

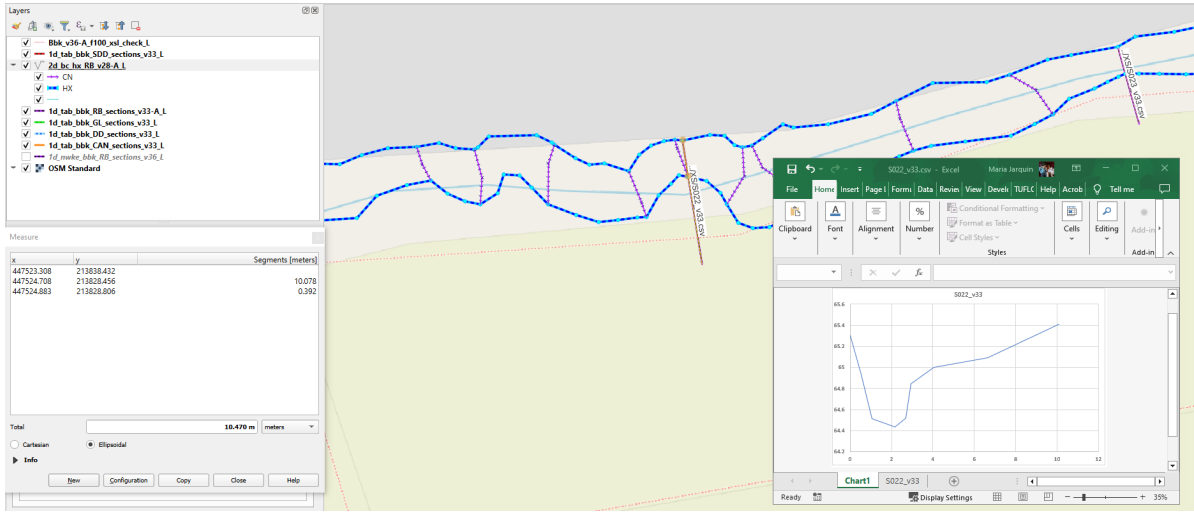
Design Note

Project Begbroke Innovation District
 Subject EA Responses to Flood Risk Comments
 Project no 052188
 Date 21 June 2024

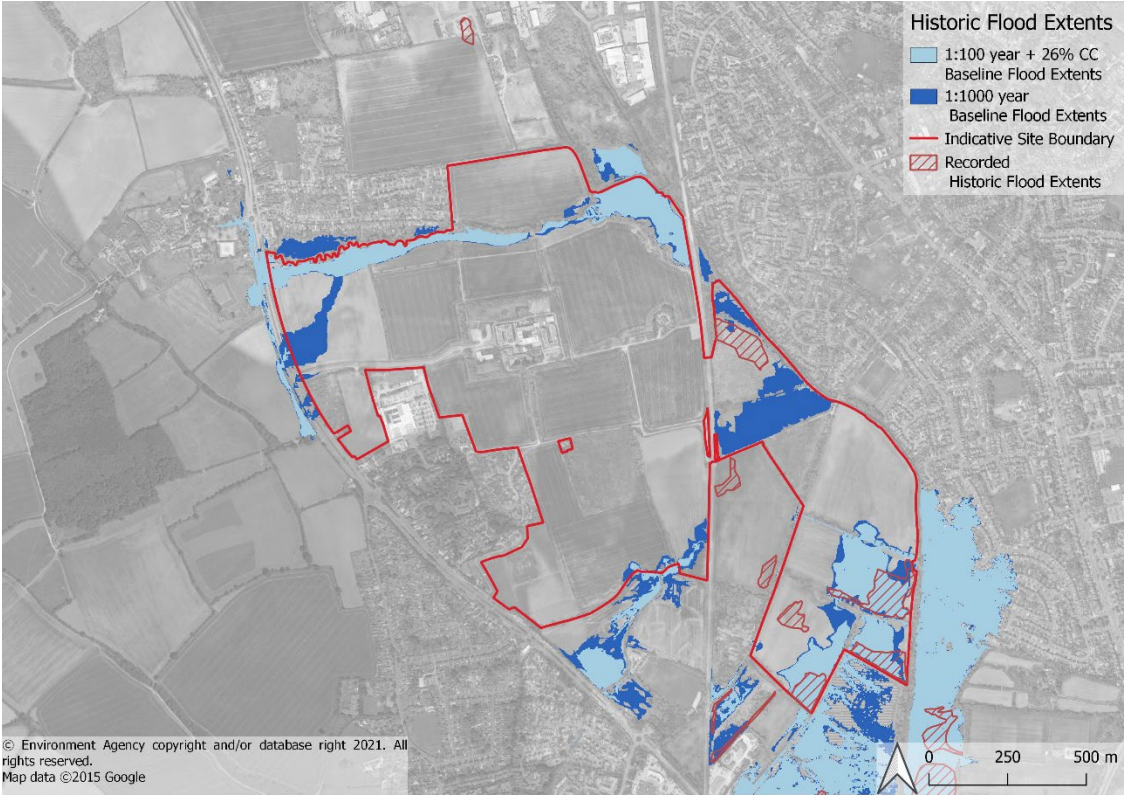
Revision	Description	Issued by	Date	Approved (signature)
00	Initial Draft EA Response to Objection 02 on the basis of Flood Risk	GJ	21/06/2024	

Item no.	Objection's/Comments	Responses and rectifications
1	Reasons for Objection	
1.1	We note that part 10.1 of the applicant's 'EA Responses to Flood Risk Comments' document states 'An update to the FRA will be made to reflect these comments and will also be dependent on the outcome of the hydraulic model comments review.' We have not been able to locate an updated FRA and are not sure if one has been provided to date.	<p>Comments have been captured in the Flood Risk Technical Note. This was made clear to the EA through correspondence.</p> <p>The document 'EA Responses to Flood Risk Comments' referred to was superseded by Appendix A of the FRA Flood Risk Technical Note (dated 12/03/24). This was made clear in the email sent 13/03/24 and was also captured in the summary document that the EA sent us to confirm their understanding of the data they had been sent to review (Document list.docx, sent 14/03/24).</p> <p>Item 10.1 of the updated responses, provided in Appendix A states that the updates requested by the EA on the first comments are captured in the Flood Risk Technical Note.</p>

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1.2	<p>Reasons The developer's additional flood risk information fails to:</p> <ul style="list-style-type: none"> demonstrate the flood modelling used within the FRA is appropriate 	<p>The approach to the FRA was discussed and agreed with the EA prior to submission of the outline planning application (See section 2.6 of the FRA, which notes that a Technical note setting out the approach to the hydraulic model was shared with the EA in November 2022, with feedback received during the meeting on the 16th November 2022).</p> <p>The EA note in <i>130772-02.pdf</i> that the hydrology is now considered fit for purpose. The majority of the responses following the 1st review have now been accepted in <i>Non-real time Hydraulic Model Review_BegbrokeDec23_1stfollowon.xlsx</i>.</p> <p>Detailed responses to the outstanding issues identified within <i>130772-02.pdf</i> regarding the hydraulic modelling are provided in the responses to Items 2.2 – 2.6 of this document.</p> <p>The hydraulic modelling has also been undertaken following best practice and EA guidance. The FRA produced in support of this Outline Planning Application demonstrates that both existing and future flood risk can be appropriately managed and mitigated.</p>
1.3	<p>Reasons The developer's additional flood risk information fails to:</p> <ul style="list-style-type: none"> demonstrate the development will not increase flood risk elsewhere 	<p>The FRA demonstrates that the development will not increase flood risk elsewhere. The interventions to the north-west area of the site have been tested in the hydraulic model to ensure no offsite, third-party disbenefit occurs in terms of flood risk. The FRA demonstrates that all increases in flood extents and flood depths as a result of the re-grading of the school can be accommodated within the red line boundary through a flood storage area.</p> <p>Section 5.3 of the Flood Risk Technical Note demonstrates that following the updated hydraulic modelling, all increases in flood extents and flood depths as a result of the regrading of the school can still be accommodated within the red line boundary through a flood storage area.</p> <p>It is recognised in the comments provided in Item 6.7 of this document that hydraulic modelling of the secondary school site is requested. The exact location of the secondary school has not yet been confirmed and so it is considered reasonable and appropriate to secure further modelling alongside the point at which the exact location and design of the secondary school is known. This can be provided pursuant to a condition attached to the outline planning permission. This is considered sufficient for this outline stage of planning.</p>
1.4	<p>Reasons The developer's additional flood risk information fails to:</p> <ul style="list-style-type: none"> address the opportunities presented by this development for reducing flood risk 	<p>Please refer to the response to Item 5.2 within this document.</p>

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2	Flood Risk Information	
2.1	We have reviewed the applicant's revised flood modelling and additional comments. The hydrology is now considered fit for purpose, with only minor review comments outstanding.	Noted.
2.2	<p>However, the hydraulic model still has several outstanding issues. The most significant of these are:</p> <ul style="list-style-type: none"> The 1D and 2D representation of river channel widths do not match. This may be resulting in double counting of modelled flow and lead to model inaccuracies. 	<p>Not Agreed.</p> <p>This comment is also summarised in Item No. 12.3 of the <i>Non-real time Hydraulic Model Review_BegbrokeDec23_1stfollowon.xlsm</i> spreadsheet. The EA have undertaken spot checks using the xsl check file. This check makes reference to the tab file and not to the actual cross-section width given by the source csv file.</p> <p>The figure below shows the actual cross-section used as a csv file, demonstrating the cross-section widths of the 2D and the csv are in agreement. The tab file specifies the location of the cross-section (where it intersects the network line) but the information used by the model for the 1D conveyance is based on the csv source file. The source information widths match the channel width in the model correctly. It is advisable to use <i>Bbk_v36-A_f100_1d_ta_tables_check.csv</i> to check widths.</p> 

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2.3	<p>However, the hydraulic model still has several outstanding issues. The most significant of these are:</p> <ul style="list-style-type: none"> • While several sensitivity tests have been completed, an inflow sensitivity test (usually routine) has not been undertaken. Therefore, we do not have a complete picture of model uncertainty. 	<p>As part of the original modelling undertaken, sensitivity testing was undertaken on roughness, downstream boundary conditions and change in pound level in the canal. This detail was provided within the Hydraulic Modelling Report, appended to the FRA.</p> <p>With the first review by the EA (comments provided in <i>130772.pdf</i> and <i>Non-real time Hydraulic Model Review_BegbrokeDec23.xlsm</i>), the EA provided no comment that they would like to see sensitivity testing done on inflows.</p> <p>The modelling has been prepared based on a methodology agreed with the EA. The development has been developed based on the findings of a more conservative climate change scenario (1 in 100 +41% CC) than is required by NPPF (+26% CC allowance).</p> <p>Therefore whilst a separate sensitivity test, increasing the flows of the design flood event by 10%, has not been provided, for the purposes of planning it would be reasonable for the EA to consider the results of the 1 in 100 +41% climate change scenario to be a proxy for the flow sensitivity test (10% increase in flows) based on the design flood event for planning which is the 1 in 100 + 26% event.</p> <p>If one were to multiply the 1 in 100 year flows both by 1.26 (for climate change) and 1.1 (flow sensitivity) this would be equivalent to multiplying them by 1.39 (+39%). An increase of +41% therefore provides both a reasonably close and yet marginally <u>more</u> conservative proxy for this sensitivity test.</p> <p>It is also recognised that as noted in response to Item 7.2, FFLs including freeboard are proposed to be conditioned based on the modelled flood levels. If the modelled levels therefore change at a later date, then the FFLs would be adjusted as required.</p>

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2.4	<p>However, the hydraulic model still has several outstanding issues. The most significant of these are:</p> <ul style="list-style-type: none"> There has been no comparison of modelled outputs against the Historic Flood Map which does highlight areas of past flooding within the 2D model domain. 	<p>Figure 8 of the original FRA shows the flood mapping of historic flood events. This demonstrates there to be no historic flood events recorded within the proposed area for development. A few polygons of historic flood events are identified east of the railway line which generally align with where flooding is seen in the hydraulic modelling.</p> <p>An image overlaying the historic flood events mapping over the hydraulic modelling outputs is provided for clarity (see below and <i>Historic Flood Events with Baseline Mapping.jpeg</i>).</p>  <p>© Environment Agency copyright and/or database right 2021. All rights reserved. Map data ©2015 Google</p>

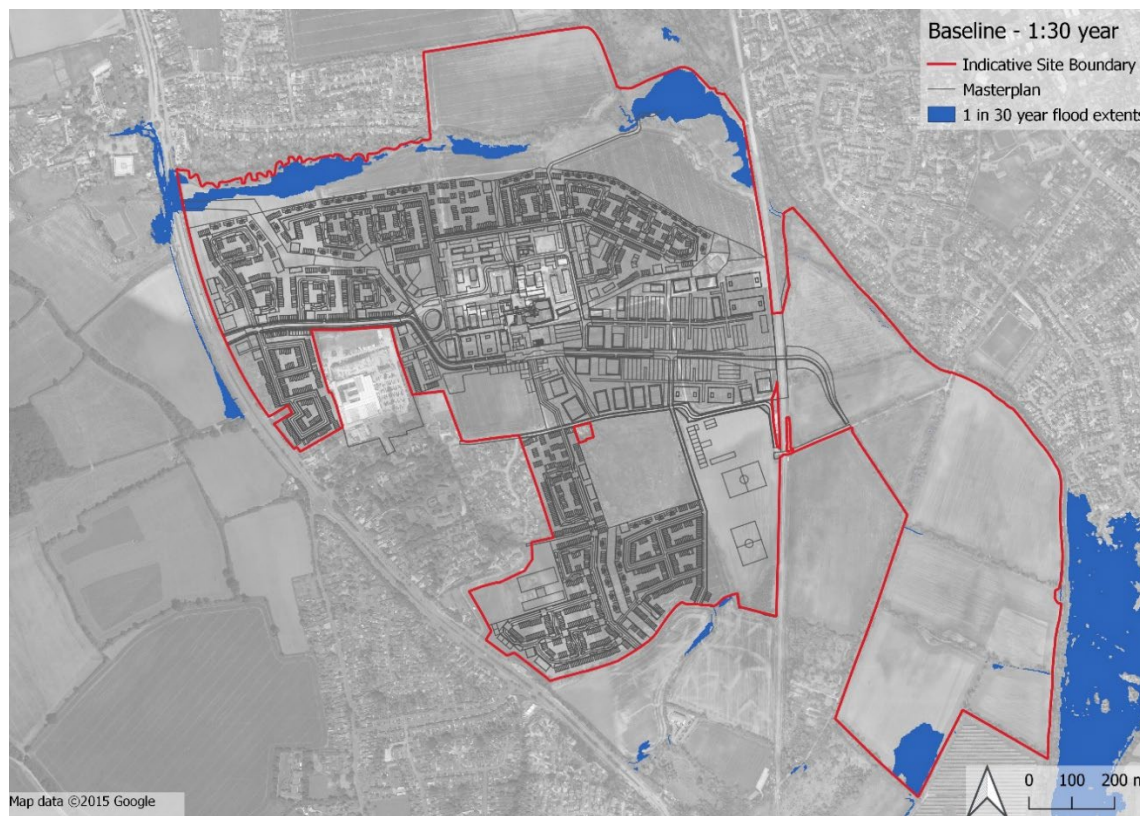
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2.5	<p>However, the hydraulic model still has several outstanding issues. The most significant of these are:</p> <ul style="list-style-type: none"> • There are several sections of the reporting which would benefit from further information and detail on modelled representation of structures and flood plain features. 	<p>An increased level of detail was provided in the updated Hydraulic Modelling Report (EVY1077_ModellingReport_RevD.pdf).</p>
2.6	<p>Therefore, it has not been demonstrated whether the flood modelling provided by the applicant of the baseline and with-scheme scenarios is appropriate to use within an FRA for the proposed development in this location. Please see the attached spreadsheets for more information and how to overcome our modelling concerns.</p>	<p>The response to Item 2.2 demonstrates that the flood modelling provided is appropriate for use within the FRA.</p>
4	Flood Zone 3B	

4.1 Figures 4-1 and 5-1 of the Technical Note (which we believe replace Figure 9 and 17 of the initial FRA) do not demonstrate that all the proposed 'more vulnerable' development would be located outside of existing and proposed Flood Zone 3b. The proposed development has still not been plotted on a map alongside the applicant's 3.3% AEP flood extent. Hence it still has not been demonstrated that any development in Flood Zone 3b is appropriate in accordance with Table 2 of the Flood Zone and flood risk tables of the PPG. Section 4.1 of the applicant's EA Responses to Flood Risk Comments document refers to Figure 17 to demonstrate that no development is proposed in Flood Zone 3b. However, Flood Zone 3b is not shown in Figure 17 so this is not clear and an additional plan should be provided.

The statement that Figures 4-1 and 5-1 of the Flood Risk Technical Note supersede Figures 9 and 17 respectively of the initial FRA is correct.

It was confirmed in Response 4.1 in Appendix A of the Flood Risk Technical Note that there is no development proposed within the 3.3%AEP flood extents. As confirmed in this response, no changes are being proposed within Flood Zone 3b. It is clear from this statement and comparing Figures 4-1 and 5-1 that no development is proposed within Flood Zone 3b.

However, to remove any doubt, a plan is provided to clearly demonstrate that there is no proposed development within the 3.3%AEP flood extents (see below and *1 in 30 year Baseline Flood Extents with Masterplan.jpeg*).



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4.2	Further, the applicant proposed to change Flood Zone 3b (3.3% AEP) on site, so a plan showing the proposed development and proposed Flood Zone 3b should also be provided.	There are no proposals for development or land raising within the 3.3%AEP flood extents. The 3.3%AEP flood extents for the proposed development demonstrate no change in flood extents.
5	Exception Test	
5.1	It has not been demonstrated, via a site-specific flood risk assessment, that for the lifetime of the development the development will be safe, without increasing flood risk elsewhere.	<p>The FRA makes clear the development will be safe without increasing flood risk elsewhere.</p> <p>The FRA outlines how the hydraulic model provides an assessment of flood risk from present day over the lifetime of the development. It provides mitigation measures sized to ensure a safe development over this duration, considering climate change scenarios in excess of the NPPF requirements.</p>
5.2	It is also not clear whether flood risk could be reduced as a result of the proposed development. The applicant's comments in section 1.8 of the EA Responses to Flood Risk Comments document do not provide evidence of any reductions in flood risk, such as how much additional floodplain storage is proposed and where it would be located.	<p>There is no policy requirement either at the local or national level that requires flood risk to be reduced through development proposals.</p> <p>This notwithstanding, the FRA identifies that the design flood event for the site includes higher climate change allowances than required through NPPF. Through providing a standard of protection above the minimum required by NPPF the development is inherently exposed to a lower overall flood risk than through design approaches aligning to the NPPF minimum requirements.</p>
5.3	It has not been demonstrated that the proposed swale in the north west of the site would reduce flood risk.	The proposed development introduces attenuation for the flows overtopping the A44 and flowing through the swale. This attenuation did not exist in the baseline with overland flows free to move overland towards Rowel Brook. Provision of flood storage and attenuation provides a reduction in flood risk to downstream receptors.
6	Floodplain Storage	
6.1	If it is deemed that development is necessary in areas at existing flood risk, level for level compensation should be provided in accordance with the PPG to prevent increases in flood risk elsewhere. The applicant has not provided level for level compensation, therefore we maintain our objection.	<p>The PPG does not mandate the use of level for level compensation – it explicitly recognises that on-site level-for-level compensation may not always be possible.</p> <p>It is not possible to provide flood storage on the secondary school site due to OCC's Design Criteria for Secondary Schools that prevent flood storage areas from being located within educational facilities.</p> <p>The flood storage area has therefore been provided outside of the secondary school site footprint. Due to the off-site nature (relative to the secondary school site) it is not possible to use level-for-level methods. The flood storage area has therefore been sized to offset and mitigate the increase in risk which has been quantified using the modelling carried out and reported in the FRA.</p>

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6.2	<p>Instead, the applicant proposed a swale and ground level changes. Whilst we are now satisfied that the swale has now been appropriately modelled and detailed in model report, the impacts on flood risk are not clear from the submitted plans. We strongly recommend that an additional plan is provided to show the difference in modelled flood depths and extents, as well as the location and design of the proposed swale.</p>	<p>The design of the swale was outlined in the original FRA. Please refer to the difference plots presenting difference in modelled flood depths and extents which are shown in Figure 6.5 and 6.6 of the updated Hydraulic Modelling Report.</p>
6.3	<p>Further, modelling alone should not be used to show that flood risk would not increase elsewhere as small changes in flood risk may not be visible in the modelling.</p>	<p>Not agreed. Hydraulic modelling is used as a key indicator in the evaluation of the change in flood risk as a result of development. If the EA require modelling to evaluate and quantify the change in flood risk, then it is appropriate for applicants to use hydraulic modelling to demonstrate that the change is negligible.</p> <p>Hydraulic modelling of this mitigation measure demonstrates the impact on flood risk, as illustrated in the difference plots presenting difference in modelled flood depths and extents shown in Figure 6.5 and 6.6 of the updated Hydraulic Modelling Report.</p>
6.4	<p>The cumulative impact of multiple small increases in flood risk from various developments can lead to a significant overall increase in flood risk. In accordance with the PPG, level for level compensation should be provided. It may be possible for part of a level for level compensation scheme to be linked to the proposed swale (please see advisory below).</p>	<p>Not agreed. As noted in the response to Item 7.4 of the 'EA Responses to Flood Risk Comments' in Appendix A of the Flood Risk Technical Note, the swale is there to transfer surface water flowing across the site towards Rowel Brook in a more defined route. The swale is designed to capture, attenuate and discharge the flows into Rowel Brook in a controlled way.</p> <p>This design provides a more sustainable approach to managing the overland flow than in the baseline, where the overland flows were free to move overland towards Rowel Brook. This mitigation measure is simply formalising the route of water that was present in the baseline. The same volume of water is being dealt with, although managed in a more sustainable way.</p> <p>It is not clear how the EA consider capture and attenuation of previously unattenuated flows could be increasing the risk to downstream receptors.</p>
6.5	<p>Section 7.7 of the applicant's document states 'The survey does not indicate a culverted ordinary watercourse passing under this corner of the site'. This is not sufficient to be sure the culvert does not exist. Evidence should be provided on whether or not there is a culvert in this location.</p>	<p>The evidence provided to date demonstrates that there is no culvert in this location. The EA have provided no evidence to the contrary.</p>

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6.6	In the south of the site, land level changes and relation the main river are proposed.	Not agreed. Changes to land levels are proposed as described in Section 4.2.1 of the FRA, but no changes to the main river are proposed.
6.7	Details of the proposed compensation have not been provided or modelled; therefore it has not been demonstrated that the proposed scheme would prevent an increase in flood risk elsewhere.	Details of the proposed compensation area have been provided. The flood storage area has been sized to mitigate the increase in risk which has been conservatively quantified using the modelling carried out and reported in the FRA / Modelling Note / Technical Note.
6.8	In fact, the current modelling demonstrates the proposed works would increase flood risk offsite.	<p>Not agreed. The current modelling demonstrates that the flood risk would increase if the storage area were not provided. This is clearly articulated in the FRA.</p> <p>The modelling of the scenario in which the land raising occurred but the flood storage area was not, is necessary to establish the volume of storage required within the flood storage area.</p>
6.9	For clarity, part of the channel that the applicant proposes to fill in (from approximately SP4835512779 to SP4841112808) is designated main river. This stretch of main river is shown in yellow in Figure 7.2 of the revised Model Report. Any changes to watercourses (main river or ordinary watercourse) may impact fluvial flood risk. Therefore, the impacts of the proposed works need to be modelled, and it will need to be demonstrated that the works will not increase flood risk onsite or elsewhere.	<p>Not agreed. The stretch of designated main river (from approximately SP4835512779 to SP4841112808) will not be infilled.</p> <p>The section of ordinary watercourse, directly upstream of the start of the main river within the footprint of the safeguarded expansion area of the secondary school plot, will be infilled as part of the OCC requirements for secondary school sites. This is clearly described in the third paragraph of Section 4.1.2 of the FRA.</p> <p>The figure from the modelling report illustrates the schematisation of the scenario run to identify the potential magnitude of the flood storage area required. The section of main river in yellow in this figure was removed for two reasons:</p> <ol style="list-style-type: none"> 1. To represent the component of the proposed condition whereby runoff from the secondary school site would be diverted to the storage area by the on-site stormwater drainage strategy rather than entering the main river directly. 2. To increase the contributing catchment in the model to provide a conservative preliminary estimate of the volume of water likely to be displaced. This would allow the flood storage area volume to be estimated conservatively. <p>It is considered in this instance that the text in the FRA outlining the project proposals should take precedent over the adjustments in the model required to conservatively quantify the displaced volume.</p>

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6.10	<p>Figures 5-5 and 5-6 in the Technical Note show changes of flood risk as a result of relocating the river. A further map showing the impacts in the 3.3% AEP should be provided, as well as zoomed in clear images of the affected area for all relevant flood events. The scale used should not include a bracket that is above and below zero.</p>	<p>Not agreed. Figures 5-5 and 5-6 illustrate what would happen if the ordinary watercourse were to be infilled and the flood storage area were not to be provided. This scenario was run to identify a conservative volume for the flood storage area.</p> <p>Item 6.9 above clarifies the contents of Section 4.2.1 of the FRA that the main river is not to be infilled.</p>
6.11	<p>Figure 5-6 shows increases in flood risk offsite, therefore we maintain our objection to the proposed development. This is not appropriately addressed in section 7.8 of the applicant's recent document. This is not an issue that can be dealt with at a later date.</p>	<p>Not agreed. Figure 5-6 of the Technical note supersedes Figure 22 contained within Section 4.1.2 of the FRA. Section 4.1.2 of the FRA clearly states that the flood storage area will be provided as part of the proposals. It also states that the storage area has been sized to offset the increases in flood extents shown in Figure 22.</p> <p>It should be clear to the EA that Figure 5-6 / Figure 22 both illustrate the increase in flood extent that would occur if the flood storage area were not to be provided. This assessment is required in order to guide preliminary sizing of the flood storage area.</p> <p>It is considered unreasonable for the EA to suggest that the increases in extent shown in Figure 5.6 are reflective of the proposed development, especially when the FRA clearly states that the storage area has been designed to eliminate these increases.</p>
6.12	<p>We are also concerned about the apparent inconsistent approach taken in the south of the site, where new properties appear to be put into the design flood event, compared to rerouting flood waters to remove properties from the design flood extent in the north.</p>	<p>Not agreed. As shown in Figure 5-1 and noted in Section 5.1 of the Flood Risk Technical Note, there are no buildings proposed within the design flood event extents in the south of the site.</p>
7	Finished Floor Levels	
7.1	<p>We welcome that the applicant has confirmed that FFLs will be set at least 300mm above the 1% AEP plus 41% allowance for climate change flood level.</p>	<p>Noted.</p>
7.2	<p>Due to the size of the site, we understand that this level varies across the site so a range of FFLs are to be proposed. Further information on precise FFLs for each building would be required before development can commence.</p>	<p>Noted. As captured in the comment above for Item 7.11, we have confirmed that FFLs will be set at least 300mm above the 1%AEP plus 41% allowance for climate change flood levels.</p> <p>Given the outline nature of the application, providing finished floor levels on a per-building basis is not appropriate. The FRA clearly states the methodology for deriving FFLs for properties and this can be secured as a condition for future development of the masterplan layout.</p>

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8	River Crossings	
8.1	We note the applicant has only confirmed that 'No river crossings are proposed as part of the outline planning application'.	Correct.
8.2	It is still not clear if any river crossings would be proposed as part of reserved matters applications. Clarity should be provided.	<p>Not agreed.</p> <p>We have confirmed that at this stage no river crossings are proposed as part of this planning application. We are unsure what further information can be provided.</p>
8.3	Bridges should be of clear span design, with abutments set back from the bank to allow for maintenance and improvement works and provide suitable space to allow mammals to pass. The soffit (underside) of the bridge should be set at least 600mm above the 1% AEP plus an appropriate allowance for climate change flood level to allow flood water and floating debris to pass beneath the bridge, to prevent blockages. The bridge should not cause flooding either upstream, downstream or at the site.	Noted.
9	Other works – Roads, paths, substation, landscaping	
9.1	Limited information has been provided on any roads, paths and landscaping. Unless mitigation is provided, there should be no changes to land levels within the design flood extent. This has not been confirmed by the applicant, who has only referred to paths and flood zones in section 9.1 of the EA Responses to Flood Risk Comments document.	<p>Not agreed.</p> <p>Within Appendix A of the Flood Risk Technical Note, a statement is made that "As part of this outline planning application, other than the two areas of the NW of the site and the Secondary School Site, based on the illustrative masterplan no further mitigation measures are required from a flood risk perspective. Any paths proposed within the flood zones would be at existing levels with more detail on proposals, design and safe access and egress being taken forward as part of Reserved Matters Applications."</p> <p>We have demonstrated where changes are proposed within the flood zones very clearly throughout both the FRA and Technical Note. It is confirmed that no changes to land levels are proposed within the design flood event extent other than for the two areas where mitigation measures are outlined and provided in the northwest of the site and the secondary school area.</p>

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9.2	We welcome that the primary substation is to be located outside the 1% AEP plus 41% allowance for climate change. This is confirmed in Figure 5-2 of the Technical Note.	Noted.
10	Overcoming our Objection	
10.1	To overcome our objection, the applicant should submit a revised FRA which addresses the points highlighted above. If this cannot be achieved, we are likely to maintain our objection. Please re-consult us on any revised FRA submitted.	No update to the FRA is required. The responses in this table make clear that the EA have the information they require to carry out their assessment and come to the same conclusion as the LLFA has; that the outline proposals are acceptable in flood risk terms. Given the number of points that are not agreed between the EA and the Applicant, the request for a meeting to discuss these points – a request echoed by the case officer - is reiterated.