INFRASTRUCTURE COMMITTEE MEETING

AGENDA

25 JUNE 2019

Your attendance is required at a meeting of the Infrastructure Committee to be held in the Council Chambers, 232 Bolsover Street, Rockhampton on 25 June 2019 commencing at 2.00pm for transaction of the enclosed business.

CHIEF EXECUTIVE OFFICER
18 June 2019

Next Meeting Date: 30.07.19

Please note:

In accordance with the *Local Government Regulation 2012*, please be advised that all discussion held during the meeting is recorded for the purpose of verifying the minutes. This will include any discussion involving a Councillor, staff member or a member of the public.

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1 OPENING

2 PRESENT

Members Present:

Councillor A P Williams (Chairperson)
The Mayor, Councillor M F Strelow
Councillor R A Swadling
Councillor N K Fisher
Councillor C E Smith
Councillor C R Rutherford
Councillor M D Wickerson

In Attendance:

Mr P Kofod – General Manager Regional Services (Executive Officer)
Mr E Pardon – Chief Executive Officer

3 APOLOGIES AND LEAVE OF ABSENCE

4 CONFIRMATION OF MINUTES

Minutes of the Infrastructure Committee held 28 May 2019

5 DECLARATIONS OF INTEREST IN MATTERS ON THE AGENDA

6 BUSINESS OUTSTANDING

6.1 LIFTING MATTERS FROM THE TABLE

File No:	**11979**
Attachments:	**Nil**
Authorising Officer:	**Evan Pardon - Chief Executive Officer**
Author:	**Evan Pardon - Chief Executive Officer**

SUMMARY

Items laid on the table require a report to be lifted from the table before being dealt with. This report is designed to lift all necessary reports from the table to be dealt with at the Infrastructure Committee meeting on 25 June 2019.

OFFICER'S RECOMMENDATION

THAT the following matter be lifted from the table and dealt with accordingly:

- Poison Creek Road Immunity

7 PUBLIC FORUMS/DEPUTATIONS

Nil

8 OFFICERS' REPORTS

8.1 POISON CREEK ROAD IMMUNITY

File No:	**377**
Attachments:	**1. Cross Drainage Locations**
Authorising Officer:	**Martin Crow - Manager Infrastructure Planning** **Peter Kofod - General Manager Regional Services**
Author:	**Stuart Harvey - Coordinator Strategic Infrastructure**

SUMMARY

This matter was laid on the table at the Infrastructure Committee meeting on 28 May 2019 with the following resolution:

**THAT this matter lay on the table until the next Infrastructure Committee meeting."*

A subsequent investigation has been conducted into the works required to improve the flood immunity of the existing low level floodways on Poison Creek Road and the immunity of the wider Razorback Road route to Mount Morgan.

OFFICER'S RECOMMENDATION

THAT the Poison Creek Road Immunity report be 'received'.

COMMENTARY

The Planning and Regulatory committee requested an investigation into providing a higher level of flood immunity to residents in Mount Morgan, through the upgrade of the floodways on Poison Creek Road. A subsequent request was made to consider the flood immunity of the wider Razorback Road route to Mount Morgan to provide context to the benefit provided by the culverts on Poison Creek Road.

Officers performed a preliminary assessment of the route from the Burnett Highway to Mount Morgan along the Razorback Road. It identified that there are 14 major cross drainage locations on the Razorback Road route to Mount Morgan (Attachment 1). Of these 14, 4 are flood ways (Cross Drainage 1 – 4 on Poison Creek Road and Razorback Road). The remaining 10 cross drainage structure are culverts. Review of the Mount Morgan Local Catchment flood model has indicated that the remaining 10 cross drainage culverts do not have 1%AEP capacity and result in water over the road in a 1%AEP event. At many of these culverts, flood water overtops the road in an 18%AEP (5year ARI) event. This is due to a combination of the culvert size and the velocity of the floodwater in this mountainous area. Given the low immunity of the Razorback Road route to Mount Morgan, it is not recommended to upgrade cross drainage 1 and 2 at this current time.

Officers have corresponded with the Department of Transport and Main Roads (DTMR) regarding the flood immunity of the Mount Morgan Range. Previous issues with the isolation of Mount Morgan residents and detour to the Razorback Road has been due to the substantial closure of the Mount Morgan Range after the 2013 rain event. DTMR have not conducted any flood studies in this area and are currently not able to provide an assessment of the flood immunity of the Burnett Highway at Mount Morgan. High level review of the contours and road alignment indicates that the immunity of the Mount Morgan Range may be greater than that of the Razorback Road.

BACKGROUND

Poison Creek Road provides a connection between the Burnett Highway and the Razorback Road, in particular for heavy vehicles that utilise the link to bypass the Mount Morgan Range crossing when travelling between Mount Morgan and Rockhampton / Gracemere. The road has an AADT of 1,081 (2016) including 7.5% heavy vehicles, and is currently identified as an approved B-Double route under TMR's Multi Combination Vehicle mapping.

The road currently utilises two low level concrete floodways to cross the minor waterways at each end of the link. These low level crossings become inundated in small rain events (39% AEP), causing the temporary closure of Poison Creek Road for vehicles. As Poison Creek is one of the major collector roads for the community of Mount Morgan, an investigation into improvements to the flood immunity was undertaken.

PREVIOUS DECISIONS

On 24 July 2018, The Infrastructure Committee resolved:

THAT a further report be prepared identifying the number of flood events at which this road would have provided access, when no other road would have provided access.

BUDGET IMPLICATIONS

Currently there is no budget allocation for these works

CORPORATE/OPERATIONAL PLAN

The report contributes to Council's Corporate Plan goals, specifically:

3.1.1 Consult on, advocate, plan, deliver and maintain a range of safe urban and rural public infrastructure appropriate to the Region's needs, both present and into the future.

CONCLUSION

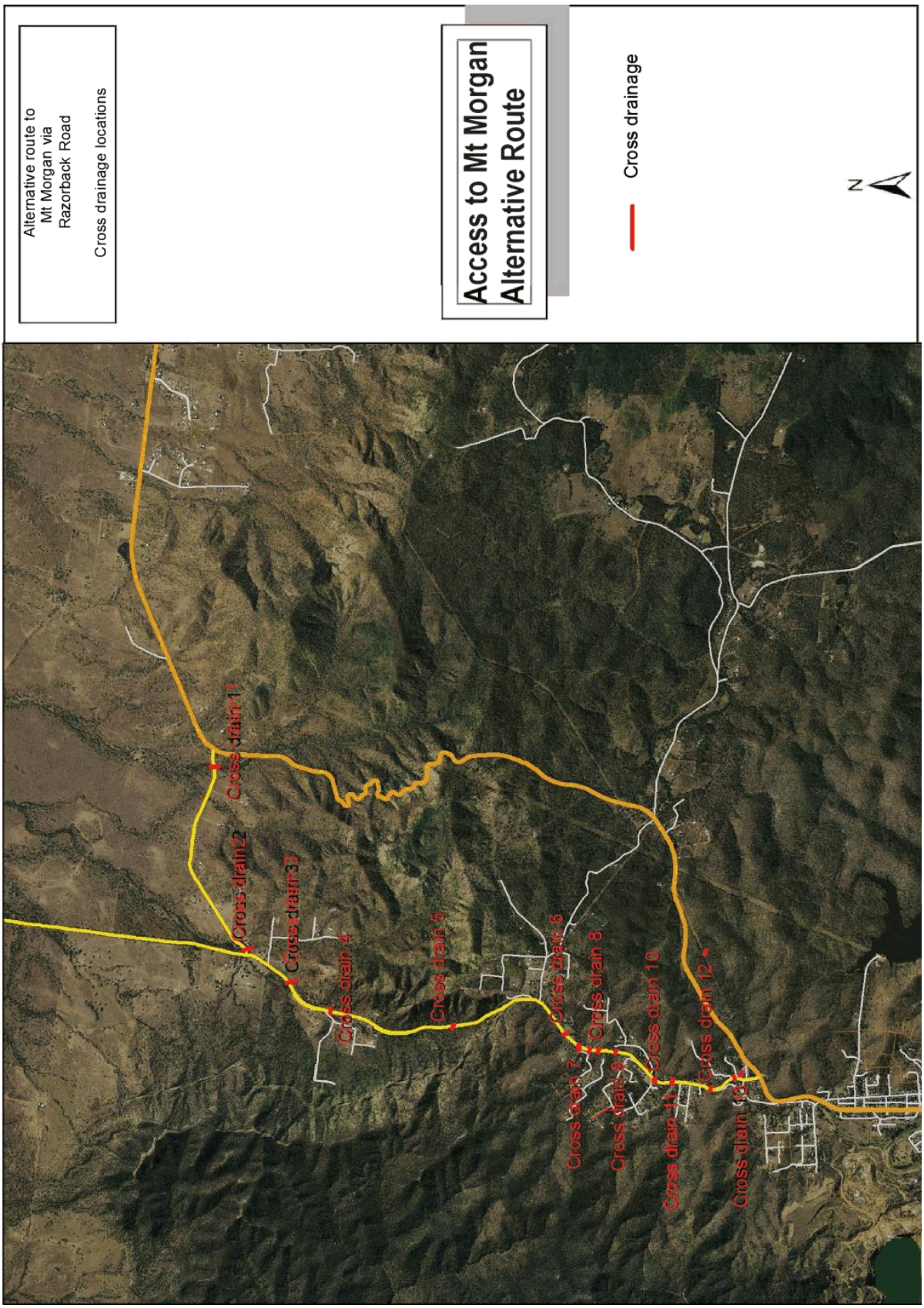
A further investigation into the Razorback Road route to Mount Morgan has indicated that there are several locations where the flood immunity of the road is at or under 18%AEP (5 year ARI). These results are provided to Council for their information.

POISON CREEK ROAD IMMUNITY

Cross Drainage Locations

Meeting Date: 25 June 2019

Attachment No: 1


Alternative route to Mt Morgan via Razorback Road
Cross drainage locations
Access to Mt Morgan Alternative Route
Cross drainage
N
Cross drain 1
Cross drain2
Cross drain3
Cross drain 4
Cross drain 5
Cross drain 6
Cross drain 7
Cross drain 8
Cross drain 9
Cross drain 10
Cross drain 11
Cross drain 12

8.2 ROCKHAMPTON REGION FLOOD STUDIES

File No: 1743

Attachments:
1. Moores Creek Executive Summary⇩
2. Splitters Creek Executive Summary⇩
3. Limestone Creek Executive Summary⇩
4. Ramsay Creek Executive Summary⇩
5. South Rockhampton Catchment Executive Summary⇩
6. West Rockhampton Catchment Executive Summary⇩
7. Mount Morgan Catchment Executive Summary⇩

Authorising Officer: Martin Crow - Manager Infrastructure Planning
Peter Kofod - General Manager Regional Services

Author: Stuart Harvey - Coordinator Strategic Infrastructure

SUMMARY

This report presents updated flood studies for the North side Creek catchments originally prepared in 2014 and new flood studies for South Rockhampton, West Rockhampton and Mount Morgan catchments. This report seeks Council's endorsement of these flood studies.

OFFICER'S RECOMMENDATION

THAT Council endorse:

1. The Moores Creek Local Catchment Study (October 2018)
2. The Splitters Creek Local Catchment Study (October 2018)
3. The Limestone Creek Local Catchment Study (October 2018)
4. The Ramsay Creek Local Catchment Study (October 2018)
5. The South Rockhampton Local Catchment Study (October 2018)
6. The Wandal and West Rockhampton Local Catchment Study (October 2018)
7. The Mount Morgan Local Catchment Study (December 2018)

COMMENTARY

Council, as part of its on-going commitment to the Rockhampton Regional Council Flood Management Strategy, has completed several flood studies to improve its current flood information and understanding of existing flood risks in the Rockhampton region. A key component of this work has involved updating several Creek flood studies, and undertaking new flood studies within the region.

In the past and in the absence of appropriate flood studies, some Councils have relied upon past historical events in order to set flood levels for planning and building controls. The Queensland Flood Commission of Inquiry (QFCI) indicated that this approach in general is unsatisfactory as it does not allow for a full range of flood events to be considered. The recommendation of the QFCI is that a recent flood study should be available for use in floodplain management for every urban area in Queensland. The QFCI also goes on to say that:

"It is desirable for governments to implement comprehensive floodplain management plans. By doing so they might begin to meet the expectations that government protect its constituents from floods which are to be experienced but are yet to occur".

The flood studies undertaken are scientific investigations and do not involve matters of policy. The QFCI report acknowledges that once a flood study is completed, it is Councils who must take responsibility for their assessment and use. The key elements out of the flood studies for policy direction revolve around the release of flood mapping and the adoption of a defined flood event for the purposes of planning and building controls.

A specific recommendation was made by the QFCI that:

"Councils and the Queensland Government should display on their websites all flood mapping they have commissioned or adopted".

A copy of the executive summary of each of the Flood Studies has been attached to this report (Attachment 1-7) and, due to their size, the full reports and appendices have been sent to Councillors via a dropbox link.

The revised flood studies incorporate new modelling methodology, updated national best practice guidance from Australian Rainfall and Runoff, and updated creek catchment information, including new terrain data, stormwater network, and floor level survey data. The flood modelling (with exception of Limestone Creek and Ramsay Creek) has also been calibrated and validated against various rainfall events including the February 2015 (TC Marcia) local flood event, the 2013 (Ex TC Oswald) flood event, and the 2017 (Ex-TC Debbie) flood events.

The new flood studies provide improved flood risk management information:

- Updated Hazard identification
- Indicative flood damages for residential and commercial buildings
- Identification of buildings subject to over-floor flooding
- Major overland flowpath areas
- Hazard profile across the catchment
- Vulnerable areas and critical asset locations
- Time and duration of inundation
- Areas of potential isolation
- Indicative Evacuation routes
- Climate Change scenario mapping

The study outcomes provide Council with a better understanding of local catchment flood behaviour, flood risk, and vulnerability, to assist with the development of flood mitigation options and inform future natural hazard overlays for associated development controls. The flood studies also provide information to assist in emergency management planning. The information contained within the reports will be made available through Council's website and flood information will be included on property flood searches. Wider consultation regarding the administrative planning controls, implemented as a result of updated flood risk, will be undertaken as part of the next major amendment to the planning scheme. The timing of this next major amendment is yet to be decided by Council.

BACKGROUND

In 2014, Council undertook local catchment flood studies for the Northside Creek Catchments to better understand local flood impacts and gauge local flood risk for communities located within these creek floodplain areas. They also served to inform flood mitigation and management measures. These flood studies were endorsed by Council for land use planning and policy administration purposes, and the flood mapping produced was adopted and incorporated as part of the Flood Management Overlay flood mapping in Council's current planning scheme (Rock e Plan 2015). The 2014 modelling highlighted other local catchments, which had not yet been modelled, that required analysis to improve Council's understanding of risk and flooding behaviour.

Recent local and riverine flood events have highlighted the need to improve the long-term flood resilience of the region. Council seeks to take this opportunity by identifying and improving the current available information, and enhancing the risk profiling of the Rockhampton region.

Improved awareness of the flood risk, along with updated flood mapping will contribute to better decision making about future development in Rockhampton, as well as decisions about rebuilding following flood events.

PREVIOUS DECISIONS

Council resolved on 18 September 2018 to endorse the 2017 Frenchmans Thozets Creek Flood Study. This was the first of the updated flood studies to be completed.

LEGISLATIVE CONTEXT

Completing an updated flood study is also consistent with the findings of the Final Report of the Queensland Floods Commission of Inquiry (2012) which recommended all Councils to provide up to date flood information and warnings to residents. Improved awareness of the flood risk, along with updated flood mapping contributes to better decision making about future development in Rockhampton, as well as decisions about rebuilding following flood events.

RISK ASSESSMENT

The updated flood study has determined the flood depths and velocities within these catchments. This information has increased the understanding of flood risk within the catchment and will be used to guide and manage future development and flood mitigation projects.

CORPORATE/OPERATIONAL PLAN

This study achieves the following outcomes in the Corporate Plan:

1.1 Safe, accessible, reliable and sustainable infrastructure and facilities

CONCLUSION

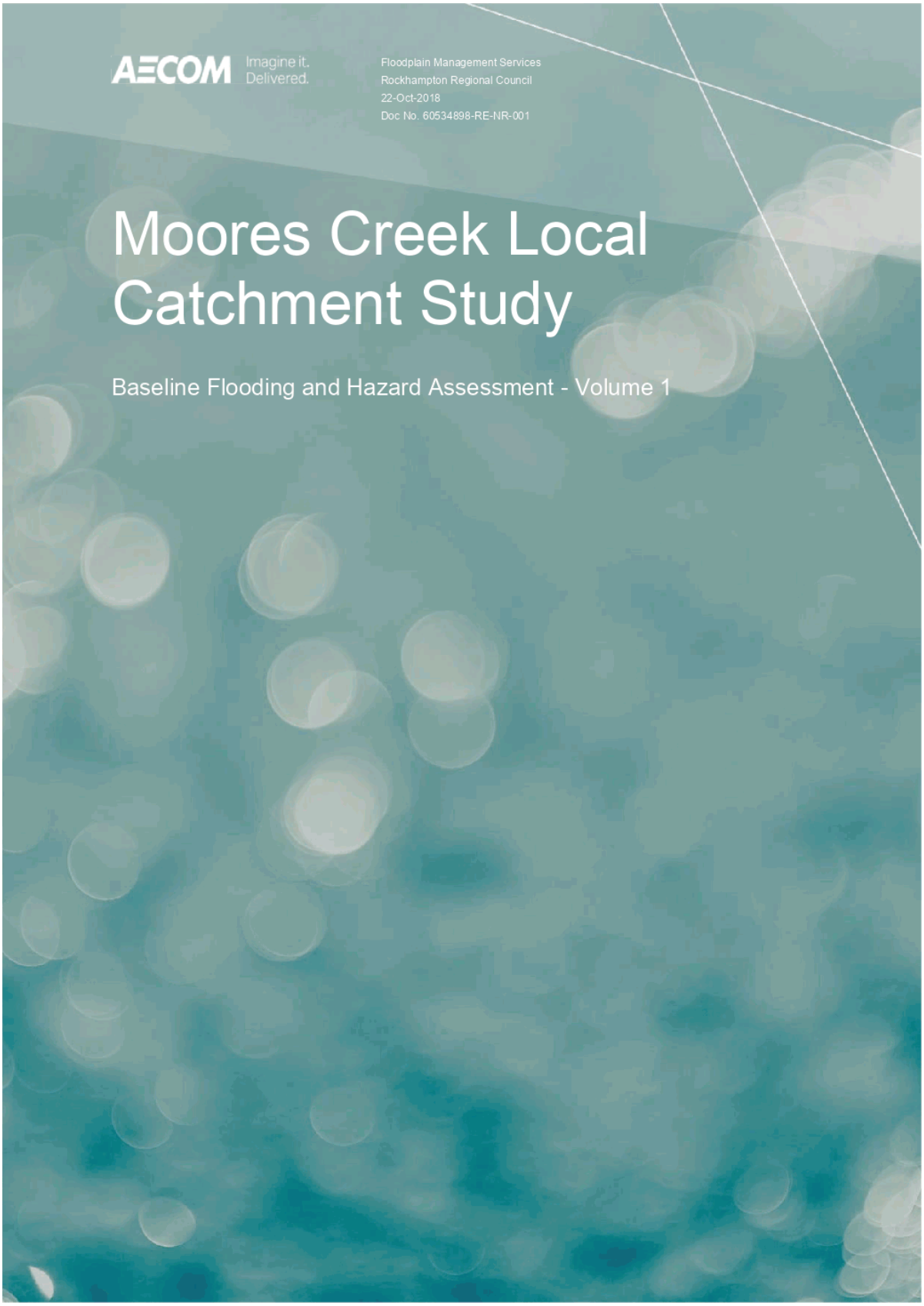
The flood studies for Moores Creek, Splitters Creek, Limestone Creek, Ramsay Creek, South Rockhampton Catchment, Mount Morgan catchment and Wandal and West Rockhampton Catchments provide an understanding of the flood behaviour in these catchments and will assist in future planning and flood mitigation. These reports are presented to Council for endorsement.

ROCKHAMPTON REGION FLOOD STUDIES

Moores Creek Executive Summary

Meeting Date: 25 June 2019

Attachment No: 1


AECOM
Imagine it.
Delivered.
Floodplain Management Services
Rockhampton Regional Council
22-Oct-2018
Doc No. 60534898-RE-NR-001
Moores Creek Local Catchment Study
Baseline Flooding and Hazard Assessment - Volume 1

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017 calendar year. The FMS program entails the completion of a number of individual floodplain management projects including the Moores Creek Local Catchment Study, which is the subject of this report.

Flooding in North Rockhampton can occur as a result of three different flood mechanisms:

- Riverine flooding due to rainfall over the Fitzroy River catchment.
- Overland flooding due to rainfall over the local urban catchment.
- Creek flooding due to rainfall over the local creek catchment.

This study focuses on overland and creek flooding due to rainfall over the local catchment.

The key objectives of this study are:

- The development of a detailed hydraulic model based on current best practice procedures, capable of adequately simulating the flood characteristics and behaviour of the local catchment using the latest available data.
- The assessment of existing flood risk within the study area. It is expected that these results will be used to inform long term infrastructure planning, future emergency planning and floodplain management.
- The development of clear and easy to understand flood mapping products for use in future community education and awareness campaigns.
- Determination of key hydraulic controls within the study area which will later be used to inform mitigation options analysis.

Catchment Characteristics

The Moores Creek catchment covers an area of approximately 30.5 km^2 starting within the upper reaches of Mount Archer National Park and serves as the border between the residential suburbs of Norman Gardens - Frenchville and Park Avenue – Berserker.

Moores Creek is an ephemeral meandering system consisting of low flow paths with pools and riffles within the mid and lower portions of the catchment. The natural creek bed material varies from exposed medium-sized cobbles / rocks to silty / sandy soils. Riparian vegetation along the creek can also vary from very dense grasses, shrubs and trees – to very limited vegetation in high velocity sections of the reach

Urbanisation has increased the proportion of impervious areas such as roads, concrete and building structures. Urban overland flow paths within the Moores Creek catchment generally follow defined natural or constructed channels and road corridors.

Hydrologic / Hydraulic Analysis

The study included the development of a TUFLOW model for the urbanised portion of the Moores Creek local catchment. This model utilises a combination of runoff-routing and direct rainfall approaches in order to determine the overland flow paths and establish baseline flood extents and depths within the study area.

Anecdotal and recorded data was obtained and used to calibrate the model to a local flood event caused by TC Marcia in February 2015. Further model validations were undertaken for two other local flood events, namely Ex-TC Debbie in March 2017 and Ex-TC Oswald in January 2013. The model calibrated well to the 2015 event.

The validation to the 2017 event resulted in a reasonable comparison between modelled and recorded levels, with some points below tolerance. This was likely due to variability of the spatial distribution of rainfall across orographic features within the catchment.

Revision E – 22-Oct-2018
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

The validation to the 2013 event revealed the majority of anecdotal records matched simulated levels within tolerance. Locations at which discrepancies exceeded allowable tolerances were expected to be a result of changes to the channel geometry due to ongoing geomorphological processes.

Overall, the model calibrates and validates well with modelled behaviours anticipated to appropriately predict flood patterns at the time of this study.

On completion of the calibration / validation process, various design flood events and durations were simulated and results extracted. The critical duration for the catchment was determined to be the 180 minute event. A comparison of the design events found that for events up to the 18% AEP event, the road and subsurface drainage infrastructure was able to prevent runoff from entering private property. For larger flood events, the overland flow paths continue to develop and are predicted to impact public and privately owned infrastructure throughout the catchment.

The modelling has confirmed that there are a number of key hydraulic controls within the catchment – particularly the various bridges which cross Moores Creek and the culverts in the area of Sunset Drive, German Street and Norman Road. The area adjacent to the Stockland Shopping centre is also critical, involving several bridge crossings within a high velocity section of the creek reach.

Sensitivity analyses have been undertaken to highlight the uncertainties in the model results, which will support the selection and application of an appropriate freeboard provision when using the model outputs for planning purposes.

Baseline Flood Hazard and Vulnerability Assessment

Following completion of baseline model development, design event modelling and sensitivity analyses; a flood hazard and vulnerability assessment was completed for the Moores Creek catchment. This included:

- Flood hazard analysis.
- Vulnerability assessment of key infrastructure.
- Evacuation route analysis.
- Building inundation and impact assessment.
- Flood Damages Assessment (FDA).

Each of these aspects has been discussed in further detail below.

Flood Hazard

Flood hazard categorisation provides a better understanding of the variation of flood behaviour and hazard across the floodplain and between different events. The degree of hazard varies across a floodplain in response to the following factors:

- Flow depth.
- Flow velocity.
- Rate of flood level rise (including warning times).
- Duration of inundation.

Identifying hazards associated with flood water depth and velocity help focus management efforts on minimizing the risk to life and property. As such, a series of Flood Hazard Zones have been developed according to ARR 2016, in alignment with recommendations made in the ARR, Data Management and Policy Review (AECOM, 2017).

Figure E1 shows the adopted hazard categories along with a general description of the risk associated with each category.

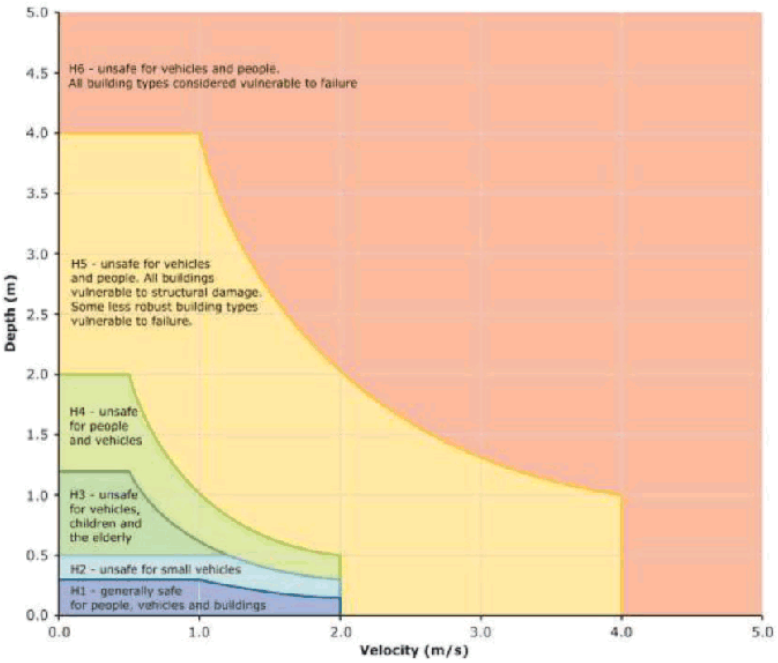


Figure E1 Hazard Vulnerability Classifications (Graphical)

Analysis of the 1% AEP baseline flood hazard within the Moores Creek catchment generally shows:

- Low to medium hazard (H1 and H2) across the majority of urbanised areas within the catchment.
- High hazard (H3 and H4) within a majority of natural and man-made channels, as well as open spaces such as local parks and the Kershaw Gardens.
- High to extreme hazard (H4 and H5) within some natural and man-made open channels.
- High to extreme hazard (H4 and H5) in the overland flow path between Elphinstone Street and Musgrave Street, extending to the western side of Musgrave Street into Kirkellen Street.
- Extreme hazard (H5 or H6) within the Moores Creek channel and adjacent overbank areas.

Vulnerability Assessment

A baseline vulnerability assessment has been undertaken to identify critical infrastructure and community assets which are at risk of flooding. The following categories have been included in this assessment:

- Water and sewerage infrastructure.
- Emergency services facilities including ambulance, police, fire and hospitals.
- Community infrastructure including schools, day-care centres, nursing homes, retirement villages and community facilities.
- Key road and rail assets.

The following provides a summary of key findings of the vulnerability assessment:

- The Redhill Sewerage Pump Station (SPS, Ref: 639767) is predicted to have less than the desired 0.2% AEP flood immunity. It is noted however that this SPS is a below ground station and improvements to flood immunity would be very difficult to achieve. It is recommended this information be passed onto FRW as the asset owner.
- Inundation is predicted at Narnia Kindergarten and Preschool in the 0.2% AEP, however the low depth and velocity of flood waters is expected to presents a low hazard to pedestrians.
- The Yeppoon Branch Rail Line is predicted to have a high level of flood immunity to Top of Ballast, with inundation only predicted for a short section of rail during the PMF event.
- A number of roads within the catchment are predicted to experience inundation in the 1EY event and larger. Time of Submergence (TOS) ranges from 0.5 hours to approximately 6 hours.

Evacuation Routes

Generally local catchment flooding within the Moores Creek catchment is due to short duration, high intensity rainfall events. The relatively steep upper catchment and urbanisation throughout much of the middle and lower catchment can result in inundation of residential and commercial buildings. In addition, inadequate stormwater infrastructure in some locations results in nuisance flooding within the urbanised catchment due to overland runoff.

Due to the short critical duration of the Moores Creek catchment, the warning time between the commencement of the rain event and subsequent flood inundation can be short. This limits the opportunity for evacuation, and generally the action taken by the community is to '*shelter in place*' until the flooding has passed.

An assessment of evacuation routes has therefore focussed on areas that become isolated during flooding, as well as high hazard areas that may require flood free evacuation access.

The following areas have been assessed as being isolated and/or lack adequate evacuation routes during the PMF event:

- Danker Street → loses evacuation via Dodgson Street to Norman Road and/or via Rowe Street to Moores Creek Road.
- Warner Avenue → loses evacuation via Cheney Street to German Street.
- Rickart Street and Magee Street → loses evacuation via Waterloo Street to Kerrigan Street.
- Salamanca Street → loses evacuation via Waterloo Street to Kerrigan Street and/or via Stewart Street to Berserker Street.
- Main Street and Medcraft Street (between Twigg Street and Alexandra Street) → loses evacuation via Main Street to Alexandra Street and/or Yaamba Road.
- Kerr Street and Tynan Street (southern end) → loses evacuation via Main Street to Alexandra Street and/or Yaamba Road.
- Cowap Street and Martin Street → loses evacuation to Alexandra Street and/or Main Street.
- Stawell Court and Miles Street → loses evacuation via Victoria Place to High Street.
- Kirkellen Street and Bernard Street → loses evacuation to Queen Elizabeth Drive.

Building Impact Assessment

Council provided a building database, containing ~6,250 buildings digitised within the Moores Creek modelled area. Of these, ~1,050 buildings contained surveyed data, focussed on Creek flooding extents.

In order to complete a Building Impact Assessment and FDA, a complete building database with floor levels, classifications and ground levels is needed within the modelled area. To achieve this, the following tasks were completed:

- Review of the digitised buildings, to remove erroneous data such as *footpaths*, *building demolished*, *no building* etc.
- Estimation of ~5,200 floor levels and ground levels within the Moores Creek modelled area, for buildings outside Council's surveyed database.
- Classification of ~6,250 buildings within the Moores Creek modelled area, in accordance with ANUFLOOD requirements.

The ground level at each building was estimated from aerial survey (LiDAR) provided for the project. Ground levels were assigned to the building footprints based on the average LiDAR elevation within the building extents.

Buildings lacking data regarding number of storeys were assumed to be one storey. Buildings on slabs were assumed to have a minimum habitable floor level of 100mm above ground level. Low set buildings were assumed to have a minimum habitable floor level of 600mm above ground level and high set buildings were assumed to have a minimum habitable floor level of 1,800mm above ground level. Buildings lacking data regarding what type of floor they have were assumed to be on slabs.

Table E2 provides a summary of the number of residential and commercial buildings anticipated to be inundated for various flood events within the Moores Creek catchment. These results are also shown graphically in Figure E2. Existing buildings which experience flood levels above ground level are noted and buildings inundated above floor level are shown in brackets beside.

Note that the indicated number of buildings is for entire buildings. Residential multi-unit buildings may contain multiple dwellings per building. Also, large commercial/industrial buildings may include multiple businesses.

Table E2 № of Buildings Impacted

AEP (%)	№ Residential Buildings Flood level above property ground level (building inundated above floor level)	№ Commercial Buildings Flood level above property ground level (building inundated above floor level)
1EY	39 (5)	10 (5)
39	63 (11)	19 (8)
18	104 (24)	28 (15)
10	156 (36)	35 (23)
5	221 (63)	48 (32)
2	271 (77)	56 (42)
1	352 (107)	62 (50)
0.2	672 (297)	112 (95)
0.05	1060 (555)	158 (137)
PMF	2167 (1648)	303 (280)

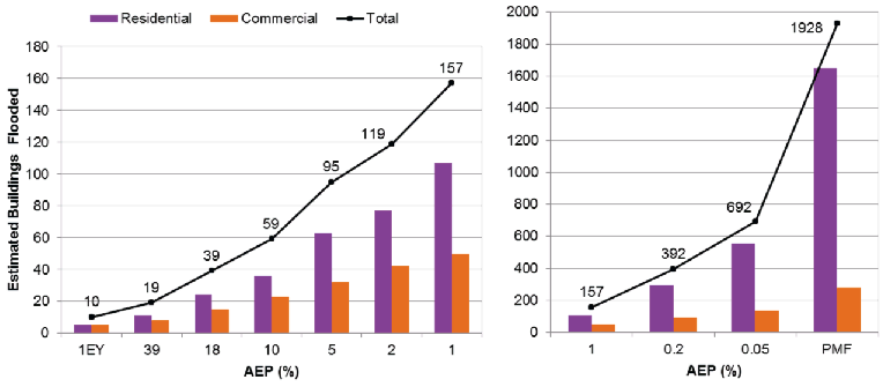


Figure E2 Estimated Buildings with Above Floor Flooding (Number of Buildings)

Figure E3 provides a breakdown of the number of buildings inundated in 'creek' and 'overland flow' areas. The graph confirms that the majority of existing buildings within the catchment (70%) are not inundated up to and including the PMF event. Of the 30% of buildings predicted to experience inundation, approximately 12% are impacted by overland flow and the 18% are impacted by creek inundation.

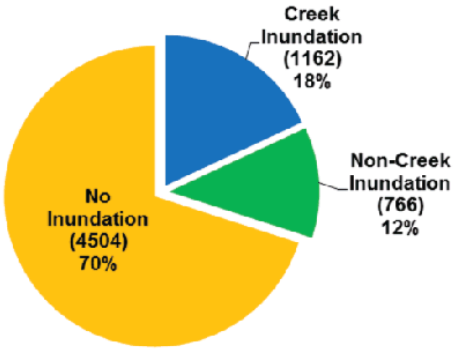


Figure E3 Inundation within Creek and Overland Flow Areas (Number of Buildings)

As shown in Figure E4, median flood depths are generally less than 0.1 metre for each flood event. This indicates that reductions in flood depths of 0.1 metre could significantly reduce overall damage. The figure also shows that a significant number of buildings experience flood depths of 0.3 metre or less during frequent events such as the 1EY flood event, generally corresponding to higher flood damages.

It is noted that where surveyed floor levels were not available, slab on ground buildings were assumed to have a floor level 0.1m above the existing ground level. This is consistent with other studies undertaken in the Rockhampton area, however may result in a higher estimate of inundated buildings and consequential flood damages due to the increased incidence of above floor flooding.

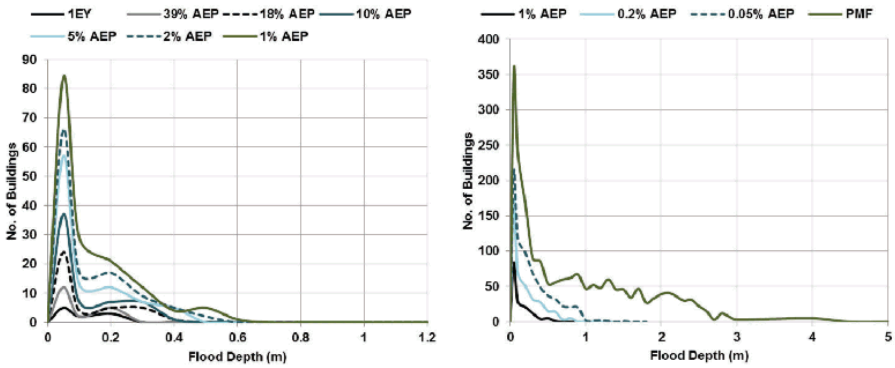


Figure E4 Estimated Flood Depths Above Floor Level by % AEP (Number of Buildings)

Flood Damages Assessment

Flood damages, or the anticipated cost to residents, businesses and infrastructure due to flooding, have been estimated using a standardised approach adopted throughout Australia. The approach estimates the tangible impacts flooding has on people, property, and infrastructure, such as flooding of a building and/or contents, the lost opportunity value associated with wages and revenue and flooding of transport and utility networks. These tangible impacts are estimated based on the depth, likelihood of flooding and type of building. Intangible impacts, such as emotional stress and inconvenience, were not quantified due to their non-tangible nature.

Figure E5 summarises the estimated total flood damages for various flood events according to their AEP. As shown, total damages range from $534,000 (1EY flood event) to $431M (PMF event) using the O2 Environmental Damage Curves. Figure E4Figure 41 shows that 10 buildings are expected to be inundated above floor in the 1EY event, whilst 1,928 buildings are anticipated to be inundated above floor in the PMF event.

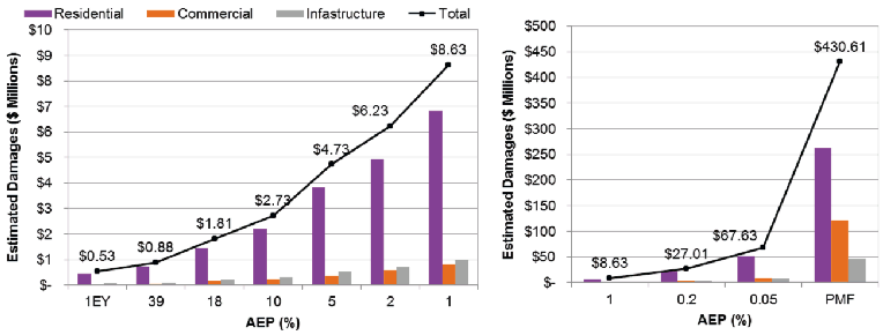


Figure E5 Estimated Flood Damages – O2 Environmental Damage Curves ($ Million)

These figures also demonstrate that residential buildings make up the large majority of impacted buildings, and the estimated flood damages, within the Moores Creek catchment across the full range of design events assessed.

While the above provides an estimate of potential damages during specific flood events, understanding what damages may be expected on an annual basis is often an easier way to relate risk to residents and businesses. As such, the above damages were converted to Average Annual Damages (AAD) based on the likelihood of the flood event and the total estimated damage during that event.

The calculated AAD for the Moores Creek catchment is estimated to range from approximately $1,318,000 to $1,403,000 per annum.

Figure E6 provides a breakdown of the AAD and building impact assessment. The area in blue corresponds to individual building AAD (residential and non-residential combined) in brackets of $100 per annum. The orange line corresponds to the cumulative AAD for residential and non-residential buildings combined. Note that this does not include infrastructure damages.

As shown, 88% of all buildings exhibit less than $500 damage per annum and produce only 11% of the total damage.

77% of damages are associated with less than 5% of all buildings. This demonstrates that a minority of buildings produce the majority of damages.

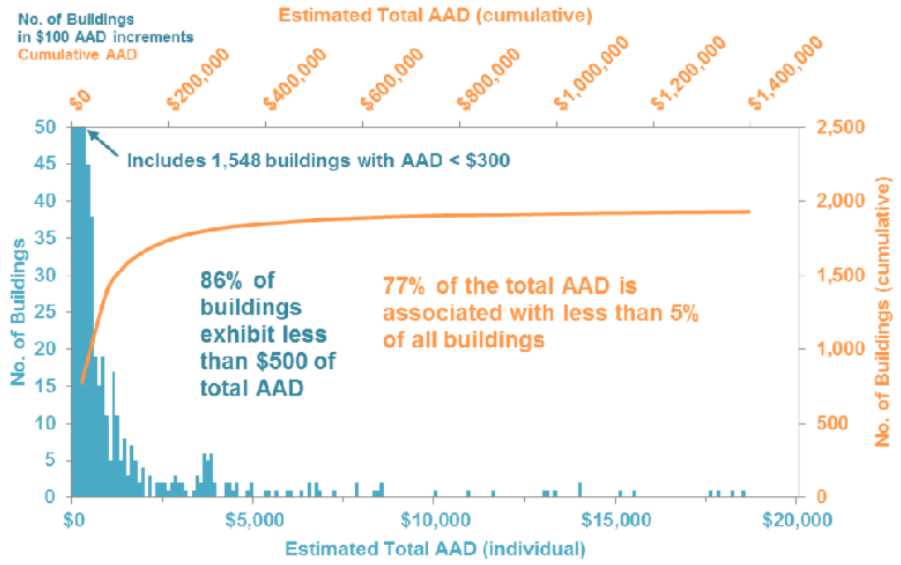


Figure E6 Individual Building vs. Cumulative Total Average Annual Damages

Rainfall Gauge, Maximum Flood Height Gauge and Flood Warning Network

A desktop review of the existing rainfall gauge, maximum flood height gauge and flood warning network yielded the following recommendations/findings for the Moores Creek catchment:

- Additional rain gauges should be installed at NRSTP and SRSTP.
- Additional maximum flood height gauges should be installed at Berserker Street (northern end), Simpson Street (western end), High Street bridge crossing and Macaree Street (western end).
- There is no current flood warning system within the Moores Creek catchment.

Recommendations

A number of recommendations have been made in relation to this study:

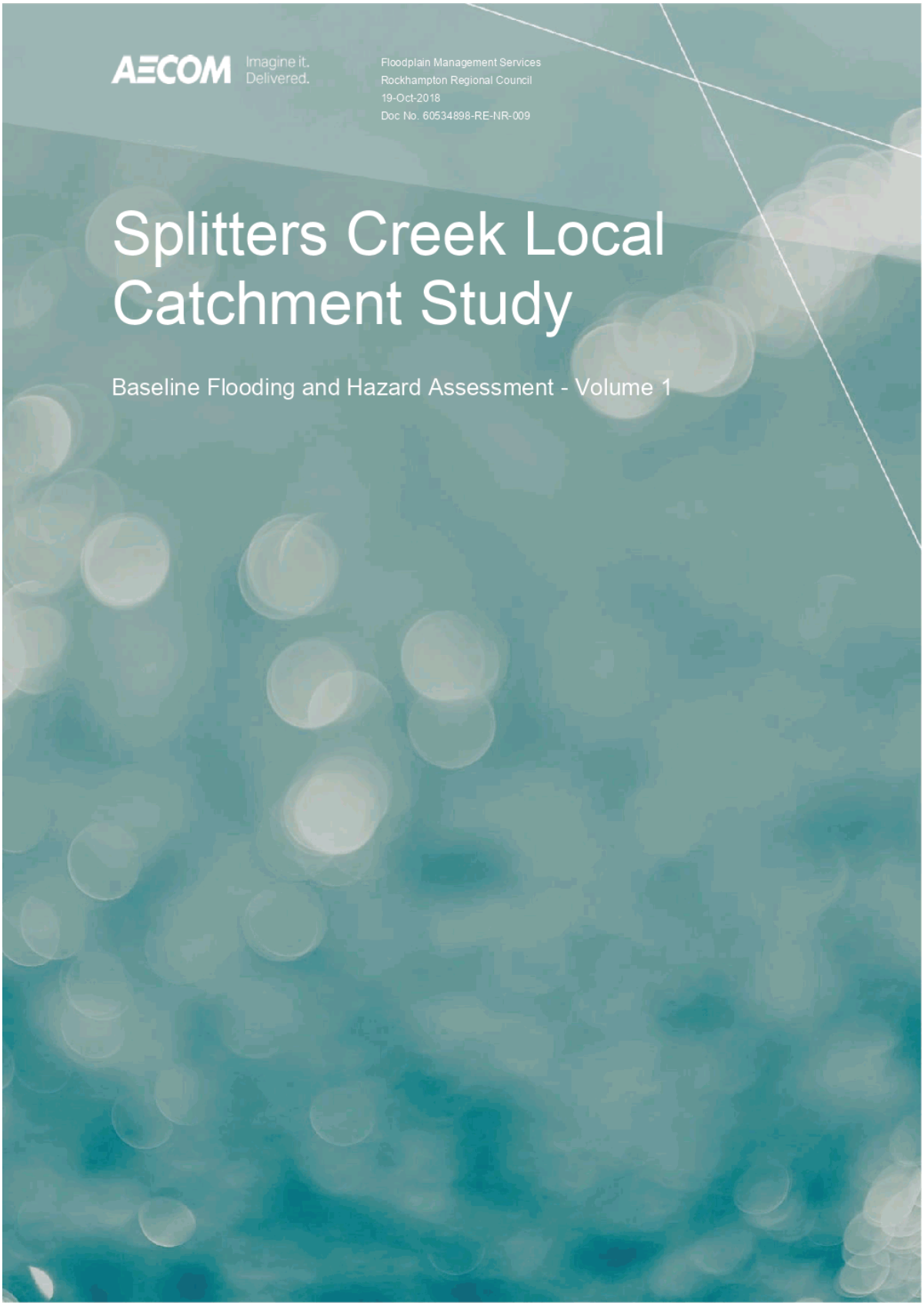
- Baseline flood mapping (i.e. peak depths, velocities and water surface elevations) provided in this study should be used to update Council's current Planning Scheme layers, at the next available opportunity.
  - Final post-processing of the GIS flood layers is recommended in accordance with the procedures outlined in the ARR, Data Management and Policy Review (AECOM, 2017).
  - Appropriate freeboard provisions should be included, based on the findings of the sensitivity analyses outlined in this study.
- This report and associated outputs should be communicated to the community and relevant stakeholders when appropriate.
- Hydrologic and hydraulic modelling undertaken for this study has been based on methods and data outlined in Australian Rainfall and Runoff 1987. The 1987 revision has been adopted as per Council's request. It is recommended that future updates to this study incorporate the new 2016 updates.
- It is recommended that Council continue to undertake building floor level survey within the Moores Creek catchment to supplement the existing building database. An updated FDA should be undertaken when additional building survey data has been obtained.
- It is recommended that Council continue to record rainfall and flood heights associated with future Moores Creek catchment flood events. This data will support ongoing model calibration / validation works that should be undertaken in future updates to this study. The implementation of additional gauges identified in this study is also recommended.
- Updated creek cross sectional survey should be undertaken after major flood events, and prior to undertaking future updates to this study. It is recommended that cross sections be surveyed at the same locations undertaken in this study to assess longer term geomorphic changes, and potential implications to flood behaviour.
- The baseline vulnerability and flood hazard assessment outputs from this report should be used to support Phase 3 of the Study (Flood Mitigation Options Development and Assessment). Potential mitigation options should be focussed on both creek and overland flooding.

ROCKHAMPTON REGION FLOOD STUDIES

Splitters Creek Executive Summary

Meeting Date: 25 June 2019

Attachment No: 2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Floodplain Management Services
Rockhampton Regional Council
19-Oct-2018
Doc No. 60534898-RE-NR-009
Splitters Creek Local Catchment Study
Baseline Flooding and Hazard Assessment - Volume 1

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017 calendar year. The FMS program entails the completion of a number of individual floodplain management projects including the Splitters Creek Catchment Study, which is the subject of this report.

Flooding in North Rockhampton can occur as a result of three different flood mechanisms:

- Riverine flooding due to rainfall over the Fitzroy River catchment.
- Overland flooding due to rainfall over the local urban catchment.
- Creek flooding due to rainfall over the local creek catchment.

This study focuses on creek flooding due to rainfall over the local creek catchment.

The key objectives of this study are:

- To update Council's existing Splitters Creek TUFLOW model, to refine the grid size, incorporate latest LiDAR and aerial imagery information. It is noted that the current model configuration utilised an XP-Rafts hydrologic model to apply lumped flows directly to Splitters Creek.
- The assessment of existing flood risk within the study area, related to flooding within and directly adjacent to Splitters Creek. It is expected that these results will be used to inform long term infrastructure planning, future emergency planning and floodplain management.
- The development of clear and easy to understand flood mapping products for use in future community education and awareness campaigns.
- Determination of key hydraulic controls within the study area which will later be used to inform mitigation options analysis.

The minimisation of flood damages through more informed and reliable planning, appropriate mitigation, education, and disaster response is the key to developing more resilient communities which will ultimately result in future growth and prosperity. The overall objective of this study is to minimise loss, disruption and social anxiety; for both existing and future floodplain occupants.

Catchment Characteristics

The Splitters Creek catchment covers an area of approximately 13.1 km^2 starting within the western extent of Mount Archer National Park and stretching to the eastern bank of the Fitzroy River. Splitters Creek is positioned between the larger catchments of Limestone Creek (north) and Moores Creek (southwest).

The upper half of Splitters Creek is a combination of confined ephemeral channels which join to form the wider Splitters Creek channel near Yaamba Road. Further downstream, the system graduates into a broader floodplain. The natural creek bed material varies from exposed medium-sized cobbles / rocks and maintained grass within the urbanised segments, to silty / sandy soils in lower-lying areas. Riparian vegetation along the creek can also vary from very dense grasses to shrubs and trees.

Urbanisation of much of the catchment has increased the proportion of impervious areas such as roads, concrete and building structures. Urban overland flow paths within the Splitters Creek catchment generally follow constructed channels and road corridors.

Previous Study

In May 2014 Aurecon delivered Revision 2 of the *Rockhampton Local Catchments Flood Study - Splitters Creek Hydrologic and Hydraulic Modelling Report* (Aurecon, May 2014). The study applied XP-Rafts hydrologic model hydrographs as lumped catchment inflows to the two dimensional TUFLOW hydraulic model. The XP-Rafts hydrographs were applied directly within the creek channel, to represent the runoff from upstream sub-catchments.

Revision D – 19-Oct-2018
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

It should be noted that the modelling undertaken did not simulate overland flows within the upstream sub-catchments, as no direct rainfall was applied within the TUFLOW model.

The TUFLOW two-dimensional hydraulic model was calibrated to recorded levels from the January 2013 local catchment rain event. It was reported that the modelled flood levels had an absolute average difference of 0.42 m when compared to the recorded levels.

Design events were modelled by Aurecon for the 39%, 18%, 10%, 5%, 2%, 1%, 0.5%, 0.2% Annual Exceedance Probability (AEP) and Probable Maximum Flood (PMF) local catchment flood events. Climate change scenarios were modelled for 20% and 30% increases in rainfall intensity, for the 1%, 0.5% and 0.2% AEP events.

On 14 June 2016 Aurecon delivered to Council a memorandum detailing Splitters Creek Model Upgrade works, undertaken at Council's request. The model upgrade works centred around Council's development of a new Digital Elevation Model (DEM), with the intent of better representing flooding within the Splitters Creek catchment. The Aurecon Memorandum detailed a number of topographic, 1D network, XP-Rafts inflow, boundary condition and materials layer updates, as well as a summary of design events modelled, results and comparison to previously reported flooding characteristics.

Council's June 2016 Splitters Creek TUFLOW hydraulic model and XP-Rafts hydrologic model were used as the basis for this current study.

Updated Modelling

Prior to utilising Council's Splitters Creek TUFLOW hydraulic model in this current study to assess baseline flood hazard, a number of model updates were completed as part of this current study.

These included topographic updated to incorporate latest LiDAR and aerial imagery, plus more refined representation of the model grid, road crowns and channel invert levels. In addition, 1D network configuration and setup changes resulted in a more stable model.

Various design flood events and durations were simulated and results extracted. The critical duration for the catchment was determined to be the 60 minute event. A comparison of the design events found that for events up to the 18% AEP event, the road and subsurface drainage infrastructure was able to prevent runoff from entering private property. For larger flood events, the overland flow paths continue to develop and are predicted to impact public and privately owned infrastructure throughout the catchment.

Sensitivity analyses have been undertaken to highlight the uncertainties in the model results, which will support the selection and application of an appropriate freeboard provision when using the model outputs for planning purposes.

Baseline Flood Hazard and Vulnerability Assessment

Following completion of baseline model development, design event modelling and sensitivity analyses; a flood hazard and vulnerability assessment was completed for the Splitters Creek catchment. This included:

- Flood hazard analysis.
- Vulnerability assessment of key infrastructure.
- Evacuation route analysis.
- Building inundation and impact assessment.
- Flood Damages Assessment (FDA).

Each of these aspects has been discussed in further detail below.

Flood Hazard

Flood hazard categorisation provides a better understanding of the variation of flood behaviour and hazard across the floodplain and between different events. The degree of hazard varies across a floodplain in response to the following factors:

- Flow depth.
- Flow velocity.
- Rate of flood level rise (including warning times).
- Duration of inundation.

Identifying hazards associated with flood water depth and velocity help focus management efforts on minimizing the risk to life and property. As such, a series of Flood Hazard Zones have been developed according to ARR 2016, in alignment with recommendations made in the ARR, Data Management and Policy Review (AECOM, 2017).

Figure E1 shows the adopted hazard categories along with a general description of the risk associated with each category.

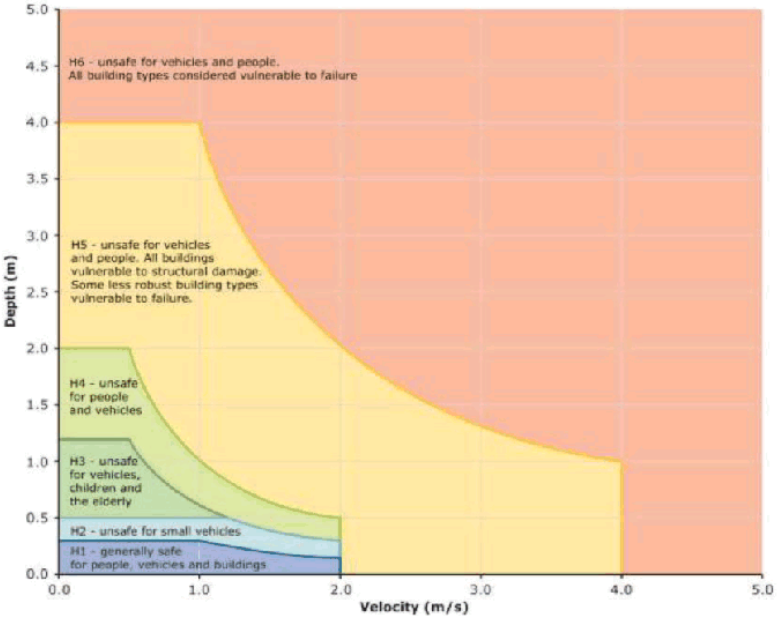


Figure E1 Hazard Vulnerability Classifications (Graphical)

Analysis of the 1% AEP baseline flood hazard within the Splitters Creek catchment generally shows:

- Low to medium hazard (H1 and H2) in some urbanised areas.
- High hazard (H3 and H4) within the floodplain area to the west of Alexandra Street Extended.
- High to extreme hazard (H4 and H5) within some natural and man-made open channels.
- Extreme hazard (H5 or H6) within the Splitters Creek channel and adjacent overbank areas.

Vulnerability Assessment

A baseline vulnerability assessment has been undertaken to identify critical infrastructure and community assets which are at risk of flooding. The following categories have been included in this assessment:

- Water and sewerage infrastructure.
- Emergency services facilities including ambulance, police, fire and hospitals.
- Community infrastructure including schools, day-care centres, nursing homes, retirement villages and community facilities.
- Key road and rail assets.

The following provides a summary of key findings of the vulnerability assessment:

- The Hadgraft Street Sewerage Pump Station (SPS, Ref: 463733) and Stringybark Avenue - Forest Park SPS (Ref: 463751) are predicted to have less than 0.2% flood immunity. It is noted however that the predicted flood levels and hazard are low in the 0.2% AEP event. It is recommended this information be passed onto FRW as the asset owner.
- Low depth flooding is predicted at the Norman Road Hospital in the 0.2% AEP.
- The North Coast Rail Line is predicted to be inundated over ballast level in the 10% AEP event and larger.
- A number of road segments are predicted to experience inundation in the 1EY event and larger. Approximate TOS values ranges from 0.5 hours to approximately 3.5 hours.

Evacuation Routes

Generally local catchment flooding within the Splitters Creek catchment is due to short duration, high intensity rainfall events. The relatively steep upper catchment and urbanisation throughout much of the middle and lower catchment can result in inundation of residential and commercial buildings. In addition, inadequate stormwater infrastructure in some locations results in nuisance flooding within the urbanised catchment due to overland runoff.

Due to the short critical duration of the Splitters Creek catchment, the warning time between the commencement of the rain event and subsequent flood inundation can be short. This limits the opportunity for evacuation, and generally the action taken by the community is to '*shelter in place*' until the flooding has passed.

An assessment of evacuation routes has therefore focussed on areas that become isolated during flooding, as well as high hazard areas that may require flood free evacuation access.

The following areas have been assessed as being isolated and/or lack adequate evacuation routes during the PMF event:

- Bulman Street and Smithwick Street → loses evacuation via Wormald Street to Farm Street.
- Foxglove Avenue, Bushpea Court, Snow Gum Street and Plumb Drive → loses evacuation via Bramble Street to Farm Street.
- Primrose Avenue, Frangipani Court, Red Penda Court, Saintwood Avenue, Lace Flower Court and Silky Oak Court → loses evacuation via Bramble Street to Farm Street.
- Bramble Street, Mistletoe Avenue, Stringybark Avenue, Waratah Court, Messmate Court and Aspen Court → loses evacuation via River Rose Drive to Norman Road.
- Larcombe Street and Sandys Place → loses evacuation vis Macalister Street to Glenmore Road and/or via York Street to Haynes Street

Building Impact Assessment

Council provided a building database, containing ~28,000 buildings digitised within the modelled area. Of these, ~5,900 buildings contained surveyed data, focussed on Creek flooding extents in North Rockhampton and Fitzroy River flood extents in South Rockhampton.

In order to complete a Building Impact Assessment and FDA, a complete building database with floor levels, classifications and ground levels is needed within the modelled area. To achieve this, the following tasks were completed:

- Review of the digitised buildings, to remove erroneous data such as *footpaths*, *building demolished*, *no building* etc.
- Estimation of ~8,540 floor levels and ground levels within the Splitters Creek modelled area, for buildings outside Council's surveyed database.
- Classification of ~10,000 buildings within the Splitters Creek modelled area, in accordance with ANUFLOOD requirements.

The ground level at each building was estimated from aerial survey (LiDAR) provided for the project. Ground levels were assigned to the building footprints based on the average LiDAR elevation within the building extents.

Buildings lacking data regarding number of storeys were assumed to be one storey. Buildings on slabs were assumed to have a minimum habitable floor level of 100mm above ground level. Low set buildings were assumed to have a minimum habitable floor level of 600mm above ground level and high set buildings were assumed to have a minimum habitable floor level of 1,800mm above ground level. Buildings lacking data regarding what type of floor they have were assumed to be on slabs.

Table E2 provides a summary of the number of residential and commercial buildings anticipated to be inundated for various flood events within the Splitters Creek catchment. These results are also shown graphically in Figure E2. Existing buildings which experience flood levels above ground level are noted and buildings inundated above floor level are shown in brackets beside.

Note that the indicated number of buildings is for entire buildings. Residential multi-unit buildings may contain multiple dwellings per building. Also, large commercial/industrial buildings may include multiple businesses.

Table E2 № of Buildings Impacted

AEP (%)	№ Residential Buildings Flood level above property ground level (building inundated above floor level)	№ Commercial Buildings Flood level above property ground level (building inundated above floor level)
1EY	3 (0)	0 (0)
39	9 (0)	0 (0)
18	18 (2)	8 (4)
10	33 (7)	13 (7)
5	72 (24)	18 (12)
2	107 (34)	23 (19)
1	132 (42)	24 (21)
0.2	324 (154)	51 (37)
0.05	457 (222)	68 (51)
PMF	864 (470)	164 (143)

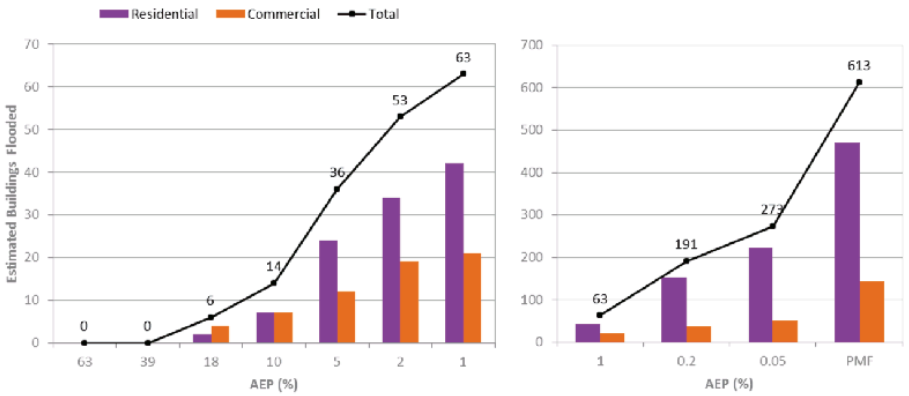


Figure E2 Estimated Buildings with Above Floor Flooding (Number of Buildings)

As shown in Figure E3, median flood depths are generally less than 0.5 metre for each flood event. This indicates that reductions in flood depths of 0.5 metre could significantly reduce overall damage. The figure also shows that a significant number of buildings experience flood depths of 0.2 metre or less during frequent events such as the 1EY flood event, generally corresponding to higher flood damages.

It is noted that where surveyed floor levels were not available, slab on ground buildings were assumed to have a floor level 0.1m above the existing ground level. This is consistent with other studies undertaken in the Rockhampton area, however may result in a higher estimate of inundated buildings and consequential flood damages due to the increased incidence of above floor flooding.

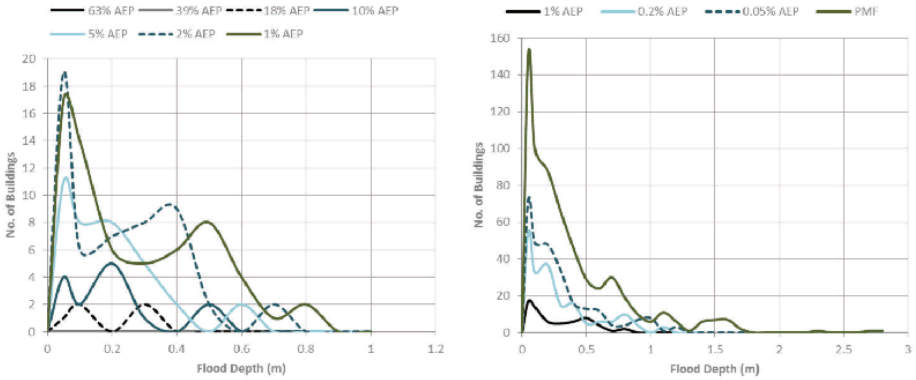


Figure E3 Estimated Flood Depths Above Floor Level by % AEP (Number of Buildings). Note: curves for the 63% AEP and 39% AEP events are not shown as there is not predicted to be above floor flooding in these events.

Flood Damages Assessment

Flood damages, or the anticipated cost to residents, businesses and infrastructure due to flooding, have been estimated using a standardised approach adopted throughout Australia. The approach estimates the tangible impacts flooding has on people, property, and infrastructure, such as flooding of a building and/or contents, the lost opportunity value associated with wages and revenue and flooding of transport and utility networks.

These tangible impacts are estimated based on the depth, likelihood of flooding and type of building. Intangible impacts, such as emotional stress and inconvenience, were not quantified due to their non-tangible nature.

Figure E4 summarises the estimated total flood damages for various flood events according to their AEP. As shown, total damages range from $42,000 (1EY flood event) to $92.7M (PMF event) using the O2 Environmental Damage Curves. Figure E2 shows that zero buildings are expected to be inundated above floor in the 1EY event, whilst 613 buildings are anticipated to be inundated above floor in the PMF event.

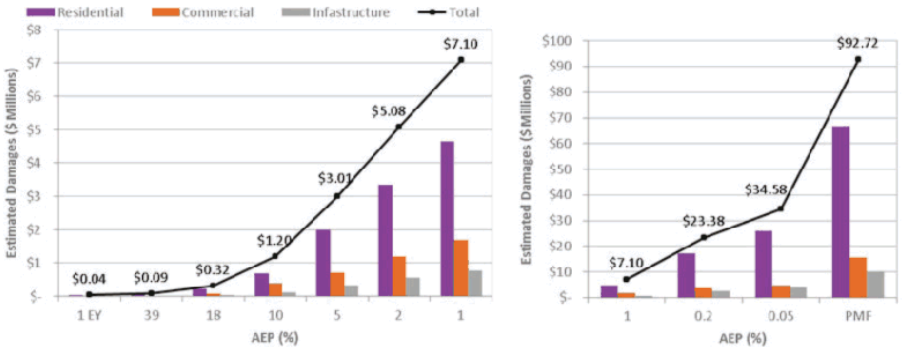


Figure E4 Estimated Flood Damages – O2 Environmental Damage Curves ($ Million)

These figures also demonstrate that residential buildings make up the large majority of impacted buildings, and the estimated flood damages, within the Splitters Creek catchment across the full range of design events assessed.

While the above provides an estimate of potential damages during specific flood events, understanding what damages may be expected on an annual basis is often an easier way to relate risk to residents and businesses. As such, the above damages were converted to Average Annual Damages (AAD) based on the likelihood of the flood event and the total estimated damage during that event.

The calculated AAD for the Splitters Creek catchment is estimated to range from approximately $552,000 to $606,000 per annum.

Figure E5 provides a breakdown of the AAD and building impact assessment. The area in blue corresponds to individual building AAD (residential and non-residential combined) in brackets of $100 per annum. The orange line corresponds to the cumulative AAD for residential and non-residential buildings combined. Note that this does not include infrastructure damages.

As shown, 79% of all buildings exhibit less than $500 damage per annum.

72% of damages are associated with less than 5% of all buildings. This demonstrates that a minority of buildings produce the majority of damages.

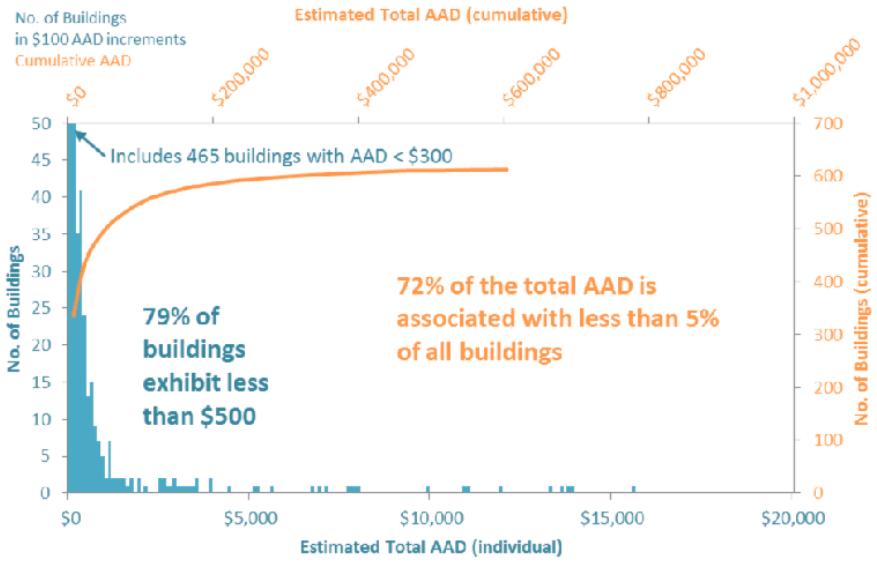


Figure E5 Individual Building vs. Cumulative Total Average Annual Damages

Rainfall Gauge, Maximum Flood Height Gauge and Flood Warning Network

Review of the existing rainfall gauge, maximum flood height gauge and flood warning network yielded the following recommendations/findings for the Splitters Creek catchment:

- Additional rain gauges should be installed at NRSTP and SRSTP.
- Additional maximum flood height gauges should be installed at Stringybark Avenue (Mistletoe Avenue intersection), Richardson Road and Thompson Street intersection, Kluver Street and Hadgraft Street (in the vicinity of the Hadgraft Street SPS).
- There is no current flood warning system within the Splitters Creek catchment.

Recommendations

A number of recommendations have been made in relation to this study:

- It is highly recommended that the TUFLOW model be upgraded to a direct rainfall hydrologic methodology in the future, to align with the outcomes of other studies undertaken for Council as part of the FMS project. Within this scope of works, updated calibration and validation of the model should be undertaken to historical local catchment events.
- Baseline flood mapping (i.e. peak depths, velocities and water surface elevations) provided in this study should be used to update Council's current Planning Scheme layers, at the next available opportunity.
  - Final post-processing of the GIS flood layers is recommended in accordance with the procedures outlined in the ARR, Data Management and Policy Review (AECOM, 2017).
  - Appropriate freeboard provisions should be included, based on the findings of the sensitivity analyses outlined in this study.
- This report and associated outputs should be communicated to the community and relevant stakeholders when appropriate.

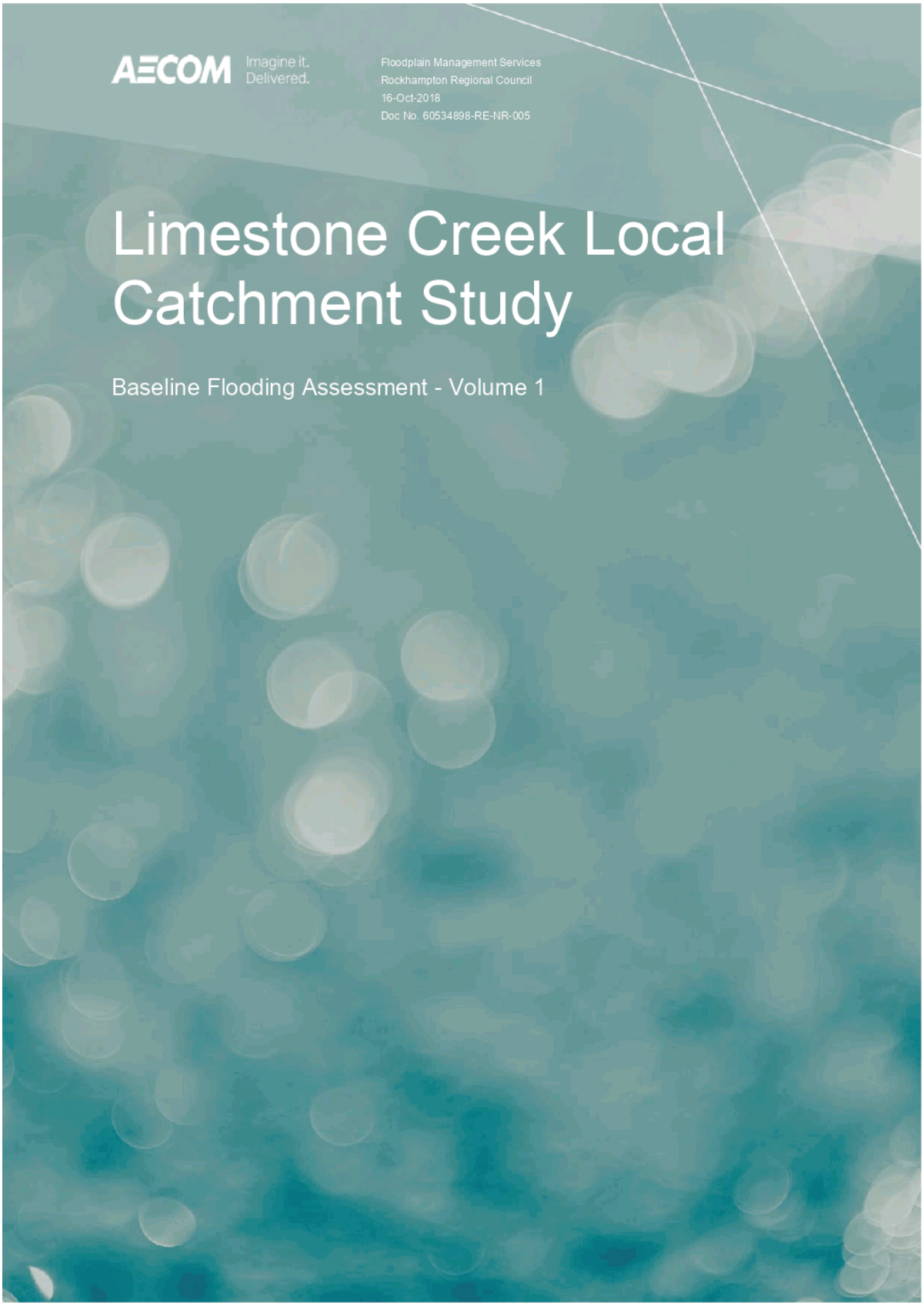
- Hydrologic and hydraulic modelling undertaken for this study has been based on methods and data outlined in Australian Rainfall and Runoff 1987. The 1987 revision has been adopted as per Council's request. It is recommended that future updates to this study incorporate the new 2016 updates.
- It is recommended that Council continue to undertake building floor level survey within the Splitters Creek catchment to supplement the existing building database. An updated FDA should be undertaken when additional building survey data has been obtained and the TUFLOW model has been upgraded to the direct rainfall methodology.
- It is recommended that Council continue to record rainfall and flood heights associated with future Splitters Creek catchment flood events. This data will support ongoing model calibration / validation works that should be undertaken in future updates to this study. The implementation of additional gauges identified in this study is also recommended.
- The baseline vulnerability and flood hazard assessment outputs from this report should be used to support Phase 3 of the Study (Flood Mitigation Options Development and Assessment). Potential mitigation options should be focussed on both creek and overland flooding.

ROCKHAMPTON REGION FLOOD STUDIES

Limestone Creek Executive Summary

Meeting Date: 25 June 2019

Attachment No: 3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Floodplain Management Services
Rockhampton Regional Council
16-Oct-2018
Doc No. 60534898-RE-NR-005
Limestone Creek Local Catchment Study
Baseline Flooding Assessment - Volume 1

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017 calendar year. The FMS program entails the completion of a number of individual floodplain management projects including the Limestone Creek Local Catchment Study, which is the subject of this report.

Flooding in North Rockhampton can occur as a result of three different flood mechanisms:

- Riverine flooding due to rainfall over the Fitzroy River catchment.
- Overland flooding due to rainfall over the local urban catchment.
- Creek flooding due to rainfall over the local creek catchment.

This study focuses on overland and creek flooding due to rainfall over the local catchment.

The key objectives of this study are:

- The development of a detailed hydraulic model based on current best practice procedures, capable of adequately simulating the flood characteristics and behaviour of the local catchment using the latest available data.
- The development of clear and easy to understand flood mapping products for use in future community education and awareness campaigns.
- Determination of key hydraulic controls within the study area which will later be used to inform mitigation options analysis.

The minimisation of flood damages through more informed and reliable planning, appropriate mitigation, education, and disaster response is the key to developing more resilient communities which will ultimately result in future growth and prosperity. The overall objective of this study is to minimise loss, disruption and social anxiety; for both existing and future floodplain occupants.

Catchment Characteristics

The Limestone Creek catchment covers an area of approximately 42.4 km^2 starting within the north-western reaches of Mount Archer National Park, north of Rockhampton-Yeppoon Road, and extending westwards through the Parkhurst industrial estate towards the Fitzroy River. The southern boundary passes through CQ University and residential subdivisions south of the Rockhampton Soundshell. The northern boundary extends from Olive Street in Parkhurst to Belmont Road near the Glenmore Water Treatment Plant. The Fitzroy River forms the western boundary of the catchment.

The Limestone Creek catchment runoff generally flows from east to west towards the Fitzroy River, with the Bruce Highway and North Coast Rail Line the main hydraulic controls within the catchment. Individual sub-catchments flow towards Limestone Creek generally from either the south or north, with the creek channel bisecting the overall catchment.

Hydrologic / Hydraulic Analysis

The Limestone Creek Phase 1 Baseline Flood Study included the development of a TUFLOW model for the lower portion of the Limestone Creek local catchment. This model utilises a combination of runoff-routing and direct rainfall approaches in order to determine the overland flow paths and establish baseline flood extents and depths within the study area.

Recorded data was received and used to compare the model to a local flood event caused by Ex-TC Debbie in March 2017. Holistic calibration and verification was unable to be undertaken due to the lack of historical data. Comparisons revealed that whilst the model is expected to perform well at the upper end of the middle catchment segment (near Boundary Road) in a large event, smaller events do not meet the set tolerances upstream and further downstream of Yaamba Road. It is expected that the model performance (especially during smaller events) will benefit from within-catchment rainfall data, creek channel bathymetric survey and additional anecdotal and gauge data.

Revision B – 16-Oct-2018
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

In order to maintain consistency across North Rockhampton local catchment models, loss and roughness parameters from other successfully calibrated models were adopted as the best estimate until additional recorded data within the catchment becomes available.

Various design events and durations were simulated and assessed to develop an understanding of the key flood behaviours. The critical duration for the catchment was determined to be the 180 minute event. A comparison of the design events found that for events up until the 18% AEP event the road and subsurface drainage infrastructure was able to prevent runoff from entering private property. For larger flood events, the overland flow paths continue to develop. The critical areas of this catchment are industrial properties alongside Limestone Creek and those within the Rachel Drive area. The critical controls within the catchment are the open drain alongside McLaughlin Street, the culverts and bridge crossings of Yamba Road and the railway line.

Sensitivity analyses have been undertaken to highlight the uncertainties in the model results and support the selection and application of an appropriate freeboard provision when using the model outputs for planning purposes.

It is recommended that the model be reviewed when additional flood event and topographic data becomes available. Updates to the model should also be undertaken once the Rockhampton Northern Access Upgrade Project is completed by the Department of Transport and Main Roads (currently planned for 2018).

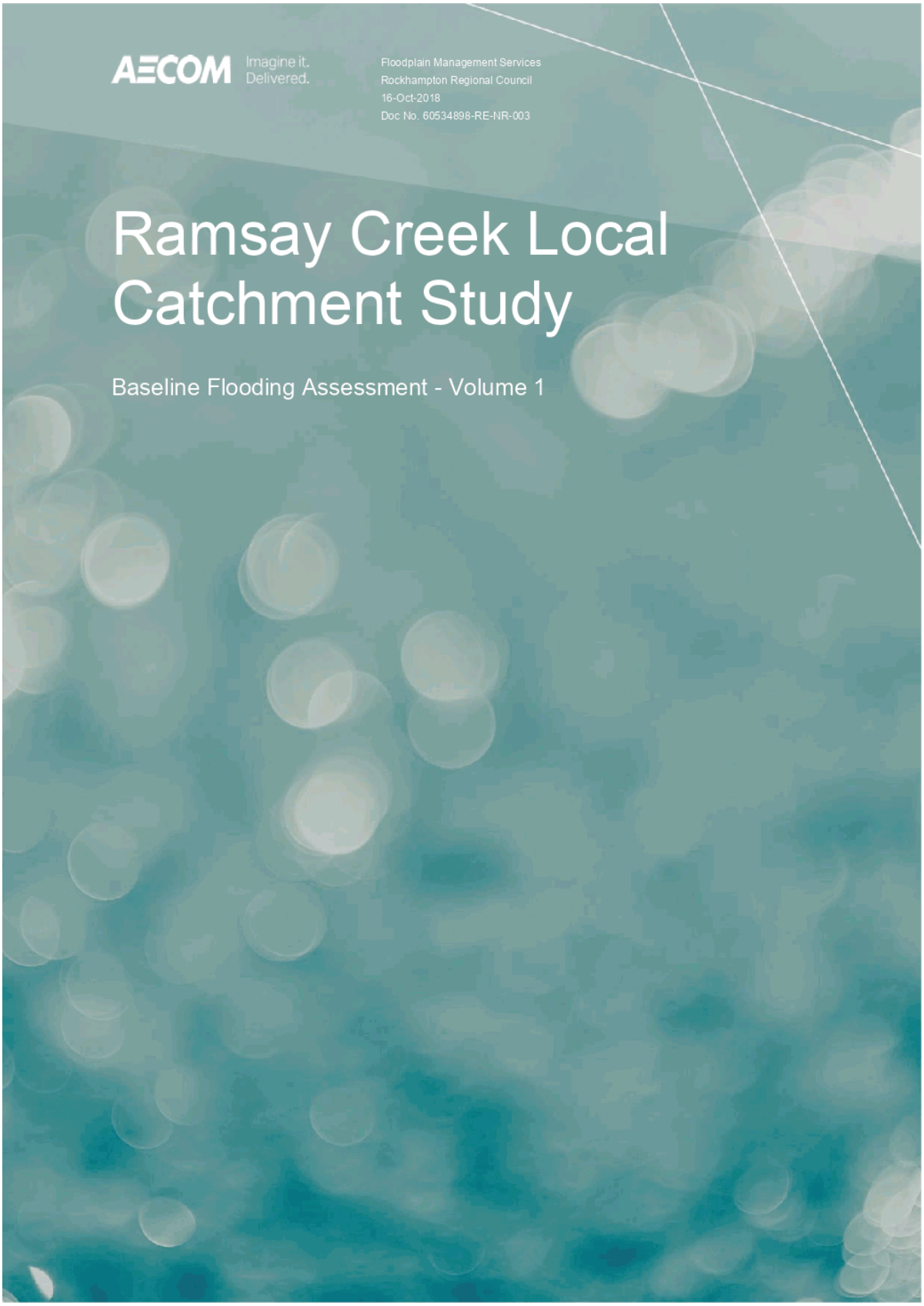
Revision B – 16-Oct-2018
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

ROCKHAMPTON REGION FLOOD STUDIES

Ramsay Creek Executive Summary

Meeting Date: 25 June 2019

Attachment No: 4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Floodplain Management Services
Rockhampton Regional Council
16-Oct-2018
Doc No. 60534898-RE-NR-003
Ramsay Creek Local Catchment Study
Baseline Flooding Assessment - Volume 1

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017 calendar year. The FMS program entails the completion of a number of individual floodplain management projects including the Ramsay Creek Local Catchment Study, which is the subject of this report.

Flooding in North Rockhampton can occur as a result of three different flood mechanisms:

- Riverine flooding due to rainfall over the Fitzroy River catchment.
- Overland flooding due to rainfall over the local urban catchment.
- Creek flooding due to rainfall over the local creek catchment.

This study focuses on overland and creek flooding due to rainfall over the local catchment.

The key objectives of this study are:

- The development of a detailed hydraulic model based on current best practice, capable of adequately simulating the flood characteristics and behaviour of the local catchment using the latest available data.
- The development of clear and easy to understand flood mapping products for use in future community education, awareness campaigns and planning scheme updates.
- Determination of key hydraulic controls within the study area to support the future assessment of potential flood mitigation options.

The minimisation of flood damages through more informed and reliable planning, appropriate mitigation, education, and disaster response is the key to developing more resilient communities which will ultimately result in future growth and prosperity. The overall objective of this study is to minimise loss, disruption and social anxiety; for both existing and future floodplain occupants.

Catchment Characteristics

The Ramsay Creek catchment covers an area of approximately 18.5 km^2 starting in the mountainous areas to the North of Rockhampton-Yeppoon Road and extending westwards to the Fitzroy River. The southern boundary of the Ramsay Creek catchment adjoins the northern boundary of the Limestone Creek catchment, and extends from Olive Street in Parkhurst to Belmont Road near the Glenmore Water Treatment Plant. The northern catchment boundary passes centrally through The Olive Estate and the southern section of Glenlee estate. The catchment then traverses open floodplain areas to the confluence with the Fitzroy River. The western boundary is the Fitzroy River.

The upper Ramsay Creek catchment varies in elevation from 229mAHD to 32mAHD, covering an area of approximately 7.0km^2. The land use in the upper catchment is predominantly dense bushland and open grazing land with very little urbanisation. Overland runoff from the catchment quickly accumulates within the upper reach of Ramsay Creek due to the steep natural topography and is conveyed by the natural creek channel towards The Olive Estate.

Ramsay Creek is an ephemeral meandering system consisting of low flow paths and riffle pools within the mid and lower portions of the catchment. The natural creek bed material is generally silty / sandy soils. Riparian vegetation along the creek can also vary from very dense grasses, shrubs and trees – to very limited vegetation in higher velocity sections of the reach.

Urban overland flow paths within the Ramsay Creek catchment generally follow defined natural or constructed channels and road corridors. The Ramsay Creek catchment runoff generally flows from east to west towards the Fitzroy River, with the Bruce Highway and North Coast Rail Line the main controls within the catchment. Individual sub-catchments flow towards Ramsay Creek from either the south or north, with the creek channel bisecting the overall catchment.

Revision C – 16-Oct-2018
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

Hydrologic / Hydraulic Analysis

The Ramsay Creek Study included the development of a 1D/2D dynamically linked TUFLOW model for the lower urbanised portion of the Ramsay Creek catchment. This model utilises a combination of runoff-routing and direct rainfall approaches in order to simulate overland flow paths and creek flood behaviour in order to establish baseline flood extents and depths within the study area.

Input data for the catchment was sourced and utilised within this process, although the absence of anecdotal and recorded flood event data meant the model was unable to be calibrated and validated to historical flood events. In order to maintain consistency across the North Rockhampton local catchment models, loss and roughness parameters from other successfully calibrated models were adopted as the best estimate until recorded data within the catchment becomes available.

Various design flood events and storm durations were simulated and assessed to develop an understanding of key flood behaviour. The critical duration for the catchment was determined to be the 90 minute event. A comparison of the design events found that for events up until the 39% AEP event the road and subsurface drainage infrastructure was able to prevent runoff from entering private property. For larger flood events, the overland flow paths continue to develop. The critical areas of this catchment are properties north of Stirling Drive and commercial parcels fronting Yaamba Road. The critical controls within the catchment are the open channel drains between developed parcels and cross-drainage structures beneath major road and rail corridors.

Sensitivity analyses have been undertaken to highlight the uncertainties in the model results and support the selection and application of an appropriate freeboard provision when using the model outputs for planning purposes.

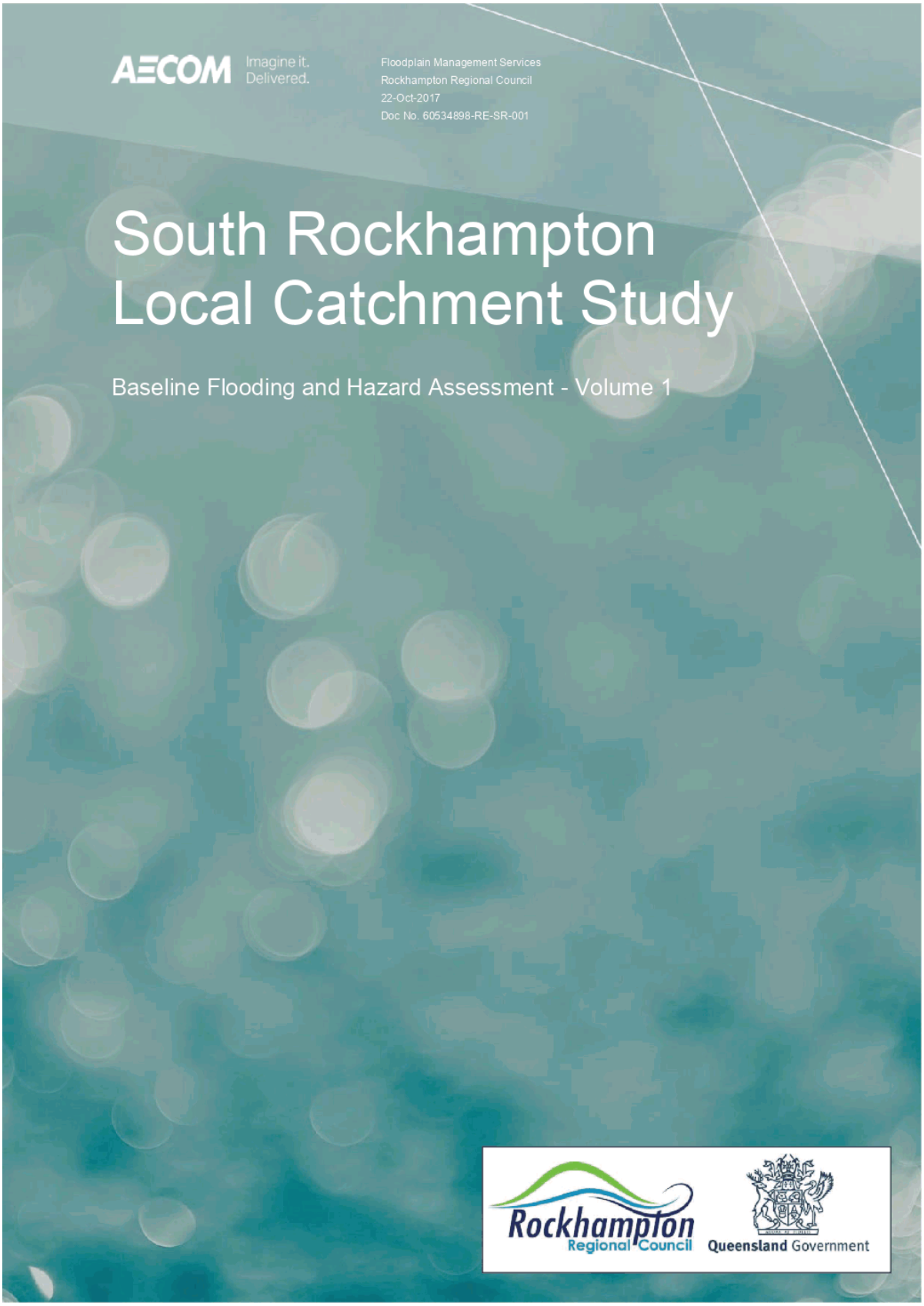
It is recommended that the model be reviewed when flood event data becomes available. Updates to the model should also be undertaken once the Rockhampton Northern Access Upgrade Project is completed by the Department of Transport and Main Roads (currently planned for 2018).

ROCKHAMPTON REGION FLOOD STUDIES

South Rockhampton Catchment Executive Summary

Meeting Date: 25 June 2019

Attachment No: 5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Floodplain Management Services
Rockhampton Regional Council
22-Oct-2017
Doc No. 60534898-RE-SR-001
South Rockhampton
Local Catchment Study
Baseline Flooding and Hazard Assessment - Volume 1
Rockhampton
Regional Council
Queensland Government

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017 calendar year. The FMS program entails the completion of a number of individual floodplain management projects including the South Rockhampton Local Catchment Study, which is the subject of this report.

Flooding in South Rockhampton can occur as a result of two different flood mechanisms:

- Riverine flooding due to rainfall over the Fitzroy River catchment.
- Flash flooding due to rainfall over the local urban catchment.

This study focuses on flash flooding due to rainfall over the local urban catchment.

The key objectives of this study are:

- The development of a detailed hydraulic model based on current best practice procedures, capable of adequately simulating the flood characteristics and behaviour of the local catchment using the latest available data.
- The assessment of existing flood risk within the study area. It is expected that these results will be used to inform long term infrastructure planning, future emergency planning and floodplain management.
- The development of clear and easy to understand flood mapping products for use in future community education and awareness campaigns.
- Determination of key hydraulic controls within the study area which will later be used to inform mitigation options analysis.

The minimisation of flood damages through more informed and reliable planning, appropriate mitigation, education, and disaster response is the key to developing more resilient communities which will ultimately result in future growth and prosperity. The overall objective of this study is to minimise loss, disruption and social anxiety; for both existing and future floodplain occupants.

Catchment Characteristics

The South Rockhampton urban catchment covers approximately 10.8 km^2 within the suburbs of The Range, Rockhampton City, Allenstown, Depot Hill and Port Curtis. The western catchment boundary follows the crest of the Range, which is roughly aligned to Agnes Street. Elevations along this ridgeline reach up to 65mAHD with moderate slopes (5% - 10%) directing stormwater runoff east through the City towards the primary drainage path, known locally as the 'Main Drain'. For the purposes of this report the Main Drain upstream of the North Coast Rail Line is referred to as Upper Main Drain, with the area downstream of the North Coast Rail Line referred to as Lower Main Drain.

The catchments within the Rockhampton City (adjacent to the Upper Main Drain) discharge towards the Fitzroy River, with runoff south of this catchment draining to both the Lower Main Drain (via overland flow paths) and the Fitzroy River (via an underground drainage system). These catchments have flat slopes in comparison to the upper reaches of the catchment.

The lower catchment south of the rail and main drain has little natural grade with the majority being below 6 mAHD. This wetland area is known as the Fiddes Street Lagoon area and commonly retains water during the wet season. Most of the lagoon area drains to the south-east via cross-drainage under Fiddes Street towards Gavial Creek, which outlets to the Fitzroy River.

Hydrologic / Hydraulic Analysis

The South Rockhampton Phase 1 Baseline Flood Study included the development of a TUFLOW model for the urban South Rockhampton catchment. This model utilises a direct rainfall approach to modelling to determine the overland flow paths and establish baseline flood extents and depths within the study area.

Revision D – 22-Oct-2017
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

Anecdotal and recorded data for the catchment was used to calibrate and verify the TUFLOW model. The model was calibrated to a local flood event caused by TC Marcia in February 2015 and verified to two other local flood events, namely Ex-TC Debbie in March 2017 and Ex-TC Oswald in January 2013. The model calibrated very well to the 2015 event and was verified by the 2017 event. The verification of the 2013 event was not as successful due to some variances in rainfall data and blockage of some critical drainage structures.

On completion of the calibration, various design events and durations were run and results extracted. The critical duration for the catchment was determined to be the 120 minute event. A comparison of the design events found that for events up until the 39% AEP event the road and subsurface drainage infrastructure was able to prevent runoff from entering private property. For larger flood events, the overland flow paths continue to develop. The critical areas of this catchment are any properties surrounding the Upper Main Drain area. The critical controls within the catchment are the cross drainage structures which move water from one side of the railway to the other.

The modelling has confirmed that there are a number of key hydraulic controls within the catchment – particularly the Main Drain, Rail Embankment and Lower Dawson Road.

Sensitivity analyses have been undertaken to highlight the uncertainties in the model results, which will support the selection and application of an appropriate freeboard provision when using the model outputs for planning purposes.

Baseline Flood Hazard and Vulnerability Assessment

Following completion of baseline model development, design event modelling and sensitivity analyses; a flood hazard and vulnerability assessment was completed for the South Rockhampton urban catchment. This included:

- Flood hazard analysis.
- Vulnerability assessment of key infrastructure.
- Evacuation route analysis.
- Building inundation and impact assessment.
- Flood Damages Assessment (FDA).

Each of these aspects has been discussed in further detail below.

Flood Hazard

Flood hazard categorisation provides a better understanding of the variation of flood behaviour and hazard across the floodplain and between different events. The degree of hazard varies across a floodplain in response to the following factors:

- Flow depth.
- Flow velocity.
- Rate of flood level rise (including warning times).
- Duration of inundation.

Identifying hazards associated with flood water depth and velocity help focus management efforts on minimizing the risk to life and property. As such, a series of Flood Hazard Zones have been developed according to ARR 2016, in alignment with recommendations made in the ARR, Data Management and Policy Review (AECOM, 2017).

Figure E1 shows the ARR 2016 flood hazard classification limits, which are the adopted hazard categories for this project, along with a general description of the risk associated with each category.

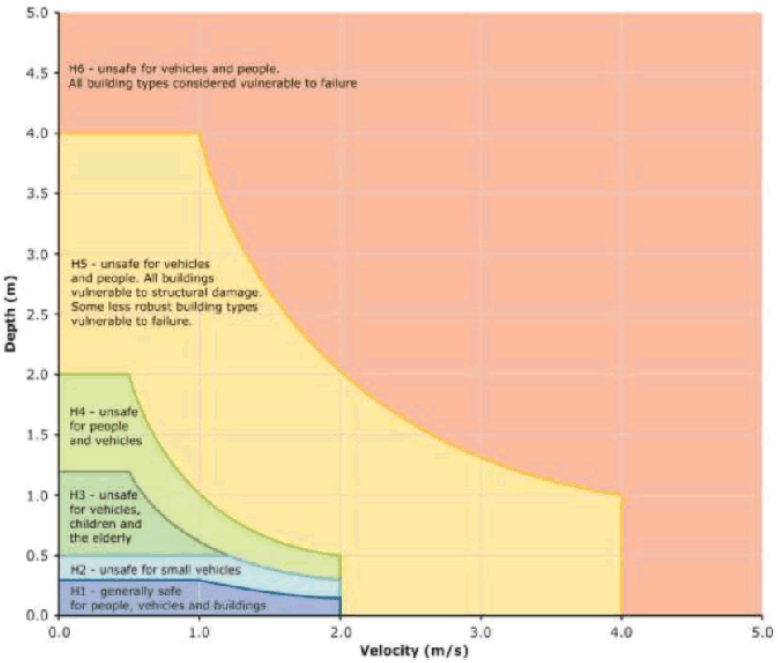


Figure E1 Hazard Vulnerability Classifications (Graphical)

Analysis of the 1% AEP baseline flood hazard within the South Rockhampton urban catchment generally shows:

- Low to medium hazard (H1 and H2) across the majority of urbanised areas west of Gladstone Road and within the CBD and urbanised Depot Hill areas.
- High hazard (H3 and H4) within the Upper Main Drain, Lower Main Drain, Fiddes Street wetland, Stanley Street / Talford Street west of Gladstone Road, Saleyards Park, Kettle Park and O'Shanesy Park areas.
- Extreme hazard (H5) within portions of the Upper Main Drain, Lower Main Drain, Kettle Park, O'Shanesy Park and the South Rockhampton Cemetery (main channel flow path only).

Vulnerability Assessment

A baseline vulnerability assessment has been undertaken to identify critical infrastructure and community assets which are at risk of flooding. The following categories have been included in this assessment:

- Water and sewerage infrastructure.
- Emergency services facilities including ambulance, police, fire and hospitals.
- Community infrastructure including schools, day-care centres, nursing homes, retirement villages and community facilities.
- Key road and rail assets.

The following provides a summary of key findings of the vulnerability assessment:

- The Fitzroy Street Sewage Pump Station (SPS, Ref: 463755), Arthur Street SPS (Ref: 463754), Lower Dawson Road SPS (Ref: Caravan Park) and Ferguson Street SPS (Ref: 463756) are predicted to have less than 0.2% AEP flood immunity. It is noted however that some of these pump stations are below ground and improvements to flood immunity would be very difficult to achieve. It is recommended this information be passed onto FRW as the asset owner.
- Low depth flooding is predicted at TAFE Rockhampton, Blue Care Homes and Allies Early Learning Centre in the 0.2% AEP event.
- Frequent flooding is predicted at Rockhampton Fire Station, Rockhampton Ambulance Centre, The Cathedral College and Allenstown State School.
- The North Coast Rail Line is predicted to experience frequent flooding to Top of Ballast level, within the city reaches, with some areas predicted to be inundated during the 1EY local catchment event.
- A number of road segments are predicted to experience inundation in the 1EY event and larger. Estimated Time of Submergence ranges from 2.0 hours to approximately 5.5 hours in the 1% AEP event.

Evacuation Routes

Generally local catchment flooding within the South Rockhampton catchment is due to short duration, high intensity rainfall events. The relatively steep upper catchment and urbanisation throughout much of the upper, middle and lower catchment can result in inundation of residential and commercial buildings. In addition, inadequate stormwater infrastructure in some locations results in nuisance flooding within the urbanised catchment due to overland runoff.

Due to the short critical duration of the South Rockhampton catchment, the warning time between the commencement of the rain event and subsequent flood inundation can be short. This limits the opportunity for evacuation, and generally the action taken by the community is to '*shelter in place*' until the flooding has passed.

An assessment of evacuation routes has therefore focussed on areas that become isolated during flooding, as well as high hazard areas that may require flood free evacuation access.

The following areas have been assessed as being isolated and/or lack adequate evacuation routes during the PMF event:

- Depot Hill Area → Bounded by Arthur Street to the north, West Street to the west, Lucius Street to the south and Denison Street to the east.
- Area bounded by Stanley Street, Bolsover Street, O'Connell Street and Quay Street.
- Area bounded by Cambridge Street, Murray Street, Denham Street and Denison Street.

Building Impact Assessment

Council provided a building database containing ~28,000 digitised buildings focussed on Creek flooding extents in North Rockhampton and Fitzroy River flood extents in South Rockhampton. Of these, ~5,900 buildings contained surveyed data.

In order to complete a Building Impact Assessment and FDA, a complete building database with floor levels, classifications and ground levels is needed within the modelled area. To achieve this, the following tasks were completed:

- Review of the digitised buildings, to remove erroneous data such as *footpaths*, *building demolished*, *no building* etc.
- Estimation of ~5,600 floor levels and ground levels within the South Rockhampton modelled area, for buildings outside Council's surveyed database.
- Classification of ~7,040 buildings within the South Rockhampton modelled area, in accordance with ANUFLOOD requirements.

The ground level at each building was estimated from aerial survey (LiDAR) provided for the project. Ground levels were assigned to the building footprints based on the average LiDAR elevation within the building extents.

Buildings lacking data regarding number of storeys were assumed to be one storey. Buildings on slabs were assumed to have a minimum habitable floor level of 100mm above ground level. Low set buildings were assumed to have a minimum habitable floor level of 600mm above ground level and high set buildings were assumed to have a minimum habitable floor level of 1,800mm above ground level. Buildings lacking data regarding what type of floor they have were assumed to be on slabs.

Table E2 provides a summary of the number of residential and commercial buildings anticipated to be inundated for various flood events within the South Rockhampton urban catchment. These results are also shown graphically in Figure E2. Existing buildings which experience flood levels above ground level are noted and buildings inundated above floor level are shown in brackets beside.

Note that the indicated number of buildings is for entire buildings. Residential multi-unit buildings may contain multiple dwellings per building. Also, large commercial/industrial buildings may include multiple businesses.

Table E2 № of Buildings Impacted

AEP (%)	№ Residential Buildings Flood level above property ground level (building inundated above floor level)	№ Commercial Buildings Flood level above property ground level (building inundated above floor level)
1EY	37 (5)	13 (7)
39	100 (17)	26 (15)
18	246 (37)	59 (35)
10	328 (54)	82 (50)
5	351 (66)	95 (61)
2	485 (100)	145 (98)
1	574 (124)	172 (124)
0.2	943 (241)	266 (198)
0.05	1182 (333)	330 (273)
PMF	1991 (713)	681 (580)

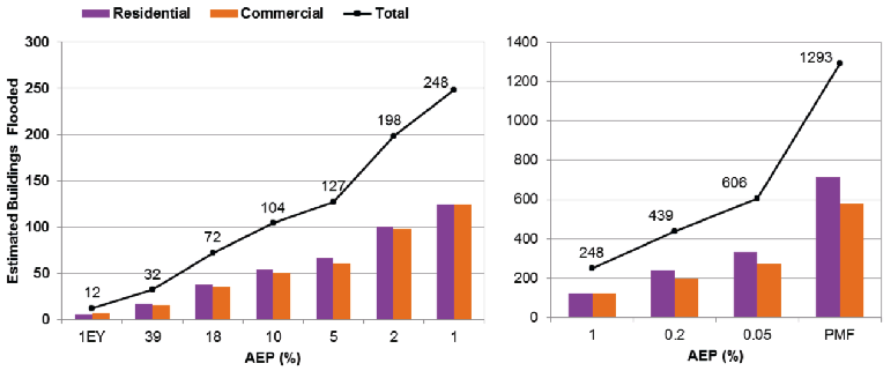


Figure E2 Estimated Buildings with Above Floor Flooding (Number of Buildings)

As shown in Figure E3, median flood depths are generally less than 0.2 metre for each flood event. This indicates that reductions in flood depths of 0.2 metre could significantly reduce overall damage. The figure also shows that a significant number of buildings experience flood depths of 0.2 metre or less during frequent events such as the 1EY flood event, generally corresponding to higher flood damages.

It is noted that where surveyed floor levels were not available, slab on ground buildings were assumed to have a floor level 0.1m above the existing ground level. This is consistent with other studies undertaken in the Rockhampton area, however may result in a higher estimate of inundated buildings and consequential flood damages due to the increased incidence of above floor flooding.

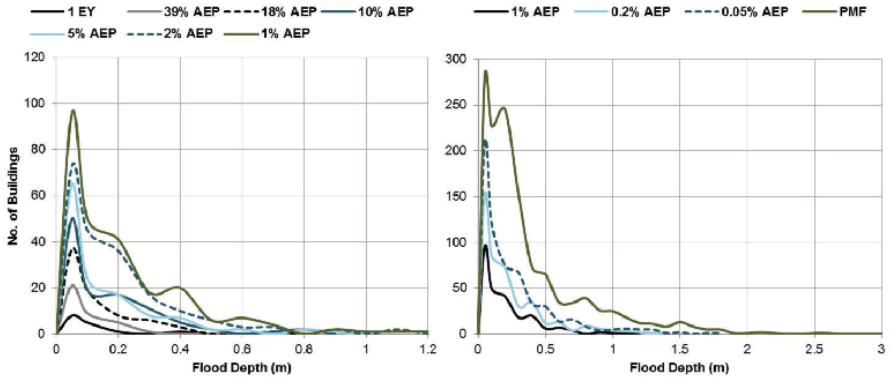


Figure E3 Estimated Flood Depths Above Floor Level by % AEP (Number of Buildings)

Flood Damages Assessment

Flood damages, or the anticipated cost to residents, businesses and infrastructure due to flooding, have been estimated using a standardised approach adopted throughout Australia. The approach estimates the tangible impacts flooding has on people, property, and infrastructure, such as flooding of a building and/or contents, the lost opportunity value associated with wages and revenue and flooding of transport and utility networks. These tangible impacts are estimated based on the depth, likelihood of flooding and type of building. Intangible impacts, such as emotional stress and inconvenience, were not quantified due to their non-tangible nature.

Figure E4 summarises the estimated total flood damages for various flood events according to their AEP. As shown, total damages range from $557,000 (1EY flood event) to $128M (PMF event) using the O2 Environmental Damage Curves. Figure 34 shows that 12 buildings are expected to be inundated above floor in the 1EY event, whilst 1,293 buildings are anticipated to be inundated above floor in the PMF event.

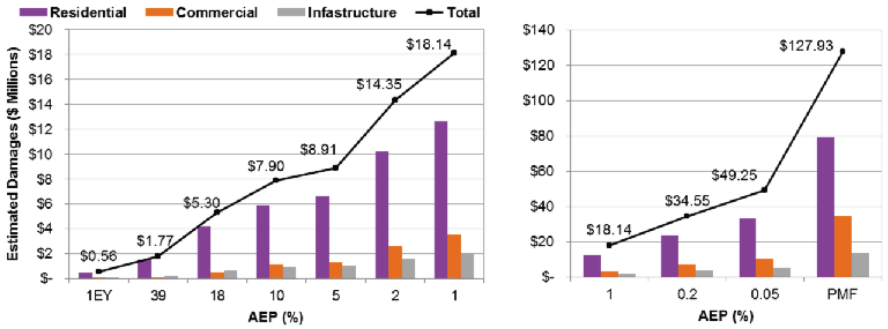


Figure E4 Estimated Flood Damages – O2 Environmental Damage Curves ($ Million)

These figures also demonstrate that residential buildings make up the large majority of impacted buildings, and the estimated flood damages, within the South Rockhampton local catchment across the full range of design events assessed.

While the above provides an estimate of potential damages during specific flood events, understanding what damages may be expected on an annual basis is often an easier way to relate risk to residents and businesses. As such, the above damages were converted to Average Annual Damages (AAD) based on the likelihood of the flood event and the total estimated damage during that event.

The calculated AAD for the South Rockhampton urban catchment is estimated to range from approximately $2,754,000 to $2,815,000 per annum.

Figure E5 provides a breakdown of the AAD and building impact assessment. The area in blue corresponds to individual building AAD (residential and non-residential combined) in brackets of $100 per annum. The orange line corresponds to the cumulative AAD for residential and non-residential buildings combined. Note that this does not include infrastructure damages.

As shown, 88% of all buildings exhibit less than $500 damage per annum.

80% of damages are associated with less than 5% of all buildings. This demonstrates that a minority of buildings produce more than half of damages.

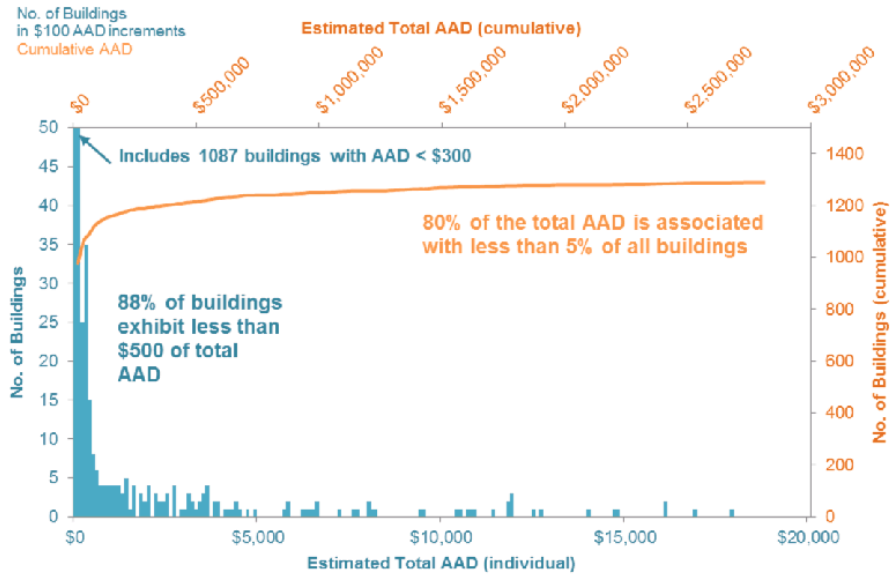


Figure E5 Individual Building vs. Cumulative Total Average Annual Damages

Rainfall Gauge, Maximum Flood Height Gauge and Flood Warning Network

Review of the existing rainfall gauge, maximum flood height gauge and flood warning network yielded the following recommendations/findings for the South Rockhampton catchment:

- Additional rain gauges should be installed at NRSTP and SRSTP.
- Additional maximum flood height gauges should be installed at:
  - Stanley Street / Talford Street corner, near Gladstone Road Seafoods;
  - West Street (north of Stanley Street), within the Upper Main Drain reserve; and
  - Elizabeth Street / Saleyards Street, adjacent the rail corridor.
- There is no current flood warning system within the South Rockhampton catchment.

Recommendations

A number of recommendations have been made in relation to this study:

- Baseline flood mapping (i.e. peak depths, velocities and water surface elevations) provided in this study should be used to update Council's current Planning Scheme layers, at the next available opportunity.
  - Final post-processing of the GIS flood layers is recommended in accordance with the procedures outlined in the ARR, Data Management and Policy Review (AECOM, 2017).
  - Appropriate freeboard provisions should be included, based on the findings of the sensitivity analyses outlined in this study. It is further recommended that Council apply additional freeboard (nominally 0.5 m) in the Lower Main Drain area (upstream of the rail line) for planning purposes.
- This report and associated outputs should be communicated to the community and relevant stakeholders when appropriate.

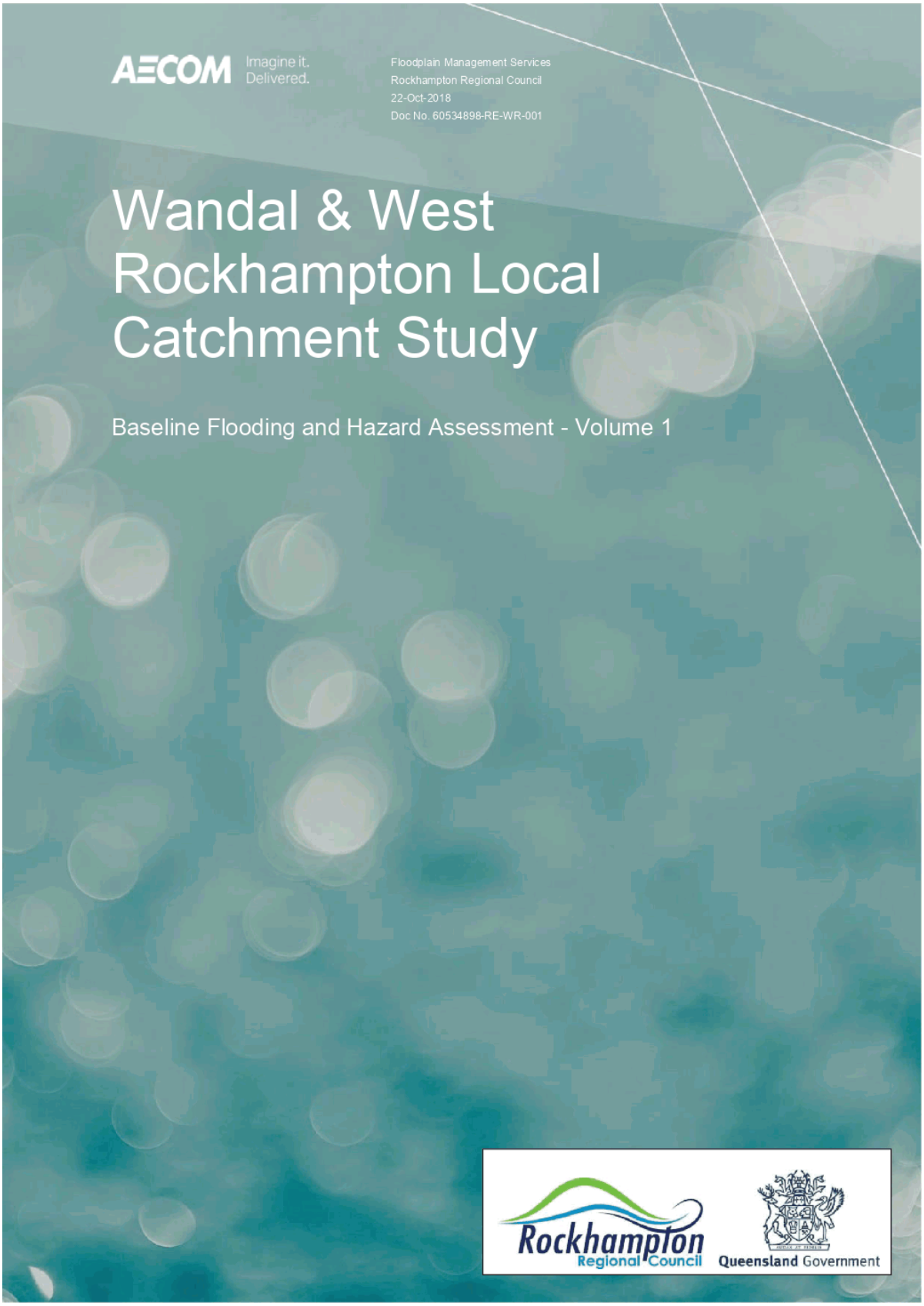
- Hydrologic and hydraulic modelling undertaken for this study has been based on methods and data outlined in Australian Rainfall and Runoff 1987. The 1987 revision has been adopted as per Council's request. It is recommended that future updates to this study incorporate the new 2016 updates.
- It is recommended that Council continue to undertake building floor level survey within the South Rockhampton catchment to supplement the existing building database. An updated FDA should be undertaken when additional building survey data has been obtained.
- It is recommended that Council continue to record rainfall and flood heights associated with future South Rockhampton catchment flood events. This data will support ongoing model calibration / validation works that should be undertaken in future updates to this study. The implementation of additional gauges identified in this study is also recommended.
- The assessment of flood behaviour within the South Rockhampton catchment has been the subject of previous technical investigations associated with the South Rockhampton Flood Levee project in 2014.
    - It is noted that the previous modelling used for the levee project has been updated and these results should be reviewed and adopted for the South Rockhampton Levee project moving forward. It may be necessary to make alterations to the current design to account for the latest modelling undertaken.
- The baseline vulnerability and flood hazard assessment outputs from this report should be used to support Phase 3 of the Study (Flood Mitigation Options Development and Assessment). Furthermore, the assessment of potential flood mitigation options should consider the implications to the South Rockhampton Flood Levee.

ROCKHAMPTON REGION FLOOD STUDIES

West Rockhampton Catchment Executive Summary

Meeting Date: 25 June 2019

Attachment No: 6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Rockhampton Regional Council
22-Oct-2018
Doc No. 60534898-RE-WR-001
Wandal & West Rockhampton Local Catchment Study
Baseline Flooding and Hazard Assessment - Volume 1
Rockhampton Regional Council
Queensland Government

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017 calendar year. The FMS program entails the completion of a number of individual floodplain management projects including the Wandal and West Rockhampton Local Catchment Study, which is the subject of this report.

Flooding in Wandal and West Rockhampton can occur as a result of two different flood mechanisms:

- Riverine flooding due to rainfall over the Fitzroy River catchment.
- Flash flooding due to rainfall over the local urban catchment.

This study focuses on flash flooding due to rainfall over the local urban catchment.

The key objectives of this study are:

- The development of a detailed hydraulic model based on current best practice procedures, capable of adequately simulating the flood characteristics and behaviour of the local catchment using the latest available data.
- The assessment of existing flood risk within the study area. It is expected that these results will be used to inform long term infrastructure planning, future emergency planning and floodplain management.
- The development of clear and easy to understand flood mapping products for use in future community education and awareness campaigns.
- Determination of key hydraulic controls within the study area which will later be used to inform mitigation options analysis.

The minimisation of flood damages through more informed and reliable planning, appropriate mitigation, education, and disaster response is the key to developing more resilient communities which will ultimately result in future growth and prosperity. The overall objective of this study is to minimise loss, disruption and social anxiety; for both existing and future floodplain occupants.

Catchment Characteristics

The Wandal and West Rockhampton urban catchment covers approximately 16.3 km^2 within the suburbs of The Range, Wandal, Pink Lily and West Rockhampton which also encompasses the Rockhampton Airport.

The western catchment boundary follows Nine Mile Road and continues along Old Nine Mile Road to form the southern boundary. Further east, the southern boundary crosses Crescent lagoon, the fringes of Murray Lagoon and extends to the southern tip of The Range near Yeppen Lagoon. From this southernmost point the catchment boundary tends north along the crest of The Range until it meets the Rockhampton Base Hospital. After this point the catchment roughly follows North Street to the Fitzroy River. The eastern boundary continues up the Fitzroy River to just north of the Lion Creek outlet. The northern boundary extends from the Fitzroy River along Dargel Road to Ridgelands Road at the Nine Mile Road turnoff.

Hydrologic / Hydraulic Analysis

The Phase 1 Baseline Flood Study included the development of a TUFLOW model for the urban Wandal and West Rockhampton catchment. This model utilises a direct rainfall approach to modelling to determine the overland flow paths and establish baseline flood extents and depths within the study area.

Data for the catchment was sourced and utilised within this process, the anecdotal and recorded data was vital in the model development. Anecdotal and recorded data was received and used to calibrate the model to a local flood event caused by Ex-TC Debbie in March 2017. The model calibrated well to the 2017 event. At this stage, it is recommended that additional verification events are assessed in the future to gain further confidence in the modelling outputs.

Revision B – 22-Oct-2018
Prepared for – Rockhampton Regional Council – ABN: 59 923 523 766

On completion of the calibration, various design events and durations were run and results extracted. The critical duration for the catchment was determined to be the 90 minute event. A comparison of the design events found that for events up until the 39% AEP event the road and subsurface drainage infrastructure was able to prevent runoff from entering private property. For larger flood events, the overland flow paths continue to develop.

Sensitivity analyses have been undertaken to highlight the uncertainties in the model results, which will support the selection and application of an appropriate freeboard provision when using the model outputs for planning purposes.

Baseline Flood Hazard and Vulnerability Assessment

Following completion of baseline model development, design event modelling and sensitivity analyses; a flood hazard and vulnerability assessment was completed for the Wandal and West Rockhampton catchment. This included:

- Flood hazard analysis.
- Vulnerability assessment of key infrastructure.
- Evacuation route analysis.
- Building inundation and impact assessment.
- Flood Damages Assessment (FDA).

Each of these aspects has been discussed in further detail below.

Flood Hazard

Flood hazard categorisation provides a better understanding of the variation of flood behaviour and hazard across the floodplain and between different events. The degree of hazard varies across a floodplain in response to the following factors:

- Flow depth.
- Flow velocity.
- Rate of flood level rise (including warning times).
- Duration of inundation.

Identifying hazards associated with flood water depth and velocity help focus management efforts on minimizing the risk to life and property. As such, a series of Flood Hazard Zones have been developed according to ARR 2016 (Book 6, Chapter 7: General Flood Hazard Curves, Section 7.2.7), in alignment with recommendations made in the ARR, Data Management and Policy Review (AECOM, 2017).

Figure E1 shows the adopted hazard categories along with a general description of the risk associated with each category.

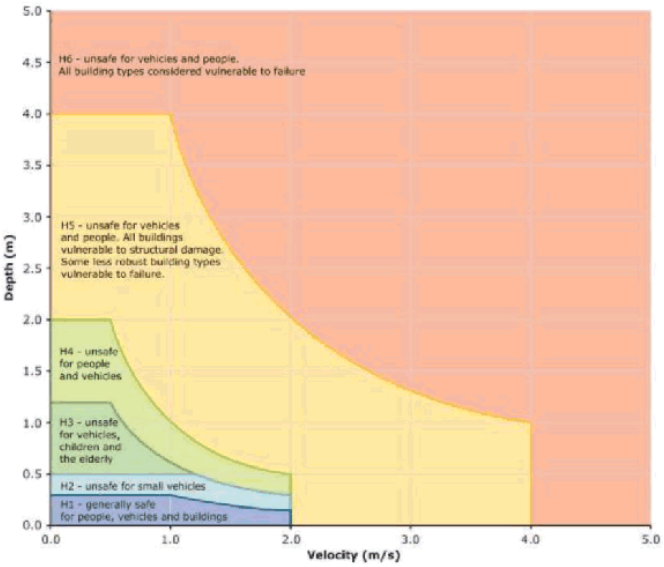


Figure E1 Hazard Vulnerability Classifications (Graphical)

Analysis of the 1% AEP baseline flood hazard within the Wandal and West Rockhampton catchment generally shows:

- Low to medium hazard (H1 and H2) across the majority of urbanised areas within the catchment.
- High hazard (H3 and H4) within a majority of natural and man-made channels and open areas such as Jardine Park and Alf Kele Memorial Rotary Park.
- High to extreme hazard (H4 and H5) within major natural and man-made flowpaths between Heilbronn Street and Western Street, along Pearson Street, along North Street and along the flowpath traversing Ann Street.
- Extreme hazard (H5 or H6) within the Lion Creek channel.

Vulnerability Assessment

A baseline vulnerability assessment has been undertaken to identify critical infrastructure and community assets which are at risk of flooding. The following categories have been included in this assessment:

- Water and sewerage infrastructure.
- Emergency services facilities including ambulance, police, fire and hospitals.
- Community infrastructure including schools, day-care centres, nursing homes, retirement villages and community facilities.
- Key road and rail assets.

The following provides a summary of key findings of the vulnerability assessment:

- The sewerage pump stations at Jardine Park and Kele Park are predicted to have less than 39% AEP flood immunity, with the Melbourne Street Sewerage Pump Station having less than 18% AEP flood immunity. It is noted that in a 1% AEP event, the pump station at Jardine Park is predicted to reach hazard class 4 which is unsafe for both people and vehicles. It is recommended this information be passed onto FRW as the asset owner.
- Flood inundation is predicted at Rockhampton State High School in the 39% AEP event, however the low depth and velocity of flooding is expected to present a low risk until larger events where the hazard reaches Class 2.
- A number of roads are predicted to experience inundation in the 1EY event and larger. Predicted TOS generally ranges from 1 to 2 hours, with Canoona Road predicted to be inundated for almost 1 day in a 1% AEP 90min event.

Evacuation Routes

Generally local catchment flooding within the Wandal and West Rockhampton catchment is due to short duration, high intensity rainfall events. The relatively steep upper catchment and urbanisation throughout the upper and middle catchment can result in inundation of key roads as well as residential and commercial buildings. In addition, inadequate stormwater infrastructure in some locations results in nuisance flooding within the urbanised catchment due to overland runoff.

Due to the short critical duration of the Wandal and West Rockhampton catchment, the warning time between the commencement of the rain event and subsequent flood inundation can be short. This limits the opportunity for evacuation, and generally the action taken by the community is to '*shelter in place*' until the flooding has passed.

An assessment of evacuation routes has therefore focussed on areas that become isolated during flooding, as well as high hazard areas that may require flood free evacuation access.

The following areas have been assessed as being isolated and/or lack adequate evacuation routes during the PMF event:

- Ann Street / Pennycuick Street → lose evacuation to Denham Street.
- Western Street / Melbourne Street → lose evacuation via Melbourne Street to Hunter Street.
- Pearson Street / Kalare Street / Peterson Street → lose access to Western Street.
- Cannona Road / Western Street → lose access to Lion Creek Road.
- Lion Creek Road / Dally Street → lose access to Lion Creek Road via Duncan Street, Barry Street and Bedden Avenue.
- Lion Creek Road / Harman Street / Hall Street → lose access to Lion Creek Road via Luck Avenue and Savage Street.

Building Impact Assessment

Council provided a building database, containing ~4,300 buildings digitised within the Wandal and West Rockhampton modelled area. Of these, ~1,800 buildings contained surveyed data, focussed on Fitzroy River flooding extents.

In order to complete a Building Impact Assessment and FDA, a complete building database with floor levels, classifications and ground levels is needed within the modelled area. To achieve this, the following tasks were completed:

- Review of the digitised buildings, to remove erroneous data such as *footpaths*, *building demolished*, *no building* etc.
- Estimation of ~2,500 floor levels and ground levels within the Wandal and West Rockhampton modelled area, for buildings outside Council's surveyed database.
- Classification of ~4,300 buildings within the Wandal and West Rockhampton modelled area, in accordance with ANUFLOOD requirements.

The ground level at each building was estimated from aerial survey (LiDAR) provided for the project. Ground levels were assigned to the building footprints based on the average LiDAR elevation within the building extents.

Buildings lacking data regarding number of storeys were assumed to be one storey. Buildings on slabs were assumed to have a minimum habitable floor level of 100mm above ground level. Low set buildings were assumed to have a minimum habitable floor level of 600mm above ground level and high set buildings were assumed to have a minimum habitable floor level of 1,800mm above ground level. Buildings lacking data regarding what type of floor they have were assumed to be on slabs.

Table E2 provides a summary of the number of residential and commercial buildings anticipated to be inundated for various flood events within the Wandal and West Rockhampton catchment. These results are also shown graphically in Figure E2. Existing buildings which experience flood levels above ground level are noted and buildings inundated above floor level are shown in brackets beside.

Note that the indicated number of buildings is for entire buildings. Residential multi-unit buildings may contain multiple dwellings per building. Also, large commercial/industrial buildings may include multiple businesses.

Table E2 № of Buildings Impacted

AEP (%)	№ Residential Buildings Flood level above property ground level (building inundated above floor level)	№ Commercial Buildings Flood level above property ground level (building inundated above floor level)
1EY	11 (3)	0 (0)
39	25 (7)	2 (2)
18	45 (13)	3 (3)
10	70 (22)	5 (5)
5	92 (29)	8 (8)
2	107 (36)	12 (11)
1	129 (40)	18 (15)
0.2	194 (67)	23 (20)
0.05	273 (99)	33 (30)
PMF	593 (232)	65 (61)

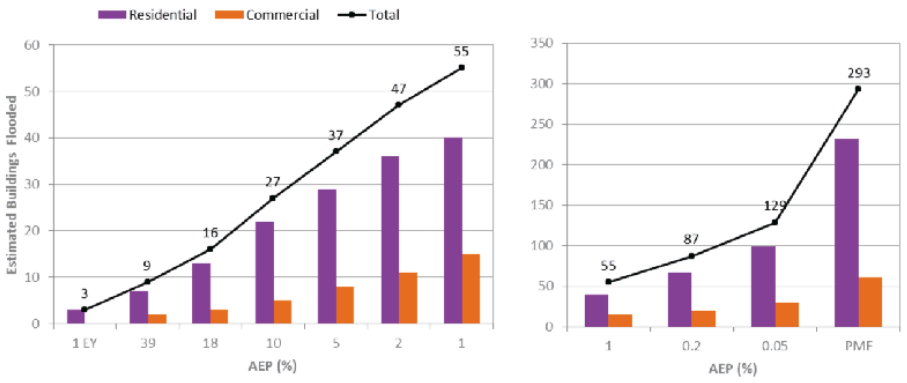


Figure E2 Estimated Buildings with Above Floor Flooding (Number of Buildings)

As shown in Figure E3, median flood depths are generally less than 0.3 metre for each flood event. This indicates that reductions in flood depths of 0.3 metre could significantly reduce overall damage. The figure also shows that a significant number of buildings experience flood depths of 0.1 metre or less during frequent events such as the 1EY flood event, generally corresponding to higher flood damages.

It is noted that where surveyed floor levels were not available, slab on ground buildings were assumed to have a floor level 0.1m above the existing ground level. This is consistent with other studies undertaken in the Rockhampton area, however may result in a higher estimate of inundated buildings and consequential flood damages due to the increased incidence of above floor flooding.

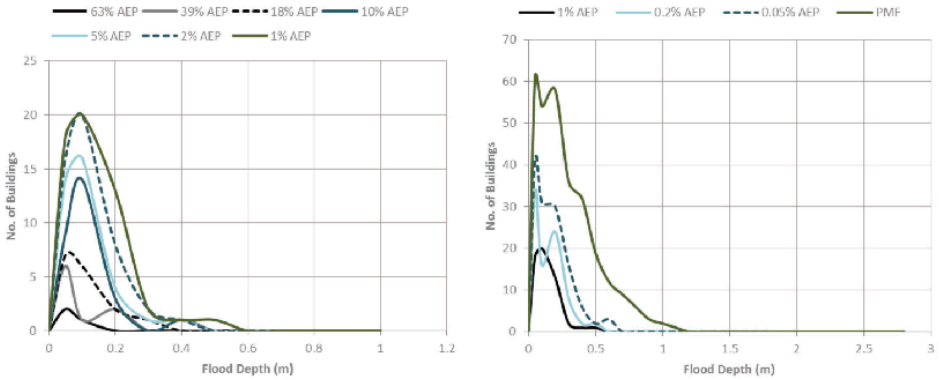


Figure E3 Estimated Flood Depths Above Floor Level by % AEP (Number of Buildings)

Flood Damages Assessment

Flood damages, or the anticipated cost to residents, businesses and infrastructure due to flooding, have been estimated using a standardised approach adopted throughout Australia. The approach estimates the tangible impacts flooding has on people, property, and infrastructure, such as flooding of a building and/or contents, the lost opportunity value associated with wages and revenue and flooding of transport and utility networks. These tangible impacts are estimated based on the depth, likelihood of flooding and type of building. Intangible impacts, such as emotional stress and inconvenience, were not quantified due to their non-tangible nature.

Figure E4 summarises the estimated total flood damages for various flood events according to their AEP. As shown, total damages range from $265,000 (1EY flood event) to $47M (PMF event) using the O2 Environmental Damage Curves. 3 buildings are expected to be inundated above floor in the 1EY event, whilst 293 buildings are anticipated to be inundated above floor in the PMF event.

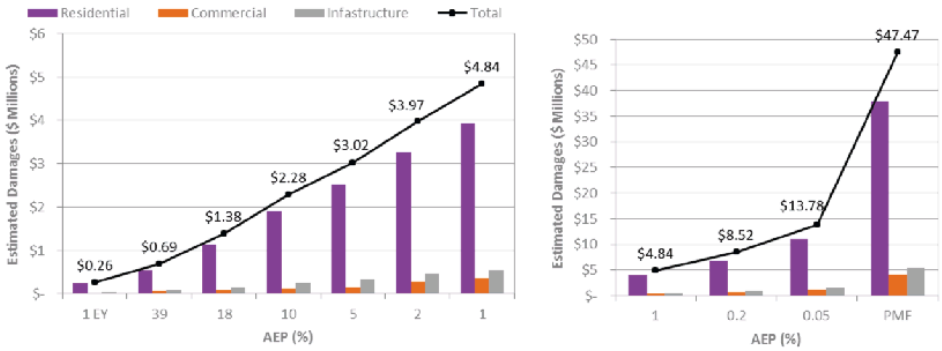


Figure E4 Estimated Flood Damages – O2 Environmental Damage Curves ($ Million)

These figures also demonstrate that Residential buildings make up the large majority of impacted buildings, and the estimated flood damages, within the Wandal and West Rockhampton catchment across the full range of design events assessed.

While the above provides an estimate of potential damages during specific flood events, understanding what damages may be expected on an annual basis is often an easier way to relate risk to residents and businesses. As such, the above damages were converted to Average Annual Damages (AAD) based on the likelihood of the flood event and the total estimated damage during that event.

The calculated AAD for the Wandal and West Rockhampton catchment is estimated to range from approximately $850,000 to $860,000 per annum.

Figure E5 provides a breakdown of the AAD and building impact assessment. The area in blue corresponds to individual building AAD (residential and non-residential combined) in brackets of $100 per annum. The orange line corresponds to the cumulative AAD for residential and non-residential buildings combined.

As shown, 81% of all buildings exhibit less than $500 damage per annum and produce only 4% of the total damage.

60% of damages are associated with less than 5% of all buildings. This demonstrates that a minority of buildings produce the majority of damages.

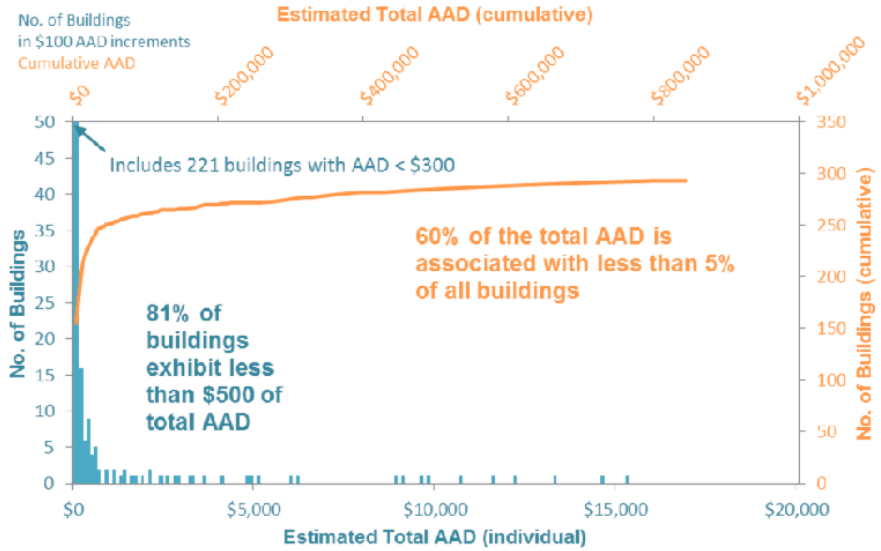


Figure E5 Individual Building vs. Cumulative Total Average Annual Damages

Rainfall Gauge, Maximum Flood Height Gauge and Flood Warning Network

A desktop review of the existing rainfall gauge, maximum flood height gauge and flood warning network yielded the following recommendations/findings for the Wandal and West Rockhampton catchment:

- A sufficient spread of rainfall gauges are installed within the catchment to provide a confident record of rainfall depths and patterns across Wandal and West Rockhampton.
- In addition to the three existing maximum flood height gauges within the Wandal and West Rockhampton catchment, it is recommended that gauges be installed at the following locations (as shown on Figure 50):
  - South-western face of Lion Creek Road (at the low point) between Sir Raymond Huish Drive and South Rockhampton SHS Access Road.
  - Eastern side of the concrete inverted spoon drain running into Jardine Park, accessible via Morgan Street. Gauge should be placed just prior to the end of the upper soccer fields, south of the netball courts on Allenby Street.

Recommendations

A number of recommendations have been made in relation to this study:

- Baseline flood mapping (i.e. peak depths, velocities and water surface elevations) provided in this study should be used to update Council's current Planning Scheme layers, at the next available opportunity.
  - Final post-processing of the GIS flood layers is recommended in accordance with the procedures outlined in the ARR, Data Management and Policy Review (AECOM, 2017).
  - Appropriate freeboard provisions should be included, based on the findings of the sensitivity analyses outlined in this study.
- This report and associated outputs should be communicated to the community and relevant stakeholders when appropriate.

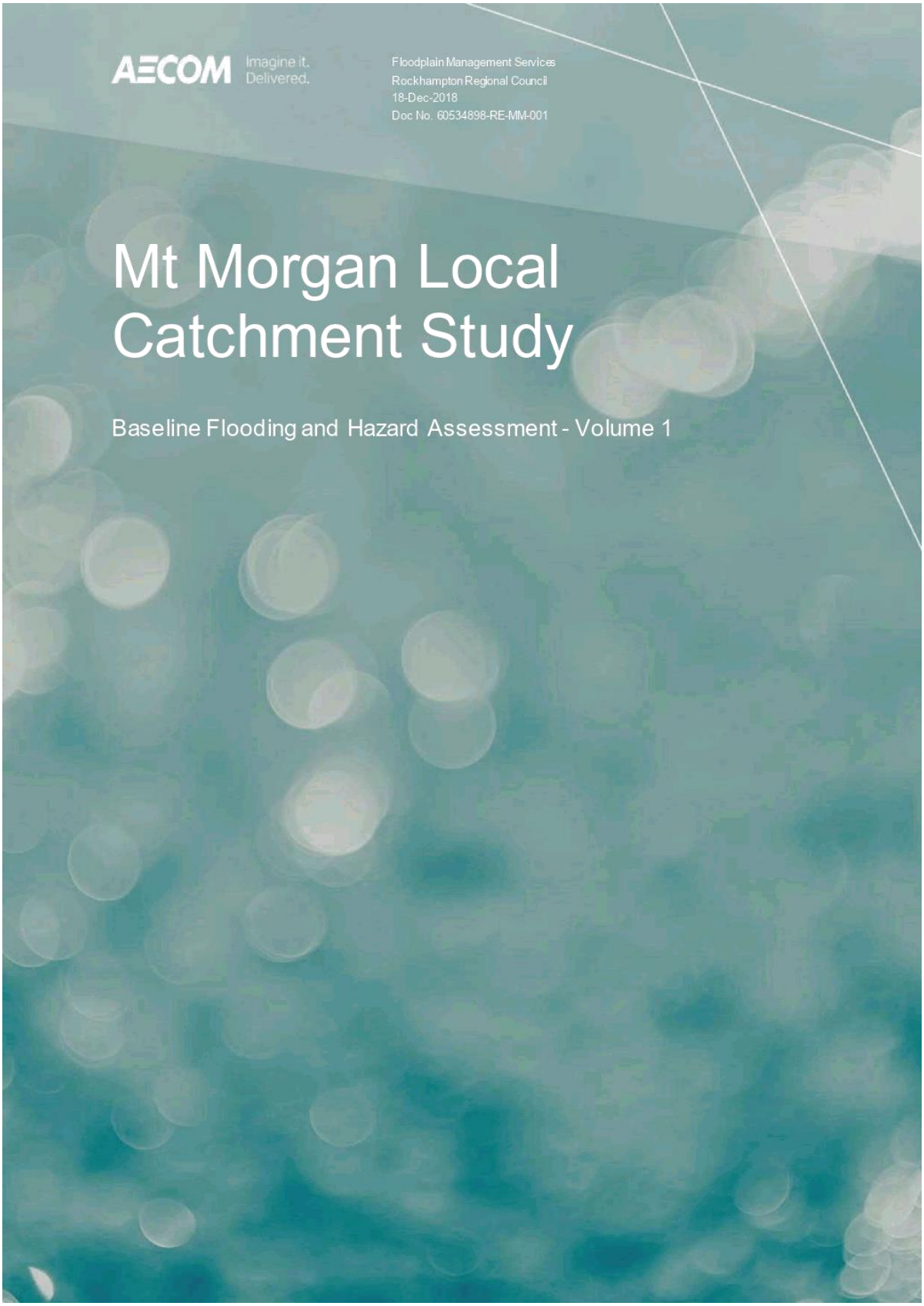
- Hydrologic and hydraulic modelling undertaken for this study has been based on methods and data outlined in Australian Rainfall and Runoff 1987. The 1987 revision has been adopted as per Council's request. It is recommended that future updates to this study incorporate the new 2016 updates.
- It is recommended that Council continue to undertake building floor level survey within the Wandal and West Rockhampton catchment to supplement the existing building database. An updated FDA should be undertaken when additional building survey data has been obtained.
- It is recommended that Council continue to record rainfall and flood heights associated with future Wandal and West Rockhampton catchment flood events. This data will support ongoing model calibration / validation works that should be undertaken in future updates to this study. The implementation of additional gauges identified in this study is also recommended.
- The baseline vulnerability and flood hazard assessment outputs from this report should be used to support a future Phase 3 of the Study (Flood Mitigation Options Development and Assessment).

ROCKHAMPTON REGION FLOOD STUDIES

Mount Morgan Catchment Executive Summary

Meeting Date: 25 June 2019

Attachment No: 7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Floodplain Management Services
Rockhampton Regional Council
18-Dec-2018
Doc No. 60534898-RE-MM-001
Mt Morgan Local Catchment Study
Baseline Flooding and Hazard Assessment - Volume 1

Executive Summary

Background

In December 2016, Rockhampton Regional Council (RRC) engaged AECOM Australia Pty Ltd (AECOM) to undertake the Floodplain Management Services (FMS) program for the 2017/18 calendar years. The FMS program entails the completion of a number of individual floodplain management projects including the Mount Morgan Local Catchment Study, which is the subject of this report.

Flooding in Mount Morgan can occur as a result of two different flood mechanisms:

- Riverine flooding due to rainfall over the Dee River and Mount Morgan No. 7 Dam catchment.
- Flash flooding due to rainfall over the local catchment.

This study focuses on flash flooding due to rainfall over the local urban catchment, including flooding of the Horse Creek and Dairy Creek catchments.

The key objectives of this study are:

- The development of a detailed hydraulic model based on current best practice procedures, capable of adequately simulating the flood characteristics and behaviour of the local catchment using the latest available data.
- The assessment of existing flood risk within the study area. It is expected that these results will be used to inform long term infrastructure planning, future emergency planning and floodplain management.
- The development of clear and easy to understand flood mapping products for use in future community education and awareness campaigns.
- Determination of key hydraulic controls within the study area which will later be used to inform future mitigation options analysis.

The minimisation of flood damages through more informed and reliable planning, appropriate mitigation, education, and disaster response is the key to developing more resilient communities which will ultimately result in future growth and prosperity. The overall objective of this study is to minimise loss, disruption and social anxiety; for both existing and future floodplain occupants.

Catchment Characteristics

The Mount Morgan catchment covers approximately 82.3 km^2 within the suburbs of Moongan, Leydens Hill, Baree and Mount Morgan which also encompasses Mount Morgan No.7 Dam and Mount Morgan Mine.

The northern catchment boundary follows Pinnacle Mountain Range along Poison-Creek Road and Moongan-Bouldercombe Road through Moongan and continues along Creek Street through Baree to the rural catchment of Mount Morgan. The eastern boundary runs along the Dee Range, further east, the Burnett Highway runs through Leydens Hill to the rural catchment of Mount Morgan. After this, the catchment roughly follows the Burnett Highway to the Southern boundary through the urban town centre of Mount Morgan. Further south-east, Mount Morgan No. 7 Dam discharges into the Dee River extending south-west through the urban catchment. At this point, the western boundary extends to the eastern side of the Mount Morgan Mine and Pinnacle Mountain Range.

The western and northern-eastern catchment boundaries contain mountainous ranges with forest vegetation and well defined, overland flow paths. Closer to the centre of the catchment within the urban area, the slope is relatively flat and, in most instances, runoff is discharged via urban drainage infrastructure (predominantly open channels and sub-surface drainage networks). Ultimately the runoff from the urban portion of the catchment is directed to the nearest watercourse, being the Dee River.

Runoff travelling from the Northern boundary (Pinnacle Mountain Range) accumulates and flows south into Dairy Creek from the rural area of the catchment into the urban area. Runoff travelling from the Eastern boundary (Dee Range) accumulates in the Dee River and Mount Morgan No. 7 Dam flowing from the rural area of the catchment into the urban area. Dairy Creek then flows into the Dee River

with the flow path traversing through the urban town centre of Mount Morgan and exiting the catchment at the Southern boundary.

Major urban flow paths run into the Dee River from both the northern and southern directions within the urban catchment. Flow from James Street and Byrnes Parade flows from North to South entering the Dee River. Flow from Central Street, East Street and Black Street flows from South to North entering the Dee River. A major concrete lined channel contributes to this flow, directing runoff from Pattison Street to Dee Esplanade, parallel with Central Street.

Hydrologic / Hydraulic Analysis

The Mt Morgan Phase 1 Local Catchment Study included the development of a TUFLOW model for the urban and rural Mt Morgan catchment. This model utilises a direct rainfall approach to modelling to determine the overland flow paths and establish baseline flood extents and depths within the study area.

Data for the catchment was sourced and utilised within this process with anecdotal evidence serving a key role in developing confidence in the model performance through validation to the local flood events caused by Ex-TC Oswald in January 2013, TC Marcia in February 2015 and Ex-TC Debbie in March 2017.

On completion of the validation, various design events and durations were run and results extracted. The critical duration for the catchment shows that for a 1% AEP event, the majority of steep flow paths across the catchment have a 60min critical duration. The primary channel of Dairy Creek has a 180min critical duration. Horse Creek has a 180min critical duration upstream of the Burnett Highway which transitions to a 720min duration further downstream. Similarly, the Dee River has a 720min critical duration.

Baseline Flood Hazard and Vulnerability Assessment

Following completion of baseline model development, design event modelling and sensitivity analyses; a flood hazard and vulnerability assessment was completed for the Mt Morgan catchment. This included:

- Flood hazard analysis.
- Vulnerability assessment of key infrastructure.
- Evacuation route analysis.
- Building inundation and impact assessment.
- Flood Damages Assessment (FDA).

Each of these aspects has been discussed in further detail below.

Flood Hazard

Flood hazard categorisation provides a better understanding of the variation of flood behaviour and hazard across the floodplain and between different events. The degree of hazard varies across a floodplain in response to the following factors:

- Flow depth.
- Flow velocity.
- Rate of flood level rise (including warning times).
- Duration of inundation.

Identifying hazards associated with flood water depth and velocity help focus management efforts on minimizing the risk to life and property. As such, a series of Flood Hazard Zones have been developed according to ARR 2016, in alignment with recommendations made in the ARR, Data Management and Policy Review (AECOM, 2017).

Figure E1 shows the adopted hazard categories along with a general description of the risk associated with each category.

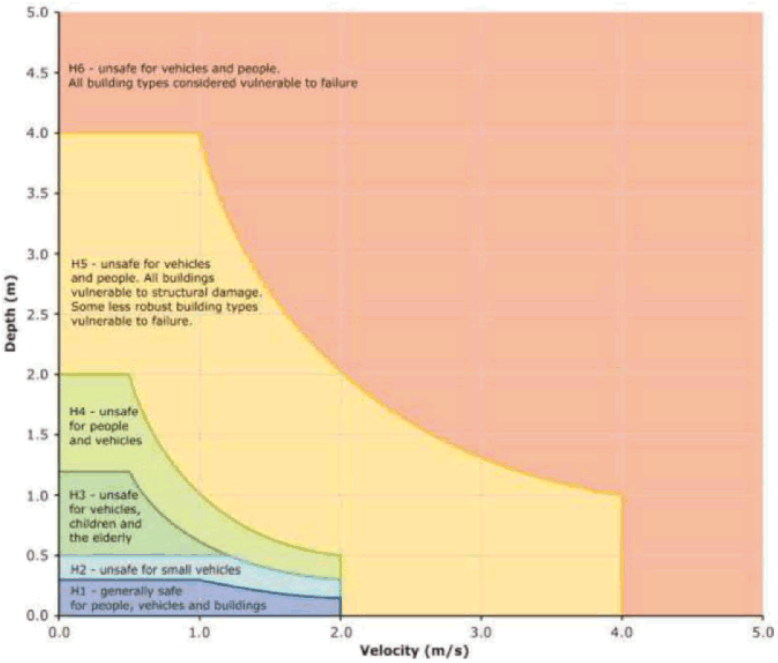

Figure E1 Hazard Vulnerability Classifications (Graphical)

Analysis of the 1% AEP baseline flood hazard within the Mt Morgan catchment generally shows:

- Low to medium hazard (H1 and H2) across the majority of ill-defined urban flow paths.
- Moderate to extreme hazard (H3 and H5) across the majority of steep gullies.
- Extreme hazard (H5 or H6) within steep, concrete-lined urban flow paths.
- Extreme hazard (H5 or H6) within the Dairy Creek, Horse Creek and Dee River channels.

Vulnerability Assessment

A baseline vulnerability assessment has been undertaken to identify critical infrastructure and community assets which are at risk of flooding. The following categories have been included in this assessment:

- Water and sewerage infrastructure.
- Emergency services facilities including ambulance, police, fire and hospitals.
- Community infrastructure including schools, day-care centres, nursing homes, retirement villages and community facilities.
- Key road and rail assets.

The following provides a summary of key findings of the vulnerability assessment:

- The Dee River (No. 4) sewerage pump station in James Street is predicted to be inundated by up to 0.29m in the 0.2% AEP 60min event. It is important to note that this is not the critical duration for the Dee River; longer duration storms are likely to result in higher peak flood depths and inundation frequency at this site. All other water and sewerage infrastructure have the desired 0.2% AEP flood immunity. It is recommended this information be passed onto FRW as the asset owner.

- Flood inundation is not predicted at any community infrastructure or emergency facilities.
- A number of roads are predicted to experience inundation in the 1EY event and larger. Predicted TOS generally ranges from 0.4 to 9.0 hours, with low immunity crossings across the Dee River (Piddichs Crossing, Racecourse Road and Randwick Road) predicted to be inundated between 5.6 and 9.0 hours in a 1% AEP 60min event.

Evacuation Routes

This assessment relates to isolated areas as a result of local catchment flood events and should be read in conjunction with the Mt Morgan Water Supply No 7 Dam Emergency Action Plan (FRW, 2018). Generally local catchment flooding within the Mount Morgan local catchment is due to short duration, high intensity rainfall events. The relatively steep flowpaths and urbanisation throughout catchment can result in inundation of key roads as well as residential and commercial buildings.

Due to the short critical duration of the Mount Morgan local catchment, the warning time between the commencement of the rain event and subsequent flood inundation can be short. This limits the opportunity for evacuation, and generally the action taken by the community is to '***shelter in place***' until the flooding has passed.

An assessment of evacuation routes has therefore focussed on areas that become isolated during flooding, as well as high hazard areas that may require flood free evacuation access.

The following areas have been assessed as being isolated and/or lack adequate evacuation routes during the PMF event:

- Horse Creek Lane, Burnett Lane and Showgrounds Road → loses evacuation to Burnett Highway during to high stage Horse Creek flood levels.
- Black Street and Campion Street → loses evacuation via Hall Street and Gordon Street to East Street.
- Baree Road and Gordon Lane → loses evacuation via Gordon Lane to James Street.
- Creek Street → loses evacuation to Creek Street (Razorback Road) due to high stage Dairy Creek flood levels.

Building Impact Assessment

Council provided a building database, containing over 2,000 buildings digitised within the modelled area.

In order to complete a Building Impact Assessment and FDA, a complete building database with floor levels, classifications and ground levels is needed within the PMF direct rainfall flood extent. To achieve this, Council undertook the following tasks:

- Review of the digitised buildings, to remove erroneous data such as *footpaths*, *building demolished*, *no building* etc.
- Estimation of floor levels and ground levels for buildings outside surveyed information.
- Classification of buildings within the modelled area, in accordance with ANUFLOOD requirements:
  - Buildings were divided into residential and commercial based on a combination of attribute fields, depending on what fields contained data for each building.
  - Commercial buildings were assigned a size class based on floor area – small/medium/large.
  - Commercial building classifications were assigned a value class of 3 (on a scale from 1 to 5) assigned to buildings lacking data.

The ground level at each building was estimated based on the 1m LiDAR DEM provided for the project. Ground levels were assigned to the building footprints based on the average elevation of the DEM within the building extents.

Buildings lacking data regarding number of storeys were assumed to be one storey. Buildings on slabs were assumed to have a minimum habitable floor level of 100mm above ground level. Low set buildings were assumed to have a minimum habitable floor level of 600mm above ground level and high set buildings were assumed to have a minimum habitable floor level of 1,800mm above ground level. Buildings lacking data regarding what type of floor they have were assumed to be on slabs.

Table E2 provides a summary of the number of residential and commercial buildings anticipated to be inundated for various flood events within the Mt Morgan catchment. These results are also shown graphically in Figure E2. Existing buildings which experience flood levels above ground level are noted and buildings inundated above floor level are shown in brackets beside.

Note that the indicated number of buildings is for entire buildings. Residential multi-unit buildings may contain multiple dwellings per building. Also, large commercial/industrial buildings may include multiple businesses.

Table E2 № of Buildings Impacted

AEP (%)	№ Residential Buildings	№ Commercial Buildings
	Flood level above property ground level (building inundated above floor level)	Flood level above property ground level (building inundated above floor level)
1EY	0 (0)	0 (0)
39	2 (0)	0 (0)
18	4 (2)	1 (1)
10	7 (2)	1 (1)
5	14 (5)	1 (1)
2	17 (6)	3 (2)
1	19 (7)	3 (2)
0.2	48 (21)	7 (6)
0.05	77 (37)	8 (6)
PMF	255 (179)	36 (32)

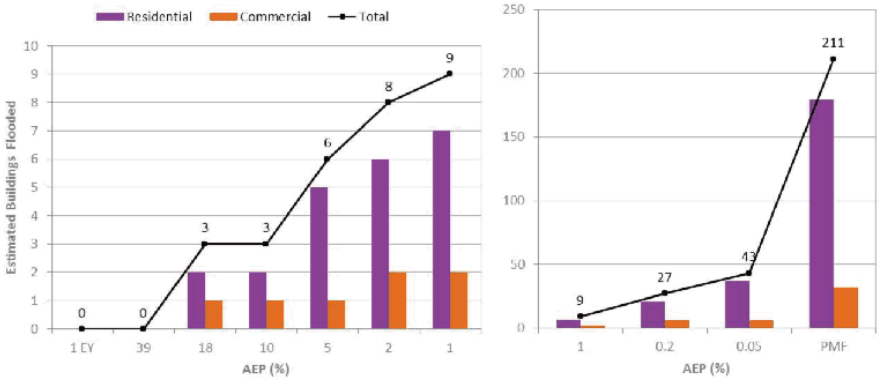

Figure E2 Estimated Buildings with Above Floor Flooding (Number of Buildings)

Figure E3 provides a breakdown of the number of buildings inundated in 'creek' and 'overland flow' areas. The graph confirms that the majority of buildings within the catchment (90%) are not inundated up to and including the PMF event. Of the 10% of buildings predicted to experience inundation, approximately 23% are impacted by overland flow and 77% are impacted by creek inundation.

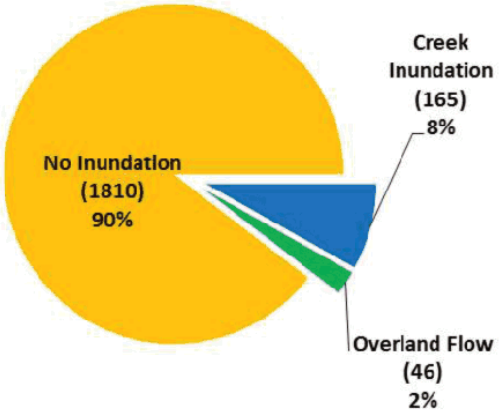

Figure E3 Inundation within Creek and Overland Flow Areas (Number of Buildings)

As shown in Figure E4, median flood depths are generally less than 0.3m for each flood event. This indicates that reductions in flood depths of 0.3m could significantly reduce overall damage. The figure also shows that a pockets of impacted buildings experience flood depths of 0.1m or less during more frequent events.

It is noted that where surveyed floor levels were not available, slab on ground buildings were assumed to have a floor level 0.1m above the existing ground level. This is consistent with other studies undertaken in the Rockhampton area, however may result in a higher estimate of inundated buildings and consequential flood damages due to the increased incidence of above floor flooding.

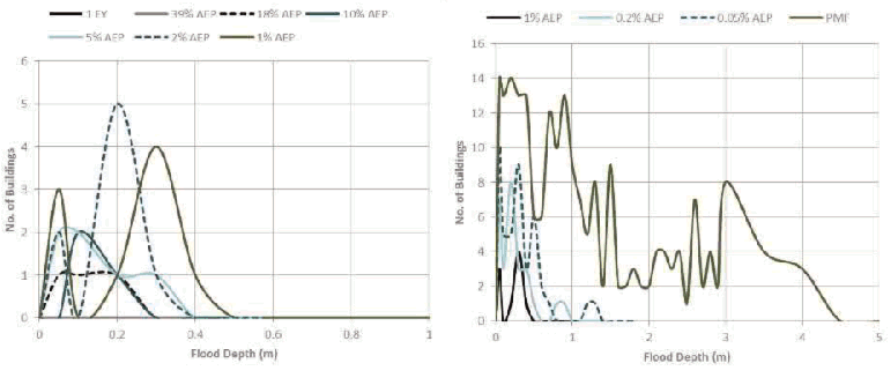

Figure E4 Estimated Flood Depths Above Floor Level by % AEP (Number of Buildings)

Flood Damages Assessment

Flood damages, or the anticipated cost to residents, businesses and infrastructure due to flooding, have been estimated using a standardised approach adopted throughout Australia. The approach estimates the tangible impacts flooding has on people, property, and infrastructure, such as flooding of a building and/or contents, the lost opportunity value associated with wages and revenue and flooding of transport and utility networks. These tangible impacts are estimated based on the depth, likelihood of flooding and type of building. Intangible impacts, such as emotional stress and inconvenience, were not quantified due to their non-tangible nature.

Figure E5 summarises the estimated total flood damages for various flood events according to their AEP. As shown, total damages range from no damage (1EY flood event) to $54M (PMF event). Figure E4 confirms that no buildings are expected to be inundated above floor in the 1EY event, whilst 211 buildings are anticipated to be inundated above floor in the PMF event.

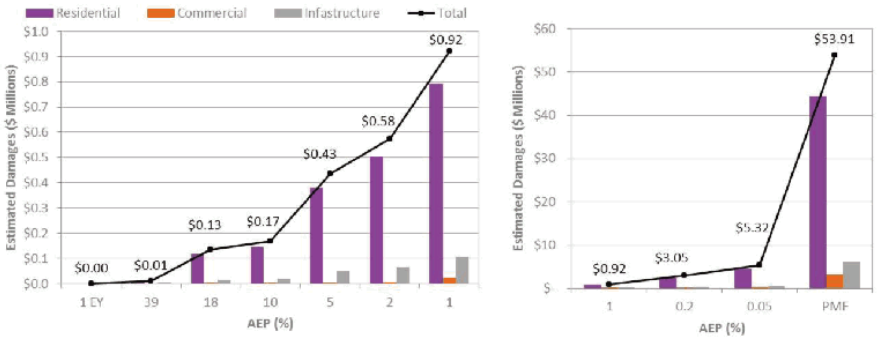

Figure E5 Estimated Flood Damages – O2 Environmental Damage Curves ($ Million)

These figures also demonstrate that residential buildings make up the large majority of impacted buildings, and consequently estimated flood damages, within the Mount Morgan catchment across the full range of design events assessed.

While the above provides an estimate of potential damages during specific flood events, understanding what damages may be expected on an annual basis is often an easier way to relate risk to residents and businesses. As such, the above damages were converted to Average Annual Damages (AAD) based on the likelihood of the flood event and the total estimated damage during that event.

The calculated AAD for the Mount Morgan catchment is estimated to range from approximately $95,000 to $103,000 per annum.

Figure E6 provides a breakdown of the AAD and building impact assessment. The area in blue corresponds to individual building AAD (residential and non-residential combined) in brackets of $100 per annum. The orange line corresponds to the cumulative AAD for residential and non-residential buildings combined. Note that this does not include infrastructure damages.

As shown, 92% of all buildings exhibit less than $500 damage per annum and produce only 6% of the total damage.

79% of damages are associated with ten buildings. This demonstrates that a minority of buildings produce the majority of damages.

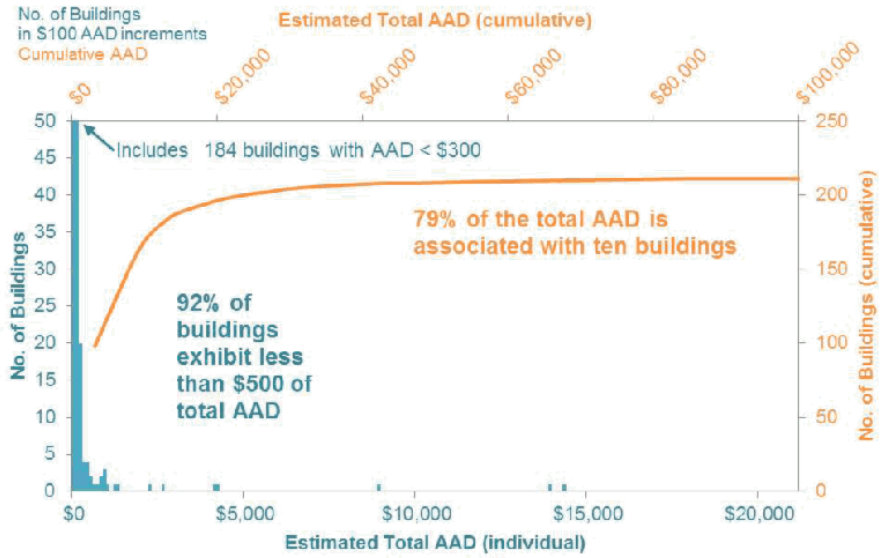

Figure E6 Individual Building vs. Cumulative Total Average Annual Damages

Rainfall Gauge, Maximum Flood Height Gauge and Flood Warning Network

A desktop review of the coverage provided by the existing gauges has been undertaken, with the following recommendations provided for future upgrades to the system:

- A suitable rainfall gauge is maintained by DNRM within the upper catchment of the Dee River. Active rainfall gauges track rainfall patterns within the Mount Morgan Township at Black Street WTP. As such, it is recommended that the pluviograph station continues to record detailed rainfall data for future events.
- A single flood height gauge is recommended for inclusion within the East Street / Campion Street concrete channel near Morgan Street to develop confidence in urban impacts within the area.

Recommendations

A number of recommendations have been made in relation to this study:

- Baseline flood mapping (i.e. peak depths, velocities and water surface elevations) provided in this study should be used to update Council's current Planning Scheme layers, at the next available opportunity.
  - Final post-processing of the GIS flood layers is recommended in accordance with the procedures outlined in the AR&R, Data Management and Policy Review (AECOM, 2017).
  - Appropriate freeboard provisions should be included, based on the findings of the sensitivity analyses outlined in this study.
- This report and associated outputs should be communicated to the community and relevant stakeholders when appropriate.
- Hydrologic and hydraulic modelling undertaken for this study has been based on methods and data outlined in AR&R 1987. The 1987 revision has been adopted as per Council's request. It is recommended that future updates to this study incorporate the new 2016 updates.

- It is recommended that Council record rainfall and flood heights associated with Mount Morgan catchment flood events. This data will support ongoing model calibration / validation works that should be undertaken in future updates to this study. The implementation of an additional gauge identified in this study is also recommended.
- Channel cross sectional survey should be undertaken after major flood events in order to assess long term geomorphic changes, and potential implications to flood behaviour.
- The results of this study should be communicated to the dam owner which will allow for a better understanding of potential flood risks and reassessment of the need for an updated failure impact assessment.
- The baseline vulnerability and flood hazard assessment outputs from this report should be used to support a future Phase 3 of the Study (Flood Mitigation Options Development and Assessment).

8.3 PLANNING ASSUMPTIONS REPORT VERSION 3

File No:	**11344**
Attachments:	**1. Executive Summary PAMv3⇩**
Authorising Officer:	**Martin Crow - Manager Infrastructure Planning** **Peter Kofod - General Manager Regional Services**
Author:	**Stuart Harvey - Coordinator Strategic Infrastructure**

SUMMARY

Officers have reviewed and updated Council's Planning Assumptions Model to a Version 3. This version includes updated population forecasts, development approvals and developments constructed since Version 2 was completed in 2014. This updated model and report will inform the upcoming amendment to the Local Government Infrastructure Plan (LGIP). This report and its findings are presented to Council for their consideration.

OFFICER'S RECOMMENDATION

THAT Council adopt the Planning Assumptions Report (Version 3)

COMMENTARY

Council officers have reviewed and updated the Planning Assumptions Model as a part of an upcoming review of the Local Government Infrastructure Plan (LGIP). A copy of the report is included as Attachment 1. Due to size restrictions, the full report and appendices have been sent to Councillors via Dropbox link. Updates, since the previous planning assumption model in 2014, were focussed around:

- constructed development
- approved development
- changes in baseline population and employment
- changes in forecast population and employment
- sequencing of future development

Since the previous version of the Planning Assumptions model, the Queensland Government Statisticians Office have revised and lowered the population projections for the region. Additionally, since the PAR v2, the projection timeframes have had another 5 year cohort added (2036).

The Planning Assumptions Model (PAM) population growth projections are required to be benchmarked against Queensland Government Statistician's Office (QGSO) population projections to ensure that projections are based on appropriate sources. PAM v3 resident population growth projections are benchmarked against QGSO 2015 Medium Series population projections and were rebased using 2016 census data. QGSO 2018 population projections have since been released but were not available at the time of the PAM review. Although the 2018 Medium series population projections are lower than the 2015 Medium Series population projections, the growth rates are very similar at 0.9% pa and 1.0% pa respectively. These are consistent with the 10 year (2006-2016) average annual growth rate of 0.9% for the region.

As of 10 October 2017, the estimated resident population (ERP) of the Rockhampton region is modelled in the PAM v3 to be 82,841 persons. By 2036, it is projected that the total ERP will be 98,237 persons.

BACKGROUND

To date two Planning Assumptions Reports (PAR) have been prepared as part of the Rockhampton Region Planning Scheme and Local Government Infrastructure Plan (LGIP) process. The last revision of the PAR (v2) was completed in 2014.

The Planning Assumptions Report contains the planning assumptions and growth projections underpinning the LGIP and has been prepared to:

- document the methodology and assumptions used to prepare dwelling, population, gross floor area (GFA) and employment planning assumptions and the timing of development (development sequence);
- present and discuss dwelling, population, GFA, employment projections and development sequence; and
- identify the Priority Infrastructure Area (PIA);

The planning assumptions are critical elements underpinning the LGIP. Their purpose is to provide a logical and consistent basis for detailed infrastructure planning within network catchments and state assumptions about the type, scale, location and timing of future development and subsequent population and employment growth.

The PAR v3 applies to all land within the boundaries of Rockhampton Regional Council (as set out within the Rockhampton Region Planning Scheme), and demonstrates how the strategic outcomes of the Rockhampton Region Planning Scheme are to be implemented at the local level. The planning period for the PAR v3 is 19 years to 2036.

PREVIOUS DECISIONS

Council adopted the Planning Assumption Report version 2 on 24 June 2014 as it formed part of the extrinsic material used to inform the development of the Local Government Infrastructure Plan (LGIP) and Rockhampton Planning Scheme (2015)

LEGISLATIVE CONTEXT

Under the *Planning Act 2016*, a local government that wishes to levy infrastructure charges or impose conditions about trunk infrastructure is required to prepare an LGIP. The LGIP is part of the planning scheme and identifies Council's plans for trunk infrastructure that are necessary to service urban development at the desired standard of service (DSS) in a coordinated, efficient and financially sustainable manner. The Planning Assumptions is a mandatory component of the LGIP.

RISK ASSESSMENT

There is a risk that inconsistent development projections will result in forecasting and construction of infrastructure before or after it is required. This can have significant impacts on Council's budget and forward works program. Council's PAM v3 is benchmarked to QGSO growth rates to reduce this risk. In the event that growth occurs quicker than forecasted, the sequencing timeframes will accelerate but it is unlikely that this will have a detrimental impact on the LGIP and forward works planning.

CORPORATE/OPERATIONAL PLAN

The projects align with Rockhampton Regional Council's Corporate Plan 2017-2022 objectives, including:

1. Community

1.1 Safe, accessible, reliable and sustainable infrastructure and facilities

2. Economy

2.4 Infrastructure services are driven to deliver future economic growth

CONCLUSION

The PAR contains the planning assumptions and growth projections underpinning the LGIP. The PAR has been updated to version 3 to incorporate revised QGSO population projections. PAR v3 is now presented to Council for consideration and adoption to inform upcoming Local Government Infrastructure Plan updates.

PLANNING ASSUMPTIONS REPORT VERSION 3

Executive Summary PAMv3

Meeting Date: 25 June 2019

Attachment No: 1

Rockhampton Regional Council

Planning Assumptions Report

Version 3

May 2019

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Executive Summary

This Planning Assumptions Report (PAR) contains the planning assumptions and growth projections underpinning the Local Government Infrastructure Plan (LGIP) prepared by Rockhampton Regional Council.

This PAR has been scoped to:

- document the methodology and assumptions used to prepare the Planning Assumptions Model (PAM), dwelling, population, gross floor area (GFA) and employment planning assumptions and the timing of development (development sequence);
- present and discuss dwelling, population, GFA, employment projections and development sequence; and
- identify the Priority Infrastructure Area (PIA);

The planning assumptions are critical elements underpinning the LGIP. Their purpose is to provide a logical and consistent basis for detailed infrastructure planning within network catchments and state assumptions about the type, scale, location and timing of future development and subsequent population and employment growth. The PAR applies to all land within the boundaries of Rockhampton Regional Council (as set out within the Rockhampton Region Planning Scheme), and demonstrates how the strategic outcomes of the Rockhampton Region Planning Scheme are to be implemented at the local level. The planning period for the PAR is 19 years to 2036.

Methodology

To guide the process of developing planning assumptions for the Rockhampton Regional Council LGIP, a detailed, robust and transparent methodology has been adopted consisting of seven key steps. The seven steps are;

Step 1 – Existing Land Use and Development Assumptions

Step 2 – Future Land Use Assumptions

Step 3 – Development Capacity Analysis

Step 4 – Development Sequencing Analysis

Step 5 – Priority Infrastructure Area

Step 6 – Growth Projections

Step 7 – Planning Assumptions Report

The Rockhampton region resident population growth projections are benchmarked against Queensland Government Statistician's Office (QGSO) 2015 Medium Series population projections. Residential development sequencing and population growth projections are guided by the sub-regional allocation of population growth for the former Rockhampton City, Fitzroy and Mount Morgan Local Government areas.

Priority Infrastructure Area

The PIA identifies sufficient land to accommodate forecast growth to October 2036. The PIA is a two dimensional extent consisting of multiple geographically discreet areas and is to read in combination with development sequencing assumptions detailed in Appendix P. The PIA is shown in Appendix Q.

Population

As of 10 October 2017, the estimated resident population (ERP) of the Rockhampton region is modelled in the PAM to be 82,841 persons with a non-resident population (NRP) of 4,352 persons and a total population (ERP plus NRP) of 87,193 persons (refer to Section 4.2.1). By 2036, it is projected that the total population will be 104,383 persons. As shown in Figure E.1, the resident population of the Rockhampton Regional Council (RRC) area is projected in the PAM to grow in line with the 2018 Medium Series population. Although the PAM population projection is lower than the 2015 Medium Series population projection, the growth rates are similar at 0.9% pa and 1.0% pa respectively. Section 2.5.2 provides the population projections methodology used.

A summary of population projections at a sub-regional scale is shown in Table E.1. A summary of population inside and outside the PIA is shown in Table E.2.

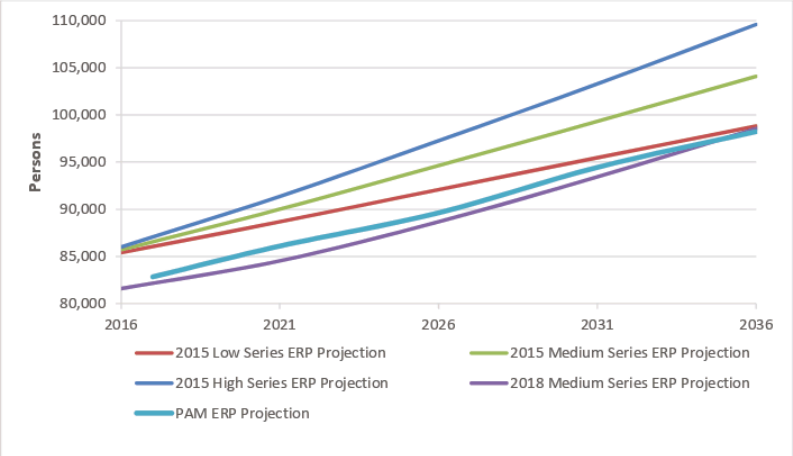


Figure E.1 - Planning Assumptions Model and Queensland Government ERP Projections

Table E.1 - Planning Assumptions Model and Queensland Government ERP Projection Comparison

		Existing (2017)#	2021	2026	2031	2036	Growth Rate ^	RRC Growth Share (2017 - 2036)
Rockhampton City Area	Planning Assumptions Model	63,507	65,560	67,191	69,761	72,330	0.7%	57.3%
	2015 Medium Series Projection	66,167	68,288	70,376	72,727	75,719		
	Difference with PAM	**-2,660**	**-2,728**	**-3,185**	**-2,966**	**-3,389**		
		-4.2%	**-4.2%**	**-4.7%**	**-4.3%**	**-4.7%**		
	2018 Medium Series Projection	62,019	63,328	65,450	67,890	70,154		
	Difference with PAM	**1,488**	**2,232**	**1,741**	**1,871**	**2,176**		
		2.3%	**3.4%**	**2.6%**	**2.7%**	**3.0%**		
Fitzroy Area	Planning Assumptions Model	16,307	17,519	19,408	21,504	22,726	1.8%	41.7%
	2015 Medium Series Projection	17,179	18,454	20,792	22,788	24,323		
	Difference with PAM	**-872**	**-935**	**-1,384**	**-1,284**	**-1,597**		
		-5.3%	**-5.3%**	**-7.1%**	**-6.0%**	**-7.0%**		
	2018 Medium Series Projection	**17,143**	**18,193**	**20,218**	**22,525**	**25,354**		
	Difference with PAM	**-836**	**-674**	**-810**	**-1,021**	**-2,628**		
		-5.1%	**-3.8%**	**-4.2%**	**-4.7%**	**-11.6%**		
Mount Morgan Area	Planning Assumptions Model	3,027	3,024	3,024	3,183	3,181	0.3%	1.0%
	2015 Medium Series Projection	3,192	3,270	3,478	3,806	4,059		
	Difference with PAM	**-165**	**-246**	**-454**	**-623**	**-878**		
		-5.5%	**-8.1%**	**-15.0%**	**-19.6%**	**-27.6%**		
	2018 Medium Series Projection	**2,987**	**3,010**	**3,013**	**3,029**	**3,059**		
	Difference with PAM	**40**	**15**	**11**	**153**	**123**		
		1.3%	**0.5%**	**0.4%**	**4.8%**	**3.9%**		

		Existing (2017)#	2021	2026	2031	2036	Growth Rate ^	RRC Growth Share (2017 - 2036)
RRC LGA	Planning Assumptions Model	82,841	86,104	89,623	94,448	98,237	0.9%	100.0%
	2015 Medium Series Projection	86,538	90,012	94,646	99,321	104,101		
	Difference with PAM	**-3,697**	**-3,908**	**-5,023**	**-4,873**	**-5,864**		
		-4.5%	**-4.5%**	**-5.6%**	**-5.2%**	**-6.0%**		
	2018 Medium Series Projection	82,149	84,532	88,680	93,444	98,567		
	Difference with PAM	**692**	**1,572**	**942**	**1,004**	**-329**		
		0.8%	**1.8%**	**1.1%**	**1.1%**	**-0.3%**		

^Average annual population growth rate between 2017 and 2036

2015 Medium Series Projection and 2018 Medium Series Projection Existing (2017) estimated using average annual growth between 2016 and 2021

Table E.2 - Population Summary

	Existing (2017)	2021	2026	2031	2036
Total ERP in PIA	73,818	76,934	80,348	85,173	88,960
Total ERP outside PIA	9,023	9,169	9,275	9,275	9,277
Total Non-Resident Population	4,352	4,528	5,363	5,864	6,146
Total RRC Population Projection (ERP + NRP)	**87,193**	**90,631**	**94,986**	**100,312**	**104,383**

Employment

As of 10 October 2017, the number of employed persons in urban based employment in the Rockhampton region is modelled in the PAM to be 37,786 (refer to Section 5.1.1). By 2036, it is projected that the total urban based employment in the Rockhampton Region will be 47,760 persons. Figure E.2 below shows a comparison between employment and population projections (ERP plus NRP).

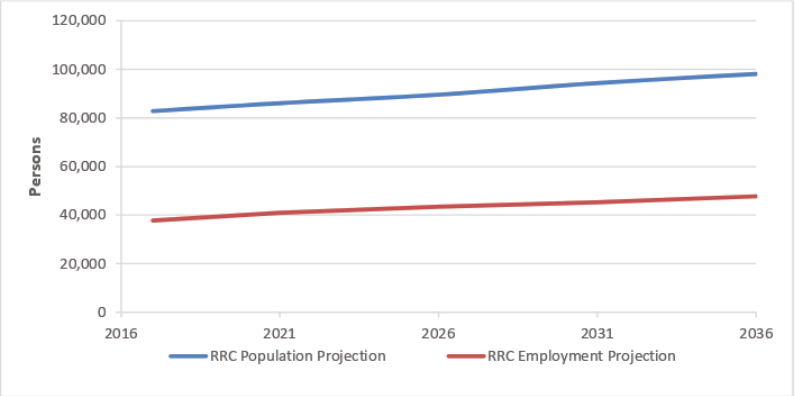


Figure E.2 - RRC Population and Employment Projections

A summary of employment projections at a sub-regional scale and inside and outside the PIA is shown in Table E.3. Employment projections for sub-regional areas are shown in Figure E.3.

Table E.3 - Employment Projection Summary

	Existing (2017)	2021	2026	2031	2036
Employment Projection by Sub-Regional Area					
Rockhampton City Area Employment	35,051	38,076	39,959	41,388	43,271
Fitzroy Area Employment	1,951	2,115	2,760	3,106	3,618
Mount Morgan Area Employment	784	784	784	818	871
Employment Projection Summary					
Total Employment in PIA	36,532	39,702	42,218	44,013	46,447
Total Employment outside PIA	1,254	1,274	1,286	1,300	1,314
Total RRC Employment	**37,786**	**40,976**	**43,504**	**45,313**	**47,760**

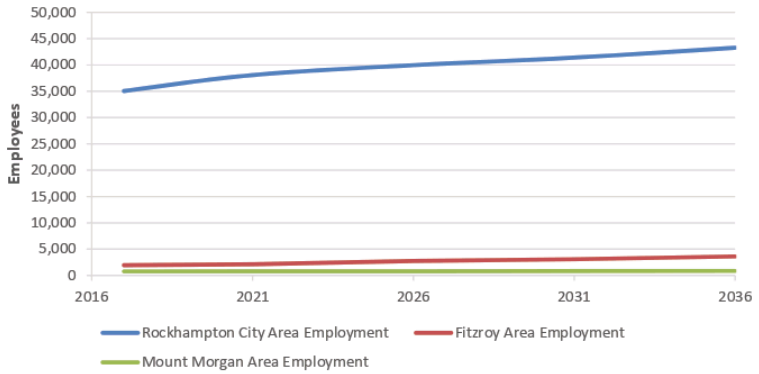


Figure E.3 - Employment Projections for Sub-Regional Areas

As shown in Figure E.4, it is projected that retail and commercial development will drive employment growth, with steady growth in community purposes based employment.

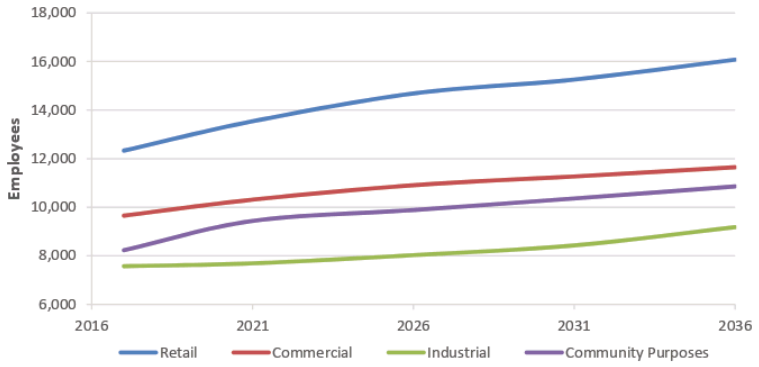


Figure E.4 - Employment Projections by Employment Category

Achieved Density

A comparison of the maximum dwelling per hectare yield and the average dwelling yield achieved in the PAM on residential greenfield land (> 2,500m^2) is shown in Table E.4.

Table E.4 - Comparison Between Maximum Possible Dwelling Yield and Average Achieved Dwelling Yield for Greenfield Residential Land

SPP Residential Zone	Maximum Yield (dwellings/ha of net developable area)	Average Yield Achieved in PAM (dwellings/ha of net developable area)	Average Achieved Lot Size Per Dwelling (m^2)
Low density residential	16.3	10.8	926
Medium density residential	24.4	20.4	491
High density residential	880.0	880.0	11.4
Emerging community	16.3	11.8	847
Rural residential	0.5	0.4	24,334

8.4 CIVIL OPERATIONS MONTHLY OPERATIONS REPORT

File No:	**7028**
Attachments:	**1. Civil Operations Monthly Operations Report - May 2019⇩**
Authorising Officer:	**Peter Kofod - General Manager Regional Services**
Author:	**Michael O'Keeffe - Acting Manager Civil Operations**

SUMMARY

This report outlines Civil Operations Monthly Operations Report on the activities and services in May 2019.

OFFICER'S RECOMMENDATION

THAT the Civil Operations Monthly Operations Report on the activities and services in May 2019 be received.

COMMENTARY

The Civil Operations Section submits a monthly report outlining the details of the programmed works for the upcoming month to assist Council's Executives and Councillors when they receive enquiries from their constituents in relation to road and associated road reserve works.

CIVIL OPERATIONS MONTHLY OPERATIONS REPORT

Civil Operations Monthly Operations Report - May 2019

Meeting Date: 25 June 2019

Attachment No: 1

MONTHLY OPERATIONS REPORT

CIVIL OPERATIONS

PERIOD ENDED MAY 2019

1. Operational Summary

Highlights

- Webber Park – In Progress.
- Alexandra Street – In Progress.
- Quay Street, William Street to Derby Street – In Progress.
- Gracemere CBD Footpath – Completed.
- Mt Morgan CBD – 65% Completed.
- Upper Dawson Road – 20% Completed.

Innovations, Improvements and Variations

Successful use of high pressure water with power head used on Gracemere CBD footpath with no avid usage.

Legislative Compliance and Standards (including Risk and Safety)

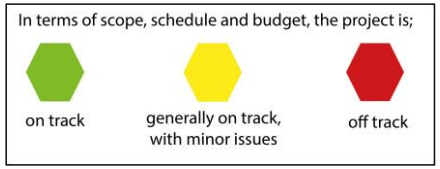
Nil

1. Customer Service Requests

The Traffic Light Report for this reporting period (May 2019) was not available at the time this report was submitted.

2. Capital Projects

Details of capital projects not reported regularly to Council or a particular Committee in other project specific report updates as at 07 June 2019 – 92% of year elapsed.



Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
CP422 CAPITAL CONTROL RURAL OPERATIONS WEST				
ANNUAL RESEAL PROGRAM			410,000	
RESEAL				
Allen Rd Gracemere Ch 0.25-0.62 km	Completed			11,718
Childs Ave Bouldercombe Ch 0.00-0.50km	Completed			28,419
Edmistone Rd Alton Downs Ch 0.00-0.80km	Completed			16,660
Kroombit Dr Bouldercombe Ch 0.00-0.80km	Completed			35,224
Mt Hopeful Rd Bajool Ch 0.00 to 0.49	Completed			4,506
Nicholson Rd Alton Downs Ch 0.00-1.44 km	Completed			28,598
Nine Mile Rd Pink Lily Ch 1.75-1.94 2.00-2.16 2.2	Completed			234,012
Old Gracemere Rd Fairy Bower Ch 0.05-0.8 km	Completed			25,374
Richmont Dr Bouldercombe Ch 0.00-0.1.10km	Completed			27,108
Six Mile Rd Alton Downs Ch 2.76-3.52 km	Completed			21,607

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
LOW STANDARD SEAL				
South Ulam Road CH 7.0-8.0 km	10% Completed	30 June 2019	2,600	
BRIDGES				
BDG-Calmorin Rd Hansons Bridge (Revenue)			285,200	
BDG-Calmorin Road-Hansens Bridge Replacement	80% Completed	7 July 2019	12,900	613,142
BDG-Casuarina Rd -Serpentine Creek Bridge (Expense				14,304
BDG-Casuarina Rd -Swan Creek Bridge (Revenue 114885				14,304
BDG-Glenroy Rd - Louisa Creek Bridge	Deferred to 2020-2021		43,500	9,021
BDG-Mount Hopeful Road Ch 0.4km	10% Completed	1 July 2019	379,000	121,115
FLOODWAYS				
Glenroy Marlborough Rd - Ch 25.98	10% Completed	30 June 2019		3,656
Gum Tree Avenue - Ch 0.40 (upgrade floodway)	Completed		51,000	237,542
Kalapa Black Mtn Rd - Ch 4.04 5.71 6.68 & 7.99	Completed		126,000	193
Kalapa Black Mtn Rd - Ch 4.02	Completed			47,838
Kalapa Black Mtn Rd - Ch 5.42	Completed			1,537
Kalapa Black Mtn Rd - Ch 5.70	Completed		5,000	76,137
Kalapa Black Mtn Rd - Ch 6.66	Completed			45,730
Kalapa Black Mtn Rd - Ch 7.97	Completed			19,131
Morinish Rd - Ch 6.07	Completed		229,000	24,197

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Moses Rd - Ch 3.13	Completed			25,822
Moses Rd - Ch 3.13 & 5.29	Completed		208,000	30,124
Nine Mile Rd floodway Ch7.85-10.68	Completed		250	
Rosewood Road Ch 36.55	Completed		40,000	14,877
Rosewood Road Ch 42.48	Completed		23,000	2,227
Rosewood Road Ch 42.69 45.89 & 48.11	Completed			
Rosewood Road Ch 45.64	Completed		10,000	1,438
Rosewood Road Ch 47.85	Completed			1,499
Seymour Rd - Ch 0.26 0.82	Completed		70,000	22,176
Seymour Rd - Ch 0.82	Completed			34,784
RENEWAL OF UNSEALED ROAD GRAVEL PROGRAM			2,200,000	
GRADING				
Aremby Road Midgee Ch TBA	Completed			15,124
Bills Rd Marmor TBA	Completed			18,292
Black Gin Creek Rd Alton Downs Ch 1.26-2.38 km (1	Completed			14,709
Boulder Creek Road Boulder Creek Ch 0.9-1.04 1.89	20% Completed	30 June 2019		5,652
Bowlin Road Port Curtis Ch 4250 to 7100Km	Completed			24,501
Boys Road Alton Downs Ch TBA	Completed			13,927
Craigilee Road Morinish Ch 0.00-1.2 km	Completed		370,000	26,809

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Cranston Road Alton Downs Ch 0.00-1.61 km	Completed			41,734
Dalma Ridgelands Rd Ridgelands Ch 2.73-5.68 km	Completed			120,931
Deep Creek Road Alton Downs Ch 0.300-0.325 0.570-	Completed			10,062
E Williams Rd Kabra Ch 0.6-1.85 km	Completed			43,804
Edmistone Rd Pink Lilly Ch 0.79-1.89 km	Completed			31,559
Fairview Rd Morinish Ch 1.2-1.8 2.8-2.9 3.5-3.55	Completed		486,000	27,820
Glenroy Road Glenroy Ch 8.50-10.84 km	Started	30 June 2019		56
Goodwin Rd Gracemere Ch 0.15-1.26 km	Completed			31,636
Grant Road Moongan - Chainage TBA	Completed			7,041
Green Up Road Alton Downs Ch 0.00-0.8 km	Completed			17,776
Halfpenny Rd Gracemere Ch 0.10-0.725 0.755-0.85 k	Completed			16,691
Harding Rd Alton Downs Ch 2.10-2.50 4.30-4.70 km	Completed			14,910
Hopper Rd Nine Mile Ch 0.00-0.63 km	Completed			20,940
Hunt Rd Alton Downs Ch 1.45-3.20 3.40-4.60 km	Completed			87,406
Hunt Rd Bouldercombe Ch TBA	Completed			15,948
Kabra Scrubby Creek Rd Kabra Ch 0.8 - 1.8 km	Completed			
Kabralea Rd Kabra Ch 0.75-1.15 km	Completed		3,300	15,276
Kirk Rd Bajool Ch 1.24 - 2.24 km	Completed			21,088
Klaproth Road Alton Downs Ch 0.00-0.01 0.2-0.97 k	Completed			13,699

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Laurel Bank Road Alton Downs Ch 4.7-7.6 km	Completed			76,869
Limestone Road Limestone - Chainage TBA	Completed			6,885
Lyttle Lane Ridgelands Ch 0.6-2.0 km	Completed			29,850
Martin Rd Pink Lily Ch 0.00-0.18 km	Completed			9,031
McCamley Road Bajool Ch: 0.65 – 2.10Km	Completed			43,674
McNamara Road Alton Downs Ch 0.00-0.81 km	Completed			14,864
Mogilno Road Midgee Ch TBA	Completed			9,378
Morinish Rd Morinish Ch 0.4-0.8 1.8-2.0 2.4-3.3 3	Completed		10,500	
Murphy Rd Kabra Ch 0.0-0.35 km	Completed			9,473
North Langmorn Marmor Ch: 0.33 - 1.60Km	Completed			51,949
Punter Rd Ch 0.300-0.700-1.75-1.85Km	Completed			10,446
Rayner Road Alton Downs Ch 0.00-0.56 km	Completed			8,990
Reid Road Alton Downs Ch 5.74-5.914 km	Completed			5,479
River Road Midgee Ch 5.95-7.66 km	Completed			24,971
Riverslea Road Gogango Ch 3.70-5.75 7.50-8.30 10.	20% Completed	30 June 2019		48,310
Rookwood Road Gogango Ch 1.85-2.65 km	Completed			23,891
Rosewood Rd Morinish Ch 46.3-46.9 47.5-49.13 49.8	Completed			202,209
San Jose Rd Marmor Ch 0.0-1.1 1.7-2.0 2.9-3.3 4.5	Completed			95,257
Scott Rd Alton Downs Ch 0.1-0.6 km	Completed			17,384

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Shannen Rd Dalma Ch 0.293-2.28 2.28-2.4 2.44-2.68	Completed			71,440
Sheehan Road Alton Downs Ch 0.6-1.64 km	Completed			12,372
Shields Rd Marmor Ch 0.0-1.23 km	Completed			
Six Mile Road Bajool Ch 2.5-2.8 3.34-4.14 km	10% Completed	30 June 2019		15,148
Ski Garden Road Alton Downs Ch 0.0-0.78 km	Completed			15,725
Smith Rd Rockwood Ch 11.2 - 12.7km	Completed			30,845
South Ulam Rd Bajool Ch 18.8-20.9 km	Completed			6,006
South Yaamba Rd South Yaamba Ch 21.77-21.94 km	Completed			29,266
South Yaamba Road Shoulder South Yaamba Ch 0.00-1	Completed			13,391
South Yaamba Road South Yaamba Ch 3.76-5.3 km	Completed			52,276
Stanley Rd Gracemere Ch 0.312 - .600Km	Completed			6,124
Stanwell Waroula Rd Dalma Ch 10.63-11.7 11.9-12.5	Completed			485
Stoneleigh Road Gogango Ch 0.05-0.85 km	Completed			18,744
Sugarloaf Rd Westwood Ch TBA	Completed			1,415
Sullivan Rd Dalma Ch 0.1-0.22 0.35-0.61 0.725-0.7	Completed			6,769
Taylor Road Leydens Hill - Chainage TBA	Completed			4,935
Thirsty Creek Road Gogango Ch 5.0-7.0 7.6-7.9 9.6	Completed			62,810
Upper Ulam Rd Bajool Ch 0.0-2.6 km	50% Completed	30 June 2019		26,750
Upper Ulam Road Bajool Ch TBA	50% Completed	30 June 2019		18,864

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Wedel Road Alton Downs Ch 0.00-2.06 km	Completed			34,073
Weder Road Alton Downs Ch 0.00-0.5 km	Completed			22,791
Weir Park Road Gogango Ch TBA	Completed			7,224
Woodford Road Alton Downs Ch 0.821-1.203 1.253-2.	Completed			33,021
Yarra Road Gogango Ch 6.3-6.5 7.0-7.3 km	Completed			11,810
MAJOR CULVERTS				
South Yaamba Rd Sandy Creek	Completed		10,900	10,868
NEW CONSTRUCTION				
Kabra Scrubby Creek Rd Kabra - bitumen seal CH 0.	Completed			12,481
Newton Road Gogango (Capricorn Hwy to Gate) - Rev	Completed			195,783
Old Joe Road Bajool (Bajool-Port Alma Rd to WTS)	Completed			18,996
RECONSTRUCTION				
Alton Downs to 9 Mile Rd - Ch 1.50 to Ch 4.70 reh	Completed			29,019
Brickworks Rd - Warren Rd Intersection seal	Completed			32,978
Cherryfield Rd (Reigal to Ashford) seal road	Completed		6,000	351,592
Dalma-Ridgelands Rd - Moses Rd Intersection Impro	Completed			117,763
Griffith St (Stanwell) - Ch 0 to 0.25	Completed		35,000	133,077
Hanrahan Road Floodway-Fitzroy River (Revenue 111	Design Only		5,000	13,696
Kabra Road - Boongary Rd Intersection	Design Only			2,732

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Laurel Bank Rd - Wedel Rd Intersection Improvemen	Completed			65,295
Malchi-Nine Mile Road-Ch 7.5 to Ch 9.5	Deferred to 2020-2021		925,000	
Malchi-Nine Mile Road-Ch 9.5 to 9.7	Completed			43,535
Nine Mile Rd Pink Lily Ch 1.75-2.53 Pavement Reha	Completed		35,000	429,449
Nine Mile Road Floodway Stage 3 Ch 7.8 - 8.4 km	Completed		75,000	598,693
Reid Rd Ch 3.31-3.41 Pavement Rehab and Seal	Completed			32,769
South Ulam Road - Widening 2017 use 1078559	Completed		306,000	
South Ulam Rd Ch12.47-13.25 km - widen to 6.5m	Completed			210,858
Thirsty Creek Road - CH 0.0 to 14.5 km	Design Only			7,784
STORMWATER				
Arthur St Wwood-Ch 2.49	Completed		1,000	1,515
J Pierce Rd Ch 1.54				
Melville Street Open Channel	Deferred to 2019-2020		2,000	3,482
Murphy Rd Ch 3.30	Completed			33,380
Neerkol Rd Stanwell	Completed			12,962
			6,366,150	**5,989,493**

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
CP427 CAPITAL CONTROL CENTRAL URBAN OPERATIONS				
ANNUAL RESEAL PROGRAM			3,880,000	
ASPHALT SEAL				
Agnes Street - Archer Street to Roundabout	Completed			84,796
Agnes Street - Denham Street to Roundabout	Completed			114,644
Berserker Street - Kerrigan Street to Roundabout	Completed			76,951
Canning Street - Derby Street to Denham Street	Completed			110,867
Cowap Street (17 Cowap St - End)	Completed			110,178
Daniel Street - Stenhouse Street to Horner Street	Completed			39,015
Dean Street - Vallis Street to Robinson	Completed			816,716
Denham Street - Alma Street to Denison Street	Completed			90,033
Elphinstone Street - Dean Street to Craig Street	Completed			71,201
Farm Street - Bramble Street to Norman Road	Completed			140,995
Farm Street - Scott Street to Walker Street	Completed			203,134
German Street - Norman Road to Rosewood Drive	Completed			133,447
Richardson Road - Scott Street to Denning Street	Completed			66,841
Rockonia Road - Thozet Road to Stack Street	20% Completed	30 June 2019		194,642
Rundle Street - Jardine St to Woodville St Inboun	Completed			127,790
Tung Yeen Street - Haynes Street to Glenmore Road	Completed			60,635

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
SLURRY SEAL				
Arrow Street - Campbell Street to End	Completed			5,413
Arthur Street - Quay to End	Completed			25,538
Barambah Street - Knutsford Street to Rundle Str	Completed			29,682
Bawden Street - Elphinstone Street to Bedford St	Completed			15,116
Beaconsfield Terrace - Bellevue Terrace to Denha	Completed			12,352
Bedford Street - Berserker Street to Dean Street	Completed			54,313
Blair Street - Withers Street to End	Completed			11,554
Bloomfield Street - Pillich Street to Cul-de-sac	Completed			3,609
Boldeman Street - Spencer Street to End	Completed			9,856
Bolsover Street - Wood Street to O'Connell Stree	Completed			61,534
Boreham - Melbourne Street to Cul-de-sac	Completed			3,721
Bremner Street - Rodboro Street to Mason Street	Completed			26,858
Broughton Street - Pillich Street to Cul-de-sac	Completed			7,859
Burnett Street - Musgave Street to River End	Completed			27,854
Calder Street - 19 Calder Street to Medcraf Stre	Completed			19,346
Campbell Street - O'Connell Street to Wood Stree	Completed			9,202
Campbell Street (Shoulders) - Wood Street to 395	Completed			2,406
Canovan Street - Bridge Street to End	Completed			9,779

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Carpenter Street - Murphy to End	Completed			23,355
Cavan Lane - Stenhouse Street to End	Completed			7,441
Caxton Street - Pennycuick Street to Harrow Stre	Completed			2,330
Col Crescent - Rachel Drive to Rachel Drive	Completed			25,020
Craiglee Street - Spencer Street to End	Completed			9,797
Cruikshank Street - 156 Cruikshank Street to Dea	Completed			14,071
Dally Street - Lion Creek Road to Hamilton Aven	Completed			6,015
Deacon Street - Musgrave Street to Edwards Stree	Completed			651
Diplock Street - 289/291 Diplock Street to High	Completed			37,846
Face Street - Alexandra Street to Taylor Street	Completed			38,236
Ferricks Avenue - Marsh Avenue to End	Completed			4,282
Gorle Street - Hunter Street to Melbourne Street	Completed			15,157
Gray Street - Rice Street to Alexandra Street	Completed			43,129
Griffith Street - Tozer Street to Unmack Street	Completed			8,448
Harbourne Street - Stenhouse Street to Lakes Cre	Completed			8,526
Harman Street - Lion Creek Road to Bridge	Completed			8,421
Hawkins Street - Pennycuick Street to Meter Stre	Completed			5,593
Higgins Street - Bridge Street to End	Completed			7,263
Huntington Street - Melbourne Street to Cul-de-s	Completed			3,947

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Jard Street - Frenchville Road to End	Completed			16,337
Jardine Street (North St - Wandal Rd)	Completed			222,280
Lavarack Street - Wiseman Street to Nathan Stree	Completed			27,937
Marsh Avenue - Irving Avenue to Mills Avenue	Completed			45,127
McCullough Street - Eichelberger Street to Geord	Completed			32,204
McKelligett Street - Naughton Street to Norman S	Completed			39,997
Meade Street - Little Oackley Street to Herbert	Completed			8,744
Melbourne Street - Lund Street to End	Completed			9,473
Mercer Street - Stenlake Avenue to Richardson Rd	Completed			12,672
Meter Street - Archer Street to Gardener Street	Completed			39,267
Mills Avenue - Halford Street to Marsh Avenue	Completed			19,996
Montgomerie Street - Vesty Street to End	Completed			13,984
Naughton Street - Wandal Road to Jones Street	Completed			15,788
O'Connell Street - Bolsover Street to Wharf Stre	Completed			14,319
Parker Street - Pearson Street to Wambool Street	Completed			11,788
Paterson Avenue - Cooper Street to Rhodes Street	Completed			54,131
Paterson Street - Cooper Street to Mackay Street	Completed			26,314
Pattermore Street - Duffy Street to Mercer Stree	Completed			19,397
Pennycuick Street - Archer Street to Schofield S	Completed			3,162

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Randwick Street - Robdboro Street to Charles Str	Completed			23,602
Rice Street - 104 Rice Street to Booker Street	Completed			17,688
Robert Street - North Street to End	Completed			5,624
Robinson Street - Salamanca Street to Berserker	Completed			24,724
Rockonia Road - Stack Street to Cooper Street	Completed			52,196
Rundle Street - 118 Rundle Street to Naughton St	Completed			7,443
Rundle Street - Jardine Street to Naughton Stree	Completed			15,412
Salamanca Street - Stewart Street to Simpson Str	Completed			75,427
Spencer Street - Jessie Street to Agnes Street	Completed			19,965
Tozer Street - Griffith Street to Byrne Street	Completed			10,958
Unmack Street - Griffith Street to Byrne Street	Completed			9,659
Victoria Street - Melbourne Street to End	Completed			8,758
Werner Street - MacAlister Street to End	Completed			21,644
William Street - Davis Street to Caroline Stret	Completed			85,036
William Street - Murray Stret to Canning Street	Completed			137,744
Wiltshire Street - Bloxsom Street to Dempsey Str	Completed			24,941
Wood Street - Murray Street to West Street	Completed			2,860
Woodville Street (Wandal Rd - Rundal St)	Completed			61,084
Wooster Street-Clanfield Street to Dean Street	Completed			420

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
BRIDGES				
Bridge Rehabilitation	Deferred to 2019-2020		250,000	
Quay Street Bridge Major Renewal	Deferred to 2019-2020		100,000	42,718
BUS STOP PROGRAM	80% Completed	30 June 2019	170,000	177,520
CARPARK				
Swadling Park Car Park	Completed		53,250	47,118
FOOTPATHS				
Reconstruction Footpaths-To be determined from Asset			176,000	65,556
Alma Street - Denham Street Roundabout	Completed		333,000	333,269
Alma Street - Derby St to Town Hall Entrance W4Q	Completed			47,353
Carlton Street - Orr Av to McLaughlin St W4Q Roun	Completed			2,334
Denham Street - Athelstane Ter to Canning St W4Q	Completed			80,654
East Street-Royal St Intersection	Pending	20 June 2019		4,142
Footpath and cycleway Round 2 W4Q bgt (Revenue 1	Completed		287,000	67
German Street-Rosewood Drive to Sunset Drive	Completed		13,000	13,068
Rockonia Rd to 366 Stack St - Div 3	Completed		15,000	
Rockonia Road (Connor to Stack previous - Division 3	Completed		8,600	8,636
Thozet Rd to Elphinstone Street - Div 3	Completed		18,000	18,573
Thozet Road-Lilley Ave to Zervos Ave Design only	Completed		230,000	229,229

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
MISCELLANEOUS				
Blackspot Allocation for 100% Projects			500,000	
Bolsover Street Streetscape - Derby St to Cambridge St	Started	30 August 2019		
Chancellors Estate defect repairs (Revenue 1078917)	Deferred to 2019-2020		82,000	8,497
Disability Assess Infrastructure - Ramps (Various - Div 6	Pending		20,000	
Disabled Ramp - Cnr East street and Market Lane - Div 6	Completed			5,814
Heavy Patching across Urban Area from Asset Management l	Completed		410,000	590,979
Kerb Ramp Program - Bulk Allocation	Pending	30 July 2019	25,000	95
Marine Infrastructure Design	Pending		100,000	
PCYC Berserker Flood Valves W4Q Round 2 (Rev 10	Completed		68,000	67,724
W&S Belmont Rd Widening - FRW Entrance to South Boun	Deferred to 2019-2020		220,000	
NEW CONSTRUCTION				
Jones St -Brosnan Cr to Norman Rd	95% Completed	30 June 2019	300,000	56,572
North St-Victoria Pde to Campbell St cycle path	95% Completed	30 June 2019	364,000	570,141
Wintergarden Carpark Alma St	Completed		35,000	28,834
PILBEAM DRIVE				
Pilbeam Drive Carpark Ch 0.2km	95% Completed	21 June 2019		178,613
Pilbeam Drive Footpath - Bridge to Existing Path W4Q Round	95% Completed	21 June 2019	138,000	144,036
Pilbeam Drive Guard Rails	Used for Betterment Works			

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Pilbeam Drive Reseal	Used for Betterment Works		315,000	
Pilbeam Drive Safety Audit Works	Used for Betterment Works		30,000	
Pilbeam Drive Walkway connection to Frenchville R	Completed		700,000	499,189
RECONSTRUCTION				
Alexander St - Richardson Rd to Moores Creek Rd	75% Completed	13 August 2019	2,100,000	1,708,332
Bennett St - Ford St to Eldon St	40% Completed	20 July 2019	200,000	162,927
Berserker St-Simpson St-Robinson St	Completed		175,000	171,722
Bridge Street (Yeppoon Railway to Queen Elizabeth	Completed		185,000	183,810
Clanfield St (Wooster St to Simpson St)	Completed		231,000	225,580
Dean st Talbort to Elphinstone	Completed		75,200	75,204
Denham Street-Campbell Street Roundabout (Revenue	Completed		11,480	11,482
Glenmore Road-(Main St-NC Railway)	90% Completed	30 June 2019	305,000	270,590
Haig Street-Wandal Road to Cavell Street	Completed		321,000	311,558
Haynes Street - Hollingsworth to Byrne St	Deferred to 2019-2020		72,000	
Hindley Street-Elphinstone Street to Livingstone	Completed		190,000	191,588
Main St pavement failures	Completed		391,300	377,255
Mason Ave-Hotham Cl to Norman Rd	Completed		1,160,000	1,361,938
North St - Hospital to Hunter Stret	Completed		205,000	112,181
Pavement rehabiliation of Quay St (William to Der	Completed		713,000	189,944

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Quay Ln & Pilbeam Theatre Carpark (Revenue)	Deferred to 2019-2020		513,000	32,717
Schultz St - Denham St Ext to Verney St	Deferred to 2019-2020		188,000	20,515
Stanley Street-Alma Street Intersection (Revenue	Completed		12,000	12,111
Upper Dawson Rd (Nathan St to Wakefield St)	Pending	15 July 2019	48,000	57,410
Upper Dawson Rd-Nathan-Wakefield	20% completed	15 July 2019	543,000	90,263
ROAD FURNITURE				
Replacement & straightening Street Signage W4Q Ro	Completed		75,000	118,574
ROAD SAFETY				
Road Safety Minor Works Program	Pending	30 June 2019	205,000	58,685
Ibis Av and Nuttall St Reseals (Part funded b	Completed			23,083
STREET LIGHTING				
Streetlighting Improvement Program	Pending	30 June 2019	50,000	1,673
STORMWATER				
Stormwater general allocation for small projects	Completed		29,000	
231 Victoria Place Drainage Improvements	Completed		71,000	70,682
Satinwood Avenue - Pipe Replacements	Completed			11,114
Alexander Street Drainage	Completed		199,000	211,468
Caribbea Estate Stg 2	Completed		7,100	7,039
Dean St Drainage_Rodboro St to Peter St	Completed		132,700	133,217

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Park Street Drainage 5A - Tung Yeen Street (Reven	Completed		900,000	1,099,130
Quay Lane_North St to Albert St	Completed		65,000	3,732
Replace Stormwater Inlets	Completed		95,000	90,930
South Rockhampton Main Drain	Completed		21,000	
Wackford Street Drainage	5% Completed	27 February 2020	720,000	127,361
Webber park Stage 1B inlets/outlets	90% Completed	30 June 2019	1,210,000	828,834
TRAFFIC LIGHTS				
Berserker St and Simpson Street - Blackspot (Reve	Completed			677,095
Traffic Light Upgrades- (PAPL to Radio Link)			156,000	
Elphinstone St and Dean St (Bulbs)	Completed			34,882
Frenchville Road - Beasley Street Intersection	Completed			7,860
Graeme Action Way pedestrian crossing (Controller	Completed			24,738
Main St and Haynes St (Bulbs)	Completed			6,308
Norman Rd and Farm St (Controller)	Pending	30 June 2019		70
TRAFFIC MANAGEMENT				
Canning Street - Derby Street Roundabout	Completed		330,000	319,565
Enhanced School Zone Program 2018-2019	Completed		3,000	2,927
			19,911,730	**17,435,789**

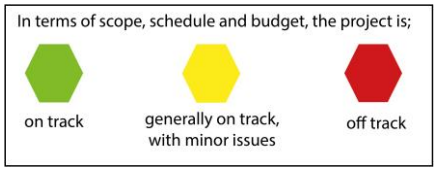
Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
CP428 CAPITAL CONTROL WEST URBAN OPERATIONS				
ANNUAL RESEAL PROGRAM			400,000	
ASPHALT SEAL				
Johnson Road (Inbound) - Bland Street to Breakspe	Completed			129,776
SLURRY SEAL				
Gracemere State School Carpark - Lawrie Street	90% Completed	20 June 2019		24,590
Middle Road (Johnson Rd - Capricorn St)	90% Completed	20 June 2019		42,931
Morgan Street - East Street to Black Street	90% Completed	20 June 2019		59,694
SPRAY SEAL				
Calighan Lane - Showgrounds Road to End	Completed			10,890
Central Street - Pattison Street to Darcy Street	Completed			2,359
Cutter Lane - Central Street to West Street	Completed			3,042
Douglas Street - Macquarie Street to Stewart Stre	Completed			22,533
East Street South - Davis Street to End	Completed			2,244
Foster Street - Macquarie Street to Stewart Stree	Completed			23,546
Old Capricorn Highway - Reservoir Street to Scrub	Completed			15,098
Perlick Street - Byrnes Parade to River Road	Completed			4,532
Rifle Range Road - Rifle Range Road T Intersection	Completed			1,769

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Tipperary road - Derry Lane to Ryan Lane	Completed			1,769
West Street - 23 West Street to 27 West Street	Completed			3,198
BUS STOPS				
Morgan Street Long Range Coach Stop	Completed		50,000	133,619
FOOTPATHS				
Bland St Johnson rd (Cemetery frontage) to Arlott	Completed		70,000	69,159
Bouldercombe - Division 4	Completed		50,000	59,319
Gracemere CBD W4Q Round 2 Bgt only (Revenue 1079	Completed		494,000	720,907
Morgan Street - CBD inc improve seating and rubbi	65% Completed	15 July 2019	450,000	559,988
MISCELLANEOUS				
Low cost sealing of minor roads	Completed		103,000	164
Mt Morgan Fishing Platform	Design only			4,481
NEW CONSTRUCTION				
Byrnes Parade-Service Road	Completed		6,000	6,461
Kent Street - Bouldercombe Ch 0.00-0.80	Completed			11,460
RECONSTRUCTION				
Baree Crescent	Completed		27,000	69,488
Macquarie St- Sommerset Rd-Middle Road GIA W4Q Ro	Completed		684,302	669,748
Macquarie St-Somerset Rd to Middle Rd	Pending	31 January 2020	600,000	292,307

Project Description	Project Status	Planned End Date	Revised Budget 3	Total Committals
Morgan Street Upgrade as part of streetscape	10% Completed	7 August 2019	185,000	102,084
Railway Parade (outside 96 James St)	Completed		24,000	23,373
Ranger St - Fisher St to Lawrie St	Deferred		106,000	
River Street Mt Morgan - Seal Ch 0.00-0.70 km	Completed			128,536
			3,264,902	**3,215,819**

3. Operational Projects

As at 07 June 2019 – 92% of year elapsed.



Project	Planned Start Date	Planned End Date	On Track	Comment	Budget Estimate	YTD actual (incl committals)
Rural	*1 July*	*30 June*		*As planned – 82%*	*$4,851,841*	*$3,969,484*
Urban Central	*1 July*	*30 June*		*As planned – 108%*	*$6,444,247*	*$6,938,322*
Urban West	*1 July*	*30 June*		*As planned – 108%*	*$1,066,521*	*$1,147,626*

4. Budget

Financial performance as expected for the reporting period.

2018.2019 - As at 07-Jun-2019 - CAPITAL

	Revised Budget	*Actual Expenditure*	*Actual Expend Inc Committals*	*% Variance*
Rural	$5,877,000	$5,784,357	$6,001,211	102%
Urban Central	$21,098,403	$15,193,027	$16,887,890	79%
Urban West	$2,908,400	$3,001,631	$3,451,149	119%
Capital Total	$29,883,803	$23,979,014	$26,340,250	88%

Comments

As at 07 June 2019 – approximately 92% of year elapsed – year to date expenditure is **88%** – expenditure is within set target.

2018.2019 - As at 07-Jun-2019 - OPERATING

	Adopted Budget	*Actual Revenue*	*Actual Expenditure*	*Actuals Inc Commitals*	
Rural	$4,851,841		$3,890,052	$3,969,484	82%
Urban Central	$6,444,247		$6,904,123	$6,938,322	108%
Urban West	$1,066,521		$1,147,626	$1,147,626	108%
	$12,362,608	$0	$11,941,801	$12,055,432	98%
RMPC	-$88,394	-$1,165,962	$995,627	$1,004,569	-161,393
Private Works	-$682,407	-$2,718,052	$2,275,443	$2,351,443	-366,609
	$11,591,807	-$3,884,014	$15,212,870	$15,411,444	133%
Works other Units		-$88,258	$88,258	$89,193	935

Comments

As at 07 June 2019 – approximately 92% of year elapsed – year to date expenditure is **98%.**

5. Section Statistics

Service Level	Target	Current Performance	Service Level Type (Operational or Adopted)
Conquest Inspections – Customer Request / Conquest Inspections (finalised within 14 working days) from April 2019.	100%	95.43%	Adopted

Rural Grading – YTD – July to June 2019

Road Name	*KM*	*Cost*	*Road Name*	*KM*	*Cost*
Archer Road	2.60	6,492.73	Edmistone Road	3.30	16,308.48
Arthur Street	2.49	13,705.07	Enright Street	0.20	635.04
Barnett Road	1.36	3,316.00	Evergreen Road	5.85	20,376.35
Bartlem Road	2.10	9,661.00	Fairview Road	7.60	54,424.34
Bills Road - Marmor	4.65	18,502.20	Flaherty Road	0.75	3,916.71
Black Gin Creek Road	2.25	17,339.02	Galton Street	0.23	1,360.00
Brickworks Road	0.60	4,846.64	Glenroy Road	30.00	148,731.00
Bull Frog Lane	7.00	17,246.00	Goodwin Road - Gracemere	2.38	7,304.76
Bushley Road	2.00	12,234.06	Grantleigh Road	4.40	18,011.82
Butler Road	0.70	1,671.44	Halfpenny Road	2.81	13,763.00
Bycroft Road	0.55	4,217.04	Hallam Road	0.79	5,305.67
Callan Road	2.10	9,342.05	Hanrahan Road	5.83	30,607.85
Calliungal Lane	0.20	725.00	Hansen Road	1.77	9,032.83
Calliungal Road	0.80	4,347.00	Harding Road	2.00	9,581.66
Calmorin Road	5.00	15,982.82	Harnsworth Road	0.80	3,935.37
Candlelight Road	1.70	4,286.21	Hinchliff Avenue	0.30	718.90
Chapple Street	0.13	1,650.75	Hopkins Road	1.50	5,691.48
Connors Road	2.00	12,171.68	Hopper Road	4.40	10,344.00
Cowie Road	0.55	3,956.62	Horigan Road	2.30	6,164.00
Craigilee Road	2.30	18,814.00	Hume Road	3.80	23,098.95
Dalma - Ridgelands Road	1.33	6,231.55	Hunt Road - Alton Downs	6.62	34,306.91
Dargel Road	1.00	6,281.65	Iker Road	3.55	11,371.00
Dee Road	0.50	1,236.82	Inslay Avenue	1.30	3,480.48
Deep Creek Road	1.48	8,665.00	Isabella Street	0.50	4,067.18
Delaney Lane	0.30	1,435.70	Jones Street	1.50	5,450.00
Dobson Street	0.18	825.01	Kabralea Road	1.20	13,572.00
Donovan Road	5.24	22,413.42	Kalapa-Black Mountain Road	6.60	7,006.08
Dovecot Road	0.90	2,669.83	Kelly Road	2.9	20296.67
Duncan Road - Alton Downs	0.25	1,255.00	Kime Road	5.10	39,555.10
Dunning Road	3.30	4,812.09	Kirk Road	3.01	15,863.00
E Williams Road	1.08	6,168.30	Lanyon Road	1.57	9,598.17
Subtotal 1	***56.64***	***$242,501.70***	***Subtotal 2***	***114.86***	***$553,878.80***

Road Name	KM	Cost
Laurel Bank Road	0.71	1,731.57
Lee Farm Road	1.25	2,760.00
Lion Mountain Road	11.15	42,114.05
Little Road	0.85	6,166.00
Lyttle Lane	0.80	3,241.00
Marble Ridges Road	5.71	14,766.56
Marmor Road	1.25	3,922.00
McCamley Road	0.58	2,029.08
McLoughlin Road	0.35	622.20
Middle Road	1.10	2,553.45
Milner Road	0.25	1,552.93
Mogilno Road	5.60	5,062.41
Morris Road	0.20	674.00
Mount View Road	1.10	5,846.12
Murphy Road	3.96	19,466.00
Native Cat Road	1.89	3,357.03
North Langmorn Road	8.91	25,518.81
Nugget Avenue	1.00	3,154.55
O'Brien Road	1.80	12,474.46
Offord Road	0.70	1,101.94
Ohio Road	1.20	6,880.00
Old Coach Road	7.90	42,537.58
Old Rifle Range Road	0.15	1,528.00
Pandora Road	2.60	6,018.20
Panorama Road	0.50	1,948.00
Pink Lily Road	0.75	2,452.18
Porters Road	0.20	984.00
Preston Road	0.70	4,723.75
Pump Lane	0.70	1,855.00
Quarryline Street	0.30	1,835.85
Rack Lane	0.20	1,252.33
Redbank Road	8.52	63,918.99
Subtotal 3	***72.88***	***$294,048.04***

Road Name	KM	Cost
Reid Road	2.44	6,371.91
Rookwood Road	19.90	108,414.65
Scott Road	0.90	1,605.49
Shannen Road	2.70	5,486.00
Sheehan Road	0.70	3,193.10
Sheridan Street	0.59	3,066.51
Sheldrake Road	2.70	11,404.47
Smith Road - Gogango	14.65	62,364.00
South Yaamba Road	21.67	64,232.80
Spragg Road	0.70	2,986.64
Springs Road	0.85	2,021.00
Stanwell-Waroula Road	4.80	26,076.00
Stewart Park Road	1.10	4,501.02
Stoneleigh Road	1.15	6,734.24
Struck Oil Road	2.50	8,749.42
Sunray Avenue	0.30	817.48
Taylor Street	0.65	4,056.00
Tee Tree Road	0.90	3,435.50
Thirsty Creek Road	16.40	66,918.11
Toowarra Road	3.10	2,285.12
Truelson Road	1.20	2,198.43
Tysoe Road	0.60	2,927.00
Ulam Connection Road	4.20	18,620.00
Upper Ulam Road	9.30	24,402.91
Von Allmen Road	1.65	9,427.64
Washpool Road	1.00	5,093.13
Wayne's Lane	0.50	2,089.13
Wedel Road	1.70	3,537.39
Weir View Road	0.75	3,747.57
Woodford Road	0.50	2,123.40
Wyvills Road	0.50	1,887.68
Subtotal 4	***120.60***	***$470,773.74***
TOTAL	***364.98***	***$1,561,202.28***

Reporting Month	May 19
Project	South Ulam Road - Bajool
Project Number	2018-061
Project Manager	Steve Hughes
Council Committee	Infrastructure

PROJECT SCOPE
Widen section of narrow bitumen Ch 12.50-13.50 to 6.50m wide

PROJECT MILESTONES			
ITEM	**TARGET DATE**		**COMMENTARY**
	ORIGINAL	**REVISED**	
Project Planning	July 2018	July 2018	
Design Development	February 2019	February 2019	Construction Plans completed
Procurement	March 2019	March 2019	Gravel and bitumen quotes requested
Construction	April 2019	May 2019	Construction planned to commence early April

FINANCIAL PROFILE								
On schedule								
	Project Life				**Current Year**			
	Total Budget	**Actual to date**	**Committals**	**Remaining Budget**	**Budget**	**Actual to date**	**Committals**	**Remaining Budget**
Expenditure	$306,000	$168,033	$42,825	$95,142	$306,000	$168,033	$42,825	$95,142
External Funding								

PROJECT STATUS
Work completed 30 May 2019

Reporting Month	May 19
Project	Mt Hopeful Road - Bajool
Project Number	2015-002
Project Manager	Steve Hughes
Council Committee	Infrastructure

PROJECT SCOPE
Replace timber bridge (Bellingen's Bridge) with concrete box culverts

PROJECT MILESTONES			
ITEM	**TARGET DATE**		**COMMENTARY**
	ORIGINAL	**REVISED**	
Project Planning	July 2018	July 2018	
Design Development			Not applicable
Procurement	November 2018	November 2018	Culverts ordered November 2018
Construction	March 2019	May 2019	Planned to commence 20th May 2019

FINANCIAL PROFILE								
On schedule								
	Project Life				**Current Year**			
	Total Budget	**Actual to date**	**Committals**	**Remaining Budget**	**Budget**	**Actual to date**	**Committals**	**Remaining Budget**
Expenditure	$379,000	$105,224	$15,891	$257,885	$379,000	$105,224	$15,891	$257,885
External Funding					$135,000			

PROJECT STATUS
Construction commenced 03 June 2019

Reporting Month	May 19
Project	Calmorin Road – Hanson's Bridge replacement
Project Number	2017-185
Project Manager	Steve Hughes
Council Committee	Infrastructure

PROJECT SCOPE
Replace existing single lane timber bridge with RCBC structure 7.0m wide Minor re-alignment of approaches to improve safety

PROJECT MILESTONES			
ITEM	**TARGET DATE**		**COMMENTARY**
	ORIGINAL	**REVISED**	
Project Planning	March 18	March 18	
Design Development	August 18	September 18	
Procurement	November 18	November 18	Culverts ordered early Nov 2018
Construction	December 18	March 19	Planned to commence 15th March

FINANCIAL PROFILE

Budget on track

	Project Life				**Current Year**			
	Total Budget	**Actual to date**	**Committals**	**Remaining Budget**	**Budget**	**Actual to date**	**Committals**	**Remaining Budget**
Expenditure	$925,000	$570,225	$42,918	$311,857	$925,000	$570,225	$42,918	$311,857
External Funding					$463,250			

PROJECT STATUS
Concrete base was poured on Monday 15th April 2019
Culverts placed on 30th April 2019
Precast wing walls placed 10 May 2019
Concrete deck completed 07 June 2019
Approach earthworks commencing 11 June 2019

Reporting Month	May 19
Project	Bennett Street (Ford Street – Eldon Street)
Project Number	2019 - 104
Project Manager	Jason Pierce
Council Committee	Infrastructure

PROJECT SCOPE

- Replacement of 550 metres of kerb and channel
- Reconstruction of 115m2 of concrete driveways
- Construction 1,612m2 asphalt overlay

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	23 January 2019		Design Approved
Procurement	-	-	Not Applicable
Construction	July 2019		Anticipated Completion

FINANCIAL PROFILE

On budget.

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$400,000	$ 163,013	$ 359	$ 236,628	$ 205,000	$ 163,013	$ 359	$ 41,628
External Funding								

PROJECT STATUS

- There was a 2 week cessation of these works while the crew was redeployed to the Quay Street footpath to speed its completion
- Kerb and channel replacement works progressing (approximately 70% complete)

Reporting Month	May 19
Project	Quay Street Footpath (William Street – Derby Street)
Project Number	2019-082
Project Manager	Jason Pierce
Council Committee	Infrastructure

PROJECT SCOPE

- Install 16m of 375 diameter stormwater pipe
- Construct 1 manhole chamber
- Construct 2 inlets
- Replace 40 metres of kerb and channel
- Excavate and pour 700m2 of Exposed aggregate concrete footpath
- Install 21 tree plots and associated irrigation works
- Install electrical and communications conduits and pits with provision for future smart pole street lighting
- Install 200 metres of handrails
- Install 61 concrete wheel stops to adjacent angle parks

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	25 February 2019		Design Approved
Procurement	-	-	Not Applicable
Construction	January 2019	July 2019	Anticipated completion

FINANCIAL PROFILE

Over budget.

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$ 560,000	$ 527,176	$ 56,239	- $ 23,415	$ 560,000	$ 527,176	$ 56,239	- $ 23,415
NDRRA Funding	$ 120,000				$ 120,000			

PROJECT STATUS

- Stormwater work is complete
- Installation of conduits and subsoil drainage complete
- Exposed aggregate concrete footpath complete
- Landscaping, street furniture, irrigation and fencing to be completed

Reporting Month	May 19
Project	Upper Dawson Road (King Street – Brecknell Street)
Project Number	2019-071
Project Manager	Jason Pierce
Council Committee	Infrastructure

PROJECT SCOPE

- Installation of stormwater pipe and manholes
- Installation of subsoil drainage
- Construct new kerb and channel
- Construction of new concrete footpath
- Construction of new road pavement
- New asphalt seal

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	10 April 2019		Design Approved
Procurement			Not Applicable
Construction	June 2019	August 2019	Anticipated Completion

FINANCIAL PROFILE

On budget

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$ 700,000	$ 262,742	$ 18,341	$ 418,916	$ 510,000	$ 78,112	$ 18,341	$ 413,547
External Funding								

PROJECT STATUS

- Stormwater works 90% complete
- Kerb Replacement works 20% complete

Reporting Month	May 19
Project	Wackford Street Flood mitigation works
Project Number	2016- 068
Project Manager	Jason Pierce
Council Committee	Infrastructure

PROJECT SCOPE

- Install 242 metres of 1200 x 900 Box culverts
- Install 360 metres of 900 dia concrete stormwater pipe
- Install 62 metres of 750 dia concrete stormwater pipe
- Construct all associated stormwater chambers and inlets
- Lower level of Wackford St by excavation of approximately 3000 m3
- Reconstruct Wackford St pavement with approximately 1200 m3 of gravels
- Reconstruct 810m of kerb and channel
- Reconstruct 1000m2 of concrete driveways
- 3000m2 of new asphalt surfacing

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	15 February 2019		IFC drawings finalised
Procurement			Not applicable
Construction	June 2019	January 2020	Anticipated completion

FINANCIAL PROFILE

Over budget.

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$ 3,768,110	$196,392	$ 236,553	$ 3,335,165	$ 720,000	$ 160,754	$ 236,553	$ 322,693
External Funding	$ 1,884.055							

PROJECT STATUS

- 75m of 1200 x 900 box culverts installed
- Major sub-contract for the construction of stormwater chambers awarded to A&A Complete concreting

Reporting Month	May 19
Project	Webber Park Stage 1A flood Mitigation Works
Project Number	2018-186
Project Manager	Jason Pierce
Council Committee	Infrastructure

PROJECT SCOPE

- Earthworks for reconfiguration of the topography through 15 Chalmers Street (inlet) and 24 Barrett Street (outlet)
- Associated service relocations and reconfiguration (stormwater, sewer and telecommunications services)
- Scour protection and associated surface treatments rock protection, concrete protection, reinforced turf etc
- Other required civil works including berms, bollards, pathways and pedestrian fencing.

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	27 September 2018		Design Approved
Procurement			Not Applicable
Construction	April 2019	July 2019	Anticipated Completion

FINANCIAL PROFILE

On budget

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$1,201,000	$ 820,395	$ 29,446	$ 351,159	$1,201,000	$ 866,394	$ 29,446	$ 305,660
NDRP Funding	$ 400,770				$ 400,770			

PROJECT STATUS

- Development application Approved 27 March 2019
- Sewer Relocation completed
- Telstra relocation works completed
- Bulk earthworks completed
- Stormwater relocation works completed
- Major scope change – bulk earth berms changed to concrete
- Work currently progressing on reinforced turf and bollards

Reporting Month	May 19
Project	Alexandra Street – Reconstruction
Project Number	C1125972
Project Manager	Matthew Smith
Council Committee	Infrastructure

PROJECT SCOPE

Full road reconstruction from Richardson Road to Sheehy Street

- Reconstruct pavement
- New drainage infrastructure
- Replace existing kerb and channel
- New centre medians
- Asphalt overlay

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	November 18		Design complete
Procurement			Not applicable
Construction	November 18		Project commenced 27 November 2018. Construction period approximately 9 months.

FINANCIAL PROFILE

$421,000 External Funding – Roads to Recovery is included in the $2.1 million budget.

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$2,100,000	$1,070,000	$0	$1,030,000	$2,100,000	$1,610,000	$107,000	$383,000
External Funding	$421,000				$421,000			

PROJECT STATUS

Project commenced 27 November 2018. Area under construction – Alexandra Street (Richardson Road to Sheehy Street)

The pavement works for 3 quarter of the road width has been completed and spray sealed. Both inbound lanes have been Asphalt sealed and line marked.

The remaining Kerb and pavement works for the outer outbound lane is expected to be completed by end of June. The Asphalt seal remaining half of the road is scheduled for late June.

Centre median works will commence following the asphalt seal. Estimated completion date for these works is end of July.

Reporting Month	May 19
Project	Yaamba Road – On Road Cycle Paths Stage 2A
Project Number	J5094942 and J5098963
Project Manager	Matthew Smith
Council Committee	Infrastructure

PROJECT SCOPE

Upgrading Yaamba Road Cycle Network between Farm Street and Nuttall Street (South & North bound lanes)

- Pavement widening and overlay
- Upgrade of existing drainage infrastructure
- Improve road batter grade (additional fill)
- New kerb and channel
- Line marking
- Guardrail

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	January 19		Design complete
Procurement			Not applicable
Construction	March 19		Project commenced 23rd March 2019. Construction period 5 months.

FINANCIAL PROFILE

This project is fully funded by Department of Transport and Main Roads. Profit margin for this works is 10% ($47,500)

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$1,775,000	$460,000	$35,000	$1,280,000	$1,775,000	$460,000	$35,000	$1,280,000
External Funding	$1,775,000				$1,775,000			

PROJECT STATUS

Project commenced 23rd March. Area under construction – South bound lanes on Yaamba Road (Nuttall Street to Carlton Street)

North Bound Lanes has now been added to the program at value of $1.3 Million

- South Bound component is 90% complete (Line Marking Remaining)
- North Bound component is 40% complete
  - Stormwater
  - Pavement Widening
  - Guardrail
  - Line Marking
  - Culvert extension
  - Open Drain construction

Reporting Month	May 19
Project	Gracemere CBD upgrade – W4QR2
Project Number	2018-140
Project Manager	Natalie Chapman
Council Committee	Infrastructure

PROJECT SCOPE

All-abilities access to Gracemere CBD properties.

Improved bins and seating facilities.

Provision of trees along shop frontages.

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	January 2019		Completed
Procurement	January 2019		Completed
Construction	May 2019		Completed

FINANCIAL PROFILE

Exceed budget

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$514,000	$715,558	$11,796	-$213,354	$494,000	$709,110	$11,796	-$226,906
External Funding	$500,000							

PROJECT STATUS

Footpath works 95% complete, for example minor landscaping, tactile indicators and clear coat outstanding.

Reporting Month	May 19
Project	Mount Morgan CBD upgrade – W4QR2
Project Number	2018-084
Project Manager	Natalie Chapman
Council Committee	Infrastructure

PROJECT SCOPE
All-abilities access to Mount Morgan CBD properties. Improved bins and seating facilities. Improved stormwater drainage. CBD project funding (C 111 2832, $450,000) combined with streetscape funding (C 107 6592, $185,000).

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning			
Design Development	January 2019	March 2019	Completed
Procurement	January 2019	March 2019	Completed
Construction	March 2019	July 2019	In progress

FINANCIAL PROFILE

On track.

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date 18/19	Committals	Remaining Budget
Expenditure	$715,000	$609,659	$103,243	$2,098	$635,000	$558,827	$103,243	$27,070
External Funding	$450,000							

PROJECT STATUS
Stormwater works 95% complete. Footpath works 30% complete. Both day works and night works occurring at present, to increase progress prior to end of financial year. Additional crew carrying out day works along quieter section of Morgan Street.

8.5 REPLACEMENT OF GAVIAL CREEK BRIDGE

File No:	**363**
Attachments:	**1⇩. Bowlin Road Access Report (in confidential)** **2. Gavial Creek Bridge Level 3 Inspection⇩**
Authorising Officer:	**Peter Kofod - General Manager Regional Services**
Author:	**Martin Crow - Manager Infrastructure Planning**

SUMMARY

Gavial Creek Bridge on Bowlin Road is in poor condition and has reached the end of its useful life. This report looks at options that are available to Council to maintain public access to Bowlin Road.

OFFICER'S RECOMMENDATION

THAT Council proceed with the demolition and replacement of the Gavial Creek Bridge.

COMMENTARY

The Council report exploring the options available to maintain access to Bowlin Road has been attached for Council's further consideration. Further advice in relation to some of the matters raised in the report is as follows.

South Rockhampton Recycled Water Scheme and Biosolids Management

Council's Environmental Sustainability Strategy commits to improving river health, waste reduction and recycling programs and showcasing leading water management practices.

FRW's South Rockhampton Recycled Water Scheme and Biosolids Management proposal supports this strategy by proposing to divert biosolids and treated effluent generated at the South Rockhampton Sewage Treatment Plant to the agricultural areas immediately south of Gavial Creek. This represents not only the most environmentally sustainable practice but represents the most financially sound solution as well.

It is estimated that utilizing the biosolids on the agricultural area via the alternate road options could cost in the order of an additional $120,000 per year in transport costs. Disposal of biosolids to landfill would be significantly greater and could be in the order of $600,000 to $900,000 per year depending on the tonnages transported and the prevailing waste disposal rate. A stand- alone bridge structure to take a future effluent pipeline across Gavial Creek to the agricultural area could cost in the order of $1.2 million for the 64m spanning distance. This is based on a similar structure across Moores Creek built in recent years with a spanning distance of 35m at a cost of approximately $700,000.

Gavial Creek Bridge Condition

The Level 3 Bridge Inspection Report for the Gavial Creek Bridge (February 2017) is attached for Council's information. This is the report on which Council Officers are basing their opinion that the bridge structure is at the end of it's useful life. It is the condition of the substructure, that being the abutments and the piers, that is of greatest concern and driving the recommendation to replace the bridge. Section 7 "Conclusion" of the report provides a more detailed summary supporting this recommendation. This is also the concern in pursuing any alternative use that requires the continued use of the abutments and piers. Note that the 15 Ton load limit is currently in place on the bridge. The report also identifies that as a result of movement of the abutments, the bridge is effectively "locked up" and this brings into question the ability of the structure to withstand significant horizontal loads.

BACKGROUND

In March 2019, Council considered a report in relation to the options available to continue to provide access onto Bowlin Road. This report was precipitated by the condition of the Gavial Creek Bridge which was considered to be at the end of it's useful life.

The decision by Council was put on hold pending the outcome of a funding submission to the State Government for the replacement of the Gavial Creek Bridge. Council has been notified by the State Government that their funding bid has been unsuccessful.

PREVIOUS DECISIONS

At the Council meeting of 5th March 2019, Council resolved to demolish and remove the existing Gavial Creek Bridge and that a cost estimate be prepared for the removal of the steel trusses and restoration. Subsequent to that, at the same Council meeting, Council further resolved to place on hold the demolition of the Gavial Creek Bridge until further consideration pending the outcome of the grant that has been applied for under the Local Government Grants and Subsidies Program.

BUDGET IMPLICATIONS

An additional $1.5 million has been included in the draft 2019/20 capital budget for the demolition and replacement of the Gavial Creek Bridge.

RISK ASSESSMENT

The risk of failure of the bridge is currently being managed through regular condition inspections and the implementation of a load limit as recommended in the level 3 Bridge Inspection Report for Gavial Creek Bridge. This strategy is considered reasonable in the short term whilst Council decides whether to replace the bridge however residual risk of failure still exists as a result of the assumptions made in relation to the structural condition of the piers and abutments and the questionable ability of the structure to withstand horizontal loads.

CORPORATE/OPERATIONAL PLAN

1.1 Safe, accessible, reliable and sustainable infrastructure and facilities.

3.1.5 Develop and implement management practices for improved waterway health

3.3.2 Ensure environmentally sustainable business processes and decision making.

CONCLUSION

Although the most expensive up-front capital option, the replacement of the Gavial Creek Bridge is comparable in overall lifecycle costs to the other options presented, facilitates additional benefits and cost savings for the operations of FRW and has the least impact on current users and property owners in the area.

REPLACEMENT OF GAVIAL CREEK BRIDGE

Gavial Creek Bridge Level 3 Inspection

Meeting Date: 25 June 2019

Attachment No: 2

Sterling

TOTA VITA
Bridge Engineering

LEVEL 3 BRIDGE INSPECTION REPORT

GAVIAL CREEK

25 February 2017
Job No. 17-02-0001

ROCKHAMPTON REGIONAL COUNCIL

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Document Control

Version	Date	Author	
		Name	Initials
1 – Draft	13 March 2017	David Crowe	DC
2 - Final	29 March 2017	David Crowe	DC

EXECUTIVE SUMMARY

Rockhampton Regional Council, following on from Level 2 Inspections that have been carried out by The Sterling Group, has requested Level 3 Bridge Inspections be carried out on a number of their Bridges.

This report is to document the findings of the inspection on the Gavial Creek Bridge.

The Gavial Creek bridge has had Level 3 inspections carried out in 2013 and 2015. Previous inspections, including these previous Level 3 inspections, have rated the bridge in Condition State 4 – Very Poor. This is due mainly to excessive cracking and spalling of concrete in Piers 1 and 2. There is also cracking identified in the piles at the abutments and at Pier 3. The through truss is in poor condition, with the paint system totally broken down. A load assessment carried out in 2013 found that the longitudinal timber decking beams are under capacity, and recommended a load limit of 15t be applied.

The bridge is made up of several components. The main span is estimated to have been in place for around 90 years. The through truss has been reused from an older bridge, and is therefore likely to be significantly older, however it is the condition of the piers in the original span that is of most concern. The inspection concluded that the piers in particular have come to the end of their useful life. Note that some of the original timber approach span piers are still in place under the bridge itself.

The approach spans are more recent, and the superstructure for these is in fair condition. However the condition of the piles in the abutments and piers is considered to be deficient, due to large cracking. The piles at Abutment A have now been covered by shotcrete in order to prevent further scour from undermining the abutment and the approach road, however the cracking measured during the previous level 3 inspection measured up to 1.3mm width in the headstock.

The recommendations included in this report include replacement of the structure.

Other recommendations include:

- Implement 15t load limit, with assessments for specialist vehicles that require access
- Implement a regular inspection program, which has been occurring, with regular Level 2 and Level 3 inspections being carried out.

LEVEL 3 INSPECTION REPORT

TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

Rockhampton Regional Council, following on from Level 2 Inspections that have been carried out by The Sterling Group, has requested Level 3 Bridge Inspections be carried out on a number of their Bridges.

The purpose of this project is to obtain technical data on the condition of a number of Rockhampton Regional Council owned bridges. This data will be used for Maintenance Program purposes.

Tota Vita Bridge Engineering (TVBE), on behalf of The Sterling Group, has been appointed to carry out Level 3 inspections on the following bridges:

- Riverslea Road Crossing over Fitzroy River:
- Bowlin Road Bridge over Gavial Creek
- Larcombe Road Bridge over Splitters Creek, and:
- Casuarina Road Bridge #2 over Swan Creek.

The Level 3 inspection for Casuarina Road bridge is to also include a load capacity assessment to determine the bridges capacity and confirm the load limit to be applied.

This report details the inspection for Bowlin Road Bridge over Gavial Creek. The bridge location is shown in Figure 1 below.

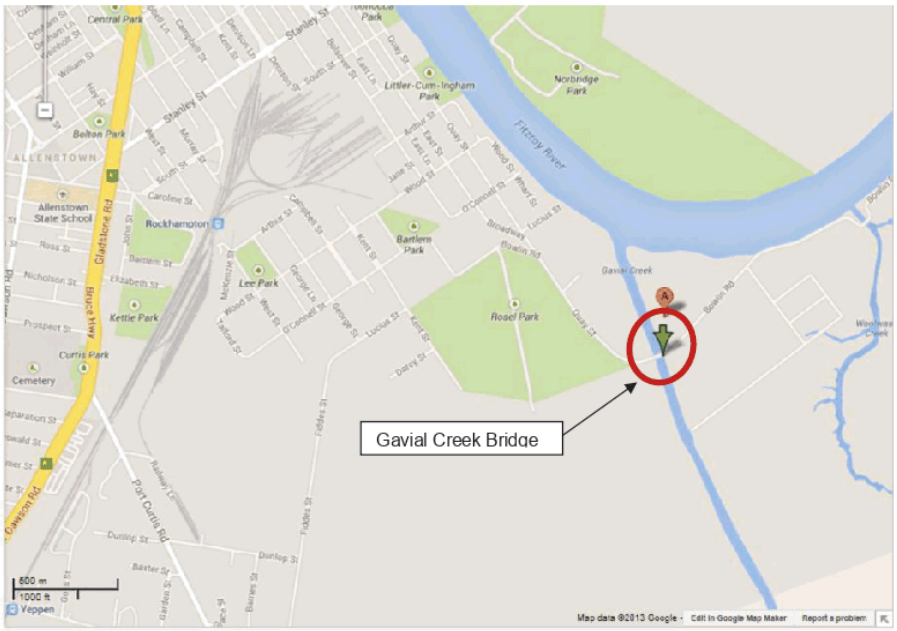

Figure 1 – Location Diagram

2. SCOPE OF WORK

TVBE's scope of work comprised carrying out a detailed Engineering Inspection of the Gavial Creek Crossing.

The recent Level 2 Bridge Condition Inspection identified issues with the bridge and recommended a Level 3 inspection. There have been a number of inspections carried out on this structure recently as the defects that have been identified are numerous and significant. These inspections include Level 2 and Level 3 inspections. The Level 3 inspections were carried out in 2013 and 2015.

Principle defects include the condition of Piers 1 and 2, cracking in PCC piles to both abutments and at Pier 3 with associated reflective cracking in the abutment headstocks and the bridge articulation. The through truss also has no protective coating, although there is no significant section loss apparent.

The Level 3 Detail Structural Engineering Inspection is to be carried out in accordance with the Queensland Department of Transport and Main Roads Structures Inspection Manual (SIM).

As a Level 2 Bridge Condition Assessment has been carried out recently, it is not considered beneficial to provide another report. However, comments on the recent inspection have been included in a section of this report.

The scope does not include for any destructive testing or coring. If necessary, these would be recommended as part of this report for further action and investigation.

3. STRUCTURE

The bridge is a 4 span bridge that carries Bowlin Road over Gavial Creek. The date of construction of the bridge is not known, however the deck planks in the approach spans are dated 2007, which is likely to be the most recent reconstruction of the bridge. The main span is an old railway type riveted half-through truss bridge and is possibly up to 100 years old. Note that some of the original construction is still evident at the site, with timber piles in place and including a cast iron bracing arrangement.

Anecdotal information provided by RCC was that the main span was put in place circa 1920's, which makes the piers around 90-100 years old. The truss itself was apparently brought up from a railway bridge in Victoria and is therefore likely to be much older than this.

The approach spans are a very recent addition to the bridge, as noted above. These spans consist of precast deck slabs which span transversely between the 4 steel girders that are the main support elements. The deck slabs are dated 29/03/2007 and the steel girders are likely to also be of similar age. The abutments and Pier 3 consist of reinforced concrete headstocks and precast octagonal piles. Note that there are no wingwalls at either abutment.

Piers 2 and 3 are of much older construction, and as noted above would date back to circa 1920-1930. The pier is reinforced concrete, and is formed as a portal frame, with the top of the frame forming the bearing shelf. The main support elements are square columns, and there are infill walls between the columns on the front and rear faces down to approximately the ground or water level. There are no infill walls between the front and rear faces, so that it would be possible to walk through the pier. There are tie beams at the approximate ground/water level. The columns continue into the ground as piles but the depth of these elements could not be determined.

The main span of the bridge is a riveted steel half-through truss construction, commonly used in railways from the turn of the last century. The half-through trusses are connected by steel cross beams which are part of the original construction. The deck is timber, and has been recently refurbished over a part of the span.

Photo 1 – View of Bridge from Approach 1

Photo 2 – Side on view from left hand side (taken 26/02/17 – note high water level)

Photo 3 – View of structure from underneath (Span 2), looking towards Pier 2 (taken from 2013 inspection)

4. METHOD OF INSPECTION

The inspection was carried out during the day under full light conditions. The inspection was carried out broadly in accordance with the Queensland Department of Transport and Main Roads Bridge Inspection Manual.

Abutment 1 in the inspection has been specified as the western abutment, closest to Rockhampton city centre.

Inspection of the top of the bridge was conducted by walking along the structure.

The lengthening spans (Spans 1, 3 and 4) were inspected from ground level from underneath. This included inspection of the abutment and piers and close (within touching distance) inspection of the girders where possible.

Inspection of the underneath of the Span 2 truss was not included in the scope of this inspection.

No testing was carried out on the structure.

5. STRUCTURE CONDITION

The inspection was carried out during the day on Saturday the 25th of February 2017 by David Crowe of TVBE. Another visit was carried out on Sunday the 26th to take some more photos. On the Sunday the water level was much higher than on Saturday. The weather was fine during the inspection. The structure was considered to be in very poor condition overall, with an overall rating of Condition State (CS) 4.

Much of the structure had not changed significantly from previous inspections. This includes the truss members, the approach span deck slabs and steel beams, the barrier over the approach spans and the main span, the bearings and the waterway. For information on these elements, reference should be made to the previous inspection reports.

The elements discussed below are elements that are of particular concern or elements that have changed or deteriorated since the previous Level 3 inspection.

5.1 Approaches

The bridge approaches are generally in fair condition, with transverse cracking evident. The crack shown in Photo 4 below is the same crack that was identified in previous inspections. At the joint between the deck and the carriageway at Approach 1 there is a transverse crack at the abutment joint. The joint is unformed, and relies purely on asphalt being placed up against the concrete deck. There has been a patch carried out in this area recently that was not there during the previous inspection as can be seen in Photo 5.

The previous reports identified significant scour under Abutment 1. The scour has been repaired with shotcrete as can be seen in the photos below. It is assumed that during this repair, any voids under and behind the abutment were identified and filled but this could not be verified during the inspection. The shotcrete is thin at the edges, and is showing signs of minor undermining. There are also some large cracks suggesting some settlement has occurred, however at this stage it is intact and will provide protection to the approach embankment.

A2 appears to be unchanged from the previous inspection.

Photo 4: AP1. Note transverse crack

Photo 5: AP1. Note repair and crack at rear of abutment

Photo 6: PRO to RHS A1. Note crack

Photo 7: PRO to LHS A1

Photo 8: A1 toe of PRO showing minor scour under

Photo 9: rubble under Span 4 adjacent to A2

5.2 Timber Deck

The timber deck over the main span is principally made of layers of structural plywood. Over the first half of the main span, there are longitudinal running boards. Several of these boards are missing.

The second half of the main span has been re-decked with recycled decking boards from another bridge, as previously noted and is still in fair condition. As a part of the rectification works, additional members have been bolted to the longitudinal decking boards, in order to pack them out and fix the new deck planks to them at the correct level. The As Built information as provided by Rockhampton Regional Council personell is included in Appendix B.

There is also a length of timber kerb that is missing, as noted in the Level 2 inspection.

Due to the missing boards in the deck, the timber deck for S2 is rated as CS4. RRC has been notified of the missing boards and that is expected to be fixed in the short term, at which stage the condition rating would return to CS2.

Photo 10: Deck construction – structural plywood layers

Photo 11: Longitudinal decking boards missing

Photo 12: Longitudinal decking boards missing

Photo 13: Longitudinal decking boards missing, note kerb board missing LHS

5.3 Abutments

The abutments have been previously reported as being in poor condition due to severe cracking in the headstocks and piles. The piles at Abutment A have now been covered by the PRO, however it is not certain if the cracking was treated. In any event, it is expected that the cracking is due to corrosion caused by chloride ingress and therefore is likely that the corrosion will continue irrespective of any treatment.

The abutments are also leaning forward. This had been identified in the previous Level 3 inspection. This has resulted in the steel beam headstock on the piers leaning. Closer inspection of photos taken during the inspection in 2013 show the steel beam in the same position, i.e. it is leaning over. Therefore, it can be assumed that the abutments have been leaning this way for some time.

The major concern with the abutments leaning forward is that the bridge is totally locked up. The main span rocker bearings on Pier 1 are leaning over and locked into position, leaving no capacity for movement in them. Coupling this with the abutment leaning over and pushing the approach spans against the main spans potentially increases lateral loads on the piers which have severe corrosion and therefore likely reduced capacity to take horizontal loads. This will be discussed further at a later stage in this report.

Photo 14: Girder at A1 hard up against ballast wall

Photo 15: Spalling concrete at top of ballast wall from impact of deck slab

Photo 16: Headstock Girder at Pier 1 looking towards A1 showing tilt of girder

Photo 17: View of top of headstock girder showing tilt and separation between deck beam and headstock girder

5.4 Piers 1 and 2

The original Piers 1 and 2, as noted above are thought to be approaching 100 years of age. Given the environment that they are in, their condition is not surprising. The cracking in the pier column sections is significant and may be growing, as corrosion of the reinforcement continues. While the original assessment carried out in conjunction with the 2013 inspection showed that the piers have sufficient capacity their condition is such that a total failure could occur.

Previous inspections should be referenced for more detailed descriptions of the cracking and other defects on the piers. However, of particular note are the following issues:

1. The worst exposure classification is for the tidal/splash zone of elements in contact with salt water. From the photos below, it can be seen that the water height in the river varies

significantly, effectively resulting in the majority of the pier being in the tidal/splash zone. This would mean that the entire pier could be exposed to chlorides when the tide level is up, and subsequently exposed to the open air, allowing oxygen to access the reinforcement through the cracks and spalls. These are the essential ingredients for corrosion and therefore it is safe to conclude that corrosion is extensive and ongoing in the pier reinforcement.

Photo 18: Pier 2 face 1 (previous 2013 inspection). Note water level

Photo 19: Side view of bridge. Note water level against piers

2. While the previous assessment carried out in 2013 showed that the capacity of the pier was adequate, even allowing for a reduction in reinforcement due to corrosion, the assessment was carried out purely for vertical loads. As the abutments are leaning towards the piers, it can be assumed that they are putting a horizontal load onto the piers (refer Photos 16 and 17 above which show the headstock beam at the pier rotating). In addition, the rocker bearing at Pier 1 is leaning over all the way and has locked up. This results in this bearing being effectively fixed where the intention was that this bearing is a moving bearing, allowing the bridge to move with temperature. As such, changes in temperature would also result in loads being transmitted onto the piers. The piers in their current condition may not be able to accommodate significant horizontal loads.

Piers 1 and 2 are provided with a rating of CS4 due to the cracking and spalling and the likelihood of extensive corrosion to the reinforcing steel.

6. COMMENTS ON LEVEL 2 INSPECTION

A Level 2 Inspection was completed by Sterling on 06/09/2016. Rather than provide another Level 2 report, the following is a summary of comments on the recent Level 2 inspection.

Generally, the report is accurate. The overall condition state rating of 4 is appropriate. The following are some of the comments on the Inventory Report (Sheet B2/2).

Group	Component	Standard Number	Comments
P1	B	43S	The rockers have rotated to their extreme limit and appear to be locked in place. They are in the same position as during the previous level 3 inspections. The paint system has totally failed and there is no lubrication in place. The rating should be revised to CS4.
P1/P2	H	54S	The headstock at each pier has rotated due to the abutments leaning forward. The current CS3 rating is appropriate.
P2	B	43S	This bearing is a fixed bearing and the Standard Number should therefore be changed to 40O. The paint system has completely broken down and there is surface corrosion over all surfaces. However the corrosion is not significant and therefore the rating should be revised to CS2.
A1	A	50C	The description noted that "Previous L3 inspection has addressed this with treatment for ASR and backfilling." However the previous inspection report recommended testing for ASR and this has not been carried out. ASR is thought to be unlikely however due to the age of the abutment construction. There has been no treatment to the abutment itself, with the backfilling and scour protection only preventing further scour and reducing the risk of the approach being undermined. The current CS4 rating is appropriate.
A1/A2	A	50C	It should be noted that the abutment has moved forward by more than 20mm, resulting in spalling concrete surfaces where if bears against the deck concrete, and rotating of the steel headstock beams at Piers 1 and 3 respectively. This movement would also rate as CS4, therefore the current rating is considered appropriate.

The Defective Components Report (Form B2/3) includes a lot of items as each element that is rated SC3 or 4 is included on this form.

Many of the actions from this report can be broken down into the following generalised activities:

- Monitoring – this would be carried out during regular inspections, and will include monitoring:
  - Subsidence in the approaches
  - Cracking in the concrete kerbs in Spans 1, 3 and 4
  - Cracking to abutments, piles to Abutment B (noting that Abutment A piles are no longer visible) and Pier 3, pier walls on Piers 2 and 3.
    - This monitoring would form a part of the recommended inspection regime.
- Reinstatement of guardrail connections to posts on AP1 and 2. This should be carried out.
- Replacement of missing/rotten timber decking planks and kerb members on Span 2. This should be carried out.
- Assessment of bridge rail, which is non compliant with AS5100 requirements. This has been noted previously however there is insufficient width over Span 2 to provide a compliant bridge rail.
- Clean steel elements and assess for section loss, particularly to bearings on the approach spans, and provide new paint coating. At this stage, this is not considered feasible.

- Implement actions from previous Level 3 inspection reports. This should be carried out, as per the recommendations below.
- Commission Level 3 inspection, which is the basis for this report.
- Inspect using underbridge inspection unit (UBIU). This was carried out as a part of the Level 3 inspection in 2013. At this stage, it is not considered necessary to undertake a further inspection using the UBIU, as the critical elements for this structure are the substructure. However, it may be worth considering carrying out an inspection of the piers at low tide by boat to provide regular records of crack widths.

7. CONCLUSIONS

The Level 2 inspection was consistent with previous inspections carried out on this structure which rated it in Condition State 4.

The load capacity assessment carried out in 2013 provided a rating for the bridge and recommended a limit of 15t based on the capacity of the 300 deep by 100 wide longitudinal deck members of the truss span. It stated: "If the timber deck members alone are replaced, due to the rating factor of the truss top chord, the load limit could be increased to 36t." The load limit of 36t has been applied, however it appears that the previous statement has been misinterpreted. The timber deck members in this statement are the longitudinal deck beams. There has been no strengthening works or works to replace these beams. The 2015 Level 3 inspection provided recommendations for strengthening these members.

Aside from the capacity issues with the deck, which is possible to rectify, the issues with the substructure are significantly more difficult to rectify, and may not be possible to rectify with sufficient confidence to provide a 100 year design life. It is obvious that the main piers have reached the end of their useful life, and these would have to be totally replaced. In addition, the cracking in the precast piles at the abutments and at Pier 3 would need significant work to rectify and guarantee durability and integrity. In addition the movement of the abutments resulting in the ballast wall striking the concrete deck planks, and rotation of the headstock on the piers along with the fact that the rocker bearing is laying over at its maximum means that the bridge is totally locked up and is not acting in the way it was originally designed. Rectification of all of these issues is difficult, technically and physically challenging and may not provide value for money for Council in that a 100 year design life would not be provided.

The major conclusion from this inspection, coupled with the ones carried out over the last few years is that this structure has reached the end of its life and Council should replace the bridge.

8. RECOMMENDATIONS

The following steps should be taken by Council to manage the risk for the structure and to ensure that maximum value for money is provided in the future. It is understood that the roadway cannot be closed as the detour is significant.

The major risk for this bridge is collapse, which could happen while it is under use, or during a flood event. At this stage, it is not showing signs of imminent collapse, however to ensure that service is guaranteed, Council should start planning for replacement of the structure in the next 2-3 years.

8.1 Bridge Management

As per the previous reports, the bridge needs to be managed in order to reduce the loads on the substructure and due to the understrength members that were identified during the 2013 load capacity assessment.

ACTION 1:

- Implement 15t load restriction as outlined in the 2013 Level 3 Inspection and Capacity Assessment report and reiterated in the 2015 Level 3 Inspection report.
- In the event of particular heavier vehicles requiring access over the structure, these can be assessed on a case by case basis and if they are found to be acceptable can be permitted to use the bridge, potentially under speed or other restrictions. If there is a regular requirement for heavier vehicles to use the bridge, Council should consider implementing the strengthening recommendations from the 2015 Level 3 Inspection report. However, the load limit should remain at 15t to avoid overloaded vehicles from using the bridge and to minimise the stress on the substructure.

ACTION 2:

- Implement a regular inspection program, to include a Level 1 inspection, followed by a Level 2 inspection 6 months later. In this way, the bridge will be inspected twice every 6 months. This was also outlined in the previous Level 3 inspection reports and is in line with the recommendations in the DTMR SIM (Part 3, Table 2.4).

ACTION 3:

- Carry out the maintenance activities as per the Structure Management Plan included in Appendix A. This will allow the bridge to continue to be used in the short term. These maintenance works include replacing missing/rotten timber decking planks and kerb members on Span 2.

ACTION 4:

- In the event that the bridge is not deemed suitable for replacement, the strengthening works outlined in the previous Level 3 Inspection report should be carried out.

8.2 Bridge Replacement

As noted in Section 7, it is recommended that the bridge be replaced as Piers 1 and 2 have reached the end of their useful life, and the remainder of the substructure is showing significant signs of deterioration.

ACTION 3:

- Council should therefore begin planning for a replacement structure. To minimise the time that the road is needed to be closed, a new structure could be built offline, next to the existing structure. Traffic can then be changed over and the existing structure could

be left in place for pedestrian use, or deconstructed at a time that fits into Councils budget.

The new structure could be constructed using Super-T beams over the main span. These will span the 34m that the current truss spans, and therefore will not effect the waterway. The approach spans can be done in deck units. The main issue with this is that the approaches must be lifted by approximately 2m, which is a significant amount and will result in significant earthworks on the approaches. As shown in Photo 19, it is not considered viable to lower the soffit of the bridge as the water level is too high. Providing embankments of this height may also affect the flood characteristics of the area so this should be taken into consideration as well.

As an alternative, rather than using Super-T girders, the existing through truss bridge could be lifted and placed on a new substructure. As previously noted, the truss structure is generally in good condition, however it would need a new coat of paint. The truss could be lifted and transported by barge to a location where it can be sand-blasted and recoated, and then reinstated on the new piers. A new deck would also have to be installed.

The approximate cost of a new bridge made out of Super-T's would likely be as follows:

- Design Cost, including geotechnical investigation, hydraulic assessment: $150-200,000
- Construction cost, including approach embankments, $2.5 to 3 million.

The cost estimate for reuse of the existing truss is not a simple thing that can be done at a high level with any confidence. This could be further evaluated during the concept design process.

The design process could be commenced immediately, funds permitting, enabling Council to have a design ready to build when funds become available.

APPENDIX A

Structure Management Plan

Structure Management Plan

Jul-12 | SMP1 | Sheet 1 / 1

Structure ID	*638366*	Name	*Gavial Creek Bridge*
Crossing Name	*Gavial Creek*	Alt. Name	
Structure Type	*Bridge*	Owner	*Rockhampton Regional Council*
Construction Type	*Steel through truss*	District	
Construction Material	*Steel, precast concrete, insitu concrete*	LGA Id	*Rockhampton Regional Council*

Defective Components Form B2/3 Refer Sterling Level 2 Inspection Report **DATE** **06 September 2016**

Interim Plan **Final Plan** Departure

Road Number **Road Name** Bowlin Road

Chainage

Deficiencies	**Severe deterioration to substructure, particularly Piers 1 and 2. Abutments leaning forward >20mm. Crackign in precast piles and abutment headstocks. Rocker bearing seized.**
Location	**Details (Nature, Extent, Severity)**
Superstructure:	**Rocker bearings at P2 seized (CS4). Guardrail posts on AP1/AP2 need connection to rail (CS3/CS4). Rotted/missing timber decking boards and kerb (CS3/CS4)**
Substructure:	**Cracking and spalling concrete due to corrosion to pier reinforcement P2/P3 (CS4).**
Bridge Function:	**River crossing, single lane, low traffic volumes, some heavy vehicles**

Programmed Remedial Measures (Repair, Rehabilitate, Strengthen or Replace)

Substructure	Superstructure	Bridge	Estimate($)	Fin. Year
	Replace rotten/missing timber decking boards and kerb		$10,000	2017
	Reinstatement of guardrail connections to posts on AP1 and 2.		$5,000	2017
	Strengthen longitudinal decking members, as per recommendations in previous Level 3 inspection report (ref: Cardno Report A11532, dated 15 November 2015)		$100,000	
		Replace Bridge	$2.5 million to $3 million	2020

Interim Management Measures	Yes	No	**Attachments**
	✓		**Comments**
Weight Restriction	✓		15t load limit as per previous report
Lane Width Restriction			
One Way Working			
Prop Structure			
Close Structure			
Construct Sidetrack			
Sign Detour			
Install Height Bars			
Monitor Structure	✓		Inspections every 6 months, alternating between Level 1 and Level 2
Load Testing			
Other (e.g.. Inspection Freq.)	✓		Commission design for replacement structure

Approval of Structures Management Plan

Senior Structures Engineer **Date**

General Manager Engineering Services **Date**

Structure Monitoring Plan			
NAME	*Gavial Creek Bridge*	**Required Monitoring Frequency**	*6 months (alternate Level 1 & Level 2 inspections)*
Structure ID	*638366*	**Level 2 Inspection Frequency**	*12 month*

Component Details			**Proposed Monitoring Regime**	**Intervention Level**
Group	**Component**	**CODE**		
AP1/AP2	AP	70O	*Standard Level 1 & 2 Inspections*	*Subsidence of approaches, cracking in surfacing*
S1/S3/S4	K	3C	*Standard Level 1 & 2 Inspections*	*Cracking in insitu concrete kerb >1.0mm carry out crack injection*
P1/P2	PW	58C	*Standard Level 1 & 2 Inspections*	*Additional concrete spalls, cracks grows significantly. May not be possible to monitor closely, visual inspection from shore. If spalling concrete detected, get inspection by Engineer, possibly shut bridge.*
P1/P2 A1/A2	H A	54S 50C	*Standard Level 1 & 2 Inspections*	*Rotation of steel headstock on P1/P2. Movement to abutment and bearing on concrete deck/steel girder. If movement found via visual inspection, notify Engineer*
S2	TT	23S	*Standard Level 1 & 2 Inspections*	*Monitor corrosion, particularly to bolts. Monitor for vehicle impact due to lack of sufficient barrier*
A1/A2	A	50C	*Standard Level 1 & 2 Inspections*	*Cracking in insitu headstocks >1.5m, notify engineer*

APPENDIX B

Redecking – As Built Information

Rockhampton Regional Council
Asset Information Form

Email completed form to Assets.

Sections 1.0 - 3.0 - To be completed by Requester - for clarification on any information required on this form please contact Assets.

1.0 Asset Layer / Class

☐ Airport	☐ Disaster	☐ Land	☐ Sewer / Effluent
☐ Buildings	☐ Fleet	☐ Parks & Gardens	☐ Site Improvements
☑ Bridges	☐ Heritage & Cultural	☐ Plant & Equipment	☐ Stormwater
☐ Community	☐ Intangibles	☐ Roads	☐ Water

2.0 Asset Details

Description/ Title of Works: Repairs to Gavial Creek Bridge

Asset ID/s: | Asset Type/s: Bridge

Locality: Depot Hill | Address: Quay st Extended

Work Order No: | Capital Project No:

☑ Supporting Information attached (A plan with all relevant dimensions and/or supporting documentation must be provided)

3.0 Prepared By

Name: Jason Pierce | Contact No: | Date: 24 July 2014

Please submit completed forms via link provided or email to the assets@rrc.qld.gov.au with subject as Asset Information Form

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Section 4.0 - To be completed by Assets.

4.0 Financial Actions

☐ None (data correction only - Asset Custodian & Finance Management authorisation is not required)

☐ Developer Contributed (1)	☐ Disposal/ Demolition	☐ EANPR
☐ Write Off	☐ Non-Developer Contributed	☐ Duplicate/Error
☐ Impairment	☐ Asset Type Change (2)	☐ Asset Class Change

Cost Value (3): | Written Down Value:

☐ Supporting Information Attached (all workings and Conquest load data must be attached)

5.0 Review

Asset Management

Name: | Signature: | Date:

Finance Management

Name: | Signature: | Date:

6.0 Approval (4)

Asset Custodian

Name:		Financial Delegation:	
Signature:		Date:	
Name:		Financial Delegation:	
Signature:		Date:	

System changes must not be carried out until Sections 5.0 and 6.0 are completed.

7.0 System Changes

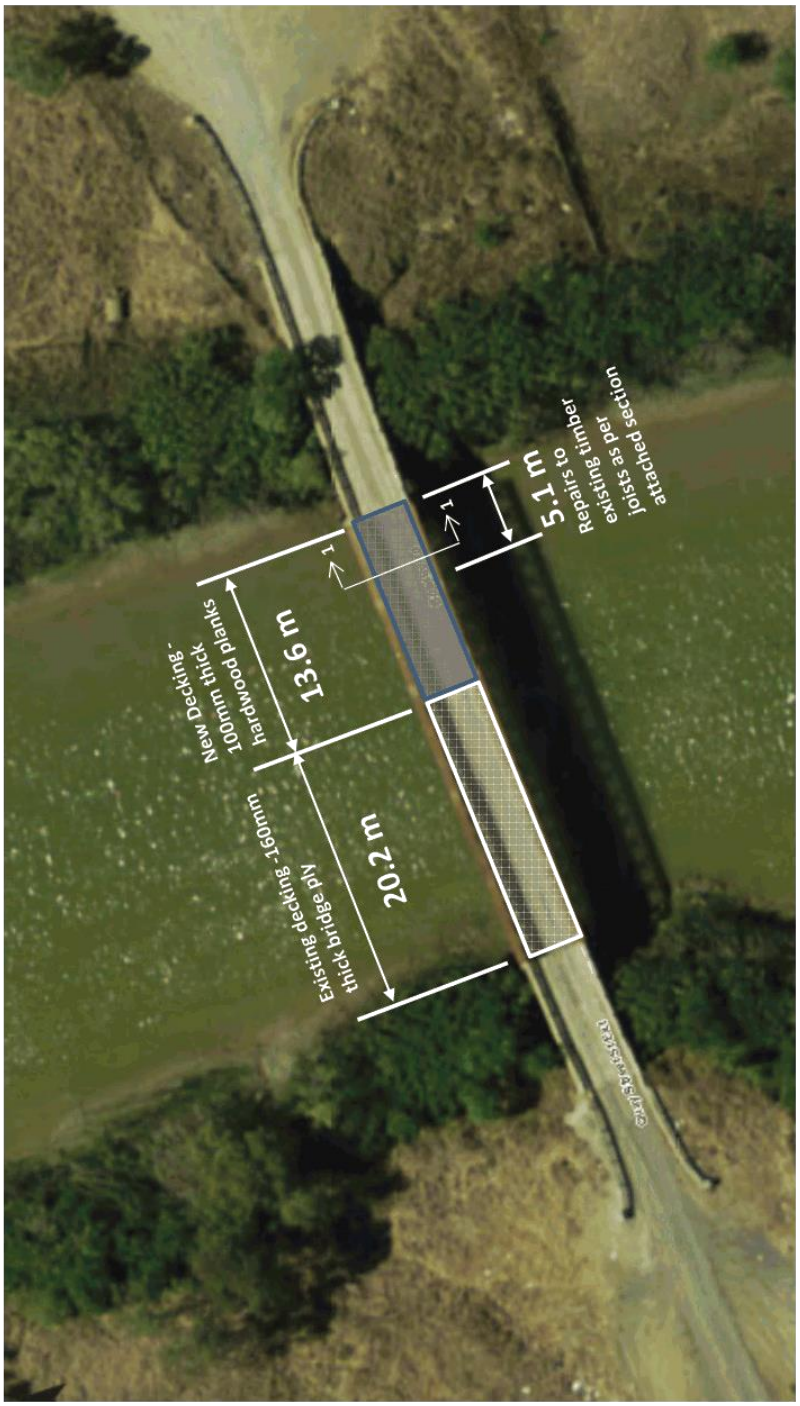
Entered in Conquest and the form attached to all relevant assets.

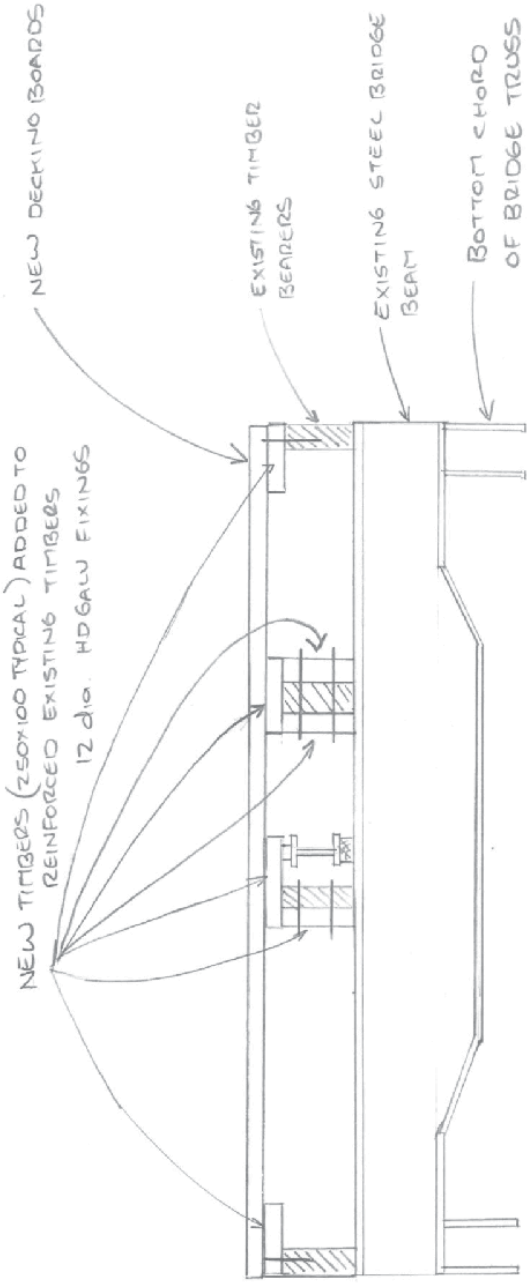
Name		Signature:		Date:	

Entered in GIS

Name:		Signature:		Date:	

(1) By exception only i.e. Land. Developer Contributions are captured through the External As-Con Process.
(2) The materiality of any Asset Type Change will be reviewed by Finance.
(3) Cost Value = Value plus Accumulated Capital Works.
(4) Removal actions must be approval by an Officer with the appropriate financial delegation. Addition actions can be approved by the Manager.


5.1 m
Repairs to existing timber joists as per attached section
1
1
13.6 m
New Decking - 100mm thick hardwood planks
20.2 m
Existing decking -160mm thick bridge ply


NEW DECKING BOARDS
EXISTING TIMBER BEARERS
EXISTING STEEL BRIDGE BEAM
BOTTOM CHORD OF BRIDGE TRUSS
NEW TIMBERS (250X100 TYPICAL) ADDED TO REINFORCED EXISTING TIMBERS
12 dia. HDGALV FIXINGS

SECTION ① - ①

8.6 INFRASTRUCTURE PLANNING MONTHLY OPERATIONS REPORT - MAY 2019

File No:	**7028**
Attachments:	**1. Infrastructure Planning Monthly Operations Report - May 2019⇩**
Authorising Officer:	**Peter Kofod - General Manager Regional Services**
Author:	**Martin Crow - Manager Infrastructure Planning**

SUMMARY

This report outlines Infrastructure Planning Monthly Operations Report for the period to the end of May 2019.

OFFICER'S RECOMMENDATION

THAT the Infrastructure Planning Monthly Operations Report for May 2019 report be received.

COMMENTARY

The Infrastructure Planning Section submits a monthly operations report outlining issues faced by the section and performance against nominated service level criteria. Due to the reporting timeframes and agenda requirements of the Infrastructure Committee, the statistics utilised in the reports will lag the committee meeting dates by approximately 1 month.

INFRASTRUCTURE PLANNING MONTHLY OPERATIONS REPORT - MAY 2019

Infrastructure Planning Monthly Operations Report - May 2019

Meeting Date: 25 June 2019

Attachment No: 1

MONTHLY OPERATIONS REPORT

Infrastructure Planning

PERIOD ENDED May 2019

1. Highlights

Civil Design

Civil Design Unit is required to have a minimum of Ten (10) 2019/2020 Capital Works Projects completed by June 30, 2019. Below is a list of completed projects, and projects which are substantially underway with delivery expected in June or July 2019. The projects are a combination of Urban Operations, Rural Operations, FRW, and Special Projects.

Project	Status	Unit
Boundary Road / Norman Road Intersection	Completed	Urban Operations
Meter Street Carparking	Completed	Urban Operations
Haynes Street Reconstruction	Completed	Urban Operations
Robison Street Drainage	Completed	Urban Operations
Campbell Street K&C	Completed	Urban Operations
Thirsty Creek Road	Completed	Rural Operations
Alton Downs – Nine Mile Road	Completed	Rural Operations
Card Street Sewer	Completed	FRW
Brecknell Street Sewer	Completed	FRW
Breakspear Street WMR	Completed	FRW
Harrow Street WMR	Completed	FRW
Archer Street WMR	Completed	FRW
McMillan Avenue WMR	Completed	FRW
Stanley Street WMR	Completed	FRW
Western District Waste Transfer Station	Completed	RRWR
Luscius Street Fishing Platform	Completed	Advance Rockhampton
Alexandra Street Recon (Stage 2)	To be completed by 30/6/19	Urban Operations
Upper Dawson Road Reconstruction	To be completed by 30/6/19	Urban Operations
Harriette Street Stormwater	To be completed by 30/6/19	Urban Operations
North Street Cycle Route Upgrades	To be completed by 15/7/19	Urban Operations
Knight Street Reconstruction	To be completed by 30/7/19	Urban Operations
Milner Road	To be completed by 30/6/19	Rural Operations
Boongary Road / Kabra Road Intersection	To be completed by 30/7/19	Rural Operations
Hanrahan's Crossing	To be completed by 30/7/19	Rural Operations
Burnett Highway WMR	To be completed by 30/6/19	FRW
510 Quay Street Access (SRFL Early Works)	To be completed by 30/6/19	Major Projects
Queen's Park Fishing Platform	To be completed by 30/6/19	Advance Rockhampton
Donovan Park Fishing Platform	To be completed by 30/6/19	Advance Rockhampton

Strategic Infrastructure

Officers are continuing work with Water Modelling Solutions to complete modelling work and drainage design works in Gracemere for the upcoming LGIP review. Officers have appointed AECOM to undertake the refinement of several local catchment hazard mapping and flood overlay mapping. Internally officers are also working to update the Floodplain Management Strategy to reflect the significant work completed over the years since 2014.

Sewer network modelling continues to enable review of the future water and sewer infrastructure schemes as part of an upcoming LGIP review. This work considers the currently proposed schemes and whether they are still necessary to service future development. The focus at the moment has been on the Gracemere Water and Sewer Schemes and modifying their timeframes to reflect the changes in development patterns in Gracemere.

Officers are progressing with Blackspot locations for the upcoming round. The proposed locations will be brought to Council before submission on 2 August. Unsuccessful projects from the previous year will be resubmitted and some additional projects will be added to the application list based on crash data or road safety audits. The corridor study for Upper Dawson Road has commenced with 28 traffic counting tubes installed along the minor roads of Upper Dawson Road. This data will be used to determine volumes on the minor roads and the intersections may need specific intersection Counts. Officers are also continuing the preliminary design of Transport projects identified in the LGIP to update the LGIP costings and inform future budgets.

Assets and GIS

Bridge Condition Assessments

Officers continue to perform routine condition assessments and defect monitoring activities as planned.

All on-site inspections and testing associated with the Level 3 bridge investigations have been completed. A final report from ARRB is expected in June 2019.

Road Condition Assessment

Officers are currently reviewing the methodology that is used to determine the condition and remaining useful life of our unsealed road pavements. This technical review has included discussions with Civil Operations on the methodology they use to develop their gravel re-sheet programs. On completion, this review will inform the scope of works for 2019/20 road condition assessments.

Footpath Inspections

The 2019 footpath inspection program has commenced. This year the entire footpath network (219km) is scheduled for inspection. To date approximately 105km (48%) of the footpath network has been inspected.

Asset Data Reviews

Work continues on the review of Council's asset data in both GIS and Conquest.

- The Conquest review of all road segments is now on hold as end of year capitalisations take precedence.
- The GIS and Conquest review of all bus stops has been completed.

ArcGIS and GeoCortex Upgrades

Work continues on the ArcGIS and GeoCortex upgrades. The health check completed by ESRI Australia found no significant issues with Council's ArcGIS Enterprise 10.6.1 implementation. The external production site has now been installed and configuration will commence in June 2019.

Asset Revaluations
The water and sewer revaluations were loaded into Conquest on 25 May 2019. All asset revaluations for the 2018/19 financial year have now been completed.

Disaster Management Training

Training
- QFES facilitated Exercise Management Training, for Council employees and the LDMG (7)
- Meteorology for Disaster Managers Masterclass was attended by members of the LDMG

Key Meetings and Workshops
- Inspector General Emergency Management (IGEM) Disaster Management Officers (DMOs) Forum was held between 1-3 May to provide an opportunity for the State's DMOs to discuss common themes within the Disaster Management Arrangements
- Rockhampton District Human and Social Recovery Committee and the Inaugural meeting of the CQ Bushfire CDO Reference Group where held to develop an updated understanding of the current recovery needs of the community and plan appropriate strategies to build resilience and prepare for future recovery needs
- Maj General (Rtd) Stuart Smith visited Rockhampton to seek information on Rockhampton Region's recovery status, 6 months on following the November Fires
- Rockhampton Local Disaster Management Group met
- Community engagement and education activities
    - Emergency Service Day planning meetings
    - Operation Community Connect planning meetings
    - Smoke Hazard and Heatwave Communications working group meetings

Key Activities
- Review of the Bushfire Mitigation strategy and MOU continues with RRC Parks, QFES and DES
- Finalisation of flood station installations (Rockhampton Town gauge and Stanwell gauge)
- Additional feedback provided to IGEM November Bushfires Review
- QFES –SES review of Food boat Operations since 2015
- QFES – SES review of fleet (vehicles, trucks, trailers and registered assets)
- Assistance provided to Major Projects for the completion of Gracemere SES shed
- SES Operations – Fleet management, training and operational capabilities mapping and volunteer management

2. Innovations, Improvements and Variations

Nil

3. Customer Service Requests

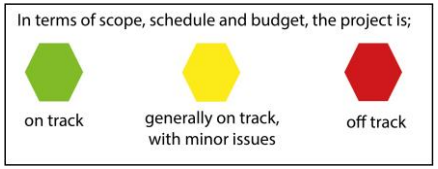
Response times for completing customer requests in this reporting period for May 2019 are within the set timeframes.

All Monthly Requests (Priority 3)
Infrastructure Planning 'Traffic Light' report
May 2019

	Balance B/F	Completed in Current Mth	Current Month NEW Requests		TOTAL INCOMPLETE REQUESTS BALANCE	Work Orders Issued	On Hold	Completion Standard (days)	Avg Completion Time (days) Current Mth	Avg Completion Time (days) 6 Months	Avg Completion Time (days) 12 Months	Avg Duration (days) 12 Months (complete and incomplete)
			Received	Completed								
Disaster Management / SES	0	0	0	0	0	0	0	14	0.00	0.00	0.00	0.00
Flood Management Creeks/Rivers	0	0	2	1	1	0	0	14	0.00	4.80	3.41	2.44
GIS - Map Production Requests	0	0	0	0	0	0	0	10	0.00	2.00	10.50	0.00
Infrastructure Planning - General Enquiry	0	0	1	0	0	0	0	5	0.00	4.63	4.00	4.33
Speed Limits/Traffic Volumes (Not related to MTCE)	0	0	1	1	0	0	0	28	4.00	7.33	6.68	8.29
Traffic Management – General Enquiry	2	2	5	3	1	0	0	28	4.67	5.85	7.92	7.58
Signs & Lines (New Request - not already existing)	4	2	6	2	6	0	0	28	11.50	8.30	7.70	7.91

4. Capital Projects

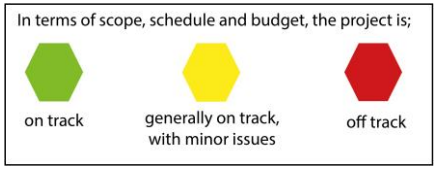
Details of capital projects not reported regularly to Council or a particular Committee in other project specific report updates as at period – May 2019 – 83.3% of year elapsed.



Project	Planned Start Date	Planned End Date	On Track	Budget Estimate	YTD actual (incl committals)
Land Acquisitions and Resumptions	01/07/2018	30/06/2019		$375,000	$44,720
LDCC Equipment Upgrade	01/07/2018	30/06/2019		$100,000	$99,072
Preliminary design and conceptual layouts	01/07/2018	30/06/2019		$197,000	0
New Design Office Survey Equipment	01/07/2018	30/06/2019		$60,000	$64,853
Webber Park Drainage Scheme Stage 1	01/07/2018	30/06/2019		$5,000	$2,149
Purchase of Charles Street Residence (SES)	01/07/2018	30/06/2019		$6,500	$848
Port Alma Boat Ramp – Land Acquisitions	01/01/19	31/12/2019		$100,000	0

5. Operational Projects

As at period – May 2019 – 83.3% of year elapsed



Project	Planned Start Date	Planned End Date	On Track	Comment	Budget Estimate	YTD actual (incl committals)
Traffic/Transport Planning Consultancy Budget	01/07/2018	30/06/2019		Traffic models for Rockhampton and Gracemere and secondment for transport planning.	$100,000	$142,572
Stormwater Drainage Planning Consultancy Budget	01/07/2018	30/06/2019		Continuation of stormwater and flood mitigation investigations.	$300,000	$100,677
Road Safety Consultancy Budget	01/07/2018	30/06/2019		Road Safety Audits	$25,000	0
Roads Alliance Consultancy Budget	01/07/2018	30/06/2019		Technical Coordinator support to the Regional Roads and Transport Group	$55,000	$50,000
Water and Sewerage Planning Consultancy Budget	01/07/2018	30/06/2019		Water Loss and Sewer Infiltration Investigations	$15,000	0

Project	Planned Start Date	Planned End Date	On Track	Comment	Budget Estimate	YTD actual (incl committals)
Design Services Consultancy Budget	01/07/2018	30/06/2019		Technical Support for the Design Services section when required.	$15,000	$21,769
Disaster Management Consultancy Budget	01/07/2018	30/06/2019		Master Planning SES Facilities Flood Gauge Investigations	$50,000	0
Road Management and Risk Assessment Consultancy Budget	01/07/2018	30/06/2019		Road management services and risk assessment of heritage bridges	$45,000	$28,660
Asset & GIS Operational Consultancy Budget	01/07/2018	30/06/2019		Asset and GIS operational projects	$50,000	$53,530
Stormwater Network Consultancy Budget	01/07/2018	30/06/2019		Stormwater network	$20,000	0
Bridge Management System Consultancy Budget	01/07/2018	30/06/2019		Bridge management system	$30,000	$56,375

8.7 PROJECT DELIVERY MONTHLY REPORT - MAY 2019

File No:	**7028**
Attachments:	**1. Project Delivery Report - May 2019⇩**
Authorising Officer:	**Peter Kofod - General Manager Regional Services**
Author:	**Andrew Collins - Manager Project Delivery**

SUMMARY

Monthly reports on the projects currently managed by Project Delivery.

OFFICER'S RECOMMENDATION

THAT the Project Delivery Monthly Report for May 2019 be received.

COMMENTARY

The project delivery section submits a monthly project report outlining the status of the capital projects. The following projects have a one page capital monthly report outlining progress against time and budget.

A. CBD Smart Technology – on hold subject to funding
B. Gavial Creek Bridge – on hold subject to funding
C. Town Gauge Smart Pole – LDCC Equipment Upgrade
D. Pilbeam Drive Reconstruction (NDRRA)
E. Urban (NDRRA)
F. Webber Park Drainage Scheme

PROJECT DELIVERY MONTHLY REPORT - MAY 2019

Project Delivery Report - May 2019

Meeting Date: 25 June 2019

Attachment No: 1

PROJECT DELIVERY – MONTHLY REPORT

Reporting Month	May 19
Project	Gavial Creek Bridge
Project Number	C.1076610
Project Manager	Ruwan Weerakoon
Council Committee	Infrastructure

PROJECT SCOPE

Construction of a new single lane concrete bridge over Gavial Creek. The proposed new bridge over Gavial Creek is to be a three span structure, approximately 64m long with end spans approximately 12m and 20m in length and a 34m main span. The span lengths reflect those of the existing bridge. Following completion of the new bridge, it is intended to use the old bridge as a pedestrian bridge with a fishing platform. This project is delivered as a design and construction model contract.

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning	June 17	July 17	
Design Development	January 18	April 18	
Procurement	September 18	September 18	
Construction	May 19	November 19	Seeking for additional funds from Federal Government

FINANCIAL PROFILE

2018/19 Budget $1 M
2019/20 Budget $2 M

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$3 M	$130 K	$0	$2.7 M	$1 M	$130 K	$0	$700 K
External Funding								

PROJECT STATUS

Project on hold until funding approved.

PROJECT DELIVERY – MONTHLY REPORT

Reporting Month	May 19
Project	Town Gauge Smart Pole – LDCC Equipment Upgrade
Project Number	0971899
Project Manager	Nathan Everton
Council Committee	Infrastructure

PROJECT SCOPE

Install the 'procured' town flood gauge system on an engineered 'Smart Pole' at the current town gauge site at Quay Street and Derby Street.

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning	October 18		Completed
Design Development	October 18		Completed
Procurement	January 19	February 19	Orders placed
Construction	March 19	April 19	

FINANCIAL PROFILE

Current budget is insufficient for these works.

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$100,000	$45,575	$53,497	$928	$100,000	$45,575	$53,497	$928
External Funding	Nil							

PROJECT STATUS

Final Engineering and Design has been completed.
Construction of pole has been completed.
Footing and civil works has been installed.
Installation of pole is due first week of June 2019.
Installation of flood equipment is due first week of June 2019.

PROJECT DELIVERY – MONTHLY REPORT

Reporting Month	May 19
Project	Restoration of essential road assets in urban areas – TC Debbie Pilbeam Drive Reconstruction
Project Number	C. 1112567
Project Manager	Ruwan Weerakoon
Council Committee	Infrastructure

PROJECT SCOPE

Pilbeam Drive Reconstruction Activities has 145 recorded defects, including 16 landslips of varying severity, 7 cross drainage culverts and 3000m concrete table drains.

Predominately;

- Slope stabilisation
- Rock nailing and shotcreting
- Rock netting
- Installation of concrete lined drains
- Culvert/cross drainage installations; and resurfacing

Other work includes:

- Silt and debris removal
- Pothole / patch repairs
- Reshaping table drains / bulk fill scours
- Replace signage and guideposts
- Concrete rock protection, culvert inlet/outlet works and associated ancillary works

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning	April 17	May 17	
Design Development	May 17	July 17	
Procurement	December 17	August 18	Unexpected delays on QRA funds approvals
Construction	October 18	November 18	Delays in tender award due to tender prices higher than approved budget

FINANCIAL PROFILE

Original construction contract value $3.4 M

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$4.1 M	$3.1 M	$500 K	$500 K	$4.1 M	$3.1 M	$500 K	$500 K
External Funding	$3.8 M							

PROJECT STATUS

Construction contract was awarded to JRT contractor on 19 October 2018 and construction work started on 12 November; the project shall be completed by the end of June 2019.

Work completed up to May 2019:

- Boom gate installation at bottom of Pilbeam Drive to control the public traffic and pedestrians.
- Installation of traffic variable message signs, portable traffic signals and traffic control sings in Pilbeam Drive for road construction activities according to approved Traffic Management Plan.
- Pavement repairs in 42 locations.
- Water main relocation work started in early March and completed in end of April.
- Concrete table drain repairs in 17 locations and shot creating in 4 locations.
- Descaling and rock anchoring of 10 slips.
- 4 x cross drainage works completed.

Remaining work activities in June 2019:

- Asphalt resurfacing
- Drain outlets and rock protection works
- Linemarking
- Road signs and furniture
- Site clearing and slashing work
- Demobilisation

PROJECT DELIVERY – MONTHLY REPORT

Reporting Month	May 19
Project	Restoration of essential road assets in urban areas – TC Debbie
Project Number	C.1076618
Project Manager	Ruwan Weerakoon
Council Committee	Infrastructure

PROJECT SCOPE

There are about 800 repair and reconstruction activities in our urban road network in 180 roads and type of treatments are mentioned below:

- Earthworks on roads and shoulders
- Installation of road furniture and signs, guideposts and linemarking
- Debris removal
- Grading and gravel re-sheeting
- Stormwater, flood ways, rock protection
- Pavement repairs and sealing
- Culverts and back flow prevention devices installation.

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning	April 17	May 17	
Design Development	May 17	June 17	
Procurement	November 17	May 18	Unexpected delays on QRA funds approvals
Construction	April 18	July 18	

FINANCIAL PROFILE

Fully funded by the Queensland Reconstruction Authority to the value of $4,288,259.00

	Project Life				Current Year			
	Total Budget	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$4.3 M	$ 4.1M	$100K	$100 K	$4.3 M	$ 4.1M	$100K	$100 K
External Funding	$4.3 M							

PROJECT STATUS

All restoration works planned are to be completed by end of June 2019.
Works are being undertaken by both Council staff and contractors.
River Street Rehabilitation work was completed in November 2018
Quay Street Reconstruction work between Derby Street and William Street was completed in November 2018.
Water Street Betterment work was completed in April 2019.
Golding Contractor completed all their assigned urban restoration work in December 2018.
Quay Street footpath reconstruction work between Derby Street and William Street will be completed in June 2019.

PROJECT DELIVERY – MONTHLY REPORT

Reporting Month	May 19
Project	Webber Park Drainage Scheme
Project Number	1076402 / 1066683
Project Manager	Shirley Hynes
Council Committee	Infrastructure

PROJECT SCOPE

Construction of Overland Flow Paths at the inlet and outlet to Webber Park.
Stage 1B – Construction of Overland Flow Paths at Inlet and Outlet - in progress.

PROJECT MILESTONES

ITEM	TARGET DATE		COMMENTARY
	ORIGINAL	REVISED	
Project Planning	October 16		Project instigated following community engagement activities in the aftermath of Tropical Cyclone Marcia
Design Development	February 18		Stage 1A – complete
Procurement	August 18		Procurement Barrett Street and Chalmers Street properties complete. Site clearance work – complete.
Construction	September 18		Construction Works will be carried out in stages.

FINANCIAL PROFILE

The current approved budget covers the approved scope of works.
Natural Disaster Resilience Program (NDRP) funding in the sum of $400,770 awarded.

	Project Life				Current Year			
	Total Budge	Actual to date	Committals	Remaining Budget	Budget	Actual to date	Committals	Remaining Budget
Expenditure	$1,600,000	$ 1,010,481	$ 49,940	$ 322,161	$ 1,215,000	$ 832,900	$ 49,940	$322,161
External Funding	$ 400,770							

PROJECT STATUS

Project progressing in accordance with program:

- Inlet and Outlet construction works in connection with flood mitigation commenced April 2019
- FRW diversion works complete.
- Stakeholder liaison ongoing.

9 NOTICES OF MOTION

Nil

10 URGENT BUSINESS/QUESTIONS

Urgent Business is a provision in the Agenda for members to raise questions or matters of a genuinely urgent or emergent nature, that are not a change to Council Policy and can not be delayed until the next scheduled Council or Committee Meeting.

11 CLOSURE OF MEETING