Land Off Windsor Drive, Devizes, Wiltshire

Robert Hitchins Ltd

Flood Risk Assessment

&

Drainage Strategy

March 2026

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Executive Summary

This site-specific FRA has been produced in accordance with the requirements of the NPPF, Planning Practice Guidance (PPG), and EA advice notes, and demonstrates that the proposed development will be safe from flood risk and that it will not increase flood risk elsewhere.

The site is in Flood Zone 1 with a low flood risk (less than 1:1,000 or 0.1% annual probability of flooding from rivers).

The proposed residential development is classified as 'More Vulnerable' and is in Flood Zone 1; the proposed residential development is suitable in this zone and the NPPF Sequential and Exception Tests are not required.

Development levels will be designed to route surface water flows away from dwellings to protect them from flooding.

Flood risk from fluvial, pluvial, sewers, surface water, groundwater and artificial sources have been assessed, and it has been demonstrated that the proposed development will not be at risk from flooding from all sources.

Surface water from the proposed development will discharge into the existing highway drain alongside Windsor Drive. Overland runoff from the site currently runs on to Windsor Drive and into this highway drain. The discharge will be limited to Qbar for events up to and including the 1:100 + 45% climate change/urban creep allowance event with 30% betterment provided compared with existing greenfield rates. This will ensure that flood risk is not increased in the drainage system downstream of the development for the lifetime of the development. Details of the proposed drainage strategy are shown on drawing 638-P106 in Appendix G.

Attenuation will be provided in a pond or basin with sewers discharging directly into it via precast concrete headwalls. Bank slopes will be 1 in 3 in accordance with The SuDS Manual Ciria C753. The discharge will be controlled by a vortex control device, and an overflow gate will be provided for more extreme events.

Flood routes will be provided for exceedance events, or for local failure of the drainage system (blockage, damage, etc.), and will ensure that flood flows are directed safely through or around the development to the downstream drainage system. Details will be provided with the reserved matters application.

Cutoff channels and Drains will be provided to intercept flows from the higher land to the south and will discharge to the pond.

The use of SuDS will remove pollution from surface water run-off and improve water quality with additional SuDS features provided with practical.

The foul flows from the site will connect to the existing sewage network to the north in Tornio Close as confirmed by Wessex Water; full details of the connection will be agreed with Wessex Water.

The foul sewers will be adopted by Wessex Water or other approved Water/Sewerage Undertaker to ensure that they will be maintained for the lifetime of the development.

The Flood Risk Assessment and Drainage Strategy demonstrate that the proposed development meets with all the national and local policy requirements and satisfies all the criteria of the Planning Authority, Lead Local Flood Authority, and Environment Agency.

The Flood Risk Assessment concludes that the site can be safely developed without flood risk and without increasing flood risk elsewhere using an appropriately designed and maintained Sustainable Drainage System.

1. Introduction

This Flood Risk Assessment (FRA) has been prepared by Phoenix Design Partnership Limited on behalf of Robert Hitchins Ltd and their successors in title to support an Outline Planning Application for the proposed residential development at Land Off Windsor Drive, Devizes.

The proposed development is approximately 2.97Ha (including existing highway) and will involve the construction of a residential development of up to 40 no. dwellings, with access from Windsor Drive. Indicative Masterplan is included in Appendix A.

This site-specific Flood Risk Assessment (FRA) has been produced in accordance with the National Planning Policy Framework document, Section 14 'Meeting the challenge of climate change, flooding and coastal change' and Planning Practice Guidance document 'Flood Risk and Coastal Change' together with Environment Agency FRA Guidance Notes.

The FRA demonstrates that the site is suitable for development without flood risk and without causing an increase in flood risk to others, including allowances for climate change. It also demonstrates how SuDS will be used to manage surface water from the development, and to ensure that water quality is not adversely affected.

2. Policy & Guidance

2.1. National Planning Policy Framework (NPPF): 2024

As set out in paragraph 170 of the NPPF, all strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources. Footnote 62&63 in the NPPF states that a site specific Flood Risk Assessment should be provided for all developments in Flood 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified within a strategic flood risk assessment as being at increased flood risk in the future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use. This includes householder development, small non-residential extensions (with a footprint of less than 250m2) and changes of use; except for changes of use to caravan, camping or chalet site, or to a mobile home or park site, where the sequential and exception tests should be applied as appropriate.

Section 14 'Meeting the challenge of climate change, flooding and coastal change' sets out the government policies on development and flood risk.

2.2. Planning Practice Guidance: 2016 (Updated September 2025)

The Section 'Flood Risk & Coastal Change' (March 2014): The National Planning Policy Framework sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed. The main steps to be followed are set out in the guidance which, in summary, are designed to ensure that if there are better sites in terms of flood risk, or a proposed development cannot be made safe, it should not be permitted.

The section 'Climate Change' advises on how planning can identify suitable mitigation and adaptation measures in plan-making and the application process to address the potential impacts of climate change. Detailed guidance on climate change allowances for fluvial flows and rainfall intensity over the lifetime of development is included in the document 'Climate change allowances for planners' issued by the Environment Agency in September 2013.

The Section 'Water Supply, Wastewater & Water Quality' advises on how the Water Environment Regulations 2017 apply to surface waters (including some coastal waters) and groundwater (water below the surface of the ground). These regulations set out requirements to prevent the deterioration of aquatic ecosystems; protect, enhance and restore water bodies to 'good' status; and achieve compliance with standards and objectives for protected areas. Local planning authorities must, in exercising their functions, have regard to River Basin Management Plans. These plans contain the main issues for the water environment and the actions needed to tackle them.

Section 027 now states where a site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development.

2.3. Flood & Water Management Act 2010 (FWMA)

The FMWA provides legislation for better, more comprehensive management of flood risk. Changes to planning came in force in April 2015 requiring detail and SuDS now to be included in planning applications.

2.4. Wiltshire Core Strategy 2015

Core Policy 67: Flood Risk

Development proposed in Flood Zones 2 and 3 as identified within the Strategic Flood Risk Assessment will need to refer to the Strategic Housing Land Availability Assessment when providing evidence to the local planning authority in order to apply the sequential test in line with the requirements of national policy and established best practice.

All new development will include measures to reduce the rate of rainwater run-off and improve rainwater infiltration to soil and ground (sustainable urban drainage) unless site or environmental conditions make these measures unsuitable.

Core Policy 68: Water Resources

Development must not prejudice the delivery of the actions and targets of the relevant River Basin or Catchment Management Plan and should contribute towards their delivery where possible.

Non-residential development will be required to incorporate water efficiency measures. Developers will be expected to submit details of how water efficiency has been considered during the design of proposals.

Development proposals within a Source Protection Zone, Safeguard Zone or Water Protection Zone must assess any risk to groundwater resources and groundwater quality and demonstrate that these would be protected throughout the construction and operational phases of development.

2.5. Wiltshire Strategic Flood Risk Assessment (SFRA)

The most recent Level 1 SFRA was produced by JBA, dated November 2024.

Further details of the findings of the SFRA are within Section 4 of this report.

2.6. National standards for sustainable drainage systems June 2025

National standards for SuDS were published in June 2025 for the application in the design of surface water drainage systems for new infrastructure and development. These state the criteria that a surface water drainage system should satisfy.

The guidance sets out details of 7 overriding standards that are complementary and provide multiple benefits. The guidance notes that there may be specific circumstances in which it is not possible to deliver one or more of the standards.

2.7. Ciria C753 'The SuDS Manual'

Ciria C753 'The SuDS Manual' published in 2015 (latest v6 2019) provides comprehensive guidance on the implementation of Sustainable Drainage Systems (SuDS) in the UK. C753 guidance should be used to help develop the strategy and design of the SuDS.

2.8. Ciria C635 'Designing for Exceedance'

Ciria C635 'Designing for Exceedance in Urban Drainage – Good Practice' published in 2006 provides guidance on the design and management of urban sewerage and drainage systems to reduce the impacts from drainage exceedance. C635 guidance should be used to help develop the strategy and design of the flood routes for the development.

2.9. Design and Construction Guidance

Sewers for Adoption 7th Edition published by Water UK in August 2012 has now been replaced by '*Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code")': November 2023* and provides guidance on the design and construction of foul and surface water drainage systems for adoption by Water Companies.

2.10. EA, Defra & DCLG

'Preliminary Rainfall Runoff Management for Developments' (R&D Technical Report W5-074/A/TR/1, Revision E) jointly published in January 2012 for the Department for Environment Food and Rural Affairs (Defra) and the Environment Agency (EA) provides

advice on the Management of Stormwater Drainage for developments at Planning stage and in particular the preliminary sizing of storage for the control and treatment of storm water runoff.

2.11. Building Regulations Part H 2015 'Drainage & Waste Disposal'.

The above documents should be used to assist in the design of the drainage and SuDS.

2.12. BS 8582:2013 Code of practice for surface water management for development sites

'BS 8582:2013 Code of practice for surface water management for development sites' published in November 2013 by BSI Standards Limited gives recommendations on the planning, design, construction and maintenance of surface water management systems for new developments and redevelopment sites.

2.13. Non-Statutory Technical Standards for Sustainable Drainage Systems 2015

This document sets out the Non-Statutory Technical Standards for Sustainable Drainage Systems and should be used in conjunction with the National Planning Policy Framework and Planning Practice Guidance.

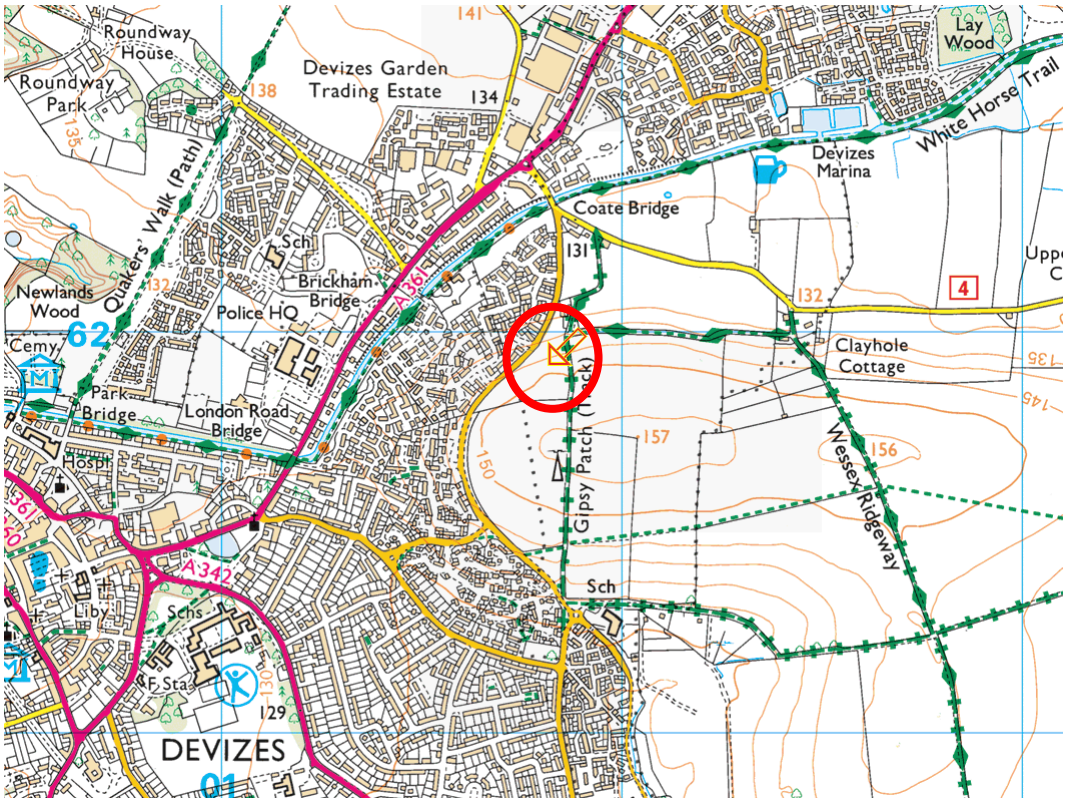
2.14. EA 'Flood risk assessments: climate change allowances' 2016 (Updated May 2022)

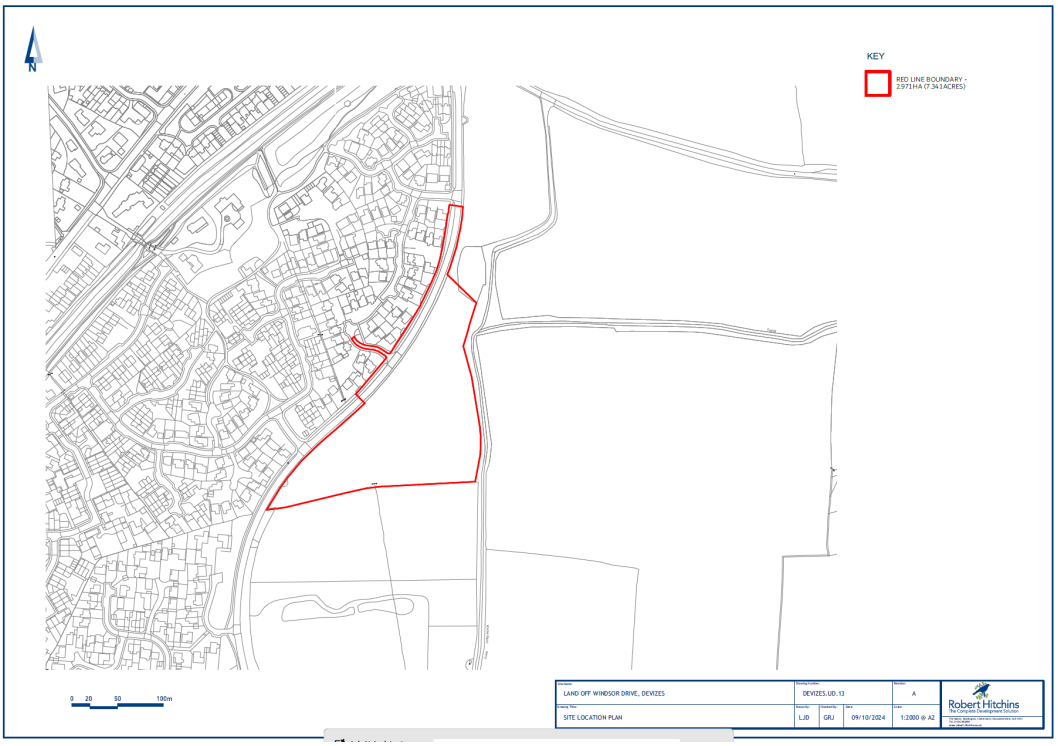
The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. NPPF and supporting planning practice guidance on Flood Risk and Coastal Change explain when and how flood risk assessments should be used. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account. Local planning authorities refer to this when preparing local plans and considering planning applications. This advice updates previous climate change allowances to support NPPF. The Environment Agency (EA) has produced it as the government's expert on flood risk.

3. Existing Site Details

3.1. Site Location and Description

The site is located to the southeast of Windsor Drive in the east of Devizes in Wiltshire. The location is indicated on the images below and the site centred OS Grid Co-ordinate is E401800, N161900; the nearest postcode is SN10 2TD.





Location Plan

Aerial Image

The site is currently a green-field site of approximately 2.525Ha (application area approximately 2.97Ha including existing highway).

To the northwest is Windsor Drive and residential development, to the south a field and allotments, to the east is Gypsypatch (track/PROW) and fields. Hedgerows run along the southern and eastern boundaries; the northwestern boundary is generally open with a post and wire fence.

Windsor Drive: Looking Northeast with The Site on the right.

Windsor Drive: Looking South with The Site on the left.

Indicative Masterplan

3.2. Topographical Survey

A Topographic Survey was undertaken by Ruxton Surveys in June 2020 and can be seen on the drawing included in Appendix B.

The site generally falls from the southeast towards Winsor Drive. Levels vary from approximately 153mAOD in the southeast to approximately 135mAOD in the north. Slopes are generally from 2.5% (1:40) in the southeast to 12.5% (1:8) in the north.

Details of the elevations and slopes are shown on the drawings listed below and included in Appendix B.

638-P102	Existing Elevations
638-P103	Existing Slopes
638-P104	Existing Slope Direction

3.3. Existing Hydrology

Details of the existing hydrology are shown on drawing 638-P101 'Existing Topography & Hydrology' included in Appendix C.

The only relevant hydrological feature is the existing highway drain in the verge on the southeast side of Windsor Drive.

Runoff from the site flows northwest onto Windsor Drive and to the highway drain.

3.4. FEH Rainfall

FEH Point Rainfall Date (obtained February 2026):

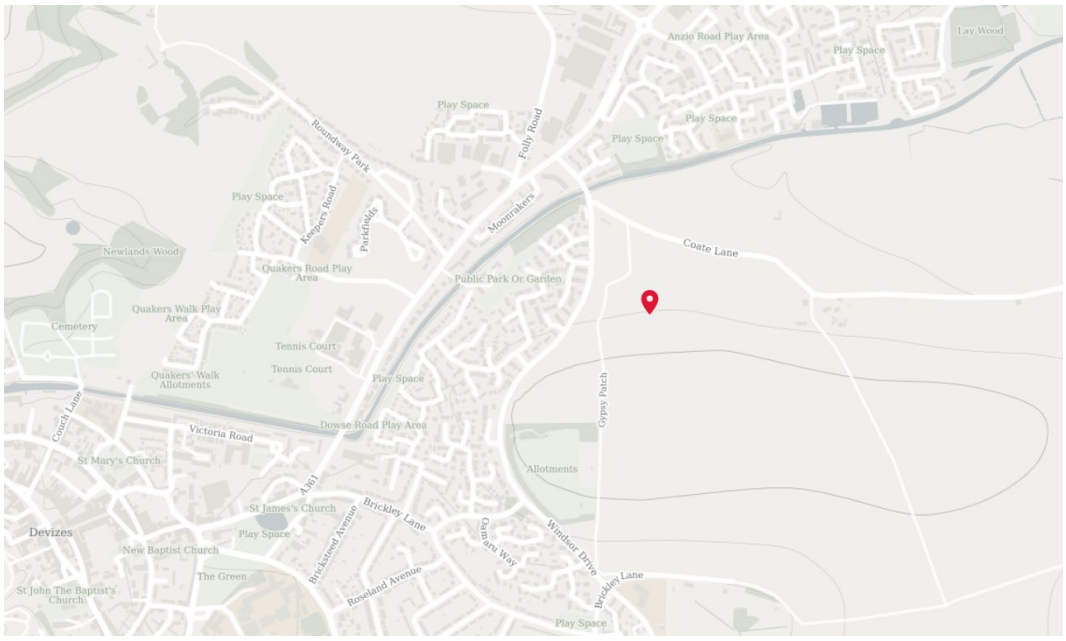
Point data at 402000,162000

Point: 402000,162000

Tag: 638/639 DEVIZES

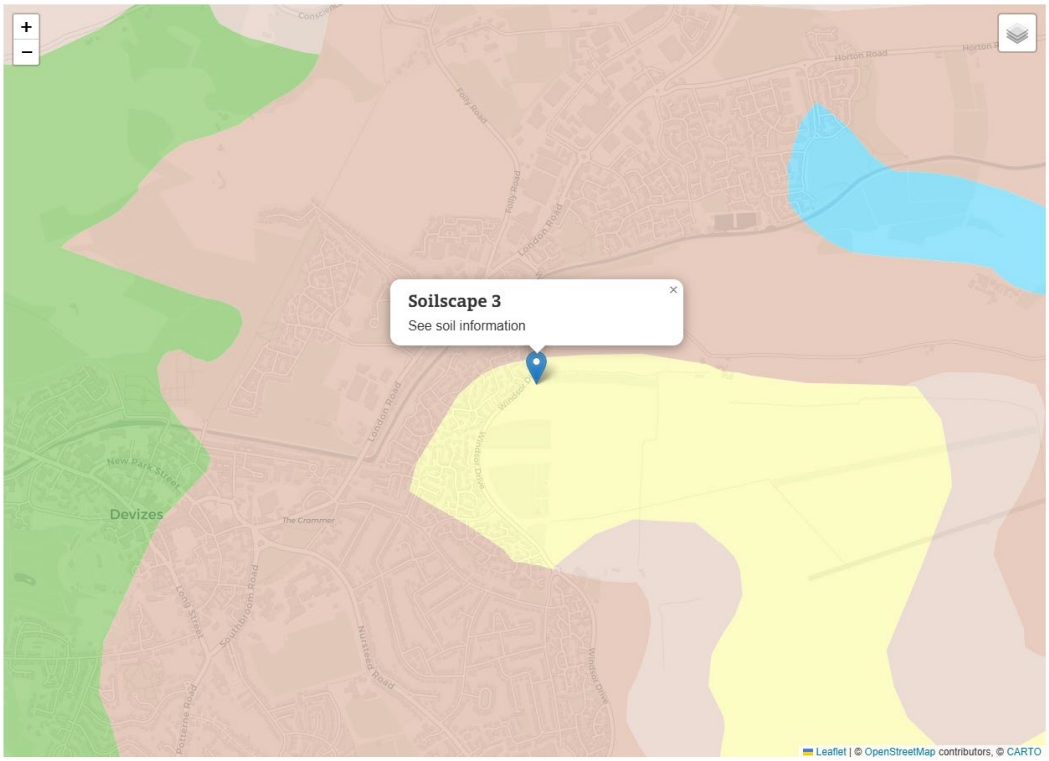
Rainfall Export

Descriptor	Value
NGR	SU 02000 62000
BFIHOST	0.82
BFIHOST19	0.671
BFIHOST19SCALED	0.671
PROPWET	0.34
SAAR6190	737 mm
SAAR9120	778 mm



3.5. Soilscape – Soil Classification

The Soilscape Soil Classification map extract below shows the site to be in an area of:



3 – Shallow lime-rich soils over chalk or limestone

Soil Information

Soilscape 3:

Shallow lime-rich soils over chalk or limestone

Texture:
Loamy

Coverage:
England: 7.0%,**Wales:** 0.0%,**England & Wales:**6.0%

Drainage:
Freely draining

Fertility:
Lime-rich

Landcover:
Arable and grassland

Habitats:
Herb-rich Downland and limestone pastures; limestone pavements in the uplands; Beech hangers and other lime-rich woodlands

Carbon:
Low/Medium

Drains to:
Chalk or limestone groundwater

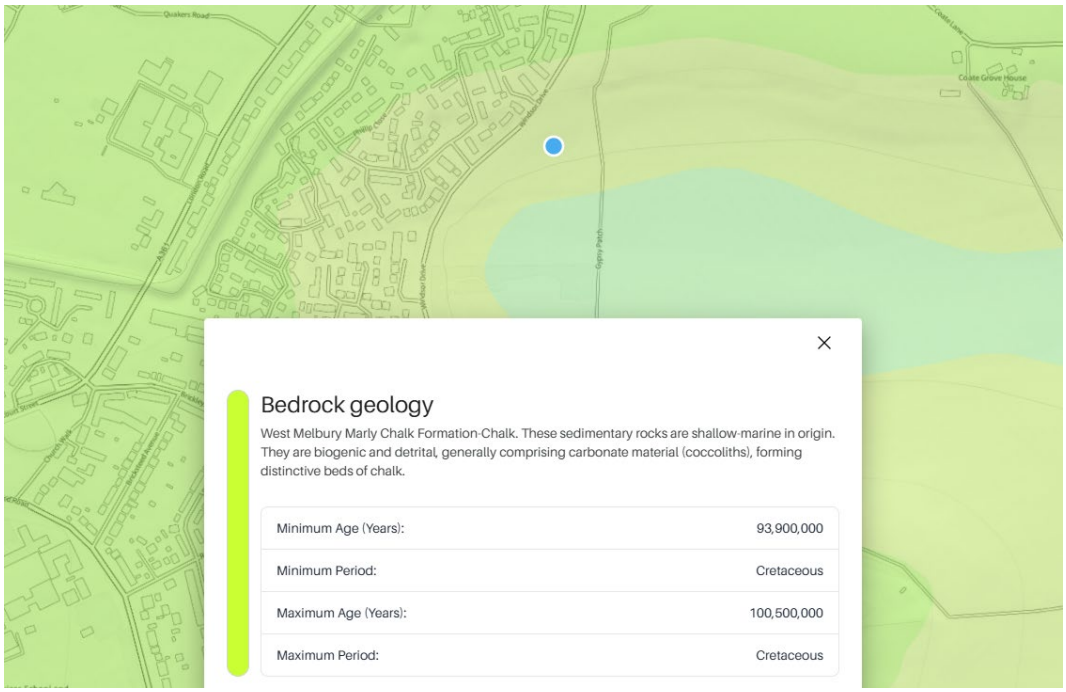
Water protection:
Particularly vulnerable to leaching of nitrate and pesticides to groundwater; surface capping and erosion of chalk soils on steeper slopes under cereals is linked with eutrophication and silting of chalk streams and their gravel spawning beds

General cropping:
Over chalk, spring and autumn cereals can be grown but the soils are especially vulnerable to nitrate leaching and attract stricter fertiliser limits. Suitable only for grassland where there is hard limestone. Lack of soil moisture is most likely limiting factor to yields

Refer to Ground Investigation details in Section 3.8.

3.6. The British Geological Survey (BGS)

Geological Survey of Great Britain mapping indicates that the site lies predominantly within the West Melbury Marly Chalk Formation - Chalk.



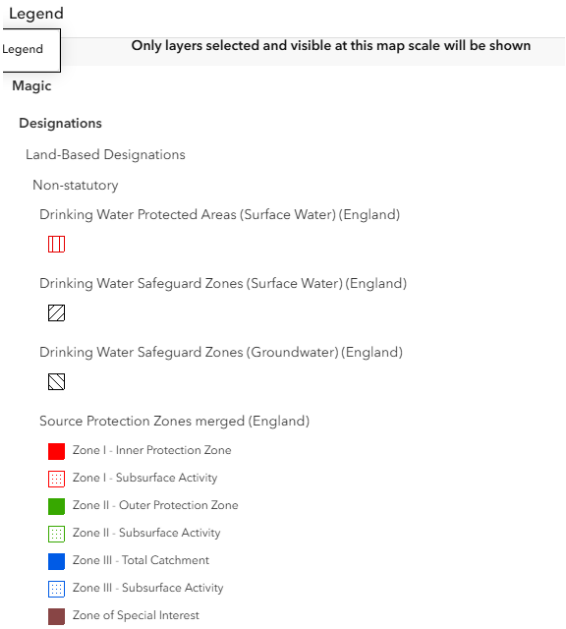
The bedrock geology suggests that infiltration in the chalk formation might be possible.

Refer to Section 3.8 below for details of Ground Investigation.

3.7. Environment Agency Hydrogeology Information

Drinking Water Protected Areas (Surface Water), Drinking Water Safeguard Zones (Surface Water), Drinking Water Safeguard Zones (Groundwater), Groundwater Source Protection Zones

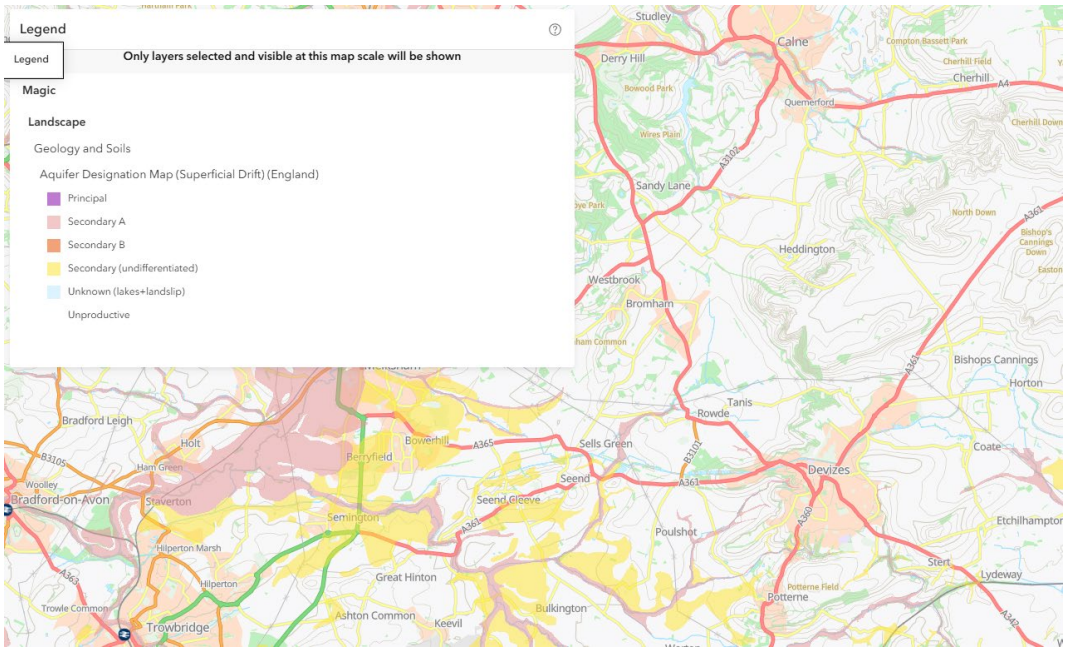
Groundwater provides a third of our drinking water in England, and it also maintains the flow in many of our rivers. In some areas of Southern England, groundwater supplies up to 80% of the drinking water. The site is not located within a Drinking Water Protected or Safeguarded area, or Source Protection Zone.



The site is not within any of these protection areas and zones.

Aquifer Designation Map Bedrock

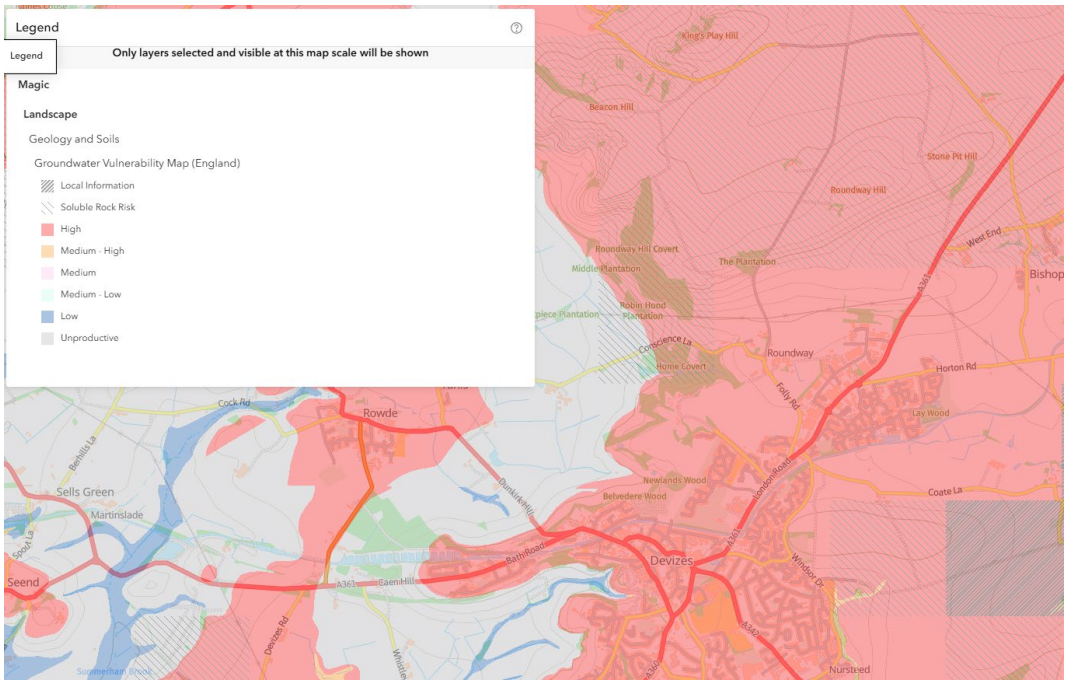
Aquifer Designation Map Superficial Drift



The site is in an area where the bedrock is classified as a Principle Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

The superficial drift is not classified as a aquifer.

Groundwater Vulnerability Map



The site is in an area classified as High Groundwater Vulnerability.

Overall, the site is in an area of Medium to High Vulnerability in terms of Groundwater sensitivity.

3.8. Ground Investigation

A ground investigation report was prepared by Wilson Associates dated November 2025, report No 5498. Test hole locations, logs, and infiltration test results are included in Appendix D.

Key extracts from the report are shown below:

GI Table 6: Summary of Observed Strata

Stratum	Base Depth (m)	Notes / Occurrences
TOPSOIL: probable soft-stiff, dark greyish-brown, organic, dry, desiccated sandy, slightly gravelly CLAY with many roots. Gravel is fine to medium chalk and/or flint	0.24 - 0.35	Encountered in all pits and boreholes
CHALK: variable weathered deposit recovered as probable low density to high density, off-white, structureless CHALK. Chalk recovered as a mixture of fine and coarse soil. See individual logs for specific details. *(WEST MARLBURY MARLY CHALK FORMATION)*	>2.36	Encountered in all pits and boreholes
Perched / Groundwater	None encountered	
Roots	Generally restricted to surface topsoil	
Desiccation	Visually appears restricted to surface topsoil	

GI Extract: Soakaway Testing – Soakaway Feasibility

6.15 Percolation testing has been completed within all six trial pits SA1 – SA6 with test zone depths variably between c0.80-1.86m (test records shown on logs in Appendix 2). Given the limited time to complete testing, the limited water supply and to maximise the area covered by insitu testing, only a single test was completed in each pit.

6.16 The tests all took place into weathered structureless chalk of the recorded WMCk. Due to the proportion of cohesive soil present, very low/negligible infiltration was recorded in all test pits, meaning that it has not been possible to calculate a soil infiltration rate at these test locations. The infiltration results are in this Practice's opinion representative of the soils beneath the rest of the site and the subsoil is considered unsuitable for the adoption of a conventional SUDS-type soakaway drainage system. Based on these findings it is therefore recommended that an alternative drainage option be considered such as transmission of storm water run-off to an attenuation pond or the existing drainage network. In the case of the latter it will be necessary to provide evidence to the local drainage authority that the adoption of soakaways within the site is not practical given the impermeable nature of the underlying geology, and the results on the logs in Appendix 2 should suffice.

The GI concludes that the underlying soils are not suitable for the proposed development to drain to infiltration.

Groundwater was not encountered in any of the test pits or window sampling boreholes:

3.9. Existing Green-field Run-off Rates

The green-field run-off rate for the development catchment area has been calculated using ReFH2 Rainfall descriptors from the FEH web service:

Point data at 402000,162000

Point: 402000,162000

Tag: 638/639 DEVIZES

Rainfall Export

Descriptor	Value
NGR	SU 02000 62000
BFIHOST	0.82
BFIHOST19	0.671
BFIHOST19SCALED	0.671
PROPWET	0.34
SAAR6190	737 mm
SAAR9120	778 mm

Flow software results are included in Appendix E and summarised below

Catchment	Development Area		Total Catchment	
Area (Ha)	1.655		4.099	
Betterment (%)	0	30	0	30
Q2 (l/s)	2.7	1.9	6.6	4.6
Q30 (l/s)	7.2	5.0	17.7	12.4
Q100 (l/s)	9.5	6.7	23.4	16.4
Qbar (l/s)	3.1	2.2	7.5	5.2

3.10. Existing Greenfield Run-off Volume.

Ciria C753 & the EA/DEFRA guide 'Preliminary Rainfall Runoff Management for Developments' recommend that the basis for considering the run-off volume is the difference pre- and post-development for the 1:100 6-hour event.

Ciria C753 (Section 24.10)

Green-field Run-off Volume = 10*RD*A*SPR

RD: 1:100 6-hour rainfall (6 hours @ 10.126mm/hr, from Flow) = 60.8mm
A: Site Development Area (Ha) = 1.655Ha & 4.099
SPR: Soil Type Standard Percentage Run-off (BFIHOST19 = 0.671)* = 27 (SPR = 0.27)

Existing 1:100 6-hour Green-field Run-off Volume: 10 x 60.8 x 1.655 x 0.27 = **272m³**

Existing 1:100 6-hour Green-field Run-off Volume: 10 x 60.8 x 4.099 x 0.27 = **673m³**

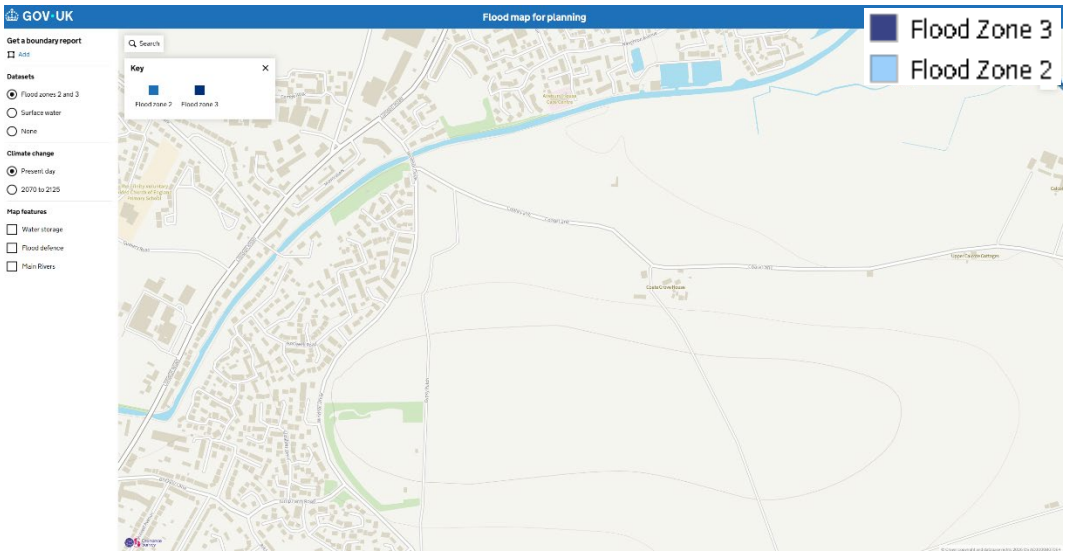
* BFIHOST19 = (72-SPR) / 66.5: SPR = 72 – (BFIHOST x 66.5)

4. Flood Risk Assessment

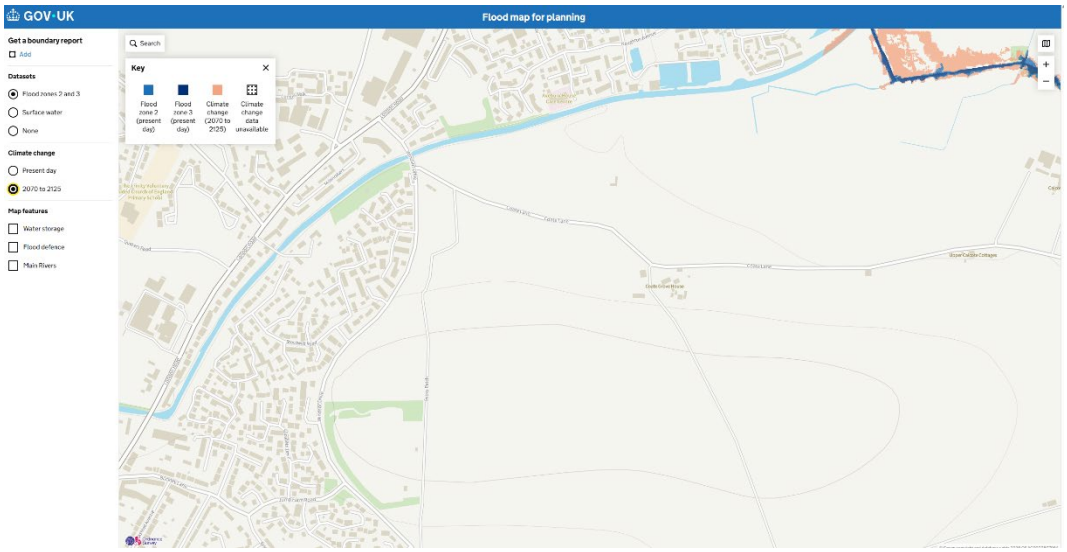
4.1. Environment Agency Flood Zone Mapping

The site benefits from various flood maps as listed below.

EA Flood Map for Planning – Flood Zones



EA Flood Map for Planning – Flood Zones Climate Change 2070 to 2125



Flood mapping shows that the east is Flood Zone 1 now, and in the future allowing for climate change, and that it is not at risk from fluvial flooding.

EA Flood Map for Planning – Surface Water

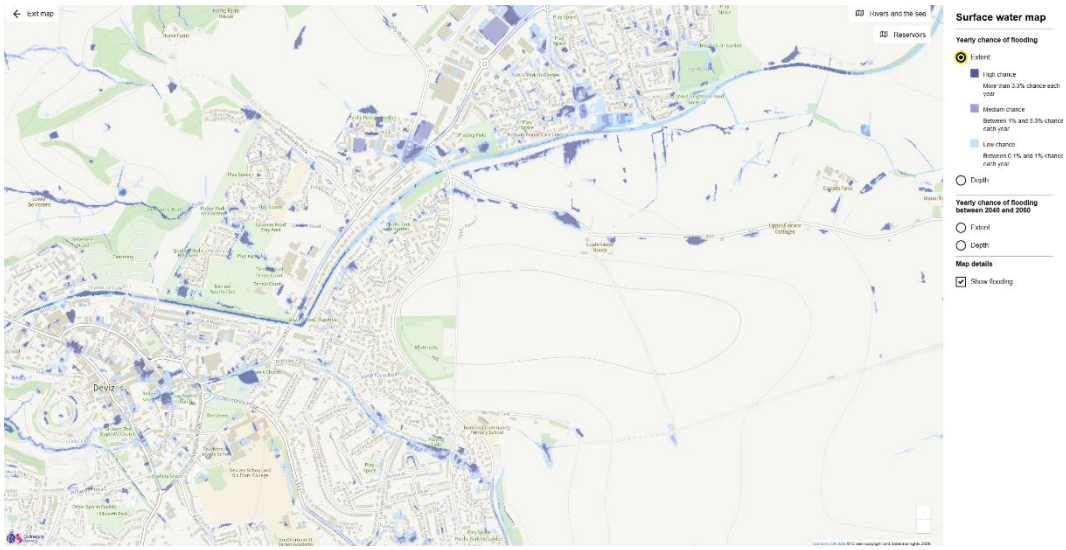
The mapping is created by dropping a volume of rainfall on the land for the various events (0.1%, 1%, & 3.3%) and modelling where it flows, and the depth and velocity of the flow. The modelling does not include smaller bridges, culverts, etc. and is intended to provide guidance on areas where flood risk from surface water needs to be considered in more detail.

The EA states that: 'Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.'

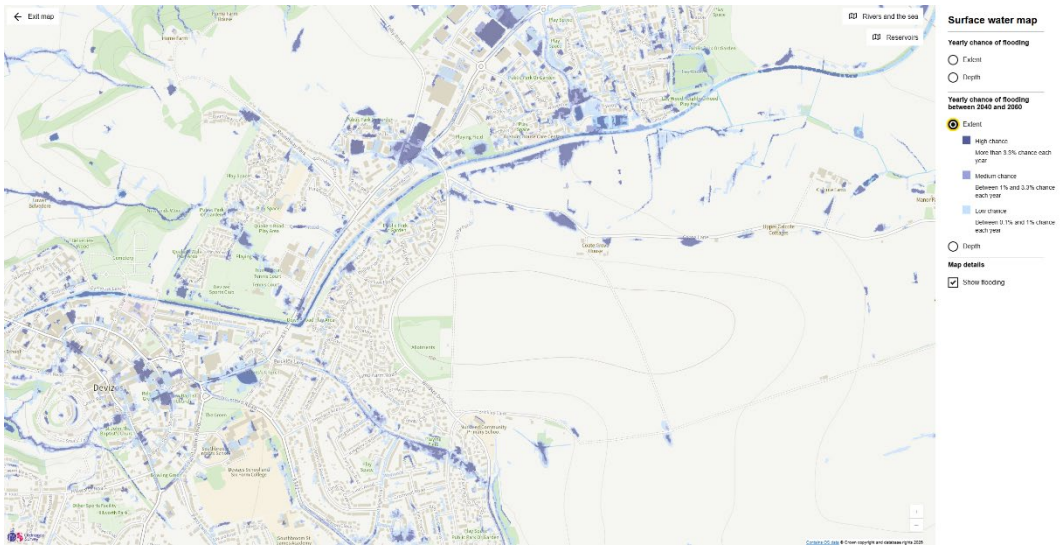
Definition of risk categories:

- **Very low risk** means that each year this area has a chance of flooding of less than 0.1% (<1:1,000). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped or fail.
- **Low risk** means that each year this area has a chance of flooding of between 0.1% and 1% (1:1,000 – 1:100). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
- **Medium risk** means that each year this area has a chance of flooding of between 1% and 3.3% (1:100 – 1:30). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.
- **High risk** means that each year this area has a chance of flooding of greater than 3.3% (>1:30). This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

Surface Water Extents (Present Day)

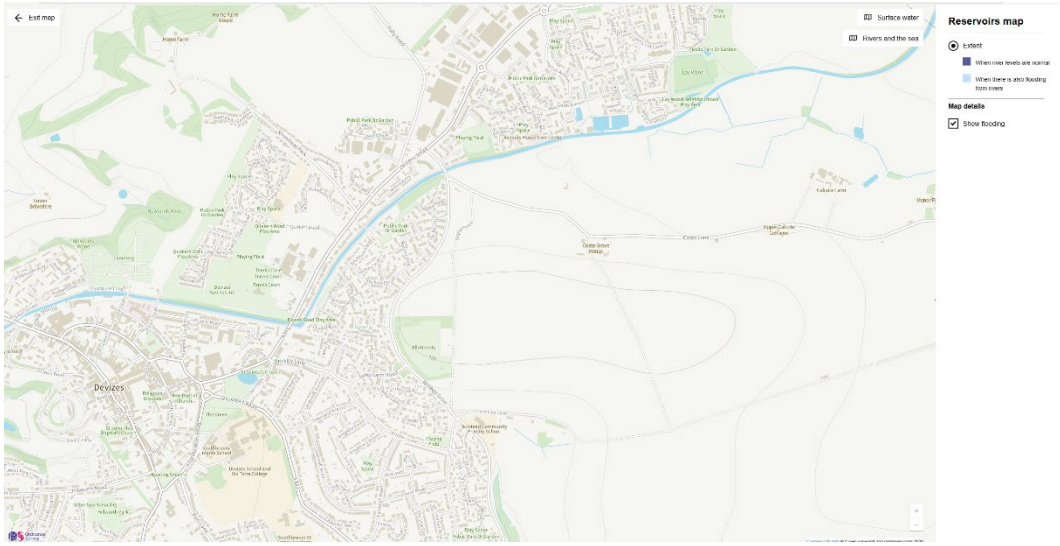


Surface Water Extents (Climate Change 2040 to 2060)



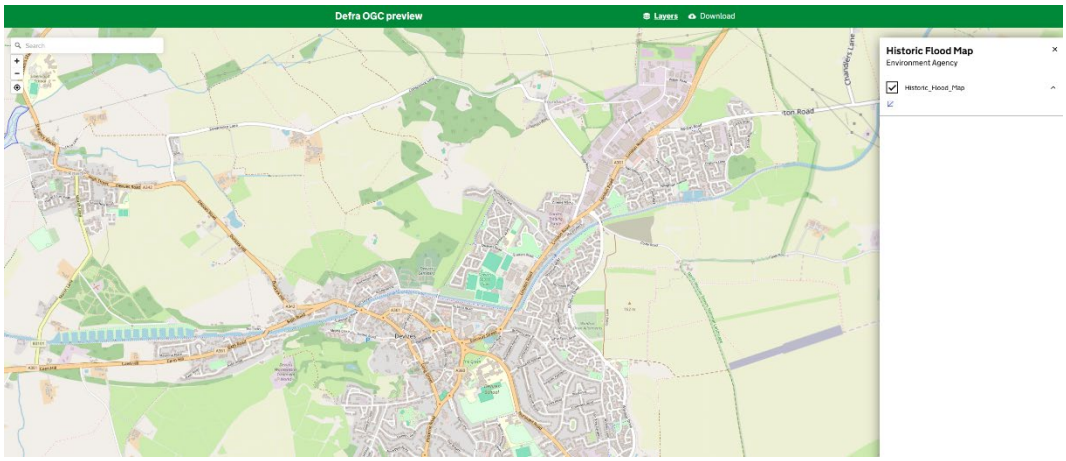
The maps show that the site is not at risk of flooding from surface water now or in the future allowing for climate change.

EA Map Risk of Flooding from Reservoirs



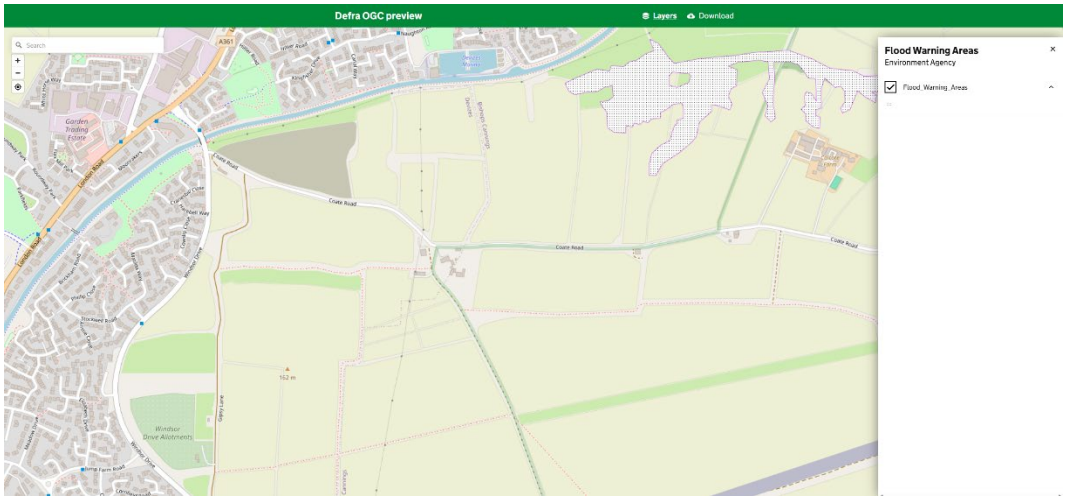
The site is not at risk of flooding from Reservoirs.

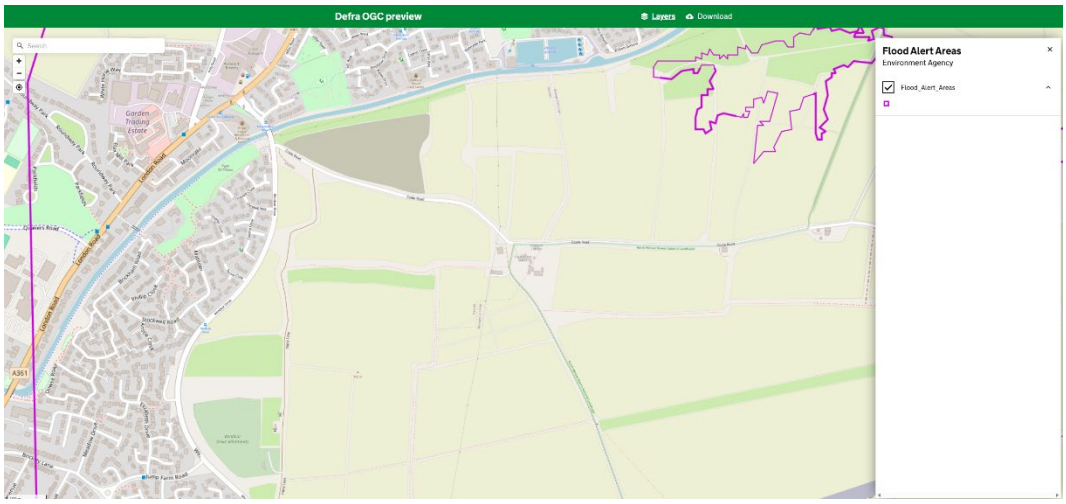
EA Historic Flood Map



There are no records of the site flooding in the past.

EA Flood Warning & Alert Areas





The site is not in a Flood Warning or Alert Area.

4.2. Strategic Flood Risk Assessment (Level 1 SFRA) JBA Final Version November 2024

The most recent Level 1 SFRA was undertaken by JBA with the final report dated November 2024.

The Appendices are available via the Council's Strategic Flood Risk Assessment Data Explorer found at:
https://wiltscouncil.maps.arcgis.com/apps/webappviewer/index.html?id=28c00215d87b468a9a0cd79c63d3d270

The table below lists the risk of flooding for the relevant appendices.

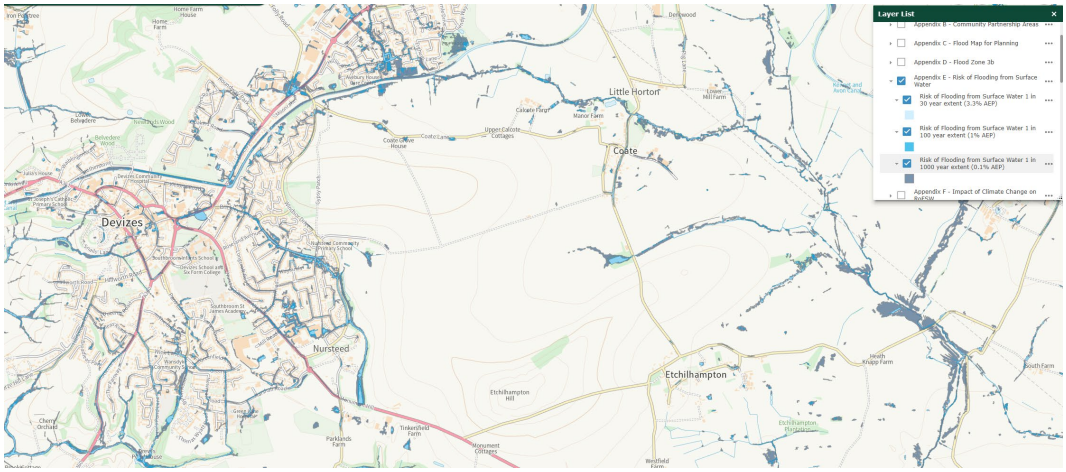
Appendix	Flood Risk Information
*Appendix C – Flood Map for Planning**	Site is Flood Zone 1.
Appendix D - Flood Zone 3b	Site is Flood Zone 1
*Appendix E – Risk of Flooding from Surface Water**	The site is not at risk of flooding from surface water.
*Appendix F – Impact of Climate Change on RoFSW **	The site is not at risk of flooding in the 1:100 + CC event.
*Appendix G – Groundwater Emergence**	The site is in an area where Flooding from Groundwater is unlikely.
Appendix H – Risk of Flooding from Reservoirs	The site is not at risk of flooding from Reservoirs.
*Appendix I – Risk of Flooding from Sewers**	The site is in an area where there has been between 1 & 10 sewer flooding incidents. There are no sewers within or adjacent to the site that would cause flooding of the site.
*Appendix J – Recorded Flood Outlines**	There are no recorded flood outlines or incidents within or adjacent to the site.
*Appendix K – Flood Alert and Warning Areas**	The site is within the groundwater alert and flood alert areas.
Appendix L1 – Type of Flood Defences	No Flood Defences are shown on or near the site.
Appendix L2 – Flood Defences Standard of Protection	There are no Flood Defences.
Appendix L3 – Condition of Flood Defences	There are no Flood Defences.
Appendix L4 – Reduction in Risk of Flooding from Rivers and Sea	The site is not at risk of flooding from rivers and sea.
*Appendix M – Risk of Flooding from Canals and Recorded Incidents**	The site is not at risk of Canal Flooding and there are no recorded incidents.

*Appendix O – Cumulative Impact Assessment**	Cumulative Impact Score is Low
Appendix P - Fluvial plus Central Climate change Flood Risk	Not at risk of Fluvial Flooding.
Appendix Q – Fluvial plus Higher Central Climate Change Flood Risk	Not at risk of Fluvial Flooding

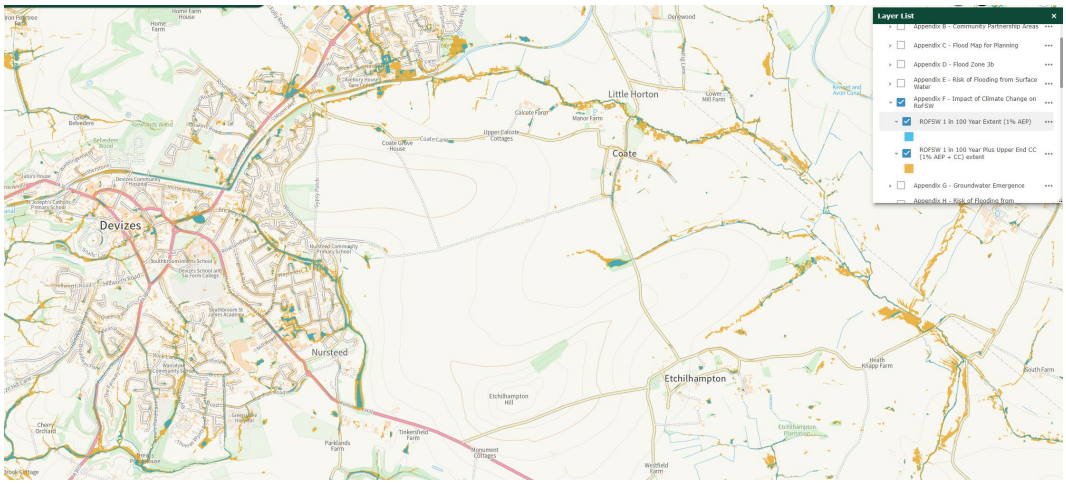
*Denotes an extract of drawing that can be seen below, the remainder can be seen at the link above.

Appendix C – Flood Map for Planning

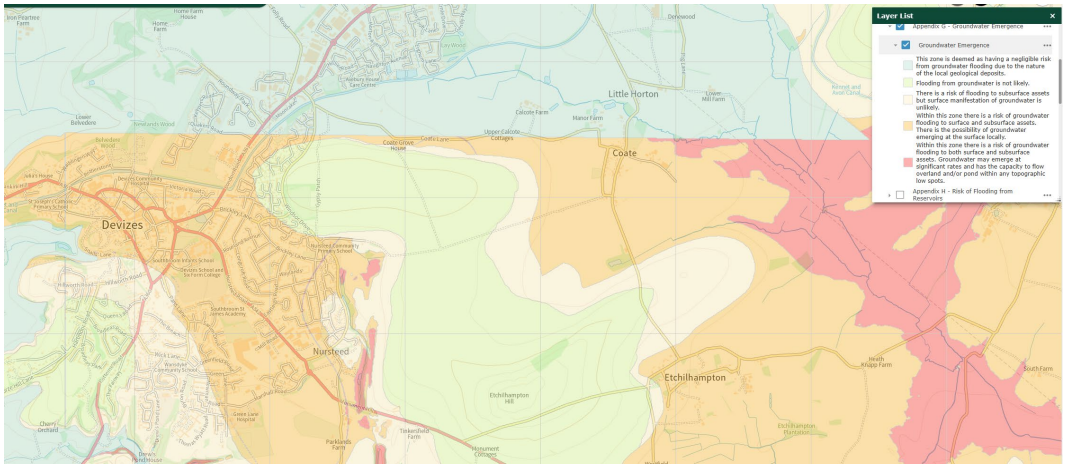
Appendix E – Risk of Flooding from Surface Water



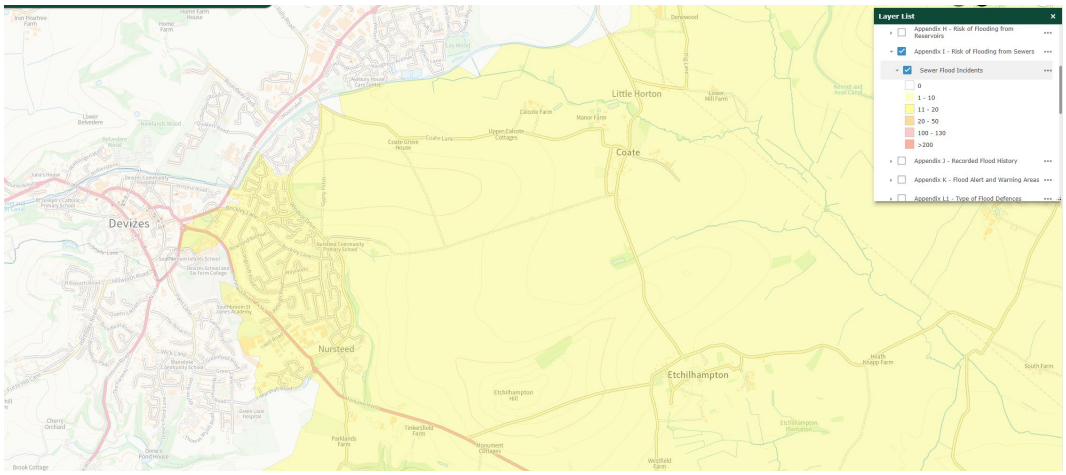
Appendix F – Impact of Climate Change on RoFSW



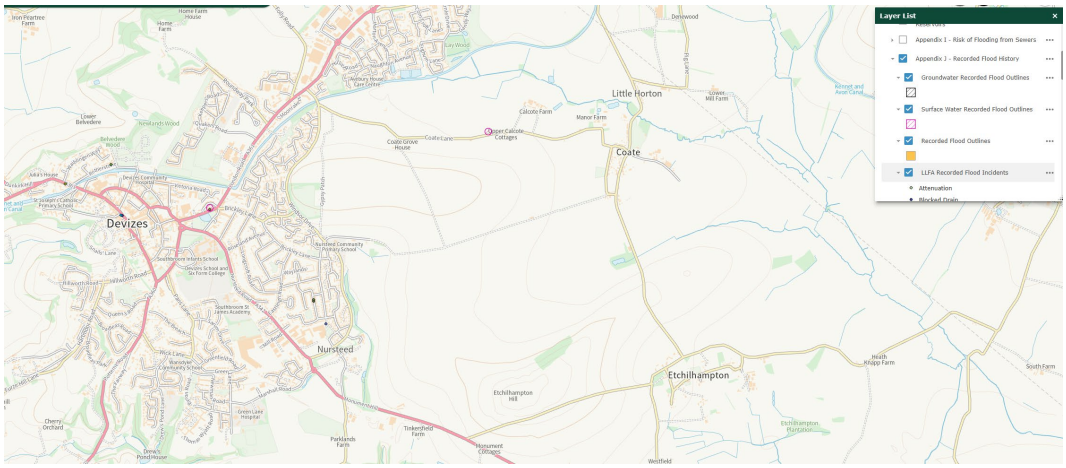
Appendix G – Risk of Flooding from Groundwater



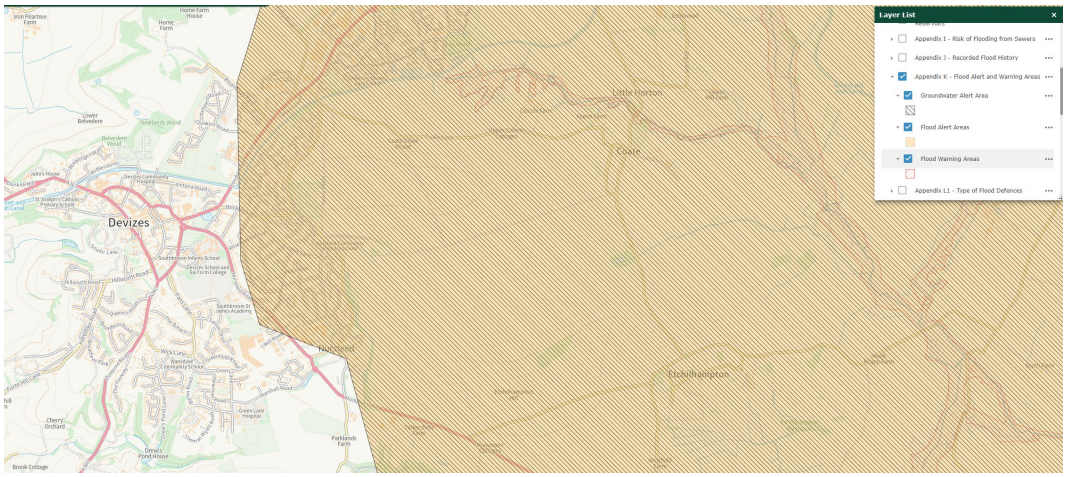
Appendix I – Risk of Flooding from Sewers



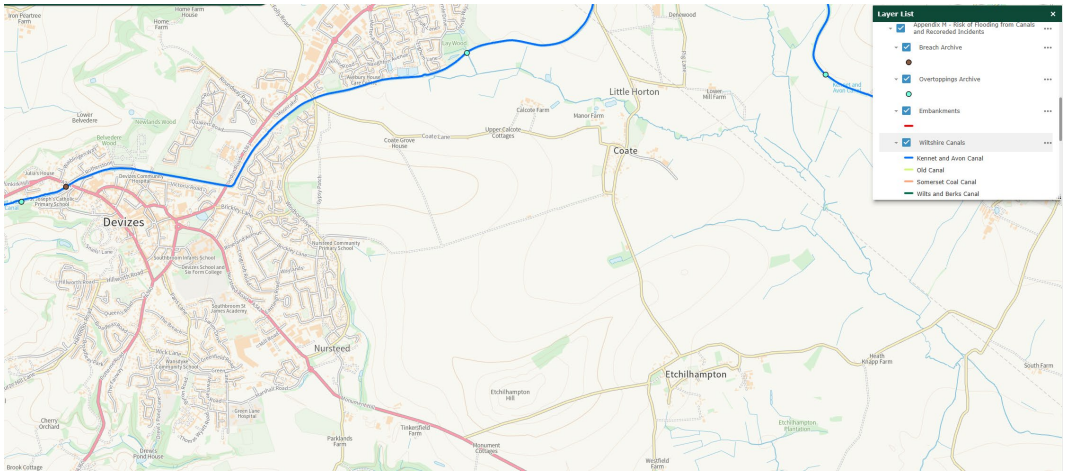
Appendix J – Recorded Flood History



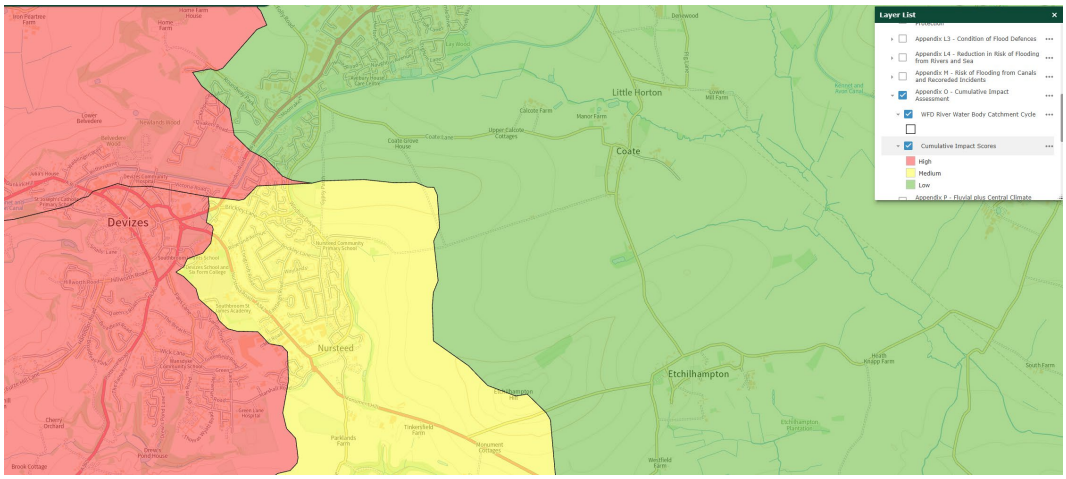
Appendix K – Flood Alert and Warning Areas



Appendix M – Risk of Flooding Canals & Recorded Incidents



Appendix O – Cumulative Impact Assessment



4.3. Fluvial Flood Risk

The EA and SFRA mapping show the site in Flood Zone 1 now and in the future.

The Risk of Fluvial Flooding is therefore Low.

4.4. Risk of Flooding Surface Water (RoFSW)

The EA and SFRA mapping shows RoFSW to be very low now and in the future.

Surface run-off from the higher land to south will be intercepted and diverted through the site.

The RoFSW is therefore Low.

4.5. Flood Risk from Groundwater

The SFRA mapping shows that Flooding from Groundwater is unlikely.

The underlying geology also reduces the likelihood of high groundwater levels as the Head Deposits form a low permeability confining layer over the underlying Chalk Bedrock. No groundwater was encountered in any of the GI pits or boreholes.

The risk of flooding from groundwater is low.

4.6. Flood Risk from Sewers

Details of the existing drains and sewers are shown on drawing 638-P100 included in Appendix C and on Wessex Water sewer records in Appendix F:

- There are no surface water sewers in the vicinity of the site.
- A Highway Drain runs along the southeastern side of Windsor Drive flowing northeast and eventually discharging to the Kennet & Avon Canal.
- There are no foul sewers within or adjacent to the site.

Flood risk from the highway drain is low; flood flows would run northeast along Windsor Drive and not on to the site. There is no risk of flooding from foul sewers.

The SFRA mapping does not show any incidents of sewer flooding in or adjacent to the site.

The risk of flooding from Sewers is Low.

4.7. Flood Risk from Artificial and Other Sources

The EA and SFRA mapping shows that the site is not at risk of flooding from any artificial or other sources.

The risk of flooding from Artificial and Other Sources is low.

4.8. Flood Risk Vulnerability Classification

The proposed development, classified in accordance with Table 3 of the Planning Practice Guidance 'Flood Risk and Coastal Change', is 'More Vulnerable' (residential).

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Paragraph: 067 Reference ID: 7-067-20140306

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

4.9. Sequential Test

Paragraph 174 of the NPPF states that:

'Within this context the aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test

Paragraph 175 of the NPPF states that:

The sequential test should be used in areas known to be at risk now or in the future from any form of flooding, except in situations where a site-specific flood risk assessment demonstrates that no built development within the site boundary, including access or escape routes, land raising or other potentially vulnerable elements, would be located on an area that would be at risk of flooding from any source, now and in the future (having regard to potential changes in flood risk).

PPG Section 027

A site-specific flood risk assessment demonstrates clearly that the proposed layout, design, and mitigation measures would ensure that occupiers and users would remain safe from current and future surface water flood risk for the lifetime of the development

A site-specific flood risk assessment has been undertaken. The site is at low risk of flooding from all sources now and in the future.

The proposals are therefore considered to be in accordance with the NPPF sequential approach to locate development in areas of lowest flood risk and a sequential test is therefore not required

4.10. Exception Test

Paragraph 177 of the NPPF states that:

'Having applied the sequential test, if it is not possible for development to be located in areas with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3'

Paragraph 178 of the NPPF states that:

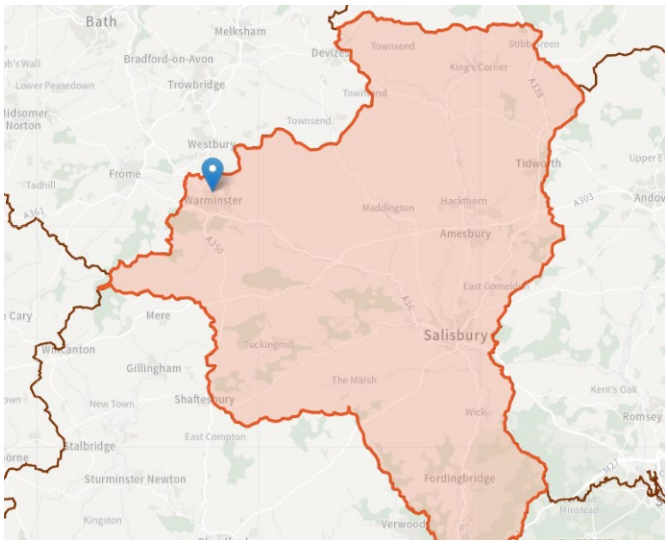
The application of the exception test should be informed by a strategic or site specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
b) b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The Flood Risk Vulnerability and Flood Zone 'Compatibility' Table 3 within Section 5.3 shows that the proposed development is appropriate and compatible and therefore an exception test is not required. The development levels and drainage will be designed to manage surface water and ensure that the proposed development is not at risk of flooding.

4.11. Climate Change

In accordance with the 2016 EA guidance (updated 2022) 'Flood risk assessments: climate change allowances' the SuDS design will include a 45% (upper end) allowance for the predicted increase in rainfall intensity over the lifetime of the residential development (100-year design life to 2070 to 2115). Extract from guidance below:



Avon Hampshire Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	20%	35%
2070s	25%	40%

1% annual exceedance rainfall event

Epoch

	Central allowance	Upper end allowance
2050s	25%	40%
2070s	25%	45%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

4.12. Urban Creep

To allow for additional run-off resulting from the extending of properties, conservatories, additional parking and larger patios an additional allowance of 10% for Urban Creep will be included in the SuDS design.

Drawing 638-P105 (Appendix H) shows the assumed Urban Creep areas (roofs, and drives & parking areas; c. 60% of impermeable area) on the impermeable area plan. The effective Urban Creep for these areas is 6% of the overall impermeable area (assuming 0% for highways; c. 40% of impermeable area).

4.13. Exceedance

To manage any residual flood risk, the Proposed Development will include flood exceedance routes to direct any flows from extreme events or localised failures away from existing or proposed properties safely to the downstream surface water drainage system. Existing routes with either be maintained, managed, or diverted.

4.14. Probability of Flood Risk

The risk of flooding from all sources has been assessed and the FRA demonstrates how flood risk and surface water run-off will be managed to ensure that the development will be safe from flood risk and that it will not increase flood risk elsewhere, including allowance for climate change.

IT IS CONCLUDED THAT THE PROPOSED DEVELOPMENT WILL BE AT A LOW RISK OF FLOODING NOW AND IN THE FUTURE.

5. Surface Water Run-off

5.1. Sustainable Drainage System (SuDS)

SuDS will be used to manage surface water run-off from the proposed development with surface water discharging to the watercourse running through the site. The SuDS will be designed to ensure that the existing run-off regime is maintained as closely as possible and that there is no increase in flood risk because of the development of the site. The SuDS will also prevent pollution of the receiving watercourses.

5.2. Run-off Volumes

Guidance recommends that the run-off volume for the 1:100 6-hour event is used to compare existing and proposed volumes. Existing run-off from the development area has been calculated at 1,879m^3. The developed run-off has been calculated using formulae from Ciria C753 as shown below.

Developed Run-off Volume:

10.RD.A[((PIMP/100)α0.8) + ((1-(PIMP/100))βSPR)] (C753 Section 24.10)

RD = Rainfall Depth (mm)
A = Catchment Area
SPR =Standard Percentage Run-off (0.27 for BFIHOST19 of 0.671)
α = Proportion of impermeable draining to system at 80% (0.8) run-off (roofs, parking, roads, etc). Can be increased to 100 % (1.0) for more conservative assessment (will depend on materials, drainage...).
β = Proportion of pervious areas draining to system, 0-1.0 (gardens, open space, etc).

RD: 1:100 6-hour rainfall (6 hours @ 10.126m/hr, from Micro Drainage) = 60.8mm
A: Site Area (Ha) = 1.655Ha Development Area & Imp Area = 0.91Ha (55%), Total Catchment = 4.099Ha (22% Impermeable)
PIMP: 22%
SPR: Soil Type Standard Percentage Run-off = 0.27
α: 1.0 (100%) assumed
β: 1.0 (100%) assumed

Developed 1:100 Year + 45% 6-hour Volume (4.099Ha) = **1,397m^3**

The calculations show that that there is a increase in the volume of run-off from the development (1,397m^3 cw. 673m^3). As the underlying soils are impermeable and are not suitable for infiltration it will be necessary to follow alternative guidance to mitigate for the increase in run-off volume resulting from the development.

To mitigate for the additional run-off volume EA/Defra and Ciria guidance together with BS8582 recommend that Extended Attenuation Storage is provided and that run-off is restricted to the Mean Annual Flood Flow (Qbar) green-field rate for all events above the 1:1 up to the 1:100 with an allowance for climate change and urban creep.

6. Surface Water Drainage Strategy

6.1. Surface Water Parameters

A preliminary surface water drainage strategy has been developed that incorporates a Sustainable Drainage System. The SuDS will ensure that flood risk resulting from pluvial events (rainfall) will be managed on-site and that flood risk will not be increased elsewhere because of the development.

The surface water drainage and SuDS will be designed in accordance with the following:

- Building Regulations Part H: Drainage & Waste Disposal
- Design and Construction Guidance (formerly Sewers for Adoption)
- The requirements of Wessex Water or other approved Water/Sewerage Undertaker
- Ciria C753: The SuDS Manual.
- National standards for sustainable drainage systems
- Lead Local Flood Authority requirements
    - 10% Urban Creep allowance
    - 30% betterment on greenfield runoff rates
    - MADD factor 0
    - Cv of 1
    - Use Suds features / source control where practicable
    - Modelling for surcharged watercourse / outfall scenario

The hierarchy for the disposal of surface water is that rainwater shall discharge to one of the following, listed in order of priority:

a) an adequate soakaway, or some other adequate infiltration system: or, where that is not reasonably practicable,
b) a watercourse: or, where that is not reasonably practicable,
c) a sewer.

6.2. Surface Water Outfall

The ground investigation (Section 3.13) shows that the site is not suitable for the use of soakaways or infiltration, and there are no watercourses in or near to the site.

Surface water run-off from the development will therefore be discharged to the existing highway drain alongside Windsor Drive as shown on drawing 638-P106 'Drainage Strategy' included in Appendix G. Runoff from the site currently runs onto Windsor Drive and into the highway drain. The proposed strategy will reduce flows significantly particularly in the more extreme events.

6.3. Flood Risk, Development Levels, and Flood Routes

The external levels of dwellings will generally be a minimum of 150mm below the floor levels; levels and flood routes will be designed to direct surface water flows away from the dwellings. Flood exceedance routes will be designed to direct flows safely through or around the development to ensure that all properties are safe from flooding.

6.4. Proposed Strategy

Details of the outline surface water drainage strategy are shown on drawing 638-P106 'Drainage Strategy' included in Appendix G.

Discharge will be limited to existing 4.099Ha (Total Catchment) Qbar Mean Annual Flood Flow of 6.0l/s (approx. 1:2.3 annual probability event) for events up to 1:100 event with a 45% allowance for climate change and 6% effective allowance for Urban Creep (see Section 3.9 for existing greenfield runoff rates, and Section 4.12 for the effective urban creep allowance). Flow will be restricted using a Vortex Control device (Hydrobrake or similar) located downstream of the attenuation. An additional overflow gate will also be used for more extreme events to allow and increased flow/discharge. The discharge will be reduced to 30% less than the existing greenfield rates (see Section 6.5).

Attenuation will be provided primarily in a basin or pond as detailed in Section 7 below. Surface water will discharge into the basin or pond via precast concrete headwalls that will be to adoptable standards. Guardrails will be provided on the headwalls to reduce the risk of falls as will safety gratings to prevent unauthorised access.

Cutoff channels and Drains will be provided to intercept flows from the higher land to the south and will discharge to the pond.

It is proposed that the surface water sewers will be adopted by Wessex Water or other approved Water/Sewerage Undertaker (NAV) under a Section 104 Agreement.

The estimated total volume of attenuation required for events up to the 1:100 + 45% allowance for climate change/urban creep is listed below. Impermeable areas are shown on drawing 638-P105 along with assumed urban creep allowance.

Flow calculations are included in Appendix I and provide the following results:

Event (+CC+UC)	Discharge (l/s)	Water Level (m)	Attenuation Depth (m)	Attenuation Volume (m3)	Freeboard (m)
1:2	4.1	134.68	0.65	200	1.62
1:30+40%+6%	10.2*	135.93	1.92	830	0.37
1:100+45%+6%	15.1~	136.30	2.30	1,100	0.00

*4.9l/s Hydrobrake + 5.4l/s Gate = 10.2l/s Total

~5.5l/s Hydrobrake + 9.8l/s Gate = 15.1l/s Total

Existing Qbar for 4.099Ha Catchment = 7.5l/s

6.5. Betterment

In accordance with Wiltshire Council's policy discharge rates for 1:2, 1:30 and 1:100-year events should provide at least a 30% betterment when compared to the equivalent existing greenfield rates.

The Betterment between existing rates and proposed rates are shown below

Event	Existing Greenfield Rate (l/s)	Proposed Discharge Rate (l/s)	Betterment
1:2	6.6	4.1	38%
1:30	17.7	10.2	42%
1:100	23.4	15.1	35%

The proposed rates above all provided more than 30% betterment when compared to the existing greenfield runoff rates.

6.6. Additional SuDS features

The use of additional SuDS features could be used to improve water quality, to decelerate the surface water, attenuate runoff, and meet the requirements of the National SuDS standards

It is proposed that where practicable driveways and Rainwater Pipes could connect into either a swale or rain gardens, although this would be limited by site gradients which are very steep in places.

Permeable pavements are not currently proposed but could be used in private areas if required and subject to gradients. The impermeable nature of the existing ground means that any permeable paving would not infiltrate but instead connect into the proposed drainage network.

Water Butts could also be used for garden irrigation.

The anticipated features would be confirmed during reserved matters.

7. SuDS Details

7.1. Attenuation Pond Design

To provide treatment to the surface water run-off from the development and remove pollutants prior to discharge to the downstream receiving drainage system the pond will have a permanent pool with a 0.9m depth of water.

The pond will have storage for surface water attenuation for events up to and including the 1:100 event with a 45% climate change & 6% urban creep allowance. This also includes allowance for runoff from the higher land to the south.

The pond has been designed with bank slopes of 1 in 3 in accordance with The SuDS Manual Ciria C753.

The pond will have a shallow zone (aquatic bench) along the edge of the permanent pool to support wetland planting which will act as a biological filter and safety margin (3m width with a slope of 1:20). The pond will provide ecology, amenity and biodiversity benefits and will add to the aesthetics of the open space.

7.2. Detention Basin

The alternative to an attenuation pond is a detention basin.

A basin is used to attenuate surface water during rainfall events and has no permanent water, i.e. is dry outside of rainfall events. An internal swale could be used as a low flow channel.

The basin will have storage available for surface water attenuation for events up to and including the 1:100 event with a 45% climate change & 6% urban creep allowance.

The basin will be designed with bank slopes of 1 in 3 in accordance with The SuDS Manual Ciria C753.

7.3. Landscaping

The landscaping and aquatic planting for the pond will be designed by the Landscape Architect to provide a diversity of plant species to enhance visual interest and provide a variety of wildlife habitats. Details of the planting will be agreed with the Local Planning Authority and adopting body at the detailed engineering stage.

7.4. Pond or Basin Access

Access to the pond will be via the new development roads. A grassed maintenance strip will be provided around the perimeter of the pond to allow routine maintenance activities and inspections to be carried out.

7.5. Water Butts

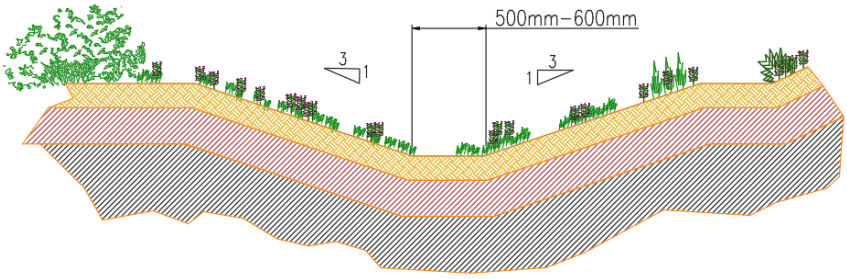
Water butts collect surface water from House and Garage roofs to be used in gardens. Once they reach capacity excess runoff will discharge to the drainage network. Water butts could be used where appropriate in gardens but not where a Rainwater pipes connection is not possible.

7.6. Swales

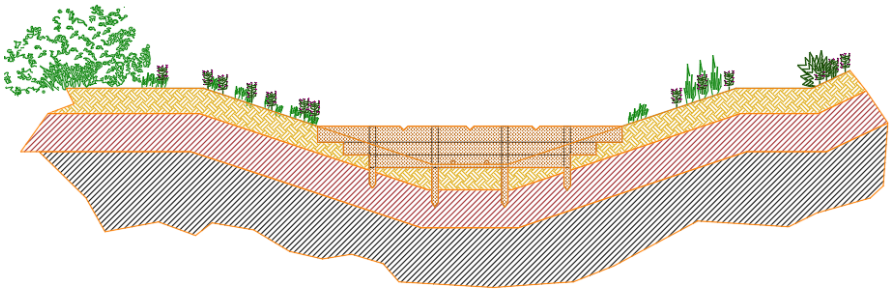
These are shallow, flat bottomed, vegetated open channels designed to convey, treat and sometimes attenuate surface water run-off. When incorporated into the site design, they can enhance the natural landscape and provide aesthetic and biodiversity benefits. They are often used to drain roads, paths, roofs, or dives/parking areas and can replace conventional pipework as a means of conveying run-off. The use of adjacent filter strips can also remove the need for kerbs and gullies.

Swales will typically be 500-600mm wide at the base, 300-600mm deep with side slopes of 1:3. The minimum gradient is typically 1:200 with check dams provided where gradients exceed 1:30.

Some examples of swales are shown below including a check dam. Filter medium could also be placed underneath to allow rainwater pipe connections.



TYPICAL UNLINED SWALE



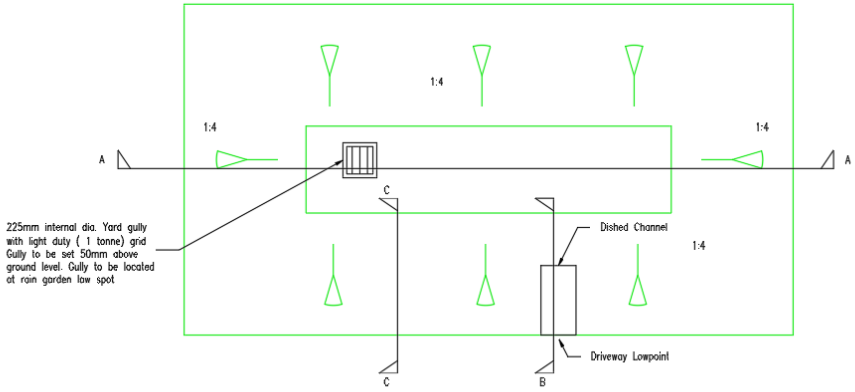
TYPICAL CHECK DAM ELEVATION

7.7. Rain Gardens

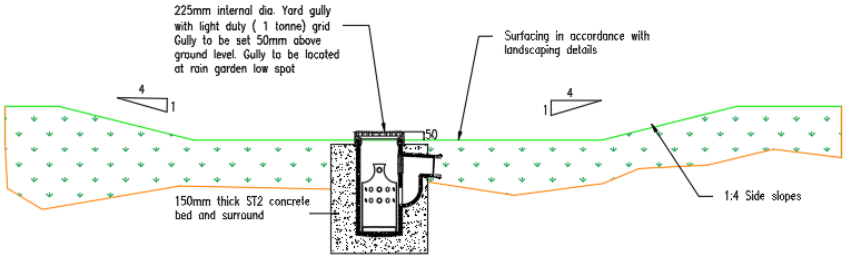
Rain Gardens are shallow landscaped depressions that use soil and vegetation to treat pollutants and can reduce surface water runoff. They are also an attractive landscape feature providing habitat and biodiversity. They are more informal than other forms of bioretention.

Rain gardens will be fed by a small number of driveways, have an above ground overflow and connect into the sewer network.

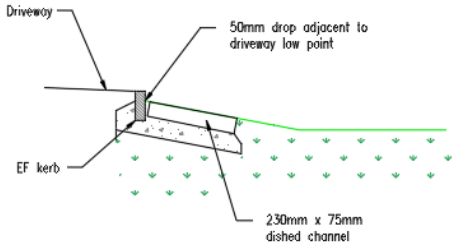
An example of a rain garden arrangement is shown below.



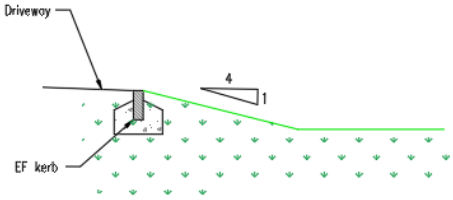
Rain Garden Plan



Section A
Rain Garden Standard Section



Section B
Rain Garden Section adjacent to driveway low point

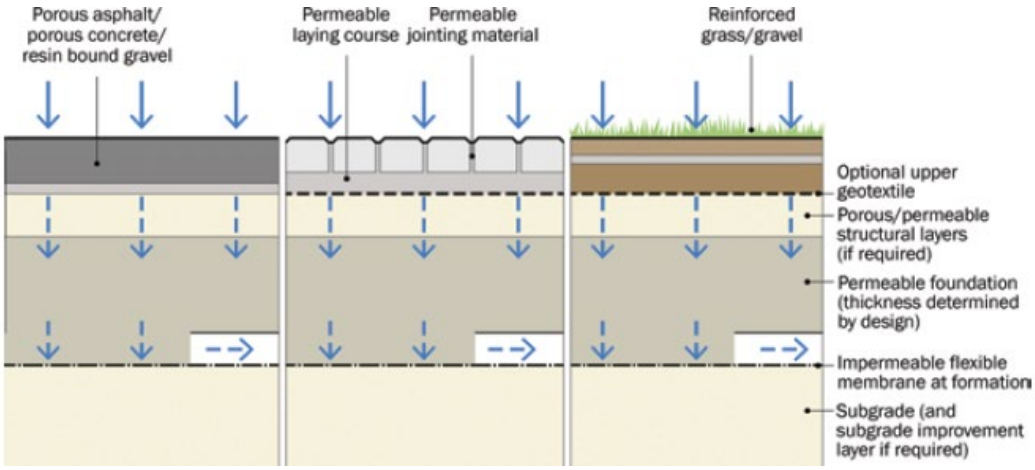


Section C
Rain Garden Section adjacent to driveway

7.8. Permeable Pavement

Permeable pavements allow surface water to infiltrate through the surface providing treatment to surface water. As infiltration is not possible due to ground conditions then surface water would need to be collected and connect into the sewer network via a fin drainage / diffuser.

The pavement can be either block paved or a porous asphalt. C753 shows the potential types of permeable pavement.



7.9. Health and Safety

Fencing would isolate the pond and reduce its amenity benefit. Barrier planting and landscaping will therefore be used to discourage public access to the open areas of water.

Safety signage and information boards can be provided around the perimeter to improve awareness, discourage unauthorised access and to inform the public of the potential danger, and the purpose and benefits of the pond.

Fencing or guarding will be provided around any structures such as headwalls where there is a vertical drop of 600mm or more.

Full safety details will be considered prior to construction and will be agreed with the Local Planning Authority and adopting body at the detailed design stage.

8. Water Quality

The proposed development will include roads, hard standings, roofs and landscaped areas. Run-off from roofs is unlikely to contain significant pollution. Run-off from roads and hard standings will pick up fuel, oil, heavy metals, rubbish and other pollutants. Run-off from landscaped areas could include pesticides and fertilisers.

Ciria C753, Chapter 26 provides guidance on Water Quality Management: Design Methods. The SuDS pollution mitigation index should equal or exceed the pollution hazard index. Tables 26.2 and 26.3 below provide details of the indices.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

The table below summarizes the Indices for the proposed development. The mitigation index for the pond can be seen to exceed the pollution index for all hazards.

Pollution & Mitigation Indices

	Total Suspended Solids	Metals	Hydrocarbons
Pollution Index (Residential Roofs)	0.2	0.2	0.05
Pollution Index (Driveways, Residential Roads)	0.5	0.4	0.4
Mitigation Index (Attenuation Pond)	0.7	0.7	0.5
Mitigation Index (Swale)	0.5	0.6	0.6
Mitigation Index (Rain Gardens / Bioretention system)	0.8	0.8	0.8

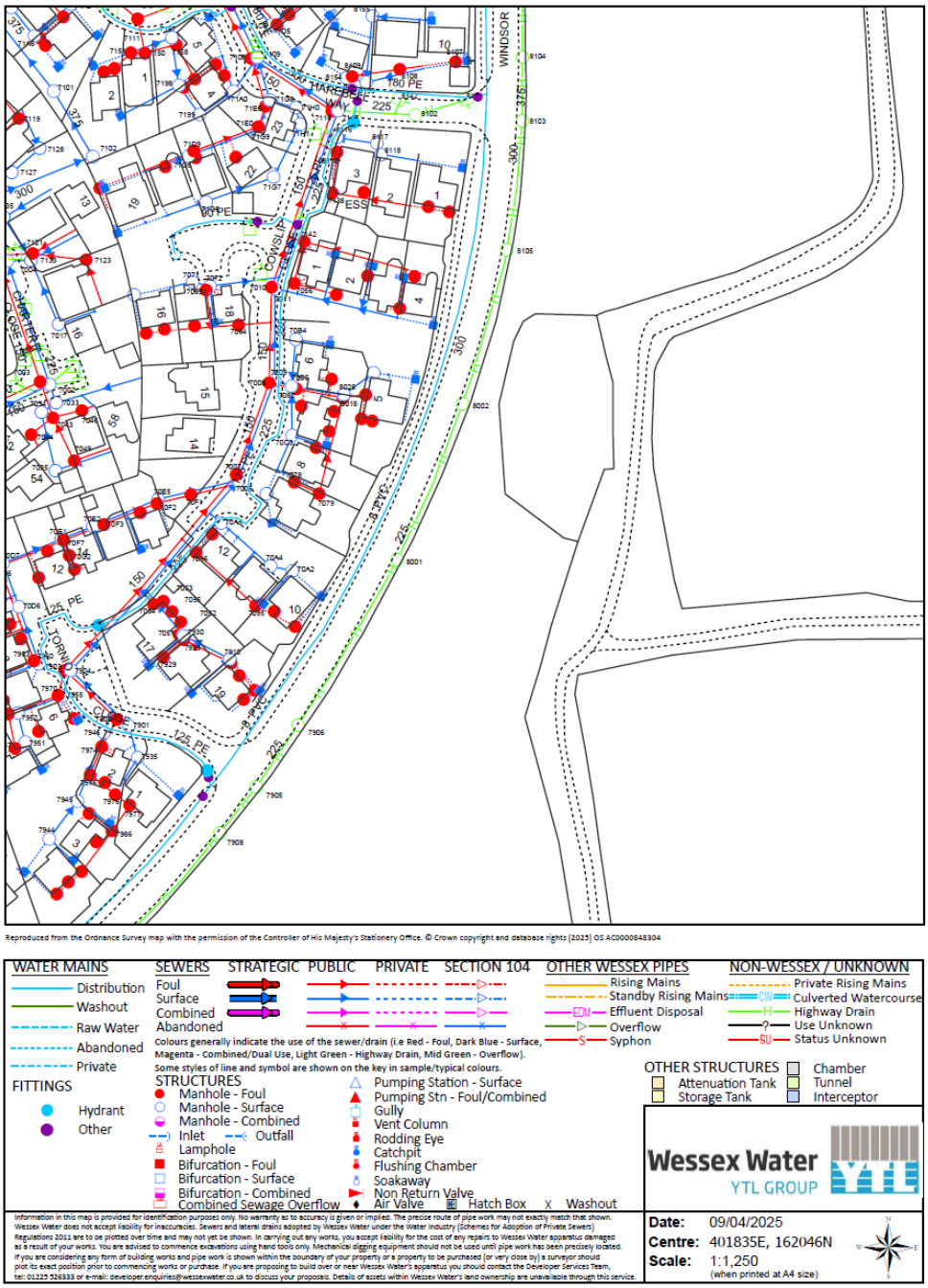
Trapped gullies will also be used for Access Roads, Drives and Parking Areas which will remove sediments and debris.

9. Foul Drainage Strategy

9.1. Existing Sewers

There is an existing 150mm diameter Wessex Water Sewer in Tornio Close approx. 30m to the northwest of the site, refer to Drawing 638-P106 'Drainage Strategy' included in Appendix G. Wessex Water has confirmed that a 150mm diameter connection to Manhole SU01617902 in the Tornio Close will be acceptable. Wessex Water correspondence and mapping is included in Appendix F.

Windsor Drive, Devizes



9.2. Proposed Strategy

The proposed foul strategy is shown on drawing 638-P106 in Appendix G

The proposed development of 40 dwellings will drain by gravity to the existing WW sewer and will have a peak foul discharge of approx. 1.9l/s (6xDWF).

The foul sewers for the proposed development will be adopted by Wessex Water or other approved Water/Sewerage Undertaker under a Section 104 Agreement; private foul drainage will be in accordance with Part H of the Building regulations approved documents and will remain in private or management company ownership.

10. Management & Maintenance

10.1. General

The table below lists the proposed drainage and anticipated Maintenance / Management responsibilities.

Drainage Feature	**Management and Maintenance Responsibility**
Sewers (Foul & Surface Water).	Wessex Water or other approved Water/Sewerage Undertaker.
Precast Concrete Headwalls	Regulated Adopting Body (for example Wessex Water)
Attenuation Pond or Basin	Regulated Adopting Body (for example Wessex Water) or a Private Management Company with appropriate experience
Flow Control	Regulated Adopting Body (for example Wessex Water) or a Private Management Company with appropriate experience
Highway Drains and Gullies	Wiltshire Council Highways.
Drainage for buildings, drives, parking areas, landscaping, etc. in private ownership	The owners where in sole ownership, and either shared responsibility or a Private Management Company for shared features.
Swales	Regulated Adopting Body or a Private Management Company with appropriate experience or the homeowners where in sole ownership
Rain Gardens	The homeowners where in sole ownership or Management Company with appropriate experience
Permeable Pavement	The homeowners where in sole ownership or Management Company with appropriate experience
Water Butts	The homeowners where in sole ownership

The exact maintenance regime will be confirmed although it is likely it will be similar to that recommended by the SUDS manual.

TABLE 32.1 Typical key SuDS components operation and maintenance activities (for full specifications, see Chapters 11–23)

Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/ trees	Filter strip	Green roofs	Proprietary treatment systems
Regular maintenance													
Inspection	■	■	■	■	■	■	■	■	■	■	■	■	■
Litter and debris removal	■	■	■	■	□	■	■	□	■	■	■		□
Grass cutting	■	■	■	■	□	■	■	□	□	■	■		
Weed and invasive plant control	□	□	□	□		□	□		□		□	■	
Shrub management (including pruning)	□	□	□	□					□	□	□		
Shoreline vegetation management	■	■	□										
Aquatic vegetation management	■	■	□										
Occasional maintenance													
Sediment management[1]	■	■	■	■	■	■	■	■	■	■	■		■
Vegetation replacement	□	□	□	□						□	□	■	
Vacuum sweeping and brushing									■				
Remedial maintenance													
Structure rehabilitation /repair	□	□	□	□	□	□	□	□	□	□	□	□	
Infiltration surface reconditioning				□	□	□	□		□	□	□		

Key

■ will be required

□ may be required

Notes

1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device.

10.2. Pond

TABLE 23.1 Operation and maintenance requirements for ponds and wetlands

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1–5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25–50 years
Remedial actions	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

10.3. Basins

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

10.3. Swales

TABLE 17.1 Operation and maintenance requirements for swales

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

10.4. Rain Gardens

TABLE 18.3 Operation and maintenance requirements for bioretention systems

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

10.5. Water Butts

TABLE 11.6 Operation and maintenance requirements for RWH systems

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters	Annually (and following poor performance)
	Cleaning of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters	Three monthly (or as required)
Remedial actions	Repair of overflow erosion damage or damage to tank	As required
	Pump repairs	As required

10.6. Permeable Pavement

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

10.7. Management & Maintenance Plan

A management and Maintenance Plan will be produced for agreement with the LPA at reserved matter stage identifying ownership and maintenance responsibilities for the drainage system to ensure that it will be maintained and will operate effectively for the lifetime of the development.

11. Conclusions

11.1. Flood Risk

This site-specific FRA has been produced in accordance with the requirements of the NPPF, Planning Practice Guidance (PPG), and EA advice notes, and demonstrates that the proposed development will be safe from flood risk and that it will not increase flood risk elsewhere.

The site is in Flood Zone 1 with a low flood risk (less than 1:1,000 or 0.1% annual probability of flooding from rivers).

The proposed residential development is classified as 'More Vulnerable' and is in Flood Zone 1; the proposed residential development is suitable in this zone and the NPPF Sequential and Exception Tests are not required.

Development levels will be designed to route surface water flows away from dwellings to protect them from flooding.

Flood risk from fluvial, pluvial, sewers, surface water, groundwater and artificial sources have been assessed, and it has been demonstrated that the proposed development will not be at risk from flooding from all sources.

11.2. Surface Water Drainage

Surface water from the proposed development will discharge into the watercourse running through the site with the discharge limited to Qbar for events up to and including the 1:100 + 45% climate change/urban creep allowance event with 30% betterment provided compared with existing greenfield rates. This will ensure that flood risk is not increased in the receiving drainage systems downstream of the development for the lifetime of the development.

Attenuation will be provided in a basin or pond with sewers discharging directly into it via precast concrete headwalls. The pond will have a permanent pool to provide treatment to the surface water run-off from the development. Bank slopes will be 1 in 3 in accordance with The SuDS Manual Ciria C753.

Flood routes will be provided for exceedance events, or for local failure of the drainage system (blockage, damage, etc.), and will ensure that flood flows are directed safely through or around the development to the downstream drainage system and watercourse. Details of flood exceedance routes will be provided with the reserved matters application.

Cutoff channels and Drains will be provided to intercept flows from the higher land to the south and will discharge to the pond.

The use of SuDS will remove pollution from surface water run-off and improve water quality with additional SuDS features provided with practical.

11.3. Foul Drainage

The foul flows from the site will connect to the existing sewage network in Tornio Close approximately 30m northwest of the site as confirmed by Wessex Water; full details of the connection will be agreed with Wessex Water.

The foul sewers will be adopted by Wessex Water or other approved Water/Sewerage Undertaker to ensure that they will be maintained for the lifetime of the development.

11.4. Summary

The Flood Risk Assessment and Drainage Strategy demonstrate that the proposed development meets with all the national and local policy requirements and satisfies all the criteria of the Planning Authority, Lead Local Flood Authority, and Environment Agency.

The Flood Risk Assessment concludes that the site can be safely developed without flood risk and without increasing flood risk elsewhere using an appropriately designed and maintained Sustainable Drainage System.

Appendix A
Locations Plan & Indicative Masterplan

KEY

RED LINE BOUNDARY - 2.971HA (7.341ACRES)

Site Name:	Drawing Number:			Revision:
LAND OFF WINDSOR DRIVE, DEVIZES	DEVIZES.UD.13			A
Drawing Title:	Drawn By:	Checked By:	Date:	Scale:
SITE LOCATION PLAN	LJD	GRJ	09/10/2024	1:2000 @ A2

Robert Hitchins
The Complete Development Solution
The Manor, Boddington, Cheltenham, Gloucestershire, GL51 0TJ
Tel: 01242 680694
www.robert-hitchins.co.uk

N

KEY

- PROPOSED VEHICULAR ACCESS INTO THE SITE
- PROPOSED RESIDENTIAL
- MAIN ROAD WITH GREEN VERGE AND STREET TREE PLANTING
- PRIVATE DIRVEWAY
- EXISTING VEGETATION
- PROPOSED WOODLAND PLANTING
- EXISTING PROW
- PROPOSED PLAY AREA
- PROPOSED ATTENUATION

0 10 50m

Site Name:	Drawing Number:			Revision:
LAND OFF WINDSOR DRIVE, DEVIZES	390.UD.10			L
Drawing Title:	**Drawn By:**	**Checked By:**	**Date:**	**Scale:**
INDICATIVE MASTERPLAN	LD	GRJ	28/08/2025	1:1000 @ A2

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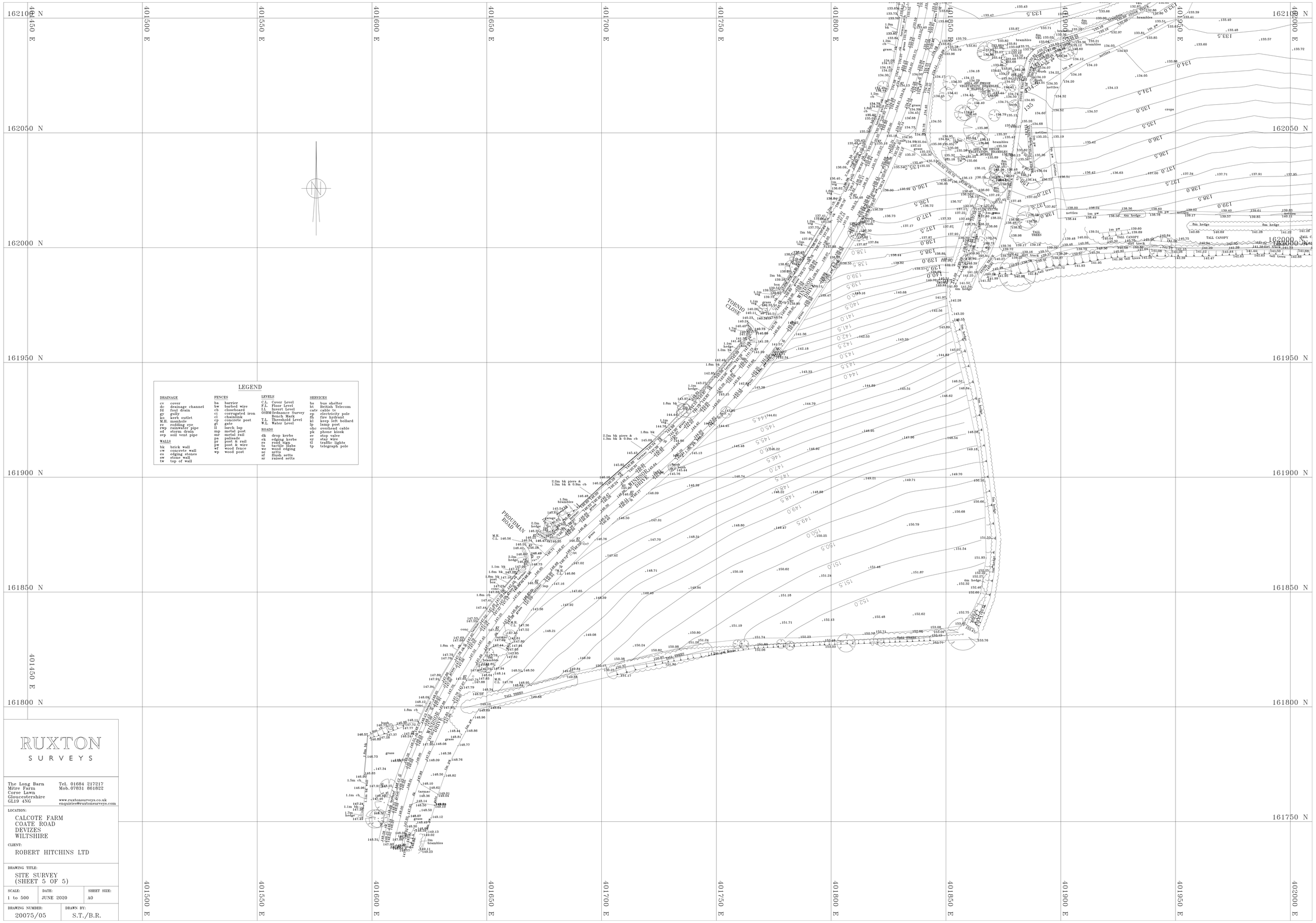
Appendix B
Topographical Survey, Elevations, & Slopes



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Corse Lawn
Gloucestershire
GL19 4NG

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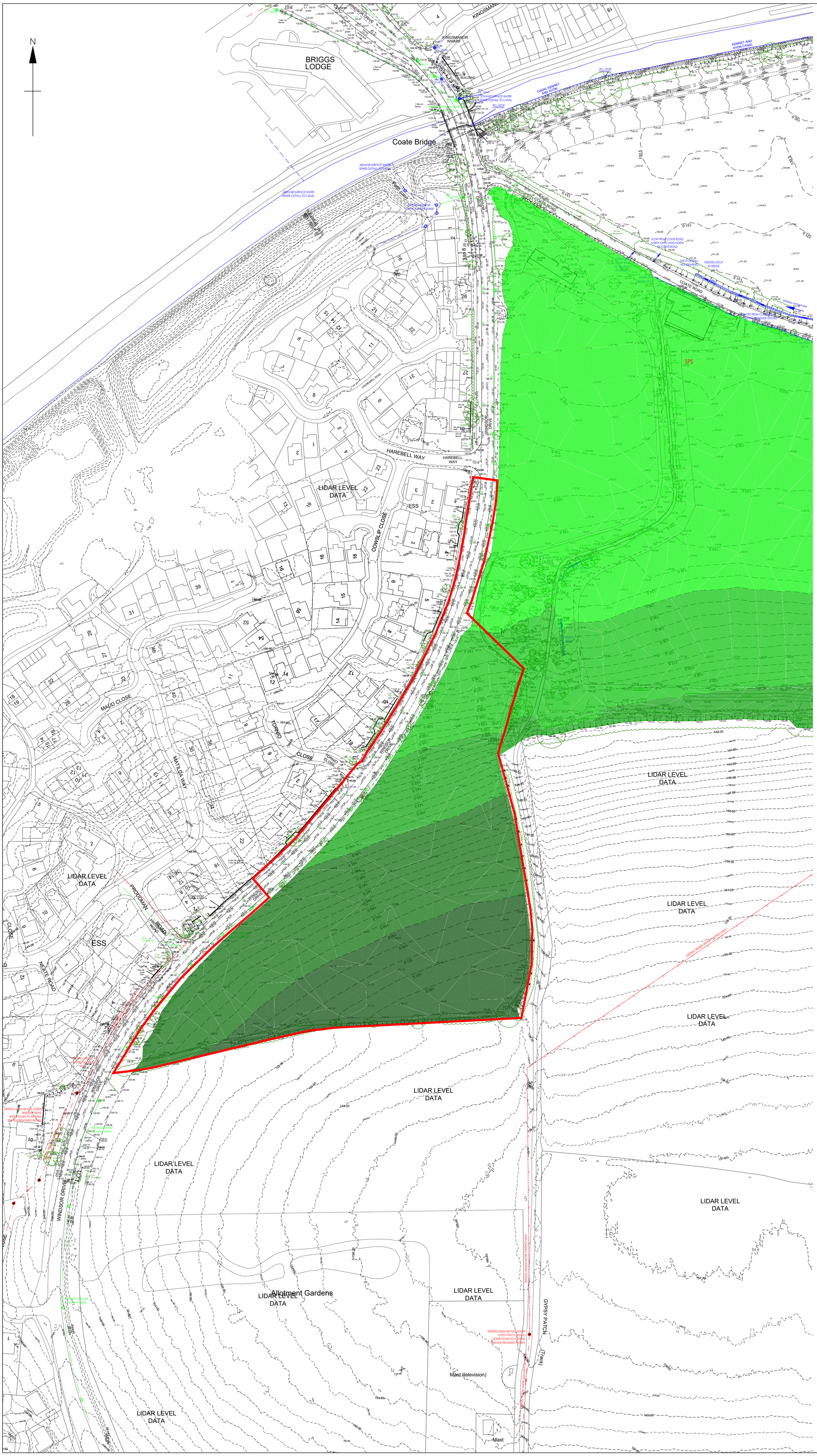
LOCATION:
CALCOTE FARM
COATE ROAD
DEVIZES
WILTSHIRE

CLIENT:
ROBERT HITCHINS LTD

DRAWING TITLE:
SITE SURVEY
(SHEET 5 OF 5)

SCALE:	DATE:	SHEET SIZE:
1 to 500	JUNE 2020	A0

DRAWING NUMBER:	DRAWN BY:
20075/05	S.T./B.R.



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130.00 - 135.00 mAOD	
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140.00 - 145.00 mAOD	
145.00 - 150.00 mAOD	
150.00 - 155.00 mAOD	
155.00 - 160.00 mAOD	

0 20 40 60 80 100
Metres (Scale 1:1,000)

Revisions

Project: Land Off Windsor Drive
Devizes

Client:

Robert Hitchins
The Complete Development Solution

Drawing: Existing Elevations

Scale: 1:1,000 @ A1
Date: 19/03/2025
Drawn by: P.A.

Drawing No: 638-P102
Rev: -

PHOENIX DESIGN Partnership Ltd.

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Slopes Table	
< 1.00% (<1:100)	
1.00% - 2.50% (1:100 - 1:40)	
2.50% - 5.00% (1:40 - 1:20)	
5.00% - 8.00% (1:20 - 1:12.5)	
8.00% - 12.50% (1:12.5 - 1:8)	
> 12.50% (> 1:8)	

0 20 40 60 80 100
Metres (Scale 1:1,000)

Revisions

Project: Land Off Windsor Drive
Devizes

Client:

Robert Hitchins
The Complete Development Solution

Drawing: Existing Slopes

Scale: 1:1,000 @ A1
Date: 19/03/2025
Drawn by: P.A.

Drawing No: 638-P103
Rev: -

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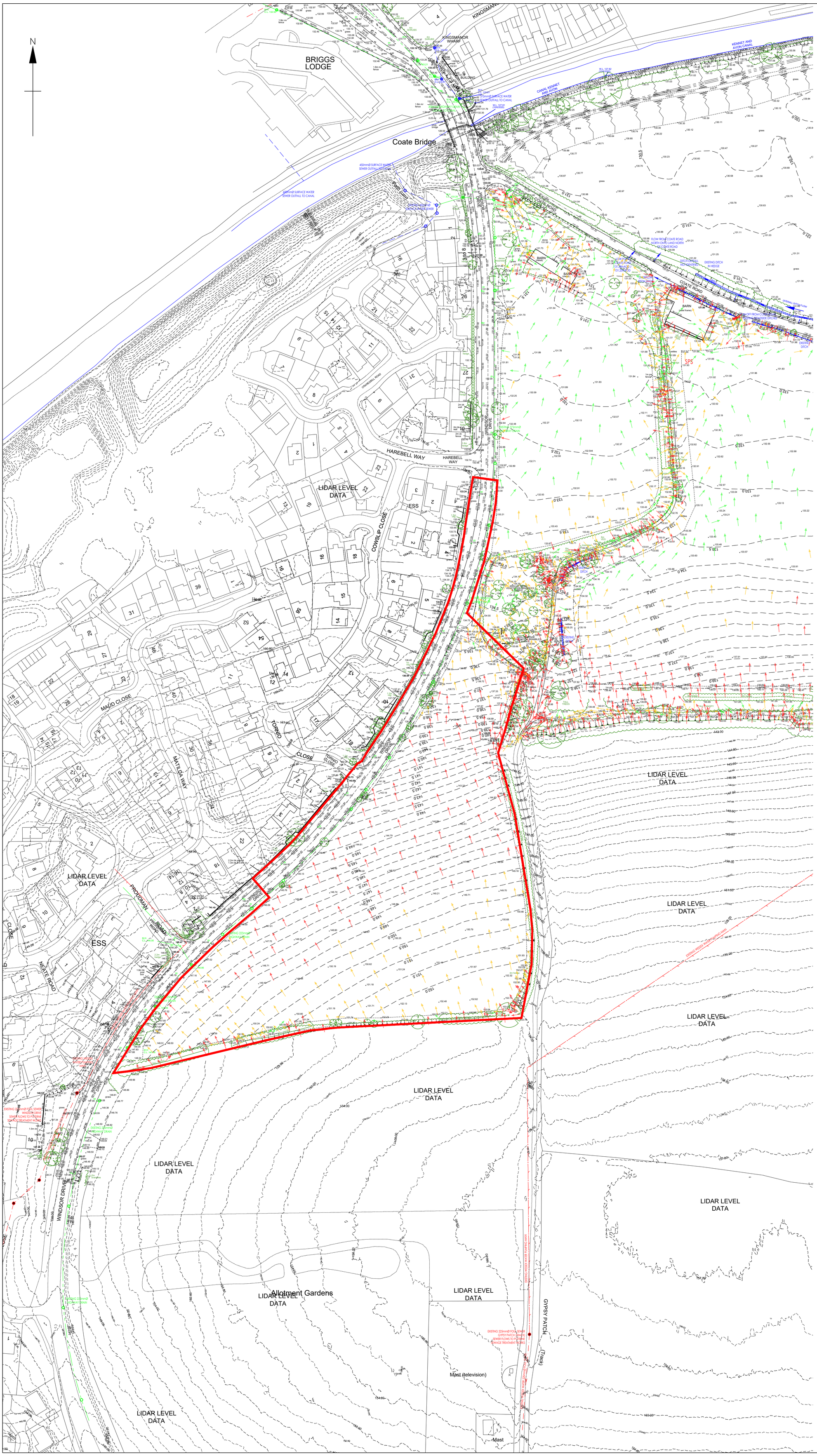

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> 8.00% (> 1:12.5)	

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Metres (Scale 1:1,000)

Revisions

Project: Land Off Windsor Drive Devizes

Client: RobertHitchins The Complete Development Solution

Drawing: Existing Slope Directions

Scale: 1:1,000 @ A1 | Date: 19/03/2025 | Drawn by: P.A.

Drawing No: 638-P104 | Rev: -

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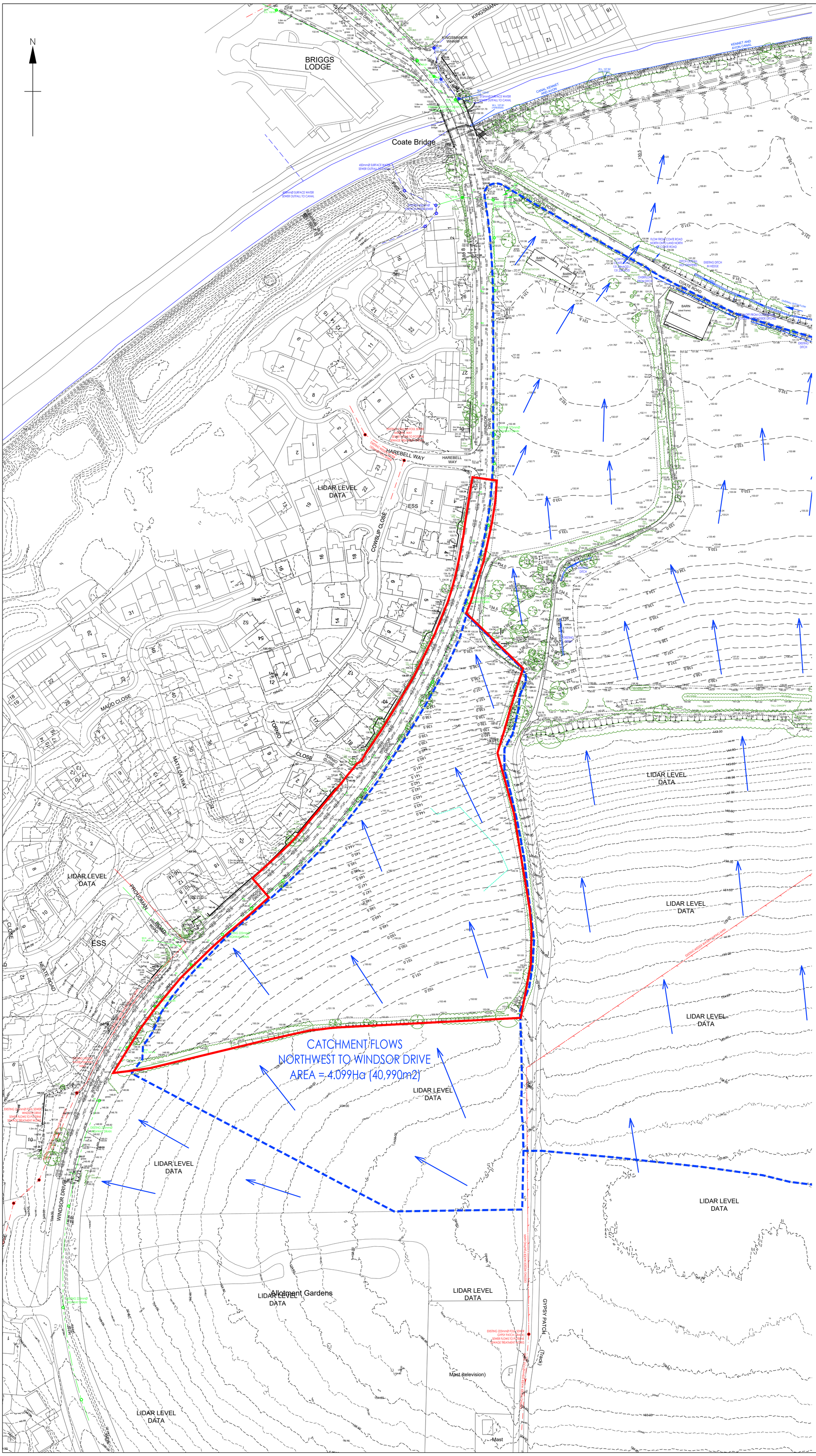
Appendix C
Existing Hydrology & Flood Risk



A 26/02/2026 Catchment updated, & fouls sewer in Harebell Way added.

Revisions

Project: Land Off Windsor Drive
Devizes

Client:

RobertHitchins
The Complete Development Solution

Drawing: Existing Topography & Hydrology

Scale: 1:1,000 @ A1

Date: 18/03/2025

Drawn by: P.A.

Drawing No: 638-P100

Rev: A

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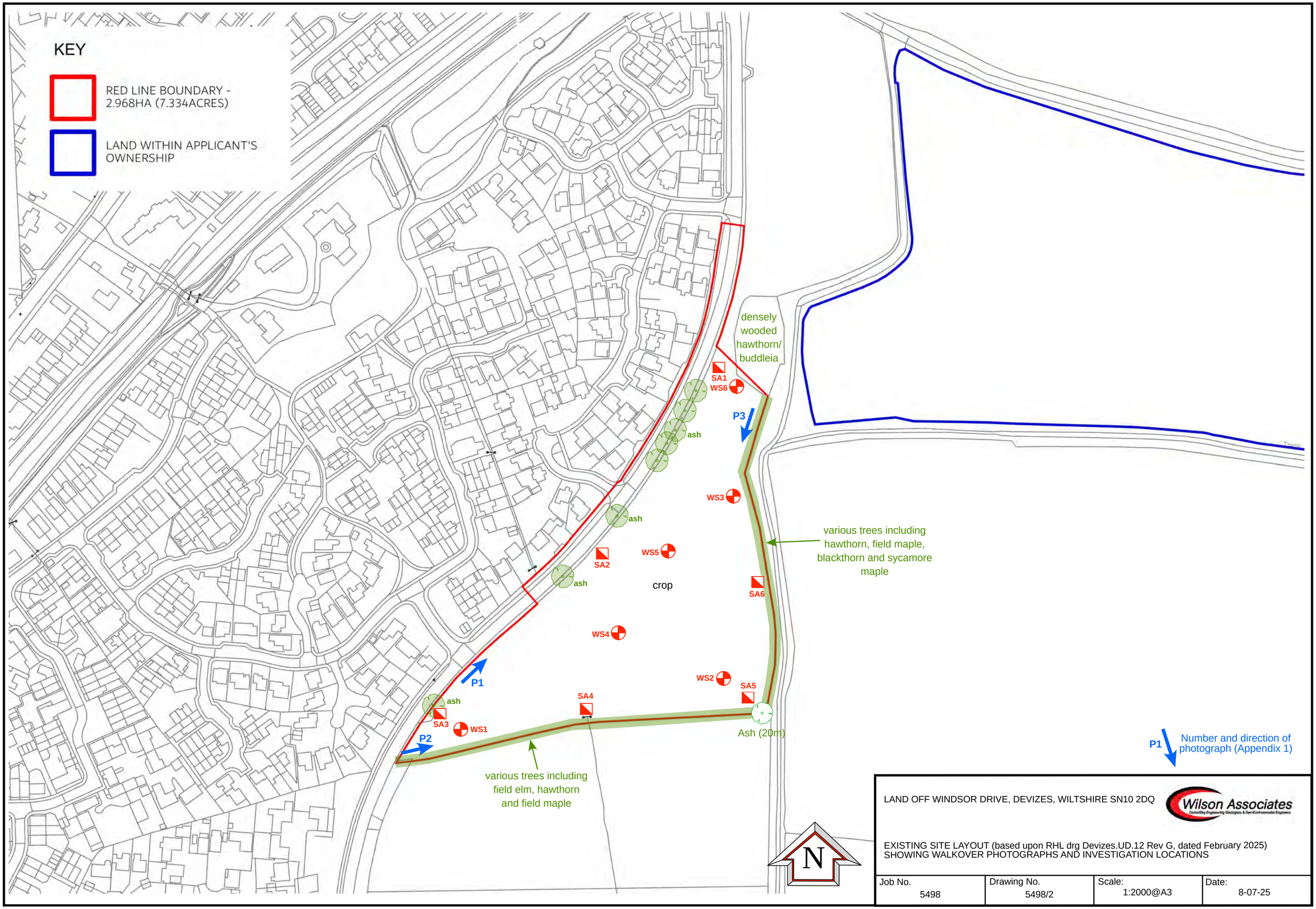
Appendix D
Ground Investigation Extracts



LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

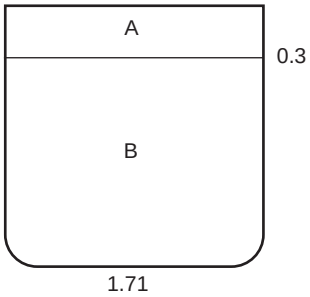
EXISTING SITE LAYOUT (based upon RHL drg Devizes.UD.12 Rev G, dated February 2025)
SHOWING WALKOVER PHOTOGRAPHS AND INVESTIGATION LOCATIONS

Job No.	Drawing No.	Scale:	Date:
5498	5498/2	1:2000@A3	8-07-25

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

36 Brunswick Road, Gloucester GL1 1JJ
Tel: 01452 422843
Email: info:wilsonac.co.uk

Site: LAND OFF WINDSOR DRIVE, DEVIZES,WILTSHIRE				TRIAL PIT No.
Job No.	**Date**	**Ground Level (c.m, AOD)**	**Co-Ordinates (c.)**	**SA1**
5498	26-06-25	141.00	E 401,837 N 162,009	



DETAILS OF SUBSOIL

A TOPSOIL: probable stiff desiccated organic dry sandy, slightly gravelly CLAY. Gravel is sub-angular, fine to medium flint

B Structureless CHALK compound of low density clay matrix with 10mm clasts of very weak off-white angular, occasional flint cobble

[WEST MELBURY MARLY CHALK MEMBER Grade Dm]

Notes:

1. Pit logged from surface
2. Pit dry and stable
3. Contamination sample taken at 0.00-0.30m depth
4. Falling Head Test carried out:
   Pit dimensions 1.6 x 0.55 x 1.708m (LxWxD)

Scale: NTS	**Client:** Robert Hitchins Limited	**Logged by:** DB

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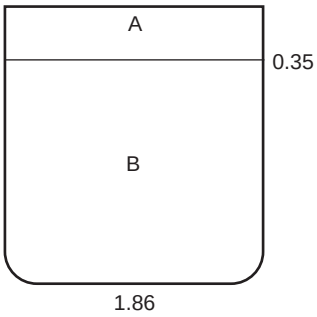
Site: LAND OFF WINDSOR DRIVE, DEVIZES,WILTSHIRE				TRIAL PIT No.
Job No. 5498	Date 26-06-25	Ground Level (c.m, AOD) 145.00	Co-Ordinates (c.) E 401,784 N 161,938	SA2



DETAILS OF SUBSOIL

A TOPSOIL: probable stiff desiccated organic, dry sandy, slightly gravelly CLAY. Gravel is sub-angular, fine to medium flint

B Structureless CHALK, medium density, off white 80/20 clasts matrix (off white silty clay)
1.2m: orange discolouration
[WEST MELBURY MARLY CHALK MEMBER Grade Dm]

Notes:

1. Pit logged from surface
2. Pit dry and stable
3. Contamination sample taken at 0.00-0.30m depth
4. Falling Head Test carried out:
   Pit dimensions 1.8 x 0.55 x 1.855m (LxWxD)

Scale: NTS	Client: Robert Hitchins Limited	Logged by: DB

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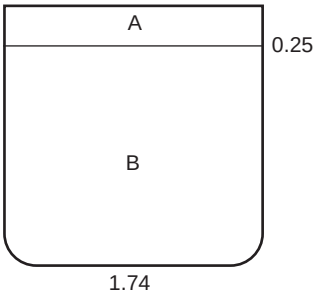
Site: LAND OFF WINDSOR DRIVE, DEVIZES,WILTSHIRE				TRIAL PIT No.
Job No.	**Date**	**Ground Level (c.m, AOD)**	**Co-Ordinates (c.)**	**SA3**
5498	26-06-25	148.00	E 401,718 N 161,862	



DETAILS OF SUBSOIL

A TOPSOIL: probable soft, slightly gravelly, silty plastic CLAY. Gravel is sub-angular, fine to coarse brick and chalk with occasional ceramics and rope

B Structureless CHALK, medium density, off white 80/20 clasts matrix (off white silty clay)
1.2m: orange discolouration
[WEST MELBURY MARLY CHALK MEMBER Grade Dm]

Notes:

1. Pit logged from surface
2. Pit dry and stable
3. Contamination sample taken at 0.00-0.30m depth
4. Falling Head Test carried out:
   Pit dimensions 1.6 x 0.55 x 1.736m (LxWxD)

Scale: NTS	**Client:** Robert Hitchins Limited	**Logged by:** DB

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Consulting Engineering Geologists & Geo-Environmental Engineers

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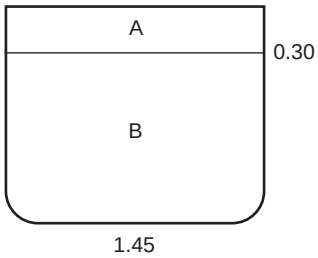
Email: info:wilsonac.co.uk

Site: LAND OFF WINDSOR DRIVE, DEVIZES,WILTSHIRE				TRIAL PIT No.
Job No. 5498	Date 26-06-25	Ground Level (c.m, AOD) 150.00	Co-Ordinates (c.) E 401,758 N 162,845	SA4



DETAILS OF SUBSOIL

A TOPSOIL: probable stiff desiccated, slightly gravelly, silty plastic CLAY. Gravel is sub-angular, fine to coarse brick and chalk with occasional ceramics and rope

B Structureless CHALK, medium to high density, off white 80/20 clasts matrix (off white silty clay)
1.2m: orange discolouration
[WEST MELBURY MARLY CHALK MEMBER Grade Dm]

Notes:

1. Pit logged from surface
2. Pit dry and stable
3. Contamination sample taken at 0.00-0.30m depth
4. Falling Head Test carried out:
   Pit dimensions 1.8 x 0.5 x 1.8m (LxWxD)

Scale: NTS	Client: Robert Hitchins Limited	Logged by: DB

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36 Brunswick Road, Gloucester GL1 1JJ
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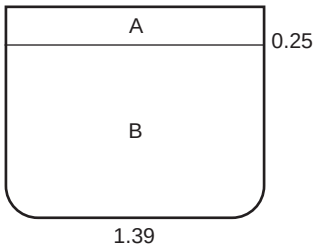
Email: info:wilsonac.co.uk

Site: LAND OFF WINDSOR DRIVE, DEVIZES,WILTSHIRE				TRIAL PIT No.
Job No.	**Date**	**Ground Level (c.m, AOD)**	**Co-Ordinates (c.)**	**SA5**
5498	26-06-25	152.00	E 401,849 N 161,851	



DETAILS OF SUBSOIL

A TOPSOIL: probable stiff gravelly, desiccated CLAY. Gravel is sub-angular, fine to coarse chalk

B Structureless CHALK compound of high density off white chalk. Discontinuities very closely spaced, partially open, infilled with silty clay occasional flint

[WEST MELBURY MARLY CHALK MEMBER Grade Dm]

Notes:

1. Pit logged from surface
2. Pit dry and stable
3. Contamination sample taken at 0.00-0.30m depth
4. Falling Head Test carried out:
   Pit dimensions 1.8 x 0.55 x 1.390m (LxWxD)

Scale: NTS	**Client:** Robert Hitchins Limited	**Logged by:** DB

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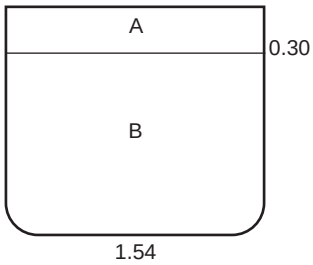
Email: info:wilsonac.co.uk

Site: LAND OFF WINDSOR DRIVE, DEVIZES,WILTSHIRE				TRIAL PIT No.
Job No.	**Date**	**Ground Level (c.m, AOD)**	**Co-Ordinates (c.)**	**SA6**
5498	26-06-25	148.00	E 401,846 N 161,937	



DETAILS OF SUBSOIL

A TOPSOIL: probable stiff gravelly silty desiccated CLAY. Gravel is sub-angular, fine to coarse chalk with occasional flint and brick

B Structureless CHALK compound oflow density clay matrix with 10mm clasts of very weak off-white angular, occasional flint cobble

[WEST MELBURY MARLY CHALK MEMBER Grade Dm]

Notes:

1. Pit logged from surface
2. Pit dry and stable
3. Contamination sample taken at 0.00-0.30m depth
4. Falling Head Test carried out:
   Pit dimensions 1.7 x 0.5 x 1.540m (LxWxD)

Scale: NTS	**Client:** Robert Hitchins Limited	**Logged by:** DB

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

BOREHOLE LOG

Project				BOREHOLE No
LAND OFF WINDSOR DRIVE, DEVIZES SN10 2DQ				**WS1**
Job No	Date	Ground Level (c.m,AOD)	Co-Ordinates (c.)	
5498	03-07-25	148.00	E 401,683 N 161,829	
Contractor				Sheet
Cook Ground Investigation Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.35	TOPSOIL: probable firm, dark greyish-brown, organic, dry desiccated sandy CLAY with rootlets and occasional fine gravel of chalk		
0.35-0.60	D					0.62	CHALK (structureless): composed of high density off-while CHALK GRAVEL of fine to coarse, off-white, angular CHALK	WMCK	
1.00	D					(1.38)	CHALK: medium density, off-white CHALK; horizontal jointing (<1mm with no flints)	WMCK	
1.00-1.45	SPT C								
1.45		N28							
						2.00	1.80 - high density		
2.00	D								
2.00-2.39	SPT C								
2.39		N50							

Core Recovery:
0.0 - 0.7m hand dug starter pit
0.7 - 2.0m 100%

Borehole terminated at 2.0m depth; backfilled with arisings

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To
03/07/2025					DRY					

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

WMCK = West Melbury Chalk Formation

All dimensions in metres Scale 1:50	Client Robert Hitchins Limited	Method/ Plant Used Archway Dart/Window Sampling	Logged By BK

BOREHOLE PHOTOGRAPHS

Project LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ	Borehole No. **WS1**
Job No. 5498 Date: 03-07-25	

Starter pit arisings (0.0 – 0.7m)

Borehole Core (0.7 – 2.0m)

Client	Method/Plant Used	Logged By
Robert Hitchins Limited	Archway Dart / Window Sampling	BK

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

BOREHOLE LOG

Project				BOREHOLE No
LAND OFF WINDSOR DRIVE, DEVIZES SN10 2DQ				**WS2**
Job No	Date	Ground Level (c.m,AOD)	Co-Ordinates (c.)	
5498	03-07-25	152.00	E 401,797 N 161,843	
Contractor				Sheet
Cook Ground Investigation Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.24	TOPSOIL: probable firm, dark greyish-brown, organic, dry, desiccated sandy CLAY with rootlets and occasional fine gravel of chalk		
0.24-0.67	D					(0.43) 0.67	CHALK (structureless): composed of high density off-while CHALK GRAVEL of fine to coarse, off-white, angular CHALK	WMCK	
0.50	D					1.00	CHALK: high density, off-white CHALK; horizontal jointing (<1mm with no flints)	WMCK	
1.00-1.25	SPT C								
1.26		N50/ 150 mm							

Core Recovery:
0.0 - 0.7m hand dug starter pit
0.7 - 1.0m 100%

Borehole terminated at 1.0m depth; backfilled with arisings

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To
03/07/2025					DRY					

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

WMCK = West Melbury Chalk Formation

All dimensions in metres Scale 1:50	Client Robert Hitchins Limited	Method/ Plant Used Archway Dart/Window Sampling	Logged By BK

BOREHOLE PHOTOGRAPHS

Project LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ	Borehole No. **WS2**
Job No. 5498 Date: 03-07-25	

Starter pit arisings (0.0 – 0.7m)

Borehole Core (0.7 – 1.0m)

Client	Method/Plant Used	Logged By
Robert Hitchins Limited	Archway Dart / Window Sampling	BK

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

BOREHOLE LOG

Project				BOREHOLE No
LAND OFF WINDSOR DRIVE, DEVIZES SN10 2DQ				**WS3**
Job No	Date	Ground Level (c.m,AOD)	Co-Ordinates (c.)	
5498	03-07-25	144.00	E 401,838 N 161,973	
Contractor				Sheet
Cook Ground Investigation Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.25	TOPSOIL: probable firm, dark greyish-brown, organic, dry, desiccated sandy CLAY with rootlets and occasional fine gravel of chalk		
0.25-0.60	D					(0.58) 0.83	CHALK (structureless): medium density off-white CHALK of fine to coarse, medium, angular gravel chalk lumps	WMCK	
1.00	D					(0.87) 1.70	CHALK: medium density, off-white CHALK; horizontal jointing (<1mm with no flints)	WMCK	
1.00-1.45	SPT C								
1.45		N28							
1.50	D								
1.70-2.10	SPT C								
2.10		N50/ 245 mm					Core Recovery: 0.0 - 1.0m hand dug starter pit 1.0 - 1.7m 100% Borehole terminated on refusal in SPT at 1.7m depth; backfilled with arisings		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To
03/07/2025					DRY					

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

WMCK = West Melbury Chalk Formation

All dimensions in metres Scale 1:50	Client Robert Hitchins Limited	Method/ Plant Used Archway Dart/Window Sampling	Logged By BK

BOREHOLE PHOTOGRAPHS

Project LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ	Borehole No. **WS3**
Job No. 5498 Date: 03-07-25	

Starter pit arisings (0.0 – 1.0m) and Borehole Core (1.0 – 2.0m)

Client	Method/Plant Used	Logged By
Robert Hitchins Limited	Archway Dart / Window Sampling	BK

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

BOREHOLE LOG

Project				BOREHOLE No
LAND OFF WINDSOR DRIVE, DEVIZES SN10 2DQ				**WS4**
Job No	Date	Ground Level (c.m,AOD)	Co-Ordinates (c.)	
5498	01-08-25	149.00	E 401,782 N 161,888	
Contractor				Sheet
Cook Ground Investigation Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
0.10	D					0.25	TOPSOIL: Probable soft/firm, dark brown, organic, dry, desiccated CLAY with many roots from former crop		
0.50	D					(1.35)	CHALK: medium density, light grey/off-white, dry friable structureless CHALK recovered as medium to coarse gravel chalk lumps. No flint	WMCK	
1.00-1.45 1.00	SPT C	N39				1.60			
1.55-1.90 1.55	SPT C	N50/ 220 mm					1.58 - probable high density chalk with relict structure evident		
							Core Recovery: 0.0 - 1.6m 100% Drilled from surface using dynamic sampling 101mm barrels: 0.00-1.60m. No groundwater encountered. No casing used. Upon completion backfilled with arisings		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To
01/08/2025	101	1.9			DRY					

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

WMCK = West Melbury Chalk Formation

All dimensions in metres Scale 1:50	Client Robert Hitchins Limited	Method/ Plant Used Archway Dart/Window Sampling	Logged By TC

BOREHOLE PHOTOGRAPHS

Project LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ	Borehole No. **WS4**
Job No. 5498 Date: 01-08-25	

Borehole Core (0.0 – 1.6m)

Client	Method/Plant Used	Logged By
Robert Hitchins Limited	Archway Dart / Window Sampling	BK

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

BOREHOLE LOG

Project				BOREHOLE No
LAND OFF WINDSOR DRIVE, DEVIZES SN10 2DQ				**WS5**
Job No	Date	Ground Level (c.m,AOD)	Co-Ordinates (c.)	
5498	01-08-25	145.00	E 401,810 N 161,948	
Contractor				Sheet
Cook Ground Investigation Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
0.20	D		1			0.30	TOPSOIL: probable soft to firm, dark brown, dry, friable slightly gravelly CLAY with many roots. Gravel is fine to medium chalk lumps. No flint		
0.80	D					(0.70) 1.00	CHALK: medium density, light grey/off white, structureless, dry, friable CHALK with roots	WMCK	
1.00-1.36 1.00	SPT C	N48/ 210 mm					Core Recovery: 0.0 - 1.0m 100% Drilled from surface using dynamic sampling 101mm barrels: 0.00-1.00m. Groundwater encountered at 0.50m. No casing used. Upon completion backfilled with arisings		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To
01/08/2025	101	1			0.50					

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

WMCK = West Melbury Chalk Formation

All dimensions in metres Scale 1:50	Client Robert Hitchins Limited	Method/ Plant Used Archway Dart/Window Sampling	Logged By TC

BOREHOLE PHOTOGRAPHS

Project LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ	Borehole No. **WS5**
Job No. 5498 Date: 01-08-25	

Borehole Core (0.0 – 1.0m)

Client	Method/Plant Used	Logged By
Robert Hitchins Limited	Archway Dart / Window Sampling	BK

Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

BOREHOLE LOG

Project				BOREHOLE No
LAND OFF WINDSOR DRIVE, DEVIZES SN10 2DQ				**WS6**
Job No	Date	Ground Level (c.m,AOD)	Co-Ordinates (c.)	
5498	01-08-25	139.00	E 401,845 N 162,032	
Contractor				Sheet
Cook Ground Investigation Limited				1 of 1

SAMPLES & TESTS			STRATA						
Depth	Type No	Test Result	Water	Undrained Shear Strength	Legend	Depth (Thick-ness)	DESCRIPTION	Geology	Instrument/ Backfill
						0.35	TOPSOIL: probable soft/firm dark brown, organic, plastic CLAY with rare roots		
0.30	D		1				CHALK: low density, dull grey structureless CHALK/CLAY with rare clasts		
0.50	D								
1.00	D								
1.00-1.45	SPT C					(1.65)		WMCK	
1.00		N17							
							1.50 - probable medium density CHALK with relict structure		
						2.00	1.80 - probable high density CHALK		
2.00-2.36	SPT C						Core Recovery: 0.0 - 2.0m 100%		
2.00		N50/ 220 mm							
							Drilled from surface using dynamic sampling 101mm barrels: 0.00-2.00m. Groundwater encountered at 0.50m. No casing used. Upon completion backfilled with arisings		

Boring Progress and Water Observations						Chiselling			Water Added	
Date	Hole Dia. mm	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To
01/08/2025	101	2			0.50					

GENERAL REMARKS

Borehole position scanned using Cable Avoidance Tool (CAT); no services detected

WMCK = West Melbury Chalk Formation

All dimensions in metres Scale 1:50	Client Robert Hitchins Limited	Method/ Plant Used Archway Dart/Window Sampling	Logged By TC

BOREHOLE PHOTOGRAPHS

Project LAND OFF WINDSOR DRIVE, DEVIZES, WILTSHIRE SN10 2DQ	Borehole No. **WS6**
Job No. 5498 Date: 01-08-25	

Borehole Core (0.0 – 2.0m)

Client	Method/Plant Used	Logged By
Robert Hitchins Limited	Archway Dart / Window Sampling	BK

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KEY TO BOREHOLE LOG SYMBOLS

Symbol	Explanation
D or J	Small Disturbed Sample (tub or jar sample)
B	Large Disturbed Sample
U	Undisturbed Sample
W	Water Sample
U70	Undisturbed Sample

Undrained Shear Strength Test (HSV)

90	Hand vane - direct reading in kN/m^2

Standard Penetration Test (SPT)

15	SPT 'N' Value (BS EN ISO 22476-3:2005)
125/50	Where full test drive not completed, penetration (125mm) and blow count (50) recorded
NR	No effective penetration

Water

	Water struck
	Water standing

Test/Core Range

TCR	Total Core Recovery - as percentage of core run. Where value significantly exceeds 100%, a note is given on remarks on log
SCR	Solid Core Recovery - as percentage of core run. Note: assessment of solid core is based on full diameter
RQD	Rock Quality Designation - the amount of solid core greater than 100mm expressed as percentage of core run
	Where SPT has been carried out at beginning of core run, disturbed section of core excluded from SCR and RQD assessment

Instrumentation

	Bentonite Seal
	Solid / Perforated Standpipe
	Granular Response Zone

Appendix E
Greenfield Runoff Calculations

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	ReFH2
FEH filename	S:\PDP Projects\638 Lanc
Region	England, Wales, NI
Include Baseflow	☐
Positively Drained Area (ha)	1.655
Betterment (%)	0

Load

OK

Cancel

Calc

Note: FEH point descriptors can be downloaded from fehweb.ceh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor
ReFH2 – Contains the new BFIHOST19 descriptor

Return Period (years)	Q (l/s)
2	2.7
30	7.2
100	9.5

GFR 1.655Ha Development Area – 0% Betterment

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	ReFH2
FEH filename	S:\PDP Projects\638 Lanc
Region	England, Wales, NI
Include Baseflow	☐
Positively Drained Area (ha)	1.655
Betterment (%)	30

Load

OK

Cancel

Calc

Note: FEH point descriptors can be downloaded from fehweb.ceh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor
ReFH2 – Contains the new BFIHOST19 descriptor

Return Period (years)	Q (l/s)
2	1.9
30	5.0
100	6.7

GFR 1.655Ha Development Area – 30% Betterment

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	ReFH2
FEH filename	S:\PDP Projects\638 Land
Region	England, Wales, NI
Include Baseflow	☐
Positively Drained Area (ha)	4.099
Betterment (%)	0

Load

OK

Cancel

Calc

Note: FEH point descriptors can be downloaded from fehweb.ceh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor
ReFH2 – Contains the new BFIHOST19 descriptor

Return Period (years)	Q (l/s)
2	6.6
30	17.7
100	23.4

GFR 4.099Ha Total Catchment Area – 0% Betterment

Pre-development discharge

Site Makeup	Greenfield
Greenfield Method	ReFH2
FEH filename	S:\PDP Projects\638 Land
Region	England, Wales, NI
Include Baseflow	☐
Positively Drained Area (ha)	4.099
Betterment (%)	30

Load

OK

Cancel

Calc

Note: FEH point descriptors can be downloaded from fehweb.ceh.ac.uk

Only XML file format can be used

FEH-22 is the current FEH data and this should be used for new development

ReFH2 legacy – Doesn't contain the new BFIHOST19 descriptor
ReFH2 – Contains the new BFIHOST19 descriptor

Return Period (years)	Q (l/s)
2	4.6
30	12.4
100	16.4

GFR 4.099Ha Total Catchment Area – 30% Betterment

Appendix F
Wessex Water Correspondence & Mapping

Outlook

WWDevRespSU06SW/ 397 Land Off Windsor Drive Devizes

From Planning Liaison <planning.liaison@wessexwater.co.uk>
Date Wed 4/9/2025 4:27 PM
To Edward Argent <ejargent@robert-hitchins.co.uk>
Cc Alison Kurobasa <Alison.Kurobasa@wessexwater.co.uk>

2 attachments (2 MB)
WWmap Harebell Way Devizes.pdf; WWmap Windsor Drive Devizes.pdf;

Hello Ed

Land Off Windsor Drive, Devizes, Wiltshire
40 Dwellings

Thank you for your pre-development enquiry. I have attached extracts from our mapping showing our apparatus in the vicinity of the site.

Separate systems of drainage are required.

Foul Sewerage
Development will require a 150mm foul connection.

I note the topography falls towards the north of the site and I would expect a gravity connection to be achievable in this direction.

There is a public foul sewer network in the housing estate to the west of Windsor Drive: -

- Harebell Way manhole SU01627116; Cover Level 133.020, Invert Level 130.720
- Torino Close manhole SU01617902; Cover Level 138.740, Invert Level 136.610

Either option requires a length of off-site sewer and the onus is with you to determine that you can achieve a connection, as either route may need to cross other sewers.

Wessex Water will accommodate foul only flows in the public foul sewer with connections made on a 'size for size' basis.
Developers fund the cost of connecting to the nearest 'size for size' sewer and Wessex Water will manage the network to accommodate the additional foul flows from granted development . We fund any capacity improvements through our Infrastructure Charging arrangements.

The point of connection to the public network is by application and agreement with Wessex Water and subject to satisfactory engineering proposals constructed to current adoptable standards.
Please Note: No surface water runoff or land drainage will be accepted into the public foul sewer either directly or indirectly.

Surface Water Strategy
For development of this site you will be required to follow the SUDS hierarchy and NPPF guidelines.
We will only consider a restricted discharge to a public surface water sewer (at an agreed rate) when higher methods in the SUDS hierarchy are proven not viable.
Wessex Water will be looking for a full suite of SuDS components to be considered and included in the proposals for the capture, storage and discharge of surface water runoff.
Surface water strategy, discharge rates and volumes will need to be agreed and approved by the LLFA, in consultation with Wessex Water.

No groundwater or land drainage will be accepted into the public sewer either directly or indirectly.

Note: These comments are based upon known circumstances prevailing at the time of writing. A review of the contents of this email is required where 18 months or more have

elapsed since issue or in the light of significant changes likely to impact upon the response (e.g. changes in development numbers or phasing). Please email review requests to planning.liaison@wessexwater.co.uk

Alison Kurobasa
Planning Liaison

Wessex Water
Operations Centre, Claverton Down, Bath BA2 7WW

Email alison.kurobasa@wessexwater.co.uk
Web ytl.com | wessexwater.co.uk

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This email is being sent to you on behalf of Wessex Water Limited, a company registered in England and Wales with number 02366633. Its registered office is Wessex Water Operations Centre, Claverton Down Road, Claverton Down, Bath, BA2 7WW.

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This email is being sent to you on behalf of Wessex Water Services Limited, a company registered in England and Wales with number 02366648. The registered office is Wessex Water Operations Centre, Claverton Down Road, Claverton Down, Bath, BA2 7WW.

Windsor Drive, Devizes

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WATER MAINS
- Distribution
- Washout
- Raw Water
- Abandoned
- Private

FITTINGS
- Hydrant
- Other

SEWERS — STRATEGIC / PUBLIC / PRIVATE / SECTION 104
- Foul
- Surface
- Combined
- Abandoned

Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow). Some styles of line and symbol are shown on the key in sample/typical colours.

STRUCTURES
- Manhole - Foul
- Manhole - Surface
- Manhole - Combined
- Inlet
- Outfall
- Lamphole
- Bifurcation - Foul
- Bifurcation - Surface
- Bifurcation - Combined
- Combined Sewage Overflow
- Pumping Station - Surface
- Pumping Stn - Foul/Combined
- Gully
- Vent Column
- Rodding Eye
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Air Valve
- Hatch Box
- X Washout

OTHER WESSEX PIPES
- Rising Mains
- Standby Rising Mains
- EDM Effluent Disposal
- Overflow
- S Syphon

NON-WESSEX / UNKNOWN
- Private Rising Mains
- CW Culverted Watercourse
- H Highway Drain
- ? Use Unknown
- SU Status Unknown

OTHER STRUCTURES
- Attenuation Tank
- Storage Tank
- Chamber
- Tunnel
- Interceptor

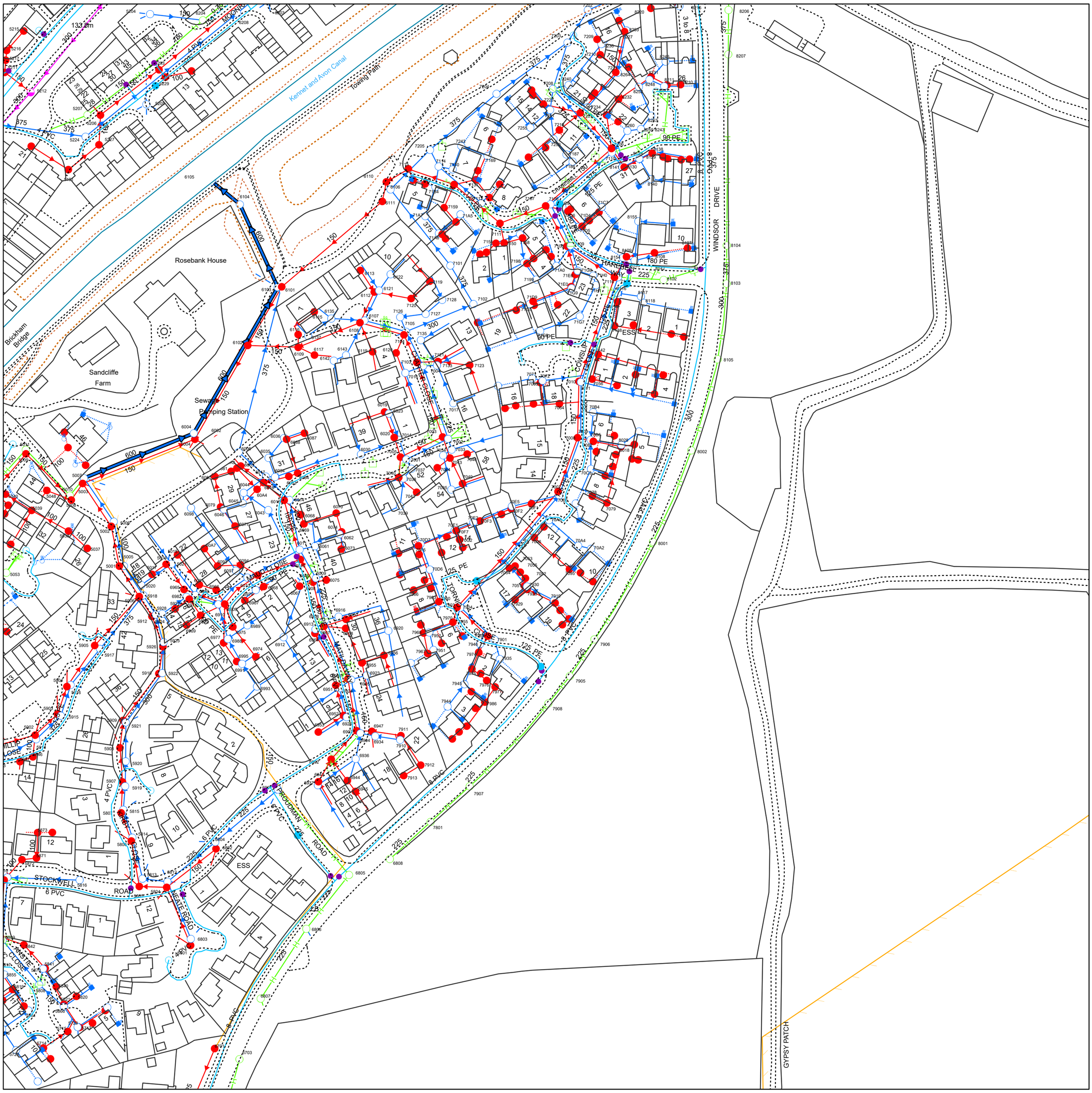
Wessex Water
YTL GROUP

Information in this map is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown. In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located. If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. If you are proposing to build over or near Wessex Water's apparatus you should contact the Developer Services Team, tel: 01225 526333 or e-mail: developer.enquiries@wessexwater.co.uk to discuss your proposals. Details of assets within Wessex Water's land ownership are unavailable through this service.

Date: 09/04/2025
Centre: 401835E, 162046N
Scale: 1:1,250
(when printed at A4 size)

N W E S

Windsor Drive, Devizes



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WATER MAINS

- Distribution
- Washout
- Raw Water
- Abandoned
- Private

FITTINGS

- Hydrant
- Other

SEWERS

	STRATEGIC	PUBLIC	PRIVATE	SECTION 104
Foul				
Surface				
Combined				
Abandoned				

Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow).
Some styles of line and symbol are shown on the key in sample/typical colours.

STRUCTURES

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- Inlet
- Outfall
- Lamphole
- Bifurcation - Foul
- Bifurcation - Surface
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- Combined Sewage Overflow
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- Rodding Eye
- Catchpit
- Flushing Chamber
- Soakaway
- Non Return Valve
- Air Valve
- Hatch Box
- Washout

OTHER WESSEX PIPES

- Rising Mains
- Standby Rising Mains
- Effluent Disposal
- Overflow
- Syphon

NON-WESSEX / UNKNOWN

- Private Rising Mains
- Culverted Watercourse
- Highway Drain
- Use Unknown
- Status Unknown

OTHER STRUCTURES

- Attenuation Tank
- Storage Tank
- Chamber
- Tunnel
- Interceptor

Wessex Water
YTL GROUP

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Date: 09/04/2025
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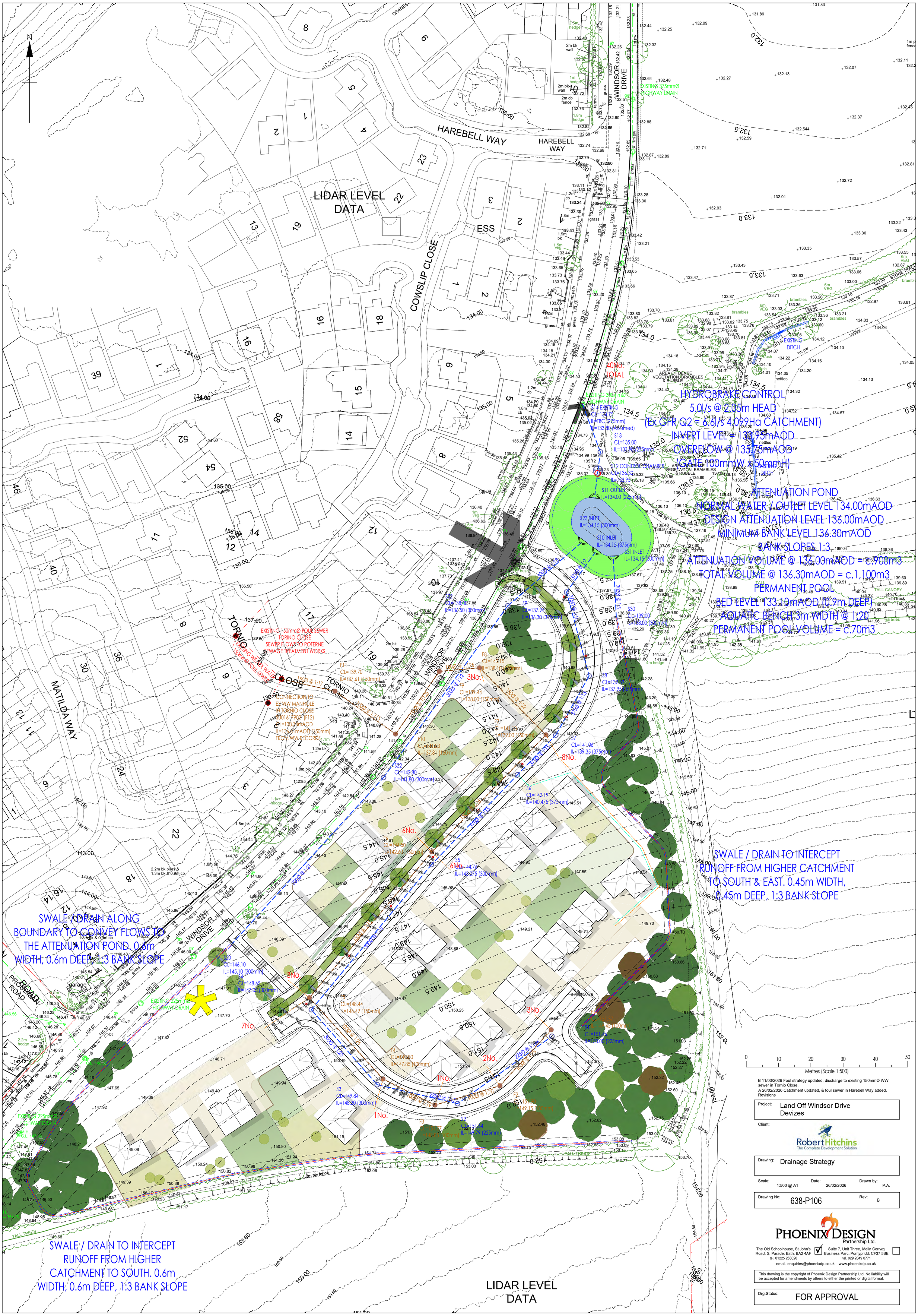
(when printed at A2 size)

N W E S

Appendix G
Drainage Strategy



B 11/03/2026 Foul strategy updated; discharge to existing 150mmØ WW sewer in Tornio Close.
A 26/02/2026 Catchment updated, & foul sewer in Harebell Way added.
Revisions

Project: Land Off Windsor Drive
Devizes

Client:

Robert Hitchins
The Complete Development Solution

Drawing: Drainage Strategy

Scale: 1:500 @ A1
Date: 26/02/2026
Drawn by: P.A.

Drawing No: 638-P106
Rev: B

PHOENIX DESIGN Partnership Ltd.

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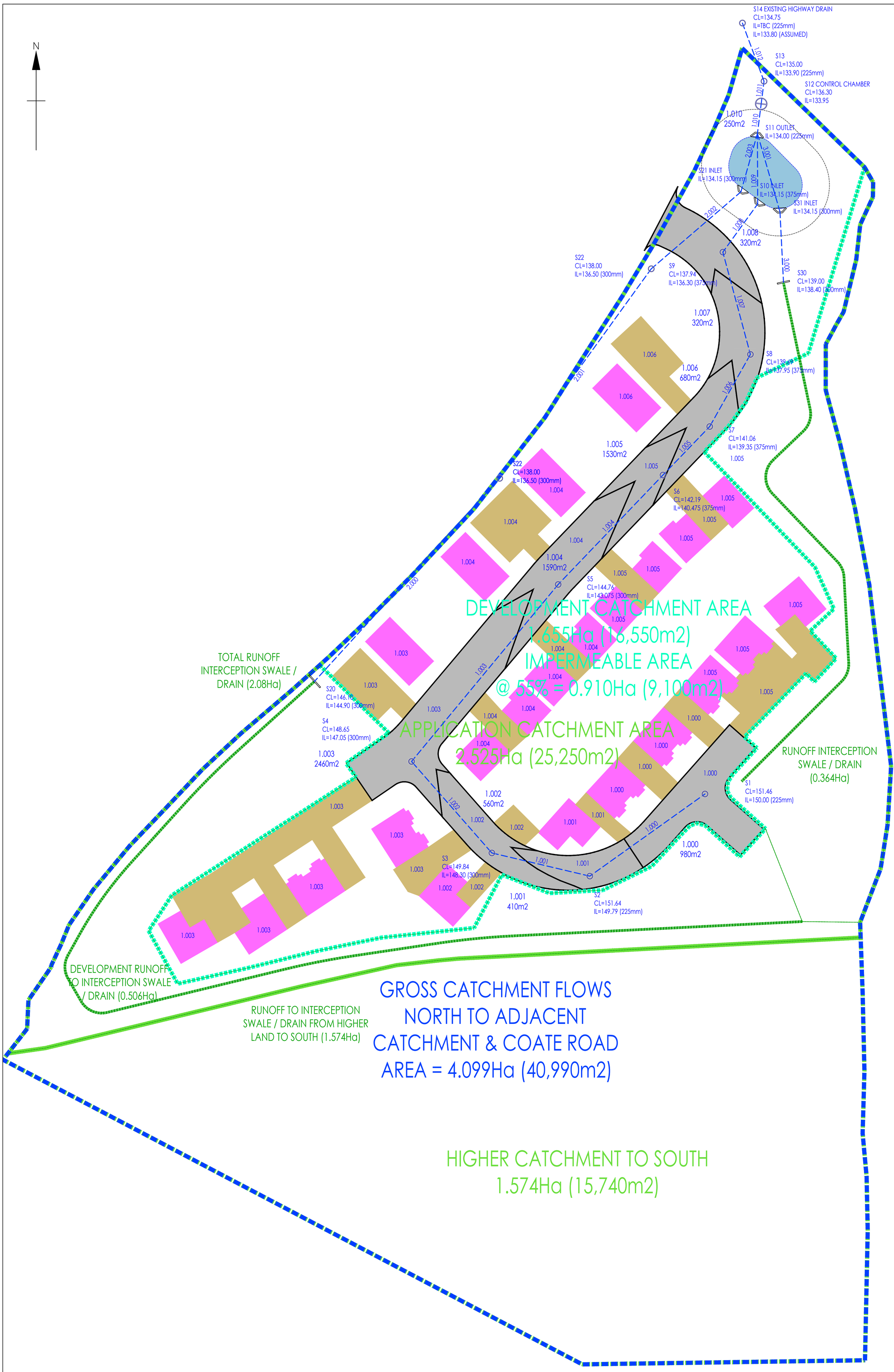
Drg.Status: FOR APPROVAL

Appendix H
Impermeable Area



IMPERMEABLE AREAS (40 DWELLINGS)

DEVELOPMENT AREA CATCHMENT = 16,550m2

HIGHWAYS = 3,270m2 (39%)

ROOFS = 2,450m2 (29%)

DRIVES/PARKING = 2,520m2 (29%)

ATTENUATION POND = 230m2 (3%)

IMPERMEABLE AREA = 8,470m2

DESIGN CONTINGENCY = 630m2 (7%)

TOTAL = 9,100m2 (0.910Ha)

GROSS DRAINAGE CATCHMENT	=	4.099Ha
HIGHER LAND TO THE SOUTH	=	1.574Ha (38%)
APPLICATION CATCHMENT (EXCL. EX. H'WAY,)	=	2.525Ha (62%)
OPENSPACE AREA IN APPLICATION AREA	=	0.870Ha (34%)
DEVELOPMENT AREA CATCHMENT	=	1.655Ha (66%)
IMPERMEABLE AREA	=	0.910Ha (55%)
GARDENS & LANDSCAPE IN DEVELOPMENT AREA	=	0.745Ha (45%)
URBAN CREEP = 10% (ROOFS & DRIVES/PARKING)	=	6%

AVON HAMPSHIRE MANAGEMENT CATCHMENT PEAK RAINFALL ALLOWANCES

CLIMATE CHANGE ALLOWANCE 1:30 EVENT	=	40%
CLIMATE CHANGE ALLOWANCE 1:100 EVENT	=	45%

0 10 20 30 40 50
Metres (Scale 1:500)

A 26/02/2026 Catchment updated, & fouls sewer in Harebell Way added.
Revisions

Project: Land Off Windsor Drive
Devizes

Client: Robert Hitchins
The Complete Development Solution

Drawing: Impermeable Areas Plan

Scale: 1:500 @ A1 | Date: 26/02/2026 | Drawn by: P.A.

Drawing No: 638-P105 | Rev: -

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Appendix I
Flow SW Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1	0.098	5.00	151.463	1350	401823.819	161865.801	1.463
S2	0.041	5.00	151.640	1200	401795.483	161845.577	1.850
S3	0.056	5.00	149.839	1350	401770.615	161851.456	1.539
S4	0.246	5.00	148.651	1350	401750.235	161874.671	1.601
S5	0.259	5.00	144.763	1350	401787.450	161919.576	1.688
S6	0.153	5.00	142.193	1350	401814.055	161947.341	1.718
S7	0.068	5.00	141.055	1350	401825.917	161959.640	1.705
S8	0.032	5.00	139.691	1350	401836.248	161977.952	1.741
S9	0.032	5.00	137.974	1350	401829.256	162003.895	1.674
S10			136.300	1500	401838.097	162016.119	2.150
S20		5.00	146.100	1200	401725.527	161894.909	1.000
S21			142.800	1350	401772.595	161946.508	1.000
S22			138.001	1350	401811.078	161999.663	1.501
S23			136.300	1500	401833.846	162019.193	2.150
S30		5.00	139.000	1350	401844.659	161996.091	1.000
S31			136.300	1500	401843.756	162014.111	2.150
S11	0.025	5.00	136.300	1500	401838.032	162033.985	2.300
S12			136.300	1200	401838.984	162041.516	2.350
S13			135.500	1350	401839.711	162047.261	1.600
S14			134.750	1350	401834.219	162062.008	0.950

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	S1	S2	34.813	0.600	150.000	149.790	0.210	165.8	225	5.57	49.4
1.001	S2	S3	25.553	0.600	149.790	148.300	1.490	17.1	225	5.71	48.9
1.002	S3	S4	30.891	0.600	148.300	147.050	1.250	24.7	300	5.87	48.3
1.003	S4	S5	58.322	0.600	147.050	143.150	3.900	15.0	300	6.11	47.5
1.004	S5	S6	38.454	0.600	143.075	140.475	2.600	14.8	375	6.24	47.0
1.005	S6	S7	17.087	0.600	140.475	139.350	1.125	15.2	375	6.30	46.8
1.006	S7	S8	21.025	0.600	139.350	137.950	1.400	15.0	375	6.38	46.5
1.007	S8	S9	26.869	0.600	137.950	136.300	1.650	16.3	375	6.48	46.2
1.008	S9	S10	15.086	0.600	136.300	134.150	2.150	7.0	375	6.51	46.1
1.009	S10	S11	17.866	0.600	134.150	134.000	0.150	119.1	900	6.62	45.7

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	1.012	40.3	17.5	1.238	1.625	0.098	0.0	104	0.980
1.001	3.175	126.2	24.6	1.625	1.314	0.139	0.0	67	2.479
1.002	3.175	224.4	34.1	1.239	1.301	0.195	0.0	78	2.308
1.003	4.085	288.8	75.7	1.301	1.313	0.441	0.0	105	3.463
1.004	4.731	522.6	118.9	1.313	1.343	0.700	0.0	121	3.864
1.005	4.669	515.6	144.3	1.343	1.330	0.853	0.0	135	4.027
1.006	4.695	518.6	154.9	1.330	1.366	0.921	0.0	140	4.124
1.007	4.508	497.9	159.1	1.366	1.299	0.953	0.0	145	4.029
1.008	6.875	759.3	164.0	1.299	1.775	0.985	0.0	118	5.528
1.009	2.870	1825.6	162.7	1.250	1.400	0.985	0.0	179	1.813

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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)
2.000	S20	S21	69.842	0.600	145.100	141.800	3.300	21.2	300	5.34	50.0
2.001	S21	S22	65.623	0.600	141.800	136.500	5.300	12.4	300	5.58	49.4
2.002	S22	S23	29.997	0.600	136.500	134.150	2.350	12.8	300	5.70	49.0
2.003	S23	S11	15.373	0.600	134.150	134.000	0.150	102.5	900	5.78	48.7
3.000	S30	S31	18.043	0.600	138.000	134.150	3.850	4.7	300	5.04	50.0
3.001	S31	S11	20.682	0.600	134.150	134.000	0.150	137.9	900	5.17	50.0
1.010	S11	S12	7.591	0.600	134.000	133.950	0.050	151.8	900	6.67	45.5
1.011	S12	S13	5.791	0.600	133.950	133.900	0.050	115.8	900	6.70	45.4
1.012	S13	S14	15.736	0.600	133.900	133.800	0.100	157.4	900	6.81	45.1

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)
2.000	3.432	242.6	0.0	0.700	0.700	0.000	0.0	0	0.000
2.001	4.491	317.5	0.0	0.700	1.201	0.000	0.0	0	0.000
2.002	4.423	312.6	0.0	1.201	1.850	0.000	0.0	0	0.000
2.003	3.095	1968.7	0.0	1.250	1.400	0.000	0.0	0	0.000
3.000	7.308	516.6	0.0	0.700	1.850	0.000	0.0	0	0.000
3.001	2.666	1696.2	0.0	1.250	1.400	0.000	0.0	0	0.000
1.010	2.540	1616.1	166.3	1.400	1.450	1.010	0.0	192	1.670
1.011	2.910	1851.4	165.8	1.450	0.700	1.010	0.0	179	1.839
1.012	2.495	1587.2	164.5	0.700	0.050	1.010	0.0	193	1.644

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	34.813	165.8	225	Circular	151.463	150.000	1.238	151.640	149.790	1.625
1.001	25.553	17.1	225	Circular	151.640	149.790	1.625	149.839	148.300	1.314
1.002	30.891	24.7	300	Circular	149.839	148.300	1.239	148.651	147.050	1.301
1.003	58.322	15.0	300	Circular	148.651	147.050	1.301	144.763	143.150	1.313
1.004	38.454	14.8	375	Circular	144.763	143.075	1.313	142.193	140.475	1.343
1.005	17.087	15.2	375	Circular	142.193	140.475	1.343	141.055	139.350	1.330
1.006	21.025	15.0	375	Circular	141.055	139.350	1.330	139.691	137.950	1.366
1.007	26.869	16.3	375	Circular	139.691	137.950	1.366	137.974	136.300	1.299
1.008	15.086	7.0	375	Circular	137.974	136.300	1.299	136.300	134.150	1.775
1.009	17.866	119.1	900	Circular	136.300	134.150	1.250	136.300	134.000	1.400
2.000	69.842	21.2	300	Circular	146.100	145.100	0.700	142.800	141.800	0.700
2.001	65.623	12.4	300	Circular	142.800	141.800	0.700	138.001	136.500	1.201
2.002	29.997	12.8	300	Circular	138.001	136.500	1.201	136.300	134.150	1.850
2.003	15.373	102.5	900	Circular	136.300	134.150	1.250	136.300	134.000	1.400
3.000	18.043	4.7	300	Circular	139.000	138.000	0.700	136.300	134.150	1.850

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	S2	1200	Manhole	Adoptable
1.001	S2	1200	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.002	S3	1350	Manhole	Adoptable	S4	1350	Manhole	Adoptable
1.003	S4	1350	Manhole	Adoptable	S5	1350	Manhole	Adoptable
1.004	S5	1350	Manhole	Adoptable	S6	1350	Manhole	Adoptable
1.005	S6	1350	Manhole	Adoptable	S7	1350	Manhole	Adoptable
1.006	S7	1350	Manhole	Adoptable	S8	1350	Manhole	Adoptable
1.007	S8	1350	Manhole	Adoptable	S9	1350	Manhole	Adoptable
1.008	S9	1350	Manhole	Adoptable	S10	1500	Manhole	Adoptable
1.009	S10	1500	Manhole	Adoptable	S11	1500	Manhole	Adoptable
2.000	S20	1200	Manhole	Adoptable	S21	1350	Manhole	Adoptable
2.001	S21	1350	Manhole	Adoptable	S22	1350	Manhole	Adoptable
2.002	S22	1350	Manhole	Adoptable	S23	1500	Manhole	Adoptable
2.003	S23	1500	Manhole	Adoptable	S11	1500	Manhole	Adoptable
3.000	S30	1350	Manhole	Adoptable	S31	1500	Manhole	Adoptable

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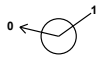
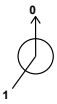
Pipeline Schedule

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)
3.001	20.682	137.9	900	Circular	136.300	134.150	1.250	136.300	134.000	1.400
1.010	7.591	151.8	900	Circular	136.300	134.000	1.400	136.300	133.950	1.450
1.011	5.791	115.8	900	Circular	136.300	133.950	1.450	135.500	133.900	0.700
1.012	15.736	157.4	900	Circular	135.500	133.900	0.700	134.750	133.800	0.050

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
3.001	S31	1500	Manhole	Adoptable	S11	1500	Manhole	Adoptable
1.010	S11	1500	Manhole	Adoptable	S12	1200	Manhole	Adoptable
1.011	S12	1200	Manhole	Adoptable	S13	1350	Manhole	Adoptable
1.012	S13	1350	Manhole	Adoptable	S14	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S1	401823.819	161865.801	151.463	1.463	1350		0	1.000	150.000	225
S2	401795.483	161845.577	151.640	1.850	1200		1	1.000	149.790	225
							0	1.001	149.790	225
S3	401770.615	161851.456	149.839	1.539	1350		1	1.001	148.300	225
							0	1.002	148.300	300
S4	401750.235	161874.671	148.651	1.601	1350		1	1.002	147.050	300
							0	1.003	147.050	300
S5	401787.450	161919.576	144.763	1.688	1350		1	1.003	143.150	300
							0	1.004	143.075	375
S6	401814.055	161947.341	142.193	1.718	1350		1	1.004	140.475	375
							0	1.005	140.475	375
S7	401825.917	161959.640	141.055	1.705	1350		1	1.005	139.350	375
							0	1.006	139.350	375
S8	401836.248	161977.952	139.691	1.741	1350		1	1.006	137.950	375
							0	1.007	137.950	375
S9	401829.256	162003.895	137.974	1.674	1350		1	1.007	136.300	375
							0	1.008	136.300	375
S10	401838.097	162016.119	136.300	2.150	1500		1	1.008	134.150	375
							0	1.009	134.150	900
S20	401725.527	161894.909	146.100	1.000	1200		0	2.000	145.100	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S21	401772.595	161946.508	142.800	1.000	1350		1	2.000	141.800	300
							0	2.001	141.800	300
S22	401811.078	161999.663	138.001	1.501	1350		1	2.001	136.500	300
							0	2.002	136.500	300
S23	401833.846	162019.193	136.300	2.150	1500		1	2.002	134.150	300
							0	2.003	134.150	900
S30	401844.659	161996.091	139.000	1.000	1350		0	3.000	138.000	300
S31	401843.756	162014.111	136.300	2.150	1500		1	3.000	134.150	300
							0	3.001	134.150	900
S11	401838.032	162033.985	136.300	2.300	1500		1	3.001	134.000	900
							2	2.003	134.000	900
							3	1.009	134.000	900
							0	1.010	134.000	900
S12	401838.984	162041.516	136.300	2.350	1200		1	1.010	133.950	900
							0	1.011	133.950	900
S13	401839.711	162047.261	135.500	1.600	1350		1	1.011	133.900	900
							0	1.012	133.900	900
S14	401834.219	162062.008	134.750	0.950	1350		1	1.012	133.800	900

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	1.9
Summer CV	1.000	Drain Down Time (mins)	5760	30 year (l/s)	5.0
Winter CV	1.000	Additional Storage (m³/ha)	0.0	100 year (l/s)	6.7
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	Check Discharge Volume	x

Storm Durations

60	120	180	240	360	480	600	720	960	1440	2160	2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	6	0
30	40	6	0				

Pre-development Discharge Rate

Site Makeup	Greenfield	Betterment (%)	30
Greenfield Method	ReFH2	Q 2 year (l/s)	1.9
Region	England, Wales, NI	Q 30 year (l/s)	5.0
Include Baseflow	x	Q 100 year (l/s)	6.7
Positively Drained Area (ha)	1.655		

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Node S20 ReFH2 Dynamic Hydrograph

Overrides Design Area	x	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Area (ha)	2.080
Depression Storage Area (m²)	0	Region	England, Wales, NI
Depression Storage Depth (mm)	0	Include Baseflow	x

Applies to All storms

Node S30 ReFH2 Dynamic Hydrograph

Overrides Design Area	x	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Area (ha)	0.364
Depression Storage Area (m²)	0	Region	England, Wales, NI
Depression Storage Depth (mm)	0	Include Baseflow	x

Applies to All storms

Node S12 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	133.950	Product Number	CTL-SHE-0091-5000-2050-5000
Design Depth (m)	2.050	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node S12 Online Gate Control

Flap Valve	x	Invert Level (m)	135.750	Height (m)	0.050
Replaces Downstream Link	✓	Width (m)	0.100	Discharge Coefficient	0.610

Node S11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	134.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1785

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	231.4	0.0	0.600	342.7	0.0	1.200	474.7	0.0	1.800	627.1	0.0
0.100	248.3	0.0	0.700	363.3	0.0	1.300	498.7	0.0	1.900	654.4	0.0
0.200	266.0	0.0	0.800	384.5	0.0	1.400	523.2	0.0	2.000	682.4	0.0
0.300	284.4	0.0	0.900	406.2	0.0	1.500	548.3	0.0	2.100	710.9	0.0
0.400	303.2	0.0	1.000	428.5	0.0	1.600	574.0	0.0	2.200	739.9	0.0
0.500	322.7	0.0	1.100	451.3	0.0	1.700	600.2	0.0	2.300	769.6	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 60 minute summer	43.138	11.400	2 year 480 minute winter	8.533	3.394
2 year 60 minute winter	28.660	11.400	2 year 600 minute summer	10.561	2.889
2 year 120 minute summer	30.650	8.100	2 year 600 minute winter	7.216	2.889
2 year 120 minute winter	20.363	8.100	2 year 720 minute summer	9.421	2.525
2 year 180 minute summer	25.002	6.434	2 year 720 minute winter	6.332	2.525
2 year 180 minute winter	16.252	6.434	2 year 960 minute summer	7.728	2.035
2 year 240 minute summer	20.434	5.400	2 year 960 minute winter	5.119	2.035
2 year 240 minute winter	13.576	5.400	2 year 1440 minute summer	5.581	1.496
2 year 360 minute summer	16.127	4.150	2 year 1440 minute winter	3.751	1.496
2 year 360 minute winter	10.483	4.150	2 year 2160 minute summer	3.993	1.104
2 year 480 minute summer	12.844	3.394	2 year 2160 minute winter	2.752	1.104

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 2880 minute summer	3.343	0.896	30 year +40% CC +6% A 2880 minute winter	5.663	2.258
2 year 2880 minute winter	2.246	0.896	100 year +45% CC +6% A 60 minute summer	222.215	58.725
30 year +40% CC +6% A 60 minute summer	165.585	43.759	100 year +45% CC +6% A 60 minute winter	147.635	58.725
30 year +40% CC +6% A 60 minute winter	110.011	43.759	100 year +45% CC +6% A 120 minute summer	133.055	35.162
30 year +40% CC +6% A 120 minute summer	101.267	26.762	100 year +45% CC +6% A 120 minute winter	88.399	35.163
30 year +40% CC +6% A 120 minute winter	67.279	26.762	100 year +45% CC +6% A 180 minute summer	101.277	26.062
30 year +40% CC +6% A 180 minute summer	77.485	19.939	100 year +45% CC +6% A 180 minute winter	65.832	26.062
30 year +40% CC +6% A 180 minute winter	50.367	19.939	100 year +45% CC +6% A 240 minute summer	79.696	21.061
30 year +40% CC +6% A 240 minute summer	61.051	16.134	100 year +45% CC +6% A 240 minute winter	52.948	21.061
30 year +40% CC +6% A 240 minute winter	40.561	16.134	100 year +45% CC +6% A 360 minute summer	60.479	15.563
30 year +40% CC +6% A 360 minute summer	46.303	11.915	100 year +45% CC +6% A 360 minute winter	39.313	15.563
30 year +40% CC +6% A 360 minute winter	30.098	11.915	100 year +45% CC +6% A 480 minute summer	47.440	12.537
30 year +40% CC +6% A 480 minute summer	36.156	9.555	100 year +45% CC +6% A 480 minute winter	31.518	12.537
30 year +40% CC +6% A 480 minute winter	24.021	9.555	100 year +45% CC +6% A 600 minute summer	38.680	10.580
30 year +40% CC +6% A 600 minute summer	29.355	8.029	100 year +45% CC +6% A 600 minute winter	26.428	10.580
30 year +40% CC +6% A 600 minute winter	20.057	8.029	100 year +45% CC +6% A 720 minute summer	34.310	9.195
30 year +40% CC +6% A 720 minute summer	25.949	6.954	100 year +45% CC +6% A 720 minute winter	23.058	9.195
30 year +40% CC +6% A 720 minute winter	17.439	6.954	100 year +45% CC +6% A 960 minute summer	27.878	7.341
30 year +40% CC +6% A 960 minute summer	21.003	5.531	100 year +45% CC +6% A 960 minute winter	18.467	7.341
30 year +40% CC +6% A 960 minute winter	13.913	5.531	100 year +45% CC +6% A 1440 minute summer	19.792	5.305
30 year +40% CC +6% A 1440 minute summer	14.834	3.976	100 year +45% CC +6% A 1440 minute winter	13.302	5.305
30 year +40% CC +6% A 1440 minute winter	9.969	3.976	100 year +45% CC +6% A 2160 minute summer	13.674	3.779
30 year +40% CC +6% A 2160 minute summer	10.318	2.851	100 year +45% CC +6% A 2160 minute winter	9.422	3.779
30 year +40% CC +6% A 2160 minute winter	7.109	2.851	100 year +45% CC +6% A 2880 minute summer	11.046	2.960
30 year +40% CC +6% A 2880 minute summer	8.426	2.258	100 year +45% CC +6% A 2880 minute winter	7.424	2.960

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	33	150.083	0.083	10.5	0.1188	0.0000	OK
60 minute summer	S2	33	149.842	0.052	14.9	0.0588	0.0000	OK
60 minute summer	S3	33	148.361	0.061	20.9	0.0879	0.0000	OK
60 minute summer	S4	33	147.133	0.083	47.4	0.1189	0.0000	OK
60 minute summer	S5	33	143.170	0.095	75.2	0.1360	0.0000	OK
60 minute summer	S6	33	140.588	0.113	91.6	0.1622	0.0000	OK
60 minute summer	S7	33	139.465	0.115	98.9	0.1642	0.0000	OK
60 minute summer	S8	33	138.076	0.126	102.2	0.1802	0.0000	OK
60 minute summer	S9	33	136.393	0.093	105.5	0.1334	0.0000	OK
600 minute winter	S10	585	134.683	0.533	19.7	0.9421	0.0000	OK
240 minute winter	S20	200	145.128	0.028	4.1	0.0316	0.0000	OK
240 minute winter	S21	196	141.824	0.024	4.1	0.0343	0.0000	OK
240 minute winter	S22	196	136.524	0.024	4.1	0.0345	0.0000	OK
600 minute winter	S23	585	134.683	0.533	3.3	0.9422	0.0000	OK
180 minute summer	S30	152	138.009	0.009	0.7	0.0122	0.0000	OK
600 minute winter	S31	585	134.683	0.533	0.6	0.9420	0.0000	OK
600 minute winter	S11	585	134.683	0.683	33.4	201.5708	0.0000	OK
600 minute winter	S12	585	134.686	0.736	14.5	0.8322	0.0000	OK
480 minute summer	S13	1024	133.934	0.034	4.1	0.0491	0.0000	OK
120 minute summer	S14	396	133.833	0.033	4.1	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)
60 minute summer	S1	1.000	S2	10.5	1.050	0.261	0.3520	
60 minute summer	S2	1.001	S3	14.9	1.902	0.118	0.2004	
60 minute summer	S3	1.002	S4	20.9	1.602	0.093	0.4050	
60 minute summer	S4	1.003	S5	47.3	3.017	0.164	0.9137	
60 minute summer	S5	1.004	S6	75.1	3.014	0.144	0.9602	
60 minute summer	S6	1.005	S7	91.6	3.238	0.178	0.4832	
60 minute summer	S7	1.006	S8	98.8	3.243	0.191	0.6408	
60 minute summer	S8	1.007	S9	102.1	3.817	0.205	0.7221	
60 minute summer	S9	1.008	S10	105.4	3.217	0.139	0.5046	
600 minute winter	S10	1.009	S11	21.4	0.861	0.012	8.1071	
240 minute winter	S20	2.000	S21	4.1	1.400	0.017	0.2055	
240 minute winter	S21	2.001	S22	4.1	1.564	0.013	0.1721	
240 minute winter	S22	2.002	S23	4.1	0.771	0.013	1.0956	
600 minute winter	S23	2.003	S11	4.0	0.069	0.002	6.9764	
180 minute summer	S30	3.000	S31	0.7	0.569	0.001	0.6401	
600 minute winter	S31	3.001	S11	0.4	0.020	0.000	9.3842	
600 minute winter	S11	1.010	S12	14.5	0.338	0.009	4.0664	
600 minute winter	S12	Hydro-Brake®	S13	4.1				
600 minute winter	S12	Gate	S13	0.0				
480 minute summer	S13	1.012	S14	4.1	0.565	0.003	0.1168	327.6

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Results for 30 year +40% CC +6% A Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	33	150.204	0.204	42.9	0.2921	0.0000	OK
60 minute summer	S2	33	149.903	0.113	60.8	0.1272	0.0000	OK
60 minute summer	S3	33	148.427	0.127	85.2	0.1818	0.0000	OK
60 minute summer	S4	33	147.237	0.187	192.8	0.2670	0.0000	OK
60 minute summer	S5	33	143.282	0.207	305.9	0.2967	0.0000	OK
60 minute summer	S6	33	140.755	0.280	372.8	0.4013	0.0000	OK
60 minute summer	S7	33	139.635	0.285	402.5	0.4082	0.0000	OK
60 minute summer	S8	33	138.271	0.321	416.3	0.4588	0.0000	OK
60 minute summer	S9	33	136.522	0.222	430.2	0.3174	0.0000	OK
720 minute summer	S10	720	135.930	1.780	75.2	3.1445	0.0000	SURCHARGED
180 minute summer	S20	164	145.155	0.055	16.7	0.0620	0.0000	OK
180 minute summer	S21	164	141.847	0.047	16.7	0.0671	0.0000	OK
180 minute summer	S22	164	136.547	0.047	16.7	0.0670	0.0000	OK
720 minute summer	S23	720	135.930	1.780	13.4	3.1445	0.0000	SURCHARGED
120 minute summer	S30	130	138.016	0.016	2.9	0.0231	0.0000	OK
720 minute summer	S31	720	135.930	1.780	2.4	3.1445	0.0000	SURCHARGED
720 minute summer	S11	720	135.930	1.930	83.0	831.8994	0.0000	SURCHARGED
720 minute winter	S12	690	135.937	1.987	18.4	2.2467	0.0000	SURCHARGED
720 minute summer	S13	720	133.953	0.053	10.3	0.0752	0.0000	OK
720 minute summer	S14	720	133.851	0.051	10.2	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)
60 minute summer	S1	1.000	S2	42.9	1.448	1.065	1.0047	
60 minute summer	S2	1.001	S3	60.7	2.830	0.481	0.5485	
60 minute summer	S3	1.002	S4	85.2	2.287	0.380	1.1496	
60 minute summer	S4	1.003	S5	192.6	4.310	0.667	2.6066	
60 minute summer	S5	1.004	S6	305.9	4.033	0.585	2.9013	
60 minute summer	S6	1.005	S7	372.7	4.179	0.723	1.5239	
60 minute summer	S7	1.006	S8	402.3	4.225	0.776	2.0008	
60 minute summer	S8	1.007	S9	416.2	4.902	0.836	2.2597	
60 minute summer	S9	1.008	S10	429.6	4.318	0.566	1.3437	
720 minute summer	S10	1.009	S11	74.7	1.001	0.041	11.3230	
180 minute summer	S20	2.000	S21	16.7	2.119	0.069	0.5514	
180 minute summer	S21	2.001	S22	16.7	2.387	0.053	0.4591	
180 minute summer	S22	2.002	S23	16.7	0.582	0.053	1.1611	
720 minute summer	S23	2.003	S11	13.1	0.029	0.007	9.7430	
120 minute summer	S30	3.000	S31	2.9	0.069	0.006	0.6484	
720 minute summer	S31	3.001	S11	2.2	0.009	0.001	13.1077	
720 minute summer	S11	1.010	S12	20.4	0.289	0.013	4.8110	
720 minute winter	S12	Hydro-Brake®	S13	4.9				
720 minute winter	S12	Gate	S13	5.4				
720 minute summer	S13	1.012	S14	10.2	0.711	0.006	0.2263	1146.0

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Results for 100 year +45% CC +6% A Critical Storm Duration. Lowest mass balance: 99.87%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	S1	33	150.472	0.472	57.5	0.6749	0.0000	SURCHARGED
60 minute summer	S2	33	149.926	0.136	80.7	0.1535	0.0000	OK
60 minute summer	S3	33	148.450	0.150	113.4	0.2139	0.0000	OK
60 minute summer	S4	32	147.280	0.230	257.9	0.3287	0.0000	OK
60 minute summer	S5	34	144.057	0.982	405.8	1.4052	0.0000	SURCHARGED
60 minute summer	S6	34	142.193	1.718	480.7	2.4585	1.5162	FLOOD
60 minute summer	S7	34	140.853	1.503	497.5	2.1512	0.0000	FLOOD RISK
60 minute summer	S8	34	139.035	1.085	511.3	1.5525	0.0000	SURCHARGED
60 minute summer	S9	35	136.602	0.302	529.7	0.4319	0.0000	OK
960 minute summer	S10	705	136.300	2.150	80.9	3.7991	19.3732	FLOOD
240 minute summer	S20	200	145.167	0.067	24.7	0.0753	0.0000	OK
240 minute summer	S21	200	141.857	0.057	24.7	0.0813	0.0000	OK
240 minute summer	S22	200	136.557	0.057	24.7	0.0811	0.0000	OK
960 minute summer	S23	705	136.300	2.150	18.9	3.7991	7.8416	FLOOD
180 minute summer	S30	160	138.020	0.020	4.3	0.0279	0.0000	OK
1440 minute summer	S31	1020	136.300	2.150	2.8	3.7991	0.0807	FLOOD
960 minute summer	S11	705	136.300	2.300	92.9	1097.5980	11.3752	FLOOD
960 minute summer	S12	690	136.300	2.350	17.5	2.6579	0.4493	FLOOD
600 minute summer	S13	540	133.964	0.064	15.1	0.0909	0.0000	OK
720 minute summer	S14	585	133.861	0.061	15.1	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)
60 minute summer	S1	1.000	S2	56.6	1.570	1.407	1.1278	
60 minute summer	S2	1.001	S3	80.5	3.037	0.638	0.6776	
60 minute summer	S3	1.002	S4	113.4	2.474	0.505	1.4229	
60 minute summer	S4	1.003	S5	253.7	4.437	0.878	3.7249	
60 minute summer	S5	1.004	S6	395.5	4.041	0.757	4.2414	
60 minute summer	S6	1.005	S7	458.8	4.163	0.890	1.8846	
60 minute summer	S7	1.006	S8	493.6	4.475	0.952	2.3190	
60 minute summer	S8	1.007	S9	511.9	4.896	1.028	2.7590	
60 minute summer	S9	1.008	S10	528.9	4.905	0.697	1.5491	
960 minute summer	S10	1.009	S11	80.4	1.003	0.044	11.3230	
240 minute summer	S20	2.000	S21	24.7	2.372	0.102	0.7285	
240 minute summer	S21	2.001	S22	24.7	2.675	0.078	0.6061	
240 minute summer	S22	2.002	S23	24.7	0.582	0.079	1.1945	
960 minute summer	S23	2.003	S11	18.6	0.036	0.009	9.7430	
180 minute summer	S30	3.000	S31	4.3	0.101	0.008	0.6525	
1440 minute summer	S31	3.001	S11	2.6	0.010	0.002	13.1077	
960 minute summer	S11	1.010	S12	17.5	0.307	0.011	4.8110	
960 minute summer	S12	Hydro-Brake®	S13	5.3				
960 minute summer	S12	Gate	S13	9.8				
600 minute summer	S13	1.012	S14	15.1	0.798	0.010	0.2981	1479.1

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Foul Calculation Settings

Flow per unit per day (l/day): 4000.0

Self Cleansing Velocity (m/s): 0.75

Foul Calculations for Outfall: F12 (7902)

Manhole Schedule

Manhole	Units	Size (mm)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
F1	3.0	1200	Type B	151.370	149.450	1.820	401824.498	161868.457
F2	2.0	1350	Type B	151.903	149.150	2.653	401808.614	161851.128
F3	1.0	1350	Type B	151.271	148.850	2.321	401788.504	161845.150
F4	1.0	1350	Type B	149.802	147.850	1.852	401772.400	161853.230
F5	10.0	1350	Type B	148.443	146.490	1.803	401749.602	161878.368
F6	12.0	1350	Type B	144.560	142.600	1.810	401786.952	161922.829
F7	8.0	1350	Type B	141.134	139.000	1.984	401822.889	161959.730
F8	3.0	1350	Type C	139.699	138.100	1.449	401802.295	161980.450
F9	0.0	1350	Type C	139.440	138.000	1.290	401789.871	161979.362
F10	0.0	1350	Type A	141.027	137.810	3.067	401776.300	161959.964
F11	0.0	1350	Type B	139.700	137.610	1.940	401757.558	161973.212
F12 (7902)	0.0	1350	Type B	138.740	136.610	1.980	401741.006	161976.998

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (mm)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	F1	149.450	F2	149.150	Circ	100	23.507	78	1.500	1.820	2.653
1.001	F2	149.150	F3	148.850	Circ	100	20.979	70	1.500	2.653	2.321
1.002	F3	148.850	F4	147.900	Circ	100	18.018	19	1.500	2.321	1.802
1.003	F4	147.850	F5	146.540	Circ	100	33.936	26	1.500	1.852	1.803
1.004	F5	146.490	F6	142.600	Circ	150	58.068	15	1.500	1.803	1.810
1.005	F6	142.600	F7	139.000	Circ	150	51.509	14	1.500	1.810	1.984
1.006	F7	139.000	F8	138.100	Circ	150	29.214	32	1.500	1.984	1.449
1.007	F8	138.100	F9	138.000	Circ	150	12.471	125	1.500	1.449	1.290
1.008	F9	138.000	F10	137.810	Circ	150	23.674	125	1.500	1.290	3.067
1.009	F10	137.810	F11	137.610	Circ	150	22.952	115	1.500	3.067	1.940
1.010	F11	137.610	F12 (7902)	136.610	Circ	150	16.979	17	1.500	1.940	1.980

Foul Calculation Results

Pipe Number	Accumulated Units	Flow Capacity (l/s)	Velocity @ Capacity (m/s)	Actual Flow, Q (l/s)	Actual Velocity (m/s)	Actual Depth (mm)	Velocity @ 1/3rd Q (m/s)
1.000	3.0	5.90	0.75	0.14	0.30	10	0.21
1.001	5.0	6.25	0.80	0.23	0.37	13	0.26
1.002	6.0	12.04	1.53	0.28	0.61	11	0.42
1.003	7.0	10.30	1.31	0.32	0.57	12	0.40
1.004	17.0	40.21	2.28	0.79	0.87	15	0.61
1.005	29.0	41.07	2.32	1.34	1.05	19	0.74
1.006	37.0	27.23	1.54	1.71	0.85	26	0.60
1.007	40.0	13.84	0.78	1.85	0.54	37	0.39
1.008	40.0	13.85	0.78	1.85	0.54	37	0.39
1.009	40.0	14.43	0.82	1.85	0.56	36	0.40
1.010	40.0	37.69	2.13	1.85	1.09	23	0.77