Regional Floodplain Database:

2014 Model Maintenance Report - Pumicestone Passage (PUM)

Moreton Bay Regional Council

Moreton Bay Regional Council
PO Box 159
CABOOLTURE QLD 4510
Email: mbrc@moretonbay.qld.gov.au
Phone: (07) 3205 0555

Moreton Bay Regional Council

Regional Floodplain Database 2014 Model Maintenance Report Pumicestone Passage (PUM)

June 2015

Document Status

Version	Doc type	Reviewed by	Approved by	Date issued
V01	Final Report	Alister Daly	Alister Daly	25/06/2015
V02	Final Report	Alister Daly	Alister Daly	30/06/2015
V03	Final Report	Alister Daly	Alister Daly	03/07/2015

PROJECT DETAILS

Project Name	MBRC Flood Updates 2014 - PUM
Client	Moreton Bay Regional Council
Client Project Manager	Hester Van Zijl
Water Technology Project Manager	Alister Daly
Report Authors	Ryan Dermek
Job Number	J3498
Report Number	R01
Document Name	J3498-01_PUM_R01V02.docx

Cover Photo: Google Satellite Image of Pumicestone Passage Minor Basin Area

93 Boundary Street
West End QLD 4101
Telephone (07) 3105 1460
Fax (07) 3846 5144

ABN No. 60 093 377 283
ACN No. 093 377 283

Quality ISO 9001 SAI GLOBAL
Environment ISO 14001 SAI GLOBAL
Health & Safety AS 4801 SAI GLOBAL

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AEP	Annual Exceedence Probability
ARI	Average Recurrence Interval
EY	Exceedances per Year
BoM	Bureau of Meteorology
DNRM	Department of Natural Resources and Mines
DTM	Digital Terrain Model
GIS	Geographic Information System
IFD	Intensity–Frequency–Duration
LIDAR	Laser Detection and Ranging
MBRC	Moreton Bay Regional Council
MDS	MBRC Design Storm (MDS) event (1% AEP embedded storm event)
MHWS	Mean High Water Springs
RFD	Regional Floodplain Database
PUM	Pumicestone Passage

“This page left intentionally blank”

1. Introduction

Moreton Bay Regional Council (MBRC) Regional Floodplain Database (RFD) is a hydrologic and hydraulic model library that interacts with spatial databases to deliver detailed flood information throughout the MBRC area. The model library includes a total of fourteen (14) coupled hydrologic and hydraulic models that cover the greater area of the MBRC.

The RFD project and associated flood model library was originally developed and prepared between 2009 and 2012. The PUM models have not been updated since this time. This current project is the RFD 2014 Maintenance Project and represents the first maintenance of the PUM RFD model libraries undertaken since the models were originally developed.

Water Technology Pty Ltd (WT) was commissioned by MBRC to prepare the necessary RFD Maintenance tasks and upgrades to the Pumicestone Passage (PUM) minor basin areas. The report details the methodology and outcomes from the updates to both the WBNM and TUFLOW models and has been prepared in accordance with MBRC's reporting template.

2. 2014 MODEL MAINTENANCE DETAILS

2.1 RFD Maintenance Tasks

The RFD maintenance tasks associated with this project included model updates to both the WBNM and TUFLOW models. The various technical work elements for the models were specifically outlined as a series of model update tasks detailed in Council's technical project brief.

2.2 WBNM Model Updates

RFD maintenance tasks associated with WBNM model updates are summarised as follows: -

1. WBNM model files were consolidated in accordance with Council's updated naming conventions and folder structure guidelines;
2. The PUM model minor catchment boundaries were updated based on the new 2014 LiDAR data which was collected and provided by Council for this project. Minor catchment boundaries were revised and provided to Council for approval;
3. The rainfall loss rates in the WBNM model were revised to include a 15mm initial loss and 2.5mm/hr continuing loss for the 1 Exceedance Per Year (EY), 0.5EY, 20%, 10% and 5% Annual Exceedance Probability (AEP) events. Rainfall loss rates for all other design events were kept the same as that prepared in the original models;
4. Updated WBNM models were analysed for the 1EY, 0.5EY, 20%, 10%, 5%, 2%, 1%, 0.5%, 0.2%, 0.1%, 0.05%, 0.02% and 0.01% AEP events, in addition with the PMF event. In each case, the WBNM models were analysed for the full range of storm durations;
5. The WBNM model was run based on the MBRC Design Storm (MDS) event (being a 1% AEP event with a 15 minute in 270 minute embedded design storm event); and
6. The results of the updated WBNM model were then compared with previous modelling results and checked, with iterative adjustments made to the model where required.

For Item 4 of the WBNM model updates (see above), a total of 10 storm durations were identified by WT for each of the 1% AEP and 0.1% AEP design flood events based on the peak flows determined from the WBNM models. These storm durations were then presented to Council for prior approval for inclusion on the critical duration assessment required in Task D1 of the project brief. Further details on the critical duration assessment are provided in Section 3.2.1. Some of the nominated storm events for the PUM model were not available in the previous model library dataset and had not been assessed using the WBNM model developed for the original RFD Project. Accordingly, additional WBNM storm events were prepared and provided by Council for the purposes of the critical duration assessments under this project.

2.3 TUFLOW Model Updates

The RFD maintenance tasks associated with the TUFLOW model updates are summarised as follows: -

1. TUFLOW model files were consolidated in accordance with Council's updated naming conventions and folder structure guidelines.
2. The existing model was changed so that it could be run using the latest TUFLOW executable (i.e. TUFLOW Build 2013-12-AD).
3. The previous TUFLOW model was updated to include the new 2014 LiDAR data (which was collected and provided by Council for this project). In locations where 2014 LiDAR was not available 2009 LiDAR was used.
4. Breakline ZLG lines were prepared manually along the waterway centrelines to better represent the streamlines and to otherwise remove erroneous high points caused by dense vegetation. The breaklines were prepared based on careful selection of point elevations along each of the major waterways. The extent of the breakline ZLG line prepared for the PUM model is illustrated in Figure 1.
5. New or updated hydraulic structures were included in the TUFLOW model based on the structure data provided by Council. This data included GIS datasets, detailed survey as well as hardcopy structure plans, all of which were sourced and supplied by Council. For the PUM model, new and updated structures included those as summarised in Table 1. These culverts are also highlighted in Figure 1.

Table 1 - Updated structures applicable to PUM catchment

Minor Basin	Stream ID	Waterway ID	Road Name	Suburb	Comment	Structure Type
PUM	NIN_05	NA	Freeman Rd	Toorbul	New from plan	Culvert
PUM	SMC_12	SMC_12_00384	Twin View Rd	Wamuran	New from plan & GIS	Culvert

A review of the PUM model layered flow constriction data for bridge structures identified that a FLC = 0 had been applied to all bridge structures. A zero FLC value effectively ignores any energy losses associated with the bridge deck. The recommended value in TUFLOW is specified as FLC=1.56 (WBM BMT, 2010). The FLC value applied in the PUM model was raised for discussion with Council during the course of this project. Council subsequently advised that they will not be making any changes to the layer flow constriction modelling approach and parameters as part of the RFD 2014 maintenance project. Accordingly, WT have adopted the same FLC=0 in the current model updates.

6. The TUFLOW model has included adjustments to the method of modelling trunk drainage to direct inflows to pits as per Council's technical instructions. This includes the default TUFLOW manhole loss approach option of "ENGELHUND". WT identified with Council that this method does not necessarily allow for all pit losses to be attributed to pipe connections and may underestimate losses in the trunk drainage given that only specific trunk drainage is being

included in the model. Council has since advised that the default option is to be used to be consistent with previous models and methodologies applied.

7. PO lines including locations and naming conventions have been reviewed and revised accordingly to match with the project conventions set by Council. This included adding significantly more PO lines in the model to aid Council in the extraction of hydraulic model results at various locations throughout the PUM model domain.
8. A review of the model investigation areas identified by council (Figure 1) was undertaken using the updated TUFLOW model. These areas were reviewed in terms of model structure and improvements added as appropriate to provide a more representative assessment of localised flooding in the area. A detailed description of the issues identified for each of the investigation areas along with the changes made to the model are presented in Table 2 and are shown in Figure 1.
9. Spatial definition of hydraulic roughness was reviewed in areas of significant flow conveyance and updated to reflect and be consistent with the changed landuse as provided by Council. Key areas where modified land use resulted in model roughness changes is displayed in Figure 1.
10. The method for modelling large buildings and large clusters of smaller buildings in the floodplain was considered and adjusted where necessary. In accordance with Council's instructions provided during the project, modelling of buildings within the floodplain was undertaken using either an urban block layer (where the majority of flow passed through an area of urban landuse) in addition with modelling specific building footprints themselves.
11. Revised flows from the updated WBNM model maintenance tasks were incorporated in the updated TUFLOW models. Initial test runs of the TUFLOW model were undertaken for the 5% and 1% AEP events based on a 2 hour single storm duration for the PUM model and using the 5m grid model. Initial results from the TUFLOW model were reviewed and adjustments made as necessary.

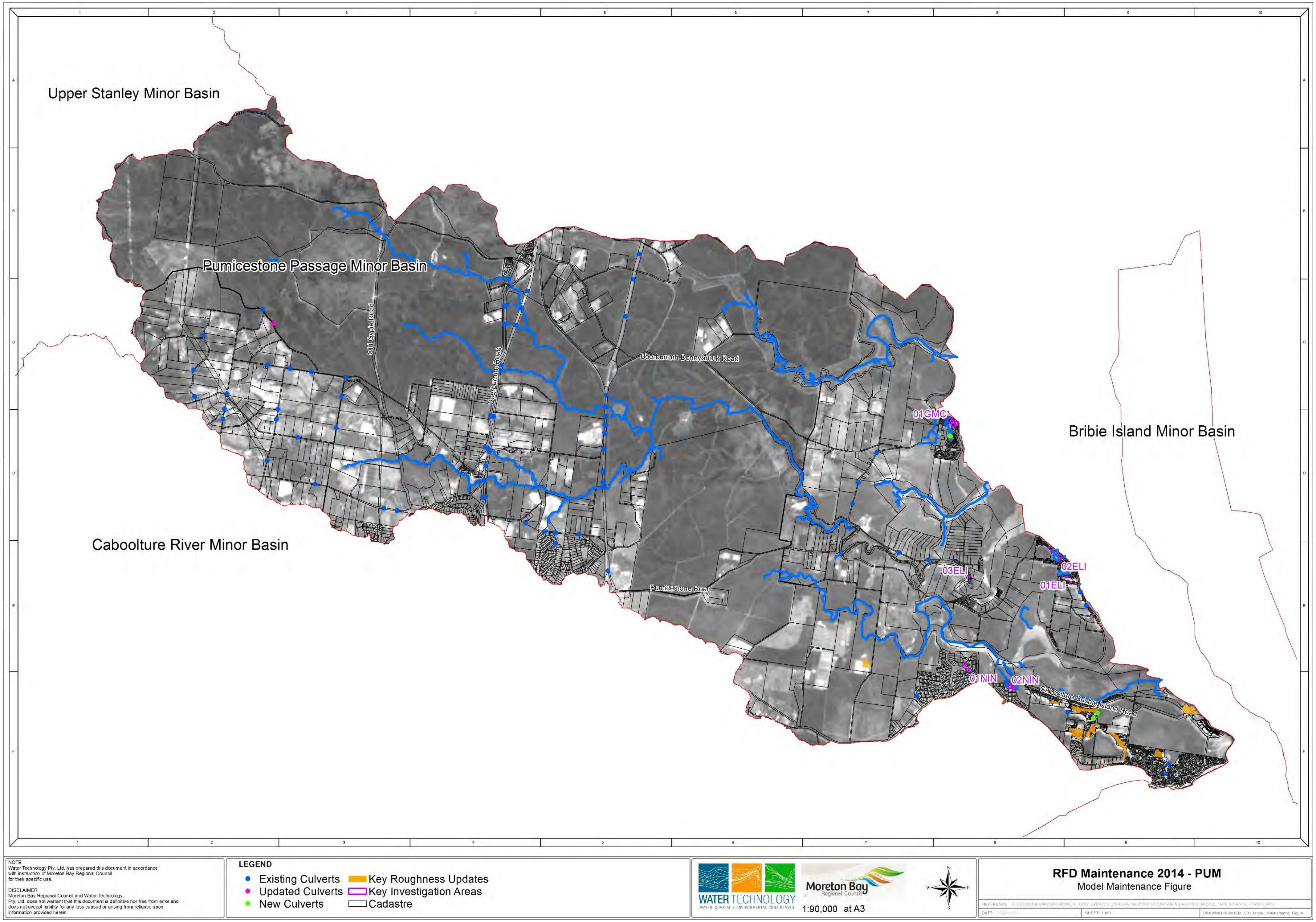

Figure 1 – PUM Model Maintenance

Table 2 – Investigation Area Summary for PUM Model

Minor Basin	Study Area ID	Major Catchment	No. of Properties Impacted	Study Area Name
PUM	01ELI	ELI	4	Willmer Road - Toorbul
• Local boundary condition modified so as not being applied directly to properties				
Comments	Flooding reduced at property			
PUM	02ELI	ELI	1	Duke Street - Meldale
• Initial water level modified so properties are not wet at start of model • Local boundaries modified to not directly on properties • Inclusion of underground pipe assists				
Comments	Flooding reduced at properties			
PUM	03ELI	ELI	17	Esplanade - Toorbul
• Assessment of model conditions showed model conditions were appropriate, and no justifiable changes could be made				
Comments	No Change			
PUM	01NIN	NIN	3	Relesah Drive - Ningi
• Inclusion of pipes upstream of Relesah Drive provides better connectivity to local open drain • Local boundary condition application changed from a traditional SA to a SA PITS to improve distribution of flow				
Comments	Improved model performance in this area			
PUM	02NIN	NIN	4	Sunny Court - Ningi
• Local boundary conditions modified • Obvert of culvert was higher than road level. The invert was lowered so obvert was under Bribie Island Road. • Gully line extended downstream of Bribie Island Road to improve conveyance.				
Comments	Improved model performance in this area			
PUM	01GMC	GMC	26	Amy Street - Donnybrook
• Amy St culverts updated • Z gully line extended to Alice St and Edith St • Culvert added under Alice St • Local boundary conditions modified to better represent flows				
Comments	Improved model performance in this area			

3. MODEL SIMULATIONS

3.1 Verification

Verification against recorded rainfall and flood marks was not undertaken for the PUM model because of limited historical event data.

3.2 Design Flood Events

3.2.1 River & Creek Critical Duration Assessment

The 10 selected storm duration events approved by Council as discussed previously in Section 2.2 have been used to undertake a critical duration assessment for the updated TUFLOW models. Table 3 summarises the 10 storm durations selected by Council for the PUM model.

To determine the critical storm durations, the TUFLOW models have been analysed using a 10m grid to model the 10 separate storm durations for each of the 1% and 0.1% AEP design events. From this, the critical duration storms were able to be determined throughout the PUM model domain. A critical storm duration map for the 1% and 0.1% AEP events was prepared and submitted to Council for the selection of the 3 critical storm durations for each event, and are shown in Figure 2 and Figure 3.

Although there are a number of critical durations represented throughout the PUM model domain, council selected three critical design event storms, as shown in Table 3.

To determine the critical storm durations, the difference between mapped peak flood level for the selected storm durations and mapped peak flood level for the all storm durations was considered. These differences are displayed in Figure 4 and Figure 5, and show that the selected critical durations represent the maximum peak flood level throughout most of the model domain.

Table 3 – Critical Duration Assessment

Design Event	Tested Storm Durations (min)	Selected Durations (min)	Adopted Events
1% AEP	30, 60, 90, 120, 180, 270, 360, 540, 720 and 1440	180, 540 and 720	1EY, 0.5EY, 20%, 10%, 5%, 2%, 1% AEP
0.1% AEP	30, 45, 60, 90, 120, 180, 240, 300, 360 and 720	120, 180 and 360	0.5%, 0.2%, 0.1%, 0.05%, 0.02%, 0.01% AEP and PMF

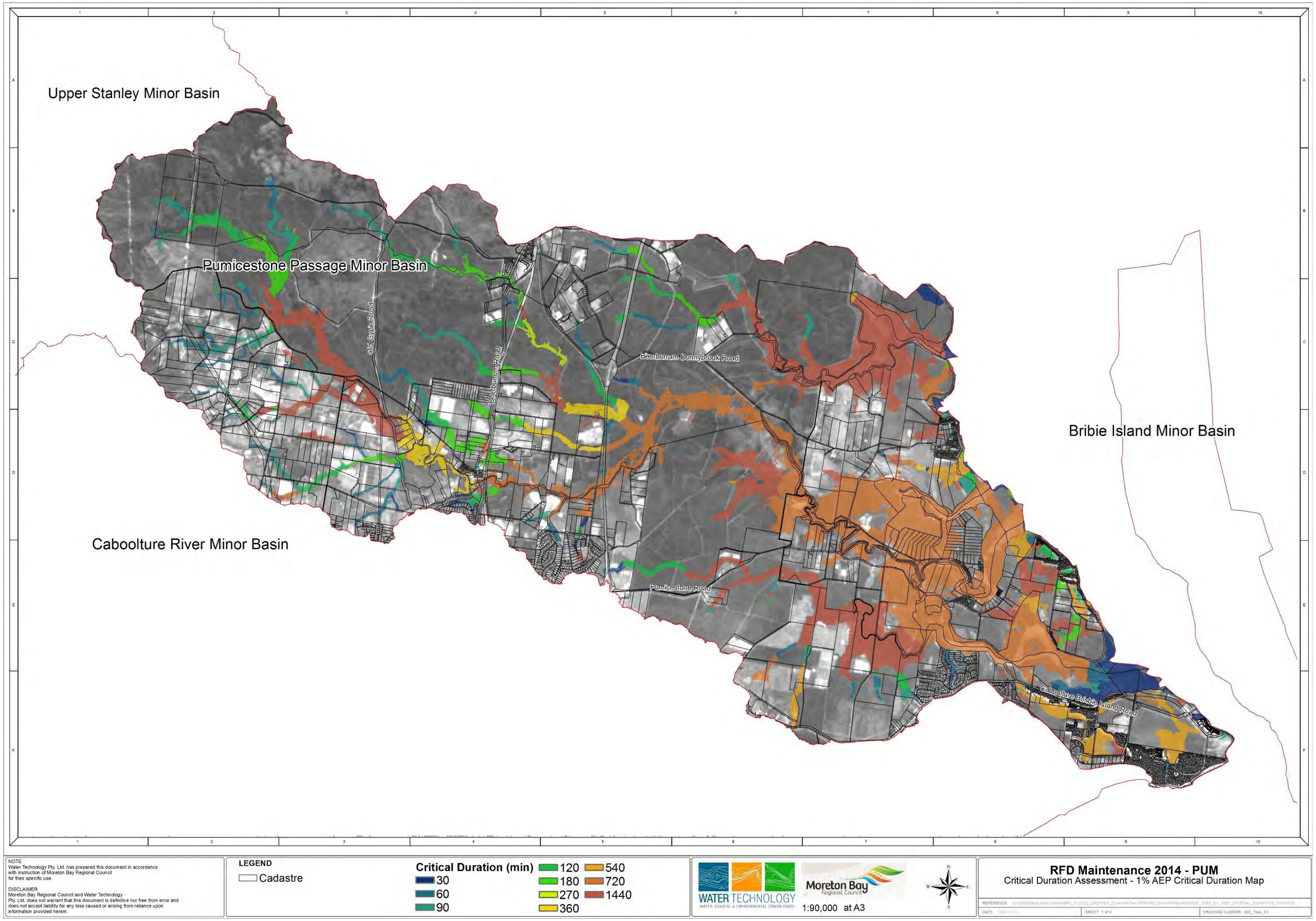

Figure 2 – PUM 1% AEP Event Critical Duration Assessment

"This page left intentionally blank"

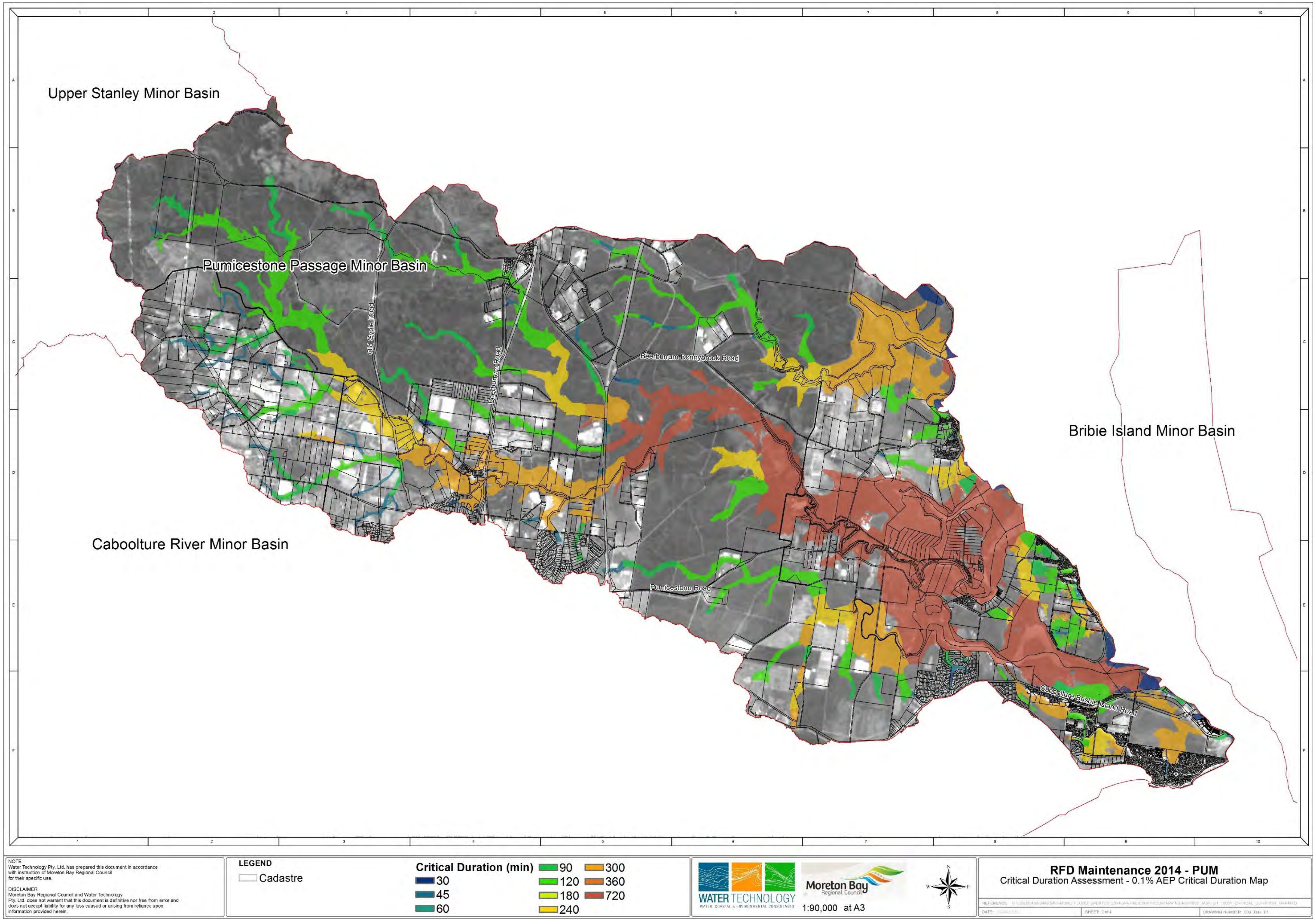

Figure 3 – PUM 0.1% AEP Event Critical Duration Assessment

"This page left intentionally blank"

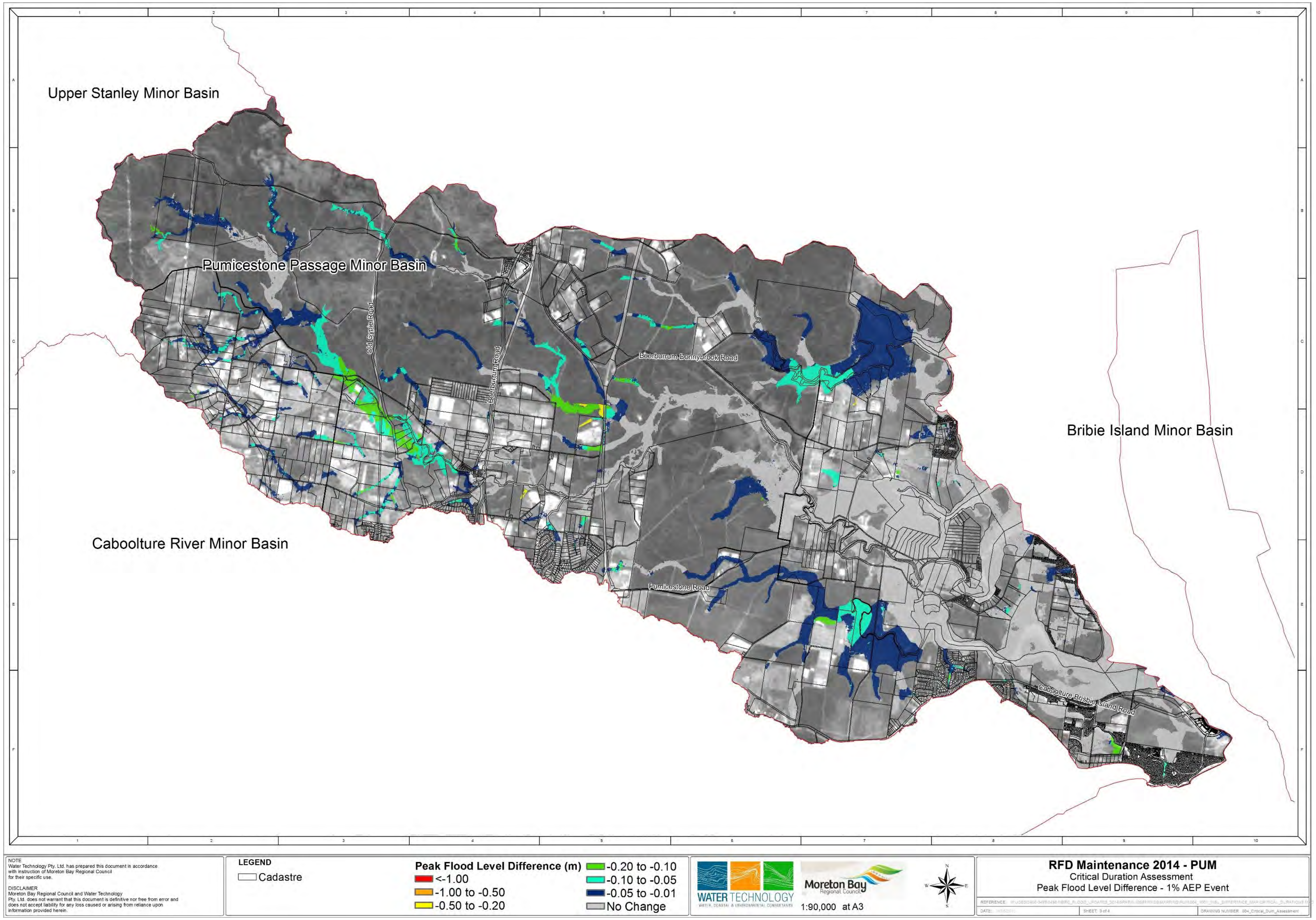

Figure 4 – Change in 1% AEP Peak Water Surface Levels

"This page left intentionally blank"

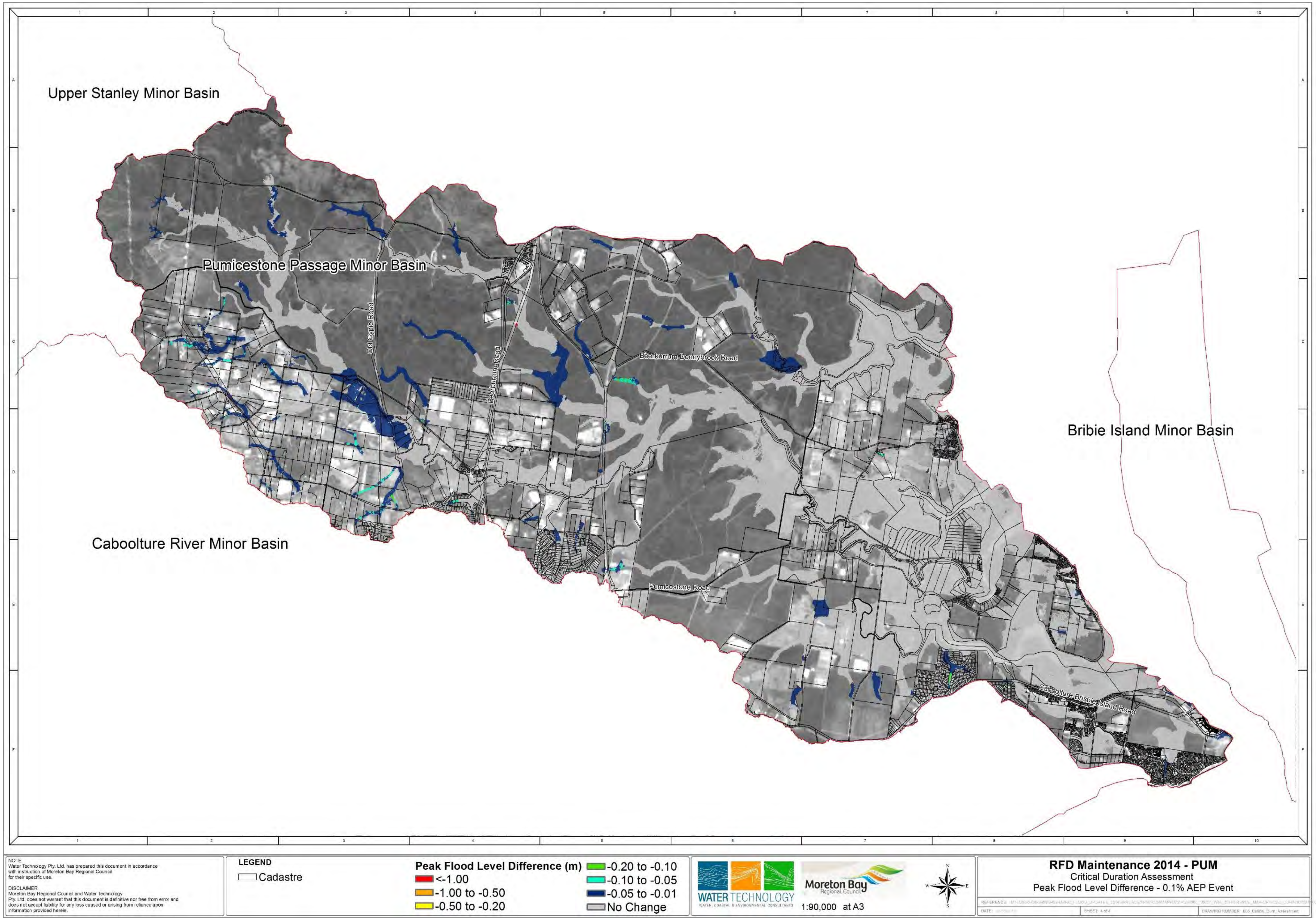

Figure 5 – Change in 0.1% AEP Peak Water Surface Levels

3.2.2 River & Creek Design Event Simulations

The updated PUM TUFLOW models were analysed for the 1EY, 0.5EY, 20%, 10%, 5%, 2%, 0.5%, 0.2%, 0.05%, 0.02%, 0.01% AEP events, in addition to the PMF event. The model simulations have been undertaken based on the following storm durations: -

- 180, 540 and 720 minute storms for the 1EY to 1% AEP events; and
- 120, 180 and 360 minute storms for the 0.5% AEP event through to the PMF event.

A 5m grid model has been used for design event simulations of the 1% AEP and smaller plus the 0.1% event, whilst events larger than a 1% AEP use a 10m grid model.

In addition to the above design simulations, the updated TUFLOW model has also been used to run the MBRC Design Storm (MDS) event (i.e. a 1% AEP event with a 15 minute in 270 minute 'Embedded Design Storm'). The analysis of the 1% AEP MDS event has also been undertaken based on a 5m grid model.

All results relating to the design event simulations have been provided to Council in a digital format and include post processed result files for all events analysed. There was no requirement to provide any GIS mapping for any of the design event simulations as part of the project technical specification.

3.2.3 Storm Tide Design Event Simulations

To simulate storm tide events, no rainfall was applied and a dynamic storm tide boundary for five events (see Table 4) was applied. The dynamic storm tide boundaries were generated using the Storm Tide Hydrograph Calculator developed by Cardno Lawson Treloar in 2010 as part of the Storm Tide Hazard Study. The following fourteen storm tide reference points were used: MBC – 062, MBC – 063, MBC – 064, MBC – 065, MBC – 070, MBC – 071, MBC – 072, MBC – 073, MBC – 074, MBC – 075, MBC – 076, MBC – 082, MBC – 083, MBC – 084.

Table 4 – Summary of Storm Tide events

ID	Description
PUM_S_002c_E_00020Y	No Rainfall, dynamic Storm Tide (5% AEP current)
PUM_S_002c_E_00100Y	No Rainfall, dynamic Storm Tide (1% AEP current)
PUM_S_002c_E_01000Y	No Rainfall, dynamic Storm Tide (0.1% AEP current)
PUM_S_002c_E_10000Y	No Rainfall, dynamic Storm Tide (0.01% AEP current)
PUM_S_002c_F_00100Y	No Rainfall, dynamic Storm Tide (1% AEP future (0.8m sea level rise and increased cyclonic activity))

3.3 Sensitivity Analysis

A range of sensitivity, climate change and future landuse scenario simulations were undertaken using the updated PUM TUFLOW model. The specific scenarios analysed as part of this project are outlined separately below. In all cases, the updated TUFLOW 5m grid model prepared for PUM was applied based on the MDS event. The sensitivity scenarios are detailed in Table 5.

Table 5 – Sensitivity Analysis Summary

ID	Description	Section
R01	Roughness	3.3.1
R02	Blockage	3.3.2
R03	Climate Change - Rainfall	3.3.3
R04	Climate Change – Increased Tailwater Level	3.3.3
R05	Climate Change – Rainfall and Increased Tailwater Level	3.3.3
R06	Storm tide – Current storm tide with current rainfall	3.3.3
R07	Storm tide – future storm tide with future rainfall and sea level rise	3.3.3
R08	Vegetated Floodplain	3.3.4
R09	Future Residential Development	3.3.4
R10	Vegetated Floodplain and Future Residential Development	3.3.4

3.3.1 Hydraulic Roughness Analysis

The following hydraulic roughness sensitivity assessment has been undertaken as part of this study:

- R01 – Increased Manning's "n" roughness by 20%.

All Manning's 'n' values in the model were increased by 20%.

3.3.2 Structure Blockage Scenario

The following structure blockage sensitivity assessment has been undertaken as part of this study:-

- R02 – Inclusion of structure blockage (moderate blockage).

The adopted blockage parameters were outlined in the SKM report (SKM, 2012a). For the moderate blockage case, this includes: -

- Full blockage (100% blockage) for culverts and pipes with a width equal to or less than 2.4 m; and
- Partial blockage (15% blockage) blockage for culverts and pipes with a width greater than 2.4 m.

The moderate blockage case applies to the 1d culvert layers (culverts) and no blockage allowance was made to the 1d network layer (the stormwater drainage network).

3.3.3 Climate Change and Downstream Boundary Conditions

The following climate change sensitivity assessments have been undertaken as part of this study:-

- R03 – Increased rainfall by 20% in WBNM model and re-run of hydraulic model based on revised flows;

- R04 – Increased downstream tailwater boundary. For the PUM model, this includes raising the tailwater boundary to Mean High Water Spring (MHWS) plus 0.8m sea level rise.
- R05 - A combination scenario based on cases R03 and R04.
- R06 – Investigated the impact of a 1% AEP current static storm tide level with concurrent 1% AEP MDS rainfall event.
- R07 – Investigated the impact of an increase in rainfall and an increase in sea level. An increase in rainfall of 20% was applied combined with a 1% AEP static storm tide level (100y GHG) + 0.8m.

The technical methodology relating to methodology for the climate change sensitivity testing is contained within the SKM report (SKM, 2012b).

3.3.4 Future Landuse Analysis

The following future land use change sensitivity assessments have been undertaken as part of this study:-

- R08 – Increased vegetation (i.e. medium dense vegetation types were changed to high dense vegetation and low grass/grazing vegetation types changed to medium dense vegetation);
- R09 – Increased residential development based on an update of the WBNM fraction imperviousness provided by Council; and
- R10 - A combination scenario based on cases R08 and R09.

Future fraction imperviousness for hydrologic modelling was provided by council based on future land use planning.

4. Model Results and Outcomes

4.1 2014 Model Maintenance

The results of the initial runs were provided to Council for review and approval. Results from the initial TUFLOW model runs including comparisons to previous model results are shown in Figure 6 and Figure 7 for the 1% and 5% AEP events respectively. The storm durations used in creating a combined envelope for the two models and events are shown in Figure 6 and Figure 7.

Table 6 – Storm duration comparison for 5% and 1% AEP events

Event	Storm Durations for 2012 Model	Storm Durations for 2014 Maintenance Model
5% AEP	180, 360 and 720m	180, 540 and 720m
1% AEP	180, 360 and 720m	180, 540 and 720m

General reductions in the extent of flooding and flood levels were achieved when compared with the 2012 RFD model, especially in the 5% event. Negative values in the figures mean that the 2014 PUM maintenance model results are lower than the 2012 PUM model results and vice versa.

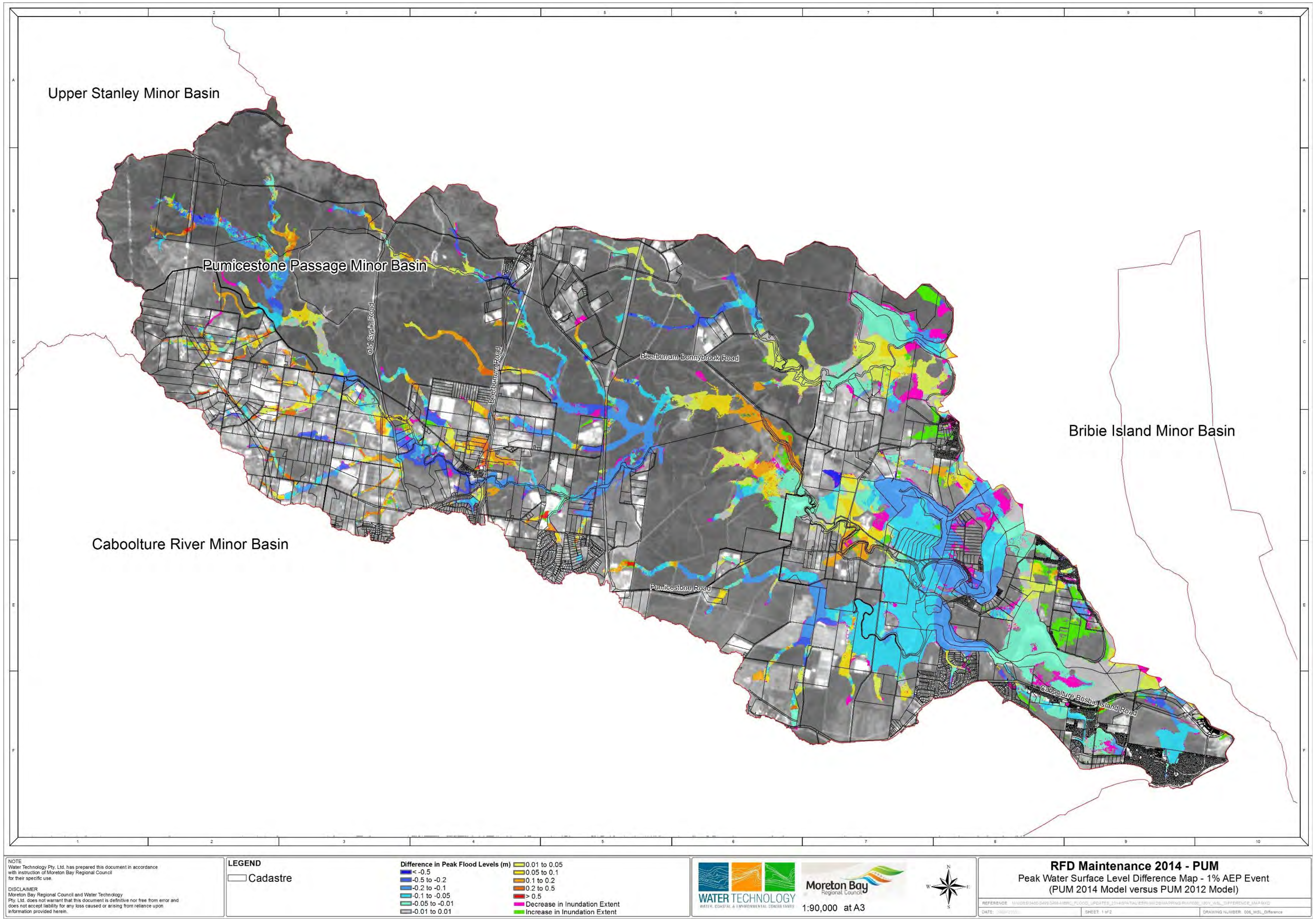

Figure 6 – PUM 1% AEP Event Water Surface Level Difference Map

“This page left intentionally blank”

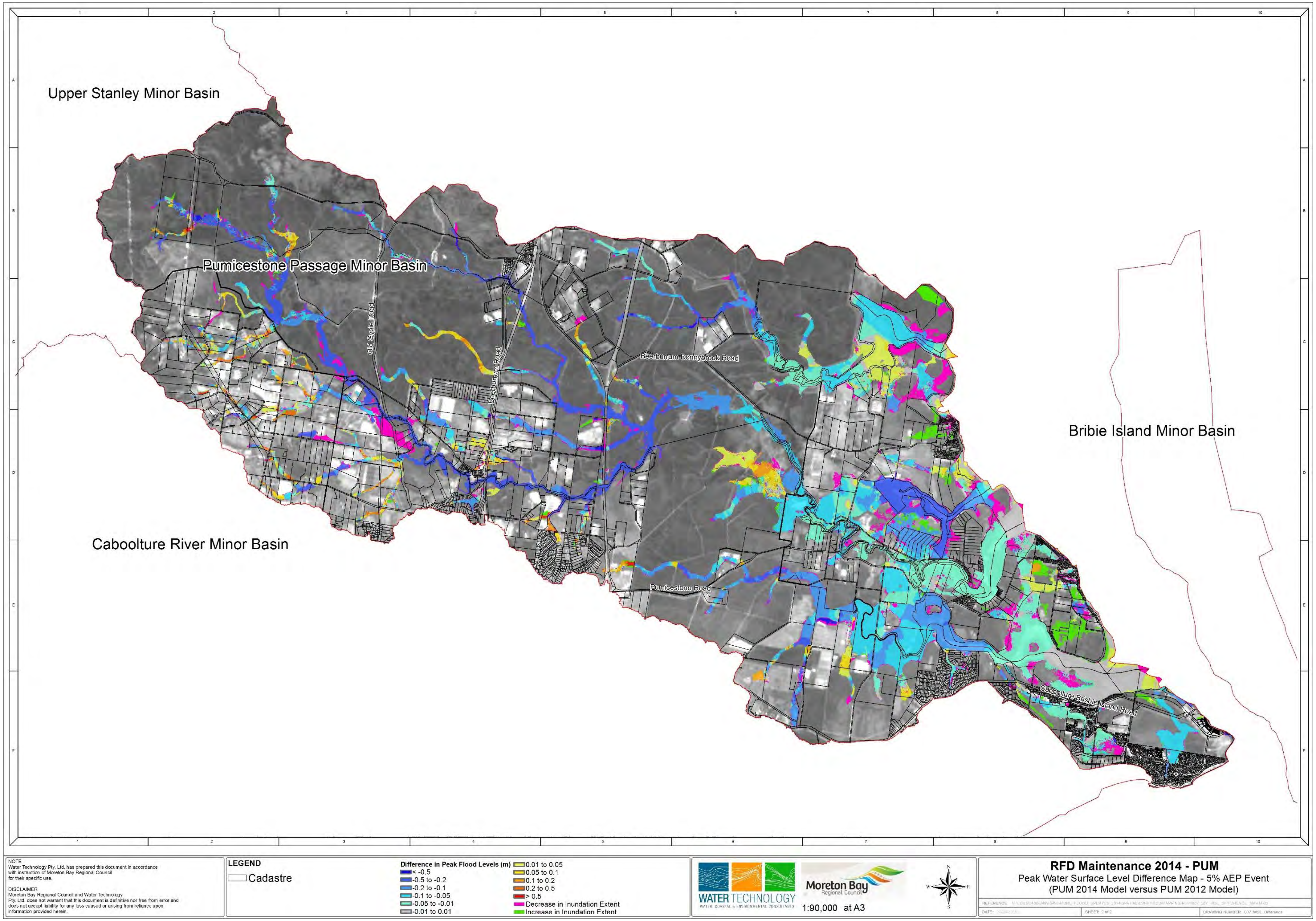

Figure 7 – PUM 5% AEP Event Water Surface Level Difference Map

4.2 Verification

Verification against recorded rainfall and flood marks was not undertaken for the PUM model because of limited historical event data.

4.3 Design Flood Behaviour

TUFLOW outputs (xmdf format) were provided to council for all simulations, which saved at 20 minute intervals. Peak value grids were also provided for each event and variable. The output variables include:

- Water Surface Level (H)
- Water Depth (D)
- Water Velocity (V)
- Water Depth Velocity Product (Z0)
- Hazard (ZMBRC, ZQRA, Z9)
- Stream Power (SP)

4.3.1 River & Creek

A maximum float grid was derived using the envelope of all critical storms (section 3.2.1) durations for each event and all the TUFLOW outputs listed in Section 4.2 above. Results for the 5%, 1% and 0.1% AEP events are available on Council's website (www.moretonbay.qld.gov.au/floodcheck) as PDF suburb maps or in the Flood Explorer interactive mapping tool.

4.3.2 Storm Tide

Float grids were generated for each event (Section 3.2.3) and for all TUFLOW outputs listed in Section 4.2 above. Results for the 5%, 1% and 0.1% AEP events are available on Council's website (www.moretonbay.qld.gov.au/floodcheck) as PDF suburb maps or in the Flood Explorer interactive mapping tool.

4.4 Sensitivity Analysis Results

The Moreton Bay Design Storm (MDS) was used as a base case for the sensitivity analysis. The results of the sensitivity analysis are summarised in sections 4.4.1 to 4.4.4. The MDS is approximately 100mm higher than the 1% AEP event in the upper catchment and 300mm lower in the middle catchment. The lower catchment exhibits minimal water level differences.

4.4.1 Hydraulic Roughness Analysis

Increasing Manning's 'n' by 20% resulted in increases of between 100mm and 200mm in the upstream areas of the catchment. Minimal water surface level differences were recorded throughout the middle and lower parts of the catchment.

4.4.2 Structure Blockage Analysis

The structure blockage analysis shows that peak flood levels increase by more than 3000mm upstream of blocked structures, with most locations showing increases greater than 1000mm, and the extent of flooding also increases. This is especially noticeable upstream of key structures along the Bruce Highway and Beerburrum Road. Decreases in peak flood levels of up to 500mm are observed downstream of some of the blocked structures.

4.4.3 Climate Change and Downstream Boundary Condition Analysis

Climate change has a significant impact on flood levels especially in the lower catchment.

Increase in Rainfall Intensity of 20%

An increase in rainfall throughout the catchment increased flood levels by between 100 - 400mm in most parts of the catchment.

Increased downstream boundary of 0.8m due to predicted sea level rise

An increase in downstream boundary to simulate the effects of sea level rise increases flood levels in the downstream area by up to 800mm. The flooding extent is also increased in the lower catchment.

Increase in rainfall intensity and 0.8m increase in downstream boundary

Combining the above two scenarios affects the entire catchment with increases in flood levels of up to 800mm in the lower catchment, 100 – 200mm in the middle catchment, and 100 – 400mm in the upper catchment.

4.4.4 Future Land use Analysis

Increasing the vegetation in the floodplain

Increasing the vegetation in the floodplain only increases and decreases flood levels depending on the area. Generally impacts are minimal.

Increased residential development

Increased residential development has no significant impact on peak flood levels in the catchment.

Increased vegetation in the floodplain and residential development

Combining the two scenarios above does not have an additional impact over and above the individual scenarios.

4.5 Model Limitations and Quality

The RFD maintenance tasks prepared by WT have been undertaken based on the specific project briefing and technical requirements as outlined by MBRC. The 2014 maintenance tasks prepared by WT are therefore limited in nature to undertaking:-

- Model revisions and updates in accordance with the project specifications and Council instructions; and
- Model revisions and updates performed without undertaking an extensive review or check of the overall structure and configuration of the originally developed models.

The model updates and revisions undertaken have culminated in overall model improvements compared to the models originally developed in 2012.

The following limitations apply to the updated WBNM and TUFLOW models prepared for this project:

- The same model limitations identified and discussed by Aurecon (Aurecon, 2012) as part of the original development of the PUM models equally apply to this study.
- The topography of the floodplain has been represented based on 2009 and 2014 LiDAR survey data provided by Council. The LiDAR data is subject to accuracy statements and these same accuracy statements will therefore equally apply to the models updated as part of this study.
- Bathymetric survey partially covers downstream areas, however the majority of the topography of the waterways has been defined using LiDAR data. LiDAR data is unable to pick up ground levels below the water surface, and therefore the invert of the waterways is not precisely represented.
- Watercourses have been represented in the 2D domain based on a grid resolution of 5m. A 3d breakline in the form of a ZLG layer has also been included in the TUFLOW model to aid in channel continuity and conveyance. The representation of the watercourses in the model may lead to the model over or underestimating conveyance and indirectly affecting modelled flood levels.
- The PUM model includes a FLC=0 model parameter that has been applied to all bridge structures modelled as a layered flow constriction. A zero FLC value effectively ignores any energy losses associated with the bridge deck. The recommended value in TUFLOW is specified as FLC=1.56 (BMT WBM, 2010). Modelled flood levels in the areas of bridge structures may therefore be lower than would otherwise be the case where appropriate energy losses were applied to the bridge structures.
- The TUFLOW model includes adjustments to the method of modelling trunk drainage to direct inflows to pits and is based on a manhole loss approach option of "ENGELHUND". This method does not necessarily allow for all pit losses to be attributed to pipe connections and may underestimate losses in the trunk drainage network given that only specific trunk drainage is being included in the model.

4.6 Model Specification and Run Times

Table 7 provides a brief summary of the PUM TUFLOW model specification and run times. PUM is a large catchment within the MBRC RFD study area, encompassing 575.9km^2 and 23,034,700 grid cells (at 5m cell size) and has long runtimes.

Table 7– PUM Model Specification and Run Times

Event	Model Grid Size	Model Run Time (hours)	2d Model Memory (RAM) [Gb]
1 EY (720m)	5m	196.9	23.7
1% AEP (720m)	5m	579.5	23.7
1% AEP (720m)	10m	18.0	6.0
0.1% AEP (720m)	10m	25.6	6.0
0.01% AEP (720m)	10m	20.5	6.0
MDS	5m	178.5	23.8
1% AEP Storm Tide	5m	581.1	23.8

5. Conclusion

A range of WBNM and TUFLOW model updates and revisions have been prepared and documented in this report. These revisions and model updates have been prepared in accordance with the technical project specification prepared by MBRC. One of the key aspects for the model updates was the inclusion of new LiDAR data collected by Council in 2014.

Following the model updates, initial model tests have been undertaken as well as model validation tasks. The model was then used to complete a critical duration assessment which directed the design flood event assessments for the full range of events from the 1 EY event through to the PMF event. Multiple storm durations as well as Council's Design Storm (MDS) Event were also assessed for the range of design events. Storm tide scenarios were also assessed for a range of events. Additionally, a number of sensitivity scenarios have also been assessed and includes future land use impacts, climate change scenarios, increased roughness, consideration of structure blockage as well as various combinations of the same.

The Regional Floodplain Database Project is focused on structuring model input and output data in a GIS database held by Council. Consequently, all model input and output data has been prepared and provided to Council in a digital format at the completion of the study. The data includes all model files for all the design events, sensitivity analysis, climate change assessment and future landuse scenarios, and includes all associated post-processing of model results as required.

The RFD Maintenance 2014 Project undertaken for the PUM minor basin as documented in this report has been successful in addressing the overall objectives of the study.

It is recommended that Council continue to progressively upgrade and revise the PUM models and digital data on a continual basis to maintain model performance and to ensure that the model outputs are appropriately representing the flooding behaviour of the PUM floodplain.

6. References

Aurecon (2012). Regional Floodplain Databasse: Hydrologic and Hydraulic Modelling – Pumicestone Passage (PUM).

BMT WBM, 2009: TUFLOW Build 2009-07-AA Release Notes (http://www.tuflow.com/Downloads/Releases/TUFLOW%20Release%20Notes.2009-07-AA.001.pdf)

BMT WBM (2010), "Form loss for a 1d Bridge Channel", TUFLOW User Manual.

Sinclair Knight Merz (SKM), 2012a, "MBRC Regional Floodplain Database – Floodplain Parameterisation"

Sinclair Knight Merz (SKM), 2012b, "MBRC Regional Floodplain Database - Boundary Conditions, Joint Probability & Climate Change"