aurecon

Scenic Rim Flood Modelling

Purga Creek Flood Modelling – Consolidated Final Report

Scenic Rim Regional Council

14 December 2017
Revision: 1
Reference: 255060

Bringing ideas to life

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd

ABN 54 005 139 873

Level 14, 32 Turbot Street
Brisbane QLD 4000

Locked Bag 331
Brisbane QLD 4001
Australia

T +61 7 3173 8000
F +61 7 3173 8001
E brisbane@aurecongroup.com
W aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control						
Report title		Purga Creek Flood Modelling – Consolidated Final Report				
Document ID		255060-004-REP-HH-001-0	**Project number**		255060	
File path		255060-004-REP-HH-001-0-Purga Creek Flood Model Consolidated Report.docx				
Client		Scenic Rim Regional Council				
Client contact		Scott Turner, Manager Planning	**Client reference**		-	
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
0	15 September 2017	Final Draft Issue	J Di Trapani	T Graham	-	T Graham
1	14 December 2017	Final Issue	J Di Trapani	T Graham	-	T Graham
Current revision		**1**				

Approval			
Author signature	[signature]	Approver signature	[signature]
Name	Joel Di Trapani	Name	Trinity Graham
Title	Senior Water Engineer	Title	Technical Director

Contents

Appendices

Appendix A

Figures

Tables

1 Introduction

1.1 Study background

Scenic Rim Regional Council (SRRC) is seeking to gain a better understanding of the Region's Natural Hazard (Flood) characteristics. Aurecon has undertaken flood studies across the Scenic Rim Regional Council (SRRC) area for seven major waterway systems including Logan River, Albert River, Bremer River, Teviot Brook, Warrill Creek, Purga Creek and the Upper Coomera River. These studies involved the development of catchment wide models for each of the waterways, covering the majority of creeks and tributaries.

Aurecon were originally commissioned by SRRC to undertake flood modelling of each system to provide SRRC with flood extents, heights, velocities and hazard categories for the 1% AEP event. This modelling focussed on providing information to assist Council with strategic planning objectives.

Council recognised that whilst the 1% AEP event provided important information on large scale flooding across each catchment, understanding the behaviour of more frequent events was also important in particular when looking at risk to properties, access and egress routes during floods and for disaster management planning.

As such, Council commissioned Aurecon to update the flood models for each of its seven major catchments to include assessment of the 2%, 5% and 10% AEP flood events.

This report consolidates and presents the investigation completed for the Purga Creek catchment.

1.2 Study area

Purga Creek forms part of the Bremer River catchment located in the Brisbane River Basin. Purga Creek extends north from the Queensland/New South Wales border ranges to its confluence with Warrill Creek at Ipswich. The area of interest for this flood study is the Purga Creek catchment from Teviotville to Peak Crossing. This area of the catchment is predominantly rural. The Scenic Rim Local Government boundary extends to Peak Crossing and this defines the boundary for the lower extent of this study.

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

1.3 Study objectives

The Scenic Rim Flood Hazard Management and Disaster Mitigation Assessment Project for the Purga Creek Catchment is a joint initiative of Scenic Rim Regional Council, the Queensland Government and the Australian Government

SRRC initially requested a flood study that was compliant with the current State Planning Policy (and associated guidelines) and the relevant requirements of the Building Act 1975 (Act). The flood study is to provide Council with the ability to designate a flood hazard area under Section 13 of the Act.

The second stage objective was to provide information to assist with Council's disaster management planning and response functions. The following tasks were undertaken as part of this two-stage assessment:

- Hydrologic modelling of the catchment and calibration against selected historical events
- Hydraulic modelling of Purga Creek and joint calibration with the hydrologic model
- Preparation of 1% AEP flood mapping presenting flood inundation extents, flood depths, flow velocities and hazard rating
- Identification of the minimum and maximum flood levels for each property inundated by the 1% AEP event
- Updated hydrologic and hydraulic modelling for the 10%, 5% and 2% AEP events
- Updated definition of minor, moderate and major flood events at each key stream gauge location to enable Council to inform BOM (and to update the current flood gauges)
- Review of the current flood gauge network to ascertain whether there are any further locations where flood gauges could/should be located
- Review of the correlation between gauge height, flooding event and scale of event, and
- Preparation of flood mapping for the additional events presenting flood inundation extents, flood depths, flow velocities and hazard ratings

The work undertaken to achieve the above objectives is documented in the following report.

The Scenic Rim Flood Hazard Management and Disaster Mitigation Assessment Project for the Purga Creek catchment is a joint initiative of Scenic Rim Regional Council, the Queensland Government and the Australian Government

2 Study Data

A number of datasets have been collated, reviewed and adopted for use in this project as described below.

2.1 Previous studies

The hydrologic URBS model for Purga Creek was originally developed for the Wivenhoe and Somerset Dam Optimisation Study (WSDOS) (Seqwater, 2013) and recalibrated by Aurecon in 2015 as part the Brisbane River Catchment Flood Study (BRCFS) (Aurecon, 2015). The BRCFS (Aurecon, 2015) calibrated the Purga Creek URBS model to the Loamside gauge located approximately 9km downstream of the SRRC boundary. The URBS model was calibrated to the 1974, 1996, 1999, 2011 and 2013 events.

2.2 Survey Data

2.2.1 Aerial LiDAR Survey

SRRC's 2011 Aerial LiDAR Survey (ALS) data was utilised as the basis for topographic representation within the Purga Creek catchment as per the 2016 study. ALS data typically produces levels within an accuracy of ±150 mm and a horizontal accuracy of ±300 mm.

As part of the Logan River Flood Study (Aurecon, 2014), the ALS data was verified against ground survey (2013) of Permanent Survey Marks (PSM). The ALS data was found to provide elevations within ±300 mm of the ground survey PSM. This is considered a reasonably accurate representation of the topography and confirmed that the LiDAR was suitable for use in the hydraulic model.

In 2017, Council also provided data generated by SEQ Catchments 2013 which provided refinement of the topographic data. However, it was found that this data did not provide coverage of the Purga Creek catchment only in the upper reaches of the Warrill Creek catchment and as such it was not used for the additional flood modelling.

No bathymetric data was provided for this study and it was noted for the 1% AEP modelling that the river bed definition was limited by the presence standing water. Whilst this limitation was not considered significant for the 1% AEP event due to the high proportion of overbank flow in the major storm event, it was considered more significant for the analysis of minor to moderate storm events due to the higher proportion of flow conveyed within the banks.

2.2.2 Structure data

2.2.2.1 1% AEP event

Structure details for a number of bridges were provided by SRRC. The bridge information was limited with no As-Constructed details available. The following simplified assumptions have been made regarding bridge structures:

- It has been assumed that the bridge deck has the same level as the adjacent road level
- The thickness of the deck has been assumed to be 900 mm

- A blockage factor of 20% has been assumed to allow for pier losses

2.2.2.2 2%, 5% and 10% AEP events

To assist with providing information for emergency management response critical road crossings were identified within the Purga Creek Catchment. This was carried out in consultation with Council. Detailed field survey was commissioned to obtain structure details for incorporation into the hydraulic model. In the Purga Creek catchment, the following crossings were surveyed:

- Ipswich-Boonah Road – Peak Crossing Township
- Ipswich-Boonah Road – Culvert north of township
- Dwyers Road
- Woolooman Road
- Roadvale Road

Using this field survey improvements were made to the bathymetric representation within the current model. This is discussed further in Section 6.2.3.2.

2.3 GIS data

The following GIS datasets were provided by SRRC which were utilised as per the 2016 study:

- Aerial imagery – High resolution 2013 aerial imagery
- GIS based hydraulic structures data. Details regarding refinements to the modelling of hydraulic structures is provided in Section 6.2.3.2.
- Updated DCDB (2017)

These datasets have been utilised for the generation of flood mapping and tabulated flood levels.

2.4 Report terminology

This report adopts the latest approach to design flood terminology as detailed in the updated *Australian Rainfall and Runoff – Book 1 Terminology* (AR&R, National Committee on Water Engineering, 2016). Therefore, all design events are discussed in terms of Annual Exceedance Probability (AEP) using percentage probability (eg 1% AEP design event).

Table 1, an extract of Figure 1.2.1 from Book 1 (AR&R, 2016), details the relationship between Annual Recurrence Interval (ARI) and AEP for a range of design events.

Table 1 Extract from Figure 1.2.1 AR&R adopted terminology

AEP (%)	AEP (1 in x)	Average recurrence interval (ARI)
10.00	10	9.49
5.00	20	20
2.00	50	50
1.00	100	100
0.50	200	200
0.20	500	500

As can be seen from Table 1, the difference between AEP and ARI is minimal for 10 year ARI event and above. This range of events reflects a focus on flooding therefore use of the AEP terminology has been adopted.

3 Hydrologic Model

The Brisbane River Catchment Flood Study (BRCFS) URBS hydrologic model of the Purga Creek catchment was considered suitable for use and adopted for this study. URBS is a runoff routing model and an industry standard tool commonly used for hydrologic studies.

3.1 Modelling extents

The URBS hydrologic model delineates the Purga Creek catchment to Loamside and was calibrated to the Loamside gauge. The extent of this current flood study is defined by the SRRC local government boundary as shown in Figure 1. The BRCFS URBS covers the current study area.

The BRCFS URBS model was considered suitable for use and adopted for this study. However, the model calibration was reviewed against the Loamside gauge and a joint hydrologic and hydraulic calibration prepared on historical records at the Peak Crossing gauge.

3.2 Initial URBS model parameters

The URBS model parameters recommended in the BRCFS study (DNRM, 2015) are detailed in Table 2. These parameters were adopted as a starting point and modified as part of the joint calibration process. The adopted calibration parameters were then used to determine design event parameters for the design events.

Table 2 BRCFS URBS model calibration parameters

Event	Calibration parameters				
	Initial Loss Rate (mm)	Continuing Loss Rate (mm/hr)	Alpha,a	Beta,b	m
24 January 1974	80	2.1	0.4	4.0	0.8
30 April 1996	90	0.5	0.9	3.0	0.8
07 February 1999	30	1.2	1.5	4.0	0.8
02 January 2011	40	0.5	0.9	2.5	0.8
23 January 2013	165	8.0	0.7	6.0	0.8

URBS uses five key parameters which can be varied to represent hydrological conditions:

- Alpha – channel and storage routing parameter typical range 0.03 to 0.20
- Beta – catchment routing parameter typical range 1 to 9
- m – catchment routing exponent typical range 0.6 to 1.0
- IL – Initial Loss (mm) typical range 0 to 100
- CL – Continuing Loss (mm/hr) typical range 0 to 5

The initial loss parameter is largely event specific relating to the antecedent conditions in the catchment, and as expected varies between calibration events.

Figure 1 Purga Creek catchment

4 Hydraulic model

4.1 Software platform and modelling approach

A 2-dimensional (2D) hydraulic modelling approach was adopted for this study. The Purga Creek hydraulic model has been developed to cover the entire floodplain and includes representation of the major hydraulic structures and topographic features that influence flood behaviour. Adoption of the 2D modelling software enabled floodplain and breakout flows to be accurately represented. Modelling has been undertaken using the TUFLOW software (version 2016-03-AA).

4.2 Modelling extents

The model extends from downstream of Peak Crossing to Roadville in the upper reaches of the catchment and includes an area of approximately 184 km^2. It is noted that the extent of the Purga Creek system modelled and mapped correlates well to the extents presented by the Queensland Reconstruction Authority (QRA) interim flood lines for the SRRC area.

4.3 Topography

The hydraulic model was based on topographic information sourced from the 2011 LiDAR survey provided by SRRC. The topography is represented in the hydraulic model using a 10 m grid size. This grid size allows sufficient detail for the channel and floodplain representation in the hydraulic model suitable for the 1% AEP flood event, whilst allowing for reasonable model run times.

4.4 Initial roughness assumptions

Initial surface roughness values used in the hydraulic model are presented in Table 3 and were based on accepted industry values. Land use types were identified for areas using aerial photography provided. The spatial discretisation of land use (roughness) in the 2D model domain is shown in Figure A-2, Appendix A.

Table 3 Adopted roughness/Manning's n values

Land use type	Manning's n
Low Density Residential	0.090
Dense Vegetation	0.090
Medium Vegetation	0.070
Low Vegetation	0.045
Agricultural areas	0.050
Road Reserve	0.020
River Corridor	0.040

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

4.5 Hydraulic structures

A number of hydraulic structures were included in the TUFLOW hydraulic model. Bridge details were obtained from SRRC data provided. Where no bridge data was available, structure details were assumed from topographic survey and aerial imagery. Details of the existing structures included are outlined in Table 4.

Table 4 Existing bridges

Name	Locality	Description	Bridge Type	Bridge Length
N/A	Peak Crossing	Purga Creek Crossing at Ipswich – Boonah Road	Concrete	N/A
Dwyers Bridge	Peak Crossing	Purga Creek Crossing at Dwyers Road	Timber	15.4 m
N/A	Millbong	Purga Creek Crossing at Woolooman Road	Timber	20.1 m
N/A	Millbong	Purga Creek Crossing at Ipswich – Boonah Road	Concrete	N/A

4.6 Boundary conditions

The URBS model outputs were applied as inflows into the TUFLOW model. Local inflows were applied throughout the model domain.

A normal depth boundary condition was applied at the downstream boundary assuming a water surface slope of 0.003 m/m. Since the downstream boundary is not a well-defined water level, a stage-discharge relationship was used in TUFLOW to define the boundary condition. This boundary was located approximately 4 km downstream from the study area. Boundary effects on the study area are not expected.

5 Calibration

5.1 Process of calibration

Four events were considered for the URBS model calibration being the 1974, 1996, 2011 and 2013 events. The 2011 and 2013 events were used in a joint calibration with the TUFLOW hydraulic model.

Inflow hydrographs from the URBS model were incorporated into the TUFLOW hydraulic model at a number of locations within the study area. The hydraulic model was simulated and the resulting water levels and discharges compared to the available stream gauge data. An iterative joint calibration approach was then undertaken with both hydrologic and hydraulic model parameters adjusted to achieve the best match against the available recorded historical data.

5.2 Calibration targets

Ideally, the following tolerances are indicative of a good calibration:

Table 5 Calibration targets

Water level	Discharge
+/- 0.15 m at stream gauges	+/- 10%

5.3 Calibration data

5.3.1 Stream gauge data

The stream gauges available within the Purga Creek catchment are included in Table 6 and presented on Figure A-1, Appendix A. Within the study area, reliable calibration data was only available for the BoM gauge at Peak Crossing for the 2011 and 2013 events.

It is noted that the Loamside gauge is owned by DNRM and is the only rated gauge in the catchment with recorded flow data. Recorded flow measurements are used to develop a rating curve for the relationship between flood level and flow rate. This gauge was selected as a primary gauge for the BRCFS (Aurecon, 2015). The rating curve was reviewed and revised as part of the BRCFS (Aurecon, 2015). This revised rating curve has been adopted for the current study. The Loamside gauge is located beyond the limits of the available SRRC LiDAR survey. Therefore, a joint calibration of the hydraulic model to Loamside was not possible.

The Peak Crossing and Washpool Alert gauges are owned by BoM/Seqwater. These are flood alert gauges and record historic stream level data only. Seqwater had previously developed a rating curve for Peak Crossing based on a best fit of hydrologic model data only. The BRCFS (Aurecon, 2015) noted that there is a limited record length at this gauge and no independent flow data records. Consequently, there is a generally low confidence in the gauge rating at Peak Crossing.
Peak Crossing was recommended as a secondary gauge for calibration in the BRCFS (Aurecon, 2015).

The available gauge data for calibration is presented in Table 6.

Review of the gauge data and previous works prepared for WSDOS (Seqwater, 2013) and BRCFS (Aurecon, 2015) highlighted the following:

- A difference of approximately 380 mm was noted between the BoM water level records and the WSDOS records (Seqwater, 2013) for the 2011 event. The reasoning for this discrepancy is unclear. The differences are presented in Figure 2. The WSDOS records were adopted for this assessment.
- For the 2013 event, the DNRM gauge at Loamside failed. DNRM have supplemented the missing data with estimated levels. The WSDOS (Seqwater, 2013) and BRCFS (Aurecon, 2015) works adopted the BoM/Seqwater gauge data. The datasets are compared in Figure 3. The DNRM records and estimated levels were adopted for this assessment.

Table 6 Available stream gauge information

Gauge	Owner	Confidence Level	Historic Data				
			1974	1996	1999	2011	2013
143113A Loamside	DNRM	▪ Primary gauge in the catchment and adopted in the BRCFS as the key gauge for calibration ▪ Located approximately 9km downstream of SRRC boundary ▪ Flow and level data available for calibration with DNRM rating curve	✓	✓	✓	✓	✓
143869 Peak Crossing	BoM	▪ BoM flood alert gauge. Primary use for flood level warning. Low confidence in rating curve. ▪ Flow and level data available for calibration ▪ Adopted as a secondary calibration gauge in the BRCFS	n/a	n/a	n/a	✓	✓
143835 Washpool Alert	BoM	▪ BoM flood alert gauge. Primary use for flood level warning. Low confidence in rating curve. ▪ Flow and level data available for calibration ▪ Review of data showed poor data quality. Gauge not adopted for this assessment.	n/a	✓	✓	n/a	n/a

Table 7 Stream gauges used for calibration

Station number	Station name	Period	Gauge zero
143113A	Loamside	1973-current (DNRM)	18.48 AHD
143869	Peak Crossing	2000-current (BOM)	45.32 m AHD

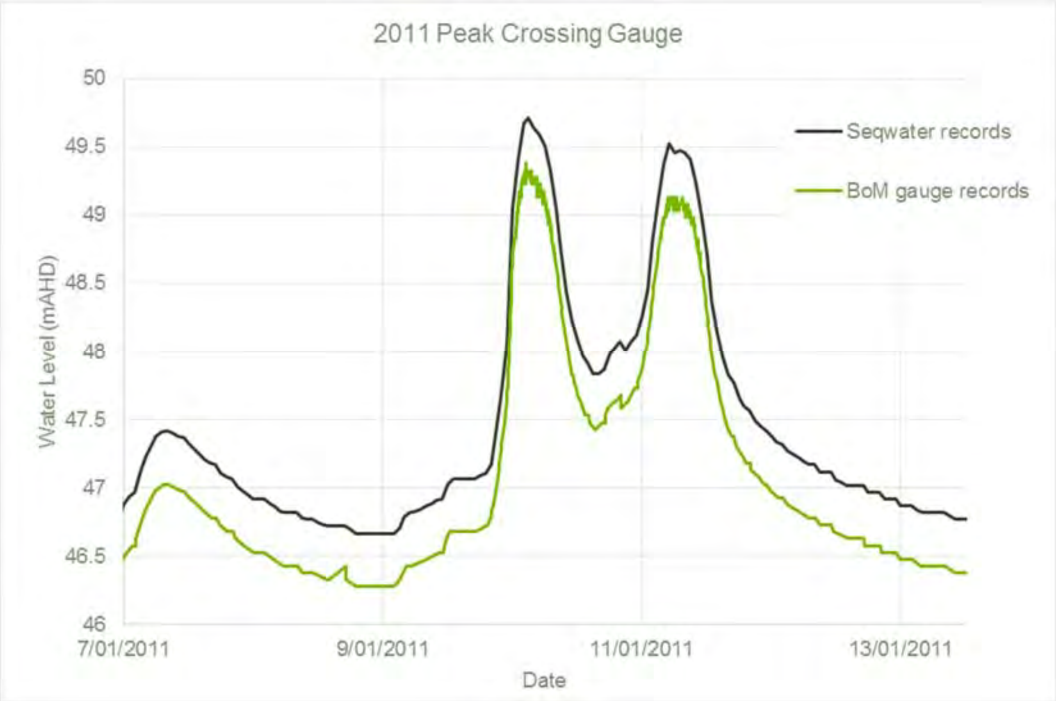


Figure 2 Water level records at Peak Crossing for the 2011 event

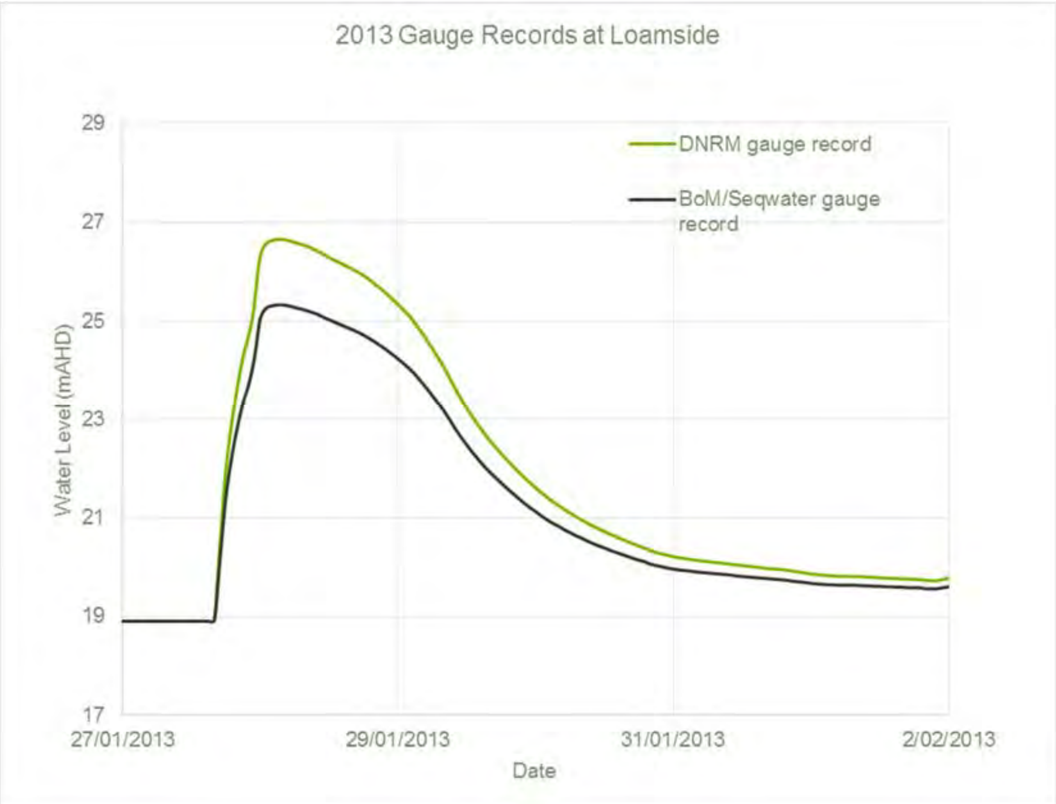


Figure 3 Comparison of recorded levels at Loamside

5.3.2 Flood level observations

SRRC have previously provided information on historic flood observations. This is in the form of surveyed flood or debris marks and provides valuable input into the hydraulic model calibration. Unfortunately, there are no flood level observations available for the Purga Creek catchment for use in this study. Calibration was limited to recorded flood levels at Peak Crossing gauge.

5.4 Calibration results

The following plots present the results from the joint calibration against the recorded gauge data. The calibration is based on achieving a reasonable match against the rising limb of the flood hydrograph, the peak levels, and flood volumes.

The rating for the Peak Crossing stream gauge was developed as part of the WSDOS (Seqwater, 2013) based on a fit to hydrologic modelling. Consequently, there is low confidence in the flow estimates for historic flood events. The URBS hydrologic model was thus calibrated to the primary gauge at Loamside and the model predictions checked against the Peak Crossing estimates. The TUFLOW model water level predictions were then calibrated to the Peak Crossing recorded levels.

5.4.1 1974 Event

Only hydrologic model calibration to Loamside gauge was considered for this event.

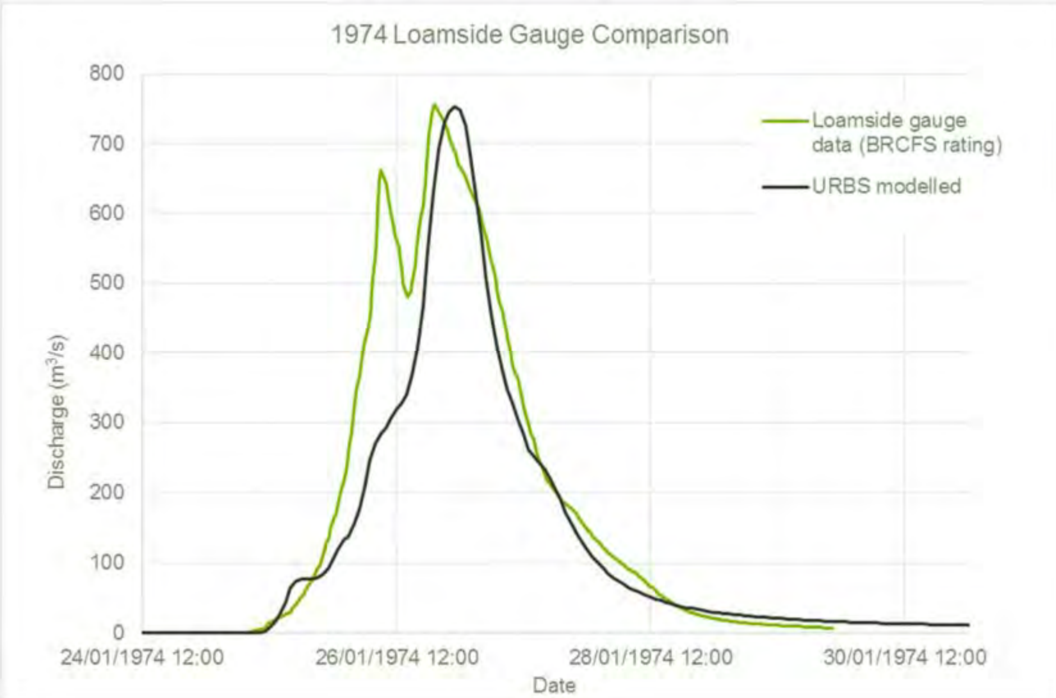


Figure 4 URBS hydrologic model calibration at Loamside gauge

5.4.2 1996 Event

Only hydrologic model calibration to Loamside gauge was considered for this event.

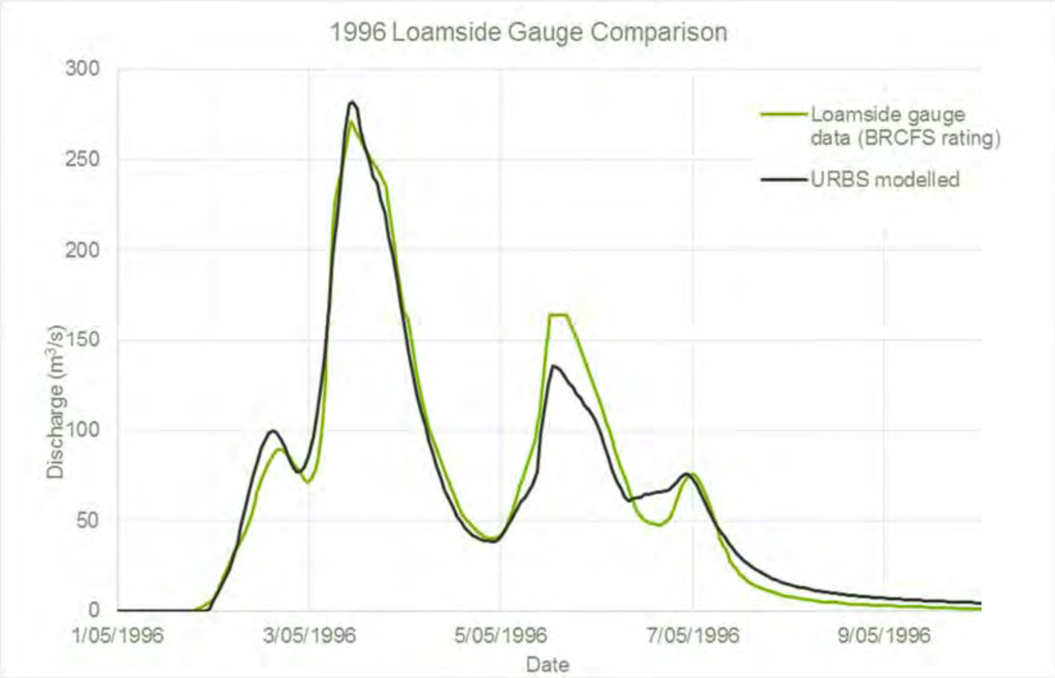


Figure 5 URBS hydrologic model calibration at Loamside gauge

5.4.3 2011 Event

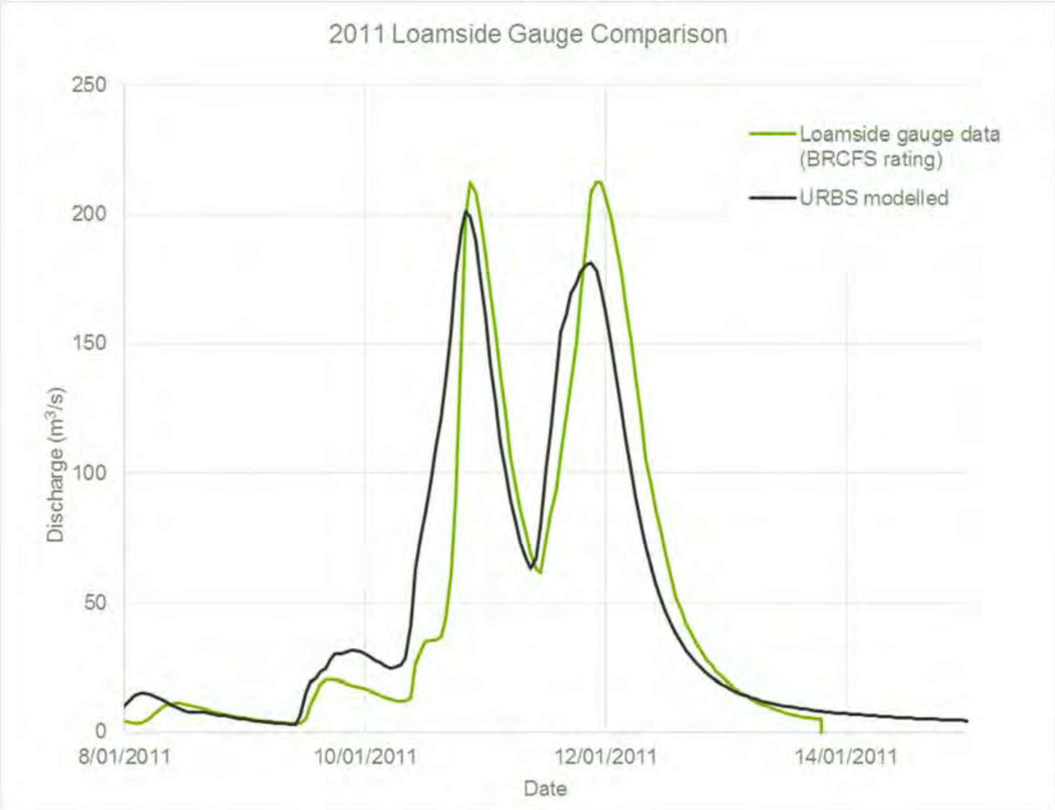


Figure 6 URBS hydrologic model calibration at Loamside gauge

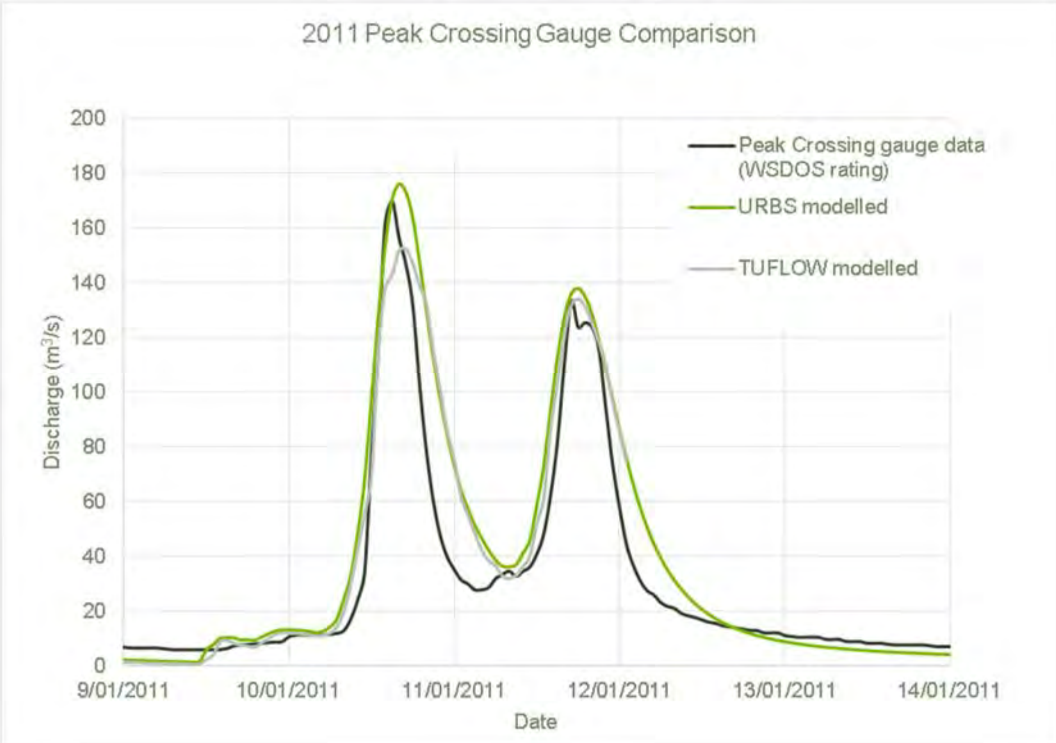


Figure 7 Model calibration at Peak Crossing gauge - Discharge

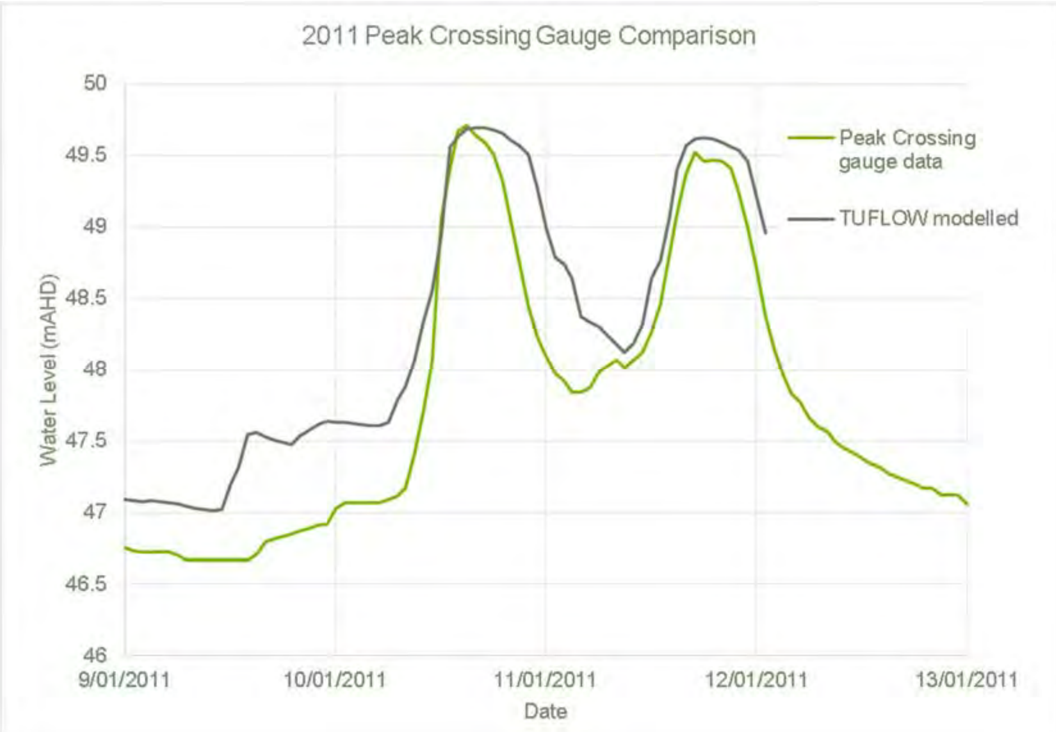


Figure 8 Model calibration at Peak Crossing gauge – Water levels

5.4.4 2013 Event

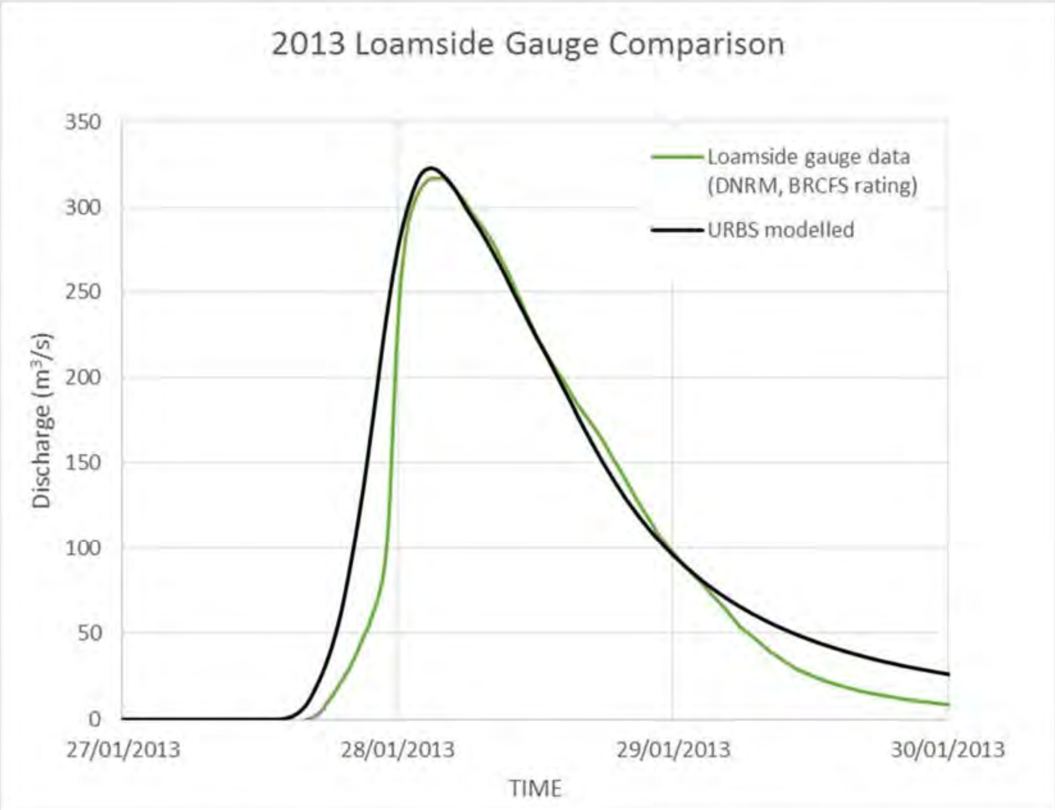


Figure 9 URBS hydrologic model calibration at Loamside gauge

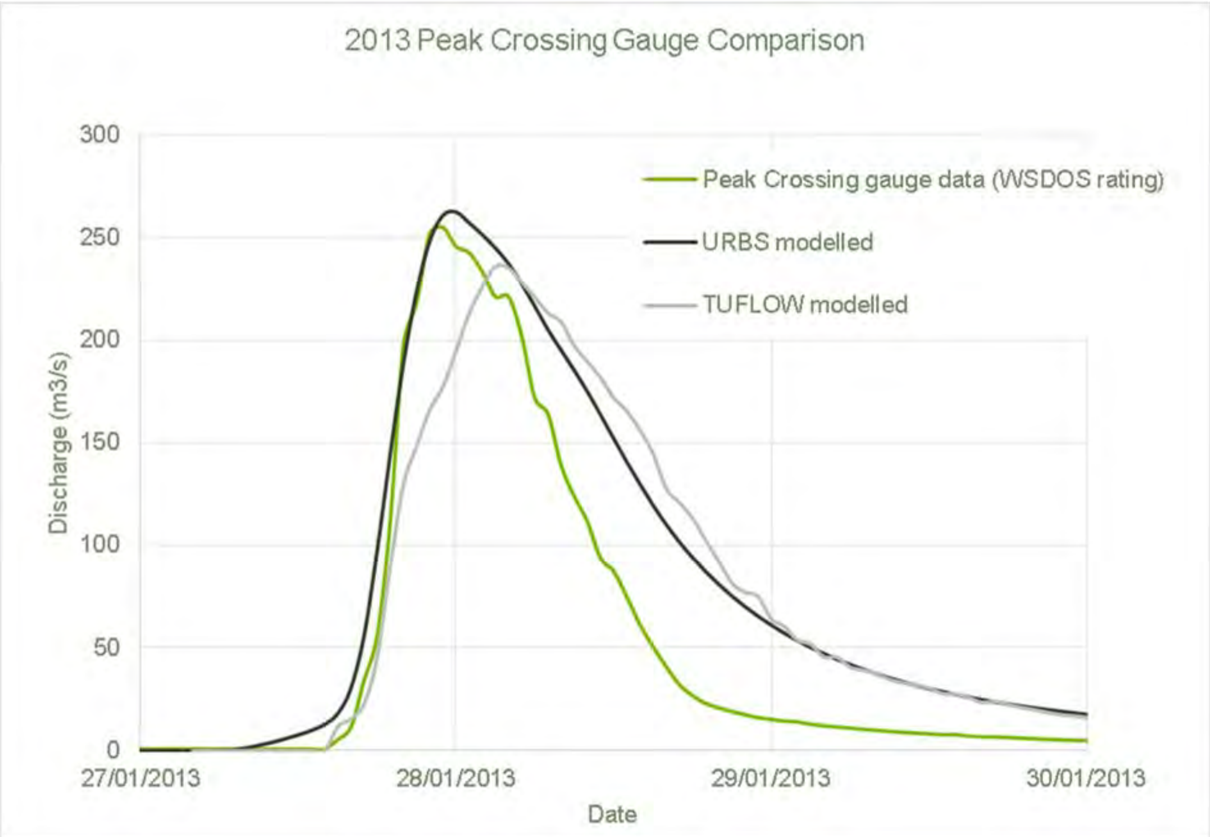


Figure 10 Model calibration at Peak Crossing gauge – Discharge

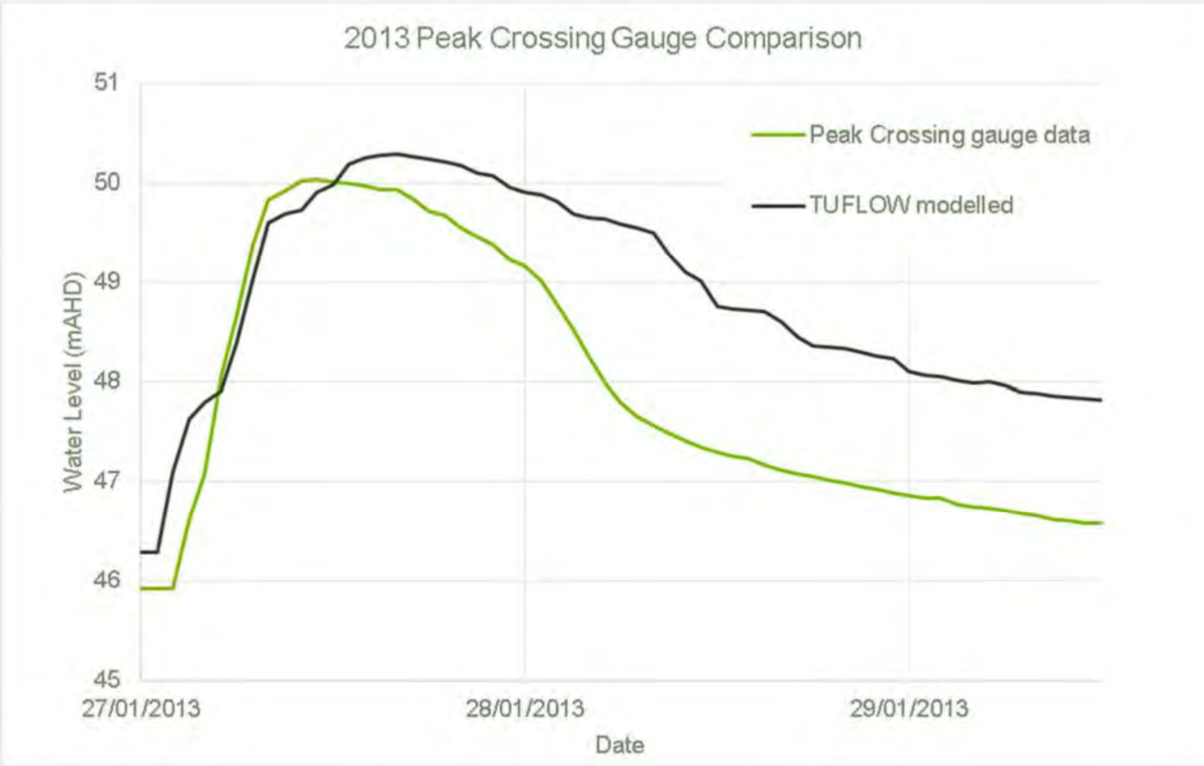


Figure 11 Model calibration at Peak Crossing gauge – Water levels

The following tables show the calibration achieved at Peak Crossing stream gauge for the 1974, 1996, 2011 and 2013 events.

Table 8 Observed vs modelled discharges at Loamside stream gauge

Result	1974 Event		1996 Event		2011 Event		2013 Event	
	Recorded	Modelled	Recorded	Modelled	Recorded	Modelled	Recorded	Modelled
Peak discharge (m^3/s)	756	753 (-0.4 %)	271	282 (+4.1 %)	213	201 (-5.6 %)	317	323 (+1.9 %)

Table 9 Observed vs modelled level and discharge at Peak Crossing stream gauge

Result	2011 Event		2013 Event	
	Recorded	Modelled	Recorded	Modelled
Peak water level (m AHD)	49.71	49.70 (+0.01)	50.04	50.29 (+0.21)
Peak discharge (m^3/s)	170	176 (+3.5 %)	255	262 (+2.7 %)

5.5 Gauge limitations

5.5.1 Loamside gauge

The URBS hydrologic model calibrated well against the Loamside gauge records. This was selected as the primary gauge for the BRCFS (Aurecon, 2015) and there is high confidence in this gauge. However, the following is noted:

- The gauge is located beyond the extents of the hydraulic model thus a joint calibration was not possible
- The gauge failed during the 2013 event and the peak was not recorded. DNRM have estimated the peak from an alternate source to complete the data. The accuracy of the 2013 peak is unclear. However, calibration to the Loamside gauge estimated peak produced a reasonable calibration at the Peak Crossing gauge.

5.5.2 Peak Crossing gauge

The Peak Crossing gauge is an alert gauge used for flood level records only. The rating curve is a best fit using hydrologic modelling prepared for the WSDOS (Seqwater, 2013). There is low confidence in the recorded flow data. However, the gauge provides a good source for historic level data for calibration of the hydraulic model. The 2011 and 2013 events both calibrated well to this gauge.

5.6 Discussion

Overall, a reasonable calibration has been achieved based on the available information and suitability for the objectives of this study. The findings for each calibration event are described in the following sections.

5.6.1 1974 event

The hydrologic results are compared below.

- Loamside Gauge
  - The RAFTS hydrologic model showed a good match to recorded hydrographs in terms of both shape, volume and peak flow. The peak flows fall within the +/- 10% tolerance.

5.6.2 1996 event

The hydrologic results are compared below.

- Loamside Gauge
  - The RAFTS hydrologic model showed a good match to recorded hydrographs in terms of both shape, volume and peak flow. The peak flows fall within the +/- 10% tolerance.

5.6.3 2011 event

A joint hydrologic and hydraulic model calibration was prepared for this event. A discussion of the results at each of the gauges is outlined below.

- Loamside Gauge
  - The RAFTS hydrologic model showed a good match to recorded hydrographs in terms of both shape, volume and peak flow. The peak flows fall within the +/- 10% tolerance.
- Peak Crossing Gauge
  - The RAFTS hydrologic model parameters were not calibrated to this gauge as this is an alert gauge with no flow measurements available for development of a rating curve. The flow data available is based on a best fit of hydrology model data prepared for WSDOS (Seqwater, 2013) and BRCFS (Aurecon, 2015).
  - The RAFTS hydrologic model showed a good match to recorded hydrographs in terms of shape, volume and peak flow. The peak flows fall within the +/- 10% tolerance.

- The hydraulic model predicted a good match with the gauge records in terms of timing, shape and peak water level. The peak levels are within the +/- 0.15m tolerance.

5.6.4 2013 event

A joint hydrologic and hydraulic model calibration was prepared for this event. A discussion of the results at each of the gauges is outlined below.

- Loamside Gauge
  - The RAFTS hydrologic model showed a good match to recorded hydrographs in terms of shape, volume and peak flow. The peak flows fall within the +/- 10% tolerance.
    - It is noted that the DNRM gauge failed during this event and estimated levels were adopted by DNRM to complete the dataset. The hydrology model was calibrated to the DNRM estimated levels.
- Peak Crossing Gauge
  - The RAFTS hydrologic model parameters were not calibrated to this gauge as this is an alert gauge with no flow measurements available for development of a rating curve. The flow data available is based on a best fit of hydrology model data prepared for WSDOS (Seqwater, 2013) and BRCFS (Aurecon, 2015).
  - The RAFTS hydrologic model showed a good match to recorded hydrographs in terms of shape, volume and peak flow (assuming the WSDOS rating curve at Peak Crossing). The peak flows fall within the +/- 10% tolerance.
  - The hydraulic model predicted a good match in terms of timing and shape. However, the predicted peak flood levels are not within the +/- 0.15 m tolerance (+0.21 m achieved). The difference may be attributed to:
    - The assumptions of modelled blockages at the Peak Crossing bridge (20% blockage assumed)
    - The hydrology model is calibrated to an estimated peak level at Loamside. Error in the Loamside estimate may translate to the differences found at Peak Crossing gauge.

5.7 Adopted URBS model calibration parameters

As detailed above, a joint calibration exercise was undertaken and the following parameters were adopted for the URBS model for each historical event:

Table 10 URBS model calibration parameters

Event	Calibration parameters				
	IL (mm)	CL (mm/hr)	IL (mm)	β	IL (mm)
1974	80	2.1	0.4	4.0	0.8
1996	90	0.5	0.9	3.0	0.8
2011	40	0.5	0.9	2.5	0.8
2013	120	3.0	0.7	6.0	0.8

5.8 Adopted roughness values

Aerial photography was used to define the land use within the study area and industry accepted values of Manning's 'n' roughness was applied. Following the joint calibration process, the final roughness values adopted are presented in Table 11.

Table 11 Adopted Manning's 'n' roughness values

Land use type	Manning's n
Low Density Residential	0.068
Dense Vegetation	0.068
Medium Vegetation	0.053
Low Vegetation	0.034
Agricultural areas	0.028
Road Reserve	0.015
River Corridor	0.030

6 Design events

As the design event modelling was undertaken in two stages, the following section of the report covers the 1% AEP event first then the additional design events and refinements undertaken for those events.

6.1 1% AEP event

Model calibration parameters for each historical event were established through the joint calibration process. The parameters adopted for calibration and the results of the flood frequency analysis were used to formulate design event parameters for the 1% AEP. The adopted 1% AEP design event parameters are consistent with the BRCFS (Aurecon, 2015). The adopted parameters are detailed in Table 12.

Table 12 1% AEP design event parameters

Design Event	Calibration parameters				
	Initial Loss Rate (mm)	Continuing Loss Rate (mm/hr)	Alpha, α	Beta, β	m
1% AEP event	0	0.5	0.93	3.8	0.8

Using the calibrated hydrologic and hydraulic models, modelling of the 1% AEP event was undertaken. The 1987 rainfall (IFD) and temporal patterns were adopted from Australian Rainfall and Runoff (AR&R).

6.1.1 Flood frequency analysis

A Flood Frequency Analysis (FFA) was prepared to provide further validation of the Purga Creek flood modelling. Historic annual peak flows were analysed from the Loamside Gauge. The final FFA analysis is presented in Figure 12.

The FFA predicts a 1% AEP flow of 805 m^3/s at the Loamside Gauge whilst the calibrated URBS hydrologic model predicts a 1% AEP peak flow of 532 m^3/s. It is noted that the FFA was based on only 27 years of data. The modelled design event prediction is located within the lower 90% confidence limit of the FFA. The modelled 1% AEP flow is consistent with the reconciled flow estimates of the BRCFS (Aurecon, 2015). The BRCFS (Aurecon, 2015) used a combination of Flood Frequency Analysis, Design Event Approach and Monte Carlo Simulations to develop the reconciled flow estimates.

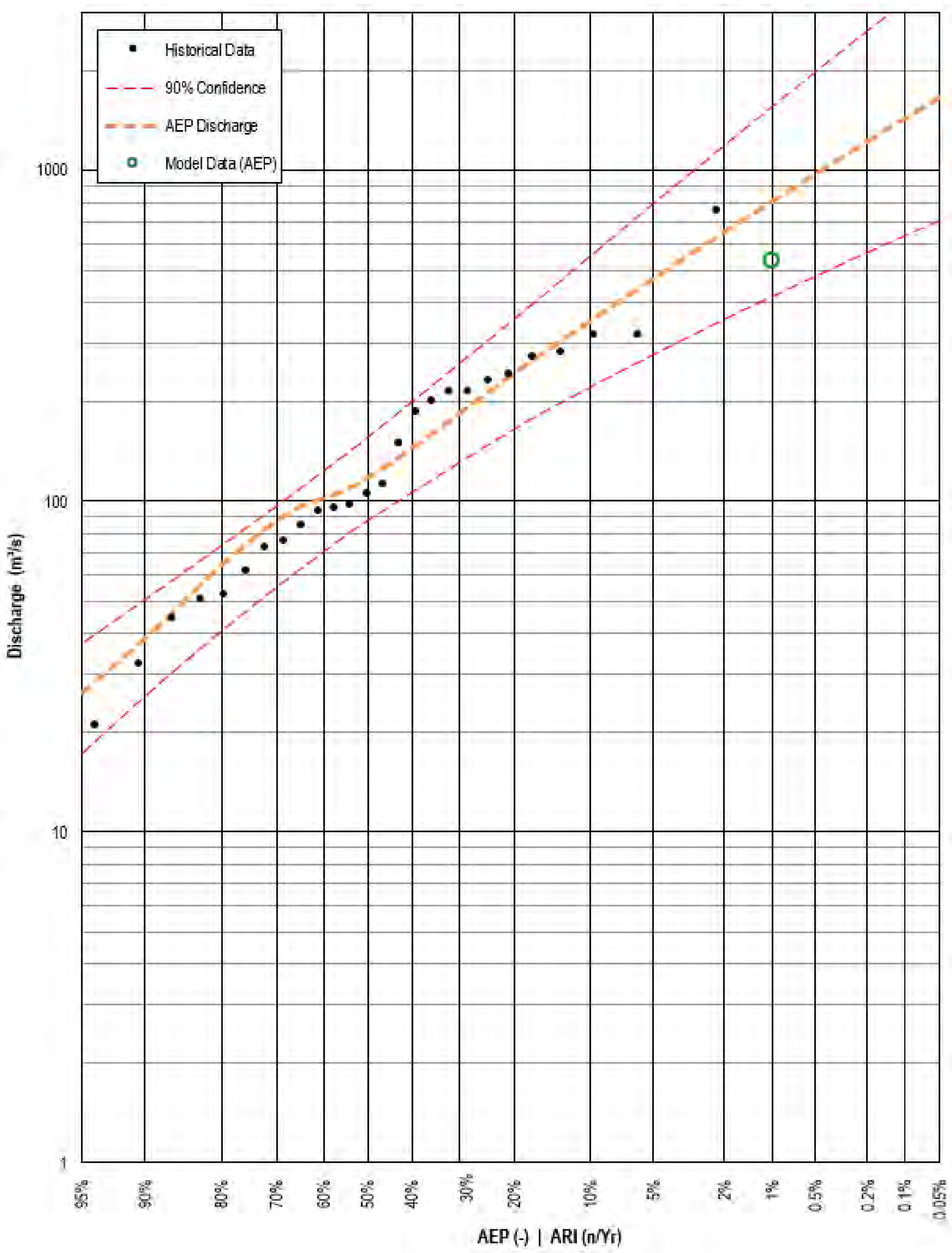


Figure 12 Flood frequency analysis at Loamside

6.2 2%, 5% and 10% AEP events

6.2.1 Hydrology

Parameterisation of the URBS model for the 10%, 5% and 2% AEP events was based on the calibrated 1% AEP event hydrologic model. The event independent Alpha, Beta and m parameters were retained as per the calibrated 1% AEP event Purga Creek URBS model.

Initial and continuing loss rates are typically adjusted across the range of design events to reflect the likelihood of lower levels of catchment saturation antecedent to more minor events. Loss parameters were adopted as per the BRCFS URBS models for the 10% 5% and 2% events. Adopted URBS model parameters shown in Table 13.

Table 13 Purga Creek URBS model design event parameters

Design Event	Calibration parameters				
	Initial Loss Rate (mm)	Continuing Loss Rate (mm/hr)	Alpha, α	Beta, β	m
2% AEP	8	0.5	0.93	3.8	0.8
5% AEP	16	0.8	0.93	3.8	0.8
10% AEP	24	1.2	0.93	3.8	0.8

6.2.2 Hydraulics

The calibrated TUFLOW model developed to investigate the 1% AEP flooding behaviour within the Purga Creek catchment was adopted to assess the additional smaller design events. The 1% AEP event model was developed using a 10 m grid resolution and was intended for investigation of the rare flooding events during which a significant proportion of flooding occurs as overland flow outside of defined watercourse banks. A number of model refinements have been undertaken to more accurately assess the smaller design events as detailed in the following sections.

6.2.3 Model refinements

6.2.3.1 Initial indicative low flow modelling

As an initial step, inflow hydrographs for the 1% AEP were scaled down to represent a minor / moderate storm scenario. The results from this simulation were used to inform and assess which hydraulic structures should be included in the hydraulic model refinement, and to review locations where additional bathymetric data may be required. This simulation was only used to guide model development and the results of this simulation are not presented in this report.

6.2.3.2 Hydraulic structures

Improvements to the representation of hydraulic structures details and watercourse bathymetry has been achieved using new ground survey undertaken by Aurecon in February 2017. Locations for ground survey based on review of the initial modelling and discussions between Council and Aurecon. Waterway crossings were identified that were of significance in terms of understanding flooding impacts on access through the Purga Creek catchment and the relative timing of road closures during flood events. The following aspects were considered in the selection of locations for survey and model refinement:

- Consequence of overtopping in terms of population affected by inundation and loss of access
- Likelihood of overtopping in minor/moderate storm events
- Degree of inundation in minor/moderate storm events

In light of the above, Table 14 details the Purga Creek crossing locations selected for survey. These structures have been included in the refined hydraulic model.

Table 14 Surveyed Purga Creek crossings

Locality	Description	Structure Type	Key structure dimensions (m)	Deck/Road Level (m AHD)
Roadvale	Purga Creek crossing at Roadvale Road – concrete box culverts with concrete floodway	Concrete box culvert	3 no. x2.5(w) x 2.5 (h)	105.45
Woolooman	Purga Creek crossing at Woolooman Road	Timber bridge	20.0 (l) x 3.5(w)	81.15
Millbong	Purga Creek crossing at Dwyers Road	Timber bridge	16.5 (l) x 3.3 (w)	53.75
Peak Crossing	Purga Creek crossing at Ipswich-Boonah Road	Concrete bridge	55.0 (l) x 8.9(w)	50.50 (crown), 50.35 (edges)
Peak Crossing	Pedestrian footbridge adjacent to Ipswich-Boonah Road bridge	Concrete footbridge	35.0 (l) x 2.2 (w)	49.90
Peak Crossing	Secondary Purga Creek flowpath approx 1.5km north of Ipswich-Boonah Road bridge	Concrete box culvert	3 no. x1.2 (w) x 1.6m (h)	47.20

6.2.3.3 Bathymetry

Improvements to the hydraulic model bathymetry have been made in the vicinity of each of the surveyed waterway crossings and populated areas. In addition to the actual bridge and culvert structures, survey of the watercourse was undertaken both upstream and downstream at each location. This has enabled an improved representation of the conveyance area at each crossing structure and to improved delineation between in and out of bank flow conditions.

6.2.3.4 Grid resolution

The 1% AEP model was developed using a 10 m square grid resolution which was appropriate for the assessment of major flooding during which a large portion of the flood is typically conveyed outside of the watercourse. However, for the 10% to 2% AEP events, a greater portion of catchment discharge flows within the banks of the watercourse. As the upper reaches of Purga Creek are less than 10 m wide in a number of locations, the model resolution was increased to 5 m. By increasing the grid resolution, better definition of watercourse bathymetry is achieved allowing an improved representation of bed and bank levels and overall cross-section conveyance area.

7 Modelling results

7.1 Climate change

There are several aspects of design flood estimation that are likely to be impacted by climate change. These include:

- Rainfall Intensity-Frequency-Duration (IFD) relationships
- Rainfall temporal patterns
- Continuous rainfall sequences
- Antecedent conditions and baseflow regimes
- Compound extremes (eg riverine flooding combined with storm surge inundation)

Typically, the approach to addressing climate change in flood studies is through consideration of sea-level rise (SLR) and/or increased rainfall intensities. SRRC is located in the upper reaches of the Bremer River drainage basin and therefore is unlikely to be influenced by sea-level rise. The effect of climate change on the Purga Creek flood levels was therefore assessed for increased rainfall intensity predictions only.

The latest AR&R (2016) recommendations on climate change consider two Representative Concentration Pathways (RCPs) for greenhouse gas and aerosol concentrations driving climate change for the East Coast Cluster – RCP4.5 & RCP8.5. AR&R (2016) recommends using RCP4.5 as the minimum design basis but notes RCP8.5 should be considered where *'additional expense can be justified on socioeconomic and environmental grounds'*. This guideline recommends an increase in rainfall intensity of 12% for RCP4.5 and 22% for RCP8.5 to the 2090 planning horizon.

Table 15 Predicted increased rainfall intensity (AR&R, 2016)

Representative Concentration Pathway	Temperature increase (°C) at 2090 horizon	Increase in rainfall intensity (%)
4.5	2.25	12
8.5	4.10	22

For the 1% AEP event both Scenarios RCP4.5 and RCP8.5 were assessed and the results are presented on the figures in Appendix A. This includes afflux maps representing the difference in peak flood levels between the climate change and no-climate change scenarios.

SRRC have adopted the 1% AEP event with the RCP4.5 scenario for their Planning Scheme. This event has been used to set levels for development across the region.

For the 10% to 2% AEP events, the climate change investigation is based on RCP 4.5 only.

7.2 Mapping

The TUFLOW model results were analysed and a series of maps (Appendix A) were developed to present the results for each modelled return period. Four sets of maps were produced to display:

- Inundation extents with peak water surface levels – these maps present 1 m contours of the peak water surface levels
- Peak depths – these maps present peak depth contours in 0.5 m bands up to a depth of 5 m, with the lower band separated into two bands covering 0 to 0.3 m and 0.3 to 0.5 m
- Peak velocities – these maps present peak velocity contours in 0.5 m bands up to a velocity of 5 m/s
- Hazard maps – Guidelines for presentation of flood mapping are provided in the Australian Emergency Management Handbook Series (2013) produced by Emergency Management Australia (EMA). The guidelines include categorisation for flood hazard as shown below in Figure 13.
  The prepared hazard maps have used a simplified version of this classification, where only 3 levels are outlined (Low, Medium and High Hazard). Each of these simplified bands represent 2 bands within the EMA classification.

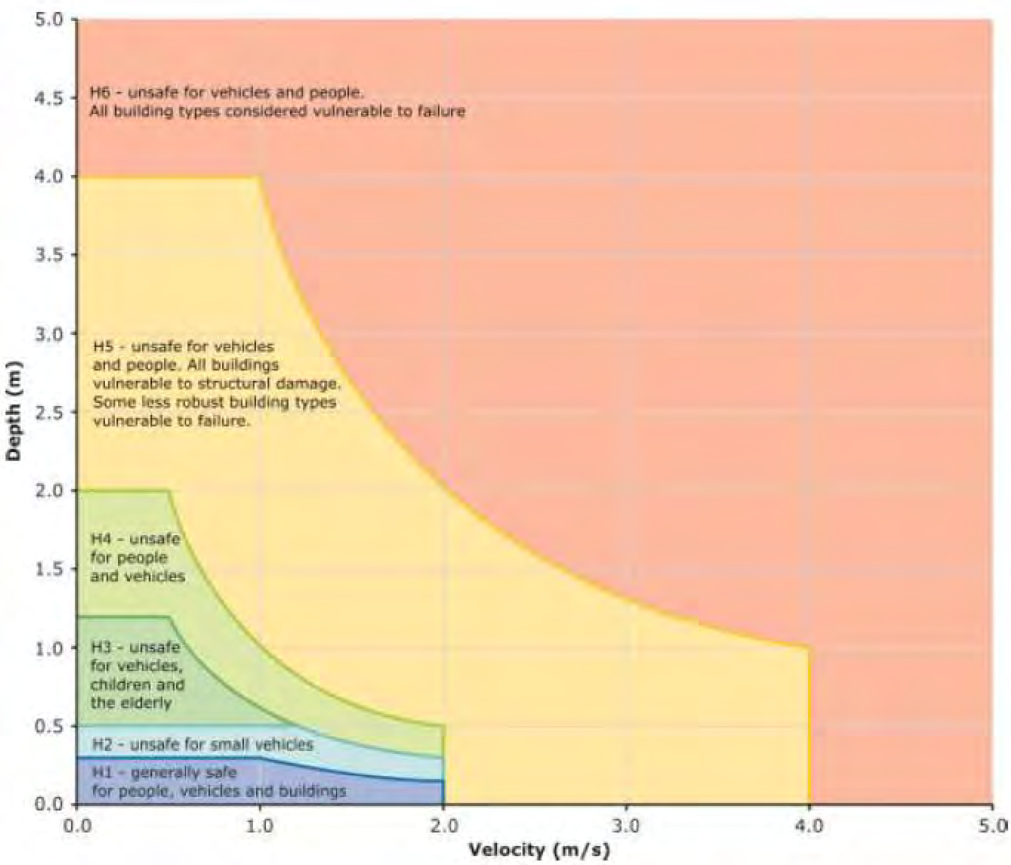


Figure 13 EMA revised flood hazard classification. ***Source: Australian Emergency Management Handbook Series (2013) - Technical flood risk management guideline: Flood hazard***

The flood maps accompanying this report provide a regional overview of the modelling results and are supplemented by GIS data to be supplied to SRRC which can be interrogated to provide further detail. A list of the figures and the full set of maps is presented in Appendix A.

7.3 Property flood levels

Peak water levels at properties affected by each of the design events were determined from the flood modelling results. The results are tabulated by property and will be provided to Council in spreadsheet format.

7.4 Design event discharges

Peak design event discharges are shown below in Table 16. The table shows the increase in peak discharge both with severity of the event and increasing distance travelled downstream through the catchment. Please note the crossings in the following table relate to the structures outlined in Table 14.

Table 16 Design event (AEP) peak discharges at key locations on Purga Creek

Location	Peak Discharge (m^3/s)		
	10% AEP	5% AEP	2% AEP
Purga Creek crossing at Roadvale Road	10.2	13.8	18.4
Purga Creek Crossing at Hansen Road	29.4	40.2	54.6
Purga Creek Crossing at Zingleman Road	44.4	59.9	80.5
Purga Creek Crossing at Woolooman Road	52.1	69.0	91.7
Purga Creek Crossing at Washpool Road	106.2	142.0	192.1
Purga Creek crossing at Dwyers Road	111.0	157.3	217.8
Purga Creek crossing at Ipswich-Boonah Road	152.70	210.8	291.3

7.5 Road closures

Management of flooding related road closure risk is key for effective emergency planning and response functions. An understanding of the timing and location of road closures will enable emergency services to forewarn residents of impending loss of access prior to the arrival of the flood.

7.5.1 Design event road closures

Closure of key road crossings has been reviewed for the 10%, 5%, 2% and 1% AEP design events. Figure F has been prepared and presents the estimated flooded width for each AEP for each key crossing within the Purga Creek catchment. In addition, peak flood levels for each AEP have been presented for each stream gauge within the catchment. Historical flood levels at the stream gauge are also presented.

This mapping can be used in conjunction with predicted gauge levels that the BoM issue during events to give Council's response team an understanding of the likely crossings that will be inundated and to assist in guiding response measures.

7.6 Gauge rating review

A network of stream alert gauges is owned and operated by various agencies which are used to provide early warning of flooding and for flood forecasting operations by the Bureau of Meteorology (BoM). The stream alert gauges provide classifications for flood severity corresponding to various gauge depths. The descriptors for these classifications as provided by the BoM are as follows:

- **Minor Flooding:** This causes inconvenience such as closing of minor roads and the submergence of low level bridges and makes the removal of pumps located adjacent to the river necessary.
- **Moderate Flooding:** This causes the inundation of low lying areas requiring the removal of stock and/or the evacuation of some houses. Main traffic bridges may be closed by flood waters.
- **Major Flooding:** This causes inundation of large areas, isolating towns and cities. Major disruptions occur to road and rail links. Evacuation of many houses and business premises may be required. In rural areas, widespread flooding of farmland is likely.

It is understood that the gauge flood classification levels may not be reflective of the actual flood severity at some locations. A review of the gauge level flood classifications has therefore been undertaken as detailed in the following sections.

7.6.1 Washpool alert gauge

The Washpool alert gauge is located on Purga Creek in a rural area upstream of Washpool Road and is operated by Seqwater. There are currently no published flood classification levels for this gauge. The primary land use in the Washpool area is grazing with associated farm dwellings. The area is sparsely populated as is typical for rural grazing areas. Whilst gauge flood classifications were not available from the BoM for the Washpool gauge, a minor flood gauge level classification is suggested below based on the BoM hazard rating descriptors in light of population and land use characteristics of the Washpool road area. As the flooding characteristics in the Washpool area are similar for events for 10% to 2% AEP, no moderate or major flood classifications are suggested for this gauge.

Table 17 Washpool gauge level analysis

Proposed Water level (m AHD)	Peak flood conditions description	Suggested flood classification
RL 64.10	Overtopping of the downstream Washpool Road causeway across Purga Creek and adjacent section of Washpool road. Inundation of grazing land. Farm dwelling and buildings not affected in up to and including 2% AEP.	Minor and above

7.6.2 Peak Crossing alert gauge

The Peak Crossing stream gauge is located immediately upstream of the Ipswich-Boonah road crossing of Purga Creek. Peak Crossing is a small urban centre and due to the presence of a major arterial (Ipswich-Boonah Road), Peak Crossing State School and numerous dwellings; flooding severity has the potential to cover the full range of BoM classifications from minor to major.
The current flood classification gauge levels for the Peak Crossing gauge are shown in Table 18.

Table 18 Existing BoM flood classifications – Peak Crossing gauge

Flood height (m)		
Minor	**Moderate**	**Major**
Peak Crossing (Station #540065, AWRC # 143869) – Bridge Height 5.10		
2.0	3.5	5.0

A review of flood classification levels in light of modelled flooding conditions is provided below in Table 19. The review indicates that the current flood classifications at Peak Crossing are overstated with respect to their respective gauge levels.

Table 19 Peak Crossing gauge analysis

Water level (m AHD)	Gauge Level (m)	Flood condition description	Suggested flood classification
50.1	**4.8**	■ At the upper limit of this range, peak flood waters overtop the banks of the Purga Creek main channel around the township. ■ Inundated areas include the Peak Mountain View Park and bushland to the South of Peak Crossing State School. ■ Dwyer's Road is overtopped and access is lost.	Minor

Water level (m AHD)	Gauge Level (m)	Flood condition description	Suggested flood classification
50.6	**5.3**	■ Flooding in Peak Mountain View Park and bushland to the South of Peak Crossing State School is more extensive as is the flooding of the pasture land. ■ Overtopping of Ipswich-Boonah Road occurs approximately at gauge level **5.6.** The overtopping flowpath impacts the school car park area and farm areas to the north. ■ Noonan's Lane is overtopped and access is lost. ■ No inundation of dwellings or habitable buildings.	Moderate
51.1	**5.8**	■ Widespread inundation of the Peak Crossing State School grounds including school buildings. Inundation extends to farmland north of the school. ■ There is an additional breakout flowpath from the Allens Road crossing through cropping land to the north of Peak Crossing. This flowpath crosses Ipswich-Boonah Road approximately 1.5km north of the road bridge and then re-joins the Purga Creek main channel approximately 2.5km to the north.	Major

7.6.3 Opportunities for additional alert gauges

Due to the relatively rural nature of the Purga Creek catchment, low population and low risk of the access being lost along the major arterial connection, Ipswich-Boonah Road; no specific additional alert gauging locations are recommended.

8 Conclusions

Scenic Rim Regional Council (SRRC) has undertaken work to gain a better understanding of the region's Natural Hazard (Flood) characteristics for a range of events from relatively frequent (10% AEP) to rare (1% AEP). This flood study has been undertaken for the Purga Creek catchment within Council's boundaries to provide Council with detailed flood information across the catchment.

Hydrologic modelling has been carried out using the established BRCFS URBS model. Hydraulic modelling of the main floodplain areas has been carried out through the development of a 2D TUFLOW hydraulic model. Refinement of modelling parameters was carried out through a joint calibration of the hydrologic and hydraulic models. Calibration of the models was undertaken against stream gauge records for four historical flood events.

Design event modelling for the 1%, 2%, 5% and 10% AEP events was undertaken. Mapping of the modelling results has been prepared and includes flood inundation extents, peak water levels, depths, velocities and hazard zoning in accordance with current guidelines.

Two climate change scenarios were assessed for the 1% AEP flood event to the 2090 planning horizon. Allowances for climate change considered 12% and 22% increases in rainfall intensities as recommended in AR&R (2016).

The RCP 4.5 climate change scenario was assessed for the additional flood events to the 2090 planning horizon. Allowances for climate change for the 10%, 5% and 2% AEP events considered 12% increases in rainfall intensities as recommended in AR&R (2016).

For planning purposes, a tabulation of peak water levels for each design event at properties within the catchment has been prepared. This information and the GIS mapping will be provided in digital format to Council.

9 Assumptions, limitations and recommendations

The following limitations relate to this study:

- Calibration
  - The calibration and verification exercise was undertaken for four events. Although the calibration was successful there were limitations due to the accuracy of the available information.
  - The hydrologic model assumes existing development conditions
  - The available calibration events for the hydraulic model was limited due to limited historic level data within the study area
- 1% AEP event
  - The hydraulic structures modelled in the 1% event are limited to the detail available at the time of analysis
  - The hydraulic modelling for the 1% AEP event adopted a 10 m grid hydraulic model. This model resolution may not be representative of features such as small local drainage channels.
- 2%, 5% and 10% AEP events
  - The hydraulic structures modelled are limited to the detail provided except where survey has been undertaken at agreed locations
  - The hydraulic modelling presented for these events adopted a 5 m grid hydraulic model. This model resolution may not be representative of features such as small local drainage channels.
- General
  - Hydraulic models are influenced by the boundary conditions. Areas of flooding in proximity of the downstream boundary condition should be investigated with caution. Note that the downstream boundary is outside of the Scenic Rim Regional Council boundary.
  - Information presented in this report is indicative only and may vary, depending upon the level of catchment and floodplain development. Filling of land or excavation and levelling may alter the ground levels locally at any time, whilst errors may occur from place to place in local ground elevation data from which the model has been developed.

10 References

Aurecon 2016, Purga Creek Flood Study – Final Report

BMT WBM, 2010, TUFLOW User Manual

Bureau of Meteorology, 2013, Intensity-Frequency-Duration data

Carroll, DG, 2009, URBS Manual – A Rainfall Runoff Routing Model for Flood Forecasting and Design

CSIRO, 2000, Floodplain Management in Australia: Best Practice Principles and Guidelines, SCARM Report

Emergency Management Australia, 2013, Managing the floodplain: a guide to best practice in flood risk management in Australia – Handbook 7

Institution of Engineers Australia, 1998, Australian Rainfall & Runoff: A guide to Flood Estimation

Institution of Engineers Australia, 2016, Australian Rainfall & Runoff: A guide to Flood Estimation

Queensland Government, 2015, Building Act 1975

Seqwater, 2013, Wivenhoe and Somerset Dam Optimisation Study

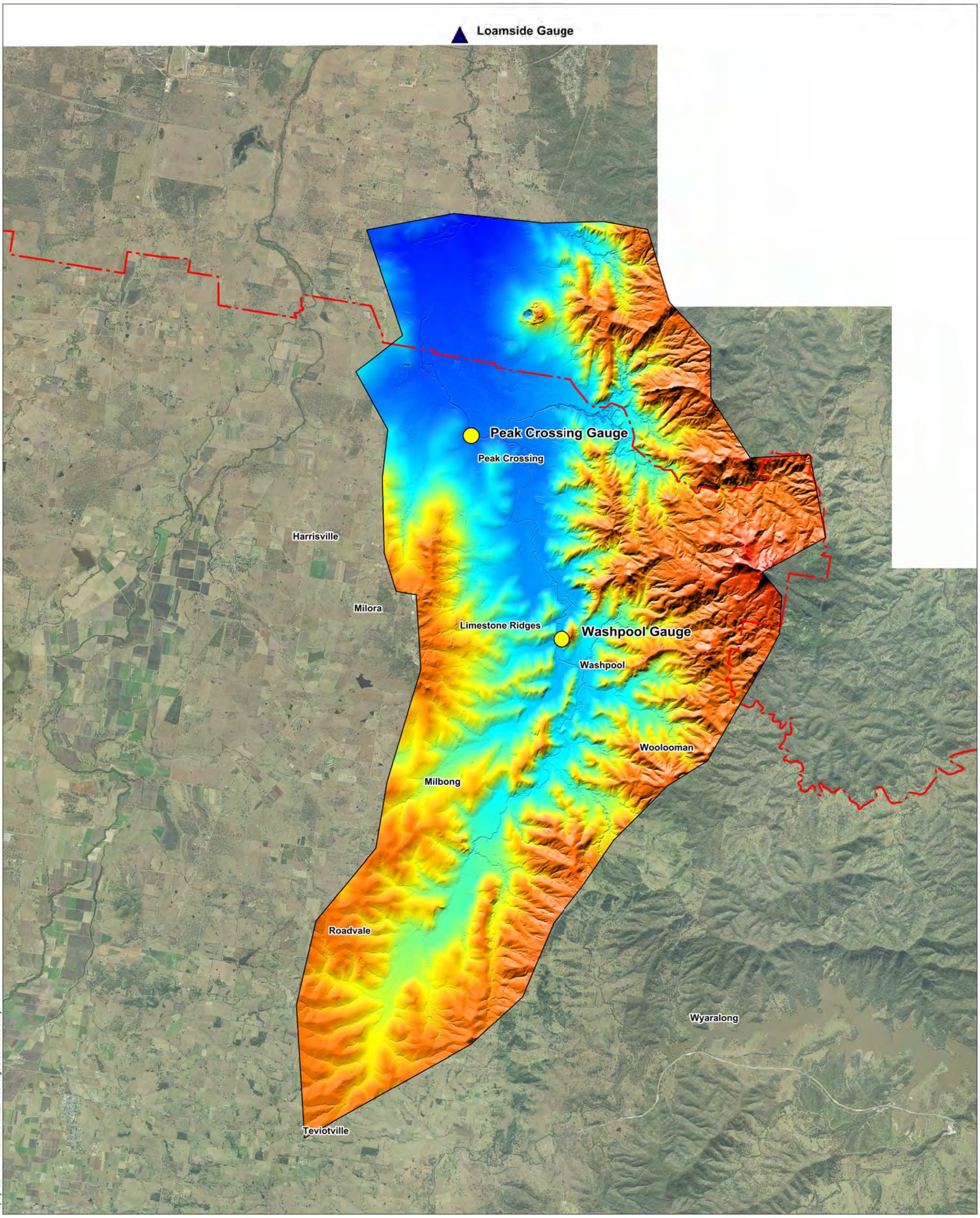
Aurecon, 2015, Brisbane River Catchment Flood Study

Appendices

Appendix A Figures

Figure	Description
Figure A1	Topography
Figure A2	Roughness Values
Figure B1	1% AEP Event - Inundation Extent Map
Figure B2-a	1% AEP Event - 4.5 Climate Change Scenario – Afflux Map
Figure B2-b	1% AEP Event - 8.5 Climate Change Scenario – Afflux Map
Figure B3-a	1% AEP Event - Inundation Extent Map with 4.5 Climate Change Scenario
Figure B3-b	1% AEP Event - Inundation Extent Map with 8.5 Climate Change Scenario
Figure B4	1% AEP Event - 4.5 Climate Change Scenario – Inundation Extent Map
Figure B5	1% AEP Event - 4.5 Climate Change Scenario – Peak Velocities Map
Figure B6	1% AEP Event - 4.5 Climate Change Scenario – Peak Depth Map
Figure B7	1% AEP Event - 4.5 Climate Change Scenario – Peak Hazard Map
Figure C1	2% AEP Event - Inundation Extent Map
Figure C2	2% AEP Event - Peak Velocities Map
Figure C3	2% AEP Event - Peak Depth Map
Figure C4	2% AEP Event - Hazard Map
Figure C5-a	2% AEP Event - Inundation Extent Map with 4.5 Climate Change Scenario
Figure C5-b	2% AEP Event - 4.5 Climate Change Scenario – Afflux Map
Figure D1	5% AEP Event - Inundation Extent Map
Figure D2	5% AEP Event - Peak Velocities Map
Figure D3	5% AEP Event - Peak Depth Map
Figure D4	5% AEP Event - Hazard Map
Figure D5-a	5% AEP Event - Inundation Extent Map with 4.5 Climate Change Scenario
Figure D5-b	5% AEP Event - 4.5 Climate Change Scenario - Afflux Map
Figure E1	10% AEP Event - Inundation Extent Map
Figure E2	10% AEP Event - Peak Velocities Map
Figure E3	10% AEP Event - Peak Depth Map
Figure E4	10% AEP Event - Hazard Map
Figure E5-a	10% AEP Event - Inundation Extent Map with 4.5 Climate Change Scenario
Figure E5-b	10% AEP Event - 4.5 Climate Change Scenario - Afflux Map

aurecon



Legend

BOM Gauge
SRRC Boundary
DNRM Gauge

Notes:

A3 scale 1:100000

0 2,500 m 5,000 m

Date: 27/06/2016 Version: 0 Job No: 251536

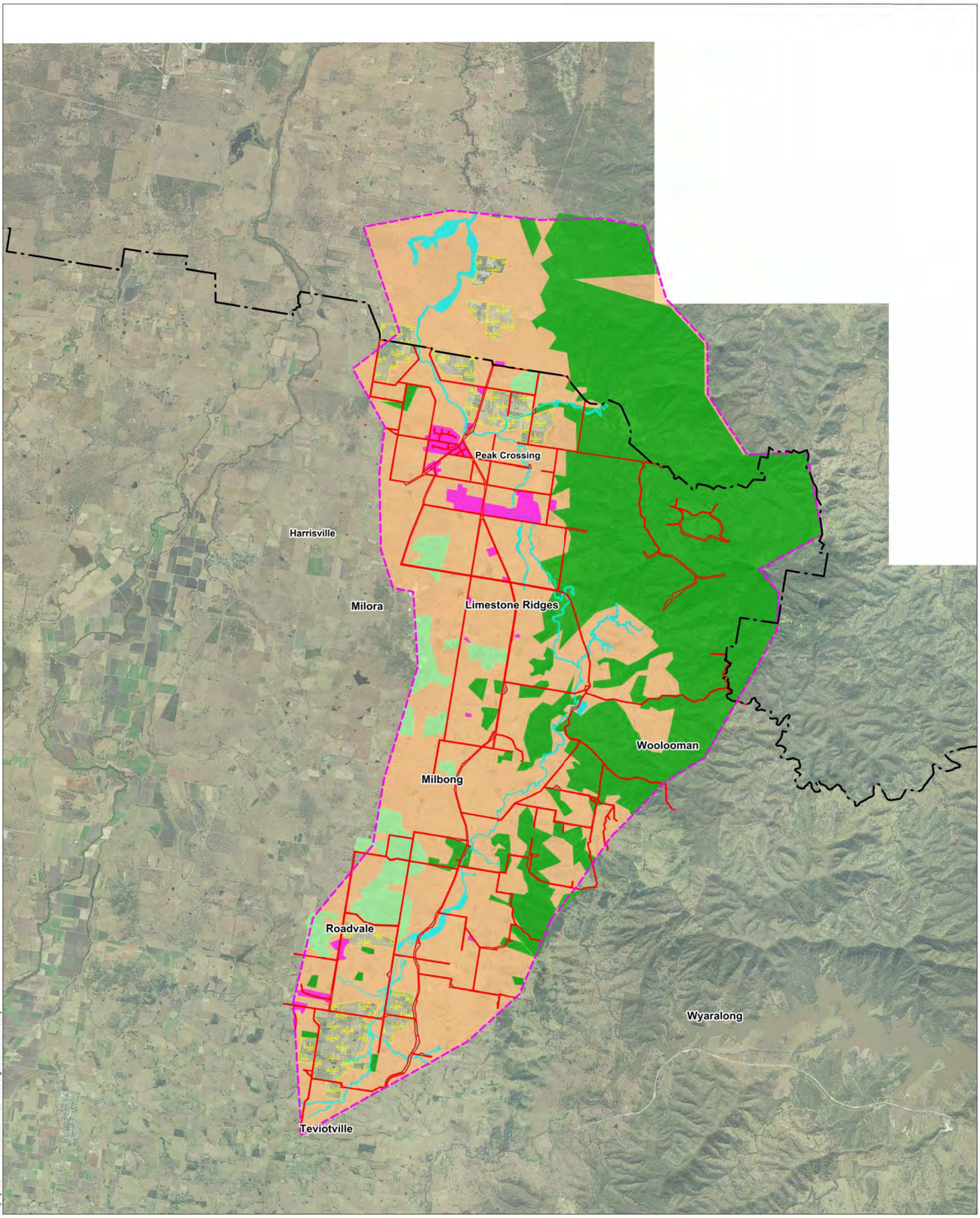
Projection: MGA Zone 56

Purga Creek Flood Study

Figure A-1

Topography

aurecon



Legend

Open Space
Crops
Creek
Model Extent
Roads
Residential
SRRC Boundary
Dense Vegetation
Medium Vegetation

Notes:

A3 scale 1:100,000

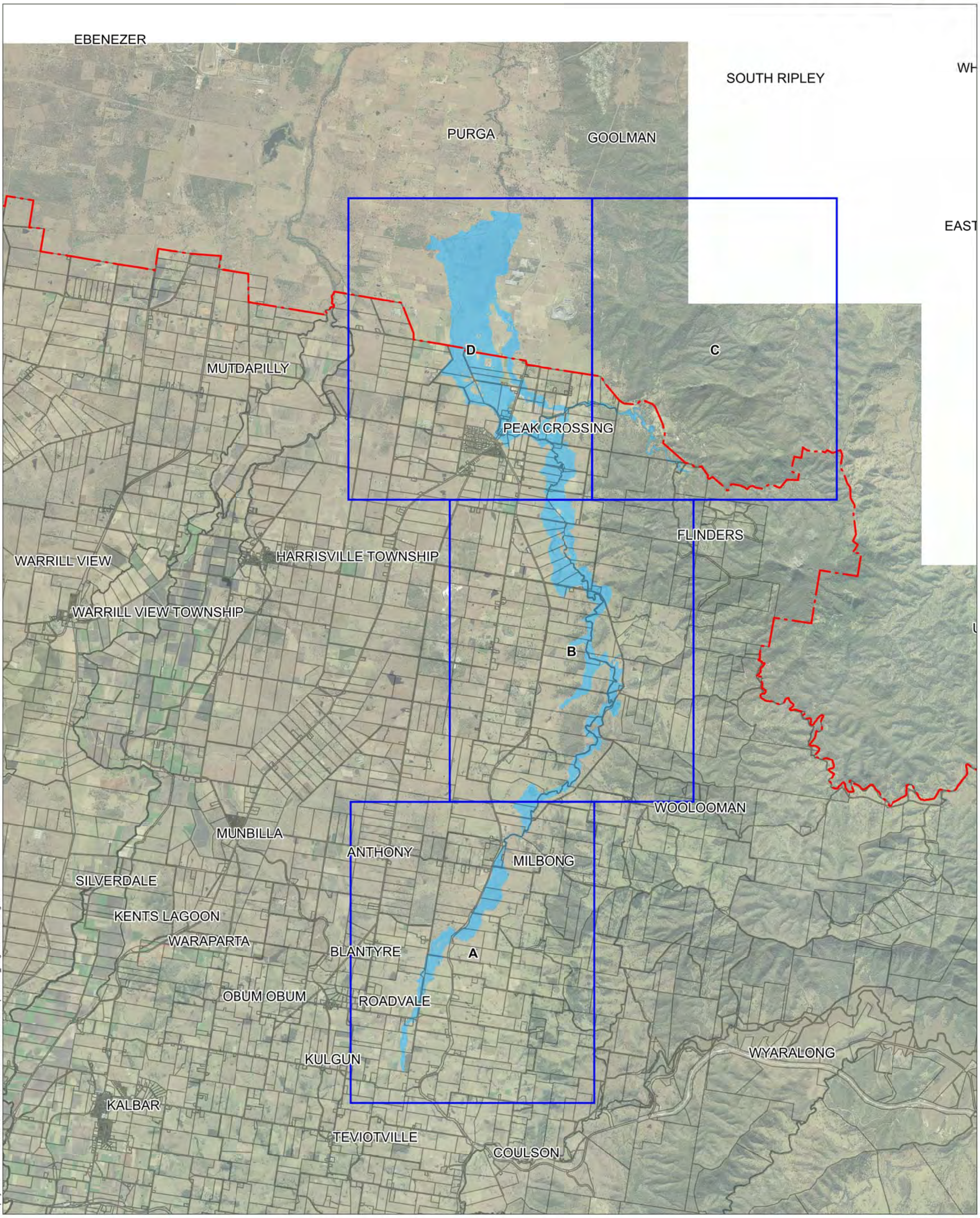
0 2,500 m 5,000 m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure A-2**

Roughness Values



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:100,000

0 2,500 m 5,000 m

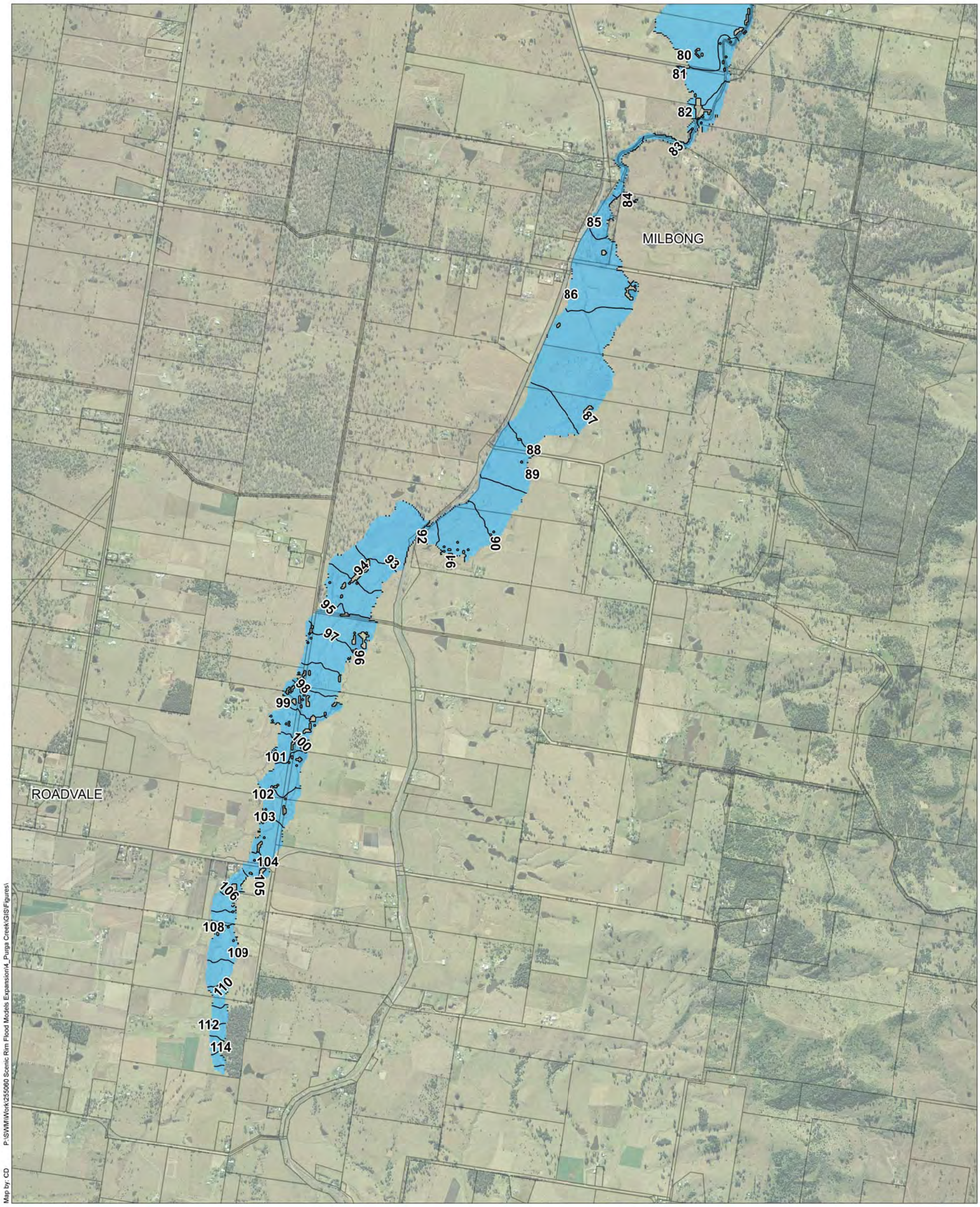
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B1**

1% AEP Event Climate Change Scenario 4.5 - Inundation Extent

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

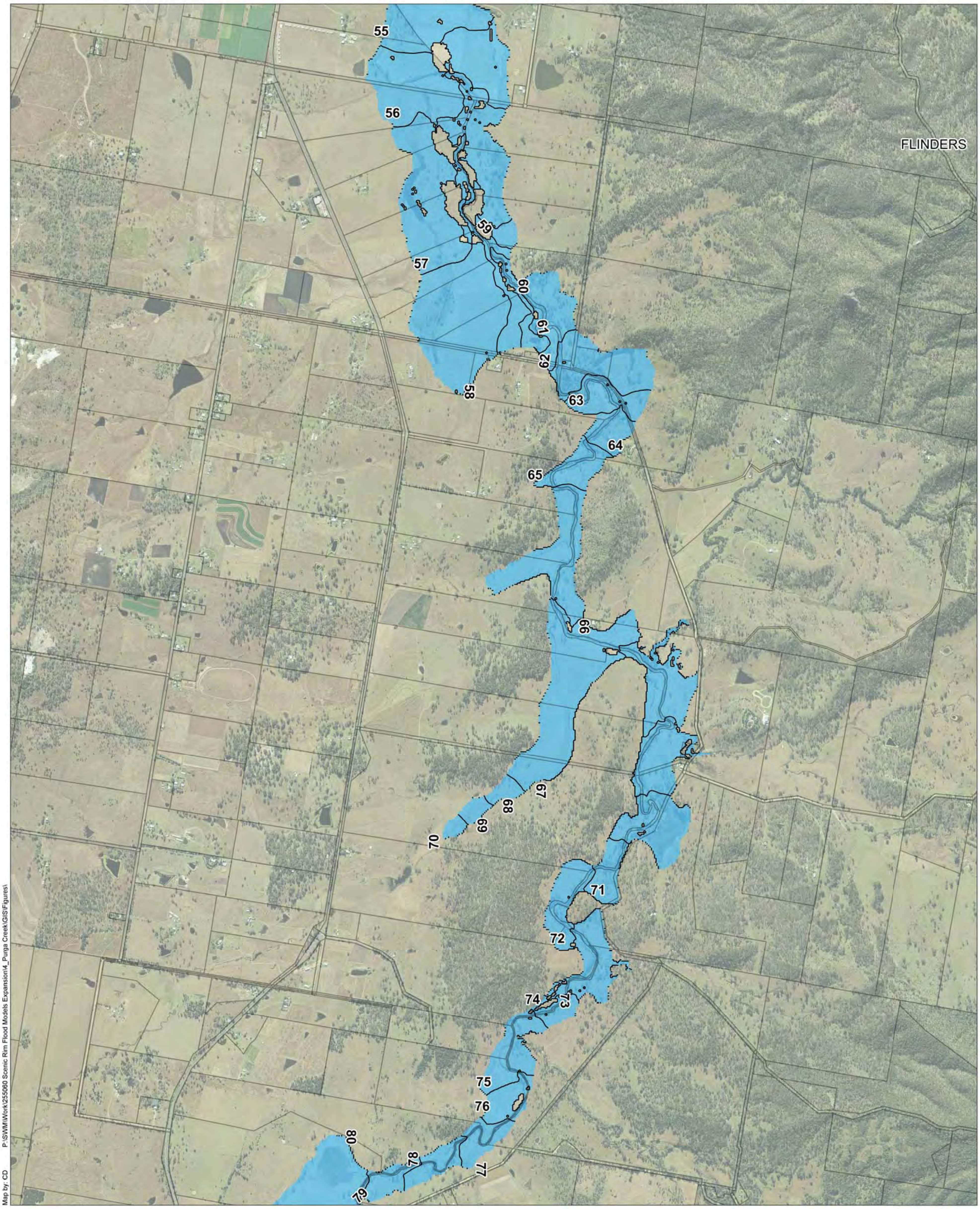
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B1-a**

1% AEP Event Climate Change Scenario 4.5 - Inundation Extent

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B1-b**

1% AEP Event Climate Change Scenario 4.5 - Inundation Extent

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

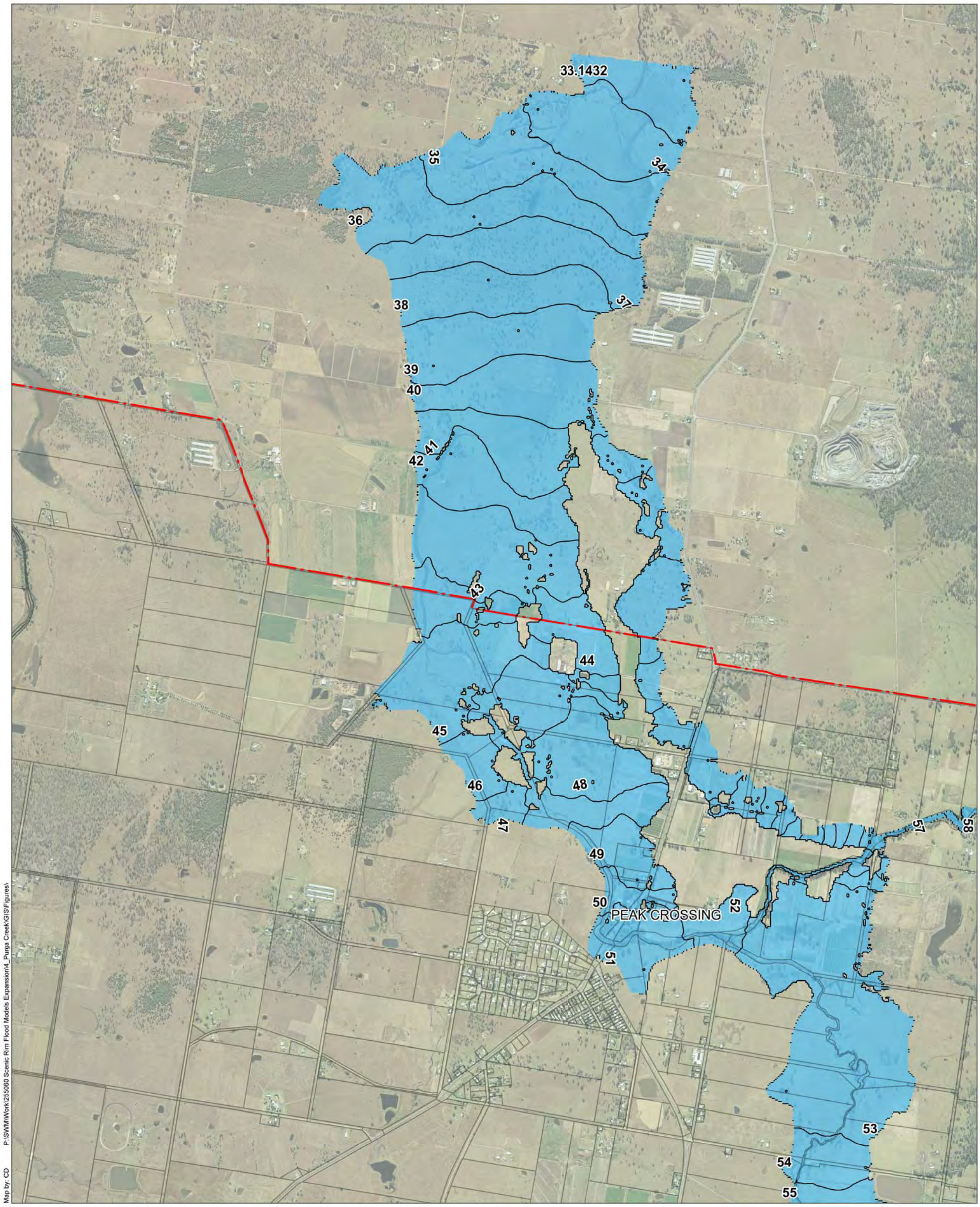
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study

Figure B1-c

1% AEP Event Climate Change Scenario 4.5 - Inundation Extent



Legend

- SRRC Boundary
- Cadastral Boundary
- Inundation Extent
- Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

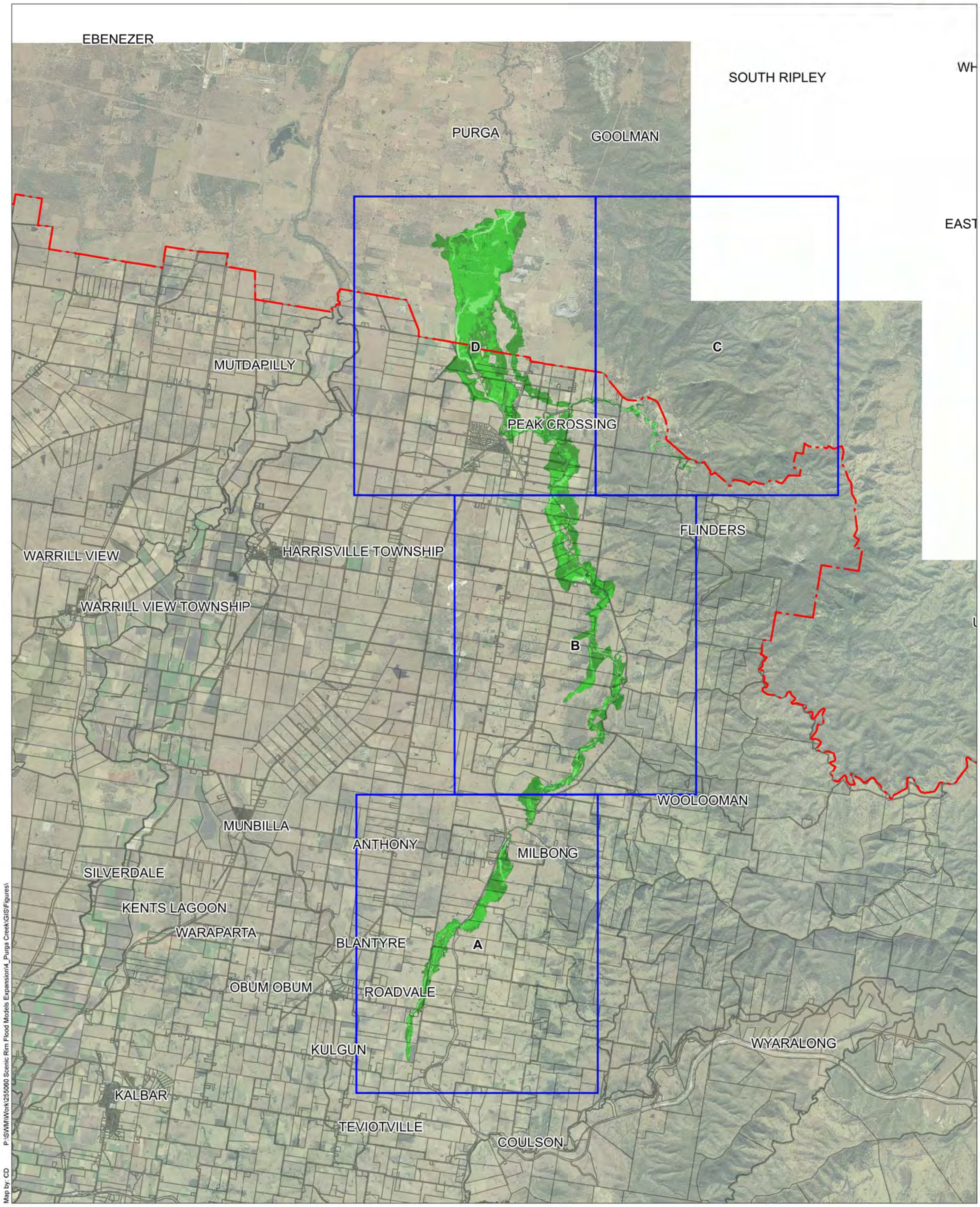
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B1-d**

1% AEP Event Climate Change Scenario 4.5 - Inundation Extent

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017



Legend

Velocity (m/s)

- SRRC Boundary
- Cadastral Boundary

0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

1:100,000

0 2,500 m 5,000 m

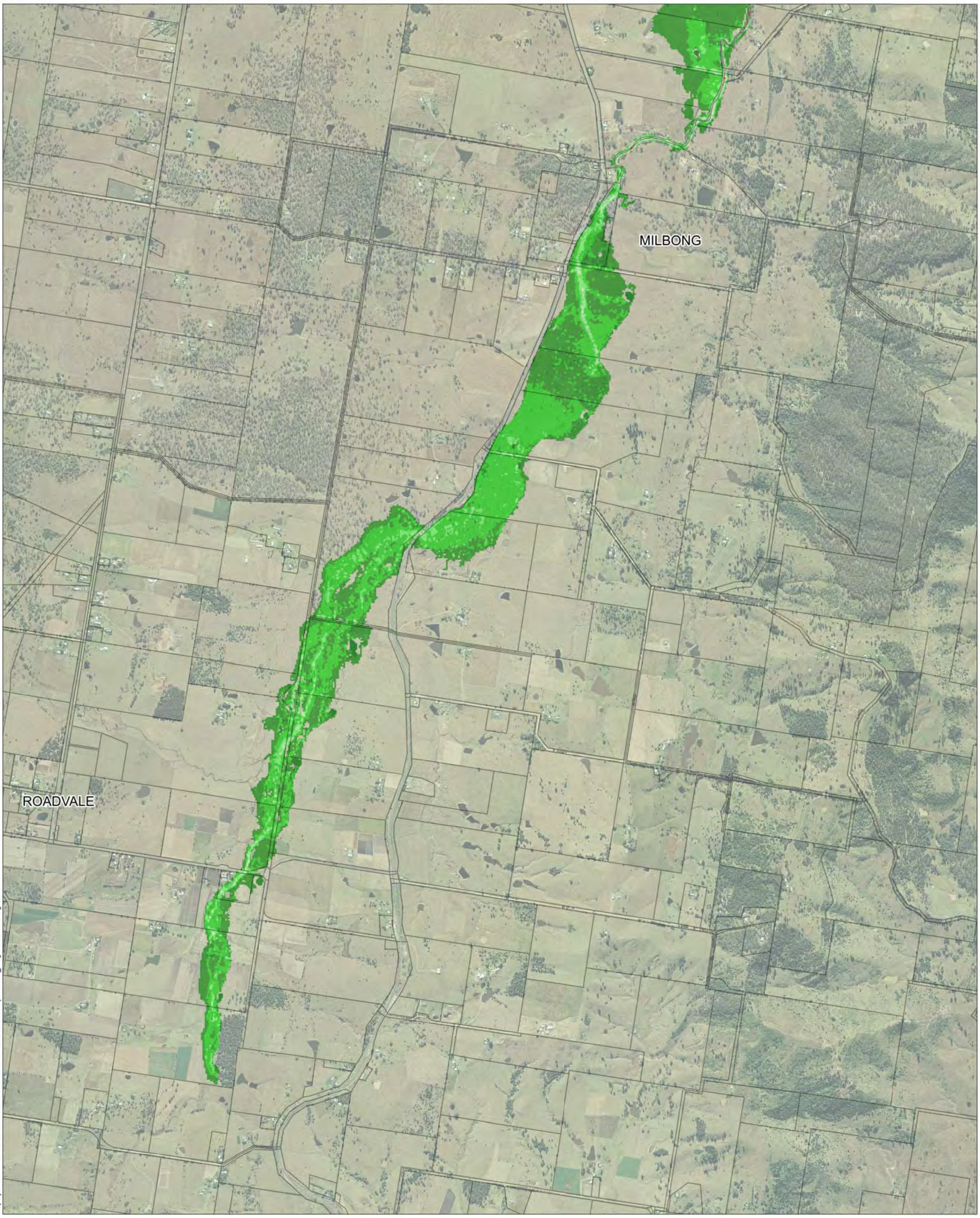
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B2**

1% AEP Event Climate Change Scenario 4.5 - Peak Velocities

aurecon



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000

0 625 m 1,250 m

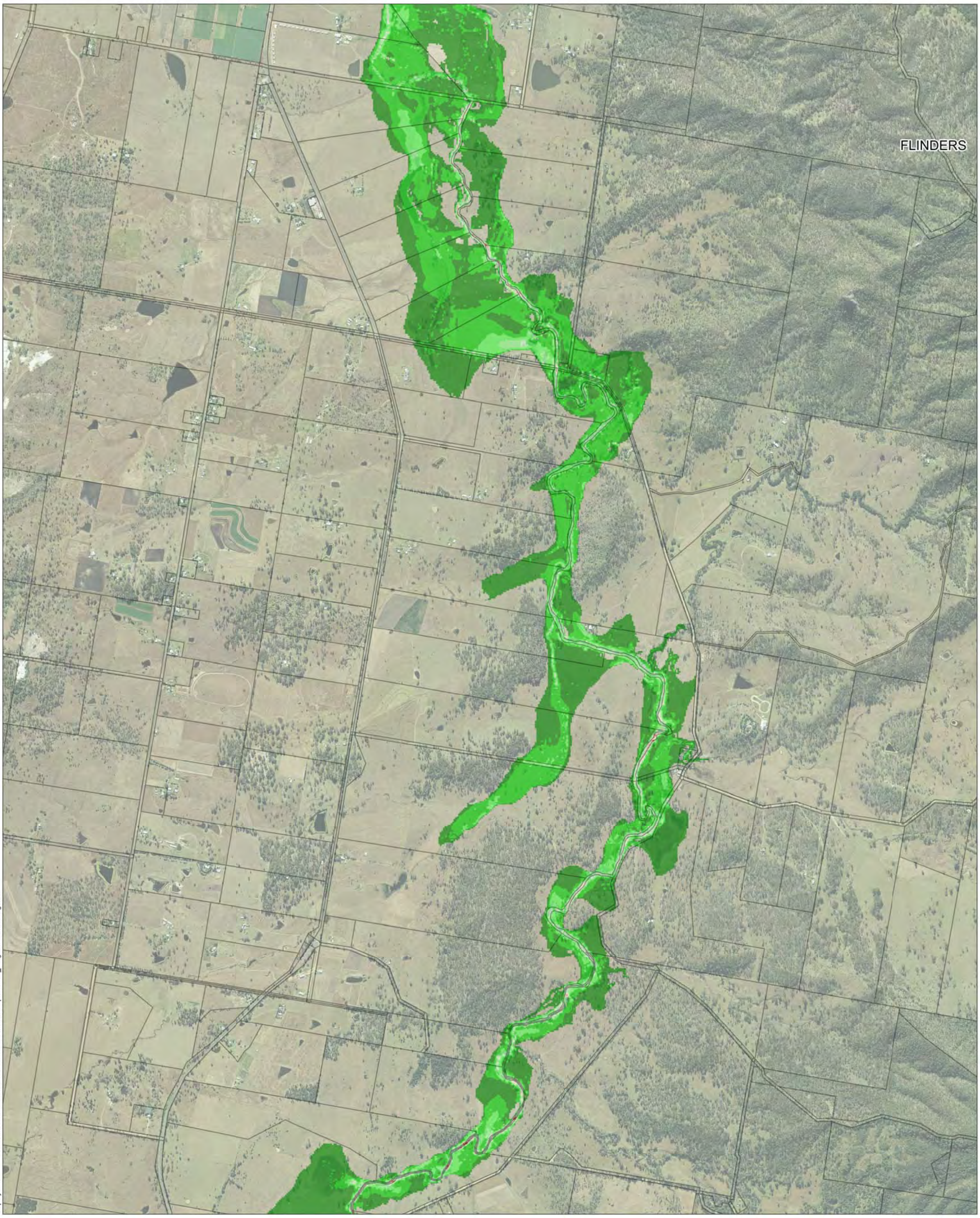
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B2-a**

1% AEP Event Climate Change Scenario 4.5 - Peak Velocities

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Velocity (m/s)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

0 625 m 1,250 m

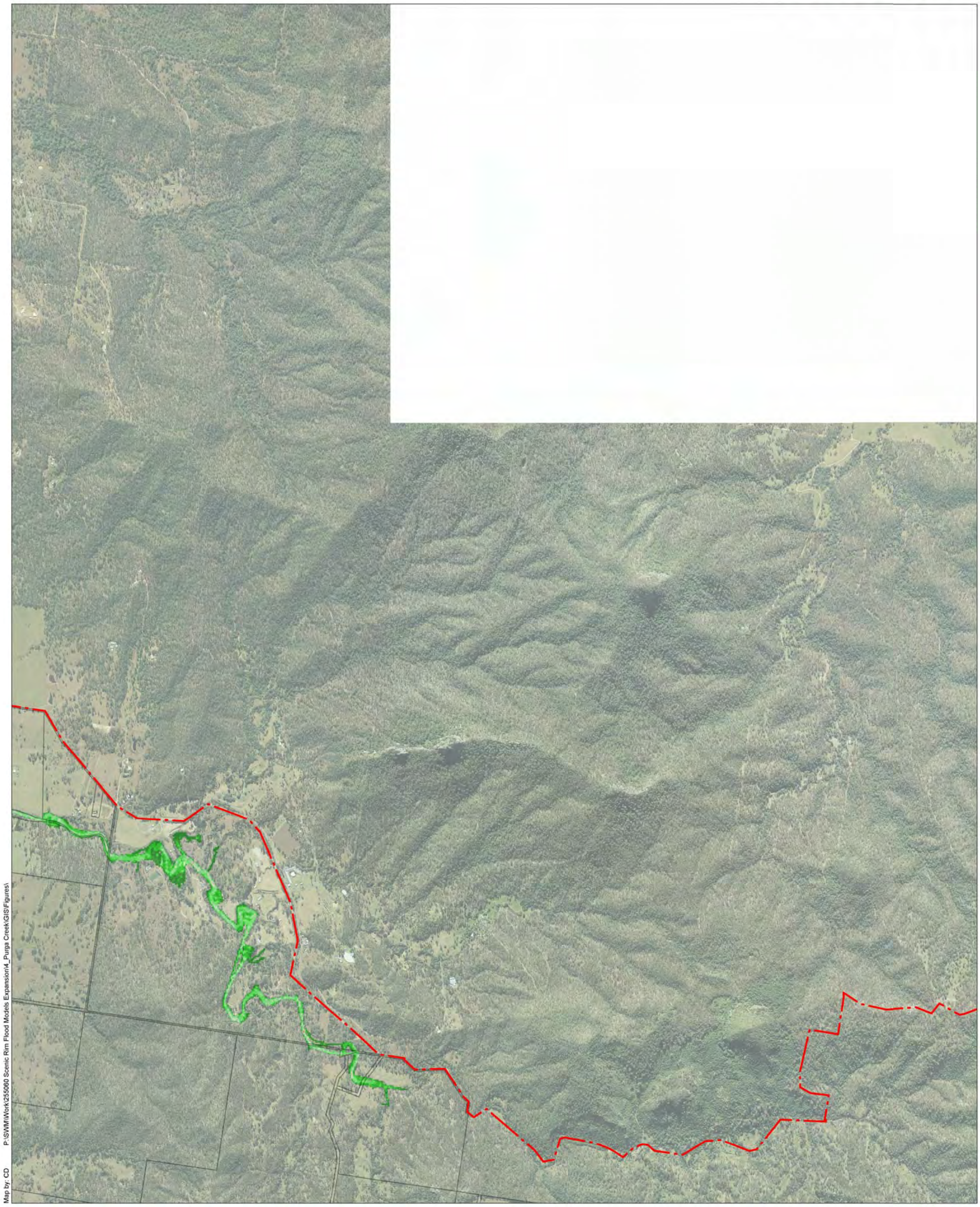
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B2-b**

1% AEP Event Climate Change Scenario 4.5 - Peak Velocities

aurecon



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000

0 625 m 1,250 m

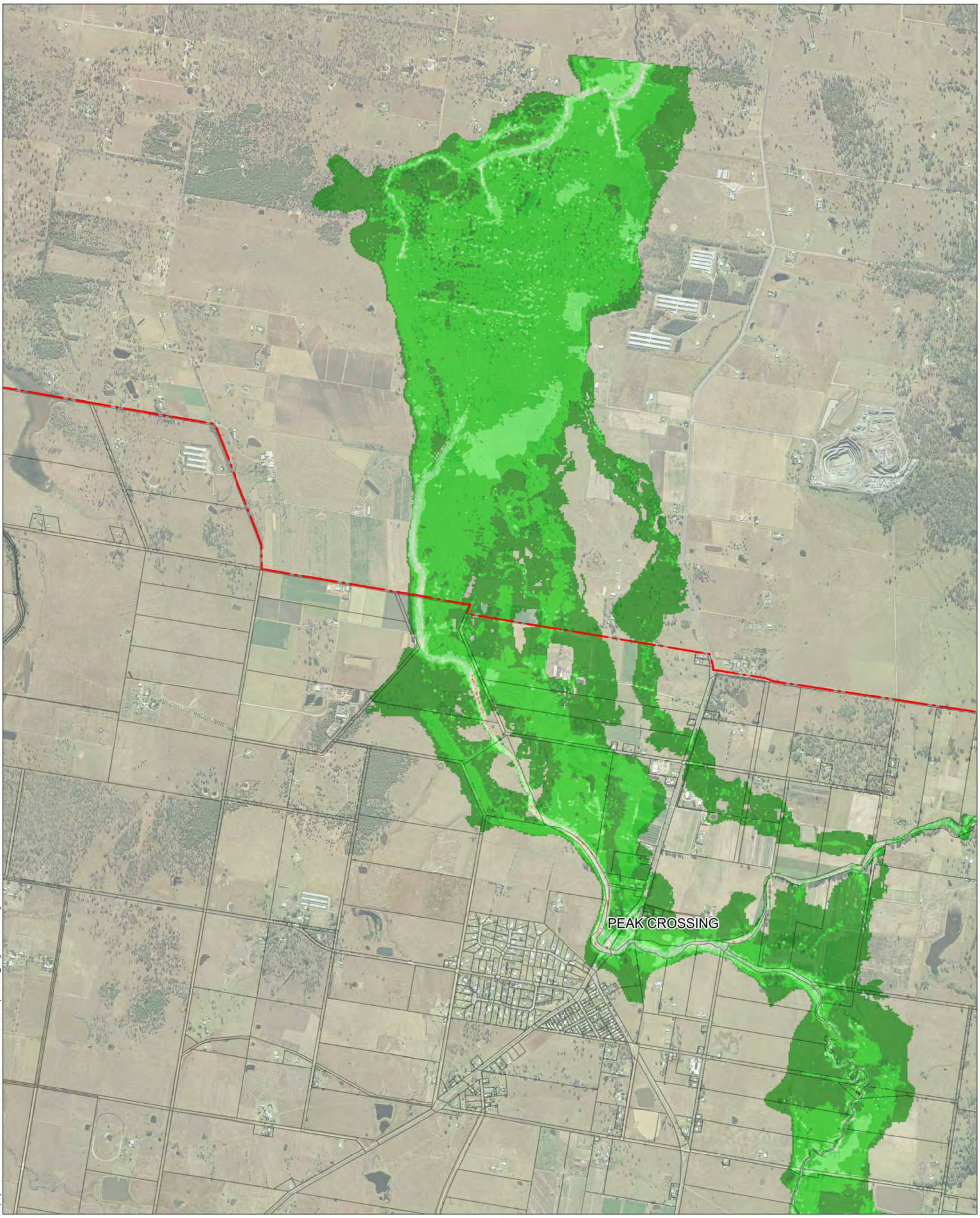
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B2-c**

1% AEP Event Climate Change Scenario 4.5 - Peak Velocities

aurecon



Legend

Velocity (m/s)

- SRRC Boundary
- Cadastral Boundary
- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

0 625 m 1,250 m

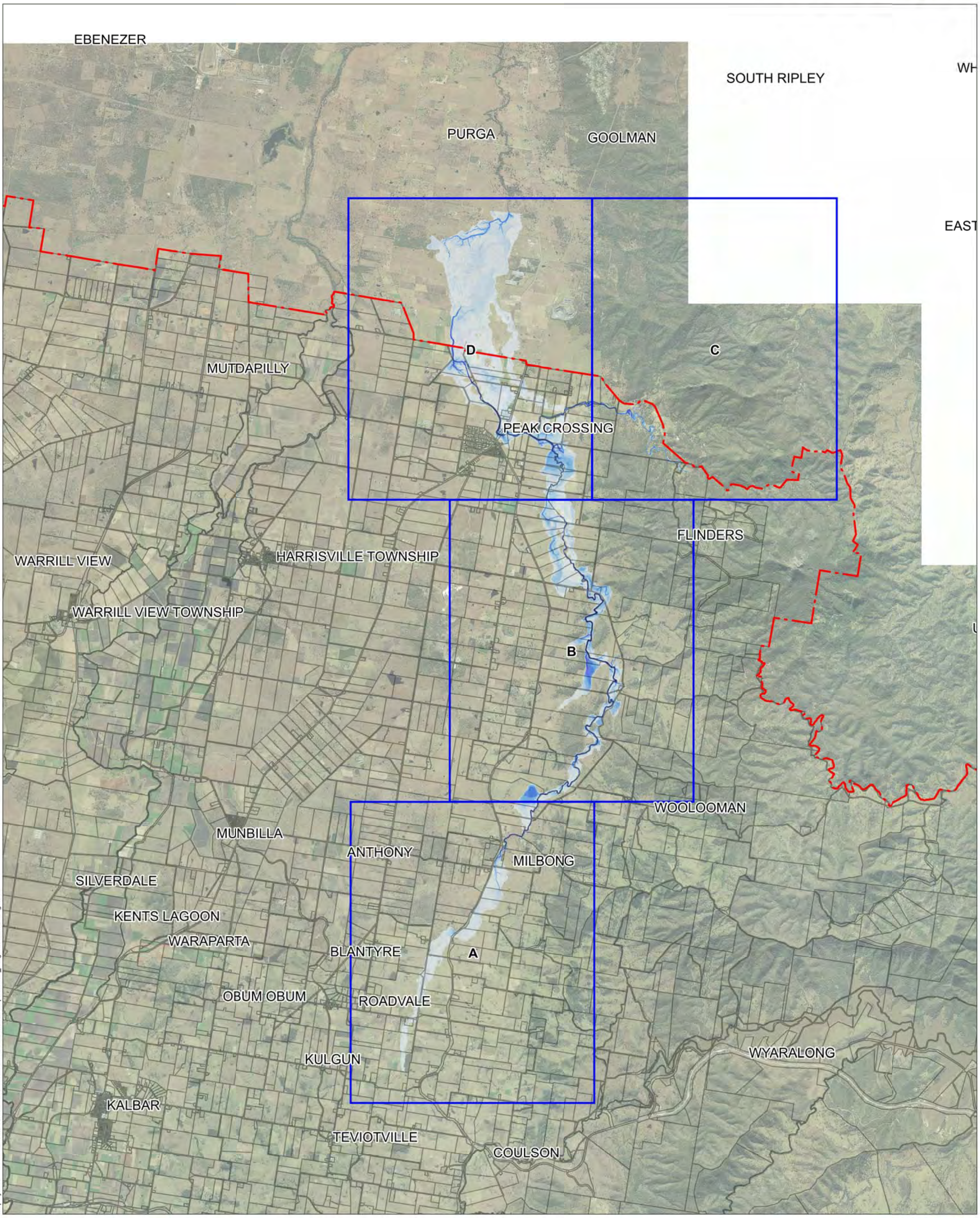
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B2-d**

1% AEP Event Climate Change Scenario 4.5 - Peak Velocities

aurecon



Map by: CD P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:100,000

0 2,500 m 5,000 m

Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B3**

1% AEP Event Climate Change Scenario 4.5 - Peak Depth Map

aurecon

Legend

Notes:

Depth (m)

SRRC Boundary	0.0 to 0.5
Cadastral Boundary	0.5 to 1.0
	1.0 to 1.5
	1.5 to 2.0
	2.0 to 2.5
	2.5 to 3.0
	3.0 to 3.5
	3.5 to 4.0
	4.0 to 4.5
	4.5 to 5.0
	> 5.0

1:25,000

0 625 m 1,250 m

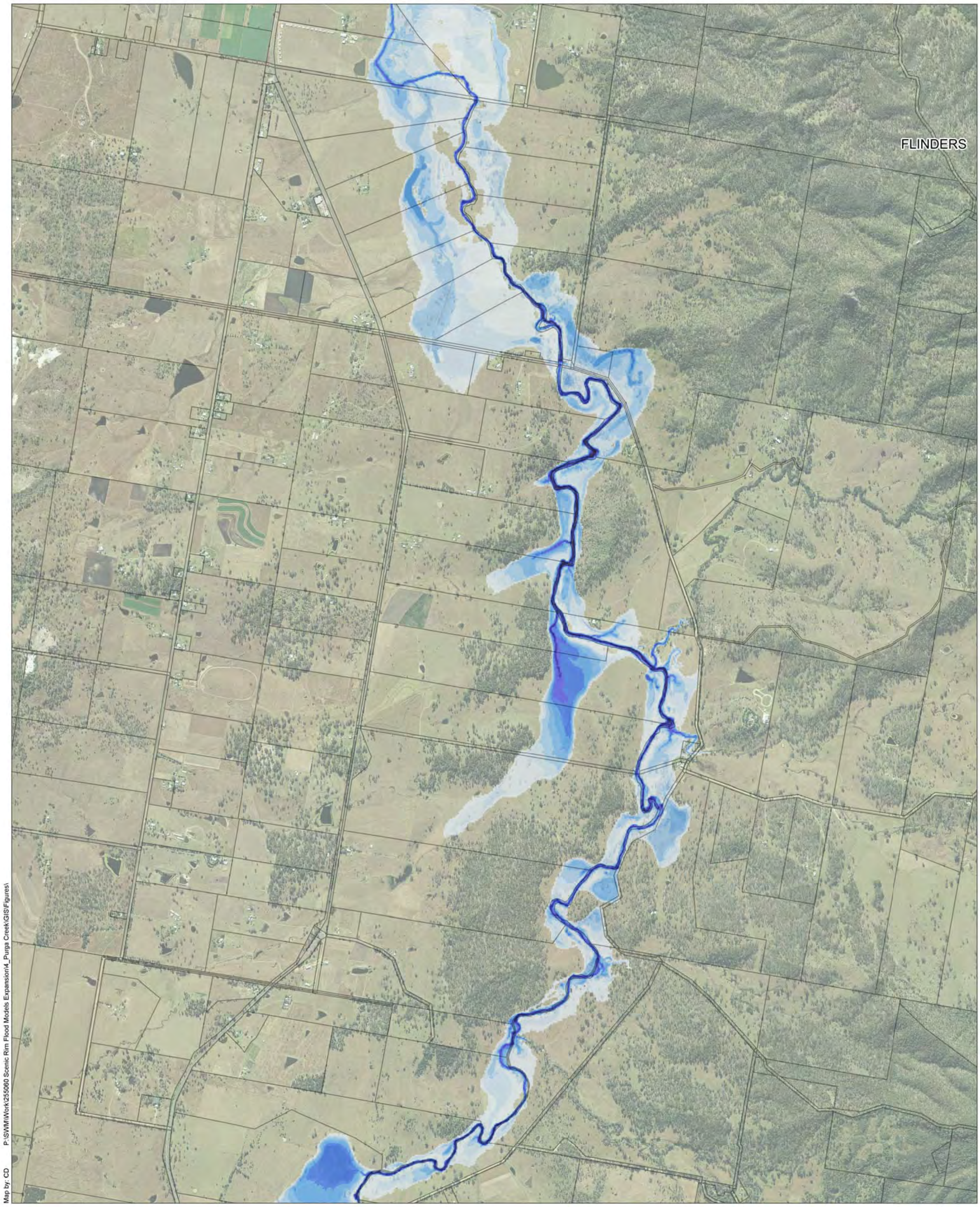
Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B3-a**

1% AEP Event Climate Change Scenario 4.5 - Peak Depth Map

aurecon



Legend

Depth (m)

SRRC Boundary	0.0 to 0.5
Cadastral Boundary	0.5 to 1.0
	1.0 to 1.5
	1.5 to 2.0
	2.0 to 2.5
	2.5 to 3.0
	3.0 to 3.5
	3.5 to 4.0
	4.0 to 4.5
	4.5 to 5.0
	> 5.0

Notes:

1:25,000

0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B3-b**

1% AEP Event Climate Change Scenario 4.5 - Peak Depth Map

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

aurecon

Legend

Depth (m)

SRRC Boundary	0.0 to 0.5	3.0 to 3.5
Cadastral Boundary	0.5 to 1.0	3.5 to 4.0
	1.0 to 1.5	4.0 to 4.5
	1.5 to 2.0	4.5 to 5.0
	2.0 to 2.5	> 5.0
	2.5 to 3.0	

Notes:

1:25,000

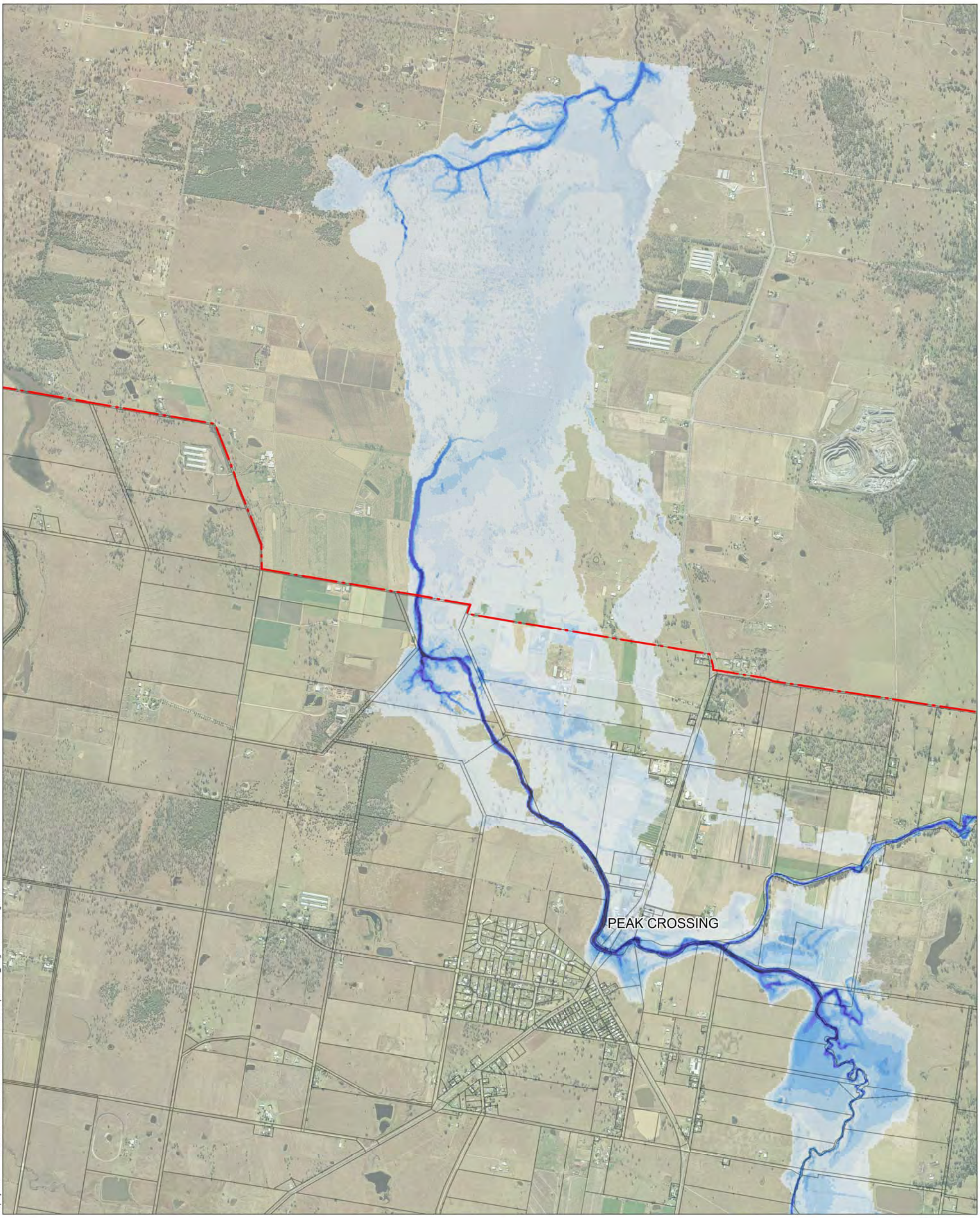
0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B3-c**

1% AEP Event Climate Change Scenario 4.5- Peak Depth Map



Legend

Depth (m)

SRRC Boundary	0.0 to 0.5
Cadastral Boundary	0.5 to 1.0
	1.0 to 1.5
	1.5 to 2.0
	2.0 to 2.5
	2.5 to 3.0
	3.0 to 3.5
	3.5 to 4.0
	4.0 to 4.5
	4.5 to 5.0
	> 5.0

Notes:

1:25,000

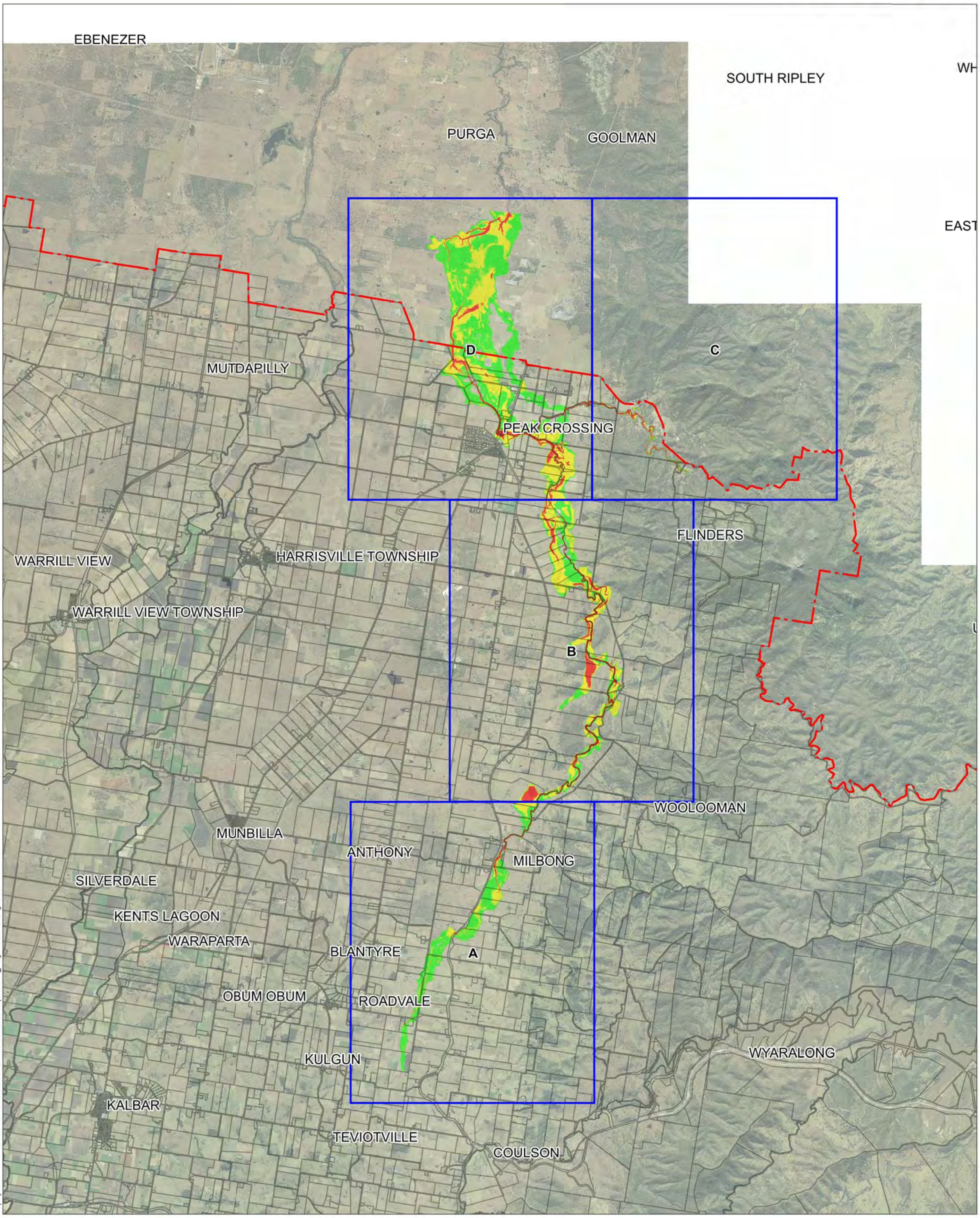
0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B3-d**

1% AEP Event Climate Change Scenario 4.5- Peak Depth Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Low Hazard
- Medium Hazard
- High Hazard

Notes:

1:100,000

0 | 2,500 m | 5,000 m

Date: 18/07/2017 Version: 0 Job No: 255060

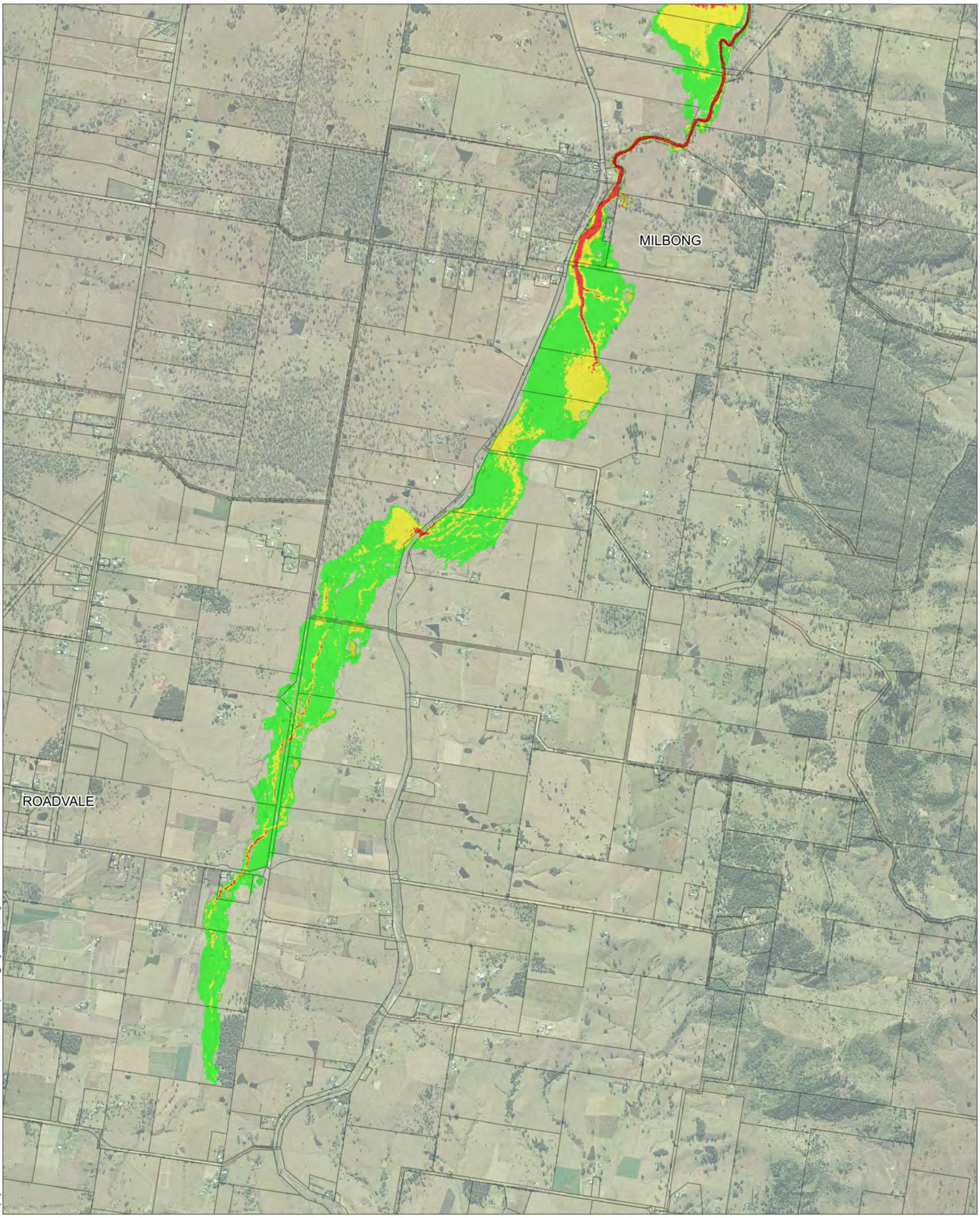
Projection: MGA Zone 56

Purga Creek Flood Study

Figure B4

1% AEP Event Climate Change Scenario 4.5 - Peak Hazard Map

aurecon



Legend

SRRC Boundary
Cadastral Boundary

Low Hazard
Medium Hazard
High Hazard

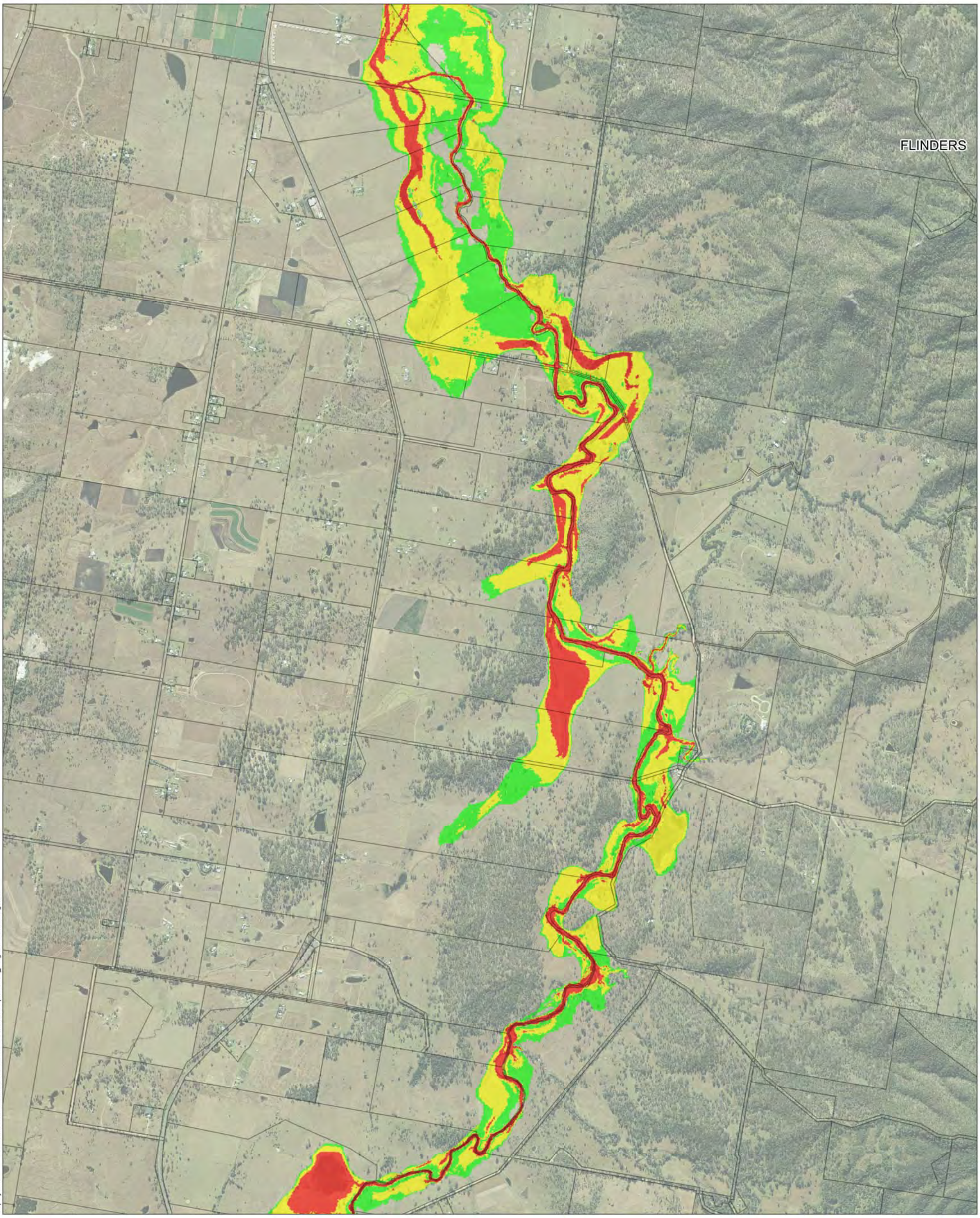
Notes:

1:25,000
0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study Figure B4-a

1% AEP Event Climate Change Scenario 4.5 - Peak Hazard Map



Legend

SRRC Boundary

Cadastral Boundary

Low Hazard

Medium Hazard

High Hazard

Notes:

1:25,000

0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

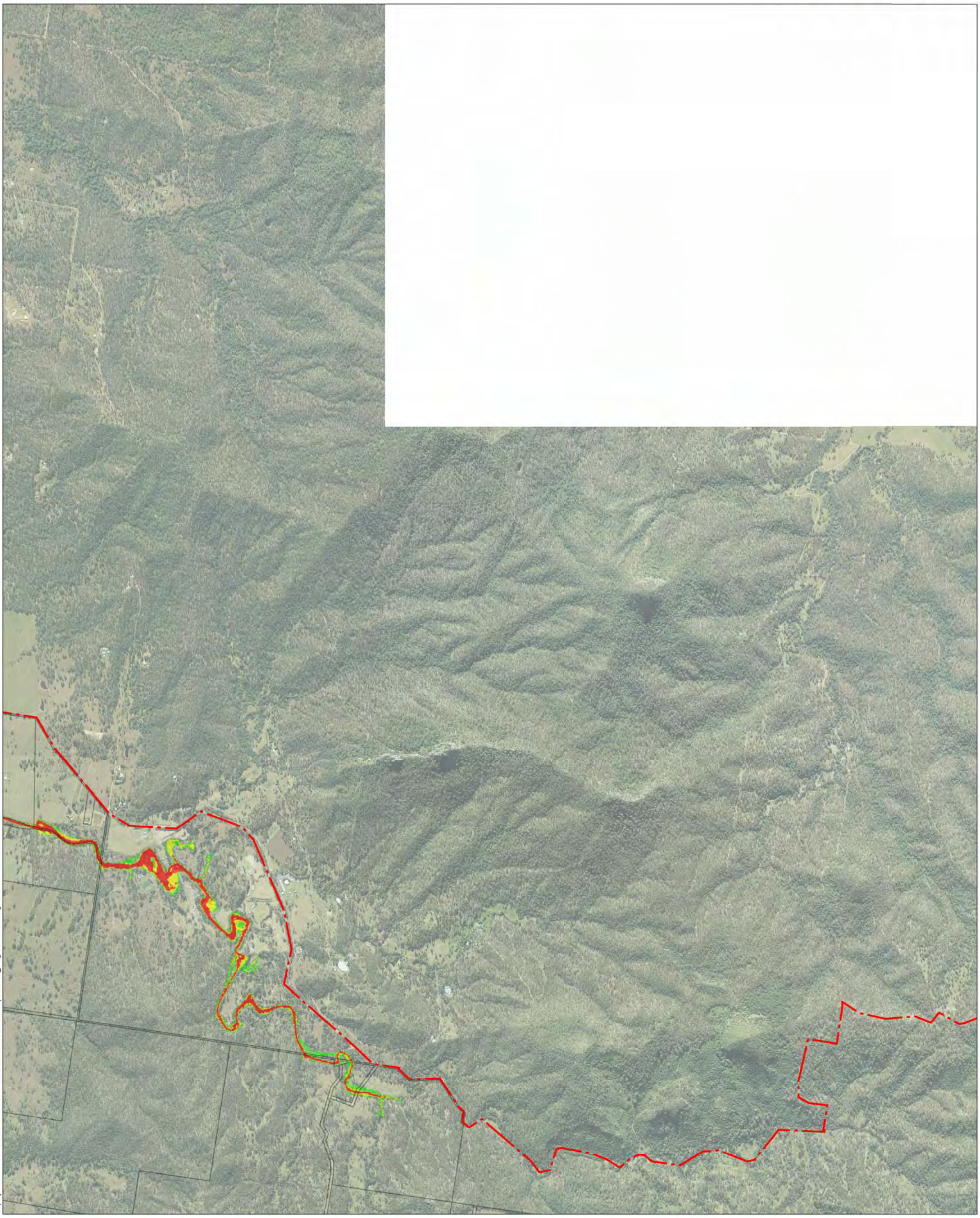
Projection: MGA Zone 56

Purga Creek Flood Study

Figure B4-b

1% AEP Event Climate Change Scenario 4.5 - Peak Hazard Map

aurecon



Map by: CD

P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Low Hazard

Medium Hazard

High Hazard

Notes:

1:25,000

0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

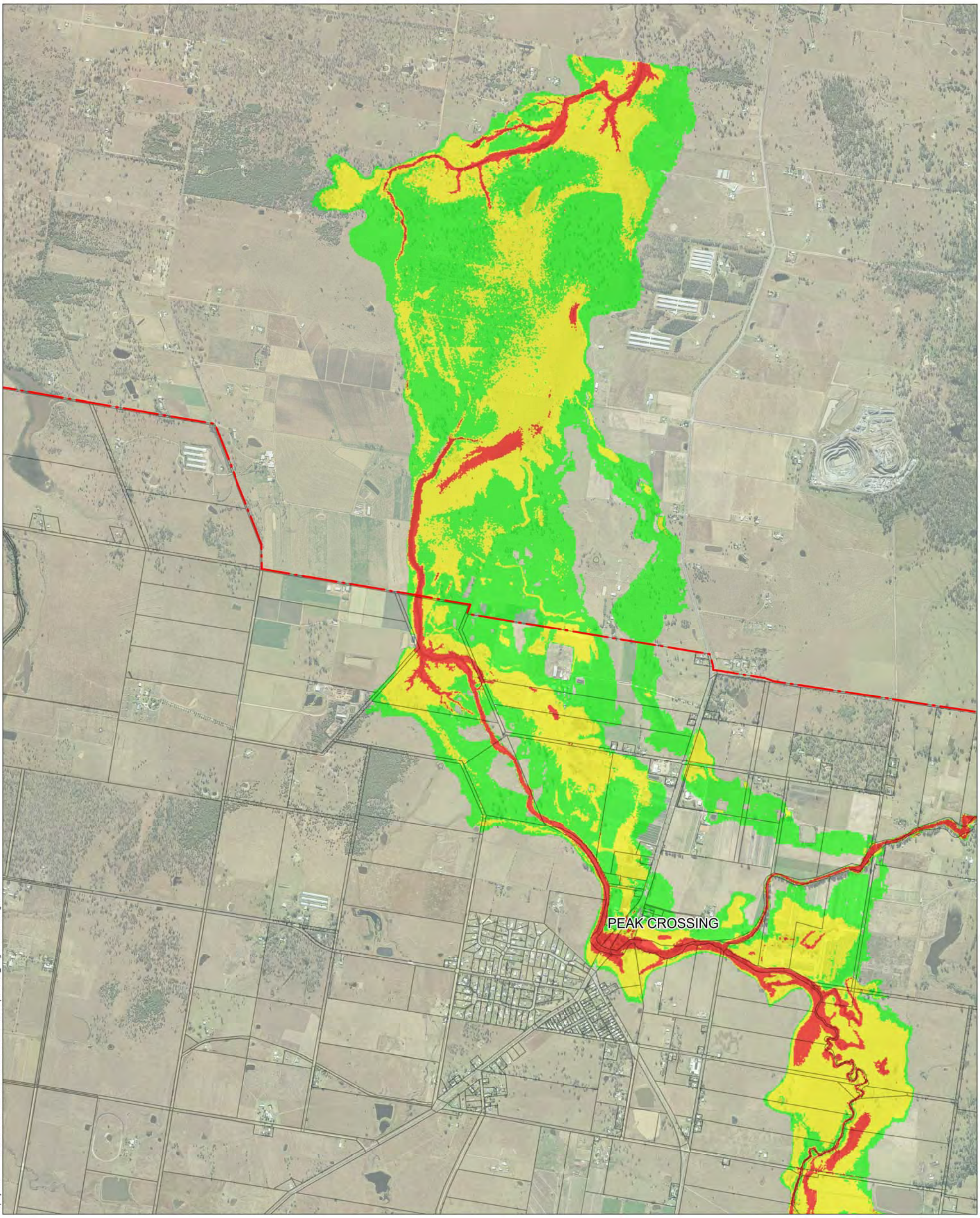
Projection: MGA Zone 56

Purga Creek Flood Study **Figure B4-c**

1% AEP Event Climate Change Scenario 4.5 - Peak Hazard Map

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Low Hazard

Medium Hazard

High Hazard

Notes:

1:25,000

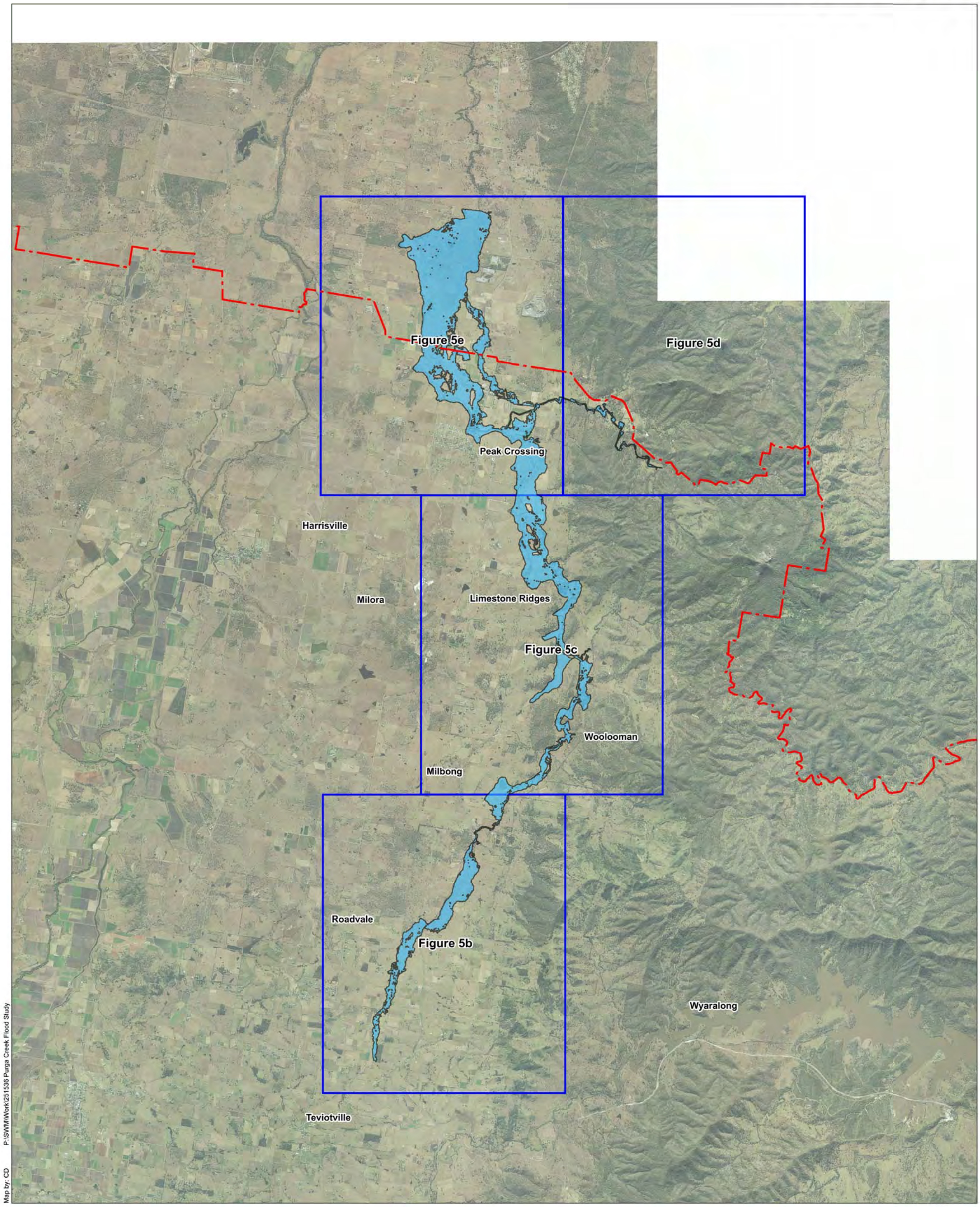
0 625 m 1,250 m

Date: 18/07/2017 Version: 0 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B4-d**

1% AEP Event Climate Change Scenario 4.5 - Peak Hazard Map



Legend

SRRC Boundary

Inundation Extents

Notes:

A3 scale 1:100,000

0 2,500 m 5,000 m

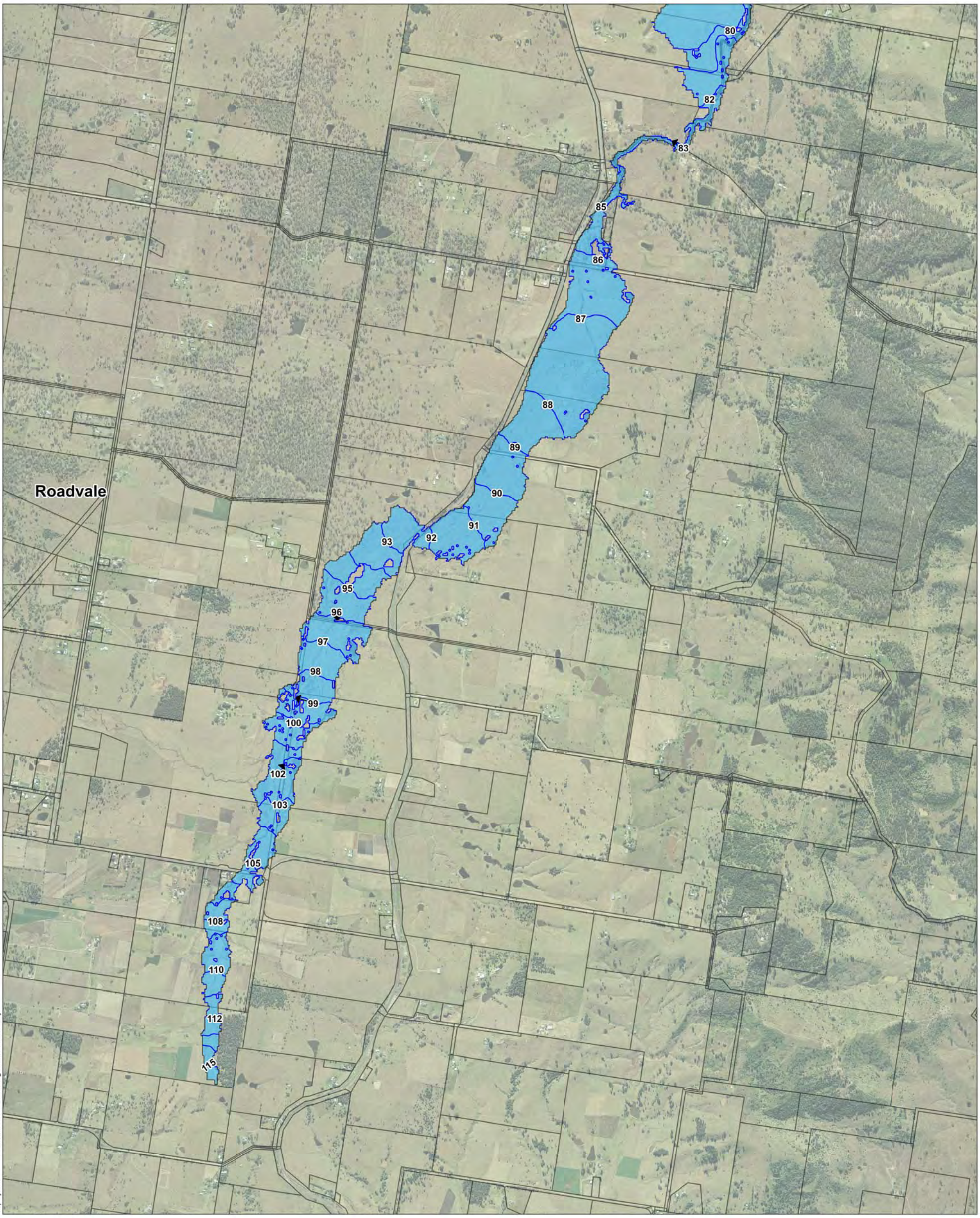
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-5a**

1% AEP Event - Inundation Extent & Peak Water Levels

aurecon



Legend

- SRRC Boundary
- Peak Water Level Contour [m AHD]
- Inundation Extents
- Cadastral Boundary

Notes:

A3 scale 1:25,000

0 625 m 1,250 m

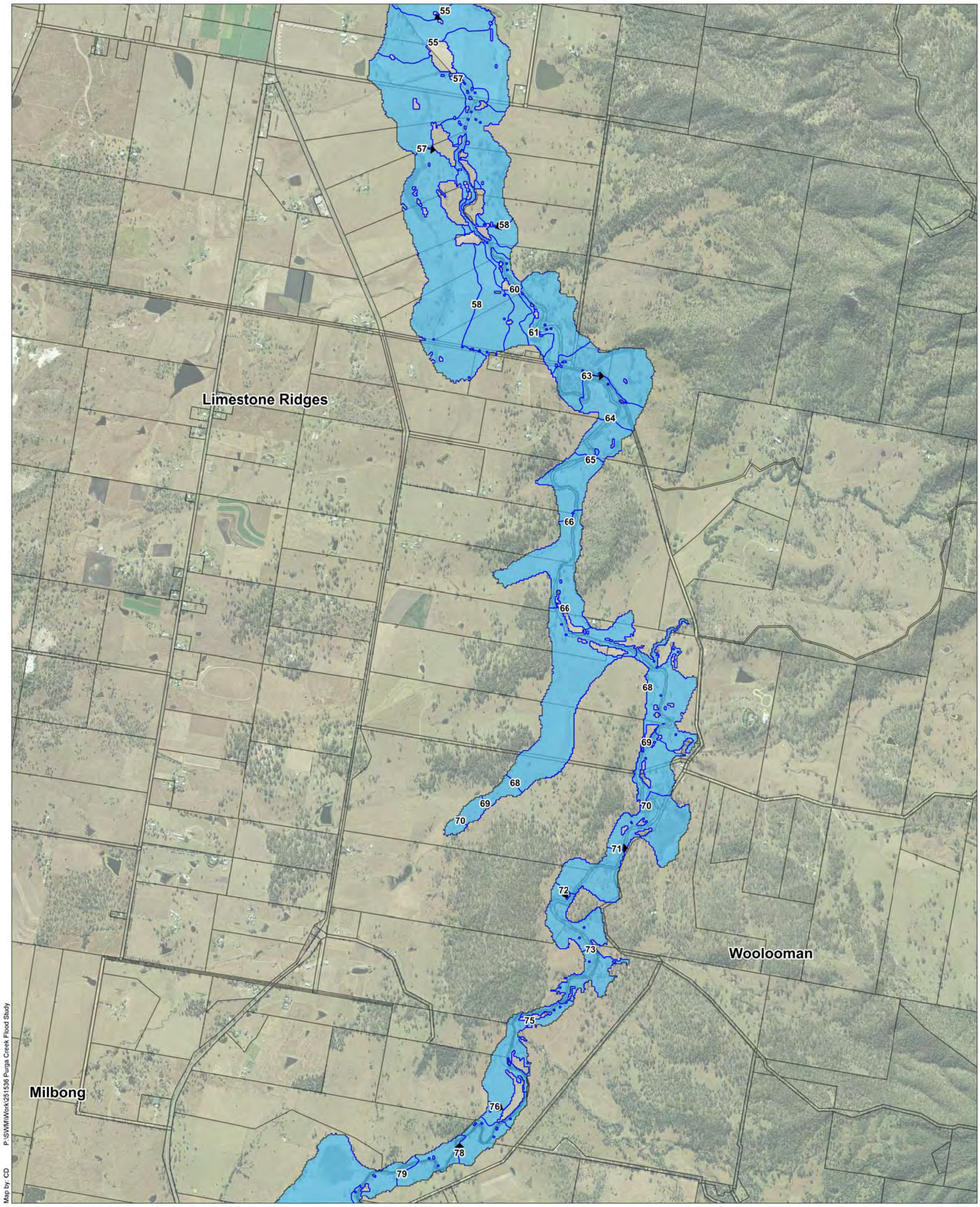
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-5b**

1% AEP Event - Inundation Extent & Peak Water Levels

aurecon



Legend

SRRC Boundary

Inundation Extents

Peak Water Level Contour [m AHD]

Cadastral Boundary

Notes:

A3 scale 1:25,000

0 625 m 1,250 m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-5c**

1% AEP Event - Inundation Extent & Peak Water Levels

aurecon

Legend

- SRRC Boundary
- Peak Water Level Contour [m AHD]
- Inundation Extents
- Cadastral Boundary

Notes:

A3 scale 1:25,000

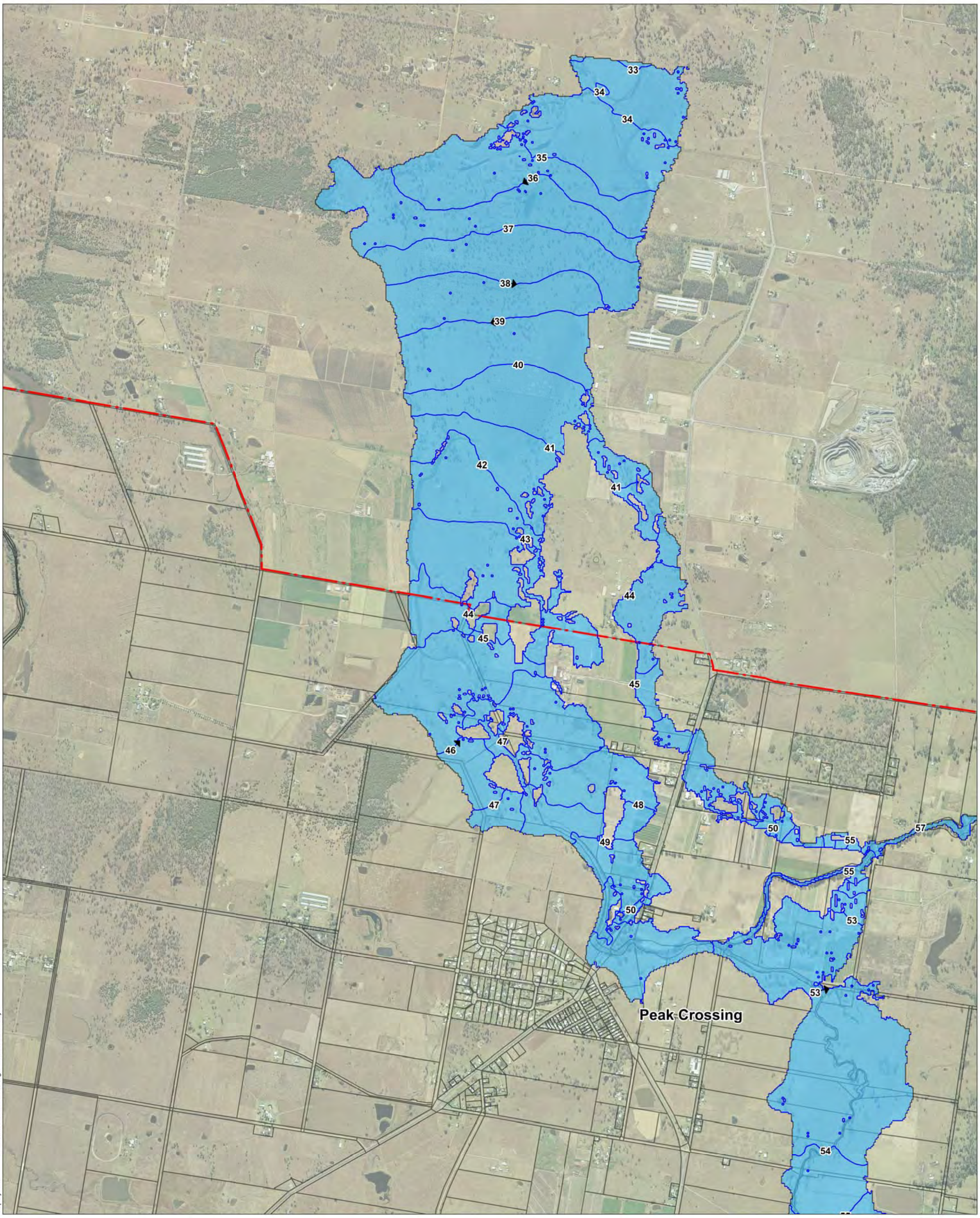
0 625 m 1,250 m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-5d**

1% AEP Event - Inundation Extent & Peak Water Levels



Legend

- SRRC Boundary
- Inundation Extents
- Peak Water Level Contour [m AHD]
- Cadastral Boundary

Notes:

A3 scale 1:25,000

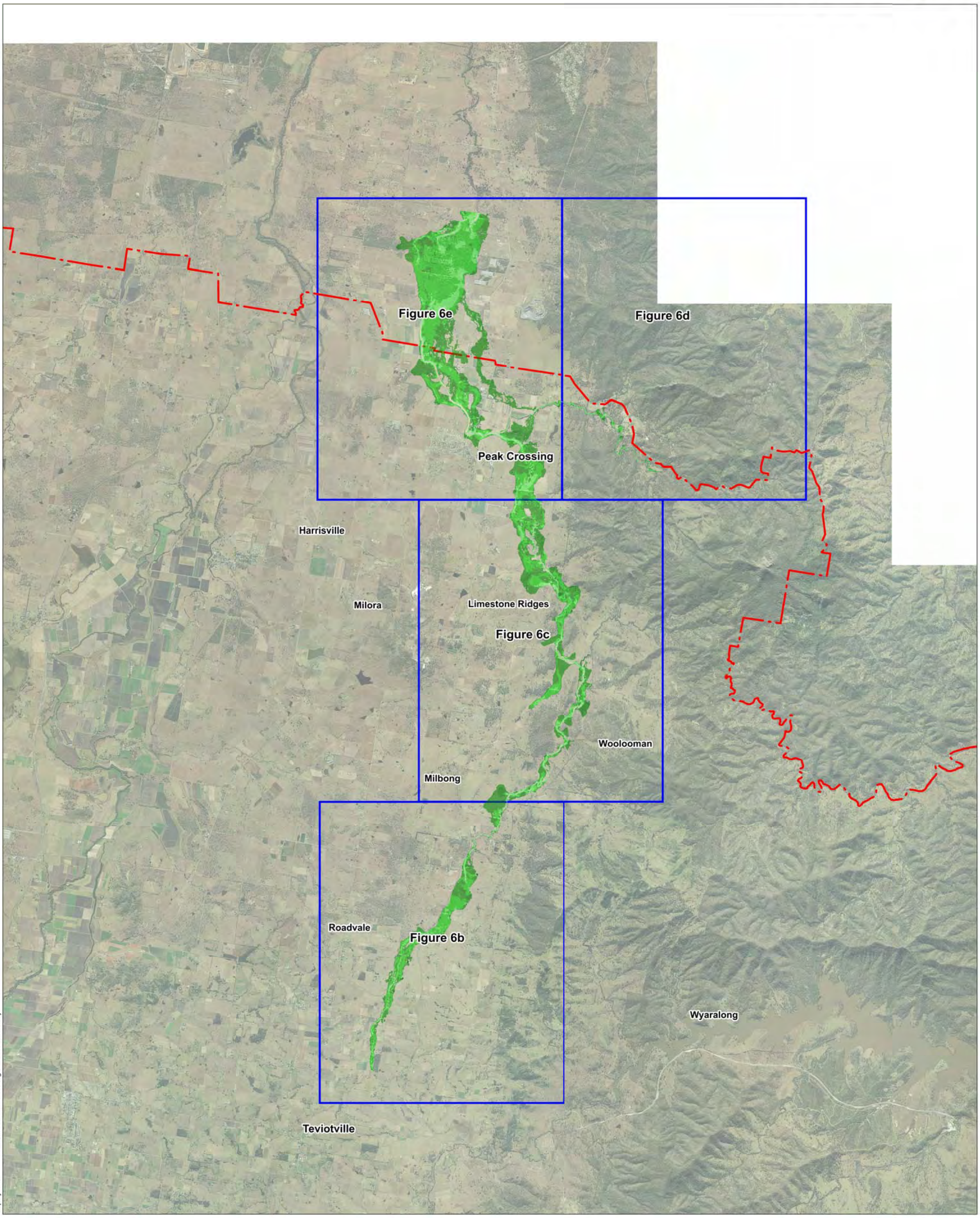
0 625 m 1,250 m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-5e**

1% AEP Event - Inundation Extent & Peak Water Levels



Legend

SRRC Boundary

Velocity (m/s)

0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

A3 scale 1:100,000

0 2,500m 5,000m

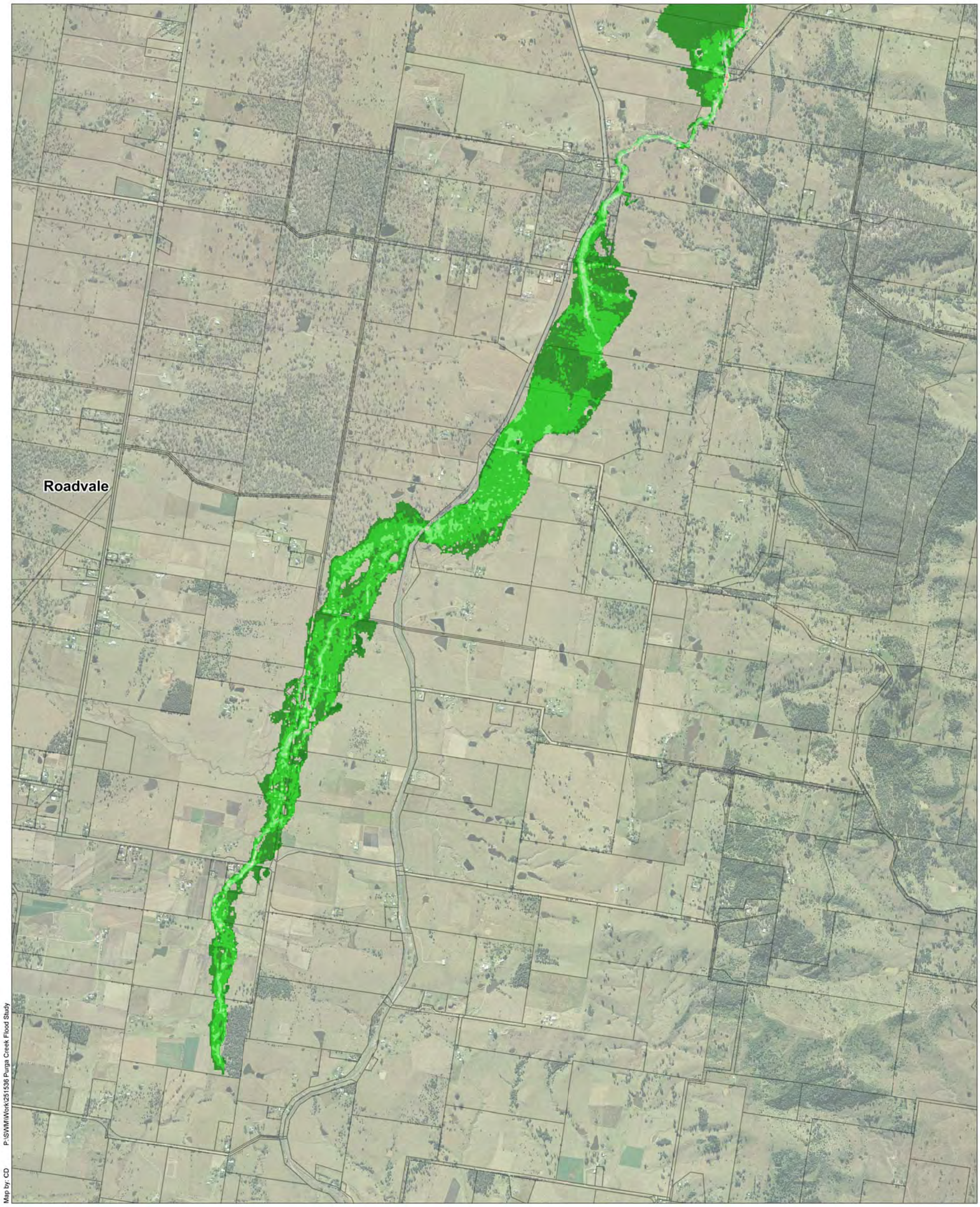
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-6a**

1% AEP Event - Maximum Velocities

aurecon



Legend

Velocities (m/s)

SRRC Boundary
Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

A3 scale 1:25,000

0 625m 1,250m

Date: 27/06/2016 Version: 0 Job No: 251536

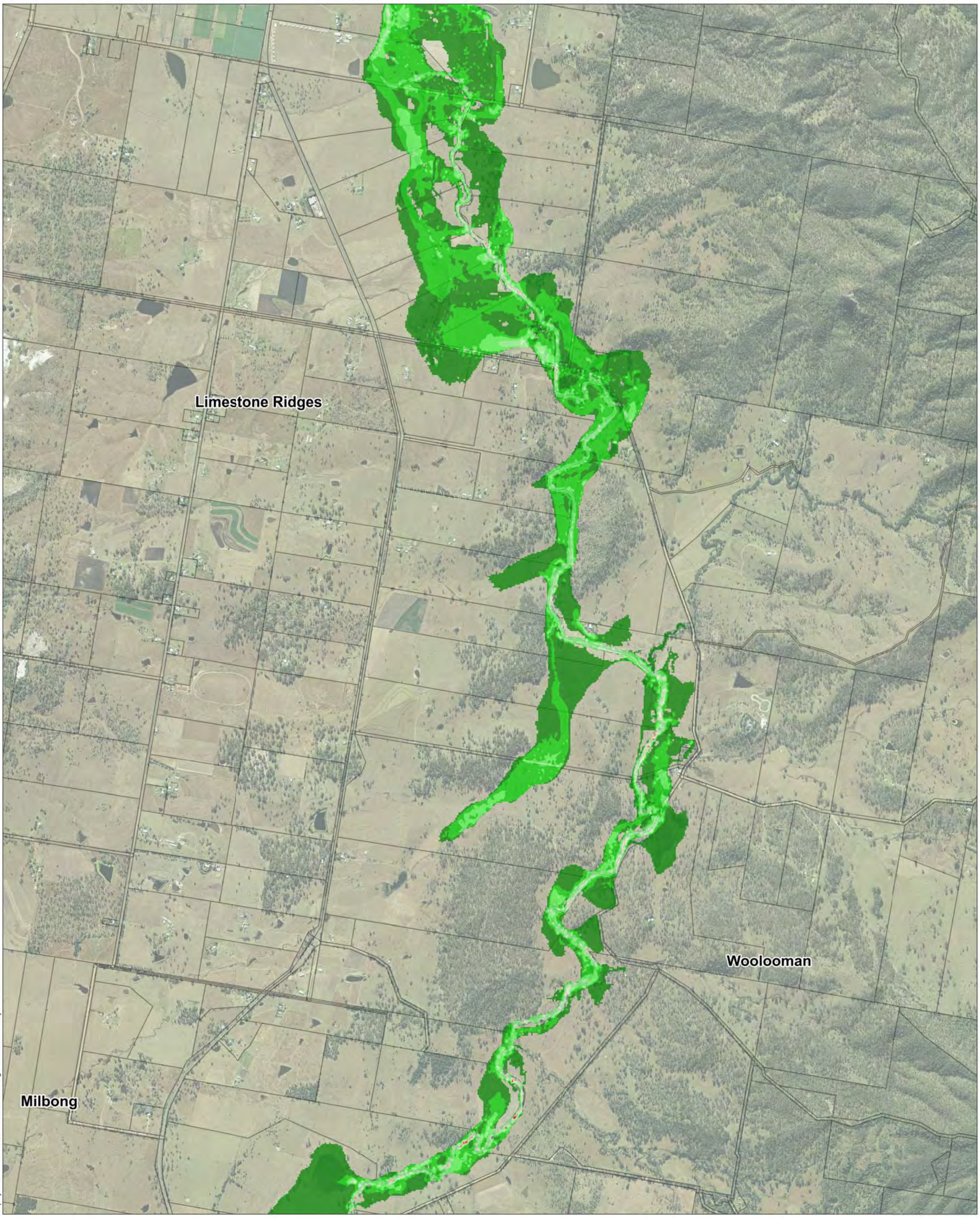
Projection: MGA Zone 56

Purga Creek Flood Study

Figure B-6b

1% AEP Event - Maximum Velocities

aurecon



Map by: CD P:\SWM\Work\251536 Purga Creek Flood Study

Legend

Notes:

		Velocities (m/s)	
SRRC Boundary		0.0 to 0.5	3.0 to 3.5
		0.5 to 1.0	3.5 to 4.0
Cadastral Boundary		1.0 to 1.5	4.0 to 4.5
		1.5 to 2.0	4.5 to 5.0
		2.0 to 2.5	> 5.0
		2.5 to 3.0	

A3 scale 1:25,000

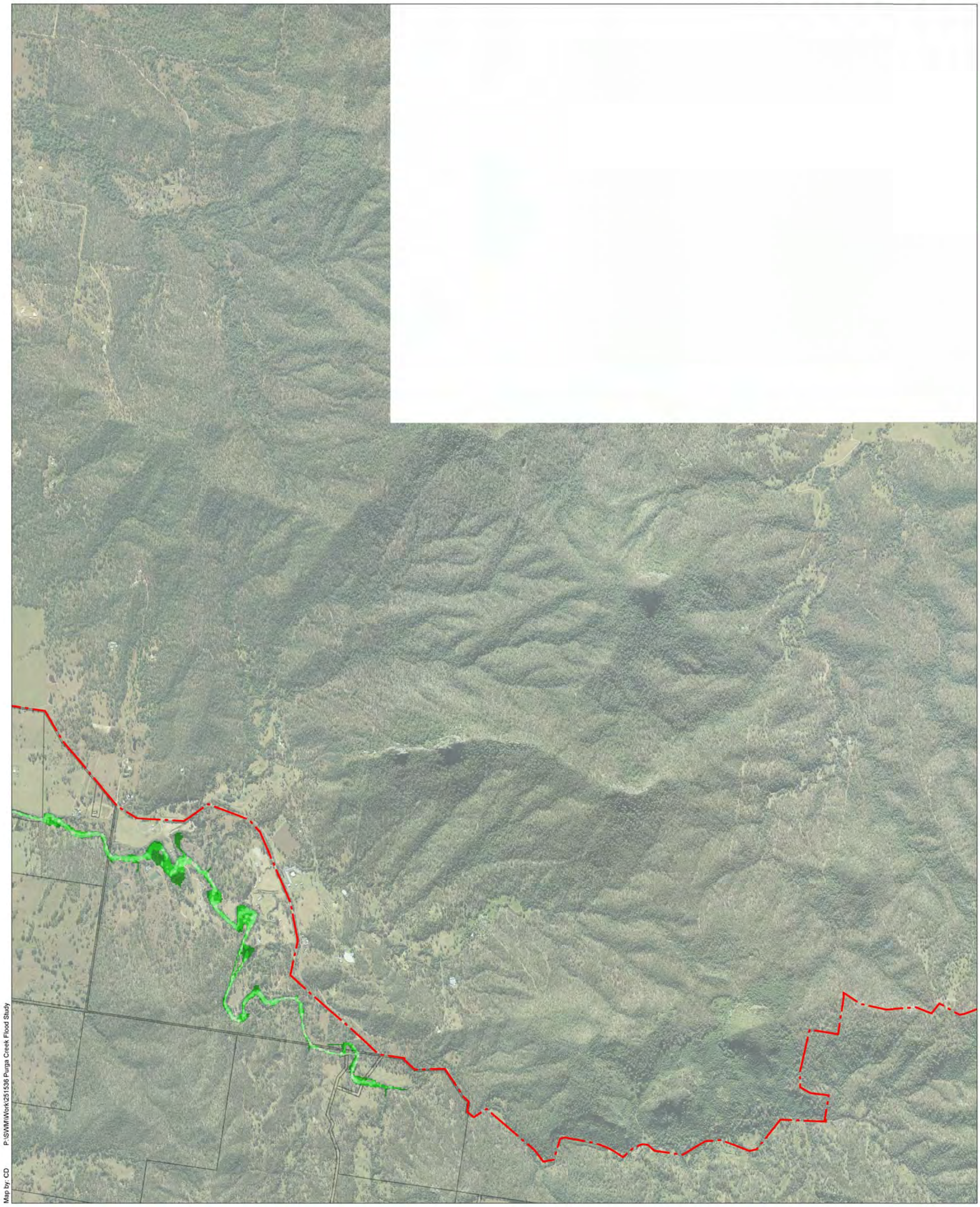
0 625m 1,250m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-6c**

1% AEP Event - Maximum Velocities



Legend

SRRC Boundary
Cadastral Boundary

Velocities (m/s)

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

A3 scale 1:25,000

0 625m 1,250m

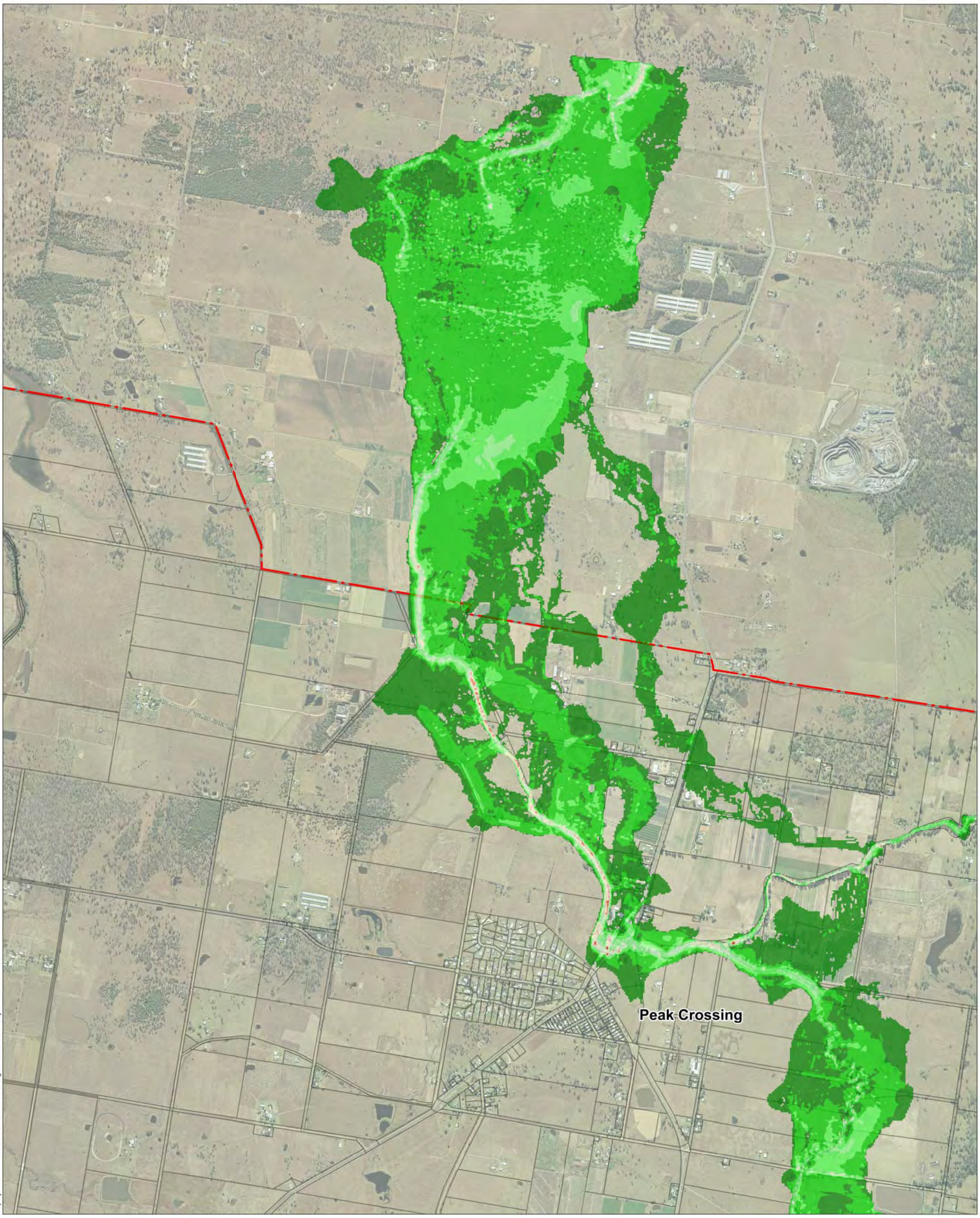
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-6d**

1% AEP Event - Maximum Velocities

aurecon



Legend

SRRC Boundary	
Cadastral Boundary	

Velocities (m/s)

0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

A3 scale 1:25,000

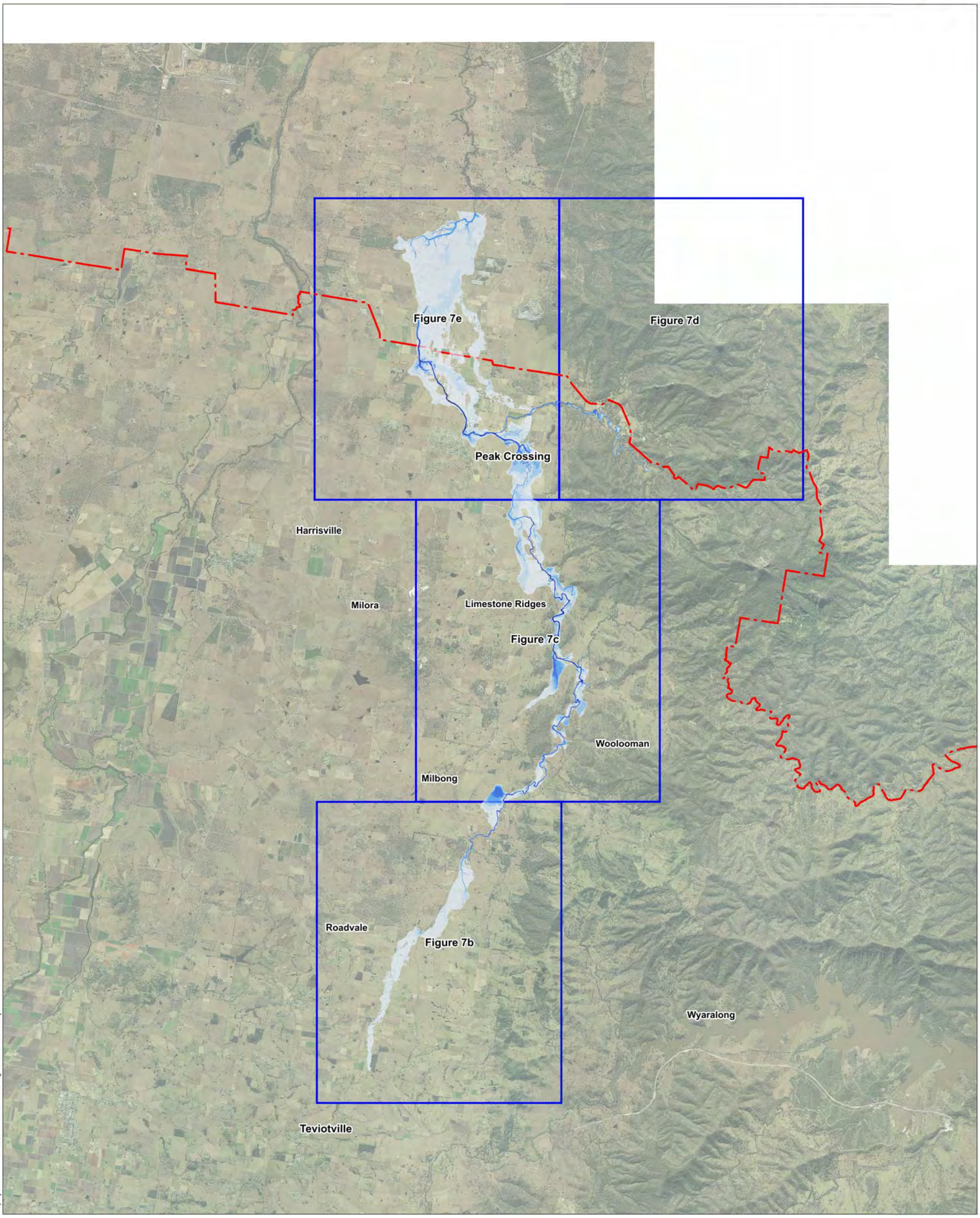
0 625m 1,250m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-6e**

1% AEP Event - Maximum Velocities



Legend

SRRC Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

A3 scale 1:100,000

0 2,500m 5,000m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-7a**

1% AEP Event - Peak Depths

aurecon

Legend

SRRC Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

A3 scale 1:25,000

0 625m 1,250m

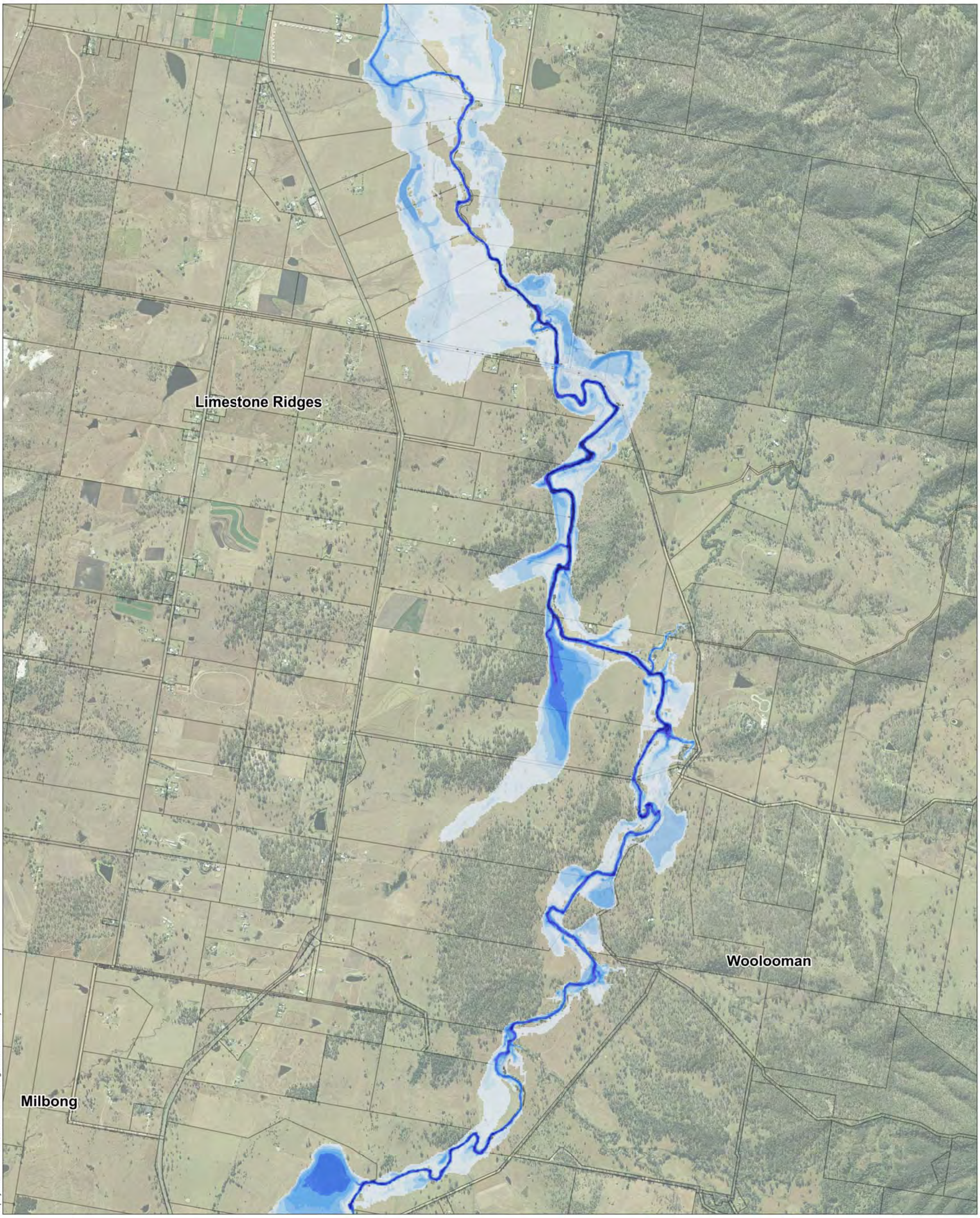
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-7b**

1% AEP Event - Peak Depths

aurecon



Map by: CD

P:\SWM\Work\251536 Purga Creek Flood Study

Legend

SRRC Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

A3 scale 1:25,000

0 625m 1,250m

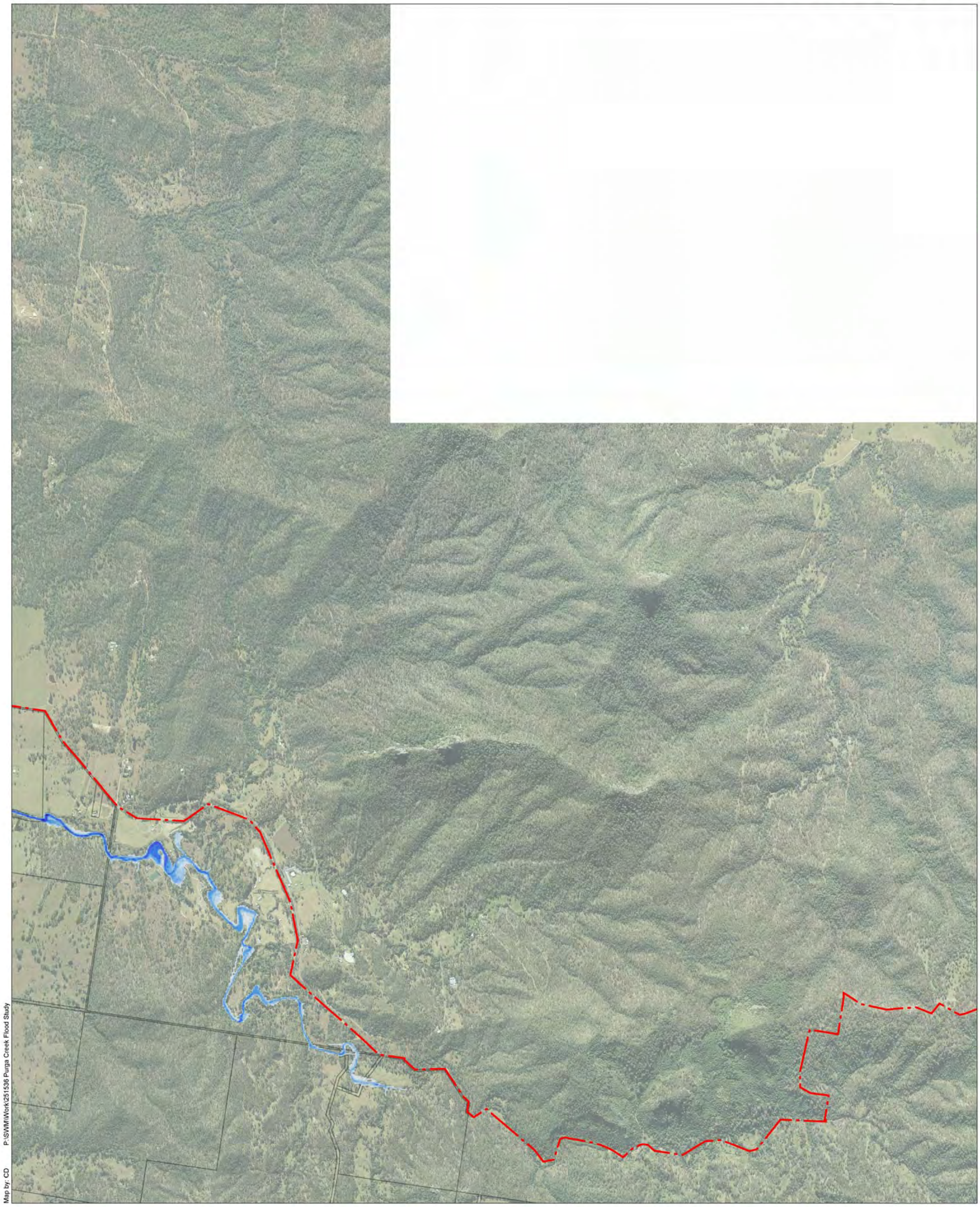
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-7c**

1% AEP Event - Peak Depths

aurecon



Legend

SRRC Boundary

Depth (m)
- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

A3 scale 1:25,000

0 625m 1,250m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-7d**

1% AEP Event - Peak Depths

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

Legend

SRRC Boundary

Depth (m)
- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

A3 scale 1:25,000

0 625m 1,250m

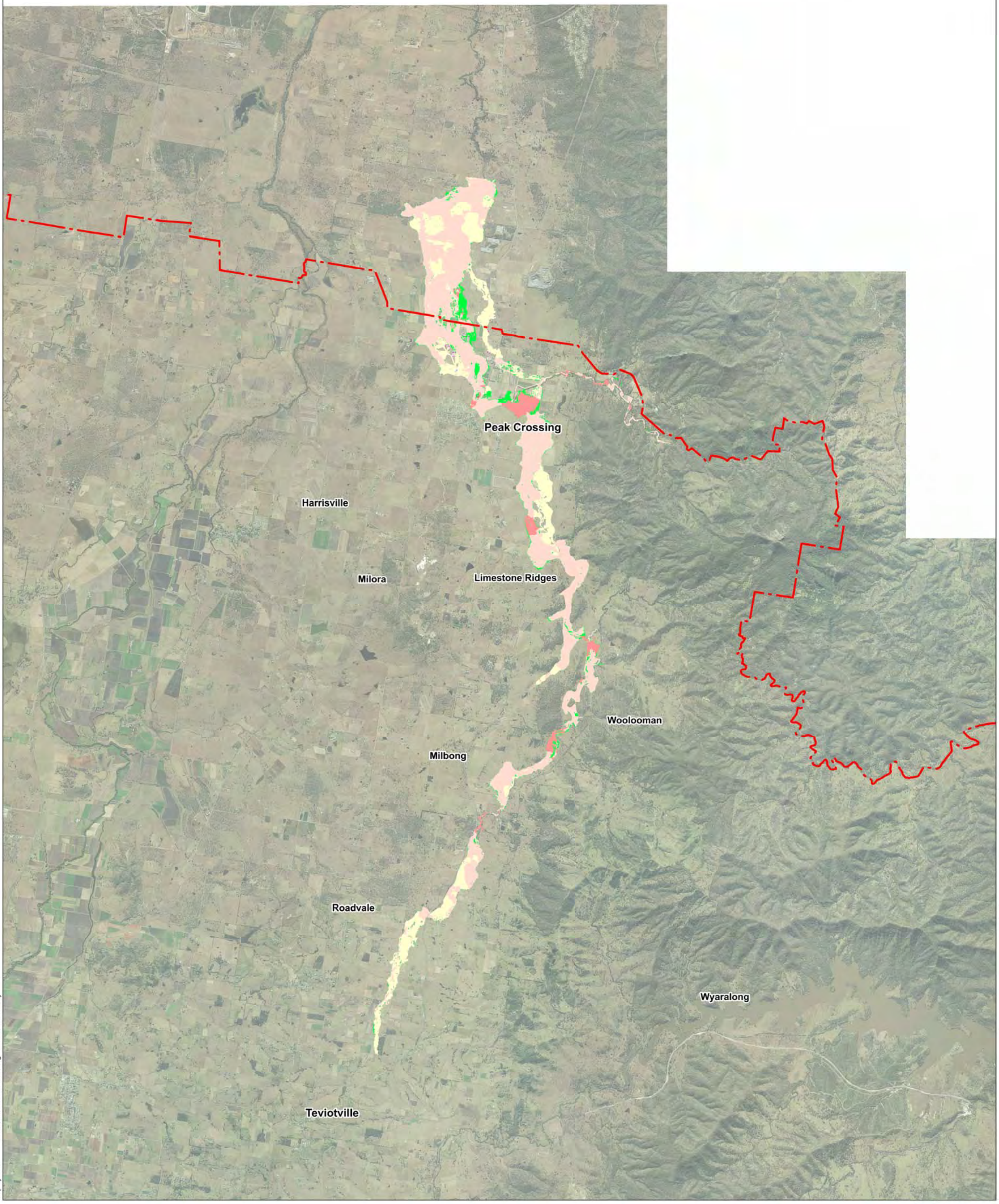
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-7e**

1% AEP Event - Peak Depths

aurecon



Map by: CD

P:\SWM\Work\251536 Purga Creek Flood Study

Legend

SRRC Boundary

Afflux (m)

- < -0.80
- -0.80 to -0.60
- -0.60 to -0.40
- -0.40 to -0.20
- -0.20 to -0.03
- -0.03 to 0.03
- 0.03 to 0.20
- 0.20 to 0.40
- 0.40 to 0.60
- 0.60 to 1.0
- > 1.0
- Was Dry Now Wet
- Was Wet Now Dry

Notes:

A3 scale 1:100,000

0 2,500m 5,000m

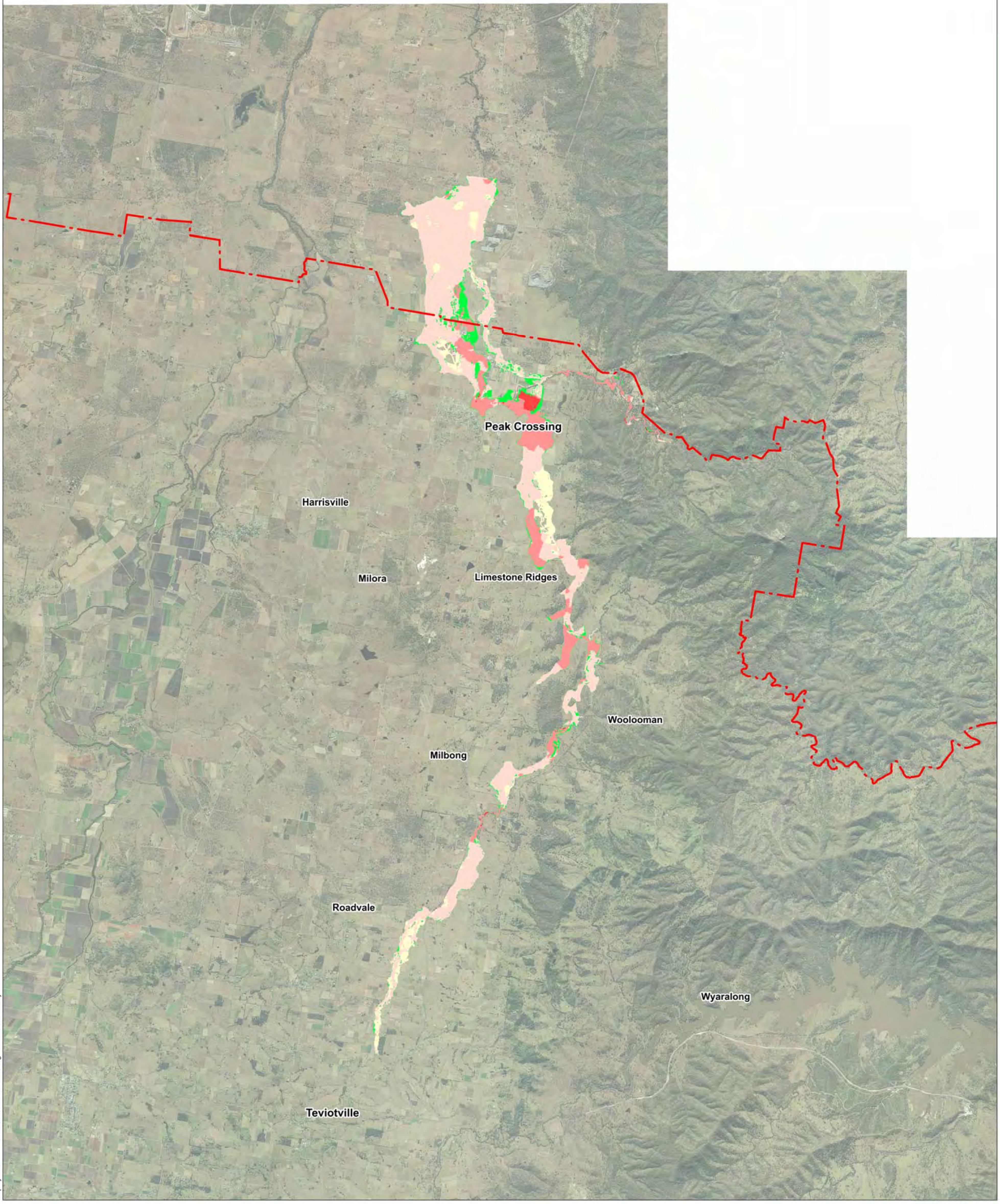
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-8a**

Climate Change Scenario 4.5 - 1% Afflux Map

aurecon



Legend

SRRC Boundary

Afflux (m)

- < -0.80
- -0.80 to -0.60
- -0.60 to -0.40
- -0.40 to -0.20
- -0.20 to -0.03
- -0.03 to 0.03
- 0.03 to 0.2
- 0.20 to 0.4
- 0.40 to 0.6
- 0.60 to 1.0
- > 1.0
- Was Dry Now Wet
- Was Wet Now Dry

Notes:

A3 scale 1:100,000

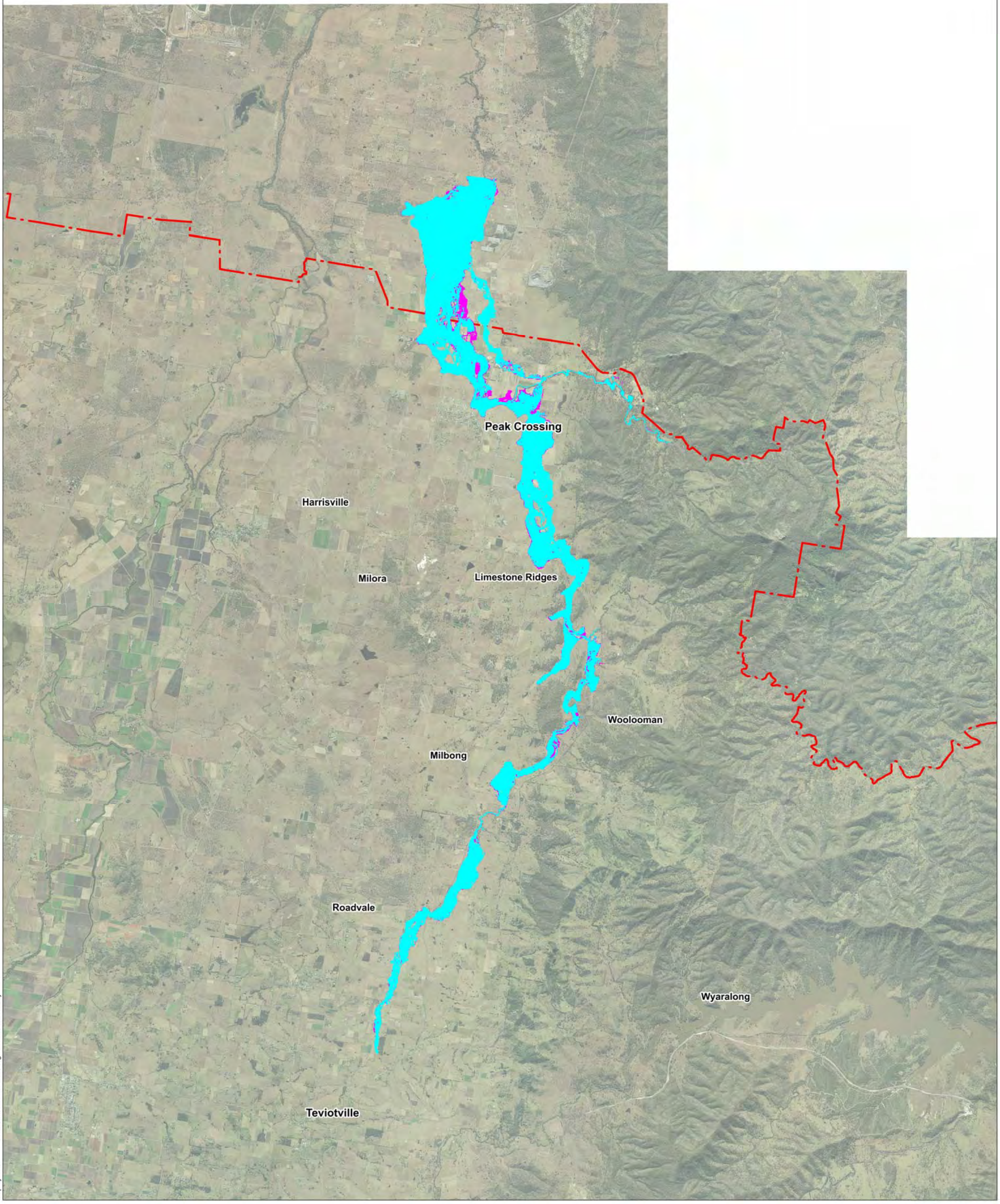
0 2,500m 5,000m

Date: 27/06/2016 Version: 0 Job No: 251538

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-8b**

Climate Change Scenario 8.5 - 1% Afflux Map



Legend

- SRRC Boundary
- Climate Change Scenario 4.5
- Existing Scenario

Notes:

A3 scale 1:100,000

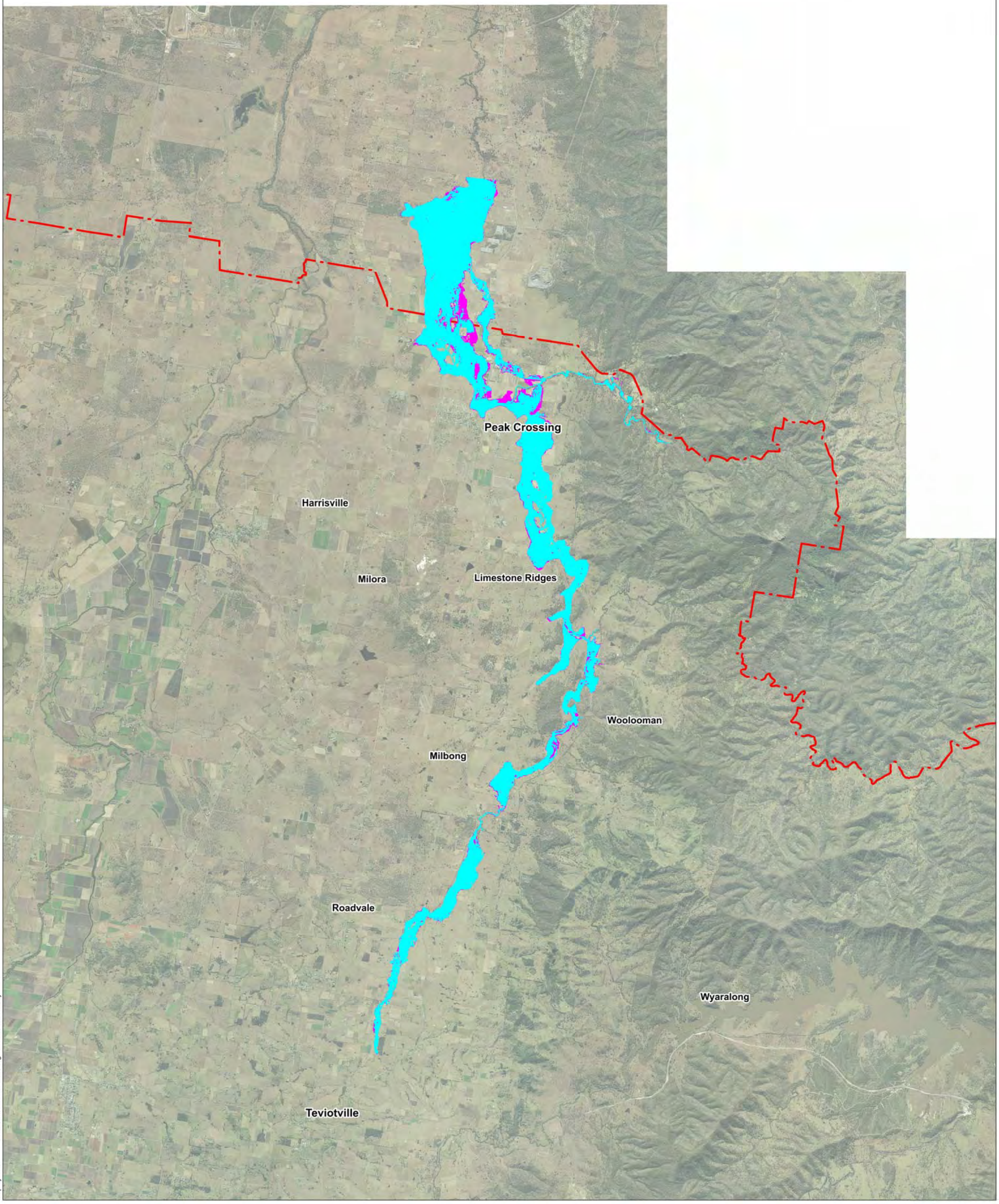
0 2,500m 5,000m

Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-9a**

Climate Change Scenario 4.5 - 1% Inundation Extent



Legend

- Climate Change Scenario 8.5
- Existing Scenario
- SRRC Boundary

Notes:

A3 scale 1:100,000

0 2,500m 5,000m

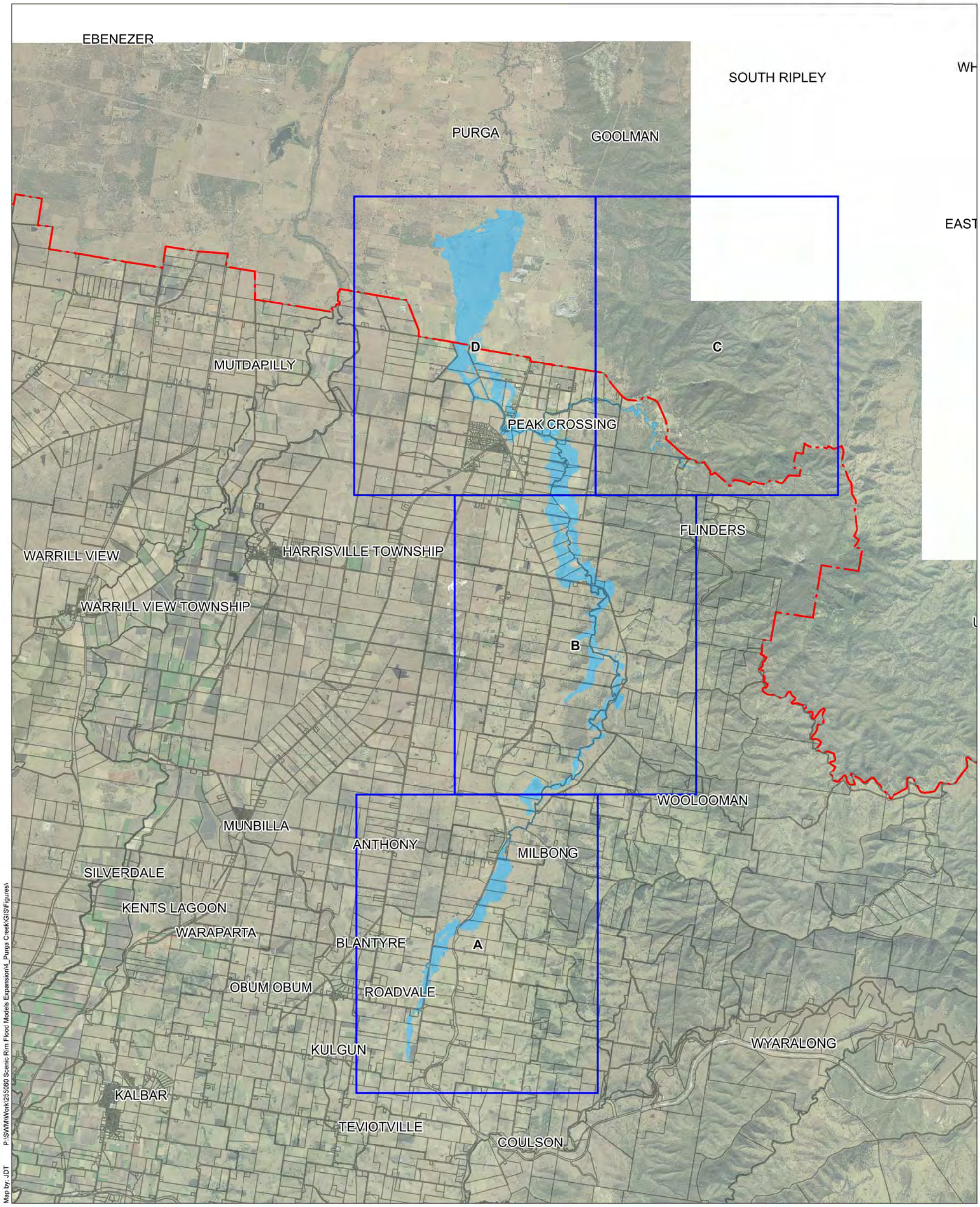
Date: 27/06/2016 Version: 0 Job No: 251536

Projection: MGA Zone 56

Purga Creek Flood Study **Figure B-9b**

Climate Change Scenario 8.5 - 1% Inundation Extent

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:100,000

0 2,500 m 5,000 m

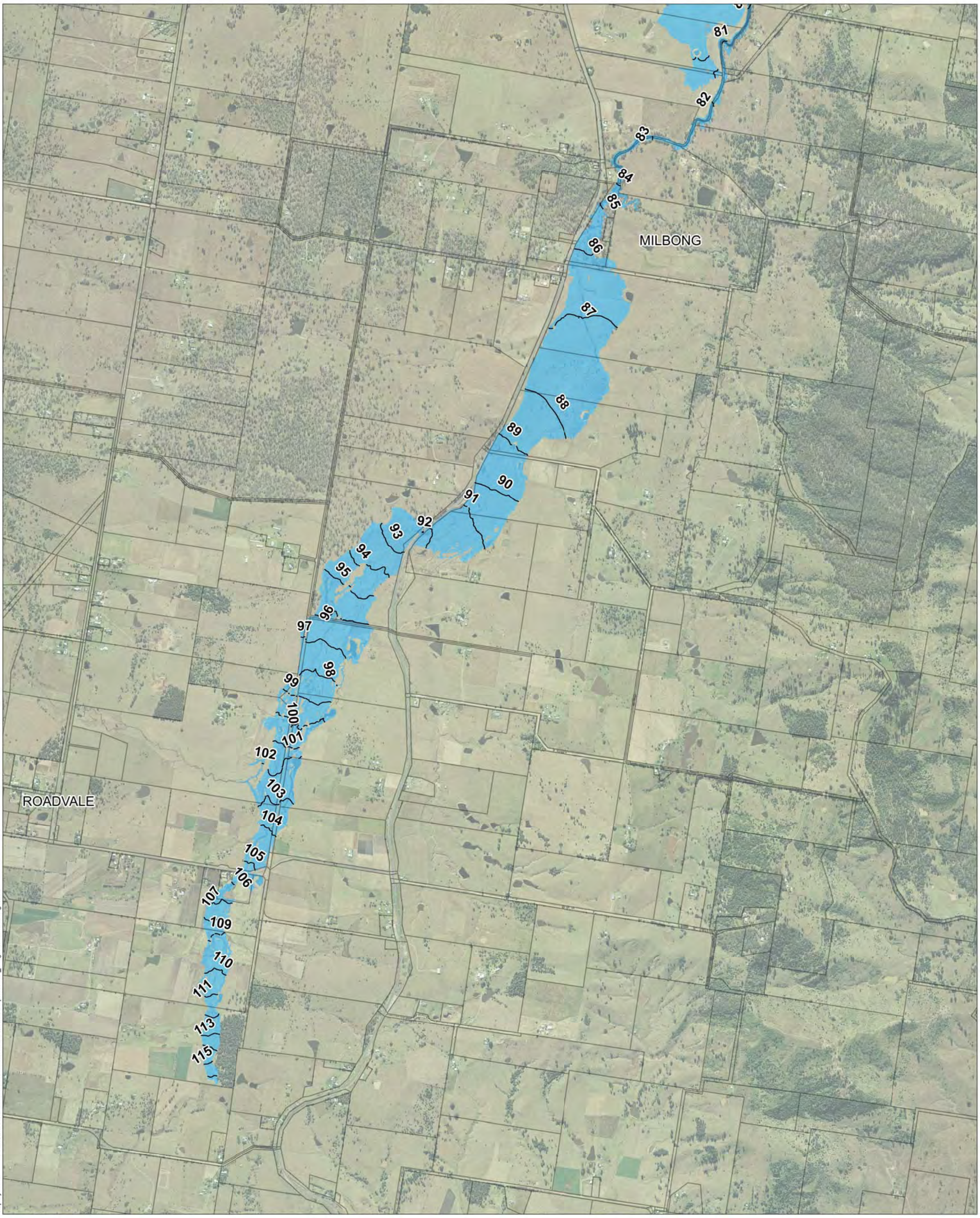
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C1**

2% AEP Event - Inundation Extent

aurecon



P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Map by: JDT

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

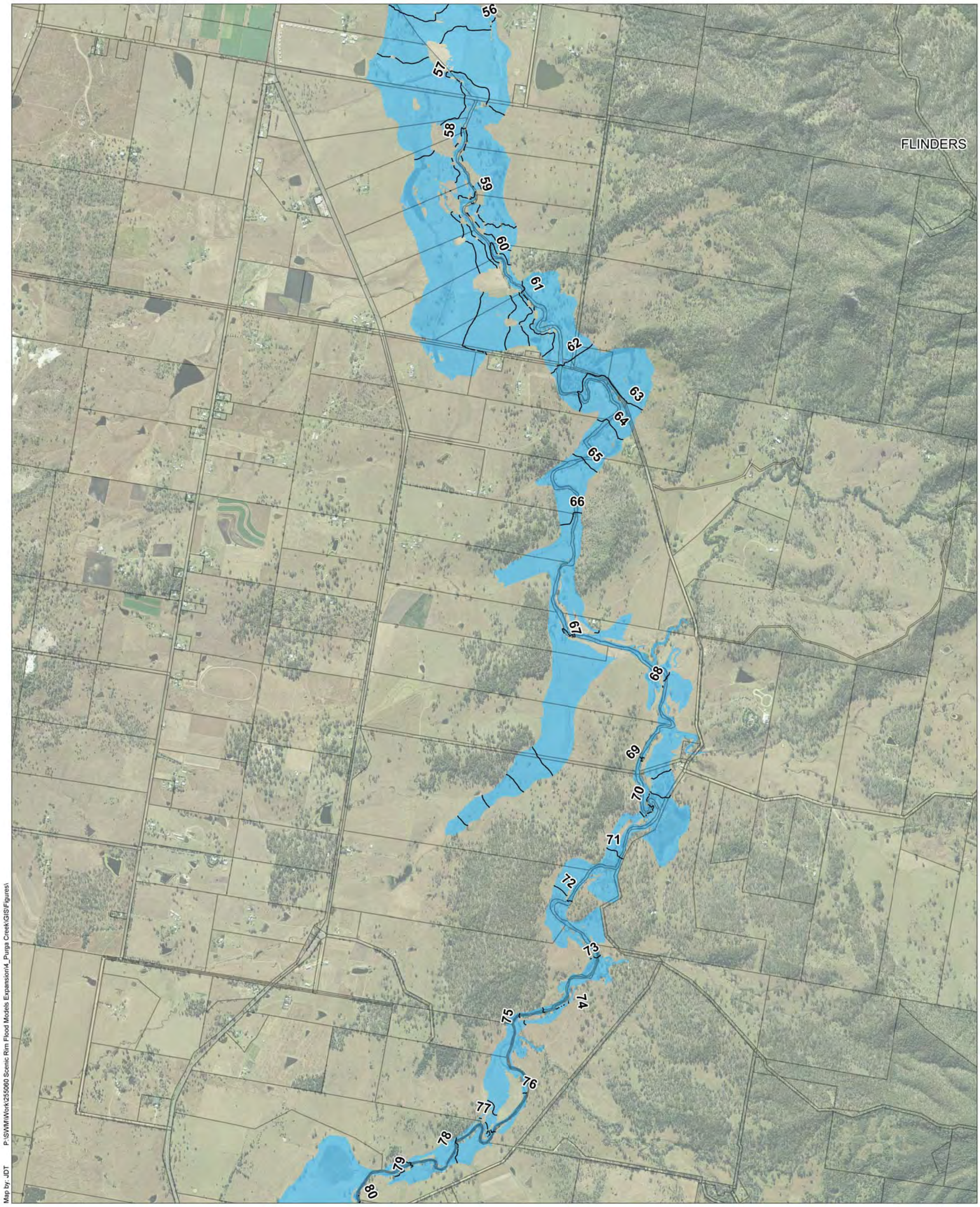
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C1-a**

2% AEP Event - Inundation Extent



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

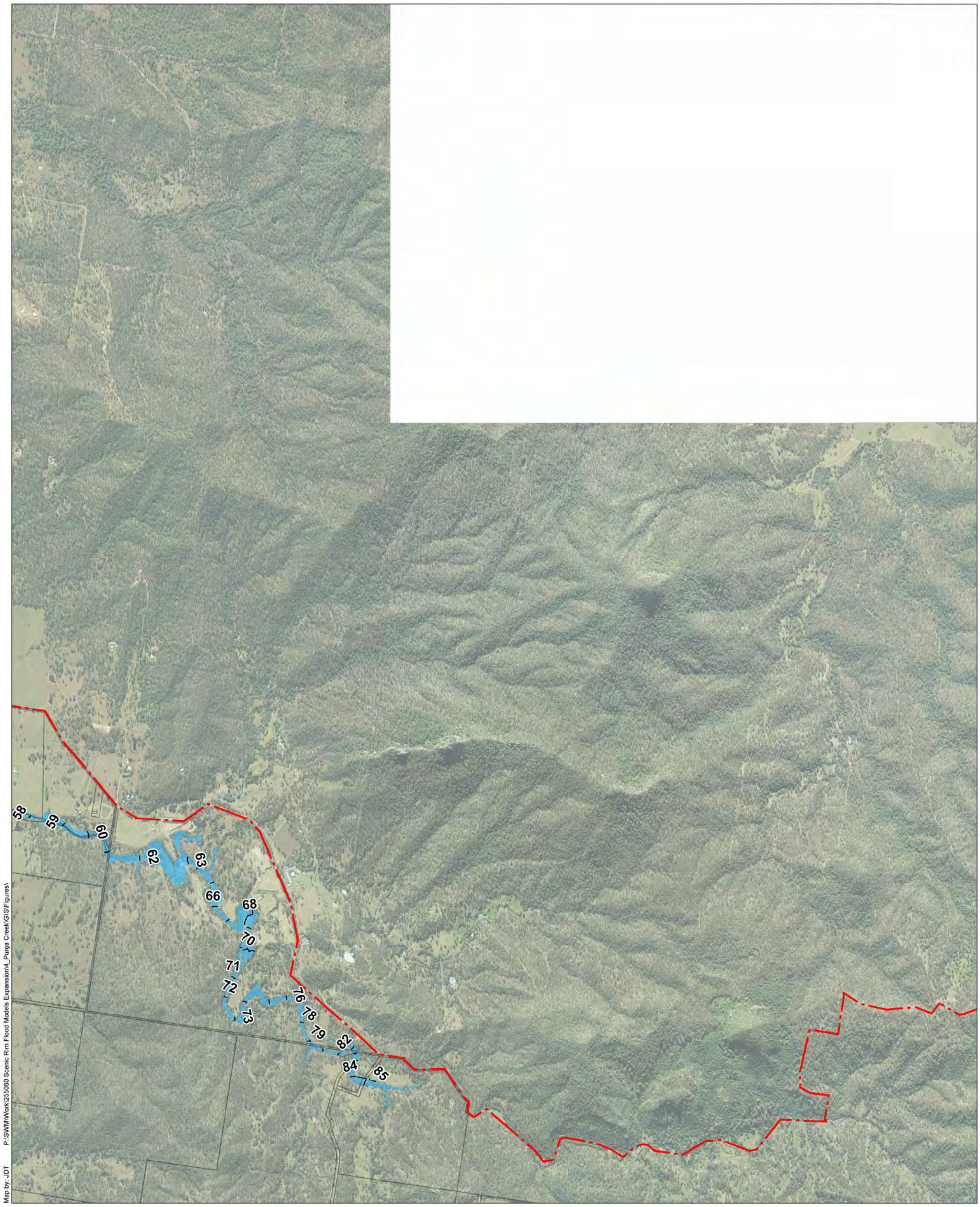
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C1-b**

2% AEP Event - Inundation Extent

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

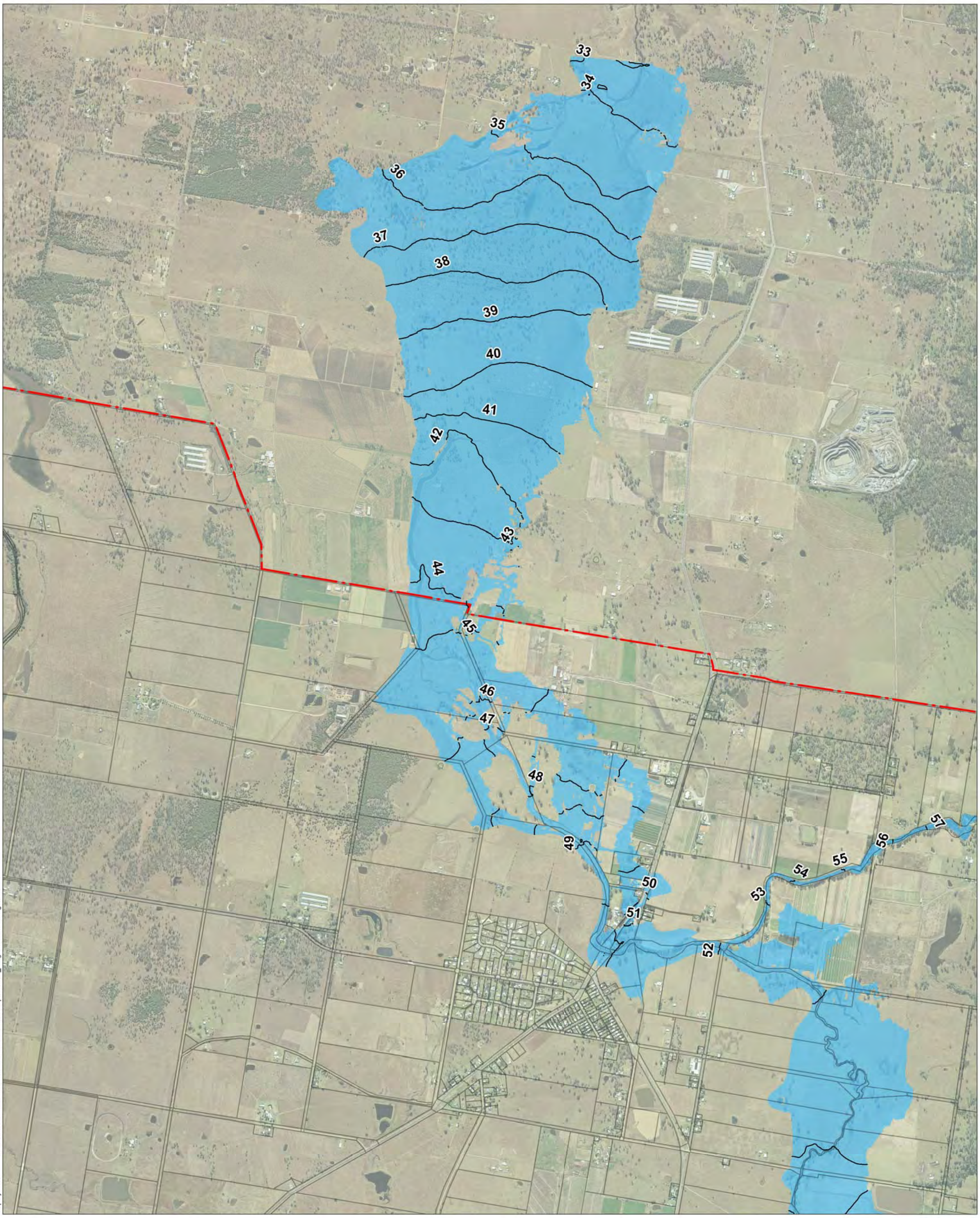
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C1-c**

2% AEP Event - Inundation Extent

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

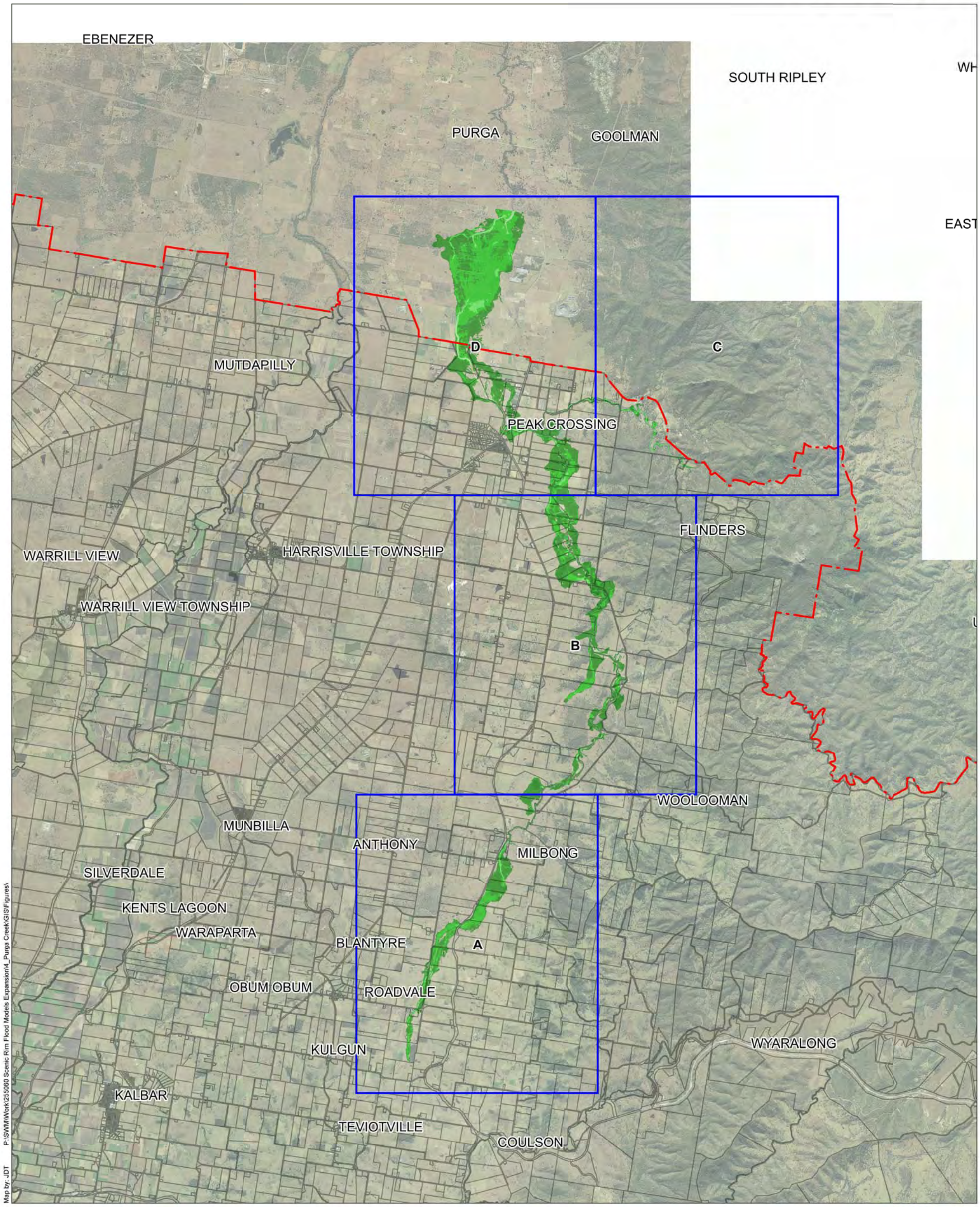
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C1-d**

2% AEP Event - Inundation Extent



Legend

Velocity (m/s)

SRRC Boundary	0.0 to 0.5	3.0 to 3.5	
Cadastral Boundary	0.5 to 1.0	3.5 to 4.0	
	1.0 to 1.5	4.0 to 4.5	
	1.5 to 2.0	4.5 to 5.0	
	2.0 to 2.5	> 5.0	
	2.5 to 3.0		

Notes:

1:100,000

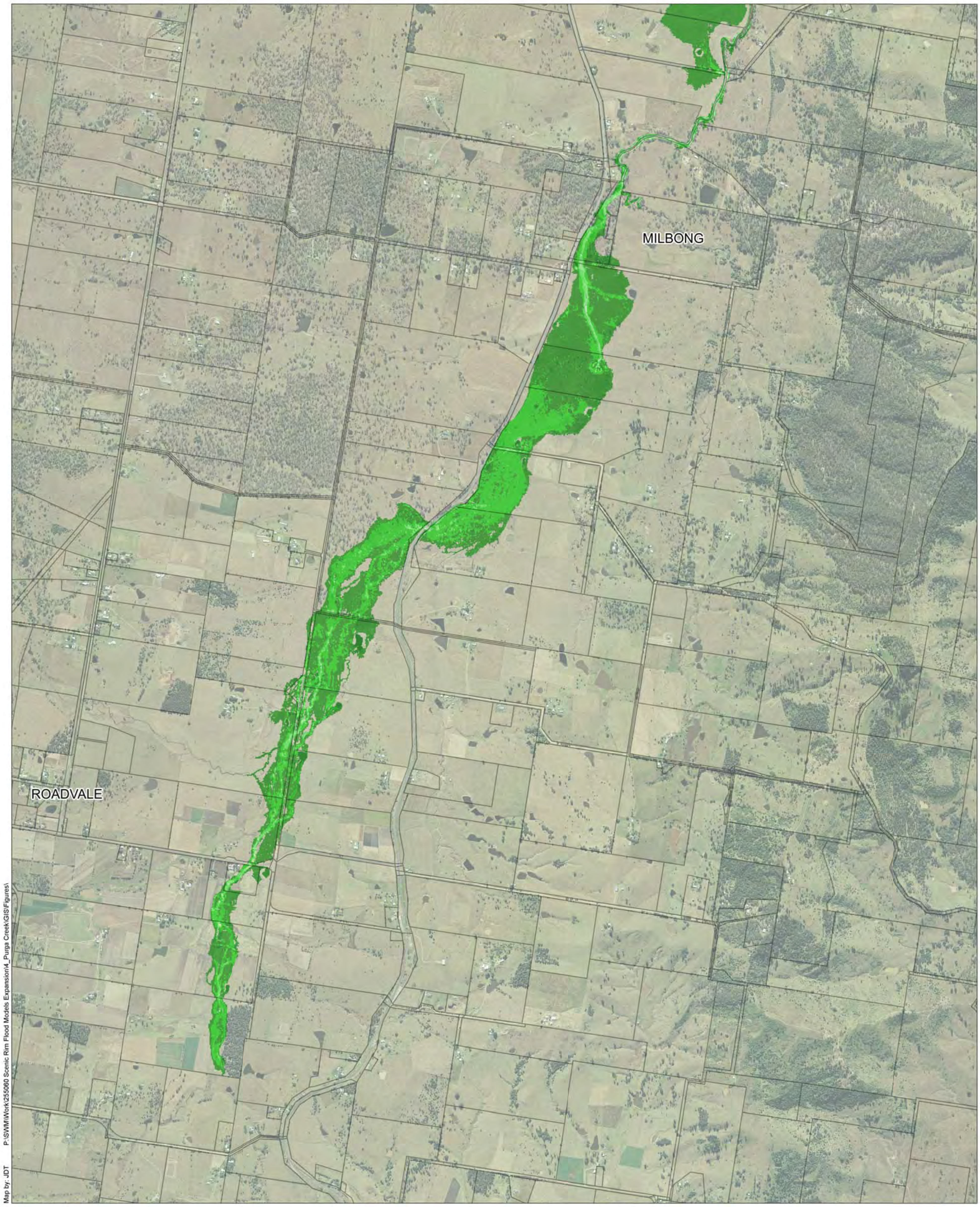
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C2**

2% AEP Event - Peak Velocities



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000

0 625 m 1,250 m

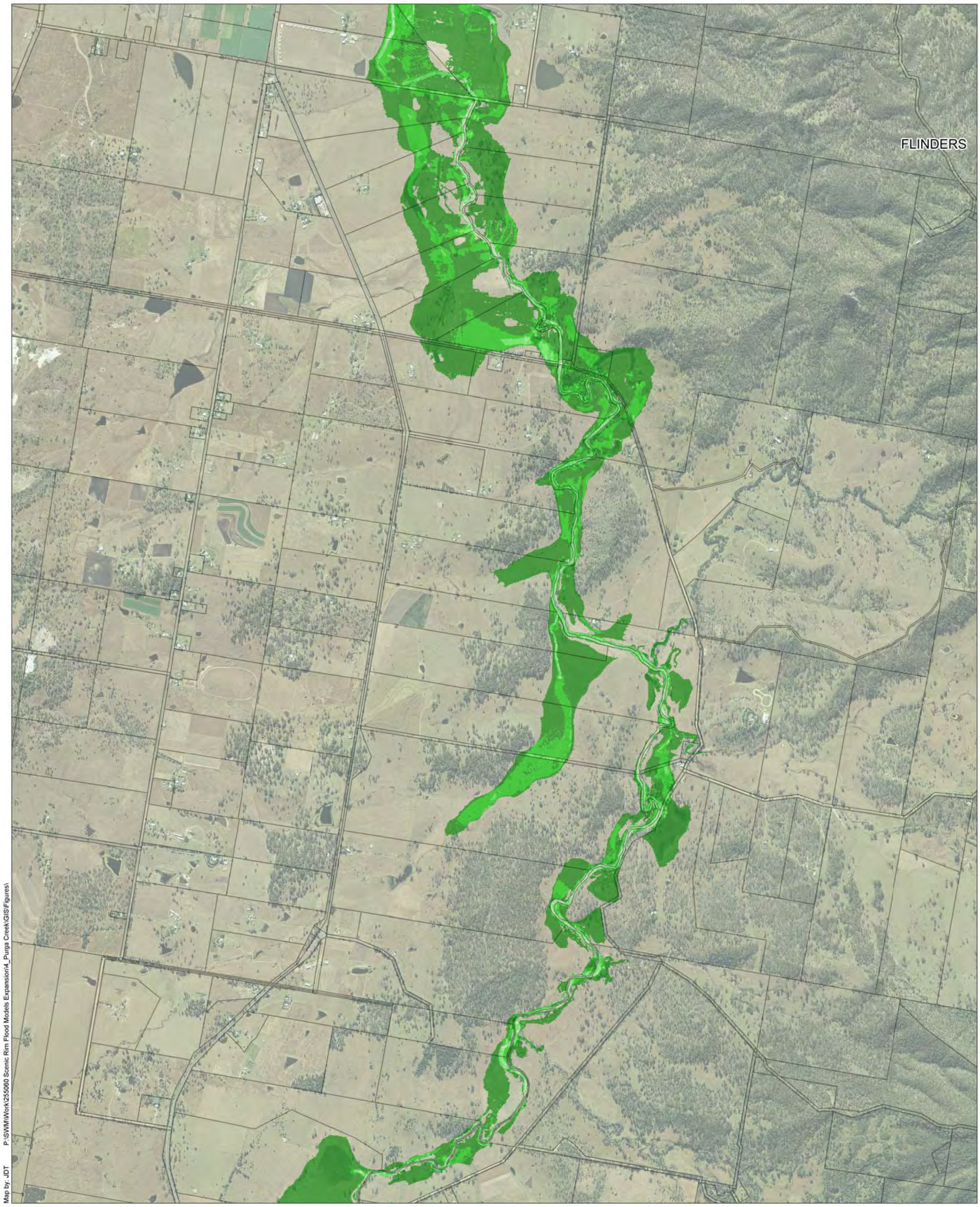
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C2-a**

2% AEP Event - Peak Velocities

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Velocity (m/s)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

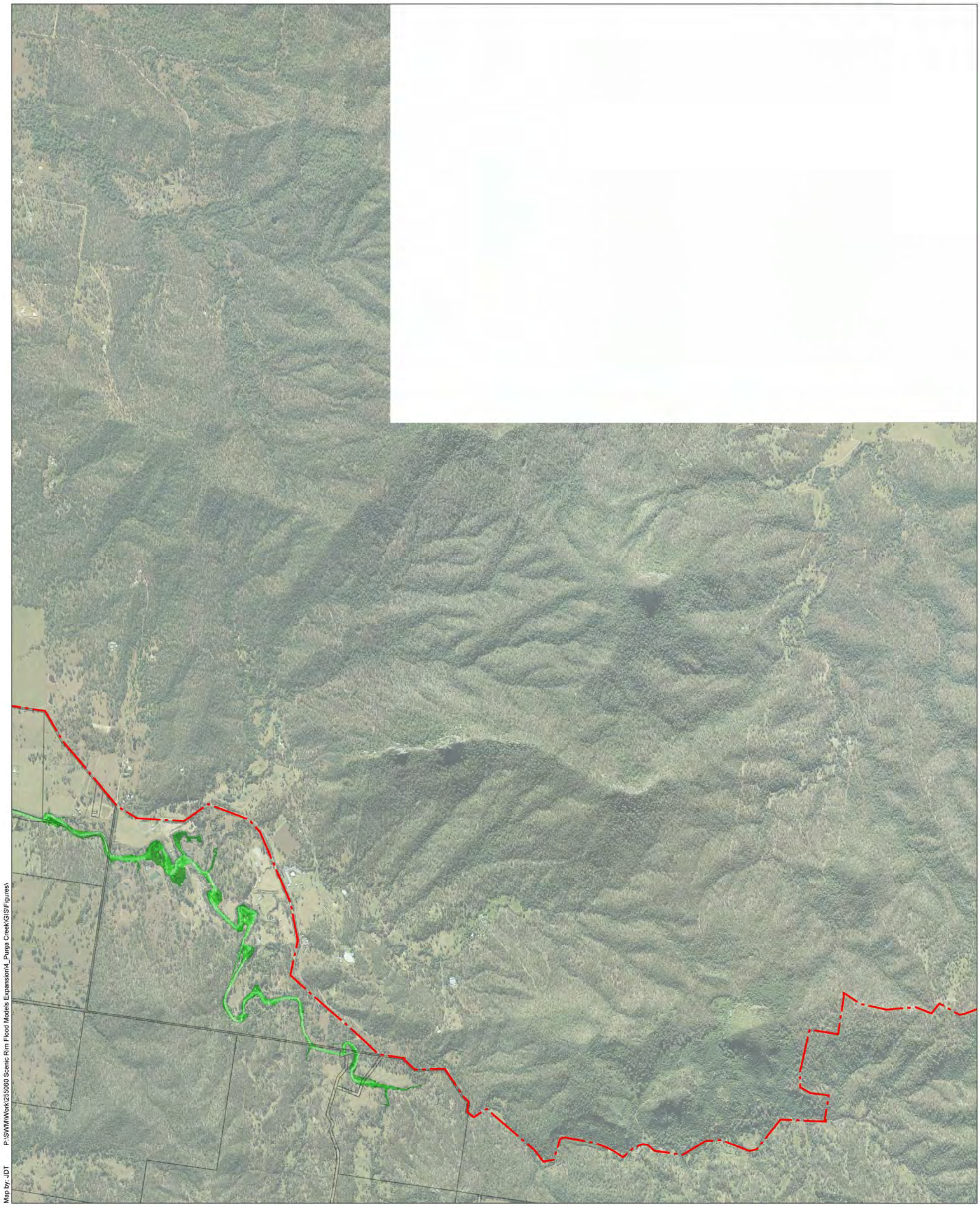
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C2-b**

2% AEP Event - Peak Velocities



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000

0 625 m 1,250 m

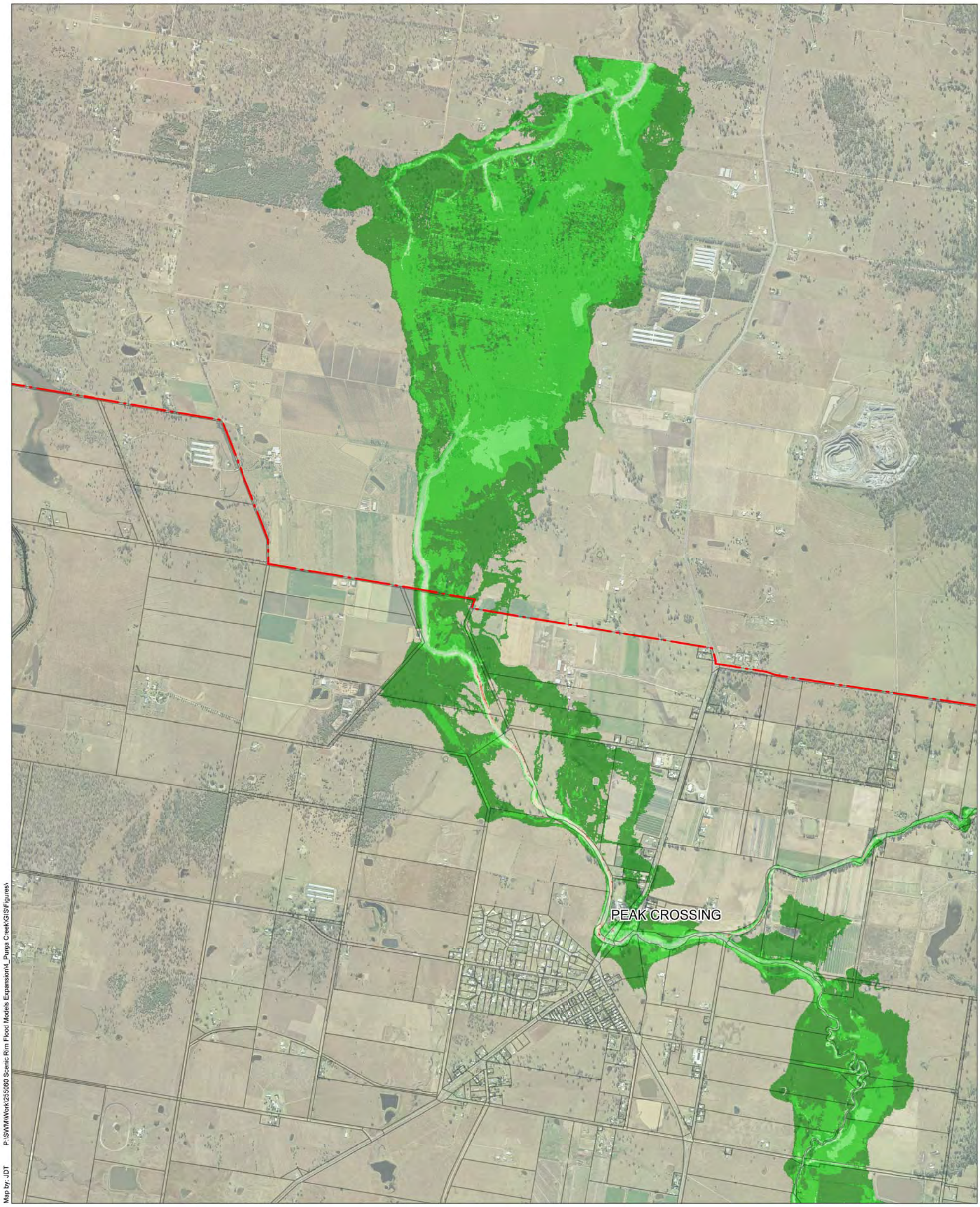
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C2-c**

2% AEP Event - Peak Velocities

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000

0 625 m 1,250 m

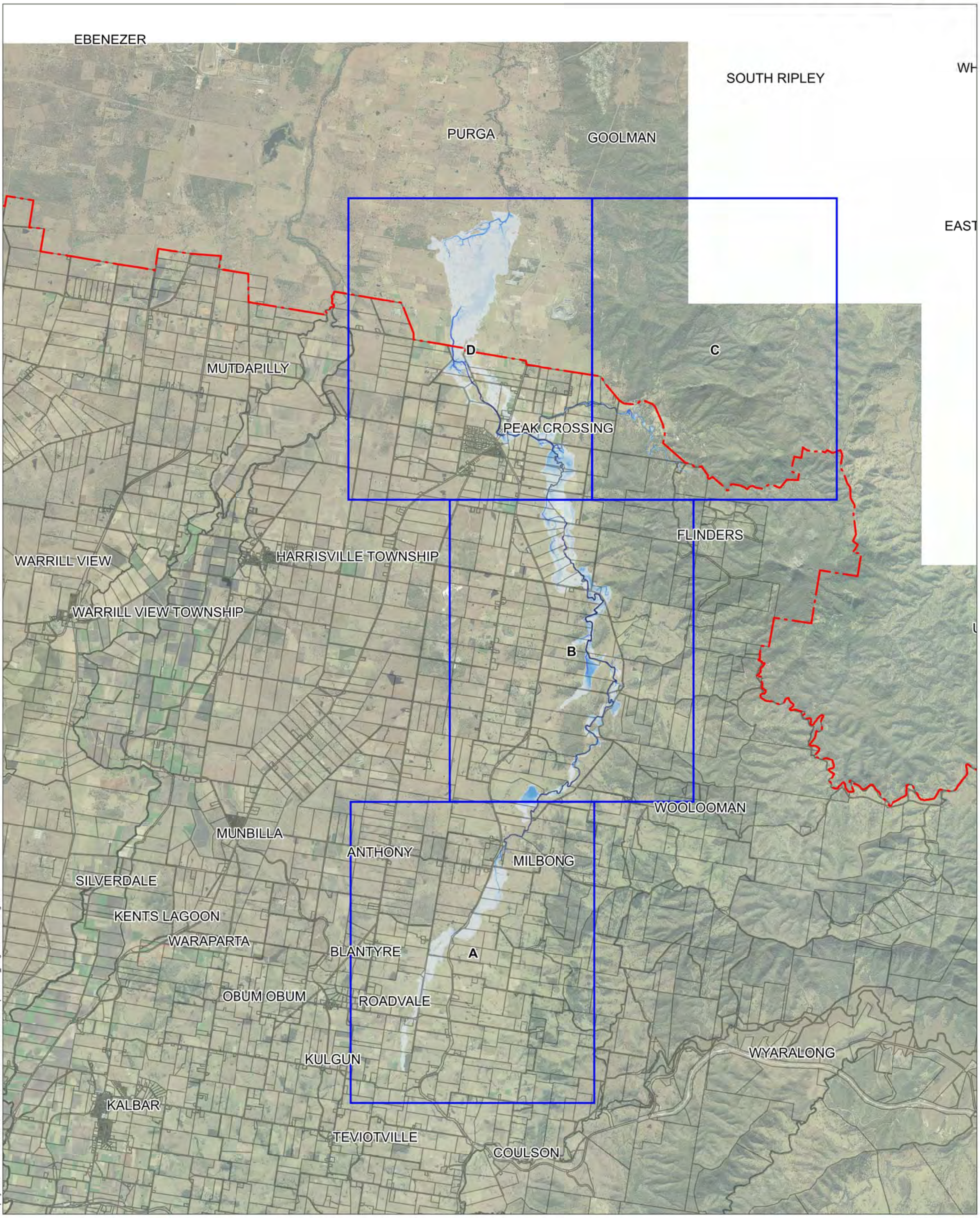
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C2-d**

2% AEP Event - Peak Velocities

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:100,000

0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C3**

2% AEP Event - Peak Depth Map

aurecon

Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

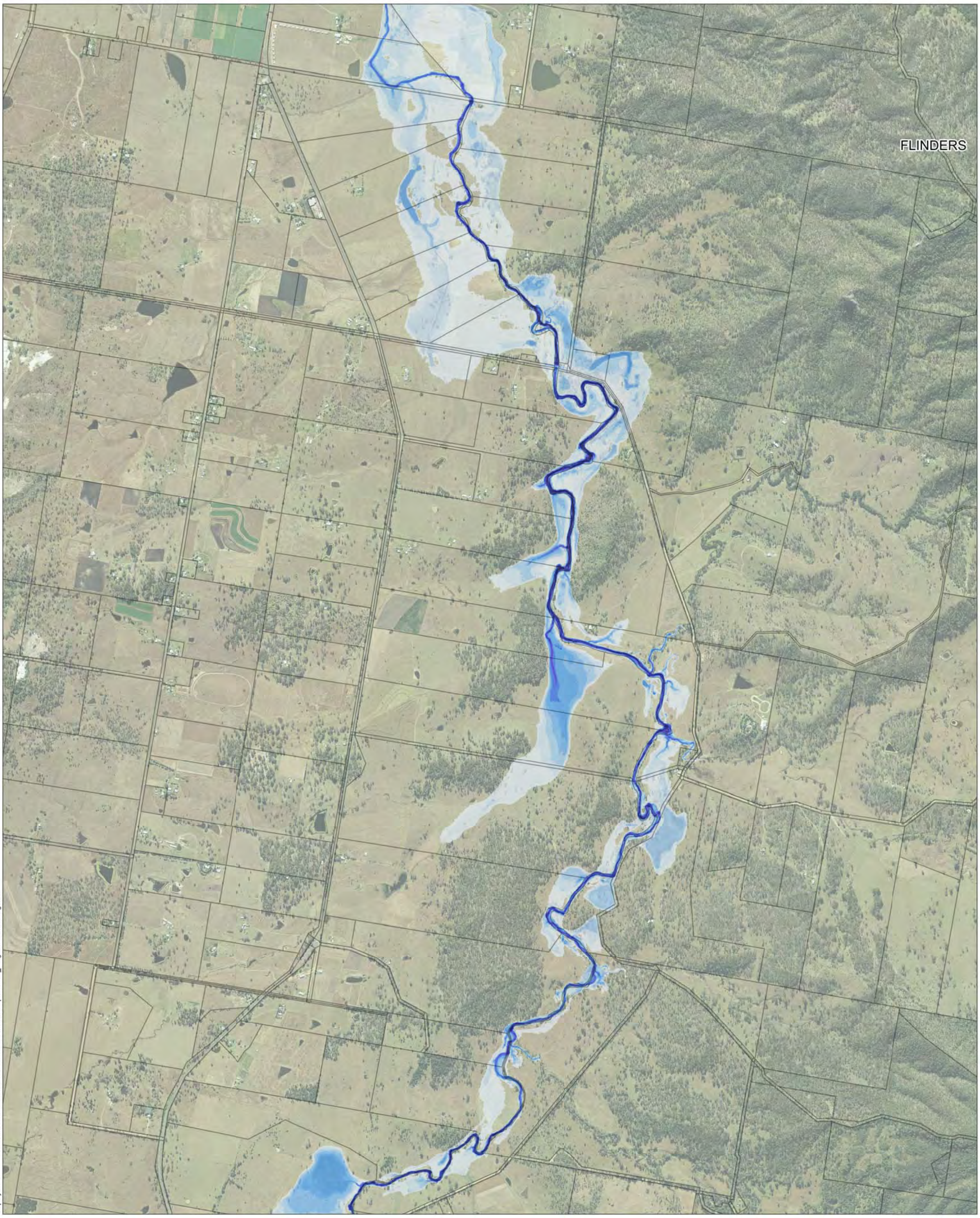
Projection: MGA Zone 56

Purga Creek Flood Study

Figure C3-a

2% AEP Event - Peak Depth Map

aurecon



Legend

Depth (m)

SRRC Boundary		0.0 to 0.5	3.0 to 3.5
Cadastral Boundary		0.5 to 1.0	3.5 to 4.0
		1.0 to 1.5	4.0 to 4.5
		1.5 to 2.0	4.5 to 5.0
		2.0 to 2.5	> 5.0
		2.5 to 3.0	

Notes:

1:25,000

0 625 m 1,250 m

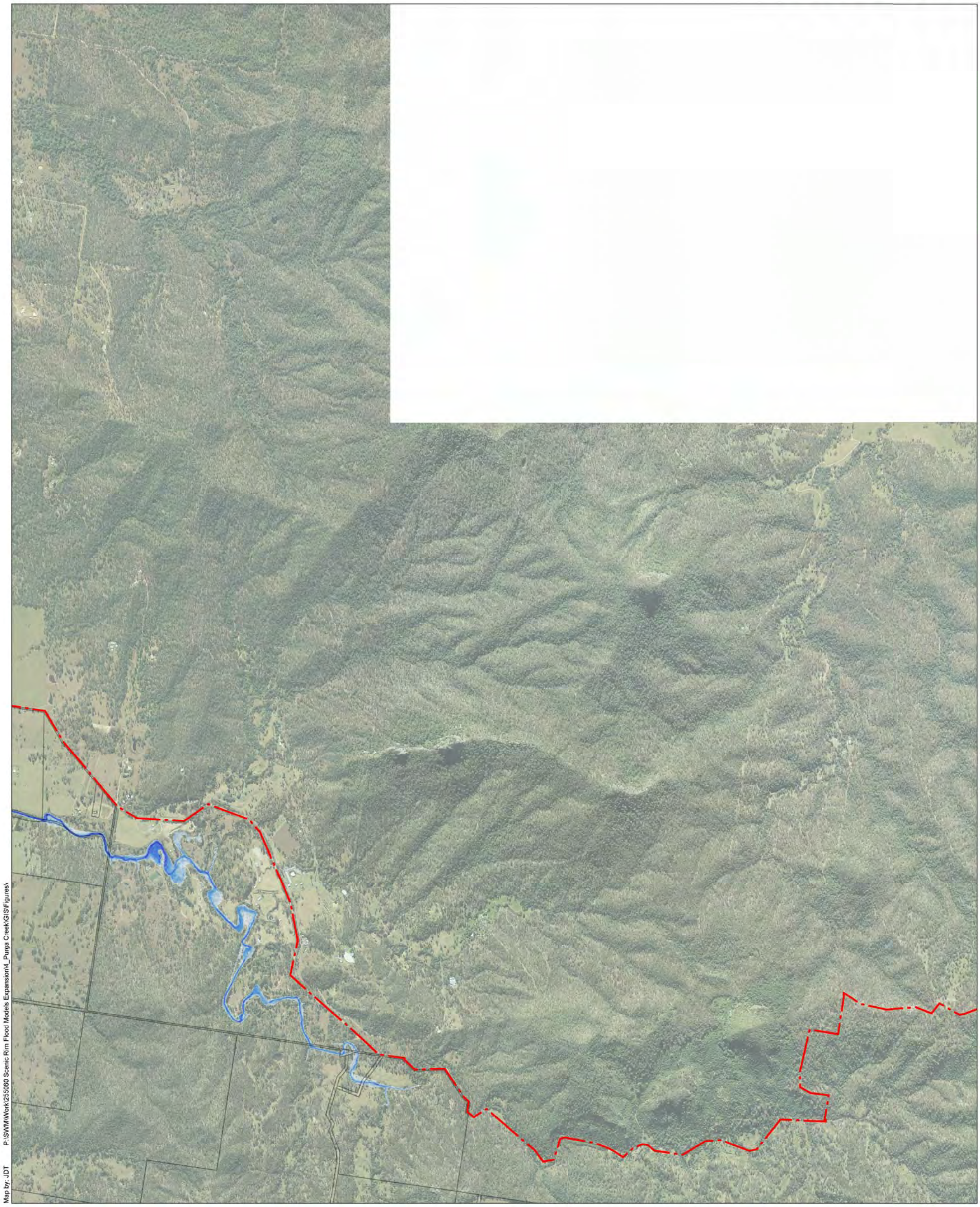
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C3-b**

2% AEP Event - Peak Depth Map

aurecon



Legend

Depth (m)

SRRC Boundary	0.0 to 0.5	3.0 to 3.5
Cadastral Boundary	0.5 to 1.0	3.5 to 4.0
	1.0 to 1.5	4.0 to 4.5
	1.5 to 2.0	4.5 to 5.0
	2.0 to 2.5	> 5.0
	2.5 to 3.0	

Notes:

1:25,000

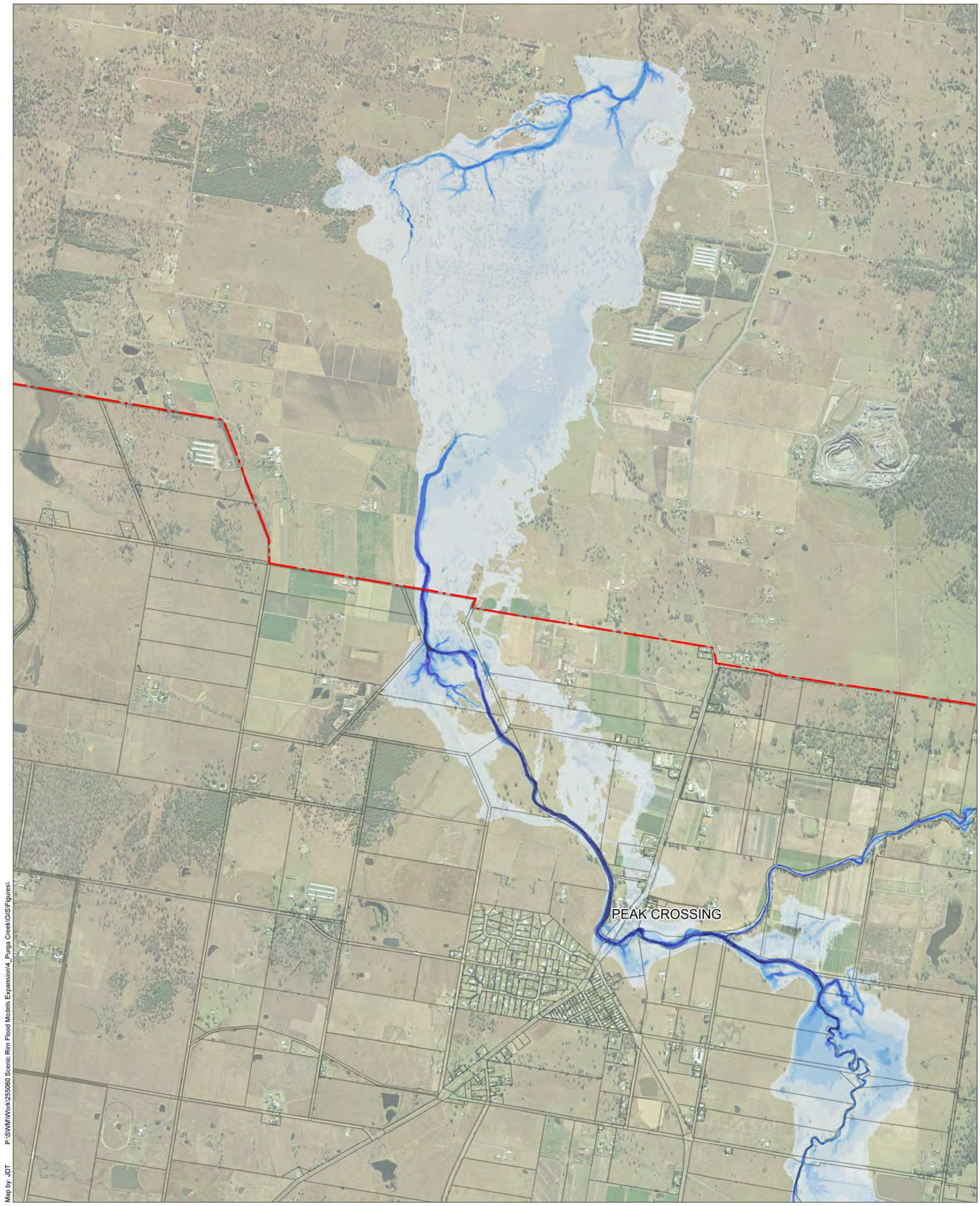
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C3-c**

2% AEP Event - Peak Depth Map



aurecon

Legend

Depth (m)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000
0 625 m 1,250 m

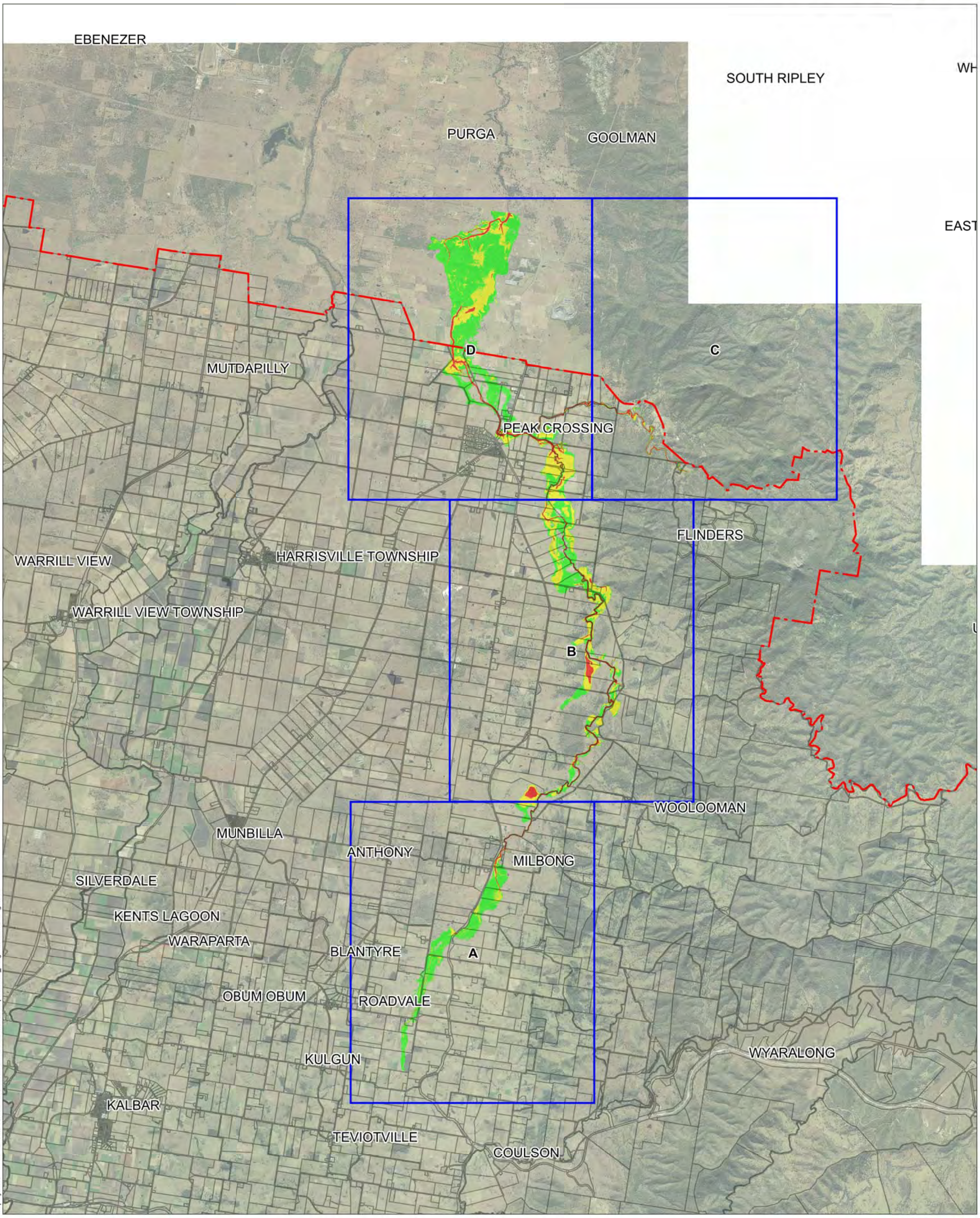
Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure C3-d**

2% AEP Event - Peak Depth Map

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary
Cadastral Boundary
Low Hazard
Medium Hazard
High Hazard

Notes:

1:100,000

0 2,500 m 5,000 m

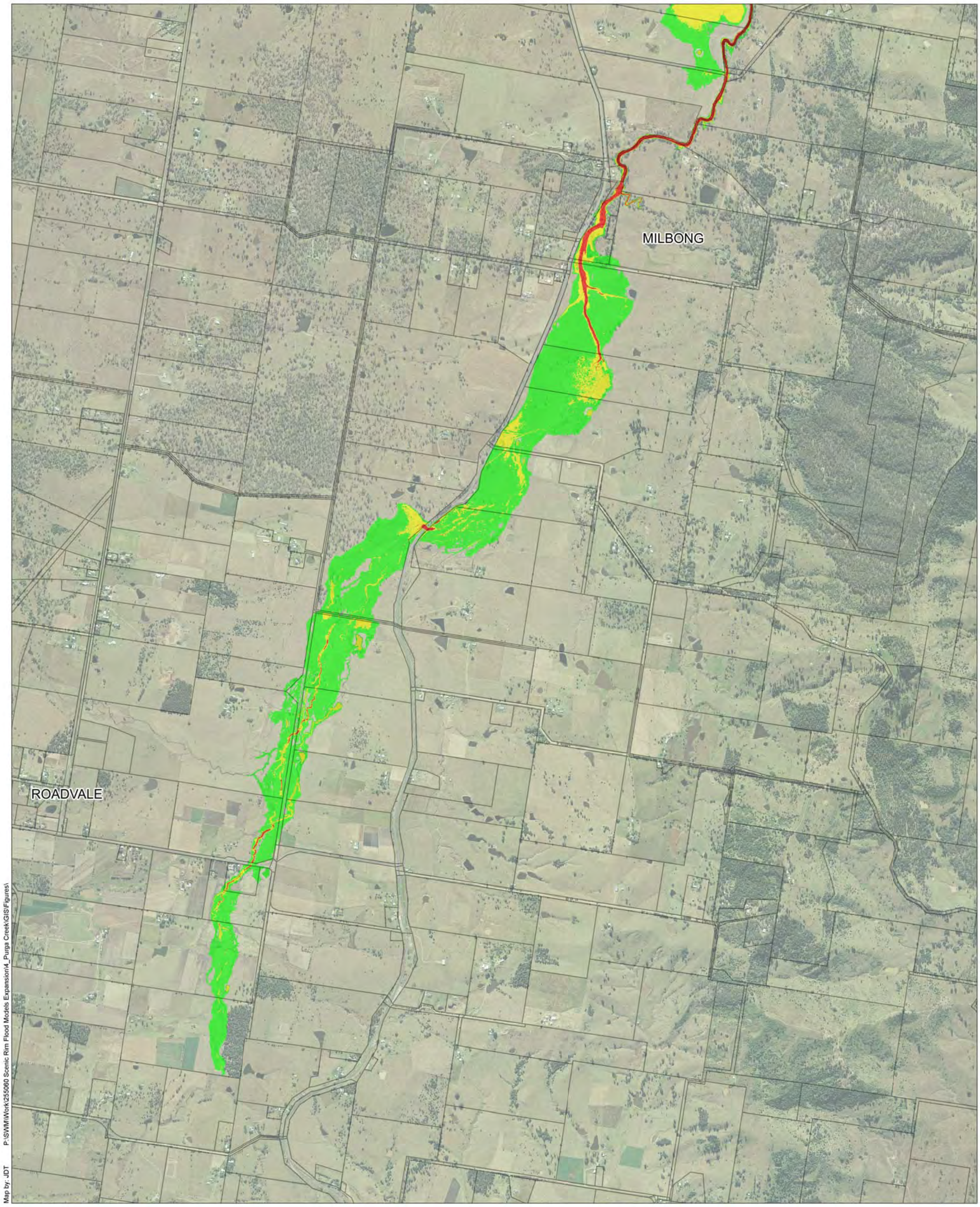
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C4**

2% AEP Event - Peak Hazard Map

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Low Hazard

Medium Hazard

High Hazard

Notes:

1:25,000

0 625 m 1,250 m

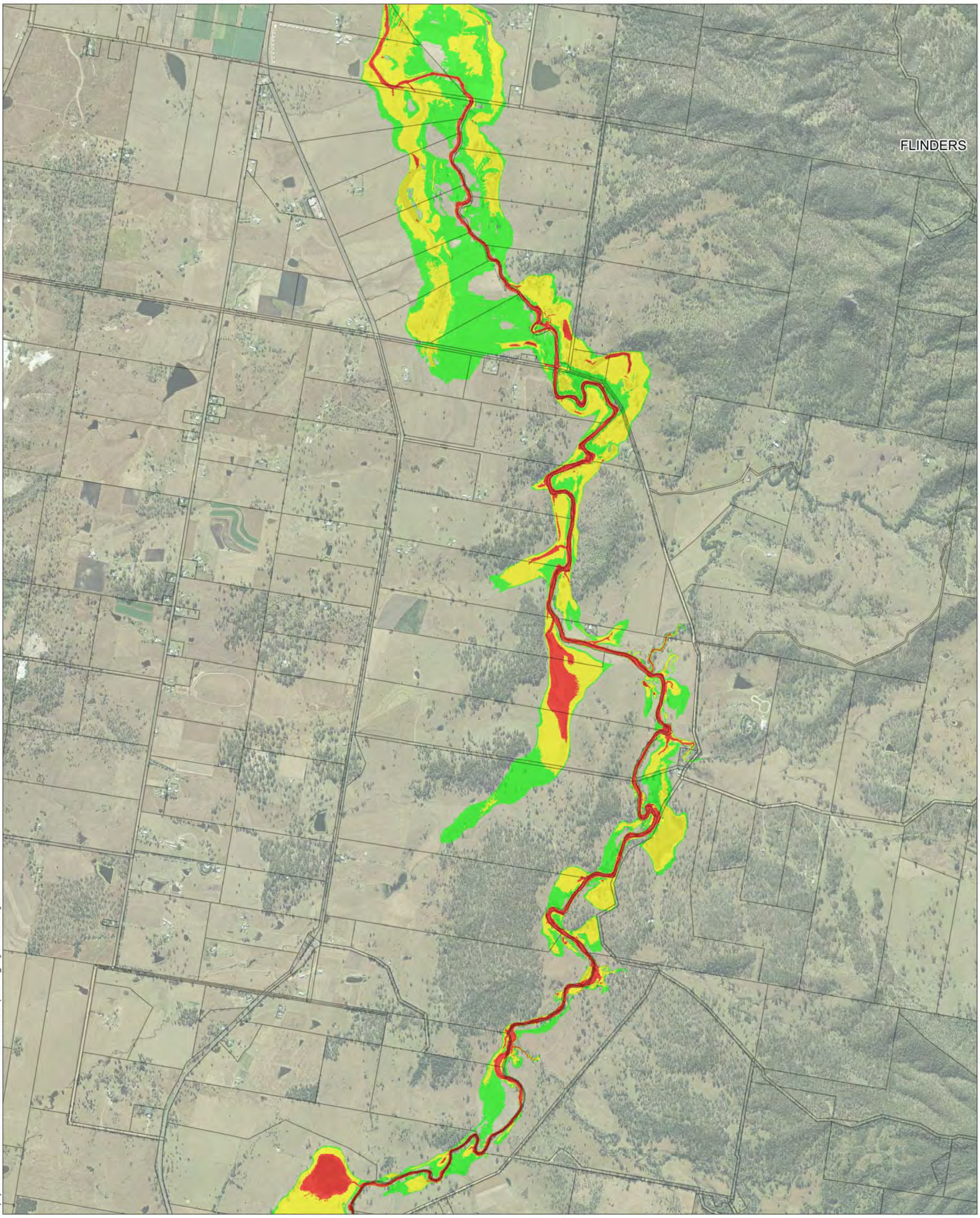
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C4-a**

2% AEP Event - Peak Hazard Map

aurecon



Legend

SRRC Boundary
Cadastral Boundary
Low Hazard
Medium Hazard
High Hazard

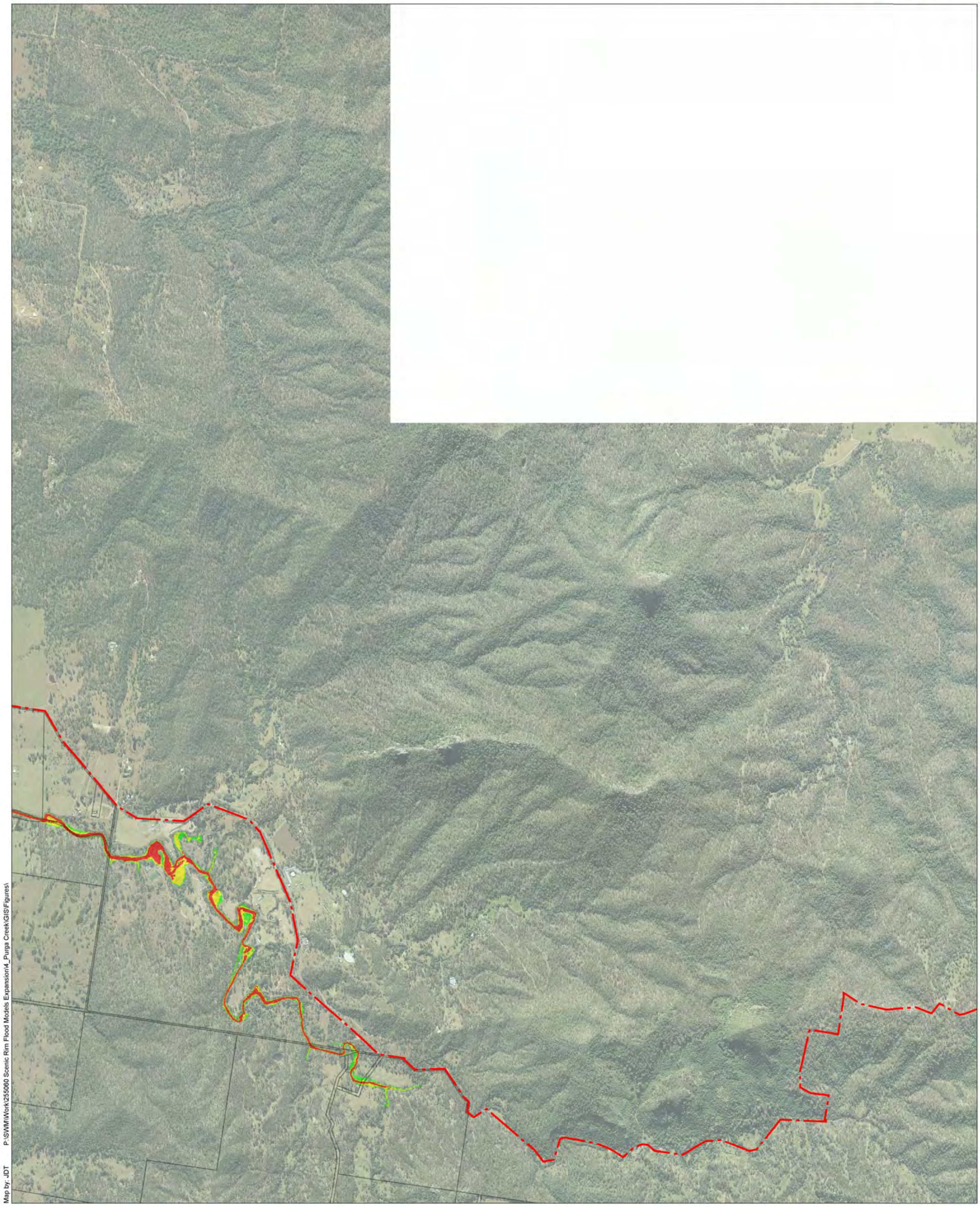
Notes:

1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure C4-b**

2% AEP Event - Peak Hazard Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Low Hazard
- Medium Hazard
- High Hazard

Notes:

1:25,000

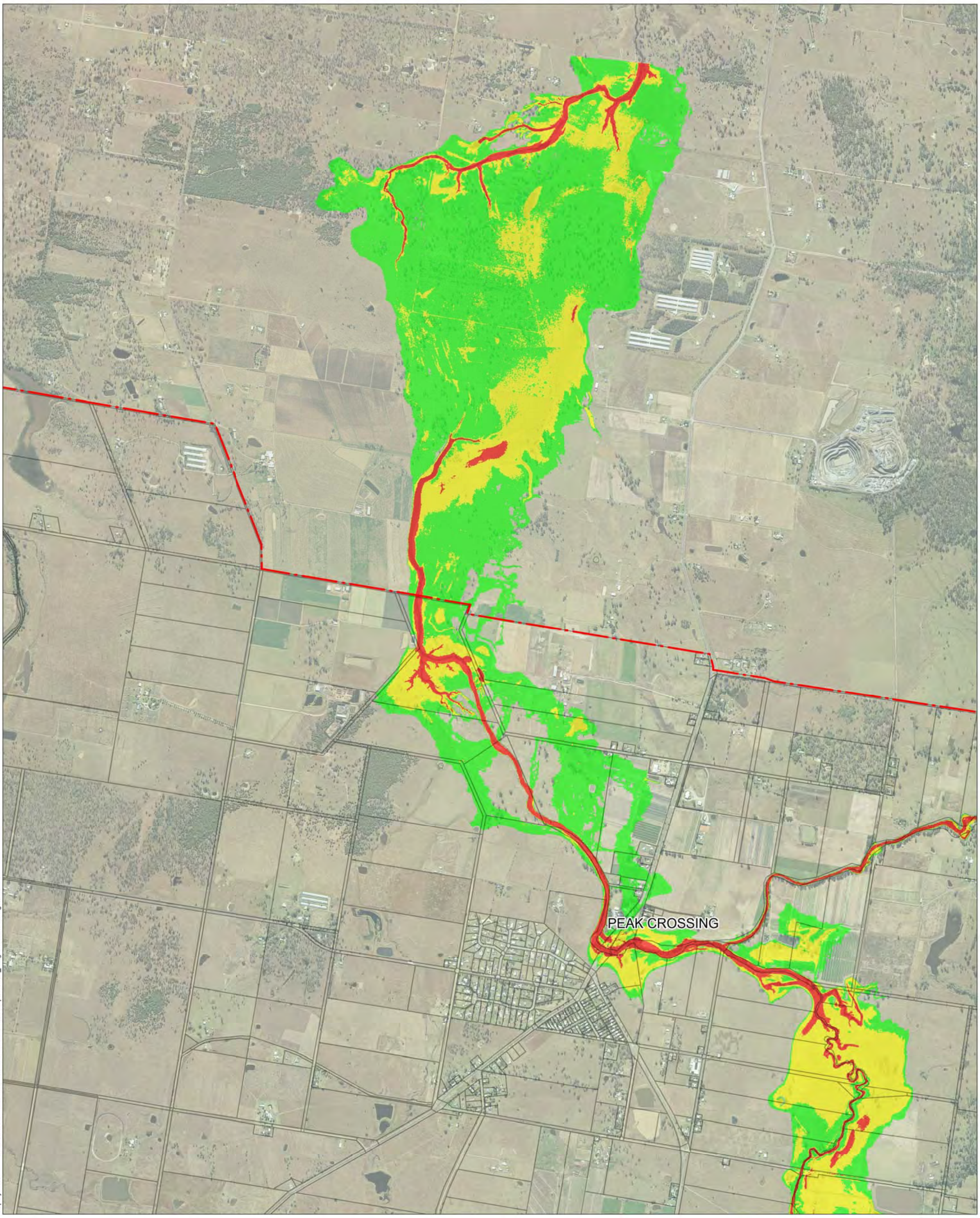
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C4-c**

2% AEP Event - Peak Hazard Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Low Hazard
- Medium Hazard
- High Hazard

Notes:

1:25,000

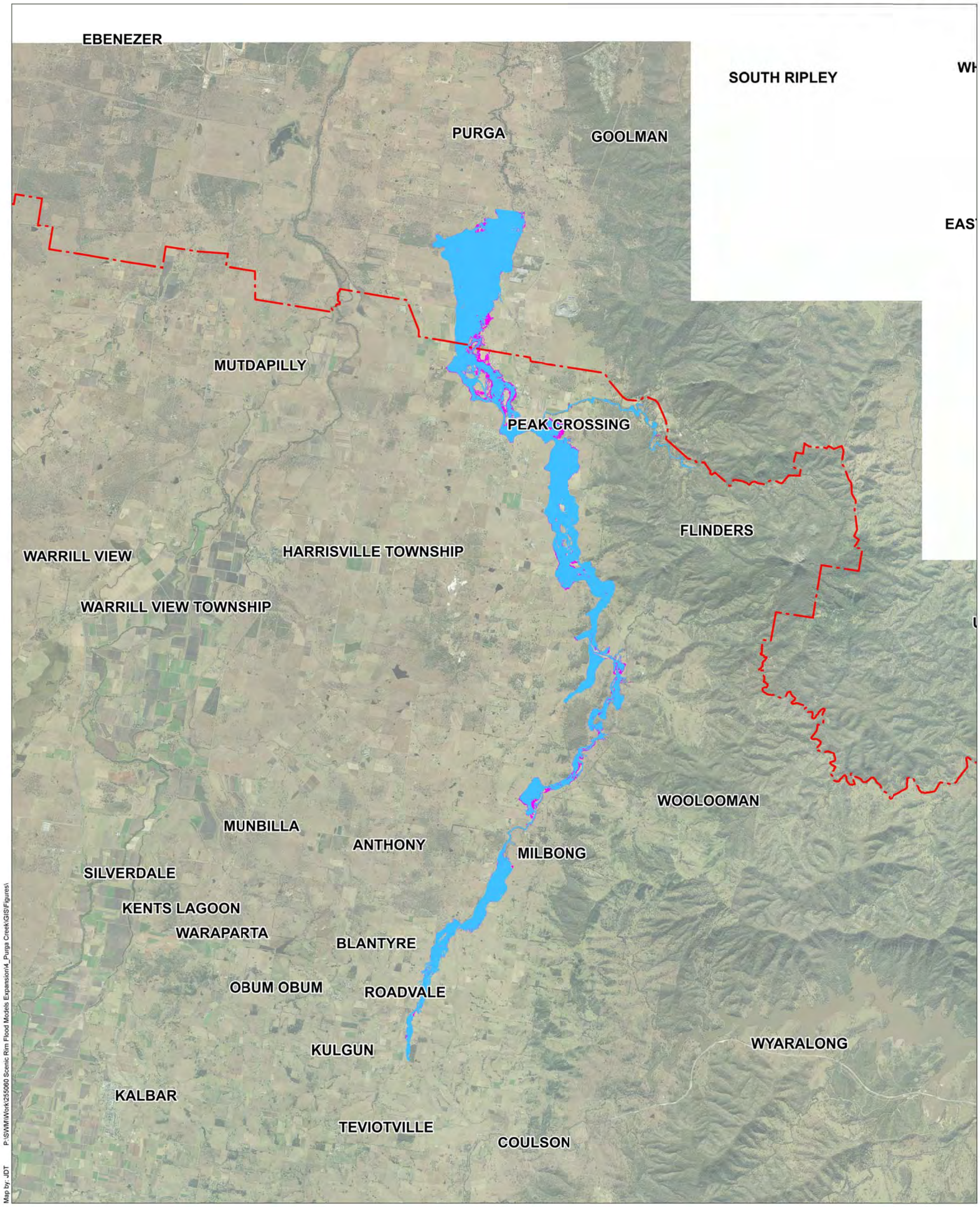
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C4-d**

2% AEP Event - Peak Hazard Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Existing Scenario Inundation Extents
- Climate Change Scenario 4.5 Inundation Extent

Notes:

1:100,000

0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

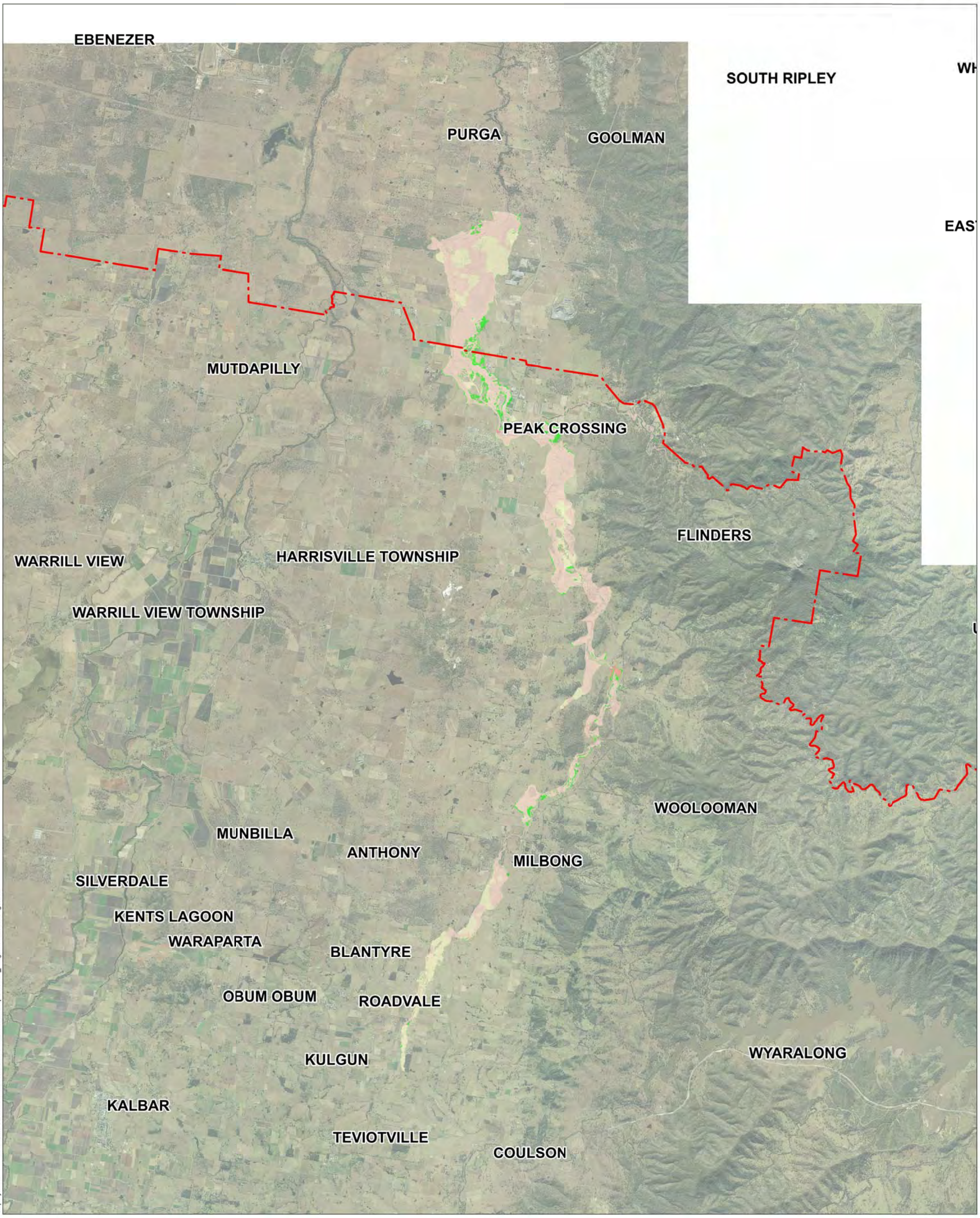
Purga Creek Flood Study

Figure C5-a

Climate Change Scenario 4.5 - 2% AEP Event Inundation Extent

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

- SRRC Boundary
- Cadastral Boundary

Afflux (m)

- < -0.80
- -0.80 to -0.60
- -0.60 to -0.40
- -0.40 to -0.20
- -0.20 to -0.03
- -0.03 to 0.03
- 0.03 to 0.20
- 0.20 to 0.40
- 0.40 to 0.60
- 0.60 to 0.80
- 0.80 to 1.20
- > 1.20
- Was Dry Now Wet
- Was Wet Now Dry

Notes:

1:100,000

0 2,500 m 5,000 m

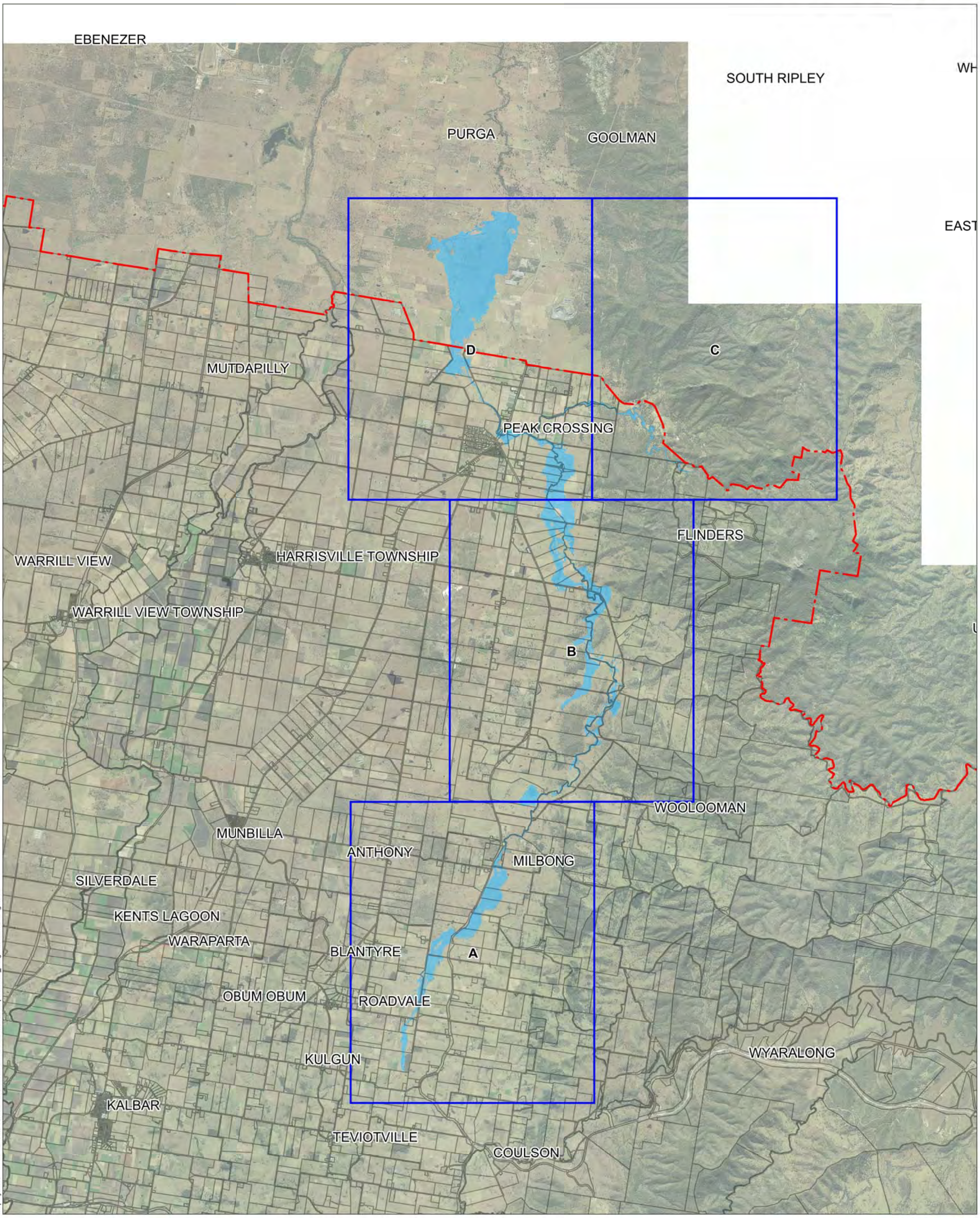
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure C5-b**

Climate Change Scenario 4.5 - 2% AEP Event Afflux map

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:100,000

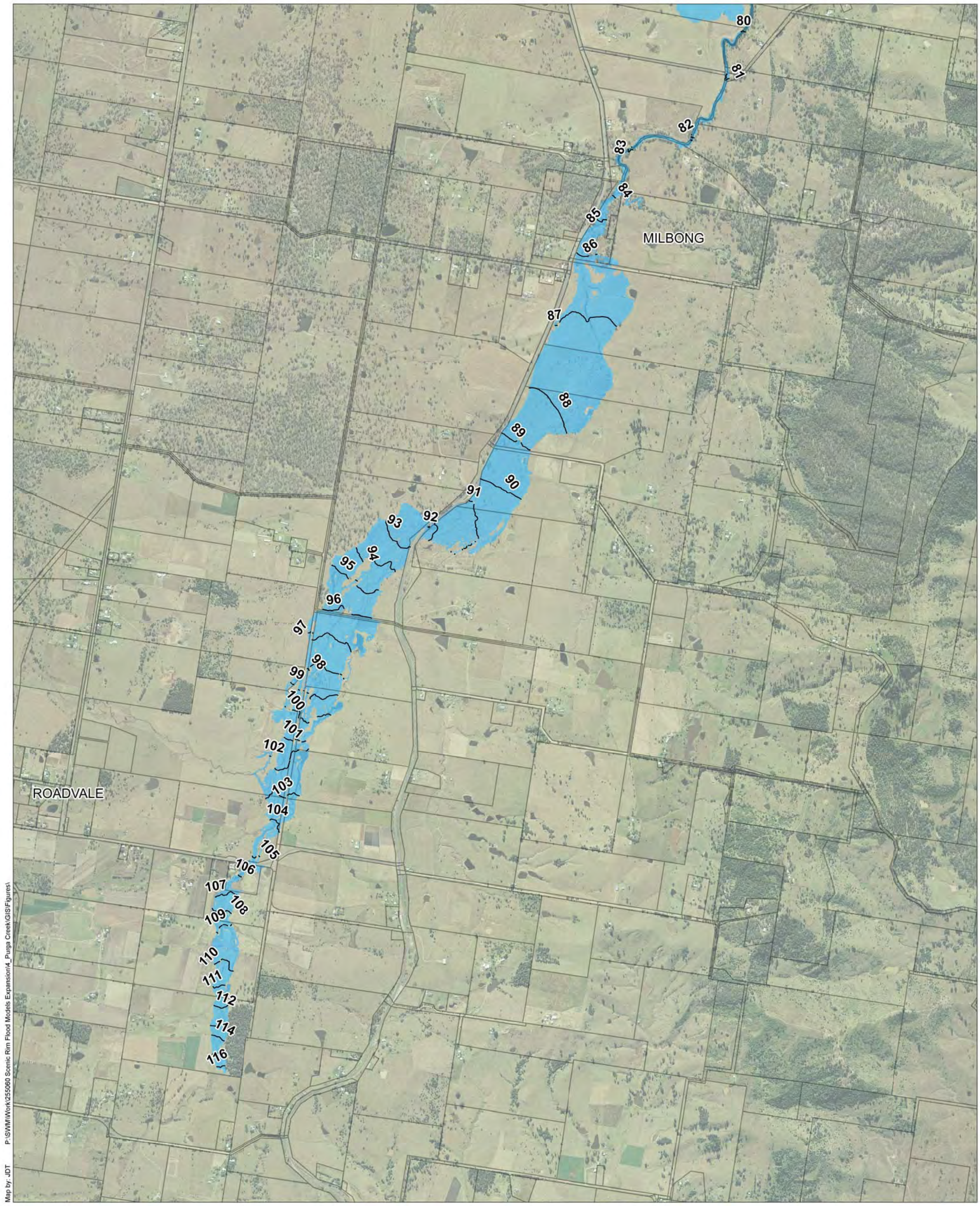
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D1**

5% AEP Event - Inundation Extent



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

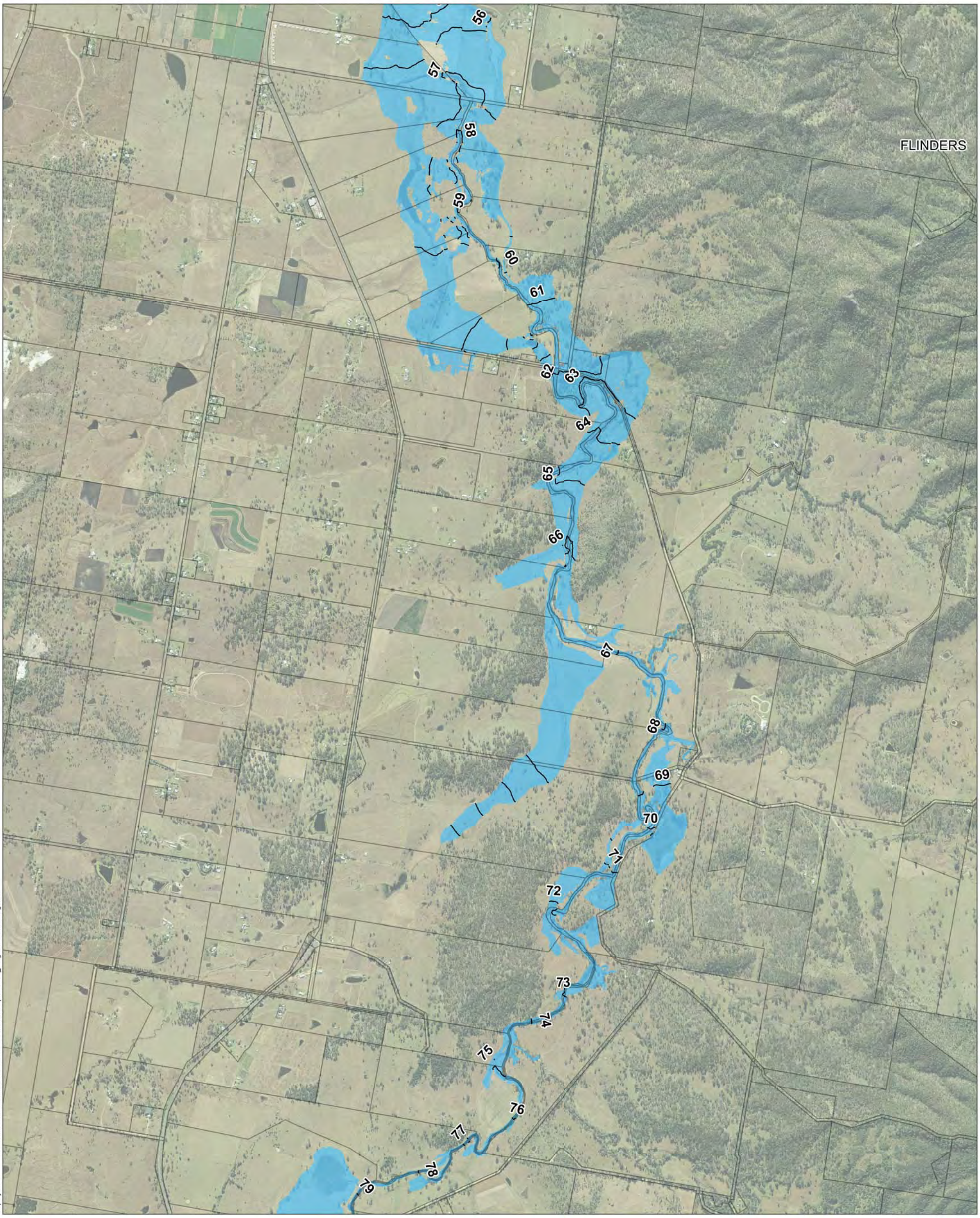
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D1-a**

5% AEP Event - Inundation Extent



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

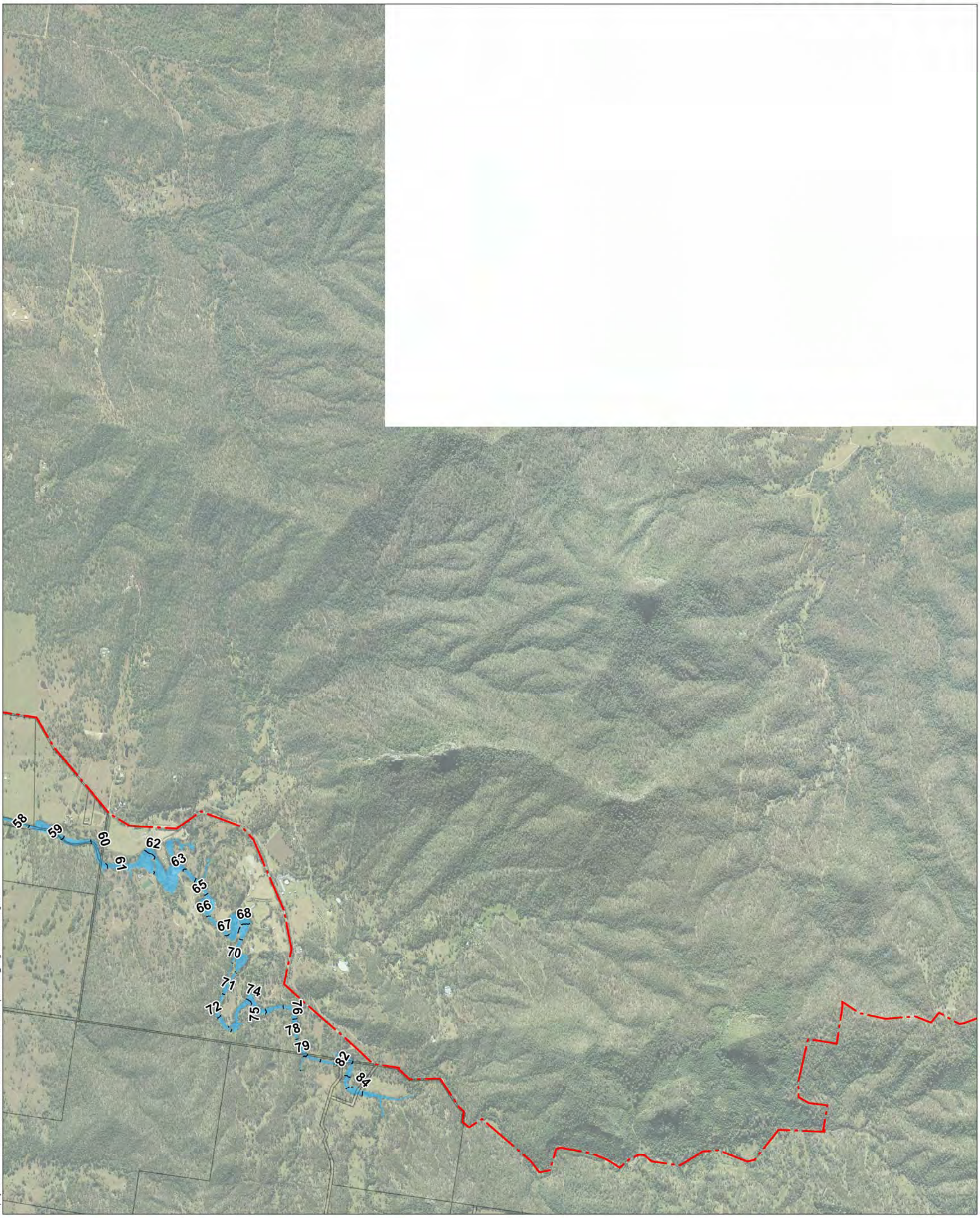
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D1-b**

5% AEP Event - Inundation Extent

aurecon



P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Map by: JDT

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

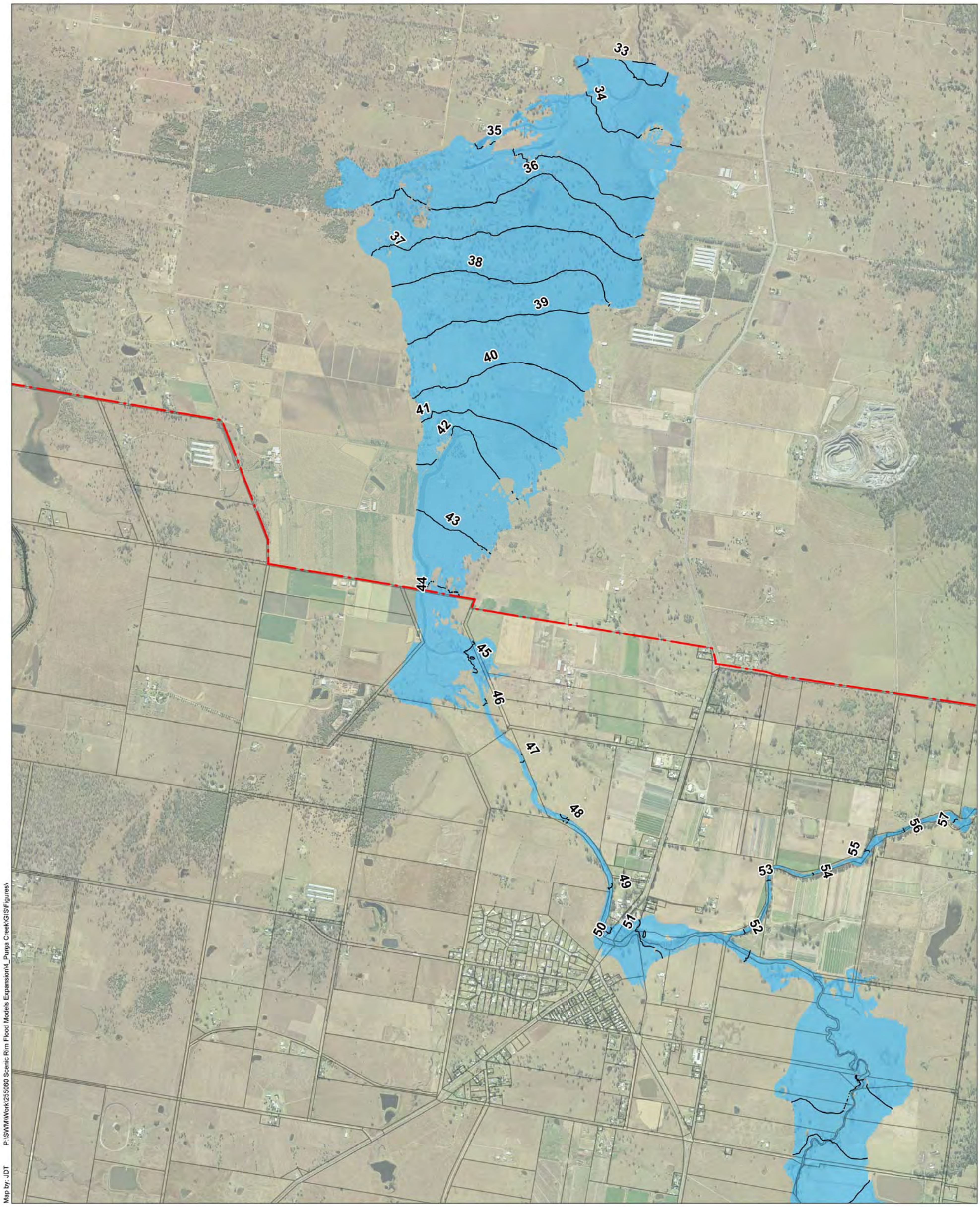
Projection: MGA Zone 56

Purga Creek Flood Study **Figure D1-c**

5% AEP Event - Inundation Extent

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

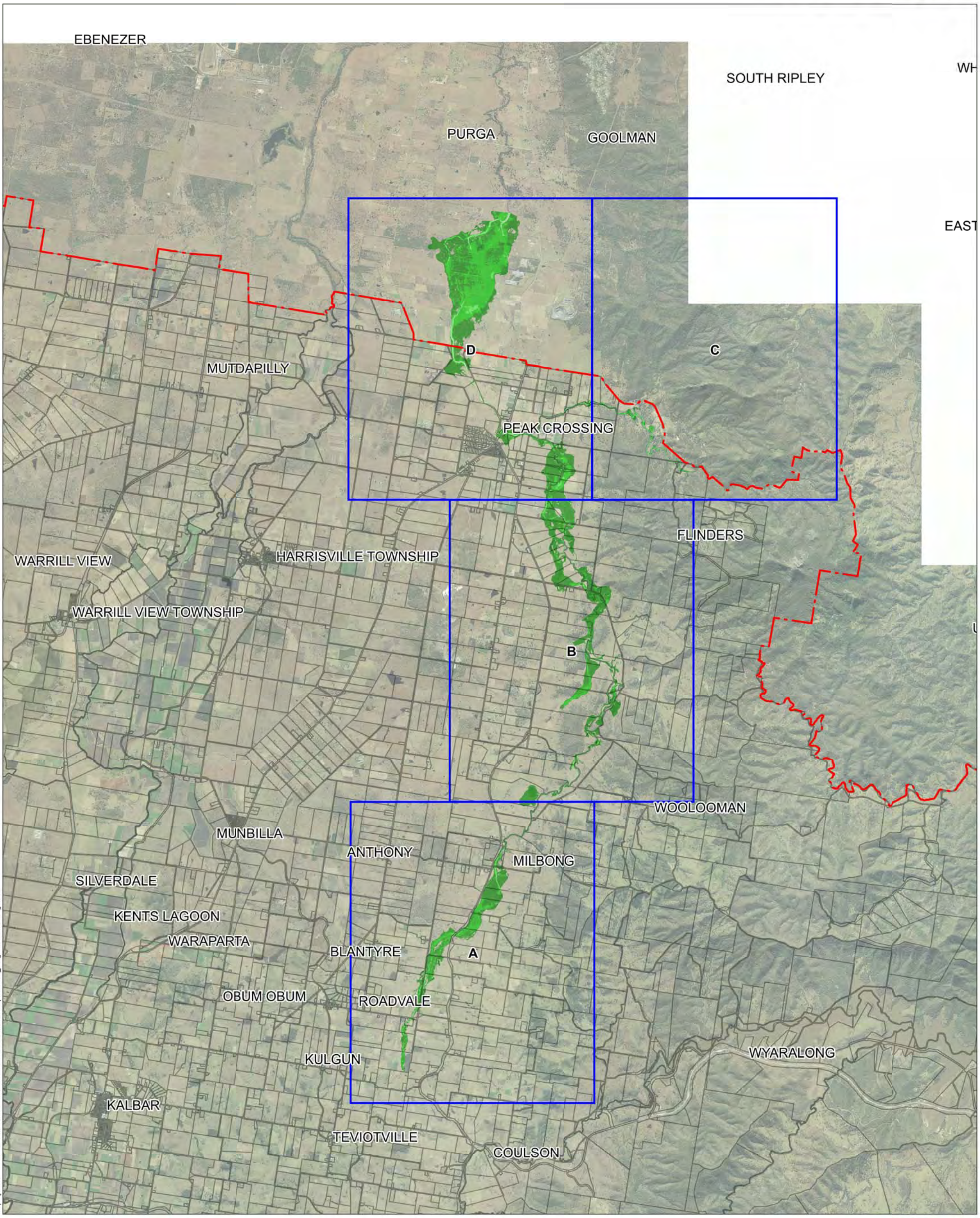
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D1-d**

5% AEP Event - Inundation Extent

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Velocity (m/s)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:100,000

0 2,500 m 5,000 m

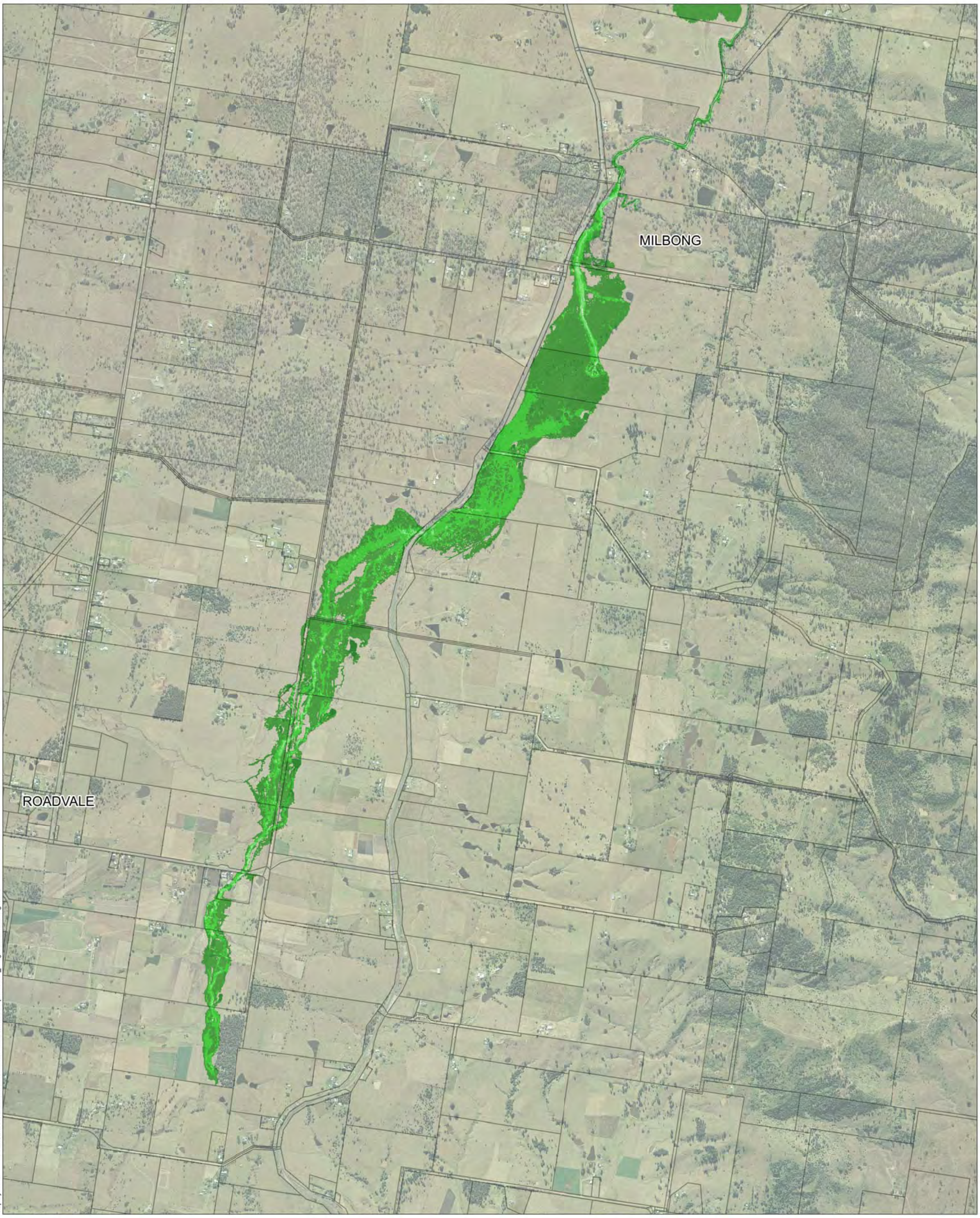
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D2**

5% AEP Event - Peak Velocities

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Velocity (m/s)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

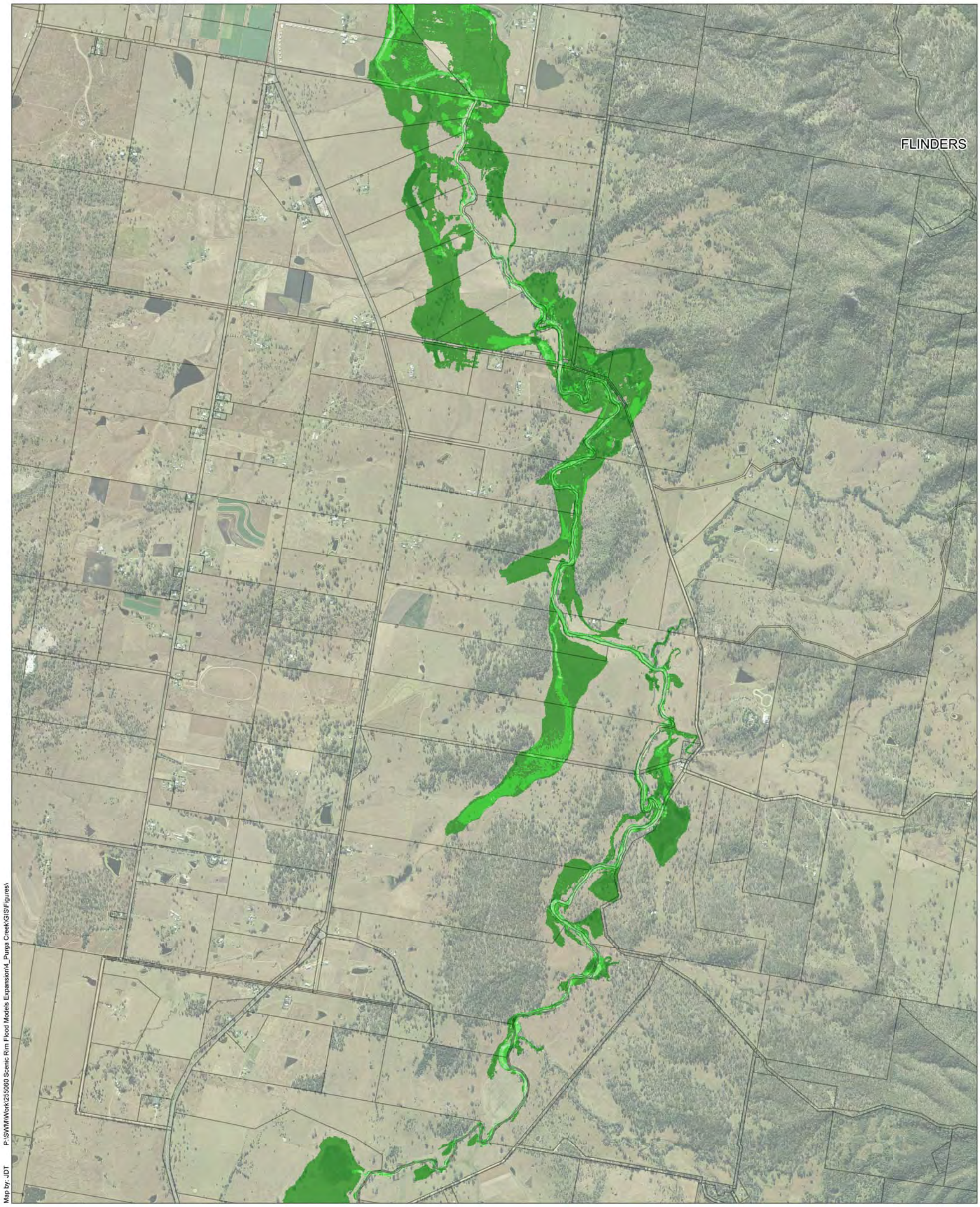
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D2-a**

5% AEP Event - Peak Velocities



Legend

Velocity (m/s)

SRRC Boundary	0.0 to 0.5
Cadastral Boundary	0.5 to 1.0
	1.0 to 1.5
	1.5 to 2.0
	2.0 to 2.5
	2.5 to 3.0
	3.0 to 3.5
	3.5 to 4.0
	4.0 to 4.5
	4.5 to 5.0
	> 5.0

Notes:

1:25,000

0 625 m 1,250 m

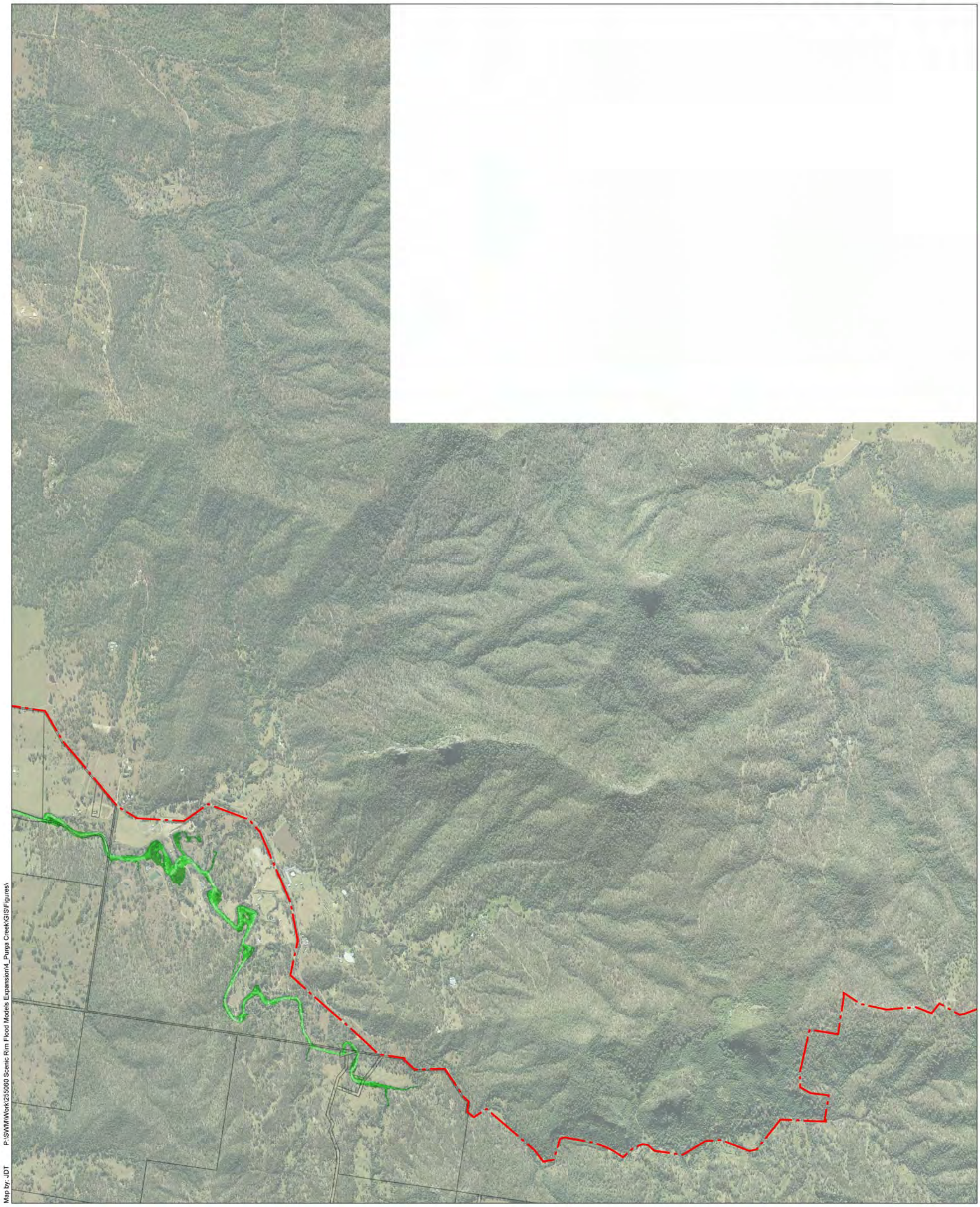
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D2-b**

5% AEP Event - Peak Velocities

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

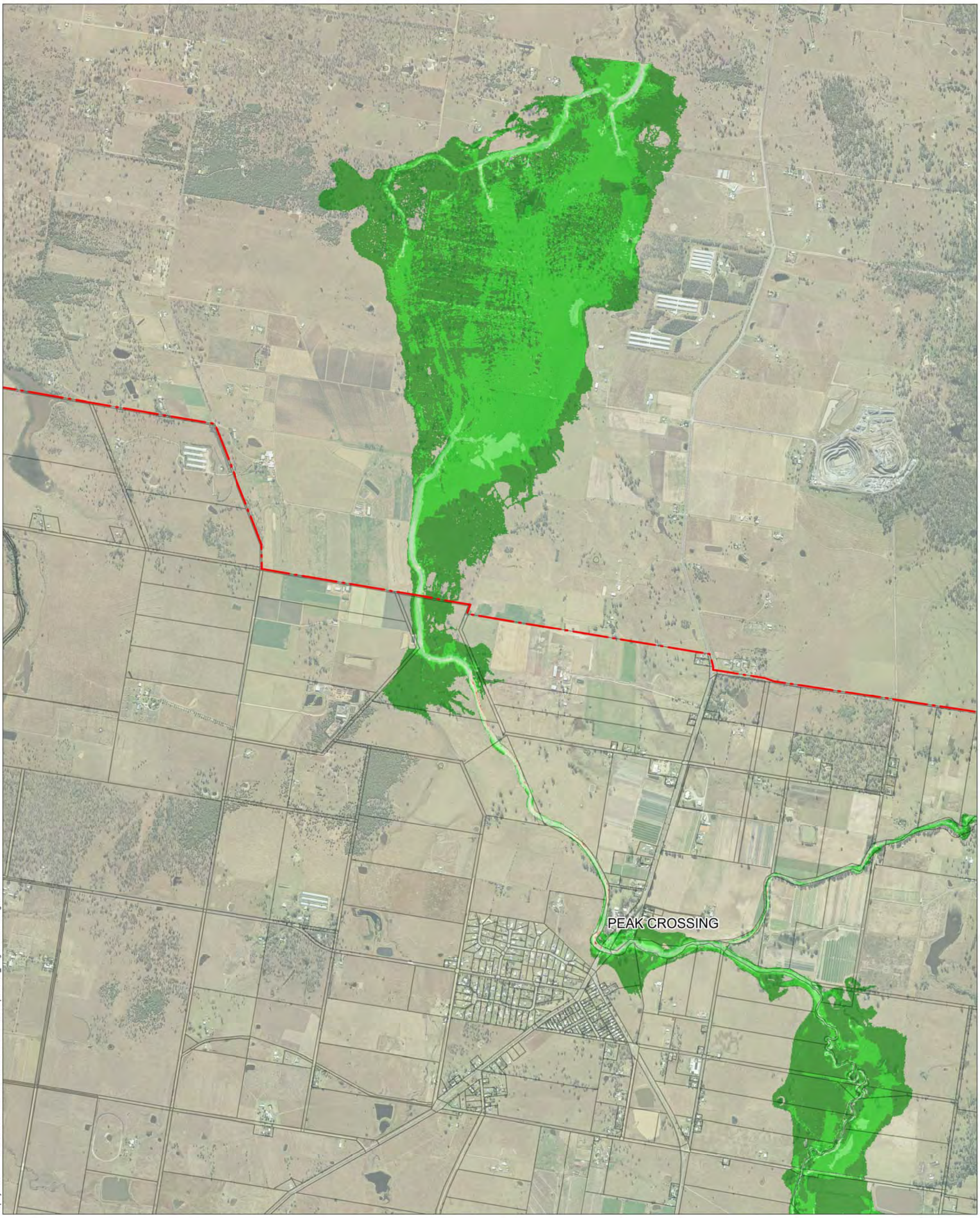
1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure D2-c**

5% AEP Event - Peak Velocities

aurecon



Legend

SRRC Boundary
Cadastral Boundary

Velocity (m/s)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

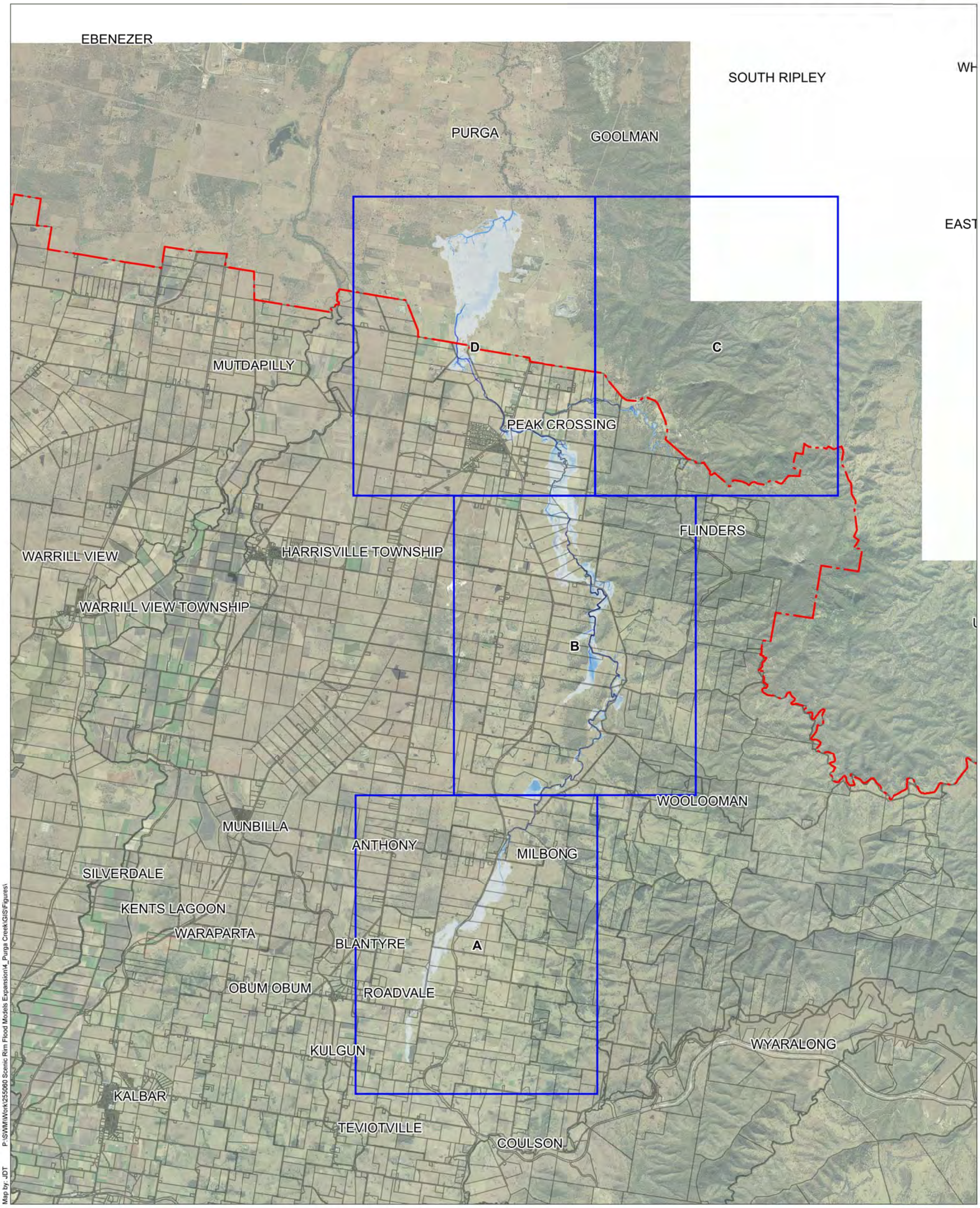
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D2-d**

5% AEP Event - Peak Velocities



Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:100,000

0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D3**

5% AEP Event - Peak Depth Map

aurecon

Legend

Depth (m)

- SRRC Boundary
- Cadastral Boundary

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

0 625 m 1,250 m

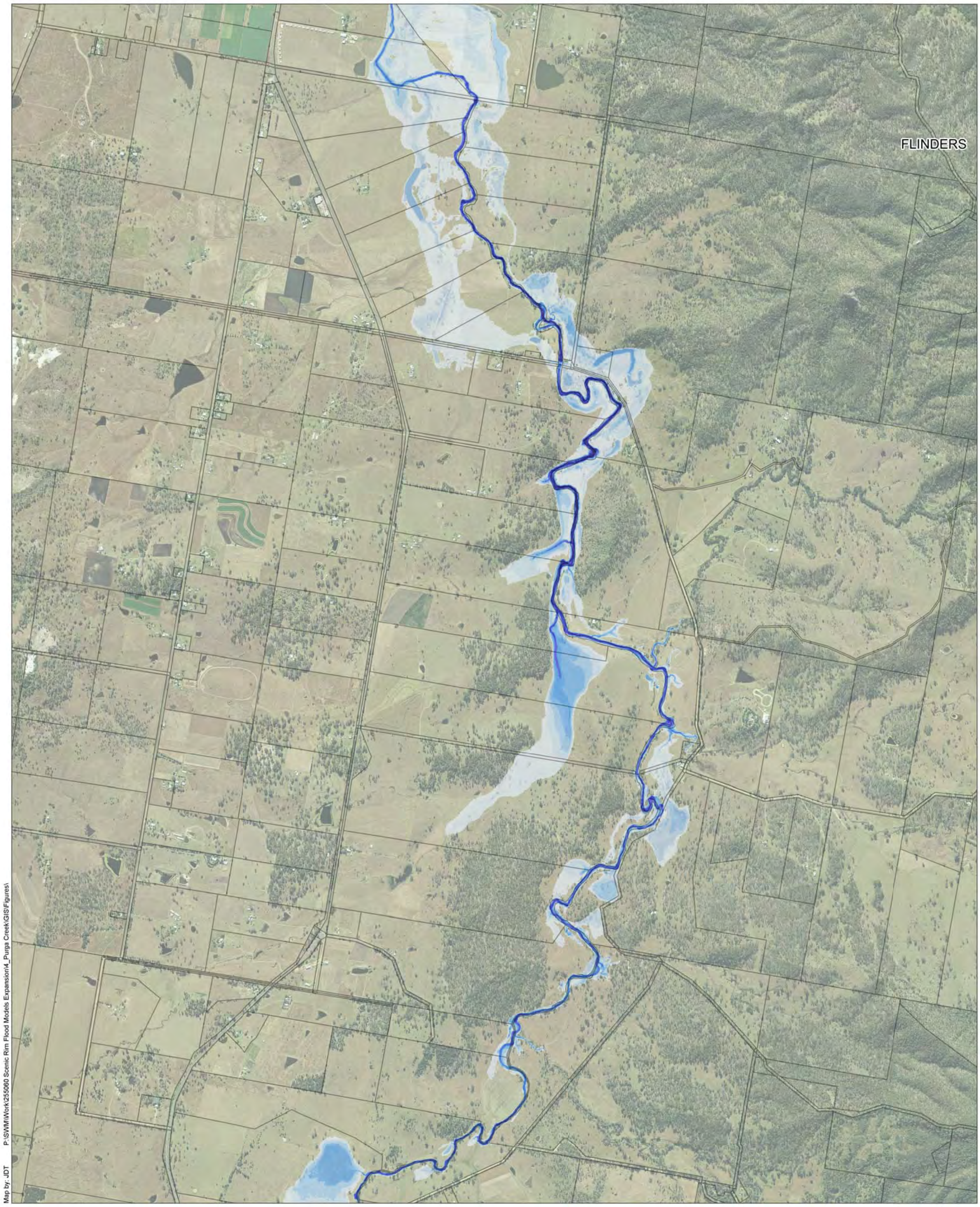
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D3-a**

5% AEP Event - Peak Depth Map

aurecon



Legend

Depth (m)

SRRC Boundary	0.0 to 0.5
Cadastral Boundary	0.5 to 1.0
	1.0 to 1.5
	1.5 to 2.0
	2.0 to 2.5
	2.5 to 3.0
	3.0 to 3.5
	3.5 to 4.0
	4.0 to 4.5
	4.5 to 5.0
	> 5.0

Notes:

1:25,000

0 625 m 1,250 m

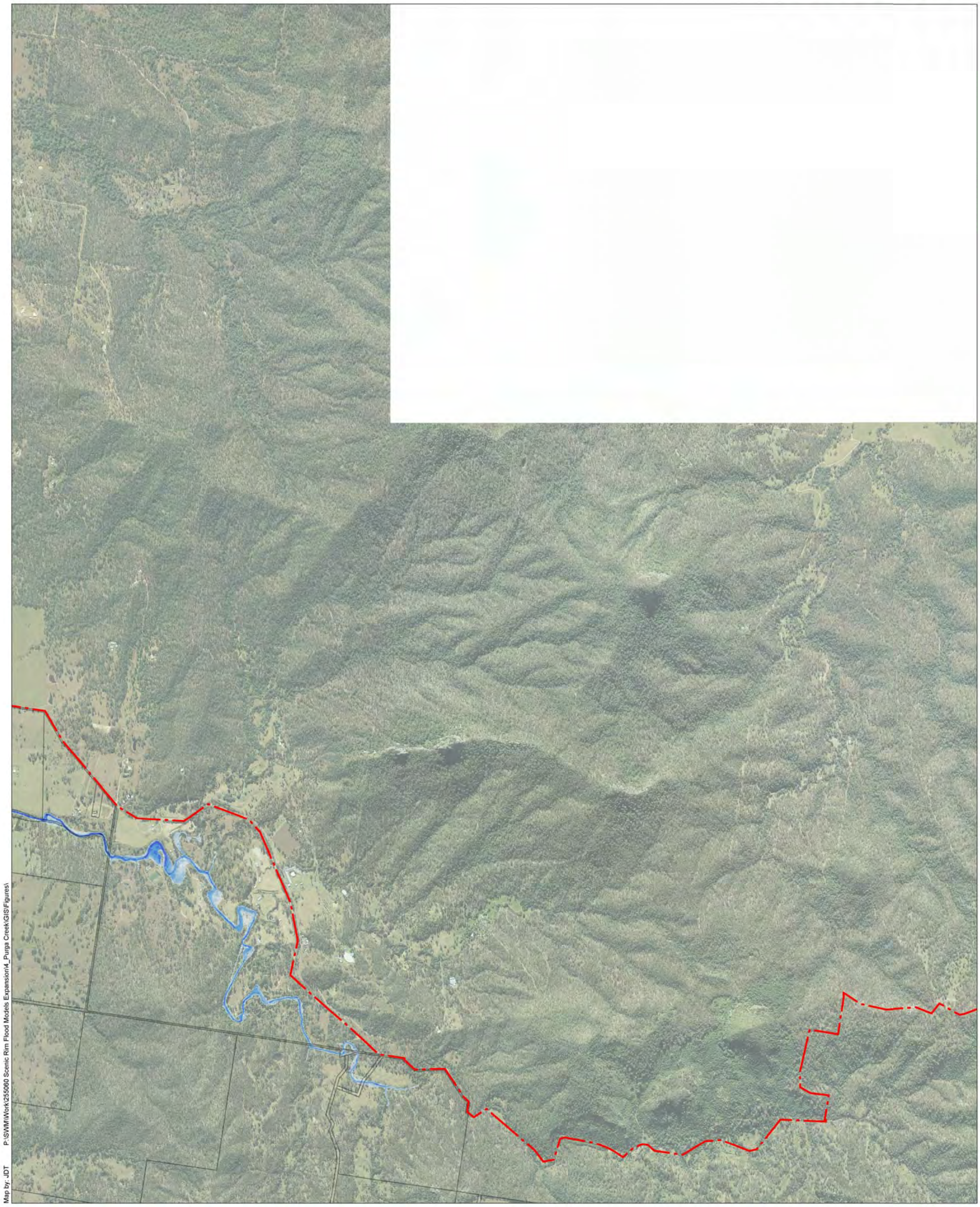
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D3-b**

5% AEP Event - Peak Depth Map

aurecon



Legend

Depth (m)

SRRC Boundary	0.0 to 0.5
Cadastral Boundary	0.5 to 1.0
	1.0 to 1.5
	1.5 to 2.0
	2.0 to 2.5
	2.5 to 3.0
	3.0 to 3.5
	3.5 to 4.0
	4.0 to 4.5
	4.5 to 5.0
	> 5.0

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D3-c**

5% AEP Event - Peak Depth Map

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

Legend

Depth (m)

- SRRC Boundary
- Cadastral Boundary
- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

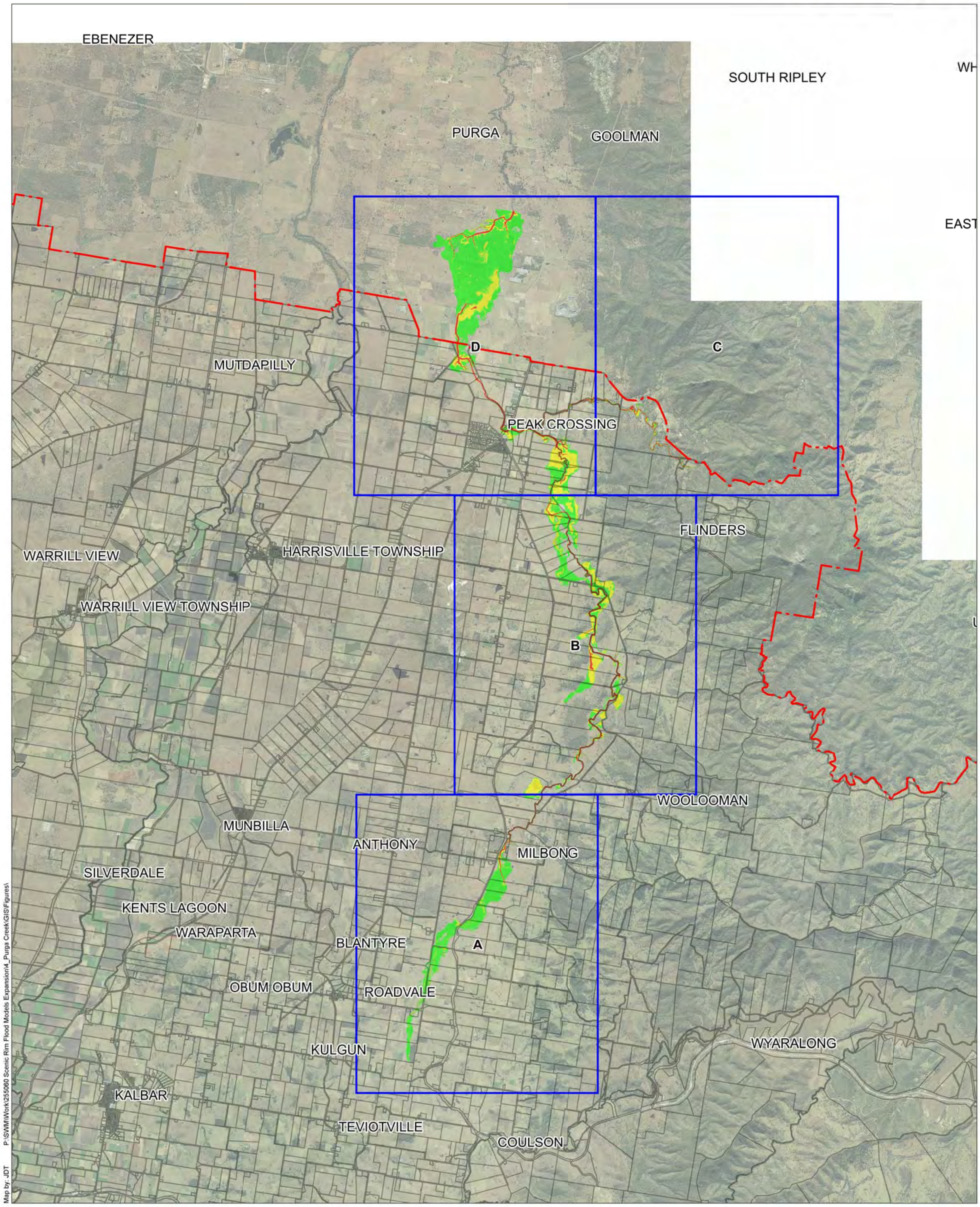
0 | 625 m | 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D3-d**

5% AEP Event - Peak Depth Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Low Hazard
- Medium Hazard
- High Hazard

Notes:

1:100,000

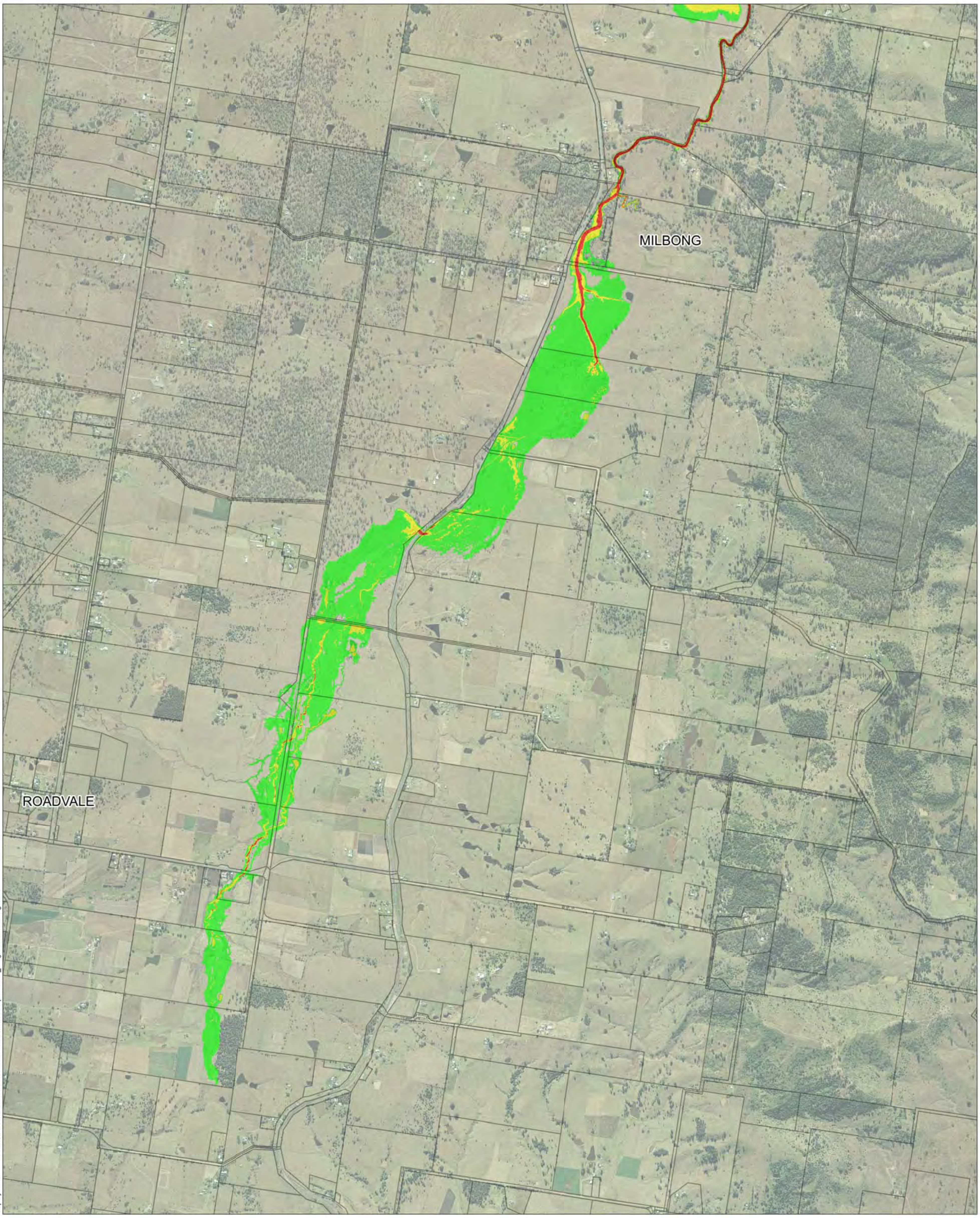
0 | 2,500 m | 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D4**

5% AEP Event - Peak Hazard Map



Map by: JDT   P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary
Cadastral Boundary
Low Hazard
Medium Hazard
High Hazard

Notes:

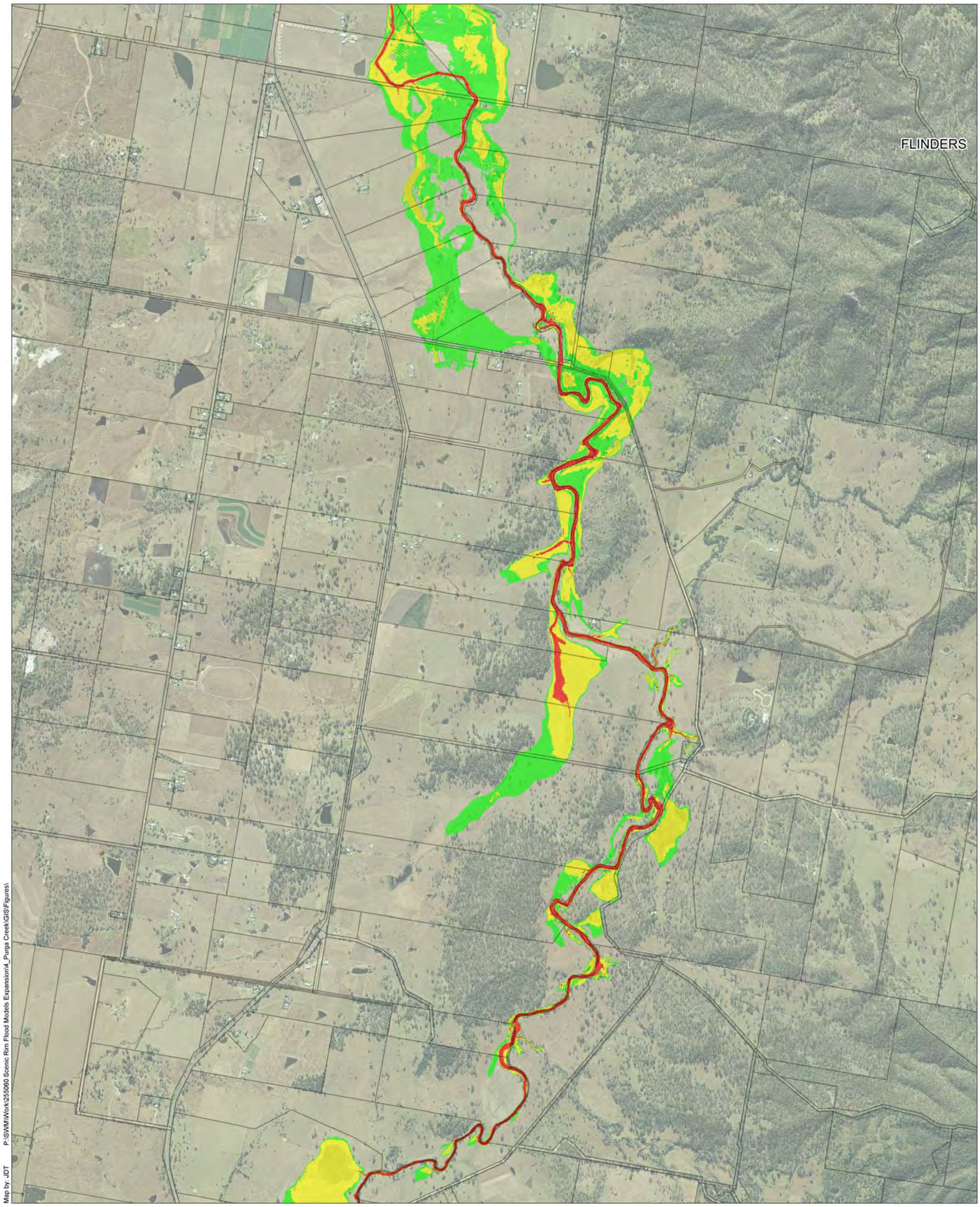
1:25,000
0   625 m   1,250 m

Date: 30/06/2017   Version: 1   Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study   **Figure D4-a**

5% AEP Event - Peak Hazard Map

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Low Hazard

Medium Hazard

High Hazard

Notes:

1:25,000

0 625 m 1,250 m

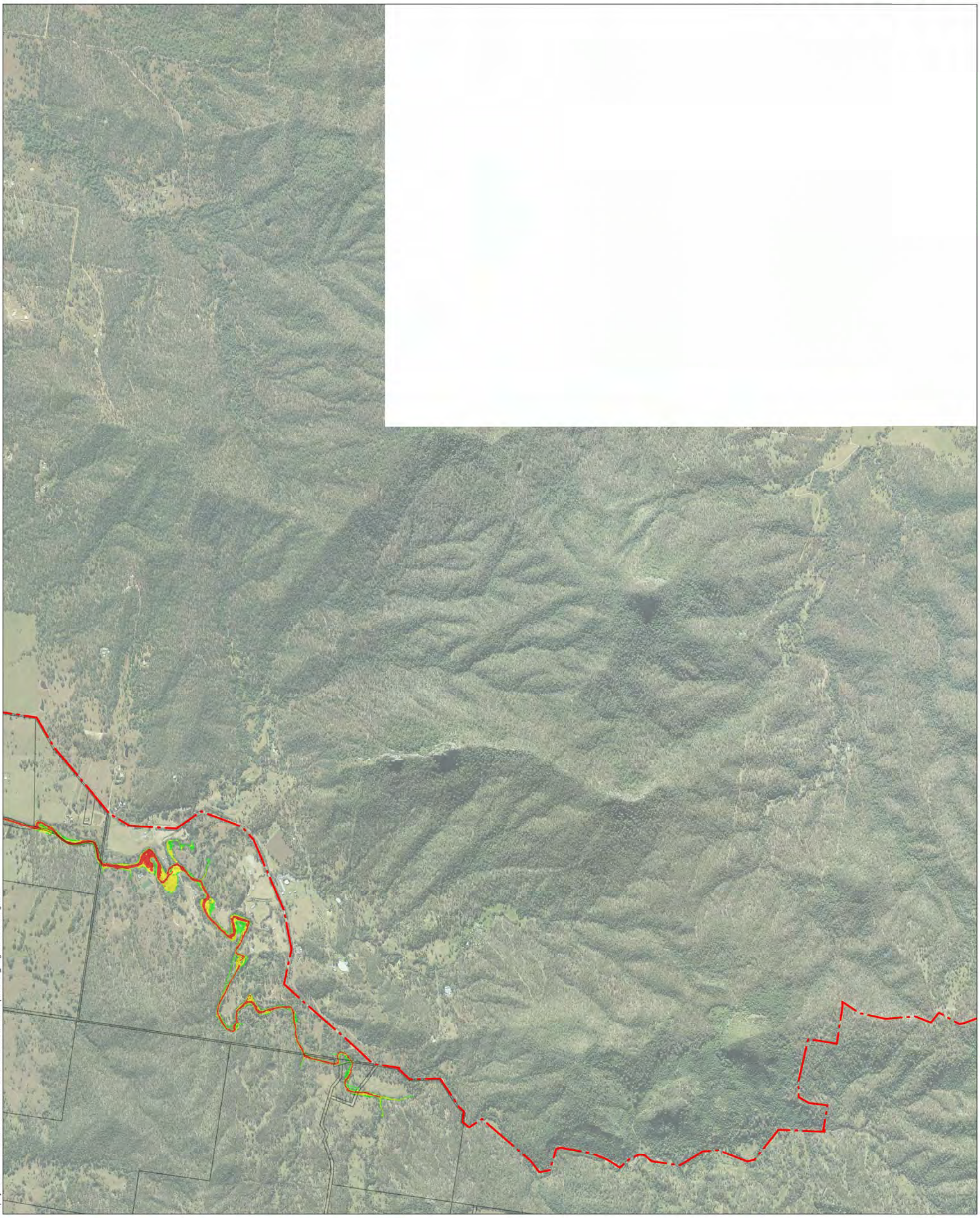
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study

Figure D4-b

5% AEP Event - Peak Hazard Map



Legend

SRRC Boundary
Cadastral Boundary

Low Hazard
Medium Hazard
High Hazard

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

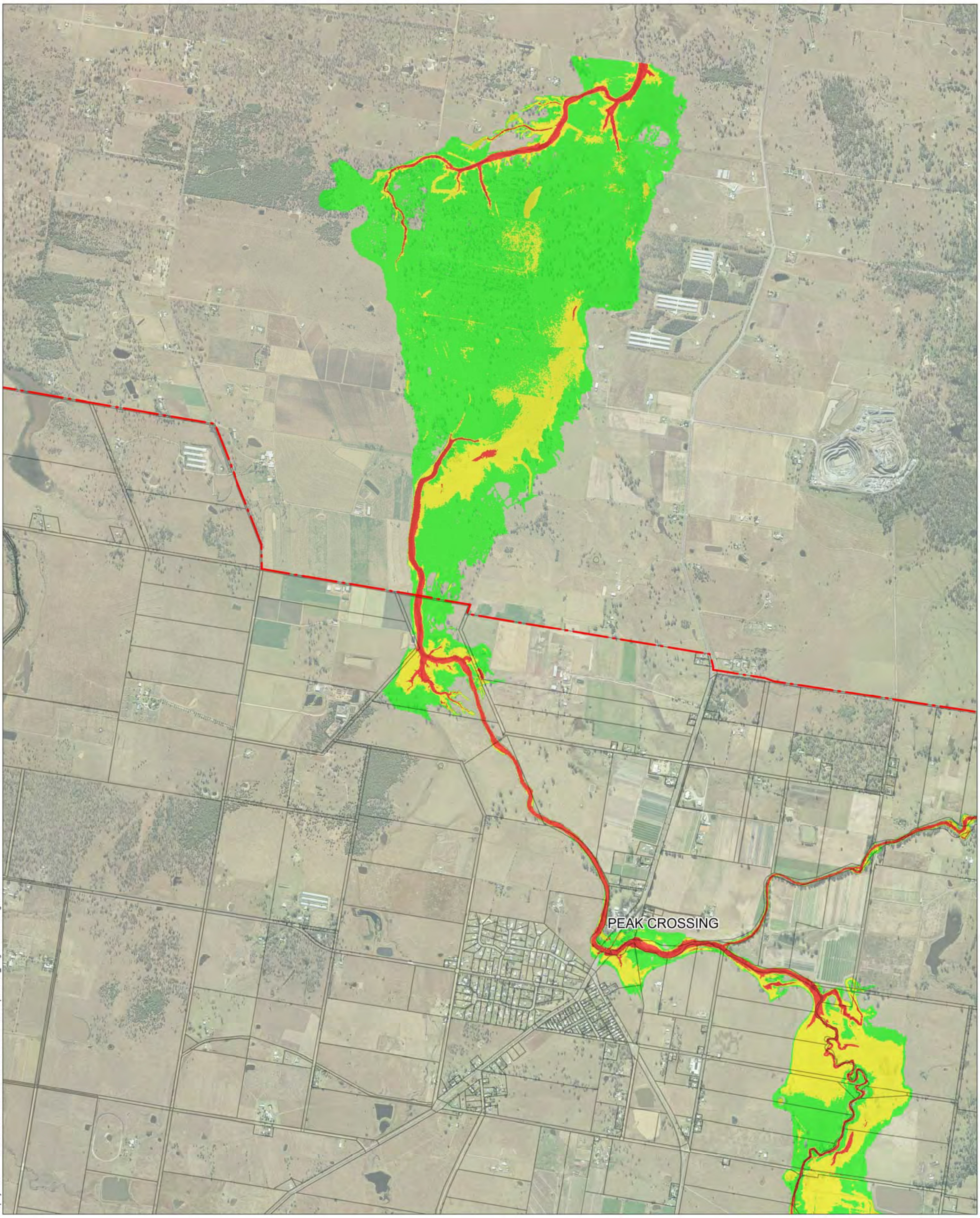
Projection: MGA Zone 56

Purga Creek Flood Study

Figure D4-c

5% AEP Event - Peak Hazard Map

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Low Hazard

Medium Hazard

High Hazard

Notes:

1:25,000

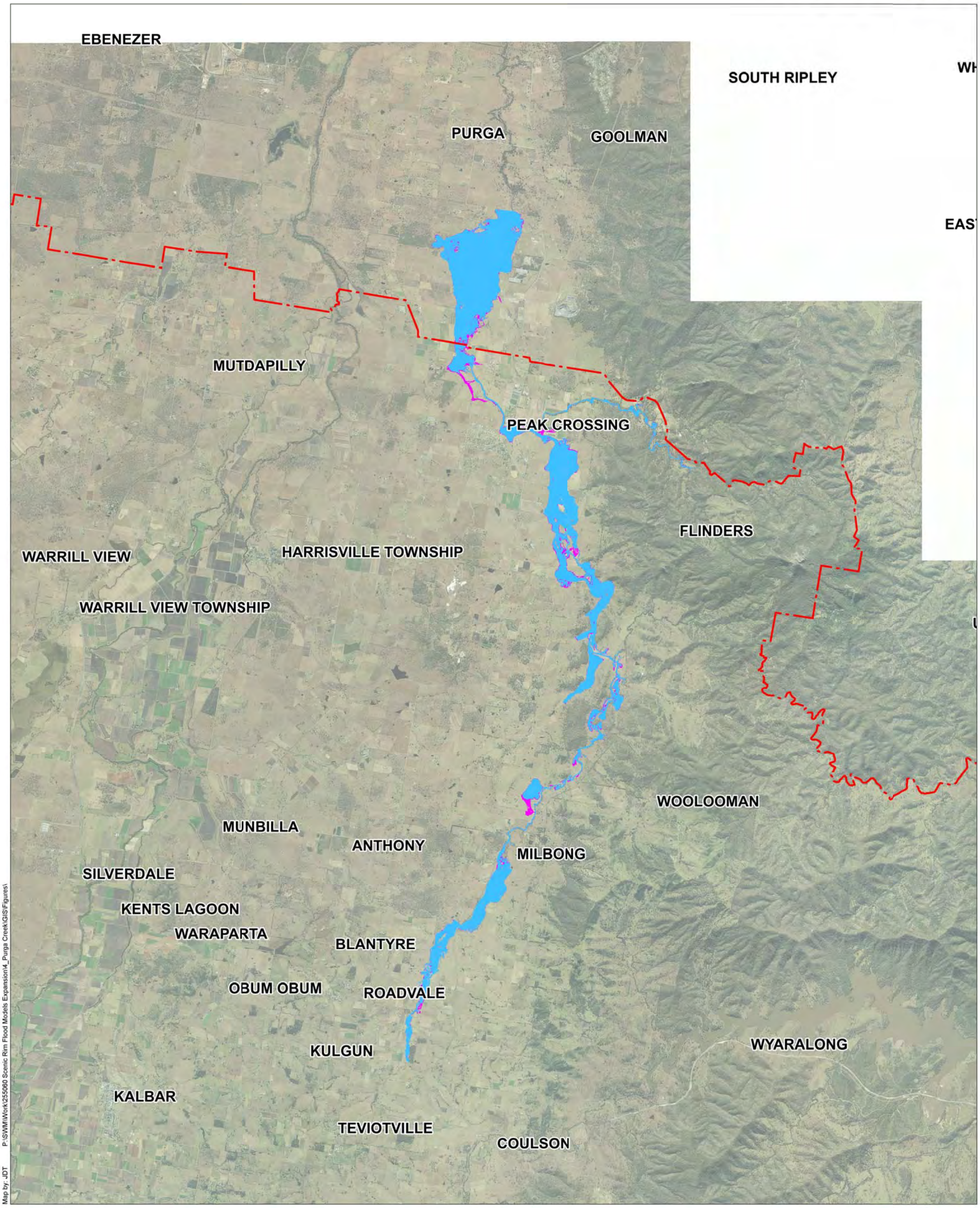
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D4-d**

5% AEP Event - Peak Hazard Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Existing Scenario Inundation Extents
- Climate Change Scenario 4.5 Inundation Extent

Notes:

1:100,000

0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure D5-a**

Climate Change Scenario 4.5 - 5% AEP Event Inundation Extent

aurecon

Map by: JDT

P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

- SRRC Boundary
- Cadastral Boundary

Afflux (m)

- < -0.80
- -0.80 to -0.60
- -0.60 to -0.40
- -0.40 to -0.20
- -0.20 to -0.03
- -0.03 to 0.03
- 0.03 to 0.20
- 0.20 to 0.40
- 0.40 to 0.60
- 0.60 to 0.80
- 0.80 to 1.20
- > 1.20
- Was Dry Now Wet
- Was Wet Now Dry

Notes:

1:100,000

0 | 2,500 m | 5,000 m

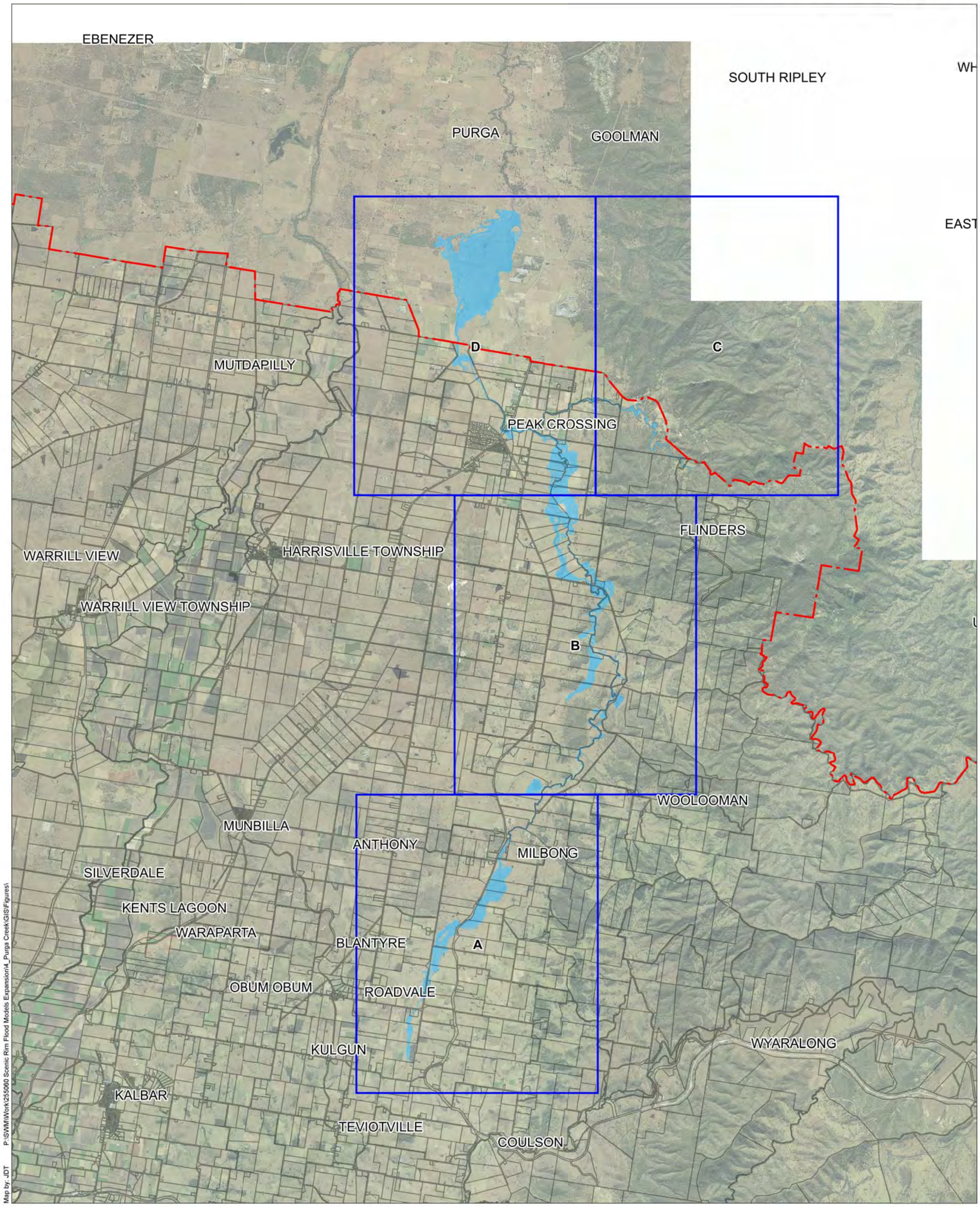
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study

Figure D5-b

Climate Change Scenario 4.5 - 5% AEP Event Afflux map



Legend

SRRC Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Cadastral Boundary

Notes:

1:100,000

0 2,500 m 5,000 m

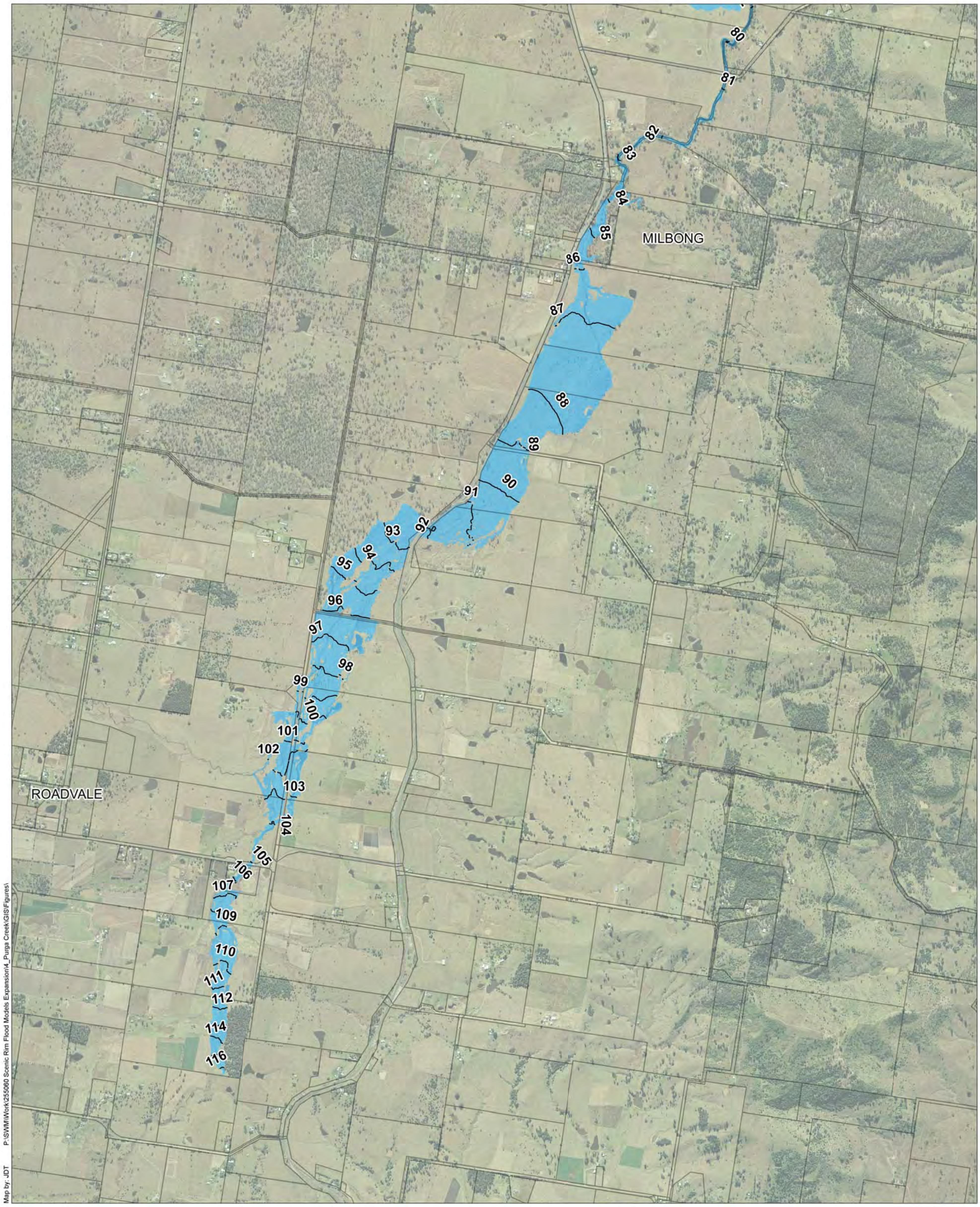
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E1**

10% AEP Event - Inundation Extent

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

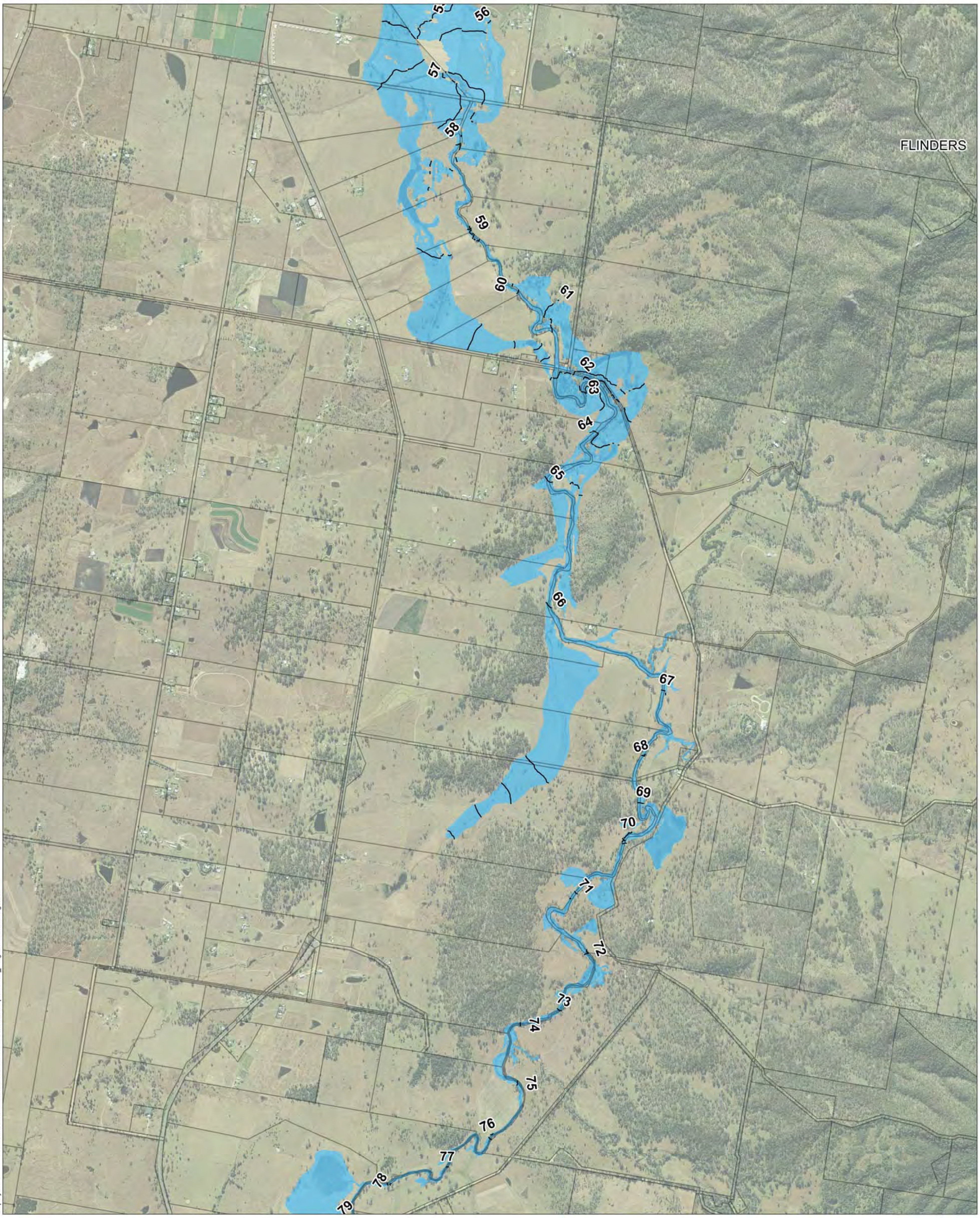
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E1-a**

10% AEP Event - Inundation Extent

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E1-b**

10% AEP Event - Inundation Extent

aurecon

Legend

SRRC Boundary

Cadastral Boundary

Inundation Extent

Peak Water level Contour (mAHD)

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

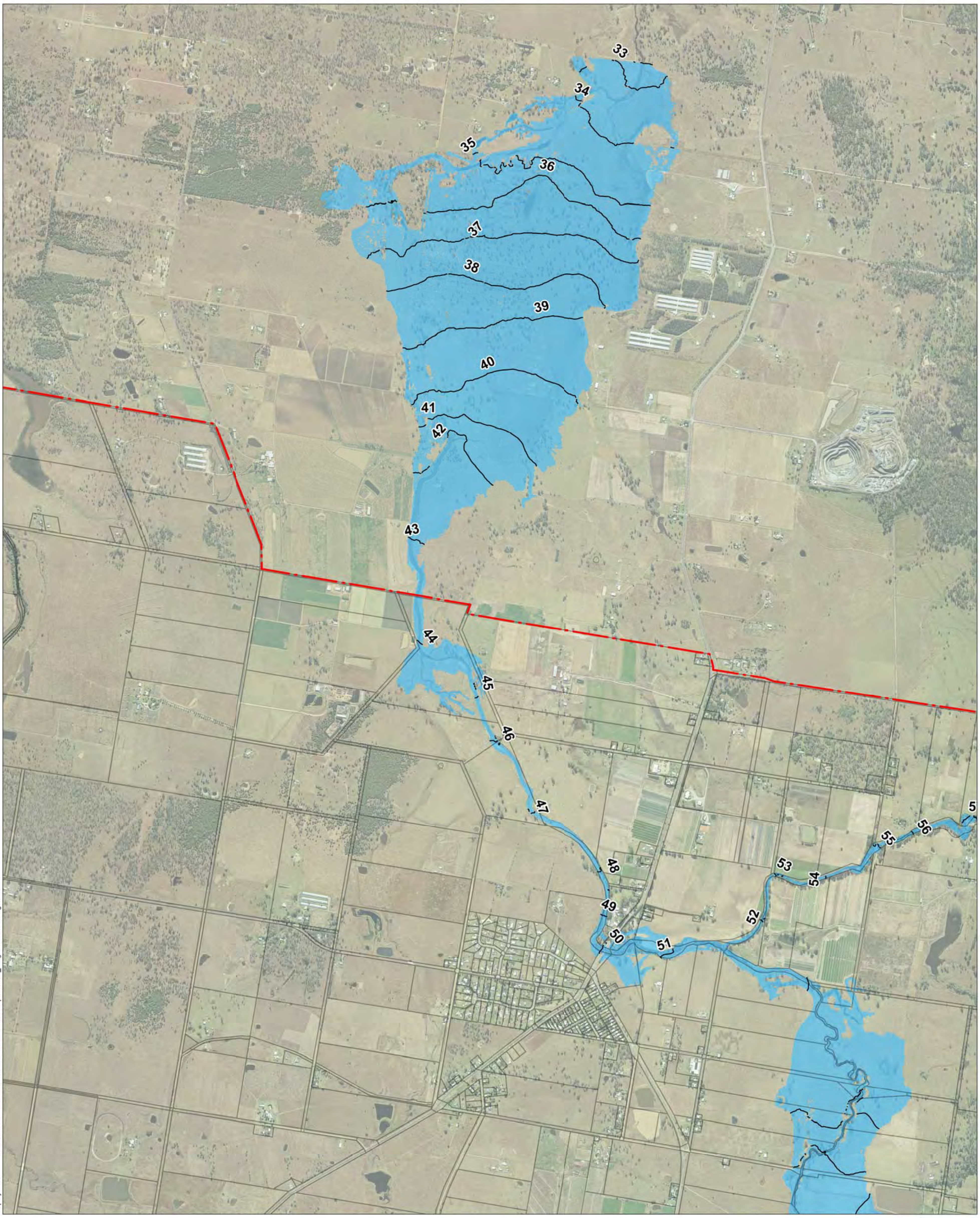
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E1-c**

10% AEP Event - Inundation Extent

Document Set ID: 10154453
Version: 1, Version Date: 21/12/2017

aurecon



Map by: JDT
P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary
Cadastral Boundary
Inundation Extent
Peak Water level Contour (mAHD)

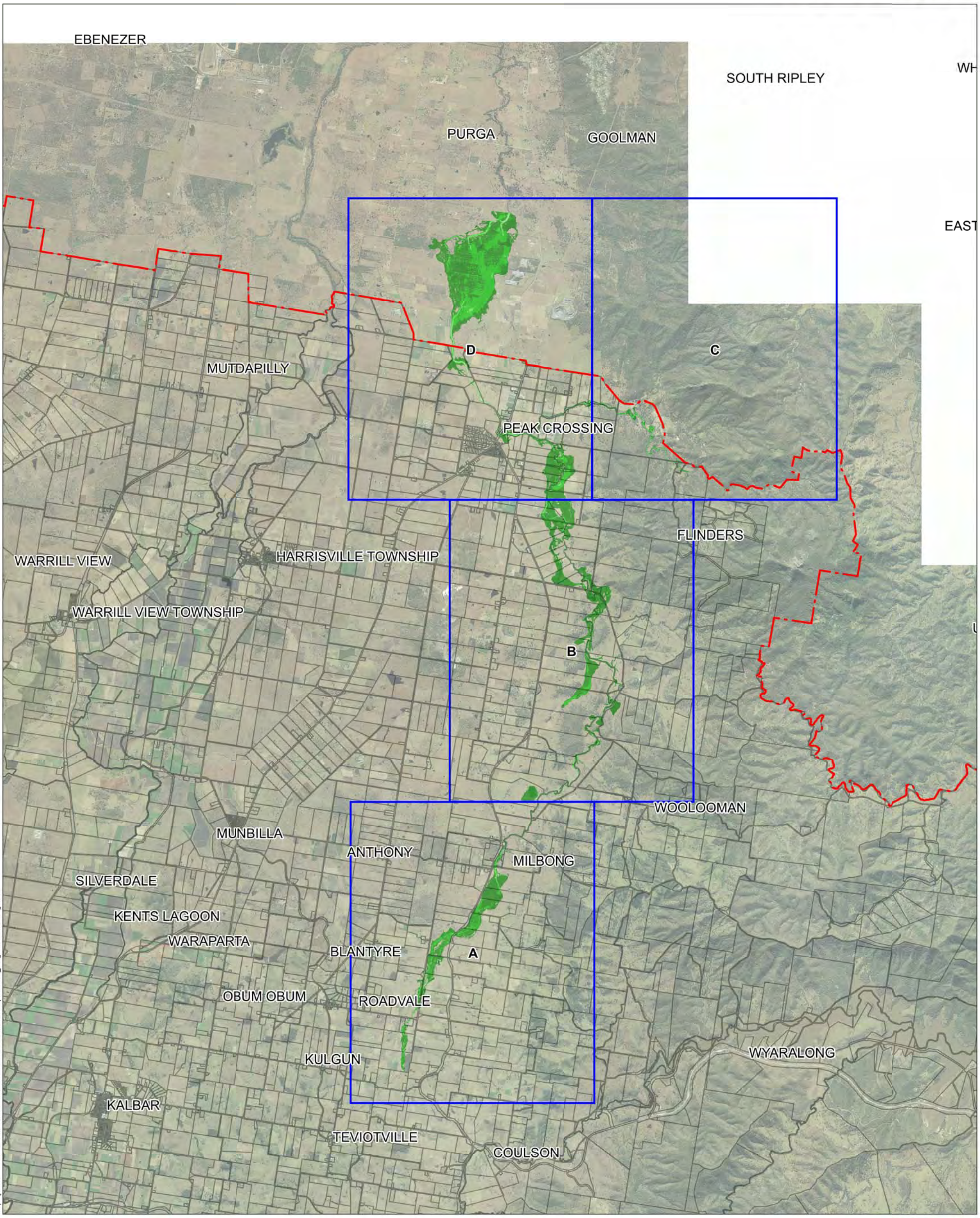
Notes:

1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E1-d**

10% AEP Event - Inundation Extent



Map by: JDT

P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Velocity (m/s)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:100,000

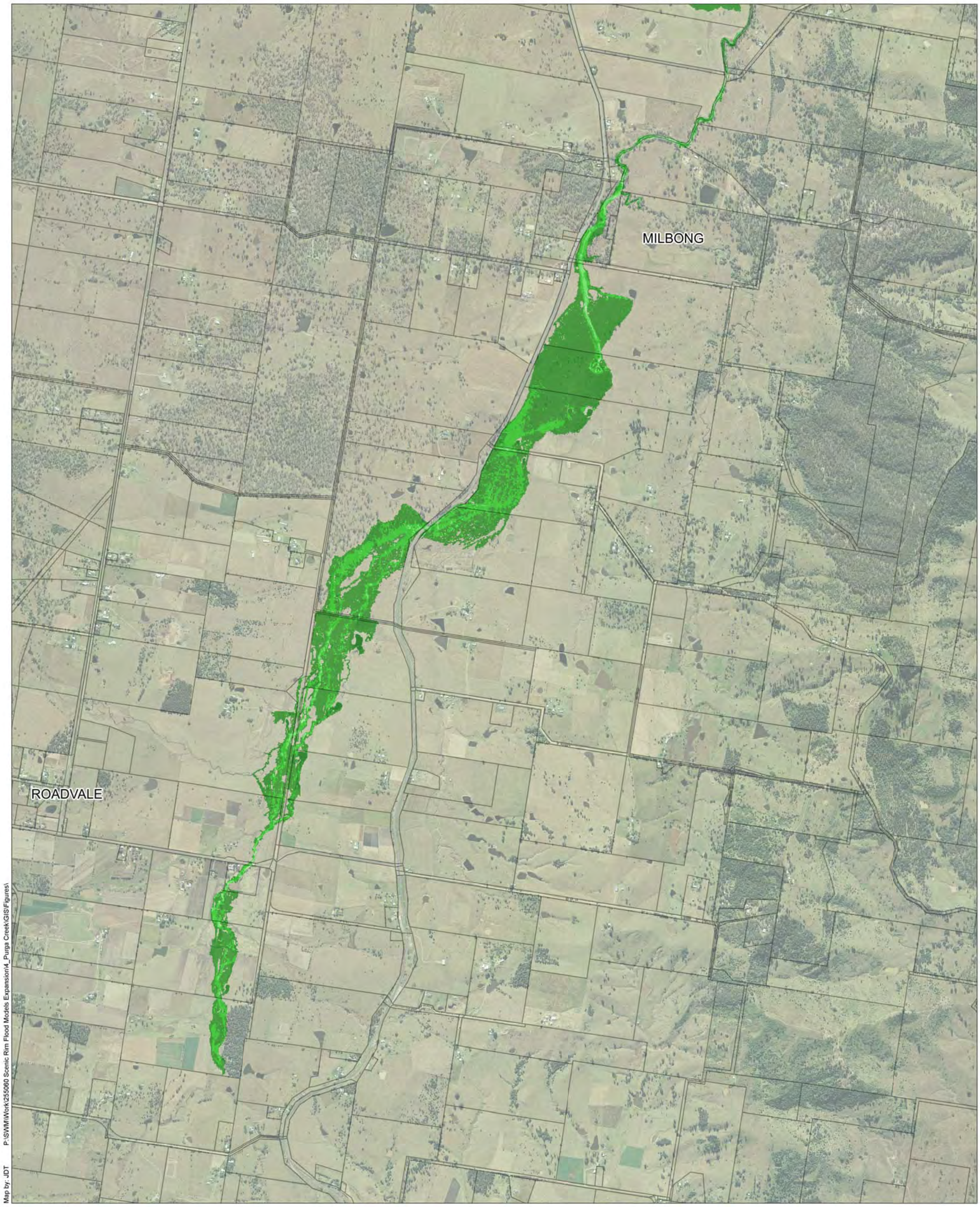
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E2**

10% AEP Event - Peak Velocities



Legend

Velocity (m/s)

SRRC Boundary

Cadastral Boundary

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

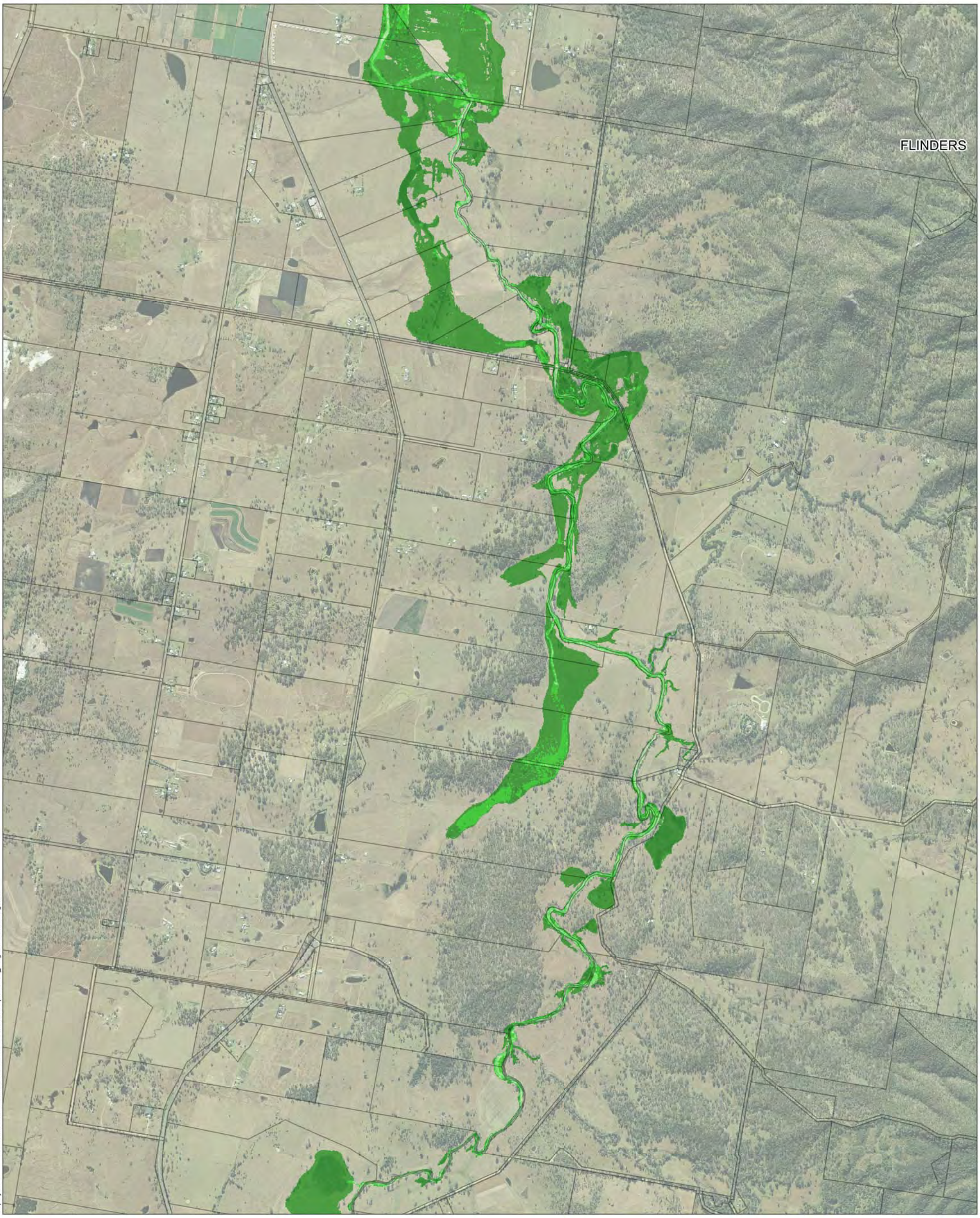
1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E2-a**

10% AEP Event - Peak Velocities

aurecon



Legend

Velocity (m/s)

- SRRC Boundary
- Cadastral Boundary

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

0 625 m 1,250 m

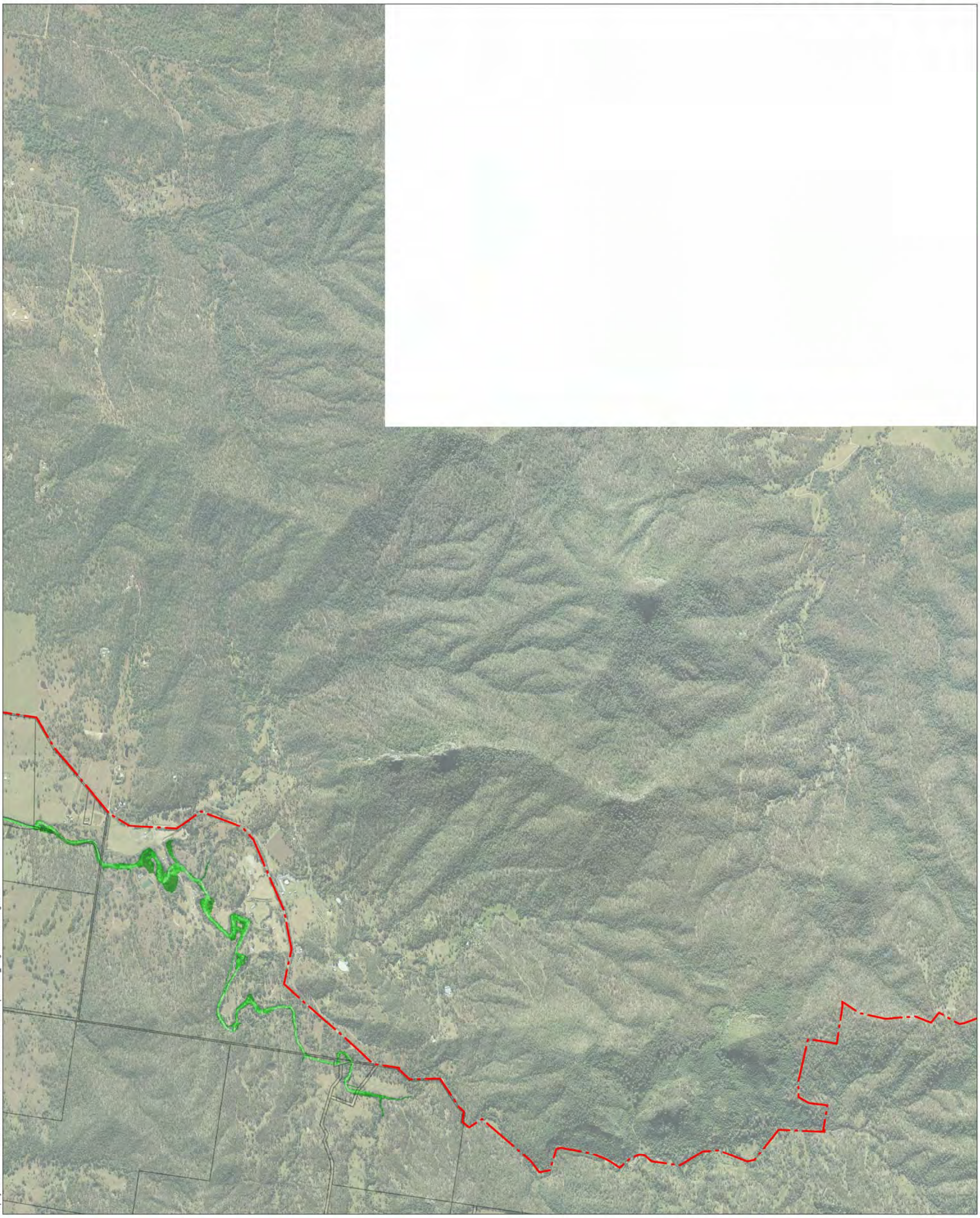
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E2-b**

10% AEP Event - Peak Velocities

aurecon



Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

Velocity (m/s)

- SRRC Boundary
- Cadastral Boundary

0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

1:25,000

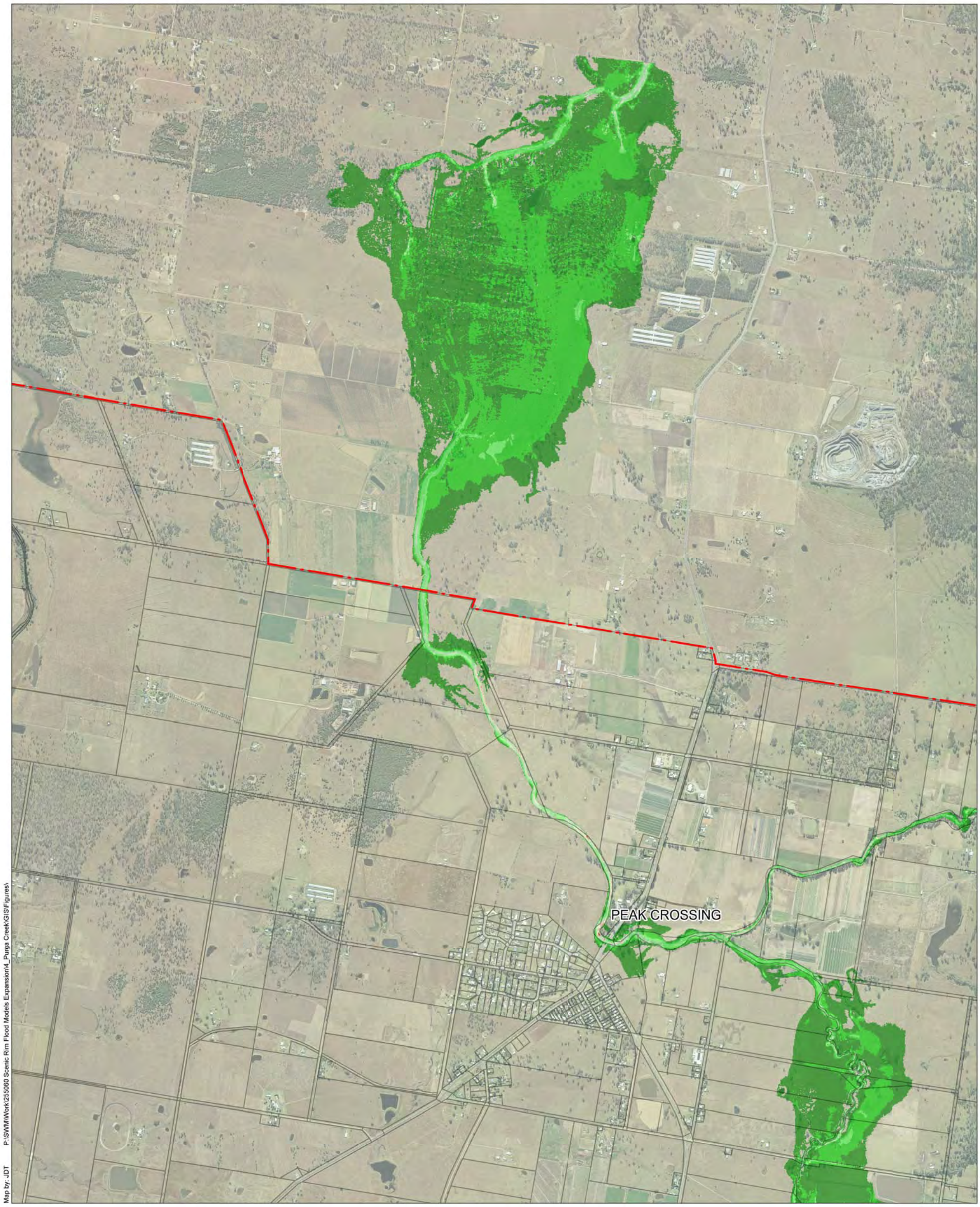
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E2-c**

10% AEP Event - Peak Velocities



Legend

Velocity (m/s)

- SRRC Boundary
- Cadastral Boundary

Velocity (m/s)	Velocity (m/s)
0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

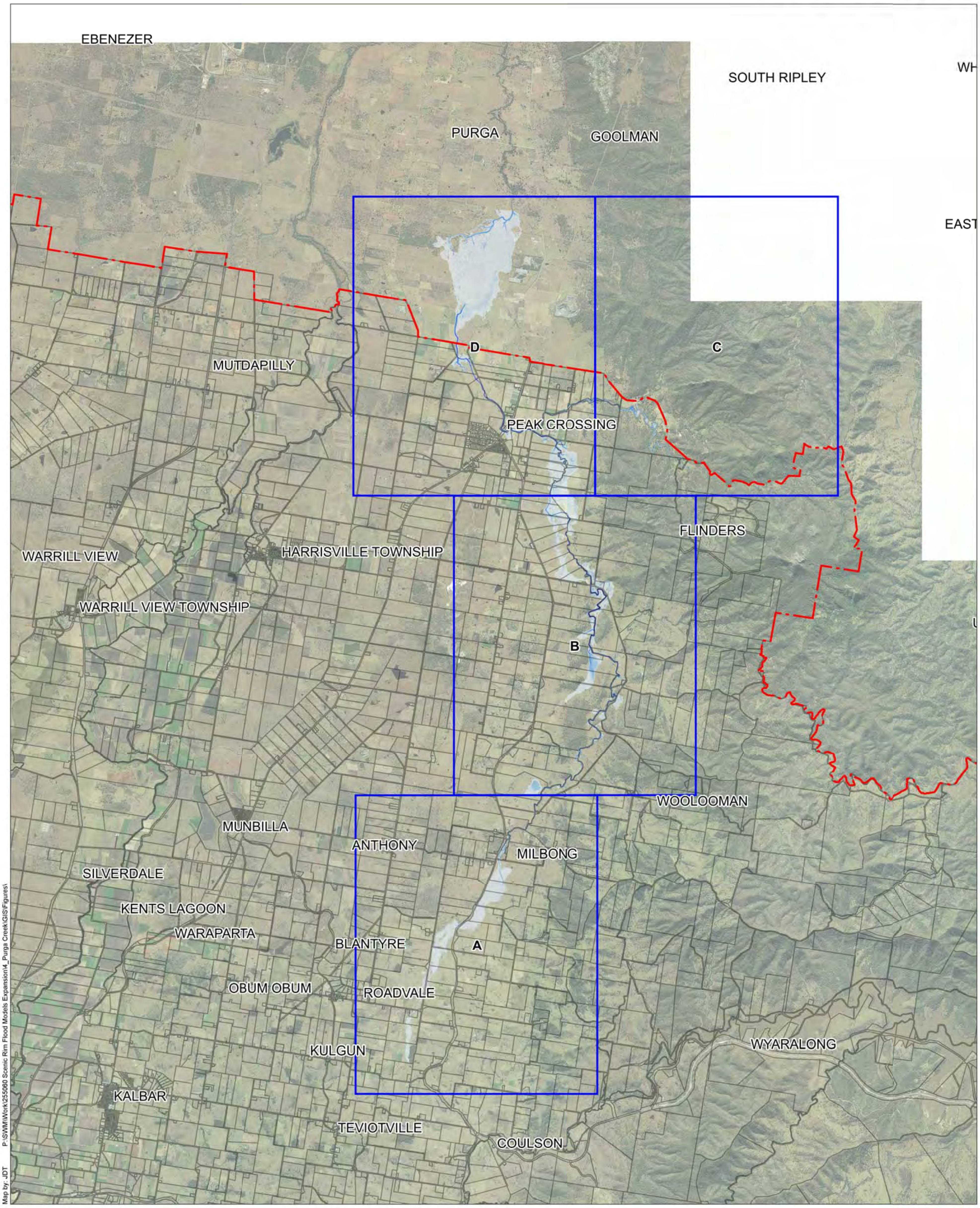
1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study Figure E2-d

10% AEP Event - Peak Velocities

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:100,000
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E3**

10% AEP Event - Peak Depth Map

aurecon

Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

0.0 to 0.5
0.5 to 1.0
1.0 to 1.5
1.5 to 2.0
2.0 to 2.5
2.5 to 3.0
3.0 to 3.5
3.5 to 4.0
4.0 to 4.5
4.5 to 5.0
> 5.0

Notes:

1:25,000

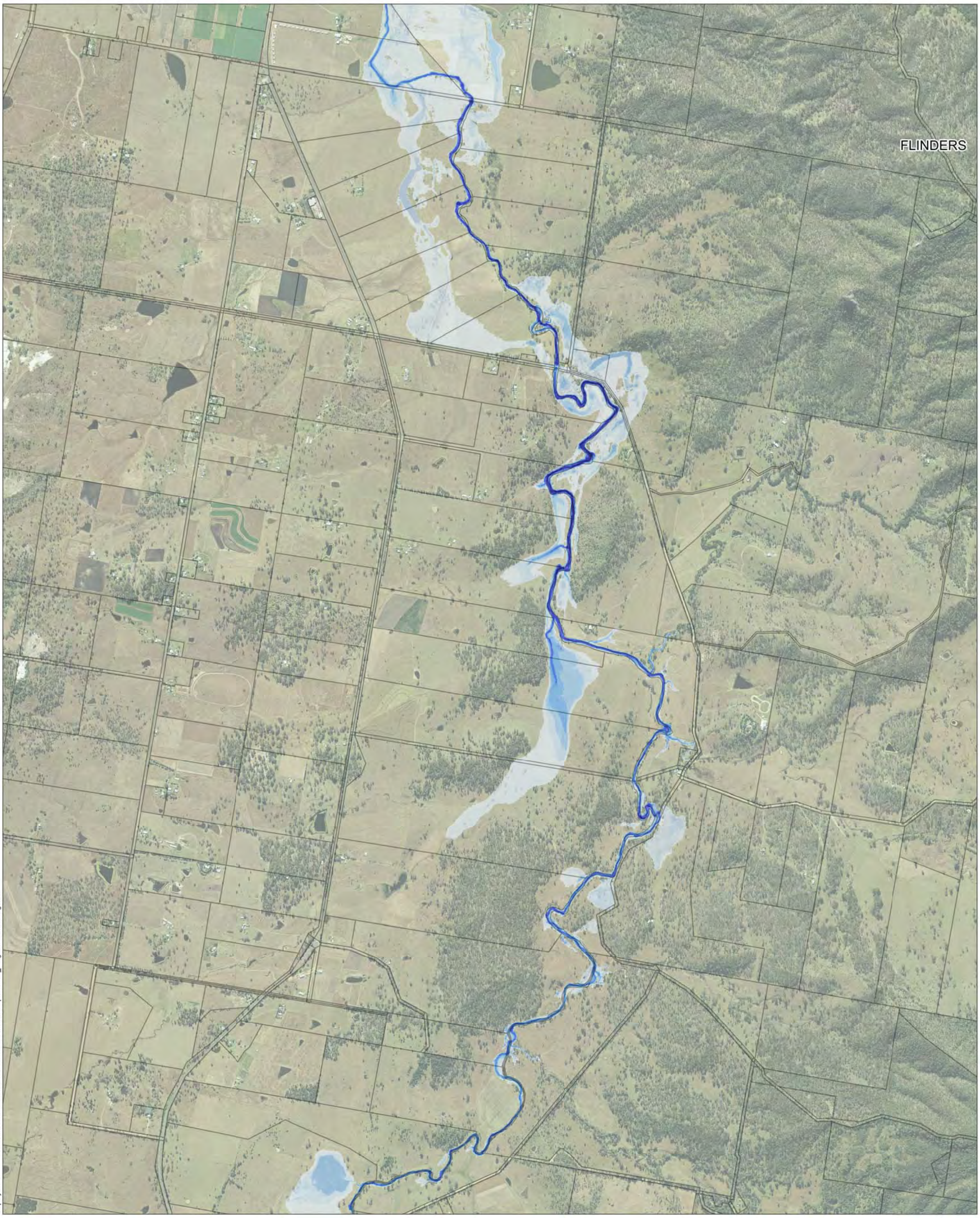
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E3-a**

10% AEP Event - Peak Depth Map



Legend

Depth (m)

- SRRC Boundary
- Cadastral Boundary

0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E3-b**

10% AEP Event - Peak Depth Map

aurecon

Map by: JDT   P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

SRRC Boundary

Cadastral Boundary

Depth (m)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 4.5
- 4.5 to 5.0
- > 5.0

Notes:

1:25,000

0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E3-c**

10% AEP Event - Peak Depth Map

aurecon

Legend

SRRC Boundary	
Cadastral Boundary	

Depth (m)

0.0 to 0.5	3.0 to 3.5
0.5 to 1.0	3.5 to 4.0
1.0 to 1.5	4.0 to 4.5
1.5 to 2.0	4.5 to 5.0
2.0 to 2.5	> 5.0
2.5 to 3.0	

Notes:

1:25,000

0 625 m 1,250 m

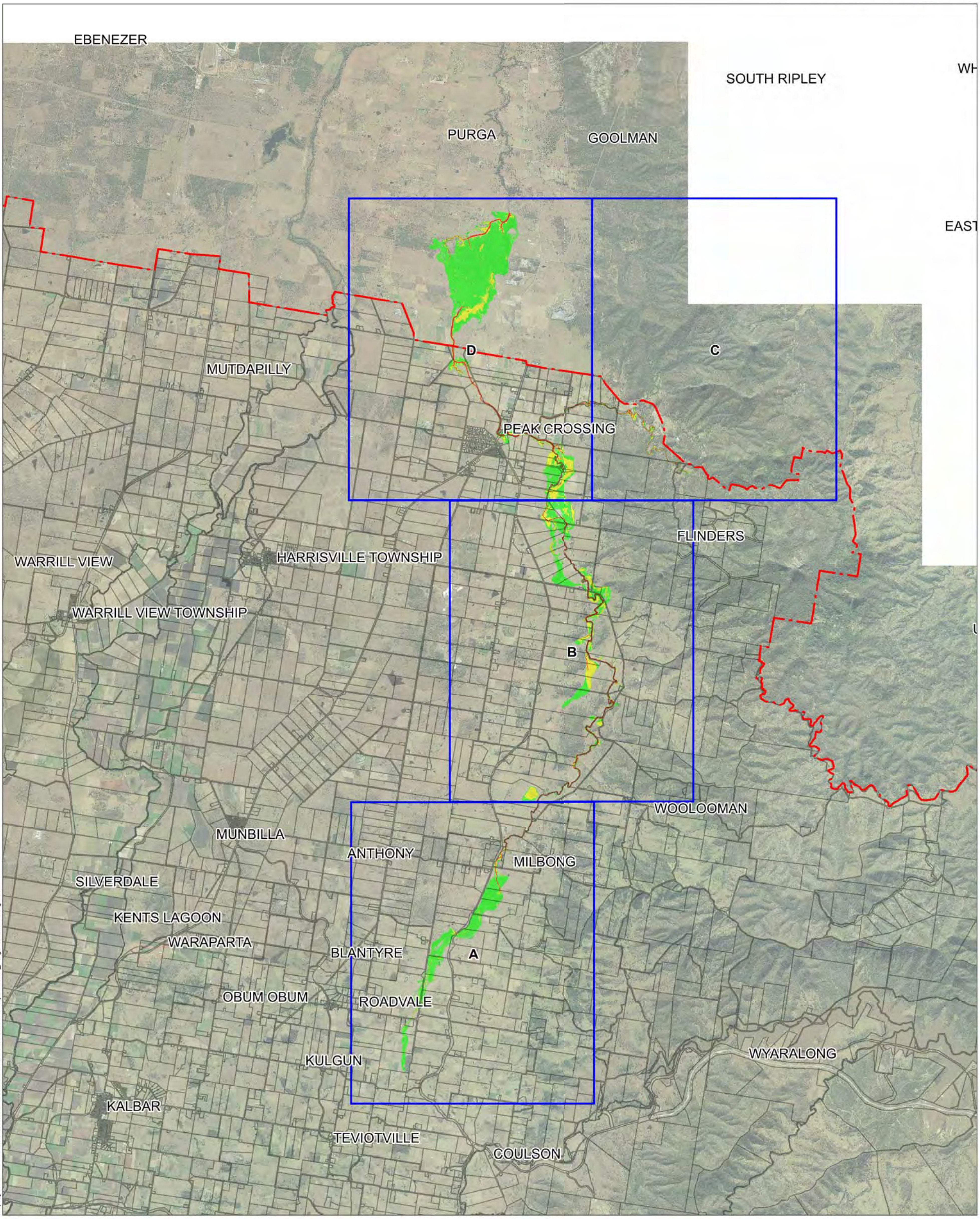
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E3-d**

10% AEP Event - Peak Depth Map

aurecon



Legend

SRRC Boundary
Cadastral Boundary
Low Hazard
Medium Hazard
High Hazard

Notes:

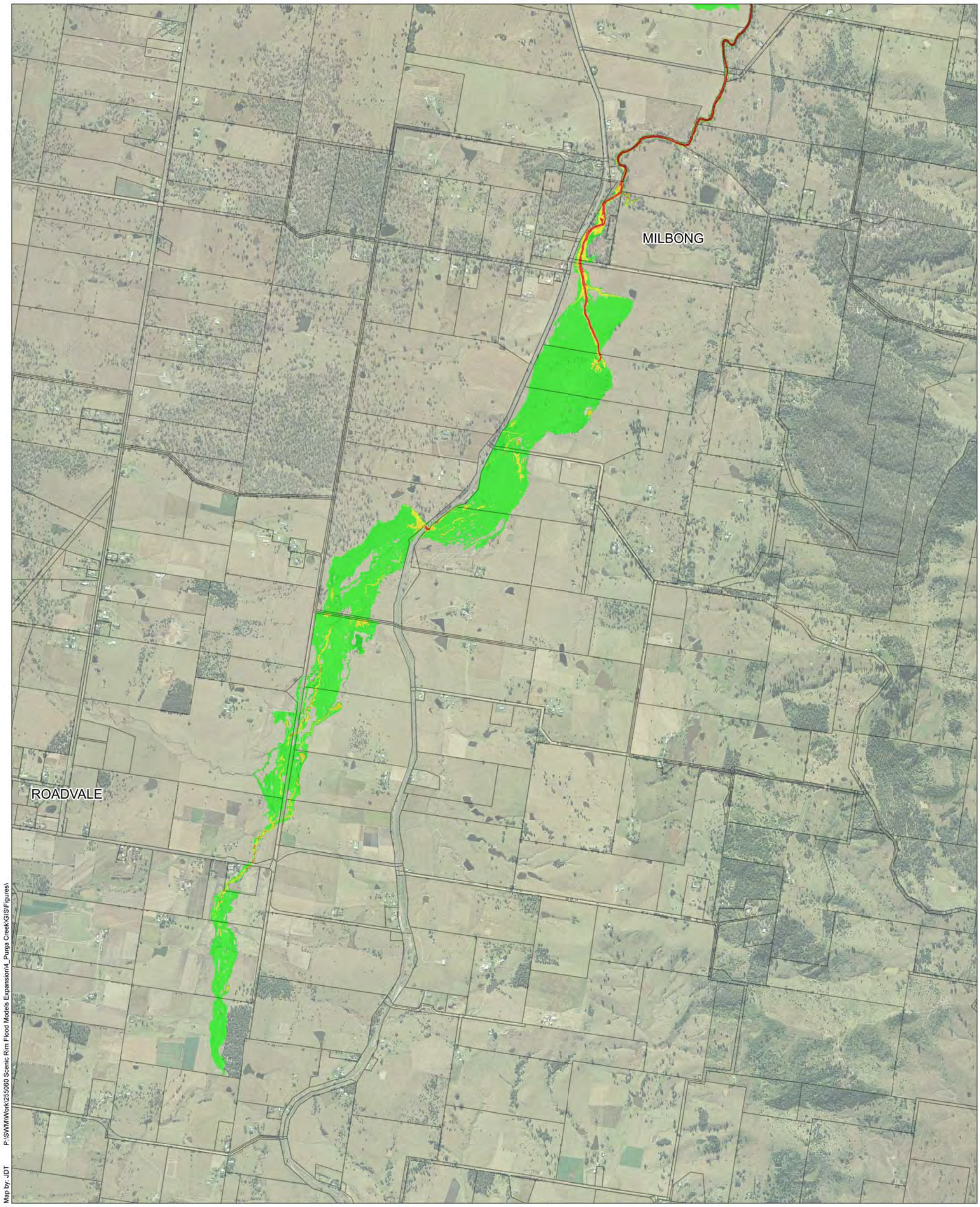
1:100,000
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E4**

10% AEP Event - Peak Hazard Map

aurecon



Legend

SRRC Boundary

Cadastral Boundary

Low Hazard
Medium Hazard
High Hazard

Notes:

1:25,000

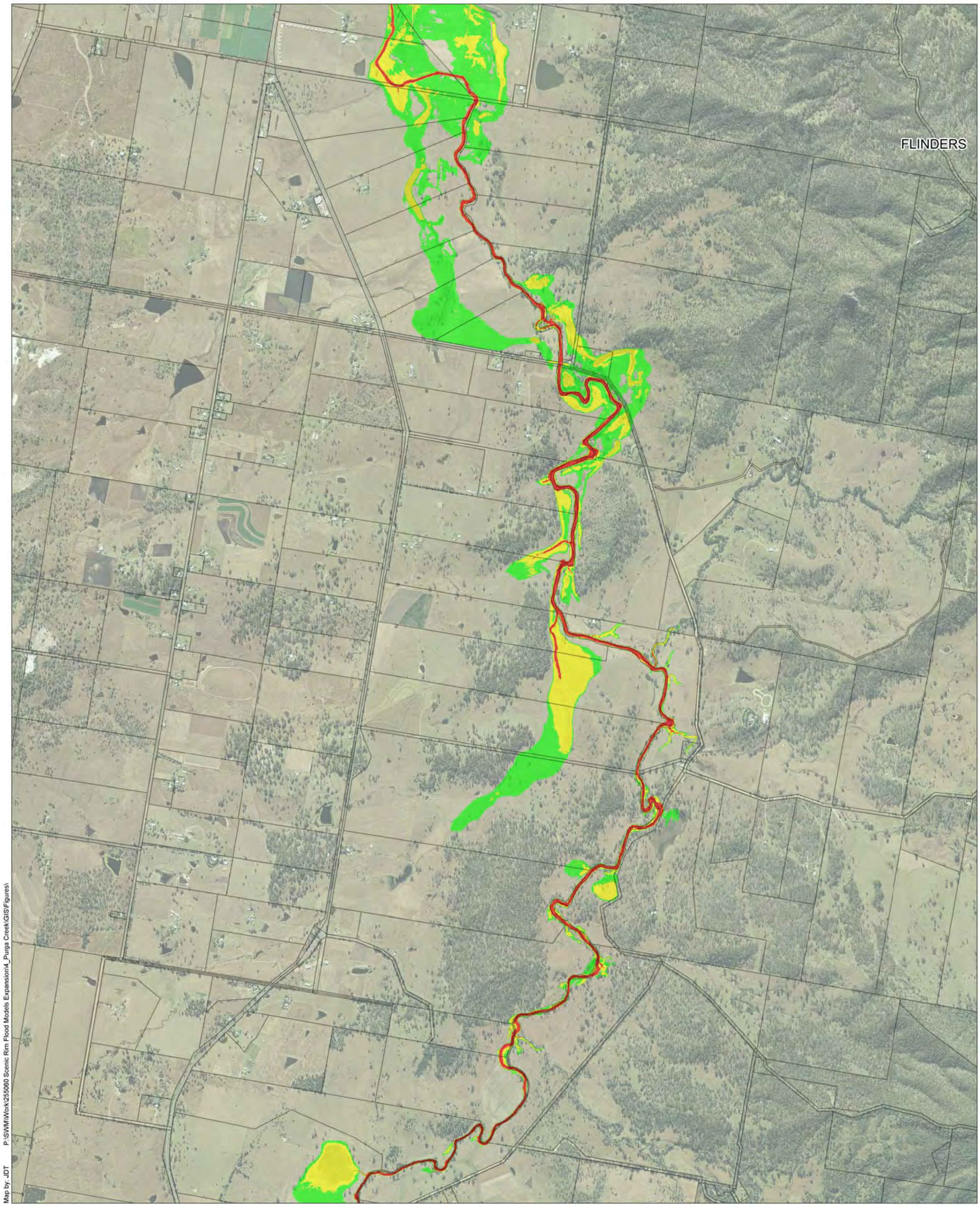
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E4-a**

10% AEP Event - Peak Hazard Map



Legend

- SRRC Boundary
- Cadastral Boundary
- Low Hazard
- Medium Hazard
- High Hazard

Notes:

1:25,000

0 625 m 1,250 m

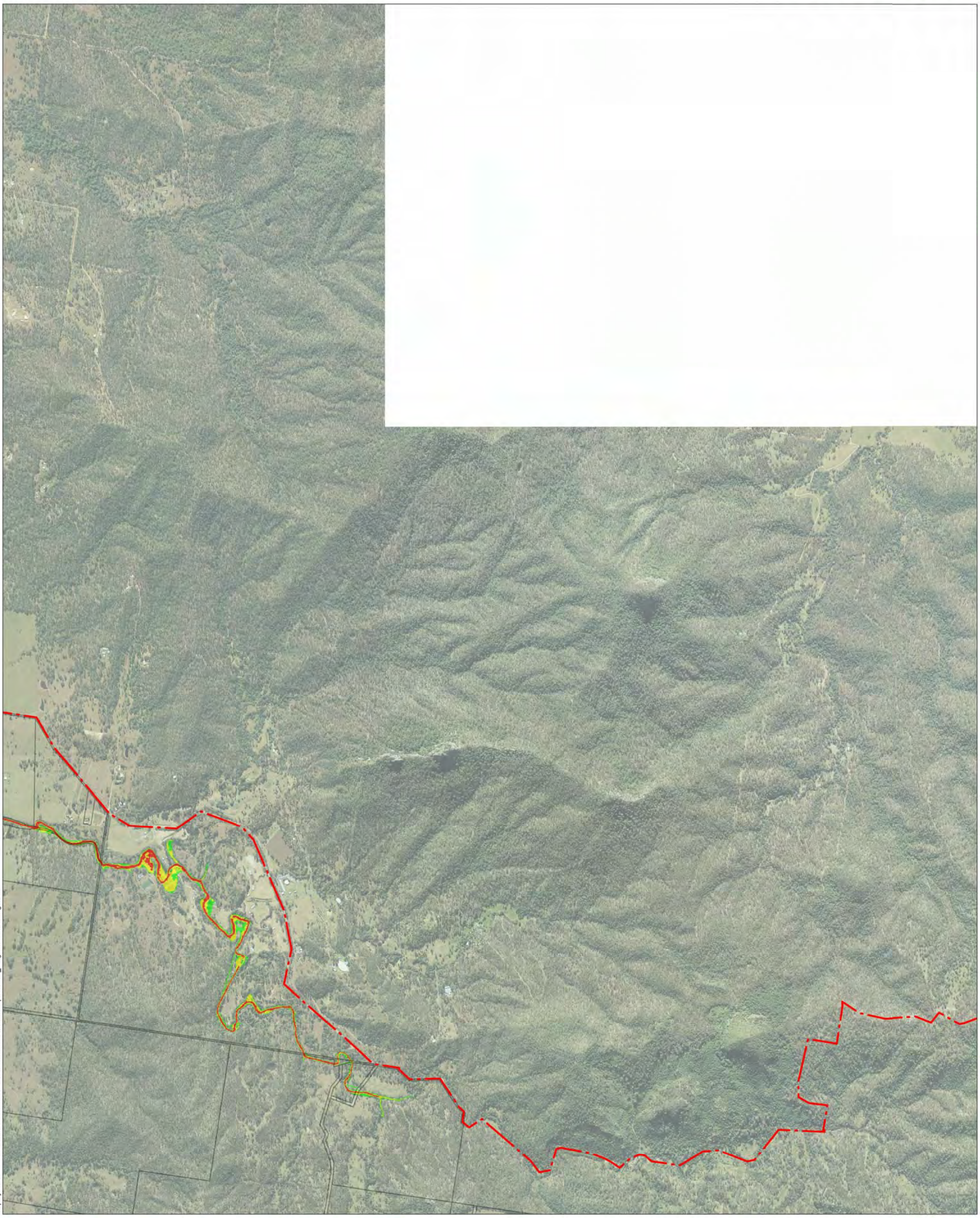
Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study

Figure E4-b

10% AEP Event - Peak Hazard Map



Legend

SRRC Boundary
Cadastral Boundary
Low Hazard
Medium Hazard
High Hazard

Notes:

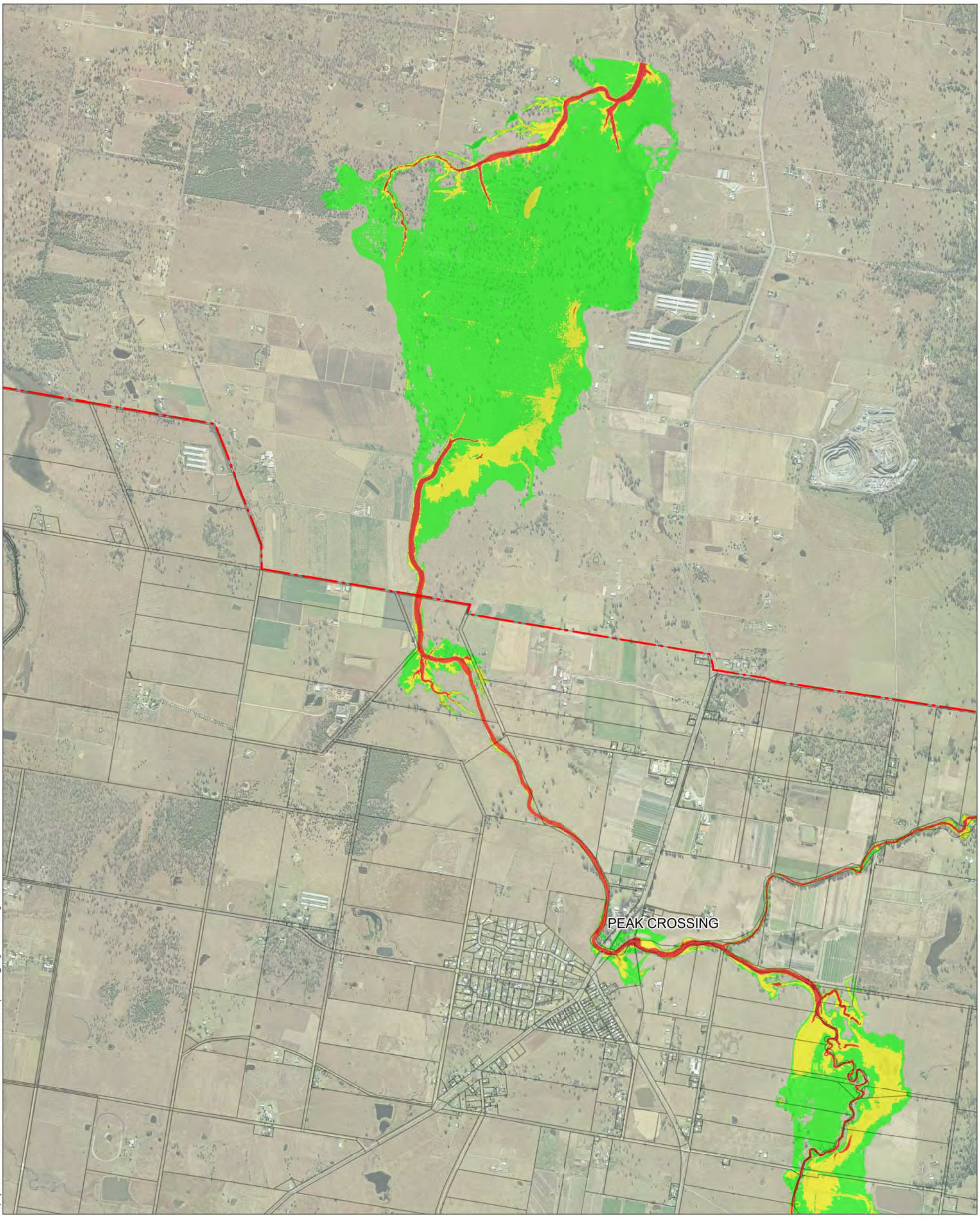
1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E4-c**

10% AEP Event - Peak Hazard Map

aurecon



Legend

SRRC Boundary
Cadastral Boundary
Low Hazard
Medium Hazard
High Hazard

Notes:

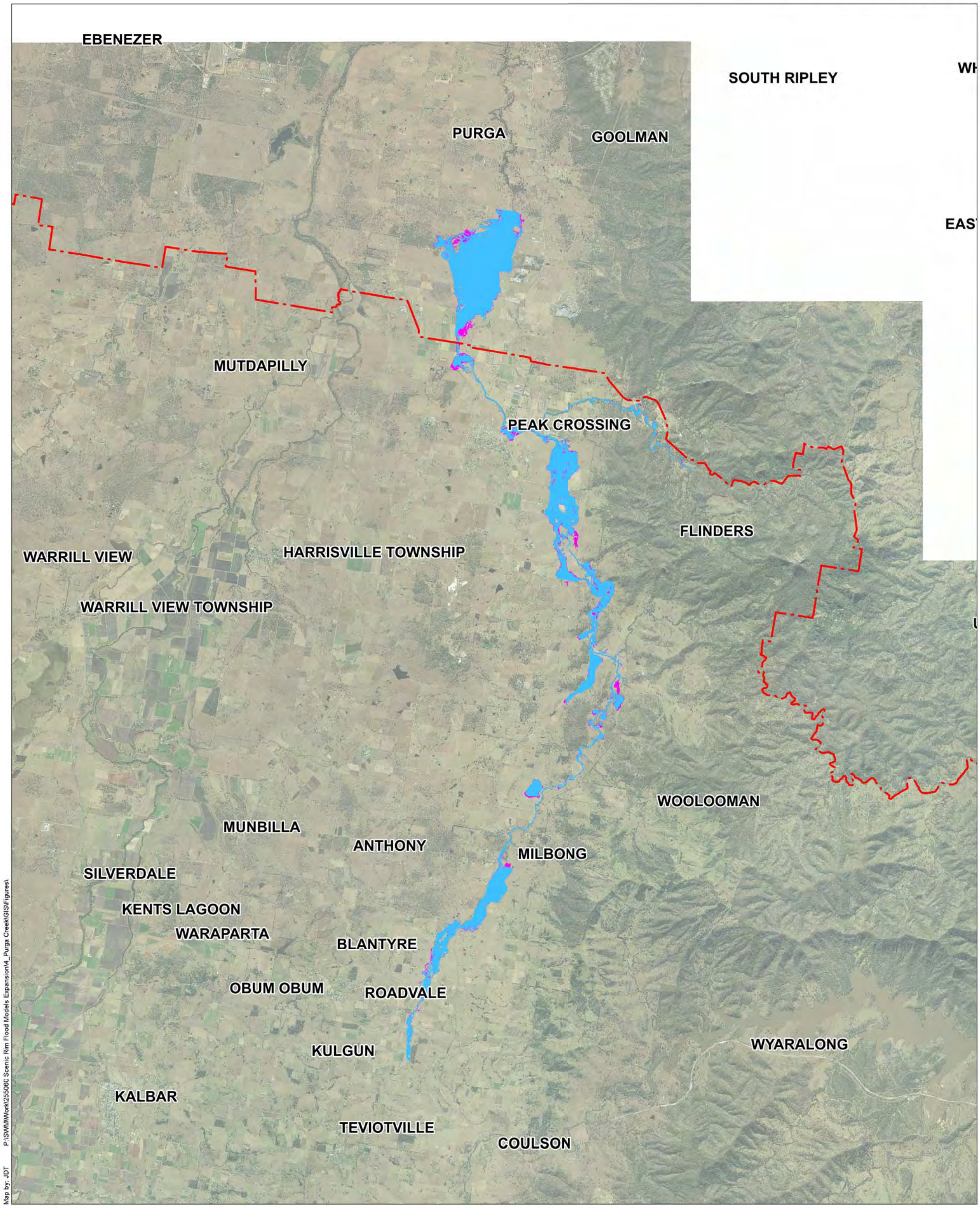
1:25,000
0 625 m 1,250 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E4-d**

10% AEP Event - Peak Hazard Map

aurecon



Legend

- SRRC Boundary
- Cadastral Boundary
- Existing Scenario Inundation Extents
- Climate Change Scenario 4.5 Inundation Extent

Notes:

1:100,000

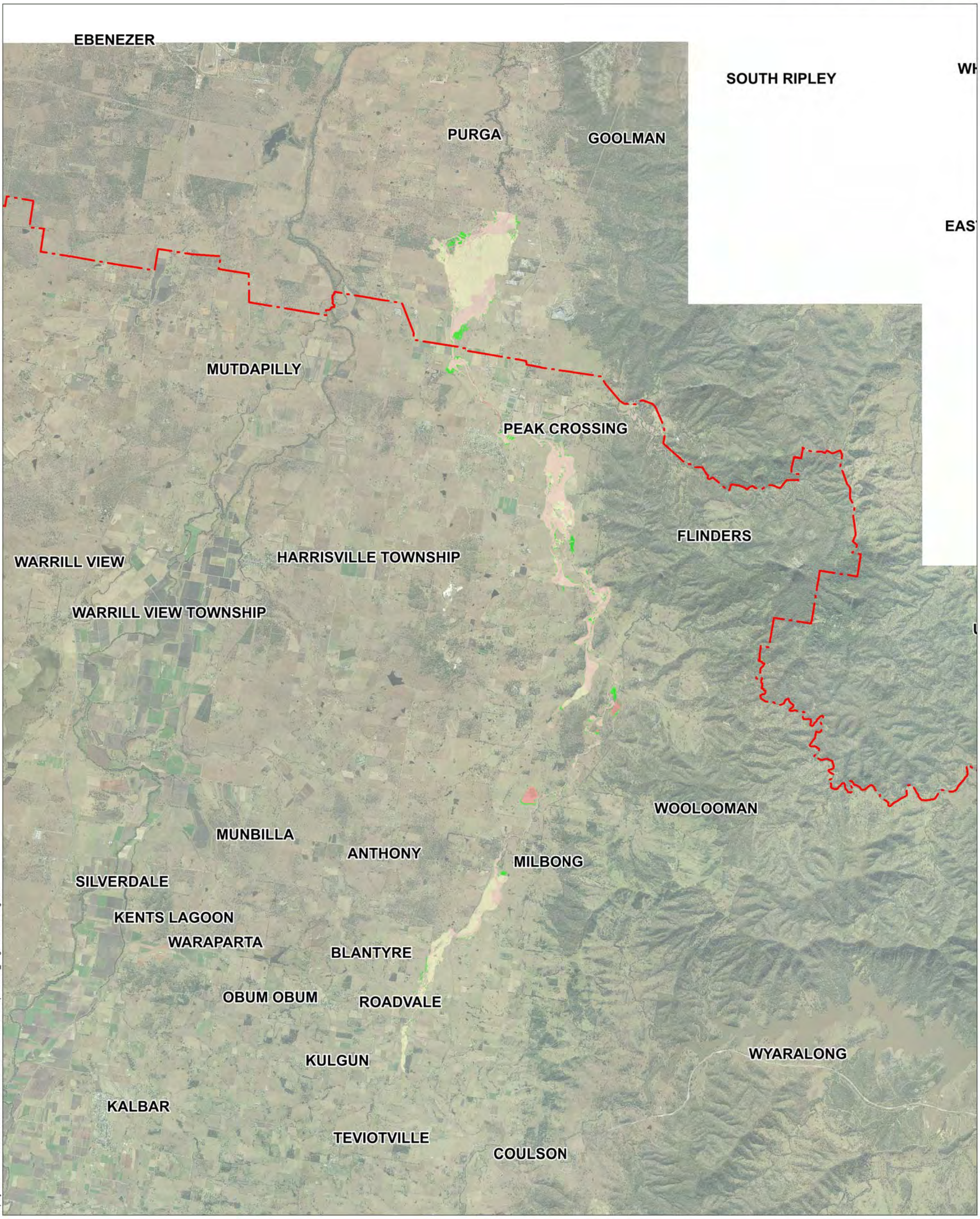
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure E5-a**

Climate Change Scenario 4.5 - 10% AEP Event Inundation Extent



Legend

SRRC Boundary
Cadastral Boundary

Afflux (m)

< -0.80	0.03 to 0.20
-0.80 to -0.60	0.20 to 0.40
-0.60 to -0.40	0.40 to 0.60
-0.40 to -0.20	0.60 to 0.80
-0.20 to -0.03	0.80 to 1.20
-0.03 to 0.03	> 1.20

Was Dry Now Wet
Was Wet Now Dry

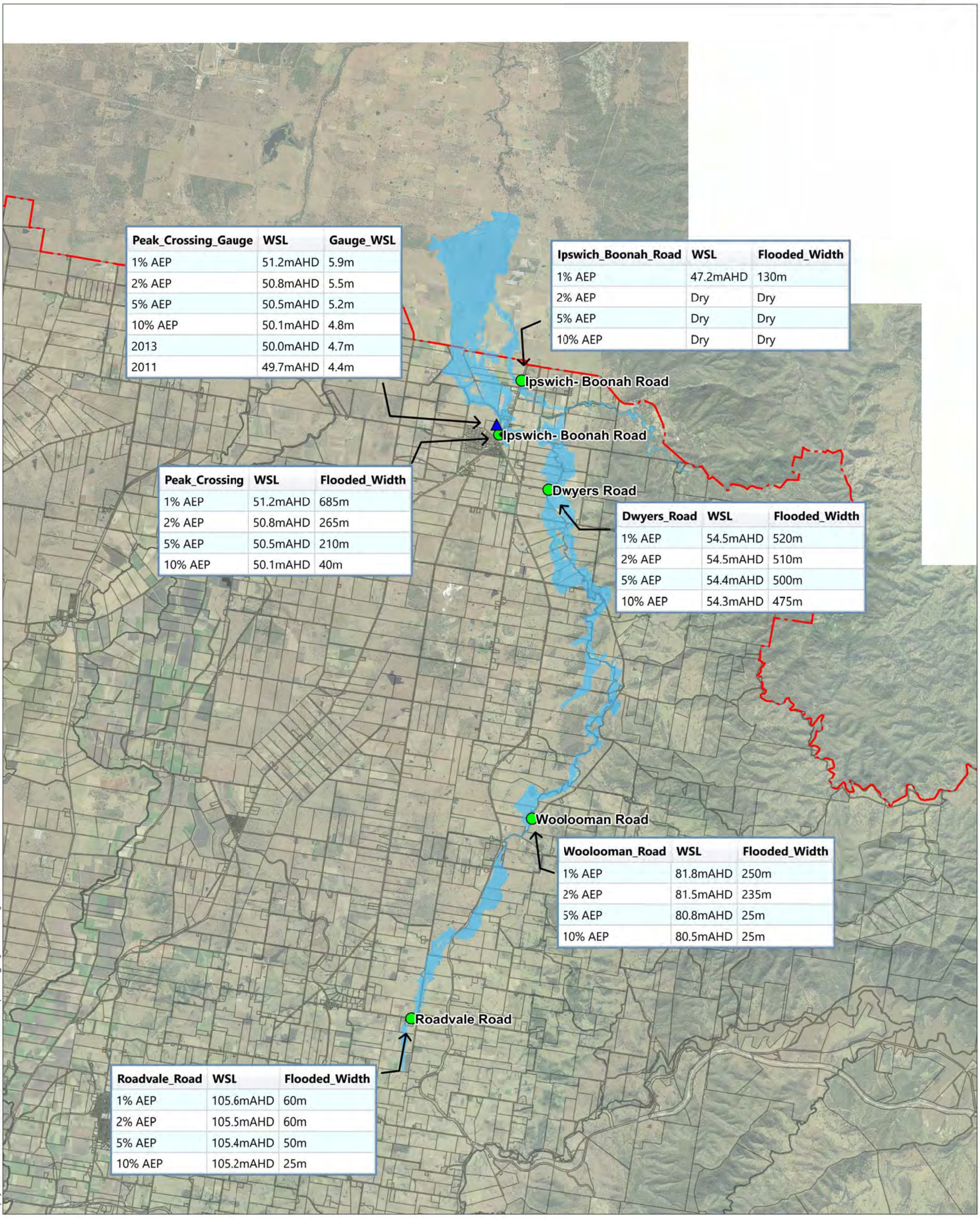
Notes:

1:100,000
0 2,500 m 5,000 m

Date: 30/06/2017 Version: 1 Job No: 255060
Projection: MGA Zone 56

Purga Creek Flood Study **Figure E5-b**

Climate Change Scenario 4.5 - 10% AEP Event Afflux map



Peak_Crossing_Gauge	WSL	Gauge_WSL
1% AEP	51.2mAHD	5.9m
2% AEP	50.8mAHD	5.5m
5% AEP	50.5mAHD	5.2m
10% AEP	50.1mAHD	4.8m
2013	50.0mAHD	4.7m
2011	49.7mAHD	4.4m

Ipswich_Boonah_Road	WSL	Flooded_Width
1% AEP	47.2mAHD	130m
2% AEP	Dry	Dry
5% AEP	Dry	Dry
10% AEP	Dry	Dry

Peak_Crossing	WSL	Flooded_Width
1% AEP	51.2mAHD	685m
2% AEP	50.8mAHD	265m
5% AEP	50.5mAHD	210m
10% AEP	50.1mAHD	40m

Dwyers_Road	WSL	Flooded_Width
1% AEP	54.5mAHD	520m
2% AEP	54.5mAHD	510m
5% AEP	54.4mAHD	500m
10% AEP	54.3mAHD	475m

Woolooman_Road	WSL	Flooded_Width
1% AEP	81.8mAHD	250m
2% AEP	81.5mAHD	235m
5% AEP	80.8mAHD	25m
10% AEP	80.5mAHD	25m

Roadvale_Road	WSL	Flooded_Width
1% AEP	105.6mAHD	60m
2% AEP	105.5mAHD	60m
5% AEP	105.4mAHD	50m
10% AEP	105.2mAHD	25m

Map by: JDT P:\SWM\Work\255060 Scenic Rim Flood Models Expansion\4_Purga Creek\GIS\Figures\

Legend

- SRRC Boundary
- Cadastral Boundary
- Inundation Extent
- Road Crossing
- Stream Gauge

Notes:

1:100,000

0 2,500 m 5,000 m

Date: 22/06/2017 Version: 1 Job No: 255060

Projection: MGA Zone 56

Purga Creek Flood Study **Figure F**

Emergency Response Mapping - Stream Gauge & Road Crossing Details

Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 14, 32 Turbot Street
Brisbane QLD 4000
Locked Bag 331
Brisbane QLD 4001
Australia

T +61 7 3173 8000
F +61 7 3173 8001
E brisbane@aurecongroup.com
W aurecongroup.com

Aurecon offices are located in:
Angola, Australia, Botswana, China,
Ghana, Hong Kong, Indonesia, Kenya,
Lesotho, Macau, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Qatar, Singapore, South Africa,
Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam.