

Supplementary Notes to Flood Risk Comments received from NRW ref P/2017/0919

Opus, 8th March 2018

- NRW Comment 1**

However, the assessment only includes two blockage scenarios of 30% and 60% blockage for the 1% AEP and not all three blockage scenarios for a range of events for 1% and 1% plus climate change (as set out in GPG101 2015 producing flood risk hydraulic models and flood consequence assessments for development planning purposes).

- Opus Response 1 (please refer to hydraulic model report Sections 2.3, 3.8, 4.2, 5)**

The scope of the FCA included the hydraulic modelling of the existing watercourse, pond and culvert system on site.

The following events were run:

Return Period (yrs)	Peak Flow (m ³ /s)
2	0.070
20	0.147
100	0.207
100+30%CC	0.269
100+75%CC	0.362
1000	0.412

This included the attempted model runs with blockage scenarios of 30%, 67% and 95% at the culvert entrance, in accordance with current best practice guidance. However, due to model instability issues, as stated in the Hydraulic Modelling report, only the 30% and 60% blockages scenarios were possible.

To avoid unnecessary model runs, the scope of works included blockages scenarios for the 1% and the worst case scenario out of the 1% + climate change and the 0.1% events.

Given that, in this case, the 0.1% event was found to have the highest water level compared to the 100year + climate change events, the 1%+ climate change event was not deemed necessary to be modelled with a blockage scenario and not reported on any further in the FCA.

An extract of the hydraulic report showing the model runs undertaken as part of this FCA is shown below:

Name	Sensitivity	Run?
Q20	-	✓
Q100	-	✓
100yr Blockage 30%	-	✓
100yr Blockage 60%	-	✓
100yr Blockage 90%	-	-
1000yr Blockage 30%	-	✓
1000yr Blockage 60%	-	✓
1000yr Blockage 90%	-	-
Q100_mMannings	-20% Manning's	✓
Q100_pMannings	+20% Manning's	✓
Q100_mBound	-20% Boundary	✓
Q100_pBound	+20% Boundary	✓
Q100+20q	+20% Discharge	✓
Q100-20q	-20% Discharge	✓
Q100+30%	-	✓
Q100+75%	-	✓
Q1000	-	✓
Q100+inflow	-	✓
Q100+inflow2	-	✓

A summary of the results of the hydraulic modelling report and blockage scenarios is shown as follows:

Name	Stage (m AOD)	Depth (m)	Existing development m AOD	Proposed development m AOD
Q20	36.379	0.059	37.05	36.74
Q100	36.417	0.097		
Q100+30% CC	36.452	0.132		
Q100+75%CC	36.504	0.184		
Q100+inflow	36.417	0.097		
Q100+inflow2	36.417	0.097		
Q1000	36.523	0.203		
Blockage Scenarios				
Q100 blk 30%	36.417	0.097		
Q100 blk 60%	36.417	0.097		
Q100 blk 90% **	N/A	N/A		
Q1000 blk 30%	36.523	0.203		
Q1000 blk 60%	36.630	0.310		
Q1000 blk 90% **	N/A	N/A		

The “GPG101 2015” guidance document referred to by the NRW letter **ref P/2017/0919** does not provide **any** detailed guidance on any percentage blockages scenario that need to be applied to culverts. The only reference to blockage in the above guidance document is as follows:

“If a development project has a long duration or a flood event occurs, it may be necessary to review the hydrology, hydraulic model calibration and blockage scenarios being considered in light of new data becoming available”

The model results for the 100 year events, even with the climate change allowance upto 75% included, did not cause any flooding to the proposed development site. The 1% and 0.1% year fluvial events, even with the blockage scenario of upto 60% included, did not show any flooding to the existing and proposed development areas.

Some relevant extracts of the “GPG101 2015” guidance and notes relating to the model are shown below:

- *Current national policy requires climate change to be considered on all fluvial flows up to and including the 1% (1 in 100) annual probability of occurrence, and 0.1 % (1 in 1000) for coastal. **The hydraulic modelling included the 1% event with both 30% and 75% climate events, both demonstrated no flooding to the site.***
- *An assessment of the flood consequences of the development to third parties for an appropriate range of fluvial flows and coastal flood levels (including climate change) up to and including the 0.1 % annual probability of occurrence (1 in 1000 in any given year). **Although the site is not affected by coastal flooding, the 0.1% event was modelled and found to have no flooding risk to the site.***
- *Section A1.12 of TAN15 states that any development must show “no flooding elsewhere” Current national policy suggest this should include a flood event with a 0.1% (1 in a 1000) annual probability of occurrence (including climate change for coastal flood levels). **As above, the hydraulic modelling and FCA have shown that the 0.1% event does not show any flood risk to the site.***

- **NRW Comment 2**

The assessment refers to an upper end estimate of climate change of 30% for up to 2050s which is equivalent of a 33-year lifetime of development and not the expected 75 years for a non-residential development.

- **Opus Response 2 (refer to Hydraulic Modelling report Sections 2.2, 2.3, Appendix E)**

In the assessment of flood risk, we have referred to guidance provided by the Welsh Government and Natural Resources Wales on climate change allowances provided on the following link:

<http://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>.

Table 1 of this guidance is reproduced below:

Table 1: peak river flow allowances by river basin district (use 1961 to 1990 baseline²)

	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Severn			
Upper end estimate	25%	40%	70%
Change factor /central estimate	10%	20%	25%
Lower end estimate	0%	5%	5%
West Wales			
Upper end estimate	25%	40%	75%
Change factor /central estimate	15%	25%	30%
Lower end estimate	5%	10%	15%
Dee			
Upper end estimate	20%	30%	45%
Change factor /central estimate	10%	15%	20%
Lower end estimate	5%	5%	5%

The site is located within the River Dee catchment and as can be seen, the recommended Upper end climate change allowance is 45% for assessment upto 2080. The Opus assessment was very conservative and has gone further by assessing the climate change allowance for upto to the 100 year + 75% climate change allowance for the development upto the year 2080. This assessment has shown the site not to be at risk of flooding using the 75% allowances which is well beyond the recommended 45% allowance for Wrexham in the Dee catchment.

- **NRW Comment 3**

The assessment of surface water flood risks is inconclusive, as further assessment of infiltration is required and refers to higher finished floor levels (FFL) but does not specify what these will involve in terms of Units 11, 12 and 55.

- **Opus Comment 3 (refer to FCA report Sections 3.1.2 and 4.2)**

Section 3.1.2 of the FCA provides an appropriate assessment of current surface water flooding on the site, based on data sourced from NRW's website. Section 3.1.2 provides recommendations for the design of internal finished floor levels and external ground level gradients on site, together with the new external surface water drainage on site to minimise surface water flood risk.

Assessment of infiltration is referred to in a different section of the report (Section 4.2) in the drainage strategy Section 4.2 of the report and is not related to the assessment of surface water flood risk, which is purely based on the NRW's flood maps.

The outline drainage strategy was prepared as part of the FCA using the best available information at the time of writing. Opus are currently undertaking detail design of the surface water drainage system for the development and will be able to use the latest available site information to provide the most appropriate surface water management option for this site without increasing the risk of surface water flooding to the site and elsewhere. This is being developed in consultation with the LLFA.

Although the FCA report recommended undertaking BRE365 soakaway tests to assess the infiltration potential of the ground, as good practice, a review of the borehole logs included within the FCA report, (See section 2.4 and 4.2.1 and Appendix C of the report) confirmed that the site is underlain by stiff clay and therefore there will be no requirements for any BRE365 infiltration tests to confirm that the use of infiltration to drain surface water from this site will not be viable.

- **NRW Comment 4**

The proposal will involve the building over a culverted watercourse which is not considered best practice and will require the advice of the Lead Local Flood Authority (LLFA).

The LLFA may not consider that the CCTV survey and condition assessment and proposed four mitigation measure which includes, strengthening of foundations, manhole repairs, culvert repairs, maintaining future access and culvert lining to be acceptable.

- **Opus Response 4**

Opus are currently in consultation with the LLFA to determine a potential diversion route for the existing culvert and any other requirements. NRW may be consulted again by the LLFA on the diversion of the existing culvert.

- **NRW Comment 5**

In addition, the FCA does not specify the existing or proposed maintenance of the culvert within the site and this should be included within the revised report.

- **Opus Comment 5 (See Section 4.2.6 of the FCA report)**

This does not generally form part of FCAs, but Section 4.2.6 of the FCA report includes a set of general measures for maintaining the quality of the surface water discharge and prevention of flooding from the culvert. Existing and future maintenance of drainage assets is normally the responsibility of the riparian owner. These maintenance measures will be discussed and agreed further with the LLFA as part of the culvert diversion application process.

- **NRW Comment 6**

In conclusion, the revised FCA is currently deficient and does not demonstrate the acceptability of development as required by TAN 15.

- **Opus Response 6**

The updated FCA submitted is **not** deficient and has appropriately demonstrated that the existing culvert **has** capacity for a range of events up to the 0.1% fluvial event, including blockage scenarios. The hydraulic modelling was undertaken in accordance with the best practice and guidance from the Welsh Government and NRW and the FCA is fully in line with the requirements of TAN15.

The purpose of the FCA and the hydraulic model, as required by the NRW and LLFA, was to confirm the Flood Zone A classification of the site and this has been demonstrated by the FCA. The NRW letter confirms that the site lies in Flood Zone A.

In accordance with TAN15, the proposed development (***Less vulnerable - General industrial – Figure 2, Page 15 of TAN15***) is suitable in Flood Zone A (***an area “Considered to be at little or no risk of fluvial or tidal/coastal flooding” and “Used to indicate that justification test is not applicable and no need to consider flood risk further” – Figure 1, page 5 of TAN15***).

The drainage design is currently being undertaken at a detail design stage by Opus and will further refine the surface water management options stated in the FCA and Outline Drainage Strategy report.

It is recommended that NRW and the LLFA review the hydraulic modelling report provided and this supplementary note to reconsider their position and advice on flood risk grounds for this particular development.