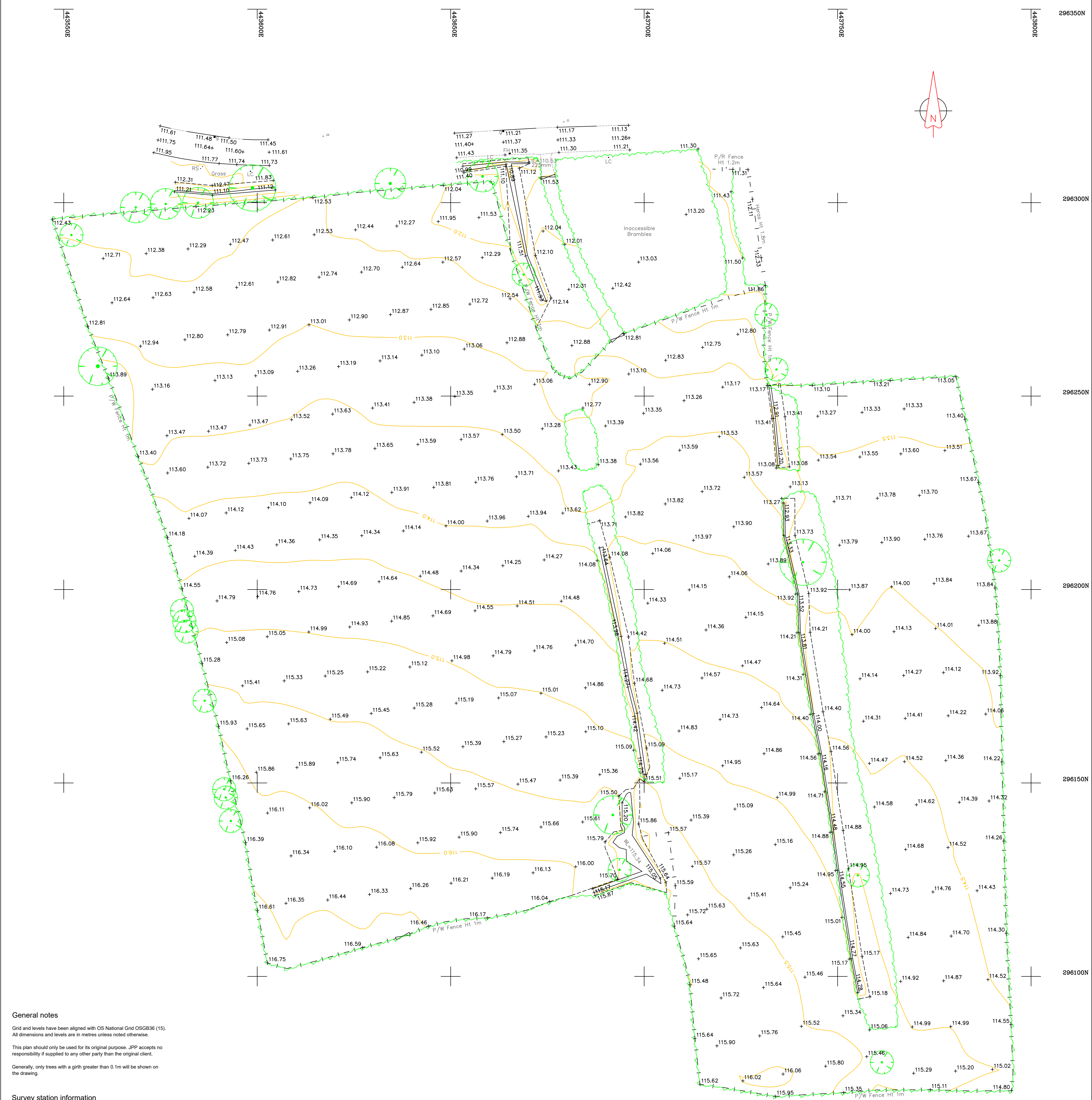




Appendix I – Topographic Survey



General notes

Grid and levels have been aligned with OS National Grid OSGB36 (15).
All dimensions and levels are in metres unless noted otherwise.

This plan should only be used for its original purpose. JPP accepts no responsibility if supplied to any other party than the original client.

Generally, only trees with a girth greater than 0.1m will be shown on the drawing.

Survey station information			
STATION	EASTING	NORTHING	HEIGHT
J1	443679.201	296320.874	111.318
J2	443617.058	296317.149	111.506

Key			
AV	Air Valve	FL	Flood Light
Bol	Bollard	FW	Foul Water
BH	Borehole	g	Gully
BL	Bed Level	GV	Gas Valve
BT	BT Cover	Ht.	Height
CATV	Cable TV Cover	IC	Inspection Chamber
C/B	Close Boarded Fence	IL	Invert Level
C/L	Chain Link Fence	I/R	Iron Railing
CL	Cover Level	ko	Kerb Outlet
Col	Column	LP	Lamp Post
EI	Elec	MH	Manhole
ER	Earth Rod	Mkr	Marker Post
EP	Electricity Pole	O/H	Overhead
FH	Fire Hydrant	PB	Post Box
FL	Floor Level	Po	Post
P/R	Post & Rail Fence	WM	Water Meter
P/W	Post & Wire Fence	wo	Wash Out
RE	Rodding Eye		
RS	Road Sign		
rwp	Rainwater Pipe		
SV	Stop Valve		
svp	Soil & Vent Pipe		
SW	Surface Water		
TL	Traffic Light		
TP	Telegraph Pole		
TW	Top of wall		
utl	Unable To Lift		
VP	Vent Pipe		
WL	Water Level		

Building		Bottom of Bank	
Control Station		Top of Bank	
Tree		Vegetation	
Bore Hole		Change of surface	
Gate		Fence	
		Contours	
		OH Telecom	
		OH Electric	

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- Infrastructure Design
- Structural Engineering
- Planning Services

- Geotechnical & Environmental
- Surveying
- Professional Advice

Drawn By:	JG	Client	Cemetery Developments Ltd.
Chkd By:	TB	Project	Land at Crabtree Farm, Barwell
Scale @ A1:	1:500	Title	Topographical Survey
Date:	15/2/19		
Status:	FOR INFORMATION		
Project No.:	11190Y	Drawing No:	01
		Rev:	

Appendix II – Rural Run-off Calculation

Rural Runoff Calculator

Micro Drainage

ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years)

Area (ha)

SAAR (mm)

Soil

Growth Curve

Partly Urbanised Catchment (QBAR)

Urban

Region

Results

QBAR rural (l/s)

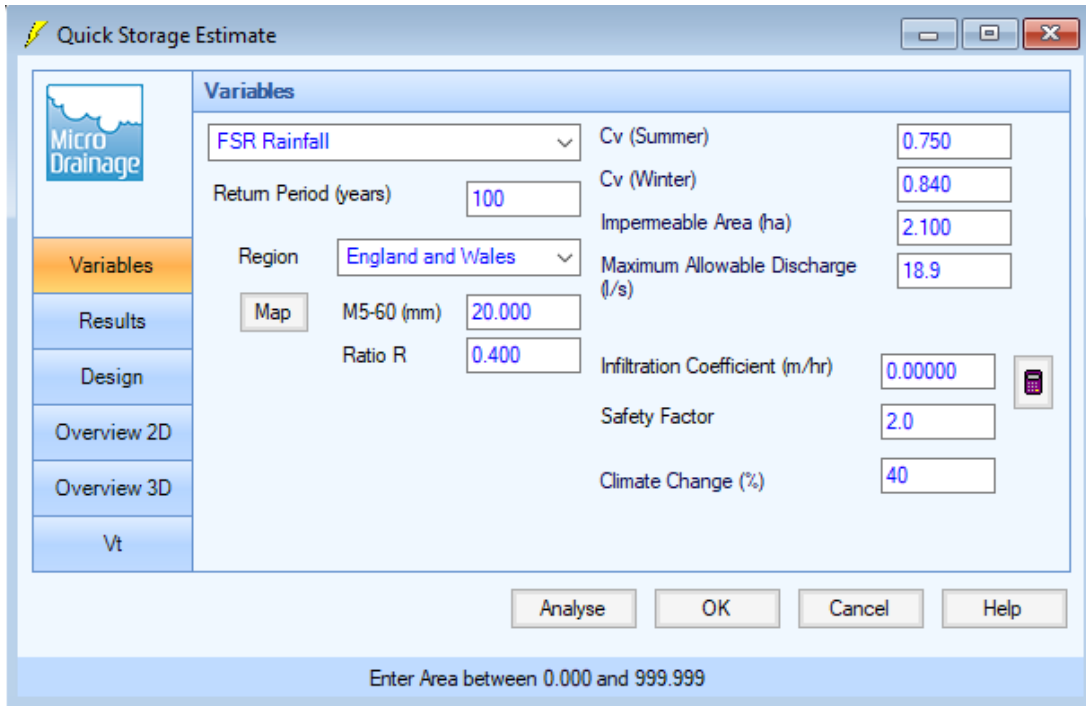
QBAR urban (l/s)

Return Period Flood

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 (l/s)
Region 1	18.9	47.0	16.1	35.8	
Region 2	18.9	49.8	16.5	35.9	
Region 3	18.9	39.4	16.3	33.3	
Region 4	18.9	48.7	15.7	37.1	
Region 5	18.9	67.4	16.5	45.5	
Region 6/Region 7	18.9	60.4	16.1	42.9	
Region 8	18.9	45.8	14.8	36.1	
Region 9	18.9	41.3	16.7	33.4	

Enter Return Period between 1 and 1000

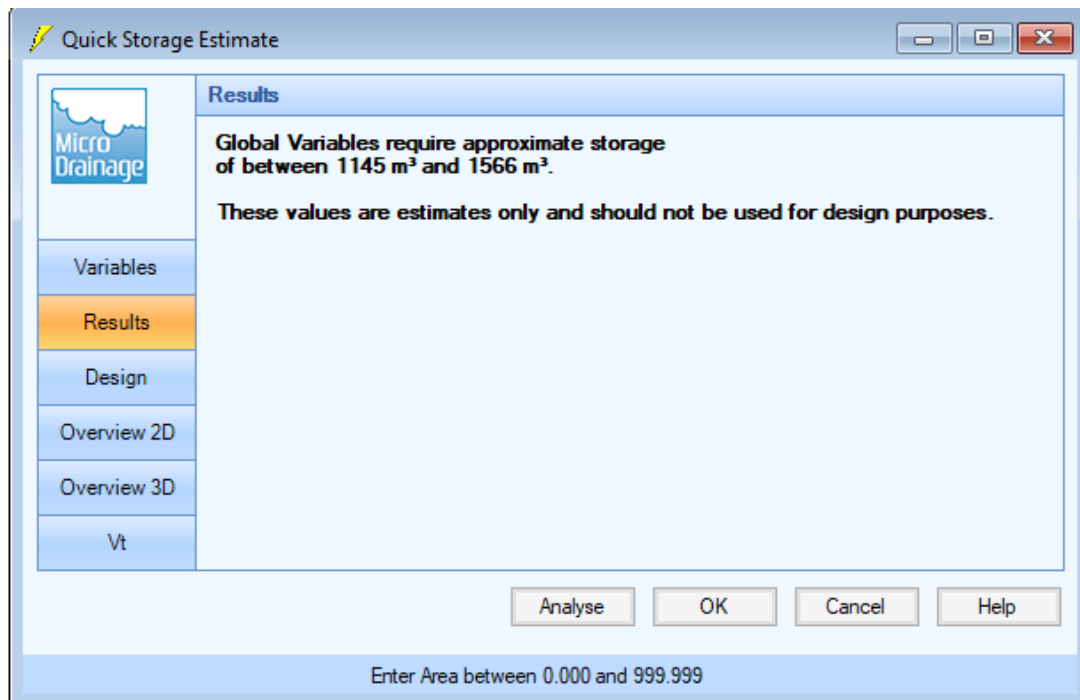
Appendix III – MicroDrainage Flood Storage Estimates



The screenshot shows the 'Variables' tab of the 'Quick Storage Estimate' window. The left sidebar contains buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area contains the following fields:

Field	Value
FSR Rainfall	FSR Rainfall
Return Period (years)	100
Region	England and Wales
Map	M5-60 (mm)
Ratio R	0.400
Cv (Summer)	0.750
Cv (Winter)	0.840
Impemeable Area (ha)	2.100
Maximum Allowable Discharge (l/s)	18.9
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	40

Buttons at the bottom: Analyse, OK, Cancel, Help. A status bar at the bottom reads: Enter Area between 0.000 and 999.999.



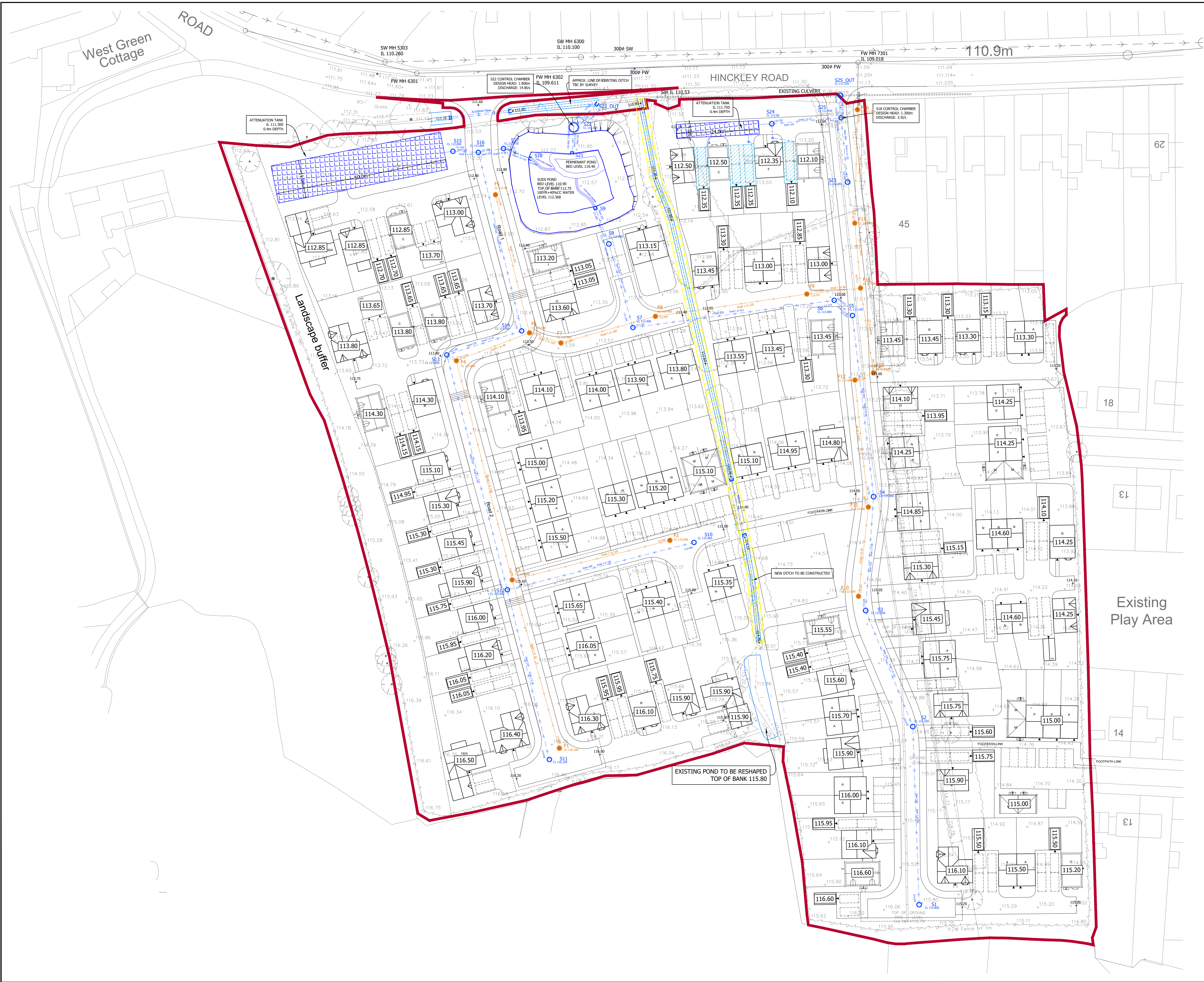
The screenshot shows the 'Results' tab of the 'Quick Storage Estimate' window. The left sidebar contains buttons for Variables, Results, Design, Overview 2D, Overview 3D, and Vt. The main area displays the following text:

Global Variables require approximate storage of between 1145 m³ and 1566 m³.

These values are estimates only and should not be used for design purposes.

Buttons at the bottom: Analyse, OK, Cancel, Help. A status bar at the bottom reads: Enter Area between 0.000 and 999.999.

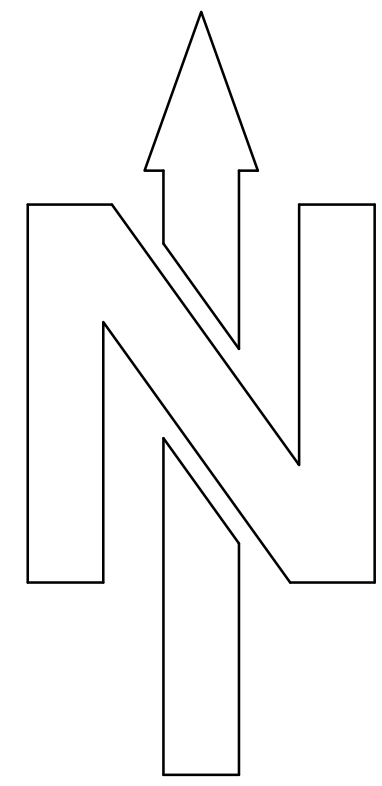
Appendix IV – Surface Water Drainage Strategy



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KEY

- SURFACE WATER SEWER
- FOUL WATER SEWER
- INDICATIVE FLOOR LEVELS
- PERMEABLE PAVING
- PROPOSED EASEMENT
- PROPOSED CULVERTED WATERCOURSE



REV	B	NEW DITCH CENTRE OF SITE, REINSTATED DITCH TO NORTH, REVISED FFL'S NEAR POND	20.06.24	LK	TW
	A	ADDITIONAL PERMEABLE PAVING, EASEMENT FOR WATERCOURSE, BATTERS ON POND ADDED	08.03.24	LK	TW
		DESCRIPTION	DATE	BY	AUTH

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CLIENT FORT ESTATES LIMITED		
PROJECT HINCKLEY ROAD, BARWELL		
TITLE DRAINAGE STRATEGY		
DRAWN LK	AUTHORISED TW	SCALE 1:500@A1
PROJECT NO. 20185		DATE 24.11.23
DRAWING NO. 020		REV B
STATUS PRELIMINARY		



BARWELL CAPITAL LIMITED

**PROPOSED RESIDENTIAL
DEVELOPMENT AT
HINCKLEY ROAD, BARWELL**

**FLOOD RISK ASSESSMENT
AND DRAINAGE STRATEGY**

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		Prepared by	Checked by

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1.0 INTRODUCTION

1.1 Commission

- 1.1.1 Travis Baker Limited have been commissioned by Barwell Capital Limited to prepare a Flood Risk Assessment (FRA) to be submitted with a planning application for the development up to 126 dwellings with associated public open space, landscaping and infrastructure.

1.2 Background

- 1.1.2 In accordance with current Environment Agency guidelines, an FRA must be undertaken for all sites over one hectare, located within in flood zone 1 and any site located in flood zone 2 or greater. The FRA must demonstrate the development will be safe for its proposed lifetime. A suitable FRA will also consider the risk of flooding from sources other than fluvial or tidal, and make an assessment of the potential of the proposed development to increase flooding elsewhere through changes in the generation and management of surface water.
- 1.1.3 This document is based on the best available and most up to date flood risk information provided by the Environment Agency. The Environment Agency's Flood Zone Map, an extract of which is reproduced in Figure 2, shows the site to be located in Flood Zone 1.
- 1.1.4 Areas located within Flood Zone 1 are classified as 'low risk' of flooding from fluvial or tidal sources, and have an associated annual probability of flooding of less than 0.1% (1 in 1000) in any year.

1.3 Flood Risk Assessment Methodology

- 1.1.5 The aim of an FRA is to assess the risks of all forms of flooding to and from a development. The Environment Agency emphasises the need for a risk-based approach to be adopted by Local Planning Authorities through the application of the Source-Pathway-Receptor model. Travis Baker's approach to a flood risk assessment is based on the Source-Pathway-Receptor model.
- 1.1.6 The Source-Pathway-Receptor model firstly identifies the causes or 'sources' of flooding to and from a development. The identification is based on a review of local conditions and consideration of the effects of climate change. The nature and likely extent of flooding arising from any one source is considered, e.g. whether such flooding is likely to be localised or widespread.
- 1.1.7 The presence of a flood source does not always imply a risk. The exposure pathway or 'flooding mechanism' determines the risk to the receptor and the effective consequence of exposure. For example, the presence of a sewer does not necessarily increase the risk of flooding unless the sewer is local to the site and ground levels encourage surcharged water to accumulate.
- 1.1.8 The varying effect of flooding on the 'receptors' depends largely on the sensitivity of the target. Receptors include any people or buildings within the range of the flood source, which are connected to the source by a pathway.
- 1.1.9 In order for there to be a flood risk all the elements of the model must be present. Furthermore, effective mitigation can be provided by removing one element of the model, for example by removing the pathway or receptor.

- 1.1.10 A desk-based review of available information has been undertaken to establish the likely flooding sources and mechanisms for the site. Once the flood risk has been established, mitigation measures are proposed (where necessary) and residual risks explained.

1.4 Aims and Objectives

The aims and objectives of this FRA are as follows:

- Collect and review existing flood risk data including topographical data, surface water drainage strategy, public sewerage records, ground investigation report, scheme proposals and any relevant Strategic Flood Risk Assessments;
- Assess and interpret available information to identify potential sources of flood risk including groundwater, sewers, surface water and infrastructure failure;
- Summarise the proposed surface water drainage strategy to demonstrate that surface water from the site can be managed in a sustainable manner, including appropriate allowances for climate change;
- Provide recommendations for appropriate flood risk mitigation measures (where applicable);
- Produce an FRA to accompany the planning application for the proposed development.

1.5 Sources of Information

1.1.11 The following information has been used to inform the flood study:

- Proposed site layout – A951_05D OVERALL SITE LAYOUT (Geoff Perry Associates)
- Topographical Survey – 11190Y (JPP)
- Environment Agency (EA) Flood mapping data
- Level 1 and 2 Strategic Flood Risk Assessment (Hinckley and Bosworth Borough Council, Blaby District Council and Oadby and Wigston Borough Council)
- Preliminary Flood Risk Assessment (Leicestershire County Council)
- Local Flood Risk Management Strategy (Leicestershire County Council)
- Severn Trent Water Sewer Records
- BGS Geological Data

1.6 Consultees

Organisations consulted during the preparation of this report have included:

- Wastewater Services – Severn Trent Water Ltd (STW)

2.0 SITE SETTING

2.1 Site Description

- 2.1.1 The site is approximately 1km to the southwest of central Barwell. The site is to be accessed from two proposed junctions with Hinckley Road to the north of the site. The site is approximately 4.31ha in size and is currently open grassland with hedged boundaries. The site is currently accessed from the north by track from an existing access off Hinckley Road. The site is bounded by the aforementioned Hinckley Road to the north, existing housing to the east, and further grassland to the south and west.
- 2.1.2 The site location plan in Figure 1 below identifies the site in context with its surroundings.

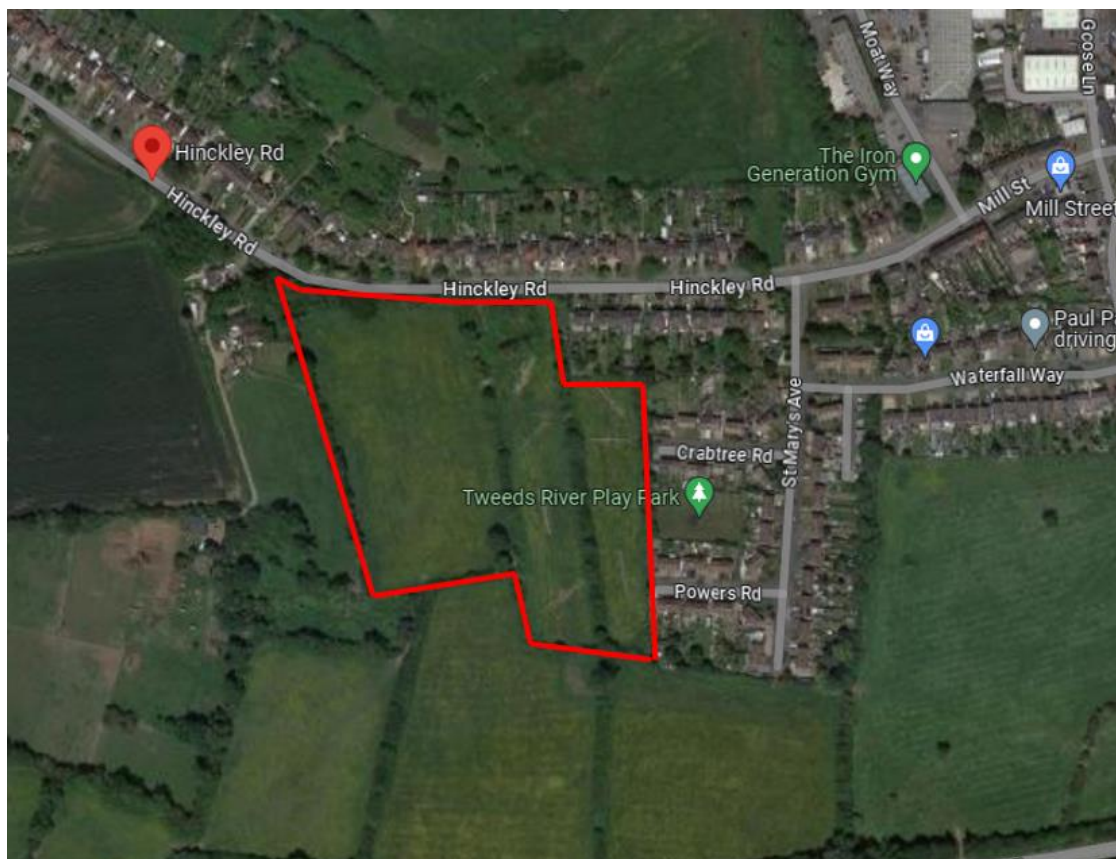


Figure 1 - Site Location Plan (Site boundary indicated in red)

2.2 Topography

- 2.2.1 A site-specific topographical survey has been undertaken and is included within Appendix I of this report. The site falls generally from south to north and west to east. The highest level of approximately 116.75m AOD is found at the south western corner of the site and the lowest level of approximately 111.10m AOD is found on the north eastern corner.

2.3 Local Drainage Features

- 2.3.1 There is an existing ditch running along the northern boundary of the site just south of Hinckley Road, which is culverted at points. Collected run-off flows eastwards under Hinckley Road and discharges to the tributary of the Tweed River under Mill Street. This flows northwards where it joins the Tweed River near Stapleton Lane.

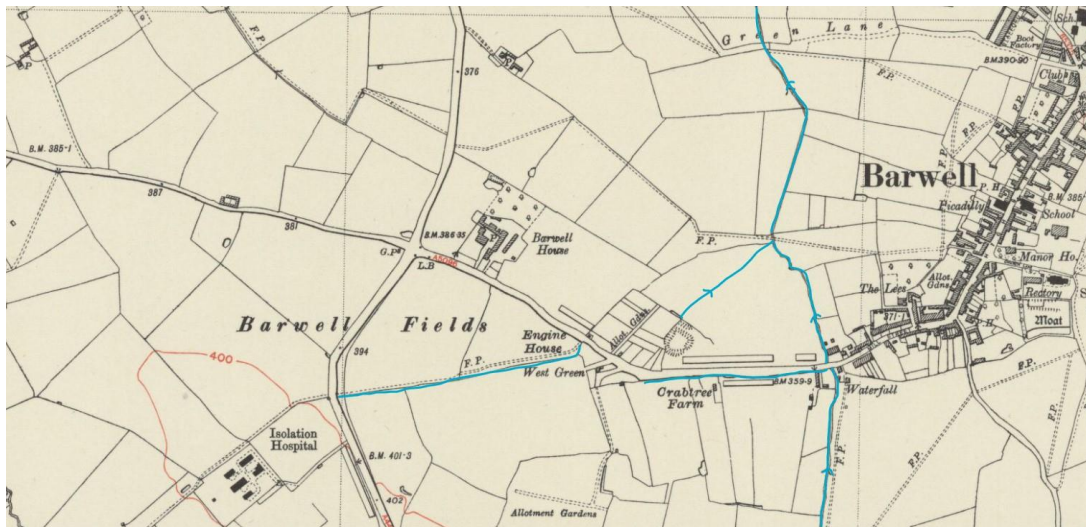


Figure 2 - Extract from 1936 Historic Maps indicating watercourses prior to major development in Barwell

- 2.3.2 There is existing drainage infrastructure under the existing Hinckley Road to the north of the site. This includes both surface and foul water sewers. These both run west to east.
- 2.3.3 There are no main rivers (As defined by the EA) within close proximity to the site.

2.4 Proposed Development

- 2.4.1 The proposal is for the construction of up to 126 new residential dwellings. The scheme involves formation of two new access onto Hinckley Road and new estate roads to serve the new properties. The proposed site layout is shown in Appendix V.

3.0 FLOOD RISK PLANNING POLICY

3.1 National Planning Policy Framework (NPPF)

- 3.1.1 The NPPF sets out the government's national planning policy for consideration of aspects of flood risk for new developments. To support the NPPF, a technical guidance document has also been published to ensure the NPPF is effectively implemented.
- 3.1.2 The technical guidance document classifies different forms of development into higher or lower levels of vulnerability depending on the perceived consequences of being flooded. Policy outlines the types of development that may be permitted in areas of differing levels of flood risk. Details of the vulnerability classification for different types of development are listed below.

Vulnerability Classification	Development Type
Essential Infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly Vulnerable	Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure")
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 sites 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.
Less Vulnerable	Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water Compatible	Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

3.2 Sequential Test and Exceptional Test

- 3.2.1 The Sequential Test is designed to steer new development to areas with the lowest probability of flooding. The exercise compares the Flood Zone of the development area (as discussed in Section 1) against the vulnerability classification of the type of development.
- 3.2.2 The vulnerability classifications previously outlined indicates that the development type can be classified as 'More Vulnerable'.
- 3.2.3 The following table summarises the types of development that can be considered appropriate for any given Flood Zone.

	Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	x	Exception Test required	✓
	Zone 3b	Exception Test required	✓	x	x	x

- ✓ Appropriate development
x Development should not be permitted

- 3.2.4 As the site is classed as More Vulnerable and located within Flood Zone 1 it can be considered as appropriate for development. Therefore, the requirement to undertake the Sequential Test and Exceptional Test need not apply.



Figure 3 - Flood Zone Map. Flood Zone 3 shown in dark blue, Flood Zone 2 in light blue and site location marked

4.0 FLOOD RISK – TO DEVELOPMENT

4.1 Fluvial Flood Risk

- 4.1.1 Current guidance requires that all potential sources of flooding that could affect the proposed development are considered. The current Environment Agency's Flood Zone Map for the site, provided as Figure 2 within the report, indicates that the site lies within Flood Zone 1. The definitions of each zone are outlined in table 4-1.

Table 4-1: Flood Zone Definitions

Flood Zone Definitions		
Flood Zone 1	Low Probability – less than 1 in 1000 annual probability of river or coastal flooding	Appropriate for all land uses
Flood Zone 2	Medium Probability – between 1 in 100 and 1 in 1000 annual probability of river flooding or 1 in 200 and 1 in 1000 annual probability of coastal flooding	Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses are appropriate in this zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.
Flood Zone 3a	High Probability – having a greater than 1 in 100 year annual probability of river flooding or 1 in 200 year probability of coastal flooding.	The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.
Flood Zone 3b	Functional Floodplain - having a greater than 1 in 20 year annual probability of river flooding or 1 in 200 year probability of coastal flooding	Only the water-compatible uses and essential infrastructure that has to be there should be permitted in this zone. It should be designed and constructed to: • remain operational and safe for users in times of flood; • result in no net loss of floodplain storage; • not impede water flows; and • not increase flood risk elsewhere. Essential infrastructure in this zone should pass the Exception Test.

- 4.1.2 As the site has probability of annual flooding from fluvial sources of less than 1 in 1000 or 0.1%. The site can be considered to be at a very low risk.

4.2 Tidal Flood Risk

- 4.2.1 As the site is not coastal or in a low-lying area, the risks of tidal flooding have been discounted for the purposes of this assessment.

4.3 Pluvial Flood Risk

- 4.3.1 In assessing the flood risk to development site, consideration shall be given to the risk of flooding from overland run-off in the event that the local drainage networks capacity is exceeded.

Figure 3 below indicates the perceived risk to the site based on pluvial flood map data obtained from the Environment Agency. The extract indicates an existing flood route through the centre of the site running south to north. The extent of pluvial flooding is shown to be of moderate

severity throughout these areas. Given the above, the pluvial flood risk is therefore considered to be moderate.

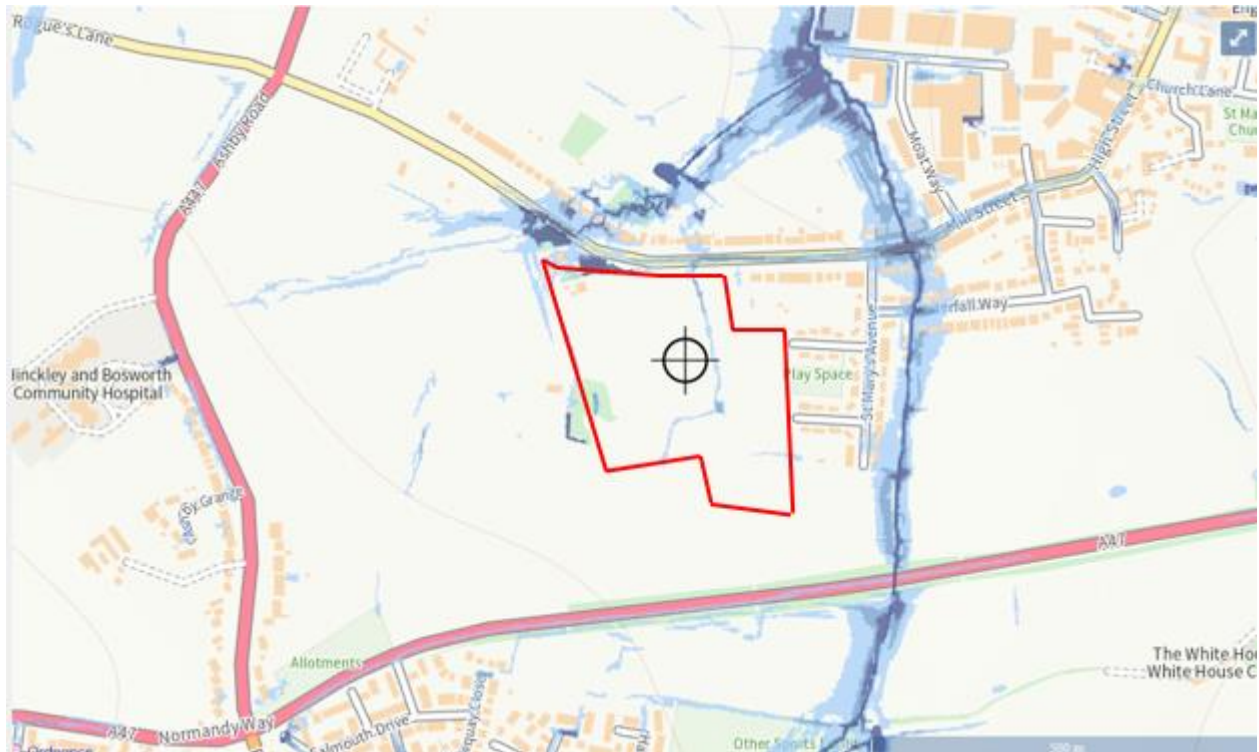


Figure 4 - Extract from EA Surface Water Flood Risk Maps, Darker Blue indicates more severe flooding. Site boundary in red.

4.4 Groundwater Flood Risk

- 4.4.1 Sites susceptible to flooding from groundwater after prolonged or intensive bouts of rain are likely to be in low lying areas, overly aquifers or on steeply sloped sites prone to groundwater seepage.
- 4.4.2 Hinckley and Bosworth Borough Council SFRA designates the site to be within an area within the <25% susceptible groundwater flooding classification due to the lower permeability of the bedrock. Therefore, the risk of groundwater flooding is considered to be low.
- 4.4.3 This leads to the conclusion that there is low risk of Groundwater flooding.

4.5 Flood Risk from Artificial Sources

- 4.5.1 Artificial flood sources included raised channels such as canals or storage features such as ponds and reservoirs. Flood Data obtained from the Strategic Flood Risk Assessment indicate that there is no overt risk to the site from flooding from artificial sources.
- 4.5.2 Flood data for reservoirs breaches is prepared by the EA and indicates the worst case flood extent in the case of catastrophic failure although reservoirs are well maintained and breaches are extremely rare. Given the above, the risk of flooding from reservoirs is considered to be extremely low.

4.6 Flood Risk from Sewers

- 4.6.1 There are sewers present within Hinckley Road to the north of the site. Despite this close proximity, the risk of sewer flooding affecting the site is low given that the topography shows the site to slope up from the road.
- 4.6.2 Modern drainage systems are designed to accommodate the 1 in 30 year annual probability storm event, therefore in any storms greater than this sewers can be expected to surcharge. However, older sewer systems were not subject to these design standards (introduced by Sewers for Adoption) and the risk of flooding from such systems is difficult to quantify.
- 4.6.3 Severn Trent Water (STW) is responsible for the management of urban drainage and sewerage within the Barwell area. Details of specific flooding incidents on the public sewerage network cannot be obtained as part of data gathering for Site Specific Flood Risk Assessments due to the rights of the affected property owners being respected under the terms of the Data Protection Act. That said, it is important to highlight that this is not a measure of risk, and sewer failure may occur at any point within the underground system. It is highlighted that issues associated with failures of the underground drainage/sewer systems are often relatively localised and should not preclude development.
- 4.6.4 Given that there are no existing sewers located within the site, there is no overt perceived risk of flooding. The flood risk from sewers is therefore considered to be low.

4.7 Summary

The table below summarises the potential risk to the development from sources outside of the site prior to any mitigation measures.

Potential Sources of Flooding	Flood Risk				Description
	Low	Moderate	High	None	
Fluvial	x				Located in Flood Zone 1
Tidal				x	Inland site
Pluvial		x			There is evidence of surface water flood routing through the site.
Groundwater	x				Groundwater flooding risk indicated as low by SFRA
Artificial Sources	x				No artificial sources are in close proximity to site.
Sewers	x				No sewers are located within the site

5.0 FLOOD RISK – FROM DEVELOPMENT

5.1 Current Policy

- 5.1.1 Current Policy states that as well as assessing the risk to a development, a suitable flood risk assessment should consider the risk of flooding arising from a development.
- 5.1.2 The surface water arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development unless specific off-site arrangements are made and result in the same net effect.

5.2 Climate change

- 5.2.1 The design of the storm water system will need to take into account the anticipated increase in rainfall intensity as well as the piped drainage system. In accordance with the table below, design flows have been increased by 40% to accommodate the anticipated effects of climate change. Provision is therefore made to manage the risk of climate change in accordance with current government guidance.
- 5.2.2 Table 5-1: Recommended national precautionary sensitivity ranges for peak rainfall intensities for small and urban catchments.

Applies across all of England	2015-2039	2040 - 2069	2070-2115
Upper End	10%	20%	40%
Central	5%	10%	20%

5.3 Existing Surface Water Runoff

- 5.3.1 The site has significant falls with run-off directed toward the northern boundary of the site. As it stands, the site will generate run-off rates equivalent to greenfield rates.
- 5.3.2 Run-off from the site will naturally migrate to the northern boundary. A CCTV survey has been undertaken to understand the condition of the existing culverted watercourse under Hinckley Road. The survey was unable to be completed for the full extent due to restricted access, however the surveyed extent was found to be in good condition and free of obstructions. A copy of the CCTV survey can be found in Appendix X of this report
- 5.3.3 Other surface water drainage features on the western and southern boundaries direct run-off away from the site and therefore have no impact upon the development drainage strategy.

5.4 Proposed Surface Water Management Principles

- 5.4.1 New surface water drainage provision will need to be made for all new dwellings and the associated highway infrastructure and under the requirements of the Building Regulations, disposal of surface water run-off by means of ground infiltration shall be investigated as a primary means of disposal before any outfall to a watercourse or sewer shall be considered.
- 5.4.2 BGS Bedrock Geology records indicate that the site is underlain by Mercia Mudstone, a largely impermeable material. This indicates that surface water discharge via Infiltration will not be feasible. Any in-situ soil testing undertaken at the site shall make an assessment of the soil porosity to confirm this.
- 5.4.3 The drainage strategy for the site proposes to integrate sustainable drainage features with traditional drainage systems for buildings and roads. This includes the use of an attenuation basin in the north of the site with adequate low flow routing and an underground tank.
- 5.4.4 In accordance with the planning policy, the new development shall ensure that development run-off into the existing watercourse downstream of the alterations shall not exceed existing greenfield conditions. Using the Interim Code of Practice for SUDS recommendations (ICP SUDS) of pro-rata rates based upon the calculation methodology outlined in IH 124 Flood Estimation for Small Catchments, predicted run-off rates for the site are as follows:
- 5.4.5 Details of the calculation criteria for QBAR for the developed area are detailed in Appendix II, giving the following outputs;

QBAR (l/s)	Q 1 year (l/s)	Q 100 year (l/s)
18.9	15.7	48.7
Where Q= Peak Flow Rate		

- 5.4.6 For the purposes of this assessment, the development drainage strategy included within Appendix IV of this report ensures that peak flows downstream of the proposed alterations to the existing watercourse shall be limited to the sum of QBAR rates for the developed land for all design storms up to and including critical storms for the 1 in 100 year return period (plus an allowance for climate change).
- 5.4.7 The discharge of the surface water shall be split into 2 outfalls to accommodate for levels on site. The discharge rate to the watercourse will be 15.4l/s and an additional outfall to serve a small number of plots will be made downstream into the culvert at 3.5l/s.

Return Period (yr)	Peak Discharge Restriction (l/s)	Attenuation Volume (m ³)
@100yr+40%cc	18.9	1566

- 5.4.8 The table above indicates the estimated attenuation volumes required for a site outfall with a rate restricted to the QBAR equivalent. The storage requirements are based on a 2.1Ha impermeable area calculated from the site layout. Any detailed proposal that stages out flow rates to the 1, 30 and 100 year equivalents shall demonstrate that the development includes

sufficient long term storage to ensure that run-off volumes do not increase the flood risk to the surrounding area. Details of the estimated attenuation volumes are detailed in Appendix III of this report.

- 5.4.9 Sewers serving multiple properties are to be offered for adoption by STW subject to their design and construction to water company standards. The attenuation basin will be offered for adoption by Severn Trent Water.
- 5.4.10 Surface levels shall be designed to ensure that run-off is not directed toward properties or off site in the event that the drainage system fails or its design capacity is exceeded. Exceedance flows shall be directed toward the attenuation feature at the natural low point of the site, ensuring that the flood volumes generated by critical storm events for the 1 in 100 year return period, plus climate change allowance shall be retained on site and not impose a flood risk to any property.
- 5.4.11 The existing pluvial flood route through the centre of the site will be modified given the changes in ground levels when forming the roads and plot levels. The development drainage system will ensure that exceedance flood routes are managed and that new properties are not at risk in the event of failure of the drainage system.
- 5.4.12 The majority of the development drainage system is to outfall to the existing watercourse to the north side of the site, just south of Hinckley Road. The development proposals ensure that the nature and behaviour of the surface water drainage replicates that of the pre-developed site.
- 5.4.13 There will be a second outfall into the culvert adjacent to Hinckley road to accommodate a small number of plots in which levels dictate they cannot discharge into the watercourse.

5.5 Proposed Foul Drainage

- 5.5.1 All new properties will be drained via gravity to the existing STW foul water sewer under Hinckley Road given the topography and its relationship to the available outfall from the site. Approval for connection to the public sewerage network shall be sought from Severn Trent Water via a Section 106 application under the terms of the Water Industry Act 1991.

6.0 RESIDUAL RISK

The need to manage residual risks is identified within current guidance. Residual risks are the risks to the proposed development should the existing and/or proposed flood mitigation measures fail to perform as intended. Examples of residual flood risk include:

- The failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, failure of a flap-valve, overtopping of an upstream storage area, or failure of a pumped drainage system;
- A severe flood event that exceeds a flood management design standard.

6.1 Assessment of Flooding Consequences

- 6.1.1 It is considered that the measures described in Section 5.4 provide adequate protection against flooding. In the unlikely event that an extreme rainfall event exceeds the capacity of the rainwater collection systems, ground modelling will ensure that overland flows are directed away from the buildings. Wherever applicable, external levels shall generally be 150mm lower than finish floor levels at ground floor.
- 6.1.2 Although risk of groundwater flooding is considered to be low, some consideration of groundwater should be made in the development drainage strategy wherever retaining structures are proposed.
- 6.1.3 It is therefore considered that the consequences of flooding and the possibility of flooding are minimal and acceptable within the standards set.

6.2 Access and Egress

- 6.2.1 Current guidance required that, where required, safe access and escape is available to/from new developments in flood risk areas.
- 6.2.2 As the development affected area is situated within flood zone 1 and is of a type compatible with this flood zone, and therefore not at risk of flooding from any watercourse, dry access has not been considered in further detail.

7.0 CONCLUSIONS

Following the completion of this flood risk assessment, in line with the recommendations of current guidance, the following conclusions can be made:

7.1 Flood Risk – To Development

- 7.1.1 This flood risk assessment concluded that the proposed development is at a low risk of flooding from tidal, fluvial, overland flow, drainage flooding, groundwater flooding and flooding from artificial sources. Under normal circumstances the site is at low risk of flooding as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).

7.2 Flood Risk – From the Development

- 7.2.1 The proposed development represents an increase in impermeable, positively drained areas over the pre-development condition. Flood risk to the site and the surrounding area would increase without the mitigation measures proposed in Section 7.3 being put in place.

7.3 Flood Mitigation Measures

- 7.3.1 The proposed development will discharge to the local drainage network at rates equivalent to greenfield conditions. The surface water drainage system shall be designed to ensure that flood storage volumes are retained onsite for critical storm events up to the 1 in 100-year return period plus an allowance for the effects of climate change.
- 7.3.2 To further mitigate the flood risk to properties in the event of a failure within in the drainage system, surface levels will be designed to ensure that flood flows are not directed toward dwellings. The design shall make due consideration of the existing surface water flow paths from off site that traverse to study site. External levels surrounding dwellings shall generally 150mm below ground floor levels.
- 7.3.3 The attenuation basin is to include a permanent pond and adequate low flow channels to allow for de-sedimentation of any collected run-off. This will ensure that the proposals will provide the two stages of treatment required by C753 SUDS Manual. The treatment provided from these features is assessed in Appendix VII where the treatment is shown to be adequate according to the Simple Index Approach described with the aforementioned C753 SUDS Manual.
- 7.3.4 The development drainage system is to have a controlled outfall to the existing watercourse just south of Hinckley Road. The development proposals ensure that the nature and behaviour of the surface water drainage replicates that of the pre-developed site.

7.4 Residual Risk – Flood Consequences

- 7.4.1 It is considered that the proposed development will not result in any detrimental impact onto the existing surrounding properties.
- 7.4.2 It is considered that the proposed drainage scheme will neither result in nor cause an increase of flood risk to surrounding properties or the development site.
- 7.4.3 It is therefore considered that Planning Consent should not be withheld on flood risk grounds.



Appendix V – Site Layout

Appendix VI – SuDS Maintenance Plan

DRAINAGE MANAGEMENT STATEMENT – HINCKLEY ROAD, BARWELL

The purpose of this document is to outline the implementation, adoption, maintenance and management of the sustainable drainage system proposed for the residential scheme at Hinckley Road, Barwell – Planning Reference 21/000695/FUL

1.0 Summary of drainage components at Hinckley Road, Barwell

As outlined in the Travis Baker Flood Risk Assessment reference 20185-1 and shown within the Drainage Strategy in Appendix IV of the FRA, surface water is to be drained via adoptable gravity sewers with topography toward the north end of the site. Surface water attenuation is proposed to be provided for this network in the form of an attenuation basin, an underground attenuation tank and oversized pipework if necessary. The network is proposed to discharge into the existing Severn Trent surface water sewer under Hinckley Road at greenfield rates. Calculations for the equivalent greenfield runoff rate for the site and required attenuation volumes can be found in the aforementioned Travis Baker Flood Risk Assessment.

The foul water network is to consist of gravity sewers connecting to the existing Severn Trent foul water sewer under Hinckley Road. The details of the proposed foul water network are outlined within the Flood Risk Assessment and shown in the Drainage Strategy in Appendix IV of the report.

2.0 Adoptable drainage network

The surface water and foul water networks are both to be adopted by Severn Trent. As such, the network should be designed and constructed to comply with the latest sewerage sector guidance ('DCG' 2020) to ensure its adoptability.

It is proposed for the networks to be offered for adoption under an agreement made pursuant to section 104 of the Water Industry Act 1991. Responsibility for maintenance and management of the network from point of adoption will lie with Severn Trent.

Connections are proposed to be made to the existing network under Section 106 of the Water Industry Act 1991.

3.0 Attenuation Basin

The proposed attenuation basin has been sized to attenuate all design events up to the 100 year + 40% Climate Change event to ensure that surface water discharge from the development does not exceed the equivalent greenfield rate for all events up to this.

The attenuation basin will be offered up for adoption to Severn Trent. If adoption of the basin is found by Severn Trent to be unfeasible, it will be maintained by a private management company for the development.

An outline of required maintenance activities for the basin and frequencies for these activities is provided within Appendix I of this document.

4.0 Underground Attenuation Tank

The proposed attenuation tank may be offered for adoption by Severn Trent. If so, any product used will be pre-approved by Severn Trent. Responsibility for maintenance and management of the tank from point of adoption will lie with Severn Trent. If the tank is not to be offered for

adoption, it will be managed and maintained by a private management company for the development

APPENDIX I – SUDS MAINTENANCE PLAN

SUDS MAINTENANCE PLAN – HINCKLEY ROAD, BARWELL

The purpose of this document is to provide concise and easy to follow guidance for the management of the site-specific SuDS features. It is the responsibility of the managing authority to ensure that these features are adequately maintained and that the drainage system upon which it relies are not unduly compromised by a failure to do so.

1.0 An introduction to sustainable drainage systems or SuDS

SuDS are an environmentally friendly approach to managing rainfall that uses landscape features to deal with surface water. SuDS aim to:

- Control the flow, volume and frequency of water leaving a development area
- Prevent pollution by intercepting silt and cleaning runoff from hard surfaces
- Provide attractive surroundings for the community
- Create opportunities for wildlife

2.0 SuDS at Hinckley Road

The SuDS are designed to prevent flooding of the development and control the flow of water from the site drainage system.

- The attenuation ponds are largely designed to be predominantly dry in normal conditions with exception for an area of permanent pond upstream of the outfall headwall and a low flow channel through the basin.
- Low flows are directed into the permanent pond areas before being discharged through the gravity outfall into the existing STW sewers at controlled rates.
- The basins have been designed to cater for all critical storm events up to the 100-year return period plus a 40% allowance for climate change.

3.0 Managing the SuDS

The SuDS at Hinckley Road have been designed for easy maintenance to comprise:

- **Regular day to day care** - litter collection, grass cutting and checking the inlets and outlets where water enters or leaves the SuDS feature
- **Occasional tasks** - managing pond vegetation, removal of weeds or management of permeable paving, and removing any silt that builds up in the SuDS features
- **Remedial work** - repairing damage where necessary.

4.0 Maintenance Regime Summary

	Drainage Mechanism	Minimum Frequency of Maintenance
REGULAR MAINTENANCE	Litter Management	Monthly visits to collect all litter or other debris and remove from site at each site visit.
	Grass Maintenance	Monthly visits to mow grass access paths and verges surrounding basins, ponds and wetlands areas at 35mm-50mm min. and 75mm max. or as specified to provide a cared for appearance and allow pedestrian access. Mow rough grass areas for occasional access or habitat reasons at 100mm and maximum 150mm with cuttings removed to wildlife piles, as required 4-6 times annually Grass areas not required for access may be managed for wildlife interest and to reduce costs. Annually or as required 2 cuts in July and September or 1 cut annually in September or October as specified and cuttings removed to wildlife piles.
	Inlet and Outlet Headwalls	Inspected monthly or after intense storms. Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris.
OCCASIONAL TASKS	Pond Vegetation	Annually cut (strim) at 100mm with cuttings removed to wildlife piles September - October or Maintain as a mosaic to be cut 25-30% in any one year at 100mm in September or October with cuttings removed to wildlife pile. Annually, or after prolonged periods of extreme events, embankments around the ponds should be checked for erosion and other issues that may stop them from functioning as required. If this is the case maintenance should then be carried out immediately, i.e. reseeding or re-turfing, to ensure these areas of embankment are working as expected and do not increase the risk to any adjacent properties. Stabilise and mow contributing and adjacent areas – As required.
	Silt Management	Annually or every 3 years as required. Where silt accumulates on apron or area in front of inlet or outlet then remove and land apply within design profile of SuDS. Where silt accumulates more than 150mm in base of permanent pond undertake a phased removal of silt subject to Client approval. Remove silt as instructed but not more than 30% of pond or wetland area at any one time and to an agreed depth but not subsoil layer. Retain as much representative existing vegetation as possible to ensure rapid re-colonisation of open areas. Stack excavated material adjacent to wetland to allow de-watering of silt. Undertake silt removal during September-October to minimise damage to protected wildlife and ensure re-growth of

		aquatic vegetation before winter.
		Spread excavated material on site above SUDS design profile, e.g. top of banks, in accordance with E.A. Waste Exemption Guidance.
REMEDIAL WORK	Pond	Repair erosion or other damage as required. Replant, where necessary – as required. Aerate pond when signs of eutrophication are detected – as required. Realign rip-rap or repair other damage – as required. Repair/rehabilitate inlets, outlets and overflows – as required.

5.0 Spillage – Emergency Action

Most spillages on development sites are on or in construction compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system.

Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.)

Contact the Environment Agency immediately.

Appendix VII – Water Quality Assessment – Simple Index Approach

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type Pollution Hazard Level Pollution Hazard Indices TSS Metals Hydrocarbons	Roads (excluding low traffic roads, highly frequented lorry approaches to industrial estates, trunk roads/motorways) Medium 0.7 0.6 0.7				
SuDS components proposed					
Component 1	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Ponds/wetlands should be preceded by an upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events		
Component 2	Pond or wetland				
Component 3	None				
SuDS Pollution Mitigation Indices TSS Metals Hydrocarbons	 0.85 0.85 0.85				
Groundwater protection type Groundwater protection Pollution Mitigation Indices TSS Metals Hydrocarbons	None 0 0 0				
Combined Pollution Mitigation Indices TSS Metals Hydrocarbons Acceptability of Pollution Mitigation TSS Metals Hydrocarbons	 0.85 0.85 0.85 Sufficient Sufficient Sufficient	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			

Appendix VIII – Surface Water Network Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	9.900
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.116	5.00	115.800	1500	443746.056	296076.293	1.725
2	0.116	5.00	115.350	1500	443744.221	296127.901	1.725
3	0.116	5.00	115.050	1500	443730.552	296161.518	1.725
4	0.116	5.00	114.500	1500	443732.854	296194.521	1.725
5	0.116	5.00	113.100	1500	443726.715	296247.007	1.725
6	0.116	5.00	113.000	1500	443721.429	296251.406	1.725
7	0.116	5.00	113.400	1500	443662.726	296245.073	2.250
8	0.116	5.00	112.850	1500	443656.118	296267.765	1.750
9			112.650	1500	443652.357	296277.731	1.600
10	0.116	5.00	114.400	1500	443680.789	296181.252	1.500
11	0.116	5.00	116.100	1500	443638.876	296118.362	1.650
12	0.116	5.00	115.600	1500	443626.693	296167.544	3.084
13	0.116	5.00	113.800	1500	443609.159	296235.609	1.650
14	0.116	5.00	113.500	1500	443630.846	296242.554	1.725
15	0.116	5.00	112.800	1500	443610.919	296294.586	1.500
16	0.116	5.00	112.800	1500	443618.284	296294.286	1.550
17	0.116	5.00	112.750	1500	443625.585	296295.402	1.625
18	0.116	5.00	112.750	1500	443637.802	296290.797	1.700
21			112.750	1500	443645.490	296294.434	1.850
22			112.750	3000	443645.983	296301.771	1.900
22_OUT			112.000	1500	443652.318	296307.895	1.200
23	0.058	5.00	112.000	1200	443725.310	296285.680	1.600
24	0.058	5.00	112.000	1200	443699.264	296302.216	1.250
25			111.550	1200	443723.420	296304.319	1.300
25_OUT			111.250	1200	443723.157	296311.841	1.050

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	51.641	0.600	114.075	113.625	0.450	114.8	525	5.41	50.0
1.001	2	3	36.290	0.600	113.625	113.325	0.300	121.0	525	5.71	50.0
1.002	3	4	33.083	0.600	113.325	112.775	0.550	60.2	525	5.90	50.0
1.003	4	5	52.844	0.600	112.775	111.375	1.400	37.7	525	6.14	49.8
1.004	5	6	6.877	0.600	111.375	111.275	0.100	68.8	525	6.18	49.7
1.005	6	7	59.044	0.600	111.275	111.150	0.125	472.3	525	7.14	46.3
1.006	7	8	23.635	0.600	111.150	111.100	0.050	472.7	525	7.53	45.0
1.007	8	9	10.652	0.600	111.100	111.050	0.050	213.0	525	7.65	44.7
1.008	9	21	18.060	0.600	111.050	110.900	0.150	120.4	525	7.79	44.3
2.000	10	12	55.806	0.600	112.900	112.516	0.384	145.3	450	5.55	50.0
3.000	11	12	50.668	0.600	114.450	112.516	1.934	26.2	525	5.19	50.0
2.001	12	13	70.287	0.600	112.516	112.150	0.366	192.0	525	6.28	49.3
2.002	13	14	22.772	0.600	112.150	111.775	0.375	60.7	525	6.41	48.8
2.003	14	16	53.235	0.600	111.775	111.250	0.525	101.4	525	6.81	47.4
4.000	15	16	7.371	0.600	111.300	111.250	0.050	147.4	525	5.07	50.0
2.004	16	17	7.386	0.600	111.250	111.125	0.125	59.1	525	6.85	47.2
2.005	17	18	13.056	0.600	111.125	111.050	0.075	174.1	525	6.98	46.8
2.006	18	21	8.505	0.600	111.050	110.900	0.150	56.7	525	7.03	46.6
1.009	21	22	7.354	0.600	110.900	110.850	0.050	147.1	525	7.86	44.1
1.010	22	22_OUT	8.811	0.600	110.850	110.800	0.050	176.2	525	7.95	43.8
6.000	23	25	18.735	0.600	110.400	110.250	0.150	124.9	300	5.22	50.0
5.000	24	25	24.247	0.600	110.750	110.325	0.425	57.1	225	5.23	50.0
5.001	25	25_OUT	7.527	0.600	110.250	110.200	0.050	150.5	300	5.33	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.090	452.4	15.7	1.200	1.200	0.116	0.0	66	0.998
1.001	2.035	440.6	31.4	1.200	1.200	0.232	0.0	94	1.199
1.002	2.891	625.9	47.2	1.200	1.200	0.348	0.0	96	1.732
1.003	3.653	790.9	62.7	1.200	1.200	0.464	0.0	99	2.223
1.004	2.703	585.2	78.1	1.200	1.200	0.580	0.0	128	1.907
1.005	1.024	221.6	87.3	1.200	1.725	0.696	0.0	228	0.965
1.006	1.023	221.5	99.1	1.725	1.225	0.812	0.0	246	0.996
1.007	1.530	331.3	112.4	1.225	1.075	0.928	0.0	210	1.388
1.008	2.040	441.6	111.3	1.075	1.325	0.928	0.0	179	1.712
2.000	1.684	267.8	15.7	1.050	2.634	0.116	0.0	73	0.938
3.000	4.388	949.9	15.7	1.125	2.559	0.116	0.0	46	1.682
2.001	1.613	349.1	46.5	2.559	1.125	0.348	0.0	128	1.136
2.002	2.878	622.9	61.4	1.125	1.200	0.464	0.0	110	1.862
2.003	2.224	481.4	74.5	1.200	1.025	0.580	0.0	138	1.632
4.000	1.842	398.8	15.7	0.975	1.025	0.116	0.0	70	0.912
2.004	2.917	631.6	104.0	1.025	1.100	0.812	0.0	143	2.180
2.005	1.694	366.8	117.7	1.100	1.175	0.928	0.0	204	1.516
2.006	2.979	644.8	132.0	1.175	1.325	1.044	0.0	160	2.365
1.009	1.844	399.3	235.5	1.325	1.375	1.972	0.0	290	1.917
1.010	1.684	364.5	234.2	1.375	0.675	1.972	0.0	307	1.783
6.000	1.405	99.3	7.9	1.300	1.000	0.058	0.0	57	0.847
5.000	1.735	69.0	7.9	1.025	1.000	0.058	0.0	51	1.166
5.001	1.279	90.4	15.7	1.000	0.750	0.116	0.0	84	0.965

Pipeline Schedule

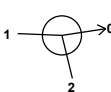
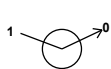
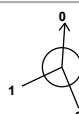
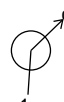
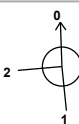
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	51.641	114.8	525	Pipe	115.800	114.075	1.200	115.350	113.625	1.200
1.001	36.290	121.0	525	Pipe	115.350	113.625	1.200	115.050	113.325	1.200
1.002	33.083	60.2	525	Pipe	115.050	113.325	1.200	114.500	112.775	1.200
1.003	52.844	37.7	525	Pipe	114.500	112.775	1.200	113.100	111.375	1.200
1.004	6.877	68.8	525	Pipe	113.100	111.375	1.200	113.000	111.275	1.200
1.005	59.044	472.3	525	Pipe	113.000	111.275	1.200	113.400	111.150	1.725
1.006	23.635	472.7	525	Pipe	113.400	111.150	1.725	112.850	111.100	1.225
1.007	10.652	213.0	525	Pipe	112.850	111.100	1.225	112.650	111.050	1.075
1.008	18.060	120.4	525	Pipe	112.650	111.050	1.075	112.750	110.900	1.325
2.000	55.806	145.3	450	Pipe	114.400	112.900	1.050	115.600	112.516	2.634
3.000	50.668	26.2	525	Pipe	116.100	114.450	1.125	115.600	112.516	2.559
2.001	70.287	192.0	525	Pipe	115.600	112.516	2.559	113.800	112.150	1.125
2.002	22.772	60.7	525	Pipe	113.800	112.150	1.125	113.500	111.775	1.200
2.003	53.235	101.4	525	Pipe	113.500	111.775	1.200	112.800	111.250	1.025
4.000	7.371	147.4	525	Pipe	112.800	111.300	0.975	112.800	111.250	1.025
2.004	7.386	59.1	525	Pipe	112.800	111.250	1.025	112.750	111.125	1.100
2.005	13.056	174.1	525	Pipe	112.750	111.125	1.100	112.750	111.050	1.175
2.006	8.505	56.7	525	Pipe	112.750	111.050	1.175	112.750	110.900	1.325
1.009	7.354	147.1	525	Pipe	112.750	110.900	1.325	112.750	110.850	1.375
1.010	8.811	176.2	525	Pipe	112.750	110.850	1.375	112.000	110.800	0.675
6.000	18.735	124.9	300	Pipe	112.000	110.400	1.300	111.550	110.250	1.000
5.000	24.247	57.1	225	Pipe	112.000	110.750	1.025	111.550	110.325	1.000
5.001	7.527	150.5	300	Pipe	111.550	110.250	1.000	111.250	110.200	0.750

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1500	Manhole	Adoptable	2	1500	Manhole	Adoptable
1.001	2	1500	Manhole	Adoptable	3	1500	Manhole	Adoptable
1.002	3	1500	Manhole	Adoptable	4	1500	Manhole	Adoptable
1.003	4	1500	Manhole	Adoptable	5	1500	Manhole	Adoptable
1.004	5	1500	Manhole	Adoptable	6	1500	Manhole	Adoptable
1.005	6	1500	Manhole	Adoptable	7	1500	Manhole	Adoptable
1.006	7	1500	Manhole	Adoptable	8	1500	Manhole	Adoptable
1.007	8	1500	Manhole	Adoptable	9	1500	Manhole	Adoptable
1.008	9	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
2.000	10	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
3.000	11	1500	Manhole	Adoptable	12	1500	Manhole	Adoptable
2.001	12	1500	Manhole	Adoptable	13	1500	Manhole	Adoptable
2.002	13	1500	Manhole	Adoptable	14	1500	Manhole	Adoptable
2.003	14	1500	Manhole	Adoptable	16	1500	Manhole	Adoptable
4.000	15	1500	Manhole	Adoptable	16	1500	Manhole	Adoptable
2.004	16	1500	Manhole	Adoptable	17	1500	Manhole	Adoptable
2.005	17	1500	Manhole	Adoptable	18	1500	Manhole	Adoptable
2.006	18	1500	Manhole	Adoptable	21	1500	Manhole	Adoptable
1.009	21	1500	Manhole	Adoptable	22	3000	Manhole	Adoptable
1.010	22	3000	Manhole	Adoptable	22_OUT	1500	Manhole	Adoptable
6.000	23	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable
5.000	24	1200	Manhole	Adoptable	25	1200	Manhole	Adoptable
5.001	25	1200	Manhole	Adoptable	25_OUT	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
1	443746.056	296076.293	115.800	1.725	1500		0	1.000	114.075	525
2	443744.221	296127.901	115.350	1.725	1500		1	1.000	113.625	525
3	443730.552	296161.518	115.050	1.725	1500		1	1.001	113.325	525
4	443732.854	296194.521	114.500	1.725	1500		1	1.002	112.775	525
5	443726.715	296247.007	113.100	1.725	1500		1	1.003	111.375	525
6	443721.429	296251.406	113.000	1.725	1500		1	1.004	111.275	525
7	443662.726	296245.073	113.400	2.250	1500		1	1.005	111.150	525
8	443656.118	296267.765	112.850	1.750	1500		1	1.006	111.100	525
9	443652.357	296277.731	112.650	1.600	1500		1	1.007	111.050	525
10	443680.789	296181.252	114.400	1.500	1500		0	2.000	112.900	450
11	443638.876	296118.362	116.100	1.650	1500		0	3.000	114.450	525
12	443626.693	296167.544	115.600	3.084	1500		1	3.000	112.516	525
13	443609.159	296235.609	113.800	1.650	1500		2	2.000	112.516	450
							0	2.001	112.516	525
							1	2.001	112.150	525
							0	2.002	112.150	525

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
14	443630.846	296242.554	113.500	1.725	1500		1	2.002	111.775	525
							0	2.003	111.775	525
15	443610.919	296294.586	112.800	1.500	1500		0	4.000	111.300	525
16	443618.284	296294.286	112.800	1.550	1500		1	4.000	111.250	525
							2	2.003	111.250	525
							0	2.004	111.250	525
17	443625.585	296295.402	112.750	1.625	1500		1	2.004	111.125	525
								0	2.005	111.125
18	443637.802	296290.797	112.750	1.700	1500		1	2.005	111.050	525
								0	2.006	111.050
21	443645.490	296294.434	112.750	1.850	1500		1	2.006	110.900	525
							2	1.008	110.900	525
							0	1.009	110.900	525
22	443645.983	296301.771	112.750	1.900	3000		1	1.009	110.850	525
								0	1.010	110.850
22_OUT	443652.318	296307.895	112.000	1.200	1500		1	1.010	110.800	525
23	443725.310	296285.680	112.000	1.600	1200					
							0	6.000	110.400	300
24	443699.264	296302.216	112.000	1.250	1200					
							0	5.000	110.750	225
25	443723.420	296304.319	111.550	1.300	1200		1	6.000	110.250	300
							2	5.000	110.325	225
							0	5.001	110.250	300
25_OUT	443723.157	296311.841	111.250	1.050	1200		1	5.001	110.200	300

Node 22 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	110.850	Product Number	CTL-SHE-0160-1480-1900-1480
Design Depth (m)	1.900	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	14.8	Min Node Diameter (mm)	1500

Node 25 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	110.250	Product Number	CTL-SHE-0084-3500-1300-3500
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Node 22 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	110.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	403.0	0.0	1.850	920.0	0.0	1.851	0.0	0.0

Node 15 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	111.300
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	550.0	0.0	0.400	550.0	0.0	0.401	0.0	0.0

Node 24 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	110.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	158

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	96.0	0.0	0.400	96.0	0.0	0.401	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	1 year 180 minute winter	15.102	5.979
1 year 15 minute winter	76.857	30.991	1 year 240 minute summer	18.475	4.882
1 year 30 minute summer	71.439	20.215	1 year 240 minute winter	12.274	4.882
1 year 30 minute winter	50.133	20.215	1 year 360 minute summer	14.169	3.646
1 year 60 minute summer	48.435	12.800	1 year 360 minute winter	9.210	3.646
1 year 60 minute winter	32.179	12.800	1 year 480 minute summer	11.185	2.956
1 year 120 minute summer	30.053	7.942	1 year 480 minute winter	7.431	2.956
1 year 120 minute winter	19.966	7.942	1 year 600 minute summer	9.182	2.511
1 year 180 minute summer	23.233	5.979	1 year 600 minute winter	6.274	2.511

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 720 minute summer	8.203	2.199	30 year 960 minute winter	9.416	3.743
1 year 720 minute winter	5.513	2.199	30 year 1440 minute summer	10.161	2.723
1 year 960 minute summer	6.768	1.782	30 year 1440 minute winter	6.829	2.723
1 year 960 minute winter	4.483	1.782	100 year +40% CC 15 minute summer	488.233	138.153
1 year 1440 minute summer	4.949	1.326	100 year +40% CC 15 minute winter	342.620	138.153
1 year 1440 minute winter	3.326	1.326	100 year +40% CC 30 minute summer	320.551	90.705
30 year 15 minute summer	268.706	76.035	100 year +40% CC 30 minute winter	224.948	90.705
30 year 15 minute winter	188.566	76.035	100 year +40% CC 60 minute summer	214.603	56.713
30 year 30 minute summer	174.929	49.499	100 year +40% CC 60 minute winter	142.577	56.713
30 year 30 minute winter	122.757	49.499	100 year +40% CC 120 minute summer	129.587	34.246
30 year 60 minute summer	116.589	30.811	100 year +40% CC 120 minute winter	86.094	34.246
30 year 60 minute winter	77.459	30.811	100 year +40% CC 180 minute summer	97.729	25.149
30 year 120 minute summer	70.438	18.615	100 year +40% CC 180 minute winter	63.526	25.149
30 year 120 minute winter	46.797	18.615	100 year +40% CC 240 minute summer	75.977	20.078
30 year 180 minute summer	53.298	13.715	100 year +40% CC 240 minute winter	50.477	20.078
30 year 180 minute winter	34.645	13.715	100 year +40% CC 360 minute summer	56.677	14.585
30 year 240 minute summer	41.604	10.995	100 year +40% CC 360 minute winter	36.841	14.585
30 year 240 minute winter	27.641	10.995	100 year +40% CC 480 minute summer	43.979	11.622
30 year 360 minute summer	31.221	8.034	100 year +40% CC 480 minute winter	29.219	11.622
30 year 360 minute winter	20.295	8.034	100 year +40% CC 600 minute summer	35.604	9.738
30 year 480 minute summer	24.324	6.428	100 year +40% CC 600 minute winter	24.327	9.738
30 year 480 minute winter	16.160	6.428	100 year +40% CC 720 minute summer	31.433	8.424
30 year 600 minute summer	19.756	5.404	100 year +40% CC 720 minute winter	21.125	8.424
30 year 600 minute winter	13.498	5.404	100 year +40% CC 960 minute summer	25.432	6.697
30 year 720 minute summer	17.490	4.687	100 year +40% CC 960 minute winter	16.847	6.697
30 year 720 minute winter	11.754	4.687	100 year +40% CC 1440 minute summer	18.055	4.839
30 year 960 minute summer	14.215	3.743	100 year +40% CC 1440 minute winter	12.134	4.839

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	114.142	0.067	16.4	0.1175	0.0000	OK
15 minute winter	2	11	113.721	0.096	32.4	0.1699	0.0000	OK
15 minute winter	3	11	113.425	0.100	47.5	0.1763	0.0000	OK
15 minute winter	4	11	112.874	0.099	63.1	0.1747	0.0000	OK
15 minute winter	5	11	111.548	0.173	78.8	0.3051	0.0000	OK
15 minute winter	6	11	111.521	0.246	93.9	0.4338	0.0000	OK
15 minute winter	7	12	111.419	0.269	108.0	0.4761	0.0000	OK
15 minute winter	8	12	111.343	0.243	119.3	0.4297	0.0000	OK
240 minute winter	9	184	111.288	0.238	27.5	0.4210	0.0000	OK
15 minute winter	10	10	112.973	0.073	16.4	0.1296	0.0000	OK
15 minute winter	11	10	114.497	0.047	16.4	0.0834	0.0000	OK
15 minute winter	12	11	112.648	0.132	48.4	0.2338	0.0000	OK
15 minute winter	13	11	112.264	0.114	62.1	0.2009	0.0000	OK
15 minute winter	14	11	111.917	0.142	77.0	0.2504	0.0000	OK
60 minute winter	15	48	111.328	0.027	13.4	15.1606	0.0000	OK
15 minute winter	16	11	111.413	0.163	91.7	0.2873	0.0000	OK
15 minute winter	17	11	111.330	0.205	96.3	0.3623	0.0000	OK
240 minute winter	18	188	111.288	0.238	43.2	0.4204	0.0000	OK
120 minute winter	21	84	111.296	0.396	94.7	0.7001	0.0000	OK
240 minute winter	22	188	111.288	0.438	77.9	180.6516	0.0000	OK
240 minute winter	22_OUT	188	110.870	0.070	14.4	0.0000	0.0000	OK
30 minute winter	23	29	110.760	0.359	6.3	0.4066	0.0000	SURCHARGED
30 minute winter	24	23	110.781	0.031	6.3	3.0479	0.0000	OK
60 minute winter	25	47	110.755	0.505	5.7	0.5708	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	16.0	0.757	0.035	1.1033	
15 minute winter	2	1.001	3	31.8	1.147	0.072	1.0070	
15 minute winter	3	1.002	4	47.7	1.686	0.076	0.9363	
15 minute winter	4	1.003	5	63.4	1.450	0.080	2.3748	
15 minute winter	5	1.004	6	78.5	0.980	0.134	0.5528	
15 minute winter	6	1.005	7	92.6	0.886	0.418	6.1714	
15 minute winter	7	1.006	8	106.5	1.018	0.481	2.4739	
15 minute winter	8	1.007	9	120.0	1.313	0.362	0.9742	
240 minute winter	9	1.008	21	32.8	0.578	0.074	2.4039	
15 minute winter	10	2.000	12	15.9	0.602	0.059	1.5473	
15 minute winter	11	3.000	12	16.2	0.716	0.017	1.3137	
15 minute winter	12	2.001	13	46.7	1.217	0.134	2.7036	
15 minute winter	13	2.002	14	61.6	1.523	0.099	0.9254	
15 minute winter	14	2.003	16	76.3	1.487	0.159	2.7623	
60 minute winter	15	4.000	16	-5.1	0.480	-0.013	0.1289	
15 minute winter	16	2.004	17	80.9	1.226	0.128	0.4981	
15 minute winter	17	2.005	18	96.0	1.307	0.262	0.9717	
240 minute winter	18	2.006	21	46.4	0.645	0.072	1.1317	
120 minute winter	21	1.009	22	84.5	0.968	0.212	1.2890	
240 minute winter	22	1.010	22_OUT	14.4	0.801	0.039	0.1579	283.1
30 minute winter	23	6.000	25	5.8	0.448	0.059	1.3193	
30 minute winter	24	5.000	25	2.9	0.489	0.042	0.5227	
60 minute winter	25	5.001	25_OUT	3.4	0.603	0.038	0.0424	12.3

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
30 minute winter	25_OUT	23	110.240	0.039	3.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	114.178	0.103	40.1	0.1818	0.0000	OK
15 minute winter	2	10	113.780	0.155	79.5	0.2734	0.0000	OK
15 minute winter	3	10	113.486	0.161	117.7	0.2840	0.0000	OK
15 minute winter	4	11	112.930	0.155	155.9	0.2741	0.0000	OK
15 minute winter	5	12	111.822	0.447	193.8	0.7894	0.0000	OK
15 minute winter	6	12	111.802	0.527	217.4	0.9316	0.0000	SURCHARGED
15 minute winter	7	12	111.677	0.527	247.7	0.9314	0.0000	SURCHARGED
240 minute winter	8	232	111.602	0.502	56.7	0.8866	0.0000	OK
240 minute winter	9	232	111.602	0.552	54.5	0.9754	0.0000	SURCHARGED
15 minute winter	10	10	113.015	0.115	40.1	0.2026	0.0000	OK
15 minute winter	11	10	114.522	0.072	40.1	0.1275	0.0000	OK
15 minute winter	12	11	112.730	0.214	119.1	0.3780	0.0000	OK
15 minute winter	13	11	112.343	0.193	154.8	0.3404	0.0000	OK
15 minute winter	14	11	112.014	0.239	192.9	0.4224	0.0000	OK
240 minute winter	15	236	111.602	0.302	61.4	166.6746	0.0000	OK
240 minute winter	16	236	111.602	0.352	56.0	0.6223	0.0000	OK
240 minute winter	17	236	111.603	0.478	47.5	0.8439	0.0000	OK
240 minute winter	18	240	111.602	0.552	68.6	0.9747	0.0000	SURCHARGED
240 minute winter	21	232	111.602	0.702	161.2	1.2409	0.0000	SURCHARGED
240 minute winter	22	236	111.602	0.752	139.5	357.0433	0.0000	SURCHARGED
120 minute winter	22_OUT	72	110.871	0.071	14.8	0.0000	0.0000	OK
60 minute winter	23	57	110.920	0.520	10.2	0.5880	0.0000	SURCHARGED
60 minute winter	24	58	110.920	0.170	17.9	16.4930	0.0000	OK
60 minute winter	25	57	110.920	0.670	10.5	0.7575	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	39.4	0.962	0.087	2.1385	
15 minute winter	2	1.001	3	78.0	1.441	0.177	1.9772	
15 minute winter	3	1.002	4	117.2	2.149	0.187	1.8035	
15 minute winter	4	1.003	5	156.0	1.573	0.197	6.4819	
15 minute winter	5	1.004	6	179.6	1.044	0.307	1.4158	
15 minute winter	6	1.005	7	210.9	0.999	0.952	12.7485	
15 minute winter	7	1.006	8	242.8	1.144	1.096	5.0408	
240 minute winter	8	1.007	9	54.5	1.070	0.164	2.2830	
240 minute winter	9	1.008	21	68.4	0.591	0.155	3.9016	
15 minute winter	10	2.000	12	39.3	0.761	0.147	2.9447	
15 minute winter	11	3.000	12	39.7	0.903	0.042	2.5316	
15 minute winter	12	2.001	13	117.0	1.517	0.335	5.4252	
15 minute winter	13	2.002	14	155.1	1.858	0.249	1.9058	
15 minute winter	14	2.003	16	192.9	1.837	0.401	5.6832	
240 minute winter	15	4.000	16	-54.3	-1.067	-0.136	1.0413	
240 minute winter	16	2.004	17	40.4	0.986	0.064	1.3305	
240 minute winter	17	2.005	18	46.1	1.136	0.126	2.7573	
240 minute winter	18	2.006	21	95.6	0.654	0.148	1.8374	
240 minute winter	21	1.009	22	139.5	0.974	0.349	1.5887	
240 minute winter	22	1.010	22_OUT	14.8	0.808	0.041	0.1613	370.0
60 minute winter	23	6.000	25	10.5	0.442	0.106	1.3193	
60 minute winter	24	5.000	25	-8.7	0.489	-0.126	0.8719	
60 minute winter	25	5.001	25_OUT	3.4	0.603	0.038	0.0424	29.6

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute summer	25_OUT	91	110.240	0.039	3.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
--------------------------------	---------	------	---------	---------------	----------------	----------	---------------	--------------------

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	114.214	0.139	72.9	0.2454	0.0000	OK
15 minute winter	2	10	113.843	0.218	144.8	0.3854	0.0000	OK
15 minute winter	3	10	113.550	0.225	214.9	0.3981	0.0000	OK
15 minute winter	4	12	113.262	0.487	289.1	0.8602	0.0000	OK
15 minute winter	5	12	113.087	1.712	323.9	3.0243	0.0000	FLOOD RISK
15 minute winter	6	11	113.000	1.725	381.6	3.0481	1.5598	FLOOD
15 minute winter	7	11	112.607	1.457	426.8	2.5740	0.0000	SURCHARGED
480 minute winter	8	472	112.369	1.269	61.0	2.2423	0.0000	SURCHARGED
480 minute winter	9	472	112.369	1.319	58.8	2.3307	0.0000	FLOOD RISK
15 minute winter	10	10	113.056	0.156	72.9	0.2761	0.0000	OK
15 minute winter	11	10	114.546	0.096	72.9	0.1704	0.0000	OK
15 minute winter	12	11	112.822	0.306	216.9	0.5405	0.0000	OK
15 minute winter	13	11	112.439	0.289	282.1	0.5114	0.0000	OK
480 minute winter	14	480	112.371	0.596	39.5	1.0524	0.0000	SURCHARGED
480 minute winter	15	480	112.371	1.071	61.5	222.1681	0.0000	SURCHARGED
360 minute winter	16	376	112.483	1.233	74.4	2.1784	0.0000	SURCHARGED
480 minute winter	17	472	112.370	1.245	59.7	2.1994	0.0000	SURCHARGED
360 minute winter	18	376	112.401	1.351	80.9	2.3874	0.0000	SURCHARGED
480 minute winter	21	472	112.369	1.469	128.0	2.5959	0.0000	SURCHARGED
480 minute winter	22	472	112.368	1.518	120.1	903.6844	0.0000	SURCHARGED
15 minute summer	22_OUT	15	110.871	0.071	14.8	0.0000	0.0000	OK
120 minute winter	23	92	111.551	1.151	11.5	1.3017	0.0000	SURCHARGED
120 minute winter	24	98	111.551	0.801	19.5	39.3543	0.0000	SURCHARGED
120 minute winter	25	92	111.550	1.300	11.3	1.4703	1.6406	FLOOD

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	71.9	1.113	0.159	3.3659	
15 minute winter	2	1.001	3	142.1	1.713	0.322	3.1434	
15 minute winter	3	1.002	4	220.5	2.390	0.352	4.6479	
15 minute winter	4	1.003	5	267.0	1.614	0.338	11.2296	
15 minute winter	5	1.004	6	324.7	1.503	0.555	1.4857	
15 minute winter	6	1.005	7	371.8	1.721	1.678	12.7554	
15 minute winter	7	1.006	8	428.5	1.984	1.934	5.1059	
480 minute winter	8	1.007	9	58.8	0.835	0.177	2.3012	
480 minute winter	9	1.008	21	59.5	0.571	0.135	3.9016	
15 minute winter	10	2.000	12	71.7	0.882	0.268	4.5368	
15 minute winter	11	3.000	12	72.3	1.072	0.076	3.9732	
15 minute winter	12	2.001	13	213.5	1.700	0.612	8.8749	
15 minute winter	13	2.002	14	283.6	2.069	0.455	3.1912	
480 minute winter	14	2.003	16	39.5	1.150	0.082	11.5005	
480 minute winter	15	4.000	16	-54.1	-1.016	-0.136	1.5924	
360 minute winter	16	2.004	17	62.9	0.946	0.100	1.5956	
480 minute winter	17	2.005	18	57.7	0.907	0.157	2.8205	
360 minute winter	18	2.006	21	80.4	0.749	0.125	1.8374	
480 minute winter	21	1.009	22	120.1	0.877	0.301	1.5887	
480 minute winter	22	1.010	22_OUT	14.8	0.808	0.041	0.1613	508.5
120 minute winter	23	6.000	25	11.3	0.425	0.114	1.3193	
120 minute winter	24	5.000	25	-8.0	0.493	-0.116	0.9643	
120 minute winter	25	5.001	25_OUT	3.4	0.606	0.038	0.0429	63.7

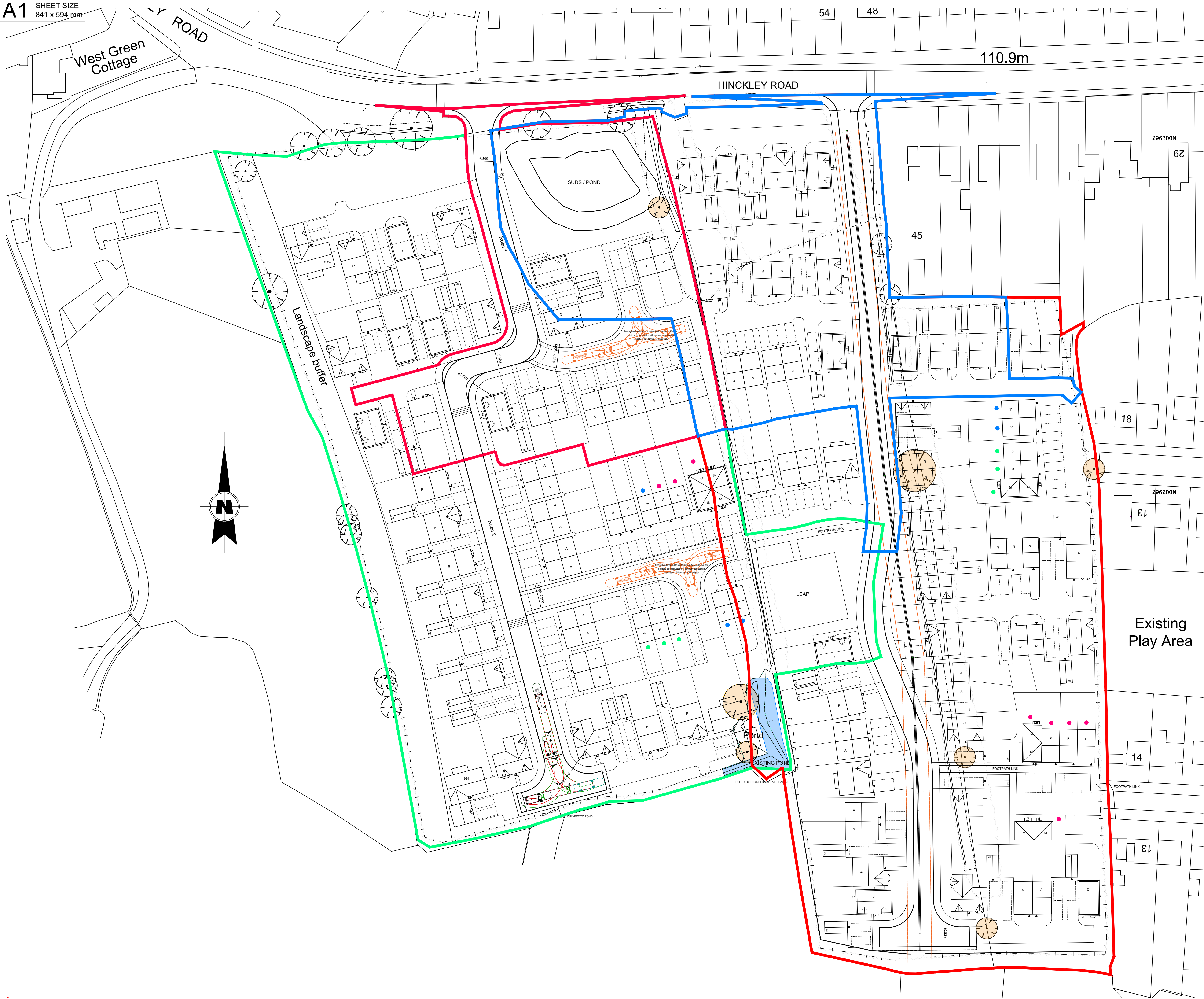
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
60 minute winter	25_OUT	59	110.240	0.040	3.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
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Appendix IX – Boundary Plans



The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspected on fluid ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees are to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. Geoff Perry Associates Limited do not accept any responsibility for any losses (financial or otherwise) to any Client or third party arising out of the Client's (be it Developer or Contractor but not limited thereto) non-compliance with above mentioned provisions. © This drawing is the property of Geoff Perry Associates Limited and may not be copied or used for any purpose other than that for which it is supplied without the express written authority of Geoff Perry Associates Limited.

Rev:	Description:	Initials:	Date:
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E: enquiries@geoffperryassoc.co.uk

Client:
Barwell Capital

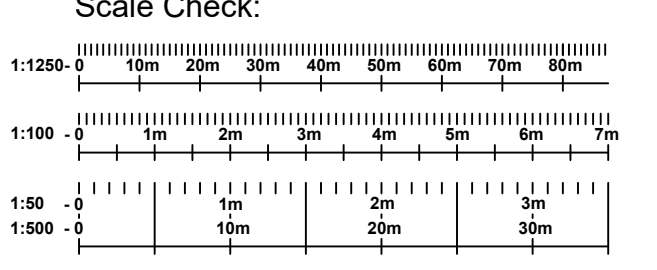
Project:
Crabtree Farm Barwell

Title:
Overall Boundary Plan

Date: NOV 2023
Drawn by: EW

Scale: 1:500 @ A1
Checked by:

Job No. A951
Drg No. 013
Rev. ~



West Green Cottage

HINCKLEY ROAD

66

54

48

34

110.9m

HINCKLEY ROAD

SUDS / POND

PHASE A

PHASE A

296300N

62

45

18

296200N

13

Existing Play Area

Pond

EXISTING POND

14

13

Legend

- Site Application Boundary
- Site Ownership

Phase B:
East Field - 51 Dwellings

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc, whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or flat ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees are to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. Geoff Perry Associates Limited do not accept any responsibility for any losses (financial or otherwise) to any Client or third party arising out of the Client's Use & Developer or Contractor but not limited thereto) non-compliance with above mentioned provisions. (C) This drawing is the property of Geoff Perry Associates Limited and may not be copied or used for any purpose other than that for which it is supplied without the express written authority of Geoff Perry Associates Limited.

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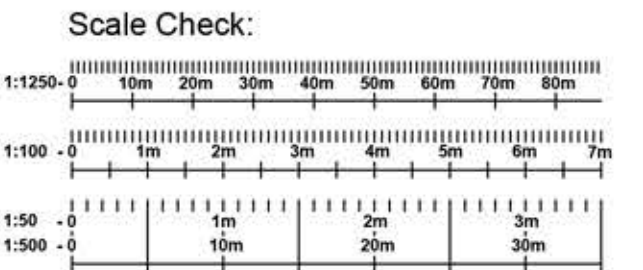
Client:
Barwell Capital

Project:
Crabtree Farm Barwell

Title:
Phase B - East Field 51 Dwellings

Date: NOV 2023 Scale: 1:500 @ A1
Drawn by: EW Checked by:

Job No. Drg No. Rev.
A951 009 ~



West Green Cottage

HINCKLEY ROAD

HINCKLEY ROAD

110.9m

PHASE C

Landscape buffer

SUDS / POND

LEAP

Existing Play Area

Pond

EXISTING POND

Legend

- Site Application Boundary
- Site Ownership

Phase B:
West Field - 45 Dwellings

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or flat ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees are to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. Geoff Perry Associates Limited do not accept any responsibility for any losses (financial or otherwise) to any Client or third party arising out of the Client's (as a Developer or Contractor but not limited thereto) non-compliance with above mentioned provisions. (c) This drawing is the property of Geoff Perry Associates Limited and may not be copied or used for any purpose other than that for which it is supplied without the express written authority of Geoff Perry Associates Limited.

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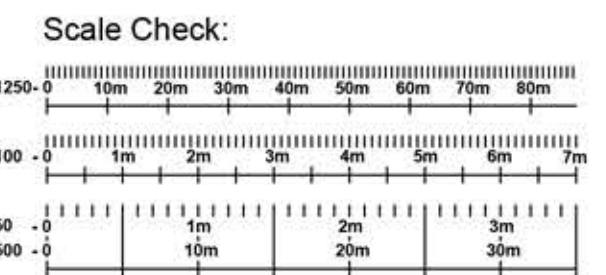
Client:
Barwell Capital

Project:
Crabtree Farm Barwell

Title:
Phase D - West Field 45 Dwellings

Date: NOV 2023 Scale: 1:500 @ A1
Drawn by: EW Checked by:

Job No. Drg No. Rev.
A951 010 ~



West Green
Cottage

HINCKLEY ROAD

66

54

48

34

110.9m

HINCKLEY ROAD

SUDS / POND

Road 1

45

296300N

62

18

296200N

13

Existing
Play Area

14

13

Pond

44778

Legend

- Site Application Boundary
- Site Ownership

Phase B:
West Field - 14 Dwellings

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or flat ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees are to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. Geoff Perry Associates Limited do not accept any responsibility for any losses (financial or otherwise) to any Client or third party arising out of the Client's Use & Developer or Contractor but not limited thereto) non-compliance with above mentioned provisions. © This drawing is the property of Geoff Perry Associates Limited and may not be copied or used for any purpose other than that for which it is supplied without the express written authority of Geoff Perry Associates Limited.

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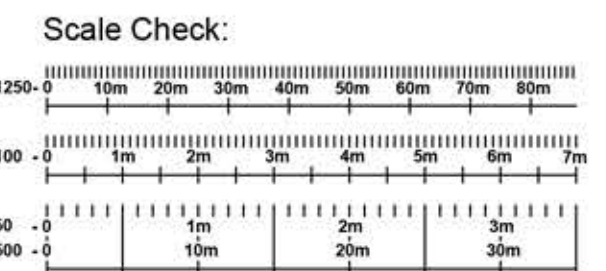
Client:
Barwell Capital

Project:
Crabtree Farm Barwell

Title:
Phase C - West Field 14 Dwellings

Date: NOV 2023 **Scale:** 1:500 @ A1
Drawn by: EW **Checked by:**

Job No. A951 **Drg No.** 011 **Rev.** ~



West Green Cottage

HINCKLEY ROAD

66

54

48

34

110.9m

HINCKLEY ROAD

PHASE C

SUDS / POND

45

62

18

Existing Play Area

296200N

296200E

13

14

13

Pond

44778

Legend

- Site Application Boundary
- Site Ownership

Phase B:
East Field - 16 Dwellings

The Contractor is to check and verify all building and site dimensions, levels and sewer invert levels at connection points before work starts. The Contractor is to comply in all respects with current Building Legislation, British Standard Specifications, Building Regulations, Construction (Design & Management) Regulations, Party Wall Act, etc. whether or not specifically stated on this drawing. This drawing must be read with and checked against any structural, geotechnical or other specialist documentation provided. This drawing is not intended to show details of foundations, ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor. A suitable method of foundation should be provided allowing for existing ground conditions. Any suspect or flat ground, contaminants on or within the ground, should be further investigated by a suitable expert. Any earthwork constructions shown indicate typical slopes for guidance only & should be further investigated by a suitable expert. Where existing trees are to be retained they should be subject to a full Arboricultural Inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services. A suitable method of foundation is to be provided to accommodate the proposed tree planting. Geoff Perry Associates Limited do not accept any responsibility for any losses (financial or otherwise) to any Client or third party arising out of the Clients Use & Developer or Contractor but not limited thereto) non-compliance with above mentioned provisions. (c) This drawing is the property of Geoff Perry Associates Limited and may not be copied or used for any purpose other than that for which it is supplied without the express written authority of Geoff Perry Associates Limited.

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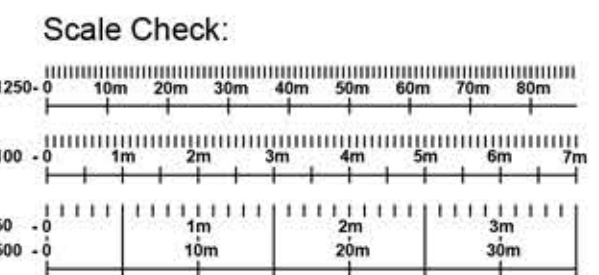
Client:
Barwell Capital

Project:
Crabtree Farm Barwell

Title:
Phase A - East Field 16 Dwellings

Date: NOV 2023 Scale: 1:500 @ A1
Drawn by: EW Checked by:

Job No. Drg No. Rev.
A951 012 ~





Appendix X – Drainage CCTV Survey, Hinckley Rd Culvert



Project

Project Name: Forts Estates LTD Hinckley Road PJ479983
Project Date: 12/05/2023



**Lanes
Group plc**



Table of Contents

Project Name

Forts Estates LTD Hinckley Road PJ479983

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12/05/2023

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Section: 4; Headwall > Unknown (HeadwallY)	6
Section: 5; Headwall > Unknown (HeadwallZ)	8
Section: 6; Headwall > Unknown (HeadwallA)	10
WinCan	12



Project Information

Project Name

Forts Estates LTD Hinckley Road PJ479983

Project Date

12/05/2023

Site

Company: Fort Estates LTD
Street: Hinckley Road
Town or City: Barwell
County: Leicestershire

Contractor

Company: Lanes Group plc
Description: East Midlands Division
Contact: Chris Dakin
Department: Regional Manager
Street: Unit 4 Riverside Park East Service Road Raynesway
Town or City: Derby
County: Derbyshire
Post Code: DE21 7RW
Phone: 01332 280280
Email: eastmidsops@lanesgroup.co.uk





Project Information

Project Name

Forts Estates LTD Hinckley Road PJ479983

Project Date

12/05/2023

Project Notes

On site to survey lines as directed by site contact. All lines surveyed and found defects in all, including debris and roots.



Project Pictures

Project Name

Forts Estates LTD Hinckley Road PJ479983

Project Date

12/05/2023



Further works will need TM (1)



Further works will need TM (2)



Headwall



MH1



Roughly where MH2 is outside 72 (1)



Roughly where MH2 is outside 72 (2)



Project Pictures

Project Name

Forts Estates LTD Hinckley Road PJ479983

Project Date

12/05/2023



Ditch where cleansed from (1)



Ditch where cleansed from (2)



Section Profile

Project Name
Forts Estates LTD Hinckley Road PJ479983

Project Date
12/05/2023

Circular, 225 mm

Section	Upstream Node	Downstream Node	Date	Road	Asset Material	Total Length	Inspected Length
6	Headwall	Unknown	08/06/2023	Hinckley Road	Concrete pipe	73.75 m	73.75 m

Total: 1 Inspection x Circular 225 mm = 73.75 m Total Length and 73.75 m Inspected Length

Circular, 300 mm

Section	Upstream Node	Downstream Node	Date	Road	Asset Material	Total Length	Inspected Length
1	MH1	MH2	12/05/2023	Hinckley Road	Concrete pipe	58.01 m	58.01 m

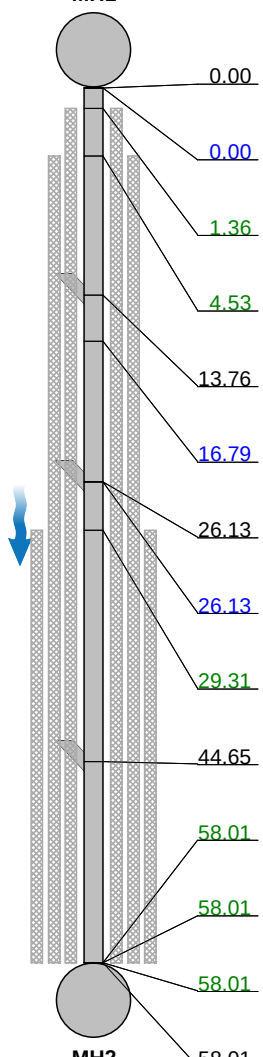
Total: 1 Inspection x Circular 300 mm = 58.01 m Total Length and 58.01 m Inspected Length

Total: 2 Inspections = 131.76 m Total Length and 131.76 m Inspected Length

Section Inspection - 12/05/2023 - MH1X

Section	Inspection	Date	Time	Lanes Job Number	Weather	Pre Cleaned	PLR
1	1	12/05/23	9:22	P00479983	Dry	No	MH1X
Operator		Asset Location:		Camera	Preset Length	Legal Status	Alternative ID
N. Farrell		Road		Small Crawler	Not Specified	Public Sewer	Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	MH1
Road:	Hinckley Road	Inspected Length:	58.01 m	Upstream Pipe Depth:	0
Post Code:	LE9 8DJ	Total Length:	58.01 m	Downstream Node:	MH2
Surface Type:	Asphalt Footway	Joint Length:	2.50 m	Downstream Pipe Depth:	0
Asset Use:	Other	Asset Shape:	Circular		
Asset Type:	Gravity drain/sewer	Dia/Height:	300 mm		
Asset Owner:	Public	Asset Material:	Concrete pipe		
Year Constructed:	Not Specified	Asset Lining Type:	No Lining		
Inspection Purpose:	Condition survey	Asset Lining Material:	No Lining		
Comments:	Multiple defects including full cleanse				
Recommendations:					

Scale:	1:501	Position [m]	Code	Observation	MPEG	Photo	Grade																																																																						
Depth: m MH1  0.00 0.00 1.36 4.53 13.76 16.79 26.13 26.13 29.31 44.65 58.01 58.01 58.01 58.01 MH2 Depth: m <table><tr><td>MH</td><td>Start node, manhole, reference: MH1</td><td>00:00:01</td><td></td><td></td></tr><tr><td>WL</td><td>Water level, 5% of the vertical dimension</td><td>00:00:01</td><td></td><td></td></tr><tr><td>S02 RFJ</td><td>Roots, fine at joint, start</td><td>00:00:14</td><td>MH1X_be 1794be-35 72-4021-a</td><td></td></tr><tr><td>S01 DEC</td><td>Settled deposits, hard or compacted, 5% cross-sectional area loss, start</td><td>00:00:38</td><td>MH1X_93 58778a-26 84-4085-9</td><td></td></tr><tr><td>CN</td><td>Connection other than junction at 01 o'clock, diameter: 150mm</td><td>00:01:41</td><td></td><td></td></tr><tr><td>WL</td><td>Water level, 40% of the vertical dimension</td><td>00:02:22</td><td></td><td></td></tr><tr><td>CXB</td><td>Connection defective, connecting pipe is blocked at 01 o'clock, diameter: 150mm</td><td>00:03:46</td><td>MH1X_9d 364977-05 eb-40c5-8</td><td></td></tr><tr><td>WL</td><td>Water level, 5% of the vertical dimension</td><td>00:03:54</td><td></td><td></td></tr><tr><td>S03 DEEJ</td><td>Attached deposits, encrustation at joint from 12 o'clock to 12 o'clock, 5% cross-sectional area loss, start</td><td>00:04:27</td><td>MH1X_caa 4ccd6-a17 5-469f-944</td><td></td></tr><tr><td>CN</td><td>Connection other than junction at 01 o'clock, diameter: 150mm</td><td>00:06:50</td><td></td><td></td></tr><tr><td>F02 RFJ</td><td>Roots, fine at joint, finish</td><td>00:08:07</td><td></td><td>2</td></tr><tr><td>F01 DEC</td><td>Settled deposits, hard or compacted, 5% cross-sectional area loss, finish</td><td>00:08:11</td><td></td><td>2</td></tr><tr><td>F03 DEEJ</td><td>Attached deposits, encrustation at joint from 12 o'clock to 12 o'clock, 5% cross-sectional area loss, finish</td><td>00:08:13</td><td></td><td>2</td></tr><tr><td>MHF</td><td>Finish node, manhole, reference: MH2</td><td>00:08:15</td><td></td><td></td></tr></table>								MH	Start node, manhole, reference: MH1	00:00:01			WL	Water level, 5% of the vertical dimension	00:00:01			S02 RFJ	Roots, fine at joint, start	00:00:14	MH1X_be 1794be-35 72-4021-a		S01 DEC	Settled deposits, hard or compacted, 5% cross-sectional area loss, start	00:00:38	MH1X_93 58778a-26 84-4085-9		CN	Connection other than junction at 01 o'clock, diameter: 150mm	00:01:41			WL	Water level, 40% of the vertical dimension	00:02:22			CXB	Connection defective, connecting pipe is blocked at 01 o'clock, diameter: 150mm	00:03:46	MH1X_9d 364977-05 eb-40c5-8		WL	Water level, 5% of the vertical dimension	00:03:54			S03 DEEJ	Attached deposits, encrustation at joint from 12 o'clock to 12 o'clock, 5% cross-sectional area loss, start	00:04:27	MH1X_caa 4ccd6-a17 5-469f-944		CN	Connection other than junction at 01 o'clock, diameter: 150mm	00:06:50			F02 RFJ	Roots, fine at joint, finish	00:08:07		2	F01 DEC	Settled deposits, hard or compacted, 5% cross-sectional area loss, finish	00:08:11		2	F03 DEEJ	Attached deposits, encrustation at joint from 12 o'clock to 12 o'clock, 5% cross-sectional area loss, finish	00:08:13		2	MHF	Finish node, manhole, reference: MH2	00:08:15		
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Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	3	3.0	102.9	140.0	5.0



Section Pictures - 12/05/2023 - MH1X

Section	Inspection Direction	PLR	Inspection	Lanes Job Number
1	Downstream	MH1X	1	P00479983



MH1X_be1794be-3572-4021-a4f4-c6ea53cc6a12_20230512_092320_558.jpg, 00:00:14, 1.36 m
Roots, fine at joint, start



MH1X_9358778a-2684-4085-95bd-070cae35a578_20230512_092347_170.jpg, 00:00:38, 4.53 m
Settled deposits, hard or compacted, 5% cross-sectional area loss, start



MH1X_9d364977-05eb-40c5-8a1d-4b2cbe5c1326_20230512_092742_945.jpg, 00:03:46, 26.13 m
Connection defective, connecting pipe is blocked at 01 o'clock, diameter: 150mm



MH1X_caa4ccd6-a175-469f-9445-378d2495e79a_20230512_092838_343.jpg, 00:04:27, 29.31 m
Attached deposits, encrustation at joint from 12 o'clock to 12 o'clock, 5% cross-sectional area loss, start



Section Inspection - 12/05/2023 - MH2X

Section	Inspection	Date	Time	Lanes Job Number	Weather	Pre Cleaned	PLR
2	1	12/05/23	9:38	P00479983	Dry	No	MH2X
Operator		Asset Location:		Camera	Preset Length	Legal Status	Alternative ID
N. Farrell		Road		Small Crawler	Not Specified	Public Sewer	Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	MH2
Road:	Hinckley Road	Inspected Length:	8.23 m	Upstream Pipe Depth:	0
Post Code:	LE9 8DJ	Total Length:	8.23 m	Downstream Node:	MH3
Surface Type:	Asphalt Footway	Joint Length:	2.50 m	Downstream Pipe Depth:	0
Asset Use:	Other	Asset Shape:	Circular		
Asset Type:	Gravity drain/sewer	Dia/Height:	300 mm		
Asset Owner:	Public	Asset Material:	Concrete pipe		
Year Constructed:	Not Specified	Asset Lining Type:	No Lining		
Inspection Purpose:	Condition survey	Asset Lining Material:	No Lining		
Comments:	Survey abandoned, unable to see				
Recommendations:					

Scale:	1:71	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH2							
		0.00	MH	Start node, manhole, reference: MH2	00:00:06		
		0.00	WL	Water level, 10% of the vertical dimension	00:00:06		
		2.18	CN	Connection other than junction at 01 o'clock, diameter: 150mm	00:00:29		
		2.18	CN	Connection other than junction at 01 o'clock, diameter: 150mm	00:00:30		
		8.23	CUW	Loss of vision, camera under water	00:01:05		
		8.23	SA	Survey abandoned: Unable to see and going into the unknown	00:01:06		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0



Section Inspection - 12/05/2023 - HeadwallX

Section	Inspection	Date	Time	Lanes Job Number	Weather	Pre Cleaned	PLR
3	1	12/05/23	10:07	P00479983	Dry	No	HEADWALLX
Operator		Asset Location:		Camera	Preset Length	Legal Status	Alternative ID
N. Farrell		Road		Small Crawler	Not Specified	Public Sewer	Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	HEADWALL
Road:	Hinckley Road	Inspected Length:	5.73 m	Upstream Pipe Depth:	0
Post Code:	LE9 8DJ	Total Length:	5.73 m	Downstream Node:	UNKNOWN
Surface Type:	Grass	Joint Length:	0.70 m	Downstream Pipe Depth:	0
Asset Use:	Other	Asset Shape:	Circular		
Asset Type:	Gravity drain/sewer	Dia/Height:	225 mm		
Asset Owner:	Public	Asset Material:	Vitrified clay		
Year Constructed:	Not Specified	Asset Lining Type:	No Lining		
Inspection Purpose:	Condition survey	Asset Lining Material:	No Lining		
Comments:	Survey abandoned full cleanse				
Recommendations:					

Scale:	1:50	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m Headwall							
	0.00	OC		Start node, other special chamber, reference: Headwall:	00:00:03		
	0.00	WL		Water level, 5% of the vertical dimension	00:00:03		
	0.00	S01	DEC	Settled deposits, hard or compacted, 5% cross-sectional area loss, start	00:00:04	HeadwallX_dbc4058-8-2428-42	
	5.73	F01	DEC	Settled deposits, hard or compacted, 5% cross-sectional area loss, finish	00:00:59		2
	5.73	SA		Survey abandoned: Needs cleanse	00:01:01		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	1.0	0.0	6.0	2.0



Section Pictures - 12/05/2023 - HeadwallX

Section	Inspection Direction	PLR	Inspection	Lanes Job Number
3	Downstream	HEADWALLX	3	P00479983



HeadwallX_dbe40588-2428-429a-a180-0996b50be15e_20230512_100737_938.jpg, 00:00:04, 0.00 m
Settled deposits, hard or compacted, 5% cross-sectional area loss, start



Section Inspection - 12/05/2023 - Headwally

Section	Inspection	Date	Time	Lanes Job Number	Weather	Pre Cleaned	PLR
4	1	12/05/23	9:32	P00479983	Dry	No	HEADWALLY
Operator		Asset Location:		Camera	Preset Length	Legal Status	Alternative ID
N. Farrell		Road		Small Crawler	Not Specified	Public Sewer	Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	HEADWALL
Road:	Hinckley Road	Inspected Length:	23.08 m	Upstream Pipe Depth:	0
Post Code:	LE9 8DJ	Total Length:	23.08 m	Downstream Node:	UNKNOWN
Surface Type:	Grass	Joint Length:	0.70 m	Downstream Pipe Depth:	0
Asset Use:	Other	Asset Shape:	Circular		
Asset Type:	Gravity drain/sewer	Dia/Height:	225 mm		
Asset Owner:	Public	Asset Material:	Vitrified clay		
Year Constructed:	Not Specified	Asset Lining Type:	No Lining		
Inspection Purpose:	Condition survey	Asset Lining Material:	No Lining		
Comments:	Same line, attempt with push rod				
Recommendations:					

Scale:	1:199	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m Headwall							
		0.00	OC	Start node, other special chamber, reference: Headwall:	00:00:00		
		0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
		0.00	S01 DEC	Settled deposits, hard or compacted, 5% cross-sectional area loss, start	00:00:00	Headwally_ef8fb813-651a-4342	
		23.08	CUW	Loss of vision, camera under water	00:01:39		
		23.08	F01 DEC	Settled deposits, hard or compacted, 5% cross-sectional area loss, finish	00:01:39		2
		23.08	SA	Survey abandoned: Unable to push further	00:01:39		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	1.0	0.0	24.0	2.0



Section Pictures - 12/05/2023 - Headwally

Section	Inspection Direction	PLR	Inspection	Lanes Job Number
4	Downstream	HEADWALLY	4	P00479983



Headwally_ef8fb813-651a-4342-958d-f61b861e3aef_20230512_105325_342.jpg, 00:00:00, 0.00 m
Settled deposits, hard or compacted, 5% cross-sectional area loss, start



Section Inspection - 08/06/2023 - HeadwallZ

Section	Inspection	Date	Time	Lanes Job Number	Weather	Pre Cleaned	PLR
5	1	08/06/23	10:11	P00479983	Dry	No	HEADWALLZ
Operator		Asset Location:		Camera	Preset Length	Legal Status	Alternative ID
N. Farrell		Road		Small Crawler	Not Specified	Public Sewer	Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	HEADWALL
Road:	Hinckley Road	Inspected Length:	28.33 m	Upstream Pipe Depth:	0
Post Code:	LE9 8DJ	Total Length:	28.33 m	Downstream Node:	UNKNOWN
Surface Type:	Grass	Joint Length:	2.50 m	Downstream Pipe Depth:	0
Asset Use:	Other	Asset Shape:	Circular		
Asset Type:	Gravity drain/sewer	Dia/Height:	225 mm		
Asset Owner:	Public	Asset Material:	Concrete pipe		
Year Constructed:	Not Specified	Asset Lining Type:	No Lining		
Inspection Purpose:	Condition survey	Asset Lining Material:	No Lining		
Comments:	Pre Survey				
Recommendations:					

Scale:	1:245	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m Headwall							
	0.00	OC	Start node, other special chamber, reference: Headwall: Headwall	00:00:02			
	0.00	WL	Water level, 5% of the vertical dimension	00:00:11			
	6.45	JN	Junction at 09 o'clock, diameter: 150mm	00:01:18			
	15.45	S01	RFJ	Roots, fine at joint, start	00:02:30	HeadwallZ_ed0df475-4ebc-498f	
	21.47	H	Hole in drain or sewer from 11 o'clock to 12 o'clock	00:03:34	HeadwallZ_7866e841-7100-4af		4
	28.33	F01	RFJ	Roots, fine at joint, finish	00:04:31		2
	28.33	SA	Survey abandoned: mass root	00:04:37			

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
1	80.0	5.2	80.0	4.0	1	1.0	0.8	13.0	2.0

Section Pictures - 08/06/2023 - HeadwallZ

Section	Inspection Direction	PLR	Inspection	Lanes Job Number
5	Downstream	HEADWALLZ	5	P00479983



HeadwallZ_ed0df475-4ebc-498f-b62e-c4c11c447984_20230608_101406_030.jpg, 00:02:30, 15.45 m
Roots, fine at joint, start



HeadwallZ_7866e841-7100-4af3-8475-b18f6978f9f6_20230608_101520_678.jpg, 00:03:34, 21.47 m
Hole in drain or sewer from 11 o'clock to 12 o'clock



Section Inspection - 08/06/2023 - HeadwallA

Section	Inspection	Date	Time	Lanes Job Number	Weather	Pre Cleaned	PLR
6	1	08/06/23	13:42	P00479983	Dry	No	HEADWALLA
Operator		Asset Location:		Camera	Preset Length	Legal Status	Alternative ID
N. Farrell		Road		Small Crawler	Not Specified	Public Sewer	Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	HEADWALL
Road:	Hinckley Road	Inspected Length:	73.75 m	Upstream Pipe Depth:	0
Post Code:	LE9 8DJ	Total Length:	73.75 m	Downstream Node:	UNKNOWN
Surface Type:	Grass	Joint Length:	0.70 m	Downstream Pipe Depth:	0
Asset Use:	Other	Asset Shape:	Circular		
Asset Type:	Gravity drain/sewer	Dia/Height:	225 mm		
Asset Owner:	Public	Asset Material:	Concrete pipe		
Year Constructed:	Not Specified	Asset Lining Type:	No Lining		
Inspection Purpose:	Condition survey	Asset Lining Material:	No Lining		
Comments:	Survey ended over scope of works, defects in line				
Recommendations:					

Scale: 1:636	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m Headwall Unknown Depth: m						
	0.00	OC	Start node, other special chamber, reference: Headwall: Headwall	00:00:00		
	0.00	WL	Water level, 5% of the vertical dimension	00:00:05		
	6.66	JN	Junction at 09 o'clock, diameter: 150mm	00:00:50		
	15.31	S01 RFJ	Roots, fine at joint, start	00:01:54		
	21.57	H	Hole in drain or sewer from 11 o'clock to 12 o'clock	00:02:39		4
	38.74	JN	Junction at 11 o'clock, diameter: 100mm	00:04:36	HeadwallA_1a61a5c	
	41.30	JN	Junction at 11 o'clock, diameter: 100mm	00:04:55	5-41b7-47	
	51.74	F01 RFJ	Roots, fine at joint, finish	00:06:43		2
	59.65	RFJ	Roots, fine at joint	00:06:17	HeadwallA_247d0fcd-3474-4e0	2
	65.30	RFJ	Roots, fine at joint	00:00:00	HeadwallA_b0145eaf-9605-414f	2
	73.75	JN	Junction at 09 o'clock, diameter: 150mm	00:00:13		
	73.75	OCF	Finish node, other special chamber, reference: Unknown: Over scope of works	00:00:26		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
1	80.0	1.1	80.0	4.0	3	1.0	0.5	39.0	2.0



Section Pictures - 08/06/2023 - HeadwallA

Section	Inspection Direction	PLR	Inspection	Lanes Job Number
6	Downstream	HEADWALLA	6	P00479983



HeadwallA_1a61a5c5-41b7-47a5-a858-f0ddada7ab86_20230608_104613_162.jpg, 00:04:36, 38.74 m
Junction at 11 o'clock, diameter: 100mm



HeadwallA_247d0fcd-3474-4e02-8490-c9ee06e1604d_20230608_134839_398.jpg, 00:06:17, 59.65 m
Roots, fine at joint



HeadwallA_b0145eaf-9605-414f-9f97-1fa380cf1c8b_20230608_134932_957.jpg, 00:00:00, 65.30 m
Roots, fine at joint

WinCan

Notes:

Thank you for choosing to use WinCan to carry out your drainage investigation works.

The results and views carried in this report are those of the engineer(s) appointed to carry out the investigation and are considered relevant on the day of the survey. Drain and sewer performance is known to alter over time, so liability cannot be accepted for differences between the recorded data and the actual data at a time after this report was generated.

This survey has been created in accordance with the drainage standard used in the country and language settings for this PC.

If a DVD has been supplied with this report, please note that it can only be used in a Windows based PC. Please browse the DVD and navigate to the PDF folder to find project-based documents such as drawings, engineer's site notes and survey specifications amongst others.

CCTV subsidence investigations do not account for the water tightness of the pipes and are merely a visual inspection of inside of the drains. CCTV drainage engineers are generally not qualified to comment on the causes of subsidence, and can only suggest required remedial actions for the pipes, and not the affected buildings.

Subsidence is a building structural failure, which can occur for many reasons. Although drainage failures can contribute to subsidence problems, other causes should always be investigated as part of a considered approach. In order to eliminate drains from suspicion, WinCan suggests that all pipes within at least 10m of the subsidence area be pressure tested over and above a CCTV inspection, and remedial suggestions considered based on the findings.

Unless otherwise specified in an associated task order (or similar), the data gathered in this report may not be suitable for use as a pre-lining investigation. WinCan are happy to carry out such surveys, but this must be agreed prior to the commencement of the works, and the client must specify the data they wish to capture and the acceptable tolerances.

Where GPS coordinates and heights have been issued within this report, they are to 1m accuracy, and 2m accuracy for heights. Greater accuracy can be provided on request.