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jpp

Proposed Residential Development
Land off West Street
Chatteris
Cambridgeshire
PE16 6FA

Flood Risk Assessment and Drainage Strategy

Revision A: December 2023
R-FRA-26065-01-A

Registered office

NORTHAMPTON	MILTON KEYNES	POOLE
Grand Union Works	B2A, Denbigh Business Park	Suite 8 Branksome Park
Whilton Locks	23 First Avenue	Branksome Business Park
Daventry, Northampton	Denbigh	Bourne Valley Road | Poole
NN11 2NH	Milton Keynes | MK1 1DN	Dorset | BH12 1ED
T: 01604 781811	T: 01908 889433	T: 01202 540888

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JPP Consulting Ltd., Grand Union Works, Whilton Locks, Daventry, Northamptonshire, NN11 2NH
T: 01604 781811 E: mail@jppuk.net W: jppuk.net

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Report Originators

Prepared by

[redacted]
Technician
[redacted]@jppuk.net

[redacted]
Engineer
[redacted]@jppuk.net

Reviewed by

[redacted]
Associate
[redacted]@jppuk.net

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0	17th July 2023	Draft Issue	[redacted]	[redacted]
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Contents

Appendices

Figures

Tables

1.0 Introduction

1.1 Background

1.1.1 This report is a Flood Risk Assessment and Drainage Strategy which has been prepared by JPP Consulting Limited on behalf of Minster Property Group Ltd for a residential development. The benefit of this report is to our instructing Client.

1.1.2 The proposed residential development is located at West Street, Chatteris, as shown in Figure 1.1 below. Chatteris is located north of Cambridge and south-east of Peterborough. The National Grid Reference for the site is E538640 N285300. The proposed development has a total development area of 2.98ha (29,800m^2) of which 1.087ha (10,870m^2) will be positively drained.

Figure 1.1 Site Location Plan
Source: OpenStreetMap
Obtained: 03/04/2023

1.2 Objectives

1.2.1 The objective of this report is to advise interested parties regarding the potential risk of flooding and the management of surface water run-off arising from the proposals.

1.2.2 This report has been prepared to support a detailed planning application.

1.3 Reference documents

1.3.1 This report has been prepared with reference to the following publications:-

- Ministry of Housing, Communities and Local Government (March 2012, updated July 2021), National Planning Policy Framework
- Ministry of Housing, Communities and Local Government (March 2014, updated August 2021), Planning Practice Guidance 'Flood Risk and Coastal Change'
- Department for Environment, Food and Rural Affairs (March 2015), Non-statutory technical standards for sustainable drainage systems
- Environment Agency (September 2013), Climate Change Allowances for Planners: Guidance to support the National Planning Policy Framework
- Environment Agency (October 2013), Delivering benefits through evidence: Rainfall runoff management for developments
- HM Government (2010), The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, The NBS, Newcastle Upon Tyne
- Wilson, Bray, Cooper (2004), Sustainable drainage systems: Hydraulic, structural and water quality advise, C609, CIRIA, London
- Woods-Ballard et al (2015), The SUDS Manual, C753, CIRIA, London
- CIRIA Report C624 Development and flood risk
- National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage Systems,
- Institute of Hydrology (1999), Flood Estimation Handbook, Institute of Hydrology, Wallingford
- BS EN 752:2008 Drain and sewer systems outside buildings. Hydraulic design and environmental considerations
- BS 8533:2011 Assessing and managing flood risk in development – Code of Practice
- CIRIA Report C635 Designing for exceedance in urban drainage – good practice
- Fenland Level 1 Strategic Flood Risk Assessment – Fenland District Council (June 2022)

1.4 Report history

1.4.1 This report has been revised (Revision A) in response to consultation comments received from the Lead Local Flood Authority (LLFA) and Anglian Water (AW), as part of the planning application (Fenland District Council application reference F/YR23/0940/F).

1.4.2 Changes to the report are indicated by a vertical line in the right-hand column.

2.0 Description and history of the site and development proposals

2.1 Location and description of the site

2.1.1 The proposed residential development is located at West Street, Chatteris, as shown in Figure 1.1 above. The site is bound by Chatteris Town Football Club to the north, West Street neighbouring residential dwellings to the east, fields to the south and Twenty Foot Drain to the west with Bartlett Business Park beyond.

2.2 History of the site

2.2.1 Site history

2.2.1.1 The site is currently fields, as shown on the topographical survey enclosed in **Appendix A**. We are not aware of any previous development on the site.

2.2.1.2 Aerial imagery dating back to December 2009 shows that the site was fields during this time, see Figure 2.1 below.

Figure 2.1 Aerial imagery dated December 1999
Obtained: Google Earth Pro 03/04/2023

2.2.2 Planning history

2.2.2.1 A previous planning application for residential development comprising 58 units was granted permission in 2016 by Fenland District Council (reference: F/YR15/0512/0). This application was supported by a Flood Risk Assessment (FRA) report prepared by others. The site later received Reserved Matters planning approval for 58 residential dwellings in January 2018, Fenland District Council reference F/YR17/0591-RM.

2.3 Proposed development

2.3.1 The proposed development will comprise 70 residential dwellings. The proposed development layout is shown on the plan enclosed in **Appendix B.**

2.4 Site topography

2.4.1 The topographical survey indicates that site levels fall from the north-east (at approximately 3.5m) towards the west (lowest point of approximately 0.5m). The topographical survey is shown on the plan enclosed in **Appendix A**.

2.5 Existing drainage infrastructure

2.5.1 Anglian Water's asset plan is enclosed in **Appendix C.** The asset plan identifies a combined water sewer which runs from north to south, crossing the western part of the proposed development site. There are gravity surface, combined and foul water sewers in West Street to the east of the site. A foul rising main is shown to the west of the site, parallel to the site boundary.

2.5.2 A utilities survey has been undertaken for the site, see plans enclosed in **Appendix D.** Two private surface water sewers approach the eastern site boundary of the site. It is understood that these sewers connect to the ditches that cross the site. A private combined water sewer and two private foul water sewers are shown to cross the site from east to west, each connecting into the adopted combined water sewer shown on the Anglian Water asset plan.

2.5.3 Twenty Foot Drain is located to the west of the site, parallel to the site boundary.

2.6 Geology of the site and ground investigation data

2.6.1 Inspection of the geological maps show that the superficial deposits at the site are peat. The bedrock geology which underlies the site is West Walton Formation and Ampthill Clay Formation and also Oxford Clay Formation – Mudstone.

2.6.2 Elemental GI Ltd have completed a Geo-Environmental Investigation for the site, see report extract enclosed in **Appendix E**. This investigation found topsoil overlying Made Ground, which overlies Clay. Details of encountered ground conditions from the 7 Window Sampler Drilling Rigs and 8 Trial Pits are summarised below.

- Topsoil: Encountered to depths between 0.20m bgl – 0.50m bgl
- Made Ground: Encountered to depths between 0.40m bgl – 1.40m bgl
- Clay: Encountered to depths between 2.55m bgl – 5.00m bgl (base of exploration)

2.6.3 Groundwater was encountered in two locations (TP02 and WS13), for which the GI report notes the following:

- TP02: Slow ingress of water encountered at 2.50m depth during excavation
- WS13: Water struck at 2.00m depth, recorded to be standing at 1.20m depth (after removal casing)

2.6.4 The GI also states that during return visits to site, groundwater depths were recorded ranging between 1.70m to 4.78m bgl in monitoring wells, with some wells recording no water.

2.6.5 In situ infiltration feasibility testing was undertaken at two locations, namely WS201a and WS206a. In general accordance with BRE365, the two test locations were excavated and surveyed before being filled with water and subsequently monitored. The test results are shown below in Table 2.1.

Summary of Infiltration Testing			
Trial Pit Position	**Cycle**	**Base Depth of Trial Pit**	**Infiltration Rate**
WS201a	1	1.0m bgl	Insufficient infiltration to derive a rate
WS206a	1	1.0m bgl	Insufficient infiltration to derive a rate
Source:			

Table 2.1 Infiltration Testing Information

2.6.6 As shown above, infiltration rates 'failed' at the locations indicating soakaways are not likely to be feasible at the proposed development location. Therefore, infiltration is not a viable form of drainage for the proposed development.

2.7 Development proposals and flood risk vulnerability

2.7.1 With reference to Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) to the National Planning Policy Framework (NPPF), the proposed residential development would be classed as a More development.

2.7.2 An extract from Table 2 of the PPG for Flood Risk and Coastal Change is replicated below in Table 2.2 with the proposed development type highlighted.

Flood Risk Vulnerability Classification	
Vulnerability	**Development Types**
More Vulnerable	Hospitals.
	Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
	Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
	Non-residential uses for health services, nurseries and educational establishments.
	Landfill and site used for waste management facilities for hazardous waste.
	Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Source: Planning Practice Guidance - 2014	

Table 2.2 Flood Risk Vulnerability Classification

3.0 Flood risk

3.1 Fluvial / Tidal flooding

3.1.1 An extract of the Environment Agency's Flood Map for Planning (Rivers and Sea) is provided below in Figure 3.1. The flood map was extracted from the GOV.UK website on 3rd April 2023. The approximate application site boundary is shown in red. The map indicates that the majority of the development site is located within Flood Zone 1 (Low Probability).

3.1.2 There are small areas on the western boundary of the site which are located within Flood Zone 3 (High probability).

Figure 3.1 Flood Map for Planning (Rivers and Sea)
Source: GOV.UK website - April 2023

3.1.3 Flood information has been obtained from the Environment Agency, as enclosed in **Appendix F**. This includes details of the modelled breach locations, along with the maximum flood depth, velocity and hazard ratings across the site. The flood extents are shown to not extend into the development site, with the flood extents remaining to the west of Twenty Foot Drain and the adjacent former railway embankment.

3.1.4 The Flood Risk Assessment report prepared by others to support the outline planning application (REF: F/YR15/0512/O as discussed above) considered the fluvial flood risk at the site to be low. This is with reference to the nearest designated Main River being over 6km away, as well as the presence of embankments adjacent to the proposed development site.

3.1.5 The above assessment of flood risk was adopted for the outline planning application, and in turn the reserved matters planning application, which were both approved. The principles of the original approved strategies will therefore be used to inform the current proposals.

3.1.6 Based on the above, the embankment along the western site boundary is therefore considered to offer flood protection to the site.

3.1.7 In keeping with the original FRA, a sequential approach has been taken, with the proposed dwellings located within the northern and eastern parts of the site, where site levels are higher and therefore at the lowest risk of fluvial flooding.

3.1.8 All Finished Floor Levels are to be set at a minimum of 2.4m AOD. This is in accordance with the approved FRA, where the minimum FFL was set as 1.8m.

3.1.9 It is therefore considered that the proposed development site is at a low risk of fluvial flooding.

3.1.10 Table 3.1 below is a copy of Table 1 from Planning Practice Guidance for *'Flood Risk and Coastal Change'* to the National Planning Policy Framework which defines Flood Zones. The proposed development, which is located within Flood Zone 3, is defined as having a less than 1 in 100 annual probability of river or sea flooding in any year.

Flood Zone Definitions	
Flood Zone	**Definition**
Zone 1: Low Probability	**Land having a less than 1 in 1,000 annual probability of river or sea flooding.**
Zone 2: Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a: High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b: The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.
Source: Planning Practice Guidance - 2014	

Table 3.1 Flood Zone Definitions

3.2 Flooding from surface water

3.2.1 An extract of the Environment Agency map 'Risk of Flooding from Surface Water' is provided below in Figure 3.2. The approximate application site boundary is shown in red. The site is generally shown to be located at a very low (less than 1 in 1000) risk of surface water flooding in a given year. Small areas of the site are shown to be at low (1 in 100 to 1 in 1000) and medium (1 in 30 to 1 in 100) risk of surface water flooding in a given year. These are linear areas following the existing ditches that cross the site, and the site's western boundary.

3.2.2 Levels of the site will be such that proposed dwellings are not at risk of surface water flooding.

Figure 3.2 Risk of Flooding from Surface Water
Source: GOV.UK website - April 2023

3.2.3 It should be noted that this map is generated using a broad methodology applied at the national scale. The model utilises generalised information on infiltration, sewerage infrastructure, rainfall events and catchment topography to route rainfall over a ground surface model. As such, the analysis does not take account of site-scale factors / characteristics that may exert an influence upon surface water flood depths and extents. The map therefore only provides a guide regarding the areas that may be vulnerable to this source of flooding.

3.2.4 With reference to Table 3-8 of the Fenland Level 1 Strategic Flood Risk Assessment (SFRA) dated June 2022, the site labelled Land West & South of 74 West Street has a low risk of surface water flooding.

3.3 Flooding from groundwater

3.3.1 The Fenland Level 1 SFRA has been reviewed with regards to flooding from groundwater. Table 3-8 within the SFRA presents a detailed assessment of potential sites around the district. For the site referenced Land West & South of 74 West Street, the risk of flooding from groundwater is identified as low.

3.3.2 The information available at the time of preparing this report, and the nature of the underlying geology, suggests that groundwater emergence at the surface is unlikely, such that groundwater flood risk does not constitute a constraint in this instance.

3.4 Flooding from sewers

3.4.1 Anglian Water's asset plan is enclosed in **Appendix C**. There is a single combined water sewer which runs from north to south, crossing the western part of the proposed development site. The existing sewer will be accommodated in the area of public open space within the proposed layout.

3.4.2 The Fenland Level 1 SFRA has been reviewed with regards to flooding from sewers. For the site referenced Land West & South of 74 West Street, Table 3-8 within the SFRA identifies the risk of flooding from sewers as 'medium'.

3.4.3 Table C2 of the SFRA identifies there have been eight incidents of sewer flooding with the postcode area of PE16 6, where the site is located. However, this is not specific to the proposed site location. It is also mentioned in the SFRA that *"no locations in Fenland are classified as being at risk from foul flooding…"*. This information is also shown on Map J of the SFRA, see **Appendix G.**

3.4.4 We do not have any records of sewer flooding at the location of the proposed development.

3.4.5 We therefore do not consider the risk of flooding from sewers to be a significant risk to the proposed development.

3.5 Flooding from reservoirs, canals and other artificial sources

3.5.1 We are not aware of any canals or artificial water sources that may result in flooding of this site.

3.5.2 The EA provides maps (https://flood-warning-information.service.gov.uk/long-term-flood-risk/) showing the area that may be affected by flooding as a result of a breach of a large, raised reservoir (i.e. capable of storing over 25,000 cubic metres of water above the natural level of any part of the surrounding land).

3.5.3 An extract of the Environment Agency map 'Risk of Flooding from Reservoirs' is provided below in Figure 3.3. The site is shown to not be at risk of reservoir flooding when river levels are normal. However, the site is shown to be at risk of reservoir flooding when there is also flooding from rivers.

Figure 3.3 Risk of Flooding from Reservoirs
Source: GOV.UK website - April 2023

3.5.4 However, it is generally acknowledged that reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by qualified civil engineers (referred to as Panel Engineers) and, as the enforcement authority for the Reservoirs Act 1975, the Environment Agency ensures that reservoirs are inspected regularly and essential safety work is carried out.

3.5.5 It can therefore be concluded that whilst there is a residual risk of flooding from reservoirs, the actual risk is low.

3.6 Historic flooding

3.6.1 Map J of the Fenland Level 1 SFRA (enclosed in **Appendix G**) provides the following historic flooding information:

- Historic Incidents Record 2012-2020 Locations
- Historic Flood Map
- Flood Storage Area
- Sewer Flooding Incidents within the postcode area (DG5)

3.6.2 There are a number of historic incidents recorded between 2012 and 2020 that are located in Chatteris and within the vicinity of the proposed site location. However, it is not possible to determine the specific locations of these floods. Further, it is not stated how severe these floods were and the impacts that they held on the location.

3.6.3 As shown below in Figure 3.4, the Environment Agency published a data set in February 2023 that deciphers flooding around the UK. With refence to this map, there has been no serious flooding incidents in Chatteris, and more specifically around the proposed development.

Figure 3.4 Chatteris Historic Flood Map
Source: EA Historic Flood Map Download

3.7 Flood risk vulnerability and flood zone compatibility

3.7.1 Based on the above assessment of the site being located within Flood Zone 3 and classified as a More Vulnerable development, and with reference to Table 3.2 below (Planning Practice Guidance for 'Flood Risk and Coastal Change' to the National Planning Policy Framework, Table 3), the proposed development of this site would be considered "appropriate". A copy of Table 3 is presented below highlighting the above. An Exception Test will be required.

Table 3 – Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	X	Exception test required ✓	✓
Zone 3b	Exception test required	✓	X	X	X
✓ = Development is appropriate			X = Development should not be permitted		

Source: Planning Practice Guidance – 2014

Table 3.2 Flood Risk Vulnerability and Flood Zone Compatibility

3.8 Flood compensation

3.8.1 As referenced above, the current strategy is based on the principles of the original Flood Risk Assessment which was approved as part of the outline planning application, and later received Reserved Matters approval from Fenland District Council. It was agreed for levels associated with the surface water attenuation basin (discussed in Section 4.0 below) to be raised, in order to protect the basin from any flood risk. It is understood that no flood compensation requirements were triggered as part of the approved proposals.

3.8.2 The original principles are being replicated as part of the current proposals, and therefore flood compensation measures are not considered to be required.

3.9 Access and egress

3.9.1 Access and egress to and from this site in the event of flooding will be via the proposed development's access road off West Street, which will allow residents of the development to move to higher ground.

4.0 Management of surface water

4.1 Current conditions

4.1.1 The site is currently open with no existing development, and is therefore considered a greenfield site with no existing drainage. Therefore, greenfield run-off calculations shall be used to derive the allowable run off rate from the site.

4.2 Surface water drainage outfalls

4.2.1 It is a requirement of The Building Regulations (2010), Drainage and Waste Disposal, Approved Document H, to dispose of surface water collected by a development in accordance with the following, listed in order of priority:-

1. Infiltration systems where ground condition permit
2. To watercourses
3. To sewers

4.2.2 Each of these is considered separately below:

4.2.3 Infiltration systems

4.2.3.1 The geology of the site is described in Section 2.6 above. The Ground Investigation report completed by Elemental GI Ltd concluded, based on the underlying ground geology and infiltration testing, that soakaways are not suitable for the development.

4.2.4 Watercourses / Main River

4.2.4.1 Twenty Foot Drain is located along the site's western boundary. Surface water will outfall to Twenty Foot Drain via a new headwall.

4.2.5 Sewers

4.2.5.1 Draining the site to an existing watercourse is a viable option therefore the use of surface water sewers will not be considered further.

4.3 Surface water drainage strategy

4.3.1 Surface water discharge rates will be restricted to greenfield equivalent run-off rates to ensure that the rate of surface water run-off from the site does not increase as a result of the proposed development.

4.3.2 A surface water layout plan is enclosed in **Appendix H.** The drawing shows that surface water will be attenuated through two connected online detention basins. The use of a flow control chamber will limit surface water flows from the site; surface water will outfall into Twenty Foot Drain watercourse to the western boundary of the development.

4.4 SUDS assessment

4.4.1 We have considered the suitability of SUDS for use on the development site. The review is set out in below Table 4.1.

SUDS Assessment		
SUDS Technique	**Suitability**	**Justification**
Rain Water Harvesting	Maybe	To be determined at detailed design stage.
Green Roofs	No	Green roofs are generally only viable on flat roofs. We understand that the proposed dwellings are to have pitched roofs.
Infiltration	No	Underlying geology unviable / lack of space.
Filter Strips / Filter Drains	No	Pervious paving and attenuation basins will be used to manage surface water.
Swales	No	Pervious paving and attenuation basins will be used to manage surface water.
Bioretention Systems	No	Pervious paving and attenuation basins will be used to manage surface water.
Trees	Yes	A number of existing trees will be retained, plus new landscaped areas are proposed.
Pervious Pavements	Yes	Tanked permeable paving will be used for interception purposes and to provide a level of surface water treatment.
Attenuation Tanks	No	Surface water will be attenuated above ground within detention basins.
Detention Basin	Yes	Surface water will be attenuated via two online detention basins, with a low flow channel and micropools provided for water quality purposes.
Ponds and Wetlands	No	Pervious paving and attenuation basins will be used to manage surface water.
Trapped Drainage	No	A sufficient level of water treatment will be provided through the use of permeable paving and online detention basins with low flow channel and micropool.

Table 4.1 SUDS Assessment

4.5 Water quality

4.5.1 Chapter 26 of The SuDS Manual 2015 (CIRIA 753) provides guidance on the methods that should be used to design SuDS to meet the water quality design criteria and good practice design standards. Based on the simple index approach, the pollution hazard indices for different land use classifications are listed in Table 26.2, Chapter 26 of the SuDS Manual. Table 4.2 below summarises the pollution hazard indices that are applicable for residential land use development.

Pollution Hazard Indices for Different Land Use Classifications				
Land Use	**Pollution Hazard Level**	**Total Suspended Solids (TSS)**	**Metals**	**Hydro-carbons**
Residential Roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg school, offices) ie <300 traffic movements/day	Low	0.5	0.4	0.4
TOTAL		**0.7**	**0.6**	**0.45**
Source: Table 26.2 of The SuDS Manual				

Table 4.2 Pollution Hazard Indices for Different Land Use Classifications

4.5.2 Surface water run-off from the development will pass through permeable paving to private driveways and online detention basins with sediment forebay, low flow channel and micropool.

4.5.3 Table 26.3 of The SuDS Manual shows the mitigation indices for a range of SuDS components for discharges to surface waters. An extract of this is provided in Table 4.3 below for the components relevant to the proposed development. For the purposes of this assessment, the online detention basins are considered to be ponds.

Indicative SuDS Mitigation Indices for Discharges to Surface Waters			
Type of SuDS Component	**Mitigation Indices**		
	TSS	**Metals**	**Hydro-carbons**
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Source: Table 26.3 of The SuDS Manual			

Table 4.3 Indicative SuDS Mitigation Indices for Discharges to Surface Waters

4.5.4 As set out in The SuDS Manual, where two or more components are utilised, *"a factor of 0.5 is used to account for the reduced performance of the secondary or tertiary components"*. This will therefore need to be considered where multiple SUDS components are proposed.

4.5.5 Based on the information and assessment set out above, the range of proposed SuDS features are considered to provide sufficient water treatment for the development proposals.

4.6 Surface water drainage design and management

4.6.1 Proposals are to design the surface water drainage system to accommodate storms up to the 1 in 100 year event plus an allowance of 40% for climate change. The design life of a residential development is considered to be greater than 60 years. Table 4.4 below is a copy of Table 2 from the Environment Agency's guidance 'Flood risk assessments: climate change allowances' to support the National Planning Policy Framework, which defines the climate change allowances.

Peak Rainfall Intensity Allowance in Small and Urban Catchments			
Allowance	**'2020s' (2015 to 2039)**	**'2050s' (2040 to 2069)**	**'2080s' (2070 to 2115)**
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%
Source: Environment Agency - 2016			

Table 4.4 Peak Rainfall Intensity Allowance in Small and Urban Catchments

4.7 Existing run-off rates

4.7.1 To reflect the changes in the near surface geology across the site the greenfield run-off rates have been calculated. The greenfield run off rate has been calculated using an area of 2.099ha; the total developable area minus the large open space areas. The method used to calculate the greenfield run off rates is the ICP SUDS and the calculations are presented in **Appendix I**.

4.7.2 The greenfield run off rate, for the application site, is:

Soil type	= 0.338 – obtained from the FEH parameters
SAAR	= 543mm – obtained from the FEH parameters
Urban	= 0.000
Region number	= 5
Area	= 2.099ha
Q_1	= 3.2 l/s
Q_{bar}	= 3.7 l/s
Q_{30}	= 8.8 l/s
Q_{100}	= 13.1 l/s

4.7.3 Surface water run-off from the proposed development will be limited to the greenfield equivalent rate of 3.7 l/s via a vortex flow control device.

4.8 Attenuation requirements

4.8.1 Surface water will discharge into Twenty Foot Drain and will be attenuated to the Q_{bar} greenfield run-off rate of 3.7 l/s. To achieve this, surface water will be attenuated via two attenuation basins in the west of the proposed site to accommodate a 1 in 100 year event plus an allowance of 40% for climate change.

4.8.2 The drained area of the site is 1.087ha, as shown on the plan enclosed in **Appendix J**. An allowance of 10% has been included for urban creep. Therefore, the drainage calculations have been undertaken based on a drained area of 1.197ha.

4.8.3 Based on the proposed drained area and allowable discharge rate of 3.7l/s, the storage requirement for the 1 in 100 year plus climate change event has been calculated utilising the following parameters. Full calculations are enclosed in **Appendix K.**

Rainfall profile	= Flood Estimation Handbook
Return period	= 100 year
Durations	= 60 to 10080 minutes
Climate change	= 40%
Drained area	= 1.197 ha
Limiting flow to watercourse	= 3.7 l/s
Control	= Vortex flow control
Total storage provided by detention basins	= 1,779.6m^3

4.8.4 A design check has been undertaken to confirm that the addition of the detention basin footprint at the top of bank level to the total drained area does not result in flooding. This is to account for the management of rainfall landing in the basins when the basins fill with water. As such, the drained area associated with this sensitivity check is 1.376ha. Calculations for this scenario are enclosed in **Appendix L**.

4.8.5 The surface water drainage layout incorporating the attenuation is shown on the plan enclosed in **Appendix H.**

4.9 Overland flows

4.9.1 Proposals are to design the surface water drainage to accommodate the 1 in 100 year storm event taking into account the predicted future effects of climate. Clearly there is a risk of this storm event being exceeded, albeit this risk is considered very low. In such an event the proposed drainage systems will become overwhelmed and overland flows could occur. Overland flows will be directed to follow the path that overland flows currently follow.

4.9.2 A surface water exceedance flow routing plan can be found in **Appendix M**.

5.0 Foul water drainage strategy

5.1 Foul water will discharge to a new foul manhole constructed online of the existing Anglian Water combined sewer. Anglian Water has confirmed the existing sewer has capacity for the proposed 70 dwellings, see their pre-planning assessment report enclosed in **Appendix N.**

5.2 The foul water drainage strategy is shown on the plan enclosed in Appendix H. A new manhole is to be constructed online of the existing drainage at the eastern boundary of the development, and relaid along the proposed road corridor, connecting back into existing manhole MH03 further downstream.

6.0 Maintenance

6.1 Surface water drainage maintenance

6.1.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption. The various areas will be maintained as set out in Table 6.1 below.

Maintenance Areas – Surface Water	
Aspect	**Maintainer**
Private Drains	Home owner
SUDS – Private	Home owner
SUDS – Communal	SUDS Adoption Authority / Management Company
Adopted Sewers	Anglian Water

Table 6.1 Maintenance Areas – Surface Water

6.2 Foul water drainage maintenance

6.2.1 The drainage system will be designed to minimise maintenance requirements, however, a full maintenance scheme will be established for those elements not being offered for adoption. The various areas will be maintained as set out in Table 6.2 below.

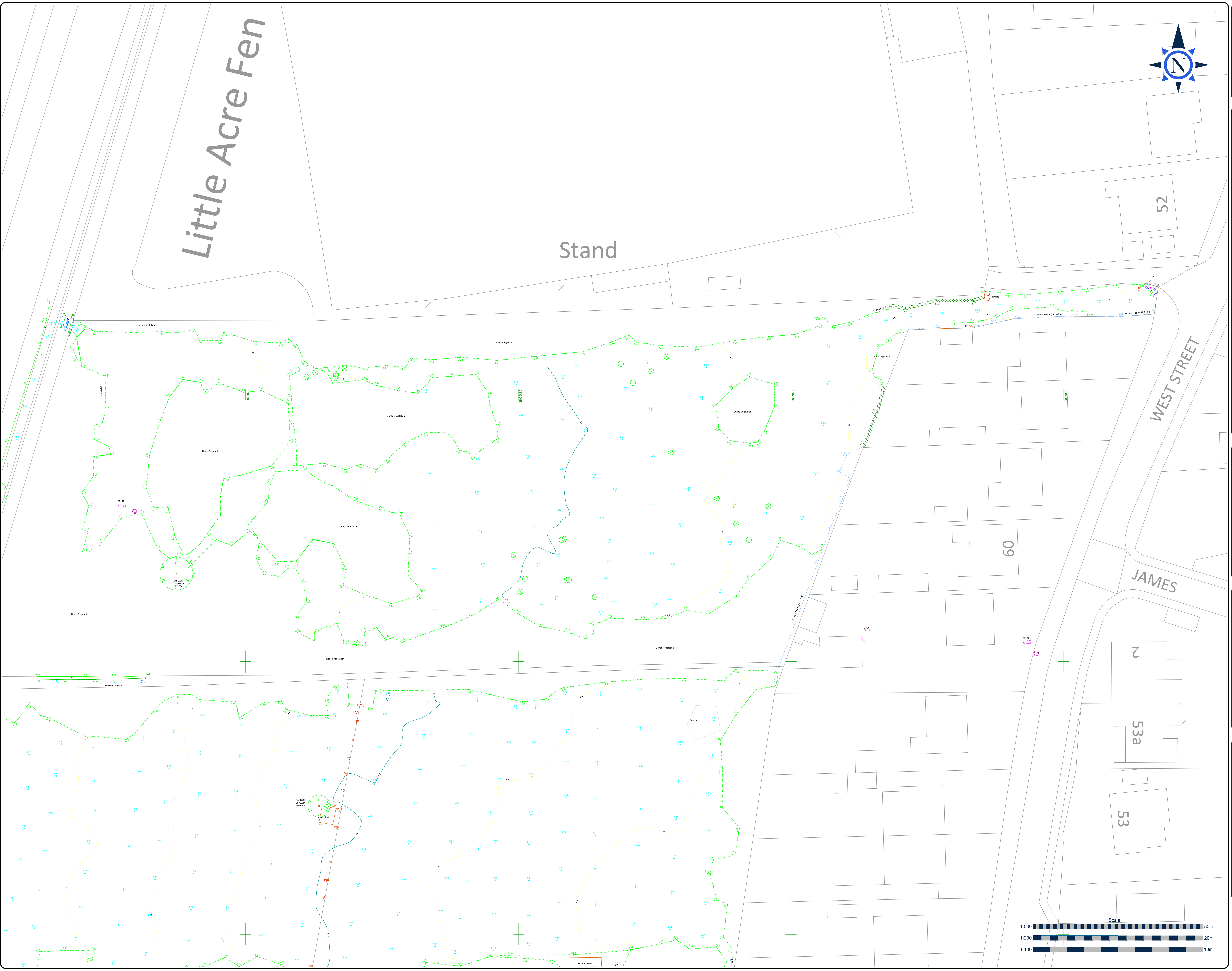
Maintenance Areas – Foul Water	
Aspect	**Maintainer**
Private Drains	Home owner
Adopted Sewers	Anglian Water

Table 6.2 Maintenance Areas – Foul Water

Appendix A

Topographic Survey

Utility Mapping drawing no. UM23-1726-MIN 01 to 03



Sheet Layout

Legend

Station Table

Drawing Notes

Utility depths and levels shown are in meters.

Pipe sizes and materials which cannot be obtained by visual survey are taken from record drawings or marker plates where available.

Cable routes shown as a single line may actually consist on many cables please refer to annotated configuration details where provided.

Drainage pipe sizes and invert levels have been determined without man entry into chambers. Every effort has been made to correctly obtain this information however accuracy is dependant on the visibility of the service.

Coordinates and Levels are derived from Ordnance Survey datum OSGB36 through a series of GNSS RTK Observations.

Client Logo:

MINSTER PROPERTY GROUP

Project Address:

West Street
Chatteris
Cambridgeshire
PE16 6HW

Project Title
PAS128 QL-B 2D M2 Utility Mapping + Topographic Survey

Surveyor	Drawn	Checked	Survey Date:	Scale:
JM/LM	RN/LM	PL/GK	04/04/2023	1:250 @ A0

Project Number:	Sheet No :	Revision:
UM23-1726-MIN	01 OF 03	01

Revision	Revision Notes	Date

Utility MAPPING
0800 024 UMAP (8627)
www.u-map.co.uk info@u-map.co.uk

Sheet Layout

Legend

AR	Assumed Route	MW	Monitoring Well
AV	Air Valve	NVP	No Visible Pipe
Boll.	Bollard	OH	Overhead
BT	Boundary Stone	OHA	Overhang Area
BTIC	BT Inspection Chamber	OSBM	Ordnance Survey Benchmark
C/Box	Control Box	PR	Pipe Riser
CP	Catchpit	PT	Prox Trace
CL	Cover Level	RE	Rodding Eye
Conc.	Concrete	RetWall	Retaining Wall
CR	Culvert Riser	RH	Road Hump
CTV	Cable TV	RWP	Rain Water Pipe
D/Chan	Drainage Channel	SA	Soakaway
DP	Down Pipe	SL	Soffit Level
EJB	Electricity Junction Box	SP	Stop Tap
EOT	End of Trace	STN	Survey Control Station
ER	Electric Riser	SV	Stop Valve
ER	Earth Rod	SVP	Soil Vent Pipe
FFL	Finished Floor Level	TBM	Temporary Benchmark
FH	Fire Hydrant	TFR	Taken From Records
FP	Flag Pole	THL	Threshold Level
GL	Ground Level	TL	Trough Level
G	Gully	TP	Telegraph Pole
G/Run	Gully Run	U/S	Underside
GV	Gas Valve	UL	Uplight
HT	Height	UTF	Unable to Find
IB	Instructive Bollard	UTL	Unable to Lift
IC	Inspection Chamber	UTR	Unable to Rod
IGP	Illuminated Guidepost	UTS	Unable to Survey
IL	Invert Level	UTT	Unable to Trace
KO	Kerb Outlet	VP	Vent Pipe
LB	Low Level Bollard	WC	Water Recovery
LC	Lighting Column	WFC	Water Filled Chamber
LP	Lamppost	WM	Water Meter
MH	Manhole	WO	Wash Out
MKR	Marker	WR	Water Riser
MTR	Meter	Ø	Diameter

0.00 0.00	Building	0.00 0.00	Wall
0.00 0.00	Canopy	0.00 0.00	Fence
0.00 0.00	Furniture	0.00 0.00	Gate with Posts
0.00 0.00	Structure	0.00 0.00	Door
		0.00 0.00	Foliage
0.00 0.00	Top of Bank	0.00 0.00	Hedge
0.00 0.00	Bottom of Bank	0.00 0.00	Cliff Face
0.00 0.00	Top of Ditch		
0.00 0.00	Bottom of Ditch	0.00	Borehole
0.00 0.00	Top of Kerb		Bush
0.00 0.00	Kerb		
0.00 0.00	Drop Kerb		Tree
0.00 0.00	Verge		
0.00 0.00	Concrete	UMXX 0.000	Station
0.00 0.00	Concrete Base		
0.00 0.00	Drainage Channel		
0.00 0.00	Speed Bump	0.00 0.00	Line Marking
0.00 0.00	Surface Change	0.00 0.00	Line Marking Red
0.00 0.00	Trench Scar	0.00 0.00	Line Marking Yellow
0.00 0.00	Water's Edge	0.00 0.00	Road Marking
	Hatch - Building		Hatch - No Access
	Hatch - Obstruction		Hatch - Foliage

Station Table

Drawing Notes

Utility depths and levels shown are in meters.

Pipe sizes and materials which cannot be obtained by visual survey are taken from record drawings or marker plates where available.

Cable routes shown as a single line may actually consist on many cables please refer to annotated configuration details where provided.

Drainage pipe sizes and invert levels have been determined without man entry into chambers. Every effort has been made to correctly obtain this information however accuracy is dependant on the visibility of the service.

Coordinates and Levels are derived from Ordnance Survey datum OSGB36 through a series of GNSS RTK Observations.

Client Logo

MINSTER PROPERTY GROUP

Project Address:

West Street
Chatteris
Cambridgeshire
PE16 6HW

Project Title:

PAS128 QL-B 2D M2 Utility Mapping + Topographic Survey

Surveyor	Drawn	Checked	Survey Date:	Scale:
JM/LM	RN/LM	PL/GK	04/04/2023	1:250 @ A0

Project Number:	Sheet No:	Revision:
UM23-1726-MIN	02 OF 03	01

Revision	Revision Notes	Date

Utility MAPPING

0800 024 UMAP (8627)

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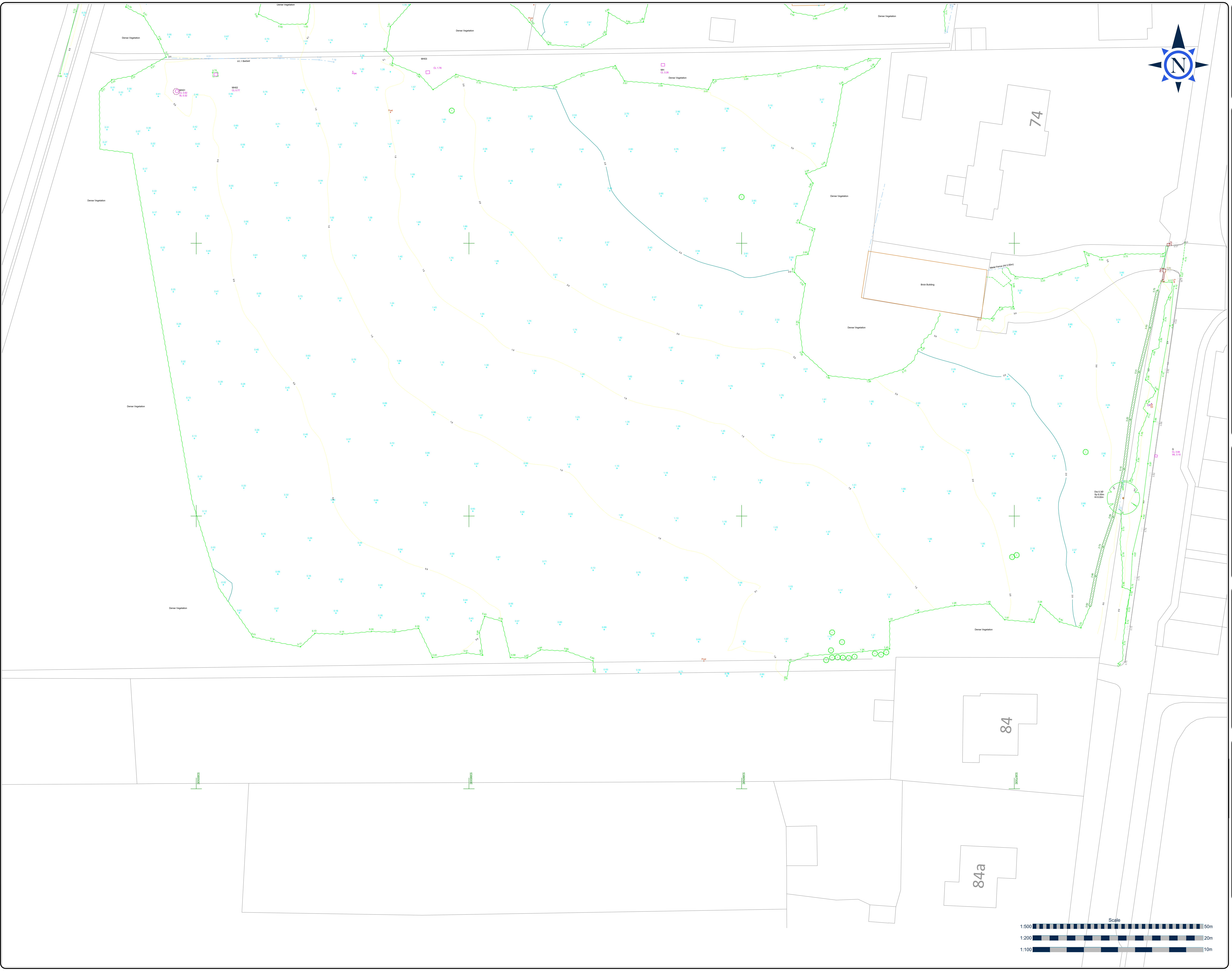

Sheet Layout

Legend

Station Table

Drawing Notes

Utility depths and levels shown are in meters.

Pipe sizes and materials which cannot be obtained by visual survey are taken from record drawings or marker plates where available.

Cable routes shown as a single line may actually consist on many cables please refer to annotated configuration details where provided.

Drainage pipe sizes and invert levels have been determined without man entry into chambers. Every effort has been made to correctly obtain this information however accuracy is dependant on the visibility of the service.

Coordinates and Levels are derived from Ordnance Survey datum OSGB36 through a series of GNSS RTK Observations.

Client Logo:

MINSTER PROPERTY GROUP

Project Address:

West Street
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Cambridgeshire
PE16 6HW

Project Title

PAS128 QL-B 2D M2 Utility Mapping + Topographic Survey

Surveyor	Drawn	Checked	Survey Date:	Scale:
JM/LM	RN/LM	PL/GK	04/04/2023	1:250 @ A0

Project Number:	Sheet No :	Revision:
UM23-1726-MIN	03 OF 03	01

Revision	Revision Notes	Date

Utility MAPPING

0800 024 UMAP (8627)

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Appendix B

Feasibility Site Layout

Minster Property Group drawing no. 21002-001-P08

Feasibility Site Layout

Scale: 1:500

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Source File:
21002 Model.pln

Rev	Date	Drawn	Note
P02	05/12/2022	JKG	Amended to move development out of Flood Zone 3 / Flood Defence area. Unit removed and SoA updated.
P03	05/12/2022	JKG	Red line, Open Space, and SoA updated.
P04	13/01/2023	JKG	Attenuation Basin amended and Pump Station added.
P05	21/04/2023	JKG	Scheme reduced to 74no. units. Mix and SoA amended. Parking relocated between dwellings. Further planting added.
P06	15/05/2023	JKG	Existing drainage easement shown, scheme amended, mix and SoA updated.
P07	29/06/2023	JKG	Site constraints amended. Highway loop road moved, plots adjusted, SoA updated.
P08	05/07/2023	JKG	Plots 01, 09, 29-31, 35 and 36 updated. Garden access shown. Refuse collection points added. SoA updated.

schedule of accommodation

housetype	code	area	quantity
2B4P House	A	70m²	22 no. units
2B4P House	B	74m²	07 no. units
3B5P House	C	82m²	22 no. units
3B5P Det. House	D	90m²	04 no. units
3B5P Det. House	E	90m²	03 no. units
4B6P House	F	96m²	06 no. units
2B3P Bungalow	G	60m²	06 no. units
Total Number of Units			**70 no. units**
approximate site area :		2.98Ha / 7.36 acres	
density :		23.2 dwellings per hectare	
open space		0.765Ha	
parking provision :		300% / 200% / 100%	

Scale (m)

0 10 20 30 40 50

N

Key

- Application site boundary
- Proposed Housing
- Existing Surrounding Buildings
- Private Rear Garden Area
- Public Open / Green Space
- Principal Highway / Road
- Private Drive
- Car Parking Spaces
- Pedestrian Footpaths
- Drainage Easement
- Proposed Tree Planting (indicative only - to be designed and specified by Landscape Architect)
- Proposed Hedge / Shrub Planting (indicative only - to be designed and specified by Landscape Architect)
- Housetypes - Primary Point of Access
- Primary Site Access

Note: This drawing is for feasibility purposes only. This information must not be used for setting out and is subject to a full site/topographical survey being undertaken, and full engagement with the LPA.

MINSTER PROPERTY GROUP

JGA ARCHITECTURE & PLANNING
e: hello@jg-a.co.uk t: 07429 162 747

Client
Minster Property Group Ltd.

Project Title
Proposed Residential Development at Land off West Street, Chatteris

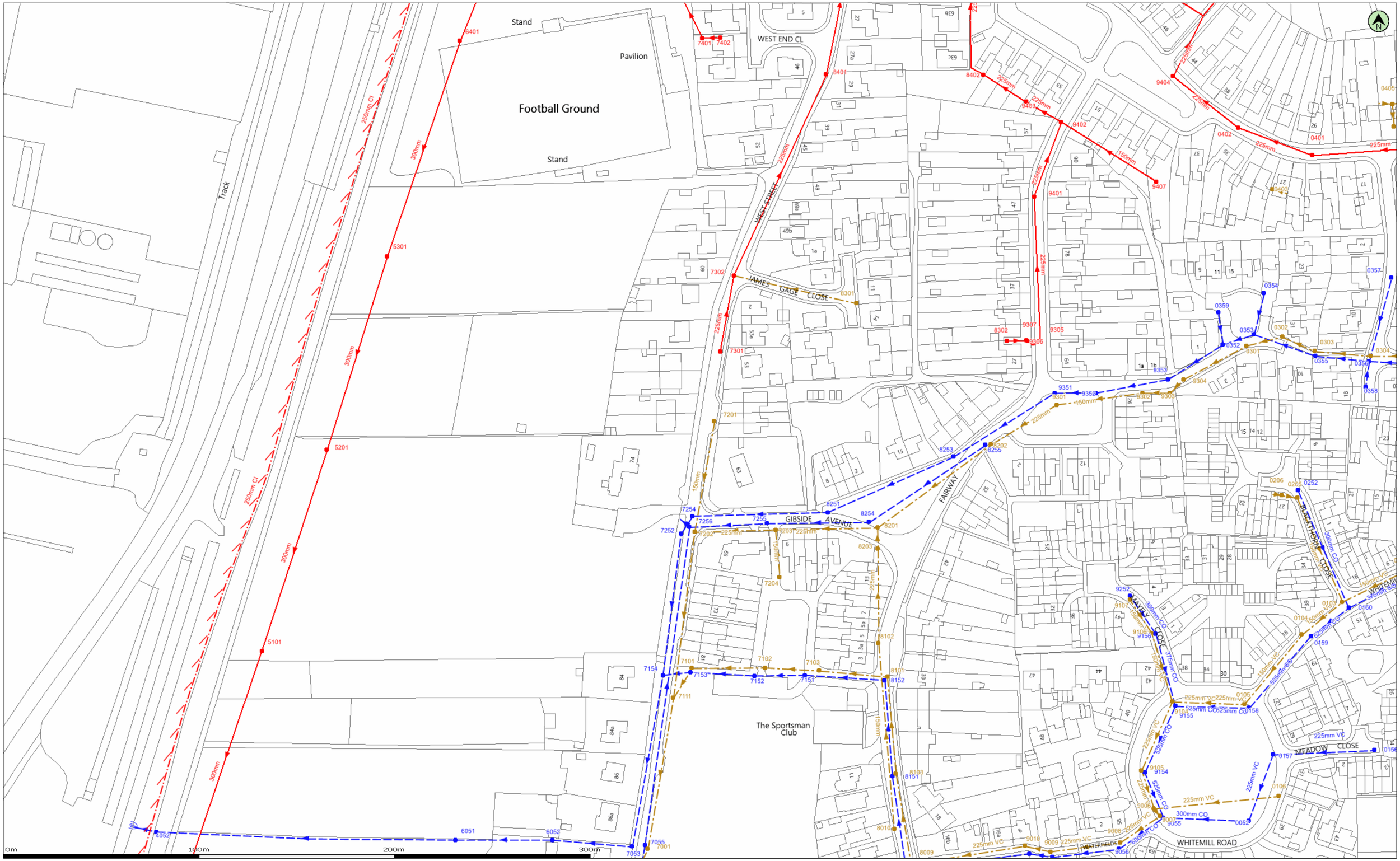
Drawing Title
Feasibility Site Layout

Drawing Status
Preliminary

Scale(s):	Original Paper Size:
1:500	A1
Drawn:	**Date:**
JKG	18.01.21
Project Number:	**Drawing Number:** / **Revision:**
21002	001 / P08

Appendix C

Anglian Water Asset Plan



(c) Crown copyright and database rights 2023 Ordnance Survey 100022432 | Date: 21/03/23 | Scale: 1:1250 | Map Centre: 538738,285288 | Data updated: 28/02/23 | Our Ref: 1117170 - 2 | Wastewater Plan A2

Foul Sewer			
Surface Sewer	Outfall*	Sewage Treatment Works	
Combined Sewer			
Final Effluent	Inlet*	Public Pumping Station	
Rising Main*			
Private Sewer*	Manhole*	Decommissioned Pumping Station	
Decommissioned Sewer*		*(Colour denotes effluent type)	

[redacted]@jppuk.net
26065

love every drop anglianwater

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0401	C	9.2	8.26	0.94
0402	C	8.8	7.69	1.11
5101	C	0.2	-1.11	1.31
5201	C	0.62	-0.69	1.31
5301	C	1.29	-0.22	1.51
6401	C	1.78	0.57	1.21
7301	C	4.84	4.06	0.78
7302	C	3.88	2.8	1.08
7401	C	-	-	-
7402	C	3.88	2.95	0.93
8302	C	-	-	-
8401	C	5.36	3.82	1.54
8402	C	7.31	5.95	1.36
9305	C	-	-	-
9306	C	-	-	-
9307	C	-	-	-
9401	C	8.1	6.99	1.11
9402	C	7.91	6.5	1.41
9403	C	7.44	6.18	1.26
9404	C	8.32	7.41	0.91
9407	C	-	-	-
0103	F	9.8	7.26	2.54
0104	F	10.54	7.07	3.47
0105	F	9.82	6.69	3.13
0106	F	-	7.66	-
0205	F	10.2	8.32	1.88
0206	F	-	-	-
0301	F	-	-	-
0302	F	-	-	-
0303	F	-	-	-
0304	F	-	-	-
0403	F	-	-	-
0405	F	-	-	-
0406	F	-	-	-
7001	F	3.39	2.23	1.16
7101	F	-	-	-
7102	F	-	-	-
7103	F	-	-	-
7111	F	-	-	-
7201	F	4.57	3.81	0.76
7202	F	4.08	3.27	0.81
7203	F	5.41	4.35	1.06
7204	F	5.61	4.85	0.76
8010	F	-	-	-
8101	F	-	-	-
8102	F	8.4	6.7	1.7
8103	F	-	-	-
8201	F	7.51	5.8	1.71
8202	F	8.38	6.61	1.77
8203	F	8.36	6.65	1.71
8301	F	-	-	-
9006	F	8.28	6.24	2.04
9007	F	8.95	6.23	2.72
9008	F	8.84	6.13	2.71
9009	F	8.63	5.96	2.67
9010	F	8.6	5.91	2.69
9104	F	9.68	6.53	3.15
9105	F	8.77	6.36	2.41
9106	F	9.35	6.87	2.48
9107	F	9.5	7.04	2.46
9301	F	8.97	7.44	1.53
9302	F	9.94	7.93	2.01
9303	F	-	-	-
9304	F	8.39	7.28	1.11
0052	S	9.11	6.93	2.18
0156	S	9.35	7.85	1.5
0157	S	9.5	7.34	2.16
0158	S	9.82	7.14	2.68
0159	S	10.54	7.37	3.17
0160	S	9.8	7.5	2.3
0252	S	10.2	7.83	2.37

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0352	S	-	-	-
0353	S	-	-	-
0354	S	-	-	-
0355	S	-	-	-
0356	S	-	-	-
0357	S	-	-	-
0358	S	-	-	-
0359	S	-	-	-
4052	S	-	-	-
6051	S	-	-	-
6052	S	-	-	-
7053	S	-	-	-
7055	S	-	-	-
7151	S	-	-	-
7152	S	-	-	-
7153	S	-	-	-
7154	S	-	-	-
7252	S	-	-	-
7254	S	-	-	-
7255	S	-	-	-
7256	S	-	-	-
8151	S	-	-	-
8152	S	-	-	-
8251	S	-	-	-
8253	S	-	-	-
8254	S	-	-	-
8255	S	-	-	-
9055	S	8.9	6.53	2.37
9056	S	8.8	6.41	2.39
9057	S	8.7	6.26	2.44
9058	S	8.96	6.21	2.75
9154	S	8.75	6.75	2
9155	S	9.48	6.97	2.51
9156	S	9.35	7.26	2.09
9252	S	9.5	7.44	2.06
9351	S	-	-	-
9352	S	-	-	-
9353	S	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

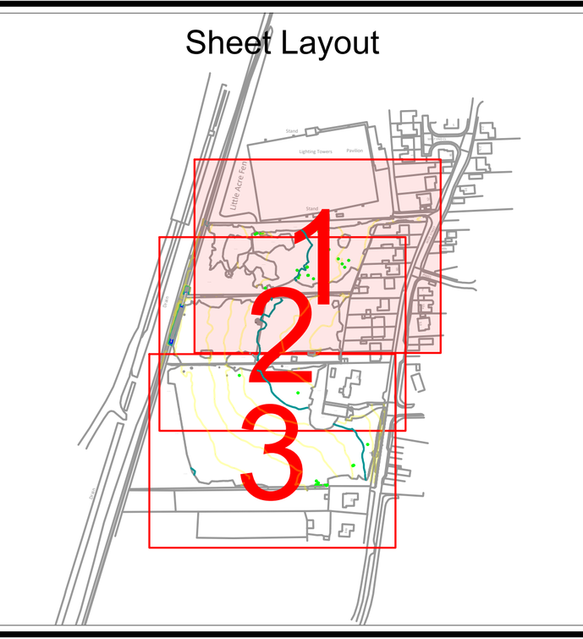
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix D

Utility Mapping

Utility Mapping drawing no. UM23-1726-MIN 01 to 03

Sheet Layout



Legend

AR	Assumed Route	G/Run	Gully Run	RS	Road Sign
AV	Air Valve	GR	Gas Riser	RWP	Rain Water Pipe
BD	Backdrop	GV	Gas Valve	SA	Soakaway
BP	Block Paving	HOR	Head of Run	SL	Soffit Level
Boll.	Bollard	HT	Height	ST	Stop Tap
BH	Borehole	IB	Illuminous Bollard	STN	Survey Control Station
BTIC	BT Inspection Chamber	IC	Inspection Chamber	SV	Stop Valve
C/Box	Control Box	IGP	Illuminated Guidepost	SVP	Soil Vent Pipe
C/Pit	Catchpit	IL	Invert Level	TBM	Temporary Benchmark
CE	Chamber Extents	KO	Kerb Outlet	TFR	Taken From Records
CL	Cover Level	LB	Lighting Bollard	THL	Threshold Level
Conc.	Concrete	LC	Lighting Column	TL	Traffic Light
CPS	Concrete Paving Slabs	LH	Lamphole	TOS	Top of Silt
CR	Cable Riser	LP	Lamppost	TP	Telegraph Pole
CTV	Cable TV	MH	Manhole	U/S	Underside
D/Chan.	Drainage Channel	MKR	Marker	UL	Uplight
DFP	Down Facing Pipe	MTR	Meter	UTF	Unable to Find
DL	Directly Laid	MW	Monitoring Well	UTL	Unable to Lift
DP	Down Pipe	NDU	Number of Ducts Unknown	UTR	Unable to Rod
DR	Duct Riser	NVI	No Visible Incoming	UTS	Unable to Survey
EJB	Electricity Junction Box	NVO	No Visible Outgoing	UTT	Unable to Trace
EOT	End of Trace	NVP	No Visible Pipe	VP	Vent Pipe
EP	Electricity Pole	OH	Overhead	VR	Vapour Recovery
ER	Earth Rod	OSA	Off Survey Area	WFC	Water Filled Chamber
FFL	Finished Floor Level	OSBM	Ordinance Survey Benchmark	WM	Water Meter
FH	Fire Hydrant	PR	Pipe Riser	WO	Wash Out
FP	Flag Pole	PT	Poor Trace	WR	Water Riser
FS	Fire Switch	RE	Rodding Eye	Ø	Diameter
G	Gully	R/Wall	Retaining Wall	3SI	3-Stage Interceptor

Pipeline Material Abbreviations

AC	Asbestos Cement	PVC	Polyvinyl Chloride
CI	Cast Iron	RC	Reinforced Concrete
DI	Ductile Iron	S	Steel
HDPE	High Density Polyethylene	SS	Stainless Steel
MS	Mild Steel	VC	Vitrified Clay
PE	Polyethylene	WI	Wrought Iron

Utility Legend

EHV	Extra High Voltage Electricity	FWS	Foul Drainage
HV	High Voltage Electricity	SWS	Surface Drainage
LV	Low Voltage Electricity	CWS	Combined Drainage
SL	Street Lighting	EWS	Effluent Drainage
ES	Earthing Strip	ADB	AdBlue Line
TS	Traffic Signals	O	Offset Fill Line
CATV	Cable Television	V	Vent Line
CCTV	Closed Circuit Television	F	Fuel Line
COM	Communications	VR	Vapour Recovery
BT	British Telecoms	G	Gauge Line
FO	Fibre Optics	OIL	Oil Pipe
GAS	Gas	HPL	Heating Pipe
HPG	High Pressure Gas	A	Compressed Air
IPG	Intermediate Pressure Gas	O2	Oxygen Supply
LHPG	Localised High Pressure Gas	AL	Alarm Cable
MPG	Medium Pressure Gas	ED	Empty Duct
W	Water		Survey Boundary
P	Pipeline		Chamber Extents
UNK	Unknown Asset		Approx. CE

Utility Location Depth Explanation

The located depth of a service obtained during a survey may be received to 3 different locations;

Center (c); EML Electromagnetic locating provides a depth to the center of the magnetic field received which is also the center of the pipe or cable.

Invert (i); Depths obtained during drainage surveys or using Flexi Trace or Sonde are taken at the invert of a pipe.

Top (t); GPR Ground Penetrating Radar provides depths to the top or crown of a pipe.

LV 0.30c — SWS 0.30i — UNK 0.30t

The letter following the depth indicates to where the depth has been measured to.

ELECTRO-MAGNETIC DETECTION	SONDE & FLEXI TRACE	GROUND PENETRATING RADAR
APPROX. DEPTH TO CENTRE	APPROX DEPTH TO INVERT	APPROX DEPTH TO EXTERNAL CROWN
PIPE OR CABLE (CONDUCTIVE)	EMPTY DUCT OR DRAINAGE	PIPE OR CABLE (NON CONDUCTIVE)

Utility Block Legend

EOT	Capped	TFR	Junc.
End of Trace	Capped Service	End of Service End of Record	Junction Observed On Drainage CCTV

PAS 128 Quality Level Classifications

Quality Level labeling of located utilities with a classification code allows the user of the information to understand clearly how it was obtained and then apply appropriate confidence and reliance upon it. Project risks relating to underground utilities can then be properly managed.

QL A Information is obtained by visually confirming the utility location, type, position and size. Services can be visually proven by way of Non destructive digging (NDD) using Vacuum Excavation or hand digging techniques to expose the buried service. Once accurately surveyed tolerances for a QL-A classification are: +/- 50mm of given depth and +/- 25mm horizontally.

QL B1 Information is obtained using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment. in order to achieve a B1 classification at least two methods must accurately locate and agree on a buried service location. Once accurately surveyed tolerances for a QL-B1 classification are: +/- 15% of given depth and +/- 150mm horizontally.

QL B2 Information is obtained using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment. in order to achieve a B2 classification one method must accurately locate a buried service location. Once accurately surveyed tolerances for a QL-B2 classification are: +/- 40% of given depth and +/- 250mm horizontally.

QL B3 Information is obtained using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment. in order to achieve a B3 classification one method may indicate a possible position for a service location however due to possible interference or poor results no depth can be achieved. Once accurately surveyed tolerances for a QL-B3 classification are: no given depth and +/- 500mm horizontally.

QL B4 Information is has been unable to be located using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment but is believed to exist until proven otherwise. This type of information could also be associated with assumed routes and Taken from records. There are no design tolerances associated with a B4 quality level and information should be treated with caution.

QL C Information is collected by correlating the survey of visible surface features such as marker plates, manholes or trench scars with existing drawing or record information to enable the approximate position of a utility to be determined. There are no design tolerances associated with a QL-C quality level.

QL D Information is the most basic level of Utility information derived from existing drawing and record information . This method should always be treated as an indication of the presence of a service and should not be used for design.

Drawing Notes

Utility depths and levels shown are in meters.

Pipe sizes and materials which cannot be obtained by visual survey are taken from record drawings or marker plates where available.

Cable routes shown as a single line may actually consist on many cables please refer to annotated configuration details where provided.

Drainage pipe sizes and invert levels have been determined without man entry into chambers. Every effort has been made to correctly obtain this information however accuracy is dependant on the visibility of the service.

For all equipment specifications, site procedures and limitations encountered on this project please see the survey report.

Coordinates and Levels are derived from Ordnance Survey datum OSGB36 through a series of GNSS RTK Observations.

Detection Disclaimer: Electromagnetic locating techniques as well as Ground Penetrating Radar have been utilized in the location of underground services. These results are non infallible and a NDD non destructive process should be carried out to confirm service identification positions and particularly depths where these are critical. Although all reasonable effort has been made in the locating and mapping of underground services the complete extents of this Utility survey information cannot be guaranteed.

Client Logo:

MINSTER PROPERTY GROUP

Project Address:

West Street
Chatteris
Cambridgeshire
PE16 6HW

Project Title
PAS128 QL-B 2D M2 Utility Mapping + Topographic Survey

Surveyor	Drawn	Checked	Survey Date:	Scale:
JM/LM	RN/LM	PL/GK	04/04/2023	1:250 @ A0

Project Number:	Sheet No :	Revision:
UM23-1726-MIN	01 OF 03	01

Revision	Revision Notes	Date
01	Utility drainage added after site revisit	11/05/2023

Utility MAPPING

0800 024 UMAP (8627)

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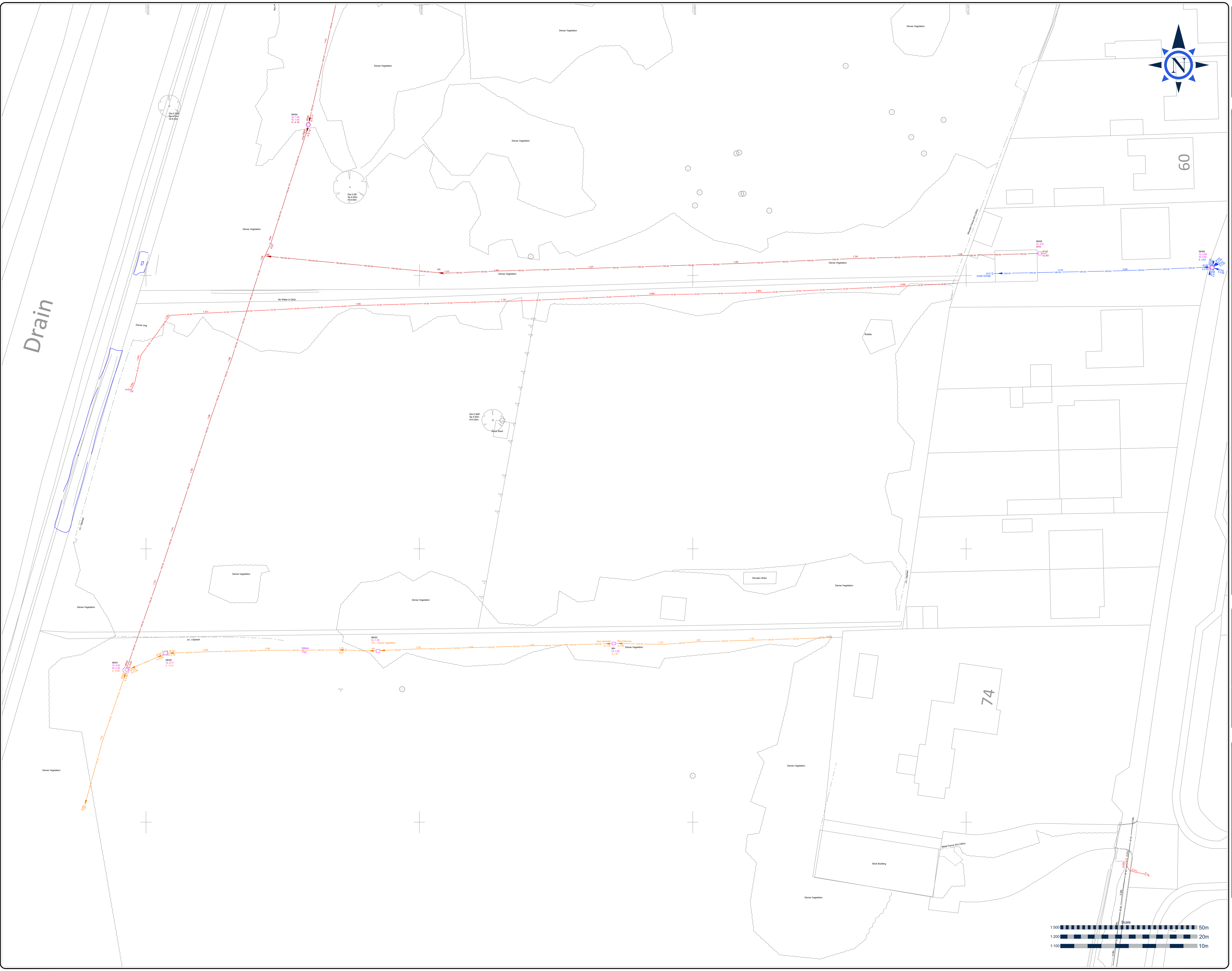
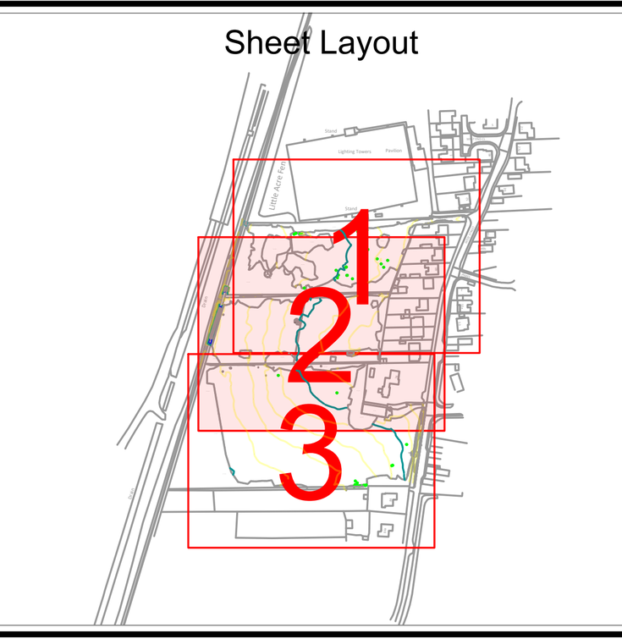


Sheet Layout



Legend

AR	Assumed Route				
AV	Air Valve				
BD	Backdrop	G/Run	Gully Run	RS	Road Sign
BP	Block Paving	GR	Gas Riser	RWP	Rain Water Pipe
Boll.	Bollard	GV	Gas Valve	SA	Soakaway
BH	Borehole	HOR	Head of Run	SL	Soffit Level
BTIC	BT Inspection Chamber	HT	Height	ST	Stop Tap
C/Box	Control Box	IB	Illuminous Bollard	STN	Survey Control Station
C/Pit	Catchpit	IC	Inspection Chamber	SV	Stop Valve
CE	Chamber Extents	IGP	Illuminated Guidepost	SVP	Soil Vent Pipe
CL	Cover Level	IL	Invert Level	TBM	Temporary Benchmark
Conc.	Concrete	KO	Kerb Outlet	TFR	Taken From Records
CPS	Concrete Paving Slabs	LB	Lighting Bollard	THL	Threshold Level
CR	Cable Riser	LC	Lighting Column	TL	Traffic Light
CTV	Cable TV	LH	Lamphole	TOS	Top of Silt
D/Chan.	Drainage Channel	LP	Lamppost	TP	Telegraph Pole
DFP	Down Facing Pipe	MH	Manhole	U/S	Underside
DL	Directly Laid	MKR	Marker	UL	Uplight
DP	Down Pipe	MTR	Meter	UTF	Unable to Find
DR	Duct Riser	MW	Monitoring Well	UTL	Unable to Lift
EJB	Electricity Junction Box	NDU	Number of Ducts Unknown	UTR	Unable to Rod
EOT	End of Trace	NVI	No Visible Incoming	UTS	Unable to Survey
EP	Electricity Pole	NVO	No Visible Outgoing	UTT	Unable to Trace
ER	Earth Rod	NVP	No Visible Pipe	VP	Vent Pipe
FFL	Finished Floor Level	OH	Overhead	VR	Vapour Recovery
FH	Fire Hydrant	OSA	Off Survey Area	WFC	Water Filled Chamber
FP	Flag Pole	OSBM	Ordinance Survey Benchmark	WM	Water Meter
FS	Fire Switch	PR	Pipe Riser	WO	Wash Out
G	Gully	PT	Poor Trace	WR	Water Riser
		RE	Rodding Eye	Ø	Diameter
		R/Wall	Retaining Wall	3SI	3-Stage Interceptor

Pipeline Material Abbreviations

AC	Asbestos Cement	PVC	Polyvinyl Chloride
CI	Cast Iron	RC	Reinforced Concrete
DI	Ductile Iron	S	Steel
HDPE	High Density Polyethylene	SS	Stainless Steel
MS	Mild Steel	VC	Vitrified Clay
PE	Polyethylene	WI	Wrought Iron

Utility Legend

EHV	Extra High Voltage Electricity	FWS	Foul Drainage
HV	High Voltage Electricity	SWS	Surface Drainage
LV	Low Voltage Electricity	CWS	Combined Drainage
SL	Street Lighting	EWS	Effluent Drainage
ES	Earthing Strip	ADB	AdBlue Line
TS	Traffic Signals	O	Offset Fill Line
CATV	Cable Television	V	Vent Line
CCTV	Closed Circuit Television	F	Fuel Line
COM	Communications	VR	Vapour Recovery
BT	British Telecoms	G	Gauge Line
FO	Fibre Optics	OIL	Oil Pipe
GAS	Gas	HPL	Heating Pipe
HPG	High Pressure Gas	A	Compressed Air
IPG	Intermediate Pressure Gas	O2	Oxygen Supply
LHPG	Localised High Pressure Gas	AL	Alarm Cable
MPG	Medium Pressure Gas	ED	Empty Duct
W	Water		Survey Boundary
P	Pipeline		Chamber Extents
UNK	Unknown Asset		Approx. CE

Utility Location Depth Explanation

The located depth of a service obtained during a survey may be received to 3 different locations;

Center (c); EML Electromagnetic locating provides a depth to the center of the magnetic field received which is also the center of the pipe or cable.

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Top (t); GPR Ground Penetrating Radar provides depths to the top or crown of a pipe.

LV 0.30c   SWS 0.30i   UNK 0.30t

The letter following the depth indicates to where the depth has been measured to.

ELECTRO-MAGNETIC DETECTION	SONDE & FLEXI TRACE	GROUND PENETRATING RADAR
APPROX. DEPTH TO CENTRE	APPROX DEPTH TO INVERT	APPROX DEPTH TO EXTERNAL CROWN
PIPE OR CABLE (CONDUCTIVE)	EMPTY DUCT OR DRAINAGE	PIPE OR CABLE (NON CONDUCTIVE)

Utility Block Legend

EOT	Capped	TFR	Junc.
End of Trace	Capped Service	End of Service End of Record	Junction Observed On Drainage CCTV

PAS 128 Quality Level Classifications

Quality Level labeling of located utilities with a classification code allows the user of the information to understand clearly how it was obtained and then apply appropriate confidence and reliance upon it. Project risks relating to underground utilities can then be properly managed.

QL A Information is obtained by visually confirming the utility location, type, position and size. Services can be visually proven by way of Non destructive digging (NDD) using Vacuum Excavation or hand digging techniques to expose the buried service. Once accurately surveyed tolerances for a QL-A classification are: +/- 50mm of given depth and +/- 25mm horizontally.

QL B1 Information is obtained using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment. in order to achieve a B1 classification at least two methods must accurately locate and agree on a buried service location. Once accurately surveyed tolerances for a QL-B1 classification are: +/- 15% of given depth and +/- 150mm horizontally.

QL B2 Information is obtained using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment. in order to achieve a B2 classification one method must accurately locate a buried service location. Once accurately surveyed tolerances for a QL-B2 classification are: +/- 40% of given depth and +/- 250mm horizontally.

QL B3 Information is obtained using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment. in order to achieve a B3 classification one method may indicate a possible position for a service location however due to possible interference or poor results no depth can be achieved. Once accurately surveyed tolerances for a QL-B3 classification are: no given depth and +/- 500mm horizontally.

QL B4 Information is has been unable to be located using Electromagnetic Pipe & Cable locators EML, Sonde or Flexi trace and Ground Penetrating Radar GPR equipment but is believed to exist until proven otherwise. This type of information could also be associated with assumed routes and Taken from records. There are no design tolerances associated with a B4 quality level and information should be treated with caution.

QL C Information is collected by correlating the survey of visible surface features such as marker plates, manholes or trench scars with existing drawing or record information to enable the approximate position of a utility to be determined. There are no design tolerances associated with a QL-C quality level.

QL D Information is the most basic level of Utility information derived from existing drawing and record information . This method should always be treated as an indication of the presence of a service and should not be used for design.

Drawing Notes

Utility depths and levels shown are in meters.

Pipe sizes and materials which cannot be obtained by visual survey are taken from record drawings or marker plates where available.

Cable routes shown as a single line may actually consist on many cables please refer to annotated configuration details where provided.

Drainage pipe sizes and invert levels have been determined without man entry into chambers. Every effort has been made to correctly obtain this information however accuracy is dependant on the visibility of the service.

For all equipment specifications, site procedures and limitations encountered on this project please see the survey report.

Coordinates and Levels are derived from Ordnance Survey datum OSGB36 through a series of GNSS RTK Observations.

Detection Disclaimer: Electromagnetic locating techniques as well as Ground Penetrating Radar have been utilized in the location of underground services. These results are non infallible and a NDD non destructive process should be carried out to confirm service identification positions and particularly depths where these are critical. Although all reasonable effort has been made in the locating and mapping of underground services the complete extents of this Utility survey information cannot be guaranteed.

Client Logo:

MINSTER PROPERTY GROUP

Project Address:

West Street
Chatteris
Cambridgeshire
PE16 6HW

Project Title
PAS128 QL-B 2D M2 Utility Mapping + Topographic Survey

Surveyor	Drawn	Checked	Survey Date:	Scale:
JM/LM	RN/LM	PL/GK	04/04/2023	1:250 @ A0

Project Number:	Sheet No :	Revision:
UM23-1726-MIN	02 OF 03	01

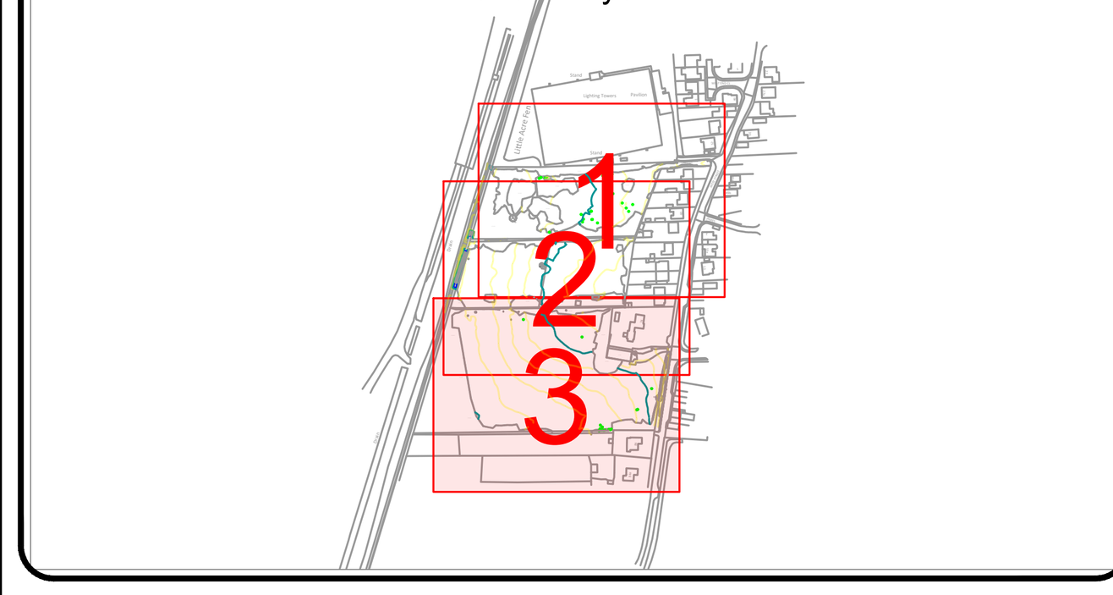
Revision	Revision Notes	Date
01	Utility drainage added after site revisit	11/05/2023

Utility MAPPING

0800 024 UMAP (8627)

www.u-map.co.uk info@u-map.co.uk

Sheet Layout



Legend

AR	Assumed Route	G/Run	Gully Run	RS	Road Sign
AV	Air Valve	GR	Gas Riser	RWP	Rain Water Pipe
BD	Backdrop	GV	Gas Valve	SA	Soakaway
BP	Block Paving	HOR	Head of Run	SL	Soffit Level
Boll.	Bollard	HT	Height	ST	Stop Tap
BH	Borehole	IB	Illuminous Bollard	STN	Survey Control Station
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01	Utility drainage added after site revisit	11/05/2023

Utility MAPPING

0800 024 UMAP (8627)

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Appendix E

Extract of Geo-Environmental Investigation
Elemental GI Ltd report ref. E23103/2a/1

Elemental GI Ltd

REPORT: SUPPLEMENTARY PHASE 2 GEO-ENVIRONMENTAL INVESTIGATION FOR SITE OFF WEST STREET, CHATTERIS

CLIENT: MINSTER PROPERTY GROUP LTD

Project No: E23103
Ref No: E23103/2a/1

Date: Oct. 2023
Rev: 1

info@elementalgi.com
www.elementalgi.com

Registered in England No. 13391634

Semi-Technical Summary

The reader is referred to the terms and conditions which accompany this report, and which are presented at the end of this document. Please refer to the terms and conditions shown at the end of this report for an important list of exclusions / assumptions etc.

This semi-technical summary provides a brief overview of the main conditions which have been noted on site. These features / factors (alongside others) are explained fully in the following report and the following should therefore not be referred to in isolation. No reliance should be placed on the following summary until the whole report has been read in full.

Ground Conditions / Foundations	The site is typically underlain by topsoil which is underlain by reworked natural soils and subsequently by natural cohesive soils which have occasional sandy bands. Granular soils have been encountered locally. Ground conditions have been identified which provisionally require significantly increased concrete design classifications. It has been recommended that the Client contacts a concrete design / specification specialist for further guidance. Shallow natural soils may proviiosnally be suitable to allow shallow foundations to be considered based upon their strengths. However, adjustments to foundation depths due the high volume change potential and potential desiccation status of some soils at the site are now required, which may necessitate a deepened (piled) foundation approach. We await updates / information on your Structural Engineer's proposals for the site, after which pursuit of cost-effective recommendations (including increased allowable bearing capacities) may be sought.
Contamination	This report and accompanying assessment(s) have benefitted from the thorough sampling and analysis of soils over 2 No. separate investigations. No significant exceedances have been recorded. Additional sampling and analysis of soils beneath / around the sheds, tank and associated infrastructure is required following the removal of these features to verify their condition. A ground gas monitoring exercise has been completed. Significant ground gas has not been recorded, and ground gas protection measures are therefore not required, subject to regulatory / warranty provider approval.
Other issues	*In situ* initial infiltration feasibility testing has been undertaken as part of the recent investigation. This confirmed that the cohesive soils tested did not exhibit significant discharge of water during the test periods and *in situ* drainage devices are therefore not considered feasible at the site, subject to drainage engineer / regulatory approval.
Recommendations	Further works have been recommended in this report, including the following main recommendations: ▪ Discussion with Structural Engineers to confirm final foundation depth proposals so that specific bearing capacities may be recommended; ▪ Submission of our reports to regulators / warranty providers to confirm approval of the works reported herein and of remediation requirements / contingencies across the site; ▪ Completion of confirmatory inspection works within currently uninvestigated areas of the site (i.e. beneath sheds and beneath / around tank and associated infrastructure): ▪ Verification of appropriate utility construction materials with the relevant providers; and ▪ Where soils are to be removed from site for disposal it is recommended that these are fully characterised (i.e. to confirm material types and disposal options you're your preferred contractors and that advice is sought from the appointed contractors to determine any requirements for specific testing etc.

1.0 INTRODUCTION

1.1 Report Status

A Phase I Assessment and a Phase II Environmental Investigation has been undertaken for the site by Herts & Essex Site Investigations (both referenced 15045 and dated October 2018 and November 2018 respectively). Please see section 1.2 below for further information.

Elemental GI Ltd were appointed by Minster Property Group Ltd (hereafter referred to as 'the Client') to undertake a Supplementary Phase II Geo-Environmental Investigation for the Site off West Street, Chatteris (hereafter referred to as 'the site'). It must be noted that a Phase II Environmental Investigation has been reported under separate cover by ourselves in advance of this report (ref. E23103/2/0 dated Aug. 2023) to provide rapid / initial recommendations relating to environmental setting and chemical quality of soils etc.

This document (E23103/2a/1) presents a combined geotechnical and environmental ('geo-environmental') report which provides additional information (i.e. in addition to report E23103/2/0 dated Aug. 2023) and recommendations / conclusions relating to the ground conditions, foundation options etc.

This report has been prepared on the understanding that the site is to redevelopment to support residential housing. We have been supplied with a copy of the proposed layout (Ref. 21002/001/P04 dated Jan. 2021), and extracts of this plan are presented in the Proposed Site Layout Plan (Drawing 001) in Appendix I.

This report has been prepared in accordance with our notes concerning the terms and conditions of these works and of our engagement, which are presented at the end of this report. Please refer to these terms and conditions for an important list of exclusions / assumptions etc.

Should the development proposals alter, then the recommendations in this report may be subject to change. Whilst it may be utilised by others for reference purposes at the Client's discretion, it has not been prepared for any other purposes (e.g. waste classification etc.) and therefore additional works may be required by third parties dependent upon their own requirements / works.

Users of any / all of our reports, letters etc. must always ensure that they are reading the latest version / revision before undertaking any works and / or making any assessments, designs, decisions or related ventures. Please stop and check that this is the latest version for this site / project before proceeding any further.

1.2 Previous Reports

Elemental GI Ltd have been supplied with copies of the following documents by the Client which relate to the subject site:

- Herts & Essex Site Investigations: Phase I Desk Top Study Report for West Street, Chatteris (Ref. 15045 dated Oct. 2018); and
- Herts & Essex Site Investigations: Phase II Environmental Report for West Street, Chatteris (Ref. 15045 dated Nov. 2018).

The above referenced documents have not been reproduced herein and they should be referred to in full alongside this report.

It is understood that the Client has reliance on the above referenced reports.

We have not undertaken a review of our Phase II Environmental Investigation (ref. E23103/2/0 dated Aug. 2023) as this is incorporated fully within this Geo-Environmental Report (Ref. E23103/2a/1).

1.2.1 Summary of Previous Reports

Phase I Desk Top Study

The Phase I Report provides an overview of the site's geo-environmental setting and includes a review of environmental database information and historic mapping. It also includes a record of discussions / consultations with local regulators.

The following were noted by the third party within their report:

- *Within the site area open land is recorded in place from the earliest map reference and remains in place to date. The site form three section of land with ditches and hedges in place forming the boundary. Within the southern section of the site a building is recorded from 1972 onwards.*
- *Within the southern section of the site a building is in place; forming a brick storage warehouse, with a concrete floor and corrugated likely asbestos roof. Within the building there is storage of household furniture, cardboard boxes and a car. To the east of the storage warehouse large sliding door are in place and this leads onto a small area of concrete and then an area of compact hardcore over grown with low level wild grasses. To the north east of the building there is an old petrol pump in place, with a manhole in place to the east of the pump, this would suggest that a below ground tank may be in place within this area of the site and will therefore form a potential source of fuel risk. The remaining area of the site is laid to wild grasses and weeds.*

- *Surrounding the site, open land is in place, with a farm in place to the north of the site, 200 meters from the site. To the north of the site area a football ground is in place from 1972 and remain in place to date. To the west of the site area about 5 meters a railway line was in place from pre 1887 until 1972 when these are recorded as dismantled and within the area there is currently a surface water feature in place.*
- *The nearest surface water features are recorded as within the site area, and are shown as ditches in place at the boundary of the land parcels.*
- *To the west of the site area, a number of drains and ditches are recorded along side the Fenton Lode or Twenty Foot Drain, which extends from north to south.*
- *The nearest abstraction well is located on site recorded for General Agriculture: Spray Irrigation - Direct from Drains at Chatteris This is not an abstraction that is taken from the groundwater. No potable abstractions are recorded surrounding the site area.*
- *The ground conditions based on geological maps and BGS information shows the site to be on the boundary of two geology's. The east of the site is recorded as within West Walton Formation and Ampthill Clay Formation, to the west of the site area Peat is recorded in place above the Oxford Clay Formation. (*NB subsequent sections in the third party's report record 'Filled / Re-Worked Ground' on site based on geological mapping*).*

The third party's review of historic mapping dating back to 1887 was also included. This indicated that the site supported open fields in 1887 and that a building was recorded in the southern area of the site from 1972. Further development was not recorded.

The third party constructed an initial conceptual site model within their Phase I Report which explored potential risks from various sources at the site in relation to multiple potential receptors including human health and controlled waters. The following were identified as potential sources:

- The southern 'storage warehouse', including suspected asbestos sheeting and fuel pump and tank on site; and
- A historic farm (200m north) and historic railway land (5m west) off-site.

The following potential pathways were identified by the third party:

- Direct Contact;
- Inhalation of Dust;
- Inhalation of Fibres;
- Ingestion of Hone Grown Produce;
- Ingestion of Contaminated Water Through Pipework;

- Inhalation of Vapours;
- Inhalation of Gases;
- Leaching of Contaminants;

The following potential receptors were identified by the third party:

- Site Users;
- Construction Workers;
- Adjoining Land Owners;
- Controlled Surface Waters;
- Groundwater / Abstraction Well;
- Flora; and
- Building / Construction Materials.

Whilst the third party's conceptual site model is considered comprehensive and robust, it was noted from a review that ground gas risks from peat had not been considered / included.

Phase II Report

The third party's investigation works were undertaken in November 2018 and included the drilling of 16 No. window sampler boreholes to a maximum depth of 3.00m, and the drilling of 4 No. cable percussive ('shell and auger') boreholes to a maximum depth of 20.0m. Samples were retrieved from these exploratory holes by the third party for chemical laboratory analysis.

The investigation encountered made ground in most areas, extending to a maximum depth of 0.80m. It is noted that the third party's logs are brief and unclear in places, commonly identifying strata as 'fill' but with no explanation / detail to support these classifications (e.g. presence of anthropogenic materials, appearing reworked etc.). This is also not explained in the third party's report, which lacks a section to discuss and fully explain the soils encountered.

The third party reported that soils of the West Walton Formation and Ampthill Clay Formation were also present at the site, encountered as clayey silty sands, sandy clays (with flint gravel), silty clays and silty clays with shell fragments. 'Claystone' was recorded at 2 No. locations from depths of 8.40m.

The investigation recorded the following in relation to the site's contamination status:

- *"The site has identified a shallow layer of Made Ground the only risk in place within the site area is recorded as :-*

- *FILL :- Isolated contamination from Arsenic to the area of BH1 ONLY - Remediation works will be required to this area, (PBET testing may aid in further assessing the risk of this contamination impacting of the future users of the site).*

- *Based on the above, remedial measures will likely be required areas where pathways to receptors are in place."*

Potential risks from vapours were not identified at the site by the third party based on their testing works.

Risks to groundwater were also discounted, and the report also concluded that "*No sources of Land Gases are recorded in place within the site area*.". Elemental GI Ltd would note that the peat which is recorded on / near to the site on geological mapping is commonly considered to be a feasible (and often significant) ground gas source.
It is noted that the third party completed 2 No. exploratory holes in close proximity to the fuel pump and suspected underground tank, which were 'WS14' and 'BH1'. Neither of these boreholes recorded visual / olfactory evidence of potential hydrocarbon contamination, and the testing of soils from these locations did not include any exceedances of the chosen screening thresholds.

Remaining analysis of soil samples included a high density of analyses for various determinands including heavy metals, speciated petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). No exceedances of the selected screening values (LQM/CIEH 'S4ULs') were reported.

1.3 The Site

The site is situated to the west of West Street, Chatteris, approximately 0.85km to the south-west of Chatteris Town Centre. The site is roughly centred at National Grid Reference 538637, 285336.

1.3.1 Site:

The following observations were made by Engineers from Elemental GI Ltd in August 2023 prior to the start of our supplementary investigation works:

- The site is approximately 2.98ha in area, and forms an irregularly shaped parcel of land;
- The site is currently accessible via an open access point at the north-eastern corner;
- The site supports several open fields which were mostly overgrown at the time of our investigation, with areas of dense vegetation (brambles) present in places. The fields are separated from one another by hedges, with open field access points present in some areas;

- Some small derelict sheds are present on site which have potential asbestos containing materials as part of their building fabrics;
- A small storage area is present in the north-eastern corner adjacent to the access point which currently supports assorted pallets of bricks and other building materials (inaccessible at the time of our works);
- Marsh vegetation is present along the far western boundary areas of the site, potentially indicating the presence of marsh / soft ground locally in this area;
- A manhole / inspection cover is present in the centre of the site within an area of recently disturbed ground, indicating the potential recent construction of a drain (running adjacent to a hedge in an approximate east-to-west orientation);
- A derelict building is present in the southern area of the site. This was surrounded by dense vegetation and could not be approached / inspected, although a single fuel pump was visible adjacent to its north-eastern corner;
- The site is used informally by local / neighbouring residents for dog walking etc.; and
- No obvious topographical gradients were observed across the site.

The appendices contained in this report include a Site Location Plan (Drawing 002), Site Features Plan (Drawing 003) and a General Photographic Record (Drawing 004). A Site Investigation Plan is also presented (Drawing 005).

The description of the site provided above is taken following a relatively brief visit and should not be taken as a full and thorough description of all of the site's features, some of which may also have been obscured during our visit in inaccessible areas, hidden by vegetation etc.

1.3.2 Surrounding Area:

The site is set within a mixed recreational, industrial and residential area of the site.

- Land north of the site supports a football club;
- Land east of the site supports residential housing;
- Land south of the site supports further open fields and residential housing; and
- Land west of the site supports a footpath (suspected former railway) beyond which are various factories / industrial units.

2.0 SCOPE OF PHASE II INVESTIGATION

2.1 Potential Areas of Concern

The Phase I report identified the following as potential sources, although it is considered that these were adequately addressed during their Phase II works:

- The southern 'storage warehouse', including suspected asbestos sheeting and fuel pump and tank on site; and
- A historic farm (200m north) and historic railway land (5m west) off-site.

The Phase II report identified the following exceedance at the site:

- Arsenic within made ground at BH1.

The area around the storage barn and fuel tank were inaccessible at the time of our own recent investigation, although this is not considered significantly impact our works as further investigations are required in this area following demolition and tank removal regardless and are therefore beyond the scope of this supplementary investigation.

2.2 Site Investigation Layout

The following supplementary exploratory holes have been positioned at the site:

Table 2.1: Site Investigation Layout

Potential Source / Issue	Exploratory Holes
General Site Coverage	ALL HOLES
Potential Peat Deposits	WS201, WS203, WS204, WS206, TP01, TP04, TP06-TP08
Ground Gas Wells	WS201, WS202, WS206
Northern Field	WS201, WS202, TP01, TP02
Central Fields	WS203, WS204, WS205TP03, TP04
Southern Field	WS207, TP05-TP08
In Situ Infiltration Feasibility Tests	WS201a and WS206a

Our investigation has been configured to provide an update on site ground conditions following previous works at the site by others and is presented as a supplementary assessment / investigation. Whilst all reasonable efforts will be made to ensure sufficient supplementary coverage of the site / potential areas of concern, it should be noted that ground conditions may vary between exploratory positions. The reader is referred to the terms, conditions and notes which are presented at the end of this report in relation to its potential limitations.

All arisings shall be inspected following completion of each exploratory hole, and samples will be selected for analysis on the basis of their appearance (including visual or olfactory evidence of contamination). Elemental GI Ltd shall arrange for samples to be delivered to a suitably accredited laboratory for subsequent testing.

Samples shall be tested for a general range of contaminants (in accordance with NHBC Standards Chapter 4.1 'Land Quality – managing ground conditions' and CLR 8 'Potential Contaminants for the Assessment of Land' (withdrawn but used for reference purposes where applicable)). Where appropriate they shall also be analysed for specific / targeted analyses, and at the subject site this shall include:

- Heavy metals;
- Polycyclic aromatic hydrocarbons (PAHs);
- Phenols;
- pH;
- Total petroleum hydrocarbons (TPH);
- Asbestos; and
- Pesticides.

3.0 SITE INVESTIGATION WORKS

3.1 Completion of Works

The recent site investigation works were completed by Elemental GI Ltd in general accordance with BS 5930:2015+A1: 2020. For clarity it should be noted that these recent works were completed in two phases. The drilling works were completed on the 1st August 2023 and the trial pit excavations were completed on the 15th September 2023.

Underground services (drainage and redundant electricity cables) have been noted running adjacent to 2 No. central hedge-lines (running from east to west). A temporary easement was therefore imposed upon all works within the immediate vicinity of these features (where detected / recorded) as a precautionary measure. Exploratory holes which were proposed in the vicinity of these were re-positioned to alternative locations nearby.

Very dense vegetation was present in the area surrounding the southern barn structure which prevented access during the recent investigation.

3.2 Site Investigation Details

The exploratory holes were completed by Elemental GI Ltd at the site as listed in Table 2.1 (above). These were completed to a maximum total depth of 5.00m below existing ground level (begl). Table 3.1 (below) presents a summary of the works completed:

Table 3.1: Site Investigation Summary

Exploratory Hole(s) ID	Maximum Final Depth (m)	Notes
WS201 to WS207	5.00	Window Sampler Drilling Locations
WS201a and WS206a	1.00	*In Situ* Soakaway Feasibility Tests
TP01 to TP08	2.95	Trial Pit Excavations
WS201, WS202 and WS206	5.00	Combined Gas / Groundwater Monitoring Wells

A copy of the exploratory hole records from these works is presented in Appendix VI.

3.3 *In Situ* Soakaway Testing

2 No. exploratory locations WS201a and WS206a were positioned adjacent to boreholes WS201 and WS206 as *in situ* infiltration feasibility test locations. These were completed to depths of 1.0m begl.

In general accordance with BRE365, the 2 No. test locations were excavated and surveyed before being filled with water and subsequently monitored. Table 3.2 overleaf presents a summary of the findings of these works. Exploratory hole logs are enclosed within Appendix VI.

Table 3.2: Soakaway Testing Summary

Exploratory Hole(s) ID	Indicative Infiltration Rates Recorded (m/s)	Comments
WS201a	TEST FAIL	Water recorded over 5 hours, noted to plateau / stall at 0.40m begl after c. 3.0 hours.
WS206a	TEST FAIL	Water recorded over 3.5 hours, noted to plateau / stall at 0.15m begl after c. 2 hours.

The *in situ* testing at both locations exhibited a relatively slow rate of discharge over the first few hours before it appeared to slow significantly and / or 'stop'. It was considered likely that the shallow discharge observed at both locations may have been through the shallow soils at each location, but that the deeper soils did not exhibit a significant infiltration potential.

4.0 GEOTECHNICAL ASSESSMENT

4.1 General Ground Conditions

4.1.1 Made Ground

Made ground was identified within the recent supplementary exploratory holes at most locations. With the exception of WS203, TP02 and TP06, the shallow soils at all locations were recorded to be 'potentially reworked' to a maximum depth of 1.40m (WS204) due to their structure and appearance.

It is noted that the third party recorded disturbed ground across the site on geological mapping, and they also recorded 'fill' in exploratory holes although these observations were not supported with further detail. It is considered that the reworked nature of the shallow soils which were recently encountered during our own investigation are reflective of the third party's own observations.

4.1.2 Topsoil

Topsoil was encountered in all areas of the site to a maximum total depth of 0.50m begl, although it typically extended to depths of between 0.25m and 0.35m begl. This generally comprised dark brown slightly sandy slightly gravelly silty soils with rootlets.

It was noted that the topsoil was underlain by a visually similar subsoil at most locations. This stratum is discussed in detail above (reworked natural soils), but it is considered worth noting that the third party recorded greater topsoil thicknesses than those encountered during our own investigation. It is considered likely that this may be explained by a lack of differentiation between the topsoil and subsoil at some locations within their report.

4.1.3 Natural Soils / Bedrock

The natural soils at the subject typically comprised slightly sandy slightly gravelly grey and orangish brown clay soils with occasional bands of sand. Thicker bands and larger pockets of sand were noted in some trial pits. This typically became predominantly grey / dark grey with depth at all locations. Crystalline inclusions, and shell fragments were noted with depth at all locations with rare decayed vegetation noted at depth in some locations.

The general descriptions of the Oxford Clay Formation and West Walton Formation presented by the British Geological Survey both closely resemble the natural soils encountered on site during the recent investigation. It is considered likely that residual soils of both formations may be present on site at shallow depths based on the solid geological boundary (which separates the Oxford Clay Formation and West Walton Formation (with Ampthill Clay Formation)) running through / near to the site.

Peat was <u>not</u> encountered in any of the recent exploratory holes during our recent investigation. Soils described as 'peaty' were only recorded at 1 No. of the third party

locations (WS13) from depths of c. 0.40m to 0.80m begl. However, it was noted during our own recent investigations that the position of the third party location BH2 (which was completed as a monitoring well) was c. 50m to the west of the location that they had recorded on their exploratory hole layout plan. This suggests that the third party location WS13 (which was recorded by them to be close to the south-western site boundary) may actually have been off-site if it was recorded inaccurately (i.e. recorded with the same precision / accuracy as their location 'BH2'). 2 No. trial pits (TP06 and TP08) were excavated by Elemental GI Ltd in the vicinity of WS13 and no peat was encountered.

4.1.4 Groundwater and Stability

Water was not recorded within any of the recent exploratory holes during the recent supplementary drilling works. However, a slow ingress of water was noted in the following trial pit:

- TP02: Slow ingress of water encountered at 2.50m depth during excavation;

Water was only recorded by the third party at the following location:

- WS13 – Water struck at 2.00m depth, recorded to be standing at 1.20m depth (after removal of casing).

Return visits undertaken to site so far have recorded water ranging from 1.70m to 4.78m begl in monitoring wells (where present), with some wells recording no water (i.e. 'dry').

At this stage it is considered likely that dewatering (or similar) is likely to be required for excavations across parts of the subject site during construction as the cohesive nature of soils is likely to lead to pooling / puddles of water during periods of adverse weather.

In general, the exploratory holes which were recently completed as part of our investigation remained stable for the short time which they were left 'open'. However, stability should always be considered carefully in the context of health and safety and trench support as part of all future construction works as soils / made ground can often behave variable when excavated and / or saturated (see Exploratory Hole records presented in Appendix VI for further information).

7.0 RECOMMENDATIONS

A review of the available site information (as discussed herein) has been undertaken to inform the following conclusions and recommendations. However, this report should be submitted to the appropriate regulators (and other stakeholders, as necessary) by the Client prior to the start of any irrecoverable works associated with the site.

7.1 Foundations and Enabling Works

The third party report implied natural ground strengths that would be unsuitable for shallow / traditional foundations as they exhibited insufficient potential bearing capacities. However, our own recent investigations indicate that shallow natural soils may potentially be sufficiently competent to allow shallow foundations to be considered based upon their strengths. However, adjustments to foundation depths due the high volume change potential and potential desiccation status of some soils at the site are now required, which may necessitate a deepened (piled) foundation approach. We await updates / information on your Structural Engineer's proposals for the site, after which pursuit of cost-effective recommendations (including increased allowable bearing capacities) may be sought.

Please see section 4.0 for further information.

7.2 Groundwater

Groundwater was not commonly encountered during either the 2018 or 2023 investigations. Return visits undertaken to site so far have recorded water ranging from 1.70m to 4.78m begl in monitoring wells (where present), with some wells recording no water (i.e. 'dry').

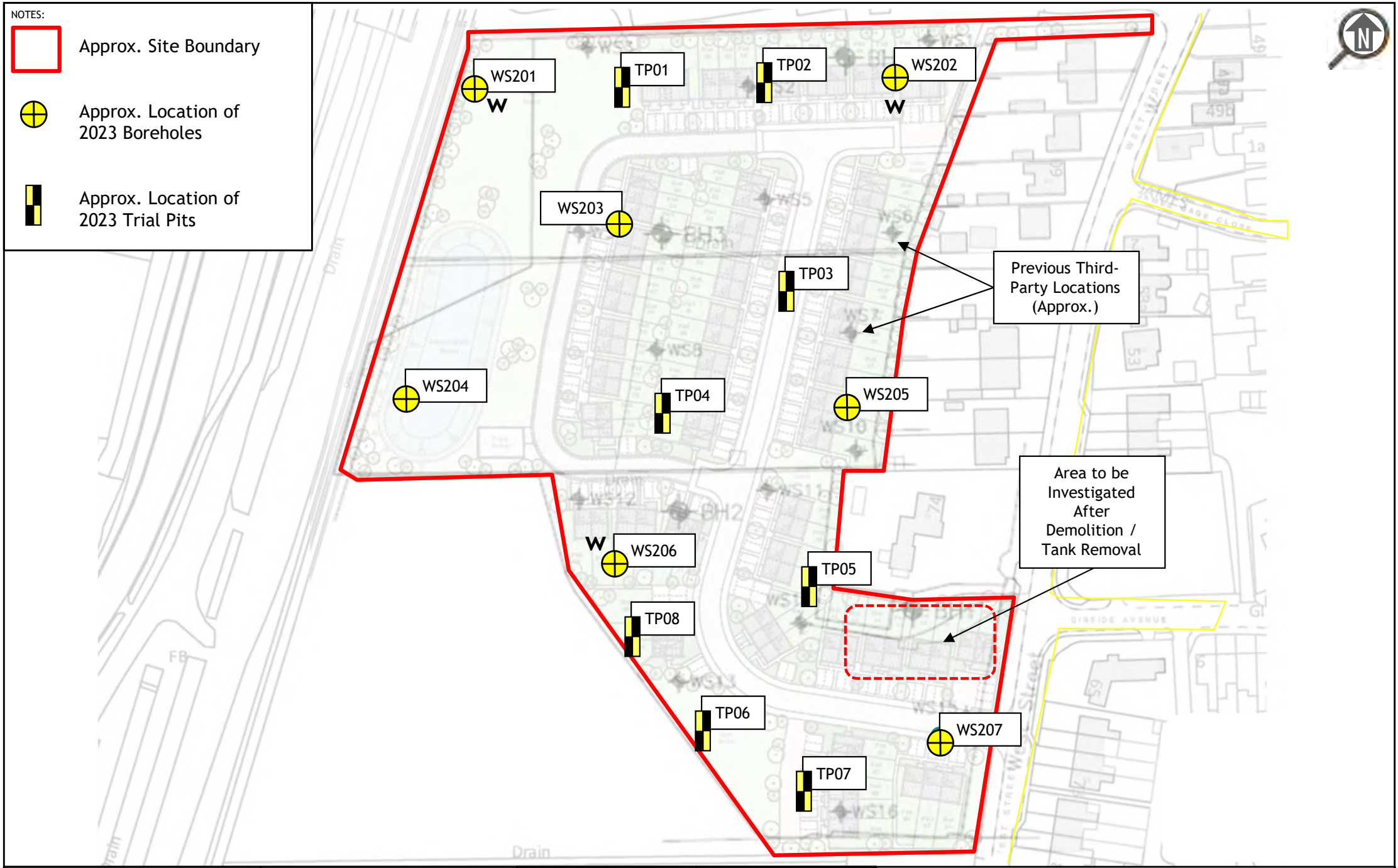
At this stage it is considered likely that dewatering (or similar) is likely to be required for excavations across parts of the subject site during construction as the cohesive nature of soils is likely to lead to pooling / puddles of water during periods of adverse weather.

7.3 Road Construction

Literature sources typically suggest that CBR values of less than 2% can be anticipated in the made ground and topsoil and values between 2% and 5% can be anticipated in the underlying natural soils subject to *in situ* testing. All road construction proposals should be agreed with the Local Authority prior to finalising designs.

7.4 Drainage

Elemental GI Ltd completed in situ infiltration feasibility testing at 2 No. locations during the recent investigation. 'Fails' were recorded at both locations which indicates that further testing / in situ soakaways are not likely to be feasible at the subject site. Please refer to section 3.3 for further information.



CLIENT: MINSTER	TITLE: Exploratory Hole Layout Plan	DATE: Aug. 2023	SCALE@SIZE: NOT TO SCALE
		DRAWING No: E23103_005	DESIGN/DRAWN: JR

Elemental GI Ltd

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS201
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend / Well
0.30	JT		0.25	Vegetation over brown slightly sandy clayey TOPSOIL with rootlets and with rare subangular to subrounded fine to medium gravel of mixed lithology.	
			0.50	MADE GROUND (Comprising brown slightly sandy slightly gravelly clay/silt. Gravel is subrounded fine to medium of mixed lithology. Appears reworked).	
		HSV @ 0.90m = 78 N = 9	1m	Firm grey and orangish brown mottled slightly sandy slightly gravelly CLAY with rare rootlets. Gravel is subrounded fine of mixed lithology including chalk.	
		HSV @ 1.70m = 100		… with a band of light orangish brown medium to coarse sand present between 1.30m and 1.40m depth. … with gravel of chalk becoming coarse from 1.40m depth and with frequent decayed rootlets also present.	
		N = 15	2m	… becoming stiff from 2.00m depth. … with occasional shell fragments noted from 2.15m depth. … with occasional crystalline inclusions present from 2.30m depth. … with orangish brown mottling, decayed rootlets and shell fragments absent from 2.40m depth.	
		HSV @ 2.85m = 65 N = 14	3m		
		HSV @ 3.50m = 102		… becoming stiff to very stiff with crystalline inclusions absent and very rare shell fragments noted from 3.40m depth.	
		N = 24	4m		
		N = 23	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.
2) Borehole completed as a monitoring well.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS202
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend
0.10	JVT			Vegetation over brown slightly sandy clayey TOPSOIL with rootlets and with rare subangular to subrounded fine to medium gravel of mixed lithology.	
			0.40		
0.60	B			MADE GROUND (Comprising orangish brown and greyish brown mottled slightly sandy slightly gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology. Appears reworked). Possibly desiccated.	
			0.75		
		HSV @ 0.85m = 78 N = 7	1m	Firm grey and orangish brown slightly gravelly CLAY with rare rootlets. Gravel is subrounded fine to medium of mixed lithology including chalk. … possibly reworked to 1.00m depth.	
		HSV @ 1.30m = 50		… with orangish brown colouring absent from 1.00m depth.	
		HSV @ 1.50m = 60		… becoming orangish brown mottled from 1.10m depth.	
		HSV @ 1.80m = 60			
		N = 10	2m	… with rootlets absent from 2.00m depth.	
				… with frequent crystalline inclusions present from 2.20m depth.	
		HSV @ 2.50m = 85		… becoming stiff from 2.50m depth.	
		HSV @ 2.80m = 88			
		N = 12	3m		
		HSV @ 3.60m = 70		… with crystalline inclusions becoming rare and with rare shell fragments noted from 3.50m depth.	
		HSV @ 3.90m = 82			
		N = 23	4m	… becoming very stiff and predominantly grey from 4.00m depth.	
		N = 32	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.
2) Borehole completed as a monitoring well.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS203
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend / Well
			0.50	Turf over dark brown slightly sandy slightly gravelly silty TOPSOIL with rootlets. Gravel is subangular medium of flint. … c. 50% recovery between 0.00m and 0.50m depth.	
		HSV @ 0.75m = 95		Firm grey and orangish brown mottled slightly gravelly CLAY with rootlets. Gravel is subangular to subrounded fine of chalk.	
		N = 8	1m	… with very sandy thin bands of sand present between 0.95m and 1.15m depth.	
		HSV @ 1.40m = 52			
		HSV @ 1.55m = 62		… with frequent decayed rootlets present from 1.50m depth.	
		HSV @ 1.80m = 68			
		N = 8	2m	… with rootlets absent from 1.90m depth.	
		HSV @ 2.50m = 52		… with decayed rootlets absent from 2.50m depth.	
2.50-3.50	B	N = 9	3m	… with frequent thin (3mm) bands of crystalline inclusions present from 2.75m depth. … with bands becoming less frequent and with shell fragments noted from 3.20m depth.	
		N = 19	4m	… becoming stiff from 4.00m depth.	
		N = 28	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS204
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend / Well
			0.25	Turf over dark brown slightly sandy slightly gravelly silty TOPSOIL with rootlets. Gravel is subangular medium of flint.	
		N = 6	1m	MADE GROUND (Comprising grey and orangish brown mottled slightly sandy slightly gravelly clay with frequent decayed rootlets. Gravel is subrounded fine of mixed lithology. Appears reworked).	
		HSV @ 1.20m = 32		… becoming soft to firm from 1.10m depth.	
			1.40		
		HSV @ 1.60m = 55		Firm grey and orangish brown mottled CLAY with rare rootlets and decayed rootlets.	
		HSV @ 1.80m = 52		… with rare shell fragments from 1.70m depth.	
		N = 8	2m	… becoming predominantly grey and with all rootlets absent from 1.90m depth.	
		HSV @ 2.20m = 58			
		HSV @ 2.65m = 68		… with frequent shell fragments and crystalline inclusions from 2.600m depth.	
		N = 11	3m	… becoming stiff from 3.00m depth.	
		HSV @ 3.50m = 75		… with shell fragments and crystalline inclusions becoming rare from 3.30m depth.	
		N = 15	4m		
		N = 29	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS205
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend / Well
			0.25	Vegetation over brown slightly sandy clayey TOPSOIL with rootlets and with rare subangular to subrounded fine to medium gravel of mixed lithology.	
0.50	B	HSV @ 0.80m = 68	0.90	MADE GROUND (Comprising grey and orangish brown mottled slightly sandy gravelly clay. Gravel is subrounded fine to coarse of mixed lithology. Appears reworked). Possibly desiccated.	
		N = 6	1m	Firm grey and orangish brown mottled CLAY with frequent very gravelly pockets up to 5cm diameter. Gravel is subangular fine of mixed lithology including chalk.	
1.20	B	HSV @ 1.50m = 35		... with gravel pockets absent but with occasional bands/pockets of crystalline inclusions present from 1.10m depth. … becoming soft to firm from 1.20m depth. … becoming predominantly grey from 1.30m depth.	
1.80	T	HSV @ 1.80m = 45 HSV @ 1.90m = 48		… becoming firm with frequent crystalline inclusions present from 1.80m depth.	
		N = 9	2m		
		HSV @ 2.30m = 58		… with a sandy band of crystalline inclusions present between 2.40m and 2.42m depth.	
		HSV @ 2.60m = 65		… with rare shell fragments present from 2.60m depth.	
		HSV @ 2.80m = 80			
		N = 14	3m	… becoming stiff from 3.00m depth.	
		HSV @ 3.70m = 85		… with shell fragments absent and crystalline inclusions becoming rare from 3.70m depth.	
		N = 16	4m		
		N = 30	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS206
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend
0.20	JVT			Turf over dark brown slightly sandy slightly gravelly silty TOPSOIL with rootlets. Gravel is subangular medium of flint.	
			0.35		
0.60	B			MADE GROUND (Comprising grey and orangish brown mottled slightly sandy very gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology. Appears reworked). Possibly desiccated.	
		N = 6	1.00		
		HSV @ 1.20m = 60		Firm grey and orangish brown mottled CLAY with rare rootlets and decayed rootlets.	
1.40	B	HSV @ 1.50m = 65			
		HSV @ 1.80m = 75			
		N = 8	2m	… with all rootlets absent from 2.00m depth.	
		HSV @ 2.20m = 50		… with frequent crystalline inclusions from 2.05m depth.	
		HSV @ 2.50m = 52		… with rare shell fragments from 2.50m depth.	
		HSV @ 2.65m = 52			
		HSV @ 2.75m = 58			
		N = 8	3m		
		HSV @ 3.30m = 60			
		HSV @ 3.55m = 68		… becoming grey and greyish brown mottled and with crystalline inclusions mostly absent from 3.50m depth.	
		HSV @ 3.75m = 68			
		N = 19	4m	… becoming stiff from 4.00m depth.	
		N = 23	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.
2) Borehole completed as a monitoring well.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: RP Drilling	Project No: E23103	Sheet: 1 of 1	WS207
Equipment: Window Sampler Drilling Rig	Logged by: JR	Date: 1st August 2023	

Field Monitoring and Sampling			Strata		
Depth (m)	Type	Result (SPT)(HSV)	Depth (m)	Description	Legend / Well
0.20	JVT		0.30	Turf over dark brown slightly sandy slightly gravelly silty TOPSOIL with rootlets. Gravel is subangular medium of flint.	
			0.70	MADE GROUND (Comprising grey and orangish brown mottled slightly sandy very gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology. Appears reworked). Possibly desiccated.	
		HSV @ 0.80m = 58		Firm grey and orangish brown mottled slightly gravelly CLAY. Gravel is subrounded fine of chalk.	
1.00	JVT	N = 7	1m		
		HSV @ 1.20m = 48			
1.00-2.00	B	HSV @ 1.50m = 55		… with rare decayed rootlets present and gravel becoming medium to coarse from 1.50m depth.	
		HSV @ 1.75m = 60			
		N = 9	2m		
				… with occasional crystalline inclusions from 2.20m depth.	
		HSV @ 2.50m = 78		… becoming predominantly grey from 2.50m depth.	
		HSV @ 2.80m = 68		… with rare shell fragments and with crystalline inclusions present in frequent thin bands from 2.70m depth	
		N = 12	3m		
				… with crystalline inclusions becoming rare from 3.50m depth.	
		N = 22	4m		
		N = 24	5.00		
				Borehole completed at 5.00m depth.	

Water Observations:
No water encountered during drilling.

Remarks:
1) Borehole terminated on completion of testing at 5.00m depth.

Where unaccompanied by in situ tests, strength descriptions of soils are based on Engineer's field description(s) and must **not** be relied upon.
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP01
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.25	Vegetation over brown silty sandy TOPSOIL with rootlets.	
0.40	B			MADE GROUND (Comprising reworked brown and grey sandy very gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology).	
			0.85		
		HSV @ 1.00m = 100, 110, 95	1m	Stiff grey and orangish brown mottled CLAY. … with a 20cm band of sand present at rear of pit between 0.90m and 1.10m depth.	
		HSV @ 1.35m = 135, 108, 138		… becoming dark grey and slightly gravelly from 1.40m depth. Gravel is subrounded fine to medium of mixed lithology including chalk.	
2.00	TB	HSV @ 2.00m = 105, 115, 120	2m	… with rare brown veins of decayed vegetation present from 1.95m depth. … becoming friable from 2.10m depth.	
		HSV @ 2.30m = 115, 140, 120		… with frequent crystalline inclusions present from 2.30m depth.	
			2.80		
			3m	Trial pit completed at 2.80m depth.	
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.80m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP02
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.30	Vegetation over brown silty sandy TOPSOIL with rootlets.	
0.90	TB	HSV @ 0.70m = 130, 120, 118		Stiff to very stiff grey and orangish brown mottled CLAY with rare subangular to subrounded fine to medium gravel of mixed lithology including chalk. … with a large band of sand present at rear of pit between 0.50m and 0.60m depth.	
		HSV @ 1.10m = 120, 120, 128	1m	… with rare crystalline inclusions from 1.10m depth. … with a large band of sand present at rear of pit between 1.10m and 1.35m depth. … with a large band of sand present at front of pit between 1.00m and 1.50m depth.	
		HSV @ 1.55m = 95, 80, 90		... with rare small 10cm sandy pockets present to 1.40m depth.	
		HSV @ 1.70m = 115, 130, 110		… with rare decayed vegetation and sandy bands present from 1.50m depth.	
		HSV @ 2.15m = 85, 92, 88	2m		
		HSV @ 2.30m = 85, 90, 100			
2.60	B	HSV @ 2.40m = 85, 85, 80			
		HSV @ 2.60m = 72, 68, 65		… becoming locally firm from 2.60m depth.	
		HSV @ 2.75m = 95, 84, 82	2.75		
			3m	Trial pit completed at 2.75m depth.	
			4m		
			5m		

Water Observations:
Slow ingress of water encountered at 2.50m depth during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.75m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP03
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.30	Vegetation over brown silty sandy TOPSOIL with rootlets.	
			0.75	MADE GROUND (Comprising reworked brown and grey sandy very gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology).	
1.00	TB	HSV @ 0.90m = 105, 120, 110	1m	Stiff grey and orangish brown mottled CLAY with rare subrounded medium gravel of mixed lithology including chalk.	
		HSV @ 1.30m = 58, 58, 65		… becoming firm from 1.30m depth.	
				… with rare crystalline inclusions present from 1.60m depth.	
		HSV @ 1.90m = 65, 75, 68	2m	… with rare brown veins of decayed vegetation present from 2.00m depth.	
2.30	B	HSV @ 2.15m = 55, 65, 62			
		HSV @ 2.30m = 62, 75, 75			
		HSV @ 2.60m = 75, 68, 85			
		HSV @ 2.70m = 100, 95, 98	2.85		
			3m	Trial pit completed at 2.85m depth.	
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.85m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP04
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.40	MADE GROUND (Comprising grass over reworked brown silty sandy topsoil).	
			0.80	MADE GROUND (Comprising reworked brown and grey sandy very gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology including sandstone. Rare boulders (25cm width) present at rear of pit).	
		HSV @ 1.05m = 110, 82, 105	1m	Stiff grey and orangish brown mottled slightly sandy CLAY.	
1.50	TB	HSV @ 1.50m = 100, 110, 105		… becoming gravelly from 1.40m depth. Gravel is subangular to subrounded fine to coarse of mixed lithology including chalk and with rare crystalline inclusions also present.	
		HSV @ 1.75m = 80, 65, 80		… with gravel mostly absent from 1.70m depth.	
		HSV @ 1.95m = 90, 95, 92	2m	… becoming locally firm from 2.10m depth.	
		HSV @ 2.10m = 75, 65, 72		… with rare brown veins of decayed vegetation present from 2.15m depth.	
2.50	T	HSV @ 2.45m = 75, 85, 72		… becoming predominantly dark grey and with rare crystalline inclusions present from 2.45m depth.	
		HSV @ 2.80m = 95, 105, 110	2.80		
			3m	Trial pit completed at 2.80m depth.	
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.80m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP05
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.30	MADE GROUND (Comprising vegetation over reworked brown silty sandy topsoil with occasional brick fragments).	
0.60	B	HSV @ 0.60m = 92, 110, 115	0.90	Stiff brownish grey CLAY with rare rootlets.	
1.10	T	HSV @ 1.15m = 95, 82, 92	1m	Stiff light grey and orangish brown mottled CLAY with rare crystalline inclusions and rare subrounded fine gravel of chalk. … with frequent sandy bands/pockets up to 10cm wide present from 1.10m depth	
		HSV @ 1.40m = 75, 85, 70		… becoming locally firm from 1.40m depth.	
1.80	B	HSV @ 1.80m = 75, 82, 68			
1.90	T	HSV @ 1.90m = 90, 80, 62	2m	… with frequent crystalline inclusions present from 1.90m depth.	
		HSV @ 2.40m = 92, 70, 80		… with crystalline inclusions becoming rare from 2.20m depth.	
		HSV @ 2.75m = 68, 62, 45	2.75		
			3m	Trial pit completed at 2.75m depth.	
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.75m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP06
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.40	Vegetation over slightly cemented dark brown sandy silty TOPSOIL with rootlets.	
		HSV @ 0.80m = 125, 130, 130		Stiff brownish grey slightly sandy CLAY.	
1.25	TB	HSV @ 1.25m = 90, 82, 92 HSV @ 1.40m = 90, 65, 60 HSV @ 1.80m = 70, 70, 65	1m	… with occasional sandy pockets and becoming slightly gravelly from 1.20m depth. Gravel is subangular to subrounded fine of mixed lithology including chalk. … with crystalline inclusions present and becoming firm from 1.25m depth. … with a large sandy pocket 40cm(h) x 50cm(w) present in rear of pit at 1.50m depth. … with sandy pockets absent from 1.60m depth	
		HSV @ 2.25m = 70, 62, 72 HSV @ 2.50m = 75, 65, 72	2m		
			2.55	Trial pit completed at 2.55m depth.	
			3m		
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.55m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP07
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.20	Vegetation over slightly cemented dark brown sandy silty TOPSOIL with rootlets.	
			0.70	MADE GROUND (Comprising reworked brown slightly gravelly sandy clay/silt).	
		HSV @ 0.75m = 150, 150, 125		Stiff to very stiff grey CLAY with frequent orangish brown sandy pockets c.5cm diameter.	
1.00	B	HSV @ 1.10m = 100, 100, 95	1m	… becoming gravelly from 0.90m depth. Gravel is subrounded and fine to medium of mixed lithology including chalk.	
				… possibly desiccated to c.1.40m depth.	
		HSV @ 1.65m = 70, 75, 75		… becoming slightly gravelly and firm from 1.70m depth.	
		HSV @ 1.95m = 80, 70, 75		… with gravel and sandy pockets absent from 1.75m depth.	
			2m	… with rare sandy pockets up to 20cm width present from 2.00m depth.	
2.10	T	HSV @ 2.00m = 82, 78, 82		… becoming light brown mottled from 2.10m depth.	
		HSV @ 2.20m = 72, 76, 92		… becoming predominantly dark grey from 2.40m depth.	
		HSV @ 2.40m = 90, 90, 94			
		HSV @ 2.55m = 90, 80, 100		… with rare crystalline inclusions present from 2.65m depth.	
		HSV @ 2.60m = 65, 100, 72	2.95		
		HSV @ 2.90m = 82, 78, 88		Trial pit completed at 2.95m depth.	
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 2.95m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Site:	Site off West Street, Chatteris	Elemental GI Ltd	
Client:	Minster Property Group Ltd		
Contractor: Adrian Eyles	Project No: E23103	Sheet: 1 of 1	TP08
Equipment: JCB 3CX	Logged by: JR	Date: 15th September 2023	

Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	Depth (m)	Description	
			0.25	Vegetation over slightly cemented dark brown sandy silty TOPSOIL with rootlets.	
			0.60	MADE GROUND (Comprising dark brown and light brown slightly sandy gravelly clay. Gravel is subangular to subrounded fine to coarse of mixed lithology with rare brick).	
		HSV @ 0.70m = 105, 150, 130	0.70	Stiff grey CLAY with rare subrounded fine gravel of chalk and frequent sandy pockets up to 5cm width.	
				Trial pit completed at 0.70m depth.	
			1m		
			2m		
			3m		
			4m		
			5m		

Water Observations:
No water encountered during excavation.

Remarks:
1) Trial pit terminated on completion of testing at 0.70m depth.

Where they are unaccompanied by in situ tests, strength descriptions of granular soils are based on initial Engineer's field description(s)
HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm^2)

Appendix F
Environment Agency Information

Modelled Breach Locations
centred on land west of West Street, Chatteris, nearest post code PE16 6FA

NGR TL3860285265
Ref 304441
Created 14/04/2023

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE

Environment Agency

Legend

- Site
- Breach Locations 1% AEP

0 1.25 2.5 5 km

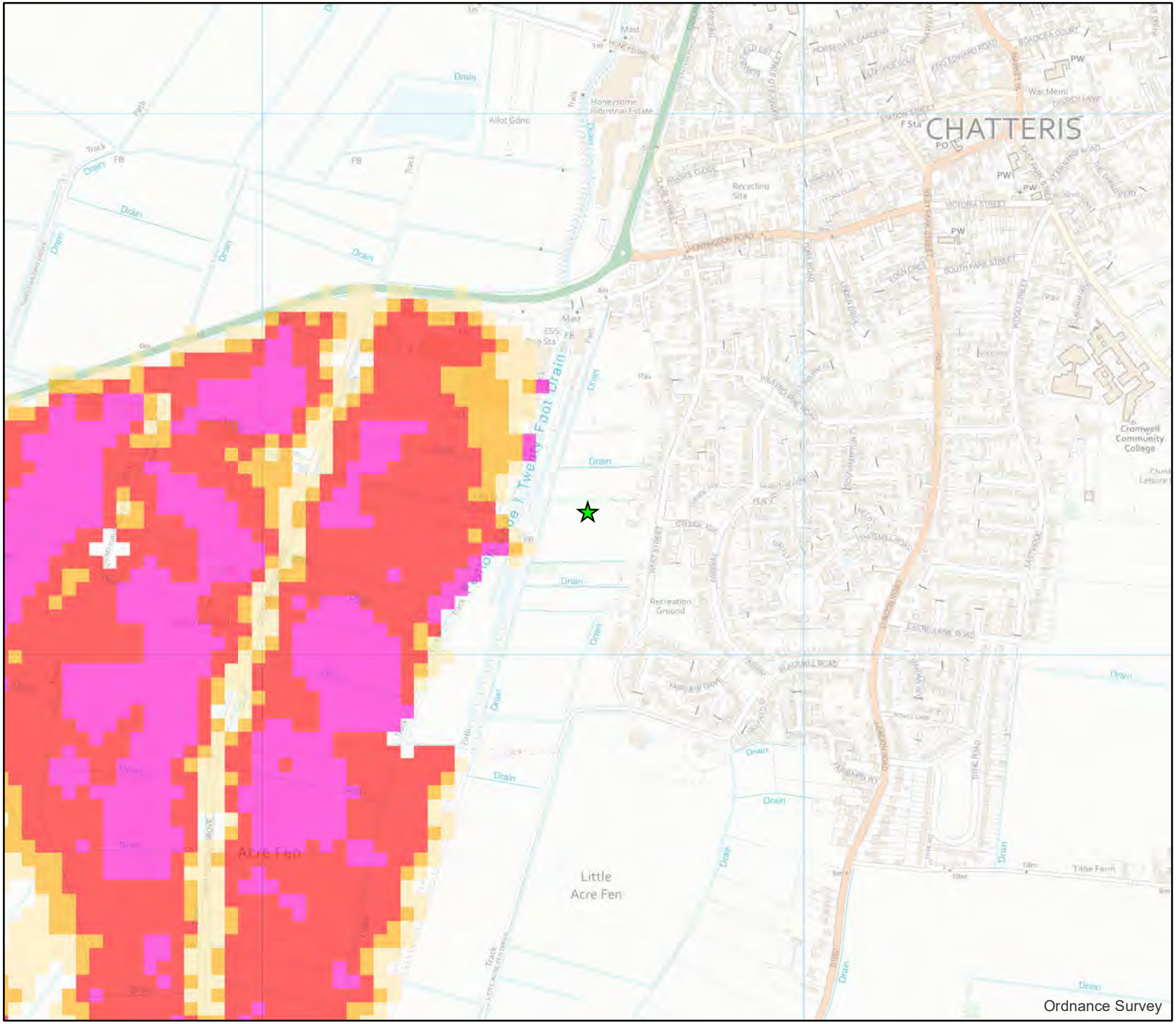
Information

1.The map shows the locations of computer simulated breaches. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, or different flood flows may all give different results.
2. If you require the results from individual breach simulations, please request these by emailing Enquiries_EastAnglia@environment-agency.gov.uk
3.The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.
4. AEP - Annual Exceedance Probability - The probability of a given event occurring in any one year. Please note this is not a return period.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Map Showing the Maximum Flood Depth (combined breach) centred on land west of West Street, Chatteris, nearest post code PE16 6FA

NGR TL3860285265
Ref 304441
Created 14/04/2023



Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE

Environment Agency

Legend

- Site
- 0m to 0.25m
- 0.25m to 0.5m
- 0.5m to 1m
- 1m to 2m
- >2m

0 0.125 0.25 0.5 km

Information

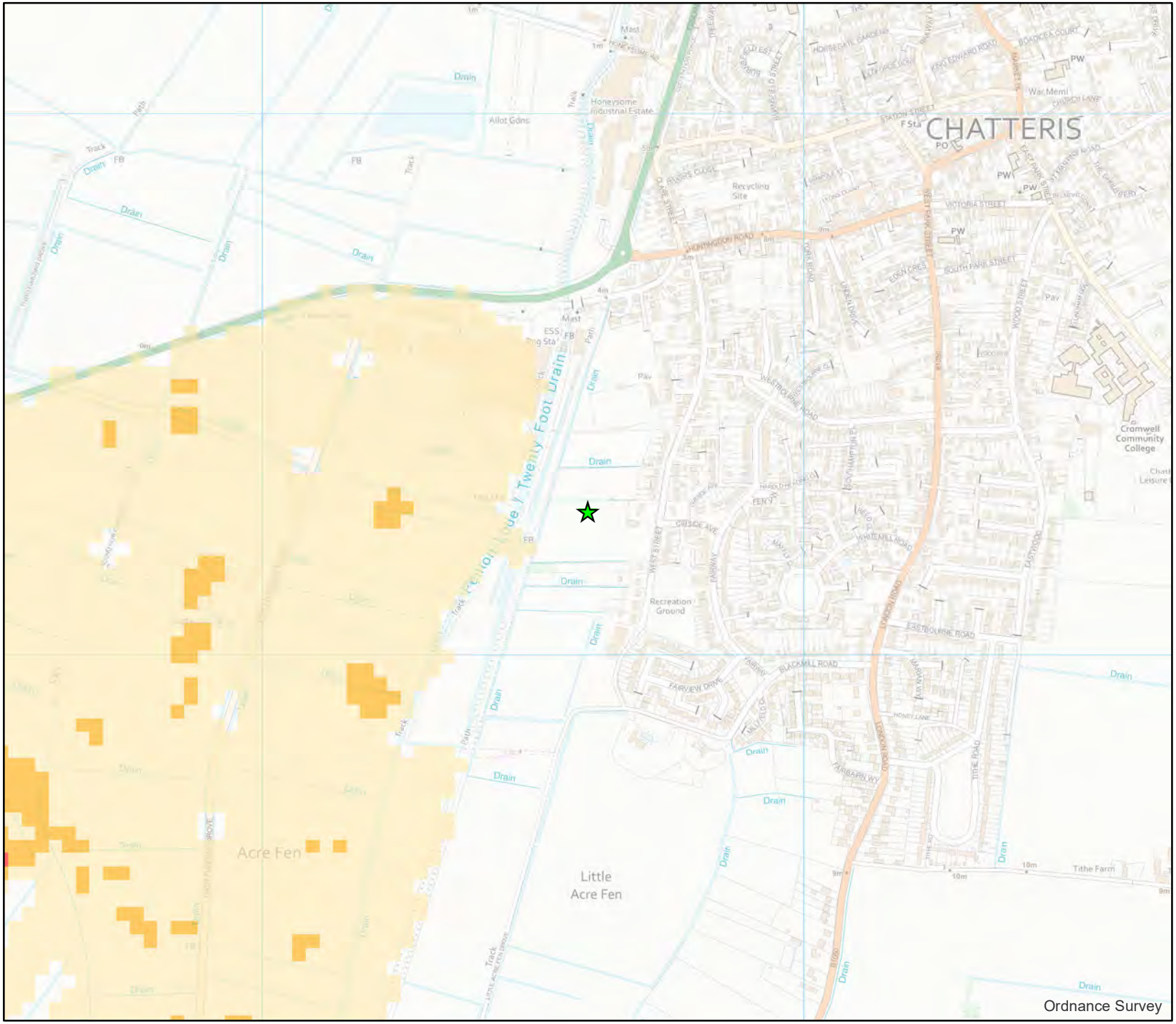
1. The map is based on computer modelling of simulated breaches at specific locations and a failure of Earith Sluice for the 1% AEP event. Each breach/failure has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, or different flood flows may all give different results.
2. The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.
3. An allowance for climate change has only been incorporated into the modelling for a limited number of breaches. If available, these outlines have been provided, but are based on a 20% increase in flows to account for climate change impacts.

We have recently released updated guidance on climate change allowances for flood risk assessments.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Map Showing the Maximum Flood Velocity (combined breach) centred on land west of West Street, Chatteris, nearest post code PE16 6FA

NGR TL3860285265
Ref 304441
Created 14/04/2023



Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE

Legend

- Site
- 0m/s to 0.3m/s
- 0.3m/s to 1m/s
- 1m/s to 1.5m/s
- 1.5m/s to 2.5m/s
- >2.5m/s

0 0.125 0.25 0.5 km

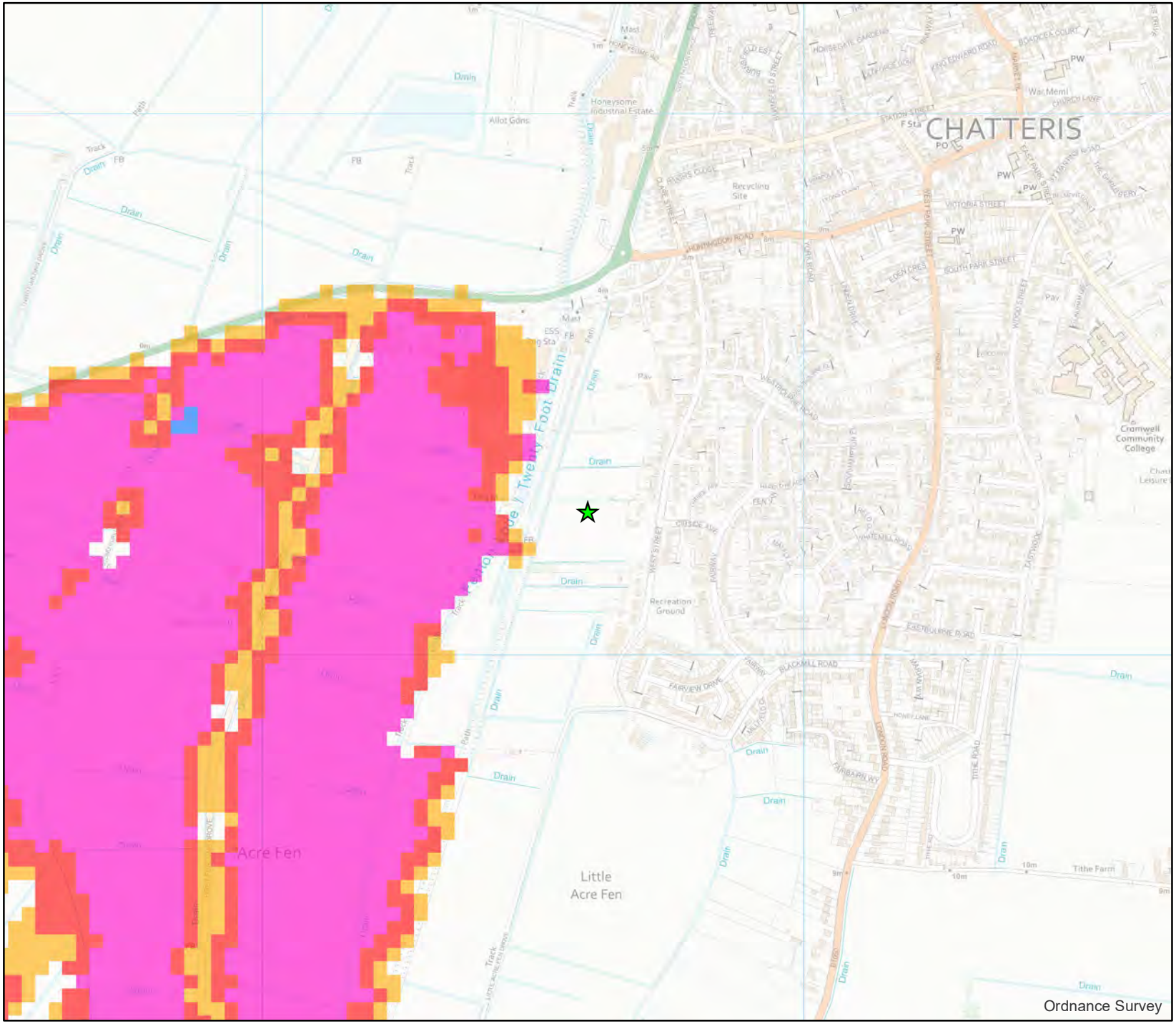
Information

1.The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map.Multiple breaches, other combinations of breaches, or different flood flows may all give different results.
2.The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.
3. An allowance for climate change has only been incorporated into the modelling for a limited number of breaches. If available, these outlines have been provided, but are based on a 20% increase in flows to account for climate change impacts. We have recently released updated guidance on climate change allowances for flood risk assessments.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6).
Email: enquiries@environment-agency.gov.uk

Map Showing the Maximum Hazard Rating (combined breach) centred on land west of West Street, Chatteris, nearest post code PE16 6FA

NGR TL3860285265
Ref 304441
Created 14/04/2023



Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE

Environment Agency

Legend

- Site
- Low Hazard
- Danger For Some
- Danger For Most
- Danger For All

0 0.125 0.25 0.5 km

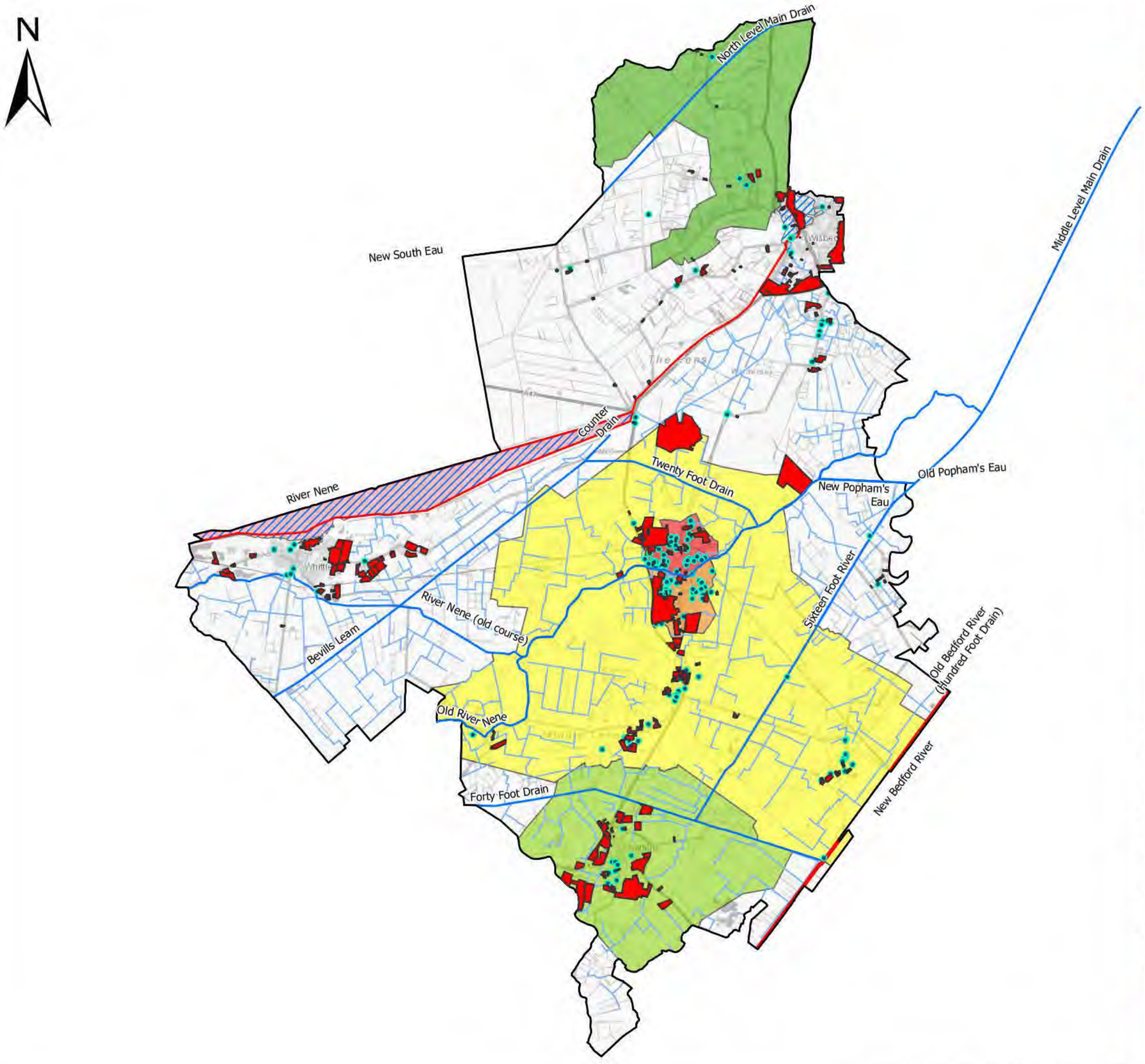
Information

1.This map shows the level of flood hazard to people (hazard rating) if our flood defences are breached at certain locations and a failure of Earith Sluice. The hazard rating depends on the depth and velocity of floodwater and maximum values of these are also mapped.
2.The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, or different flood flows may all give different results.
3.The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring.
4. An allowance for climate change has only been incorporated into the modelling for a limited number of breaches. If available, these outlines have been provided, but are based on a 20% increase in flows to account for climate change impacts. We have recently released updated guidance on climate change allowances for flood risk assessments.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY Tel: 03708 506 506 (Mon-Fri 8-6).
Email: enquiries@environment-agency.gov.uk

Appendix G

Historic Flooding Records
Fenland District Council SFRA: Map J



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LEGEND:

- All Potential Development Locations
- Study Area Boundary
- Historic Incidents Records 2012-2020 Locations (Source - Environment Agency, Cambridgeshire County Council)
- Main River
- IDB Main Drain
- IDB Drain
- Historic Flood Map
- Flood Storage Area

Sewer Flooding Incidents within the postcode area (DG5)*

- 1 Incident
- 8 Incidents
- 10 Incidents
- 15 Incidents
- 28 Incidents

(Source - Anglian Water)

*NOTE: The locations of flooded properties are covered by the Data Protections Act and information is shown using postcode area where these incidents have occurred

Fenland CAMBRIDGESHIRE
Fenland District Council

PROJECT: Strategic Flood Risk Assessment and Water Cycle Study
CLIENT: Fenland District Council

VERSION: F02	DRAWN BY: EH	CHECKED BY: AS

TITLE: **Historic flooding records**

FIGURE: MAP J	DATE: AUG 2022

SCALE: 1:150,000 @ A3 — 0 1.5 3 6 KM

CO-ORDINATE SYSTEM: BRITISH NATIONAL GRID

ROYAL HASKONINGDHV

RightWell House
Bretton
Peterborough
PE3 8DW
01733 334455
www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

Appendix H

Preliminary Drainage Strategy
JPP Consulting drawing no. 26065-103E

General Notes

1. All dimensions are in metres unless otherwise stated.
2. All levels are in metres.
3. This drawing is to be read in conjunction with all relevant Engineers and Architect's drawings, Specifications, Reports and Engineering Details.

Drawing Key

- Site Boundary (Taken from latest site layout referenced)
- Existing surface water drainage sewer(taken from subscan survey by utility mapping reference 'PAS128 QL-B 2D M2 Utility Mapping + Topographical Survey' Revision 01)
- Existing foul water drainage sewer(taken from subscan survey by utility mapping reference 'PAS128 QL-B 2D M2 Utility Mapping + Topographical Survey' Revision 01)
- Existing foul water drainage to be abandoned and grubbed out
- Adoptable section 104 surface water sewer with pipe diameter, gradient,material and manhole details (SA01, CL:68.900, 150Ø 1:150 CLAY, 1.000 L:15.000m)
- Adoptable foul water sewer with pipe diameter, gradient,material and manhole details (FA01, CL:69.800, 150Ø 1:150, 1.000 L:15.000m CLAY)
- Adoptable Section 104 headwall
- Existing Anglian Water Rising Main (taken from AW Asset Records '1117170_A2_Wastewater')
- Existing HV cable (taken from subscan survey by utility mapping reference 'PAS128 QL-B 2D M2 Utility Mapping + Topographical Survey' Revision 01)
- Existing BT cable (taken from subscan survey by utility mapping reference 'PAS128 QL-B 2D M2 Utility Mapping + Topographical Survey' Revision 01)
- Finished Floor Levels (+/- 0/5m subject to detailed design) (FFL=3.600)
- Road contours (68.400)
- Indicative retaining wall (R/W 0.000m)
- Banking
- Permeable paving with impermeable membrane lining
- Existing sewer easement
- Proposed sewer easement
- Extent of detention basin
- Extent of basin groundworks
- Micropool (0.3m deep)
- Foul pumping station

Health, safety & the environment

In accordance with the Construction (Design and Management) Regulations 2015, the designs and details on this drawing have been the subject of a Designers Risk Assessment, to identify risks in the construction, use, or demolition of the scheme.

It is not considered necessary for Designers to highlight obvious and/or common risks (such as deep excavations, manual handling and working around heavy plant) which Contractors should be familiar with, and be able to control by good management and site practice.

So far as is reasonably practicable, the risks inherent in the design have been eliminated. Where it has been considered that elimination of a risk (or part of a risk) is not reasonably practicable, it has been reduced.

This drawing has been based/developed using the following external drawings

Type	Company	Drawing date	Drawing title	Date received	Rev
Site Layout	JGA Architecture	18.01.2021	21022-001-P08-Feasibility Site Layout	05.07.2023	P08
Topographical survey	Utility Mapping	04.04.2023	UM23-1726-MIN-2D West Street, Chatteris_Rev01	12.05.2023	01
OS Data	Utility Mapping	04.04.2023	UM23-1726-MIN-2D West Street, Chatteris_Rev01	12.05.2023	01

Existing Anglian Water Rising Main

Proposed pipe to link basins. Depth of existing sewer has been taken from the subscan survey carried out by Utility Mapping, dated 04/04/23.

Additional survey information is required to confirm the exact depth and diameter of existing sewer in order to confirm the new surface water sewer crossing.

Detention Basin 1

Online detention basin designed to receive flows up to and including 1 in 100 year + 40% climate change

Basin Invert Level: 0.275m
Top of Bank Level: 1.775m
Basin volume at top of bank level: 961.7m³

Max water level 1 in 100 year +40%: 1.620m

Sensitivity check undertaken to confirm basin has capacity for additional impermeable area of 0.179ha (to account for basins surface areas)

Flow Control Chamber
Hydrobrake flow control chamber to limit surface water flows from site.

Design Flow: 3.7l/s (greenfield runoff rate based on a developable area of 2.099ha)
Design Head: 1.500m
Invert Level: 0.269m
Cover Level: 1.875m
Type: Hydrobrake Optimum
MD-SHE-0084-3700-1500-3700
The following measures are to be provided to reduce risk of blockage of the flow control device:

1. Permeable paving provided to all driveways
2. Trapped road gullies provided to road areas
3. Sediment forebay provided to all inlets to the detention basins
4. Low flow channel and micropool provided in the final basin upstream of the flow control device

Surface water outfall into Twenty Foot Drain via new headwall subject to S23 consent. Surface water flows restricted to 3.7l/s.

New foul water drainage from the development to connect to existing Anglian Water sewer via a new manhole constructed online of existing sewer. (connection subject to S106 approval from Anglian Water).

Anglian Water have confirmed the existing sewer has capacity for the 70 new dwellings - refer to Anglian Water Pre-Planning Assessment Report ref: PPE-0182786.

Invert level of new manhole F8 interpolated using upstream and downstream levels - Contractor to confirm exact level of sewer at location of proposed new manhole to at least 4 weeks prior to starting works.

Detention Basin 2

Online detention basin designed to receive flows up to and including 1 in 100 year + 40% climate change

Basin Invert Level: 0.465m
Top of Bank Level: 1.775m
Basin volume at top of bank level: 817.9m³

Max water level 1 in 100 year +40%: 1.620m

Sensitivity check undertaken to confirm basin has capacity for additional impermeable area of 0.179ha (to account for basins surface areas)

Sediment forebay

Low flow channel

Existing Anglian Water Manhole 5301 CL 1.30 SL 1.05

Existing Anglian Water MH 5201 CL 0.67 SH 0.37 IL -0.68

Existing length of sewer to be relaid to allow for existing manhole located within proposed kerbline to be abandoned and replaced upstream out of kerbline.

Existing manhole to be removed and replaced with new manhole upstream.

New manhole to be constructed online of existing drainage and relaid to connect back into existing MH03 downstream.

Additional topographical survey required to determine rear garden gradients and retaining wall heights.

New manhole to be constructed online of existing drainage and diverted through proposed road corridor and re-connected back further downstream.

Trace of existing surface water sewer terminated inside of garage. Downstream route of sewer is to be confirmed and an allowance to divert the sewer through site is to be made.

Existing electricity cable to be diverted through the development.

Proposed levels lifted in this area lifted by circa 1m above existing ground levels to allow for gravity drainage system and to reduce depth of downstream drainage.

Additional topographical survey required to determine rear garden gradients and retaining wall heights.

Additional topographical survey required to determine rear garden gradients and retaining wall heights.

Table 1: Operation and maintenance requirements for Permeable Pavements:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is moat likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or 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 or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 2: Operation and maintenance requirements for detention basin

Maintenance schedule	Required action	Record frequency
Regular maintenance	Remove litter, debris and trash	Monthly
	Cut grass - for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass - meadow grass in and around basin	Half yearly: Spring (before nesting season) and Autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional maintenace	Reseed areas of poor vegetation	As required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial actions	Repair erosion or other damage by reseeding or returfing	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

SuDS Features Health and Safety Considerations

Detention basin

The following mitigation measures have been considered within the basin design to reduce the risks associated with dry detention basins:

1. All residents living within the development are to be informed of the location and purpose of the detention basin.
2. Signs must be provided to warn pedestrians of detention basin, and further "nag" signs must be provided to alert pedestrians further.
3. Adequate lighting to be provided as part of the public highway with sufficient overspill lighting for the detention basin.
4. Banking on the basin limited to 1:3 to allow for safe maintenance access/egress and unaided movement in either direction.
5. Grills will be provided at headwalls to prevent entry to larger pipes.
6. The basin is situated close to the public right of way and dwellings to ensure a high degree of natural surveillance.
7. Vegetation shall be planted around the basin to discourage access but will not obstruct visibility of the water level.

Drawing is not to be used for construction until status is CONSTRUCTION

Rev	E	Updated in response to LLFA comments and Anglian Water pre-planning report	By AD	Checked LC	18.12.2023
Rev	D	'Do not scale' note removed as requested by LPA.	By GM	Checked LC	02.11.2023
Rev	C	Minor amendment to notes.	By GM	Checked DJ	11.10.2023
Rev	B	Plot's 3 & 11 FFL's amended as per James Garner comments received 18.07.2023.	By GM	Checked LC	18.07.2023
Rev	A	Surface water design amended to suit revised urban creep.	By GM	Checked LC	17.07.2023

jpp
- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

Northampton
Grand Union Works, Whilton Locks, Daventry
Northamptonshire, NN11 2NH
T: 01604 781811
Poole Milton Keynes Warwick
E: mail@jppuk.net **W**: jppuk.net

Client: Minster Property Group
Project: West Street, Chatteris
Title: Preliminary Drainage Strategy

Scale at A1	Drawn by	Checked by	Date
1:500	ARJ	LC	July 2023

Status	Project ref	Drawing no.	Revision
FOR PLANNING	26065	103	E

Appendix I
Greenfield Calculation

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.338
Area (ha)	2.099	Urban	0.000
SAAR (mm)	543	Region Number	Region 5

Results l/s

QBAR Rural	3.7
QBAR Urban	3.7
Q100 years	13.1
Q1 year	3.2
Q30 years	8.8
Q100 years	13.1

Appendix J

Drained Areas Layout

JPP Consulting drawing no. 26065-104D

General Notes

1. All dimensions are in metres unless otherwise stated.
2. All levels are in metres.
3. This drawing is to be read in conjunction with all relevant Engineers and Architect's dra Specifications, Reports and Engineering Details.

Drawing Key

Site Boundary - Taken from site layout referenced

Drained Areas			
Hatch	Pipe Code	Area (Ha)	Area +10% Urban Creep*
	1.000	0.013	0.014
	1.001	0.196	0.216
	1.002	0.020	0.022
	1.003	0.060	0.066
	1.005	0.062	0.068
	1.006	0.082	0.090
	1.007	0.061	0.067
	1.010	0.016	0.018
	1.011	0.022	0.024
	2.000	0.052	0.057
	3.000	0.119	0.131
	3.001	0.056	0.062
	3.003	0.050	0.055
	3.004	0.137	0.151
	3.007	0.034	0.037
	4.000	0.031	0.034
	5.000	0.077	0.085
	Total	1.087	1.197

*An allowance for 10% urban creep has been made based on the overall impermeable area of 1.087 hectares. 10% has been taken from Table 1 'Cambridgeshire County Council Surface Water Planning Guidance June 2021'. The 10% has been based on ≤25 dwellings per hectare

A sensitivity check has been undertaken to confirm adding the detention basins top of bank areas to the total impermeable area does not result in flooding. The following areas have been added to the hydraulic calculations.

Drained Areas		
Hatch	Pipe Code	Area (Ha)
	1.013	0.088
	3.009	0.091

Refer to hydraulic calculations '26065 - SW MicroDrainage Simulation Results - FEH - Sensitivity check' for simulation results including the above basin areas, (the calculations include a total impermeable area of 1.376ha)

Health, safety & the environment

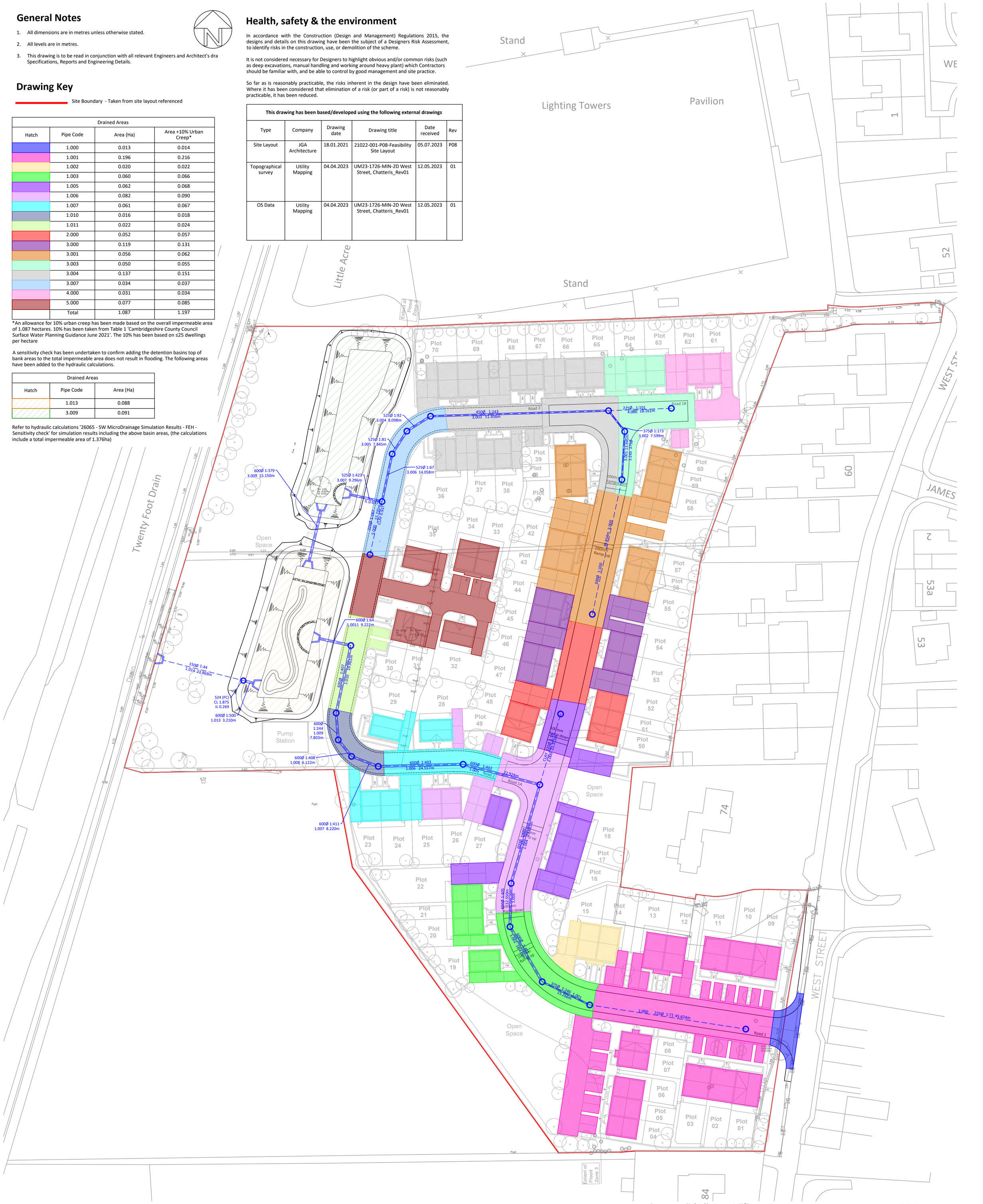
In accordance with the Construction (Design and Management) Regulations 2015, the designs and details on this drawing have been the subject of a Designers Risk Assessment, to identify risks in the construction, use, or demolition of the scheme.

It is not considered necessary for Designers to highlight obvious and/or common risks (such as deep excavations, manual handling and working around heavy plant) which Contractors should be familiar with, and be able to control by good management and site practice.

So far as is reasonably practicable, the risks inherent in the design have been eliminated. Where it has been considered that elimination of a risk (or part of a risk) is not reasonably practicable, it has been reduced.

This drawing has been based/developed using the following external drawings

Type	Company	Drawing date	Drawing title	Date received	Rev
Site Layout	JGA Architecture	18.01.2021	21022-001-P08-Feasibility Site Layout	05.07.2023	P08
Topographical survey	Utility Mapping	04.04.2023	UM23-1726-MIN-2D West Street, Chatteris_Rev01	12.05.2023	01
OS Data	Utility Mapping	04.04.2023	UM23-1726-MIN-2D West Street, Chatteris_Rev01	12.05.2023	01



Rev	D	Updated in response to LLFA comments	By AD	Checked LC	18.12.2023
Rev	C	'Do not scale' note removed as requested by LPA.	By GM	Checked LC	02.11.2023
Rev	B	Minor amendment to notes.	By GM	Checked DJ	11.10.2023
Rev	A	Amendment to urban creep allowance	By ARJ	Checked LC	17.07.2023

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- Surveying

Northampton
Grand Union Works, Whilton Locks, Daventry
Northamptonshire, NN11 2NH
T: 01604 781811

Poole **Milton Keynes** **Warwick**

E: mail@jppuk.net **W**: jppuk.net

Client: Minster Property Group

Project: West Street Chatteris

Title: Drained Areas Layout

Drawing is not to be used for construction until status is CONSTRUCTION

Scale at A1	Drawn by	Checked by	Date
1:500	ARJ	LC	July 2023

Status	Project ref	Drawing no.	Revision
FOR PLANNING	26065	104	D

Appendix K
Drainage Calculations

FEH Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.450	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	550	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.578	4-8	0.618	8-12	0.001

Total Area Contributing (ha) = 1.197

Total Pipe Volume (m³) = 97.781

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	45.624	0.639	71.4	0.014	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	15.266	0.062	246.2	0.216	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	18.435	0.046	400.8	0.022	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.003	12.550	0.031	404.8	0.066	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.004	29.681	0.073	406.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	71.58	5.49	2.104	0.014	0.0	0.0	0.0	1.55	61.6	2.7
1.001	70.29	5.71	1.315	0.230	0.0	0.0	0.0	1.15	127.0	43.8
1.002	68.87	5.97	1.028	0.252	0.0	0.0	0.0	1.21	342.2	47.0
1.003	67.93	6.14	0.982	0.318	0.0	0.0	0.0	1.20	340.4	58.5
1.004	65.82	6.55	0.951	0.318	0.0	0.0	0.0	1.20	339.7	58.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	21.312	0.703	30.3	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	22.924	0.057	402.2	0.068	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.006	24.557	0.061	402.6	0.090	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.007	8.220	0.020	411.0	0.067	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	6.122	0.015	408.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.009	7.803	0.032	243.8	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.010	19.961	0.049	407.4	0.018	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.011	9.222	0.144	64.0	0.024	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.012	22.936	0.225	101.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.000	39.854	0.400	99.6	0.131	5.00	0.0	0.600	o	300	Pipe/Conduit	
3.001	13.945	0.057	244.6	0.062	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.002	7.599	0.044	172.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	18.161	0.180	100.9	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.003	51.456	0.212	242.7	0.055	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.004	8.098	0.088	92.0	0.151	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.005	7.845	0.097	80.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.006	14.058	0.211	66.6	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	73.69	5.15	1.956	0.057	0.0	0.0	0.0	2.38	94.8	11.4
1.005	64.30	6.87	0.878	0.443	0.0	0.0	0.0	1.21	341.6	77.1
1.006	62.76	7.21	0.821	0.533	0.0	0.0	0.0	1.21	341.4	90.6
1.007	62.25	7.32	0.760	0.600	0.0	0.0	0.0	1.19	337.9	101.2
1.008	61.89	7.41	0.740	0.600	0.0	0.0	0.0	1.20	339.0	101.2
1.009	61.53	7.49	0.725	0.600	0.0	0.0	0.0	1.56	439.7	101.2
1.010	60.38	7.77	0.693	0.618	0.0	0.0	0.0	1.20	339.4	101.2
1.011	60.17	7.82	0.644	0.642	0.0	0.0	0.0	3.05	861.4	104.6
1.012	59.55	7.98	0.500	0.642	0.0	0.0	0.0	2.41	682.0	104.6
3.000	72.00	5.42	1.971	0.131	0.0	0.0	0.0	1.58	111.3	25.5
3.001	70.80	5.62	1.496	0.193	0.0	0.0	0.0	1.15	127.4	37.0
3.002	70.27	5.72	1.439	0.193	0.0	0.0	0.0	1.38	151.9	37.0
4.000	73.16	5.23	1.725	0.034	0.0	0.0	0.0	1.30	51.8	6.7
3.003	66.71	6.37	1.320	0.282	0.0	0.0	0.0	1.30	206.8	50.9
3.004	66.42	6.43	1.033	0.433	0.0	0.0	0.0	2.34	505.6	77.9
3.005	66.15	6.48	0.945	0.433	0.0	0.0	0.0	2.49	539.5	77.9
3.006	65.73	6.57	0.848	0.433	0.0	0.0	0.0	2.75	594.7	77.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	15.735	0.094	167.4	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.007	9.296	0.022	422.5	0.037	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.008	9.734	0.150	64.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.009	15.150	0.040	378.8	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.010	38.563	0.150	257.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.013	3.210	0.006	535.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.014	23.869	0.545	43.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	72.99	5.26	1.031	0.085	0.0	0.0	0.0	1.01	40.1	16.8
3.007	65.03	6.71	0.637	0.555	0.0	0.0	0.0	1.08	234.5	97.8
3.008	64.76	6.77	0.615	0.555	0.0	0.0	0.0	2.78	602.6	97.8
3.009	63.81	6.97	0.465	0.555	0.0	0.0	0.0	1.25	352.1	97.8
3.010	61.92	7.40	0.425	0.555	0.0	0.0	0.0	1.51	428.1	97.8
1.013	59.35	8.03	0.275	1.197	0.0	0.0	0.0	1.05	295.7	192.4
1.014	58.37	8.29	0.269	1.197	0.0	0.0	0.0	1.52	26.9«	192.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	3.529	1.425	Open Manhole	1350	1.000	2.104	225				
2	2.897	1.582	Open Manhole	1350	1.001	1.315	375	1.000	1.465	225	
3	3.022	1.994	Open Manhole	1500	1.002	1.028	600	1.001	1.253	375	
4	3.181	2.199	Open Manhole	1500	1.003	0.982	600	1.002	0.982	600	
5	3.162	2.211	Open Manhole	1500	1.004	0.951	600	1.003	0.951	600	
6	3.381	1.425	Open Manhole	1350	2.000	1.956	225				
7	3.164	2.286	Open Manhole	1500	1.005	0.878	600	1.004	0.878	600	
								2.000	1.253	225	
8	3.059	2.238	Open Manhole	1500	1.006	0.821	600	1.005	0.821	600	
9	2.750	1.990	Open Manhole	1500	1.007	0.760	600	1.006	0.760	600	
10	2.645	1.905	Open Manhole	1500	1.008	0.740	600	1.007	0.740	600	
11	2.571	1.846	Open Manhole	1500	1.009	0.725	600	1.008	0.725	600	
12	2.493	1.800	Open Manhole	1500	1.010	0.693	600	1.009	0.693	600	
13	2.244	1.600	Open Manhole	1800	1.011	0.644	600	1.010	0.644	600	
HW1	1.775	1.275	Open Manhole	1500	1.012	0.500	600	1.011	0.500	600	
14	3.471	1.500	Open Manhole	1350	3.000	1.971	300				
15	3.071	1.575	Open Manhole	1350	3.001	1.496	375	3.000	1.571	300	
16	3.023	1.584	Open Manhole	1350	3.002	1.439	375	3.001	1.439	375	
17	3.150	1.425	Open Manhole	1350	4.000	1.725	225				
18	2.970	1.650	Open Manhole	1500	3.003	1.320	450	3.002	1.395	375	
								4.000	1.545	225	
19	2.558	1.525	Open Manhole	1500	3.004	1.033	525	3.003	1.108	450	
20	2.470	1.525	Open Manhole	1500	3.005	0.945	525	3.004	0.945	525	
21	2.373	1.525	Open Manhole	1500	3.006	0.848	525	3.005	0.848	525	
22	2.256	1.225	Open Manhole	1200	5.000	1.031	225				
23	2.204	1.567	Open Manhole	1500	3.007	0.637	525	3.006	0.637	525	
								5.000	0.937	225	
HW2	1.775	1.160	Open Manhole	1800	3.008	0.615	525	3.007	0.615	525	
HW3	1.775	1.310	Open Manhole	2100	3.009	0.465	600	3.008	0.465	525	
HW4	1.775	1.350	Open Manhole	2100	3.010	0.425	600	3.009	0.425	600	
HW5	1.775	1.500	Open Manhole	1500	1.013	0.275	600	1.012	0.275	600	
								3.010	0.275	600	
24 (FC)	1.875	1.606	Open Manhole	2100	1.014	0.269	150	1.013	0.269	600	
HW6	0.500	0.776	Open Manhole	0		OUTFALL		1.014	-0.276	150	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	538710.181	285209.371	538710.181	285209.371	Required	
2	538665.095	285216.361	538665.095	285216.361	Required	
3	538651.374	285223.052	538651.374	285223.052	Required	
4	538642.057	285238.960	538642.057	285238.960	Required	
5	538642.376	285251.506	538642.376	285251.506	Required	
6	538656.683	285300.451	538656.683	285300.451	Required	
7	538650.673	285280.004	538650.673	285280.004	Required	
8	538628.522	285285.908	538628.522	285285.908	Required	
9	538603.973	285285.300	538603.973	285285.300	Required	
10	538596.276	285288.187	538596.276	285288.187	Required	
11	538592.436	285292.954	538592.436	285292.954	Required	
12	538591.824	285300.733	538591.824	285300.733	Required	
13	538596.072	285320.237	538596.072	285320.237	Required	
HW1	538587.068	285322.231	538587.068	285322.231	Required	
14	538665.839	285329.261	538665.839	285329.261	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
15	538674.390	285368.187	538674.390	285368.187	Required	
16	538675.208	285382.108	538675.208	285382.108	Required	
17	538688.687	285388.794	538688.687	285388.794	Required	
18	538670.539	285388.103	538670.539	285388.103	Required	
19	538619.107	285386.518	538619.107	285386.518	Required	
20	538612.261	285382.193	538612.261	285382.193	Required	
21	538608.011	285375.599	538608.011	285375.599	Required	
22	538601.588	285346.507	538601.588	285346.507	Required	
23	538605.081	285361.849	538605.081	285361.849	Required	
HW2	538595.998	285363.826	538595.998	285363.826	Required	
HW3	538587.432	285359.203	538587.432	285359.203	Required	
HW4	538583.964	285344.455	538583.964	285344.455	Required	
HW5	538568.128	285309.294	538568.128	285309.294	Required	
24 (FC)	538565.019	285310.094	538565.019	285310.094	Required	
HW6	538541.888	285315.981			No Entry	

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	o	225	1	3.529	2.104	1.200	Open Manhole	1350
1.001	o	375	2	2.897	1.315	1.207	Open Manhole	1350
1.002	o	600	3	3.022	1.028	1.394	Open Manhole	1500
1.003	o	600	4	3.181	0.982	1.599	Open Manhole	1500
1.004	o	600	5	3.162	0.951	1.611	Open Manhole	1500
2.000	o	225	6	3.381	1.956	1.200	Open Manhole	1350
1.005	o	600	7	3.164	0.878	1.686	Open Manhole	1500
1.006	o	600	8	3.059	0.821	1.638	Open Manhole	1500
1.007	o	600	9	2.750	0.760	1.390	Open Manhole	1500
1.008	o	600	10	2.645	0.740	1.305	Open Manhole	1500
1.009	o	600	11	2.571	0.725	1.246	Open Manhole	1500
1.010	o	600	12	2.493	0.693	1.200	Open Manhole	1500
1.011	o	600	13	2.244	0.644	1.000	Open Manhole	1800
1.012	o	600	HW1	1.775	0.500	0.675	Open Manhole	1500
3.000	o	300	14	3.471	1.971	1.200	Open Manhole	1350
3.001	o	375	15	3.071	1.496	1.200	Open Manhole	1350
3.002	o	375	16	3.023	1.439	1.209	Open Manhole	1350

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	45.624	71.4	2	2.897	1.465	1.207	Open Manhole	1350
1.001	15.266	246.2	3	3.022	1.253	1.394	Open Manhole	1500
1.002	18.435	400.8	4	3.181	0.982	1.599	Open Manhole	1500
1.003	12.550	404.8	5	3.162	0.951	1.611	Open Manhole	1500
1.004	29.681	406.6	7	3.164	0.878	1.686	Open Manhole	1500
2.000	21.312	30.3	7	3.164	1.253	1.686	Open Manhole	1500
1.005	22.924	402.2	8	3.059	0.821	1.638	Open Manhole	1500
1.006	24.557	402.6	9	2.750	0.760	1.390	Open Manhole	1500
1.007	8.220	411.0	10	2.645	0.740	1.305	Open Manhole	1500
1.008	6.122	408.1	11	2.571	0.725	1.246	Open Manhole	1500
1.009	7.803	243.8	12	2.493	0.693	1.200	Open Manhole	1500
1.010	19.961	407.4	13	2.244	0.644	1.000	Open Manhole	1800
1.011	9.222	64.0	HW1	1.775	0.500	0.675	Open Manhole	1500
1.012	22.936	101.9	HW5	1.775	0.275	0.900	Open Manhole	1500
3.000	39.854	99.6	15	3.071	1.571	1.200	Open Manhole	1350
3.001	13.945	244.6	16	3.023	1.439	1.209	Open Manhole	1350
3.002	7.599	172.7	18	2.970	1.395	1.200	Open Manhole	1500

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)
4.000	o	225	17	3.150	1.725	1.200	Open Manhole	1350
3.003	o	450	18	2.970	1.320	1.200	Open Manhole	1500
3.004	o	525	19	2.558	1.033	1.000	Open Manhole	1500
3.005	o	525	20	2.470	0.945	1.000	Open Manhole	1500
3.006	o	525	21	2.373	0.848	1.000	Open Manhole	1500
5.000	o	225	22	2.256	1.031	1.000	Open Manhole	1200
3.007	o	525	23	2.204	0.637	1.042	Open Manhole	1500
3.008	o	525	HW2	1.775	0.615	0.635	Open Manhole	1800
3.009	o	600	HW3	1.775	0.465	0.710	Open Manhole	2100
3.010	o	600	HW4	1.775	0.425	0.750	Open Manhole	2100
1.013	o	600	HW5	1.775	0.275	0.900	Open Manhole	1500
1.014	o	150	24 (FC)	1.875	0.269	1.456	Open Manhole	2100

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)
4.000	18.161	100.9	18	2.970	1.545	1.200	Open Manhole	1500
3.003	51.456	242.7	19	2.558	1.108	1.000	Open Manhole	1500
3.004	8.098	92.0	20	2.470	0.945	1.000	Open Manhole	1500
3.005	7.845	80.9	21	2.373	0.848	1.000	Open Manhole	1500
3.006	14.058	66.6	23	2.204	0.637	1.042	Open Manhole	1500
5.000	15.735	167.4	23	2.204	0.937	1.042	Open Manhole	1500
3.007	9.296	422.5	HW2	1.775	0.615	0.635	Open Manhole	1800
3.008	9.734	64.9	HW3	1.775	0.465	0.785	Open Manhole	2100
3.009	15.150	378.8	HW4	1.775	0.425	0.750	Open Manhole	2100
3.010	38.563	257.1	HW5	1.775	0.275	0.900	Open Manhole	1500
1.013	3.210	535.0	24 (FC)	1.875	0.269	1.006	Open Manhole	2100
1.014	23.869	43.8	HW6	0.500	-0.276	0.626	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.014	0.014	0.014
1.001	-	-	100	0.216	0.216	0.216
1.002	-	-	100	0.022	0.022	0.022
1.003	-	-	100	0.066	0.066	0.066
1.004	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.057	0.057	0.057
1.005	-	-	100	0.068	0.068	0.068
1.006	-	-	100	0.090	0.090	0.090
1.007	-	-	100	0.067	0.067	0.067
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.018	0.018	0.018
1.011	-	-	100	0.024	0.024	0.024
1.012	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.131	0.131	0.131
3.001	-	-	100	0.062	0.062	0.062
3.002	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.034	0.034	0.034
3.003	-	-	100	0.055	0.055	0.055
3.004	-	-	100	0.151	0.151	0.151
3.005	-	-	100	0.000	0.000	0.000
3.006	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.085	0.085	0.085
3.007	-	-	100	0.037	0.037	0.037
3.008	-	-	100	0.000	0.000	0.000
3.009	-	-	100	0.000	0.000	0.000
3.010	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.197	1.197	1.197

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.014	HW6	0.500	-0.276	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	1.000	5	1.000	9	1.000	13	1.000	17	1.000	21	1.000
2	1.000	6	1.000	10	1.000	14	1.000	18	1.000	22	1.000
3	1.000	7	1.000	11	1.000	15	1.000	19	1.000	23	1.000
4	1.000	8	1.000	12	1.000	16	1.000	20	1.000	24	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
25	1.000	75	1.000	125	1.000	175	1.000	225	1.000	275	1.000
26	1.000	76	1.000	126	1.000	176	1.000	226	1.000	276	1.000
27	1.000	77	1.000	127	1.000	177	1.000	227	1.000	277	1.000
28	1.000	78	1.000	128	1.000	178	1.000	228	1.000	278	1.000
29	1.000	79	1.000	129	1.000	179	1.000	229	1.000	279	1.000
30	1.000	80	1.000	130	1.000	180	1.000	230	1.000	280	1.000
31	1.000	81	1.000	131	1.000	181	1.000	231	1.000	281	1.000
32	1.000	82	1.000	132	1.000	182	1.000	232	1.000	282	1.000
33	1.000	83	1.000	133	1.000	183	1.000	233	1.000	283	1.000
34	1.000	84	1.000	134	1.000	184	1.000	234	1.000	284	1.000
35	1.000	85	1.000	135	1.000	185	1.000	235	1.000	285	1.000
36	1.000	86	1.000	136	1.000	186	1.000	236	1.000	286	1.000
37	1.000	87	1.000	137	1.000	187	1.000	237	1.000	287	1.000
38	1.000	88	1.000	138	1.000	188	1.000	238	1.000	288	1.000
39	1.000	89	1.000	139	1.000	189	1.000	239	1.000	289	1.000
40	1.000	90	1.000	140	1.000	190	1.000	240	1.000	290	1.000
41	1.000	91	1.000	141	1.000	191	1.000	241	1.000	291	1.000
42	1.000	92	1.000	142	1.000	192	1.000	242	1.000	292	1.000
43	1.000	93	1.000	143	1.000	193	1.000	243	1.000	293	1.000
44	1.000	94	1.000	144	1.000	194	1.000	244	1.000	294	1.000
45	1.000	95	1.000	145	1.000	195	1.000	245	1.000	295	1.000
46	1.000	96	1.000	146	1.000	196	1.000	246	1.000	296	1.000
47	1.000	97	1.000	147	1.000	197	1.000	247	1.000	297	1.000
48	1.000	98	1.000	148	1.000	198	1.000	248	1.000	298	1.000
49	1.000	99	1.000	149	1.000	199	1.000	249	1.000	299	1.000
50	1.000	100	1.000	150	1.000	200	1.000	250	1.000	300	1.000
51	1.000	101	1.000	151	1.000	201	1.000	251	1.000	301	1.000
52	1.000	102	1.000	152	1.000	202	1.000	252	1.000	302	1.000
53	1.000	103	1.000	153	1.000	203	1.000	253	1.000	303	1.000
54	1.000	104	1.000	154	1.000	204	1.000	254	1.000	304	1.000
55	1.000	105	1.000	155	1.000	205	1.000	255	1.000	305	1.000
56	1.000	106	1.000	156	1.000	206	1.000	256	1.000	306	1.000
57	1.000	107	1.000	157	1.000	207	1.000	257	1.000	307	1.000
58	1.000	108	1.000	158	1.000	208	1.000	258	1.000	308	1.000
59	1.000	109	1.000	159	1.000	209	1.000	259	1.000	309	1.000
60	1.000	110	1.000	160	1.000	210	1.000	260	1.000	310	1.000
61	1.000	111	1.000	161	1.000	211	1.000	261	1.000	311	1.000
62	1.000	112	1.000	162	1.000	212	1.000	262	1.000	312	1.000
63	1.000	113	1.000	163	1.000	213	1.000	263	1.000	313	1.000
64	1.000	114	1.000	164	1.000	214	1.000	264	1.000	314	1.000
65	1.000	115	1.000	165	1.000	215	1.000	265	1.000	315	1.000
66	1.000	116	1.000	166	1.000	216	1.000	266	1.000	316	1.000
67	1.000	117	1.000	167	1.000	217	1.000	267	1.000	317	1.000
68	1.000	118	1.000	168	1.000	218	1.000	268	1.000	318	1.000
69	1.000	119	1.000	169	1.000	219	1.000	269	1.000	319	1.000
70	1.000	120	1.000	170	1.000	220	1.000	270	1.000	320	1.000
71	1.000	121	1.000	171	1.000	221	1.000	271	1.000	321	1.000
72	1.000	122	1.000	172	1.000	222	1.000	272	1.000	322	1.000
73	1.000	123	1.000	173	1.000	223	1.000	273	1.000	323	1.000
74	1.000	124	1.000	174	1.000	224	1.000	274	1.000	324	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
325	1.000	375	1.000	425	1.000	475	1.000	525	1.000	575	1.000
326	1.000	376	1.000	426	1.000	476	1.000	526	1.000	576	1.000
327	1.000	377	1.000	427	1.000	477	1.000	527	1.000	577	1.000
328	1.000	378	1.000	428	1.000	478	1.000	528	1.000	578	1.000
329	1.000	379	1.000	429	1.000	479	1.000	529	1.000	579	1.000
330	1.000	380	1.000	430	1.000	480	1.000	530	1.000	580	1.000
331	1.000	381	1.000	431	1.000	481	1.000	531	1.000	581	1.000
332	1.000	382	1.000	432	1.000	482	1.000	532	1.000	582	1.000
333	1.000	383	1.000	433	1.000	483	1.000	533	1.000	583	1.000
334	1.000	384	1.000	434	1.000	484	1.000	534	1.000	584	1.000
335	1.000	385	1.000	435	1.000	485	1.000	535	1.000	585	1.000
336	1.000	386	1.000	436	1.000	486	1.000	536	1.000	586	1.000
337	1.000	387	1.000	437	1.000	487	1.000	537	1.000	587	1.000
338	1.000	388	1.000	438	1.000	488	1.000	538	1.000	588	1.000
339	1.000	389	1.000	439	1.000	489	1.000	539	1.000	589	1.000
340	1.000	390	1.000	440	1.000	490	1.000	540	1.000	590	1.000
341	1.000	391	1.000	441	1.000	491	1.000	541	1.000	591	1.000
342	1.000	392	1.000	442	1.000	492	1.000	542	1.000	592	1.000
343	1.000	393	1.000	443	1.000	493	1.000	543	1.000	593	1.000
344	1.000	394	1.000	444	1.000	494	1.000	544	1.000	594	1.000
345	1.000	395	1.000	445	1.000	495	1.000	545	1.000	595	1.000
346	1.000	396	1.000	446	1.000	496	1.000	546	1.000	596	1.000
347	1.000	397	1.000	447	1.000	497	1.000	547	1.000	597	1.000
348	1.000	398	1.000	448	1.000	498	1.000	548	1.000	598	1.000
349	1.000	399	1.000	449	1.000	499	1.000	549	1.000	599	1.000
350	1.000	400	1.000	450	1.000	500	1.000	550	1.000	600	1.000
351	1.000	401	1.000	451	1.000	501	1.000	551	1.000	601	1.000
352	1.000	402	1.000	452	1.000	502	1.000	552	1.000	602	1.000
353	1.000	403	1.000	453	1.000	503	1.000	553	1.000	603	1.000
354	1.000	404	1.000	454	1.000	504	1.000	554	1.000	604	1.000
355	1.000	405	1.000	455	1.000	505	1.000	555	1.000	605	1.000
356	1.000	406	1.000	456	1.000	506	1.000	556	1.000	606	1.000
357	1.000	407	1.000	457	1.000	507	1.000	557	1.000	607	1.000
358	1.000	408	1.000	458	1.000	508	1.000	558	1.000	608	1.000
359	1.000	409	1.000	459	1.000	509	1.000	559	1.000	609	1.000
360	1.000	410	1.000	460	1.000	510	1.000	560	1.000	610	1.000
361	1.000	411	1.000	461	1.000	511	1.000	561	1.000	611	1.000
362	1.000	412	1.000	462	1.000	512	1.000	562	1.000	612	1.000
363	1.000	413	1.000	463	1.000	513	1.000	563	1.000	613	1.000
364	1.000	414	1.000	464	1.000	514	1.000	564	1.000	614	1.000
365	1.000	415	1.000	465	1.000	515	1.000	565	1.000	615	1.000
366	1.000	416	1.000	466	1.000	516	1.000	566	1.000	616	1.000
367	1.000	417	1.000	467	1.000	517	1.000	567	1.000	617	1.000
368	1.000	418	1.000	468	1.000	518	1.000	568	1.000	618	1.000
369	1.000	419	1.000	469	1.000	519	1.000	569	1.000	619	1.000
370	1.000	420	1.000	470	1.000	520	1.000	570	1.000	620	1.000
371	1.000	421	1.000	471	1.000	521	1.000	571	1.000	621	1.000
372	1.000	422	1.000	472	1.000	522	1.000	572	1.000	622	1.000
373	1.000	423	1.000	473	1.000	523	1.000	573	1.000	623	1.000
374	1.000	424	1.000	474	1.000	524	1.000	574	1.000	624	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
625	1.000	675	1.000	725	1.000	775	1.000	825	1.000	875	1.000
626	1.000	676	1.000	726	1.000	776	1.000	826	1.000	876	1.000
627	1.000	677	1.000	727	1.000	777	1.000	827	1.000	877	1.000
628	1.000	678	1.000	728	1.000	778	1.000	828	1.000	878	1.000
629	1.000	679	1.000	729	1.000	779	1.000	829	1.000	879	1.000
630	1.000	680	1.000	730	1.000	780	1.000	830	1.000	880	1.000
631	1.000	681	1.000	731	1.000	781	1.000	831	1.000	881	1.000
632	1.000	682	1.000	732	1.000	782	1.000	832	1.000	882	1.000
633	1.000	683	1.000	733	1.000	783	1.000	833	1.000	883	1.000
634	1.000	684	1.000	734	1.000	784	1.000	834	1.000	884	1.000
635	1.000	685	1.000	735	1.000	785	1.000	835	1.000	885	1.000
636	1.000	686	1.000	736	1.000	786	1.000	836	1.000	886	1.000
637	1.000	687	1.000	737	1.000	787	1.000	837	1.000	887	1.000
638	1.000	688	1.000	738	1.000	788	1.000	838	1.000	888	1.000
639	1.000	689	1.000	739	1.000	789	1.000	839	1.000	889	1.000
640	1.000	690	1.000	740	1.000	790	1.000	840	1.000	890	1.000
641	1.000	691	1.000	741	1.000	791	1.000	841	1.000	891	1.000
642	1.000	692	1.000	742	1.000	792	1.000	842	1.000	892	1.000
643	1.000	693	1.000	743	1.000	793	1.000	843	1.000	893	1.000
644	1.000	694	1.000	744	1.000	794	1.000	844	1.000	894	1.000
645	1.000	695	1.000	745	1.000	795	1.000	845	1.000	895	1.000
646	1.000	696	1.000	746	1.000	796	1.000	846	1.000	896	1.000
647	1.000	697	1.000	747	1.000	797	1.000	847	1.000	897	1.000
648	1.000	698	1.000	748	1.000	798	1.000	848	1.000	898	1.000
649	1.000	699	1.000	749	1.000	799	1.000	849	1.000	899	1.000
650	1.000	700	1.000	750	1.000	800	1.000	850	1.000	900	1.000
651	1.000	701	1.000	751	1.000	801	1.000	851	1.000	901	1.000
652	1.000	702	1.000	752	1.000	802	1.000	852	1.000	902	1.000
653	1.000	703	1.000	753	1.000	803	1.000	853	1.000	903	1.000
654	1.000	704	1.000	754	1.000	804	1.000	854	1.000	904	1.000
655	1.000	705	1.000	755	1.000	805	1.000	855	1.000	905	1.000
656	1.000	706	1.000	756	1.000	806	1.000	856	1.000	906	1.000
657	1.000	707	1.000	757	1.000	807	1.000	857	1.000	907	1.000
658	1.000	708	1.000	758	1.000	808	1.000	858	1.000	908	1.000
659	1.000	709	1.000	759	1.000	809	1.000	859	1.000	909	1.000
660	1.000	710	1.000	760	1.000	810	1.000	860	1.000	910	1.000
661	1.000	711	1.000	761	1.000	811	1.000	861	1.000	911	1.000
662	1.000	712	1.000	762	1.000	812	1.000	862	1.000	912	1.000
663	1.000	713	1.000	763	1.000	813	1.000	863	1.000	913	1.000
664	1.000	714	1.000	764	1.000	814	1.000	864	1.000	914	1.000
665	1.000	715	1.000	765	1.000	815	1.000	865	1.000	915	1.000
666	1.000	716	1.000	766	1.000	816	1.000	866	1.000	916	1.000
667	1.000	717	1.000	767	1.000	817	1.000	867	1.000	917	1.000
668	1.000	718	1.000	768	1.000	818	1.000	868	1.000	918	1.000
669	1.000	719	1.000	769	1.000	819	1.000	869	1.000	919	1.000
670	1.000	720	1.000	770	1.000	820	1.000	870	1.000	920	1.000
671	1.000	721	1.000	771	1.000	821	1.000	871	1.000	921	1.000
672	1.000	722	1.000	772	1.000	822	1.000	872	1.000	922	1.000
673	1.000	723	1.000	773	1.000	823	1.000	873	1.000	923	1.000
674	1.000	724	1.000	774	1.000	824	1.000	874	1.000	924	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
925	1.000	975	1.000	1025	1.000	1075	1.000	1125	1.000	1175	1.000
926	1.000	976	1.000	1026	1.000	1076	1.000	1126	1.000	1176	1.000
927	1.000	977	1.000	1027	1.000	1077	1.000	1127	1.000	1177	1.000
928	1.000	978	1.000	1028	1.000	1078	1.000	1128	1.000	1178	1.000
929	1.000	979	1.000	1029	1.000	1079	1.000	1129	1.000	1179	1.000
930	1.000	980	1.000	1030	1.000	1080	1.000	1130	1.000	1180	1.000
931	1.000	981	1.000	1031	1.000	1081	1.000	1131	1.000	1181	1.000
932	1.000	982	1.000	1032	1.000	1082	1.000	1132	1.000	1182	1.000
933	1.000	983	1.000	1033	1.000	1083	1.000	1133	1.000	1183	1.000
934	1.000	984	1.000	1034	1.000	1084	1.000	1134	1.000	1184	1.000
935	1.000	985	1.000	1035	1.000	1085	1.000	1135	1.000	1185	1.000
936	1.000	986	1.000	1036	1.000	1086	1.000	1136	1.000	1186	1.000
937	1.000	987	1.000	1037	1.000	1087	1.000	1137	1.000	1187	1.000
938	1.000	988	1.000	1038	1.000	1088	1.000	1138	1.000	1188	1.000
939	1.000	989	1.000	1039	1.000	1089	1.000	1139	1.000	1189	1.000
940	1.000	990	1.000	1040	1.000	1090	1.000	1140	1.000	1190	1.000
941	1.000	991	1.000	1041	1.000	1091	1.000	1141	1.000	1191	1.000
942	1.000	992	1.000	1042	1.000	1092	1.000	1142	1.000	1192	1.000
943	1.000	993	1.000	1043	1.000	1093	1.000	1143	1.000	1193	1.000
944	1.000	994	1.000	1044	1.000	1094	1.000	1144	1.000	1194	1.000
945	1.000	995	1.000	1045	1.000	1095	1.000	1145	1.000	1195	1.000
946	1.000	996	1.000	1046	1.000	1096	1.000	1146	1.000	1196	1.000
947	1.000	997	1.000	1047	1.000	1097	1.000	1147	1.000	1197	1.000
948	1.000	998	1.000	1048	1.000	1098	1.000	1148	1.000	1198	1.000
949	1.000	999	1.000	1049	1.000	1099	1.000	1149	1.000	1199	1.000
950	1.000	1000	1.000	1050	1.000	1100	1.000	1150	1.000	1200	1.000
951	1.000	1001	1.000	1051	1.000	1101	1.000	1151	1.000	1201	1.000
952	1.000	1002	1.000	1052	1.000	1102	1.000	1152	1.000	1202	1.000
953	1.000	1003	1.000	1053	1.000	1103	1.000	1153	1.000	1203	1.000
954	1.000	1004	1.000	1054	1.000	1104	1.000	1154	1.000	1204	1.000
955	1.000	1005	1.000	1055	1.000	1105	1.000	1155	1.000	1205	1.000
956	1.000	1006	1.000	1056	1.000	1106	1.000	1156	1.000	1206	1.000
957	1.000	1007	1.000	1057	1.000	1107	1.000	1157	1.000	1207	1.000
958	1.000	1008	1.000	1058	1.000	1108	1.000	1158	1.000	1208	1.000
959	1.000	1009	1.000	1059	1.000	1109	1.000	1159	1.000	1209	1.000
960	1.000	1010	1.000	1060	1.000	1110	1.000	1160	1.000	1210	1.000
961	1.000	1011	1.000	1061	1.000	1111	1.000	1161	1.000	1211	1.000
962	1.000	1012	1.000	1062	1.000	1112	1.000	1162	1.000	1212	1.000
963	1.000	1013	1.000	1063	1.000	1113	1.000	1163	1.000	1213	1.000
964	1.000	1014	1.000	1064	1.000	1114	1.000	1164	1.000	1214	1.000
965	1.000	1015	1.000	1065	1.000	1115	1.000	1165	1.000	1215	1.000
966	1.000	1016	1.000	1066	1.000	1116	1.000	1166	1.000	1216	1.000
967	1.000	1017	1.000	1067	1.000	1117	1.000	1167	1.000	1217	1.000
968	1.000	1018	1.000	1068	1.000	1118	1.000	1168	1.000	1218	1.000
969	1.000	1019	1.000	1069	1.000	1119	1.000	1169	1.000	1219	1.000
970	1.000	1020	1.000	1070	1.000	1120	1.000	1170	1.000	1220	1.000
971	1.000	1021	1.000	1071	1.000	1121	1.000	1171	1.000	1221	1.000
972	1.000	1022	1.000	1072	1.000	1122	1.000	1172	1.000	1222	1.000
973	1.000	1023	1.000	1073	1.000	1123	1.000	1173	1.000	1223	1.000
974	1.000	1024	1.000	1074	1.000	1124	1.000	1174	1.000	1224	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1225	1.000	1261	1.000	1297	1.000	1333	1.000	1369	1.000	1405	1.000
1226	1.000	1262	1.000	1298	1.000	1334	1.000	1370	1.000	1406	1.000
1227	1.000	1263	1.000	1299	1.000	1335	1.000	1371	1.000	1407	1.000
1228	1.000	1264	1.000	1300	1.000	1336	1.000	1372	1.000	1408	1.000
1229	1.000	1265	1.000	1301	1.000	1337	1.000	1373	1.000	1409	1.000
1230	1.000	1266	1.000	1302	1.000	1338	1.000	1374	1.000	1410	1.000
1231	1.000	1267	1.000	1303	1.000	1339	1.000	1375	1.000	1411	1.000
1232	1.000	1268	1.000	1304	1.000	1340	1.000	1376	1.000	1412	1.000
1233	1.000	1269	1.000	1305	1.000	1341	1.000	1377	1.000	1413	1.000
1234	1.000	1270	1.000	1306	1.000	1342	1.000	1378	1.000	1414	1.000
1235	1.000	1271	1.000	1307	1.000	1343	1.000	1379	1.000	1415	1.000
1236	1.000	1272	1.000	1308	1.000	1344	1.000	1380	1.000	1416	1.000
1237	1.000	1273	1.000	1309	1.000	1345	1.000	1381	1.000	1417	1.000
1238	1.000	1274	1.000	1310	1.000	1346	1.000	1382	1.000	1418	1.000
1239	1.000	1275	1.000	1311	1.000	1347	1.000	1383	1.000	1419	1.000
1240	1.000	1276	1.000	1312	1.000	1348	1.000	1384	1.000	1420	1.000
1241	1.000	1277	1.000	1313	1.000	1349	1.000	1385	1.000	1421	1.000
1242	1.000	1278	1.000	1314	1.000	1350	1.000	1386	1.000	1422	1.000
1243	1.000	1279	1.000	1315	1.000	1351	1.000	1387	1.000	1423	1.000
1244	1.000	1280	1.000	1316	1.000	1352	1.000	1388	1.000	1424	1.000
1245	1.000	1281	1.000	1317	1.000	1353	1.000	1389	1.000	1425	1.000
1246	1.000	1282	1.000	1318	1.000	1354	1.000	1390	1.000	1426	1.000
1247	1.000	1283	1.000	1319	1.000	1355	1.000	1391	1.000	1427	1.000
1248	1.000	1284	1.000	1320	1.000	1356	1.000	1392	1.000	1428	1.000
1249	1.000	1285	1.000	1321	1.000	1357	1.000	1393	1.000	1429	1.000
1250	1.000	1286	1.000	1322	1.000	1358	1.000	1394	1.000	1430	1.000
1251	1.000	1287	1.000	1323	1.000	1359	1.000	1395	1.000	1431	1.000
1252	1.000	1288	1.000	1324	1.000	1360	1.000	1396	1.000	1432	1.000
1253	1.000	1289	1.000	1325	1.000	1361	1.000	1397	1.000	1433	1.000
1254	1.000	1290	1.000	1326	1.000	1362	1.000	1398	1.000	1434	1.000
1255	1.000	1291	1.000	1327	1.000	1363	1.000	1399	1.000	1435	1.000
1256	1.000	1292	1.000	1328	1.000	1364	1.000	1400	1.000	1436	1.000
1257	1.000	1293	1.000	1329	1.000	1365	1.000	1401	1.000	1437	1.000
1258	1.000	1294	1.000	1330	1.000	1366	1.000	1402	1.000	1438	1.000
1259	1.000	1295	1.000	1331	1.000	1367	1.000	1403	1.000	1439	1.000
1260	1.000	1296	1.000	1332	1.000	1368	1.000	1404	1.000	1440	1.000

Simulation Criteria for Storm

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Simulation Criteria for Storm

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.450		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 24 (FC), DS/PN: 1.014, Volume (m³): 6.0

Unit Reference	MD-SHE-0084-3700-1500-3700
Design Head (m)	1.500
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	0.269
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	3.7
Flush-Flo™	0.369	3.3
Kick-Flo®	0.748	2.7
Mean Flow over Head Range	-	3.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	3.3	3.000	5.1	7.000	7.6
0.200	3.1	1.400	3.6	3.500	5.5	7.500	7.9
0.300	3.3	1.600	3.8	4.000	5.8	8.000	8.1
0.400	3.3	1.800	4.0	4.500	6.2	8.500	8.3
0.500	3.3	2.000	4.2	5.000	6.5	9.000	8.6
0.600	3.2	2.200	4.4	5.500	6.8	9.500	8.8
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.3		

Storage Structures for Storm

Tank or Pond Manhole: HW3, DS/PN: 3.009

Invert Level (m) 0.465

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	396.0	1.310	885.0

Tank or Pond Manhole: HW5, DS/PN: 1.013

Invert Level (m) 0.275

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	405.8	1.500	910.0

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 538500 285350 TL 38500 85350
Data Type	Catchment
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	60 Summer	2	+0%					2.130
1.001	2	60 Summer	2	+0%	30/60 Summer				1.450
1.002	3	60 Summer	2	+0%	100/60 Summer				1.201
1.003	4	60 Summer	2	+0%	100/60 Summer				1.171
1.004	5	60 Summer	2	+0%	100/60 Summer				1.138
2.000	6	60 Summer	2	+0%					2.001
1.005	7	60 Summer	2	+0%	30/60 Summer				1.097
1.006	8	60 Summer	2	+0%	30/60 Summer				1.062
1.007	9	60 Summer	2	+0%	30/60 Summer				1.024
1.008	10	60 Summer	2	+0%	30/60 Summer				0.978
1.009	11	60 Summer	2	+0%	30/60 Summer				0.936
1.010	12	60 Summer	2	+0%	30/240 Summer				0.908
1.011	13	60 Summer	2	+0%	30/240 Summer				0.821
1.012	HW1	1440 Winter	2	+0%	30/120 Summer				0.804

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.199	0.000	0.03		1.9	OK	
1.001	2	-0.240	0.000	0.28		28.6	OK	
1.002	3	-0.427	0.000	0.13		31.2	OK	
1.003	4	-0.411	0.000	0.20		38.9	OK	
1.004	5	-0.413	0.000	0.14		38.4	OK	
2.000	6	-0.180	0.000	0.09		7.6	OK	
1.005	7	-0.381	0.000	0.20		52.2	OK	
1.006	8	-0.359	0.000	0.23		61.7	OK	
1.007	9	-0.336	0.000	0.40		68.8	OK	
1.008	10	-0.362	0.000	0.33		68.6	OK	
1.009	11	-0.389	0.000	0.27		68.8	OK	
1.010	12	-0.385	0.000	0.28		70.5	OK	
1.011	13	-0.423	0.000	0.19		72.6	OK	
1.012	HW1	-0.296	0.000	0.01		6.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	14	60 Summer	2	+0%	100/60 Summer			
3.001	15	60 Summer	2	+0%	100/60 Summer			
3.002	16	60 Summer	2	+0%	100/60 Summer			
4.000	17	60 Summer	2	+0%	100/60 Summer			
3.003	18	60 Summer	2	+0%	100/60 Summer			
3.004	19	60 Summer	2	+0%	100/60 Summer			
3.005	20	60 Summer	2	+0%	100/60 Summer			
3.006	21	60 Summer	2	+0%	100/60 Summer			
5.000	22	60 Summer	2	+0%	30/60 Summer			
3.007	23	60 Summer	2	+0%	30/60 Summer			
3.008	HW2	1440 Summer	2	+0%	30/180 Summer			
3.009	HW3	1440 Summer	2	+0%	30/120 Summer			
3.010	HW4	1440 Winter	2	+0%	30/120 Summer			
1.013	HW5	1440 Winter	2	+0%	30/60 Summer			
1.014	24 (FC)	1440 Summer	2	+0%	2/60 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	14	2.053	-0.218	0.000	0.17		17.5	OK	
3.001	15	1.623	-0.248	0.000	0.25		25.1	OK	
3.002	16	1.563	-0.251	0.000	0.24		25.1	OK	
4.000	17	1.772	-0.178	0.000	0.10		4.6	OK	
3.003	18	1.454	-0.316	0.000	0.19		36.0	OK	
3.004	19	1.199	-0.359	0.000	0.22		54.3	OK	
3.005	20	1.111	-0.359	0.000	0.22		54.2	OK	
3.006	21	0.985	-0.388	0.000	0.15		54.2	OK	
5.000	22	1.118	-0.138	0.000	0.32		11.4	OK	
3.007	23	0.913	-0.249	0.000	0.54		69.3	OK	
3.008	HW2	0.804	-0.336	0.000	0.03		9.1	OK	
3.009	HW3	0.804	-0.261	0.000	0.01		2.0	OK	
3.010	HW4	0.804	-0.221	0.000	0.01		2.1	OK	
1.013	HW5	0.804	-0.071	0.000	0.03		7.5	OK	
1.014	24 (FC)	0.813	0.394	0.000	0.13		3.3	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 538500 285350 TL 38500 85350
Data Type	Catchment
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	60 Summer	30	+40%					2.155
1.001	2	60 Summer	30	+40%	30/60 Summer				1.722
1.002	3	240 Winter	30	+40%	100/60 Summer				1.628
1.003	4	240 Winter	30	+40%	100/60 Summer				1.582
1.004	5	60 Summer	30	+40%	100/60 Summer				1.551
2.000	6	60 Summer	30	+40%					2.045
1.005	7	60 Summer	30	+40%	30/60 Summer				1.498
1.006	8	60 Summer	30	+40%	30/60 Summer				1.456
1.007	9	60 Summer	30	+40%	30/60 Summer				1.403
1.008	10	360 Summer	30	+40%	30/60 Summer				1.376
1.009	11	360 Summer	30	+40%	30/60 Summer				1.372
1.010	12	360 Summer	30	+40%	30/240 Summer				1.368
1.011	13	360 Summer	30	+40%	30/240 Summer				1.360
1.012	HW1	1440 Winter	30	+40%	30/120 Summer				1.339

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.174	0.000	0.12		7.0	OK	
1.001	2	0.032	0.000	1.15		117.5	SURCHARGED	
1.002	3	0.000	0.000	0.15		36.0	OK	
1.003	4	0.000	0.000	0.23		45.4	OK	
1.004	5	0.000	0.000	0.57		157.0	OK	
2.000	6	-0.136	0.000	0.33		28.6	OK	
1.005	7	0.020	0.000	0.80		212.6	SURCHARGED	
1.006	8	0.035	0.000	0.92		247.7	SURCHARGED	
1.007	9	0.043	0.000	1.61		274.1	SURCHARGED	
1.008	10	0.036	0.000	0.46		94.9	SURCHARGED	
1.009	11	0.047	0.000	0.37		94.3	SURCHARGED	
1.010	12	0.075	0.000	0.38		96.4	SURCHARGED	
1.011	13	0.116	0.000	0.26		97.3	SURCHARGED	
1.012	HW1	0.239	0.000	0.04		18.3	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	14	60 Summer	30	+40%	100/60 Summer			
3.001	15	60 Summer	30	+40%	100/60 Summer			
3.002	16	60 Summer	30	+40%	100/60 Summer			
4.000	17	60 Summer	30	+40%	100/60 Summer			
3.003	18	60 Summer	30	+40%	100/60 Summer			
3.004	19	60 Summer	30	+40%	100/60 Summer			
3.005	20	60 Summer	30	+40%	100/60 Summer			
3.006	21	60 Summer	30	+40%	100/60 Summer			
5.000	22	60 Summer	30	+40%	30/60 Summer			
3.007	23	1440 Winter	30	+40%	30/60 Summer			
3.008	HW2	1440 Winter	30	+40%	30/180 Summer			
3.009	HW3	1440 Winter	30	+40%	30/120 Summer			
3.010	HW4	1440 Winter	30	+40%	30/120 Summer			
1.013	HW5	1440 Winter	30	+40%	30/60 Summer			
1.014	24 (FC)	1440 Winter	30	+40%	2/60 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	14	2.145	-0.126	0.000	0.64		65.7	OK	
3.001	15	1.790	-0.081	0.000	0.97		97.3	OK	
3.002	16	1.723	-0.091	0.000	0.93		97.0	OK	
4.000	17	1.819	-0.131	0.000	0.37		17.1	OK	
3.003	18	1.613	-0.157	0.000	0.74		139.9	OK	
3.004	19	1.458	-0.100	0.000	0.85		210.2	OK	
3.005	20	1.418	-0.052	0.000	0.82		204.5	OK	
3.006	21	1.361	-0.012	0.000	0.58		206.0	OK	
5.000	22	1.363	0.107	0.000	1.17		41.6	SURCHARGED	
3.007	23	1.340	0.178	0.000	0.13		17.1	SURCHARGED	
3.008	HW2	1.340	0.200	0.000	0.06		17.0	SURCHARGED	
3.009	HW3	1.339	0.274	0.000	0.02		3.5	SURCHARGED	
3.010	HW4	1.339	0.314	0.000	0.01		3.1	SURCHARGED	
1.013	HW5	1.339	0.464	0.000	0.05		12.4	SURCHARGED	
1.014	24 (FC)	1.352	0.933	0.000	0.13		3.3	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 538500 285350 TL 38500 85350
Data Type	Catchment
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	60 Summer	100	+40%					2.178
1.001	2	60 Summer	100	+40%	30/60 Summer				2.157
1.002	3	60 Summer	100	+40%	100/60 Summer				2.019
1.003	4	60 Summer	100	+40%	100/60 Summer				1.989
1.004	5	60 Summer	100	+40%	100/60 Summer				1.958
2.000	6	60 Summer	100	+40%					2.062
1.005	7	60 Summer	100	+40%	30/60 Summer				1.915
1.006	8	60 Summer	100	+40%	30/60 Summer				1.854
1.007	9	60 Summer	100	+40%	30/60 Summer				1.762
1.008	10	360 Winter	100	+40%	30/60 Summer				1.651
1.009	11	360 Winter	100	+40%	30/60 Summer				1.647
1.010	12	360 Winter	100	+40%	30/240 Summer				1.643
1.011	13	360 Winter	100	+40%	30/240 Summer				1.635
1.012	HW1	1440 Summer	100	+40%	30/120 Summer				1.620

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.151	0.000	0.16		9.5	OK	
1.001	2	0.467	0.000	1.48		150.6	SURCHARGED	
1.002	3	0.391	0.000	0.67		161.7	SURCHARGED	
1.003	4	0.407	0.000	1.02		200.3	SURCHARGED	
1.004	5	0.407	0.000	0.71		195.2	SURCHARGED	
2.000	6	-0.119	0.000	0.45		38.9	OK	
1.005	7	0.437	0.000	1.03		271.7	SURCHARGED	
1.006	8	0.433	0.000	1.22		326.2	SURCHARGED	
1.007	9	0.402	0.000	2.15		367.3	SURCHARGED	
1.008	10	0.311	0.000	0.42		87.4	SURCHARGED	
1.009	11	0.322	0.000	0.34		87.6	SURCHARGED	
1.010	12	0.350	0.000	0.36		90.2	SURCHARGED	
1.011	13	0.391	0.000	0.25		93.8	SURCHARGED	
1.012	HW1	0.520	0.000	0.08		38.2	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	14	60 Summer	100	+40%	100/60 Summer			
3.001	15	60 Summer	100	+40%	100/60 Summer			
3.002	16	60 Summer	100	+40%	100/60 Summer			
4.000	17	60 Summer	100	+40%	100/60 Summer			
3.003	18	60 Summer	100	+40%	100/60 Summer			
3.004	19	360 Summer	100	+40%	100/60 Summer			
3.005	20	360 Summer	100	+40%	100/60 Summer			
3.006	21	1440 Summer	100	+40%	100/60 Summer			
5.000	22	1440 Summer	100	+40%	30/60 Summer			
3.007	23	1440 Summer	100	+40%	30/60 Summer			
3.008	HW2	1440 Winter	100	+40%	30/180 Summer			
3.009	HW3	1440 Winter	100	+40%	30/120 Summer			
3.010	HW4	1440 Winter	100	+40%	30/120 Summer			
1.013	HW5	1440 Winter	100	+40%	30/60 Summer			
1.014	24 (FC)	2160 Winter	100	+40%	2/60 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	14	2.408	0.137	0.000	0.83		86.1	SURCHARGED	
3.001	15	2.141	0.270	0.000	1.21		121.9	SURCHARGED	
3.002	16	2.044	0.230	0.000	1.17		122.3	SURCHARGED	
4.000	17	2.003	0.053	0.000	0.48		22.2	SURCHARGED	
3.003	18	1.947	0.177	0.000	0.93		175.0	SURCHARGED	
3.004	19	1.800	0.242	0.000	0.39		96.9	SURCHARGED	
3.005	20	1.691	0.221	0.000	0.39		96.5	SURCHARGED	
3.006	21	1.621	0.248	0.000	0.08		27.2	SURCHARGED	
5.000	22	1.621	0.365	0.000	0.16		5.7	SURCHARGED	
3.007	23	1.620	0.458	0.000	0.28		35.2	SURCHARGED	
3.008	HW2	1.620	0.480	0.000	0.08		24.2	FLOOD RISK	
3.009	HW3	1.620	0.555	0.000	0.02		4.3	FLOOD RISK	
3.010	HW4	1.620	0.595	0.000	0.01		4.2	FLOOD RISK	
1.013	HW5	1.620	0.745	0.000	0.02		4.8	FLOOD RISK	
1.014	24 (FC)	1.628	1.209	0.000	0.14		3.5	FLOOD RISK	

FSR Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.450	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	550	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.578	4-8	0.618	8-12	0.001

Total Area Contributing (ha) = 1.197

Total Pipe Volume (m³) = 97.781

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	45.624	0.639	71.4	0.014	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	15.266	0.062	246.2	0.216	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	18.435	0.046	400.8	0.022	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.003	12.550	0.031	404.8	0.066	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.004	29.681	0.073	406.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	71.58	5.49	2.104	0.014	0.0	0.0	0.0	1.55	61.6	2.7
1.001	70.29	5.71	1.315	0.230	0.0	0.0	0.0	1.15	127.0	43.8
1.002	68.87	5.97	1.028	0.252	0.0	0.0	0.0	1.21	342.2	47.0
1.003	67.93	6.14	0.982	0.318	0.0	0.0	0.0	1.20	340.4	58.5
1.004	65.82	6.55	0.951	0.318	0.0	0.0	0.0	1.20	339.7	58.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	21.312	0.703	30.3	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	22.924	0.057	402.2	0.068	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.006	24.557	0.061	402.6	0.090	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.007	8.220	0.020	411.0	0.067	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	6.122	0.015	408.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.009	7.803	0.032	243.8	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.010	19.961	0.049	407.4	0.018	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.011	9.222	0.144	64.0	0.024	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.012	22.936	0.225	101.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.000	39.854	0.400	99.6	0.131	5.00	0.0	0.600	o	300	Pipe/Conduit	
3.001	13.945	0.057	244.6	0.062	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.002	7.599	0.044	172.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	18.161	0.180	100.9	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.003	51.456	0.212	242.7	0.055	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.004	8.098	0.088	92.0	0.151	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.005	7.845	0.097	80.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.006	14.058	0.211	66.6	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	73.69	5.15	1.956	0.057	0.0	0.0	0.0	2.38	94.8	11.4
1.005	64.30	6.87	0.878	0.443	0.0	0.0	0.0	1.21	341.6	77.1
1.006	62.76	7.21	0.821	0.533	0.0	0.0	0.0	1.21	341.4	90.6
1.007	62.25	7.32	0.760	0.600	0.0	0.0	0.0	1.19	337.9	101.2
1.008	61.89	7.41	0.740	0.600	0.0	0.0	0.0	1.20	339.0	101.2
1.009	61.53	7.49	0.725	0.600	0.0	0.0	0.0	1.56	439.7	101.2
1.010	60.38	7.77	0.693	0.618	0.0	0.0	0.0	1.20	339.4	101.2
1.011	60.17	7.82	0.644	0.642	0.0	0.0	0.0	3.05	861.4	104.6
1.012	59.55	7.98	0.500	0.642	0.0	0.0	0.0	2.41	682.0	104.6
3.000	72.00	5.42	1.971	0.131	0.0	0.0	0.0	1.58	111.3	25.5
3.001	70.80	5.62	1.496	0.193	0.0	0.0	0.0	1.15	127.4	37.0
3.002	70.27	5.72	1.439	0.193	0.0	0.0	0.0	1.38	151.9	37.0
4.000	73.16	5.23	1.725	0.034	0.0	0.0	0.0	1.30	51.8	6.7
3.003	66.71	6.37	1.320	0.282	0.0	0.0	0.0	1.30	206.8	50.9
3.004	66.42	6.43	1.033	0.433	0.0	0.0	0.0	2.34	505.6	77.9
3.005	66.15	6.48	0.945	0.433	0.0	0.0	0.0	2.49	539.5	77.9
3.006	65.73	6.57	0.848	0.433	0.0	0.0	0.0	2.75	594.7	77.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	15.735	0.094	167.4	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.007	9.296	0.022	422.5	0.037	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.008	9.734	0.150	64.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.009	15.150	0.040	378.8	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.010	38.563	0.150	257.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.013	3.210	0.006	535.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.014	23.869	0.545	43.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	72.99	5.26	1.031	0.085	0.0	0.0	0.0	1.01	40.1	16.8
3.007	65.03	6.71	0.637	0.555	0.0	0.0	0.0	1.08	234.5	97.8
3.008	64.76	6.77	0.615	0.555	0.0	0.0	0.0	2.78	602.6	97.8
3.009	63.81	6.97	0.465	0.555	0.0	0.0	0.0	1.25	352.1	97.8
3.010	61.92	7.40	0.425	0.555	0.0	0.0	0.0	1.51	428.1	97.8
1.013	59.35	8.03	0.275	1.197	0.0	0.0	0.0	1.05	295.7	192.4
1.014	58.37	8.29	0.269	1.197	0.0	0.0	0.0	1.52	26.9«	192.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	3.529	1.425	Open Manhole	1350	1.000	2.104	225				
2	2.897	1.582	Open Manhole	1350	1.001	1.315	375	1.000	1.465	225	
3	3.022	1.994	Open Manhole	1500	1.002	1.028	600	1.001	1.253	375	
4	3.181	2.199	Open Manhole	1500	1.003	0.982	600	1.002	0.982	600	
5	3.162	2.211	Open Manhole	1500	1.004	0.951	600	1.003	0.951	600	
6	3.381	1.425	Open Manhole	1350	2.000	1.956	225				
7	3.164	2.286	Open Manhole	1500	1.005	0.878	600	1.004	0.878	600	
								2.000	1.253	225	
8	3.059	2.238	Open Manhole	1500	1.006	0.821	600	1.005	0.821	600	
9	2.750	1.990	Open Manhole	1500	1.007	0.760	600	1.006	0.760	600	
10	2.645	1.905	Open Manhole	1500	1.008	0.740	600	1.007	0.740	600	
11	2.571	1.846	Open Manhole	1500	1.009	0.725	600	1.008	0.725	600	
12	2.493	1.800	Open Manhole	1500	1.010	0.693	600	1.009	0.693	600	
13	2.244	1.600	Open Manhole	1800	1.011	0.644	600	1.010	0.644	600	
HW1	1.775	1.275	Open Manhole	1500	1.012	0.500	600	1.011	0.500	600	
14	3.471	1.500	Open Manhole	1350	3.000	1.971	300				
15	3.071	1.575	Open Manhole	1350	3.001	1.496	375	3.000	1.571	300	
16	3.023	1.584	Open Manhole	1350	3.002	1.439	375	3.001	1.439	375	
17	3.150	1.425	Open Manhole	1350	4.000	1.725	225				
18	2.970	1.650	Open Manhole	1500	3.003	1.320	450	3.002	1.395	375	
								4.000	1.545	225	
19	2.558	1.525	Open Manhole	1500	3.004	1.033	525	3.003	1.108	450	
20	2.470	1.525	Open Manhole	1500	3.005	0.945	525	3.004	0.945	525	
21	2.373	1.525	Open Manhole	1500	3.006	0.848	525	3.005	0.848	525	
22	2.256	1.225	Open Manhole	1200	5.000	1.031	225				
23	2.204	1.567	Open Manhole	1500	3.007	0.637	525	3.006	0.637	525	
								5.000	0.937	225	
HW2	1.775	1.160	Open Manhole	1800	3.008	0.615	525	3.007	0.615	525	
HW3	1.775	1.310	Open Manhole	2100	3.009	0.465	600	3.008	0.465	525	
HW4	1.775	1.350	Open Manhole	2100	3.010	0.425	600	3.009	0.425	600	
HW5	1.775	1.500	Open Manhole	1500	1.013	0.275	600	1.012	0.275	600	
								3.010	0.275	600	
24 (FC)	1.875	1.606	Open Manhole	2100	1.014	0.269	150	1.013	0.269	600	
HW6	0.500	0.776	Open Manhole	0		OUTFALL		1.014	-0.276	150	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	538710.181	285209.371	538710.181	285209.371	Required	
2	538665.095	285216.361	538665.095	285216.361	Required	
3	538651.374	285223.052	538651.374	285223.052	Required	
4	538642.057	285238.960	538642.057	285238.960	Required	
5	538642.376	285251.506	538642.376	285251.506	Required	
6	538656.683	285300.451	538656.683	285300.451	Required	
7	538650.673	285280.004	538650.673	285280.004	Required	
8	538628.522	285285.908	538628.522	285285.908	Required	
9	538603.973	285285.300	538603.973	285285.300	Required	
10	538596.276	285288.187	538596.276	285288.187	Required	
11	538592.436	285292.954	538592.436	285292.954	Required	
12	538591.824	285300.733	538591.824	285300.733	Required	
13	538596.072	285320.237	538596.072	285320.237	Required	
HW1	538587.068	285322.231	538587.068	285322.231	Required	
14	538665.839	285329.261	538665.839	285329.261	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
15	538674.390	285368.187	538674.390	285368.187	Required	
16	538675.208	285382.108	538675.208	285382.108	Required	
17	538688.687	285388.794	538688.687	285388.794	Required	
18	538670.539	285388.103	538670.539	285388.103	Required	
19	538619.107	285386.518	538619.107	285386.518	Required	
20	538612.261	285382.193	538612.261	285382.193	Required	
21	538608.011	285375.599	538608.011	285375.599	Required	
22	538601.588	285346.507	538601.588	285346.507	Required	
23	538605.081	285361.849	538605.081	285361.849	Required	
HW2	538595.998	285363.826	538595.998	285363.826	Required	
HW3	538587.432	285359.203	538587.432	285359.203	Required	
HW4	538583.964	285344.455	538583.964	285344.455	Required	
HW5	538568.128	285309.294	538568.128	285309.294	Required	
24 (FC)	538565.019	285310.094	538565.019	285310.094	Required	
HW6	538541.888	285315.981			No Entry	

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	o	225	1	3.529	2.104	1.200	Open Manhole	1350
1.001	o	375	2	2.897	1.315	1.207	Open Manhole	1350
1.002	o	600	3	3.022	1.028	1.394	Open Manhole	1500
1.003	o	600	4	3.181	0.982	1.599	Open Manhole	1500
1.004	o	600	5	3.162	0.951	1.611	Open Manhole	1500
2.000	o	225	6	3.381	1.956	1.200	Open Manhole	1350
1.005	o	600	7	3.164	0.878	1.686	Open Manhole	1500
1.006	o	600	8	3.059	0.821	1.638	Open Manhole	1500
1.007	o	600	9	2.750	0.760	1.390	Open Manhole	1500
1.008	o	600	10	2.645	0.740	1.305	Open Manhole	1500
1.009	o	600	11	2.571	0.725	1.246	Open Manhole	1500
1.010	o	600	12	2.493	0.693	1.200	Open Manhole	1500
1.011	o	600	13	2.244	0.644	1.000	Open Manhole	1800
1.012	o	600	HW1	1.775	0.500	0.675	Open Manhole	1500
3.000	o	300	14	3.471	1.971	1.200	Open Manhole	1350
3.001	o	375	15	3.071	1.496	1.200	Open Manhole	1350
3.002	o	375	16	3.023	1.439	1.209	Open Manhole	1350

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	45.624	71.4	2	2.897	1.465	1.207	Open Manhole	1350
1.001	15.266	246.2	3	3.022	1.253	1.394	Open Manhole	1500
1.002	18.435	400.8	4	3.181	0.982	1.599	Open Manhole	1500
1.003	12.550	404.8	5	3.162	0.951	1.611	Open Manhole	1500
1.004	29.681	406.6	7	3.164	0.878	1.686	Open Manhole	1500
2.000	21.312	30.3	7	3.164	1.253	1.686	Open Manhole	1500
1.005	22.924	402.2	8	3.059	0.821	1.638	Open Manhole	1500
1.006	24.557	402.6	9	2.750	0.760	1.390	Open Manhole	1500
1.007	8.220	411.0	10	2.645	0.740	1.305	Open Manhole	1500
1.008	6.122	408.1	11	2.571	0.725	1.246	Open Manhole	1500
1.009	7.803	243.8	12	2.493	0.693	1.200	Open Manhole	1500
1.010	19.961	407.4	13	2.244	0.644	1.000	Open Manhole	1800
1.011	9.222	64.0	HW1	1.775	0.500	0.675	Open Manhole	1500
1.012	22.936	101.9	HW5	1.775	0.275	0.900	Open Manhole	1500
3.000	39.854	99.6	15	3.071	1.571	1.200	Open Manhole	1350
3.001	13.945	244.6	16	3.023	1.439	1.209	Open Manhole	1350
3.002	7.599	172.7	18	2.970	1.395	1.200	Open Manhole	1500

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)
4.000	o	225	17	3.150	1.725	1.200	Open Manhole	1350
3.003	o	450	18	2.970	1.320	1.200	Open Manhole	1500
3.004	o	525	19	2.558	1.033	1.000	Open Manhole	1500
3.005	o	525	20	2.470	0.945	1.000	Open Manhole	1500
3.006	o	525	21	2.373	0.848	1.000	Open Manhole	1500
5.000	o	225	22	2.256	1.031	1.000	Open Manhole	1200
3.007	o	525	23	2.204	0.637	1.042	Open Manhole	1500
3.008	o	525	HW2	1.775	0.615	0.635	Open Manhole	1800
3.009	o	600	HW3	1.775	0.465	0.710	Open Manhole	2100
3.010	o	600	HW4	1.775	0.425	0.750	Open Manhole	2100
1.013	o	600	HW5	1.775	0.275	0.900	Open Manhole	1500
1.014	o	150	24 (FC)	1.875	0.269	1.456	Open Manhole	2100

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)
4.000	18.161	100.9	18	2.970	1.545	1.200	Open Manhole	1500
3.003	51.456	242.7	19	2.558	1.108	1.000	Open Manhole	1500
3.004	8.098	92.0	20	2.470	0.945	1.000	Open Manhole	1500
3.005	7.845	80.9	21	2.373	0.848	1.000	Open Manhole	1500
3.006	14.058	66.6	23	2.204	0.637	1.042	Open Manhole	1500
5.000	15.735	167.4	23	2.204	0.937	1.042	Open Manhole	1500
3.007	9.296	422.5	HW2	1.775	0.615	0.635	Open Manhole	1800
3.008	9.734	64.9	HW3	1.775	0.465	0.785	Open Manhole	2100
3.009	15.150	378.8	HW4	1.775	0.425	0.750	Open Manhole	2100
3.010	38.563	257.1	HW5	1.775	0.275	0.900	Open Manhole	1500
1.013	3.210	535.0	24 (FC)	1.875	0.269	1.006	Open Manhole	2100
1.014	23.869	43.8	HW6	0.500	-0.276	0.626	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.014	0.014	0.014
1.001	-	-	100	0.216	0.216	0.216
1.002	-	-	100	0.022	0.022	0.022
1.003	-	-	100	0.066	0.066	0.066
1.004	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.057	0.057	0.057
1.005	-	-	100	0.068	0.068	0.068
1.006	-	-	100	0.090	0.090	0.090
1.007	-	-	100	0.067	0.067	0.067
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.018	0.018	0.018
1.011	-	-	100	0.024	0.024	0.024
1.012	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.131	0.131	0.131
3.001	-	-	100	0.062	0.062	0.062
3.002	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.034	0.034	0.034
3.003	-	-	100	0.055	0.055	0.055
3.004	-	-	100	0.151	0.151	0.151
3.005	-	-	100	0.000	0.000	0.000
3.006	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.085	0.085	0.085
3.007	-	-	100	0.037	0.037	0.037
3.008	-	-	100	0.000	0.000	0.000
3.009	-	-	100	0.000	0.000	0.000
3.010	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.197	1.197	1.197

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.014	HW6	0.500	-0.276	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	1.000	5	1.000	9	1.000	13	1.000	17	1.000	21	1.000
2	1.000	6	1.000	10	1.000	14	1.000	18	1.000	22	1.000
3	1.000	7	1.000	11	1.000	15	1.000	19	1.000	23	1.000
4	1.000	8	1.000	12	1.000	16	1.000	20	1.000	24	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
25	1.000	75	1.000	125	1.000	175	1.000	225	1.000	275	1.000
26	1.000	76	1.000	126	1.000	176	1.000	226	1.000	276	1.000
27	1.000	77	1.000	127	1.000	177	1.000	227	1.000	277	1.000
28	1.000	78	1.000	128	1.000	178	1.000	228	1.000	278	1.000
29	1.000	79	1.000	129	1.000	179	1.000	229	1.000	279	1.000
30	1.000	80	1.000	130	1.000	180	1.000	230	1.000	280	1.000
31	1.000	81	1.000	131	1.000	181	1.000	231	1.000	281	1.000
32	1.000	82	1.000	132	1.000	182	1.000	232	1.000	282	1.000
33	1.000	83	1.000	133	1.000	183	1.000	233	1.000	283	1.000
34	1.000	84	1.000	134	1.000	184	1.000	234	1.000	284	1.000
35	1.000	85	1.000	135	1.000	185	1.000	235	1.000	285	1.000
36	1.000	86	1.000	136	1.000	186	1.000	236	1.000	286	1.000
37	1.000	87	1.000	137	1.000	187	1.000	237	1.000	287	1.000
38	1.000	88	1.000	138	1.000	188	1.000	238	1.000	288	1.000
39	1.000	89	1.000	139	1.000	189	1.000	239	1.000	289	1.000
40	1.000	90	1.000	140	1.000	190	1.000	240	1.000	290	1.000
41	1.000	91	1.000	141	1.000	191	1.000	241	1.000	291	1.000
42	1.000	92	1.000	142	1.000	192	1.000	242	1.000	292	1.000
43	1.000	93	1.000	143	1.000	193	1.000	243	1.000	293	1.000
44	1.000	94	1.000	144	1.000	194	1.000	244	1.000	294	1.000
45	1.000	95	1.000	145	1.000	195	1.000	245	1.000	295	1.000
46	1.000	96	1.000	146	1.000	196	1.000	246	1.000	296	1.000
47	1.000	97	1.000	147	1.000	197	1.000	247	1.000	297	1.000
48	1.000	98	1.000	148	1.000	198	1.000	248	1.000	298	1.000
49	1.000	99	1.000	149	1.000	199	1.000	249	1.000	299	1.000
50	1.000	100	1.000	150	1.000	200	1.000	250	1.000	300	1.000
51	1.000	101	1.000	151	1.000	201	1.000	251	1.000	301	1.000
52	1.000	102	1.000	152	1.000	202	1.000	252	1.000	302	1.000
53	1.000	103	1.000	153	1.000	203	1.000	253	1.000	303	1.000
54	1.000	104	1.000	154	1.000	204	1.000	254	1.000	304	1.000
55	1.000	105	1.000	155	1.000	205	1.000	255	1.000	305	1.000
56	1.000	106	1.000	156	1.000	206	1.000	256	1.000	306	1.000
57	1.000	107	1.000	157	1.000	207	1.000	257	1.000	307	1.000
58	1.000	108	1.000	158	1.000	208	1.000	258	1.000	308	1.000
59	1.000	109	1.000	159	1.000	209	1.000	259	1.000	309	1.000
60	1.000	110	1.000	160	1.000	210	1.000	260	1.000	310	1.000
61	1.000	111	1.000	161	1.000	211	1.000	261	1.000	311	1.000
62	1.000	112	1.000	162	1.000	212	1.000	262	1.000	312	1.000
63	1.000	113	1.000	163	1.000	213	1.000	263	1.000	313	1.000
64	1.000	114	1.000	164	1.000	214	1.000	264	1.000	314	1.000
65	1.000	115	1.000	165	1.000	215	1.000	265	1.000	315	1.000
66	1.000	116	1.000	166	1.000	216	1.000	266	1.000	316	1.000
67	1.000	117	1.000	167	1.000	217	1.000	267	1.000	317	1.000
68	1.000	118	1.000	168	1.000	218	1.000	268	1.000	318	1.000
69	1.000	119	1.000	169	1.000	219	1.000	269	1.000	319	1.000
70	1.000	120	1.000	170	1.000	220	1.000	270	1.000	320	1.000
71	1.000	121	1.000	171	1.000	221	1.000	271	1.000	321	1.000
72	1.000	122	1.000	172	1.000	222	1.000	272	1.000	322	1.000
73	1.000	123	1.000	173	1.000	223	1.000	273	1.000	323	1.000
74	1.000	124	1.000	174	1.000	224	1.000	274	1.000	324	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
325	1.000	375	1.000	425	1.000	475	1.000	525	1.000	575	1.000
326	1.000	376	1.000	426	1.000	476	1.000	526	1.000	576	1.000
327	1.000	377	1.000	427	1.000	477	1.000	527	1.000	577	1.000
328	1.000	378	1.000	428	1.000	478	1.000	528	1.000	578	1.000
329	1.000	379	1.000	429	1.000	479	1.000	529	1.000	579	1.000
330	1.000	380	1.000	430	1.000	480	1.000	530	1.000	580	1.000
331	1.000	381	1.000	431	1.000	481	1.000	531	1.000	581	1.000
332	1.000	382	1.000	432	1.000	482	1.000	532	1.000	582	1.000
333	1.000	383	1.000	433	1.000	483	1.000	533	1.000	583	1.000
334	1.000	384	1.000	434	1.000	484	1.000	534	1.000	584	1.000
335	1.000	385	1.000	435	1.000	485	1.000	535	1.000	585	1.000
336	1.000	386	1.000	436	1.000	486	1.000	536	1.000	586	1.000
337	1.000	387	1.000	437	1.000	487	1.000	537	1.000	587	1.000
338	1.000	388	1.000	438	1.000	488	1.000	538	1.000	588	1.000
339	1.000	389	1.000	439	1.000	489	1.000	539	1.000	589	1.000
340	1.000	390	1.000	440	1.000	490	1.000	540	1.000	590	1.000
341	1.000	391	1.000	441	1.000	491	1.000	541	1.000	591	1.000
342	1.000	392	1.000	442	1.000	492	1.000	542	1.000	592	1.000
343	1.000	393	1.000	443	1.000	493	1.000	543	1.000	593	1.000
344	1.000	394	1.000	444	1.000	494	1.000	544	1.000	594	1.000
345	1.000	395	1.000	445	1.000	495	1.000	545	1.000	595	1.000
346	1.000	396	1.000	446	1.000	496	1.000	546	1.000	596	1.000
347	1.000	397	1.000	447	1.000	497	1.000	547	1.000	597	1.000
348	1.000	398	1.000	448	1.000	498	1.000	548	1.000	598	1.000
349	1.000	399	1.000	449	1.000	499	1.000	549	1.000	599	1.000
350	1.000	400	1.000	450	1.000	500	1.000	550	1.000	600	1.000
351	1.000	401	1.000	451	1.000	501	1.000	551	1.000	601	1.000
352	1.000	402	1.000	452	1.000	502	1.000	552	1.000	602	1.000
353	1.000	403	1.000	453	1.000	503	1.000	553	1.000	603	1.000
354	1.000	404	1.000	454	1.000	504	1.000	554	1.000	604	1.000
355	1.000	405	1.000	455	1.000	505	1.000	555	1.000	605	1.000
356	1.000	406	1.000	456	1.000	506	1.000	556	1.000	606	1.000
357	1.000	407	1.000	457	1.000	507	1.000	557	1.000	607	1.000
358	1.000	408	1.000	458	1.000	508	1.000	558	1.000	608	1.000
359	1.000	409	1.000	459	1.000	509	1.000	559	1.000	609	1.000
360	1.000	410	1.000	460	1.000	510	1.000	560	1.000	610	1.000
361	1.000	411	1.000	461	1.000	511	1.000	561	1.000	611	1.000
362	1.000	412	1.000	462	1.000	512	1.000	562	1.000	612	1.000
363	1.000	413	1.000	463	1.000	513	1.000	563	1.000	613	1.000
364	1.000	414	1.000	464	1.000	514	1.000	564	1.000	614	1.000
365	1.000	415	1.000	465	1.000	515	1.000	565	1.000	615	1.000
366	1.000	416	1.000	466	1.000	516	1.000	566	1.000	616	1.000
367	1.000	417	1.000	467	1.000	517	1.000	567	1.000	617	1.000
368	1.000	418	1.000	468	1.000	518	1.000	568	1.000	618	1.000
369	1.000	419	1.000	469	1.000	519	1.000	569	1.000	619	1.000
370	1.000	420	1.000	470	1.000	520	1.000	570	1.000	620	1.000
371	1.000	421	1.000	471	1.000	521	1.000	571	1.000	621	1.000
372	1.000	422	1.000	472	1.000	522	1.000	572	1.000	622	1.000
373	1.000	423	1.000	473	1.000	523	1.000	573	1.000	623	1.000
374	1.000	424	1.000	474	1.000	524	1.000	574	1.000	624	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
625	1.000	675	1.000	725	1.000	775	1.000	825	1.000	875	1.000
626	1.000	676	1.000	726	1.000	776	1.000	826	1.000	876	1.000
627	1.000	677	1.000	727	1.000	777	1.000	827	1.000	877	1.000
628	1.000	678	1.000	728	1.000	778	1.000	828	1.000	878	1.000
629	1.000	679	1.000	729	1.000	779	1.000	829	1.000	879	1.000
630	1.000	680	1.000	730	1.000	780	1.000	830	1.000	880	1.000
631	1.000	681	1.000	731	1.000	781	1.000	831	1.000	881	1.000
632	1.000	682	1.000	732	1.000	782	1.000	832	1.000	882	1.000
633	1.000	683	1.000	733	1.000	783	1.000	833	1.000	883	1.000
634	1.000	684	1.000	734	1.000	784	1.000	834	1.000	884	1.000
635	1.000	685	1.000	735	1.000	785	1.000	835	1.000	885	1.000
636	1.000	686	1.000	736	1.000	786	1.000	836	1.000	886	1.000
637	1.000	687	1.000	737	1.000	787	1.000	837	1.000	887	1.000
638	1.000	688	1.000	738	1.000	788	1.000	838	1.000	888	1.000
639	1.000	689	1.000	739	1.000	789	1.000	839	1.000	889	1.000
640	1.000	690	1.000	740	1.000	790	1.000	840	1.000	890	1.000
641	1.000	691	1.000	741	1.000	791	1.000	841	1.000	891	1.000
642	1.000	692	1.000	742	1.000	792	1.000	842	1.000	892	1.000
643	1.000	693	1.000	743	1.000	793	1.000	843	1.000	893	1.000
644	1.000	694	1.000	744	1.000	794	1.000	844	1.000	894	1.000
645	1.000	695	1.000	745	1.000	795	1.000	845	1.000	895	1.000
646	1.000	696	1.000	746	1.000	796	1.000	846	1.000	896	1.000
647	1.000	697	1.000	747	1.000	797	1.000	847	1.000	897	1.000
648	1.000	698	1.000	748	1.000	798	1.000	848	1.000	898	1.000
649	1.000	699	1.000	749	1.000	799	1.000	849	1.000	899	1.000
650	1.000	700	1.000	750	1.000	800	1.000	850	1.000	900	1.000
651	1.000	701	1.000	751	1.000	801	1.000	851	1.000	901	1.000
652	1.000	702	1.000	752	1.000	802	1.000	852	1.000	902	1.000
653	1.000	703	1.000	753	1.000	803	1.000	853	1.000	903	1.000
654	1.000	704	1.000	754	1.000	804	1.000	854	1.000	904	1.000
655	1.000	705	1.000	755	1.000	805	1.000	855	1.000	905	1.000
656	1.000	706	1.000	756	1.000	806	1.000	856	1.000	906	1.000
657	1.000	707	1.000	757	1.000	807	1.000	857	1.000	907	1.000
658	1.000	708	1.000	758	1.000	808	1.000	858	1.000	908	1.000
659	1.000	709	1.000	759	1.000	809	1.000	859	1.000	909	1.000
660	1.000	710	1.000	760	1.000	810	1.000	860	1.000	910	1.000
661	1.000	711	1.000	761	1.000	811	1.000	861	1.000	911	1.000
662	1.000	712	1.000	762	1.000	812	1.000	862	1.000	912	1.000
663	1.000	713	1.000	763	1.000	813	1.000	863	1.000	913	1.000
664	1.000	714	1.000	764	1.000	814	1.000	864	1.000	914	1.000
665	1.000	715	1.000	765	1.000	815	1.000	865	1.000	915	1.000
666	1.000	716	1.000	766	1.000	816	1.000	866	1.000	916	1.000
667	1.000	717	1.000	767	1.000	817	1.000	867	1.000	917	1.000
668	1.000	718	1.000	768	1.000	818	1.000	868	1.000	918	1.000
669	1.000	719	1.000	769	1.000	819	1.000	869	1.000	919	1.000
670	1.000	720	1.000	770	1.000	820	1.000	870	1.000	920	1.000
671	1.000	721	1.000	771	1.000	821	1.000	871	1.000	921	1.000
672	1.000	722	1.000	772	1.000	822	1.000	872	1.000	922	1.000
673	1.000	723	1.000	773	1.000	823	1.000	873	1.000	923	1.000
674	1.000	724	1.000	774	1.000	824	1.000	874	1.000	924	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
925	1.000	975	1.000	1025	1.000	1075	1.000	1125	1.000	1175	1.000
926	1.000	976	1.000	1026	1.000	1076	1.000	1126	1.000	1176	1.000
927	1.000	977	1.000	1027	1.000	1077	1.000	1127	1.000	1177	1.000
928	1.000	978	1.000	1028	1.000	1078	1.000	1128	1.000	1178	1.000
929	1.000	979	1.000	1029	1.000	1079	1.000	1129	1.000	1179	1.000
930	1.000	980	1.000	1030	1.000	1080	1.000	1130	1.000	1180	1.000
931	1.000	981	1.000	1031	1.000	1081	1.000	1131	1.000	1181	1.000
932	1.000	982	1.000	1032	1.000	1082	1.000	1132	1.000	1182	1.000
933	1.000	983	1.000	1033	1.000	1083	1.000	1133	1.000	1183	1.000
934	1.000	984	1.000	1034	1.000	1084	1.000	1134	1.000	1184	1.000
935	1.000	985	1.000	1035	1.000	1085	1.000	1135	1.000	1185	1.000
936	1.000	986	1.000	1036	1.000	1086	1.000	1136	1.000	1186	1.000
937	1.000	987	1.000	1037	1.000	1087	1.000	1137	1.000	1187	1.000
938	1.000	988	1.000	1038	1.000	1088	1.000	1138	1.000	1188	1.000
939	1.000	989	1.000	1039	1.000	1089	1.000	1139	1.000	1189	1.000
940	1.000	990	1.000	1040	1.000	1090	1.000	1140	1.000	1190	1.000
941	1.000	991	1.000	1041	1.000	1091	1.000	1141	1.000	1191	1.000
942	1.000	992	1.000	1042	1.000	1092	1.000	1142	1.000	1192	1.000
943	1.000	993	1.000	1043	1.000	1093	1.000	1143	1.000	1193	1.000
944	1.000	994	1.000	1044	1.000	1094	1.000	1144	1.000	1194	1.000
945	1.000	995	1.000	1045	1.000	1095	1.000	1145	1.000	1195	1.000
946	1.000	996	1.000	1046	1.000	1096	1.000	1146	1.000	1196	1.000
947	1.000	997	1.000	1047	1.000	1097	1.000	1147	1.000	1197	1.000
948	1.000	998	1.000	1048	1.000	1098	1.000	1148	1.000	1198	1.000
949	1.000	999	1.000	1049	1.000	1099	1.000	1149	1.000	1199	1.000
950	1.000	1000	1.000	1050	1.000	1100	1.000	1150	1.000	1200	1.000
951	1.000	1001	1.000	1051	1.000	1101	1.000	1151	1.000	1201	1.000
952	1.000	1002	1.000	1052	1.000	1102	1.000	1152	1.000	1202	1.000
953	1.000	1003	1.000	1053	1.000	1103	1.000	1153	1.000	1203	1.000
954	1.000	1004	1.000	1054	1.000	1104	1.000	1154	1.000	1204	1.000
955	1.000	1005	1.000	1055	1.000	1105	1.000	1155	1.000	1205	1.000
956	1.000	1006	1.000	1056	1.000	1106	1.000	1156	1.000	1206	1.000
957	1.000	1007	1.000	1057	1.000	1107	1.000	1157	1.000	1207	1.000
958	1.000	1008	1.000	1058	1.000	1108	1.000	1158	1.000	1208	1.000
959	1.000	1009	1.000	1059	1.000	1109	1.000	1159	1.000	1209	1.000
960	1.000	1010	1.000	1060	1.000	1110	1.000	1160	1.000	1210	1.000
961	1.000	1011	1.000	1061	1.000	1111	1.000	1161	1.000	1211	1.000
962	1.000	1012	1.000	1062	1.000	1112	1.000	1162	1.000	1212	1.000
963	1.000	1013	1.000	1063	1.000	1113	1.000	1163	1.000	1213	1.000
964	1.000	1014	1.000	1064	1.000	1114	1.000	1164	1.000	1214	1.000
965	1.000	1015	1.000	1065	1.000	1115	1.000	1165	1.000	1215	1.000
966	1.000	1016	1.000	1066	1.000	1116	1.000	1166	1.000	1216	1.000
967	1.000	1017	1.000	1067	1.000	1117	1.000	1167	1.000	1217	1.000
968	1.000	1018	1.000	1068	1.000	1118	1.000	1168	1.000	1218	1.000
969	1.000	1019	1.000	1069	1.000	1119	1.000	1169	1.000	1219	1.000
970	1.000	1020	1.000	1070	1.000	1120	1.000	1170	1.000	1220	1.000
971	1.000	1021	1.000	1071	1.000	1121	1.000	1171	1.000	1221	1.000
972	1.000	1022	1.000	1072	1.000	1122	1.000	1172	1.000	1222	1.000
973	1.000	1023	1.000	1073	1.000	1123	1.000	1173	1.000	1223	1.000
974	1.000	1024	1.000	1074	1.000	1124	1.000	1174	1.000	1224	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1225	1.000	1261	1.000	1297	1.000	1333	1.000	1369	1.000	1405	1.000
1226	1.000	1262	1.000	1298	1.000	1334	1.000	1370	1.000	1406	1.000
1227	1.000	1263	1.000	1299	1.000	1335	1.000	1371	1.000	1407	1.000
1228	1.000	1264	1.000	1300	1.000	1336	1.000	1372	1.000	1408	1.000
1229	1.000	1265	1.000	1301	1.000	1337	1.000	1373	1.000	1409	1.000
1230	1.000	1266	1.000	1302	1.000	1338	1.000	1374	1.000	1410	1.000
1231	1.000	1267	1.000	1303	1.000	1339	1.000	1375	1.000	1411	1.000
1232	1.000	1268	1.000	1304	1.000	1340	1.000	1376	1.000	1412	1.000
1233	1.000	1269	1.000	1305	1.000	1341	1.000	1377	1.000	1413	1.000
1234	1.000	1270	1.000	1306	1.000	1342	1.000	1378	1.000	1414	1.000
1235	1.000	1271	1.000	1307	1.000	1343	1.000	1379	1.000	1415	1.000
1236	1.000	1272	1.000	1308	1.000	1344	1.000	1380	1.000	1416	1.000
1237	1.000	1273	1.000	1309	1.000	1345	1.000	1381	1.000	1417	1.000
1238	1.000	1274	1.000	1310	1.000	1346	1.000	1382	1.000	1418	1.000
1239	1.000	1275	1.000	1311	1.000	1347	1.000	1383	1.000	1419	1.000
1240	1.000	1276	1.000	1312	1.000	1348	1.000	1384	1.000	1420	1.000
1241	1.000	1277	1.000	1313	1.000	1349	1.000	1385	1.000	1421	1.000
1242	1.000	1278	1.000	1314	1.000	1350	1.000	1386	1.000	1422	1.000
1243	1.000	1279	1.000	1315	1.000	1351	1.000	1387	1.000	1423	1.000
1244	1.000	1280	1.000	1316	1.000	1352	1.000	1388	1.000	1424	1.000
1245	1.000	1281	1.000	1317	1.000	1353	1.000	1389	1.000	1425	1.000
1246	1.000	1282	1.000	1318	1.000	1354	1.000	1390	1.000	1426	1.000
1247	1.000	1283	1.000	1319	1.000	1355	1.000	1391	1.000	1427	1.000
1248	1.000	1284	1.000	1320	1.000	1356	1.000	1392	1.000	1428	1.000
1249	1.000	1285	1.000	1321	1.000	1357	1.000	1393	1.000	1429	1.000
1250	1.000	1286	1.000	1322	1.000	1358	1.000	1394	1.000	1430	1.000
1251	1.000	1287	1.000	1323	1.000	1359	1.000	1395	1.000	1431	1.000
1252	1.000	1288	1.000	1324	1.000	1360	1.000	1396	1.000	1432	1.000
1253	1.000	1289	1.000	1325	1.000	1361	1.000	1397	1.000	1433	1.000
1254	1.000	1290	1.000	1326	1.000	1362	1.000	1398	1.000	1434	1.000
1255	1.000	1291	1.000	1327	1.000	1363	1.000	1399	1.000	1435	1.000
1256	1.000	1292	1.000	1328	1.000	1364	1.000	1400	1.000	1436	1.000
1257	1.000	1293	1.000	1329	1.000	1365	1.000	1401	1.000	1437	1.000
1258	1.000	1294	1.000	1330	1.000	1366	1.000	1402	1.000	1438	1.000
1259	1.000	1295	1.000	1331	1.000	1367	1.000	1403	1.000	1439	1.000
1260	1.000	1296	1.000	1332	1.000	1368	1.000	1404	1.000	1440	1.000

Simulation Criteria for Storm

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Simulation Criteria for Storm

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.450		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 24 (FC), DS/PN: 1.014, Volume (m³): 6.0

Unit Reference	MD-SHE-0084-3700-1500-3700
Design Head (m)	1.500
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	0.269
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	3.7
Flush-Flo™	0.369	3.3
Kick-Flo®	0.748	2.7
Mean Flow over Head Range	-	3.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	3.3	3.000	5.1	7.000	7.6
0.200	3.1	1.400	3.6	3.500	5.5	7.500	7.9
0.300	3.3	1.600	3.8	4.000	5.8	8.000	8.1
0.400	3.3	1.800	4.0	4.500	6.2	8.500	8.3
0.500	3.3	2.000	4.2	5.000	6.5	9.000	8.6
0.600	3.2	2.200	4.4	5.500	6.8	9.500	8.8
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.3		

Storage Structures for Storm

Tank or Pond Manhole: HW3, DS/PN: 3.009

Invert Level (m) 0.465

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	396.0	1.310	885.0

Tank or Pond Manhole: HW5, DS/PN: 1.013

Invert Level (m) 0.275

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	405.8	1.500	910.0

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	2	+0%	100/15 Summer				2.139
1.001	2	15 Summer	2	+0%	30/15 Summer				1.494
1.002	3	15 Summer	2	+0%	30/15 Summer				1.252
1.003	4	15 Summer	2	+0%	30/15 Summer				1.225
1.004	5	15 Summer	2	+0%	30/15 Summer				1.194
2.000	6	15 Summer	2	+0%	100/15 Summer				2.016
1.005	7	15 Summer	2	+0%	30/15 Summer				1.160
1.006	8	15 Summer	2	+0%	30/15 Summer				1.127
1.007	9	15 Summer	2	+0%	30/15 Summer				1.091
1.008	10	15 Summer	2	+0%	30/15 Summer				1.035
1.009	11	15 Summer	2	+0%	30/15 Summer				0.986
1.010	12	15 Summer	2	+0%	100/15 Summer				0.958
1.011	13	15 Summer	2	+0%	100/15 Summer				0.859
1.012	HW1	1440 Winter	2	+0%	30/600 Summer				0.785
3.000	14	15 Summer	2	+0%	100/15 Summer				2.084
3.001	15	15 Summer	2	+0%	30/15 Summer				1.669
3.002	16	15 Summer	2	+0%	30/15 Summer				1.607

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.190	0.000	0.06		3.3	OK	
1.001	2	-0.196	0.000	0.46		46.5	OK	
1.002	3	-0.376	0.000	0.21		50.3	OK	
1.003	4	-0.357	0.000	0.31		61.5	OK	
1.004	5	-0.357	0.000	0.21		59.2	OK	
2.000	6	-0.165	0.000	0.16		13.6	OK	
1.005	7	-0.318	0.000	0.30		79.2	OK	
1.006	8	-0.294	0.000	0.34		91.1	OK	
1.007	9	-0.269	0.000	0.59		100.4	OK	
1.008	10	-0.305	0.000	0.48		100.1	OK	
1.009	11	-0.339	0.000	0.39		100.6	OK	
1.010	12	-0.335	0.000	0.41		102.6	OK	
1.011	13	-0.385	0.000	0.28		105.0	OK	
1.012	HW1	-0.315	0.000	0.01		6.4	OK	
3.000	14	-0.187	0.000	0.30		30.6	OK	
3.001	15	-0.202	0.000	0.43		42.9	OK	
3.002	16	-0.207	0.000	0.41		43.3	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
4.000	17	15 Summer	2	+0%	100/15 Summer			
3.003	18	15 Summer	2	+0%	30/15 Summer			
3.004	19	15 Summer	2	+0%	30/15 Summer			
3.005	20	15 Summer	2	+0%	30/15 Summer			
3.006	21	15 Summer	2	+0%	30/15 Summer			
5.000	22	15 Summer	2	+0%	30/15 Summer			
3.007	23	15 Summer	2	+0%	30/15 Summer			
3.008	HW2	15 Summer	2	+0%	30/960 Summer			
3.009	HW3	1440 Winter	2	+0%	30/360 Summer			
3.010	HW4	1440 Winter	2	+0%	30/240 Summer			
1.013	HW5	1440 Winter	2	+0%	30/60 Summer			
1.014	24 (FC)	1440 Summer	2	+0%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.000	17	1.788	-0.162	0.000	0.17		8.1	OK	
3.003	18	1.498	-0.272	0.000	0.32		59.8	OK	
3.004	19	1.250	-0.308	0.000	0.35		87.4	OK	
3.005	20	1.161	-0.309	0.000	0.35		87.9	OK	
3.006	21	1.048	-0.325	0.000	0.25		88.2	OK	
5.000	22	1.154	-0.102	0.000	0.57		20.1	OK	
3.007	23	1.018	-0.144	0.000	0.88		111.9	OK	
3.008	HW2	0.838	-0.302	0.000	0.37		111.2	OK	
3.009	HW3	0.785	-0.280	0.000	0.01		2.1	OK	
3.010	HW4	0.785	-0.240	0.000	0.01		2.0	OK	
1.013	HW5	0.786	-0.089	0.000	0.04		7.9	OK	
1.014	24 (FC)	0.795	0.376	0.000	0.13		3.3	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	30	+40%	100/15 Summer				2.162
1.001	2	15 Summer	30	+40%	30/15 Summer				1.800
1.002	3	15 Summer	30	+40%	30/15 Summer				1.681
1.003	4	15 Summer	30	+40%	30/15 Summer				1.654
1.004	5	15 Summer	30	+40%	30/15 Summer				1.625
2.000	6	15 Summer	30	+40%	100/15 Summer				2.058
1.005	7	15 Summer	30	+40%	30/15 Summer				1.585
1.006	8	15 Summer	30	+40%	30/15 Summer				1.529
1.007	9	15 Summer	30	+40%	30/15 Summer				1.449
1.008	10	15 Summer	30	+40%	30/15 Summer				1.392
1.009	11	15 Summer	30	+40%	30/15 Summer				1.343
1.010	12	30 Summer	30	+40%	100/15 Summer				1.293
1.011	13	2160 Winter	30	+40%	100/15 Summer				1.190
1.012	HW1	2160 Winter	30	+40%	30/600 Summer				1.190
3.000	14	15 Summer	30	+40%	100/15 Summer				2.200
3.001	15	15 Summer	30	+40%	30/15 Summer				1.960
3.002	16	15 Summer	30	+40%	30/15 Summer				1.879

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.167	0.000	0.15		8.7	OK	
1.001	2	0.110	0.000	1.57		160.2	SURCHARGED	
1.002	3	0.053	0.000	0.67		163.3	SURCHARGED	
1.003	4	0.072	0.000	1.02		200.7	SURCHARGED	
1.004	5	0.074	0.000	0.70		193.9	SURCHARGED	
2.000	6	-0.123	0.000	0.42		36.1	OK	
1.005	7	0.107	0.000	0.94		249.9	SURCHARGED	
1.006	8	0.108	0.000	1.09		291.3	SURCHARGED	
1.007	9	0.089	0.000	1.87		319.2	SURCHARGED	
1.008	10	0.052	0.000	1.54		320.3	SURCHARGED	
1.009	11	0.018	0.000	1.25		319.5	SURCHARGED	
1.010	12	0.000	0.000	1.14		288.8	OK	
1.011	13	-0.054	0.000	0.03		10.7	OK	
1.012	HW1	0.090	0.000	0.02		10.6	SURCHARGED	
3.000	14	-0.071	0.000	0.78		81.1	OK	
3.001	15	0.089	0.000	1.16		117.0	SURCHARGED	
3.002	16	0.065	0.000	1.12		116.6	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
4.000	17	15 Summer	30	+40%	100/15 Summer			
3.003	18	15 Summer	30	+40%	30/15 Summer			
3.004	19	15 Summer	30	+40%	30/15 Summer			
3.005	20	15 Summer	30	+40%	30/15 Summer			
3.006	21	15 Summer	30	+40%	30/15 Summer			
5.000	22	15 Summer	30	+40%	30/15 Summer			
3.007	23	15 Summer	30	+40%	30/15 Summer			
3.008	HW2	2160 Winter	30	+40%	30/960 Summer			
3.009	HW3	2160 Winter	30	+40%	30/360 Summer			
3.010	HW4	2160 Winter	30	+40%	30/240 Summer			
1.013	HW5	2160 Winter	30	+40%	30/60 Summer			
1.014	24 (FC)	2160 Winter	30	+40%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.000	17	1.833	-0.117	0.000	0.46		21.5	OK	
3.003	18	1.792	0.022	0.000	0.84		157.5	SURCHARGED	
3.004	19	1.636	0.078	0.000	0.90		224.7	SURCHARGED	
3.005	20	1.547	0.077	0.000	0.90		223.3	SURCHARGED	
3.006	21	1.433	0.060	0.000	0.65		227.3	SURCHARGED	
5.000	22	1.466	0.210	0.000	1.48		52.6	SURCHARGED	
3.007	23	1.270	0.108	0.000	2.28		292.1	SURCHARGED	
3.008	HW2	1.190	0.050	0.000	0.03		9.6	SURCHARGED	
3.009	HW3	1.190	0.125	0.000	0.01		2.9	SURCHARGED	
3.010	HW4	1.190	0.165	0.000	0.01		2.7	SURCHARGED	
1.013	HW5	1.190	0.315	0.000	0.03		6.5	SURCHARGED	
1.014	24 (FC)	1.203	0.784	0.000	0.12		3.0	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	1.000
M5-60 (mm)	20.000	Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Summer	100	+40%	100/15 Summer				2.462
1.001	2	15 Summer	100	+40%	30/15 Summer				2.436
1.002	3	15 Summer	100	+40%	30/15 Summer				2.252
1.003	4	15 Summer	100	+40%	30/15 Summer				2.218
1.004	5	15 Summer	100	+40%	30/15 Summer				2.182
2.000	6	15 Summer	100	+40%	100/15 Summer				2.304
1.005	7	15 Summer	100	+40%	30/15 Summer				2.134
1.006	8	15 Summer	100	+40%	30/15 Summer				2.053
1.007	9	15 Summer	100	+40%	30/15 Summer				1.911
1.008	10	15 Summer	100	+40%	30/15 Summer				1.734
1.009	11	15 Summer	100	+40%	30/15 Summer				1.560
1.010	12	15 Summer	100	+40%	100/15 Summer				1.409
1.011	13	2880 Winter	100	+40%	100/15 Summer				1.355
1.012	HW1	2880 Winter	100	+40%	30/600 Summer				1.355
3.000	14	15 Summer	100	+40%	100/15 Summer				2.872
3.001	15	15 Summer	100	+40%	30/15 Summer				2.493
3.002	16	15 Summer	100	+40%	30/15 Summer				2.356

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.133	0.000	0.20		11.7	SURCHARGED	
1.001	2	0.746	0.000	1.88		191.8	SURCHARGED	
1.002	3	0.624	0.000	0.84		204.2	SURCHARGED	
1.003	4	0.636	0.000	1.27		250.3	SURCHARGED	
1.004	5	0.631	0.000	0.82		227.4	SURCHARGED	
2.000	6	0.123	0.000	0.54		46.8	SURCHARGED	
1.005	7	0.656	0.000	1.17		308.7	SURCHARGED	
1.006	8	0.632	0.000	1.35		362.6	SURCHARGED	
1.007	9	0.551	0.000	2.36		403.2	SURCHARGED	
1.008	10	0.394	0.000	1.94		401.9	SURCHARGED	
1.009	11	0.235	0.000	1.58		404.1	SURCHARGED	
1.010	12	0.116	0.000	1.62		410.2	SURCHARGED	
1.011	13	0.111	0.000	0.03		11.0	SURCHARGED	
1.012	HW1	0.255	0.000	0.02		11.0	SURCHARGED	
3.000	14	0.601	0.000	0.95		98.5	SURCHARGED	
3.001	15	0.622	0.000	1.42		142.6	SURCHARGED	
3.002	16	0.542	0.000	1.36		142.0	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
4.000	17	15 Summer	100	+40%	100/15 Summer			
3.003	18	15 Summer	100	+40%	30/15 Summer			
3.004	19	15 Summer	100	+40%	30/15 Summer			
3.005	20	15 Summer	100	+40%	30/15 Summer			
3.006	21	15 Summer	100	+40%	30/15 Summer			
5.000	22	15 Summer	100	+40%	30/15 Summer			
3.007	23	15 Summer	100	+40%	30/15 Summer			
3.008	HW2	2880 Winter	100	+40%	30/960 Summer			
3.009	HW3	2880 Winter	100	+40%	30/360 Summer			
3.010	HW4	2880 Winter	100	+40%	30/240 Summer			
1.013	HW5	2880 Winter	100	+40%	30/60 Summer			
1.014	24 (FC)	2880 Winter	100	+40%	2/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
4.000	17	2.297	0.347	0.000	0.58		27.0	SURCHARGED	
3.003	18	2.223	0.453	0.000	1.06		200.0	SURCHARGED	
3.004	19	1.971	0.413	0.000	1.21		300.3	SURCHARGED	
3.005	20	1.806	0.336	0.000	1.20		297.5	SURCHARGED	
3.006	21	1.646	0.273	0.000	0.83		294.0	SURCHARGED	
5.000	22	1.820	0.564	0.000	1.89		66.8	SURCHARGED	
3.007	23	1.486	0.324	0.000	2.98		381.1	SURCHARGED	
3.008	HW2	1.355	0.215	0.000	0.03		9.5	SURCHARGED	
3.009	HW3	1.355	0.290	0.000	0.02		3.9	SURCHARGED	
3.010	HW4	1.355	0.330	0.000	0.01		3.6	SURCHARGED	
1.013	HW5	1.355	0.480	0.000	0.03		7.7	SURCHARGED	
1.014	24 (FC)	1.367	0.948	0.000	0.12		3.2	SURCHARGED	

Appendix L

Drainage Calculations: FEH Sensitivity Check

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.450	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	550	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.730	4-8	0.646	8-12	0.001

Total Area Contributing (ha) = 1.376

Total Pipe Volume (m³) = 97.781

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	45.624	0.639	71.4	0.014	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	15.266	0.062	246.2	0.216	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.002	18.435	0.046	400.8	0.022	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.003	12.550	0.031	404.8	0.066	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.004	29.681	0.073	406.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	71.58	5.49	2.104	0.014	0.0	0.0	0.0	1.55	61.6	2.7
1.001	70.29	5.71	1.315	0.230	0.0	0.0	0.0	1.15	127.0	43.8
1.002	68.87	5.97	1.028	0.252	0.0	0.0	0.0	1.21	342.2	47.0
1.003	67.93	6.14	0.982	0.318	0.0	0.0	0.0	1.20	340.4	58.5
1.004	65.82	6.55	0.951	0.318	0.0	0.0	0.0	1.20	339.7	58.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	21.312	0.703	30.3	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	22.924	0.057	402.2	0.068	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.006	24.557	0.061	402.6	0.090	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.007	8.220	0.020	411.0	0.067	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	6.122	0.015	408.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.009	7.803	0.032	243.8	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.010	19.961	0.049	407.4	0.018	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.011	9.222	0.144	64.0	0.024	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.012	22.936	0.225	101.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.000	39.854	0.400	99.6	0.131	5.00	0.0	0.600	o	300	Pipe/Conduit	
3.001	13.945	0.057	244.6	0.062	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.002	7.599	0.044	172.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	18.161	0.180	100.9	0.034	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.003	51.456	0.212	242.7	0.055	0.00	0.0	0.600	o	450	Pipe/Conduit	
3.004	8.098	0.088	92.0	0.151	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.005	7.845	0.097	80.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.006	14.058	0.211	66.6	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	73.69	5.15	1.956	0.057	0.0	0.0	0.0	2.38	94.8	11.4
1.005	64.30	6.87	0.878	0.443	0.0	0.0	0.0	1.21	341.6	77.1
1.006	62.76	7.21	0.821	0.533	0.0	0.0	0.0	1.21	341.4	90.6
1.007	62.25	7.32	0.760	0.600	0.0	0.0	0.0	1.19	337.9	101.2
1.008	61.89	7.41	0.740	0.600	0.0	0.0	0.0	1.20	339.0	101.2
1.009	61.53	7.49	0.725	0.600	0.0	0.0	0.0	1.56	439.7	101.2
1.010	60.38	7.77	0.693	0.618	0.0	0.0	0.0	1.20	339.4	101.2
1.011	60.17	7.82	0.644	0.642	0.0	0.0	0.0	3.05	861.4	104.6
1.012	59.55	7.98	0.500	0.642	0.0	0.0	0.0	2.41	682.0	104.6
3.000	72.00	5.42	1.971	0.131	0.0	0.0	0.0	1.58	111.3	25.5
3.001	70.80	5.62	1.496	0.193	0.0	0.0	0.0	1.15	127.4	37.0
3.002	70.27	5.72	1.439	0.193	0.0	0.0	0.0	1.38	151.9	37.0
4.000	73.16	5.23	1.725	0.034	0.0	0.0	0.0	1.30	51.8	6.7
3.003	66.71	6.37	1.320	0.282	0.0	0.0	0.0	1.30	206.8	50.9
3.004	66.42	6.43	1.033	0.433	0.0	0.0	0.0	2.34	505.6	77.9
3.005	66.15	6.48	0.945	0.433	0.0	0.0	0.0	2.49	539.5	77.9
3.006	65.73	6.57	0.848	0.433	0.0	0.0	0.0	2.75	594.7	77.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
5.000	15.735	0.094	167.4	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.007	9.296	0.022	422.5	0.037	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.008	9.734	0.150	64.9	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
3.009	15.150	0.040	378.8	0.088	0.00	0.0	0.600	o	600	Pipe/Conduit	
3.010	38.563	0.150	257.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.013	3.210	0.006	535.0	0.091	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.014	23.869	0.545	43.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
5.000	72.99	5.26	1.031	0.085	0.0	0.0	0.0	1.01	40.1	16.8
3.007	65.03	6.71	0.637	0.555	0.0	0.0	0.0	1.08	234.5	97.8
3.008	64.76	6.77	0.615	0.555	0.0	0.0	0.0	2.78	602.6	97.8
3.009	63.81	6.97	0.465	0.643	0.0	0.0	0.0	1.25	352.1	111.1
3.010	61.92	7.40	0.425	0.643	0.0	0.0	0.0	1.51	428.1	111.1
1.013	59.35	8.03	0.275	1.376	0.0	0.0	0.0	1.05	295.7	221.2
1.014	58.37	8.29	0.269	1.376	0.0	0.0	0.0	1.52	26.9«	221.2

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	3.529	1.425	Open Manhole	1350	1.000	2.104	225				
2	2.897	1.582	Open Manhole	1350	1.001	1.315	375	1.000	1.465	225	
3	3.022	1.994	Open Manhole	1500	1.002	1.028	600	1.001	1.253	375	
4	3.181	2.199	Open Manhole	1500	1.003	0.982	600	1.002	0.982	600	
5	3.162	2.211	Open Manhole	1500	1.004	0.951	600	1.003	0.951	600	
6	3.381	1.425	Open Manhole	1350	2.000	1.956	225				
7	3.164	2.286	Open Manhole	1500	1.005	0.878	600	1.004	0.878	600	
								2.000	1.253	225	
8	3.059	2.238	Open Manhole	1500	1.006	0.821	600	1.005	0.821	600	
9	2.750	1.990	Open Manhole	1500	1.007	0.760	600	1.006	0.760	600	
10	2.645	1.905	Open Manhole	1500	1.008	0.740	600	1.007	0.740	600	
11	2.571	1.846	Open Manhole	1500	1.009	0.725	600	1.008	0.725	600	
12	2.493	1.800	Open Manhole	1500	1.010	0.693	600	1.009	0.693	600	
13	2.244	1.600	Open Manhole	1800	1.011	0.644	600	1.010	0.644	600	
HW1	1.775	1.275	Open Manhole	1500	1.012	0.500	600	1.011	0.500	600	
14	3.471	1.500	Open Manhole	1350	3.000	1.971	300				
15	3.071	1.575	Open Manhole	1350	3.001	1.496	375	3.000	1.571	300	
16	3.023	1.584	Open Manhole	1350	3.002	1.439	375	3.001	1.439	375	
17	3.150	1.425	Open Manhole	1350	4.000	1.725	225				
18	2.970	1.650	Open Manhole	1500	3.003	1.320	450	3.002	1.395	375	
								4.000	1.545	225	
19	2.558	1.525	Open Manhole	1500	3.004	1.033	525	3.003	1.108	450	
20	2.470	1.525	Open Manhole	1500	3.005	0.945	525	3.004	0.945	525	
21	2.373	1.525	Open Manhole	1500	3.006	0.848	525	3.005	0.848	525	
22	2.256	1.225	Open Manhole	1200	5.000	1.031	225				
23	2.204	1.567	Open Manhole	1500	3.007	0.637	525	3.006	0.637	525	
								5.000	0.937	225	
HW2	1.775	1.160	Open Manhole	1800	3.008	0.615	525	3.007	0.615	525	
HW3	1.775	1.310	Open Manhole	2100	3.009	0.465	600	3.008	0.465	525	
HW4	1.775	1.350	Open Manhole	2100	3.010	0.425	600	3.009	0.425	600	
HW5	1.775	1.500	Open Manhole	1500	1.013	0.275	600	1.012	0.275	600	
								3.010	0.275	600	
24 (FC)	1.875	1.606	Open Manhole	2100	1.014	0.269	150	1.013	0.269	600	
HW6	0.500	0.776	Open Manhole	0		OUTFALL		1.014	-0.276	150	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	538710.181	285209.371	538710.181	285209.371	Required	
2	538665.095	285216.361	538665.095	285216.361	Required	
3	538651.374	285223.052	538651.374	285223.052	Required	
4	538642.057	285238.960	538642.057	285238.960	Required	
5	538642.376	285251.506	538642.376	285251.506	Required	
6	538656.683	285300.451	538656.683	285300.451	Required	
7	538650.673	285280.004	538650.673	285280.004	Required	
8	538628.522	285285.908	538628.522	285285.908	Required	
9	538603.973	285285.300	538603.973	285285.300	Required	
10	538596.276	285288.187	538596.276	285288.187	Required	
11	538592.436	285292.954	538592.436	285292.954	Required	
12	538591.824	285300.733	538591.824	285300.733	Required	
13	538596.072	285320.237	538596.072	285320.237	Required	
HW1	538587.068	285322.231	538587.068	285322.231	Required	
14	538665.839	285329.261	538665.839	285329.261	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
15	538674.390	285368.187	538674.390	285368.187	Required	
16	538675.208	285382.108	538675.208	285382.108	Required	
17	538688.687	285388.794	538688.687	285388.794	Required	
18	538670.539	285388.103	538670.539	285388.103	Required	
19	538619.107	285386.518	538619.107	285386.518	Required	
20	538612.261	285382.193	538612.261	285382.193	Required	
21	538608.011	285375.599	538608.011	285375.599	Required	
22	538601.588	285346.507	538601.588	285346.507	Required	
23	538605.081	285361.849	538605.081	285361.849	Required	
HW2	538595.998	285363.826	538595.998	285363.826	Required	
HW3	538587.432	285359.203	538587.432	285359.203	Required	
HW4	538583.964	285344.455	538583.964	285344.455	Required	
HW5	538568.128	285309.294	538568.128	285309.294	Required	
24 (FC)	538565.019	285310.094	538565.019	285310.094	Required	
HW6	538541.888	285315.981			No Entry	

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	o	225	1	3.529	2.104	1.200	Open Manhole	1350
1.001	o	375	2	2.897	1.315	1.207	Open Manhole	1350
1.002	o	600	3	3.022	1.028	1.394	Open Manhole	1500
1.003	o	600	4	3.181	0.982	1.599	Open Manhole	1500
1.004	o	600	5	3.162	0.951	1.611	Open Manhole	1500
2.000	o	225	6	3.381	1.956	1.200	Open Manhole	1350
1.005	o	600	7	3.164	0.878	1.686	Open Manhole	1500
1.006	o	600	8	3.059	0.821	1.638	Open Manhole	1500
1.007	o	600	9	2.750	0.760	1.390	Open Manhole	1500
1.008	o	600	10	2.645	0.740	1.305	Open Manhole	1500
1.009	o	600	11	2.571	0.725	1.246	Open Manhole	1500
1.010	o	600	12	2.493	0.693	1.200	Open Manhole	1500
1.011	o	600	13	2.244	0.644	1.000	Open Manhole	1800
1.012	o	600	HW1	1.775	0.500	0.675	Open Manhole	1500
3.000	o	300	14	3.471	1.971	1.200	Open Manhole	1350
3.001	o	375	15	3.071	1.496	1.200	Open Manhole	1350
3.002	o	375	16	3.023	1.439	1.209	Open Manhole	1350

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	45.624	71.4	2	2.897	1.465	1.207	Open Manhole	1350
1.001	15.266	246.2	3	3.022	1.253	1.394	Open Manhole	1500
1.002	18.435	400.8	4	3.181	0.982	1.599	Open Manhole	1500
1.003	12.550	404.8	5	3.162	0.951	1.611	Open Manhole	1500
1.004	29.681	406.6	7	3.164	0.878	1.686	Open Manhole	1500
2.000	21.312	30.3	7	3.164	1.253	1.686	Open Manhole	1500
1.005	22.924	402.2	8	3.059	0.821	1.638	Open Manhole	1500
1.006	24.557	402.6	9	2.750	0.760	1.390	Open Manhole	1500
1.007	8.220	411.0	10	2.645	0.740	1.305	Open Manhole	1500
1.008	6.122	408.1	11	2.571	0.725	1.246	Open Manhole	1500
1.009	7.803	243.8	12	2.493	0.693	1.200	Open Manhole	1500
1.010	19.961	407.4	13	2.244	0.644	1.000	Open Manhole	1800
1.011	9.222	64.0	HW1	1.775	0.500	0.675	Open Manhole	1500
1.012	22.936	101.9	HW5	1.775	0.275	0.900	Open Manhole	1500
3.000	39.854	99.6	15	3.071	1.571	1.200	Open Manhole	1350
3.001	13.945	244.6	16	3.023	1.439	1.209	Open Manhole	1350
3.002	7.599	172.7	18	2.970	1.395	1.200	Open Manhole	1500

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)
4.000	o	225	17	3.150	1.725	1.200	Open Manhole	1350
3.003	o	450	18	2.970	1.320	1.200	Open Manhole	1500
3.004	o	525	19	2.558	1.033	1.000	Open Manhole	1500
3.005	o	525	20	2.470	0.945	1.000	Open Manhole	1500
3.006	o	525	21	2.373	0.848	1.000	Open Manhole	1500
5.000	o	225	22	2.256	1.031	1.000	Open Manhole	1200
3.007	o	525	23	2.204	0.637	1.042	Open Manhole	1500
3.008	o	525	HW2	1.775	0.615	0.635	Open Manhole	1800
3.009	o	600	HW3	1.775	0.465	0.710	Open Manhole	2100
3.010	o	600	HW4	1.775	0.425	0.750	Open Manhole	2100
1.013	o	600	HW5	1.775	0.275	0.900	Open Manhole	1500
1.014	o	150	24 (FC)	1.875	0.269	1.456	Open Manhole	2100

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)
4.000	18.161	100.9	18	2.970	1.545	1.200	Open Manhole	1500
3.003	51.456	242.7	19	2.558	1.108	1.000	Open Manhole	1500
3.004	8.098	92.0	20	2.470	0.945	1.000	Open Manhole	1500
3.005	7.845	80.9	21	2.373	0.848	1.000	Open Manhole	1500
3.006	14.058	66.6	23	2.204	0.637	1.042	Open Manhole	1500
5.000	15.735	167.4	23	2.204	0.937	1.042	Open Manhole	1500
3.007	9.296	422.5	HW2	1.775	0.615	0.635	Open Manhole	1800
3.008	9.734	64.9	HW3	1.775	0.465	0.785	Open Manhole	2100
3.009	15.150	378.8	HW4	1.775	0.425	0.750	Open Manhole	2100
3.010	38.563	257.1	HW5	1.775	0.275	0.900	Open Manhole	1500
1.013	3.210	535.0	24 (FC)	1.875	0.269	1.006	Open Manhole	2100
1.014	23.869	43.8	HW6	0.500	-0.276	0.626	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.014	0.014	0.014
1.001	-	-	100	0.216	0.216	0.216
1.002	-	-	100	0.022	0.022	0.022
1.003	-	-	100	0.066	0.066	0.066
1.004	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.057	0.057	0.057
1.005	-	-	100	0.068	0.068	0.068
1.006	-	-	100	0.090	0.090	0.090
1.007	-	-	100	0.067	0.067	0.067
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
1.010	-	-	100	0.018	0.018	0.018
1.011	-	-	100	0.024	0.024	0.024
1.012	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.131	0.131	0.131
3.001	-	-	100	0.062	0.062	0.062
3.002	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.034	0.034	0.034
3.003	-	-	100	0.055	0.055	0.055
3.004	-	-	100	0.151	0.151	0.151
3.005	-	-	100	0.000	0.000	0.000
3.006	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.085	0.085	0.085
3.007	-	-	100	0.037	0.037	0.037
3.008	-	-	100	0.000	0.000	0.000
3.009	-	-	100	0.088	0.088	0.088
3.010	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.091	0.091	0.091
1.014	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.376	1.376	1.376

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.014	HW6	0.500	-0.276	0.000	0	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1	1.000	5	1.000	9	1.000	13	1.000	17	1.000	21	1.000
2	1.000	6	1.000	10	1.000	14	1.000	18	1.000	22	1.000
3	1.000	7	1.000	11	1.000	15	1.000	19	1.000	23	1.000
4	1.000	8	1.000	12	1.000	16	1.000	20	1.000	24	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
25	1.000	75	1.000	125	1.000	175	1.000	225	1.000	275	1.000
26	1.000	76	1.000	126	1.000	176	1.000	226	1.000	276	1.000
27	1.000	77	1.000	127	1.000	177	1.000	227	1.000	277	1.000
28	1.000	78	1.000	128	1.000	178	1.000	228	1.000	278	1.000
29	1.000	79	1.000	129	1.000	179	1.000	229	1.000	279	1.000
30	1.000	80	1.000	130	1.000	180	1.000	230	1.000	280	1.000
31	1.000	81	1.000	131	1.000	181	1.000	231	1.000	281	1.000
32	1.000	82	1.000	132	1.000	182	1.000	232	1.000	282	1.000
33	1.000	83	1.000	133	1.000	183	1.000	233	1.000	283	1.000
34	1.000	84	1.000	134	1.000	184	1.000	234	1.000	284	1.000
35	1.000	85	1.000	135	1.000	185	1.000	235	1.000	285	1.000
36	1.000	86	1.000	136	1.000	186	1.000	236	1.000	286	1.000
37	1.000	87	1.000	137	1.000	187	1.000	237	1.000	287	1.000
38	1.000	88	1.000	138	1.000	188	1.000	238	1.000	288	1.000
39	1.000	89	1.000	139	1.000	189	1.000	239	1.000	289	1.000
40	1.000	90	1.000	140	1.000	190	1.000	240	1.000	290	1.000
41	1.000	91	1.000	141	1.000	191	1.000	241	1.000	291	1.000
42	1.000	92	1.000	142	1.000	192	1.000	242	1.000	292	1.000
43	1.000	93	1.000	143	1.000	193	1.000	243	1.000	293	1.000
44	1.000	94	1.000	144	1.000	194	1.000	244	1.000	294	1.000
45	1.000	95	1.000	145	1.000	195	1.000	245	1.000	295	1.000
46	1.000	96	1.000	146	1.000	196	1.000	246	1.000	296	1.000
47	1.000	97	1.000	147	1.000	197	1.000	247	1.000	297	1.000
48	1.000	98	1.000	148	1.000	198	1.000	248	1.000	298	1.000
49	1.000	99	1.000	149	1.000	199	1.000	249	1.000	299	1.000
50	1.000	100	1.000	150	1.000	200	1.000	250	1.000	300	1.000
51	1.000	101	1.000	151	1.000	201	1.000	251	1.000	301	1.000
52	1.000	102	1.000	152	1.000	202	1.000	252	1.000	302	1.000
53	1.000	103	1.000	153	1.000	203	1.000	253	1.000	303	1.000
54	1.000	104	1.000	154	1.000	204	1.000	254	1.000	304	1.000
55	1.000	105	1.000	155	1.000	205	1.000	255	1.000	305	1.000
56	1.000	106	1.000	156	1.000	206	1.000	256	1.000	306	1.000
57	1.000	107	1.000	157	1.000	207	1.000	257	1.000	307	1.000
58	1.000	108	1.000	158	1.000	208	1.000	258	1.000	308	1.000
59	1.000	109	1.000	159	1.000	209	1.000	259	1.000	309	1.000
60	1.000	110	1.000	160	1.000	210	1.000	260	1.000	310	1.000
61	1.000	111	1.000	161	1.000	211	1.000	261	1.000	311	1.000
62	1.000	112	1.000	162	1.000	212	1.000	262	1.000	312	1.000
63	1.000	113	1.000	163	1.000	213	1.000	263	1.000	313	1.000
64	1.000	114	1.000	164	1.000	214	1.000	264	1.000	314	1.000
65	1.000	115	1.000	165	1.000	215	1.000	265	1.000	315	1.000
66	1.000	116	1.000	166	1.000	216	1.000	266	1.000	316	1.000
67	1.000	117	1.000	167	1.000	217	1.000	267	1.000	317	1.000
68	1.000	118	1.000	168	1.000	218	1.000	268	1.000	318	1.000
69	1.000	119	1.000	169	1.000	219	1.000	269	1.000	319	1.000
70	1.000	120	1.000	170	1.000	220	1.000	270	1.000	320	1.000
71	1.000	121	1.000	171	1.000	221	1.000	271	1.000	321	1.000
72	1.000	122	1.000	172	1.000	222	1.000	272	1.000	322	1.000
73	1.000	123	1.000	173	1.000	223	1.000	273	1.000	323	1.000
74	1.000	124	1.000	174	1.000	224	1.000	274	1.000	324	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
325	1.000	375	1.000	425	1.000	475	1.000	525	1.000	575	1.000
326	1.000	376	1.000	426	1.000	476	1.000	526	1.000	576	1.000
327	1.000	377	1.000	427	1.000	477	1.000	527	1.000	577	1.000
328	1.000	378	1.000	428	1.000	478	1.000	528	1.000	578	1.000
329	1.000	379	1.000	429	1.000	479	1.000	529	1.000	579	1.000
330	1.000	380	1.000	430	1.000	480	1.000	530	1.000	580	1.000
331	1.000	381	1.000	431	1.000	481	1.000	531	1.000	581	1.000
332	1.000	382	1.000	432	1.000	482	1.000	532	1.000	582	1.000
333	1.000	383	1.000	433	1.000	483	1.000	533	1.000	583	1.000
334	1.000	384	1.000	434	1.000	484	1.000	534	1.000	584	1.000
335	1.000	385	1.000	435	1.000	485	1.000	535	1.000	585	1.000
336	1.000	386	1.000	436	1.000	486	1.000	536	1.000	586	1.000
337	1.000	387	1.000	437	1.000	487	1.000	537	1.000	587	1.000
338	1.000	388	1.000	438	1.000	488	1.000	538	1.000	588	1.000
339	1.000	389	1.000	439	1.000	489	1.000	539	1.000	589	1.000
340	1.000	390	1.000	440	1.000	490	1.000	540	1.000	590	1.000
341	1.000	391	1.000	441	1.000	491	1.000	541	1.000	591	1.000
342	1.000	392	1.000	442	1.000	492	1.000	542	1.000	592	1.000
343	1.000	393	1.000	443	1.000	493	1.000	543	1.000	593	1.000
344	1.000	394	1.000	444	1.000	494	1.000	544	1.000	594	1.000
345	1.000	395	1.000	445	1.000	495	1.000	545	1.000	595	1.000
346	1.000	396	1.000	446	1.000	496	1.000	546	1.000	596	1.000
347	1.000	397	1.000	447	1.000	497	1.000	547	1.000	597	1.000
348	1.000	398	1.000	448	1.000	498	1.000	548	1.000	598	1.000
349	1.000	399	1.000	449	1.000	499	1.000	549	1.000	599	1.000
350	1.000	400	1.000	450	1.000	500	1.000	550	1.000	600	1.000
351	1.000	401	1.000	451	1.000	501	1.000	551	1.000	601	1.000
352	1.000	402	1.000	452	1.000	502	1.000	552	1.000	602	1.000
353	1.000	403	1.000	453	1.000	503	1.000	553	1.000	603	1.000
354	1.000	404	1.000	454	1.000	504	1.000	554	1.000	604	1.000
355	1.000	405	1.000	455	1.000	505	1.000	555	1.000	605	1.000
356	1.000	406	1.000	456	1.000	506	1.000	556	1.000	606	1.000
357	1.000	407	1.000	457	1.000	507	1.000	557	1.000	607	1.000
358	1.000	408	1.000	458	1.000	508	1.000	558	1.000	608	1.000
359	1.000	409	1.000	459	1.000	509	1.000	559	1.000	609	1.000
360	1.000	410	1.000	460	1.000	510	1.000	560	1.000	610	1.000
361	1.000	411	1.000	461	1.000	511	1.000	561	1.000	611	1.000
362	1.000	412	1.000	462	1.000	512	1.000	562	1.000	612	1.000
363	1.000	413	1.000	463	1.000	513	1.000	563	1.000	613	1.000
364	1.000	414	1.000	464	1.000	514	1.000	564	1.000	614	1.000
365	1.000	415	1.000	465	1.000	515	1.000	565	1.000	615	1.000
366	1.000	416	1.000	466	1.000	516	1.000	566	1.000	616	1.000
367	1.000	417	1.000	467	1.000	517	1.000	567	1.000	617	1.000
368	1.000	418	1.000	468	1.000	518	1.000	568	1.000	618	1.000
369	1.000	419	1.000	469	1.000	519	1.000	569	1.000	619	1.000
370	1.000	420	1.000	470	1.000	520	1.000	570	1.000	620	1.000
371	1.000	421	1.000	471	1.000	521	1.000	571	1.000	621	1.000
372	1.000	422	1.000	472	1.000	522	1.000	572	1.000	622	1.000
373	1.000	423	1.000	473	1.000	523	1.000	573	1.000	623	1.000
374	1.000	424	1.000	474	1.000	524	1.000	574	1.000	624	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
625	1.000	675	1.000	725	1.000	775	1.000	825	1.000	875	1.000
626	1.000	676	1.000	726	1.000	776	1.000	826	1.000	876	1.000
627	1.000	677	1.000	727	1.000	777	1.000	827	1.000	877	1.000
628	1.000	678	1.000	728	1.000	778	1.000	828	1.000	878	1.000
629	1.000	679	1.000	729	1.000	779	1.000	829	1.000	879	1.000
630	1.000	680	1.000	730	1.000	780	1.000	830	1.000	880	1.000
631	1.000	681	1.000	731	1.000	781	1.000	831	1.000	881	1.000
632	1.000	682	1.000	732	1.000	782	1.000	832	1.000	882	1.000
633	1.000	683	1.000	733	1.000	783	1.000	833	1.000	883	1.000
634	1.000	684	1.000	734	1.000	784	1.000	834	1.000	884	1.000
635	1.000	685	1.000	735	1.000	785	1.000	835	1.000	885	1.000
636	1.000	686	1.000	736	1.000	786	1.000	836	1.000	886	1.000
637	1.000	687	1.000	737	1.000	787	1.000	837	1.000	887	1.000
638	1.000	688	1.000	738	1.000	788	1.000	838	1.000	888	1.000
639	1.000	689	1.000	739	1.000	789	1.000	839	1.000	889	1.000
640	1.000	690	1.000	740	1.000	790	1.000	840	1.000	890	1.000
641	1.000	691	1.000	741	1.000	791	1.000	841	1.000	891	1.000
642	1.000	692	1.000	742	1.000	792	1.000	842	1.000	892	1.000
643	1.000	693	1.000	743	1.000	793	1.000	843	1.000	893	1.000
644	1.000	694	1.000	744	1.000	794	1.000	844	1.000	894	1.000
645	1.000	695	1.000	745	1.000	795	1.000	845	1.000	895	1.000
646	1.000	696	1.000	746	1.000	796	1.000	846	1.000	896	1.000
647	1.000	697	1.000	747	1.000	797	1.000	847	1.000	897	1.000
648	1.000	698	1.000	748	1.000	798	1.000	848	1.000	898	1.000
649	1.000	699	1.000	749	1.000	799	1.000	849	1.000	899	1.000
650	1.000	700	1.000	750	1.000	800	1.000	850	1.000	900	1.000
651	1.000	701	1.000	751	1.000	801	1.000	851	1.000	901	1.000
652	1.000	702	1.000	752	1.000	802	1.000	852	1.000	902	1.000
653	1.000	703	1.000	753	1.000	803	1.000	853	1.000	903	1.000
654	1.000	704	1.000	754	1.000	804	1.000	854	1.000	904	1.000
655	1.000	705	1.000	755	1.000	805	1.000	855	1.000	905	1.000
656	1.000	706	1.000	756	1.000	806	1.000	856	1.000	906	1.000
657	1.000	707	1.000	757	1.000	807	1.000	857	1.000	907	1.000
658	1.000	708	1.000	758	1.000	808	1.000	858	1.000	908	1.000
659	1.000	709	1.000	759	1.000	809	1.000	859	1.000	909	1.000
660	1.000	710	1.000	760	1.000	810	1.000	860	1.000	910	1.000
661	1.000	711	1.000	761	1.000	811	1.000	861	1.000	911	1.000
662	1.000	712	1.000	762	1.000	812	1.000	862	1.000	912	1.000
663	1.000	713	1.000	763	1.000	813	1.000	863	1.000	913	1.000
664	1.000	714	1.000	764	1.000	814	1.000	864	1.000	914	1.000
665	1.000	715	1.000	765	1.000	815	1.000	865	1.000	915	1.000
666	1.000	716	1.000	766	1.000	816	1.000	866	1.000	916	1.000
667	1.000	717	1.000	767	1.000	817	1.000	867	1.000	917	1.000
668	1.000	718	1.000	768	1.000	818	1.000	868	1.000	918	1.000
669	1.000	719	1.000	769	1.000	819	1.000	869	1.000	919	1.000
670	1.000	720	1.000	770	1.000	820	1.000	870	1.000	920	1.000
671	1.000	721	1.000	771	1.000	821	1.000	871	1.000	921	1.000
672	1.000	722	1.000	772	1.000	822	1.000	872	1.000	922	1.000
673	1.000	723	1.000	773	1.000	823	1.000	873	1.000	923	1.000
674	1.000	724	1.000	774	1.000	824	1.000	874	1.000	924	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
925	1.000	975	1.000	1025	1.000	1075	1.000	1125	1.000	1175	1.000
926	1.000	976	1.000	1026	1.000	1076	1.000	1126	1.000	1176	1.000
927	1.000	977	1.000	1027	1.000	1077	1.000	1127	1.000	1177	1.000
928	1.000	978	1.000	1028	1.000	1078	1.000	1128	1.000	1178	1.000
929	1.000	979	1.000	1029	1.000	1079	1.000	1129	1.000	1179	1.000
930	1.000	980	1.000	1030	1.000	1080	1.000	1130	1.000	1180	1.000
931	1.000	981	1.000	1031	1.000	1081	1.000	1131	1.000	1181	1.000
932	1.000	982	1.000	1032	1.000	1082	1.000	1132	1.000	1182	1.000
933	1.000	983	1.000	1033	1.000	1083	1.000	1133	1.000	1183	1.000
934	1.000	984	1.000	1034	1.000	1084	1.000	1134	1.000	1184	1.000
935	1.000	985	1.000	1035	1.000	1085	1.000	1135	1.000	1185	1.000
936	1.000	986	1.000	1036	1.000	1086	1.000	1136	1.000	1186	1.000
937	1.000	987	1.000	1037	1.000	1087	1.000	1137	1.000	1187	1.000
938	1.000	988	1.000	1038	1.000	1088	1.000	1138	1.000	1188	1.000
939	1.000	989	1.000	1039	1.000	1089	1.000	1139	1.000	1189	1.000
940	1.000	990	1.000	1040	1.000	1090	1.000	1140	1.000	1190	1.000
941	1.000	991	1.000	1041	1.000	1091	1.000	1141	1.000	1191	1.000
942	1.000	992	1.000	1042	1.000	1092	1.000	1142	1.000	1192	1.000
943	1.000	993	1.000	1043	1.000	1093	1.000	1143	1.000	1193	1.000
944	1.000	994	1.000	1044	1.000	1094	1.000	1144	1.000	1194	1.000
945	1.000	995	1.000	1045	1.000	1095	1.000	1145	1.000	1195	1.000
946	1.000	996	1.000	1046	1.000	1096	1.000	1146	1.000	1196	1.000
947	1.000	997	1.000	1047	1.000	1097	1.000	1147	1.000	1197	1.000
948	1.000	998	1.000	1048	1.000	1098	1.000	1148	1.000	1198	1.000
949	1.000	999	1.000	1049	1.000	1099	1.000	1149	1.000	1199	1.000
950	1.000	1000	1.000	1050	1.000	1100	1.000	1150	1.000	1200	1.000
951	1.000	1001	1.000	1051	1.000	1101	1.000	1151	1.000	1201	1.000
952	1.000	1002	1.000	1052	1.000	1102	1.000	1152	1.000	1202	1.000
953	1.000	1003	1.000	1053	1.000	1103	1.000	1153	1.000	1203	1.000
954	1.000	1004	1.000	1054	1.000	1104	1.000	1154	1.000	1204	1.000
955	1.000	1005	1.000	1055	1.000	1105	1.000	1155	1.000	1205	1.000
956	1.000	1006	1.000	1056	1.000	1106	1.000	1156	1.000	1206	1.000
957	1.000	1007	1.000	1057	1.000	1107	1.000	1157	1.000	1207	1.000
958	1.000	1008	1.000	1058	1.000	1108	1.000	1158	1.000	1208	1.000
959	1.000	1009	1.000	1059	1.000	1109	1.000	1159	1.000	1209	1.000
960	1.000	1010	1.000	1060	1.000	1110	1.000	1160	1.000	1210	1.000
961	1.000	1011	1.000	1061	1.000	1111	1.000	1161	1.000	1211	1.000
962	1.000	1012	1.000	1062	1.000	1112	1.000	1162	1.000	1212	1.000
963	1.000	1013	1.000	1063	1.000	1113	1.000	1163	1.000	1213	1.000
964	1.000	1014	1.000	1064	1.000	1114	1.000	1164	1.000	1214	1.000
965	1.000	1015	1.000	1065	1.000	1115	1.000	1165	1.000	1215	1.000
966	1.000	1016	1.000	1066	1.000	1116	1.000	1166	1.000	1216	1.000
967	1.000	1017	1.000	1067	1.000	1117	1.000	1167	1.000	1217	1.000
968	1.000	1018	1.000	1068	1.000	1118	1.000	1168	1.000	1218	1.000
969	1.000	1019	1.000	1069	1.000	1119	1.000	1169	1.000	1219	1.000
970	1.000	1020	1.000	1070	1.000	1120	1.000	1170	1.000	1220	1.000
971	1.000	1021	1.000	1071	1.000	1121	1.000	1171	1.000	1221	1.000
972	1.000	1022	1.000	1072	1.000	1122	1.000	1172	1.000	1222	1.000
973	1.000	1023	1.000	1073	1.000	1123	1.000	1173	1.000	1223	1.000
974	1.000	1024	1.000	1074	1.000	1124	1.000	1174	1.000	1224	1.000

Surcharged Outfall Details for Storm

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
1225	1.000	1261	1.000	1297	1.000	1333	1.000	1369	1.000	1405	1.000
1226	1.000	1262	1.000	1298	1.000	1334	1.000	1370	1.000	1406	1.000
1227	1.000	1263	1.000	1299	1.000	1335	1.000	1371	1.000	1407	1.000
1228	1.000	1264	1.000	1300	1.000	1336	1.000	1372	1.000	1408	1.000
1229	1.000	1265	1.000	1301	1.000	1337	1.000	1373	1.000	1409	1.000
1230	1.000	1266	1.000	1302	1.000	1338	1.000	1374	1.000	1410	1.000
1231	1.000	1267	1.000	1303	1.000	1339	1.000	1375	1.000	1411	1.000
1232	1.000	1268	1.000	1304	1.000	1340	1.000	1376	1.000	1412	1.000
1233	1.000	1269	1.000	1305	1.000	1341	1.000	1377	1.000	1413	1.000
1234	1.000	1270	1.000	1306	1.000	1342	1.000	1378	1.000	1414	1.000
1235	1.000	1271	1.000	1307	1.000	1343	1.000	1379	1.000	1415	1.000
1236	1.000	1272	1.000	1308	1.000	1344	1.000	1380	1.000	1416	1.000
1237	1.000	1273	1.000	1309	1.000	1345	1.000	1381	1.000	1417	1.000
1238	1.000	1274	1.000	1310	1.000	1346	1.000	1382	1.000	1418	1.000
1239	1.000	1275	1.000	1311	1.000	1347	1.000	1383	1.000	1419	1.000
1240	1.000	1276	1.000	1312	1.000	1348	1.000	1384	1.000	1420	1.000
1241	1.000	1277	1.000	1313	1.000	1349	1.000	1385	1.000	1421	1.000
1242	1.000	1278	1.000	1314	1.000	1350	1.000	1386	1.000	1422	1.000
1243	1.000	1279	1.000	1315	1.000	1351	1.000	1387	1.000	1423	1.000
1244	1.000	1280	1.000	1316	1.000	1352	1.000	1388	1.000	1424	1.000
1245	1.000	1281	1.000	1317	1.000	1353	1.000	1389	1.000	1425	1.000
1246	1.000	1282	1.000	1318	1.000	1354	1.000	1390	1.000	1426	1.000
1247	1.000	1283	1.000	1319	1.000	1355	1.000	1391	1.000	1427	1.000
1248	1.000	1284	1.000	1320	1.000	1356	1.000	1392	1.000	1428	1.000
1249	1.000	1285	1.000	1321	1.000	1357	1.000	1393	1.000	1429	1.000
1250	1.000	1286	1.000	1322	1.000	1358	1.000	1394	1.000	1430	1.000
1251	1.000	1287	1.000	1323	1.000	1359	1.000	1395	1.000	1431	1.000
1252	1.000	1288	1.000	1324	1.000	1360	1.000	1396	1.000	1432	1.000
1253	1.000	1289	1.000	1325	1.000	1361	1.000	1397	1.000	1433	1.000
1254	1.000	1290	1.000	1326	1.000	1362	1.000	1398	1.000	1434	1.000
1255	1.000	1291	1.000	1327	1.000	1363	1.000	1399	1.000	1435	1.000
1256	1.000	1292	1.000	1328	1.000	1364	1.000	1400	1.000	1436	1.000
1257	1.000	1293	1.000	1329	1.000	1365	1.000	1401	1.000	1437	1.000
1258	1.000	1294	1.000	1330	1.000	1366	1.000	1402	1.000	1438	1.000
1259	1.000	1295	1.000	1331	1.000	1367	1.000	1403	1.000	1439	1.000
1260	1.000	1296	1.000	1332	1.000	1368	1.000	1404	1.000	1440	1.000

Simulation Criteria for Storm

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Simulation Criteria for Storm

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.450		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 24 (FC), DS/PN: 1.014, Volume (m³): 6.0

Unit Reference	MD-SHE-0084-3700-1500-3700
Design Head (m)	1.500
Design Flow (l/s)	3.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	0.269
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	3.7
Flush-Flo™	0.369	3.3
Kick-Flo®	0.748	2.7
Mean Flow over Head Range	-	3.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	3.3	3.000	5.1	7.000	7.6
0.200	3.1	1.400	3.6	3.500	5.5	7.500	7.9
0.300	3.3	1.600	3.8	4.000	5.8	8.000	8.1
0.400	3.3	1.800	4.0	4.500	6.2	8.500	8.3
0.500	3.3	2.000	4.2	5.000	6.5	9.000	8.6
0.600	3.2	2.200	4.4	5.500	6.8	9.500	8.8
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.3		

Storage Structures for Storm

Tank or Pond Manhole: HW3, DS/PN: 3.009

Invert Level (m) 0.465

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	396.0	1.310	885.0

Tank or Pond Manhole: HW5, DS/PN: 1.013

Invert Level (m) 0.275

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	405.8	1.500	910.0

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 538500 285350 TL 38500 85350
Data Type	Catchment
Cv (Summer)	1.000
Cv (Winter)	1.000

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

Profile(s)	Summer and Winter
Duration(s) (mins)	60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	60 Summer	100	+40%					2.178
1.001	2	60 Summer	100	+40%	100/60 Summer				2.157
1.002	3	60 Summer	100	+40%	100/60 Summer				2.019
1.003	4	60 Summer	100	+40%	100/60 Summer				1.989
1.004	5	60 Summer	100	+40%	100/60 Summer				1.958
2.000	6	60 Summer	100	+40%					2.062
1.005	7	60 Summer	100	+40%	100/60 Summer				1.915
1.006	8	60 Summer	100	+40%	100/60 Summer				1.854
1.007	9	360 Winter	100	+40%	100/60 Summer				1.771
1.008	10	1440 Summer	100	+40%	100/60 Summer				1.770
1.009	11	1440 Summer	100	+40%	100/60 Summer				1.770
1.010	12	1440 Summer	100	+40%	100/60 Summer				1.769
1.011	13	1440 Summer	100	+40%	100/60 Summer				1.769
1.012	HW1	1440 Summer	100	+40%	100/60 Summer				1.768

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.151	0.000	0.16		9.5	OK	
1.001	2	0.467	0.000	1.48		150.6	SURCHARGED	
1.002	3	0.391	0.000	0.67		161.7	SURCHARGED	
1.003	4	0.407	0.000	1.02		200.3	SURCHARGED	
1.004	5	0.407	0.000	0.71		195.2	SURCHARGED	
2.000	6	-0.119	0.000	0.45		38.9	OK	
1.005	7	0.437	0.000	1.03		271.7	SURCHARGED	
1.006	8	0.433	0.000	1.22		326.2	SURCHARGED	
1.007	9	0.411	0.000	0.50		85.8	SURCHARGED	
1.008	10	0.430	0.000	0.19		38.8	SURCHARGED	
1.009	11	0.445	0.000	0.15		38.7	SURCHARGED	
1.010	12	0.476	0.000	0.16		39.7	SURCHARGED	
1.011	13	0.525	0.000	0.11		41.1	SURCHARGED	
1.012	HW1	0.668	0.000	0.09		41.0	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	14	60 Summer	100	+40%	100/60 Summer			
3.001	15	60 Summer	100	+40%	100/60 Summer			
3.002	16	360 Summer	100	+40%	100/60 Summer			
4.000	17	360 Summer	100	+40%	100/60 Summer			
3.003	18	360 Summer	100	+40%	100/60 Summer			
3.004	19	360 Summer	100	+40%	100/60 Summer			
3.005	20	360 Summer	100	+40%	100/60 Summer			
3.006	21	1440 Summer	100	+40%	100/60 Summer			
5.000	22	1440 Summer	100	+40%	100/60 Summer			
3.007	23	1440 Summer	100	+40%	100/60 Summer			
3.008	HW2	1440 Summer	100	+40%	100/60 Summer			
3.009	HW3	1440 Summer	100	+40%	100/60 Summer			
3.010	HW4	1440 Summer	100	+40%	100/60 Summer			
1.013	HW5	1440 Summer	100	+40%	100/60 Summer			
1.014	24 (FC)	960 Winter	100	+40%	100/60 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	14	2.408	0.137	0.000	0.83		86.1	SURCHARGED	
3.001	15	2.141	0.270	0.000	1.21		121.9	SURCHARGED	
3.002	16	2.061	0.247	0.000	0.42		43.4	SURCHARGED	
4.000	17	2.019	0.069	0.000	0.16		7.7	SURCHARGED	
3.003	18	2.012	0.242	0.000	0.34		63.2	SURCHARGED	
3.004	19	1.915	0.357	0.000	0.37		92.4	SURCHARGED	
3.005	20	1.805	0.335	0.000	0.37		91.6	SURCHARGED	
3.006	21	1.769	0.396	0.000	0.08		27.8	SURCHARGED	
5.000	22	1.770	0.514	0.000	0.16		5.7	SURCHARGED	
3.007	23	1.769	0.607	0.000	0.27		35.0	SURCHARGED	
3.008	HW2	1.768	0.628	0.000	0.12		34.9	FLOOD RISK	
3.009	HW3	1.768	0.703	0.000	0.03		6.8	FLOOD RISK	
3.010	HW4	1.768	0.743	0.000	0.02		6.6	FLOOD RISK	
1.013	HW5	1.768	0.893	0.000	0.05		11.1	FLOOD RISK	
1.014	24 (FC)	1.765	1.346	0.000	0.14		3.6	FLOOD RISK	

Appendix M

Surface Water Exceedance Flow Routing Plan
JPP Consulting drawing no. 26065-107

General Notes

1. All dimensions are in metres unless otherwise stated.
2. All levels are in metres.
3. This drawing is to be read in conjunction with all relevant Engineers and Architect's drawings, Specifications, Reports and Engineering Details.

Drawing Key

- Site Boundary (Taken from latest site layout referenced)
- Adoptable Section 104 surface water drainage
- Banking
- Direction of flood routing in exceedance events

Health, safety & the environment

In accordance with the Construction (Design and Management) Regulations 2015, the designs and details on this drawing have been the subject of a Designers Risk Assessment, to identify risks in the construction, use, or demolition of the scheme.

It is not considered necessary for Designers to highlight obvious and/or common risks (such as deep excavations, manual handling and working around heavy plant) which Contractors should be familiar with, and be able to control by good management and site practice.

So far as is reasonably practicable, the risks inherent in the design have been eliminated. Where it has been considered that elimination of a risk (or part of a risk) is not reasonably practicable, it has been reduced.

This drawing has been based/developed using the following external drawings

Type	Company	Drawing date	Drawing title	Date received	Rev
Site Layout	JGA Architecture	18.01.2021	21022-001-P08-Feasibility Site Layout	05.07.2023	P08
Topographical survey	Utility Mapping	04.04.2023	UM23-1726-MIN-2D West Street, Chatteris_Rev01	12.05.2023	01
OS Data	Utility Mapping	04.04.2023	UM23-1726-MIN-2D West Street, Chatteris_Rev01	12.05.2023	01

Drawing is not to be used for construction until status is CONSTRUCTION

jpp
- Infrastructure Design
- Structural Engineering
- Development Planning
- Professional Advice
- Geotechnical & Environmental
- Surveying

Milton Keynes
T: 01908 889433
Northampton & Poole
E: mail@jppuk.net **W:** jppuk.net

Client: Minster Property Group
Project: West Street Chatteris
Title: Surface Water Exceedance Flow Routing Plan

Scale at A3	Drawn by	Checked by	Date
1:1000	AD	LC	December 2023

Status	Project ref	Drawing no.	Revision
FOR PLANNING	26065	107	-

Appendix N

Anglian Water Pre-Planning Assessment Report

Pre-Planning Assessment Report

West Street, Chatteris

InFlow Reference: PPE-0182786

Assessment Type: Used Water

Report published: 24/11/2023

Thank you for submitting a pre-planning enquiry.

This has been produced for Minster Property Group Ltd..

Your reference number is **PPE-0182786.**

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

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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**
Dwellings	70

The anticipated residential build rate is:

Year	Y1	Y2
Build rate	50	20

Development type: Greenfield

Planning application status: Approved

Site grid reference number: TL3857785227

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)
Sewer mains	300	3.00 m either side of the centre line
Sewer mains	Unknown	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 Chatteris-Nightlayer Fen 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 ermined in reference to the calculated discharge flow and on this basis, a 150mm internal diameter pipe is required to drain the development site. We have assessed your preferred connection point which is to the 300mm combine sewer at 5201 located on site at National Grid reference (NGR)TL3854685278 . The cover level is 0.61 and the invert level is 0.69. 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

You indicated on the Pre-Planning Application form that a connection to the public surface water sewer network is not required. Therefore a capacity assessment has not been made on the public surface water network A new surface water sewer can be used as a mechanism to discharge surface water to a watercourse or as part of a Suds scheme where appropriate. Subject to the sewer being designed in accordance with the current version of Sewers For Adoption, the sewer can be put forward for adoption by Anglian Water under Section 104 of the Water Industry Act 1991. If the outfall is to a watercourse, the applicant will be required to obtain consent to discharge via the appropriate body. However, should this situation change and you wish to have a surface water connection assessment on the local network, then we will provide this free of charge if requested within 12 months of this report and you are able to provide the relevant evidence that your original strategy was unviable.

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

As the proposed method of surface water disposal is not relevant to Anglian Water; we suggest that you contact the relevant Local Authority, Lead Local Flood Authority, the Environment Agency or the Internal Drainage Board, as appropriate.

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 Recyling Infrastructure charge for your dwellings is:

Infrastructure charge	Number of units	Total
£ 400	70	£28,000.00

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 2023-24 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 1:Showing your water recycling foul 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

Encroachment

Anglian Water operates a risk based approach to development encroaching close to our used water infrastructure. We assess the issue of encroachment if you are planning to build within 400 metres of a water recycling centre or, within 15 metres to 100 metres of a pumping station. We have more information available on our website

Locating our assets

Maps detailing the location of our water and used water infrastructure including both underground assets and above ground assets such as pumping stations and recycling centres are available from digdat

All requests from members of the public or non-statutory bodies for maps showing the location of our assets will be subject to an appropriate administrative charge.

We have more information on our website

Charging arrangements

Our charging arrangements and summary for this year's water and used water connection and infrastructure charges can be found on our website

Section 6 - Disclaimer

The information provided in this report is based on data currently held by Anglian Water Services Limited ('Anglian Water') or provided by a third party. Accordingly, the information in this report is provided with no guarantee of accuracy, timeliness, completeness and is without indemnity or warranty of any kind (express or implied).

This report should not be considered in isolation and does not nullify the need for the enquirer to make additional appropriate searches, inspections and enquiries. Anglian Water supports the plan led approach to sustainable development that is set out in the National Planning Policy Framework ('NPPF') and any infrastructure needs identified in this report must be considered in the context of current, adopted and/or emerging local plans. Where local plans are absent, silent or have expired these needs should be considered against the definition of sustainability holistically as set out in the NPPF.

Whilst the information in this report is based on the presumption that proposed development obtains planning permission, nothing in this report confirms that planning permission will be granted or that Anglian Water will be bound to carry out the works/proposals contained within this report.

No liability whatsoever, including liability for negligence is accepted by Anglian Water or its partners, employees or agents, for any error or omission, or for the results obtained from the use of this report and/or its content.

Furthermore, in no event will any of those parties be liable to the applicant or any third party for any decision made or action taken as a result of reliance on this report.

This report is valid from the date issued and the enquirer is advised to resubmit their request for an up to date report should there be a delay in submitting any subsequent application for water supply/sewer connection(s). Our pre-planning reports are valid for 12 months, however please note Anglian Water cannot reserve capacity and available capacity in our network can be reduced at any time due to increased requirements from existing businesses and houses as well as from new housing and new commercial developments.