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S73 Application
Remediation Surface Water Management Strategy

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1 Introduction

1.1 Planning History & Previous Reporting

Planning Permission

1.1.1 Planning permission was granted by Sedgemoor District Council (SDC) in June 2012 for the remediation of the former Royal Ordnance Factory (ROF) situated between Puriton and Woolavington. The SDC planning reference was 42/11/00017. This application was separate to the extant planning permission for an Energy Park on site.

1.1.2 The planning application was supported by a Flood Risk Assessment (FRA) and Surface Water Management Strategy (SWMS) (ref: 18998/704). Revision 2 of the SWMS, prepared by Stantec (at the time operating as Peter Brett Associates LLP), set out the outline surface water drainage strategy for the remediation works including the temporary drainage requirements to protect the existing watercourses from potential sources of pollution.

Conditions to Planning Permission

1.1.3 The planning permission was granted with conditions, two of which relate to surface water drainage as follows:

Condition 8: *No earthworks or remedial works shall take place on any part of the site (or other such time or stage agreed in writing by the Local Planning Authority) until a scheme for the disposal of surface water from the site during all works has been submitted to, and approved in writing by, the Local Planning Authority. The scheme shall include details of the maintenance responsibilities for all surface water drainage infrastructure. The development shall be implemented and maintained in accordance with the approved scheme until the development has been completed unless otherwise agreed in writing by the Local Planning Authority.*

Condition 9: *No earthworks or remedial works shall take place on any art of the site (or other such time or stage agreed in writing by the Local Planning Authority) until full details of any modifications to any ditch, drain or watercourse on site have been submitted to, and approved in writing, by the Local Planning Authority. The details shall include maintenance responsibilities for the rhyne system upon completion of the development. The development shall be implemented in accordance with the approved details unless otherwise agreed in writing by the Local Planning Authority*

Discharge of Conditions

1.1.4 The proposed remediation works were to be carried out in several phases.

1.1.5 The SWMS report was updated (Revision 3) to build upon the outline strategy and provide further detail of the proposed drainage scheme for the remediation works, setting out principles which will govern the management of surface water for the whole site during all phases of remediation. Revision 3 of the SWMS report was sufficient to discharge Condition 8.

1.1.6 Revision 3 of the SWMS report acknowledged that as the phased remediation works were progressed, further submissions would be made to detail specific modifications to the site ditch network in order to accommodate each respective remediated area. Those submissions would be prepared to allow Condition 9 to be discharged on a phase-by-phase basis. The report also stated that each phase will also require separate Land Drainage Consent (LDC) applications to be made to the Somerset Drainage Boards Consortium (SDBC).

1.1.7 In January 2014, Stantec (again still operating as Peter Brett Associates LLP) produced a report to discharge Condition 9 for the first phase of remediation; “Huntspill Energy Park Remediation Works: Drainage Scheme for Plots J & K” (ref: 18998/706 Revision C).

1.2 Scope of this Report

1.2.1 At this stage, it is understood that Gravity is now being progressed through a Local Development Order (LDO) as a new consenting process for the entire site. As part of this, the site area has increased and the development proposals have been updated. More detailed documentation will be proposed as part of that LDO process. Some documentation relevant to the preparation of a LDO has already been produced and approved by the relevant authorities, where required, including: the Strategic Design Code, Strategic Landscape Masterplan and the Clean and Inclusive Growth Strategy

1.2.2 This report forms part of an overall S73 Application to amend the approved remediation works to reflect the updated scheme currently being designed as part of the LDO.

1.2.3 The principles provided in revision 3 of the SWMS report (ref: 18998/704), specifically to discharge the requirements of Condition 8, remain unchanged and are not updated within this report i.e. these principles will be maintained. Therefore, the S73 application does not seek to vary Condition 8. This report deals solely with the details of the proposed remediation drainage relevant to the discharge of Condition 9. For ease of reference, revision 3 of the SWMS report for Condition 8 can be found in **Appendix A**.

1.2.4 Previous reporting indicated that the remediation of the site would be undertaken in phases and therefore a series of reports discharging Condition 9 would be required, pertinent to each phase of remediation. However, this report will seek to address Condition 9 for the entire LDO area. As such, this report has been prepared based on the details contained within the previous report “Huntspill Energy Park Remediation Works: Drainage Scheme for Plots J & K” (ref: 18998/706 Revision C), relevant to Condition 9.

2 Existing Drainage

2.1 Topography

2.1.1 The site is relatively flat, with nominal fall from the south to the north.

2.1.2 The site lies at the base of Knowle Hill, the crest of which is situated 1.7km south of the site entrance. Levels along Woolavington Road are in the region of 20m AOD, from where the land slopes gently northward down to 7.4m AOD at the main gate of the former ROF site.

2.1.3 The topography quickly flattens out within the fenced area, where levels are generally between 5m and 6m AOD. The north-east corner of the site is marginally the lowest area. Existing ground levels within the former ROF site are shown in drawing 332310092/4002/SK01 in **Appendix B**.

2.2 Effluent Drainage

2.2.1 When the ROF site was operational, large volumes of process effluent were treated and discharged each day. Effluent was piped or pumped to a large treatment tank in the centre of the site (known as the 'Lido') and then pumped from there to the large reed bed facility stretching north of the site. The tank also has an overflow to a ditch which runs west to the site boundary before turning north and circumnavigating the site clockwise as far as the reed beds. This ditch is often termed the 'Acid Ditch'.

2.2.2 Following passage through the reed beds, treated flows are pumped into a ditch immediately to the north. This ditch then turns west and flows parallel to (but separate from) the Huntspill all the way to the Parrett Estuary. This ditch is subject to a maintenance agreement with the Environment Agency (EA) and the outfall from the reed beds falls under a discharge consent licence.

2.2.3 The outfall ditch from the reed beds is also referred to as the 'Acid Ditch'. To avoid confusion, the ditch within the site will be termed the 'Site Acid Ditch' in this report.

2.3 Surface Water Drainage

2.3.1 At present, the site is served by a network of ditches that convey surface waters generally northwards. The ditches fall into one of two categories; namely, those that convey flows through the site from upstream and those that purely serve the site itself. Careful inspection of the ditch network has been carried out in order to understand the flow routes and connections across the site. This inspection has confirmed the sub-catchment areas and various outfall locations.

2.3.2 Drawing 332310092/4002/SK01 included in **Appendix B** illustrates the existing drainage patterns.

2.3.3 The existing drainage on site can be divided into a number of sub-catchments. These are described as follows:

- Sub-Catchment A – A small section of land on western boundary, and another north-west of centre, discharges into the Black Ditch directly.
- Sub-Catchment B – The majority of the western parts of the site drain to the "Site Acid Ditch".
- Sub-Catchment C – A small section of land located centrally in the north of site drains to the "Site Acid Ditch".

- Sub-Catchment D – Central areas, representing a significant proportion of the site, drain to a south-to-north rhyne which continues parallel to (but separate from) an existing reed bed system before discharging into the Huntspill River via the “North Water Outfall”.

- Sub-Catchment E – Eastern parts of the site drain north-eastwards to the Stoning Pound Rhyne.

- Sub-Catchment F – South-western areas of the site which drain to the unnamed viewed rhyne to the west. This area is associated Gravity Link Road, which has been consented as part of the previous outline consent and is currently under construction.

- Sub-Catchment G – North-western areas of the site associated with the existing railway, which appear to discharge into adjacent rhynes and ditches before conveying flows westwards to either the Huntspill River or Parrett Estuary.

2.3.4 The Black Ditch and the Stoning Pound Rhyne are managed by the SDBC while the Huntspill River is managed by the EA.

2.3.5 Water levels in the Huntspill and the upstream rhyne network are carefully managed. In winter, water levels in the rhynes are controlled to reduce the risk of flooding. In summer, water levels are maintained for irrigation and water supply by the use of pens and stop-logs. Peak water level in the network is therefore during the summer period and the summer pen level downstream of the site is 4.35m AOD.

2.3.6 Normal summer water level in the Huntspill is approximately 3.5m AOD compared with 2.9m AOD in winter.

2.4 Ground Conditions

2.4.1 The local geology is principally clay/silt deposits over mudstone bedrock. These conditions are generally low permeability; hence the long historic use of land drainage rhynes.

2.4.2 Groundwater levels vary but can be close to the surface at the northern end of the site following periods of wet weather. Recorded data from between 2006 and 2010 is shown in drawing 332310092/4002/SK01 in **Appendix B**.

3 Proposals

3.1 Remediation

3.1.1 The planning consent granted in June 2012 covers the engineering works to facilitate the remediation of the site prior to development in accordance with an extant outline planning consent. This report has been produced in support of a S73 variation of this consent.

3.1.2 The scope of the required remediation works is summarised as follows:

- Demolition of remaining buildings.
- Treatment of contaminated material.
- Recycling of suitable existing blast mound material to raise ground levels generally.
- Creation of a landscaped mound at the west of the site.
- Creation of development plot platforms (including import material where necessary).
- Modifications to the site drainage infrastructure to serve the site in the remediated condition.

3.1.3 The works will be carried out in several phases over a period of around 5 years.

3.2 Development

3.2.1 A separate outline planning application (ref: 42/13/00010) was submitted for the Energy Park proposals which included a surface water management strategy for the development. This was subsequently granted consent

3.2.2 At this stage, it is understood that Gravity is now being progressed through an LDO as a new consenting process for the entire site, therefore a more detailed surface water management plan will be produced in support of the development as part of that LDO process.

3.2.3 The LDO proposals are as follows:

The development of a smart campus including

i. commercial building or buildings with a total Gross External Area of up to 1,000,000m^2 which would sit within current Use Classes E(a) - (g), B2, B8 and sui generis floorspace uses and

ii. a range of buildings up to 100,000m2 within use classes C1, C2, E (a) – (g) and F , including restaurants / cafes, shops, leisure, education and sui generis uses and

iii. up to 750 homes in use class C3,

together with associated infrastructure including restoration of the railway line for passenger and freight services, rail infrastructure including terminals, sidings and operational infrastructure and change of use of land to operational rail land, multi-modal transport interchange, energy generation, energy distribution and management infrastructure, utilities and associated buildings and infrastructure, digital infrastructure, car parking, a site wide sustainable water management system and associated green infrastructure, access roads and landscaping.

3.2.4 It is proposed to fully integrate the 3.7 hectares of reed beds stretching north of the site into the surface water system for treatment and storage. All development drainage will eventually be directed through the reed beds and out to the Huntspill River via a new/modified outfall.

3.2.5 During the interim period, the existing outfall arrangements will be preserved as far as possible.

4 Surface Water Management Strategy

4.1 Overview

4.1.1 Revision 3 of the SWMS report (ref: 18998/704) produced to discharge Condition 8 of planning application 42/11/00017 set out five key objectives for the remediation SWMS. Taking account of the LDO proposals, these are as follows:

i. To provide treatment and pollution prevention measure during the remediation works

ii. To preserve the function and hydraulic continuity in the land drainage network through the site

iii. To reflect/accommodate the emerging LDO development's surface water management strategy

iv. To provide sufficient land drainage, including temporary drainage features, to serve the site in its remediated condition prior to the commencement of the LDO development construction

v. To ensure adequate maintenance of the drainage system, including the existing outfall routes

4.1.2 Further details regarding these can be found in revision 3 of the SWMS report in **Appendix A**.

5 Pollution Control

5.1 Overview

5.1.1 Revision 3 of the SWMS report (ref: 18998/704) produced to discharge Condition 8 of planning application 42/11/00017 discussed matters relevant to pollution control during and after the remediation works completion. These set out key requirements and proposals for pollution control that remain relevant today, including:

- Legal framework.
- Pollution risk from site operations.
- Contaminated soils.
- Silt.
- Pollution control techniques.
- Plant maintenance and fuel storage areas.

5.1.2 Further details regarding these can be found in revision 3 of the SWMS report in **Appendix A**.

6 Drainage Design

6.1 Overview

6.1.1 The layout of new and modified ditch routes is intended to reflect the existing site drainage characteristics as close as possible, while preserving flexibility for the design of the future development plots.

6.1.2 The existing land drainage network at the site performs well and was subject to a regular programme of inspection and maintenance during the life of the ROF. With the decommissioning of the ROF site, maintenance of the ditches has understandably become less frequent. Despite this, the network is still performing well which indicates that the existing layout and size of the ditches is adequate to serve the site. The remediation works provide the opportunity to re-establish a suitable maintenance programme and this is discussed in more detail in **Section 8**.

6.1.3 The remediation works do not include any introduction of hardstanding areas. Conversely, existing buildings and hardstanding areas at the site are being demolished. Therefore, there will be no increase in runoff rates and volumes from the site as a result of the works. Hence, there is no requirement to limit discharge rates and provide attenuation storage.

6.1.4 The detailed design of the drainage scheme will be carried out in preparation for a Land Drainage Consent (LDC) application which will be made to the SDBC. This will include defining the exact locations, alignments, layouts, invert levels, crest/bank levels, channel profiles and gradients of each ditch, culvert and structure within the scheme. This LDC application will be made following granting consent of this S73 application.

6.2 Ditch Design

Principles

6.2.1 The existing ditches serving as land drainage for the site itself are fairly uniform in size and profile. The ditches tend to be in the order of 0.75m deep and 1m to 1.5m wide at the base with bank slopes between 1:1 and 1:2. Spacing varies but the ditches are generally around 100 metres apart. The new and temporary site drainage ditches for the remediation works will be sized and spaced in accordance with these proportions to mimic the existing regime.

6.2.2 The more important arterial ditch routes through the site are generally larger and deeper than the site drainage ditches. Where these routes are to be altered, the profile and capacity at the upstream and downstream connection locations will be confirmed. The new profile will be designed to ensure no loss of capacity along the new ditch length.

6.2.3 Culverts on retained watercourses will be opened up wherever possible although some new culverts/bridges may be required at plot access locations.

6.2.4 The original strategy and design criteria were discussed with SDBC on 12th December 2013. It is assumed that, given the principles remain the same, as set out in revision 3 of the SWMS in **Appendix A**, and only the layout and scale remediation works have been updated, no further agreement or discussion is required.

6.2.5 Similarly, the EA was consulted regarding discharge permits and confirmed that:

- the site drainage from the construction areas will not require a permit, provided that suitable pollution prevention measures are taken; and
- runoff from areas used for treatment of contaminated soil which is discharged through the reed beds will require a variation to the existing permit.

6.2.6 It is again assumed that, provided these principles are maintained, further agreement or discussion with the EA would not be required.

Proposed Works – Ditches Conveying Off-Site Flows

6.2.7 The arterial ditch routes will be diverted to accommodate the plots within the development proposals. Ultimately, all drainage on site, both post-remediation and post-development, will drain to these ditches, therefore these will be diverted during the initial remediation works to provide the necessary plot layouts as the development is progressed. This will also avoid individual plots being reliant on one another, allowing greater flexibility regarding the development programme.

6.2.8 Where ditches are to be diverted it will be important to design the new connections with sufficient capacity so as to avoid impeding the existing flows. Some of the diversion routes make use of existing ditches. These ditches will be cleared and profiles upgraded as required to ensure capacity is undiminished.

6.2.9 Diversion routes are identified in drawing 332310102/4002/100 in **Appendix C**.

6.2.10 Initial high-level calculations and modelling of the proposed remediation SWMS have been undertaken for up to the 1 in 100 year (plus 40% allowance for climate) as the intention is that these rhynes will also serve the proposed development without significant alteration. However, it should be noted that the site will exist in its remediated state for only a short period of time, therefore the short return period events testing are more relevant in this context.

6.2.11 The calculations and model results are provided in **Appendix C**, alongside a model schematic drawing to illustrate the model build.

6.2.12 Although the ditches conveying off-site flows have been designed to serve the future development on site, they may require additional capacity checks and possible upgrades to manage development runoff as part of that respective design process. This will be dealt with as part of the LDO process. For the remediation works the existing capacities of the off-plot drainage routes are being retained.

Proposed Works – On-Plot Ditches

6.2.13 It is proposed to infill all ditches within the proposed plot boundaries as part of the works. As each plot is brought forward for development in the future, an on-plot drainage system will be required linking into the overall surface water strategy for the development proposals. However, a temporary/interim land drainage system will be needed to drain the plot and this will be installed as part of the remediation works.

6.2.14 Ditch modifications is based on the following principles:

- All existing ditches within the plot boundaries to be infilled.
- Where ditches that convey flows from upstream pass through the plot area, these will be diverted around the perimeter of the plot.
- A network of ditches will be provided on-plot to serve as land drainage in the remediated condition.
- Existing catchments and outfall locations will be preserved as far as practicable in order to avoid impacts on the downstream drainage regime.

6.2.15 The existing site ditches are generally spaced around 100m apart and the proposed layout of on-plot ditches has been prepared with a similar spacing.

6.2.16 Material will be imported on site to form the proposed LDO development platforms, raising levels above existing. Ground levels will be defined to provide a slight fall into the plot from the boundaries towards the ditches. Watersheds within the plot will be defined between the ditches.

6.2.17 A minimum interim earthworks level of 5.5m AOD has been identified based on the FRA work previously carried out by Stantec (in support of the extant outline planning permission, not the LDO). This will be the lowest ground level on all plots upon completion of the remediation works. This will form a level in which the design levels stated in the FRA and Surface Water Drainage Strategy for the LDO can be constructed above.

6.2.18 A general ditch profile based on the existing ditch characteristics has been applied to the new ditch design. This profile comprises a 1m bed width, around 0.7m deep, with 1:1 bank slopes. A bed gradient of 1 in 1,000 has generally been used, with depths a little greater than 0.7m at the downstream end and a little less than 0.7m at the upstream end.

6.2.19 Initial, high-level calculations demonstrating the performance of these proposed temporary on-plot ditches were provided in the "Huntpsill Energy Park Remediation Works: Drainage Scheme for Plots J & K" (ref: 18998/706 Revision C) previously produced to discharge Condition 9 for part of the site. The capacity checks were made using greenfield runoff rates to ensure the drainage system can accommodate the 1 in 100 year storm event (including a 20% allowance for climate change). Given the temporary nature of these ditches, this design principle is considered conservative and therefore suitable to maintain as part of this S73 application, despite recent updates to climate change guidance. The results demonstrated that the typical profile is more than adequate for the anticipated runoff, even if a reduced bed width of 0.6m was used. For these on-plot ditches, the width can therefore be defined by the excavator bucket dimensions for ease of construction.

6.2.20 On-plot ditches are identified in drawing 332310102/4002/100 in **Appendix C**.

6.3 Silt Control

6.3.1 A range of measures will be needed to capture runoff from exposed earthwork areas and allow silt particles to settle out prior to discharge to the off-plot watercourses.

6.3.2 The proposed ditch layout and levels have been prepared so that all runoff will be directed into the plot and will therefore flow into the plot ditches.

6.3.3 Proposed ground levels at the plot perimeter will generally be higher than existing levels immediately outside the plot. The perimeter will thus need to be formed by tapering down to existing levels and therefore a narrow strip of land (1 to 2m wide) around the perimeter will fall away to the boundary. Where a ditch is situated directly adjacent to the boundary, a silt barrier/fence will be needed to protect the watercourse. Where there is no ditch, the small amount of silty runoff that may leave the plot will naturally be treated by the grass and vegetation.

6.3.4 Upon completion of the earthworks, it is proposed to encourage rapid grass cover of the proposed diverted strategic rhynes and large commercial area perimeter ditch by means of 'hydroseeding'. This will reduce the duration that material is exposed and therefore limit the period when the risk of silt pollution exists. The proposed post-remediation drainage ditches will be temporary in nature, therefore these will be left to self-seed instead of hydroseeding them. The location of these ditches are shown in 332310102/4002/100 in **Appendix C**.

6.3.5 The risk of silt pollution downstream can be further reduced by using permeable baffles within the ditches, such as straw bales or gabions. These will trap silt particles and slow velocities, which will in turn assist with settlement.

6.3.6 Regular inspection of the ditches will be undertaken to monitor silt levels within them, and when necessary silt removal works will need to be undertaken to maintain their effective

performance. This practice is currently ongoing on site but will be augmented by the additional silt management activities listed above.

6.3.7 Further localised measures may be needed to prevent silt pollution during particular operations on site. Such measures were set out in revision 3 of the SWMS report (see **Appendix A**), indicating a toolkit for use during the works.

6.3.8 Revision 3 of the SWMS indicated that settlement lagoons would also be constructed on site. This report was written at a time where these lagoons would later be converted into the on-site strategic attenuation features. However, subsequent works which have been carried forward to this point heave demonstrated, in agreement with the EA and SDBC, that strategic attenuation features are no longer required on site. Therefore, these settlement lagoons have been removed from the remediation drainage strategy at this stage. The proposed strategy of regular inspection of the ditches and remedial works as necessary has been ongoing practice on site for a number of years without negative impacts downstream. Continuing of this practice alongside additional silt management works represents further improvement on the status quo.

6.4 Landscape Mound and Site Acid Ditch

6.4.1 The remediation works will include the creation of a landscaped mound at the west of the site using material from the plot areas which is unsuitable for use as engineering fill. This task has already commenced as part of the remediation works originally consented prior to this S73 application, however this task is not yet completed and material may yet still be added to the mound.

6.5 Underground Services

6.5.1 The construction of new ditches will involve excavation work and therefore it will be important to check the locations of underground services prior to commencement. The site has a complex network of services, most of which will now be redundant. Nonetheless, any conflicts will need to be ascertained from site records. If necessary, local re-alignment of the proposed ditch routes will be designed.

7 Sequence of Works

7.1 Overview

7.1.1 The sequence of works needs to be carefully considered in order to prevent localised flooding or silt pollution issues during the construction phase. The suggested sequence is set out below; however, more detailed considerations may become necessary in some areas prior to work taking place.

7.2 Drainage Works

7.2.1 The following general sequence is suggested. This will apply to any given sub-catchment/work area, not necessarily a whole plot at once.

i. Remediate contaminated hotspots (with drainage isolated).

ii. Construct any off-plot drainage route(s)/diversion(s).

iii. Connect the new diversion route(s). Straw bales and/or sumps will be used along new routes and immediately downstream of connection areas to control silt.

iv. Backfill the existing ditches from the upstream end working down.

v. Dig the new ditches from the downstream end working up.

vi. Remove the topsoil from work area (some areas of topsoil will have already been removed in connection with the preceding steps).

vii. Spread and compact material within the work area to finished levels.

viii. Hydroseed the proposed diverted strategic rhynes and large commercial area perimeter ditch.

8 Maintenance Arrangements

8.1.1 The continued function of the land drainage network will depend upon adequate maintenance of each part of the drainage system. This is Gravity Ltd as the landowner will take responsibility for the maintenance of all parts of the drainage system within its land ownership. This responsibility will be clearly set out as part of any land conveyance agreement in the future.

8.1.2 All silt control measures will require regular monitoring during the works along with silt clearance as required to ensure effective operation.

8.1.3 A programme of water quality monitoring will be established in agreement with both the EA and the SDBC.

8.1.4 **Table 8.1** sets out the proposed maintenance activities and frequencies for the different types of drainage feature. This is based on best-practice guidance and adapted to the specific circumstances at the site (subject to ecological constraints).

Feature	Schedule	Activity	Frequency
Rhynes / Ditches	Regular	Inspect throughout for blockages	Monthly
		Inspect throughout for silt accumulation	Fortnightly during construction reducing to bi-monthly upon completion
		Debris/litter removal	Monthly (in conjunction with inspection)
		Manage vegetation – mowing, strimming	As required during growing season
		Silt removal	Twice a year or as established during inspections
	Remedial/ Reactive	Inspection to review performance	After each heavy rainfall event
		Repair erosion damage – reinstate design levels and re-plant/re-seed	As required
		Remediate poor vegetation growth	Annually as required
		Safely remove and dispose of oils etc	As required
		Debris/litter removal	Monthly (in conjunction with inspection)
		Manage vegetation – mowing, strimming, removing nuisance plants	As required during growing season Meadow grass to be cut twice a year outside of nesting season Tidy dead growth and trim trees annually before growing season
		Silt removal	Annually or as established during inspections
Culverts and structures	Regular	Inspect for blockages	Monthly
		Inspect for silt accumulation, especially inlets	Fortnightly during construction reducing to bi-monthly upon completion
		Silt removal	Twice a year or as established during inspections
		Debris/litter removal	Monthly (in conjunction with inspection)

Feature	Schedule	Activity	Frequency
		Check mechanical devices – penstocks, flap valves etc	Twice a year
	Remedial/ Reactive	Inspect ion to review performance/condition	After each heavy rainfall event
		Repair/realign	As required

Table 8.1 - Maintenance Schedule

8.1.5 The frequencies outlined in **Table 8.1** should be subject to review over time and adjusted as required to ensure the maintenance regime remains balanced and effective.

8.1.6 Maintenance responsibilities outside the remediation site area (the ROF perimeter fence) will remain as at present.

Appendix A Application 42/11/00017 SWMS

Huntspill Energy Park Remediation Application – Surface Water Management Strategy (ref: 18998/704, rev: 3, date: Oct 2013)

Huntspill Energy Park Remediation Application

Surface Water Management Strategy

On behalf of **BAE Systems**

Project Ref: 18998/704 | Rev: 3 | Date: October 2013

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2	27.10.2011	Minor updates	PH	PS	PS
3	17.10.2013	Updates and further detail added for discharge of Condition 8	PH	PS	PS

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1 Introduction

Planning permission was granted by Sedgemoor District Council (SDC) in June 2012 for the remediation of the former Royal Ordnance Factory (ROF) situated between Puriton and Woolavington.

The planning application was supported by a Flood Risk Assessment (FRA) and the Surface Water Management Strategy (SWMS), Revision 2, both prepared by Peter Brett Associates LLP (PBA). The SMWS Revision 2 report set out the outline surface water drainage strategy for the remediation works including the temporary drainage requirements to protect the existing watercourses from potential sources of pollution. The SDC planning reference was 42/11/00017.

The former ROF benefits from an allocation within the Sedgemoor Core Strategy as an Energy Park. Proposals for redeveloping the site as an Energy Park have been taking shape and a separate planning application has been submitted. However, the planning consent already granted relates purely to the engineering works required to remediate the site.

The planning consent was granted with conditions, two of which relate to surface water drainage as follows:

Condition 8: *No earthworks or remedial works shall take place on any part of the site (or other such time or stage agreed in writing by the Local Planning Authority) until a scheme for the disposal of surface water from the site during all works has been submitted to, and approved in writing by, the Local Planning Authority. The scheme shall include details of the maintenance responsibilities for all surface water drainage infrastructure. The development shall be implemented and maintained in accordance with the approved scheme until the development has been completed unless otherwise agreed in writing by the Local Planning Authority.*

Condition 9: *No earthworks or remedial works shall take place on any part of the site (or other such time or stage agreed in writing with the Local Planning Authority) until full details of any modifications to any ditch, drain or watercourse on site have been submitted to, and approved in writing by, the Local Planning Authority. The details shall include maintenance responsibilities for the rhyne system upon completion of the development. The development shall be implemented in accordance with the approved details unless otherwise agreed in writing by the Local Planning Authority.*

The proposed remediation works will be carried out in several phases. Due to the size of the former ROF and the number of ditches criss-crossing the site, the detail of the surface water drainage scheme has to be progressed with each phase.

This latest revision of the SWMS report, along with the accompanying drawings, builds upon the approved outline strategy by providing further detail of the proposed drainage scheme for the remediation works and setting out principles which will govern the management of surface water for the whole site during all phases. This revision has been prepared in order to allow Condition 8 to be discharged.

As each phase comes forward further submissions will be made detailing specific modifications to the site ditch network to accommodate the remediation works in each phase area. Those submissions will be prepared in order to allow Condition 9 to be discharged on a phase-by-phase basis. Each phase will also require separate Land Drainage Consent applications to the Somerset Drainage Boards Consortium (SDBC).

2 Existing Drainage

2.1 Topography

The site lies at the base of Knowle Hill, the crest of which is situated 1.7km south of the site entrance. Levels along Woolavington Road are in the region of 20m AOD, from where the land slopes gently northward down to 7.4m AOD at the main gate.

The topography quickly flattens out within the fence where levels are generally between 5m and 6m AOD. The north-east corner of the site is marginally the lowest area. Existing ground levels are shown on the Existing Layout plan in Appendix A.

2.2 Effluent Drainage

When the ROF site was operational, large volumes of process effluent were treated and discharged each day. Effluent was piped or pumped to a large treatment tank in the centre of the site (known as the 'Lido') and then pumped from there to the large reed bed facility stretching north of the site. The tank also has an overflow to a ditch which runs west to the site boundary before turning north and circumnavigating the site clockwise as far as the reed beds. This ditch is often termed the 'Acid Ditch'.

Following passage through the reed beds, treated flows are pumped into a ditch immediately to the north. This ditch then turns west and flows parallel to (but separate from) the Huntspill all the way to the Parrett Estuary. This ditch is subject to a maintenance agreement with the Environment Agency (EA) and the outfall from the reed beds falls under a discharge consent licence.

The outfall ditch from the reed beds is also referred to as the 'Acid Ditch'. To avoid confusion, the ditch within the site will be termed the 'Site Acid Ditch' in this report.

2.3 Surface Water Drainage

At present, the site is served by a network of ditches that convey surface waters generally northwards. The ditches fall into one of two categories; namely, those that convey flows through the site from upstream and those that purely serve the site itself. Careful inspection of the ditch network has been carried out in order to understand the flow routes and connections across the site. This inspection has confirmed the sub-catchment areas and various outfall locations.

A plan is included in Appendix A illustrating the existing drainage patterns including the sub-catchments and outfall locations. These are described as follows taken in turn generally from west to east:

A. A narrow strip of land along the western boundary drains north to the Black Ditch. The Black Ditch begins immediately north of the site boundary at the west of the reed beds before flowing westwards. It forms part of the land drainage network which ultimately discharges into the Huntspill to the north.

B. Surface water in the western parts of the site generally drains into the Site Acid Ditch and on into the reed beds. This sub-catchment is therefore separate from the Huntspill at present.

C. An area of the site north-west from the centre drains into the Black Ditch.

D. Central parts of the site drain into the rhyne running north through the central spine which bisects the site. This rhyne continues parallel to (but separate from) the reed beds before discharging into the Huntspill via the North Water Outfall.

E. Eastern parts of the site drain to the north-east into the Stoning Pound Rhyne system which ultimately discharges into the Huntspill.

The Black Ditch and the Stoning Pound Rhyne are managed by the SDBC while the Huntspill River is managed by the EA.

Water levels in the Huntspill and the upstream rhyne network are carefully managed. In winter, water levels in the rhynes are controlled to reduce the risk of flooding. In summer, water levels are maintained for irrigation and water supply by the use of pens and stop-logs. Peak water level in the network is therefore during the summer period and the summer pen level downstream of the site is 4.35m AOD.

Normal summer water level in the Huntspill is approximately 3.5m AOD compared with 2.9m AOD in winter.

2.4 Ground Conditions

The local geology is principally clay/silt deposits over mudstone bedrock. These conditions are generally low permeability; hence the long historic use of land drainage rhynes.

Groundwater levels vary but can be close to surface at the northern end of the site following periods of wet weather. Recorded data from between 2006 and 2010 is shown on the Existing Layout plan in Appendix A.

3 Proposals

The planning consent granted in June 2012 covers the engineering works to facilitate the remediation of the site prior to its future development as an Energy Park.

The scope of the required remediation works is summarised as follows:

- Demolition of remaining buildings.
- Treatment of contaminated material.
- Recycling of suitable existing blast mound material to raise ground levels generally.
- Creation of a landscaped mound at the west of the site.
- Creation of development plot platforms.
- Modifications to the site drainage infrastructure to serve the site in the remediated condition.

The works will be carried out in several phases over a period of around 5 years. The current phasing plan is indicated on the Proposed Strategy plan included in Appendix A.

A separate planning application has now been submitted for the Energy Park proposals included a surface water management strategy for the development. As part of the Energy Park application, it is proposed to fully integrate the 3.7 hectares of reed beds stretching north of the site into the surface water system for treatment and storage. All development drainage will be directed through the reed beds and out to the Huntspill via a new/modified outfall.

The reed beds will only be converted to the surface water system to serve the Energy Park once their current function for effluent treatment is no longer required. During the interim period, the existing outfall arrangements will be preserved as far as possible.

The treatment of contaminated material for the whole site will take place during the first phase of the remediation works. Therefore the need for the reed beds to serve as effluent treatment will last only until the first phase is completed. This is discussed further in the following section.

4 Surface Water Management Strategy

The approved remediation works include the creation of the future Energy Park development plot platforms. Suitable material will be spread across parts of the site in order to raise ground levels and create a 'blank canvas' for the future development plots. This will involve modification of the existing site land drainage network to realign / divert watercourse routes around the plot areas.

The updated Surface Water Management Strategy is illustrated in Appendix A. The strategy has been prepared with five key objectives in mind, each of which is discussed below.

i. To provide treatment and pollution prevention measures during the remediation works.

This is discussed in the following section of this report.

ii. To preserve the function and hydraulic continuity in the land drainage network through the site.

Where it is proposed to infill sections of ditch that convey flows from upstream, a diverted route will be defined around the edge of the future development plot.

Where it is proposed to infill sections of ditch that purely serve the site itself, the function of these will be replaced by temporary land drainage arrangements. This is discussed further as part of the fourth key objective.

As mentioned earlier, the outfall arrangements will be changed as part of the Energy Park development. However, during the remediation period the existing outfall routes from the site will be unchanged and the existing catchments retained as far as possible. This is reflected on the proposed strategy plan in Appendix A.

iii. To reflect/accommodate the emerging Energy Park surface water management strategy.

The proposed modifications to the site ditch layout are based around the emerging Masterplan proposals for the Energy Park. New and diverted ditch routes have been defined by the proposed plot boundaries and road layouts.

iv. To provide sufficient land drainage including temporary drainage features to serve the site in its remediated condition prior to the commencement of the Energy Park construction.

The remediation works include the creation of the future development plots, each as a *'blank canvas'*. Each plot will be developed with an on-plot drainage design as it comes forward in the future. The remediation drainage scheme includes the retention of some existing site ditches and creation of new temporary ditches within the future plot areas to serve as land drainage for the plots in the interim. The layout of these will be designed in order to mimic approximately the spacing and lengths of the existing ditch layout.

v. To ensure adequate maintenance of the drainage system including the existing outfall routes.

Maintenance arrangements are discussed in Section 7 below.

5 Pollution Control

5.1 Legal Framework

The EA is responsible for both the protection of "controlled waters" from pollution under the Water Resources Act 1991 in England and Wales and the prevention of pollution of the environment, harm to human health and detriment to local amenity by waste management activities under the Environmental Protection Act 1990.

It is an offence to cause pollution of controlled waters either deliberately or accidentally. In addition, the formal consent of the EA is required for many discharges to controlled waters. Consents are granted subject to conditions and are not issued automatically.

All discharges to foul sewers require authorisation by the sewerage undertaker and may be subject to the terms and conditions of a trade effluent consent. Any other waste produced on an industrial site will be subject to the Duty of Care under the Environmental Protection Act 1990 and may also be subject to control under the Waste Management Licensing Regulations 1994. Certain hazardous wastes are subject to the Special Waste Regulations 1996.

5.2 Pollution Risk from Site Operations

The proposed remediation of the Energy Park site will include the movement of approximately 600,000m³ of cut/fill material, the majority of which currently forms the blast mounds. Of this volume, the suitable material will be used to raise ground levels and create the future development plot platforms. Unsuitable material will be placed to form the landscaped mound at the west of the site.

The works will be undertaken once the demolition and site clearance works have been undertaken; however, existing drains, sewers and ditches will still be partially operational on site. Due to the presence of watercourses on site and their land drainage function, any large scale disturbance of earth would pose a potential source of pollution.

Appropriate safeguards and controls will be needed to prevent the contamination of the watercourses from silt pollution as well as from oil/fuel spills and leaks associated with the operation of earth moving plant.

5.3 Contaminated Soils

BAE Systems has undertaken an assessment of contamination of soils within the site. Contaminant residues and fragments have been identified at isolated locations around the site associated with the historic buildings and processes.

The amount of contaminated material requiring removal is estimated to be around 30,000m³. It is proposed to re-use this material (following treatment, if necessary) within the landscaped mound at the west of the site (total volume of the mound is approximately 110,000m³).

Control measures are needed to prevent contaminants entering a watercourse via surface runoff from areas where contaminated material is being processed. The scheme for the treatment of contaminated material as part of the works has been prepared by BAE Systems and submitted as part of an application to discharge Condition 10 (which relates to contamination risks). This report focuses here purely on how the works could interact with the site drainage systems and local watercourses.

The existing treatment and discharge arrangements using the Lido, Site Acid Ditch, reed beds and outfall to the Acid Ditch will be retained during the initial phase of the remediation works while contaminated material is treated. Hotspots have been identified around the site where

explosive residue contaminants are or may be present. Prior to removing any material the work areas will be isolated hydraulically from the drainage system and surrounded by the use of bunds, cut-off ditches and coffer dams as required.

Hotspot areas are localised and the in-situ work required to deal with each one will be completed in a short duration. The work will be carried out during dry weather periods as far as possible and this will naturally limit the likelihood, and hence the volume, of any rainfall runoff from each hotspot area. Any such runoff will be captured in cut-off ditches before being transferred to the Lido (likely by tanker vehicle) or alternatively taken off site under licensed removal.

The removed material will be conveyed securely to a designated treatment area. The area selected for this is the slab of the former building 3/58 B in the centre of the site close to the Lido. No part of the existing land drainage system lies between the slab and the Lido. The slab will be surrounded with cut-off ditches and bunds to capture any runoff. An existing piped process drainage system runs adjacent to the slab en route to the Lido and this could be used to collect runoff from the cut-off ditches.

Treated runoff from the soil treatment area leaving the site via the reed beds will fall within consented limits. Discussion is taking place between the Environment Agency (EA) and BAE Systems regarding the existing discharge consent and the need for any variation covering the remediation period. Alternatively, contaminated runoff from the soil treatment area could be taken off site under licensed removal.

All of the hotspots will be dealt with and treated during the first phase of the remediation works. Once this process is complete, the use of the Lido, reed beds and Acid Ditch for effluent treatment and discharge can be phased out as part of the wider Energy Park proposals.

In the unlikely event that further contamination is discovered during later phases, any affected areas will need to be treated in isolation but with contaminated runoff taken off site under licensed removal.

BAE Systems' Remediation Implementation Plan (submitted as part of the application to discharge Condition 10) sets out the proposed surface water monitoring regime during the works. The regime comprises monthly sampling at each surface water exit location from the site as well as additional sampling timed to coincide with remediation activities involving effluent treatment.

5.4 Silt

Aside from the contamination hotspots and treatment areas described above, surface water from the other areas of the site will be free of potential contaminants and no special arrangements will be required for treatment of contaminated runoff.

However, due to the nature of the construction earthworks it will be important to mitigate the increased risk of mobilisation of sediment in order to protect the existing watercourses downstream. This is particularly true outside of any catchment draining to the reed beds which will naturally encourage settlement of silts.

Proposed control measures are set out as follows:

- Restrictions on the extent of vegetation removal in advance of earthworks. The phased approach will ensure that only parts of the site are exposed at any one time.
- Construction of cut-off drains and grips to intercept surface water and ground water flows which will then divert flows to settlement ponds.

- Silt fences, bunds and grips at top of watercourse embankments.
- Settlement ponds to remove suspended solids (regularly maintained).
- Grassland infiltration where appropriate.
- Designated wheel and plant wash facilities (regularly maintained).

One of the key requirements will be the provision of settlement lagoons at the downstream end of the work area but upstream of the receiving watercourses. The earlier revisions of this SWMS identified strategic locations within the Energy Park masterplan where proposed future attenuation storage basins could serve as settlement lagoons in the interim. However, the attenuation strategy for the Energy Park has since been revised such that storage will primarily be located within the reed beds.

Based on the current phasing plan, likely locations for settlement lagoons have been identified around the site and are illustrated on the Proposed Strategy plan in Appendix A.

Lagoons will be sized to provide sufficient volume for the 5-year return period rainfall. The volume will depend upon the required detention time in order to promote the settlement of silts. Indicative locations are illustrated on the plan in Appendix A; however, locations and sizes will be reviewed and confirmed as part of the detailed design for each phase as it comes forward.

5.5 Pollution Control Techniques

Key site-specific pollution control measures have been discussed under the preceding headings. However, a range of typical best practice pollution control measures will need to be implemented during the works.

The existing watercourses on site shall be protected by the construction of a temporary drainage system which shall be designed to intercept and divert surface water or groundwater flows to the settlement ponds prior to discharge. The temporary drainage system will include the use of temporary ponds, filter strips, swales and cut-off ditches and bunds. These measures are required not only in the immediate vicinity of the site operations but also where topsoil or other excavated materials are to be stockpiled.

Earthworks operations next to a watercourse present a greater risk than those remote from watercourses. However, any significant disturbance of earth on site will create a potential source of silt pollution unless an adequate surface water drainage system is in place to divert, collect and treat water so that it can be discharged appropriately in a controlled and approved manner.

Fuel or chemical spills may also pose a possible source of water/soil contamination. Safe methods of storage and effective means of control of spills shall be put in place together with suitable training for site staff.

Due to the size of the development site and the separated nature of some of the development areas within it, the earthworks operations will need to be phased. Each phase and area will be considered and provided with a suitable temporary and/or permanent (as appropriate) drainage system to intercept surface water and groundwater and attenuate flows for settlement, until suitable for discharge to a designated watercourse.

The pollution control features used within the remediation works will be a combination of the features described under the following sub-headings. Some features may not be used whilst others may be implemented in more than one location. The proposed system will be designed to provide all necessary pollution control methods to ensure as far as practicable that the

existing watercourses and soils are not contaminated by silt, fuel/oil, or chemical pollutants. Specific measures to deal with runoff affected by explosive residues have been considered in Section 5.3.

Site Strip

Earthworks and vegetation removal at the start of a project can increase the volume of silty surface water run-off. It can also reduce the area of vegetated land available for disposal of silty water (see the subheading "Grassland Infiltration"). To help minimise the risk of silt pollution from site stripping the following measures should be applied:

- Minimise the amount of exposed ground and soil stockpiles from which the water drains and the period of time such water drains.
- Only remove vegetation from the area that needs to be exposed in the near future.
- Seed or cover stockpiles if appropriate and timescales permit.
- Use silt fences at the toe of the slope, made from geotextiles, to reduce silt transport.
- Collect run-off using cut-off ditches/grips and transport to settlement ponds to allow suspended solids to settle before disposal to a suitable outfall.

Existing Sewers and Drains

Existing drainage systems will be traced to verify outfall locations. Any existing drainage runs that are to be retained shall be temporarily diverted or sealed to prevent contamination if necessary. Redundant sewers or drains that are identified as being contaminated will be removed or grouted up. Uncontaminated redundant drains will be removed where encountered during earthworks.

Cut-off Drains & Ditches

Cut-off drains/ditches/grips will be constructed on site. The drains/ditches will perform a number of functions as follows:

- Intercept surface water and near surface ground water before entry into earthworks areas.
- Intercept surface water and ground water at low points/boundaries of earthworks areas.
- Prevent surface water carrying suspended solids or other contamination from entering watercourses (top of embankment drains).
- Transfer captured surface water and ground water to settlement ponds.

Pumping from Sumps

Sumps within the earthworks/excavations can be used to remove water that has not been collected by the cut-off drain/ditch system. Care should be taken when operating pumps as follows:

- Support inlet hoses above the bed to avoid pumping sediment/silt.
- Discharge on to hard spillway surfaces (concrete slabs/gravel) in to surface waters/ponds.

- Use of appropriate pump rates to avoid disturbance of bed or bank. The maximum rate should be set after consideration of the flow of the river, the location of the discharge and the risk of erosion.

- Protection of the pump inlet to avoid drawing in aquatic life and debris.

Settlement Ponds

The use of ponds to store site runoff water is one of the most effective treatment methods available. They are particularly useful for larger construction sites where the attenuation of storm flows is also required and where bulk earthworks form a significant part of the project.

A pond provides a highly effective method of containing any intercepted water for the settlement of suspended solids, quality monitoring or any other treatment if required.

Sizing ponds and determining the required retention times for settling pollutants depends upon the area of site draining to the pond, the soil type over or through which the water flows and the particle size of the suspended solids. In the case of suspended solids, settlement ponds offer a simple and effective way of controlling the concentration of substances in suspension.

Site runoff is diverted away from the watercourses and into a pond constructed specifically to allow any suspended solids to settle out before discharge. Due to the time required for suspended solids to settle, several ponds may be needed. Flocculating agents may be added in certain circumstances to increase the rate of settlement of fine particles. Ponds can also be used to control oil spillage via the introduction of oil booms or on line oil separators (interceptors) through which flows pass prior to discharge. Regular maintenance of the settlement pond, oil booms and oil separators is required to ensure optimum performance.

Grassland Infiltration

This method of control is only suitable for water polluted by suspended solids. Water is discharged over an area of grassland at a rate equivalent to the infiltration rate of the soil, the amount of vegetation cover and gradient. This method is also subject to variation in rate due to weather conditions. Soils saturated by heavy rainfall will not provide the infiltration rate required and discharge may be reduced to zero.

Grassland infiltration is unlikely to be practicable at the former ROF site other than during dry summer periods.

Oil/Fuel Pollution

Construction plant can cause water pollution by transporting and depositing fuels and oil, mud and contaminated material. Wheel washers and surfaced haul roads can prevent the deposition of contaminating material. Fuel leaks can be minimized by only using properly maintained plant, and the designated maintenance areas must be isolated from groundwater and watercourses. Drip trays should be kept available within these areas in case of equipment failure.

If existing roads are used as haul routes, gully gratings should be lined with a suitable geotextile membrane to prevent silt laden water entering the drainage system. If the highway gullies outfall directly or indirectly to a watercourse, then flows should be redirected to a settlement pond that has oil booms or oil separators (interceptors) through which flows pass prior to discharge. This will also reduce the risk of pollution from oil spillages/leaks.

Further information is contained in Section 5.6.

Existing Watercourses

Water from settlement ponds will be discharged to the existing on-site rhyne network. However, it is possible that untreated water (water that has not passed through a settlement pond) may find its way into the rhyne network. This may be as a result of rainfall exceeding the design/attenuation levels set for the settlement ponds or through accident or unforeseen circumstances.

To provide an additional pollution safeguard, oil booms could be installed across the existing rhynes downstream of the works but upstream of the site fence. A temporary lagoon could be constructed 'in-line' with an oil boom and weir system.

5.6 Plant Maintenance and Fuel Storage Areas

Earth moving plant and machinery can cause contamination of soils and pollution of water through the leakage of fuel or oil during site operations, refuelling or maintenance. Sources of silt such as plant and wheel washing pose a high risk of causing pollution if not suitably located and controlled. To reduce the pollution risks the following measures will be applied:

- Plant and wheel washing is carried out in a designated area of hard standing at least 10 metres from any watercourse or surface water drain.
- Bunds or cut-off drains are constructed to ensure that polluted water is collected.
- Run-off is collected in a sump - recycle and reuse water where possible.
- Settled solids are removed regularly.
- Discharge of contaminated water to foul sewer (if possible) with prior permission from the relevant authority.

The risk of spilling fuel is at its greatest during refuelling of plant. The following precautions will be taken to minimise this risk:

- Refuel mobile plant in a designated bunded area, on an impermeable base away from drains or watercourses.
- Use a bunded bowser.
- Supervise all refuelling and bulk deliveries.
- Check the available capacity in the tank before refuelling.
- Check hoses and valves regularly for signs of wear.
- Turn off valves after refuelling and lock them when not in use.
- Position drip trays under pumps to catch minor spills.
- Keep a spill kit with sand, earth or commercial products for containment of spillages.
- Provide incident response training for staff and contractors.

Storage areas for fuel and any other hazardous material shall be on an impervious or isolated (by use of chemical and puncture resistant separation membrane) base within a secondary containment system such as a bund. The base and bund walls should be impermeable to the material stored and able to contain at least 110% of the volume stored.

The storage area should be located above any flood water level (consider local topography – is the proposed store location within a local dip/low point?) and where possible away from high-risk locations (such as within 10 metres of a watercourse or 50 metres of a well, borehole or spring), to minimise the risk of a spill entering the water environment.

Detailed guidelines concerning above ground oil storage tanks can found in the EA's PPG 2 and PPG 26 documents.

A spill kit with sand, earth or commercial products that are approved for the stored materials, should be kept close to all storage areas. Site staff should be trained on how to use these correctly.

Damaged, leaking or empty drums should be removed from site immediately and disposed of via a registered waste disposal contractor.

6 Drainage Design

The layout of new and modified ditch routes is intended to reflect the existing site drainage characteristics while preserving flexibility for the design of the future development plots.

The existing land drainage network at the site performs well and was subject to a regular programme of inspection and maintenance during the life of the ROF. With the decommissioning of the ROF site, maintenance of the ditches has understandably become less frequent. Despite this, the network is still performing well which indicates that the existing layout and size of the ditches is adequate to serve the site. The remediation works provide the opportunity to re-establish a suitable maintenance programme and this is discussed in more detail in Section 7.

The existing ditches serving as land drainage for the site itself are fairly uniform in size and profile. The ditches tend to be in the order of 0.75m deep and 1m to 1.5m wide at the base with bank slopes between 1:1 and 1:2. Spacing varies but the ditches are generally around 100 metres apart. The new and temporary site drainage ditches for the remediation works will be sized and spaced in accordance with these proportions to mimic the existing regime.

The more important arterial ditch routes through the site are generally larger and deeper than the site drainage ditches. Where these routes are to be altered, the profile and capacity at the upstream and downstream connection locations will be confirmed. The new profile will be designed to ensure no loss of capacity along the new ditch length.

Culverts on retained watercourses will be opened up wherever possible although some new culverts/bridges may be required at plot access locations.

The site has a number of distinct existing sub-catchments and outfall routes as illustrated in Appendix A. As each phase is progressed during the proposed remediation works, the sub-catchments and outfall arrangements will be preserved as far as practicable in order to ensure no change to the existing drainage patterns downstream of the site.

The remediation earthworks will include the raising of ground levels generally across the site. Material will be graded to slight falls towards the retained/new/temporary ditches to reduce the occurrence of ponding.

The remediation works do not include any introduction of hardstanding areas. Conversely, existing buildings and hardstanding areas at the site are being demolished. Therefore, there will be no increase in runoff rates and volumes from the site as a result of the works. Hence, there is no requirement to limit discharge rates and provide attenuation storage. Storage for settlement will be provided as discussed in Section 5.4.

The detailed design of the drainage scheme will be carried out in preparation for the Land Drainage Consent application which will be made to the SDBC. This will include defining the exact locations, alignments, layouts, invert levels, crest/bank levels, channel profiles and gradients of each ditch, lagoon, culvert and structure within the scheme.

7 Maintenance Arrangements

The continued function of the land drainage network will depend upon adequate maintenance of each part of the drainage system. BAE Systems as the landowner will take responsibility for the maintenance of all parts of the drainage system within its land ownership. This responsibility will be clearly set out as part of any land conveyance agreement in the future.

Table 7-1 sets out the proposed maintenance activities and frequencies for the different types of drainage feature. This is based on best-practice guidance and adapted to the specific circumstances at the Energy Park site (subject to ecological constraints).

Feature	Schedule	Activity	Frequency
Ditches	Regular	Inspect throughout for blockages	Monthly
		Inspect throughout for silt accumulation	Fortnightly during construction reducing to bi-monthly upon completion
		Debris/litter removal	Monthly (in conjunction with inspection)
		Manage vegetation – mowing, strimming	As required during growing season
		Silt removal	Twice a year or as established during inspections
	Remedial/ Reactive	Inspect ion to review performance	After each heavy rainfall event
		Repair erosion damage – reinstate design levels and re-plant/re-seed	As required
		Remediate poor vegetation growth	Annually as required
		Safely remove and dispose of oils etc	As required
Lagoons	Regular	Inspect for silt accumulation	Monthly during construction reducing to quarterly upon completion
		Debris/litter removal	Monthly (in conjunction with inspection)
		Manage vegetation – mowing, strimming, removing nuisance plants	As required during growing season Meadow grass to be cut twice a year outside of nesting season Tidy dead growth and trim trees annually before growing season
		Silt removal	Annually or as established during inspections
	Remedial/ Reactive	Inspection to review performance	After each heavy rainfall event

Feature	Schedule	Activity	Frequency
		Repair erosion damage – reinstate design levels and re-plant/re-seed	As required
		Remediate poor vegetation growth	Annually as required
		Safely remove and dispose of oils etc	As required
Culverts and structures	Regular	Inspect for blockages	Monthly
		Inspect for silt accumulation, especially inlets	Fortnightly during construction reducing to bi-monthly upon completion
		Silt removal	Twice a year or as established during inspections
		Debris/litter removal	Monthly (in conjunction with inspection)
		Check mechanical devices – penstocks, flap valves etc	Twice a year
	Remedial/ Reactive	Inspect ion to review performance/condition	After each heavy rainfall event
		Repair/realign	As required

Table 7-1: Maintenance Schedule

The frequencies outlined in Table 7-1 should be subject to review over time and adjusted as required to ensure the maintenance regime remains balanced and effective.

Maintenance responsibilities outside the remediation site area (the ROF perimeter fence) will remain as at present.

8 Reference Documents

- Environment Agency Pollution Prevention Guidelines (PPGs – refer to http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx):
  - PPG 1: General guide to the prevention of water pollution
  - PPG 5: Works and maintenance in or near water
  - PPG 6: Working at construction and demolition sites
- CIRIA Guidance:
  - C532: Control of water pollution from construction sites – Guidance for consultants and contractors
  - C650: Environmental good practice on site (2nd edition)
- Huntspill Energy Park – Planning Documents:
  - Sedgemoor DC Decision Notice for the Remediation Application (42/11/00017) - June 2012
  - Remediation Implementation Plan – BAE Systems, November 2012
  - Energy Park Surface Water Management Strategy – PBA, April 2013
  - Addendum to Energy Park Surface Water Management Strategy – PBA, October 2013

Appendix A Plans

- Figure 1: Location Plan
- 18998-401-100 P1: Existing Layout and Drainage Patterns
- 11-07-14 Rev A: Illustrative Landscape Masterplan
- 18998-401-101 P1: Proposed Surface Water Management Strategy
- 18998-401-SK43 P3: Typical Sections

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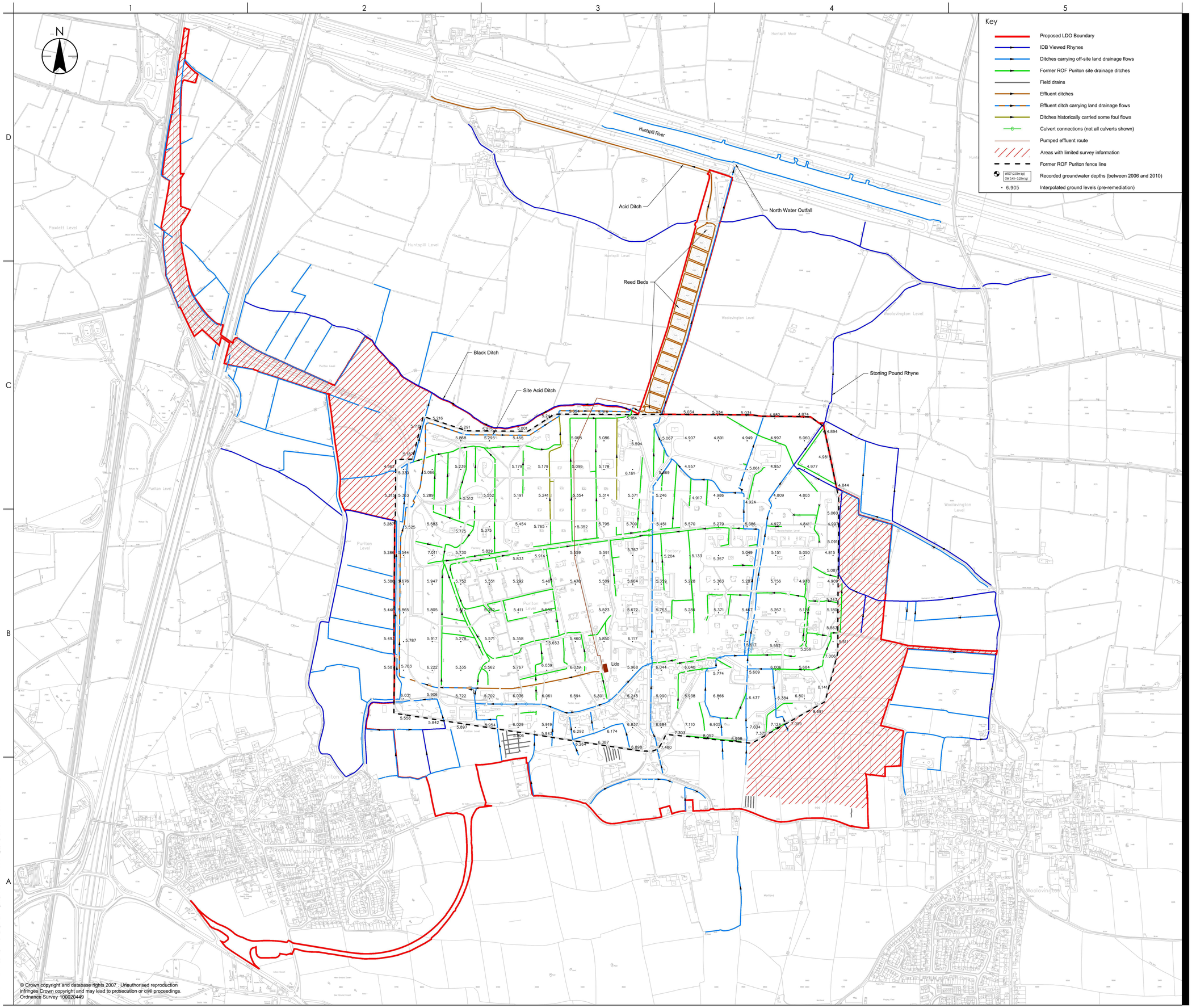
Appendix B Existing Drainage Conditions

332310092/4002/SK01 – Existing Drainage Conditions



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Notes

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

1. This drawing is to be read in conjunction with all other Engineer's and Architect's drawings.
2. All dimensions are in metres unless noted otherwise.
3. All levels are in metres above Ordnance Datum (AOD).
4. The location of ditches and rhynes has been determined based on Ordnance Survey data and topographical surveys undertaken by Lewis Brown Chartered Land Surveyors (ref: N07029, date: Sep 2007 and ref: B02002, date: Feb 2020).
5. Areas of the site where topographical survey information is limited are indicated and it is recommended that more detailed surveys of these areas are undertaken prior to detailed design works commencing.

Issued/Revision	By	Appd	YYYY.MM.DD
A REMOVED PROJECT GROVE PLATFORM BOUNDARY	TM	RAS	2021.10.15
	LWD	-	AJ	2021.08.19
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

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Title
Existing Drainage Conditions

Project No.
332310092

Scale
NTS

Revision
A

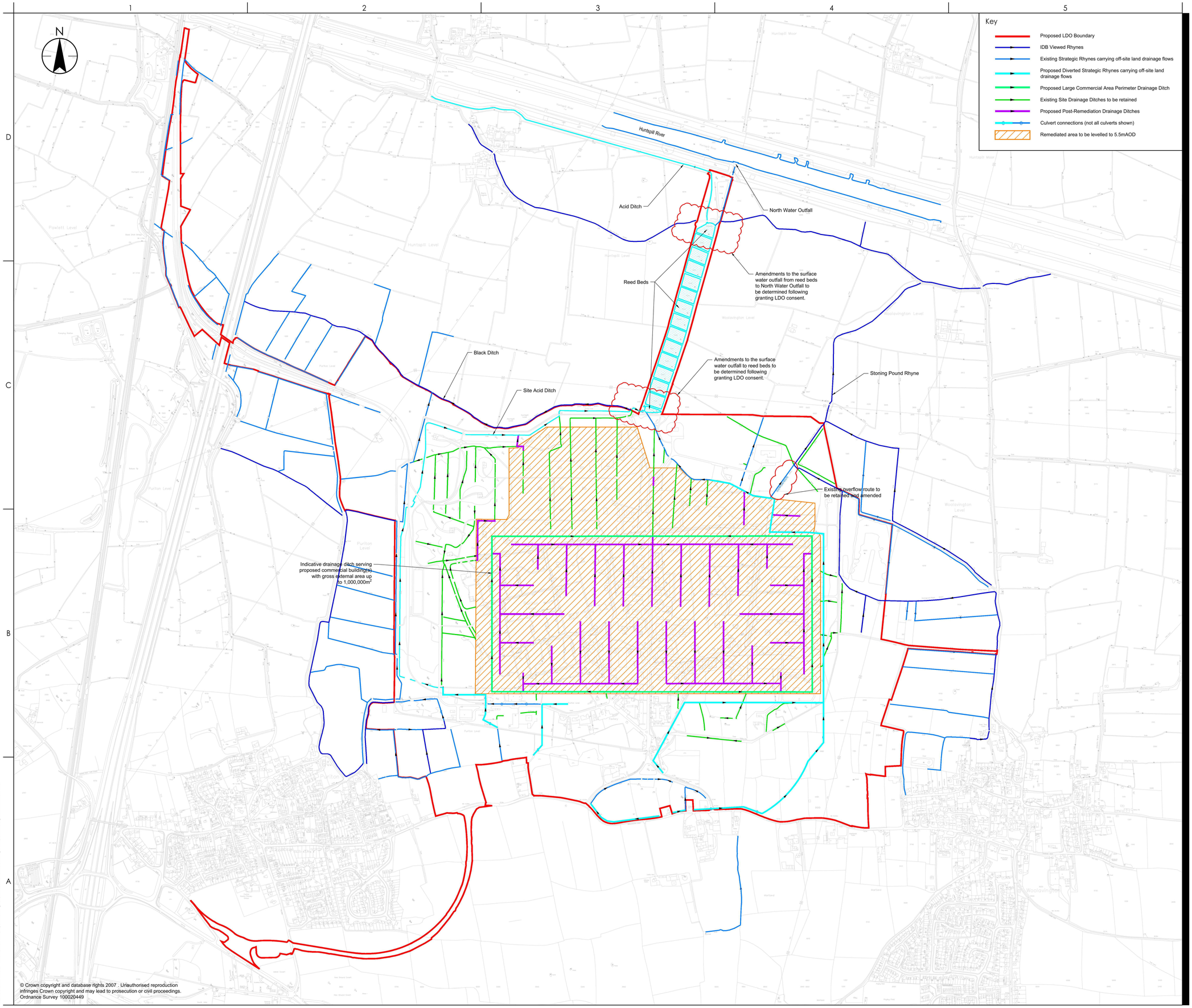
Drawing No.
332310092/4002/SK01

Appendix C Proposed Surface Water Drainage Strategy

332310102/4002/100 – Proposed Surface Water Drainage Post-Remediation

MicroDrainage Network Model Output

332310102/4002/SK04 – Proposed Surface water Drainage Strategy Model Schematic



Key

- Proposed LDO Boundary
- IDB Viewed Rhynes
- Existing Strategic Rhynes carrying off-site land drainage flows
- Proposed Diverted Strategic Rhynes carrying off-site land drainage flows
- Proposed Large Commercial Area Perimeter Drainage Ditch
- Existing Site Drainage Ditches to be retained
- Proposed Post-Remediation Drainage Ditches
- Culvert connections (not all culverts shown)
- Remediated area to be levelled to 5.5mAOD

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Notes

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1. This drawing is to be read in conjunction with all other Engineer's and Architect's drawings.
2. All dimensions are in metres unless noted otherwise.
3. All levels are in metres above Ordnance Datum (AOD).
4. The location of ditches and rhynes has been determined based on Ordnance Survey data and topographical surveys undertaken by Lewis Brown Chartered Land Surveyors (ref: N07029, date: Sep 2007 and ref: B02002, date: Feb 2020).
5. Proposed ground levels are not yet available, therefore the proposed ditch diversion routes have been based on the assumption that proposed ground levels will be amended to maintain gravity drainage.

	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	LWD	LWD	AJ / RS	2021.09.02

Issue Status

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Title

Proposed Surface Water Drainage Post-Remediation

Project No.	Scale
332310102	NTS

Revision	Drawing No.
-	332310102/4002/100

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ORIGINAL SHEET - ISO-A1 \\sim-vfs-001\Vol\projects\APH\02 gravity lots\4002 flood risk & drainage_to hydr\cad\dwgs\332310102-4002-100

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 391363 263985 SO 91363 63985
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	174.208	2.500	69.7	9.692	10.00	0.0	0.040	\/	-2	Pipe/Conduit	
S1.001	68.976	0.046	1499.5	0.488	0.00	0.0	0.040	\/	-5	Pipe/Conduit	
S1.002	50.644	0.204	248.3	0.000	0.00	0.0	0.040	\/	-3	Pipe/Conduit	
S1.003	49.705	1.000	49.7	0.000	0.00	0.0	0.040	\/	-3	Pipe/Conduit	
S2.000	23.605	0.500	47.2	8.180	10.00	0.0	0.040	\/	-2	Pipe/Conduit	
S1.004	41.249	0.750	55.0	0.000	0.00	0.0	0.040	\/	-3	Pipe/Conduit	
S1.005	53.899	0.750	71.9	0.000	0.00	0.0	0.040	\/	-3	Pipe/Conduit	
S1.006	27.034	1.250	21.6	0.000	0.00	0.0	0.040	\/	-3	Pipe/Conduit	
S1.007	26.281	2.652	9.9	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S3.000	43.816	1.000	43.8	7.418	10.00	0.0	0.040	\/	-2	Pipe/Conduit	
S3.001	80.001	4.750	16.8	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S3.002	18.710	0.250	74.8	0.263	0.00	0.0	0.040	\/	-2	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	11.33	15.750	9.692	0.0	0.0	0.0	2.18	6541.9	1312.4
S1.001	50.00	13.46	13.250	10.180	0.0	0.0	0.0	0.54	3244.2	1378.6
S1.002	50.00	14.14	13.204	10.180	0.0	0.0	0.0	1.23	4938.1	1378.6
S1.003	50.00	14.44	13.000	10.180	0.0	0.0	0.0	2.76	11035.8	1378.6
S2.000	50.00	10.15	12.500	8.180	0.0	0.0	0.0	2.65	7947.9	1107.7
S1.004	50.00	14.70	12.000	18.360	0.0	0.0	0.0	2.62	10491.3	2486.2
S1.005	50.00	15.10	11.250	18.360	0.0	0.0	0.0	2.29	9177.9	2486.2
S1.006	50.00	15.20	10.500	18.360	0.0	0.0	0.0	4.18	16730.4	2486.2
S1.007	50.00	15.28	9.250	18.360	0.0	0.0	0.0	5.78	17347.5	2486.2
S3.000	50.00	10.27	17.000	7.418	0.0	0.0	0.0	2.75	8250.0	1004.5
S3.001	50.00	10.57	16.000	7.418	0.0	0.0	0.0	4.44	13306.7	1004.5
S3.002	50.00	10.71	11.250	7.682	0.0	0.0	0.0	2.10	6312.5	1040.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.003	49.823	0.033	1509.8	0.000	0.00	0.0	0.040	\/	-5	Pipe/Conduit	
S3.004	10.958	0.007	1565.4	0.000	0.00	0.0	0.040	\/	-5	Pipe/Conduit	
S3.005	17.085	0.011	1553.2	0.000	0.00	0.0	0.040	\/	-5	Pipe/Conduit	
S3.006	24.982	0.948	26.4	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S3.007	13.386	0.250	53.5	0.183	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S3.008	22.523	0.500	45.0	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S3.009	127.759	0.750	170.3	0.194	0.00	0.0	0.040	\/	-4	Pipe/Conduit	
S3.010	86.536	1.750	49.4	1.885	0.00	0.0	0.040	\/	-4	Pipe/Conduit	
S3.011	163.547	0.109	1500.4	2.593	0.00	0.0	0.040	\/	-11	Pipe/Conduit	
S3.012	65.241	0.044	1482.8	1.973	0.00	0.0	0.040	\/	-11	Pipe/Conduit	
S1.008	78.844	0.053	1487.6	3.258	0.00	0.0	0.040	\/	-10	Pipe/Conduit	
S1.009	145.650	1.618	90.0	0.000	0.00	0.0	0.040	\/	-5	Pipe/Conduit	
S4.000	160.373	0.500	320.7	15.140	10.00	0.0	0.040	\/	-5	Pipe/Conduit	
S4.001	23.446	0.016	1465.4	0.000	0.00	0.0	0.040	\/	-7	Pipe/Conduit	
S4.002	24.295	0.016	1518.4	0.000	0.00	0.0	0.040	\/	-7	Pipe/Conduit	
S4.003	60.127	1.968	30.6	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S4.004	37.107	2.500	14.8	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S4.005	29.859	2.500	11.9	0.000	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S4.006	99.059	1.750	56.6	1.564	0.00	0.0	0.040	\/	-2	Pipe/Conduit	
S4.007	110.900	0.074	1498.6	1.330	0.00	0.0	0.040	\/	-8	Pipe/Conduit	
S5.000	41.040	1.574	26.1	0.000	5.00	0.0	0.040	\/	-1	Pipe/Conduit	
S4.008	22.176	0.015	1478.4	1.303	0.00	0.0	0.040	\/	-8	Pipe/Conduit	
S4.009	55.223	1.911	28.9	1.706	0.00	0.0	0.040	\/	-3	Pipe/Conduit	
S4.010	230.261	1.500	153.5	5.962	0.00	0.0	0.040	\/	-4	Pipe/Conduit	
S4.011	242.460	0.162	1496.7	3.475	0.00	0.0	0.040	\/	-10	Pipe/Conduit	
S4.012	242.460	0.162	1496.7	2.304	0.00	0.0	0.040	\/	-10	Pipe/Conduit	
S1.010	294.526	0.464	635.4	2.008	0.00	0.0	0.040	\/	-14	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)
S3.003	50.00	12.26	11.000	7.682	0.0	0.0	0.0	0.54	3233.1	1040.2
S3.004	50.00	12.60	10.967	7.682	0.0	0.0	0.0	0.53	3175.1	1040.2
S3.005	50.00	13.14	10.960	7.682	0.0	0.0	0.0	0.53	3187.6	1040.2
S3.006	50.00	13.25	10.949	7.682	0.0	0.0	0.0	3.55	10638.0	1040.2
S3.007	50.00	13.34	10.001	7.865	0.0	0.0	0.0	2.49	7463.0	1065.0
S3.008	50.00	13.48	9.751	7.865	0.0	0.0	0.0	2.71	8136.6	1065.0
S3.009	50.00	14.85	9.251	8.059	0.0	0.0	0.0	1.56	7780.6	1091.3
S3.010	50.00	15.35	8.501	9.944	0.0	0.0	0.0	2.89	14441.0	1346.5
S3.011	50.00	19.99	6.751	12.537	0.0	0.0	0.0	0.59	7046.2	1697.6
S3.012	50.00	21.83	6.642	14.510	0.0	0.0	0.0	0.59	7088.0	1964.8
S1.008	50.00	24.08	6.598	36.129	0.0	0.0	0.0	0.59	6435.4	4892.3
S1.009	50.00	25.18	6.545	36.129	0.0	0.0	0.0	2.21	13240.7	4892.3
S4.000	50.00	12.29	18.000	15.140	0.0	0.0	0.0	1.17	7014.5	2050.1
S4.001	50.00	12.97	17.500	15.140	0.0	0.0	0.0	0.57	4554.7	2050.1
S4.002	50.00	13.70	17.484	15.140	0.0	0.0	0.0	0.56	4474.4	2050.1
S4.003	50.00	14.00	17.468	15.140	0.0	0.0	0.0	3.29	9879.8	2050.1
S4.004	50.00	14.13	15.500	15.140	0.0	0.0	0.0	4.72	14174.7	2050.1
S4.005	50.00	14.23	13.000	15.140	0.0	0.0	0.0	5.27	15801.7	2050.1
S4.006	50.00	14.91	10.500	16.703	0.0	0.0	0.0	2.42	7258.4	2261.8
S4.007	50.00	18.15	8.750	18.033	0.0	0.0	0.0	0.57	5138.0	2441.9
S5.000	50.00	5.22	10.250	0.000	0.0	0.0	0.0	3.18	6351.5	0.0
S4.008	50.00	18.79	8.676	19.336	0.0	0.0	0.0	0.57	5173.1	2618.4
S4.009	50.00	19.04	8.661	21.042	0.0	0.0	0.0	3.62	14473.6	2849.4
S4.010	50.00	21.38	6.750	27.005	0.0	0.0	0.0	1.64	8196.2	3656.8
S4.011	50.00	28.31	5.250	30.480	0.0	0.0	0.0	0.58	6415.9	4127.4
S4.012	50.00	30.00	5.089	32.784	0.0	0.0	0.0	0.58	6415.9	4439.3
S1.010	50.00	30.00	4.927	70.921	0.0	0.0	0.0	1.05	19987.1	9603.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.011	294.662	0.464	635.7	6.089	0.00	0.0	0.040	\/	-14	Pipe/Conduit	
S1.012	54.568	0.036	1515.8	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.013	133.777	0.090	1486.4	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.014	117.224	0.124	945.4	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.015	76.058	0.043	1768.8	0.751	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.016	92.412	0.053	1743.6	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.017	75.260	0.043	1750.2	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.018	38.718	0.022	1759.9	3.137	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.019	10.530	0.006	1755.0	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.020	7.896	0.005	1579.2	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.021	5.390	0.003	1796.7	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.022	14.368	0.008	1796.0	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.023	37.467	0.021	1784.1	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.024	15.192	0.009	1688.0	4.129	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.025	10.836	0.006	1806.0	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.026	11.048	0.006	1841.3	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.027	26.547	0.015	1769.8	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.028	14.888	0.009	1654.2	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.029	50.033	0.029	1725.3	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S1.030	49.507	0.028	1768.1	0.000	0.00	0.0	0.040	\/	-15	Pipe/Conduit	
S6.000	550.262	0.366	1503.4	6.801	5.00	0.0	0.040	\/	-7	Pipe/Conduit	
S6.001	272.012	0.181	1502.8	0.000	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S6.002	272.012	0.181	1502.8	6.801	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S6.003	282.777	0.188	1504.1	6.775	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S6.004	282.777	0.188	1504.1	6.801	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S7.000	549.222	0.366	1500.6	6.801	5.00	0.0	0.040	\/	-7	Pipe/Conduit	
S7.001	272.012	0.091	2989.1	0.000	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S7.002	272.012	0.182	1494.6	6.801	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S7.003	277.485	0.232	1196.1	6.801	0.00	0.0	0.040	\/	-6	Pipe/Conduit	
S7.004	276.445	0.232	1191.6	6.801	0.00	0.0	0.040	\/	-6	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.011	50.00	30.00	4.464	77.010	0.0	0.0	0.0	1.05	19982.4	10428.1
S1.012	50.00	30.00	3.500	77.010	0.0	0.0	0.0	0.76	18796.0	10428.1
S1.013	50.00	30.00	3.464	77.010	0.0	0.0	0.0	0.77	18980.8	10428.1
S1.014	50.00	30.00	3.374	77.010	0.0	0.0	0.0	0.96	23800.5	10428.1
S1.015	50.00	30.00	3.250	77.761	0.0	0.0	0.0	0.70	17399.9	10529.8
S1.016	50.00	30.00	3.207	77.761	0.0	0.0	0.0	0.71	17525.0	10529.8
S1.017	50.00	30.00	3.154	77.761	0.0	0.0	0.0	0.71	17491.9	10529.8
S1.018	50.00	30.00	3.111	80.898	0.0	0.0	0.0	0.70	17443.7	10954.6
S1.019	50.00	30.00	3.089	80.898	0.0	0.0	0.0	0.71	17468.1	10954.6
S1.020	50.00	30.00	3.083	80.898	0.0	0.0	0.0	0.74	18414.7	10954.6
S1.021	50.00	30.00	3.078	80.898	0.0	0.0	0.0	0.70	17264.3	10954.6
S1.022	50.00	30.00	3.075	80.898	0.0	0.0	0.0	0.70	17267.5	10954.6
S1.023	50.00	30.00	3.067	80.898	0.0	0.0	0.0	0.70	17324.8	10954.6
S1.024	50.00	30.00	3.046	85.026	0.0	0.0	0.0	0.72	17811.4	11513.6
S1.025	50.00	30.00	3.037	85.026	0.0	0.0	0.0	0.70	17219.7	11513.6
S1.026	50.00	30.00	3.031	85.026	0.0	0.0	0.0	0.69	17053.7	11513.6
S1.027	50.00	30.00	3.025	85.026	0.0	0.0	0.0	0.70	17394.9	11513.6
S1.028	50.00	30.00	3.010	85.026	0.0	0.0	0.0	0.73	17992.3	11513.6
S1.029	50.00	30.00	3.001	85.026	0.0	0.0	0.0	0.71	17617.9	11513.6
S1.030	50.00	30.00	2.972	85.026	0.0	0.0	0.0	0.70	17403.2	11513.6
S6.000	50.00	21.32	5.350	6.801	0.0	0.0	0.0	0.56	4496.7	921.0
S6.001	50.00	29.52	4.984	6.801	0.0	0.0	0.0	0.55	3867.3	921.0
S6.002	50.00	30.00	4.803	13.602	0.0	0.0	0.0	0.55	3867.3	1841.9
S6.003	50.00	30.00	4.622	20.377	0.0	0.0	0.0	0.55	3865.6	2759.3
S6.004	50.00	30.00	4.434	27.178	0.0	0.0	0.0	0.55	3865.6	3680.3
S7.000	50.00	21.27	5.350	6.801	0.0	0.0	0.0	0.56	4500.9	921.0
S7.001	50.00	30.00	4.984	6.801	0.0	0.0	0.0	0.39	2742.1	921.0
S7.002	50.00	30.00	4.893	13.602	0.0	0.0	0.0	0.55	3878.0	1841.9
S7.003	50.00	30.00	4.711	20.403	0.0	0.0	0.0	0.62	4335.0	2762.9
S7.004	50.00	30.00	4.479	27.204	0.0	0.0	0.0	0.62	4343.1	3683.8

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.005	257.224	0.170	1513.1	0.000	0.00	0.0	0.040	\/	-11	Pipe/Conduit	
S6.006	129.778	0.362	358.5	0.000	0.00	0.0	0.040	\/	-11	Pipe/Conduit	
S1.031	2.873	0.002	1436.5	0.000	0.00	0.0	0.035	\/	-20	Pipe/Conduit	
S1.032	2.881	0.002	1440.5	0.000	0.00	0.0	0.035	\/	-20	Pipe/Conduit	
S1.033	11.659	0.007	1665.6	0.000	0.00	0.0	0.035	\/	-20	Pipe/Conduit	
S1.034	3.876	0.002	1938.0	0.000	0.00	0.0	0.035	\/	-20	Pipe/Conduit	
S1.035	2.832	0.002	1416.0	0.000	0.00	0.0	0.035	\/	-20	Pipe/Conduit	
S1.036	14.804	0.008	1850.5	0.000	0.00	0.0	0.035	\/	-20	Pipe/Conduit	
S1.037	9.386	0.005	1877.2	0.000	0.00	0.0	0.035	\/	-20	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)
S6.005	50.00	30.00	3.976	54.382	0.0	0.0	0.0	0.58	7016.6«	7364.1
S6.006	50.00	30.00	3.806	54.382	0.0	0.0	0.0	1.20	14415.0	7364.1
S1.031	50.00	30.00	2.944	139.409	0.0	0.0	0.0	0.91	29406.4	18877.7
S1.032	50.00	30.00	2.942	139.409	0.0	0.0	0.0	0.91	29365.6	18877.7
S1.033	50.00	30.00	2.940	139.409	0.0	0.0	0.0	0.85	27309.5	18877.7
S1.034	50.00	30.00	2.933	139.409	0.0	0.0	0.0	0.79	25317.4	18877.7
S1.035	50.00	30.00	2.931	139.409	0.0	0.0	0.0	0.92	29618.5	18877.7
S1.036	50.00	30.00	2.929	139.409	0.0	0.0	0.0	0.80	25909.0	18877.7
S1.037	50.00	30.00	2.921	139.409	0.0	0.0	0.0	0.80	25724.1	18877.7

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	27	35.897	9.692	9.692
1.001	User	-	100	0.488	0.488	0.488
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
2.000	User	-	27	30.296	8.180	8.180
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
3.000	User	-	27	27.475	7.418	7.418
3.001	-	-	100	0.000	0.000	0.000
3.002	User	-	100	0.263	0.263	0.263
3.003	-	-	100	0.000	0.000	0.000
3.004	-	-	100	0.000	0.000	0.000
3.005	-	-	100	0.000	0.000	0.000
3.006	-	-	100	0.000	0.000	0.000
3.007	User	-	100	0.183	0.183	0.183
3.008	-	-	100	0.000	0.000	0.000
3.009	User	-	100	0.194	0.194	0.194
3.010	User	-	100	1.380	1.380	1.380
	User	-	100	0.505	0.505	1.885
3.011	User	-	100	0.232	0.232	0.232
	User	-	100	0.771	0.771	1.003
	User	-	100	1.590	1.590	2.593
3.012	User	-	100	1.247	1.247	1.247
	User	-	100	0.727	0.727	1.973
1.008	User	-	100	0.214	0.214	0.214
	User	-	100	1.167	1.167	1.381
	User	-	100	1.878	1.878	3.258
1.009	-	-	100	0.000	0.000	0.000
4.000	User	-	27	56.073	15.140	15.140
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
4.003	-	-	100	0.000	0.000	0.000
4.004	-	-	100	0.000	0.000	0.000
4.005	-	-	100	0.000	0.000	0.000
4.006	User	-	100	1.564	1.564	1.564
4.007	User	-	100	1.330	1.330	1.330
5.000	-	-	100	0.000	0.000	0.000
4.008	User	-	100	1.303	1.303	1.303
4.009	User	-	100	1.706	1.706	1.706
4.010	User	-	100	3.344	3.344	3.344
	User	-	100	1.037	1.037	4.381
	User	-	100	1.581	1.581	5.962
4.011	User	-	100	2.475	2.475	2.475
	User	-	100	1.001	1.001	3.475
4.012	User	-	100	1.163	1.163	1.163
	User	-	100	0.757	0.757	1.920
	User	-	100	0.384	0.384	2.304
1.010	User	-	100	1.355	1.355	1.355
	User	-	100	0.654	0.654	2.008
1.011	User	-	100	6.089	6.089	6.089
1.012	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.000	0.000	0.000
1.015	User	-	100	0.751	0.751	0.751
1.016	-	-	100	0.000	0.000	0.000
1.017	-	-	100	0.000	0.000	0.000
1.018	User	-	100	3.137	3.137	3.137
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.000	0.000	0.000
1.024	User	-	100	4.129	4.129	4.129
1.025	-	-	100	0.000	0.000	0.000
1.026	-	-	100	0.000	0.000	0.000
1.027	-	-	100	0.000	0.000	0.000
1.028	-	-	100	0.000	0.000	0.000
1.029	-	-	100	0.000	0.000	0.000
1.030	-	-	100	0.000	0.000	0.000
6.000	User	-	100	6.801	6.801	6.801

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
6.001	-	-	100	0.000	0.000	0.000
6.002	User	-	100	6.801	6.801	6.801
6.003	User	-	100	6.775	6.775	6.775
6.004	User	-	100	6.801	6.801	6.801
7.000	User	-	100	6.801	6.801	6.801
7.001	-	-	100	0.000	0.000	0.000
7.002	User	-	100	6.801	6.801	6.801
7.003	User	-	100	6.801	6.801	6.801
7.004	User	-	100	6.801	6.801	6.801
6.005	-	-	100	0.000	0.000	0.000
6.006	-	-	100	0.000	0.000	0.000
1.031	-	-	100	0.000	0.000	0.000
1.032	-	-	100	0.000	0.000	0.000
1.033	-	-	100	0.000	0.000	0.000
1.034	-	-	100	0.000	0.000	0.000
1.035	-	-	100	0.000	0.000	0.000
1.036	-	-	100	0.000	0.000	0.000
1.037	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				248.719	139.409	139.409

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.037	S	0.000	2.916	0.000	0	0

Simulation Criteria for Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.100	Cv (Summer)	0.750
Return Period (years)	1	Ratio R	0.350	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

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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 0.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 391363 263985 SO 91363 63985 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2880
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	2	+0%					16.102	-0.648	0.000
S1.001	S2	15 Winter	2	+0%	100/15 Winter	100/15 Winter			13.730	-0.520	0.000
S1.002	S3	15 Winter	2	+0%					13.597	-0.607	0.000
S1.003	S4	15 Winter	2	+0%					13.241	-0.759	0.000
S2.000	S5	15 Winter	2	+0%					12.785	-0.715	0.000
S1.004	S6	15 Winter	2	+0%					12.341	-0.659	0.000
S1.005	S7	15 Winter	2	+0%					11.617	-0.633	0.000
S1.006	S8	15 Winter	2	+0%					10.757	-0.743	0.000
S1.007	S9	15 Winter	2	+0%					9.508	-0.742	0.000
S3.000	S10	15 Winter	2	+0%					17.261	-0.739	0.000
S3.001	S11	15 Winter	2	+0%					16.194	-0.806	0.000
S3.002	S12	15 Winter	2	+0%					11.566	-0.684	0.000
S3.003	S13	15 Winter	2	+0%					11.445	-0.555	0.000
S3.004	S14	15 Winter	2	+0%					11.354	-0.613	0.000
S3.005	S15	15 Winter	2	+0%					11.334	-0.626	0.000
S3.006	S16	15 Winter	2	+0%					11.169	-0.780	0.000
S3.007	S17	15 Winter	2	+0%					10.278	-0.723	0.000
S3.008	S18	15 Winter	2	+0%					10.013	-0.738	0.000
S3.009	S19	15 Winter	2	+0%					9.512	-0.739	0.000
S3.010	S20	30 Winter	2	+0%					8.686	-0.815	0.000
S3.011	S21	30 Winter	2	+0%	100/30 Winter	100/15 Summer			7.132	-0.619	0.000
S3.012	S22	30 Winter	2	+0%	100/15 Winter				7.085	-0.557	0.000
S1.008	S23	30 Winter	2	+0%	100/15 Summer				7.058	-0.540	0.000
S1.009	S24	30 Winter	2	+0%					6.878	-0.667	0.000
S4.000	S25	15 Winter	2	+0%		100/15 Winter			18.424	-0.576	0.000
S4.001	S26	15 Winter	2	+0%					17.978	-0.522	0.000
S4.002	S27	15 Winter	2	+0%					17.921	-0.563	0.000
S4.003	S28	15 Winter	2	+0%					17.790	-0.678	0.000
S4.004	S29	15 Winter	2	+0%					15.758	-0.742	0.000
S4.005	S30	15 Winter	2	+0%					13.241	-0.759	0.000
S4.006	S31	15 Winter	2	+0%					10.889	-0.611	0.000
S4.007	S32	30 Winter	2	+0%	100/15 Winter	100/15 Winter			9.201	-0.549	0.000
S5.000	S33	15 Summer	2	+0%					10.250	-1.000	0.000
S4.008	S34	30 Winter	2	+0%					9.072	-0.604	0.000
S4.009	S35	30 Winter	2	+0%					8.909	-0.752	0.000
S4.010	S36	30 Winter	2	+0%					7.111	-0.639	0.000
S4.011	S37	60 Winter	2	+0%					5.644	-0.606	0.000
S4.012	S38	60 Winter	2	+0%					5.464	-0.625	0.000
S1.010	S39	60 Winter	2	+0%					5.252	-0.675	0.000
S1.011	S40	60 Winter	2	+0%					4.781	-0.682	0.000
S1.012	S41	120 Winter	2	+0%					4.043	-0.957	0.000
S1.013	S42	120 Winter	2	+0%					3.980	-0.984	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.16			1050.4	OK	
S1.001	S2	0.26			1049.0	OK	2
S1.002	S3	0.20			1007.0	OK	
S1.003	S4	0.09			1001.8	OK	
S2.000	S5	0.12			901.8	OK	
S1.004	S6	0.16			1682.4	OK	
S1.005	S7	0.18			1670.9	OK	
S1.006	S8	0.11			1676.7	OK	
S1.007	S9	0.10			1678.1	OK	
S3.000	S10	0.10			817.8	OK	
S3.001	S11	0.06			817.6	OK	
S3.002	S12	0.13			846.1	OK	
S3.003	S13	0.21			826.8	OK	
S3.004	S14	0.20			805.2	OK	
S3.005	S15	0.29			800.3	OK	
S3.006	S16	0.08			802.8	OK	
S3.007	S17	0.11			809.1	OK	
S3.008	S18	0.11			807.6	OK	
S3.009	S19	0.10			790.3	OK	
S3.010	S20	0.06			855.1	OK	
S3.011	S21	0.11			920.5	OK	7
S3.012	S22	0.11			974.6	OK	
S1.008	S23	0.27			2124.3	OK	
S1.009	S24	0.16			2088.9	OK	
S4.000	S25	0.22			1575.5	OK	
S4.001	S26	0.37			1393.3	OK	
S4.002	S27	0.36			1378.6	OK	
S4.003	S28	0.14			1376.2	OK	
S4.004	S29	0.10			1374.8	OK	
S4.005	S30	0.09			1372.1	OK	
S4.006	S31	0.19			1393.3	OK	
S4.007	S32	0.22			1380.8	OK	2
S5.000	S33	0.00			0.0	OK	
S4.008	S34	0.32			1347.5	OK	
S4.009	S35	0.09			1373.5	OK	
S4.010	S36	0.18			1454.8	OK	
S4.011	S37	0.19			1481.9	OK	
S4.012	S38	0.18			1386.7	OK	
S1.010	S39	0.15			2965.3	OK	
S1.011	S40	0.15			2966.4	OK	
S1.012	S41	0.12			2846.1	OK	
S1.013	S42	0.12			2795.0	OK	

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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	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.014	S43	120 Winter	2	+0%					3.892	-0.982	0.000	0.11
S1.015	S44	120 Winter	2	+0%					3.817	-0.933	0.000	0.11
S1.016	S45	120 Winter	2	+0%					3.767	-0.940	0.000	0.11
S1.017	S46	120 Winter	2	+0%					3.712	-0.942	0.000	0.11
S1.018	S47	120 Winter	2	+0%					3.662	-0.949	0.000	0.12
S1.019	S48	120 Winter	2	+0%					3.624	-0.965	0.000	0.10
S1.020	S49	120 Winter	2	+0%					3.620	-0.963	0.000	0.07
S1.021	S50	120 Winter	2	+0%					3.617	-0.961	0.000	0.05
S1.022	S51	120 Winter	2	+0%					3.616	-0.959	0.000	0.14
S1.023	S52	120 Winter	2	+0%					3.608	-0.959	0.000	0.12
S1.024	S53	120 Winter	2	+0%					3.569	-0.977	0.000	0.14
S1.025	S54	120 Winter	2	+0%					3.558	-0.979	0.000	0.10
S1.026	S55	120 Winter	2	+0%					3.553	-0.978	0.000	0.10
S1.027	S56	120 Winter	2	+0%					3.547	-0.978	0.000	0.14
S1.028	S57	120 Winter	2	+0%					3.516	-0.994	0.000	0.14
S1.029	S58	120 Winter	2	+0%					3.505	-0.996	0.000	0.10
S1.030	S59	120 Winter	2	+0%					3.447	-1.025	0.000	0.10
S6.000	S60	15 Winter	2	+0%					5.731	-0.619	0.000	0.11
S6.001	S61	60 Winter	2	+0%					5.212	-0.772	0.000	0.06
S6.002	S62	120 Winter	2	+0%					5.094	-0.709	0.000	0.09
S6.003	S63	120 Winter	2	+0%					4.955	-0.667	0.000	0.13
S6.004	S64	120 Winter	2	+0%					4.769	-0.665	0.000	0.16
S7.000	S65	15 Winter	2	+0%					5.731	-0.619	0.000	0.11
S7.001	S66	60 Winter	2	+0%					5.236	-0.748	0.000	0.05
S7.002	S67	60 Winter	2	+0%					5.169	-0.724	0.000	0.08
S7.003	S68	60 Winter	2	+0%					5.026	-0.685	0.000	0.12
S7.004	S69	120 Winter	2	+0%					4.815	-0.664	0.000	0.16
S6.005	S70	120 Winter	2	+0%					4.328	-0.648	0.000	0.17
S6.006	S71	120 Winter	2	+0%					4.059	-0.747	0.000	0.10
S1.031	S72	120 Winter	2	+0%					3.381	-1.063	0.000	0.04
S1.032	S73	120 Winter	2	+0%		100/2880 Winter			3.367	-1.075	0.000	0.04
S1.033	S74	120 Winter	2	+0%					3.368	-1.072	0.000	0.11
S1.034	S75	120 Winter	2	+0%					3.335	-1.098	0.000	0.05
S1.035	S76	120 Winter	2	+0%					3.322	-1.109	0.000	0.04
S1.036	S77	120 Winter	2	+0%					3.322	-1.107	0.000	0.14
S1.037	S78	120 Winter	2	+0%					3.261	-1.160	0.000	0.09

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.014	S43			2675.3	OK	
S1.015	S44			2576.6	OK	
S1.016	S45			2512.2	OK	
S1.017	S46			2447.5	OK	
S1.018	S47			2417.2	OK	
S1.019	S48			2404.1	OK	
S1.020	S49			2400.6	OK	
S1.021	S50			2397.8	OK	
S1.022	S51			2395.4	OK	
S1.023	S52			2388.0	OK	
S1.024	S53			2384.4	OK	
S1.025	S54			2382.3	OK	
S1.026	S55			2380.4	OK	
S1.027	S56			2376.7	OK	
S1.028	S57			2369.7	OK	
S1.029	S58			2364.3	OK	
S1.030	S59			2348.7	OK	
S6.000	S60			586.1	OK	
S6.001	S61			264.0	OK	
S6.002	S62			419.6	OK	
S6.003	S63			595.2	OK	
S6.004	S64			763.8	OK	
S7.000	S65			613.0	OK	
S7.001	S66			245.9	OK	
S7.002	S67			378.6	OK	
S7.003	S68			567.8	OK	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S7.004	S69			766.5	OK	
S6.005	S70			1493.2	OK	
S6.006	S71			1470.3	OK	
S1.031	S72			3571.7	OK	
S1.032	S73			3563.5	OK	
S1.033	S74			3767.2	OK	
S1.034	S75			3657.4	OK	
S1.035	S76			3621.6	OK	
S1.036	S77			3765.3	OK	
S1.037	S78			3739.6	OK	

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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 0.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 391363 263985 SO 91363 63985 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2880
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	5	+0%					16.171	-0.579	0.000
S1.001	S2	15 Winter	5	+0%	100/15 Winter	100/15 Winter			13.818	-0.432	0.000
S1.002	S3	15 Winter	5	+0%					13.679	-0.525	0.000
S1.003	S4	15 Winter	5	+0%					13.293	-0.707	0.000
S2.000	S5	15 Winter	5	+0%					12.840	-0.660	0.000
S1.004	S6	15 Winter	5	+0%					12.411	-0.589	0.000
S1.005	S7	15 Winter	5	+0%					11.693	-0.557	0.000
S1.006	S8	15 Winter	5	+0%					10.812	-0.688	0.000
S1.007	S9	15 Winter	5	+0%					9.563	-0.687	0.000
S3.000	S10	15 Winter	5	+0%					17.316	-0.684	0.000
S3.001	S11	15 Winter	5	+0%					16.235	-0.765	0.000
S3.002	S12	15 Winter	5	+0%					11.626	-0.624	0.000
S3.003	S13	15 Winter	5	+0%					11.519	-0.481	0.000
S3.004	S14	15 Winter	5	+0%					11.414	-0.553	0.000
S3.005	S15	15 Winter	5	+0%					11.393	-0.567	0.000
S3.006	S16	15 Winter	5	+0%					11.219	-0.730	0.000
S3.007	S17	15 Winter	5	+0%					10.336	-0.665	0.000
S3.008	S18	15 Winter	5	+0%					10.070	-0.681	0.000
S3.009	S19	15 Winter	5	+0%					9.567	-0.684	0.000
S3.010	S20	30 Winter	5	+0%					8.725	-0.776	0.000
S3.011	S21	30 Winter	5	+0%	100/30 Winter	100/15 Summer			7.230	-0.521	0.000
S3.012	S22	30 Winter	5	+0%	100/15 Winter				7.188	-0.454	0.000
S1.008	S23	30 Winter	5	+0%	100/15 Summer				7.162	-0.436	0.000
S1.009	S24	30 Winter	5	+0%					6.953	-0.592	0.000
S4.000	S25	15 Winter	5	+0%		100/15 Winter			18.511	-0.489	0.000
S4.001	S26	15 Winter	5	+0%					18.060	-0.440	0.000
S4.002	S27	15 Winter	5	+0%					18.005	-0.479	0.000
S4.003	S28	15 Winter	5	+0%					17.856	-0.612	0.000
S4.004	S29	15 Winter	5	+0%					15.815	-0.685	0.000
S4.005	S30	15 Winter	5	+0%					13.296	-0.704	0.000
S4.006	S31	15 Winter	5	+0%					10.973	-0.527	0.000
S4.007	S32	30 Winter	5	+0%	100/15 Winter	100/15 Winter			9.288	-0.462	0.000
S5.000	S33	15 Summer	5	+0%					10.250	-1.000	0.000
S4.008	S34	30 Winter	5	+0%					9.150	-0.526	0.000
S4.009	S35	30 Winter	5	+0%					8.966	-0.695	0.000
S4.010	S36	30 Winter	5	+0%					7.193	-0.557	0.000
S4.011	S37	60 Winter	5	+0%					5.724	-0.526	0.000
S4.012	S38	60 Winter	5	+0%					5.541	-0.548	0.000
S1.010	S39	60 Winter	5	+0%					5.325	-0.602	0.000
S1.011	S40	60 Winter	5	+0%					4.850	-0.613	0.000
S1.012	S41	60 Winter	5	+0%					4.137	-0.863	0.000
S1.013	S42	60 Winter	5	+0%					4.070	-0.894	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.22			1426.7	OK	
S1.001	S2	0.36			1425.3	OK	2
S1.002	S3	0.28			1372.8	OK	
S1.003	S4	0.12			1370.7	OK	
S2.000	S5	0.16			1224.6	OK	
S1.004	S6	0.22			2304.1	OK	
S1.005	S7	0.25			2289.1	OK	
S1.006	S8	0.14			2296.5	OK	
S1.007	S9	0.13			2297.6	OK	
S3.000	S10	0.13			1110.5	OK	
S3.001	S11	0.08			1110.3	OK	
S3.002	S12	0.18			1148.9	OK	
S3.003	S13	0.28			1125.6	OK	
S3.004	S14	0.28			1104.9	OK	
S3.005	S15	0.41			1101.9	OK	
S3.006	S16	0.11			1101.5	OK	
S3.007	S17	0.15			1112.5	OK	
S3.008	S18	0.15			1113.3	OK	
S3.009	S19	0.14			1091.1	OK	
S3.010	S20	0.08			1178.8	OK	
S3.011	S21	0.15			1262.6	OK	7
S3.012	S22	0.16			1376.4	OK	
S1.008	S23	0.38			2972.6	OK	
S1.009	S24	0.22			2932.9	OK	
S4.000	S25	0.30			2139.2	OK	
S4.001	S26	0.51			1922.1	OK	
S4.002	S27	0.50			1909.0	OK	
S4.003	S28	0.19			1900.3	OK	
S4.004	S29	0.13			1901.7	OK	
S4.005	S30	0.12			1900.6	OK	
S4.006	S31	0.26			1922.0	OK	
S4.007	S32	0.30			1889.0	OK	2
S5.000	S33	0.00			0.0	OK	
S4.008	S34	0.45			1870.5	OK	
S4.009	S35	0.13			1910.9	OK	
S4.010	S36	0.25			2028.7	OK	
S4.011	S37	0.26			2025.9	OK	
S4.012	S38	0.24			1914.6	OK	
S1.010	S39	0.21			4131.2	OK	
S1.011	S40	0.21			4098.9	OK	
S1.012	S41	0.17			3961.6	OK	
S1.013	S42	0.17			3860.1	OK	

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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	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.014	S43	120 Winter	5	+0%					3.981	-0.893	0.000	0.15
S1.015	S44	120 Winter	5	+0%					3.907	-0.843	0.000	0.14
S1.016	S45	120 Winter	5	+0%					3.855	-0.852	0.000	0.14
S1.017	S46	120 Winter	5	+0%					3.796	-0.858	0.000	0.14
S1.018	S47	120 Winter	5	+0%					3.742	-0.869	0.000	0.16
S1.019	S48	120 Winter	5	+0%					3.700	-0.889	0.000	0.13
S1.020	S49	120 Winter	5	+0%					3.695	-0.888	0.000	0.10
S1.021	S50	120 Winter	5	+0%					3.692	-0.886	0.000	0.07
S1.022	S51	120 Winter	5	+0%					3.690	-0.885	0.000	0.18
S1.023	S52	120 Winter	5	+0%					3.682	-0.885	0.000	0.16
S1.024	S53	120 Winter	5	+0%					3.637	-0.909	0.000	0.19
S1.025	S54	120 Winter	5	+0%					3.627	-0.910	0.000	0.13
S1.026	S55	120 Winter	5	+0%					3.621	-0.910	0.000	0.14
S1.027	S56	120 Winter	5	+0%					3.615	-0.910	0.000	0.19
S1.028	S57	120 Winter	5	+0%					3.583	-0.927	0.000	0.19
S1.029	S58	120 Winter	5	+0%					3.570	-0.931	0.000	0.14
S1.030	S59	120 Winter	5	+0%					3.500	-0.972	0.000	0.14
S6.000	S60	15 Winter	5	+0%					5.809	-0.541	0.000	0.15
S6.001	S61	60 Winter	5	+0%					5.259	-0.725	0.000	0.07
S6.002	S62	60 Winter	5	+0%					5.154	-0.649	0.000	0.11
S6.003	S63	60 Winter	5	+0%					5.021	-0.601	0.000	0.17
S6.004	S64	60 Winter	5	+0%					4.831	-0.603	0.000	0.21
S7.000	S65	15 Winter	5	+0%					5.809	-0.541	0.000	0.15
S7.001	S66	60 Winter	5	+0%					5.291	-0.693	0.000	0.07
S7.002	S67	60 Winter	5	+0%					5.228	-0.665	0.000	0.11
S7.003	S68	60 Winter	5	+0%					5.093	-0.618	0.000	0.16
S7.004	S69	60 Winter	5	+0%					4.880	-0.599	0.000	0.21
S6.005	S70	60 Winter	5	+0%					4.387	-0.589	0.000	0.22
S6.006	S71	120 Winter	5	+0%					4.103	-0.703	0.000	0.13
S1.031	S72	240 Winter	5	+0%					3.394	-1.050	0.000	0.05
S1.032	S73	120 Winter	5	+0%		100/2880 Winter			3.387	-1.055	0.000	0.05
S1.033	S74	120 Winter	5	+0%					3.376	-1.064	0.000	0.14
S1.034	S75	120 Winter	5	+0%					3.357	-1.076	0.000	0.06
S1.035	S76	120 Winter	5	+0%					3.357	-1.074	0.000	0.05
S1.036	S77	120 Winter	5	+0%					3.351	-1.078	0.000	0.17
S1.037	S78	120 Winter	5	+0%					3.302	-1.119	0.000	0.11

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.014	S43			3454.6	OK	
S1.015	S44			3341.1	OK	
S1.016	S45			3269.3	OK	
S1.017	S46			3203.4	OK	
S1.018	S47			3183.5	OK	
S1.019	S48			3170.1	OK	
S1.020	S49			3169.0	OK	
S1.021	S50			3168.8	OK	
S1.022	S51			3168.2	OK	
S1.023	S52			3162.4	OK	
S1.024	S53			3158.9	OK	
S1.025	S54			3154.3	OK	
S1.026	S55			3154.8	OK	
S1.027	S56			3156.9	OK	
S1.028	S57			3156.5	OK	
S1.029	S58			3153.7	OK	
S1.030	S59			3167.7	OK	
S6.000	S60			805.5	OK	
S6.001	S61			345.2	OK	
S6.002	S62			542.3	OK	
S6.003	S63			783.3	OK	
S6.004	S64			996.3	OK	
S7.000	S65			830.4	OK	
S7.001	S66			334.4	OK	
S7.002	S67			501.7	OK	
S7.003	S68			774.3	OK	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S7.004	S69			1017.6	OK	
S6.005	S70			1923.6	OK	
S6.006	S71			1910.7	OK	
S1.031	S72			4288.4	OK	
S1.032	S73			4720.3	OK	
S1.033	S74			4622.8	OK	
S1.034	S75			4740.5	OK	
S1.035	S76			4661.3	OK	
S1.036	S77			4542.5	OK	
S1.037	S78			4568.2	OK	

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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 0.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 391363 263985 SO 91363 63985 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2880
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	10	+0%					16.236	-0.514	0.000
S1.001	S2	15 Winter	10	+0%	100/15 Winter	100/15 Winter			13.892	-0.358	0.000
S1.002	S3	15 Winter	10	+0%					13.748	-0.456	0.000
S1.003	S4	15 Winter	10	+0%					13.336	-0.664	0.000
S2.000	S5	15 Winter	10	+0%					12.890	-0.610	0.000
S1.004	S6	15 Winter	10	+0%					12.478	-0.522	0.000
S1.005	S7	15 Winter	10	+0%					11.764	-0.486	0.000
S1.006	S8	15 Winter	10	+0%					10.859	-0.641	0.000
S1.007	S9	15 Winter	10	+0%					9.610	-0.640	0.000
S3.000	S10	15 Winter	10	+0%					17.360	-0.640	0.000
S3.001	S11	15 Winter	10	+0%					16.272	-0.728	0.000
S3.002	S12	15 Winter	10	+0%					11.681	-0.569	0.000
S3.003	S13	15 Winter	10	+0%					11.579	-0.421	0.000
S3.004	S14	15 Winter	10	+0%					11.464	-0.503	0.000
S3.005	S15	15 Winter	10	+0%					11.444	-0.516	0.000
S3.006	S16	15 Winter	10	+0%					11.260	-0.689	0.000
S3.007	S17	15 Winter	10	+0%					10.383	-0.618	0.000
S3.008	S18	15 Winter	10	+0%					10.114	-0.637	0.000
S3.009	S19	15 Winter	10	+0%					9.612	-0.639	0.000
S3.010	S20	30 Winter	10	+0%					8.759	-0.742	0.000
S3.011	S21	30 Winter	10	+0%	100/30 Winter	100/15 Summer			7.321	-0.430	0.000
S3.012	S22	30 Winter	10	+0%	100/15 Winter				7.283	-0.359	0.000
S1.008	S23	30 Winter	10	+0%	100/15 Summer				7.255	-0.343	0.000
S1.009	S24	30 Winter	10	+0%					7.021	-0.524	0.000
S4.000	S25	15 Winter	10	+0%		100/15 Winter			18.586	-0.414	0.000
S4.001	S26	15 Winter	10	+0%					18.124	-0.376	0.000
S4.002	S27	15 Winter	10	+0%					18.069	-0.415	0.000
S4.003	S28	15 Winter	10	+0%					17.919	-0.549	0.000
S4.004	S29	15 Winter	10	+0%					15.864	-0.636	0.000
S4.005	S30	15 Winter	10	+0%					13.342	-0.658	0.000
S4.006	S31	15 Winter	10	+0%					11.046	-0.454	0.000
S4.007	S32	30 Winter	10	+0%	100/15 Winter	100/15 Winter			9.360	-0.390	0.000
S5.000	S33	15 Summer	10	+0%					10.250	-1.000	0.000
S4.008	S34	30 Winter	10	+0%					9.209	-0.467	0.000
S4.009	S35	30 Winter	10	+0%					9.014	-0.647	0.000
S4.010	S36	30 Winter	10	+0%					7.268	-0.482	0.000
S4.011	S37	60 Winter	10	+0%					5.796	-0.454	0.000
S4.012	S38	60 Winter	10	+0%					5.611	-0.478	0.000
S1.010	S39	60 Winter	10	+0%					5.391	-0.536	0.000
S1.011	S40	60 Winter	10	+0%					4.913	-0.551	0.000
S1.012	S41	60 Winter	10	+0%					4.228	-0.772	0.000
S1.013	S42	60 Winter	10	+0%					4.161	-0.803	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.28			1801.7	OK	
S1.001	S2	0.45			1775.5	OK	2
S1.002	S3	0.35			1725.3	OK	
S1.003	S4	0.16			1726.1	OK	
S2.000	S5	0.21			1546.3	OK	
S1.004	S6	0.28			2940.0	OK	
S1.005	S7	0.32			2914.1	OK	
S1.006	S8	0.18			2927.1	OK	
S1.007	S9	0.17			2930.5	OK	
S3.000	S10	0.17			1402.4	OK	
S3.001	S11	0.11			1402.1	OK	
S3.002	S12	0.23			1439.8	OK	
S3.003	S13	0.36			1409.3	OK	
S3.004	S14	0.35			1388.8	OK	
S3.005	S15	0.51			1390.9	OK	
S3.006	S16	0.13			1387.9	OK	
S3.007	S17	0.19			1392.4	OK	
S3.008	S18	0.19			1395.8	OK	
S3.009	S19	0.18			1367.3	OK	
S3.010	S20	0.10			1475.7	OK	
S3.011	S21	0.18			1568.3	OK	7
S3.012	S22	0.20			1731.6	OK	
S1.008	S23	0.49			3837.4	OK	
S1.009	S24	0.29			3787.4	OK	
S4.000	S25	0.39			2701.4	OK	
S4.001	S26	0.66			2474.5	OK	
S4.002	S27	0.64			2457.2	OK	
S4.003	S28	0.25			2438.4	OK	
S4.004	S29	0.17			2444.8	OK	
S4.005	S30	0.15			2447.5	OK	
S4.006	S31	0.34			2463.8	OK	
S4.007	S32	0.38			2418.2	OK	2
S5.000	S33	0.00			0.0	OK	
S4.008	S34	0.58			2412.8	OK	
S4.009	S35	0.17			2467.9	OK	
S4.010	S36	0.32			2607.0	OK	
S4.011	S37	0.33			2574.8	OK	
S4.012	S38	0.31			2438.6	OK	
S1.010	S39	0.27			5320.4	OK	
S1.011	S40	0.26			5151.6	OK	
S1.012	S41	0.21			4954.5	OK	
S1.013	S42	0.21			4831.6	OK	

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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	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.014	S43	60 Winter	10	+0%					4.071	-0.803	0.000	0.19
S1.015	S44	60 Winter	10	+0%					3.992	-0.758	0.000	0.19
S1.016	S45	60 Winter	10	+0%					3.935	-0.772	0.000	0.18
S1.017	S46	120 Winter	10	+0%					3.871	-0.783	0.000	0.17
S1.018	S47	120 Winter	10	+0%					3.813	-0.798	0.000	0.19
S1.019	S48	120 Winter	10	+0%					3.767	-0.822	0.000	0.16
S1.020	S49	120 Winter	10	+0%					3.762	-0.821	0.000	0.12
S1.021	S50	120 Winter	10	+0%					3.759	-0.819	0.000	0.09
S1.022	S51	120 Winter	10	+0%					3.757	-0.818	0.000	0.22
S1.023	S52	120 Winter	10	+0%					3.749	-0.818	0.000	0.20
S1.024	S53	120 Winter	10	+0%					3.700	-0.846	0.000	0.23
S1.025	S54	120 Winter	10	+0%					3.689	-0.848	0.000	0.17
S1.026	S55	120 Winter	10	+0%					3.684	-0.847	0.000	0.17
S1.027	S56	120 Winter	10	+0%					3.678	-0.847	0.000	0.23
S1.028	S57	120 Winter	10	+0%					3.645	-0.865	0.000	0.23
S1.029	S58	120 Winter	10	+0%					3.632	-0.869	0.000	0.17
S1.030	S59	120 Winter	10	+0%					3.554	-0.918	0.000	0.17
S6.000	S60	15 Winter	10	+0%					5.878	-0.472	0.000	0.19
S6.001	S61	60 Winter	10	+0%					5.305	-0.679	0.000	0.09
S6.002	S62	60 Winter	10	+0%					5.211	-0.592	0.000	0.14
S6.003	S63	60 Winter	10	+0%					5.087	-0.535	0.000	0.21
S6.004	S64	60 Winter	10	+0%					4.898	-0.536	0.000	0.27
S7.000	S65	15 Winter	10	+0%					5.878	-0.472	0.000	0.17
S7.001	S66	60 Winter	10	+0%					5.338	-0.646	0.000	0.09
S7.002	S67	60 Winter	10	+0%					5.278	-0.615	0.000	0.13
S7.003	S68	30 Winter	10	+0%					5.155	-0.556	0.000	0.20
S7.004	S69	60 Winter	10	+0%					4.948	-0.531	0.000	0.27
S6.005	S70	60 Winter	10	+0%					4.448	-0.528	0.000	0.28
S6.006	S71	60 Winter	10	+0%					4.144	-0.662	0.000	0.17
S1.031	S72	120 Summer	10	+0%					3.462	-0.982	0.000	0.06
S1.032	S73	120 Summer	10	+0%		100/2880 Winter			3.460	-0.982	0.000	0.06
S1.033	S74	120 Summer	10	+0%					3.459	-0.981	0.000	0.16
S1.034	S75	120 Summer	10	+0%					3.426	-1.007	0.000	0.07
S1.035	S76	120 Summer	10	+0%					3.425	-1.006	0.000	0.06
S1.036	S77	120 Summer	10	+0%					3.424	-1.005	0.000	0.21
S1.037	S78	120 Winter	10	+0%					3.330	-1.091	0.000	0.14

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.014	S43			4582.9	OK	
S1.015	S44			4379.1	OK	
S1.016	S45			4255.1	OK	
S1.017	S46			3971.1	OK	
S1.018	S47			3967.0	OK	
S1.019	S48			3947.7	OK	
S1.020	S49			3942.9	OK	
S1.021	S50			3936.5	OK	
S1.022	S51			3931.6	OK	
S1.023	S52			3933.0	OK	
S1.024	S53			3934.6	OK	
S1.025	S54			3931.5	OK	
S1.026	S55			3931.1	OK	
S1.027	S56			3926.4	OK	
S1.028	S57			3918.8	OK	
S1.029	S58			3923.1	OK	
S1.030	S59			3937.1	OK	
S6.000	S60			1043.7	OK	
S6.001	S61			438.2	OK	
S6.002	S62			668.0	OK	
S6.003	S63			996.5	OK	
S6.004	S64			1267.6	OK	
S7.000	S65			936.1	OK	
S7.001	S66			428.0	OK	
S7.002	S67			608.9	OK	
S7.003	S68			932.4	OK	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S7.004	S69			1285.0	OK	
S6.005	S70			2414.5	OK	
S6.006	S71			2380.3	OK	
S1.031	S72			5380.8	OK	
S1.032	S73			5440.6	OK	
S1.033	S74			5332.6	OK	
S1.034	S75			5293.3	OK	
S1.035	S76			5391.2	OK	
S1.036	S77			5443.2	OK	
S1.037	S78			5709.2	OK	

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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 0.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 391363 263985 SO 91363 63985 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2880
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	30	+0%					16.327	-0.423	0.000
S1.001	S2	15 Winter	30	+0%	100/15 Winter	100/15 Winter			14.009	-0.241	0.000
S1.002	S3	15 Winter	30	+0%					13.857	-0.347	0.000
S1.003	S4	15 Winter	30	+0%					13.403	-0.597	0.000
S2.000	S5	15 Winter	30	+0%					12.968	-0.532	0.000
S1.004	S6	15 Winter	30	+0%					12.574	-0.426	0.000
S1.005	S7	15 Winter	30	+0%					11.866	-0.384	0.000
S1.006	S8	15 Winter	30	+0%					10.933	-0.567	0.000
S1.007	S9	15 Winter	30	+0%					9.683	-0.567	0.000
S3.000	S10	15 Winter	30	+0%					17.431	-0.569	0.000
S3.001	S11	15 Winter	30	+0%					16.326	-0.674	0.000
S3.002	S12	15 Winter	30	+0%					11.767	-0.483	0.000
S3.003	S13	15 Winter	30	+0%					11.670	-0.330	0.000
S3.004	S14	15 Winter	30	+0%					11.538	-0.429	0.000
S3.005	S15	15 Winter	30	+0%					11.517	-0.443	0.000
S3.006	S16	15 Winter	30	+0%					11.319	-0.630	0.000
S3.007	S17	15 Winter	30	+0%					10.460	-0.541	0.000
S3.008	S18	15 Winter	30	+0%					10.187	-0.564	0.000
S3.009	S19	15 Winter	30	+0%					9.686	-0.565	0.000
S3.010	S20	30 Winter	30	+0%					8.814	-0.687	0.000
S3.011	S21	30 Winter	30	+0%	100/30 Winter	100/15 Summer			7.488	-0.263	0.000
S3.012	S22	30 Winter	30	+0%	100/15 Winter				7.444	-0.198	0.000
S1.008	S23	30 Winter	30	+0%	100/15 Summer				7.399	-0.199	0.000
S1.009	S24	30 Winter	30	+0%					7.125	-0.420	0.000
S4.000	S25	15 Winter	30	+0%		100/15 Winter			18.704	-0.296	0.000
S4.001	S26	15 Winter	30	+0%					18.219	-0.281	0.000
S4.002	S27	15 Winter	30	+0%					18.162	-0.322	0.000
S4.003	S28	15 Winter	30	+0%					18.012	-0.456	0.000
S4.004	S29	15 Winter	30	+0%					15.940	-0.560	0.000
S4.005	S30	15 Winter	30	+0%					13.413	-0.587	0.000
S4.006	S31	15 Winter	30	+0%					11.159	-0.341	0.000
S4.007	S32	30 Winter	30	+0%	100/15 Winter	100/15 Winter			9.469	-0.281	0.000
S5.000	S33	15 Summer	30	+0%					10.250	-1.000	0.000
S4.008	S34	30 Winter	30	+0%					9.298	-0.378	0.000
S4.009	S35	30 Winter	30	+0%					9.092	-0.569	0.000
S4.010	S36	30 Winter	30	+0%					7.384	-0.366	0.000
S4.011	S37	60 Winter	30	+0%					5.915	-0.335	0.000
S4.012	S38	60 Winter	30	+0%					5.725	-0.364	0.000
S1.010	S39	60 Winter	30	+0%					5.495	-0.432	0.000
S1.011	S40	60 Winter	30	+0%					5.015	-0.448	0.000
S1.012	S41	60 Winter	30	+0%					4.369	-0.631	0.000
S1.013	S42	60 Winter	30	+0%					4.301	-0.663	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.37			2438.4	OK	
S1.001	S2	0.61			2411.0	FLOOD RISK*	2
S1.002	S3	0.48			2351.1	OK	
S1.003	S4	0.21			2348.9	OK	
S2.000	S5	0.28			2092.4	OK	
S1.004	S6	0.38			4022.2	OK	
S1.005	S7	0.43			3991.8	OK	
S1.006	S8	0.25			4003.0	OK	
S1.007	S9	0.23			4009.5	OK	
S3.000	S10	0.23			1897.6	OK	
S3.001	S11	0.14			1897.2	OK	
S3.002	S12	0.31			1948.3	OK	
S3.003	S13	0.48			1913.1	OK	
S3.004	S14	0.48			1896.0	OK	
S3.005	S15	0.70			1894.5	OK	
S3.006	S16	0.18			1894.9	OK	
S3.007	S17	0.26			1903.6	OK	
S3.008	S18	0.25			1899.8	OK	
S3.009	S19	0.24			1867.5	OK	
S3.010	S20	0.14			2032.3	OK	
S3.011	S21	0.25			2146.1	FLOOD RISK*	7
S3.012	S22	0.28			2394.9	OK	
S1.008	S23	0.68			5327.9	OK	
S1.009	S24	0.40			5268.1	OK	
S4.000	S25	0.52			3655.8	FLOOD RISK*	
S4.001	S26	0.90			3405.4	FLOOD RISK*	
S4.002	S27	0.88			3377.4	OK	
S4.003	S28	0.34			3373.3	OK	
S4.004	S29	0.24			3364.6	OK	
S4.005	S30	0.21			3364.6	OK	
S4.006	S31	0.47			3414.6	OK	
S4.007	S32	0.53			3346.5	FLOOD RISK*	2
S5.000	S33	0.00			0.0	OK	
S4.008	S34	0.80			3369.7	OK	
S4.009	S35	0.24			3453.2	OK	
S4.010	S36	0.45			3685.6	OK	
S4.011	S37	0.46			3626.5	OK	
S4.012	S38	0.44			3432.6	OK	
S1.010	S39	0.37			7462.6	OK	
S1.011	S40	0.36			7186.4	OK	
S1.012	S41	0.29			6704.8	OK	
S1.013	S42	0.28			6563.4	OK	

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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.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.014	S43	60 Winter	30	+0%					4.211	-0.663	0.000	0.26
S1.015	S44	60 Winter	30	+0%					4.132	-0.618	0.000	0.26
S1.016	S45	60 Winter	30	+0%					4.070	-0.637	0.000	0.25
S1.017	S46	60 Winter	30	+0%					3.999	-0.655	0.000	0.25
S1.018	S47	60 Winter	30	+0%					3.931	-0.680	0.000	0.28
S1.019	S48	60 Winter	30	+0%					3.878	-0.711	0.000	0.23
S1.020	S49	60 Winter	30	+0%					3.873	-0.710	0.000	0.18
S1.021	S50	60 Winter	30	+0%					3.869	-0.709	0.000	0.13
S1.022	S51	60 Winter	30	+0%					3.866	-0.709	0.000	0.32
S1.023	S52	60 Winter	30	+0%					3.858	-0.709	0.000	0.28
S1.024	S53	60 Winter	30	+0%					3.800	-0.746	0.000	0.33
S1.025	S54	60 Winter	30	+0%					3.789	-0.748	0.000	0.24
S1.026	S55	60 Winter	30	+0%					3.782	-0.749	0.000	0.24
S1.027	S56	60 Winter	30	+0%					3.776	-0.749	0.000	0.33
S1.028	S57	60 Winter	30	+0%					3.740	-0.770	0.000	0.33
S1.029	S58	120 Winter	30	+0%					3.728	-0.773	0.000	0.23
S1.030	S59	120 Winter	30	+0%					3.640	-0.832	0.000	0.23
S6.000	S60	15 Winter	30	+0%					5.983	-0.367	0.000	0.24
S6.001	S61	60 Winter	30	+0%					5.380	-0.604	0.000	0.13
S6.002	S62	60 Winter	30	+0%					5.300	-0.503	0.000	0.18
S6.003	S63	60 Winter	30	+0%					5.191	-0.431	0.000	0.29
S6.004	S64	60 Winter	30	+0%					5.006	-0.428	0.000	0.37
S7.000	S65	15 Winter	30	+0%					5.983	-0.367	0.000	0.21
S7.001	S66	60 Winter	30	+0%					5.421	-0.563	0.000	0.13
S7.002	S67	30 Winter	30	+0%					5.364	-0.529	0.000	0.15
S7.003	S68	30 Winter	30	+0%					5.257	-0.454	0.000	0.27
S7.004	S69	60 Winter	30	+0%					5.053	-0.426	0.000	0.37
S6.005	S70	60 Winter	30	+0%					4.546	-0.430	0.000	0.38
S6.006	S71	60 Winter	30	+0%					4.214	-0.592	0.000	0.23
S1.031	S72	120 Winter	30	+0%					3.545	-0.899	0.000	0.08
S1.032	S73	120 Winter	30	+0%		100/2880 Winter			3.543	-0.899	0.000	0.09
S1.033	S74	120 Winter	30	+0%					3.542	-0.898	0.000	0.24
S1.034	S75	120 Winter	30	+0%					3.510	-0.923	0.000	0.10
S1.035	S76	120 Winter	30	+0%					3.507	-0.924	0.000	0.09
S1.036	S77	120 Winter	30	+0%					3.505	-0.924	0.000	0.31
S1.037	S78	120 Winter	30	+0%					3.396	-1.025	0.000	0.20

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.014	S43			6259.2	OK	
S1.015	S44			6014.7	OK	
S1.016	S45			5876.9	OK	
S1.017	S46			5748.6	OK	
S1.018	S47			5673.5	OK	
S1.019	S48			5638.5	OK	
S1.020	S49			5629.4	OK	
S1.021	S50			5626.5	OK	
S1.022	S51			5624.3	OK	
S1.023	S52			5610.9	OK	
S1.024	S53			5594.9	OK	
S1.025	S54			5588.8	OK	
S1.026	S55			5583.9	OK	
S1.027	S56			5578.0	OK	
S1.028	S57			5574.7	OK	
S1.029	S58			5288.7	OK	
S1.030	S59			5287.5	OK	
S6.000	S60			1324.7	OK	
S6.001	S61			597.2	OK	
S6.002	S62			874.0	OK	
S6.003	S63			1368.5	OK	
S6.004	S64			1762.4	OK	
S7.000	S65			1161.2	OK	
S7.001	S66			599.9	OK	
S7.002	S67			707.1	OK	
S7.003	S68			1278.0	OK	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S7.004	S69			1771.5	OK	
S6.005	S70			3296.2	OK	
S6.006	S71			3255.3	OK	
S1.031	S72			7896.8	OK	
S1.032	S73			8039.3	OK	
S1.033	S74			8085.9	OK	
S1.034	S75			8002.5	OK	
S1.035	S76			8071.7	OK	
S1.036	S77			8157.5	OK	
S1.037	S78			8105.3	OK	

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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 0.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 391363 263985 SO 91363 63985 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2880
Return Period(s) (years) 2, 5, 10, 30, 100
Climate Change (%) 0, 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	100	+40%					16.577	-0.173	0.000
S1.001	S2	15 Winter	100	+40%	100/15 Winter	100/15 Winter			14.262	0.012	12.148
S1.002	S3	15 Winter	100	+40%					14.148	-0.056	0.000
S1.003	S4	15 Winter	100	+40%					13.588	-0.412	0.000
S2.000	S5	15 Winter	100	+40%					13.175	-0.325	0.000
S1.004	S6	15 Winter	100	+40%					12.842	-0.158	0.000
S1.005	S7	15 Winter	100	+40%					12.155	-0.095	0.000
S1.006	S8	15 Winter	100	+40%					11.139	-0.361	0.000
S1.007	S9	15 Winter	100	+40%					9.885	-0.365	0.000
S3.000	S10	15 Winter	100	+40%					17.623	-0.377	0.000
S3.001	S11	15 Winter	100	+40%					16.474	-0.526	0.000
S3.002	S12	15 Winter	100	+40%					12.041	-0.209	0.000
S3.003	S13	15 Winter	100	+40%					11.955	-0.045	0.000
S3.004	S14	15 Winter	100	+40%					11.730	-0.237	0.000
S3.005	S15	15 Winter	100	+40%					11.708	-0.252	0.000
S3.006	S16	15 Winter	100	+40%					11.490	-0.459	0.000
S3.007	S17	15 Winter	100	+40%					10.668	-0.333	0.000
S3.008	S18	15 Winter	100	+40%					10.384	-0.367	0.000
S3.009	S19	15 Winter	100	+40%					9.890	-0.361	0.000
S3.010	S20	30 Winter	100	+40%					8.965	-0.536	0.000
S3.011	S21	30 Winter	100	+40%	100/30 Winter	100/15 Summer			7.764	0.013	14.112
S3.012	S22	30 Winter	100	+40%	100/15 Winter				7.718	0.076	0.000
S1.008	S23	30 Winter	100	+40%	100/15 Summer				7.688	0.090	0.000
S1.009	S24	30 Winter	100	+40%					7.474	-0.071	0.000
S4.000	S25	15 Winter	100	+40%		100/15 Winter			19.000	0.000	0.169
S4.001	S26	15 Winter	100	+40%					18.464	-0.036	0.000
S4.002	S27	15 Winter	100	+40%					18.403	-0.081	0.000
S4.003	S28	15 Winter	100	+40%					18.262	-0.206	0.000
S4.004	S29	15 Winter	100	+40%					16.147	-0.353	0.000
S4.005	S30	15 Winter	100	+40%					13.606	-0.394	0.000
S4.006	S31	30 Winter	100	+40%					11.458	-0.042	0.000
S4.007	S32	30 Winter	100	+40%	100/15 Winter	100/15 Winter			9.760	0.010	10.176
S5.000	S33	15 Summer	100	+40%					10.250	-1.000	0.000
S4.008	S34	30 Winter	100	+40%					9.530	-0.146	0.000
S4.009	S35	30 Winter	100	+40%					9.311	-0.350	0.000
S4.010	S36	30 Winter	100	+40%					7.707	-0.043	0.000
S4.011	S37	30 Winter	100	+40%					6.249	-0.001	0.000
S4.012	S38	60 Winter	100	+40%					6.047	-0.042	0.000
S1.010	S39	30 Winter	100	+40%					5.804	-0.123	0.000
S1.011	S40	60 Winter	100	+40%					5.304	-0.160	0.000
S1.012	S41	60 Winter	100	+40%					4.748	-0.252	0.000
S1.013	S42	60 Winter	100	+40%					4.683	-0.281	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.70			4591.9	FLOOD RISK*	
S1.001	S2	1.13			4498.2	FLOOD	2
S1.002	S3	0.90			4445.0	OK	
S1.003	S4	0.40			4430.6	OK	
S2.000	S5	0.52			3939.4	OK	
S1.004	S6	0.74			7730.7	FLOOD RISK*	
S1.005	S7	0.84			7704.5	FLOOD RISK*	
S1.006	S8	0.48			7682.9	OK	
S1.007	S9	0.45			7707.2	OK	
S3.000	S10	0.43			3572.7	OK	
S3.001	S11	0.27			3571.9	OK	
S3.002	S12	0.58			3662.5	FLOOD RISK*	
S3.003	S13	0.91			3616.0	FLOOD RISK*	
S3.004	S14	0.91			3601.5	OK	
S3.005	S15	1.32			3591.3	OK	
S3.006	S16	0.35			3597.4	OK	
S3.007	S17	0.48			3618.6	OK	
S3.008	S18	0.48			3617.0	OK	
S3.009	S19	0.46			3550.4	OK	
S3.010	S20	0.27			3927.6	OK	
S3.011	S21	0.49			4208.6	FLOOD	7
S3.012	S22	0.54			4624.7	FLOOD RISK*	
S1.008	S23	1.50			11763.8	SURCHARGED*	
S1.009	S24	0.87			11567.0	OK	
S4.000	S25	0.98			6878.1	FLOOD	
S4.001	S26	1.74			6557.1	FLOOD RISK*	
S4.002	S27	1.70			6545.8	FLOOD RISK*	
S4.003	S28	0.66			6524.6	FLOOD RISK*	
S4.004	S29	0.46			6533.8	OK	
S4.005	S30	0.41			6533.0	OK	
S4.006	S31	0.92			6668.6	FLOOD RISK*	
S4.007	S32	1.05			6604.4	FLOOD	2
S5.000	S33	0.00			0.0	OK	
S4.008	S34	1.60			6692.8	OK	
S4.009	S35	0.48			6881.0	OK	
S4.010	S36	0.91			7451.9	FLOOD RISK*	
S4.011	S37	0.93			7284.7	FLOOD RISK*	
S4.012	S38	0.88			6909.4	OK	
S1.010	S39	0.73			14545.9	OK	
S1.011	S40	0.72			14393.6	OK	
S1.012	S41	0.57			13149.1	FLOOD RISK*	
S1.013	S42	0.55			12837.7	OK	

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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.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.014	S43	60 Winter	100	+40%					4.588	-0.286	0.000	0.52
S1.015	S44	60 Winter	100	+40%					4.498	-0.252	0.000	0.52
S1.016	S45	60 Winter	100	+40%					4.424	-0.283	0.000	0.51
S1.017	S46	60 Winter	100	+40%					4.338	-0.316	0.000	0.50
S1.018	S47	60 Winter	100	+40%					4.253	-0.358	0.000	0.55
S1.019	S48	60 Winter	100	+40%					4.205	-0.384	0.000	0.47
S1.020	S49	60 Winter	100	+40%					4.196	-0.387	0.000	0.35
S1.021	S50	60 Winter	100	+40%					4.189	-0.389	0.000	0.25
S1.022	S51	60 Winter	100	+40%					4.184	-0.391	0.000	0.63
S1.023	S52	60 Winter	100	+40%					4.172	-0.395	0.000	0.56
S1.024	S53	60 Winter	100	+40%					4.119	-0.427	0.000	0.66
S1.025	S54	60 Winter	100	+40%					4.106	-0.431	0.000	0.47
S1.026	S55	60 Winter	100	+40%					4.097	-0.434	0.000	0.48
S1.027	S56	60 Winter	100	+40%					4.087	-0.438	0.000	0.66
S1.028	S57	60 Winter	100	+40%					4.055	-0.455	0.000	0.65
S1.029	S58	60 Winter	100	+40%					4.043	-0.458	0.000	0.48
S1.030	S59	60 Winter	100	+40%					3.933	-0.539	0.000	0.48
S6.000	S60	15 Winter	100	+40%					6.275	-0.075	0.000	0.38
S6.001	S61	60 Winter	100	+40%					5.630	-0.354	0.000	0.26
S6.002	S62	30 Winter	100	+40%					5.557	-0.246	0.000	0.31
S6.003	S63	30 Winter	100	+40%					5.485	-0.137	0.000	0.52
S6.004	S64	60 Winter	100	+40%					5.308	-0.126	0.000	0.73
S7.000	S65	15 Winter	100	+40%					6.275	-0.075	0.000	0.36
S7.001	S66	60 Winter	100	+40%					5.677	-0.307	0.000	0.26
S7.002	S67	30 Winter	100	+40%					5.621	-0.272	0.000	0.30
S7.003	S68	30 Winter	100	+40%					5.552	-0.159	0.000	0.52
S7.004	S69	60 Winter	100	+40%					5.352	-0.127	0.000	0.73
S6.005	S70	60 Winter	100	+40%					4.831	-0.145	0.000	0.74
S6.006	S71	60 Winter	100	+40%					4.416	-0.390	0.000	0.44
S1.031	S72	60 Winter	100	+40%					3.705	-0.739	0.000	0.17
S1.032	S73	60 Winter	100	+40%		100/2880 Winter			3.699	-0.743	0.000	0.17
S1.033	S74	60 Winter	100	+40%					3.696	-0.744	0.000	0.48
S1.034	S75	60 Winter	100	+40%					3.665	-0.768	0.000	0.20
S1.035	S76	60 Winter	100	+40%					3.657	-0.774	0.000	0.17
S1.036	S77	60 Winter	100	+40%					3.652	-0.777	0.000	0.61
S1.037	S78	60 Winter	100	+40%					3.571	-0.850	0.000	0.39

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.014	S43			12310.4	OK	
S1.015	S44			11945.2	FLOOD RISK*	
S1.016	S45			11711.8	OK	
S1.017	S46			11457.3	OK	
S1.018	S47			11282.1	OK	
S1.019	S48			11212.1	OK	
S1.020	S49			11195.0	OK	
S1.021	S50			11181.0	OK	
S1.022	S51			11170.2	OK	
S1.023	S52			11144.1	OK	
S1.024	S53			11094.2	OK	
S1.025	S54			11072.3	OK	
S1.026	S55			11066.5	OK	
S1.027	S56			11061.2	OK	
S1.028	S57			11039.8	OK	
S1.029	S58			11033.8	OK	
S1.030	S59			11018.9	OK	
S6.000	S60			2092.8	FLOOD RISK*	
S6.001	S61			1246.0	OK	
S6.002	S62			1448.2	OK	
S6.003	S63			2462.1	OK	
S6.004	S64			3473.4	OK	
S7.000	S65			2008.5	FLOOD RISK*	
S7.001	S66			1238.7	OK	
S7.002	S67			1421.0	OK	
S7.003	S68			2449.7	OK	

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

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S7.004	S69			3478.1	OK	
S6.005	S70			6404.6	OK	
S6.006	S71			6335.3	OK	
S1.031	S72			15968.4	OK	
S1.032	S73			15866.4	OK	
S1.033	S74			15949.7	OK	
S1.034	S75			15960.4	OK	
S1.035	S76			15916.5	OK	
S1.036	S77			15921.4	OK	
S1.037	S78			15929.1	OK	

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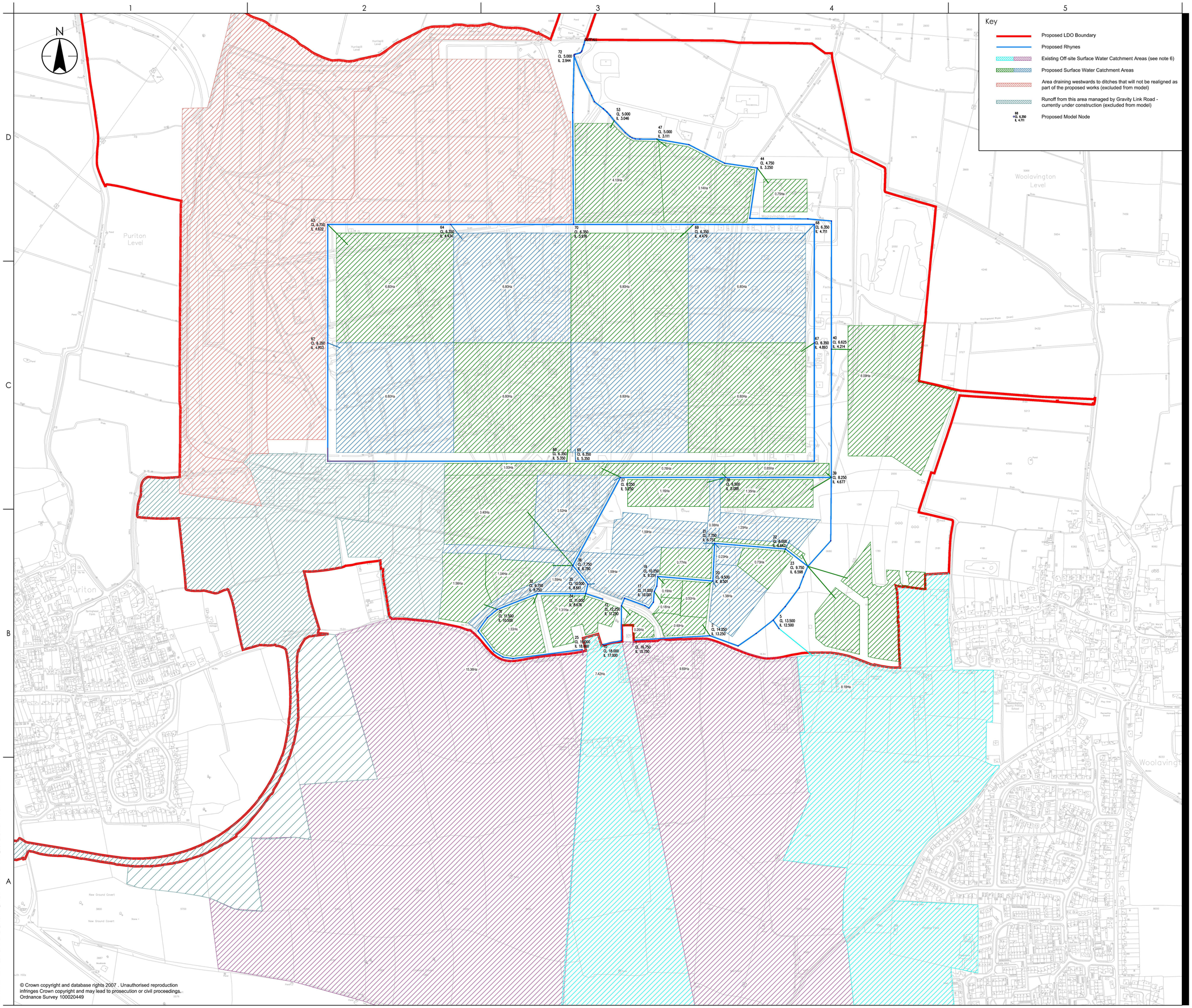

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Plotted: 18.08.2021 22:21:28, 18.3-24.0.2 File By: Groves, Dom
FIGURA.DWG ; GCA1 ; \\sirv-fp01\srv\projects\332310102 gravity ltd\A002 flood risk & drainage_to hwr\Civil\sketches\332310102-4002-sk04

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Notes

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

1. This drawing is to be read in conjunction with all other Engineer's and Architect's drawings.
2. All dimensions are in metres unless noted otherwise.
3. All levels are in metres above Ordnance Datum (AOD).
4. The location of ditches and rhynes has been determined based on Ordnance Survey data and topographical surveys undertaken by Lewis Brown Chartered Land Surveyors (ref: N07029, date: Sep 2007 and ref: B02002, date: Feb 2020).
5. Proposed ground levels are not yet available, therefore the proposed ditch diversion routes have been based on the assumption that proposed ground levels will be amended to maintain gravity drainage.
6. A Soil Percentage Runoff (SPR) value for off-site catchment areas has been calculated using Flood Estimation Handbook (FEH) data from the FEH Web Service. This has been calculated to be 27.45%.
7. Refer to drawing 332310102/4002/002 for Existing Off-Site Drainage Catchment Plan.
8. Proposed Cover Levels and Invert Levels are indicative based on an approximate MicroDrainage Model.
9. Proposed Impermeable Area's shown are taken at 100% Impermeability, except for existing catchments taken as 27.45% (as per note 6).

Issued/Revision	By	Appd	YYYY.MM.DD
	DG	DG	-	2021.08.10
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Issue Status

FOR INFORMATION

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Local Development Order

Former ROF Puriton, Somerset, United Kingdom

Title
PROPOSED SURFACE WATER DRAINAGE STRATEGY - MODEL SCHEMATIC

Project No.	Scale
332310102	NTS

Revision	Drawing No.
-	332310102/4002/SK04

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