

## TECHNICAL NOTE

JBA Project Code  
Contract

2020s1712  
Review of Drainage Strategy for Thames  
Farm, Shiplake  
Shiplake Parish Council  
12/03/2021  
Paul Eccleston

Client  
Day, Date and Time  
Author  
Reviewer / Sign-off  
Subject

Review of Flood Risk Appraisal and  
Drainage Study



### 1 Introduction

JBA Consulting (JBA) were commissioned by Shiplake Parish Council (SPC) to undertake a review of the Flood Risk Appraisal and Drainage Study for Thames Farm, Shiplake.

The Thames Farm site at Reading Road, Lower Shiplake, obtained outline planning permission in 2017, following an appeal, for up to 95 homes on a 5.6Ha site<sup>1</sup>. The appeal decision included the following drainage related condition:

*11. No development shall commence until a drainage strategy, detailing all on and off site surface and foul drainage works, has been submitted to and approved in writing by the local planning authority. No discharge of foul or surface water from the site shall occur before the drainage strategy has been completed and brought into use.*

*Reason: to safeguard the water environment and to prevent flooding of the area.*

The developer had originally proposed to drain the site to infiltration basins, permeable paving and trench soakaways<sup>2</sup>, however subsequent ground investigations have identified that the site has a large number of sub-surface voids formed by dissolution of the underlying chalk bedrock. Consequently, the developer is now proposing to grout and vibro-compact the site in order to stabilise it for construction. Concerned that shallow soakaways will wash material from the voids and increase the risk of collapse, and prevented from using deep borehole soakaways as the site is in Source Protection Zone 1, the surface water strategy was amended in 2020 to propose a pumped discharge of attenuated surface water to the Lash Brook<sup>3</sup>. The Parish Council and a large number of residents were concerned about this, principally:

- The potential for increased flood risk from the Lash Brook.
- The risks to the water supply aquifer from the proposed grouting operation.
- Disruption and nuisance caused by the need to construct a rising main through the village.

Following representations from SPC and the Thames Farm Action Group (TFAG) to Taylor Wimpey, South Oxfordshire District Council (SODC), the Environment Agency (EA) and Thames Water Utilities Limited (TWUL), a revised proposal has been supplied to TFAG by developers Taylor Wimpey. This note is a review of that revised Flood Risk

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1 The Planning Inspectorate (2017) Appeal Decision: Appeal Ref: APP/Q3115/W/16/3161733 Accessed online at [https://data.southoxon.gov.uk/ccm/support/dynamic\\_serve.jsp?ID=1418241337&CODE=2311F630D11AD5E4C421D65F994A4BF8](https://data.southoxon.gov.uk/ccm/support/dynamic_serve.jsp?ID=1418241337&CODE=2311F630D11AD5E4C421D65F994A4BF8) on 11/03/2021

2 CEC (2016) Flood Risk Assessment for Proposed Residential Development Thames Farm, Shiplake. Accessed online at [https://data.southoxon.gov.uk/ccm/support/dynamic\\_serve.jsp?ID=1418241303&CODE=2311F630D11AD5E4E995AC1DFEBAD6C5](https://data.southoxon.gov.uk/ccm/support/dynamic_serve.jsp?ID=1418241303&CODE=2311F630D11AD5E4E995AC1DFEBAD6C5) on 11/03/2021

3 Abley Letchford Partnership Limited (2020) Thames Farm Shiplake, Drainage Statement

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Appraisal and Drainage Study.<sup>4</sup> The study references back to the work undertaken in 2016 and 2020; relevant sections of these documents have also been reviewed. A review of the hydrogeological implications of the proposed grouting scheme has been prepared separately<sup>5</sup>.

## 2 Flood Risk

### 2.1 Scope

In section 1.4.1 it is stated that *"the Flood Risk Appraisal and Drainage Study is limited to the assessment of fluvial flood risk arising from the proposed surface water drainage outfall to watercourse, and opportunities for betterment to existing surface water flooding issues arising from existing surface water runoff from the Site."*

This is not actually the case, since the report (section 3) goes on to consider baseline flood risk to the site, including an improved assessment of surface water flow pathways across the site (two pathways are identified, whereas the 2016 FRA only identified one). As such, the study is improving the assessment of flood risk to the site but, because it does not seek to replace the FRA, makes no recommendations as to how these flow pathways should be managed. The site layout shown in the 2020 Drainage Strategy shows that properties are designed within the flow paths (see Figure 2-1). This indicates a lack of sequential planning within the site (a requirement of National Planning Policy Guidance) and designing for exceedance (a good-practice approach to drainage design recommended in the SuDS Manual<sup>6</sup>).

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4 Enzygo (2021) Flood Risk Appraisal and Drainage Study. Thames Farm, Shiplake.

5 JBA Consulting (2021) Review of Drainage Strategy for Thames Farm, Shiplake: Hydrogeological review of drainage proposal.

6 CIRIA (2015) The SuDS Manual

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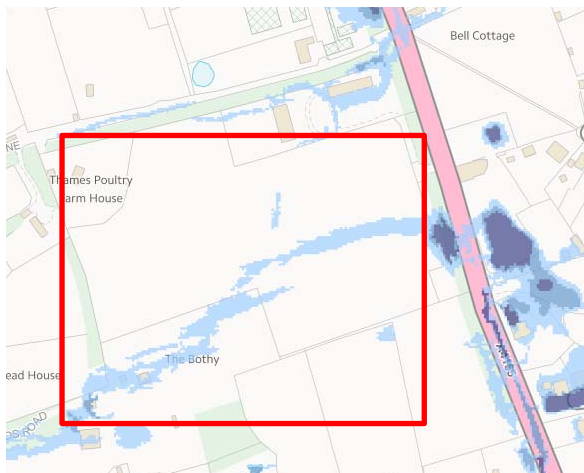
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(a) Risk of flooding from surface water map showing two flow pathways across site - red box shows the approximate area covered in (b).

(b) Detail from the 2020 Drainage Strategy

**Figure 2-1: Surface water flow pathways and site layout**

Further review of the flood risk appraisal is included below under the review of the drainage scheme.

### 3 Drainage scheme

#### 3.1 Drainage strategy

##### 3.1.1 The drainage hierarchy

The drainage hierarchy is a well-established principal which defines the order of preference in which surface water discharge routes should be considered, and is usually expressed as:

- Treat at source / reuse
- Soakaway or other infiltration to ground
- Discharge to a watercourse
- Discharge to a surface water sewer
- Discharge to a combined sewer

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The principal is supported by Building Regulations Part H, the lead Local Flood Authority (LLFA) Oxfordshire County Council (OCC)<sup>7</sup> and by the water industry<sup>8</sup>.

It is acknowledged that deep borehole soakaways would not be permitted as the site is in SPZ1, and that infiltration features close to buildings have the potential to encourage the formation of voids, preventing the use of shallow infiltration features close to buildings. However, this would not necessarily preclude the use of shallow infiltration features set further from buildings. It is probable that the developer has not considered this option because it would mean reducing the number of dwellings on the site in order to make space for adequate infiltration features.

### 3.1.2 The drainage route and point of discharge

Having rejected discharge to ground on site (Option 1), the study goes on to consider three possible routes for a surface water discharge to watercourse:

- Option 2 - Sewer requisition to the Lash Brook
- Option 3 - Gravity outfall to the North-East Watercourse
- Option 4 - Pumped outfall to the Northern Watercourse (preferred option).

It is welcoming to see that various options have been considered, compared to the 2020 proposal which only considered discharge to the Lash Brook. Each of the three watercourses has been walked and photographed (where accessible).

The consultant summarises the Lash Brook as *"comprised of disconnected reaches along the upstream (southern) and middle reaches, including poorly defined and overgrown dry reaches, as well as reaches of standing water. The watercourse is considered to be a 'relic watercourse', which is likely to have been a former mill race."*

This matches our conclusion reached from our own inspection of the Lash Brook, and we welcome their rejection of the Lash Brook as the preferred discharge location for the Thames Farm development.

The report opts for Option 4, discharge to the Northern Watercourse, as the preferred option. We have reviewed the assessment of the impacts of the discharge below in section 3.3.

### 3.1.3 Options not considered

We have noted above that the option of changing the development intensity in order to make space for discharge to ground using shallow infiltration features has not been considered. It is worth also noting that discharge to a deep borehole soakaway off the site has also not been considered. In theory water could be discharged to a deep borehole soakaway outside of Source Protection Zone 1 as shown by the red area in Figure 3-2. Such an option could result in a shorter length of pipework, and would be in line with the discharge hierarchy, however we acknowledge that such an option is

7 <https://www.oxfordshirefloodtoolkit.com/wp-content/uploads/2018/12/LOCAL-STANDARDS-AND-GUIDANCE-FOR-SURFACE-WATER-DRAINAGE-ON-MAJOR-DEVELOPMENT-IN-OXFORDSHIRE.pdf>

8 <https://www.water.org.uk/wp-content/uploads/2020/03/SSG-App-C-Des-Con-Guide-v-2-100320-C.pdf>

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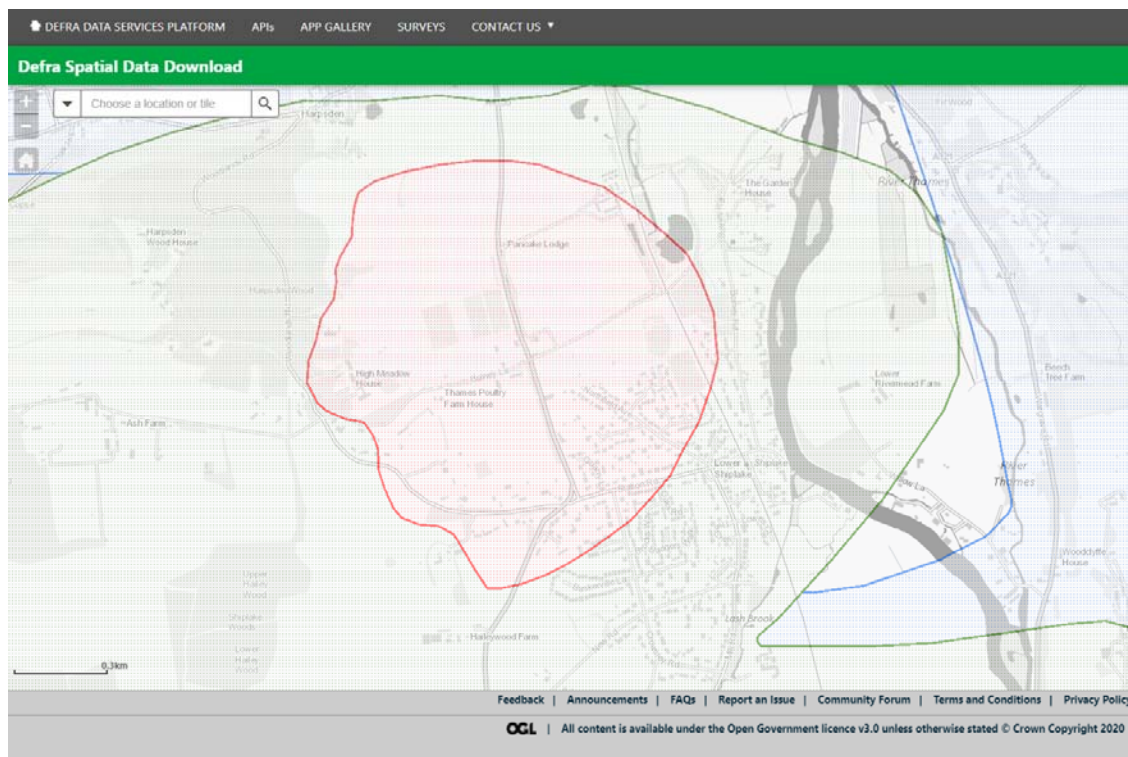
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not without difficulties, and would likely require a landowner to be willing to sell or long-term lease a suitable plot of land to locate the soakaway.



**Figure 3-1: Source Protection Zones**

### 3.1.4 Sustainability

It is proposed that the pumped drainage system is adopted by TWUL. Along with the rest of the UK water industry, TWUL have pledged to become operationally net-zero by 2030<sup>9,10</sup>. The adoption of an energy intensive pumped surface water system, as opposed to an infiltration-based system with no pumping required, is contrary to the aims of this policy.

### 3.2 Storage calculations

The 2021 Enzygo study has re-used the flow and storage calculations developed for the 2020 study, thus in this section we refer to that 2020 study. Storage calculations have been made following the advice in the Interim Code of Practice for SuDS<sup>11</sup>, which recommends use of the IH124 method for estimating greenfield runoff rates on sites of less than 50 hectares. This method is still supported by the SuDS Manual and OCC

9 <https://www.thameswater.co.uk/about-us/responsibility/climate-change>

10 <https://www.water.org.uk/routemap2030/>

11 National SUDS Working Group (2004) Interim Code of Practice for SuDS

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guidance, although research for the EA recommends that it is no longer the preferred method and that FEH Statistical should be preferred in permeable catchments<sup>12</sup>.

The peak flow and storage calculations are based on 2.42Ha of the 5.60Ha site being made impervious, based on the internal road, roofs, hardstanding areas, and a section of the Reading Road which will also drain into the system. In this calculation, it is assumed that the remaining 3.18Ha remains permeable and will continue to drain in the same manner as prior to development. This is a normal assumption in site drainage design, however in this case there are two reasons why this should be questioned:

- The extensive grouting and compaction works are likely to change the natural hydrology of the ground which will remain as gardens and green spaces, which we know to have been highly permeable prior to development. These are recognised effects of both techniques. Grouting is sometimes used, for example, in the ground around pipelines to reduce water infiltration, whilst vibro-compaction can be used to reduce the risk of solifluction. This proposed work is likely to increase the percentage runoff from the site, with the consequence that the planned drainage may fill up quicker than designed, and/or runoff off the site may increase, although this could be recaptured back onto the system by the highway drainage improvements which have already been installed. The question remains, however, and we consider that an allowance should have been made to account for the reduced permeability of green spaces as a result of ground compaction and grouting.
- The southern surface water flow pathway onto the site (shown in Figure 2-1) has the potential to bring in runoff from outside of the site and subsequently for this water to enter the site's drainage system. No allowance for such runoff has been made, and as discussed in section 2.1, the layout of the site has not been planned to allow for this flow pathway.

The combination of these two effects is considered likely to result in premature filling of the site's drainage storage, and the standard of protection offered by this drainage system is likely to be compromised.

### 3.3 Assessment of flood risk in the Northern Watercourse

#### 3.3.1 Hydraulic modelling

Enzygo have developed a 1D-2D hydraulic model of the Northern Watercourse in order to assess its capacity and the impact of the discharge from Thames Farm, which is proposed to discharge immediately upstream of the A4155 culvert. Unfortunately, the model, hydrology and modelling reports and channel survey were not provided for review, and very little information is provided in the main report. Consequently, it is not possible to provide a full assessment of this work. We note, however, that:

- The Northern Watercourse has a highly permeable catchment. The photographs in the flood risk appraisal indicate that when Enzygo visited it was dry along most of

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12 Faulkner DS et al (2011) Greenfield run off and flood estimation on small catchments Accessed online at <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1753-318X.2011.01128.x>

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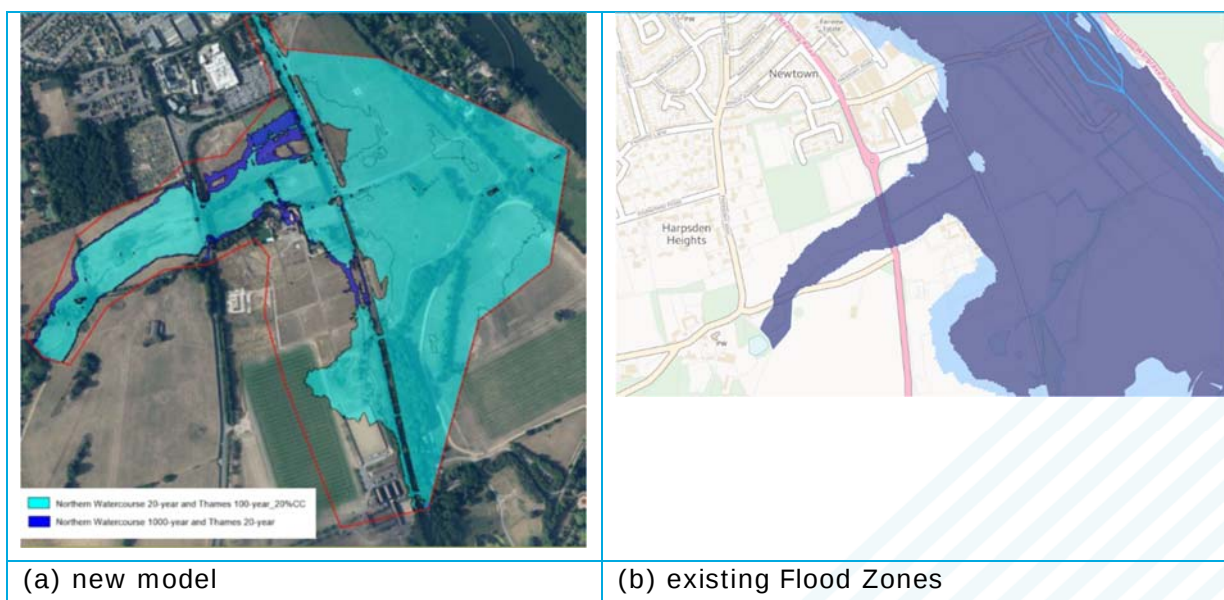
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its length, and it should probably be considered to be an ephemeral stream. As such, we would expect to see appropriate application of suitable hydrological methods. FEH Statistical with permeable adjustment is likely to be an appropriate method, but consideration should also be given to correlating any observed flow records with local borehole data. Such a study was carried out by JBA on the neighbouring Assendon Stream<sup>13</sup>.

- The new flood outlines are broadly similar to the existing Flood Zones. The main differences appear to be due to the use of more detailed LiDAR terrain data available to the 2021 study (see Figure 3-2).



**Figure 3-2: Comparison of newly modelled and existing flood outlines**

- The Northern Watercourse is an ordinary watercourse and therefore the relevant authority to provide Land Drainage Consent is OCC. The hydrology and modelling reports and the model itself should be submitted to OCC for review.

### 3.3.2 Impact of the proposed 30l/s discharge

The base model was then used to test the impact of an additional 30l/s discharge from Thames Farm, immediately upstream of the A4155 culvert. It is stated that this resulted in a "very minor" increase in flood extents in a 1 in 20-year event, and a 1mm rise in water levels in a 1 in 1,000-year event. However, no detailed model results are provided either as a map of flood extents, in tabular format or in long section. The consultant should demonstrate the impacts more clearly, in particular:

13 JBA Trust (2016) Emergence of an ephemeral chalk stream at Assendon, Oxfordshire, in 2014  
Accessed online at <https://www.jbatrust.org/wp-content/uploads/2017/03/W15-1389-Assendon-Stream-2014-Event-Report-Final-.pdf> on 11/03/2021

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- Is there any increase in flood extents impacting neighbouring properties at Lavender Lodge, Jubilee Park and Mill Lane?
- The consultant's photographs of sections of the Northern Watercourse immediately downstream of the Reading Road, notably NW9 to NW14 show a heavily overgrown channel with some very restrictive culverts. A comparison of base-case and post-development water levels along this reach for various return periods is required to demonstrate the impact of the proposed discharge.

## 4 Conclusions

The February 2021 Flood Risk Appraisal and Drainage Study recognises that the Lash Brook is a disconnected and poorly defined watercourse, and as such is unsuitable for the 30l/s discharge from Thames Farm. However, the study remains some way from adequately demonstrating that the drainage strategy is appropriate, in line with planning policies and design good practice, and will not increase flood risk. Particular attention is drawn to the following points:

- The flood risk appraisal identifies the two pathways of "low risk" (i.e. low probability) surface water flooding running across the site. These indicate the risks of surface water flows entering from offsite, but these are not taken into account either within the layout of homes on the site, nor in the design of the drainage system. This raises the risk that the site drainage system will not deliver the standard of protection that it has been designed to meet.
- In considering options for discharging surface water, the study has not considered the option of reducing the development intensity on the site to make space for infiltration drainage to be used at a safe distance from buildings. Neither has a deep borehole soakaway outside of SPZ1 been considered.
- A pumped discharge to the Northern Watercourse is selected as the preferred option. Introducing pumping commits Thames Water, as proposed adopters of the system, to an energy intensive solution, which is contrary to both Thames Water's, and SODCs stated objectives on climate change and achieving net-zero greenhouse emissions.
- The calculation of surface water storage on the site has not considered the impacts of the proposed grouting and compaction on the areas of the site which will remain as green surfaces. These measures are likely to reduce the ground's permeability and thus increase runoff from what is currently a highly permeable site, increasing the risk of overloading the site's drainage system or of causing runoff from the site.

The study has modelled the Northern Watercourse to which discharge is proposed. However, the report is very light on the details of the hydrological methods applied, and shows no detailed model results. The consultant's photographs show sections of the Northern Watercourse to be highly overgrown with constricting culverts. The impact of the proposed discharge on water levels in this watercourse has not been adequately demonstrated, so it is not yet possible to conclude that the proposal will have negligible impact on flood risk. The discharge will require a land drainage consent, and the model and modelling and hydrology reports should be submitted to OCC for review.