BETTS HYDRO
CONSULTING ENGINEERS

BERRY HILL ROAD
ADDERBURY

FLOOD RISK ASSESSMENT AND DRAINAGE MANAGEMENT STRATEGY

For
Hollins Strategic Land
Suite 14
1 King Street
Manchester
M2 6AW

HSL | HOLLINS STRATEGIC LAND

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DRAINAGE MANAGEMENT STRATEGY

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Prepared by: [redacted]
Patrick Taylor BSc (Hons)
Graduate Flood Risk Analyst

Checked b [redacted]
Dominic Kearney BEng (Hons) MSc PhD
Principal Hydraulic Analyst

Authorised b [redacted]
Richard Nicholas BEng (Hons) MBA
Director

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041
www.betts-associates.co.uk

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EXECUTIVE SUMMARY

This Flood Risk Assessment and Drainage Management Strategy was commissioned by Hollins Strategic Land, referred to hereafter as 'the client'. This report has been prepared to support a planning application for the construction of residential development on land north of Berry Hill Road in Adderbury, Oxfordshire.

Flood Risk

The total site covers 4.00ha and is located wholly within Flood Zone 1 based on the Environment Agency Flood Zone Map for Planning. The proposals are for a residential development, which is classed as more vulnerable in Table 2: Flood Risk Vulnerability Classification within the Planning Practice Guidance (PPG). This nature of development is confirmed by the PPG to be appropriate within Flood Zone 1.

This report has reviewed all sources of flood risk to both the proposed development and to existing development. No historical flooding at the site was identified during the research or consultations undertaken as part of this assessment. The nearest Main River is Sor Brook located 80m to the north of the site, due to the difference in existing ground levels between the River and the site, the flood risk from this source is considered low. The flood risk associated with all sources is identified to be low.

Due to the low flood risks identified, the development is considered to be appropriate in accordance with the National Planning Policy Framework and Planning Practice Guidance. The principle focus of this assessment has been the effective management of surface water run-off, so not to increase flood risk elsewhere as a result of the development, this includes consideration of sustainable management options in accordance with national and local policy.

Drainage Strategy

In accordance with the drainage hierarchy there are three methods that have been reviewed for the appropriate management and discharge of surface water. These have been applied in the order of priority: discharge via infiltration, to a watercourse or to public sewerage system. Based on the ground conditions identified via web based resources, it is considered that infiltration would likely provide a surface water drainage solution for the whole of the site. Further Soakaway Testing (to BRE365) is required to confirm infiltration will be an appropriate surface water management solution for the run-off generated by the proposals.

As the substrata is identified to be favourable for infiltration, it is proposed to use this drainage method for management of surface water run-off generated by the development (subject to further testing). The specific drainage infrastructure will be confirmed during the detailed design stage following discussion with all relevant parties. It is advised that new soakaway(s) (or other infiltration methods) be implemented within the boundaries of site such being designed to BRE365 standard.

Should further testing at the site identify that infiltration will not offer a feasible surface water management solution then the next method in the hierarchical approach should be to discharge to a watercourse. Sor Brook is located approximately 80m north of the site and would provide an alternative connection for surface water run-off generated by the proposals. Detailed design will

be required to confirm feasibility of the strategy. Consents from the Environment Agency will also be required for any new outfall structure, along with agreements of proposed rates of discharge.

In accordance with the SuDS Manual (CIRIA 753) and the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) all sites (greenfield and brownfield) should endeavour to achieve as close to pre-development greenfield rates as is viable. If discharge to the watercourse is the surface management option, the development will reduce flood risk through restricting the discharge from site to 5l/s for all storm events. This restriction is based on the minimum constraint of a standard flow control device.

The restricted flow will generate a storage requirement during periods of intense rainfall. This will need to be considered in terms of onsite attenuation as part of detailed design following confirmation of the feasibility of infiltration. The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with overland run-off from storm events up to and including the 1 in 100yr return period event with a 40% allowance for climate change being contained onsite.

It would be beneficial to implement SuDS features including permeable surfaces and bio-filtration where at all feasible (subject to ground investigation and a detailed levels review). If designed appropriately the SuDS features could potentially aid in the attenuation requirements for the proposals and provide added benefits in terms of water quality. Detailed design will be required to confirm whether SuDS can be incorporated.

This report has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The Flood Risk Assessment & Drainage Management Strategy is considered to be commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance.

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APPENDIX N: NOTES OF LIMITATIONS.....

Specialist Software

- MicroDrainage WinDES (v.14.1) – Calculation of Greenfield run-off rates IH124/ICP-SUDS, Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability
BGL	Below Ground Level
BGS	British Geological Survey
CC	Climate Change
CDC	Cherwell District Council
CSAI	Cranfield Soil and Agrifood Institute
DMS	Drainage Management Strategy
EA	Environment Agency
FRA	Flood Risk Assessment
FZ	Flood Zone
Ha	Hectare
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	Metres Above Ordnance Datum
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NSRI	National Soil Resources Institute
OS	Ordnance Survey
OCC	Oxfordshire County Council
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
QSE	Quick Storage Estimate
QBAR	Mean Annual Flood
SFA	Sewers For Adoption
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Urban Drainage Systems
TW	Thames Water
TWL	Top Water Level
UKCIP	United Kingdom Climate Impacts Programme

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1.0 INTRODUCTION

1.1 Planning Policy Context

1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the NPPF and the supporting Planning Practice Guidance (PPG) (refer to extracts in **Appendix A**).

1.1.2 A Flood Risk Assessment and Drainage Management Strategy (FRA&DMS) has been completed in accordance with NPPF/PPG to review all sources of flood risk both to and from the proposed development. The report also considers the most appropriate drainage options including the implementation of Sustainable Drainage Systems (SuDS) in line with the recent changes to national policy.

1.1.3 The proposals are for residential development and as such classified as 'more vulnerable' in Table 2: Flood Risk Vulnerability Classification within Planning Practice Guidance. The PPG confirms that this type of land use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

1.2 Site Context

1.2.1 This FRA&DMS has been prepared to support a planning application for a residential development on land north of Berry Hill Road, Adderbury (Oxfordshire). The proposals will be complete with access, car parking, external works and lighting, landscaping, boundary walls and fencing, external services and drainage. The site is located in close proximity to Sor Brook. This and other potential sources of flood risk to the proposals will be considered within this assessment.

1.3 Consultation

1.3.1 The preparation of this report has been undertaken in consultation with the following interested parties including: The Environment Agency (EA), Thames Water (TW), Cherwell District Council (CDC) and Oxfordshire County Council (OCC). Consultation responses can be seen in **Appendix B, C** and **D** respectively. The NPPF advises that Cherwell District Council as the Local Planning Authority (LPA) should consult with the EA who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications.

1.3.2 Responses from Cherwell District Council are outstanding at this time.

2.0 EXISTING SITE LOCATION

2.1 Location

2.1.1 The proposed development site is accessed off Berry Hill Road in Adderbury. The Ordnance Survey National Grid Reference (OS NGR) for the site is E: 446877, N: 234796 and the nearest postcode is OX17 3HF. The total site covers approximately 4.0ha and is edged in red in **Figure 1** (see location plan in **Appendix E**).

2.1.2 The site is bounded, to the north by a pumping station and adjacent land with Sor Brook located beyond. To the south, the site is bounded by Berry Hill Road with undeveloped land used for agricultural purposes located beyond with similar land use to the east of site (shown in **Figure 1**). To the west of site are gardens and dwellings accessed off Berry Hill Road.

Figure 1: Aerial Photograph of site (Bing Maps, 2017)
Aerial view of the proposed development area (edged in red).

2.2 Existing and Historical Land Use

2.2.1 The preparation of this report has identified that the site is predominantly undeveloped and comprises of a low-density vegetation, each boundary is sparsely covered by taller shrubs and trees. The site is currently used for recreational purposes with existing stables and equestrian ménage present adjacent to the eastern boundary of the site. No other historical uses have been determined in the preparation of this report.

2.3 Topography

2.3.1 The topography generally falls from the southern boundary to the northern boundary within site (as illustrated in **Figure 1**). The site is slightly undulating, with levels ranging from 108mAOD (adjacent to Berry Hill Road) to 95mAOD (on the northern boundary). A full site topographic survey is included in **Appendix F**.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

3.1.1 This planning application is for the construction of residential development on land to the north of Berry Hill Road in Adderbury (Oxfordshire). The illustrative proposals (outlined in **Figure 2/Appendix G**) will be complete with access, footpaths, car parking, external works and lighting, landscaping, boundary walls and fencing, external services and drainage.

3.1.2 The total site covers approximately 4.00ha. At present the site is considered to be predominantly undeveloped and comprises of low density vegetation and therefore is considered permeable. An existing stable building and informal access road are currently located onsite. A portion of the development is set aside for Public Open Space (POS) and remain undeveloped, as a result the development area is approximately 1.97ha (edged in green in **Figure 2**). Post-development, the proposed impermeable area will increase to approximately 45% of the development area, given the nature of the proposals.

Figure 2: Indicative Planning Proposals (DEN Architects, 2017)

3.1.3 It is proposed that permeable surfaces are utilised where at all feasible onsite to minimise the surface water run-off generated by the increase impermeable areas. It would also be beneficial to implement SuDS features where at all feasible onsite if designed appropriately SuDS could potentially aid in the attenuation requirements and provide added benefits in terms of water quality. Detailed design will be required to confirm, subject to ground investigation and a detailed levels review, refer to Section 5.0 for the proposed outline drainage strategy.

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

4.1.1 Information relating to flood risk at the site has been obtained from the Environment Agency and from the Gov.UK website. An extract of the EA's Flood Zone Map for Planning is shown in **Figure 3.**

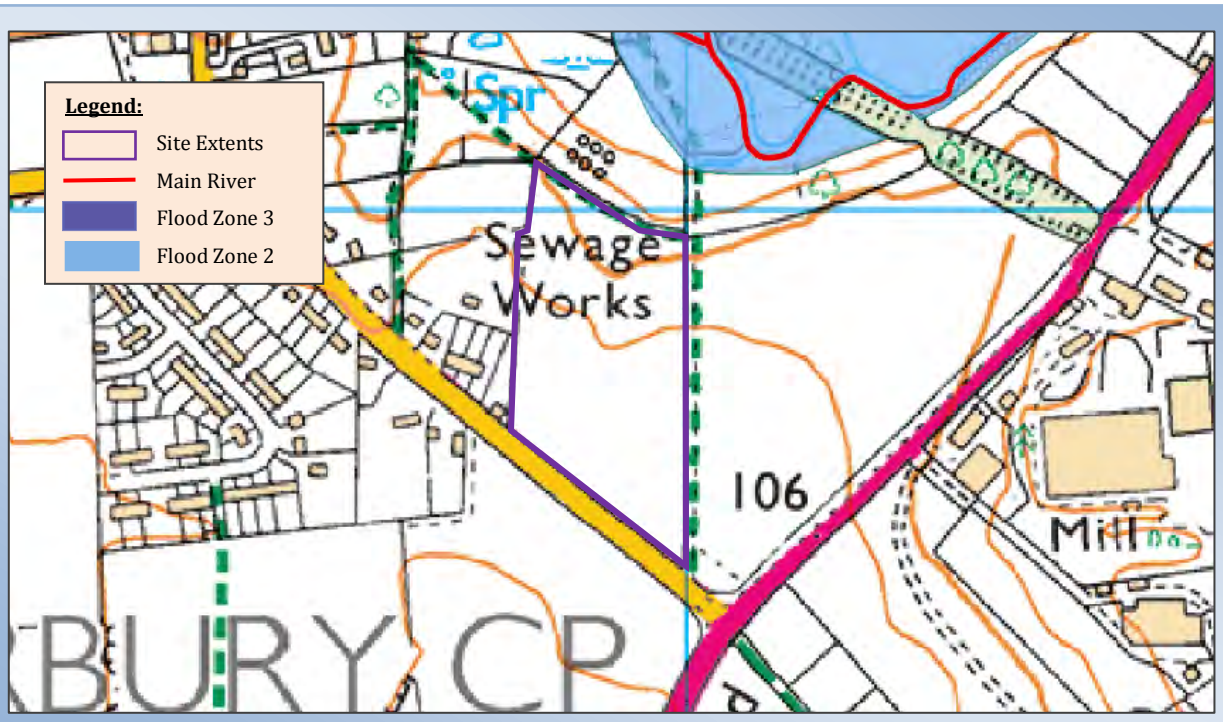

Figure 3: Fluvial/Tidal Flood Zone Map for Planning Extract (EA, 2017)

4.1.2 The Flood Map for Planning shows that the site is wholly located within Flood Zone 1 as seen in **Figure 3**, the site is also identified to be at 'low' risk of fluvial flooding on the long-term flood risk mapping (refer to **Appendix B**). The nearest Main River (Sor Brook) is identified to be 80m to the north east of site, due to the levels difference between Sor Brook (86mAOD) and the lowest elevation of site (95mAOD) the potential flood risk from this source is considered to be low.

4.1.3 Ordinary Watercourses/land drainage ditches are located within 1km of the site, the nearest being an ordinary watercourse approximately 550m to the north west of the site. Due to the proximity to the site, the flood risk from this source is classed as very low.

4.2 Tidal Flood Risk

4.2.1 The coastline is located more than 154km south-east of the development site and the Thames Estuary is located approximately 115km south west of the site. The associated tidal flood risks to site are therefore considered to be 'low'.

4.3 Flood Risk Vulnerability Classification and Flood Zone Compatibility

4.3.1 The proposals are solely 'residential' in nature and as such is classified as 'more vulnerable' in Table 2: Flood Risk Vulnerability Classification within the PPG. Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility' within the PPG confirms that this type of land use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

4.4 Surface Water Flood Risk

4.4.1 Surface water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. The risk associated with surface water run-off is indicated by the long-term flood mapping (extract shown in **Figure 4**). It illustrates that the development site is at a 'very low' risk of surface water flooding.

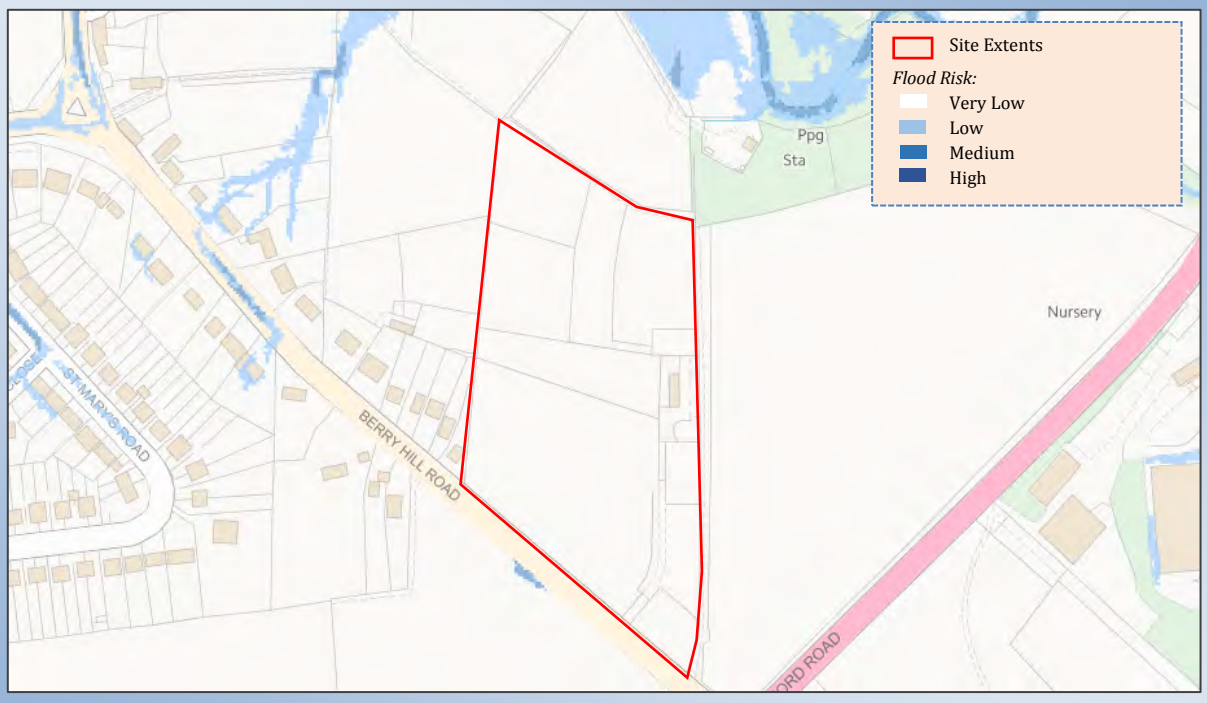

Figure 4: Surface Water Flood Map Extract (GOV.UK, 2017)

4.4.2 The risk to the proposals from surface water will be managed through the implementation of appropriate onsite drainage infrastructure. Furthermore, it would be recommended that (following any re-grade of the site) finished floor levels are raised a minimum of 150mm above the external levels to provide overland flood routes for excess surface water run-off. This will help protect properties from excess surface water run-off. Safe access and egress will be maintained via Berry Hill Road, which is shown to have predominantly 'very low' flood risk.

Pluvial (Overland run-off) Flood Risk

4.4.5 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land use can have a strong influence on the direction and depth of flow. Interception ditches can in incorporated along boundaries whereby the potential for overland flow is identified during the detailed design stage (either onto site or resulting from the site).

4.4.6 The volume and rate of overland flow from land can be exacerbated if development increases the percentage of impermeable area. Any overland flows generated by the development must be carefully controlled; safe avenues directing overland flow away from adjacent dwellings is advised.

Sewer Flood Risk

4.4.7 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and waste water known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away.

4.4.8 Sewer records identify the nearest public to be foul water sewers. A public foul water sewer (150mm dia.) is located to the west of site within Berry Hill Road and a further public foul water sewer (375mm dia.) is located adjacent to the eastern site boundary, running north. Thames Water have been contacted as to whether they identify any recorded sewer flooding issues in the vicinity of the site. At this time, a response is outstanding.

4.5 Groundwater Flood Risk

4.5.1 High groundwater levels are usually the key source of groundwater flooding, which occurs when excess water emerges at the grounds surface (or within manmade underground structures such as basements). Groundwater flooding is often more insistent than surface water flooding and would typically last for weeks/months rather than days meaning the result to property is often more severe.

4.5.2 In general terms groundwater flooding can occur from three main sources:

- If groundwater levels are naturally close to the surface then this can present a flood risk during times of intense rainfall. No groundwater flood risk has been identified during consultation with the various interested parties, including review the Cherwell District Council (CDC) Strategic Flood Risk Assessment (SFRA) and Oxfordshire County Council (OCC) Preliminary Flood Risk Assessment (PFRA).
- Seepage and percolation occur where embankments above ground level hold water. In these cases, water travels through the embankment material and emerges on the opposite side of the embankment. At present there are no reported problems with groundwater flooding.
- Groundwater recovery / rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water, table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping

conditions, where these were at or close to ground level. As with the seepage scenario the likelihood of flooding from this source is low.

4.5.3 The EA mapping data for groundwater shows that the site is underlain by Secondary A bedrock aquifer with no secondary superficial deposits identified (**Appendix B**). The site is located within an intermediate vulnerability to a minor aquifer and no historical groundwater flooding of the site has been identified during consultation with interested parties. Irrespective, it is advised that external levels fall away from the property (where feasible) to minimise the flood risk from a variety of sources. By keeping the finished floor levels elevated relative to the externals, this should help create an overland flow route.

4.6 Artificial Sources of Flood Risk

4.6.1 National policy states that a FRA should consider the potential risks from a variety of sources including the flood risk associated with artificial sources (such as risks from reservoirs and canals).

Reservoirs

4.6.2 The EA recognises reservoirs as bodies of water over 25,000cu.m, the site is not considered to be influenced by any flooding associated with a breach or failure in the neighbouring reservoirs (mapping included **Appendix B**).

4.6.3 There are a number of small bodies of water (less than 25,000cu.m) located within 1km from site, including several ponds, these features are understood to aid in local drainage. Although due to the natural topography and their scale, the risk they pose to site is considered to be 'low'.

Canals

4.6.4 The Oxford Canal is located approximately 2km east of the site. The risk associated with canals is considered to be 'very low,' due to the proximity and local topography (levels falling away from site). Irrespective, it is advised that external levels fall away from the property (where feasible) to minimise the flood risk from a variety of sources. By keeping the finished floor levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of flooding that could lead to overland flows including reservoir or canal flooding.

4.7 Historical and Anecdotal Flooding Information

4.7.1 An internet based search for flooding did not identify any historical flooding to the site area. Review of Cherwell District Council Strategic Flood Risk Assessment (SFRA) highlighted historic flooding of the River Cherwell Corridor in Adderbury in which Adderbury East was cut off from Adderbury West in 1875. No onsite flooding was identified however (some general mapping is included in **Appendix H**).

4.7.2 Consultation with various interested parties including the EA, did not highlight any historical flooding to the immediate site area.

4.8 Flood Risk Mitigation Measures & Residual Risks

4.8.1 The development site is located within Flood Zone 1 based on the mapping information. To observe a more conservative approach, some mitigation measures have been discussed below in accordance with NPPF to take into account the uncertainties of future climate changes.

Mitigation Measures

4.8.2 Given the low flood risks identified, provided Finished Floor Levels are raised a minimum of 150mm above the external the proposals will be safeguarded the proposed dwellings against flooding from fluvial/tidal sources and other sources leading to potential overland flows.

4.8.3 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).

4.8.4 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with a 40% allowance for climate change being contained onsite.

4.8.5 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either the Water Company or the Local Authority then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

Residual Risks

4.8.6 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the proposed planning layout in the event that the capacity of the drainage system is exceeded.

5.0 SURFACE WATER MANAGEMENT

5.1 Pre-Development Surface Water Run-off

5.1.1 The total site covers approximately 4.00ha and at present is approximately 100% permeable, the development area of the site is 1.97ha based on the indicative planning proposals showing POS areas. At present the existing permeable and impermeable areas (stables) of the site naturally drain to ground overtime and Sor Brook via overland flow to the north of the site.

5.1.2 The peak rates and volumes of run-off generated by the site have been calculated for the peak events shown in **Table 1** (full details **Appendix I**). The surface water run-off rates have been calculated using the IH124 Greenfield run-off method.

Site Area	Run-Off Rates				Run-Off Volumes	
	1 In 1 Year	1 In 30 Year	1 In 100 Year	QBar	1 In 1 Year	1 In 100 Year
1.97ha (greenfield)	0.6l/s	1.7l/s	2.4l/s	0.7l/s	12.6cu.m	83.6cu.m

Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2017)

5.2 Post Development Surface Water Run-Off

5.2.1 The nature of the proposals means that the impermeable areas of the site will increase, based on the indicative layout to 45% of the development area. The unrestricted post-development run-off rates have been detailed in **Table 2,** based on the impermeable area.

Development Area	Run-Off Rates		
	1 In 1 Year	1 In 30 Year	1 In 100 Year +CC
Brownfield Portion (0.886ha)	34.7l/s	76.6l/s	129.3l/s

Table 2: Post-Development Un-Restricted Run-Off Rates (Betts Hydro, 2017)

5.2.2 The development proposals will provide significant betterment to the unrestricted rates noted above, the surface water run-off generated by the development area will mimic the pre-development situation, meaning betterment on the uncontrolled rates quoted above. The proposed discharge rates are discussed in Section 5.6 along with the drainage strategy.

5.3 Sustainable Drainage Systems (SuDS)

5.3.1 Sustainable Drainage Systems (SuDS) have the ability to address four core objectives: water quantity, water quality, amenity and biodiversity. In accordance with the NPPF, the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) and the SuDS Manual (CIRIA 753) SuDS should be specified wherever possible to manage surface water run-off generated onsite.

5.3.2 Where possible, peak surface water discharge rates to watercourses and sewers should be appropriately managed and where possible reduced. Preference should always be

given to SuDS over the traditional methods of buried sewers wherever possible and practical.

5.3.3 It would be beneficial to implement wider green space/POS area(s) in one or more locations within site, where SuDS features could be implemented (indicative proposals show POS to the south-west of the development). Multiple benefits to using SuDS include the improvement of bio-diversity, aesthetics, ecology and water quality. Furthermore, there may be the potential to utilise some SuDS features for conveyance/attenuation of surface water flows, opposed to the traditional below ground storage methods.

5.3.4 Opportunities should be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off, furthermore depending on the scale of the proposals there may be the opportunity to incorporate methods such as swales, rills and rain gardens to provide a degree of treatment before flows are carried offsite (examples seen in **Figure 5**).

5.3.5 It would also be recommended that permeable paving and bio-filtration be considered in private (non-adopted areas) where at all feasible to assist locally with surface water management (subject to optimum ground conditions following further onsite testing). If infiltration is not feasible then the permeable paving should be lined with a positive connection into the main drainage for the site.

Figure 5: SuDS Photographs (SusDrain, 2012)

5.3.6 Should the ground conditions onsite prove favourable, the infiltration measures should be considered where at all feasible, promoting SuDS to deal with surface water at the source, limiting the required attenuation and reducing the volume of surface water in the sewer infrastructure. Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.

5.4 Methods of Surface Water Management

5.4.1 At present the development area covers 1.97ha, the proposed impermeable area is set to increase to approximately 45% based on the planning proposals. There are three methods that have been reviewed for the management and discharge of surface water. These may be applied individually or collectively to form a complete strategy and should be applied in the order of priority listed below:

- Discharge via infiltration
- Discharge to watercourse
- Discharge to public sewerage system

5.5 Discharge via Infiltration

5.5.1 Any impermeable areas that can drain to soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water systems.

5.5.2 The Cranfield Soil and AgriFood Institute (CSAI), Soilscapes viewer identifies the soil within the area of the site to be slightly acid but base rich loamy soils. Drainage in the areas is considered to be freely draining to the groundwater.
The British Geology Survey (BGS) mapping data indicates that ground conditions are as follows: -
Bedrock Geology: Marlstone Rock Formation – Ferruginous Limestone and Ironstone

5.5.3 The ground conditions identified by the online datasets suggest infiltration characteristics at the site will be favourable for surface water management at the site, furthermore the soil characteristics within the region are confirmed to be low (0.150) suggesting a positive percolation rate. Given the above characteristics, further investigation on the site is required to be undertaken including Soakaway Testing to BRE365.

5.5.4 Should Soakaway Testing identify the substrata to be favourable for infiltration, the proposals are to utilise infiltration methods to manage the surface water run-off generated by the proposals (refer to drainage strategy plan in **Figure 6**; **Appendix K**). The specific drainage infrastructure will be confirmed during the detailed design stage following discussion with all relevant parties, although given the residential nature of the proposals it is likely domestic soakaways will be utilised where feasible with an appropriate highways infiltration method being adopted.

5.5.5 In terms of discharge rates, these will be in accordance with the SuDS Manual and Non-Statutory Technical Standard for SuDS. The proposed discharge will not exceed that of the existing greenfield situation.

Figure 6: Preliminary Drainage Strategy Plan extract (Betts Hydro, 2017)

5.5.6 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event wholly below ground with overland run-off from storm events up to and including the 1 in 100yr return period storm event with a 40% allowance for climate change being contained onsite.

5.5.7 It would be beneficial to implement SuDS features into the design to aid in reducing the surface water generated by the proposed impermeable areas of the site, some SuDS features will also assist with any attenuation.

5.6 Discharge to Watercourse

5.6.1 Should further testing at the site identify that infiltration will not offer a feasible surface water management solution (in part or in full) then the next method in the hierarchical approach should be to discharge to watercourse. The nearest watercourse to the site is the Sor Brook (Main River) located 80m to the north of the site.

5.6.2 It would be proposed that surface water run-off generated by the proposals discharge to Sor Brook as illustrated in **Figure 6**. As the existing ground levels onsite fall predominantly towards the watercourse, it is assumed that a gravity solution could be feasible at the site, this is subject to further analysis as part of detailed drainage designs.

5.6.3 Consent will be required to outfall into Sor Brook from both the Environment Agency (as the watercourse is Main River) and the Lead Local Flood Authority (Oxfordshire County Council). An Environmental Permit will be required for any works to the Main River network including consents for any new outfall structures and early discussion would be advised with the EA to identify any constraints. The Lead Local Flood Authority will be required to agree the proposed discharge rate(s) under Land Drainage Consents.

5.6.4 A connection to the watercourse will require offsite routeing. Should any off-site works be required outside of land controlled by the developer then consents should be obtained from the relevant parties at an early stage.

5.6.5 In accordance with the SuDS Manual (CIRIA 753) and the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) all sites (greenfield and brownfield) should endeavour to achieve as close to pre-development greenfield rates as is viable, therefore the proposals are to restrict the rate of discharge from the site to mimic the greenfield situation. The development will reduce flood risk through restricting the discharge from site to 5l/s for all storm events (this restriction is based on the minimum constraint of a standard flow control device).

5.6.6 The restricted flow will generate a storage requirement during periods of intense rainfall. The stormwater storage figures quoted in **Table 3/Appendix L** are estimates only and the detailed drainage design will determine with accuracy the stormwater storage requirements. Should intrusive investigations identify a more stringent discharge rate is required then this will be addressed during detailed drainage design stage.

Impermeable Area (0.113ha)	1 In 1 Year	1 In 30 Year	1 In 100 Year + 40% CC
Restricted Run-Off Rate	5l/s	5l/s	5l/s
Estimated Stormwater Storage Volume	82cu.m-131cu.m	253cu.m-353cu.m	541cu.m-724cu.m

Table 3: Estimated Stormwater Storage Requirements (Betts Hydro, 2017)

5.6.7 It would be beneficial to implement SuDS features including permeable surfaces and bio-filtration where at all feasible (subject to ground investigation and a detailed level review). If designed appropriately the SuDS features could potentially aid in the attenuation requirements for the proposals and provide added benefits in terms of water quality. Detailed design will be required to confirm whether SuDS can be incorporated, given the small scale of this development.

5.7 Discharge to Public Sewer Network

5.7.1 Should infiltration not be feasible (following further investigation) then the proposals are to utilise the watercourse network near the development site for the management of surface water run-off. There are no proposals at this time to discharge surface water generated at the site to the public sewer network.

5.8 Climate Change

5.8.1 There are indications that the climate in the UK is changing significantly and it is widely believed that the nature of climate change will vary greatly by region. Current expert opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall. It is believed that the impact of climate change means there is likely to be a long-term increase in the average sea levels, with an expectation that sea levels will rise gradually. An increase in flood water levels means that future flooding events will occur more frequently and will have a greater impact.

5.8.2 In light of the future uncertainties Climate Change should be accounted for within the design of all new developments. The recently published Environment Agency document '*Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities*' supersedes Defra's policy statement on Flood Risk and Coastal Erosion Risk Management (2009) and should be used for future proposals. Climate change factors have been considered and any increase in the level of flood risk (to the site) from climate change is likely to be related to the increase in rainfall intensity and duration and its impact upon the surface water drainage system.

5.8.3 In accordance with the updated Climate Change projections provides estimated changes to rainfall intensity (**Table 4**) and based on the design life of the development (100yrs) the "total potential change figures for the 2080's" has been utilised.

PROJECTIONS	TOTAL POTENTIAL CHANGE ANTICIPATED FOR THE 2080'S
Upper End Estimate	40%
Central Change Factor	20%

Table 4: Change to Extreme Rainfall Intensity Compared to 1961-1990 Baseline (Environment Agency, 2016)

6.0 FOUL WATER MANAGEMENT

6.1 Review of the Thames Water sewer records identify there to be foul sewers within the vicinity, the nearest public foul water sewer (375mm dia.) runs north, parallel to the eastern boundary of the site towards a pumping station. There is also a foul sewer system (150mm dia.) which travels westwards along Berry Hill Road.

6.2 Due to the nature of use onsite at present there are no existing foul water flows generated or any known foul water connections. Based on the proposals for the construction of 60no. residential units, the approximate peak foul water flows generated by the development are 2.7l/s. This is based on 4000 litres per dwelling per 24 hours; the guidance contained within Sewers for Adoption (SfA).

6.3 The foul water flows generated by the development are proposed to connect into the adjacent foul water sewer (375mm dia.) to the east of site. Detailed drainage design will be required to confirm this strategy and identify whether a site wide gravity connection is feasible.

6.4 Consents and relevant agreements will be required from Thames Water prior to commencement of works. Consultation with Thames Water will identify their preferred point(s) of connection and it is advised this early discussion is undertaken early to establish whether there are any additional constraints which need to be considered.

6.5 Should any off-site works be required outside of land controlled by the developer (highways), then discussions with the appropriate third parties should be obtained at an early stage.

7.0 SUMMARY AND CONCLUSIONS

7.1 This Flood Risk Assessment and Drainage Management Strategy was commissioned by Hollins Strategic Land referred to hereafter as 'the client'. This report has been prepared to support an outline planning application for the construction of a residential development on land to the north of Berry Hill Road in Adderbury.

Flood Risk

7.2 The site covers 4.00ha and is located within Flood Zone 1 based on the Environment Agency Flood Zone Map for Planning. The proposals are for a residential development, which is more vulnerable in Table 2: Flood Risk Vulnerability Classification within the Planning Practice Guidance (PPG). This nature of development is confirmed to be appropriate within Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

7.3 This report has reviewed all sources of flood risk to both the proposed development and to existing development, no historical flooding at the site was identified during the research or consultations undertaken as part of this assessment. The nearest Main River (Sor Brook) is located 80m to the north-west of the site. The flood risk associated with fluvial sources is identified to be low, furthermore the flood risk associated with surface water, tidal, groundwater, sewer and artificial flood sources are also considered to be low.

7.4 Due to the low flood risks identified, the development is considered to be appropriate in accordance with the National Planning Policy Framework and Planning Practice Guidance. The principle focus of this assessment has been the effective management of surface water run-off, so not to increase flood risk elsewhere as a result of the development, this includes consideration of sustainable management options in accordance with national and local policy.

Drainage Strategy

7.5 In accordance with the drainage hierarchy there are three methods that have been reviewed for the appropriate management and discharge of surface water, these have been applied in the order of priority; discharge via infiltration, to a watercourse and finally to public sewerage system. Based on the ground conditions identified online, it can be considered that infiltration would likely provide a feasible surface water drainage solution for the site. In accordance with LPA's and TW requirements, Soakaway Testing to BRE365 will still be required to be undertaken to evidence that discharge to ground will be a viable solution (prior to exploring other methods in the drainage hierarchy).

7.6 As the substrata is identified via web based resources to be favourable for infiltration, the proposals are to utilise this drainage method for management of surface water run-off generated by the development. Given the residential nature of the proposals it is likely domestic soakaways will be utilised where at all feasible with an appropriate highways infiltration system being implemented following discussion with the highways authority. The specific drainage infrastructure will be confirmed during the detailed design stage following discussion with all relevant parties, it is advised that new soakaway(s) (or other infiltration methods) be implemented within the boundaries of site such being designed to BRE365 standard.

7.7 In terms of discharge rates, in accordance with the SuDS Manual (CIRIA 753) and the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. The proposals are to therefore discharge as close to greenfield as practical, the discharge rate will not exceed that of the existing onsite percolation rate(s).

7.8 Should further testing at the site identify that infiltration will not offer a feasible surface water management solution then the next method in the hierarchical approach should be to discharge to watercourse. Sor Brook is located approximately 80m north of the site and would provide an alternative connection for surface water run-off generated by the proposals. Detailed design will be required to confirm feasibility of the strategy. Consents from the Environment Agency will also be required for any new outfall structure, along with agreements of proposed rates of discharge.

7.9 The discharge of surface water run-off generated by the site is proposed to be restricted to 5.0l/s. The restricted flow will generate a storm water storage requirement during the extreme events. The estimated attenuation would be 253cu.m-353cu.m for the 1 in 30-year storm event and 541cu.m-724cu.m for a 100 year (+40% climate change).

7.10 This report has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The Flood Risk Assessment & Drainage Management Strategy is considered to be commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance.

8.0 RECOMMENDATIONS

8.1 Given the low flood risks identified, provided finished floor levels are raised a minimum of 150mm above the external levels, the proposals will be safeguarded the proposed dwellings against flooding from fluvial/tidal sources and other sources leading to potential overland flows. Any overland flows generated by the proposed development must be controlled, safe avenues directing overland flow away from any existing buildings is advised.

8.2 To minimise the flood risk to the neighbouring property and proposed dwellings it is proposed that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted in accordance with the NPPF and Non-Technical Standards for SuDS.

8.3 Detailed drainage design will be required to confirm the exact infiltration methods to be used within the development site following further design and discussion. Early discussion with all relevant parties including highways is advised at an early stage, this will identify any additional considerations.

8.4 Consideration is recommended into the stormwater attenuation requirements due to restricting the surface water discharge from the site. The proposed onsite surface water drainage system will need to be sized to contain the 30yr return period event wholly below ground with overland run-off from storm events up to and including the 1 in 100yr return period storm event with an allowance for climate change being contained onsite. Based on the design life this allowance for CC is in the form of a 40% increase in rainfall intensity.

8.5 It is important that should any drainage systems not be offered for adoption to either the Water Company or the Local Authority then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

BIBLIOGRAPHY & REFERENCES

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Chronology of British Hydrological Events – www.dundee.ac.uk/
CIRIA – http://www.ciria.org/
Cranfield University – http://www.landis.org.uk/soilscapes/
Environment Agency – www.environment-agency.gov.uk/
FloodProBE – http://www.floodprobe.eu/
Flood Forum – http://www.floodforum.org.uk/
Google Maps – http://maps.google.co.uk/
Streetmap – http://www.streetmap.co.uk/
Thames Water - https://www.thameswater.co.uk/

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APPENDIX A: NPFF EXTRACTS

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Table 1: Flood zones

(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - low probability

Definition
This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Appropriate uses
All uses of land are appropriate in this zone.

Flood risk assessment requirements
For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.

Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems[2].

Zone 2 - medium probability

Definition
This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses
Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are *only* appropriate in this zone if the Exception Test is passed.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.

Zone 3a - high probability

Definition
This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses
The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;

- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b - the functional floodplain

Definition
This zone comprises land where water *has* to flow or be stored in times of flood.

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses
Only the water-compatible uses and the essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.

Table 2: Flood risk vulnerability classification

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use[3]. • Installations requiring hazardous substances consent[4]. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure")[5].
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[6]. • Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*[7]
Less vulnerable • Police, ambulance and fire stations which are *not* required to be operational during flooding. • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non–residential institutions not included in "more vulnerable", and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do *not* need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan.*

APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Patrick Taylor

From: Enquiries_THM <enquiries_THM@environment-agency.gov.uk>
Sent: 22 June 2017 16:15
To: Patrick Taylor
Subject: THM51091 Product 4 BERRY HILL ROAD, ADDERBURY
Attachments: Historic Flood Map.pdf; Flood Map.pdf

Dear Patrick

Our Reference: THM51091

Thank you for your email requesting product 4 data/modelled flood levels*.

We unfortunately do not have any detailed flood risk modelling in this location.

We are sorry that we are therefore unable to provide modelled flood levels and extents for your site.

We have attached a copy of our Flood Map for Planning and a map showing the historic flood event outlines we have records for Berry Hill Road, Adderbury.

I trust this is helpful.

How we have considered your request
We have considered your request under the provisions of the Freedom of Information Act 2000 / Environmental Information Regulations 2004 (EIR). The Act requires that we respond to requests by advising you whether or not information is held, and if so by providing you with that information.
EIR Regulation 3(2) states that information is held if it is in our possession and has been produced or received by us, or it is held by another person on our behalf at the time the request is received.

Information not held
In this case, the information you have requested is not held by the Environment Agency, and we are therefore refusing your request on the grounds that there is no information we can provide.

Where a request is for environmental information, the Regulations allow us to refuse to disclose it if the exception at EIR Regulation 12(4)(a) applies. The regulation states that a public authority may refuse to disclose environmental information to the extent that it does not hold that information when an applicant's request is received.

It is not possible for us to conduct a public interest balancing test because the reason for non-disclosure is that the information is not held.

I hope that we have correctly interpreted your request. Please refer to our Open Government Licence for the permitted use of the supplied data:
http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Please be aware that many of our datasets are now available online. Simply visit environment.data.gov.uk

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

We are committed to providing a professional customer service. Please help us understand more about what is important to you by completing our two minute survey.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely

Alyson Barnes
Customers & Engagement Officer
Direct Dial: 0208 474 8836
Internal: 48836

Environment Planning & Engagement Team
Thames Area
Red Kite House, Howbery Park, Wallingford OX10 8BD

From: Patrick Taylor [mailto:patricktaylor@betts-associates.co.uk]
Sent: 22 June 2017 11:36
To: Enquiries_THM <enquiries_THM@environment-agency.gov.uk>
Cc: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Subject: FRA ADVICE: BERRY HILL ROAD, ADDERBURY

To whom it may concern,

BERRY HILL ROAD, ADDERBURY.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment for the above site (location plan attached), including details of historical flooding and water levels(PRODUCT 4); this would be greatly appreciated. Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Patrick Taylor BSc(Hons)
Graduate Flood Risk Analyst

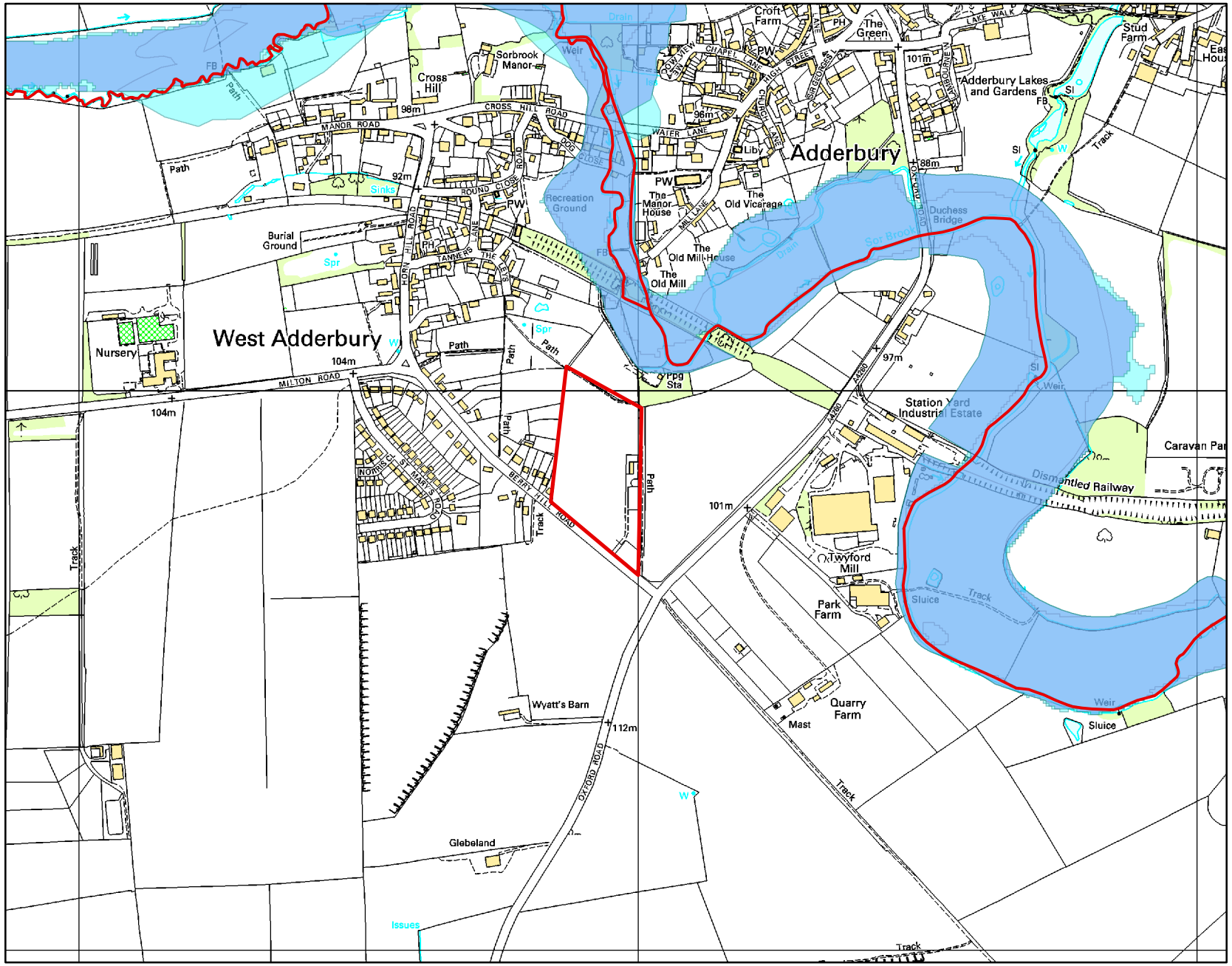
BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

patricktaylor@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEO-TECHNICAL

Flood Map for Planning centred on Berry Hill Road, Adderbury OX17 3HF
Created on 22/06/17 REF: THM51091



Environment Agency

Kilometres

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Legend

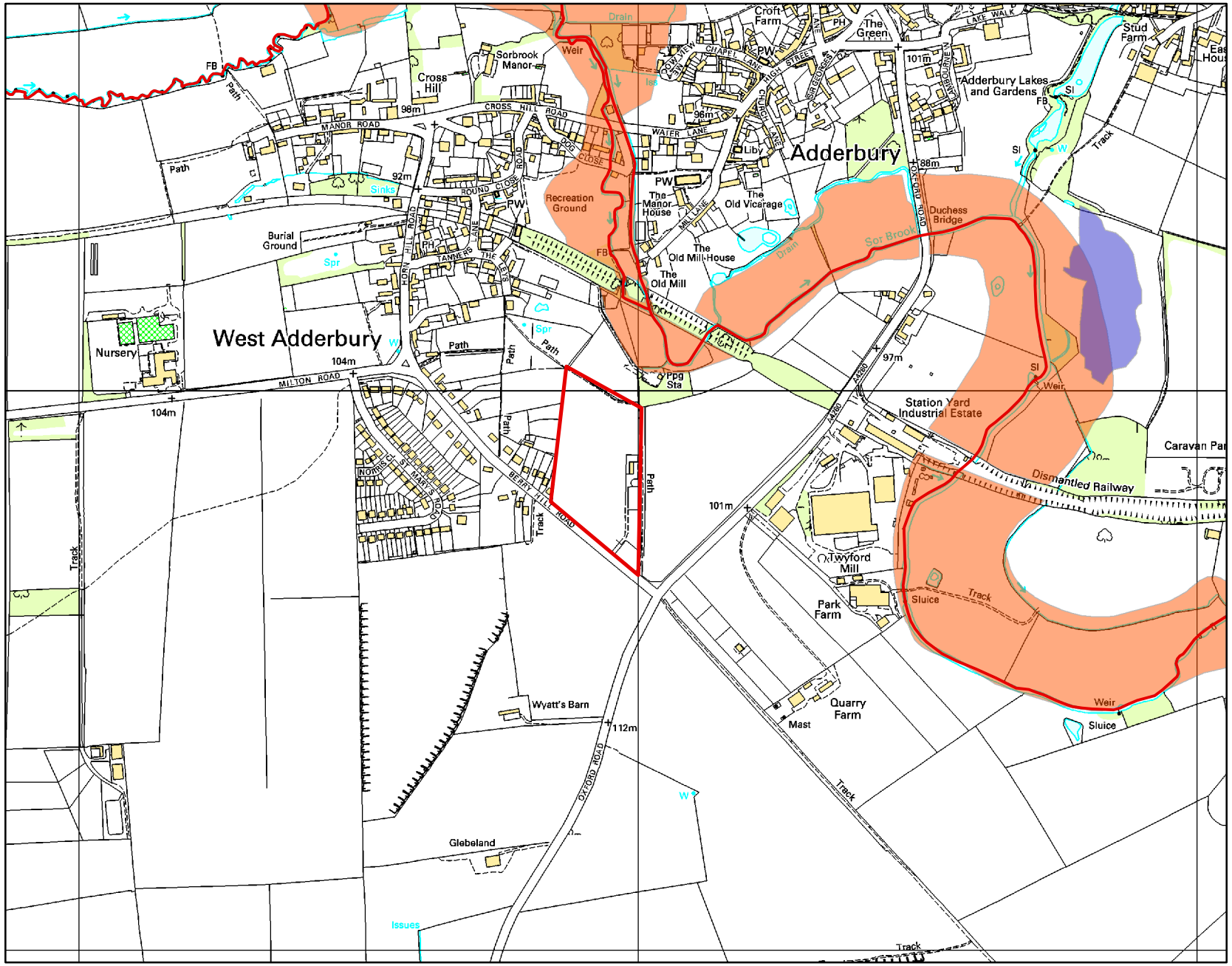
- Main River
- Flood defences
- Areas benefiting from flood defences
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- Flood Map - flood storage areas

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Historic Flood Map centred on Berry Hill Road, Adderbury OX17 3HF
Created on 22/06/17 REF: THM51091



Environment Agency

Kilometres

0 0.25 0.5

Legend

Main River

Historic Flood Events

year

- 1947
- 1992
- 1998
- 2002
- 2007
- 2014

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
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Environment Agency

This service will be closing on July 27, 2017
For more information and where the data can now be found please see the information pages.

Enter a postcode or place name: Adderbury, Oxfordshire Go

Other topics for this area... Groundwater

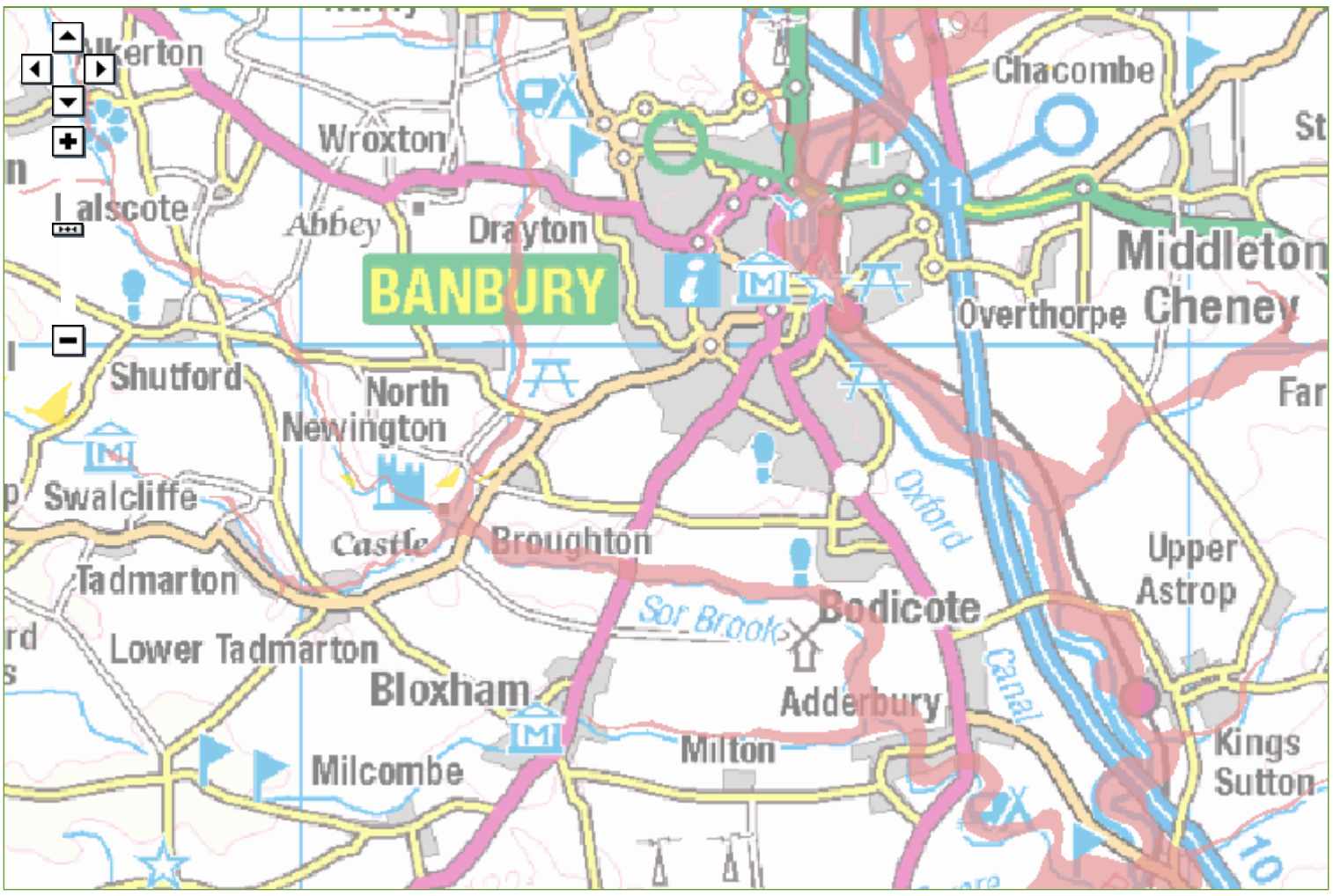
Groundwater

Map legend

- Groundwater source protection zones
  - Inner zone (Zone 1)
  - Inner zone - subsurface activity only (Zone 1c)
  - Outer zone (Zone 2)
  - Outer zone - subsurface activity only (Zone 2c)
  - Total catchment (Zone 3)
  - Total catchment - subsurface activity only (Zone 3c)
  - Special interest (Zone 4)
- BGS Aquifer Maps - Superficial Deposits Designation
  - Principal
  - Secondary A
  - Secondary B
  - Secondary (undifferentiated)
  - Unknown (lakes and landslip)
- BGS Aquifer Maps - Bedrock Designation
  - Principal
  - Secondary A
  - Secondary B
  - Secondary (undifferentiated)
- Groundwater Vulnerability Zones
- Other national environmental organisations

Adderbury, Oxfordshire at scale 1:75,000

Other maps Data search Text only version



More about Groundwater

Groundwater Source Protection Zones:

Groundwater provides a third of our drinking water. We ensure that your water is safe to drink defining Source Protection Zones. These zones help to monitor the risk of contamination from any activities that might cause pollution in the area.

The Source Protection Zones are not displayed at scales greater than 1:20,000 (Ordnance Survey 1:50,000 scale) as the data was only modelled to this level and is not accurate pass this. They should not be compared against field boundaries.

Understanding Groundwater Source Protection Zones maps

British Geological Survey's Aquifer Maps:

From 1st April 2010 new aquifer designations replace the old system of classifying aquifers as Major, Minor and Non-Aquifer. This new system is in line with our Groundwater Protection Policy (GP3) and the Water Framework Directive (WFD) and is based on British Geological Survey mapping.

The Aquifer Extents are not displayed at scales greater than 1:75,000 (Ordnance Survey 1:250,000 scale) as the data was only modelled to this level and is not accurate pass this.

Understanding the British Geological Survey's Aquifer maps

Groundwater Vulnerability Maps:

Ww are currently updating our groundwater vulnerability maps to reflect improvements in data mapping and understanding of the factors affecting vulnerability. The new maps will be released later in 2017.

The 'New groundwater vulnerability mapping methodology' report provides technical information about how the new maps have been created.
The user guide outlines the kinds of activities the new maps can be used for.
These reports have been published on GOV.UK in advance of the release of the new maps to give users time to understand the new approach and how this differs from the previous groundwater vulnerability maps.

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  - Secondary (undifferentiated)
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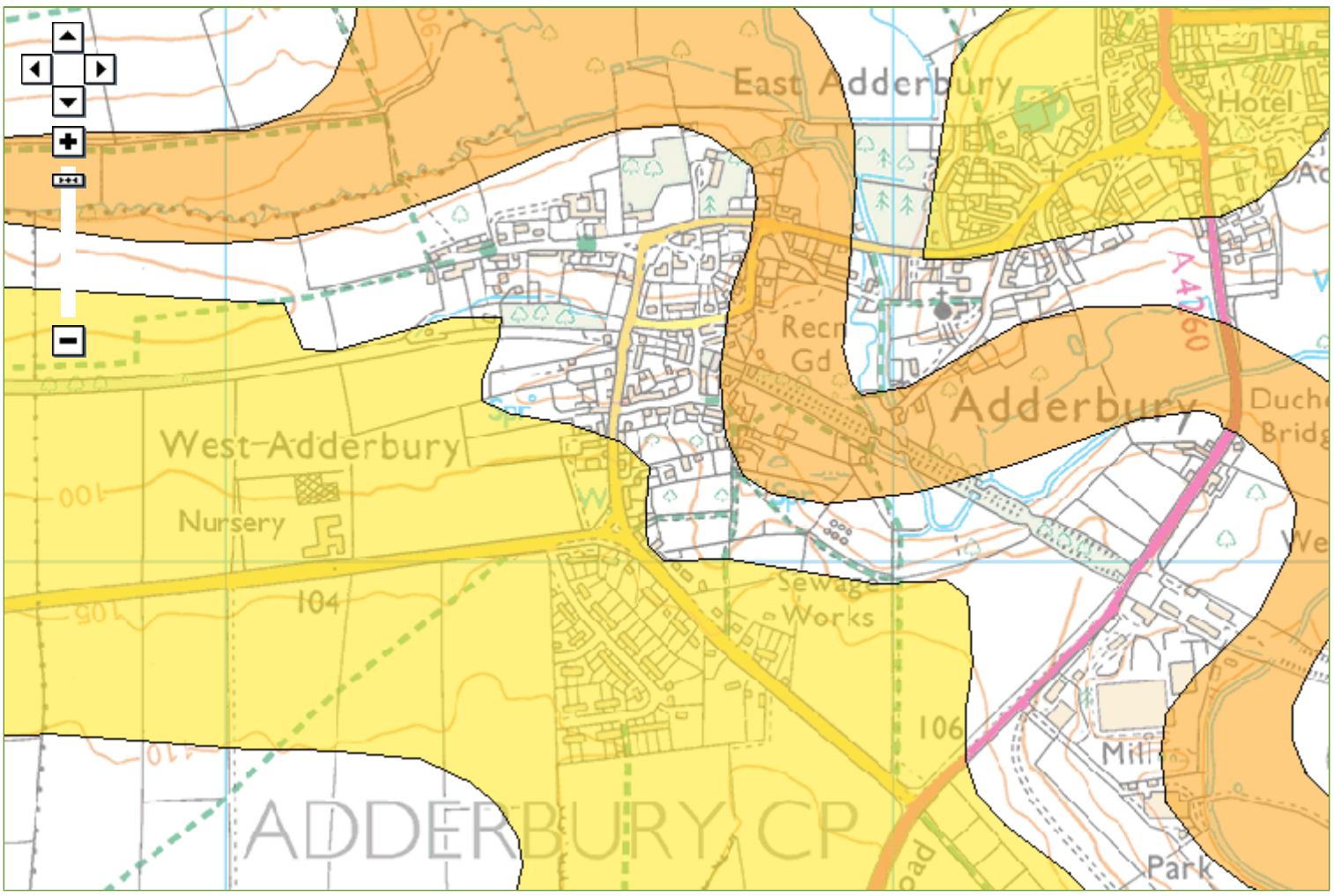
  - Major Aquifer Intermediate
  - Major Aquifer Low
  - Minor Aquifer High
  - Minor Aquifer Intermediate
  - Minor Aquifer Low
- Other national environmental organisations
  - Natural Resources Wales Area of responsibility
  - Scottish Environment Protection Agency Area of responsibility

Adderbury, Oxfordshire at scale 1:10,000 Other maps Data search Text only version



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Understanding Groundwater Vulnerability maps

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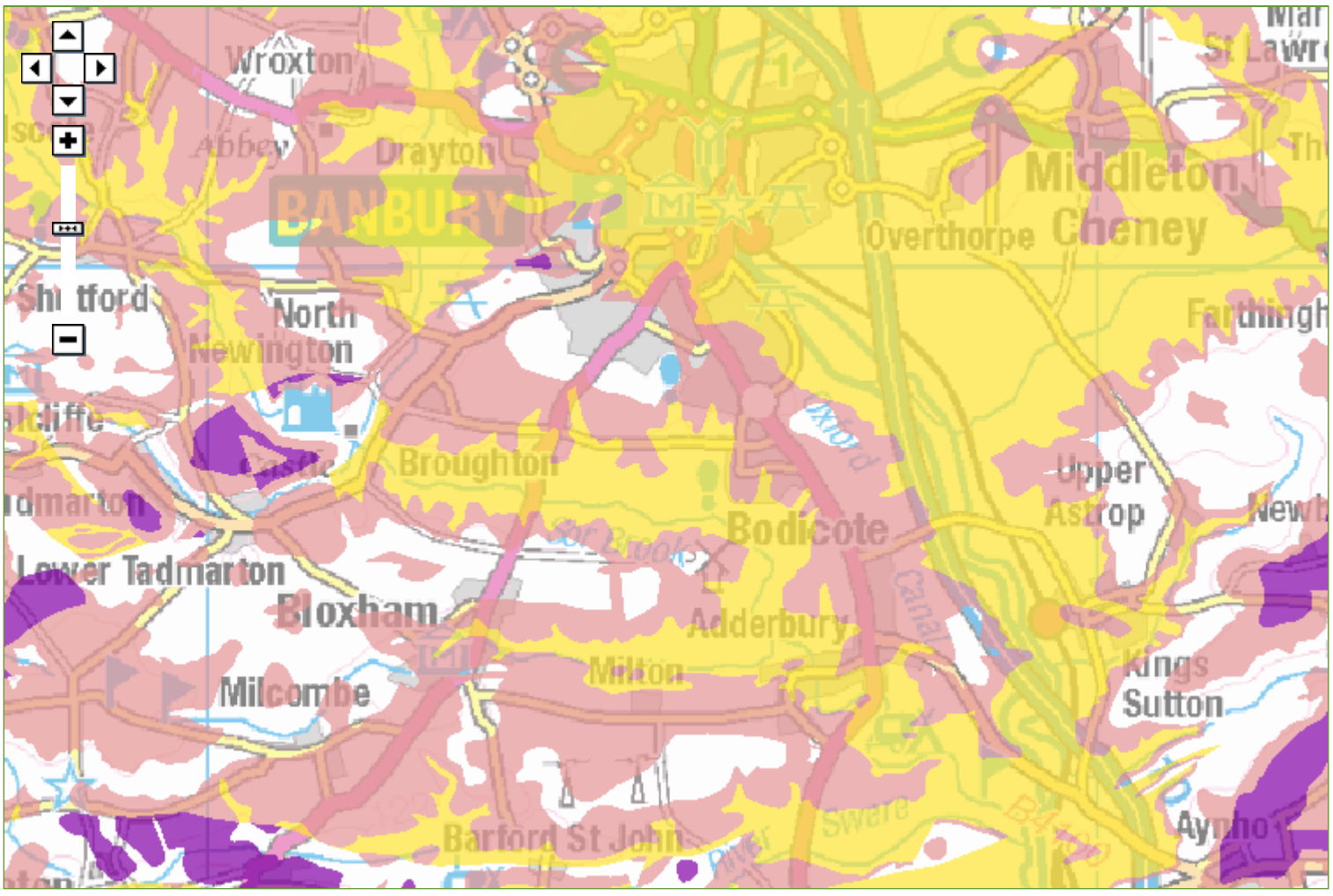
  - Principal
  - Secondary A
  - Secondary B
  - Secondary (undifferentiated)
- Groundwater Vulnerability Zones
- Other national environmental organisations

Adderbury, Oxfordshire at scale 1:75,000

Other maps Data search Text only version



More about Groundwater

Groundwater Source Protection Zones:

Groundwater provides a third of our drinking water. We ensure that your water is safe to drink defining Source Protection Zones. These zones help to monitor the risk of contamination from any activities that might cause pollution in the area.

The Source Protection Zones are not displayed at scales greater than 1:20,000 (Ordnance Survey 1:50,000 scale) as the data was only modelled to this level and is not accurate pass this. They should not be compared against field boundaries.

Understanding Groundwater Source Protection Zones maps

British Geological Survey's Aquifer Maps:

From 1st April 2010 new aquifer designations replace the old system of classifying aquifers as Major, Minor and Non-Aquifer. This new system is in line with our Groundwater Protection Policy (GP3) and the Water Framework Directive (WFD) and is based on British Geological Survey mapping.

The Aquifer Extents are not displayed at scales greater than 1:75,000 (Ordnance Survey 1:250,000 scale) as the data was only modelled to this level and is not accurate pass this.

Understanding the British Geological Survey's Aquifer maps

Groundwater Vulnerability Maps:

Ww are currently updating our groundwater vulnerability maps to reflect improvements in data mapping and understanding of the factors affecting vulnerability. The new maps will be released later in 2017.

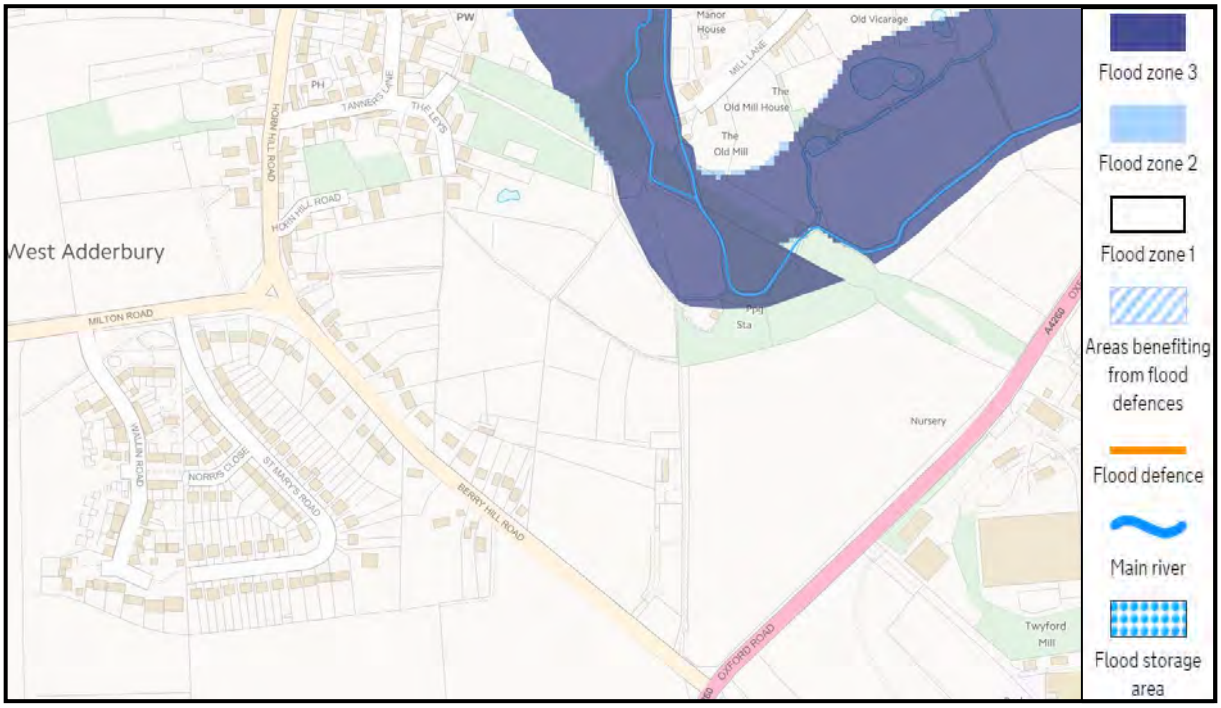
The 'New groundwater vulnerability mapping methodology' report provides technical information about how the new maps have been created.
The user guide outlines the kinds of activities the new maps can be used for.
These reports have been published on GOV.UK in advance of the release of the new maps to give users time to understand the new approach and how this differs from the previous groundwater vulnerability maps.

Understanding Groundwater Vulnerability maps

NATIONAL FLOOD MAPPING

BETTS HYDRO
CONSULTING ENGINEERS

Flood Map for Planning

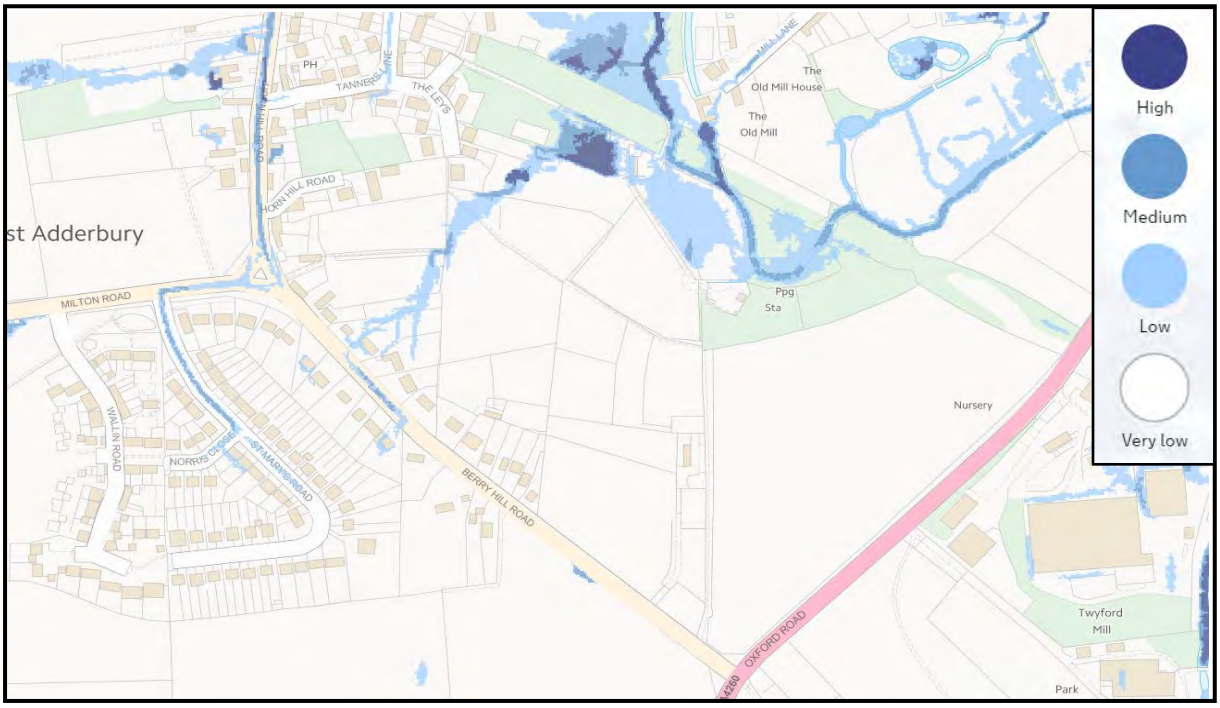


Long Term Flood Risk – Rivers or Sea

NATIONAL FLOOD MAPPING

BETTS HYDRO
CONSULTING ENGINEERS

Long Term Flood Risk – Surface Water



Long Term Flood Risk - Reservoirs

APPENDIX C: TW CORRESPONDENCE

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Patrick Taylor

From: Patrick Taylor
Sent: 22 June 2017 14:59
To: 'DEVELOPER.SERVICES@THAMESWATER.CO.UK'
Subject: FRA ADVICE: BERRY HILL ROAD, ADDERBURY
Attachments: HYD250 Location Plan.pdf

To whom it may concern,

BERRY HILL ROAD, ADDERBURY.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment for the above site (location plan attached), including details of historical flooding and water levels; this would be greatly appreciated. Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Patrick Taylor BSc(Hons)
Graduate Flood Risk Analyst

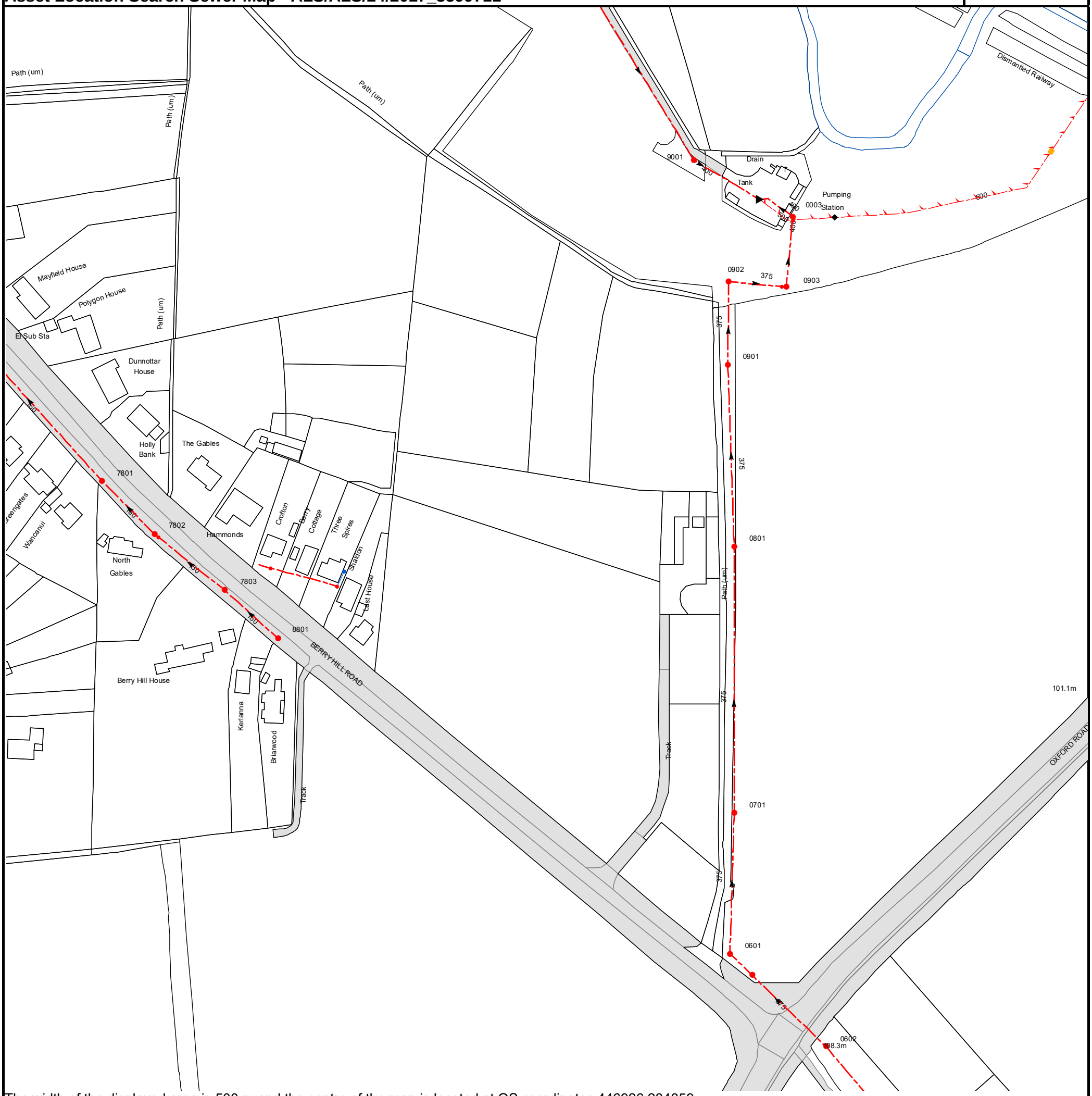
BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

patricktaylor@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEO-TECHNICAL

Asset Location Search Sewer Map - ALS/ALS/24/2017_3599711



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 446926,234859

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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