



**Cyfoeth
Naturiol**
Cymru
**Natural
Resources**
Wales

Dragon Parc, Abercanaid NRW Model Review

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Rev No: v3

Revision	Prepared By	Date
V1	Emily Harris	11/02/2019
V2	Emily Harris	09/04/2019
V3	Emily Harris	30/12/2019

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Recommendations below are colour coded as follows:

Green – No change necessary (suggestion for improvement / good practice but which is unlikely to change the model outcome).

Amber – Preferred but not compulsory (non-standard method or method not following guidance but unlikely to have impacted on model results).

Red – Change needed (omission/error that could make the model findings subject to challenge and which requires correction/further work).

1 Dragon Parc Model Review

Huntley Wood Investments commissioned Thomas Mackay to undertake modelling for the site, where the baseline modelling was accepted by NRW in May 2019; in September 2019 JBA have taken on the FCA project.

Both the River Taff and the Nant Canaid tributary have been modelled in ESTRY - TuFLOW.

The FCA (JBA) is for the proposed development of Flood Mitigation.

1. Reprofilng the site; raising the site elevations to 157mAOD and the Southern section raised to 155mAOD (above the 1000y SoP).
2. 6m wide dry swale on the Western side of the site (depth ranging from 0.19m-2m); diverting water from the North and West into the Taff.
3. Two new box culverts (2.4m wide) at the Southern end of the site that will convey water from the swale into the River Taff.

2 Model Review

2.1 Hydrology Review

NRW v2 response: We can confirm that both set of design flood flows for the Nant Cannaid and the River Taff are now considered suitable.

Graphs showing oscillations have been justified and accepted; NRW have checked the upstream and downstream cross sections in QGIS which look appropriate.

2.2 Modelling Software

The NRW model was altered from FMP-TuFLOW to ESTRY-TuFLOW because of a 1D-1D bug which was identified. The ESTRY-TuFLOW model is acceptable for this use.

2.3 Model Construction - Review of GIS Layers

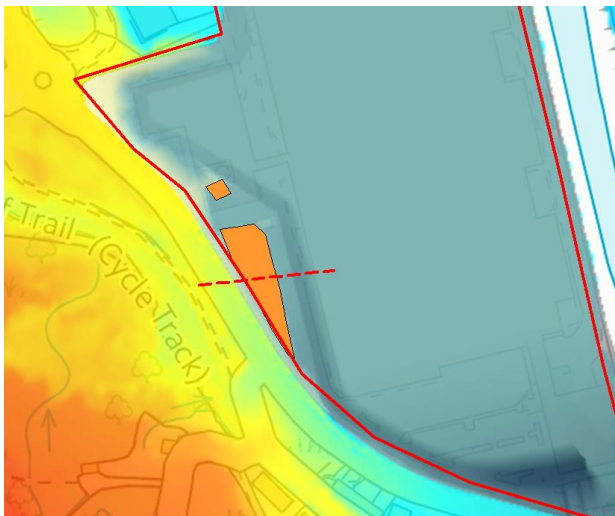
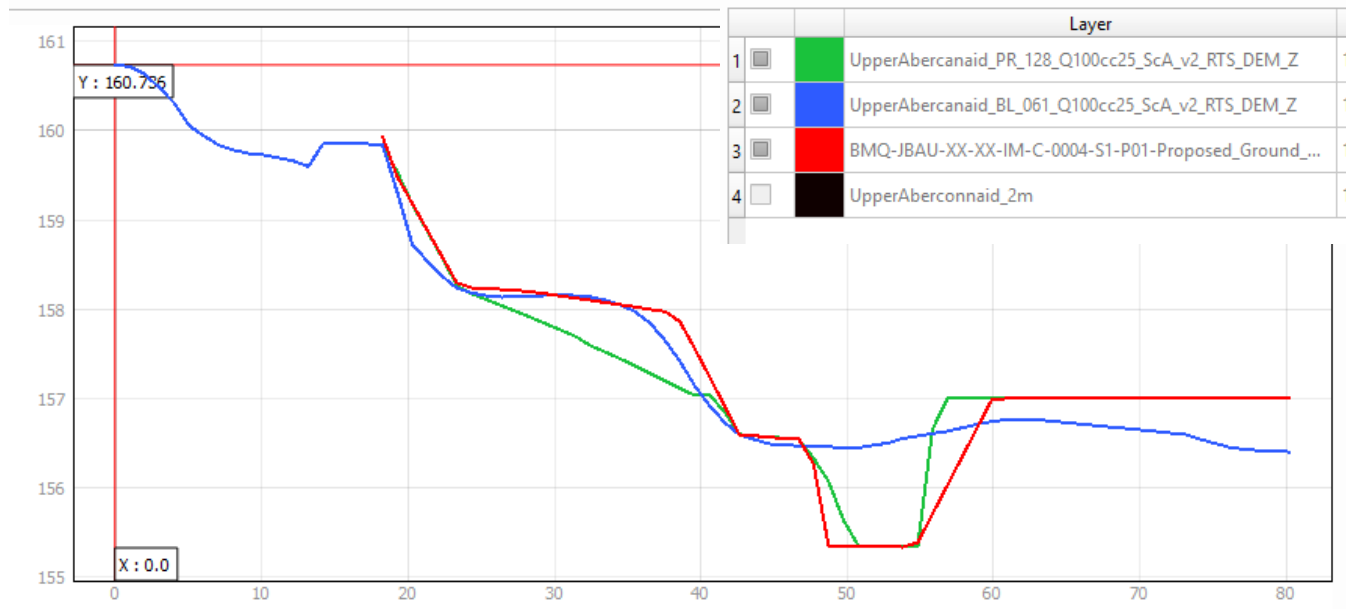
Proposed mitigation works are inputted into the 2D model using the proposed DEM and the culverts were inputted into the 1D model via SX links.

The .tbc file was checked alongside the 2d_bc layers for the proposed scenario showing the spills at the inflow to the culverts and the connections to the outflow from the pond connection.

The same base input LiDAR has been used for both the proposed and baseline scenario; the proposed scenario has included extra layers which alter the topography of the site (excavated area, LiDAR fix and a reprofile zshp).

Input LiDAR fix

The *2d_zsh_UpperAberconnaid_SiteLidarFixes_R_075* is not shown to be altering the DTM to 157mAOD as is noted in the attribute table. Please review this file to check it is altering the DTM as intended.



Mannings N values:

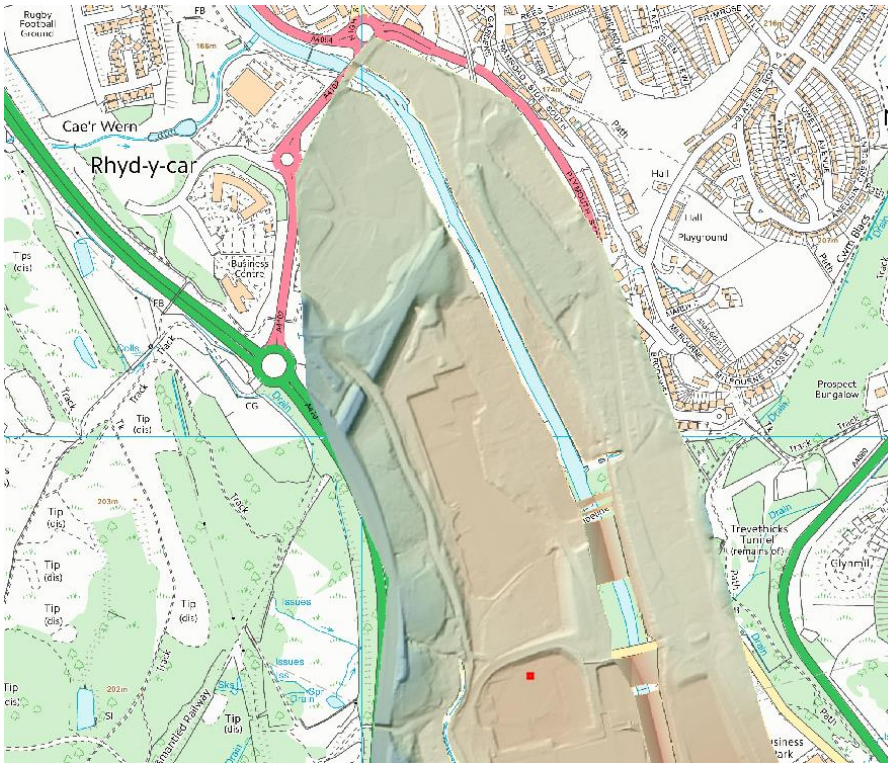
1D Mannings values in the culvert and ESTRY cross-sections are reasonable.

2D values in the .tmf are reasonable for the baseline scenario.

The .tmf values are used for both the baseline and proposed scenario; we would assume a difference in roughness values in the proposed scenario around the swales and site (access roads etc). Please review and update where necessary, justify decisions made within the report.

WLL

There are significant gaps in the model grid files which highlight that there are missing WLL, please review.



Nant Canaid Culvert:

Meeting in October between NRW and Thomas Mackay highlighted that the culvert surveyors wouldn't survey the whole culvert as there are some blockages/obstacles. The survey report states that there is a section of the culvert which has not been surveyed, however the inlet, outfalls, junctions and route have been surveyed. Thomas Mackay have provided photos of the survey and uneven ground which lead to the abandonment of the survey. Information on the culvert survey has been inputted into the culvert survey reporting.

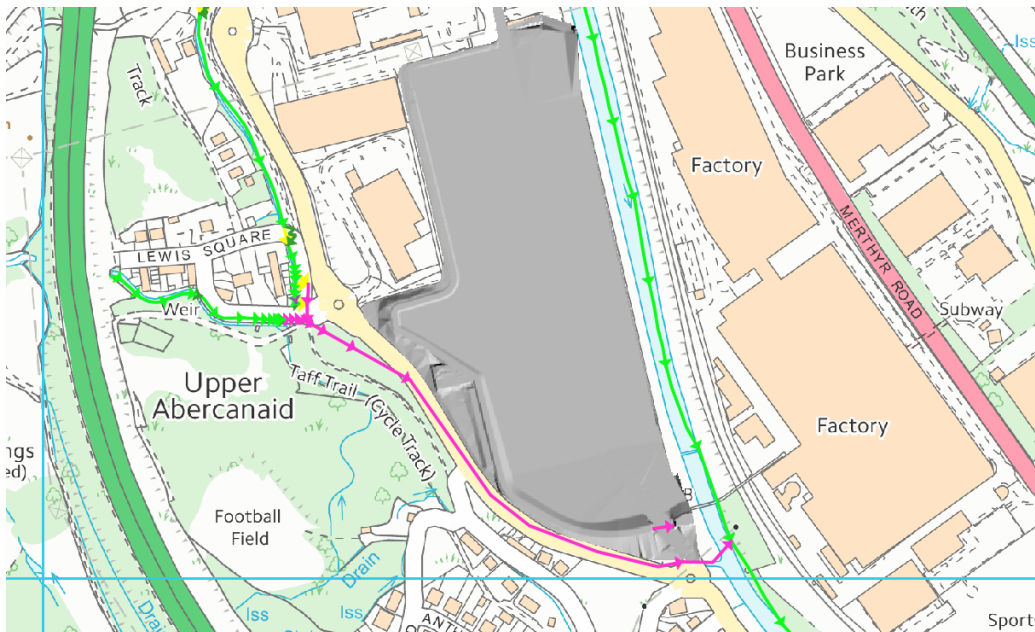
Please can the following questions be reviewed and inputted into the report:

When does the culvert reach capacity?

Do the two box culverts from the swale to the Taff back up into the site/swale?

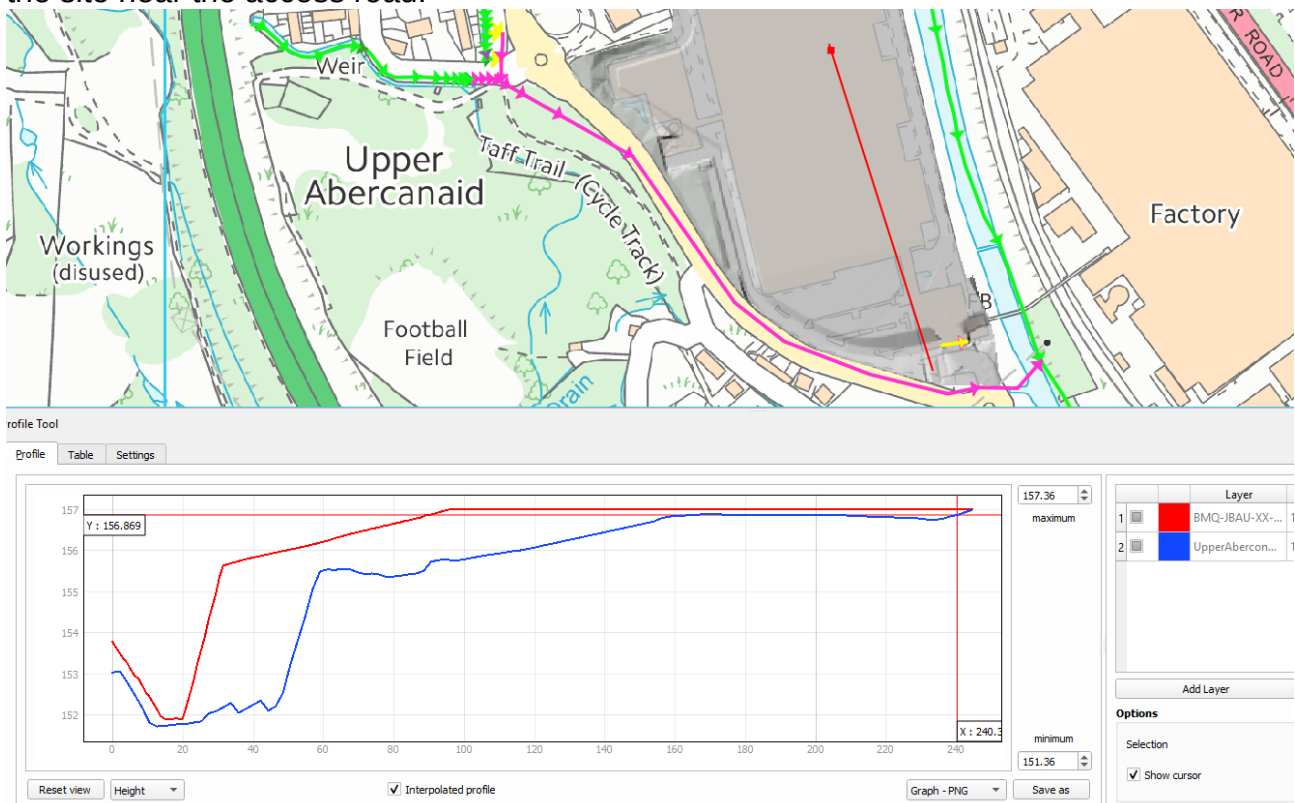
In a period of high flow, will there be capacity in the culverts to also carry flow from the swale into the River Taff if the Taff is at high flows?

The culvert (pink) is shown in the 1D domain, there is a swale inputted in the 2D domain (proposed ground modelling output) which drains to the south of the site. This then is connected to the River Taff by two culverts.



The site has been elevated to a consistent level of 157mAOD (Q1000 SoP) as stated in the report.

The swale has been reduced to a level of approximately 151.8mAOD at the south end of the site near the access road.

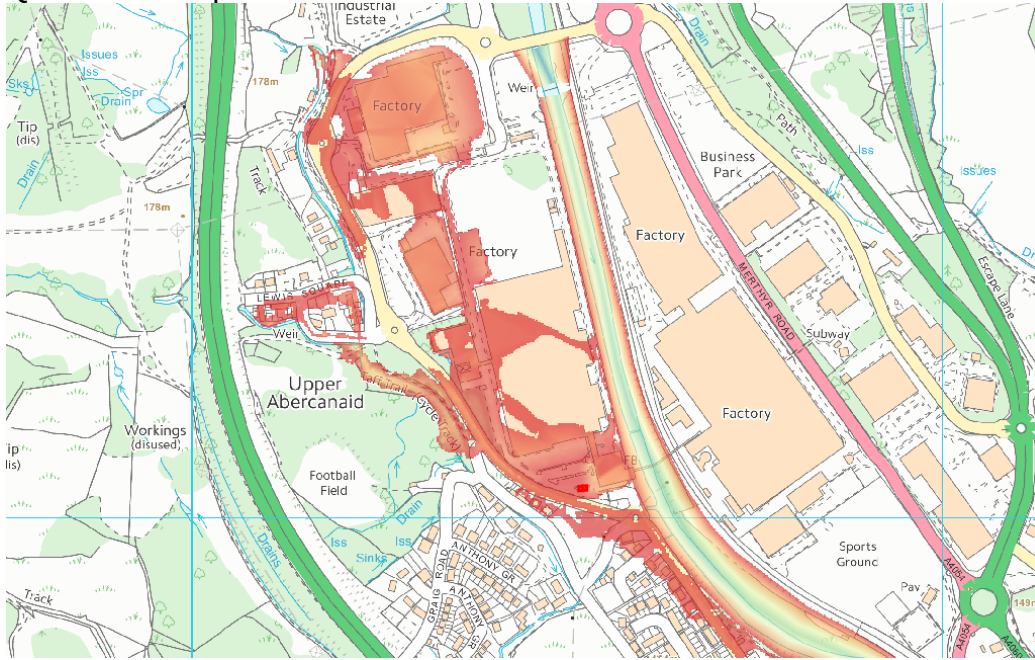


3 Results Review

3.1 Baseline Results

Primary source of flooding is from the Nant Canaid West as the channel and culvert are exceeded.

Q100+25% depths:



Blockage scenarios have been run and the proposed results have been included in the results files as well as in the model report (30% and 95%).

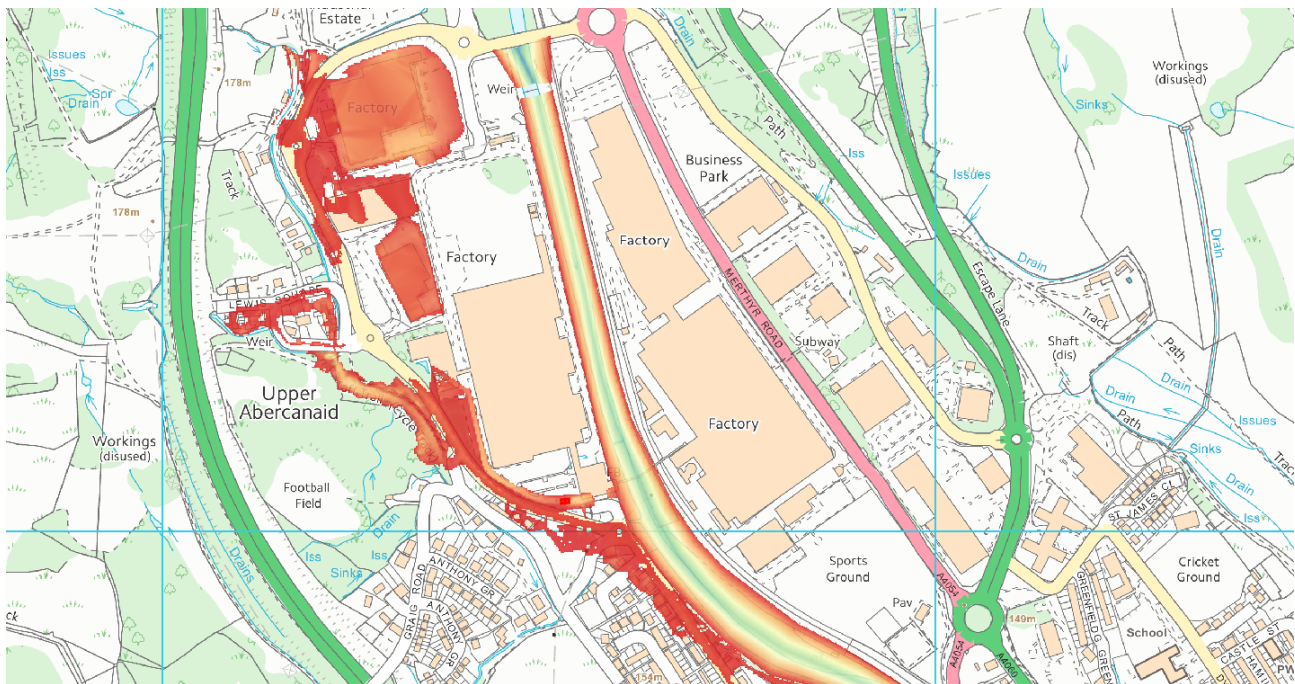
We want to be confident in the model, as there is not a full culvert survey, the sensitivity events such as blockage (30% & 95%) will be used to review the baseline scenario.

Please provide the baseline blockage scenario results files so these can be compared with the proposed scenario to check for detriment.

The FCA will require comments on the comparisons between the baseline and proposed 95% blockage scenarios as this is the design event for the site.

3.2 Proposed Results

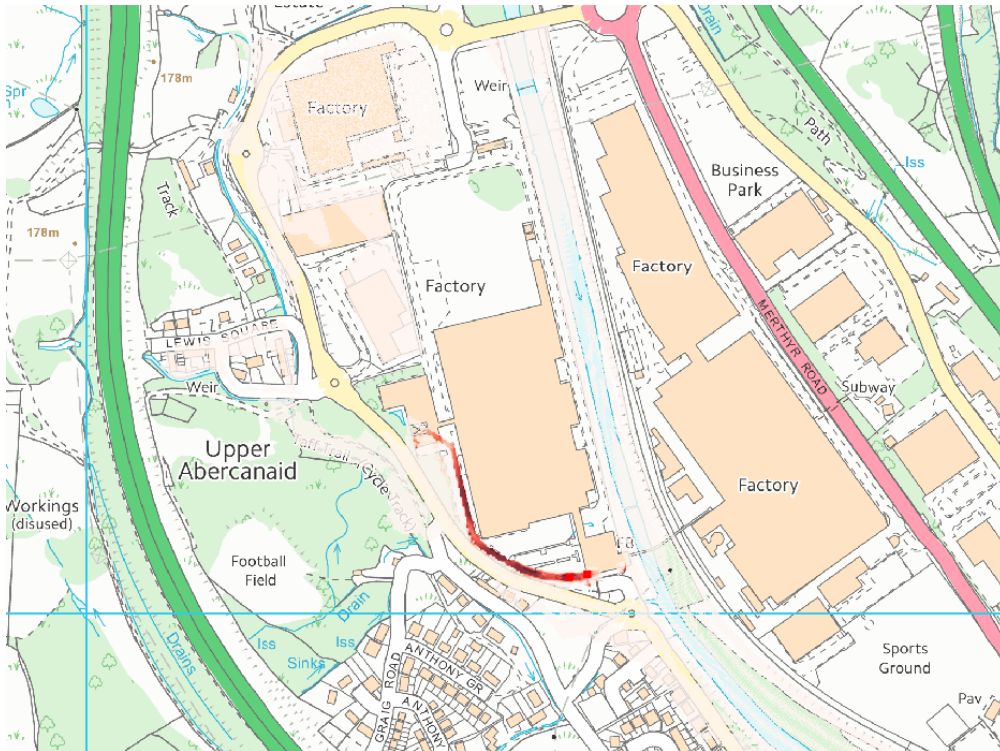
Q100+25% proposed depths:



3.3 Third party Impact

p16-p18 states that there are no adverse impacts on third-parties due to the proposed works in the 1% and 0.1% AEP. However, as the Development Control team/Planning have asked for the 95% blockage scenario as the design event (email dated 13th November 2019) there needs to be a comparison between the baseline and proposed scenario to look at third party impacts.

The area of detriment in the Q100+25% which is over 5mm is maintained within the site boundary, however this is not the design scenario:



3.4 Sensitivity Results

The baseline scenario which was accepted in late 2019 included details on the sensitivity to roughness and downstream boundary. As this update uses the baseline model, it is not necessary to provide these results unless they differ from the previous version. **Please review this and provide results if so.** In the previous version of the model, the increase in roughness on the Q100+25% highlighted that there will be a decrease in depths in the ground lowering area which compensates for the flooding. There is also an increase in depths outside the site boundary in 3rd party land. Taking this into consideration there may be a need for regular maintenance to ensure the roughness is maintained (**DFR/Planning**).

The previous version of the model was not sensitive to the changes in downstream boundary (less than 20mm).

It is noted in the model report that the blockage scenario has little impact in the out of bank flooding until the 0.1% with 95% blockage (p19).

The 95% (high) blockage scenario shows that the main area of detriment due to the blockage would be onsite.

As noted above, please supply NRW with both the baseline and proposed blockage scenarios (30% & 95%); include comparisons and review of the modelled outputs in the FCA along with maps.

4 Conclusions and Recommendations

NRW have concluded an intermediate model review and it is strongly recommended that the modeller reviews all the comments above. The suggested changes are around the design event submission of results and comparisons within the FCA, model input layers and overall completeness of information provided. The model software is appropriate for use in this area, and is a sound basis for the FCA, however, the comments above need to be addressed.

We have the summarised following recommendations;

- Submit all sensitivity event results for the most recent update to the model.
- Comment on the detriment and comparison between the baseline and proposed scenarios with 95% blockage (design event).
- Add in responses to questions raised about the culverts leading out of the site into the Taff.
- Review the proposed Mannings roughness values within the swale and site.
- Review the input layers listed in the .tgc for site reprofiling.

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