Katherine Brommage

From: Katherine Brommage
Sent: 13 October 2016 14:33
To: Planning Comments
Subject: FW: Query 256 - FW: 3rd Party Planning Application - 15/01376/OUT - DTS 44306

From: Devcon Team [mailto:devcon.team@thameswater.co.uk]
Sent: 07 October 2016 15:46
To: Katherine Brommage
Subject: RE: Query 256 - FW: 3rd Party Planning Application - 15/01376/OUT - DTS 44306

Dear Katherine,

Further to your email correspondence. I have consulted with the Asset Planner for the area and she has responded with the comments below:

Thames Water acknowledges how distressing sewer flooding is to customers, and as part of the consultation on new development we assess the potential impact on existing customers to ensure that they are not impacted negatively. However we also work with developers to promote sustainable growth.

The foul water increase associated with this development is so small that the impact cannot be assessed using our standard method, which is hydraulic modelling. Therefore the impact is considered negligible and we cannot request a Grampian style condition.

With regards the wet weather issues experienced in Poulton in the past, the drainage strategy aims to confirm the root cause of the problems, which may be surface water connections into a foul only system, and the level of risk within the catchment, so that appropriate interventions can be planned.

I hope that this assists you with questions you have raised.

Regards

Margaret Keen
Planner
Development Planning
Planning for and enabling growth
Thames Water Utilities Ltd, Maple Lodge STW, Denham Way, Rickmansworth, Hertfordshire WD3 9SQ
Tel: 0203 577 9998
Email: devcon.team@thameswater.co.uk

Asset Management

Driving Intelligent Investment

From: Katherine Brommage [mailto:Katherine.Brommage@cotswold.gov.uk]
Sent: 03 October 2016 17:24
To: Devcon Team
Subject: RE: 3rd Party Planning Application - 15/01376/OUT

Dear John,

I have received further correspondence from the Parish Council in respect of the above application and particularly the comments received below on behalf of Thames Water. I would appreciate a formal response to the attached and, in particular, the suggestion that a 'Grampian condition' should be imposed. Whilst I am not saying that I disagree with the position taken by Thames Water, I do need to be in a position to explain clearly and succinctly in my committee report (to be completed before the end of the month) exactly what the problems during wet weather are in Poulton and therefore the impact of the application in this context. On the basis of the below comments I am likely to be asked at Planning Committee why it is permissible to add any additional dwellings to the existing foul system if there is acknowledged to be an existing issue?

I do not wish to misinterpret your response or misinform the public so I would appreciate a response as soon as possible.

If you have any queries then please do not hesitate to contact me.

Best Regards,

Katherine.

Katherine Brommage MPlan, MRTPI
Senior Case Officer (Development Management)

From: John Georgoulias [mailto:john.georgoulias@thameswater.co.uk] **On Behalf Of** Devcon Team
Sent: 21 September 2016 16:52
To: Katherine Brommage
Subject: FW: 3rd Party Planning Application - 15/01376/OUT

Dear Katherine,

Please find attached the comments from our Specialist Asset planner:

The sewerage system in Poulton is in fact foul only, and not combined. The reason for not raising capacity concerns is that the foul flow from the proposed development of 9 new dwellings will take up only a fraction of the pipe capacity (less than 1%) and as such the impact on existing customers is considered to be negligible. Also, flows of this size are too small to model hydraulically, which is normally the way we assess detriment.

Nevertheless we are aware that Poulton has experienced problems during wet weather in the past. For this reason we are undertaking a drainage strategy study for the whole of Ampney St Peter, of which Poulton forms part of. We have completed the first stage of the study and the report has been published on our website here. The solution development stage is programmed to be completed by the end of next year.

Hopefully this demonstrates that we are taking the concerns of our customers into account.

I trust the above to be satisfactory.

Kind regards

John Georgoulias
Team Leader
Development Planning
Planning for and enabling growth
Thames Water Utilities Ltd, Maple Lodge STW, Denham Way, Rickmansworth, Hertfordshire WD3 9SQ
Tel: 020 3577 9998 devcon.team@thameswater.co.uk

Katherine Brommage

From: Sue Bremner on behalf of Planning mail
Sent: 08 September 2016 15:26
To: Planning Comments; Katherine Brommage
Subject: FW: 3rd Party Planning Application - 15/01376/OUT

——Original Message——
From: BCTAdmin@thameswater.co.uk [mailto:BCTAdmin@thameswater.co.uk]
Sent: 08 September 2016 15:19
To: Planning mail
Subject: 3rd Party Planning Application - 15/01376/OUT

Council Offices
Trinity Road
Cirencester
Glos
GL7 1PX

Our DTS Ref: 44306
Your Ref: 15/01376/OUT

8 September 2016

Dear Sir/Madam

Re: LAND EAST OF, BELL LANE, POULTON, CIRENCESTER, GLOUCESTERSHIRE , GL7

Waste Comments
Thames Water would advise that with regard to sewerage infrastructure capacity, we would not have any objection to the above planning application.

Water Comments
Thames Water recommend the following informative be attached to this planning permission. Thames Water will aim to provide customers with a minimum pressure of 10m head (approx 1 bar) and a flow rate of 9 litres/minute at the point where it leaves Thames Waters pipes. The developer should take account of this minimum pressure in the design of the proposed development.

Supplementary Comments

WASTEWATER: Thames Water would like to commend the applicant for adhering to the surface water disposal hierarchy and disposing of surface water flows via land drain, and not proposing to connect to the public sewer. Where disposal of surface water is other than to a public sewer, then the applicant shall ensure that approval for the discharge has been obtained from the appropriate authorities. The above comments are based on foul flows being connected to the foul sewer by gravity. If any pumped flows are introduced, Thames Water would need to re-assess the application and review the comments accordingly.

Yours faithfully
Development Planning Department

Development Planning,
Thames Water,
Maple Lodge STW,
Denham Way,
Rickmansworth,
WD3 9SQ
Tel:020 3577 9998
Email: devcon.team@thameswater.co.uk

Katherine Brommage

Subject: FW: 3rd Party Planning Application - 15/01376/OUT

-----Original Message-----
From: Devcon Team [mailto:devcon.team@thameswater.co.uk]
Sent: 20 October 2015 16:34
To: Katherine Brommage
Subject: RE: 3rd Party Planning Application - 15/01376/OUT

Hi Katherine,

Having checked the application on our system it does appear that the 'Grampion' condition is no longer necessary, as the drainage strategy has been changed and it is proposed to discharge surface water flows to land drain rather than public foul sewer.

Regards

Margaret Keen
Planner
Development Planning
Thames Water Utilities Ltd, Maple Lodge STW, Denham Way, Rickmansworth, Herts WD3 9SQ T 0203 577 9998

-----Original Message-----
From: Katherine Brommage [mailto:Katherine.Brommage@cotswold.gov.uk]
Sent: 20 October 2015 16:22
To: Devcon Team
Subject: FW: 3rd Party Planning Application - 15/01376/OUT

Dear Thames Water,

Many thanks. However, I did want do double check that I am correct to assume that there is no longer a requirement to impose the 'Grampion' conditions originally recommended by yourselves (see previous comments attached).

Katherine.

Katherine Brommage MPlan, MRTPI
Senior Case Officer (Development Management)

Planning Service Customer Feedback Questionnaire - Have we responded to your enquiry or determined your application? - Please take a few minutes to complete our short tick-box questionnaire at the link below to assist us in our continuous programme to improve standards of service to our customers and service users. Thank you.

http://www.cotswold.gov.uk/residents/planning-building/planning/customer-feedback/

-----Original Message-----
From: Ann Pain On Behalf Of Planning mail
Sent: 20 October 2015 16:06
To: Katherine Brommage
Subject: FW: 3rd Party Planning Application - 15/01376/OUT

From: BCTAdmin@thameswater.co.uk [mailto:BCTAdmin@thameswater.co.uk]
Sent: 20 October 2015 15:55
To: Planning mail
Subject: 3rd Party Planning Application - 15/01376/OUT

Council Offices
Trinity Road
Cirencester
Glos
GL7 1PX

Our DTS Ref: 44306
Your Ref: 15/01376/OUT

20 October 2015 53

Dear Sir/Madam

Re: LAND EAST OF, BELL LANE, POULTON, CIRENCESTER, GLOUCESTERSHIRE , GL7

Waste Comments
Thames Water would advise that with regard to sewerage infrastructure capacity, we would not have any objection to the above planning application.

Water Comments
Thames Water recommend the following informative be attached to this planning permission. Thames Water will aim to provide customers with a minimum pressure of 10m head (approx 1 bar) and a flow rate of 9 litres/minute at the point where it leaves Thames Waters pipes. The developer should take account of this minimum pressure in the design of the proposed development.

Supplementary Comments

Thames Water would not raise any objections to the proposed drainage strategy given that it is proposed to discharge all surface water runoff to land drain.

Yours faithfully
Development Planning Department

Development Planning,
Thames Water,
Maple Lodge STW,
Denham Way,
Rickmansworth,
WD3 9SQ
Tel:020 3577 9998
Email: devcon.team@thameswater.co.uk

Katherine Brommage

From: Rachel Bentley on behalf of Planning mail
Sent: 14 May 2015 15:27
To: Katherine Brommage
Subject: FW: 15/01376/OUT

From: Devcon Team [mailto:devcon.team@thameswater.co.uk]
Sent: 14 May 2015 15:17
To: Planning mail
Subject: FW: 15/01376/OUT

Dear Sir/Madam,

Apologies for the confusion but please find a further amended response to the above application.

Council Offices Trinity Road Cirencester Glos GL7 1PXOur DTS Ref: 44306 Your Ref: 15/01376/OUT (Amended response) 14 May 2015

Dear Sir/Madam

Re: LAND EAST OF, BELL LANE, POULTON, CIRENCESTER, GLOUCESTERSHIRE , GL7

Waste Comments
Following initial investigation, Thames Water has identified an inability of the existing waste water infrastructure to accommodate the needs of this application. Should the Local Planning Authority look to approve the application, Thames Water would like the following 'Grampian Style' condition imposed. "Development shall not commence until a drainage strategy detailing any on and/or off site drainage works, has been submitted to and approved by, the local planning authority in consultation with the sewerage undertaker. No discharge of foul or surface water from the site shall be accepted into the public system until the drainage works referred to in the strategy have been completed". Reason - The development may lead to sewage flooding; to ensure that sufficient capacity is made available to cope with the new development; and in order to avoid adverse environmental impact upon the community. Should the Local Planning Authority consider the above recommendation is inappropriate or are unable to include it in the decision notice, it is important that the Local Planning Authority liaises with Thames Water Development Control Department (telephone 0203 577 9998) prior to the Planning Application approval.

Water Comments
On the basis of information provided, Thames Water would advise that with regard to water infrastructure capacity, we would not have any objection to the above planning application.

Supplementary Comments
Waste: Thames Water have concerns based on the proposal to discharge surface water flows into the foul water network. An impact study will be required to ascertain whether detriment is caused by this increase in flow and propose potential solutions.

Yours faithfully

Development Planning Department

Development Planning, Thames Water, Maple Lodge STW, Denham Way, Rickmansworth, WD3 9SQ Tel:020 3577 9998 Email: devcon.team@thameswater.co.uk

Kind regards,

Philippa Richardson

Planner
Development Planning
Thames Water Utilities Ltd, Maple Lodge STW, Denham Way, Rickmansworth, Herts WD3 9SQ
☎ 0203 577 9998
devcon.team@thameswater.co.uk

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Asset Management

Driving Intelligent Investment

From: Devcon Team
Sent: 14 May 2015 13:22
To: 'planning@cotswold.gov.uk'
Subject: 15/01376/OUT

Dear Sir/Madam,

Please find below an amended response from Thames Water which supersedes our previous consultation response.

Council Offices Trinity Road Cirencester Glos GL7 1PXOur DTS Ref: 44306 Your Ref: 15/01376/OUT (Amended response) 14 May 2015

Dear Sir/Madam

Re: LAND EAST OF, BELL LANE, POULTON, CIRENCESTER, GLOUCESTERSHIRE , GL7

Waste Comments
Following initial investigation, Thames Water has identified an inability of the existing waste water infrastructure to accommodate the needs of this application. Should the Local Planning Authority look to approve the application, Thames Water would like the following 'Grampian Style' condition imposed. "Development shall not commence until a drainage strategy detailing any on and/or off site drainage works, has been submitted to and approved by, the local planning authority in consultation with the sewerage undertaker. No discharge of foul or surface water from the site shall be accepted into the public system until the drainage works referred to in the strategy have been completed". Reason - The development may lead to sewage flooding; to ensure that sufficient capacity is made available to cope with the new development; and in order to avoid adverse environmental impact upon the community. Should the Local Planning Authority consider the above recommendation is inappropriate or are unable to include it in the decision notice, it is important that the Local Planning Authority liaises with Thames Water Development Control Department (telephone 0203 577 9998) prior to the Planning Application approval.

Water Comments
On the basis of information provided, Thames Water would advise that with regard to water infrastructure capacity, we would not have any objection to the above planning application.

Yours faithfully

Development Planning Department

Development Planning, Thames Water, Maple Lodge STW, Denham Way, Rickmansworth, WD3 9SQ Tel:020 3577 9998 Email: devcon.team@thameswater.co.uk

Kind regards,

Philippa Richardson

Planner
Development Planning
Thames Water Utilities Ltd, Maple Lodge STW, Denham Way, Rickmansworth, Herts WD3 9SQ
☎ 0203 577 9998
devcon.team@thameswater.co.uk

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Asset Management

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Bell Lane, Poulton: Non-Technical Summary & Rebuttal of New Evidence

Project:	SHF.1109.005.HY.R.005.A – Bell Lane Poulton
Client:	Mr/s Wigram
Status:	Final
Date:	November 2016
Author:	Daniel Alstead, BSc (Hons), MSc, MCIWEM - Principal Hydrologist
Contributor:	Mark Jarvis - Principal Drainage Engineer
Contributor:	Dr Paul Hardwick, BSc (Hons), PhD FGS - Director of Water Sciences
Approver:	Matt Travis, BSc (Hons), MSc, MCIWEM, C.WEM, CEnv, CSci - Director

1. Introduction

Mr/s Wigram commissioned Enzygo Ltd to produce a Flood Risk Assessment (FRA) during March 2015, in support of an outline planning application for a residential development to comprise a maximum of 11 units, with access roads, gardens and landscaped areas.

Following submission of the FRA report, Enzygo has engaged in a number of email exchanges, telecoms, letters, technical file notes and face to face meetings with Gloucestershire County Council and Cotswold District Council, with the aim of addressing the flood risk and drainage issues associated with the Site, and the potential impact the proposed development may or may not have on flood risk in the wider Poulton area.

During the course of the discussions, Enzygo have produced a series of technical file notes, and drainage drawings (supported by calculations), which have refined both the layout and number of units within the Site (now reduced to 9 units), as well as the indicative drainage strategy, and mitigation measures.

The changes in the approach to flood risk and drainage reflect Enzygo's willingness to engage with Gloucestershire County Council, the Lead Local Flood Authority (LLFA), and address their concerns, which have been raised by local residents, Poulton Parish Council, and Poulton Working Group.

2. Purpose of this File Note

It is understandable that it may be difficult for local residents, Poulton Parish Council and Poulton Working Group to understand the technical reports, and to be able to track the changes as the design of the drainage strategy has evolved. Therefore, the purpose of this file note is to:

- Provide a non-technical summary of drainage technical matters.
- Provide additional comment on the issues raised in the recent meets held between:
  - LLFA Public Meeting (3rd October 2016, see Appendix 1)

- Cotswold District Council with Parish Council and Poulton Working Group. During this meeting, an independent study (PFA file note) was presented. Section 7 of this file note outlines the questions asked at this meeting, and key points to be resolved as requested by the LLFA and Cotswold District Council.

- Review the independent file note produced by PFA.
- Address the questions raised following the meeting, which has also been influenced following receipt of the PFA file note.

3. Non-Technical summary of Flood Risk and Drainage Technical Matters

3.1 Existing Surface Water Drainage Arrangement

The Development Site is approximately 0.98 hectares (Ha) in area and is currently a grassed field, surrounded by hedgerows and mature trees.

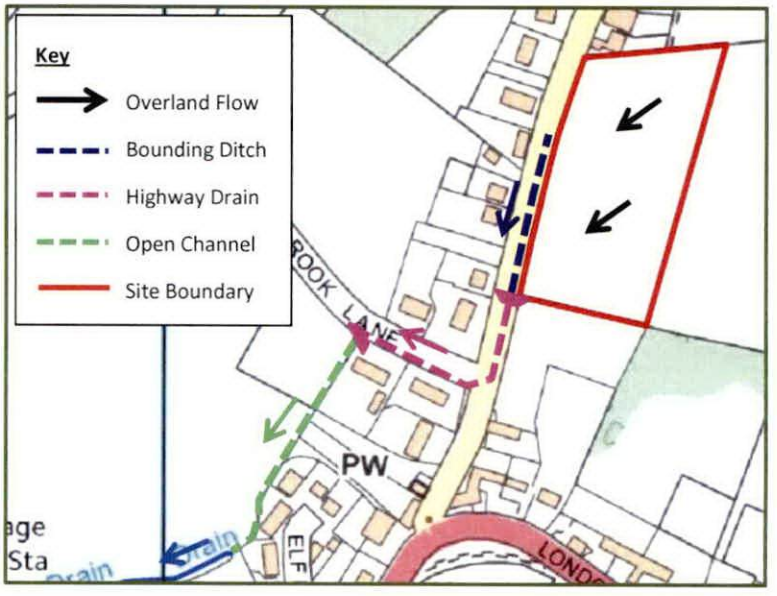
The Site slope falls from the north-east corner towards the south-west corner with the low point located adjacent to the bounding ditch on Bell Lane.

The Site is underlain by clayey soils with restricted drainage. The bedrock geology beneath the majority of the Site is mudstone, which has a high clay content. As such, the permeability of both the soils and bedrock is low and a higher percentage of rainfall runs off across the ground surface than would be the case with more permeable soils and rock. Soakaway testing was also carried out, confirming the low permeability. Therefore, surface water runoff occurs mainly as overland flow, following the topography of the Site, with a smaller amount of infiltration and movement through the soils. Overland flow runs off the Site along the south-west boundary into the bounding ditch on Bell Lane. The ditch ends just outside the south-west corner of the Site, where it enters into a culvert, which is confirmed as a highway drain.

A CCTV inspection of the highway drain found it conveys flows southward alongside Bell Lane, then west along Ashbrook Lane, before discharging to an open ditch. The ditch conveys flows southward, along the rear (west) of the properties located off Bell Lane/Elf Meadow.

A schematic of the existing drainage is shown in Figure 3.1. For clarification, the ditch and culvert is under the authority of Gloucestershire County Council.

Figure 3.1. Schematic of Existing Drainage



3.2 Existing Flooding Conditions

i. The Site

The March 2015 FRA concluded that the undeveloped Site is at low risk of flooding from all sources (tidal, fluvial, groundwater, surface water, sewer and infrastructure/reservoir failure). The subsequent email exchanges, telecoms, letters, technical file notes and face to face meetings have focussed on addressing the flood risk from the proposed development, primarily from surface water runoff, and on developing a drainage strategy to mitigate this source of flooding.

ii. The Wider Area (Poulton)

Ashbrook (an 'Ordinary Watercourse', under the authority of the local drainage authority) flows southward through Poulton. There is an area of Flood Zone 2 and 3 associated with the watercourse, which is land at 'medium' and' high' risk of fluvial (river) flooding respectively.

The capacity of the Poulton public foul sewer network has been reduced over the years due to the connection of additional surface water drains from newer developments (Thames Water Correspondence in Appendix 3). Consequently, the foul sewer network can be overwhelmed by runoff from existing residential development during rainfall events where uncontrolled surface water runoff from the locality, including from the Site finds its way into the highway drainage and the foul sewer network, overwhelming both systems, thereby contributing to fluvial flooding within Poulton.

The BGS Groundwater Flooding Susceptibility map (see Appendix 4), shows that there is a risk of groundwater flooding within Poulton and the wider area. There is potential for groundwater flooding to contribute towards fluvial, sewer and highway drain flooding where high groundwater tables, constructional joints and damaged (cracked) infrastructure can enable groundwater to leak into the systems.

The assessment of flood risk to the wider area (as described above) is based on existing (baseline) conditions (i.e. an undeveloped Site). Historical flood events are as a result of the baseline conditions.

4. Non-Technical Summary of Proposed Drainage Strategy

4.1 Principles of Surface Water Drainage

Enzygo has produced a sustainable drainage strategy (SuDS) to control and thereby manage surface water from the proposed development, through controlled attenuation and discharge.

The SuDS is based on the industry standard approach to the management of surface water from a new development (requirement H3 of the Building Regulations 2000). The requirement states that rainwater shall discharge to one of the following, listed in order of priority:

i. An adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,

ii. a watercourse; or where that is not reasonably practicable,

iii. a sewer.

Enzygo's investigation into appropriate outfall points concluded:

i. The permeability of the soil and bedrock geology is low, soakaway tests found negligible infiltration and so soakaways are not practicable.

ii. A ditch flows in a southerly direction along the western boundary of the Site, along the eastern side of Bell Lane. The ditch ends just outside the south-west corner of the Site, where it enters into a highway drain (see Figure 4.1 above).

iii. Thames Water will not accept additional surface water into its foul sewer network. Please note that Thames Water accepted a controlled discharge rate into the foul sewer network as part of the original FRA report, which was inclusive of a drainage strategy. Thames Water later objected to the surface water outfall, since the initial acceptance was in error. This is one reason (amongst others) why the drainage strategy has been amended.

The only practicable option in accordance with the Building Regulations is Option ii. The proposed SuDS for the development would outfall to the ditch and highway drain, as is currently the case.

4.2 Mitigation of Flood Risk from the Proposed Development

At present, uncontrolled runoff from rain falling on the Site area and a wider catchment is a contributing factor to historical flooding incidents within Poulton and will continue to occur going forward without the proposed development.

The proposed residential development will increase the impermeable (hardstanding) of the Site area, and so in theory would increase the existing runoff from the Site compared to the undeveloped state. However, in line with NPPF guidance, the SuDS for the development will control, manage and reduce the flood risk posed by surface water runoff, and so will provide a betterment to the present uncontrolled situation.

The SuDS will be designed in accordance with current guidance to control and manage surface water for events up to and including the 1 in 100-year rainfall event (with an additional climate change allowance of 40% to account for predicted future increases in rainfall). Rather than an open pond, the surface water will be attenuated by collection within an oversized pipe and controlled discharge to the adjacent ditch. A drawing of the indicative drainage design is included in Appendix 2. The proposed SuDS also accommodates surface water from a 1.37 Ha catchment to the east of the Site, thereby offering a betterment. Surface water runoff from the wider catchment (e.g. tile drainage) will either be captured or will bypass the Site entirely as at present.

Any tile drainage encountered entering the Site during construction will be diverted into the attenuation (oversized pipe) which has been sized to accommodate the 100 year plus 40% climate change for the 1.37 Ha catchment to the east (outside) of the site. If the system is full, it will overflow onto Bell Lane as present, but will provide a betterment compared to the current situation. Any residual risk of flooding to the new units will be mitigated through the raised finished floor levels (+150mm).

A simplified view of the SuDS strategy is to see it as a bath (the oversized pipe) with an open plug hole (outfall orifice) filling with water from the tap (rainfall). As the bath fills, the plug hole allows water to escape, however the rate at which water escapes is slower than the rate entering the bath from the tap, causing the bath to fill.

The length of time the tap is turned on (the design rainfall event) is designed into the size of the bath to hold (attenuate) the water, so that the bath does not overtop. If the tap is turned off later (exceedance event) the bath will overflow. In this case, the oversized pipe has been designed to attenuate the 1 in 100-year event, plus 40% climate change allowance and to accommodate the increased volume of runoff predicted from impermeable (hardstanding) areas associated with the proposed development.

5 Matters to be Addressed from the Meeting Minutes

Enzygo has reviewed the minutes of a recent public meeting held with the LLFA (see Appendix 1 - Minutes of Meeting, 3rd October 2016).

We note that the themes of the issues raised are reflective of the objections reported on the Council's Planning Portal. We have assumed that all relevant flood risk and drainage matters were raised within the meeting.

Below are our responses from a flood risk and drainage perspective to what we perceive are the key issues raised:

- **Poulton has historically flooded, and the new development will exacerbate flooding.**

We are aware of historic flooding within Poulton. As described in Section 4.2 above, the new development will attenuate surface water onsite up to the design rainfall event (1 in 100-year event, plus 40% climate change allowance), therefore no more runoff will come from the development than at present (as clarified above in the non-technical bath description), and less runoff will occur from the Site due to climate change in future years (40% climate change allowance for potential change anticipated for 2060 to 2115) (see Table 2 of document: 'Flood Risk Assessment: Climate Change Allowances).

The proposed SuDS goes further by collecting and attenuating additional uncontrolled surface water runoff from a 1.37 Ha catchment to the east of the Site. Thereby the scheme provides a betterment to existing conditions by removing uncontrolled runoff from this area that presently adds to the flooding problems in Poulton.

- **Historical flooding includes incidents where the sewer was blocked at the back of Elf Meadow, causing issues at the London Road/Bell Lane Junction. There has been silt blockages near Ashbrook Lane, which could indicate a broken system, allowing soil to enter with the groundwater. The network has backed up as far as the pumping station.**

These issues result from poor sewer maintenance and so are the responsibility of Thames Water.

The proposed SuDS for the development will reduce the amount of sediment in runoff leaving the Site and the 1.37ha catchment to its east. Sediment collected in the SuDS (i.e. silt traps) will be a maintenance issue for a management company or the riparian owner.

- **There has been a failure to appreciate how water and sewerage runs through the village, and the seriousness of flooding and sewerage issues on established households.**

Flooding within the local area is well recognised and understood as summarised in Section 3.2 of this file note, which details the flooding mechanisms within Poulton. Poulton has experienced flooding incidents as a result of past surface water connections to the foul sewer network (from established households) which has overwhelmed the network. Overwhelming of the highway drain/foul sewer network resulted from uncontrolled overland flow from adjacent agricultural land. There is also an element of fluvial flooding from Ashbrook, and potential groundwater flooding (albeit not associated with the Site itself).

- **There is a failure to demonstrate that the development will not increase flood risk elsewhere as required by NPPF paragraph 100. There is a failure to consider alternative Sites with less risk of flooding as required by NPPF paragraph 101 and also the NPPF paragraph 14 requirement that permission only be granted if the adverse impacts are significantly and demonstrably outweighed by the benefits.**

There is a misunderstanding of the NPPF guidance. The Site is located within Flood Zone 1 (low risk) and at low risk of flooding from all sources, as identified by the FRA submitted during March 2015. As such, an alternative Site does not need to be considered and the assessment is compliant with NPPF paragraph 101. The technical information provided to date demonstrates that any risk of flooding on the Site would be from unmanaged surface water from the proposed development but surface runoff will be managed via a SuDS scheme. The proposed SuDS would mitigate the risk of flooding from the proposed development reducing it in the long term as a consequence of climate change thereby ensuring that no greater runoff is discharged from the Site when

compared to the current uncontrolled conditions. The proposal is therefore consistent with the relevant paragraphs in the NPPF.

- **There is a failure to address the sewage issues.**

The proposed foul sewerage strategy from the proposed development will be for connection to the local foul sewer network.

The Thames Water foul water response (see Appendix 3) states:

"Thames Water acknowledges how distressing sewer flooding is to customers, and as part of the consultation on new development we assess the potential impact on existing customers to ensure that they are not impacted negatively. However, we also work with developers to promote sustainable growth.

The foul water increase associated with this development is so small that the impact cannot be assessed using our standard method, which is hydraulic modelling. Therefore, the impact is considered negligible and we cannot request a Grampian style condition.

With regards the wet weather issues experienced in Poulton in the past, the drainage strategy aims to confirm the root cause of the problems, which may be surface water connections into a foul only system, and the level of risk within the catchment, so that appropriate interventions can be planned."

Thames Water also provided the following comments to Cotswold Council:

"Please find attached the comments from our Specialist Asset planner:

The sewerage system in Poulton is in fact foul only, and not combined. The reason for not raising capacity concerns is that the foul flow from the proposed development of 9 new dwellings will take up only a fraction of the pipe capacity (less than 1%) and as such the impact on existing customers is considered to be negligible. Also, flows of this size are too small to model hydraulically, which is normally the way we assess detriment.

Nevertheless, we are aware that Poulton has experienced problems during wet weather in the past. For this reason, we are undertaking a drainage strategy study for the whole of Ampney St Peter, of which Poulton forms part of. We have completed the first stage of the study and the report has been published on our website here. The solution development stage is programmed to be completed by the end of next year.'

Hopefully this demonstrates that we are taking the concerns of our customers into account."

Based on the above, the foul sewage issues associated with the developments impact have been addressed and accepted by the statutory sewerage undertaker.

- **The oversized pipe storage capacity is insufficient.**

The indicative attenuation storage of 337m^3 has been calculated, and an indicative attenuation pipe with a diameter of 1.5m and length of 154m has been proposed. A basic calculation of diameter (1.5m) x length (154m) would suggest the pipe could only accommodate 231m^3. However, the calculations allow for storage within the manhole chambers (S1 to S4), as well as the discharge of surface water from the pipe at the 5 l/s controlled greenfield rate.

The pipe/chamber system and outfall arrangement is deliberately oversized and designed to attenuate the 1 in 100 year event, plus 40% climate change allowance. An extract from the drainage calculations have been included below, which include annotations. These are indicative figures, and will be refined at detailed design.

Results for 100 year +40% Critical Storm Duration. Largest routing error: 0.27%

Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Name	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	1	464	100.823	3.178	12.8	15.9761	0.0000	SURCHARGED	1.000	2	16.0	0.146	0.007	35.7308	
480 minute winter	2	464	100.815	3.196	25.2	17.4847	0.0000	SURCHARGED	1.001	3	16.2	0.274	0.006	104.2259	
480 minute winter	3	464	100.819	3.280	25.5	16.8936	0.0000	SURCHARGED	1.002	4	10.9	0.234	0.004	131.3972	
480 minute winter	4	464	100.819	3.379	10.9	15.2888	0.0000	SURCHARGED	1.003	5	4.9	0.599	0.436	0.3886	
480 minute winter	5	464	97.247	0.072	4.9	0.0000	0.0000	OK	1.004	6	4.9	0.630	0.436	0.3982	147.1
480 minute winter	6	464	97.188	0.063	4.9	0.0000	0.0000	OK							

Volume of manhole chambers (S1 to S4) = 65.6m³

Volume of pipe lengths between manhole chambers = 271.4m³

Volume of manhole chambers S1 to S4 = 337.0m³

- **The design of the surface water system should be designed for more than a 1 in 100 year event, because of the frequency of flooding within Poulton.**

Surface water design standard is for the 100 year plus 40% climate change allowance, which is in line with NPPF and was agreed by the Lead Local Flood Authority Gloucestershire County Council. The 40% allowance for climate change provides the higher design standard requested.

Furthermore, the 1.37 Ha catchment to the east will be managed to the same standard, thereby offering a betterment to existing conditions, where it would have normally shed water through overland runoff in an uncontrolled manner.

The surface water drainage strategy goes above and beyond to mitigate flood risk from the Site and is designed to cater for more than the present day 1 in 100 year event.

- **Groundwater Flooding issues.**

Groundwater flooding occurs sporadically in both location and time. It tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example tunnels, basements and car parks) underlain by permeable rocks (aquifers) at outcrop or near-surface.

The BGS Groundwater Flooding Susceptibility map (see Appendix 4), shows that the Site is of very low susceptibility to groundwater flooding. There is no significant permeable bedrock and the soils are demonstrated to be of low permeability.

Poulton Spring (which is actually an old sunk well) at NGR SP0991009 is in the Cornbrash (borehole record in Appendix 5). The wellhead is at 303ft (92.35mAOD), i.e. 6.9m lower than the lowest part of the Site at 99.28mAOD and the water level in the 9ft (2.74m deep) well is at 7ft (2.13m) below well top i.e. 90.22mAOD. Therefore, groundwater at Poulton Spring is some 9m below the Site.

Soil mapping shows that the Site is underlain by clayey soils with impeded drainage. The bedrock geology beneath the majority of the Site is mudstone, which has a high clay content. As such, the permeability of the soil and geology is considered to be low.

Soakaway testing was carried out and found negligible infiltration. It is common practice for poorly drained agricultural land to be drained using by 'tile drainage'. Tile drainage is a subsurface drainage, which removed excess water from soils. Tile drains are installed below the surface, which ultimately discharge to a perimeter ditch. Older systems are comprised of short lengths of clay tiles, whereas modern systems are made of perforated plastic tubing. The tile drainage flows when the water table in the soil is higher than the tile. The tile drainage network is laid out in a variety of way, depending on site specific requirements (i.e. crop type) and conditions (i.e. soil

type, topography, and hydrology). Tile drainage typically has a working life of 20-40 years, depending on factors such as siltation, misalignment, and collapsing.

Water bubbling up out of the ground in such situations is a result of a damaged tile drains. The location and orientation of historical tile drainage is often unmapped and therefore unknown. Water emerging from a tile drain is therefore sourced primarily from surface water which has infiltrated into the ground rather than ground water rising to the surface.

In conclusion, the risk of groundwater flooding is negligible and excavation of foundations will not cause any significant emergence of groundwater. In addition, the development will not include dwellings with basements and finished floor levels will be +150mm above current ground level.

The intercepting swale/oversized pipe will be sealed, so will not accept groundwater, and would not be directing this into the surface water drainage network.

- **There has been a huge reduction in the contributing catchment to the east of the Site. There is a reduction in the pipe size and attenuation volume.**

During the course of discussions, Enzygo has produced a series of technical file notes, and drainage drawings (supported by calculations), which have refined both the layout and number of units within the Site (now 9 units), as well as the indicative drainage strategy, and mitigation measures.

The initial catchment area investigation was to calculate the catchment contributing to flows into the highway drainage inlet (29.7 Ha), which was generated using LiDAR data (ground model data, depicting local topographic levels).

Following consultation with Gloucestershire County Council, it was agreed that due to the size of the Site, and multiple land ownership, it is unfeasible and unrealistic to expect the Site to intercept and attenuate all overland flows from the 29.7 Ha catchment upstream of the highway culvert inlet.

However, it was agreed that a 1.37 Ha sub catchment area of the 29.7 Ha that contributes to overland flows routing through the Site could be intercepted and attenuated within the Site thereby offering a betterment. The remaining 28.3 Ha is routed around the site, not through the Site.

As part of this study, Enzygo obtained a more accurate LiDAR data set than that first used, and utilised industry standard PDS flow pathway analysis to more accurately refine the catchment area which would contribute to overland flows through the Site. Consequently, the contributing catchment has reduced significantly compared to that shown in the initial catchment area investigation.

- **The use of 40% PIMP within the catchment.**

The percentage of drained area that is impermeable (PIMP) value of 40% has been applied to the catchment to allow for the low permeability of the clay soils and geology within the catchment. A 40% PIMP is representative of the clay soils and geology, and generates a higher (and so worst case) runoff rate than if a lower or no PIMP value was applied.

The 40% PIMP value has been based on the FEH catchment description 'SPRHOST'. The SPRHOST parameter reflects the amount of surface runoff in a catchment, and is a function of the HOST soils classifications. Using the online calculation 'HR Wallingford UK Sustainable Drainage Guidance & Tools – Greenfield Runoff Estimation for Sites', the soil HOST value (3) has an SPR value of 0.37 (i.e. 37% of rainfall sheds overland). In this instance, we have rounded the 37% up to 40%, thereby using a more conservative PIMP value within the calculations.

- **Data provided by Enzygo was not independent and therefore could not be relied upon.**

Enzygo Ltd is an independent professional multidisciplinary consultancy, capable of providing the necessary technical input to flood risk and drainage studies. Factual data, often provided by third party organisations, is interpreted and reported on by Enzygo staff who have the relevant skills and experience to produce such documents. Summary profiles for staff who have contributed to the technical input into the flood risk and drainage documentation submitted as part of the outline planning application, are included below.

Matt Travis,** BSc (Hons), MSc, MCIWEM, C.WEM, CEnv, CSci - **Director

Matt is one of the three founding directors of the Environmental Consultancy Enzygo. Matt's role is as a Board Director with responsibility for the Sheffield Office, Hydrology/Drainage and the company's ISO9001 accreditation. Over the past eighteen years Matt has project managed and completed hundreds of flood risk related studies for insurance disputes, planning applications, flood defence schemes and risk management across the UK and Europe. These studies have involved numerical modelling for river, tidal and reservoir flood studies. Matt has reviewed and designed SuDS designs for residential developments, landfills, quarries and managed drainage studies at industrial facilities. He has designed field pipe drainage systems to reduce the ponding of water at railway embankments, and carried out hydrological calculations for SuDS systems for highways runoff. Over the last eighteen years Matt has been involved in several planning inquiries on the matters of flood risk and drainage.

Dr Paul Hardwick,** BSc (Hons), PhD FGS - **Director of Water Sciences

Paul has over 19 years commercial consultancy and an additional 13 years academic/consultancy experience in the fields of geology, hydrogeology, hydrology and contaminated land. He is a Fellow of the Geological Society (elected in 2000). Paul joined Enzygo in July 2015 as Director of Water Sciences and is responsible for the direction and management of technical support services as part of the Water Sciences team based in Sheffield. His projects include hydrogeological risk assessments and ground condition assessments for minerals and waste Sites, onshore pipelines and cables, onshore windfarms and unconventional oil and gas fields. Paul has directed the flood risk assessment programme for two major UK electricity Distribution Network Operators and is also a specialist on UK carbonate aquifers. Paul has also been involved in several planning appeals and public inquiries relating to groundwater flood risk.

Mark Jarvis – Principal Drainage Engineer

Mark has over 25 years' experience working for a number of developers and consultancies, in which time he has worked on numerous engineering appraisals of developable land and infrastructure design. Mark has considerable experience of liaison with developers, contractors, local authorities and public utilities. He has been involved in the preparation of legal agreements within the Highway & Water Acts, and has worked on multidiscipline project management projects within the residential, commercial & education sectors.

Daniel Alstead,** BSc (Hons), MSc, MCIWEM, C.WEM – **Principal Hydrologist

Daniel is a chartered hydrologist who has been actively involved in environmental consultancy for 9 years, working for various consultancies. Daniel has experience in providing hydrological advice in the areas of; flood risk (FRA's, Flood Evacuation and Management Plans, and Sequential/Exception Tests), hydrological assessments, hydraulic modelling and drainage strategies. He has experience in the modelling of hydrological events, 1D/2D modelling of tidal and fluvial events, and modelling of surface water

flooding, using a variety of industry standard methodologies. Daniel is also able to develop deliverable surface water drainage strategies using industry standard methods and software.

Gloucestershire County Council and Cotswold District Council are reliant upon technical information being provided by the applicant. The applicant required the assistance of a consultancy capable of providing the necessary technical input. Based on the staff profiles above, the professional capabilities of Enzygo staff in providing technical inputs are more than sufficient.

Enzygo has prepared technical input based on a fixed fee contract with Mr/s Wigram, and will not benefit from any profits from the proposed development, whether planning is granted or not. As such, Enzygo has no motive to influence information, and to suggest otherwise is defamatory.

Again, **the changes in the approach to flood risk and drainage reflect Enzygo's willingness to** engage with Gloucestershire County Council, the Lead Local Flood Authority (LLFA), and address their concerns, which have been raised by local residents, Poulton Parish Council and the Poulton Working Group.

It is understandable that the technical information presented can be difficult to understand, especially when reading back through the various documentation as the drainage aspect has evolved. However, the technical information has been generated in full cooperation with the LLFA, which has been reviewed and approved. It is the purpose of this non-technical summary to try and clarify key issues. However, objection should be based on reasoned argument of the factual information as presented.

- **Enzygo had used flow through a pipe to calculate the capacity of the flow under the bridge. By merely halving the pipe simulation they ignore the resistance of the rough bed of the brook.**

The resistance of the bed is expressed as a Mannings 'n' roughness value. A Mannings 'n' roughness value of 0.035 was considered appropriate as an upper limit for the channel bed (a straight, clean and featureless reach, which appeared well maintained – see Figure 5.1 and 5.2 below)

Figure 5.1. Mannings n for Channels <100 ft

Manning's n for Channels (Chow, 1959).

Type of Channel and Description	Minimum	Normal	Maximum
Natural streams - minor streams (top width at floodstage < 100 ft)			
1. Main Channels			
a. clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
b. same as above, but more stones and weeds	0.030	0.035	0.040

Figure 5.2. Road Bridge Orifice

The concrete lined orifice (see Figure 5.1 below) is considered to have a lower roughness volume (0.013).

Figure 5.3. Mannings n for Closed Conduits

Manning's n for Closed Conduits Flowing Partly Full (Chow, 1959).

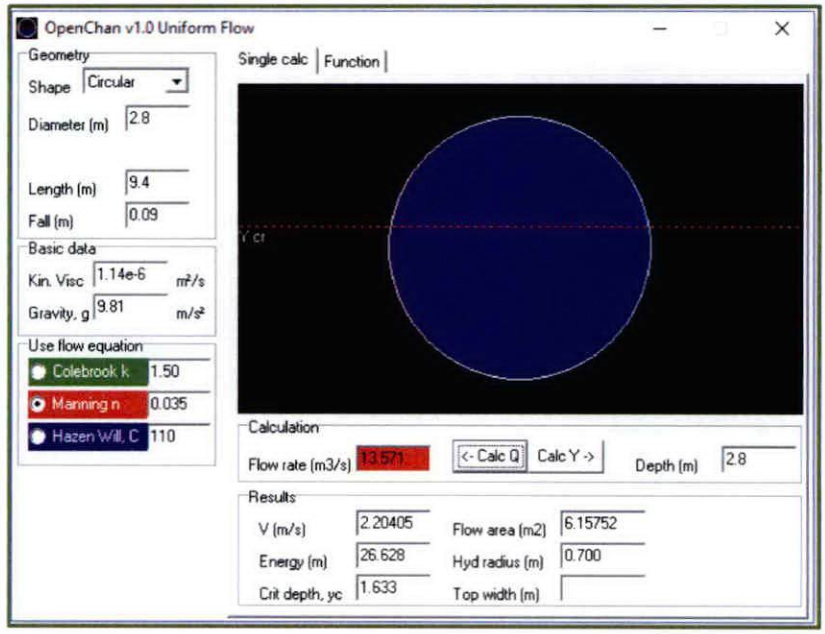
Type of Conduit and Description	Minimum	Normal	Maximum
1. Brass, smooth:	0.009	0.010	0.013
2. Steel:			
Lockbar and welded	0.010	0.012	0.014
Riveted and spiral	0.013	0.016	0.017
3. Cast Iron:			
Coated	0.010	0.013	0.014
Uncoated	0.011	0.014	0.016
4. Wrought Iron:			
Black	0.012	0.014	0.015
Galvanized	0.013	0.016	0.017
5. Corrugated Metal:			
Subdrain	0.017	0.019	0.021
Stormdrain	0.021	0.024	0.030
6. Cement:			
Neat Surface	0.010	0.011	0.013
Mortar	0.011	0.013	0.015

However, the OpenChan calculation only has input for one roughness value as it is a pipe calculation. The roughness value of the bed (0.035) was utilised, thereby providing a conservative approach (i.e. the concrete arch has the same roughness as the bed). Higher roughness results in lower conveyance.

- **The dimensions (length) of the bridge at London Road is incorrect in the Enzygo report – have their dimensions been checked? What are the implications if their calculations are based on incorrect measurement data?**

The width of the bridge was measured using Ordnance Survey mapping, which was found to be approximately 18m (conveying 4.9m^3/s). Measuring of the Ordnance Survey mapping may have led to inaccuracies. We accept the revised figure of 9.4m quoted by objectors, and provide the following calculations (see Figure 5.1), which demonstrate that the shortened bridge can convey a higher figure of 6.8m^3/s (half of flow rate set out below in Figure 5.1). Both the flows quoted above exceed the 1 in 100yr plus climate change flows calculated along the watercourse. The purpose of the capacity checks was to demonstrate that there is reasonable conveyance through the outfall drainage route. The fact that the bridge surcharges has no impact to the Development Site. The flood risk from the Site is based on surface water discharge, which has been demonstrated to be attenuated onsite to an acceptable return period, including climate change (see previous comments).

Figure 5.1. OpenChan Calculation of Bridge Orifice



- **Councillor Davies said the figures had been constantly changed, inconsistent and negligent. He said that a competent Engineer would not have got it wrong in first instance. Cllr. Fowles said that the numbers had been gradually changed to get through the planning process.**

It is understandable that the technical information presented can be difficult to understand, especially when reading back through the various documentation as the drainage aspect has evolved. Defamatory remarks aside, Councillors Davies and Fowles should appreciate that Enzygo have openly engaged with Gloucestershire County Council to agree a way forward on the drainage strategy. This has led to a change in approach and change in figures. The change in approach has been led by objections from local residents and the Poulton Working Group. This is common practice when applicants respond to objections raised during the application process. Of course, if a change to approach has not been made, it would not be possible to get through the planning process.

6 Review of PFA File Note

6.1 Introduction

A file note was produced by PFA Consulting during October 2016 and was commissioned by the Poulton Working Group, as an independent study. A copy of the PFA file note has been included within Appendix 6.

PFA provide a summary of baseline conditions and existing flooding problems within Poulton, which includes:

- Fluvial flooding of the Ashbrook during prolonged rainfall events.
- Infiltration and misconnection into the public foul water sewer network causing backing up in the lower parts of the village.
- Overland/land drainage flows from the east and north flowing into the village.
- Groundwater flows and springs draining into ditches and watercourses.

PFA state: *"The first two of these are not covered in this report as they are not considered to directly affect the proposals on Bell Lane"*. As such, the file note proceeds to discuss only overland/discharge flows and groundwater flows.

6.2 Overland Flows and Land Drainage

We provide commentary on the overland flows and land drainage observations within the PFA file note:

- **A ditch flowing north to south along the eastern side of Bell Lane, adjacent to the Site has been identified. An analysis of LiDAR data and Ordnance Survey mapping indicated an approximate 67 Ha catchment.**

We note that PFA fail to provide mapped evidence of the catchment boundary, and provide no details of the software and method used to define the catchment area. At this stage, the catchment area is speculative at best, whereas our catchment area is clearly identified.

- **Anecdotal evidence has been presented, of land drainage (underground land drains) to the east of the Site, and provide photographic evidence of an outfall to the Bell Lane ditch.**

We don't dispute the presence of underground land drains, or 'tile drainage'. It is common practice for poorly drained agricultural soils to be under drained by tile drainage, which is used to remove excess water from waterlogged heavy clay soils. Water conveyed by tile drainage is therefore sourced primarily rain falling on the soils.

Tile drainage typically has a working life of 20-40 years, depending on factors such as siltation, misalignment, and collapsing. As noted in the key questions raised: *"Local knowledge confirms that applicants' father had them installed in late 1960s"*. Whilst some of the tile drainage network is still active, the capacity of the tile drainage is likely to be reduced, which is evident by the waterlogged ground conditions witnessed when a 4x4 vehicle got stuck.

Any tile drainage encountered entering the Site during construction will be diverted into the attenuation (oversized pipe) which has been sized to accommodate the 100 year plus 40% climate change for the 1.37 Ha catchment to the east (outside) of the site. If the system is full, it will overflow onto Bell Lane as present, but it provides a betterment compared to the current situation. Any residual risk of flooding to the new units will be mitigated through the raised finished floor levels (+150mm).

- **There is a 700m length of highway to the north of the Site, which also drains towards Poulton. When the gullies become blocked and/or the highways system is overloaded, it is likely that overland flows from the highways will also contribute to flows running into the ditch and Bell Lane. When flows in the ditch exceed capacity, flows are routed south along Bell Lane and Ashbrook Lane.**

We don't dispute this analysis of flooding causes but highways flows are nothing to do with the Site. The blockage of the highways system is a maintenance issue for Gloucestershire County Council. The highway system is designed to a certain standard, and exceedance is a result of the design standard.

- **A simple hydraulic model has been created to represent surface water flooding route and depths adjacent to the Site, and within Poulton.**

We note the following from the modelling reporting:

- Failure to disclose a copy of the hydraulic model to Gloucestershire County Council for review. It is unlikely that the approach to the modelling methodology was discussed and agreed with the Council. At this stage, we do not know which modelling software has been used, and we are unable to review the model inputs (i.e. FSR Unit Hydrograph and roughness, how the channel bathymetry has been derived) to determine whether sensible inputs have been used.
- There is no description of the LiDAR resolution and the grid size used within the model. At this stage, we are unable to review the model inputs and determine whether sensible inputs have been used.
- Failure to provide mapped evidence of the catchment boundary, and provide details of the software and method used to define the catchment area.
- Failure to disclose copied of the FSR Unit Hydrograph calculations. Moreover, the FSR Unit Hydrograph is an outdated method of deriving the model input hydrograph. The FSR method was first superseded by the FEH Rainfall Runoff and later by the FEH Statistical and ReFH (Revitalised Flood Hydrograph) methods, since the FEH Rainfall Runoff method relied on fewer catchment descriptors and often overestimated peak flows. The overestimation is a result of not accounting for a 'kink' in the descending limb of the hydrograph, which allows for a degree of catchment infiltration.
- No consideration of climate change.
- Failure to undertake sensitivity analysis of Mannings 'n' roughness values.
- Failure to calibrate the model using photographic, mapped, and anecdotal information.
- The depth of flooding within the mapped outputs are banded by 10mm-100mm, 100mm-300mm and 300mm-600mm. Why has a banding of 100mm between 0mm-600mm not been considered? The outputs from the 300mm-600mm at the point of the proposed surface water outfall is skewing results to depict the maximum possible flood depth. There have been no numerical results provided to define where the flood depth lies between the 300mm-600mm outline.
- If it is the purpose of the model to depict flood depths adjacent to the proposed surface water outfall, then the model is not fit for purpose. This is justified by the fact that the model introduced a hydrograph (from an outdated method) within the ditch, just upstream from the culvert inlet, which is considered a 'pinch point'. The model represents a scenario where peak flows from the suggested 67 Ha catchment (which is unproven and disputed) are entering the culvert at once, thereby artificially inflating the flood depth, as the model needs time to allow flows (dumped in one location) to disperse from the input point. The outfall point of the onsite surface water drainage would be set at a suitable level to prevent the network becoming surcharged. Whilst this

information is not required at outline stage, the Site is higher than the receiving ditch, and an outfall should therefore be achievable. If at detailed design stage the levels are found not to work, a flap value could be fitted to the outfall, requiring additional storage within the oversized pipe and the drainage can be revised to accommodate this. Based on preliminary investigations, an overly conservative depth of 1.0m at the outfall point, over a 6 hour inundation period, would require an additional 20m3 of storage within the oversized pipe attenuating off site flood water (1.37 Ha catchment to the east of the Site). This could easily be attenuated by upgrading the Ø1500mm pipe to a Ø1600mm. The onsite drainage (smaller 0.98 Ha Site) could also be increase in a similar way. As such, surcharging is not considered an issue with this Site and there is sufficient space within the Site to accommodate further storage, if required.

6.3 Groundwater

- **Cotswold District Council's Strategic Flood Risk Assessment makes reference to groundwater flooding issues within the area but does not make any specific reference to problems in the immediate vicinity of the Site.**
- **Further evidence of a high groundwater table does exist as follows. The water level in a well in a the rear garden of a property on Bell Lane was recorded at 1.1 metres below ground level during the summer of 2016 and has been close ground level (99m AOD) in winter months. It is understood that trial pits excavated on the application Site experienced groundwater ingress and had to be dewatered before being backfilled.**
- **Video evidence appears to show groundwater issues in the ditch on Bell Lane with groundwater rising directly into the base of the ditch.**

The 'evidence' of a high groundwater table is not substantiated by provision of relevant factual data. The well in the rear garden of the property may be an ornamental feature and may be rainwater fed.

The BGS Groundwater Flooding Susceptibility map (see Appendix 4), shows that the Site is of very low susceptibility to groundwater flooding. There is no significant permeable bedrock and the soils are demonstrated to be of low permeability.

Poulton Spring (which is an old sunk well) at NGR SP0991009 is in the Cornbrash (borehole record in Appendix 5). The wellhead is at 303ft (92.35mAOD) (i.e. 6.9m lower than the lowest part of the Site at 99.28mAOD) and the water level in the 9ft (2.74m deep) well is historically at 7ft (2.13m) below well top (i.e. 90.22mAOD). Therefore, groundwater at Poulton Spring is some 9m below the Site.

Soil mapping shows that the Site is underlain by clayey soils with impeded drainage. The bedrock geology beneath the majority of the Site is mudstone, which has a high clay content. As such, the permeability of the soil and geology is considered to be low.

Soakaway testing was carried out and found negligible infiltration. It is common practice for poorly drained agricultural land to be drained using by 'tile drainage'. Water bubbling up out of the ground in such situations is a result of a damaged tile drains. Any tile drainage encountered during development works will be managed and incorporated into the SuDS scheme.

In our view the risk of groundwater flooding is negligible and the excavation of foundations will not cause any significant emergence of groundwater. In addition, the development will not include dwellings with basements and finished floor levels will be +150mm above current ground level.

There is no evidence that the water bubbling up along Bell Lane is groundwater, and is likely to be associated with a tile drain outlet. As previously noted, any tile drainage encountered entering the Site during construction will be diverted into the attenuation (oversized pipe).

6.4 Attenuation of Offsite Flows

- **The oversized pipes have been designed to attenuate offsite flows, based on a catchment area of 1.37 Ha. A review of 1m LiDAR data indicated that the actual catchment area is around 2 Ha.**

Again, there is a failure to disclose the software and methodology to derive the 2 Ha catchment, as well as the mapped catchment outline. Enzygo's approach to defining the catchment has been through the use of PDS flow pathway analysis (industry standard method and software) to more accurately refine the catchment area (much more accurate than a hand drawn catchment boundary), which would contribute to overland flows through the Site.

We note that a standard surface water drainage approach would be to manage surface water from the Development Site alone (i.e. no more surface water leaves the Site post-development, compared to pre-development). In this instance, it has been agreed with Gloucestershire County Council to restrict flows to the recommended minimum runoff rate of 5 l/s, and to attenuate overland flows from the 1.37 Ha catchment to the east of the Site. The principle of this method is to offer a betterment, by attenuating surface water from the Site and 1.37 Ha catchment within the Site boundary, and to control the release into the ditch, which would otherwise flow into the ditch uncontrolled.

- **The volumes shown for the pipes on the Indicative Drainage Layout does not tally with the pipe dimensions.**

We believe this point has been sufficiently addressed previously in this report. There are flows leaving the pipe at a controlled rate, at the same time as there being additional attenuation volume within the manhole chambers.

- **The installation of a swale with a 1.5m diameter pipe beneath it could intersect the groundwater table. This could cause groundwater flooding to rise to the surface in this area and the swale, pipe and pipe trenching could form a flow route for subsurface flows leading to significant increase in flows entering the ditch. Groundwater monitoring over a wet winter season would be required to fully understand the groundwater levels in this area.**

The groundwater table is several metres below the lowest elevation of the Site as indicated elsewhere in this file note. We would agree that groundwater monitoring would provide understanding of groundwater levels within the Site. This is however a matter for detailed design, and would not be required at outline stage.

6.5 Onsite Drainage

- **It is unclear whether flows from the driveways and private areas have been included within the impermeable areas (constructed permeable paving) used for sizing the oversized pipes. Permeable paving has been proposed to encourage infiltration, however the report states that infiltration is unlikely to be effective, so these areas should be included within the areas for the onsite drainage system.**

The permeable and impermeable areas have been included within the drainage calculations. Whilst infiltration alone may not be feasible (i.e. an outfall is required due to low permeability), some surface water will infiltrate. It is normal for SuDS features (i.e. permeable paving) to be incorporated into the drainage design, to allow for limited infiltration, and to improve water quality. The attenuation calculation has assumed no infiltration as a conservative approach, however some surface water will be able to infiltrate, therefore there is some allowance for overestimation of attenuation volume. It has been demonstrated that attenuation for the proposed development can be delivered. This level of detail should be sufficient at outline stage.

7 Questions Raised Following the Meeting and Receipt of Independent File Note

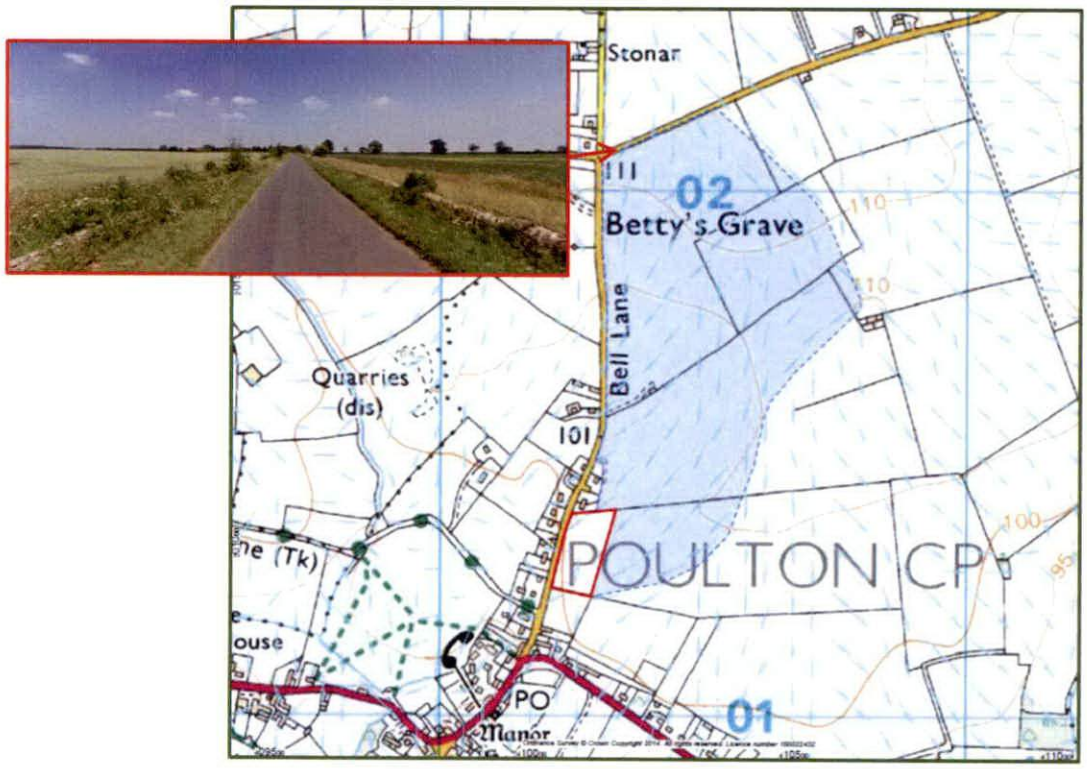
A copy of the questions raised following the meeting, which have been influenced following receipt of the PFA file note, has been included within Appendix 7. A response to the questions raised have been address below:

- **Has the catchment area been correctly calculated?**

The initial catchment area investigation was to calculate the catchment contributing to flows into the highway drainage inlet (29.7 Ha), which was generated using LiDAR data (ground model, depicting local topographic levels). The initial investigations used readily available, but less accurate LiDAR data set, with the catchment boundary drawn visually around the flow pathway arrows.

Figure 7.1 below depicts the 29.7 Ha catchment, contributing to flows within the highway drainage. The catchment boundary was derived through a visually drawn line around the flow pathway arrows, and was previously submitted as part of a rebuttal response to a previous Gloucester County Council objection. The highway running east-west along the northern end of the catchment is topographically higher than land to the north, therefore would not contribute to the catchment area, and would divert flows east and west. This would also be influenced by a depression in the land along the north and southern boundary of the highway, and by stone walls (see image below, view looing east along highway). The properties to the north of the Site discharge surface water to the public foul network.

Figure 7.1. Highway Drainage Catchment



Following consultation with Gloucestershire County Council, it was agreed that due to the size of the Site, and land ownership restrictions, it would be unfeasible and unrealistic to expect the Site to intercept and attenuate all overland flows from the 29.7 Ha catchment upstream from the

highway culvert inlet. It was however agreed that as a betterment, the area of the catchment which would contribute to flows being routed through the Site boundary (1.37 Ha) could be intercepted and attenuated within the Site boundary, thereby offering a betterment. The remaining 28.3 Ha is routed around the site, not through the Site.

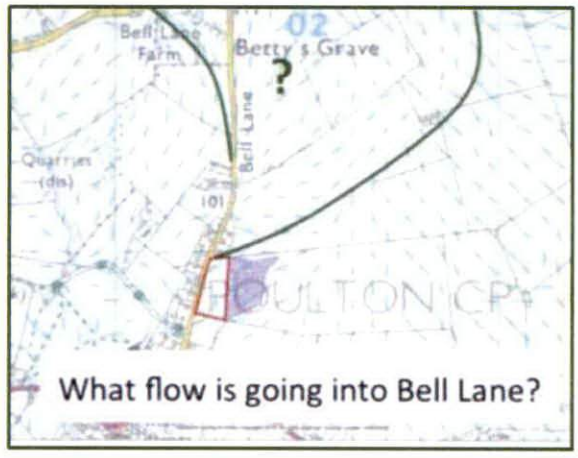
As part of this study, Enzygo obtained a more accurate LiDAR data set, and utilised PDS flow pathway analysis (industry standard method and software) to more accurately refine the catchment area (much more accurate than a hand drawn catchment boundary), which would contribute to overland flows through the Site. As such, the perceived (albeit misunderstood) contributing catchment has reduced significantly (flow pathways arrows refined) compared to the catchment depicted within the initial catchment area investigation.

Based on the above, we have presented a reasonable and justifiable catchment boundary for the catchment to the east, contributing to flows across the Site.

Following a review of the PFA file note, there is a failure to disclose the software and methodology to derive the wider 67 Ha catchment and the 2 Ha catchment contributing to overland flows from the east, and there is no mapped catchment outline.

The Poulton Working Group have submitted a partial image of a perceived catchment contributing to flows within the ditch which flows along Bell Lane (see Figure 7.2). The catchment appears to be derived from the flow pathway arrows within the catchment, previously produced by Enzygo. We assume that the catchment has been drawn visually around the flow pathway arrows, however there is insufficient coverage for the Poulton Working Group to have derived a full catchment and no attempt to quantify the size of the catchment. As such, there is insufficient evidence to demonstrate that the catchment contributing to the highway drain catchment is bigger than 29.7 Ha.

Figure 7.2. Poulton Working Group Interpretation of Catchment

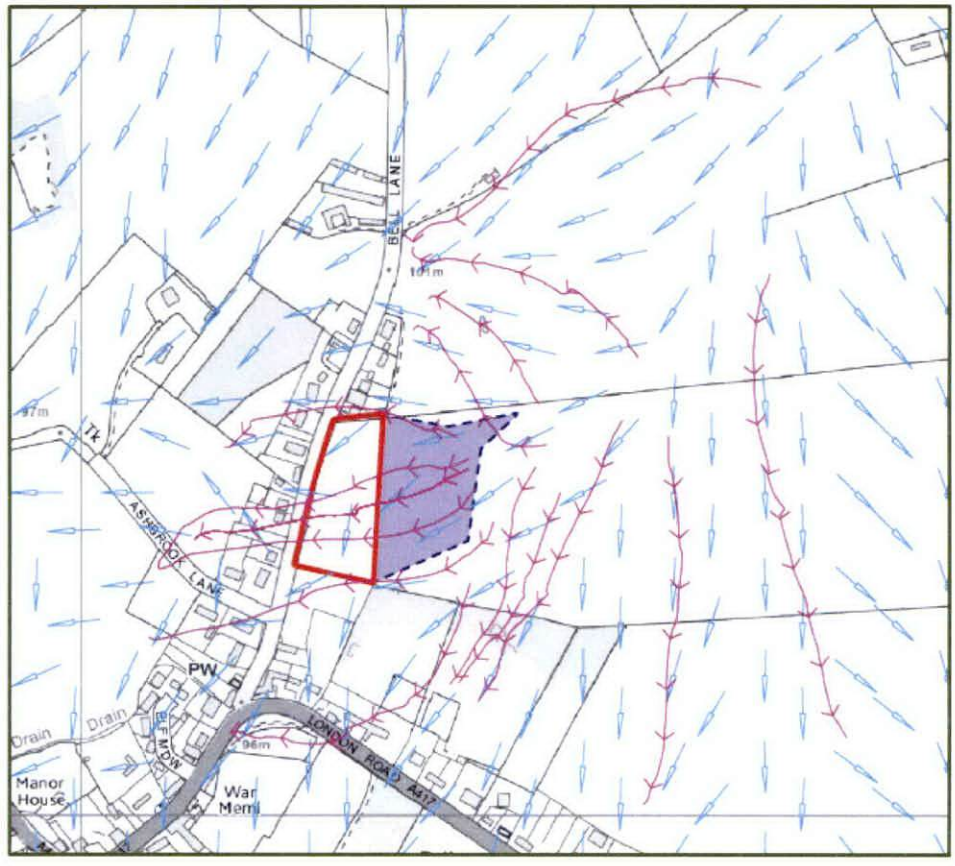


The Poulton Working Group have also submitted an image of a perceived catchment contributing to overland flow (from a catchment to the east of the Site), which would flow through the site (see Figure 7.3 [left]). The catchment appears to be derived from the flow pathway arrows within the catchment, previously produced by Enzygo. We assume that the catchment has been drawn visually around the flow pathway arrows. As stated above, Enzygo utilised PDS flow pathway analysis to more accurately refine the catchment area, which is much more accurate than a hand drawn catchment boundary. As such, there is insufficient evidence to demonstrate that the catchment to the east of the Site is bigger than 1.37 Ha.

Figure 7.3 Poulton Working Group Interpretation of Flow Pathways Analysis

Put simply, whilst the arrows are shown pointing towards the Site, the PDS flow pathway analysis refines the boundary, which means that the actual boundary is smaller than perceived by the arrows. An extract from the PDS flow pathway analysis has been included below within Figure 7.4. The flow pathway analysis is essentially a process of tipping a bucket of water at various points within and around the Site, and tracking the flow direction. This is represented by the pink flow pathway arrows.

Figure 7.4. PDS Flow Pathway Analysis Extract



Poulton Working Group have also misinterpreted the direction and number of flow pathway arrows between the flows pathways within the wider 29.7 Ha catchment, the 1.37 Ha catchment to the east of the Site, and the flow pathways within the Site boundary itself. The difference in direction and number of flow arrows is a function of the detail of the coverage trying to be depicted between the drawings. The zoomed-out map for the wider 29.7 Ha catchment is more generalised, and less data rich (i.e. fewer flow pathway arrows) (see Figure 7.3, [left]). The catchment for the 1.37 Ha catchment to the east of the Site as submitted by Poulton Working Group is based on the same zoom level. The flow pathway arrows within the Site is based on a zoomed-in map, which is more detailed and data rich (i.e. more flow pathway arrows) (see Figure 7.3, [right]). The zoom level used by Enzygo is determined by what level of information is considered appropriate for each drawing.

- **On what basis has the highway capacity of the highways drain been assessed? It is inferred in the information submitted to date that capacity has been assessed on the basis of the drain being empty and does not take into account the surface water from the 69ha that feeds into the same drain via land drains and Bell Lane.**

The capacity of flows entering the highway drain has been based on a 29.7 Ha catchment, which has been justified elsewhere in this file note (not 69 Ha, or 67 Ha as claimed by Poulton Working Group and the PFA file note).

The highway drain has been designed to accept flow from the receiving catchment (including the undeveloped Site and 1.37 Ha catchment to the east of the Site). The developed Site will attenuate surface water up to a 1 in 100 year event, plus 40% climate change allowance, with a restricted 5 l/s discharge rate. As such, there will be no additional flows from the proposed development, which would contribute to flooding.

As a betterment, the 1.37 Ha catchment to the east of the Site will also be attenuated to the same standard described above. The attenuation of the catchment to the east of the Site would offer a betterment, rather than allowing uncontrolled flows to shed overland into the highway drain.

- **Why have the ditches in the fields behind the Site been ignored?**

The 'tile drainage' issues have been discussed elsewhere within this report.

- **Why has the issue of high groundwater indicators been ignored?**

There are no indicators of high groundwater levels within the Site itself as discussed elsewhere within this file note.

The statement within the March and September 2015 FRA report states:

"Secondary flooding sources were identified within the Site, including, ground water flooding and overland flow flooding"

Paragraphs 4.1.9 to 4.1.12 of the report considers groundwater flooding and concludes that there is a negligible risk of groundwater flooding.

"The BGS Groundwater Flooding Susceptibility Map indicates that the entire the Site is located within an area considered to have negligible potential for groundwater flooding to occur (see Drawing 3).

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

No below surface infrastructure and buildings are proposed for the Site, as such the Site is not considered at risk of flooding from rising / high groundwater."

As noted elsewhere in this file note, the 'evidence' of a high groundwater table is not substantiated by provision of relevant factual data.

As noted elsewhere in this file note, soakaway testing was carried out and found negligible infiltration. The trail pits were observed to be dry (i.e. with no groundwater ingress), as limited infiltration means no groundwater water rising to the surface. The limited infiltration is a result of clayey soils with restricted drainage. Water bubbling up out of the ground during is a result of damaged tile drains, not from groundwater ingress (as explained elsewhere in this file note).

Based on the above, the Site is considered to be at low risk of groundwater flooding.

- **There is a potential risk to the outfall system.**

The result of the PFA modelling exercise are justifiably questionable. It is Enzygo's opinion that the approach to the model is not fit for purpose.

The outfall point of the onsite surface water drainage would be set at a suitable level to prevent the network becoming surcharged. The Site is higher than the receiving ditch, and an outfall should therefore be achievable. If at detailed design stage the levels are found not to work, a flap value could be fitted to the outfall, requiring additional storage within the oversized pipe and the drainage will be revised to accommodate this. There is sufficient space within the Site to accommodate further storage if needed.

- **Have the multiple errors in pipe calculations been fully investigated and how can you be confident that there are no other errors?**

We have presented this file note to explain and justify the methods and software used. An understanding of technical matters has led to a misinterpretation and perception of 'errors'.

The drainage design simulation settings state M100+40%CC event produces a volume of 560m^3, which is the greenfield runoff volume, for a storm duration 360mins. This is not the correct volume to interpret attenuation volumes from, because it's the volume of water generated from the greenfield runoff rates over the expected 6 hour storm duration.

The oversized pipes will require 337m^3 of storage for the M100+40%CC event, based on a 5 l/s discharge rate from the oversized pipe over the duration of a design storm event. The attenuation volume of the oversized pipe has been detailed elsewhere within this file note.

- **Has the ownership of the surface water drain been clarified? The latest report quotes Thames Water as owners, however Thames Water only own foul sewers in Poulton.**

There was an error within the key on the Indicative Drainage Drawing. This has been corrected (see Appendix 2) (Revisions H). For clarification, the ditch and culvert is under the authority of Gloucestershire County Council. A discharge rate of 5 l/s was agreed in principle. The public foul drainage network is under the authority of Thames Water.

- **Why has the public health impact of the overloaded sewerage system been ignored? The system is broken. Adding 9 houses is not a betterment, it can only make things worse.**

The proposed 9 residential units will not discharge surface water to the foul network. The reference to betterment is linked to the surface water drainage strategy.

Foul flows from the Site will however discharge to the Thames Water public foul sewer. As noted by Thames Water:

"The sewerage system in Poulton is in fact foul only, and not combined. The reason for not raising capacity concerns is that the foul flow from the proposed development of 9 new dwellings will

take up only a fraction of the pipe capacity (less than 1%) and as such the impact on existing customers is considered to be negligible. Also, flows of this size are too small to model hydraulically, which is normally the way we assess detriment.

8 Summary and Conclusions

This file note presented the following:

- A non-technical summary of flood risk and drainage technical matters.
- A response to the comments and issues which have been raised by local residents, by Poulton Parish Council, and by the Poulton Working Group.
- A review and rebuttal of an independent technical file note.

This file note concludes:

- The undeveloped Site is a low risk of flooding from all sources.
- The risk of flooding from the developed Site will be mitigated through a sustainable drainage strategy. The developed Site would offer a betterment to existing conditions.

The proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere, and is compliant with the requirements of the NPPF.

The development should not therefore be precluded on the grounds of flood risk or drainage.

9 Closure

We trust that the details presented herein are self-explanatory and we have clarified the technical misunderstandings, and have addressed the issues raised within the Minutes, the PFA file note, Cotswold District Council meeting, and the questions raised following the meeting minutes.

Appendix 1 – Meeting Minutes

15/01376/OUT | Outline planning application for the erection of up to 9 dwellings and associated access (appearance, layout, landscape and scale reserved for future consideration) | Land East of Bell Lane Poulton Gloucestershire

Minutes of Meeting with Local Lead Flood Authority (LLFA)
Poulton Village Hall
3rd October 2016 at 7.30 pm

Present:

Naveen Tangri-Gloucestershire County Council LLFA
Peter Siret-Gloucestershire County Council LLFA
Cllr. David Fowles –Cotswold District Council (Ward Councillor)
Cllr. Abagail Beccle – Cotswold District Council (Vice Chair Planning Committee)
Cllr. Sue Coakley – Cotswold District Council (Environment Cabinet Planning Committee)
Cllr. Ray Theodoulou – County Councillor (neighbouring District Councillor)
Cllr. Chris Davies – Poulton Parish Council
Helen Haresign – Bell Lane Action Group

1. **Introductions.**

Cllr. Fowles introduced the panel of visitors to the public. Cllr. Beccle and Cllr. Coakley were both unable to contribute to the discussion at the meeting due to their involvement on the Planning Committee. Cllr. Theodoulou was invited to attend the meeting, as the County Councillor for Poulton, Cllr. Shaun Parsons, declared an interest as he is a personal friend of the applicant and was therefore unable to attend.

2. **Context.**

Cllr. Davies was asked to explain the context of the application to the meeting.

The planning application to build houses on the east side of Bell Lane has been on-going for about twenty months. During that time the number of houses proposed has been reduced from eleven houses, to include five affordable units, to outline planning for nine houses without any affordable housing. Over the twenty months planning remits have changed and conflicting opinions have been coming from statutory consultees.

For example Thames Water originally requested a Grampian Order to be placed on the application and then withdrew this request without any improvements being made to the sewage system. Likewise the conservation officer objected to the estate-like layout of the development but has now approved it, again without any change to the access arrangements to the properties, albeit with the rather strange rider that "the relationship to the lane is slightly unusual."

We find it hard to understand why there has been so much contradiction in the opinions of the consultees and changes made to the application.

The parish council has consistently been opposed to this application. This has been re-enforced by about 100 objectors plus supporting evidence to each application.

This is not the right part of Poulton for an estate style development and taking aside the issues which are open for discussion tonight there are more suitable sites in the village for such a development.

The proposal causes substantial harm to the landscape and appearance of Bell Lane.

I have to comment that planning departments in pre-planning discussion are quite happy to engage with developers, landowners and agents but not with parish councils who know their communities better than anyone else.

The council has objected to the application on the following grounds:

Sustainability, the development boundary, sewage, drainage, highways issues and appearance.

This meeting has been arranged to discuss with the Local Lead Flood Authority the impact of this development on drainage and flooding issues within the village.

In the 2007 floods twenty properties flooded in the village from fluvial, surface, groundwater and sewer sources. Properties in Bell Lane were flooded from both surface water run-off from the fields behind and from the road.

The council has worked with FWAG and Thames Water to identify the problem areas in the village. This has been reported to the LLFA and CDC and it should be borne in mind that the number of houses known to be affected is probably greater than stated as there is reluctance by householders to report these issues, especially with regard to sewage ingress and restricted toilet use.

We know of property flooding incidents in 1999, 2000, 2007, 2008, and 2015. The flood plain at Ranbury floods on average a couple of times each winter. Areas which have been affected by property flooding include Bell Lane, Ashbrook Lane, Stoney Pool, Ranbury, the London Road/Bell Lane junction and the southern end of the village.

Sewage overspill issues and restricted toilet use are evident at the London Road/Bell Lane junction, Stoney Pool, Cricklade Street, London Road east and the southern part of the village. One resident has reported that this occurs about three to four times a year.

These events are associated with high, and not necessarily excessive, rainfall and will be exacerbated by this development especially south of the site to where water runs down and at the London Road/Bell Lane junction where a bottleneck in the sewage system exists.

It is also pertinent to note that there have recently been two incidences, one in July and one in September, when the sewer has blocked where it runs down the back of Elf Meadow causing issues at the London Road/Bell Lane junction.

In the July incident it was blocked towards the pumping station begging the question as to how adequate that is.

In the recent episode the sewer was blocked with silt, going towards Ashbrook Lane, which can only indicate a broken system allowing soil to enter with the groundwater.

These events occurred when there was no rainfall and it is unbelievable that the request for a Grampian Condition was removed.

There seems to be a failure to appreciate how water and sewage runs through the village and of the seriousness of flooding and sewage issues on established households. This can only be exacerbated by this development as a result of construction, hard standings and a disturbance of the established drainage of the site itself.

It is critical that all specifics of the scheme are clarified now and not after permission is agreed, as this will be too late.

The council opposes this application. There is a failure to demonstrate that the development will not increase flood risk elsewhere as required by the NPPF paragraph 100, it fails to consider alternative sites with less risk of flooding as required by NPPF paragraph 101 and also the NPPF paragraph 14 requirement that permission only be granted if the adverse impacts are significantly and demonstrably outweighed by the benefits.

It fails to address the sewage issue at all and a Grampian Condition should be imposed.

3. **Overview of latest proposal.**

Cllr. Fowles said that as Poulton is classed as a non-sustainable settlement; all objections to planning decisions are considered against existing Policy frameworks. Cllr Fowles asked Mr Tangri to explain to the meeting what a Grampian Order was. Mr Tangri said he thought it should be up to the Planning Officer to explain, as he was unsure. Cllr. Davies explained to the meeting, the implications of a Grampian Order which would mean that a condition would need to be imposed on the development site to improve the sewerage system before work on the housing commenced. The applicant and/or developer would also need to pay for such improvements.

The meeting was shown a plan of the outline planning application showing 9 houses with no garages in Bell Lane. It was noted that affordable housing has been removed. A video was then shown of flooding which occurred in 2007, wider flooding issues in the village north of the bridge over the Ashbrook, south of the bridge and around the bridge.

Mr Tangri showed the meeting where the overland flow from the fields surrounding the proposed site would be assessed. This catchment area is 1.37 hectares. An oversized pipe measuring 1.5m in diameter would run along the back of the proposed site and store 337m³ of water which would then have a controlled discharge at 5l/s. Mr Tangri said that this has been designed for the 40% betterment factor and this is why he had cleared the objection as this would be betterment for the village. A member of the meeting asked if the situation would be worsened by the additional hardstanding for cars to each of the properties. Mr Siret said that the surface water collected from the hardstanding would be collected and 230m³ could be stored by the pipe running under the driveway.

Mr Collyer-Bristow asked where the water would then go, would it be discharged into the existing drainage and how would it be controlled. Mr Tangri said that drainage for the overland water would be controlled and held in manholes of 64m³ he said it was designed for 1 in a 100, was within the 1% (1 in 100 year) parameters. Cllr Davies said it should be designed for more than 1 in a 100 because of the frequency of flooding in Poulton. Mr Tangri said he had put a condition on that - they have to provide an exceedance route.

Cllr. Fowles asked Mr Tangri to explain his role to the meeting. Mr Tangri said that he was a Consultee to the Planning Authority to look at the outline and later the detailed design to see if the development is causing any flooding on the site or elsewhere and would give an overview to the Planning Committee. Cllr Fowles stated that Naveen is the case officer of the Local Lead Flood Authority. It is his view which the Planning Committee rely on as the recognized expert and technical officer.

Mr Collyer-Bristow said that there had been over 10 years of flooding concerns within the village. Mr Siret said that the County Council had collected data and has a register of reports of flooding. He said that Poulton had only experienced flooding in 2007 according to the data held. Cllr. Davies disputed this, he had provided the LLFA with dates and details of both flooding and sewage overspill and said that there was a total disconnect with flooding issues. Dates had been sent to GCC and CDC in the past and that Parish Councils were not being listened to. Cllr. Fowles said that this site would affect the village as a whole with regard to sewerage and flooding.

Questions

Sewage

1. As flooding and sewage overspill are inextricably linked why is the impact on the sewage system being taken so lightly?

Mr Tangri said that GCC have a remit to deal with surface water only. Thames Water emailed to say that there was no problem and that 9 houses would have a negligible impact on existing customers.

Their drainage strategy study report is available on their website but this is only a consultation document.

Cllr Davies said that 9 houses would be negligible only if the sewer system was perfect but it isn't. It is broken and some households do run their surface water into the sewers as this is permissible.

Cllr Davies said that surface and ground water are going into the sewers and houses are presently using a broken system which is clogged with silt. He stated that Andy Young (Parish Councillor) went to a meeting with Thames Water and their strategy would be decided by 2020. There is no guarantee of any funding and it would only be directed at major problems.

A slide was shown summarising the Thames Water Strategy document. The key points were that Thames Water was well aware of the Poulton issues, knew that ground water makes SUDS less effective and that drainage conditions should be imposed on planning applications. The only action identified in the report, however, is to replace manhole covers. No risk assessment has yet been carried out.

Mr Tangri said that GCC would consider all angles.

Groundwater

2. How are you confident that the solution will work when it is unclear exactly what the ground water level on the site is and therefore the impact this will have on the site and surrounding area?

The meeting was shown slides and video of groundwater bubbling up in Bell Lane (2015) and the high level of water in a well in a property opposite the site (August 2016). Also of a 4x4 vehicle stuck on waterlogged ground at the site. Reference was made of inconsistencies in the Enzygo reports regarding ground water.

Mr Tangri said he recognised this issue and he spoke to Enzygo about this and was told it would be addressed by the developer.

Mr Tangri said they definitely have to protect the land drains, Cllr Davies said the land drains served the whole field not just the site. Mr Kilby also pointed out that the land drains drained the whole 29 hectares. Mr Tangri said he can only rely on the information he is given.

3. How will displaced groundwater from the site and from the land behind be stopped from filling the oversized pipes?

Mr Tangri said that there is a controlled mechanism in the pipes releasing the water at a rate of 5l/s.

4. When the soakaway tests were performed in January 2015 the ground was waterlogged. The results in the Enzygo report showed "insufficient uptake to calculate infiltration rate" and this

statement is misleading. The trial pits could not take any water, in fact from one of them water was actually coming out of the ground. Are the LLFA aware of this? If so, has Enzygo been asked to explain their position and correct the impact this result has on the design?

Mr Tangri replied that this will be covered in the detailed design stage and he had already placed two conditions on the application.

Catchment Area and Impermeable Areas

1. Your email dated 26 September accepts all the responses to your queries on Enzygo's submissions. Can you tell us what response they gave to your request that they justify the storage capacity of the larger attenuation pipe as one has not been included in the application documentation?

Mr Tangri said that there would be 3 or 4 manholes to store the additional volume. He had been told this verbally by Enzygo.

2. You have queried the huge reduction in catchment for the surface water arriving at the Eastern boundary of the site. What information have you received to justify this reduction bearing in mind that the drawing of the catchment area included in Enzygo's last submission appears to be arbitrary, actually cutting across flow lines? Mr Tough highlighted on the drawing that the flow arrows indicated a larger catchment area than stated.

Mr Tangri replied that only 1.37 hectares would be contributing to the overland flow according to their LIDAR. He said that he is totally reliant on information provided by the applicant but that the applicant would be liable for any erroneous information.

3. Can you explain what relevance the 40% PIMP has to the catchment area outside of the site and what is the percentage impermeable area used on the site itself as this seems to vary from 29% to 42% within the same submission?

Mr Tangri stated that he did not understand why it stated the PIMP was 40%. Mr. Tough pointed out that there is no percentage impermeable area for a greenfield site.

4. How do you check the submitted calculations? From the previous submission in August the only difference in the submitted calculations is an increase in the Percentage Runoff from 0.44 to 0.467 and an increase 100 year discharge volume from 377 to 560 m^3. However, the eastern attenuation pipe has decreased by 67% and the outflow from this pipe has decreased by 90%. This is described by Enzygo as "clarification".

Mr Tangri said that he used software which is very reliable and his own calculations. Manholes as well as pipes are now shown rather than just pipes. He said that the correct figures were now being stated for pipe sizes on the latest application. He said that he would check the final submission. He agreed that the previous figures had been a mistake.

5. Why have the pipe sizes been reduced in the latest drawing and has the impact of the reduced capacity been evaluated in the context of the overall scheme – the catchment area is the same so why have the pipe sizes been reduced?
(Pipe storage that was 1016m^3 has been reduced to 337m^3 – but should be 272m^3 based on pipe dimensions provided. Catchment area remains 1.37ha.)

Mr Tangri said he is reliant on the information that is given to him.

Helen Haresign said that the meeting appreciated that he was reliant upon Enzygo for data but stated that this was not independent and therefore could not be relied upon. Mr Tangri said it was all up to the Planning Officer. She said that the Planning Officer was relying on Mr Tangri but he was depending on the applicant for data. Cllr. Fowles said that the numbers did not stack up and that the community was relying on Mr Tangri as the expert.

6. Surface water flow arrows shown on the catchment area appear to have changed – they now flow in a different direction – we are concerned that the complete flow is not captured and therefore surface water run off calculation is incorrect (no attributed source for latest diagram at a lower level detail).

The meeting was then shown slides of differing flow pathways showing water flowing directly to the site area. Mrs Kilby with the aid of the flow pathways map showed that there was an underestimation of water flowing on to the site.

Helen Haresign stated Naveen is dependent on Enzygo's figures and we are not confident that these figures are right. If they are not right these people will flood. Mr Tangri said that is true. You can raise that concern with the planning officer.

7. The site currently absorbs rainwater directly into the ground. Ignoring the currently invisible garages, in periods of sudden heavy rainfall, how can the hard standings and sloping road directly to Bell Lane be classed as 'Betterment'?

Mr Tangri said that there was storage in the two pipes on the site and controlled discharge. He said that velocity of flow causes flooding and this would be avoided using the controlled discharge from the pipes.

Land Drains.

1. What consideration has been given to the loss of the land drains and the impact on the site, the land above and the attenuation measures?

Mr Tangri said that these would be covered in the detailed planning application.

Cllr. Coakley said that there could be a Public Meeting to discuss general flooding issues and she would look to bring a Thames Water representative to that meeting. The meeting was shown an aerial view of the site and land drains were pointed out. Mrs Kilby told Mr Tangri where the land drains were situated and said that these were not shown on the planning application but covered an area of 29 hectares.

Other Questions.

1. Bearing in mind that resistance to water flow per metre along a conduit is dependent on pipe boundary conditions and turbulence, can you explain how you were satisfied by the Manning open channel calculation provided by Enzygo as a reasonable estimate of the capacity of the flow under the bridge?

Mr. Tough explained that Enzygo had used flow through a pipe to calculate the capacity of the flow under the bridge. By merely halving the pipe simulation they ignore the resistance of the rough bed of the brook. Furthermore the resistance caused by the turbulence at the entry to the bridge seriously restricts the capacity of the bridge. Mr Tough emphasised that turbulence becomes enormous around

the bridge as the water rises at peak levels and stated that the calculations were rubbish. Mr Tangri could not comment on this.

2. The dimension (length) of the bridge at London Road is incorrect in the Enzygo report – have their dimensions been checked? What are the implications if their calculations are based on incorrect measurement data?

Mr Tangri said that the bridge size had been incorrectly stated and the data was now as given.

3. Why have the water flows been reduced so dramatically, from 50l/s to just 5l/s? What have they done to resolve the manhole flooding issue on the August 2016 design?

Mr Tangri believed that the information was outdated and the flow depended on the catchment area. Cllr Davies said that the figures had been constantly changed, inconsistent and negligent. He said that a competent Engineer would not have got it wrong in the first instance. Cllr. Fowles said that the numbers had been gradually changed to get through the planning process.

4. Why was the River Frome and the Aqueduct referenced in the Enzygo report as having a factor on flooding in Poulton?

Mr Tangri said that this was irrelevant to the site of the development and that the software uses parameters.

5. As important figures for catchment area and surface water outflow from the attenuator have both reduced to less than 10% of that shown in previous Enzygo submissions, would you agree that these previous submissions were highly misleading and inaccurate, and the latest version of these submissions is just as likely to be misleading and inaccurate and should be rejected?

Mr Tangri could not comment on this.

6. As a result of this meeting, can you summarise the actions you will take?

Mr Tangri said that they have now been told to take a more lenient view on outline planning applications. The Planning Officer must discharge all of the conditions applied by the LLFA. Mr Kilby asked Mr Tangri to discuss these figures with the Planning Officer. Helen Haresign asked how the Bell Lane Action Group could help Mr Tangri. He said that only the Planning Officer can request that the figures are questioned when changes are made.

7. Will the LLFA put in writing that the Bell Lane proposed development will have no adverse effect on the site or the surrounding area and will not make flooding and sewage issues worse? (as required by the NPPF)?

Mr Tangri was content that the development would have no adverse effect on the surrounding area based on the information he had been given. He would ensure that conditions to the application are set regarding how the water from the land flow would be discharged and also a condition regarding the 1 in 100 year probability of flooding. Mr Vessey said that there have been sewage overspill problems for the last 28 years and these have not vanished. He has been in discussions with Thames Water for the last 16 years and got nowhere. Another member of the meeting said that the problem of sewage in his garden at Elf Meadow had increased and the situation was wholly inadequate. Mr Tangri reiterated that this was for Thames Water to solve. Cllr Davies said that the village had had many developments including in Bell Lane, Elf Meadow and Edwards Close and no sewer improvements had been made in all that time. He said that the Planning Department are negligent for not taking information at face value when

people report it. He also stated that the treatment works at Ampney St Peter are regularly pumped out which does not overcome the problem. Cllr. Fowles said that the problem will only get worse and was a recipe for disaster. Cllr. Davies said the junction at Bell Lane and London Road was the key area as all sewage runs to this point plus water which runs off Bell Lane. He said that smaller communities are being overlooked.

Mr Tangri said that he would look into the issue and try to alleviate it. He would be speaking to Katherine Brommage, the Planning Officer, in the morning.

The meeting concluded by saying that the village had no objection to one or two houses but the site in Bell Lane was not suitable.

Next Action - Cllr. Fowles to discuss the issue with the Head of Planning and the case officer at Cotswold District Council with a view to arrange a meeting. Cllr. Coakley to be asked to hold a public meeting with Thames Water, The Drainage Officer and the village.

NOTE: The Chair appears not to have asked the following question which was under the 'Groundwater' heading:

Are the properties on the site itself going to be more prone to flooding themselves as a result of water running off the arable land above/behind the site? The finished floor levels on site have been raised to mitigate flood risk.

The meeting closed at 9.40 pm.

POST MEETING NOTE regarding the capacity of the bridge over the A417

The calculations for the capacity of the bridge have been based on the bridge being a full semicircle whereas property flooding happens (as evident in the photographs taken on 20.01.99, previously provided and shown here) when water is at least 23cms, and probably more, below the top of the arch of the conduit. Hence the actual capacity of the bridge when flooding occurs is some 7.8% less than the space below the arch as calculated by Enzygo. The photograph of the bridge also demonstrates the amount of turbulence that arises and which is referred to in the minutes above.