Dated 10TH OCTOBER **2024**

STEPHEN WILLIAM MADDISON

PATRICIA MARGARET MADDISON (1)

THE COUNTY OF HEREFORDSHIRE DISTRICT COUNCIL (2)

PLANNING OBLIGATION PURSUANT TO SECTION 106 OF THE TOWN AND COUNTRY PLANNING ACT 1990 AND ASSOCIATED POWERS

RELATING TO BARN AT MONKSBURY COURT FARM, MONKHIDE, LEDBURY, HEREFORDSHIRE, HR8 2TU

Herefordshire Council
Legal Services
Plough Lane
Herefordshire
HR4 0LE

Council's Legal Ref: **MS/016303**

Council's Planning Ref: P233397/F

THIS DEED is made the 10TH day of OCTOBER 2024

BETWEEN

(1) **STEPHEN WILLIAM MADDISON and PATRICIA MARGARET MADDISON** of The Old Hop Barn, Monkbury Court, Monkside, Herefordshire, HR8 2TU (**Owners**);

(2) **THE COUNTY OF HEREFORDSHIRE DISTRICT COUNCIL** of Plough Lane Offices, Plough Lane, Hereford, HR4 0LE (**Council**);

BACKGROUND

(A) The Council is the Local Planning Authority for the purposes of the 1990 Act for the area in which the Development is situated.

(B) The Owners are the freehold owners of the Site.

(C) The Planning Application was submitted to the Council for permission to develop the Site for the purposes and in the manner described in the Planning Application.

(D) Having considered the Planning Application the Council has concluded that it is appropriate to grant the Planning Permission subject to conditions and the prior completion of this Deed.

(E) Pursuant to its statutory duty under section 63 of the 2017 Regulations the Council is required to undertake an appropriate assessment of the implications of the Development and to satisfy itself that the Mitigation secured by way of the obligations contained in this Deed will ensure the Development is Phosphate Neutral, and will not adversely affect the integrity of the Catchment Area as a Habitat Site.

(F) The Council has considered the provisions of the development plan and taken into account material planning considerations affecting the site and considers that in the interests of the proper planning of its area the Development of the Site ought to be only permitted subject to the terms of this Deed and for that purpose the parties are expressly willing to enter into this Deed.

(G) The Owners have agreed that the Development shall be carried out only in accordance with the rights and obligations set out in this Deed and that they may be enforced by the Council against the Owners and their respective successors in title.

THIS DEED WITNESSES AS FOLLOWS:-

OPERATIVE PROVISIONS

1. INTERPRETATION

1.1 For the purposes of the recitals and the covenants in the Agreement, in this Deed the following words and expressions have the following meanings:

"1990 Act"	The Town and Country Planning Act 1990 (as amended);
"2017 Regulations"	The Conservation of Habitats and Species Regulations 2017 (as amended);
"Catchment Area"	means the River Lugg Catchment Area which is an integral part of the River Wye Special Area of Conservation;
"Commencement Date"	means any material operation as defined by section 56(4) of the 1990 Act in relation to any Dwelling on the Site and for the avoidance of doubt this shall not include the: - site clearance, - demolition work, - environmental site investigations, - excavation and laying of foundations; - drainage; - erection of any building; - archaeological investigations, - site survey works; - investigations for the purpose of assessing ground conditions, - preparatory and remedial work in respect of any decontamination or - other adverse ground conditions, - diversion and laying of services,

- erection of any temporary means of enclosure and the temporary display of site notices or advertisements.

The words "Commence", "Commencement" shall be construed accordingly;

"Development" means the development of the Site as authorised by the Planning Permission;

"Disposal" means any disposition of whole of the Site under a transfer of the freehold title or grant of leasehold of at least 125 years;

"Dwelling" means the dwelling (including houses flats apartments and maisonettes) to be constructed on the Site pursuant to the Planning Permission;

"Habitat Site" means any site which would be included within the definition at regulation 8 of the Conservation of Habitats and Species Regulations 2017 for the purpose of those regulations, including candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation, Special Protection Areas and any relevant Marine Sites;

"Management Plan" means the detailing the management of the Orchard as appended to this Deed at Appendix B;

"Mitigation" means measures to reduce the input of phosphates to the Catchment Area to off-set the adverse impact of the phosphate output

	of development, to ensure that the Development is Phosphate Neutral in line with Natural England's policy requirements;
"Mortgage Lender"	means a chargee mortgagee or lender that may have an interest in the Site by way of a charge secured over all or part of the Site (from time to time);
"Occupation"	means occupation for the purposes permitted by the Planning Permission but does not include occupation for the purposes of fitting out, decoration, marketing, staff training or site security and "Occupy" and "Occupying" shall be construed accordingly;
"Orchard"	means the orchard to be planted comprising 5 (five) Braeburn apple trees on the Site in accordance with the Surface and Foul Water Drainage Strategy prepared by Corner Consulting and annexed hereto as Appendix A;
"Package Treatment Plant"	means the Graf One2Clean package treatment plant and drainage field installed at the Site to serve and treat wastewater from the Development which shall be installed and operated in accordance with the Surface and Foul Water Drainage Strategy prepared by Corner Consulting dated 15th November 2023 and annexed hereto as Appendix A and in the approximate location shown on Plan 1896.01C;
"Phosphate Neutral"	means that a development plan or project does not add to existing phosphate burdens

	within the Catchment Areas, so there is no net increase in phosphates as a result of the plan or project;
"Plan"	means the plan attached to this Deed at Appendix C;
"Planning Application"	means the application for Planning Permission for the Development submitted to the Council and to which the Council has allocated the reference **P233397/F**;
"Planning Obligations Manager"	means the Council employee who manages, implements and monitors Section 106 agreements;
"Planning Permission"	means the planning permission subject to conditions which may be granted in respect of the Planning Application;
"Site"	means the land shown edged red on the Plan against which this Deed may be enforced and registered at HM Land Registry under title number HE21754;
"Working Day(s)"	Mondays to Fridays (excluding days that in England are public holidays) inclusive.

1.2 In this Deed:

1.2.1 the clause headings in this Deed are for convenience only and do not affect its interpretation;

1.2.2 unless otherwise indicated references to clauses and Schedules are to clauses of and Schedules to this Deed and references in a Schedule to a Part or paragraph are to a Part or paragraph of that Schedule;

1.2.3 Unless the context otherwise requires, a reference to a statute or statutory provision is a reference to it as amended, extended or re-enacted from time to time and shall include any subordinate legislation made from time to time under that statute or statutory provision.

1.2.4 the headings in this Deed are inserted for convenience only and shall not affect the construction or interpretation of this Deed;

1.2.5 references to the Site include any part of it;

1.2.6 references to any party in this Deed include the successors in title of that party and assigns and any person deriving title through or under that party. In addition, references to the Council include any successor to its functions as local planning authority exercising planning powers under the 1990 Act;

1.2.7 any words following the term(s) **including**, **include**, **in particular**, **for example** or any similar expression shall be construed as illustrative and shall not limit the sense of the words, description, definition, phrase or term preceding those terms;

1.2.8 any covenant by the Owners not to do any act or thing includes a covenant not to permit or allow the doing of that act or thing;

1.2.9 where two or more people form a party to this Deed the obligations of that party will be joint and several and may be enforced against them all jointly or against each of them individually;

1.2.10 if any provision of this Deed is held by a Court of competent jurisdiction to be illegal unlawful invalid or unenforceable then to the extent possible the offending provision(s) will be severed from the Deed and the legality lawfulness validity and enforceability of the remainder of the Deed shall be unaffected and continue in full force and effect;

1.2.11 words importing the singular shall include the plural and vice versa;

1.2.12 words importing the masculine gender include the feminine and neuter genders and words denoting actual persons include companies corporations and firms and all such words shall be construed interchangeable in that manner.

1.3 Without prejudice to the terms of any other provision contained in this Deed the Owners shall pay all reasonable and proper costs, charges and expenses (including without

prejudice to legal costs and Surveyor's fees) reasonably and properly incurred by the Council for the purpose of or incidental to the enforcement of any right or power of the Council or any obligation of the Owners arising under this Deed;

1.4 The parties to this Deed do not intend that any of its terms will be enforceable by virtue of the Contracts (Rights of Third Parties) Act 1999 as amended, by any person not a party to it and the terms of this Deed may be varied by a deed agreed between the parties without the consent of any third party being required;

1.5 No party will be liable for any breach of the terms of this Deed occurring after the date on which they part with their entire interest in the Site or the part of the Site in respect of which such breach occurs but without prejudice to liability for any breaches of this Deed occurring before parting with such interests. Neither the reservations of any rights nor the inclusion of any covenants or restrictions over the Site in any transfer of the Site will constitute an interest for the purposes of this sub-clause;

1.6 This Deed shall not be enforceable against owners/occupiers or tenants of an individual Dwelling nor against those deriving title from them, or any Mortgage Lender not in possession;

1.7 The obligations in this Deed will not be enforceable against a statutory undertaker after the transfer of the statutory apparatus and any land upon or in which the statutory apparatus is situated by the Owners to that statutory undertaker;

1.8 No waiver (whether expressed or implied) by the Council or Owners of any breach or default in performing or observing any of the covenants terms or conditions of this Deed shall constitute a continuing waiver and no such waiver shall prevent the Council or Owner from enforcing any of the relevant terms or conditions or from acting upon any subsequent breach or default.

2. EFFECT OF THIS DEED

2.1 This Deed is made pursuant to section 106 of the 1990 Act and to the extent that they fall within the terms of section 106 of the 1990 Act the obligations contained in this Deed are planning obligations for the purposes of section 106 of the 1990 Act and are enforceable by the Council.

2.2 To the extent that any of the obligations contained in this Deed are not planning obligations within the meaning of the 1990 Act, they are entered into pursuant to the powers contained in section 111 Local Government Act 1972, section 2 of the Local Government Act 2000, section 1 Localism Act 2011 and all other enabling powers, with the intention that they bind the Owners and their successors in title.

2.3 The covenants, restrictions and requirements of the Owners contained in this Deed are planning obligations for the purposes of Section 106 of the Act and are entered into by the Owners with the intention that they bind the interests held by them in the Site and their respective successors and assigns.

2.4 Nothing in this Deed restricts or is intended to restrict the proper exercise at any time by the Council of any of its statutory powers, functions or discretions in relation to the Site or otherwise.

2.5 This Deed will be registered as a local land charge by the Council.

3. MISCELLANEOUS

3.1 Nothing in this Deed prohibits or limits the right to develop any part of the Site in accordance with a planning permission, other than one relating to the Development as specified in the Planning Application, granted after the date of this Deed, whether or not pursuant to an appeal.

3.2 Nothing in this Deed shall be construed as a grant of planning permission.

3.3 Unless expressly agreed otherwise in this Deed, the covenants in this Deed shall be enforceable without any limit of time against the Owners and any successors in title to the Site and assigns of the Owners in an interest or estate to the Site or any part or parts of the Site as if that person had also been an original covenanting party in respect of the interest or estate for the time being held by that person.

4. COMMENCEMENT

The provisions of this Deed shall have effect upon the date upon which it is completed.

5. OBLIGATIONS OF THE OWNER

The Owners covenant with the Council as set out in Schedule 1 of this Deed.

6. TERMINATION OF THIS DEED

6.1 This Deed will cease to have effect (insofar only as it has not already been complied with) if:

6.1.1 the Planning Application is refused;

6.1.2 the Planning Permission is quashed, revoked or otherwise withdrawn prior to the Commencement Date so as to render this Deed or any part of it irrelevant, impractical or unviable or;

6.1.3 the Planning Permission expires prior to the Commencement Date.

7. NOTICES

7.1 A notice under this Deed is valid only if it is given by hand, sent by recorded delivery or document exchange and it is served at the address shown in this Deed for the receiving party or at any address specified in a notice given by that party to the other parties.

7.2 A notice sent to the Council:

7.2.1 in relation to any matters arising from Schedule 1 (Part 2) of this Deed shall be addressed to the Planning Obligations Manager Development Management Team, Herefordshire Council, Plough Lane, Hereford HR4 0LE quoting reference P233397/F;

7.3 A notice:

7.3.1 if delivered by hand, on signature of a delivery receipt provided that, if delivery occurs:

(a) before 9.00 am on a Working Day, the notice will be deemed to have been received at 9.00 am on that day; and

(b) if delivery occurs after 5.00 pm on a Working Day, or on a day which is not a Working Day, the notice will be deemed to have been received at 9.00 am on the next Working Day; or

7.3.2 sent by recorded delivery is to be treated as served on the second working day after posting if sent by first class post or on the third working day after posting if sent by second class post;

7.3.3 sent through a document exchange is to be treated as served on the first working day after the day on which it would normally be available for collection by the recipient.

8. CHANGE IN OWNERSHIP

8.1 At the time of execution of this Deed, the Owners warrant that no person other than the Owners has any legal or equitable interest in the Site.

8.2 The Owners agree to give the Council immediate written notice of any change in ownership of any of their interests in the Site occurring before all the obligations under this Deed have been discharged such notice to give details of the transferee's full name and registered office (if a company address or usual address if not) together with the area of the Site or unit of occupation purchased by reference to a plan PROVIDED THAT this clause shall not apply in respect of the disposal of any individual Dwelling.

9. ENFORCEMENT

9.1 This Deed is to be governed by and interpreted in accordance with the law of England;

9.2 The Courts of England are to have jurisdiction in relation to any disputes between the parties out of or related to this Deed. This clause operates for the benefit of the Council who retains the right to sue the Owners and enforce any judgment against the Owners in the courts of any competent jurisdiction.

10. DISPUTE

Any dispute or disputes between any of the parties to this Deed arising out of the provisions of this Deed (other than a dispute or difference relating to a matter of law or concerning the meaning or construction of this Deed) shall be referred to a single arbitrator to be agreed between the parties or in default of agreement on the application of any party by the President of the Royal Institute of Chartered Surveyors in accordance with the Arbitration Act 1996 or any statutory modification or re-enactment for the time-being in force.

11. COUNCIL'S COSTS

The Owners covenant and agree with the Council that prior to completion of this Deed the Owners shall pay to the Council its reasonable and proper legal costs in connection with the preparation of this Deed, together with all disbursements, incurred in connection with the negotiation, preparation, completion and registration of this Deed in the amount of £1,500

SCHEDULE 1

Owners' Obligations

The Owners covenant with the Council

1. Prior to the Occupation of the Dwelling to:
    a. install the Package Treatment Plant (which shall FOR THE AVOIDANCE OF DOUBT include the drainage field) such that it is operational and to provide evidence of the effective operation of the Package Treatment Plant to the Council;
    b. plant the Orchard; and
    c. submit written confirmation and photographs to the Council by way of evidence of the planting of the Orchard.
2. Not to remove all or any trees comprising the Orchard from the Site.
3. To replace any tree comprising the Orchard which dies or becomes diseased.
4. To manage and maintain the Orchard in accordance with the Management Plan at Appendix B of this Deed for a period of no less than 80 (eighty) years from completion of the planting of the Orchard (unless otherwise agreed in writing with the Council).
5. To maintain and manage the Package Treatment Plant (which shall FOR THE AVOIDANCE OF DOUBT include the drainage field) in good repair and condition and in the event that the Package Treatment Plant permanently ceases to function to replace the Package Treatment Plant with a package treatment plant of the same or better efficiency.

APPENDIX A

Surface and Foul Water Drainage Strategy prepared by Corner Consulting

Barn Conversion to One Residential Dwelling, Monksbury Court, Monkhide, HR8 2TU

Surface and Foul Water Drainage Strategy

Client: Mr and Mrs S Maddison

Report Reference: CWC240-RP-01 Rev 3

Corner Water
CONSULTING

Contents

QUALITY ASSURANCE RECORD

Contributors for Corner Water Consulting Ltd:

Name	Role
Alan Corner	Project Director

Document Status and Revision History:

Version	Date	Project Contact	Status / Comment
1	24/4/2023	AC	First issue
2	22/06/2023	AC	Second Issue
3	15/11/2023	AC	Third Issue

Limitation of liability and use

The work described in this report was undertaken for the party or parties stated, for the purpose or purposes stated, to the time and budget constraints stated. No liability is accepted for use by other parties or for other purposes, or unreasonably beyond the terms and parameters of its commission and its delivery to normal professional standards. Circumstances, regulations, assessment methodology and professional standards do change which could subsequently affect the validity of this Report.

The methodologies adopted plus the sources of information used by Corner Water Consulting Ltd (CWC) in providing its services are outlined within this Report. Any information provided by third parties and referred to herein has not been checked or verified by CWC, unless otherwise expressly stated within this Report. This Report was checked and approved for issue on the date of issue shown, all data, parameters and methodology are valid on this date.

EXECUTIVE SUMMARY

The key aspects and findings of this assessment are:

- In December 2020 planning permission for application number P193574/F was given for the Old Hop Barn, Monksbury Court, Monkhide Village Road, Monkhide, HR8 2TU to be converted into 2 dwellings.
- A 2019 FRA report plus 2 Foul Drainage Strategy Technical Notes in 2020 in support of that planning application were prepared by Hydro-Logic Services Ltd using the same Project Director that now works for Corner Water Consulting Ltd, who therefore has detailed knowledge of this site and location.
- The author of this report has visited the site on 3 separate occasions.
- This FRA and drainage report is in relation to the conversion of the same Old Hop Barn into a single dwelling and therefore there will be a lesser number of residents if permission is granted, therefore less persons who may be at risk of flooding, together with less foul flows.
- The overall river flood risk to the proposed development has been assessed, including an estimate of the 1% AEP fluvial flood level, with an additional climate change allowance as set by UK Government. Assessed against a 37% CC allowance that is appropriate in 2023. Previously the site was assessed against a 34% CC allowance.
- Surface water and SuDS design were assessed against a Climate Change increase in rainfall of 45% plus 10% creep of impermeable areas; previously it was assessed against 40% increase in rainfall;
- Surface water and foul drainage management plans has been determined, complying with current local authority SuDS policies, National Planning Policy Framework (NPPF) requirements, Sustainable Drainage (SuDS) policies, together with local plus national foul drainage and Nutrient Neutral requirements.
- Modelling of SuDS features has been undertaken to ensure that the design complies with the NPPF non-statutory technical standards and meets council SuDS Guidance.
- Recommendations provided to ensure compliance with the NPPF and local authority's flood risk plus SuDS policies.
- Recommendations and a design provided to ensure the foul drainage complies with all UK requirements plus legislation, together with Natural England and council Nutrient Neutral requirements.

The key outcomes of the work are:

- The conversion proposals meet Government guidance for preparing a flood risk assessment, within standing advice for vulnerable developments, which states that finished floor levels should be a minimum of whichever is the highest of 300mm above the:
    - average ground level of the site
    - adjacent road level to the building
    - estimated river or sea flood level including climate change allowance.
- The conversion will include a FFL of 63.45mAOD that is 300mm above the average ground level of 63.15mAOD.
- The conversion will also utilise construction materials that have low permeability up to at least 500mm above finished floor level.
- The surface water runoff from the building roof is managed by SuDS features.

- The site falls within the red zone River Lugg catchment of the River Wye Special Area of Conservation (SAC). Therefore, the foul drainage strategy must achieve Nutrient Neutrality to avoid adverse impacts on the SAC.
- The proposals minimise phosphate outputs from the dwelling into the environment by the use of best practice wastewater treatment equipment.
- As the site utilises a standard drainage field north of the barn, the scheme would have a greater phosphate output to the water environment than currently as all phosphate may not enter and be retained in the soil. This could result in a negative impact.
- The site can achieve Nutrient Neutrality by ensuring that the proposals ensure all nutrients are absorbed and none reach the water environment. This has been achieved by the inclusion of a small traditional apple orchard, assessed in accordance with a methodology agreed by Natural England.
- This on-site orchard mitigation overcomes the lack of progress by the council in their efforts to generate nutrient credits via wetland creation. The council ecology team in comments dated 24 May 2023 have stated "At this time the procurement and completed purchase of such credits has not been demonstrated and the required HRA process cannot be progressed at this time – and no planning permission can be granted." This statement was made because the council have not yet offered a legally binding agreement to the applicant to sell the required number of credits.
- Based on other applications within Herefordshire the small orchard mitigation strategy complies with the HRA process.

1. INTRODUCTION

1.1 Purpose of this report

This report describes a Flood Risk Assessment (FRA), Surface Water Management Plan (SWMP) and Foul Drainage Strategy (FDS), for the proposed conversion of a Dutch barn into a single residential dwelling in Monkhide, Ledbury.

This report is an update to meet current planning and Nutrient Neutrality requirements of a 2019 FRA, SWMP and FDS report, plus two 2020 FDS Technical Notes for this same site – all of which were undertaken by the same staff that have prepared this report. In 2019 and 2020 the staff were employed by Hydro-Logic Services Ltd. The previous reports supported a planning application number P193574/F, for the conversion of the barn into 2 residential dwellings - with permission granted on 18 December 2020.

This FRA and drainage report is in relation to the conversion of the same Old Hop Barn into a single dwelling and therefore if permission is granted there will be a lesser number of residents, therefore less persons who may be at risk of flooding, together with less foul flows.

This report ensures that the correct overall flood risk to the proposed development has been assessed, including an estimate of the 1% AEP fluvial flood level, with an additional climate change allowance as set by UK Government. The site has been assessed against a 49% CC allowance that is appropriate in 2023. Previously the site was assessed against a 35% CC allowance.

Surface water and foul drainage management plans has been prepared, both of which comply with local authority policies, National Planning Policy Framework (NPPF) requirements, Sustainable Drainage (SuDS) policies and local plus national foul drainage requirements.

To provide evidence that the surface water runoff meets all policy requirements and guidance modelling of SuDS features has been undertaken for all rainfall events up to and including the 1 in 100-year plus Climate Change threshold. This approach ensures that the design complies with the NPPF non-statutory technical standards and meets council SuDS Guidance.

To ensure the conversion proposal mitigates the risk of flooding to appropriate levels the conversion meets Government guidance for preparing a flood risk assessment, within published standing advice for vulnerable developments. This guidance states that finished floor levels should be the minimum of whichever is the highest of 300mm above the:

- average ground level of the site
- adjacent road level to the building
- estimated river or sea flood level including climate change allowance.

To further mitigate for the impacts of flooding both during and after an event the conversion will have a FFL that is 300mm above Ground Level and will also utilise construction materials that have low permeability up to at least 500mm above finished floor level.

The surface water runoff from the building roof is managed by SuDS features, as policy and approved in the previous planning permission.

The site is within the red zone River Lugg catchment of the River Wye Special Area of Conservation (SAC). Therefore, the foul drainage strategy is required to achieve Nutrient Neutrality to avoid adverse impacts on the SAC. The design does this by:

- minimising the phosphate outputs from the dwelling by implementing a low water consumption regime to bring down daily consumption to 110 l/head/day as will be required by any planning permission.
- by utilising an efficient sewage PTP to extract nutrients from the foul flows – with an output of 1.6 mg P / litre;
- by using a foul drainage treatment system including a traditional drainage field supplemented by an orchard and thus achieving zero nutrient discharge.

1.2 Background

The National Planning Policy Framework (NPPF) was last updated in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied. Planning Practice Guidance is published online and details how flood risk should be assessed as part of a planning application.

Flooding is addressed, principally within Chapter 14 – "Meeting the challenge of climate change, flooding and coastal change", paragraphs 152 to 173 of the NPPF. Policy seeks to avoid inappropriate development in areas at risk of flooding by steering development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

A site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3; in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

A site-specific flood risk assessment must demonstrate the following:

- that the development will be safe for its lifetime taking account of the vulnerability of its users;
- it should not increase flood risk elsewhere;
- it should, if possible, reduce flood risk overall.

As this site is located within Flood Zone 2, a site-specific FRA is required. For More Vulnerable developments in Flood Zone 2 Standing advice has been published. This will be produced alongside a Surface Water Management Plan (SWMP) and Foul Drainage Strategy (FDS) for the site.

1.3 Sources of Information

This Report has been informed by:

- Development proposals by Thomas Margrett Architecture & Design;
- The Flood Map for Planning and Long-Term Flood Maps;
- DEFRA's LiDAR Digital Elevation Models;
- The National Planning Policy Framework (NPPF) plus the Technical Guidance to the NPPF;
- Ground investigations undertaken at the site;
- Natural England plus Council Nutrient Neutral publications plus websites.

1.4 Structure of the report

The Report has been structured in order to deal with key flood related issues of the NPPF and Practice Guide, plus to outline a strategy to manage rainfall runoff generated from the roof the Dutch Barn. The principal sections are as follows.

- Section 2 refers to spatial planning considerations by reference to the proposed land use and risk of flooding at the site;
- Section 3 presents an assessment of flood risks associated with the proposed development along with any mitigation that may be required, including the SWMP;
- Section 4 provides a Foul Drainage Strategy in accordance with UK and local policy;
- Section 5 provides a summary of the investigations;
- Section 6 details the reference sources used in the preparation of this report.

Additional Appendices are provided that deal with the following:

- Appendix A presents the report for the ground investigation held at the site;
- Appendix B shows the hydraulic drainage modelling outputs for the SWMP.

2. SPATIAL PLANNING CONSIDERATIONS AND FLOOD RISK

2.1 Location plan

The location of the proposed development site is shown in Figure 2-1 with the location details shown in Table 2-1. The site comprises a Dutch barn with a total roof area of 201m². See also Figure 2-3 to Figure 2-5 for details of the site

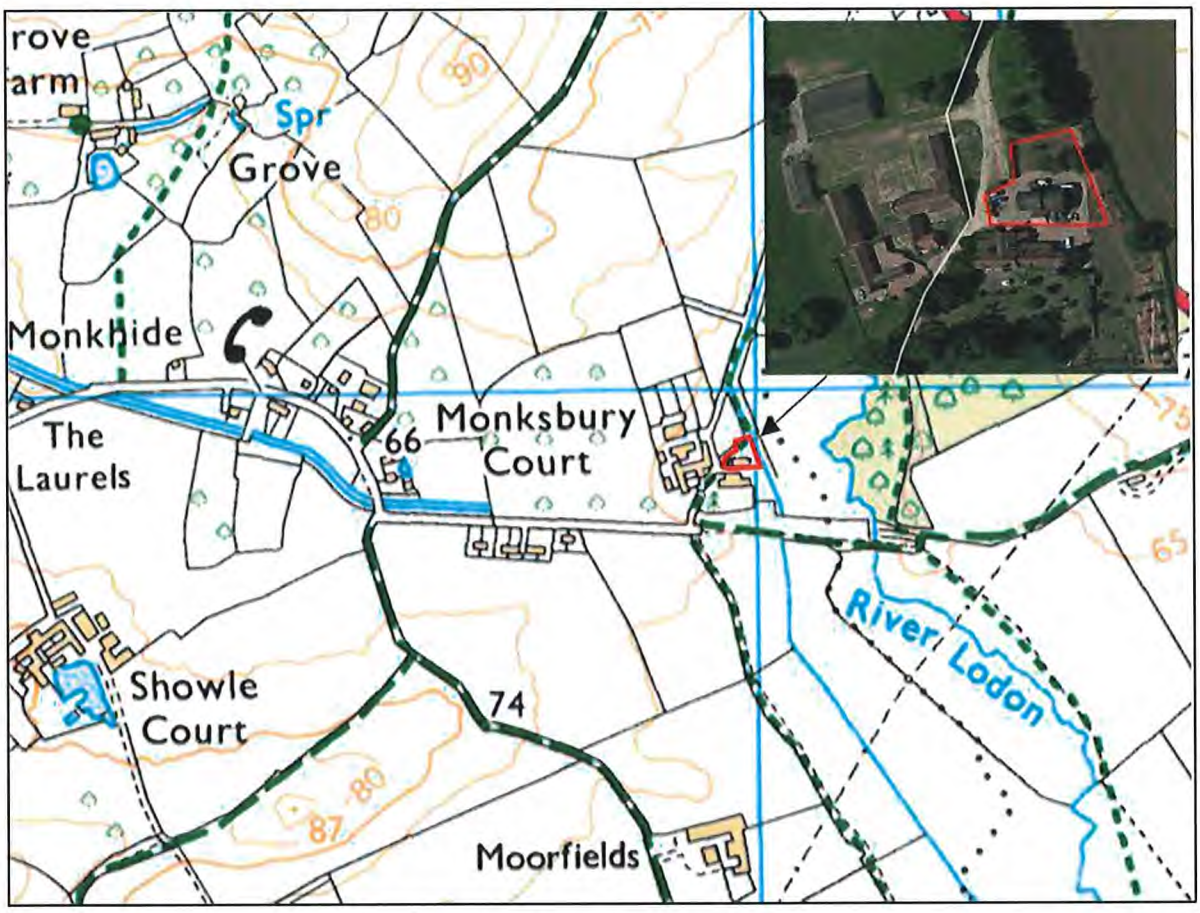


Figure 2-1: Location of development site
(Reproduced under OS Licence 0100065866)
Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

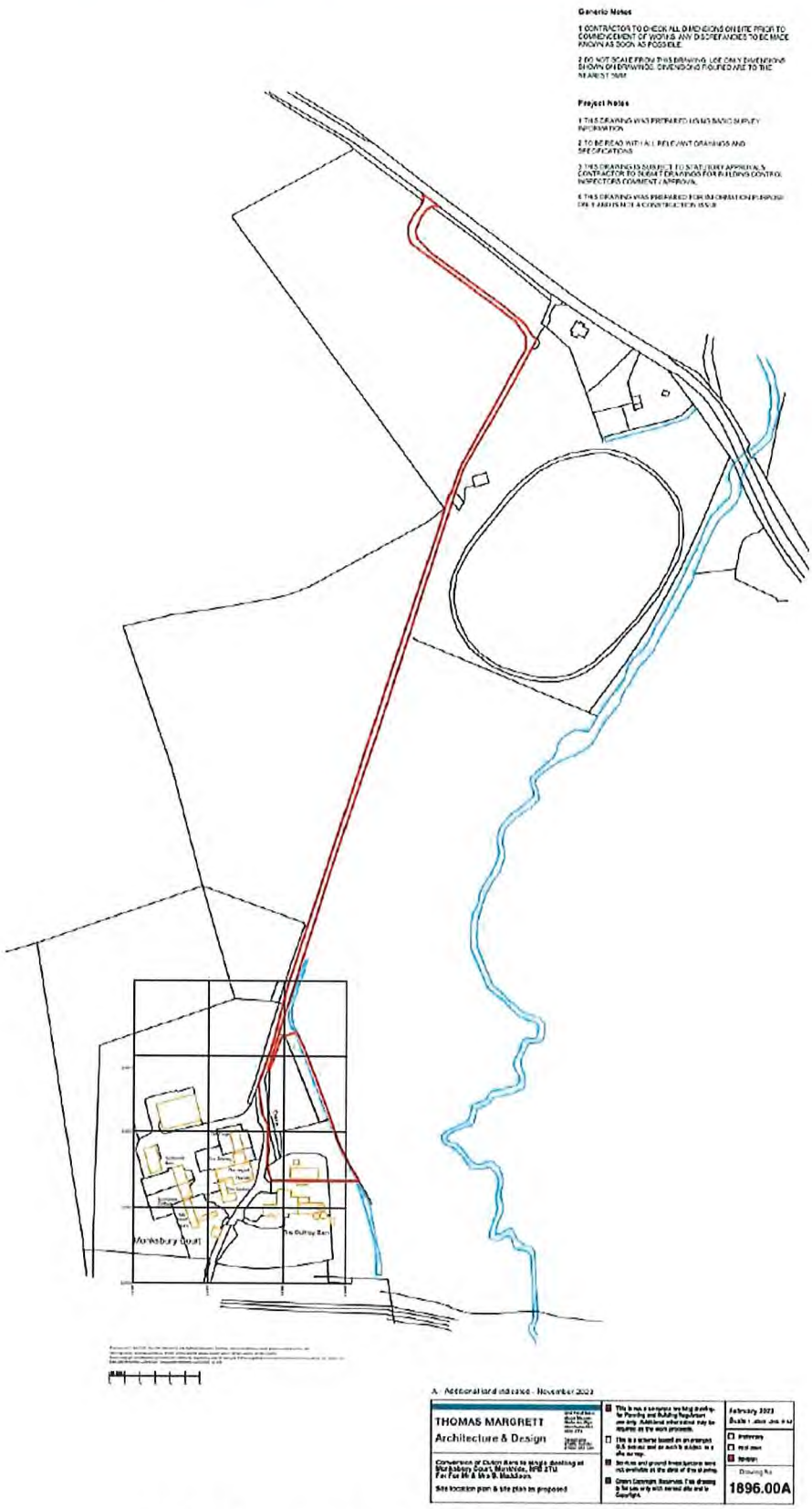


Figure 2-2: Location Plan and Red Line Boundary

Reference	Value
OS X (Eastings)	361983
OS Y (Northings)	243911
Nearest Post Code	HR8 2TU
Lat, Long	52.092229, -2.556316
Nat Grid	SO619439 / SO6198343911
What3words	ozone.booms.blending

Table 2-1: Grid reference details for the site (www.streetmap.co.uk)

Figure 2-3: Aerial View (Source Bing Maps)
Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation.

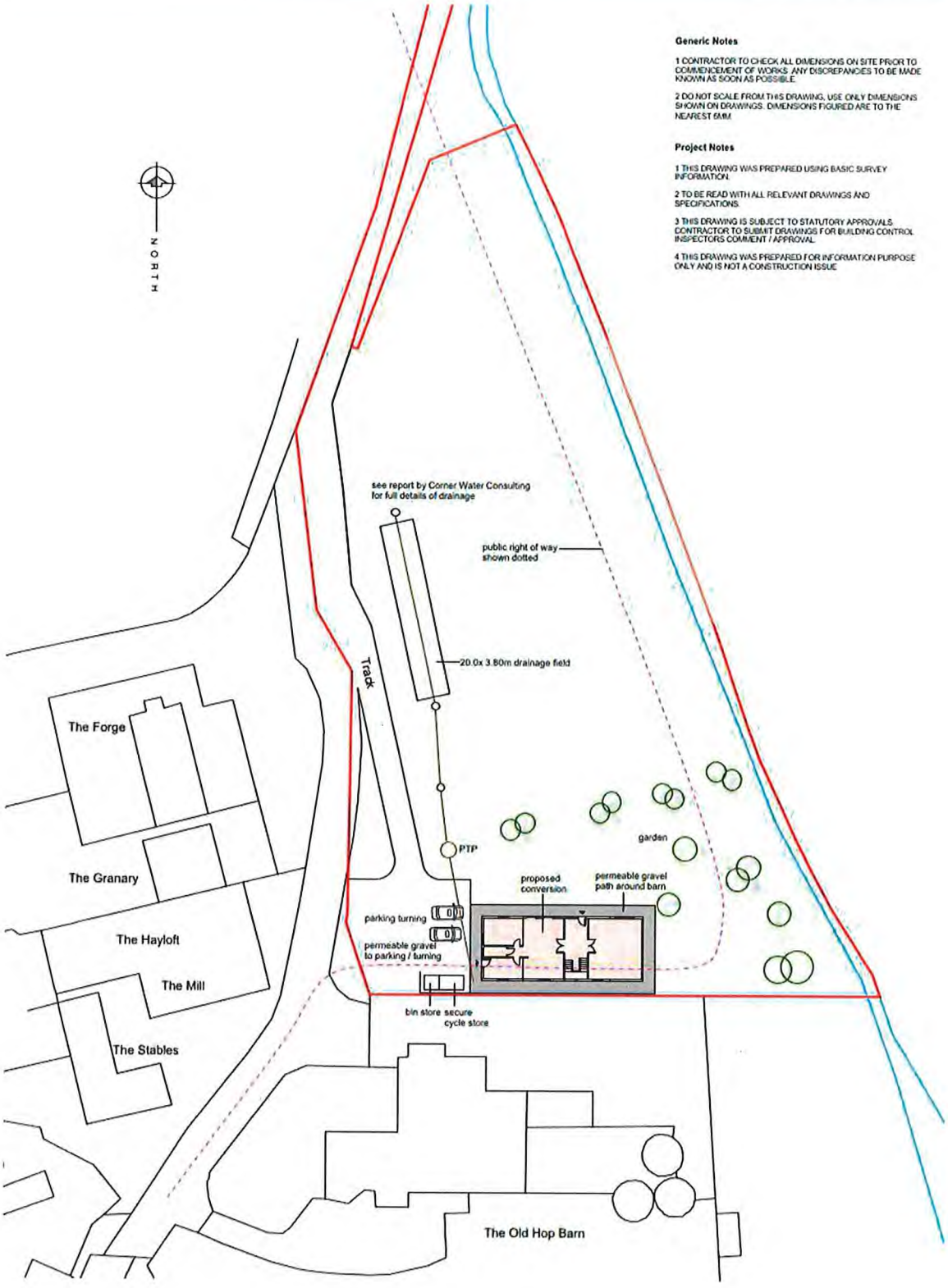


Figure 2-4: Site Plan (Source Drawing 1896.01B)

Figure 2-5: Area of Land Purchased (Source Berrys Land Transfer plan)

Vulnerability classification is defined within the NPPF Annex 3: Flood risk vulnerability classification, reproduced as Figure 2-6. For this proposed development the classification is 'More Vulnerable', meaning that it preferable to locate it within Flood Zone 1 or Flood Zone 2 when there is no requirement for an Exception Test, see Table 2-2.

More vulnerable
• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill* and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Figure 2-6: Flood Risk Vulnerability Classification (NPPF)

2.2 Environment Agency Flood Zone

The Environment Agency have confirmed that they do not have a hydraulic model for this location and are thus unable to provide Product 4 detailed data.

The Flood Risk Map for planning is shown in Figure 2-7 with the barn, the attached smaller structures on the North and South elevations that are to be removed (shown in the photographs within Figure 2-15), plus the retained existing parking area to the West outlined in Red. To provide a greater level of clarity a close up of the barn area is shown in Figure 2-8.

The planning application covers the existing barn conversion, plus proposed garden space to the North and East, plus an area to the West unchanged as parking. To the South there will be a small access and maintenance zone between the barn conversion and the adjacent Monksbury Court.

For this site the EA state "Your selected location is in flood zone 2, an area with a medium probability of flooding." The Flood Map for Planning shows that:

- most of the barn;
- most of the parking area to the West;
- some of the garden to the North;

lie within Flood Zone 2. Flood Zone 2 indicates land subject to an annual exceedence probability (AEP) of flooding between 0.1% and 1% (1 in 1,000 years and 1 in 100 years respectively).

The existing grassed and future proposed garden areas to the North and the East of the barn are shown to be in Flood Zone 1.

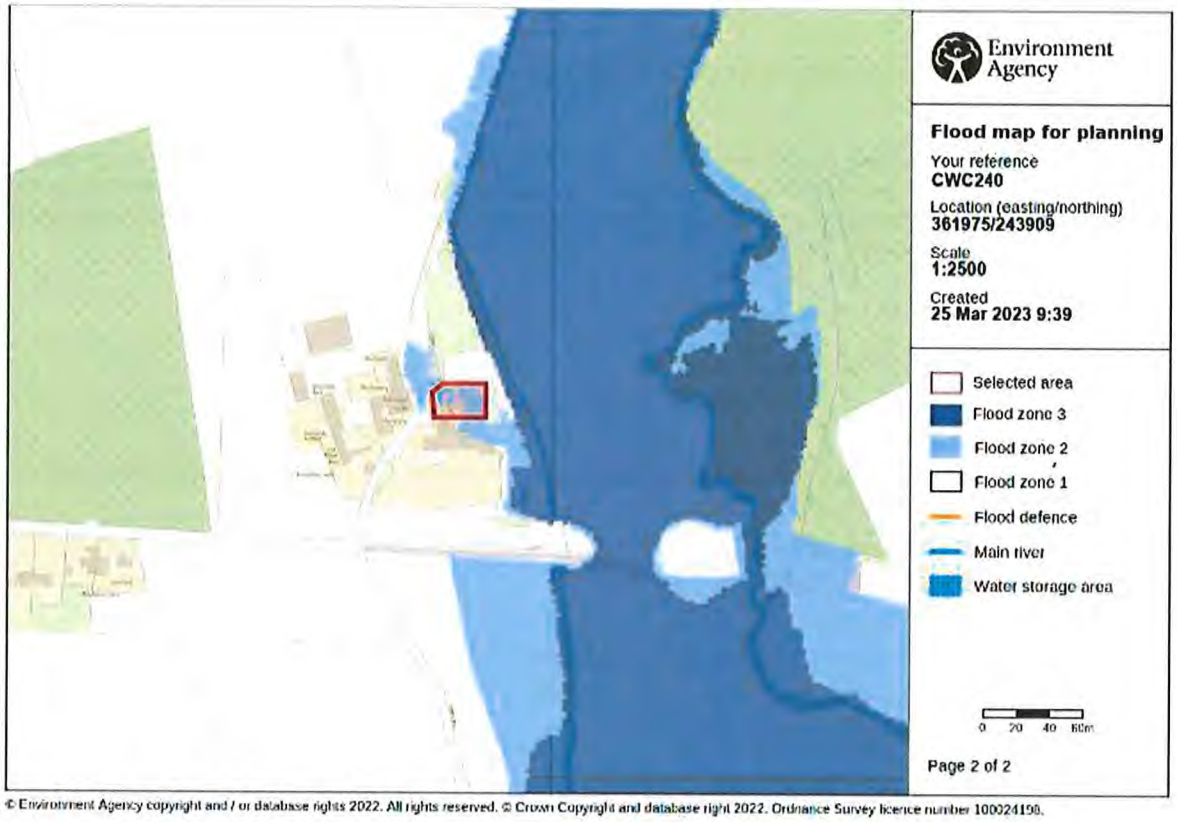


Figure 2-7: Flood Zone map (Copyright Environment Agency)

Figure 2-8: Close Up Flood Zone map (Copyright Environment Agency)

2.3 Flood Zone Compatibility

The NPPF Guidance includes Table 2: Flood risk vulnerability and flood zone 'incompatibility' a table that highlights whether particular types of development are appropriate in each flood zone, reproduced as Table 2-2. The proposed development would be classed as 'More Vulnerable' in accordance with the NPPF Vulnerability Classification, see Figure 2-6.

This type of development is acceptable in Flood Zone 1 and 2, when there is no requirement for either the Sequential or the Exception Tests.

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

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 †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

Table 2-2: Flood Risk Vulnerability and Flood Zone incompatibility (Table 2 from NPPF Technical Guide)

2.4 Catchment Characteristics and Runoff

The site garden areas adjoin the west side of an unnamed small watercourse. The site is also to the west of farmland and the River Lodon. There is a disused and infilled canal south of the adjacent Monksbury Court. The catchment that appears to drain to the disused canal (based on topography) shown in Figure 2-9 does not include the site. However, it is believed that it is better representative of the site hydrology and soil characteristics due to its extent – 0.65km^2. Note that the nearest water catchment in the river Lodon covers a total extent of 36.99km^2.

The parameters of the catchment – extracted from the FEH web service – indicate that the soils at the site have a runoff coefficient (SPRHOST) of 40.47%; this is average in a UK context where values typically range from around 5% for permeable catchments to 55% on relatively impermeable clay catchments. Similarly, the baseflow index (BFIHOST) is of an average value at 0.562.

Information from the British Geological Survey 'Superficial Deposits Map', notes that the superficial deposits covering the site include alluvium – clay, silt, sand and gravel. These deposits were formed up to 2 million years ago in the Quaternary period.

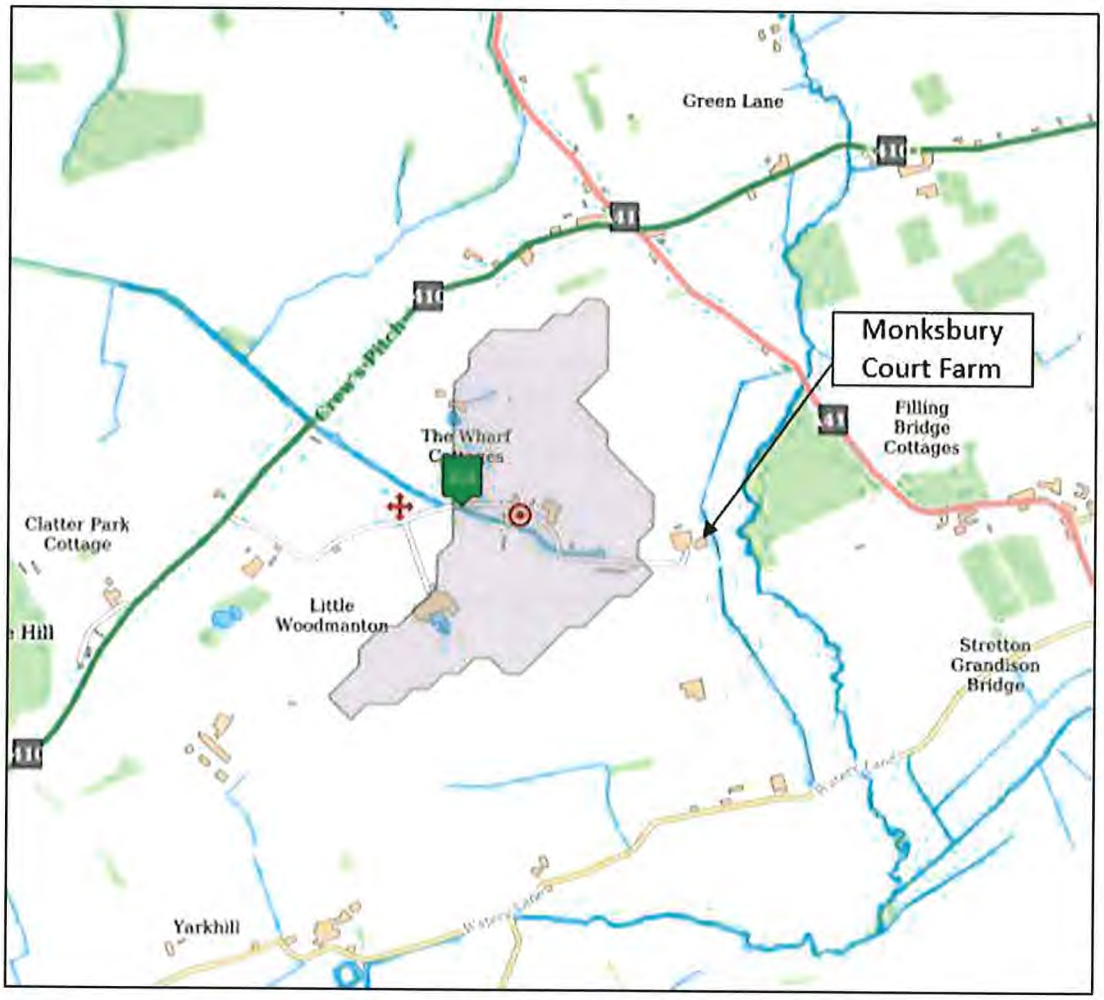


Figure 2-9: Canal Catchment Boundary (FEH Web Service)

	Location:	Disused canal @ Monksbury
	NGR:	SO 61390 43979
AREA	Catchment area (km2)	0.6525
ALTBAR	Mean elevation (m)	73
ASPBAR	Mean aspect	262
ASPVAR	Variance of aspect	0.12
BFIHOST	**Base flow index**	0.562
DPLBAR	Mean drainage path length (km)	0.53
DPSBAR	Mean drainage path slope	45.4
FARL	Index of lakes	0.953
FPEXT	Prop. of catchment in1% FP	0.0613
FPDBAR	Mean flood depth (catchment)	0.487
FPLOC	Avg dist of FP to outlet	0.471
LDP	Longest drainage path (km)	1.07
PROPWET	Proportion of time soil is wet	0.32
RMED-1H	Median 1 hour rainfall (mm)	9.8
RMED-1D	Median 1 day rainfall (mm)	30.3
RMED-2D	Median 2-day rainfall (mm)	38.6
SAAR	**Average annual rainfall (mm)**	664
SAAR4170	Ditto for 1941-1970 (mm)	692
SPRHOST	**Percentage runoff**	40.47
URBEXT1990	Urban extent 1990	0
URBEXT2000	Urban extent 2000	0

Table 2-3: Characteristics of the Catchment

The greenfield runoff rates corresponding to the total impermeable areas were estimated – via ReFH2 – and presented in Table 2-4.

Return period (years)	Greenfield runoff rates (l/s/ha)	Greenfield runoff rates (l/s)
2	1.0	0.020
30	2.2	0.044
100	2.9	0.058

Table 2-4 – Greenfield runoff rates for a critical storm duration of 11hrs

2.5 Ground Investigations

Infiltration testing to BRE365 and Percolation testing to BS6297 were carried out by Procuro Planning Services Ltd on 5th August 2019 – see report in Appendix A. The four locations of the trial pits are shown in Figure 2-10. A total of 2 infiltration tests to BRE365 were conducted, with an additional deeper pit of 2.5m to assess the position of groundwater level as well as 2 percolation tests.

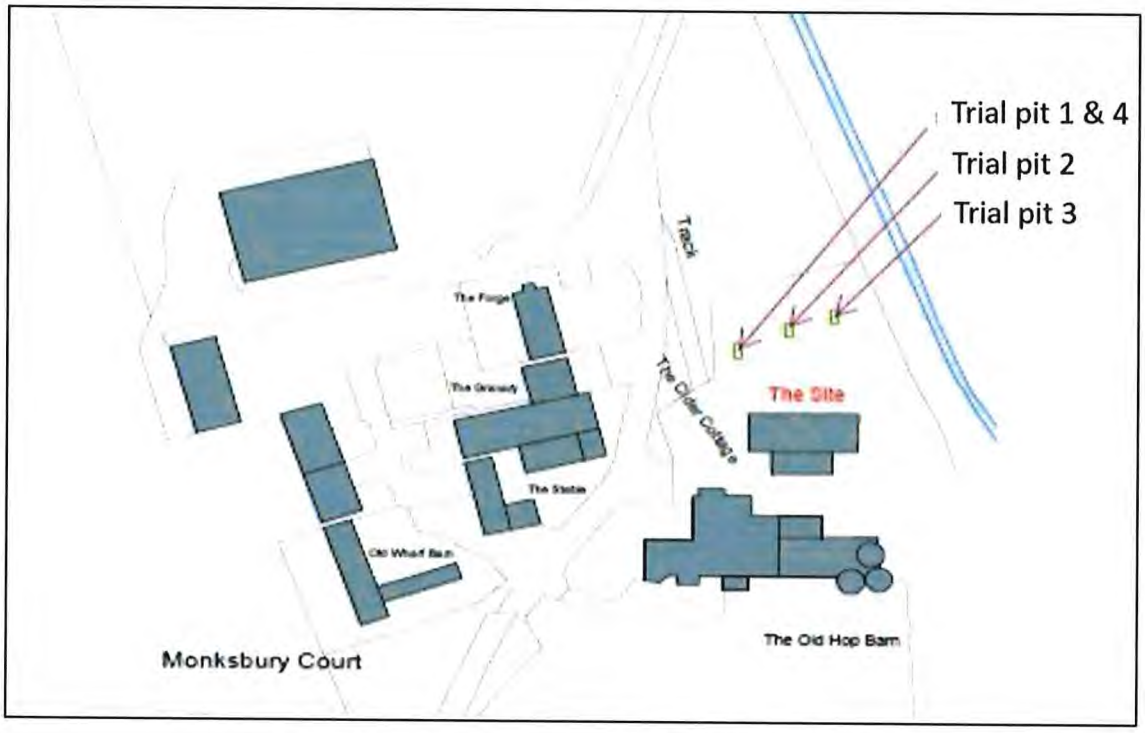


Figure 2-10: Ground investigations – trial pit location

The trial pit logs are as follows:

- TP1 was excavated to a depth of 700mm, with a 300mm squared hole in the bottom of the pit to conduct percolation testing according to BS6297 and The Building Regulations Part H;
- TP2 was excavated to a total depth of 2.5m and signs of groundwater were found in the bottom of the pit. Groundwater raised to a depth of 370mm above the bottom of the pit, so it was assumed that groundwater level is located 2.1m BGL;
- TP3 was excavated to a total depth of 1.5m and infiltration testing to BRE365 was conducted. However, water level didn't drop below 1.13m BGL;
- TP4 was excavated to a total depth of 1.5m and infiltration testing to BRE365 was conducted. However, the water within the pit dropped to a maximum level of 0.64m BGL.

Given the proximity of groundwater level to ground – 2.1m BGL, infiltration soakaway SuDS deeper than 1.1m should be disregarded, so permeable paving for a patio at a maximum of 500-600mm would be possible.

To assess the capacity of the soil to absorb treated foul flows a percolation test pit TP1 was excavated a total of 1m deep. This was tested twice by adding 255mm and then 200mm of water and the results based on the site data recorded are that the soil has Vp values of:

- Calculated over 75% to 25% of the test depth 16.1 and 31.6 s/mm, average 23.85 s/mm.
- And over the full depth of measurements 17.6 and 42 s/mm, average 29.8 s/mm.

Further soil testing was undertaken on 28 March 2022 at a location between the stream on the eastern site boundary and the River Lodon as part of an EA Permit application, and those tests gave similar Vp results. For the buried foul drainage field design in this report the lowest average Vp value of 29.8 sec/mm has been used.

2.6 Source of flood risk

The site is at low to medium risk of flooding from all sources as shown in Table 2-5.

Key sources of flooding	Possibility at Site
Fluvial (Rivers)	*Medium – Flood Zone 2*
Tidal	*N/A*
Groundwater	*Low – 2.1m Below GL*
Sewers	*Unknown*
Surface water	*Low to Medium as per Figure 2-12*
Infrastructure failure	*None that may affect the Site*

Based on NPPF Practice Guide

Table 2-5: Sources of Flood Risk affecting the Site

The Government/Environment Agency provides an online flood risk service – via the Long-Term Flood Risk website. From this service at the Old Hop Barn the defined flood risks are shown in Figure 2-11.

Flood risk summary for the area around:

THE OLD HOP BARN, MONKSBURY COURT, MONKHIDE, LEDBURY, HR8 2TU

Surface water

Medium risk

▸ What this information means

Surface water flooding, sometimes known as flash flooding:

- happens when heavy rain cannot drain away
- is difficult to predict as it depends on rainfall volume and location
- can happen up hills and away from rivers and other bodies of water
- is more widespread in areas with harder surfaces like concrete

Lead local flood authorities (LLFA) are responsible for managing the flood risk from surface water and may hold more detailed information.

Your LLFA is **Herefordshire, County of council**.

▸ What you can do

View a map of the risk of flooding from surface water

Rivers and the sea

Very low risk

▸ What this information means

The Environment Agency is responsible for managing the flood risk from rivers and the sea.

View a map of the risk of flooding from rivers and the sea

Figure 2-11: Long-Term Flood Risk Summary

2.7 Surface Water Flood Risk

The Long-Term Flood Risk website also includes maps indicating the extent of Surface Water Flooding throughout England, with the site at The Old Hop Barn displayed for the 1 in 100 year scenario in Figure 2-13 and for the 1 in 1000 year extreme event in Figure 2-14.

The flood risk from surface water runoff is shown to be less than 300mm deep for all scenarios. It is minimal in the 1 in 100-year event, with some south of the barn conversion where there are no windows or doors. In the extreme 1 in 1000-year event there is some additional extent adjacent to the northern and part of the end elevations of the barn. As the FFL of the barn and the windows and doors are all shown to be 300mm above the adjacent GL this will not affect the internal space.

Figure 2-12: Key to Surface Water Flood maps

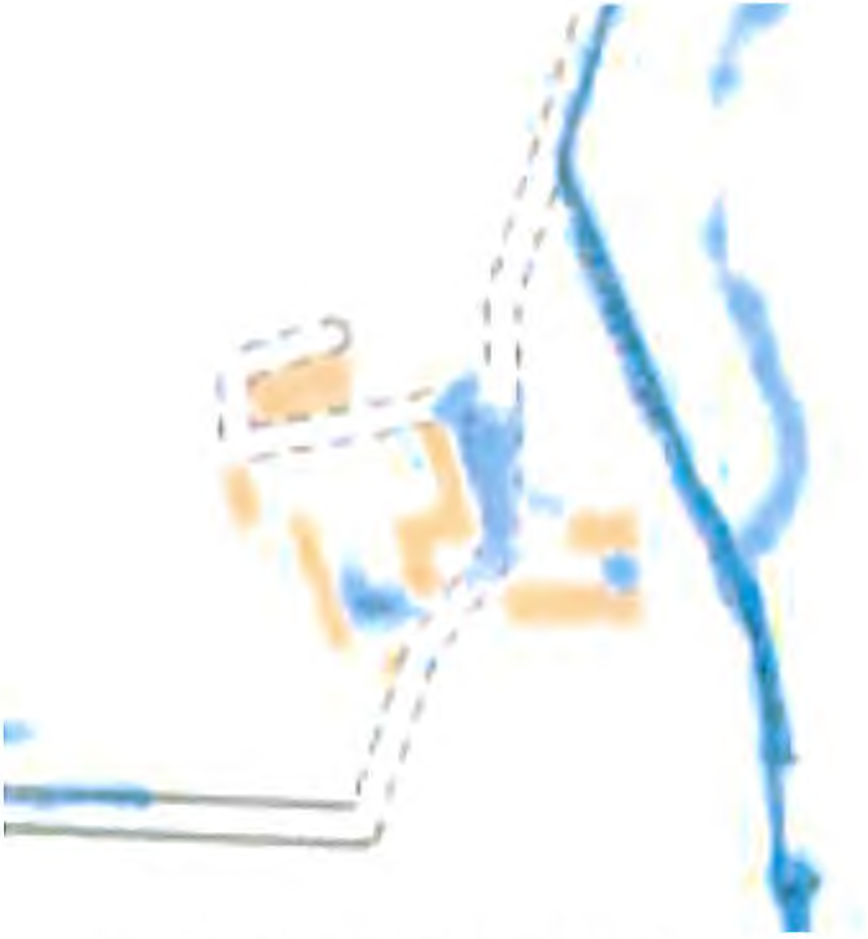


Figure 2-13: Medium Risk 1 in 100-year Surface Water Flood map

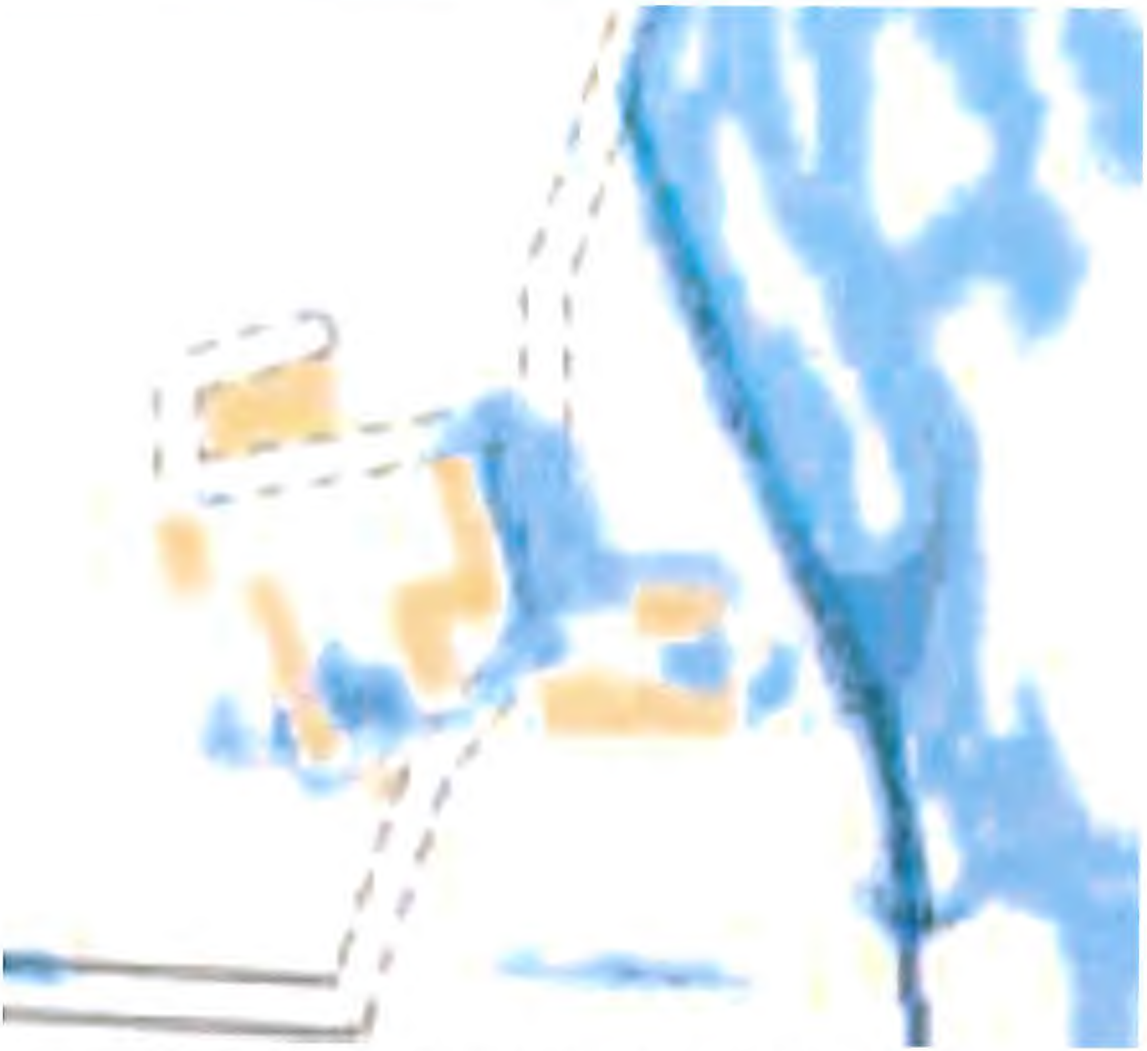


Figure 2-14: Low Risk 1 in 1000-year Surface Water Flood map

2.8 Existing Surface Water Drainage Arrangements

There are no existing below ground drainage arrangements currently on the site (Figure 2-15a). The Dutch barn only presents a system of gutters and downpipes that take rainfall runoff, generated from the roof to the ground. On observation of the topography displayed in Figure 2-15b, it is possible to infer that the runoff discharged on to the ground is being directed to the ditch that runs along the Eastern boundary of the site.

a) Surface water drainage arrangements b) Ground fall around the Dutch barn

Figure 2-15: Surface water drainage arrangement of the barn and local fall of the ground

In terms of soil infiltration capacity, the Soilscape map shown in Figure 2-16 show the barn to be located in the boundary between freely draining and slightly impeded drainage soils.

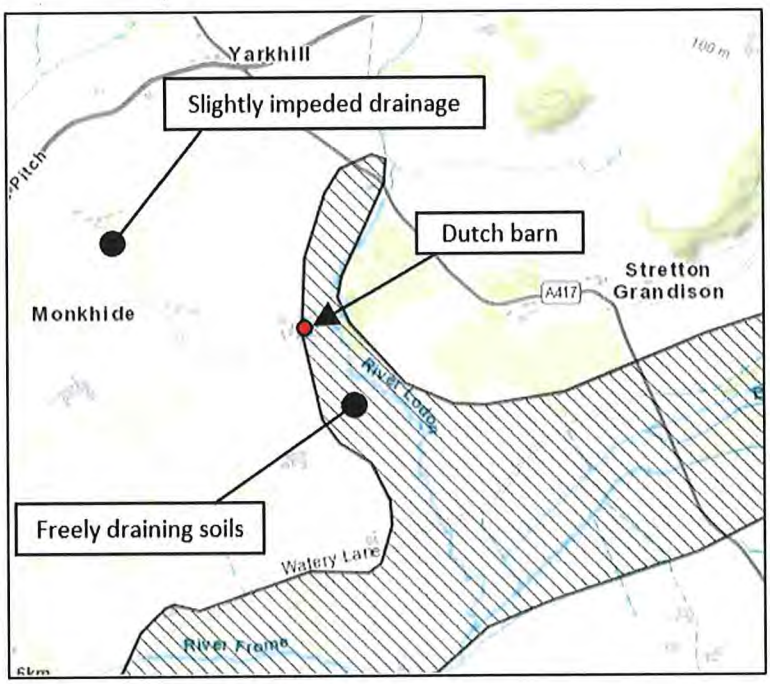


Figure 2-16: Soilscape Map (slightly impeded drainage to the West of the barn, and freely draining floodplain to the West)

3. ASSESSMENT OF FLOOD RISK FOR PROPOSED DEVELOPMENT

3.1 The development proposals

The proposals include the change of use of a Dutch barn into a single residential dwelling – Figure 3-1. The area within the red line boundary will remain either as existing parking area/driveway, unchanged grassland as domestic garden, or (impermeable) existing Dutch barn roof.

The changes are removal of the existing 'lean to' extensions on the north and south elevations of the Dutch barn – see Figure 2-15, which will in part be replaced by some new gravel pathways around the building. The development is located to the north of Monksbury Court and to the west of river Lodon.

Most of the land within the red line boundary will remain as managed grassland, incurring no change in the permeability. The redevelopment is to an existing building, with no proposed extensions, which means no increase in its roof area, and thus no increase in surface water runoff. The proposal actually removes roof area as the various existing extensions are removed.

As required by National and council planning plus drainage policy, it is proposed that runoff is managed by SuDS, which should substantially reduce the risk of flooding within and downstream of the site by mitigating for climate change effects.

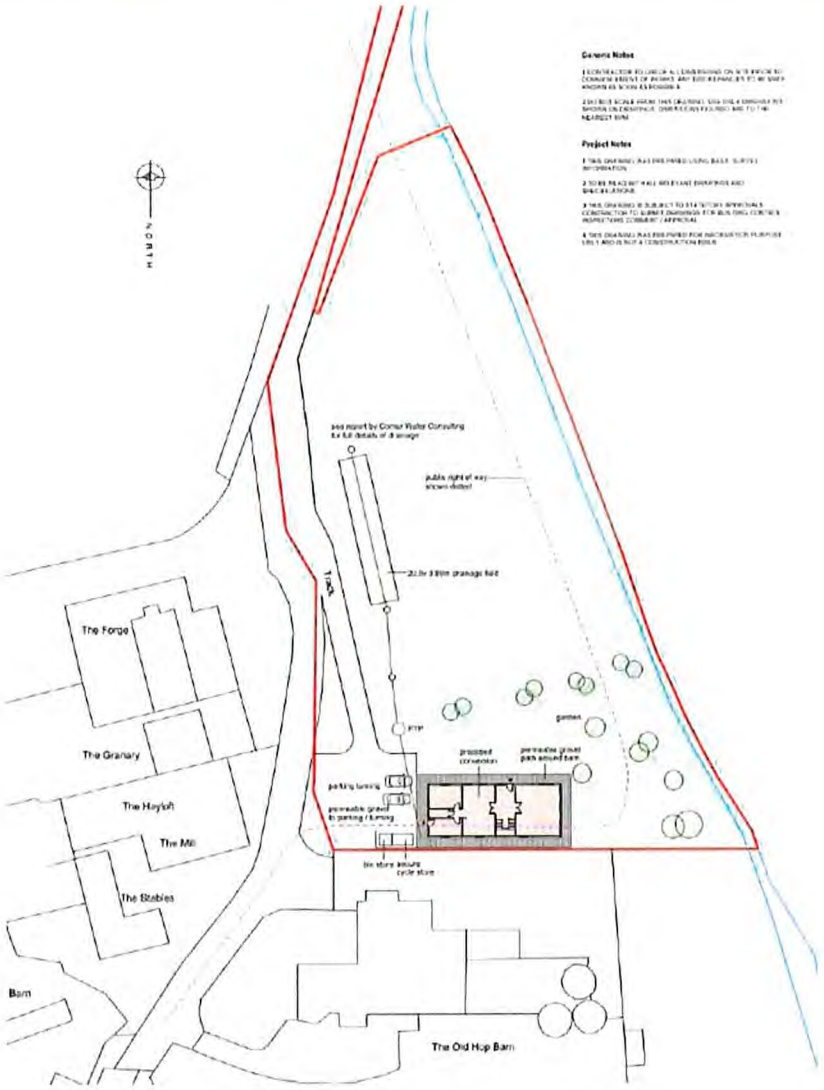


Figure 3-1: Development proposals for site

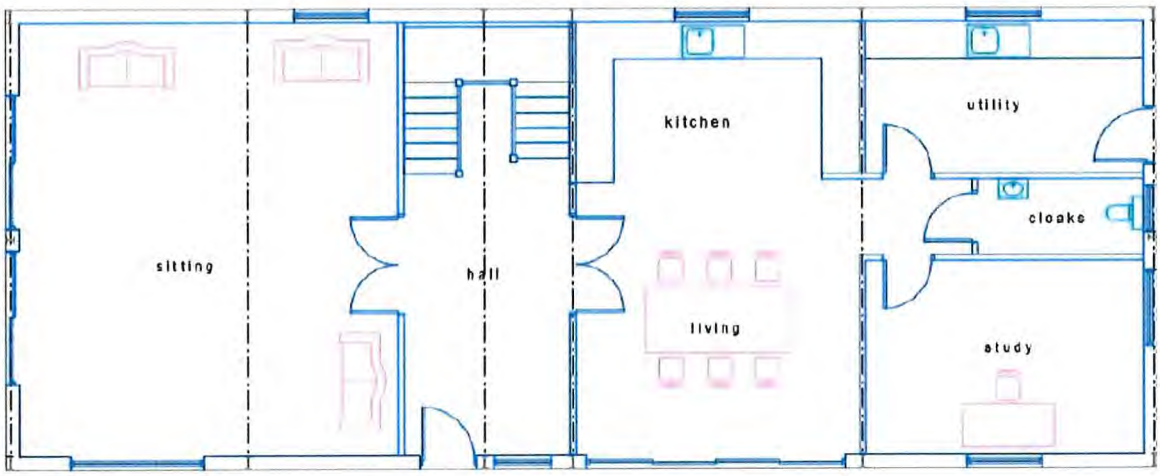


Figure 3-2: Ground Floor Plan Showing External Doors

Figure 3-3: Proposed Elevations Showing FFL and Openings

Figure 3-4: Local Watercourses – Source FEH Web Service

3.2 Climate change impacts

The NPPF requires a consideration of the impacts of climate change on flood risk for any proposed development. In terms of rainfall increases plus peak river flows, the different figures for Herefordshire are published by DEFRA.

For river flooding impacts the NPPF requires the following peak river flow allowances for flood risk assessments. NPPF states that for **'more vulnerable' development** – e.g., residential houses – the impact of the **central 2080s increase** needs to be assessed. Within the Wye Management Catchment area the various river flow allowances are shown in Table 3-1.

Therefore, in this design river flows will be increased by 37% to reflect both the design life and the vulnerability classification of the development. In the 2019 FRA the site was assessed versus a 35% Climate Change increase in river flows, so this is a small change.

Wye MC Management Catchment peak river flow allowances

	Central	Higher	Upper
2020s	14%	19%	29%
2050s	20%	27%	47%
2080s	37%	49%	80%

Table 3-1: Peak river flows allowance for Wye MC.
(Adopted climate change allowance highlighted in yellow.)

For drainage design the NPPF requires the use of the development lifetime guidance to work out the lifetime of your development, e.g., consider residential development to have a minimum lifetime of a 100 years. For developments with a lifespan beyond 2100 upper end allowances, for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125).

In terms of rainfall peak intensity, the relevant climate change guidelines are shown in Table 3-2. Therefore, in this SWMP design rainfall will be increased by 40% for the 30-year design and 45% for the 100-year design to reflect both the design life and the vulnerability classification of the development. In the 2019 FRA and SWMP design the site was assessed versus a 40% Climate Change increase in rainfall, so this is a small change.

Wye MC 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	30%	45%

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

This map contains information generated by Met Office Hadley Centre (2019) UKCP Local Projections on a 5km grid over the UK for 1980-2080, Centre for Environmental Data Analysis, 2022

Table 3-2: Peak Rainfall Intensity Increases
(Adopted climate change allowance highlighted in yellow.)

3.3 Flood risk management and measures to protect the site

Due to the presence of the River Lodon Flood Zone 2 to the east of the barn, there is a risk of flooding from a fluvial event. Protecting the building from this event will also ensure that the lesser impact of surface water flooding will be mitigated.

The flood extents available in the flood map for planning do not include any climate change allowance. In an effort to incorporate climate change in the design, Product 4 was requested, but no information was available for the site of interest. An alternative methodology was then followed to estimate the flood peak water levels for the 1% AEP with a climate change allowance, this is the same approach as the 2019 FRA. The key difference is that in 2019 the site was assessed versus a 35% Climate Change increase in river flows, but for this report the allowance has increased slightly to 37%.

The current March 2023 DEFRA GIS data for the FZ2 and FZ3 extents have been compared with the topography at the site. As a result, the 1%AEP flood level was determined as 63.00mAOD see Figure 3-5, which shows the barn is not affected with the river remaining in the wide floodplain.

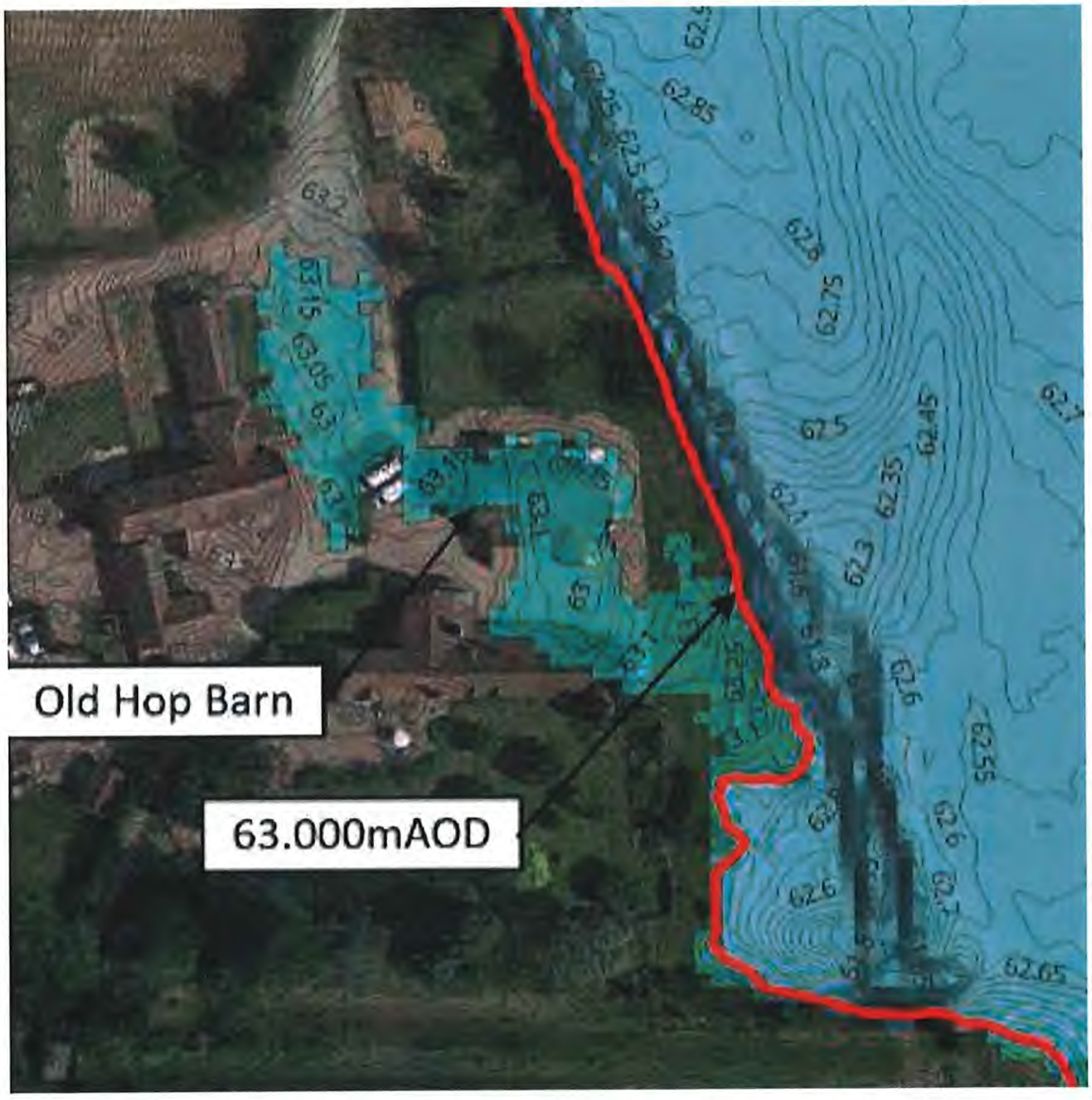


Figure 3-5: 1% AEP flood level by comparison of DEFRA GIS against LiDAR contours

From an analysis of the river flows provided by ReFH2 and extrapolating climate change event flows it can be seen that the 1%AEP + 37%CC plus the 1%AEP + 49%CC river flow both fall between the river flows for the 1%AEP and 0.1%AEP. It was thus possible to interpolate the corresponding flood levels for the 1%AEP plus climate change events, see Table 3-3. The development is classified as 'more vulnerable' and thus the central 2080s climate change allowance was adopted in the analysis – 37% in the Wye Management Catchment, see section 3.2.

Table 3-3: Interpolation of the 1% AEP + Climate Change flood levels

Annual Exceedance Probability (AEP)	Flood level (mAOD)	Flow (m^3/s)
1%	63.000	12.25
1% + 35%cc 2019	63.107 *	16.54*
1% + 37%cc 2023	63.112 *	16.78*
1% + 49%cc 2023	63.148 *	18.25*
0.1%	63.200	20.28

* Estimated via interpolation of FEH data

As the QGIS contour plan for the site provides the 61.15m contour, rather than seek to interpolate to a level of 63.112mAOD to determine the 1%AEP + 37%CC, the higher flood extent for the 63.150mAOD flood level has been displayed in Figure 3-6, noting that this contour line represents the 1%AEP + 49%cc event. As this comparison shows that the river remains in the flood plain it is concluded that the barn - which will have a FFL set 300mm above ground level - is not affected by this event.

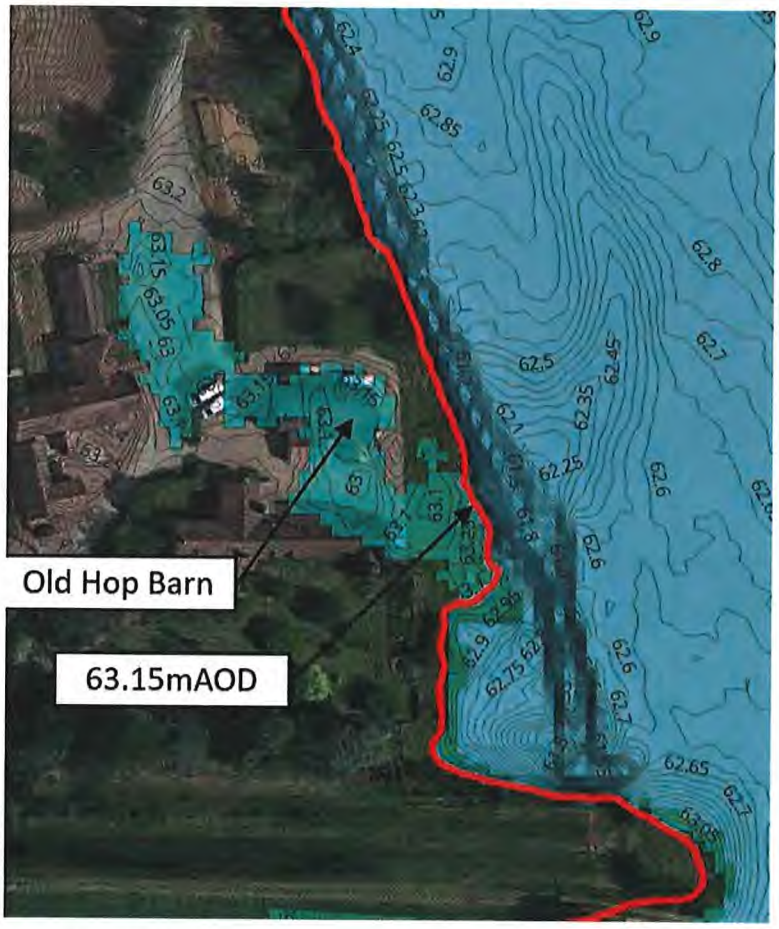


Figure 3-6: Flood extents for 1%AEP+49%cc flood level

The more extreme 0.1%AEP or 1 in 1000-year RP event produces a peak water level of 63.20mAOD. From the LiDAR contouring it can be seen that parts of the river bank to the south of the barn are below this level and thus there would be a localised area of shallow likely static ponding around the Dutch Barn and the road to the west in this flood event, see Figure 3-7. In this event the footpath around the barn, plus the access driveway for the Dutch barn will have around 50mm of ponded water over the surface so access and egress even in this extreme event is possible. However, as the barn has a FFL of 63.45mAOD that is 300mm above ground level, the dwelling is not affected by this even more extreme event.

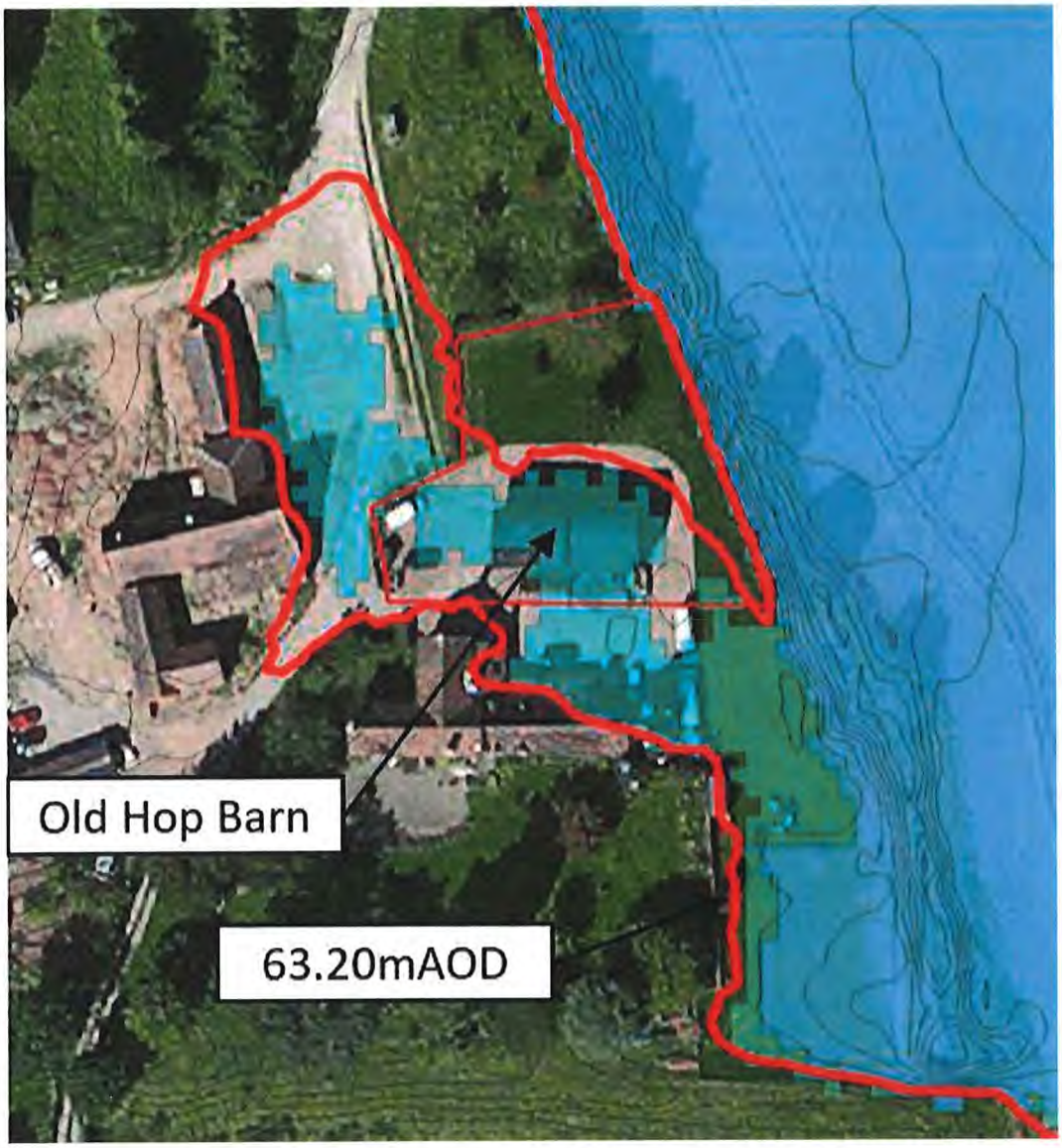


Figure 3-7: 0.1% flood level by comparison of DEFRA GIS against LiDAR contours

3.4 Surface Water Management Plan

3.4.1 General

As mentioned previously, the pre-development conditions of the Dutch barn do not include any below ground surface water drainage arrangements. With the slope of the land all of the rainfall that was not absorbed by the soil would enter the local stream along the eastern boundary of the site.

This section outlines a surface water management plan, designed to ensure that the proposed development does not lead to increased flood risk elsewhere. The proposed change of use includes the retention of a total of 201m² of impermeable roof area – corresponding to the unchanged roof of the barn.

As mentioned previously, due to the shallow groundwater level at the site, the surface water drainage strategy will take advantage of attenuation to slow the post-development runoff rates to pre-development greenfield runoff rates.

3.4.2 Design Philosophy and modelling outputs

Runoff attributable to the roof area of the barn (201m²), will be managed by an attenuation geo-cellular tank. The tank will be located to the east of the barn – see the drainage layout for both foul and surface water in Figure 3-8 and the pipework plus chambers layout in Figure 3-9. A full version of the pipework layout drawing is included in Appendix B.

Note that due to the very small site area the pre-development greenfield runoff rates are also very low – only 0.06 l/s for the 1 in 100-year event, see Table 2-4. This would require a very small flow control outlet diameter to meet such rates and that would increase the risk of blockage. This design therefore uses a minimum discharge rate of 2.0 l/s to match the value set in the council's SuDS Guidance. This flow rate allows the use of a Hydro-Brake vortex flow control with a clear opening size orifice of 72mm.This size of outlet is considered to decrease the risk of blockage significantly.

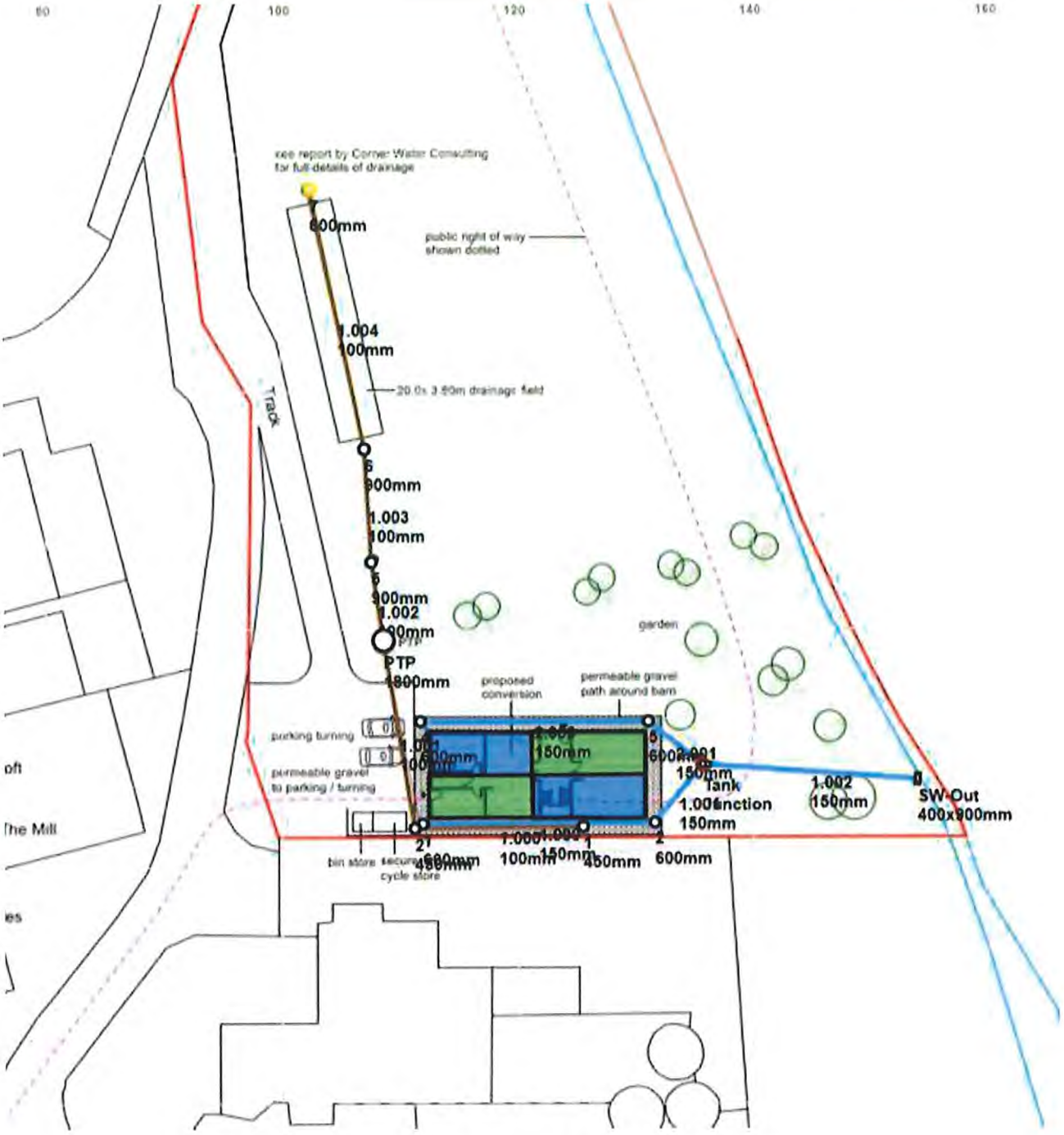


Figure 3-8: Drainage Layouts with SuDS Catchments Shaded

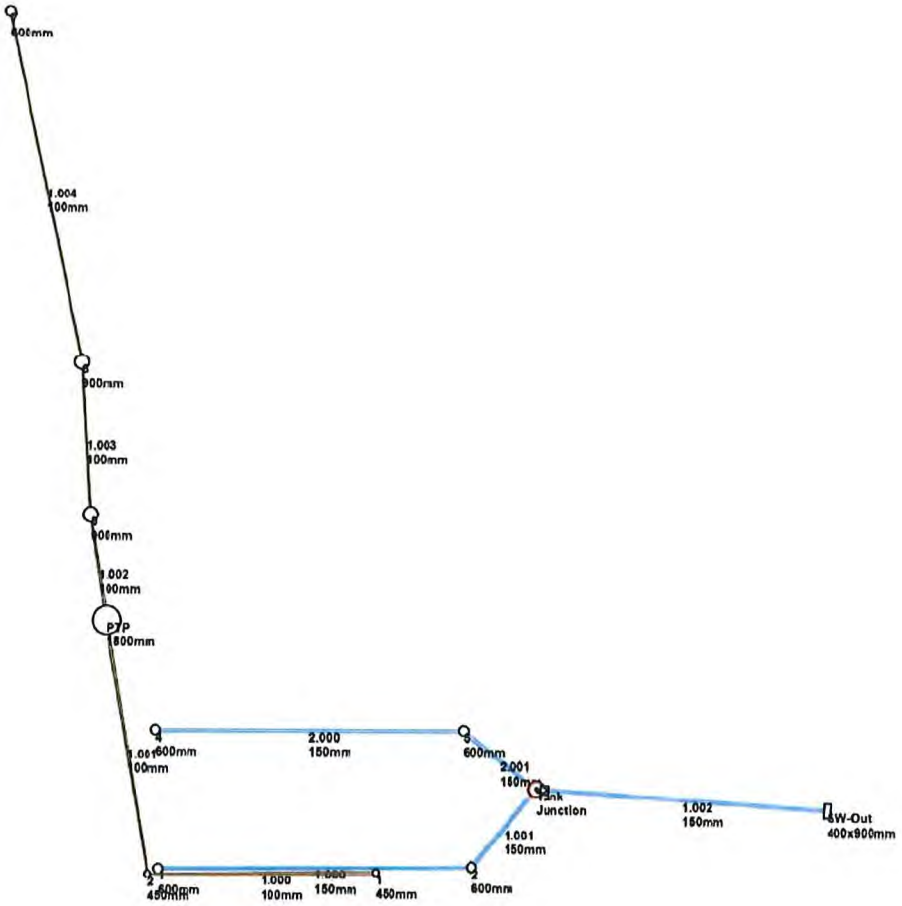


Figure 3-9: SW and Foul Drainage Pipework Plan

The characteristics of the attenuation structure were analysed using the Flow hydraulic modelling software by Causeway that is a widely used UK drainage systems hydraulic modelling software. The following conservative assumptions and design parameters were applied within the modelling:

- Rainfall intensity was obtained through the FEH methodology and increased by 45%, the NPPF recommended allowance for increase in rainfall due to climate change;
- The attenuation was designed to not flood for the 30-year event and to fully manage runoff from the 1:100-year rainfall event plus Climate Change, plus 10% creep, within the site boundary;
- An impermeable area of 201m^2 was considered for the SuDS design;
- A 1.0 runoff coefficient was used in the modelling, meaning that all the rainfall runoff generated by the roof is directed to the tank;
- No infiltration was assumed to occur through the sides or base of the attenuation;
- A minimum discharge rate of 2.0 l/s was assumed in the design, to accord with the council's SuDS Guidance, allowing a Hydro-Brake outlet diameter of 72mm – see Table 3-4.

Table 3-4 – Flow control details

Flow control	Reference	Outlet diameter (mm)	Design Flow (l/s)	Design Head (mm)
Hydro-Brake	CTL-SHE-0072-2000-0400-2000	72	2.0	700

The modelling results for the 4.0m by 3.2m and 660mm deep geo-cellular tank for the return periods of 1 in 2, 1 in 30 and 1 in 100-years are shown in Table 3-5 with the post development events allowing for Climate Change. The tank has an invert level of 62.20mAOD and will be fitted with a non-return valve, the outfall into the stream is set 200mm above the bed level. The results show that a maximum water level of 632mm is reached within the tank, with the full modelling report detailing the simulation and design settings, including a manhole plus pipework schedule, detailing flow controls and storage items being included in Appendix B.

Table 3-5 – Modelling outputs; maximum outflow rates and water levels

Return Period (years)	Pre-development	Post-development	
	Greenfield runoff rates (l/s)	Outflow runoff rates (l/s)	Maximum water depth (mm) *
1 in 2	0.02	1.4	62.257m or 57mm
1 in 30	0.04	2.0	62.533m or 333mm
1 in 100	0.06	2.0	62.832m or 632mm

* In respect to the invert level of the tank.

Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	62.834	0.034	3.1	0.0161	0.0000	OK
60 minute winter	2	54	62.832	0.524	3.3	0.1954	0.0000	SURCHARGED
15 minute winter	SW-Out	1	61.876	0.000	2.0	0.0000	0.0000	OK
15 minute winter	4	10	62.834	0.034	3.2	0.0164	0.0000	OK
60 minute winter	5	53	62.832	0.516	7.4	0.3051	0.0000	SURCHARGED
60 minute winter	Tank	54	62.832	0.647	8.7	7.8661	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	3.1	0.687	0.110	0.2023	
60 minute winter	2	1.001	Tank	2.4	0.549	0.104	0.1121	
15 minute winter	4	2.000	5	3.2	0.482	0.113	0.1995	
60 minute winter	5	2.001	Tank	6.4	1.092	0.242	0.1032	
60 minute winter	Tank	Hydro-Brake®	SW-Out	2.0				15.5

Figure 3-10: Results for 1 in 100-year plus CC plus Creep

3.5 Residual risks

Residual risks will comprise:

- Exceedance of design events; and
- Under performance due to poor maintenance.

Design exceedance and/or poor maintenance of the attenuation systems may lead to surcharging of the proposed geo-cellular tank. To mitigate possible silting of the pipework and of the attenuation tank itself, it is advised that a catchpit manhole chamber is located upstream of the attenuation tank. A regular inspection of the catchpit manhole should then be followed to remove any debris silted in the bottom of the feature.

Structures which manage surface water runoff require little maintenance; however, a regular maintenance schedule, on an annual basis and after heavy rainfall, should be established by the site owners to ensure the system remains in good working order. Table 3-6 shows recommended operation and maintenance activities for attenuation tanks, which is taken from 'The SuDS Manual' (CIRIA C753, 2015, Table 21.3 Pg.468). Maintenance and inspection of the attenuation system would be the responsibility of the property owners.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table 3-6: CIRIA Table 13.1: Operation and maintenance requirements for attenuation tanks

The drainage network and the tank have some spare capacity, but runoff flows from rainfall events with magnitude greater than the 1 in 100-year return period plus climate change (or in the event of blockage), exceedance flows will exceed the capacity. In these circumstances excess runoff will be unable to enter the drainage network and will travel as overland flow into the stream bordering the site to the East, which is what currently occurs due to the slope of the land – Figure 3-11.

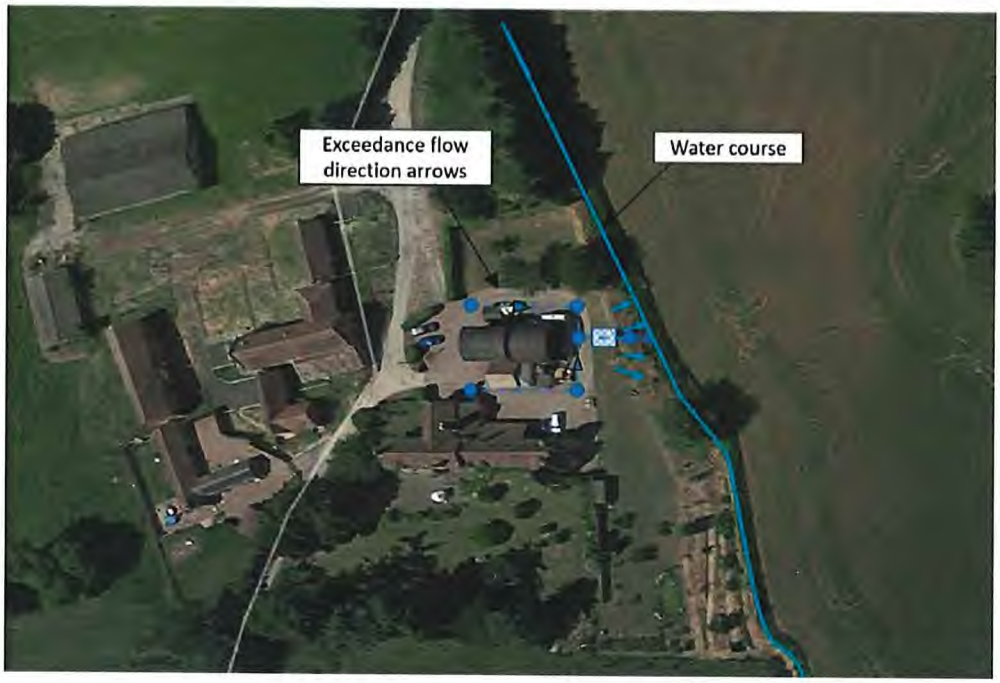


Figure 3-11 -Flow paths of exceedance flows

4. FOUL DRAINAGE STRATEGY

4.1 Background comments

As per Policy SD3 of Herefordshire Core Strategy, foul and surface water should be managed separately, which has been achieved. To reduce the amount of foul water flows generated the dwelling will incorporate water efficiency measures to achieve a maximum of 120 l/head/day, as required by planning policy and any planning approval.

There are no local public foul sewers, so following Policy SD4 a sewage package treatment plant (PTP) is proposed. Discharge into the soil has been considered as the groundwater level is 2.1m below ground level, plus the average indicative soil capacity is Vp = 29.8 sec/mm.

General Binding Rules for Small Sewage Discharges (SSDs) with effect from January 2015 state:

- the daily flow must be less than 2m^3/day – based on a 4-bed dwelling it will be 6 persons at a maximum design flow of 150 l/h/day so 0.9 m^3/day;
- the sewage must be domestic and be treated by a British Standard compliant septic tank or PTP;
- not located in a source protection zone – the closest is over 10km away in Ledbury and there are no boreholes nearby.

A drainage field should be offset from a dwelling, plus also set at least 10m away from the Eastern boundary stream.

The drainage field offsets are set out in various guidance: -

- positioned with a 7m offset from the dwelling as detailed in BS6297,
- or with a 15m offset as set out in the Building Regulations Part H.

The drainage field has been offset more than 15m from the dwelling.

The applicant has plenty of land available north of the barn conversion to locate the foul drainage systems, some was originally part of the previous planning applications red-line boundary, with some being as a result of a recent land purchase.

There is a hedged area immediately north of the barn that was in the previous applications red-line boundary, see Figure 2-3 and Figure 3-1, that extends 22m north from the face of the barn. As shown on the plan in Figure 4-1, there is a further 57m of land measured along the Eastern boundary that the applicant has purchased.

Figure 4-1: Land Ownership North of the Barn

Figure 4-2: Foul Drainage Layout

4.2 Primary and Secondary Foul Treatment

The foul water flows from the proposed residential dwelling will be given primary and secondary treatment via a UK certified sewage package treatment plant. Specifically, a Graf One2Clean unit that with all biological treatment processes can achieve a phosphate output concentration of 1.6 mg/l.

Finally in accordance with typical UK on site foul treatment systems the effluent will be given a final degree of aerobic treatment in a trench drainage field sized and constructed in accordance with BS6297, which will also discharge the flow into the subsoil. The proposed foul network is shown in Figure 4-2.

The design of the foul treatment is based on the following assumptions:

- The foul water flows are to be collected in a separate drainage system, then treated and discharged into the soil at the site. Any residual treated flow in the soil will sustain the adjacent orchard planting with water and nutrients;
- Any sewage treatment plant or septic tank should be sited at least 7m from any habitable parts of buildings to meet Building Regulations Part H;
- The property owners of the dwelling would be responsible for the management and maintenance of the foul drainage system serving the property and can ensure this is done effectively by employing a local experienced drainage contractor of which there are a number;
- According to Flows and Loads – 4 Code of Practice by British Water, the system should be designed for a total of 5PE each using 150l/h/day which will oversize the foul treatment elements as the Herefordshire average occupancy is 2.3 persons and the council planning policy will restrict water usage to 110 l/h/day. So, ignoring the design population which can account for family gatherings the difference in actual and design flow adds a factor of safety of 1.36.

4.3 Tertiary Foul Treatment

Following the PTP all foul effluent will enter a traditional stone trench drainage field. A drainage field should be offset from a dwelling, plus also set at least 10m away from the Eastern boundary stream. New orchard planting is proposed to the east of the drainage field.

For the buried foul drainage field design in this report the lowest average Vp value of 29.8 sec/mm has been used. Using the formula in BS6297 and 6 persons for a 4-bed dwelling, with a PTP the drainage field area required would be: -

Area of soil contact = Population (6 PE) x Vp (29.8 sec/mm) x 0.20 = 35.8m^2.

This can be provided as 40 linear m of 900mm wide trench, laid out as;

- 2nr trenches each at 20m long, covering an area of 3.8m x 20m.

The longer arrangement has been selected as it will allow a better distribution of residual foul flows into the soil to dampen the soil and support the orchard. All of the proposals are designed to avoid impacts on the local ecologically sensitive features and further to seek to improve matters.

As all foul water effluent from the new dwelling is given treatment plus is then fully utilised by an orchard via plant absorption and evapotranspiration this report assesses that the proposals will not have any negative impact on the water environment or other ecological receptors. The orchard is not in a location at risk of flooding. There will thus be no effluent nutrient plume.

PIA
Prüfinstitut für Abwassertechnik GmbH

PERFORMANCE RESULTS

Otto Graf GmbH
Carl-Zeiss-Str. 2 - 6, 79331 Teningen, Germany

EN 12566-3
Small wastewater treatment systems for up to 50 PT

Small wastewater treatment system one2clean
SBR plant in one two-zone polypropylene tank

Test report PIA2014-216B14.01.e

Nominal organic daily load*	0.27	kg/d
Nominal hydraulic daily load	0.75	m³/d
Material	polypropylene	

Treatment efficiency (nominal sequences)	Efficiency	Effluent
COD	84.2 %	43 mg/l
BOD_5	98.0 %	7 mg/l
SS	90.3 %	14 mg/l
NH_4-N**	98.3 %	0.5 mg/l
N_{ges}**	87.0 %	7.9 mg/l
P_{ges}	80.2 %	1.6 mg/l

Electrical consumption 0.53 kWh/d

*At a test influent of ≥ 300 mg/l BOD_5 (mean)
**determined for temperatures ≥ 12°C in the bioreactor

Performance tested by

PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

This document replaces neither the declaration of performance nor the CE marking

DAkkS

Figure 4-3: Test Certification for Graf One2Clean

4.4 Ecological and Nutrient Impacts

The site is not located in or within 500 metres of a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, biological Site of Special Scientific Interest (SSSI), freshwater pearl mussel population, designated bathing water, or protected shellfish water; 200 metres of an aquatic local nature reserve; 50 metres of a chalk river or aquatic local wildlife site. Therefore, it meets the ecological requirements of the General Binding Rules.

The site is located in the Red Zone of the council's River Wye/River Lugg catchment map, thus it is within the River Lugg Catchment. Guidance from the council released in March 2023 entitled "Package Treatment Plants and Small Scale Impacts in the Lugg Catchment Herefordshire Council - Interim Guidelines" dated 17 March 2023 details the requirements for a small foul discharge to avoid impacting the water environment.

As detailed in Section 4.1 the daily flows are less than 2m³/day. The Wastewater Treatment design in this report achieves Nutrient Neutrality, as it has a zero-discharge arrangement for nutrients due to the orchard.

As part of the land usage changes proposed to benefit the environment there is a plan to create a small orchard as another element of the stand-alone mitigation strategy. The orchard strategy follows an approach that has been developed by Environmental Consultancy Halpin Robbins and that has been agreed with Natural England (John Stobart, Senior Conservation and Planning Manager), whereby orchards planted downgradient of a drainage field act to remove any additional phosphorus exported to the environment.

For a single dwelling with flows treated via a Graf package treatment plant, the people inside the building generate 0.16 kg TP/year, see Figure 4-4, which is Stage 1 of the Natural England River Lugg nutrient calculator. This impact should be given a 20% buffer – so mitigation should account for 0.19 kg TP/year.

Stage 1

User Inputs

Date of first occupancy:	01/08/2024	
Average occupancy rate:	2.30	
Water usage (litres/person/day):	120	
Development Proposal (dwellings/units):	1	
Wastewater treatment works:	Package Treatment Plant user defined	
Wastewater treatment works P permit (mg TP/litre):	Please enter value in cell to the right:	1.6

Stage 1 Calculated Loading

Additional population	2.3	people
Wastewater by development	276	litres/day
Annual wastewater TP load	0.16	kg TP/yr

Figure 4-4: Nutrient Impact Due to People

4.5 Nutrient Mitigation

As part of the land usage changes proposed to benefit the environment, there is a proposal to create a small orchard of apple trees as another element of nutrient mitigation strategy, as apples trees have a relatively high phosphorous absorption rate and are a traditional crop in Herefordshire. The orchard strategy follows an approach that has been developed by Environmental Consultancy Halpin Robbins and that has been agreed with Natural England (John Stobart, Senior Conservation and Planning

Manager), whereby orchards planted downgradient of a drainage field act to remove any additional phosphorus exported to the environment.

This also accords with Herefordshire Council Ecology Team comments on planning application 212634 - Proposed Two Detached Single Storey Dwellings In Cartshed Form At Two Hoots, Bush Bank, Herefordshire, HR4 8EJ. These comments related to the benefit of orchards in absorbing nutrients and were: -

"*The location of the mound within an active commercial orchard will further reduce any potential for phosphate pathways as the growing trees require phosphate as part of their nutrient requirements.*"

Therefore, with the small orchard in place adjacent to the foul drainage field the development will not create any additional nutrient impact to an area beyond the locality of the drainage field. Thus, there will be no in combination effects affecting the water environment.

From research undertaken and provided by Halpin Robbins into commercial varieties each Braeburn apple tree absorbs between 0.0487 and 0.074 kg TP/year, see Table 4-1. In this assessment the lowest values in the range have been used – in line with the precautionary principle required by Natural England and in relation to an HRA or Appropriate Assessment.

Below is a table detailing the lowest specific absorption for a number of different tree types, as agreed with Natural England.

The proposed mitigation/benefit at this site is to plant a minimum of 5 Braeburn apple trees as this will absorb 0.24 kg TP/year which is more than the maximum amount of phosphates that will enter the drainage field – taken as 0.19 kg TP/year with a 20% safety factor or buffer. The Braeburn trees should be a minimum of 1.5m high with a minimum age of 2 years.

Table 4-1 – Fruiting Trees Phosphate Absorption Capacity

Type of Tree	Average Phosphorus Absorption in the Fruit Crop per Tree (kg/tree/year)	Number of Trees	Phosphorus Absorption (kg/year)
Braeburn (apple)	0.0487	5	0.24
Cherries, sweet	0.0018		
Pears	0.0013		
Medlar	0.0060		
Quince	0.0024		
Hazelnuts	0..078		
Walnuts	0.1580		
Total P Uptake			**0.24**

An example of an approved application in Somerset is the first application that was accepted - application number 36/21/0017 in Stoke St Gregory in Somerset West and Taunton that was reviewed and approved by the Natural England Wessex Team.

The planning authority is now Somerset Council. Link to the council planning website:

Planning application search (somersetwestandtaunton.gov.uk)

5. SUMMARY AND CONCLUSIONS

A summary of the main conclusions for this FRA, SWMP and FDS is presented below:

- The site is at 'low' to 'medium' risk of flooding from all sources.
- The proposed development will consist of 201m² of retained impermeable roof area; corresponding to the roof area of the Dutch Barn – with other areas of roof removed.
- The generalised Soilscapes indicated soils at the site to be 'freely draining flood plain' to the East of the Dutch barn, and 'slightly impeded drainage clayey soils' to the West of the barn.
- Ground investigations showed groundwater level to be 2.1m BGL, so deeper traditional concrete soakaways are thus not viable - but shallow infiltration SuDS such as the permeable pathways around the barn can be considered.
- It is recommended that surface water runoff generated in the roof of the barn is managed by a geo-cellular attenuation tank, located to the east of the building. A 4.0m by 3.2m by 660mm deep tank was shown to be able to manage runoff up to the 1 in 100-year return period event.
- The attenuation tank is to be maintained by the property owners, and exceedance flows from around the barn are unlikely to cause a threat to buildings as these will follow the slope of the land eastwards and also south-eastwards to the stream that is on the eastern site boundary.
- Foul water flows are to be fully treated within the site using a biological PTP. In this design the foul flows from the PTP then enter a traditional stone trench drainage field north of the dwelling.
- To ensure that any residual nutrients in the treated flows are completely absorbed at the site, and do not reach the adjacent stream, a small orchard will be planted to the east of the drainage field. Thus the barn will have zero nutrient impact.
- Both the surface water and the foul water drainage systems will have to be maintained through their design life. The responsibility to conduct and arrange such maintenance falls with the property owners.

6. REFERENCES

Author	Date	Title/Description
Centre for Ecology and Hydrology.		The Flood Estimation Handbook Web Service
WHS	2016	Revitalised Flood Hydrograph Model ReFH2: Technical Guidance.
CIRIA	2015	The SUDS Manual - CIRIA Report C753.
Department for Levelling Up, Housing and Communities	2012	National Planning Policy Framework - Planning practice guidance
Ministry of Housing, Communities & Local Government	July 2021	National Planning Policy Framework
DEFRA	March 2023	River and Rainfall Climate Change Values Wye Management Catchment Climate change allowances for peak river flow in England (data.gov.uk)
Berrys and Greenaway Planning		Planning appeal in relation to seven dwellings with garages to the west of Monksbury Court.
HM Government	2022	The Flood Map for Planning Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)
HM Government	2022	Long Term Flood Risk for England https://check-long-term-flood-risk.service.gov.uk
CIRIA	2015	The SUDS Manual – CIRIA Report C753
Herefordshire Council	June 2018	Sustainable Drainage Systems (SuDS) Handbook
Herefordshire Council	March 2023	Package Treatment Plants and Small-Scale Impacts in the Lugg and Clun Catchment, Herefordshire Council - Interim Guidance (January 2023), version 2 dated March 2023.
Herefordshire Council	March 2023	Nutrient management – Herefordshire Council Nutrient management - guidance for developers – Herefordshire Council Nutrient neutrality private mitigations – Herefordshire Council Willow wetland systems – Herefordshire Council
British Water	2013	Flows and Loads version 4
HM Government	2015	The Building Regulations 2010 – Drainage and Waste Disposal Approved Document H, 2015 Edition
British Standards	2008	BS 6297 Code of practise for the design and installation of drainage fields for use in wastewater treatment
Natural England	March	Letter - Advice for development proposals with the potential to affect water quality resulting in adverse

	2022	nutrient impacts on habitats sites
Natural England	Feb 2015	NERC170 The impact of phosphorus inputs from small discharges on designated freshwater sites
Natural England	Feb 2015	NECR171 Development of a risk assessment tool to assess the significance of septic tanks around freshwater SSSIs
Natural England	March 2015	NECR179 A review of the effectiveness of different on-site wastewater treatment systems and their management to reduce phosphorus pollution
Natural England	Sept 2016	NECR221 Phosphorous in Package Treatment Plant effluents
Natural England	Sept 2016	NECR 222 Development of a Risk Assessment Tool to Evaluate the Significance of Septic Tanks Around Freshwater SSSIs

Appendix A: Ground investigations report

PROCURO
PLANNING SERVICES
TOWN AND COUNTRY PRACTICE, PROCEDURE AND LAW

Ground and Foul Water Infiltration Test Result Document

MRS CAROLINE BORLEY

Monksbury Court Farm
Monkhide Village Road
Monkhide
Ledbury
HR8 2TU

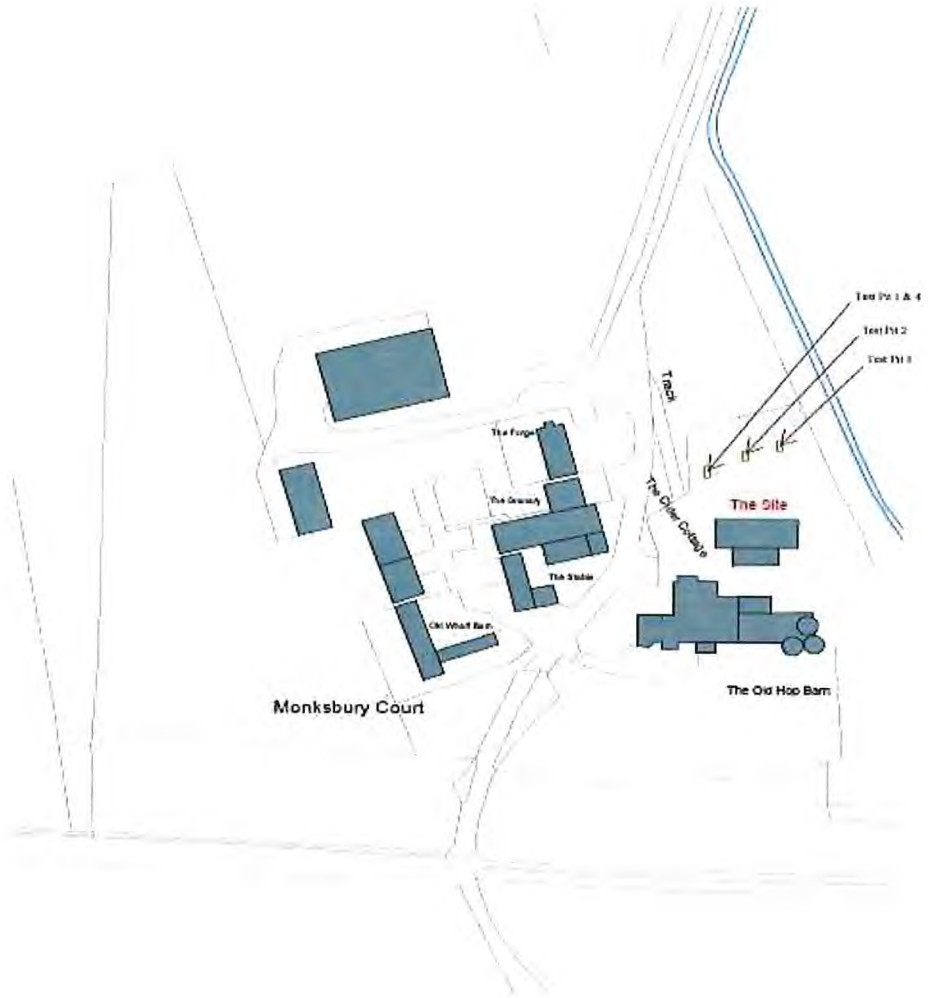
Date Carried Out

5th August 2019

R/O: Procuro, St.Owens Cross, Hereford, HR2 8LG
Tel: +44 (0) 1989 730700 **Email:** pps@procuroplanning.com
Co. Reg. No. 7266519 **V.A.T. Reg. No.** 991 9382 65
www.procuroplanning.com

Borley Ground and Foul Water Infiltration Test Document

Scope



Four Pits were dug

1. Foul Water Drainage Test Pit
2. Ground Water Test Pit
3. Surface Water Drainage Test Pit
4. Surface Water Drainage Test Pit

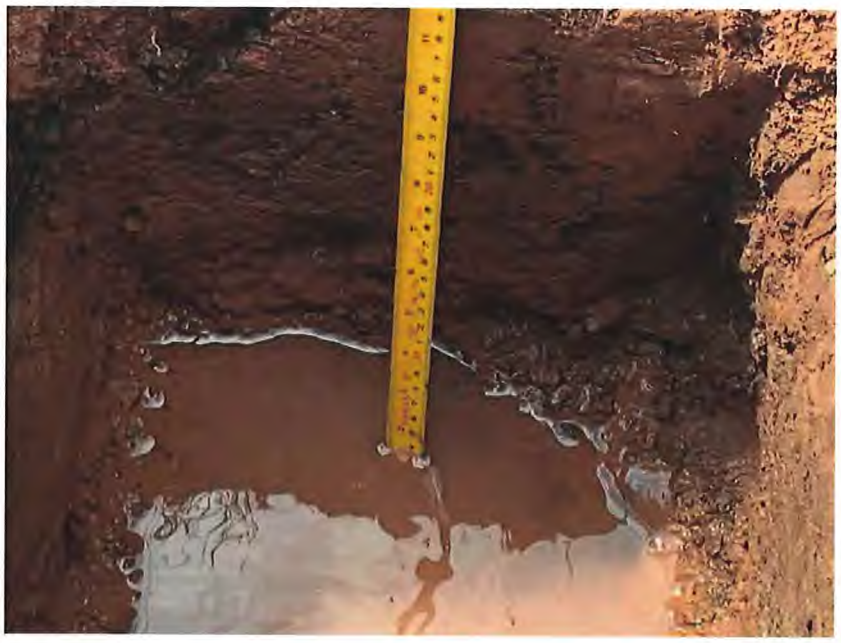
The following results were recorded with Supporting Photographs.

TRIAL PIT 1, Foul water percolation test. Date of Testing: 5th August 2019

This pit was excavated on Monday 5th October 2019 at 13:13 to a depth of 700 mm a further square hole was dug at the bottom of this pit to 300mm square. This square hole was filled with water to a depth of 155 mm.

At 13.51 the water level in Trial Pit 1 was recorded at 80mm

At 14:16 the water level in Trial Pit 1 was recorded at 40mm



At 14:18 Trial Pit 1 was refilled with water to 200mm

At 15:28 the water level in Trial Pit 1 was recorded at 100mm
This trial was ended at this time.

Image of soil type at Test Pit 1

TRIAL PIT 2 Ground Water Assessment. Date of Testing: 5th August 2019

This pit was dug to a depth of 2.5 meters at 12:53 on Monday 5th August 2019

This pit was inspected again on Monday 5th August 2019 at 17:44 and found to ground water to a depth of 400mm as indicated by the following pictures measuring from bottom of pit and from surface of water. This trial was ended at this time.

Image of soil type at Test Pit 2

TRIAL PIT 3 BRE365 Infiltration test. Date of Testing: 5th August 2019

This pit was excavated on Monday 5th August 2019 at 13:20 to a depth of 1.5 meters and filled to a depth of 0.7 meters with water.

At 14:40 the water level in Trial Pit 3 was recorded at 0.65m

At 15:45 the water level in Trial Pit 3 was recorded at 0.49m

At 16:21 the water level in Trial Pit 3 was recorded at 0.44m

At 17:43 the water level in Trial Pit 3 was recorded at 0.37m. This trial was ended at this time

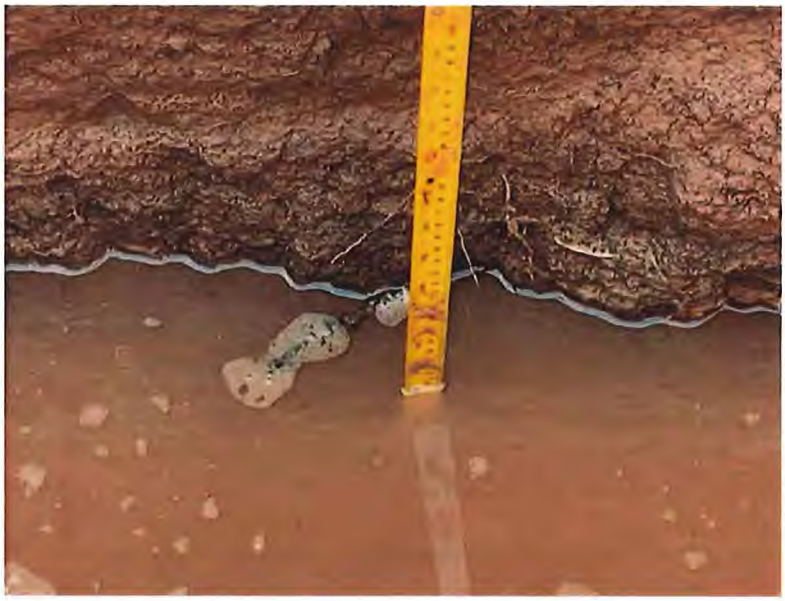
Image of soil type at Test Pit 3

TRIAL PIT 4 BRE365 Infiltration test. Date of Testing: 5th August 2019

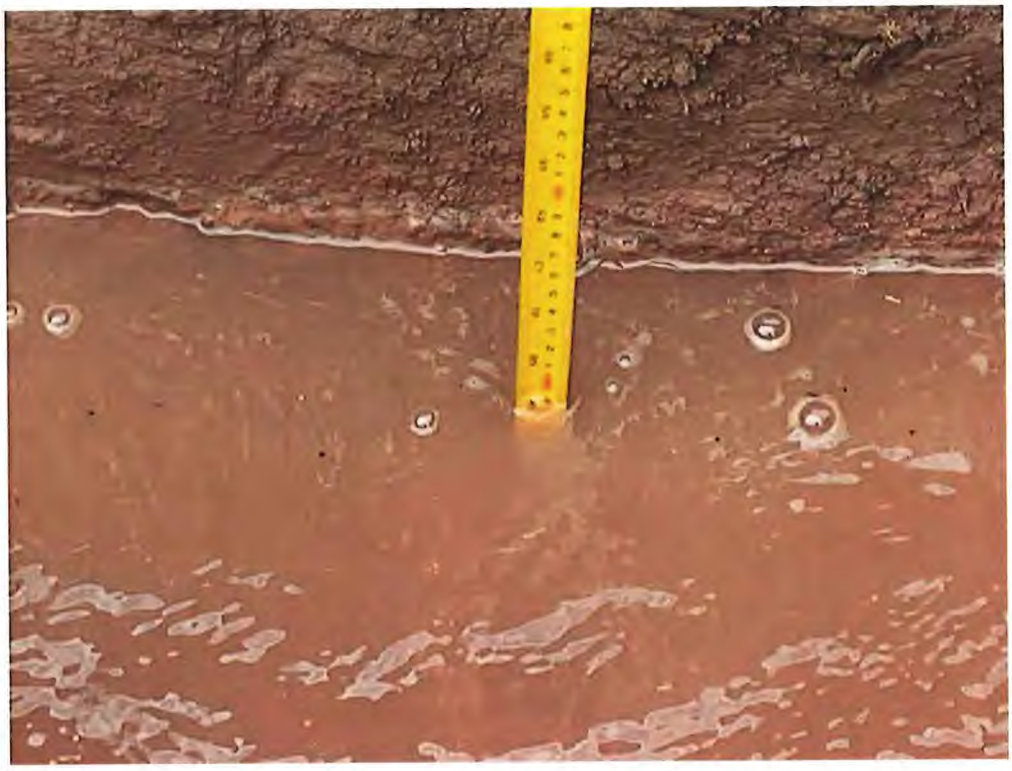
This pit was excavated by enlarging the Trial Pit 1 position on Monday 5th August 2019 at 15:33 to a depth of 1.5 meters and filled to a depth of 1 meter with water.

At 15:53 the water level in Trial Pit 4 was recorded at 0.69m

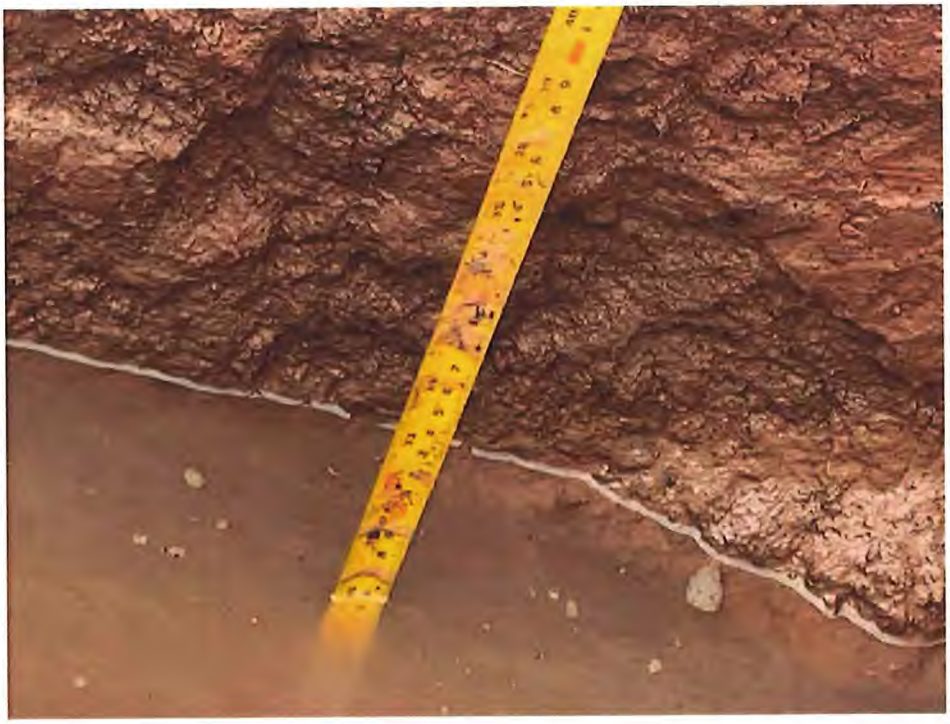
At 16:22 the water level in Trial Pit 4 was recorded at 0.63m



At 16:42 the water level in Trial Pit 4 was refilled to 1m



At 16:52 the water level in Trial Pit 4 was recorded at 0.76m



At 17:47 the water level in Trial Pit 4 was recorded at 0.64m. This trial was ended at this time.

Image of soil type at Test Pit 4

Panoramic view of test site

TABLE OF RESULTS

Trial Pit 1 Results, Foul water percolation test. Date of Testing: 5th Aug 2019

Length	1000mm with 300mm length hole at bottom		
Width	500mm with 300mm width hole at bottom		
Depth	700mm with 300mm deep hole at bottom		
	Time	Water Level (mm)	Notes
Start	13:13	155	
Interval 1	13:51	80	
Interval 2	14:16	40	
Refilled	14:18	200	
Interval 3	15:28	100	Trial Finished

Trial Pit 2 Results, Groundwater Assessment. Date of Testing: 5th Aug 2019

Length (m)	1.5		
Width (m)	0.5		
Depth (m)	2.5		
	Time	Water Level (mm)	Notes
Start	12:53	0	
1			
2			
Finish	17:44	400	Trial Finished

TRIAL PIT 3, BRE365 Infiltration test. Date of Testing: 5th August 2019

Length (m)	1		
Width (m)	0.5		
Depth (m)	1.5		
	Time	Water Level (m)	Notes
Start	13:20	0.7	
Interval 1	14:40	0.65	
Interval 2	15:45	0.49	
Interval 3	16:21	0.44	
Finish	17:43	0.37	Trial Finished

TRIAL PIT 4, BRE365 Infiltration test. Date of Testing: 5th August 2019

Length (m)	1		
Width (m)	0.5		
Depth (m)	1.5		
	Time	Water Level (m)	Notes
Start	15:33	1.0	
Interval 1	15:53	0.69	
Interval 2	16:22	0.63	
Interval 3	16:42	1.0	Refilled
Interval 4	16:52	0.76	
Interval 5	17:47	0.64	Trial Finished

Leigh Martin
7.8.19

Appendix B: Drainage Hydraulic Modelling

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.200
CV	1.000	Preferred Cover Depth (m)	0.200
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.003	4.00	63.150	600		111.906	63.616	0.350
2	0.003	4.00	63.150	600		131.603	63.734	0.842
SW-Out			63.500	400	900	153.934	67.344	1.624
4	0.003	4.00	63.150	600		111.710	72.259	0.350
5	0.012	4.00	63.150	600		131.065	72.256	0.834
Tank			63.300			135.672	68.633	1.115

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	19.697	0.600	62.800	62.308	0.492	40.0	150	4.21	136.7
1.001	2	Tank	6.368	0.600	62.308	62.202	0.106	60.0	150	4.29	136.7
2.000	4	5	19.355	0.600	62.800	62.316	0.484	40.0	150	4.20	136.7
2.001	5	Tank	5.861	0.600	62.316	62.185	0.131	44.7	150	4.27	136.7
1.002	Tank	SW-Out	18.307	0.600	62.185	61.876	0.309	59.2	150	4.52	136.7

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	1.596	28.2	1.5	0.200	0.692	0.003	0.0	24	0.854
1.001	1.301	23.0	3.3	0.692	0.948	0.007	0.0	38	0.927
2.000	1.596	28.2	1.6	0.200	0.684	0.003	0.0	24	0.854
2.001	1.508	26.7	7.3	0.684	0.965	0.015	0.0	54	1.289
1.002	1.309	23.1	10.6	0.965	1.474	0.021	0.0	71	1.280

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	19.697	40.0	150	Circular	63.150	62.800	0.200	63.150	62.308	0.692
1.001	6.368	60.0	150	Circular	63.150	62.308	0.692	63.300	62.202	0.948
2.000	19.355	40.0	150	Circular	63.150	62.800	0.200	63.150	62.316	0.684
2.001	5.861	44.7	150	Circular	63.150	62.316	0.684	63.300	62.185	0.965

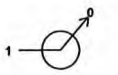
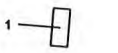
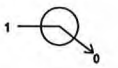
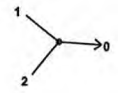
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600		Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	Tank			Junction	
2.000	4	600	Manhole	Adoptable	5	600		Manhole	Adoptable
2.001	5	600	Manhole	Adoptable	Tank			Junction	

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)
1.002	18.307	59.2	150	Circular	63.300	62.185	0.965	63.500	61.876	1.474

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Node Type	MH Type
1.002	Tank		Junction		SW-Out	400	900	Manhole	Headwall

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)
1	111.906	63.616	63.150	0.350	600					
							0	1.000	62.800	150
2	131.603	63.734	63.150	0.842	600			1	1.000	62.308	150
								0	1.001	62.308	150
SW-Out	153.934	67.344	63.500	1.624	400	900		1	1.002	61.876	150
4	111.710	72.259	63.150	0.350	600					
							0	2.000	62.800	150
5	131.065	72.256	63.150	0.834	600			1	2.000	62.316	150
								0	2.001	62.316	150
Tank	135.672	68.633	63.300	1.115				1	2.001	62.185	150
								2	1.001	62.202	150
								0	1.002	62.185	150

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	3600	Check Discharge Volume	x
Analysis Speed	Normal	Additional Storage (m³/ha)	20.0		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	45	10	0

Node Tank Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Downstream Link	1.002	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0072-2000-0700-2000
Invert Level (m)	62.185	Min Outlet Diameter (m)	0.100
Design Depth (m)	0.700	Min Node Diameter (mm)	1200
Design Flow (l/s)	2.0		

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	3.0	Invert Level (m)	62.185
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	53

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	12.8	0.0	0.660	12.8	0.0	0.661	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	62.814	0.014	0.5	0.0064	0.0000	OK
15 minute winter	2	10	62.329	0.021	1.0	0.0078	0.0000	OK
15 minute winter	SW-Out	1	61.876	0.000	1.4	0.0000	0.0000	OK
15 minute winter	4	10	62.814	0.014	0.5	0.0064	0.0000	OK
15 minute winter	5	10	62.346	0.030	2.3	0.0168	0.0000	OK
30 minute winter	Tank	22	62.257	0.072	2.5	0.8783	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)
15 minute winter	1	1.000	2	0.5	0.432	0.018	0.0230	
15 minute winter	2	1.001	Tank	1.0	0.624	0.043	0.0205	
15 minute winter	4	2.000	5	0.5	0.314	0.018	0.0318	
15 minute winter	5	2.001	Tank	2.3	0.955	0.086	0.0278	
30 minute winter	Tank	Hydro-Brake®	SW-Out	1.4				1.9

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	62.827	0.027	2.0	0.0125	0.0000	OK
30 minute winter	2	29	62.533	0.225	3.2	0.0820	0.0000	SURCHARGED
15 minute winter	SW-Out	1	61.876	0.000	2.0	0.0000	0.0000	OK
15 minute winter	4	10	62.827	0.027	2.0	0.0125	0.0000	OK
30 minute winter	5	29	62.533	0.217	7.1	0.1222	0.0000	SURCHARGED
30 minute winter	Tank	29	62.533	0.348	8.8	4.2276	0.0000	SURCHARGED

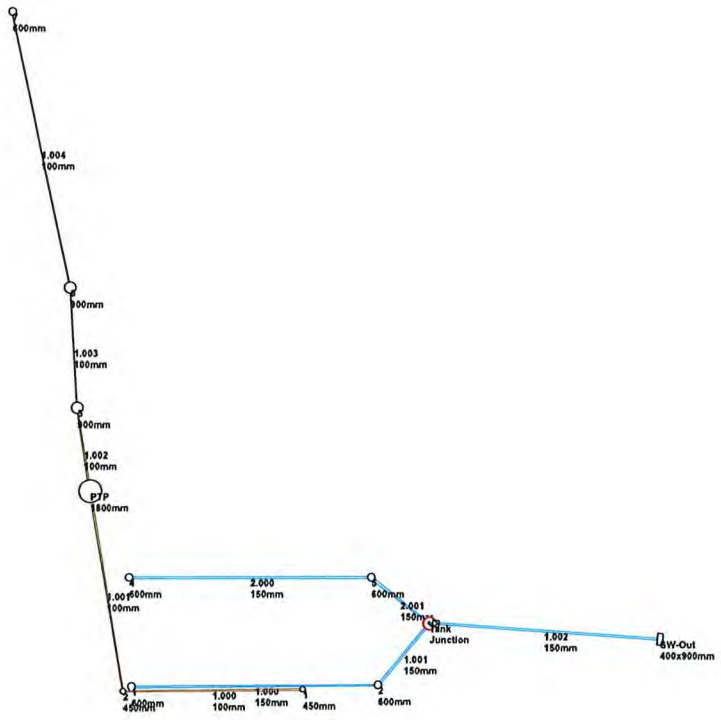
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	2.0	0.632	0.071	0.1859	
30 minute winter	2	1.001	Tank	2.7	0.557	0.117	0.1121	
15 minute winter	4	2.000	5	2.0	0.451	0.071	0.1833	
30 minute winter	5	2.001	Tank	6.8	1.087	0.256	0.1032	
30 minute winter	Tank	Hydro-Brake®	SW-Out	2.0				7.9

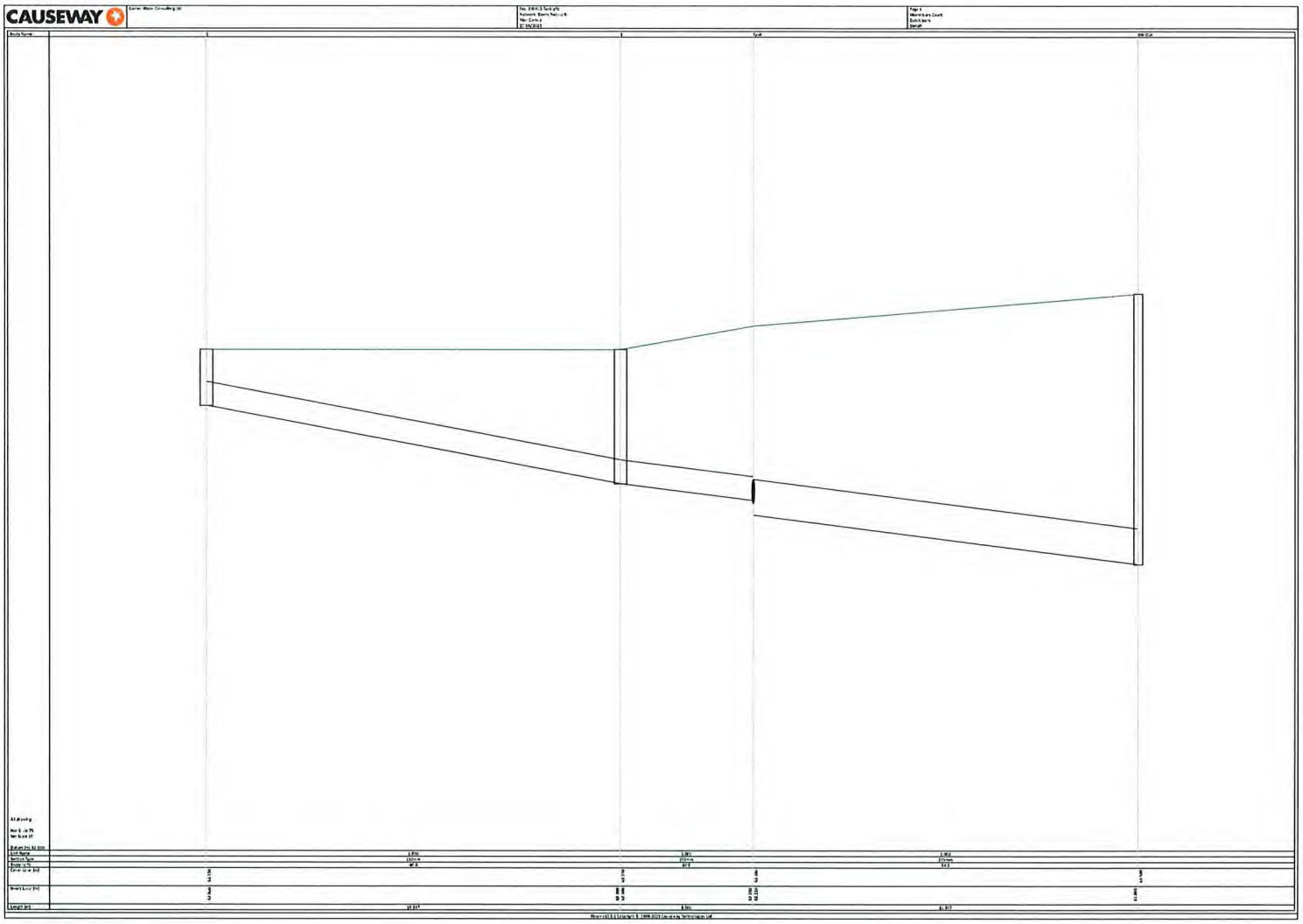
Results for 100 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

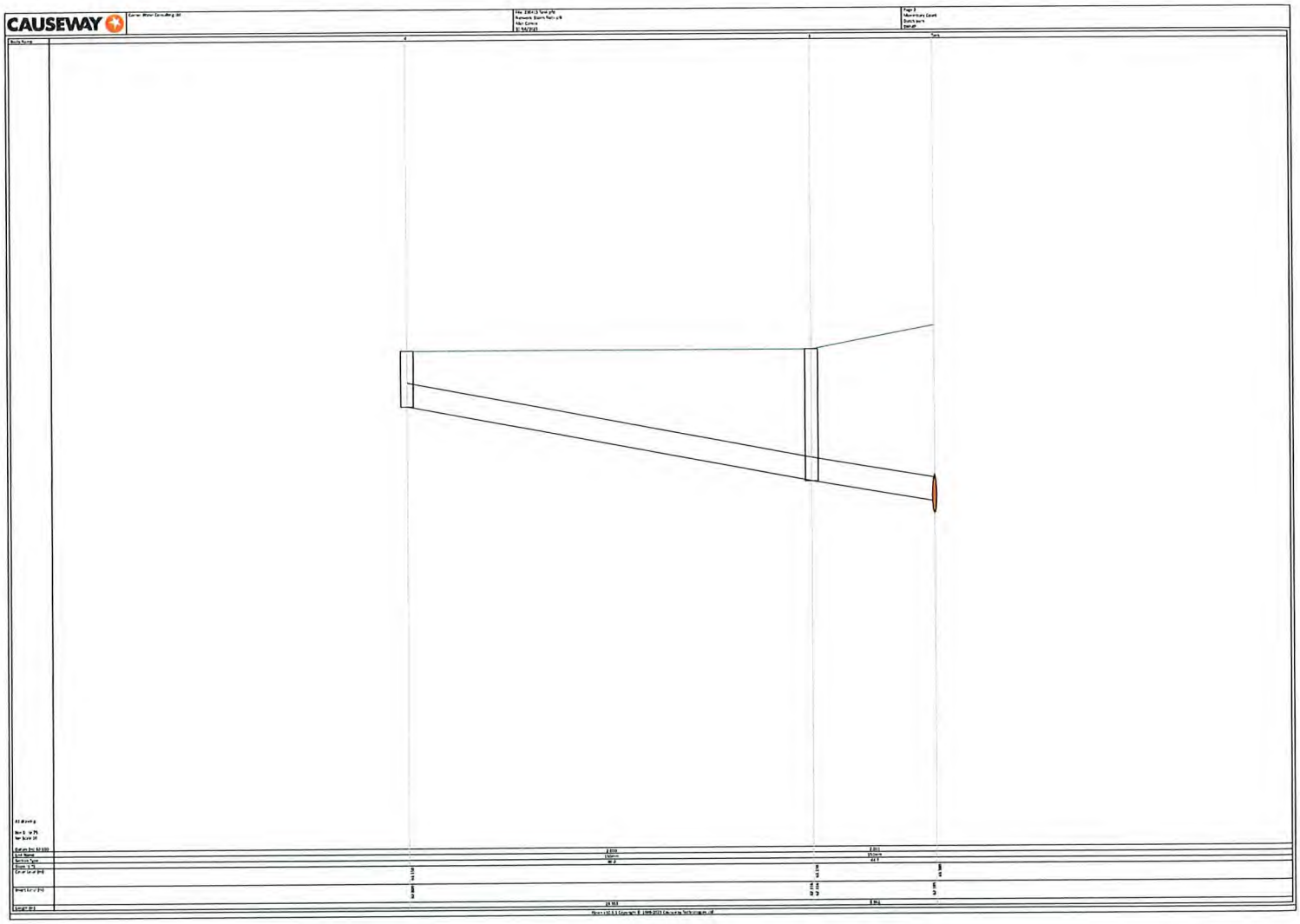
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	62.834	0.034	3.1	0.0161	0.0000	OK
60 minute winter	2	54	62.832	0.524	3.3	0.1954	0.0000	SURCHARGED
15 minute winter	SW-Out	1	61.876	0.000	2.0	0.0000	0.0000	OK
15 minute winter	4	10	62.834	0.034	3.2	0.0164	0.0000	OK
60 minute winter	5	53	62.832	0.516	7.4	0.3051	0.0000	SURCHARGED
60 minute winter	Tank	54	62.832	0.647	8.7	7.8661	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	3.1	0.687	0.110	0.2023	
60 minute winter	2	1.001	Tank	2.4	0.549	0.104	0.1121	
15 minute winter	4	2.000	5	3.2	0.482	0.113	0.1995	
60 minute winter	5	2.001	Tank	6.4	1.092	0.242	0.1032	
60 minute winter	Tank	Hydro-Brake®	SW-Out	2.0				15.5

CAUSEWAY	Corner Water Consulting Ltd	File: 231027 Orchard.pfd Network: Foul Alan Corner 15/11/2023	Page 1 Monksbury Court Dutch Barn Drainage Plan







Design Settings

Frequency of use (kDU)	0.50	Minimum Velocity (m/s)	1.00
Flow per dwelling per day (l/day)	4000	Connection Type	Level Soffits
Domestic Flow (l/s/ha)	0.0	Minimum Backdrop Height (m)	1.000
Industrial Flow (l/s/ha)	0.0	Preferred Cover Depth (m)	0.300
Additional Flow (%)	0	Include Intermediate Ground	✓

Nodes

Name	Dwellings	Cover Level (m)	Manhole Type	Easting (m)	Northing (m)	Depth (m)
1		63.150	Adoptable	125.545	63.392	0.400
2	1	63.150	Adoptable	111.216	63.250	0.639
PTP		63.250	Adoptable	108.609	79.097	0.940
5		63.300	Adoptable	107.589	85.696	1.073
6		63.400	Adoptable	107.028	95.227	1.292
7		63.400	Adoptable	102.504	117.111	1.404

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	1	2	14.330	1.500	62.750	62.511	0.239	60.0	100
1.001	2	PTP	16.060	1.500	62.511	62.310	0.201	80.0	100
1.002	PTP	5	6.678	1.500	62.310	62.227	0.083	80.0	100
1.003	5	6	9.547	1.500	62.227	62.108	0.119	80.0	100
1.004	6	7	22.347	1.500	62.108	61.996	0.112	200.0	100

Name	Pro Vel @ 1/3 Q (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Dwellings (ha)	Σ Units (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.000	0.860	6.8	0.0	0.300	0.539	0.000	0	0.0	0.0	0	0.000
1.001	0.146	0.744	5.8	0.0	0.539	0.840	0.000	1	0.0	0.0	7	0.206
1.002	0.146	0.744	5.8	0.0	0.840	0.973	0.000	1	0.0	0.0	7	0.206
1.003	0.146	0.744	5.8	0.0	0.973	1.192	0.000	1	0.0	0.0	7	0.206
1.004	0.104	0.469	3.7	0.0	1.192	1.304	0.000	1	0.0	0.0	8	0.151

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	14.330	60.0	100	Circular	63.150	62.750	0.300	63.150	62.511	0.539
1.001	16.060	80.0	100	Circular	63.150	62.511	0.539	63.250	62.310	0.840
1.002	6.678	80.0	100	Circular	63.250	62.310	0.840	63.300	62.227	0.973
1.003	9.547	80.0	100	Circular	63.300	62.227	0.973	63.400	62.108	1.192
1.004	22.347	200.0	100	Circular	63.400	62.108	1.192	63.400	61.996	1.304

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	450	Manhole	Adoptable	2	450	Manhole	Adoptable
1.001	2	450	Manhole	Adoptable	PTP	1800	Manhole	Adoptable
1.002	PTP	1800	Manhole	Adoptable	5	900	Manhole	Adoptable
1.003	5	900	Manhole	Adoptable	6	900	Manhole	Adoptable
1.004	6	900	Manhole	Adoptable	7	600	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	125.545	63.392	63.150	0.400	450				
						0	1.000	62.750	100
2	111.216	63.250	63.150	0.639	450		1	1.000	62.511	100
						0	1.001	62.511	100
PTP	108.609	79.097	63.250	0.940	1800		1	1.001	62.310	100
						0	1.002	62.310	100
5	107.589	85.696	63.300	1.073	900		1	1.002	62.227	100
						0	1.003	62.227	100
6	107.028	95.227	63.400	1.292	900		1	1.003	62.108	100
						0	1.004	62.108	100
7	102.504	117.111	63.400	1.404	600		1	1.004	61.996	100

Corner Water Consulting

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13675352

Contact

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APPENDIX B

Management Plan

Old Hop Barn Orchard Maintenance Plan

References

1. Planning Applications 231296 and 23397.
2. Barn Conversion to One Residential Dwelling, Monksbury Court, Monkhide, HR8 2TU Surface and Foul Water Drainage Strategy:
    A. Report Reference: CWC240-RP-01, Version 2a, dated 15 December 2023.
    B. Report Reference: CWC240-RP-01, Rev 3 Version 2a, dated 15 November 2023.
3. Unilateral Undertaking. (add reference)

1. Summary

This Orchard Maintenance Plan supports the proposal for a small orchard to be planted as part of a comprehensive Surface and Foul Water Drainage Strategy (see References 2.A and 2.B for the planned Barn Conversion to One Residential Dwelling at Monksbury Court Barns, Ledbury, HR8 2TU. The orchard is intended to be the final component in that strategy to ensure that nutrient neutrality is achieved to meet current regulations on foul water management.

This Orchard Maintenance Plan is supported by a Unilateral Undertaking (see Reference 3) which will provide a legal obligation on the property owners to maintain the orchard in perpetuity.

2. Nutrient Mitigation

It is proposed to create a small orchard of apple trees as another element of the nutrient mitigation strategy for the property. This is because apples trees have a relatively high phosphorous absorption rate and are a traditional crop in Herefordshire.

There have been several planning applications within Herefordshire, plus HRA assessments, where the foul drainage scheme includes a mitigating orchard (see approved applications 202984 and 223381). Therefore, with a small orchard in place adjacent to the foul drainage field, (diagram??) the development will not create any additional nutrient impact to an area beyond the locality of the drainage field. Thus, there will be no in combination effects impacting the water environment.

From research undertaken and provided by Halpin Robbins into commercial varieties each Braeburn apple tree absorbs between 0.0487 and 0.074 kg TP/year, see Table 1-1. In this assessment the lowest values in the range have been used – in line with the precautionary principle required by Natural England and in relation to an HRA or Appropriate Assessment.

Below is a table detailing the lowest specific absorption for a number of different tree types, as agreed with Natural England.

The proposed mitigation/benefit at this site is to plant a minimum of 5 Braeburn apple trees as this will absorb 0.24 kg TP/year, which is more than the maximum amount of phosphates

that will enter the drainage field – taken as 0.19 kg TP/year with a 20% safety factor or buffer.

Type of Tree	Average Phosphorus Absorption in the Fruit Crop per Tree (kg/tree/ year)	Number of Trees	Phosphorus Absorption (kg/year)
Braeburn (apple)	0.0487	5	0.24
Cherries, sweet	0.0018		
Pears	0.0013		
Medlar	0.0060		
Quince	0.0024		
Hazelnuts	0.0078		
Walnuts	0.1580		
Total			**0.24**

Table 1-1 – Fruiting Trees Phosphate Absorption Capacity

Braeburn apple trees are proposed in the new orchard. These trees will be obtained from a long stablished grower - Frank P Mathews of Berrington, Tenbury Wells. The trees planted initially will be a minimum of 1.5m high and with a minimum age of 2 years.

The trees would be on MM106 rootstock giving semi-vigorous growth resulting in a height of approximately 4 metres after 10 years.

The Tree Council provide data on this type of apple tree as below, which will be followed.

> Name of rootstock: MM106 (semi-vigorous) Fruits: Apples (including cider) and Malus crab apples.
> Suitable for: half standards. Start fruiting: After three or four years. Ultimate height: 3-4m (10-13ft) x 4m(13ft).
> Growing conditions: Tolerant of a range of soils including grassed orchards and poor soils provided there is good drainage.
> Staking:5 years; longer in exposed locations. Spacing: 3.6m (12ft) with 4.5m (15ft) between the rows.

The apple trees will be set out in two parallel rows with the longest edge running East to West and parallel, but offset by 4m from the current hedge to avoid shading – see Figure 1-1 below.

Each tree is spaced a minimum of 3.6m apart. The rows will be 4.5m apart.

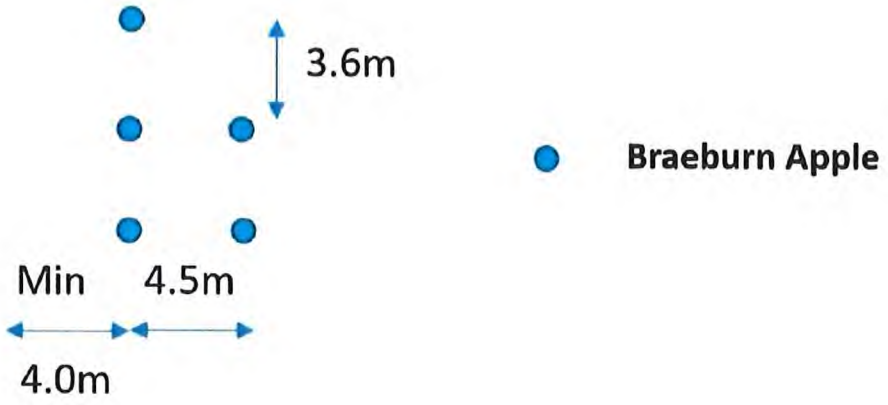


Figure 1-1: Orchard Layout

3. Maintenance of the New Orchard

The apple orchard is managed by this Maintenance Plan which will ensure that trees are inspected at least annually, damaged / diseased trees are replaced, fruit is harvested, and the trees are pruned annually.

Overall responsibility for the arranging the care and management of the orchard is with the dwelling and landowner. The landowner has the necessary equipment for grass cutting in the orchard and all cuttings will be removed from site and taken to local recycling facilities.

A local competent tree management company will be employed to carry out annual pruning (with removal from site and appropriate disposal of prunings) as well as the inspection of the trees.

Records will be kept throughout the lifespan of the orchard. A minimum of annual inspections shall be undertaken. The records will include but not be limited to; tree type and rootstock purchased, supplier name and details, age/dimensions of the trees, date of planting.

The ongoing inspection records will identify the date of the inspection, name of person or persons undertaking the inspection, any pruning or maintenance carried out in the period since the previous inspection and the dates thereof. The records will be kept safely, and will be plus provided to the council for review within 14 days of any request.

Trees Planting

The orchard will be managed and maintained to produce fruiting bodies relevant to the tree type. After the first 5 years the trees will be maintained as required to meet the then UK climate conditions. This would currently be that the fruiting trees should be pruned in winter between leaf fall and bud burst (between November and early March).

Planting - Year 1 (October to April)

Record tree type purchased, supplier and dimensions of the trees, plus date of planting.

Excavate a hole as recommended by tree supplier, but at least 5-10% wider than root ball of tree and equal to the root ball depth to be dug.

- Fork base and sides of hole to remove soil compaction.
- Plant tree with top of root ball at soil level.
- Excavated soil to be used to backfill around the root ball.
- Tree to be protected by a professional tree guard to prevent animal damage.
- Tree to be staked – with a stake at one third of the height of the tree. Place stake at 45-degree angle and attach to the trunk of the tree using an adjustable tree tie.
- Tree to be watered thoroughly on planting.

To reduce weeds that will compete for moisture, nutrients, space and light with the fruit trees, either an area around the tree will be kept bare of vegetation or mulching will be utilised around each tree. The mulch shall cover an area around the tree of at least 1 square metre.

The Tree Council recommend for apple trees that: -
"To help the fruit trees to establish it is important to keep the base of the tree largely free of weeds for at least five years. Mulching is the most efficient method of keeping weeds under control. Mulch should be applied immediately after planting, and one application of mulch is usually adequate for a number of years. However the trees will benefit from being remulched in years 2 or 3 and this is best applied early in the year when the ground is moist – but after all weeds have been cleared.

Mulch should be spread to a depth of 50 – 100mm and could be:

- wood chips – although not fresh ones because there is a danger of nitrogen loss from the soil as they degrade;
- composted bark;
- well-rotted lawn clippings – or grass clippings from the previous cut;
- leaf litter."

Management – Years 1 to 5 Winter

- Weed around base of trees (1m from base)
- Prune out dead, crossing or broken branches.
- Check tree ties, stakes and guards. Replace if needed.
- Remove and replace any trees that are dead or nearly dead.

Management – Years 1 to 5 Summer

- Check tree ties, stakes and guards. Replace as needed.
- Water trees twice weekly in periods of dry weather where it has not rained for 2 weeks.
- Harvest crop annually.

The tree supplier has detailed that pruning in first two years will be to determine a good strong framework and height of trunk. Thereafter, pruning will consist of removing any weak or crossing branches.

Management - Year 5

- Assess trees for establishment success, assess successes, and failures.
- Inspect trees for damage and ill health. Duplicate any tree that is severely damaged or in ill health by planting a new tree offset from the rest.
- Tree stakes and ties to be removed, if no longer required.
- Formative pruning should be carried out to ensure good shape on all trees.

Management - Year 6 to 10

- Annual inspection of trees for damage and ill health. Replace any tree that is severely damaged or in ill health by planting a new tree offset from the rest.
- Formative pruning if required.
- Harvest crop annually.

Management - Year 10 onwards

- Assess trees for continued success, plus consider any issues.
- Update management approach if required.
- Inspect and where necessary prune trees on an annual basis.
- Harvest crop annually.
- Annual inspection of trees for damage and ill health. Replace any tree that is severely damaged or in ill health by planting a new tree offset from the rest.
- Remove any trees that are dead.

Maintenance of Grassland Under Orchard

The management of the orchard also includes care of the grassland below and around the trees – with the grass to be mechanically cut as required through-out the year using a small mower.

Cutting close to the trees should only be done using hand tools during suitable weather conditions to not negatively affect the orchard trees through ground compaction or root disturbance.

If the grassed areas need to be restored any cultivating of the soil in preparation of reseeding should be limited to a depth of 125mm.

The trees themselves will require pruning, including to promote healthy growth. Smaller cuttings less than 50mm can be left within the orchard or removed. Anything larger than 50mm should be removed.

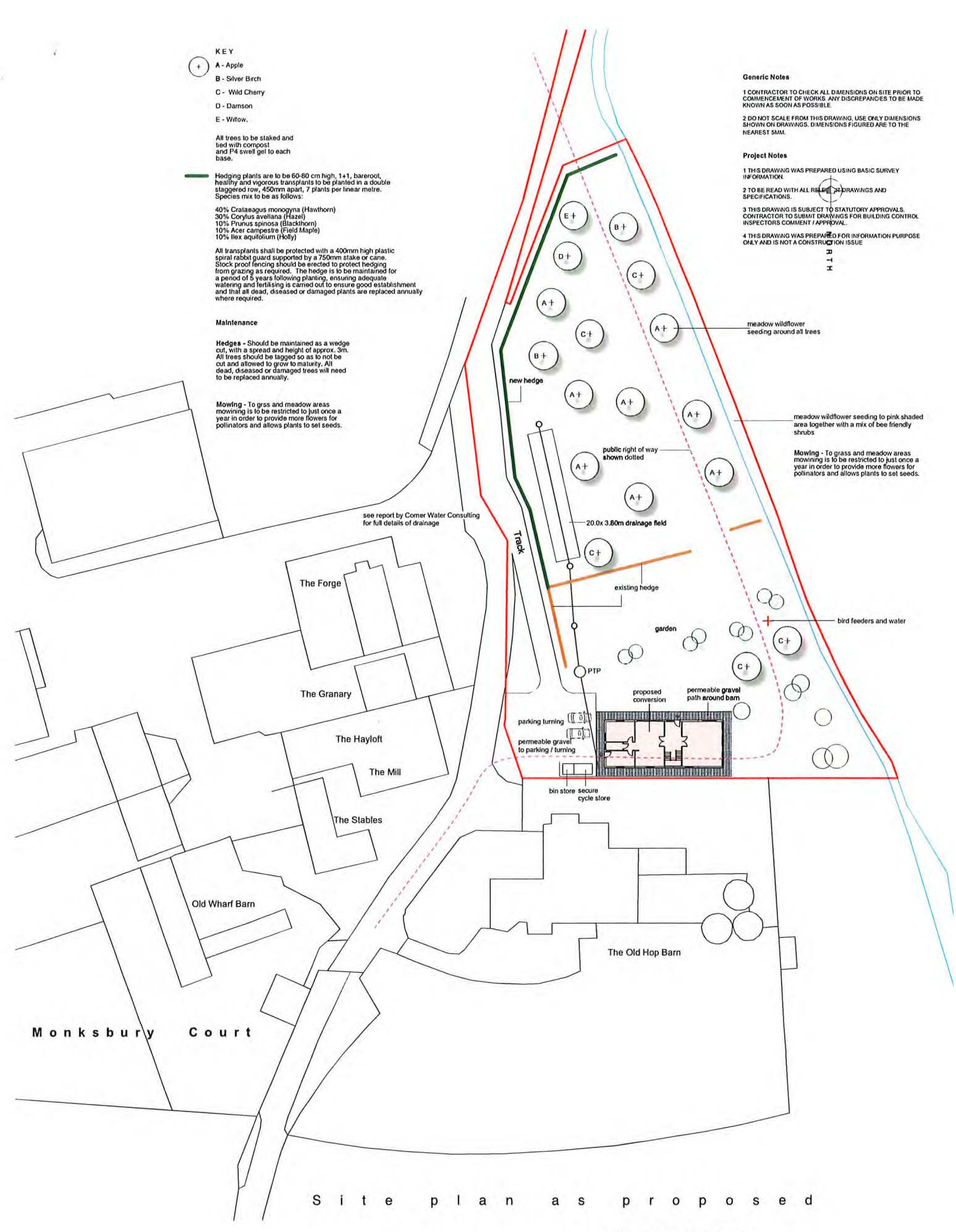
No fertiliser or mulching will be applied to the grassed areas.

Grass cuttings from the orchard will be removed and taken to the local recycling centre.

Unilateral Undertaking

A Unilateral Undertaking has been produced (see Reference 3) to ensure continued implementation of this Orchard Maintenance Plan. The Unilateral Undertaking is a legal document, agreed between the Council's legal team and the original owners, which levies an ongoing commitment to maintain the orchard in accordance with the Maintenance Plan, for as long as the orchard is in existence. Because it is a legal document, it will apply to all future owners of the property.

APPENDIX C
Plan



Site plan as proposed

C - Additional landscaping indicated - April 2024
B - Additional land indicated - November 2023
A - Willow bed indicated - June 2023

10 0 10 20 30 40 50
Metres

THOMAS MARGRETT
Architecture & Design
Old Field Barn, Kops Morsel, Ross-on-Wye, Herefordshire HR9 5TJ
Telephone 01989 750255, 07802 222 522

Conversion of Dutch Barn to single dwelling at Monksbury Court, Monkhide, HR8 2TU.
For For Mr & Mrs S. Maddison.

Site plan as proposed.

- This is not a complete working drawings for Planning and Building Regulation use only. Additional information may be required as the work proceeds.
- This is a scheme based on an enlarged O.S. extract and as such is subject to a site survey.
- Services and ground investigations were not available at the date of this drawing.
-

February 2023
Scale 1 :500 @ A3
- Preliminary
- First issue
- Revision

Drawing No
1896.01C

IN WITNESS of which the parties have executed this Deed on the date of first written above.

EXECUTED AS A DEED when)

THE COMMON SEAL OF)

THE COUNTY OF HEREFORDSHIRE)

DISTRICT COUNCIL

Was hereunto affixed **BY ORDER**)

[redacted]

Authorised Signatory :

[redacted]

14562

SIGNED as a **DEED** by
STEPHEN WILLIAM MADDISON
in the presence of [redacted]

Witness Name [redacted]
Signature of Witness [redacted]
Address [redacted]

SIGNED as a **DEED** by
PATRICIA MARGARET MADDISON
in the presence of [redacted]

Witness Name [redacted]
Signature of Witness [redacted]
Address [redacted]