ARUP

Technical Note

Project title	RFD 2022 Major Flood Model Update Mary River (MAR) Catchment
Job number	305456-00
File reference	Peer Review Technical Note
cc	Alana Mosely
Prepared by	Greg Rogencamp, Kok Keng Tan
Date	3 February 2025
Subject	Independent Technical Review – Technical Note

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1. Introduction

City of Moreton Bay (CMB) is currently undertaking a major flood model update of the Mary River (MAR) Catchment and has commissioned Arup to undertake an independent technical review of the hydrologic and hydraulic models in line with CMB project brief requirements.

This technical note documents the methodology and findings associated with the review.

2. Supplied Data

This technical review has been undertaken using the following supplied data:

CMB Methodology Reports:

- RFD ARR 2019 Methodology and Pilot Study Report (Arup, 2021)
- Draft HEH Modelling Methodology technical note (BMT, 2022)
- Bridge modelling method technical note (BMT, 2022)

WBNM Model:

- Model file and associated results (ARFc to ARFe) for existing and future conditions

TUFLOW Model:

- TUFLOW Control file (MAR_R_003a_~s1~_~e1~~e2~_~e3~_19.tcf, MAR_R_003a_~s1~_~e1~~e2~_~e3~_20.tcf)
- All associated TUFLOW model input files for design events
- All associated TUFLOW model results and log files for design events
- Check files for selected 1% AEP E00 run

Report

The following documentation was received:

- A work in progress report to assist with the flood model review
- Internal review records for base model development dated October 2024

Other

- Memo for IFD sensitivity analysis modelling for Redcliffe catchment (Water Tech, 2023)

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3. Summary and Recommendation

The models and methodology were generally found to be sound and in line with current best industry practices. Of note, the WBNM model for this study is not HEH trained. Whilst there are minor departures from CMB methodology and some engineering judgement exercised, given the scale and locality of the catchment, the final outcome is considered acceptable. For details of review elements and comments, refer to the 'Flood Model Verification Record' attached at the end of this technical note.

Reliance Statement

The sole purpose of this technical note the associated services performed by Arup is in accordance with the scope of services set out in the contract between Arup and CMB for the Project. In preparing this technical note, Arup has relied upon, and presumed accurate, information provided by CMB. Except as otherwise stated in this technical note, Arup has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Arup has undertaken this peer review in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures, and practices at the date of issue of this technical note. For the reasons outlined above however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in the technical note, to the extent permitted by law.

This assessment has been prepared on behalf of, and for the exclusive use of, CMB, and is subject to, and issued in accordance with, the provisions of the contract between Arup and CMB. Arup accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this technical note and flood modelling by any third party.

DOCUMENT CHECKING

	Prepared by	Checked by	Approved by
Name	Kok Keng Tan	Greg Rogencamp	Greg Rogencamp
Signature			

Attached: QA review form

ARUP

Subject Flood Model Verification Record

Date 2 December 2024 Doc Ref 305456_MAR_CHECK

123123

Flood Assessment Model Checklist			
Project Name	RFD 2022 Major Flood Model Update Mary River (MAR) Catchment	**Date**	2/12/2024
		Version	2

DESIGNER		
Company / Staff	**CMB**	

REVIEWER		
Company / Staff	**Arup**	Greg Rogencamp, Kok Keng Tan

Notes:

- This checklist is a tool to be used by modellers as a QA mechanism.
- This checklist is a general overview of typical design elements.
- This checklist is to be used for all phases of design. It is to be completed and included at each formal review phase of the project. It is best employed as a living document during the execution of a project.

1 Calibration Performance Checklist

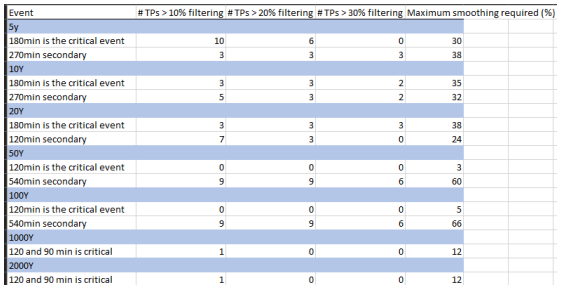
Check Item	Reviewer Comments (Arup)	Designer Response (CMB)	Rank	Reviewer Closeout
WBNM and TUFLOW Calibration Performance				
Other comments/issues	Model is uncalibrated. 2/12/24: Response noted.	Uncalibrated model, but utilising roughness parameters adopted from 'regional calibration' process i.e. in line with other basins within the local government area for which calibration and validation completed	Commentary. No action	Closed

2 WBNM Hydrologic Modelling Checklist

Check Item	Reviewer Comments (Arup)	Designer Response (CMB)	Rank	Reviewer Closeout
Catchment Definition				
Catchment boundary drawn correctly	Appropriate. Minor refinement along the western boundary of MAR_33_03278 to capture ridge could be considered in future revisions. 2/12/24: Response noted.	Noted, to be considered in future hydrography update	Commentary. No action	Closed
Sub-catchment boundaries drawn correctly	Appropriate.		Commentary. No action	Closed
Network structure is correct	Spot check WBNM indicate appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments (Arup)	Designer Response (CMB)	Rank	Reviewer Closeout
Subareas, reaches and nodes names appropriate	Appropriate.		Commentary. No action	Closed
Output locations are consistent with project goals	Appropriate.		Commentary. No action	Closed
Areas have been entered correctly	Appropriate.		Commentary. No action	Closed
Surface type division is appropriate and correct	Appropriate.		Commentary. No action	Closed
Impervious fractions have been entered correctly	Report indicates existing conditions FI was defined using TIA raster (instead of EIA raster). The highest FI observed within an individual sub-area is 4.6% at MAR015_00000. Overall, FI application is generally consistent with aerial imagery. Future conditions FI were unchanged existing conditions (which suggest that future EIA raster yielded lower FI). This approach of is not consistent with region wide flood study. Nonetheless, given the limited influence of FI of this catchment, this approach is deemed acceptable 2/12/24: Response noted.	This is a known misalignment with overall RFD approach but would result in a conservative outcome. FI to be updated in next minor update to align with remainder of region.	Commentary. No action	Closed
Slope calculations are appropriate and correct	N/A		Commentary. No action	Closed
Routing calculations are correct	Appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments (Arup)	Designer Response (CMB)	Rank	Reviewer Closeout
Special elements have been entered correctly	No special elements were defined. Several farm dams observed from aerial (i.e. within sub-areas MAR023_01820, MAR017_09893) were not represented in WBNM/TUFLOW model. The scale of these features relative to the catchment is insignificant. Hence, deemed to have limited influence on the overall outcome. Hence, this approach is deemed acceptable. 2/12/24: Response noted.	Identified farm dams are upstream of the hydraulic model, and so would be considered within the hydrologic model. Should farm dams be assumed full at onset of flood event, agree their presence would likely have minimal impact on flow hydrograph. Farm dams within the hydraulic model extent have an IWL applied to enable full dam at onset of model.	Commentary. No action	Closed
IFD method and parameters are correct	Appropriate.		Commentary. No action	Closed
Pre-Burst Application	Appropriate		Commentary. No action	Closed
Duration and intensities are correct	Appropriate.		Commentary. No action	Closed

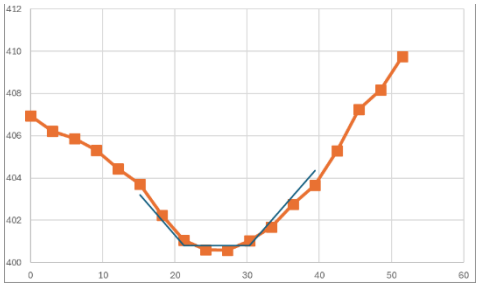
Temporal patterns and zones are correct	Selection of temporal patterns and zones are appropriate. Embedded burst filtering not used for existing conditions run but used for future conditions runs. The report noted that embedded burst filtering for existing conditions was not adopted as it would cause a reduction in water levels (based on testing conducted on 20% AEP). This approach of is not consistent with region wide flood study. Please comment on the following: 1. What justification supports that the flood levels without embedded burst filtering are correct? Especially given that, the design flood levels have overall, already reduced as a result of the update. 2. If the effects of embedded burst filtering on reducing flood levels in existing conditions are considered unacceptable, how is it deemed acceptable for future conditions? 2/12/24: Response noted. Comment closed.	The draft report is misleading and will be amended to reflect the below conveyed. Embedded burst filtering was initially missed when MAR hydrologic and hydraulic models were run for the existing scenario, which was identified by subsequent internal reviews. The review then sought to understand the impact of this omission. This process involved running the hydrologic model through Storm Injector with embedded burst filtering enabled, and comparing results to the hydrologic model without embedded burst filtering. In particular, it was sought to identify the number of storms for which filtering was required, and the degree of smoothing required. A summary of this analysis is tabulated below.  Based on the testing in the Pilot study, it was considered that smoothing of 10% or less was not likely to have a significant impact on project results.	Low	Closed

Event	# TPs > 10% filtering	# TPs > 20% filtering	# TPs > 30% filtering	Maximum smoothing required (%)
5Y				
180min is the critical event	10	6	0	30
270min secondary	3	3	3	38
10Y				
180min is the critical event	3	3	2	35
270min secondary	5	3	2	32
20Y				
180min is the critical event	3	3	3	38
120min secondary	7	3	0	24
50Y				
120min is the critical event	0	0	0	3
540min secondary	9	9	6	60
100Y				
120min is the critical event	0	0	0	5
540min secondary	9	9	6	66
1000Y				
120 and 90 min is critical	1	0	0	12
2000Y				
120 and 90 min is critical	1	0	0	12

		It was found that; • No storms required smoothing above 40% (the limit for which removal of the storm from simulation would be warranted) • Smoothing somewhat tended to be required for ARF E and D, rather than C (the majority of MAR catchments being within the ARF C zone) • The most number of storms requiring smoothing was for 20% AEP. The 1% AEP had only 4 storms requiring smoothing, of 5% or less. The 0.1% AEP event had one storm with 12% smoothing and one with 7% smoothing, and five storms requiring 5% smoothing or less. • The critical storms forming the peak water surface level in TUFLOW (from the un-filtered runs) predominately required no smoothing (had no embedded burst), or less than 5% smoothing. The exception was the 20% AEP event, which had one critical storm of 10% smoothing and one of 7% smoothing. As such, re-running the 20% AEP through the hydraulic model with embedded burst filtering included was deemed necessary to determine if the omission of embedded burst filtering was acceptable or not.		

Check Item	Reviewer Comments (Arup)	Designer Response (CMB)	Rank	Reviewer Closeout
		From the re-run of the 20% AEP event it was found that peak water levels were 20-50mm lower than the unfiltered run.  This degree of conservatism was considered acceptable, and it was decided to keep the embedded burst filtering omission in the existing case runs (i.e. not re-run the model). The use of embedded burst filtering was subsequently undertaken for the future scenario runs, as use of embedded burst filtering is the recommended and adopted approach for the RFD.		

ARF applied correctly	ARF factors applied for this catchment only captured area range from 5km^2 to 75km^2 (ARFc to ARFe). This approach would lead to an underestimation across the upstream watercourses. However, the example presented in report for MAR037_00000 indicated that, despite the significant underprediction in peak flows, the relative reduction in flood depth is insignificant. Overall, this approach is deemed an acceptable compromise. 2/12/24: Response noted.	This analysis has been furthered and updated subsequent to the document provided for the independent review, as summarised here: As a sensitivity, WBNM was run with no ARF (ARF = 1). Differences in flow was then checked for the critical storm for several events. It was found that peak flow difference was less than 10% for the 5% and 1% AEP storms, and was 15% for the 1 in 1000 and 1 in 2000 AEP storms. The largest difference in ARF value was noted as the 1 in 2000 AEP 10 minute storm (which is noted to be not a critical duration for the catchment). This resulted in a 35% difference in peak flow (magnitude of 6.5m3/s difference, total flow of 18.7m3/s with ARF=1). These flow changes were tested in a representative cross-section per below, utilising Manning's equation (assuming a channel roughness of 0.057). The results indicate 30mm or less difference in depth for the 5% and 1% AEP critical storm events (depth approximately 0.9m), and 100mm difference for the 1 in 1000 and 1 in 2000 AEP critical storm events (total depth approximately 1.3m). This was repeated for a channel with a roughness value of 0.03. Difference in depth was 20mm or less difference for the 5% and 1% AEP critical storm events (depth approximately 0.6m), and 80mm difference for the 1 in 1000 and 1 in 2000 AEP critical storm events (total depth approximately 0.9m). Regarding the larger (approximately 100mm) difference for the more rare storms, it is noted that	Commentary. No action	Closed

		the Pilot study indicated that differences in this order of magnitude could occur if picking a sub-selection of storms for modelling in TUFLOW (as compared to running all storms in TUFLOW). This was considered a tolerable outcome when noting the benefits of running a sub-selection of storms chosen from a HEH model as compared to running all in TUFLOW. Thus, whilst not ideal, the 100mm difference in the MAR model as a result of ARF C (instead of ARF A) for the larger and more rare storms is considered acceptable. Council will consider in the next model update if adopting more conservative ARF values is more appropriate for this catchment. *Representative cross section:*  *Analysis results:*		

<table>
<tr><th>Check Item</th><th>Reviewer Comments (Arup)</th><th>Designer Response (CMB)</th><th>Rank</th><th>Reviewer Closeout</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>AEP</th><th>Critical Event</th><th>ARF C (approx)</th><th>Qmax (m3/s) ARFc</th><th>Qmax (m3/s) ARFa</th><th>Depth(m) ARFc</th><th>Depth (m) ARFa</th><th>Diff depth (m)</th><th>Flow difference</th><th>Depth difference</th></tr>
<tr><td>20y</td><td>270m tp9</td><td>0.945</td><td>18.36</td><td>19.58</td><td>0.83</td><td>0.86</td><td>0.03</td><td>6%</td><td>3%</td></tr>
<tr><td>100y</td><td>540m tp1</td><td>0.966</td><td>23.23</td><td>24.12</td><td>0.95</td><td>0.97</td><td>0.02</td><td>4%</td><td>2%</td></tr>
<tr><td>1000y</td><td>120m tp5</td><td>0.879</td><td>32.63</td><td>38.11</td><td>1.15</td><td>1.25</td><td>0.10</td><td>14%</td><td>8%</td></tr>
<tr><td>2000y</td><td>120m tp5</td><td>0.871</td><td>36.00</td><td>42.47</td><td>1.22</td><td>1.33</td><td>0.12</td><td>15%</td><td>9%</td></tr>
<tr><td>2000y</td><td>10min tp7 (not critical, additional test)</td><td>0.783</td><td>12.13</td><td>18.73</td><td>0.66</td><td>0.84</td><td>0.19</td><td>35%</td><td>22%</td></tr>
</table>
N=0.03 roughness results:
<table>
<tr><th>AEP</th><th>Critical Event</th><th>ARF approx</th><th>Qmax (m3/s) ARFc</th><th>Qmax (m3/s) ARFa</th><th>Depth(m) ARFc</th><th>Depth (m) ARFa</th><th>Diff depth (m)</th><th>pc diff Q_max</th><th>pc diff depth</th></tr>
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<tr><td>100y</td><td>540m tp1</td><td>0.966</td><td>23.23</td><td>24.12</td><td>0.66</td><td>0.67</td><td>0.01</td><td>4%</td><td>2%</td></tr>
<tr><td>1000y</td><td>120m tp5</td><td>0.879</td><td>32.63</td><td>38.11</td><td>0.80</td><td>0.88</td><td>0.07</td><td>14%</td><td>8%</td></tr>
<tr><td>2000y</td><td>120m tp5</td><td>0.871</td><td>36.00</td><td>42.47</td><td>0.85</td><td>0.93</td><td>0.08</td><td>15%</td><td>9%</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>Allowance for Climate Change incorporated as per brief</td><td>Appropriate</td><td></td><td>Commentary. No action</td><td>Closed</td></tr>
<tr><td>Extreme event modelling methodology is in line with ARR19</td><td>Appropriate</td><td></td><td>Commentary. No action</td><td>Closed</td></tr>
<tr><td colspan="5">Losses and coefficients</td></tr>
<tr><td>Loss method and values is appropriate</td><td>Appropriate</td><td></td><td>Commentary. No action</td><td>Closed</td></tr>
<tr><td colspan="5">Simulation</td></tr>
<tr><td>Run time step and duration are appropriate</td><td>Appropriate</td><td></td><td>Commentary. No action</td><td>Closed</td></tr>
<tr><td colspan="5">Hydraulic Equivalence Performance</td></tr>
</table>

Check Item	Reviewer Comments (Arup)	Designer Response (CMB)	Rank	Reviewer Closeout
Model Performance	N/A Critical event is determined in TUFLOW. WBNM model is not HEH trained.		Commentary. No action	Closed

3 TUFLOW Hydraulic Modelling checklist

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
General setup				
Any changes to model version since calibration review?	N/A. Model is uncalibrated.	Per above; uncalibrated model, but utilising roughness parameters adopted from 'regional calibration' process i.e. in line with other basins within the local government area for which calibration and validation completed.	Commentary. No action	Closed
Model simulation run to completion?	Yes.		Commentary. No action	Closed
Are event (~e~) and or scenario (~s~) logic commands used? If yes, are the options listed in the handover document?	Two tcf files (identical settings) were used to model existing and future conditions. It is recommended to use a single TCF file for consistency and to avoid errors. 2/12/24: Response noted. Comment closed.	Recommendation accepted for final model; model will be updated.	Medium	Closed
Terrain Representation (2D Domain)				
Is the cell (grid) size appropriate for the intended purpose of the modelling?	Appropriate.		Commentary. No action	Closed
Is the cell size smaller than water depth in main channel/flow path of the subject study? If yes, Wu sub-grid turbulence scheme (i.e. 2020 TUFLOW HPC or newer) must be used.	Wu sub-grid turbulence scheme used. Appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
Is the model grid orientation appropriate?	Appropriate.		Commentary. No action	Closed
Is sub-grid sampling (SGS) used as the topography sampling method	N/A. SGS not used.		Commentary. No action	Closed
Are topography modifiers appropriately applied?	Topography modifiers applied for watercourses, roads and as stability patches for steep areas/waterfalls. Generally appropriate. "2d_zsh_ridges_05" used to enforce road ridge appear to raise model cells within the creek at the Kilcoy Lane bridge crossing. Since this is a low-level crossing, the bumps are unlikely to affect results. 2/12/24: Response noted. Comment closed.	The terrain difference due to "ridges_05" has a magnitude of approx. 100mm. The 20% AEP existing water depth at this location is approx. 4m. As such, the road reinforcement is unlikely to affect results. Noting also Kilcoy Lane is in Sunshine Coast Council region, far enough downstream of area of interest to not impact model results in City Moreton Bay region. Next model update to improve representation of Kilcoy Lane crossing.	Low	Closed
Other Issues/Comments	Model code outside of domain extent. Whilst it does not affect results, recommend extending it in future stages (being a simple change) as a good practice. 2/12/24: Response noted.	Will be updated in next model update.	Commentary. No action	Closed
Roughness				
Are the manning's values appropriate?	Appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
Is / are the Materials Layer(s) delineation reasonable relative to the model cell size?	Appropriate. Various stability patches applied at steep areas. The most upstream watercourse (within MAR019_01269) is ideally defined as natural vegetation rather than crop land; Roads are also noted to be represented well in regard to the grid resolution. However, this change would have no material effect on the overall results.	Review of watercourse roughness value to be undertaken in next model update.	Commentary. No action	Closed
If multiple material input layers are used, is data layering of the Materials Layer(s) correct (i.e. The order of the files with the TUFLOW Geometry Control File)? Note, bottom most layer takes precedence where datasets overlap.	Appropriate		Commentary. No action	Closed
1d Hydraulic Structures				
Are the pipe/channel alignments correct?	Appropriate. Several road crossings (with hydraulic structures, sizes unknown) within private property were carved out using 2d_zsh.	If more detailed information at road crossings desired by Council in future, survey of structures to be undertaken to allow for more appropriate representation within the model in the next model update.	Commentary. No action	Closed
Are pipes connected throughout system (any snapping issues)?	Appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
Is network free of grade or cover issues?	Appropriate. Of note, 01_03422 appear to have obvert above ground – however this crossing is not within modelled flow path.	This culvert crossing has a zshp to adjust the upstream/downstream levels of the terrain; however, the downstream 1D/2D connection falls on the road raising zshp and not within the culverrt crossing zshp. Notwithstanding, the invert levels and the pipe dimensions do indicate the culvert is above ground level at this location. This culvert is located in Sunshine Coast Council's local government area and not a key area of interest for Moreton Bay Council. Structure representation to be edited in next model update.	Commentary. No action	Closed
Do drainage network asset sizes logical (i.e. increase as move down system)?	Appropriate.		Commentary. No action	Closed
Are pipe lengths defined properly?	Appropriate.		Commentary. No action	Closed
Are pipe manning's n appropriate? Is the manhole loss approach appropriate?	Appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
Is the pipe geometry orientation appropriate for Engelund losses?	N/A		Commentary. No action	Closed
Are additional form loss pipe losses set correctly where required?	N/A		Commentary. No action	Closed
Are contraction coefficients appropriate?	Appropriate.		Commentary. No action	Closed
Is pit modelling approach appropriate?	N/A		Commentary. No action	Closed
Are pit loses set appropriately?	N/A		Commentary. No action	Closed
Is the model 1D network free from Additional Nodal Area (ANA) values, of if these have been used are the values appropriate?	N/A		Commentary. No action	Closed
Are entry/exit losses set or are they automatically defined for pipes that have SX outlets?	Appropriate.		Commentary. No action	Closed
2d Hydraulic Structures				

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
Are there any culverts represented as 2D bridges? 2D bridges should not be used for Culvert representation unless the culvert size is greater than the cell size.	No. All culverts are generally smaller than cell size and modelled in 1D.		Commentary. No action	Closed
Is the approach used to define the additional hydraulic losses associated with bridges appropriate? What bridge form loss calculation method has been used (Method A (cumulative), Method B(Portion), Method C, Method D). Note, Method C and D are only available from release version 2020-10-AA or newer.	Of note, bridge represented as thin line which is not consistent with BMT's recommendation for L2. However, is deemed acceptable given the limited significance of this crossing.	Noting any error in modelling approach for this bridge does not cause issues within City Moreton Bay LGA as bridge is in Sunshine Coast LGA.	Commentary. No action	Closed
Provide spreadsheets outlining how form loss values are derived with reference to publications including page, chapter, section table etc.	Not required. Single span low level crossing. Several structures appear missing (i.e. Aherns Road) defined however appear to be low level crossing. 2/12/24: Response noted. Comment closed.	Due to the magnitude discharge at Ahern's Rd, the road overflows for approx. 300m of road section for all tested events. Therefore, the missing flow constriction is not expected to cause significant changes in flood behaviour. Noting also; Ahems Road is within Sunshine Coast Council region, sufficiently downstream that structure	Low	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
		representation will not affect results within Moreton Bay region. Inclusion of missing structures will be considered in next model update, depending on Council interest in detailed results at these locations.		
Other hydraulic structures	N/A		Commentary. No action	Closed
Boundary Conditions				
Are tailwater level(s) or slope parameters associated with HQ downstream boundaries correct? Note, the 2020-10-AA version of HPC and newer uses a consistent approach with Classic for HQ boundaries.	Two (2) HQ boundaries defined with different slope. Current delineation not ideal but results appear unaffected. Recommend refining model extent and outlet boundary in future.	Agreed - boundary review to occur during next model update.	Commentary. No action	Closed
Are the model upstream and downstream boundaries a sufficient distance away from the study area?	Appropriate.		Commentary. No action	Closed
Are model inflows correct?	Local inflows with total upstream area corresponding to relevant ARF output from Storm Injector were applied directly in TUFLOW.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
	Approach is appropriate, and most suited for the POI located mid-catchment.			
Is the flow distribution acceptable?	No issues found.		Commentary. No action	Closed
Are the 1D-2D linkages defined correctly?	No issues found.		Commentary. No action	Closed
Are there terrain adjustments at 1D-2D linkages? If yes, are they appropriate?	Appropriate.		Commentary. No action	Closed
Are IWL conditions applied correctly?	IWL defined at two farm dams located in the most upstream watercourse in MAR019_01269 appeared to be set slightly above the crest. Overall, this will not have material impact to the study.	More northern dam the IWL was set at 516.7mAHD; more detailed inspection of terrain indicates the control level is 516.5mAHD. Southern dam IWL set as 534.1, inspection of LiDAR indicates 533.9mAHD is the control value. UVPT check file indicates control value is 533.88mAHD. To be updated in next model update, noting this would have provided conservative results.	Commentary. No action	Closed
TUFLOW Run Files				
Is the 2D dtStar value reported in the *<<simulation>>.hpc.dt.csv*	Spot check conducted. Generally acceptable. Small timesteps occur at steep areas (topo/roughness stability patches already applied).		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
file greater than recommended minimum relative to the grid cell size for TUFLOW HPC simulations based on the dominant control number (courant, celerity or diffusion number)?				
Are TUFLOW default parameters used? If non-default values are used, list them and justify their use?	No issues found.		Commentary. No action	Closed
Log File				
If HPC, are there no repeat timestep, if there are, are they acceptable?	No issues found.		Commentary. No action	Closed
Are there no Negative Depth Warnings, if there are, are they acceptable?	No issues found. A small number of runs displayed a warning message for unstable timestep correction. This message occurred only once and not for the selected critical event:		Commentary. No action	Closed
Messages Layer				
Are there no ERRORs in the messages layer?	None identified.		Commentary. No action	Closed
CHECK 2118 and WARNING 2118: Are ZC values lowered by a reasonable amount and do	Appropriate.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
the lowered cells match the neighbouring terrain?				
WARNING 1100: Are the invert mismatches acceptable?	None identified		Commentary. No action	Closed
CHECK 1401 and CHECK 1402: Are these failures in automatic manholes creation ok?	None identified.		Commentary. No action	Closed
CHECK 1111: Are these overwrites mistakes or by design?	None identified.		Commentary. No action	Closed
Are the other Checks and Warnings in the messages layer acceptable?	This is coded in tcf file "SX ZC Check == OFF". Suggest removing it. 2/12/24: Response noted. Comment closed.	Recommendation accepted for final model; model will be updated.	Low	Closed
Results				
Is *Map Output Data Types == dt* specified for review of the location that defines the minimum timestep for the simulation?	No issues identified.		Commentary. No action	Closed
Are there any topographic or boundary condition input definition errors which correlate to the location of minimum timestep?	No issues identified.		Commentary. No action	Closed
Check results stability at Culvert SX inlet/outlet; where instability existing	No issues identified.		Commentary. No action	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
consider using SX polygon with A Factor set to 5.				
Are there PO lines at all key locations?	Generally appropriate.		Commentary. No action	Closed
Are pipes flowing full where expected (refer to _CCA.mif)?	No issues identified.		Commentary. No action	Closed
Are maximum water surface levels (h) realistic?	No issues identified.		Commentary. No action	Closed
Are maximum velocities (v) realistic?	No issues identified.		Commentary. No action	Closed
Are flows in pipes and channels realistic?	No issues identified.		Commentary. No action	Closed
Is the model extent sufficient, such that the area of inundation does not abut against the model extent code boundary for the largest modelled flood event?	No issues identified.		Commentary. No action	Closed
Do flood extents for the range of modelled event magnitude follow a logical order of progression (1% > 2% > 5% AEP etc.)	No issues identified.		Commentary. No action	Closed
Critical Duration Distribution is realistic?	A review of the supplied processed grid was conducted. It was found that a single duration tends to dominate each AEP. Consequently, the final selection of critical events between 20% and 1% AEP consists of multiple TPs of the	Noting; the selection of critical events affects only the Future scenario model results, as the Existing scenario ran all	Low	Closed

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
	same duration. Ideally, a spread of duration would be preferred. A cursory check of the individual 1% AEP flood level grids indicates that the differences between durations and TPs are not significant (~0.1 m). Moving forward to checking the processed grids for the future conditions runs, it was found that a single TP tend to dominate. Please consider whether the selection of 3 to 4 events can be further narrowed down. Of note, long duration storms were reflected as critical along the upstream watercourses on the east for the 2% and 1% AEP. This may be an anomaly, and since the individual flood level differences are minimal, this anomaly can be disregarded. 2/12/24: Response noted. Comment closed.	storms in order to create the enveloped surface. It would be possible to narrow-down the selection of critical storms for the future run. However, due to the small size of the model, it is not considered burdensome to run one or two extra storm for Future scenario events. In existing scenario, in 1%AEP predominately 120minute is critical, but as noted one creek in the eastern areas had 540min identified as critical. The difference between the median 120min surface and the overall critical surface is approximately 30mm in the area where 540min is noted as critical (generally 20-50mm. As such, the 540minute storm was not selected for use for the future conditions runs (also noting the creek for which 540min was critical is within Sunshine Coast Council region). Three temporal patterns were run for 120min for the future 1% AEP scenario, and two temporal patterns dominate the final grid. It is not considered necessary to remove the third temporal pattern run.		

Check Item	Reviewer Comments	Designer Response	Rank	Reviewer Closeout
		For 2% AEP, predominately the 120min storm was critical, with some 90min areas, and 540min in an eastern creek. The peak water level difference between 540min and 120min is approximately 20mm. As such took forth only 120min storms for the Future scenario. It is noted multiple temporal patterns do show as critical on the final surface for the Future scenario. For the 5% AEP, the 180min storm was critical everywhere. Four temporal patterns were selected for simulation in Future scenario, with the future peak water level grid demonstrating three patterns as critical(though one does dominate). Overall, as HEH is not used in MAR, it was not considered necessary to gain a spread of durations for the Future scenario run, but to be guided by the critical source grid from the Existing scenario.		
Other Issues/Comments	It is noted that existing conditions were ran on tcf v19, while future conditions were run on tcf v20, and general setup within both tcf appear identical. Please comment why does the flood extents for F00 0.05% AEP run differ from all other run at sub-area MAR023_01820?	This artefact also occurs in the current adopted flood database for 1 in 5000 AEP. Reviewing the timeseries outputs, it appears possible that some small	Low	Closed

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	2/12/24: Response noted. Comment closed.	instability causes cells to become wet upstream of the original inflow location, which then causes the SA polygon to distribute the inflow hydrograph over these newly-wetted cells. A sensitivity test was run whereby the inflow SA polygon was trimmed to the most downstream part of the subcatchment. This resulted in an increase in peak water levels for the downstream area of approximately 20-50mm, and in the immediate downstream area of 50-100mm. A limited reliability note will not be added to this location as the model is reliable in events other than the 1 in 2000 AEP event. The instability will either be resolved in the next model update or the trimmed SA inflow polygon utilised.		
Structure Blockage				
Structure Blockage Calculation and Application	Blocked scenario is not modelled due to the limited significance of hydraulic structures in the study area (all low-level crossings). Therefore, blockage scenario is deemed unnecessary.		Commentary. No action	Closed