winter			
S1.004	S3	15 Winter	1	+0%	30/15 Winter			
S6.000	S10	15 Winter	1	+0%	1/15 Summer	1/15 Summer		
S1.005	S10	30 Winter	1	+0%	30/15 Summer			
S1.006	S11	30 Winter	1	+0%	30/15 Summer			
S1.007	S12	30 Winter	1	+0%	30/15 Summer			
S7.000	S10	15 Winter	1	+0%	100/15 Summer			
S7.001	S11	15 Winter	1	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	3.122	-0.153	0.000	0.22			11.0	OK
S2.000	S2	3.006	-0.019	0.000	0.34			9.8	OK
S1.001	S2	2.986	0.160	0.000	1.02			29.7	SURCHARGED
S3.000	S4	2.646	-0.129	0.000	0.29			15.0	OK
S1.002	S4	2.629	0.130	0.000	1.30			37.5	SURCHARGED
S4.000	S5	2.643	-0.132	0.000	0.36			18.5	OK
S5.000	S6	2.609	-0.166	0.000	0.15			8.4	OK
S1.003	S5	1.944	-0.275	0.000	0.44			86.7	OK
S1.004	S3	1.823	-0.275	0.000	0.40			83.3	OK
S6.000	S10	4.709	1.284	8.671	2.10			81.4	FLOOD
S1.005	S10	1.681	-0.144	0.000	0.84			155.6	OK
S1.006	S11	1.581	-0.169	0.000	0.79			153.9	OK
S1.007	S12	1.461	-0.166	0.000	0.80			152.8	OK
S7.000	S10	3.196	-0.254	0.000	0.36			54.4	OK
S7.001	S11	2.958	-0.305	0.000	0.47			147.9	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	9
S2.000	S2	14
S1.001	S2	7
S3.000	S4	6
S1.002	S4	
S4.000	S5	
S5.000	S6	
S1.003	S5	
S1.004	S3	
S6.000	S10	33
S1.005	S10	
S1.006	S11	
S1.007	S12	
S7.000	S10	
S7.001	S11	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	30	+0%	30/15 Summer	30/15 Summer		
S2.000	S2	15 Winter	30	+0%	30/15 Summer	30/15 Summer		
S1.001	S2	15 Winter	30	+0%	1/15 Summer	30/15 Summer		
S3.000	S4	15 Winter	30	+0%	30/15 Summer	30/15 Winter		
S1.002	S4	15 Winter	30	+0%	1/15 Summer			
S4.000	S5	15 Winter	30	+0%	100/15 Summer			
S5.000	S6	15 Winter	30	+0%				
S1.003	S5	15 Winter	30	+0%	30/15 Winter			
S1.004	S3	15 Winter	30	+0%	30/15 Winter			
S6.000	S10	30 Winter	30	+0%	1/15 Summer	1/15 Summer		
S1.005	S10	30 Winter	30	+0%	30/15 Summer			
S1.006	S11	30 Winter	30	+0%	30/15 Summer			
S1.007	S12	30 Winter	30	+0%	30/15 Summer			
S7.000	S10	15 Winter	30	+0%	100/15 Summer			
S7.001	S11	15 Winter	30	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	4.253	0.978	3.302	0.65			32.8	FLOOD
S2.000	S2	4.014	0.989	13.540	1.54			44.0	FLOOD
S1.001	S2	4.251	1.425	0.698	1.52			44.3	FLOOD
S3.000	S4	3.750	0.975	0.315	0.55			28.3	FLOOD
S1.002	S4	3.665	1.166	0.000	2.46			71.0	SURCHARGED
S4.000	S5	2.714	-0.061	0.000	0.85			44.1	OK
S5.000	S6	2.647	-0.128	0.000	0.37			20.3	OK
S1.003	S5	2.224	0.005	0.000	1.04			204.6	SURCHARGED
S1.004	S3	2.102	0.004	0.000	0.91			188.0	SURCHARGED
S6.000	S10	4.870	1.445	169.991	2.20			85.2	FLOOD
S1.005	S10	1.962	0.137	0.000	1.30			241.8	SURCHARGED
S1.006	S11	1.838	0.088	0.000	1.22			239.3	SURCHARGED
S1.007	S12	1.653	0.026	0.000	1.25			237.7	SURCHARGED
S7.000	S10	3.450	0.000	0.000	0.84			126.5	OK
S7.001	S11	3.306	0.043	0.000	1.11			347.3	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	9
S2.000	S2	14
S1.001	S2	7
S3.000	S4	6
S1.002	S4	
S4.000	S5	
S5.000	S6	
S1.003	S5	
S1.004	S3	
S6.000	S10	33
S1.005	S10	
S1.006	S11	
S1.007	S12	
S7.000	S10	
S7.001	S11	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+0%	30/15 Summer	30/15 Summer		
S2.000	S2	30 Winter	100	+0%	30/15 Summer	30/15 Summer		
S1.001	S2	15 Winter	100	+0%	1/15 Summer	30/15 Summer		
S3.000	S4	15 Winter	100	+0%	30/15 Summer	30/15 Winter		
S1.002	S4	15 Summer	100	+0%	1/15 Summer			
S4.000	S5	15 Winter	100	+0%	100/15 Summer			
S5.000	S6	15 Winter	100	+0%				
S1.003	S5	15 Winter	100	+0%	30/15 Winter			
S1.004	S3	30 Winter	100	+0%	30/15 Winter			
S6.000	S10	60 Winter	100	+0%	1/15 Summer	1/15 Summer		
S1.005	S10	30 Winter	100	+0%	30/15 Summer			
S1.006	S11	30 Winter	100	+0%	30/15 Summer			
S1.007	S12	30 Winter	100	+0%	30/15 Summer			
S7.000	S10	15 Winter	100	+0%	100/15 Summer			
S7.001	S11	15 Winter	100	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	4.258	0.983	8.770	0.74			37.4	FLOOD
S2.000	S2	4.029	1.004	28.521	1.58			45.2	FLOOD
S1.001	S2	4.254	1.428	4.234	1.55			45.3	FLOOD
S3.000	S4	3.754	0.979	4.044	0.63			32.7	FLOOD
S1.002	S4	3.712	1.213	0.000	2.49			71.8	FLOOD RISK
S4.000	S5	3.004	0.229	0.000	1.00			51.7	SURCHARGED
S5.000	S6	2.662	-0.113	0.000	0.48			26.2	OK
S1.003	S5	2.472	0.253	0.000	1.21			236.5	SURCHARGED
S1.004	S3	2.380	0.282	0.000	1.06			217.7	SURCHARGED
S6.000	S10	4.970	1.545	269.722	2.26			87.5	FLOOD
S1.005	S10	2.159	0.334	0.000	1.57			293.1	SURCHARGED
S1.006	S11	1.980	0.230	0.000	1.46			286.0	SURCHARGED
S1.007	S12	1.715	0.088	0.000	1.49			283.0	SURCHARGED
S7.000	S10	3.746	0.296	0.000	1.09			163.3	SURCHARGED
S7.001	S11	3.496	0.233	0.000	1.45			453.1	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S1	9
S2.000	S2	14
S1.001	S2	7
S3.000	S4	6
S1.002	S4	
S4.000	S5	
S5.000	S6	
S1.003	S5	
S1.004	S3	
S6.000	S10	33
S1.005	S10	
S1.006	S11	
S1.007	S12	
S7.000	S10	
S7.001	S11	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	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 Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	30 Winter	1	+0%	1/15 Summer	30/15 Summer		
S1.001	S2	30 Winter	1	+0%	1/15 Summer	1/15 Winter		
S1.002	S3	30 Winter	1	+0%	1/15 Summer	1/15 Summer		
S1.003	S4	30 Winter	1	+0%	1/15 Summer	1/15 Winter		
S1.004	S5	30 Winter	1	+0%	1/15 Summer	30/15 Summer		
S2.000	S6	30 Winter	1	+0%	1/15 Summer	30/15 Summer		
S2.001	S7	30 Winter	1	+0%	1/15 Summer	1/15 Summer		
S1.005	S8	30 Winter	1	+0%	1/15 Summer	30/15 Summer		
S1.006	SSEPARATOR	30 Winter	1	+0%	1/15 Summer			
S1.007	S10	30 Winter	1	+0%	1/15 Summer			
S1.008	S11	30 Winter	1	+0%	1/15 Summer			
S1.009	S12	30 Winter	1	+0%	1/15 Summer			
S3.000	S13	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
S3.001	S14	15 Winter	1	+0%	30/15 Summer	100/15 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	4.551	0.618	0.000	0.82			10.0	FLOOD RISK
S1.001	S2	4.503	0.869	3.029	1.19			14.6	FLOOD
S1.002	S3	4.506	1.151	6.504	0.55			16.8	FLOOD
S1.003	S4	4.603	1.917	3.407	1.24			36.5	FLOOD
S1.004	S5	4.545	1.988	0.000	1.37			40.3	FLOOD RISK
S2.000	S6	4.819	0.811	0.000	0.80			44.4	FLOOD RISK
S2.001	S7	4.615	1.222	15.258	1.39			75.2	FLOOD
S1.005	S8	4.336	1.912	0.000	2.51			133.8	FLOOD RISK
S1.006	SSEPARATOR	3.869	1.523	0.000	2.53			132.0	SURCHARGED
S1.007	S10	3.489	1.205	0.000	2.50			130.8	SURCHARGED
S1.008	S11	3.078	0.861	0.000	2.38			130.0	SURCHARGED
S1.009	S12	2.481	0.369	0.000	2.39			129.7	SURCHARGED
S3.000	S13	3.583	-0.142	0.000	0.11			3.6	OK
S3.001	S14	3.578	-0.087	0.000	0.69			36.6	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	18
S1.001	S2	40
S1.002	S3	40
S1.003	S4	32
S1.004	S5	21
S2.000	S6	28
S2.001	S7	39
S1.005	S8	14
S1.006	SSEPARATOR	
S1.007	S10	
S1.008	S11	
S1.009	S12	
S3.000	S13	2
S3.001	S14	1

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S1	30 Winter	30	+0%	1/15 Summer	30/15 Summer	
S1.001	S2	120 Winter	30	+0%	1/15 Summer	1/15 Winter	
S1.002	S3	120 Winter	30	+0%	1/15 Summer	1/15 Summer	
S1.003	S4	60 Winter	30	+0%	1/15 Summer	1/15 Winter	
S1.004	S5	30 Winter	30	+0%	1/15 Summer	30/15 Summer	
S2.000	S6	30 Winter	30	+0%	1/15 Summer	30/15 Summer	
S2.001	S7	60 Winter	30	+0%	1/15 Summer	1/15 Summer	
S1.005	S8	15 Winter	30	+0%	1/15 Summer	30/15 Summer	
S1.006	SSEPARATOR	15 Summer	30	+0%	1/15 Summer		
S1.007	S10	15 Summer	30	+0%	1/15 Summer		
S1.008	S11	15 Winter	30	+0%	1/15 Summer		
S1.009	S12	15 Summer	30	+0%	1/15 Summer		
S3.000	S13	15 Winter	30	+0%	30/15 Summer	100/15 Summer	
S3.001	S14	15 Winter	30	+0%	30/15 Summer	100/15 Winter	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	S1		4.685	0.752	6.962	0.76			9.3
S1.001	S2		4.539	0.905	39.147	2.04			24.9
S1.002	S3		4.557	1.202	57.413	0.91			28.0
S1.003	S4		4.673	1.987	72.788	1.51			44.4
S1.004	S5		4.633	2.076	33.182	1.85			54.5
S2.000	S6		5.022	1.014	62.403	0.74			41.4
S2.001	S7		4.784	1.391	183.727	1.61			87.3
S1.005	S8		4.617	2.193	16.761	2.94			156.7
S1.006	SSEPARATOR		4.128	1.782	0.000	2.85			148.2
S1.007	S10		3.702	1.418	0.000	2.75			143.8
S1.008	S11		3.233	1.016	0.000	2.55			138.9
S1.009	S12		2.547	0.435	0.000	2.54			137.9
S3.000	S13		4.257	0.532	0.000	0.34			11.1
S3.001	S14		4.246	0.581	0.000	1.69			89.9

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	FLOOD	18
S1.001	S2	FLOOD	40
S1.002	S3	FLOOD	40
S1.003	S4	FLOOD	32
S1.004	S5	FLOOD	21
S2.000	S6	FLOOD	28
S2.001	S7	FLOOD	39
S1.005	S8	FLOOD	14
S1.006	SSEPARATOR	SURCHARGED	
S1.007	S10	SURCHARGED	
S1.008	S11	SURCHARGED	
S1.009	S12	SURCHARGED	
S3.000	S13	FLOOD RISK	2
S3.001	S14	SURCHARGED	1

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S1	30 Winter	100	+0%	1/15 Summer	30/15 Summer	
S1.001	S2	180 Winter	100	+0%	1/15 Summer	1/15 Winter	
S1.002	S3	180 Winter	100	+0%	1/15 Summer	1/15 Summer	
S1.003	S4	60 Winter	100	+0%	1/15 Summer	1/15 Winter	
S1.004	S5	60 Winter	100	+0%	1/15 Summer	30/15 Summer	
S2.000	S6	60 Winter	100	+0%	1/15 Summer	30/15 Summer	
S2.001	S7	60 Winter	100	+0%	1/15 Summer	1/15 Summer	
S1.005	S8	30 Winter	100	+0%	1/15 Summer	30/15 Summer	
S1.006	SSEPARATOR	15 Summer	100	+0%	1/15 Summer		
S1.007	S10	15 Winter	100	+0%	1/15 Summer		
S1.008	S11	15 Summer	100	+0%	1/15 Summer		
S1.009	S12	15 Winter	100	+0%	1/15 Summer		
S3.000	S13	15 Winter	100	+0%	30/15 Summer	100/15 Summer	
S3.001	S14	15 Winter	100	+0%	30/15 Summer	100/15 Winter	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S1.000	S1		4.690	0.757	12.356	0.79			9.6
S1.001	S2		4.563	0.929	62.558	2.06			25.1
S1.002	S3		4.585	1.230	85.378	1.03			31.6
S1.003	S4		4.708	2.022	107.604	1.49			43.9
S1.004	S5		4.660	2.103	59.719	1.80			53.0
S2.000	S6		5.067	1.059	107.235	0.74			41.1
S2.001	S7		4.874	1.481	273.515	1.62			87.9
S1.005	S8		4.642	2.218	41.830	2.86			152.4
S1.006	SSEPARATOR		4.141	1.795	0.000	2.92			152.1
S1.007	S10		3.710	1.426	0.000	2.77			144.8
S1.008	S11		3.237	1.020	0.000	2.55			139.2
S1.009	S12		2.550	0.438	0.000	2.55			138.1
S3.000	S13		4.530	0.805	2.082	1.03			33.9
S3.001	S14		4.590	0.925	0.054	2.00			106.6

PN	US/MH Name	Status	Level Exceeded
S1.000	S1	FLOOD	18
S1.001	S2	FLOOD	40
S1.002	S3	FLOOD	40
S1.003	S4	FLOOD	32
S1.004	S5	FLOOD	21
S2.000	S6	FLOOD	28
S2.001	S7	FLOOD	39
S1.005	S8	FLOOD	14
S1.006	SSEPARATOR	SURCHARGED	
S1.007	S10	SURCHARGED	
S1.008	S11	SURCHARGED	
S1.009	S12	SURCHARGED	
S3.000	S13	FLOOD	2
S3.001	S14	FLOOD	1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes ECC

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	1	+25%				
N-1.001	MH(N)-2	15 Winter	1	+25%				
N-2.000	MH(N)-3	15 Winter	1	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	1	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	1	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	1	+25%				
N-3.001	MH(N)-7	15 Winter	1	+25%				
N-4.000	MH(N)-8	15 Winter	1	+25%				
N-4.001	MH(N)-9	15 Winter	1	+25%	30/15 Winter			
N-4.002	MH(N)-10	15 Winter	1	+25%				
N-1.003	MH(N)-11	15 Winter	1	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	1	+25%				
N-5.001	MH(N)-13	15 Winter	1	+25%				
N-6.000	MH(N)-14	15 Winter	1	+25%				
N-6.001	MH(N)-15	15 Winter	1	+25%	15/15 Summer			
N-6.002	MH(N)-16	15 Winter	1	+25%	20/180 Winter			
N-1.004	MH(N)-17	240 Winter	1	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	1	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.605	-0.195	0.000	0.26			20.3	OK
N-1.001	MH(N)-2	3.419	-0.188	0.000	0.30			31.2	OK
N-2.000	MH(N)-3	3.708	-0.167	0.000	0.38			31.2	OK
N-2.001	MH(N)-4	3.266	-0.126	0.000	0.63			40.5	OK
N-1.002	MH(N)-5	3.130	-0.137	0.000	0.72		4	69.5	OK
N-3.000	MH(N)-6	3.533	-0.267	0.000	0.18			24.6	OK
N-3.001	MH(N)-7	3.250	-0.276	0.000	0.15			38.0	OK
N-4.000	MH(N)-8	3.623	-0.177	0.000	0.34			28.0	OK
N-4.001	MH(N)-9	3.273	-0.208	0.000	0.40			47.1	OK
N-4.002	MH(N)-10	3.030	-0.234	0.000	0.30			58.3	OK
N-1.003	MH(N)-11	2.607	-0.143	0.000	0.80		3	150.3	OK
N-5.000	MH(N)-12	3.538	-0.262	0.000	0.19			26.9	OK
N-5.001	MH(N)-13	3.162	-0.356	0.000	0.09			42.0	OK
N-6.000	MH(N)-14	3.550	-0.250	0.000	0.23			36.3	OK
N-6.001	MH(N)-15	3.125	-0.230	0.000	0.46			77.1	OK
N-6.002	MH(N)-16	2.815	-0.311	0.000	0.21			76.8	OK
N-1.004	MH(N)-17	2.588	-0.012	0.000	0.06		123	28.7	OK
N-7.000	MH(N)-18	3.319	-0.265	0.000	0.18			44.6	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

1 year Return Period 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
N-8.000	MH(N)-19	15 Winter	1	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	1	+25%	25/15 Winter		
N-8.002	MH(N)-21	15 Winter	1	+25%	20/120 Winter		
N-8.003	MH(N)-22	15 Winter	1	+25%	10/120 Winter		
N-1.005	MH(N)-23	240 Winter	1	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	1	+25%			
N-10.000	MH(N)-25	15 Winter	1	+25%			
N-10.001	MH(N)-26	15 Winter	1	+25%	25/15 Summer		
N-10.002	MH(N)-27	15 Winter	1	+25%	20/120 Winter		
N-1.006	MH(N)-28	180 Winter	1	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	180 Winter	1	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.565	-0.235	0.000	0.45			101.0
N-8.001	MH(N)-20		3.268	-0.275	0.000	0.44			127.3
N-8.002	MH(N)-21		2.971	-0.272	0.000	0.47			152.1
N-8.003	MH(N)-22		2.688	-0.305	0.000	0.37			152.9
N-1.005	MH(N)-23		2.511	0.000	0.000	0.07		145	43.0
N-9.000	MH(N)-24		3.485	-0.200	0.000	0.24			48.6
N-10.000	MH(N)-25		3.505	-0.295	0.000	0.25			58.8
N-10.001	MH(N)-26		3.121	-0.237	0.000	0.45			93.5
N-10.002	MH(N)-27		2.769	-0.310	0.000	0.21			93.9
N-1.006	MH(N)-28		2.506	0.581	0.000	0.28		197	42.7
N-1.007	MH(N)-EX-37		1.919	0.308	0.000	0.18			42.7

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	OK	
N-8.003	MH(N)-22	OK	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years)	1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%)	25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	2	+25%				
N-1.001	MH(N)-2	15 Winter	2	+25%				
N-2.000	MH(N)-3	15 Winter	2	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	2	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	2	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	2	+25%				
N-3.001	MH(N)-7	15 Winter	2	+25%				
N-4.000	MH(N)-8	15 Winter	2	+25%				
N-4.001	MH(N)-9	15 Winter	2	+25%	30/15 Winter			
N-4.002	MH(N)-10	15 Winter	2	+25%				
N-1.003	MH(N)-11	180 Winter	2	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	2	+25%				
N-5.001	MH(N)-13	15 Winter	2	+25%				
N-6.000	MH(N)-14	15 Winter	2	+25%				
N-6.001	MH(N)-15	15 Winter	2	+25%	15/15 Summer			
N-6.002	MH(N)-16	15 Winter	2	+25%	20/180 Winter			
N-1.004	MH(N)-17	180 Winter	2	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	2	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.621	-0.179	0.000	0.34			26.3	OK
N-1.001	MH(N)-2	3.437	-0.170	0.000	0.39			40.4	OK
N-2.000	MH(N)-3	3.730	-0.145	0.000	0.49			40.4	OK
N-2.001	MH(N)-4	3.300	-0.092	0.000	0.81			52.4	OK
N-1.002	MH(N)-5	3.179	-0.088	0.000	0.94		4	89.9	OK
N-3.000	MH(N)-6	3.548	-0.252	0.000	0.23			31.7	OK
N-3.001	MH(N)-7	3.265	-0.261	0.000	0.20			48.9	OK
N-4.000	MH(N)-8	3.643	-0.157	0.000	0.44			36.2	OK
N-4.001	MH(N)-9	3.301	-0.180	0.000	0.51			61.0	OK
N-4.002	MH(N)-10	3.052	-0.212	0.000	0.39			75.4	OK
N-1.003	MH(N)-11	2.693	-0.057	0.000	0.31		47	57.6	OK
N-5.000	MH(N)-12	3.554	-0.246	0.000	0.25			34.7	OK
N-5.001	MH(N)-13	3.173	-0.345	0.000	0.12			54.3	OK
N-6.000	MH(N)-14	3.569	-0.231	0.000	0.30			47.1	OK
N-6.001	MH(N)-15	3.163	-0.192	0.000	0.59			99.7	OK
N-6.002	MH(N)-16	2.835	-0.291	0.000	0.27			99.3	OK
N-1.004	MH(N)-17	2.669	0.069	0.000	0.11		145	54.7	SURCHARGED
N-7.000	MH(N)-18	3.334	-0.250	0.000	0.24			57.6	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

2 year Return Period 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
N-8.000	MH(N)-19	15 Winter	2	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	2	+25%	25/15 Winter		
N-8.002	MH(N)-21	15 Winter	2	+25%	20/120 Winter		
N-8.003	MH(N)-22	15 Winter	2	+25%	10/120 Winter		
N-1.005	MH(N)-23	180 Winter	2	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	2	+25%			
N-10.000	MH(N)-25	15 Winter	2	+25%			
N-10.001	MH(N)-26	15 Winter	2	+25%	25/15 Summer		
N-10.002	MH(N)-27	15 Winter	2	+25%	20/120 Winter		
N-1.006	MH(N)-28	180 Winter	2	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	180 Winter	2	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.602	-0.198	0.000	0.58			130.7
N-8.001	MH(N)-20		3.311	-0.232	0.000	0.57			164.8
N-8.002	MH(N)-21		3.015	-0.228	0.000	0.60			197.2
N-8.003	MH(N)-22		2.723	-0.270	0.000	0.47			197.7
N-1.005	MH(N)-23		2.666	0.155	0.000	0.14		165	89.6
N-9.000	MH(N)-24		3.500	-0.185	0.000	0.31			62.9
N-10.000	MH(N)-25		3.530	-0.270	0.000	0.32			76.2
N-10.001	MH(N)-26		3.157	-0.201	0.000	0.58			120.9
N-10.002	MH(N)-27		2.788	-0.291	0.000	0.27			121.3
N-1.006	MH(N)-28		2.663	0.738	0.000	0.32		205	48.9
N-1.007	MH(N)-EX-37		1.921	0.310	0.000	0.21			48.9

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	OK	
N-8.003	MH(N)-22	OK	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	5	+25%				
N-1.001	MH(N)-2	15 Winter	5	+25%				
N-2.000	MH(N)-3	15 Winter	5	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	5	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	5	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	5	+25%				
N-3.001	MH(N)-7	15 Winter	5	+25%				
N-4.000	MH(N)-8	15 Winter	5	+25%				
N-4.001	MH(N)-9	15 Winter	5	+25%	30/15 Winter			
N-4.002	MH(N)-10	15 Winter	5	+25%				
N-1.003	MH(N)-11	180 Winter	5	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	5	+25%				
N-5.001	MH(N)-13	15 Winter	5	+25%				
N-6.000	MH(N)-14	15 Winter	5	+25%				
N-6.001	MH(N)-15	15 Winter	5	+25%	15/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.640	-0.160	0.000	0.43			34.0	OK
N-1.001	MH(N)-2	3.458	-0.149	0.000	0.50			52.2	OK
N-2.000	MH(N)-3	3.757	-0.118	0.000	0.63			52.3	OK
N-2.001	MH(N)-4	3.359	-0.033	0.000	1.00			64.7	OK
N-1.002	MH(N)-5	3.212	-0.055	0.000	1.00		4	96.0	OK
N-3.000	MH(N)-6	3.566	-0.234	0.000	0.30			40.9	OK
N-3.001	MH(N)-7	3.281	-0.245	0.000	0.26			63.2	OK
N-4.000	MH(N)-8	3.667	-0.133	0.000	0.57			46.9	OK
N-4.001	MH(N)-9	3.334	-0.147	0.000	0.66			79.1	OK
N-4.002	MH(N)-10	3.078	-0.186	0.000	0.50			97.4	OK
N-1.003	MH(N)-11	2.842	0.092	0.000	0.38		83	71.8	SURCHARGED
N-5.000	MH(N)-12	3.574	-0.226	0.000	0.32			44.9	OK
N-5.001	MH(N)-13	3.189	-0.329	0.000	0.16			70.2	OK
N-6.000	MH(N)-14	3.591	-0.209	0.000	0.39			60.8	OK
N-6.001	MH(N)-15	3.212	-0.143	0.000	0.77			129.0	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	

5 year Return Period 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
N-6.002	MH(N)-16	15 Winter	5	+25%	20/180 Winter		
N-1.004	MH(N)-17	180 Winter	5	+25%	2/60 Winter		
N-7.000	MH(N)-18	15 Winter	5	+25%			
N-8.000	MH(N)-19	15 Winter	5	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	5	+25%	25/15 Winter		
N-8.002	MH(N)-21	15 Winter	5	+25%	20/120 Winter		
N-8.003	MH(N)-22	180 Winter	5	+25%	10/120 Winter		
N-1.005	MH(N)-23	180 Winter	5	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	5	+25%			
N-10.000	MH(N)-25	15 Winter	5	+25%			
N-10.001	MH(N)-26	15 Winter	5	+25%	25/15 Summer		
N-10.002	MH(N)-27	180 Winter	5	+25%	20/120 Winter		
N-1.006	MH(N)-28	180 Winter	5	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	180 Winter	5	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		2.860	-0.266	0.000	0.35			128.4
N-1.004	MH(N)-17		2.835	0.235	0.000	0.16		177	78.1
N-7.000	MH(N)-18		3.354	-0.230	0.000	0.31			74.5
N-8.000	MH(N)-19		3.650	-0.150	0.000	0.76			169.0
N-8.001	MH(N)-20		3.363	-0.180	0.000	0.74			213.2
N-8.002	MH(N)-21		3.070	-0.173	0.000	0.78			253.0
N-8.003	MH(N)-22		2.844	-0.149	0.000	0.16			67.7
N-1.005	MH(N)-23		2.832	0.321	0.000	0.15		194	100.0
N-9.000	MH(N)-24		3.518	-0.167	0.000	0.40			81.4
N-10.000	MH(N)-25		3.557	-0.243	0.000	0.42			98.5
N-10.001	MH(N)-26		3.204	-0.154	0.000	0.75			156.4
N-10.002	MH(N)-27		2.832	-0.247	0.000	0.09			40.8
N-1.006	MH(N)-28		2.828	0.903	0.000	0.36			54.6
N-1.007	MH(N)-EX-37		1.924	0.313	0.000	0.24			54.6

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	OK	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	OK	
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	OK	
N-8.003	MH(N)-22	OK	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	10	+25%				
N-1.001	MH(N)-2	15 Winter	10	+25%				
N-2.000	MH(N)-3	15 Winter	10	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	10	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	10	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	10	+25%				
N-3.001	MH(N)-7	15 Winter	10	+25%				
N-4.000	MH(N)-8	15 Winter	10	+25%				
N-4.001	MH(N)-9	15 Winter	10	+25%	30/15 Winter			
N-4.002	MH(N)-10	15 Winter	10	+25%				
N-1.003	MH(N)-11	240 Winter	10	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	10	+25%				
N-5.001	MH(N)-13	15 Winter	10	+25%				
N-6.000	MH(N)-14	15 Winter	10	+25%				
N-6.001	MH(N)-15	15 Winter	10	+25%	15/15 Summer			
N-6.002	MH(N)-16	240 Winter	10	+25%	20/180 Winter			
N-1.004	MH(N)-17	240 Winter	10	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	10	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.653	-0.147	0.000	0.50			39.3	OK
N-1.001	MH(N)-2	3.481	-0.126	0.000	0.62			64.3	OK
N-2.000	MH(N)-3	3.777	-0.098	0.000	0.73			60.6	OK
N-2.001	MH(N)-4	3.439	0.047	0.000	1.20			77.5	SURCHARGED
N-1.002	MH(N)-5	3.233	-0.034	0.000	1.00		4	96.0	OK
N-3.000	MH(N)-6	3.579	-0.221	0.000	0.34			47.3	OK
N-3.001	MH(N)-7	3.299	-0.227	0.000	0.32			78.6	OK
N-4.000	MH(N)-8	3.683	-0.117	0.000	0.66			54.3	OK
N-4.001	MH(N)-9	3.378	-0.103	0.000	0.83			99.0	OK
N-4.002	MH(N)-10	3.107	-0.157	0.000	0.63			122.9	OK
N-1.003	MH(N)-11	2.976	0.226	0.000	0.34		113	63.7	SURCHARGED
N-5.000	MH(N)-12	3.586	-0.214	0.000	0.38			51.9	OK
N-5.001	MH(N)-13	3.205	-0.313	0.000	0.20			87.8	OK
N-6.000	MH(N)-14	3.605	-0.195	0.000	0.45			70.4	OK
N-6.001	MH(N)-15	3.298	-0.057	0.000	0.97			162.1	OK
N-6.002	MH(N)-16	2.972	-0.154	0.000	0.09			33.3	OK
N-1.004	MH(N)-17	2.969	0.369	0.000	0.16		212	80.8	SURCHARGED
N-7.000	MH(N)-18	3.366	-0.218	0.000	0.36			86.3	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

10 year Return Period 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
N-8.000	MH(N)-19	15 Winter	10	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	10	+25%	25/15 Winter		
N-8.002	MH(N)-21	15 Winter	10	+25%	20/120 Winter		
N-8.003	MH(N)-22	120 Winter	10	+25%	10/120 Winter		
N-1.005	MH(N)-23	240 Winter	10	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	10	+25%			
N-10.000	MH(N)-25	15 Winter	10	+25%			
N-10.001	MH(N)-26	15 Winter	10	+25%	25/15 Summer		
N-10.002	MH(N)-27	240 Winter	10	+25%	20/120 Winter		
N-1.006	MH(N)-28	240 Winter	10	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	240 Winter	10	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.683	-0.117	0.000	0.87			195.7
N-8.001	MH(N)-20		3.419	-0.124	0.000	0.88			253.5
N-8.002	MH(N)-21		3.125	-0.118	0.000	0.94			307.6
N-8.003	MH(N)-22		3.016	0.023	0.000	0.25			105.5
N-1.005	MH(N)-23		2.965	0.454	0.000	0.15		231	94.9
N-9.000	MH(N)-24		3.530	-0.155	0.000	0.47			94.3
N-10.000	MH(N)-25		3.576	-0.224	0.000	0.48			114.0
N-10.001	MH(N)-26		3.256	-0.102	0.000	0.92			192.1
N-10.002	MH(N)-27		2.966	-0.113	0.000	0.09			38.7
N-1.006	MH(N)-28		2.962	1.037	0.000	0.39		248	58.8
N-1.007	MH(N)-EX-37		1.926	0.315	0.000	0.25			58.8

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	OK	
N-8.003	MH(N)-22	SURCHARGED	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years)	1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%)	25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	15	+25%				
N-1.001	MH(N)-2	15 Winter	15	+25%				
N-2.000	MH(N)-3	15 Winter	15	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	15	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	15	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	15	+25%				
N-3.001	MH(N)-7	15 Winter	15	+25%				
N-4.000	MH(N)-8	15 Winter	15	+25%				
N-4.001	MH(N)-9	15 Winter	15	+25%	30/15 Winter			
N-4.002	MH(N)-10	15 Winter	15	+25%				
N-1.003	MH(N)-11	240 Winter	15	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	15	+25%				
N-5.001	MH(N)-13	15 Winter	15	+25%				
N-6.000	MH(N)-14	15 Winter	15	+25%				
N-6.001	MH(N)-15	15 Winter	15	+25%	15/15 Summer			
N-6.002	MH(N)-16	240 Winter	15	+25%	20/180 Winter			
N-1.004	MH(N)-17	240 Winter	15	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	15	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.661	-0.139	0.000	0.55			42.8	OK
N-1.001	MH(N)-2	3.491	-0.116	0.000	0.67			70.0	OK
N-2.000	MH(N)-3	3.792	-0.083	0.000	0.80			65.9	OK
N-2.001	MH(N)-4	3.473	0.081	0.000	1.30			84.3	SURCHARGED
N-1.002	MH(N)-5	3.247	-0.020	0.000	1.00		5	96.0	OK
N-3.000	MH(N)-6	3.586	-0.214	0.000	0.37			51.5	OK
N-3.001	MH(N)-7	3.306	-0.220	0.000	0.35			85.7	OK
N-4.000	MH(N)-8	3.695	-0.105	0.000	0.72			59.1	OK
N-4.001	MH(N)-9	3.396	-0.085	0.000	0.91			107.8	OK
N-4.002	MH(N)-10	3.120	-0.144	0.000	0.69			133.6	OK
N-1.003	MH(N)-11	3.066	0.316	0.000	0.35		131	66.2	SURCHARGED
N-5.000	MH(N)-12	3.594	-0.206	0.000	0.41			56.6	OK
N-5.001	MH(N)-13	3.211	-0.307	0.000	0.22			95.7	OK
N-6.000	MH(N)-14	3.615	-0.185	0.000	0.49			76.8	OK
N-6.001	MH(N)-15	3.371	0.016	0.000	1.03			172.4	SURCHARGED
N-6.002	MH(N)-16	3.064	-0.062	0.000	0.10			36.5	OK
N-1.004	MH(N)-17	3.058	0.458	0.000	0.17		235	83.1	SURCHARGED
N-7.000	MH(N)-18	3.373	-0.211	0.000	0.39			94.0	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

15 year Return Period 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
N-8.000	MH(N)-19	15 Winter	15	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	15	+25%	25/15 Winter		
N-8.002	MH(N)-21	120 Winter	15	+25%	20/120 Winter		
N-8.003	MH(N)-22	120 Winter	15	+25%	10/120 Winter		
N-1.005	MH(N)-23	240 Winter	15	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	15	+25%			
N-10.000	MH(N)-25	15 Winter	15	+25%			
N-10.001	MH(N)-26	15 Winter	15	+25%	25/15 Summer		
N-10.002	MH(N)-27	240 Winter	15	+25%	20/120 Winter		
N-1.006	MH(N)-28	240 Winter	15	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	240 Winter	15	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.705	-0.095	0.000	0.95			213.2
N-8.001	MH(N)-20		3.448	-0.095	0.000	0.96			276.1
N-8.002	MH(N)-21		3.240	-0.003	0.000	0.36			117.1
N-8.003	MH(N)-22		3.111	0.118	0.000	0.27			113.0
N-1.005	MH(N)-23		3.054	0.543	0.000	0.16		247	102.3
N-9.000	MH(N)-24		3.537	-0.148	0.000	0.51			102.7
N-10.000	MH(N)-25		3.588	-0.212	0.000	0.53			124.2
N-10.001	MH(N)-26		3.287	-0.071	0.000	0.99			206.2
N-10.002	MH(N)-27		3.066	-0.013	0.000	0.09			42.0
N-1.006	MH(N)-28		3.051	1.126	0.000	0.41		261	61.5
N-1.007	MH(N)-EX-37		1.927	0.316	0.000	0.27			61.5

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	OK	
N-8.003	MH(N)-22	SURCHARGED	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years)	1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%)	25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	20	+25%				
N-1.001	MH(N)-2	15 Winter	20	+25%				
N-2.000	MH(N)-3	15 Winter	20	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	20	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	20	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	20	+25%				
N-3.001	MH(N)-7	15 Winter	20	+25%				
N-4.000	MH(N)-8	15 Winter	20	+25%				
N-4.001	MH(N)-9	15 Winter	20	+25%	30/15 Winter			
N-4.002	MH(N)-10	240 Winter	20	+25%				
N-1.003	MH(N)-11	240 Winter	20	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	20	+25%				
N-5.001	MH(N)-13	15 Winter	20	+25%				
N-6.000	MH(N)-14	15 Winter	20	+25%				
N-6.001	MH(N)-15	15 Winter	20	+25%	15/15 Summer			
N-6.002	MH(N)-16	240 Winter	20	+25%	20/180 Winter			
N-1.004	MH(N)-17	240 Winter	20	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	20	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.668	-0.132	0.000	0.58			45.5	OK
N-1.001	MH(N)-2	3.499	-0.108	0.000	0.71			74.4	OK
N-2.000	MH(N)-3	3.840	-0.035	0.000	0.83			68.4	OK
N-2.001	MH(N)-4	3.494	0.102	0.000	1.37			88.4	SURCHARGED
N-1.002	MH(N)-5	3.257	-0.010	0.000	1.00		5	96.0	OK
N-3.000	MH(N)-6	3.592	-0.208	0.000	0.40			54.7	OK
N-3.001	MH(N)-7	3.311	-0.215	0.000	0.37			91.1	OK
N-4.000	MH(N)-8	3.703	-0.097	0.000	0.77			62.8	OK
N-4.001	MH(N)-9	3.411	-0.070	0.000	0.96			114.4	OK
N-4.002	MH(N)-10	3.138	-0.126	0.000	0.15			29.0	OK
N-1.003	MH(N)-11	3.134	0.384	0.000	0.36		146	67.7	SURCHARGED
N-5.000	MH(N)-12	3.600	-0.200	0.000	0.43			60.1	OK
N-5.001	MH(N)-13	3.216	-0.302	0.000	0.23			101.7	OK
N-6.000	MH(N)-14	3.622	-0.178	0.000	0.52			81.6	OK
N-6.001	MH(N)-15	3.409	0.054	0.000	1.09			183.6	SURCHARGED
N-6.002	MH(N)-16	3.130	0.004	0.000	0.10			38.4	SURCHARGED
N-1.004	MH(N)-17	3.126	0.526	0.000	0.17		246	86.3	SURCHARGED
N-7.000	MH(N)-18	3.379	-0.205	0.000	0.41			99.9	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

20 year Return Period 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
N-8.000	MH(N)-19	15 Winter	20	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	20	+25%	25/15 Winter		
N-8.002	MH(N)-21	180 Winter	20	+25%	20/120 Winter		
N-8.003	MH(N)-22	180 Winter	20	+25%	10/120 Winter		
N-1.005	MH(N)-23	240 Winter	20	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	20	+25%			
N-10.000	MH(N)-25	15 Winter	20	+25%			
N-10.001	MH(N)-26	15 Winter	20	+25%	25/15 Summer		
N-10.002	MH(N)-27	240 Winter	20	+25%	20/120 Winter		
N-1.006	MH(N)-28	240 Winter	20	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	240 Winter	20	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.758	-0.042	0.000	0.99			221.3
N-8.001	MH(N)-20		3.520	-0.023	0.000	0.99			283.6
N-8.002	MH(N)-21		3.329	0.086	0.000	0.29			93.4
N-8.003	MH(N)-22		3.187	0.194	0.000	0.21			87.2
N-1.005	MH(N)-23		3.122	0.611	0.000	0.17		260	110.3
N-9.000	MH(N)-24		3.543	-0.142	0.000	0.54			109.2
N-10.000	MH(N)-25		3.597	-0.203	0.000	0.56			132.0
N-10.001	MH(N)-26		3.354	-0.004	0.000	1.00			208.6
N-10.002	MH(N)-27		3.123	0.044	0.000	0.10			44.5
N-1.006	MH(N)-28		3.118	1.193	0.000	0.42		277	63.9
N-1.007	MH(N)-EX-37		1.928	0.317	0.000	0.28			63.9

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	SURCHARGED	
N-8.003	MH(N)-22	SURCHARGED	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	25	+25%				
N-1.001	MH(N)-2	15 Winter	25	+25%				
N-2.000	MH(N)-3	15 Winter	25	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	25	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	25	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	25	+25%				
N-3.001	MH(N)-7	15 Winter	25	+25%				
N-4.000	MH(N)-8	15 Winter	25	+25%				
N-4.001	MH(N)-9	15 Winter	25	+25%	30/15 Winter			
N-4.002	MH(N)-10	240 Winter	25	+25%				
N-1.003	MH(N)-11	240 Winter	25	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	25	+25%				
N-5.001	MH(N)-13	15 Winter	25	+25%				
N-6.000	MH(N)-14	15 Winter	25	+25%				
N-6.001	MH(N)-15	15 Winter	25	+25%	15/15 Summer			
N-6.002	MH(N)-16	240 Winter	25	+25%	20/180 Winter			
N-1.004	MH(N)-17	240 Winter	25	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	25	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.673	-0.127	0.000	0.61			47.7	OK
N-1.001	MH(N)-2	3.506	-0.101	0.000	0.75			78.0	OK
N-2.000	MH(N)-3	3.888	0.013	0.000	0.86			71.0	SURCHARGED
N-2.001	MH(N)-4	3.511	0.119	0.000	1.41			91.6	SURCHARGED
N-1.002	MH(N)-5	3.266	-0.001	0.000	1.00		6	96.0	OK
N-3.000	MH(N)-6	3.596	-0.204	0.000	0.42			57.4	OK
N-3.001	MH(N)-7	3.315	-0.211	0.000	0.39			95.5	OK
N-4.000	MH(N)-8	3.710	-0.090	0.000	0.80			65.9	OK
N-4.001	MH(N)-9	3.437	-0.044	0.000	0.98			117.2	OK
N-4.002	MH(N)-10	3.191	-0.073	0.000	0.16			30.5	OK
N-1.003	MH(N)-11	3.186	0.436	0.000	0.37		156	69.0	SURCHARGED
N-5.000	MH(N)-12	3.605	-0.195	0.000	0.46			63.0	OK
N-5.001	MH(N)-13	3.219	-0.299	0.000	0.24			106.6	OK
N-6.000	MH(N)-14	3.628	-0.172	0.000	0.55			85.5	OK
N-6.001	MH(N)-15	3.439	0.084	0.000	1.15			192.7	SURCHARGED
N-6.002	MH(N)-16	3.182	0.056	0.000	0.11			40.0	SURCHARGED
N-1.004	MH(N)-17	3.178	0.578	0.000	0.18		257	87.5	SURCHARGED
N-7.000	MH(N)-18	3.384	-0.200	0.000	0.43			104.8	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

25 year Return Period 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
N-8.000	MH(N)-19	15 Winter	25	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	25	+25%	25/15 Winter		
N-8.002	MH(N)-21	180 Winter	25	+25%	20/120 Winter		
N-8.003	MH(N)-22	180 Winter	25	+25%	10/120 Winter		
N-1.005	MH(N)-23	240 Winter	25	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	25	+25%			
N-10.000	MH(N)-25	15 Winter	25	+25%			
N-10.001	MH(N)-26	15 Winter	25	+25%	25/15 Summer		
N-10.002	MH(N)-27	240 Winter	25	+25%	20/120 Winter		
N-1.006	MH(N)-28	240 Winter	25	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	240 Winter	25	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.827	0.027	0.000	1.03			229.4
N-8.001	MH(N)-20		3.563	0.020	0.000	1.02			293.0
N-8.002	MH(N)-21		3.388	0.145	0.000	0.30			98.0
N-8.003	MH(N)-22		3.244	0.251	0.000	0.22			90.8
N-1.005	MH(N)-23		3.174	0.663	0.000	0.17		276	111.3
N-9.000	MH(N)-24		3.548	-0.137	0.000	0.56			114.4
N-10.000	MH(N)-25		3.604	-0.196	0.000	0.59			138.4
N-10.001	MH(N)-26		3.385	0.027	0.000	1.06			221.0
N-10.002	MH(N)-27		3.174	0.095	0.000	0.10			46.2
N-1.006	MH(N)-28		3.170	1.245	0.000	0.46		291	68.6
N-1.007	MH(N)-EX-37		1.930	0.319	0.000	0.30			68.6

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	SURCHARGED	
N-8.001	MH(N)-20	SURCHARGED	
N-8.002	MH(N)-21	SURCHARGED	
N-8.003	MH(N)-22	SURCHARGED	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	30	+25%				
N-1.001	MH(N)-2	15 Winter	30	+25%				
N-2.000	MH(N)-3	15 Winter	30	+25%	25/15 Winter			
N-2.001	MH(N)-4	15 Winter	30	+25%	10/15 Summer			
N-1.002	MH(N)-5	15 Winter	30	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	30	+25%				
N-3.001	MH(N)-7	15 Winter	30	+25%				
N-4.000	MH(N)-8	15 Winter	30	+25%				
N-4.001	MH(N)-9	15 Winter	30	+25%	30/15 Winter			
N-4.002	MH(N)-10	240 Winter	30	+25%				
N-1.003	MH(N)-11	240 Winter	30	+25%	5/60 Winter			
N-5.000	MH(N)-12	15 Winter	30	+25%				
N-5.001	MH(N)-13	15 Winter	30	+25%				
N-6.000	MH(N)-14	15 Winter	30	+25%				
N-6.001	MH(N)-15	15 Winter	30	+25%	15/15 Summer			
N-6.002	MH(N)-16	240 Winter	30	+25%	20/180 Winter			
N-1.004	MH(N)-17	240 Winter	30	+25%	2/60 Winter			
N-7.000	MH(N)-18	15 Winter	30	+25%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.677	-0.123	0.000	0.63			49.6	OK
N-1.001	MH(N)-2	3.511	-0.096	0.000	0.78			81.1	OK
N-2.000	MH(N)-3	3.931	0.056	0.000	0.89			73.4	SURCHARGED
N-2.001	MH(N)-4	3.526	0.134	0.000	1.45			94.1	SURCHARGED
N-1.002	MH(N)-5	3.271	0.004	0.000	1.14		6	109.0	SURCHARGED
N-3.000	MH(N)-6	3.600	-0.200	0.000	0.43			59.6	OK
N-3.001	MH(N)-7	3.319	-0.207	0.000	0.40			99.2	OK
N-4.000	MH(N)-8	3.716	-0.084	0.000	0.84			68.4	OK
N-4.001	MH(N)-9	3.481	0.000	0.000	1.00			119.3	SURCHARGED
N-4.002	MH(N)-10	3.234	-0.030	0.000	0.16			31.8	OK
N-1.003	MH(N)-11	3.226	0.476	0.000	0.37		163	69.9	SURCHARGED
N-5.000	MH(N)-12	3.609	-0.191	0.000	0.47			65.5	OK
N-5.001	MH(N)-13	3.222	-0.296	0.000	0.25			110.8	OK
N-6.000	MH(N)-14	3.633	-0.167	0.000	0.57			88.9	OK
N-6.001	MH(N)-15	3.466	0.111	0.000	1.19			200.1	SURCHARGED
N-6.002	MH(N)-16	3.224	0.098	0.000	0.11			41.2	SURCHARGED
N-1.004	MH(N)-17	3.220	0.620	0.000	0.17		265	85.1	SURCHARGED
N-7.000	MH(N)-18	3.388	-0.196	0.000	0.45			108.9	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	
N-6.002	MH(N)-16	
N-1.004	MH(N)-17	
N-7.000	MH(N)-18	

30 year Return Period 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
N-8.000	MH(N)-19	15 Winter	30	+25%	25/15 Winter		
N-8.001	MH(N)-20	15 Winter	30	+25%	25/15 Winter		
N-8.002	MH(N)-21	180 Winter	30	+25%	20/120 Winter		
N-8.003	MH(N)-22	180 Winter	30	+25%	10/120 Winter		
N-1.005	MH(N)-23	240 Winter	30	+25%	1/180 Winter		
N-9.000	MH(N)-24	15 Winter	30	+25%			
N-10.000	MH(N)-25	15 Winter	30	+25%			
N-10.001	MH(N)-26	15 Winter	30	+25%	25/15 Summer		
N-10.002	MH(N)-27	240 Winter	30	+25%	20/120 Winter		
N-1.006	MH(N)-28	240 Winter	30	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	240 Winter	30	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-8.000	MH(N)-19		3.879	0.079	0.000	1.06			237.0
N-8.001	MH(N)-20		3.598	0.055	0.000	1.05			301.1
N-8.002	MH(N)-21		3.439	0.196	0.000	0.31			101.5
N-8.003	MH(N)-22		3.295	0.302	0.000	0.22			93.5
N-1.005	MH(N)-23		3.216	0.705	0.000	0.15		292	95.9
N-9.000	MH(N)-24		3.552	-0.133	0.000	0.59			118.9
N-10.000	MH(N)-25		3.611	-0.189	0.000	0.61			143.8
N-10.001	MH(N)-26		3.413	0.055	0.000	1.10			230.3
N-10.002	MH(N)-27		3.217	0.138	0.000	0.11			47.5
N-1.006	MH(N)-28		3.212	1.287	0.000	0.50		294	74.8
N-1.007	MH(N)-EX-37		1.933	0.322	0.000	0.32			74.8

PN	US/MH Name	Status	Level Exceeded
N-8.000	MH(N)-19	SURCHARGED	
N-8.001	MH(N)-20	SURCHARGED	
N-8.002	MH(N)-21	SURCHARGED	
N-8.003	MH(N)-22	SURCHARGED	
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes ECC

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	1	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	15 Winter	1	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	15 Winter	1	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	15 Winter	1	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	15 Winter	1	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	15 Winter	1	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	15 Winter	1	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	15 Winter	1	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	15 Winter	1	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	1	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	1	+25%	1/180 Winter			
N-5.000	MH(N)-12	15 Winter	1	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	15 Winter	1	+25%	5/600 Winter			
N-6.000	MH(N)-14	15 Winter	1	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	15 Winter	1	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.605	-0.195	0.000	0.26			20.3	OK
N-1.001	MH(N)-2	3.419	-0.188	0.000	0.30			31.2	OK
N-2.000	MH(N)-3	3.708	-0.167	0.000	0.38			31.2	OK
N-2.001	MH(N)-4	3.266	-0.126	0.000	0.63			40.5	OK
N-1.002	MH(N)-5	3.130	-0.137	0.000	0.72		4	69.5	OK
N-3.000	MH(N)-6	3.533	-0.267	0.000	0.18			24.6	OK
N-3.001	MH(N)-7	3.250	-0.276	0.000	0.15			38.0	OK
N-4.000	MH(N)-8	3.623	-0.177	0.000	0.34			28.0	OK
N-4.001	MH(N)-9	3.273	-0.208	0.000	0.40			47.1	OK
N-4.002	MH(N)-10	3.062	-0.202	0.000	0.03			6.2	OK
N-1.003	MH(N)-11	3.062	0.312	0.000	0.09			17.0	SURCHARGED
N-5.000	MH(N)-12	3.538	-0.262	0.000	0.19			26.9	OK
N-5.001	MH(N)-13	3.162	-0.356	0.000	0.09			42.0	OK
N-6.000	MH(N)-14	3.550	-0.250	0.000	0.23			36.3	OK
N-6.001	MH(N)-15	3.125	-0.230	0.000	0.46			77.1	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

1 year Return Period 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
N-6.002	MH(N)-16	720 Winter	1	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	1	+25%	1/120 Summer		
N-7.000	MH(N)-18	15 Winter	1	+25%	5/600 Winter		
N-8.000	MH(N)-19	15 Winter	1	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	15 Winter	1	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	1	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	1	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	1	+25%	1/60 Winter		
N-9.000	MH(N)-24	15 Winter	1	+25%	5/720 Winter		
N-10.000	MH(N)-25	15 Winter	1	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	15 Winter	1	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	1	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	1	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	1	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		3.062	-0.064	0.000	0.02			8.3
N-1.004	MH(N)-17		3.062	0.462	0.000	0.04			21.3
N-7.000	MH(N)-18		3.319	-0.265	0.000	0.18			44.6
N-8.000	MH(N)-19		3.565	-0.235	0.000	0.45			101.0
N-8.001	MH(N)-20		3.268	-0.275	0.000	0.44			127.3
N-8.002	MH(N)-21		3.062	-0.181	0.000	0.05			16.1
N-8.003	MH(N)-22		3.062	0.069	0.000	0.04			15.8
N-1.005	MH(N)-23		3.062	0.551	0.000	0.03			22.4
N-9.000	MH(N)-24		3.485	-0.200	0.000	0.24			48.6
N-10.000	MH(N)-25		3.505	-0.295	0.000	0.25			58.8
N-10.001	MH(N)-26		3.121	-0.237	0.000	0.45			93.5
N-10.002	MH(N)-27		3.062	-0.017	0.000	0.02			9.7
N-1.006	MH(N)-28		3.062	1.137	0.000	0.02			3.0
N-1.007	MH(N)-EX-37		3.062	1.451	0.000	0.00			0.0

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	OK	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	OK	
N-8.000	MH(N)-19	OK	3
N-8.001	MH(N)-20	OK	3
N-8.002	MH(N)-21	OK	1
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	3
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	5
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years)	1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%)	25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	2	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	15 Winter	2	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	15 Winter	2	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	15 Winter	2	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	720 Winter	2	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	15 Winter	2	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	15 Winter	2	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	15 Winter	2	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	15 Winter	2	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	2	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	2	+25%	1/180 Winter			
N-5.000	MH(N)-12	15 Winter	2	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	720 Winter	2	+25%	5/600 Winter			
N-6.000	MH(N)-14	15 Winter	2	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	720 Winter	2	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.621	-0.179	0.000	0.34			26.3	OK
N-1.001	MH(N)-2	3.437	-0.170	0.000	0.39			40.4	OK
N-2.000	MH(N)-3	3.730	-0.145	0.000	0.49			40.4	OK
N-2.001	MH(N)-4	3.300	-0.092	0.000	0.81			52.4	OK
N-1.002	MH(N)-5	3.251	-0.016	0.000	0.09			8.8	OK
N-3.000	MH(N)-6	3.548	-0.252	0.000	0.23			31.7	OK
N-3.001	MH(N)-7	3.265	-0.261	0.000	0.20			48.9	OK
N-4.000	MH(N)-8	3.643	-0.157	0.000	0.44			36.2	OK
N-4.001	MH(N)-9	3.301	-0.180	0.000	0.51			61.0	OK
N-4.002	MH(N)-10	3.251	-0.013	0.000	0.04			7.6	OK
N-1.003	MH(N)-11	3.251	0.501	0.000	0.10			19.1	SURCHARGED
N-5.000	MH(N)-12	3.554	-0.246	0.000	0.25			34.7	OK
N-5.001	MH(N)-13	3.252	-0.266	0.000	0.01			5.0	OK
N-6.000	MH(N)-14	3.569	-0.231	0.000	0.30			47.1	OK
N-6.001	MH(N)-15	3.252	-0.103	0.000	0.06			10.2	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

2 year Return Period 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
N-6.002	MH(N)-16	720 Winter	2	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	2	+25%	1/120 Summer		
N-7.000	MH(N)-18	15 Winter	2	+25%	5/600 Winter		
N-8.000	MH(N)-19	15 Winter	2	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	15 Winter	2	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	2	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	2	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	2	+25%	1/60 Winter		
N-9.000	MH(N)-24	15 Winter	2	+25%	5/720 Winter		
N-10.000	MH(N)-25	15 Winter	2	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	2	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	2	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	2	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	2	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		3.252	0.126	0.000	0.03			10.1
N-1.004	MH(N)-17		3.252	0.652	0.000	0.05			23.4
N-7.000	MH(N)-18		3.334	-0.250	0.000	0.24			57.6
N-8.000	MH(N)-19		3.602	-0.198	0.000	0.58			130.7
N-8.001	MH(N)-20		3.311	-0.232	0.000	0.57			164.8
N-8.002	MH(N)-21		3.252	0.009	0.000	0.06			19.6
N-8.003	MH(N)-22		3.252	0.259	0.000	0.04			18.7
N-1.005	MH(N)-23		3.252	0.741	0.000	0.04			23.4
N-9.000	MH(N)-24		3.500	-0.185	0.000	0.31			62.9
N-10.000	MH(N)-25		3.530	-0.270	0.000	0.32			76.2
N-10.001	MH(N)-26		3.252	-0.106	0.000	0.06			11.8
N-10.002	MH(N)-27		3.252	0.173	0.000	0.03			11.7
N-1.006	MH(N)-28		3.252	1.327	0.000	0.02			3.2
N-1.007	MH(N)-EX-37		3.252	1.641	0.000	0.00			0.0

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	SURCHARGED	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	OK	
N-8.000	MH(N)-19	OK	3
N-8.001	MH(N)-20	OK	3
N-8.002	MH(N)-21	SURCHARGED	1
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	3
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	720 Winter	5	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	720 Winter	5	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	720 Winter	5	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	720 Winter	5	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	720 Winter	5	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	720 Winter	5	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	720 Winter	5	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	720 Winter	5	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	720 Winter	5	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	5	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	5	+25%	1/180 Winter			
N-5.000	MH(N)-12	720 Winter	5	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	720 Winter	5	+25%	5/600 Winter			
N-6.000	MH(N)-14	720 Winter	5	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	720 Winter	5	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.879	0.079	0.000	0.04			2.9	SURCHARGED
N-1.001	MH(N)-2	3.879	0.272	0.000	0.04			4.6	SURCHARGED
N-2.000	MH(N)-3	3.879	0.004	0.000	0.06			4.6	SURCHARGED
N-2.001	MH(N)-4	3.879	0.487	0.000	0.10			6.2	SURCHARGED
N-1.002	MH(N)-5	3.878	0.611	0.000	0.11			10.9	SURCHARGED
N-3.000	MH(N)-6	3.877	0.077	0.000	0.02			3.4	SURCHARGED
N-3.001	MH(N)-7	3.877	0.351	0.000	0.02			5.6	SURCHARGED
N-4.000	MH(N)-8	3.878	0.078	0.000	0.05			4.0	SURCHARGED
N-4.001	MH(N)-9	3.878	0.397	0.000	0.06			7.4	SURCHARGED
N-4.002	MH(N)-10	3.878	0.614	0.000	0.05			9.3	SURCHARGED
N-1.003	MH(N)-11	3.877	1.127	0.000	0.11			20.6	SURCHARGED
N-5.000	MH(N)-12	3.876	0.076	0.000	0.03			3.7	SURCHARGED
N-5.001	MH(N)-13	3.875	0.357	0.000	0.01			6.2	SURCHARGED
N-6.000	MH(N)-14	3.876	0.076	0.000	0.03			5.1	SURCHARGED
N-6.001	MH(N)-15	3.876	0.521	0.000	0.07			12.5	SURCHARGED

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

5 year Return Period 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
N-6.002	MH(N)-16	720 Winter	5	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	5	+25%	1/120 Summer		
N-7.000	MH(N)-18	720 Winter	5	+25%	5/600 Winter		
N-8.000	MH(N)-19	720 Winter	5	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	720 Winter	5	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	5	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	5	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	5	+25%	1/60 Winter		
N-9.000	MH(N)-24	720 Winter	5	+25%	5/720 Winter		
N-10.000	MH(N)-25	720 Winter	5	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	5	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	5	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	5	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	5	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		3.876	0.750	0.000	0.03			11.9
N-1.004	MH(N)-17		3.876	1.276	0.000	0.05			26.2
N-7.000	MH(N)-18		3.875	0.291	0.000	0.03			6.2
N-8.000	MH(N)-19		3.878	0.078	0.000	0.06			14.2
N-8.001	MH(N)-20		3.877	0.334	0.000	0.07			19.3
N-8.002	MH(N)-21		3.877	0.634	0.000	0.07			23.4
N-8.003	MH(N)-22		3.876	0.883	0.000	0.05			22.5
N-1.005	MH(N)-23		3.875	1.364	0.000	0.04			27.9
N-9.000	MH(N)-24		3.875	0.190	0.000	0.03			6.7
N-10.000	MH(N)-25		3.876	0.076	0.000	0.04			8.4
N-10.001	MH(N)-26		3.876	0.518	0.000	0.07			14.5
N-10.002	MH(N)-27		3.875	0.796	0.000	0.03			13.6
N-1.006	MH(N)-28		3.874	1.949	0.000	0.09			13.8
N-1.007	MH(N)-EX-37		3.706	2.095	0.000	0.06			13.8

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	SURCHARGED	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	SURCHARGED	
N-8.000	MH(N)-19	SURCHARGED	3
N-8.001	MH(N)-20	SURCHARGED	3
N-8.002	MH(N)-21	SURCHARGED	1
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	SURCHARGED	
N-10.000	MH(N)-25	SURCHARGED	3
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	FLOOD RISK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	720 Winter	10	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	720 Winter	10	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	720 Winter	10	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	720 Winter	10	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	720 Winter	10	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	720 Winter	10	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	720 Winter	10	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	720 Winter	10	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	720 Winter	10	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	10	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	10	+25%	1/180 Winter			
N-5.000	MH(N)-12	720 Winter	10	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	720 Winter	10	+25%	5/600 Winter			
N-6.000	MH(N)-14	720 Winter	10	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	720 Winter	10	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	4.095	0.295	0.000	0.04			3.3	SURCHARGED
N-1.001	MH(N)-2	4.093	0.486	0.000	0.05			5.4	SURCHARGED
N-2.000	MH(N)-3	4.097	0.222	0.000	0.06			5.3	SURCHARGED
N-2.001	MH(N)-4	4.094	0.702	0.000	0.11			7.2	SURCHARGED
N-1.002	MH(N)-5	4.091	0.824	0.000	0.13			12.6	SURCHARGED
N-3.000	MH(N)-6	4.091	0.291	0.000	0.03			4.0	SURCHARGED
N-3.001	MH(N)-7	4.090	0.564	0.000	0.03			6.5	SURCHARGED
N-4.000	MH(N)-8	4.095	0.295	0.000	0.06			4.6	SURCHARGED
N-4.001	MH(N)-9	4.093	0.612	0.000	0.07			8.6	SURCHARGED
N-4.002	MH(N)-10	4.091	0.827	0.000	0.05			10.6	SURCHARGED
N-1.003	MH(N)-11	4.089	1.339	0.000	0.11			21.3	SURCHARGED
N-5.000	MH(N)-12	4.087	0.287	0.000	0.03			4.4	SURCHARGED
N-5.001	MH(N)-13	4.086	0.568	0.000	0.02			7.2	SURCHARGED
N-6.000	MH(N)-14	4.091	0.291	0.000	0.04			6.0	SURCHARGED
N-6.001	MH(N)-15	4.090	0.735	0.000	0.09			14.4	SURCHARGED

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

10 year Return Period 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
N-6.002	MH(N)-16	720 Winter	10	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	10	+25%	1/120 Summer		
N-7.000	MH(N)-18	720 Winter	10	+25%	5/600 Winter		
N-8.000	MH(N)-19	720 Winter	10	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	720 Winter	10	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	10	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	10	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	10	+25%	1/60 Winter		
N-9.000	MH(N)-24	720 Winter	10	+25%	5/720 Winter		
N-10.000	MH(N)-25	720 Winter	10	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	10	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	10	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	10	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	10	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		4.087	0.961	0.000	0.04			13.0
N-1.004	MH(N)-17		4.085	1.485	0.000	0.05			26.1
N-7.000	MH(N)-18		4.085	0.501	0.000	0.03			7.3
N-8.000	MH(N)-19		4.094	0.294	0.000	0.07			16.5
N-8.001	MH(N)-20		4.091	0.548	0.000	0.08			22.3
N-8.002	MH(N)-21		4.088	0.845	0.000	0.09			27.9
N-8.003	MH(N)-22		4.086	1.093	0.000	0.07			27.9
N-1.005	MH(N)-23		4.083	1.572	0.000	0.04			26.7
N-9.000	MH(N)-24		4.084	0.399	0.000	0.04			7.8
N-10.000	MH(N)-25		4.088	0.288	0.000	0.04			9.7
N-10.001	MH(N)-26		4.086	0.728	0.000	0.08			16.7
N-10.002	MH(N)-27		4.083	1.004	0.000	0.04			15.9
N-1.006	MH(N)-28		4.081	2.156	0.000	0.21			32.0
N-1.007	MH(N)-EX-37		3.714	2.103	0.000	0.14			32.0

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	SURCHARGED	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	SURCHARGED	
N-8.000	MH(N)-19	SURCHARGED	3
N-8.001	MH(N)-20	SURCHARGED	3
N-8.002	MH(N)-21	SURCHARGED	1
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	SURCHARGED	
N-10.000	MH(N)-25	SURCHARGED	3
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	FLOOD RISK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	720 Winter	15	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	720 Winter	15	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	720 Winter	15	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	720 Winter	15	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	720 Winter	15	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	720 Winter	15	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	720 Winter	15	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	720 Winter	15	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	720 Winter	15	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	15	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	15	+25%	1/180 Winter			
N-5.000	MH(N)-12	720 Winter	15	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	720 Winter	15	+25%	5/600 Winter			
N-6.000	MH(N)-14	720 Winter	15	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	720 Winter	15	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	4.427	0.627	0.000	0.05			3.6	SURCHARGED
N-1.001	MH(N)-2	4.425	0.818	0.000	0.06			5.9	SURCHARGED
N-2.000	MH(N)-3	4.430	0.555	0.000	0.07			5.8	SURCHARGED
N-2.001	MH(N)-4	4.426	1.034	0.000	0.12			7.9	SURCHARGED
N-1.002	MH(N)-5	4.423	1.156	0.000	0.14			13.5	SURCHARGED
N-3.000	MH(N)-6	4.422	0.622	0.000	0.03			4.4	SURCHARGED
N-3.001	MH(N)-7	4.421	0.895	0.000	0.03			7.1	SURCHARGED
N-4.000	MH(N)-8	4.428	0.628	0.000	0.06			5.0	SURCHARGED
N-4.001	MH(N)-9	4.425	0.944	0.000	0.08			9.4	SURCHARGED
N-4.002	MH(N)-10	4.422	1.158	0.000	0.06			11.4	SURCHARGED
N-1.003	MH(N)-11	4.419	1.669	0.000	0.11			21.5	SURCHARGED
N-5.000	MH(N)-12	4.416	0.616	0.000	0.03			4.8	SURCHARGED
N-5.001	MH(N)-13	4.415	0.897	0.000	0.02			7.8	SURCHARGED
N-6.000	MH(N)-14	4.422	0.622	0.000	0.04			6.5	SURCHARGED
N-6.001	MH(N)-15	4.420	1.065	0.000	0.09			15.5	SURCHARGED

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

15 year Return Period 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
N-6.002	MH(N)-16	720 Winter	15	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	15	+25%	1/120 Summer		
N-7.000	MH(N)-18	720 Winter	15	+25%	5/600 Winter		
N-8.000	MH(N)-19	720 Winter	15	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	720 Winter	15	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	15	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	15	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	15	+25%	1/60 Winter		
N-9.000	MH(N)-24	720 Winter	15	+25%	5/720 Winter		
N-10.000	MH(N)-25	720 Winter	15	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	15	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	15	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	15	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	15	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		4.416	1.290	0.000	0.04			14.9
N-1.004	MH(N)-17		4.413	1.813	0.000	0.06			28.0
N-7.000	MH(N)-18		4.413	0.829	0.000	0.03			7.9
N-8.000	MH(N)-19		4.426	0.626	0.000	0.08			18.0
N-8.001	MH(N)-20		4.422	0.879	0.000	0.08			24.4
N-8.002	MH(N)-21		4.418	1.175	0.000	0.09			30.4
N-8.003	MH(N)-22		4.414	1.421	0.000	0.07			30.3
N-1.005	MH(N)-23		4.411	1.900	0.000	0.06			36.4
N-9.000	MH(N)-24		4.412	0.727	0.000	0.04			8.5
N-10.000	MH(N)-25		4.417	0.617	0.000	0.04			10.6
N-10.001	MH(N)-26		4.415	1.057	0.000	0.09			18.1
N-10.002	MH(N)-27		4.411	1.332	0.000	0.04			18.0
N-1.006	MH(N)-28		4.408	2.483	0.000	0.31			46.8
N-1.007	MH(N)-EX-37		3.721	2.110	0.000	0.20			46.8

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	SURCHARGED	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	SURCHARGED	
N-8.000	MH(N)-19	SURCHARGED	3
N-8.001	MH(N)-20	SURCHARGED	3
N-8.002	MH(N)-21	SURCHARGED	1
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	SURCHARGED	
N-10.000	MH(N)-25	SURCHARGED	3
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	FLOOD RISK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	720 Winter	20	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	720 Winter	20	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	720 Winter	20	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	720 Winter	20	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	720 Winter	20	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	720 Winter	20	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	720 Winter	20	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	720 Winter	20	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	720 Winter	20	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	20	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	20	+25%	1/180 Winter			
N-5.000	MH(N)-12	720 Winter	20	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	720 Winter	20	+25%	5/600 Winter			
N-6.000	MH(N)-14	720 Winter	20	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	720 Winter	20	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	4.717	0.917	0.000	0.05			3.8	FLOOD RISK
N-1.001	MH(N)-2	4.715	1.108	0.000	0.06			6.2	FLOOD RISK
N-2.000	MH(N)-3	4.721	0.846	0.000	0.07			6.2	FLOOD RISK
N-2.001	MH(N)-4	4.716	1.324	0.000	0.13			8.4	FLOOD RISK
N-1.002	MH(N)-5	4.711	1.444	0.000	0.15			14.2	FLOOD RISK
N-3.000	MH(N)-6	4.711	0.911	0.000	0.03			4.6	FLOOD RISK
N-3.001	MH(N)-7	4.710	1.184	0.000	0.03			7.5	FLOOD RISK
N-4.000	MH(N)-8	4.719	0.919	0.000	0.07			5.3	FLOOD RISK
N-4.001	MH(N)-9	4.715	1.234	0.000	0.08			10.0	FLOOD RISK
N-4.002	MH(N)-10	4.711	1.447	0.000	0.06			11.9	FLOOD RISK
N-1.003	MH(N)-11	4.707	1.957	0.000	0.12			21.6	FLOOD RISK
N-5.000	MH(N)-12	4.704	0.904	0.000	0.04			5.1	FLOOD RISK
N-5.001	MH(N)-13	4.702	1.184	0.000	0.02			8.7	FLOOD RISK
N-6.000	MH(N)-14	4.711	0.911	0.000	0.04			6.9	FLOOD RISK
N-6.001	MH(N)-15	4.708	1.353	0.000	0.10			16.4	FLOOD RISK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

20 year Return Period 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
N-6.002	MH(N)-16	720 Winter	20	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	20	+25%	1/120 Summer		
N-7.000	MH(N)-18	720 Winter	20	+25%	5/600 Winter		
N-8.000	MH(N)-19	720 Winter	20	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	720 Winter	20	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	20	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	20	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	20	+25%	1/60 Winter		
N-9.000	MH(N)-24	720 Winter	20	+25%	5/720 Winter		
N-10.000	MH(N)-25	720 Winter	20	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	20	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	20	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	20	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	20	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		4.704	1.578	0.000	0.04			16.2
N-1.004	MH(N)-17		4.700	2.100	0.000	0.05			27.2
N-7.000	MH(N)-18		4.700	1.116	0.000	0.03			8.4
N-8.000	MH(N)-19		4.715	0.915	0.000	0.09			19.1
N-8.001	MH(N)-20		4.711	1.168	0.000	0.09			25.6
N-8.002	MH(N)-21		4.706	1.463	0.000	0.10			31.6
N-8.003	MH(N)-22		4.701	1.708	0.000	0.08			31.5
N-1.005	MH(N)-23		4.697	2.186	0.000	0.07			44.2
N-9.000	MH(N)-24		4.698	1.013	0.000	0.04			9.1
N-10.000	MH(N)-25		4.705	0.905	0.000	0.05			11.3
N-10.001	MH(N)-26		4.702	1.344	0.000	0.09			19.5
N-10.002	MH(N)-27		4.697	1.618	0.000	0.04			19.4
N-1.006	MH(N)-28		4.693	2.768	0.000	0.38			56.7
N-1.007	MH(N)-EX-37		3.725	2.114	0.000	0.25			56.7

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	FLOOD RISK	
N-1.004	MH(N)-17	FLOOD RISK	
N-7.000	MH(N)-18	FLOOD RISK	
N-8.000	MH(N)-19	FLOOD RISK	3
N-8.001	MH(N)-20	FLOOD RISK	3
N-8.002	MH(N)-21	FLOOD RISK	1
N-8.003	MH(N)-22	FLOOD RISK	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	SURCHARGED	
N-10.000	MH(N)-25	FLOOD RISK	3
N-10.001	MH(N)-26	FLOOD RISK	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	FLOOD RISK	

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

Simulation Criteria

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

Number of Input Hydrographs 0
Number of Storage Structures 5
Number of Online Controls 1
Number of Time/Area Diagrams 0
Number of Offline Controls 0
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Ratio R 0.400
Region England and Wales
Cv (Summer) 0.750
M5-60 (mm) 17.000
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	720 Winter	25	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	720 Winter	25	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	720 Winter	25	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	720 Winter	25	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	720 Winter	25	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	720 Winter	25	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	720 Winter	25	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	720 Winter	25	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	720 Winter	25	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	720 Winter	25	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	720 Winter	25	+25%	1/180 Winter			
N-5.000	MH(N)-12	720 Winter	25	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	720 Winter	25	+25%	5/600 Winter			
N-6.000	MH(N)-14	720 Winter	25	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	720 Winter	25	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	4.965	1.165	0.000	0.05			4.0	FLOOD RISK
N-1.001	MH(N)-2	4.963	1.356	0.000	0.06			6.6	FLOOD RISK
N-2.000	MH(N)-3	4.970	1.095	0.000	0.08			6.5	FLOOD RISK
N-2.001	MH(N)-4	4.964	1.572	0.000	0.14			8.8	FLOOD RISK
N-1.002	MH(N)-5	4.959	1.692	0.000	0.15			14.7	FLOOD RISK
N-3.000	MH(N)-6	4.958	1.158	0.000	0.04			4.9	FLOOD RISK
N-3.001	MH(N)-7	4.957	1.431	0.000	0.03			7.9	FLOOD RISK
N-4.000	MH(N)-8	4.967	1.167	0.000	0.07			5.6	FLOOD RISK
N-4.001	MH(N)-9	4.963	1.482	0.000	0.09			10.4	FLOOD RISK
N-4.002	MH(N)-10	4.958	1.694	0.000	0.06			12.3	FLOOD RISK
N-1.003	MH(N)-11	4.954	2.204	0.000	0.12			21.8	FLOOD RISK
N-5.000	MH(N)-12	4.950	1.150	0.000	0.04			5.3	FLOOD RISK
N-5.001	MH(N)-13	4.948	1.430	0.000	0.02			10.3	FLOOD RISK
N-6.000	MH(N)-14	4.958	1.158	0.000	0.05			7.3	FLOOD RISK
N-6.001	MH(N)-15	4.955	1.600	0.000	0.10			17.4	FLOOD RISK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

25 year Return Period 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
N-6.002	MH(N)-16	720 Winter	25	+25%	2/480 Winter		
N-1.004	MH(N)-17	720 Winter	25	+25%	1/120 Summer		
N-7.000	MH(N)-18	720 Winter	25	+25%	5/600 Winter		
N-8.000	MH(N)-19	720 Winter	25	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	720 Winter	25	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	720 Winter	25	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	720 Winter	25	+25%	1/600 Winter		
N-1.005	MH(N)-23	720 Winter	25	+25%	1/60 Winter		
N-9.000	MH(N)-24	720 Winter	25	+25%	5/720 Winter		
N-10.000	MH(N)-25	720 Winter	25	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	25	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	25	+25%	2/480 Winter		
N-1.006	MH(N)-28	720 Winter	25	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	720 Winter	25	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		4.950	1.824	0.000	0.05			17.1
N-1.004	MH(N)-17		4.946	2.346	0.000	0.06			30.2
N-7.000	MH(N)-18		4.946	1.362	0.000	0.04			8.8
N-8.000	MH(N)-19		4.963	1.163	0.000	0.09			20.0
N-8.001	MH(N)-20		4.958	1.415	0.000	0.09			26.8
N-8.002	MH(N)-21		4.952	1.709	0.000	0.10			33.6
N-8.003	MH(N)-22		4.947	1.954	0.000	0.08			33.4
N-1.005	MH(N)-23		4.942	2.431	0.000	0.08			50.8
N-9.000	MH(N)-24		4.944	1.259	0.000	0.05			9.5
N-10.000	MH(N)-25		4.951	1.151	0.000	0.05			11.8
N-10.001	MH(N)-26		4.948	1.590	0.000	0.10			20.4
N-10.002	MH(N)-27		4.942	1.863	0.000	0.05			20.2
N-1.006	MH(N)-28		4.938	3.013	0.000	0.43			65.3
N-1.007	MH(N)-EX-37		3.729	2.118	0.000	0.28			65.2

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	FLOOD RISK	
N-1.004	MH(N)-17	FLOOD RISK	
N-7.000	MH(N)-18	FLOOD RISK	
N-8.000	MH(N)-19	FLOOD RISK	3
N-8.001	MH(N)-20	FLOOD RISK	3
N-8.002	MH(N)-21	FLOOD RISK	1
N-8.003	MH(N)-22	FLOOD RISK	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	FLOOD RISK	
N-9.000	MH(N)-24	FLOOD RISK	
N-10.000	MH(N)-25	FLOOD RISK	3
N-10.001	MH(N)-26	FLOOD RISK	
N-10.002	MH(N)-27	FLOOD RISK	
N-1.006	MH(N)-28	FLOOD RISK	
N-1.007	MH(N)-EX-37	FLOOD RISK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720
Return Period(s) (years) 1, 2, 5, 10, 15, 20, 25, 30
Climate Change (%) 25, 25, 25, 25, 25, 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	720 Winter	30	+25%	5/720 Winter	30/480 Winter		
N-1.001	MH(N)-2	720 Winter	30	+25%	5/600 Winter	30/480 Winter		
N-2.000	MH(N)-3	720 Winter	30	+25%	5/720 Winter	30/480 Winter		
N-2.001	MH(N)-4	720 Winter	30	+25%	5/480 Winter	30/480 Winter		
N-1.002	MH(N)-5	600 Winter	30	+25%	5/360 Winter	30/600 Winter		
N-3.000	MH(N)-6	600 Winter	30	+25%	5/720 Winter	30/480 Winter		
N-3.001	MH(N)-7	600 Winter	30	+25%	5/600 Winter	30/480 Winter		
N-4.000	MH(N)-8	720 Winter	30	+25%	5/720 Winter	30/480 Winter		
N-4.001	MH(N)-9	600 Winter	30	+25%	5/600 Winter	30/480 Winter		
N-4.002	MH(N)-10	600 Winter	30	+25%	5/360 Winter	30/480 Winter		
N-1.003	MH(N)-11	600 Winter	30	+25%	1/180 Winter			
N-5.000	MH(N)-12	600 Winter	30	+25%	5/720 Winter	30/600 Winter		
N-5.001	MH(N)-13	600 Winter	30	+25%	5/600 Winter			
N-6.000	MH(N)-14	600 Winter	30	+25%	5/720 Winter	30/480 Winter		
N-6.001	MH(N)-15	600 Winter	30	+25%	5/480 Winter	30/480 Winter		

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	5.002	1.202	2.395	0.08			6.0	FLOOD
N-1.001	MH(N)-2	5.000	1.393	0.298	0.07			6.9	FLOOD
N-2.000	MH(N)-3	5.005	1.130	4.980	0.14			11.8	FLOOD
N-2.001	MH(N)-4	5.000	1.608	0.431	0.19			12.2	FLOOD
N-1.002	MH(N)-5	5.000	1.733	0.015	0.18			17.6	FLOOD
N-3.000	MH(N)-6	5.000	1.200	0.387	0.04			5.8	FLOOD
N-3.001	MH(N)-7	5.000	1.474	0.029	0.04			9.5	FLOOD
N-4.000	MH(N)-8	5.004	1.204	4.109	0.11			9.4	FLOOD
N-4.001	MH(N)-9	5.001	1.520	1.105	0.11			12.5	FLOOD
N-4.002	MH(N)-10	5.000	1.736	0.068	0.08			14.8	FLOOD
N-1.003	MH(N)-11	4.999	2.249	0.000	0.15			27.5	FLOOD RISK
N-5.000	MH(N)-12	5.000	1.200	0.012	0.05			6.4	FLOOD
N-5.001	MH(N)-13	4.997	1.479	0.000	0.02			10.4	FLOOD RISK
N-6.000	MH(N)-14	5.002	1.202	1.659	0.06			8.7	FLOOD
N-6.001	MH(N)-15	5.000	1.645	0.263	0.12			20.8	FLOOD

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	3
N-1.001	MH(N)-2	3
N-2.000	MH(N)-3	3
N-2.001	MH(N)-4	3
N-1.002	MH(N)-5	1
N-3.000	MH(N)-6	3
N-3.001	MH(N)-7	2
N-4.000	MH(N)-8	3
N-4.001	MH(N)-9	3
N-4.002	MH(N)-10	3
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	3
N-6.001	MH(N)-15	3

30 year Return Period 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
N-6.002	MH(N)-16	600 Winter	30	+25%	2/480 Winter		
N-1.004	MH(N)-17	600 Winter	30	+25%	1/120 Summer		
N-7.000	MH(N)-18	600 Winter	30	+25%	5/600 Winter		
N-8.000	MH(N)-19	720 Winter	30	+25%	5/720 Winter	30/480 Winter	
N-8.001	MH(N)-20	600 Winter	30	+25%	5/600 Winter	30/480 Winter	
N-8.002	MH(N)-21	600 Winter	30	+25%	2/720 Winter	30/600 Winter	
N-8.003	MH(N)-22	600 Winter	30	+25%	1/600 Winter		
N-1.005	MH(N)-23	600 Winter	30	+25%	1/60 Winter		
N-9.000	MH(N)-24	600 Winter	30	+25%	5/720 Winter		
N-10.000	MH(N)-25	600 Winter	30	+25%	5/720 Winter	30/480 Winter	
N-10.001	MH(N)-26	720 Winter	30	+25%	5/480 Winter		
N-10.002	MH(N)-27	720 Winter	30	+25%	2/480 Winter		
N-1.006	MH(N)-28	600 Winter	30	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	600 Winter	30	+25%	1/15 Summer		

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		4.997	1.871	0.000	0.06			20.5
N-1.004	MH(N)-17		4.994	2.394	0.000	0.08			37.8
N-7.000	MH(N)-18		4.996	1.412	0.000	0.04			10.6
N-8.000	MH(N)-19		5.005	1.205	5.402	0.09			20.8
N-8.001	MH(N)-20		5.001	1.458	0.786	0.11			31.9
N-8.002	MH(N)-21		5.000	1.757	0.021	0.12			38.5
N-8.003	MH(N)-22		4.996	2.003	0.000	0.09			38.2
N-1.005	MH(N)-23		4.991	2.480	0.000	0.09			57.2
N-9.000	MH(N)-24		4.997	1.312	0.000	0.06			11.4
N-10.000	MH(N)-25		5.000	1.200	0.251	0.06			14.2
N-10.001	MH(N)-26		4.998	1.640	0.000	0.10			20.9
N-10.002	MH(N)-27		4.991	1.912	0.000	0.05			20.9
N-1.006	MH(N)-28		4.987	3.062	0.000	0.47			70.3
N-1.007	MH(N)-EX-37		3.731	2.120	0.000	0.30			70.1

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	FLOOD RISK	
N-1.004	MH(N)-17	FLOOD RISK	
N-7.000	MH(N)-18	FLOOD RISK	
N-8.000	MH(N)-19	FLOOD	3
N-8.001	MH(N)-20	FLOOD	3
N-8.002	MH(N)-21	FLOOD	1
N-8.003	MH(N)-22	FLOOD RISK	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	FLOOD RISK	
N-9.000	MH(N)-24	FLOOD RISK	
N-10.000	MH(N)-25	FLOOD	3
N-10.001	MH(N)-26	FLOOD RISK	
N-10.002	MH(N)-27	FLOOD RISK	
N-1.006	MH(N)-28	FLOOD RISK	
N-1.007	MH(N)-EX-37	FLOOD RISK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes ECC

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	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 Storage Structures	5
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.400		

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

Simulation Criteria

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

Number of Input Hydrographs 0 | Number of Storage Structures 5
Number of Online Controls 1 | Number of Time/Area Diagrams 0
Number of Offline Controls 0 | Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR | Ratio R 0.400
Region England and Wales | Cv (Summer) 0.750
M5-60 (mm) 17.000 | Cv (Winter) 0.840

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

Profile(s): Summer and Winter
Duration(s) (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years): 1, 30, 100
Climate Change (%): 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	1	+25%				
N-1.001	MH(N)-2	15 Winter	1	+25%				
N-2.000	MH(N)-3	15 Winter	1	+25%	30/15 Summer			
N-2.001	MH(N)-4	15 Winter	1	+25%	30/15 Summer			
N-1.002	MH(N)-5	15 Winter	1	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	1	+25%				
N-3.001	MH(N)-7	15 Winter	1	+25%				
N-4.000	MH(N)-8	15 Winter	1	+25%	100/15 Summer			
N-4.001	MH(N)-9	15 Winter	1	+25%	100/15 Summer			
N-4.002	MH(N)-10	15 Winter	1	+25%	100/60 Winter			
N-1.003	MH(N)-11	15 Winter	1	+25%	30/15 Summer			
N-5.000	MH(N)-12	15 Winter	1	+25%				
N-5.001	MH(N)-13	15 Winter	1	+25%				
N-6.000	MH(N)-14	15 Winter	1	+25%	100/15 Summer			
N-6.001	MH(N)-15	15 Winter	1	+25%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.605	-0.195	0.000	0.26			20.3	OK
N-1.001	MH(N)-2	3.419	-0.188	0.000	0.30			31.2	OK
N-2.000	MH(N)-3	3.708	-0.167	0.000	0.38			31.2	OK
N-2.001	MH(N)-4	3.266	-0.126	0.000	0.63			40.5	OK
N-1.002	MH(N)-5	3.130	-0.137	0.000	0.72		4	69.5	OK
N-3.000	MH(N)-6	3.533	-0.267	0.000	0.18			24.6	OK
N-3.001	MH(N)-7	3.250	-0.276	0.000	0.15			38.0	OK
N-4.000	MH(N)-8	3.623	-0.177	0.000	0.34			28.0	OK
N-4.001	MH(N)-9	3.273	-0.208	0.000	0.40			47.1	OK
N-4.002	MH(N)-10	3.030	-0.234	0.000	0.30			58.3	OK
N-1.003	MH(N)-11	2.607	-0.143	0.000	0.80		3	150.3	OK
N-5.000	MH(N)-12	3.538	-0.262	0.000	0.19			26.9	OK
N-5.001	MH(N)-13	3.162	-0.356	0.000	0.09			42.0	OK
N-6.000	MH(N)-14	3.550	-0.250	0.000	0.23			36.3	OK
N-6.001	MH(N)-15	3.125	-0.230	0.000	0.46			77.1	OK

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	

1 year Return Period 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.
N-6.002	MH(N)-16	15 Winter	1	+25%	100/30 Winter			
N-1.004	MH(N)-17	60 Winter	1	+25%	30/15 Summer			
N-7.000	MH(N)-18	15 Winter	1	+25%				
N-8.000	MH(N)-19	15 Winter	1	+25%	30/15 Summer			
N-8.001	MH(N)-20	15 Winter	1	+25%	30/15 Summer			
N-8.002	MH(N)-21	15 Winter	1	+25%	30/15 Winter			
N-8.003	MH(N)-22	15 Winter	1	+25%	30/60 Winter			
N-1.005	MH(N)-23	60 Winter	1	+25%	30/15 Summer			
N-9.000	MH(N)-24	15 Winter	1	+25%				
N-10.000	MH(N)-25	15 Winter	1	+25%	100/15 Summer			
N-10.001	MH(N)-26	15 Winter	1	+25%	30/15 Summer			
N-10.002	MH(N)-27	15 Winter	1	+25%	100/30 Winter			
N-1.006	MH(N)-28	60 Winter	1	+25%	1/15 Summer			
N-1.007	MH(N)-EX-37	60 Winter	1	+25%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16	2.815	-0.311	0.000	0.21			76.8
N-1.004	MH(N)-17	2.388	-0.212	0.000	0.20		44	97.1
N-7.000	MH(N)-18	3.319	-0.265	0.000	0.18			44.6
N-8.000	MH(N)-19	3.565	-0.235	0.000	0.45			101.0
N-8.001	MH(N)-20	3.268	-0.275	0.000	0.44			127.3
N-8.002	MH(N)-21	2.971	-0.272	0.000	0.47			152.1
N-8.003	MH(N)-22	2.688	-0.305	0.000	0.37			152.9
N-1.005	MH(N)-23	2.385	-0.126	0.000	0.18		58	115.9
N-9.000	MH(N)-24	3.485	-0.200	0.000	0.24			48.6
N-10.000	MH(N)-25	3.505	-0.295	0.000	0.25			58.8
N-10.001	MH(N)-26	3.121	-0.237	0.000	0.45			93.5
N-10.002	MH(N)-27	2.769	-0.310	0.000	0.21			93.9
N-1.006	MH(N)-28	2.380	0.455	0.000	0.38			57.1
N-1.007	MH(N)-EX-37	1.262	-0.349	0.000	0.25			57.1

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	OK	
N-1.004	MH(N)-17	OK	
N-7.000	MH(N)-18	OK	
N-8.000	MH(N)-19	OK	
N-8.001	MH(N)-20	OK	
N-8.002	MH(N)-21	OK	
N-8.003	MH(N)-22	OK	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	OK	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	OK	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	30	+25%				
N-1.001	MH(N)-2	15 Winter	30	+25%				
N-2.000	MH(N)-3	15 Winter	30	+25%	30/15 Summer			
N-2.001	MH(N)-4	15 Winter	30	+25%	30/15 Summer			
N-1.002	MH(N)-5	15 Winter	30	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	30	+25%				
N-3.001	MH(N)-7	15 Winter	30	+25%				
N-4.000	MH(N)-8	15 Winter	30	+25%	100/15 Summer			
N-4.001	MH(N)-9	15 Winter	30	+25%	100/15 Summer			
N-4.002	MH(N)-10	15 Winter	30	+25%	100/60 Winter			
N-1.003	MH(N)-11	120 Winter	30	+25%	30/15 Summer			
N-5.000	MH(N)-12	15 Winter	30	+25%				
N-5.001	MH(N)-13	15 Winter	30	+25%				
N-6.000	MH(N)-14	15 Winter	30	+25%	100/15 Summer			
N-6.001	MH(N)-15	15 Winter	30	+25%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.677	-0.123	0.000	0.63			49.6	OK
N-1.001	MH(N)-2	3.511	-0.096	0.000	0.78			81.1	OK
N-2.000	MH(N)-3	3.930	0.055	0.000	0.89			73.3	SURCHARGED
N-2.001	MH(N)-4	3.525	0.133	0.000	1.45			94.0	SURCHARGED
N-1.002	MH(N)-5	3.271	0.004	0.000	1.13		6	108.9	SURCHARGED
N-3.000	MH(N)-6	3.600	-0.200	0.000	0.43			59.6	OK
N-3.001	MH(N)-7	3.319	-0.207	0.000	0.40			99.2	OK
N-4.000	MH(N)-8	3.716	-0.084	0.000	0.84			68.4	OK
N-4.001	MH(N)-9	3.481	0.000	0.000	1.00			119.4	OK
N-4.002	MH(N)-10	3.137	-0.127	0.000	0.77			148.4	OK
N-1.003	MH(N)-11	3.041	0.291	0.000	0.66		64	123.1	SURCHARGED
N-5.000	MH(N)-12	3.609	-0.191	0.000	0.47			65.5	OK
N-5.001	MH(N)-13	3.222	-0.296	0.000	0.25			110.8	OK
N-6.000	MH(N)-14	3.633	-0.167	0.000	0.57			88.9	OK
N-6.001	MH(N)-15	3.464	0.109	0.000	1.19			199.8	SURCHARGED

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	

30 year Return Period 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
N-6.002	MH(N)-16	120 Winter	30	+25%	100/30 Winter		
N-1.004	MH(N)-17	120 Winter	30	+25%	30/15 Summer		
N-7.000	MH(N)-18	15 Winter	30	+25%			
N-8.000	MH(N)-19	15 Winter	30	+25%	30/15 Summer		
N-8.001	MH(N)-20	15 Winter	30	+25%	30/15 Summer		
N-8.002	MH(N)-21	15 Winter	30	+25%	30/15 Winter		
N-8.003	MH(N)-22	120 Winter	30	+25%	30/60 Winter		
N-1.005	MH(N)-23	120 Winter	30	+25%	30/15 Summer		
N-9.000	MH(N)-24	15 Winter	30	+25%			
N-10.000	MH(N)-25	15 Winter	30	+25%	100/15 Summer		
N-10.001	MH(N)-26	15 Winter	30	+25%	30/15 Summer		
N-10.002	MH(N)-27	120 Winter	30	+25%	100/30 Winter		
N-1.006	MH(N)-28	120 Winter	30	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	120 Winter	30	+25%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		3.033	-0.093	0.000	0.19			70.2
N-1.004	MH(N)-17		3.026	0.426	0.000	0.16		124	79.0
N-7.000	MH(N)-18		3.388	-0.196	0.000	0.45			108.9
N-8.000	MH(N)-19		3.879	0.079	0.000	1.06			236.9
N-8.001	MH(N)-20		3.597	0.054	0.000	1.05			300.8
N-8.002	MH(N)-21		3.264	0.021	0.000	1.07			348.8
N-8.003	MH(N)-22		3.028	0.035	0.000	0.31			131.1
N-1.005	MH(N)-23		3.018	0.507	0.000	0.16		140	100.4
N-9.000	MH(N)-24		3.552	-0.133	0.000	0.59			118.9
N-10.000	MH(N)-25		3.611	-0.189	0.000	0.61			143.8
N-10.001	MH(N)-26		3.411	0.053	0.000	1.10			230.0
N-10.002	MH(N)-27		3.019	-0.060	0.000	0.18			81.1
N-1.006	MH(N)-28		3.009	1.084	0.000	0.85			127.2
N-1.007	MH(N)-EX-37		1.364	-0.247	0.000	0.55			127.2

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	OK	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	OK	
N-8.000	MH(N)-19	SURCHARGED	
N-8.001	MH(N)-20	SURCHARGED	
N-8.002	MH(N)-21	SURCHARGED	
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	OK	
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	OK	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 5
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
N-1.000	MH(N)-1	15 Winter	100	+25%				
N-1.001	MH(N)-2	15 Winter	100	+25%				
N-2.000	MH(N)-3	15 Winter	100	+25%	30/15 Summer			
N-2.001	MH(N)-4	15 Winter	100	+25%	30/15 Summer			
N-1.002	MH(N)-5	120 Winter	100	+25%	30/15 Winter			
N-3.000	MH(N)-6	15 Winter	100	+25%				
N-3.001	MH(N)-7	120 Winter	100	+25%				
N-4.000	MH(N)-8	15 Winter	100	+25%	100/15 Summer			
N-4.001	MH(N)-9	15 Winter	100	+25%	100/15 Summer			
N-4.002	MH(N)-10	120 Winter	100	+25%	100/60 Winter			
N-1.003	MH(N)-11	120 Winter	100	+25%	30/15 Summer			
N-5.000	MH(N)-12	15 Winter	100	+25%				
N-5.001	MH(N)-13	120 Winter	100	+25%				
N-6.000	MH(N)-14	15 Winter	100	+25%	100/15 Summer			
N-6.001	MH(N)-15	15 Winter	100	+25%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
N-1.000	MH(N)-1	3.712	-0.088	0.000	0.82			64.0	OK
N-1.001	MH(N)-2	3.574	-0.033	0.000	0.97			101.2	OK
N-2.000	MH(N)-3	4.301	0.426	0.000	1.10			91.1	SURCHARGED
N-2.001	MH(N)-4	3.674	0.282	0.000	1.75			113.3	SURCHARGED
N-1.002	MH(N)-5	3.355	0.088	0.000	0.83		36	80.1	SURCHARGED
N-3.000	MH(N)-6	3.629	-0.171	0.000	0.56			76.9	OK
N-3.001	MH(N)-7	3.358	-0.168	0.000	0.17			41.5	OK
N-4.000	MH(N)-8	3.967	0.167	0.000	1.02			83.8	SURCHARGED
N-4.001	MH(N)-9	3.614	0.133	0.000	1.27			150.8	SURCHARGED
N-4.002	MH(N)-10	3.362	0.098	0.000	0.35			68.8	SURCHARGED
N-1.003	MH(N)-11	3.350	0.600	0.000	0.72		84	135.8	SURCHARGED
N-5.000	MH(N)-12	3.640	-0.160	0.000	0.61			84.5	OK
N-5.001	MH(N)-13	3.377	-0.141	0.000	0.10			45.9	OK
N-6.000	MH(N)-14	3.911	0.111	0.000	0.71			110.3	SURCHARGED
N-6.001	MH(N)-15	3.691	0.336	0.000	1.50			252.1	SURCHARGED

PN	US/MH Name	Level Exceeded
N-1.000	MH(N)-1	
N-1.001	MH(N)-2	
N-2.000	MH(N)-3	
N-2.001	MH(N)-4	
N-1.002	MH(N)-5	
N-3.000	MH(N)-6	
N-3.001	MH(N)-7	
N-4.000	MH(N)-8	
N-4.001	MH(N)-9	
N-4.002	MH(N)-10	
N-1.003	MH(N)-11	
N-5.000	MH(N)-12	
N-5.001	MH(N)-13	
N-6.000	MH(N)-14	
N-6.001	MH(N)-15	

100 year Return Period 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
N-6.002	MH(N)-16	120 Winter	100	+25%	100/30 Winter		
N-1.004	MH(N)-17	120 Winter	100	+25%	30/15 Summer		
N-7.000	MH(N)-18	15 Winter	100	+25%			
N-8.000	MH(N)-19	15 Winter	100	+25%	30/15 Summer		
N-8.001	MH(N)-20	15 Winter	100	+25%	30/15 Summer		
N-8.002	MH(N)-21	15 Winter	100	+25%	30/15 Winter		
N-8.003	MH(N)-22	120 Winter	100	+25%	30/60 Winter		
N-1.005	MH(N)-23	120 Winter	100	+25%	30/15 Summer		
N-9.000	MH(N)-24	15 Winter	100	+25%			
N-10.000	MH(N)-25	15 Winter	100	+25%	100/15 Summer		
N-10.001	MH(N)-26	15 Winter	100	+25%	30/15 Summer		
N-10.002	MH(N)-27	120 Winter	100	+25%	100/30 Winter		
N-1.006	MH(N)-28	120 Winter	100	+25%	1/15 Summer		
N-1.007	MH(N)-EX-37	120 Winter	100	+25%			

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
N-6.002	MH(N)-16		3.414	0.288	0.000	0.24			86.7
N-1.004	MH(N)-17		3.403	0.803	0.000	0.20		144	99.5
N-7.000	MH(N)-18		3.418	-0.166	0.000	0.58			140.5
N-8.000	MH(N)-19		4.434	0.634	0.000	1.28			285.4
N-8.001	MH(N)-20		4.014	0.471	0.000	1.30			372.2
N-8.002	MH(N)-21		3.474	0.231	0.000	1.38			450.2
N-8.003	MH(N)-22		3.408	0.415	0.000	0.39			163.8
N-1.005	MH(N)-23		3.401	0.890	0.000	0.21			135.0
N-9.000	MH(N)-24		3.583	-0.102	0.000	0.76			153.4
N-10.000	MH(N)-25		3.880	0.080	0.000	0.74			174.6
N-10.001	MH(N)-26		3.628	0.270	0.000	1.39			290.7
N-10.002	MH(N)-27		3.408	0.329	0.000	0.23			100.5
N-1.006	MH(N)-28		3.393	1.468	0.000	1.04			155.7
N-1.007	MH(N)-EX-37		1.407	-0.204	0.000	0.67			154.9

PN	US/MH Name	Status	Level Exceeded
N-6.002	MH(N)-16	SURCHARGED	
N-1.004	MH(N)-17	SURCHARGED	
N-7.000	MH(N)-18	OK	
N-8.000	MH(N)-19	SURCHARGED	
N-8.001	MH(N)-20	SURCHARGED	
N-8.002	MH(N)-21	SURCHARGED	
N-8.003	MH(N)-22	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
N-1.005	MH(N)-23	SURCHARGED	
N-9.000	MH(N)-24	OK	
N-10.000	MH(N)-25	SURCHARGED	
N-10.001	MH(N)-26	SURCHARGED	
N-10.002	MH(N)-27	SURCHARGED	
N-1.006	MH(N)-28	SURCHARGED	
N-1.007	MH(N)-EX-37	OK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Proposed Storm

Pipe Sizes STANDARD Manhole Sizes ECC

FSR Rainfall Model - England and Wales

Return Period (years)	30	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	17.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.400	PIMP (%)	100	Min Vel for Auto Design only (m/s)	0.80
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Proposed Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
SE-1.000	34.890	0.092	379.2	0.272	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-1.001	33.567	0.098	342.5	0.221	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE-1.002	64.269	0.148	434.3	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
SE-2.000	60.376	0.283	213.3	0.257	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-2.001	60.143	0.220	273.4	0.243	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE-1.003	40.913	0.082	498.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
SE-3.000	36.985	0.123	300.7	0.176	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-3.001	55.477	0.111	499.8	0.189	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE-3.002	55.477	0.111	499.8	0.251	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-1.004	25.000	0.050	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
SE-4.000	35.820	0.119	301.0	0.177	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-4.001	53.730	0.107	500.0	0.185	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE-4.002	53.730	0.107	502.1	0.192	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-4.003	21.384	0.073	294.9	0.061	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-5.000	15.829	0.063	250.0	0.199	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-5.001	15.266	0.061	250.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-4.004	14.815	0.073	204.4	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-1.005	34.248	0.068	503.6	0.137	0.00	0.0	0.600	o	750	Pipe/Conduit	
SE-6.000	40.178	0.154	260.9	0.092	5.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
SE-1.000	50.00	5.73	3.240	0.272	0.0	0.0	0.0	0.80	56.6	36.9
SE-1.001	50.00	6.30	3.073	0.493	0.0	0.0	0.0	0.97	107.5	66.8
SE-1.002	50.00	7.22	2.750	0.493	0.0	0.0	0.0	1.16	328.6	66.8
SE-2.000	50.00	5.94	3.330	0.257	0.0	0.0	0.0	1.07	75.8	34.8
SE-2.001	50.00	6.86	2.972	0.500	0.0	0.0	0.0	1.09	120.5	67.7
SE-1.003	50.00	7.85	2.602	0.993	0.0	0.0	0.0	1.08	306.3	134.5
SE-3.000	50.00	5.68	3.330	0.176	0.0	0.0	0.0	0.90	63.7	23.8
SE-3.001	50.00	6.71	3.057	0.365	0.0	0.0	0.0	0.90	143.5	49.4
SE-3.002	50.00	7.64	2.871	0.616	0.0	0.0	0.0	1.00	215.4	83.4
SE-1.004	50.00	8.19	2.370	1.609	0.0	0.0	0.0	1.24	549.9	217.9
SE-4.000	50.00	5.66	3.330	0.177	0.0	0.0	0.0	0.90	63.7	24.0
SE-4.001	50.00	6.65	3.061	0.362	0.0	0.0	0.0	0.90	143.5	49.0
SE-4.002	50.00	7.56	2.879	0.554	0.0	0.0	0.0	0.99	214.9	75.1
SE-4.003	50.00	7.83	2.772	0.615	0.0	0.0	0.0	1.30	281.2	83.3
SE-5.000	50.00	5.27	3.100	0.199	0.0	0.0	0.0	0.99	70.0	27.0
SE-5.001	50.00	5.52	3.037	0.199	0.0	0.0	0.0	0.99	70.0	27.0
SE-4.004	50.00	7.99	2.700	0.814	0.0	0.0	0.0	1.56	338.4	110.3
SE-1.005	50.00	8.65	2.320	2.560	0.0	0.0	0.0	1.24	547.9	346.7
SE-6.000	50.00	5.83	3.505	0.092	0.0	0.0	0.0	0.80	32.0	12.5

Network Design Table for Proposed 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
SE-7.000	28.186	0.154	183.0	0.083	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-6.001	20.864	0.111	188.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-8.000	40.339	0.155	260.3	0.124	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-9.000	26.843	0.155	173.2	0.082	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-6.002	8.156	0.086	94.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
SE-6.003	30.316	0.061	500.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-6.004	33.388	0.067	500.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-10.000	19.301	0.097	200.0	0.151	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-6.005	67.013	0.134	500.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-6.006	62.384	0.125	500.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-11.000	63.458	0.160	396.6	0.487	5.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-11.001	50.895	0.138	368.8	0.314	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
SE-12.000	43.771	0.167	262.1	0.309	5.00	0.0	0.600	o	300	Pipe/Conduit	🔒
SE-12.001	43.117	0.131	329.1	0.220	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-11.002	35.463	0.141	251.5	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	🔒
SE-13.000	65.749	0.300	219.2	0.522	5.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-13.001	20.866	0.070	298.1	0.102	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
SE-13.002	50.101	0.167	300.0	0.174	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
SE-14.000	43.633	0.167	261.3	0.207	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-14.001	43.633	0.116	376.1	0.149	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
SE-11.003	33.711	0.067	503.1	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	🔒
SE-15.000	43.615	0.167	261.2	0.205	5.00	0.0	0.600	o	225	Pipe/Conduit	🔒
SE-15.001	43.615	0.116	376.0	0.150	0.00	0.0	0.600	o	300	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)
SE-7.000	50.00	5.49	3.505	0.083	0.0	0.0	0.0	0.96	38.3	11.2
SE-6.001	50.00	6.20	3.351	0.175	0.0	0.0	0.0	0.95	37.8	23.7
SE-8.000	50.00	5.83	3.395	0.124	0.0	0.0	0.0	0.81	32.0	16.8
SE-9.000	50.00	5.45	3.395	0.082	0.0	0.0	0.0	0.99	39.4	11.2
SE-6.002	50.00	6.28	3.165	0.382	0.0	0.0	0.0	1.61	114.1	51.7
SE-6.003	50.00	6.91	3.004	0.382	0.0	0.0	0.0	0.80	88.7	51.7
SE-6.004	50.00	7.60	2.943	0.382	0.0	0.0	0.0	0.80	88.7	51.7
SE-10.000	50.00	5.35	3.545	0.151	0.0	0.0	0.0	0.92	36.6	20.4
SE-6.005	50.00	8.99	2.876	0.533	0.0	0.0	0.0	0.80	88.7	72.1
SE-6.006	50.00	10.29	2.742	0.533	0.0	0.0	0.0	0.80	88.7	72.1
SE-11.000	50.00	6.17	2.875	0.487	0.0	0.0	0.0	0.90	99.8	65.9
SE-11.001	50.00	6.98	2.640	0.801	0.0	0.0	0.0	1.05	167.4	108.4
SE-12.000	50.00	5.75	2.950	0.309	0.0	0.0	0.0	0.97	68.3	41.8
SE-12.001	50.00	6.48	2.708	0.528	0.0	0.0	0.0	0.99	109.7	71.6
SE-11.002	50.00	7.40	2.427	1.329	0.0	0.0	0.0	1.41	304.8	180.0
SE-13.000	50.00	5.90	2.975	0.522	0.0	0.0	0.0	1.22	134.7	70.7
SE-13.001	50.00	6.23	2.675	0.625	0.0	0.0	0.0	1.04	115.3	84.6
SE-13.002	50.00	6.95	2.530	0.799	0.0	0.0	0.0	1.17	185.8	108.2
SE-14.000	50.00	5.90	3.155	0.207	0.0	0.0	0.0	0.80	32.0	28.0
SE-14.001	50.00	6.81	2.913	0.356	0.0	0.0	0.0	0.80	56.9	48.2
SE-11.003	50.00	7.88	2.136	2.484	0.0	0.0	0.0	1.16	415.7	336.4
SE-15.000	50.00	5.90	3.155	0.205	0.0	0.0	0.0	0.80	32.0	27.8
SE-15.001	50.00	6.81	2.913	0.355	0.0	0.0	0.0	0.80	56.9	48.1

Network Design Table for Proposed 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
SE-16.000	61.503	0.166	370.5	0.284	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-11.004	17.826	0.036	495.2	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
SE-11.005	87.286	0.175	498.8	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
SE-11.006	59.507	0.119	500.1	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
SE-17.000	65.551	0.328	200.0	0.141	5.00	0.0	0.600	o	225	Pipe/Conduit	
SE-18.000	9.758	0.049	200.0	0.075	5.00	0.0	0.600	o	225	Pipe/Conduit	
SE-17.001	8.847	0.044	200.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
SE-11.007	29.755	0.059	504.3	0.000	0.00	0.0	0.600	o	825	Pipe/Conduit	
SE-19.000	24.297	0.093	260.8	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
SE-19.001	43.610	0.167	261.1	0.170	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-19.002	43.610	0.115	379.2	0.150	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-20.000	27.782	0.143	194.3	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
SE-20.001	37.265	0.140	266.2	0.242	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-19.003	34.369	0.193	178.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-21.000	34.088	0.109	312.7	0.206	5.00	0.0	0.600	o	525	Pipe/Conduit	
SE-21.001	36.058	0.349	103.3	0.163	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-19.004	65.941	0.132	499.6	0.223	0.00	0.0	0.600	o	600	Pipe/Conduit	
SE-19.005	65.941	0.132	499.6	0.228	0.00	0.0	0.600	o	750	Pipe/Conduit	
SE-19.006	29.513	0.084	351.3	0.219	0.00	0.0	0.600	o	750	Pipe/Conduit	
SE-22.000	37.512	0.125	300.0	0.198	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-22.001	35.430	0.101	350.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE-22.002	31.001	0.062	504.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE-23.000	51.137	0.170	300.8	0.294	5.00	0.0	0.600	o	375	Pipe/Conduit	
SE-23.001	41.934	0.140	300.0	0.154	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE-23.002	56.296	0.113	500.0	0.344	0.00	0.0	0.600	o	450	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)
SE-16.000	50.00	6.26	2.947	0.284	0.0	0.0	0.0	0.81	57.3	38.5
SE-11.004	50.00	8.10	1.919	3.124	0.0	0.0	0.0	1.33	709.6	423.0
SE-11.005	50.00	9.20	1.883	3.124	0.0	0.0	0.0	1.32	707.0	423.0
SE-11.006	50.00	9.95	1.708	3.124	0.0	0.0	0.0	1.32	706.1	423.0
SE-17.000	50.00	6.19	2.600	0.141	0.0	0.0	0.0	0.92	36.6	19.1
SE-18.000	50.00	5.18	3.155	0.075	0.0	0.0	0.0	0.92	36.6	10.2
SE-17.001	50.00	6.35	2.272	0.216	0.0	0.0	0.0	0.92	36.6	29.3
SE-11.007	50.00	10.33	1.589	3.340	0.0	0.0	0.0	1.32	703.0	452.3
SE-19.000	50.00	5.50	3.155	0.085	0.0	0.0	0.0	0.80	32.0	11.5
SE-19.001	50.00	6.25	2.987	0.255	0.0	0.0	0.0	0.97	68.4	34.5
SE-19.002	50.00	7.16	2.820	0.405	0.0	0.0	0.0	0.80	56.6	54.8
SE-20.000	50.00	5.50	3.155	0.000	0.0	0.0	0.0	0.93	37.2	0.0
SE-20.001	50.00	6.14	2.937	0.242	0.0	0.0	0.0	0.96	67.8	32.8
SE-19.003	50.00	7.65	2.705	0.647	0.0	0.0	0.0	1.18	83.1«	87.7
SE-21.000	50.00	5.45	2.745	0.206	0.0	0.0	0.0	1.26	273.0	27.9
SE-21.001	50.00	5.72	2.636	0.369	0.0	0.0	0.0	2.20	477.0	50.0
SE-19.004	50.00	8.66	2.212	1.239	0.0	0.0	0.0	1.08	306.1	167.8
SE-19.005	50.00	9.55	1.930	1.467	0.0	0.0	0.0	1.25	550.1	198.7
SE-19.006	50.00	9.88	1.798	1.686	0.0	0.0	0.0	1.49	657.0	228.3
SE-22.000	50.00	5.69	3.050	0.198	0.0	0.0	0.0	0.90	63.8	26.8
SE-22.001	50.00	6.31	2.850	0.198	0.0	0.0	0.0	0.96	106.3	26.8
SE-22.002	50.00	6.88	2.674	0.198	0.0	0.0	0.0	0.90	142.9	26.8
SE-23.000	50.00	5.82	2.975	0.294	0.0	0.0	0.0	1.04	114.8	39.8
SE-23.001	50.00	6.49	2.805	0.448	0.0	0.0	0.0	1.04	115.0	60.6
SE-23.002	50.00	7.53	2.590	0.792	0.0	0.0	0.0	0.90	143.5	107.2

Network Design Table for Proposed 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
SE-22.003	40.186	0.080	500.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE-22.004	37.906	0.076	498.8	0.115	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-22.005	59.139	0.118	501.2	0.291	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-22.006	59.139	0.118	501.2	0.167	0.00	0.0	0.600	o	600	Pipe/Conduit	
SE-24.000	35.267	0.176	200.0	0.129	5.00	0.0	0.600	o	225	Pipe/Conduit	
SE-24.001	57.844	0.210	275.4	0.176	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-24.002	72.256	0.144	501.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
SE-25.000	34.362	0.137	250.0	0.412	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-22.007	24.808	0.050	500.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
SE-19.007	39.872	0.080	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
SE-11.008	29.753	0.060	495.9	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
SE-26.000	63.522	0.380	167.2	1.947	5.00	0.0	0.600	o	225	Pipe/Conduit	
SE-6.007	30.912	0.076	406.7	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-6.008	69.903	0.140	499.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-6.009	16.722	0.041	412.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-6.010	25.231	0.063	400.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
SE-1.006	51.147	0.102	501.4	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
SE-1.007	60.917	0.122	499.3	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
SE-27.000	45.574	0.228	200.0	0.504	5.00	0.0	0.600	o	300	Pipe/Conduit	
SE-27.001	11.492	0.077	150.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
SE-1.008	50.144	0.167	300.3	0.000	0.00	0.0	0.600	o	525	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)
SE-22.003	50.00	8.27	2.477	0.990	0.0	0.0	0.0	0.90	143.5	134.1
SE-22.004	50.00	8.91	2.322	1.105	0.0	0.0	0.0	1.00	215.6	149.6
SE-22.005	50.00	9.90	2.246	1.396	0.0	0.0	0.0	0.99	215.1	189.1
SE-22.006	50.00	10.81	2.053	1.564	0.0	0.0	0.0	1.08	305.6	211.7
SE-24.000	50.00	5.64	3.125	0.129	0.0	0.0	0.0	0.92	36.6	17.5
SE-24.001	50.00	6.66	2.874	0.305	0.0	0.0	0.0	0.94	66.6	41.3
SE-24.002	50.00	8.16	2.589	0.305	0.0	0.0	0.0	0.80	88.6	41.3
SE-25.000	50.00	5.58	3.100	0.412	0.0	0.0	0.0	0.99	70.0	55.8
SE-22.007	50.00	11.17	1.860	2.281	0.0	0.0	0.0	1.17	417.0	308.8
SE-19.007	50.00	11.70	1.714	3.967	0.0	0.0	0.0	1.24	549.9	537.1
SE-11.008	50.00	12.25	1.530	7.307	0.0	0.0	0.0	0.91	144.1«	989.4
SE-26.000	50.00	6.05	3.200	1.947	0.0	0.0	0.0	1.01	40.1«	263.6
SE-6.007	50.00	12.71	1.471	9.786	0.0	0.0	0.0	1.10	239.1«	1325.1
SE-6.008	50.00	13.88	1.395	9.786	0.0	0.0	0.0	1.00	215.5«	1325.1
SE-6.009	50.00	14.14	1.255	9.786	0.0	0.0	0.0	1.10	237.3«	1325.1
SE-6.010	50.00	14.52	1.215	9.786	0.0	0.0	0.0	1.11	241.1«	1325.1
SE-1.006	50.00	15.13	0.799	12.346	0.0	0.0	0.0	1.39	885.8«	1671.8
SE-1.007	50.00	15.86	0.697	12.346	0.0	0.0	0.0	1.40	887.7«	1671.8
SE-27.000	50.00	5.69	3.330	0.504	0.0	0.0	0.0	1.11	78.3	68.3
SE-27.001	50.00	5.83	3.102	0.504	0.0	0.0	0.0	1.28	90.6	68.3
SE-1.008	50.00	16.51	0.575	12.850	0.0	0.0	0.0	1.29	278.7«	1740.1

Area Summary for Proposed Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.272	0.272	0.272
1.001	User	-	100	0.158	0.158	0.158
	User	-	100	0.063	0.063	0.221
1.002	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.257	0.257	0.257
2.001	User	-	100	0.207	0.207	0.207
	User	-	100	0.035	0.035	0.243
1.003	-	-	100	0.000	0.000	0.000
3.000	User	-	100	0.176	0.176	0.176
3.001	User	-	100	0.189	0.189	0.189
3.002	User	-	100	0.185	0.185	0.185
	User	-	100	0.066	0.066	0.251
1.004	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.177	0.177	0.177
4.001	User	-	100	0.185	0.185	0.185
4.002	User	-	100	0.192	0.192	0.192
4.003	User	-	100	0.061	0.061	0.061
5.000	User	-	100	0.199	0.199	0.199
5.001	-	-	100	0.000	0.000	0.000
4.004	-	-	100	0.000	0.000	0.000
1.005	User	-	100	0.137	0.137	0.137
6.000	User	-	100	0.092	0.092	0.092
7.000	User	-	100	0.083	0.083	0.083
6.001	-	-	100	0.000	0.000	0.000
8.000	User	-	100	0.124	0.124	0.124
9.000	User	-	100	0.082	0.082	0.082
6.002	-	-	100	0.000	0.000	0.000
6.003	-	-	100	0.000	0.000	0.000
6.004	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.151	0.151	0.151
6.005	-	-	100	0.000	0.000	0.000
6.006	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.393	0.393	0.393
	User	-	100	0.094	0.094	0.487
11.001	User	-	100	0.314	0.314	0.314
12.000	User	-	100	0.309	0.309	0.309
12.001	User	-	100	0.220	0.220	0.220
11.002	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.522	0.522	0.522
13.001	User	-	100	0.102	0.102	0.102
13.002	User	-	100	0.174	0.174	0.174
14.000	User	-	100	0.207	0.207	0.207
14.001	User	-	100	0.149	0.149	0.149
11.003	-	-	100	0.000	0.000	0.000
15.000	User	-	100	0.205	0.205	0.205
15.001	User	-	100	0.150	0.150	0.150
16.000	User	-	100	0.172	0.172	0.172
	User	-	100	0.112	0.112	0.284
11.004	-	-	100	0.000	0.000	0.000
11.005	-	-	100	0.000	0.000	0.000
11.006	-	-	100	0.000	0.000	0.000
17.000	User	-	100	0.141	0.141	0.141
18.000	User	-	100	0.075	0.075	0.075
17.001	-	-	100	0.000	0.000	0.000
11.007	-	-	100	0.000	0.000	0.000
19.000	User	-	100	0.085	0.085	0.085
19.001	User	-	100	0.170	0.170	0.170
19.002	User	-	100	0.150	0.150	0.150
20.000	-	-	100	0.000	0.000	0.000
20.001	User	-	100	0.115	0.115	0.115
	User	-	100	0.127	0.127	0.242
19.003	-	-	100	0.000	0.000	0.000
21.000	User	-	100	0.206	0.206	0.206
21.001	User	-	100	0.163	0.163	0.163
19.004	User	-	100	0.223	0.223	0.223
19.005	User	-	100	0.228	0.228	0.228
19.006	User	-	100	0.219	0.219	0.219
22.000	User	-	100	0.198	0.198	0.198
22.001	-	-	100	0.000	0.000	0.000
22.002	-	-	100	0.000	0.000	0.000
23.000	User	-	100	0.294	0.294	0.294
23.001	User	-	100	0.154	0.154	0.154
23.002	User	-	100	0.344	0.344	0.344
22.003	-	-	100	0.000	0.000	0.000
22.004	User	-	100	0.115	0.115	0.115
22.005	User	-	100	0.291	0.291	0.291
22.006	User	-	100	0.167	0.167	0.167
24.000	User	-	100	0.129	0.129	0.129
24.001	User	-	100	0.176	0.176	0.176
24.002	-	-	100	0.000	0.000	0.000
25.000	User	-	100	0.394	0.394	0.394
	User	-	100	0.018	0.018	0.412
22.007	-	-	100	0.000	0.000	0.000
19.007	-	-	100	0.000	0.000	0.000

Area Summary for Proposed Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
11.008	-	-	100	0.000	0.000	0.000
26.000	User	-	100	1.947	1.947	1.947
6.007	-	-	100	0.000	0.000	0.000
6.008	-	-	100	0.000	0.000	0.000
6.009	-	-	100	0.000	0.000	0.000
6.010	-	-	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
27.000	User	-	100	0.504	0.504	0.504
27.001	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				12.850	12.850	12.850

Surcharged Outfall Details for Proposed Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
SE-1.008	MH(SE)-	3.000	0.408	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
630	1.900	3150	1.900	5670	1.900	8190	1.900	10710	1.900	13230	1.900	15750	1.900	18270	1.900
1260	1.900	3780	1.900	6300	1.900	8820	1.900	11340	1.900	13860	1.900	16380	1.900	18900	1.900
1890	1.900	4410	1.900	6930	1.900	9450	1.900	11970	1.900	14490	1.900	17010	1.900	19530	1.900
2520	1.900	5040	1.900	7560	1.900	10080	1.900	12600	1.900	15120	1.900	17640	1.900	20160	1.900

Simulation Criteria for Proposed Storm

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

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	3	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	17.000	Cv (Summer)	0.750
Return Period (years)	30	Ratio R	0.400	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Proposed Storm

Hydro-Brake® Optimum Manhole: MH(SE)-23, DS/PN: SE-6.003, Volume (m³): 2.7

Unit Reference	MD-SHE-0105-5000-1000-5000	Sump Available	Yes
Design Head (m)	1.000	Diameter (mm)	105
Design Flow (l/s)	5.0	Invert Level (m)	3.004
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0	Kick-Flo®	0.637	4.1
Flush-Flo™	0.296	5.0	Mean Flow over Head Range	-	4.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	0.600	4.3	1.600	6.2	2.600	7.8	5.000	10.6	7.500	12.9
0.200	4.8	0.800	4.5	1.800	6.6	3.000	8.4	5.500	11.1	8.000	13.3
0.300	5.0	1.000	5.0	2.000	6.9	3.500	9.0	6.000	11.6	8.500	13.7
0.400	4.9	1.200	5.4	2.200	7.2	4.000	9.6	6.500	12.1	9.000	14.1
0.500	4.7	1.400	5.8	2.400	7.5	4.500	10.1	7.000	12.5	9.500	14.5

Hydro-Brake® Optimum Manhole: MH(SE)-65, DS/PN: SE-11.008, Volume (m³): 39.6

Unit Reference	MD-SHE-0266-5000-3000-5000
Design Head (m)	3.000
Design Flow (l/s)	50.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	266
Invert Level (m)	1.530
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.000	50.0	Kick-Flo®	1.829	39.4
Flush-Flo™	0.863	50.0	Mean Flow over Head Range	-	43.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.5	0.600	48.8	1.600	44.9	2.600	46.7	5.000	64.0	7.500	77.9
0.200	27.4	0.800	49.9	1.800	40.4	3.000	50.0	5.500	67.0	8.000	80.4
0.300	41.9	1.000	49.8	2.000	41.1	3.500	53.9	6.000	69.9	8.500	82.8
0.400	45.3	1.200	49.0	2.200	43.1	4.000	57.5	6.500	72.7	9.000	85.2
0.500	47.5	1.400	47.5	2.400	44.9	4.500	60.8	7.000	75.4	9.500	87.4

Orifice Manhole: MH(SE)-72, DS/PN: SE-1.008, Volume (m³): 48.9

Diameter (m) 0.300 Discharge Coefficient 0.600 Invert Level (m) 0.575

Storage Structures for Proposed Storm

Cellular Storage Manhole: MH(SE)-23, DS/PN: SE-6.003

Invert Level (m) 3.004 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	500.0	0.0	0.300	500.0	0.0	0.301	0.0	0.0

Cellular Storage Manhole: MH(SE)-65, DS/PN: SE-11.008

Invert Level (m) 1.530 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	2500.0	0.0	1.500	2500.0	0.0	1.501	0.0	0.0

Cellular Storage Manhole: MH(SE)-72, DS/PN: SE-1.008

Invert Level (m) 0.575 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1250.0	0.0	1.800	1250.0	0.0	1.801	0.0	0.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 5, 10, 20, 30
Climate Change (%) 25, 25, 25, 25, 25

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-1.000	MH(SE)-1	15 minute 1 year Winter I+25%	4.740	3.439	-0.101	0.000	0.74		0.220	0.8	38.8	OK
SE-1.001	MH(SE)-2	15 minute 1 year Winter I+25%	4.740	3.300	-0.148	0.000	0.68		0.982	0.9	65.1	OK
SE-1.002	MH(SE)-3	15 minute 1 year Winter I+25%	4.740	2.969	-0.381	0.000	0.21		0.328	0.7	62.4	OK
SE-2.000	MH(SE)-4	15 minute 1 year Winter I+25%	4.830	3.485	-0.145	0.000	0.50		0.170	1.0	36.1	OK
SE-2.001	MH(SE)-5	15 minute 1 year Winter I+25%	4.830	3.178	-0.169	0.000	0.56		0.537	1.1	63.6	OK
SE-1.003	MH(SE)-6	15 minute 1 year Winter I+25%	4.830	2.900	-0.302	0.000	0.44		6.995	0.9	114.3	OK
SE-3.000	MH(SE)-7	15 minute 1 year Winter I+25%	4.830	3.470	-0.160	0.000	0.43		0.153	0.8	25.4	OK
SE-3.001	MH(SE)-8	15 minute 1 year Winter I+25%	4.830	3.247	-0.260	0.000	0.35		0.249	0.8	46.5	OK
SE-3.002	MH(SE)-9	15 minute 1 year Winter I+25%	4.830	3.096	-0.300	0.000	0.38		1.644	0.8	74.7	OK
SE-1.004	MH(SE)-10	15 minute 1 year Winter I+25%	4.830	2.803	-0.317	0.000	0.45		4.973	0.7	182.6	OK
SE-4.000	MH(SE)-11	15 minute 1 year Winter I+25%	4.830	3.471	-0.159	0.000	0.44		0.153	0.8	25.6	OK
SE-4.001	MH(SE)-12	15 minute 1 year Winter I+25%	4.830	3.251	-0.260	0.000	0.35		0.248	0.8	46.3	OK
SE-4.002	MH(SE)-13	15 minute 1 year Winter I+25%	4.830	3.095	-0.309	0.000	0.34		1.432	0.8	65.3	OK
SE-4.003	MH(SE)-14	15 minute 1 year Winter I+25%	4.830	2.984	-0.313	0.000	0.32		3.099	0.9	71.0	OK
SE-5.000	MH(SE)-LC-EAST	15 minute 1 year Winter I+25%	4.400	3.250	-0.150	0.000	0.49		0.164	0.8	28.8	OK
SE-5.001	MH(SE)-16	15 minute 1 year Winter I+25%	4.700	3.186	-0.151	0.000	0.49		0.528	0.8	29.0	OK
SE-4.004	MH(SE)-14-1	15 minute 1 year Winter I+25%	4.915	2.923	-0.302	0.000	0.38		1.513	1.1	93.8	OK
SE-1.005	MH(SE)-15	15 minute 1 year Winter I+25%	5.000	2.761	-0.309	0.000	0.65		6.295	1.0	282.0	OK
SE-6.000	MH(SE)-16	15 minute 1 year Winter I+25%	4.930	3.611	-0.119	0.000	0.43		0.114	0.7	13.1	OK
SE-7.000	MH(SE)-17	15 minute 1 year Winter I+25%	4.930	3.596	-0.134	0.000	0.34		0.098	0.8	12.0	OK
SE-6.001	MH(SE)-18	15 minute 1 year Winter I+25%	4.930	3.491	-0.085	0.000	0.70		0.867	0.9	24.2	OK
SE-8.000	MH(SE)-19	15 minute 1 year Winter I+25%	4.820	3.522	-0.098	0.000	0.58		0.138	0.8	17.6	OK
SE-9.000	MH(SE)-20	15 minute 1 year Winter I+25%	4.820	3.485	-0.135	0.000	0.33		0.096	0.8	11.9	OK
SE-6.002	MH(SE)-21	15 minute 1 year Winter I+25%	4.820	3.354	-0.111	0.000	0.72		0.820	1.1	52.6	OK
SE-6.003	MH(SE)-23	360 minute 1 year Winter I+25%	4.970	3.100	-0.279	0.000	0.04		45.474	0.4	3.2	OK
SE-6.004	MH(SE)-23-1	15 minute 1 year Winter I+25%	4.985	2.998	-0.320	0.000	0.02		0.237	0.3	1.4	OK
SE-10.000	MH(SE)-22	15 minute 1 year Winter I+25%	4.970	3.681	-0.089	0.000	0.66		0.149	0.9	21.9	OK
SE-6.005	MH(SE)-24	15 minute 1 year Winter I+25%	5.000	3.002	-0.249	0.000	0.23		0.765	0.6	19.1	OK
SE-6.006	MH(SE)-25	15 minute 1 year Winter I+25%	5.000	2.862	-0.255	0.000	0.22		0.881	0.6	18.6	OK
SE-11.000	MH(SE)-26	15 minute 1 year Winter I+25%	4.450	3.123	-0.127	0.000	0.70		0.275	0.9	66.0	OK
SE-11.001	MH(SE)-27	15 minute 1 year Winter I+25%	4.450	2.911	-0.179	0.000	0.65		2.166	1.0	99.1	OK
SE-12.000	MH(SE)-28	15 minute 1 year Winter I+25%	4.450	3.139	-0.111	0.000	0.69		0.208	1.0	44.0	OK
SE-12.001	MH(SE)-29	15 minute 1 year Winter I+25%	4.450	2.940	-0.143	0.000	0.68		0.911	1.0	68.7	OK
SE-11.002	MH(SE)-30	15 minute 1 year Winter I+25%	4.450	2.737	-0.215	0.000	0.62		3.880	1.3	162.2	OK
SE-13.000	MH(SE)-31-1	15 minute 1 year Winter I+25%	4.550	3.187	-0.163	0.000	0.58		0.234	1.2	73.5	OK
SE-13.001	MH(SE)-31	15 minute 1 year Winter I+25%	4.580	2.944	-0.106	0.000	0.86		2.474	1.0	83.5	OK
SE-13.002	MH(SE)-32	15 minute 1 year Winter I+25%	4.580	2.784	-0.196	0.000	0.60		1.011	1.1	100.5	OK
SE-14.000	MH(SE)-33	15 minute 1 year Winter I+25%	4.580	3.337	-0.043	0.000	0.95		0.200	0.9	29.0	OK
SE-14.001	MH(SE)-34	15 minute 1 year Winter I+25%	4.580	3.132	-0.081	0.000	0.87		0.657	0.8	46.3	OK
SE-11.003	MH(SE)-35	15 minute 1 year Winter I+25%	4.580	2.640	-0.171	0.000	0.88		7.967	1.0	295.0	OK
SE-15.000	MH(SE)-36	15 minute 1 year Winter I+25%	4.580	3.335	-0.045	0.000	0.94		0.198	0.9	28.8	OK
SE-15.001	MH(SE)-37	15 minute 1 year Winter I+25%	4.580	3.131	-0.082	0.000	0.87		0.654	0.8	46.3	OK
SE-16.000	MH(SE)-39	15 minute 1 year Winter I+25%	4.580	3.146	-0.101	0.000	0.76		0.219	0.8	41.3	OK
SE-11.004	MH(SE)-40	15 minute 1 year Winter I+25%	4.580	2.535	-0.209	0.000	0.91		8.478	0.9	363.2	OK
SE-11.005	MH(SE)-41	15 minute 1 year Winter I+25%	4.750	2.343	-0.365	0.000	0.55		4.918	1.2	348.3	OK
SE-11.006	MH(SE)-42	15 minute 1 year Winter I+25%	4.750	2.189	-0.344	0.000	0.54		22.363	1.1	324.4	OK
SE-17.000	MH(SE)-43-1	15 minute 1 year Winter I+25%	4.580	2.725	-0.100	0.000	0.55		0.135	0.9	19.4	OK
SE-18.000	MH(SE)-43-2	15 minute 1 year Winter I+25%	4.580	3.250	-0.130	0.000	0.36		0.101	0.7	11.0	OK
SE-17.001	MH(SE)-43-3	15 minute 1 year Winter I+25%	4.580	2.454	-0.043	0.000	0.99		0.761	0.9	29.7	OK
SE-11.007	MH(SE)-43	1440 minute 1 year Winter I+25%	4.650	2.060	-0.354	0.000	0.05		15.263	0.4	26.4	OK
SE-19.000	MH(SE)-44-1	15 minute 1 year Winter I+25%	4.580	3.258	-0.122	0.000	0.42		0.111	0.7	12.3	OK
SE-19.001	MH(SE)-44	15 minute 1 year Winter I+25%	4.580	3.141	-0.146	0.000	0.50		0.316	0.9	32.2	OK
SE-19.002	MH(SE)-45	15 minute 1 year Winter I+25%	4.580	3.048	-0.072	0.000	0.90		1.617	0.9	47.9	OK
SE-20.000	MH(SE)-46	15 minute 1 year Summer I+25%	4.580	3.155	-0.225	0.000	0.00		0.000	0.0	0.0	OK
SE-20.001	MH(SE)-47	15 minute 1 year Winter I+25%	4.580	3.085	-0.152	0.000	0.47		0.260	0.9	29.7	OK
SE-19.003	MH(SE)-48	15 minute 1 year Winter I+25%	4.580	2.940	-0.065	0.000	0.97		2.541	1.3	74.1	OK
SE-21.000	MH(SE)-51	15 minute 1 year Winter I+25%	4.550	2.871	-0.399	0.000	0.13		0.173	0.8	29.7	OK
SE-21.001	MH(SE)-52	15 minute 1 year Winter I+25%	4.680	2.758	-0.403	0.000	0.12		0.728	1.3	49.9	OK
SE-19.004	MH(SE)-53	15 minute 1 year Winter I+25%	4.580	2.517	-0.295	0.000	0.50		1.267	1.0	137.1	OK
SE-19.005	MH(SE)-54	15 minute 1 year Winter I+25%	4.580	2.284	-0.396	0.000	0.31		4.065	0.8	147.3	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-19.006	MH(SE)-55	15 minute 1 year Winter I+25%	4.580	2.215	-0.333	0.000	0.30		13.422	0.7	152.2	OK
SE-22.000	MH(SE)-56	15 minute 1 year Winter I+25%	4.550	3.200	-0.150	0.000	0.48		0.164	0.8	28.4	OK
SE-22.001	MH(SE)-57	15 minute 1 year Winter I+25%	4.550	2.989	-0.236	0.000	0.29		0.300	0.8	27.8	OK
SE-22.002	MH(SE)-58	15 minute 1 year Winter I+25%	4.550	2.842	-0.282	0.000	0.21		0.539	0.6	26.0	OK
SE-23.000	MH(SE)-59-5	15 minute 1 year Winter I+25%	4.550	3.142	-0.208	0.000	0.39		0.183	0.9	41.7	OK
SE-23.001	MH(SE)-59-4	15 minute 1 year Winter I+25%	4.550	3.008	-0.172	0.000	0.56		1.693	1.0	58.4	OK
SE-23.002	MH(SE)-59-3	15 minute 1 year Winter I+25%	4.550	2.883	-0.157	0.000	0.69		1.939	0.9	90.8	OK
SE-22.003	MH(SE)-59-2	15 minute 1 year Winter I+25%	4.550	2.802	-0.125	0.000	0.86		6.928	0.9	109.8	OK
SE-22.004	MH(SE)-59-1	15 minute 1 year Winter I+25%	4.565	2.650	-0.197	0.000	0.62		3.191	0.8	115.1	OK
SE-22.005	MH(SE)-59	15 minute 1 year Winter I+25%	4.580	2.565	-0.206	0.000	0.66		4.373	1.0	128.7	OK
SE-22.006	MH(SE)-60	15 minute 1 year Winter I+25%	4.580	2.369	-0.284	0.000	0.49		4.203	0.9	133.8	OK
SE-24.000	MH(SE)-61-1	15 minute 1 year Winter I+25%	4.550	3.245	-0.105	0.000	0.54		0.130	0.9	18.6	OK
SE-24.001	MH(SE)-61	15 minute 1 year Winter I+25%	4.550	3.048	-0.126	0.000	0.61		0.357	0.9	38.5	OK
SE-24.002	MH(SE)-62	15 minute 1 year Winter I+25%	4.700	2.766	-0.198	0.000	0.46		0.482	0.7	38.3	OK
SE-25.000	MH(SE)-LC-WEST	15 minute 1 year Winter I+25%	4.400	3.331	-0.069	0.000	0.94		0.255	1.0	60.2	OK
SE-22.007	MH(SE)-63	15 minute 1 year Winter I+25%	4.580	2.253	-0.282	0.000	0.56		7.266	0.9	176.8	OK
SE-19.007	MH(SE)-64	15 minute 1 year Winter I+25%	4.750	2.192	-0.272	0.000	0.73		11.497	1.1	327.8	OK
SE-11.008	MH(SE)-65	1440 minute 1 year Winter I+25%	4.615	2.060	0.080	0.000	0.22		1276.290	0.4	27.8	SURCHARGED
SE-26.000	MH(SE)-EX-66	30 minute 1 year Winter I+25%	4.700	4.732	1.307	31.517	2.11		33.208	2.1	82.0	FLOOD
SE-6.007	MH(SE)-67	1440 minute 1 year Winter I+25%	4.580	1.958	-0.038	0.000	0.23		5.028	0.7	46.3	OK
SE-6.008	MH(SE)-68	1440 minute 1 year Winter I+25%	4.830	1.954	0.034	0.000	0.23		6.903	0.7	46.0	SURCHARGED
SE-6.009	MH(SE)-69	1440 minute 1 year Winter I+25%	4.830	1.949	0.169	0.000	0.28		15.804	0.6	44.7	SURCHARGED
SE-6.010	MH(SE)-69-1	1440 minute 1 year Winter I+25%	4.830	1.946	0.206	0.000	0.23		4.367	0.7	44.3	SURCHARGED
SE-1.006	MH(SE)-70	1440 minute 1 year Winter I+25%	4.830	1.942	0.243	0.000	0.09		8.017	0.5	63.8	SURCHARGED
SE-1.007	MH(SE)-71	1440 minute 1 year Winter I+25%	4.830	1.940	0.343	0.000	0.08		34.543	0.5	61.5	SURCHARGED
SE-27.000	MH(SE)-72-2	15 minute 1 year Winter I+25%	4.830	3.576	-0.054	0.000	0.98		0.273	1.2	71.7	OK
SE-27.001	MH(SE)-72-1	15 minute 1 year Winter I+25%	4.830	3.351	-0.051	0.000	1.00		1.634	1.1	69.3	OK
SE-1.008	MH(SE)-72	1440 minute 1 year Winter I+25%	4.740	1.938	0.838	0.000	0.09		1659.388	0.2	21.7	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 5, 10, 20, 30
Climate Change (%) 25, 25, 25, 25, 25

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-1.000	MH(SE)-1	15 minute 5 year Winter I+25%	4.740	3.587	0.047	0.000	1.22		0.387	0.9	63.9	SURCHARGED
SE-1.001	MH(SE)-2	15 minute 5 year Winter I+25%	4.740	3.454	0.006	0.000	1.07		2.497	1.0	102.9	SURCHARGED
SE-1.002	MH(SE)-3	15 minute 5 year Winter I+25%	4.740	3.081	-0.269	0.000	0.33		0.864	0.8	97.1	OK
SE-2.000	MH(SE)-4	15 minute 5 year Winter I+25%	4.830	3.550	-0.080	0.000	0.84		0.243	1.2	60.4	OK
SE-2.001	MH(SE)-5	15 minute 5 year Winter I+25%	4.830	3.266	-0.081	0.000	0.94		1.426	1.2	105.7	OK
SE-1.003	MH(SE)-6	15 minute 5 year Winter I+25%	4.830	3.042	-0.160	0.000	0.67		14.758	0.9	175.2	OK
SE-3.000	MH(SE)-7	15 minute 5 year Winter I+25%	4.830	3.524	-0.106	0.000	0.72		0.213	0.9	42.2	OK
SE-3.001	MH(SE)-8	15 minute 5 year Winter I+25%	4.830	3.312	-0.195	0.000	0.59		0.631	0.9	77.4	OK
SE-3.002	MH(SE)-9	15 minute 5 year Winter I+25%	4.830	3.176	-0.220	0.000	0.62		3.412	0.9	121.3	OK
SE-1.004	MH(SE)-10	15 minute 5 year Winter I+25%	4.830	2.970	-0.150	0.000	0.69		11.807	0.8	284.2	OK
SE-4.000	MH(SE)-11	15 minute 5 year Winter I+25%	4.830	3.525	-0.105	0.000	0.72		0.215	0.9	42.6	OK
SE-4.001	MH(SE)-12	15 minute 5 year Winter I+25%	4.830	3.316	-0.195	0.000	0.59		0.626	0.9	77.2	OK
SE-4.002	MH(SE)-13	15 minute 5 year Winter I+25%	4.830	3.170	-0.234	0.000	0.56		3.063	0.9	108.1	OK
SE-4.003	MH(SE)-14	15 minute 5 year Winter I+25%	4.830	3.060	-0.237	0.000	0.53		5.189	1.0	117.9	OK
SE-5.000	MH(SE)-LC-EAST	15 minute 5 year Winter I+25%	4.400	3.311	-0.089	0.000	0.82		0.233	0.9	48.2	OK
SE-5.001	MH(SE)-16	15 minute 5 year Winter I+25%	4.700	3.246	-0.091	0.000	0.83		0.844	0.9	48.6	OK
SE-4.004	MH(SE)-14-1	15 minute 5 year Winter I+25%	4.915	3.001	-0.224	0.000	0.62		2.401	1.2	154.6	OK
SE-1.005	MH(SE)-15	15 minute 5 year Winter I+25%	5.000	2.931	-0.139	0.000	1.00		10.592	1.1	435.2	OK
SE-6.000	MH(SE)-16	15 minute 5 year Winter I+25%	4.930	3.657	-0.073	0.000	0.72		0.166	0.8	21.7	OK
SE-7.000	MH(SE)-17	15 minute 5 year Winter I+25%	4.930	3.633	-0.097	0.000	0.56		0.139	0.9	19.9	OK
SE-6.001	MH(SE)-18	15 minute 5 year Winter I+25%	4.930	3.593	0.017	0.000	1.06		2.094	1.0	36.4	SURCHARGED
SE-8.000	MH(SE)-19	15 minute 5 year Winter I+25%	4.820	3.582	-0.038	0.000	0.96		0.206	0.9	29.3	OK
SE-9.000	MH(SE)-20	15 minute 5 year Winter I+25%	4.820	3.516	-0.104	0.000	0.54		0.131	0.9	19.9	OK
SE-6.002	MH(SE)-21	15 minute 5 year Winter I+25%	4.820	3.468	0.003	0.000	1.05		2.662	1.2	77.2	SURCHARGED
SE-6.003	MH(SE)-23	240 minute 5 year Winter I+25%	4.970	3.155	-0.224	0.000	0.05		71.949	0.4	4.1	OK
SE-6.004	MH(SE)-23-1	15 minute 5 year Winter I+25%	4.985	3.043	-0.275	0.000	0.04		0.452	0.4	3.1	OK
SE-10.000	MH(SE)-22	15 minute 5 year Winter I+25%	4.970	3.785	0.015	0.000	1.11		0.266	0.9	36.6	SURCHARGED
SE-6.005	MH(SE)-24	15 minute 5 year Winter I+25%	5.000	3.043	-0.208	0.000	0.39		1.254	0.7	32.2	OK
SE-6.006	MH(SE)-25	15 minute 5 year Winter I+25%	5.000	2.901	-0.216	0.000	0.37		1.648	0.7	31.2	OK
SE-11.000	MH(SE)-26	15 minute 5 year Winter I+25%	4.450	3.327	0.077	0.000	1.17		0.506	1.1	109.3	SURCHARGED
SE-11.001	MH(SE)-27	15 minute 5 year Winter I+25%	4.450	3.105	0.015	0.000	0.98		6.245	1.1	149.5	SURCHARGED
SE-12.000	MH(SE)-28	15 minute 5 year Winter I+25%	4.450	3.300	0.050	0.000	1.12		0.391	1.0	71.4	SURCHARGED
SE-12.001	MH(SE)-29	15 minute 5 year Winter I+25%	4.450	3.097	0.014	0.000	1.07		2.761	1.0	107.2	SURCHARGED
SE-11.002	MH(SE)-30	15 minute 5 year Winter I+25%	4.450	2.988	0.036	0.000	0.91		12.249	1.3	238.6	SURCHARGED
SE-13.000	MH(SE)-31-1	15 minute 5 year Winter I+25%	4.550	3.363	0.013	0.000	0.92		0.433	1.3	116.5	SURCHARGED
SE-13.001	MH(SE)-31	15 minute 5 year Winter I+25%	4.580	3.108	0.058	0.000	1.36		5.734	1.2	132.8	SURCHARGED
SE-13.002	MH(SE)-32	15 minute 5 year Winter I+25%	4.580	2.999	0.019	0.000	0.91		2.551	1.2	152.9	SURCHARGED
SE-14.000	MH(SE)-33	15 minute 5 year Winter I+25%	4.580	3.670	0.290	0.000	1.46		0.577	1.1	44.4	SURCHARGED
SE-14.001	MH(SE)-34	15 minute 5 year Winter I+25%	4.580	3.294	0.081	0.000	1.34		1.916	1.0	71.3	SURCHARGED
SE-11.003	MH(SE)-35	15 minute 5 year Winter I+25%	4.580	2.867	0.056	0.000	1.33		15.727	1.3	448.0	SURCHARGED
SE-15.000	MH(SE)-36	15 minute 5 year Winter I+25%	4.580	3.664	0.284	0.000	1.45		0.570	1.1	44.1	SURCHARGED
SE-15.001	MH(SE)-37	15 minute 5 year Winter I+25%	4.580	3.293	0.080	0.000	1.35		1.910	1.0	71.8	SURCHARGED
SE-16.000	MH(SE)-39	15 minute 5 year Winter I+25%	4.580	3.332	0.085	0.000	1.25		0.430	1.0	68.4	SURCHARGED
SE-11.004	MH(SE)-40	15 minute 5 year Winter I+25%	4.580	2.744	0.000	0.000	1.41		12.749	1.1	561.9	OK
SE-11.005	MH(SE)-41	15 minute 5 year Winter I+25%	4.750	2.495	-0.213	0.000	0.85		7.270	1.3	535.0	OK
SE-11.006	MH(SE)-42	15 minute 5 year Winter I+25%	4.750	2.352	-0.181	0.000	0.82		33.913	1.2	492.2	OK
SE-17.000	MH(SE)-43-1	15 minute 5 year Winter I+25%	4.580	2.842	0.017	0.000	0.89		0.268	1.0	31.6	SURCHARGED
SE-18.000	MH(SE)-43-2	15 minute 5 year Winter I+25%	4.580	3.283	-0.097	0.000	0.61		0.140	0.8	18.5	OK
SE-17.001	MH(SE)-43-3	15 minute 5 year Winter I+25%	4.580	2.562	0.065	0.000	1.63		1.666	1.2	48.6	SURCHARGED
SE-11.007	MH(SE)-43	1440 minute 5 year Winter I+25%	4.650	2.270	-0.144	0.000	0.07		25.389	0.5	37.3	OK
SE-19.000	MH(SE)-44-1	15 minute 5 year Winter I+25%	4.580	3.456	0.076	0.000	0.67		0.335	0.8	19.8	SURCHARGED
SE-19.001	MH(SE)-44	15 minute 5 year Winter I+25%	4.580	3.424	0.137	0.000	0.70		1.407	0.9	44.9	SURCHARGED
SE-19.002	MH(SE)-45	15 minute 5 year Winter I+25%	4.580	3.349	0.229	0.000	1.26		3.590	1.0	66.9	SURCHARGED
SE-20.000	MH(SE)-46	15 minute 5 year Winter I+25%	4.580	3.204	-0.176	0.000	0.01		0.050	0.2	0.3	OK
SE-20.001	MH(SE)-47	15 minute 5 year Winter I+25%	4.580	3.214	-0.023	0.000	0.78		0.910	1.0	48.8	OK
SE-19.003	MH(SE)-48	15 minute 5 year Winter I+25%	4.580	3.162	0.157	0.000	1.37		5.846	1.5	104.5	SURCHARGED
SE-21.000	MH(SE)-51	15 minute 5 year Winter I+25%	4.550	2.911	-0.359	0.000	0.21		0.231	0.9	49.7	OK
SE-21.001	MH(SE)-52	15 minute 5 year Winter I+25%	4.680	2.797	-0.364	0.000	0.20		1.282	1.5	83.6	OK
SE-19.004	MH(SE)-53	15 minute 5 year Winter I+25%	4.580	2.614	-0.198	0.000	0.76		2.644	1.1	209.0	OK
SE-19.005	MH(SE)-54	15 minute 5 year Winter I+25%	4.580	2.496	-0.184	0.000	0.45		12.221	0.9	216.7	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-19.006	MH(SE)-55	15 minute 5 year Winter I+25%	4.580	2.467	-0.081	0.000	0.40		25.361	0.7	205.2	OK
SE-22.000	MH(SE)-56	15 minute 5 year Winter I+25%	4.550	3.261	-0.089	0.000	0.81		0.233	0.9	47.5	OK
SE-22.001	MH(SE)-57	15 minute 5 year Winter I+25%	4.550	3.036	-0.189	0.000	0.49		0.551	0.9	46.4	OK
SE-22.002	MH(SE)-58	15 minute 5 year Winter I+25%	4.550	2.982	-0.142	0.000	0.30		2.102	0.6	36.8	OK
SE-23.000	MH(SE)-59-5	15 minute 5 year Winter I+25%	4.550	3.210	-0.140	0.000	0.65		0.261	1.0	69.6	OK
SE-23.001	MH(SE)-59-4	15 minute 5 year Winter I+25%	4.550	3.159	-0.021	0.000	0.81		4.417	1.0	85.3	OK
SE-23.002	MH(SE)-59-3	15 minute 5 year Winter I+25%	4.550	3.084	0.044	0.000	1.05		4.721	0.9	137.8	SURCHARGED
SE-22.003	MH(SE)-59-2	15 minute 5 year Winter I+25%	4.550	2.967	0.040	0.000	1.31		12.309	1.1	167.4	SURCHARGED
SE-22.004	MH(SE)-59-1	15 minute 5 year Winter I+25%	4.565	2.793	-0.054	0.000	0.93		5.704	0.9	172.5	OK
SE-22.005	MH(SE)-59	15 minute 5 year Winter I+25%	4.580	2.699	-0.072	0.000	0.99		6.956	1.0	193.3	OK
SE-22.006	MH(SE)-60	15 minute 5 year Winter I+25%	4.580	2.571	-0.082	0.000	0.73		10.334	0.9	198.9	OK
SE-24.000	MH(SE)-61-1	15 minute 5 year Winter I+25%	4.550	3.296	-0.054	0.000	0.90		0.188	1.0	31.1	OK
SE-24.001	MH(SE)-61	15 minute 5 year Winter I+25%	4.550	3.155	-0.019	0.000	0.99		1.007	1.0	62.5	OK
SE-24.002	MH(SE)-62	15 minute 5 year Winter I+25%	4.700	2.831	-0.133	0.000	0.74		1.083	0.8	62.1	OK
SE-25.000	MH(SE)-LC-WEST	15 minute 5 year Winter I+25%	4.400	3.568	0.168	0.000	1.51		0.523	1.4	96.9	SURCHARGED
SE-22.007	MH(SE)-63	15 minute 5 year Winter I+25%	4.580	2.495	-0.040	0.000	0.86		15.529	1.0	272.8	OK
SE-19.007	MH(SE)-64	15 minute 5 year Winter I+25%	4.750	2.442	-0.022	0.000	1.00		20.224	1.2	448.7	OK
SE-11.008	MH(SE)-65	1440 minute 5 year Winter I+25%	4.615	2.269	0.289	0.000	0.24		1781.883	0.4	29.9	SURCHARGED
SE-26.000	MH(SE)-EX-66	30 minute 5 year Winter I+25%	4.700	4.823	1.398	123.365	2.17		125.053	2.1	84.2	FLOOD
SE-6.007	MH(SE)-67	1440 minute 5 year Winter I+25%	4.580	2.068	0.072	0.000	0.28		5.327	0.7	55.7	SURCHARGED
SE-6.008	MH(SE)-68	1440 minute 5 year Winter I+25%	4.830	2.056	0.136	0.000	0.28		7.330	0.7	54.9	SURCHARGED
SE-6.009	MH(SE)-69	1440 minute 5 year Winter I+25%	4.830	2.039	0.259	0.000	0.33		15.955	0.6	52.5	SURCHARGED
SE-6.010	MH(SE)-69-1	1440 minute 5 year Winter I+25%	4.830	2.029	0.289	0.000	0.26		4.486	0.7	51.7	SURCHARGED
SE-1.006	MH(SE)-70	1440 minute 5 year Winter I+25%	4.830	2.018	0.319	0.000	0.11		8.210	0.4	80.8	SURCHARGED
SE-1.007	MH(SE)-71	1440 minute 5 year Winter I+25%	4.830	2.012	0.415	0.000	0.11		34.727	0.5	79.6	SURCHARGED
SE-27.000	MH(SE)-72-2	15 minute 5 year Winter I+25%	4.830	4.018	0.388	0.000	1.48		0.772	1.6	108.7	SURCHARGED
SE-27.001	MH(SE)-72-1	15 minute 5 year Winter I+25%	4.830	3.498	0.096	0.000	1.55		3.198	1.5	107.2	SURCHARGED
SE-1.008	MH(SE)-72	1440 minute 5 year Winter I+25%	4.740	2.006	0.906	0.000	0.24		1740.827	0.3	59.2	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 5, 10, 20, 30
Climate Change (%) 25, 25, 25, 25, 25

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-1.000	MH(SE)-1	15 minute 10 year Winter I+25%	4.740	3.712	0.172	0.000	1.39		0.528	1.1	72.7	SURCHARGED
SE-1.001	MH(SE)-2	15 minute 10 year Winter I+25%	4.740	3.523	0.075	0.000	1.34		2.820	1.2	128.8	SURCHARGED
SE-1.002	MH(SE)-3	15 minute 10 year Winter I+25%	4.740	3.214	-0.136	0.000	0.40		2.417	0.8	117.3	OK
SE-2.000	MH(SE)-4	15 minute 10 year Winter I+25%	4.830	3.649	0.019	0.000	0.93		0.356	1.2	67.1	SURCHARGED
SE-2.001	MH(SE)-5	15 minute 10 year Winter I+25%	4.830	3.392	0.045	0.000	1.10		3.201	1.2	123.6	SURCHARGED
SE-1.003	MH(SE)-6	15 minute 10 year Winter I+25%	4.830	3.186	-0.016	0.000	0.73		22.164	0.9	190.5	OK
SE-3.000	MH(SE)-7	15 minute 10 year Winter I+25%	4.830	3.545	-0.085	0.000	0.83		0.238	0.9	48.8	OK
SE-3.001	MH(SE)-8	15 minute 10 year Winter I+25%	4.830	3.362	-0.145	0.000	0.73		0.981	0.9	96.6	OK
SE-3.002	MH(SE)-9	15 minute 10 year Winter I+25%	4.830	3.238	-0.158	0.000	0.80		4.974	1.0	154.9	OK
SE-1.004	MH(SE)-10	15 minute 10 year Winter I+25%	4.830	3.115	-0.005	0.000	0.73		18.789	0.7	298.2	OK
SE-4.000	MH(SE)-11	15 minute 10 year Winter I+25%	4.830	3.547	-0.083	0.000	0.84		0.239	0.9	49.3	OK
SE-4.001	MH(SE)-12	15 minute 10 year Winter I+25%	4.830	3.365	-0.146	0.000	0.74		0.972	0.9	96.5	OK
SE-4.002	MH(SE)-13	15 minute 10 year Winter I+25%	4.830	3.221	-0.183	0.000	0.71		4.277	1.0	137.5	OK
SE-4.003	MH(SE)-14	15 minute 10 year Winter I+25%	4.830	3.140	-0.157	0.000	0.64		7.445	1.0	141.4	OK
SE-5.000	MH(SE)-LC-EAST	15 minute 10 year Winter I+25%	4.400	3.335	-0.065	0.000	0.94		0.260	1.0	55.8	OK
SE-5.001	MH(SE)-16	15 minute 10 year Winter I+25%	4.700	3.270	-0.067	0.000	0.96		0.959	1.0	56.2	OK
SE-4.004	MH(SE)-14-1	15 minute 10 year Winter I+25%	4.915	3.108	-0.117	0.000	0.77		3.928	1.2	190.4	OK
SE-1.005	MH(SE)-15	15 minute 10 year Winter I+25%	5.000	3.070	0.000	0.000	1.06		13.634	1.1	459.9	OK
SE-6.000	MH(SE)-16	15 minute 10 year Winter I+25%	4.930	3.730	0.000	0.000	0.79		0.248	0.8	23.9	OK
SE-7.000	MH(SE)-17	15 minute 10 year Winter I+25%	4.930	3.699	-0.031	0.000	0.63		0.214	0.9	22.5	OK
SE-6.001	MH(SE)-18	15 minute 10 year Winter I+25%	4.930	3.653	0.077	0.000	1.18		2.757	1.0	40.6	SURCHARGED
SE-8.000	MH(SE)-19	15 minute 10 year Winter I+25%	4.820	3.675	0.055	0.000	1.08		0.311	0.9	32.8	SURCHARGED
SE-9.000	MH(SE)-20	15 minute 10 year Winter I+25%	4.820	3.551	-0.069	0.000	0.62		0.171	1.0	22.7	OK
SE-6.002	MH(SE)-21	15 minute 10 year Winter I+25%	4.820	3.497	0.032	0.000	1.24		2.981	1.3	91.3	SURCHARGED
SE-6.003	MH(SE)-23	240 minute 10 year Winter I+25%	4.970	3.183	-0.196	0.000	0.06		85.094	0.4	4.5	OK
SE-6.004	MH(SE)-23-1	15 minute 10 year Winter I+25%	4.985	3.055	-0.263	0.000	0.04		0.549	0.4	3.4	OK
SE-10.000	MH(SE)-22	15 minute 10 year Winter I+25%	4.970	3.827	0.057	0.000	1.29		0.313	1.1	42.5	SURCHARGED
SE-6.005	MH(SE)-24	15 minute 10 year Winter I+25%	5.000	3.058	-0.193	0.000	0.44		1.433	0.7	36.8	OK
SE-6.006	MH(SE)-25	15 minute 10 year Winter I+25%	5.000	2.913	-0.204	0.000	0.43		1.902	0.7	35.8	OK
SE-11.000	MH(SE)-26	15 minute 10 year Winter I+25%	4.450	3.491	0.241	0.000	1.27		0.691	1.2	119.5	SURCHARGED
SE-11.001	MH(SE)-27	15 minute 10 year Winter I+25%	4.450	3.282	0.192	0.000	1.16		7.596	1.2	176.1	SURCHARGED
SE-12.000	MH(SE)-28	15 minute 10 year Winter I+25%	4.450	3.473	0.223	0.000	1.23		0.586	1.2	78.7	SURCHARGED
SE-12.001	MH(SE)-29	15 minute 10 year Winter I+25%	4.450	3.272	0.189	0.000	1.27		3.630	1.2	127.8	SURCHARGED
SE-11.002	MH(SE)-30	15 minute 10 year Winter I+25%	4.450	3.102	0.150	0.000	1.10		13.412	1.4	287.5	SURCHARGED
SE-13.000	MH(SE)-31-1	15 minute 10 year Winter I+25%	4.550	3.527	0.177	0.000	1.03		0.618	1.3	131.3	SURCHARGED
SE-13.001	MH(SE)-31	15 minute 10 year Winter I+25%	4.580	3.250	0.200	0.000	1.45		7.460	1.3	141.2	SURCHARGED
SE-13.002	MH(SE)-32	15 minute 10 year Winter I+25%	4.580	3.102	0.122	0.000	1.01		2.810	1.2	171.2	SURCHARGED
SE-14.000	MH(SE)-33	15 minute 10 year Winter I+25%	4.580	3.892	0.512	0.000	1.67		0.828	1.3	50.8	SURCHARGED
SE-14.001	MH(SE)-34	15 minute 10 year Winter I+25%	4.580	3.392	0.179	0.000	1.59		2.205	1.2	84.6	SURCHARGED
SE-11.003	MH(SE)-35	15 minute 10 year Winter I+25%	4.580	2.930	0.119	0.000	1.56		16.953	1.5	525.2	SURCHARGED
SE-15.000	MH(SE)-36	15 minute 10 year Winter I+25%	4.580	3.885	0.505	0.000	1.66		0.820	1.3	50.5	SURCHARGED
SE-15.001	MH(SE)-37	15 minute 10 year Winter I+25%	4.580	3.392	0.179	0.000	1.62		2.204	1.2	86.1	SURCHARGED
SE-16.000	MH(SE)-39	15 minute 10 year Winter I+25%	4.580	3.419	0.172	0.000	1.45		0.528	1.1	78.9	SURCHARGED
SE-11.004	MH(SE)-40	15 minute 10 year Winter I+25%	4.580	2.773	0.029	0.000	1.66		13.098	1.3	665.0	SURCHARGED
SE-11.005	MH(SE)-41	15 minute 10 year Winter I+25%	4.750	2.708	0.000	0.000	1.00		10.073	1.3	627.5	OK
SE-11.006	MH(SE)-42	15 minute 10 year Winter I+25%	4.750	2.513	-0.020	0.000	0.92		43.756	1.2	551.5	OK
SE-17.000	MH(SE)-43-1	15 minute 10 year Winter I+25%	4.580	2.965	0.140	0.000	1.02		0.407	1.0	36.0	SURCHARGED
SE-18.000	MH(SE)-43-2	15 minute 10 year Winter I+25%	4.580	3.297	-0.083	0.000	0.70		0.154	0.8	21.4	OK
SE-17.001	MH(SE)-43-3	15 minute 10 year Winter I+25%	4.580	2.596	0.099	0.000	1.85		1.957	1.4	55.2	SURCHARGED
SE-11.007	MH(SE)-43	15 minute 10 year Winter I+25%	4.650	2.386	-0.028	0.000	1.00		30.236	1.1	530.3	OK
SE-19.000	MH(SE)-44-1	15 minute 10 year Winter I+25%	4.580	3.873	0.493	0.000	0.70		0.806	0.8	20.6	SURCHARGED
SE-19.001	MH(SE)-44	15 minute 10 year Winter I+25%	4.580	3.831	0.544	0.000	0.83		1.867	0.9	53.3	SURCHARGED
SE-19.002	MH(SE)-45	15 minute 10 year Winter I+25%	4.580	3.706	0.586	0.000	1.57		3.994	1.2	82.9	SURCHARGED
SE-20.000	MH(SE)-46	15 minute 10 year Winter I+25%	4.580	3.504	0.124	0.000	0.05		0.389	0.3	1.8	SURCHARGED
SE-20.001	MH(SE)-47	15 minute 10 year Winter I+25%	4.580	3.510	0.273	0.000	0.92		1.699	1.0	57.9	SURCHARGED
SE-19.003	MH(SE)-48	15 minute 10 year Winter I+25%	4.580	3.399	0.394	0.000	1.74		6.326	1.9	133.0	SURCHARGED
SE-21.000	MH(SE)-51	15 minute 10 year Winter I+25%	4.550	2.926	-0.344	0.000	0.25		0.251	0.9	57.6	OK
SE-21.001	MH(SE)-52	15 minute 10 year Winter I+25%	4.680	2.818	-0.343	0.000	0.25		1.579	1.6	103.7	OK
SE-19.004	MH(SE)-53	15 minute 10 year Winter I+25%	4.580	2.705	-0.107	0.000	0.95		4.748	1.1	263.1	OK
SE-19.005	MH(SE)-54	15 minute 10 year Winter I+25%	4.580	2.573	-0.107	0.000	0.53		15.172	1.0	257.0	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-19.006	MH(SE)-55	15 minute 10 year Winter I+25%	4.580	2.529	-0.019	0.000	0.52		27.655	0.8	264.8	OK
SE-22.000	MH(SE)-56	15 minute 10 year Winter I+25%	4.550	3.284	-0.066	0.000	0.93		0.260	1.0	55.0	OK
SE-22.001	MH(SE)-57	15 minute 10 year Winter I+25%	4.550	3.105	-0.120	0.000	0.54		1.204	0.9	51.9	OK
SE-22.002	MH(SE)-58	15 minute 10 year Winter I+25%	4.550	3.078	-0.046	0.000	0.34		3.393	0.6	41.7	OK
SE-23.000	MH(SE)-59-5	15 minute 10 year Winter I+25%	4.550	3.420	0.070	0.000	0.69		0.498	1.0	73.4	SURCHARGED
SE-23.001	MH(SE)-59-4	15 minute 10 year Winter I+25%	4.550	3.349	0.169	0.000	0.98		6.100	1.0	102.6	SURCHARGED
SE-23.002	MH(SE)-59-3	15 minute 10 year Winter I+25%	4.550	3.214	0.174	0.000	1.29		5.199	1.1	170.4	SURCHARGED
SE-22.003	MH(SE)-59-2	15 minute 10 year Winter I+25%	4.550	3.061	0.134	0.000	1.50		13.735	1.2	191.7	SURCHARGED
SE-22.004	MH(SE)-59-1	15 minute 10 year Winter I+25%	4.565	2.886	0.039	0.000	1.06		6.729	0.9	197.3	SURCHARGED
SE-22.005	MH(SE)-59	15 minute 10 year Winter I+25%	4.580	2.801	0.030	0.000	1.11		8.306	1.0	215.6	SURCHARGED
SE-22.006	MH(SE)-60	15 minute 10 year Winter I+25%	4.580	2.647	-0.006	0.000	0.82		12.223	0.9	222.3	OK
SE-24.000	MH(SE)-61-1	15 minute 10 year Winter I+25%	4.550	3.462	0.112	0.000	0.99		0.376	1.0	34.3	SURCHARGED
SE-24.001	MH(SE)-61	15 minute 10 year Winter I+25%	4.550	3.289	0.115	0.000	1.21		1.754	1.1	76.7	SURCHARGED
SE-24.002	MH(SE)-62	15 minute 10 year Winter I+25%	4.700	2.868	-0.096	0.000	0.88		1.554	0.9	74.0	OK
SE-25.000	MH(SE)-LC-WEST	15 minute 10 year Winter I+25%	4.400	3.666	0.266	0.000	1.73		0.635	1.6	111.0	SURCHARGED
SE-22.007	MH(SE)-63	15 minute 10 year Winter I+25%	4.580	2.551	0.016	0.000	1.07		17.257	1.0	341.3	SURCHARGED
SE-19.007	MH(SE)-64	15 minute 10 year Winter I+25%	4.750	2.495	0.031	0.000	1.35		21.467	1.4	605.0	SURCHARGED
SE-11.008	MH(SE)-65	1440 minute 10 year Winter I+25%	4.615	2.375	0.395	0.000	0.30		2039.409	0.4	37.4	SURCHARGED
SE-26.000	MH(SE)-EX-66	30 minute 10 year Winter I+25%	4.700	4.864	1.439	164.227	2.19		165.918	2.1	85.1	FLOOD
SE-6.007	MH(SE)-67	1440 minute 10 year Winter I+25%	4.580	2.138	0.142	0.000	0.29		5.430	0.7	58.2	SURCHARGED
SE-6.008	MH(SE)-68	1440 minute 10 year Winter I+25%	4.830	2.123	0.203	0.000	0.29		7.434	0.7	57.4	SURCHARGED
SE-6.009	MH(SE)-69	1440 minute 10 year Winter I+25%	4.830	2.102	0.322	0.000	0.34		16.045	0.6	54.7	SURCHARGED
SE-6.010	MH(SE)-69-1	1440 minute 10 year Winter I+25%	4.830	2.090	0.350	0.000	0.28		4.573	0.7	54.0	SURCHARGED
SE-1.006	MH(SE)-70	1440 minute 10 year Winter I+25%	4.830	2.076	0.377	0.000	0.12		8.357	0.4	85.6	SURCHARGED
SE-1.007	MH(SE)-71	1440 minute 10 year Winter I+25%	4.830	2.069	0.472	0.000	0.11		34.872	0.5	84.7	SURCHARGED
SE-27.000	MH(SE)-72-2	15 minute 10 year Winter I+25%	4.830	4.224	0.594	0.000	1.68		1.006	1.8	123.3	SURCHARGED
SE-27.001	MH(SE)-72-1	15 minute 10 year Winter I+25%	4.830	3.553	0.151	0.000	1.77		3.474	1.7	122.6	SURCHARGED
SE-1.008	MH(SE)-72	1440 minute 10 year Winter I+25%	4.740	2.062	0.962	0.000	0.29		1806.885	0.4	72.4	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 5, 10, 20, 30
Climate Change (%) 25, 25, 25, 25, 25

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-1.000	MH(SE)-1	15 minute 20 year Winter I+25%	4.740	3.835	0.295	0.000	1.62		0.667	1.2	84.2	SURCHARGED
SE-1.001	MH(SE)-2	15 minute 20 year Winter I+25%	4.740	3.585	0.137	0.000	1.55		2.955	1.4	148.8	SURCHARGED
SE-1.002	MH(SE)-3	15 minute 20 year Winter I+25%	4.740	3.247	-0.103	0.000	0.44		2.857	0.8	129.5	OK
SE-2.000	MH(SE)-4	15 minute 20 year Winter I+25%	4.830	3.815	0.185	0.000	1.06		0.543	1.2	76.3	SURCHARGED
SE-2.001	MH(SE)-5	15 minute 20 year Winter I+25%	4.830	3.475	0.128	0.000	1.22		4.194	1.3	137.8	SURCHARGED
SE-1.003	MH(SE)-6	15 minute 20 year Winter I+25%	4.830	3.213	0.011	0.000	0.92		23.235	0.9	241.8	SURCHARGED
SE-3.000	MH(SE)-7	15 minute 20 year Winter I+25%	4.830	3.570	-0.060	0.000	0.96		0.265	1.0	56.6	OK
SE-3.001	MH(SE)-8	15 minute 20 year Winter I+25%	4.830	3.394	-0.113	0.000	0.85		1.351	0.9	111.3	OK
SE-3.002	MH(SE)-9	15 minute 20 year Winter I+25%	4.830	3.278	-0.118	0.000	0.92		5.999	1.0	178.2	OK
SE-1.004	MH(SE)-10	15 minute 20 year Winter I+25%	4.830	3.140	0.020	0.000	0.94		19.850	0.9	385.2	SURCHARGED
SE-4.000	MH(SE)-11	15 minute 20 year Winter I+25%	4.830	3.574	-0.056	0.000	0.97		0.270	1.0	57.0	OK
SE-4.001	MH(SE)-12	15 minute 20 year Winter I+25%	4.830	3.398	-0.113	0.000	0.85		1.328	0.9	111.2	OK
SE-4.002	MH(SE)-13	15 minute 20 year Winter I+25%	4.830	3.258	-0.146	0.000	0.81		5.195	1.0	157.3	OK
SE-4.003	MH(SE)-14	15 minute 20 year Winter I+25%	4.830	3.180	-0.117	0.000	0.69		8.562	1.0	153.6	OK
SE-5.000	MH(SE)-LC-EAST	15 minute 20 year Winter I+25%	4.400	3.408	0.008	0.000	1.07		0.343	0.9	63.3	SURCHARGED
SE-5.001	MH(SE)-16	15 minute 20 year Winter I+25%	4.700	3.337	0.000	0.000	1.03		1.285	0.9	60.6	OK
SE-4.004	MH(SE)-14-1	15 minute 20 year Winter I+25%	4.915	3.140	-0.085	0.000	0.84		4.387	1.3	208.3	OK
SE-1.005	MH(SE)-15	15 minute 20 year Winter I+25%	5.000	3.092	0.022	0.000	1.36		14.036	1.3	591.5	SURCHARGED
SE-6.000	MH(SE)-16	15 minute 20 year Winter I+25%	4.930	3.854	0.124	0.000	0.86		0.390	0.8	26.1	SURCHARGED
SE-7.000	MH(SE)-17	15 minute 20 year Winter I+25%	4.930	3.810	0.080	0.000	0.69		0.339	1.0	24.7	SURCHARGED
SE-6.001	MH(SE)-18	15 minute 20 year Winter I+25%	4.930	3.750	0.174	0.000	1.36		3.057	1.2	46.5	SURCHARGED
SE-8.000	MH(SE)-19	15 minute 20 year Winter I+25%	4.820	3.773	0.153	0.000	1.21		0.422	1.0	37.0	SURCHARGED
SE-9.000	MH(SE)-20	15 minute 20 year Winter I+25%	4.820	3.607	-0.013	0.000	0.70		0.234	1.0	25.6	OK
SE-6.002	MH(SE)-21	15 minute 20 year Winter I+25%	4.820	3.542	0.077	0.000	1.43		3.450	1.5	104.7	SURCHARGED
SE-6.003	MH(SE)-23	240 minute 20 year Winter I+25%	4.970	3.215	-0.164	0.000	0.06		100.698	0.4	4.8	OK
SE-6.004	MH(SE)-23-1	15 minute 20 year Winter I+25%	4.985	3.069	-0.249	0.000	0.05		0.706	0.4	3.7	OK
SE-10.000	MH(SE)-22	15 minute 20 year Winter I+25%	4.970	3.882	0.112	0.000	1.49		0.375	1.2	49.1	SURCHARGED
SE-6.005	MH(SE)-24	15 minute 20 year Winter I+25%	5.000	3.074	-0.177	0.000	0.51		1.619	0.8	42.4	OK
SE-6.006	MH(SE)-25	15 minute 20 year Winter I+25%	5.000	2.928	-0.189	0.000	0.49		2.199	0.8	41.2	OK
SE-11.000	MH(SE)-26	15 minute 20 year Winter I+25%	4.450	3.776	0.526	0.000	1.39		1.013	1.3	130.0	SURCHARGED
SE-11.001	MH(SE)-27	15 minute 20 year Winter I+25%	4.450	3.492	0.402	0.000	1.33		7.834	1.3	202.4	SURCHARGED
SE-12.000	MH(SE)-28	15 minute 20 year Winter I+25%	4.450	3.740	0.490	0.000	1.34		0.888	1.3	85.8	SURCHARGED
SE-12.001	MH(SE)-29	15 minute 20 year Winter I+25%	4.450	3.480	0.397	0.000	1.41		3.876	1.4	141.2	SURCHARGED
SE-11.002	MH(SE)-30	15 minute 20 year Winter I+25%	4.450	3.281	0.329	0.000	1.27		13.729	1.6	331.4	SURCHARGED
SE-13.000	MH(SE)-31-1	15 minute 20 year Winter I+25%	4.550	3.794	0.444	0.000	1.13		0.920	1.4	143.5	SURCHARGED
SE-13.001	MH(SE)-31	15 minute 20 year Winter I+25%	4.580	3.458	0.408	0.000	1.69		8.009	1.5	164.1	SURCHARGED
SE-13.002	MH(SE)-32	15 minute 20 year Winter I+25%	4.580	3.275	0.295	0.000	1.17		3.009	1.3	198.2	SURCHARGED
SE-14.000	MH(SE)-33	15 minute 20 year Winter I+25%	4.580	4.130	0.750	0.000	1.91		1.097	1.5	58.2	SURCHARGED
SE-14.001	MH(SE)-34	15 minute 20 year Winter I+25%	4.580	3.484	0.271	0.000	1.80		2.327	1.4	95.8	SURCHARGED
SE-11.003	MH(SE)-35	15 minute 20 year Winter I+25%	4.580	3.067	0.256	0.000	1.78		18.885	1.7	601.0	SURCHARGED
SE-15.000	MH(SE)-36	15 minute 20 year Winter I+25%	4.580	4.121	0.741	0.000	1.89		1.087	1.5	57.8	SURCHARGED
SE-15.001	MH(SE)-37	15 minute 20 year Winter I+25%	4.580	3.484	0.271	0.000	1.84		2.327	1.4	97.9	SURCHARGED
SE-16.000	MH(SE)-39	15 minute 20 year Winter I+25%	4.580	3.531	0.284	0.000	1.65		0.654	1.3	90.0	SURCHARGED
SE-11.004	MH(SE)-40	15 minute 20 year Winter I+25%	4.580	2.848	0.104	0.000	1.90		14.063	1.4	759.4	SURCHARGED
SE-11.005	MH(SE)-41	15 minute 20 year Winter I+25%	4.750	2.758	0.050	0.000	1.15		10.491	1.4	723.1	SURCHARGED
SE-11.006	MH(SE)-42	15 minute 20 year Winter I+25%	4.750	2.566	0.033	0.000	1.11		45.618	1.3	667.3	SURCHARGED
SE-17.000	MH(SE)-43-1	15 minute 20 year Winter I+25%	4.580	3.124	0.299	0.000	1.16		0.587	1.1	41.1	SURCHARGED
SE-18.000	MH(SE)-43-2	15 minute 20 year Winter I+25%	4.580	3.312	-0.068	0.000	0.81		0.172	0.9	24.8	OK
SE-17.001	MH(SE)-43-3	15 minute 20 year Winter I+25%	4.580	2.639	0.142	0.000	2.10		2.319	1.6	62.7	SURCHARGED
SE-11.007	MH(SE)-43	1440 minute 20 year Winter I+25%	4.650	2.503	0.089	0.000	0.09		33.087	0.5	47.4	SURCHARGED
SE-19.000	MH(SE)-44-1	15 minute 20 year Winter I+25%	4.580	4.177	0.797	0.000	0.80		1.150	0.7	23.4	SURCHARGED
SE-19.001	MH(SE)-44	15 minute 20 year Winter I+25%	4.580	4.131	0.844	0.000	0.94		2.206	1.0	60.1	SURCHARGED
SE-19.002	MH(SE)-45	15 minute 20 year Winter I+25%	4.580	3.976	0.856	0.000	1.75		4.299	1.3	92.8	SURCHARGED
SE-20.000	MH(SE)-46	15 minute 20 year Winter I+25%	4.580	3.725	0.345	0.000	0.07		0.640	0.3	2.6	SURCHARGED
SE-20.001	MH(SE)-47	15 minute 20 year Winter I+25%	4.580	3.734	0.497	0.000	1.00		1.952	1.0	62.8	SURCHARGED
SE-19.003	MH(SE)-48	15 minute 20 year Winter I+25%	4.580	3.591	0.586	0.000	1.98		6.543	2.2	150.9	SURCHARGED
SE-21.000	MH(SE)-51	15 minute 20 year Winter I+25%	4.550	2.950	-0.320	0.000	0.28		0.286	0.9	66.0	OK
SE-21.001	MH(SE)-52	15 minute 20 year Winter I+25%	4.680	2.869	-0.292	0.000	0.29		2.405	1.6	118.5	OK
SE-19.004	MH(SE)-53	15 minute 20 year Winter I+25%	4.580	2.821	0.009	0.000	1.05		7.773	1.1	289.5	SURCHARGED
SE-19.005	MH(SE)-54	15 minute 20 year Winter I+25%	4.580	2.655	-0.025	0.000	0.61		17.921	1.0	292.4	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-19.006	MH(SE)-55	15 minute 20 year Winter I+25%	4.580	2.594	0.046	0.000	0.60		29.512	0.8	306.2	SURCHARGED
SE-22.000	MH(SE)-56	15 minute 20 year Winter I+25%	4.550	3.366	0.016	0.000	1.07		0.351	0.9	62.9	SURCHARGED
SE-22.001	MH(SE)-57	15 minute 20 year Winter I+25%	4.550	3.315	0.090	0.000	0.56		2.987	0.9	53.5	SURCHARGED
SE-22.002	MH(SE)-58	15 minute 20 year Winter I+25%	4.550	3.287	0.163	0.000	0.40		4.468	0.6	49.0	SURCHARGED
SE-23.000	MH(SE)-59-5	15 minute 20 year Winter I+25%	4.550	3.658	0.308	0.000	0.75		0.767	1.0	80.3	SURCHARGED
SE-23.001	MH(SE)-59-4	15 minute 20 year Winter I+25%	4.550	3.572	0.392	0.000	1.11		6.377	1.1	116.7	SURCHARGED
SE-23.002	MH(SE)-59-3	15 minute 20 year Winter I+25%	4.550	3.426	0.386	0.000	1.49		5.439	1.3	196.5	SURCHARGED
SE-22.003	MH(SE)-59-2	15 minute 20 year Winter I+25%	4.550	3.268	0.341	0.000	1.69		14.391	1.4	215.3	SURCHARGED
SE-22.004	MH(SE)-59-1	15 minute 20 year Winter I+25%	4.565	3.048	0.201	0.000	1.21		7.221	1.1	224.7	SURCHARGED
SE-22.005	MH(SE)-59	15 minute 20 year Winter I+25%	4.580	2.944	0.173	0.000	1.27		8.905	1.2	247.8	SURCHARGED
SE-22.006	MH(SE)-60	15 minute 20 year Winter I+25%	4.580	2.747	0.094	0.000	0.94		13.393	1.0	256.7	SURCHARGED
SE-24.000	MH(SE)-61-1	15 minute 20 year Winter I+25%	4.550	3.630	0.280	0.000	1.16		0.565	1.0	39.9	SURCHARGED
SE-24.001	MH(SE)-61	15 minute 20 year Winter I+25%	4.550	3.407	0.233	0.000	1.39		1.952	1.3	87.7	SURCHARGED
SE-24.002	MH(SE)-62	15 minute 20 year Winter I+25%	4.700	2.907	-0.057	0.000	0.98		2.084	0.9	82.3	OK
SE-25.000	MH(SE)-LC-WEST	15 minute 20 year Winter I+25%	4.400	3.801	0.401	0.000	1.99		0.787	1.8	127.8	SURCHARGED
SE-22.007	MH(SE)-63	15 minute 20 year Winter I+25%	4.580	2.636	0.101	0.000	1.28		19.687	1.1	406.7	SURCHARGED
SE-19.007	MH(SE)-64	15 minute 20 year Winter I+25%	4.750	2.554	0.090	0.000	1.58		22.314	1.6	710.0	SURCHARGED
SE-11.008	MH(SE)-65	1440 minute 20 year Winter I+25%	4.615	2.501	0.521	0.000	0.35		2340.053	0.4	43.0	SURCHARGED
SE-26.000	MH(SE)-EX-66	30 minute 20 year Winter I+25%	4.700	4.914	1.489	213.716	2.22		215.407	2.2	86.2	FLOOD
SE-6.007	MH(SE)-67	1440 minute 20 year Winter I+25%	4.580	2.218	0.222	0.000	0.30		5.545	0.7	59.8	SURCHARGED
SE-6.008	MH(SE)-68	1440 minute 20 year Winter I+25%	4.830	2.200	0.280	0.000	0.30		7.545	0.7	58.9	SURCHARGED
SE-6.009	MH(SE)-69	1440 minute 20 year Winter I+25%	4.830	2.176	0.396	0.000	0.36		16.151	0.6	58.2	SURCHARGED
SE-6.010	MH(SE)-69-1	1440 minute 20 year Winter I+25%	4.830	2.161	0.421	0.000	0.30		4.676	0.7	58.2	SURCHARGED
SE-1.006	MH(SE)-70	1440 minute 20 year Winter I+25%	4.830	2.145	0.446	0.000	0.12		8.532	0.4	90.4	SURCHARGED
SE-1.007	MH(SE)-71	1440 minute 20 year Winter I+25%	4.830	2.136	0.539	0.000	0.12		35.043	0.5	90.0	SURCHARGED
SE-27.000	MH(SE)-72-2	15 minute 20 year Winter I+25%	4.830	4.486	0.856	0.000	1.91		1.301	2.0	139.9	SURCHARGED
SE-27.001	MH(SE)-72-1	15 minute 20 year Winter I+25%	4.830	3.622	0.220	0.000	2.01		3.714	2.0	139.1	SURCHARGED
SE-1.008	MH(SE)-72	1440 minute 20 year Winter I+25%	4.740	2.128	1.028	0.000	0.35		1885.251	0.4	86.5	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 17.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 5, 10, 20, 30
Climate Change (%) 25, 25, 25, 25, 25

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-1.000	MH(SE)-1	15 minute 30 year Winter I+25%	4.740	3.923	0.383	0.000	1.76		0.767	1.3	91.8	SURCHARGED
SE-1.001	MH(SE)-2	15 minute 30 year Winter I+25%	4.740	3.631	0.183	0.000	1.68		3.006	1.5	161.7	SURCHARGED
SE-1.002	MH(SE)-3	15 minute 30 year Winter I+25%	4.740	3.304	-0.046	0.000	0.47		3.532	0.9	140.2	OK
SE-2.000	MH(SE)-4	15 minute 30 year Winter I+25%	4.830	3.943	0.313	0.000	1.13		0.688	1.2	81.7	SURCHARGED
SE-2.001	MH(SE)-5	15 minute 30 year Winter I+25%	4.830	3.553	0.206	0.000	1.30		4.673	1.4	146.8	SURCHARGED
SE-1.003	MH(SE)-6	15 minute 30 year Winter I+25%	4.830	3.267	0.065	0.000	0.99		24.354	0.9	260.1	SURCHARGED
SE-3.000	MH(SE)-7	15 minute 30 year Winter I+25%	4.830	3.636	0.006	0.000	1.02		0.341	1.0	60.3	SURCHARGED
SE-3.001	MH(SE)-8	15 minute 30 year Winter I+25%	4.830	3.413	-0.094	0.000	0.91		1.555	1.0	119.3	OK
SE-3.002	MH(SE)-9	15 minute 30 year Winter I+25%	4.830	3.317	-0.079	0.000	0.98		6.900	1.0	189.9	OK
SE-1.004	MH(SE)-10	15 minute 30 year Winter I+25%	4.830	3.185	0.065	0.000	1.02		21.613	0.9	416.4	SURCHARGED
SE-4.000	MH(SE)-11	15 minute 30 year Winter I+25%	4.830	3.638	0.008	0.000	1.04		0.343	0.9	61.1	SURCHARGED
SE-4.001	MH(SE)-12	15 minute 30 year Winter I+25%	4.830	3.416	-0.095	0.000	0.91		1.527	1.0	119.7	OK
SE-4.002	MH(SE)-13	15 minute 30 year Winter I+25%	4.830	3.286	-0.118	0.000	0.87		5.864	1.0	168.9	OK
SE-4.003	MH(SE)-14	15 minute 30 year Winter I+25%	4.830	3.225	-0.072	0.000	0.74		9.669	1.0	164.8	OK
SE-5.000	MH(SE)-LC-EAST	15 minute 30 year Winter I+25%	4.400	3.439	0.039	0.000	1.18		0.378	1.0	69.6	SURCHARGED
SE-5.001	MH(SE)-16	15 minute 30 year Winter I+25%	4.700	3.347	0.010	0.000	1.18		1.317	1.0	69.3	SURCHARGED
SE-4.004	MH(SE)-14-1	15 minute 30 year Winter I+25%	4.915	3.184	-0.041	0.000	0.90		5.008	1.2	221.5	OK
SE-1.005	MH(SE)-15	15 minute 30 year Winter I+25%	5.000	3.132	0.062	0.000	1.46		14.671	1.4	634.0	SURCHARGED
SE-6.000	MH(SE)-16	15 minute 30 year Winter I+25%	4.930	3.946	0.216	0.000	0.90		0.493	0.8	27.4	SURCHARGED
SE-7.000	MH(SE)-17	15 minute 30 year Winter I+25%	4.930	3.893	0.163	0.000	0.73		0.433	0.9	25.8	SURCHARGED
SE-6.001	MH(SE)-18	15 minute 30 year Winter I+25%	4.930	3.819	0.243	0.000	1.48		3.146	1.3	50.7	SURCHARGED
SE-8.000	MH(SE)-19	15 minute 30 year Winter I+25%	4.820	3.845	0.225	0.000	1.31		0.504	1.0	39.8	SURCHARGED
SE-9.000	MH(SE)-20	15 minute 30 year Winter I+25%	4.820	3.651	0.031	0.000	0.74		0.284	1.0	27.0	SURCHARGED
SE-6.002	MH(SE)-21	15 minute 30 year Winter I+25%	4.820	3.574	0.109	0.000	1.56		3.746	1.6	114.6	SURCHARGED
SE-6.003	MH(SE)-23	240 minute 30 year Winter I+25%	4.970	3.238	-0.141	0.000	0.06		111.633	0.4	4.9	OK
SE-6.004	MH(SE)-23-1	15 minute 30 year Winter I+25%	4.985	3.079	-0.239	0.000	0.05		0.810	0.4	3.8	OK
SE-10.000	MH(SE)-22	15 minute 30 year Winter I+25%	4.970	3.921	0.151	0.000	1.62		0.420	1.3	53.5	SURCHARGED
SE-6.005	MH(SE)-24	15 minute 30 year Winter I+25%	5.000	3.084	-0.167	0.000	0.55		1.739	0.8	46.0	OK
SE-6.006	MH(SE)-25	15 minute 30 year Winter I+25%	5.000	2.938	-0.179	0.000	0.54		2.386	0.8	44.7	OK
SE-11.000	MH(SE)-26	15 minute 30 year Winter I+25%	4.450	3.985	0.735	0.000	1.47		1.250	1.3	137.8	SURCHARGED
SE-11.001	MH(SE)-27	15 minute 30 year Winter I+25%	4.450	3.697	0.607	0.000	1.41		8.066	1.4	215.5	SURCHARGED
SE-12.000	MH(SE)-28	15 minute 30 year Winter I+25%	4.450	3.939	0.689	0.000	1.39		1.112	1.3	88.9	SURCHARGED
SE-12.001	MH(SE)-29	15 minute 30 year Winter I+25%	4.450	3.680	0.597	0.000	1.48		4.103	1.4	148.6	SURCHARGED
SE-11.002	MH(SE)-30	15 minute 30 year Winter I+25%	4.450	3.452	0.500	0.000	1.37		13.973	1.7	356.5	SURCHARGED
SE-13.000	MH(SE)-31-1	15 minute 30 year Winter I+25%	4.550	4.004	0.654	0.000	1.19		1.158	1.4	150.4	SURCHARGED
SE-13.001	MH(SE)-31	15 minute 30 year Winter I+25%	4.580	3.661	0.611	0.000	1.78		8.239	1.6	173.8	SURCHARGED
SE-13.002	MH(SE)-32	15 minute 30 year Winter I+25%	4.580	3.454	0.474	0.000	1.26		3.212	1.4	213.2	SURCHARGED
SE-14.000	MH(SE)-33	15 minute 30 year Winter I+25%	4.580	4.296	0.916	0.000	2.03		1.285	1.6	61.8	FLOOD RISK
SE-14.001	MH(SE)-34	15 minute 30 year Winter I+25%	4.580	3.549	0.336	0.000	1.93		2.401	1.5	102.4	SURCHARGED
SE-11.003	MH(SE)-35	15 minute 30 year Winter I+25%	4.580	3.211	0.400	0.000	1.91		19.894	1.8	643.9	SURCHARGED
SE-15.000	MH(SE)-36	15 minute 30 year Winter I+25%	4.580	4.286	0.906	0.000	2.05		1.273	1.6	62.5	FLOOD RISK
SE-15.001	MH(SE)-37	15 minute 30 year Winter I+25%	4.580	3.547	0.334	0.000	1.96		2.398	1.5	104.2	SURCHARGED
SE-16.000	MH(SE)-39	15 minute 30 year Winter I+25%	4.580	3.611	0.364	0.000	1.78		0.745	1.4	96.9	SURCHARGED
SE-11.004	MH(SE)-40	15 minute 30 year Winter I+25%	4.580	2.970	0.226	0.000	2.02		16.510	1.5	806.3	SURCHARGED
SE-11.005	MH(SE)-41	15 minute 30 year Winter I+25%	4.750	2.841	0.133	0.000	1.22		10.940	1.5	769.5	SURCHARGED
SE-11.006	MH(SE)-42	15 minute 30 year Winter I+25%	4.750	2.613	0.080	0.000	1.20		47.256	1.4	720.4	SURCHARGED
SE-17.000	MH(SE)-43-1	15 minute 30 year Winter I+25%	4.580	3.238	0.413	0.000	1.25		0.715	1.2	44.4	SURCHARGED
SE-18.000	MH(SE)-43-2	15 minute 30 year Winter I+25%	4.580	3.322	-0.058	0.000	0.89		0.184	0.9	27.0	OK
SE-17.001	MH(SE)-43-3	15 minute 30 year Winter I+25%	4.580	2.672	0.175	0.000	2.27		2.585	1.7	67.7	SURCHARGED
SE-11.007	MH(SE)-43	1440 minute 30 year Winter I+25%	4.650	2.591	0.177	0.000	0.10		33.668	0.5	51.3	SURCHARGED
SE-19.000	MH(SE)-44-1	15 minute 30 year Winter I+25%	4.580	4.391	1.011	0.000	0.85		1.393	0.8	25.1	FLOOD RISK
SE-19.001	MH(SE)-44	15 minute 30 year Winter I+25%	4.580	4.342	1.055	0.000	1.01		2.445	1.0	64.4	FLOOD RISK
SE-19.002	MH(SE)-45	15 minute 30 year Winter I+25%	4.580	4.166	1.046	0.000	1.87		4.514	1.4	99.1	SURCHARGED
SE-20.000	MH(SE)-46	15 minute 30 year Winter I+25%	4.580	3.884	0.504	0.000	0.09		0.819	0.2	3.2	SURCHARGED
SE-20.001	MH(SE)-47	15 minute 30 year Winter I+25%	4.580	3.893	0.656	0.000	1.07		2.133	1.0	66.8	SURCHARGED
SE-19.003	MH(SE)-48	15 minute 30 year Winter I+25%	4.580	3.728	0.723	0.000	2.12		6.698	2.3	161.4	SURCHARGED
SE-21.000	MH(SE)-51	15 minute 30 year Winter I+25%	4.550	2.967	-0.303	0.000	0.31		0.310	0.9	71.6	OK
SE-21.001	MH(SE)-52	15 minute 30 year Winter I+25%	4.680	2.894	-0.267	0.000	0.30		2.853	1.7	123.3	OK
SE-19.004	MH(SE)-53	15 minute 30 year Winter I+25%	4.580	2.854	0.042	0.000	1.15		8.429	1.2	316.5	SURCHARGED
SE-19.005	MH(SE)-54	15 minute 30 year Winter I+25%	4.580	2.699	0.019	0.000	0.67		18.998	1.0	323.1	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
SE-19.006	MH(SE)-55	15 minute 30 year Winter I+25%	4.580	2.647	0.099	0.000	0.68		30.148	0.8	343.6	SURCHARGED
SE-22.000	MH(SE)-56	15 minute 30 year Winter I+25%	4.550	3.555	0.205	0.000	1.16		0.565	1.0	68.7	SURCHARGED
SE-22.001	MH(SE)-57	15 minute 30 year Winter I+25%	4.550	3.502	0.277	0.000	0.57		3.299	0.9	54.7	SURCHARGED
SE-22.002	MH(SE)-58	15 minute 30 year Winter I+25%	4.550	3.471	0.347	0.000	0.42		4.677	0.6	51.9	SURCHARGED
SE-23.000	MH(SE)-59-5	15 minute 30 year Winter I+25%	4.550	3.865	0.515	0.000	0.80		1.001	1.0	84.9	SURCHARGED
SE-23.001	MH(SE)-59-4	15 minute 30 year Winter I+25%	4.550	3.786	0.606	0.000	1.17		6.619	1.2	123.2	SURCHARGED
SE-23.002	MH(SE)-59-3	15 minute 30 year Winter I+25%	4.550	3.628	0.588	0.000	1.59		5.667	1.4	209.5	SURCHARGED
SE-22.003	MH(SE)-59-2	15 minute 30 year Winter I+25%	4.550	3.451	0.524	0.000	1.82		14.599	1.5	233.1	SURCHARGED
SE-22.004	MH(SE)-59-1	15 minute 30 year Winter I+25%	4.565	3.198	0.351	0.000	1.31		7.435	1.1	243.4	SURCHARGED
SE-22.005	MH(SE)-59	15 minute 30 year Winter I+25%	4.580	3.070	0.299	0.000	1.39		9.086	1.3	271.2	SURCHARGED
SE-22.006	MH(SE)-60	15 minute 30 year Winter I+25%	4.580	2.838	0.185	0.000	1.03		13.625	1.0	282.0	SURCHARGED
SE-24.000	MH(SE)-61-1	15 minute 30 year Winter I+25%	4.550	3.749	0.399	0.000	1.26		0.700	1.1	43.4	SURCHARGED
SE-24.001	MH(SE)-61	15 minute 30 year Winter I+25%	4.550	3.484	0.310	0.000	1.50		2.039	1.4	95.0	SURCHARGED
SE-24.002	MH(SE)-62	15 minute 30 year Winter I+25%	4.700	2.964	0.000	0.000	1.01		2.988	0.9	84.5	OK
SE-25.000	MH(SE)-LC-WEST	15 minute 30 year Winter I+25%	4.400	3.898	0.498	0.000	2.16		0.897	2.0	138.6	SURCHARGED
SE-22.007	MH(SE)-63	15 minute 30 year Winter I+25%	4.580	2.704	0.169	0.000	1.42		21.566	1.3	450.6	SURCHARGED
SE-19.007	MH(SE)-64	15 minute 30 year Winter I+25%	4.750	2.604	0.140	0.000	1.76		22.701	1.8	790.5	SURCHARGED
SE-11.008	MH(SE)-65	1440 minute 30 year Winter I+25%	4.615	2.590	0.610	0.000	0.37		2550.901	0.4	45.2	SURCHARGED
SE-26.000	MH(SE)-EX-66	60 minute 30 year Winter I+25%	4.700	4.947	1.522	247.421	2.24		249.112	2.2	87.0	FLOOD
SE-6.007	MH(SE)-67	1440 minute 30 year Winter I+25%	4.580	2.275	0.279	0.000	0.32		5.627	0.7	63.9	SURCHARGED
SE-6.008	MH(SE)-68	1440 minute 30 year Winter I+25%	4.830	2.255	0.335	0.000	0.32		7.624	0.7	63.9	SURCHARGED
SE-6.009	MH(SE)-69	1440 minute 30 year Winter I+25%	4.830	2.228	0.448	0.000	0.40		16.226	0.6	63.9	SURCHARGED
SE-6.010	MH(SE)-69-1	1440 minute 30 year Winter I+25%	4.830	2.212	0.472	0.000	0.33		4.748	0.7	64.0	SURCHARGED
SE-1.006	MH(SE)-70	1440 minute 30 year Winter I+25%	4.830	2.194	0.495	0.000	0.13		8.657	0.4	95.9	SURCHARGED
SE-1.007	MH(SE)-71	1440 minute 30 year Winter I+25%	4.830	2.185	0.588	0.000	0.13		35.166	0.5	95.9	SURCHARGED
SE-27.000	MH(SE)-72-2	15 minute 30 year Winter I+25%	4.830	4.670	1.040	0.000	2.05		1.510	2.1	150.3	FLOOD RISK
SE-27.001	MH(SE)-72-1	15 minute 30 year Winter I+25%	4.830	3.673	0.271	0.000	2.16		3.774	2.1	149.5	SURCHARGED
SE-1.008	MH(SE)-72	1440 minute 30 year Winter I+25%	4.740	2.175	1.075	0.000	0.38		1941.805	0.5	95.1	SURCHARGED

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes ECC

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	17.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	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)	0.85
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	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 Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.000	Storm Duration (mins)	30
Ratio R	0.400		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	25, 25, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	1	+25%	30/15 Summer			
S1.001	S2	15 Winter	1	+25%	100/15 Summer			
S1.002	S3	30 Winter	1	+25%	100/15 Summer			
S1.003	S4	30 Winter	1	+25%	100/15 Summer			
S1.004	S5	30 Winter	1	+25%	30/30 Winter			
S1.005	S6	30 Winter	1	+25%	30/30 Winter			
S1.006	S7	30 Winter	1	+25%	30/30 Winter			
S1.007	S8	30 Winter	1	+25%	30/30 Summer			
S1.008	S9	60 Winter	1	+25%	30/15 Summer			
S2.000	S10	15 Winter	1	+25%	30/15 Summer			
S2.001	S11	15 Winter	1	+25%	100/15 Summer			
S1.009	S10	60 Winter	1	+25%	30/15 Summer			
S3.000	S11	15 Summer	1	+25%	100/15 Summer			
S3.001	S12	15 Winter	1	+25%	30/15 Summer			
S3.002	S13	15 Winter	1	+25%	30/15 Summer			
S4.000	S14	15 Summer	1	+25%	30/15 Summer			
S4.001	S15	15 Winter	1	+25%	30/15 Summer	100/15 Winter		
S4.002	S16	15 Winter	1	+25%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	3.409	-0.161	0.000	0.59			63.8	OK	
S1.001	S2	3.127	-0.249	0.000	0.40		10	56.1	OK	
S1.002	S3	2.950	-0.302	0.000	0.35			72.9	OK	
S1.003	S4	2.841	-0.287	0.000	0.42			87.9	OK	
S1.004	S5	2.655	-0.335	0.000	0.37			105.3	OK	
S1.005	S6	2.526	-0.313	0.000	0.43			118.6	OK	
S1.006	S7	2.401	-0.307	0.000	0.48			131.4	OK	
S1.007	S8	2.249	-0.324	0.000	0.35			139.1	OK	
S1.008	S9	2.222	-0.215	0.000	0.34			136.5	OK	
S2.000	S10	3.415	-0.145	0.000	0.47			33.0	OK	
S2.001	S11	2.963	-0.158	0.000	0.45			32.6	OK	
S1.009	S10	2.211	-0.044	0.000	0.31			159.3	OK	
S3.000	S11	3.155	-0.375	0.000	0.00			0.0	OK	
S3.001	S12	2.938	-0.244	0.000	0.54			113.6	OK	
S3.002	S13	2.698	-0.344	0.000	0.37			149.1	OK	
S4.000	S14	3.725	-0.375	0.000	0.00			0.0	OK	
S4.001	S15	3.610	-0.163	0.000	0.61			67.2	OK	1
S4.002	S16	3.494	-0.179	0.000	0.65			119.0	OK	

1 year Return Period 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.
S4.003	S17	15 Winter	1	+25%	100/15 Summer			
S3.003	S18	15 Winter	1	+25%	30/15 Summer	100/1440 Winter		
S5.000	S19	15 Winter	1	+25%	30/15 Summer			
S5.001	S20	15 Winter	1	+25%	30/15 Summer			
S5.002	S21	15 Winter	1	+25%	30/15 Summer			
S5.003	S22	15 Winter	1	+25%	100/15 Summer			
S6.000	S23	15 Winter	1	+25%	30/15 Summer	100/15 Summer		
S6.001	S24	15 Winter	1	+25%	30/15 Summer			
S6.002	S25	15 Winter	1	+25%	30/15 Summer			
S6.003	S26	15 Winter	1	+25%	30/15 Winter			
S3.004	S27	15 Winter	1	+25%	30/15 Summer	100/1440 Winter		
S3.005	S28	15 Winter	1	+25%	30/15 Summer			
S3.006	S29	30 Winter	1	+25%	30/15 Summer			
S3.007	S30	60 Winter	1	+25%	30/15 Summer			
S7.000	S31	15 Winter	1	+25%	30/15 Summer	100/15 Summer		
S7.001	S32	15 Winter	1	+25%	30/15 Summer			
S7.002	S31	15 Winter	1	+25%	30/15 Summer			
S7.003	S32	15 Winter	1	+25%	30/15 Summer			
S7.004	S33	15 Winter	1	+25%	30/15 Summer			
S7.005	S34	15 Winter	1	+25%	30/15 Summer			
S7.006	S35	15 Winter	1	+25%	30/15 Summer			
S1.010	S36	60 Winter	1	+25%	1/15 Summer			
S1.011	S37	60 Winter	1	+25%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S4.003	S17	2.955	-0.396	0.000	0.25			153.7	OK
S3.003	S18	2.473	-0.318	0.000	0.52			287.6	OK
S5.000	S19	3.532	-0.133	0.000	0.69			73.9	OK
S5.001	S20	3.294	-0.176	0.000	0.64			95.2	OK
S5.002	S21	3.189	-0.134	0.000	0.81			113.5	OK
S5.003	S22	2.817	-0.376	0.000	0.30			132.4	OK
S6.000	S23	3.500	-0.090	0.000	0.75			44.9	OK
S6.001	S24	3.263	-0.121	0.000	0.75			69.9	OK
S6.002	S25	3.049	-0.180	0.000	0.67			93.8	OK
S6.003	S26	2.680	-0.411	0.000	0.21			114.6	OK
S3.004	S27	2.394	-0.249	0.000	0.87			526.7	OK
S3.005	S28	2.337	-0.248	0.000	0.75			510.4	OK
S3.006	S29	2.205	-0.245	0.000	0.54			454.8	OK
S3.007	S30	2.195	-0.125	0.000	0.61			337.0	OK
S7.000	S31	3.368	-0.192	0.000	0.27			17.6	OK
S7.001	S32	3.286	-0.177	0.000	0.27			17.3	OK
S7.002	S31	3.250	-0.128	0.000	0.61			44.1	OK
S7.003	S32	3.028	-0.125	0.000	0.75			91.1	OK

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S7.004	S33	2.721	-0.207	0.000	0.55			88.7	OK
S7.005	S34	2.543	-0.227	0.000	0.48			86.3	OK
S7.006	S35	2.363	-0.199	0.000	0.59			105.7	OK
S1.010	S36	2.190	0.136	0.000	0.51			551.5	SURCHARGED
S1.011	S37	2.183	0.941	0.000	0.89		50	119.5	SURCHARGED

PN	US/MH Name	Level Exceeded
S4.003	S17	
S3.003	S18	
S5.000	S19	
S5.001	S20	
S5.002	S21	
S5.003	S22	
S6.000	S23	4
S6.001	S24	
S6.002	S25	
S6.003	S26	
S3.004	S27	
S3.005	S28	
S3.006	S29	
S3.007	S30	
S7.000	S31	3
S7.001	S32	
S7.002	S31	
S7.003	S32	
S7.004	S33	
S7.005	S34	
S7.006	S35	
S1.010	S36	
S1.011	S37	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

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	S1	15 Winter	30	+25%	30/15 Summer				3.782
S1.001	S2	15 Winter	30	+25%	100/15 Summer				3.345
S1.002	S3	30 Winter	30	+25%	100/15 Summer				3.195
S1.003	S4	30 Winter	30	+25%	100/15 Summer				3.120
S1.004	S5	30 Winter	30	+25%	30/30 Winter				3.007
S1.005	S6	60 Winter	30	+25%	30/30 Winter				2.922
S1.006	S7	120 Winter	30	+25%	30/30 Winter				2.847
S1.007	S8	120 Winter	30	+25%	30/30 Summer				2.835
S1.008	S9	120 Winter	30	+25%	30/15 Summer				2.825
S2.000	S10	15 Winter	30	+25%	30/15 Summer				3.757
S2.001	S11	15 Winter	30	+25%	100/15 Summer				3.115
S1.009	S10	120 Winter	30	+25%	30/15 Summer				2.813
S3.000	S11	15 Winter	30	+25%	100/15 Summer				3.411
S3.001	S12	15 Winter	30	+25%	30/15 Summer				3.412
S3.002	S13	15 Winter	30	+25%	30/15 Summer				3.275

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.212	0.000	1.39			151.4	SURCHARGED	
S1.001	S2	-0.031	0.000	0.99		9	139.1	OK	
S1.002	S3	-0.056	0.000	0.83			173.6	OK	
S1.003	S4	-0.007	0.000	0.98			205.6	OK	
S1.004	S5	0.016	0.000	0.84			236.1	SURCHARGED	
S1.005	S6	0.083	0.000	0.81			222.5	SURCHARGED	
S1.006	S7	0.139	0.000	0.68			187.9	SURCHARGED	
S1.007	S8	0.262	0.000	0.51			204.8	SURCHARGED	
S1.008	S9	0.388	0.000	0.59			238.4	SURCHARGED	
S2.000	S10	0.197	0.000	1.12			79.0	SURCHARGED	
S2.001	S11	-0.006	0.000	1.00			71.9	OK	
S1.009	S10	0.558	0.000	0.59			301.3	SURCHARGED	
S3.000	S11	-0.119	0.000	0.01			1.3	OK	
S3.001	S12	0.230	0.000	1.27			266.1	SURCHARGED	
S3.002	S13	0.233	0.000	0.79			316.6	SURCHARGED	

30 year Return Period 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.
S4.000	S14	15 Winter	30	+25%	30/15 Summer			
S4.001	S15	15 Winter	30	+25%	30/15 Summer	100/15 Winter		
S4.002	S16	15 Winter	30	+25%	30/15 Summer			
S4.003	S17	15 Winter	30	+25%	100/15 Summer			
S3.003	S18	15 Winter	30	+25%	30/15 Summer	100/1440 Winter		
S5.000	S19	15 Winter	30	+25%	30/15 Summer			
S5.001	S20	15 Winter	30	+25%	30/15 Summer			
S5.002	S21	15 Winter	30	+25%	30/15 Summer			
S5.003	S22	15 Winter	30	+25%	100/15 Summer			
S6.000	S23	15 Winter	30	+25%	30/15 Summer	100/15 Summer		
S6.001	S24	15 Winter	30	+25%	30/15 Summer			
S6.002	S25	15 Winter	30	+25%	30/15 Summer			
S6.003	S26	15 Winter	30	+25%	30/15 Winter			
S3.004	S27	15 Winter	30	+25%	30/15 Summer	100/1440 Winter		
S3.005	S28	15 Winter	30	+25%	30/15 Summer			
S3.006	S29	120 Winter	30	+25%	30/15 Summer			
S3.007	S30	120 Winter	30	+25%	30/15 Summer			
S7.000	S31	15 Winter	30	+25%	30/15 Summer	100/15 Summer		
S7.001	S32	15 Winter	30	+25%	30/15 Summer			
S7.002	S31	15 Winter	30	+25%	30/15 Summer			
S7.003	S32	15 Winter	30	+25%	30/15 Summer			
S7.004	S33	15 Winter	30	+25%	30/15 Summer			
S7.005	S34	15 Winter	30	+25%	30/15 Summer			
S7.006	S35	120 Winter	30	+25%	30/15 Summer			
S1.010	S36	120 Winter	30	+25%	1/15 Summer			
S1.011	S37	120 Winter	30	+25%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S4.000	S14	4.374	0.274	0.000	0.02			2.1	SURCHARGED
S4.001	S15	4.380	0.607	0.000	1.51			167.0	SURCHARGED
S4.002	S16	4.185	0.512	0.000	1.50			274.7	SURCHARGED
S4.003	S17	3.279	-0.072	0.000	0.56			346.1	OK
S3.003	S18	3.177	0.386	0.000	1.06			591.8	SURCHARGED
S5.000	S19	4.578	0.913	0.000	1.55			164.9	SURCHARGED
S5.001	S20	4.076	0.605	0.000	1.47			218.4	SURCHARGED
S5.002	S21	3.712	0.389	0.000	1.89			265.0	SURCHARGED
S5.003	S22	3.134	-0.059	0.000	0.66			293.6	OK
S6.000	S23	4.518	0.928	0.000	1.65			98.1	FLOOD RISK
S6.001	S24	3.931	0.547	0.000	1.67			154.2	SURCHARGED
S6.002	S25	3.435	0.206	0.000	1.47			206.7	SURCHARGED
S6.003	S26	3.106	0.015	0.000	0.44			235.3	SURCHARGED
S3.004	S27	3.048	0.405	0.000	1.68			1018.8	SURCHARGED
S3.005	S28	2.892	0.307	0.000	1.47			997.6	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.006	S29	2.817	0.367	0.000	0.62			522.0	SURCHARGED
S3.007	S30	2.810	0.490	0.000	0.94			523.1	SURCHARGED
S7.000	S31	4.345	0.785	0.000	0.61			39.5	SURCHARGED
S7.001	S32	4.306	0.843	0.000	0.68			43.0	SURCHARGED
S7.002	S31	4.271	0.893	0.000	1.37			99.6	SURCHARGED
S7.003	S32	3.836	0.683	0.000	1.83			220.9	SURCHARGED
S7.004	S33	3.139	0.211	0.000	1.28			205.0	SURCHARGED
S7.005	S34	2.919	0.149	0.000	1.08			192.3	SURCHARGED
S7.006	S35	2.809	0.248	0.000	0.63			112.2	SURCHARGED
S1.010	S36	2.803	0.749	0.000	0.86			919.4	SURCHARGED
S1.011	S37	2.797	1.555	0.000	0.89			119.5	SURCHARGED

PN	US/MH Name	Level Exceeded
S4.000	S14	
S4.001	S15	1
S4.002	S16	
S4.003	S17	
S3.003	S18	
S5.000	S19	
S5.001	S20	
S5.002	S21	
S5.003	S22	
S6.000	S23	4
S6.001	S24	
S6.002	S25	
S6.003	S26	
S3.004	S27	
S3.005	S28	
S3.006	S29	
S3.007	S30	
S7.000	S31	3
S7.001	S32	
S7.002	S31	
S7.003	S32	
S7.004	S33	
S7.005	S34	
S7.006	S35	
S1.010	S36	
S1.011	S37	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 17.000 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 25, 25, 25

WARNING: Half Drain Time has not been calculated as the structure is too full.

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	S1	30 Winter	100	+25%	30/15 Summer				4.571
S1.001	S2	30 Winter	100	+25%	100/15 Summer				4.392
S1.002	S3	30 Winter	100	+25%	100/15 Summer				4.222
S1.003	S4	30 Winter	100	+25%	100/15 Summer				4.082
S1.004	S5	30 Winter	100	+25%	30/30 Winter				3.872
S1.005	S6	30 Winter	100	+25%	30/30 Winter				3.690
S1.006	S7	30 Winter	100	+25%	30/30 Winter				3.479
S1.007	S8	180 Winter	100	+25%	30/30 Summer				3.217
S1.008	S9	180 Winter	100	+25%	30/15 Summer				3.210
S2.000	S10	15 Winter	100	+25%	30/15 Summer				4.157
S2.001	S11	15 Winter	100	+25%	100/15 Summer				3.217
S1.009	S10	180 Winter	100	+25%	30/15 Summer				3.201
S3.000	S11	30 Winter	100	+25%	100/15 Summer				4.304
S3.001	S12	30 Winter	100	+25%	30/15 Summer				4.307
S3.002	S13	30 Winter	100	+25%	30/15 Summer				4.128

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	1.001	0.000	1.41			153.5	FLOOD RISK	
S1.001	S2	1.016	0.000	1.32		16	184.3	SURCHARGED	
S1.002	S3	0.970	0.000	1.12			234.1	SURCHARGED	
S1.003	S4	0.954	0.000	1.30			271.6	SURCHARGED	
S1.004	S5	0.882	0.000	1.12			316.1	SURCHARGED	
S1.005	S6	0.851	0.000	1.28			351.1	SURCHARGED	
S1.006	S7	0.771	0.000	1.40			385.9	SURCHARGED	
S1.007	S8	0.645	0.000	0.54			214.8	SURCHARGED	
S1.008	S9	0.773	0.000	0.62			252.7	SURCHARGED	
S2.000	S10	0.597	0.000	1.39			98.0	SURCHARGED	
S2.001	S11	0.096	0.000	1.28			92.1	SURCHARGED	
S1.009	S10	0.946	0.000	0.62			318.2	SURCHARGED	
S3.000	S11	0.774	0.000	0.03			3.4	SURCHARGED	
S3.001	S12	1.125	0.000	1.33			277.5	SURCHARGED	
S3.002	S13	1.086	0.000	0.93			373.1	SURCHARGED	

100 year Return Period 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.
S4.000	S14	15 Winter	100	+25%	30/15 Summer			
S4.001	S15	15 Winter	100	+25%	30/15 Summer	100/15 Winter		
S4.002	S16	15 Winter	100	+25%	30/15 Summer			
S4.003	S17	30 Winter	100	+25%	100/15 Summer			
S3.003	S18	30 Winter	100	+25%	30/15 Summer	100/1440 Winter		
S5.000	S19	15 Winter	100	+25%	30/15 Summer			
S5.001	S20	15 Winter	100	+25%	30/15 Summer			
S5.002	S21	15 Winter	100	+25%	30/15 Summer			
S5.003	S22	30 Winter	100	+25%	100/15 Summer			
S6.000	S23	15 Winter	100	+25%	30/15 Summer	100/15 Summer		
S6.001	S24	30 Winter	100	+25%	30/15 Summer			
S6.002	S25	30 Winter	100	+25%	30/15 Summer			
S6.003	S26	30 Winter	100	+25%	30/15 Winter			
S3.004	S27	30 Winter	100	+25%	30/15 Summer	100/1440 Winter		
S3.005	S28	30 Winter	100	+25%	30/15 Summer			
S3.006	S29	180 Winter	100	+25%	30/15 Summer			
S3.007	S30	180 Winter	100	+25%	30/15 Summer			
S7.000	S31	15 Winter	100	+25%	30/15 Summer	100/15 Summer		
S7.001	S32	15 Winter	100	+25%	30/15 Summer			
S7.002	S31	15 Winter	100	+25%	30/15 Summer			
S7.003	S32	15 Winter	100	+25%	30/15 Summer			
S7.004	S33	15 Winter	100	+25%	30/15 Summer			
S7.005	S34	15 Winter	100	+25%	30/15 Summer			
S7.006	S35	180 Winter	100	+25%	30/15 Summer			
S1.010	S36	180 Winter	100	+25%	1/15 Summer			
S1.011	S37	180 Winter	100	+25%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S4.000	S14	5.001	0.901	0.000	0.04			5.0	FLOOD RISK
S4.001	S15	5.001	1.228	1.155	1.73			191.1	FLOOD
S4.002	S16	4.761	1.088	0.000	1.87			341.5	FLOOD RISK
S4.003	S17	4.129	0.778	0.000	0.57			350.0	SURCHARGED
S3.003	S18	3.977	1.187	0.000	1.23			683.7	SURCHARGED
S5.000	S19	5.433	1.768	0.000	1.95			208.3	SURCHARGED
S5.001	S20	4.699	1.228	0.000	1.85			275.0	SURCHARGED
S5.002	S21	4.354	1.030	0.000	2.34			328.2	SURCHARGED
S5.003	S22	3.914	0.721	0.000	0.74			330.6	SURCHARGED
S6.000	S23	4.797	1.207	7.387	1.61			95.6	FLOOD
S6.001	S24	4.438	1.054	0.000	1.81			167.2	SURCHARGED
S6.002	S25	4.119	0.890	0.000	1.64			230.7	SURCHARGED
S6.003	S26	3.870	0.779	0.000	0.51			272.1	SURCHARGED
S3.004	S27	3.784	1.141	0.000	2.09			1268.9	SURCHARGED
S3.005	S28	3.516	0.931	0.000	1.82			1237.0	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S3.006	S29	3.207	0.757	0.000	0.61			508.1	SURCHARGED
S3.007	S30	3.199	0.879	0.000	0.91			507.3	SURCHARGED
S7.000	S31	4.768	1.208	7.766	1.30			83.8	FLOOD
S7.001	S32	4.868	1.405	0.000	1.38			87.8	SURCHARGED
S7.002	S31	4.892	1.514	0.000	1.60			116.2	FLOOD RISK
S7.003	S32	4.597	1.443	0.000	2.17			262.2	SURCHARGED
S7.004	S33	3.671	0.743	0.000	1.54			246.4	SURCHARGED
S7.005	S34	3.328	0.558	0.000	1.30			232.6	SURCHARGED
S7.006	S35	3.200	0.638	0.000	0.57			101.7	SURCHARGED
S1.010	S36	3.194	1.140	0.000	0.86			922.0	SURCHARGED
S1.011	S37	3.188	1.946	0.000	0.89			119.5	SURCHARGED

PN	US/MH Name	Level Exceeded
S4.000	S14	
S4.001	S15	1
S4.002	S16	
S4.003	S17	
S3.003	S18	
S5.000	S19	
S5.001	S20	
S5.002	S21	
S5.003	S22	
S6.000	S23	4
S6.001	S24	
S6.002	S25	
S6.003	S26	
S3.004	S27	
S3.005	S28	
S3.006	S29	
S3.007	S30	
S7.000	S31	3
S7.001	S32	
S7.002	S31	
S7.003	S32	
S7.004	S33	
S7.005	S34	
S7.006	S35	
S1.010	S36	
S1.011	S37	

Appendix C. Documents

C1 Environmental Permit

C2 Immingham Drainage Channel Plan (Plan Courtesy of North East Lindsey Drainage Board)

WIMS NO / EDRM CASE REFERENCE:

PRNTS18163

PERMIT NO / EDRM OTHER REFERENCE:

ADDITIONAL REF:

Consent to Discharge
Water Resources Act 1991
Section 88, Schedule 10
(as amended by the
Environment Act 1995)

ENVIRONMENT
AGENCY

Modification of Consent to Discharge

WATER RESOURCES
ACT REGISTER
DATE ENTRY
FIRST MADE
13 JAN 2006

Consent Modification Number: **PRNTS/18163A**

Reference Number: **PRNTS/18484**

To: **Immingham Outflow Ltd ("the Consent Holder")**
Immingham Dock
Immingham
North East Lincolnshire
DN20 2NS

WHEREAS the Environment Agency ("the Agency") in pursuance of its powers under the Water Resources Act 1991 Schedule 10 (as amended by the Environment Act 1995) **GRANTED CONSENT** to the making of a discharge of **TRADE EFFLUENT consisting of SITE DRAINAGE and/or BIOLOGICALLY TREATED SEWAGE EFFLUENT,**

From: Premises at Immingham Dock, Immingham, North East Lincolnshire

To: The River Humber

on 27 May 2005; **NOW** the Agency in pursuance of its powers under the Water Resources Act 1991 (as amended by the Environment Act 1995) **GIVES NOTICE** that Consent **PRNTS/18163** is hereby modified in accordance with the details specified in the following schedule:

Trade Effluent **PRNTS/18163A 01**

Subject to the provisions of Paragraphs 7 and 8 of Schedule 10 of the Water Resources Act 1991 (as amended by the Environment Act 1995), no notice shall be served by the Agency, altering this notice of modification, without the agreement in writing of the Consent Holder, during a period of 4 years from the date this notice is served.

This Modification of Consent is issued on: 12 December 2005.

This Modification of Consent takes effect on: 12 December 2005

Signed [redacted]

Simon Nugent, Team Leader, Regulatory Water Quality

NOTE: The specified conditions are now replaced by the conditions in the schedule attached herewith. Consent PRNTS/18163 is updated accordingly.

01 Conditions of Consent for trade effluent consisting of site drainage and/or biologically treated sewage effluent

1 Conditions to be modified and replaced

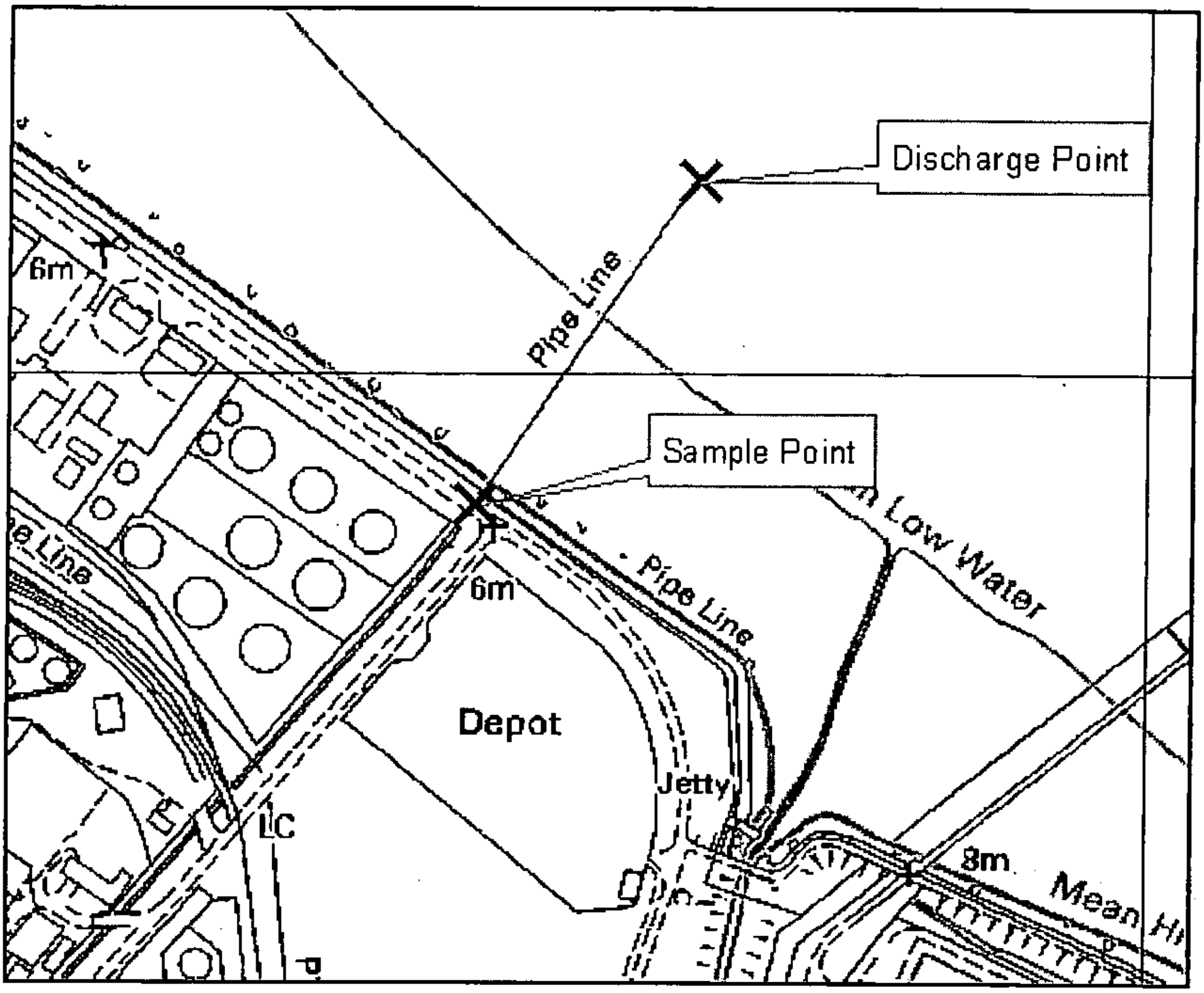
Condition 1.3.2 in Consent **PRNTS/18163** is hereby modified to read as follows:

1.3.2 An appropriately labelled sample point shall be provided and maintained at National Grid Reference TA 2064 1593, as shown marked 'Sample point ' on the Site Plan attached to this consent, so that a representative sample of the Discharge may be obtained. The Consent Holder shall ensure that all constituents of the Discharge pass through the said sampling point at all times and in any legal proceedings it shall, for the purposes of Section 10 of the Rivers (Prevention of Pollution) Act 1961, be presumed, until the contrary is shown, that any sample of the Discharge taken at the said sampling point is a sample of what was being discharged into controlled waters.

2 Other conditions of the Consent

All other conditions of the consent remain in force. Consent **PRNTS/18163** is updated accordingly.

Site Plan


Discharge Point
Pipe Line
Sample Point
Low Water
6m
Pipe Line
6m
Depot
Jetty
LC
8m
Mean Hi

ENVIRONMENT AGENCY

Consent to Discharge

Water Resources Act 1991 (as amended by the Environment Act 1995)

Consent Holder(s)

Immingham Outflow Ltd
Immingham Dock
Immingham
North East Lincolnshire
DN20 2NS

Consent to Discharge from

Premises at Immingham Dock
Immingham
North East Lincolnshire

Consent Number **PRNTS/18163**

Environment Agency Anglian Region
Waterside House, Waterside North, Lincoln, LN2 5HA
Tel 08708 506506 Fax: 01522 785878

Consent to Discharge

Water Resources Act 1991
Section 88, Schedule 10
(as amended by the
Environment Act 1995)

ENVIRONMENT AGENCY

Consent to Discharge

Consent Number
PRNTS/18163

To:

Immingham Outflow Ltd ("the Consent Holder")
Immingham Dock
Immingham
North East Lincolnshire
DN20 2NS

The Environment Agency ("the Agency") in pursuance of its powers under the Water Resources Act 1991(as amended by the Environment Act 1995) hereby consents to the making of a discharge:

Of:
Trade effluent consisting of site drainage and/or biologically treated sewage effluent ("the Discharge")

At:
Premises at Immingham Dock, Immingham, North East Lincolnshire

To:
The River Humber

Subject to the conditions set out in this notice of Consent to Discharge.

Subject to the provisions of Paragraphs 7 and 8 of Schedule 10 of the Water Resources Act 1991(as amended by the Environment Act 1995), no notice shall be served by the Agency, altering this consent, without the agreement of the Consent Holder, during a period of 4 years from the date this notice is issued.

This Consent is issued on: 27 May 2005

This Consent takes effect on: 27 May 2005

Signed

[redacted]

Simon J Nugent
Team Leader Water Quality Regulatory

1 Conditions of Consent for trade effluent consisting of site drainage and/or biologically treated sewage effluent

1.1 Nature of Discharge

1.1.1 (a) The Discharge shall not contain any poisonous, noxious, or polluting matter or solid waste matter.

(b) Provided that the Discharge hereby consented is made in accordance with the following conditions of this consent, such discharge shall not be taken to be in breach of condition (a) above by reason of containing substances or having properties identified in and controlled by these conditions.

1.1.2 The Discharge shall consist solely of trade effluent comprising site drainage, boiler blowdown, cooling tower blowdown, vehicle washing, and container washing as specified in the application, and/or biologically treated sewage effluent from an appropriately sized and designed sewage treatment plant installed, operated and maintained in accordance with the manufacturer's instructions as updated from time to time.

1.2 Place of Discharge

1.2.1 The Discharge shall be made in the manner and at the place specified as:

a discharging to the River Humber;

b at National Grid Reference TA 2076 1610;

c shown marked "Discharge Point" on Site Plan attached to this consent.

1.3 Sampling Point Requirements

1.3.1 A sampling point with facilities enabling fully representative samples of the discharge of **biologically treated sewage effluent** to be readily and safely taken at all times shall be installed by the Consent Holder immediately downstream of the treatment plant. The Consent Holder shall ensure that all constituents of the biologically treated sewage effluent discharge pass through the said sampling point at all times and in any legal proceedings it shall, for the purposes of Section 10 of the Rivers (Prevention of Pollution) Act 1961, be presumed, until the contrary is shown, that any sample of the discharge taken by the Agency at the said sampling point is a sample of what was passing into controlled waters from the said treatment plant.

1.3.2 A sample point shall be provided and maintained at National Grid Reference TA 2027 1544 as shown marked "Sample Point" on the Site Plan attached to this consent, so that a representative sample of the Discharge may be obtained. The Consent Holder shall ensure that all constituents of the Discharge pass through the said sampling point at all times and in any legal proceedings it shall, for the purposes of Section 10 of the Rivers (Prevention of Pollution) Act 1961, be presumed, until the contrary is shown that any sample of the Discharge taken at the said sampling point is a sample of what was discharging into controlled waters.

1.4 Volume

1.4.1 The volume of biologically treated sewage effluent discharged shall not exceed 10 cubic metres per day.

1.5 Composition

1.5.1 As far as is reasonably practicable, the discharge shall not contain any matter to such an extent as to cause the receiving waters, or any waters of which the receiving waters are a tributary, to be poisonous or injurious to fish in those waters, or to the spawning grounds, spawn or food of fish in those waters, or otherwise cause damage to the ecology of those waters, or to have any other adverse environmental impact.

1.5.2 No biocides or any other chemicals shall be added to the discharge without the prior written agreement of the Agency.

1.5.3 No other processes should be carried out on site which generate an effluent other than those specified in the application without the prior written agreement of the Agency.

1.5.4 The discharge shall not contain more than 10 milligrammes per litre of total hydrocarbon.

1.5.5 The discharge shall not contain more than 300 milligrammes per litre of chemical oxygen demand.

1.5.6 The discharge shall not contain more than 200 milligrammes per litre of suspended solids (measured after drying at 105°C).

1.5.7 The discharge shall have a pH value of not less than 6.0 nor greater than 8.5.

1.5.8 The discharge shall contain no visible oil or grease.

1.6 Flow measurement

1.6.1

a At the request of the Agency, the Consent Holder shall install, operate and maintain a means of flow measuring to a specification and at a location required by the Agency, to enable the daily volume and/or instantaneous flow of the discharge to be recorded.

b The Consent Holder shall calibrate, operate and maintain the flow monitoring and recording system to a standard agreed or specified by the Agency. The flow and maintenance records shall be provided to the Agency as and when requested.

1.7 Maintenance

1.7.1 The discharge pipe, onsite interceptors and pumping equipment shall all be maintained in an efficient and operational condition

1.8 Recording and Reporting

1.8.1

a The Consent Holder shall establish and operate a documented maintenance programme and record all non-routine actions undertaken that may have adversely affected effluent quality. Copies of the programme shall be made available for inspection by the Agency's officers at all reasonable times.

b On request the Consent Holder shall supply the Agency with a written report on the maintenance and all non-routine actions that may have adversely affected effluent quality

c The Consent Holder shall as soon as reasonably practicable report to the Agency all non-routine actions that may have adversely affected effluent quality.

1.9 Listed substances

1.9.1 The Consent Holder shall notify the Agency forthwith in writing if any change occurs on site that may increase or introduce into the effluent any "dangerous substance" (set out in Annex 1 to this notice as updated from time to time and notified to the Consent Holder in writing), and any other substance considered by the Consent Holder as having or likely to have a significant effect on the receiving waters.

1.10 Dangerous Substance List II Condition

1.10.1

a The quantity of List II Substances (as defined in the Dangerous Substances Directive 76/464/EEC) in the Discharge shall not increase above the levels in the discharge on the date of effect of this Consent where no specific level is authorised; and.

b notwithstanding **a** above, the Discharge shall not contain quantities of any List II Substance such as to cause or contribute to the concentration of that substance in the receiving water exceeding the relevant Environmental Quality Standard (EQS).

1.11 Operational Surveillance and Audit

1.11.1

a The Consent Holder shall maintain a record of any changes in processes that may result in a change in the Dangerous Substances composition of the effluent discharge.

b The Consent Holder, at a time scale and frequency agreed by the Agency, shall undertake and record an audit to identify any additions or changes to the concentrations and loads of Dangerous Substances in the effluent since the date of issue of the Consent.

c The audit procedure is to be previously agreed in writing by the Agency.

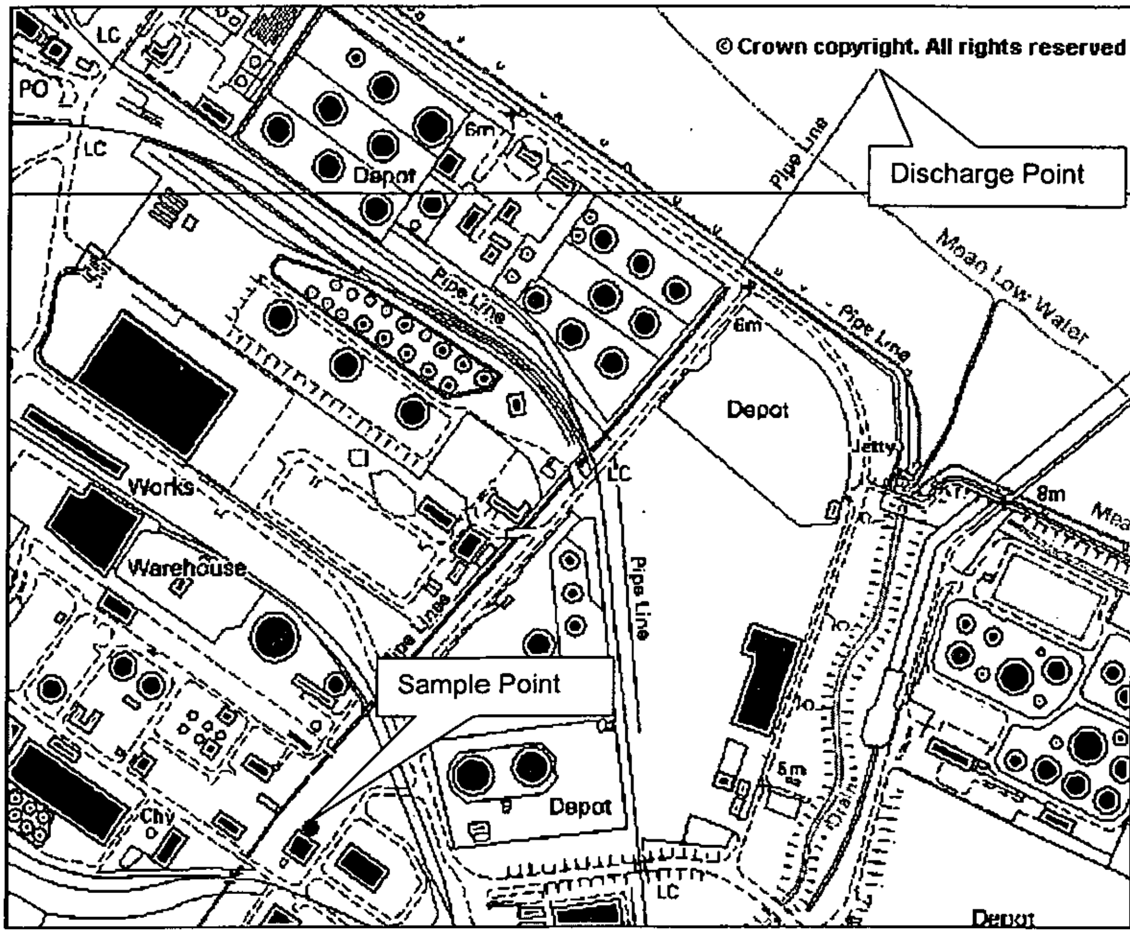
d The records kept in accordance with paragraphs a and b above shall be made available to the Agency on request.

1.12 Monitoring

1.12.1 The Consent Holder shall carry out an effluent-monitoring programme as directed in writing by the Agency.

1.12.2 The results of the monitoring programme shall be submitted to the Agency in a format and at a frequency, as directed in writing by the Agency.

2 Site plan


© Crown copyright. All rights reserved
Discharge Point
Sample Point
Mean Low Water
Pipe Line
Depot
Works
Warehouse
Jetty
LC
PO
Chy
6m
8m

Annex 1 Dangerous substances

1.	Mercury and its compounds	2.	Cadmium and its compounds
3.	Hexachlorocyclohexane (lindane and related compounds)	4.	Carbon tetrachloride
5.	DDT (the isomers of 1,1,1-trichloro-2,2 bis{p-chlorophenyl} ethane)		
6.	Pentachlorophenol (PCP)	7.	Aldrin
8.	Dieldrin	9.	Endrin
10.	Isodrin	11.	Hexachlorobenzene (HCB)
12.	Hexachlorobutadiene (HCBD)	13.	Chloroform
14.	Polychlorinated biphenyls	15.	Dichlorvos
16.	1,2-Dichloroethane	17.	Trichlorobenzene
18.	Atrazine	19.	Simazine
20.	Tributyltin compounds	21.	Triphenyltin compounds
22.	Trifluralin	23.	Fenitrothion
24.	Azinphos-methyl	25.	Malathion
26.	Endosulfan	27.	Lead
28.	Chromium	29.	Zinc
30.	Copper	31.	Nickel
32.	Arsenic	33.	*Iron
34.	*pH if outside the range 5.5 to 9.0	35.	*Boron
36.	Vanadium	37.	PCSD'S
38.	Cyfluthrin	39.	Sulcofuron
40.	Flucofuron	41.	Permethrin
42.	4-Chloro-3-methyl-phenol	43.	2-Chlorophenol
44.	2,4-Dichlorophenol	45.	2,4-D (ester)
46.	2,4-D (non ester)	47.	1,1,1-Trichloroethane
48.	1,1,2-Trichloroethane	49.	Bentazone
50.	Benzene	51.	Biphenyl
52.	Chloronitrotoluenes	53.	Demeton
54.	Dimethoate	55.	Linuron
56.	MCPA	57.	Mecoprop
58.	Mevinphos	59.	Napthalene
60.	Omethoate	61.	Toluene
62.	Trizaphos	63.	Xylene
64.	Cyanide	65.	Azinphos-ethyl
66.	Fenthion	67.	Parathion
68.	Parathion-methyl	69.	Trichloroethylene
70.	Tetrachloroethylene	71.	Dioxins
72.	PAHs	73.	Nonyl phenol
74.	Nonyl phenyl ethoxylate	75.	Di-ethylhexyl phthalate
76.	Bisphenol-A	77.	Diazinon
78.	Chlorfenvinphos	79.	Chlorotoluron
80.	Isoproturon	81.	Diuron
82.	Propetamphos	83.	Flumethrin
84.	Amitraz	85.	High-Cis Cypermethrin
86.	Cyromazine	87.	Deltamethrin
88.	Cypermethrin		

This list is applicable as at 1 December 1998 and will be updated as and when changes to the relevant legislative requirements occur.

*Notification to the Agency by the Consent holder is only required in respect of changes to trade effluents likely to cause significant changes to the pH value, and/or iron or boron concentrations, of the crude sewage.

South Killingholme Drain
Habrough Marsh Drain Branch 4
Habrough Marsh Drain
Immingham Pump Drain
Kings Road
Queens Road
A1173
IMMINGHAM
Immingham PS
Middle Drain Branch 5
Middle Drain
Ashmaur House
Mauxhall Farm
Legend
North_East_Lindsey_IDB_Boundary
North_East_Lindsey_IDB_Extended_Boundary
NEL Drains
EA Main River
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