

ENVIRONMENT

Redrow Homes Ltd (Harrow Estates Division)

Land East of the Common

Barwell

Sustainable Drainage Statement

ENVIRONMENT

Redrow Homes Ltd (Harrow Estates Division)
Land East of the Common
Barwell
Sustainable Drainage Statement

Birmingham
Livery Place, 35 Livery Street, Colmore Business District, Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street, Manchester, M1 3HU
0161 233 4260

Nottingham
Waterfront House, Station Street, Nottingham NG2 3DQ
T: 0115 924 1100

November 2023

DOCUMENT ISSUE RECORD

Document Number:	LCB-BWB-ZZ-XX-RP-CD-0001_SDS
BWB Reference:	232722-SDS

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	28/11/23	S2	William James BEng (Hons), MSc	Keith Alger BSc (Hons) MSc	Graham Littlewood BEng (Hons)
P02	13/12/23	S2	William James BEng (Hons), MSc	Keith Alger BSc (Hons) MSc	Graham Littlewood BEng (Hons)

Notice

All comments and proposals contained in this report, including any conclusions, are based on information available to BWB Consulting during investigations. The conclusions drawn by BWB Consulting could therefore differ if the information is found to be inaccurate or misleading. BWB Consulting accepts no liability should this be the case, nor if additional information exists or becomes available with respect to this scheme.

Except as otherwise requested by the client, BWB Consulting is not obliged to and disclaims any obligation to update the report for events taking place after: -

- (i) The date on which this assessment was undertaken, and
- (ii) The date on which the final report is delivered

BWB Consulting makes no representation whatsoever concerning the legal significance of its findings or the legal matters referred to in the following report.

All Environment Agency mapping data used under special license. Data is current as of November 2023 and is subject to change.

The information presented, and conclusions drawn, are based on statistical data and are for guidance purposes only. The study provides no guarantee against flooding of the study site or elsewhere, nor of the absolute accuracy of water levels, flow rates and associated probabilities.

This document has been prepared for the sole use of the Client in accordance with the terms of the appointment under which it was produced. BWB Consulting Limited accepts no responsibility for any use of or reliance on the contents of this document by any third party. No part of this document shall be copied or reproduced in any form without the prior written permission of BWB

CONTENTS

1.	INTRODUCTION.....	1
	Sustainable Drainage Guidance.....	2
2.	EXISTING CONDITIONS	5
	Existing Runoff Rates	9
	Existing Runoff Volume	10
3.	SURFACE WATER DRAINAGE STRATEGY	11
	Drainage Hierarchy	11
	Infiltration	11
	Discharge to Surface Water Body	11
	Peak Flow Control.....	12
	Storm Water Storage	12
	Runoff Volume Control	13
	Sustainable Drainage Systems	14
	Residual Risk and Designing for Exceedance	15
4.	MAINTENANCE	16
5.	FOUL WATER DRAINAGE.....	17
6.	SUMMARY	18

FIGURES

Figure 1.1: Site Location

Figure 2.1: Existing Site Conditions

Figure 2.2: Environment Agency Surface Water Flood Risk Mapping

Figure 2.3: CCTV Survey Connectivity

Figure 3.1: 1 in 100-Year, 6 Hour Runoff Volume

TABLES

Table 1.1: Site Details

Table 1.2: Peak Rainfall Climate Change Allowances for the Soar Management Catchment

Table 1.3: Urban Creep Allowance

Table 2.1: Existing Runoff Rate from the Site

Table 3.1: Existing & Proposed Runoff Rates

Table 3.2: Outline Attenuated Storage Requirements

Table 3.3: Runoff Volume Comparison

Table 6.1: Sustainable Drainage Statement Summary

APPENDICES

Appendix 1: Proposed Site Layout
Appendix 2: Topographical Survey
Appendix 3: Severn Trent Water Pre-Development Enquiry and Asset Record
Appendix 4: CCTV Survey
Appendix 5: Greenfield Runoff Rate
Appendix 6: Greenfield Runoff Volume
Appendix 7: MicroDrainage Source Control Calculations
Appendix 8: Post Development Runoff Calculations
Appendix 9: Conceptual Drainage Strategy

1. INTRODUCTION

- 1.1 A Sustainable Drainage Statement (SDS) sets out the principles of drainage design for a development and summarises the reasoning behind the chosen design. This includes consideration of national and local guidance, justification of specific flow rates, volumes of attenuated storage, as well as the appropriate level of treatment to be provided to surface water runoff.
- 1.2 This SDS has been produced by BWB Consulting on behalf of Redrow Homes Ltd (Harrow Estates Division) (the Client) in respect of a planning application for a proposed residential development at Land East of the Common, Barwell. The report is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.
- 1.3 The application is made in outline with all matters, except for access, reserved. The development is for up to 95 dwellings, together with associated access, open space and landscaping. Access is for a 5.5m wide carriageway (with footways). The application is supported by an Illustrative Masterplan which sets out the Applicant's particular proposals for the site, including strategic landscaping proposals, demonstrating why this proposal should be considered acceptable. A masterplan is included as **Appendix 1**
- 1.4 A Flood Risk Assessment has been developed for the site (reference: LCB-BWB-ZZ-XX-RP-YE-0001_FRA) and this Sustainable Drainage Statement accompanies this overarching document.
- 1.5 The location of the site is illustrated within **Figure 1.1**, with contextual information provided within **Table 1.1**.

Table 1.1: Site Details

Site Name	Land East of The Common
Location	Barwell
NGR (approx.)	SP450965
Application Site Area (ha)	10.9 (Approx.)
Development Area (ha)	4.3 (Approx.)
Development Type	Residential
Lead Local Flood Authority	Leicestershire County Council
Local Planning Authority	Hinckley & Bosworth Borough Council
Sewerage Undertaker	Severn Trent Water

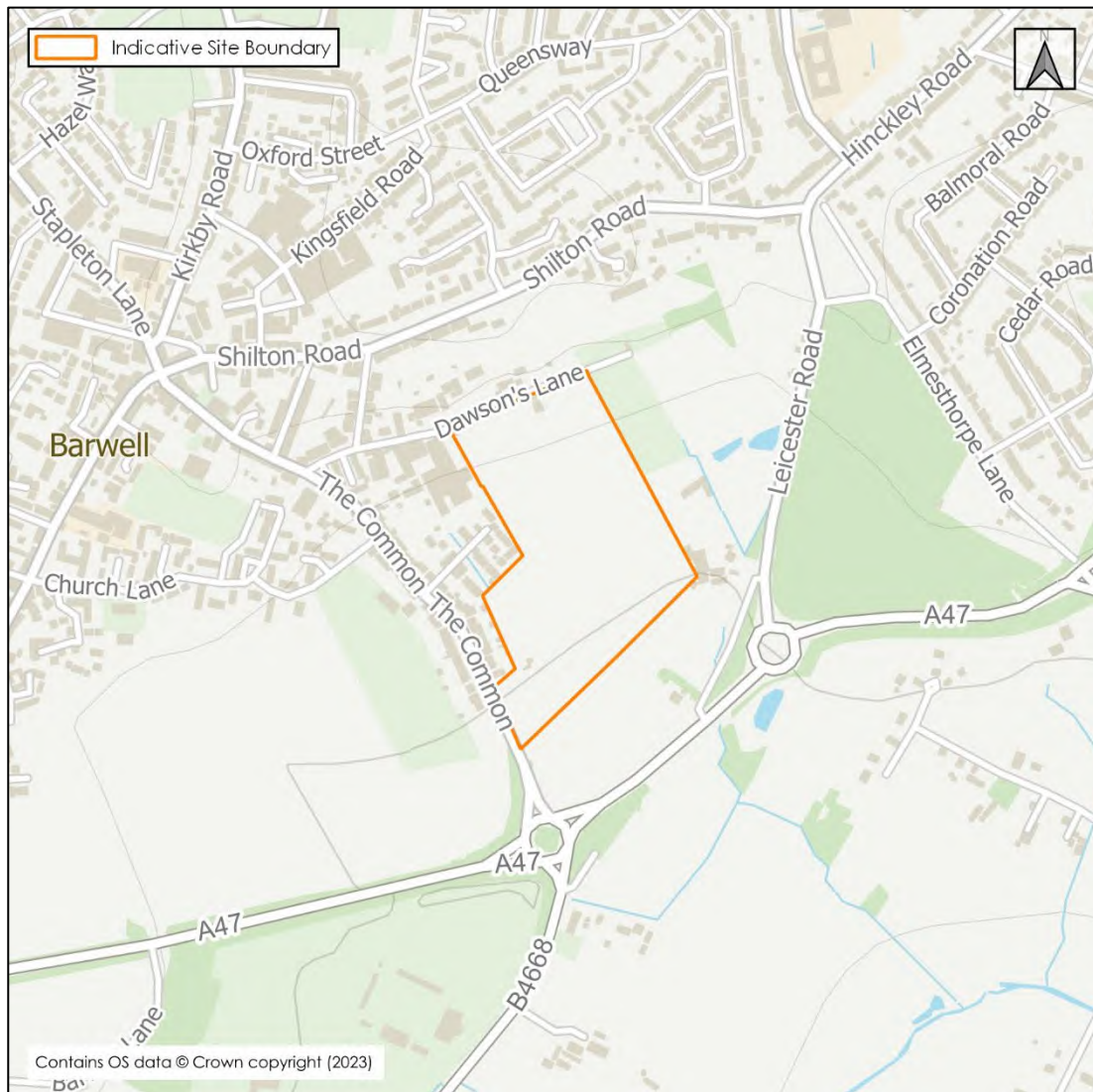


Figure 1.1: Site Location

Sustainable Drainage Guidance

- 1.6 Sustainable Drainage Systems (SuDS) aim to reduce the impact of development by replicating the natural runoff regime in a sustainable, cost-effective manner whilst protecting water quality and reducing pollution. The four key objectives of SuDS design are to achieve improvements in water quantity, water quality, amenity provision and biodiversity.
- 1.7 Leicestershire County Council, as the Lead Local Flood Authority (LLFA), have published a 'Lead Local Flood Authority – Statutory Consultation Checklist Guidance'¹ which is meant to serve as an interim document until completion of more comprehensive guidance.

¹ Lead Local Flood Authority – Statutory Consultation Checklist guidance (Leicestershire County Council, October 2018) available at: <https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2018/10/11/LLFA-checklist-interim-guidance.pdf>

- 1.8 Within the interim document a number of key elements/consideration relating to the management of surface water within new developments, these include;
- Where applicable, the impacts of 'urban creep' should be included. Unless it can be demonstrated otherwise, a 10% increase in the impermeable area should be included within the storage calculations. Further details relating to this are outlined within **Table 1.3**.
 - To minimise the risk of system blockage the council would allow 5 l/s as the minimum discharge rate from a site.
 - Outline applications generally do not require definitive details (aside from elements of the proposals which are not reserved), only sufficient information to demonstrate that a viable drainage scheme can be delivered. Layout, scale and the specific locations of SuDS and drainage features should be identified indicatively, being confirmed in further detail as part of a subsequent reserved matters application. Although only indicative details are required at this stage, there should still be sufficient detail to support them.
- 1.9 The guidance states that developers should refer to the CIRIA SuDS Manual² for guidance on the planning, design, construction, and maintenance of SuDS for effective implementation into new developments.
- 1.10 Predicted future changes in peak rainfall intensity caused by climate change are provided by the Environment Agency (EA). Table 2 from the Environment Agency's 'Flood risk assessments: climate change allowances'³, included as **Table 1.2** shows the anticipated changes in peak rainfall intensity for the site based on the anticipated lifespan of the development, in this case 100+ years, as per EA guidance.

Table 1.2: Peak Rainfall Climate Change Allowances for the Soar Management Catchment

Soar Management Catchment Allowance	Total Potential Change Anticipated for the '2050s' (Lifetime up to 2060)	Total Potential Change Anticipated for the '2070s' (2061 to 2125)
1 in 30-Year Rainfall Event		
Upper End	35%	35%
Central	20%	25%
1 in 100-Year Rainfall Event		
Upper End	40%	40%
Central	20%	25%

- 1.11 Given the development proposals, and the percentages set out by the EA, a climate change allowance of 40% has been made for the 1 in 100-year return period. It should

² The SuDS Manual (C753) - CIRIA

³ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

be noted that the 1 in 30-year plus climate change event will need to be considered in the detailed design stage.

- 1.12 To ensure that SuDS schemes can cope with future demand, an allowance for urban creep must be made in the design calculations. **Table 1.3** sets out the factors that should be applied to the impermeable areas of a development to account for urban creep.

Table 1.3: Urban Creep Allowance

Residential Development Density (dwellings/ha)	Change Allowance (% of impermeable area)
<= 25	10
30	8
35	6
45	4
>= 50	2
Flats and Apartments	0

- 1.13 The housing density for the scheme has been approximately calculated as 26.6 dwellings per hectare. Using **Table 1.3**, a conservative value of 10% urban creep allowance will be used.
- 1.14 The local guidance has been considered in conjunction with the Non-Statutory Technical Standards for Sustainable Drainage Systems⁴ and CIRIA SuDS Manual.

⁴ 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

2. EXISTING CONDITIONS

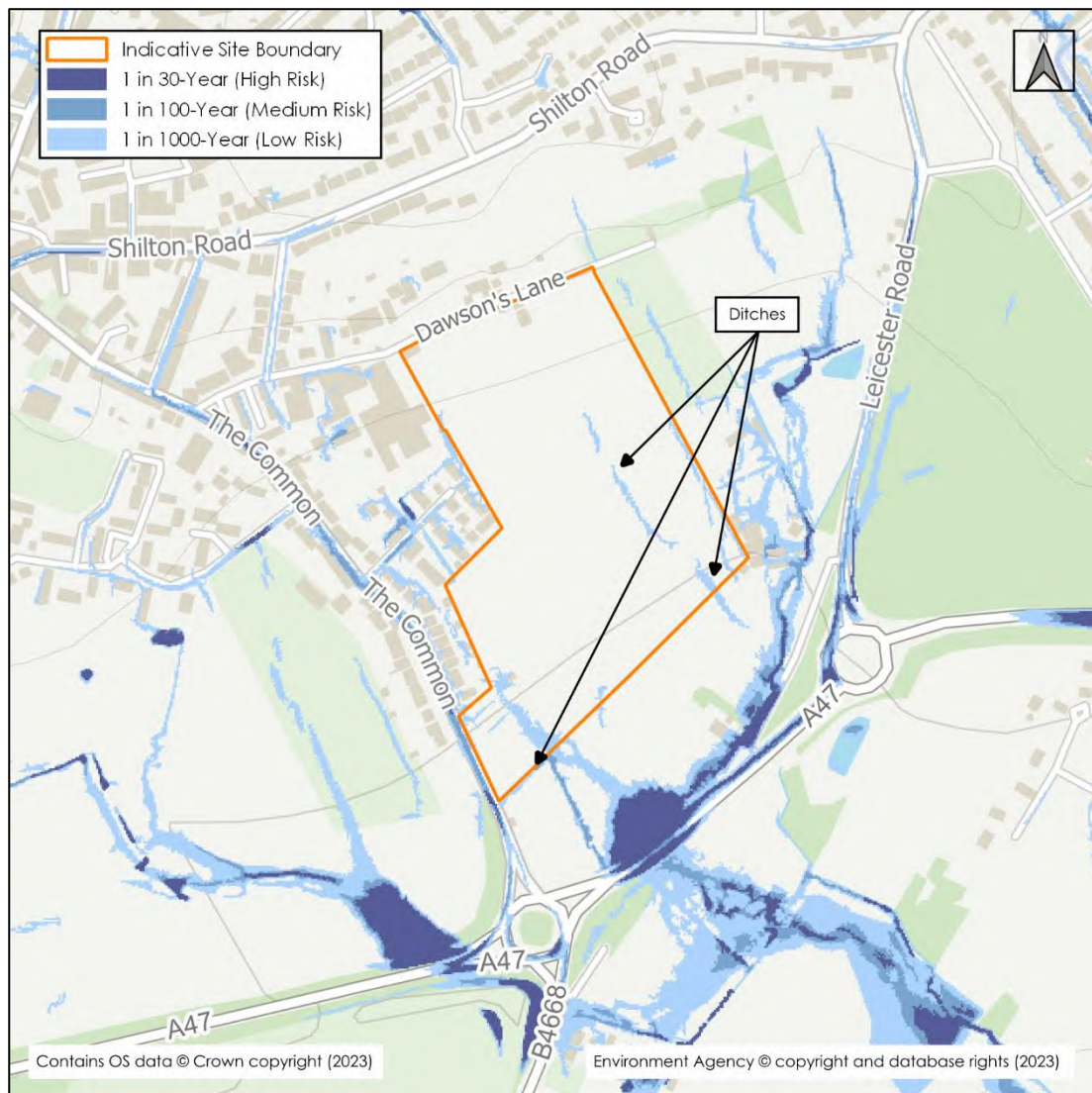
- 2.1 The existing site is greenfield, comprising of agricultural land. The site is bound to the north by Dawson's Lane, to the east by existing fields, to the south by the A47 and to the west by The Common.
- 2.2 The site is made up of various different parcels of greenfield land, separated by hedgerows and trees. The current use of the site is agriculture and paddocks with a series of outbuildings located in the northern parcel. A typical image of the current condition of the site, as observed by BWB Consulting in 2021, is shown in **Figure 2.1**.



Figure 2.1: Existing Site Conditions (taken from within the western area of the site facing Northwest to The Common and Gardner Close)

- 2.3 A topographical survey included as **Appendix 2**, shows the site to fall in a south-easterly direction from approximately 116m Above Ordnance Datum (AOD) in the north to around 96m AOD in the south.

- 2.4 Most of the site is shown to be at a very low risk of flooding from surface water, as shown in



- 2.5 **Figure 2.2.** However, the south of the site is shown to be at a low (1 in 1000 year) to high (1 in 30 year) risk of flooding from surface water. The topographical survey shows levels within this area of the site to fall from approximately 97.60m AOD in to 94.90m AOD with the A47 acting as a topographical barrier to the south of the parcel, resulting in surface water pooling.

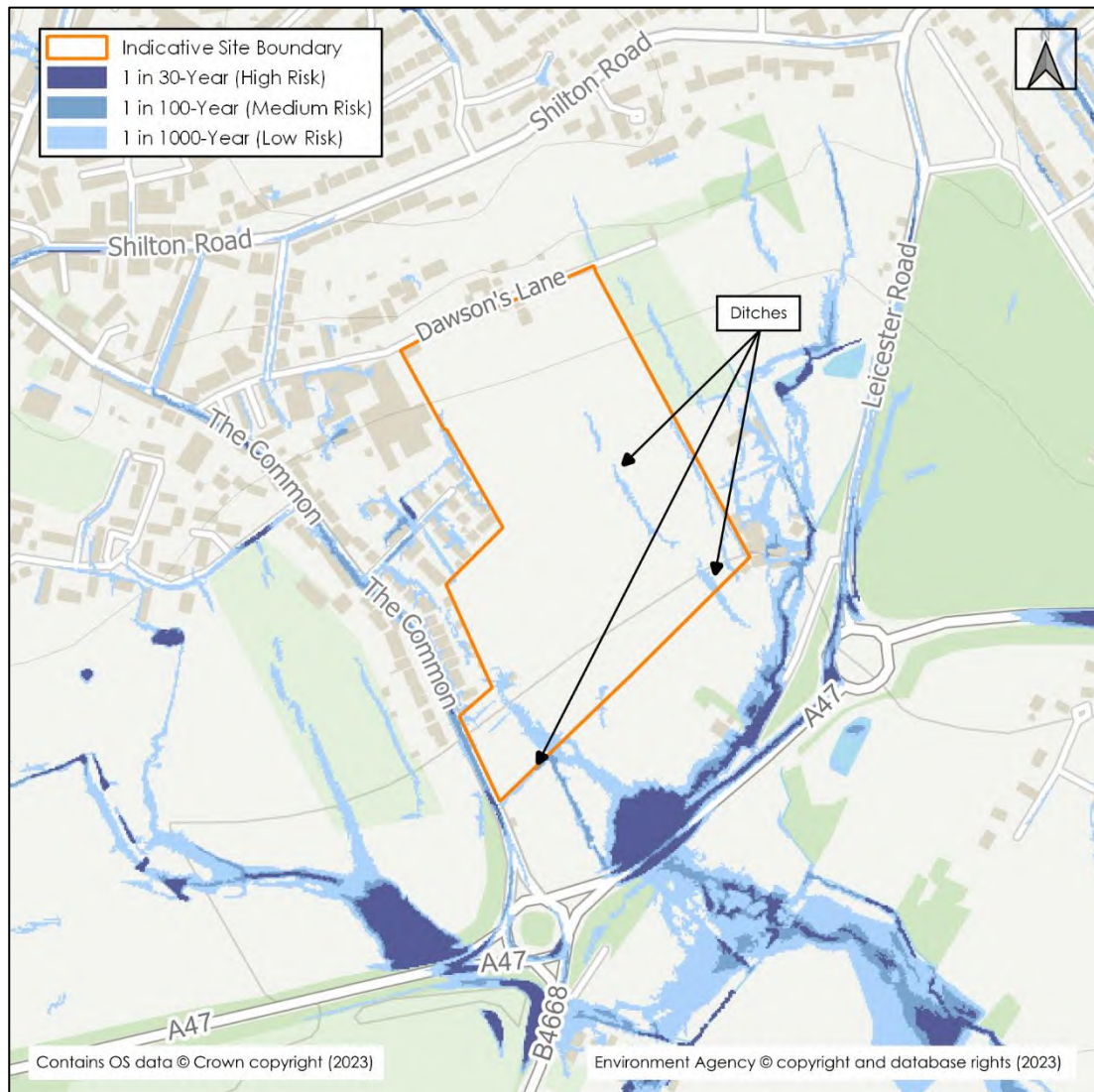


Figure 2.2: Environment Agency Surface Water Flood Risk Mapping

- 2.6 British Geological Survey (BGS) mapping shows the site to be underlain by Mercia Mudstone. The bedrock is designated by the EA as Secondary B Aquifers. Secondary B Aquifers are defined as predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons, and weathering.

- 2.7 Superficial deposits of Bosworth Clay and Silt and Thrusington Diamicton are present at the site. These are designated as Unproductive and Undifferentiated Secondary Aquifers respectively. Unproductive Aquifers are defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. Undifferentiated Secondary Aquifers are designated in cases where it has not been possible to assign category A or B to a rock type.
- 2.8 The nearest publicly available borehole is located 1.17km south-east of the site at Bridge Farm. This borehole record (ref: SP49NE1250 shows superficial deposits of silty clay to a depth of 3.9m below ground level (bgl) before encountering bands of mudstone. The borehole record shows a small water strike at 10.5m bgl.
- 2.9 Severn Trent Water (STW) asset records attached as **Appendix 3**, show a combined sewer and two surface water sewers in The Common. These sewers run adjacent to the western boundary of the site and flow southwards towards the A47.
- 2.10 A Drainage Connectivity Survey has been undertaken by Premium Environmental Services in September 2021 and is included as **Appendix 4**. **Figure 2.3** shows the connectivity, which was confirmed using dye testing, between a headwall in Garner Close, *IFHW1*, to a manhole in The Common, SP44969304 which is shown on the sewer records shown in **Appendix 4**, which then outfalls to an existing ditch on the south-western boundary of the site via a headwall with a pipe diameter of 225mm.

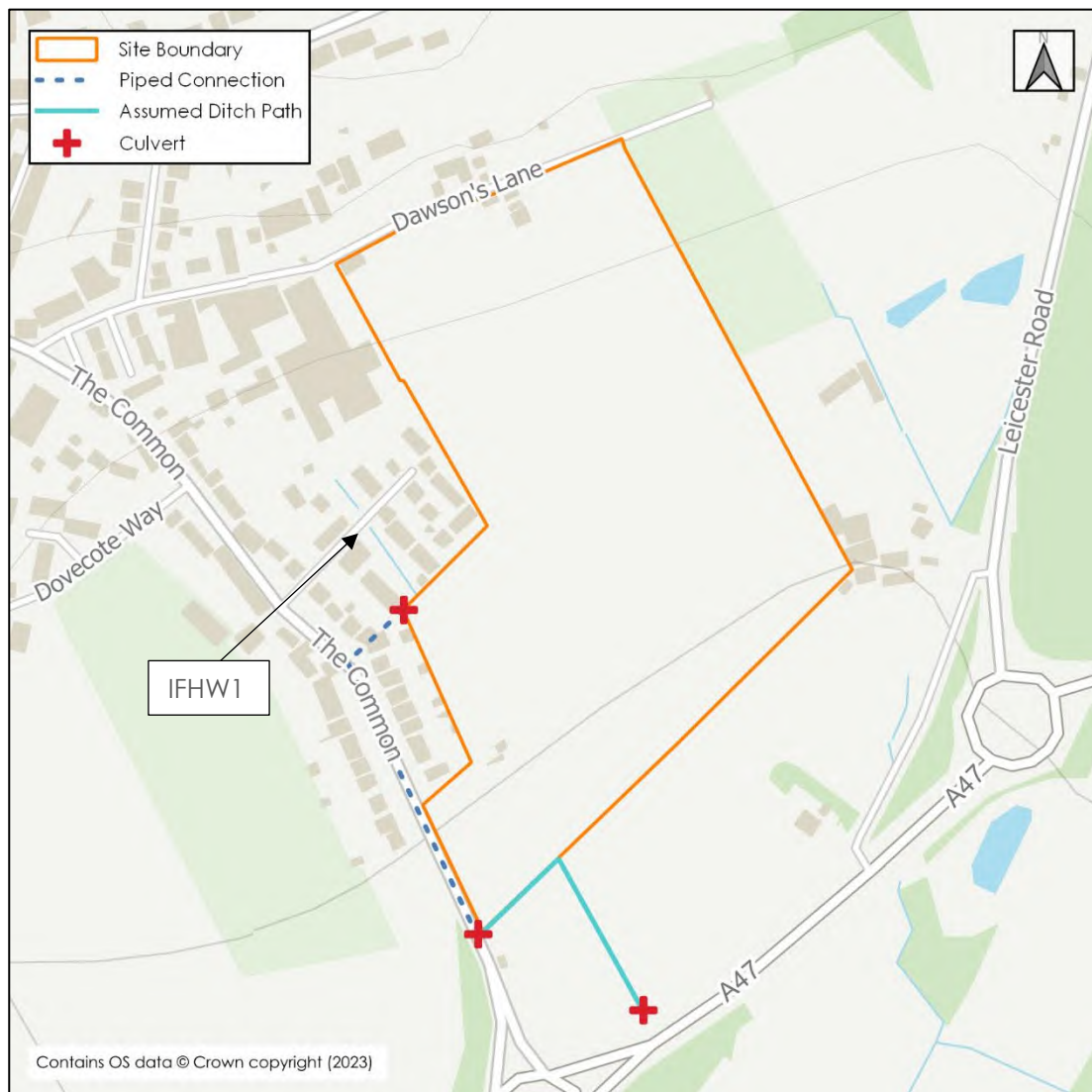


Figure 2.3: CCTV Survey Connectivity

- 2.11 It is understood that only natural drainage features exist within the site therefore, it is likely that the existing drainage regime initially consists of infiltration into the ground, followed by rapid surface water runoff towards the south of the site and the existing ditch located to the south-west of the site when infiltration potential is exceeded.

Existing Runoff Rates

- 2.12 An assessment of the existing surface water runoff rates from the proposed development area (4.3ha approx.) has been undertaken and is summarised within **Table 2.1**. Calculations are included within **Appendix 5**.
- 2.13 The runoff rates have been estimated using the IH124 method, with appropriate prorated adjustments for a site of less than 50ha, as recommended in Interim Code of

Practice for Sustainable Drainage⁵. This was undertaken within Micro Drainage, which makes the necessary adjustments for small sites automatically.

Table 2.1: Existing Runoff Rate from the Site

Return Period (Yrs.)	Runoff Rate (l/s)
1	15.7
Mean Annual Flow Rate (QBAR)	18.9
30	37.0
100	48.5

Existing Runoff Volume

- 2.14 An assessment of the existing surface water runoff rates from the area proposed for development (4.3ha) has been made for a 1 in 100-year, 6-hour storm.
- 2.15 As the existing site is permeable, the runoff volume has been calculated using the Source Control module within Micro Drainage to be **1224m³**, results are included within **Appendix 6**.

⁵ The National SUDS Working Group (2004), Interim Code of Practice for Sustainable Drainage

3. SURFACE WATER DRAINAGE STRATEGY

Drainage Hierarchy

- 3.1 The Planning Policy Guidance⁶ and the SuDS Manual⁷ identify that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable:
- i. into the ground (infiltration);
 - ii. to a surface water body;
 - iii. to a surface water sewer, highway drain, or another drainage system;
 - iv. to a combined sewer.
- 3.2 The aim of this approach is to manage surface water runoff close to where it falls and mimic natural drainage as closely as possible.

Infiltration

- 3.3 Due to the clay soils and mudstone bedrock geology, it is expected that infiltration will not be viable at the site, however site-specific infiltration testing to BRE365 standard should be carried out to confirm the onsite infiltration rates prior to the commencement of constructions.

Discharge to Surface Water Body

- 3.4 The existing site is expected to outfall to the ditch to the south-west of the site. It is therefore proposed that the surface water runoff from the development outfalls to this existing ditch, post development.
- 3.5 The open channel section of the ditch is expected to be outside of landownership and therefore it is proposed to connect to the culverted section of the ditch within The Common. Following further review of levels, in particular establishing an interpolated level of the culverted ditch, it is considered that a gravity connection can be made, is subject to further investigations taking place.
- 3.6 The downstream headwall noted within **Appendix 4**(reference IFHW3)) is recorded as being heavily silted both upstream and downstream therefore, maintenance work is recommended prior to connection being made.
- 3.7 In the event that the ditch is not found to be a viable option, surface water from the site could be discharged to the 225mm or 525mm STW surface water sewers located in The Common. An outfall to either of these surface water assets has been accepted by STW, via their pre-development enquiry (**Appendix 3**), should it be required.

⁶ Planning Practice Guidance. <http://planningguidance.planningportal.gov.uk/>.

⁷ The SuDS Manual (C753). CIRIA 2015.

Peak Flow Control

- 3.8 In order to comply with the Non-Statutory Technical Standards for Sustainable Drainage Systems S2-S3⁸, runoff from greenfield developments should not exceed the equivalent greenfield rates for the 1 and 100-year return period events.
- 3.9 Rainfall events will be restricted to the equivalent greenfield QBAR rate up to the 1 in 100-year plus climate change event. This is summarised within **Table 3.1** and is based on the development area.

Table 3.1: Existing & Proposed Runoff Rates

Return Period (Yr.)	Existing Runoff Rate (l/s)	Proposed Discharge Rate (l/s)
1	15.7	18.9
QBAR	18.9	
30	37.0	
100	48.5	
100 + 40%	-	

Storm Water Storage

- 3.10 As the development proposals require a restricted runoff rate, it will be necessary to provide attenuated storage to balance the excess volume in a safe manner within the site.
- 3.11 The surface water storage should be located within the site in a position where it can receive runoff from the development and discharge from the site by gravity, and also in a position where it is hydraulically isolated from any fluvial floodplain or external surface water floodplain/overland flow route that may be present in the site.
- 3.12 Sufficient storage for events up to the 1 in 100-year storm with a 40% allowance for climate change, should be allow for. A further allowance should be applied to the proposed impermeable area, to allow for the potential of urban creep over the lifetime of the development. At this time, based upon the current layout, an allowance of 10% of the current impermeable area, has been applied to the attenuation calculations.
- 3.13 Any above ground storage feature should allow for a 600mm freeboard on the 100-year plus 40% climate change event.

⁸ 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

- 3.14 After considering the site constraints and development aspirations it is suggested that the necessary surface water storage volume is found within a detention basin located to the south-west of the site, as to avoid the high risk of flooding from surface water which is present to the south of the site. It is assumed that the basin can be placed within areas shown to be at a low risk of surface water flooding as the mapping suggests that the flows originate within the site and will therefore be managed as part of the drainage strategy.
- 3.15 For the purpose of this outline assessment, it has been assumed that the detention basin will accommodate all of the necessary storage, but it may be possible to redistribute a portion of the storage within other drainage components during the detailed design of the development (e.g.: in the pipe network, swales, filter drains, etc).
- 3.16 A simulation has been run using Micro Drainage software to identify the necessary storage provision. Using a restriction of 18.9l/s and applying an additional 10% allowance to the proposed impermeable area of 3.1ha. The impermeable area was taken as 65% of the developable area and the addition of 10% urban creep. The developable area was taken as the areas associated with the residential development, roads and SuDs features is the BNG area plan that is included in **Appendix 1**.
- 3.17 The volume of attenuated storage required for the development has been calculated for storm events up to the 100 year + 40% storm. The results are summarised in **Table 3.2** and calculations are included as **Appendix 7**.

Table 3.2: Outline Attenuated Storage Requirements

Rainfall Method	Critical Storm	Maximum Volume (m ³)
Flood Studies Report (FSR)	600 Min Winter	2030
Flood Estimation Handbook (FEH)	600 Min Winter	2150

- 3.18 It is envisaged that the final required attenuated storage volume will be determined during the detailed design stage once the development layout and drainage areas are fixed.

Runoff Volume Control

- 3.19 The Non-Statutory Technical Standards for Sustainable Drainage Systems S4-S6⁹ states that where reasonably practical the runoff volume from a development for the 1 in 100-year 6-hour rainfall event should not exceed the runoff volume prior to development or redevelopment. Where it is not reasonably practicable to constrain the volume of runoff from a development at or below the existing volume, then the runoff must be discharged in a manner that does not adversely affect flood risk, i.e.:
- The additional runoff volume resulting from the development (the 'long term storage volume') should be discharged separately from the site at a rate of 2L/s/ha or less.
Or,

⁹ 2015, DEFRA. Non-statutory technical standards for sustainable drainage systems

- ii. All the runoff volume from the development should be discharged at a rate equivalent to the mean annual flow rate (QBAR) rate under greenfield conditions or less. Or,
 - iii. All the runoff volume from the development should be discharged at a rate of 2L/s/ha or less.
- 3.20 The existing and post-development runoff volumes during the 1 in 100-year 6-hour storm are compared within **Table 3.3**.
- 3.21 The post-development runoff volume from the impermeable portion of the proposed development (3.1ha) has been calculated using the formula outlined within **Figure 3.1**. The average rainfall intensity was calculated using FEH rainfall data within Micro Drainage. The 1 in 100-year 6-hour rainfall profile is provided as **Appendix 8**.

$$\text{Av. Rainfall (m/hr)} \times 6 \text{ (hours)} \times \text{Impermeable Area (m}^2\text{)} = \text{Runoff Volume (m}^3\text{)}$$
$$0.010373 \times 6 \times 31000 = 1930\text{m}^3$$

Figure 3.1: 1 in 100-Year, 6 Hour Runoff Volume

- 3.22 The post-development run off volume for the permeable area was calculated in the same method as in **Section 2**. The proposed runoff from the 'permeable' area set out in the table below was calculated by subtracting the proposed impermeable area (3.1ha) from the developable area (4.3ha) to give the permeable area as 1.2ha, with this value then being used to calculate the runoff volume from the permeable element. The post-development runoff calculations for the permeable area are included in **Appendix 8**.

Table 3.3: Runoff Volume Comparison

Existing Volume (m³)	Proposed Volume (m³)		Difference (m³)
	Permeable	Impermeable	
1224	342	1930	+1048

- 3.23 The 1 in 100-year 6-hour storm runoff volume from the site has been shown to increase as a result of the proposed development. However, as the runoff volume from the development will be discharged at a rate equivalent to the mean annual flow rate (QBAR) rate under greenfield conditions, the volume control criteria will be met. Therefore, long-term storage is not required.

Sustainable Drainage Systems

- 3.24 Surface water runoff will be stored within an above ground detention basin located to the south-west of the development. The detention basin has been designed to be 1m deep with a 600mm freeboard in the 1 in 100-year + 40% event. The detention basin banks should not exceed a 1:4 gradient.

- 3.25 Across the developable area surface water runoff will be captured via a combination of drains, gullies, and downpipes before being conveyed through the site via a beneath ground pipe system into the storage features. It is recommended that above ground features such as swales are incorporated into the masterplan where possible in order to convey surface water through the site.
- 3.26 The detention basin will outfall via an oversized gravity pipe to a proposed surface water sewer within The Common and ultimately outfall into the ditch located to the south-west of the site. The flow control will be located at the end of the oversized pipe and will be limited to QBAR discharge rate of 18.9l/s.
- 3.27 The detention basin should be appropriately planted to encourage treatment and biodiversity, as well as being landscaped into the public open space to provide an amenity value. Where possible, the basin should be enhanced to include variable depths, gradients, low flow channels and forebays in order to improve the water quality; this will be confirmed at detailed design stage.
- 3.28 Further levels of treatment could also be provided in the form of rain gardens, tree pits or similar. It is envisaged that the treatment stages will be determined during the detailed design stage once the development layout and drainage areas are fixed.
- 3.29 Where possible, the detention basin should be unlined to allow for any residual infiltration.
- 3.30 In line with best practice, a 3m access easement should be applied to any SuDS features for maintenance purposes.
- 3.31 An Illustrative Drainage Strategy for the development is presented within **Appendix 9** (Drawing reference: LCB-BWB-ZZ-XX-DR-CD-0001).

Residual Risk and Designing for Exceedance

- 3.32 The storage has been designed with a minimum 600mm freeboard in the 100-year + 40% event to protect against extreme events in exceedance of the drainage infrastructure, the external levels of the development and adoptable highways should be profiled to direct water away from vulnerable infrastructure and towards the nearest drainage point.
- 3.33 In addition to the volume of storage provided within the main attenuation, there will be capacity within upstream pipes and manholes which has not been accounted for at this stage and a further level of redundancy to the network will therefore be provided.
- 3.34 Should the capacity of the basin be exceeded, runoff would flow overland in a southerly direction where it would be intercepted by the open channel south of the site.

4. MAINTENANCE

- 4.1 The proposed drainage system should be designed in accordance with the Design and Construction Guidance (DCG) and be offered up for adoption to Severn Trent Water. If any parts of the drainage network remain unadopted, or until the point they are, an appropriate management company should be appointed, to ensure continuous maintenance and management.
- 4.2 Requirements for ongoing maintenance of the drainage network should form part of the Operation and Maintenance manual for the site. Any specialist or proprietary products that are specified at detailed design should have a manufacturer specific maintenance regime which should be included within the document.
- 4.3 It is envisaged that the Operation and Maintenance manual will be developed at the detailed design stage, but some examples are included below.
- iv. All drainage features should be located in open areas which are readily accessible.
 - v. Gullies should be inspected and de-silted at least once a year, where necessary.
 - vi. Pipes, manholes and silt traps should be inspected and de-silted at least once a year, where necessary.
 - vii. Regular inspections of the detention basin should be undertaken to remove litter/debris, invasive/colonising vegetation and silt build up, as necessary. Inlet and outlet structures to be regularly inspected, with remedial work as required to maintain water flows and prevent silt/vegetation build up.
 - viii. Vegetation/grass with the detention basin should be maintained appropriately to allow establishment and promote habitat formation, without impeding the operation of the inlet and outlet structure.
 - ix. Flow controls should be inspected every 6 months, litter/debris and silt build up should be removed, as necessary.

5. FOUL WATER DRAINAGE

- 5.1 As the existing site is currently undeveloped, a new foul water outfall will be required. It is proposed to drain foul water separately from surface water.
- 5.2 The foul sewer network in the area is under the jurisdiction of Severn Trent Water. Their sewer records are included as **Appendix 3**. A 300mm combined sewer is present to the west of the site in The Common which runs southwards to a Sewerage Pumping Station (SPS).
- 5.3 A Developer Enquiry was submitted to STW (**Appendix 3**), it states that a connection to the 300mm combined sewer in The Common, based upon the expected flows generated from the previous proposals for circa 340 dwellings would be acceptable. However, due to the overall development size and the SPS further downstream a hydraulic assessment would need to be undertaken. This will be carried out by Severn Trent Water at the appropriate juncture, at no extra cost.
- 5.4 Given the levels outlined within the sewer records, for the combined sewer, a gravity connection will be viable.
- 5.5 A S106 (Water Industry Act 1991) application should be made to Severn Trent Water for approval prior to a connection being made.

6. SUMMARY

- 6.1 This statement and supporting appendices demonstrate that the drainage design for the development will comply with the relevant local and national standards, specifically the hierarchy of discharge, runoff rate and volume criterion.
- 6.2 This SDS is intended to support an outline planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

Table 6.1: Sustainable Drainage Statement Summary

		Existing Site	Proposed Development
Site Area (Ha)		10.9	
Developable Area (Ha)		-	4.3
Impermeable Area (Ha)		-	3.1
Outfall Location		Watercourse/Infiltration	Ditch
Peak Runoff Rate (l/s)	QBAR	18.9	18.9
	1 in 30-Year	37.0	
	1 in 100-Year	48.5	
	1 in 100-Year + CC	-	
Runoff Volume (100yr RP 6-hour Storm)		1224m ³	2272m ³
Volume Control		-	Discharge rate limited to QBAR
Proposed Storage Volume		-	2150m ³
Flow Control Type		-	Vortex
SuDS Features		-	Detention Basin
Maintenance Responsibility		-	Sewerage Company/ Private Management Company/ Homeowner

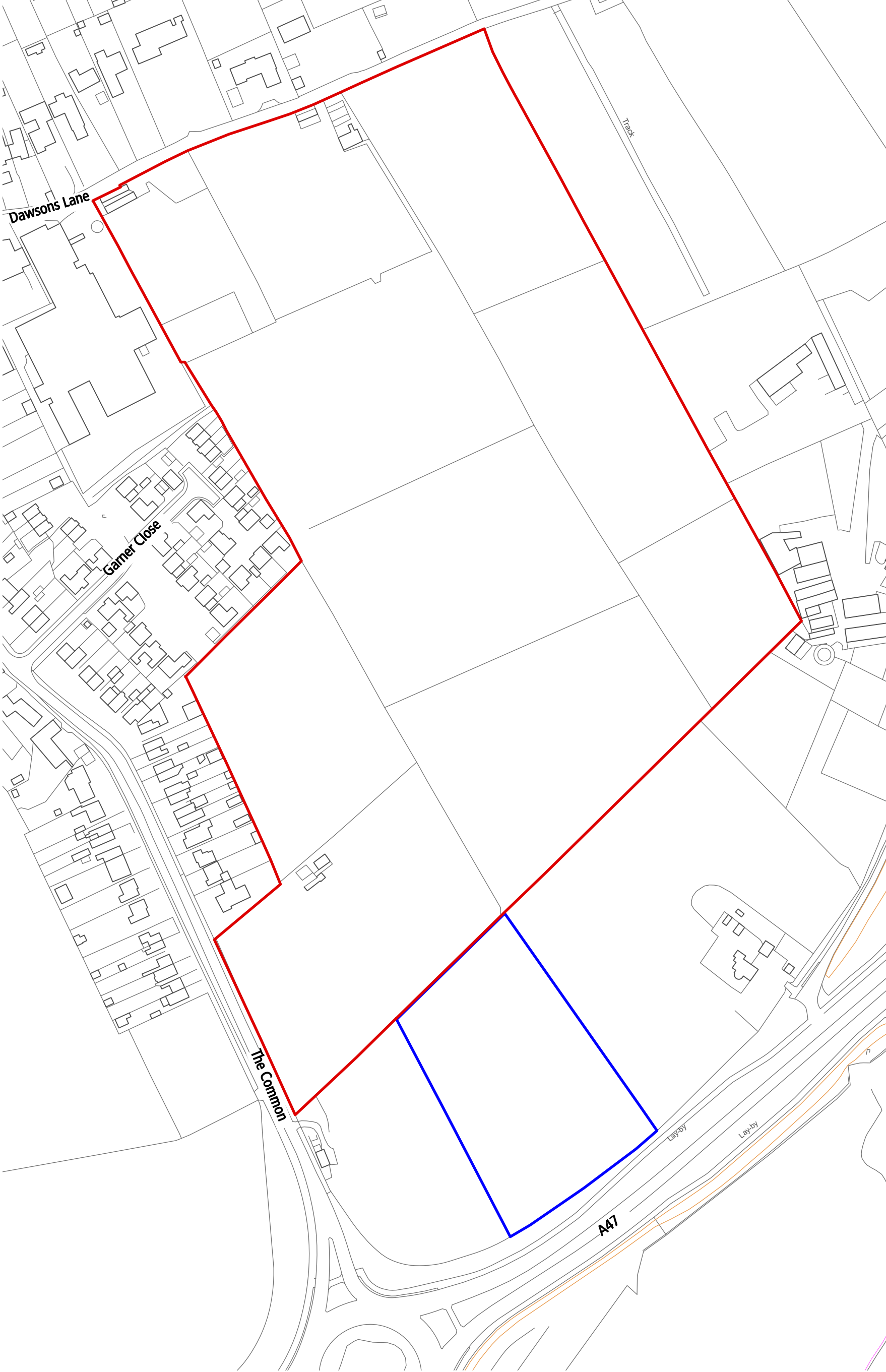
- 6.3 It is envisaged that the final drainage strategy will be determined during the detailed design stage, as the development layout is finalised.

APPENDICES

Appendix 1: Proposed Site Layout

Site boundary

Land also under the control of the applicant



client:
Harrow Estates

project:
Land East of The Common, Barwell

drawing title:
Site Boundary Plan

job number:
HAR102

scale
1:2000 @ A3

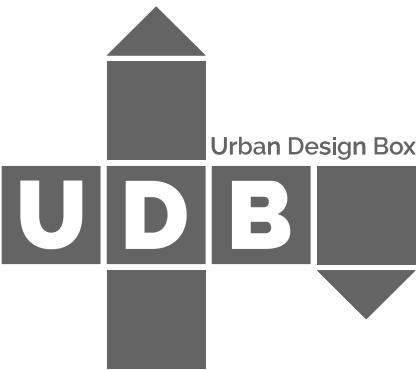
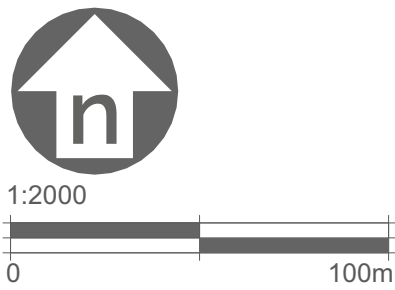
date:
November 2023

drawing number:
1001D

drawn
AJ

status:
Preliminary

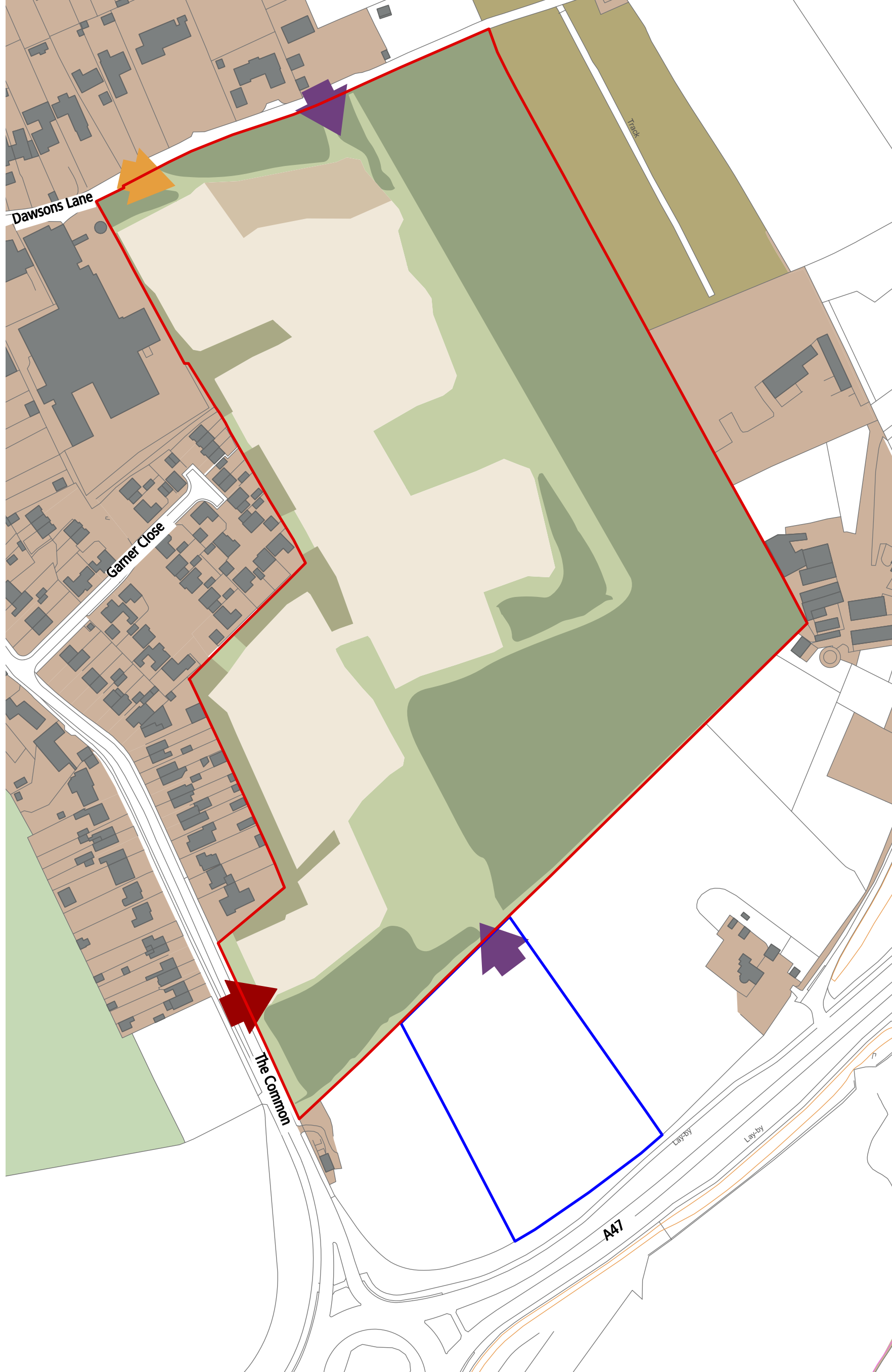
urbandesignbox.co.uk
Copyright of Urban Design Box. This drawing is for illustrative purposes only and should not be used for any construction or estimation purposes. No liability or responsibility is accepted arising from reliance upon the information contained within this drawing. DO NOT SCALE DRAWINGS FOR CONSTRUCTION PURPOSES.



-  Site boundary
-  Land also under the control of the applicant
-  Proposed all modes access
-  Proposed pedestrian and cycle access
-  Proposed pedestrian access
-  Residential development and access roads
-  Self build development and access roads
-  Public open space
-  Meadow grassland with mown paths and attenuation area
-  Maintenance area

NOTE

A limited deviation of +/- 5m should be allowed to area boundaries to give flexibility of the detailed street design at Reserved Matters stage, whilst balancing the overall quantum.



client:
Harrow Estates

project:

Land East of The Common, Barwell

drawing title:
Parameter Plan

urbandesignbox.co.uk

Copyright of Urban Design Box. This drawing is for illustrative purposes only and should not be used for any construction or estimation purposes. No liability or responsibility is accepted arising from reliance upon the information contained within this drawing. **DO NOT SCALE DRAWINGS FOR CONSTRUCTION PURPOSES.**

job number:
HAR102

scale
1:2000 @ A3

date:
December 2023

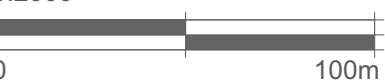
drawing number:
3501C

drawn
AJ

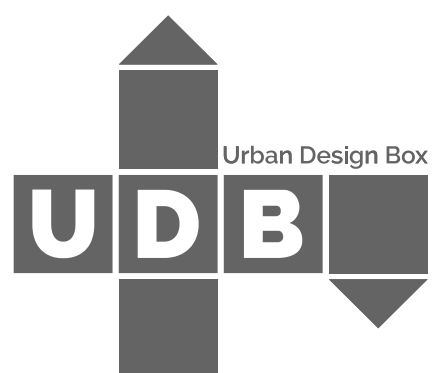
status:
Preliminary



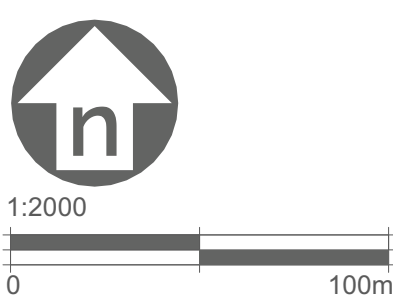
:2000



Urban Design Box



- Site boundary
- Land also under the control of the applicant
- Proposed all modes access
- Proposed pedestrian and cycle access
- Proposed pedestrian access
- Proposed pedestrian route
- Proposed shared pedestrian and cycle route
- Residential development
- Self build development
- Proposed main street and pathway
- Proposed shared surface
- Public open space
- Meadow grassland with mown paths
- Maintenance area
- Attenuation area / swales
- Existing hedges / trees / planting
- Proposed trees
- Proposed woodland
- Proposed hedges / strategic planting infrastructure
- Play area
- Outdoor recreation
- Walking routes
- Offsite proposed permissive pedestrian route



client:
Harrow Estates

project:
Land East of The Common, Barwell

drawing title:
Illustrative Masterplan

job number:
HAR102

scale
1:2000 @ A3

date:
December 2023

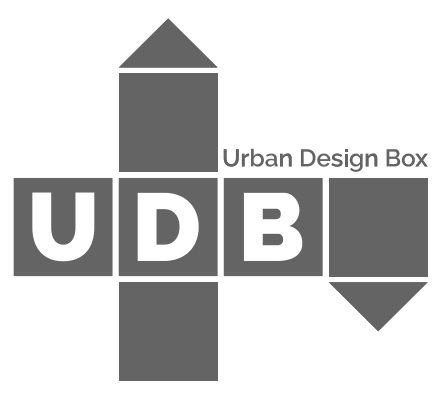
drawing number:
4001G

drawn
AJ

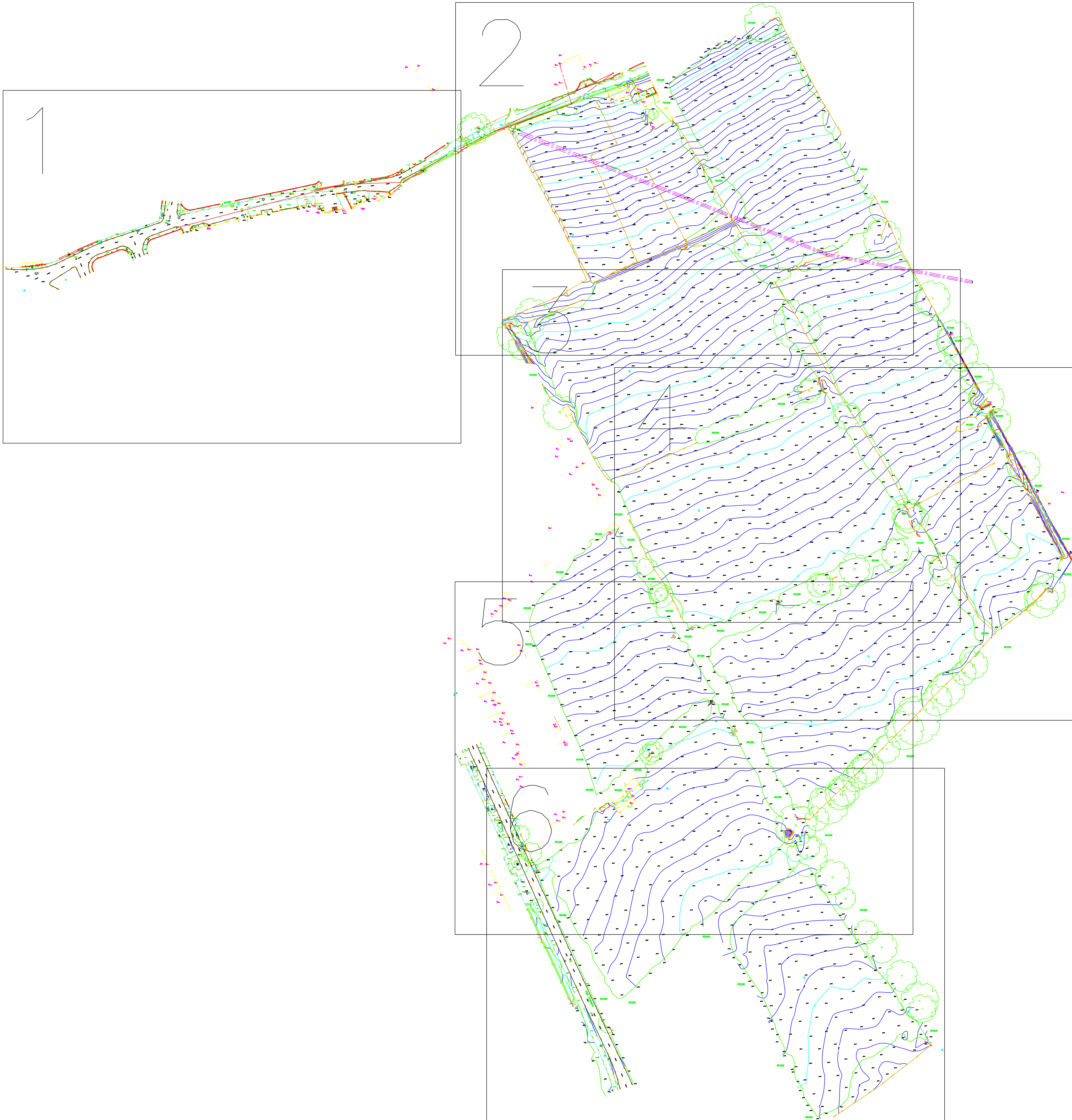
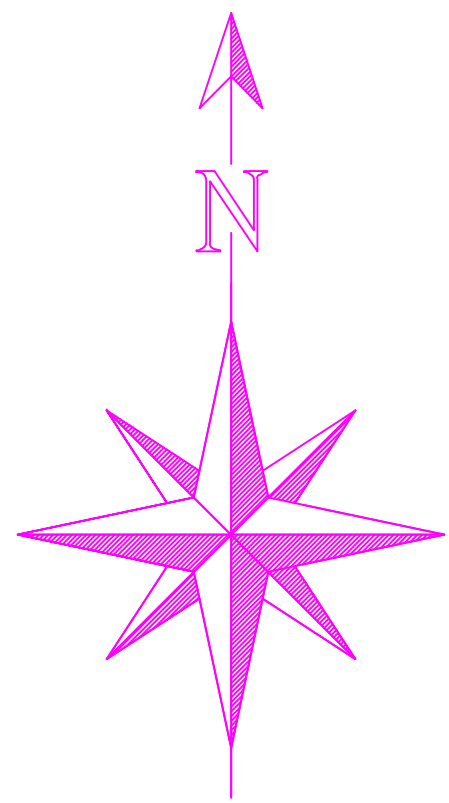
status:
Preliminary

urbandesignbox.co.uk

Copyright of Urban Design Box. This drawing is for illustrative purposes only and should not be used for any construction or estimation purposes. No liability or responsibility is accepted arising from reliance upon the information contained within this drawing. DO NOT SCALE DRAWINGS FOR CONSTRUCTION PURPOSES.



Appendix 2: Topographical Survey



SURVEY CONTROL STATIONS			
STN	EASTING	NORTHING	HEIGHT
2001	444963.494	296512.274	102.497
2002	444991.686	296527.427	106.509
2003	444991.686	296527.427	106.509
2004	444991.686	296527.427	106.509
2005	444919.445	296796.827	114.792
2006	445043.094	296779.500	110.763
2007	445127.272	296650.454	104.522
2008	445176.209	296560.499	100.757
2009	445094.620	296458.830	100.072
2010	445086.433	296392.223	98.480
2011	445090.802	296313.768	96.253
2012	445013.076	296430.986	99.396
2013	444936.734	296375.272	100.200
2015	444842.574	296729.570	125.413
2016	444991.686	296729.570	96.411
2017	444920.153	296368.464	100.239
2019	444980.310	296402.950	99.509
2020	445040.719	296429.068	100.148
2021	444991.026	296416.075	98.500
2022	444988.188	296413.798	99.471
2023	444991.026	296411.075	114.108
2024	444991.726	296819.787	114.729
2025	445191.335	296454.477	102.503
2026	445214.816	296573.304	100.147
2027	445212.122	296459.862	100.849
2028	445184.913	296776.772	95.361
2030	444892.474	296783.216	115.365
2032	444988.188	296814.536	114.510
2033	444991.890	296822.909	112.069
2034	444813.130	296709.816	114.762
2035	444769.856	296752.025	114.495
2036	444756.667	296742.768	114.271
2037	444690.959	296730.509	112.661
2038	444646.509	296703.295	113.902

LEGEND

- CONTROL STATIONS
MANHOLE
BUSH
TREE
DROP KERB
EMBANKMENT
OVERHEAD ELECTRICITY LINE
OVERHEAD TELEPHONE LINE
FOOTPATH
FENCE
HEDGE
FOUJAGE
DITCH
VERGE
EXISTING BUILDING
MAIN CONTOUR
CONTOUR
SW SEWER
FW SEWER

- AV Air Valve
BH Benchhole
BS Box Stop
BM Bench Mark
BT BT Inspection Chamber
C/L Cable TV Cover
C/L Chain Link Fence
C/L Chain Link Fence
CPS Concrete Paving Stop
ECB Electricity Control Box
EH Building Eaves Level
ER Earthing Rod
FB Flower Bed
FL Floor Level
GH Greenhouse
GR Gate Post
GR Gate
GV Gas Valve
GV Gully
IC Inspection Chamber
IL Invert Level
KO Kerb Outlet
JB Junction Box
Lamp Post
MH Man Hole
MH Man Hole
MS Man Stone Marker
MS Man Stone Marker
O/H Overhead
PB Post Box
PB Post Box
PM Parking Meter
P/R Post & Rail Fence
P/W Post & Wire Fence
P/W Electricity Pylon
RE Roadside Eye
RSJ Reinforced Steel Joist
R/W Retaining Wall
RWP Reinforced Pipe
S/S Stone Paving Slabs
SL Sign Level
SP Sign Post
ST Stop Sign
SV Stop Sign
SY Stop Sign
TC Traffic Crossing
TOW Top Of Wall Level
TH Tree Hole
TL Traffic Light
TP Drainage Pipe
UL Under Lift
WM Water Meter
WH Building Valley Level

Disclaimer
Man Entry to sewers has not been undertaken. Depths, Pipe sizes etc are measured from the ground. All sewers and inverts to be checked prior to any works commencing on site. Geomatic Surveys Limited are not responsible for manholes, services, information not surveyed which may have an impact on site development.
Boundaries shown are physical and may not represent legally conveyed ownership.
Tree species have only been identified using basic identification techniques. For precise tree species identification, it is recommended that a qualified arboriculturist is used prior to tree removal.

REV DATE DESCRIPTION BY APP.

Sheet Layout

Sheet 1

Survey Information
The Survey has been orientated to Ordnance Survey National Grid and datum using one central control station. No Scale Factor has been applied to the coordinates meaning that the survey is arbitrary and not true Ordnance Survey Coordinates.

Geomatic Surveys Ltd
LAND SURVEYORS AND CONSULTING ENGINEERS
Bank House, The Paddock
Wilmslow Road
Handforth
Cheshire
SK9 3HQ
Tel/Fax: 01625 521405
Email: info@geomaticsurveys.co.uk
Web: www.geomaticsurveys.co.uk

Client
REDROW HOMES LTD
(HARROW ESTATES DIVISION)

Project Title
THE COMMON
BARWELL
LEICESTERSHIRE

Drawing Title
PLOT SHEET LAYOUT

Drawn: MRW Checked: IRH Surveyed Date: July 2021

Date: 14/07/2021 Scale: 1:1000 @ AD Sheet No: SHEET 1 OF 1

Dwg. No: 02663/Topo Rev:

Copyright © Geomatic Surveys Limited 2021

Appendix 3: Severn Trent Water Pre-Development Enquiry and Aset Record

WONDERFUL ON TAP



Severn Trent Water Ltd
Regis Road
Wolverhampton
WV6 8RU

Tel: 0345 2667930
www.stwater.co.uk
net.dev.west@severntrent.co.uk

Contact: Sadeq Hadi

Your ref:
Our ref: 1019686

6th October 2021

Sam Cooper
BWB Consulting Ltd
35 Livery Street
Birmingham
B3 2PB

Dear Sam Cooper,

**Proposed development for 110 houses @ The Common, Barwell,
LE9 8NG**

I refer to your Development Enquiry Request in respect of the above site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

Protective Strips

Due to recent change in legislation on 1st October 2011, there could be sewers, which have transferred over to the Company that are not shown on the statutory sewer records but are located on your clients land. These sewers will have protective strips that we will not allow to be built over. The sewers could be identified whilst the land is being surveyed. If this is the case, please contact us for further guidance upon discovery.

Foul Water Drainage

Our enclosed sewer records show the available of a 300mm diameter combined sewer located east of the site within the verge of The Common.. I can confirm the flows from the proposed development of 341 houses, will generate approximate peak flow of 1.56/s (2xDWF). Given the overall development size and Sewerage Pump Station further downstream (SPS), it will be necessary to undertake a hydraulic assessment of the site. As you may be aware, we no longer charge developers for the hydraulic modelling service. All sites now go forward for prioritization against our risk matrix that takes into account such things as planning status and potential impact on the environment or our existing customers.

We may contact you in due course for further information and will liaise with you over time with regard to the outcome of our investigations and any impact that may have on the Planning status, occupation, or phasing of the site. However, while we can provide a brief summary of our findings if you need us to, we will no longer provide the full external SCA report. In the meantime, as you progress matters for your site, we would appreciate any updates you have regarding the development

WONDERFUL ON TAP

SEVERN

TRENT

progression, as we will be reviewing the modelling requirements on a weekly basis. I would therefore be grateful if you would forward as soon as possible the following details:

- **Please advise us of your preferred connection point, at the earliest opportunity.**
- Proposed submission of your Planning Application
- Proposed planned start and completion date.
- Any phasing details of the proposed development
- Planned occupation dates

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2010, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical, you can liaise directly with the Lead Local Flood Authority and Canal and River Trust for a discharge into the local ditch south or east of the site. If this proved to be impractical, we can in this case accept a restricted discharge into the 225mm or 525mm surface water networks passing through The Common. Flow restrictions must be agreed with the LLFA.

Connections

For any new connections including the use, reuse and indirect to the public sewerage system, the developer will need to submit Section 106 application. Our Developer Services department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from www.stwater.co.uk

Please quote 1019686 in any future correspondence (including e-mails) with STW Limited. Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours Sincerely,



Sadeq Hadi
Senior Evaluation Technician
Network Solutions
Developer Services

Appendix 4: CCTV Survey

THE COMMON BARWELL



DRAINAGE SURVEY **REPORT**

SEPTEMBER 2021 P2109161



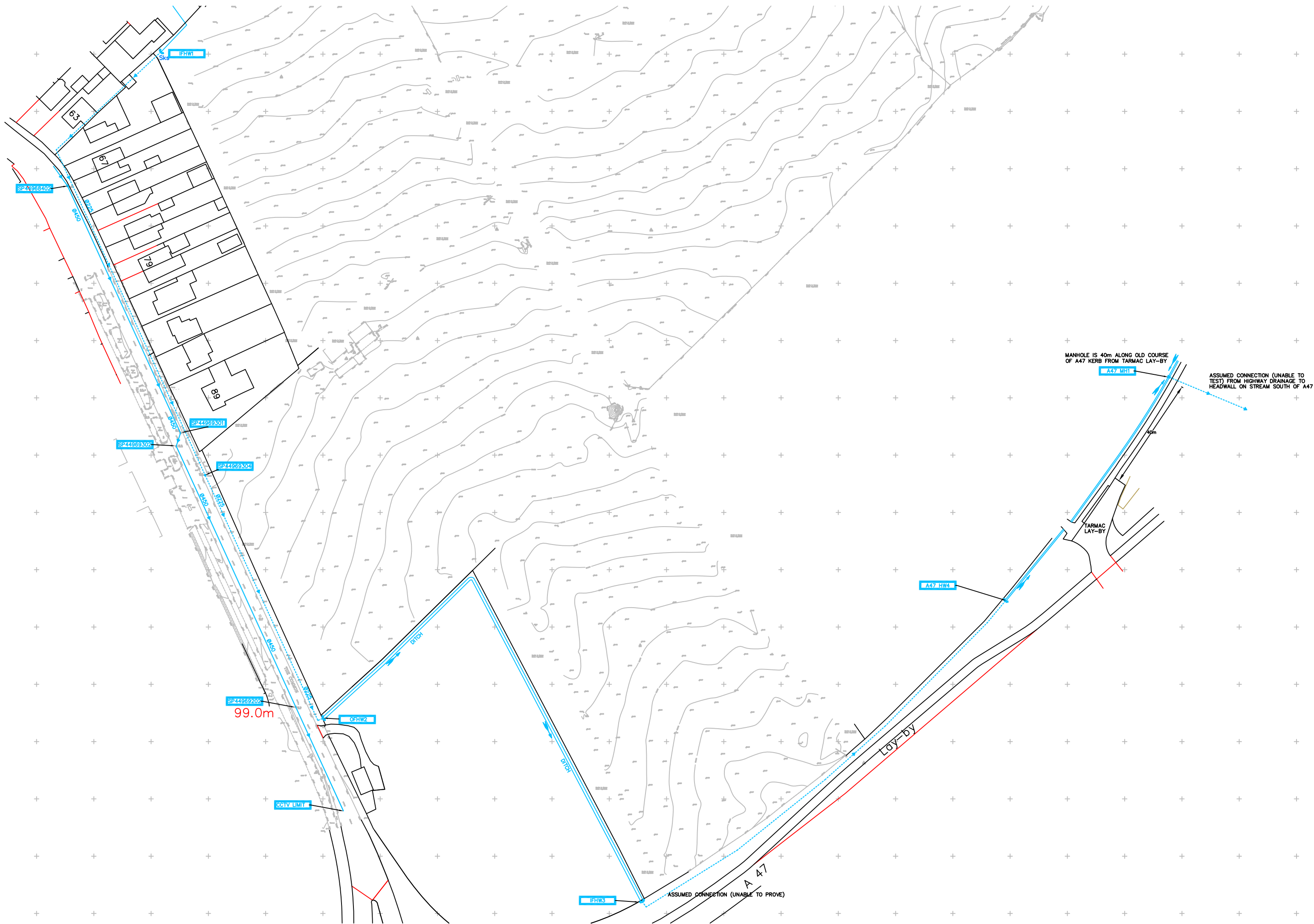
PES, The Workshop Business Centre
Main Street, Pinvin, Pershore. WORCS.
Tel.01386 555895 www.premium-es.co.uk

DRAINAGE SURVEY

The investigation was undertaken to establish the storm drainage route taken by surface water from Granger Close to South of the A47 via "The Common". Granger Close had a large storm ditch which was dry at the time of survey, to be used in time of heavy rainfall as run off storage. The storm systems on Granger Close discharged via 2 headwalls into the ditch and flowed under the site boundary to a piped infall headwall IFHW1. The headwall contains a Ø225 pipe which flows to manhole SP44969304. The route went from the field containing IFHW1 under the property "No.63 The Common"(confirmed by the householder as during construction of an extension to the property it was built over). The pipe then carried out to the front of the properties and turned to follow the route south along the verge of "The Common" connecting to MH SP44969304. Due to tree roots and debris in the pipe the CCTV works were limited but the connectivity was proved by dye testing. From MH SP44969304 the Ø225 pipe continued south along the verge to the steel gates at the next field boundary at which an outfall headwall was located which the storm water flowed out of into an open ditch. The ditch runs around the perimeter of the field. The ditch is approx. 600-750mm wide and shallow in flow depth. The ditch is overgrown for a lot of its length and has had rubbish dumped in it in places. The ultimate destination for the ditch is an infall headwall IFHW3. The ditch on the upstream face of the headwall is heavily silted and the pipe is not visible and it is a similar story on the downstream face. It is our assumption that the flow should enter a culvert along the northern boundary of the A47 and then emerge at the headwall "A47 HW4" into the open ditch at this location. From here an open ditch runs along the A47 verge under the entrance to "White Oaks" and along the old verge alignment of the A47 to MH "A47MH 1". The manhole "A47MH1" collects the water from the ditch and has an outgoing pipe which we assume runs under the A47 and discharges via a headwall outfall to the watercourse on the south side of the A47. We found the headwall but were unable to CCTV or dye test the run to be sure but this seems to be the termination point of the storm system. According to drainage records a second storm run consisting of a Ø450mm pipe flows along "The Common". We CCTV surveyed the length of the run for the site extents to verify that the storm water from the Ø225mm system did not enter it and this proved to be the case. The

run was surveyed from MH SP44968402 to a point 40m downstream from MH SP44969202. The pipes appeared clean and in good condition.

All the drainage routes are indicated on the accompanying Topo survey drawing.



DRAINAGE REPORT

ABREVIATIONS USED

Status	PU	Public	Pipe Shape	C	Circular
	PR	Private		E	Egg
	24	Section 24		R	Rectangle
	HD	Highway drain		S	Square
	WC	Culverted watercourse		T	Trapezoidal
Function	F	Foul		A	Arched
	C	Combined		B	Barrel
	S	Surface water		H	Horseshoe (inverted u)
	T	Trade effluent		U	U-shaped with flat top
				X	Other (state in remarks)
Manhole Type	IF	Infall	Pipe (or lining material)	BR	Brick
	MH	Manhole		CI	Cast Iron
	CP	Catchpit		SI	Spun (grey) iron
	LH	Lamphole		CO	Concrete
	RE	Rodding Eye		CSB	Conc. Segments (bolted)
	SO	Storm overflow		CSU	Conc. Segments (unbolted)
	GU	Gully		CC	Conc. Box culvert
	OF	Outfall		DI	Ductile iron
	SA	Soakaway		GRC	Glass reinforced conc
	CSO	Combined Storm overflow		GRP	Glass reinforced plastic
Cover Duty	L	Light duty		PVC	Polyvinyl chloride
	M	Medium duty		PE	Polyethylene
	H	Heavy duty		RPM	Reinforced plastic matrix
				ST	Steel
				VC	Vitrified Clay
Cover Shape	S	Square		PP	Polypropylene
	R	Rectangle		PF	Pitch Fibre
	DT	Double Triangle		MAC	Masonry, coursed
	T	Triangle		MAR	Masonry, random courses
	C	Circular		XXX	Other (state in remarks)
	GAT	Gattic			
	CLO	Clover			
	M	Multiple			
Soffit	R	Reducing slab			
	A	Arch			
	C	Corbel			
	T	Taper			
Manhole Construction	BR	Brick			
	PRE	Pre-cast Concrete			
	INS	Insitu concrete			
	GRP	Glass reinforced plastic			
	SEG	Segments			

Node Ref **SP44968402**MH Number **0001**Location **IN CARRIAGEWAY OUTSIDE No.67 THE COMMON
BARWELL LEICESTERSHIRE**Job No. **P2109161**COORDS X= **444890.826** Y= **296473.989**Survey Date **15/09/2021**Cover Level **102.704** m Datum Level Used: O.S.Gas Test **OK**

Year Laid Status **PU** Function **S** Node Type **MH**

COVER Shape **DT** Hinge Lock Duty **H** Size **610 X 610** Toxic **N**

SHAFT Side Entry R/Courses **3** Depth Size **610 X 610** Vermin **N**

CHAMBER Soffit **RS** Steps **5** Ladders Landings Size **Ø1200** Constr **PRE**

Flow Depth (mm) **15** Silt Depth (mm) **0** Evidence of Surcharge **NO** Surcharge Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
A	SP44968405	C	450				CON		2.685	100.019
B										
C										
D										

OUT			Cond		Crit					
X	SP44969301	C	450				CON		2.700	100.004

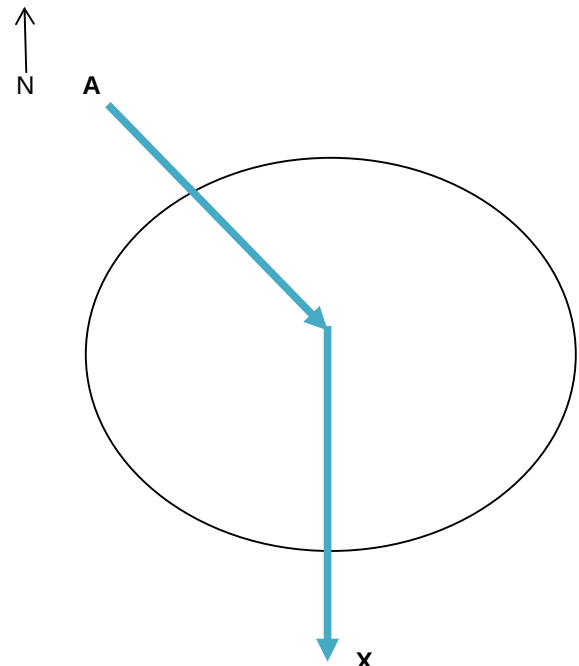
Condition (OK, P = Poor, X = attention required - see remarks)

Cover ☒ Steps/Lad ☒ Shaft ☒ Chamber ☒ Benching ☒ Channel ☒Remarks - **CCTV UPSTREAM AND DYE TESTING REVEALED NO INCOMING CONNECTION WITH PIPE FROM FIELD THAT RUNS UNDERNEATH No.63 THE COMMON**

Location



Manhole Sketch



MH SP44968402



LOCATION



CHAMBER

Node Ref **SP44969301**MH Number **0002**Location **SOUTHBOUND CARRIAGEWAY OUTSIDE No.89 THE COMMON
BARWELL LEICESTERSHIRE**Job No. **P2109161**COORDS X= **444930.288** Y= **296387.741**Survey Date **15/09/2021**Cover Level **100.440** m Datum Level Used: O.S.Gas Test **OK**

Year Laid Status **PU** Function **S** Node Type **MH**

COVER Shape **DT** Hinge Lock Duty **H** Size **600 X 600** Toxic **N**

SHAFT Side Entry R/Courses Depth Size **600 X 600** Vermin **N**

CHAMBER Soffit **RS** Steps **5** Ladders Landings Size **Ø1200** Constr **PRE**

Flow Depth (mm) **15** Silt Depth (mm) **0** Evidence of Surchage **NO** Surcharge Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
A	SP44968402	C	450				CON		2.500	97.940
B										
C										
D										

OUT			Cond		Crit					
X	SP44969302	C	450				CON		2.510	97.930

Condition (OK, P = Poor, X = attention required - see remarks)

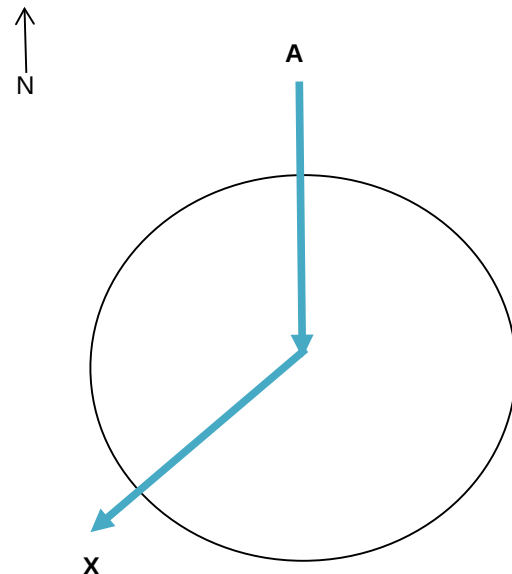
Cover ☒ Steps/Lad ☒ Shaft ☒ Chamber ☒ Benching ☒ Channel ☒

Remarks -

Location



Manhole Sketch



MH SP44969301



LOCATION



CHAMBER

Node Ref **SP44969302**MH Number **0003**Location **NORTHBOUND CARRIAGEWAY OUTSIDE No.90 THE COMMON
BARWELL LEICESTERSHIRE**Job No. **P2109161**COORDS X= **444928.819** Y= **296383.166**Survey Date **15/09/2021**Cover Level **100.430** m Datum Level Used: O.S.Gas Test **OK**

Year Laid Status **PU** Function **S** Node Type **MH**

COVER Shape **DT** Hinge Lock Duty **H** Size **610 X 610** Toxic **N**

SHAFT Side Entry R/Courses **2** Depth Size **610 X 610** Vermin **N**

CHAMBER Soffit **RS** Steps **5** Ladders Landings Size **Ø1200** Constr **PRE**

Flow Depth (mm) **15** Silt Depth (mm) **0** Evidence of Surcharge **NO** Surcharge Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
A	SP44969301	C	450				CON		2.620	97.810
B										
C										
D										

OUT			Cond		Crit					
X	SP44969202	C	450				CON		2.670	97.760

Condition (OK, P = Poor, X = attention required - see remarks)

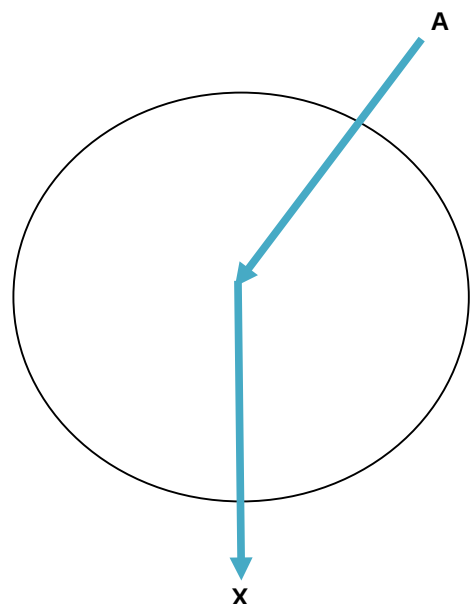
Cover ☒ Steps/Lad ☒ Shaft ☒ Chamber ☒ Benching ☒ Channel ☒

Remarks -

Location



Manhole Sketch



MH SP44969302



LOCATION



CHAMBER

Node Ref **SP44969202**MH Number **0004**Location **IN SOUTHBOUND CARRIAGEWAY THE COMMON
BARWELL LEICESTERSHIRE**Job No. **P2109161**COORDS X= **44970.558** Y= **296292.064**Survey Date **15/09/2021**Cover Level **99.010** m Datum Level Used: O.S.Gas Test

Year Laid Status **PU** Function **S** Node Type **MH**

COVER Shape **DT** Hinge Lock Duty **H** Size **610 X 610** Toxic **N**

SHAFT Side Entry R/Courses Depth Size Vermin **N**

CHAMBER Soffit Steps Ladders Landings Size Constr **PRE**

Flow Depth (mm) Silt Depth (mm) Evidence of Surchage **NO** Surcharge Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
A	SP44969302	C	450				CON			
B		C								
C		C								
D		C								

OUT			Cond		Crit					
X	UNKNOWN	C	450				CON			

Condition (OK, P = Poor, X = attention required - see remarks)

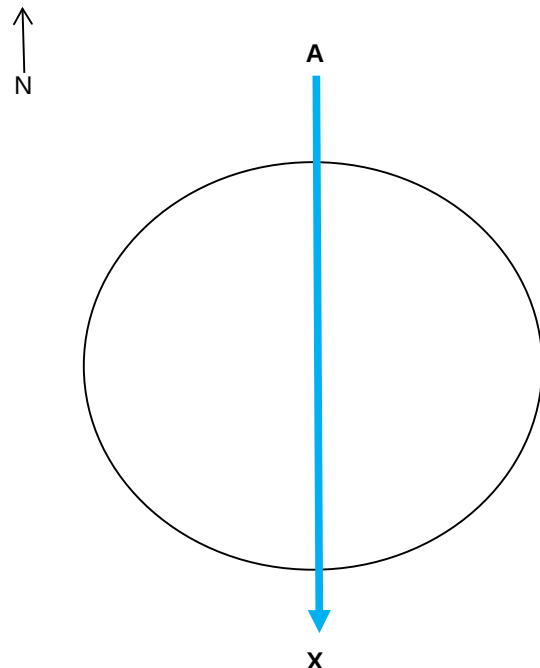
Cover **X** Steps/Lad Shaft Chamber Benching Channel

Remarks - **MANHOLE IS STUCK IN FRAME UNABLE TO RAISE. CCTV THROUGH MANHOLE UNTIL 40m
BEYOND MANHOLE FROM UPSTREAM MANHOLE REVEALS NO CONNECTION TO WATERCOURSE IN FIELDS.**

Location



Manhole Sketch



MH SP44969202



LOCATION



**COVER UNABLE TO RAISE
COMPACTED IN FRAME**

GARNER CLOSE



**OPEN DRAINAGE DITCH
LOOKING TOWARDS
NORTHERN SITE
FENCE/HEDGE**



**OPEN DRAINAGE DITCH
LOOKING TOWARDS
GARNER CLOSE**

Node Ref MH Number Location
Job No. COORDS X= Y= Survey Date Headwall Level m Datum Level Used: O.S.Gas Test

Year Laid Status Function Node Type

COVER Shape Hinge Lock Duty Size Toxic

SHAFT Side Entry R/Courses Depth Size Vermin

CHAMBER Soffit Steps Ladders Landings Size Constr

Flow Depth (mm) Silt Depth (mm) Evidence of Surchage Surcharge Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
	GARNER CLOSE DITCH									

IF INVERT

Cond

Crit

IF	SP44969304	C	225				VC		0.390	102.566
----	------------	---	-----	--	--	--	----	--	-------	---------

Condition (OK, P = Poor, X = attention required - see remarks)

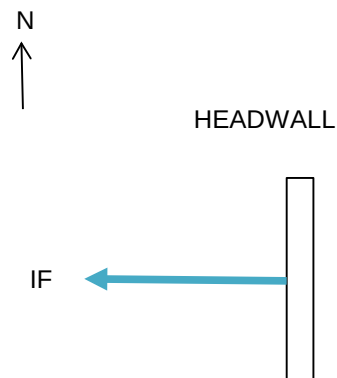
Cover Steps/Lad Shaft Chamber Benching Channel

Remarks - INFALL HEADWALL COLLECTS WATER FROM THE GENERAL AREA AT THE END OF THE OPEN DRAINAGE DITCH ON GARNER CLOSE. THE PIPE GOES UNDERGROUND AT THIS POINT AND INTO THE GARDEN OF "63 THE COMMON" AND ACCORDING TO THE PROPERTY OWNER HAS BEEN BUILT OVER. THE PIPE CHANGES MATERIAL AND IS IN BAD CONDITION PREVENTING CCTV GOING VERY FAR. THE PIPE THEN CONTINUES OUT TO THE FRONT OF THE PROPERTY AND DOWN THE VERGE TO MH SP44969304

Location



Headwall Sketch



THE COMMON BARWELL

IFHW1



LOCATION



LOCATION



LOCATION



INFALL



WATER AT IFHW1

Node Ref **SP44969304**MH Number **0005**Location **IN VERGE AT ACCESS GATE TO SITE OFF THE COMMON
BARWELL LEICESTERSHIRE**Job No. **P2109161**COORDS X= **444938.846** Y= **296373.036**Survey Date **15/09/2021**Cover Level **100.270** m Datum Level Used: O.S.Gas Test **OK** **ALARM**

Year Laid Status **PU** Function **S** Node Type **MH**

COVER Shape **C** Hinge Lock Duty **H** Size **Ø650** Toxic **N**

SHAFT Side Entry R/Courses Depth Size **-** Vermin **N**

CHAMBER Soffit **RS** Steps Ladders Landings Size **750 X 1200** Constr **BR**

Flow Depth (mm) **20** Silt Depth (mm) Evidence of Surchage **NO** Surchage Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
A	HW1	C	225				VC		0.960	99.310
B		C								
C		C								
D		C								

OUT				Cond		Crit				
X	HW2	C	225				VC		0.980	99.290

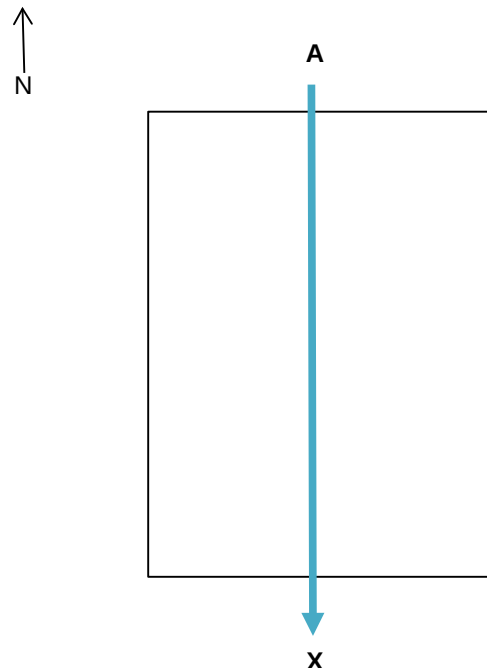
Condition (OK, P = Poor, X = attention required - see remarks)

Cover ☒ Steps/Lad **N/A** Shaft **N/A** Chamber ☒ Benching ☒ Channel ☒

Remarks - **UNABLE TO CCTV VERY FAR UPSTREAM FROM MANHOLE DUE TO ROOTS IN PIPE SO NO OTHER UPSTREAM MANHOLES FOUND ON RUN BETWEEN CHAMBER AND HW1 IN FIELD. CONNECTIVITY BETWEEN HW1 AND MANHOLE VERIFIED BY DYE TESTING. SIMILAR DOWN STREAM TO HW2(DYE TESTED)**



Manhole Sketch



MH SP44969304



LOCATION



**DYE TEST FROM IFHW1
IN CHAMBER TO PROVE
CONNECTION**



CHAMBER

Node Ref

OFHW2



MH Number

0006

Location

 ADJ TO STEEL FIELD ACCESS GATE OFF THE COMMON
 BARWELL LEICESTERSHIRE

Job No.

P2109161

COORDS

X= 444980.162

Y= 296288.224

Survey Date

15/09/2021

Headwall Level

98.106m

Datum Level Used: O.S.

Gas Test

OK

Year Laid

Status

PU

Function

S

Node Type

OF

COVER

Shape

Hinge

Lock

Duty

Size

Toxic

N

SHAFT

Side Entry

R/Courses

Depth

Size

Vermin

N

CHAMBER

Soffit

Steps

Ladders

Landings

Size

Constr

CON

Flow Depth (mm)

Silt Depth (mm)

Evidence of
Surcharge

NO

Surcharge Depth
(mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
	SP44969304	C					VC			

OF INVERT

Cond

Crit

OF	DITCH	C	225				CON		0.570	97.536
----	-------	---	-----	--	--	--	-----	--	-------	--------

Condition (OK, P = Poor, X = attention required - see remarks)

Cover

Steps/Lad

Shaft

Chamber

Benching

Channel

Remarks - HEADWALL CONTAINS THE PIPE RUNNING FROM MH SP44969304 AND IT DISCHARGES INTO AN OPEN DITCH RUNNING AROUND A FIELD BOUNDARY ULTIMATELY LINKING UP TO AN INFALL HEADWALL IFHW3 AT THE NORTH SIDE OF THE A47.

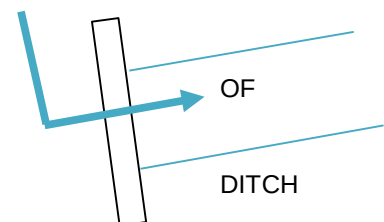
Location



Headwall Sketch



HEADWALL



HWOFF2



LOCATION



**OUTFALL HEADWALL
TO DITCH**

FIELD BOUNDARY DITCH



START AT OFHW2



DITCH(OVERGROWN)



DITCH



DITCH(OVERGROWN)



**DITCH(EVIDENCE OF
DUMPING)**



DITCH



**END OF FIELD DITCH AT
IFHW3
NOTE FIELD DITCH SILTED
U/S OF HW & D/S OF HW
HIGHWAY DRAINAGE DITCH**

Node Ref MH Number Location
Job No. COORDS X= Y= Survey Date Headwall Level m Datum Level Used: O.S.Gas Test

Year Laid Status Function Node Type

COVER Shape Hinge Lock Duty Size Toxic

SHAFT Side Entry R/Courses Depth Size Vermin

CHAMBER Soffit Steps Ladders Landings Size Constr

Flow Depth (mm) Silt Depth (mm) Evidence of Surcharge Surcharge Depth (mm)

Pipe	Upstream / Downstream Manhole	Shape	Pipe Size (height / diameter) mm	Pipe Size (width) mm	B/Drop Diameter (mm)	B/Drop Depth (m)	Material	Lining Material	Depth to Invert (m)	Invert Level (m)
	FIELD DITCH						?		?	NO ACCESS

IF INVERT					Cond	Crit				
IF	HIGHWAY DITCH						?		?	NO ACCESS

Condition (OK, P = Poor, X = attention required - see remarks)

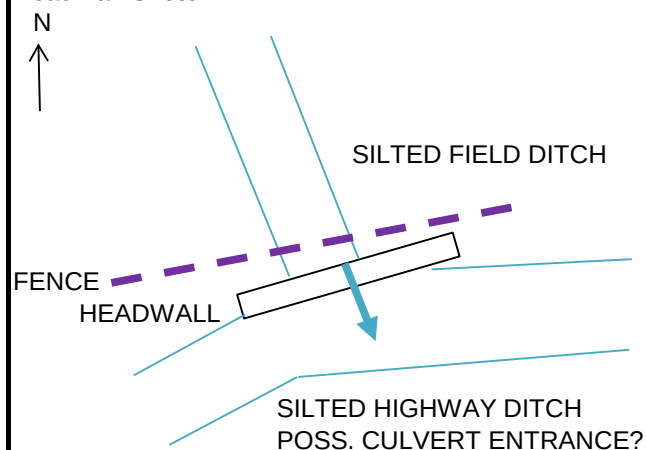
Cover Steps/Lad Shaft Chamber Benching Channel

Remarks - INFALL HEADWALL IS AT END OF THE OPEN DRAINAGE DITCH RUNNING AROUND FIELD. AT THE A47 BOUNDARY FENCE THE HEADWALL SHOULD COLLECT THE WATER FROM THE FIELD DITCH AND ALLOW IT TO PASS THROUGH TO INFALL INTO A HIGHWAY DITCH(POSSIBLY HEAVILY SILTED) OR CULVERT(AGAIN BURIED). BOTH PIPES ON EITHER SIDE ARE BURIED SO INVERT LEVELS AND PIPE SIZES AT THE HEADWALL ARE UNOBTAINABLE.

Location



Headwall Sketch



IFHW3



LOCATION IN A47 VERGE



VIEW FROM D/S



LAMP POST IS NO.3



VIEW ON U/S FACE

A47 HW4



**LOCATION (IN HEDGE NEAR
THIS SIGN ON A47)**



HEADWALL



**HEADWALL INTO HIGHWAY
DRAINAGE DITCH**

A47 MH1



**LOCATION REAR OF
FOOTPATH ON OLD A47**



HIGHWAY DITCH INCOMING



CHAMBER



WATERCOURSE INCOMING

**HEADWALL SOUTH
OF A47 INTO WATERCOURSE**



**HEADWALL ON
WATERCOURSE**

CCTV REPORT



Project Name: The Common Barwell

Project Date: 15/09/2021

Inspection Standard: MSCC4 Sewers & Drainage GB (SRM4 Scoring)



Project Information

Project Name The Common Barwell	Project Number P2109161	Project Date 15/09/2021
---	-----------------------------------	-----------------------------------

Contractor

Company: PES
Contact: Kim Randall
Department: CCTV
Phone: 01386 555895
Mobile: 07891 927593





PES

Tel. 01386 555895

Section Profile

Project Name
The Common Barwell

Project Number

Project Date
15/09/2021

Circular, 450 mm

Section	Upstream Node	Downstream Node	Date	Road	Pipe Material	Total Length	Inspected Length
4	SP44969301	SP44969302	15/09/2021	The Common	Concrete	3.10 m	3.10 m
5	SP44969302	SP44969202	15/09/2021	The Common	Concrete	101.00 m	101.00 m

Total: 2 Inspections x Circular 450 mm = 104.10 m Total Length and 104.10 m Inspected Length

Total: 2 Inspections = 104.10 m Total Length and 104.10 m Inspected Length



PES

Tel. 01386 555895

Section Inspection - 15/09/2021 - ?X

Section 1	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR ?X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	?
Road:	The Common	Inspected Length:	6.00 m	Upstream Pipe Depth:	
Location:		Total Length:	6.00 m	Downstream Node:	44969304
Surface Type:		Joint Length:	0.60 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	225 mm		
Year Constructed:		Pipe Material:	Vitrified clay pipe (i.e. all clayware)		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:
Recommendations:

Scale:	1:53	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m ?							
		0.00	WL	Water level, 10% of the vertical dimension	00:00:00		
		0.00	MH	Start node type, manhole, reference number: ?	00:00:00		
		0.70	MCAC	Material changes to asbestos cement	00:00:22	_X_af490d 8f-1502-4e 2d-b38c-85	
		0.70	PC	Joint length of pipe forming drain or sewer changes, new length: 3000mm	00:00:25		
		6.00	RM	Roots, mass, 60% cross-sectional area loss	00:01:37	_X_5f304a e7-a971-4 180-bdd8-	5
		6.00	SA	Survey abandoned: Camera Unable to pass	00:02:37		

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
0	0.0	0.0	0.0	1.0	1	15.0	21.4	15.0	5.0



PES

Tel. 01386 555895

Section Pictures - 15/09/2021 - ?X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
1	Downstream	?X		



_X_af490d8f-1502-4e2d-b38c-858b3ffb67ac_20210915_09210
0_473.jpg, 00:00:22, 0.70 m
Material changes to asbestos cement



_X_5f304ae7-a971-4180-bdd8-d945b1fa45b4_20210915_0922
46_352.jpg, 00:01:37, 6.00 m
Roots, mass, 60% cross-sectional area loss

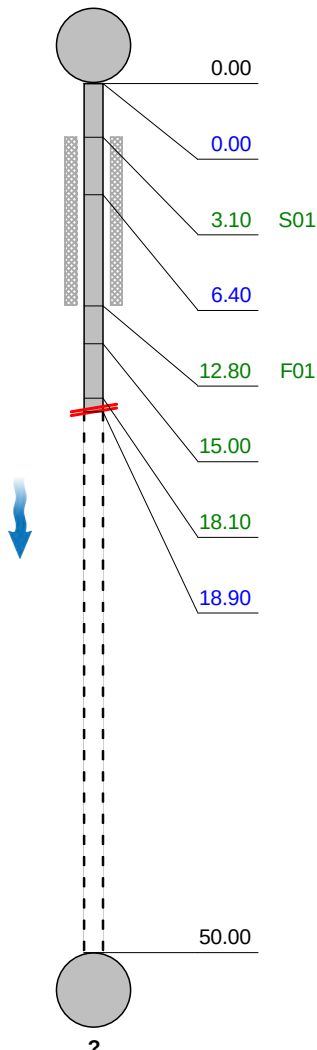
Section Inspection - 15/09/2021 - SP44969304X

Section 2	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR SP44969304X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	SP44969304
Road:	The Common	Inspected Length:	18.90 m	Upstream Pipe Depth:	
Location:		Total Length:	50.00 m	Downstream Node:	?
Surface Type:		Joint Length:	0.60 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	225 mm		
Year Constructed:		Pipe Material:	Vitrified clay pipe (i.e. all clayware)		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:

Recommendations:

Scale:	1:435	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m SP44969304 							
	0.00	MH	Start node type, manhole, reference number: 44969304	00:00:00			
	0.00	WL	Water level, 30% of the vertical dimension	00:02:38	44969304 X_0493e1 92-3ae8-4		
	3.10	S01 DEX	Settled deposits, other, 30% cross-sectional area loss, start: Stones	00:02:38	44969304 X_c8b927 7b-d51e-4		
	6.40	GP	General photograph taken at this point	00:02:05	44969304 X_06e2cca 7-0eec-41b		
	12.80	F01 DEX	Settled deposits, other, 30% cross-sectional area loss, finish: Stones	00:04:05			4
	15.00	RTJ	Roots, tap at joint	00:04:15	44969304 X_222e1a 04-1bbc-4b		4
	18.10	DEX	Settled deposits, other, 35% cross-sectional area loss: Stones	00:04:39	44969304 X_af71568 a-4de3-48		4
	18.90	SA	Survey abandoned: Too much debris	00:05:11			
	50.00		End of pipe				
? Depth: m							

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	3	5.0	0.0	60.0	4.0

**Section Pictures - 15/09/2021 - SP44969304X**

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SP44969304X		



44969304X_0493e192-3ae8-4370-aaab-ff8b2572b6a9_202109
15_092716_830.jpg, 00:02:38, 0.00 m
Water level, 30% of the vertical dimension



44969304X_96954ea0-1821-42f3-95ef-5b383f259c3a_2021091
5_092753_942.jpg, 00:02:38, 0.00 m
Water level, 30% of the vertical dimension



44969304X_c8b9277b-d51e-4de4-a6bf-7dcb52b176a3_202109
15_092856_250.jpg, 00:02:38, 3.10 m
Settled deposits, other, 30% cross-sectional area loss, start,
Stones



44969304X_06e2cca7-0eec-41b9-af30-9e0b6f651069_202109
15_093645_844.jpg, 00:02:05, 6.40 m
General photograph taken at this point



PES

Tel. 01386 555895

Section Pictures - 15/09/2021 - SP44969304X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
2	Downstream	SP44969304X		



44969304X_222e1a04-1bbc-4be9-b13a-ef4936e4c40c_20210915_093917_271.jpg, 00:04:15, 15.00 m
Roots, tap at joint



44969304X_af71568a-4de3-480d-9f97-5f19523ae225_20210915_093957_014.jpg, 00:04:39, 18.10 m
Settled deposits, other, 35% cross-sectional area loss, Stones



PES

Tel. 01386 555895

Section Inspection - 15/09/2021 - SP44968402X

Section 3	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR SP44968402X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Upstream	Upstream Node:	SP44968402
Road:	The Common	Inspected Length:	30.60 m	Upstream Pipe Depth:	
Location:		Total Length:	30.60 m	Downstream Node:	SP44969301
Surface Type:		Joint Length:	2.50 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	450 mm		
Year Constructed:		Pipe Material:	Concrete		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:

Recommendations:

Scale: 1:267	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m SP44969301						
	0.00	WL	Water level, 5% of the vertical dimension	00:00:00		
	0.00	MH	Start node type, manhole, reference number: 44969301	00:05:13		
	4.40	CN	Connection other than junction at 12 o'clock, diameter: 150mm	00:00:40		
	12.00	S01 DEE	Attached deposits, encrustation from 7 o'clock to 5 o'clock, 5% cross-sectional area loss, start	00:01:48		
	18.20	OBX	Other obstacles in invert from 5 o'clock to 6 o'clock, 10% cross-sectional area loss: cement	00:02:25		5
	18.40	CN	Connection other than junction at 1 o'clock, diameter: 150mm	00:02:22		
	30.60	F01 DEE	Attached deposits, encrustation from 7 o'clock to 5 o'clock, 5% cross-sectional area loss, finish	00:04:02		2
	30.60	OBX	Other obstacles in invert from 9 o'clock to 3 o'clock, 5% cross-sectional area loss: joint seal	00:04:05		5
	30.60	SA	Survey abandoned: Camera Unable to pass	00:04:12		

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	3	11.0	2.1	39.0	5.0

The Common Barwell



PES

Tel. 01386 555895

Section Inspection - 15/09/2021 - SP44969301X

Section 4	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR SP44969301X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	SP44969301
Road:	The Common	Inspected Length:	3.10 m	Upstream Pipe Depth:	
Location:		Total Length:	3.10 m	Downstream Node:	SP44969302
Surface Type:		Joint Length:	2.50 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	450 mm		
Year Constructed:		Pipe Material:	Concrete		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:

Recommendations:

Scale:	1:50	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m SP44969301 0.00 0.00 3.10 SP44969302 Depth: m							
		0.00	MH	Start node type, manhole, reference number: 44969301	00:00:00		
		0.00	WL	Water level, 5% of the vertical dimension	00:04:17		
		3.10	MHF	Finish node type, manhole, reference number: SP44969302	00:00:34		

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



PES

Tel. 01386 555895

Section Inspection - 15/09/2021 - SP44969302X

Section 5	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR SP44969302X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	SP44969302
Road:	The Common	Inspected Length:	101.00 m	Upstream Pipe Depth:	
Location:		Total Length:	101.00 m	Downstream Node:	SP44969202
Surface Type:		Joint Length:	2.50 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	450 mm		
Year Constructed:		Pipe Material:	Concrete		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:
Recommendations:

Scale:	1:879	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m SP44969302							
	0.00	WL		Water level, 5% of the vertical dimension	00:00:00		
	0.00	MH		Start node type, manhole, reference number: SP44969302	00:00:36		
	67.30	CN		Connection other than junction at 12 o'clock, diameter: 150mm	00:04:55		
	101.00	MHF		Finish node type, manhole, reference number: SP44969202	00:07:46	SP44969302X_a736604f-dcfb-	
SP44969202 Depth: m							

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



PES

Tel. 01386 555895

Section Pictures - 15/09/2021 - SP44969302X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
5	Downstream	SP44969302X		



SP44969302X_a736604f-dcfb-4293-942f-097d95082289_2021
0915_103538_060.jpg, 00:07:46, 101.00m
Finish node type, manhole, reference number: SP44969202



PES

Tel. 01386 555895

Section Inspection - 15/09/2021 - SP44969202X

Section 6	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR SP44969202X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	SP44969202
Road:	The Common	Inspected Length:	52.00 m	Upstream Pipe Depth:	
Location:		Total Length:	52.00 m	Downstream Node:	SP45960102
Surface Type:		Joint Length:	2.50 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	450 mm		
Year Constructed:		Pipe Material:	Concrete		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:
Recommendations:

Scale:	1:453	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m SP44969202							
		0.00	MH	Start node type, manhole, reference number: SP44969202	00:00:00		
		0.00	WL	Water level, 5% of the vertical dimension	00:07:55		
		52.00	CN	Connection other than junction at 12 o'clock, diameter: 150mm	00:04:28		
		52.00	SA	Survey abandoned: End of survey	00:04:30	SP449692 02X_f9b3a fb5-fded-4	

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



PES

Tel. 01386 555895

Section Pictures - 15/09/2021 - SP44969202X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
6	Downstream	SP44969202X		



SP44969202X_f9b3afb5-fded-40d4-8b97-fa7ac7f700ab_20210

915_105306_229.jpg, 00:04:30, 52.00 m

Survey abandoned, End of survey



PES

Tel. 01386 555895

Section Inspection - 15/09/2021 - SP44968402X

Section 7	Inspection 1	Date 15/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR SP44968402X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	SP44968402
Road:	The Common	Inspected Length:	64.40 m	Upstream Pipe Depth:	
Location:		Total Length:	64.40 m	Downstream Node:	SP44969301
Surface Type:		Joint Length:	2.50 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	450 mm		
Year Constructed:		Pipe Material:	Concrete		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:
Recommendations:

Scale: 1:560	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m SP44968402						
	0.00	MH	Start node type, manhole, reference number: SP44968402	00:00:00		
	0.00	WL	Water level, 5% of the vertical dimension	00:04:39		
	17.40	CN	Connection other than junction at 1 o'clock, diameter: 150mm	00:01:43		
	29.50	OBX	Other obstacles in invert from 10 o'clock to 2 o'clock, 5% cross-sectional area loss: joint seal	00:03:28	SP449684 02X_213e 87f8-b81c-	5
	64.40	OBB	Obstacles, brick or masonry in invert from 9 o'clock to 3 o'clock, 5% cross-sectional area loss: Completed	00:07:08		5
	64.40	SA	Survey abandoned: Length completed	00:07:17	SP449684 02X_b2db 40e0-8525	

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	2	10.0	0.7	20.0	5.0

**Section Pictures - 15/09/2021 - SP44968402X**

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
7	Downstream	SP44968402X		



SP44968402X_213e87f8-b81c-473a-867b-c9baa1e2c6bd_20210915_114137_685.jpg, 00:03:28, 29.50m
Other obstacles in invert from 10 o'clock to 2 o'clock, 5% cross-sectional area loss, joint seal



SP44968402X_b2db40e0-8525-4b68-9019-65fe188b795c_20210915_114625_508.jpg, 00:07:17, 64.40m
Survey abandoned, Length completed



PES

Tel. 01386 555895

Section Inspection - 10/09/2021 - Inlet 1X

Section 8	Inspection 1	Date 10/09/21	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned Not Specified	PLR INLET 1X
Operator Not Specified		Vehicle	Camera Ipek	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Barwell	Inspection Direction:	Downstream	Upstream Node:	INLET 1
Road:	The Common	Inspected Length:	21.20 m	Upstream Pipe Depth:	
Location:		Total Length:	21.20 m	Downstream Node:	?
Surface Type:		Joint Length:	3.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:	Gravity drain/sewer	Dia/Height:	225 mm		
Year Constructed:		Pipe Material:	Polypropylene		
Flow Control:	No flow control	Lining Type:	No Lining		
Inspection Purpose:		Lining Material:	No Lining		

Comments:
Recommendations:

Scale:	1:185	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m Inlet 1							
		0.00	MH	Start node type, manhole, reference number: Inlet 1			
		0.00	WL	Water level, 35% of the vertical dimension			
		21.10	DEZ	Attached deposits, other from 5 o'clock to 7 o'clock, 25% cross-sectional area loss: Below water level			4
		21.20	SA	Survey abandoned: Camera unable to pass			84de2ae9 -5e38-46cd -aa6d-ae6

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	5.0	0.2	5.0	4.0



PES

Tel. 01386 555895

Section Pictures - 10/09/2021 - Inlet 1X

Section	Inspection Direction	PLR	Client`s Job Ref	Contractor`s Job Ref
8	Downstream	INLET 1X		



_84de2ae9-5e38-46cd-aa6d-ae625238febe_20210916_101054.
jpg, 21.20 m

Survey abandoned, Camera unable to pass

Appendix 5: Greenfield Runoff Rate

BWB Consulting Ltd		Page 1
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	232722, Barwell Greenfield Runoff Rate ICP SuDS	
Date 21/11/2023 File Barwell storage 100yr p...	Designed by W. James Checked by G. Littlewood	
Innovyze	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	4.300	Urban	0.000
SAAR (mm)	700	Region Number	Region 4

Results l/s

QBAR Rural	18.9
QBAR Urban	18.9
Q100 years	48.5
Q1 year	15.7
Q30 years	37.0
Q100 years	48.5

©1982-2020 Innovyze

Appendix 6: Greenfield Runoff Volume

BWB Consulting Ltd		Page 1
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	232722, Barwell Greenfield Runoff Volume FSR	
Date 21/11/2023 File Barwell storage 100yr p...	Designed by W. James Checked by G Littlewood	
Innovyze	Source Control 2020.1	

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.400
Areal Reduction Factor	1.00
Area (ha)	4.300
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	45.91
Greenfield Runoff Volume (m³)	1223.421

©1982-2020 Innovyze

Appendix 7: MicroDrainage Source Control Calculations

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.823	0.423	18.8	780.1	O K
30 min Summer	98.935	0.535	18.8	1019.6	O K
60 min Summer	99.042	0.642	18.8	1260.8	O K
120 min Summer	99.139	0.739	18.8	1490.0	O K
180 min Summer	99.186	0.786	18.8	1605.0	O K
240 min Summer	99.212	0.812	18.8	1670.3	O K
360 min Summer	99.240	0.840	18.8	1739.4	O K
480 min Summer	99.251	0.851	18.8	1768.4	O K
600 min Summer	99.253	0.853	18.8	1773.0	O K
720 min Summer	99.249	0.849	18.8	1762.2	O K
960 min Summer	99.235	0.835	18.8	1727.3	O K
1440 min Summer	99.204	0.804	18.8	1650.0	O K
2160 min Summer	99.153	0.753	18.8	1524.6	O K
2880 min Summer	99.096	0.696	18.8	1387.6	O K
4320 min Summer	98.984	0.584	18.8	1128.0	O K
5760 min Summer	98.885	0.485	18.8	910.4	O K
7200 min Summer	98.799	0.399	18.8	731.8	O K
8640 min Summer	98.730	0.330	18.8	592.7	O K
10080 min Summer	98.676	0.276	18.7	488.6	O K
15 min Winter	98.868	0.468	18.8	875.7	O K
30 min Winter	98.992	0.592	18.8	1145.2	O K
60 min Winter	99.109	0.709	18.8	1418.1	O K
120 min Winter	99.215	0.815	18.8	1677.5	O K
180 min Winter	99.267	0.867	18.8	1809.6	O K
240 min Winter	99.297	0.897	18.8	1886.7	O K
360 min Winter	99.329	0.929	18.8	1972.4	O K
480 min Winter	99.345	0.945	18.8	2013.2	O K
600 min Winter	99.350	0.950	18.8	2027.1	O K
720 min Winter	99.349	0.949	18.8	2024.1	O K
960 min Winter	99.335	0.935	18.8	1988.0	O K
1440 min Winter	99.295	0.895	18.8	1883.1	O K
2160 min Winter	99.230	0.830	18.8	1715.4	O K
2880 min Winter	99.156	0.756	18.8	1531.4	O K
4320 min Winter	98.984	0.584	18.8	1128.5	O K
5760 min Winter	98.834	0.434	18.8	802.9	O K
7200 min Winter	98.714	0.314	18.8	562.6	O K
8640 min Winter	98.634	0.234	18.4	409.4	O K
10080 min Winter	98.595	0.195	17.5	336.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	137.396	0.0	744.6	26
30 min Summer	90.218	0.0	980.2	41
60 min Summer	56.422	0.0	1283.5	70
120 min Summer	34.083	0.0	1551.7	130
180 min Summer	25.037	0.0	1709.4	188
240 min Summer	19.995	0.0	1819.4	248
360 min Summer	14.522	0.0	1979.7	366
480 min Summer	11.573	0.0	2100.3	484
600 min Summer	9.697	0.0	2195.8	602
720 min Summer	8.389	0.0	2274.5	720
960 min Summer	6.669	0.0	2397.2	824
1440 min Summer	4.819	0.0	2542.2	1074
2160 min Summer	3.477	0.0	2889.6	1476
2880 min Summer	2.755	0.0	3051.2	1880
4320 min Summer	1.982	0.0	3284.1	2644
5760 min Summer	1.567	0.0	3489.0	3400
7200 min Summer	1.306	0.0	3631.2	4104
8640 min Summer	1.124	0.0	3747.8	4760
10080 min Summer	0.991	0.0	3841.4	5448
15 min Winter	137.396	0.0	835.8	26
30 min Winter	90.218	0.0	1095.5	40
60 min Winter	56.422	0.0	1438.5	70
120 min Winter	34.083	0.0	1737.9	128
180 min Winter	25.037	0.0	1913.6	184
240 min Winter	19.995	0.0	2035.9	242
360 min Winter	14.522	0.0	2213.3	358
480 min Winter	11.573	0.0	2345.7	472
600 min Winter	9.697	0.0	2449.3	586
720 min Winter	8.389	0.0	2533.0	696
960 min Winter	6.669	0.0	2656.2	908
1440 min Winter	4.819	0.0	2735.2	1132
2160 min Winter	3.477	0.0	3236.9	1600
2880 min Winter	2.755	0.0	3417.2	2052
4320 min Winter	1.982	0.0	3679.9	2856
5760 min Winter	1.567	0.0	3908.8	3576
7200 min Winter	1.306	0.0	4068.5	4192
8640 min Winter	1.124	0.0	4200.0	4760
10080 min Winter	0.991	0.0	4307.3	5336

Rainfall Details

Rainfall Model	FSR	Ratio R	0.400	Cv (Winter)	0.840
Return Period (years)	100	Summer Storms	Yes	Shortest Storm (mins)	15
Region	England and Wales	Winter Storms	Yes	Longest Storm (mins)	10080
M5-60 (mm)	19.900	Cv (Summer)	0.750	Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.100

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 1.034	4	8 1.033	8	12 1.033

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1634.0	1.000	2739.0	1.600	3451.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0194-1890-1000-1890	Sump Available	Yes
Design Head (m)	1.000	Diameter (mm)	194
Design Flow (l/s)	18.9	Invert Level (m)	98.400
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	18.9	Kick-Flo®	0.714	16.1
Flush-Flo™	0.336	18.8	Mean Flow over Head Range	-	15.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.600	17.8	1.600	23.6	2.600	29.8	5.000	40.9	7.500	49.7
0.200	18.0	0.800	17.0	1.800	25.0	3.000	31.9	5.500	42.8	8.000	51.3
0.300	18.8	1.000	18.9	2.000	26.3	3.500	34.4	6.000	44.6	8.500	52.9
0.400	18.7	1.200	20.6	2.200	27.5	4.000	36.7	6.500	46.4	9.000	54.4
0.500	18.4	1.400	22.2	2.400	28.7	4.500	38.8	7.000	48.1	9.500	55.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	98.816	0.416	18.8	766.0	O K
30 min Summer	98.927	0.527	18.8	1002.8	O K
60 min Summer	99.034	0.634	18.8	1241.3	O K
120 min Summer	99.141	0.741	18.8	1493.5	O K
180 min Summer	99.201	0.801	18.8	1642.3	O K
240 min Summer	99.239	0.839	18.8	1738.2	O K
360 min Summer	99.280	0.880	18.8	1842.6	O K
480 min Summer	99.293	0.893	18.8	1878.0	O K
600 min Summer	99.293	0.893	18.8	1877.0	O K
720 min Summer	99.285	0.885	18.8	1854.8	O K
960 min Summer	99.258	0.858	18.8	1786.9	O K
1440 min Summer	99.206	0.806	18.8	1654.7	O K
2160 min Summer	99.132	0.732	18.8	1471.8	O K
2880 min Summer	99.058	0.658	18.8	1298.2	O K
4320 min Summer	98.942	0.542	18.8	1034.1	O K
5760 min Summer	98.850	0.450	18.8	837.5	O K
7200 min Summer	98.780	0.380	18.8	693.8	O K
8640 min Summer	98.728	0.328	18.8	589.7	O K
10080 min Summer	98.689	0.289	18.7	513.1	O K
15 min Winter	98.861	0.461	18.8	859.9	O K
30 min Winter	98.983	0.583	18.8	1126.3	O K
60 min Winter	99.100	0.700	18.8	1396.1	O K
120 min Winter	99.217	0.817	18.8	1681.5	O K
180 min Winter	99.283	0.883	18.8	1851.4	O K
240 min Winter	99.326	0.926	18.8	1963.2	O K
360 min Winter	99.373	0.973	18.8	2089.1	O K
480 min Winter	99.391	0.991	18.8	2137.7	O K
600 min Winter	99.394	0.994	18.8	2145.6	O K
720 min Winter	99.388	0.988	18.8	2129.9	O K
960 min Winter	99.361	0.961	18.8	2058.3	O K
1440 min Winter	99.297	0.897	18.8	1888.5	O K
2160 min Winter	99.206	0.806	18.8	1654.0	O K
2880 min Winter	99.112	0.712	18.8	1424.3	O K
4320 min Winter	98.932	0.532	18.8	1013.3	O K
5760 min Winter	98.794	0.394	18.8	720.9	O K
7200 min Winter	98.696	0.296	18.8	526.8	O K
8640 min Winter	98.633	0.233	18.4	407.1	O K
10080 min Winter	98.599	0.199	18.0	344.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	134.960	0.0	731.1	26
30 min Summer	88.760	0.0	964.4	41
60 min Summer	55.580	0.0	1264.2	70
120 min Summer	34.160	0.0	1555.2	130
180 min Summer	25.587	0.0	1746.8	188
240 min Summer	20.755	0.0	1888.1	248
360 min Summer	15.307	0.0	2085.2	366
480 min Summer	12.210	0.0	2213.4	484
600 min Summer	10.190	0.0	2303.9	602
720 min Summer	8.762	0.0	2371.3	720
960 min Summer	6.861	0.0	2461.1	830
1440 min Summer	4.830	0.0	2546.7	1074
2160 min Summer	3.390	0.0	2818.0	1476
2880 min Summer	2.645	0.0	2930.3	1856
4320 min Summer	1.887	0.0	3127.3	2636
5760 min Summer	1.502	0.0	3343.7	3352
7200 min Summer	1.273	0.0	3540.5	4048
8640 min Summer	1.121	0.0	3738.3	4760
10080 min Summer	1.014	0.0	3934.6	5448
15 min Winter	134.960	0.0	820.8	26
30 min Winter	88.760	0.0	1078.3	40
60 min Winter	55.580	0.0	1416.9	70
120 min Winter	34.160	0.0	1741.8	128
180 min Winter	25.587	0.0	1955.3	184
240 min Winter	20.755	0.0	2112.2	242
360 min Winter	15.307	0.0	2329.7	358
480 min Winter	12.210	0.0	2469.4	474
600 min Winter	10.190	0.0	2566.0	586
720 min Winter	8.762	0.0	2635.5	698
960 min Winter	6.861	0.0	2719.4	910
1440 min Winter	4.830	0.0	2737.4	1134
2160 min Winter	3.390	0.0	3156.6	1596
2880 min Winter	2.645	0.0	3282.1	2052
4320 min Winter	1.887	0.0	3505.6	2816
5760 min Winter	1.502	0.0	3746.1	3520
7200 min Winter	1.273	0.0	3967.0	4184
8640 min Winter	1.121	0.0	4189.3	4760
10080 min Winter	1.014	0.0	4411.7	5328

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 445700 295900 SP 45700 95900	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.100

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:
	(ha)		(ha)		(ha)
0	4 1.034	4	8 1.033	8	12 1.033

Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 98.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1634.0	1.000	2739.0	1.600	3451.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0194-1890-1000-1890	Sump Available	Yes
Design Head (m)	1.000	Diameter (mm)	194
Design Flow (l/s)	18.9	Invert Level (m)	98.400
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

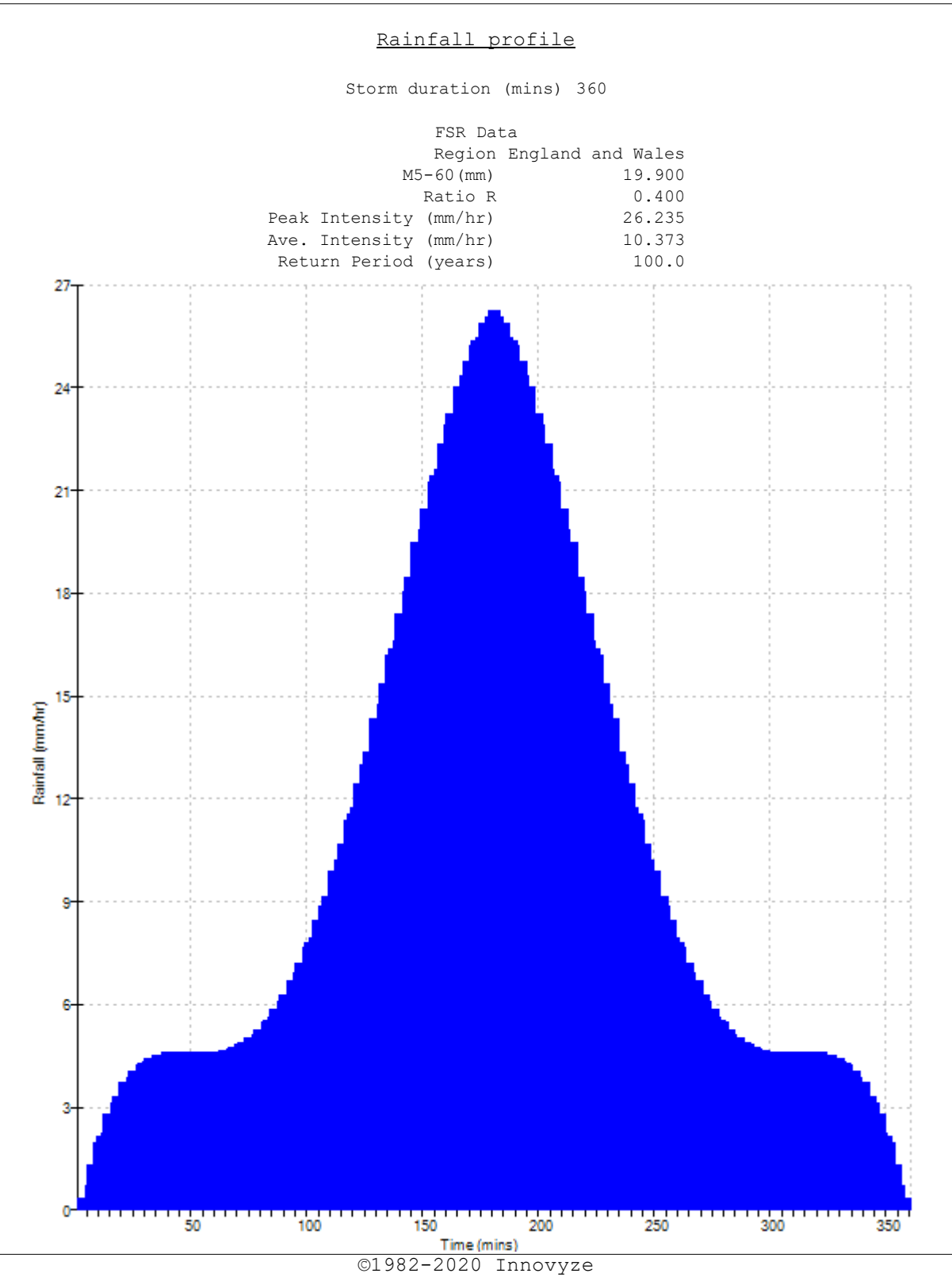
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	18.9	Kick-Flo®	0.714	16.1
Flush-Flo™	0.336	18.8	Mean Flow over Head Range	-	15.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	0.600	17.8	1.600	23.6	2.600	29.8	5.000	40.9	7.500	49.7
0.200	18.0	0.800	17.0	1.800	25.0	3.000	31.9	5.500	42.8	8.000	51.3
0.300	18.8	1.000	18.9	2.000	26.3	3.500	34.4	6.000	44.6	8.500	52.9
0.400	18.7	1.200	20.6	2.200	27.5	4.000	36.7	6.500	46.4	9.000	54.4
0.500	18.4	1.400	22.2	2.400	28.7	4.500	38.8	7.000	48.1	9.500	55.8

Appendix 8: Post Development Runoff Calculations

BWB Consulting Ltd		Page 1
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	232722, Barwell 1 in 100, 6-Hour Rainfall FSR	
Date 21/11/2023 File Barwell storage 100yr p...	Designed by W. James Checked by G. Littlewood	
Innovyze	Source Control 2020.1	



BWB Consulting Ltd		Page 1
5th Floor, Waterfront House 35 Station Street Nottingham, NG2 3DQ	232722, Barwell Post Dev Runoff Volume FSR	
Date 21/11/2023 File Barwell storage 100yr p...	Designed by W. James Checked by G. Littlewood	
Innovyze	Source Control 2020.1	

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.400
Areal Reduction Factor	1.00
Area (ha)	1.200
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	45.91
Greenfield Runoff Volume (m³)	341.420

©1982-2020 Innovyze

Appendix 9: Conceptual Drainage Strategy