Anglia Square, Norwich Proposed Surface Water Drainage Strategy Rev C

Weston Homes

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The content of this report is based on information available as of September 2022, the validity of the statements made may therefore vary over time as planning guidance / policies and the evidence base change.



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1 Introduction

- 1.1 A hybrid planning application (Ref. 22/00434/F) (the Application) was submitted by Weston Homes (the Applicant) to Norwich City Council (NCC) on 1st April 2022 for the comprehensive redevelopment of Anglia Square and various parcels of mostly open surrounding land, (the Site), as shown within a red line on drawing 'ZZ-00-DR-A-01-0200'. The Application comprised a full set of technical documents to assess the potential impacts of the proposals, including an EIA which covered a number of topics. In respect of SuDS Drainage Strategy, this was described and explained in the Surface Water Drainage Strategy Report (Rev B dated 01.04.2022). Please refer to the original documents for further details. NB: this version of the Surface Water Drainage Strategy Report supersedes previous issues and any Addendum letters and should be read in conjunction with the Flood Risk Assessment by Royal Haskoning DHV.
- 1.2 Application Ref. 22/00434/F follows a previous application on a somewhat smaller development parcel, (NCC Ref. 18/00330/F) made jointly by Weston Homes Plc as development partner and Columbia Threadneedle Investments, (CTI), the Site's owner, for a residential-led mixed use scheme consisting of up to 1,250 dwellings with decked parking, and 11,000 sqm GEA flexible ground floor retail/commercial/non-residential institution floorspace, hotel, cinema, multi-storey public car park, place of worship, and associated public realm and highway works. This was subject to a Call-in by the Secretary of State (PINS Ref. APP/G2625/V/19/3225505) who refused planning permission on 12th November 2020, (the 'Call in Scheme').
- 1.3 Following submission of the Application Ref. 22/00434/F, and completion of the statutory consultation exercise, amended application material (RevA) was submitted in July 2022 in response to consultation comments. Following completion of the second statutory consultation on the RevA material, the Applicant has worked with NCC to review the consultation responses received to identify an appropriate response where considered relevant. As a result of consideration of these comments, as well as ongoing discussions with NCC, some further minor amendments are now proposed which are summarised in the Planning Statement Addendum. The Amended Application material (RevB) submitted in September 2022 continues to seek consent for up to 1,100 dwellings and up to 8,000 Sqm (NIA) non-residential floorspace and associated development. However, since the amendments result in minor changes to the full development description, an updated version of the full Amended Application description is contained in **Appendix A** along with the Site Location Plan.
- 1.4 This update to the Surface Water Drainage Strategy Report sets out where necessary a response to the drainage related comments received on the Rev-A application material, then describes how the design has been developed and adapted as a result of these and other comments, and finally considers the implications of the changes to the scheme now proposed.
- 1.5 The proposed Outline/Full Planning Application Boundaries and Development Proposals are contained in **Appendix B.**
- 1.6 A summary of the drainage related comments on the Application are contained in Appendix
 C.

- 1.7 A separate report, undertaken by Royal Haskoning DHV, deals with the flood risk assessment, hydraulic modelling study and impact assessment and should be read in conjunction with this report.
- 1.8 The Application Description and Location Plan are contained in Appendix A.

2 Policy Framework and Pre-Application Comments

Local Policy

Greater Norwich Local Plan

- 2.1 The GNLP was submitted to the Secretary of Stage for independent examination on 30th July 2021. The emerging plan allocates the Anglia Square site (GNLP0506) for Mixed Use Allocation.
- 2.2 Emerging Policy: GNLP Policy 2 would be anticipated to reduce the risk of fluvial flooding that may arise as a result of development, through the requirement to carry out flood risk assessments, and incorporate sustainable drainage measures.
- 2.3 Emerging Policy : GNLP Policy 2 would be anticipated to mitigate the risk of surface water flooding that may arise as a result of development, through the requirement for development to incorporate sustainable drainage measures and contribute to the green infrastructure cover.
- 2.4 A SuDS drainage plan incorporating sustainable drainage (SuDS) is included in Section 7, detailing how surface water will be managed on the site and the rationale for the approaches used. Surface water runoff from the site will be restricted as far as possible to ensure that the risk of flooding both to the site and elsewhere is minimised, taking into account the effects of climate change.
- 2.5 This section sets out the policy context. This FRA is based on the advice set out in the National Planning Policy Framework (NPPF) published in July 2021, the Planning Practice Guidance (PPG) published March 2014, which is updated on an ad hoc basis and Annex 3: Flood risk vulnerability classification.

Development Management Policies Local Plan

2.6 The Development Management Policies Plan (DM policies) sets out policies which will apply across the whole city, as well as policies which apply in designated areas.

Policy DM5 – Planning effectively for flood resilience' details the policy for flooding, sustainable drainage and surface water flooding and surface treatment. The policy states:

"Developers will be required to show that the proposed development:

-would not increase the vulnerability of the site, or the wider catchment, to flooding from surface water run-off from existing or predicted water flows; and

-would, wherever practicable, have a positive impact on the risk of surface water flooding in the wider area.

Development must, as appropriate, incorporate mitigation measures to reduce surface water runoff, manage surface water flood risk to the development itself and to others, maximise the use of permeable materials to increase infiltration capacity, incorporate on-site water storage and make use of green roofs and walls wherever reasonably practicable.

The use of permeable materials, on-site rainwater storage, green roofs and walls will be required unless the developer can provide justification to demonstrate that this would not be practicable or feasible within the constraints or configuration of the site, or would compromise wider regeneration objectives."

2.7 The landscaping of the development in terms of surface water management is also considered in Policy DM5. This states:

"Development proposals will be required to maximise the use of soft landscaping and permeable surfacing materials unless the developer can provide justification to demonstrate that this is not feasible.

Where permission is required, proposals involving the provision of new or replacement paved and other impermeable surfaced areas will only be permitted:

-in areas of impermeable soils as identified in Appendix 1;

-in other areas where it can be demonstrated that permeable surfaces are not practicable due to poor soil infiltration capacity, high groundwater levels or risk of subsidence; and

-in areas with soils with average or good infiltration capacity, where it can be demonstrated that there is an exceptional and overriding justification for such surfaces.

In cases where poor soil infiltration capacity or other factors preclude the use of permeable surfacing materials, development proposals should seek to manage and minimise the impact of surface water run-off by suitable measures for water storage on-site."

2.8 A SuDS drainage plan incorporating sustainable drainage (SuDS) is included in Section 7, detailing how surface water will be managed on the site and the rationale for the approaches used. Surface water runoff from the site will be restricted as far as possible to ensure that the risk of flooding both to the site and elsewhere is minimised, taking into account the effects of climate change.

Natural England and Nutrient Neutrality Assessments

- 2.9 In In March 2022, Natural England issued a letter to Local Planning Authorities, Environment Agency and all Heads of Planning and Chief Executives to give advice for development proposals with the potential to affect water quality resulting in adverse nutrient impacts on habitats and sites. The letter provides advice on the assessment of new plans and projects under Regulation 63 of the Habitats Regulations. The purpose of that assessment is to avoid adverse effects occurring on habitats sites as a result of the nutrients released by those plans and projects. This advice does not address the positive measures that will need to be implemented to reduce nutrient impacts from existing sources, such as existing developments, agriculture, and the treatment and disposal of wastewater. It proposes that nutrient neutrality might be an approach that planning authorities wish to explore.
- 2.10 The following background is given:

"In freshwater habitats and estuaries, poor water quality due to nutrient enrichment from elevated nitrogen and phosphorus levels is one of the primary reasons for habitats sites being in unfavourable condition. Excessive levels of nutrients can cause the rapid growth of certain plants through the process of eutrophication. The effects of this look different depending on the habitat, however in each case, there is a loss of biodiversity, leading to sites

being in 'unfavourable condition'. To achieve the necessary improvements in water quality, it is becoming increasingly evident that in many cases substantial reductions in nutrients are needed. In addition, for habitats sites that are unfavourable due to nutrients, and where there is considerable development pressure, mitigation solutions are likely to be needed to enable new development to proceed without causing further harm.

In light of this serious nutrient issue, Natural England has recently reviewed its advice on the impact of nutrients on habitats sites which are already in unfavourable condition. Natural England is now advising that there is a risk of significant effects in more cases where habitats sites are in unfavourable condition due to exceeded nutrient thresholds. More plans and projects are therefore likely to proceed to appropriate assessment.

The principles underpinning HRAs are well established. At the screening stage, plans and projects should only be granted consent where it is possible to exclude, on the basis of objective information, that the plan or project will have significant effects on the sites concerned. Where it is not possible to rule out likely significant effects, plans and projects should be subject to an appropriate assessment. That appropriate assessment must contain complete, precise and definitive findings which are capable of removing all reasonable scientific doubt as to the absence of adverse effects on the integrity of the site.

Appropriate assessments should be made in light of the characteristics and specific environmental conditions of the habitats site. Where sites are already in unfavourable condition due to elevated nutrient levels, Natural England considers that competent authorities will need to carefully justify how further inputs from new plans or projects, either alone or in combination, will not adversely affect the integrity of the site in view of the conservation objectives. This should be assessed on a case-by-case basis through appropriate assessment of the effects of the plan or project. In Natural England's view, the circumstances in which a Competent Authority can allow such plans or projects may be limited. Developments that contribute water quality effects at habitats sites may not meet the no adverse effect on site integrity test without mitigation.

Mitigation through nutrient neutrality offers a potential solution. Nutrient neutrality is an approach which enables decision makers to assess and quantify mitigation requirements of new developments. It allows new developments to be approved with no net increase in nutrient loading within the catchments of the affected habitats site.

Where properly applied, Natural England considers that nutrient neutrality is an acceptable means of counterbalancing nutrient impacts from development to demonstrate no adverse effect on the integrity of habitats sites and we have provided guidance and tools to enable you to do this."

2.11 A Nutrient Neutrality Assessment is to be undertaken by others and will be submitted as part of this planning application.

3 Existing Site Assessment

Existing Site Description

- 3.1 The site is located at Anglia Square, Norwich and consists of a shopping precinct including stores such as Iceland and Boots and a former cinema. Large office blocks are also present at the site; the disused seven-storey Sovereign House which runs north-south along Botolph Street previously housed Her Majesty's Stationary Office (HMSO) and the under-utilised six-storey Gildengate House, built over shops underneath. The Full and Outline Application boundaries cover a combined area of 4.65ha which also includes some areas of adopted highway.
- 3.2 The existing site is almost entirely impermeable and is served by both private and adopted foul and surface water sewers. Surface water run-off is unrestricted and untreated and ultimately outfalls to the adopted sewer network to the south-east of the site. This is further evidenced and discussed below.

Site Levels

- 3.3 A site-specific topographical survey (including a utilities/drainage survey) is included in Appendix D. For the main Anglia Square site, levels vary between 5.09m AOD in the north west corner to 2.40m AOD at the existing access road from St Crispin's Road to the south of the site. Away from this low spot, levels in the south east corner of the site are in the region of 3.08m AOD. For the existing Anglia Square shopping centre, levels are around 3.51m AOD. The site slopes in a generally south easterly direction at a gradient of approximately 1:125.
- 3.4 The parcel north west of New Botolph Street slopes in a southerly direction, at a gradient of approximately 1:185 with the highest level to the north west of the site at 5.40m AOD and the lowest level at 5.11m AOD at the southern extent of the parcel. The site is approximately 0.35-0.4m higher than the carriageway of New Botolph Street/ Edward Street.
- 3.5 North of Edward Street the site slopes towards the north, at a gradient of approximately 1:100, with the highest point in the south west corner at a level of 4.27m AOD and the lowest point in the north at 3.87m AOD.

Sewer Network

- 3.6 Sewer records, obtained from Anglian Water and included in Appendix E, show there to be a 850mm/24" surface water sewer and 300mm foul sewer flowing in a south westerly direction through the site. It should be noted that a drainage survey of the surface water sewer crossing Anglia Square shows this to be a 675dia sewer and not 850dia/24" as indicated on the sewer records. For ease and in line with the gathered survey data, this sewer shall be referred to as 675dia throughout the remainder of this report.
- 3.7 A 300mm surface water sewer and 225mm foul sewer also run west to east with Edward Street, to the north of the main portion of the site. Both sewers connect to the respective foul and surface water sewers in Magdalen Street before flowing southwards with surface water sewers discharging into the River between Fye Bridge Street and Whitefriars Bridge.

- 3.8 A further 525mm combined sewer flows southwards along Magdalen Street. It is highly likely that surface water flows from the Dalymond Dyke flow within this sewer, given the location of the sewer and the available information on the Dalymond Dyke.
- 3.9 The sewer locations and sizes within the site boundary are shown in more detail on the topographical survey contained in Appendix D.

Pre-Development Run-off Rate

- 3.10 The total site area covers 4.65ha and is entirely brownfield comprising a shopping centre, office block, paved open spaces and car parks with some areas of landscaping and planting. The existing impermeable area (not including adopted highway) has been measured at 4.1768ha.
- 3.11 In order to calculate the brownfield (existing) surface water runoff rates from the proposed development site, a review of the Anglian Water sewer mapping, the topographical survey (including utility and drainage survey data) and CCTV drainage surveys was undertaken to determine the existing catchment areas and existing drainage features that serve the site.
- 3.12 The topographical survey is contained in Appendix D and Anglian Water Sewer Mapping is contained in Appendix E. A CCTV drainage survey, undertaken by Draincare Environmental Ltd is contained in Appendix F.
- 3.13 The CCTV drainage survey of the 675dia sewer crossing Anglia Square shows a number of incoming connections from the north and south of the sewer. These are summarised below and for ease, are clearly indicated on the last page of Appendix F.
 - Ex. Connection 1 outfall to 225dia sewer in Edward Street Edward Street Area 1 and page 48 of the cctv survey report in Appendix F.
 - Ex. Connection 2 outfall to 300dia sewer in Edward Street via 0458 Edward Street Area 2 and page 56 of the cctv survey report.
 - Ex. Connection 3 outfall to 675dia sewer at mh 0453 Plan 1 and page 32 of the cctv survey report in Appendix F.
 - Ex. Connections 4 to 9 outfalls to 675dia sewer between mhs 9460 and 9459 shown as junctions on page 45 of the cctv survey report.
 - Ex. Connection 10 outfall to 675dia sewer shown as junction on page 33 of the cctv survey report in Appendix F.
 - Ex. Connection 11 outfall to 675dia sewer see Plan 2, Plan 4 and page 13 of the cctv survey report in Appendix F.
 - Ex. Connection 12 outfall to 675dia sewer see Plan 3 and shown as junction on page 39 of the cctv survey report in Appendix F.
- 3.14 The CCTV drainage survey connections, when compared against the topographical/drainage survey verifies these connections and proves that the site is served by a private surface water drainage system that freely outfalls to the adopted sewer network, aside from the brown-coloured car park area shown on SK01-D in Appendix G.
- 3.15 In order to calculate the existing outfall rates, the LLFA in their consultation comments (ref FW2022_0423), requested that FEH Methods in line with CIRIA SuDS Manual C753 should be applied. Section 24.5 in the CIRIA SuDS Manual C753 discusses Peak Run-of Rates for Previously Developed Sites as below:

Runoff characteristics for a previously developed site can be estimated in a number of ways:

1 Any land that has been previously developed is likely to have had a system in place to drain surface water runoff from the site. This drainage system may or may not have included storage and flow control systems. Where any drainage system is still operational, peak flow rates at the outfall for the relevant return periods (usually 1:1 year, 1:30 year and 1:100 year) can be demonstrated by producing a simulation model that includes an accurate representation of the drainage system and site area contributions – thus allowing derivation of an appropriate head–discharge relationship at the outfall.

It is recognised that existing drainage systems will probably be overwhelmed for the 1:30 and 1:100 year events and therefore the actual rate of discharge from the site in such scenarios is likely to be increased by overland flow contributions or surcharging. However, these effects should not be accounted for, and the discharge limit should be based solely on the flow rate from the piped system (thus providing a conservative estimate).

- 3.16 As the topographical survey contains details of the existing drainage system, it is possible to produce a simulation model that includes an accurate representation of the drainage system and site area contributions thus allowing derivation of an appropriate head-discharge relationship at the outfall.
- 3.17 SK01-D in Appendix G shows the existing impermeable and permeable areas as well as the existing drainage systems serving the site and their catchment areas. The site is split into 8no. catchments areas. In their consultation comments (ref FW2022_0703) the LLFA requested that a section of landscaped area to the west of Area 4 (395m²) should be included in the brownfield runoff rates, as such, the greenfield runoff rate for this area shall be added to the calculations.
- 3.18 Greenfield Run-off Rates are discussed below. In order to avoid overestimation of brownfield runoff rates and provide a robust calculation, a brown-coloured car park area to the west of Area 3 (2814m²) is not included in the impermeable area as the drainage survey is incomplete and does not confirm where this area drains to. It would therefore be inappropriate to include this within the following calculations. The total contributing area for brownfield runoff is therefore 3.9577ha (including 395m² of landscaped area).
- 3.19 The CCTV Drainage survey and topographical drainage survey show that surface water runoff from the existing site (with the exception of the brown-coloured car park area of 2814m and landscaped areas of 1845m²) is directed adopted surface water sewers in Edward Street, the 675dia sewer crossing Anglia Square and the 36" sewer in Magdalen Street. Looking at SK01-D in Appendix G it can be determined:
 - Outfalls to Edward Street Sewer: Area 1 (around 50% of this catchment) to AWMH 0452 Area 2 (via a sewer in Beckham Place) to AWMH 0459 Area 3 to AWMH 0451 Area 4 to AWMH 0452
 - Outfalls to 675dia Sewer: Area 1 (around 50% of this catchment) via AWMH 9462 in St Augustin Street Area 5 to AWMH 1352 Area 7 to AWMH 0354 Area 8 to AWMH 9459
 - Outfalls to Magdalen Street sewer:

Area 6 to AWMH 1357

3.20 It is not possible to model a 1:1yr storm event with FEH data therefore, to ascertain what the equivalent 1:1yr outfall rate would be for an FEH storm, it is deemed appropriate to apply a percentage to the FEH calculated runoff. This percentage shall be based on runoff rates for a 1:1yr and 1:2yr storm event generated using FSR rainfall data using the formula below:

A FSR 1:1yr storm runoff is 20 l/s

A FSR 1:2yr storm runoff is 25 l/s

 $20 \div 25 = 0.8$

As such, the 1:1yr runoff rate is 80% of the 1:2yr runoff rate

- If the FEH 1:2yr storm runoff is 23 l/s the 1:1yr equivalent is 18.4 l/s
- 3.21 WINDES Microdrainage was used to model each existing catchment using FEH data for a range of storm events (whilst applying a MADD Factor of 0 as requested by the LLFA). As described above, FSR data was used to generate runoff rates for 1:1yr and 1:2yr storm events as a means to calculate a 1:1yr FEH equivalent. The hydraulic model results are contained in Appendix H and show brownfield runoff rate calculations for 1:1yr, 1:2yr, 1:30yr, 1:30yr+45%CC, 1:100yr and 1:100yr+45%CC rates.
- 3.22 1:1yr Brownfield Runoff Rates are summarised below and includes the greenfield runoff rate for the 395m² of landscaped area:

	Contributing	1:2 FEH	1:1 FSR	1:2 FSR	% 1:1 to 1:2	1:1 FEH
	Area (ha)	l/s	l/s	l/s	FSR	Equivalent l/s
Area 1	0.239	32.9	29.5	34.3	86.0	28.29
Area 2	0.125	25.1	18.5	24.1	76.8	19.27
Area 3	0.170	30.0	22.3	28.7	77.8	23.31
Area 4	0.352	61.0	45.4	58.1	78.1	47.67
Area 5	0.251	44.9	33.2	42.9	77.4	34.75
Area 6	0.105	16.4	12.7	15.8	80.4	13.18
Area 7	1.197	194.5	145.1	186.5	77.8	151.32
Area 8	1.479	209.1	164.1	200.8	81.7	170.88
395m2	0.0395					(REFH2 0.9
landscape						l/s/ha)
area						0.036
Total	3.957	613.9	470.8	591.2		488.706

- 3.23 The 1:1yr brownfield runoff rate for the site is therefore 488.706 l/s.
- 3.24 The 1:1yr brownfield runoff rate directed to the Edward Street Sewer is: 104.395 l/s.
- 3.25 The 1:1yr brownfield runoff rate directed to the 675dia sewer is: 371.131 l/s (including the green landscaped area).
- 3.26 The 1:1yr brownfield runoff rate directed to the Magdalen Street sewer is:13.18 l/s.

Pre-Development Storage Volumes

- 3.27 A simple analysis was carried out based on the topographical survey. The various sewers serving the existing site along with the diameters are shown on the topographic survey. These were measured and the available capacity in each sewer has been calculated. This analysis identified only the private sewers which outfall from the existing development to the adopted sewers but does not include the adopted sewers themselves or any outfall pipes from gullies or rainwater pipes. It is noted that there could be additional private sewers which haven't been picked up on the topographical survey so were not included in this analysis.
- 3.28 The storage volume available in the pipe network serving the existing brownfield site is as follows:

150dia @ 335.4m = 6.04m3 225dia @ 296.4m = 11.86m3 300dia @ 71.5m = 5.08m3 375dia @ 34.9m = 3.84m3

Assume 1m3 volume for each manhole. $37 \times \text{manholes} = 37\text{m}^3$

3.29 The total 'storage' volume available in the surface water sewers on the existing site is therefore approximately 63.82m3.

Existing Sewers, Diversions and Build-Overs

- 3.30 The proposals will require the adopted surface and foul water sewers which cross the site to be diverted. It is anticipated that a S185 Sewer diversion Application shall be made to Anglian Water which will preclude the need for any Build-Over Agreements. Further information on sewer diversions are contained in Section 4.
- 3.31 A number of private surface and foul water sewers serve the existing site. These sewers are not anticipated to be retained as part of the proposed surface water drainage strategy and will therefore be removed and new surface and foul water sewers provided. Removal/divestment of any sewers shall be agreed with Anglian Water as part of a S185 Application.

Greenfield Run-off Rates

- 3.32 The LLFA in their consultation comments (ref FW2022_0423 and FW2022_0703) request that greenfield runoff rates are provided and calculation using FEH rainfall data methods. Using hydraulic modelling software Causeway Flow, greenfield runoff rates for 1:1yr, 1:2yr, 1:30yr and 1:100yr storm events were calculated using FEH rainfall data and also using ReFH2 rainfall data. The results of which are contained in Appendix I, and show runoff rates for each proposed discrete drainage system as outlined in Section 4 of this report.
- 3.33 Causeway Flow (and also MicroDrainage) hydraulic modeling software does not generate greenfield runoff rates including Climate Change Allowance. Causeway Flow were contacted to ascertain how a Climate Change Allowance could be applied to the generated greenfield flow rate, but they were unable to confirm how this could be done. For the purpose of discussion, it is proposed to apply a growth-factor to the greenfield runoff rates. As such, for 45% Climate Change Allowance, for that storm event, the greenfield runoff rate shall be multiplied by 1.45. So for a 1:100yr greenfield runoff rate of 1.0 l/s to calculate a 1:100yr + 45% Climate Change event, 1.0 l/s shall be multiplied by 1.45 giving a rate of 1.45 l/s.

- 3.34 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, ReFH2 methods (5.9 litres per second per hectare), to the total application boundary (4.65ha) results in a rate of 27.435 l/s.
- 3.35 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, ReFH2 methods (5.9 litres per second per hectare), to the total proposed contributing area (4.7ha) results in a rate of 27.73 l/s (NB Total contributiong area includes some off-site adopteable highway for robustness).
- 3.36 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, FEH methods (2.9 litres per second per hectare), to the total application boundary (4.65ha) results in a rate of 13.485 l/s.
- 3.37 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, FEH methods (2.9 litres per second per hectare), to the total proposed contributing area (4.7ha) results in a rate of 13.63 l/s (NB Total contributiong area includes some off-site adopteable highway for robustness).
- 3.38 Outfall rates to be applied to the proposed surface water drainage strategy are discussed below.

4 **Proposed Drainage Strategy**

Relevant SuDS Policy

- 4.1 The NPPF states that, "using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management)".
- 4.2 SuDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood.
- 4.3 The SuDS management train incorporates a hierarchy of techniques and considers all three SuDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefit. In decreasing order of preference, the preferred means of disposal of surface water runoff is:
 - Discharge to ground.
 - Discharge to a surface water body.
 - Discharge to a surface water sewer.
 - Discharge to a combined sewer.
- 4.4 The philosophy of SuDS is to replicate as closely as possible the natural drainage from a site pre-development and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:
 - Reducing runoff rates, thus reducing the flood risk downstream.
 - Reducing pollutant concentrations, thus protecting the quality of the receiving water body
 - Groundwater recharge
 - Contributing to the enhanced amenity and aesthetic value of development areas.
 - Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Site Specific SuDS

4.5 The various SuDS methods need to be considered in relation to site-specific constraints. Several SuDS options are available to reduce or temporarily hold back the discharge of surface water runoff. Table 4.1 outlines the constraints and opportunities to each of the SuDS devices in accordance with the hierarchical approach outlined in The SuDS Manual CIRIA C753. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Roof Terraces and Roof Gardens are proposed as part of this development.	Yes
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Potential for high groundwater and contamination indicated due to brownfield site.	No
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Potential for high groundwater and contamination indicated due to brownfield site. Lined permeable paving is proposed in some pedestrian areas which are outside the main thoroughfares.	Yes
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the site by reusing water for non-potable uses e.g. toilet flushing, recycling processes.	Water butts are proposed for Block C and rainwater recycling for landlord use to wash-down bin stores is also proposed.	Yes
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Due to spatial constraints, swales are not proposed for conveyance and due to potential for high groundwater not proposed for infiltration.	No
Bioretention System	Shallow landscaped depression that can reduce runoff rates and volumes and treat pollution through engineered soils and vegetation.	Bioretention systems and tree- pits are proposed throughout the public realm and alongside highways where possible and where spatial constraints allow.	Yes
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Some areas of the site may be suitable for u se of filter drains, however no infiltration is expected to be viable due to contamination. Filter drains would therefore be lined and used for Water Quality purposes to filter waters prior to outfall.	Yes
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from run-off from adjacent areas.	Potential for high groundwater and contamination indicated due to brownfield site.	No
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	High density city centre site Potential for high groundwater and contamination indicated due to brownfield site.	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	High density city centre site so no landscaped areas for ponds and wetlands.	No
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	These are proposed as the SuDS listed above will not achieve sufficient volumes to restrict to the required rate. This is likely to be used alongside other means of attenuation at the site to provide the required storage volume.	Yes

Table 4.1: Site Specific Sustainable Drainage

Site Specific SuDS

4.6 Where possible, rainwater harvesting features shall be incorporated in the proposals where it is suitable to do so. The suitability of rainwater harvesting features has been considered against the Environment Agency's Energy and carbon implications of rainwater harvesting and greywater recycling (Report: SC090018), available here: scho0610bsmq-e-e.pdf (publishing.service.gov.uk), which summarises its key findings as follows:

1. Buildings using harvested rainwater or treated greywater typically increase greenhouse gas emissions compared to using mains water, where total cradle to gate embodied and operational carbon are considered. For example over 30 years, where an 'average' 90m2 house has a RWH system with a polyethylene tank, the total carbon footprint is approximately 1.25 – 2 tonnes of carbon dioxide equivalent (CO2e). This is similar to one year of energy-related emissions from a house built to Code for Sustainable Homes Level 3 energy efficiency standards. The footprints of systems applied to commercial buildings vary widely, but over a 30 year lifespan were found to represent around one month's operational energy-related emissions in the hotel, office and schools studied.

2. With one exception, the operational energy and carbon intensities of the systems studied were higher than for mains water by around 40 per cent for a typical rainwater application, and over 100 per cent for most greywater applications. The exception is short retention greywater systems which are around 40 per cent less carbon intensive than mains water supply. The assumed operational intensities of rainwater and greywater systems are based on the limited measured data and information available to this study.

3. There is scope to improve the efficiency and design of systems to reduce their carbon footprints. Storage tanks account for a large proportion of the embodied carbon footprint of rainwater systems; slightly less so for greywater. Pumps also make up a large proportion of rainwater and greywater embodied carbon and pumping determines net operational carbon. Direct feed rainwater systems have a large operational footprint because both rainwater and mains backup are pumped to end uses via the storage tank. Innovation in these and other areas could reduce carbon footprints. Manufacturers and suppliers should work quickly to reduce the footprints of their systems, and particularly to reduce the energy intensity of pumps and treatment systems."

- 4.7 Taking the above into consideration, the proposals do not allow for rainwater harvesting for mixed-use areas as rainwater harvesting would need to be pumped for re-use. There is scope to provide suitable rainwater harvesting where the use of pumps is not required, this will be in the form of water-butts for individual properties and for above ground tanks to serve bin-wash down areas for mixed-use buildings.
- 4.8 The developer was asked to consider rainwater re-use for toilets in the Community Centre in Block D. An assessment on required tank size was undertaken using the calculator on www.rainwaterharvesting.co.uk/tank-size-calcuator/. Based on an average 25 flushes per day (considered to be a conservative estimate of use) and a contributing roof area of 265m2 (the non-green-roof-area of Block D), it is concluded that not enough rainwater is generated to make this viable, see screen-shot below. This also concludes that a rainwater harvesting

tank of volume 15,000 litres would be required (or 15m3) for which there is not space to provide within the community centre.

HOW CAN RAINWATER HARVESTING HELP WITH HOSEPIPE BANS	COLLECTA	BLE RO	OF AF	REA (M ²)					
WATER NEUTRALITY AND RAINWATER	Main Building	Width:	26.5	Length:	10	Rain Collection Area:		265	
HARVESTING	Extension one	Width:		Length:		Rain Collection Area:		0	
SHALLOW VS DEEP DIG – CONSIDERATIONS WHEN INSTALLING YOUR RAINWATER HARVESTING TANK	Extension Two	Width:		Length:		Rain Collection Area:		0	
WILL WE LEARN FROM THE ENERGY CRISIS	Extension Three	Width:		Length:		Rain Collection Area:		0	
OF TODAY?	Or the total roof are	ea, if you alre	ady know it	2	0	Total area of collectable roof space	:e:	265	
RAINWATER HARVESTING REGULATIONS IN THE UK – WHAT YOU NEED TO KNOW	Select Your Region		England	ł	•	Average rainfall per year in your r	region:	71	
BEFORE INSTALLATION	Collectable rainwa	ater per ann	um in litres	- discounted	by 20% to	account for water loss		150520	
	USE OF RA				ILDIN	G	people:	bedroon	ns.
	Number of people of	or bedrooms	in the build	ing -			25	0	
	Number of o	clothes was	ning cycles	per day (<i>50</i>)	itres eacl	7)	0.00 Cycles	0.00	
	 Number of t 	toilet flushe	s per day (4.42 flushes j	per perso	n, average 5 litres each)	110.50 Flushes	552.50	,
	Outdoor use in litre	s, per person	per day (<i>re</i>	commended 5	litres per	person per day)	0	0.00	
	Amount of water yo	ou require eve	ery day					552.5	
	Amount of water y	ou require (every year				DEMAND	201663	2
	FINAL FIGU	RES							
	How many days drou	ight protectio	n do you ne	ed? Typically 2	1 (18 minir	num)	21		
	Capacity of water stor	rage in litres	required for	r drought prote	ction		11602	.50	ι
	The lesser of YIELD (b	olue) or DEMA	ND (green)	per annum			15052	D	ι
	Therefore, volume o	of rainwater	storage red	quired			8660		1
		ON							

4.9 The following assessment therefore forms the basis of Rainwater Harvesting features that could be viable at the proposed development site for each Block:

Block	Description	Constraints / Comments	Appropriate
Block A – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be ocated within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block B – Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	There is potential for individual owners of the terraced houses within this Block to install a system in the future, however for commercial reasons it is not proposed for these residential units at this planning stage. It is not expected there will be opportunity for the leaseholder of the apartment block in Block B to retrofit rainwater harvesting however.	No
Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater Water-Butts are to be incorporated for the terraced houses along the northern boundary of Block B.	Yes
llock C – Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	For commercial and maintenance/management reasons it is not proposed to provide rainwater reuse for toilets for the apartment units at this planning stage.	No
Full Planning)	The use of filtered rainwater for reuse at	Not possible for this Block due to possible leaseholder issues.	No
Block D – Commercial and Residential.	outside taps. The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash-	Yes
	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No

Block E – Commercial and Residential. (Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block F – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block G – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block H – Commercial and Residential. Outline Planning)	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to	No

Block J — Commercial and Residential.		deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	
(Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block J3 – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block K/L – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block M – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes

Table 4.2: Site Specific Rainwater Harvesting

Post- Development Run-off Rate

- 4.10 Given the potentially high groundwater and contamination of the site, infiltration is not recommended. The Royal Haskoning DHV FRA Report (Section 7.11, Table 5) discusses borehole data and shows historic groundwater borehole information showing a winter (January 1993) groundwater level of 2.40m bgl and a spring (May 1993) groundwater level of 4.40m bgl. The relatively high groundwater levels precludes the use of infiltration devices. There are no nearby watercourses to which a connection could be made, and therefore it is proposed that the development will drain to the existing Anglian Water surface water network in the vicinity of the site (matching the existing situation), however at a restricted discharge rate in order to provide a betterment.
- 4.11 The greenfield runoff rates provided in Section 3 above are very low due to the local geology of chalk. However, in reality the site is almost entirely impermeable, historical mapping shows the site has been developed since at least 1885 and has been a shopping/town centre for many years. The site is Brownfield and it is therefore considered appropriate to review the existing run-off rates with a view to provide a betterment. Using greenfield run-off rates for a site which has been brownfield for over 137 years is inappropriate and would result in excessive attenuation volumes and therefore tank sizes, which could have impacts on other features such as the local archaeology, groundwater and geology.
- 4.12 S3 of the Non-Adoptable Technical Standards for Sustainable Drainage Systems (2015) states: For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event."
- 4.13 As discussed in para. 3.32 above, the 1:100yr + 45% Climate Change greenfield runoff rate for the entire application site (4.65ha) is 27.435 l/s. An assessment of whether it is practicable to restrict flows from the development site to match greenfield runoff rates was undertaken by applying the greenfield runoff rate for the entire application boundary of 27.435 l/s to the largest proposed catchment Block A, M, K/L and J3. Using WINDES Microdrainage Source Control, the storage volume, using greenfield runoff rate was calculated at: 832.9m3 requiring a geocellular storage device size of 525m2 x 1.67m x 95% voids. When allowing for a proposed outfall rate of 65 l/s (based on a reduced brownfield/existing run-off rate), the storage volume requirement is calculated as 682.2m3 requiring a geocellular storage device size of 430m2 x 1.67m x 95% voids. This is an increase of 150.7m3 of volume that would be required if using the total 1:100yr + 45% CC greenfield run-off rate for a 1:100yr + 45% CC Storm Event. Refer to **Appendix J** for hydraulic calculations and a sketch showing the sizes of attenuation. Taking into consideration that additional storage volume will be required for some proposed catchments which may rely on a pumped outfall, it is clear that spatial constraints prevent the use of greenfield run-off rates being applied. This assessment shows that it is not possible or practicable to apply greenfield runoff rates.
- 4.14 S3 above concludes that where it is not reasonably practicable to match peak runoff rates that are directed to a drain or sewer to greenfield rates – proposed rates <u>"should never</u> <u>exceed the rate of discharge from the development prior to redevelopment for that event"</u>
- 4.15 As it is not practicable to restrict flows from the proposed development site to greenfield runoff rates and the proposals are to direct flows to the adopted sewer network (as per existing), in order to determine an appropriate proposed outfall rate, Anglian Water were

consulted. A Pre-Development Assessment Report confirmed that a total discharge rate of 242 I/s would be acceptable, see **Appendix K**. Subsequent discussions with Anglian Water during the consultation period addressed the proposed outfall points and outfall rates. Anglian Water provided a further email statement to confirm that the proposed outfall rates (pumped and gravity) and proposed outfall points were acceptable, this email is contained in **Appendix L**.

4.16 In order to confirm the determined maximum outfall rate of 242 I/s shall never exceed the rate of discharge from the development prior to redevelopment for each storm event, the assessment below looks at the brownfield runoff rates for 1:1yr, 1:30yr and 1:100yr events and compares these with the proposed maximum 242 I/s outfall rate:

	Existing Run-off Rate	Proposed Run-off Rate	Reduction
1:1 Yr Storm	488.706 l/s	242 l/s	-246.706 l/s
1:30 Yr Storm	1439.119 l/s	242 l/s	-1197.119 l/s
1:100yr Storm	1781.933 l/s	242 l/s	-1539.933 l/s

4.17 It is clear from the above assessment that the proposed maximum outfall rate of 242 l/s to manage all storms up to and including the 1:100yr + 45% Climate Change Event shall significantly reduce flows from the development site for all storm events. The proposed 242 l/s is the equivalent of 49.5% of the existing 1:1yr brownfield run-off rate and therefore satisfies S3 of the Non-Adoptable Technical Standards for Sustainable Drainage Systems (2015). This rate and the proposed outfall points are acceptable to Anglian Water as discussed in **Appendix L** and shall therefore inform the proposed surface water drainage strategy as follows.

Proposed Drainage Strategy

- 4.18 In accordance with the Environment Agency's May 2022 published Climate Change Allowances, all surface water drainage is to be designed to a 1:100yr + 45% Climate Change Event. As per LLFA's Developer Guidance, FEH Rainfall Data shall be used within the hydraulic models whilst also applying a MADD Factor of 0. As requested by the LLFA, the hydraulic model assumes that adopted sewers are running at full bore and will be surcharged to the top of pipe.
- 4.19 The proposed drainage systems shall be hydraulically modelled to test a 1:1yr Storm, 1:30yr
 Storm, 1:30yr + 40% Climate Change Storm, a 1:100yr Storm and finally a 1:100yr + 45% Climate Change Event.
- 4.20 As discussed above, the total maximum outfall rate of 242 l/s, to manage all storms up to and including the 1:100yr + 45% Climate Change Event will match 49.5% of the existing 1:1yr brownfield runoff rate providing a significant betterment to the existing situation for all storm events.
- 4.21 The former Barclays Bank building in the north east corner of the site and Surrey Chapel in the south-west corner of the site are existing buildings which are outside the Application Boundary. These are to be retained along with the drainage networks which serve them. Runoff from these areas shall not be included within the proposed surface water drainage networks. It is intended to ensure that any drainage pipework serving these buildings that may cross into the Application Boundary will be diverted accordingly if required.

- 4.22 This maximum outfall rate of 242 l/s shall be proportioned to each proposed catchment area, taking into account the contributing area and spatial constraints whilst ensuring that flow rates to each adopted sewer do not exceed existing 1:1yr Brownfield runoff rates. As discussed in para 3.19 to 3.22 above, 50% of existing Area 1 and the whole of Area 2. Area 3 and Area 4 drain to the Edward Street surface water sewer at a 1:1yr Brownfield rate of 104.395 l/s. In the proposed situation, Blocks B and C (discussed in more detail below) will drain to the Edward Street Sewer at a combined maximum outfall rate of 10 l/s. A significant reduction.
- 4.23 For the 675dia surface water sewer, in the existing situation 50% of Area 1, and the whole of Area 5, Area 7 and Area 8 drain to this sewer at a 1:1yr Brownfield rate of 371.095 l/s. In the proposed situation, Blocks D, A, M, K/L, J3, E, F, G, J and H (discussed in more detail below), will drain to the diverted 675dia surface water sewer at a combined maximum outfall rate of 232 l/s, again a significant reduction.
- 4.24 The finished floor levels (FFL's) for each Block have been set following the hydraulic modelling undertaken by Royal Haskoning DHV and are discussed further within their FRA report.
- 4.25 As described in Section 1, it is proposed to make a Hybrid planning application: Full Planning for Blocks, A, B, C, D, J3, K/L and M and Outline Planning for Blocks E, F, G, H and J.
- 4.26 The Hybrid site layout precludes the option for completely separating drainage for Outline areas from Full-Planning areas however, largely, the drainage systems serve only Outline or only Full-Planning areas
- 4.27 development parcels have been split into 9no. drainage catchments:
 - System 1 Serves Block B (Full-Planning)
 - System 2 Serves Block C (Full-Planning)
 - System 3 Serves Block D (Full-Planning)
 - System 4 Serves Block A, M J3 and K/L (Full Planning)
 - System 5 Serves Botolph Street/Public Realm Area (Full Planning)
 - System 6 Serves Block E (Outline Planning)
 - System 7 Serves Block F (Outline Planning)
 - System 8 Serves Blocks G and J (Outline Planning)
 - System 9 Serves Block H (Outline Planning)

System 1 – Block B – Full Planning

4.28 SuDS Feature Selection – This catchment comprises residential dwellings, footpaths, patios and parking areas. The residential apartment block facing New Botolph St has a green roof – the details of which can be seen on the Landscape Masterplan – Roof Level PlanIt drawing in Appendix M. It is proposed to utilise lined permeable paving to manage run-off from the

trafficked areas. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. Residential rainwater harvesting (waterbutts) are to be provided for the terraced houses. A surface water drainage network shall collect run-off from roof, patios and other hardstanding areas with all flows directed to a geocellular storage device with outfall to the adopted 225dia surface water sewer in Edward Street (MH AW 0452) via a Downstream Defender (proprietary treatment unit) and Hydrobrake gravity flow control device.

- 4.29 The contributing area for this catchment has been calculated as: 1790.5m², comprising:
 - Roof Area (515m² x 110% allowing for 10% Urban Creep) 566.5m²
 - Green Roof Area 290m² (assuming the green roof is saturated and do not provide any storage volume)
 - Permeable Paving (trafficked) Area 580m²
 - Patios and Footpaths 354m²
- 4.30 The maximum outfall rate for this catchment has been set at 5.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in **Appendix O** and shows the network serving Block B on drawing DR-001.
- 4.31 There are two sections of permeable paving attenuation system, PP1 covers an area of 432m² and PP2 covers an area of 150m². Surface water runoff from 240m² of surrounding hardstanding areas will be directed to the permeable paving attenuation system PP1. Surface water attenuation volume in the permeable paving attenuation system is provided within the sub- base voids (usually 30% voids and no-fines). Flows from these permeable paving systems are restricted using orifice-plate flow control chambers flows are then directed to/cascade to the geo-cellular attenuation device which also collects surface water runoff from the remainder of the contributing area.
- 4.32 WinDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the permeable paving areas and the geo-cellular storage device whilst restricting flows to a maximum of 5.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. The maximum flow from proposed Block D should therefore be noted from looking at the Pipe Flow for node/manhole "B-Hydrobrake" in the hydraulic outputs.
- 4.33 The hydraulic output data shows results for a 1:1yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 39.027m3 in PP1, a volume of 8.117m² in PP2 and a volume of 24.192m3 in the geocellular storage device is calculated. This volume can be contained within the sub-base of the permeable paving areas and within a geo-cellular storage device sized 35.2m² x 1.32m deep with 95% voids.
- 4.34 Half Drain Times For the 1:100yr + 45% Climate Change event, the hydraulic model demonstrates that Permeable Paving Area 1 has a half-drain time of 369mins, Permeable Paving Area 2 is 229mins and the Geo-cellular storage device half-drains in 116mins. All well within 24hrs.

- 4.35 Water Quality Assessment This catchment comprises residential roofs and low-traffic roads only.
- 4.36 Relating to runoff from trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Low-Traffic Roads have a Pollution Hazard Level of LOW. All low-traffic roads in this catchment are anticipated to comprise lined permeable paving construction with outfall directed to the adopted sewer via the geo-cellular attenuation device. Table 26.2 shows Low-Traffic Roads have TSS of 0.5 Metals, 0.4 and Hydrocarbons 0.4. Table 26.3, SuDS mitigation indices for discharges to surface waters, shows that Permeable Paving alone provides mitigation for TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from low-traffic-road areas is more than sufficiently mitigated by use of Permeable Paving.
- 4.37 Relating to runoff from 'standard' roofs and footpaths: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders
- 4.38 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

System 2 – Block C – Full Planning

- 4.39 SuDS Feature Selection This catchment comprises a residential apartment block, footpaths and landscaped areas. The residential apartment block utilises a green roof the details of which can be seen on the Landscape Masterplan Roof Level PlanIt drawing in Appendix M. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in Appendix N. A surface water drainage network shall collect run-off from the green roof and footpaths with all flows directed to a geo-cellular storage device with outfall to the adopted 300dia surface water sewer in Edward Street (new MH AW 0451A) via a Downstream Defender (proprietary treatment unit) and a Hydrobrake gravity flow control device.
- 4.40 The contributing area for this catchment has been calculated as: 728m², comprising:
 - Green Roof Area 433m² (assuming the green roof is saturated and do not provide any storage volume)
 - Footpaths 295m²

- 4.41 The maximum outfall rate for this catchment has been set at 5.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix M and shows the network serving Block C on drawing DR-001.
- 4.42 Surface water run-off from the Green Roof and pedestrian hardstanding areas is collected in a surface water drainage network which outfalls to a geo-cellular attenuation device. Flows from the geo-cellular attenuation device are restricted using a Hydrobrake gravity flow control device prior to outfall to the adopted surface water sewer via a proprietary treatment unit.
- 4.43 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to a maximum of 5.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. The maximum flow from proposed Block C should therefore be noted from looking at the Pipe Flow for pnode/manhole "C-Hydrobrake" in the hydraulic outputs.
- 4.44 The hydraulic output data shows results for a 1:1yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 18.983m3 in in the geo-cellular storage device is calculated and can be contained within a geo-cellular storage device sized 62.72m² x 0.66m deep with 95% voids this provides a maximum attenuation volume of 59.584m3.
- 4.45 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 61mins. Well within 24hrs.
- 4.46 Water Quality Assessment This catchment comprises footpaths and residential roofs only.
- 4.47 Relating to runoff from pedestrian footpaths, as there is no specific reference for hardscaped areas, it is considered prudent to apply a residential roof as comparison: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from the hard landscaping shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows "Residential Roofs" have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from the hard landscaping areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.48 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

System 3 – Block D – Full Planning

- 4.49 SuDS Feature Selection This catchment comprises public realm area, a commercial unit block with community centre and residential apartments above. A portion of Block D roof area is green-roof the details of which can be seen on the Landscape Masterplan Roof Level PlanIt drawing in **Appendix M**. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. A surface water drainage network shall collect run-off from the green roof, other roof areas and public realm areas (via bioretention systems, channel/slot drains and gullies) with all flows directed to a geo-cellular storage device. As Block D has level-thresholds, levels are designed to fall away from doorways, however as a precaution a slot-drain is also provided around the building line. Outfall is directed to the diverted adopted 675dia surface water sewer which crosses Anglia Square (new MH SW-A-04) via a Downstream Defender (proprietary treatment unit) and a Hydrobrake gravity flow control device.
- 4.50 The contributing area for this catchment has been calculated as: 2580m², comprising:
 - Green Roof Area 610m² (assuming the green roof is saturated and do not provide any storage volume)
 - Roof Area 265m²
 - Public Realm (including bioretention systems which are assumed to be saturated and do not provide any storage volume) – 1705m²
- 4.51 The maximum outfall rate for this catchment has been set at 12.5 I/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix M and shows the network serving Block D on drawing DR-001.
- 4.52 Surface water run-off from the Green Roof, Roof and Public Realm areas is collected in a surface water drainage network which outfalls to a geo-cellular attenuation device. Due to spatial constraints, and to ensure a minimum 5m offset from the building line, the geocellular storage device is split into two sections and is linked by a 600dia connector pipe. Flows from the geo-cellular attenuation device are restricted using a Hydrobrake gravity flow control device prior to outfall to the adopted diverted 675dia surface water sewer via a proprietary treatment unit.
- 4.53 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to a maximum of 12.5 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. The maximum flow from proposed Block D should therefore be noted from looking at the Pipe Flow for node/manhole "D-Hydrobrake" in the hydraulic outputs.
- 4.54 The hydraulic output data shows results for a 1:1yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 116.506m3 in in the geo-cellular storage device and 4.864m3 in the 600dia connector pipe is calculated and can be contained within a geo-cellular storage device sized 80m² x 1.32m deep with 95% voids this provides a maximum attenuation volume of 59.584m3.

- 4.55 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 105mins. All well within 24hrs.
- 4.56 Water Quality Assessment This catchment comprises commercial/residential roofs and green roofs as well as pedestrian Public Realm areas.
- 4.57 Relating to runoff from 'standard' roofs and pedestrian public realm: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.58 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

System 4 – Blocks A, M, J3 and K/L – Full Planning

- 4.59 SuDS Feature Selection This catchment comprises public realm area and commercial unit blocks with residential apartments above. Some roof area is green-roof the details of which can be seen on the Landscape Masterplan Roof Level PlanIt drawing in **Appendix M**. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. A surface water drainage network shall collect run-off from the green roof, other roof areas and public realm areas (via bio-retention systems, channel/slot drains and gullies) with all flows directed to a geo-cellular storage device. As Blocks in this catchment have level-thresholds, levels are designed to fall away from doorways, however as a precaution a slot-drain is also provided around the building lines. Outfall is directed to the diverted adopted 675dia surface water sewer which crosses Anglia Square (new MH SW-A-07) via a surface water pump flow control device and Downstream Defender (proprietary treatment unit.
- 4.60 The contributing area for this catchment has been calculated as: 14,850m², comprising:
 - Green Roof Area 2535m² (assuming the green roof is saturated and do not provide any storage volume)
 - Roof Area 6313m²
 - Public Realm (including bioretention systems which are assumed to be saturated and do not provide any storage volume) – 6002 m²

- 4.61 The maximum outfall rate for this catchment has been set at 65.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in **Appendix O** and shows the network serving Block A, M, K/L and J3 on drawings DR-002 and DR-004.
- 4.62 Surface water run-off from the Green Roof, Roof and Public Realm areas is collected in a surface water drainage network which outfalls to a geo-cellular attenuation device. Due to spatial constraints, contributing area and the depth of the adopted sewer, it is necessary to pump surface water flows/outfall from this catchment. Flows from the geo-cellular attenuation device are restricted using a surface water flow control device prior to outfall to the adopted diverted 675dia surface water sewer via a proprietary treatment unit.
- 4.63 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to a maximum of 65.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. The maximum flow from proposed Block A, M, K/L and J3 should therefore be noted from looking at the Pipe Flow for node/manhole "SW-PUMP" in the hydraulic outputs.
- 4.64 The hydraulic output data shows results for a 1:1yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in Appendix P, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 608.287m3 in the geo-cellular storage device and can be contained within a geo-cellular storage device sized 322.6m² x 1.98m deep with 95% voids.
- 4.65 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 103mins. All well within 24hrs.
- 4.66 Water Quality Assessment This catchment comprises commercial/residential roofs and green roofs as well as pedestrian Public Realm areas.
- 4.67 Relating to runoff from 'standard' roofs and pedestrian public realm: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.68 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.69 Relating to run-ff from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as

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Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.

System 4 – Blocks A, M, J3 and K/L – Full Planning

- 4.70 SuDS Feature Selection This catchment comprises public realm area and a small area of trafficked access road. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. A surface water drainage network shall collect run-off from the paved areas via bioretention systems, channel drains and gullies with all flows directed to an over-sized pipe storage device. Outfall is directed to the diverted adopted 675dia surface water sewer which crosses Anglia Square (new MH SW-A-04) via a Downstream Defender (proprietary treatment unit) and a Hydrobrake gravity flow control device.
- 4.71 The proposed over-size pipe system will run underneath the bio-retention systems, Planlt, the landscape architect for this scheme, were consulted to gain confirmation of planting within the bioretention systems and their root depths. It was confirmed that the proposed planting root depth is not expected to exceed 1.0m in depth and in the main will be contained within 0.6m of depth from the cover level of the bio-retention system. As such, the design ensures that the pipe soffit/top-of-pipe is always at least 1.2m in depth from the lowest bio-retention system cover level to allow for a 200mm drainage layer. This ensures that there will be no root ingress to the proposed over-size pipe system and that outlets from the bioretention systems can be directed to the surface water drainage system.
- 4.72 The contributing area for this catchment has been calculated as: 1630m², comprising:
 - Public Realm (including bioretention systems which are assumed to be saturated and do not provide any storage volume) – 1630m²
- 4.73 The maximum outfall rate for this catchment has been set at 10.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the network serving Block D on drawing DR-003.
- 4.74 Surface water run-off from the Public Realm area is collected in an oversized pipe surface water drainage network with flows restricted using a Hydrobrake gravity flow control device prior to outfall to the adopted diverted 675dia surface water sewer via a proprietary treatment unit.
- 4.75 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the oversized-pipe storage/drainage system whilst restricting flows to a maximum of 10.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. The maximum flow from proposed Block D should therefore be noted from looking at the Pipe Flow for node/manhole "B.ST Hydrobrake" in the hydraulic outputs.
- 4.76 The hydraulic output data shows results for a 1:1yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along

with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 72.557m3 in pipes 1.000 to 1.006.

- 4.77 Half Drain Times based on a rate of 10l/s, a volume of 72.557 can be drained in 121mins, well within 24hrs.
- 4.78 Water Quality Assessment This catchment comprises Public Realm areas with low traffic roads.
- 4.79 CIRIA 763 SuDS Manual Table 26.2 shows Low Traffic Roads have a Pollution Hazard Level of LOW. Runoff from all hardstanding areas shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Low-Traffic Roads have TSS of 0.5 Metals, 0.4 and Hydrocarbons 0.4. Table 26.3. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.80 Relating to run-off from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.

System 6 – Block E – Outline Planning

- 4.81 SuDS Feature Selection This catchment comprises commercial units with residential dwellings above and some public realm/pedestrian walkways. Green roof shall cover some roof area. Bioretention systems shall collect run-off from highway areas to the west, as agreed in principle with the Highway Authority. Details of the split between private and highway catchments and the drainage features which serve these areas shall be confirmed during detailed design stage. For now, and to be conservative, the hydraulic models shall assume all areas within the catchment boundary will be collected within a private drainage network. The catchment shall be considered 100% impermeable with a contributing area of 6420m².
- 4.82 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall.
- 4.83 The maximum outfall rate for this catchment has been set at 30.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the indicative surface water drainage network serving Block E on drawing DR-003.

- 4.84 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 30.0 l/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs and bio-retention areas has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 277.2m³ in the geo-cellular storage device with a maximum outfall rate of 30.0 l/s is required to manage a 1 in 100 year + 45% Climate Change event. This can be contained within a geo-cellular storage device sized 147.2m² x 1.98m with 95% voids this provides a maximum attenuation volume of 276.9m³.
- 4.85 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 83mins for a 1 in 100yr + 45% Climate Change Storm Event. All well within 24hrs.
- 4.86 Water Quality This catchment comprises Other Roofs, Green Roofs as well as Pedestrian Walkways.
- 4.87 Relating to runoff from 'standard' roofs and pedestrian public realm, to undertake a water quality assessment, the pedestrian areas have also been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.88 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.89 Relating to run-off from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.

System 7 – Block F – Outline Planning

4.90 SuDS Feature Selection – This catchment comprises commercial units with residential dwellings above and some public realm/pedestrian walkways. Green roof shall cover some roof area whilst a section of permeable paving system shall form the external parking area (approx.350 m²). Bioretention systems shall collect run-off from pedestrian walkways

where possible. For now, and to be conservative, the hydraulic models shall assume all areas within the catchment boundary shall be collected within a private drainage network. The catchment shall be considered 100% impermeable with a contributing area of 4460m².

- 4.91 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a Geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall.
- 4.92 The maximum outfall rate for this catchment has been set at 20.0 I/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the network serving Block F on drawing DR-003.
- 4.93 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 20.0 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs, permeable paving and bio-retention areas has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 187.9m³ in the geo-cellular storage device with a maximum outfall rate of 20.0 I/s is required to manage a 1 in 100 year + 45% Climate Change event. This can be contained within a geo-cellular storage device sized 112.6m² x 1.98m with 95% voids this provides a maximum attenuation volume of 211.8m³. Noting that due to spatial constraints and to maintain a distance of 5m from the building line, the geocellular storage device is split in two sections and are connected via a 600dia connector pipe.
- 4.94 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 79mins for a 1 in 100yr + 45% Climate Change Storm Event. All well within 24hrs.
- 4.95 Water Quality This catchment comprises Other Roofs, Green Roofs as well as Pedestrian Walkways.
- 4.96 Relating to runoff from 'standard' roofs and pedestrian public realm: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in Appendix Q as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.97 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5,

Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself

- 4.98 Relating to run-off from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.
- 4.99 Relating to runoff from other public realm areas that do not drain to bioretention systems, to undertake a water quality assessment, these pedestrian areas have been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from these pedestrian areas shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.100 Relating to runoff from permeable block paved trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Residential Car Parks have a Pollution Hazard Level of LOW. Runoff from permeable block paving will be managed by itself. Table 26.2 shows Residential Car Parks have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. Table 26.3 shows mitigation indices for Permeable Pavement is TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Permeable Block Paving itself.

System 8 – Blocks G and J – Outline Planning

- 4.101 SuDS Feature Selection This catchment comprises residential units, commercial units with residential dwellings above as well as some public realm/pedestrian walkways and vehicular access to undercroft car parks in Blocks G and J. Green roof shall cover some roof area. Permeable block paving covering an area of approx. 614 m² shall collect surface water run-off from part of the vehicular access areas that will be trafficked. A surface water drainage network will collect surface water runoff from rainwater down pipes, external paved areas via channel drains and gullies and convey to the geocelular storage device. The catchment shall be considered 100% impermeable with a contributing area of 9640m² for robustness with no allowance for green roofs or permeable block paving.
- 4.102 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a Geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall. The maximum outfall rate for this catchment has been set at 70.0 l/s to manage all storms up to and including the 1 in 100yr + 45%

Climate Change Event. The proposed Surface Water Drainage Layouts are contained in **Appendix O** and shows the network serving Block F on drawing DR-003 and DR-004.

- 4.103 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 70.0 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs and permeable block paving has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 370.4m³ in the geo-cellular storage device with a maximum outfall rate of 70.0 I/s is required to manage a 1 in 100 year + 45% Climate Change event. This can be contained within a geo-cellular storage device sized 195.8m² x 1.67m with 95% voids this provides a maximum attenuation volume of 310.63m³.
- 4.104 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 53mins for a 1:100yr + 45% Climate Change Storm Event. All well within 24hrs.
- 4.105 Water Quality Assessment This catchment comprises commercial/residential roofs, pedestrian walkways and low-traffic roads only.
- 4.106 Relating to runoff from 'standard' roofs and pedestrian public realm, to undertake a water quality assessment, the pedestrian areas have also been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.107 Relating to runoff from non-permeable block paved trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Residential Car Parks have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Car Parks have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.108 Relating to runoff from permeable block paved trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Residential Car Parks have a Pollution Hazard Level of LOW. Runoff from permeable block paving will be managed by itself. Table 26.2 shows Residential Car Parks have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. Table 26.3 shows mitigation indices for Permeable Pavement is TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Permeable Block Paving itself.

4.109 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

System 9 – Block H – Outline Planning

- 4.110 SuDS Feature Selection This catchment comprises commercial units with residential dwellings above and some public realm/pedestrian walkways. Green roof shall cover some roof area and a bioretention system is proposed some runoff from hardstanding area is directed to this system, however most runoff from hardstanding shall be directed to the proposed surface water drainage network via channel drains and gullies. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. For now, and to be conservative, the hydraulic models shall assume all areas within the catchment boundary shall be collected within a private drainage network. The catchment shall be considered 100% impermeable with a contributing area of 3460m².
- 4.111 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall. The maximum outfall rate for this catchment has been set at 24.5 I/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the network serving Block H on drawing DR-002.
- 4.112 WINDES MicroDrainage modelling software has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 24.5 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 141.1m³ in the geo-cellular storage device with a maximum outfall rate of 24.5 I/s is required to manage a 1 in 100 year + 40% Climate Change event. This can be contained within a geo-cellular storage device sized 112.0m² x 1.32m with 95% voids this provides a maximum attenuation volume of 140.448m³.
- 4.113 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 61mins. All well within 24hrs.
- 4.114 Water Quality This catchment comprises Other Roofs as well as Pedestrian Walkways.
- 4.115 Relating to runoff from 'standard' roofs and pedestrian public realm, to undertake a water quality assessment, the pedestrian areas have also been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International

Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.

4.116 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

Summary of Catchments and Proposed Outfall Rates

- 4.117 As discussed in para. 4.13, the total allowable outfall rate for the Anglia Square Regeneration site has been set at 242 l/s, which is a reduction of 50.5% against the existing 1:1yr Brownfield Runoff Rate a significant betterment. Below is a breakdown of outfall rates for each catchment (System) and total:
 - System 1 Maximum surface water outfall rate of 5.0 l/s
 - System 2 Maximum surface water outfall rate of 5.0 l/s
 - System 3 Maximum surface water outfall rate of 12.5 l/s
 - System 4 Maximum surface water outfall rate of 65.0 l/s
 - System 5 Maximum surface water outfall rate of 10.0 l/s
 - System 6 Maximum surface water outfall rate of 30.0 l/s
 - System 7 S Maximum surface water outfall rate of 20.0 l/s
 - System 8 Maximum surface water outfall rate of 70.0 l/s
 - System 9 Maximum surface water outfall rate of 24.5 l/s
 - All Systems Total 242.0 I/s maximum outfall rate to manage all storms up to and including the 1:100yr + 45% Climate Change Event. The equivalent of 49.5% of the existing 1:1yr surface water run-off rate. This is a significant improvement to the existing situation. In addition, the existing drainage system does not benefit from any water treatment stages, whilst the proposed drainage strategy allows for water quality and treatment stages to meet the guidance within CIRIA 753 SuDS Manual.

Attenuation Tank Alarm System

- 4.118 The proposed development site shall be served by a Flood Evacuation Warning Plan, the proposals of which are discussed in the Flood Risk Assessment Report however will be detailed further at a Discharge of Conditions stage. As the development site is within a Critical Drainage Catchment and there is risk of off-site flows from entering the proposed on-site drainage system, it is identified that monitoring of attenuation capacity would be beneficial for maintenance and management purposes and to reduce the risk of flooding. Full Planning Block A, M, K/L and J3 and Outline Planning Block E, Block F, Block G and J and Block H catchments are served by geocellular attenuation devices whereby the outfalls are controlled using surface water pumps. These pumping stations will be equipped with a secondary back-up pump as well as a telemetry alarm system to alert the Management Company of any pump failures. Block, B, Block C, Block D and Botolph Street proposed drainage systems are controlled using gravity type Flow Control Devices (hydro brakes), which are not alarmed.
- 4.119 The proposed surface water drainage systems are not be designed to include any flows or volumes from off-site which may enter the system. It is appreciated that off-site flows could enter the proposed surface water drainage systems in certain catchments and as such it is appropriate to install an alarm system which will be triggered to alert the Management Company when tanks fail to drain-down after a storm event. This type of system monitors the hydrostatic pressure within attenuation devices and communicates the available capacity via a radio transmitter to a receiving control panel that shall be located within kiosks as shown on the Proposed Surface Water Drainage Layouts in Appendix O.
- 4.120 Failure to drain-down after a storm event could occur due to debris/blockages within pipework or attenuation devices, or could be attributed to flow control devices not operating effectively. By identifying a possible issue in the drainage system, maintenance can be undertaken to ensure that the drainage systems operate fully and attenuation volumes, as required, are available at all times. This means that should overland flow routes pass through the site, these paths and depths of surface water are not exacerbated by poorly functioning on-site drainage systems.
- 4.121 This alarm system could be linked to the Flood Evacuation Plan (to be Conditioned) for information only, however its primary function is to inform the need for any Maintenance to be undertaken.

Surface Water Pump Alarm System

- 4.122 Wherever possible it is proposed to utilise an outfall to the adopted sewer network via a gravity connection using a hydrobrake or other suitable flow control device, such as orifice plates for permeable paving outlets. Where this is not possible, due to attenuation volume requirements, spatial constraints and/or the receiving adopted sewer being higher than the proposed drainage, surface water has to be pumped to a 'demarcation' chamber to allow waters to flow into the adopted sewer network by gravity connection.
- 4.123 Where surface water pumps are to be used, it is proposed to install a secondary backup pump as well as a telemetry alarm system. The telemetry alarm system shall be linked to the elected Management Company to alert in case of pump failure. In the event of primary pump failure, the secondary pump shall manage flows until the primary pump is repaired or replaced. In the unlikely event that the secondary pump fails before the primary pump is repaired, the telemetry alarm system will alert the Maintenance Company who shall

install a temporary pump. The surface water pump control panels shall be located within kiosks as shown on the Proposed Surface Water Drainage Layouts.

4.124 The risk of pump failure is low, however in the very unlikely event that primary, secondary and temporary pumps all fail, waters would fill the attenuation tanks and overspill into the public realm, following the overland flow paths. There is no risk to property as pumps and tanks are located externally.

Surface Water Pumps – Power Failure

- 4.125 In case of power failure, it is necessary to consider the impact on surface water drainage systems which rely on a powered surface water pump. It is therefore proposed to connect the surface water pumps serving Block A, M, K/L and J3 (Full) and Blocks, E, F, G, J and H (Outline) to the emergency power generator system serving the site. This emergency power generator system will serve the site's electrical needs during a power failure, this includes emergency lighting, sprinkler systems and surface water drainage pumps. In the event that a power failure occurs during a storm event, the surface water pumps will be unaffected and will continue to function. It is recommended that the emergency power generator system link to the surface water drainage pumps is tested regularly for maintenance and monitoring purposes. This is discussed further in the Maintenance and Management Plan.
- 4.126 No additional 'emergency' attenuation volume is therefore required, the proposed attenuation devices are sized to manage all storms up to and including a 1:100yr + 45% Climate Change event and measures are put in place to ensure power to the surface water pumps is available during a power cut/power failure to the site. The indicative locations of emergency generators are indicated on the surface water drainage layouts.

Exceedance Routes

- 4.127 In the event of a greater than 1 in 100 year (+45%CC) rainfall event occurring, the exceedance routes would follow proposed and existing surface water flow paths as identified on SK05 in **Appendix R.** The flow paths shown head towards the south-east of the site and follow routes as identified in the Flood Risk Assessment Report by Royal Haskoning DHV.
- 4.128 As discussed in the separate FRA by Royal Haskoning DHV, their hydraulic model assumes the public sewer system is almost at capacity and there is no functioning drainage system within the site boundary. This would result in the overland flows collecting in the pedestrian walkways and passing through the site from north west to south east. The flows would leave the site at Magdalen Street.

Sewer Diversions

4.129 As noted in Section 3, there are a number of Anglian Water sewers passing through the existing site. Anglian Water were consulted in 2018 for the previous scheme on the potential diversion of several of their sewers around the proposed development and it is understood that this will need to be considered in detail at a later stage through a diversion application, when information such as the foundation design is available. Anglian Water Drainage Engineer Darren Sewell provided some information on the requirements when diverting sewers within a new development site. This has been included at Appendix S. To summarise.

- Any re-development areas falling within 3m of an existing public sewer but remaining only 'built near' an existing sewer, assuming the same clearance and access is available, would in principle be acceptable.
- Any areas falling within 3m of the existing public sewer would need to comply with Part H4 Building Regulations in respect of 'building near' public sewers and Anglian Water criteria on the website.
- Foundation design of the new buildings would need to be carefully considered to ensure that no loading would be transferred on a 45 degree 'angle of repose' onto the sewer.
- The only area which would appear to require consideration of a formal diversion of a sewer would be the existing 675mm diameter surface water sewer and the existing 225mm foul sewer running immediately south of unit A1.01 (675mm surface water sewer close to MH 0453 to 0456 and 225mm foul sewer near to MH 0405 to 0408).
- The above sewer may require a diversion, and the technicalities of this will be considered at a later stage. Anglian Water could consider formally devesting some sections of the existing public sewer which are no longer needed/fall beneath buildings (these need to be sewers serving only the existing site and no third parties). This means the Developer would apply to devest the sewer into their private ownership, and these sections of devested sewer could then be removed if no longer needed.
- 4.130 It would be necessary to consult Anglian Water further on the diverting and devesting of their public sewers across the site prior to any development taking place, to ensure that the issues raised in the email at **Appendix S** have been addressed.

Foul Sewer Network

4.131 An Anglian Water capacity check was carried out for the previous scheme to determine whether there would be sufficient capacity within their existing foul network to accommodate the foul flows from the proposed development. This is in their pre-development enquiry in **Appendix K** and confirms that there is sufficient capacity in the existing foul network and no improvements would be needed to the network.

Standard Surface Water Drainage Construction Details

- 4.132 The LLFA Developer Guidance requires that details of proposed surface water drainage features are provided at Full Planning Application stage. Standard Construction Details for the following features has therefore been provided in **Appendix T**.
 - Green Roofs see PlanIt drawings and cross-sections
 - Bio-Retention Systems
 - Manholes, Gullies and Channel Drains
 - Typical Hydro-Brakes
 - Surface Water Pumps

• Permeable Block Paving

Carbon Impact Consideration

- 4.133 In accordance with Policy E8 "Towards Net Zero" the developer has considered how the carbon emissions can be minimised for the drainage systems associated with the proposed development.
- 4.134 The primary objective of the design is for the systems to operate under gravity, thereby avoiding the need for pumps which generate carbon emissions from their operation. Wherever possible and where cover and invert levels of receiving adopted sewers allow, surface water runoff from the development site is attenuated and restricted using gravity-type flow control devices, such as hydrobrakes or orifice plates.
- 4.135 Where the proposed drainage and storage devices cannot be shallower than the adopted sewer network, due to cover levels, length of drainage network, attenuation volumes and spatial constraints, it is necessary to pump restricted flows. The use of surface water pumping stations to serve some catchments within the development site is unavoidable though is only proposed where necessary.
- 4.136 For the Full Planning Application areas (Blocks A, B, C, D, M, K/L and J3), the surface water drainage strategy has been developed to drain catchments by gravity wherever possible. Blocks B, C, D and Botolph Street catchments are drained into the adopted sewer network via a gravity Hydrobrake type device whilst Block A, M, K/L and J3 catchment will rely on a pumped outfall (1no. surface water pump in the full Application). The pump specifications for this catchment are contained in **Appendix T**.
- 4.137 For the Outline Planning Application areas (Blocks E, F, H, G and J) there may be scope at a later design stage to reduce the areas flowing to pumping stations by splitting catchment areas into smaller areas, whereby some may be able to drain via gravity, however at this stage it is considered conservative to allow for these 4no. pumping stations.
- 4.138 Where pumps are necessary, their operational carbon emissions will be minimised through the following measures.
 - Minimised peak flow rate through attenuation and flow control devices to reduce the size of the pumps and hence their power demand.
 - Pumps selected to maximise efficiency at the design duty to lower energy demand
 - Pump operation controlled on levels within the chamber to ensure they only operate when required
 - Appropriate electrical metering and links to the development control systems to allow monitoring of energy use.
 - Regular cleaning and servicing to ensure the pumps are operating as efficiently as possible. This is discussed in the Maintenance and Management Plan.

5 Proposed SuDS Features Information

SuDS Features and the "Four Pillars of SuDS"

5.1 The city center site gives opportunities for "urban types" of SuDS features to be incorporated. These features provide water quantity, water quality, biodiversity and amenity enhancements. The table below summarises the proposed SuDS Features and how they contribute to the Four Pillars of SuDS. Further details of the proposed SuDS Features are discussed from para 5.2 onwards.

Water Quantity	Water Quality	Biodiversity	Amenity
The Bio-Retention Systems proposed allow for reduction of water quantity by providing opportunity for transpiration.	The engineered soils and	The Bioretention Systems proposed will provide biodiversity enhancement by introducing new habitats in the urban environment.	Amenity space in bioretention systems is formed by shallow depressions in the landscaping with stepping stones and seating areas.
The Tree-Pits proposed allow for reduction of water quantity by providing opportunity for transpiration.	The engineered soils within the proposed tree- pits provide a filter medium to cleanse waters prior to outfall to the drainage network.	The Tree-Pits proposed will provide biodiversity enhancement by introducing new habitats in the urban environment.	The Tree-Pits proposed will enhance the amenity space of the public realm.
The Green Roofs proposed allow for reduction of water quantity by providing opportunity for transpiration.	The proposed green-roofs provide a water quality treatment stage for runoff from these roof areas.	The intensive and extensive green roofs will provide new habitats in the urban environment.	Amenity space is provided on green-roof terraces on the podiums.
Some transpiration will occur for waters on the permeable block paving surface and will reduce water quantity, though it is appreciated it will not be to the same extent as	The granular subbase within permeable block paving attenuation systems provide a water quality treatment stage for runoff from trafficked areas.		
bioretention systems or green roofs could provide. Rainwater harvesting. Some reduction in water quantity is expected by reuse for private gardens in			
Block B and for bin- wash-down in Blocks, A, D, E, F, G, H, J, K/L, M and J3.			

Green Roofs

- 5.2 Green Roofs will provide Amenity, Biodiversity, Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. Amenity space is formed by roof-top gardens and terraces for. Biodiversity is formed by use of extensive and intensive green-roofs. Water Quality, the green roof areas will provide a treatment stage for surface water runoff. Water Volume, green roofs provide attenuation volume and slow the rate of waters entering the main sewer system. Transpiration shall also reduce overall water volumes.
- 5.3 CIRIA SuDS Manual C753 Chapter 12 describes Green Roofs as follows:

"Green roofs area areas of living vegetation, installed on the top of buildings, for a range of reasons including visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff. Types of green roof can be divided into two main categories:

-Extensive roofs, have low substrate depths (and therefore low loadings on the building structure), simple planting and low maintenance requirements; they tend not to be accessible.

-Intensive roofs (or roof gardens) have deeper substrate (and therefore higher loadings on the building structure) that can support a wide variety of planting but which tend to require more intensive maintenance; they are usually accessible."



- 5.4 The Full Planning proposals include for a number of garden roof terraces which comprise some areas of extensive and intensive type green roof as well as paved areas these are currently detailed on Blocks A, D, M and K/L. Green roofs are also shown indicatively on Outline Application Blocks E, F, G, J, and H, it is expected that these will also comprise extensive and intensive green roof areas and paved areas. Details of the Proposed Green Roofs can be found on PlanIt Roof Masterplan drawing in Appendix M. As described above, the drainage calculations in Section 4 do not account for any attenuation that may be available on green roof areas. However, as a general rule, it is assumed that green roofs are saturated when calculating a site's attenuation requirements anyhow.
- 5.5 Green roofs and Garden Roof Terraces will provide water quality and biodiversity benefits to the overall scheme.

Bio-Retention Systems

- 5.6 Bio-Retention Systems will provide Amenity, Biodiversity, Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. Amenity space is formed by shallow depressions in the landscaping with stepping stones and seating areas. Biodiversity is formed by use of suitable planting. In terms of Water Quality, the bioretention systems shall provide a treatment stage for surface water runoff. Water Volume bioretention systems shall provide attenuation volume and slow the rate of waters entering the main sewer system. Transpiration shall also reduce overall water volumes.
- 5.7 CIRIA SuDS Manual C753 Chapter 18 describes Bio-Retention Systems as follows:

"Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce run-off rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide: attractive landscape features that are self-irrigating and ; habitat and biodiversity; and cooling of the micro-climate due to evapotranspiration."



- 5.8 Bio-Retention Systems are proposed within the public realm of the Full Planning Application and Outline Planning Application areas. Where possible, surface water run-off from public realm hardstanding hall be directed to these bioretention systems which shall provide a first stage of attenuation and treatment of run-off. Overflow from these bio-retention systems shall be directed into the wider surface water drainage system.
- 5.9 Norwich County Council's Highway Team have been consulted as part of the application consultation process and have commented upon the provision of bio-retention systems along the western boundary of the site which would collect surface water run-off from Botolph Street and form part of the highway drainage network. They have raised no objection shall require a commuted sum in order to adopt them. This will be detailed further post-planning in any S278/S38 negotiations.

Tree Pits

- 5.10 Tree-Pits will provide Biodiversity, Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. Biodiversity is formed by use of suitable planting. In terms of Water Quality, the bioretention tree-pit filter mediums shall provide a treatment stage for surface water runoff. Water Volume bioretention tree-pits shall provide attenuation volume and slow the rate of waters entering the main sewer system. Transpiration shall also reduce overall water volumes.
- 5.11 CIRIA SuDS Manual C753 Chapter 19 describes Tree Systems as follows:

"Trees and their planting structures provide benefits to surface water management in the following ways:

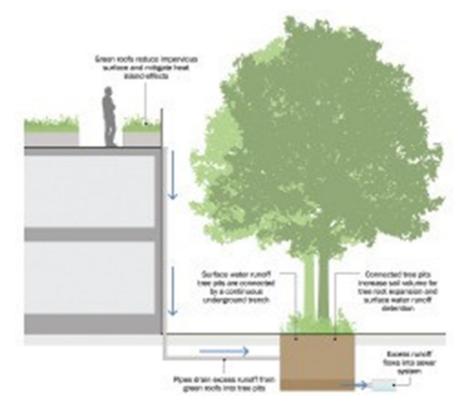
Transpiration – This is the process by which water, taken in from soil by tree roots, is evapourated through the pores or stomata on the surface of leaves. Trees draw large quantities of water from the soil, which can contribute to reducing run-off volumes.

Interception – Leaves, branches and trunk surfaces intercept (store and allow water to evapourate) and absorb rainfall, reducing the amount of water that reached the ground, delaying the onset and reducing the volume of run-off.

Increased infiltration – Root growth and decomposition increase soil infiltration capacity and rate, reducing runoff volumes.

Phytoremediation – In the process of drawing water from the soil, trees also take up trace amounts of harmful chemicals, including metals, organs compunds, fuels and solvents that are present in the soil. Inside the tree, these chemicals can be transformed into less harmful substances, used as nutrients and/or storeg in roots, stems and leaves.

...Tree Planters are essentially bio-retention systems with trees in them, to enhance capacity and performance, and/or to deliver amenity and biodiversity benefits. They have similar functionality and design requiements to standard tree pits, but have open surace and generally a larger surface area, so their overall appearance is different"



5.12 Tree-Pits are proposed within the public realm of the Full Planning Application and Outline Planning Application areas. Where possible, surface water run-off from public realm hardstanding hall be directed to these bioretention systems which shall provide a first stage of attenuation and treatment of run-off. Overflow shall be directed into the wider surface water drainage system.

Permeable Block Paving

- 5.13 Permeable block paving (pervious pavements) will provide Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. In terms of Water Quality, the subbase gravels shall provide a treatment stage for surface water runoff. Water Volume subbase gravels shall provide attenuation volume and slow the rate of waters entering the main sewer system. Some transpiration shall also reduce overall water volumes as waters within the subbase and within sand layers between blocks shall have (little) opportunity to evaporate this is still to be considered overall.
- 5.14 CIRIA SuDS Manual C753 Chapter 20 describes Pervious Pavements as follows:

"Pervious surfaces, along with their associated substructures, are an efficient means of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium. Treatment processes that occur within the surface structure, the subsurface matrix and the geotextile layers include:

-Filtration

-Absorption

-Biodegredation

-Sedimentation"



5.15 Lined Permeable Block Paving Attenuation Systems are proposed across the site. The access road and parking areas for Block B and Block F as well as access and hardstanding areas around Block G and J.

6 Mainenance of Development Drainage

- 6.1 The responsibility for ongoing maintenance will be the responsibility of an elected Management Company whom will be appointed by the Site Owner.
- 6.2 The proposed private surface water drainage features should be regularly inspected and maintained to ensure they are effective throughout the lifetime of the development and do not become blocked or damaged over time.
- 6.3 Some maintenance details for elements of the drainage system from CIRIA SUDS Manual (C753) are included in the tables below:

Maintenance Schedule	Required Action	Frequency
	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance) and from silt traps prior to cells.	Monthly
Regular maintenance	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration as necessary	Annually
Remove sediment from pre-treatment structure and/or internal forebays		Annually or as required
Remedial actions	Reconstruct soakaway if performance deteriorates or in the event of failure.	As required
	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year then annually
	Survey inside of tank for sediment build up and remove if necessary.	Every 5 years or as required
Monitoring		

Table 6.1: Maintenance tasks for attenuation tanks (Source: CIRIA C753, The SuDS Manual)

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid- summer, after autumn leaf fall, or as required based on site specific observations of clogging or manufacturer's recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds.	As required.
	Remediate any landscaping which, through vegetation maintenance of soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance of a hazard to the user.	As required
Remedial actions	Rehabilitation of surface and upper sub-surface.	As required (if infiltration performance is reduced as a result of significant clogging.)
	Initial inspection	Monthly for 3 months after installation. 3 monthly, 48 hours after large storms.
Monitoring	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action	Annually.
Wontoring	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually

Table 6.2: Maintenance tasks for permeable paving (Source: CIRIA C753, The SuDS Manual)

Maintenance Schedule	Required Action	Frequency
	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
Regular Inspections	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular	Remove litter and surface debris and weeds	Quarterly
Maintenance	Replace any plants, to maintain planting density	As required
	Remove sediment, littler and debris build up from around inlets or from forebays	Quarterly to biannually
Occasional	Infill and holes or scour in the filter medium, improve erosion protection if required	As required
Maintenance	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

Table 6.3 Operation and maintenance tasks for bioretention systems (Source: CIRIA C753, The SUDS Manual)

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structures for proper operation, integrity of waterproofing and structural stability Inspect soil substrate for evidence for erosion channels and identify any sediment sources Inspect drain inlets inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system Inspect underside of roof for evidence of leakage	Annually and after severe storms Annually and after severe storms Annually and after severe storms Annually and after severe storms
Remedial Actions	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth During establishment (i.e. year one) replace dead plants as required Post establishment, replace dead plants as required (where >5% of coverage) Remove fallen leaves and debris from deciduous plant foliage Remove nuisance and invasive vegetation, including weeds Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly and annually or as required Monthly (but usually responsibility of manufacturer) Annually (in autumn) Six monthly or as required Six monthly or as required Six monthly or as required
	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed. Survey inside of tank/crate system for sediment build-up and remove if necessary.	Annually Every 5 years or as required.

Table 6.4 Maintenance tasks and frequencies for green roofs (The SUDS Manual C753, CIRIA)

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
Maintenance	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Table 6.4 Maintenance tasks and frequencies for tree pits (The SUDS Manual C753, CIRIA)

Maintenance Schedule	Required Action	Frequency
Routine Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Sixth Monthly
	Change the filter media	As recommended by the manufacturer
	Remove sediment, oil, grease and floatables	As necessary-indicated by a system inspections or immediately following significant spill
Remedial Actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six Monthly
	Inspect filter media and establish appropriate replacement frequencies	Six Monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

Table 6.5 Example operation and maintenance requirements for propriety treatment systems (The SUDS Manual C753, CIRIA)

Adopted Sewer Network

6.4 The adopted surface and foul water sewers which cross the propose development site will be diverted and or divested accordingly and as agreed with Anglian Water. Adopted sewers are and will continue to be the responsibility of the Water Authority – Anglian Water.

Geocellular Storage Device – Drain-Down Alarm System

6.5 It is recommended that the drain-down alarm systems are tested every 3 months and to the manufacturers guidelines. The telemetry alarm system should also be tested to ensure

notifications and warnings are received by the Management Company accordingly. Most manufacturers will offer a maintenance service to ensure the alarm system is functioning correctly and effectively. Kiosks containing control panels should be checked for damage and replaced as necessary.

Surface Water Pumps – Pump Failure Alarm System

6.6 It is recommended that the surface water primary and secondary pumps are tested every 3 months and to manufacturers guidelines. The telemetry alarm system should also be tested to ensure notifications and warnings are received by the Management Company accordingly. Most manufacturers will offer a maintenance service to ensure the pumps and telemetry alarm systems are functioning correctly and effectively. Kiosks containing control panels should be checked for damage and replaced as necessary.

Surface Water Pumps – Link to Emergency Back-up Power Generator System

6.7 The site shall be served by an emergency power system/back-up generators to ensure essential services such as emergency lighting and sprinkler pumps are able to function in case of power failure/power cut. It is proposed to link the surface water pumps serving the site to this back-up power generator system. This will ensure that, should a power failure occur during a storm event, the surface water pumps will continue to function. It is therefore necessary to ensure the link between the surface water pumps and the emergency–back-up generator system is functional. It is recommended that the power link to the pumps are tested every 3 months and to manufacturers guidelines.

Manholes and Sewers

- 6.8 Manhole covers should be lifted each year to remove visible debris and check for blockages – it is suggested that this is undertaken every November after the heaviest leaf-fall has occurred.
- 6.9 Should a blockage occur at any time, it is advised to seek professional help to jet the drainage system to clean and clear the system.

Gutters and Downpipes

6.10 t is good practice to ensure that these are occasionally inspected to ensure they are in good order and free of leaves & debris. Once every 6 months should be sufficient.

Orifice Plate with Suitable Filter

6.11 It is advised that maintenance company take time to review the manufactures maintenance recommendations and follow accordingly, with regular inspections anticipated to be required every 3 months and after heavy rainfall events.

7 Water Quality Management During Construction

- 7.1 It is anticipated that a suitably worded Condition to Planning shall be included which sets out requirement to confirm any schemes for water quality management during the construction of the development. For guidance and to demonstrate that this has been considered during the planning stage, a construction phase plan has been provided in **Appendix U**, showing 4no. construction phases.
- 7.2 Anglian Water have been contacted to gain an agreement in principle for temporary surface water outfalls for during the construction period. It has been demonstrated that surface water shall be treated prior to outfall via a proprietary treatment unit and that the risk of surface water flooding is not increased compared to the existing situation. Once temporary and permanent drainage features are installed, the risk of flooding is further reduced due to the provision of a modern standard drainage system. Anglian Water's agreement in principle is contained in **Appendix U** also.
- 7.3 The Construction Phase Plan shows that each discreet drainage system can be constructed within a single phase with the exception of Block A, M, K/L and J3 which is split between Phase 1 and 2. Blocks A and M will be in Phase 1 whilst Block K/L and J3 are in Phase 2. The proposed geocellular storage device which serves System 4 will therefore be built in two phases. The geocellular storage device within Phase 1 will be built first, then when Phase 2 begins, the geocellular storage cells will be "extended" to complete System 4. A temporary connection to the diverted 675dia sewer for Phase 1 will be agreed with Anglian Water accordingly post-planning.
- 7.4 As the geocellular storage device will straddle the two phases, it will necessary to ensure that the storage volume constructed or each phase can deal with surace water runoff from that phase. For Block A, M, K/L and J3 catchment, Phase 1 covers 62% of this area and Phase 2 covers 38% of the catchment. As such, it is proposed to ensure that 62% of the proposed geocellular storage device is constructed in Phase 1 and 38% in Phase 2. This is indicated on the proposed surface water drainage layouts in **Appendix O**.
- 7.5 Further information regarding the construction phase : Activities such as earthworks and construction plant use may result in an increase of silt load in surface water runoff onsite. The presence of heavy plant and other vehicles onsite also introduces the potential for spillages, for example, diesel and hydraulic fluids, wet concrete, construction chemicals and wash-down wastes. Contaminants could enter the sub-soils, surface water, groundwater and nearby watercourse via infiltration and surface water runoff.
- 7.6 Earthmoving operations should be sequenced and timed to avoid heavy rainfall events. This will reduce the risk of soils and silts being mobilised within surface water run-off. Designated vehicle washdown areas shall be provided. Wash-down and surface water run-off from this area will be directed to the drainage network via a silt trap and oil interceptor and a suitable agreement for a temporary use with Anglian Water will be sought. A watching brief for unforeseen contamination of groundwater and surface water will be prepared. Spillages of fuels and chemicals will be controlled in secure bunded areas and containment at refueling and maintenance facilities in accordance with the EA guidelines.

8 Conclusions

- 8.1 EAS have been commissioned by Weston Homes Ltd to prepare a Surface Water Drainage Strategy for the redevelopment of Anglia Square, Norwich, Norfolk.
- 8.2 A separate report, undertaken by others, deals with the flood risk assessment, hydraulic modelling study and impact assessment and should be read in conjunction with this report.
- 8.3 As described in Section 1, it is proposed to make a Hybrid planning application: Full Planning for Blocks, A, B, C, J3, K/L and M and Outline Planning for Blocks E, F, G, H and J.
- 8.4 The proposed surface water drainage strategy for the Hybrid Planning Application site has been based on sustainable principles with aim to provide a significant betterment to the existing situation. Currently the site does not benefit from any attenuation features and as such surface water run-off flows freely into the adopted sewer network, unrestricted and untreated.
- 8.5 The city center site gives opportunities for "urban types" of Sustainable Drainage Systems (SuDS) features to be incorporated. These features provide water quantity, water quality, biodiversity and amenity enhancements in line with the Four Pillars of SuDS. The proposals include green roofs, bioretention systems, tree-pits, lined permeable paving and geo-cellular attenuation devices.
- 8.6 An assessment was undertaken to determine the existing surface water run-off from the site and what flow rate would likely enter the adopted sewer network. The assessment was discussed with Anglian Water and the LLFA. Anglian Water have agreed in principle to a maximum outfall rate of 242 l/s to be directed to a diverted 675dia surface water sewer which crosses the site and also to the surface water sewer in Edward Street. Anglian Water have also provided an agreement in principle for the proposed 9no. outfalls to the adopted surface water sewer network.
- 8.7 A maximum surface water outfall rate of 242 l/s has been agreed to to manage all storms up to and including the 1:100yr + 45% Climate Change Event. This will be the equivalent of 49.5% of the existing 1:1yr surface water run-off rate, a significant reduction.
- 8.8 The development parcels have been split into 9no. drainage catchments. Each catchment has a restricted outfall to the adopted surface water sewer network and attenuation designed to accommodate a 1:100yr + Climate Change Storm Event. Suitable water treatment stages, in line with CIRIA SuDS Manual are proposed and will provide an improvement to the existing situation, where waters enter the adopted sewer network, untreated.
- 8.9 Maintenance of the attenuation features will remain the responsibility of the site owner or an appointed management company. The Anglian Water sewers that pass through the site will remain the responsibility of Anglian Water.

9 Appendices

Appendix: A – Location Plan and Application Description

Appendix: B – Application Boundary

Appendix: C – LLFA Comments Tracker

Appendix: D – Topographical Survey and Utilities Survey

Appendix: E - Anglian Water Sewer Records

Appendix: F - CCTV Survey

Appendix: G - Existing Impermeable Areas and Drainage Catchments

Appendix: H – FEH Brownfield Runoff Hydraulic Calculations

Appendix: I – Greenfield Run-off Rate Calculations

Appendix J – Greenfield vs. Brownfield Storage Volumes

Appendix K – Anglian Water Pre-Development Enquiry

Appendix L – Anglian Water Agreement in Principle for Outfalls

Appendix M – Roof Level Soft Landscaping Plan (Green Roofs)

Appendix N – Hard and Soft Landscaping Masterplan

Appendix O – Proposed Surface Water Drainage Layouts

Appendix P – WinDes Hydraulic Model Outputs

Appendix Q - Downstream Defender Mitigation Indices and Unit Selection

Appendix R – Exceedance Routes

Appendix S – Anglian Water Sewer Diversion Information

Appendix T – Standard Surface Water Drainage Details

Appendix U – Construction Phasing Plan

Appendix: A – Location Plan and Application Description

Site Anglia Square, Norwich, Norfolk NR3 1DZ and the second T OLAVES ROAD ALBANY ROAD SE ROA L ROAD Wensum FB Park SH PSTONE ROAD KNOWSLE ROAD LARKE ROAL FB PW-D ONSFIELD ROAD UERNSEY NCE MARLBOROUGH STACY ROAL Allot Gdns Track WODEHOUSI STREET Tower (rems of) pat Park Park TRW. Park BistsAviours ROAL STI CRISPINS Ð A147 Subwa FB Cow Tower PW (remains of) MUSPO Sch City Wall The Close Water Gate 2452 Plotted Scale 1:7500 Promap E Mus vay T ANDR

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Anglia Square: Hybrid Application Development Description

"Hybrid (part full/part outline) application on site of 4.65ha for demolition and clearance of all buildings and structures and the phased, comprehensive redevelopment of the site with 14 buildings ranging in height from 1 to 8 storeys, for a maximum of 1,100 residential dwellings, (houses, duplexes and flats) (Use Class C3); a maximum of 8,000 sqm flexible retail, commercial and other non-residential floorspace (retail, business, services, food and drink premises, offices, workshops, non-residential institutions, community hub, local community uses, and other floorspace (Use Classes E/F1/F2/Sui Generis (public conveniences, drinking establishments with expanded food provision, bookmakers and/or nail bars (up to 550sqm), and dry cleaner (up to 150sqm))); service yard, cycle and refuse stores, plant rooms, car parking and other ancillary space; with associated new and amended means of access on Edward Street and Pitt Street, closure of existing means of access on Edward Street, New Botolph Street, Pitt Street and St Crispins Road flyover, formation of cycle path between Edward Street and St Crispins Road, formation of wider footways, laybys and other associated highway works on all boundaries, formation of car club parking area off New Botolph Street, up to 450 car parking spaces (at least 95% spaces for class C3 use, and up to 5% for class E/F1/F2/Sui Generis uses), hard and soft landscaping of public open spaces comprising streets and squares/courtyards for pedestrians and cyclists, other landscape works within existing streets surrounding the site, service infrastructure and other associated work; (All floor areas given as maximum Net Internal Area);

Comprising;

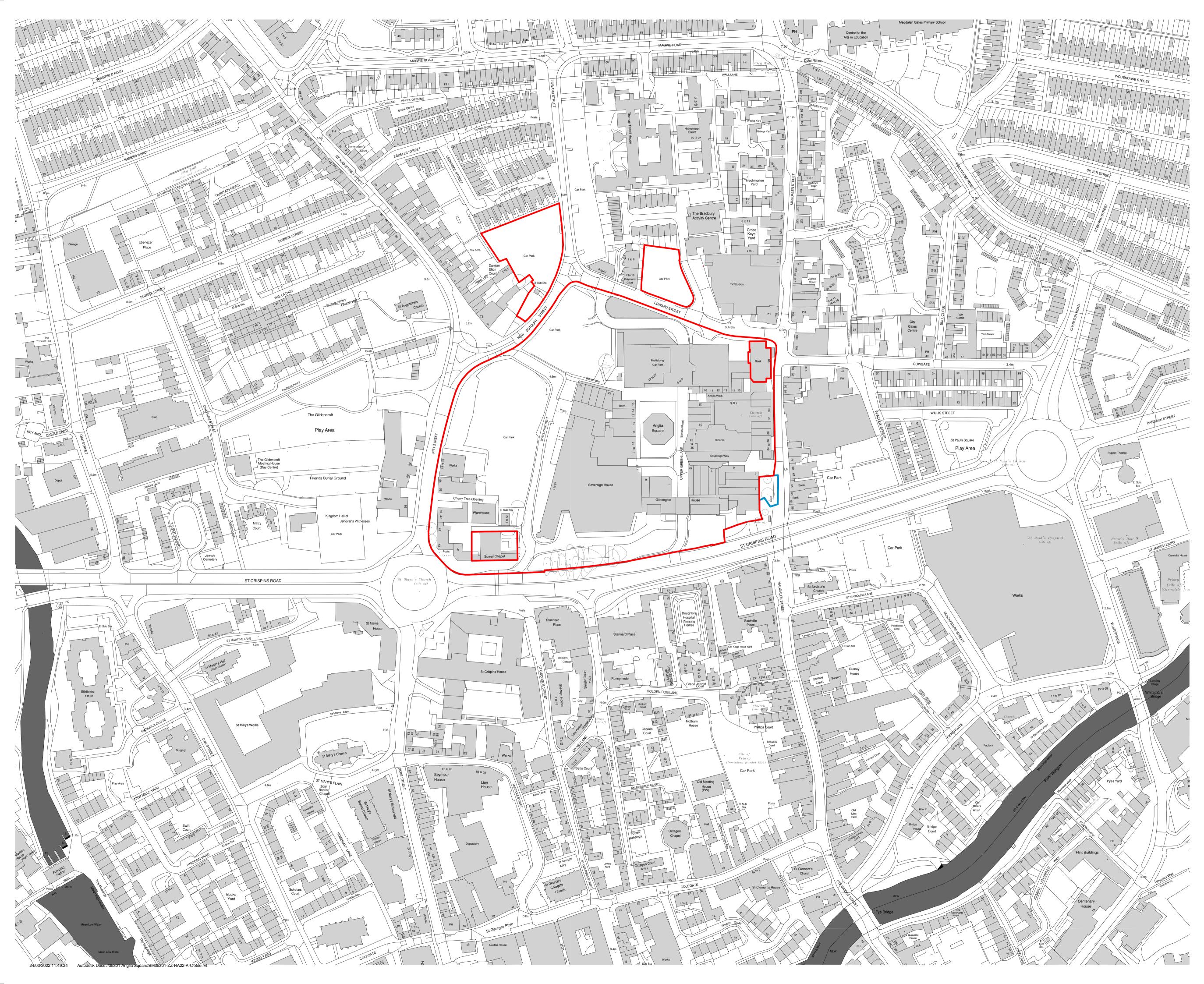
Full planning permission on 2.25ha of the site for demolition and clearance of all buildings and structures, erection of 8 buildings ranging in height from 1 to 7 storeys for 353 residential dwellings (Use Class C3) (142 dwellings in Block A, 25 dwellings in Block B, 21 dwellings in Block C, 28 dwellings in Block D, 8 dwellings in Block J3, 81 dwellings in Block K/L, and 48 dwellings in Block M) with associated cycle and refuse stores), and, for 5,906sqm flexible retail, commercial and other nonresidential floorspace (retail, business, services, food and drink premises, offices, workshops, nonresidential institutions, community hub, local community uses, and other floorspace (Use Classes E/F1/F2/Sui Generis (public conveniences, drinking establishments with expanded food provision, bookmakers and/or nail bars (up to 550sqm), and dry cleaner (up to 150sqm))), service yard, cycle and refuse stores, plant rooms, car parking and other ancillary space, with associated new and amended means of access on Edward Street, closure of existing means of access on Edward Street and New Botolph Street, formation of cycle path from Edward Street to St Crispins Road, formation of wider footways, laybys and other associated highway works on Edward Street, New Botolph Street, and Magdalen Street, formation of car club parking area off New Botolph Street, 134 car parking spaces (at least 95% spaces for class C3 use, and up to 5% for class E/F1/F2/Sui Generis uses) within Blocks A and B, hard and soft landscape works to public open spaces comprising streets and squares for pedestrians and cyclists, other landscape works, service infrastructure and other associated works; (All floor areas given as maximum Net Internal Areas);

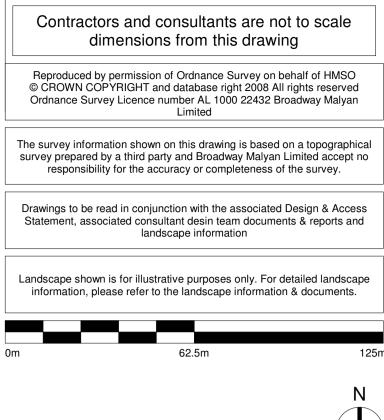
and

Outline planning permission on 2.4ha of the site, with landscaping and appearance as reserved matters, for demolition and clearance of all buildings and structures, erection of 6 buildings (Blocks E – H and J) ranging in height from 2 to 8 stories for up to 747 residential dwellings, (houses, duplexes, and flats) (Use Class C3), a maximum of 2,094 sqm flexible retail, commercial and other non-residential floorspace (retail, business, services, food and drink premises, offices, non-residential institutions, local community uses and other floorspace (Use Classes E/F1/F2/Sui Generis (drinking

establishments with expanded food provision, bookmakers and/or nail bars (up to 550sqm), and dry cleaner (up to 150sqm))); cycle and refuse stores, plant rooms, car parking and other ancillary space; with associated new and altered means of access on Pitt Street and St Crispins Road, closure of means of access on Pitt Street and St Crispins Road flyover, formation of wider footways, laybys and other associated highway works on Pitt Street and St Crispins Road, a maximum of 316 car parking spaces (at least 95% spaces for class C3 use, and up to 5% for class E/F1/F2/Sui Generis uses), service infrastructure and other associated works (landscaping and appearance are reserved matters); (All floor areas given as maximum Net Internal Areas)."

Appendix: B – Application Boundary







General Notes

All figures and areas are approximate only and subject to statutory constraints, detail design & design development
Structural Design: Subject to structural input & coordination
Services Design: Subject to services input & coordination

Fire Strategy: Subject to fire input & coordination

Application Boundary
 Land Ownerd by CT to be subject to separate application for part of the Mobility Hub

 D0-1
 31.03.22
 Issued For Planning

 Revision
 Date
 Drawn By
 Description

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Client Weston Homes Project Anglia Square Norwich Description Hybrid Application - Location Plan on Existing OS Base

StatusFor Plan JungScaleDrawn ByDate1:1250@A1BM31.03.22Job NumberDrawing NumberRevision35301ZZ-00-DR-A-01-1000D0-1

Appendix: C – LLFA Comments Tracker

Green Item	Consultee Comment (FW2022_0423)	EAS Drainage Strategy Response (Rev D (dated 15 July 2022))	RHDHV FRA Response (FRA dated 13 July 2022)	LLFA Review Comments (dated 24 August 2022) (FW2022_0703)	EAS Drainage Strategy Respons
1 Whole	An updated Flood Risk Assessment (FRA), Drainage Strategy and Hydraulic Modelling Study that consistently provides information that interlinks each of the documents.	Cross-references have been added throughout this document where appropriate.	-	Some improvement in the cross referencing.	Noted, further cross-references h
2 Whole	Within the FRA, Drainage Strategy, Hydraulic Modellin, Study and yet to be developed detailed drainage design, we request these documents incorporates the evidence to address the issues identified in the Annex.	to maintenance of nutrient neutrality. This is being addressed by Others and a	The issues identified in the Annex have been addressed within this report.	Please see the responses in the sections below that address each of the points discussed and responded to.	See below

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es have been provided.

2.1	The assessment of the	The hydraulic model prepared for the Surface Water Drainage networks serving	Addressed in Drainage Strategy Report prepared by		Greenfield and Brownfield R
Whole	greenfield and brownfield	each catchment area now include FEH rainfall data as requested. See hydraulic	EAS		in line with the methodologie
	rates and volumes are	model outputs in Appendix J of this report.		developer guidance (Section 14.3). NPPF clearly states in paragraph 169 "a) take account of advice from the lead	
	required to be calculated accurately using the FEH in			local flood authority;". The LLFA's position is based upon S3 of the Non-Adoptable Technical Standards for Sustainable Drainage Systems (2015) which states "S3 For developments which were previously developed, the	
	accordance with the LLFA			peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event	
	Developer Guidance			and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from	
	requirements and presented			the development for the same rainfall event, but should never exceed the rate of discharge from the development	
	clearly and consistently			prior to redevelopment for that event". Therefore, it is a clear and common approach that is commonly applied in	
	within the technical reports.			the surface water management industry and the LLFA requires the information to be provided. This has been	
				previously requested by the LLFA and has not been provided by the applicant.	
				All "original pre-development (greenfield) runoff rate" calculations should be undertaken using the most appropriate and uptodate Flood Estimation Handbook (FEH) rainfall data and catchment characteristics as per	
				section 14.4 of the LLFA Developer Guidance. The LLFA notes that the greenfield runoff run calculations shown in	
				Appendix H of the Drainage Strategy are for a 1 hectare area and does not reflect either the area of the site or the	
				proposed discreet drainage areas. They also do not use an FEH calculation method. Therefore, these greenfield	
				calculations are also incorrect and not appropriate for use at this time. From a review of the Drainage Strategy	
				Addendum Letter, the LLFA notes the brownfield runoff rates were re-calculated for this site using FEH13	
				hydrology.	
				In the Drainage Strategy the LLFA notes:	
				 The Modified Rational Method has been used to calculate the existing runoff rate rather than the FEH approach. The greenfield runoff rate for the whole site and for each of the proposed discreet drainage system areas has 	
				not been provided as per the LLFA's previous request in accordance with the LLFA's Developer guidance and the	
				Non-Adoptable SuDS Standards. This means there is no baseline to compare and assess whether there is a likely	
				increase in flood risk from the proposed development.	
				• In the currently provided, but incorrect, approach that has been applied, some of the greenfield areas identified	
				in green to the east of the car park area marked in brown in Appendix F appear to be served by a surface water	
				drain that discharge to the Anglian Water surface water sewer network.	
				 The LLFA would consider these areas would appear to have a surface water discharge connection that indicates they are positively drained. 	
				 The brown car park area is indicated as a private drainage system on the plan in Appendix F. However, it is not 	
				clear from the plan or the report where these drains discharge to. Are they infiltration or do they connect to the	
				public sewer network?	
				 To the east of the flyover there is an area marked as permeable that is impermeable. 	
				• The LLFA notes that section 3.13 states "existing run-off rate calculations are contained in Appendix E", which is	
				not correct. Rather, Appendix E shows the runoff rate for one storm with an intensity of 50mm/hr and does not	
				show the runoff rates for the various return periods that are referred to in section 3.12, and are required by the	
				LLFA Developer Guidance in accordance with the SuDS Non-Statutory Technical Standards. While in section 3.12 three different return periods are shown with three unrelated storm intensities when compared to the intensity	
				shown in Appendix E. Section 3.12 identifies that these were undertaken using WINDES MicroDrainage, however,	
				no calculations were provided to support this statement or indicate the parameters used in the drainage strategy.	
				• The LLFA have reviewed the Surface Water Drainage Network modelling which clearly shows the Synthetic	
				Rainfall Details for proposed Block D networks (on page 9 of the calculation sheets) uses the FSR rainfall model not	
				the FEH rainfall model. While on page 12 of the same series of calculation sheets the FEH Rainfall model is applied.	
				This is not acceptable as it is not in accordance with the LLFA Developer Guidance. This has occurred in other sets	
				of calculation for each of the systems.	
				While in the Drainage Strategy Appended Letter, the LLFA notes: • The brownfield runoff rate is calculated and a comparison using the FSR and FEH13 methods and data.	
				• The MicroDrainage Calculations show that for the storm summary results the FEH13 method is used for the	
				synthetic Rainfall Details, while in the pipeline schedule the FSR method is still used. This means that all the	
				calculations prepared in MicroDrainage have a mixture of FSR and FEH hydrology applied.	
				• The MicroDrainage Calculations have used a MADD Factor of 2 which should be 0, otherwise double counting will	
				be experienced in the network. Again the information provided in the Drainage Strategy addendum Letter did not	
				provide the information previously requested or in accordance with the LLFA Developer Guidance.	L
		The site is Brownfield and currently drains unrestricted and untreated into the existing Anglian Water surface water sewers which cross the site. As the site is			Justification of proposed runc Anglian Water for the propos
		Brownfield and practically 100% impermeable, it is not considered reasonable or		should be achieved and agreed with the relevant drainage body (LLFA, IDB or Anglian Water) providing evidence as	e 1 1
		appropriate to apply greenfield run-off rates for this Application. Anglian Water		to why an alternative should be considered." At present, EAS has not accurately defined the predevelopment	-F
		state that where this is not practical they will assess capacity based on the 1:1		(greenfield) runoff rate of the site. Therefore it is not possible to compare the predevelopment and post	
		year calculated rate. They therefore permit a maximum discharge rate of 242 l/s		development runoff rate. While we appreciate the reminder of the Anglian Water approach, the LLFA guidance	
		to manage all storms up to and including the 1:100yr + Climate Change Event. A		differs slightly and at the LLFA we apply the LLFA's Developer Guidance. We shall remind the applicant that NPPF	
	Provide evidence to support	Pre-Development Enquiry and Capacity Check from Anglian Water confirming this		in paragraph 169a states "take account of advice from the lead local flood authority".	
	the justification of increasing	is contained in Appendix I of this report.		The LLFA notes the current agreement in principle from Anglia Water is for a single discharge point at manhole	
2.2 Mhola	the greenfield discharge rate		Addressed in Drainage Strategy Report prepared by	1355 that is near to the southeast corner of the site. The current proposal has four connection points not in this location. In addition, the evidence base to support the proposed design is incomplete to due a lack of correctly	
Whole	is required in accordance with the LLFA Developer		EAS	calculated information. It would be appropriate to discuss this with Anglian Water as at present the proposed	
	Guidance.			design discharge locations are not in accordance with the agreement in principle.	
				The applicant's response states the site is "Brownfield and practically 100% impermeable" yet your existing runoff	
				calculations do not reflect this. Please see comments above on the existing surface water run off calculation	
				corrections that are required as the wrong method and approach has been applied. This means it is not possible	
				for the applicant to demonstrate the difference between the predevelopment (as defined in section 14.3 of the	
				LLFA Developer Guidance) and the proposed submission. The current approach taken which calculates the existing brownfield runoff rate is not acceptable to the LLFA. The LLFA considers this requirement incomplete for a second	
				time.	
			1		

Runoff Rate calculations are provided in Section 3 of the report, es required by LLFA.

noff rates is provided in Section 4 of the report. Agreement from osed outfall points and rates is shown in Appendix L of the

2.3 Whi	(Apply the latest (May 2022) Climate change guidance, which would require the application of a 45% climate change allowance to the 1% AEP and to apply the appropriate climate change allowance of 40% to the 3.3% AEP calculations.	The hydraulic models prepared for the Surface Water Drainage networks serving each catchment area now include the up-to date Climate Change Allowances as requested. See hydraulic model outputs in Appendix J of this report.	All model runs now include the latest climate change allowance, which were released post completion of the previous FRA. See Figures in Appendix I and J	The LLFA notes the applicant's commitment to using the latest climate change allowance for peak rainfall intensity in the drainage strategy in section 4.15. This was thought to continue through to the drainage calculations in Appendix J. However on review of the drainage calculations the LLFA note that there is no climate change allowance included on page 13 of the calculations for Block A, M, J3 and K/L SW Drainage Network which is where the FSR rainfall model is also noted as being used. However, in the subsequent calculations for the 1% for the Block A, M, J3 and K/L SW Drainage Network which is where the FSR rainfall model is also noted as being used. However, in the subsequent calculations for the 1% for the Block A, M, J3 and K/L SW Drainage Network the FEH Rainfall model is used and has a 45% climate change allowance applied. The same has occurred on the Block B, the Bolph Street, SW Network Calculations where the FSR method has been used in part of the network assessment and FEH has been reported in the 1% +45% CC storm results. The LLFA notes that drainage design for Block E, F, H, G and J have the FEH rainfall method applied and the 1% +45% for climate change applied. These systems are in the outline planning application area. The LLFA notes there are no 3.3% and 3.3% +CC calculations submitted for any area as per the requirements of the latest climate guidance and the LLFA Developer Guidance. The LLFA notes that on the Block B Porous Car Park Manholes, a Factor of Safety of 2 is applied. The Ciria SuDS Manual (C753) recommends that a factor of safety of 10 is applied to the surface infiltration rate for all types of surface (Chapter 20 section 5.1 (page 400)). This will require updating.	All existing and proposed catchment of 0, FEH Rainfall Data and to gene 1:100yr + 45%CC storm events. See Appendices. Regarding the hydrauli WinDes Microsoft displays hydraul the results below "Event" shows the allowance. I cannot change this. Ple storm event including the climate cl
2.4 Wh	ole t	Evidence that recent liaison with Anglian Water relevant to this new planning application that provides:	Up-to-date sewer records have been obtained and an up-to-date pre- development enquiry has been received. Sewer records are contained in Appendix D and Pre-dev enquiry is contained in Appendix I.	Addressed in Drainage Strategy Report prepared by EAS	As per response 2.2, the LLFA notes the applicant has obtained updated Anglian Water sewer plans in April 2022. In addition, the applicant has received a high level pre-planning assessment report (PPE-0143339 dated: 08/04/2022). The LLFA have reviewed this PPE and note this planning report provides an agreement in principle for one connection to discharge a maximum of 242 l/s to manhole 1355 in the south east corner subject to the provision of connection hierarchy information being provided to AW. The proposed outline drainage design provided for the hybrid application identifies there will be four discharge locations to the AW sewers in locations not specified by the Pre-Application Assessment. In addition, the LLFA observes the PPE has not considered the site is located within the largest critical drainage catchment (CDC) in Norfolk or that the proposed drainage systems to connect to the network are pumped. The PPE states "should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required." At present, the proposed drainage design submitted for the hybrid application is not in accordance with the Pre-Planning Assessment agreement in principle and therefore it is not considered in keeping with the agreement in principle. The LLFA require that these	Anglian Water have provided an up and Appendix L of the report.
2.4. Wh	.1	Confirmation from Anglian Water that no changes have occurred in the public network since 2017.	Up-to-date sewer records are contained in Appendix D.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA notes the applicant has obtained updated Anglian Water sewer plans in April 2022.	Noted
2.4. Wh		Obtain recent drainage assessment from Anglian Water that relates to the current proposed development.	Up-to-date pre-development enquiry is contained in Appendix I.	Addressed in Drainage Strategy Report prepared by EAS	The applicant has received a high level pre-planning assessment report (PPE-0143339 dated: 08/04/2022). The LLFA have reviewed this PPE and note this planning report provides an agreement in principle for one connection to discharge a maximum of 242 l/s to manhole 1355 in the south east corner subject to the provision of connection hierarchy information being provided to AW. The proposed outline drainage design provided for the hybrid application identifies there will be four discharge locations to the AW sewers in locations not specified by the PPE. In addition, the LLFA observes the PPE has not considered the site is located within the largest critical drainage catchment (CDC) in Norfolk or that the proposed drainage systems to connect to the network are pumped. The PPE states "should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required." Therefore, at present the proposed drainage design submitted for the hybrid application is not in accordance with the PPE and should be re-assessed by AW.	Anglian Water have provided an up and Appendix L of the report.
2.4. Wh		records from Anglian Water.	Anglian Water were able to confirm that there have been cases of sewer flooding in the vicinity of the site, but for data protection were unable to specify any locations. See email dated 22.06.2022 in Appendix M.	Addressed in Drainage Strategy Report prepared by EAS	The applicant has now obtained confirmation that there have been incidents of sewer flooding in the vicinity of the proposed development as demonstrated in Appendix M. No specifics were given at this time. This is further supported by a letter in Appendix C of the Drainage Strategy Addendum Letter.	Noted
	ole ' a s	"agreement in principle" with	Surface water drainage serving private catchments will be the responsibility of an elected Management and Management Company, whom shall be appointed by the Site Owner. Any adopted sewer or diverted adopted sewers within the red- line boundary shall be the responsibility of Anglian Water.	Addressed in Drainage Strategy Report prepared by EAS	No evidence of Anglian Water agreement in principle to take on the maintenance and management of the proposed drainage system is provided in the PPE. The LLFA requires this evidence for all structures that it applies to in the full planning application area of the design. For adoptable structures in the outline planning areas, this can be conditioned.	All proposed surface water drainage privately owned and managed/main 675dia sewer. This sewer is currentl adopted and maintained by Anglian Application should be made to agre intend on retaining their ownership requested a statement from AW to t
2.5 Wh	ole o a ł	Provide a more in-depth consideration and assessment of rainwater harvesting and re-use opportunities.	See Section 4 para. 4.6 and 4.7.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed Paragraph 4.6 which contains a very limited consideration of rainwater harvesting in relation to the proposed development. There is no breakdown of the assessment per block or quantative assessment of the rainwater harvesting potential. The and Paragraph 4.7 is not relevant to this matter. The statements made in the drainage strategy are unevidenced and further assessment remains required to support the statements made.	This section has now been expander rainwater harvesting opportunities
2.6 Wh	ole a	Provide a more in-depth consideration and assessment of groundwater flood risk.	Addressed in Royal Haskoning DHV FRA Report.	Included at 7.10 onwards and 8.52	The LLFA has reviewed section 7.9 to 7.16 in the FRA. The LLFA notes that Figure 6 only defines the banding names not the meaning of all the bandings. In section 7.10 a definition of Band B is given but no others. This means it is not possible for the LLFA to reasonably be able to interpret the information provided by the applicant at this time. Furthermore, there appears to potentially be a fourth undefined colour band which the site sits within. Further clarification is required before the LLFA can accept the information being presented in the report. The FRA in section 7.11 confirms that site-specific boreholes have not been drilled yet and nor has groundwater monitoring been undertaken. Historic groundwater borehole information is provided in Table 5 with the two most recent results (showing a winter (January 1993) groundwater level of 2.40m bgl and a spring (May 1993) groundwater level of 4.40m bgl) confirming that in the likely worst case there is not likely to be suitable distance between the bace of a below ground infiltration structure and the groundwater level all wear round. It is not	RHDHV

ments have been hydraulically modelled using MADD factor generate a 1:1yr, 1:30yr, 1:30yr + 45% CC, 1:100yr and s. See Sections 3 and 4 of the report and the corresponding traulic model out I'm afraid the above is the only way that lraulic model outputs. The return period is listed above, in *is* that the model has been run with 45% climate change s. Please refer to the results "Event" for confirmation of the te change allowance.

n update to their Pre-Development Enquiry, see Appendix K

n update to their Pre-Development Enquiry, see Appendix K

inage within the site boundary (Full or Outline) will be maintained - with the exception of the diverted adopted rently adopted and after diversion will continue to be glian Water. Anglian Water have stated that a \$185 agree the diversion formally - this itself confirms that AW ship and responsibility of the 675dia sewer. EAS have / to this effect and await their response.

anded to include a more detailed assessment of suitable ies

2.7 Whole	Provide a more in-depth consideration and assessment of sewer flood risk.	Addressed in Royal Haskoning DHV FRA Report.	Included at 7.3 and 8.59	The LLFA have reviewed the FRA section referred to. The LLFA notes that Anglian Water have been contacted in June 2022 and confirmed that sewer flooding has occurred recently in the local area. Further information is currently being waited for, although the precise locations of the incidents will not be recieved due to confidentiality. The information provided in the email dated 22 June 2022 from Anglian Water states "Anglian Water is able to confirm that there have been instances of flooding within the vicinity of the proposed development." Yet the FRA states in section 7.8 that "Although no sewer flooding has been reported locally to date, there may be potential for sewer flooding in extreme events greater than those modelled" which misrepresents the information provided by Anglian Water that indicates sewer flooding has occurred locally but they are unable to share any more details. While in the Drainage Strategy Addendum Letter (Appendix C) Anglian Water confirm in mid July 2022 that they "have no records of flooding in the vicinity that can be attributed to capacity limitations". The LLFA notes there is further ambiguous information in section 7.6 of the FRA, which states there is capacity in both the foul and surface water severs. Although on review of the preplanning assessment in Appendix G there is no clear statement from Anglian Water that confirms this. The Anglian Water Pre-Planning Enquiry Report for the site only states there is "available capacity" in the foul water assessment at that time. It is clear in the Anglian Water assessment that it is possible for Anglian Water to revise their response which may result in the need for an alternative solution, connection point or flow rate. Further comments on the pre-Planning Assessment of sever flood in the substrate that some areas of the site have a historic connection to the Anglian Water to revise their response which may result in the need for an alternative solution, connection point or flow rate. Further comments on the pre-Planning Assessment o	
2.8 Whole	Provide clarification on the retention of surface water runoff on the site and whether this is actually the provision of either blue or green roofs not previously included in the surface water drainage calculations.	No blue-roofs are proposed on site. Greenroofs are to be provided. In terms of drainage calculations. It is considered robust to assume green-roofs are saturated and will not provide any attenuation for large storm events. As such, the 1:100yr + Climate Change hydraulic modelling assumes all roof areas are impermeable. This provides a conservative assessment of required attenuation volumes.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed this assessment approach and can accept this approach at this time.	Noted
2.9 Full	Provide clarification on the water depth for the return periods given at Edward Street Service Yard as there are significant discrepancies.	Addressed in Royal Haskoning DHV FRA Report.	Clarified in 5.38-5.40	The proposed development model runs included all ground FFLs of the buildings where known, as Zshapes. The basement car park located in Block A is within the surface water flow path and therefore identified as a vulnerable part of the development. The LLFA requested that the basement car park was set at ground floor level, or the entrance to the car park is raised 300mm above the 1 in 100 year (+45%CC) flood level. Discussion within the applicant's documents confirms that humps could be located at the entrance to the basement car park and the entrance to the low lying service yard, which would be set 300mm higher than the 1 in 100 year (+45%CC) flood level. The humps were represented as Z-lines which were set at the level 300mm higher than the flood level at these locations. For the entrance car park, this was a level of 4.80m AOD and for the service yard it was a level of 4.45m AOD. This prevented surface water from entering these two vulnerable parts of the site. Walls were located around the service yard and basement car park entrance ramp, to prevent water from flowing 'through' walls and into the low lying areas. The walls were represented as Z-lines and set at 999m high within the model, to prevent any water passing through. The proposed model was run for both the 'no mitigation' and 'mitigation' scenarios upon the request of the LLFA, and flood maps have been prepared for both. The 'no mitigation' runs are called 'Proposed' and the 'mitigation' scenarios including the humps at the car park and service yard entrances are called 'Proposed_Barrier'. FRA report section 5.38 and 5.39 outline the 1%+CC depth but does not present the 1 in 30 year depths. Mitigation is discussed in Section 5.4.1. The maps in Appendix I show no flooding of the service yard in the proposed mitigation depths adjacent to the barrier are Max 0.1m and adjacent to the building wall are 0.2m. Representation of these features in the model are described in section 7.3.2 of the modelling report (extract in modelling column). The levels mod	

fom AW regarding sewer flooding ocurring downstream of the remove any ambiguity.

2.10 Full	Prepare and provide a full detailed drainage design that includes all the proposed elements of the surface water management system. This includes clarification of the design details (including plans, modelling, calculations and supporting information in accordance with the LEA's Developer Guidance) of suitable drainage featured, such as green/blue roofs, bio- retention features and tree- pits.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	The detailed design information is missing some calculations, plans and supporting information as well as requiring corrections to the calculations provided. Information missing includes typical design sections and plans, 3.3% and 3.3%+CC calculations for each element. The SW drainage model includes the larger SuDS elements but appears to be missing some features. All SW Drainage calculations have a manhole table that has at least one column that is not visible to read as it is off the page in the results PDF in Appendix K. This needs to be updated so that the information is provided in a readable format. The LLFA notes that section 8.2 and 8.3 indicate which development blocks are at flood risk however there is no summary of which roads and pedestrian access routes which are at surface water flood risk. The LLFA observes this gives an overly optimistic outlook on the flood risk across the site. In section 8.4 the FRA notes that "is impractical to prevent offsite flows entering the onsite drainage design for the any offsite surface water that may enter the system. An allowance for offsite flows needs to be included within those systems likely to be affected by offsite flows.	clearly, ensuring data outputs are via 1:30yr+CC, 1:100yr and 1:100yr+C discussed, no attenuation volume is swales/tree pits in order to provide a The proposed surface water drainage falling within the redline application designed to manage all storms up to
2.10.1 Full	response to 2.10 for system 1			 System 1 relates to Block B - Full It is not clear to the LLFA how a discharge rate of 5 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. No patios shown on the drawing information submitted for the residential houses. Urban creep should be applied to the residential houses and the patios need to be included in the design along with their drainage connections. One of the parking spaces in the residential houses area appears to not be permeable. Is this correct? The LLFA would recommend that this space is also included within the permeable paving area too as there is no justification made by the applicant not to include it. The LLFA requests clarification on this approach. No design information shown on plan for inflow and outflow pipes for PP2 on the SW drainage plan. This is needs to be included as part of the full application. In section 4.20 of the drainage Strategy and in the plan (drawing No PJ-3831 DR-002) a flow control device is identified at the outfall of the system, in section 4.25 it states a downstream defender (a hydrodynamic vortex separator) is specified in the design which is supported by the design on the plan. While in the MicroDrainage calculations for Block B a Hydrobrake Optimum device is specified and included in the calculations there is no downstream defender included in the calculations. The calculations will need to be updated to reflect the 	 The proposed rate for this catching Report. The proposed hardlandscaping is i Appendix N. An allowance for patie houses. proposed hardlandscaping is in acco N. All areas that can be permeable p The hydraulic model includes all r A Hydro-brake is proposed to rest a downstream defender treatment ur hydraulic model though it is not nec no flow control measures and was sis outfall rate from teh flow control de not including the downstream defen Hatching updated on the drainage
2:10:2 Full	response to 2.10 for system 2			 inclusion of the downstream defender as Block B (System 1) is part of the full application area. System 2 relates to Block C - Full It is not clear to the LLFA how a discharge rate of 5 l/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. The LLFA has reviewed the proposal to discharge the rising main from the attenuation tank through the medium of small bioretention system is not considered appropriate in combination with a pumped discharge to the medium in a highly urban environment within a critical drainage catchment. The bioretention feature is designed to slow water conveyance while the pumped discharge to the medium could potentially overload the system and cause localised surface water flooding on a very flat site. The LLFA notes the area with the bio-retention features would experience flooding in a 1% +45% climate change to a depth of typically between 100mm to 200mm. Therefore the LLFA consider that the pumped discharge for 1% +45% climate change, the medium would likely be saturated and flood risk would likely be increased by the proposed surface water drainage design currently proposed. The LLFA notes there is a significant area of the site that is understood to be paved, although it is not confirmed what this area is to be paved with, its finished ground levels or how it will be drained. Clarification of the surfacing is required. The bioretention swale is not included within the MicroDrainage calculations and neither are the last couple of manholes and pipes (C11 and C12). Therefore, the submitted calculations are incomplete for this system. In addition the MircoDrainage calculations indicate that the applicant is to offer pipe 1.007 onwards for adoption. This means the statements regarding the half drain times are not appropriate as the downstream elements of the system have not been included within the corner of the geo-cellular tank is at least 5m away from the building. The LLFA	 The proposed rate for this catching Report. The surface water drianage for this amendments to the site layout (reme catchment o drain via gravity. It is n catchment, following advice from Ll proposed. The hardstandings drain t defender. on the drainage layout drawings and to slot drains, which outfall to the n is in accordance with PlanIt's Lanse. Bioretention swale removed as per The geocellular storage device is 5 No trees are proposed over the geo A Hydro-brake is proposed to rest a downstream defender treatment un hydraulic model though it is not nec no flow control measures and was si outfall rate from teh flow control de not inlcuding the downstream defen Hatching updated on the drainage

ter drainage hydraulic calculations shall be presented e visible. Drainage systems shall be tested for 1:1yr, 1:30yr, r+CC storm events. MADD Factor of 0 shall be applied. As e is accounted for within green-roofs and bioretention de a robust assessment.

hage systems for the development site will deal with rainfall tion boundary only. The attenuation volumes shall be p to and including the 1:100yr + 45% Climate Change Anglian Water agreed outfall rates. The proposed surface be designed to include any flows or volumes from off-site s appreciated that off site flows/volumes will affect the systems in certain catchments and as such it is appropriate will be triggered to alert the Managemetn Company when storm event. Failure to drain-down after a storm event could ithin pipework or attenuation devices, or could be attributed rating effectively. By identifying a possible issue in the an be undertaken to ensure that the drainage systems operate s required, are available at all times. This means that should gh the site, these paths and depths of surface water are not ing on site drainage systems. This alarm system could be Plan (to be Conditioned) for information only, however its e need for any Maintenance to be undertaken.

hment is discussed in para. 4.22 and 4.23 of the Drainage

g is in accordance with PlanIt's Lanscape Masterplan in patios and urban creep has been made for the terraced • The

accordance with PlanIt's Lanscape Masterplan in Appendix ble paving are so.

all nodes.

restrict flows from this catchment. After flows are restricted, nt unit is provided. The hydrobrake is included in the t necessary to include the downstream defender as it offers vas sized by Hydro-International based on the maximum ol device (hydrobrake). There is no benefit or disbenefit form efencer in the model.

age layout drawings and included in the key.

hment is discussed in para. 4.22 and 4.23 of the Drainage

this catchment has been redesigned following slight removal of cycle store) and it is now possible for this is no longer proposed to utilise bioretention swales in this m LLFA and taking into consideration that a green roof is ain to slot drains and are treated via a down-stream

• The proposed levels are shown s and confirm that runoff from hardstanding areas is directed he main surface water sewer network. The hardlandscaping anscape Masterplan in Appendix N.

per LLFA advice.

is 5m from the building line.

geocellular storage device.

restrict flows from this catchment. After flows are restricted, t unit is provided. The hydrobrake is included in the

necessary to include the downstream defender as it offers as sized by Hydro-International based on the maximum I device (hydrobrake). There is no benefit or disbenefit form efencer in the model.

age layout drawings and included in the key.

		I	• The LLFA observe that based on the manhole cover levels of 4.050m and the given finished floor level of 4.650m	• The proposed levels have been up
			there is a 600mm freeboard incorporated into the design. On review of the applicant's surface water flood risk	RHDHV in their hydraulic model F
			hydraulic modelling within the latest FRA, which shows the mapped results indicate the surface water flood depths	The drainage layout drawings have
			to the north of the block are typically between 300mm to 500mm, while the southern end of the building is	hardstanding areas is directed to slo
			typically between 100mm and 300mm. The FRA indicates the finished floor level is 300mm higher than the level of the design flood event (1% AEP	network. The hardlandscaping is in Appendix N.
			+45% CC). However, the report and the maps indicate that in some areas to the north of Block C the modelled	• The uptodate site layout has been
			water depth is 420mm. This would indicate that the finished floor levels would need to be at least 4.75m to	· Kiosk shown for tank alarm syster
			provide the required 300mm freeboard above the design flood event water level.	The geocellular storage device is 5
			 It is not clear where some of the patio areas to the east of the building and the pathway areas to the west of the building will be draining to as there is no drainage shown for these areas, only drainage associated with the roof. 	their hydraulic model to answer que
			As the site is very flat (based on the manhole cover levels given as no finished ground levels are provided) there	
			drainage in these areas is important to ensure that dry access and egress to the building is possible.	
			The LLFA observes that the drainage plans in Appendix K of the drainage strategy are using different block layout	
			arrangements for Block C compared to those shown in Drawing number 35301-ZC_00_DR-A-03-0100-D0-2 (dated	
			31.03.22). Please confirm which block layout represents the current design?Based on the information provided in the plans, it is not clear to the LLFA what the feature is that extends from	
			the downstream side of the geocellular crate to the pump chamber. The LLFA requires clarification on what this	
			feature is from the applicant as there is nothing shown either in the drawing or in the legend of the drawing.	
			The below ground infrastructure for the pumping station is indicated however it is not clear whether there will	
			be any above ground control kiosk for the pumping station. The LLFA reminds the applicant the level of the	
			control kiosk for the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA's Developer Guidance in section 20.3. The LLFA requires confirmation of the	
			proposed outline arrangements for the control kiosk.	
			The LLFA is not able to determine from the drawings if the geocellular structures are an appropriate distance	
			from the foundations of Block C. The notes that section 3.1 from Ciria C737 on the Structural and geotechnical	
			design of modular geocellular drainage systems determines that the geocellular tanks must be at least 2m plus the	
			depth of the storage structure from the foundations of a building. Due to the space constraints the LLFA will require demonstration from the applicant the proposed Geocellular tank is able to meet this requirement. This is	
			to demonstrate the proposed outlined drainage system is achievable when the drainage design is developed in full	
			at a later stage.	
			The LLFA has reviewed the proposed surface water drainage System 2 which serves Block C. The LLFA notes the	
			applicant is intending to place a residential block of flats with a green roof in an area of surface water flood risk. The extent of the surface water flood risk has been modelled by the applicant and confirms the block located in an	
			area of flood risk, which is not in keeping with the application of the sequential test. The building is proposed to	
			have a green roof that would discharge surface water into the drainage system that would attenuation the flow in	
			a below ground geocellular tank. At least two trees planted are proposed to be planted on top of the geocelluar	
			tank. The water from the tank would be pumped out into the medium of a small bioretention area with a	
			perforated pipe underdrain before the system connects through a series of standard below ground pipes in the site and the road to discharges to the existing Anglian Water sewer in Edward Street.	
			The LIFA is very concerned the trees planted over the tank would damage the tank and reduce the capacity and	
			function of the system as the trees grow. In addition, the pumped discharge to a small bioretention area is unlikely	
			to operate and would lead to exacerbating the existing and residual flood risk in this location, which could increase	
			the difficulties associated with safe access and egress from the block. While it is questionable about whether the location for this residential accommodation being located in this area of the site due to the existing and post	
			development flood risk, the proposed ground level surface water drainage system combined with the pumped	
			discharge of the attenuation tank is considered by the LLFA likely to increase the surface water risk associated with	
			Block C. Therefore, only for Block C in this proposed development the LLFA recommend an alternative design	
2.10.3 Full	response to 2.10 for system 3		System 3 relates to Block D - Full	 The proposed rate for this catchm Depart • This type has been correct
Full			 It is not clear to the LLFA how a discharge rate of 12.5 l/s was derived and how this relates to the pre- development greenfield runoff rate for the drainage area. 	Report. • This typo has been correc building line as a precaution and du
			 Paragraph 4.32 states "to be conservative, the hydraulic models shall assume green-roofs are saturated and will 	away from the building and towards
			bit allow for any impermeable areas, as such will be considered 100% impermeable with a contributing area of	updated drainage layout drawings r
			2580m2." The LLFA observes the statement indicates that "no impermeable area will be allowed for" but then the	are designed to fall away from the b
			model assumes a "100% impermeable area". This contradiction in the statement needs to be corrected.A channel /slot drain is positioned around the perimeter of the building. The bio-retention tree pits and swales	slot drains. The updated drainage la report. • Levels have been updated
			are positioned further away from the building. These bioretention feature discharge to the drainage network.	lasted hydraulic model report. The
			However, it is not clear what discreet drainage area these bio-retention features serve as there is very limited	and this is shown on the drainage la
			information about the finished ground levels as only the cover levels of the manholes and tanks are provided.	redesigned to ensure geocellular sto
			Paragraph	for updated levels. This has present
			4.37 indicates that "roofs and pedestrian walkways will discharge directly to the adopted sewer via a bioretention swale". However, this is not supported by the proposed drainage plan shown in Appendix K as it is not clear how	catchment drains to the adopted sev longer directed into the bioretention
			the water will be directed to these bioretention swale features rather than the slot drains to benefit from the	features becoming overwhelmed.
			water treatment. In addition, there is no connection shown directly from the roofs to the bio-rention swales,	in the WinDes drainage models as t
			meaning the roof water will not be directed through the swales for water quality treatment. Therefore, the text in	storage volume. This then assumes
			the drainage strategy is not consistent with the proposed drainage layout and the proposed drainage layout is not	device and provides a robust calculation
			considered appropriate at this time based on the limited information provided. The proposed design requires further work as there is insufficient information for a full drainage design and design improvement to be made.	bioretention swales or green roofs to tenk drain-down alarm system is sho
			 The LLFA observe that northern section of the building the manhole cover levels of 4.950m and the given 	is no longer proposed. • The geoce
			finished floor level of building is set at 4.950m meaning there is a no freeboard incorporated into the design. it is	clearance from proposed building li
			the same at the southern end of the building manhole cover levels of 4.500m and the given finished floor level of	
			building is set at 4.500m meaning again is a no freeboard incorporated into the design. This is not in accordance	
			with the LLFA Developer Guidance and means there is a risk of surface water entering the building. The LLFA's concern is supported by the applicant's surface water flood risk hydraulic modelling within the latest FRA, which	
			show the mapped results indicate the southern end of the Block D building would likely flood in a 1%AEP with	
			45% climate change allowance to a depth of between 50mm to 100mm.	
			• A pumped discharge is identified on the outline drainage plan in Appendix K, yet there is no pumped discharge	
			identified in the drainage description for system 3 (paragraph 4.32 - 4.37). The pumped discharge set at a rate of	
			12.5 I/s is proposed to discharge through the filter medium of the bio- retention swale before discharging to the diverted Anglian Water Sewer. The LEA has reviewed the proposal to discharge the rising main from the	
			diverted Anglian Water Sewer. The LLFA has reviewed the proposal to discharge the rising main from the attenuation tank through the medium of small bioretention system is not considered appropriate in combination	
				1
			with a pumped discharge to the medium in a highly urban environment within a critical drainage catchment. The	
			with a pumped discharge to the medium in a highly urban environment within a critical drainage catchment. The bioretention feature is designed to slow water conveyance while the pumped discharge to the medium could	

updated and are in line with the levels proposed by l FRA report.

have been updated and confirm that runoff from slot drains, which outfall to the main surface water sewer in accordance with PlanIt's Lanscape Masterplan in

een included.

rstem described in para. 4.47. No pumps. : is 5m away fromt he building line. RHDHV have updated query relating to sequential test.

chment is discussed in para. 4.22 and 4.23 of the Drainage rrected. • A slot drain has been provided around the due to the level thresholds. Levels are designed to fall ards the bioretention swales or other slot drains. The s reflect this and this is described int he report. • Levels e building and towards the bioretention swales or other ge layout drawings reflect this and this is described in the ated to be in line with those provided by RHDHV in thir The south side of Block D level has been raised to 4.6mAOD re layout drawings. The surface water drainage has been r storage is 5m away from proposed buildings and allowing sented opportunity for a gravity outfall and as such, this sewer network via a hydrobrake. Outfall flows are no tion swale medium meaning there is lower risk of these

 Bioretention swales and greenroofs are not included as these are assumed to be saturated, not providing any mes that all flows are directed to the geocellular storage Iculation. It is not considered necessary or beneficial to add offs to the hydraulic calculations. • The kiosk to serve the s shown on the drainage layout drawings. note that a pump eocellular storage device has been rearranged to ensure 5m g lines.

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Normality			 The LLFA notes the north facing commercial unit on the western part of Block A has a finished floor level of 4.5m 	shown on the drainage l
kink is a subset of the restoration is block a oper density on a significant book for water is a sinterview of water is a significant book for water is a s			which is lower than the manhole 01 cover level of 4.95m, while the neighbouring residential unit has a finished	been provided by the ar
Full Service Servic			floor level of 5.4m. This puts the commercial unit at an increased flood risk by design. The LLFA observes the	rainwater down pipe rou
Note: And other commercial usits match the level of adjacent mainbox cores. The LLPA requires the inference of the level on adjacent mainbox cores. The LLPA requires the inference of the level condext and the level on adjacent mainbox cores. The LLPA requires the inference of the level condext and the level of adjacent mainbox cores. The LLPA requires the inference of the level condext and the level of adjacent mainbox cores. The LLPA requires the inference of the level condext and the level condext			access to the residential lobbies on the east side of Block A open directly on to a significant flood flow route in	drainage design provide
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			lof the assessment of water quality for this system.	J

for this catchment is discussed in para. 4.22 and 4.23 of the Drainage l drainage is shown for information only - it is not intended to present awings which show internal rainwater down-pipe routes through the ered that the external and below ground surface water drainage design he LLFA a suitable amount of information to prove that surface water aged effectively and in line with Anglian Water's requirements and the er pipe locations have been provided by the architect - the structural esign for the rainwater down pipe routes are not considered necessary LLFA. • Levels have been updated to be in line with those provided sted hydraulic model report. • Further details of the ramps leading to ck A and Block M are provided in the FRA report. The levels are now ge layout drawings. • The green roof rainwater pipe locations have e architect - the structural internal and M&E design for the green roof routes are not available. The external and below ground surface water ided will gives the LLFA a suitable amount of information to prove that e can be managed effectively and in line with Anglian Water's NPPF . • The area around former Barclays Bank building is included vork. • The drainage layout drawings have been updated to include a rres or ensuring that features are labelled. • A kiosk for the tank drainontrol panel as well as control panel serving the pump is now indicated t drawing and is on a plinth above the flood level.

for this catchment is discussed in para. 4.22 and 4.23 of the Drainage ention swale in question straddles Botolph Street catchment and Block ended that the section in Botolph Street catchment will be built in r section in Phase 4. An outfall for the section in Phase 3 will be oh Street drainage network and a second outfall to the Block F drainage ided in Phase 4. • Further details for levels have been provided. • The nave been renames bioretention systems in line wuth CIRIA. A further g a Downstream Defender is proposed to ensure water quality or all runoff. • overland flow paths are considered and discussed in • all pipes are included in the model.

System 6 relates to Block E - Outline • It is not clear to the LLFA how a discharge rate of 30 I/s was derived and h		 The proposed ra Report.
• It is not clear to the LEFA now a discharge rate of so it's was derived and it development greenfield runoff rate for the drainage area. The LEFA require		pipe networks add
• The LLFA notes that this is part of the outline planning application, however	-	are walled garden
the approximate size and location of the proposed green roofs within the d	, ,	storage from cove
• The LIFA notes the geocellular tank is located in the system 5 draininge ar	_	surface water pun
the earth of the second s		system added. • D
Appendix J to support the initial tank sizing. There is no modelling of the ou	-	possible to follow
Most of Block E appears to be in a downstream location to the attenuation	tank. The LLFA requires a preliminary	recommended tha
indication of the drainage network to demonstrate that a workable solution	n to discharge the surface water to the	within their loadii
tank. This is to demonstrate the proposed outlined drainage system is achie	evable when the drainage design is	
developed in full at a later stage.		
The LLFA is not able to determine from the drawings if the geocellular str	ructures are an appropriate distance	
from the foundations of Block E. The notes that section 3.1 from Ciria C737	7 on the Structural and geotechnical	
design of modular geocellular drainage systems determines that the geocell	llular tanks must be at least 2m plus the	
2.10.6 response to 2.10 for system 6		
Outline require demonstration from the applicant the proposed Geocellular tank is		
to demonstrate the proposed outlined drainage system is achievable when	the drainage design is developed in full	
at a later stage.		
• The text in the drainage strategy (paragraph 4.47 to 4.52) does not include		
shown on the plans in Appendix K. The LLFA requires confirmation of wheth		
as it is a significant component of the proposed drainage system. Furthermo be updated to reflect the design appropriately.	fore the drainage strategy will need to	
Based on the information provided in the plans, it is not clear to the LLFA	what the feature is that extends from	
the downstream side of the geocellular crate to the pump chamber. The LL		
feature is from the applicant as there is nothing shown either in the drawin	-	
• The below ground infrastructure for the pumping station is indicated how		
be any above ground control kiosk for the pumping station. The LLFA remin		
control kiosk for the pumping station should be above the design flood wat	ter level and include appropriate	
freeboard as defined in the LLFA's Developer Guidance in section 20.3. The	LLFA requires confirmation of the	
proposed outline arrangements for the control kiosk.		
System 7 relates to Block F - Outline	• • • • • • • • • • • •	1 1
System 7 relates to Block F - Outline • It is not clear to the LLFA how a discharge rate of 20 I/s was derived and h		Report. • Greenro
System 7 relates to Block F - Outline It is not clear to the LLFA how a discharge rate of 20 I/s was derived and h development greenfield runoff rate for the drainage area. The LLFA requires	es this information. p	Report. • Greenro pipe networks add
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I rate for this catchment is discussed in para. 4.22 and 4.23 of the Drainage nroofs are indicated on the drainage layout drawings. • Indicative drainage added. • Geocellular Storage is located 5m from the building line (note there len entrances which are not to be confused with the building line) Depth of over to base is no more than 3m.. • The text has been updated to describe the bumped outfall. . • Control kiosk for surface water pump and drain-time alarm • Due to spatial constraints for this particular catchment it is not always low the <u>guidance</u> within Design Guidance such as CIRIA. As such, it is that the structural engineer allow for the location of geocellular storage adings calculations and adjust the structure accordingly.

I rate for this catchment is discussed in para. 4.22 and 4.23 of the Drainage nroofs are indicated on the drainage layout drawings. • Indicative drainage added. • Geocellular Storage is located 5m from the building line (it has been lit the geocellular storage device into two sections and link with a connector this). • The text has been updated to describe the surface water pumped trol kiosk for surface water pump and drain-time alarm system added.• arrow tive drainage layout shown to demonstrate how features could be linked to rage device. • Bioretention system straddles two systems and will be two phases, ensuring outlest are directed to the corresponding phase sw

System 8 relates to Blocks G and J - Outline	 The proposed rate for this catch
 It is not clear to the LLFA how a discharge rate of 70 //s was derived and how this relates to the pre- development greenfield runoff rate for the outline planning application, however, the LLFA require an indication of the approximate size and location of the proposed green roofs within the drainage area. It is not clear whether the geocelluar tank will be lined or not, this is particular relevant in an area where the geocellular tank crosses the permeable paving. It is not clear if water will be able to infiltrate through the tank walls for this feature or whether it will be solely through the denoted inlets. The LLFA request clarifications on this matter. The text in the drainage strategy (paragraph 4.60 to 4.66) does not include a pump in the description, yet it is shown on the plans in Appendix K. The LLFA requires confirmation of whether the pump is to be included or not as it is a significant component of the proposed drainage system. Furthermore the drainage strategy will need to be updated to reflect the design appropriately. Based on the information provided in the plans, it is not clear to the LLFA what the feature is that extends from the downstream side of the geocellular crate to the pump chamber. The LLFA requires clarification on what this feature is from the applicant as there is nothing shown either in the drawing or in the legend of the drawing. The below ground infrastructure for the pumping station. The LLFA requires confirmation of the proposed outline arrangements for the control kiosk. The LLFA requires confirmation of the proposed trainage strategy will need to the control kiosk for the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA's Developer Guidance in section 20.3. The LLFA requires confirmation of the proposed outline arrangements for the control kiosk. The LLFA notes that the drainage area for System 8 is in part shared with the discharge from Syst	The proposed rate for this calculate the proposed rate for this calculate devices are all wrapped in an impletails in Appendix T. Indicative linked • The text has been updd drainage features are labelled or for surface water pump and drain trees. • channel drains indicated. is not always possible to follow t such, it is recommended that the storage within their loadings calculate the storage within their loadings calculated are such as the storage within the
 System 9 relates to Block H - Outline It is not clear to the LLFA how a discharge rate of 24.5 J/s was derived and how this relates to the pre- development greenfield runninge on the south vestem corner of the system drainage catchment. The LLFA questions whether this is realistic? The LLFA suggests this little sither should be included in the System 5 drainage area. Please adjust the catchment areas accordingly. The LLFA notes that this is part of the outline planning application, however, the LLFA require an indication of the approximate size and location of the green roof within the drainage area. The discharge route of the disfuel pipe run is proposed to pass under trees. The LLFA does not find this route acceptable and requests the pipe is not placed under two trees. Minor point the label arrow for the geocellular tank is not pointing at the tank rather it's pointing to a room in Block G. The text in the drainage strategy (paragraph AG7 to A72) does not include a pump in the description, yet it is shown on the plans in Appendix K. The LLFA requires confirmation of whether the pump is to be included or not as it is a significant component of the proposate drainage system. Fincturemore the drainage stratey will need to be updated to refire the design appropriately. Based on the information provided in the plans, it is not clear to the LLFA requires clarification on what this feature is from the applicant as there is nothing shown either in the drawing or in the legend of the drawing. The below ground infrastructure for the pumping station. Fine LLFA requires clarification on the the drawstream location to the appropriately. Based on the information should be above the design flood water text end bin drawing. The below ground infrastructure for the pumping station. Since LLFA requires clarification on that this feature is from the applicant as there is nothing shown either in the drawing or in the leggend of the drawing.	 The proposed rate for this catch Report. slither rectified. Green moved. geocellular storage devid describe pump. all drainage feat Control kiosk for surface water p drainage layout provided. pump for outlet for bioretention system inc catchment it is not always possib CIRIA. As such, it is recommend geocellular storage within their lo
	 The LLFA notes that this is part of the outline planning application, however, the LLFA require an indication of the approximate size and location of the gene rook within the drivinger area. The discharge route of the off-site piper run is proposed to pass under trees. The LLFA does not find this route acceptable and requests the pipe is not placed number two trees. Nimor point the label arrow for the geocellular tank is not pointing at the tank rather it's pointing to a room in Block G. The geocellular tank sppears to be under features between Block H and Block T. The LLFA reguires and the discription, yet it is to shown on the discription, yet it is shown on the laps in Appendix to the Article Scatter and the average fragmagh 4.57 to 4.73) does not include a pump in the description, yet it is a significant component of the proposed drainage system. Furthermore the drainage strategy will need to be updated to raftect the design appropriately. The bead to reflect the design appropriately. The bead to reflect the design appropriately. The bead to reflect the design appropriately to relative a strates will need to be updated to relative is from the applicant as there is nothing shown either in the LLFA require sind that reverds from the downtare mide of the genocellular crate to the LLFA what the feature is that accented is the strate is from the applicant as there is nothing shown either in the draving certain with this feature is from the applicant to the use of the cortrol kioks. Outline design calculators have been provided in Appendix 1 to support the initial ank siting. Three is no modelling of the outline drainage network is to the strate have midel to the gene applicant as the responsed outline design acloudous to responsed the strate and a shore the strate have applicant and is the strate showe the design flow outline the applicant as there is nortable applicant as the strate strate and bapplicate and appendix and the strate applicat

atchment is discussed in para. 4.22 and 4.23 of the Drainage cated on the drainage layout drawings. •Geocellular storage impermeable geomembrane as poer Standard Construction tive drainage pipe networks added to show how systems are updated to describe the surface water pumped outfall. • all or in the key on the drainage layout drawings. • Control kiosk rain-time alarm system added.• drainage located away from ted. • Due to spatial constraints for this particular catchment it ow the guidance within Design Guidance such as CIRIA. As the structural engineer allow for the location of geocellular calculations and adjust the structure accordingly.

atchment is discussed in para. 4.22 and 4.23 of the Drainage ireenroofs indicated. •pipework moved away from trees. •arrow levice is located beneath paved area only. •Text updated to features labelled or in key on drainage layout drawings. • er pump and drain-time alarm system added.• indivative mp failure mitigation discussed. • channel drains indicated. • indicated. • Due to spatial constraints for this particular ssible to follow the **guidance** within Design Guidance such as uended that the structural engineer allow for the location of eir loadings calculations and adjust the structure accordingly.

2.11 Whole	Provide the proposed discreet drainage catchment areas and supporting information on a plan for each of the proposed systems in accordance with the LLFA Developer Guidance.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	Provided in plans in Appendix K (Drawing no. 3831-DR-001, 3831-DR-002, 3831-DR-003 and 3831-DR-004, dated 13/07/2022). Shown as dashed coloured line. The System Information Summary box has the same coloured dashed line as the discreet drainage area. This is shown for all 9 drainage systems.	Noted
2.12 Whole	Undertake an assessment that demonstrates how the proposed SuDS systems meets the four pillars of SuDS in accordance with the LIFA Developer guidance and in relation to Policy E9 of the Local Flood Risk Management Plan.	See paragraphs 5.4, 5.9, 5.13 and 5.16.	Addressed in Drainage Strategy Report prepared by EAS	Consideration of the textual information regarding the four pillars of SuDS (water quantity, water quality, biodiversity and amenity) and the benefits provided by the various SuDS elements included in the system. The SuDS features included in this as assessment are Green Roofs, bio-retention swales, tree planters (also known as Tree Pits) and Pervious Pavement (although the description given is for permeable paving rather than pervious paving). The LLFA notes the applicant is intending to include areas of permeable block paving in the design, however they have also referred to pervious paving (such as pervious ashfelt is laid). The LLFA requires clarification on which surfacing system is being proposed by the applicant.	See Section 5 in the drainage repor
2.13 Whole	Undertake a further assessment and consideration of the carbon impact of additional pumps operating on this site is recommended in accordance with Policy E8 of the Local Flood Risk Management Plan.	A further assessment of the carbon impact of pumps has been undertaken by the M&E Engineer and is included within their report.	Addressed in Drainage Strategy Report prepared by EAS	The LIFA have reviewed the Drainage Strategy and the Drainage Strategy Addendum Letter. In the Drainage Strategy Addendum Letter the applicant states that "the primary objective of the design is for the systems to operate under gravity, therefs worlding the need for pumps which generate carbon emissions from their operation. Wherever possible and where cover and invert levels of receiving adopted severs allow, surface water runoff from the development site is attenuated and restricted using gravity-type flow control devices, such as hydro brakes or office plates. Where the proposed drainage and storage devices cannot be shallower than the adopted sever network due to cover levels length of drainage network, attenuation volumes and spatial constraints, it is necessary to pump restricted flows. The use of surface water graving design and notes that of the nine proposed systems only two discharge using gravity. Therefore, the applicant's proposed design puts forward that seven of the nine surface water gravitance water drainage systems are proposed to discharge to the largest critical drainage catheme in the courty. These pumped drainage systems are proposed to discharge to three out of the four discharge locations. This is not in keeping with the elower end of the largest critical drainage cathemet in the courty. These pumped drainage systems are proposed due to take through attenuation and flow control devices to reduce the size of the pumps and hence their power demand.	Due to comments received from LL possible to reduce the number of st discussed above. There is commitm development, and as such some rain Impact Consideration has been upd Tank Drain-Down Alarm System ac Panels is now shown on the draina; and drain-down alarm system adde water pumps shall be linked to the during a power cut/power failure. C

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n LLFA and amendments to some external levels, it has been of surface water pumps in the Full Planning Application as nitment to minimise the carbon footprint of the proposed e rainwater harvesting systems are not viable. The Carbon updated and added to the drainage report.

m added to proposals. Location of Pumping Station Control ainage layout drawings. Maintenance of surface water pumps added to the Maintenance and Management Plan. Surface the emergency power meaning that they remain functional re. Greenfield runoff rates have been provided.

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2.14 Full	Prepare a surface water drainage phasing plan for the development.	Weston Homes have provided a Draft Phasing Strategy document which is included in the Rev A Submission. This shows the following blocks to be delivered in each phase. Phase 1 = Block A, B, C, D and M Phase 2 = Block K/L and J3 Phase 3 = Block H, G and J Phase 4 = Block E and F The proposed drainage strategy allows for Blocks B, C, D, E, F, G, J and H to be managed by stand-alone drainage systems that do not rely on other phases to be built. System 4 managing Blocks A, M, J3 and K/L shall be delivered in Phase 1 and 2 and as such it is anticipated that a temporary drainage network, comprising as much of the designed drainage for Block A and M shall be installed in Phase 1 and shall be linked with Block K/L and J3 in Phase 2. As these phases follow each-other, it is considered suitable to allow for one drainage system to cover two phases.	Addressed in Designer Starteney Descent arranged by	The LLFA reviewed ES Addendum A2 Updated Phasing Strategy which contains a series of plans that identify the activities to be undertaken at and within each phase. The activities relate to the construction of the dominant structures and not the supporting infrastructures such as surface water drainage and sewer diversions. The LLFA notes that in phase one, Blocks B and C will discharge to Edward Street while Blocks A, D and M will discharge in to the diverted sewer which is not mentioned in the phasing plan. As the phase one is under consideration of full planning application and as the diverted surface water sewer currently serves a large number of properties upstream of the proposed development which are all within a critical drainage catchment, the LLFA requires details of the proposed diversion of the sewer and the management of surface water runoff during the construction phase. It is likely that some dewatering activities are likely to be required during the construction of the basement car park. This is scheduled to start at the beginning of Q1 2023 and complete by the end of Q1 2025. The LLFA notes the phasing Strategy to show when the surface water drainage will be constructed and sewer diverted in relation to the construction of each of the blocks in Phase One. The LLFA observed the schedule identifies that the ground level for Blocks A, D and M will be undertaken very soon and would expect that discussions with AW to address this matter will be ongoing at present, therefore the LLFA request the applicant provides confirmation that AW support the proposed phasing approach. This is nequest the proposed development which are approach. The is neglecant provides confirmation that AW support the proposed development. The severe diverted is neglecant provides the provide the proposed development. The log phase one blocks in the proposed development which are approach. This (and other) information is requested by the order of the phase one force the the phase one blocks in phase one blocks in phase the applic	See Section 7 in the drainage repo
2.15 Whole	Provide updated water quality assessment information that acknowledge the inclusion of all elements of the SuDS system.	See Section 4 showing water quality treatment features for each catchment.	Addressed in Drainage Strategy Report prepared by EAS	Greenroofs have not been included within the water quality assessment. This appears to have lead to the greater need to incorporate a secondary treatment process. The LLFA notes that in the applicant is likely to be able to better demonstrate water quality benefit if they apply the indices given in Annex 5, Table 26.14 and Table 26.15 of the Ciria SuDS Manual (C753) which includes figures for Green Roofs. The LLFA will expect the Water quality assessment to be updated to include the greenroofs.	All SuDS Features have been incl
2.16 Full	Provide further information regarding the water quality management approaches required for the construction of the proposed development	See Section 7	Addressed in Drainage Strategy Report prepared by EAS	Insufficient information has been provided for the area under full planning application for the water quality management approaches during the construction phase. At present there is very limited consideration of sediment ingress management to the sewers within the largest critical drainage catchment in Norfolk. Section 7 of the drainage strategy indicates the applicant's intention to manage the sediment movement through management practises and the installation of silt traps and oil interceptors. However no temporary surface water drainage plan has been provided to identify the locations where the temporary sediment traps are to be installed along with a size indication, the maintenance and management arrangement and confirmation of when these temporary sediment traps are to be removed and how the assessment of any remedial works will be undertaken should it be identified as necessary. A commitment from the applicant to undertake an asset condition inspection of the sever sections immediately downstream of the sediment traps before and after the construction of the development to ensure that there is no deteriation in the condition of the severs due to the development. This is to ensure the	See Section 7 in the drainage repo
2.17 Full / Whole	Identify and assess the residual risk and provide suitable mitigation associated with the management of pumps and the attenuation tanks.	See paragraphs 4.75 to 4.77.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the Drainage Strategy as referenced in the applicant's response. Paragraph 4.77 states the flowpaths for the exceedance routes greater than the 1% AEP +45% climate change allowance are shown in Figure 1. On review of Figure 1, there is no legend for the information on the figure. The information provided relates to some numbers (possibly levels) inside boxes. It is not clear what these numbers relate to nor are they clear to read due to the resolution quality of the image. The clarity of the arrows in the image is also not clear due to the resolution. The quality of the figure needs to be improved and a legend included. Figure 1 also includes an aerial base image and the what appears to be a hazard map. The hazard map extent outline in Figure 1 for an undefined "event greater than 1% AEP plus 45% for climate change. The LLFA observed significant extent differences between the hazard map extents shown in the FRA Appendix J and the drainage strategy Figure 1, with the extents in figure 1 being significantly smaller even though the text in paragraph 4.77 to 4.78 infer event modelled was greater and the hydraulic model representation of the sewers assumed they were nearly at full capacity and no surface water drainage was present. Therefore, the results shown in Figure 1 are contradicting those shown in the FRA.	Surface water pumps shall be link functional during a power cut/pov required.
2.18 Whole	Provide a site layout plan that demonstrates all surface water drainage features sized appropriately and to ensure suitable space is available within the proposed development. The design should be in accordance with both the LLFA Developer Guidance, the Ciria Suds manual, the building regulations and other relevant local and national guidance, practices and policies.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the Drainage Strategy Appendix K plans. The LLFA is not able to determine from the drawings if the geocellular structures are an appropriate distance from the foundations of BlocksC, D, E and H. The LLFA notes that section 3.1 from Ciria C737 on the Structural and geotechnical design of modular geocellular drainage systems determines that the geocellular tanks must be at least 2m plus the depth of the storage structure from the foundations of a building. Due to the space constraints the LLFA will require demonstration from the applicant the proposed Geocellular tank is able to meet this requirement. This information must be provided for all blocks within the full and outline planning application areas to demonstrate the proposed drainage design for the affected systems is achievable. In addition the LLFA notes that while there are pumping stations shown in manholes, there are no pumping station kiosks included in the proposed design layout shown on the plans. The LLFA reminds the applicant the level of the control kiosk for the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA's Developer Guidance in section 20.3. The LLFA requires confirmation of the proposed arrangements for the control kiosk for both the full and outline planning applications with obviously more detailed information being required for those in the full planning application area.	
2.19 Full	Provide detailed information of the design and operation of the flood barrier for inclusion within the hydraulic model as part of the full application.	Addressed in Royal Haskoning DHV FRA Report.	Not required – Alternative mitigation measures discussed in Section 8	The LLFA notes that the basement car park mitigation has changed to include a hump at the entrance 300mm above the 100y + 45% CC. This is modelled at the level described in the FRA (4.8mAOD) and maps in Appendix I show no flooding. A wall has been included around the basement car park at 999m, this is considered acceptable provided the precautions to ensure the carpark is watertight, described in Section 8.16-8.19 of the FRA, are adhered to and airbricks/ window/ doors etc. are above the modelled water levels adjacent to the walls.	Noted

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included in the Water Quality Assessments for each catchment.

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linked to the emergency power meaning that they remain power failure. No additional storage is anticipated to be

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2.20 Full / Whole	Update the hydraulic model and the drainage strategy to ensure they are consistent with other technical disciplines' submissions.	See Appendix J and K.	RHDHV have further liaised with EAS and Weston Homes to ensure consistency with respect to the updates.	The LLFA has reviewed the information provided in Appendix J (microdrainage calculations) and K (drainage strategy plan). The information provided in these appendices has improved as the plans now include information about the location of more of the SuDS features such as swales and tree pits. However, not all the information has been included such as the outline indication of the green roof positions for Blocks in the outline planning area. The information in Appendix J is also not consistent with the information used with the FRA assessment as no downstream boundary data has been applied to represent the typical flow in the AW severs for the various discharge locations. This information could be provided by AW from their own models or flow sensors. Although it is clear from the review of the FRA and surface water flood risk hydraulic modelling report that the information used in this model is requires further clarification (see response comments to 3.2). In addition, the LLFA note that the MADD factor is currently set to 2 when it should be set to 0, otherwise this increases capacity within the sewer network without the capacity ever being constructed. The LLFA also notes that calculations for only the 1% 45% for climate change were submitted, however no modelled information or calculations were provided for the 3.3% + 40% for climate change as is required by the National Guidance on Flood Risk Assessment: Climate Change Allowances (https://www.gov.uk/guidance/flood-risk-assessments-climate-change allowances#using-peak-rainfall-intensity-allowances-to-assess-surface-water- flood-risk) which clearly states in the peak rainfall intensity that "You must do this for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125)." This is also required by the LLFA Developer Guidance. This means the application is not in accordance with NPPF.	
2.21 Whole	An assessment of the surface water treatment required for all elements of the proposed development to determine whether the SuDS system is providing an appropriate amount of water quality treatment.	See updated Section 4.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed the appropriate paragraphs within section 4 against the information provided in Appendix K. The LLFA note the approach used for many of the systems is the simple index approach from the Ciria SuDS Manual (C753). However, the benefits that green roofs provide has not been considered in any of the systems where these features has been incorporated. The simple index approach has not been applied to all the systems where these features has been incorporated. The simple index approach has not been applied to all the systems where these features has been incorporated. The simple index approach has not been applied to all the systems where though it is possible. A summary of the finding for each of the systems can be found in the system specific notes below. System 1 · Water quality assessment approach is acceptable although there is a lack of information regarding the water quality treatment to be provided by the downstream defender. As this element is within the full planning application area this information is required to be provided at this time. System 2 · The only treatment process acknowledged in the water quality assessment relates to the bioretention area. There is no inclusion of the proposed green roof that would cover the whole roof space of the main residential block (see response 2.15). While the technical approach to the simple index method of assessment is in accordance with the Ciria SuDS Manual, the proposed design is not considered appropriate (see previous comments in Response 2.10). The LLFA therefore considers the current water quality assessment is not suitable at this time as it does not assess all the elements and it assesses a system that requires redesigning. System 3 · There is no inclusion of the proposed green roofs (see response 2.15). There is a lack of information regarding the water quality treatment to be provided by the downstream defender. As these elements are within the full planning application area this information is required to be provided at this time	See Water Quality Assessment for each
2.22 Whole	A surface water drainage design that includes a site plan with appropriately sized SuDS Features and conveyance with both the LLFA Developer Guidance and the Ciria SuDS Manual.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the proposed drainage strategy plan in Appendix K of the Drainage Strategy. At present the LLFA considers the plan to be incomplete as SuDS features proposed to be incorporated into the design and the support principle infrastructure has not been included on all the nine drainage systems being proposed on site. Furthermore, some of the items shown on the plan are not included in the system description within section 4 (see Response 2.10). This contradiction leaves the LLFA unsure about what is being actually being proposed and	See Appendix O and Appendix T.
2.23 Full	Identification of the structures to be placed below ground and an assessment of the risk of groundwater flooding and specific mitigation measures to manage the groundwater flood risk to those structures where required.	Addressed in Royal Haskoning DHV FRA Report.	Included at 7.10 onwards and 8.52	No mention of groundwater in the hydraulic modelling report. There is very limited historic groundwater levels from between the 1970s and mid 1990s that gives an indication of shallow groundwater While there is no site specific groundwater monitoring to ascertain whether there would be infiltration into the system. However, the LLFA can accept the conclusions of the FRA in section 7.16 that states "the site is considered to be at moderate risk of flooding from groundwater. This could impact the proposed below ground basement car park and the service yard, which is lower than the existing ground level." A review of section 8.52 to 8.58 in the FRA which states "the basement car park and service yard will be made water- tight ('tanked') to prevent water ingress.", "a sump pump will be included in both of these areas as a failsafe" and that "All subsurface surface water drainage infrastructure must be designed with high groundwater levels in mind at the detailed design stage, so that rising groundwater levels will not compromise the attenuation volume available in the cellular storage tanks. Cellular storage tanks will be lined accordingly.". However the finished floor level of all buildings in the proposed development are not raised above ground level. Therefore should the groundwater reach surface level groundwater ingress is possible. The LEA	RHDHV

w include outline green roof areas. Hydraulic models have ttfall to represent adopted sewer surcharge. All catchments 1:30yr, 1:30+40%CC, 1:100yr and 1:100yr+45%CC storm o 0 and using FEH rainfall data.

for each catchment within Section 4 of the drainage reort.

				1		here in the
	2.24 Whole	A Maintenance and Management Plan detailing the activities required to manage the proposed SuDS including confirmation of ownership, maintenance responsibilities and in principle agreements.	See updated Section 6.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed section 6 of the Drainage Strategy where the applicant was able to confirm that a management company would be responsible for the private surface water sewers, attenuation tanks and green/brown roofs. However, there is no indication of who will be specifically responsible for the areas permeable paving, pumps, downstream defenders, bio-retention areas and bioretention swales. Some of the proposed surface drainage network is within the roads to connect to the AW sewers but it is not clear (particularly on the full drainage application area) the extent of each network that will not be under the management of the management company. Further information is required to better define the extent of the responsibility of the management company. A review of the maintenance schedules in section 6 shows that no maintenance schedule for the pumps, downstream defenders, bio-retention areas and bioretention swales has been provided. The maintenance and management plan is required to be updated to identify who will be responsible for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedule for the features not included in the plan and the maintenance schedul	Maintenance and Manageme
	2.25 Whole	2.25 Provide an updated assessment of the suitability of the different types of SuDS components on the site.	See Table 4.1.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed Table 4.1 and acknowledge the table has been updated.	Noted
Ĩ	2.26 Full	2.26 Provide further evidence to support the viability of the Edward Street Service Yard residual risk mitigation and provide clarification on whether an automated flood barrier could be installed.	Addressed in Royal Haskoning DHV FRA Report.	Flood barrier no longer required – see 5.38- 5.43	Mitigation is discussed in Section 5.4.1. The maps in Appendix I show no flooding of the service yard in the proposed mitigation scenario, depths adjacent to the barrier are Max 0.1m and adjacent to the building wall are 0.2m. Representation of these features in the model are described in section 7.3.2 of the modelling report (extract in modelling column). The ground levels modelled for the entrance hump match the proposed mitigation levels, which is considered reasonable. The walls are modelled as 999m high, depths against them do not exceed 200mm, therefore this is considered a reasonable representation provided that any doors/airbricks in the wall between Block M and the service yard are above this level, as inputting exact levels in this instance would not change model results. Section 8.12 of the FRA states "No openings such as air bricks, doors or windows should be included in the neighbouring wall with Block M, to prevent water ingress into the surrounding blocks". The LLFA notes the word "should" is used and requests clarification that these measures will be taken. Additionally, please note LLFA comment responses 3.1 to 3.2.2 relating to remaining concerns with	RHDHV
2 F	2.27 -ull	The Emergency Flood Plan should be prepared in accordance with the ADEPT guidance (2019), available at https://adeptnet.org.uk/fl oodriskemergency plan and demonstrate ongoing liaison with the relevant Emergency Planning Team	Addressed in Royal Haskoning DHV FRA Report. It is understood that The Emergency Planning Team (Teresa Cannon) has confirmed that this can be Conditioned.	Acknowledged. Norwich City Council Emergency Planning Team were contacted and agreed the Flood Plan could be conditioned (Appendix M and 8.41)	The LLFA are pleased the applicant has agreed to use the Flood Plan Guidance by ADEPT/ Environment Agency to prepare the Flood Plan for each of the blocks. The LLFA advises the LPA that NPPF Paragraph 167 (e) states that "When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that: (e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan." The applicant's own surface water flood risk modelling and FRA identifies significant flood risk remains on site once the site has been developed. This indicates that an emergency plan should be provided prior to determination of a planning application. Therefore the LLFA would advise the LPA that the applicant's proposal to discharge this requirement by conditioning is not in accordance with the NPPF requirements.	RHDHV
2 B	2.28 Full	An assessment of the potential to install some flow and level monitoring gauges to enable the site manager to monitor and manage the flood risk on site.	Addressed in Royal Haskoning DHV FRA Report.	No longer required – Section 8 discusses amended mitigation measures	The LLFA notes the change in mitigation approach for both the below ground level service yard and the basement car park. However, in a review of section 8 of the FRA, we note there is reference to a flood warning and evacuation plan in relation to Block C (Section 8.22 -8.23), as well as a site wide warning and evacuation plan in relation to Block C (Section 8.22 -8.23), as well as a site wide warning and evacuation plan (Section 8.26-8.40) and a flood warning notice for the south east of block J. The LLFA notes that section 8.2 and 8.3 indicate which development blocks are at flood risk however there is no summary of which roads and pedestrian access routes which are at surface water flood risk. The LLFA observes this gives an overly optimistic outlook on the flood risk across the site. In section 8.4 the FRA notes that "is impractical to prevent offsite flows entering the onsite drainage system in some areas". However, within the Drainage Strategy there are no allowances given within the drainage design for the any offsite surface water that may enter the system. The LLFA notes the proposed use of tank alarms for tanks affected by offsite site flows when they reach 75% capacity. The alarm would trigger a co- ordinated response to warn all the relevant ground floor properties of the potential flood risk so they can close and prepare for potential flooding as appropriate. However, the FRA (section 8.7) also acknowledges that at present they do not know if the 75% capacity is will give a suitable amount of time for properties to evacuate and prepare for potential flooding by stating "The 75% capacity level was considered to be acceptable as it would ensure the alarms would not be triggered in the lower return period, every day events, but further analysis to provide supporting evidence to this approach needs be provided to verify this." In addition, while the idea of this tank alarm system is acceptable if all other forms of mitigation have applied. However, the applicatin has not yet avoided flood risk through	RHDHV

gement Plan updated, see Section 6 in the drainage report.

F	ull /	Update the assessment of the residual flood risks within the FRA for the proposed development and its components.	Addressed in Royal Haskoning DHV FRA Report.	Included at 8.59 onwards	This section does not reference the hydraulic model. FRA (Section 8.59) states that "in the event of a rainfall event greater than that considered in this assessment, the external areas may experience some flooding. The likely exceedance routes in this event have been considered in the Proposed Surface Water Drainage Strategy, prepared by EAS." This contradicts the statement in the drainage strategy that this will be addressed in the Royal Haskoning DHV FRA report. The LLFA requires this contradiction to be addressed and resolved. The residual flood risk assessment in sections 8.59 to 8.61 of the FRA is very limited and has considered a very limited range of residual risks that focus on blockage due to lack of maintenance and exceedance flooding. The information provided is vague and has not considered issues such as additional water capacity of attenuation tanks due to pump failure or loss of power (see Response 2.13 and other part of other response). The LLFA note in general the FRA makes recommendations for mitigation but does not commit to what will be included within the design. In addition their is no detailed design information available to confirm what will be included in within the proposed design. A review of the design and access statement indicates that there is a difference in the amount of green roofs indicated between the Drainage Strategy and the Design and Access Statement, which means there is further inconsistency between the different documents that are supporting the planning submission and erodes the LLFAs confidence in the delivery of the proposed surface water drainage Strategy and its Addendum Letter. For example, an example Flood Warning sign in the car park, However, the LLFA is not able to identify any car parking shown on site in the surface water drainage plans. In addition a Flood Evacuation Plan is seen as vital importance for residents of Block C to facilitate the development, yet the application has not included the application has not Flood Plan for the Full application area c	
2 F	.3 ull	Inclusion of an updated Exceedance Flow Routes Plan for the site with proposed finished floor levels marked on.	Figure 1 in Section 4 updated to show levels as requested.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the Drainage Strategy as reference in the applicant's response. Paragraph 4.77 states the flowpaths for the exceedance routes greater than the 1% AEP +45% climate change allowance are shown in Figure 1. On review of Figure 1, there is no legend for the information on the figure. The information provided relates to some numbers (possibly levels) inside boxes. It is not clear what these numbers relate to nor are they clear to read due to the resolution quality of the image. The clarity of the arrows in the image is also not clear due to the resolution. The quality of the figure needs to be improved and a legend included. Figure 1 also includes an aerial base image and the what appears to be a hazard map. The hazard map extent outline in Figure 1 for an undefined "event greater than 1% AEP plus 45% for climate change was compared to the hazard maps given in the FRA Appendix J for the 1% AEP plus 45% for climate change. The LLFA observed significant extent differences between the hazard map extents shown in the FRA Appendix J and the drainage strategy Figure 1, with the extents in figure 1 being significantly smaller even though the text in paragraph 4.77 to 4.78 infer event modelled was greater and the hydraulic model representation of the sewers assumed they were nearly at full capacity and no surface water drainage was present. Therefore, the results shown in Figure 1 are contradicting those shown in the FRA. Further	See Appendix R
	.31 Vhole	Both the FRA and the Drainage Strategy require updating to address the large number of statements and conjecture that are not supported by evidence. These statements and assessment need to be evidence based for the statements to validated.	Noted and actioned.	Noted. This FRA is supported by evidence whe	The FRA and Drainage Strategy have been reviewed by the LLFA and it is acknowledge that some minor updates have occurred however, there are other significant updates that are required to ensure the surface water management is in accordance with both NPPF and the LLFA's Developer Guidance.	Actioned
	.32 ull	Provide a proposed drainage design with supporting evidence (plans, calculations, modelling and detailed design) that provide evidence of inclusion and support the proposed offsite drainage of surface water for the car park entrance and the service yard entrance on Edward Street. The evidence should demonstrate that the mitigation is appropriate, operable and "agreed in principle" by Anglian Water along with identifying who will be responsible for the maintenance and management.	Addressed in Royal Haskoning DHV FRA Report.	Drainage from service yard to Anglian Water sewer in Edward Street no longer required as service yard will not flood in any event up to and including the 100 year (+45%CC) event. A drain with a flap valve has been included in this area which now connects into the onsite drainage system in the event that an event greater than the 1 in 100 year (+45%CC) occurs and floodwater reaches this area. (Discussed in 8.11)	The LLFA has reviewed both the Drainage Strategy and the FRA with regard to the Edward Street Service Yard internal drainage solution and flood mitigation approach. The FRA has included a 300mm hump in the service yard to discharge any exceedance flow that may entre the yard (See section 8.11). The Drainage Strategy plan in Appendix K indicates that a gully will be included in the service yard (no cover or invert levels are given and this has not been included in the MicroDrainage Model) and will discharge to the north of Block M in Edward Street. The system 4 text does not discuss the inclusion of this gully nor is their any indication that a flap value will be installed. In the hydraulic Modelling report it is stated that a inlet pit has been included in the surface water flood model with a flap valve. This inlet pit is to drain any exceedance flow from the service yard into the diverted Anglian Water sewer via the onsite drainage system. The modelling report has indicated that as the inlet pit was not used in the 1%AEP +45% CC "proposed scenario" model runs, it has not been included in the surface water drainage design (Section 7.4 (paragraph 6) in the Modelling report). The LLFA notes that no exceedance events were run to confirm this. In addition, there appears to be an inconsistent approach applied to the detailed drainage design of the service yard between the FRA, the Drainage Strategy and the modelling reports. The LLFA requires clarification from the applicant and their different design on what the drainage proposals are for this area. The FRA response summary indicates that a flap valve was included in the design proposed but none is shown in section 8.11 of the FRA or the Drainage design for all areas of the full application area (such as typical cross sections and detailed designs plans for each of the structures proposed) remains unsubmitted and the LLFA requires these to be submitted for the full application area.	The speed humps are shown o

wn on Drainage Layout Drawings in Appendix O.

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	33 'hole	Provide clarifications from the applicant on whether the inclusion of flood doors have been considered on the proposed development.	Addressed in Royal Haskoning DHV FRA Report.	Flood doors are not required – all residential uses FFL raised at least 300mm above 100 year (+45%CC) flood level (Section 8 and 5.46)	The LLFA observes that the drainage strategy does not indicate that the finished floor levels adhere to the LLFA Developer guidance. It states "It should be demonstrated that the drainage system must be designed so that unless an area is designated to hold or convey water flooding must not occur in any part of a building or utility plant susceptible to water e.g. pumping station or electricity sub-station (Standard S8 of the SuDS Non-Statutory Technical Standards (2015))." (section 20.3 of the LLFA Developer Guidance). There is inconsistency between the approach taken in the drainage strategy and the approach in the FRA. The FRA indicates the residential buildings are raised approximately 300mm above the design flood event. However, on review of the FRA details in section 5.46 and section 8, the LLFA notes that no finished floor level is set only a freeboard allowance is provided with a maximum modelled water depth of 420mm. The FRA observes that the bin store in Block C is likely o flood but not the residential accommodation implying there are different flood levels within Block C. While in the Drainage Strategy, the finished floor level is set at a single finished floor level of 4.65m rather than 4.75m which would provide the 300mm freeboard allowance required. Regarding the other residential areas of the development there is less information available when compared to Block C. In the drainage strategy, the finished floor levels in the commercial and other building areas are set to match the street level. Therefore, there are inconsistencies between the FRA and the drainage strategy on this matter and the LLFA require design clarification	2
	34 'hole	Provide discussion on whether an alternative design approach and location was considered before placing the car park entrance ramp on Edward Street.	Addressed in Royal Haskoning DHV FRA Report.	Included at 3.48-3.58	The LLFA have reviewed the FRA, the Drainage Strategy and the Modelling Report. The surface water model is not used to support the argument for it's location. The FRA reviewed sections 3.48-3.58 of the FRA as referred to in the applicant's response. It is clear from the response that there were many factors considered in the location of where to access the basement car parking but that flood risk was not one of the factors considered until raised by the LLFA as a significant concern. A permanent hump in the access way to the basement car parking has now been included but the location of the basement car parking access has remaining in a nea of flood risk due to non flood risk related constraints. The LLFA remains concerns about the location of the access although we acknowledge that the flood mitigation access hump has been installed and the model demonstrates it is located as an appropriate level. It is not clear whether the residents will be prevented from accessing the basement during floods as driving vehicles through the water is likely to wash flood water in to the basement. The LLFA requires the	
	35 ill	Provide an assessment of flow entering the basement car park should mitigation not be installed or the failure of mitigation measures.	Addressed in Royal Haskoning DHV FRA Report.	Model was run for proposed scenario with no mitigation measures – 5.39-5.40 and Table 3	The LLFA observe that the model has been simulated without the barrier to the basement carpark included. Appendix I shows flood depths of 0.1-0.2m in the unmitigated scenario and no flooding in the mitigated scenario. The LLFA notes that proposed mitigation has changed to include a hump at the entrance 300mm above the 1% AEP + 45% Climate Change. This is modelled at the level described in the FRA (4.8mAOD) and maps in FRA Appendix I show no flooding. A wall has been included around the basement carpark at 999m, which is considered acceptable provided the precautions to ensure the carpark is watertight, described in Section 8.16-8.19 of the FRA, are adhered to and airbricks/ window/ doors etc. are above the modelled water levels adjacent to the walls. Additionally please note LLFA comment responses 3.1 to 3.2.2 relating to remaining concerns with the model set up and consequent results. These will need to be acted upon and then reviewed against this issue subsequently.	
	36 'hole	Provide evidence the proposed development scheme that in accordance with NPPF where "the development should be made safe for its lifetime without increasing flood risk elsewhere."	Addressed in Royal Haskoning DHV FRA Report.	Discussed in Sections 6 and 8	Section 6 of the FRA report outlines the impact of the development on flood risk Section 6.9 states that "Various limitations mean that the level of flooding shown in Appendices I and K may be overestimated." Section 10.2 of the modelling report outlines some limitations of the modelling, the LLFA acknowledges these limitations. However, these limitations could result in under-estimation of depths or over-estimation. Section 8 outlines mitigation measures. Modelling data is used to define the levels of mitigation features and floor levels. Please note LLFA comment responses 3.1 to 3.2.2 relating to remaining concerns with the model set up and consequently results. These will need to be acted upon and then reviewed against this issue subsequently.	RHDHV
	37 'hole	Address all LLFA queries given in the attached Annex.	See point 2. above.	Noted and included throughout this FRA	The LLFA has provided comments and responses against other responses above and below.	Noted
3 W	'hole	The hydraulic modelling report and model requires updating to include.				RHDHV

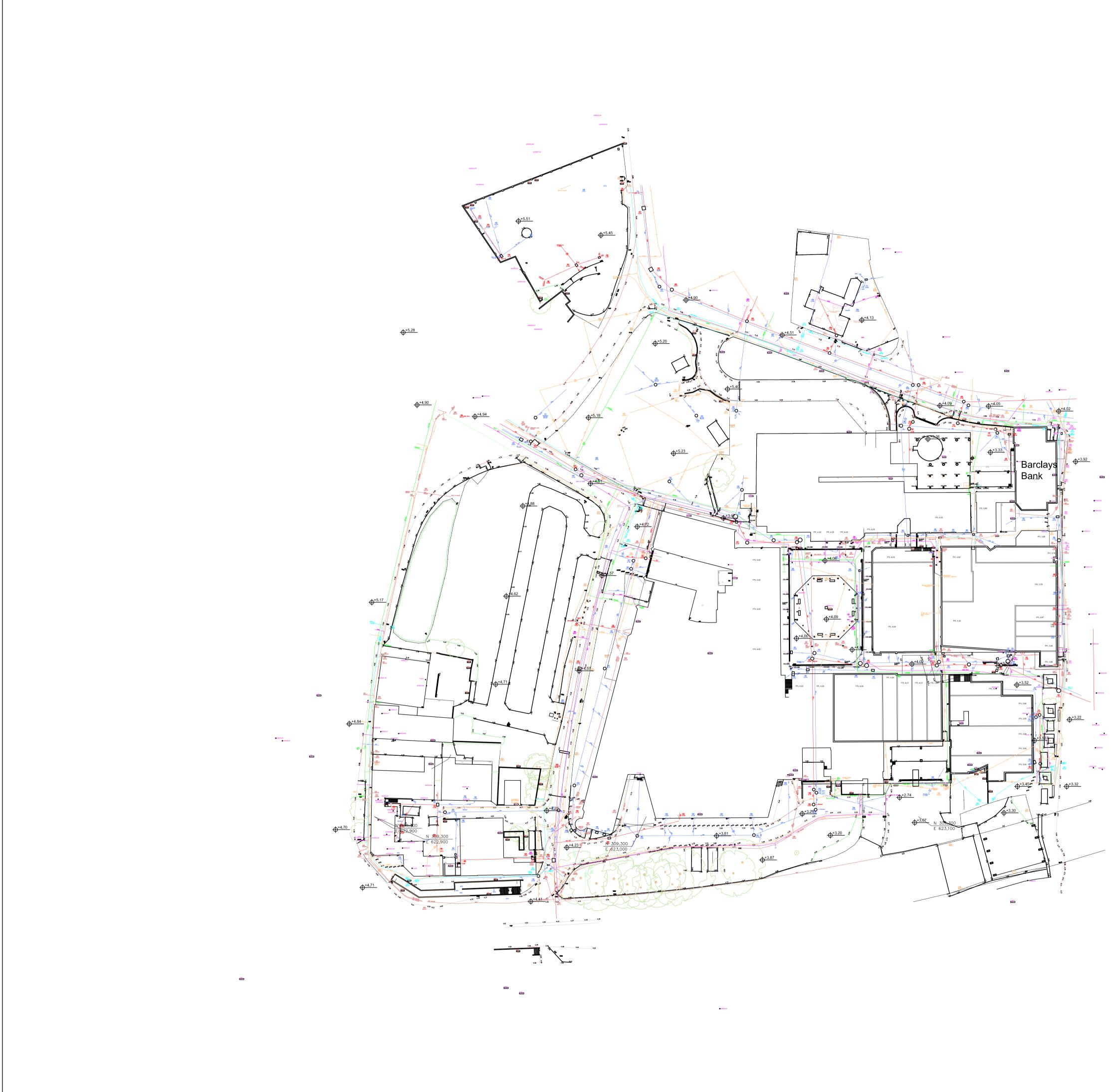
sures are detailed in the RHDHV FRA Report. The Drainage L's are as per FRA recommendations and in line with

hydraulic model shows that flooding does not occur in r mitigation measures are no longer required as agreed with

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3.1 Whole	Confirmation that the key parameters (URBEXT, Catchment area, etc.) have been checked and the parameters where appropriate adjusted accordingly.	Addressed in Royal Haskoning DHV FRA Report.	Section 6 of the hydraulic modelling report: 'Anglia Square Norwich Modelling Study (July 2022)'	It is important and considered standard practice in UK hydrology assessments and subsequent fluvial hydraulic modelling to undertake at least a rudimentary check on some of the FEH catchment descriptors obtained from the FEH Web Service before proceeding with in-depth hydrological catchment analysis. With regards to the direct rainfall approach used in surface water or pluvial modelling the checking of FEH catchment descriptors is viewed as not so critical. However, confirmation that the catchment boundary is appropriate for the study site in question should be checked. In this study case the FEH catchment area boundary is considered conservative but appropriate, as it allows for a good understanding of overland flow routes and identification of areas of ponding across the wider urban area. The BFIHOST value assigned to the study catchment is 0.861, suggests a highly permeable underlying geological strata. This correlates with the geology data held on the BGS Geology of Britain Viewer Web Service which indicates the catchment is underlain by a bedrock of the chalk formations covered with a superficial geology of locally derived Alluvium deposits comprising of Clay, Silt, Sand and Gravel. The high BFIHOST value is also confirmed by soil data mapping held on the Soilscapes Web Service which indicates that the majority of the study catchment is on Soilscape 6 type soil, described as freely draining, slightly acid loamy soils where rainfall drains to local groundwater and rivers. The URBEXT2000 value assigned to the study catchment of 0.39 categorises the catchment area as very heavily urbanised. Confirmation of the extent of urban coverage can be undertaken in a GIS using suitable mapping data. However, this is considered only necessary when there are doubts over the degree of urban and rural coverage across a more heterogenous catchment area, which in this study this is not the case as the study area is obviously heavily urbanised. The LLFA welcomes the details added regarding checks to BFI HOST. However URBEXT s	5
3.2 Full	Includes sewers in the hydraulic model for the sewer network affecting the parts of the site included in this application to support the full application that demonstrates there is no increase in flood risk elsewhere.	Addressed in Royal Haskoning DHV FRA Report.	Model has been updated to include nearby Anglian Water sewers – please refer to 'Anglia Square Norwich Modelling Study (July 2022)' and 5.25	7.2 1D Network 7.2 1D Network Following a request from the LLFA, the Anglian Water sewer network was included in the model for the surrounding streets. The Anglian Water sewer records (obtained June 2022) were used to determine the dimensions of the sewers and manholes in the surrounding roads. The sewers were included in the model as sections of '1d_nwk' and the manholes were included as rectangular inlet pits with 'SX' boundaries. This meant that any water in the inlet pit cell would be directed into the 1D sewer network. The downstream end of the sewers networks (at the edge of the Anglian Water mapping) were represented as 'HT' boundaries which allowed water to freely exit the sewers. 7.4 Paragraph 4 "Anglian Water sewers were included in the model for the roads surrounding the site. The sizes of these sewers and manholes were taken from the latest sewer records. 'SX' boundaries and inlet pits were included at each manhole to enable water reaching these cells to be taken into the sewer network. At the downstream ends of the select to discharge freely." The LLFA welcomes inclusion of the network and the downstream boundary location is justified through sensitivity testing which shows the model is not sensitive. However further detail is required to review how this has been included. Please provide a drawing showing the 1D model extent. Where the sewer included as augmentance.	
3.2.2 Whole	Is extended to cover the full catchment to ensure the inflows are calculated correctly, or includes sensitivity testing showing that these inflows do not impact flood risk at the site.	Addressed in Royal Haskoning DHV FRA Report.	Model has been extended to cover wider catchment – please refer to 'Anglia Square Norwich Modelling Study (July 2022)' and 5.23	Section 3.1 of the modelling report details catchment delineation and model extent is shown in figure 3-3. The revised model extent is considered appropriate.	RHDHV
3.3 Whole	Provide clarification on whether Anglian Water has been contacted to supply sewer data. This should be requested and included where interactions with the sewer system are likely to impact flooding.	Addressed in Royal Haskoning DHV FRA Report.	Sections 4.26 and 7.6	See 3.2. See comments on 3.2 Anglian Water data has been requested and included. However the report has insufficient detail to confirm that sewers have been included where "interactions with the sewer system are likely to impact flooding" as the 1D extent isn't shown so its not possible to ascertain if this has been done appropriately.	RHDHV
3.4 Full	The inclusion of information regarding the onset of flooding and its associated duration for vulnerable locations across the site including the basement car park entrance and the service yard and loading facilities.	Addressed in Royal Haskoning DHV FRA Report.	Time to peak flood maps included via link in Appendix I. However, alternative mitigation measures now included (Section 8) to provide safety of vulnerable areas which is not reliant on alerts from elsewhere in the catchment/site.	Nothing specifically shown within the main body of the modelling report relating to the time to peak mapping or results. The LLFA notes that a link was provided in the FRA Appendix I to the Time to Peak Flood Maps. However, the LLFA was unable to download these maps. The LLFA cannot access these unsubmitted time to peak plans at this time and requests the applicant to submit this information via normal planning submission routes so that the LLFA can review this information.	RHDHV

SuDS Standards Review	Summary of alignment to relevant Non-Statutory Technical Standards for Sustainable Drainage Systems
S3 (Brownfield)	Incomplete - due to various updates required on the greenfield and brownfield runoff calculations and further methods - further information required.
S5/S6 (Brownfield)	Incomplete - due to a lack of drainage design information, various updates required on the greenfield and brownfield runoff calculations and further updates on the surface water hydraulic modelling - further information required.
- further information required. Incomplete - due to a lack of drainage design information - further information required.	
S8	Incomplete - due to a lack of drainage design information - further information required
S9	Unable to complete - due to a lack of drainage design information, various updates required on the greenfield and brownfield runoff calculations and further updates on the surface water hydraulic modelling required to enable appropriate evidence to assess and determine whether the mitigation measures are appropriate - <i>further information required</i>

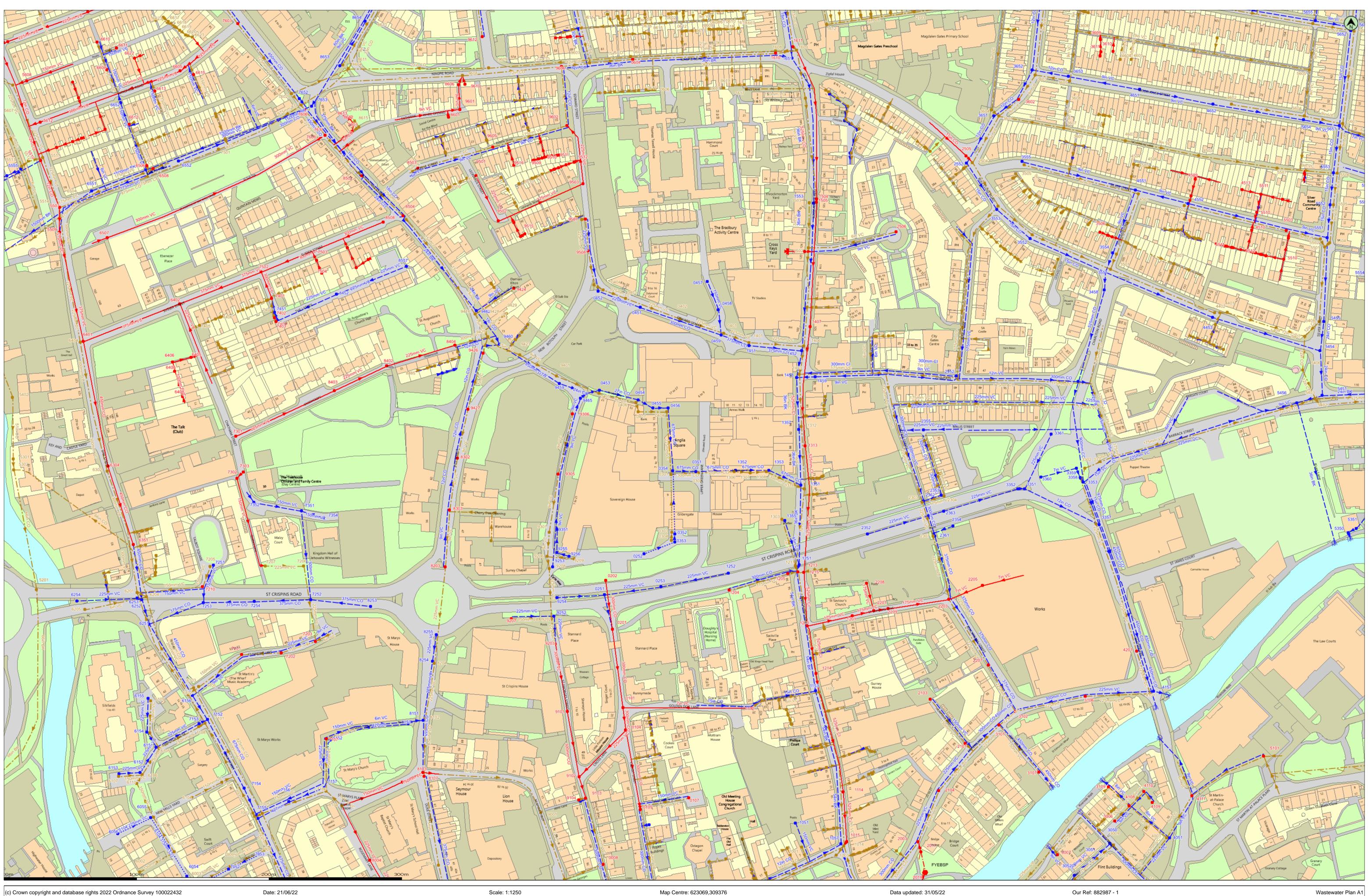
Appendix: D – Topographical Survey and Utilities Survey



SERVICE LEGEND

FOUL DRAINAGE	
SURFACE WATER DRAINAGE	>
WATER	
GAS	
ELECTRICITY	∿
TELEPHONE	
CABLE TV	
TRAFFIC SIGNAL	
OIL	
UNKNOWN SERVICE	
NEW DETAIL	
UNDERGROUND CHAMBER	

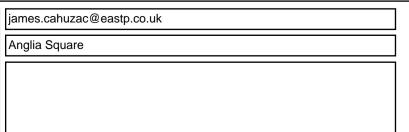
Appendix: E – Anglian Water Sewer Records



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This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2022 Ordnance Survey 100022432. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.	Surface Sewer Combined Sewer	 Outfall* Inlet* Manhole*	€ ∋	Sewage Public P Decomn

age Treatment Works	
ic Pumping Station	

ommissioned Pumping Station *(Colour denotes effluent type)



Data updated: 31/05/22



	erence Easting	Northing	Liquid Ty		vel Invert Leve	
800	623008	309060	С	3.23	0.28	2.95
101	623023	309178	С	4	1.85	2.15
104	623025	309161	С	3.95	1.74	2.21
105	623036	309101	С	3.43	0.14	3.29
107	623073	309110	С	3.64	2.28	1.36
201	623015	309237	С	4.34	2.12	2.22
202	623010	309274	С	-	-	-
604	623030	309667	С	-	-	2.4
015	623192	309077	С	-	-	-
112	623120	309178	С	3.874	1.179	2.695
114	623189	309114	С	2.742	1.072	1.67
201	623196	309247	C	3.13	1.38	1.75
203	623162	309240	C	3.147	1.647	1.5
203	623103	309240	C	3.55	1.18	2.37
204	623147	309279	C	3.38	1.17	2.21
213	623155	309280	C	3.347	1.747	1.6
214	623169	309204	C	-	-	-
215	623159	309280	C	-	-	-
313	623160	309375	С	-	-	-
407	623164	309465	С	-	-	-
504	623169	309561	С	-	-	-
505	623169	309559	С	5.342	1.407	3.935
610	623138	309671	С	-	-	2.51
611	623151	309676	С	-	-	2.68
003	623246	309077	С	-	-	4.3
017	623248	309069	С	-	-	-
101	623281	309151	С	2.47	1	1.47
103	623255	309184	C	2.99	1.86	1.13
104	623261	309115	C	-	-	3.95
201	623201	309251	C	- 3.28	- 0.13	3.15
203	623269	309260	C	-	-	3.275
205	623294	309270	C	3.02	1.29	1.73
207	623298	309210	C	-	-	3.1
208	623207	309272	C	-	-	-
209	623223	309253	С	-	-	-
505	623282	309594	С	-	-	-
506	623229	309537	С	-	-	-
006	623394	309092	С	3.5	1.97	1.53
8007	623351	309067	С	-	-	-
3101	623307	309165	С	2.449	0.349	2.1
3102	623319	309175	С	2.406	0.456	1.95
106	623372	309187	С	-	-	3.48
107	623337	309129	С	1.76	0.28	1.48
109	623389	309118	C	-	-	-
506	623383	309536	C	-	-	-
602	623321	309637	C			
609			C	-	-	-
	623383	309682		-	-	-
8610	623383	309673	C	-	-	-
8611	623383	309669	C	-	-	-
108	623405	309104	С	3.44	1.23	2.21
109	623422	309107	С	3.73	2.25	1.48
110	623416	309115	С	3.36	1.78	1.58
111	623452	309112	С	3.837	-	-
201	623410	309220	С	-	-	3.275
509	623455	309579	С	8.19	6.92	1.27
510	623497	309538	С	-	-	1.7
511	623471	309527	С	-	-	-
512	623494	309522	С	-	-	0.62
513	623490	309568	С	-	-	-
5101	623506	309141	С	-	-	3.125
503	623523	309538	C	-	-	-
507	622598	309555	C	_	-	8
509	622598	309537	C			0
			C	-	-	-
510	622584	309590		-	-	4.61
510	623521	309516	C	-	-	1.42
510	623501	309552	C	-	-	1.05
511	623504	309565	C	-	-	1.42
608	622573	309651	C	-	-	2.3
609	622559	309680	C	-	-	1.41
612	622583	309620	С	-	-	1.62
304	622635	309360	С	-	-	2.62
6351	622654	309301	С	-	-	1.82
6401	622616	309454	С	-	-	3.2
402	622689	309483	С	-	-	3.82
405	622697	309442	С	-	-	-
406	622683	309438	С	-	-	-
407	622685	309432	С	-	-	-
408	622691	309412	C	-	-	-
506	622664	309587	C	-	-	1.07
507	622634	309532	C	-	-	1
508	622669	309584	C	-	-	2.845
605	622689	309558	C	_	-	1.9
608	622639	309659	C	_	_	1.67
610	622634	309659	C			0.97
611	622641	309675	C	_	_	0.66
				-	-	
612	622651	309618	C	-	-	1.35
613	622670	309643	C	-	-	1.63
615	622699	309655	C	-	-	1.42
622	622655	309668	C	-	-	-
703	622619	309702	С	-	-	1.47
107	622799	309154	С	-	-	2.58
201	622736	309218	С	-	-	2.71
202	622765	309219	С	-	-	1.74
203	622791	309228	С	-	-	2.83
210	622706	309269	С	-	-	1.4
301	622731	309382	C	-	-	1.37
302	622732	309351	C	-	-	1.43
303	622737	309356	C	-	-	1.5
401	622758	309486	C	-	-	2.69
. • •	622760	309488	C		-	2.09
402	022100	50341Z				
		200460			_	1 00
7402 7403 7502	622761 622750	309469 309506	C C	-	-	1.98 3.56

Manhole Reference	Easting	Northing	Liquic
7504	622796	309506	С
7603	622733	309694	C C
7606 7608	622783 622798	309629 309609	C
7611	622793	309607	С
8004	622832	309063	С
8103 8107	622872 622873	309129 309126	C C
8203	622889	309284	C
8302	622898	309366	С
8303	622892	309327	C
8402 8403	622845 622805	309436 309417	C C
8404	622896	309451	C
8502	622826	309579	С
8503 8504	622868 622857	309585 309549	C C
8508	622842	309544	C
8601	622891	309623	С
8606	622899	309648	C C
8607 8612	622819 622817	309612 309622	C
8613	622815	309623	С
9101	622981	309175	C
9102 9103	622990 622995	309126 309110	C C
9104	622990	309108	C
9203	622972	309226	С
9207 9305	622939 622974	309245 309354	C C
9306	622985	309400	C
9424	622941	309494	С
9426	622917	309445	C
9427 9501	622906 622912	309403 309579	C C
9502	622929	309545	C
9503	622993	309573	С
9507 9508	622995 622997	309546 309522	C C
9509	622955	309591	C
9510	622964	309593	С
9511	622975	309595	C
9512 9515	622986 622949	309589 309535	C C
9516	622941	309587	C
9601	622900	309629	C
9602 9605	622981 622925	309617 309601	C C
9606	622977	309661	C
9610	622904	309648	С
9612 0301	622917 623059	309684 309354	C F
0302	623080	309355	F
0303	623060	309310	F
0304	623060	309304 309460	F
0401 0402	623099 623066	309400	F
0403	623025	309487	F
0404	623008	309493	F
0405 0406	623005 623033	309415 309408	F
0407	623035	309401	F
0408	623056	309401	F
0409 0601	623001 623023	309497 309693	F
0602	623056	309694	F
0603	623029	309669	F
0605	623092	309675	F
0606 0607	623046 623086	309644 309645	F F
0608	623091	309689	F
0609	623088	309690	F
0610 0611	623097 623095	309690 309690	F F
0612	623067	309688	F
0613	623079	309688	F
0614	623024	309686	F
0615 0616	623043 623039	309686 309687	F F
0617	623042	309644	F
0618	623086	309660	F
0619 1001	623099 623158	309645 309073	F
1003	623184	309067	F
1014	623190	309074	F
1107	623171	309190	F
1119 1211	623129 623153	309187 309285	F
1303	623143	309320	F
1306	623107	309356	F
1307	623119 623131	309355	F
1308 1309	623131 623160	309356 309343	F
1310	623152	309346	F
1312	623158	309390	F
1401 1403	623118 623156	309453 309429	F F
1403 1406	623156 623159	309429	F
1502	623163	309525	F
1502		200550	F
1503	623163	309559	
	623163 623114 623138	309559 309698 309673	F

Manhole Reference Easting Northing

Liquid Typ	De Cover Lev	el Invert Level	
с с	- 12.802	- 10.449	- 2.353
C	10.756	8.12	2.636
С	9.754	7.196	2.558
С	-	-	0.83
C C	- 4.18	- 1.44	1.92 2.74
C C	4.18	0.94	3.25
C	-	-	2.21
С	-	-	2.565
С	-	-	2.16
C C	-	-	2.24
с с	-	-	2 2.6
C C	- 7.483	- 3.292	4.191
c	-	-	2.011
С	7.483	3.292	4.191
С	-	-	1.93
С	-	-	0.84
C C	-	-	1.3 0.915
C C	-	-	-
C	-	-	-
C	-	-	2.51
С	3.65	1.26	2.39
С	3.6	1.04	2.56
C	3.63	1.43	2.2
C C	4.29	1.82	2.47
C C	4.76	2.73 -	2.03
C	-	-	2.77
C	-	-	2.745
С	-	-	2.92
C	-	-	3.02
C	-	-	1.04
C C	-	-	0.915
C C	- 5.15	- 3.49	1.725
C	5.09	3.49	1.78
C	-	-	-
С	-	-	0.8
C	-	-	-
C	-	-	-
C C	-	-	- 0.5
C	-	-	0.99
C	6.248	4.328	1.92
С	-	-	1.525
С	6.111	4.023	2.088
С	-	-0.61	0.61
C -	6.767	5.352	1.415
F F	3.99	0.33	3.66
r F	4 3	0.22	3.78 1.64
F	3.23	1.45	1.78
F	4.22	1.41	2.81
F	4.41	1.72	2.69
F	4.65	2.04	2.61
F	4.91	2.36	2.55
F F	4.5 3.98	1.92 1.36	2.58 2.62
F	3.97	1.14	2.83
F	3.96	0.9	3.06
F	-	-	-
F	-	-	1.22
F	-	-	1.02
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
=	-	-	-
=	-	-	-
=	-	-	-
= =	-	-	-
=	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	2.81	2.04	0.77
F	2.55 2.56	-2.02 0.8	4.57 1.76
F	2.56	-0.934	3.76
F	-		-
F	3.42	0.59	2.83
F	3.47	0.99	2.48
F	3.91	-0.02	3.93
F	3.61	-	-
F	-	-	3.35
	3.18 -	-0.2	3.38 3.5
F			1.61
F F	3.42	1.81	
F F F		1.81 1.25	2.85
	3.42		
F F F F F	3.42 4.1 3.75 4.07	1.25	2.85
F F F F F F	3.42 4.1 3.75 4.07 4.558	1.25 0.25 1.96 1.203	2.85 3.5 2.11 3.355
F F F F F	3.42 4.1 3.75 4.07	1.25 0.25 1.96	2.85 3.5 2.11

	rence Easting	Northing	Liquid T	ype Cover Lev	el Invert Leve	Depth to Inv
1612	623177	309693	F	-	-	0.91
1614	623161	309637	F	-	-	-
1617	623116	309645	F	7.333	5.473	1.86
1618	623102	309690	F	-	-	-
1619	623110	309690	F	-	-	-
2303	623249	309333	F	3.22	1.1	2.12
2304	623265	309338	F	3.37	1.57	1.8
2307	623257	309307	F	2.917	0.918	1.999
2504	623287	309589	F	-	-	2.5
2703	623243	309703	F		-	0.87
3008			F		-	0.07
	623347	309072		-	-	-
3009	623393	309074	F	-	-	-
3010	623380	309064	F	-	-	-
3011	623364	309049	F	-	-	-
3302	623371	309359	F	2.57	-0.08	2.65
3501	623391	309509	F	-	-	2.1
3502	623332	309534	F	-	-	2.2
3503	623306	309556	F	-	-	-
3504	623395	309520	F	-	-	-
3505	623326	309587	F	-	-	-
3601	623306	309624	F	-	-	2.5
3603	623334	309655	F	-	-	2.4
3604	623301	309629	F	-	-	1.2
3605	623360	309651	F	_		-
3606	623365	309688	F		-	2.13
					-	2.13
3607	623356	309615	F	-	-	-
3608	623358	309635	F	-	-	-
3609	623364	309603	F	-	-	-
4003	623433	309080	F	3.95	0.15	3.8
4101	623421	309189	F	-	-	3.455
4401	623479	309476	F	-	-	2.86
4402	623469	309476	F	-	-	2.8
4501	623412	309565	F	-	-	-
4502	623446	309557	F	-	-	-
4503	623457	309594	F	-	-	1.52
4504	623408	309588	F	-	-	-
4505	623413	309587	F	-	-	-
4506	623420	309585	F	-	-	-
4507	623438	309513	F		-	-
4508	623436	309538	F			-
4601			F	-	-	-
	623454	309674		-	-	1.37
4602	623482	309633	F	-	-	-
4603	623402	309605	F	-	-	-
4604	623406	309670	F	-	-	-
4605	623406	309667	F	-	-	-
5201	622581	309267	F	-	-	-
5301	622563	309365	F	-	-	-
5302	622564	309357	F	-	-	-
5402	622563	309412	F	-	-	-
5402	623549	309406	F	-	-	-
5403	623545	309411	F	2.87	-0.18	3.05
5406	623536	309433	F	-	-	3.607
5407	623537	309458	F	-		3.226
5408	623548	309469	F	-	-	2.77
		309464	F	-	-	
5409	623516			-	-	3.265
5410	623527	309405	F	-	-	-
5501	623552	309525	F	-	-	2.22
5502	623549	309531	F	-	-	-
5504	623556	309529	F	-	-	-
5505	623559	309557	F	-	-	2.25
5506	623562	309581	F	-	-	1.95
5507	623516	309585	F	-	-	-
5511	622586	309593	F	-	-	8.36
5512	622575	309590	F	-	-	3.886
5513	622570	309586	F	-	-	1.855
5514	622580	309555	F	-	-	0.915
5601	623566	309618	F	-	-	2.07
5602	623574	309688	F	-	-	2.28
5603	623572	309691	F	-	-	
5604	622563	309647	F	_	-	9.13
5604 5604	623537	309647	F	- 10.459	- 8.729	1.73
				10.459	0.729	
5605	623541	309659	F	-	-	1.905
5607	623543	309694	F	-	-	-
6000	622669	309095	F	4.042	2.39	1.652
6001	622684	309069	F	4.125	2.591	1.534
6002	622658	309054	F	4.3	2.792	1.508
6102	622695	309188	F	-	-	3.4
6103	622699	309193	F	-	-	6.4
6104	622698	309110	F	-	-	1.14
6105	622673	309147	F	-	1.5	-
6106	622660	309127	F	-	1.75	-
6107	622643	309126	F	-	1.95	-
6108	622666	309159	F	-	1.8	-
6109	622667	309183	F	-	2.2	-
6110	622656	309121	F	4	1.966	2.034
6201	622657	309265	F	-	1.411	-
6204	622664	309262	F	-	-	-
6205	622617	309262	F	_	- 1.643	-
6302	622634	309252	F		-	- 5.82
				-		
6404	622614	309454	F	-	-	7
6504	622609	309558	F	-	-	9.45
6616	622676	309698	F	-	-	-
6617	622680	309695	F	-	-	-
6618	622685	309692	F	-	-	-
6619	622689	309689	F	-	-	-
6620	622693	309685	F	-	-	-
	622698	309683	F	-	-	-
6621	622671	309696	F	-	-	-
		309099	F	-	_	3.66
6623	622744	, 11 1 min 1 min min				0.00
6621 6623 7002 7005	622744 622751			_	-	6.8
6623 7002 7005	622751	309098	F	-	-	6.8 3.073
6623				- 3.583 3.603	- 0.51 2.015	6.8 3.073 1.588

Manhole Refe	rence Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Inver
7101	622708	309166	F	-	-0.04	-
7104	622720	309122	F	-	-	1.17
7105	622703	309194	F	-	-	2.7
7106	622799	309115	F	-	-	3
7108	622703	309164	F	-	1.1	-
7205 7205	622712	309284	F	-	-	1.845
206 207	622782 622753	309285 309285	F F	-	-	- 1.635
207 7404	622758	309285	F	-	-	1.035
404 7405	622704	309466	F	-	-	-
406 7406	622720	309473	F.	-	-	-
7501	622718	309599	F	-	-	11.75
602	622773	309641	F	10.67	8	2.67
8001	622884	309059	F	4.27	0.55	3.72
3102	622874	309170	F	4.32	1.71	2.61
3104	622811	309104	F	-	-	1.3
3204	622881	309211	F	-	-	-
3405	622862	309430	F	-	-	-
509	622892	309570	F	-	-	-
604	622816	309660	F	-	-	-
610	622830	309693	F	9.982	5.902	4.08
611	622812	309662	F	10.267	7.147	3.12
615	622824	309616	F	-	-	-
3616	622818	309623	F	-	-	-
9001	622961	309099	F	3.87	1.77	2.1
002	622979	309048	F	3.46	1.44	2.02
202	622969	309245	F	-	-	2.6
206	622966 622967	309292	F F	-	- 2 12	2.185 2.17
208 209	622967 622986	309283 309290	F	4.3	2.13	 -
9209 9301	622986	309290	F	- 4.37	- 2.25	- 2.12
9301	622967	309310	F	4.37	-	2.12
9401	622973	309428	F	-	-	2.845
)423	622945	309444	F	-	-	2.59
)425	622943	309458	F	-	-	2.615
9428	622929	309471	F	-	-	•
9429	622935	309475	F	-	-	-
9504	622992	309546	F	-	-	-
9513	622944	309573	F	-	-	-
9514	622905	309577	F	-	-	-
9607	622998	309664	F	5.447	3.487	1.96
608	622902	309655	F	-	-	1.6
609	622922	309660	F	6.1	0.176	5.924
611	622992	309690	F	5.43	3.205	2.225
613	622935	309623	F	-	-	-
614	622948	309627	F	-	-	0.5
9615	622985	309689	F	-	-	0.95
9616	622962	309630	F	-	-	-
)251	623009	309263	S	4.47	3.05	1.42
)252	623039	309294	S	3.64	2.03	1.61
)253	623052	309269	S	-	4.66	-
)351	623078	309356	S	3.97	1.07	2.9
)352	623062 623062	309309	S	3.05	1.74	1.31
)353)354	623062	309303 309356	S S	3.28 4.01	1.83 1.03	1.45 2.98
)451	623036	309356	S	4.57	2.02	2.55
)452	623004	309492	S	5.01	2.2	2.81
)453	623005	309417	S	4.49	1.32	3.17
)454	623035	309410	S	3.95	1.21	2.74
)455	623046	309404	S	3.98	1.08	2.9
)456	623057	309404	S	3.96	1.08	2.88
)457	623087	309499	S	3.99	2.46	1.53
458	623095	309478	S	4.19	2.23	1.96
)459	623097	309459	S	4.23	1.85	2.38
051	623153	309091	S	2.83	1.69	1.14
057	623187	309075	S	-	-	-
153	623168	309191	S	-	-	2.49
251	623156	309286	S	3.51	-0.55	4.06
252	623103	309279	S	-	7.21	-
351	623157	309346	S	3.23	0.79	2.44
352	623108	309357	S	3.88	1.04	2.84
353	623133	309357	S	•	-	2.45
355	623145	309319	S	3.49	-0.26	3.75
357	623156	309388	S	-	-	-
451	623118	309451	S	4.09	1.64	2.45
452 453	623158	309447	S	-	-	-
453 459	623154	309427	S S	3.78	1.02	2.76
459 553	623168 623167	309427 309558	S	3.8	2.16	1.64 -
1553 1651	623167	309558	S	-	-	- 5.73
2351	623150	309668	S	-	-	1.93
2352	623203	309338	S	- 8.37	- 7.18	1.19
2354	623272	309315	S	3.09	1.29	1.19
2355	623250	309387	S	3.65	2.32	1.33
361	623258	309307	S	2.918	1.168	1.75
362	623250	309334	S	-	-	1.93
363	623265	309326	S	-	4.11	-
452	623274	309428	S	-	-	-
552	623282	309589	S	-	-	2.2
050	623390	309076	S	-	-	-
8051	623378	309064	S	-	-	-
8052	623364	309051	S	-	-	-
3351	623326	309343	S	3.29	1.24	2.05
3352	623321	309343	S	3.38	1.56	1.82
3353	623370	309348	S	2.54	0.65	1.89
3357	623382	309316	S	2.801	0.251	2.55
3358	623368	309351	S	-	-	-
3359	623365	309359	S	-	-	-
3360	623338	309352	S	-	-	-
3361	623346	309384	S	-	-	1.93
3457	623366	309424	S	-	-	3.04
3458	623386	309493	S	-	-	-
3551	623387	309506	S			2.1

	erence Easting	Northing	Liquid Ty	pe Cover Lev	el Invert Leve	
3552	623330	309532	S	-	-	1.8
3553	623305	309554	S	-	-	1.9
3554	623392	309521	S	-	-	-
3555	623324	309590	S	-	-	-
3651	623303	309624	S	-	-	2.1
3652 3653	623332 623359	309659 309654	S S	-	-	2.1
4051	623435	309034	S	3.97	- 1.56	- 2.41
4157	623423	309190	S	-	-	2.77
1453	623468	309472	S	-	-	2.7
4551	623409	309568	S	-	-	-
4552	623449	309558	S	-	-	-
4651	623413	309644	S	-	-	-
4652	623468	309633	S	-	-	-
5350	623570	309310	S	2.1	0.51	1.59
5351	623576	309313	S	-	-	-
5451	623550	309413	S	2.86	0.28	2.58
5454	623549	309447	S	-	-	2.16
5455	623551	309469	S	-	-	2.415
5456	623531	309408	S	-	-	-
5551	623554	309532	S	-	-	1.92
5552	623556	309557	S	-	-	1.95
5553	623559	309581	S	-	-	1.67
5555	622569	309584	S	-	-	-
5556	622558	309579	S	-	-	1.168
5651 5652	623563	309617	S S	-	-	1.76
5652 5653	623572 623575	309688 309691	S	-	-	1.98
5653 5654	623575	309691	S	- 10.441	- 9.016	- 1.425
5655	623536	309621	S	-	9.016	-
6055 6054	622694	309696	S	- 4.022	- 1.333	- 2.689
3054 3055	622667	309095	S	4.022	1.834	2.206
6056 6056	622642	309083	S	4.319	2.634	1.685
6050 6151	622671	309148	S	-	1.8	-
6152	622659	309129	S	-	2.05	-
6153	622643	309128	S	-	2.2	-
6154	622664	309160	S	-	2.1	-
6155	622665	309185	S	-	2.5	-
6156	622698	309187	S	-	-	1.2
6251	622666	309241	S	-	-	1.83
6252	622660	309259	S	-	1.548	-
6253	622657	309260	S	-	1.829	-
6254	622611	309258	S	-	2.999	-
6551	622622	309568	S	9.29	2.49	6.8
6552	622688	309590	S	10.73	7.65	3.08
652	622644	309634	S	-	-	1.27
7052	622725	309056	S	4.102	1.861	2.241
7053	622749	309067	S	3.721	2.26	1.461
7152	622710	309169	S	-	1.3	-
7153	622703	309166	S	-	1.4	-
7154	622737	309117	S	-	-	2.9
7155	622748	309094	S	-	-	-
7156	622771	309107	S	-	-	-
7157	622798	309118	S	-	-	-
7251	622714	309285	S	-	-	1.575
7252	622788	309259	S	-	-	-
7253	622707	309257	S	-	1.734	-
7254	622745	309258	S	-	1.893	-
7351	622780	309326	S	-	-	1.83
7352 7354	622745 622797	309333 309321	S S	-	-	1.6 1.3
7451	622760	309321	S	-	-	1.15
7652	622760	309476	S	-	-	3.81
7653	622788	309632	S	-	-	7.77
3151	622873	309169	S	4.32	1.96	2.36
3152	622802	309153	S	4.52	-	2.30
3152	622802	309155	S	_	-	-
3253	622833	309166	S	_	- 2.548	-
3253	622879	309234	S	-	-	-
3254 3255	622882	309233	S	-	-	-
3452	622807	309490	S	-	-	1.38
3557	622860	309490	S	-	-	-
3653	622810	309662	S	10.267	7.447	2.82
3654	622829	309696	S	9.982	6.202	3.78
)252	622971	309247	S	-	-	2.25
9253	622970	309284	S	-	-	3.99
9254	622973	309261	S	-	-	-
9255	622973	309295	S	-	-	-
9256	622982	309292	S	-	-	-
9351	622973	309312	S	-	-	-
9459	622975	309422	S	-	-	3
9460	622930	309452	S	-	-	3.15
9462	622912	309477	S	-	-	3.48
9465	622991	309411	S	-	-	-
			1			1

	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Anhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Inver

Manhole Reference	Fasting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix: F – CCTV Survey

Draincare Environmental Services Ltd

1394 - Anglia Square, Norwich, NR3 1DZ

Draincare Environmental Services Ltd Unit 2 Batford Mill, Lower Luton Road, Harpenden AL5 5BZ Tel: 01582 467111 email: info@draincare.com

Draincare Environmenta Unit 2, Batford Mill, Lowe Harpenden Tel.: 01582 467 Fax: Email: nigelgifkins@dra										
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Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Harpenden Tel.: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Table of contents** Date: Project Name: Project number: Contact: Howard Palmer 1394 - Anglia Square, Norwi 1394 13/11/2018 Section: 28, 0354 --- 1351 39 Section: 29, 0308 --- 0310 41 Section: 30, 0310 --- 0309 42 Section: 31, 9305 --- 9208 43 Section: 32, 9208 --- 9351A 44 Section: 33, 9460 --- 9459 45 Section: 34, 9423 --- 9401 46 Section: 35, MH1 outlet1 --- Main 48 Section: 36, MH1 outlet2 --- Unknown 50 Section: 37, MH4 --- MH5 52 Section: 38, MH5 Outl 1 --- Unknown 53 Section: 39, MH5 Outl 2 --- Unknown 54 Section: 40, 0457A --- 0457 56

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com

Draincare

394 - <i>I</i>	Project name Anglia Square, No			t number : 394	Contact : Howard Palme	r	Date : 13/11/2018		
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)	
35	MH1 outlet1	Main	01/11/2018	Edward street		Vitrified clay	6.25	6.25	
36	MH1 outlet2	Unknown	30/10/2018	Edward street		Vitrified clay	1.59	1.59	
39	MH5 Outl 2	Unknown	01/11/2018	Edward street site1		Vitrified clay	0.00	0.00	
			Pipe s	size: CIRCULAR 100/100 = 7.	<u>34 m (7.84 m</u>	<u>በ</u>			
								-	
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)	
10	9209	B/Junction	29/10/2018	Anglia Square		Vitrified clay	19.54	19.5	
20	8303A	8303C	30/10/2018	Anglia Square		Vitrified clay	18.69	18.6	
21	8303A	8303C	30/10/2018	Anglia Square		Vitrified clay	20.88	20.8	
37	MH4	MH5	30/10/2018	Edward street		Vitrified clay	22.98	22.9	
38	MH5 Outl 1	Unknown	01/11/2018	Edward street site1		Vitrified clay	11.74	11.7	
40	0457A	0457	31/10/2018 Bipo ci	Edward street site2 ze: CIRCULAR 150/150 = 99.	57 m (00 57)	Pitch fibre	5.74	5.74	
			<u>ripe si</u>	28. CINCOLAR 130/130 = 33.	<u>57 III (55.57 I</u>	<u></u>			
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)	
1	9401	0405	29/10/2018	Anglia Square	. ape 110.	Vitrified clay	31.82	31.8	
2	0405	0405	29/10/2018	Anglia Square		Vitrified clay	28.25	28.2	
2	0405	0408	29/10/2018	Anglia Square		Vitrified clay	26.74	26.7	
4	0408	0301	29/10/2018	Anglia Square		Vitrified clay	42.29	42.2	
7	0303	0301	29/10/2018	Anglia Square		Vitrified clay	45.47	45.4	
9	0252	0352	29/10/2018	Anglia Square		Vitrified clay	29.63	29.6	
11	9351 A	9305	29/10/2018	Anglia Square		Vitrified clay	65.25	65.2	
12	9305	9306	29/10/2018	Anglia Square		Vitrified clay	42.93	42.9	
13	9306	9305	29/10/2018	Anglia Square		Vitrified clay	43.69	43.6	
14	9305	9301	29/10/2018	Anglia Square		Vitrified clay	7.41	7.41	
16	9256	9255	30/10/2018	Anglia Square		Vitrified clay	8.84	8.84	
17	9255	9305A	30/10/2018	Anglia Square		Vitrified clay	60.82	60.8	
18	9305A	9465A	30/10/2018	Anglia Square		Vitrified clay	37.89	37.8	
19	9465A	9465	30/10/2018	Anglia Square		Vitrified clay	1.72	1.72	
31	9305	9208	01/11/2018	Anglia square		Vitrified clay	0.08	0.08	
32	9208	9351A	01/11/2018	Anglia square		Vitrified clay	16.14	16.1	
			<u>Pipe siz</u>	e: CIRCULAR 225/225 = 488.	<u>97 m (488.97</u>	<u>′m)</u>			
								-	
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)	
5	0301	0305	29/10/2018	Anglia Square		Vitrified clay	19.36	19.3	
6	0305	1306	29/10/2018	Anglia Square		Vitrified clay	24.27	24.2	
8	0352	0354	29/10/2018	Anglia Square		Vitrified clay	49.35	49.3	
15	9306	9465 Br1	29/10/2018	Anglia Square		Vitrified clay	9.95	9.95	
29	0308	0310	31/10/2018	Anglia square		Vitrified clay	3.17	3.17	
34	9423	9401	01/11/2018	Anglia square e: CIRCULAR 300/300 = 106.	10 m (106 19	Vitrified clay	0.08	0.08	
			<u>Fipe siz</u>	e. CIRCULAR 300/300 = 100.		<u>, m)</u>			
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)	
					Tape NO.	marcı idi			
22	9465	9465B	31/10/2018	Anglia square Anglia square			6.10	5.20 23.0	
23 30	9465 0310	0453	31/10/2018 31/10/2018	Anglia square		Vitrified clay	23.97 8.77	23.9 8.77	
				ze: CIRCULAR 375/375 = 38.	<u>34 m (37.94 i</u>		0.11	0.77	
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)	
24	9459	0456	31/10/2018	Anglia square			32.69	32.6	
25	9459	0454	31/10/2018	Anglia square			22.40	22.4	
	0454	0456	31/10/2018	Anglia square			27.40	27.4	

	Drain	care				Tel: C	larpenden 01582 467111 Fax: fkins@draincare.com	1
				$\Sigma \varnothing$ / Main s	ections			
94 - A	Project name nglia Square, N	: orwich, NR3	Project num 1394	iber :	Contact : Howard Palme	er	Date : 13/11/2018	
Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)
27	0456	0354	31/10/2018	Anglia square			0.16	0.16
28	0354	1351	31/10/2018	Anglia square	170.04 (470.04	(97.16	97.16
			Pipe size: Ci	IRCULAR 675/675 = ^	<u>179.81 m (179.81</u>	<u> </u>		
Ir.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)
33	9460	9459	01/11/2018	Anglia square		Brick	35.31	35.3
			All	<u>sections = 956.52 m</u>	<u>(955.61 m)</u>			

Draincare		Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com
	Project-information	
Project name : 1394 - Anglia Square, Norwich, NR3	Project Number : Contact : 1394 Howard Palr	Date : ner 29/10/2018
Client:	Weston Homes PLC	
Contact Name:	Howard Palmer	
Department:	CCTV	
Road:	Parsonage Road	
Town:	Takeley	
County:	CM22 6PU	
Telephone:	01279 873341	
Fax:		
Mobile:		
E-mail:	howard.palmer@weston	-homes.com
Site:	Weston Homes PLC	
Contact Name:	Howard Palmer	
Department:	CCTV	
Road:	Anglia Square	
Town:	Norwich	
County:	NR3 1DZ	
Telephone:	01279 873341	
Fax:		
Mobile:		
E-mail:	howard.palmer@weston	-homes.com
Contractor	Draincare Environmental	Services Ltd
Contact Name:	Nigel Gifkins	
Department:	CCTV Department	
Road:	Unit 2, Batford Mill, Lowe	er Luton Road
Town:	Harpenden	
County:	Herts, AL5 5BZ	
Telephone:	01582 467111	
Fax:		
Mobile:	07887 536573	
E-mail:	nigelgifkins@draincare.c	com
	1394 - Anglia Square, Norwich, NR3 1DZ // Page	: 3

Draincare			Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com						
Project-information									
Project name : 394 - Anglia Square, Norwich, NR3	Project Number : 1 394	Contact : Howard Palmer	Date : 29/10/2018						
Background: Draincare Environmental Serv drainage at the above site.	ices Ltd has been requ	ested to undertake an inves	stigation of the						
Executive Summary / Overvie Defects fully detailed and grac									
CCTV survey conducted to es	tablish pipework conditi	on and defects.							
Any operational or structural d 4 or 5 photographed, within th		TV works are noted and gra	aded, and if graded						
All pipework, once past the pro- responsibility, following the 20									
Note(s):									
Unable to CCTV survey the pi 0354 (Plan 2), 0351 d/s to 135 (Plan 3), 0306 d/s to 0307 (Pla to 0304 (redundant, Plan 4) ar and requiring a combination ta	2 (Plan 2 & 3), 1352 d/ an 3), 0307 d/s to 0308 nd 9208 d/s to 9305 (Pla	s to 1353 (Plan 3), 1353 d/s (Plan 3), 0308 d/s to 0310 (an 5 & 6) due to high levels	s to main in road (Plan 3), 0303 u/s						
Unable to CCTV survey down park due to the main in the roa 0402 located within Edward R attendance.	ad being blocked at the	time causing chambers 040	02A and chamber						
Recommendations:									
 All operational defects gra to be undertaken (i.e. High Pre return the pipework to a satisfa 	essure Jetting, suction,	cleaning/clearing works etc	;), in an attempt to						
2) All structural defects grade be undertaken (i.e. lining, exca satisfactory and serviceable co	avation, repair/replace e								
All operational and structural of the drainage, and are identifie All operational and structural of the drainage. All operational and structural of drainage and should be consid Pipe deformation / ovaling is of	d as a general note only lefects graded 3 are un lefects graded 4 or 5 m dered for remedial work	y. likely to be detrimental to th ay be detrimental to the effe	ne effectiveness of ectiveness of						

Pipe deformation / ovaling is described in % terms - % being an approximation of the amount of vertical dimension compressed.

The pipe materials as described should be recognised as the survey engineer's best judgement only.

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111

Draincare

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Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : PLR SUFFIX: Date : Job number : Weather : Section number : 29/10/2018 Weston no rain or snow Draincare 2 Х Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : Norwich U/S MH : 0405 Location details: Road : Anglia Square Catchment: Plan 1 & 2 U/S Depth : Location Other Pedestrian area D/S MH : 0406 Tape number : Pipe Length Inspection 0405 (D/S) 0406 D/S Depth : 2.6 Use: Circular Foul Pipe shape : Year laid : Pipe size : 225 mm Other (state in remarks) Purpose : Pipe material : Vitrified clay 28.25 m Lining : Total length : Comment : 1:225 Position Code Observation Photo Grade 0405 0.00 (Constr) 0 MH Start node type, manhole reference number: 0405 0.00 WL Water level 10 % of the vertical dimension Flow (Serv) 0 2<u>8.25</u> MHF Finish node type, manhole reference number: 0406 (Constr) 0 0406 Depth: 2.6 Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 1 0 0 0 0 1

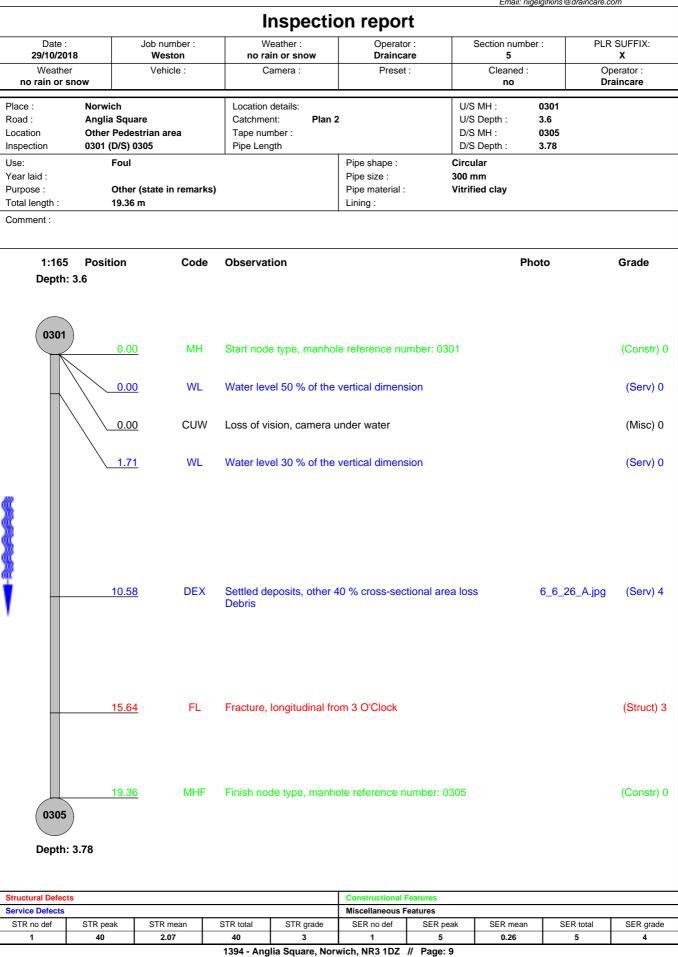
Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : PLR SUFFIX: Date : Job number : Weather : Section number : 29/10/2018 Weston no rain or snow Draincare Х 3 Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : U/S MH : 0406 Norwich Location details: Road : Anglia Square Catchment: Plan 2 U/S Depth : 2.6 0408 Location Other Pedestrian area D/S MH · Tape number : Inspection 0406 (D/S) 0408 Pipe Length D/S Depth : 3.07 Use: Circular Foul Pipe shape : Year laid : Pipe size : 225 mm Purpose : Other (state in remarks) Pipe material : Vitrified clay 26.74 m Lining : Total length : Comment : 1:225 Position Code Observation Photo Grade Depth: 2.6 0406 0<u>.00</u> MH (Constr) 0 Start node type, manhole reference number: 0406 0.00 WL Water level 10 % of the vertical dimension Flow (Serv) 0 7.72 REM General remark 0407 (Misc) 0 8.58 LL Line deviates left (Serv) 0 26.74 (Constr) 0 MHF Finish node type, manhole reference number: 0408 0408 Depth: 3.07 Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 0 0 0 0 1 1

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : Date : Job number : Weather : Section number : PLR SUFFIX: 29/10/2018 Weston no rain or snow Draincare 4 Х Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : U/S MH : 0408 Norwich Location details: Road : Anglia Square Catchment: Plan 2 U/S Depth : 3.07 Location Other Pedestrian area D/S MH · 0301 Tape number : Inspection 0408 (D/S) 0301 D/S Depth : 3.6 Pipe Length Use Circular Foul Pipe shape : Year laid : Pipe size : 225 mm Purpose : Other (state in remarks) Pipe material : Vitrified clay 42.29 m Total length : Lining : Comment : 1:345 Position Code Observation Photo Grade Depth: 3.07 0408 0.00 MH Start node type, manhole reference number: 0408 (Constr) 0 WL Water level 0 % of the vertical dimension 0.00 (Serv) 0 WL Water level 5 % of the vertical dimension Flow 0.60 (Serv) 0 15.99 WL Water level 20 % of the vertical dimension (Serv) 0 DEG 21.64 Attached deposits, grease from 5 O'Clock to 7 O'Clock 10 (Serv) 3 % cross-sectional area loss 40.36 CUW Loss of vision, camera under water (Misc) 0 42.29 MHF Finish node type, manhole reference number: 0301 (Constr) 0 0301 Depth: 3.6 **Constructional Features** Structural D Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0.05 0 0 0 0 1 2 3 1 2

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Draincar	Э		Unit 2, Batford H Tel: (ronmental Services Ltd Mill, Lower Luton Road larpenden 19582 467111 Fax: ifkins@draincare.com
Place :	Inspo Road :	ection picture	Section number :	PLR Suffix
Norwich	Anglia Square	29/10/2018	5	PLR Sullix X

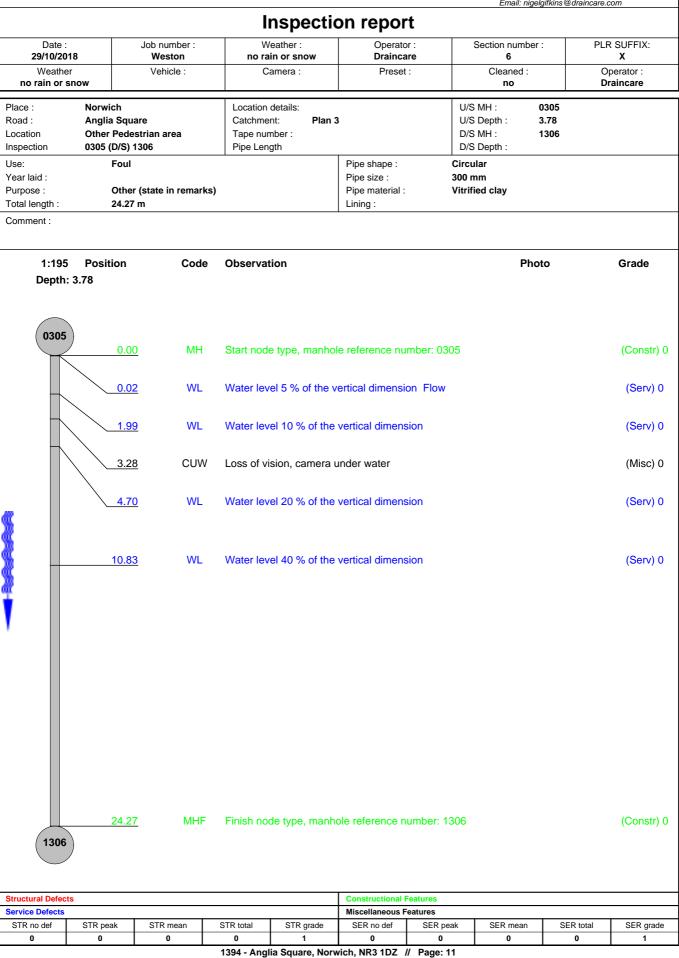


Photo: 6_6_26_A.jpg, 00:02:11 10.58m, Settled deposits, other 40 % cross-sectional area loss Debris

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Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : Date : Job number : Weather : Section number : PLR SUFFIX: 29/10/2018 Weston no rain or snow Draincare Х 7 Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : Norwich U/S MH : 0303 Location details: Road : Anglia Square Catchment: Plan 4 & 2 U/S Depth : 1.6 Location D/S MH · 0301 Road Tape number : Inspection 0303 (D/S) 0301 Pipe Length D/S Depth : 3.6 Use: Circular Foul Pipe shape : Year laid : Pipe size : 225 mm Purpose : Other (state in remarks) Pipe material : Vitrified clay 45.47 m Lining : Total length : Comment : 1:360 Position Code Observation Photo Grade Depth: 1.6 0303 0.00 (Constr) 0 MH Start node type, manhole reference number: 0303 0.00 WL Water level 0 % of the vertical dimension (Serv) 0 13.66 REM General remark 0303A (Misc) 0 31.36 WL Water level 5 % of the vertical dimension (Serv) 0 45.47 MHF Finish node type, manhole reference number: 0301 (Constr) 0 backdrop shaft prior to 0301 0301 Depth: 3.6 Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 1 0 0 0 0 1

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com

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				I	nspection	on repor	t			
	Date : 29/10/2018	3	Job number : Weston	Weather : no rain or snow		Operator : Draincare		Section number : 8		R SUFFIX:
ı	Weather no rain or sn		Vehicle :		amera :	Preset		Cleaned : no		perator : raincare
		Norwich Anglia Squa Road 0352 (D/S) (Location Catchme Tape nu Pipe Len	ent: Plan 4 mber :	4 & 2	U/S D/S	Depth: 1	0352 1.28 0354	
Use Yea Purp Tota		Surfa	ce water (state in remarks)		<u> </u>	Pipe shape : Pipe size : Pipe material : Lining :	Circu 300 r	ılar		
	1:390 Depth: 1	Position	Code	Observa	tion			Phot	to	Grade
	0352	0.00	-			le reference nu				(Constr) 0
		<u>0.00</u>	-	Water level 5 % of the vertical dimension Dimension of drain/sewer changes 300 mm high 300 mm						(Serv) 0 0
		4.13		wide Settled d		10 % cross-sec				(Serv) 3
		13.83	<u>3</u> REM	debris General ı	emark 0352A					(Misc) 0
		16.75	<u>5</u> CN	Connecti 150 mm	on other than j	unction from 11	O'Clock dian	neter:		(Constr) 0
		17.52	2 CN	Connecti 150 mm	on other than ji	unction from 1	D'Clock diamo	eter:		(Constr) 0
		39.67	Z DEX	Settled d debris	eposits, other {	5 % cross-secti	onal area loss			(Serv) 2
	0354	49.35	<u>s</u> MHF	Finish no Backdrop	de type, manh prior to 0354	ole reference n	umber: 0354			(Constr) 0
	ctural Defects					Constructional F Miscellaneous F				
	R no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
	0	0	0	0						

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				I	nspecti	on repor	ť			
2	Date : 9/10/2018		Job number : Weston	Weather : no rain or snow		Operato Drainca		Section number 9	: PLF	SUFFIX:
	Weather rain or sno	ow	Vehicle :	C	Camera :	Preset	:	Cleaned : no		perator : aincare
Place : Road : Locatio	n	Norwich Anglia Squa Road		Location Catchme Tape nu	ent: Plan mber :	4	U/\$ D/\$	S Depth : · · · · · · · · · · · · · · · · · ·	0252 1.57 0352	
Inspect Use:	ion	0252 (D/S) 0	0352 ce water	Pipe Ler	igth	Pipe shape :	D/S Circ	S Depth :		
Year lai Purpose Total le	e :		(state in remarks)	1		Pipe size : Pipe material : Lining :	225 (
Comme										
	1:240 Depth: 1	Position .57	Code	Observa	tion			Pho	to	Grade
	0252	0.00	<u>)</u> MH	Start nod	e type, manho	le reference nu	mber: 0252			(Constr) 0
		0.00	<u>)</u> WL	Water lev	vel 0 % of the v	vertical dimension	on			(Serv) 0
		1.25	<u>i</u> LL	Line devi	ates left					(Serv) 0
		2.82	2 JN	Junction	from 11 O'Cloo	ck diameter: 15	i0 mm RG			(Constr) 0
		3.69	<u>)</u> JN	Junction	from 2 O'Clock	diameter: 150	mm RG			(Constr) 0
Ş		9.75	<u>i</u> WL	Water lev	vel 5 % of the v	vertical dimension	n			(Serv) 0
Ĭ		17.92	2JN	Junction	from 10 O'Cloo	ck diameter: 15	i0 mm			(Constr) 0
		23.44	E REM	General	remark 0353					(Misc) 0
		28.32	2 DEX	Settled d Debris	eposits, other	5 % cross-secti	onal area loss	:		(Serv) 2
	0352	29.63	<u>8</u> MHF	Finish nc 0352	de type, manh	ole reference n	umber: Drain	run		(Constr) 0
Structur	al Defects					Constructional I	Features			
Service	Defects				i	Miscellaneous F	eatures	i		
STR no		STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0					1	1	1	0.03	1	2

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : PLR SUFFIX: Date : Job number : Weather : Section number : 29/10/2018 Weston no rain or snow Draincare 10 Х Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : Norwich U/S MH : 9209 Location details: Road : Anglia Square Catchment: Plan 5 U/S Depth : 1.13 Location D/S MH · **B/Junction** Road Tape number : Inspection 9209 (D/S) B/Junction D/S Depth : Pipe Length Use: Circular Foul Pipe shape : Year laid : Pipe size : 150 mm Purpose : Other (state in remarks) Pipe material : Vitrified clay 19.54 m Lining : Total length : Comment : 1:165 Position Code Observation Photo Grade Depth: 1.13 9209 0.00 MH Start node type, manhole reference number: 9209 (Constr) 0 WL Water level 0 % of the vertical dimension 0.00 (Serv) 0 (Serv) 2 14.37 DES Settled deposits, fine 5 % cross-sectional area loss 1<u>9.05</u> LL Line deviates left (Serv) 0 **B**/Junction Finish node type, major connection without manhole 19.54 BRF (Constr) 0 reference number: Blind junction downstream of 9301 Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0.05 0 0 0 0 1 1 1 2

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						Email: nigelgifkins@c	lraincare.com
				Inspecti	on report		
	Date : 29/10/2018	Job number : Weston		Weather : no rain or snow	Operator : Draincare	Section number : 11	PLR SUFFIX: X
no	Weather no rain or snow		iicle :	Camera :	Preset :	Cleaned : no	Operator : Draincare
Place Road Locat Inspe	: ion	Norwich Anglia Square Road 9351 A (D/S) 9305		Location details: Catchment: Plan Tape number : Pipe Length	5&6	U/S MH : 9351 A U/S Depth : 2.13 D/S MH : 9305 D/S Depth : 2.74	
Use: Year Purpo Total Comr	ose : length :	Surface wate Other (state 65.25 m			Pipe shape : Pipe size : Pipe material : Lining :	Circular 225 mm Vitrified clay	
	1:504 Depth: 2	Position	Code	Observation		Photo	Grade
	Doptill 2	0.00	МН	Start node type, manho	ole reference number:	9351 A	(Constr) 0
	9351 A	0.00	WL	Water level 0 % of the	vertical dimension		(Serv) 0
		1.52	WL	Water level 10 % of the	e vertical dimension		(Serv) 0
		4.64	JN	Junction from 11 O'Clo	ock diameter: 100 mm		(Constr) 0
		16.05	LR	Line deviates right			(Serv) 0
		21.20	JN	Junction from 11 O'Clo	ock diameter: 100 mm		(Constr) 0
		<u>29.28</u>	JN	Junction from 11 O'Clo	ock diameter: 150 mm		(Constr) 0
8		35.23	WL	Water level 5 % of the	vertical dimension		(Serv) 0
Ĭ		35.43	JN	Junction from 12 O'Clo	ock diameter: 150 mm		(Constr) 0
<u> </u>		36.61	JN	Junction from 11 O'Clo	ock diameter: 150 mm		(Constr) 0
		44.15	CN	Connection other than 150 mm			(Constr) 0
	0	48.89	JN	Junction from 12 O'Clo	ock diameter: 100 mm		(Constr) 0
	0	51.73	REM	General remark 9305			(Misc) 0
		54.72	JN	Junction from 12 O'Clo			(Constr) 0
		62.43	JN	Junction from 9 O'Cloc	к diameter: 150 mm		(Constr) 0

D	rain	care						Unit 2, Batford I Tel: (ironmental Serv 1 Mill, Lower Luto Harpenden 01582 467111 Fax: ifkins@draincare	n Road
				Ir	nspectio	n Repo	rt			
Date 29/10/20			number : eston		eather : in or snow	Operato Drainca	r: re	Section number : 11		PLR : X
Weath no rain or		Ve	hicle :	Ca	amera :	Preset	:	Cleaned : no		Grade:
1:504	4 Posi	tion	Code	Observat	ion				Photo	Grade
		<u>65.25</u>	SA	Survey ab	oandoned (can	't push coiler fu	ırther)			(Misc) 0
maturel Def						Concentrations				
tructural Defecter ervice Defecter						Constructional F Miscellaneous F				
STR no def 0	STR pe	ak STF	R mean	STR total	STR grade 1	SER no def 0	SER peak 0	SER mean 0	SER total 0	SER grade
						/ich, NR3 1DZ				

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : Date : Job number : Weather : Section number : PLR SUFFIX: 29/10/2018 Weston no rain or snow Draincare 12 Х Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : Norwich U/S MH : 9305 Location details: Road : Anglia Square Plan 6 & 1 U/S Depth : 2.74 Catchment: Location D/S MH · 9306 Road Tape number : Inspection 9305 (D/S) 9306 D/S Depth : Pipe Length Use: Circular Surface water Pipe shape : Year laid : Pipe size : 225 mm Purpose : Other (state in remarks) Pipe material : Vitrified clay 42.93 m Lining : Total length : Comment : 1:345 Position Code Observation Photo Grade Depth: 2.74 9305 0.00 MH Start node type, manhole reference number: 9305 (Constr) 0 WL Water level 0 % of the vertical dimension 0.00 (Serv) 0 16.26 JN Junction from 12 O'Clock diameter: 100 mm (Constr) 0 E JN Junction from 2 O'Clock diameter: 100 mm (Constr) 0 17.64 31.45 JN Junction from 9 O'Clock diameter: 100 mm (Constr) 0 33.19 JN Junction from 2 O'Clock diameter: 100 mm (Constr) 0 42.93 MHF Finish node type, manhole reference number: 9306 (Constr) 0 9306 Unable to lift Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 0 0 0 0 1 1

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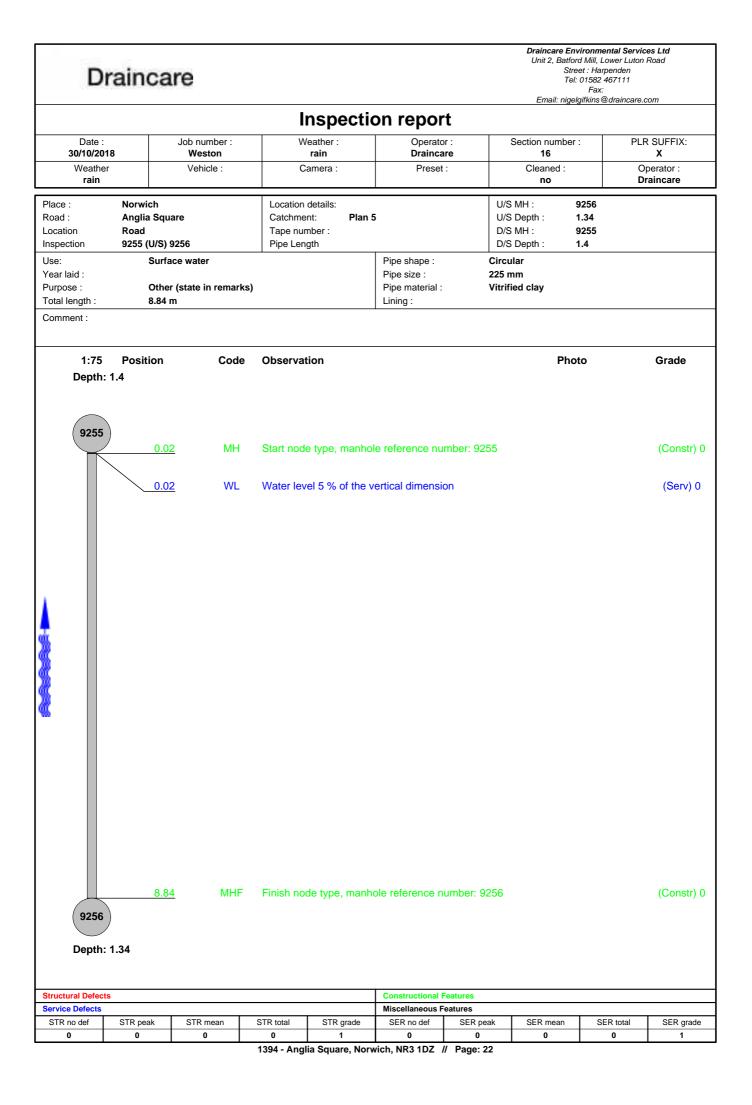
							4	Email: nigel	gifkins@draincare.c	om
					_	on repor				
	Date : 29/10/201	8	Job number : Weston		eather : in or snow	Operato Drainca		Section number 13		X SUFFIX:
no	Weather rain or s		Vehicle :	C	amera :	Preset	:	Cleaned : no		perator : aincare
Place Road Locati Inspec Use:	: on	Norwich Anglia Squa Road 9305 (U/S) 9 Foul		Location Catchme Tape nur Pipe Len	nt: Plan 6 nber :	5 & 1 Pipe shape :	U/S D/S	S Depth : S MH : S S Depth : 2	9306 9305 2.12	
Year I Purpo Total I Comm	se : ength :	Other 43.69	r (state in remark m	s)		Pipe size : Pipe material : Lining :	225 r Vitrif	nm ïied clay		
	1:345 Depth:	Position 2.12	Code	Observat	ion			Pho	to	Grade
		0.00	<u>)</u> MH	Start node	e type, manhol	le reference nu	mber: 9305			(Constr) 0
	9305	0.00	<u>)</u> WL	Water lev	el 0 % of the v	ertical dimensi	on			(Serv) 0
	2.31 JN Junction from 9 O'Clock diameter: 225 mm									(Constr) 0
		5.08	.08 DEX Settled deposits, other 10 % cross-sectional area loss Debris							(Serv) 3
	5.74 JN Junction from 2 O'Clock diameter: 225 mm								(Constr) (
		9.34	<u>I</u> JN	Junction f	Junction from 11 O'Clock diameter: 225 mm					
		10.77	<u>v</u> WL	Water lev	el 20 % of the	vertical dimens	sion			(Serv) 0
		15.36	<u>ð</u> JN	Junction f	rom 11 O'Cloc	k diameter: 22	25 mm			(Constr) (
		<u>18.10</u>	<u>)</u> JN	Junction f	rom 2 O'Clock	diameter: 225	5 mm			(Constr)
6		22.15	<u>5</u> JN	Junction f	rom 11 O'Cloc	k diameter: 22	25 mm			(Constr)
		29.81	<u>I</u> WL	Water lev	el 5 % of the v	ertical dimensi	on			(Serv) 0
		<u>33.62</u>	<u>2</u> JN	Junction f	rom 11 O'Cloc	k diameter: 22	25 mm			(Constr)
		41.56	<u>5</u> CN	Connectio 225 mm	on other than ju	unction from 2	O'Clock diam	eter:		(Constr)
		42.51	L JN	Junction f	rom 11 O'Cloc	k diameter: 15	50 mm			(Constr)
	9306	43.69	<u>)</u> MHF	Finish noo	de type, manho	ole reference n	umber: 9306			(Constr) (
	ural Defects	5				Constructional I				
	e Defects no def	STR peak	STR mean	STR total	STR grade	Miscellaneous F SER no def	eatures SER peak	SER mean	SER total	SER grade
	0	0	0	0	1	1	2	0.05	2	3

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : PLR SUFFIX: Date : Job number : Weather : Section number : 29/10/2018 Weston no rain or snow Draincare 14 Х Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : Norwich U/S MH : 9305 Location details: Road : Anglia Square Catchment: Plan 6 U/S Depth : 2.12 Location D/S MH : 9301 Road Tape number : Pipe Length Inspection 9305 (D/S) 9301 D/S Depth : Use: Circular Foul Pipe shape : Year laid : Pipe size : 225 mm Other (state in remarks) Purpose : Pipe material : Vitrified clay 7.41 m Total length : Lining : Comment : 1:60 Position Code Observation Photo Grade Depth: 2.12 9305 0.00 (Constr) 0 MH Start node type, manhole reference number: 9305 0.00 WL Water level 0 % of the vertical dimension (Serv) 0 7.41 SA Survey abandoned (can't push coiler further) (Misc) 0 Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 1 0 0 0 0 1 1394 - Anglia Square, Norwich, NR3 1DZ // Page: 20

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Draincare

						Email: nigelgifkir	ns@draincare.com
				Inspecti	on report		
	Date : 29/10/2018		Job number : Weston	Weather : no rain or snow	Operator : Draincare	Section number : 15	PLR SUFFIX: X
nc	Weather o rain or sno	w	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Draincare
Place Road Locati	: ion	Norwich Anglia Squa Road 9465 Br1 (U/		Location details: Catchment: Plan Tape number : Pipe Length		U/S MH : 9300 U/S Depth : 0/S MH : 9465 D/S MH : 9465 2.7	6 5 Br1
Use: Year I Purpo Total Comn	ose : length :		e water (state in remarks)		Pipe shape : Pipe size : Pipe material : Lining :	Circular 300 mm Vitrified clay	
	1:90 Depth: 2.	Position 7	Code	Observation		Photo	Grade
	9465 Br1	0.00	MH	Start node type, manho	ble reference number	: 9465 Br1	(Constr) 0
		0.00	WL	Water level 5 % of the	vertical dimension		(Serv) 0
	0.00 DEX Settled deposits, other 5 % cross-sectional area loss debris 2.69 JN Junction from 12 O'Clock diameter: 100 mm						
	T	3.60	DEX	Settled deposits, other debris	5 % cross-sectional a	area loss	(Serv) 2
		8.36	WL	Water level 10 % of the	e vertical dimension		(Serv) 0
	9306 Unable to	9.95		Water level 10 % of the		er: Drain run	(Serv) 0 (Constr) 0
	\bigcirc	9.95		Finish node type, man		r: Drain run	
	Unable to	9.95		Finish node type, man	nole reference numbe	۱Ş	
Servic	Unable to	9.95	MHF	Finish node type, man	Constructional Feature Miscellaneous Feature	۱Ş	



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Draincare

			Inspect	tion report		
Date : 30/10/201		number : /eston	Weather : rain	Operator : Draincare	Section number : 17	PLR SUFFIX: X
Weather rain	Ve	ehicle :	Camera :	Preset :	Cleaned : no	Operator : Draincare
lace : load : ocation nspection	Norwich Anglia Square Road 9255 (D/S) 9305A	L	Location details: Catchment: Pla Tape number : Pipe Length	ın 5 & 6	U/S MH : 9255 U/S Depth : 1.4 D/S MH : 9305A D/S Depth :	
se: ear laid : urpose :	-	iter e in remarks)		Pipe shape : Pipe size : Pipe material :	Circular 225 mm Vitrified clay	
otal length :	60.82 m			Lining :		
1:432 Depth: 1	Position 1.4	Code	Observation		Photo	Grade
\frown	0.00	MH	Start node type, man	hole reference number:	9255	(Constr)
9255	0.00	WL	Water level 0 % of the	e vertical dimension		(Serv) (
	1.40	WL	Water level 5 % of the	e vertical dimension		(Serv) (
	1.40	CCJ	Crack, circumferentia	I at joint from 12 O'Cloc	k to 6 O'Clock	(Struct)
	9.36	JN	Junction from 2 O'Clo	ock diameter: 100 mm		(Constr)
	15.86	REM	General remark 935	1		(Misc)
	<u>16.54</u>	LR	Line deviates right			(Serv)
	19.50	LR	Line deviates right	(Serv)		
	19.50	WL	Water level 10 % of t	he vertical dimension		(Serv)
	23.20	DEX	Settled deposits, othe Debris	er 20 % cross-sectional	area loss	(Serv)
	<u>24.41</u>	JN	Junction from 3 O'Clo	ock diameter: 150 mm		(Constr)
	25.24	CN	Connection other tha 100 mm	n junction from 12 O'Clo	ock diameter:	(Constr)
	<u>34.36</u>	JN	Junction from 3 O'Clo	ock diameter: 150 mm		(Constr)
	45.52	JN	Junction from 2 O'Clo	ock diameter: 100 mm		(Constr)
0	53.37	CN	Connection other tha 100 mm	n junction from 12 O'Clo	ock diameter:	(Constr)

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Harpenden Tol: 01592 467111

	Dr	ainca	re					H	Mill, Lower Lutor arpenden 1582 467111	I ROAU	
								Email: nigelgi	Fax: fkins@draincare.	.com	
				lr	nspectic	on Repo	rt				
	Date : 30/10/2018	8	Job number : Weston	W	eather : rain	Operato Drainca	or: Ire	Section number : 17		PLR : X	
	Weather rain		Vehicle :	C	amera :	Preset		Cleaned : no		Grade:	
	1:432	Position	Code	Observat	ion				Photo	Grade	
	$\neg +$	56.5	<u>1</u> JN	Junction f	rom 2 O'Clock	diameter: 100) mm			(Constr)	
		60.82	<u>2</u> MHF	Finish no	de type, manho	ole reference n	umber: 9305A			(Constr)	
	9305A)									
	ural Defects	i				Constructional F Miscellaneous F					
	no def	STR peak	STR mean	STR total	CTD avaida			050	050 1-1-1	055	
ΓR		Onvpeak	STICILIEAN	STICIDIAI	STR grade	SER no def	SER peak	SER mean	SER total	SER grad	

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com

Draincare

							Email: n	igelgifkins@drain	care.com
			Insp	pectio	on repor	t			
Date : 30/10/201		Job number : Weston	Weather rain	:	Operato Drainca		Section numb 18	per :	PLR SUFFIX: X
Weather rain		Vehicle :	Camera	:	Preset	:	Cleaned : no		Operator : Draincare
Place : Road : Location Inspection	Norwich Anglia Squa Road 9465A (U/S) 9		Location details Catchment: Tape number : Pipe Length	: Plan 1	& 6	U/S D/S	S MH : S Depth : S MH : S Depth :	9305A 9465A 2.1	
Jse: Year laid : Purpose : Total length : Comment :	Surfac	e water (state in remarks)			Pipe shape : Pipe size : Pipe material : Lining :	Circı 225 ı	ular		
1:300 Depth:	Position 2.1	Code	Observation				P	hoto	Grade
9465A) 0.00	МН	Start node type						(Constr) 0
	0.00	WL WL	Water level 0 %						(Serv) 0 (Serv) 0
	4.34	WL	Water level 10	% of the	vertical dimens	ion Flow			(Serv) 0
	6.31	CN	Connection oth 100 mm	er than ju	unction from 2 (D'Clock diam	eter:		(Constr) (
0	14.42	JN	Junction from 1	2 O'Cloc	k diameter: 10	0 mm			(Constr) 0
	20.88	WL	Water level 20	% of the	vertical dimens	ion			(Serv) 0
9305A	<u>37.89</u>)	MHF	Finish node typ	e, manho	Die reference nu Constructional F		N		(Constr) C
	;				oonstructional i	eatures			
Structural Defects Service Defects STR no def	STR peak	STR mean	STR total ST	R grade	Miscellaneous Fo		SER mean	SER tot	al SER grade

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : Weather : PLR SUFFIX: Date : Job number : Section number : 30/10/2018 Weston rain Draincare Х 19 Weather Vehicle : Camera : Preset : Cleaned : Operator : rain Draincare no Place : Norwich U/S MH : 9465A Location details: Road : Anglia Square Catchment: Plan 1 U/S Depth : 2.1 Location D/S MH : 9465 Road Tape number : Pipe Length Inspection 9465A (D/S) 9465 D/S Depth : 2.75 Use: Circular Surface water Pipe shape : Year laid : Pipe size : 225 mm Purpose : Other (state in remarks) Pipe material : Vitrified clay Lining : Total length : 1.72 m Comment : 1:50 Position Code Observation Photo Grade Depth: 2.1 9465A 0.00 MH (Constr) 0 Start node type, manhole reference number: 9465A 0.00 WL Water level 10 % of the vertical dimension Flow (Serv) 0 MHF (Constr) 0 1.72 Finish node type, manhole reference number: 9465 9465 Depth: 2.75 Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 1 0 0 0 0 1

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax: Email: pineknifking @dmineare.com

Draincare

Depth: 1.08 Algo and an analysis Algo and analysis Algo analysis									Email: nigel	Fax: lgifkins@draincare.o	com
300 702 15 Weston rain Draincare 20 X Weathing Variotics Camora : Pleast : Cleand : register : Comod : Oppoint : SSSA Uppoint : Uppoint : Uppoint : SSSA Uppoint : SSSA Uppoint : Uppoin							-				
rain ro Dialnear Place: Norwich Road : Jocation details: Plan 7 Type number : Plan 7 Type number : Plan 7 Type number : Plan 7 Dis Mit : US Mit : S030A US DM : DS Mit : S030A S030A DS Mit : S030A DS Mit :			3		W					: PLF	
Road : Anglia Siguane Road : Catchment: Pin 7 : US Depth: 1.08 : Use: instant Foul : Pipe Length : 0.5 Septh :: 0.5 Septh :: 0.5 Septh :: Variat :: Prova : Pipe stage: : Circular : 150 mm Pipe stage: : 150 mm Propose :: 0.5 Orgeth :: 16.83 m Dis Mith :: Pipe stage: : 150 mm Pipe stage: : 150 mm Total length :: 1.88 m 1.88 m Context (atta in nemarka) Pipe stage: : 150 mm Pipe stage: : 150 mm Total length :: 1.88 m 1.88 m Code Observation Photo Grad 1.150 Position Code Observation Photo Grad 8303A 0.00 MH Start node type, manhole reference number: 8303A (Code 0.00 WL Water level 5 % of the vertical dimension (Signat : (Signat : 1.178 WL Water level 5 % of the vertical dimension (Signat : (Code 1.179 WL Water level 20 % of the vertical dimension (Signat : (Code 1.179 WL Water level 20 % of the vertical dimension (Signat : (Code 1.179 WL Water level 20 % of the vertical dimension (Signat : (Signat :				Vehicle :	C	amera :	Preset	:			
Year tail: Propose: Diver (state in remarks) Pies tails: 150 mm Propose: 18.60 m Piestrativiti: Visitified clay Comment: 11.150 Position Code Observation Photo Gra 11.150 Position Code Observation Gra 11.150 Position Code Observation Gra 11.150 Position Code Code Observation Gra 11.150 Position Code Observation Gra 11.150 Position Code	Road : Location	n	Anglia Squa Road		Catchme Tape nur	nt: Plan 7 nber :	7	U/S D/S	B Depth : B MH :	1.08	
Depth: 1.08 Image: Constructional Pleatures	Year laid Purpose : Total leng	: gth :	Other		5)		Pipe size : Pipe material :	150 ו	nm		
0.00 MH Start node type, manhole reference number: 8303A (Co 0.00 WL Water level 5 % of the vertical dimension (Si 1.78 WL Water level 10 % of the vertical dimension (Si 4.34 DEX Settled deposits, other 10 % cross-sectional area loss (Si 5.85 REM General remark 8303B (M 6.831 CN Connection other than junction from 2 O'Clock diameter: (Co 100 mm 15.79 VL Water level 20 % of the vertical dimension (Si 15.79 VL Water level 20 % of the vertical dimension (Si (Si 15.79 VL Water level 20 % of the vertical dimension (Si (Si 15.79 VL Water level 20 % of the vertical dimension (Si (Si 15.79 VL Settled deposits, other 20 % cross-sectional area loss waste (Si (Si 17.62 CUW Loss of vision, camera under water (Mi (Mi 18.69 SA Survey abandoned (Mi (Mi Strictural Defects Constructional Features Six Six Six Six m				Code	Observat	lion			Pho	to	Grade
1.73 WL Water level 10 % of the vertical dimension (S 4.34 DEX Settled deposits, other 10 % cross-sectional area loss (S 5.35 REM General remark 8303B (M 6.31 CN Connection other than junction from 2 O'Clock diameter: (Connection other than junction from 2 O'Clock for % 21_21_153_Ajpg (S) 116.59 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock for % 21_21_153_Ajpg (S) (Constructional Features) Structural Defacts Constructional Features Miscellaneous Features SER no det SER no det SER no det	8	303A	0.00	<u>)</u> MH	Start node	e type, manhol	le reference nu	mber: 8303A			(Constr) 0
4.34 DEX Settled deposits, other 10 % cross-sectional area loss (Since the section of the setting section area loss waste 5.85 REM General remark 8303B (Minimized section area loss waste (Connection other than junction from 2 O'Clock diameter: 100 mm 15.79 VL Water level 20 % of the vertical dimension (Since the section area loss waste 15.79 VL Water level 20 % of the vertical dimension (Since the section area loss waste 15.79 DEX Settled deposits, other 20 % cross-sectional area loss waste (Since the section area loss waste 17.62 CUW Loss of vision, camera under water (Minimized area loss Debris 21_21_153_Ajpg (Since sectional area loss Debris) 18.69 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % 21_21_153_Ajpg (Since sectional area loss Debris) 18.69 SA Survey abandoned (Minimized area loss Debris) Structural Defects Constructional Features SER no def SER mean			0.00	<u>)</u> WL	Water lev	el 5 % of the v	ertical dimensi	on			(Serv) 0
S.85 REM General remark 8303B (M S.85 REM General remark 8303B (M S.31 CN Connection other than junction from 2 O'Clock diameter: (Control of the control of the c			1.78	<u>3</u> WL	Water lev	el 10 % of the	vertical dimens	sion			(Serv) 0
8.31 CN Connection other than junction from 2 O'Clock diameter: (Control 100 mm) 100 mm 15.79 WL Water level 20 % of the vertical dimension (Sigma 15.79) 15.79 WL Water level 20 % of the vertical dimension (Sigma 15.79) (Sigma 15.79) 15.79 DEX Settled deposits, other 20 % cross-sectional area loss (Sigma 17.62) 17.62 CUW Loss of vision, camera under water (Miscolianeous 60 %) 21_21_153_A.jpg 18.69 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % 21_21_153_A.jpg (Sigma 18.69) Structural Defects Constructional Features Sigma 18.69 (Miscolianeous Features Structural Defects Viscolianeous Features Sigma 18.69 Sigma 18.69 Sigma 18.69		-	4.34	<u>4</u> DEX		eposits, other 1	10 % cross-sec	tional area los	S		(Serv) 3
100 mm 15.79 WL Water level 20 % of the vertical dimension (Sigma constraints) 15.79 DEX Settled deposits, other 20 % cross-sectional area loss (Sigma constraints) 15.79 DEX Settled deposits, other 20 % cross-sectional area loss (Sigma constraints) 17.62 CUW Loss of vision, camera under water (Miscoliants) 18.69 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % 21_21_153_A.jpg 18.69 SA Survey abandoned (Miscolianteous Features) Structural Defects Miscolianteous Features Structures Structo) Structural Defects STR no def STR mean STR total STR grade	ĸ		5.85	5 REM	General r	emark 8303B					(Misc) 0
15.79 DEX Settled deposits, other 20 % cross-sectional area loss waste (Si waste 17.62 CUW Loss of vision, camera under water (Mi mathematical area loss of vision) 18.69 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % 21_21_153_A.jpg 18.69 SA Survey abandoned (Mi mathematical area loss of vision) Structural Defects Constructional Features Service Defects Miscellaneous Features STR no def STR peak STR mean			8.31	<u>I</u> CN		on other than ju	unction from 2	O'Clock diam	eter:		(Constr) 0
Waste 17.62 CUW Loss of vision, camera under water (M 18.69 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % 21_21_153_A.jpg (Si cross-sectional area loss Debris 18.69 SA Survey abandoned (M 18.69 SA Survey abandoned (M Structural Defects Constructional Features (M Structore Defects Miscellaneous Features SER no def SER mean STR no def STR peak STR mean STR total STR grade SER no def SER mean SER total SER				_							(Serv) 0
18.69 OBZ Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % 21_21_153_A.jpg (Si cross-sectional area loss Debris 18.69 SA Survey abandoned (M Structural Defects Constructional Features (M Service Defects Miscellaneous Features SER mean SER total SER					waste			lional area los	5		(Serv) 3 (Misc) 0
Structural Defects Constructional Features Structural Defects Miscellaneous Features STR no def STR mean STR total STR grade				_				to 9 O'Clock	\$0 % °	1 21 152 A in	
Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SEI	=			_	cross-sec	tional area los				,_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(Misc) 0
STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SE	Structural	Defects									
			CTD man's	CTD mag		OTD mer de			OED margin		OED and
			0	0	0	1	3	10	0.75	SER total	SER grade 5

Drainca	re		Unit 2, Batford H Tel: (ironmental Services Ltd Mill, Lower Luton Road Harpenden 01582 467111 Fax: ifkins@draincare.com
		ection picture		
Place : Norwich	Road : Anglia Square	Date : 30/10/2018	Section number : 20	PLR Suffix X



Photo: 21_21_153_A.jpg, 00:02:04 18.69m, Other obstacles, other from 3 O'Clock to 9 O'Clock 60 % cross-sectional area loss Debris

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								Email: nigel	Fax: gifkins@draincare.	com
					-	on repor				
	Date : 30/10/2018	5	Job number : Weston		/eather : rain	Operato Drainca	re	Section number 21		R SUFFIX:
	Weather rain		Vehicle :	C	Camera :	Preset	:	Cleaned : no		perator : raincare
Plac Roa Loca Insp	d : ation ection	Norwich Anglia Squa Road 8303A (D/S) Foul		Location Catchme Tape nu Pipe Len	ent: Plan mber :	7 Pipe shape :	U/\$ D/\$	S Depth : S MH : S Depth :	8303A 1.08 8303C	
Purp Tota	r laid : oose : Il length :	Other 20.88	(state in remarks) m			Pipe size : Pipe material : Lining :	150 Vitri	mm fied clay		
Corr	iment :									
	1:165 Depth: 1	Position	Code	Observa	tion			Pho	to	Grade
	8303A	0.00	<u>)</u> MH	Start nod	e type, manh	ole reference nu	mber: 8303A			(Constr) 0
		0.00	<u>)</u> WL	Water lev	el 0 % of the	vertical dimension	on			(Serv) 0
		2.35	<u>s</u> WL	Water lev		(Serv) 0				
		3.96	<u>5</u> DEX	Settled deposits, other 30 % cross-sectional area loss 22_22 debris						g (Serv) 4
		5.87	REM	General ı	remark 8303E	3				(Misc) 0
		8.61	_ CN	Connecti 100 mm	on other than	junction from 2 (O'Clock diam	eter:		(Constr) 0
	+	15.55		debris		20 % cross-sec	tional area los	3 5		(Serv) 3
		17.42	2 CUW	Loss of v	ision, camera	under water				(Misc) 0
	8303C	20.88	<u>s</u> MHF	Finish no	de type, manl	hole reference n	umber: 83030	5		(Constr) 0
Strue	ctural Defects					Constructional F				
	ice Defects					Miscellaneous F	eatures			
Serv	R no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade

Drainca	re		Unit 2, Batford H Tel: 0	ronmental Services Ltd Mill, Lower Luton Road larpenden 1582 467111 Fax: fkins@draincare.com
	Insp	ection picture	es	
Place : Norwich	Road : Anglia Square	Date : 30/10/2018	Section number : 21	PLR Suffix X

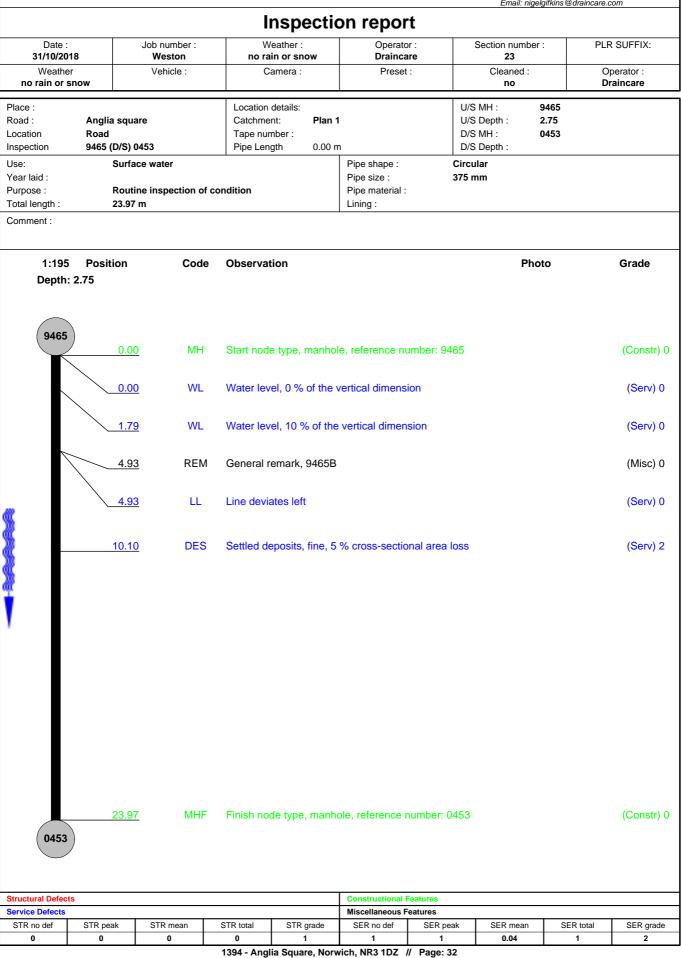


Photo: 22_22_157_A.jpg, 00:00:29 3.96m, Settled deposits, other 30 % cross-sectional area loss debris

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Operator : Date : Job number : Weather : Section number : PLR SUFFIX: 31/10/2018 Weston no rain or snow 22 Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow no Place : U/S MH : 9465 Location details: Anglia square Road : Catchment: Plan 1 U/S Depth : Location D/S MH : 9465B Road Tape number : Pipe Length Inspection 9465 (D/S) 9465B 0.00 m D/S Depth : Use: Surface water Pipe shape : Circular Year laid : Pipe size : 375 mm Purpose : Routine inspection of condition Pipe material : 6.10 m Total length : Lining : Comment : 1:50 Position Code Observation Photo Grade 9465 0.00 MH (Constr) 0 Start node type, manhole, reference number: 9465 0.00 WL Water level, 0 % of the vertical dimension (Serv) 0 1.52 WL Water level, 10 % of the vertical dimension (Serv) 0 LL Line deviates left 4.99 (Serv) 0 Finish node type, manhole reference number: 9465B 5.20 MHF (Constr) 0 9465B Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade 0 0 0 0 1 0 0 0 0 1

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111

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Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Date : Job number : Weather : Operator : Section number : PLR SUFFIX: 31/10/2018 Weston no rain or snow Draincare 24 Weather Vehicle : Camera : Preset : Cleaned : Operator : no rain or snow Draincare no Place : U/S MH : 9459 Location details: Road : U/S Depth : 2.99 Anglia square Catchment: Plan 1 D/S MH · 0456 Location Road Tape number : Inspection 9459 (D/S) 0456 0.00 m D/S Depth : 2.91 Pipe Length Use: Surface water Pipe shape : Circular Year laid : Pipe size : 675 mm Purpose : Routine inspection of condition Pipe material : 32.69 m Total length : Lining : Comment : 1:270 Position Code Observation Photo Grade Depth: 2.99 9459 0.00 MH Start node type, manhole, reference number: 9459 (Constr) 0 WL Water level, 5 % of the vertical dimension 0.00 (Serv) 0 10.01 CN Connection other than junction, at 2 o'clock, diameter: 150 (Constr) 0 mm 25.59 REM (Misc) 0 General remark, buried 0453 WL 27.24 Water level, 20 % of the vertical dimension (Serv) 0 CN Connection other than junction, at 12 o'clock, diameter: (Constr) 0 28.49 150 mm 32<u>.24</u> OBZ Other obstacles, other, from 6 o'clock, to 7 o'clock, 10 % (Serv) 3 cross-sectional area loss, hard material 32.69 SA Survey abandoned, obstruction in line (to be surveyed up (Misc) 0 from 0456) Structural Defects **Constructional Features** Service Defects Miscellaneous Features STR no def STR peak STR mean STR total STR grade SER no def SER peak SER mean SER total SER grade

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0.31

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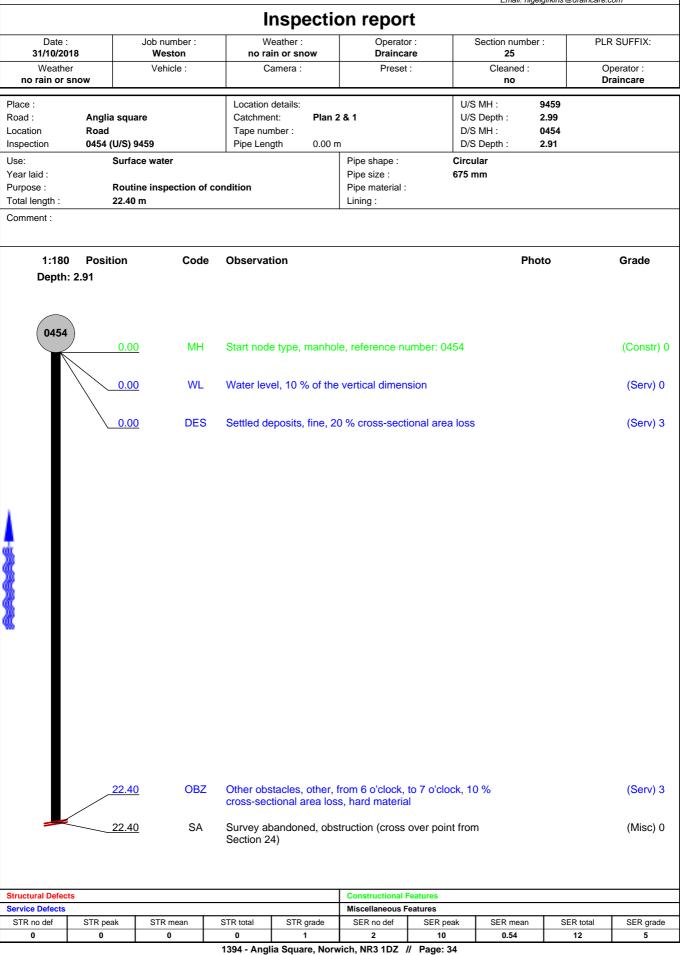
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Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111

Draincare

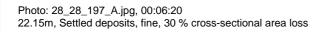
Fax: Email: nigelgifkins@draincare.com



Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com

								Email: nigelo	gifkins@draincare.co	m
				l	nspect	ion repor	t			
3	Date : 1/10/2018		Job number : Weston		eather : in or snow	Operato Drainca		Section number	: PLR	SUFFIX:
	Weather ain or sno	ow	Vehicle :	С	amera :	Preset	:	Cleaned : no		erator : incare
lace : load : ocatior		Anglia squa Road 0454 (D/S) (Location Catchme Tape nur Pipe Len	nt: Plar nber :		U/S D/S	Depth : 2	0454 2.91 0456	
se:			ce water		<u> </u>	Pipe shape :	Circu			
ear lai urpose otal ler	e : ngth :	Routi 27.40	ne inspection of c m	ondition		Pipe size : Pipe material : Lining :	675 n	nm		
	1:225 Depth: 2	Position	Code	Observat	ion			Phot	to	Grade
(0454	0.00 0.00 1.57		Water lev	el, 20 % of tł	ole, reference nu le vertical dimen 20 % cross-secti	sion			(Constr) (Serv) 0 (Serv) 3
		<u>13.70</u> 15.00	_	Line devia General r	ates left emark, 0455					(Serv) ((Misc) (
		16.10	<u>)</u> WL	Water lev	el, 40 % of th	e vertical dimen	sion			(Serv) (
		22.15	5 DES	Settled de	eposits, fine,	30 % cross-secti	onal area loss	28	_28_197_A.jpg	(Serv) 4
		23.22	2 LR	Line devia	ates right					(Serv) (
		23.73	B REM	General r	emark, 0456					(Misc) (
		25.67	<u>z</u> des	Settled de	eposits, fine,	30 % cross-secti	onal area loss	28	_28_200_A.jpg	(Serv) 4
		25.67	<u>z</u> WL	Water lev	el, 40 % of th	e vertical dimen	sion			(Serv) (
ructure	al Defects	27.40	<u>)</u> SA	Survey at	bandoned, de	bris/silt	-esturos			(Misc) (
	Defects					Miscellaneous F				
STP no	o def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0		0	0	0	1	3	5	0.44	12	4

Drainca	re		Unit 2, Batford F Tel: (ironmental Services Ltd Mill, Lower Luton Road Harpenden 01582 467111 Fax: ifkins@draincare.com
	Insp	ection picture	es	
Place :	Road : Anglia square	Date : 31/10/2018	Section number : 26	PLR Suffix :
	ALT			
	and the second s	THE R. LEWIS CO.	and the second se	CALL OF A DESCRIPTION OF A
1	A State of the second s	114 M	and the second second	



loss

Settled de 30 % cross

22.15 m

Photo: 28_28_200_A.jpg, 00:07:28 25.67m, Settled deposits, fine, 30 % cross-sectional area loss

Water level, 40 % of the vertical dimension

25.67 m

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax:

1000							Email: nigel	Fax: gifkins@draincare.c	com
				nspecti	on repor	t			
Date : 31/10/2018	3	Job number : Weston		/eather : in or snow	Operator Drainca		Section number 27	: PLF	R SUFFIX:
Weather no rain or sn	ow	Vehicle :	C	amera :	Preset	:	Cleaned : no		perator : raincare
ace : oad : ocation spection	Anglia squ Road 0354 (U/S)		Location Catchme Tape nu Pipe Len	nt: Plan		U/S D/S	Depth :	0456 2.91 0354 3	
se: ear laid : urpose : otal length : omment :		ace water tine inspection o m	f condition		Pipe shape : Pipe size : Pipe material : Lining :	Circu 675 r			
1:50 Depth: 3	Position 3	Cod	e Observa	tion			Pho	to	Grade
0354	0.0	<u>0</u> MH	Start nod	e type, manho	ole, reference nu	mber: 0354			(Constr) (
	0.0	<u>0</u> WL	Water lev	el, 10 % of th	e vertical dimens	sion			(Serv) 0
	0.0	<u>0</u> DES	S Settled de	eposits, fine, 4	40 % cross-section	onal area loss	29	9_29_204_A.jp	g (Serv) 4
	\ <u>0.1</u>	<u>6</u> SA	Survey al	pandoned, sill	t				(Misc) 0
uctural Defects					Constructional F				
vice Defects	STP noch	STD more	QTD total	CTD are de	Miscellaneous Fe		SED man	QED total	SED and
TR no def	STR peak	STR mean 0	STR total	STR grade	SER no def	SER peak 5	SER mean 31.25	SER total 5	SER grade

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31.25

Drainca	re		Unit 2, Batford F Tel: 0	ronmental Services Ltd Mill, Lower Luton Road larpenden 1/582 467111 Fax: fkins@draincare.com
	Insp	ection picture	es	
	Road :	Date :	Section number :	PLR Suffix :

Place :



Photo: 29_29_204_A.jpg, 00:00:05 0m, Settled deposits, fine, 40 % cross-sectional area loss

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com

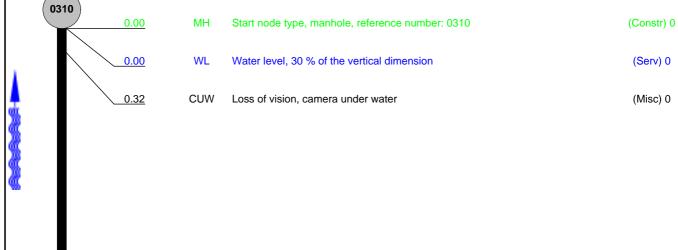
Date : 31/10/2013 Weather no rain or sr Place : Road : Location Inspection Use: Year laid : Purpose : Total length : Comment : 1:780 Depth: :	Anglia squa Road 0354 (D/S) 1 Surfac Routin 97.16	351 ce water ne inspection of co m Code MH WL DES DEE	Weather : no rain or snow Camera : Location details: Catchment: Plan Tape number : Pipe Length 0.00	m Pipe shape : Pipe size : Pipe material : Lining : Pipe material : Die, reference number e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	area loss	51 Grade (Constr) ((Serv) 0 (Serv) 3 (Serv) 3
31/10/2013 Weather no rain or sr Place : Road : Location Inspection Use: Year laid : Purpose : Total length : Comment : 1:780 Depth: 3	Anglia squa Road 0354 (D/S) 1 Surfat Routin 97.16 Position 3 0.00 4.36 14.15 14.91	Weston Vehicle : re 351 ce water ne inspection of com Code MH WL DES DEE	no rain or snow Camera : Location details: Catchment: Plan Tape number : Pipe Length 0.00 ondition Observation Start node type, manhor Water level, 20 % of th Settled deposits, fine, 2 Attached deposits, encoolcock, 20 % cross-set	Draincare Preset : 2 m Pipe shape : Pipe size : Pipe material : Lining :	28 Cleaned : no U/S MH : 03: U/S Depth : 3 D/S MH : 13: D/S Depth : 7 Circular 675 mm	Operator : Draincare 54 51 51 Grade (Constr) ((Serv) 0 (Serv) 3 (Serv) 3
no rain or sr Place : Road : Location Inspection Use: Year laid : Purpose : Total length : Comment : 1:780 Depth: 3	Anglia squa Road 0354 (D/S) 1 Surfar Routin 97.16 Position 3 0.00 4.36 14.15 14.91	re 351 ce water ne inspection of co m Code MH WL DES DEE	Location details: Catchment: Plan Tape number : Pipe Length 0.00 ondition 0 Observation 0 Start node type, manhor Water level, 20 % of the Settled deposits, fine, 2 Attached deposits, encoo'clock, 20 % cross-set	2 m Pipe shape : Pipe size : Pipe material : Lining : Dle, reference number e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	r: 0354	Draincare Draincare Draincare Construction C
Road : Location Inspection Use: Year laid : Purpose : Total length : Comment : 1:780 Depth: :	Road 0354 (D/S) 1 Surfac Routin 97.16 Position 3 0.00 4.36 14.15 14.91	351 ce water ne inspection of co m Code MH WL DES DEE	Catchment: Plan Tape number : Pipe Length 0.00 ondition 0 0 Observation 0 0 Start node type, manhor Water level, 20 % of the Settled deposits, fine, 2 Attached deposits, encoo'clock, 20 % cross-set	m Pipe shape : Pipe size : Pipe material : Lining : Pipe material : Die, reference number e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	U/S Depth : 3 D/S MH : 13 D/S Depth : Circular 675 mm Photo	51 Grade (Constr) ((Serv) 0 (Serv) 3 (Serv) 3
Jse: /ear laid : Purpose : Total length : Comment : 1:780 Depth: :	Surfau Routin 97.16 Position 3 0.00 4.36 14.15 14.91	ce water ne inspection of co m Code MH WL DES DEE	Observation Observation Start node type, manho Water level, 20 % of th Settled deposits, fine, 2 Attached deposits, enc o'clock, 20 % cross-set	Pipe shape : Pipe size : Pipe material : Lining : Die, reference number e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	Circular 675 mm Photo r: 0354	(Constr) ((Serv) 0 (Serv) 3 (Serv) 3
Purpose : fotal length : comment : 1:780 Depth: :	97.16 Position 3 0.00 4.36 14.15 14.91	m Code MH WL DES DEE	Observation Start node type, manho Water level, 20 % of th Settled deposits, fine, 2 Attached deposits, enc o'clock, 20 % cross-set	Pipe material : Lining : Die, reference number e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	Photo r: 0354 area loss	(Constr) ((Serv) 0 (Serv) 3 (Serv) 3
1:780 Depth: :	3 0.00 4.36 14.15 14.91	MH WL DES DEE	Start node type, manho Water level, 20 % of th Settled deposits, fine, 2 Attached deposits, enc o'clock, 20 % cross-sec	e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	r: 0354 area loss	(Constr) ((Serv) 0 (Serv) 3 (Serv) 3
) 0.00 4.36 14.15 14.91	WL DES DEE	Water level, 20 % of th Settled deposits, fine, 2 Attached deposits, enc o'clock, 20 % cross-set	e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	area loss	(Serv) 0 (Serv) 3 (Serv) 3
0354	0.00 4.36 14.15 14.91	WL DES DEE	Water level, 20 % of th Settled deposits, fine, 2 Attached deposits, enc o'clock, 20 % cross-set	e vertical dimension 20 % cross-sectional a rustation, from 3 o'clo	area loss	(Serv) 0 (Serv) 3 (Serv) 3
	4.36 14.15 14.91	DES DEE	Settled deposits, fine, 2 Attached deposits, end o'clock, 20 % cross-set	20 % cross-sectional a		(Serv) 3 (Serv) 3
	<u>14.15</u> <u>14.91</u>	DEE	Attached deposits, enc o'clock, 20 % cross-see	rustation, from 3 o'clo		(Serv) 3
	14.91		o'clock, 20 % cross-se		ock, to 5	
		REM	General remark, 0351			
	33.04					(Misc) 0
		REM	General remark, 1352			(Misc) 0
	43.65	REM	General remark, 0352/	A		(Misc) 0
	57.56	JN	Junction, at 9 o'clock, o	diameter: 675 mm		(Constr)
	68.12	LR	Line deviates right			(Serv) (
	68.70	REM	General remark, 1353			(Misc) 0
	71.67	DES	Settled deposits, fine, 3	30 % cross-sectional a	area loss 30_3	30_217_A.jpg (Serv) 4
1351 AW Mai	97.16) in in road	MHF	Finish node type, man	nole reference numbe	ır: 1351	(Constr)
tructural Defects				Constructional Feature	 !S	
ervice Defects			CTD total	Miscellaneous Features	s	
STR no def	STR peak	STR mean	STR total STR grade		R peak SER mean	SER total SER grade

Drainca	re		Unit 2, Batford F Tel: (ronmental Services Ltd Mill, Lower Luton Road tarpenden 01582 467111 Fax: ifkins@draincare.com
	Insp	ection picture		
Place :	Road : Anglia square	Date : 31/10/2018	Section number : 28	PLR Suffix



Photo: 30_30_217_A.jpg, 00:16:24 71.67m, Settled deposits, fine, 30 % cross-sectional area loss

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Draincare Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com **Inspection report** Weather : Operator : PLR SUFFIX: Job number : Section number : Weston no rain or snow Draincare 29 Vehicle : Camera : Preset : Cleaned : Operator : Draincare no 0308 Location details: U/S MH : Anglia square Catchment: Plan 3 U/S Depth : D/S MH : 0310 Other Pedestrian area Tape number : Pipe Length 0310 (U/S) 0308 0.00 m D/S Depth : 3.51 Foul Pipe shape : Circular Pipe size : 300 mm Routine inspection of condition Pipe material : Vitrified clay 3.17 m Lining : Code Observation Photo Grade



Date :

31/10/2018

Weather

no rain or snow

Place :

Road :

Use:

Location

Inspection

Year laid :

Purpose :

Total length :

1:50

Depth: 3.51

Position

3.17

Comment :

ςΔ	Survey abandoned, to much flow & debris underwater
JA JA	Survey abandoned. to much now a depits underwater

(Misc) 0

						-			
Structural Defec	ts				Constructional I	reatures			
Service Defects					Miscellaneous F	eatures			
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	0	0	0	0	1
			1394 - Ang	lia Square, Norv	vich, NR3 1DZ	// Page: 41			-

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111

Draincare

Fax: Email: nigelgifkins@draincare.com



Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tei: 01582 467111 Fax: Email: nigelgifkins@draincare.com

					Email: nigelg	Fax: gifkins@draincare.com
			Inspecti	on report		
Date 01/11/2		Job number : Weston	Weather : no rain or snow	Operator : Draincare	Section number : 31	PLR SUFFIX:
Weath no rain or		Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Draincare
Place : Road : Location Inspection	Anglia sc Other Pe 9208 (U/S	destrian area	Location details: Catchment: Plan Tape number : Pipe Length 0.00		U/S Depth : 2 D/S MH : 9	305 .12 .208 .29
Use: Year laid : Purpose : Total length : Comment :		ul utine inspection of a 8 m	condition	Pipe shape : Pipe size : Pipe material : Lining :	Circular 225 mm Vitrified clay	
1:50 Depth) Position n: 2.29	n Code	Observation		Phot	o Grade
920	0.	. <u>00</u> MH	Start node type, manh		r: 9208	(Constr) 0
-	0.	. <u>00</u> WL	Water level, 80 % of th	e vertical dimension		(Serv) 0
ž	0.	.00 CUW	Loss of vision, camera	under water		(Misc) 0
8	0.	. <u>08</u> SA	Survey abandoned, to	much flow		(Misc) 0
	cts			Constructional Feature		
Structural Defe						
Structural Defe Service Defects STR no def		STR mean	STR total STR grade	Miscellaneous Feature	e s ER peak SER mean	SER total SER grade

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tei: 01582 467111 Fax: Email: nigelgifkins@draincare.com

Service Defects	STR peak	STR mean	STR total STR grade	Miscellaneous F	eatures			
Structural Defec	ts			Constructional F				
93517 Depth		1 <u>4</u> MHF	Finish node type, ma	nnole, relefence f	iumper, 93517	7		(Constr) 0
	16		Finish pode time ima	nholo, reference -	11mbor 0254	A		(Constr) 0
	13.2	2 <u>3</u> WL	Water level, 30 % of		sion			(Serv) 0
	11.8	<u>35</u> CN	Connection other tha 150 mm, vast amour		'clock, diamet	er:		(Constr) 0
	9.2	2 <u>3</u> CN	Connection other tha mm	n junction, at 2 o'c	clock, diamete	r: 100		(Constr) 0
	7.5	5 <u>4</u> CN	Connection other tha mm	n junction, at 3 o'd	clock, diamete	r: 150		(Constr) 0
	5.9	9 <u>5</u> JN	Junction, at 1 o'clock	, diameter: 100 m	m			(Constr) 0
"	1.5	5 <u>3</u> JN	Junction, at 11 o'cloc	k, diameter: 100 r	nm			(Constr) 0
	0.7	7 <u>2</u> JN	150 mm Junction, at 12 o'cloc	k, diameter: 100 r	nm			(Constr) 0
	0.0	<u>)0</u> CN	Connection other tha	n junction, at 11 o	'clock, diamet	er:		(Constr) 0
	0.0	0 <u>0</u> WL	Water level, 0 % of th	ne vertical dimensi	ion			(Serv) 0
9208	0.0	<u></u>	Start node type, man	hole, reference nu	ımber: 9208			(Constr) 0
1:135 Depth		Code	Observation			Phot	0	Grade
Comment :								
Year laid : Purpose : Total length :		tine inspection of co	ondition	Pipe size : Pipe material : Lining :	225 I			
Place : Road : Location Inspection Use:	9208 (D/S)	estrian area	Tape number :	an 5 10 m Pipe shape :	U/S D/S	S Depth : 2 S MH : 9 S Depth : 2	208 .08 351A .13	
Weathe no rain or		Vehicle :	Camera :	Preset	:	Cleaned : no		Operator : Oraincare
Date : 01/11/20		Job number : Weston	Weather : no rain or snow	Operato Drainca		Section number : 32	PL	R SUFFIX:
				=				

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax: Email: nigelgifkins@draincare.com

0	0	0	0	1		0	0	0	1
Service Defects	STR peak	STR mean	STR total	STR grade	Miscellaneous F SER no def	eatures SER peak	SER mean	SER total	SER grade
Structural Defects					Constructional I Miscellaneous F				
9459 Depth		<u>1</u> MHF	Finish no	de type, manh	ole, reference r	number: 9459			(Constr) 0
	23.2	<u>2</u> CN	150 mm		ununun, dt i i C	ooor, uidmet	u.		(Constr) U
	<u> </u>	_	150 mm		unction, at 11 c unction, at 11 c				(Constr) 0 (Constr) 0
				on other there '	unotion at 14 -	lolook diamat	or		
	22.7	<u>1</u> CN	Connection mm	on other than j	unction, at 3 o'd	clock, diamete	r: 150		(Constr) 0
	9.78	<u>3</u> CN	Connection mm	on other than j	unction, at 3 o'd	clock, diamete	r: 150		(Constr) (
	4.29	9 REM	General r	emark, possib	le mh				(Misc) 0
	4.29	<u>9</u> CN	Connection mm	on other than j	unction, at 3 o'd	lock, diamete	r: 150		(Constr) (
	1.4	<u>5</u> CN	Connection 150 mm	on other than j	unction, at 11 c	'clock, diamet	er:		(Constr) (
	0.02	<u>2</u> WL	Water lev	vel, 30 % of the	e vertical dimen	sion			(Serv) 0
9460	0.0	<u>1</u> MH	Start nod	e type, manho	le, reference ni	ımber: 9460			(Constr) (
1:285 Depth		Code	Observa	tion			Pho	to	Grade
Comment :									
Year laid : Purpose : Total length :	Routi 35.31	ne inspection of m	condition		Pipe size : Pipe material : Lining :	675 Brick	nm		
Road : Location Inspection Use:	Anglia squa Other Pede 9460 (D/S) 9 Surfa	strian area	Catchme Tape nur Pipe Len	mber :		D/5 D/5	SMH: S	3.17 9459 2.99	
no rain or	I		Location					9460	raincare
01/11/20 Weathe	er	Weston Vehicle :		iin or snow amera :	Drainca Preset		33 Cleaned :		perator :
Date :	:	Job number :		lispection /eather :	Operato		Section number	: PLF	R SUFFIX:
					on repor				

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax:

Date										
Data				II	nspecti	on repor	ť			
01/11/2		Job nur Wes			eather : n or snow	Operato Drainca		Section number 34	: PLR	SUFFIX:
Weat no rain o		Vehic	cle :	Ca	amera :	Preset	:	Cleaned : no		erator : lincare
Place : Road : Location Inspection	Othe	a square r Pedestrian ar (D/S) 9401	ea	Location of Catchmer Tape num Pipe Leng	nt: Plan nber :		U/: D/:	S Depth : 2 S MH : 9	9423 2.4 9401 2.23	
Use: Year laid : Purpose : Total length : Comment :		Foul Routine inspe 0.08 m	ection of co	ondition		Pipe shape : Pipe size : Pipe material : Lining :	Circ 300 Vitri			
1:5	0 Posi h: 2.4	tion	Code	Observat	ion			Pho	to	Grade
942		0.00	МН	Start node	type, manho	ole, reference nu	umber: 9423			(Constr) 0
X		0.00	WL	Water leve	el, 50 % of the	e vertical dimen	sion			(Serv) 0
¥		0.08	OBZ	Other obs cross-sec	tacles, other, tional area los	from 3 o'clock, ss, assumed sc	to 9 o'clock, 2 ale under flow	.0 % 36	6_36_254_A.jpg	(Serv) 5
		0.08	SA	Survey ab	andoned, to	much flow				(Misc) 0
Structural Defe						Constructional I				
STR no def	STR pe	eak STR n	nean	STR total	STR grade	Miscellaneous F SER no def	SER peak	SER mean	SER total	SER grade
0	0	0		0 1394 - Angli	1 Squara Nor	1 wich. NR3 1DZ	10 // Page: 46	125	10	5

Drainca	re		Unit 2, Batford F Tel: (ronmental Services Ltd Mill, Lower Luton Road larpenden 01582 467111 Fax: ifkins@draincare.com
	Insp	ection picture	0.0	
Place :	Road : Anglia sguare	Date : 01/11/2018	Section number : 34	PLR Suffix :

Place :



Photo: 36_36_254_A.jpg, 00:00:46 0.08m, Other obstacles, other, from 3 o'clock, to 9 o'clock, 20 % cross-sectional area loss, assumed scale under flow

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Draincare

							Email: nigel	Fax: lgifkins@draincare.c	от
				Inspection	on repor	t			
Date 01/11/2		Job number : Weston		Weather : rain	Operato Drainca		Section number 35	: PLR	SUFFIX:
Weath rain		Vehicle :		Camera :	Preset	:	Cleaned : no		perator : aincare
Place : Road : Location Inspection	Norwic Edward Road MH1 ou		Catch	number :	Plan	U/S D/S	Depth :	MH1 outlet1 0.98 Main	
Use: Year laid : Purpose : Total length : Comment :	C 6	Other (state in com Other (state in rema .25 m Sdward Street Site1	arks)		Pipe shape : Pipe size : Pipe material : Lining :	Circu 100 r Vitrif			
Comment :	E	dward Street Site	Plan. Assume	ed Sw					
1:60 Deptl	D Positio h: 0.98	on Co	de Observ	vation			Pho	to	Grade
MH1 ou	/	<u>0.00</u> MI	H Start no	ode type, manho	le reference nu	mber: MH1 ou	tlet1		(Constr) 0
		<u>0.00</u> W	L Water I	evel 0 % of the v	vertical dimensiv	on			(Serv) 0
	\backslash	<u>0.70</u> DE	X Settled Debris	deposits, other 2	20 % cross-sec	tional area los	S		(Serv) 3
		<u>1.00</u> C0	C Crack,	circumferential fi	rom 9 O'Clock t	o 3 O'Clock			(Struct) 2
		<u>1.47</u> LF	R Line de	eviates right					(Serv) 0
	\mathbb{N}/\mathbb{Z}	<u>2.06</u> OJ	IL Open jo	oint, large					(Struct) 1
		<u>2.23</u> FN		e, multiple from s	9 O'Clock to 3 (D'Clock	38	3_38_263_A.jp	
		<u>3.03</u> Fl		e, longitudinal fro	om 2 O'Clock				(Struct) 3
		<u>3.03</u> LI <u>3.03</u> LI		eviates left eviates down					(Serv) 0 (Serv) 0
		<u>5.85</u> LI		eviates down					(Serv) 0
Mair		<u>5.96</u> LF	R Line de	eviates right					(Serv) 0
		<u>6.25</u> BR	RF Finish r referen	node type, major ce number: Mair	connection wit	hout manhole			(Constr) (
Structural Defe					Constructional I				
Service Defects STR no def	s STR peak	STR mean	STR total	STR grade	Miscellaneous F SER no def	sER peak	SER mean	SER total	SER grade
4	80	21.12	132	4	1	2	0.32	2	3
			120/ _ /	nglia Square Norv	Wich ND2 1D7	/ Dago: /9			

Drainca	re		Unit 2, Batford H Tel: 0	ronmental Services Ltd Mill, Lower Luton Road larpenden 1582 467111 Fax: fkins@draincare.com
	Insp	ection picture	S	
Place : Norwich	Road : Edward street	Date : 01/11/2018	Section number : 35	PLR Suffix



Photo: 38_38_263_A.jpg, 00:00:49 2.23m, Fracture, multiple from 9 O'Clock to 3 O'Clock

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Fax:

Draincare

						Email: nigelgif	Fax: [kins@draincare.co	m	
			Inspect	tion report					
Date : 30/10/2018	3	Job number : Weston	Weather : rain	Operator : Draincare	Sec	ction number : 36	PLR	SUFFIX:	
Weather rain		Vehicle :	Camera :	Preset :		Cleaned : no		erator : incare	
Place : Road : Location Inspection	Norwich Edward stre Road MH1 outlet2			Site1 Plan		U/S MH : MH1 outle U/S Depth : 0.97 D/S MH : Unknown D/S Depth :		t2	
Use: Year laid : Purpose : Total length :		r (state in comments r (state in remarks) n)	Pipe shape : Pipe size : Pipe material : Lining :	Circular 100 mm Vitrified				
Comment :	Edwa	rd Street Site1 Plan.	Assumed FW						
1:50 Depth: 0	Position).97	Code	Observation			Photo	•	Grade	
MH1 outle	t2 0.00	<u>)</u> MH	Start node type, man	hole reference numb	per: MH1 outlet	2		(Constr) 0	
	0.00	<u>)</u> WL	Water level 0 % of th	e vertical dimension				(Serv) 0	
🦉 `	<u>30.0</u>	<u>3</u> JN	Junction from 3 O'Clo	ock diameter: 100 m	ım			(Constr) 0	
	0.19	DEX	Settled deposits, othe debris	er 5 % cross-section	al area loss			(Serv) 2	
	0.19	<u>)</u> LR	Line deviates right					(Serv) 0	
Ň	1.29	<u>)</u> FM	Fracture, multiple at	12 O'Clock		39_	<u>39_</u> 275_A.jpg	(Struct) 4	
	1.59	OBZ	Other obstacles, othe area loss debris / ru		% cross-sectio	nal 39_	<u>39_</u> 276_A.jpg	(Serv) 5	
	1.59	<u>9</u> SA	Survey abandoned D	ebris / rubble				(Misc) 0	
Structural Defects				Constructional Feat	tures				
Service Defects	070			Miscellaneous Feat	ures				
	STR peak	STR mean S	STR total STR grade	EED no dof					
STR no def 1	80	50.31	80 4	SER no def	SER peak	SER mean 6.92	SER total 11	SER grade 5	

Drainca	re		Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Harpenden Tel: 01582 467111 Fax: Ernail: nigelgifkins@draincare.com		
	Insp	ection picture	es		
Place : Norwich	Road : Edward street	Date : 30/10/2018	Section number : 36	PLR Suffix	



Photo: 39_39_275_A.jpg, 00:00:20 1.29m, Fracture, multiple at 12 O'Clock



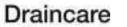
Photo: 39_39_276_A.jpg, 00:00:32 1.59m, Other obstacles, other at 12 O'Clock 70 % cross-sectional area loss debris / rubble

Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111

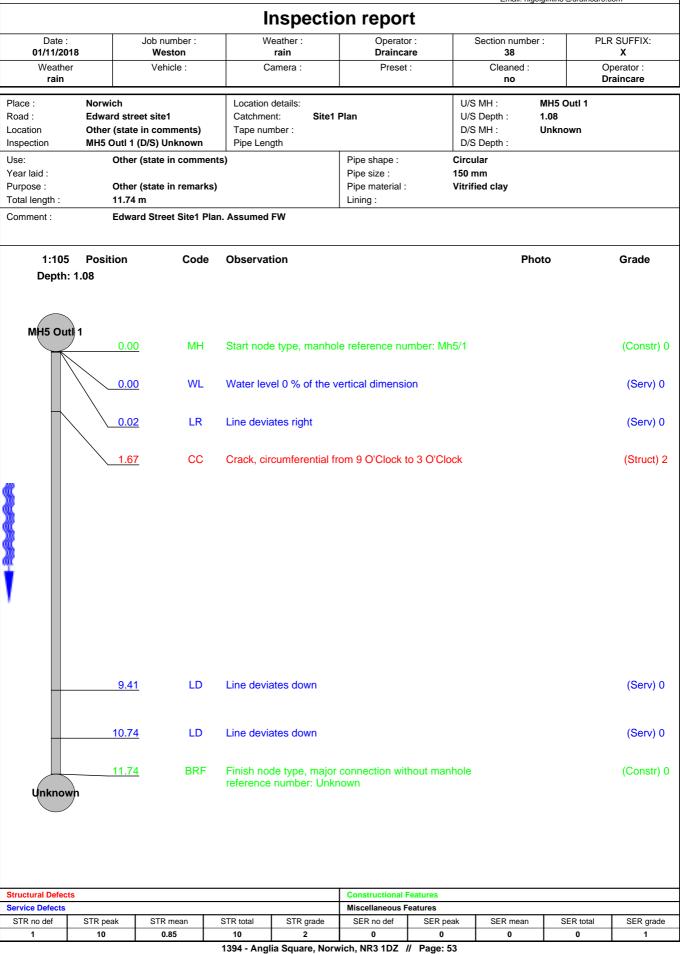


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Fax: Email: nigelgifkins@draincare.com



Draincare Environmental Services Ltd Unit 2, Batford Mill, Lower Luton Road Street : Harpenden Tel: 01582 467111 Email: nigelgifkins@draincare.com **Inspection report** Operator : Draincare Weather : PLR SUFFIX: Section number : 39 Х Operator : Camera : Preset : Cleaned :

rain				no	Draincare
Place : Road : Location Inspection	Norwich Edward street site1 Other (state in comments) MH5 Outl 2 (D/S) Unknown	Location details: Catchment: Tape number : Pipe Length	Site1 Plan	U/S Depth :	MH5 Outl 2 1.3 Unknown
Use: Year laid : Purpose : Total length :	Other (state in comm Other (state in remark 0.00 m		Pipe shape : Pipe size : Pipe material : Lining :	Circular 100 mm Vitrified clay	
Comment :	Edward Street Site1 F	lan. Assumed SW			
1:50 Depth:	Position Code	e Observation		Pho	to Grade

rain

Draincare

Job number :

Weston

Vehicle :

Date :

01/11/2018

Weather

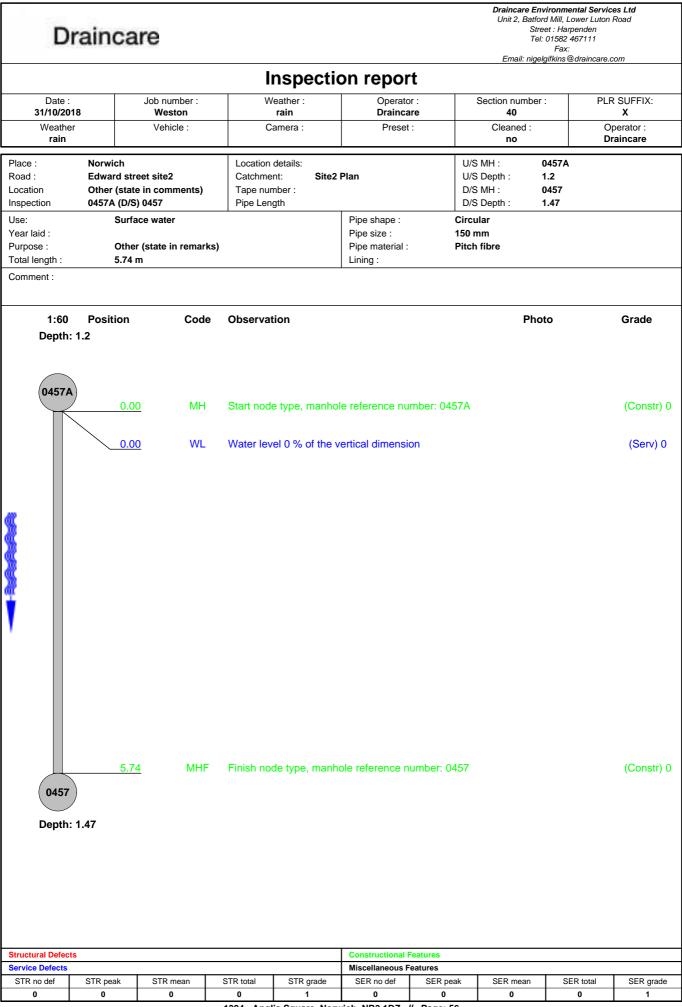
æ	M(H5 Out) 2	<u>00</u> MH	Start node type, manhole reference number: Mh5/2	(Constr) 0
8	0.	<u>00</u> WL	Water level 5 % of the vertical dimension	(Serv) 0
¥.	0.	<u>00</u> RM	Roots, mass 10 % cross-sectional area loss	(Serv) 3
		<u>00</u> DES	Settled deposits, fine 50 % cross-sectional area loss 42_42_301_A.jpg	(Serv) 4
	0.	<u>00</u> SA	Survey abandoned IC trap full of silt/roots	(Misc) 0

Structural Defec	ts				Constructional Features				
Service Defects					Miscellaneous F	eatures			
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	2	9	0	9	4
1394 - Anglia Sguare, Norwich, NR3 1DZ // Page: 54									

Drainca	are		Unit 2, Batford H Tel: (ironmental Services Ltd I Mill, Lower Luton Road Harpenden 01582 467111 Fax: iffkins@draincare.com
	Inspe	ection picture	es	
Place :	Road :	Date :	Section number :	PLR Suffix :
Norwich	Edward street site1	01/11/2018	39	Х

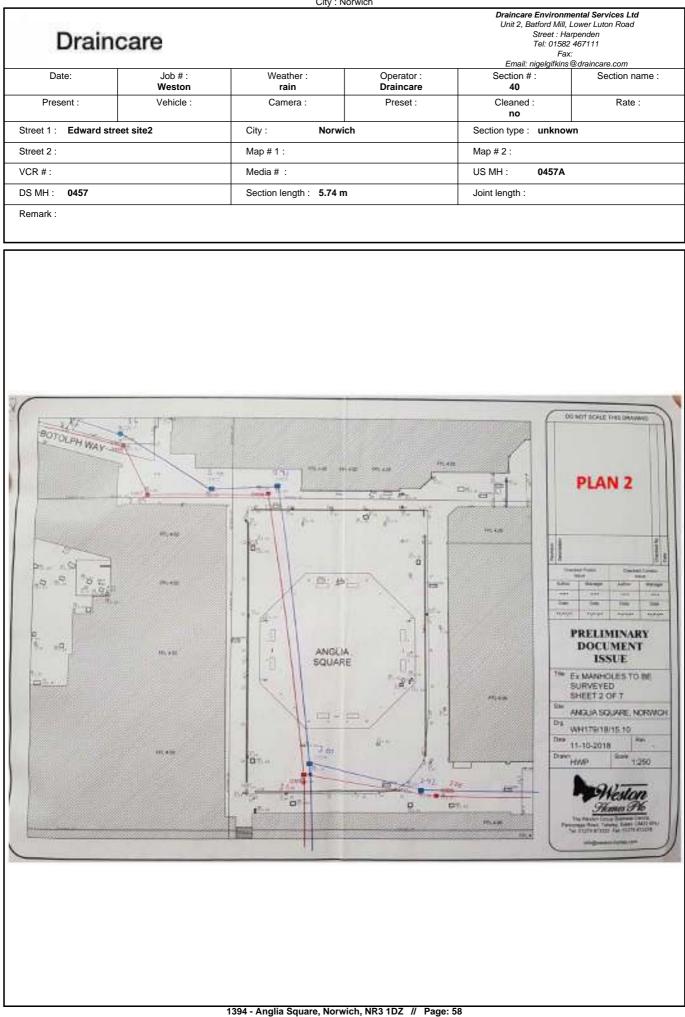


Photo: 42_42_301_A.jpg, 00:00:05 0m, Settled deposits, fine 50 % cross-sectional area loss

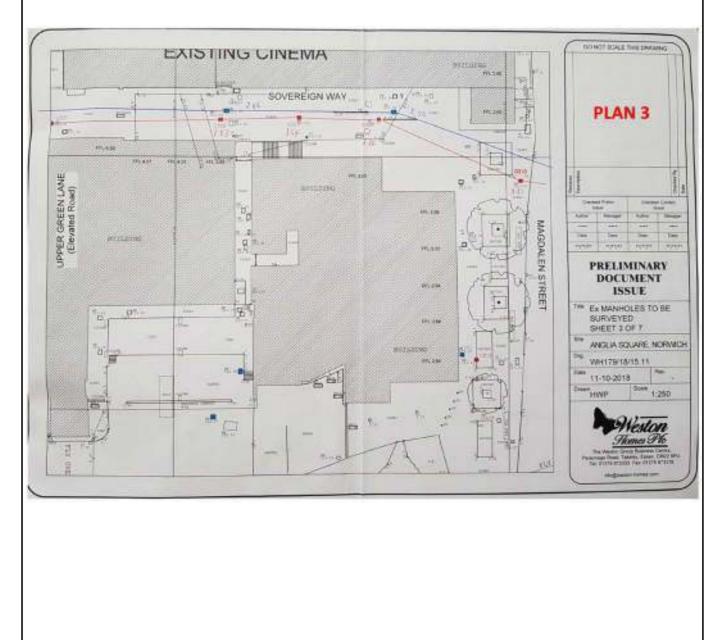


Draind	care			Draincare Environm Unit 2, Batford Mill, Street : Ha Tel: 01582 Faa Email: nigelgifkins	Lower Luton Road rpenden 467111 :	
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1: Edward stree	Street 1 : Edward street site2		City : Norwich		Section type : unknown	
Street 2 :		Map # 1 :	Map # 1 :			
VCR # :		Media # :	Media # :			
DS MH : 0457		Section length : 5.74 m	Section length : 5.74 m			
Remark :		·				

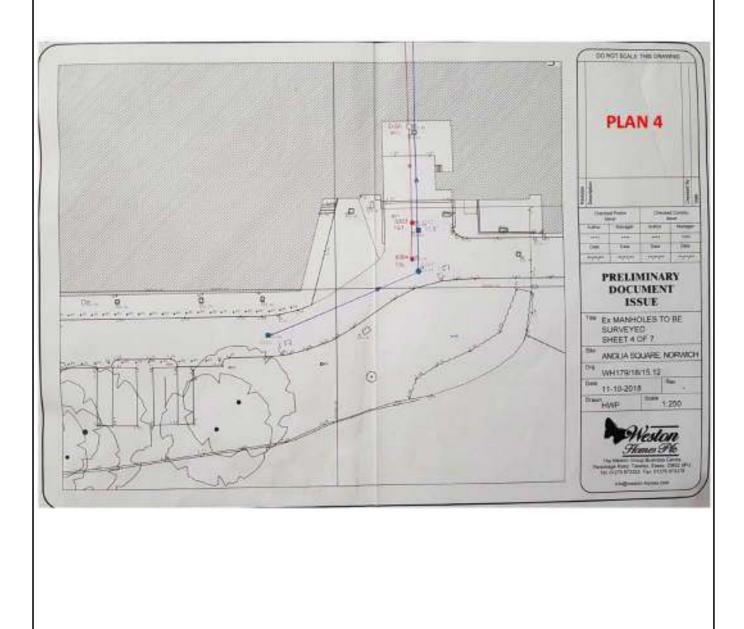


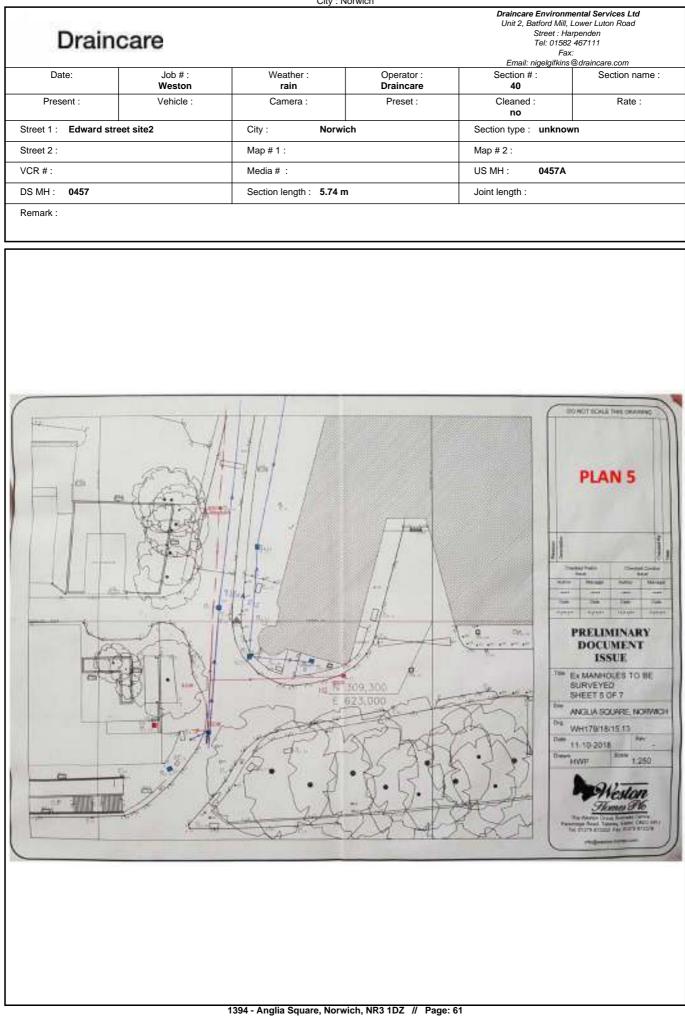


Draind	are			Street : H Tel: 0158 Fa	Lower Luton Road arpenden 2 467111	
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1 : Edward stree	Street 1 : Edward street site2		City : Norwich		wn	
Street 2 :		Map # 1 :	Map # 1 :			
VCR # :		Media # :	Media # :		US MH : 0457A	
DS MH : 0457		Section length : 5.74 m		Joint length :		
Remark :						

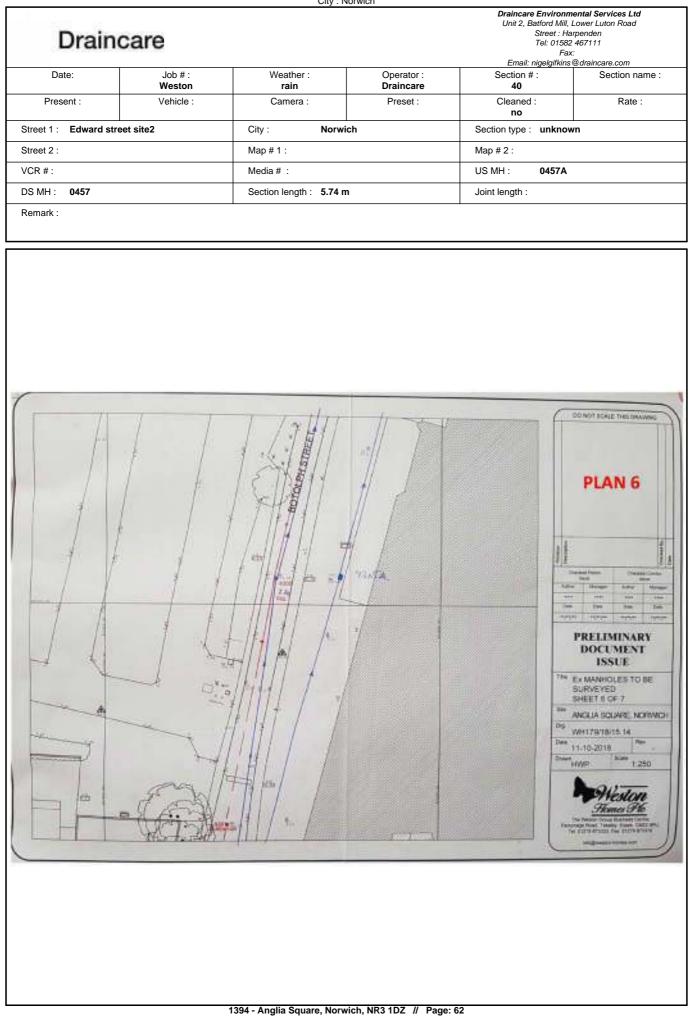


Draind	care	Draincare Environme Unit 2, Batford Mill, L Street : Har Tel: 01582 Fax: Email: nigelgifkins @	ower Luton Road penden 467111			
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1: Edward stre	et site2	City : Norwich		Section type : unknown		
Street 2 :		Map # 1 :	Map # 1 :		Map # 2 :	
VCR # :		Media # :	Media # :			
DS MH : 0457		Section length : 5.74 m	Section length : 5.74 m			
Remark :						

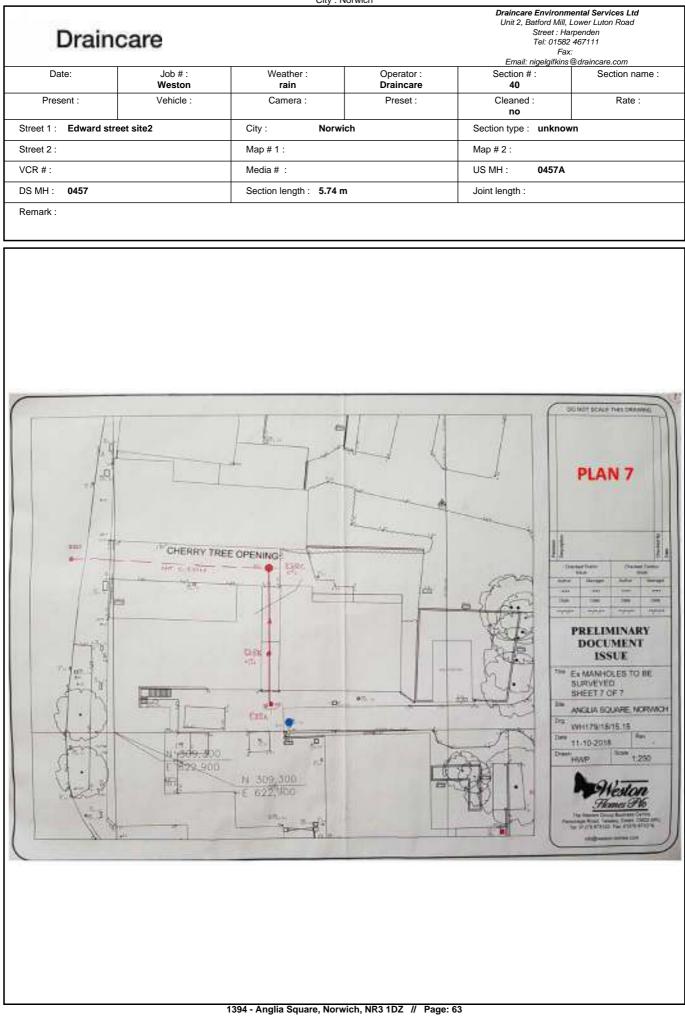




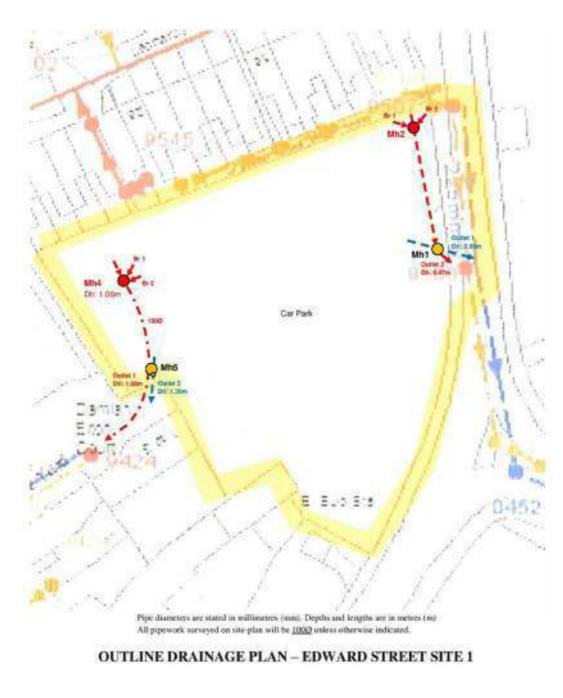
City : Norwich



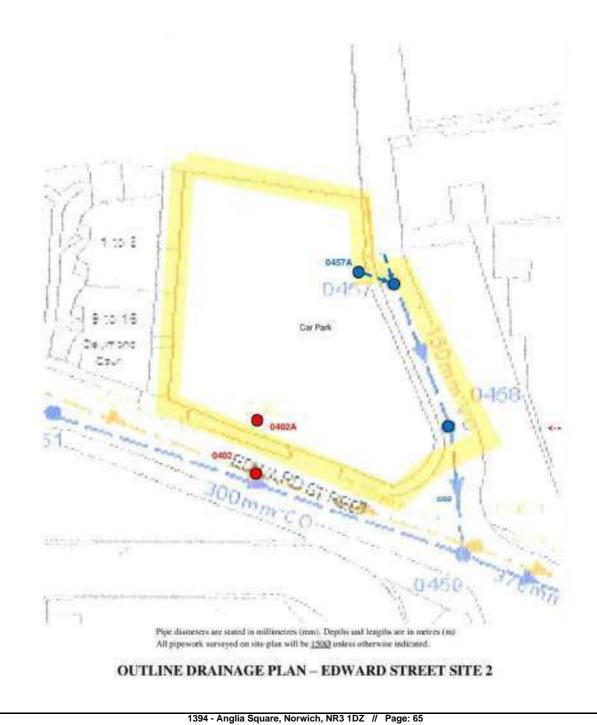
City : Norwich



Draine	care				2 467111 x:	
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1 : Edward street	Street 1 : Edward street site2		City : Norwich		wn	
Street 2 :		Map # 1 :	Map # 1 :			
VCR # :		Media # :	Media # :		US MH : 0457A	
DS MH : 0457		Section length : 5.74 m	Section length: 5.74 m			
Remark :				L		

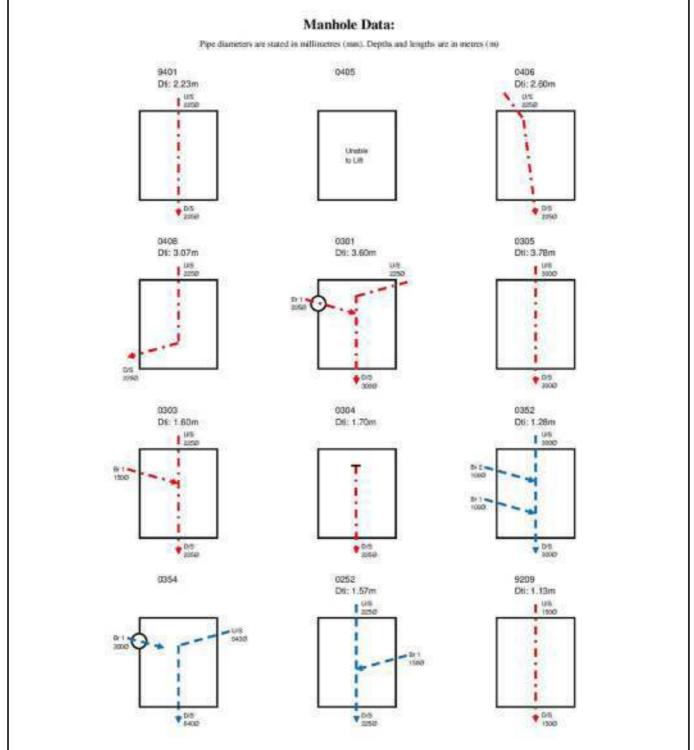


Draine	care			Draincare Environm Unit 2, Batford Mill, I Street : Ha Tel: 01582 Fax Email: nigelgifkins	Lower Luton Road rpenden 467111 :	
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1 : Edward stre	Street 1: Edward street site2		City : Norwich		Section type : unknown	
Street 2 :		Map # 1 :	Map # 1 :			
VCR # :		Media # :	Media # :		US MH : 0457A	
DS MH : 0457		Section length : 5.74 m	Section length : 5.74 m			
Remark :						

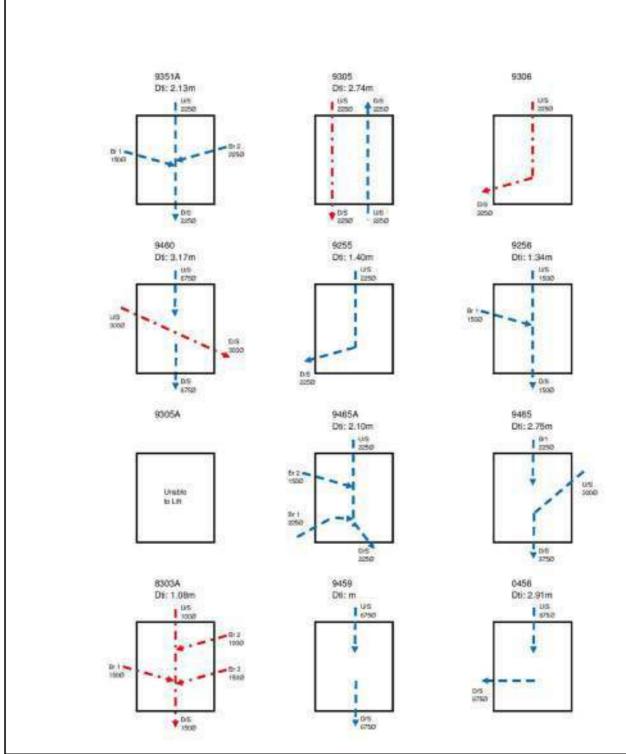


Citv		Norwich
City	٠	NUTWICH

Drain	care			Draincare Environm Unit 2, Batford Mill, I Street : Ha Tel: 01582 Fax Email: nigelgifkins(ower Luton Road rpenden 467111	
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1 : Edward street	Street 1 : Edward street site2		City : Norwich		Section type : unknown	
Street 2 :		Map # 1 :	Map # 1 :		Map # 2 :	
VCR # :		Media # :	Media # :		US MH : 0457A	
DS MH : 0457		Section length : 5.74 m	Section length : 5.74 m			
Remark :						

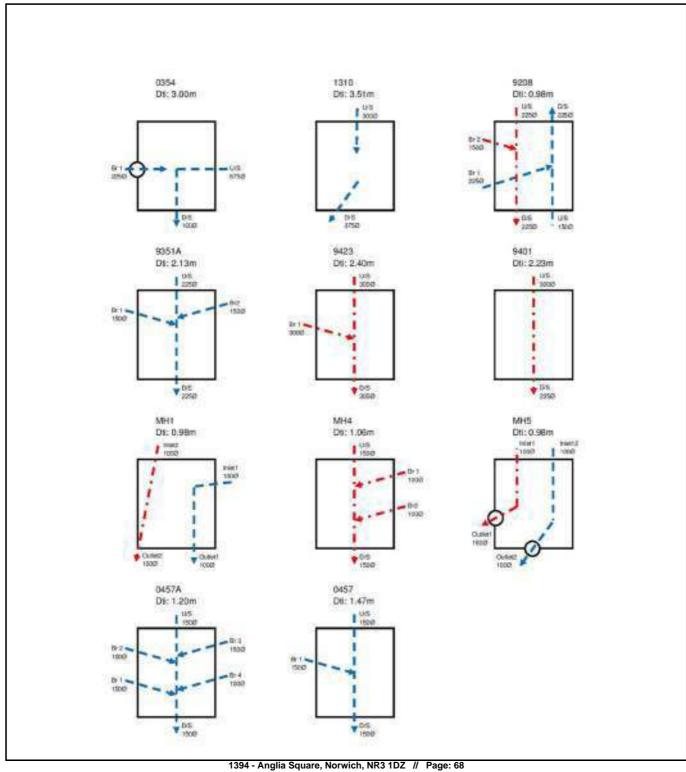


Drain	care			Unit 2, Batford Mill Street : H Tel: 0158 Fa	nental Services Ltd Lower Luton Road arpenden 2 467111 x: s@draincare.com	
Date: Job # : Weston		Weather : rain	Operator : Draincare	Section # : 40	Section name :	
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :	
Street 1: Edward street	Street 1 : Edward street site2		City : Norwich		Section type : unknown	
Street 2 :		Map # 1 :	Map # 1 :			
VCR # :		Media # :	Media # :		US MH : 0457A	
DS MH : 0457		Section length: 5.74 m		Joint length :		
Remark :						



City : Norwich

Draind	care		Draincare Environment Unit 2, Batford Mill, Low Street : Harper Tel: 01582 46; Fax: Email: nigelgifkins@dl				
Date:	Job # : Weston	Weather : rain	Operator : Draincare	Section # : 40	Section name :		
Present :	Vehicle :	Camera :	Preset :	Cleaned : no	Rate :		
Street 1 : Edward street site2		City : Norwi	ch	Section type : unknow	Section type : unknown		
Street 2 :		Map # 1 :		Map # 2 :			
VCR # :		Media # :		US MH : 0457A			
DS MH : 0457		Section length : 5.74 m	I	Joint length :			
Remark :							



Grade 1 & 2 structural and service/operational defects should not be detrimental to the effectiveness of the drainage.

Grade 3, 4 & 5 structural and service/operational defects may be detrimental to the effectiveness of the drainage, and may require remedial treatment. Pipework grading is based on the Sewerage Rehabilitating Manual (SRM) grading from the Water Research Centre (WRC).

The pipe materials as described should be recognized as the survey engineer's best judgment only.

The information provided in this report is given without obligation and the accuracy cannot be guaranteed without verification. No liability of any kind whatsoever is accepted by Draincare Ltd, their agents, or servants for any error or omission. The actual position of pipelines/services faults must be verified and established on the site before any mechanical plant is used or excavations/repairs attempted.

The survey is recorded on DVD or Hard Drive, which is enclosed with the report. Please note that DVD or Hard Drive references and survey run titles are correct in the written report. Survey run titles on DVD or Hard Drive should be referred to the written report.

If the pipework material within your survey is noted as **Pitch Fibre or Asbestos Cement** please note that any works which may disturb the pipe structure must be undertaken in accordance with the Approved Code of Practice "Managing and Working With Asbestos – Control of Asbestos Regulations 2012"

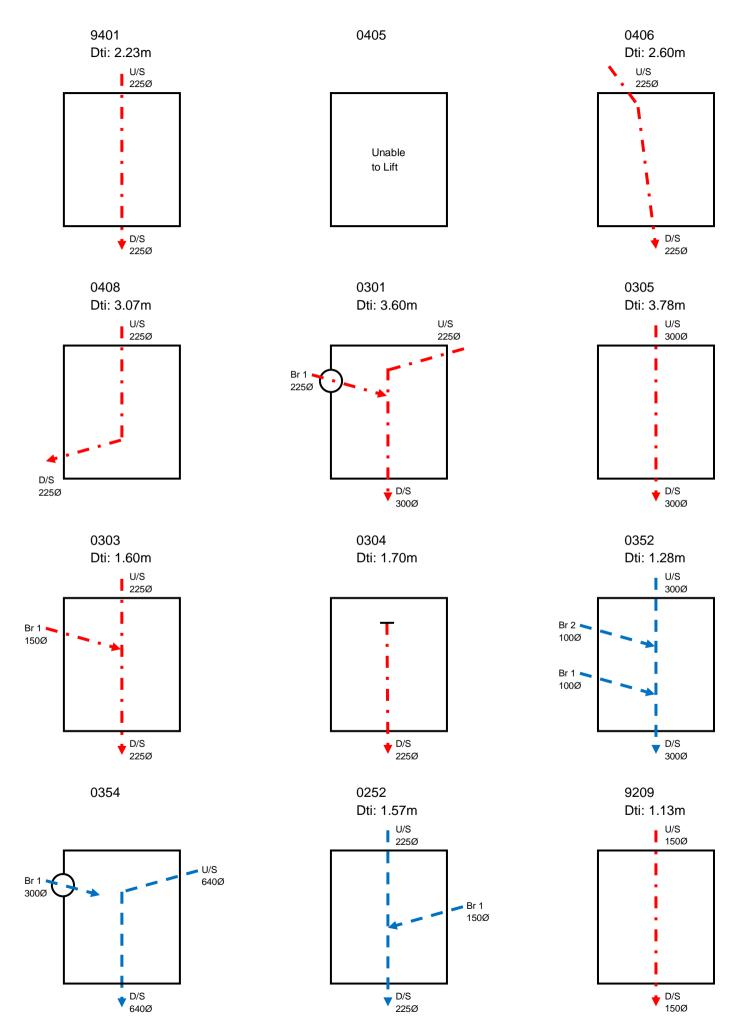
Any quotation provided in this report for remedial measures affecting **Pitch Fibre Pipes** may exclude any additional costs associated with the presence of Asbestos and specialist support services.

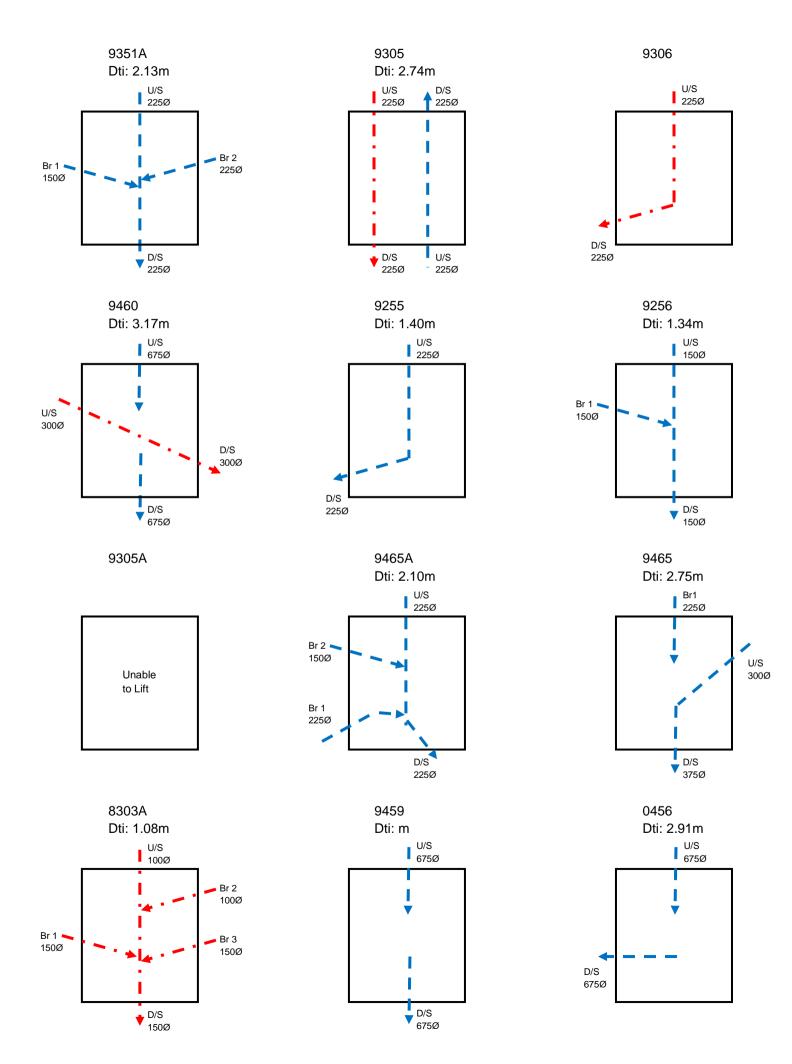
The Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 became effective from 1st October 2011. As a result your responsibility for drainage may cease at your property boundary or you may only be responsible for the pipework before it connects to a communal drain serving your property.

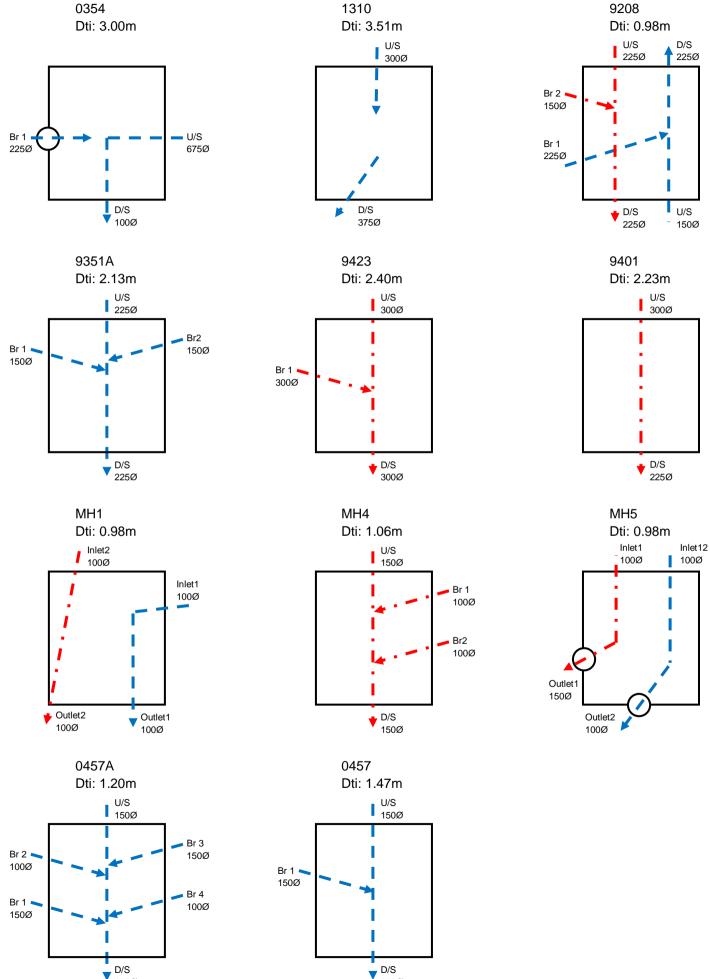
We recommend that the responsibility is determined before work to the drainage system is undertaken.

Manhole Data:

Pipe diameters are stated in millimetres (mm). Depths and lengths are in metres (m)

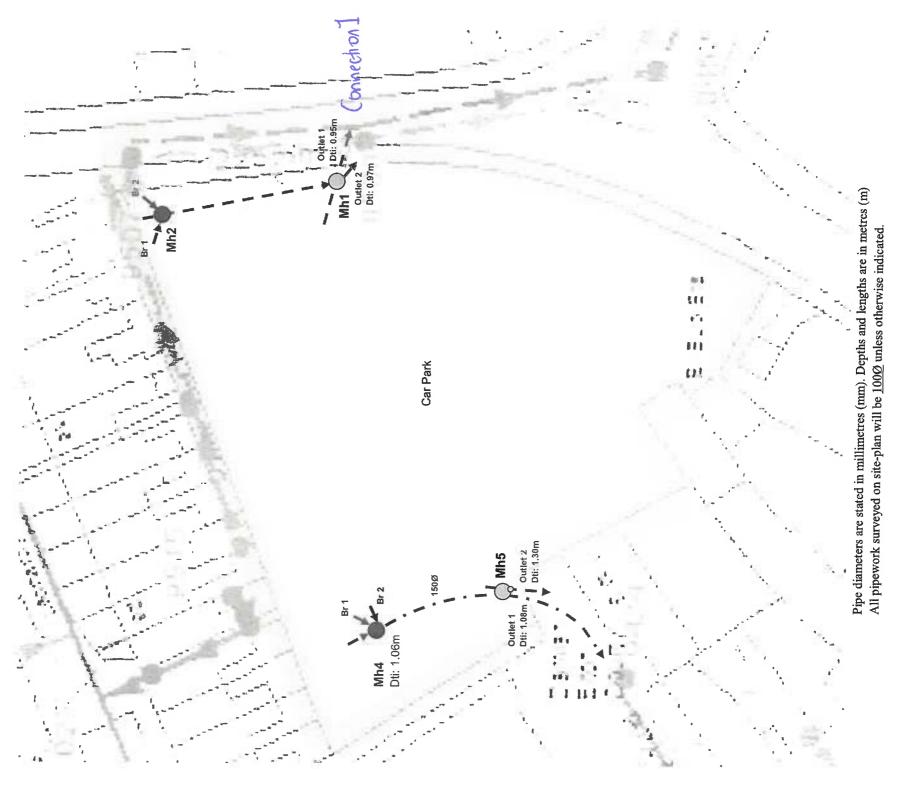




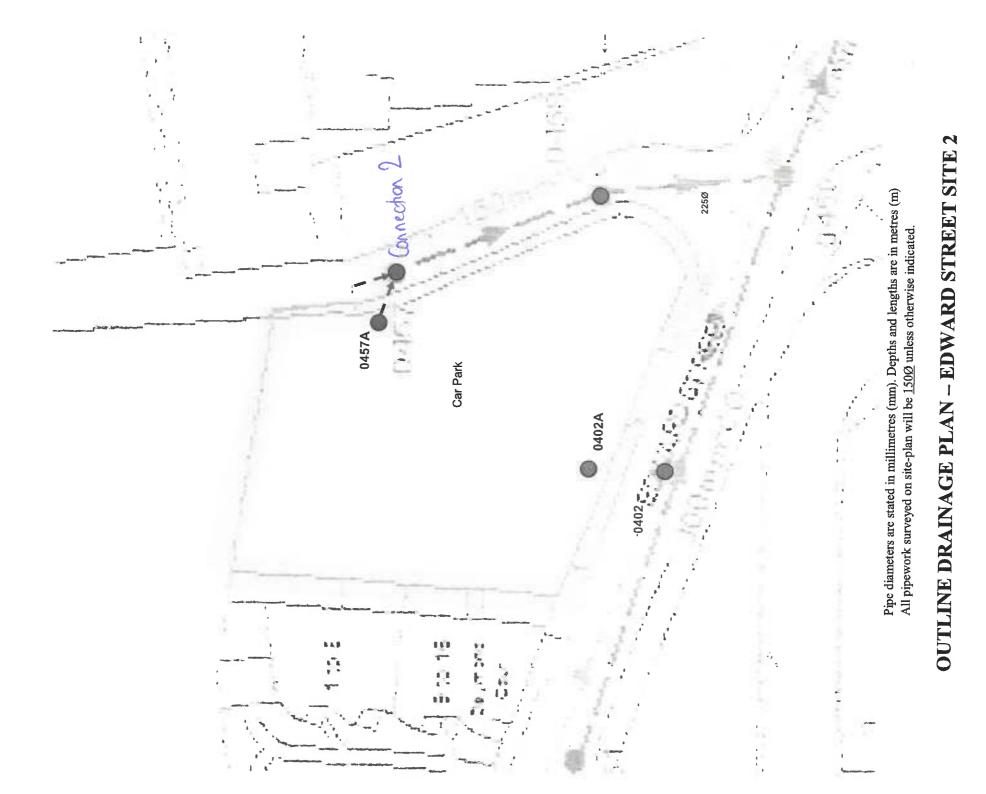


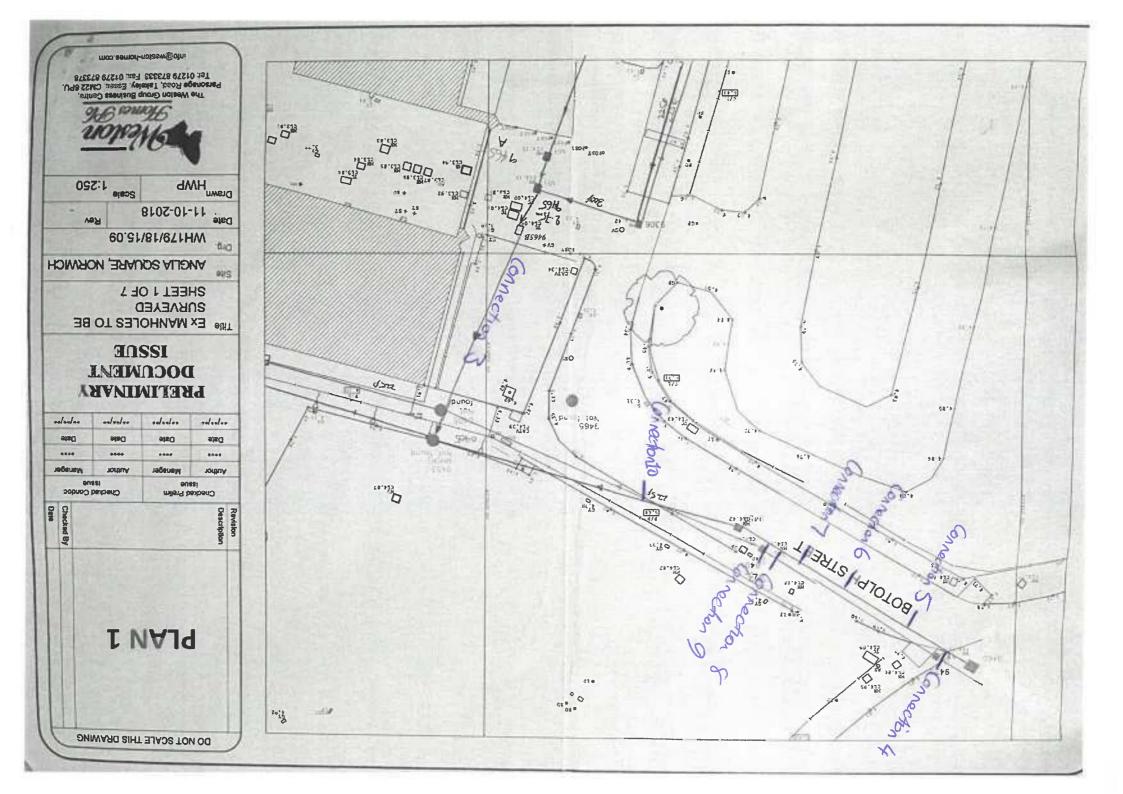
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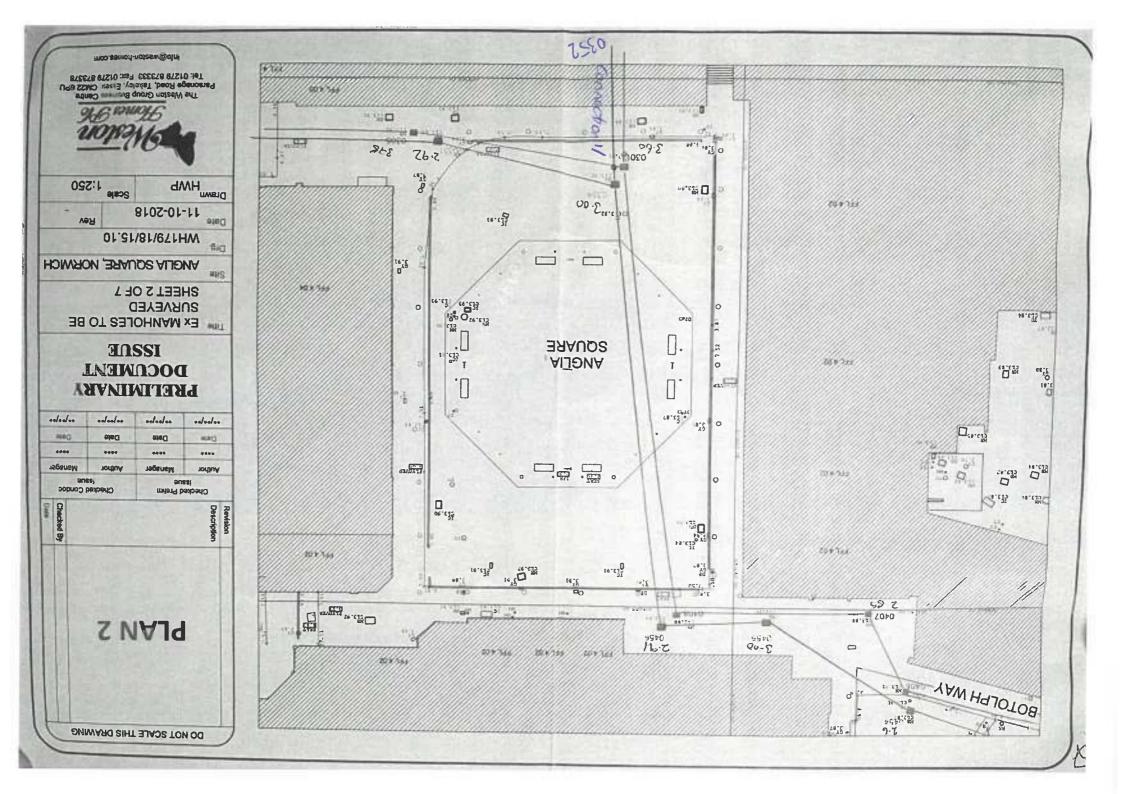
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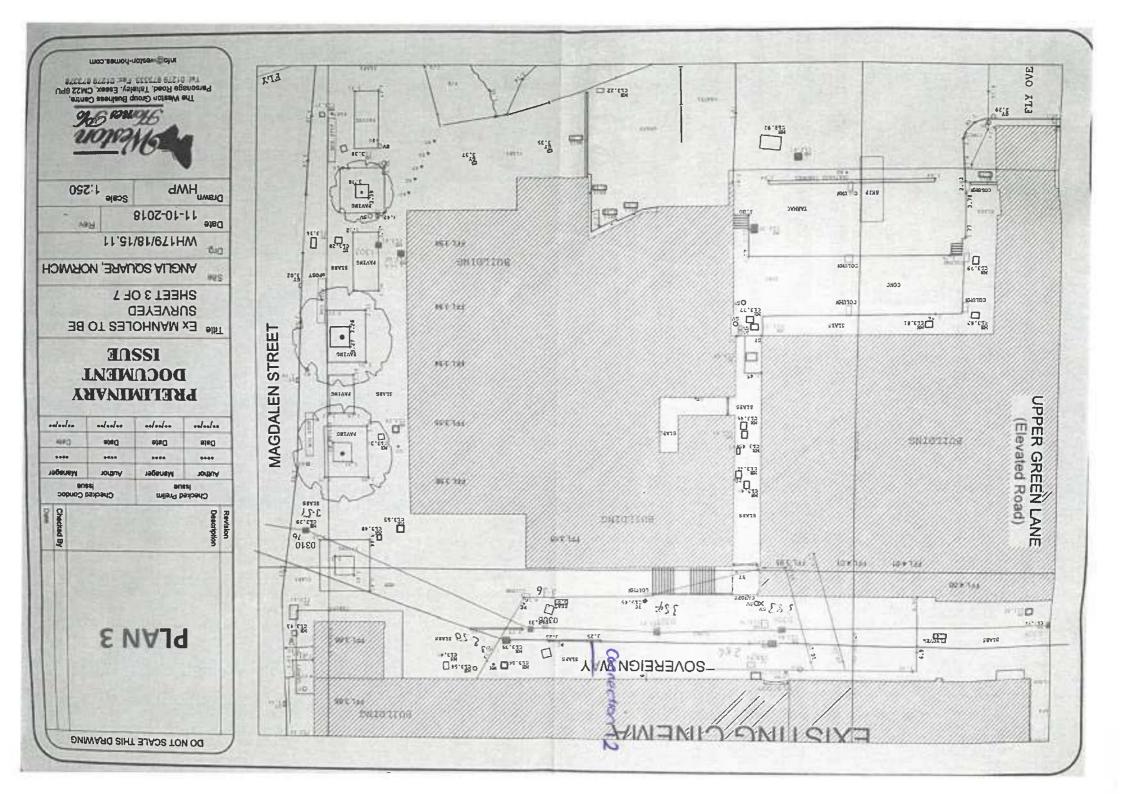


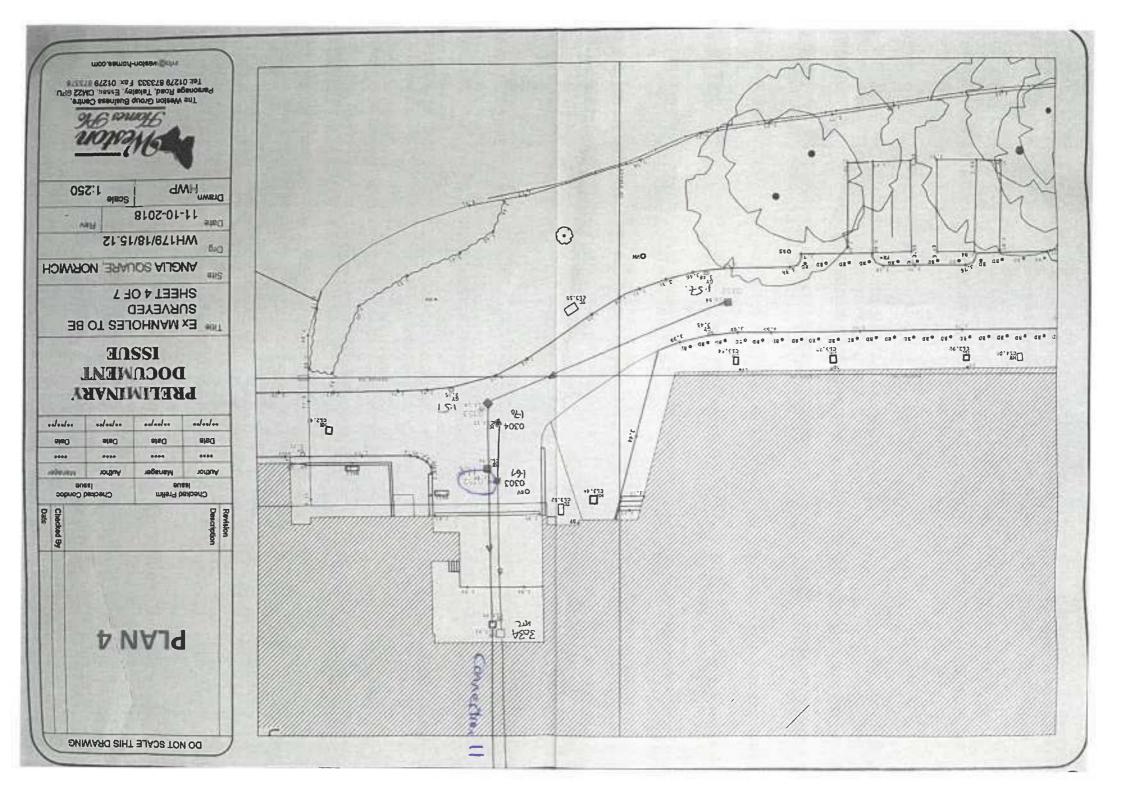
OUTLINE DRAINAGE PLAN – EDWARD STREET SITE 1

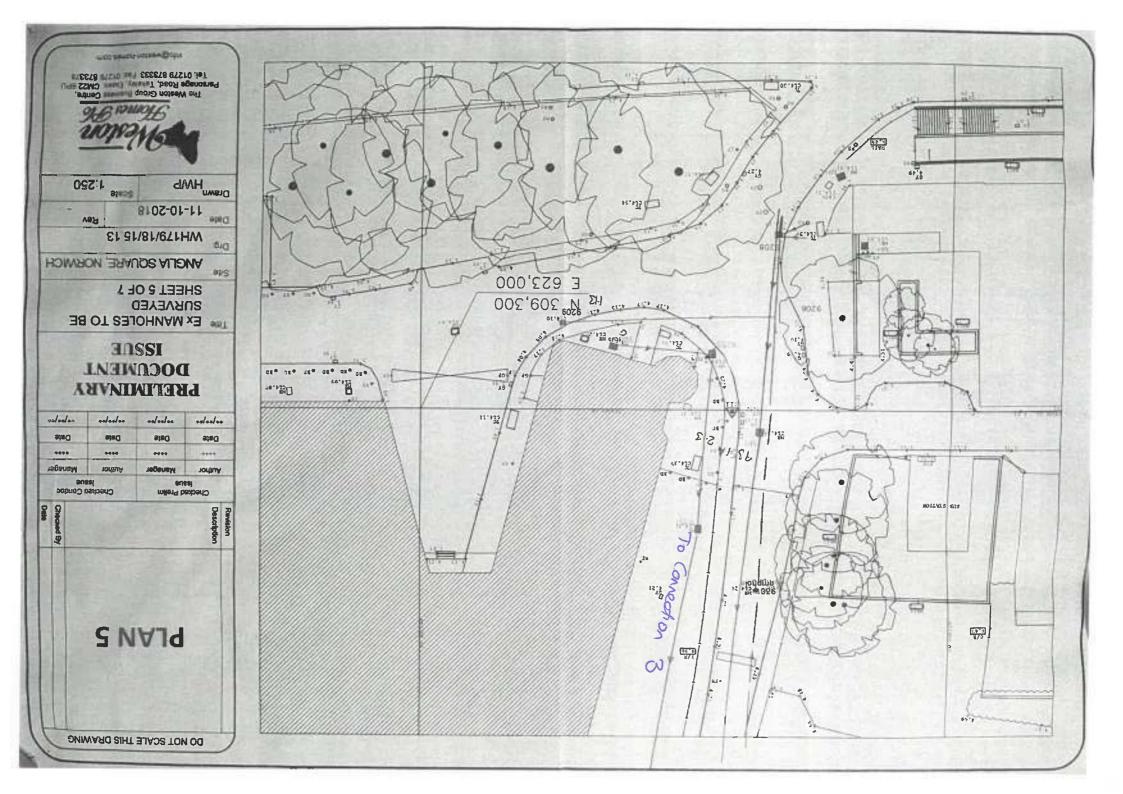


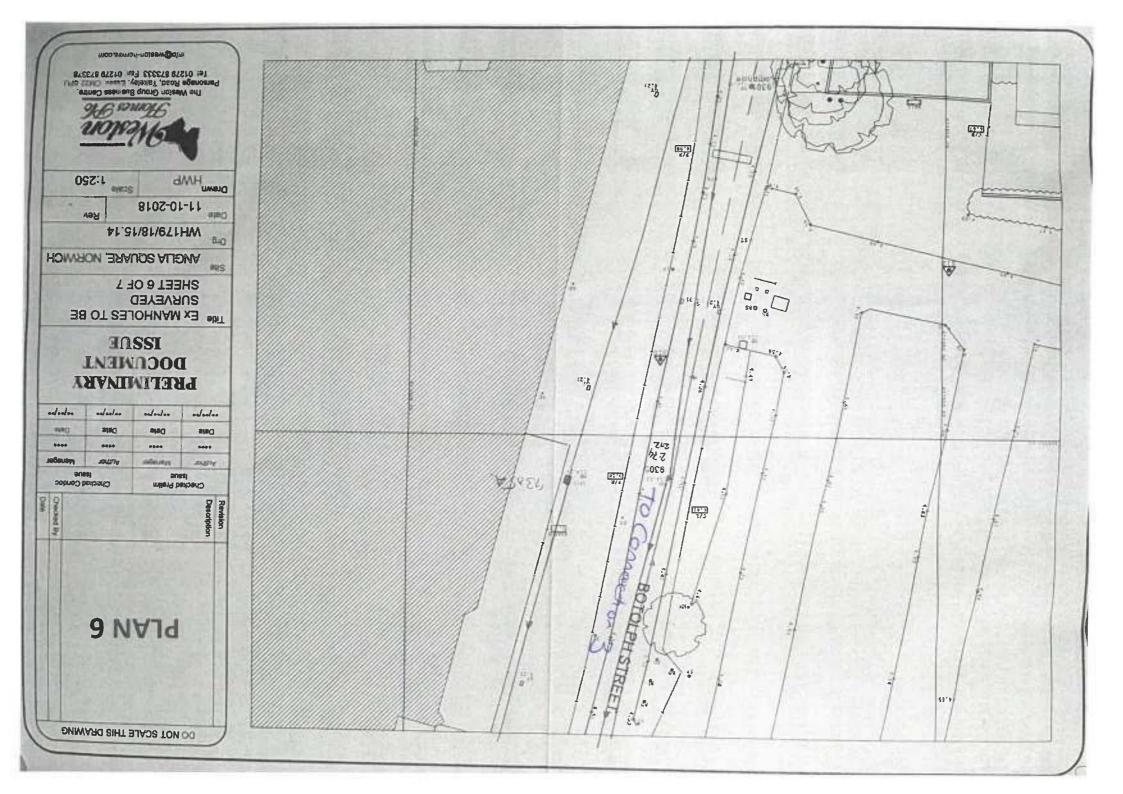


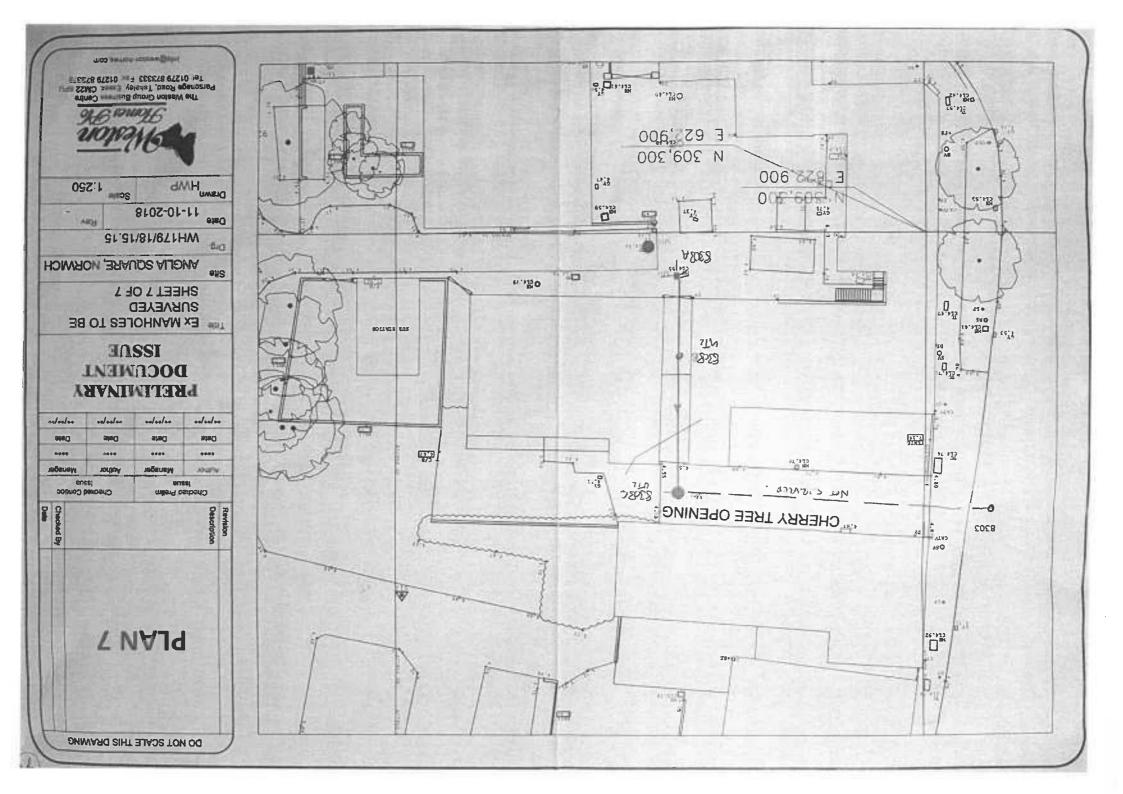












Summary of CCTV Drainage Survey Connections:

Ex. Connection 1 – outfall to 225dia sewer in Edward Street – see attached Edward Street Area 1 and page 48 of the cctv survey report.

Ex. Connection 2 – outfall to 300dia sewer in Edward Street via 0458 – see attached Edward Street Area 2 and page 56 of the cctv survey report.

Ex. Connection 3 – outfall to 675dia sewer at mh 0453 – see attached Plan 1 and page 32 of the cctv survey report.

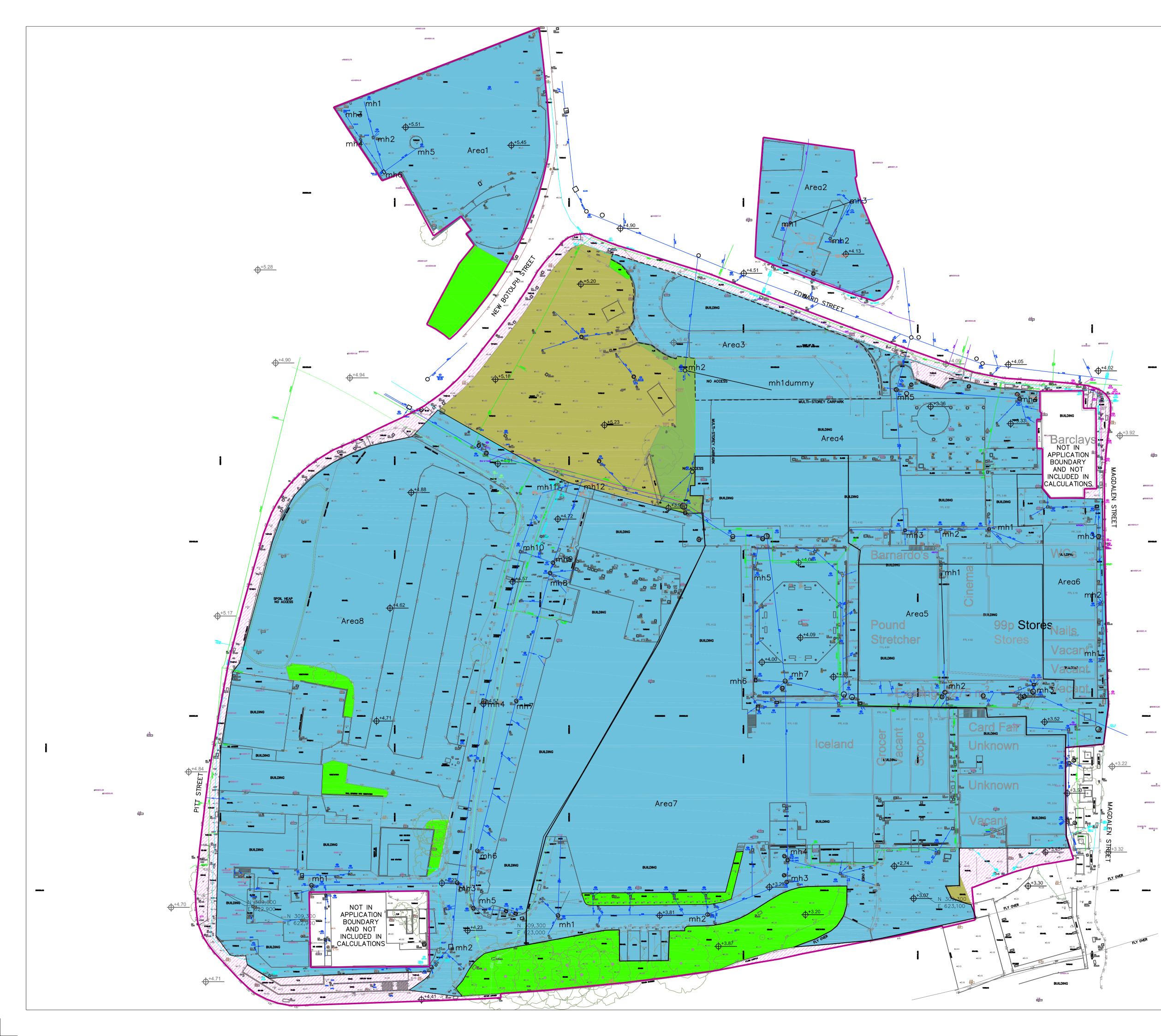
Ex. Connections 4 to 9 – outfalls to 675dia sewer between mhs 9460 and 9459 – shown as junctions on page 45 of the cctv survey report.

Ex. Connection 10 – outfall to 675dia sewer – shown as junction on page 33 of the cctv survey report.

Ex. Connection 11 – outfall to 675dia sewer - see attached Plan 2, Plan 4 and page 13 of the cctv survey report.

Ex. Connection 12 – outfall to 675dia sewer - see attached Plan 3 and shown as junction on page 39 of the cctv survey report.

Appendix: G – Existing Impermeable Areas and Drainage Catchments



	TOTAL S	SITE AREA	: 46502.	3m²
	HIGHWAY OUTSIDE BOUNDA BROWNF	OF ADOPT Y OR BUII APPLICA RY: NOT IELD RUNO ATIONS: 22	ldings Tion Include[Dff	
	OR LANI EXPECTE GREEN- OCCUR SHALL M BROWNF	F PERMEA DSCAPING. D THAT S FIELD RUN HOWEVER NOT BE IN IELD RUN ATIONS: 18-	IT IS SOME NOFF WOU THESE R CLUDED OFF	JLD ATES
	DRAINS SYSTEM WATER IN BROV CALCUL	F CAR PA TO PRIVA AND NOT SEWERS. N VNFIELD RI ATIONS: 2	TE DRAIN INTO AN NOT INCL UNOFF 814m ² .	IAGE NGLIAN
	SURFAC SURFAC EXISTINC SURFAC INCLUDE	F IMPERME E THAT DI E WATER S ANGLIAN E WATER D IN BRO CALCULA	RAINS RUN-OFF WATER SEWERS: WNFIELD	то
	EXISTING IDENTIFII THE ADO SEWER I RUNOFF INCLUDE	E WATER E LANDSCA ED AS CO OPTED SUI NETWORK. RATES AI D IN BRO CALCULA	APED AR NTRIBUTI RFACE W GREENFI PPLIED. WNFIELD	EA IS NG TO ATER ELD
REV DATE	BY	DESCRIPTION		снк ард
DRAWING STATUS:	FOR I	NFORMATIO	N	
		EAS		
Unit 23, ⁻	Ū	, Stanstead At SG12 8HG : 01920 87177		ordshire,
CLIENT:		ww.eastp.co.uk		
ARCHITECT:	WES ⁻	TON HOMES		
PROJECT:				
		IA SQUARE	9	
TITLE: EX	ISTING IMI	PERMEABLE	AREAS	
		SURFACE W		ERS
SCALE @ A1: 1:500		-drawn: MD	DATE: 06.04	.2017
PROJECT No: 3831	DRAWN		D1-D	

Appendix: H – FEH Brownfield Runoff Hydraulic Calculations

EAC Transport Dis		ing										Dago 1
EAS Transport Planning Unit 23, The Maltings EXISTING											Page 1	
-												
Stanstead Abbotts			AREA 1									
Hertfordshire, SG									Micro			
Date 09/09/2022 2		Designe	-	EAS				Drainage				
File Area 1 Existing Network.MDX						Checke						Brainage
Innovyze		Networ	k 2020	0.1.3								
				Exist	ing Ne	etwork	Detai	ls for	: Sto	orm		
		*	* - Ind	icates	pipe h	as been	modifie	ed outs	ide d	of Sy	stem 1	
	1	PN	Length	Fall	Slope	I.Area	T.E.	k	HYD	DIA	Section Type	
			(m)	(m)	(1:X)	(ha)	(mins)	(mm)	SECT	(mm)		
*	1.	000	23.300	0.291	80.1	0.040	3.00	0.600	0	150	Pipe/Conduit	
*	1.	001	21.000	0.292	71.9	0.040	0.00	0.600	0	150	Pipe/Conduit	
- -		000	10 000	0.225	00.0	0 040	2 00	0 000		1 5 0	Dine (Conduit	
				0.225				0.600	0		Pipe/Conduit Pipe/Conduit	
											1 .,	
*	3.	000	23.000	0.287	80.1	0.040	3.00	0.600	0	150	Pipe/Conduit	
*	1.	002	10.000	0.125	80.0	0.039	0.00	0.600	0	150	Pipe/Conduit	
		PN	us/N	1H US/CI	L US/I	L US	DS/C	L DS/II	LI	os	Ctrl US/MH	
			Nam	e (m)	(m)	C.Dept (m)	h (m)	(m)		epth m)	(mm)	
	*	1.00	00 mł	n1 5.510	0 4.54	5 0.81	5 5.51	0 4.254	4 1	.106	1200	
		1.00		12 5.51			6 5.50			.388	1200	
		2.0		n3 5.510 n4 5.510			8 5.51 3 5.50			.093 .358	1200 1200	
		2.01		14 0.010	0 4.20	1 1.09	5 5.50	0 3.992	5 I	0	TZOO	
	*	3.0	00 mł	n5 5.51(0 4.24	9 1.11	1 5.50	0 3.962	2 1	.388	1200	
1												

* 1.002 mh6 5.500 3.887 1.463 5.500 3.762 1.588 1200

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 1	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 20:25	Designed by EAS	Dcainago
File Area 1 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	Coni	MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	5.510	0.965	Open	Manhole	1200	1.000	4.545	150				
mh2	5.510	1.256	Open	Manhole	1200	1.001	4.254	150	1.000	4.254	150	
mh3	5.510	1.018	Open	Manhole	1200	2.000	4.492	150				
mh4	5.510	1.243	Open	Manhole	1200	2.001	4.267	150	2.000	4.267	150	
mh5	5.510	1.261	Open	Manhole	1200	3.000	4.249	150				
mh6	5.500	1.613	Open	Manhole	1200	1.002	3.887	150	1.001	3.962	150	75
									2.001	3.992	150	105
									3.000	3.962	150	75
	5.500	1.738	Open	Manhole	0		OUTFALL		1.002	3.762	150	

No coordinates have been specified, layout information cannot be produced.

EAS Transport Plar	ning								Page 3
Unit 23, The Malti	-			E	XISTING	+			rage 5
Stanstead Abbotts	1195				REA 1				
Hertfordshire, SG1	2 8HG			1.			Micco		
Date 09/09/2022 20				D	esigned	l by EAS	5		Micro
File Area 1 Existi		work.	MDX		hecked	-			urainage
Innovyze				N	etwork	2020.1	.3		
			PIE	PELINE	SCHEDUI	LES for	Storm		
				Ups	stream N	Manhole			
		Diam		1	T. T	D. Dauth		MI 573M 740	
PI	-	(mm)		(m)	I.Level (m)	D.Depth (m)	MH Connectior	MH DIAM., L*W n (mm)	
1.0		150 150		5.510 5.510			Open Manhol Open Manhol		
	01 0	100		0.010	1.201	1.100	opon namos	1200	
		150			4.492		Open Manhol		
2.0	01 0	150	mn4	5.510	4.267	1.093	Open Manhol	.e 1200	
3.0	00 0	150	mh5	5.510	4.249	1.111	Open Manhol	e 1200	
1.0	0.2	150	mhG	5.500	3.887	1 462	Open Manhel	e 1200	
1.0	02 0	100	11110	5.500	5.00/	1.403	Open Manhol	.e 1200	
				Dowr	nstream	Manhol	e		
PN	Length	n Slope	∋ MH	C.Level	L I.Level	L D.Dept	h MH	MH DIAM., L*W	1
	(m)	(1:X)	Name	(m)	(m)	(m)	Connecti	on (mm)	
1.000	23.300) 80.1	L mh2	5.510	4.254	1 1.10	6 Open Manh	ole 1200)
	L 21.000						8 Open Manh		
2.000) 18.000) mh4	E E1(4 207	7 1 0 0	2 Onen Mark	ole 1200	
	L 22.000			5.510 5.500			3 Open Manh 8 Open Manh		
							-		
3.000	23.000	80.1	L mh6	5.500	3.962	2 1.38	8 Open Manh	ole 1200)
1.002	2 10.000	80.0)	5.500	3.762	2 1.58	8 Open Manh	ole ()
		_					C C		
		Fre	96 F.T.	owing (Dutiall	Detail	s for Sto	rm	
		outfall e Numb		fall C. ame	Level I (m)	. Level (m)	Min D I. Level (1),LW	
	ьтг		er N	allie	(111)	(111)	(m)		
		1 0			F F 0 0	2 7 6 0	0.000	0	
		1.0	102		5.500	3.762	0.000	0 0	
			Sim	ulatio	n Crite	ria foi	storm		
				~ ~ ~ ~ ~					
				Coeff 0 actor 1				of Total Flow 0.0 m³/ha Storage 0.0	
			tart (0		Inlet	Coeffiecient 0.8	300
Manhala	Hot Headlo					w per Pe	-	y (l/per/day) 0.(n Time (mins)	000 60
	Sewage							terval (mins)	1
	-	-					-		
-	-							er of Time/Area Di er of Real Time Co	-
			S	yntheti	lc Raint	fall De	tails		
	Doin	fall M	lodo]				FEH	D3 (1km) 0.255	
Reti	Rain Irn Peri						РЕН 1	E (1km) 0.255 E (1km) 0.310	
	H Rainfa	ll Ver	sion				1999	F (1km) 2.498	
	Sit			B 62280	0 309650	TG 2280	0 09650 Sum		
			1km) 11mm)				-0.024 Win		
		D1 (D2 (v (Summer) 0.750 v (Winter) 0.840	
		52 (0.070 0	. (

	Page 4
EXISTING	
AREA 1	
	Micro
Designed by EAS	Drainage
Checked by	Drainage
Network 2020.1.3	
1	AREA 1 Designed by EAS Checked by

Synthetic Rainfall Details

Storm Duration (mins) 30

EAS Transport Planning							Page	-
Jnit 23, The Maltings		EXIS	STING					
Stanstead Abbotts		AREA	1					-
Hertfordshire, SG12 8HG							Mic	10
Date 09/09/2022 20:45		Desi	gned by	EAS				
File Area 1 Existing Net	twork.MDX	Chec	ked by				UIC	inago
Innovyze			ork 2020	.1.3				
<u>1 year Return Period</u>	Summary o	f Critical	Results	by Max	kimum Out	flow (Ra	nk 1) for	Storm
Area	l Reduction	Simulat Factor 1.000	tion Crite:) Additi		ow - % of '	Total Flow	0.000	
		(mins) (0 MA1	DD Fact	or * 10m³/	ha Storage	0.000	
	t Start Leve		0	5		effiecient		
Manhole Headle Foul Sewage		Jlobal) 0.500 e (l/s) 0.000	-	Person	per Day (l/per/day)	0.000	
				_				
Number of Input Hydr Number of Online (-	
			2					
Rainfall	Model		Rainfall D R M5-60 (m		100 Ctr (Sum	nmer) 0 75	0	
		and and Wale						
	c =1 1 =		<i>.</i> .					
Margin		lisk Warning Analysis Time		Second I	ncrement (300.0 Extended)		
	1	DTS St	-			ON		
		DVD St				OFF		
		DVD St Inertia St				OFF OFF		
Г		Inertia St	atus). 240.		OFF and Winter		
		Inertia St Sile(s) (mins) 15, 3	atus), 240,		OFF and Winter		
Return	Ouration(s)	Inertia St Sile(s) (mins) 15, 3 Syears)	atus), 240,		OFF and Winter 960, 1440		
Return	Ouration(s) Period(s) (Inertia St Sile(s) (mins) 15, 3 Syears)	atus), 240,		OFF and Winter 960, 1440 1, 2 0, 0	Surcharged	Floode
Return C	Ouration(s) Period(s) (Climate Char	Inertia St Sile(s) (mins) 15, 3 Syears)	atus 30, 60, 120		360, 480,	OFF 960, 1440 1, 2 0, 0 Water	Surcharged Depth	
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Return C US/MH Retu	Ouration(s) Period(s) (Climate Char Arn Climate	Inertia St File(s) (mins) 15, 3 Syears) Age (%) First (X)	atus 30, 60, 120 First (Y)	First	360, 480, (Z) Overfl	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level	Depth (m)	Volume (m³)
Return C US/MH Retu PN Name Storm Peri	Period(s) Period(s) (Climate Char Imate Char Durn Climate Dod Change 1 +0%	Inertia St File(s) (mins) 15, 3 Syears) Age (%) First (X)	atus 30, 60, 120 First (Y)	First	360, 480, (Z) Overfl	OFF 960, 1440 1, 2 0, 0 Water ow Level (m)	Depth (m) -0.087	Volume (m ³)
Return C US/MH Retu PN Name Storm Peri 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer	Period(s) Period(s) (Climate Char Imate Char Durn Climate Dod Change 1 +0%	Inertia St Sile(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge	atus 30, 60, 120 First (Y)	First	360, 480, (Z) Overfl	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556	Depth (m) -0.087 -0.069 -0.086	Volume (m ³) 0.000 0.000
Return C US/MH Retu PN Name Storm Peri 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer	Duration(s) Period(s) Climate Char urn Climate ind Change 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0%	Inertia St Sile(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer	atus 30, 60, 120 First (Y)	First	360, 480, (Z) Overfl	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351	Depth (m) -0.087 -0.069 -0.086 -0.066	Volume (m ³) 0.00 0.00 0.00 0.00
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US/MH Return US/MH Return PN Name Storm Period 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer	Duration(s) Period(s) Climate Char urn Climate tod Change 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0%	Inertia St Sile(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Winter 1/15 Summer	atus 30, 60, 120 First (Y) Flood	First Overf]	360, 480, (Z) Overfl	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00 0.00 0.00 0.00
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Return C US/MH Retu PN Name Storm Peri 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer 1.002 mh6 15 Winter	Duration(s) Period(s) Climate Char urn Climate ind Change 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0%	Inertia St File(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Winter 1/15 Summer E / Overflow	atus 30, 60, 120 First (Y) Flood	First Overf] Pipe	360, 480, (Z) Overfl	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00 0.00 0.00 0.00
Return C VS/MH PN Name Storm Peri 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer 1.002 mh6 15 Winter	<pre>Puration(s) Period(s) (Climate Char I change 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0%</pre>	Inertia St File(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Winter 1/15 Summer First (X) Surcharge 2/15 Summer 2/15 Summer (1/15)	atus 30, 60, 120 First (Y) Flood Malf Drain Time	First Overf] Pipe Flow	360, 480, (Z) Overfl Low Act.	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312 4.256 Level	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00 0.00 0.00 0.00
Return C US/MH Return PN Name Storm Perion 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer 1.002 mh6 15 Winter	Period(s) Period(s) Climate Char Climate Char Change 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% Name Cap.	Inertia St File(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Winter 1/15 Summer First (X) 4	atus 30, 60, 120 First (Y) Flood Malf Drain Time	First OverfJ Pipe Flow (l/s) 6.5 11.1	360, 480, (Z) Overfl Low Act. Status	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312 4.256 Level	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00 0.00 0.00 0.00
Return C US/MH Retu PN Name Storm Peri 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer 1.002 mh6 15 Winter PN 1.000 1.000 1.001 2.000	<pre>Period(s) Period(s) (Climate Char Climate Char Change 1 +0% 1 +0%{</pre>	Inertia St File(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Summer 1/15 Summer H (Overflow (1/s) 4 6 6	atus 30, 60, 120 First (Y) Flood Malf Drain Time	First OverfJ Pipe Flow (l/s) 6.5 11.1 6.6	360, 480, (Z) Overfl Low Act. Status OK OK OK	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312 4.256 Level	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00 0.00 0.00 0.00
Return C US/MH Return PN Name Storm Perion 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer 1.002 mh6 15 Winter PN 1.000 1.001 2.000 2.001	Duration(s) Period(s) Climate Char control Change 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 0.3 mh1 0.3 mh3 0.3 mh4 0.5	Inertia St Sile(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Summer 1/15 Summer F / Overflow (1/s) 4 6 6 9	atus 30, 60, 120 First (Y) Flood Malf Drain Time	First OverfJ Pipe Flow (l/s) 6.5 11.1 6.6 11.1	360, 480, (Z) Overfl Low Act. Status OK OK OK OK	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312 4.256 Level	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00 0.00 0.00 0.00
Return C US/MH Retu PN Name Storm Peri 1.000 mh1 15 Summer 1.001 mh2 15 Summer 2.000 mh3 15 Summer 2.001 mh4 15 Summer 3.000 mh5 15 Summer 1.002 mh6 15 Winter PN 1.000 1.000 1.001 2.000	<pre>Period(s) Period(s) (Climate Char Climate Char Change 1 +0% 1 +0%{</pre>	Inertia St Sile(s) (mins) 15, 3 Syears) age (%) First (X) Surcharge 2/15 Summer 2/15 Summer 2/15 Summer 1/15 Summer H (Overflow (1/s) 4 6 6 9 5	atus 30, 60, 120 First (Y) Flood Malf Drain Time	First OverfJ Pipe Flow (l/s) 6.5 11.1 6.6 11.1 6.5	360, 480, (Z) Overfl Low Act. Status OK OK OK	OFF and Winter 960, 1440 1, 2 0, 0 Water ow Level (m) 4.608 4.335 4.556 4.351 4.312 4.256 Level	Depth (m) -0.087 -0.069 -0.086 -0.066 -0.087	Volume (m ³) 0.00 0.00

EAS Tr	anspo	rt Play	nning									Page	2
		e Malt:				EXT	STING					1 aye	-
Stanst			90			AREA							
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		2022 20		5		Dear	igned by	EAC				- Mic	.ro
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IIIIOvy	2e					Neci	WOIK 2020	•1•3					
<u>2 ye</u>	ar Re	turn P	eriod	Sumr	mary of	Critical	Results	by Ma	aximum Ou	itflow (Rank 1	1) for	Storm
	Numbe	Foul	Hc Headl Sewage	Hot ot Sta loss (e per	t Start art Leve Coeff (G hectare	Factor 1.00 (mins)	0 MA 0 0 Flow per 0	onal F DD Fac Perso	tor * 10m ³ Inlet (n per Day	³ /ha Stor Coeffieci (l/per/d	age 0.0 ent 0.8 ay) 0.0	000 300 000	0
		-		2	-	lumber of St						2	
						Synthetic	Rainfall D	Details	3				
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				Regi	on Engla	and and Wale	es Ratic) R 0.	.405 Cv (W	inter) 0	.840		
			Return	Durat Peri	An Prof:	-	estep 2.5 s catus catus catus		Summer	C and Wint , 960, 14 1,	ed) ON DFF DFF er		
										Wate	er Sur	charged	Flooded
PN	US/MH Name					First (X) Surcharge)epth (m)	Volume (m³)
1.000	mh1	15 Sumn	ner	2	+0%					4.6	18	-0.077	0.000
1.001		15 Sumn		2	+0%	2/15 Summer				4.4		0.051	0.000
2.000		15 Sumn	ner	2	+0%					4.5		-0.076	0.000
2.001		15 Sumn		2		2/15 Summer				4.4		0.042	0.000
3.000		15 Sumn 15 Wint		2 2		2/15 Winter 1/15 Summer				4.3 4.3		-0.008	0.000
1.002	11110	10 WING		2	108	1715 Summer				7.0		0.040	0.000
						1	Half Drain	Pipe					
				US/M	H Flow ,	/ Overflow	Time	Flow		Level			
			PN	Name	e Cap.	(1/s)	(mins)	(1/s)	Status	Exceed	əd		
			1.000	mh	1 0.45	5		8.4	C	Ж			
			1.001						SURCHARGE				
			2.000		3 0.40	6		8.5		Ж			
			2.001						SURCHARGE				
			3.000					8.4)K			
			1.002	mh	6 1.94	ŧ		34.3	SURCHARGE	U.			

				Page 5
EAS Transport Planning Unit 23, The Maltings		EXISTING		rage 5
Stanstead Abbotts		AREA 1		
Hertfordshire, SG12 8HG				
Date 09/09/2022 20:25		Designed by EAS		MICIO
File Area 1 Existing Net	twork MDX	Checked by		Drainage
Innovyze	CWOIK.HDX	Network 2020.1.3		
Area Hot Manhole Headlo Foul Sewage Number of Input Hydr Number of Online (Rai FEH Rainf Si Margin	l Reduction Factor Hot Start (mins t Start Level (mm oss Coeff (Global per hectare (1/s cographs 0 Number Controls 0 Number Mfall Model fall Version te Location GB 6 for Flood Risk W Analys Ine Profile(s	<pre>i) 0 In) 0.500 Flow per Person per i) 0.000 per of Offline Controls 0 Nu thetic Rainfall Details FEH 2013 23065 309383 TG 23065 09383 arning (mm) is Timestep 2.5 Second Incre DTS Status DVD Status rtia Status</pre>	* % of Total Flow 0.0 10m³/ha Storage 0.0 let Coefficcient 0.8 Day (l/per/day) 0.0 umber of Time/Area Di umber of Real Time Co Data Type Point Cv (Summer) 0.750 Cv (Winter) 0.840 a00.0 ement (Extended) ON OFF OFF	00 00 00 00 agrams 0
Return	Period(s) (years Climate Change (%)	2 0	charged Flooded
		st (X) First (Y) First (Z)		
PN Name Storm Peri	iod Change Suro	charge Flood Overflow	Act. (m)	(m) (m ³)
1.000 mh1 15 Summer	2 +0%		4.615	-0.080 0.000
1.001 mh2 15 Summer 2.000 mh3 15 Summer	2 +0% 2/15 2 +0%	Summer	4.415 4.563	0.011 0.000 -0.079 0.000
2.001 mh4 15 Summer	2 +0% 2/15	Summer	4.420	0.003 0.000
	2 +0%		4.359	-0.040 0.000
3.000 mh5 15 Summer				
3.000 mh5 15 Summer 1.002 mh6 15 Winter	2 +0% 2/15	Summer	4.341	0.304 0.000

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EAS Transport					DUTORT]	Page 1
Unit 23, The		gs			EXISTI							
Stanstead Abb		0			AREA 1							
Hertfordshire												Micro
Date 09/09/20					-	ed by EAS						Drainage
File Area 1 H	Existin	g Netv	vork.MD	Х	Checke							brainage
Innovyze					Networ	k 2020.1.3	8					
<u>30 year Ret</u> Number	Manhole H Foul Se of Input er of Onl FEH	Areal Hot Headlos ewage p : Hydro ine Co Rain: Rainfa Site	Reductio Hot Star Start Le s Coeff er hecta graphs (ntrols (fall Mod 11 Versi e Locati or Flood	on Facto: ct (mins evel (mm (Global are (1/s) Number) Number <u>Synt</u> el on on GB 62 ! Risk Wa Analysi Iner	Ltical R Simulatio r 1.000) 0) 0.500 F) 0.000 er of Off of Stora chetic Rai 23065 3093 arning (mm s Timeste DTS Statu DVD Statu	esults by <u>n Criteria</u> Additional MADD Fa low per Pers line Control ge Structure <u>nfall Detai</u> 383 TG 23065 <u>1)</u> p 2.5 Secon 15 15	Maxir Flow actor I son pe .s 0 N es 0 N ls FEF 2013 09383 d Incr	- % of * 10m ³ , nlet Co r Day fumber umber 1 Dat 3 Cv (S 3 Cv (W rement	Total /ha St peffie (l/per of Tim of Rea a Type ummer; inter; (Exter and W:	Flow orage cient /day) me/Are ll Tim e Poin 0 0.7 0 0.8 300.0 nded) ON OFF OFF	0.000 0.000 0.800 0.000 ea Diag ne Cont)) grams O
US/MH PN Name		turn P Cl Ret	eriod(s)	(years) ange (%) mate Fi		60, 120, 24 First (Y) Flood	Fir	st (Z)		30 0 Elow		Surcharged Depth (m)
1.000 mh1	. 15 Wint	or	30	+08 30/	15 Summer						5.508	0.813
	2 15 Wint 2 15 Wint		30 30			30/15 Summe	er				5.510	
2.000 mh3	8 15 Wint	er	30	+0% 30/	15 Summer	30/15 Summe	er				5.511	0.869
	15 Wint 15 Wint		<mark>30</mark> 30			30/15 Summe	er				5.510	
	5 15 Wint 5 15 Wint				15 Summer 15 Summer						5.458 5.332	
	PN 1.000 1.001 2.000 2.001 3.000 1.002	US/MH Name mh1 mh2 mh3 mh4 mh5 mh6	Flooded	Flow / Cap. 0.80 1.03 0.78 1.12 0.66	Overflow (l/s)	Half Drain Time (mins)	Flow (1/s) 15.0 20.4 14.6 21.0 12.4	I	RISK FLOOD FLOOD FLOOD RISK	Leve Excee		

EAS Tran	sport	Plann	ing								1	Page 1
nit 23,	The	Malting	gs			EXIST	ING					
tanstea	d Abb	otts				AREA	1					
ertford	lshire	, SG12	8HG									Micro
ate 09/	09/20	22 20:2	29			Desig	ned by EAS					Desinar
ile Are	ea 1 E	xisting	g Netv	work.MI	X	Check	ed by					יטרמורומע
nnovyze	è.					Netwo	rk 2020.1.	3				
<u>30 yea</u>	r Ret	urn Per	iod S	Summary	of (Critical	Results by	Maxim	uum Outfl	ow (R	ank 1)) for Sto
	М	anhole H	Hot eadlos	Hot Sta Start L s Coeff	rt (mi evel ((Glob	tor 1.000 .ns) 0 .mm) 0	on Criteria Additional MADD F Flow per Per	actor I	* 10m³/ha S hlet Coeffi	Storag Lecien	e 0.000 t 0.800)
Ν		-	-				fline Contro age Structur				-	-
						ynthetic R	ainfall Deta					
		ו נוסיס		fall Moc 11 Versi				FEH	Data Ty Cv (Summe	-		
		FEH 1				623065 30	9383 TG 23065					
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					Allaı	DTS Sta	-	ia inci	ement (Ext	ON		
						DVD Sta	tus			OFF	,	
					I	nertia Sta	tus			OFF	•	
	US/MH	Re	turn P Cl	eriod(s) imate Ch) (yea nange	rs)	, 60, 120, 2 [,] First (Y		, 400, 500 st (Z) Ove	30 45	Water	Surcharged Depth
PN	Name	Storm	Per	iod Cha	ange	Surcharge				ct.	(m)	(m)
1.000	mh1	15 Wint	er	30	+45% 3	30/15 Summe	er 30/15 Summ	er			5.516	0.821
1.001		15 Wint					er 30/15 Summ				5.512	
2.000		15 Wint					er 30/15 Summ				5.516	
2.001 3.000		15 Wint 15 Wint					er 30/15 Summ er 30/15 Summ				5.512 5.512	
1.002		15 WINC 15 Summ				30/15 Summe		IET			5.413	
				Flooded			Half Drain	-				
		PN	US/MH Name	Volume (m³)	Flow Cap	/ Overflo . (1/s)	w Time (mins)	Flow (l/s)	Status	Lev Exce		
			manie		-	. (1/0)	(beacab	2		
		1.000	mh1	5.923				21.9	FLOOD		4	
		1.001 2.000	mh2 mh3	1.917 5.847				22.1 23.0	FLOOI FLOOI		5 6	
		2.000	mh4	2.007				23.1	FLOOD		5	
		3.000	mh5	1.693				16.7	FLOOD)	4	
		1.002	mh6	0.000) 3.	44		60.9	FLOOD RISH	t		

nit 23,		Planni	-							P	age 1
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ile Area	a 1 E:	xisting	Networ	k.MDX	Ch	necked by	7				Urun luc
nnovyze					Ne	etwork 20	20.1.3				
<u>100 yea</u>	<u>r Ret</u>	urn Per	iod Sur	nmary o	f Critio	<u>pal Resu</u>	lts by M	aximum Ou	atflow (R	ank 1)	for Sto
		7	Vroal Roy	duction		lation Cr		ow - & of	Total Flow	0 000	
		1.							ha Storage		
			Hot Sta	art Level	l (mm)	0		Inlet Co	effiecient	0.800	
	Ma						per Person	per Day (l/per/day)	0.000	
		roul Sew	age per	nectare	(l/s) 0.	000					
									of Time/Are of Real Tim		
					Syntheti	ic Rainfal	l Details				
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		FEH R	ainfall Site L		GB 623065	5 309383 т			ummer) 0.75 inter) 0.84		
			DICC 1	Ocación	00 020000	, 505505 1	0 20000 0	5505 CV (W.	111001) 0.04	10	
		Mar	gin for		lsk Warnir				300.0		
				An	-	-	5 Second	Increment			
						Status Status			ON OFF		
					Inertia				OFF		
				Profi	lle(s)			Summer a	and Winter		
						, 30, 60,	120, 240,	360, 480,			
		Ret		od(s) (y te Chang					100		
			CIIIId	te chang	je (%)				0		
										Water	Surcharge
U	JS/MH		Return	Climate	First	(X) F	irst (Y)	First (Z)	Overflow	Level	Depth
PN N	Name	Storm	Period	Change	Surcha	rge	Flood	Overflow	Act.	(m)	(m)
1.000	mh1 1	15 Winter	100	+0%	100/15 s	ummer 100	/15 Summer	2		5.514	0.81
1.001		15 Winter					/15 Summer			5.511	1.10
2.000		15 Winter					/15 Summer			5.515	0.87
2.001		5 Winter					/15 Summer			5.511	1.09
3.000 1.002		15 Winter 15 Winter			100/15 S 100/15 S		/15 Summer			5.511 5.394	1.11
1.002		MINCEL	100	TU TO	100/1J D	CHING F				5.594	1.30
			Fl	ooded		Half	Drain Pi	lpe			
		τ			low / Over			Low	Leve	el	
		PN	Name	(m³) C	Cap. (1	/s) (n	nins) (l	/s) Stat	us Excee	ded	
								0.6 F	1.000	4	
		1.000	mh1	4.270	1.09		2	0.0	LOOD	4	
		1.000			1.09 1.11				LOOD	4	
		1.001 2.000	mh2 mh3	1.196 4.577	1.11 1.14		2 2	1.9 F 1.1 F	LOOD LOOD	4 5	
		1.001	mh2 mh3 mh4	1.196 4.577 1.272	1.11		2 2 2	1.9 F 1.1 F 2.8 F	LOOD	4	

EAS Tra	nspor	t Plann	ing								P	age 1
		Maltin	-			EXISTI	NG					
Stanste			2			AREA 1						
Hertfor	dshir	e, SG12	8HG									Micco
		022 20:				Design	ed by EAS					MICIO
				ork MD	v	Checke	-					Drainage
		Existin	y Netw	JIK.MD.	Δ		а Бу k 2020.1.3	>				
Innovyz	e					Networ	K 2020.1.3	>				
100 ve	ar Re	turn Pe	riod S	ummarv	of Cr	itical B	esults by	Maxir	num Outf	low (R	ank 1)	for Storm
<u> 100 J</u>			1100 0	annina 1 j	01 01	101041		11011111		2011 (11	um 1)	101 00011
					-		n Criteria					
							Additional					
					t (mins) vel (mm)	0	MADD Fa		* 10m³/ha nlet Coeff	2		
		Manhole H					low per Pers					
					(010541) re (1/s)		Por rore	PCI	1 (±/P	,		
			-									
		-		-			line Control				-	
	Numb	er of Onl	ine Con	urois ()	Number	oi Stora	ge Structure	es U Ni	unper of R	eai Tim	le Conti	OIS U
					Synt	hetic Rai	nfall Detai	ls				
				all Mode	el			FEH	Data Ty	rpe Poir	nt	
		FEH	Rainfal			0005 005	00 = 00005		Cv (Summe			
			Site	Locatio	on GB 62	3065 3093	83 TG 23065	09383	Cv (Winte	er) 0.84	40	
		Ма	rgin fo	r Flood	Risk Wa	rning (mm	.)			300.0		
			2				p 2.5 Secon	d Incr	ement (Ext	ended)		
						DTS Statu				ON		
						DVD Statu				OFF		
					Iner	tia Statu	.5			OFF		
			D		ofile(s)		CO 100 04		ummer and			
		Re			(mins) (vears)		60, 120, 24	0, 360	, 480, 960	100		
		1.0			ange (%)					45		
											Water	Surcharged
	US/MH		Retur	n Clima	te Fi	rst (X)	First (Y)) Fi	rst (Z) Ov	erflow		-
PN	Name	Storm	Peric	d Chang	ge Su	rcharge	Flood		erflow	Act.	(m)	(m)
1.000	mh 1	15 Winte	er 10	V L U	58 100/	15 Summer	100/15 Sumr	nor			5.519	0.824
1.000		15 Winte					100/15 Sum 100/15 Sum				5.519	1.111
2.000		15 Winte					100/15 Sumr				5.519	0.877
2.001		15 Winte					100/15 Sumr				5.515	1.098
3.000		15 Winte					100/15 Sumr	ner			5.514	1.115
1.002	mh 6	15 Summe	er 10	∪ +4	J\$ 100/	15 Summer					5.458	1.421
				looded			Half Drain	-		-		
		747				Overflow	Time (ming)	Flow	St	Leve		
		PN	Name	(m³)	Cap.	(1/s)	(mins)	(1/s)	Status	Excee	uea	
		1.000	mh1	9.165	1.18			22.2	FLOO	C	6	
		1.001	mh2	4.581	1.13			22.3	FLOO		6	
		2.000	mh3	9.085				23.3	FLOO		7	
		2.001 3.000	mh4 mh5	4.680 4.242	1.24 0.97			23.3 18.2	FLOO FLOO		<mark>6</mark> 6	
		1.002	mh 6	0.000	3.49				FLOOD RIS		0	

EAS Transport P	lanning										Page 1
Unit 23, The Ma	ltings				EXISTI	NG					
Stanstead Abbott	.s				AREA 2						
Hertfordshire, S	SG12 8H	G									Micro
Date 09/09/2022	20:52				Design	ed by	Drainage				
File Area 2 Exis	sting Ne	etwork	.MDX		Checke	ed by					Diamage
Innovyze					Network 2020.1.3						
			Fall				k		-	stem 1 Section Type	
	* 1.000	19.000	0.320	59.4	0.042	3.00	0.600	0	150	Pipe/Conduit	
	* 2.000	12.000	0.380	31.6	0.042	3.00	0.600	0	150	Pipe/Conduit	
	* 1.001	10.000	0.250	40.0	0.041	0.00	0.600	0	150	Pipe/Conduit	
	PI	us/M	H US/C	L US/I	l US	DS/C	L DS/II	LD	S	Ctrl US/MH	

* 1.000 mh1 4.060 3.220 0.690 4.000 2.900 0.950

* 2.000 mh2 3.980 3.280 0.550 4.000 2.900 0.950

* 1.001 mh3 4.000 2.900 0.950 5.500 2.650 2.700

1200

1200

1200

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 2	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 20:52	Designed by EAS	Drainage
File Area 2 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	Conr	MH Nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	4.060	0.840	Open	Manhole	1200	1.000	3.220	150				
mh2	3.980	0.700	Open	Manhole	1200	2.000	3.280	150				
mh3	4.000	1.100	Open	Manhole	1200	1.001	2.900	150	1.000	2.900	150	
									2.000	2.900	150	
	5.500	2.850	Open	Manhole	0		OUTFALI	J	1.001	2.650	150	

No coordinates have been specified, layout information cannot be produced.

EAS Transport Planning	Page 3
Unit 23, The Maltings	EXISTING
Stanstead Abbotts	AREA 2
Hertfordshire, SG12 8HG	Micro
Date 09/09/2022 20:52	Designed by EAS
File Area 2 Existing Network.MDX	Checked by
Innovyze	Network 2020.1.3
PIPELIN	E SCHEDULES for Storm
U	pstream Manhole
PN Hyd Diam MH C.Leve Sect (mm) Name (m)	l I.Level D.Depth MH MH DIAM., L*W (m) (m) Connection (mm)
1.000 o 150 mh1 4.060	0 3.220 0.690 Open Manhole 1200
2.000 o 150 mh2 3.980	0 3.280 0.550 Open Manhole 1200
1.001 o 150 mh3 4.000	0 2.900 0.950 Open Manhole 1200
Dor	wnstream Manhole
PN Length Slope MH C.Lev (m) (1:X) Name (m)	-
1.000 19.000 59.4 mh3 4.0	000 2.900 0.950 Open Manhole 1200
2.000 12.000 31.6 mh3 4.0	000 2.900 0.950 Open Manhole 1200
1.001 10.000 40.0 5.5	00 2.650 2.700 Open Manhole 0
Free Flowing	Outfall Details for Storm
Outfall Outfall Pipe Number Name	C. Level I. Level Min D,L W (m) (m) I. Level (mm) (mm) (m)
1.001	5.500 2.650 0.000 0 0
Simulati	lon Criteria for Storm
Volumetric Runoff Coeff	0.750 Additional Flow - % of Total Flow 0.000
Areal Reduction Factor	
Hot Start (mins) Hot Start Level (mm)	0 Inlet Coeffiecient 0.800 0 Flow per Person per Day (l/per/day) 0.000
Manhole Headloss Coeff (Global)	
Foul Sewage per hectare (l/s)	0.000 Output Interval (mins) 1
	r of Offline Controls 0 Number of Time/Area Diagrams 0 of Storage Structures 0 Number of Real Time Controls 0
Synthe	tic Rainfall Details
Rainfall Model	FEH E (1km) 0.310
Return Period (years)	1 F (1km) 2.498
FEH Rainfall Version Site Location GB 622800 3	1999 Summer Storms Yes 309650 TG 22800 09650 Winter Storms No
Site Location GB 622800 S C (1km)	-0.024 Cv (Summer) 0.750
D1 (1km)	0.275 Cv (Winter) 0.840
D2 (1km)	0.370 Storm Duration (mins) 30
D3 (1km)	0.255

AS Transport Plan nit 23, The Maltin tanstead Abbotts ertfordshire, SG12 ate 09/09/2022 20 ile Area 2 Existin nnovyze	ngs									Page	4
tanstead Abbotts ertfordshire, SG12 ate 09/09/2022 20 ile Area 2 Existin				DUTO							1
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ile Area 2 Existin										Mi	cro
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nnouvze	ng Net	work.N	1DX		ked by						
ппо у де				Netw	ork 2020.	1.3					
Foul S Number of Inpu Number of Or Ra M	Areal Hot Headlos Sewage p at Hydro line Co linfall N R Margin f Du Seturn P	Reduct Hot St Start ss Coef per hec ographs ntrols Model egion 1 for Flo	ion Fac art (m: Level f (Gloł tare (1 0 N 0 Num <u>S</u> England od Risk Anal I Profile (s) (mi	Simulat ctor 1.000 ins) 0 (mm) 0 bal) 0.500 l/s) 0.000 umber of 0 oer of Sto Synthetic 1 FSF and Wales Warning ysis Times DTS Sta DVD Sta nertia Sta e(s) ns) 15, 36 rs)	ion Criter. Additio MAD Flow per f ffline Cont rage Struct Rainfall De M5-60 (mm Ratio (mm) step 2.5 Se atus	<u>ia</u> nal Flor D Facto Person y trols 0 tures 0 etails) 20.00 R 0.40 econd Ir	w - % c r * 10m Inlet per Day Number Number 0 Cv (5 Cv () screment	of Total ³ /ha St Coeffie (1/per c of Tim c of Rea Summer) Winter) 3 t (Exter r and Wi	Flow orage cient /day) e/Are 1 Tir 0.75 0.84 300.0 nded) ON OFF OFF	v 0.000 = 0.000 = 0.800 0 0.000 = Diagrams me Controls 50 10	0
US/MH PN Name Storm					irst (Y) F Flood (flow Le	evel	Surcharged Depth (m)	Flooded Volume (m³)
1.000 mh1 15 Summ	ler	1	+0읭					3.	280	-0.090	0.000
2.000 mh2 15 Summ	ner	1	+0%					3.	331	-0.099	0.000
1.001 mh3 15 Summ	ner	1	+0%					2.	999	-0.051	0.000
	PN 1.000 2.000 1.001	US/MH Name mh1 mh2 mh3	Flow / Cap. 0.32 0.24 0.74		Half Drain Time (mins)	Flow	Status OK OK OK				

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EAS Tra	-			-				EVIC									Page	5
Unit 23				S					STING									
Stanste			-	0.17.0				AREA	A Z									
Hertfor		,						<u> </u>									— Mi	CL0
Date 09									.gned	-	EAS						Dr	ainago
File Ar		Exis	sting	Net	work.	MDX			cked b									J
Innovyz	е							Netw	ork 2	020	.1.3							
Innovyz <u>2 ye</u> a	e ar Ret Number Numbe US/MH Name mh1 mh2	Urn Manho Fou of 1 er of 15 S 15 S	Peri Peri Peri Peri Rain Rain Rain Mar Ret	.od S Areal Hot eadlos wage F Hydro ne Co fall F R fall F R G I Uurn P Cl Retu Peri	ummar Reduct Hot St Start ss Coes ber her ographs ontrols Model egion for Flo ratior eriod imate urn Cl: .od Ch 2 2 2	Ty of tion F tart (Level ff (Gl ctare s 0 s 0 Nu Englar Dod Ris And Drofi: (s) (y (change to (s) (y (change +0% +0% +0% +0% +0%	Crit: Si actor mins) (mm) obal) (1/s) Number mber of Synth ad and sk War alysis D Inert le(s) nins) ears) e (%) First Surcha	Netw ical imula 1.000 0.500 0.000 c of c f Sto etic FS Wale ning Time TS St VD St ia St 15, 3 (X) :	Time terms of the second secon	ts <u>riter</u> ditic MAI per c Cor ctruc ll D 0 (m atio .5 S 120 (Y) 1 1	by M cia bnal H DD Fac Perso atrols ctures etail m) 20 R 0 econd , 240 First Overf n Pij Flo (1/	Flow ctor on p s 0 0.405 1 Inc 1 Inc (Z) Flow	- % * 10 Inlet er Da Numbe Numbe O Cv 5 Cv 5 Cv 5 Cv 5 Cv 5 Cv 5 Cv 5 Cv 5	of Tc m ³ /ha Coef y (l/ er of (Summ (Wint at (E: er and 30, 9 cflow st.	<pre>tal Fl Stora fiecie per/da Time/A Real T er) 0.4 area) 0.4 ar</pre>	ow 0 ge 0 nt 0 y) 0 rea : ime 7 340 0 340 0 340 0 340 0 340 0 340 2 0 2 0 5 2 0 5 2 0 2 0 5 2 0 0 2 0 0 340 34	.000 .800	Flooded Volume (m ³) 0.000 0.000
				2.000	mh2).1		K				
				1.001	mh3	0.9	96				24	1.1	0	K				

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nit 23, The	-				ISTING					
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ile Area 2	Existing	Networ	k.MDX	Che	ecked by					
nnovyze				Net	work 2020	0.1.3				
<u>2 year Ret</u>	urn Peric	d Summ	nary of	Critica	l Results	by Maxi	.mum Out	flow (Ra	nk 1) for	stor
		Hot	: Start	Simul Factor 1.0 (mins) 1 (mm)		ional Flov	r * 10m³/	Total Flow ha Storage	0.000	
:	Manhole Hea	dloss C	Coeff (G	. ,	00 Flow per	r Person p				
	-		-		Offline Co torage Stru				2	
					c Rainfall					
			l Model Version					(1km) 0.2 (1km) 0.3		
				GB 622800	309650 TG					
			C (1km)					ummer) 0.7		
			1 (1km)			0.2		inter) 0.8	40	
		D.	2 (1km)			0.3	70			
	Marg	in for		isk Warning	-			300.0		
			Ar	-	nestep 2.5	Second In	crement			
					Status Status			ON OFF		
				Inertia S				OFF		
			Prof:	ile(s)			Summer	and Winter		
		Durat	ion(s)	(mins) 15,	30, 60, 12	0, 240, 3	60, 480,	960, 1440		
	Retu		od(s) (j	-				2		
		Clima	te Chang	je (%)				0		
US/MH		Return	Climate	First (X)	First (Y)	First (Z	Overflo		Surcharged Depth	Floode
PN Name				Surcharge		Overflow		(m)	(m)	(m³)
	15 Summer	2	+0%					3.291	-0.079	0.00
1.000 mh1			+0%					3.341	-0.089	0.00
	15 Summer	2						J.J.I		
2.000 mh2	15 Summer 15 Summer	2	+0%					3.030	-0.020	0.00
2.000 mh2									-0.020	0.00
2.000 mh2		2	+0%		Half Dra	-		3.030	-0.020	0.00
2.000 mh2	15 Summer	2 US,	+0% /MH Flow	w / Overflo	ow Time	Flow	Statue	3.030 Level	-0.020	0.00
2.000 mh2	15 Summer	2 US,	+0%	w / Overflo	ow Time	Flow	Status E	3.030 Level	-0.020	0.00
2.000 mh2	15 Summer	2 US, PN Na .000 r	+0% /MH Flow me Cap mhl 0.	w / Overflo p. (l/s) .44	ow Time	Flow (1/s) 9.5	OK	3.030 Level	-0.020	0.00
2.000 mh2	15 Summer 1. 2.	2 US, PN Na .000 r .000 r	+0% /MH Flow mme Cap mh1 0. mh2 0.	w / Overflo p. (l/s) .44 .33	ow Time	Flow (1/s) 9.5 9.5	OK OK	3.030 Level	-0.020	0.00
2.000 mh2	15 Summer 1. 2.	2 US, PN Na .000 r .000 r	+0% /MH Flow mme Cap mh1 0. mh2 0.	w / Overflo p. (l/s) .44	ow Time	Flow (1/s) 9.5	OK	3.030 Level	-0.020	0.00
2.000 mh2	15 Summer 1. 2.	2 US, PN Na .000 r .000 r	+0% /MH Flow mme Cap mh1 0. mh2 0.	w / Overflo p. (l/s) .44 .33	ow Time	Flow (1/s) 9.5 9.5	OK OK	3.030 Level	-0.020	0.0(

AS Transport Planning		Page 1
nit 23, The Maltings	EXISTING	
tanstead Abbotts	AREA 2	
ertfordshire, SG12 8HG		Micro
ate 09/09/2022 20:55	Designed by EAS	
ile Area 2 Existing Network.MDX	Checked by	Drainag
nnovyze	Network 2020.1.3	
Hot Start (mir Hot Start Level (m Manhole Headloss Coeff (Globa Foul Sewage per hectare (1/ Number of Input Hydrographs 0 Nur Number of Online Controls 0 Number Sy Rainfall Model FEH Rainfall Version	Simulation Criteria for 1.000 Additional Flow - 5 hs) 0 MADD Factor * 1 mm) 0 Inle al) 0.500 Flow per Person per D (s) 0.000 mber of Offline Controls 0 Num er of Storage Structures 0 Num mthetic Rainfall Details FEH 1999 622800 309650 TG 22800 09650 -0.024 C	% of Total Flow 0.000 10m³/ha Storage 0.000 et Coeffiecient 0.800 Day (1/per/day) 0.000 ber of Time/Area Diagrams 0 ber of Real Time Controls 0
	0.370 Warning (mm) sis Timestep 2.5 Second Increm DTS Status DVD Status ertia Status	300.0 ment (Extended) ON OFF OFF
Return Period(s) (year Climate Change (s) 15, 30, 60, 120, 240, 360, s) %)	30 0 Water Surcharged
US/MH Return Climate PN Name Storm Period Change	First (X) First (Y) First Surcharge Flood Over	(Z) Overflow Level Depth flow Act. (m) (m)
2.000 mh2 15 Winter 30 +0% 30	0/15 Summer 30/15 Summer 0/15 Summer 30/15 Summer 0/15 Summer	4.0600.6903.9800.5503.8770.827
Flooded US/MH Volume Flow	Half Drain Pipe / Overflow Time Flow	Level
DS/MH VOLUME Flow PN Name (m ³) Cap.	·	Level Status Exceeded
1.000 mh1 0.266 0.8 2.000 mh2 0.332 0.6 1.001 mh3 0.000 2.0	0 17.3 3 18.0	FLOOD 2 FLOOD 2 LOOD RISK

AS Transport Planning		Page 1
nit 23, The Maltings	EXISTING	
tanstead Abbotts	AREA 2	
ertfordshire, SG12 8HG		Micro
ate 09/09/2022 20:56	Designed by EAS	Desipar
ile Area 2 Existing Network.MDX	Checked by	Drainag
nnovyze	Network 2020.1.3	
Hot Start (mi Hot Start Level (Manhole Headloss Coeff (Glob Foul Sewage per hectare (1	Simulation Criteria etor 1.000 Additional Flow - % of ns) 0 MADD Factor * 10m mm) 0 Inlet (pal) 0.500 Flow per Person per Day /s) 0.000	f Total Flow 0.000 ³ /ha Storage 0.000 Coeffiecient 0.800 (1/per/day) 0.000
Number of Input Hydrographs 0 Nu Number of Online Controls 0 Numb	umber of Offline Controls 0 Number per of Storage Structures 0 Number	-
S	ynthetic Rainfall Details	
Rainfall Model FEH Rainfall Version Site Location GB C (1km) D1 (1km) D2 (1km)	1999 622800 309650 TG 22800 09650 -0.024 Cv (03 (1km) 0.255 E (1km) 0.310 F (1km) 2.498 Summer) 0.750 Winter) 0.840
In Profile	ysis Timestep 2.5 Second Increment DTS Status DVD Status nertia Status (s) Summer ns) 15, 30, 60, 120, 240, 360, 480 rs)	ON OFF OFF
US/MH Return Climate PN Name Storm Period Change	First (X) First (Y) First (Z Surcharge Flood Overflow	Water Surcharged) Overflow Level Depth w Act. (m) (m)
2.000 mh2 15 Winter 30 +45% 3	30/15 Summer 30/15 Summer 30/15 Summer 30/15 Summer 30/15 Summer	4.063 0.693 3.984 0.554 3.941 0.891
Flooded US/MH Volume Flow		Level
PN Name (m ³) Cap	. (1/s) (mins) (1/s) Sta	atus Exceeded
1.000 mh1 3.157 0.9	98 21.3	FLOOD 4

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	nsport Plan	-			DVTORT	NO				P	age 1
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Innovyze	9				Networ	k 2020.1.	3				
<u>100 ye</u>	ar Return P	eriod S	Summary				Maxim	uum Outi	flow (R	ank 1)	for Storm
		Hot	Hot Star Start Le s Coeff	n Facto t (mins vel (mm (Global	r 1.000) 0) 0) 0.500 F	<u>n Criteria</u> Additional MADD F low per Per	actor * In	10m³/ha let Coef	Storage fiecient	0.000 0.800	
Ν	Number of Inpu Number of On	-								-	
				Synt	chetic Ra:	infall Detai	ils				
			all Mode	-				D3 (1			
	FEH	Rainfal			2000 3000	50 TG 22800	1999		.km) 0.31		
		SILE	C (1kr		22000 3090	50 IG 22000		Cv (Sumn			
			D1 (1kr	,				Cv (Wint	,		
			D2 (1kr	n)			0.370				
	Ν	Margin fo	or Flood		arning (mr s Timeste	n) ep 2.5 Secor	nd Incre	ement (Ex	300.0		
					DTS Stati	-			ON		
				_	DVD Statu				OFF		
				Iner	tia Statu	IS			OFF		
				ofile(s)				ummer and			
	T					60, 120, 24	40, 360,	, 480, 96			
	ŀ	Return Pe	eriod(s) Lmate Cha	-					100		
		011		inge (0)					0		
PN	US/MH Name Storr		rn Clima od Chang		rst (X) rcharge	First (Y Flood	•	st (Z) C erflow	Overflow Act.		Surcharged Depth (m)
1.000	mh1 15 Wint	er 1	00 +	0% 100/	15 Summer	100/15 Sum	mer			4.064	0.694
2.000	mh2 15 Wint					100/15 Sum				3.984	0.554
1.001	mh3 15 Wint	ter 1	00 +	0% 100/	15 Summer					3.946	0.896
			Flooded			Half Drain	Pipe				
				Flow /	Overflow	Time	Flow		Leve	e 1	
	PN	Name	(m³)	Cap.	(1/s)	(mins)	(1/s)	Status			
	1.00	0 mh 1	3.581	0.99			21.5	FLO	סר	4	
	2.00		3.581 4.359	0.99			21.5	FLO		4	
	1.00		0.000	2.15				FLOOD RI		-	

AS Tra	nspor	t Plannir	ng								Page 1
nit 23	, The	Maltings	5		:	EXISTIN	IG				
tanste	ead Ab	botts				area 2					
ertfor	dshir	e, SG12 8	BHG								Micro
ate 09	0/09/2	022 20:58	3		1	Designe	ed by EAS				Desinant
ile Ar	rea 2	Existing	Networ	k.MDX		Checked	l by				Diamag
nnovyz	ze]	Network	2020.1.3				
	Number	A Manhole He Foul Sew of Input H er of Onlin	real Red Hot Sta adloss (age per Hydrogra ne Contr Rainfal	duction f start art Leve Coeff (G hectare aphs 0 cols 0 N l Model	<u>Si</u> Factor (mins) l (mm) lobal) (l/s) Number umber o	mulation 1.000 0 0.500 F1 0.000 of Offl f Storag	<u>Criteria</u> Additional Fl MADD Fact .ow per Person ine Controls e Structures <u>mfall Details</u>	.ow - % c .or * 10m Inlet n per Day 0 Number 0 Number FEH 1	of Total 1 1 ³ /ha Sto: Coeffiec: r (l/per/d c of Time c of Real D3 (1km)	Flow 0.00 rage 0.00 ient 0.80 day) 0.00 /Area Dia Time Con 0.255	00 00 00 00 agrams 0
			Site L D D	C (1km) 1 (1km) 2 (1km) Flood Ri	isk Warr nalysis DI DV	ning (mm)	50 TG 22800 09 -0. 0. 0. 0. 0. 0. 0. 5 5 5	9650 .024 Cv .275 Cv .370	(Summer) (Winter) 30 t (Extend	2.498 0.750 0.840	
PN	US/MH Name		ırn Peri Clima Return		years) ge (%) Firs	15, 30, t (X) harge	60, 120, 240, First (Y) Flood	360, 48	(Z) Overf	440 100 45 Wate	-
1.000		15 Winter					100/15 Summer			4.0	
2.000		15 Winter 15 Summer					100/15 Summer 100/15 Summer			3.9 4.0	
1.001	11110	10 Dummer	100	0°CF (100/10	Cananet	100,10 Dunmer	-		0	0.93
		PN		Flooded Volume (m³)	Flow / Cap.	Overflow (1/s)	-	Flow	Le atus Exce	evel	
					-			• • •			
		1.000	mh1	9.421	1.06			23.0 F	LOOD	5	

EAS Transpo Unit 23, Th Stanstead A Hertfordshi Date 09/09/	ne Malt Abbotts ire, SG	ings	·		EXISTI	NC			Page 1
Stanstead A Hertfordshi	Abbotts ire, SG					цЭ			
	-				area 3				
Date 09/09/		12 8H	IG						Micro
	/2022 2	1:05			Design	ed by	' EAS		Desinado
File Area 3	8 Exist	ing N	letwo	rk	Checke	d by			Drainage
Innovyze					Networ	k 202	0.1.3		
	*				twork D			<u>Storm</u> ide of Sy	ret om 1
		(m)	(m)	(1:X)		mins)	(mm)	SECT (mm)	
	1.000 25 1.001 32					3.00 0.00			9 Pipe/Conduit 9 Pipe/Conduit
	PN	US/MH Name	US/CI (m)	L US/IL (m)	US C.Depth (m)	•	L DS/II (m)		Ctrl US/MH (mm)
	* 1.000 * 1.001) 3.156) 2.900			2.900 2.900		
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EAS Transport Planning		Page 1
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 3	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:10	Designed by EAS	Drainage
File Area 3 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	Coni	MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	5.000	1.844	Open	Manhole	1200	1.000	3.156	225				
mh2	5.000	2.100	Open	Manhole	1200	1.001	2.900	225	1.000	2.900	225	
	5.500	2.600	Open	Manhole	0		OUTFALL		1.001	2.900	225	

No coordinates have been specified, layout information cannot be produced.

Unit 23, The Maltings EXISTING Stanstead Abbotts AREA 3 Hertfordshire, 5612 8HG Date 09/09/2022 21:05 Designed by EAS File Area 3 Existing Network Checked by Innovyze Network 2020.1.3 FIPELINE SCHEDULES for Storm Upstream Manhole PN Hyd Diam MH C.Level I.Level D.Depth MH MH DIM., L*W Sect (mm) Name (m) (m) (m) Connection (mm) 1.000 o 225 mhl 5.000 3.156 1.619 Open Manhole 1200 1.001 o 225 mhl 5.000 2.900 1.875 Open Manhole 1200 Downstream Manhole PN Length Slope MH C.Level I.Level D.Depth MH MH DIM., L*W (m) (1:X) Name (m) (m) (m) Connection (mm) 1.000 55.600 100.0 mh2 5.000 2.900 1.875 Open Manhole 1200 Downstream Manhole PN Length Slope MH C.Level I.Level D.Opeth MH MH DIM., L*W (m) (1:X) Name (m) (m) (m) Connection (mm) 1.000 55.600 100.0 mh2 5.000 2.900 2.375 Open Manhole 1200 Downstream Manhole PI Control (m) (m) (m) (m) (m) 1.001 55.600 100.0 mh2 5.000 2.900 0.000 0 0 Free Flowing Outfall Details for Storm Outfall Outfall C.Level I.Level Min D.L W Pipe Number Name (m) (m) (m) 1.001 5.500 2.900 0.000 0 0 Simulation Criteria for Storm Volumetric Runoff Coeff 0.750 Additional Flow - \$ of Total Flow 0.000 Areal Seduction Factor 1.000 MMD Factor * 10m ³ /hs Storage 0.000 Hot Start (hins) 0 Inlet Coefficient 0.800 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of Dilue Controls 0 Number of Storage Structures 0 Number of D	EAS Transport Planning		Page 3	
Stanstead Abbotts AREA 3 Hertfordshire, SG12 8HG Designed by EAS File Area 3 Existing Network Checked by Tinnovyze Network 2020.1.3 ITTROVYZE PIPELINE SCHEDULES for Storm Upstream Manhole PN Hyd Diam MH C.Level I.Level D.Depth MH MH DIAM., L*M Downstream Manhole PN Hyd Diam MH C.Level I.Level D.Depth MH MH DIAM., L*M On 0 225 mhl 5.000 2.900 1.875 Open Manhole 1200 Downstream Manhole PN Length Slope MH C.Level I.Level D.Depth MH MH DIAM., L*M MI Diam MH C.Level I.Level D.Depth MH DIAM., L*M (m) (1:X) Name (n) (n) Connection (mm) 1.000 25.600 100.0 mh2 5.000 2.900 1.875 Open Manhole 1200 Introductall C.Level I.Level Min D.L W Prece Flowing Outfall Details for Storm Outfall Outfall C.Level I.Level Min D.L W Pipe Number Name (n) (n) I. Level (mn) (mn) I.001 5.500 2.900 0.000 0 Number Conoff Coeff 0.750 Additional Flow -6 of Total Flow 0.000 Number Conoff Coeff 0.750 Additional Flow -6 of Total Flow 0.000 </td <td></td> <td>EXISTING</td> <td></td>		EXISTING		
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Return Period (years) 1 FEH Rainfall Version 1999 Site Location GB 622800 309650 TG 22800 09650 0 C (1km) -0.024 D1 (1km) 0.275 D2 (1km) 0.370 D3 (1km) 0.255 E (1km) 0.310 F (1km) 2.498 Summer Storms Yes Winter Storms No	Rainfall Mode	मनन [/		
FEH Rainfall Version 1999 Site Location GB 622800 309650 TG 22800 09650 C (1km) -0.024 D1 (1km) 0.275 D2 (1km) 0.370 D3 (1km) 0.255 E (1km) 0.310 F (1km) 2.498 Summer Storms Yes Winter Storms No				
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F (1km) 2.498 Summer Storms Yes Winter Storms No				
Winter Storms No	F (1kr	n) 2.498		
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EAS Transport Planning		Page 4
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 3	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:05	Designed by EAS	Desinario
File Area 3 Existing Network	Checked by	Drainage
Innovyze	Network 2020.1.3	

Synthetic Rainfall Details

Cv (Summer) 0.750 Cv (Winter) 0.840 Storm Duration (mins) 30

Jnit 23,		2 Plannir							Page 5
	The	Maltings	3	EXI	ISTING				
Stanstead	d Abb	otts		ARI	ea 3				1
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ate 09/	09/20	22 21:05	5	Des	signed b	y EAS			Desinar
'ile Are	a 3 E	Cxisting	Network.	Che	ecked by				urainay
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<u>l year</u>	Retu	rn Perio	d Summary		<u>ritical B</u> for Stor		y Maxi	mum Out:	flow (Rank
	ole He ul Sew	Hot Hot Star eadloss Co wage per h Number of Number c	Start (min t Level (m eff (Globa ectare (1/ Input Hyd: of Online (cor 1.00 ns) m) al) 0.50 (s) 0.00 rographs Controls	0 M. 0 Flow pe 0 s 0 Number 3 0 Number	ional Flow ADD Factor	* 10m ³ , Inlet Co er Day re Struc rea Dia	/ha Storag beffiecier (l/per/day tures 0 grams 0	ge 0.000 nt 0.800
		Number of	: OIIIIne (Jontrois	0 Number	or Real I	ime Con	trois U	
					Rainfall			0.7	
		Rainf	Eall Model Region			R Rati s Cv (Summ			
		Ν	45-60 (mm)	-		0 Cv (Wint			
								-	
	Mar	gin for Fl	lood Risk Analy	-		Second Inc	rement	300. (Extended	
			Analy	DTS St	-	Second Inc	Temenc	(Excended)	
				DVD St	atus			OF	F
			In	ertia St	atus			OF	F
	Ret	urn Period	Profile(on(s) (min d(s) (year e Change (s) 15, 3 s)	30, 60, 12	:0, 240, 36		and Winte 960, 144 1, 0,	0 2
				imate 1	First (X)	First (Y)	First	(Z) Overi	Water
U	IS/MH		Return Cl						LOW Level
	JS/MH Name				Surcharge	Flood			
PN N	Name	Storm	Period Ch	nange S		Flood			2. (m)
	Name mh1		Period Ch	nange S					:. (m) 3.242
PN N 1.000	Name mh1	Storm 15 Summer	Period Ch	nange S	Surcharge				. (m) 3.242
PN N 1.000	mh1 mh2 1	Storm 15 Summer 15 Winter	Period Ch	nange S	Surcharge /15 Summer		Overf		. (m) 3.242
PN N 1.000 1.001	mh1 mh2 1	Storm 15 Summer 15 Winter	Period Ch 1 1 d Flooded	+0% +0% 1/	Surcharge /15 Summer		Overf		. (m) 3.242
PN N 1.000 1.001	Mame mh1 : mh2 :	Storm 15 Summer 15 Winter Surchargeo	Period Ch 1 1 d Flooded	+0% +0% 1/	Surcharge	Half Drain	Overf Pipe		. (m) 3.242 3.189
PN N 1.000 1.001	Mame mh1 1 mh2 1	Storm 15 Summer 15 Winter Surcharge Depth	Period Cr 1 1 d Flooded Volume (m ³)	+0% +0% 1/ Flow /	Surcharge /15 Summer Overflow	Half Drain Time	Overf Pipe Flow	low Act Status	. (m) 3.242 3.189 Level
PN N 1.000 1.001	Mame mh1 mh2 US/MH Name	Storm 15 Summer 15 Winter Surcharged Depth (m)	Period Cr 1 1 d Flooded Volume (m ³) 9 0.000	+0% +0% +0% 1/ Flow / Cap.	Surcharge /15 Summer Overflow	Half Drain Time	Overf Pipe Flow (l/s) 14.0	low Act Status	<pre>. (m)</pre>
PN N 1.000 1.001	Name mh1 : mh2 : US/MH Name mh1	Storm 15 Summer 15 Winter Surcharge Depth (m) -0.13	Period Cr 1 1 d Flooded Volume (m ³) 9 0.000	<pre>hange \$ +0% +0% 1/ Flow / Cap. 0.29</pre>	Surcharge /15 Summer Overflow	Half Drain Time	Overf Pipe Flow (l/s) 14.0	low Act Status O	<pre>. (m)</pre>
PN N 1.000 1.001	Name mh1 : mh2 : US/MH Name mh1	Storm 15 Summer 15 Winter Surcharge Depth (m) -0.13	Period Cr 1 1 d Flooded Volume (m ³) 9 0.000	<pre>hange \$ +0% +0% 1/ Flow / Cap. 0.29</pre>	Surcharge /15 Summer Overflow	Half Drain Time	Overf Pipe Flow (l/s) 14.0	low Act Status O	<pre>. (m)</pre>
PN N 1.000 1.001	Name mh1 : mh2 : US/MH Name mh1	Storm 15 Summer 15 Winter Surcharge Depth (m) -0.13	Period Cr 1 1 d Flooded Volume (m ³) 9 0.000	<pre>hange \$ +0% +0% 1/ Flow / Cap. 0.29</pre>	Surcharge /15 Summer Overflow	Half Drain Time	Overf Pipe Flow (l/s) 14.0	low Act Status O	<pre>. (m)</pre>
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PN N 1.000 1.001	Name mh1 : mh2 : US/MH Name mh1	Storm 15 Summer 15 Winter Surcharge Depth (m) -0.13	Period Cr 1 1 d Flooded Volume (m ³) 9 0.000	<pre>hange \$ +0% +0% 1/ Flow / Cap. 0.29</pre>	Surcharge /15 Summer Overflow	Half Drain Time	Overf Pipe Flow (l/s) 14.0	low Act Status O	<pre>. (m)</pre>

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EAS Tra	nsport.	Planning	r					F	Page 6
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Stanste		2			REA 3				
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		22 21:05	.0	De	esigned b	V FAS			MICIO
			lotuork		necked by	-			Drainage
		xisting N	letwork.		_				
Innovyz	e			INE	etwork 20	20.1.3			
<u>2 year</u>	Retur	n Period	Summary		Critical for Stor		y Maximu:	m Outfi	low (Rank
	hole Hea oul Sewa	Hot St Hot Start adloss Coes age per hec lumber of I	cart (min. Level (m Ef (Globa ctare (1/ nput Hydr	or 1.0 s) m) 1) 0.5 s) 0.0	0 M 0 00 Flow pe 00 ns 0 Number	ional Flow ADD Factor	* 10m³/ha Inlet Coef er Day (1/j e Structur	Storage fiecient per/day) res 0	e 0.000 0.800
						r of Real T	2		
			ll Model		nd and Wale	<u>Details</u> SR Rati es Cv (Summ 00 Cv (Wint	er) 0.750		
	Marc	gin for Flo	Analys	sis Tir DTS S DVD S		Second Inc	rement (Ex	300.0 tended) ON OFF OFF	
	Reti	Duration arn Period(s) 15, s)	30, 60, 12	20, 240, 36	Summer and 0, 480, 96		
	US/MH	D	oturn Cli	mato	First (V)	First (Y)	First (7)	Owerfl	Water .ow Level
PN	Name		eriod Ch		Surcharge		Overflow		
1.000		5 Summer 5 Winter	2 2	+0% +0%	1/15 Summe	c			3.279 3.238
		Surcharged		[] (Half Drain	-		T 0 1
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (1/s)	Time (mins)	Flow (l/s) S	tatus	Level Exceeded
E. 14	Traine	(111)	()	Cap.	(1/3)	((1/3) 3	cucuo	JACCEUEU
1.000	mh1	-0.102	0.000	0.37			17.8	OK	
1.001	mh2	0.113	0.000	2.35			28.7 SUR	CHARGED	
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EAS Transport Planning		Page 1
Unit 23, The Maltings	EXISTING	-
Stanstead Abbotts	AREA 3	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:06	Designed by EAS	Micro
File Area 3 Existing Network		Drainage
Innovyze	Network 2020.1.3	
	of Critical Results by Maximum Ou 1) for Storm imulation Criteria	tflow (Rank
Hot Start (mins) Hot Start Level (mm)	0 Inlet Coefficci 0.500 Flow per Person per Day (l/per/d	age 0.000 .ent 0.800
Number of Online Con	raphs 0 Number of Storage Structures 0 trols 0 Number of Time/Area Diagrams 0 trols 0 Number of Real Time Controls 0	
	etic Rainfall Details	
Rainfall Mod		
FEH Rainfall Versi Site Locati	on 1999 on GB 622800 309650 TG 22800 09650	
C (1k		
D1 (1k		
D2 (1k		
D3 (1k E (1k		
F (1k	,	
Cv (Summe	r) 0.750	
Cv (Winte	r) 0.840	
D	Timestep 2.5 Second Increment (Extende TS Status	0.0 ed) ON DFF
Inert	ia Status (OFF
Profile(s) Duration(s) (mins) Return Period(s) (years) Climate Change (%)	Summer and Wint 15, 30, 60, 120, 240, 360, 480, 960, 14	
US/MH Return Clima PN Name Storm Period Chang	te First (X) First (Y) First (Z) Ove ge Surcharge Flood Overflow A	Water erflow Level ect. (m)
	0% 0% 2/15 Summer	3.291 3.250
-	Half Drain Pipe ow / Overflow Time Flow ap. (l/s) (mins) (l/s) Statu:	Level s Exceeded
	0.38 18.5 2.45 30.0 SURCHARG	OK GED
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Jnit 23	, The	Maltings		EX	ISTING			(
Stanste	ad Abb	otts		AR	EA 3				1	_
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ate 09	/09/20	22 21:07		De	signed b	y EAS				
'ile Ar	ea 3 E	xisting N	letwork.	Ch	ecked by				Draiı	Idy
nnovyz					twork 20	20.1.3				
<u>30 yea</u>	<u>r Retu</u>	rn Period	Summary		ritical for Stor		oy Maxin	num Outf	low	(Ran
	hole He oul Sew	Hot Start adloss Coe: age per hee	cart (mins Level (mm ff (Global ctare (l/s	or 1.00 s) n) c) 0.50 s) 0.00	0 Mi 0 00 Flow pe: 00	ional Flow ADD Factor I r Person pe	* 10m³/h Enlet Coe er Day (]	a Storage effiecient /per/day	e 0.00 t 0.80	0 0
	ľ		Online Co	ontrol	s O Number	of Storag of Time/A of Real T	rea Diag	rams O		
			Syn	thetic	Rainfall	Details				
		-	ainfall M	odel				EH		
		FEH Rai	nfall Ver				19			
				tion G 1km)	в 622800 3	809650 TG 2	2800 096 -0.0			
			D1 (-0.0			
			D2 (0.3	70		
			D3 (1km)			0.2	55		
				1km)			0.3			
				1km)			2.4			
			Cv (Sum Cv (Win				0.7			
			0.0 (001/			0.0	10		
	Mar	gin for Flc		-	estep 2.5	Second Inc	rement (300.0 Extended) ON		
				DID S				OFF		
			Ine	rtia S	tatus			OFF		
	Retu	Duration urn Period() 15,)	30, 60, 12	20, 240, 36		nd Winter 960, 1440 30 0		
	US/MH Name	Re Storm Pe	eturn Clim eriod Cha		First (X) Surcharge		First Overfl		low 1	ater Level (m)
		5 Summer 5 Winter	30 30)/15 Summe:)/15 Summe:					4.349 4.128
		Surcharged	Flooded		:	Half Drain	Pipe			
	US/MH	Depth			Overflow	Time	Flow		Lev	-
PN	Name	(m)	(m³)	Cap.	(1/s)	(mins)	(1/s)	Status	Excee	eded
		0 0 0 0	0 000	0 00			10 E C			
1.000	mh1	0.968	0.000	0.88			42.0 0	URCHARGED		

EAS Tra	nsport	Planning							Page 1
	, The M			ΕX	ISTING				
	, ad Abbo	-			EA 3				
		SG12 8H	G						1 House
	0/09/202		<u> </u>	De	signed b	VEAS			Micro
	, , .	isting N	otwork		ecked by	-			Drainaq
		ISCING N	etwork.		twork 20				
innovyz	.e			116	CWOIK 20	20.1.5			
<u>30 yea</u>	<u>r Retur</u>	n Period	Summary	1)	for Stor	<u>m</u>	oy Maxi	.mum Out	flow (Ranl
	Ar	eal Reduct	ion Facto		tion Crit	<u>erıa</u> ional Flow	- %of	Total Flo	w 0.000
						ADD Factor			
		Hot Start			0			effiecien	
					-	r Person pe	er Day (l/per/day) 0.000
F	eoul Sewa	ge per hec	tare (1/s) 0.00	0				
		Number of	Online Co	ontrols	s O Number	f of Storag f of Time/A f of Real T	rea Diag	grams O	
			Syn	<u>theti</u> c	Rainfall	Details			
			ainfall M			—		FEH	
			nfall Ver		D 600000 0	309650 TG 2		999	
				tion G 1km)	6 0220UU J	USOSU IG Z	-0.0		
			D1 (,				275	
			D2 (1km)			0.3	370	
			D3 (255	
				1km) 11m)				310 498	
			F (Cv (Sum	1km) mer)				498 750	
			Cv (Win	,				840	
	Marg	in for Flo		is Time	estep 2.5	Second Inc	rement)
				DTS St DVD St				OI OFI	
			Ine	rtia St				OFI	
	Retu	Duration n Period() 15, 1)	30, 60, 12	20, 240, 36		and Winter 960, 1440 30 45))
	S/MH Jame St	Ret orm Per			rst (X) Ircharge	First (Y) Flood	•	t (Z) Ove flow A	Wate rflow Leve .ct. (m)
1.000 1.001	mh1 15 W mh2 15 W				15 Summer 15 Summer	30/15 Summ	ler		5.00 4.81
	S	urcharged Depth		'low /	Overflow	Half Drain Time	Pipe Flow		Level
	US/MU		· · · · · · · · · · · · · · · · · · ·			(mins)		G t - t	
PN	US/MH Name	(m)	(m³)	Cap.	(l/s)	(11111)	(1/5)	Status	Exceeded
PN 1.000	Name	-		-	(1/s)	(11111)	58.6	FLOOI	

TING 3 gned by EAS ted by prk 2020.1.3 Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.(MADD Factor * 10m ³ /ha Storage 0.(Inlet Coefficcient 0.4 Flow per Person per Day (l/per/day) 0.(ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Co tainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 mm) 300.0 tep 2.5 Second Increment (Extended) tus ON	000 000 800 000 iagrams 0
3 gned by EAS ted by prk 2020.1.3 Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.0 MADD Factor * 10m³/ha Storage 0.0 Inlet Coefficcient 0.3 Flow per Person per Day (1/per/day) 0.0 ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Co tainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 mm) 300.0 tep 2.5 Second Increment (Extended) tus ON	Drainage 1) for Storm 000 000 000 000 000 000 000 000 000 000 000
gned by EAS seed by prk 2020.1.3 Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.0 MADD Factor * 10m³/ha Storage 0.0 Inlet Coefficient 0.3 Flow per Person per Day (l/per/day) 0.0 ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Co tainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 mm) 300.0 tep 2.5 Second Increment (Extended) tus ON	Drainage 1) for Storm 000 000 000 000 000 000 000 000 000 000 000
<pre>keed by prk 2020.1.3 Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.0 MADD Factor * 10m³/ha Storage 0.0 Inlet Coefficcient 0.1 Flow per Person per Day (1/per/day) 0.0 ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Co tainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 mm) 300.0 tep 2.5 Second Increment (Extended) tus ON</pre>	Drainage 1) for Storm 000 000 000 000 000 000 000 000 000 000 000
<pre>keed by prk 2020.1.3 Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.0 MADD Factor * 10m³/ha Storage 0.0 Inlet Coefficcient 0.1 Flow per Person per Day (1/per/day) 0.0 ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Co tainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 mm) 300.0 tep 2.5 Second Increment (Extended) tus ON</pre>	Drainage 1) for Storm 000 000 000 000 000 000 000 000 000 000 000
Drk 2020.1.3 Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.0 MADD Factor * 10m³/ha Storage 0.0 Inlet Coefficcient 0.3 Flow per Person per Day (l/per/day) 0.0 ffline Controls 0 Number of Time/Area Dirage Structures 0 Number of Real Time Controls 0 Number of Controls 0.275 (1km) 0.255 (1km) 0.255 (1999) 9650 TG 22800 09650 F (1km) 0.255 (1km) 0.210 (1km) 0.255 (1km) 0.210 (1km) 0.215 (1km) 0.215 (1km) 0.310 (1km) 0.275 (1km) 0.310 (1km) 0.275 (1km) 0.310 (1km) 0.275 (1km) 0.310 (1km) 0.275 (1km) 0.310 (1km) 0.215 (1km)	1) for Storm 000 000 800 000 iagrams 0
Results by Maximum Outflow (Rank ion Criteria Additional Flow - % of Total Flow 0.0 MADD Factor * 10m³/ha Storage 0.0 Inlet Coefficcient 0.3 Flow per Person per Day (1/per/day) 0.0 ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Controls Mainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 300.0 tep 2.5 Second Increment (Extended) ON	000 000 800 000 iagrams 0
ion Criteria Additional Flow - % of Total Flow 0.(MADD Factor * 10m ³ /ha Storage 0.(Inlet Coefficcient 0.8 Flow per Person per Day (l/per/day) 0.(ffline Controls 0 Number of Time/Area D: rage Structures 0 Number of Real Time Co tainfall Details FEH D3 (1km) 0.255 1999 E (1km) 0.310 9650 TG 22800 09650 F (1km) 2.498 -0.024 Cv (Summer) 0.750 0.275 Cv (Winter) 0.840 0.370 mm) 300.0 tep 2.5 Second Increment (Extended) tus ON	000 000 800 000 iagrams 0
tus OFF Summer and Winter 0, 60, 120, 240, 360, 480, 960, 1440 100	
0	
First (Y) First (Z) Overflow Le	ter Surcharged evel Depth n) (m)
	003 1.622 824 1.699
(mins) (1/s) Status Exceeded 60.9 FLOOD 2 106.8 FLOOD RISK	
ne ne	First (Y) First (Z) Overflow Le Flood Overflow Act. (n ner 100/15 Summer 5. Half Drain Pipe ow Time Flow Level (mins) (1/s) Status Exceeded 60.9 FLOOD 2

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-	EXISTIN	G		
		-		
НС				
	Designe	d by FAS		Micro
		-		Drainage
Network.MDX				
	Network	2020.1.3		
real Reduction Hot Start Hot Start Leve adloss Coeff (G age per hectare Nydrographs 0	<u>Simulation</u> Factor 1.000 (mins) 0 1 (mm) 0 lobal) 0.500 Fl (l/s) 0.000 Number of Offl	Criteria Additional Flow MADD Factor In ow per Person per ine Controls 0 Na	- % of Total Flow * 10m³/ha Storage hlet Coeffiecient * Day (1/per/day) umber of Time/Area	0.000 0.000 0.800 0.000 a Diagrams 0
e Controls U N	umber of Storag	e Structures 0 N	umber of Real Time	Controls U
	Synthetic Rair	fall Details		
			, ,	
	CB 622800 30965			
C (1km)	GD 022000 50903			
D1 (1km)				
D2 (1km)		0.370		
Prof: Duration(s) rn Period(s) (<u>y</u>	DTS Status DVD Status Inertia Status (mins) 15, 30, 6 (mains) 15, 30, 6	S	ON OFF OFF ummer and Winter	
			rst (Z) Overflow	Water Surcharged Level Depth (m) (m)
100 ±15%	100/15 Summor	100/15 Summor		5.016 1.635
				4.960 1.835
Flooded US/MH Volume Name (m ³) mh1 15.999 mh2 0.041	<pre>Flow / Overflow Cap. (1/s) 1.66 9.20</pre>	Time Flow (mins) (1/s	w Level 3) Status Exceeded 8 FLOOD 4	
	real Reduction i Hot Start Hot Start Leve adloss Coeff (G age per hectare Hydrographs 0 he Controls 0 N Rainfall Model infall Version Site Location C (1km) D1 (1km) D2 (1km) D2 (1km) d1 (1km) D2 (1km) D2 (1km) d1 (1km) D2 (1km) d1 (1km) D2 (1km) d1 (1km)	EXISTIN AREA 3 HG Designe Network.MDX Checked Network Checked Network Checked Network Checked Network Checked Network Checked Network Checked Network Checked Network Checked Network Checked Network Checked Simulation Checked Hot Start (mins) 0 Hot Start Level (mm) 0 Adloss Coeff (Global) 0.500 Fl age per hectare (1/s) 0.000 Mydrographs 0 Number of Offl he Controls 0 Number of Storag Synthetic Rain Rainfall Model infall Version Site Location GB 622800 30965 C (1km) D1 (1km) D2 (1km) D1 (1km) D2 (1km) Checked DVD Status DVD Status DVD Status DVD Status DVD Status Inertia Status NVD Status DVD Status Inertia Status NVD Status DVD Status Inertia Status Neterio (s) (years) Climate Change Surcharge 100 +45% 100/15 Summer 100 +45% 100/15 Summer 100 +45% 100/15 Summer	EXISTING AREA 3 HG Designed by EAS Network.MDX Checked by Network 2020.1.3 Checked by Network 2020.1.3 Maintail Figure 1000 Control Figure 100 Control	EXISTING AREA 3 HG Designed by EAS Network.MDX Checked by Network 2020.1.3 Lod Summary of Critical Results by Maximum Outflow (Ra Simulation Criteria real Reduction Factor 1.000 Hot Start (mins) 0 MADD Factor * 10m ³ /ha Storage Hot Start Level (mm) 0 Idloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) heg per hectare (1/s) 0.000 Mydrographs 0 Number of Offline Controls 0 Number of Time/Area he Controls 0 Number of Storage Structures 0 Number of Real Time Signthetic Rainfall Details Rainfall Model FEH D3 (lkm) 0.255 Infall Version 1999 E (lkm) 0.316 Site Location GB 622800 309650 TG 22800 09650 F (lkm) 2.491 C (lkm) -0.024 Cv (Summer) 0.751 D1 (lkm) 0.275 Cv (Winter) 0.841 D2 (lkm) 0.370 din for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DTS Status OFF Inertia Status OFF Profile(s) Summer and

EAS Transport Pl	annir	ıg										Page
Unit 23, The Mal	tings	;				EXISTI	NG					
Stanstead Abbott	S					AREA 4						
Hertfordshire, S	G12 8	HG										_ Mi
Date 09/09/2022	21:19)				Design	ed by	EAS				
File Area 4 Exis	ting	Netw	ork.	MDX		Checke	d by					Dr
Innovyze						Networ	k 2020	.1.3				
			E	Existi	ing Ne	etwork	Detail	s for	: Sto	orm		
		* _	Indi	atos 1	nine h	as been	modifie	d outs	ide (of Sw	stom 1	
			THUT	cates j	ртре п	as been	IIIOGITTE	a outs	stue (JI JY.	Sceni I	
	PN	Lon	ort h	F-11	<u>51000</u>	I.Area		ŀ	חענו		Section Type	
	PN		m)		(1:X)		(mins)			(mm)	зесстоп туре	
			-			0.050						
				0.200				0.600			Pipe/Conduit Pipe/Conduit	
				0.690				0.600	0		Pipe/Conduit	
	* 2.00	0 35.	000	0.380	92.1	0.059	3.00	0.600	0	150	Pipe/Conduit	
	* 1.00	3 15.	500	0.155	100.0	0.088	0.00	0.600	0	300	Pipe/Conduit	
		PN 1	US/MH	US/CI	L US/I	L US	DS/CI	L DS/II	L 1	os	Ctrl US/MH	
			Name	•	(m)		:h (m)	(m)		epth	(mm)	
						(m)			(m)		
	* 1	.000	mh1	3.800	3.12	0 0.53	30 3.920) 2.92(0 0	.850	1200	
	* 1	.001		3.920			50 3.300			.370	1200	
	* 1	.002	mh3	3.300	2.78	0 0.29	95 3.300	2.090	0 0	.985	1200	
	*)	.000	mh4	3.640) 2 47	0 1 03	20 3.300) 2 090) 1	.060	1200	
	2			5.010	, 2.11	· · · · · 2	20 0.000	2.000		.000	1200	

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 4	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:19	Designed by EAS	Drainage
File Area 4 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	Conr	MH	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes I Invert Level (n	Diameter	Backdrop (mm)
mh1	3.800	0.680	Open	Manhole	1200	1.000	3.120	150				
mh2	3.920	1.000	Open	Manhole	1200	1.001	2.920	150	1.000	2.92	20 150	
mh3	3.300	0.520	Open	Manhole	1200	1.002	2.780	225	1.001	2.78	30 150	
mh4	3.640	1.170	Open	Manhole	1200	2.000	2.470	150				
mh5	3.300	1.210	Open	Manhole	1200	1.003	2.090	300	1.002	2.09	0 225	
									2.000	2.09	0 150	
	5.500	3.565	Open	Manhole	0		OUTFALI		1.003	1.93	35 300	

No coordinates have been specified, layout information cannot be produced.

EAS Transport Plann	ing								Page 3
Unit 23, The Maltin	gs				EXISTING	t			
Stanstead Abbotts					AREA 4				
Hertfordshire, SG12	8HG								Micco
Date 09/09/2022 21:	19				Designed	l by EAS	5		Micro
File Area 4 Existin	a Net.	work.	MDX		Checked	-			urainage
Innovyze	5				Network		. 3		
11110 1 9 2 0						2020.1	• •		
			PIF	PELINE	SCHEDU	LES for	Storm		
				Up	ostream 1	Manhole			
PN	-	Diam (mm)		.Level (m)	I.Level (m)	-		MH DIAM., L*W (mm)	
1.000	0	150	mh1	3.800	3.120	0.530	Open Manhole	1200	
1.001	0	150	mh2				Open Manhole		
1.002	0	225	mh3	3.300	2.780	0.295	Open Manhole	1200	
2.000	0	150	mh4	3.640	2.470	1.020	Open Manhole	1200	
1.003	0	300	mh5	3.300	2.090	0.910	Open Manhole	1200	
				Dow	nstream	Manhol	e		
PN	Length	Slope	e MH	C.Leve	el I.Leve	l D.Deptl	h MH	MH DIAM., L*W	N
	(m)	(1:X)	Name	(m)	(m)	(m)	Connectior	n (mm)	
1.000	8 700	43 5	5 mh2	3 91	20 2.920	0 850	0 Open Manhol	le 1200	n
1.001							0 Open Manhol 0 Open Manhol		
1.002	40.500	58.7	7 mh5	3.30	2.09	0.98	5 Open Manhol	le 1200	C
2.000	35.000	92.1	L mh5	3.30	00 2.090	0 1.06	0 Open Manhol	le 1200	0
1.003	15.500	100.0)	5.50	00 1.93	5 3.26	5 Open Manhol	le (0
		Fre	ee Flo	wing	Outfall	Detail	s for Storn	n	
	-	utfall		fall (C. Level 1		Min D,1		
	Pip	e Numb	er N	ame	(m)	(m)	I. Level (mm (m)	n) (mm)	
		1.0	03		5.500	1.935	0.000	0 0	
			Sim	ulati	on Crite	eria for	Storm		
	701,0000	-ria P	unoff	Cooff	0 750 7	ddition		f Total Flow 0.0	000
			tion F					3/ha Storage 0.0	
			tart (0			Coeffiecient 0.	
	Hot	Start	Level	(mm)	0 Flo	w per Pe	rson per Day	(l/per/day) 0.	000
Manhole 1								Time (mins)	60
Foul Se	ewage p	per he	ctare	(⊥/s)	0.000		Output Inte	erval (mins)	1
-	-							of Time/Area D of Real Time C	-
			SZ	nthet	cic Rain:	fall De	tails		
	infall					1	FEH 1	E (1km) 0	
Return Pe FEH Rain	-	-				1	1 999 S	F (1km) 2 Summer Storms	.498 Yes
				2800 3	09650 TG			Vinter Storms	No
		(1km)	2			-0.		Cv (Summer) 0	
		(1km)					275	Cv (Winter) 0	
		(1km)					370 Storm Dui	ration (mins)	30
	D3	(1km)				0.1	255		

C (1km) D1 (1km) D2 (1km) D3 (1km)

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							Mit	
				EAS				inage
g Network	.MDX		4				- Circ	moge
		Netw	vork 2020	1.3				
Areal Redu Hot Star Headloss Co ewage per h : Hydrograp ine Contro nfall Model Regior .rgin for F: Duratio	ction Fact Start (min t Level (m eff (Globa ectare (l/ hs 0 Numbe Syn a England a lood Risk W Analys Ine Profile(s on(s) (mins d(s) (years	Simula or 1.00 s) m) 1) 0.50 s) 0.00 ber of r of St nthetic FS and Wale Varning sis Time DTS St DVD St ertia St s) 15, 3	tion Criter 0 Additic 0 MAI 0 Flow per 0 Offline Con orage Struc Rainfall Dr R M5-60 (mm) estep 2.5 St tatus tatus tatus	ia nal Flow D Factor Person p trols 0 tures 0 etails n) 20.00 R 0.40 econd In	 7 - % of * 10m³/ Inlet Co oer Day of Number of Number of 0 Cv (Su 5 Cv (Wi 5 Cv (Wi crement Summer 	Total Flow Total Flow Pefficcient (1/per/day) of Time/Are of Real Tim mmer) 0.75 nter) 0.84 300.0 (Extended) OFF OFF and Winter	7 0.000 9 0.000 1 0.800 0.000 Pa Diagrams ne Controls 0 0	0
						low Level	Depth	Volume
· 1	+0%					3 188	-0 082	0.000
		Summer						
	+0%							
US/M PN Nam 1.000 mh	HH Flow / C e Cap. 11 0.41 12 0.88			Flow	Status F OK OK OK OK	Level	-0.151	0.000
	iod Summa Areal Redu Hot Hot Star Headloss Co ewage per h Hydrograpi ine Contro nfall Model Region rgin for F: Duratic turn Period Climate Return Cl Period Cr 1 1 1 1 US/M PN Nam 1.000 mh 1.001 mh	BHG 19 g Network.MDX iod Summary of Cr. Areal Reduction Factor Hot Start (min. Hot Start Level (min. Example of the start (min. Hot Start Level (min. Nume Cap. 1.000 mh1 0.41 1.001 mh2 0.88	gs EXIS AREA 8HG 19 Desi g Network.MDX Check iod Summary of Critical Simula Areal Reduction Factor 1.00 Hot Start (mins) Hot Start Level (mm) Headloss Coeff (Global) 0.50 wage per hectare (1/s) 0.00 Hydrographs 0 Number of f ine Controls 0 Number of f ine Controls 0 Number of f Region England and Wale rgin for Flood Risk Warning Analysis Time DTS St DVD St Inertia St Profile(s) Duration(s) (mins) 15, 3 turn Period(s) (years) Climate Change (%) Return Climate First (X) Period Change Surcharge 1 +0% 1 +0% 1 +0% 1 +0% US/MH Flow / Overflow PN Name Cap. (1/s) 1.000 mh1 0.41 1.001 mh2 0.88	gs EXISTING AREA 4 8HG 19 Designed by F G Network.MDX Checked by Network 2020. iod Summary of Critical Results 1 Simulation Criter Areal Reduction Factor 1.000 Addition Hot Start (mins) 0 MAD Hot Start Level (mm) 0 Headloss Coeff (Global) 0.500 Flow per Ewage per hectare (1/s) 0.000 Hydrographs 0 Number of Offline Cont Line Controls 0 Number of Storage Struct Synthetic Rainfall De Infall Model FSR M5-60 (mm Region England and Wales Ratio rgin for Flood Risk Warning (mm) Analysis Timestep 2.5 Storage Duration (s) (mins) 15, 30, 60, 120, turn Period(s) (years) Climate Change (%) Return Climate First (X) First (Y) Period Change Surcharge Flood 1 +0% 1 +0%	gs EXISTING AREA 4 8HG 19 Designed by EAS g Network.MDX Checked by Network 2020.1.3 iod Summary of Critical Results by Maxi Simulation Criteria Areal Reduction Factor 1.000 Additional Flow Hot Start Level (mm) O MADD Factor Hot Start Level (mm) O Number of Offline Controls 0 Hydrographs 0 Number of Offline Controls 0 Intertic Rainfall Details Infall Model FSR M5-60 (mm) 20.000 Region England and Wales Ratus DVD Status DVD Status DVD Status DVD Status Inertia Status Profile(s) Duration(s) (mins) 15, 30, 60, 120, 240, 3 Inertia Status DVD Status Inertia Status Inertia Status Inertia Stat	gs EXISTING AREA 4 8HG 19 Designed by EAS g Network.MDX Checked by Network 2020.1.3 iod Summary of Critical Results by Maximum Out Areal Reduction Factor 1.000 Additional Flow - % of Hot Start (mins) 0 MADD Factor * 10m7 Hot Start Level (mm) 0 Inlet Cc ieadloss Coeff (Global) 0.500 Flow per Person per Day (Maximum Cut) wage per hectare (1/s) 0.000 : Hydrographs 0 Number of Storage Structures 0 nfall Model FSR M5-60 (mm) 20.000 Cv (Su Region England and Wales Ratio R Manalysis Timestep 2.5 Second Increment DTS Status DVD Status Inertia Status VD Status Inertia Status Profile(s) Summer 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0% 1 +0%	gs EXISTING AREA 4 8HG 19 Designed by EAS g Network.MDX Checked by Network 2020.1.3 iod Summary of Critical Results by Maximum Outflow (Ra Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow Hot Start (mins) 0 MADD Factor * 100"/ha Storage Hot Start Level (mm) 0 Inlet Coefficient Haddows Coeff (Global) 0.500 Flow per Person per Day (1/per/day) wage per hectare (1/s) 0.000 Synthetic Rainfall Details rine Controls 0 Number of Storage Structures 0 Number of Real Tir final Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.75 Region England and Wales Ratio R 0.405 Cv (Winter) 0.84 rigin for Flood Risk Warning (mm) 300.0 Analysis Timestep 2.5 Second Increment (Extended) DVD Status DVD Status OFF Inertia Status OFF Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440 1, 2 Climate Change (%) 0, 0 I +0% 2.880 1 +0% 2.8	gs EXISTING AREA 4 8HG IP 19 Designed by EAS Checked by g Network.MDX Checked by Network 2020.1.3 iod Summary of Critical Results by Maximum Outflow (Rank 1) for Simulation Criteria Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000 Hot Start Evel (mm) 0 MADD Factor * 10m ³ /ha Storage 0.000 Hot Start Level (mm) 0 Inlet Coefficient 0.800 Headows Coeff (Global) 0.500 Flow per Person per Day (1/per/day) 0.000 Wade per hectare (1/s) 0.000 Hydrographs 0 Number of Offline Controls 0 Number of Real Time Controls Infall Model FSR M5-60 (mm) 20.000 CV (Summer) 0.750 Region England and Wales Ratio R 0.405 CV (Winter) 0.840 rgin for Flood Risk Warning (mm) 300.0 Manalysis Timestep 2.5 Second Increment (Extended) DTS status DTS Status OFF Inertia Status OFF Profile(s) Summer and Winter Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440 turn Period Change Surcharge Flood Overflow Act. 1 +0% 2.880 -

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ile Area		8HG							Mic	
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Numb	Manhole H Foul Se mber of Input mber of Oni Rai	Areal Re Hot St Headloss ewage per t Hydrogr line Cont nfall Mo Reg	eduction ot Start tart Leve Coeff (G r hectare raphs 0 trols 0 N odel rion Engla	Factor 1.00 (mins) 1 (mm) 10bal) 0.50 (1/s) 0.00 Number of State Synthetic	tion Crite O Additi O MA O Flow per O Offline Con orage Strue Rainfall E GR M5-60 (m es Ratic (mm)	ria onal Flo DD Facto Person ntrols (ctures (petails m) 20.0 R 0.4	ow - % of or * 10m ³ Inlet C per Day O Number O Number O Cv (Su 05 Cv (W)	Total Flow /ha Storage oeffiecient (l/per/day) of Time/Are of Real Tin ummer) 0.75 inter) 0.84 300.0	7 0.000 2 0.000 2 0.800 0.000 2a Diagrams ne Controls 0	0
				DTS St DVD St Inertia St	atus			ON OFF OFF		
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US/M PN Name	H	eturn Per Clim Return	ation(s) riod(s) (<u>mate</u> Chang Climate	(mins) 15, 3 years)	First (Y)	First	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Elow Level	Surcharged Depth	Volume
PN Name	H • Storm 1 15 Summer	Return Per Clim Return Period	ation(s) riod(s) (<u>y</u> nate Chang Climate Change +0%	(mins) 15, 3 years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Elow Level	Surcharged Depth (m) -0.070	Volume (m ³)
PN Name 1.000 mh1 1.001 mh1	H • Storm 1 15 Summer 2 15 Summer	Return Per Clim Period c 2 c 2	ation(s) riod(s) (y nate Chano Climate Change +0% +0%	(mins) 15, 3 years) ge (%) First (X)	First (Y) Flood	First	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Elow Level (m) 3.200 3.098	Surcharged Depth (m) -0.070 0.028	Volume (m ³) 0.000 0.000
PN Name 1.000 mh 1.001 mh 1.002 mh	H Storm 1 15 Summer 2 15 Summer 3 15 Winter	Return Period	ation(s) riod(s) (<u>1</u> nate Change Change +0% +0% +0% +0%	(mins) 15, 3 years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Elow Level (m) 3.200 3.098 2.896	Surcharged Depth (m) -0.070 0.028 -0.109	Volume (m ³) 0.000 0.000
PN Name 1.000 mh 1.001 mh 1.002 mh 2.000 mh	H • Storm 1 15 Summer 2 15 Summer	Return Period	ation(s) ciod(s) (y mate Change Change +0% +0% +0% +0% +0%	(mins) 15, 3 years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Slow Level (m) 3.200 3.098 2.896 2.567	Surcharged Depth (m) -0.070 0.028 -0.109 -0.053	Volume (m ³) 0.000 0.000 0.000
PN Name 1.000 mh 1.001 mh 2.000 mh	H Storm 1 15 Summer 2 15 Summer 3 15 Winter 4 15 Summer	Return Per Clim Period c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2	ation(s) riod(s) (y nate Chand Change +0% +0% +0% +0% +0%	(mins) 15, 3 years) ge (%) First (X) Surcharge 2/15 Summer	First (Y) Flood Half Drain	First Overfl Pipe	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Flow Level (m) 3.200 3.098 2.896 2.567 2.263	Surcharged Depth (m) -0.070 0.028 -0.109 -0.053	Volume (m ³) 0.000 0.000 0.000
PN Name 1.000 mh 1.001 mh 2.000 mh	H Storm 15 Summer 2 15 Summer 3 15 Winter 4 15 Summer 5 15 Winter	Return Per Clim Period c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2	ation(s) riod(s) (1) mate Change +0% +0% +0% +0% +0% +0% +0% *0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 2/15 Summer</pre>	First (Y) Flood	First Overfl	360, 480, (Z) Overf	, 960, 1440 1, 2 0, 0 Water Slow Level (m) 3.200 3.098 2.896 2.567	Surcharged Depth (m) -0.070 0.028 -0.109 -0.053	Volume (m ³) 0.000 0.000 0.000
PN Name 1.000 mh 1.001 mh 2.000 mh	H Storm 1 15 Summer 2 15 Summer 3 15 Winter 4 15 Summer 5 15 Winter	Return Per Clim Period c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2 c 2	Climate Change +0% +0% +0% +0% +0% +0% +0% MH Flow / me Cap.	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 2/15 Summer / Overflow (1/s) 3</pre>	First (Y) Flood Half Drain Time	First Overfl Pipe Flow (1/s) 12.7	<pre>360, 480, (Z) Overf .ow Act Status Official Content of the second s</pre>	, 960, 1440 1, 2 0, 0 Water Elow Level (m) 3.200 3.098 2.896 2.567 2.263 Level Exceeded K	Surcharged Depth (m) -0.070 0.028 -0.109 -0.053	Volume (m ³) 0.000 0.000 0.000
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canstea	d Abb	otts				AREA 4					1
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	М	anhole H Foul Se	Areal Hot eadlos wage p	Reductio Hot Star Start Le s Coeff er hecta	on Facto rt (mins evel (mm (Global are (l/s	<u>Simulatio</u> r 1.000) 0) 0.500 F) 0.000	low per Pers	Flow - % of ctor * 10m³ Inlet C con per Day	Total Flc /ha Storag coeffiecier (l/per/day	ow 0.000 ge 0.000 nt 0.800 7) 0.000	
Ν		-	-				line Control ge Structure			-	
		FEH F	Rainfal	fall Mod ll Versi e Locati C (1k D1 (1k D2 (1k	el on on GB 62 m) m)		nfall Detai: 550 TG 22800 -	FEH D. 1999 1		310 498 750	
					Analys	DTS Statı DVD Statı rtia Statı	ep 2.5 Second is is		(Extended Of OF and Winte	N F F	
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PN	US/MH Name	Storm		urn Clin iod Cha		irst (X) urcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.		Surcharged Depth (m)
1.000		15 Summe		2			30/15 Summe	er		3.202	-0.068
1.001		15 Summe		2		15 Summer				3.117	0.047
1.002		15 Winte 15 Summe		2 2		15 Summer 15 Summer	30/15 Summe	er		2.900 2.570	-0.105
1.003		15 Summe 15 Winte		2		15 Summer 15 Summer				2.269	-0.121
		PN	US/MH Name	Flooded Volume (m ³)		Overflow (1/s)	Half Drain Time (mins)	Flow		vel	
			-		-	· · - /	• -•				
					0.56			13.3	OK	3	
		1.000	mh1	0.000				21 7 CUDCU	ARCED		
		1.000 1.001 1.002	mh1 <mark>mh2</mark> mh3	0.000	1.17			21.7 SURCH 35.3	ARGED OK	2	
		1.001	mh2	0.000	1.17 0.55					2	

	00000	Dlame	ina									
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<u>30 yea</u>		lanhole H	Areal Hot Headlos	Reduct Hot St Start Ss Coef	ion Fact art (mir Level (r f (Globa	<u>Simulat</u> cor 1.000 ns) 0 nm) 0	Flow per Per	Flow - actor * In	% of I 10m³/h let Coe	Cotal Flo na Storag effiecien	w 0.000 e 0.000 t 0.800	
Ν		of Input	Hydro	graphs	0 Nui	mber of O	ffline Contro rage Structur				-	
					C t	nthetic 1	Rainfall Deta:	ils				
			Rain	fall Mc		ILLINCULU I	Deta.	FEH	D3	(1km) 0.2	255	
		FEH		ll Vers				1999		(1km) 0.3		
			Sit			622800 30	09650 TG 22800			(1km) 2.4		
				C (1 D1 (1	,					mmer) 0.7 nter) 0.8		
				D1 (1				0.370	00 (111		510	
		114	19111 I	01 1100	Analy	Warning sis Times DTS Sta DVD Sta ertia Sta	step 2.5 Secon atus atus	nd Incre	ement (1	300.0 Extended) OFE OFE	J	
		Re	turn P	ration eriod(s	Profile((s) (min s) (year Change (s) 15, 3 s)	0, 60, 120, 2 [,]			nd Winter 960, 1440 2, 30 0, 0)	
											17 -4	0
	US/MH		Ret	urn Cl	imate	First (X)) First (Y) Firs	st (Z) (Overflow		Surcharged Depth
PN	Name	Storm		iod Ch		Surcharge	•		rflow	Act.	(m)	(m)
					-	-	00/15					
1.000		15 Wint 30 Summ		30 30		0/15 Summ 2/15 Summ	ler 30/15 Summ	ler			3.804 3.749	0.534
1.001		15 Wint		30			ler 30/15 Summ	ler			3.302	
2.000		15 Wint		30		0/15 Summ					3.531	
	mh5	15 Wint	er	30	+0% 3	0/15 Summ	er				2.564	0.174
1.003				F 1- '	d		Half Drain	Pipe				
1.003				Floode				-				
1.003			US/MH		e Flow	/ Overflo	ow Time	Flow		Lev	/el	
1.003		PN	US/MH Name		e Flow Cap.			Flow (l/s)	Statu		vel eded	
1.003			Name	Volum (m³)	Cap.	(1/s)		(1/s)		is Exce	eded	
1.003		1.000	Name mh1	Volum (m ³) 4.22	Cap.	(1/s)		(1/s) 30.5	FL	SOOD		
1.003			Name	Volum (m³)	Cap.	(1/s) 9 0		(1/s) 30.5	FL FLOOD R	SOOD	eded	
1.003		1.000 1.001	Name mh1 mh2	Voluma (m ³) 4.22 0.00	Cap. 2 1.2 0 2.0 3 1.1	(1/s) 9 0		(1/s) 30.5 37.0 71.0	FL FLOOD R	OOD AISK	eded 3	

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	М	anhole H Foul Se	Areal Hot Headlos wage p	Reduct: Hot Sta Start 1 ss Coef: per hect	ion Fact art (min Level (m f (Globa care (l/	<u>Simulatic</u> or 1.000 s) 0 m) 0 1) 0.500 F s) 0.000	n Criteria Additional	Flow - actor * In son per	% of Tot 10m³/ha let Coeff Day (l/p	al Flo Storag iecien er/day	w 0.000 e 0.000 t 0.800) 0.000	
		-	-				ge Structure				-	
					Syı	nthetic Ra	infall Detai	ls				
				fall Mo				FEH	,	cm) 0.2		
		FEH		ll Vers			550 TG 22800	1999	,			
			SIL	e Local C (1		022800 309			F (1) Cv (Summe			
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					Allaly	DTS Stati	-	u incre	ement (Ex	ON		
						DVD Stati				OFF	,	
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		Re	turn P	ration(eriod(s	rofile(s s) (mins) (years Change (s	s) 15, 30, s)	60, 120, 24		ummer and , 480, 960)	Surcharged
	US/MH			urn Cl		First (X)	First (Y)		t (Z) Ove			Depth
PN	Name	Storm	ı Per	riod Ch	ange :	Surcharge	Flood	Ove:	rflow A	Act.	(m)	(m)
1.000	mh1	15 Wint	er	30	+45% 30	/15 Summer	30/15 Summe	er			3.812	0.542
1.001		30 Wint		30		/15 Summer					3.786	0.716
1.002		15 Wint		30			30/15 Summe				3.308	0.303
2.000		15 Wint 15 Wint		30 30		1/15 Summer 1/15 Summer	30/15 Summe	⇒T.			3.642 2.657	1.022 0.267
1.003	mh5											
1.003	mn5	PN	Name	(m³)	e Flow / Cap.	/ Overflow (l/s)	Half Drain Time (mins)	Flow (1/s)	Status	Lev Exce	eded	
1.003	mn 5	1.000	Name mh1	Volume (m ³)	e Flow / Cap. 1 1.43	(1/s)	Time	Flow (1/s) 34.0	FLOO	Exce		
1.003	mn 5	1.000 1.001	Name mh1 mh2	Volume (m ³) 11.94 0.00	Flow / Cap. 1 1.43 0 2.04	(1/s) 3 4	Time	Flow (1/s) 34.0 37.7	FLOO FLOOD RIS	Exce D K	eded 5	
1.003	mn 5	1.000	Name mh1	Volume (m ³) 11.94 0.00 8.05	 Flow , Cap. 1 1.43 0 2.04 9 1.16 	(1/s)	Time	Flow (1/s) 34.0	FLOO	Exce D K D	eded	

יא <u>ר</u> ד	20222	+'	<u> </u>									
		t Planni				DVTOUT	NO				Pa	age 1
		Malting	S			EXISTI						L.
Stanste			o			AREA 4						
		e, SG12										Micro
		022 21:2				-	ed by EAS					Drainage
ile Ar	ea 4	Existing	Netwo	rk.MDX		Checke	-					brainage
nnovyz	е					Networ	k 2020.1.3					
<u>100 ye</u>	ear Re				0	Simulatio	esults by n Criteria Additional					for Storm
		Manhole He	Ho Hot St eadloss	t Start art Leve	(mins) l (mm) lobal)	0 0 0.500 F		ctor * In	10m³/ha s let Coeff:	Storage Lecient	0.000	
1		-		-			line Control ge Structure				-	
					Synt	hetic Rai	nfall Detail	ls				
				ll Model				FEH		m) 0.25		
		FEH R		Version	GB 62	2800 3096	50 TG 22800	1999 09650	E (1k F (1k	m) 0.31 m) 2.40		
				C (1km)	00 02	2000 3090			Cv (Summe			
			Ι	01 (1km)				0.275	Cv (Winte	r) 0.84	10	
			Ι	02 (1km)				0.370				
		Mar	gin for		nalysi	rning (mm s Timeste DTS Statu DVD Statu tia Statu	p 2.5 Second is is	d Incre	ement (Ext	300.0 ended) ON OFF OFF		
		Ret	urn Per		years)		60, 120, 240		mmer and 480, 960			
PN	US/MH Name	Storm		Climate Change		st (X) charge	First (Y) Flood		st (Z) Ov erflow	erflow Act.		Surcharged Depth (m)
		15 Winter	c 100	+0응	100/1	.5 Summer	100/15 Summ	er			3.813	0.543
1.000	mh1					.5 Summer					3.738	0.668
1.000 1.001		60 Summer	r 100									
1.001 1.002	mh2 mh3	60 Summer 15 Winter	r 100				100/15 Summ				3.309	0.304
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter	r 100 r 100	+0%	100/1	.5 Summer	100/15 Summ 100/15 Summ				3.643	1.023
1.001 1.002	mh2 mh3 mh4	60 Summer 15 Winter	r 100 r 100	+0%	100/1							
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter	a 100 a 100 a 100	+0% +0%	100/1	.5 Summer	100/15 Summ	ler			3.643	1.023
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter 15 Winter	f 100 f 100 f 100 f 100 F]	+0% +0%	100/1	.5 Summer .5 Summer	100/15 Summ Half Drain	er Pipe		Leve	3.643 2.670	1.023
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter 15 Winter	f 100 f 100 f 100 f 100 F]	+0% +0% Looded colume FJ	100/1 100/1	.5 Summer .5 Summer Overflow	100/15 Summ Half Drain Time	Pipe Flow	Status	Leve	3.643 2.670	1.023
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter 15 Winter	f 100 100 100 FJ US/MH V Name	+0% +0% Looded olume FJ (m ³) (100/1 100/1 Low / Cap.	.5 Summer .5 Summer	100/15 Summ Half Drain Time	Pipe Flow (l/s)		Excee	3.643 2.670	1.023
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter 15 Winter PN 1.000	f 100 100 100 FJ US/MH V Name mh1 1	+0% +0% Looded olume FJ (m ³) (13.258	100/1 100/1 Low / Cap. 1.44	.5 Summer .5 Summer Overflow	100/15 Summ Half Drain Time	Pipe Flow (l/s) 34.1	FLOOI	Excee	3.643 2.670	1.023
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter 15 Winter PN 1.000 1.001	f 100 100 US/MH V Name mh1 1 mh2	+0% +0% Cooded olume FJ (m ³) (13.258 0.000	100/1 100/1 Low / Cap. 1.44 2.02	.5 Summer .5 Summer Overflow	100/15 Summ Half Drain Time	Pipe Flow (1/s) 34.1 37.5 H	FLOOI FLOOD RISH	Excee	3.643 2.670	1.023
1.001 1.002 2.000	mh2 mh3 mh4	60 Summer 15 Winter 15 Winter 15 Winter PN 1.000	f 100 100 100 FJ US/MH V Name mh1 1	+0% +0% Looded olume FJ (m ³) (13.258	100/1 100/1 Low / Cap. 1.44	.5 Summer .5 Summer Overflow	100/15 Summ Half Drain Time	Pipe Flow (l/s) 34.1	FLOOI	Exceed	3.643 2.670	1.023

EAS Transport P	lanning						Dago 1
Unit 23, The Ma	-		EXISTI	NC			Page 1
Stanstead Abbot	-		AREA 4				
			AREA 4				and the second
Hertfordshire,			Deeim				Micro
Date 09/09/2022				ed by EAS			Drainage
File Area 4 Exi	sting Netwo	ork.MDX	Checke	-			
Innovyze			Networ	k 2020.1.3			
Fo Number of	Areal R H Hot S hole Headloss bul Sewage per Input Hydrogr of Online Cont Rainfa FEH Rainfall Site	eduction H ot Start for cart Level Coeff (GJ r hectare raphs 0 crols 0 Nu ll Model Version Location C (1km) D1 (1km) D2 (1km) c Flood Ri	Simulatio Factor 1.000 (mins) 0 (mm) 0 Lobal) 0.500 F (1/s) 0.000 Number of Off umber of Stora <u>Synthetic Rai</u> GB 622800 3096 sk Warning (mm	n Criteria Additional F: MADD Fact low per Person line Controls ge Structures .nfall Details 550 TG 22800 0 -0 0 0	low - % of Tota cor * 10m³/ha S Inlet Coeffi n per Day (1/pe 0 Number of Ti 0 Number of Re FEH D3 (1kr 1999 E (1kr	<pre>1 Flow 0.00 torage 0.00 ecient 0.80 r/day) 0.00 me/Area Dia cal Time Con n) 0.255 n) 0.310 n) 2.498 c) 0.750 c) 0.840 300.0</pre>	00 00 00 00 agrams 0
	Return Per	tion(s) (ears)	15 15	Summer and W 360, 480, 960,		
US/MH PN Name S		n Climate d Change	First (X) Surcharge	First (Y) Flood	First (Z) Ove Overflow A		-
1.000 mh1 15 1.001 mh2 15 1.002 mh3 15 2.000 mh4 15 1.003 mh5 15	Summer100Winter100Winter100) +45%) +45%) +45%	100/15 Summer 100/15 Summer 100/15 Summer 100/15 Summer 100/15 Summer	100/15 Summer 100/15 Summer 100/15 Summer	r r	3.8 3.9 3.3 3.6 2.8	220.852220.317491.029
			ow / Overflow ap. (l/s)		ipe low ./s) Status	Level Exceeded	
	1.001 mh2	1.641 22.164 9.331	1.45 2.10 1.20 1.79 1.94	3 7 3	44.3 FLOOD 88.8 FLOOD 77.4 FLOOD 82.0 FLOOD 81.5 SURCHARGED	2 6 5	

EAS Transport Planning		Page 1	
Unit 23, The Maltings	EXISTING		
Stanstead Abbotts	AREA 5		
Hertfordshire, SG12 8HG		Micro	
Date 09/09/2022 21:31	Designed by EAS	Desinado	
File Area 5 Existing Network.MDX	Checked by	Drainage	
Innovyze	Network 2020.1.3		
	g Network Details for Storm be has been modified outside of System 1		
-	ope I.Area T.E. k HYD DIA Section Type :X) (ha) (mins) (mm) SECT (mm)		

* 1.000 34.000 0.340 100.0 0.083 3.00 0.600 o 225 Pipe/Conduit * 1.001 25.600 1.100 23.3 0.084 0.00 0.600 o 675 Pipe/Conduit * 1.002 20.000 0.200 100.0 0.084 0.00 0.600 o 675 Pipe/Conduit

(m)

* 1.001 mh2 3.740 1.140 1.925 3.350 0.040 2.635 * 1.002 mh3 3.350 0.040 2.635 5.500 -0.160 4.985

Name (m) (m) C.Depth (m) (m) C.Depth (mm)

1.755 3.740 1.590 1.925

US DS/CL DS/IL DS Ctrl US/MH

(m)

1200 ⊥∠00 1800

1800

PN US/MH US/CL US/IL

* 1.000 mhl 3.910 1.930

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EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 5	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:31	Designed by EAS	Desinano
File Area 5 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	1

MH Name	MH CL (m)	MH Depth (m)		MH Mection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	3.910	1.980	Open	Manhole	1200	1.000	1.930	225				
mh2	3.740	2.600	Open	Manhole	1800	1.001	1.140	675	1.000	1.590	225	
mh3	3.350	3.310	Open	Manhole	1800	1.002	0.040	675	1.001	0.040	675	
	5.500	5.660	Open	Manhole	0		OUTFALL		1.002	-0.160	675	

EAS Transport Planning		Page 3
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 5	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:31	Designed by EAS	MICIO
File Area 5 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	
PIPEI	LINE SCHEDULES for Storm	
	Upstream Manhole	
-	evel I.Level D.Depth MH MH DIAM. m) (m) (m) Connection (mm	
1.000 o 225 mhl 3	.910 1.930 1.755 Open Manhole	1200
	.740 1.140 1.925 Open Manhole	1800
1.002 o 675 mh3 3	.350 0.040 2.635 Open Manhole	1800
	Downstream Manhole	
PN Length Slope MH C. (m) (1:X) Name	-	M., L*W mm)
1.000 34.000 100.0 mh2	3.740 1.590 1.925 Open Manhole	1800
	3.350 0.040 2.635 Open Manhole	1800
1.002 20.000 100.0	5.500 -0.160 4.985 Open Manhole	0
Free Flowi	ing Outfall Details for Storm	
Outfall Outfa	ll C. Level I. Level Min D,L W	
Pipe Number Name		
	(m)	
1.002	5.500 -0.160 0.000 0 0	
C i mu l	ation Chitopia for Storm	
SIMUL	ation Criteria for Storm	
Volumetric Runoff Coe	eff 0.750 Additional Flow - % of Total F	'low 0.000
Areal Reduction Fact		-
Hot Start (mir Hot Start Level (r		
Manhole Headloss Coeff (Globa		- ·
Foul Sewage per hectare (1,	/s) 0.000 Output Interval (mi	ns) 1
	mber of Offline Controls 0 Number of Time/ er of Storage Structures 0 Number of Real	-
Synt	thetic Rainfall Details	
Rainfall Model	FEH E ((1km) 0.310
Return Period (years)	1 F ((1km) 2.498
FEH Rainfall Version	1999 Summer St	
Site Location GB 6228 C (1km)	00 309650 TG 22800 09650 Winter St -0.024 Cv (Sum	orms No umer) 0.750
D1 (1km)		nter) 0.840
D2 (1km)	0.370 Storm Duration (m	nins) 30
D3 (1km)	0.255	

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EAS Tra	-			-					0								Page	4	
Unit 23			-	3					STIN	G									
Stanste								ARE	A 5										
Hertfor																	– Mi	cro	
Date 09									-	d by	EAS							ainage	
File Ar		Exis	sting	Netv	work.	MDX			cked									Jiniage	
Innovyz	е							Net	work	2020	0.1.	3							
Innovyz <u>1 yea</u>	e ar Ret Number Numb US/MH Name mh1 mh2	Manho For of 1 er of St 15 s	Peri A ole He ul Sew Input I f Onlin Rainf Marg	od S real Hot adlos age p Hydro ne Co Sall N Re gin f Du urn P Cl	umman Reduc Hot S Start ss Coe ber he graph ntrol 40del egion or Flo ration eriod imate rn Cl 1 1 1	ry of ttion F tart (Level ff (G) ctare s 0 s 0 Nu Engla ood Ri An Profi n(s) ((s) (y Chang imate hange +0% +0%	Facto (mins lobal (l/s Number <u>Syn</u> nd an sk W alys Ine: le(s mins ears e (% Firs Surc	Net Net <u>Simula</u> r 1.00 r 1.00 0 0.50 0 0.00 c of St thetic thetic r f nd Wal arning is Tim DTS S DVD S rtia S)) 15,) charge	work L Res ation 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Crite Sults Crite Additi MP ow per ine Cc e Stru hfall 1 5-60 (r Ratio 2.5 50, 12 t (Y) ood	by eria ional ADD F r Per ontro o R Seco: 0, 2 Firs Ove	Maxin Flow Cactor Son pe ols 0 1 ils 20.000 0.406 nd Inc 40, 36 st (Z) rflow	- % * 10 Inlet er Day Numbe Numbe Cv Cv Cv Cv Summe Summe Summe Summe	of To m ³ /ha Coef y (1/) r of r of (Summe (Winte Mint (E) at (E) at (E) at (E) at (E) at (E) at (E) at (E)	tal Flo Storac fiecier per/day Time/An Real Ti er) 0.7 er) 0.8 300. tended OF OF d Winte 50, 144 1, 0, Water Level (m) 2.013 1.198 0.144	ow 0. je 0. it 0. it 0. cea D ime C 50 40 0) N F F 0 2 0 Surc D	1) for 000 000 800 000 iagrams ontrols	<u>s Storm</u>	
					US/MH	I Flow	/ 0	verflo	w	Time	E	low		Le	evel				
				PN	Name	Cap	•	(l/s)		(mins)	(1/s) S	Status	s Exc	eeded				
			1	.000	mh1	L 0.	28					13.5	OF	K					
				.001	mh2							23.6	OI						
			1	.002	mh3	30.	06					33.2	Oł	K					
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EAS Transport Planning				TIC				Page	5
Unit 23, The Maltings				TING					
Stanstead Abbotts			AREA	1 5					
Hertfordshire, SG12 8HG			D !		12.0			M	CL0_
Date 09/09/2022 21:31				gned by E	IAS			Dr	ainage
File Area 5 Existing Ne	twork.M	IDX		ked by	1 0				
Innovyze			Netw	ork 2020.	1.3				
Ho Manhole Headl Foul Sewage Number of Input Hyd Number of Online Rainfall Margin	l Reduct: Hot Stat t Start 1 oss Coef: per hect rographs Controls . Model Region E for Floc	ion Fac art (mi Level (f (Glob tare (l 0 Numb 0 Numb <u>S</u> Cngland od Risk Analy In Profile (s) (min	Simulat tor 1.000 ns) (mm) (al) 0.500 /s) 0.000 mber of (per of Sto ynthetic FS and Wale Warning ysis Time DTS St DVD St nertia St (s) ns) 15, 3	tion Criter Additic MAD The Additic MAD The Additic MAD The Addition MAD The Addition MAD The Addition MAD The Addition MAD The Addition MAD The Addition MAD The Additic MAD The Additic MAD	ia nal Flor D Facto Person j trols 0 tures 0 etails n) 20.00 R 0.40	W - % O: r * 10m Inlet (per Day Number Number 0 Cv (S 6 Cv (W .crement	f Total Flo ³ /ha Storag Coeffiecien (1/per/day of Time/Ar of Real Ti Summer) 0.7 Jinter) 0.8 300.((Extended) OFF OFF and Winter , 960, 1440	w 0.000 e 0.000 t 0.800) 0.000 eea Diagrams me Controls 50 40 0 V 7 7	÷ 0
US/MH Re		Change mate Fi	(%) .rst (X) 1				low Level	Surcharged	Flooded Volume (m³)
1.000 mhl 15 Summer	2	+0%					2.026	-0.129	0.000
1.001 mh2 15 Summer	2	+0%					1.210		
1.002 mh3 15 Summer	2	+0%					0.162	-0.553	0.000
PN 1.00 1.00 1.00	Name 00 mh1 01 mh2	Flow / Cap. 0.36 0.02 0.08	Overflow (1/s)	Half Drain Time (mins)	Flow	Status OK OK OK	Level Exceeded		

110 110.	nsport P	lanning						Page 1	
nit 23	, The Ma	ltings		EXI	ISTING				
tanste	ad Abbot	ts		ARE	EA 5				
ertfor	dshire,	SG12 8HG						— Micro	1
ate 09	/09/2022	21:32		Des	signed by EAS				
ile Ar	ea 5 Exi	sting Net	work.MDX	K Che	ecked by			Urain	ar
nnovyz	е			Net	work 2020.1.	3			
<u>2 yea</u>	ar Returr	1 Period S	ummary	of Critica	l Results by	Maximum O	utflow (Rank	1) for St	lori
	Fo	Hot hole Headlos oul Sewage p	Hot Star Start Le ss Coeff per hecta	n Factor 1.0 t (mins) vel (mm) (Global) 0.5 re (l/s) 0.0	0 MADD F 0 00 Flow per Per	Factor * 10m Inlet rson per Day		.000 .800 .000	
			5 1		torage Structur			2	
		FEH Rainfa		el on GB 622800 a) a)	2 Rainfall Deta 309650 TG 2280	FEH D 1999 0 09650 -0.024 Cv (3 (1km) 0.255 E (1km) 0.310 F (1km) 2.498 Summer) 0.750 Winter) 0.840		
		Margin f	or Flood	DTS S	nestep 2.5 Seco Status Status	nd Increment	300.0 (Extended) ON OFF OFF		
		Return P		(years)	30, 60, 120, 2		and Winter , 960, 1440 2, 30 0, 0		
				to First (X)	First (Y) Firs			charged Flo Depth Vol	ode lum
PN	US/MH Name S			ge Surcharge		rflow Act		-	n³)
PN 1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer	2 +					(m) (r -0.126 0	
1.000	Name S mh1 15	Storm Peri Summer Summer	2 + 2 +	ge Surcharge ०%			. (m) 2.029	(m) (r -0.126 0 -0.604 0	0.00 0.00
1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer	2 + 2 +	ge Surcharge	Flood Ove	rflow Act	. (m) 2.029 1.211	(m) (r -0.126 0 -0.604 0).00).00
1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer Summer	2 + 2 + 2 + 2 + US/MH FJ	ge Surcharge 0% 0% 0% Low / Overflc	Flood Ove Half Drain H Dw Time H	rflow Act Pipe Flow	. (m) 2.029 1.211 0.166 Level	(m) (r -0.126 0 -0.604 0).00).00
1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer	2 + 2 + 2 + 2 + US/MH FJ	ge Surcharge 0% 0% 0%	Flood Ove Half Drain H Dw Time H	rflow Act Pipe	. (m) 2.029 1.211 0.166 Level	(m) (r -0.126 0 -0.604 0).00).00
1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer Summer	2 + 2 + 2 + 2 + US/MH FJ Name C	ge Surcharge 0% 0% 0% Low / Overflc	Flood Ove Half Drain H ow Time H (mins) (rflow Act Pipe Flow	. (m) 2.029 1.211 0.166 Level	(m) (r -0.126 0 -0.604 0).00).00
1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer PN 1.000 1.001	2 + 2 + 2 + 2 + US/MH FJ Name C mh1 mh2	<pre>ge Surcharge 0% 0% 0% Low / Overflc Cap. (1/s) 0.37 0.02</pre>	Flood Ove Half Drain H ow Time H (mins) (rflow Act Pipe Flow 1/s) Status 18.3 OK 31.7 OK	. (m) 2.029 1.211 0.166 Level	(m) (r -0.126 0 -0.604 0	m³) 0.00 0.00
1.000	Name S mh1 15 mh2 15	Storm Peri Summer Summer PN 1.000	2 + 2 + 2 + 2 + US/MH FJ Name C mh1 mh2	ge Surcharge 0% 0% Cow / Overflc Cap. (1/s) 0.37	Flood Ove Half Drain H ow Time H (mins) (rflow Act Pipe Flow 1/s) Status 18.3 OK	. (m) 2.029 1.211 0.166 Level	(m) (r -0.126 0 -0.604 0).00).00
1.000 1.001	Name S mh1 15 mh2 15	Storm Peri Summer Summer PN 1.000 1.001	2 + 2 + 2 + 2 + US/MH FJ Name C mh1 mh2	<pre>ge Surcharge 0% 0% 0% Low / Overflc Cap. (1/s) 0.37 0.02</pre>	Flood Ove Half Drain H ow Time H (mins) (rflow Act Pipe Flow 1/s) Status 18.3 OK 31.7 OK	. (m) 2.029 1.211 0.166 Level	(m) (r -0.126 0 -0.604 0).00).00

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nnovyz			Network 2020.1.3		
<u>30 ye</u>		Sin	<u>mulation Criteria</u> 1.000 Additional Flow		ow 0.000
	Hot Start I	Level (mm) E (Global)	0 0.500 Flow per Person p	Inlet Coeffiecier	nt 0.800
	Number of Input Hydrographs Number of Online Controls				-
		Synthe	etic Rainfall Details		
	Rainfall Mo			EH D3 (1km) 0.	
	FEH Rainfall Vers		19 200 309650 TG 22800 096	99 E $(1km)$ 0.	
		TOU GD 0220		JO I (IKIII) Z.	4.50
	C (1	km)		24 Cv (Summer) 0.	750
			-0.0	24 Cv (Summer) 0. 75 Cv (Winter) 0.	
	C (1	km) km) od Risk Warn	-0.0 0.2 0.3	75 Cv (Winter) 0. 70 300.	840
	C (1 D1 (1 D2 (1 Margin for Floo P	km) km) od Risk Warn Analysis DT DV Inerti Crofile(s) s) (mins) 1 (years)	-0.0 0.2 0.3	75 Cv (Winter) 0. 70 crement (Extended OF) OF) Summer and Winter	840 0) N F F F 0 0
PN	C (1 D1 (1 D2 (1 Margin for Floo P Duration(Return Period(s Climate C	km) km) od Risk Warn Analysis DT DV Inerti (vofile(s) s) (mins) 1 (years) Change (%) nate First	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z)	75 Cv (Winter) 0. 70 300. crement (Extended OF OF Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level	840 0) N F F F S urcharged Flood
	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti crofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas</pre>	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z)	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m)	840 0 N F F Surcharged Flood Depth Volum (m) (m ³)
PN 1.000 1.001	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char 0 mhl 15 Summer 30	km) km) od Risk Warn Analysis DT DV Inerti (vofile(s) s) (mins) 1 (years) Change (%) nate First	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z)	75 Cv (Winter) 0. 70 300. crement (Extended OF OF Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level	840 0) N F F Surcharged Flood 0 0 0 Surcharged Flood 1 0 0 0 0 0 0 0 0 0 0 0 0 0
1.000	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char mh1 15 Summer 30 mh2 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti frofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0%</pre>	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z)	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m) 2.135	840 0) N F F Surcharged Flood 0 0 0 0 0 0 0 0 0 0 0 0 0
1.000 1.001	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char mh1 15 Summer 30 mh2 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti crofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0% +0%</pre>	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z)	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m) 2.135 1.256	840 0) N F F Surcharged Flood Depth Volum (m) (m ³) -0.020 0.0 -0.559 0.0
1.000 1.001	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char mh1 15 Summer 30 mh2 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti crofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0% +0%</pre>	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z)	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m) 2.135 1.256	840 0) N F F Surcharged Flood Depth Volum (m) (m ³) -0.020 0.0 -0.559 0.0
1.000 1.001	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char mh1 15 Summer 30 mh2 15 Summer 30 mh3 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti crofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0% +0%</pre>	-0.0 0.2 0.3 Ming (mm) Timestep 2.5 Second In S Status 20 Status 15, 30, 60, 120, 240, 3 (X) First (Y) First (Z) rge Flood Overflow Half Drain Pipe	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m) 2.135 1.256	840 0) N F F Surcharged Flood Depth Volum (m) (m ³) -0.020 0.0 -0.559 0.0
1.000 1.001	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char mh1 15 Summer 30 mh2 15 Summer 30 mh3 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti crofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0% +0% Flow / Over</pre>	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status (X) First (Y) First (Z) rge Flood Overflow Half Drain Pipe Eflow Time Flow	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m) 2.135 1.256 0.263	840 0) N F F Surcharged Flood Depth Volum (m) (m ³) -0.020 0.0 -0.559 0.0
1.000 1.001	C (1 D1 (1) D2 (1) Margin for Floo Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Char 0 mh1 15 Summer 30 mh2 15 Summer 30 mh3 15 Summer 30 mh3 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti rofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0% +0% +0% Flow / Over Cap. (1)</pre>	-0.0 0.2 0.3 Ming (mm) Timestep 2.5 Second In S Status D Status (X) First (Y) First (Z) rge Flood Overflow Half Drain Pipe Flow Time Flow (x) (mins) (1/s)	75 Cv (Winter) 0. 70 300. crement (Extended OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level 7 Act. (m) 2.135 1.256 0.263 Level Status Exceeded	840 0) N F F Surcharged Flood Depth Volum (m) (m ³) -0.020 0.0 -0.559 0.0
1.000 1.001	C (1 D1 (1 D2 (1) Margin for Floo P Duration (Return Period (s Climate C US/MH Return Clim Name Storm Period Cha mh1 15 Summer 30 mh2 15 Summer 30 mh3 15 Summer 30 mh3 15 Summer 30	<pre>km) km) km) d Risk Warn Analysis DT DV Inerti frofile(s) s) (mins) 1 c) (years) change (%) mate First nge Surchas +0% +0% Flow / Over</pre>	-0.0 0.2 0.3 Timestep 2.5 Second In S Status D Status a Status (X) First (Y) First (Z) rge Flood Overflow Half Drain Pipe Eflow Time Flow	75 Cv (Winter) 0. 70 300. crement (Extended OF) OF) Summer and Winter 60, 480, 960, 144 2, 30 0, 0 Water) Overflow Level Mater) 2.135 1.256 0.263 Level	840 0) N F F Surcharged Flood Depth Volum (m) (m ³) -0.020 0.0 -0.559 0.0

EAS Transport Pla	anning							Page	1
Unit 23, The Mali	tings		EXIS	TING					
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Date 09/09/2022 :			Desi	gned by	EAS			— Mic	
File Area 5 Exis	ting Netwo	ork.MDX		ked by				Ula	inage
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<u>30 year Return</u> Manho Fou Number of I Number of	Areal F Hot S Dle Headloss I Sewage pe nput Hydrog Online Con Rainfa FEH Rainfal	Reduction F Not Start (Start Level Coeff (Gl er hectare Traphs 0 trols 0 Nu all Model l Version	<u>Simulat</u> Sactor 1.000 mins) 0 (mm) 0 obal) 0.500 (1/s) 0.000 Number of Comber of Stor Synthetic	Results	by Max. ria onal Flow DD Factor Person p ntrols 0 ctures 0 Petails Fl 19:	 w - % of x 10m³/ Inlet Co per Day Number of Number of EH D3 EH D3 E D3 E EH D3 	Total Flow 'ha Storage peffiecient (l/per/day) of Time/Area	0.000 0.000 0.800 0.000 a Diagrams e Controls	D
		C (1km) D1 (1km) D2 (1km) r Flood Ri	GB 622800 3 sk Warning alysis Time DTS Sta DVD Sta Inertia Sta	(mm) step 2.5 S atus atus	-0.02 0.2 0.3	24 Cv (S 75 Cv (W 70	(1km) 2.49 ummer) 0.75 inter) 0.84 300.0 (Extended) ON OFF OFF	0	
US/MH PN Name Stor	Return Pe Cli Return	riod(s) (y mate Chang Climate	mins) 15, 3 ears) e (%)			60, 480, Z) Overf	30 45 Water Tow Level	Surcharged Depth (m)	Flooded Volume (m ³)
1.000 mh1 15 Sum	nmer 30	+45% 3	0/15 Summer				2.515	0.360	0.000
1.001 mh2 15 Sum		+45%	S, IS Summer				1.282		0.000
1.002 mh3 15 Sum	nmer 30	+45%					0.310	-0.405	0.000
			н	alf Drain	Pipe				

Page 1				ing	rt Plann	ranspo	EAS TI
	ING	EXIST		-	e Maltin		
	5	AREA		<u> </u>	bbotts		
	-			8HG	re, SG12		
Micro	ned by EAS	Desic			2022 21:		
Drainage	ed by		ork MDV				
	rk 2020.1.3		OIK.MDA	y Netwo	Existin		
	2K 2020.1.5	Netwo				yze	Innovy
Clow 0.000 age 0.000 ent 0.800 day) 0.000 VArea Diagrams 0 Time Controls 0 0.255 0.310 2.498 0.750 0.840	Inlet Coefficcien Flow per Person per Day (l/per/day fline Controls 0 Number of Time/Ar age Structures 0 Number of Real Ti <u>ainfall Details</u> FEH D3 (1km) 0.2 1999 E (1km) 0.3 650 TG 22800 09650 F (1km) 2.4 -0.024 Cv (Summer) 0.5 0.275 Cv (Winter) 0.8 0.370	<u>Simulati</u> Factor 1.000 (mins) 0 L (mm) 0 Lobal) 0.500 (1/s) 0.000 Number of Of umber of Stor <u>Synthetic R</u> GB 622800 30 sk Warning (1	Reduction F Hot Start (G Start Level s Coeff (G er hectare graphs 0 htrols 0 Nu all Model l Version Location C (1km) D1 (1km) D2 (1km) or Flood Ri	Areal R Hot S Headloss ewage pe : Hydrog Line Con Rainfal Site	Manhole H Foul Se er of Input uber of Onl FEH	Numbe	100
DFF ter 440	us OFF us OFF Summer and Winter 60, 120, 240, 360, 480, 960, 1440 100	ears)		eturn Pe	Re		
-	Wate First (Y) First (Z) Overflow Leve Flood Overflow Act. (m)	First (X) Surcharge	Climate Change		Storm	US/MH Name	PN
.581 0.426 0.000 .285 -0.530 0.000 .317 -0.398 0.000	1.28	00/15 Summer	+0% 10 +0% +0%	100 100 100	<pre>15 Summer 15 Summer 15 Summer</pre>	mh2	1.000 1.001 1.002
	If Drain Pipe Time Flow Level (mins) (1/s) Status Exceeded 71.4 SURCHARGED 137.0 OK 201.9 OK OK	Overflow (l/s)	/MH Flow / ame Cap. mh1 1.46 mh2 0.10 mh3 0.36	PN Na .000 r .001 r	<mark>1</mark> 1		
ed	71.4 SURCHARGED 137.0 OK		mh1 1.46 mh2 0.10	.000 r .001 r	<mark>1</mark> 1		

EAS Transport Planning		Page 1
Unit 23, The Maltings	EXISTING	rage I
Stanstead Abbotts	AREA 5	
	AREA 5	and the second
Hertfordshire, SG12 8HG		– Micro
Date 09/09/2022 21:35	Designed by EAS	Drainage
File Area 5 Existing Network.MDX	Checked by	
Innovyze	Network 2020.1.3	
Areal Reduction Factor Hot Start (mins) Hot Start Level (mm) Manhole Headloss Coeff (Global) Foul Sewage per hectare (1/s) Number of Input Hydrographs 0 Number Number of Online Controls 0 Number Synt Rainfall Model FEH Rainfall Version) 0 Inlet Coefficcient 0.) 0.500 Flow per Person per Day (l/per/day) 0.	000 000 800 000 iagrams 0
Iner Profile(s)	15, 30, 60, 120, 240, 360, 480, 960, 1440 100	
US/MH Return Climate First	Water Su t (X) First (Y) First (Z) Overflow Level harge Flood Overflow Act. (m)	Image Flooded Depth Volume (m) (m ³) 1.214 0.000 -0.503 0.000 -0.333 0.000
US/MH Flow / Over PN Name Cap. (1, 1.000 mh1 2.09 1.001 mh2 0.15 1.002 mh3 0.51	Half DrainPipeflowTimeFlowLevel/s)(mins)(1/s)StatusExceeded102.2SURCHARGED196.6OK289.8OK	

EAS Transport Plannin	g									Page 1
Unit 23, The Maltings				EXIST	ING					
Stanstead Abbotts			AREA	6						
Hertfordshire, SG12 8	HG									Micro
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File Area 6 Existing	Network	.MDX		Check	ed by					Draina
Innovyze				Netwo	rk 202	0.1.3				
DN	Tongth					1-	UVD		Contion Turno	
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)	Section Type	
		(m)	(1:X)	(ha)	(mins)		SECT	(mm)	Section Type Pipe/Conduit	
1.000 1.001	(m) 16.200 27.300	(m) 0.250 0.170	(1:X) 64.8 160.6	(ha) 0.035 0.035	(mins) 3.00 0.00	(mm) 0.600 0.600	SECT 0 0	(mm) 150 150	Pipe/Conduit Pipe/Conduit	
1.000 1.001	(m) 16.200	(m) 0.250 0.170	(1:X) 64.8 160.6	(ha) 0.035 0.035	(mins) 3.00 0.00	(mm) 0.600	SECT 0 0	(mm) 150 150	Pipe/Conduit	
1.000 1.001	(m) 16.200 27.300 20.000	(m) 0.250 0.170 0.100	(1:X) 64.8 160.6	(ha) 0.035 0.035 0.035	(mins) 3.00 0.00 0.00	(mm) 0.600 0.600	SECT 0 0	(mm) 150 150 150	Pipe/Conduit Pipe/Conduit	

				(m)			(m)	
1.000	mh1	3.500	2.810	0.540	3.560	2.560	0.850	1200
1.001	mh2	3.560	2.560	0.850	3.730	2.390	1.190	1200
1.002	mh3	3.730	2.390	1.190	5.500	2.290	3.060	1200

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 6	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:42	Designed by EAS	Drainage
File Area 6 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	1

MH Name	MH CL (m)	MH Depth (m)	Conr	MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	3.500	0.690	Open	Manhole	1200	1.000	2.810) 150				
mh2	3.560	1.000	Open	Manhole	1200	1.001	2.560	150	1.000	2.560	150	
mh3	3.730	1.340	Open	Manhole	1200	1.002	2.390	150	1.001	2.390	150	
	5.500	3.210	Open	Manhole	0		OUTFALI		1.002	2.290	150	

EAS Transport Planning		Page 3
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 6	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:42	Designed by EAS	Drainage
File Area 6 Existing Network.MDX	Checked by	brainage
Innovyze	Network 2020.1.3	
PIPELI	NE SCHEDULES for Storm	
	Upstream Manhole	
PN Hyd Diam MH C.Lev Sect (mm) Name (m)	-	
1.000 o 150 mh1 3.5	000 2.810 0.540 Open Manhole 1200	
	360 2.560 0.850 Open Manhole 1200	
1.002 o 150 mh3 3.7	730 2.390 1.190 Open Manhole 1200	
<u>D</u>	ownstream Manhole	
PN Length Slope MH C.Le (m) (1:X) Name (r	evel I.Level D.Depth MH MH DIAM., L* m) (m) (m) Connection (mm)	W
1.000 16.200 64.8 mh2 3	.560 2.560 0.850 Open Manhole 120	0
1.001 27.300 160.6 mh3 3		
1.002 20.000 200.0 5	-	0
<u>Free Flowin</u>	ng Outfall Details for Storm	
Outfall Outfall	l C. Level I. Level Min D,L W	
Pipe Number Name	(m) (m) I. Level (mm) (mm)	
	(m)	
1 002	5.500 2.290 0.000 0 0	
1.002	5.500 2.290 0.000 0 0	
Simulat	tion Criteria for Storm	
Volumetric Runoff Coef Areal Reduction Facto	f 0.750 Additional Flow - % of Total Flow 0.	
Hot Start (mins		
Hot Start Level (mm		
Manhole Headloss Coeff (Global		60
Foul Sewage per hectare (l/s) 0.000 Output Interval (mins)	1
	er of Offline Controls 0 Number of Time/Area D of Storage Structures 0 Number of Real Time C	-
Synth	etic Rainfall Details	
Rainfall Model	FEH E (1km) O	.310
Return Period (years)	1 F (1km) 2	.498
FEH Rainfall Version	1999 Summer Storms	Yes
Site Location GB 622800 C (1km)) 309650 TG 22800 09650 Winter Storms -0.024 Cv (Summer) 0	No .750
D1 (1km)	0.275 Cv (Winter) 0	
D2 (1km)	0.370 Storm Duration (mins)	30
D3 (1km)	0.255	

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		e Malti	lngs				STING						
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		re, SG1		5			 					Mi	
		2022 21					igned by	EAS				Dra	inage
File A	rea 6	Existi	ing Ne	etwor	k.MDX		cked by						mage
Innovy	ze					Net	work 2020	.1.3					
	ear Re	Manhole Foul r of Inp ber of O Ra	Area Ho e Headl Sewage Dut Hyd Dnline ainfal Margin	al Red Hot Sta loss C e per drograg Contro l Mode Regic	Nuction 1 Start rt Leve coeff (G hectare phs 0 ols 0 N el on Engla Flood Ri Ar Profi	Factor 1.00 (mins) 1 (mm) lobal) 0.50 (1/s) 0.00 Number of Synthetic Fi and and Wald isk Warning halysis Time DTS S	ation Crite 0 Additi 0 MA 0 00 Flow per 00 0 ffline Co corage Stru <u>Rainfall I</u> SR M5-60 (m es Ratico (mm) estep 2.5 S tatus tatus tatus	ria onal F DD Fact Person ntrols ctures Details nm) 20. o R 0.	low - % o tor * 10r Inlet n per Day 0 Numbe: 0 Numbe: 0 000 Cv (.405 Cv (Incremen Summe	of Tot n³/ha Coeff y (l/p r of T r of T (Summe (Winte Winte t (Ex	Cal Flow Storage Eiecient Der/day) Fime/Are Real Tim r) 0.750 r) 0.840 Solo tended) ON OFF OFF Winter	0.000 0.000 0.800 0.000 a Diagrams e Controls 0	0
	US/MH			Climat	od(s) (y te Chang	-	Direct (V)	Tinch	(7) 0			Surcharged	
PN	Name	Storm				Surcharge			• •	ct.	(m)	Depth (m)	Volume (m³)
1.000	mh 1	15 Summ	ar	1	+0%						2.866	-0.094	0.000
1.000		15 Summ		1		2/15 Summer	<u>-</u>				2.657		
1.002		15 Wint		1		1/15 Summer					2.552	0.012	
				US/MF	H Flow /	/ Overflow	Half Drain Time	Pipe Flow			Level		
			PN	Name		(1/s)	(mins)	(1/s)	Status		ceeded		
						<u>_</u>							
			1.000	mh1 mh2				5.9 9.5		OK OK			
			1.001						SURCHARG				

laximum Outfl Flow - % of Tot ctor * 10m ³ /ha Inlet Coeff on per Day (1/p s 0 Number of T s 0 Number of T s 0 Number of F 	al Flow 0. Storage 0. Siecient 0. Der/day) 0. Cime/Area D Real Time C r) 0.750 r) 0.840 300.0 tended) OFF OFF Winter	000 000 800 000 iagrams (ro inage storm
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<pre>laximum Outfl Flow - % of Tot ctor * 10m³/ha Inlet Coeff on per Day (1/p s 0 Number of T s 0 Number of T s 0 Number of F 0.000 Cv (Summe 0.405 Cv (Winter d Increment (Ext Summer and</pre>	Al Flow 0. Storage 0. Storage 0. Siecient 0. Der/day) 0. Cime/Area D Real Time C r) 0.750 r) 0.840 300.0 tended) OFF OFF Winter 0, 1440 1, 2	1) for 000 000 800 000	Storm
<pre>laximum Outfl Flow - % of Tot ctor * 10m³/ha Inlet Coeff on per Day (1/p s 0 Number of T s 0 Number of T s 0 Number of F 0.000 Cv (Summe 0.405 Cv (Winter d Increment (Ext Summer and</pre>	Al Flow 0. Storage 0. Storage 0. Siecient 0. Der/day) 0. Cime/Area D Real Time C r) 0.750 r) 0.840 300.0 tended) OFF OFF Winter 0, 1440 1, 2	000 000 800 000 iagrams (0
<pre>laximum Outfl Flow - % of Tot ctor * 10m³/ha Inlet Coeff on per Day (1/p s 0 Number of T s 0 Number of T s 0 Number of F 0.000 Cv (Summe 0.405 Cv (Winter d Increment (Ext Summer and</pre>	Al Flow 0. Storage 0. Storage 0. Siecient 0. Der/day) 0. Cime/Area D Real Time C r) 0.750 r) 0.840 300.0 tended) OFF OFF Winter 0, 1440 1, 2	000 000 800 000 iagrams (0
<pre>laximum Outfl Flow - % of Tot ctor * 10m³/ha Inlet Coeff on per Day (1/p s 0 Number of T s 0 Number of T s 0 Number of F 0.000 Cv (Summe 0.405 Cv (Winter d Increment (Ext Summer and</pre>	Al Flow 0. Storage 0. Storage 0. Siecient 0. Der/day) 0. Cime/Area D Real Time C r) 0.750 r) 0.840 300.0 tended) OFF OFF Winter 0, 1440 1, 2	000 000 800 000 iagrams (0
Flow - % of Tot ctor * 10m³/ha Inlet Coeff on per Day (1/p s 0 Number of T s 0 Number of F .0000 Cv (Summe 0.405 Cv (Winte d Increment (Ext	Al Flow 0. Storage 0. Storage 0. Siecient 0. Der/day) 0. Cime/Area D Real Time C r) 0.750 r) 0.840 300.0 tended) OFF OFF Winter 0, 1440 1, 2	000 000 800 000 iagrams (0
	OFF Winter 0, 1440 1, 2		
t (Z) Overflow	Water Sur Level	Depth	Volume
flow Act.	(m)	(m)	(m³)
	2.874 2.714 2.616	-0.086 0.004 0.076	0.000 0.000 0.000
· 1			
6 OK 3 SURCHARGED			
ow (s) 7.0	s) Status Ex	ow Level /s) Status Exceeded 7.6 OK 1.3 SURCHARGED	ow Level (s) Status Exceeded 7.6 OK 1.3 SURCHARGED

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nit 23, The M	alting	s			EXISTI	NG					
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ile Area 6 Ex	isting	Netwo	rk.MD	Х	Checke	d by					Drainaç
nnovyze					Networ	k 2020.1.3	3				
2 year Retur Mai Number o:	Inhole He Foul Sev f Input of Onli	Areal R Hot S eadloss wage pe Hydrog ne Con Rainfa ainfall	eductic ot Star cart Le Coeff r hecta caphs (crols (ll Mod Versi	on Facto ct (mins evel (mm (Global are (l/s) Number) Number el on on GB 6: m) m)	<u>Simulatio</u> r 1.000) 0) 0.500 F) 0.000 Per of Off of Stora	<u>n Criteria</u> Additional MADD Fa low per Pers line Control ge Structure .nfall Detai	Maximu Flow - actor - In son per .s 0 Nu es 0 Nu Es 0 Nu FEH 1999 09650 -0.024	- % of ' 10m³/l hlet Cod Day () umber o umber o D3 E F Cv (Su	Total Fl ha Stora effiecie l/per/da f Time/ <i>P</i>	.ow 0.000 lge 0.000 nt 0.800 ly) 0.000 Area Diag Time Cont .255 .310 .498 .750))) grams 0
	Ret	urn Pei	tion(s	Ine: ofile(s	DTS Statu DVD Statu rtia Statu)) 15, 30,	IS	S	ummer a	(Ol Ol	ON FF FF 40 30	
US/MH PN Name	Storm		rn Clim od Cha		irst (X) urcharge	First (Y) Flood		st (Z) rflow	Overflow Act.	Water W Level (m)	Surcharged Depth (m)
1.001 mh2 1	15 Summe 15 Summe 15 Winte	r	2 2 2	+0% 2/	15 Summer 15 Summer 15 Summer	30/15 Summe	er			2.876 2.734 2.631	0.024
			looded Volume (m³)		Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Statu		evel eeded	
	1.000	mh1	0.000	0.39 0.87			8.0	SURCHAI	OK	3	

AS Transport Plannin	.g					Page 2
nit 23, The Maltings		EXIST	ING			
anstead Abbotts		AREA	6			
ertfordshire, SG12 8	HG					Micco
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novyze			ork 2020.1.3			
<u>30 year Return Peri</u> An Manhole Hea Foul Sewa Number of Input H Number of Onlir FEH Ra	real Reducti Hot Start L adloss Coeff age per hect. Aydrographs ne Controls Rainfall Moc infall Versi Site Locati C (1k D1 (1k D2 (1k	of Critical <u>Simulat</u> : on Factor 1.000 rt (mins) 0 evel (mm) 0 (Global) 0.500 are (1/s) 0.000 O Number of Or O Number of Stor <u>Synthetic R</u> el on on GB 622800 30 m) m)	Results by M Ion Criteria Additional F MADD Fac Flow per Perso Efline Controls rage Structures ainfall Detail 9650 TG 22800	Flow - % of To ctor * 10m ³ /ha Inlet Coei on per Day (1, s 0 Number of s 0 Number of <u>S</u> FEH D3 (1999 E (otal Flow 0.00 a Storage 0.00 ffiecient 0.80 (per/day) 0.00 Time/Area Dia Real Time Con 1km) 0.255 1km) 0.310 1km) 2.498 mer) 0.750	00 00 00 00 agrams 0
Retu		-	tus tus tus	Summer an	ON OFF OFF d Winter	
US/MH PN Name Storm	Return Clin Period Cha			First (Z) O Overflow		r Surcharged l Depth (m)
1.000 mh1 15 Winter 1.001 mh2 15 Winter 1.002 mh3 15 Winter	30	+0% 30/15 Summe +0% 2/15 Summe +0% 2/15 Summe	er	r	3.50 3.52 3.28	4 0.814
TT		Flow / Overflo Cap. (1/s)		Pipe Flow (1/s) Status	Level Exceeded	
	lame (m³)	Cap. (1/3)	((1/5) 50200	Arceeded	

AS Transport Planning		Page 1
nit 23, The Maltings	EXISTING	
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ertfordshire, SG12 8HG		Micro
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ile Area 6 Existing Network.M		Drainac
novyze	Network 2020.1.3	
30 year Return Period Summary Areal Reducti Hot Sta Hot Start I Manhole Headloss Coeff Foul Sewage per hect Number of Input Hydrographs Number of Online Controls Rainfall Mon FEH Rainfall Vers Site Locat C (1: D1 (1: D2 (1:	y of Critical Results by Maximum Simulation Criteria on Factor 1.000 Additional Flow - % art (mins) 0 MADD Factor * 1 evel (mm) 0 Inle (Global) 0.500 Flow per Person per D care (1/s) 0.000 0 Number of Offline Controls 0 Numb 0 Number of Storage Structures 0 Numb Synthetic Rainfall Details del FEH ion 1999 ion GB 622800 309650 TG 22800 09650 km) -0.024 Co km) 0.275 Co	s of Total Flow 0.000 .0m³/ha Storage 0.000 et Coeffiecient 0.800 way (l/per/day) 0.000 per of Time/Area Diagrams 0
Duration(Return Period(s Climate C	s) (mins) 15, 30, 60, 120, 240, 360, 4) (years) hange (%)	ON OFF OFF Mer and Winter 480, 960, 1440 30 45 Water Surcharged
US/MH Return Cli PN Name Storm Period Ch		(Z) Overflow Level Depth low Act. (m) (m)
1.000 mh1 15 Winter 30 1.001 mh2 15 Winter 30 1.002 mh3 15 Winter 30	+45% 30/15 Summer 30/15 Summer +45% 30/15 Summer 30/15 Summer +45% 30/15 Summer	3.509 0.549 3.561 0.851 3.477 0.937
Flooder US/MH Volume PN Name (m ³) 1.000 mhl 8.86	e Flow / Overflow Time Flow Cap. (l/s) (mins) (l/s)	Level Status Exceeded FLOOD 5
1.001 mh2 1.32 1.002 mh3 0.00		FLOOD 2

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lle Ar	ea 6	Existin	g Netwo	ork.MDy	<	Checke	-					Drainag
novyz			<u></u>				k 2020.1.	3				
	Number	Manhole F Foul Se of Input er of Onl FEH 3	Areal R H Hot S Headloss wage pe Hydrog: ine Cont Rainfall Site	eduction ot Start tart Lev Coeff r hectan raphs 0 trols 0 all Mode Versio Locatio C (1km D1 (1km D2 (1km	n Facto t (mins vel (mm (Global re (1/s Number <u>Synt</u> 1 on <u>Synt</u> 1 on <u>GB 62</u> 0) 0) 0) Risk Wa Analysi	Simulatio r 1.000) 0) 0.500 F) 0.000 per of Off r of Stora thetic Rai 22800 3096 arning (mm is Timeste DTS Statu DVD Statu rtia Statu	low per Per line Contro ge Structur infall Detai 550 TG 22800 1) ep 2.5 Secon	. Flow - lactor * In: son per ls 0 Num es 0 Num ils FEH 1999 0 09650 -0.024 0.275 0.370 nd Incre	<pre>% of Tota 10m³/ha S let Coeffi Day (l/pe mber of Ti mber of Re D3 (1kr E (1kr F (1kr Cv (Summe: Cv (Winte:</pre>	1 Flow torage ecient r/day) .me/Area eal Time n) 0.255 n) 0.310 n) 2.498 r) 0.750 r) 0.840 300.0 ended) OFF OFF	0.000 0.000 0.800 0.000 Diagra Contro	ams 0
		Re	turn Per	ation(s)	(mins) (years)) 15, 30,)	60, 120, 24			, 1440 100 0		Guurahaan
PN	US/MH Name	Storm		n Climat d Chang		.rst (X) Ircharge	First (Y Flood	•	st (Z) Ove		Water Level (m)	Surcharge Depth (m)
1.000	mh1	15 Winte	r 10	0 +1	0% 100/	'15 Summer	100/15 Sum	mer			3.510	0.55
1.001 1.002	mh2	15 Winte 15 Winte	r 10	0 +0	0% 100/		100/15 Sum				3.562	0.85
		PN		'looded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceed		
		1.000	mh1	9.653	1.06			21.7	FLOOD		5	
					1 (2)			21.7	FLOOD		0	
		1.001	mh2 mh3	1.731 0.000	1.63 3.22				LOOD RISK		2	

AS Transport Planning		Page 1
Init 23, The Maltings	EXISTING	
tanstead Abbotts	AREA 6	
lertfordshire, SG12 8HG		Micro
ate 09/09/2022 21:47	Designed by EAS	Micro
'ile Area 6 Existing Network.MDX	Checked by	Drainage
nnovyze	Network 2020.1.3	
inito vy 20	NCCWOIR 2020.1.5	
Hot Start Level (Manhole Headloss Coeff (Glob Foul Sewage per hectare (1 Number of Input Hydrographs 0 Nu Number of Online Controls 0 Numb Rainfall Model FEH Rainfall Version	Simulation Criteria ctor 1.000 Additional Flow - % ns) 0 MADD Factor * 1 (mm) 0 Inle bal) 0.500 Flow per Person per E /s) 0.000 umber of Offline Controls 0 Numk per of Storage Structures 0 Numk ynthetic Rainfall Details FEH 1999 622800 309650 TG 22800 09650 -0.024 C	s of Total Flow 0.000 .0m³/ha Storage 0.000 et Coeffiecient 0.800 Day (l/per/day) 0.000 Der of Time/Area Diagrams 0
I Profile	ysis Timestep 2.5 Second Increm DTS Status DVD Status nertia Status (s) Sum ns) 15, 30, 60, 120, 240, 360, rs)	ON OFF OFF mer and Winter
US/MH Return Climate PN Name Storm Period Change		Water Surcharged t (Z) Overflow Level Depth flow Act. (m) (m)
1.001 mh2 15 Winter 100 +45% 10	00/15 Summer 100/15 Summer 00/15 Summer 100/15 Summer 00/15 Summer	3.5180.5583.5670.8573.5681.028
Flooded	Half Drain Pipe	
US/MH Volume Flow PN Name (m³) Cap		Level Status Exceeded
FN Name (m ⁻) Cap	. (1/5) (1115) (1/5)	Status Exceded
1.000 mh1 17.703 1.	06 21.8	FLOOD 7

EAS Transport Planni	ng									Page 1
Unit 23, The Malting	-			EXIST	ING					
Stanstead Abbotts				AREA	7					
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Date 09/09/2022 21:5	4			Desig	ned by	EAS				- Micro
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							~ .			
		Exis.	ting N	letwork	Detai	ls ic	or St	orm		
PN	Length	Fall	Slope	I.Area	T.E.	k	HYD	DIA	Section Type	
	(m)	(m)	(1:X)	(ha)	(mins)	(mm)	SECT	(mm)		
1.00	0 43.200	0.750	57.6	0.133	3.00	0.600	0	225	Pipe/Conduit	
1.00	1 24.300	0.115	211.3	0.133	0.00	0.600	0		Pipe/Conduit	
1.00	2 6.400	0.070	91.4	0.133	0.00	0.600	0	300	Pipe/Conduit	
1.00	3 51.700	0.355	145.6	0.133	0.00	0.600	0	300	Pipe/Conduit	
2.00	0 32.400	0.430	75.3	0.133	5.00	0.600	0	225	Pipe/Conduit	
2.00	1 8.500	1.070	7.9	0.133	0.00	0.600	0	225	Pipe/Conduit	
1.00	4 20.000	0.067	298.5	0.399	0.00	0.600	0	675	Pipe/Conduit	
							-			
	PN US/N	IH US/C	L US/II	L US	DS/CI	_ DS/I	с г	s	Ctrl US/MH	
	Nam	e (m)	(m)	C.Dept	:h (m)	(m)	C.D	epth	(mm)	
				(m)			(m)		
1.	000 mł	n1 4.07	0 2.810	0 1.03	35 3.540	2.06	0 1	.255	1200	
			0 2.060		5 3.190			.020	1200	
			0 1.870		20 2.900			.800	1200	
1.	003 mł	14 2.90	0 1.800	0.80	0 3.930) 1.44	52	.185	1200	

2.000mh53.8403.0200.5953.8902.5901.0752.001mh63.8902.5901.0753.9301.5202.185

1.004 mh7 3.930 1.070 2.185 5.500 1.003 3.822 1800

1200 1200

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 7	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:54	Designed by EAS	Drainage
File Area 7 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	

MH Name	MH CL (m)	MH Depth (m)	Conr	MH	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	4.070	1.260	Open	Manhole	1200	1.000	2.810	225				
mh2	3.540	1.480	Open	Manhole	1200	1.001	2.060	225	1.000	2.060	225	
mh3	3.190	1.320	Open	Manhole	1200	1.002	1.870	300	1.001	1.945	225	
mh4	2.900	1.100	Open	Manhole	1200	1.003	1.800	300	1.002	1.800	300	
mh5	3.840	0.820	Open	Manhole	1200	2.000	3.020	225				
mh6	3.890	1.300	Open	Manhole	1200	2.001	2.590	225	2.000	2.590	225	
mh7	3.930	2.860	Open	Manhole	1800	1.004	1.070	675	1.003	1.445	300	
									2.001	1.520	225	
	5.500	4.497	Open	Manhole	0		OUTFALL		1.004	1.003	675	

EAS Transport Plann	ing									Page 3
Unit 23, The Maltin				E	XISTING	5				
Stanstead Abbotts	_				AREA 7					
Hertfordshire, SG12	8HG				,					
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File Area 7 Existin		work	MDY		Checked	-				Drainage
Innovyze	ig neti	WOIK.	MDX		Jetwork	-	3			
TIIIOvýze				IN	Network	2020.1	• 2			
			PIF	PELINE	SCHEDU	LES for	Storm			
				adu	stream l	Manhole				
, NG	Thead	Diam	MIL O				МН		MI DTAM T +14	
PN	-	(mm)		(m)	I.Level (m)	(m)	Connec		MH DIAM., L*W (mm)	
1.000) 0	225	mh1	4.070	2.810	1.035	Open Ma	nhole	1200	
1.003	l o	225	mh2		2.060					
1.002		300			1.870		-			
1.003	3 о	300	mh4	2.900	1.800	0.800	Open Ma	nhole	1200	
2.000		225	mh5	3 840	3.020	0 595	Open Ma	nhole	1200	
2.000			mh6	3.890			Open Ma		1200	
1.004	1 o	675	mh7	3.930	1.070	2.185	Open Ma	nhole	1800	
				Down	nstream	Manhol	ē			
				DOWI		Hamior				
PN	Length (m)	-	e MH Name		l I.Leve (m)	l D.Depti (m)		4H ection	MH DIAM., L*W (mm)	N
	(,	(1.1)	Manie	(11)	()	()	comie		(1111)	
	43.200			3.54			5 Open M			
	24.300						0 Open M			
	6.400						0 Open M			
1.003	51.700	145.6	5 mh7	3.93	0 1.44	5 2.18	5 Open M	lanhole	e 1800	0
2 000	32.400	75 3	8 mh6	3.89	0 2.59	0 1 0 7	5 Open M	Annole	e 1200	h
	8.500						5 Open M 5 Open M			
1.004	20.000	298.5	5	5.50	0 1.00	3 3.82	2 Open M	Manhole) د	C
1.001	20.000						-		- · · ·	-
		Fre	ee Flo	owing (Outfall	Detail	s for S	Storm		
		utfall e Numb		fall C	. Level 1 (m)	I. Level (m)	Min I. Leve	D,L		
					()	()	(m)	- (,	()	
		1.0	04		5.500	1.003	0.00	0 0	0	
			Sim	ulatio	on Crite	ria for	r Storm	h		
			<u>01111</u>	uracro		.114 101	. 50011			
				Coeff 0		dditiona.	l Flow -	- % of	Total Flow 0.	000
	Areal			actor 1		MADD			/ha Storage 0.0	
			tart (0				peffiecient 0.	
			Level			w per Pe	rson per	-	(l/per/day) 0.0	
Manhole							011+		Fime (mins) rval (mins)	60 1
roul S	ewaye p	ver 116	cuare	(l/s) 0			Jucput	L INCE	LVAL (IIIIIS)	1
Number of Inpu Number of On	-								of Time/Area D: of Real Time Co	-
					ic Rain					
			<u>- 1</u>							
		fall M					FEH	Ι	03 (1km) 0.255	
	n Peric	-					1		E (1km) 0.310	
FEH	Rainfal			D (0000-	0 000755	ma	1999	~	F (1km) 2.498	
	Site			в 62280	0 309650	TG 2280				
			1km)						r Storms No	
		D1 (D2 (0.275 0.370		(Summer) 0.750 (Winter) 0.840	
		DZ (- 13111 <i>)</i>				0.070	UV.	(mincer) 0.040	

EAS Transport Planning		Page 4
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 7	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 21:54	Designed by EAS	Drainage
File Area 7 Existing Network.MDX	Checked by	Drainage
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Synthetic Rainfall Details

Storm Duration (mins) 30

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		-	15									
		obotts	0		AREA	A /						1 C - A
		re, SG12									— Mic	
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'ile A	rea 7	Existing	g Netwo	ork.MDX		cked by						in lag
innovy	ze				Net	work 2020.	1.3					
<u>1 ye</u>	ear Re		Areal R H	eduction	<u>Simula</u> Factor 1.00 (mins)		<u>ia</u> nal F	low - % tor * 1	of To Om³/ha		7 0.000 0.000	Stor
		Foul Se	eadloss wage pe Hydrog	Coeff (G r hectare raphs 0	lobal) 0.50 (l/s) 0.00 Number of	0 Flow per 0 Offline Con orage Struc	trols	n per D 0 Numb	ay (1/j	per/day) Time/Are	0.000 ea Diagrams	
	num	Der or onr.	THE CON	CIOIS U N	umber of Sc	orage struc	cures	0 Munic	er or	Neal III	le concrors	0
			c			Rainfall De		-	10		0	
		Rain	ifall Mo Rec			SR M5-60 (mm es Ratio						
			100	Jion Bugit	ina ana ware			101 00	(Willie		0	
		Maı	rgin fo		isk Warning					300.0		
				A	nalysis Time DTS St	estep 2.5 Se	econd	Increme	ent (Ex	tended) ON		
					DIS SU DVD St					OFF		
					Inertia St					OFF		
		Ret	urn Pe	ation(s) riod(s) (years)	30, 60, 120,	240,			1, 2		
		Ret	urn Pe	ation(s)	(mins) 15, years)	30, 60, 120,	240,			50, 1440 1, 2 0, 0		
	110 / 1111	Ret	curn Per Clir	ation(s) riod(s) (y mate Chano	(mins) 15, 3 years) ge (%)			360, 4	180, 96	50, 1440 1, 2 0, 0 Water	Surcharged	
PN	US/MH Name		curn Per Clir Return	ation(s) riod(s) (<u>mate</u> Chang Climate	(mins) 15, 3 years) ge (%) First (X)	First (Y)	First	360, 4 (Z) Ov	480, 96 verflow	50, 1440 1, 2 0, 0 Water Level	Depth	Volu
	Name	Storm	Clir Clir Return Period	ation(s) riod(s) (<u>s</u> mate Chang Climate Change	(mins) 15, 3 years) ge (%) First (X)		First	360, 4 (Z) Ov	480, 96 verflow	50, 1440 1, 2 0, 0 Water Level (m)	Depth (m)	Volu (m³
1.000	Name mh1	Storm 15 Summer	Clir Clir Return Period	ation(s) riod(s) (<u>s</u> mate Change Climate Change +0%	(mins) 15, years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 4 (Z) Ov	480, 96 verflow	50, 1440 1, 2 0, 0 Water Level (m) 2.902	Depth (m) -0.133	Volu (m ³)
1.000	Mame mh1 mh2	Storm 15 Summer 15 Winter	Clir Clir Return Period 1 1	ation(s) riod(s) (mate Change Change +0% +0%	(mins) 15, 3 years) ge (%) First (X)	First (Y) Flood	First	360, 4 (Z) Ov	480, 96 verflow	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298</pre>	Depth (m) -0.133 0.013	Volu (m ³) 0.0
1.000	Name mh1 mh2 mh3	Storm 15 Summer	Clir Clir Return Period	ation(s) riod(s) (mate Change Change +0% +0% +0% +0%	(mins) 15, years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 4 (Z) Ov	480, 96 verflow	50, 1440 1, 2 0, 0 Water Level (m) 2.902	Depth (m) -0.133 0.013 -0.100	Volum (m ³ 0.0 0.0
1.000 1.001 1.002	mh1 mh2 mh3 mh4 mh5	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter	Clir Clir Return Period 1 1 1	ation(s) riod(s) (<u>y</u> mate Change Change +0% +0% +0% +0% +0%	(mins) 15, years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 4 (Z) Ov	480, 96 verflow	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070</pre>	Depth (m) -0.133 0.013 -0.100 -0.102	Volu (m ³ 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period	ation(s) riod(s) (9 mate Change Change +0% +0% +0% +0% +0% +0% +0% +0%	(mins) 15, years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 4 (Z) Ov	480, 96 verflow	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volu: (m ³ 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter	Return Period	ation(s) riod(s) (9 mate Change Change +0% +0% +0% +0% +0% +0% +0% +0%	(mins) 15, years) ge (%) First (X) Surcharge	First (Y) Flood	First	360, 4 (Z) Ov	480, 96 verflow	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volu (m ³ 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period	ation(s) riod(s) (9 mate Change Change +0% +0% +0% +0% +0% +0% +0% +0%	(mins) 15, a years) ge (%) First (X) Surcharge 1/15 Summer	First (Y) Flood	First Over:	360, 4 (Z) Ov	480, 96 verflow	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³ 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period 1 1 1 1 1 1 1 1	ation(s) riod(s) (9 mate Change +0% +0% +0% +0% +0% +0% +0% +0%	(mins) 15, a years) ge (%) First (X) Surcharge 1/15 Summer	First (Y) Flood	First Over: Pipe	360, 4 (Z) Ov	verflow Act.	<pre>X = 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change Change +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 4 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow</pre>	First (Y) Flood Half Drain Time	First Over: Pipe Flow	360, 4 (Z) Ox Elow	verflow Act.	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³ 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change Change +0% +0% +0% +0% +0% +0% +0%	(mins) 15, a years) ge (%) First (X) Surcharge 1/15 Summer	First (Y) Flood Half Drain Time	First Over: Pipe	360, 4 (Z) Ov	verflow Act.	<pre>X = 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% me Cap.	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3</pre>	First (Y) Flood Half Drain Time	First Over: Pipe Flow (1/s) 21.4	360, 4 (Z) Ou Elow Stat	verflow Act.	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volur (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Uinter	Return Period 1 1 1 1 1 1 1 1 1 1 1 0 000 m 000 m	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% me Cap. mh1 0.33 mh2 1.0	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7</pre>	First (Y) Flood Half Drain Time	First Over: Pipe Flow (1/s) 21.4 35.1	360, 4 (Z) Ox Elow	verflow Act.	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volur (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 1 15 Winter 1 15 Winter	Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7</pre>	First (Y) Flood Half Drain Time	First Over: Pipe Flow (1/s) 21.4 35.1 51.1	360, 4 (Z) Ou Elow Stat	verflow Act. OK RGED OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Inter 11 Inter 12 Inter 12 Inter 13 Inter 14 Inter 15 Inter 15 Inter 16 Inter 17 Inter 18 Inter 19 Inter 19 Inter 19 Inter 19 Inter 10 Inter 11	Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7 5</pre>	First (Y) Flood Half Drain Time	First Over: Pipe Flow (1/s) 21.4 35.1 51.1 65.8	360, 4 (Z) Ou Elow Stat	verflow Act. OK RGED OK OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 I. 1. 1. 1. 2.	Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7 5 2</pre>	First (Y) Flood Half Drain Time	First Over: Pipe Flow (1/s) 21.4 35.1 51.1	360, 4 (Z) Ou Elow Stat	verflow Act. OK RGED OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 I. 1. 1. 2. 2.	Clir Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7 5 2 3 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7</pre>	First (Y) Flood Half Drain Time (mins)	First Over: Pipe Flow (1/s) 21.4 35.1 51.1 65.8 18.3	360, 4 (Z) Ou Elow Stat	us E: OK RGED OK OK OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 I. 1. 1. 2. 2.	Clir Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7 5 2 3 7 5 7 5 2 3 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7</pre>	First (Y) Flood Half Drain Time (mins)	First Over: Pipe Flow (1/s) 21.4 35.1 51.1 65.8 18.3 33.9	360, 4 (Z) Ou Elow Stat	us E: OK RGED OK OK OK OK OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 I. 1. 1. 2. 2.	Clir Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7 5 2 3 7 5 7 5 2 3 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7</pre>	First (Y) Flood Half Drain Time (mins)	First Over: Pipe Flow (1/s) 21.4 35.1 51.1 65.8 18.3 33.9	360, 4 (Z) Ou Elow Stat	us E: OK RGED OK OK OK OK OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volum (m ³) 0.0 0.0 0.0 0.0 0.0 0.0
1.000 1.001 1.002 1.003 2.000 2.001	mh1 mh2 mh3 mh4 mh5 mh6	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 I. 1. 1. 2. 2.	Clir Return Period 1 1 1 1 1 1 1 1 1 1 1 1 1	ation(s) riod(s) () mate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>(mins) 15, 3 years) ge (%) First (X) Surcharge 1/15 Summer / Overflow (1/s) 3 7 5 2 3 7 5 7 5 2 3 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7</pre>	First (Y) Flood Half Drain Time (mins)	First Over: Pipe Flow (1/s) 21.4 35.1 51.1 65.8 18.3 33.9	360, 4 (Z) Ou Elow Stat	us E: OK RGED OK OK OK OK OK	<pre>50, 1440 1, 2 0, 0 Water Level (m) 2.902 2.298 2.070 1.998 3.109 2.664 1.354 Level</pre>	Depth (m) -0.133 0.013 -0.100 -0.102 -0.136 -0.151	Volur (m ³) 0.0 0.0 0.0 0.0 0.0 0.0

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EAS Tr				-									Page	6
Unit 2			-	S				STING						
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Date 0								gned by	EAS				Dra	inage
File A	rea 7	Exi	sting	Net	work	.MDX		cked by						mage
Innovy	ze						Netv	ork 2020	.1.3					
<u>2 ye</u>	Numbe	Manh Fc r of	P nole He bul Sew Input f Onli Rain: Mar	Areal Hot adlo vage Hydr ne Co fall F gin f Du Unn H	Redu Hot Star ss Co per h ograp ontro Mode tegion for F	nction l Start Start Level Deff (G Dectare Ohs 0 N S 0 S 0 N S 0 S 0 S 0 S 0 S 0 S 0 N S 0 N S 0 N S 0 N S 0 N S 0 N S 0 N S 0 N S 0 S 0 N S 0 S 0 S 0 S 0 N S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0	Factor 1.00 (mins) 1 (mm) lobal) 0.50 (1/s) 0.00 Number of St <u>Synthetic</u> FS and and Wale alysis Time DTS St DVD St Inertia St .le(s) (mins) 15, 3 years)	tion Crite: 0 Additi 0 MAI 0 Flow per 0 Offline Con orage Struc Rainfall D R M5-60 (m s Ratio (mm) estep 2.5 S atus atus atus	ria onal F DD Fac Persc ntrols ctures <u>petails</u> m) 20 0 R 0 Second	low - % o tor * 10m Inlet n per Day 0 Number 0 Number 3 .000 Cv (% .404 Cv (% Increment	f To 3/ha Coef (1/j of Summe Winte	tal Flow Storage fiecient per/day) Time/Area Real Time er) 0.750 er) 0.840 300.0 (tended) ON OFF OFF Winter	0.000 0.000 0.800 0.000 a Diagrams e Controls	0
PN	US/MH Name						First (X) Surcharge						Surcharged Depth (m)	Volume
							2							
1.000 1.001			ummer inter		2 2	+0응 +0운	1/15 Summer					2.917 2.391	-0.118 0.106	
1.001			linter		2	+0%	1/15 Summer					2.111	-0.059	
1.003	mh4	15 W	inter		2	+0%						2.038	-0.062	
2.000			inter		2	+0%						3.123	-0.122	
2.001 1.004			linter linter		2 2	+0응 +0응						2.675 1.399	-0.140 -0.346	
1.004	11117	10 10	THCET		2	108						1.375	0.540	0.000
							-		. .					
				r	19 / MU	Flow /	f Overflow	Half Drain Time	Pipe Flow			Level		
			P		Name	Cap.	(1/s)	(mins)	(1/s)	Status		xceeded		
						-								
				000	mh1	0.42			27.7		OK			
			1.(001	mh2 mh3	1.39			45.6	SURCHARG	ed ok			
				002	mh4	0.98			85.3		OK			
				000	mh5				23.6		OK			
			2.0	001	mh6				43.8		OK			
			1.0	004	mh7	0.47			186.5		OK			

EAS Tran	sport	Plann	ing									Page 1	
Unit 23,	-					EXISTI	NG						
Stanstea						AREA 7							
Hertford			8HG									Miss	()
Date 09/		<u>'</u>				Design	ed by EAS					- Micr	U
File Are				work MD	v	Checke	-					Drair	nage
		XISCIN	y Net	WOIK.MD	Δ		а Бу k 2020.1.3)					<u> </u>
Innovyze						Networ	K 2020.1.3)					
	M umber	anhole H Foul Se of Input r of Onl	Areal Hot Wage y Hydro ine Co Rain Rainfa	Reductic Hot Start Start Le ss Coeff Der hecta ographs (ntrols (fall Mod ll Versi	on Facto evel (mins evel (mm (Global are (1/s) Number) Number <u>Synt</u> el on on GB 62 m) m)	Simulatio r 1.000) 0) 0.500 F) 0.000 er of Off of Stora chetic Rai	low per Pers line Control ge Structure <u>nfall Detai</u> 50 TG 22800	Flow - actor I son pe: .s 0 N 2s 0 N 1s FEH 1999 09650 -0.024	- % of 1 * 10m³/h nlet Coe r Day (1 umber o: umber o: D3 E F Cv (Su Cv (Su Cv (Wi	[otal ha Sto effied [/per/ f Time f Real (1km) (1km) (1km) (1km)	Flow 0.0 prage 0.0 sient 0.8 (day) 0.0 e/Area Di l Time Co 0.255 0.310 2.498 0.750	000 000 000 000 .agrams 0	<u>Storm</u>
			Du turn P	Pr	Analysi Iner ofile(s)) (mins) (years)	DTS Statu DVD Statu tia Statu 15, 30,	p 2.5 Secon s	S	ummer a	nd Wi: 960, 2	ON OFF OFF 1440 , 30 0, 0		
PN	US/MH Name			urn Clim riod Cha		irst (X) Ircharge	First (Y) Flood		st (Z) erflow	Overfi Act	low Leve	-	=h
1.000	mh1	15 Summ	er	2	+0% 30/	15 Summer	30/15 Summe	er			2.92	20 –0	.115
1.001		15 Wint		2			30/15 Summe				2.43		.128
1.002		15 Wint		2			30/15 Summe				2.1		.017
1.003		15 Wint		2			30/15 Summe	er			2.0		.045
2.000 2.001		15 Wint 15 Wint		2 2	+0% 30/	15 Summer					3.12		.119 .137
1.004		15 Wint 15 Wint		2		15 Summer					2.0		.137
		PN	US/MH Name	Flooded Volume (m³)		Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Statu	is E	Level Exceeded		
		1.000	mh1	0.000	0.44			29.0		OK	2		
		1.001	mh2	0.000					SURCHAR		4		
		1.002	mh3	0.000				66.3		OK			
		1.003	mh4	0.000	1.00			86.8		OK	3		
		2.000 2.001	mh5 mh6	0.000	0.44 0.31			24.8 45.9		OK OK			
		1.001	mh7		0.31			45.9		OK			
		004		0.000	0.10					011			

EAS Tran			-]	Page 2
Unit 23,			gs			EXISTI						
Stanstea						AREA 7						and the second
Hertford		·										Micro
Date 09/	09/20	22 21:	56			_	ed by EAS					Drainage
File Are	a 7 E	xistin	g Netu	work.MD	Х	Checke	d by					brainage
Innovyze	:					Networ	k 2020.1.3	3				
<u>30 yea</u>	<u>r Ret</u> M umber	anhole H Foul Se of Input r of Onl FEH	Areal Hot Headlos ewage p : Hydrc ine Cc Rain Rainfa Sit	Reductic Hot Star Start Le ss Coeff per hecta graphs (ntrols (fall Mod ll Versi e Locati C (1ki D1 (1ki D2 (1ki	on Facto: t (mins evel (mm (Global are (1/s) Number) Number <u>Synt</u> el on Synt el on GB 62 m) m) m) . Risk Wa Analysi	<u>Simulatio</u> r 1.000) 0) 0.500 F) 0.000 er of Off of Stora thetic Ra: 22800 3096	esults by <u>n Criteria</u> Additional MADD F. low per Per: line Control ge Structure infall Detai 550 TG 22800 a) ep 2.5 Secon 15 15	Maxim Flow - actor / Ir son per ls 0 Nu es 0 Nu 18 FEH 1999 09650 -0.024 0.275 0.370	- % of To - 10m³/ha alet Coef - Day (1/) umber of D3 (1 E (1 F (1 Cv (Summ Cv (Wint	tal Flow Storage fiecient per/day) Time/Are Real Tim km) 0.2 km) 0.3 km) 2.4 er) 0.7 er) 0.8	0.000 0.000 0.800 0.000 ea Diag ae Cont 55 10 98 50)) grams O
		Re	turn P		(years)	15, 30,	60, 120, 24		ummer and , 480, 96			
PN	US/MH Name	Storm		urn Clim		irst (X) Ircharge	First (Y) Flood		st (Z) Ov rflow		Water Level (m)	Surcharged Depth (m)
1.000 1.001 1.002 1.003 2.000 2.001 1.004	mh1 mh2 mh3 mh4 mh5 mh6	15 Summ 15 Wint 15 Summ 15 Wint 15 Wint 15 Wint 15 Wint	er er er er	30 30 30 30 30 30 30 30	+0% 30/ +0% 2/ +0% 30/ +0% 30/ +0% 30/ +0% 30/	15 Summer 15 Summer 15 Summer	30/15 Summ 30/15 Summ 30/15 Summ 30/15 Summ	er er er			4.072 3.554 3.164 2.906 3.351 2.756 1.791	1.037 1.269 0.994 0.806 0.106 -0.059
			וופ /אש	Flooded		Overflow	Half Drain Time	Pipe Flow		Leve	-1	
		PN	Name	(m ³)	flow / Cap.	(1/s)	(mins)	(1/s)	Status	Excee		
					-		,					
		1.000	mh1 mh2	1.953 13.521				54.6 98.0	FLO		2 4	
		1.001	mh2 mh3	0.026				98.0	FLO FLO		4	
		1.002	mh4	6.371				157.7	FLO		3	
		2.000	mh5	0.000					SURCHARGI			
		2.001	mh6	0.000				127.3		ЭК		
		1.004	mh7	0.000	1.21			475.4	SURCHARGI	ED		

ENC Transment Dlank	- in a					Daga 1
EAS Transport Plann Unit 23, The Maltin	-	EXISTI	NC			Page 1
	igs					
Stanstead Abbotts		AREA 7				
Hertfordshire, SG12						Micro
Date 09/09/2022 21:		-	ed by EAS			Drainage
File Area 7 Existin	ng Network.MD					
Innovyze		Networ	k 2020.1.3			
Foul S Number of Inpu Number of On FEH	Areal Reductio Hot Star Hot Start Le Headloss Coeff Gewage per hecta t Hydrographs O line Controls O Rainfall Mode Rainfall Versio Site Locatio C (1kr D1 (1kr D2 (1kr	Simulatic on Factor 1.000 t (mins) 0 vvel (mm) 0 (Global) 0.500 F re (1/s) 0.000 Number of Off Number of Stora Synthetic Ras el on GB 622800 3096 n) n)	n Criteria Additional Fl MADD Fact Tow per Person line Controls ge Structures infall Details 550 TG 22800 09 -0. 0. 0. 0.	ow - % of or * 10m ³ / Inlet Co per Day (0 Number o 0 Number o 0 Number o 550 F 650 F 024 Cv (Su 275 Cv (Wi 370	Total Flow 0. ha Storage 0. effiecient 0. l/per/day) 0. f Time/Area D f Real Time C (1km) 0.255 (1km) 0.310 (1km) 2.498 ummer) 0.750 .nter) 0.840 300.0	000 000 800 000 iagrams 0
R US/MH		ange (%)	60, 120, 240,	360, 480,	30 45	er Surcharged Vel Depth
PN Name Stor	m Period Cha	nge Surcharge	Flood	Overflow	Act. (m	.) (m)
1.000 mh1 15 Sum 1.001 mh2 15 Win 1.002 mh3 15 Sum 1.003 mh4 15 Win 2.000 mh5 15 Win 2.001 mh6 15 Win 1.004 mh7 15 Win	ter 30 + mer 30 + ter 30 + ter 30 + ter 30 +	45% 30/15 Summer 45% 30/15 Summer 45% 30/15 Summer 45% 30/15 Summer 45% 30/15 Summer 45% 30/15 Summer 45% 30/15 Summer	30/15 Summer 30/15 Summer 30/15 Summer 30/15 Summer		3.5 3.2 3.8 3.2	0781.0435691.2841.0240.8210.8210.8218430.5982640.4493750.130
PN	Flooded US/MH Volume Name (m³)	Flow / Overflow Cap. (1/s)		pe ow (s) Stati	Level us Exceeded	
		-				
1.000 1.001 1.002 1.003 2.000 2.001 1.004	mh2 28.930 mh3 3.566 mh4 21.015 mh5 2.682 mh6 0.000	0.84 3.16 2.02 1.83 1.51 1.11 1.52	10 13 15 8 16	8.7 F1 8.9 F1 8.7 F1		

EAS Tra	nspor	t Planni	na									Pa	age 1
		Malting	-			EXISTI	NG						
Stanste		-	5			AREA 7	-						
		e, SG12	9UC										
		022 21:5				Decian	ed by EAS					_	Micro
				andr MDA	7	-	-						Drainage
		Existing	Netwo	Drk.MD2	X	Checke		<u> </u>					.
Innovyz	e					Networ	k 2020.1.3	3					
	Number	Manhole He Foul Sev of Input er of Onli FEH R	Areal R Hot S eadloss wage pe Hydrog .ne Con Rainfall Site	eductio ot Star tart Le Coeff r hecta raphs 0 trols 0 all Mode Versic Locatic C (1km D1 (1km	n Factor t (mins) vel (mm) (Global) re (l/s) Number Synt el on GB 62 a) a) a) Risk Wa Analysi	Simulatio 1.000 0 0.500 F 0.000 er of Off of Stora hetic Rai 2800 3096 rning (mm	n Criteria Additional MADD F low per Per line Contro ge Structure .nfall Detai	Flow actor Ison pe ls 0 M es 0 M .1s FEI 1999 0 09650 -0.027 0.27 0.370	- % of * 10m ³ / inlet Co r Day (Jumber c Jumber c Jumber c H D3 9 E 0 F 4 Cv (Su 5 Cv (W 0)	Total ha Stc effiec l/per/ f Time f Real (1km)(1km) (1km)(1km) (1km)(1km)(1km)(1km)(1km)(1km)(1km)(1km)	Flow 0 brage 0 cient 0 (day) 0 e/Area 1 Time 0.255 0.310 2.498 0.750 0.840 00.0	.000 .000 .800 .000 Diagr	
		Ret	urn Pe	ation(s) riod(s)	Iner ofile(s)				Summer a O, 480,		1440 100 0	ater	Surcharged
PN	US/MH Name	Storm		n Clima d Chanc		rst (X) rcharge	First (Y Flood	•	irst (Z) verflow			Level (m)	Depth
1.000 1.001 1.002 1.003 2.000 2.001 1.004	mh1 mh2 mh3 mh4 mh5 mh6	15 Summer 15 Winter 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter	10 10 10 10 10 10 10	$\begin{array}{cccc} 0 & + \\ 0 & + \\ 0 & + \\ 0 & + \\ 0 & + \\ 0 & + \\ \end{array}$	0% 100/2 0% 100/2 0% 100/2 0% 100/2 0% 100/2 0% 100/2	15 Summer 15 Summer 15 Summer 15 Summer	100/15 Sum 100/15 Sum 100/15 Sum 100/15 Sum 100/15 Sum	mer mer mer mer		AU	2 3 2 3 3	4.080 3.571 3.195 2.923 3.844 3.295 1.887	(m) 1.045 1.286 1.025 0.823 0.599 0.480 0.142
		PN		looded Volume (m³)	Flow / Cap.	Overflow (1/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Stat	10 1	Level	đ	
		FIN	1401116	(cap.	(1/5)	(milis)	(1/5)	SLAL	us 1		u	
		1.000	mh1	9.518	0.84			54.7		LOOD		4	
		1.001	mh2	31.113	3.17			103.9		LOOD		6	
		1.002	mh3 mh4	4.576 22.879	2.02 1.83			133.9		LOOD LOOD		3 5	
		2.000	mh14 mh5	3.961	1.63			86.5		LOOD		2	
		2.001	mh 6	0.000	1.14				SURCHA				
		1.004	mh7	0.000	1.56			617.1	SURCHA	RGED			

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EAS Trar	-		-			1					P	age 1
Unit 23,		-	IS			EXISTI						
Stanstea						AREA 7						
Hertford												Micro
Date 09,						-	ed by EAS					Drainage
File Are	ea 7 :	Existing	n Netwo	ork.MDX	X	Checke	d by					bioinage
Innovyze	e					Networ	k 2020.1.	3				
	Number	Manhole H Foul Se of Input er of Onl	Areal R H Hot S eadloss wage pe Hydrog: ine Cont Rainfall Site	eductio ot Star tart Le Coeff r hecta raphs 0 trols 0 ll Mode . Versic	n Factor t (mins) vel (mm) (Global) re (l/s) Number Number <u>Synt</u> el on GB 62 a)	Simulatio 1.000 0 0.500 F 0.000 er of Off of Stora hetic Rai	n Criteria Additional MADD F low per Per line Contro ge Structur .nfall Detai	Flow - actor * son per ls 0 Nu es 0 Nu .ls FEH 1999 0 09650 -0.024	% of To 10m³/ha let Coef Day (1/) mber of mber of D3 (1 E (1	tal Flow Storage fiecient per/day) Time/Are Real Tim .km) 0.25 .km) 0.33 .km) 2.45 mer) 0.75	0.000 0.000 0.800 0.000 ea Diagu e Contu 55 10 98 50	
			Dura curn Per	Pro ation(s) riod(s)	Analysi Iner ofile(s)	DTS Statu DVD Statu tia Statu 15, 30,	p 2.5 Secor Is Is	Sı	ummer and	ON OFF OFF	Nation	Sunchanzad
PN	US/MH Name	Storm		n Clima d Chang		rst (X) rcharge	First (Y Flood	•	st (Z) Cerflow	Verflow Act.		Surcharged Depth (m)
1.000 1.001 1.002 1.003 2.000 2.001 1.004	mh2 mh3 mh4 mh5 mh6	15 Summe 15 Winte 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte	r 10) r 10) r 10) r 10) r 10)	0 +4 0 +4 0 +4 0 +4 0 +4 0 +4	5% 100/ 5% 100/ 5% 100/ 5% 100/ 5% 100/	15 Summer 15 Summer 15 Summer	100/15 Sum 100/15 Sum 100/15 Sum 100/15 Sum 100/15 Sum	mer mer mer			4.092 3.592 3.205 2.943 3.863 3.705 2.015	1.307 1.035 0.843 0.618 0.890
				looded	Flow /	Overflow	Half Drain Time	Pipe Flow		Leve	-1	
		PN	Name	(m ³)	Cap.	(1/s)	(mins)	(1/s)	Status	Excee		
		1.000 1.001 1.002 1.003 2.000 2.001 1.004	mh1 mh2 mh3 mh4	21.872 52.445 15.174 43.311 23.098 0.000 0.000	0.84 3.18 2.02 1.85 1.57 1.26 1.95			54.7 104.3 133.8 160.3 88.1 183.2	FLOO FLOO FLOO FLOOD RIS SURCHARGI	OD OD OD OD OD SK	6 7 4 6 4	

EAS Transport Plannin	ıg									Page 1
Unit 23, The Maltings	;			EXIST						
Stanstead Abbotts				AREA						
Hertfordshire, SG12 8	HG					_ Micro				
Date 09/09/2022 22:07	,			Desig	ned by	EAS				
File Area 8 Existing	Networ	k.MDX		Checke	ed by					Draina
Innovyze					rk 202	0.1.3				
		Exis	ting N	letwork	Detai	ls fo	r Sto	orm		
PN	Longth	E-11	Slope	I.Area	T.E.	k	HYD	NTA	Section Type	
PN	(m)	(m)	(1:X)	(ha)	(mins)	(mm)	SECT	(mm)	Section Type	
1.000	41.600	0.735	56.6	0.123	3.00	0.600	0	225	Pipe/Conduit	
2.000	17.900	0.015	1193.3	0.123	5.00	0.600	0	225	Pipe/Conduit	
1.001	52.600	0.400	131.5	0.123	0.00	0.600	0	300	Pipe/Conduit	
1.002	44.400	0.380	116.8	0.123	0.00	0.600	0	300	Pipe/Conduit	
3.000	16.400	0.230	71.3	0.123	5.00	0.600	0	225	Pipe/Conduit	
	44.400					0.600			Pipe/Conduit	
	38.000					0.600			Pipe/Conduit	
	3.400					0.600			Pipe/Conduit	
3.004	10.000	0.050	200.0	0.124	0.00	0.600	0	300	Pipe/Conduit	
1.003	18.000	0.090	200.0	0.124	0.00	0.600	0	375	Pipe/Conduit	
1.004	14.100	0.071	198.6	0.123	0.00	0.600	0	375	Pipe/Conduit	
1.005	10.000	0.023	434.8	0.124	0.00	0.600	0	675	Pipe/Conduit	

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	•	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)	
1.000	mh1	4.480	2.990	1.265	4.180	2.255	1.700		1200	
2.000	mh2	4.190	2.270	1.695	4.180	2.255	1.700		1200	
1.001	mh3	4.180	2.180	1.700	4.520	1.780	2.440		1200	
1.002	mh4	4.520	1.780	2.440	4.100	1.400	2.400		1200	
3.000	mh5	4.290	2.970	1.095	4.310	2.740	1.345		1200	
3.001	mh6	4.310	2.740	1.345	4.260	2.340	1.695		1200	
3.002	mh7	4.260	2.340	1.695	4.160	2.275	1.660		1200	
3.003	mh8	4.160	2.200	1.660	4.100	1.450	2.350		1200	
3.004	mh9	4.100	1.450	2.350	4.100	1.400	2.400		1200	
1.003	mh10	4.100	1.325	2.400	4.100	1.235	2.490		1500	
1.004	mh11	4.100	1.235	2.490	4.840	1.164	3.301		1500	
1.005	mh12	4.840	0.864	3.301	5.500	0.841	3.984		1800	

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:07	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	

MH Name	MH CL (m)	MH Depth (m)	Coni	MH nection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
mh1	4 480	1.490	Open	Manhole	1200	1.000	2.990	225				
mh2		1.920	-	Manhole		2.000	2.270	225				
mh3		2.000	-	Manhole		1.001	2.180		1.000	2.255	225	
			-1 -						2.000	2.255	225	
mh4	4.520	2.740	Open	Manhole	1200	1.002	1.780	300	1.001	1.780	300	
mh5	4.290	1.320	Open	Manhole	1200	3.000	2.970	225				
mh 6	4.310	1.570	Open	Manhole	1200	3.001	2.740	225	3.000	2.740	225	
mh7	4.260	1.920	Open	Manhole	1200	3.002	2.340	225	3.001	2.340	225	
mh8	4.160	1.960	Open	Manhole	1200	3.003	2.200	300	3.002	2.275	225	
mh9	4.100	2.650	Open	Manhole	1200	3.004	1.450	300	3.003	1.450	300	
mh10	4.100	2.775	Open	Manhole	1500	1.003	1.325	375	1.002	1.400	300	
									3.004	1.400	300	
mh11	4.100	2.865	Open	Manhole	1500	1.004	1.235	375	1.003	1.235	375	
mh12	4.840	3.976	Open	Manhole	1800	1.005	0.864	675	1.004	1.164	375	
	5.500	4.659	Open	Manhole	0		OUTFALL		1.005	0.841	675	

EAS Transport Planning		Page 3
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:07	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	·

Innovyze

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	0	225	mh1	4.480	2.990	1.265	Open Manhole	1200
2.000	0	225	mh2	4.190	2.270	1.695	Open Manhole	1200
1.001	0	300	mh3	4.180	2.180	1.700	Open Manhole	1200
1.002	0	300	mh4	4.520	1.780	2.440	Open Manhole	1200
3.000	0	225	mh5	4.290	2.970	1.095	Open Manhole	1200
3.001	0	225	mh6	4.310	2.740	1.345	Open Manhole	1200
3.002	0	225	mh7	4.260	2.340	1.695	Open Manhole	1200
3.003	0	300	mh8	4.160	2.200	1.660	Open Manhole	1200
3.004	0	300	mh9	4.100	1.450	2.350	Open Manhole	. 1200
1.003	0	375	mh10	4.100	1.325	2.400	Open Manhole	1500
1.004	0	375	mh11	4.100	1.235	2.490	Open Manhole	1500
1.005	0	675	mh12	4.840	0.864	3.301	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	41.600	56.6	mh3	4.180	2.255	1.700	Open Manhole	1200
2.000	17.900	1193.3	mh3	4.180	2.255	1.700	Open Manhole	1200
1.001	52.600	131.5	mh4	4.520	1.780	2.440	Open Manhole	1200
1.002	44.400	116.8	mh10	4.100	1.400	2.400	Open Manhole	1500
3.000	16.400	71.3	mh6	4.310	2.740	1.345	Open Manhole	1200
3.001	44.400	111.0	mh7	4.260	2.340	1.695	Open Manhole	1200
3.002	38.000	584.6	mh8	4.160	2.275	1.660	Open Manhole	1200
3.003	3.400	4.5	mh9	4.100	1.450	2.350	Open Manhole	1200
3.004	10.000	200.0	mh10	4.100	1.400	2.400	Open Manhole	1500
1.003	18.000	200.0	mh11	4.100	1.235	2.490	Open Manhole	1500
1.004	14.100	198.6	mh12	4.840	1.164	3.301	Open Manhole	1800
1.005	10.000	434.8		5.500	0.841	3.984	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall	Outfall	c.	Level	I.	Level	Min		D,L	W
Pipe Number	Name		(m)		(m)	I.	Level	(mm)	(mm)
							(m)		
1.005			5.500		0.841		0.000	0	0

EAS Transport Planning		Page 4
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:07	Designed by EAS	
File Area 8 Existing Network.MDX	Checked by	Drainago
Innovyze	Network 2020.1.3	
Simul	ation Criteria for Stor	n
		_
Volumetric Runoff Coe	eff 0.750 Additional Flow	- % of Total Flow 0.000
Areal Reduction Fact	tor 1.000 MADD Factor	* 10m³/ha Storage 0.000
Hot Start (mir	ns) 0 I	nlet Coeffiecient 0.800
Hot Start Level (m	nm) 0 Flow per Person pe	r Day (l/per/day) 0.000
Manhole Headloss Coeff (Globa	al) 0.500	Run Time (mins) 60
Foul Sewage per hectare (1/	(s) 0.000 Outpu	t Interval (mins) 1
Number of Input Hydrographs 0 Nur	mber of Offline Controls 0 N	Number of Time/Area Diagrams 0
Number of Online Controls 0 Number	er of Storage Structures 0 M	lumber of Real Time Controls 0
Synt	hetic Rainfall Details	
Rainfall Model	FEH	E (1km) 0.310
Return Period (years)	1	F (1km) 2.498
FEH Rainfall Version	1999	Summer Storms Yes
Site Location GB 62280	00 309650 TG 22800 09650	Winter Storms No
C (1km)	-0.024	Cv (Summer) 0.750
D_1 (1)-m)	0 075	$C_{\rm ext}$ (Winter) 0.040

D1 (1km) D2 (1km)

D3 (1km)

 -0.024
 Cv (Summer)
 0.750

 0.275
 Cv (Winter)
 0.840

0.370 Storm Duration (mins) 30

0.255

	anspo	rt Planni	na							Page	5
JIII /	-	e Malting	-		EXIS	STING				raye	5
Stanst		-	, ~		AREA						
		re, SG12	8HG			-				1.0	
		2022 22:0			Desi	gned by	EAS			— Mic	
		Existing		k.MDX		cked by	-			Ufa	inage
Innovy			·			ork 2020	.1.3				
<u>1 ye</u>	ear Re	Manhole H	Areal Red Hot Hot Sta eadloss C	luction Start irt Leve Coeff (G	Simula Factor 1.000 (mins) 1 (mm)	tion Crite 0 Additi 0 MA 0 0 Flow per	<u>ria</u> onal F DD Fac	aximum Out low - % of 1 tor * 10m³/h Inlet Coe n per Day (1	Total Flow na Storage effiecient	0.000 0.000 0.800	Storm
		ber of Onl:	ine Contr	el	Number of Sto Synthetic FS	orage Stru <u>Rainfall I</u> R M5-60 (m	ctures Details mm) 20	.000 Cv (Sum	f Real Tim mer) 0.75	e Controls	
			Regio	on Engla	and and Wale	s Ratio	ок ().	.405 Cv (Win	ter) 0.840	J	
		Maı	rgin for 1		isk Warning nalysis Time DTS St DVD St	estep 2.5 s atus	Second	Increment (300.0 Extended) ON OFF		
					Inertia St	atus			OFF		
			Clima	te Chan	ge (%)				0, 0		
PN	US/MH Name				• •			(Z) Overflo flow Act.	ow Level	Surcharged Depth (m)	Volume
	Name	Storm	Period (Change	• •			• •	ow Level (m)	Depth (m)	Volume (m³)
PN 1.000 2.000	Name mh1			Change +0%	• •	Flood		• •	ow Level	Depth	Volume (m ³)
1.000 2.000 1.001	Mame mh1 mh2 mh3	Storm 15 Summer 15 Winter 15 Winter	Period 0	Change +0왕 +0왕 +0왕	Surcharge	Flood		• •	Level (m) 3.078 2.503 2.339	Depth (m) -0.137 0.008 -0.141	Volume (m ³) 0.00 0.00
1.000 2.000 1.001 1.002	Name mh1 mh2 mh3 mh4	Storm 15 Summer 15 Winter 15 Winter 15 Winter	Period (1 1 1 1	Change +0% +0% +0% +0%	Surcharge 1/15 Summer 2/15 Summer	Flood		• •	Level (m) 3.078 2.503 2.339 1.959	Depth (m) -0.137 0.008 -0.141 -0.121	Volume (m ³) 0.000 0.000 0.000
1.000 2.000 1.001	mh1 mh2 mh3 mh4 mh5	Storm 15 Summer 15 Winter 15 Winter	Period 0	Change +0% +0% +0% +0% +0%	Surcharge	Flood		• •	Level (m) 3.078 2.503 2.339	Depth (m) -0.137 0.008 -0.141	Volume (m ³) 0.000 0.000 0.000 0.000
1.000 2.000 1.001 1.002 3.000 3.001 3.002	mh1 mh2 mh3 mh4 mh5 mh6 mh7	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period (1 1 1 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0%	Surcharge 1/15 Summer 2/15 Summer 2/15 Winter	Flood		• •	Level (m) 3.078 2.503 2.339 1.959 3.057 2.936 2.779	Depth (m) -0.137 0.008 -0.141 -0.121 -0.138 -0.029 0.214	Volume (m ³) 0.000 0.000 0.000 0.000 0.000 0.000
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003	Mame mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period (1 1 1 1 1 1 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge 1/15 Summer 2/15 Summer 2/15 Winter 2/15 Summer 1/15 Summer	Flood		• •	Level (m) 3.078 2.503 2.339 1.959 3.057 2.936 2.779 2.302	Depth (m) -0.137 0.008 -0.141 -0.121 -0.138 -0.029 0.214 -0.198	Volume (m ³) 0.000 0.000 0.000 0.000 0.000 0.000 0.000
1.000 2.000 1.001 1.002 3.000 3.001 3.002	Mame mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter	Period (1 1 1 1 1 1 1 1 1 1	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge 1/15 Summer 2/15 Summer 2/15 Winter 2/15 Summer	Flood		• •	Level (m) 3.078 2.503 2.339 1.959 3.057 2.936 2.779	Depth (m) -0.137 0.008 -0.141 -0.121 -0.138 -0.029 0.214	Volume (m ³) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm Storm Storm Summer Swinter Swinter Winter Winter Winter Winter Winter Winter Winter Swinter Number	Period 0 1 1 1 1 1 1 1 1 1 1 1 1 1	+0% +0% +0% +0% +0% +0% +0% +0% +0% +0% +0% +0% +0% 10% 10.30 2 1.68 3 0.54 4 0.65	Surcharge 1/15 Summer 2/15 Summer 2/15 Winter 2/15 Summer 1/15 Summer 1/15 Summer 1/15 Summer 1/15 Summer F / Overflow (1/s) 0 3 4 5	Flood Half Drain Time	Dipe Flow (1/s) 20.0 16.9 49.1 62.6	Status SURCHARGED OK OK	Level (m) 3.078 2.503 2.339 1.959 3.057 2.936 2.779 2.302 1.877 1.803 1.673 1.299	Depth (m) -0.137 0.008 -0.141 -0.121 -0.138 -0.029 0.214 -0.198 0.127 0.103 0.063	Volume (m ³) 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
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PN	US/MH Name	Storm			First (X) Surcharge				ow Level		Volume
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	Name mh1	Storm 15 Summer 15 Winter		Change +0응					ow Level	Depth	Volume (m ³)
1.000 2.000 1.001	Name mh1 mh2 mh3	15 Summer 15 Winter 15 Winter	Period 2 2 2 2 2	Change +0% +0% +0%	Surcharge				ow Level (m) 3.092 2.514 2.368	Depth (m) -0.123 0.019 -0.112	Volume (m ³) 0.00 0.00 0.00
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10	<pre>15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter</pre>	Period 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Change +0% +0% +0% +0% +0% +0% +0% +0%	Surcharge 1/15 Summer 2/15 Summer 2/15 Winter 2/15 Summer 1/15 Summer 1/15 Summer				ow Level (m) 3.092 2.514 2.368 2.148 3.131 3.160 2.925 2.315 2.054 1.941	Depth (m) -0.123 0.019 -0.112 0.068 -0.064 0.195 0.360 -0.185 0.304 0.241	Volume (m ³) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>ion(s) (r od(s) (ye te Change Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le(s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 30/15 2/15 2/15 2/15 2/15 2/15 30/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r), 480, 9 st (Z) O	d Win 60, 1 2, 0 verfl	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31	Depth (m) 4 -0.12 6 0.02 4 -0.10 9 0.11 1 0.06 3 0.25 8 0.40 8 -0.18 9 0.34
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>ion(s) (r od(s) (ye te Change Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r), 480, 9 st (Z) O	d Win 60, 1 2, 0 verfl	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.76	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>ion(s) (r od(s) (ye te Change Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r), 480, 9 st (Z) O	d Win 60, 1 2, 0 verfl	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>ion(s) (r od(s) (ye te Change Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r r), 480, 9 st (Z) O	d Win 60, 1 2, 0 verfl	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.76	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	ion(s) (r od(s) (ye te Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	Le (s) mins) fir: ears) e (%) Fir: Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 30/15 2/15 30/15 2/15 30/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r r), 480, 9 st (Z) O	d Win 60, 1 2, 0 verfl Act.	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.76	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>ion (s) (r od (s) (ye te Change Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 30/15 2/15 30/15 2/15 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2</pre>	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r Pipe Flow (1/s)), 480, 9 St (Z) O Sarflow	d Win 60, 1 2, 0 verfl Act.	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.36 1.36 Level xceeded	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate Climate Change Change +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 30/15 2/15 30/15 2/15 2/15 30/15 2/15 2/15 2/15 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2</pre>	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r r Pipe Flow (1/s) 27.1), 480, 9 st (Z) O arflow Status	d Win 60, 1 2, 0 verfl Act.	tter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.76 1.36 Level xceeded 2	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate Climate Change Change +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 30/15 2/15 30/15 2/15 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2</pre>	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	Fir Ove r r r r r Pipe Flow (1/s) 27.1), 480, 9 St (Z) O Sarflow	d Win 60, 1 2, 0 verfl Act.	tter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.36 1.36 Level xceeded	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate change climate change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 2/15 30/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	<pre>Fir Fir Cove r r r r Pipe Flow (1/s) 27.1 22.9 66.5</pre>), 480, 9 st (Z) O arflow Status	d Win 60, 1 2, 0 verfl Act. ok EED OK	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.36 Level xceeded 2 4	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 10 OOO 2.0000 1.001	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate change climate change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	<pre>Fir Fir Cove r r r r r r r r r r r r r</pre>), 480, 9 st (Z) O arflow Status	d Win 60, 1 2, 0 verfl Act. OK SED OK SED OK SED	ter 440 30 , 0 Water (m) 3.09 2.51 2.37 2.19 3.26 3.22 2.96 2.31 2.09 1.97 1.36 Level xceeded 2 4	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 10 000 2.0000 1.001 1.002 3.000 3.001	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate Climate Change Change +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	<pre>Fir Fir Ove r r r r Pipe Flow (1/s) 27.1 22.9 66.5 73.3 21.4</pre>), 480, 9 st (Z) O arflow Status SURCHARC SURCHARC	d Win 60, 1 2, 0 verfl Act. OK SED OK SED OK SED OK SED SED	tter 440 30 , 0 Water (m) 3.099 2.511 2.377 2.199 3.263 3.222 2.966 2.311 2.09 1.977 1.363 Level xceeded 2 4 3 5 4	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 10 000 2.0000 1.001 1.002 3.000 3.001 3.002	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate Climate Change Change +0% +0% +0%</pre>	Le (s) mins) 2 ears) e (%) Fir: Surd 30/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	<pre>Fir Fir Ove r r r r Pipe Flow (1/s) 27.1 22.9 66.5 73.3 21.4 37.0 53.6</pre>	st (Z) O srflow Status SURCHARC SURCHARC	d Win 60, 1 2, 0 verfl Act. Act. OK SED OK SED OK SED SED SED	tter 440 30 , 0 Water (m) 3.099 2.511 2.377 2.199 3.263 3.222 2.966 2.311 2.09 1.977 1.363 Level xceeded 2 4 3 5	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summe 15 Winte 15 Winte 10 000 2.0000 1.001 1.002 3.000 3.001	urn Perio Climat Return Period r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2 r 2	<pre>climate Climate Change Change +0%</pre>	Le (s) mins) first ears) e (%) First Surd 30/15 2/15	15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 240 First (Y) Flood 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe 30/15 Summe	<pre>Fir Ove r r r r r r r r r r r r r r r r r r r</pre>	st (Z) O srflow Status SURCHARC SURCHARC SURCHARC	d Win 60, 1 2, 0 verfl Act. Act. OK SED OK SED OK SED OK SED OK	tter 440 30 , 0 Water (m) 3.099 2.511 2.377 2.199 3.263 3.222 2.966 2.311 2.09 1.977 1.363 Level xceeded 2 4 3 5 4	Depth (m) 4 -0.12: 6 0.02: 4 -0.10: 9 0.11: 1 0.06: 3 0.25: 8 0.40: 9 0.34: 6 0.27: 6 0.15:

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:09	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Diamage
Innovyze	Network 2020.1.3	

		Flooded			Half Drain	Pipe		
	US/MH	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	(m³)	Cap.	(1/s)	(mins)	(l/s)	Status	Exceeded
1.003	mh10	0.000	1.52			176 7	SURCHARGED	
1.003	mh11	0.000	1.80				SURCHARGED	
1.005	mh12	0.000	0.94			209.1	OK	

EAS Transport Planning	Page 3
Unit 23, The Maltings	EXISTING
Stanstead Abbotts	AREA 8
Hertfordshire, SG12 8HG	Micro
Date 09/09/2022 22:09	Designed by EAS
File Area 8 Existing Network.MDX	Checked by Double Checked by Network 2020.1.3
Innovyze	Network 2020.1.3
30 year Return Period Summary of Crit	ical Results by Maximum Outflow (Rank 1) for Storm
2	imulation Criteria
	1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) Hot Start Level (mm)	. 5
	0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (1/s)	0.000
	r of Offline Controls O Number of Time/Area Diagrams O of Storage Structures O Number of Real Time Controls O
Synth	etic Rainfall Details
Rainfall Model	FEH D3 (1km) 0.255
FEH Rainfall Version Site Location GB 622	1999 E (1km) 0.310 800 309650 TG 22800 09650 F (1km) 2.498
C (1km)	-0.024 Cv (Summer) 0.750
D1 (1km) D2 (1km)	0.275 Cv (Winter) 0.840 0.370
Margin for Flood Risk War Analysis	ning (mm) 300.0 Timestep 2.5 Second Increment (Extended)
D	TS Status ON
	VD Status OFF ia Status OFF
Profile(s)	Summer and Winter
	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) Climate Change (%)	2, 30 0, 0
US/MH Return Climate Fir	Water Surcharged st (X) First (Y) First (Z) Overflow Level Depth
PN Name Storm Period Change Sur	charge Flood Overflow Act. (m) (m)
1.000 mh1 15 Summer 30 +0% 30/1	5 Summer 30/15 Summer 4.482 1.267
	5 Summer 30/15 Summer 4.203 1.708 5 Summer 30/15 Summer 4.188 1.708
	5 Summer 4.188 1.708 5 Summer 4.083 2.003
	5 Winter 30/15 Summer 4.311 1.116
	5 Summer 30/15 Summer 4.319 1.354 5 Summer 30/15 Summer 4.267 1.702
3.003 mh8 15 Summer 30 +0% 30/1	5 Summer 4.149 1.649
	5 Summer 3.989 2.239 5 Summer 3.516 1.816
	5 Summer 5.510 1.010 5 Summer 2.722 1.112
1.005 mh12 15 Winter 30 +0% 30/1	5 Summer 1.611 0.072
Flooded US/MH Volume Flow / C	Half Drain Pipe Vverflow Time Flow Level
PN Name (m ³) Cap.	(l/s) (mins) (l/s) Status Exceeded
1.000 mh1 1.797 0.72	47.6 FLOOD 2
2.000 mh2 13.158 9.28	93.1 FLOOD 4
1.001 mh3 7.788 1.28 1.002 mh4 0.000 1.43	117.1 FLOOD 3 137.3 SURCHARGED
3.000 mh5 21.361 1.20	65.9 FLOOD 5
3.001 mh6 8.840 1.45	68.1 FLOOD 4 82.8 FLOOD 3
	82.8 FLOOD 3
3.002 mh7 6.747 4.12 3.003 mh8 0.000 0.52	112.9 FLOOD RISK
3.003 mh8 0.000 0.52 3.004 mh9 0.000 2.75	

EAS Transport Planning		Page 4
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:09	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	

	Flooded			Half Drain	Pipe		
US/MH	Volume	Flow /	Overflow	Time	Flow		Level
Name	(m³)	Cap.	(1/s)	(mins)	(l/s)	Status	Exceeded
mb10	0 000	2 99			348 0	SURCHARGED	
	0.000	3.79					
mh12	0.000	2.08			465.7	SURCHARGED	
	Name mh10 mh11	US/MH Volume Name (m ³) mh10 0.000 mh11 0.000	Name (m³) Cap. mh10 0.000 2.99 mh11 0.000 3.79	US/MH Volume Flow / Overflow Name (m ³) Cap. (l/s) mh10 0.000 2.99 mh11 0.000 3.79	US/MH Volume Flow / Overflow Time Name (m³) Cap. (l/s) (mins) mh10 0.000 2.99 mh11 0.000 3.79	US/MH Volume Flow Overflow Time Flow Name (m ³) Cap. (l/s) (mins) (l/s) mh10 0.000 2.99 348.0 mh11 0.000 3.79 406.5	US/MHVolumeFlow / OverflowTimeFlowName(m³)Cap.(l/s)(mins)(l/s)Statusmh100.0002.99348.0SURCHARGEDmh110.0003.79406.5SURCHARGED

EAS Transport Pl	anning			Page 1
Unit 23, The Mal	tings	EXISTING		
Stanstead Abbott	S	AREA 8		
Hertfordshire, S	G12 8HG			Micro
Date 09/09/2022		Designed by EAS		Drainage
	ting Network.MDX	Checked by		brainage
Innovyze		Network 2020.1.3		
<u>30 year Return</u>	Period Summary of Cri	tical Results by Maxi	mum Outflow (Rank 1	l) for Storm
Foi		0 I 0.500 Flow per Person pe 0.000	* 10m³/ha Storage 0.00 Inlet Coeffiecient 0.80 er Day (l/per/day) 0.00	00 00 00
Number of	E Online Controls 0 Number	of Storage Structures 0 N	Number of Real Time Cor	ntrols 0
	Rainfall Model FEH Rainfall Version	199 2800 309650 TG 22800 0965 -0.02	0 F (1km) 2.498 4 Cv (Summer) 0.750 5 Cv (Winter) 0.840	
	_	s Timestep 2.5 Second Inc		
		DTS Status DVD Status	ON OFF	
		tia Status	OFF	
	Profile(s)		Summer and Winter	
		15, 30, 60, 120, 240, 36		
	Return Period(s) (years) Climate Change (%)		30 45	
	officie on ange (0)		10	
			Water	Surcharged
US/MH	Return Climate Fi	rst (X) First (Y) Fin	rst (Z) Overflow Leve	-
PN Name S	Storm Period Change Su	rcharge Flood Ov	verflow Act. (m)	(m)
1.000 mh1 15	Winter 30 +45% 30/2	15 Summer 30/15 Summer	4.49	0 1.275
2.000 mh2 15		15 Summer 30/15 Summer	4.21	
1.001 mh3 15		15 Summer 30/15 Summer	4.20	
1.002 mh4 15 3.000 mh5 15		15 Summer 15 Summer 30/15 Summer	4.22 4.32	
3.000 mll3 15 3.001 mh6 15		15 Summer 30/15 Summer	4.32	
3.002 mh7 15		15 Summer 30/15 Summer	4.28	
3.003 mh8 15		15 Summer 30/15 Summer	4.16	
3.004 mh9 15		15 Summer 30/15 Summer	4.10	
1.003 mh10 15	Winter 30 +45% 30/2	15 Summer	3.73	4 2.034
1.004 mh11 15			3.01	
1.005 mh12 15	Summer 30 +45% 30/3	15 Summer	1.66	7 0.128
	Flooded	Half Drain Pipe		
	US/MH Volume Flow /		Level	
	PN Name (m³) Cap.	(1/s) (mins) (1/s)	Status Exceeded	
1	.000 mh1 10.403 0.66	43.4	FLOOD 5	
	.000 mh2 27.419 10.97	110.1		
	.001 mh3 27.164 1.56	142.7		
	.002 mh4 0.000 1.49		FLOOD RISK	
	.000 mh5 30.269 1.21	66.5		
3	.001 mh6 19.760 1.58	74.5	FLOOD 5	
3	.002 mh7 22.656 4.88	98.1	FLOOD 5	
3	.003 mh8 8.972 0.72	156.8	B FLOOD 3	
3	.004 mh9 1.296 3.08	188.8	FLOOD 2	
	©1	982-2020 Innovyze		

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:11	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	•

	Flooded			Half Drain	Pipe		
US/MH	Volume	Flow /	Overflow	Time	Flow		Level
Name	(m³)	Cap.	(1/s)	(mins)	(l/s)	Status	Exceeded
03 mh10	0 000	3 06			356 1	SURCHARGED	
05 mh12	0.000	2.40			536.9	SURCHARGED	
	Name Name Mathematical Name Mathematical Name Mathematical Name Mathematical Name Mathematical Name Name Name Name Name Name Name Name	US/MH Volume Name (m³) 03 mh10 0.000 04 mh11 0.000	Name (m ³) Cap. 03 mh10 0.000 3.06 04 mh11 0.000 4.14	US/MH Volume Flow / Overflow Name (m ³) Cap. (l/s) 03 mh10 0.000 3.06 04 mh11 0.000 4.14	US/MH Volume Flow / Overflow Time Name (m³) Cap. (l/s) (mins) 03 mh10 0.000 3.06 04 mh11 0.000 4.14	US/MH Volume Flow / Overflow Time Flow Name (m ³) Cap. (1/s) (mins) (1/s) 03 mh10 0.000 3.06 356.1 04 mh11 0.000 4.14 444.0	US/MHVolumeFlowTimeFlowName(m³)Cap.(l/s)(mins)(l/s)Status03mh100.0003.06356.1SURCHARGED04mh110.0004.14444.0SURCHARGED

AS Tra	-	Malting	5			EXISTI	NG					1	
	ad Abb	-	-			AREA 8	-						
		e, SG12	0110			AREA 0							
)22 22:1				Decian	ad by EAC					_	Micro
						-	ed by EAS						Drainac
		Existing	Networ	rk.MDX		Checke							
nnovyz	e					Networ	k 2020.1.3	}					
	Mumber	Anhole He Foul Sew of Input er of Onli FEH R	real Rec Hot Sta adloss (age per Hydrogra ne Contr Rainfall Site L D D	duction t Start art Leve Coeff (G hectare aphs 0 cols 0 N l Model Version ocation C (1km) 1 (1km) 2 (1km) Flood R.	<u>Si</u> Factor (mins) 1 (mm) lobal) (1/s) Number Synth GB 622 isk War nalysis	imulation 1.000 0 0.500 F 0.000 r of Offi of Storad etic Rai 800 3096 ning (mm	low per Pers line Control ge Structure .nfall Detai 550 TG 22800 p 2.5 Secon	Flow - actor 1 son per .s 0 N es 0 N 1s FEH 1999 09650 -0.024 0.275 0.370	- % of T * 10m³/h hlet Coe c Day (1 umber of umber of D3 E F Cv (Sur Cv (Win	otal a St. /per Tim Rea (1km) (1km) (1km) uner) uter)	Flow 0 orage 0 cient 0 /day) 0 e/Area 1 Time 0.255 0.310 2.498 0.750 0.840 300.0	0.000 0.000 0.800 0.000 Diagr	rams O
				Prof	Inert	VD Statu ia Statu		S	ummer ar	nd Wi	OFF OFF nter		
	US/MH	Ret	urn Peri Clima	ion(s) .od(s) (<u>;</u> .te Chano	Inert ile(s) (mins) years) ge (%)	ia Statu 15, 30,	60, 120, 24	0, 360	, 480, 9	960,	OFF .nter 1440 100 0		Surcharge
PN	US/MH Name	Ret Storm	urn Peri Clima Return	ion(s) .od(s) (Inert ile(s) (mins) years) ge (%) Firs	ia Statu	15	0, 360) Fi		Over	OFF .nter 1440 100 0	later Level (m)	Surcharge Depth (m)
	Name	Storm	urn Peri Clima Return Period	ion(s) od(s) (<u>t</u> te Change Climate Change	Inert ile(s) (mins) years) ge (%) se Firs Surc	ia Statu 15, 30, st (X) charge	60, 120, 24 First (Y) Flood	0, 360) Fi Or	, 480, 9 rst (Z)	Over	OFF 1440 100 0 W flow 1 :t.	Level (m)	Depth (m)
1.000	Name mh1		urn Peri Clima Return Period 100	ion(s) od(s) (<u>t</u> te Change Climate Change +0%	Inert ile(s) (mins) years) ge (%) Firs Surc : 100/15	ia Statu 15, 30, st (X) charge 5 Summer	60, 120, 24 First (Y) Flood 100/15 Summ	0, 360 Fi Ox	, 480, 9 rst (Z)	Over	OFF 1440 100 0 W flow 1 :t.	Level (m) 4.490	Depth (m) 1.27
	Mame mh1 mh2	Storm 15 Summer	urn Peri Clima Return Period 100 100	<pre>ion(s) od(s) (1 te Change Climate Change +0% +0%</pre>	Inert ile(s) (mins) years) ge (%) Firs Surc : 100/15 : 100/15	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer	60, 120, 24 First (Y) Flood	0, 360 Fi Ov ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 st.	Level (m)	Depth (m)
1.000	Name mh1 mh2 mh3	Storm 15 Summer 15 Winter	urn Peri Clima Return Period 100 100	<pre>ion(s) .od(s) (1 te Change Climate Change +0% +0% +0% +0%</pre>	Inert ile(s) (mins) years) ge (%) Firs Surc : 100/15 : 100/15	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer	60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ 100/15 Summ	0, 360 Fi Ov ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 :t.	Level (m) 4.490 4.220	Depth (m) 1.22 1.72
1.000 2.000 1.001	Mame mh1 mh2 mh3 mh4	Storm 15 Summer 15 Winter 15 Winter	urn Peri Clima Return Period 100 100 100	<pre>ion(s) ion(s) (y ite Change Climate Change +0% +0% +0% +0% +0%</pre>	<pre>Inert ile(s) (mins) years) ge (%) Firs Surc 100/15 100/15 100/15 100/15</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ 100/15 Summ	0, 360) Fi Or ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 st.	Level (m) 4.490 4.220 4.210	Depth (m) 1.22 1.72 2.14
1.000 2.000 1.001 1.002	Name mh1 mh2 mh3 mh4 mh5	Storm 15 Summer 15 Winter 15 Winter 15 Winter	urn Peri Clima Return Period 100 100 100 100	<pre>ion(s) ion(s) (y ite Change Climate Change +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Inert ile(s) (mins) years) ge (%) Firs Surc 100/15 100/15 100/15 100/15 100/15</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	<pre>60, 120, 24</pre>	0, 360) Fi Ox ner ner ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 st.	Level (m) 4.490 4.220 4.210 4.224	Depth (m) 1.27 1.72
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Summer 15 Winter 15 Winter	urn Peri Clima Return Period 100 100 100 100 100 100 100	<pre>ion(s) ion(s)() ite Change Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Inert ile(s) (mins) years) ge (%) Firs Surc 100/15 1</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	First (Y) Flood 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ	0, 360) Fi or ner ner ner ner ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 st.	Level (m) 4.490 4.220 4.210 4.224 4.327 4.328 4.285 4.172	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100	<pre>climate Climate Change +0%</pre>	<pre>Inert ile(s) (mins) years) ge (%) Firs Surc 100/15 1</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	First (Y) Flood 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ	0, 360) Fi or ner ner ner ner ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 % flow 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.224 4.327 4.328 4.285 4.172 4.102 3.754	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100	<pre>climate Climate Change +0%</pre>	<pre>Inert Inert I</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ	0, 360) Fi or ner ner ner ner ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 % flow 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.224 4.327 4.328 4.285 4.172 4.102 3.754	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	<pre>climate Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Inert Inert I</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer	60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ 100/15 Summ	0, 360) Fi or ner ner ner ner ner ner	, 480, 9 rst (Z)	Over	OFF 1440 100 0 % flow 1 % flow 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.224 4.224 4.224 4.225 4.285 4.172 4.102 3.754 3.026	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer 15 Summer	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	<pre>climate Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Inert Inert I</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	<pre>60, 120, 24</pre>	0, 360) Fi or ner ner ner ner ner Pipe Flow (1/s)	, 480, 9 rst (Z) rerflow	Over Ac	OFF 1440 100 0 W flow I t. 2 2 2 2 2 2 2 2 2 2 2 2 2	Level (m) 4.490 4.220 4.210 4.224 4.327 4.328 4.285 4.172 4.102 3.754 3.026 1.674	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer 15 Summer 15 Summer 15 Summer 15 Summer 15 Summer 15 Summer	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	<pre>climate Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	Inert ile(s) (mins) years) ge (%) Firs Surc 100/15 100	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	<pre>60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ 100/15 S</pre>	0, 360) Fi or ner ner ner ner ner Pipe Flow (1/s) 44.1 110.8	, 480, 9 rst (Z) rerflow Statu FL	0000, 0000 0000	OFF Inter 1440 100 0 W flow I st. 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.327 4.328 4.285 4.172 4.102 3.754 3.026 1.674	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 S	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	<pre>climate Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Inert Inert I</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	<pre>60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ</pre>	0, 360) Fi or ner ner ner ner ner ner ner dilas 44.1 110.8 145.0	, 480, 9 rst (Z) rerflow Statu FL	000, 000 AC	OFF Inter 1440 100 0 W flow I st. 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.327 4.328 4.285 4.172 4.102 3.754 3.026 1.674 4.674	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer 15 Summer 1000 2.000 1.001 1.002	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	<pre>climate Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%</pre>	<pre>Inert Ile(s) (mins) years) ge (%) Firs Surc 100/15 10</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	<pre>60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ</pre>	0, 360) Fi or ner ner ner ner ner ner ner timer (1/s) 44.1 110.8 145.0 144.4	, 480, 9 rst (Z) rerflow Statu FL FL FLOD R FL FLOOD R FL	0000, 0000 0000 0000 0000 0000 0000 00	OFF Inter 1440 100 0 W flow I st. 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.327 4.328 4.285 4.172 4.102 3.754 3.026 1.674 4.674	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 15 Summer 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer 16 Summer 17 Summer 18 Summer 19 Summer 1000 2.000 1.001 1.002 3.000	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	Climate Climate Change +0% +0% +0% +0% +0% +0% +0% +0% +0% +0%	<pre>Inert Inert I</pre>	ia Statu 15, 30, st (X) charge 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer 5 Summer	<pre>60, 120, 24 First (Y) Flood 100/15 Summ 100/15 Summ 100/15 S</pre>	0, 360) Fi or ner ner ner ner ner ner ner timer (1/s) 44.1 110.8 145.0 144.4 66.4	, 480, 9 rst (Z) rerflow Flow FL FLOD R FL FLOOD R FL FL	over Ac	OFF Inter 1440 100 0 W flow I st. 4 4 4 4 4 4 4 4 4 4 4 4 4	Level (m) 4.490 4.220 4.210 4.224 4.327 4.328 4.285 4.172 4.102 3.754 3.026 1.674 5 6 5 6 5 6	Depth (m) 1.27 1.72 1.73 2.14 1.13 1.36 1.72 1.67 2.35 2.05 1.41
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EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:12	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	

PN	US/MH Name	Flooded Volume (m ³)		Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.003 1.004 1.005	mh10 mh11 mh12	0.000 0.000 0.000	3.04 4.16 2.44			446.3	SURCHARGED SURCHARGED SURCHARGED	

AS Tra	-		-										age 1
		Malting	S			EXISTI	NG						
tanste					1	AREA 8							The second
		e, SG12											Micro
ate 09	/09/20	022 22:1	9		I	Designe	ed by EAS	5					Drainar
ile Ar	ea 8 I	Existing	Networ	k.MDX	0	Checke	d by						Diamaç
nnovyz	e				1	Networl	k 2020.1.	3					
	INumber	A Manhole He Foul Sev of Input er of Onli FEH R	Areal Rec Hot Sta eadloss (age per Hydrogra ne Contr Rainfall Site I D	duction Start Art Leve Coeff (G hectare aphs 0 cols 0 N l Model Version ocation C (1km) 1 (1km) 2 (1km) Flood R:	Sir Factor 1 (mins) 1 (mm) lobal) ((1/s) (Number of Synthe GB 6228 isk Warn halysis DT	mulation 1.000 0 0.500 F: 0.000 of Off: f Storage tic Rai 00 3096 ing (mm	low per Pe line Contro ge Structuu nfall Deta 50 TG 2280) p 2.5 Seco s	1 Flow Factor rson pe ols 0 1 res 0 1 ils FE 199 0 0965 -0.02 0.27 0.37	- % c * 10m Inlet er Day Number Number 9 0 4 Cv 5 Cv 0	f Tota ³ /ha S Coeffi (1/pe of T of R O3 (1k E (1k F (1k (Summe (Winte	al Flow Storage iecient er/day) ime/Are eal Tim m) 0.2 m) 0.3 m) 2.4 r) 0.7 r) 0.8 300.0 ended) ON	0.000 0.000 0.800 0.000 ea Diag ne Cont 55 10 98 50	rams O
			Duran		Inerti ile(s)	D Statu a Statu	S				ON ON Winter		
		Ret	urn Peri	ion(s)	Inerti ile(s) (mins) 1 years)	a Statu					ON Winter	Water	Surcharge
PN	US/MH Name		urn Peri Clima Return	ion(s) od(s) (y te Chang Climate	Inerti ile(s) (mins) 1 years) ge (%) First	a Statu .5, 30, t (X)	S	40, 36 Y) F	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level	. Depth
PN	Name	Storm	urn Peri Clima Return Period	ion(s) od(s) (<u>y</u> te Chang Climate Change	Inerti ile(s) (mins) 1 years) ge (%) First Surch	a Statu .5, 30, t (X) harge	60, 120, 2 First (Flood	240, 36 Y) F C	50, 48	(Z) Ov	ON Winter , 1440 100 45	Level (m)	Depth (m)
1.000	Name mh1	Storm 60 Winter	urn Peri Clima Return Period 100	ion(s) od(s) (<u>y</u> te Chang Climate Change +45%	Inerti ile(s) (mins) 1 years) ge (%) First Surch 100/15	a Statu .5, 30, t (X) harge Summer	60, 120, 2 First (Flood 100/15 Sun	:40, 36 Y) F C mmer	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level (m) 4.484	Depth (m)
	Mame mh1 mh2	Storm	urn Peri Clima Return Period 100 100	ion(s) od(s) (<u>y</u> te Chang Climate Change +45% +45%	Inerti ile(s) (mins) 1 years) ge (%) First Surch 100/15 100/15	a Statu .5, 30, t (X) harge Summer	60, 120, 2 First (Flood	Y) F mmer	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level (m)	Depth (m) 1.26 1.74
1.000 2.000	Name mh1 mh2 mh3	Storm 60 Winter 15 Winter	urn Peri Clima Return Period 100 100	ion(s) od(s) (<u>y</u> te Change Climate Change +45% +45% +45%	Inerti ile(s) (mins) 1 years) ge (%) First Surch 100/15 100/15 100/15	a Statu .5, 30, t (X) harge Summer Summer	60, 120, 2 First (Flood 100/15 Sun 100/15 Sun	40, 36 Y) F C mmer mmer	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level (m) 4.484 4.241	Depth (m) 1.26 1.74 1.75
1.000 2.000 1.001	Mame mh1 mh2 mh3 mh4	Storm 60 Winter 15 Winter 15 Summer	Return Period 100 100 100	ion(s) od(s) (<u>y</u> te Change Climate Change +45% +45% +45% +45%	Inerti ile(s) (mins) 1 years) ge (%) First Surch 100/15 100/15 100/15 100/15	a Statu .5, 30, t (X) harge Summer Summer Summer	60, 120, 2 First (' Flood 100/15 Sun 100/15 Sun 100/15 Sun	40, 36 Y) F C nmer nmer nmer nmer	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level (m) 4.484 4.241 4.232	Depth (m) 1.26 1.74 1.75 2.44
1.000 2.000 1.001 1.002 3.000 3.001	Mame mh1 mh2 mh3 mh4 mh5 mh6	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Summer 15 Winter	urn Peri Clima Return Period 100 100 100 100 100	ion(s) od(s) (y te Change Climate Change +45% +45% +45% +45% +45%	Inerti ile(s) (mins) 1 years) ge(%) First Surch 100/15 100/15 100/15 100/15 100/15	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer	<pre>60, 120, 2 60, 120, 2 First (Flood 100/15 Su 100/15 Su 100/15 Su 100/15 Su 100/15 Su 100/15 Su 100/15 Su</pre>	Y) F C mmer mmer mmer mmer mmer	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349	Depth (m) 1.26 1.74 2.44 0.1.4 0.1.4
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	ion(s) od(s) (y te Change +45% +45% +45% +45% +45% +45% +45% +45%	Inerti ile(s) (mins) 1 years) ge(%) First Surch 100/15 100/15 100/15 100/15 100/15 100/15 100/15 100/15	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer Summer Summer Summer Summer Summer	<pre>60, 120, 2 60, 120, 2 First (' Flood 100/15 Su 100/</pre>	Y) F C mmer mmer mmer mmer mmer mmer mmer	irst	(Z) Ov	ON Winter , 1440 100 45 erflow	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349 4.304 4.194 4.119 3.964 3.217	Depth (m)
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1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Winter 15 Winter 15 Summer 15 S	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	ion(s) od(s) (y te Change +45% +45% +45% +45% +45% +45% +45% +45%	<pre>Inerti ile(s) (mins) 1 years) ge (%) First Surcl 100/15 100</pre>	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer Summer Summer Summer Summer	60, 120, 2 First (' Flood 100/15 Sun 100/15 Sun 1	<pre>X) F mmer mmer mmer mmer mmer mmer mmer mme</pre>	irst o Dverfl	(Z) Ov ow FLOOI FLOOI FLOOI FLOOI	ON Winter , 1440 45 erflow Act.	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349 4.304 4.194 4.119 3.964 3.217 1.722 el sded 6 7 6 1	Depth (m)
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer 15 Summer 15 Winter 15 Ninter 15 Ninter 15 Summer 15 Summer 16 Summer 17 Summer 17 Summer 18 S	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	ion(s) od(s) (y te Change +45% +45% +45% +45% +45% +45% +45% +45%	Inerti ile(s) (mins) 1 years) ge (%) First Surcl 100/15	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer Summer Summer Summer Summer	60, 120, 2 First (' Flood 100/15 Sun 100/15 Sun 1	(1/s) (40, 36 (x) (x) (x) (x) (x) (x) (x) (x) (x) (x)	irst o Dverfl	2) Ov ow FLOOI FLOOI FLOOI FLOOI FLOOI	ON Winter , 1440 45 erflow Act.	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349 4.304 4.194 4.199 3.964 3.217 1.722 el sded 6 7 6 1 8	Depth (m)
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Winter 15 Winter 15 Summer 15 S	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	ion(s) od(s) (y te Change +45% +45% +45% +45% +45% +45% +45% +45%	<pre>Inerti ile(s) (mins) 1 years) ge (%) First Surcl 100/15 100</pre>	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer Summer Summer Summer Summer	60, 120, 2 First (' Flood 100/15 Sun 100/15 Sun 1	(1/s) (40, 36 (1/s) (1	irst o Dverfl	atus FLOOI FLOOI FLOOI FLOOI FLOOI FLOOI	ON Winter , 1440 100 45 erflow Act.	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349 4.304 4.194 4.119 3.964 3.217 1.722 el sded 6 7 6 1 8 7	Depth (m)
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Winter 15 Winter 15 Summer 15 Summer 15 Summer 15 Summer 15 Winter 15 Ninter 15 Ninter 15 Summer 15 Summer 10 S	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	ion(s) od(s) (y te Change +45% +45% +45% +45% +45% +45% +45% +45%	Inerti ile(s) (mins) 1 years) ge (%) First Surcl 100/15	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer Summer Summer Summer Summer	60, 120, 2 First (' Flood 100/15 Sun 100/15 Sun 1	<pre>40, 36 (40, 36 mmer mmer mmer mmer mmer mmer mmer mmer 4 149.8 14</pre>	irst o Dverfl	atus FLOOI FLOOI FLOOI FLOOI FLOOI FLOOI FLOOI	ON Winter , 1440 100 45 erflow Act.	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349 4.304 4.194 4.119 3.964 3.217 1.722 el ed 6 7 6 1 8 7 6	Depth (m)
1.000 2.000 1.001 1.002 3.000 3.001 3.002 3.003 3.004 1.003 1.004	Name mh1 mh2 mh3 mh4 mh5 mh6 mh7 mh8 mh9 mh10 mh11	Storm 60 Winter 15 Winter 15 Summer 15 Summer 15 Winter 15 Winter 15 Summer 15 S	urn Peri Clima Return Period 100 100 100 100 100 100 100 100 100 10	ion(s) od(s) (y te Change +45% +45% +45% +45% +45% +45% +45% +45%	<pre>Inerti ile(s) (mins) 1 years) ge (%) First Surcl 100/15 100</pre>	a Statu .5, 30, t (X) harge Summer Summer Summer Summer Summer Summer Summer Summer Summer	60, 120, 2 First (' Flood 100/15 Sun 100/15 Sun 1	(1/s) (40, 36 (1/s) (1	irst o Dverfl	atus FLOOI FLOOI FLOOI FLOOI FLOOI FLOOI	ON Winter , 1440 100 45 erflow Act.	Level (m) 4.484 4.241 4.232 4.520 4.339 4.349 4.304 4.194 4.119 3.964 3.217 1.722 el sded 6 7 6 1 8 7	Depth (m)

EAS Transport Planning		Page 2
Unit 23, The Maltings	EXISTING	
Stanstead Abbotts	AREA 8	
Hertfordshire, SG12 8HG		Micro
Date 09/09/2022 22:19	Designed by EAS	Drainage
File Area 8 Existing Network.MDX	Checked by	Drainage
Innovyze	Network 2020.1.3	

		Flooded			Half Drain	-		
	US/MH	Volume	Flow /	Overflow	Time	Flow		Level
PN	Name	(m³)	Cap.	(l/s)	(mins)	(l/s)	Status	Exceeded
1.003	mh10	0.000	3.06			356.4	FLOOD RISK	
1.004	mh11	0.000	4.46			478.1	SURCHARGED	
1.005	mh12	0.000	2.76			616.8	SURCHARGED	

Appendix: I – Greenfield Run-off Rate Calculations

CAUSEWAY 🚱	Ltd File: Page 1 Network: Storm Network Stephen Adams 16/09/2022						
<u>s</u>	mulation Settings						
Winter CV 0.840 Addition	Skip Steady Statex1 year (l/s)0.5Down Time (mins)24030 year (l/s)1.4nal Storage (m³/ha)20.0100 year (l/s)2.0x Discharge Rate(s) \checkmark Check Discharge Volumex						
Storm Durations 15 30 60 120 180 240 360 480 600 720 960 1440							
Return Period Climate C (years) (CC % 2	-						
Pre-deve	lopment Discharge Rate						
Site Makeup Greenfield Method Positively Drained Area (ha) SAAR (mm) Host BFIHost Region QBar/QMed conversion factor Growth Factor 1 year	Greenfield Growth Factor 30 year 2.55 FEH Growth Factor 100 year 3.56 1.000 Betterment (%) 0 634 QMed 0.5 1 QBar 0.6 0.859 Q 1 year (l/s) 0.5 5 Q 30 year (l/s) 1.4 1.124 Q 100 year (l/s) 2.0 0.87						

	EAS Transport PLanning	g Ltd File:		Page 1
CAUSEWAY 🛟		Network: St	orm Network	
CAUSEVAI 😈		Stephen Ada	ams	
		16/09/2022		
	<u>S</u>	Simulation Settings		
Rainfall Methodolog	gy FEH-13	Skip Steady State	x	1 year (l/s) 0.5
Summer (240	30 year (l/s) 1.4
Winter 0			20.0	100 year (l/s) 2.0
Analysis Spee			✓ Check Disc	charge Volume x
		Storm Durations		
		Storin Durations		
15 30 6	0 120 180	240 360 480	600 720	960 1440
	0 120 180 eturn Period Climate C	240 360 480	1 1	
1 1	1 1 1	240 360 480 Change Additional A	1 1	
	eturn Period Climate C	240 360 480 Change Additional A	rea Additional Flo	
1 1	eturn Period Climate C (years) (CC 9 2	240 360 480 Change Additional A %) (A %) 0	rea Additional Flo (Q %) 0	W .
	eturn Period Climate C (years) (CC 9 2	240 360 480 Change Additional A %) (A %)	rea Additional Flo (Q %) 0	W .
	eturn Period Climate C (years) (CC 9 2	240 360 480 Change Additional A %) (A %) 0	rea Additional Flo (Q %) 0	W .
	eturn Period Climate C (years) (CC 9 2 <u>Pre-dev</u>	240 360 480 Change Additional A %) (A %) 0 relopment Discharge R	rea Additional Flo (Q %) 0 ate Betterment (%)	o
	eturn Period Climate C (years) (CC 9 2 <u>Pre-dev</u> Site Makeup	240 360 480 Change Additional A %) (A %) 0 <u>relopment Discharge R</u> Greenfield	rea Additional Flo (Q %) 0 late	o
	eturn Period Climate C (years) (CC 9 2 <u>Pre-dev</u> Site Makeup Greenfield Method	240 360 480 Change Additional A %) (A %) 0 <u>relopment Discharge R</u> Greenfield ReFH2	rea Additional Flo (Q %) 0 a <u>ate</u> Betterment (%) Q 1 year (l/s)	0 0 0.9

Anglia Square Greenfield Run-off Rates using FEH Methods

			FEH GRR					RFEH2 GRR					
		1 in 1 year Greenfield Runoff Rate (based on 0.5 l/s/ha)	1 in 30 year Greenfield Runoff Rate (based on 1.4 l/s/ha)	1 in 30 year + 45% Climate Change Greenfield Runoff Rate (based on 2.9 l/s/ha)	1 in 100 year Greenfield Runoff Rate (based on 2.0 l/s/ha)	1 in 100 year + 45% Climate Change Greenfield Runoff Rate (based on 1.4 l/s/ha)	1 in 1 year Greenfield Runoff Rate (based on 0.9 I/s/ha)		1 in 30 year + 45% Climate Change Greenfield Runoff Rate (based on 4.35 l/s/ha)	Runoff Rate (based on 4.1	1 in 100 year + 45% Climate Change Greenfield Runoff Rate (based on 5.9 l/s/ha)		
	(ha)	0.5	1.4	2.03	2	2.9	0.9	3	4.35	4.1	5.9		
Total Site Area	4.65	2.325	6.51	9.4395	9.3	13.485	4.185	13.95	20.2275	19.065	27.435		
Block B Total Area	0.2692	0.1346	0.37688	0.546476	0.5384	0.78068	0.24228	0.8076	1.17102	1.10372	1.58828		
Block B Impermeable Area	0.1651	0.08255	0.23114	0.335153	0.3302	0.47879	0.14859	0.4953	0.718185	0.67691	0.97409		
Block C Total Area	0.1263	0.06315	0.17682	0.256389	0.2526	0.36627	0.11367	0.3789	0.549405	0.51783	0.74517		
Block C Impermeable Area	0.075	0.0375	0.105	0.15225	0.15	0.2175	0.0675	0.225	0.32625	0.3075	0.4425		
Block D Total Area	0.258	0.129	0.3612	0.52374	0.516	0.7482	0.2322	0.774	1.1223	1.0578	1.5222		
(NB: total catchment considered impermeable)									•				
Block A, M, K/L and J3 Total Area	1.485	0.7425	2.079	3.01455	2.97	4.3065	1.3365	4.455	6.45975	6.0885	8.7615		
(NB: total catchment considered impermeable)													
Botolph Street Total Area	0.163	0.0815	0.2282	0.33089	0.326	0.4727	0.1467	0.489	0.70905	0.6683	0.9617		
(NB: total catchment considered impermeable)													
Block E Total Area	0.642	0.321	0.8988	1.30326	1.284	1.8618	0.5778	1.926	2.7927	2.6322	3.7878		
(NB: total catchment considered impermeable)													
Block F Total Area	0.446	0.223	0.6244	0.90538	0.892	1.2934	0.4014	1.338	1.9401	1.8286	2.6314		
(NB: total catchment considered impermeable)													
Block G&J Total Area	0.964	0.482	1.3496	1.95692	1.928	2.7956	0.8676	2.892	4.1934	3.9524	5.6876		
(NB: total catchment considered impermeable)													
Block H Total Area	0.346	0.173	0.4844	0.70238	0.692	1.0034	0.3114	1.038	1.5051	1.4186	2.0414		
(NB: total catchment considered impermeable)													
Total Proposed Contributing Area	4.7	2.35	6.58	9.541	9.4	13.63	4.23	14.1	20.445	19.27	27.73		

NB: Causeway Flow (and also MicroDrainage) hydraulic modeling software does not generate			
greenfield runoff rates including Climate Change Allowance. Causeway Flow were contacted			
to ascertain how a Climate Change Allowance could be applied to the generated greenfield			
flow rate, but they were unable to confirm how this could be done. For the purpose of		As such 1:30yr +45% CC is	
discussion, it is proposed to apply a growth-factor to the greenfield run-off rates. As such, for		calculated at 1.4 x 1.45 =	
45% Climate Change Allowance, for that storm event, the greenfield runoff rate shall be		2.03	
multiplied by 1.45.			

As such 1:100yr +45% CC is calculated	As such 1:30yr +45% CC is	As such 1:100yr +45% CC is
at 2.0 x 1.45 = 2.9	calculated at 3.0 x 1.45 = 4.35	calculated at 4.1 x 1.45 = 5.9

Appendix J – Greenfield vs. Brownfield Storage Volumes

EAS Transport Planning		Page 1
Unit 23, The Maltings	LARGEST PROP	
Stanstead Abbotts	CATCHMENT WITH	
Hertfordshire, SG12 8HG	ALL GRR	Micro
Date 14/09/2022 13:36	Designed by EAS	Drainage
File QSE GRR TEST 28LS.SRCX	Checked by	Drainage
Innovyze	Source Control 2020.1.3	

Half Drain Time : 261 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15	min S	Summer	1.703	1.203	0.0	28.1	28.1	599.9	ΟK
30	min S	Summer	1.823	1.323	0.0	28.1	28.1	660.0	ОК
60	min S	Summer	1.918	1.418	0.0	28.1	28.1	707.2	ΟK
120	min S	Summer	1.945	1.445	0.0	28.1	28.1	720.7	ΟK
180	min S	Summer	1.902	1.402	0.0	28.1	28.1	699.3	ΟK
240	min S	Summer	1.838	1.338	0.0	28.1	28.1	667.1	ΟK
360	min S	Summer	1.728	1.228	0.0	28.1	28.1	612.7	ΟK
480	min S	Summer	1.638	1.138	0.0	28.1	28.1	567.4	ΟK
600	min S	Summer	1.556	1.056	0.0	28.1	28.1	526.7	ΟK
720	min S	Summer	1.480	0.980	0.0	28.1	28.1	488.7	ΟK
960	min S	Summer	1.383	0.883	0.0	28.1	28.1	440.5	ΟK
1440	min S	Summer	1.197	0.697	0.0	28.1	28.1	347.6	ΟK
2160	min S	Summer	0.959	0.459	0.0	28.1	28.1	228.8	ΟK
2880	min S	Summer	0.784	0.284	0.0	28.1	28.1	141.5	ΟK
4320	min S	Summer	0.599	0.099	0.0	27.9	27.9	49.4	ΟK
5760	min S	Summer	0.578	0.078	0.0	21.8	21.8	38.9	ΟK
7200	min S	Summer	0.565	0.065	0.0	18.2	18.2	32.2	ΟK
8640	min S	Summer	0.555	0.055	0.0	15.5	15.5	27.5	ΟK
10080	min S	Summer	0.549	0.049	0.0	13.7	13.7	24.2	ΟK
15	min V	Winter	1.857	1.357	0.0	28.1	28.1	676.9	ΟK
30	min V	Winter	1.997	1.497	0.0	28.1	28.1	746.4	ΟK
60	min V	Winter	2.113	1.613	0.0	28.1	28.1	804.6	ΟK
120	min V	Winter	2.167	1.667	0.0	28.1	28.1	831.3	O K
180	min V	Winter	2.139	1.639	0.0	28.1	28.1	817.6	ΟK

Storm			Rain	Flooded	Discharge	Time-Peak
	Even	t	(mm/hr)	Volume	Volume	(mins)
				(m³)	(m³)	
			233.627	0.0	646.1	33
30		Summer		0.0	724.2	46
60	min	Summer	73.377	0.0	811.7	72
120	min	Summer	41.122	0.0	909.8	128
180	min	Summer	29.307	0.0	972.6	182
240	min	Summer	23.046	0.0	1019.8	216
360	min	Summer	16.424	0.0	1090.2	276
480	min	Summer	12.916	0.0	1143.0	342
600	min	Summer	10.719	0.0	1185.8	408
720	min	Summer	9.205	0.0	1221.7	474
960	min	Summer	7.439	0.0	1316.4	610
1440	min	Summer	5.510	0.0	1462.6	870
2160	min	Summer	4.081	0.0	1624.9	1236
2880	min	Summer	3.298	0.0	1750.9	1572
4320	min	Summer	2.331	0.0	1856.7	2204
5760	min	Summer	1.823	0.0	1935.5	2936
7200	min	Summer	1.506	0.0	1999.0	3672
8640	min	Summer	1.289	0.0	2052.4	4344
10080	min	Summer	1.129	0.0	2098.8	5104
15	min	Winter	233.627	0.0	723.7	33
30	min	Winter	130.931	0.0	811.1	46
60	min	Winter	73.377	0.0	909.1	74
120	min	Winter	41.122	0.0	1019.0	128
180	min	Winter	29.307	0.0	1089.3	182

EAS Transport Planning					
Unit 23, The Maltings	LARGEST PROP				
Stanstead Abbotts	CATCHMENT WITH				
Hertfordshire, SG12 8HG	ALL GRR	Micro			
Date 14/09/2022 13:36	Designed by EAS	Drainage			
File QSE GRR TEST 28LS.SRCX	Checked by	Drainage			
Innovyze	Source Control 2020.1.3				

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control Σ (l/s)	Max Coutflow (1/s)	Max Volume (m³)	Status
240	min V	Winter	2.079	1.579	0.0	28.1	28.1	787.3	ОК
360	min V	Winter	1.938	1.438	0.0	28.1	28.1	717.0	ΟK
480	min V	Winter	1.817	1.317	0.0	28.1	28.1	656.8	ΟK
600	min V	Winter	1.700	1.200	0.0	28.1	28.1	598.7	ΟK
720	min V	Winter	1.588	1.088	0.0	28.1	28.1	542.8	ΟK
960	min V	Winter	1.432	0.932	0.0	28.1	28.1	464.8	ΟK
1440	min V	Winter	1.137	0.637	0.0	28.1	28.1	317.7	ΟK
2160	min V	Winter	0.789	0.289	0.0	28.1	28.1	144.1	ΟK
2880	min V	Winter	0.604	0.104	0.0	28.1	28.1	52.0	ΟK
4320	min V	Winter	0.572	0.072	0.0	20.3	20.3	35.9	ОК
5760	min V	Winter	0.557	0.057	0.0	15.9	15.9	28.2	ОК
7200	min V	Winter	0.547	0.047	0.0	13.1	13.1	23.2	ОК
8640	min V	Winter	0.540	0.040	0.0	11.3	11.3	20.0	ΟK
10080	min V	Winter	0.535	0.035	0.0	9.9	9.9	17.5	O K

	Storm Event			Flooded Volume (m ³)	Discharge Volume (m³)	Time-Peak (mins)
240	min	Winter	23.046	0.0	1142.2	236
360	min	Winter	16.424	0.0	1221.0	296
480	min	Winter	12.916	0.0	1280.2	370
600	min	Winter	10.719	0.0	1328.1	444
720	min	Winter	9.205	0.0	1368.6	518
960	min	Winter	7.439	0.0	1474.4	660
1440	min	Winter	5.510	0.0	1638.1	924
2160	min	Winter	4.081	0.0	1820.2	1268
2880	min	Winter	3.298	0.0	1961.1	1504
4320	min	Winter	2.331	0.0	2079.5	2192
5760	min	Winter	1.823	0.0	2167.8	2944
7200	min	Winter	1.506	0.0	2238.9	3664
8640	min	Winter	1.289	0.0	2298.8	4344
10080	min	Winter	1.129	0.0	2350.6	5144

EAS Transport Planning		Page 3
Unit 23, The Maltings	LARGEST PROP	
Stanstead Abbotts	CATCHMENT WITH	
Hertfordshire, SG12 8HG	ALL GRR	Micro
Date 14/09/2022 13:36	Designed by EAS	Drainage
File QSE GRR TEST 28LS.SRCX	Checked by	Diamage
Innovyze	Source Control 2020.1.3	
<u>R</u>	ainfall Details	
Rainfall Model	FEH F (1km) 2.4	498
Return Period (years)	100 Summer Storms	Yes
FEH Rainfall Version	1999 Winter Storms	
	309650 TG 22800 09650 Cv (Summer) 0.	
C (1km)	-0.024 Cv (Winter) 0.8	
D1 (1km)	0.275 Shortest Storm (mins)	
D2 (1km) D3 (1km)	0.370 Longest Storm (mins) 100 0.255 Climate Change % -	
E (1km)	0.310	110
Τ.	.me Area Diagram	
<u> </u>		
То	tal Area (ha) 1.475	
Time (mins) Area Time (mins) Area 7	Time (mins) Area Time (mins) Area Time (m	nins) Area
From: To: (ha) From: To: (ha) F	rom: To: (ha) From: To: (ha) From: T	To: (ha)
0 4 0.295 4 8 0.295	8 12 0.295 12 16 0.295 16	20 0.295

LAS ILANSP	ort Plann	ing						Pac	ge 4
Unit 23, T	he Maltin	gs		LARGEST	PROP				
Stanstead	Abbotts			CATCHMEN	T WITH				
Hertfordsh	nire, SG12	8HG		ALL GRR				A STATE	Aicro
Date 14/09	/2022 13:	36		Designed	by EAS				
File QSE G	GRR TEST 2		Checked	by				Irainage	
Innovyze				Source C	ontrol 20	020.1.3			
				lar Storac vert Level Nt Base (m/H	er Level (m g <u>e Struct</u> (m) 0.500 pr) 0.00000	<u>ure</u>) Safety E) Por	Factor 2.0 cosity 0.95		
-			n ²) Depth (m		Inf. Area	(m²) Dep			
Depth (m) 2 0.000 0.660	Area (m²) I 525.0 525.0	(0.0 1.32	0 525.0	Inf. Area		oth (m) Area 1.671		
0.000	525.0	(0.0 1.32 0.0 1.67	0 525.0	Inf. Area	(m²) Dep			
0.000	525.0	(0.0 1.32 0.0 1.67 <u>Pur</u>	0 525.0 0 525.0	Inf. Area	(m²) Dep			
0.000 0.660	525.0 525.0	(0.0 1.32 0.0 1.67 <u>Pur</u>	0 525.0 0 525.0 np Outflow vert Level	Inf. Area	(m ²) Dep 0.0 0.0	1.671	0.0	0.0
0.000 0.660	525.0 525.0	(0.0 1.32 0.0 1.67 <u>Pur</u> In	0 525.0 0 525.0 np Outflow vert Level	Inf. Area	(m ²) Dep 0.0 0.0	1.671	0.0	0.0 Flow (1/s)
0.000 0.660 Depth (m) H 0.100	525.0 525.0	Depth (m) 1 0.700 0.800	0.0 1.32 0.0 1.67 Pur In Flow (1/s) D 28.1000 28.1000	0 525.0 0 525.0 np Outflow vert Level epth (m) Fl	Inf. Area <u>v Control</u> (m) 0.500 .ow (1/s) D	(m ²) Dep 0.0 0.0	1.671 Flow (1/s) 28.1000	0.0 Depth (m)	0.0 Flow (1/s) 28.1000
0.000 0.660 Depth (m) E 0.100 0.200 0.300	525.0 525.0 Flow (1/s) 28.1000 28.1000 28.1000	Depth (m) 1 0.700 0.800 0.900	0.0 1.32 0.0 1.67 Pur In Flow (1/s) D 28.1000 28.1000 28.1000	0 525.0 0 525.0 np Outflow vert Level epth (m) Fl 1.300 1.400 1.500	Inf. Area v Control (m) 0.500 cow (1/s) D 28.1000 28.1000 28.1000	(m ²) Dep 0.0 0.0 1.900 2.000 2.100	1.671 Flow (1/s) 28.1000 28.1000 28.1000	0.0 Depth (m) 2.500 2.600 2.700	0.0 Flow (1/s) 28.1000 28.1000 28.1000
0.000 0.660 Depth (m) E 0.100 0.200 0.300 0.400	525.0 525.0 Flow (1/s) 28.1000 28.1000	Depth (m) 1 0.700 0.800	0.0 1.32 0.0 1.67 Pur In Flow (1/s) D 28.1000 28.1000	0 525.0 0 525.0 np Outflow vert Level epth (m) Fl 1.300 1.400	Inf. Area v Control (m) 0.500 .ow (1/s) D 28.1000 28.1000	(m ²) Dep 0.0 0.0 0.0 1.900 2.000	1.671 Flow (1/s) 28.1000 28.1000 28.1000 28.1000	0.0 Depth (m) 2.500 2.600 2.700	0.0 Flow (1/s) 28.1000 28.1000 28.1000 28.1000

EAS Transport Planning					
Unit 23, The Maltings	LARGEST PROP				
Stanstead Abbotts	CATCHMENT WITH				
Hertfordshire, SG12 8HG	65 L/S	Micro			
Date 14/09/2022 13:43	Designed by EAS	Drainage			
File QSE GRR TEST 65LS.SRCX	Checked by	Diamage			
Innovvze	Source Control 2020.1.3				

Half Drain Time : 97 minutes.

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15	min S	ummer	1.830	1.330	0.0	65.0	65.0	543.1	ΟK
30	min S	ummer	1.930	1.430	0.0	65.0	65.0	584.1	ΟK
60	min S	ummer	1.940	1.440	0.0	65.0	65.0	588.2	ΟK
120	min S	ummer	1.788	1.288	0.0	65.0	65.0	526.3	ΟK
180	min S	ummer	1.656	1.156	0.0	65.0	65.0	472.3	ΟK
240	min S	ummer	1.543	1.043	0.0	65.0	65.0	426.3	ΟK
360	min S	ummer	1.346	0.846	0.0	65.0	65.0	345.5	ΟK
480	min S	ummer	1.174	0.674	0.0	65.0	65.0	275.4	ΟK
600	min S	ummer	1.027	0.527	0.0	65.0	65.0	215.1	ΟK
720	min S	ummer	0.903	0.403	0.0	65.0	65.0	164.4	ΟK
960	min S	ummer	0.746	0.246	0.0	65.0	65.0	100.5	ΟK
1440	min S	ummer	0.600	0.100	0.0	65.0	65.0	41.0	ΟK
2160	min S	ummer	0.575	0.075	0.0	48.9	48.9	30.7	ΟK
2880	min S	ummer	0.561	0.061	0.0	39.8	39.8	24.9	ΟK
4320	min S	ummer	0.543	0.043	0.0	28.1	28.1	17.6	ΟK
5760	min S	ummer	0.534	0.034	0.0	21.9	21.9	13.9	ΟK
7200	min S	ummer	0.528	0.028	0.0	18.4	18.4	11.5	ΟK
8640	min S	ummer	0.524	0.024	0.0	15.8	15.8	9.8	ΟK
10080	min S	ummer	0.521	0.021	0.0	13.8	13.8	8.6	ΟK
15	min W	linter	2.014	1.514	0.0	65.0	65.0	618.7	ΟK
30	min W	linter	2.136	1.636	0.0	65.0	65.0	668.1	ΟK
60	min W	linter	2.170	1.670	0.0	65.0	65.0	682.1	O K
120	min W	linter	2.014	1.514	0.0	65.0	65.0	618.6	ОК
180	min W	linter	1.838	1.338	0.0	65.0	65.0	546.7	ΟK

Storm		Rain		-	e Time-Peak		
	Even	t	(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m³)		
15	min	Summer	233.627	0.0	646.1	31	
30	min	Summer	130.931	0.0	724.2	42	
60	min	Summer	73.377	0.0	811.7	66	
120	min	Summer	41.122	0.0	909.8	102	
180	min	Summer	29.307	0.0	972.6	134	
240	min	Summer	23.046	0.0	1019.8	168	
360	min	Summer	16.424	0.0	1090.0	234	
480	min	Summer	12.916	0.0	1142.9	298	
600	min	Summer	10.719	0.0	1185.6	358	
720	min	Summer	9.205	0.0	1221.7	416	
960	min	Summer	7.439	0.0	1316.4	530	
1440	min	Summer	5.510	0.0	1462.6	740	
2160	min	Summer	4.081	0.0	1625.1	1100	
2880	min	Summer	3.298	0.0	1751.0	1464	
4320	min	Summer	2.331	0.0	1856.8	2196	
5760	min	Summer	1.823	0.0	1935.6	2936	
7200	min	Summer	1.506	0.0	1999.1	3584	
8640	min	Summer	1.289	0.0	2052.6	4328	
10080	min	Summer	1.129	0.0	2098.9	5072	
15	min	Winter	233.627	0.0	723.7	31	
30	min	Winter	130.931	0.0	811.1	43	
60	min	Winter	73.377	0.0	909.1	66	
120	min	Winter	41.122	0.0	1019.0	112	
180	min	Winter	29.307	0.0	1089.3	146	

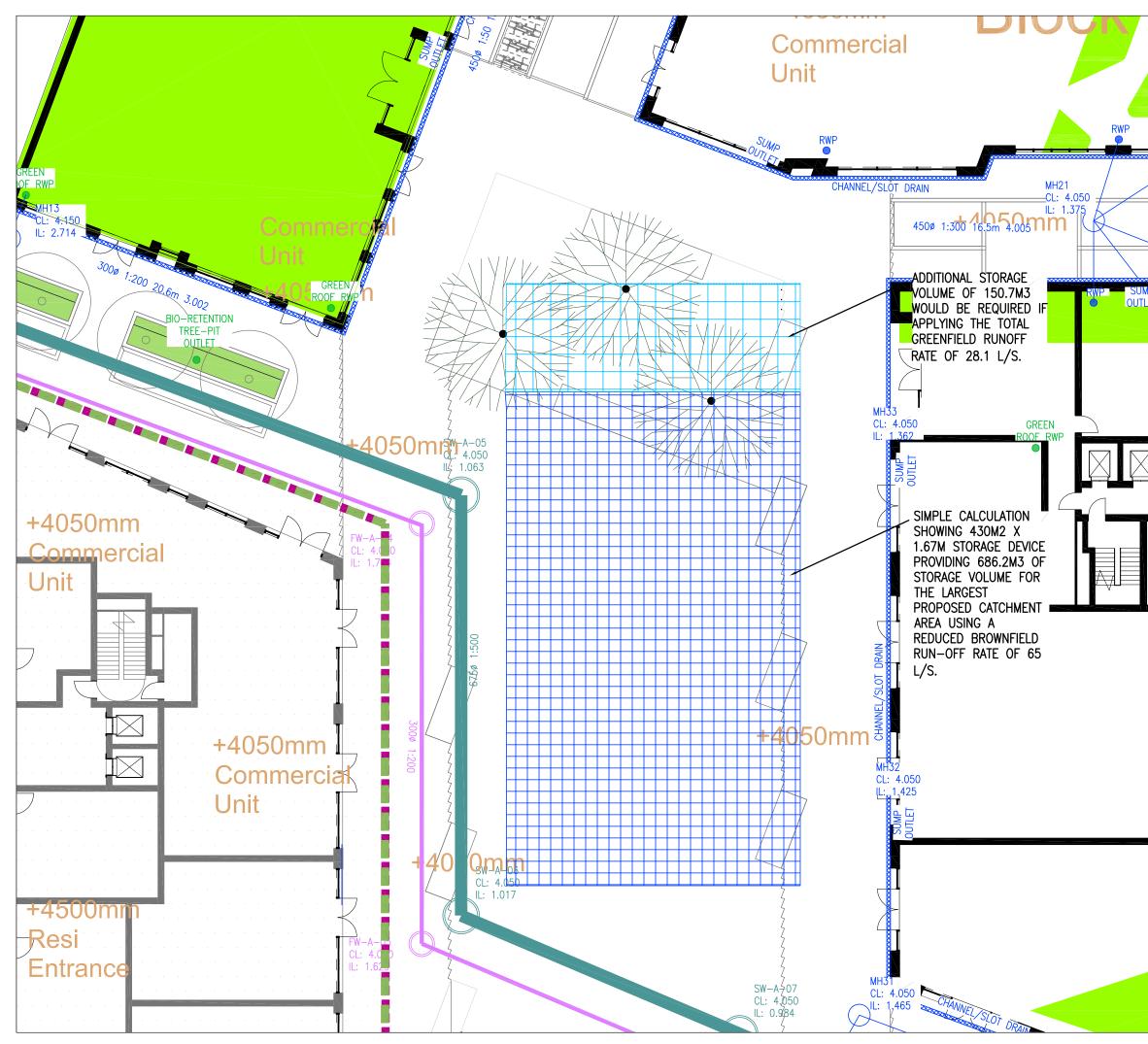
EAS Transport Planning					
Unit 23, The Maltings	LARGEST PROP				
Stanstead Abbotts	CATCHMENT WITH				
Hertfordshire, SG12 8HG	65 L/S	Micro			
Date 14/09/2022 13:43	Designed by EAS	Drainage			
File QSE GRR TEST 65LS.SRCX	Checked by	Drainage			
Innovyze	Source Control 2020.1.3				

	Storm Event		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max E Outflow (1/s)	Max Volume (m³)	Status
240	min W	inter	1.677	1.177	0.0	65.0	65.0	481.0	ОК
360	min W	inter	1.382	0.882	0.0	65.0	65.0	360.1	ΟK
480	min W	inter	1.124	0.624	0.0	65.0	65.0	255.1	ΟK
600	min W	inter	0.910	0.410	0.0	65.0	65.0	167.7	ΟK
720	min W	inter	0.744	0.244	0.0	65.0	65.0	99.6	ΟK
960	min W	inter	0.599	0.099	0.0	64.2	64.2	40.4	ΟK
1440	min W	inter	0.574	0.074	0.0	47.9	47.9	30.0	ΟK
2160	min W	inter	0.555	0.055	0.0	35.6	35.6	22.3	ΟK
2880	min W	inter	0.544	0.044	0.0	28.8	28.8	18.0	ΟK
4320	min W	inter	0.531	0.031	0.0	20.3	20.3	12.7	ΟK
5760	min W	inter	0.525	0.025	0.0	16.1	16.1	10.0	ΟK
7200	min W	inter	0.520	0.020	0.0	13.2	13.2	8.3	ΟK
8640	min W	inter	0.517	0.017	0.0	11.2	11.2	7.0	ΟK
10080	min W	inter	0.515	0.015	0.0	9.9	9.9	6.2	O K

	Storm Event			Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240	min	Winter	23.046	0.0	1142.2	182
360	min	Winter	16.424	0.0	1220.8	252
480	min	Winter	12.916	0.0	1280.0	316
600	min	Winter	10.719	0.0	1328.1	374
720	min	Winter	9.205	0.0	1368.3	426
960	min	Winter	7.439	0.0	1474.5	500
1440	min	Winter	5.510	0.0	1638.1	736
2160	min	Winter	4.081	0.0	1820.0	1096
2880	min	Winter	3.298	0.0	1961.2	1452
4320	min	Winter	2.331	0.0	2079.5	2196
5760	min	Winter	1.823	0.0	2167.9	2912
7200	min	Winter	1.506	0.0	2239.1	3608
8640	min	Winter	1.289	0.0	2298.8	4400
10080	min	Winter	1.129	0.0	2350.7	5024

EAS Transport Planning		Page 3					
Unit 23, The Maltings	LARGEST PROP						
Stanstead Abbotts	CATCHMENT WITH						
Hertfordshire, SG12 8HG	65 L/S	Micro					
Date 14/09/2022 13:43	/09/2022 13:43 Designed by EAS						
File QSE GRR TEST 65LS.SRCX	Drainage						
Innovyze	Source Control 2020.1.3						
<u></u>	ainfall Details						
Rainfall Model	FEH F (1km) 2.4	198					
Return Period (years)							
FEH Rainfall Version	1999 Winter Storms Y 309650 TG 22800 09650 Cv (Summer) 0.7						
C (1km)	-0.024 Cv (Winter) 0.8						
D1 (1km)	0.275 Shortest Storm (mins)	15					
D2 (1km)	0.370 Longest Storm (mins) 100						
D3 (1km) E (1km)	0.255 Climate Change % + 0.310	-45					
E (IKii)	0.510						
<u>Ti</u>	me Area Diagram						
Tot	tal Area (ha) 1.475						
	Time (mins) Area Time (mins) Area Time (mins) Area Time (
From: To: (ha) From: To: (ha) F	rom: To: (ha) From: To: (ha) From: T	!o: (ha)					
0 4 0.295 4 8 0.295	8 12 0.295 12 16 0.295 16	20 0.295					

EAS Trans	port Plan	ning						Pag	re 4
Unit 23, The Maltings					LARGEST PROP				
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Innovyze				Source	Control 2	020.1.3			
				Model D	etails				
			Storage i	s Online Co	over Level (m) 4.050			
			Colli	ilar Stor	age Struct	uro			
			CEIT	LIAI SLUIG	age struct	Jule			
			т	wert Level	(m) 0.50	0 Safety	Factor 20		
		Infiltrati			(m) 0.50	-			
			In Con Coefficie Con Coefficie	ent Base (m	/hr) 0.0000	0 Po	Factor 2.0 rosity 0.95		
/ .	- /	Infiltrati	lon Coefficie lon Coefficie	ent Base (m ent Side (m	/hr) 0.0000 /hr) 0.0000	0 Po 0	rosity 0.95		
Depth (m)	Area (m²)	Infiltrati	lon Coefficie lon Coefficie	ent Base (m ent Side (m	/hr) 0.0000 /hr) 0.0000	0 Po 0		u (m²) Inf	. Area (m²
Depth (m) 0.000		Infiltrati	on Coefficie on Coefficie (m ²) Depth (ent Base (m ent Side (m	/hr) 0.0000 /hr) 0.0000 2) Inf. Area	0 Po 0	rosity 0.95		. Area (m ² 0.
	430.0	Infiltrati	(m ²) Depth (0.0 1.3	ent Base (m. ent Side (m. m) Area (m ² 20 430.	/hr) 0.0000 /hr) 0.0000 2) Inf. Area	0 Po 0 a (m²) Dej	rosity 0.95 pth (m) Area		
0.000	430.0	Infiltrati	Ion Coefficient Ion Coefficient (m²) Depth 0.0 1.3 0.0 1.6	ent Base (m. ent Side (m. m) Area (m² 20 430. 70 430.	/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0	0 Po 0 a (m ²) Dep 0.0 0.0	rosity 0.95 pth (m) Area		
0.000	430.0	Infiltrati	Ion Coefficient Ion Coefficient (m²) Depth 0.0 1.3 0.0 1.6	ent Base (m. ent Side (m. m) Area (m² 20 430. 70 430.	/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0	0 Po 0 a (m ²) Dep 0.0 0.0	rosity 0.95 pth (m) Area		
0.000	430.0	Infiltrati	lon Coefficie (m ²) Depth (0.0 1.3 0.0 1.6 <u>P</u>	ent Base (m. ent Side (m. m) Area (m 20 430. 70 430. ump Outflo	/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0	0 Po 0 a (m ²) Dep 0.0 0.0	rosity 0.95 pth (m) Area		
0.000 0.660	430.0 430.0	Infiltrati Inf. Area	lon Coefficie (m ²) Depth (0.0 1.3 0.0 1.6 <u>P</u>	ent Base (m. ent Side (m. m) Area (m ² 20 430. 70 430. ump Outflo	<pre>/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0 ow Control 1 (m) 0.500</pre>	0 Po 0 a (m ²) Dej 0.0 0.0	rosity 0.95 pth (m) Area 1.671	0.0	0.
0.000 0.660	430.0 430.0	Infiltrati Inf. Area	lon Coefficie (m ²) Depth (0.0 1.3 0.0 1.6 <u>P</u>	ent Base (m. ent Side (m. m) Area (m ² 20 430. 70 430. ump Outflo	<pre>/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0 ow Control 1 (m) 0.500</pre>	0 Po 0 a (m ²) Dej 0.0 0.0	rosity 0.95 pth (m) Area	0.0	0.
0.000 0.660	430.0 430.0 Flow (1/s)	Infiltrati Inf. Area Depth (m)	lon Coefficie (m ²) Depth (0.0 1.3 0.0 1.6 <u>P</u> Flow (1/s)	ent Base (m. ent Side (m. m) Area (m ² 20 430. 70 430. ump Outflo	<pre>/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0 ow Control 1 (m) 0.500</pre>	0 Po 0 a (m ²) Dej 0.0 0.0	rosity 0.95 pth (m) Area 1.671 Flow (l/s)	0.0	0. Flow (1/s
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0.000 0.660 Depth (m) 0.100	430.0 430.0 Flow (1/s) 65.0000 65.0000	Infiltrati Inf. Area Depth (m) 0.700 0.800	<pre>Ion Coefficie Ion Coefficie (m²) Depth (0.0 1.3 0.0 1.6 <u>P</u> Flow (l/s) 65.0000 65.0000</pre>	ent Base (m. ent Side (m. m) Area (m ² 20 430. 70 430. ump Outflo invert Level Depth (m) I 1.300	<pre>/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0 .0 .0 .0 (m) 0.500 Flow (1/s) 65.0000</pre>	0 Po 0 a (m ²) Dej 0.0 0.0 L Depth (m) 1.900	rosity 0.95 pth (m) Area 1.671 Flow (1/s) 65.0000 65.0000	0.0 Depth (m) 2.500 2.600	0. Flow (1/s 65.000 65.000
0.000 0.660 Depth (m) 0.100 0.200	430.0 430.0 Flow (1/s) 65.0000 65.0000 65.0000	Infiltrati Inf. Area Depth (m) 0.700 0.800 0.900	<pre>Ion Coefficie (m²) Depth (0.0 1.3 0.0 1.6 <u>P</u> Flow (1/s) 65.0000 65.0000 65.0000</pre>	ent Base (m. ent Side (m. m) Area (m ² 20 430. 70 430. ump Outflo invert Level Depth (m) F 1.300 1.400	<pre>/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0 .0 .0 .0 I (m) 0.500 Flow (1/s) 65.0000 65.0000 65.0000</pre>	0 Po 0 a (m ²) Dej 0.0 0.0 1.900 2.000	rosity 0.95 pth (m) Area 1.671 Flow (1/s) 65.0000 65.0000 65.0000	0.0 Depth (m) 2.500 2.600 2.700	0. Flow (1/s 65.000 65.000 65.000
0.000 0.660 Depth (m) 0.100 0.200 0.300	430.0 430.0 Flow (1/s) 65.0000 65.0000 65.0000	Infiltrati Inf. Area Depth (m) 0.700 0.800 0.900 1.000 1.100	Lon Coefficie (m ²) Depth (0.0 1.3 0.0 1.6 <u>P</u> Flow (1/s) 65.0000 65.0000 65.0000 65.0000 65.0000	ent Base (m. ent Side (m. m) Area (m ² 20 430. 70 430. ump Outflo invert Level Depth (m) F 1.300 1.400 1.500	<pre>/hr) 0.0000 /hr) 0.0000 2) Inf. Area .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0</pre>	0 Po 0 a (m ²) Dej 0.0 0.0 1.900 2.000 2.100	<pre>rosity 0.95 pth (m) Area 1.671 Flow (1/s) 65.0000 65.0000 65.0000 65.0000 65.0000 </pre>	0.0 Depth (m) 2.500 2.600 2.700	0. Flow (1/s 65.000 65.000 65.000 65.000



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	REV	DATE	BY	DESCRIPTION		СНК	APD
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	DRAWI	NG STATUS:		FOR INORMATION			
		Ordnance Survey	(c) Crown	Copyright 2018. All rights reserved.	Licence number 10	0022432	
				EAS			
		Unit 23,	The Malt	ngs, Stanstead Abbotts, He Tel: 01920 871777	rtfordshire, SC	512 8H	G
				www.eastp.co.uk			
	CLIEN	Т:		WESTON HOMES			
	ARCHI	TECT:					
	PROJE	CT:					
				ANGLIA SQUARE,			
				NORWICH			
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Appendix K – Anglian Water Pre-Development Enquiry





Pre-Planning Assessment Report

Anglia Square

InFlow Reference: PPE-0143339

Assessment Type: Used Water

Report published: 08/04/2022



Thank you for submitting a pre-planning enquiry.

This has been produced for EAS Transport Planning Ltd.

Your reference number is **PPE-0143339**.

This report can be submitted as a drainage strategy for the development should it seek planning permission.

If you have any questions upon receipt of this report, you can submit a further question via InFlow. Alternatively, please contact the Planning & Capacity team on **07929 786 955** or email planningliaison@anglianwater.co.uk

Section 1 - Proposed development

The response within this report has been based on the following information which was submitted as part of your application:

List of planned developments						
Type of development	No. Of units					
Shops	50					
Restaurants and cafes	25					
Dwellings	1500					

The anticipated residential build rate is:

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12
Build rate	50	50	50	50	50	50	50	50	50	50	50	1025
Development typ Planning application Site grid reference	on statu		Un	ownfie known 2302009								

The comments contained within this report relate to the public water mains and sewers indicated on our records. Your attention is drawn to the disclaimer in the useful information section of this report.

Section 2 - Assets affected

Our records indicate that we have the following types of assets within or overlapping the boundary of your development site as listed in the table below.

Additionally, it is highly recommended that you carry out a thorough investigation of your proposed working area to establish whether any unmapped public or private sewers and lateral drains are in existence. We are unable to permit development either over or within the easement strip without our prior consent. The extent of the easement is provided in the table below. Please be aware that the existing water mains/public sewers should be located in highway or open space and not in private gardens. This is to ensure available access for any future maintenance and repair and this should be taken into consideration when planning your site layout.

Water and Used water easement information						
Asset type	Pipe size (mm)	Total easement required (m)				
Water mains	152	6.00 m overall easement				
Water mains	76	6.00 m overall easement				
Water mains	102	4.50 m overall easement				
Water mains	127	6.00 m overall easement				
Water mains	102	4.50 m overall easement				
Sewer mains	675	6.00 m either side of the centre line				
Sewer mains	300	3.00 m either side of the centre line				
Sewer mains	225	3.00 m either side of the centre line				
Sewer mains	150	3.00 m either side of the centre line				
Sewer mains	9	3.00 m either side of the centre line				
Sewer mains	Unknown	3.00 m either side of the centre line				
Sewer mains	27	3.00 m either side of the centre line				
Sewer mains	7	4.50 m either side of the centre line				
Sewer mains	850	4.00 m either side of the centre line				
Sewer mains	36	3.00 m either side of the centre line				
Sewer mains	24	6.00 m either side of the centre line				
Sewer mains	375	3.00 m either side of the centre line				
Sewer mains	225	3.00 m either side of the centre line				

If it is not possible to avoid our assets then these may need to be diverted in accordance with Section 185 of the Water Industry Act (1991). You will need to make a formal application if you would like a diversion to be considered.

Due to the private sewer transfer in October 2011 many newly adopted public used water assets and their history are not indicated on our records. You also need to be aware that your development site may contain private water mains, drains or other assets not shown on our records. These are private assets and not the responsibility of Anglian Water but that of the landowner.

Section 3 - Water recycling services

In examining the used water system we assess the ability for your site to connect to the public sewerage network without causing a detriment to the operation of the system. We also assess the receiving water recycling centre and determine whether the water recycling centre can cope with the increased flow and effluent quality arising from your development.

Water recycling centre

The foul drainage from the proposed development is in the catchment of Whitlingham Trowse Water Recycling Centre, which currently has capacity to treat the flows from your development site. Anglian Water cannot reserve capacity and the available capacity at the water recycling centre can be reduced at any time due to growth, environmental and regulation driven changes.

Used water network

Our assessment has been based on development flows connecting to the nearest foul water sewer of the same size or greater pipe diameter to that required to drain the site. The infrastructure to convey foul water flows to the receiving sewerage network is assumed to be the responsibility of the developer. Conveyance to the connection point is considered as Onsite Work and includes all work carried out upstream from of the point of connection, including making the connection to our existing network. This connection point has been determined in reference to the calculated discharge flow and on this basis, a 375mm internal diameter pipe is required to drain the development site. The preferred connection point at manhole 1310 is to a 300mm sewer, that does not have capacity to accommodate the flows from the full development. The foul sewerage system will have capacity for the development if the connection is made over several points across the network surrounding the development site.

In order to assess a suitable drainage strategy and provide connection points, please provide us with a site layout and phasing plan. Anglian water has assessed the impact of gravity flows from the planned development to the public foul sewerage network. We can confirm that this is acceptable as the foul sewerage system, at present, has available capacity for your site.

Please note that Anglian Water will request a suitably worded condition at planning application stage to ensure this strategy is implemented to mitigate the risk of flooding.

It is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network. Consequently, this report does not include any costs for the conveyance of flows.

Surface water disposal

In principle, your proposed method of surface water disposal is acceptable to Anglian Water. It is our understanding that the evidence to confirm compliance with the surface water hierarchy is not available. Once the evidence has been confirmed, then a connection point may be made to manhole 1355 at NGR TG 23145 09319 at a rate of 2421/s. Our assessment has been based on development flows connecting to the nearest surface water sewer of the same size or greater pipe diameter. It is your responsibility to provide the evidence to confirm that all alternative methods of surface water disposal have been explored and these will be required before your connection can be agreed. This is subject to satisfactory evidence which shows the surface water management hierarchy as outlined in Building Regulations Part H has been explored. This would encompass the results from the site specific infiltration testing and/or confirmation that the flows cannot be discharged to a watercourse. Anglian Water's surface water policy follows the Surface Water hierarchy, outlined in Part H of the Building Regulations. Should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required.

You are therefore advised to update Anglian Water with the key supporting evidence at your earliest convenience.

As you may be aware, Anglian Water will consider the adoption of SuDs provided that they meet the criteria outline in our SuDs adoption manual. This can be found on our website. We will adopt features located in public open space that are designed and constructed, in conjunction with the Local Authority and Lead Local Flood Authority (LLFA), to the criteria within our SuDs adoption manual. Specifically, developers must be able to demonstrate:

- 1. Effective upstream source control,
- 2. Effective exceedance design, and
- 3. Effective maintenance schedule demonstrating than the assets can be maintained both now and in the future with adequate access.

If you wish to look at the adoption of any SuDs then an expression of interest form can be found on our website

Trade Effluent

We note that you do not have any trade effluent requirements. Should this be required in the future you will need our written formal consent. This is in accordance with Section 118 of the Water Industry Act (1991).

Used Water Budget Costs

Your development site will be required to pay an Infrastructure charge for each new property connecting to the public water and sewerage network that benefits from Full planning permission. The infrastructure charge replaces the zonal charge as previously identified.

You will be required to pay an infrastructure charge upon connection for each new plot on your development site. The infrastructure charge are types of charges set out in Section 146(2) of the Water Industry Act 1991.

The charge should be paid by anyone who wishes to build or develop a property and is payable upon request of connection.

• The Infrastructure Charge is based on the cost of any reinforcement and upgrades to our existing network ("Network Reinforcements"), whether designed to address strategic or local capacity issues. For more information on our Infrastructure Charge, please see the 'Useful Information' section of this report.

Infrastructure charges are raised on a standard basis of one charge per new connection (one for water and one for sewerage).

The Water Recycling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 490	1500	£735,000.00

Please note that you should also budget for infrastructure charges on non-household premises where applicable and these will be calculated according to the number and type of water fittings in the premises. This is called the "relevant multiplier" method of calculating the charge and the relevant multiplier will be applied to the figures set out in our 2022-23 Developer Charging Arrangements to arrive at the amount payable. Details of the relevant multiplier for each fitting can be found on our website.

Section 4 - Map of Proposed Point of Connection(s)

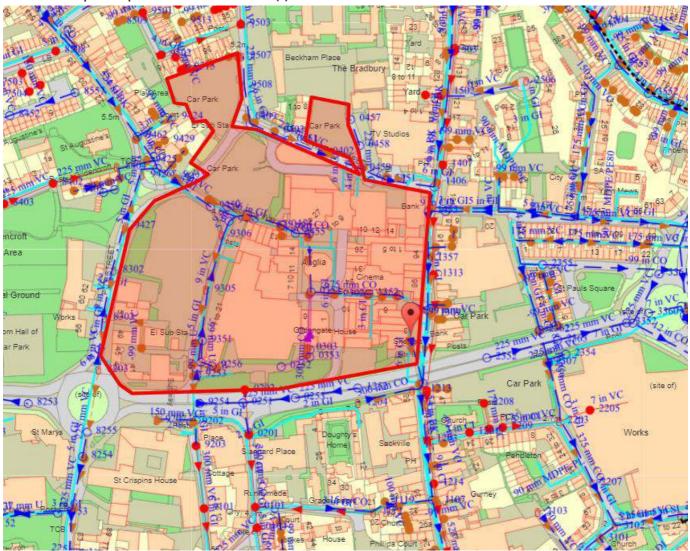


Figure 2: Showing your water recycling surface water point of connection

Section 5 - Useful information

Water Industry Act – Key used water sections

Section 98:

This provides you with the right to requisition a new public sewer. The new public sewer can be constructed by Anglian Water on your behalf. Alternatively, you can construct the sewer yourself under section 30 of the Anglian Water Authority Act 1977.

Section 102:

This provides you with the right to have an existing sewerage asset vested by us. It is your responsibility to bring the infrastructure to an adoptable condition ahead of the asset being vested.

Section 104:

This provides you with the right to have a design technically vetted and an agreement reached that will see us adopt your assets following their satisfactory construction and connection to the public sewer.

Section 106:

This provides you with the right to have your constructed sewer connected to the public sewer.

Section 185

This provides you with the right to have a public sewerage asset diverted.

Details on how to make a formal application for a new sewer, new connection or diversion are available on our website or via our Development Services team on **0345 60 66 087**.

Sustainable drainage systems

Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not resilient to climate change in the long term. .

Our preferred method of surface water disposal is through the use of Sustainable Drainage Systems or SuDS.

SuDS are a range of techniques that aim to mimic the way surface water drains in natural systems within urban areas. For more information on SuDS, please visit our website

We recommend that you contact the Local Authority and Lead Local Flood Authority (LLFA) for your site to discuss your application.

Private sewer transfers

Sewers and lateral drains connected to the public sewer on the 1 July 2011 transferred into Water Company ownership on the 1 October 2011. This follows the implementation of the Floods and Water Management Act (FWMA). This included sewers and lateral drains that were subject to an existing Section 104 Adoption Agreement and those that were not. There were exemptions and the main non-transferable assets were as follows:

Surface water sewers and lateral drains that do not discharge to the public sewer, e.g. those that discharged to a watercourse.

Foul sewers and lateral drains that discharged to a privately owned sewage treatment/collection facility.

Pumping stations and rising mains will transfer between 1 October 2011 and 1 October 2016.

The implementation of Section 42 of the FWMA will ensure that future private sewers will not be created. It is anticipated that all new sewer applications will need to have an approved section 104 application ahead of a section 106 connection.

It is anticipated that all new sewer applications will need to have an approved Section104 application ahead of a Section 106 connection

Proposed Surface Water Drainage Strategy

January 2023

EAS

Anglia Square Regeneration Norwich

Weston Homes

Document History

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The content of this report is based on information available as of January 2023 the validity of the statements made may therefore vary over time as planning guidance / policies and the evidence base change.

EAS

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1 Introduction

- 1.1 A hybrid planning application (Ref. 22/00434/F) (the Application) was submitted by Weston Homes (the Applicant) to Norwich City Council (NCC) on 1st April 2022 for the comprehensive redevelopment of Anglia Square and various parcels of mostly open surrounding land, (the Site), as shown within a red line on drawing 'ZZ-00-DR-A-01-0200'. The Application comprised a full set of technical documents to assess the potential impacts of the proposals, including an EIA which covered a number of topics. In respect of SuDS Drainage Strategy, this was described and explained in the Surface Water Drainage Strategy Report (Rev B dated 01.04.2022). Please refer to the original documents for further details. NB: this Revision-G Submission version of the Surface Water Drainage Strategy Report supersedes previous issues and any Addendum letters and should be read in conjunction with the Flood Risk Assessment by Royal Haskoning DHV.
- 1.2 Application Ref. 22/00434/F follows a previous application on a somewhat smaller development parcel, (NCC Ref. 18/00330/F) made jointly by Weston Homes Plc as development partner and Columbia Threadneedle Investments, (CTI), the Site's owner, for a residential-led mixed use scheme consisting of up to 1,250 dwellings with decked parking, and 11,000 sqm GEA flexible ground floor retail/commercial/non-residential institution floorspace, hotel, cinema, multi-storey public car park, place of worship, and associated public realm and highway works. This was subject to a Call-in by the Secretary of State (PINS Ref. APP/G2625/V/19/3225505) who refused planning permission on 12th November 2020, (the 'Call in Scheme').
- 1.3 Following submission of the Application Ref. 22/00434/F, and completion of the statutory consultation exercise, amended application material (RevA) was submitted in July 2022 in response to consultation comments. Following completion of the second statutory consultation on the RevA material, the Applicant has worked with NCC to review the consultation responses received to identify an appropriate response where considered relevant. As a result of consideration of these comments, as well as ongoing discussions with NCC, some further minor amendments are now proposed which are summarised in the Planning Statement Addendum. The Amended Application material (RevC) submitted in January 2023 continues to seek consent for up to 1,100 dwellings and up to 8,000 Sqm (NIA) non-residential floorspace and associated development. However, since the amendments result in minor changes to the full development description, an updated version of the full Amended Application description is contained in **Appendix A** along with the Site Location Plan.
- 1.4 In September 2022 an updated Proposed Surface Water Drainage Strategy was submitted to the Lead Local Flood Authority (LLFA) for comment which sets out where necessary a response to the drainage related comments received on the Rev-A application material, then describes how the design has been developed and adapted as a result of these and other comments, In November 2022, the LLFA provided comments (see Appendix C) in the Proposed Surface Water Drainage Strategy (September 2022) confirming they no longer object to the Application subject to planning conditions being imposed.
- 1.5 Following the November 2022 LLFA comments, the landscaping plans for the proposed development have been amended further, introducing additional soft landscaping, to address other consultation feedback received. As part of the RevC update to the Application, the Proposed Surface Water Drainage Strategy has been updated to reflect the amended

landscaping changes. The overall drainage strategy retains the principles and surface water run off rates as that accepted by the LLFA in November 2022.

- 1.6 The proposed Outline/Full Planning Application Boundaries and Development Proposals are contained in **Appendix B.**
- 1.7 A summary of the drainage related comments on the Application are contained in Appendix C.
- 1.8 A separate report, undertaken by Royal Haskoning DHV, deals with the flood risk assessment, hydraulic modelling study and impact assessment and should be read in conjunction with this report.
- 1.9 The Application Description and Location Plan are contained in **Appendix A**.

2 Policy Framework and Pre-Application Comments

Local Policy

Greater Norwich Local Plan

- 2.1 The GNLP was submitted to the Secretary of Stage for independent examination on 30th July 2021. The emerging plan allocates the Anglia Square site (GNLP0506) for Mixed Use Allocation.
- 2.2 Emerging Policy: GNLP Policy 2 would be anticipated to reduce the risk of fluvial flooding that may arise as a result of development, through the requirement to carry out flood risk assessments, and incorporate sustainable drainage measures.
- 2.3 Emerging Policy : GNLP Policy 2 would be anticipated to mitigate the risk of surface water flooding that may arise as a result of development, through the requirement for development to incorporate sustainable drainage measures and contribute to the green infrastructure cover.
- 2.4 A SuDS drainage plan incorporating sustainable drainage (SuDS) is included in Section 7, detailing how surface water will be managed on the site and the rationale for the approaches used. Surface water runoff from the site will be restricted as far as possible to ensure that the risk of flooding both to the site and elsewhere is minimised, taking into account the effects of climate change.
- 2.5 This section sets out the policy context. This FRA is based on the advice set out in the National Planning Policy Framework (NPPF) published in July 2021, the Planning Practice Guidance (PPG) published March 2014, which is updated on an ad hoc basis and Annex 3: Flood risk vulnerability classification.

Development Management Policies Local Plan

2.6 The Development Management Policies Plan (DM policies) sets out policies which will apply across the whole city, as well as policies which apply in designated areas.

Policy DM5 – Planning effectively for flood resilience' details the policy for flooding, sustainable drainage and surface water flooding and surface treatment. The policy states:

"Developers will be required to show that the proposed development:

-would not increase the vulnerability of the site, or the wider catchment, to flooding from surface water run-off from existing or predicted water flows; and

-would, wherever practicable, have a positive impact on the risk of surface water flooding in the wider area.

Development must, as appropriate, incorporate mitigation measures to reduce surface water runoff, manage surface water flood risk to the development itself and to others, maximise the use of permeable materials to increase infiltration capacity, incorporate on-site water storage and make use of green roofs and walls wherever reasonably practicable.

The use of permeable materials, on-site rainwater storage, green roofs and walls will be required unless the developer can provide justification to demonstrate that this would not be practicable or feasible within the constraints or configuration of the site, or would compromise wider regeneration objectives."

2.7 The landscaping of the development in terms of surface water management is also considered in Policy DM5. This states:

"Development proposals will be required to maximise the use of soft landscaping and permeable surfacing materials unless the developer can provide justification to demonstrate that this is not feasible.

Where permission is required, proposals involving the provision of new or replacement paved and other impermeable surfaced areas will only be permitted:

-in areas of impermeable soils as identified in Appendix 1;

-in other areas where it can be demonstrated that permeable surfaces are not practicable due to poor soil infiltration capacity, high groundwater levels or risk of subsidence; and

-in areas with soils with average or good infiltration capacity, where it can be demonstrated that there is an exceptional and overriding justification for such surfaces.

In cases where poor soil infiltration capacity or other factors preclude the use of permeable surfacing materials, development proposals should seek to manage and minimise the impact of surface water run-off by suitable measures for water storage on-site."

2.8 A SuDS drainage plan incorporating sustainable drainage (SuDS) is included in Section 7, detailing how surface water will be managed on the site and the rationale for the approaches used. Surface water runoff from the site will be restricted as far as possible to ensure that the risk of flooding both to the site and elsewhere is minimised, taking into account the effects of climate change.

Natural England and Nutrient Neutrality Assessments

- 2.9 In In March 2022, Natural England issued a letter to Local Planning Authorities, Environment Agency and all Heads of Planning and Chief Executives to give advice for development proposals with the potential to affect water quality resulting in adverse nutrient impacts on habitats and sites. The letter provides advice on the assessment of new plans and projects under Regulation 63 of the Habitats Regulations. The purpose of that assessment is to avoid adverse effects occurring on habitats sites as a result of the nutrients released by those plans and projects. This advice does not address the positive measures that will need to be implemented to reduce nutrient impacts from existing sources, such as existing developments, agriculture, and the treatment and disposal of wastewater. It proposes that nutrient neutrality might be an approach that planning authorities wish to explore.
- 2.10 The following background is given:

"In freshwater habitats and estuaries, poor water quality due to nutrient enrichment from elevated nitrogen and phosphorus levels is one of the primary reasons for habitats sites being in unfavourable condition. Excessive levels of nutrients can cause the rapid growth of certain plants through the process of eutrophication. The effects of this look different depending on the habitat, however in each case, there is a loss of biodiversity, leading to sites

being in 'unfavourable condition'. To achieve the necessary improvements in water quality, it is becoming increasingly evident that in many cases substantial reductions in nutrients are needed. In addition, for habitats sites that are unfavourable due to nutrients, and where there is considerable development pressure, mitigation solutions are likely to be needed to enable new development to proceed without causing further harm.

In light of this serious nutrient issue, Natural England has recently reviewed its advice on the impact of nutrients on habitats sites which are already in unfavourable condition. Natural England is now advising that there is a risk of significant effects in more cases where habitats sites are in unfavourable condition due to exceeded nutrient thresholds. More plans and projects are therefore likely to proceed to appropriate assessment.

The principles underpinning HRAs are well established. At the screening stage, plans and projects should only be granted consent where it is possible to exclude, on the basis of objective information, that the plan or project will have significant effects on the sites concerned. Where it is not possible to rule out likely significant effects, plans and projects should be subject to an appropriate assessment. That appropriate assessment must contain complete, precise and definitive findings which are capable of removing all reasonable scientific doubt as to the absence of adverse effects on the integrity of the site.

Appropriate assessments should be made in light of the characteristics and specific environmental conditions of the habitats site. Where sites are already in unfavourable condition due to elevated nutrient levels, Natural England considers that competent authorities will need to carefully justify how further inputs from new plans or projects, either alone or in combination, will not adversely affect the integrity of the site in view of the conservation objectives. This should be assessed on a case-by-case basis through appropriate assessment of the effects of the plan or project. In Natural England's view, the circumstances in which a Competent Authority can allow such plans or projects may be limited. Developments that contribute water quality effects at habitats sites may not meet the no adverse effect on site integrity test without mitigation.

Mitigation through nutrient neutrality offers a potential solution. Nutrient neutrality is an approach which enables decision makers to assess and quantify mitigation requirements of new developments. It allows new developments to be approved with no net increase in nutrient loading within the catchments of the affected habitats site.

Where properly applied, Natural England considers that nutrient neutrality is an acceptable means of counterbalancing nutrient impacts from development to demonstrate no adverse effect on the integrity of habitats sites and we have provided guidance and tools to enable you to do this."

2.11 A Nutrient Neutrality Assessment is to be undertaken by others and will be submitted as part of this planning application.

3 Existing Site Assessment

Existing Site Description

- 3.1 The site is located at Anglia Square, Norwich and consists of a shopping precinct including stores such as Iceland and Boots and a former cinema. Large office blocks are also present at the site; the disused seven-storey Sovereign House which runs north-south along Botolph Street previously housed Her Majesty's Stationary Office (HMSO) and the under-utilised six-storey Gildengate House, built over shops underneath. The Full and Outline Application boundaries cover a combined area of 4.65ha which also includes some areas of adopted highway.
- 3.2 The existing site is almost entirely impermeable and is served by both private and adopted foul and surface water sewers. Surface water run-off is unrestricted and untreated and ultimately outfalls to the adopted sewer network to the south-east of the site. This is further evidenced and discussed below.

Site Levels

- 3.3 A site-specific topographical survey (including a utilities/drainage survey) is included in Appendix D. For the main Anglia Square site, levels vary between 5.09m AOD in the north west corner to 2.40m AOD at the existing access road from St Crispin's Road to the south of the site. Away from this low spot, levels in the south east corner of the site are in the region of 3.08m AOD. For the existing Anglia Square shopping centre, levels are around 3.51m AOD. The site slopes in a generally south easterly direction at a gradient of approximately 1:125.
- 3.4 The parcel north west of New Botolph Street slopes in a southerly direction, at a gradient of approximately 1:185 with the highest level to the north west of the site at 5.40m AOD and the lowest level at 5.11m AOD at the southern extent of the parcel. The site is approximately 0.35-0.4m higher than the carriageway of New Botolph Street/ Edward Street.
- 3.5 North of Edward Street the site slopes towards the north, at a gradient of approximately 1:100, with the highest point in the south west corner at a level of 4.27m AOD and the lowest point in the north at 3.87m AOD.

Sewer Network

- 3.6 Sewer records, obtained from Anglian Water and included in Appendix E, show there to be a 850mm/24" surface water sewer and 300mm foul sewer flowing in a south westerly direction through the site. It should be noted that a drainage survey of the surface water sewer crossing Anglia Square shows this to be a 675dia sewer and not 850dia/24" as indicated on the sewer records. For ease and in line with the gathered survey data, this sewer shall be referred to as 675dia throughout the remainder of this report.
- 3.7 A 300mm surface water sewer and 225mm foul sewer also run west to east with Edward Street, to the north of the main portion of the site. Both sewers connect to the respective foul and surface water sewers in Magdalen Street before flowing southwards with surface water sewers discharging into the River between Fye Bridge Street and Whitefriars Bridge.

- 3.8 A further 525mm combined sewer flows southwards along Magdalen Street. It is highly likely that surface water flows from the Dalymond Dyke flow within this sewer, given the location of the sewer and the available information on the Dalymond Dyke.
- 3.9 The sewer locations and sizes within the site boundary are shown in more detail on the topographical survey contained in Appendix D.

Pre-Development Run-off Rate

- 3.10 The total site area covers 4.65ha and is entirely brownfield comprising a shopping centre, office block, paved open spaces and car parks with some areas of landscaping and planting. The existing impermeable area (not including adopted highway) has been measured at 4.1768ha.
- 3.11 In order to calculate the brownfield (existing) surface water runoff rates from the proposed development site, a review of the Anglian Water sewer mapping, the topographical survey (including utility and drainage survey data) and CCTV drainage surveys was undertaken to determine the existing catchment areas and existing drainage features that serve the site.
- 3.12 The topographical survey is contained in Appendix D and Anglian Water Sewer Mapping is contained in Appendix E. A CCTV drainage survey, undertaken by Draincare Environmental Ltd is contained in Appendix F.
- 3.13 The CCTV drainage survey of the 675dia sewer crossing Anglia Square shows a number of incoming connections from the north and south of the sewer. These are summarised below and for ease, are clearly indicated on the last page of Appendix F.
 - Ex. Connection 1 outfall to 225dia sewer in Edward Street Edward Street Area 1 and page 48 of the cctv survey report in Appendix F.
 - Ex. Connection 2 outfall to 300dia sewer in Edward Street via 0458 Edward Street Area 2 and page 56 of the cctv survey report.
 - Ex. Connection 3 outfall to 675dia sewer at mh 0453 Plan 1 and page 32 of the cctv survey report in Appendix F.
 - Ex. Connections 4 to 9 outfalls to 675dia sewer between mhs 9460 and 9459 shown as junctions on page 45 of the cctv survey report.
 - Ex. Connection 10 outfall to 675dia sewer shown as junction on page 33 of the cctv survey report in Appendix F.
 - Ex. Connection 11 outfall to 675dia sewer see Plan 2, Plan 4 and page 13 of the cctv survey report in Appendix F.
 - Ex. Connection 12 outfall to 675dia sewer see Plan 3 and shown as junction on page 39 of the cctv survey report in Appendix F.
- 3.14 The CCTV drainage survey connections, when compared against the topographical/drainage survey verifies these connections and proves that the site is served by a private surface water drainage system that freely outfalls to the adopted sewer network, aside from the brown-coloured car park area shown on SK01-D in Appendix G.
- 3.15 In order to calculate the existing outfall rates, the LLFA in their consultation comments (ref FW2022_0423), requested that FEH Methods in line with CIRIA SuDS Manual C753 should be applied. Section 24.5 in the CIRIA SuDS Manual C753 discusses Peak Run-of Rates for Previously Developed Sites as below:

Runoff characteristics for a previously developed site can be estimated in a number of ways:

1 Any land that has been previously developed is likely to have had a system in place to drain surface water runoff from the site. This drainage system may or may not have included storage and flow control systems. Where any drainage system is still operational, peak flow rates at the outfall for the relevant return periods (usually 1:1 year, 1:30 year and 1:100 year) can be demonstrated by producing a simulation model that includes an accurate representation of the drainage system and site area contributions – thus allowing derivation of an appropriate head–discharge relationship at the outfall.

It is recognised that existing drainage systems will probably be overwhelmed for the 1:30 and 1:100 year events and therefore the actual rate of discharge from the site in such scenarios is likely to be increased by overland flow contributions or surcharging. However, these effects should not be accounted for, and the discharge limit should be based solely on the flow rate from the piped system (thus providing a conservative estimate).

- 3.16 As the topographical survey contains details of the existing drainage system, it is possible to produce a simulation model that includes an accurate representation of the drainage system and site area contributions thus allowing derivation of an appropriate head-discharge relationship at the outfall.
- 3.17 SK01-D in Appendix G shows the existing impermeable and permeable areas as well as the existing drainage systems serving the site and their catchment areas. The site is split into 8no. catchments areas. In their consultation comments (ref FW2022_0703) the LLFA requested that a section of landscaped area to the west of Area 4 (395m²) should be included in the brownfield runoff rates, as such, the greenfield runoff rate for this area shall be added to the calculations.
- 3.18 Greenfield Run-off Rates are discussed below. In order to avoid overestimation of brownfield runoff rates and provide a robust calculation, a brown-coloured car park area to the west of Area 3 (2814m²) is not included in the impermeable area as the drainage survey is incomplete and does not confirm where this area drains to. It would therefore be inappropriate to include this within the following calculations. The total contributing area for brownfield runoff is therefore 3.9577ha (including 395m² of landscaped area).
- 3.19 The CCTV Drainage survey and topographical drainage survey show that surface water runoff from the existing site (with the exception of the brown-coloured car park area of 2814m and landscaped areas of 1845m²) is directed adopted surface water sewers in Edward Street, the 675dia sewer crossing Anglia Square and the 36" sewer in Magdalen Street. Looking at SK01-D in Appendix G it can be determined:
 - Outfalls to Edward Street Sewer: Area 1 (around 50% of this catchment) to AWMH 0452 Area 2 (via a sewer in Beckham Place) to AWMH 0459 Area 3 to AWMH 0451 Area 4 to AWMH 0452
 - Outfalls to 675dia Sewer: Area 1 (around 50% of this catchment) via AWMH 9462 in St Augustin Street Area 5 to AWMH 1352 Area 7 to AWMH 0354 Area 8 to AWMH 9459
 - Outfalls to Magdalen Street sewer:

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Area 6 to AWMH 1357

3.20 It is not possible to model a 1:1yr storm event with FEH data therefore, to ascertain what the equivalent 1:1yr outfall rate would be for an FEH storm, it is deemed appropriate to apply a percentage to the FEH calculated runoff. This percentage shall be based on runoff rates for a 1:1yr and 1:2yr storm event generated using FSR rainfall data using the formula below:

A FSR 1:1yr storm runoff is 20 l/s

A FSR 1:2yr storm runoff is 25 l/s

 $20 \div 25 = 0.8$

As such, the 1:1yr runoff rate is 80% of the 1:2yr runoff rate

- If the FEH 1:2yr storm runoff is 23 I/s the 1:1yr equivalent is 18.4 I/s
- 3.21 Causeway Flow (hydraulic modelling software) was used to model each existing catchment using FEH data for a range of storm events (whilst applying a MADD Factor of 0 as requested by the LLFA). As described above, FSR data was used to generate runoff rates for 1:1yr and 1:2yr storm events as a means to calculate a 1:1yr FEH equivalent. The hydraulic model results are contained in Appendix H and show brownfield runoff rate calculations for 1:1yr, 1:2yr, 1:30yr, 1:30yr+45%CC, 1:100yr and 1:100yr+45%CC rates.
- 3.22 1:1yr Brownfield Runoff Rates are summarised below and includes the greenfield runoff rate for the 395m² of landscaped area:

	Contributing	1:2 FEH	1:1 FSR	1:2 FSR	% 1:1 to 1:2	1:1 FEH
	Area (ha)	l/s	l/s	l/s	FSR	Equivalent I/s
Area 1	0.239	32.9	29.5	34.3	86.0	28.29
Area 2	0.125	25.1	18.5	24.1	76.8	19.27
Area 3	0.170	30.0	22.3	28.7	77.8	23.31
Area 4	0.352	61.0	45.4	58.1	78.1	47.67
Area 5	0.251	44.9	33.2	42.9	77.4	34.75
Area 6	0.105	16.4	12.7	15.8	80.4	13.18
Area 7	1.197	194.5	145.1	186.5	77.8	151.32
Area 8	1.479	209.1	164.1	200.8	81.7	170.88
395m2	0.0395					(REFH2 0.9
landscape						l/s/ha)
area						0.036
Total	3.957	613.9	470.8	591.2		488.706

- 3.23 The 1:1yr brownfield runoff rate for the site is therefore 488.706 l/s.
- 3.24 The 1:1yr brownfield runoff rate directed to the Edward Street Sewer is: 104.395 l/s.
- 3.25 The 1:1yr brownfield runoff rate directed to the 675dia sewer is: 371.131 l/s (including the green landscaped area).
- 3.26 The 1:1yr brownfield runoff rate directed to the Magdalen Street sewer is:13.18 l/s.

Pre-Development Storage Volumes

- 3.27 A simple analysis was carried out based on the topographical survey. The various sewers serving the existing site along with the diameters are shown on the topographic survey. These were measured and the available capacity in each sewer has been calculated. This analysis identified only the private sewers which outfall from the existing development to the adopted sewers but does not include the adopted sewers themselves or any outfall pipes from gullies or rainwater pipes. It is noted that there could be additional private sewers which haven't been picked up on the topographical survey so were not included in this analysis.
- 3.28 The storage volume available in the pipe network serving the existing brownfield site is as follows:

150dia @ 335.4m = 6.04m3 225dia @ 296.4m = 11.86m3 300dia @ 71.5m = 5.08m3 375dia @ 34.9m = 3.84m3

Assume 1m3 volume for each manhole. $37 \times \text{manholes} = 37\text{m}^3$

3.29 The total 'storage' volume available in the surface water sewers on the existing site is therefore approximately 63.82m3.

Existing Sewers, Diversions and Build-Overs

- 3.30 The proposals will require the adopted surface and foul water sewers which cross the site to be diverted. It is anticipated that a S185 Sewer diversion Application shall be made to Anglian Water which will preclude the need for any Build-Over Agreements. Further information on sewer diversions are contained in Section 4.
- 3.31 A number of private surface and foul water sewers serve the existing site. These sewers are not anticipated to be retained as part of the proposed surface water drainage strategy and will therefore be removed and new surface and foul water sewers provided. Removal/divestment of any sewers shall be agreed with Anglian Water as part of a S185 Application.

Greenfield Run-off Rates

- 3.32 The LLFA in their consultation comments (ref FW2022_0423 and FW2022_0703) request that greenfield runoff rates are provided and calculation using FEH rainfall data methods. Using hydraulic modelling software Causeway Flow, greenfield runoff rates for 1:1yr, 1:2yr, 1:30yr and 1:100yr storm events were calculated using FEH rainfall data and also using ReFH2 rainfall data. The results of which are contained in Appendix I, and show runoff rates for each proposed discrete drainage system as outlined in Section 4 of this report.
- 3.33 Causeway Flow hydraulic modeling software does not generate greenfield runoff rates including Climate Change Allowance. Causeway Flow were contacted to ascertain how a Climate Change Allowance could be applied to the generated greenfield flow rate, but they were unable to confirm how this could be done. For the purpose of discussion, it is proposed to apply a growth-factor to the greenfield run-off rates. As such, for 45% Climate Change Allowance, for that storm event, the greenfield runoff rate shall be multiplied by 1.45. So for

a 1:100yr greenfield runoff rate of 1.0 l/s – to calculate a 1:100yr + 45% Climate Change event, 1.0 l/s shall be multiplied by 1.45 - giving a rate of 1.45 l/s.

- 3.34 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, ReFH2 methods (5.9 litres per second per hectare), to the total application boundary (4.65ha) results in a rate of 27.435 l/s.
- 3.35 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, ReFH2 methods (5.9 litres per second per hectare), to the total proposed contributing area (4.7ha) results in a rate of 27.73 l/s (NB Total contributiong area includes some off-site adopteable highway for robustness).
- 3.36 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, FEH methods (2.9 litres per second per hectare), to the total application boundary (4.65ha) results in a rate of 13.485 l/s.
- 3.37 Applying the 1:100yr + 45% Climate Change Event greenfield runoff rate, FEH methods (2.9 litres per second per hectare), to the total proposed contributing area (4.7ha) results in a rate of 13.63 l/s (NB Total contributiong area includes some off-site adopteable highway for robustness).
- 3.38 Outfall rates to be applied to the proposed surface water drainage strategy are discussed below.

4 **Proposed Drainage Strategy**

Relevant SuDS Policy

- 4.1 The NPPF states that, "using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management)".
- 4.2 SuDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood.
- 4.3 The SuDS management train incorporates a hierarchy of techniques and considers all three SuDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefit. In decreasing order of preference, the preferred means of disposal of surface water runoff is:
 - Discharge to ground.
 - Discharge to a surface water body.
 - Discharge to a surface water sewer.
 - Discharge to a combined sewer.
- 4.4 The philosophy of SuDS is to replicate as closely as possible the natural drainage from a site pre-development and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:
 - Reducing runoff rates, thus reducing the flood risk downstream.
 - Reducing pollutant concentrations, thus protecting the quality of the receiving water body
 - Groundwater recharge
 - Contributing to the enhanced amenity and aesthetic value of development areas.
 - Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

Site Specific SuDS

4.5 The various SuDS methods need to be considered in relation to site-specific constraints. Several SuDS options are available to reduce or temporarily hold back the discharge of surface water runoff. Table 4.1 outlines the constraints and opportunities to each of the SuDS devices in accordance with the hierarchical approach outlined in The SuDS Manual CIRIA C753. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Roof Terraces and Roof Gardens are proposed as part of this development.	Yes
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Potential for high groundwater and contamination indicated due to brownfield site.	No
Pervious surfaces (source control)	Storm water is allowed to infiltrate through the surface into a storage layer, from which it can either infiltrate and/or slowly release to sewers.	Potential for high groundwater and contamination indicated due to brownfield site. Lined permeable paving is proposed in some pedestrian areas which are outside the main thoroughfares.	Yes
Rainwater harvesting (source control)	Reduces the annual average rate of runoff from the site by reusing water for non-potable uses e.g. toilet flushing, recycling processes.	Water butts are proposed for Block C and rainwater recycling for landlord use to wash-down bin stores is also proposed.	Yes
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Due to spatial constraints, swales are not proposed for conveyance and due to potential for high groundwater not proposed for infiltration.	No
Bioretention System	Shallow landscaped depression that can reduce runoff rates and volumes and treat pollution through engineered soils and vegetation.	Bioretention systems and tree- pits are proposed throughout the public realm and alongside highways where possible and where spatial constraints allow.	Yes
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Some areas of the site may be suitable for u se of filter drains, however no infiltration is expected to be viable due to contamination. Filter drains would therefore be lined and used for Water Quality purposes to filter waters prior to outfall.	Yes
Filter Strips (permeable conveyance)	Wide gently sloping areas of grass or dense vegetation that remove pollutants from run-off from adjacent areas.	Potential for high groundwater and contamination indicated due to brownfield site.	No
Infiltration basins (end of pipe treatment)	Depressions in the surface designed to store runoff and allow infiltration.	High density city centre site Potential for high groundwater and contamination indicated due to brownfield site.	No
Wet ponds & constructed wetlands (end of pipe treatment)	Provide water quality treatment & temporary storage above the permanent water level.	High density city centre site so no landscaped areas for ponds and wetlands.	No
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	These are proposed as the SuDS listed above will not achieve sufficient volumes to restrict to the required rate. This is likely to be used alongside other means of attenuation at the site to provide the required storage volume.	Yes

Table 4.1: Site Specific Sustainable Drainage

Site Specific SuDS

4.6 Where possible, rainwater harvesting features shall be incorporated in the proposals where it is suitable to do so. The suitability of rainwater harvesting features has been considered against the Environment Agency's Energy and carbon implications of rainwater harvesting and greywater recycling (Report: SC090018), available here: scho0610bsmq-e-e.pdf (publishing.service.gov.uk), which summarises its key findings as follows:

1. Buildings using harvested rainwater or treated greywater typically increase greenhouse gas emissions compared to using mains water, where total cradle to gate embodied and operational carbon are considered. For example over 30 years, where an 'average' 90m2 house has a RWH system with a polyethylene tank, the total carbon footprint is approximately 1.25 – 2 tonnes of carbon dioxide equivalent (CO2e). This is similar to one year of energy-related emissions from a house built to Code for Sustainable Homes Level 3 energy efficiency standards. The footprints of systems applied to commercial buildings vary widely, but over a 30 year lifespan were found to represent around one month's operational energy-related emissions in the hotel, office and schools studied.

2. With one exception, the operational energy and carbon intensities of the systems studied were higher than for mains water by around 40 per cent for a typical rainwater application, and over 100 per cent for most greywater applications. The exception is short retention greywater systems which are around 40 per cent less carbon intensive than mains water supply. The assumed operational intensities of rainwater and greywater systems are based on the limited measured data and information available to this study.

3. There is scope to improve the efficiency and design of systems to reduce their carbon footprints. Storage tanks account for a large proportion of the embodied carbon footprint of rainwater systems; slightly less so for greywater. Pumps also make up a large proportion of rainwater and greywater embodied carbon and pumping determines net operational carbon. Direct feed rainwater systems have a large operational footprint because both rainwater and mains backup are pumped to end uses via the storage tank. Innovation in these and other areas could reduce carbon footprints. Manufacturers and suppliers should work quickly to reduce the footprints of their systems, and particularly to reduce the energy intensity of pumps and treatment systems."

- 4.7 Taking the above into consideration, the proposals do not allow for rainwater harvesting for mixed-use areas as rainwater harvesting would need to be pumped for re-use. There is scope to provide suitable rainwater harvesting where the use of pumps is not required, this will be in the form of water-butts for individual properties and for above ground tanks to serve bin-wash down areas for mixed-use buildings.
- 4.8 The developer was asked to consider rainwater re-use for toilets in the Community Centre in Block D. An assessment on required tank size was undertaken using the calculator on www.rainwaterharvesting.co.uk/tank-size-calcuator/. Based on an average 25 flushes per day (considered to be a conservative estimate of use) and a contributing roof area of 265m2 (the non-green-roof-area of Block D), it is concluded that not enough rainwater is generated to make this viable, see screen-shot below. This also concludes that a rainwater harvesting

tank of volume 15,000 litres would be required (or 15m3) for which there is not space to provide within the community centre.

HOW CAN RAINWATER HARVESTING HELP	COLLECTA	BLE RO	OF AR	REA (M ²)	i.				
WITH HOSEPIPE BANS	Main Building	Width:	26.5	Length	10	Rain Collection Area		265	0.0
WATER NEUTRALITY AND RAINWATER HARVESTING	Extension one	Width:		Length		Rein Collection Area:		0	101
HALLOW VS DEEP DIG - CONSIDERATIONS WHEN INSTALLING	Extension Two	Width:		Length:		Rain Collection Area:		0	109
YOUR RAINWATER HARVESTING TANK	Extension Three	Width:		Length		Rain Collection Area:		0	
VILL WE LEARN FROM THE ENERGY CRISIS OF TODAY?	Or the total roof are	sa il you ake	ndy know it		ø	Total area of collectable roofs	pace	265	
RAINWATER HARVESTING REGULATIONS IN THE UK – WHAT YOU NEED TO KNOW	Select Your Region		England	65 3	•	Average rainfall per year in yo	ur region.	71	
BEFORE INSTALLATION	Collectable rainwa	iter per annu	am in litres	- discounted	by 20% to	e account for water loss		150520	
	Number of people of				Tree Har	~	25	Q.	1
	Number of a	dothes wash collet flushe s. per person	ang cytles s per day (per day (re	per day (50) 4.42 fluahes j	per perso	m, average 5 litres each)		0.00 552.90 0.00	
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4.9 The following assessment therefore forms the basis of Rainwater Harvesting features that could be viable at the proposed development site for each Block:

Block	Description	Constraints / Comments	Appropriate
Block A – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be ocated within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block B – Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	There is potential for individual owners of the terraced houses within this Block to install a system in the future, however for commercial reasons it is not proposed for these residential units at this planning stage. It is not expected there will be opportunity for the leaseholder of the apartment block in Block B to retrofit rainwater harvesting however.	No
Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater Water-Butts are to be incorporated for the terraced houses along the northern boundary of Block B.	Yes
ilock C – lesidential.	The use of filtered rainwater for reuse in toilets and washing machines.	For commercial and maintenance/management reasons it is not proposed to provide rainwater reuse for toilets for the apartment units at this planning stage.	No
Full Planning)			
	The use of filtered rainwater for reuse at outside taps.	Not possible for this Block due to possible leaseholder issues.	No
Block D – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No

Block E – Commercial and Residential. (Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block F – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block G – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block H – Commercial and Residential. (Outline Planning)	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to	No

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TRANSPORT PLANNING HIGHWAYS AND DRAINAGE FLOOD RISK TOPOGRAPHICAL SURVEYS Unit 23 The Maltings Stanstead Abbotts Hertfordshire SG12 8HG Tel 01920 871 777 e: contact@eastp.co.uk www.eastp.co.uk

Block J – Commercial and Residential.		deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	
(Outline Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block J3 – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block K/L – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes
Block M – Commercial and Residential.	The use of filtered rainwater for reuse in toilets and washing machines.	Given the complex split of usages for the Blocks (residential vs commercial) the infrastructure needed to manage this and the possible risk/concern of maintenance and management of a system to serve private, communal and public use toilet water would be difficult to deliver effectively. The use of pumps would be unavoidable and would therefore contribute to the carbon footprint of the development.	No
(Full Planning)	The use of filtered rainwater for reuse at outside taps.	Rainwater harvesting tanks to be incorporated for land- lord bin wash- down, which shall be fed by rainwater downpipes and managed and maintained solely by the landlord or elected Management and Maintenance Company. These rainwater harvesting tanks shall be located within the ground-floor bin stores and shall be fed by a nearby rainwater downpipe. Overflow from rainwater harvesting tank shall be directed back into the private surface water drainage network. NB: Gully from bin-wash-down area shall be directed to private foul water drainage network.	Yes

Table 4.2: Site Specific Rainwater Harvesting

Post- Development Run-off Rate

- 4.10 Given the potentially high groundwater and contamination of the site, infiltration is not recommended. The Royal Haskoning DHV FRA Report (Section 7.11, Table 5) discusses borehole data and shows historic groundwater borehole information showing a winter (January 1993) groundwater level of 2.40m bgl and a spring (May 1993) groundwater level of 4.40m bgl. The relatively high groundwater levels precludes the use of infiltration devices. There are no nearby watercourses to which a connection could be made, and therefore it is proposed that the development will drain to the existing Anglian Water surface water network in the vicinity of the site (matching the existing situation), however at a restricted discharge rate in order to provide a betterment.
- 4.11 The greenfield runoff rates provided in Section 3 above are very low due to the local geology of chalk. However, in reality the site is almost entirely impermeable, historical mapping shows the site has been developed since at least 1885 and has been a shopping/town centre for many years. The site is Brownfield and it is therefore considered appropriate to review the existing run-off rates with a view to provide a betterment. Using greenfield run-off rates for a site which has been brownfield for over 137 years is inappropriate and would result in excessive attenuation volumes and therefore tank sizes, which could have impacts on other features such as the local archaeology, groundwater and geology.
- 4.12 S3 of the Non-Adoptable Technical Standards for Sustainable Drainage Systems (2015) states: For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event."
- 4.13 As discussed in para. 3.32 above, the 1:100yr + 45% Climate Change greenfield runoff rate for the entire application site (4.65ha) is 27.435 l/s. An assessment of whether it is practicable to restrict flows from the development site to match greenfield runoff rates was undertaken by applying the greenfield runoff rate for the entire application boundary of 27.435 l/s to the largest proposed catchment Block A, M, K/L and J3. Using Causeway Flow (hydraulic modelling software), the storage volume, using greenfield runoff rate was calculated at: 832.9m3 requiring a geocellular storage device size of 525m2 x 1.67m x 95% voids. When allowing for a proposed outfall rate of 65 l/s (based on a reduced brownfield/existing run-off rate), the storage volume requirement is calculated as 682.2m3 requiring a geocellular storage device size of 430m2 x 1.67m x 95% voids. This is an increase of 150.7m3 of volume that would be required if using the total 1:100yr + 45% CC greenfield run-off rate for a 1:100yr + 45% CC Storm Event. Refer to Appendix J for hydraulic calculations and a sketch showing the sizes of attenuation. Taking into consideration that additional storage volume will be required for some proposed catchments which may rely on a pumped outfall, it is clear that spatial constraints prevent the use of greenfield run-off rates being applied. This assessment shows that it is not possible or practicable to apply greenfield runoff rates.
- 4.14 S3 above concludes that where it is not reasonably practicable to match peak runoff rates that are directed to a drain or sewer to greenfield rates – proposed rates <u>"should never</u> <u>exceed the rate of discharge from the development prior to redevelopment for that event"</u>
- 4.15 As it is not practicable to restrict flows from the proposed development site to greenfield runoff rates and the proposals are to direct flows to the adopted sewer network (as per existing), in order to determine an appropriate proposed outfall rate, Anglian Water were

consulted. A Pre-Development Assessment Report confirmed that a total discharge rate of 242 I/s would be acceptable, see **Appendix K**. Subsequent discussions with Anglian Water during the consultation period addressed the proposed outfall points and outfall rates. Anglian Water provided a further email statement to confirm that the proposed outfall rates (pumped and gravity) and proposed outfall points were acceptable, this email is contained in **Appendix L**.

4.16 In order to confirm the determined maximum outfall rate of 242 I/s shall never exceed the rate of discharge from the development prior to redevelopment for each storm event, the assessment below looks at the brownfield runoff rates for 1:1yr, 1:30yr and 1:100yr events and compares these with the proposed maximum 242 I/s outfall rate:

	Existing Run-off Rate	Proposed Run-off Rate	Reduction
1:1 Yr Storm	488.706 l/s	242 l/s	-246.706 l/s
1:30 Yr Storm	1439.119 l/s	242 l/s	-1197.119 l/s
1:100yr Storm	1781.933 l/s	242 l/s	-1539.933 l/s

4.17 It is clear from the above assessment that the proposed maximum outfall rate of 242 l/s to manage all storms up to and including the 1:100yr + 45% Climate Change Event shall significantly reduce flows from the development site for all storm events. The proposed 242 l/s is the equivalent of 49.5% of the existing 1:1yr brownfield run-off rate and therefore satisfies S3 of the Non-Adoptable Technical Standards for Sustainable Drainage Systems (2015). This rate and the proposed outfall points are acceptable to Anglian Water as discussed in **Appendix L** and shall therefore inform the proposed surface water drainage strategy as follows.

Proposed Drainage Strategy

- 4.18 In accordance with the Environment Agency's May 2022 published Climate Change Allowances, all surface water drainage is to be designed to manage a 1:100yr + 45% Climate Change Event. As per LLFA's Developer Guidance, FEH Rainfall Data shall be used within the hydraulic models whilst also applying a MADD Factor of 0. As requested by the LLFA, the hydraulic model assumes that adopted sewers are running at full bore and will be surcharged to the top of pipe.
- 4.19 The proposed drainage systems shall be hydraulically modelled to test a 1:2yr Storm, 1:30yr
 Storm, 1:30yr + 40% Climate Change Storm, a 1:100yr Storm and finally a 1:100yr + 45% Climate Change Event.
- 4.20 As discussed above, the total maximum outfall rate of 242 l/s, to manage all storms up to and including the 1:100yr + 45% Climate Change Event will match 49.5% of the existing 1:1yr brownfield runoff rate providing a significant betterment to the existing situation for all storm events.
- 4.21 The former Barclays Bank building in the north east corner of the site and Surrey Chapel in the south-west corner of the site are existing buildings which are outside the Application Boundary. These are to be retained along with the drainage networks which serve them. Runoff from these areas shall not be included within the proposed surface water drainage networks. It is intended to ensure that any drainage pipework serving these buildings that may cross into the Application Boundary will be diverted accordingly if required.

- 4.22 This maximum outfall rate of 242 l/s shall be proportioned to each proposed catchment area, taking into account the contributing area and spatial constraints whilst ensuring that flow rates to each adopted sewer do not exceed existing 1:1yr Brownfield runoff rates. As discussed in para 3.19 to 3.22 above, 50% of existing Area 1 and the whole of Area 2. Area 3 and Area 4 drain to the Edward Street surface water sewer at a 1:1yr Brownfield rate of 104.395 l/s. In the proposed situation, Blocks B and C (discussed in more detail below) will drain to the Edward Street Sewer at a combined maximum outfall rate of 10 l/s. A significant reduction.
- 4.23 For the 675dia surface water sewer, in the existing situation 50% of Area 1, and the whole of Area 5, Area 7 and Area 8 drain to this sewer at a 1:1yr Brownfield rate of 371.095 l/s. In the proposed situation, Blocks D, A, M, K/L, J3, E, F, G, J and H (discussed in more detail below), will drain to the diverted 675dia surface water sewer at a combined maximum outfall rate of 232 l/s, again a significant reduction.
- 4.24 The finished floor levels (FFL's) for each Block have been set following the hydraulic modelling undertaken by Royal Haskoning DHV and are discussed further within their FRA report.
- 4.25 As described in Section 1, it is proposed to make a Hybrid planning application: Full Planning for Blocks, A, B, C, D, J3, K/L and M and Outline Planning for Blocks E, F, G, H and J.
- 4.26 The Hybrid site layout precludes the option for completely separating drainage for Outline areas from Full-Planning areas however, largely, the drainage systems serve only Outline or only Full-Planning areas
- 4.27 development parcels have been split into 9no. drainage catchments:
 - System 1 Serves Block B (Full-Planning)
 - System 2 Serves Block C (Full-Planning)
 - System 3 Serves Block D (Full-Planning)
 - System 4 Serves Block A, M J3 and K/L (Full Planning)
 - System 5 Serves Botolph Street/Public Realm Area (Full Planning)
 - System 6 Serves Block E (Outline Planning)
 - System 7 Serves Block F (Outline Planning)
 - System 8 Serves Blocks G and J (Outline Planning)
 - System 9 Serves Block H (Outline Planning)

System 1 – Block B – Full Planning

4.28 SuDS Feature Selection – This catchment comprises residential dwellings, footpaths, patios and parking areas. The residential apartment block facing New Botolph St has a green roof – the details of which can be seen on the Landscape Masterplan – Roof Level PlanIt drawing in Appendix M. It is proposed to utilise lined permeable paving to manage run-off from the

trafficked areas. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. Residential rainwater harvesting (waterbutts) are to be provided for the terraced houses. A surface water drainage network shall collect run-off from roof, patios and other hardstanding areas with all flows directed to a geocellular storage device with outfall to the adopted 225dia surface water sewer in Edward Street (MH AW 0452) via a Downstream Defender (proprietary treatment unit) and Hydrobrake gravity flow control device.

- 4.29 The contributing area for this catchment has been calculated as: 1790.5m², comprising:
 - Roof Area (515m² x 110% allowing for 10% Urban Creep) 566.5m²
 - Green Roof Area 290m² (assuming the green roof is saturated and do not provide any storage volume)
 - Permeable Paving (trafficked) Area 580m²
 - Patios and Footpaths 354m²
- 4.30 The maximum outfall rate for this catchment has been set at 5.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in **Appendix O** and shows the network serving Block B on drawing DR-001.
- 4.31 There are two sections of permeable paving attenuation system, PP1 covers an area of 432m² and PP2 covers an area of 150m². Surface water runoff from 240m² of surrounding hardstanding areas will be directed to the permeable paving attenuation system PP1. Surface water attenuation volume in the permeable paving attenuation system is provided within the sub-base voids (usually 30% voids and no-fines). Flows from these permeable paving systems are restricted using orifice-plate flow control chambers flows are then directed to/cascade to the geo-cellular attenuation device which also collects surface water runoff from the remainder of the contributing area.
- 4.32 Causeway Flow (hydraulic modelling software) has been used to calculate the required attenuation volume for the permeable paving areas and the geo-cellular storage device whilst restricting flows to a maximum of 5.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. (NB: As the network is modelled with a surcharged outfall on the last pipe, the maximum outfall rate should be read from node: ADOPT1).
- 4.33 The hydraulic output data shows results for a 2:1yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 52.53m3 in PP1, a volume of 8.99m² in PP2 and a volume of 40.2534m3 in the geo-cellular storage device is calculated. This volume can be contained within the sub-base of the permeable paving areas and within a geo-cellular storage device sized 35.2m² x 1.32m deep with 95% voids.
- 4.34 Half Drain Times For the 1:100yr + 45% Climate Change event, the hydraulic model demonstrates that Permeable Paving Area 1 has a half-drain time of 616mins, Permeable Paving Area 2 is 256mins and the Geo-cellular storage device half-drains in 138mins. All well within 24hrs. (See page 7 of the hydraulic output for Block B).

- 4.35 Water Quality Assessment This catchment comprises residential roofs and low-traffic roads only.
- 4.36 Relating to runoff from trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Low-Traffic Roads have a Pollution Hazard Level of LOW. All low-traffic roads in this catchment are anticipated to comprise lined permeable paving construction with outfall directed to the adopted sewer via the geo-cellular attenuation device. Table 26.2 shows Low-Traffic Roads have TSS of 0.5 Metals, 0.4 and Hydrocarbons 0.4. Table 26.3, SuDS mitigation indices for discharges to surface waters, shows that Permeable Paving alone provides mitigation for TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from low-traffic-road areas is more than sufficiently mitigated by use of Permeable Paving.
- 4.37 Relating to runoff from 'standard' roofs and footpaths: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders
- 4.38 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.39 Rainwater Harvesting Slim-line water-butts shall be provided on rainwater downpipes to the rear of the individual properties to serve/support watering of private gardens.

System 2 – Block C – Full Planning

- 4.40 SuDS Feature Selection This catchment comprises a residential apartment block, footpaths and landscaped areas. The residential apartment block utilises a green roof the details of which can be seen on the Landscape Masterplan Roof Level PlanIt drawing in Appendix M. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in Appendix N. A surface water drainage network shall collect run-off from the green roof and footpaths with all flows directed to a geo-cellular storage device with outfall to the adopted 300dia surface water sewer in Edward Street (new MH AW 0451A) via a Downstream Defender (proprietary treatment unit) and a Hydrobrake gravity flow control device.
- 4.41 The contributing area for this catchment has been calculated as: 728m², comprising:
 - Green Roof Area 433m² (assuming the green roof is saturated and do not provide any storage volume)
 - Footpaths 295m²

- 4.42 The maximum outfall rate for this catchment has been set at 5.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix M and shows the network serving Block C on drawing DR-001.
- 4.43 Surface water run-off from the Green Roof and pedestrian hardstanding areas is collected in a surface water drainage network which outfalls to a geo-cellular attenuation device. Flows from the geo-cellular attenuation device are restricted using a Hydrobrake gravity flow control device prior to outfall to the adopted surface water sewer via a proprietary treatment unit.
- 4.44 Causeway Flow (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to a maximum of 5.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. (NB: As the network is modelled with a surcharged outfall on the last pipe, the maximum outfall rate should be read from node: C9).
- 4.45 The hydraulic output data shows results for a 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 29.068m3 in in the geo-cellular storage device is calculated and can be contained within a geo-cellular storage device sized 62.72m² x 0.66m deep with 95% voids this provides a maximum attenuation volume of 59.584m3.
- 4.46 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 55mins. Well within 24hrs. (See page 4 of the hydraulic output for Block C).
- 4.47 Water Quality Assessment This catchment comprises footpaths and residential roofs only.
- 4.48 Relating to runoff from pedestrian footpaths, as there is no specific reference for hardscaped areas, it is considered prudent to apply a residential roof as comparison: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from the hard landscaping shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows "Residential Roofs" have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from the hard landscaping areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.49 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

System 3 – Block D – Full Planning

- 4.50 SuDS Feature Selection This catchment comprises public realm area, a commercial unit block with community centre and residential apartments above. A portion of Block D roof area is green-roof the details of which can be seen on the Landscape Masterplan Roof Level PlanIt drawing in **Appendix M**. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. A surface water drainage network shall collect run-off from the green roof, other roof areas and public realm areas (via bioretention systems, channel/slot drains and gullies) with all flows directed to a geo-cellular storage device. As Block D has level-thresholds, levels are designed to fall away from doorways, however as a precaution a slot-drain is also provided around the building line. Outfall is directed to the diverted adopted 675dia surface water sewer which crosses Anglia Square (new MH SW-A-04) via a Downstream Defender (proprietary treatment unit) and a Hydrobrake gravity flow control device.
- 4.51 The contributing area for this catchment has been calculated as: 2580m², comprising:
 - Green Roof Area 610m² (assuming the green roof is saturated and do not provide any storage volume)
 - Roof Area 265m²
 - Public Realm (including bioretention systems which are assumed to be saturated and do not provide any storage volume) – 1705m²
- 4.52 The maximum outfall rate for this catchment has been set at 12.5 I/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix M and shows the network serving Block D on drawing DR-001.
- 4.53 Surface water run-off from the Green Roof, Roof and Public Realm areas is collected in a surface water drainage network which outfalls to a geo-cellular attenuation device. Due to spatial constraints, and to ensure a minimum 5m offset from the building line, the geocellular storage device is split into two sections and is linked by a 600dia connector pipe. Flows from the geo-cellular attenuation device are restricted using a Hydrobrake gravity flow control device prior to outfall to the adopted diverted 675dia surface water sewer via a proprietary treatment unit.
- 4.54 Causeway Flow (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to a maximum of 12.5 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. (NB: As the network is modelled with a surcharged outfall on the last pipe, the maximum outfall rate should be read from node: D09).
- 4.55 The hydraulic output data shows results for a 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 99.1863m3 in in the geo-cellular storage device and 2.844m3 in the 600dia connector pipe is calculated and can be contained within a geo-cellular storage device sized 80m² x 1.32m deep with 95% voids this provides a maximum attenuation volume of 59.584m3.

- 4.56 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 86mins. All well within 24hrs. (See page 4 of the hydraulic output for Block D).
- 4.57 Water Quality Assessment This catchment comprises commercial/residential roofs and green roofs as well as pedestrian Public Realm areas.
- 4.58 Relating to runoff from 'standard' roofs and pedestrian public realm: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.59 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.60 Rainwater Harvesting a rainwater harvesting tank shall be provided to serve/support a binwash-down tap in the landlord/communal bin-store.

System 4 – Blocks A, M, J3 and K/L – Full Planning

- 4.61 SuDS Feature Selection This catchment comprises public realm area and commercial unit blocks with residential apartments above. Some roof area is green-roof the details of which can be seen on the Landscape Masterplan Roof Level PlanIt drawing in Appendix M. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in Appendix N. A surface water drainage network shall collect run-off from the green roof, other roof areas and public realm areas (via bio-retention systems, channel/slot drains and gullies) with all flows directed to a geo-cellular storage device. As Blocks in this catchment have level-thresholds, levels are designed to fall away from doorways, however as a precaution a slot-drain is also provided around the building lines. Outfall is directed to the diverted adopted 675dia surface water sewer which crosses Anglia Square (new MH SW-A-07) via a surface water pump flow control device and Downstream Defender (proprietary treatment unit.
- 4.62 The contributing area for this catchment has been calculated as: 14,850m², comprising:
 - Green Roof Area 2535m² (assuming the green roof is saturated and do not provide any storage volume)
 - Roof Area 6313m²
 - Public Realm (including bioretention systems which are assumed to be saturated and do not provide any storage volume) – 6002 m²

- 4.63 The maximum outfall rate for this catchment has been set at 65.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in **Appendix O** and shows the network serving Block A, M, K/L and J3 on drawings DR-002 and DR-004.
- 4.64 Surface water run-off from the Green Roof, Roof and Public Realm areas is collected in a surface water drainage network which outfalls to a geo-cellular attenuation device. Due to spatial constraints, contributing area and the depth of the adopted sewer, it is necessary to pump surface water flows/outfall from this catchment. Flows from the geo-cellular attenuation device are restricted using a surface water flow control device prior to outfall to the adopted diverted 675dia surface water sewer via a proprietary treatment unit.
- 4.65 Causeway Flow (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to a maximum of 65.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this. (NB: As the network is modelled with a surcharged outfall on the last pipe, as such the maximum outfall rate should be read from node: MH38).
- 4.66 The hydraulic output data shows results for a 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in **Appendix P**, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 535.7961m3 in the geo-cellular storage device and can be contained within a geo-cellular storage device sized 322.6m² x 1.98m deep with 95% voids.
- 4.67 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 68mins. All well within 24hrs. (See page 9 of the hydraulic output for Block A, M, J3 , K/L).
- 4.68 Water Quality Assessment This catchment comprises commercial/residential roofs and green roofs as well as pedestrian Public Realm areas.
- 4.69 Relating to runoff from 'standard' roofs and pedestrian public realm: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.70 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.

- 4.71 Relating to run-ff from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.
- 4.72 Rainwater Harvesting rainwater harvesting tanks shall be provided to serve/support a binwash-down tap in the landlord/communal bin-stores for each Block.

System 5 – Botolph Street/Public Realm Area – Full Planning

- 4.73 SuDS Feature Selection This catchment comprises public realm area and a small area of trafficked access road. The proposed hard and soft landscaping plans are shown on PlanIt Landscape Masterplan contained in **Appendix N**. A surface water drainage network shall collect run-off from the paved areas via bioretention systems, channel drains and gullies with all flows directed to an over-sized pipe storage device. Outfall is directed to the diverted adopted 675dia surface water sewer which crosses Anglia Square (new MH SW-A-04) via a Downstream Defender (proprietary treatment unit) and a Hydrobrake gravity flow control device.
- 4.74 The proposed over-size pipe system will run underneath the bio-retention systems, Planlt, the landscape architect for this scheme, were consulted to gain confirmation of planting within the bioretention systems and their root depths. It was confirmed that the proposed planting root depth is not expected to exceed 1.0m in depth and in the main will be contained within 0.6m of depth from the cover level of the bio-retention system. As such, the design ensures that the pipe soffit/top-of-pipe is always at least 1.2m in depth from the lowest bio-retention system cover level to allow for a 200mm drainage layer. This ensures that there will be no root ingress to the proposed over-size pipe system and that outlets from the bioretention systems can be directed to the surface water drainage system.
- 4.75 The contributing area for this catchment has been calculated as: 1630m², comprising:
 - Public Realm (including bioretention systems which are assumed to be saturated and do not provide any storage volume) – 1630m²
- 4.76 The maximum outfall rate for this catchment has been set at 10.0 I/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the network serving Block D on drawing DR-003.
- 4.77 Surface water run-off from the Public Realm area is collected in an oversized pipe surface water drainage network with flows restricted using a Hydrobrake gravity flow control device prior to outfall to the adopted diverted 675dia surface water sewer via a proprietary treatment unit.
- 4.78 Causeway Flow (hydraulic modelling software) has been used to calculate the required attenuation volume for the oversized-pipe storage/drainage system whilst restricting flows to a maximum of 10.0 l/s to manage all storms up to and including a 1 in 100 year + 45% Climate Change event. As discussed in para. 4.17 above, the hydraulic model allows for the adopted surface water sewers to be surcharged and as such, the pipe flow in that node will include for this.

(NB: As the network is modelled with a surcharged outfall on the last pipe, as such the maximum outfall rate should be read from node: B.ST 07).

- 4.79 The hydraulic output data shows results for a 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and 1:100yr + 45% Climate Change events and are contained in Appendix P, along with pipe long-sections. For the 1:100yr + 45% Climate Change event an attenuation volume of 53.1257m3 in "links" 1.000 to 1.005 and their upstream "nodes".
- 4.80 Half Drain Times based on a rate of 10l/s, a volume of 53.1257m³ can be drained in 88.5mins, well within 24hrs.
- 4.81 Water Quality Assessment This catchment comprises Public Realm areas with low traffic roads.
- 4.82 CIRIA 763 SuDS Manual Table 26.2 shows Low Traffic Roads have a Pollution Hazard Level of LOW. Runoff from all hardstanding areas shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Low-Traffic Roads have TSS of 0.5 Metals, 0.4 and Hydrocarbons 0.4. Table 26.3. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.83 Relating to run-off from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.
- 4.84 The proposed landscaping layout shows bioretention swales to the south of this catchment, close to Block F, which straddle the Outline and Full Application boundaries. It is intended that the sections of Bioretention Systems shall be constructed as separate systems. This will be achieved by separating the drainage mediums with a suitable liner and ensuring outlets for each section are directed to the relevant drainage systems. Thus ensuring that flows in the Full application boundary are separated from flows in the Outline application boundary.

System 6 – Block E – Outline Planning

- 4.85 SuDS Feature Selection This catchment comprises commercial units with residential dwellings above and some public realm/pedestrian walkways. Green roof shall cover some roof area. Bioretention systems shall collect run-off from highway areas to the west, as agreed in principle with the Highway Authority. Details of the split between private and highway catchments and the drainage features which serve these areas shall be confirmed during detailed design stage. For now, and to be conservative, the hydraulic models shall assume all areas within the catchment boundary will be collected within a private drainage network. The catchment shall be considered 100% impermeable with a contributing area of 6420m².
- 4.86 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a geocellular attenuation device with a restricted outfall directed to the

diverted adopted 675dia surface water sewer crossing the site. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall.

- 4.87 The maximum outfall rate for this catchment has been set at 30.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the indicative surface water drainage network serving Block E on drawing DR-003.
- 4.88 WINDES Microdrainage (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 30.0 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs and bio-retention areas has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 277.2m³ in the geo-cellular storage device with a maximum outfall rate of 30.0 I/s is required to manage a 1 in 100 year + 45% Climate Change event. This can be contained within a geo-cellular storage device sized 147.2m² x 1.98m with 95% voids this provides a maximum attenuation volume of 276.9m³.
- 4.89 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 83mins for a 1 in 100yr + 45% Climate Change Storm Event. All well within 24hrs.
- 4.90 Water Quality This catchment comprises Other Roofs, Green Roofs as well as Pedestrian Walkways.
- 4.91 Relating to runoff from 'standard' roofs and pedestrian public realm, to undertake a water quality assessment, the pedestrian areas have also been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.92 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.93 Relating to run-off from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons

0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.

4.94 Rainwater Harvesting – a rainwater harvesting tank shall be provided to serve/support a binwash-down tap in the landlord/communal bin-store.

System 7 – Block F – Outline Planning

- 4.95 SuDS Feature Selection This catchment comprises commercial units with residential dwellings above and some public realm/pedestrian walkways. Green roof shall cover some roof area whilst a section of permeable paving system shall form the external parking area (approx.350 m²). Bioretention systems shall collect run-off from pedestrian walkways where possible. For now, and to be conservative, the hydraulic models shall assume all areas within the catchment boundary shall be collected within a private drainage network. The catchment shall be considered 100% impermeable with a contributing area of 4460m².
- 4.96 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a Geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall.
- 4.97 The maximum outfall rate for this catchment has been set at 20.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the network serving Block F on drawing DR-003.
- 4.98 WINDES Microdrainage (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 20.0 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs, permeable paving and bio-retention areas has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 187.9m³ in the geo-cellular storage device with a maximum outfall rate of 20.0 I/s is required to manage a 1 in 100 year + 45% Climate Change event. This can be contained within a geo-cellular storage device sized 112.6m² x 1.98m with 95% voids this provides a maximum attenuation volume of 211.8m³. Noting that due to spatial constraints and to maintain a distance of 5m from the building line, the geocellular storage device is split in two sections and are connected via a 600dia connector pipe.
- 4.99 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 79mins for a 1 in 100yr + 45% Climate Change Storm Event. All well within 24hrs.
- 4.100 Water Quality This catchment comprises Other Roofs, Green Roofs as well as Pedestrian Walkways.
- 4.101 Relating to runoff from 'standard' roofs and pedestrian public realm: CIRIA 763 SuDS Manual Table 26.2 shows Residential Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream

Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Roofs have TSS of 0.2 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in Appendix Q as well as advice from Hydro-International on sizing Downstream Defenders.

- 4.102 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself
- 4.103 Relating to run-off from hardstanding areas that is directed to Bioretention Systems. To undertake a water quality assessment, these pedestrian areas have been considered as Commercial Roof. CIRIA 763 SuDS Manual Table 26.2 Other Roofs have a Pollution Hazard Level of LOW. Table 26.2 shows Other Roofs have TSS of 0.3 Metals, 0.2 and Hydrocarbons 0.05. Table 26.3 shows mitigation indices for discharges to surface waters for Bioretention systems as: TSS of 0.8 Metals, 0.8 and Hydrocarbons 0.8.
- 4.104 Relating to runoff from other public realm areas that do not drain to bioretention systems, to undertake a water quality assessment, these pedestrian areas have been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from these pedestrian areas shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.105 Relating to runoff from permeable block paved trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Residential Car Parks have a Pollution Hazard Level of LOW. Runoff from permeable block paving will be managed by itself. Table 26.2 shows Residential Car Parks have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. Table 26.3 shows mitigation indices for Permeable Pavement is TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Permeable Block Paving itself.
- 4.106 Rainwater Harvesting a rainwater harvesting tank shall be provided to serve/support a binwash-down tap in the landlord/communal bin-store.
- 4.107 The proposed landscaping layout shows bioretention swales to the east of this catchment, close to Botolph Street, which straddle the Outline and Full Application boundaries. It is intended that the sections of Bioretention Systems shall be constructed as separate systems. This will be achieved by separating the drainage mediums with a suitable liner and ensuring outlets for each secion are directed to the relevant drainage systems. Thus ensuring that

flows in the Full application boundary are separated from flows in the Outline application boundary.

System 8 – Blocks G and J – Outline Planning

- 4.108 SuDS Feature Selection This catchment comprises residential units, commercial units with residential dwellings above as well as some public realm/pedestrian walkways and vehicular access to undercroft car parks in Blocks G and J. Green roof shall cover some roof area. Permeable block paving covering an area of approx. 614 m² shall collect surface water runoff from part of the vehicular access areas that will be trafficked. A surface water drainage network will collect surface water runoff from rainwater down pipes, external paved areas via channel drains and gullies and convey to the geocelular storage device. The catchment shall be considered 100% impermeable with a contributing area of 9640m² for robustness with no allowance for green roofs or permeable block paving.
- 4.109 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a Geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. Flows shall be cleansed via a Downstream Defender (proprietary treatment unit) prior to outfall. The maximum outfall rate for this catchment has been set at 70.0 l/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in Appendix O and shows the network serving Block F on drawing DR-003 and DR-004.
- 4.110 WINDES Microdrainage (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 70.0 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs and permeable block paving has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 370.4m³ in the geo-cellular storage device with a maximum outfall rate of 70.0 I/s is required to manage a 1 in 100 year + 45% Climate Change event. This can be contained within a geo-cellular storage device sized 195.8m² x 1.67m with 95% voids this provides a maximum attenuation volume of 310.63m³.
- 4.111 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 53mins for a 1:100yr + 45% Climate Change Storm Event. All well within 24hrs.
- 4.112 Water Quality Assessment This catchment comprises commercial/residential roofs, pedestrian walkways and low-traffic roads only.
- 4.113 Relating to runoff from 'standard' roofs and pedestrian public realm, to undertake a water quality assessment, the pedestrian areas have also been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore

more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.

- 4.114 Relating to runoff from non-permeable block paved trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Residential Car Parks have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Residential Car Parks have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.115 Relating to runoff from permeable block paved trafficked areas: CIRIA 763 SuDS Manual Table 26.2 shows Residential Car Parks have a Pollution Hazard Level of LOW. Runoff from permeable block paving will be managed by itself. Table 26.2 shows Residential Car Parks have TSS of 0.5 Metals 0.4 and Hydrocarbons 0.4. Table 26.3 shows mitigation indices for Permeable Pavement is TSS at 0.7; Metals at 0.6 and Hydrocarbons at 0.7. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Permeable Block Paving itself.
- 4.116 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.117 Rainwater Harvesting rainwater harvesting tanks shall be provided to serve/support a binwash-down tap in the landlord/communal bin-stores for each Block.

System 9 – Block H – Outline Planning

- 4.118 SuDS Feature Selection This catchment comprises commercial units with residential dwellings above and some public realm/pedestrian walkways. Green roof shall cover some roof area and a bioretention system is proposed some runoff from hardstanding area is directed to this system, however most runoff from hardstanding shall be directed to the proposed surface water drainage network via channel drains and gullies. Due to spatial constraints, storage volume requirements and the depth of the receiving adopted sewer, it will be necessary to pump surface water flows to a 'demarcation chamber' with a connection to the diverted 675dia surface water sewer. For now, and to be conservative, the hydraulic models shall assume all areas within the catchment boundary shall be collected within a private drainage network. The catchment shall be considered 100% impermeable with a contributing area of 3460m².
- 4.119 At this Outline stage the surface water drainage strategy shall allow for all waters to be collected within a geocellular attenuation device with a restricted outfall directed to the diverted adopted 675dia surface water sewer crossing the site. Flows shall be cleansed

via a Downstream Defender (proprietary treatment unit) prior to outfall. The maximum outfall rate for this catchment has been set at 24.5 I/s to manage all storms up to and including the 1 in 100yr + 45% Climate Change Event. The proposed Surface Water Drainage Layouts are contained in **Appendix O** and shows the network serving Block H on drawing DR-002.

- 4.120 WINDES Microdrainage (hydraulic modelling software) has been used to calculate the required attenuation volume for the geo-cellular storage device whilst restricting flows to 24.5 I/s for the 1:100yr + 45% Climate Change storm event. Any attenuation volume that may be provided in green roofs has not been allowed for to ensure a robust estimation of the required attenuation volumes to serve this catchment are made. The hydraulic output data is contained in **Appendix P** and shows an attenuation volume of 141.1m³ in the geo-cellular storage device with a maximum outfall rate of 24.5 I/s is required to manage a 1 in 100 year + 40% Climate Change event. This can be contained within a geo-cellular storage device sized 112.0m² x 1.32m with 95% voids this provides a maximum attenuation volume of 140.448m³.
- 4.121 Half Drain Times The hydraulic model demonstrates the Geo-cellular storage device halfdrains in 61mins. All well within 24hrs.
- 4.122 Water Quality This catchment comprises Other Roofs as well as Pedestrian Walkways.
- 4.123 Relating to runoff from 'standard' roofs and pedestrian public realm, to undertake a water quality assessment, the pedestrian areas have also been considered as Other Roofs. CIRIA 763 SuDS Manual Table 26.2 shows Other Roofs have a Pollution Hazard Level of LOW. Runoff from 'standard' roofs and footpaths shall be treated via a Hydro-International Downstream Defender (Advanced Vortex) proprietary treatment system. Table 26.2 shows Other Roofs have TSS of 0.3 Metals 0.2 and Hydrocarbons 0.05. Hydro-International have provided a specification sheet showing that this device can achieve mitigation for TSS at 0.5; Metals at 0.4 and Hydrocarbons at 0.5. Surface water run-off from these areas is therefore more than sufficiently mitigated by use of the Downstream Defender (Advanced Vortex). Details of the Downstream Defender is contained in **Appendix Q** as well as advice from Hydro-International on sizing Downstream Defenders.
- 4.124 Relating to runoff from the Proposed Green Roofs: CIRIA 763 SuDS Manual Table 26.14 shows Residential Roofs have: Total Suspended Solids Pollution index of 0.4-0.5, Organic Pollution Index of 0.6-0.7, Hydrocarbon Pollution Index of 0.1 and Metals Pollution Index of 0.2-0.5. Table 26.15, SuDS mitigation indices, shows that Green Roofs alone provides mitigation for Total Suspended Solids Pollution at 0.8-0.9, Organic Pollution Index at 0.5, Hydrocarbon Pollution Index at 0.9 and Metals Pollution Index at 0.7-0.9. Surface water runoff from the green roof areas is more than sufficiently mitigated by use of the green roof itself.
- 4.125 Rainwater Harvesting a rainwater harvesting tank shall be provided to serve/support a binwash-down tap in the landlord/communal bin-store.

Summary of Catchments and Proposed Outfall Rates

4.126 As discussed in para. 4.13, the total allowable outfall rate for the Anglia Square Regeneration site has been set at 242 l/s, which is a reduction of 50.5% against the existing 1:1yr Brownfield Runoff Rate – a significant betterment. Below is a breakdown of outfall rates for each catchment (System) and total:

- System 2 Maximum surface water outfall rate of 5.0 l/s
- System 3 Maximum surface water outfall rate of 12.5 l/s
- System 4 Maximum surface water outfall rate of 65.0 l/s
- System 5 Maximum surface water outfall rate of 10.0 l/s
- System 6 Maximum surface water outfall rate of 30.0 l/s
- System 7 S Maximum surface water outfall rate of 20.0 l/s
- System 8 Maximum surface water outfall rate of 70.0 l/s
- System 9 Maximum surface water outfall rate of 24.5 l/s
- All Systems Total 242.0 I/s maximum outfall rate to manage all storms up to and including the 1:100yr + 45% Climate Change Event. The equivalent of 49.5% of the existing 1:1yr surface water run-off rate. This is a significant improvement to the existing situation. In addition, the existing drainage system does not benefit from any water treatment stages, whilst the proposed drainage strategy allows for water quality and treatment stages to meet the guidance within CIRIA 753 SuDS Manual.

Attenuation Tank Alarm System

- 4.127 The proposed development site shall be served by a Flood Evacuation Warning Plan, the proposals of which are discussed in the Flood Risk Assessment Report however will be detailed further at a Discharge of Conditions stage. As the development site is within a Critical Drainage Catchment and there is risk of off-site flows from entering the proposed on-site drainage system, it is identified that monitoring of attenuation capacity would be beneficial for maintenance and management purposes and to reduce the risk of flooding. Full Planning Block A, M, K/L and J3 and Outline Planning Block E, Block F, Block G and J and Block H catchments are served by geocellular attenuation devices whereby the outfalls are controlled using surface water pumps. These pumping stations will be equipped with a secondary back-up pump as well as a telemetry alarm system to alert the Management Company of any pump failures. Block, B, Block C, Block D and Botolph Street proposed drainage systems are controlled using gravity type Flow Control Devices (hydro brakes), which are not alarmed.
- 4.128 The proposed surface water drainage systems are not be designed to include any flows or volumes from off-site which may enter the system. It is appreciated that off-site flows could enter the proposed surface water drainage systems in certain catchments and as such it is appropriate to install an alarm system which will be triggered to alert the Management Company when tanks fail to drain-down after a storm event. This type of system monitors the hydrostatic pressure within attenuation devices and communicates the available capacity via a radio transmitter to a receiving control panel that shall be located within kiosks as shown on the Proposed Surface Water Drainage Layouts in Appendix O.
- 4.129 Failure to drain-down after a storm event could occur due to debris/blockages within pipework or attenuation devices, or could be attributed to flow control devices not operating effectively. By identifying a possible issue in the drainage system, maintenance can be undertaken to

ensure that the drainage systems operate fully and attenuation volumes, as required, are available at all times. This means that should overland flow routes pass through the site, these paths and depths of surface water are not exacerbated by poorly functioning on-site drainage systems.

4.130 This alarm system could be linked to the Flood Evacuation Plan (to be Conditioned) for information only, however its primary function is to inform the need for any Maintenance to be undertaken.

Surface Water Pump Alarm System

- 4.131 Wherever possible it is proposed to utilise an outfall to the adopted sewer network via a gravity connection using a hydrobrake or other suitable flow control device, such as orifice plates for permeable paving outlets. Where this is not possible, due to attenuation volume requirements, spatial constraints and/or the receiving adopted sewer being higher than the proposed drainage, surface water has to be pumped to a 'demarcation' chamber to allow waters to flow into the adopted sewer network by gravity connection.
- 4.132 Where surface water pumps are to be used, it is proposed to install a secondary backup pump as well as a telemetry alarm system. The telemetry alarm system shall be linked to the elected Management Company to alert in case of pump failure. In the event of primary pump failure, the secondary pump shall manage flows until the primary pump is repaired or replaced. In the unlikely event that the secondary pump fails before the primary pump is repaired, the telemetry alarm system will alert the Maintenance Company who shall install a temporary pump. The surface water pump control panels shall be located within kiosks as shown on the Proposed Surface Water Drainage Layouts.
- 4.133 The risk of pump failure is low, however in the very unlikely event that primary, secondary and temporary pumps all fail, waters would fill the attenuation tanks and overspill into the public realm, following the overland flow paths. There is no risk to property as pumps and tanks are located externally.

Surface Water Pumps – Power Failure

- 4.134 In case of power failure, it is necessary to consider the impact on surface water drainage systems which rely on a powered surface water pump. It is therefore proposed to connect the surface water pumps serving Block A, M, K/L and J3 (Full) and Blocks, E, F, G, J and H (Outline) to the emergency power generator system serving the site. This emergency power generator system will serve the site's electrical needs during a power failure, this includes emergency lighting, sprinkler systems and surface water drainage pumps. In the event that a power failure occurs during a storm event, the surface water pumps will be unaffected and will continue to function. It is recommended that the emergency power generator system link to the surface water drainage pumps is tested regularly for maintenance and monitoring purposes. This is discussed further in the Maintenance and Management Plan.
- 4.135 No additional 'emergency' attenuation volume is therefore required, the proposed attenuation devices are sized to manage all storms up to and including a 1:100yr + 45% Climate Change event and measures are put in place to ensure power to the surface water pumps is available during a power cut/power failure to the site. The indicative locations of emergency generators are indicated on the surface water drainage layouts.

Exceedance Routes

- 4.136 In the event of a greater than 1 in 100 year (+45%CC) rainfall event occurring, the exceedance routes would follow proposed and existing surface water flow paths as identified on SK05-A in Appendix R. The flow paths shown head towards the south-east of the site and follow routes as identified in the Flood Risk Assessment Report by Royal Haskoning DHV.
- 4.137 As discussed in the separate FRA by Royal Haskoning DHV, their hydraulic model assumes the public sewer system is almost at capacity and there is no functioning drainage system within the site boundary. This would result in the overland flows collecting in the pedestrian walkways and passing through the site from north west to south east. The flows would leave the site at Magdalen Street.

Sewer Diversions

- 4.138 As noted in Section 3, there are a number of Anglian Water sewers passing through the existing site. Anglian Water were consulted in 2018 for the previous scheme on the potential diversion of several of their sewers around the proposed development and it is understood that this will need to be considered in detail at a later stage through a diversion application, when information such as the foundation design is available. Anglian Water Drainage Engineer Darren Sewell provided some information on the requirements when diverting sewers within a new development site. This has been included at **Appendix S**. To summarise.
 - Any re-development areas falling within 3m of an existing public sewer but remaining only 'built near' an existing sewer, assuming the same clearance and access is available, would in principle be acceptable.
 - Any areas falling within 3m of the existing public sewer would need to comply with Part H4 Building Regulations in respect of 'building near' public sewers and Anglian Water criteria on the website.
 - Foundation design of the new buildings would need to be carefully considered to ensure that no loading would be transferred on a 45 degree 'angle of repose' onto the sewer.
 - The only area which would appear to require consideration of a formal diversion of a sewer would be the existing 675mm diameter surface water sewer and the existing 225mm foul sewer running immediately south of unit A1.01 (675mm surface water sewer close to MH 0453 to 0456 and 225mm foul sewer near to MH 0405 to 0408).
 - The above sewer may require a diversion, and the technicalities of this will be considered at a later stage. Anglian Water could consider formally devesting some sections of the existing public sewer which are no longer needed/fall beneath buildings (these need to be sewers serving only the existing site and no third parties). This means the Developer would apply to devest the sewer into their private ownership, and these sections of devested sewer could then be removed if no longer needed.
- 4.139 It would be necessary to consult Anglian Water further on the diverting and devesting of their public sewers across the site prior to any development taking place, to ensure that the issues raised in the email at **Appendix S** have been addressed.

Foul Sewer Network

4.140 An Anglian Water capacity check was carried out for the previous scheme to determine whether there would be sufficient capacity within their existing foul network to accommodate the foul flows from the proposed development. This is in their pre-development enquiry in **Appendix K** and confirms that there is sufficient capacity in the existing foul network and no improvements would be needed to the network.

Standard Surface Water Drainage Construction Details

- 4.141 The LLFA Developer Guidance requires that details of proposed surface water drainage features are provided at Full Planning Application stage. Standard Construction Details for the following features has therefore been provided in **Appendix T**.
 - Green Roofs see PlanIt drawings and cross-sections
 - Bio-Retention Systems
 - Manholes, Gullies and Channel Drains
 - Typical Hydro-Brakes
 - Surface Water Pumps
 - Permeable Block Paving

Carbon Impact Consideration

- 4.142 In accordance with Policy E8 "Towards Net Zero" the developer has considered how the carbon emissions can be minimised for the drainage systems associated with the proposed development.
- 4.143 The primary objective of the design is for the systems to operate under gravity, thereby avoiding the need for pumps which generate carbon emissions from their operation. Wherever possible and where cover and invert levels of receiving adopted sewers allow, surface water runoff from the development site is attenuated and restricted using gravity-type flow control devices, such as hydrobrakes or orifice plates.
- 4.144 Where the proposed drainage and storage devices cannot be shallower than the adopted sewer network, due to cover levels, length of drainage network, attenuation volumes and spatial constraints, it is necessary to pump restricted flows. The use of surface water pumping stations to serve some catchments within the development site is unavoidable though is only proposed where necessary.
- 4.145 For the Full Planning Application areas (Blocks A, B, C, D, M, K/L and J3), the surface water drainage strategy has been developed to drain catchments by gravity wherever possible. Blocks B, C, D and Botolph Street catchments are drained into the adopted sewer network via a gravity Hydrobrake type device whilst Block A, M, K/L and J3 catchment will rely on a pumped outfall (1no. surface water pump in the full Application). The pump specifications for this catchment are contained in **Appendix T**.
- 4.146 For the Outline Planning Application areas (Blocks E, F, H, G and J) there may be scope at a later design stage to reduce the areas flowing to pumping stations by splitting catchment

areas into smaller areas, whereby some may be able to drain via gravity, however at this stage it is considered conservative to allow for these 4no. pumping stations.

- 4.147 Where pumps are necessary, their operational carbon emissions will be minimised through the following measures.
 - Minimised peak flow rate through attenuation and flow control devices to reduce the size of the pumps and hence their power demand.
 - Pumps selected to maximise efficiency at the design duty to lower energy demand
 - Pump operation controlled on levels within the chamber to ensure they only operate when required
 - Appropriate electrical metering and links to the development control systems to allow monitoring of energy use.
 - Regular cleaning and servicing to ensure the pumps are operating as efficiently as possible. This is discussed in the Maintenance and Management Plan.

5 Proposed SuDS Features Information

SuDS Features and the "Four Pillars of SuDS"

5.1 The city center site gives opportunities for "urban types" of SuDS features to be incorporated. These features provide water quantity, water quality, biodiversity and amenity enhancements. The table below summarises the proposed SuDS Features and how they contribute to the Four Pillars of SuDS. Further details of the proposed SuDS Features are discussed from para 5.2 onwards.

Water Quantity	Water Quality	Biodiversity	Amenity
The Bio-Retention Systems proposed allow for reduction of water quantity by providing opportunity for transpiration.	The engineered soils and vegetation within the proposed bio-retention systems provide a filter medium to cleanse waters prior to outfall to the drainage network.	The Bioretention Systems proposed will provide biodiversity enhancement by introducing new habitats in the urban environment.	Amenity space in bioretention systems is formed by shallow depressions in the landscaping with stepping stones and seating areas.
The Tree-Pits proposed allow for reduction of water quantity by providing opportunity for transpiration. The Green Roofs proposed allow for reduction of water quantity by providing opportunity for transpiration. Some transpiration will occur for waters on the permeable block paving surface and will reduce water quantity, though it is appreciated it will not be to the same extent as bioretention systems or green roofs could provide. Rainwater harvesting. Some reduction in water quantity is expected by reuse for private gardens in Block B and for bin- wash-down in Blocks, A, D, E, F, G, H, J, K/L,	The engineered soils within the proposed tree- pits provide a filter medium to cleanse waters prior to outfall to the drainage network. The proposed green-roofs provide a water quality treatment stage for runoff from these roof areas. The granular subbase within permeable block paving attenuation systems provide a water quality treatment stage for runoff from trafficked areas.	urban environment. The Tree-Pits proposed will provide biodiversity enhancement by introducing new habitats in the urban environment. The intensive and extensive green roofs will provide new habitats in the urban environment.	The Tree-Pits proposed will enhance the amenity space of the public realm. Amenity space is provided on green-roof terraces on the podiums.

Green Roofs

5.2 Green Roofs will provide Amenity, Biodiversity, Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. Amenity space is formed by roof-top gardens and terraces for. Biodiversity is formed by use of extensive and intensive green-roofs. Water Quality, the green roof areas will provide a treatment stage for surface water runoff. Water Volume, green roofs provide attenuation volume and slow the rate of waters entering the main sewer system. Transpiration shall also reduce overall water volumes.

5.3 CIRIA SuDS Manual C753 Chapter 12 describes Green Roofs as follows:

"Green roofs area areas of living vegetation, installed on the top of buildings, for a range of reasons including visual benefit, ecological value, enhanced building performance and the reduction of surface water runoff. Types of green roof can be divided into two main categories:

-Extensive roofs, have low substrate depths (and therefore low loadings on the building structure), simple planting and low maintenance requirements; they tend not to be accessible.

-Intensive roofs (or roof gardens) have deeper substrate (and therefore higher loadings on the building structure) that can support a wide variety of planting but which tend to require more intensive maintenance; they are usually accessible."



- 5.4 The Full Planning proposals include for a number of garden roof terraces which comprise some areas of extensive and intensive type green roof as well as paved areas these are currently detailed on Blocks A, D, M and K/L. Green roofs are also shown indicatively on Outline Application Blocks E, F, G, J, and H, it is expected that these will also comprise extensive and intensive green roof areas and paved areas. Details of the Proposed Green Roofs can be found on PlanIt Roof Masterplan drawing in Appendix M. As described above, the drainage calculations in Section 4 do not account for any attenuation that may be available on green roof areas. However, as a general rule, it is assumed that green roofs are saturated when calculating a site's attenuation requirements anyhow.
- 5.5 Green roofs and Garden Roof Terraces will provide water quality and biodiversity benefits to the overall scheme.

Bio-Retention Systems

- 5.6 Bio-Retention Systems will provide Amenity, Biodiversity, Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. Amenity space is formed by shallow depressions in the landscaping with stepping stones and seating areas. Biodiversity is formed by use of suitable planting. In terms of Water Quality, the bioretention systems shall provide a treatment stage for surface water runoff. Water Volume bioretention systems shall provide attenuation volume and slow the rate of waters entering the main sewer system. Transpiration shall also reduce overall water volumes.
- 5.7 CIRIA SuDS Manual C753 Chapter 18 describes Bio-Retention Systems as follows:

"Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce run-off rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide: attractive landscape features that are self-irrigating and ; habitat and biodiversity; and cooling of the micro-climate due to evapotranspiration."



- 5.8 Bio-Retention Systems are proposed within the public realm of the Full Planning Application and Outline Planning Application areas. Where possible, surface water run-off from public realm hardstanding hall be directed to these bioretention systems which shall provide a first stage of attenuation and treatment of run-off. Overflow from these bio-retention systems shall be directed into the wider surface water drainage system.
- 5.9 Norwich County Council's Highway Team have been consulted as part of the application consultation process and have commented upon the provision of bio-retention systems along the western boundary of the site which would collect surface water run-off from Botolph Street and form part of the highway drainage network. They have raised no objection shall require a commuted sum in order to adopt them. This will be detailed further post-planning in any S278/S38 negotiations.

Tree Pits

- 5.10 Tree-Pits will provide Biodiversity, Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. Biodiversity is formed by use of suitable planting. In terms of Water Quality, the bioretention tree-pit filter mediums shall provide a treatment stage for surface water runoff. Water Volume bioretention tree-pits shall provide attenuation volume and slow the rate of waters entering the main sewer system. Transpiration shall also reduce overall water volumes.
- 5.11 CIRIA SuDS Manual C753 Chapter 19 describes Tree Systems as follows:

"Trees and their planting structures provide benefits to surface water management in the following ways:

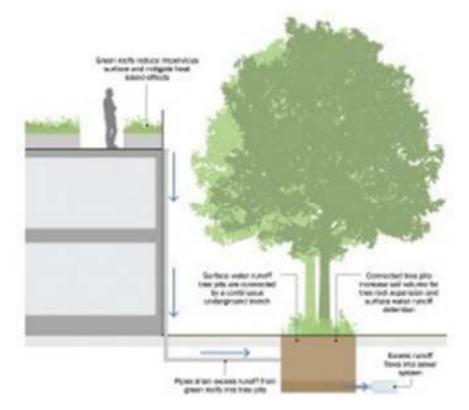
Transpiration – This is the process by which water, taken in from soil by tree roots, is evapourated through the pores or stomata on the surface of leaves. Trees draw large quantities of water from the soil, which can contribute to reducing run-off volumes.

Interception – Leaves, branches and trunk surfaces intercept (store and allow water to evapourate) and absorb rainfall, reducing the amount of water that reached the ground, delaying the onset and reducing the volume of run-off.

Increased infiltration – Root growth and decomposition increase soil infiltration capacity and rate, reducing runoff volumes.

Phytoremediation – In the process of drawing water from the soil, trees also take up trace amounts of harmful chemicals, including metals, organs compunds, fuels and solvents that are present in the soil. Inside the tree, these chemicals can be transformed into less harmful substances, used as nutrients and/or storeg in roots, stems and leaves.

...Tree Planters are essentially bio-retention systems with trees in them, to enhance capacity and performance, and/or to deliver amenity and biodiversity benefits. They have similar functionality and design requiements to standard tree pits, but have open surace and generally a larger surface area, so their overall appearance is different"



5.12 Tree-Pits are proposed within the public realm of the Full Planning Application and Outline Planning Application areas. Where possible, surface water run-off from public realm hardstanding hall be directed to these bioretention systems which shall provide a first stage of attenuation and treatment of run-off. Overflow shall be directed into the wider surface water drainage system.

Permeable Block Paving

- 5.13 Permeable block paving (pervious pavements) will provide Water Quality and Water Volume benefits in line with the Four Pillars of SuDS. In terms of Water Quality, the subbase gravels shall provide a treatment stage for surface water runoff. Water Volume subbase gravels shall provide attenuation volume and slow the rate of waters entering the main sewer system. Some transpiration shall also reduce overall water volumes as waters within the subbase and within sand layers between blocks shall have (little) opportunity to evaporate this is still to be considered overall.
- 5.14 CIRIA SuDS Manual C753 Chapter 20 describes Pervious Pavements as follows:

"Pervious surfaces, along with their associated substructures, are an efficient means of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium. Treatment processes that occur within the surface structure, the subsurface matrix and the geotextile layers include:

-Filtration

-Absorption

-Biodegredation

-Sedimentation"



5.15 Lined Permeable Block Paving Attenuation Systems are proposed across the site. The access road and parking areas for Block B and Block F as well as access and hardstanding areas around Block G and J.

6 Mainenance of Development Drainage

- 6.1 The responsibility for ongoing maintenance will be the responsibility of an elected Management Company whom will be appointed by the Site Owner.
- 6.2 The proposed private surface water drainage features should be regularly inspected and maintained to ensure they are effective throughout the lifetime of the development and do not become blocked or damaged over time.
- 6.3 Some maintenance details for elements of the drainage system from CIRIA SUDS Manual (C753) are included in the tables below:

Maintenance Schedule	Required Action	Frequency
	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance) and from silt traps prior to cells.	Monthly
Regular maintenance	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration as necessary	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually or as required
Remedial actions	Reconstruct soakaway if performance deteriorates or in the event of failure.	As required
	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year then annually
	Survey inside of tank for sediment build up and remove if necessary.	Every 5 years or as required
Monitoring		

Table 6.1: Maintenance tasks for attenuation tanks (Source: CIRIA C753, The SuDS Manual)

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid- summer, after autumn leaf fall, or as required based on site specific observations of clogging or manufacturer's recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds.	As required.
	Remediate any landscaping which, through vegetation maintenance of soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance of a hazard to the user.	As required
Remedial actions	Rehabilitation of surface and upper sub-surface.	As required (if infiltration performance is reduced as a result of significant clogging.)
	Initial inspection	Monthly for 3 months after installation. 3 monthly, 48 hours after large storms.
Monitoring	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action	Annually.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually

Table 6.2: Maintenance tasks for permeable paving (Source: CIRIA C753, The SuDS Manual)

Maintenance Schedule	Required Action	Frequency
	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
Regular Inspections	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular	Remove litter and surface debris and weeds	Quarterly
Maintenance	Replace any plants, to maintain planting density	As required
	Remove sediment, littler and debris build up from around inlets or from forebays	Quarterly to biannually
Occasional	Infill and holes or scour in the filter medium, improve erosion protection if required	As required
Maintenance	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be >20 years

Table 6.3 Operation and maintenance tasks for bioretention systems (Source: CIRIA C753, The SUDS Manual)

Maintenance Schedule	Required Action	Frequency
Regular maintenance	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structures for proper operation, integrity of waterproofing and structural stability Inspect soil substrate for evidence for erosion channels and identify any sediment sources Inspect drain inlets inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system Inspect underside of roof for evidence of leakage	Annually and after severe storms Annually and after severe storms Annually and after severe storms Annually and after severe storms
Remedial Actions	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth During establishment (i.e. year one) replace dead plants as required Post establishment, replace dead plants as required (where >5% of coverage) Remove fallen leaves and debris from deciduous plant foliage Remove nuisance and invasive vegetation, including weeds Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly and annually or as required Monthly (but usually responsibility of manufacturer) Annually (in autumn) Six monthly or as required Six monthly or as required Six monthly or as required
	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed. Survey inside of tank/crate system for sediment build-up and remove if necessary.	Annually Every 5 years or as required.

Table 6.4 Maintenance tasks and frequencies for green roofs (The SUDS Manual C753, CIRIA)

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
Maintenance	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets and outlets	Inspect monthly
Occasional maintenance	Check tree health and manage tree appropriately	Annually
	Remove silt build-up from inlets and surface and replace mulch as necessary	Annually or as required
	Water	As required (in periods of drought)
Monitoring	Inspect silt accumulation rates and establish appropriate removal frequencies	Half yearly

Table 6.4 Maintenance tasks and frequencies for tree pits (The SUDS Manual C753, CIRIA)

Maintenance Schedule	Required Action	Frequency
Routine Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Sixth Monthly
	Change the filter media	As recommended by the manufacturer
	Remove sediment, oil, grease and floatables	As necessary-indicated by a system inspections or immediately following significant spill
Remedial Actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six Monthly
	Inspect filter media and establish appropriate replacement frequencies	Six Monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

Table 6.5 Example operation and maintenance requirements for propriety treatment systems (The SUDS Manual C753, CIRIA)

Adopted Sewer Network

6.4 The adopted surface and foul water sewers which cross the propose development site will be diverted and or divested accordingly and as agreed with Anglian Water. Adopted sewers are and will continue to be the responsibility of the Water Authority – Anglian Water.

Geocellular Storage Device – Drain-Down Alarm System

6.5 It is recommended that the drain-down alarm systems are tested every 3 months and to the manufacturers guidelines. The telemetry alarm system should also be tested to ensure

notifications and warnings are received by the Management Company accordingly. Most manufacturers will offer a maintenance service to ensure the alarm system is functioning correctly and effectively. Kiosks containing control panels should be checked for damage and replaced as necessary.

Surface Water Pumps – Pump Failure Alarm System

6.6 It is recommended that the surface water primary and secondary pumps are tested every 3 months and to manufacturers guidelines. The telemetry alarm system should also be tested to ensure notifications and warnings are received by the Management Company accordingly. Most manufacturers will offer a maintenance service to ensure the pumps and telemetry alarm systems are functioning correctly and effectively. Kiosks containing control panels should be checked for damage and replaced as necessary.

Surface Water Pumps – Link to Emergency Back-up Power Generator System

6.7 The site shall be served by an emergency power system/back-up generators to ensure essential services such as emergency lighting and sprinkler pumps are able to function in case of power failure/power cut. It is proposed to link the surface water pumps serving the site to this back-up power generator system. This will ensure that, should a power failure occur during a storm event, the surface water pumps will continue to function. It is therefore necessary to ensure the link between the surface water pumps and the emergency–back-up generator system is functional. It is recommended that the power link to the pumps are tested every 3 months and to manufacturers guidelines.

Manholes and Sewers

- 6.8 Manhole covers should be lifted each year to remove visible debris and check for blockages – it is suggested that this is undertaken every November after the heaviest leaf-fall has occurred.
- 6.9 Should a blockage occur at any time, it is advised to seek professional help to jet the drainage system to clean and clear the system.

Gutters and Downpipes

6.10 t is good practice to ensure that these are occasionally inspected to ensure they are in good order and free of leaves & debris. Once every 6 months should be sufficient.

Orifice Plate with Suitable Filter

6.11 It is advised that maintenance company take time to review the manufactures maintenance recommendations and follow accordingly, with regular inspections anticipated to be required every 3 months and after heavy rainfall events.

7 Water Quality Management During Construction

- 7.1 It is anticipated that a suitably worded Condition to Planning shall be included which sets out requirement to confirm any schemes for water quality management during the construction of the development. For guidance and to demonstrate that this has been considered during the planning stage, a construction phase plan has been provided in **Appendix U**, showing 4no. construction phases.
- 7.2 Anglian Water have been contacted to gain an agreement in principle for temporary surface water outfalls for during the construction period. It has been demonstrated that surface water shall be treated prior to outfall via a proprietary treatment unit and that the risk of surface water flooding is not increased compared to the existing situation. Once temporary and permanent drainage features are installed, the risk of flooding is further reduced due to the provision of a modern standard drainage system. Anglian Water's agreement in principle is contained in **Appendix U** also.
- 7.3 The Construction Phase Plan shows that each discreet drainage system can be constructed within a single phase with the exception of Block A, M, K/L and J3 which is split between Phase 1 and 2. Blocks A and M will be in Phase 1 whilst Block K/L and J3 are in Phase 2. The proposed geocellular storage device which serves System 4 will therefore be built in two phases. The geocellular storage device within Phase 1 will be built first, then when Phase 2 begins, the geocellular storage cells will be "extended" to complete System 4. A temporary connection to the diverted 675dia sewer for Phase 1 will be agreed with Anglian Water accordingly post-planning.
- 7.4 As the geocellular storage device will straddle the two phases, it will necessary to ensure that the storage volume constructed or each phase can deal with surace water runoff from that phase. For Block A, M, K/L and J3 catchment, Phase 1 covers 62% of this area and Phase 2 covers 38% of the catchment. As such, it is proposed to ensure that 62% of the proposed geocellular storage device is constructed in Phase 1 and 38% in Phase 2. This is indicated on the proposed surface water drainage layouts in **Appendix O**.
- 7.5 Further information regarding the construction phase : Activities such as earthworks and construction plant use may result in an increase of silt load in surface water runoff onsite. The presence of heavy plant and other vehicles onsite also introduces the potential for spillages, for example, diesel and hydraulic fluids, wet concrete, construction chemicals and wash-down wastes. Contaminants could enter the sub-soils, surface water, groundwater and nearby watercourse via infiltration and surface water runoff.
- 7.6 Earthmoving operations should be sequenced and timed to avoid heavy rainfall events. This will reduce the risk of soils and silts being mobilised within surface water run-off. Designated vehicle washdown areas shall be provided. Wash-down and surface water run-off from this area will be directed to the drainage network via a silt trap and oil interceptor and a suitable agreement for a temporary use with Anglian Water will be sought. A watching brief for unforeseen contamination of groundwater and surface water will be prepared. Spillages of fuels and chemicals will be controlled in secure bunded areas and containment at refueling and maintenance facilities in accordance with the EA guidelines.

8 Conclusions

- 8.1 EAS have been commissioned by Weston Homes Ltd to prepare a Surface Water Drainage Strategy for the redevelopment of Anglia Square, Norwich, Norfolk.
- 8.2 A separate report, undertaken by others, deals with the flood risk assessment, hydraulic modelling study and impact assessment and should be read in conjunction with this report.
- 8.3 As described in Section 1, it is proposed to make a Hybrid planning application: Full Planning for Blocks, A, B, C, J3, K/L and M and Outline Planning for Blocks E, F, G, H and J.
- 8.4 The proposed surface water drainage strategy for the Hybrid Planning Application site has been based on sustainable principles with aim to provide a significant betterment to the existing situation. Currently the site does not benefit from any attenuation features and as such surface water run-off flows freely into the adopted sewer network, unrestricted and untreated.
- 8.5 The city center site gives opportunities for "urban types" of Sustainable Drainage Systems (SuDS) features to be incorporated. These features provide water quantity, water quality, biodiversity and amenity enhancements in line with the Four Pillars of SuDS. The proposals include green roofs, bioretention systems, tree-pits, lined permeable paving and geo-cellular attenuation devices.
- 8.6 An assessment was undertaken to determine the existing surface water run-off from the site and what flow rate would likely enter the adopted sewer network. The assessment was discussed with Anglian Water and the LLFA. Anglian Water have agreed in principle to a maximum outfall rate of 242 l/s to be directed to a diverted 675dia surface water sewer which crosses the site and also to the surface water sewer in Edward Street. Anglian Water have also provided an agreement in principle for the proposed 9no. outfalls to the adopted surface water sewer network.
- 8.7 A maximum surface water outfall rate of 242 l/s has been agreed to to manage all storms up to and including the 1:100yr + 45% Climate Change Event. This will be the equivalent of 49.5% of the existing 1:1yr surface water run-off rate, a significant reduction.
- 8.8 The development parcels have been split into 9no. drainage catchments. Each catchment has a restricted outfall to the adopted surface water sewer network and attenuation designed to accommodate a 1:100yr + Climate Change Storm Event. Suitable water treatment stages, in line with CIRIA SuDS Manual are proposed and will provide an improvement to the existing situation, where waters enter the adopted sewer network, untreated.
- 8.9 Maintenance of the attenuation features will remain the responsibility of the site owner or an appointed management company. The Anglian Water sewers that pass through the site will remain the responsibility of Anglian Water.

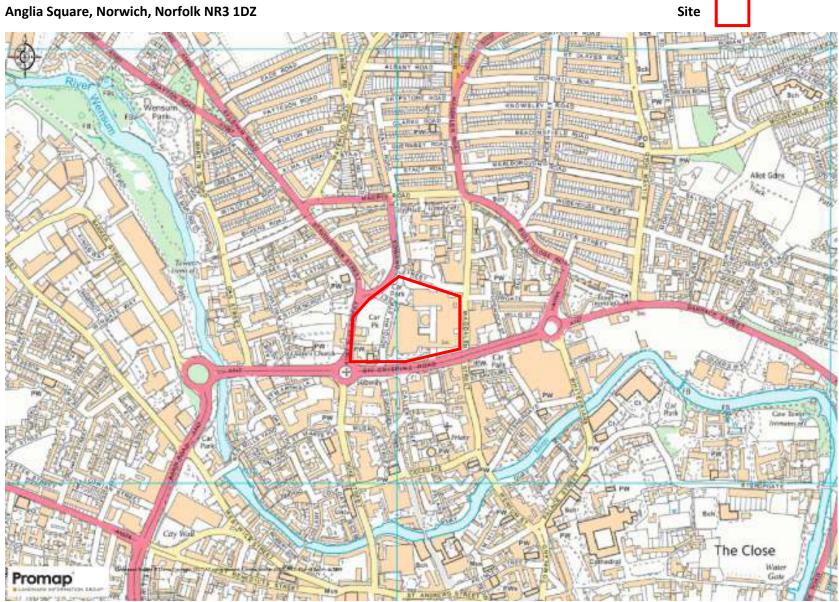
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Appendix: A – Location Plan and Application Description

Anglia Square, Norwich, Norfolk NR3 1DZ



Anglia Square: Hybrid Application Development Description

"Hybrid (part full/part outline) application on site of 4.65ha for demolition and clearance of all buildings and structures and the phased, comprehensive redevelopment of the site with 14 buildings ranging in height from 1 to 8 storeys, for a maximum of 1,100 residential dwellings, (houses, duplexes and flats) (Use Class C3); a maximum of 8,000 sqm flexible retail, commercial and other non-residential floorspace (retail, business, services, food and drink premises, offices, workshops, non-residential institutions, community hub, local community uses, and other floorspace (Use Classes E/F1/F2/Sui Generis (public conveniences, drinking establishments with expanded food provision, bookmakers and/or nail bars (up to 550sqm), and dry cleaner (up to 150sqm))); service yard, cycle and refuse stores, plant rooms, car parking and other ancillary space; with associated new and amended means of access on Edward Street and Pitt Street, closure of existing means of access on Edward Street, New Botolph Street, Pitt Street and St Crispins Road flyover, formation of cycle path between Edward Street and St Crispins Road, formation of wider footways, laybys and other associated highway works on all boundaries, formation of car club parking area off New Botolph Street, up to 450 car parking spaces (at least 95% spaces for class C3 use, and up to 5% for class E/F1/F2/Sui Generis uses), hard and soft landscaping of public open spaces comprising streets and squares/courtyards for pedestrians and cyclists, other landscape works within existing streets surrounding the site, service infrastructure and other associated work; (All floor areas given as maximum Net Internal Area);

Comprising;

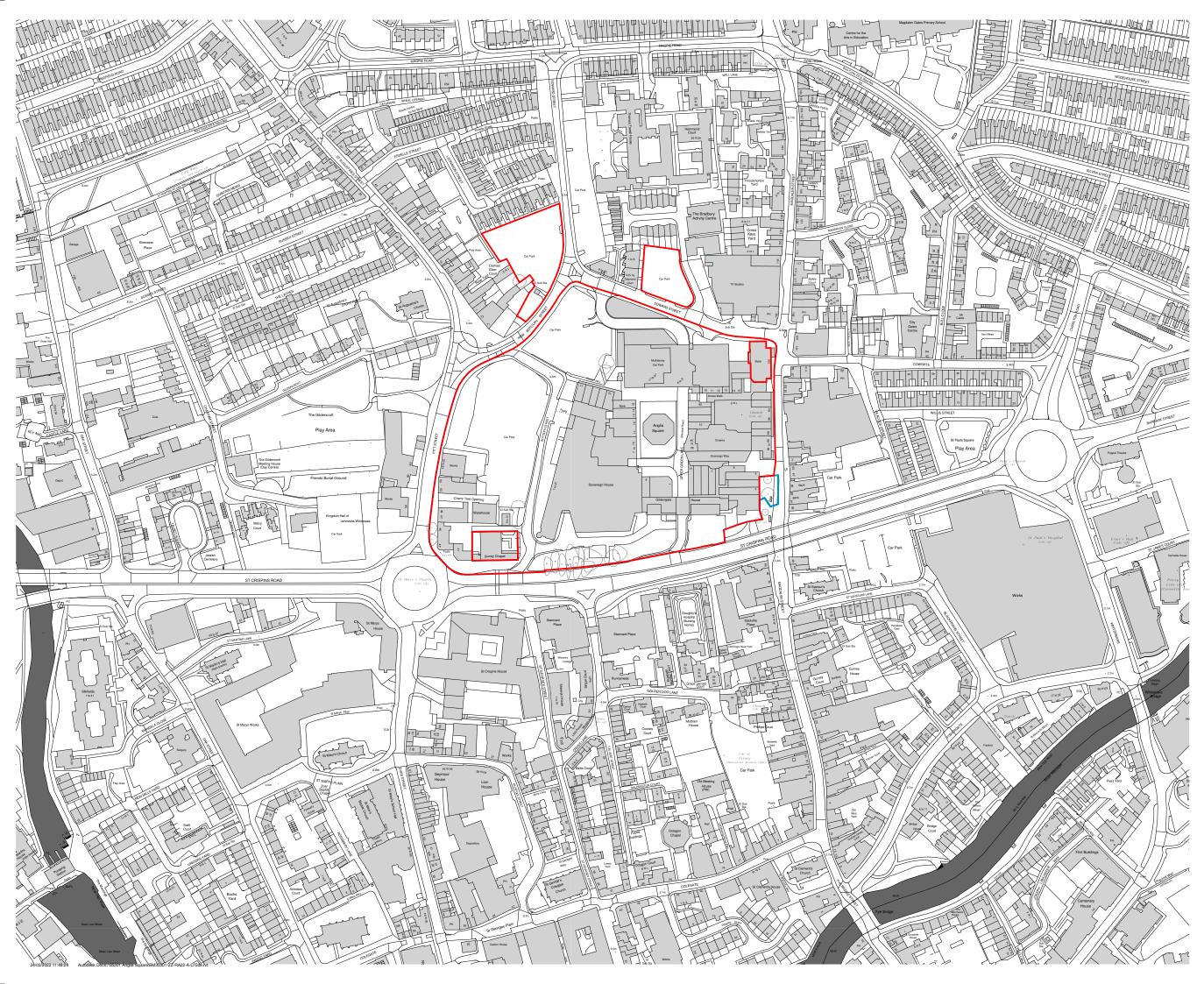
Full planning permission on 2.25ha of the site for demolition and clearance of all buildings and structures, erection of 8 buildings ranging in height from 1 to 7 storeys for 353 residential dwellings (Use Class C3) (142 dwellings in Block A, 25 dwellings in Block B, 21 dwellings in Block C, 28 dwellings in Block D, 8 dwellings in Block J3, 81 dwellings in Block K/L, and 48 dwellings in Block M) with associated cycle and refuse stores), and, for 5,906sqm flexible retail, commercial and other nonresidential floorspace (retail, business, services, food and drink premises, offices, workshops, nonresidential institutions, community hub, local community uses, and other floorspace (Use Classes E/F1/F2/Sui Generis (public conveniences, drinking establishments with expanded food provision, bookmakers and/or nail bars (up to 550sqm), and dry cleaner (up to 150sqm))), service yard, cycle and refuse stores, plant rooms, car parking and other ancillary space, with associated new and amended means of access on Edward Street, closure of existing means of access on Edward Street and New Botolph Street, formation of cycle path from Edward Street to St Crispins Road, formation of wider footways, laybys and other associated highway works on Edward Street, New Botolph Street, and Magdalen Street, formation of car club parking area off New Botolph Street, 134 car parking spaces (at least 95% spaces for class C3 use, and up to 5% for class E/F1/F2/Sui Generis uses) within Blocks A and B, hard and soft landscape works to public open spaces comprising streets and squares for pedestrians and cyclists, other landscape works, service infrastructure and other associated works; (All floor areas given as maximum Net Internal Areas);

and

Outline planning permission on 2.4ha of the site, with landscaping and appearance as reserved matters, for demolition and clearance of all buildings and structures, erection of 6 buildings (Blocks E – H and J) ranging in height from 2 to 8 stories for up to 747 residential dwellings, (houses, duplexes, and flats) (Use Class C3), a maximum of 2,094 sqm flexible retail, commercial and other non-residential floorspace (retail, business, services, food and drink premises, offices, non-residential institutions, local community uses and other floorspace (Use Classes E/F1/F2/Sui Generis (drinking

establishments with expanded food provision, bookmakers and/or nail bars (up to 550sqm), and dry cleaner (up to 150sqm))); cycle and refuse stores, plant rooms, car parking and other ancillary space; with associated new and altered means of access on Pitt Street and St Crispins Road, closure of means of access on Pitt Street and St Crispins Road flyover, formation of wider footways, laybys and other associated highway works on Pitt Street and St Crispins Road, a maximum of 316 car parking spaces (at least 95% spaces for class C3 use, and up to 5% for class E/F1/F2/Sui Generis uses), service infrastructure and other associated works (landscaping and appearance are reserved matters); (All floor areas given as maximum Net Internal Areas)."

Appendix: B – Application Boundary



Contractors and consultants are not to scale dimensions from this drawing
Reproduced by permission of Ordnance Survey on behalf of HMSO © CROWN COPYRIGHT and database right 2008 All rights reserved Ordnance Survey Licence number AL 1000 22432 Broadway Malyan Limited
The survey information shown on this drawing is based on a topographical survey prepared by a third party and Broadway Malyan Limited accept no responsibility for the accuracy or completeness of the survey.
Drawings to be read in conjunction with the associated Design & Access Statement, associated consultant desin team documents & reports and landscape information
Landscape shown is for illustrative purposes only. For detailed landscape information, please refer to the landscape information & documents.
0m 62.5m 125m
N

General Notes

All figures and areas are approximate only and subject to statutory constraints, detail design & design development

tructural Design: Subject to structural input & coordination

Services Design: Subject to services input & coordination Fire Strategy: Subject to fire input & coordination

Application Boundary

Land Ownerd by CT to be subject to separate application for part of the Mobility Hub

D0-1 31.03.22 Issued For Planning Revision Date Drawn By Description

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Weston Homes

Anglia Square Norwich

Hybrid Application - Location Plan on Existing OS Base

Status For Planning Scale Date 31.03.22 1:1250@A1 BM Job Number 35301 ZZ-00-DR-A-01-1000 D0-1

Appendix: C – LLFA Comments Tracker

LLFA Response Tracker: Anglia Square, Norwich

Red Amber		Application Full = Full Application Area Outline = Outline Application Area Whole = Both the Full and Outline Application Areas			
Item	Consultee Comment (FW2022_0423)	EAS Drainage Strategy Response (Rev D (dated 15 July 2022))	RHDHV FRA Response (FRA dated 13 July 2022)	LLFA Review Comments (dated 24 August 2022) (FW2022_0703)	LLFA Comments (FW2022_0942
1 Whole	An updated Flood Risk Assessment (FRA), Drainage Strategy and Hydraulic Modelling Study that consistently provides information that interlinks each of the documents.	Cross-references have been added throughout this document where appropriate.		Some improvement in the cross referencing.	further improvements due to upo
2 Whole	Within the FRA, Drainage Strategy, Hydraulic Modelling Study and yet to be developed detailed drainage design, we request these documents incorporates the evidence to address the issues identified in the Annex.	The issues identified in the Annex are, largely, included within the following itemised comments and are addressed as follows. Other items in the Annex raised include: -The site is within the River Wensum area and is subject to requirements relating to maintenance of nutrient neutrality. This is being addressed by Others and a report shall be submitted in Rev A Submission. - LIFA notes there is reference to Table 3, yet there is no Table 3.	The issues identified in the Annex have been addressed within this report.	Please see the responses in the sections below that address each of the points discussed and responded to.	Please see the responses in the s
2.1 Whole		The hydraulic model prepared for the Surface Water Drainage networks serving each catchment area now include FEH rainfall data as requested. See hydraulic model outputs in Appendix J of this report.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed both the Drainage Strategy and the Drainage Strategy Addendum Letter. The LLFA notes that applicant has not provided the "original pre-development (greenfield) runoff rate" as required by the LLFA developer guidance (Section 14.3). NPPP dearly states in paragraph 100° 3) takes account of advice from the lead local flood dubtority." The LLFA position is based upons 3 of the Non-Adoptable Enderhald Standard for Socianiable Drainage Systems (2015) which states "S 36 or developments which were previously developed, the paek runoff rate from the development to any drain, sever or surface water body for the 1 in 1 year rainal event and the 1 in 100 year rainal event. Therefore, it is a clear and common approach that is commonly applied in the surface water management industry and the LEFA neutres the information to be provided. This has been previously requested by the LLFA and has not been provided by the applicant. The surface water management industry and the 1LFA neutres that the greenfield runoff run calculations shown in Appendix H of the Drainage Strategy and et al. The article strate are seen and et al. The development for that are rained as not there for years of discret drainage areas. They also do not use an FHA calculation enderon. Therefore, these greenfield calculations are also incorrect and not appropriate for use at this time. From a review of the Drainage Strategy Addendum Letter, the LLFA notes the throwshild area the the Arace of the set or the proposed discret drainage system raises has not been provided as per the LLFA notes the throwshild and that the whole site and for each of the greenfield areas identified in green to the asses whether there is a likely increase in flood risk from the reprosed diverged must. The second diverge diverge method. The fore and the diverge previous sequest in accordance with the SUC sprevious request and	The LLFA have reviewed the gree guidance. The LLFA acknowledge calculated as a brownfield site in for the greenfield runoff rates fo However further work was prser drainage areas were undertaken Q1 year of 0.5 l/s/ha. The results site in order to enable a direct co
2.2 Whole	increasing the greenfield discharge rate is	The site is Brownfield and currently drains unrestricted and untreated into the existing Anglian Water surface water sewers which cross the site. As the site is Brownfield and practically 100% impermeable, it is not considered reasonable or appropriate to apply greenfield run-off rates for this Application. Anglian Water state that where this is not practical they will assess capacity based on the 1:1 year calculated rate. They therefore permit a maximum discharge rate of 242 l/s to manage all storms up to and including the 1:100yr + Climate Change Event. A Pre-Development Enquiry and Capacity Check from Anglian Water confirming this is contained in Appendix I of this report.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA Developer Guidance clearly states in section 14.3 that "Brownfield sites should discharge at the original pre-development (greenfield) runoff rate. If not possible, a significant reduction in the current rate of discharge should be achieved and agreed with the relevant drainage body (LLFA, IDB or Anglian Water) providing evidence as to why an alternative should be considered." At present, EAS has not accurately defined the predevelopment (greenfield) runoff rate of the site. Therefore it is not possible to compare the predevelopment and post development runoff rate. While we appreciate the reminder of the Anglian Water approach, the LLFA guidance differs slightly and at the LLFA we apply the LLFA's Developer Guidance. We shall remind the applicant that NPPF in paragraph 169a states "take account of advice from the lead local flood authority". The LLFA notes the current agreement in principle from Anglia Water is for a single discharge point at manhole 1355 that is near to the southeast corner of the site. The current proposal has four connection points not in this location. In addition, the evidence base to support the proposed design discharge locations are not in accordance with the agreement in principle. The applicant's response states the site is "Brownfield and practically 100% impermeable" yet your existing runoff calculations do not reflect this. Please see comments above on the existing surface water run off calculation corrections that are required as the wrong method and approach has been applied. This means it is not possible for the applicant to demonstrate the difference between the predevelopment (as cefined in section 14.3 of the LLFA considers this required as the wrong method and approach has been applied. This means it is not possible to the LLFA. The LLFA considers this required as the wrong method and approach has been applied. This means it is not possible to the LLFA. The LLFA considers this required and the proposed taken which calculates the existing brownfield runoff rate is n	The LLFA have reviewed the upd and brownfield runoff rates and network for the proposed flows.

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updates.

he sections below that address each of the points discussed and responded to.

greenfield and brownfield rates given in the Drainage Strategy. These are only partally in accordance with the LLFA develope edges the greenfield runoff rate was calculated for the landscaped areas (totaling 395m2). The rest of the site is still te in the table presented in paragraph 3.3 of the drainage strategy. Using the information provided in the Drainage strategy es for the landscaped area of 0.9 l/s/ha.

rsented later in paragraph 3.xx, the applicant states that further calculations for the greenfield runoff rate for the discreet aken. These calculations were produced using the FEH-13 methodology in Causeway Flow and estimate a Obar of 0.6 with a sults for the greenfield runoff area was then provided in a table in Appendix I for each of the proposed discreet areas of the ct comparison of the predevelopment and post development sceanrio for each of the discreet drainage areas.

updated drainage strategy and FRA that now provide further information relating to the calculation of both the greenfield and a discussion around the approach. Anglian Water have confirmed there is capacity within the surface water sewer tws.

2.3 Wh	3 hole	Apply the latest (May 2022) Climate change guidance, which would require the application of a 45% climate change allowance to the 1% AEP and to apply the appropriate climate change allowance of 40% to the 3.3% AEP calculations.	The hydraulic models prepared for the Surface Water Drainage networks serving each catchment area now include the up-to date Climate Change Allowances as requested. See hydraulic model outputs in Appendix J of this report.	All model runs now include the latest climate change allowance, which were released post completion of the previous FRA. See Figures in Appendix I and J	The LLFA notes the applicant's commitment to using the latest climate change allowance for peak rainfall intensity in the drainage strategy in section 4.15. This was thought to continue through to the drainage calculations in Appendix J. However on review of the drainage calculations the LFA note that there is no climate change allowance included on page 13 of the calculations for Block A, M, J3 and K/L SW Drainage Network which is where the FSR rainfall model is also noted as being used. However, in the subsequent calculations for the Block A, M, J3 and K/L SW Drainage Network the FEH Rainfall model is used and has a 45% climate change allowance applied. The same has occurred on the Block B, the Bolph Street, SW Network Calculations where the FSR method has been used in part of the network assessment and FEH has been reported in the 1% +45% CC storm results. The LLFA notes that drainage design for Block E, F, H, G and J have the FEH rainfall method applied and the 1% +45% for climate change applied. These systems are in the outline planning application area. The LLFA notes there are no 3.3% and 3.3% +CC calculations submitted for any area as per the requirements of the latest climate guidance and the LLFA Developer Guidance. The LLFA notes that on the Block B Porous Car Park Manholes, a Factor of Safety of 2 is applied. The Ciria SuDS Manual (C753) recommends that a factor of safety of 10 is applied to the surface infiltration rate for all types of surface (Chapter 20 section 5.1 (page 400)). This will require updating.	P15 of hydraulic modelling report The MicroDrainage (WinDES) mod
2.4 Wh		Evidence that recent liaison with Anglian Water relevant to this new planning application that provides:	Up-to-date sewer records have been obtained and an up-to-date pre- development enquiry has been received. Sewer records are contained in Appendix D and Pre-dev enquiry is contained in Appendix I.	Addressed in Drainage Strategy Report prepared by EAS	As per response 2.2, the LLFA notes the applicant has obtained updated Anglian Water sewer plans in April 2022. In addition, the applicant has received a high level pre-planning assessment report (PPE-0143339 dated: 08/04/2022). The LLFA have reviewed this PPE and note this planning report provides an agreement in principle for one connection to discharge a maximum of 242 l/s to manhole 1355 in the south east corner subject to the provision of connection hierarchy information being provided to AW. The proposed outline drainage design provided for the hybrid application identifies there will be four discharge locations to the AW severs in locations not specified by the Pre-Application Assessment. In addition, the LLFA observes the PPE has not considered the site is located within the largest critical drainage catchment (CDC) in Norfolk or that the proposed drainage systems to connect to the network are pumped. The PPE states "should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required." At present, the proposed drainage design submitted for the hybrid application is not in accordance with the Pre-Planning Assessment agreement in principle and therefore it is not considered in keeping with the agreement in principle. The LLFA require that these differences between the proposed design and the AW agreement in principle should be resolved to obtain a valid agreement in principle.	Sewer records have been obtaine extent included is adequate, see Further review of the drainage st to reach an agreement in principl
2.4 Wh		Confirmation from Anglian Water that no changes have occurred in the public network since 2017.		Addressed in Drainage Strategy Report prepared by EAS	The LLFA notes the applicant has obtained updated Anglian Water sewer plans in April 2022.	Previously provided
		Obtain recent drainage assessment from Anglian Water that relates to the current proposed development.	Up-to-date pre-development enquiry is contained in Appendix I.	Addressed in Drainage Strategy Report prepared by EAS	The applicant has received a high level pre-planning assessment report (PPE-0143339 dated: 08/04/2022). The LLFA have reviewed this PPE and note this planning report provides an agreement in principle for one connection to discharge a maximum of 242 J/s to manhole 1355 in the south east corner subject to the provision of connection hierarchy information being provided to AW. The proposed outline drainage design provided for the hybrid application identifies there will be four discharge locations to the AW sewers in locations not specified by the PPE. In addition, the LLFA observes the PPE has not considered the site is located within the largest critical drainage catchment (CDC) in Norfolk or that the proposed drainage systems to connect to the network are pumped. The PPE states "should your assumptions or evidence change then an alternative solution, connection point or flow rate may be required." Therefore, at present the proposed drainage design submitted for the hybrid application is not in accordance with the PPE and should be re-assessed by AW.	The Drainage Strategy provides e Strategy
	1.3 hole	Provide current set of DG5 records from Anglian Water.	Anglian Water were able to confirm that there have been cases of sewer flooding in the vicinity of the site, but for data protection were unable to specify any locations. See email dated 22.06.2022 in Appendix M.	Addressed in Drainage Strategy Report prepared by EAS	The applicant has now obtained confirmation that there have been incidents of sewer flooding in the vicinity of the proposed development as demonstrated in Appendix M. No specifics were given at this time. This is further supported by a letter in Appendix C of the Drainage Strategy Addendum Letter.	Previously provided
2.4 Wh			Surface water drainage serving private catchments will be the responsibility of an elected Management and Management Company, whom shall be appointed by the Site Owner. Any adopted sewer or diverted adopted sewers within the red-line boundary shall be the responsibility of Anglian Water.	Addressed in Drainage Strategy Report prepared by EAS	No evidence of Anglian Water agreement in principle to take on the maintenance and management of the proposed drainage system is provided in the PPE. The LLFA requires this evidence for all structures that it applies to in the full planning application area of the design. For adoptable structures in the outline planning areas, this can be conditioned.	The Drainage Strategy provides e Strategy
2.5 Wh		Provide a more in-depth consideration and assessment of rainwater harvesting and re-use opportunities.	See Section 4 para. 4.6 and 4.7.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed Paragraph 4.6 which contains a very limited consideration of rainwater harvesting in relation to the proposed development. There is no breakdown of the assessment per block or quantative assessment of the rainwater harvesting potential. The and Paragraph 4.7 is not relevant to this matter. The statements made in the drainage strategy are unevidenced and further assessment remains required to support the statements made.	An assessment in the drainage st supply and not enough rainwater provided at ground level for indiv The LLFA recommends that a con recommend condition* NOTED
2.6 Wh		Provide a more in-depth consideration and assessment of groundwater flood risk.	Addressed in Royal Haskoning DHV FRA Report.	Included at 7.10 onwards and 8.52	The LLFA has reviewed section 7.9 to 7.16 in the FRA. The LLFA notes that Figure 6 only defines the banding names not the meaning of all the bandings. In section 7.10 a definition of Band B is given but no others. This means it is not possible for the LLFA to reasonably be able to interpret the information provided by the applicant at this time. Furthermore, there appears to potentially be a fourth undefined colour band which the site sits within. Further clarification is required before the LLFA can accept the information being presented in the report. The FRA in section 7.11 confirms that site-specific boreholes have not been drilled yet and nor has groundwater monitoring been undertaken. Historic groundwater borehole information is provided in Table 5 with the two most recent results (showing a winter (January 1993) groundwater level of 2.40m bgl and a spring (May 1993) groundwater level of 4.40m bgl) confirming that in the likely worst case there is not likely to be suitable distance between the base of a below ground infiltration structure and the groundwater level all year round. It is not possible to identify where these boreholes are in relation to the site. The LLFA will require further information to be submitted to address these issues appropriately.	The LLFA have reviewed the upd acknowledges the moderate groo risk management.

eport states 45% used for 1%AEP and 40% for 3.3%AEP for surface water model.

modelling shows the use of 45% used for 1%AEP and and 40% for 3.3%AEP.

tained at the site but not for the full catchment. Further checks have now been undertaken by the applicant to ensure the see comment 3.2.

ge strategy has been undertaken and the LLFA observes that discussions have occured been the applicant and Anglian Water nciple.

les evidence of an agreement in principle with Anglian Water dated 15 September 2022 in appendix L of the Drainage

es evidence of an agreement in principle with Anglian Water dated 15 September 2022 in appendix L of the Drainage

ge strategy between paragraph 4.6 to 4.9 is provided which confirms that there is not enough storage capacity for a 21 day vater available for the supply needed for the toliets in the community centre. However, there is scope for waterbutts to be individal properties and the reuse of water at outdoor taps as per Table 4.2 in the Drainage Strategy.

condition requiring the installation waterbutts and water reuse facilities prior to first occupation of the properties. *LLFA

updated FRA section 7.10-7.18 and is acceptant of the clarifications and further information provided. The LLFA groundwater flood risk associated with the site and will consider this when reviewing the flood risk mitigation and residual

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	2.7 Whole	Provide a more in-depth consideration and assessment of sewer flood risk.	Addressed in Royal Haskoning DHV FRA Report.	Included at 7.3 and 8.59	The LLFA have reviewed the FRA section referred to. The LLFA notes that Anglian Water have been contacted in June 2022 and confirmed that sewer flooding has occurred recently in the local area. Further information is currently being waited for, although the precise locations of the incidents will not be recieved due to confidentiality. The information provided in the email dated 22 June 2022 from Anglian Water states "Anglian Water is able to confirm that there have been instances of flooding within the vicinity of the proposed development." Yet the FRA states in section 7.8 that "Although no sewer flooding has been reported locally to date, there may be potential for sewer flooding in extreme events greater than those modelled" which misrepresents the information provided by Anglian Water that indicates sewer flooding has occurred locally to date, there may be potential for sewer flooding in the vicinity that can be attributed to capacity limitations". The LLFA notes there is further ambiguous information in section 7.6 of the FRA, which states there is capacity in both the foul and surface water severs. Although on review of the preplanning assessment in Appendix G there is no clear statement from Anglian Water that confirms this. The Anglian Water Pre-Planning Enquiry Report for the site only states there is "available capacity" in the foul water sever network and recycling centre, however, there is no equivalent statement made by Anglian Water to revise their response which may result in the need for an alternative solution, connection point or flow rate. Further comments on the pre-Planning Assessment from Anglian Water to revise their response which may result in the need for an alternative solution, connection point or flow rate. Further comments on the pre-Planning Assessment from Anglian Water are available in response 2.4.2. Furthermore, the applicant has not yet demonstrated that some areas of the site have a historic connection to the Anglian Water sever network. Therefore, while a more considered a	The LLFA have reviewed the upd. Appendix G. The LLFA reviewed & relates to their comments on the
	2.8	Provide clarification on the retention of surface water runoff on the site and whether this is actually the provision of either blue or green roofs not previously included in the surface water drainage calculations	No blue-roofs are proposed on site. Greenroofs are to be provided. In terms of drainage calculations. It is considered robust to assume green-roofs are saturated and will not provide any attenuation for large storm events. As such, the 1:100yr + Climate Change hydraulic modelling assumes all roof areas are impermeable. This provides a conservative assessment of required attenuation volumes.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed this assessment approach and can accept this approach at this time.	Previously provided
		Provide clarification on the water depth for the return periods given at Edward Street Service Yard as there are significant discrepancies.	Addressed in Royal Haskoning DHV FRA Report.	Clarified in 5.38-5.40	The proposed development model runs included all ground FFLs of the buildings where known, as Zshapes. The basement car park located in Block A is within the surface water flow path and therefore identified as a vulnerable part of the development. The LLFA requested that the basement car park was set at ground floor level, or the entrance to the car park is raised 300mm above the 1 in 100 year (+45%CC) flood level. Discussion within the applicant's documents confirms that humps could be located at the entrance to the basement car park and the entrance to the low lying service yard, which would be set 300mm higher than the 1 in 100 year (+45%CC) flood level. The humps were represented as Z-lines which would be level 30mm higher than the flood level at these locations. For the entrance car park, this was a level of 4.80m AOD and for the service yard is a level of 4.45m AOD. This prevented surface water from entering these two vulnerable parts of the site. Walls were located around the service yard and basement car park entrance ramp, to prevent water from flowing 'through. The proposed model was run for both the 'no mitigation' and 'initigation' scenarios upon the request of the LLFA, and flood maps have been prepared for both. The 'no mitigation' and 'initigation' scenarios upon the request of the LLFA, and flood maps have been prepared for both. The 'no mitigation' and 'initigation' scenarios including the humps at the car park and service yard entrances are called 'Proposed' and the 'mitigation' scenarios including the barrier are Max 0.1m and adjacent to the building wall are 0.2m. Representation of these features in the model are described in section 7.3.2 of the modelling report (extract in modelling column). The levels modelled for the entrance hump match the proposed median betweels - this is considered reasonable. The walls are modelled as 99m high, however as depth sagainst the word on the sceed 200mm therfore this is considered a reasonable representation provided that any doors/airbricks in the wall b	Modelling of the service yard as tight to prevent water from getti groundwater. By making it water doors or windows will be include FRA now states that a gully and f water network within the hydrau surface water drainage design (S The LLFA have reviewed the FRA climate change is now reported.
	Full	Prepare and provide a full detailed drainage design that includes all the proposed elements of the surface water management system. This includes clarification of the design details (including plans, modelling, calculations and supporting information in accordance with the LLFA's Developer Guidance) of suitable drainage featured, such as green/blue roofs, bio-retention features and tree-pits.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	The detailed design information is missing some calculations, plans and supporting information as well as requiring corrections to the calculations provided. Information missing includes typical design sections and plans, 3.3% and 3.3%+CC calculations for each element. The SW drainage model includes the larger SuDS elements but appears to be missing some features. All SW Drainage calculations have a manhole table that has at least one column that is not visible to read as it is off the page in the results PDF in Appendix K. This needs to be updated so that the information is provided in a readable format. The LEAR notes that section 8.2 and 8.3 indicate which development blocks are at flood risk however there is no summary of which roads and pedestrian access routes which are at surface water flood risk. The LLFA notes that "is impractical to prevent offsite flows entering the onsite drainage system in some areas". However, within the Drainage Strategy there are no allowances given within the drainage design for the any offsite surface water that may enter the system. An allowance for offsite flows needs to be included within those systems likely to be affected by offsite flows.	FRA - The LLFA have reviewed the This was not the case and was ev for Block C. This indicates the fini The majority of the issues have th calculations for the 3.3% AEP and EAS Response - Rev C Submission 1:100yr + 45% Climate Change u Climate Change Event only.
	2.10.1 Full	response to 2.10 for system 1			 System 1 relates to Block B - Full It is not clear to the LLFA how a discharge rate of 5 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. No patios shown on the drawing information submitted for the residential houses. Urban creep should be applied to the residential houses and the patios need to be included in the design along with their drainage connections. One of the parking spaces in the residential houses area appears to not be permeable. Is this correct? The LLFA would recommend that this space is also included within the permeable paving area too as there is no justification made by the applicant not to include it. The LLFA requests clarification on this approach. No design information shown on plan for inflow and outflow pipes for PP2 on the SW drainage plan. This is needs to be included as part of the full application. In section 4.20 of the drainage Strategy and in the plan (drawing No PI-3831 DR-002) a flow control device is identified at the outfall of the system, in section 4.25 it states a downstream defender (a hydrodynamic vortex separator) is specified in the design which is supported by the design on the plan. While in the MicroDrainage calculations for Block B a Hydrobrake Optimum device is specified an included in the calculations there is no downstream defender included in the calculations. The calculations will need to be updated to reflect the inclusion of the downstream defender as Block B (System 1) is part of the full application area. The residential houses area has been hatched in on the drawing however, there is no indication of what this hatching represents. 	The LLFA notes that not all prope All other issues now addressed.
-						

e updated FRA section 7.7 and 8.59. The LLFA welcomed the additional information provided in 7.7 and the supporting wed 8.59, which relates to identification of the locations of electrical substations on the site. The LLFA is no sure how this on the assessment of sewer flooding.

rd as per previous comments appears sensible. Section 8.16 of the FRA now states "The service yard must be completely water n getting into this area from Edward Street (e.g. through service cable conduits or air vents) and from potentially high water-tight, this will also prevent water entering the adjacent buildings (such as Block M). No openings such as air bricks, ncluded in the neighbouring wall with Block M, to prevent water ingress into the surrounding blocks."

and flap valve will be included in the service yard outfalling to the foul sewer network. The flap valve is still included in surface nydraulic model. The hydraulic modelling report states that the pipe has no flow and thereore this pipe is not included in the ign (Section 7.4). Therefore this is considered acceptable.

e FRA section 5.39-5.40 and note the no water enters the Edward Street Service Yard for thte 3.3% AEP and the 3.3% AEP plus rted. A modelled water depth of 1.02m is provided although it is not clear for what scenario this relates to.

ved the updated FRA that refered to Comment 2.10 as a query on freeboard provided at Block C in paragraph 8.25 of the FRA. was eventually found in paragraph 8.29. The LLFA have reviewed 8.29 - 8.30 where a discussion on the freeboard is provided he finished floor levels of the habitable areas of Block C will be 300mm above the design flood level.

ave the addressed. Only a couple of issues were not addressed in relation to the provision of the surface water drainage EP and 3.3% AEP plus 40%CC for the outline application areas of the site.

mission includes modelling for all Storm Events required by LLFA - 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and Inge undertaken for Full Application Drainage Systems. Outline Drainage Systems have been modelled for the 1:100yr +45%

properties have a downpipe so not every property will recieve a waterbutt. Four properties will be without waterbutts.

ī	2.10.2 =ull	response to 2.10 for system 2		 System 2 relates to Block C - Full It is not clear to the LLFA how a discharge rate of 5 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. The LLFA has reviewed the proposal to discharge the rising main from the attenuation tank through the medium of small bioretention system is not considered appropriate in combination with a pumped discharge to the medium ould potentially overload the system and cause localised surface water flooding on a very flat site. The LLFA notes the area with the bio-retention features would experience flooding in a 1% +45% climate change to a depth of typically between 100mm to 200mm. Therefore the LLFA consider that the pumped discharge to 1% +45% climate change in the into the medium during a significant storm event, such as the 1% +45% climate change, the medium would likely be saturated and flood risk would likely be increased by the proposed surface water drainage design currently proposed. The LLFA notes there is a significant area of the site that is understood to be paved, although it is not confirmed what this area is to be paved with, its finished ground levels or how it will be drained. Clarification of the surfacing is required. The bioretention swale is not included within the MicroDrainage calculations and neither are the last couple of manholes and pipes (C11 and C12). Therefore, the submitted calculations are incomplete for this system. In addition the MircoDrainage calculations indicate that the applicant is to offer pipe 1.007 onwards for adoption. This means the statements regarding the half drain times are not appropriate. The LLFA requests clarification on whether the corner of the geo-cellular tank is at least 5m away from the building. The system portand would be appropriate. The LLFA requests clarification on whether the corner of the geo-cellular tank is at least 5m away from the building. The ELFA requests clarification on w	
				 The LLFA observe that based on the manhole cover levels of 4.050m and the given finished floor level of 4.650m there is a 600mm freeboard incorporated into the design. On review of the applicant's surface water flood risk hydraulic modelling within the latest FRA, which shows the mapped results indicate the surface water flood depths to the north of the block are typically between 300mm to 500mm, while the southern end of the building is typically between 100mm and 300mm. The FRA indicates the finished floor level is 300mm higher than the level of the design flood event (1% AEP +45% CC). However, the report and the maps indicate that in some areas to the north of Block C the modelled water depth is 420mm. This would indicate that the finished floor levels would need to be at least 4.75m to provide the required 300mm freeboard above the design flood event water level. It is not clear where some of the patio areas to the east of the building and the pathway areas to the west of the building will be draining to as there is no drainage shown for these areas, only drainage associated with the roof. As the site is very flat (based on the manhole cover levels given as no finished ground levels are provided) there drainage in these areas is important to ensure that dry access and egress to the building is possible. The LLFA observes that the drainage plans in Appendix K of the drainage strategy are using different block layout arrangements for Block C compared to those shown in Drawing number 35301-2C_00_DR-A-03-0100-D0-2 (dated 31.03.22). Please confirm which block layout represents the current design? Based on the information provided in the plans, it is not clear to the LLFA what the feature is that extends from the downstream side of the genoral as defined in the LLFA requires clarification on what this feature is from the applicant as there is nothol as bove the design flood acter level and include appropriate freeboard as defined in the LLFA requires clarification on what this	
				The LEFA has reviewed the proposed surface water drainage System 2 which serves Block C. The LLFA notes the applicant is intending to place a residential block of flats with a greer roof in an area of surface water flood risk. The extent of the surface water flood risk has been modelled by the applicant and confirms the block located in an area of flood risk, which is not in keeping with the application of the sequential test. The building is proposed to have a green roof that would discharge surface water into the drainage system that would attenuation the flow in a below ground geocelluar tank. At least two trees planted are proposed to be planted on top of the geocelluar tank. The water from the tank would be pumped out into the medium of a small bioretention area with a perforated pipe underdrain before the system connects through a series of standard below ground pipes in the site and the road to discharges to the existing Anglian Water sewer in Edward Street. The LLFA is very concerned the trees planted over the tank would damage the tank and reduce the capacity and function of the system as the trees grow. In addition, the pumped discharge to a small bioretention area is unlikely to operate and would lead to exacerbating the existing and residual flood risk in this location, which could increase the difficultes associated with safe access and egress from the block. While it is questionable about whether the location for this residential accommodation being located in this area of the site considered by the LLFA likely to increase the surface water risk associated with Block C. Therefore, only for Block C in this proposed development the LLFA recommend an alternative design where the bioretention facure is removed, only if the geocellular tatenuation capacity is increased significantly and discharge is achieved through a gravity connection to the Anglian Water sewer in Edward Street. This is to reduce the residual risk associated with the pumped discharge is achieved through a gravity connection to thave	2
: 8	2.10.3 ⁼ull	response to 2.10 for system 3		 System 3 relates to Block D - Full It is not clear to the LLFA how a discharge rate of 12.5 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. Paragraph 4.32 states "to be conservative, the hydraulic models shall assume green-roofs are saturated and will bit allow for any impermeable areas, as such will be considered 100% impermeable area". This contradiction in the statement needs to be corrected. A channel /slot drain is positioned around the perimeter of the building. The bio-retention tree pits and swales are positioned further away from the building. These bioretention feature discharge to the drainage network. However, it is not clear what discreet drainage area these bio-retention features serve as there is very limited information about the finished ground levels as only the cover levels of the manholes and tranks are provided. Paragraph 4.37 indicates that "noofs and pedestrian walknays will discharge directly to the adopted sewer via a bioretention swale". However, this is not supported by the proposed drainage plan shown in Appendix K as it is not clear how the water will be directed to these bio-retention swale features rather than the slot drains to benefit from the water treatment. In addition, there is no connection shown directly from the roofs to the bio-rention swales for water will not be directed to these for water use in the proposed drainage layout and the proposed drainage design and design improvement to be made. The LLFA observe that northern section of the building the manhole cover levels of 4.500m and the given finished floor level of building is set at 4.500m meaning there of the design, it is the same at the southern and of the building manhole cover levels of 4.500m and the given finished floor level of building is set at 4.500m meaning there is a no freeboard incorporated into the des	system 3, nowever it is on the The LLFA notes the additional located on the eastern bounda

he proposed design information against the previous comments and these issues are now addressed.

he proposed design information against the previous coments and these issues are now addressed.

ater harvesting for the landlord wash down is not commented on in the section 4 of the report text relating to the drainage n the drainage plans.

onal details provided regarding the pumps and the chamber. The pumping station kiosk / control panel is proposed to be undary of block A.

			 A pumped discharge is identified on the outline drainage plan in Appendix K, yet there is no pumped discharge identified in the drainage description for system 3 (paragraph 4.32 - 4.37). The pumped discharge set at a rate of 12.5 l/s is proposed to discharge through the filter medium of the bio-retention swale before discharging to the diverted Anglian Water Sewer. The LLFA has reviewed the proposal to discharge the rising main from the attenuation tank through the medium of small bioretention feature is designed to slow water conveyance while the pumped discharge to the medium could potentially overload the system and cause localise surface water flooding on a site with a gentle slope. The LLFA expects this aspect of the system will need to be re-designed appropriately. The LLFA has reviewed the proposal to discharge the rising main from the attenuation tank through the medium of small bioretention system is not considered appropriate in combination with a pumped discharge to the medium could potentially overload the system and cause localise surface water flooding on a very flat site. The LLFA new terms would partly be in a surface water flow probable water flowing a 1% +45% climate change storm event. The typical depth of surface water flooding is up to 50mm. Therefore the LLFA consider the pumped discharge to 10 discharge to 1% +45% climate change in the into the medium during a significant storm event, such as the 1% +45% climate change. He medium would likely be surrated and flood risk would likely be increased by the proposed surface water drainage design currently proposed. The tree pits, bioretention areas and the supporting pipework are not shown in the current MicroDrainage modelling. The tere pits, bioretention areas and the supporting pipework are not shown in the current MicroDrainage modelling. The tere pits, bioretention areas and the supporting pipework are not shown in the current WintorDrainage modelling. The tere pits, bioretention areas	
2.10.4 Full	response to 2.10 for system 4		System 4 relates to Blocks A, M, J3 and K/L • It is not clear to the LLFA how a discharge rate of 65 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. • The level of the suspended drainage on Blocks A, M and K/L are not identified on the plans in Appendix K. The LLFA requires clarification on this design detail. • The LLFA notes the centre of Block A has planted areas shown on the first floor courtyard area (Drawing 35301_ZA_01_DR_A_03_0101_D0_2, Dated 15/07/22). However, it is not clear how this area will be drained. • The information about the connection routes for the rainwater pipes associated with the buildings does not appear to be correct when the varying building roof heights are taken into account. As this is for the full planning application this does need to be resolved to ensure the proposed drainage design is not going to increase flood risk and that appropriate space is available to deliver the design. • The LLFA notes the north facing commercial unit on the western part of Block A has a finished floor level of 4.5m which is lower than the manhole 01 cover level of 4.95m, while the neighbouring residential unit has a finished floor level of 5.4m. This puts the commercial unit at an increase flood risk by design. The LLFA notes the north facing commercial units match the levels of adjacent manhole covers. The LLFA requires the finished floor levels for all the residential entrance lobbies and other commercial units match the levels of adjacent manhole covers. The LLFA notes the finished floor level of 0.0.3 requirements. • The LLFA notes the notes the road in front of the Block A car access to the basement car park is to be raised by 300mm as a flood resistance measure. However, it is not clear on the surface water drainage plans how far this raised section of road will extend. Further information is required to be included on these plans. • On Block M there appears to be at least 4 no. green roof rainwater points that are not loc	The LLFA have reviewed the pr The LLFA notes the additional eastern boundary of Block J.
			 Here is an existing building in the System 4 discreet drainage area that is excluded from the proposed drainage calculations. However, the area surrounding the building appears to be included within the drainage calculations, yet there is no information regarding the proposed drainage system that would serve this area. The LLFA requires clarification regarding the proposed detailed drainage design for this area of System 4. The text in sections 4.38 to 4.42 is not consistent with the proposed design in the Appendix K plans. The text does not include the pumping station to discharge the water from the attenuation system into the diverted Anglian Water surface water sewer. The LLFA observes the FRA identifies the commercial areas of Blocks A and M are to have a water exclusion strategy, however no commitment to water barriers has been included within either FRA or the drainage strategy. Therefore, at present the information provided by the applicant indicates that flooding these premises during a 1% AEP +40% Climate Change is part of the design approach (see section 8.16 of the FRA). The LLFA note the climate change allow given in this section is not in accordance with the current climate change guidance. Based on the information provided in the plans, it is not clear to the LLFA what the feature is nothing shown either in the drawing or in the legend of the drawing. The Lelow ground infrastructure for the pumping station is indicated however it is not clear whether there will be any above ground control kiosk for the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA's Developer Guidance in section 20.3. The LLFA requires confirmation should be above the design flood water level and include appropriate freeboard as defined in the LLFA's Developer Guidance in section 20.3. The LLFA requires confirmation should be above the design flood water level and include appropriate freeboard as defined in the LLFA	
2.10.5 Full	response to 2.10 for system 5		System 5 relates to Botolph Street Public Realm Area - Full It is not clear to the LLFA how a discharge rate of 10 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. The LLFA requires this information. A shared bioretention swale is included within both the areas for system 5 and 7. It is not clear with drainage area this feature will serve or how it will possibly serve both areas. The LLFA require further information to clarify which drainage area this bioretention area will serve and how it will connect and relate to the proposed drainage network. The LLFA notes that a significant amount of this proposed drainage system will be directly influenced by the finished surface levels of the road, pavement and open space areas, yet no information has been provided show the finished ground levels. The LLFA requires further design information demonstrating how water will enter the network particularly in the shared drainage area at the south of system 5. The LLFA notes that no quantitive assessment of the Water Quality indices was provided in 4.46 for system 5. As this is part of the full application area the LLFA requires further detailed information to be provided including for the proprietary device. The LLFA also notes the inclusion of a number of bioretention areas within the design that are labelled as swales. The LLFA remnets the applicant that a swale is a conveyance structure while these features are designed to look and behave like basins. As the drainage path is shorter due to the connection of each area directly to the network, the amount of biofiltration treatment achieved for the water is potentially lower compared to having them using a longer drainage path. The LLFA expects further investigation and consideration of the system 5 area adjacent to Block H. The LLFA notes the FRA shows there is a flood flowpath through the northern half of the system 5 area adjacent to Block H.	The LLFA notes in the Drainage related to system 4 and the su paragraph 4.70. EAS Response -Typo corrected Most comments have been ad serves or drains to, continues t bioretention area does have th outfalls could be more than ex- further information in the Pha: appears to be a phased approc EAS Response - Paragraphs to see paragraphs 4.84, 4.107 an The LLFA notes the additional western boundary of Block H.

roposed design information against the previous coments and these issues are now addressed.

details provided regarding the pumps and the chamber. The pumping station kiosk is proposed to be located on the

ge Strategy there is a potential typo in the sub-section title between paragraph 4.69 and 4.70. As the previous sub-section ubsequent section relates to system 6. It is likely to be System 5 for Botolph Street and this is supported by the text in

addressed although there is one area that is not clear yet. It appears the bioretention area previous queried about where it s to have limited information around its design parameters. However there does appear to be two outlets and the the discreet drainage boundary drawn through the area. This could mean that some of the flows entering either of the expected. System 5 is at full application stage (in Phase 3), while System 7 is at outline planning stage (in Phase 4). There is no sing plan. The LLFA seeks clarification around how the area discharging to this feature has been calculated for what ach.

o decribe the bioretention system which straddles Outline and Full Application areas are within Rev C Submis nd 7.4.

I details provided regarding the pumps and the chamber. The pumping station kiosk is proposed to be located on the

0.6 line	System 6 relates to Block E - Outline It is not clear to the LLFA how a discharge rate of 30 l/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. The LLFA requires this information. The LLFA notes that this is part of the outline planning application, however, the LLFA require an indication of the approximate size and location of the proposed green roofs within the drainage area. The LLFA notes the geocellular tank is located in the system 5 drainage area. There is no indication of how or where water from System 6 will enter the geocellular tanks. Outline design calculations have been provided in Appendix J to support the initial tank sizing. There is no modelling of the outline drainage network for the system. Most of Block E appears to be in a downstream location to the attenuation tank. The LLFA requires a preliminary indication of the drainage design is developed in full at a later stage. The LLFA notes the geocellular tank is to demonstrate the proposed outlined drainage system sis achievable when the drainage design is developed in full at a later stage. The LLFA is not able to determine from the drawings if the geocellular drainage systems determines that the geocellular tanks must be at least 2m plus the depth of the storage structure from the foundations of a building. Due to the space constraints the LLFA will require demonstration from the applicant the proposed Geocellular tank is able to meet this requirement. This is to demonstrate the proposed dustined drainage system is achievable when the drainage design is developed in full at a later stage. The text in the drainage targe (paragraph 4.47 to 4.5.2) does not include a pump in the description, yet it is shown on the plans in Appendix K. The LLFA requires confirmation of whether the pumps is to be included or not as it is a significant component of the proposed drainage system. Furthermore the drainage streagy will need to be updated to reflect the design appropriately. Based on the information	The LLFA notes the additional deta eastern boundary of Block E. The LLFA notes additional capacity provided and the residual risk rema The LLFA notes the 3.3% AEP +40% EAS Response - Rev C Submission 1:100yr + 45% Climate Change und Climate Change Event only.
0.7 response to 2.10 for system 7	drainage design is developed in full at a later stage. System 7 relates to Block F - Outline It is not clear to the LLFA how a discharge rate of 20 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. The LLFA requires this information. The LLFA notes that this is part of the outline planning application, however, the LLFA require an indication of the approximate size and location of the proposed green roofs within the drainage area. It is not clear whether the geocelluar tank will be lined or not, this is particular relevant in an area where the geocellular tank crosses the permeable paving. It is not clear if water will be able to infiltrate through the tank walls for this feature or whether water will be able to enter solely through the single denoted inlet to the south of the permeable paving. The LLFA requires clarifications on this matter. The LLFA requires clarifications on this matter. The tLFA requires transport of the outgragraph 4.53 to 4.59) does not include a pump in the description, yet it is shown on the plans in Appendix K. The LLFA requires confirmation of whether the pump is to be included or not as it is a significant component of the proposed drainage system. Furthermore the drainage strategy will need to be updated to reflect the design appropriately. The below ground infrastructure for the pumping station is indicated however it is not clear whether there will be any above ground control kiosk for the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA sequires confirmation of the proposed outline arrangements for the control kiosk. • The below work of the geocellular tank is not pointing at the tank rather its pointing to the permeable paving. Please correct. • The open space areas in the centre of Block F and to the north of Block F shows outlets from the bioretention tree pits from these features. However	The LLFA have reviewed the propo The LLFA notes the 3.3% AEP +40% EAS Response - Rev C Submission 1:100yr + 45% Climate Change und Climate Change Event only.
).8 response to 2.10 for system 8 line	System 8 relates to Blocks G and J - Outline • It is not clear to the LLFA how a discharge rate of 70 I/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. • The LLFA notes that this is part of the outline planning application, however, the LLFA require an indication of the approximate size and location of the proposed green roofs within the drainage area. • It is not clear whether the geocelluar tank will be lined or not, this is particular relevant in an area where the geocellular tank crosses the permeable paving. It is not clear if water will be able to infitrate through the tank walls for this feature or whether it will be solely through the denoted inlets. The LLFA request clarifications on this matter. • The text in the drainage strategy (paragraph 4.60 to 4.66) does not include a pump in the description, yet it is shown on the plans in Appendix K. The LLFA requires confirmation of whether the pump is to be included or not at it is a significant component of the proposed drainage system. Furthermore the drainage strategy will need to be updated to reflect the design appropriately. • Based on the information provided in the plans, it is not clear to the LLFA what the feature is that extends from the downstream side of the geocellular crate to the pump (chamber. The LLFA requires clarification on what this feature is from the applicant as there is nothing shown either in the drawing or in the legend of the drawing. • The below ground infrastructure for the pumping station is indicated however it is not clear whether there will be any above ground control kiosk. For the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA observes that the discharge for the system 8 is in part shared with the discharge from System 9. The discharge route of the off-site pipe run is proposed to pass under trees. The LLFA observes that the drainage area for System 8 on the western side is within the	The LLFA have reviewed the propo The LLFA notes the 3.3% AEP +40% EAS Response - Rev C Submission i + 40% Climate Change, 1:100 and 3
1.9 response to 2.10 for system 9 line	System 9 relates to Block H - Outline • It is not clear to the LLFA how a discharge rate of 24.5 l/s was derived and how this relates to the pre-development greenfield runoff rate for the drainage area. • The defined drainage has a small triangle on the south western corner of the system drainage catchment. The LLFA questions whether this is realistic? The LLFA suggests this little slither should be included in the System 5 drainage area. Please adjust the catchment areas accordingly. • The LLFA notes that this is part of the outline planning application, however, the LLFA require an indication of the approximate size and location of the green roof within the drainage area. • The discharge route of the off-site pipe run is proposed to pass under trees. The LLFA does not find this route acceptable and requests the pipe is not placed under two trees. • Minor point the label arrow for the geocellular tank is not pointing at the tank rather it's pointing to a room in Block G. • The geocelluar tank appears to be under features between Block H and Block G. The LLFA seeks clarification from the applicant about what these features are as it is not shown on the drawing. • The text in the drainage strategy (paragraph 4.67 to 4.72) does not include a pump in the description, yet it is shown on the plans in Appendix K. The LLFA requires confirmation of whether the pump is to be included or not as it is a significant component of the proposed drainage system. Furthermore the drainage strategy will need to be updated to reflect the design appropriately. • Based on the information provided in the plans, it is not clear to the LLFA what the feature is that extends from the downstream side of the geocellular crate to the pump chamber. The LLFA requires clarification on what this feature is from the applicant as there is nothing shown either in the drawing or in the legend of the drawing. • The below ground infrastructure for the pumping station is indicated however it is not clear whether there will be any above	

details provided regarding the pumps and the chamber. The pumping station kiosk is proposed to be located on the

pacity in the attenuation tank was not included due to limted space. A more robust pump and tank monitoring system was k remains should an operational failure of the system occur.

+40%CC calculations have not been provided. *LLFA condition recommended*

sion includes modelling for all Storm Events required by LLFA - 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and e undertaken for Full Application Drainage Systems. Outline Drainage Systems have been modelled for the 1:100yr +45%

proposed design information against the previous coments and these issues are now addressed.

+40%CC calculations have not been provided. *LLFA condition recommended*

sion includes modelling for all Storm Events required by LLFA - 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and e undertaken for Full Application Drainage Systems. Outline Drainage Systems have been modelled for the 1:100yr +45%

roposed design information against the previous coments and these issues are now addressed.

+40%CC calculations have not been provided.

sion now includes all Storm Events required by LLFA modelled for all Drainage Systems (Full and Outline) - 1:2, 1:30, 1:30 and 1:100 + 45% Climate Change.

proposed design information against the previous coments and these issues are now addressed.

+40%CC calculations have not been provided. *LLFA condition recommended*

sion now includes all Storm Events required by LLFA modelled for all Drainage Systems (Full and Outline) - 1:2, 1:30, 1:30 and 1:100 + 45% Climate Change.

				 Outline design calculations have been provided in Appendix J to support the initial tank sizing. There is no modelling of the outline drainage network for the system. As Block H has multiple roofs that appear in a downstream location to the attenuation tank, at this time the LEA requires a preliminary indication of the drainage network to demonstrate that a workable solution to discharge the surface water to the tank. This is to demonstrate the proposed outlined drainage system is achievable when the drainage design is developed in full at a later stage. The LEA notes there again is no additional capacity within the attenuation tank for the residual risk of pump failure. As it normally takes around 24 hours for a digust to mitigate the impact of this failure. The open space area in the centre of Block H shows a bioretention swale outlet and a bioretention tree pit outlet are positioned within these features. However, it does not show how they are intended to connect to the drainage system or relate to each other. This is to demonstrate the proposed outlined drainage system is achievable when the drainage design is developed in full at a later stage. The LEA is not able to determine from the drawings if the geocellular structures are an appropriate distance from the foundations of Block H. The notes space area go of modular geocellular drainage systems determines that the geocellular tanks must be at least 2m plus the depth of the storage structure from the foundations of a building. Due to the space constraints the LEA will require demonstrate the geocellular tank is able to meet this able to determine the space outlined drainage system is achievable when the space outlined drainage system descellular tanks must be at least 2m plus the depth of the storage structure from the foundations of a building. Due to the space constraints the LEA will require demonstrate the proposed in full at a later stage. 	
2.11 Whole	Provide the proposed discreet drainage catchment areas and supporting information on a plan for each of the proposed systems in accordance with the LLFA Developer Guidance.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	Provided in plans in Appendix K (Drawing no. 3831-DR-001, 3831-DR-002, 3831-DR-003 and 3831-DR-004, dated 13/07/2022). Shown as dashed coloured line. The System Information Summary box has the same coloured dashed line as the discreet drainage area. This is shown for all 9 drainage systems.	Previously provided
2.12 Whole	Undertake an assessment that demonstrates how the proposed SuDS systems meets the four pillars of SuDS in accordance with the LLFA Developer guidance and in relation to Policy E9 of the Local Flood Risk Management Plan.	See paragraphs 5.4, 5.9, 5.13 and 5.16.	Addressed in Drainage Strategy Report prepared by EAS	Consideration of the textual information regarding the four pillars of SuDS (water quantity, water quality, biodiversity and amenity) and the benefits provided by the various SuDS elements included in the system. The SuDS features included in this as assessment are Green Roofs, bio-retention swales, tree planters (also known as Tree Pits) and Pervious Pavement (although the description given is for permeable paving rather than pervious paving). The LLFA notes the applicant is intending to include areas of permeable block paving in the design, however they have also referred to pervious paving (such as pervious ashfelt is laid). The LLFA requires clarification on which surfacing system is being proposed by the applicant.	This information is now included v
2.13 Whole	Undertake a further assessment and consideration of the carbon impact of additional pumps operating on this site is recommended in accordance with Policy E8 of the Local Flood Risk Management Plan.	A further assessment of the carbon impact of pumps has been undertaken by the M&E Engineer and is included within their report.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed the Drainage Strategy and the Drainage Strategy Addendum Letter. In the Drainage Strategy Addendum Letter the applicant states that "the primary objective of the design is for the systems to operate under gravity, thereby avoiding the need for pumps which generate carbon emissions from their operation. Wherever possible and where cover and invert levels of receiving adopted severs allow, surface water runoff from the development site is attenuated and restricted using gravity-type flow control devices, such as hydro brakes or office plates. Where the proposed drainage and storage devices cannot be shallower than the adopted sever network due to cover levels length of drainage network, attenuation volumes and spatial constraints, it is necessary to pump restricted flows. The use of surface water pumping stations to serve some catchments within the development site is unavoidable though is only proposed where necessary". The LFA compares this commitment to the proposed surface water grainage design and notes that of the nine proposed systems only two discharge using gravity. Therefore, the applicant's proposed design puts forward that seven of the nine surface water systems on site will have a pumped discharge. This is a significant reliance on a pumped drainage system for a site in the lower end of the largest critical drainage catchment in the county. These pumped drainage systems are proposed to discharge to three out of the four discharge locations. This is not in keeping with the terms of Anglian Water's agreement in principle. The applicant considers the operation approach in order to minimise carbon emissions during the peak flow rate through attenuation and flow control devices to reduce the size of the pumps and hence their power demand. • pump operation controlled on levels within the chamber to ensure they only operate when required. • approprint the extering and flow rate through attenuation and flow control devices to reduce the size of the pumps and hence their power demand.	The LLFA has reviewed the additic design is developed for this area. planning application areas to redu applications for areas included in Noted
				The pump operation being controlled on levels needs to ensure the design attenuation volume of the tank is returned within at least a 24 hour period, although preferably sooner. Also where the attenuation tanks are unable to prevent the offsite flows entering the tanks, pumps operating of levels need to better understand how to manage these flows in relation to tank volume management and carbon emissions management effectively. The inclusion of appropriate metering of the development control systems is welcomed. However no information has been provided in either the Drainage Strategy or the Drainage Strategy Addendum Letter about where the pumping station controls will be located or what arrangements for the controls of the pumps are proposed. On review of the maintenance and management plan in Section 6 of the Drainage Strategy, there is no maintenance schedule included for the proposed pumps. However, a review of the residual risks associated with the pumps is provided. While this considers the risk of lack of maintenance of the pumps and commits to including the a secondary (backup) pump in each of the systems, there is no consideration on the site about loss of power to the site. As the majority of the site is proposed to be served by a pumped surface water drainage network located in critical drainage catchment with a significant surface water flow route passing through part of the site, will there be an independent back up power supply to the pumps? Some of these issues overlap with other comments within our response or provide a contradiction to other aspects of the application. Further information will be required in particular the greenfield runoff rates, tank sizing, pump operation, residual risk management and the maintenance and management arrangements all need to be resolved in order to demonstrate the efforts to minimise carbon emissions is demonstrated.	
2.14 Full	Prepare a surface water drainage phasing plan for the development.	Weston Homes have provided a Draft Phasing Strategy document which is included in the Rev A Submission. This shows the following blocks to be delivered in each phase. Phase 1 = Block A, B, C, D and M Phase 2 = Block K/L and J3 Phase 3 = Block H, G and J Phase 4 = Block E and F The proposed drainage strategy allows for Blocks B, C, D, E, F, G, J and H to be managed by stand-alone drainage systems that do not rely on other phases to be built. System 4 managing Blocks A, M, J3 and K/L shall be delivered in Phases 1 and 2 and as such it is anticipated that a temporary drainage network, comprising as much of the designed drainage for Block A and M Shall be installed in Phase 1 and shall be linked with Block K/L and J3 in Phase 2. As these phases follow each- other, it is considered suitable to allow for one drainage system to cover two phases.	prepared by EAS	The LLFA reviewed ES Addendum A2 Updated Phasing Strategy which contains a series of plans that identify the activities to be undertaken at and within each phase. The activities relate to the construction of the dominant structures and not the supporting infrastructures such as surface water drainage and sewer diversions. The LLFA notes that in phase one, Blocks B and C will discharge to Edward Street while Blocks A, D and M will discharge in to the diverted sewer which is not mentioned in the phasing plan. As the phase one is under consideration of full planning application and as the diverted surface water sewer currently serves a large number of properties upstream of the proposed development which are all within a critical drainage catchment, the LLFA requires details of the proposed diversion of the sewer and the management of surface water runoff during the construction phase. It is likely that some dewatering activities are likely to be required during the construction of the basement car park. This is scheduled to start at the beginning of Q1 2023 and complete by the end of Q1 2025. The LLFA notes the phasing schedule shows the ground floor of the phase one blocks A, D and M will be undertaken between Q2 and Q3 of 2023. Therefore, on consideration of all these factors the LLFA request that further detail is provided in the Phasing Strategy to show when the surface water drainage will be constructed and sewer diverted in relation to the construction of each of the blocks in Phase One. The LLFA observed the schedule identifies that the ground level for Blocks A, D and M will be undertaken between Q1 and Q3 of 2023. Therefore, on consideration and and block with the Wate MA water which will be undertaken the tween Q2 and Q3 of access with the Water Water Maximum A. This is and the ground level for Blocks A, D and M will be undertaken between Q2 and Q3 of access and Q3 of access A. D and M will be undertaken between Q4 and Q3 of access the schedule identifies that the ground level for Blocks A, D and M will	The LLFA has reviewed Appendix I email discussion between the app discharge arrangements that will development until the permanent *LLFA Condition recommended* Noted

ded within section 5 of the drainage strategy report.

dditional information for the hybrid application. Further information for the outline application area will be provided as the area. The applicant has committed to reviewing and where appropriate revising the discreet drainage areas in the outline o reduce the need for pumps further at a later stage of design. The LLFA will expect this to be undertake on all future ed in the outline area that serve blocks E, F, H, G and J. *LLFA condition recommended*

ndix U of the Drainage Strategy which contains a construction phasing plan relevant to the surface water drainage and an e applicant and Anglian Water who have agreed to the proposed approach. The LLFA notes complex phasing surface water t will be greater than the proposed final runoff rate. The LLFA recommends a condition that prevents first occupation of the anent surface water discharge rate is achieved. This is to ensure there is no increase in surface water flood risk from the site ded[#]

2.15 Who	i	Provide updated water quality assessment information that acknowledge the inclusion of all elements of the SuDS system.	See Section 4 showing water quality treatment features for each catchment.	Addressed in Drainage Strategy Report prepared by EAS	Greenroofs have not been included within the water quality assessment. This appears to have lead to the greater need to incorporate a secondary treatment process. The LLFA notes that in the applicant is likely to be able to better demonstrate water quality benefit if they apply the indices given in Annex 5, Table 26.14 and Table 26.15 of the Ciria SuDS Manual (C753) which includes figures for Green Roofs. The LLFA will expect the Water quality assessment to be updated to include the greenroofs.	The LLFA have reviewed the propr against the previous comments ar
2.16 Full	c	Provide further information regarding the water quality management approaches required for the construction of the proposed development	See Section 7	Addressed in Drainage Strategy Report prepared by EAS	Insufficient information has been provided for the area under full planning application for the water quality management approaches during the construction phase. At present there is very limited consideration of sediment ingress management to the sewers within the largest critical drainage catchment in Norfolk. Section 7 of the drainage strategy indicates the applicant's intention to manage the sediment movement through management practises and the installation of silt traps and oil interceptors. However no temporary surface water drainage plan has been provided to identify the locations where the temporary sediment traps are to be installed along with a size indication, the maintenance and management arrangement and confirmation of when these temporary sediment traps are to be removed and how the assessment of any remedial works will be undertaken should it be identified as necessary. A commitment from the applicant to undertake an asset condition inspection of the sewers due to the development. This is to ensure that there is no deteriation in the condition of the sewers due to the development. This is to ensure the development does not increase flood risk elsewhere due to the construction activities undertake in this sensitive catchment.	The LLFA have reviewed the propo addressed. The LLFA notes that a condition that requires further inf each phase. No construction work reduction in surface water from th Noted
2.17 Full , Who	s / r	Identify and assess the residual risk and provide suitable mitigation associated with the management of pumps and the attenuation tanks.	See paragraphs 4.75 to 4.77.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the Drainage Strategy as referenced in the applicant's response. Paragraph 4.77 states the flowpaths for the exceedance routes greater than the 1% AEP +45% climate change allowance are shown in Figure 1. On review of Figure 1, there is no legend for the information on the figure. The information provided relates to some numbers (possibly levels) inside boxes. It is not clear what these numbers relate to nor are they clear to read due to the resolution quality of the image. The clarity of the arrows in the image is also not clear due to the resolution. The quality of the figure needs to be improved and a legend included. Figure 1 also includes an aerial base image and the what appears to be a hazard map. The hazard map extent outline in Figure 1 for an undefined "event greater than 1% AEP plus 45% for climate change was compared to the hazard maps given in the FRA Appendix J and the drainage strategy Figure 1, with the extents in figure 1 being significantly smaller even though the text in paragraph 4.77 to 4.78 infer event modelled was greater and the hydraulic model representation of the sewers assumed they were nearly at full capacity and no surface water drainage was present. Therefore, the results shown in Figure 1 are contradicting those shown in the FRA. Further information regarding the hazard extents, how they were derived and what event they are for in the report and the supporting figure.	Uncertaintly in modelling is reduc maps are not included in the mod Extents appear to match between The exceedance flow route plan h floor / ground levels. Some of the Strategies. EAS Response - Appendix R does remedied for the Rev C Submissio
2.18 Who	s a ole t	Provide a site layout plan that demonstrates all surface water drainage features sized appropriately and to ensure suitable space is available within the proposed development. The design should be in accordance with both the LLFA Developer Guidance, the Ciria Suds manual, the building regulations and other relevant local and national guidance, practices and policies.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the Drainage Strategy Appendix K plans. The LLFA is not able to determine from the drawings if the geocellular structures are an appropriate distance from the foundations of BlocksC, D, E and H. The LLFA notes that section 3.1 from Ciria C737 on the Structural and geotechnical design of modular geocellular drainage systems determines that the geocellular tanks must be at least 2m plus the depth of the storage structure from the foundations of a building. Due to the space constraints the LLFA will require demonstration from the applicant the proposed Geocellular tank is able to meet this requirement. This information must be provided for all blocks within the full and outline planning application areas to demonstrate the proposed drainage design for the affected systems is achievable. In addition the LLFA notes that while there are pumping stations shown in manholes, there are no pumping station kiosks included in the proposed design layout shown on the plans. The LLFA reminds the applicant the level of the control kiosk for the pumping station should be above the design flood water level and include appropriate freeboard as defined in the LLFA's Developer Guidance in section 20.3. The LLFA requires confirmation of the proposed arrangements for the control kiosk for both the full and outline planning applications with obviously more detailed information being required for those in the full planning application area.	The LLFA have reviewed the varion are now addressed.
2.19 Full) v	Provide detailed information of the design and operation of the flood barrier for inclusion within the hydraulic model as part of the full application.	Addressed in Royal Haskoning DHV FRA Report.	Not required – Alternative mitigation measures discussed in Section 8	The LLFA notes that the basement car park mitigation has changed to include a hump at the entrance 300mm above the 100y + 45% CC. This is modelled at the level described in the FRA (4.8mAOD) and maps in Appendix I show no flooding. A wall has been included around the basement car park at 999m, this is considered acceptable provided the precautions to ensure the carpark is watertight, described in Section 8.16-8.19 of the FRA, are adhered to and airbricks/ window/ doors etc. are above the modelled water levels adjacent to the walls.	Previously provided
2.20 Full , Whc	/ s	Update the hydraulic model and the drainage strategy to ensure they are consistent with other technical disciplines' submissions.	See Appendix J and K.	RHDHV have further liaised with EAS and Weston Homes to ensure consistency with respect to the updates.	The LLFA has reviewed the information provided in Appendix J (microdrainage calculations) and K (drainage strategy plan). The information provided in these appendices has improved as the plans now include information about the location of more of the SuDS features such as swales and tree pits. However, not all the information has been included such as the outline indication of the green roof positions for Blocks in the outline planning area. The information in Appendix J is also not consistent with the information used with the FRA assessment as no downstream boundary data has been applied to represent the typical flow in the AW severs for the various discharge locations. This information could be provided by AW from their own models or flow sensors. Although it is clear from the review of the FRA and surface water flood risk hydraulic modelling report that the information used in this model is requires further clarification (see response comments to 3.2). In addition, the LLFA note that the MADD factor is currently set to 2 when it should be set to 0, otherwise this increases capacity within the server network without the capacity very being constructed. The LLFA also notes that calculations for only the 1¼ +45% for climate change were submitted, however no modelled information or calculations were provided for the 3.3% + 40% for climate change allowances/tusing-peak-rainfall-intensity-allowances-to-assess surface-water-flood-risk) which clearly states in the peak rainfall intensity that "You must do this for both the 1¼ and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125)." This is also required by the LLFA Developer Guidance. This means the application is not in accordance with NPPF.	Both Clarification has now been receive 40% climate change results are no The Drainage Strategy has also ap rainage networks ahve not been n EAS Response - Rev C Submission 1:100yr + 45% Climate Change un Climate Change Event only
2.21 Who	L r c ole s	An assessment of the surface water treatment required for all elements of the proposed development to determine whether the SuDS system is providing an appropriate amount of water quality treatment.	for all elements of the proposed tent to determine whether the SuDS providing an appropriate amount of		The LLFA have reviewed relevant j	

proposed design information in section 4 of the Drainage Strategy, supported by other areas of the drainage strategy, nts and these issues are now addressed.

proposed design information in section 7 of the Drainage Strategy against the previous comments and these issues are now nat a treatment unit is proposed but there is no further information about the treatment unit. The LLFA recommends a er information about the temporary treatment unit and its installation as a priorty activity in the enabling works activities for work can progress until confirmation of the treatment unit installation has been provided. This is to ensure there is no om the site during the construction phase "LLFA Condition recommended"

educed to expected levels (See comments in Section 3) . Therefore usual freeboard allowances can be applied. The Hazard model report so have reviewed FRA 1% AEP + 45% maps vs depth maps in the hydraulic modelling report as a sense check. ween the modelling report and FRA, areas of greatest hazard coincide with greatest depths as expected.

lan has been provided in Appendix R of the Drainage Strategy. This shows the exceedance flow routes but not the finished f the finished floor / ground levels are provided in the surface water drainage plans in Appendix O of the Drainage

does show proposed ground levels, however it is appreciated that the text may have been difficult to see. This has been nission.

various plans provided in Appendices M, N and O of the Drainage Strategy against the previous comments and these issues

ceived relating to information used within the hydraulic model as per comments in section 3.2. Additionally, the 3.3% AEP + re now included in the surface water modelling mapping outputs.

o applied these climate change allowances, although the LLFA note the 3.3% and 3.3%+CC scenarios for the surface water d en modelled for the Outline application areas.

ission includes modelling for all Storm Events required by LLFA - 1:2yr, 1:30yr, 1:30yr + 40% Climate Change, 1:100yr and ge undertaken for Full Application Drainage Systems. Outline Drainage Systems have been modelled for the 1:100yr +45%

vant paragraphs of section 4 of the Drainage Strategy against the previous comments and these issues are now addressed.

					System 5 - There is a lack of information regarding the water quality treatment to be provided by the downstream defender along with no inclusion of the bio-retention areas. As these elements are within the full planning application area this information is required to be provided at this time. System 6, 7, 8 and 9 - There is no inclusion of the proposed green roofs (see response 2.15) and there is a lack of information regarding the water quality treatment to be provided by the downstream defenders on each of these. As these elements are within the outline planning application area this information is required to be provided on the submission of the detailed design.	
2.22 Who	2	A surface water drainage design that includes a site plan with appropriately sized SuDS Features and conveyance with both the LLFA Developer Guidance and the Ciria SuDS Manual.	See Appendix K.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the proposed drainage strategy plan in Appendix K of the Drainage Strategy. At present the LLFA considers the plan to be incomplete as SuDS features proposed to be incorporated into the design and the support principle infrastructure has not been included on all the nine drainage systems being proposed on site. Furthermore, some of the items shown on the plan are not included in the system description within section 4 (see Response 2.10). This contradiction leaves the LLFA unsure about what is being actually being proposed and committed to within the application. In addition, the LLFA notes that brown roofs are mentioned for inclusion in the design in paragraph 6.2 of the drainage strategy but there is no further information within the drainage strategy of where these brown roofs are to be located. Further clarification of the design along with the inclusion of key elements in the propose drainage plan is required for both the outline and full areas of the planning application.	The LLFA have reviewed the Drai
2.23 Full	3 	Identification of the structures to be placed below ground and an assessment of the risk of groundwater flooding and specific mitigation measures to manage the groundwater flood risk to those structures where required.	Addressed in Royal Haskoning DHV FRA Report.	Included at 7.10 onwards and 8.52	No mention of groundwater in the hydraulic modelling report. There is very limited historic groundwater levels from between the 1970s and mid 1990s that gives an indication of shallow groundwater While there is no site specific groundwater monitoring to ascertain whether there would be infiltration into the system. However, the LLFA can accept the conclusions of the FRA in section 7.16 that states "the site is considered to be at moderate risk of flooding from groundwater. This could impact the proposed below ground basement car park and the service yard, which is lower than the existing ground level." A review of section 8.52 to 8.58 in the FRA which states "the basement car park and service yard will be made water-tight ('tanked') to prevent water ingress.", "a sump pump will be included in both of these areas as a failsafe" and that "All subsurface surface water drainage infrastructure must be designed with high groundwater levels in mind at the detailed design stage, so that rising groundwater levels of all buildings in the proposed development are not raised above ground level. Therefore should the groundwater reach surface level groundwater ingress is possible. The LLFA requires that the appropriate freeboard allowances are applied to all buildings within the proposed development in accordance with the LLFA Developer Guidance (section 20.3).	The LLFA have reviewed the FRA applicant. In paragraph 8.68, the The LLFA notes that this is lower where the applicant was able to Informative - The FRA states "Gr flooding and implement measure sustained over a much longer tim
2.24 Who	t ole	A Maintenance and Management Plan detailing the activities required to manage the proposed SuDS including confirmation of ownership, maintenance responsibilities and in principle agreements.	See updated Section 6.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed section 6 of the Drainage Strategy where the applicant was able to confirm that a management company would be responsible for the private surface water sewers, attenuation tanks and green/brown roofs. However, there is no indication of who will be specifically responsible for the areas permeable paving, pumps, downstream defenders, bio-retention areas and bioretention swales. Some of the proposed surface drainage network is within the roads to connect to the AW sewers but it is not clear (particularly on the full drainage application area) the extent of each network that will not be under the management of the management company. Further information is required to better define the extent of the responsibility of the management company. For the proposed surface drainage network is within the roads to connect to the AW sewers but it is not clear (particularly on the full drainage application area) the extent of each network that will not be under the management of the management company. Further information is required to better define the extent of the responsibility of the management company. A review of the maintenance schedules in section 6 shows that no maintenance schedule for the pumps, downstream defenders, bio-retention areas and bioretention swales has been provided. The maintenance and management plan is required to be updated to identify who will be responsible for the maintenance and management of the features not included in the plan and the maintenance schedule for the features not included at present.	The LLFA have reviewed section (
2.25 Who		2.25 Provide an updated assessment of the suitability of the different types of SuDS components on the site.	See Table 4.1.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA have reviewed Table 4.1 and acknowledge the table has been updated.	Previously provided
2.26 Full	5	2.26 Provide further evidence to support the viability of the Edward Street Service Yard residual risk mitigation and provide clarification on whether an automated flood barrier could be installed.	Addressed in Royal Haskoning DHV FRA Report.	Flood barrier no longer required – see 5.38- 5.43	Mitigation is discussed in Section 5.4.1. The maps in Appendix I show no flooding of the service yard in the proposed mitigation scenario, depths adjacent to the barrier are Max 0.1m and adjacent to the building wall are 0.2m. Representation of these features in the model are described in section 7.3.2 of the modelling report (extract in modelling column). The ground levels modelled for the entrance hump match the proposed mitigation levels, which is considered reasonable. The walls are modelled as 999m high, depths against them do not exceed 200mm, therefore this is considered are assonable representation provided that any doors/airbricks in the wall between Block M and the service yard are above this level, as inputting exact levels in this instance would not change modell results. Section 8.12 of the FRA states "No openings such as air bricks, doors or windows should be included in the neighbouring wall with Block M, to prevent water ingress into the surrounding blocks". The LLFA notes the word "should" is used and requests clarification that these measures will be taken. Additionally, please note LLFA comment responses 3.1 to 3.2.2 relating to remaining concerns with the model set up and consequently results.	FRA - The LLFA notes the FRA cor modelled water depth in the yar hump in the access area to preve flow into the service yard.
2.27 Full	,	The Emergency Flood Plan should be prepared in accordance with the ADEPT guidance (2019), available at https://adeptnet.org.uk/floodriskemergency plan and demonstrate ongoing liaison with the relevant Emergency Planning Team	Addressed in Royal Haskoning DHV FRA Report. It is understood that The Emergency Planning Team (Teresa Cannon) has confirmed that this can be Conditioned.	Acknowledged. Norwich City Council Emergency Planning Team were contacted and agreed the Flood Plan could be conditioned (Appendix M and 8.41)	The LLFA are pleased the applicant has agreed to use the Flood Plan Guidance by ADEPT/ Environment Agency to prepare the Flood Plan for each of the blocks. The LLFA advises the LPA that NPPF Paragraph 167 (e) states that "When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that: (e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan." The applicant's own surface water flood risk modelling and FRA identifies significant flood risk remains on site once the site has been developed. This indicates that an emergency plan should be provided prior to determination of a planning application. Therefore the LLFA would advise the LPA that the applicant's proposal to discharge this requirement by conditioning is not in accordance with the NPPF requirements.	FRA - The LLFA confirms the FRA rain gauges on the blocks is requi
2.28 Full	3	An assessment of the potential to install some flow and level monitoring gauges to enable the site manager to monitor and manage the flood risk on site.	Addressed in Royal Haskoning DHV FRA Report.	No longer required – Section 8 discusses amended mitigation measures	The LLFA notes the change in mitigation approach for both the below ground level service yard and the basement car park. However, in a review of section 8 of the FRA, we note there is reference to a flood warning and evacuation plan in relation to Block C (Section 8.22 -8.23), as well as a site wide warning and evacuation plan (Section 8.26-8.40) and a flood warning notice for the south east of block J. The LLFA notes that section 8.2 and 8.3 indicate which development blocks are at flood risk however there is no summary of which roads and pedestrian access routes which are at surface water flood risk. The LLFA notes that section 8.2 and 8.3 indicate which development blocks are at flood risk however there is no summary of which roads and pedestrian access routes which are at surface water flood risk. The LLFA notes that "is impractical to prevent offsite flows entering the onsite drainage system in some areas". However, within the Drainage Strategy there are no allowances given within the drainage design for the any offsite surface water that may enter the system. The LLFA notes the proposed use of tank alarms for tanks affected by offsite site flows when they reach 75% capacity. The alarm would trigger a co-ordinated response to warn all the relevant ground floor properties of the potential flood risk to they can close and prepare for potential flooding as appropriate. However, the FRA (section 8.7) also acknowledges that a present they do not know if the 75% capacity is will give a suitable amount of time for properties to evacuate and prepare for potential flooding by stating "The 75% capacity is will well was onsidered to be acceptable if all other forms of mitigation have applical. However, the application and therefore have not demonstrated there is a residual risk. Rather this approach is to address an unmitigated design risk. The LLFA Soeveloper Guidance requirements in section 20.3 . In Section 8.9 of the FRA, provides a link to a website of an example of an alarm system that could be used (RDNET1000	commercial units have been raiss measures to be installed at relev condition recommended* F62 The hydraulic modelling is used t represented in the surface water assessed as part of the microdrai

Drainage Strategy against the previous comments and these issues are now addressed.

FRA paragraph 7.10 on wards and 8.63 to 8.68 in relation to this comment and the associated response given by the the applicant confirms the finish floor level for the commercial units will be "raised at least 100mm above the ground level". wer that the LLFA requirements and will require flood resistance measures to be installed at relevant commercial properties e to only uplift the finished floor level by 100mm. ***LLFA condition recommended***

"Groundwater flooding occurs slowly so there would be ample time for ground level commercial uses to prepare for sures to prevent significant damage." However the FRA has not accounted for the fact that groundwater flooding is r timeframe that could last for months.

ion 6 of the Drainage Strategy against the previous comments and these issues are now addressed.

A confirms the modelling before any mitigation at the entrance of the Edward Street Service Yard shows that 1.02m of yard would be anticipated during a design flood with climate change. To mitigate this, the applicant proposes to constuct a revent water ingress from Edward Street. This was then modelled again and prevents surface water from the road would

FRA has a strategic Flood Emergency Warning and Evaccuation plan and block specific plans in place too. The inclusion of equired to support the warning system and from escalating the emergency plan based on local site specific conditions.

no longer referencing specific levels for the storm tank alarm. This is now suggested as an extra with the main evacuation are included to indicate any pump failure.

8.9, describes the use of tank alarms to monitor the water level within the surface water attenuation tanks combined with monitoring the performance and available storage capacity within the tanks. The LLFA notes that while the residential ise their finished floor level to meet the LLFA freeboard design requirements, while the finished floor levels for the raised by at least 100mm, this is lower that the LLFA's requirements. Therefore, the LLFA will expect flood resistance elevant commercial properties where the applicant was able to only uplift the finished floor level by 100mm. ***LLFA** 52

ed to identify vulnerable areas. The drainage system is included in the surface water model as inflows. The tanks are not ater hydraulic model. The LLFA did not observe any mention of the impact of offsite flows on the drainage system being drainage modelling. Therefore the only modelling of the offsite impact of flooding was undertaken in the RHDHV Hydraulic led results.

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F	.29 uli / Vhole	Update the assessment of the residual flood risks within the FRA for the proposed development and its components.	Addressed in Royal Haskoning DHV FRA Report.	Included at 8.59 onwards	This section does not reference the hydraulic model. FRA (Section 8.59) states that "in the event of a rainfall event greater than that considered in this assessment, the external areas may experience some flooding. The likely exceedance routes in this event have been considered in the Proposed Surface Water Drainage Strategy, prepared by EAS." This contradicts the statement in the drainage strategy that this will be addressed in the Royal Haskoning DHV FRA report. The LLFA requires this contradiction to be addressed and resolved. The residual flood risk assessment in sections 8.59 to 8.61 of the FRA is very limited and has considered a very limited range of residual risks that focus on blockage due to lack of maintenance and exceedance flooding. The information provided is vague and has not considered issues such as additional water capacity of attenuation tanks due to pump failure or loss of power (see Response 2.13 and other part of other responses). The LLFA note in general the FRA makes recommendations for mitigation but does not commit to what will be included within the design. In addition there is no detailed design information available to confirm what will be included in within the proposed design. A review of the design and access statement indicates that there is a difference in the amount of green roofs indicated between the Drainage Strategy and the Design and Access Statement, which means there is further inconsistency between the different documents that are supporting the planning submission and erodes the LLFAs confidence in the delivery of the proposed surface water drainage strategy. The various sub-sections of the FRA section 8 on Mitigation are inconsistent with other areas of the Drainage Strategy and Its Addendum Letter. For example, an example Flood Warning sign is included in section 8.22 for Block c which refers to both vehicle movements on the site and to where to put the sign in the car park, However, the LLFA is not able to identify any car parking shown on site in the surface wate	FRA - The LLFA reviewed the upda of tank capacity and the monitori
2 F		Inclusion of an updated Exceedance Flow Routes Plan for the site with proposed finished floor levels marked on.	Figure 1 in Section 4 updated to show levels as requested.	Addressed in Drainage Strategy Report prepared by EAS	The LLFA has reviewed the Drainage Strategy as reference in the applicant's response. Paragraph 4.77 states the flowpaths for the exceedance routes greater than the 1% AEP +45% climate change allowance are shown in Figure 1. On review of Figure 1, there is no legend for the information on the figure. The information provided relates to some numbers (possibly levels) inside boxes. It is not clear what these numbers relate to nor are they clear to read due to the resolution quality of the image. The clarity of the arrows in the image is also not clear due to the resolution. The quality of the figure needs to be improved and a legend included. Figure 1 also includes an aerial base image and the what appears to be a hazard map. The hazard map extent outline in Figure 1 for an undefined "event greater than 1% AEP plus 45% for climate change was compared to the theazard maps given in the FRA Appendix 1 for the 1% AEP plus 45% for climate change. The LLFA observed significant extent differences between the hazard map extents shown in the FRA Appendix 1 and the drainage strategy Figure 1, with the extents in figure 1 being significantly smaller even though the text in paragraph 4.77 to 4.78 infer event modelled was greater and the hydraulic model representation of the sewers assumed they were nearly at full capacity and no surface water drainage was present. Therefore, the results shown in Figure 1 are contradicting those shown in the FRA. Further information regarding the hazard extents, how they were derived and what event they are for in the report and the supporting figure.	The LLFA have reviewed the Drain finished floor levels were not sho
	.31 Vhole	Both the FRA and the Drainage Strategy require updating to address the large number of statements and conjecture that are not supported by evidence. These statements and assessment need to be evidence based for the statements to validated.	Noted and actioned.	Noted. This FRA is supported by evidence whe	The FRA and Drainage Strategy have been reviewed by the LLFA and it is acknowledge that some minor updates have occurred however, there are other significant updates that are required to ensure the surface water management is in accordance with both NPPF and the LLFA's Developer Guidance.	LLFA have more confidence that t
		Provide a proposed drainage design with supporting evidence (plans, calculations, modelling and detailed design) that provide evidence of inclusion and support the proposed offsite drainage of surface water for the car park entrance and the service yard entrance on Edward Street. The evidence should demonstrate that the mitigation is appropriate, operable and "agreed in principle" by Anglian Water along with identifying who will be responsible for the maintenance and management.	Addressed in Royal Haskoning DHV FRA Report.	Drainage from service yard to Anglian Water sewer in Edward Street no longer required as service yard will not flood in any event up to and including the 100 year (+45%CC) event. A drain with a flap valve has been included in this area which now connects into the onsite drainage system in the event that an event greater than the 1 in 100 year (+45%CC) occurs and floodwater reaches this area. (Discussed in 8.11)	The LLFA has reviewed both the Drainage Strategy and the FRA with regard to the Edward Street Service Yard internal drainage solution and flood mitigation approach. The FRA has included a 300mm hump in the service yard entrance to prevent water entering the yard and has confirmed that a drain is located in the service yard to discharge any exceedance flow that may entre the yard (See section 8.11). The Drainage Strategy plan in Appendix K indicates that a gully will be included in the service yard to discharge any exceedance flow that may entre the yard (See section 8.11). The Drainage Strategy plan in Appendix K indicates that a gully will be included in the service yard to discharge any exceedance flow that may entre the yard (See section 8.11). The Drainage Strategy plan in Appendix K indicates that a gully will be included in the service yard to discuss the inclusion of this gully no is their any indication that a flap value will be installed. In the hydraulic Modelling report it is stated that a inlet pit has been included in the surface water flood model with a flap value. This inlet pit is to drain any exceedance flow from the service yard into the diverted Anglian Water sever via the onsite drainage system. The modelling report has indicated that as the inlet pit was not used in the 1%AEP 445% CC "proposed scenario" model runs, it has not been included in the surface water drainage design (Section 7.4 (paragraph 6) in the Modelling report). The LLFA notes that no exceedance events were run to confirm this. In addition, there appears to be an inconsistent approach applied to the detailed drainage design of the service yard between the FRA, the Drainage Strategy and the modelling report. The LLFA requires clarification from the applicant and their different design on what the drainage proposals are for this area. The FRA response summary indicates that a flap valve was included in the design proposed but none is shown in section 8.11 of the FRA or the Drainage design for all areas of the full application	FRA was reviewed and indicates t volume of water to be drained thi entrance way. The updated drainage design and proposed development. The LLFA have reviewed the Drain
	33 Vhole	Provide clarifications from the applicant on whether the inclusion of flood doors have been considered on the proposed development.	Addressed in Royal Haskoning DHV FRA Report.	Flood doors are not required – all residential uses FFL raised at least 300mm above 100 year (+45%CC) flood level (Section 8 and 5.46)	The LLFA observes that the drainage strategy does not indicate that the finished floor levels adhere to the LLFA Developer guidance. It states "It should be demonstrated that the drainage system must be designed so that unless an area is designated to hold or convey water flooding must not occur in any part of a building or utility plant susceptible to water e.g. pumping station or electricity sub-station (Standard 58 of the SuDS Non-Statutory Technical Standards (2015))." (section 20.3 of the LLFA Developer Guidance). There is inconsistency between the approach taken in the drainage strategy and the approach in the FRA. The FRA indicates the residential buildings are raised approximately 300mm above the design flood event. However, on review of the FRA details in section 5.46 and section 8, the LLFA notes that no finished floor level is set only a freeboard allowance is provided with a maximum modelled water depth of 420mm. The FRA observes that the bin store in Block C is likely of flood but not the residential accommodation implying there are different flood levels within Block C. While in the Drainage Strategy, the finished floor level is set at a single finished floor level of 4.65m rather than 4.75m which would provide the 300mm freeboard allowance required. Regarding the other residential areas of the development there is less information available when compared to Block C. In the drainage strategy, the finished floor level is the street level. Therefore, there are inconsistencies between the FRA and ther rainage strategy on this matter and the LLFA further requests the applicant to provide the modelled flood level outputs for the site to evidence the setting of the finished floor levels. These should be provide for at least the proposed modelled scenarios.	The LLFA has reviewed the FRA ar and M being raised 500mm, while The LLFA has reviewed the inform freeboard allowances has been m LLFA's Developer Guidance, such a properties where the applicant w. The LLFA recommends that a cont with the LLFA's Developer Guidan properties by the applicant. *LLFA

updated FRA paragraph 8.69 to 8.74, which discusses a wider variety of residual risks assocated including pump failure, loss itoring sytsems to be put in place.

Drainage Strategy against the previous comments. The exceedance flow route plan showed the flow routes although the shown on this plan. These finshed floor levels were on the drainage layout plans.

hat this has been improved upon.

tes the flap is included along with the petrol interceptor to drain and treat water within the Edward Street Service area. The d through this system will be significantly lower than previously indicated due to the inclusion of the humps in the access

and surface water modelling shows there is a displacement of surface water offsite in the highways to the east of the

Drainage Strategy against the previous comments and the remaining issues are now addressed.

RA and notes that in paragraph 8.26 recommends a water exclusion strategy with the finished ground floor levels of Block A while in Block C a more modest 300mm above the design flood is proposed (paragraph 8.29).

Iformation on the drainage plans in Appendix O of the Drainage Strategy and can confirm that an improvement in the en made. However, there are a number of blocks with areas where the finished floor level is not in accordance with the such as some areas of Block D and A. Therefore, the LLFA will expect flood resistance measures to be installed at relevant in twas unable to uplift the finished floor level in accordance with the LLFA's Developer Guidance.

a condition is set that prior to construction of the proposed development where the finished floor level are not in accordance uidance, such as some areas of Block D and A, the LLFA will expect flood resistance measures to be installed at relevant *LLFA condition recommended*

2.34 Who	design approach a	n on whether an alternative and location was considered e car park entrance ramp on	Addressed in Royal Haskoning DHV FRA Report.	Included at 3.48-3.58	The LLFA have reviewed the FRA, the Drainage Strategy and the Modelling Report. The surface water model is not used to support the argument for it's location. The FRA reviewed sections 3.48-3.58 of the FRA as referred to in the applicant's response. It is clear from the response that there were many factors considered in the location of where to access the basement car parking but that flood risk was not one of the factors considered until raised by the LLFA as a significant concern. A permanent hump in the access way to the basement car parking has now been included but the location of the basement car parking has now been included but the location of the basement car parking access has remaining in an area of flood risk due to non flood risk related constraints. The LLFA remains concerns about the location of the access although we acknowledge that the flood mitigation access hump has been installed and the model demonstrates it is located as an appropriate level. It is not clear whether the residents will be prevented from accessing the basement during floods as driving vehicles through the water is likely to wash flood water in to the basement. The LLFA requires the applicant to commit to restricting vehicle access moves to the basement significantly during more extreme events. For example vehicles can leave the parking facilities but not return until flood water has drained away from the road and access way area.	The LLFA reviewed the FRA parag the statement that indicates that to the masterplan, the access nee move the access point to the wes prioritised the cycle route alignm accurately reported in the applica
2.35 Full	basement car par	sment of flow entering the rk should mitigation not be silure of mitigation measures.	Addressed in Royal Haskoning DHV FRA Report.	Model was run for proposed scenario with no mitigation measures – 5.39-5.40 and Table 3	The LLFA observe that the model has been simulated without the barrier to the basement carpark included. Appendix I shows flood depths of 0.1-0.2m in the unmitigated scenario and no flooding in the mitigated scenario. The LLFA notes that proposed mitigation has changed to include a hump at the entrance 300mm above the 1% AEP + 45% (limate Change. This is modelled at the level described in the FRA (4.8mAOD) and maps in FRA Appendix I show no flooding. A wall has been included around the basement carpark at 999m, which is considered acceptable provided the precautions to ensure the carpark is watertight, described in Section 8.16-8.19 of the FRA, are adhered to and airbricks/ window/ doors etc. are above the modelled water levels adjacent to the walls. Additionally please note LLFA comment responses 3.1 to 3.2.2 relating to remaining concerns with the model set up and consequent results. These will need to be acted upon and then reviewed against this issue subsequently.	The LLFA has reviewed the FRA ar some outstanding issues with the
2.36 Who	scheme that in ac "the development	the proposed development cordance with NPPF where it should be made safe for its ncreasing flood risk elsewhere."	Addressed in Royal Haskoning DHV FRA Report.	Discussed in Sections 6 and 8	Section 6 of the FRA report outlines the impact of the development on flood risk Section 6.9 states that "Various limitations mean that the level of flooding shown in Appendices I and K may be overestimated." Section 10.2 of the modelling report outlines some limitations of the modelling, the LLFA acknowledges these limitations. However, these limitations could result in under-estimation of depths or over-estimation. Section 8 outlines mitigation measures. Nodelling data is used to define the levels of mitigation factures and floor levels. Please note LLFA comment responses 3.1 to 3.2.2 relating to remaining concerns with the model set up and consequently results. These will need to be acted upon and then reviewed against this issue subsequently.	Reference to under-estimation in now been responded to adequate The LLFA has reviewed section 6 a distribution of flood risk onsite ar residual flood risk mitigation app in an area where there is existing Magdalen Street area and a short flood risk has been increased. The water flood risk. The FRA identific increase in flooding. Further dow the existing highways drainage ne In regard to the increase in flood highway drainage improvements development. This is to ensure th to the construction activities. The LLFA recommends that furthe risk in these areas. This will involv will better inform the applicant of Should this information identify a measures to the affected propert
2.37 Who	Annex	queries given in the attached	See point 2. above.	Noted and included throughout this FRA	The LLFA has provided comments and responses against other responses above and below.	Previously provided
3 Who	requires undating	delling report and model g to include.				Model has been updated as per c
3.1 Who	3.1 Confirmation that the key parameters (URBETT, the parameters (URBETT) accounter a magning second conter and the parameters (URBETT) accounter andet and the parameters (URBETT) accounter and the parameters (URBE		The BFIHOST value assigned to the study catchment is 0.861, suggests a highly permeable underlying geological strata. This correlates with the geology data held on the BGS Geology of Britain Viewer Web Service which indicates the catchment is underlain by a bedrock of the chalk formations covered with a superficial geology of locally derived Alluvium deposits comprising of Clay, Silt, Sand and Gravel. The high BFIHOST value is also confirmed by soil data mapping held on the Soilscapes Web Service which indicates that the majority of the study catchment sits on Soilscape 6 type soil, described as freely draining, slightly acid loamy soils where rainfall drains to local groundwater and rivers. The URBEXT2000 value assigned to the study catchment of 0.39 categorises the catchment area as very heavily urbanised. Confirmation of the extent of urban coverage can be undertaken in a GIS using suitable mapping data. However, this is considered only necessary when there are doubts over the degree of urban and rural coverage across a more heterogenous catchment area, which in this study this is not the case as the study area is obviously heavily urbanised. The LLFA welcomes the details added regarding checks to BFI HOST. However URBEXT should also be checked. The LLFA notes that if pluvial modelling is undertaken using gross rainfall and infiltration and evaporation losses accounted for in the hydraulic model, checking of the catchment descriptors is unimportant. However, in this case REFH2 net rainfall is being used. Whilst this is a valid approach, the REFH2 Urban Loss Model (Which should be used in this case given that the area is clearly very heavily to extremely heavily urbanised) uses URBEXT to calculate the Impervious Factor (IF) value. This is in turn used to calculate net rainfall. Therefore it is a critical parameter for the calculation and should be checked to ensure it is accurate and altered if necessary. Alternatively sensitivity testing in REFH2 could be used to show that net rainfall is not sensitive to th	URBEXT has now been checked ar variation will impact the results. T		
					This is particularly important when reviewed alongside sensitivity testing in Section 8.6.1 of the hydraulic modelling report which shows that the model is sensitive to rainfall inflows. It is not clear from this section what area has been used in ReFH. In Section 3.1 does contain a review of the catchment. However the catchment area has been checked against WFD catchment rather than DTM, this is likely to result in an areal reduction factor (ARF) that is too high and therefore under-estimation of rainfall. Please review the catchment area for use in REFH 2 based on the DTM or include details of this check if you have already done so. The URBEXT check requested should also be done on the DTM catchment. The model extent is considered appropriate.	Previously provided

paragraph 3.57 and was supports the majority of the context of the majority paragraph. However, the LLFA seeks to correct that LLFA "agreed that in order to not compromise the pedestrianised environment and cycle routes that are fundamental is needed to be on the north side of the building". In the meeting on 16th June 2022, the LLFA sought for the developer to e western side of the building. However, the developer sought to retain the position of the ramp off Edward street as they ignment over the flood risk to the basement from the existing surface water flood risk. The LLFA does not feel this is opplicant's documentation and therefore seeks for this to be corrected. *Informative comment in reponse letter*

RA and modelling report. Representation of basement carpark mitigation still appears ok as previously stated. However, n the model see 3.2.

on in section 10.2 of the modelling report has been removed as requested. Comments made in sections 3.1 and 3.2 have quately, see comments on these sections

on 6 and 8 of the FRA including the supporting Afflux mapping in Appendix K. It is clear there are alterations to the te and offsite. The alterations of flood risk within the site redline boundary are managed within the proposed flood risk and approaches. However, the increase flood risk in the offsite would have a negative impact on the highways drainage network sting surface water flood risk. In addition, the information within the FRA topographic survey provides data only for the short distance down Cow Gate. No topographic survey or threshold levels survey has been undertaken for the areas where 1. Therefore it is not possible to accurately determine whether the extent of the potential impact of this increase of surface ntifies that at least two commercial buildings on the corner of Magdelan Street and Cowgate are likely to experience an down Cowgate, Charlton Road and the roundabout there is also an increase in flood risk which would increase pressure on ge network and increase flood risk to be adjacent properties.

lood risk in the highway, the LLFA requires the developer to work with the Highway Authority to agree and install appropriate ents to ensure there is no increase in surface water flood risk within the highway prior to construction of the proposed re the properties identified as being at increased flood risk from the proposed development are not negetively affected prior

urther work is undertaken by the applicant to determine the number of properties impacted upon by the increase in flood nvolve undertaking an theshold level survey of properties along these roads along with a suitable topographic survey. This ant of the impact their development would have on offsite properties in addressing any residual risk due to the development. tify any properties where there is an increase in flood risk, the developer should offer and install suitable flood resistance pretries. ***LIFA Condition recommended***

per comments and detailed in the hydraulic modelling report and clarifications provided on 21/10/2022

ed and is outlined. ARFs presented for both catchments, ideally it would say which is used. However, it is not likely that this Its. Therefore this is considered acceptable.

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3 F	.2	Includes sewers in the hydraulic model for the sewer network affecting the parts of the site included in this application to support the full application that demonstrates there is no increase in flood risk elsewhere.	Addressed in Royal Haskoning DHV FRA Report.	Model has been updated to include nearby Anglian Water sewers – please refer to 'Anglia Square Norwich Modelling Study (July 2022)' and 5.25	7.2 1D Network Following a request from the LLFA, the Anglian Water sewer network was included in the model for the surrounding streets. The Anglian Water sewer records (obtained June 2022) were used to determine the dimensions of the sewers and manholes in the surrounding roads. The sewers were included in the model as sections of '1d_nwk' and the manholes were included as rectangular inlet pits with 'SX' boundaries. This meant that any water in the inlet pit cell would be directed into the 1D sewer network. The downstream end of the sewer networks (at the edge of the Anglian Water mapping) were represented as 'HT' boundaries which allowed water to freely exit the sewers. 7.4 Paragraph 4 "Anglian Water sewers were included in the model for the roads surrounding the site. The sizes of these sewers and manholes were taken from the latest sewer records. 'SX' boundaries and inlet pits were included at each manhole to enable water reaching these cells to be taken into the sewer network. At the downstream ends of the sewer networks, which were between 140m and 500m from the site, 'HT' boundaries were included to allow water to discharge freely." The LLFA welcomes inclusion of the network and the downstream boundary location is justified through sensitivity testing which shows the model is not sensitive. However further detail is required to review how this has been included. Please provide a drawing showing the 1D model extent. Where the sewer included has upstream sewers draining to it how has flow from these sewers been accounted for within the network?	The upstream extent of the Angli toward the site serving the netwo applicant on 20/10/2022 that this justification is provided for exclue therefore its inclusion is considered
	i.2.2 Vhole	Is extended to cover the full catchment to ensure the inflows are calculated correctly, or includes sensitivity testing showing that these inflows do not impact flood risk at the site.	Addressed in Royal Haskoning DHV FRA Report.	Model has been extended to cover wider catchment – please refer to 'Anglia Square Norwich Modelling Study (July 2022)' and 5.23	Section 3.1 of the modelling report details catchment delineation and model extent is shown in figure 3-3. The revised model extent is considered appropriate.	Previously provided
3	.3	Provide clarification on whether Anglian Water has been contacted to supply sewer data. This should be requested and included where interactions with the sewer system are likely to impact flooding.	Addressed in Royal Haskoning DHV FRA Report.	Sections 4.26 and 7.6	See 3.2. See comments on 3.2 Anglian Water data has been requested and included. However the report has insufficient detail to confirm that sewers have been included where "interactions with the sewer system are likely to impact flooding" as the 1D extent isn't shown so its not possible to ascertain if this has been done appropriately.	Anglian Water Sewers are now in
3 F	.4 Sull	The inclusion of information regarding the onset of flooding and its associated duration for vulnerable locations across the site including the basement car park entrance and the service yard and loading facilities.	Addressed in Royal Haskoning DHV FRA Report.	Time to peak flood maps included via link in Appendix I. However, alternative mitigation measures now included (Section 8) to provide safety of vulnerable areas which is not reliant on alerts from elsewhere in the catchment/site.	Nothing specifically shown within the main body of the modelling report relating to the time to peak mapping or results. The LLFA notes that a link was provided in the FRA Appendix I to the Time to Peak Flood Maps. However, the LLFA was unable to download these maps. The LLFA cannot access these unsubmitted time to peak plans at this time and requests the applicant to submit this information via normal planning submission routes so that the LLFA can review this information.	Time to peak maps are now inclu the start of the model run for up peak rainfall is applied to the mo hours after the peak of the rainfa

SuDS Standards Review	Summary of alignment to relevant Non-Statutory Technical Standards for Sustainable Drainage Systems (August 22)	Summary of alignment to relevant Non-Statutory Technical Standards for Sustainable Drainage Systems (October 22)
S3 (Brownfield)	Incomplete - due to various updates required on the greenfield and brownfield runoff calculations and further methods - further information required.	Complete - due to various updates provided on the greenfield and brownfield runoff calculations
S5/S6 (Brownfield)	Incomplete - due to a lack of drainage design information, various updates required on the greenfield and brownfield runoff calculations and further updates on the surface water hydraulic modelling - further information required.	Complete - due to updated information for the drainage design information, including the greenfield and brownfield runoff calculations and further updates on the surface water hydraulic modelling
S7	Incomplete - due to a lack of drainage design information - further information required.	Incomplete - The 3.3%AEP and 3.3%AEP +40%CC was only provided fo the drainage systems in the full application - further information required for the systems in the outline application area "To be conditioned"
S8	Incomplete - due to a lack of drainage design information - further information required	Complete - due to the updated drainage design information provided
59	Unable to complete - due to a lack of drainage design information, various updates required on the greenfield and brownfield runoff calculations and further updates on the surface water hydraulic modelling required to enable appropriate evidence to assess and determine whether the mitigation measures are appropriate - further information required	<i>Complete</i> - due to the updated drainage design information provided

e Anglian Water system has been checked and is included in Appendix B of the report. There are 2 manholes noted that drain network but are outside of the catchment. The location is given for the Cowgate Street Manhole. Clarification was sent by the hat this is included in the surface water model. This clarification also confirmed the position of the sewer on Aylsham Road, excluding this manhole as it is located on a overland flow path where it enters the system draining to the site downstream, nsidered unlikely to significantly change the modelling results

ow included as requested, see 3.2 for further details.

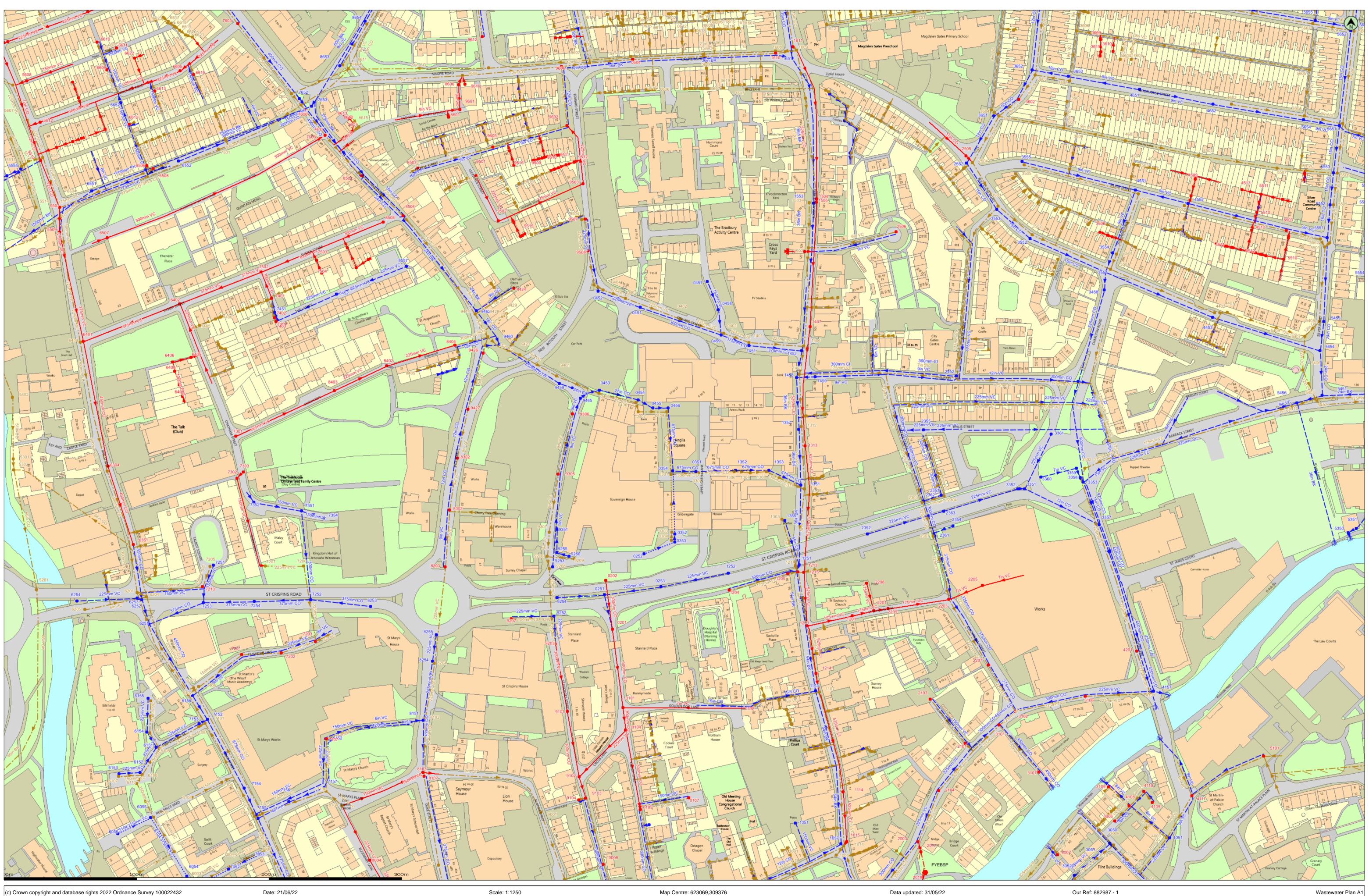
included for 1 in 30, 1 in 75, 1in 100, 1 in 1000 and 1 in 30 + CC. These show peak levels occur between 1.5 and 3 hours after or up to the 1 in 100 year event and between 3 and 4 hours for the 1000 year event. As the storm duration used is 3 hours e model approximately 1.5 hours after the start of the model run, this implies that the peak flow will occur between 0 and 1.5 rainfall. However the basement carpark and surface yard no longer flood in any of the events due to the humps installed. Appendix: D – Topographical Survey and Utilities Survey



SERVICE LEGEND

FOUL DRAINAGE	
SURFACE WATER DRAINAGE	>
WATER	
GAS	
ELECTRICITY	∿
TELEPHONE	
CABLE TV	
TRAFFIC SIGNAL	
OIL	
UNKNOWN SERVICE	
NEW DETAIL	
UNDERGROUND CHAMBER	

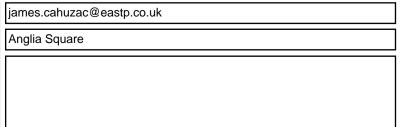
Appendix: E – Anglian Water Sewer Records



(c) Crown copyright and database rights 2022 Ordnance Survey 100022432 Date: 21/06/2	22		Sc	ale: 1:1250
carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services (a constraint of a constraint) and dot phase right of 2022 Ordenace Surgey 10022242. This men is to be used for the purpose of viewing the location of any affective of a constraint of a c	Surface Sewer Combined Sewer	 Outfall* Inlet* Manhole*	€ ∋	Sewage Public P Decomn

age Treatment Works	
ic Pumping Station	

ommissioned Pumping Station *(Colour denotes effluent type)



Data updated: 31/05/22



	rence Easting	Northing	Liquid Ty		vel Invert Leve	
800	623008	309060	С	3.23	0.28	2.95
101	623023	309178	С	4	1.85	2.15
104	623025	309161	С	3.95	1.74	2.21
105	623036	309101	С	3.43	0.14	3.29
107	623073	309110	С	3.64	2.28	1.36
201	623015	309237	С	4.34	2.12	2.22
202	623010	309274	С	-	-	-
604	623030	309667	С	-	-	2.4
015	623192	309077	С	-	-	-
112	623120	309178	С	3.874	1.179	2.695
114	623189	309114	C	2.742	1.072	1.67
201	623196	309247	C	3.13	1.38	1.75
203	623162	309240	C	3.147	1.647	1.5
203	623103	309267	C	3.55	1.18	2.37
204	623147	309279	C	3.38	1.17	2.37
213	623155	309280	C	3.347	1.747	1.6
214	623169	309204	C	-	-	-
215	623159	309280	C	-	-	-
313	623160	309375	С	-	-	-
407	623164	309465	С	-	-	-
504	623169	309561	С	-	-	-
505	623169	309559	С	5.342	1.407	3.935
610	623138	309671	С	-	-	2.51
611	623151	309676	С	-	-	2.68
003	623246	309077	С	-	-	4.3
017	623248	309069	С	-	-	-
101	623281	309151	С	2.47	1	1.47
103	623255	309184	С	2.99	1.86	1.13
104	623261	309115	C	-	•	3.95
201	623212	309251	C	3.28	0.13	3.15
201	623269	309260	C	-	-	3.275
203	623299	309280	C	- 3.02	- 1.29	1.73
				3.02	1.23	
207	623298	309210	C	-	-	3.1
208	623207	309272	C	-	-	-
209	623223	309253	C	-	-	-
2505	623282	309594	C	-	-	-
2506	623229	309537	С	-	-	-
8006	623394	309092	С	3.5	1.97	1.53
3007	623351	309067	С	-	-	-
3101	623307	309165	С	2.449	0.349	2.1
102	623319	309175	С	2.406	0.456	1.95
106	623372	309187	С	-	-	3.48
107	623337	309129	С	1.76	0.28	1.48
109	623389	309118	С	-	-	-
506	623383	309536	С	-	-	-
602	623321	309637	С	-	-	-
609	623383	309682	C	-	-	-
610	623383	309673	C	-	-	-
611	623383	309669	C	_	-	-
108	623405	309104	C	3.44	- 1.23	2.21
	623422		C			
109		309107		3.73	2.25	1.48
110	623416	309115	C	3.36	1.78	1.58
111	623452	309112	C	3.837	-	-
201	623410	309220	C	-	-	3.275
509	623455	309579	С	8.19	6.92	1.27
510	623497	309538	С	-	-	1.7
511	623471	309527	С	-	-	-
512	623494	309522	С	-	-	0.62
513	623490	309568	С	-	-	-
5101	623506	309141	С	-	-	3.125
503	623523	309538	С	-	-	-
507	622598	309555	С	-	-	8
509	622598	309537	С	-	-	-
510	622584	309590	С	-	-	4.61
510	623521	309516	С	-	-	1.42
510	623501	309552	С	-	-	1.05
511	623504	309565	C	-	-	1.42
608	622573	309651	C	-	-	2.3
609	622559	309680	C	_	-	1.41
609 612	622583	309680	C			1.62
304	622635	309360	C		-	2.62
351	622654	309301	C	-	-	1.82
401 102	622616	309454	C	-	-	3.2
402	622689	309483	C	-	-	3.82
405	622697	309442	C	-	-	-
406	622683	309438	C	-	-	-
6407	622685	309432	C	-	-	-
6408	622691	309412	С	-	-	-
506	622664	309587	С	-	-	1.07
507	622634	309532	С	-	-	1
508	622669	309584	С	-	-	2.845
605	622689	309658	С	-	-	1.9
608	622634	309659	С	-	-	1.67
610	622627	309680	С	-	-	0.97
611	622641	309675	C	-	-	0.66
612	622651	309618	C	-	-	1.35
613	622670	309643	C	-	-	1.63
	622699	309655	C	-	-	1.42
	622655	309668	C	-	-	-
615	622619	309702	C		-	1.47
615 622	a sea a coma a bal					
615 622 703		309154	C	-	-	2.58
615 622 6703 107	622799	000010	C	-	-	2.71
615 622 703 107 201	622799 622736	309218		-	-	1.74
615 622 703 107 201 202	622799 622736 622765	309219	C			0.00
615 622 703 107 201 202 203	622799 622736 622765 622791	309219 309228	С	-	-	2.83
615 622 703 107 201 202 203 210	622799 622736 622765 622791 622706	309219 309228 309269	C C	-	-	1.4
615 622 703 107 201 202 203 210	622799 622736 622765 622791	309219 309228	С	- -	- -	
615 622 703 107 201 202 203 210 301	622799 622736 622765 622791 622706	309219 309228 309269	C C	- - - -	- - -	1.4
615 622 703 107 201 202 203 210 301 302	622799 622736 622765 622791 622706 622731	309219 309228 309269 309382	C C C	- - - - -	- - - -	1.4 1.37
615 622 703 7107 201 202 203 210 301 302 303	622799 622736 622765 622791 622706 622731 622732	309219 309228 309269 309382 309351	C C C C	- - - - - - -	- - - - -	1.4 1.37 1.43
615 622 703 107 201 202 203 210 301 302 303 401	622799 622736 622765 622791 622706 622731 622732 622737	309219 309228 309269 309382 309351 309356	C C C C C C	- - - - - - - - -		1.4 1.37 1.43 1.5
i615 i622 i703 i107 i201 i202 i203 i210 i301 i302 i303 i401 i402	622799 622736 622765 622791 622706 622731 622732 622737 622758	309219 309228 309269 309382 309351 309356 309486	C C C C C C C C	- - - - - - - - - -	- - - - - - - -	1.4 1.37 1.43 1.5 2.69
3615 3615 3622 3703 7107 7201 7202 7203 7210 7301 7302 7303 7401 7402 7403 7502	622799 622736 622765 622791 622706 622731 622732 622737 622758 622760	309219 309228 309269 309382 309351 309356 309472	C C C C C C C C C	- - - - - - - - -	- - - - - - - - -	1.4 1.37 1.43 1.5 2.69 2.015

Manhole Reference	Easting	Northing	Liquic
7504	622796	309506	C
7603 7606	622733 622783	309694 309629	C C
7608	622798	309609	C
7611	622793	309607	С
8004	622832	309063	С
8103	622872	309129	C C
8107 8203	622873 622889	309126 309284	C
8302	622898	309366	C
8303	622892	309327	С
8402	622845	309436	C
8403 8404	622805 622896	309417 309451	C C
8502	622826	309579	C
8503	622868	309585	С
8504	622857	309549	C
8508 8601	622842 622891	309544 309623	C C
8606	622899	309648	C
8607	622819	309612	С
8612	622817	309622	С
8613 9101	622815	309623 309175	C C
9102	622981 622990	309175	C
9103	622995	309110	C
9104	622990	309108	С
9203	622972	309226	C
9207 9305	622939 622974	309245	C C
9306	622985	309400	C
9424	622941	309494	С
9426	622917	309445	C
9427 9501	622906 622912	309403 309579	C C
9502	622912	309545	C
9503	622993	309573	С
9507	622995	309546	С
9508 9509	622997 622955	309522 309591	C C
9510	622955	309593	C
9511	622975	309595	С
9512	622986	309589	С
9515	622949	309535	C C
9516 9601	622941 622900	309587 309629	C
9602	622981	309617	C
9605	622925	309601	С
9606	622977	309661	C
9610 9612	622904 622917	309648 309684	C C
0301	623059	309354	F
0302	623080	309355	F
0303 0304	623060 623060	309310 309304	F
0401	623099	309460	F
0402	623066	309471	F
0403	623025	309487	F
0404 0405	623008 623005	309493 309415	F
0405	623033	309408	F
0407	623035	309401	F
0408	623056	309401	F
0409	623001	309497	F
0601 0602	623023 623056	309693 309694	F
0603	623029	309669	F
0605	623092	309675	F
0606	623046	309644	F
0607 0608	623086 623091	309645 309689	F
0609	623091 623088	309689	F
0610	623097	309690	F
0611	623095	309690	F
0612 0613	623067 623079	309688 309688	F
0614	623024	309686	F
0615	623043	309686	F
0616	623039	309687	F
0617 0618	623042 623086	309644 309660	F
0619	623099	309645	F
1001	623158	309073	F
1003	623184	309067	F
1014 1107	623190 623171	309074 309190	F
1119	623129	309187	F
1211	623153	309285	F
1303	623143	309320	F
1306 1307	623107 623119	309356 309355	F F
1307	623119 623131	309355	F
1309	623160	309343	F
1310	623152	309346	F
1312 1401	623158 623118	309390 309453	F F
1401	623118 623156	309453	F
1403			F
1403 1406	623159	309451	
1406 1502	623159 623163	309525	F
1406 1502 1503	623159 623163 623163	309525 309559	F F
1406 1502	623159 623163	309525	F

Manhole Reference Easting Northing

Liquid Type	e Cover Lev	el Invert Level	Depth to Inver
C	12.802	10.449	2.353
C	10.756	8.12	2.636
C	9.754	7.196	2.558
C C	-	-	0.83
C	- 4.18	- 1.44	2.74
C	4.18	0.94	3.25
C	-	-	2.21
С	-	-	2.565
С	-	-	2.16
C	-	-	2.24
C C	-	-	2
C C	- 7.483	- 3.292	2.6 4.191
C	-	-	2.011
C	7.483	3.292	4.191
С	-	-	1.93
С	-	-	0.84
С	-	-	1.3
C	-	-	0.915
C C	-	-	-
C	-	-	- 2.51
C	- 3.65	- 1.26	2.39
C	3.6	1.04	2.56
C	3.63	1.43	2.2
C	4.29	1.82	2.47
С	4.76	2.73	2.03
С	-	-	2.77
С	-	-	2.87
C	-	-	2.745
C	-	-	2.92
C	-	-	3.02
C C	-	-	1.04
C C	-	-	0.915
C	- 5.15	- 3.49	1.66
C	5.09	3.31	1.78
C	-	-	-
С	-	-	0.8
С	-	-	-
С	-	-	-
C	-	-	-
C	-	-	0.5
C	-	-	0.99
C C	6.248	4.328	1.92 1.525
C	- 6.111	- 4.023	2.088
C	-	-0.61	0.61
C	6.767	5.352	1.415
F	3.99	0.33	3.66
F	4	0.22	3.78
F	3	1.36	1.64
F	3.23	1.45	1.78
F	4.22	1.41	2.81
F	4.41	1.72	2.69
F	4.65	2.04	2.61
F	4.91 4.5	2.36	2.55 2.58
F	4.5 3.98	1.92	2.58
F	3.98	1.14	2.83
F	3.96	0.9	3.06
F	-	-	-
F	-	-	1.22
F	-	-	1.02
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F F	-	-	-
F	-	-	-
F F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	-	-	-
F	2.81	2.04	0.77
F	2.55	-2.02	4.57
F F	2.56 2.826	0.8	1.76
_	-	-0.934	3.76
F	- 3.42	- 0.59	- 2.83
F	3.47	0.99	2.48
F	3.91	-0.02	3.93
F	3.61	-	-
F	-	-	3.35
F	3.18	-0.2	3.38
F	-	-	3.5
F	3.42	1.81	1.61
F	4.1	1.25	2.85
F	3.75	0.25	3.5
F	4.07	1.96	2.11
F	4.558	1.203	3.355
F	4.558	1.203	3.355
F	-	-	-
F	-	-	-

	rence Easting	Northing	Liquid T		el Invert Leve	Depth to Inv
1612	623177	309693	F	-	-	0.91
1614	623161	309637	F	-	-	-
1617	623116	309645	F	7.333	5.473	1.86
1618	623102	309690	F	-	-	-
1619	623110	309690	F	-	-	-
2303	623249	309333	F	3.22	1.1	2.12
2304	623265	309338	F	3.37	1.57	1.8
2307	623257	309307	F	2.917	0.918	1.999
2504	623287	309589	F	-	-	2.5
2703	623243	309703	F	-	-	0.87
3008	623347	309072	F	-		-
3009	623393	309072	F	-	-	-
				-	-	-
3010	623380	309064	F	-	-	-
3011	623364	309049	F	-	-	-
3302	623371	309359	F	2.57	-0.08	2.65
3501	623391	309509	F	-	-	2.1
3502	623332	309534	F	-	-	2.2
3503	623306	309556	F	-	-	-
3504	623395	309520	F	-	-	-
3505	623326	309587	F	-	-	-
3601	623306	309624	F	-	-	2.5
3603	623334	309655	F	-	-	2.4
3604	623301	309629	F	-	-	1.2
3605	623360	309651	F	-	-	-
3606	623365	309688	F	-	-	2.13
3607	623356	309615	F	-	_	-
				-	-	-
3608	623358	309635	F	-	-	-
3609	623364	309603	F	-	-	-
4003	623433	309080	F	3.95	0.15	3.8
4101	623421	309189	F	-	-	3.455
4401	623479	309476	F	-	-	2.86
4402	623469	309476	F	-	-	2.8
4501	623412	309565	F	-	-	-
4502	623446	309557	F	-	-	-
4503	623457	309594	F	-	-	1.52
4504	623408	309588	F	-	-	-
4505	623413	309587	F	-	-	-
4506	623420	309585	F	-	-	-
4507	623438	309513	F	-	-	-
4508	623445	309538	F	-	-	-
4601	623454	309674	F		_	1.37
4602	623482	309633	F	-	-	1.07
				-	-	-
4603	623402	309605	F	-	-	-
4604	623406	309670	F	-	-	-
4605	623406	309667	F	-	-	-
5201	622581	309267	F	-	-	-
5301	622563	309365	F	-	-	-
5302	622564	309357	F	-	-	-
5402	622563	309412	F	-	-	-
5402	623549	309406	F	-	-	-
5403	623545	309411	F	2.87	-0.18	3.05
5406	623536	309433	F	-	-	3.607
5407	623537	309458	F	-	-	3.226
5408	623548	309469	F	-	-	2.77
5409	623516	309464	F		_	3.265
5410	623527	309405	F		_	-
5501		309403	F	-	-	- 2.22
	623552			-	-	2.22
5502	623549	309531	F	-	-	-
5504	623556	309529	F	-	-	-
5505	623559	309557	F	-	-	2.25
5506	623562	309581	F	-	-	1.95
5507	623516	309585	F	-	-	-
5511	622586	309593	F	-	-	8.36
5512	622575	309590	F	-	-	3.886
5513	622570	309586	F	-	-	1.855
5514	622580	309555	F	-	-	0.915
5601	623566	309618	F	-	-	2.07
5602	623574	309688	F	-	-	2.28
5603	623572	309691	F	-	-	-
5604	622563	309647	F	-	-	9.13
5604 5604	623537	309624	F	- 10.459	- 8.729	1.73
5605	623537	309624	F	-	-	1.905
5605 5607	623541	309659	F			1.300
			F	-	2 20	1 650
6000 6001	622669	309095		4.042	2.39	1.652
6001 6002	622684	309069	F	4.125	2.591	1.534
6002	622658	309054	F	4.3	2.792	1.508
6102	622695	309188	F	-	-	3.4
6103	622699	309193	F	-	-	6.4
6104	622698	309110	F	-	-	1.14
6105	622673	309147	F	-	1.5	-
6106	622660	309127	F	-	1.75	-
6107	622643	309126	F	-	1.95	-
6108	622666	309159	F	-	1.8	-
6109	622667	309183	F	-	2.2	-
6110	622656	309121	F	4	1.966	2.034
6201	622657	309265	F	-	1.411	-
6204	622664	309262	F	-	-	-
6205	622617	309252	F	-	1.643	-
6302	622634	309356	F	-	-	5.82
6404	622614	309454	F	-	-	7
6504	622609	309558	F	_		9.45
						3.40
6616	622676	309698	F	-	-	-
6617	622680	309695	F	-	-	-
6618	622685	309692	F	-	-	-
6619	622689	309689	F	-	-	-
6620	622693	309685	F	-	-	-
6621	622698	309683	F	-	-	-
6623	622671	309696	F	-	-	-
7002	622744	309099	F	-	-	3.66
	622751	309098	F	-	-	6.8
7005				0 - 00	0.54	2.072
	622756	309072	F	3.583	0.51	3.073
7005 7007 7008	622756 622752	309072 309070	F	3.583	2.015	1.588

Manhole Reference	ence Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Inver
7101	622708	309166	F	-	-0.04	-
7104	622720	309122	F	-	-	1.17
7105	622703	309194	F	-	-	2.7
7106	622799	309115	F	-	-	3
7108	622703	309164	F	-	1.1	-
205	622712	309284	F	-	-	1.845
206	622782	309285	F	-	-	-
207	622753	309285	F	-	-	1.635
404	622758	309477	F	-	-	-
405	622704	309466	F	-	-	-
406	622720	309473	F	-	-	-
501	622718	309599	F	-	-	11.75
602	622773	309641	F	10.67	8	2.67
8001	622884	309059	F	4.27	0.55	3.72
3102	622874	309170	F	4.32	1.71	2.61
3104	622811	309104	F	-	-	1.3
3204	622881	309211	F	-	-	-
405	622862	309430	F	-	-	-
509	622892	309570	F	-	-	-
604	622816	309660	F	-	-	-
610	622830	309693	F	9.982	5.902	4.08
611	622812	309662	F	10.267	7.147	3.12
615	622824	309616	F	-	-	-
616	622818	309623	F	-	-	-
0001	622961	309099	F	3.87	1.77	2.1
002	622979	309048	F	3.46	1.44	2.02
202	622969	309245	F	-	-	2.6
206	622966	309292	F	-	-	2.185
208	622967	309292	F	- 4.3	- 2.13	2.185
208	622986	309293	F	-	-	
301	622986	309290	F	- 4.37	- 2.25	- 2.12
401			F		-	
	622973	309428		-	-	2.36
414	622911	309475	F	-	-	2.845
9423	622945	309444	F	-	-	2.59
9425	622921	309458	F	-	-	2.615
428	622929	309471	F	-	-	-
429	622935	309475	F	-	-	-
504	622992	309546	F	-	-	-
9513	622944	309573	F	-	-	-
9514	622905	309577	F	-	-	-
9607	622998	309664	F	5.447	3.487	1.96
9608	622902	309655	F	-	-	1.6
609	622922	309660	F	6.1	0.176	5.924
611	622992	309690	F	5.43	3.205	2.225
613	622935	309623	F	-	-	-
9614	622948	309627	F	-	-	0.5
9615	622985	309689	F	-	-	0.95
9616	622962	309630	F	-	-	-
)251	623009	309263	S	4.47	3.05	1.42
)252	623039	309294	S	3.64	2.03	1.61
)253	623052	309269	S	-	4.66	-
)351	623078	309356	S	3.97	1.07	2.9
)352	623062	309309	S	3.05	1.74	1.31
)353	623062	309303	S	3.28	1.83	1.45
)354	623061	309356	S	4.01	1.03	2.98
)451			S		2.02	
)452	623036 623004	309480 309492	S	4.57 5.01	2.02	2.55 2.81
9453	623005	309417	S	4.49	1.32	3.17
)454	623035	309410	S	3.95	1.21	2.74
)455	623046	309404	S	3.98	1.08	2.9
)456	623057	309404	S	3.96	1.08	2.88
)457	623087	309499	S	3.99	2.46	1.53
)458	623095	309478	S	4.19	2.23	1.96
)459	623097	309459	S	4.23	1.85	2.38
051	623153	309091	S	2.83	1.69	1.14
057	623187	309075	S	-	-	-
153	623168	309191	S	-	-	2.49
251	623156	309286	S	3.51	-0.55	4.06
252	623103	309279	S	-	7.21	-
351	623157	309346	S	3.23	0.79	2.44
352	623108	309357	S	3.88	1.04	2.84
353	623133	309357	S	-	-	2.45
355	623145	309319	S	3.49	-0.26	3.75
357	623156	309388	S	-	-	-
451	623118	309451	S	4.09	1.64	2.45
452	623158	309447	S	-	-	-
453	623154	309427	S	3.78	1.02	2.76
459	623168	309427	S	3.8	2.16	1.64
553	623167	309558	S	-	-	-
651	623150	309668	S	-	-	5.73
2351	623263	309338	S	-	-	1.93
352	623207	309309	S	8.37	7.18	1.19
354	623272	309315	S	3.09	1.29	1.13
355	623250	309387	S	3.65	2.32	1.33
355 361	623250	309387	S	2.918	2.32 1.168	1.33
				2.310	1.100	
362	623250	309334	S	-	-	1.93
363	623265	309326	S	-	4.11	
452	623274	309428	S	-	-	-
552	623282	309589	S	-	-	2.2
050	623390	309076	S	-	-	-
051	623378	309064	S	-	-	-
052	623364	309051	S	-	-	-
351	623326	309343	S	3.29	1.24	2.05
352	623321	309343	S	3.38	1.56	1.82
353	623370	309348	S	2.54	0.65	1.89
357	623382	309316	S	2.801	0.251	2.55
358	623368	309351	S	-	-	-
3359	623365	309359	S	-	-	-
	623338	309352	S	-	-	-
5360	623346	309384	S	-	-	1.93
3360 3361	the second se	000004	~	1	1	1.00
3361		309424	S	-	-	3.04
3361 3457 3458	623366 623386	309424 309493	S S	-	-	3.04

3552						
	623330	309532	S	-	-	1.8
553	623305	309554	S	-	-	1.9
554 555	623392 623324	309521 309590	S S	-	-	-
651	623303	309624	S	-		2.1
652	623332	309659	S	-	-	2.1
8653	623359	309654	S	-	-	-
1051	623435	309080	S	3.97	1.56	2.41
1157	623423	309190	S	-	-	2.77
1453	623468	309472	S	-	-	2.7
4551	623409	309568	S	-	-	-
4552	623449	309558	S	-	-	-
4651	623413	309644	S	-	-	-
4652	623468	309633	S	-	-	-
5350	623570	309310	S	2.1	0.51	1.59
5351	623576	309313	S	-	-	-
5451	623550	309413	S	2.86	0.28	2.58
5454	623549	309447	S	-	-	2.16
5455 5456	623551 623531	309469	S S	-	-	2.415
5551	623554	309408 309532	S	-	-	- 1.92
5552	623556	309557	S		-	1.95
5553	623559	309581	S	-	-	1.67
5555	622569	309584	S	-	-	-
5556	622558	309579	S	-	-	1.168
5651	623563	309617	S	-	-	1.76
5652	623572	309688	S	-	-	1.98
5653	623575	309691	S	-	-	-
5654	623536	309621	S	10.441	9.016	1.425
5655	623545	309696	S	-	-	-
8054	622694	309051	S	4.022	1.333	2.689
8055	622667	309095	S	4.04	1.834	2.206
6056	622642	309083	S	4.319	2.634	1.685
6151	622671	309148	S	-	1.8	-
6152	622659	309129	S	-	2.05	-
6153	622643	309128	S	-	2.2	-
6154 8155	622664	309160	S	-	2.1	-
6155 8156	622665	309185	S	-	2.5	-
6156	622698	309187	S S	-	-	1.2
6251 6252	622666 622660	309241 309259	S	-	- 1.548	1.83
6252 6253	622657	309260	S	-	1.829	-
6253 6254	622611	309258	S	-	2.999	-
5551	622622	309568	S	9.29	2.49	6.8
6552	622688	309590	S	10.73	7.65	3.08
652	622644	309634	S	-	-	1.27
7052	622725	309056	S	4.102	1.861	2.241
7053	622749	309067	S	3.721	2.26	1.461
7152	622710	309169	S	-	1.3	-
7153	622703	309166	S	-	1.4	-
7154	622737	309117	S	-	-	2.9
7155	622748	309094	S	-	-	-
7156	622771	309107	S	-	-	-
7157	622798	309118	S	-	-	-
7251	622714	309285	S	-	-	1.575
7252	622788	309259	S	-	-	-
7253	622707	309257	S	-	1.734	-
7254	622745	309258	S	-	1.893	-
7351	622780	309326	S	-	-	1.83
7352	622745	309333	S	-	-	1.6
7354	622797	309321	S	-	-	1.3
7451	622760	309476	S	-	-	1.15
7652	622779	309637	S	-	-	3.81
7653	622788	309632	S	-	-	7.77
3151	622873	309169	S	4.32	1.96	2.36
3152 3153	622802	309153 309166	S S	-	-	
3153 3253	622861 622833	309166	S	-	- 2.548	
3253 3254	622833	309254	S	-	2.040	
3254 3255	622879	309233	S		-	
3452	622807	309233	S		-	- 1.38
3557	622860	309511	S	-	-	-
3653	622810	309662	S	10.267	7.447	2.82
3654	622829	309696	S	9.982	6.202	3.78
9252	622971	309247	S	-	-	2.25
9253	622970	309284	S	-	-	3.99
9254	622973	309261	S	-	-	-
9255	622973	309295	S	-	-	-
9256	622982	309292	S	-	-	-
9351	622973	309312	S	-	-	-
9459	622975	309422	S	-	-	3
9460	622930	309452	S	-	-	3.15
9462	622912	309477	S	-	-	3.48
9465	622991	309411	S	-	-	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Ianhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Inver

Manhole Reference	Fasting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
	Lasting					