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Salvestro Planning
16 Fitzmaurice Street
Wagga Wagga, NSW 2650

31 October 2019

Attention: Mr G Salvestro

Dear Garry,

Re: Flood Information for 9 and 17 River Road, Gobbagombalin

Thank you for contacting WMAwater in regard to a flood information report for the property located at the above referenced address. The sites are located in close proximity to Gobbagombalin Lagoon and the Murrumbidgee River. Flood information provided herein has been taken from the Wagga Wagga Revised Murrumbidgee River Floodplain Risk Management Study and Plan (Murrumbidgee River FRMS&P) (Reference 1), completed in 2018.

In addition, the sites are located near Dukes Creek, which is separated from No. 9 River Road by Colin Knott Drive to the east of the site. Assessment of overland flow flood risk associated with the local Dukes Creek catchment is also required to understand the full range of flood risk at the site. Information for overland flow affectation is provided herein using results from the Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan (MOFFRMS&P, WMAwater, ongoing). While not yet adopted, Council approval to utilise the results of this study was granted on the 26th September, 2019 (email, M Keys).

1. SITE LOCATION AND TOPOGRAPHY

The sites at No. 9 and 17 River Road are located in Gobbagombalin, west of the Wagga Wagga CBD and on the northern side of the Murrumbidgee River. No. 17 is located between River Road and Old Narrandera Road, while No. 9 is bounded by River Road, Narrandera Road and Colin Knott Drive, which becomes Gobbagombalin Bridge and crosses the Murrumbidgee River to the south.

Ground levels within the two sites are, for the most part, above 180 mAHD, and rise steeply away from the Murrumbidgee River. As a result, majority of each site is free from riverine flooding in the PMF, with only the southern and eastern boundaries of No. 9, and the western and southern parts of No. 17 River Road impacted by flooding from the Murrumbidgee River. The site topography is shown on Figure 1, based on the digital elevation model established in the Murrumbidgee River FRMS&P using LiDAR captured in 2008.

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2. DESIGN FLOOD BEHAVIOUR

2.1. Riverine Flooding

Design peak flood depths and levels are provided on Figure 2 to Figure 4 for the 5% AEP and 1% AEP events and the PMF respectively, using results from Reference 1. The flood behaviour shown assumes that the main city levee upgrade that is currently under construction is complete. The corresponding peak level at the Hampden Bridge Gauge (No. 410001) in each design event is provided in Table 1.

Table 1 Design Peak Flood Levels at the Hampden Bridge Gauge

Design Flood Event	Peak Level @ Hampden Bridge Gauge (m)[1]
5% AEP	10.1
1% AEP	11.3
PMF	16.1

[1]Gauge zero = 170.05 mAHD

The mapped flood results indicate that the sites are largely free from riverine flooding in the 5% AEP and 1% AEP events, with only the southern fringes of the sites impacted. Peak flood levels in the river fall from 180.6 mAHD immediately upstream (north east) of No. 9 River Road, to 179 mAHD at the downstream end (western boundary) in the 1% AEP event. In the PMF event part of the western portion of the site is inundated as indicated on Figure 4, but for remainder of the site the steep topography constrains the floodplain, with only the southernmost 30-50 m of the site impacted by riverine flooding.

2.2. Overland Flow

Design peak flood depths and levels are provided on Figure 10 to Figure 12 for the 5% AEP and 1% AEP events and the PMF respectively, using results from Reference 2. The subject site is separated from Dukes Creek by Colin Knott Drive (the Olympic Highway). Minor ponding is evident on the north eastern boundary of No. 9 River Road. This ponding is due to local runoff collecting in a low point immediately south of the intersection of Old Narrandera Road and Colin Knott Drive, which can be seen in the topographic data on Figure 1. While it is not considered to pose a major flood risk to the development, should be given due consideration when designing earthworks and local site drainage. No. 17 River Road is outside of the hydraulic model extent defined in Reference 2, and as such overland flow flood information is not available in this area.

While the on-site overland flow affectation is limited, access to and from the site via the Olympic Highway may be affected. This is discussed further in Section 4.2. It is noted that in addition to the modelled design flood behaviour, flooding in Dukes Creek may be exacerbated by high tailwater levels in the Murrumbidgee River and by extension, Gobbagombalin Lagoon, into which Dukes Creek flows.

3. FLOOD PLANNING AREA

The riverine flood planning area (FPA) is defined as the area covered by the 1% AEP peak flood level, plus 500 mm freeboard (Wagga Wagga LEP 2011 and as per Reference 1), and refers to the area to which flood related planning and development controls are applied. The FPA is shown on Figure 5, and shows that the FPA only reaches the southern edge of each site. This indicates that the remainder of the site has ground levels already above the Flood Planning Level. With careful consideration of the location of proposed dwellings, it is feasible that the entire development could be designed to be sited outside of the FPA. It is noted however that depending on the type of development, other controls may be applied
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The FPA has been mapped with the proposed concept layout overlain in Figure 6, indicating that the bordering on the FPA extent. Depending on the final site layout, if the

buildings are within the FPA extent they will be subject to flood related development controls set out in Section 4 of the Wagga Wagga DCP 2010. An excerpt from this document is provided in Section 0. The Flood Planning Level for residential land uses is defined as the 1% AEP level plus 500 mm. As indicated on Figure 3, peak flood levels in

7 mAHD and 179.5 mAHD in the Murrumbidgee River resulting in a Flood Planning Level (FPL) between 180.0 mAHD and 180.1 mAHD.

It is noted that the Flood Planning Area for overland flow is not currently available, however the limited affectation in the site the 1% AEP event means that aside from the low point on the north eastern boundary of No. 9 River Road, the remainder of the sites would not be within the Overland Flow FPA.

4. EVACUATION CONSTRAINTS

4.1. Riverine Flooding

Egress from the site to the west via Old Narrandera Road is restricted in riverine flood events as frequent as the 5% AEP, with flooding over the road to depths of up to 0.3 m occurring approximately 4.5 km west of the River Road intersection, just east of Houlaghans Creek. The location at which Old Narrandera Road is overtopped is shown on Figure 7. This indicates that evacuation to the west is unlikely to be safe even in moderate flood events, and that evacuation to the north is likely to be the safest option from the proposed development.

Colin Knott Drive is free from riverine flooding in events up to and including the 0.5% AEP event (200 yr ARI event, 11.8 m at the Gauge). In the 0.2% AEP event (500 yr ARI, 12.3 m at the Gauge) however, Colin Knott Drive at Old Narrandera Road is inundated to depths of over 1 m, restricting access to the north. In this size event access to the west would also be restricted due to flooding on Old Narrandera Road.

It is noted that Pine Gully Road to the north (towards Gobbagombalin and Charles Sturt University) is not impacted by riverine flooding and provides an alternate access route north if Colin Knott Drive is closed.

4.2. Overland Flow

The Olympic Highway provides access away from the property to the north and south of Wagga Wagga. North of the site, Dukes Creek and various inflowing tributaries intersect the Olympic Highway, with bridge or culverts at points of intersection. In events equivalent to or greater than the 1% AEP event, some culverts may be overtopped, temporarily inundating the highway and posing a hazard to motorists. Possible locations where this may occur can be seen in Figure 13, which shows the full extent of flooding in the 1% AEP event as defined in Reference 2. As noted in Section 2.2, this inundation is likely to be limited to a couple of hours at the most, as it is driven by heavy local rainfall which typically occurs over a much shorter duration than riverine flooding.

It is noted that the hydraulic model boundary (indicated by the green polygon in Figures 10-13) does not extend further west of the site. As such, the behaviour of overland flow travelling towards the Murrumbidgee River from Gobbagombalin has not been defined. It is possible that Old Narranderra Road may be overtopped by local overland flow during local rain events, and should be taken into consideration when developing evacuation plans.

5. DEVELOPMENT CONTROLS OVERVIEW

Parts of the sites, if any, that are within the Flood Planning Area are subject to flood related development controls set out in the Wagga Wagga Development Control Plan (DCP) 2010.

Section 4 of the 2010 DCP Environmental Hazards and Management Flooding, outlines the objectives of the flood related development controls and includes:

O1 Minimise the public and private costs of flood damage.

O2 Minimise the risk of life during floods by encouraging construction and development that is "flood proofed" and compatible with the flood risk of the area.

O3 Ensure that development and construction are compatible with the flood hazard.

O4 Require compatibility with the Flood Plain Development Manual 2005 as relevant.

The following controls may also be applicable to the site.

C1 Essential community services are not suitable for location in any of the flood risk precincts other than Central Wagga where they are to be ***above the Probable Maximum Flood (PMF) level****. For the purposes of this Section, essential community services include:*

- *Community, information and education facilities which may provide an important role in notifying the community of flood dangers or evacuation requirements during flood events.*
- *Emergency services facilities.*
- *Health service facilities.*

C2 Critical utilities are to be ***located on land above the PMF level*** *in all precincts. For the purposes of this Section critical utilities include:*

- *Child care centres.*
- *Educational establishments.*
- *Electricity generating works.*
- *Liquid fuel depots.*
- *Offensive or hazardous industries.*
- *Public utility undertakings (including generating works which are essential to evacuation during periods of flood, or if flood affected would unreasonably affect the ability of the community to return to normal activities after flood events).*
- *Research stations.*
- *Seniors living.*
- *Telecommunications facilities and networks.*

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to the site.

Should you require any further clarification, please do not hesitate to contact the undersigned.

Yours Sincerely,
WMAwater

Catherine Goonan
Senior Engineer

Figures:

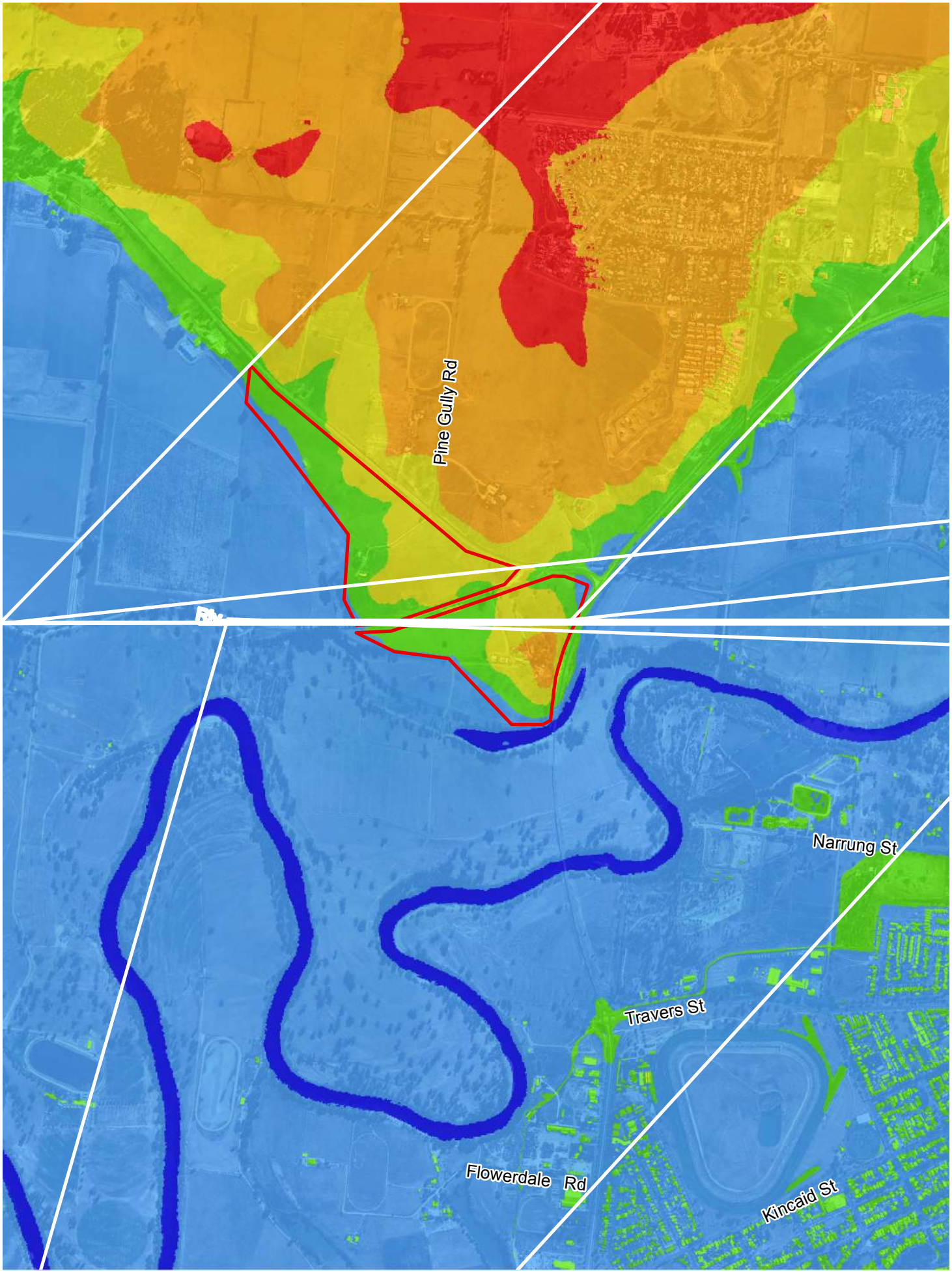
Attachments

Attachment A Concept Layout

References

1 WMAwater
Wagga Wagga Revised Murrumbidgee River Floodplain Risk Management Study and Plan
Wagga Wagga City Council, 2018

2 WMAwater
Draft Wagga Wagga Major Overland Flow Floodplain Risk Management Study and Plan
Wagga Wagga City Council, Ongoing


Pine Gully Rd
Narrung St
Travers St
Flowerdale Rd
Kincaid St

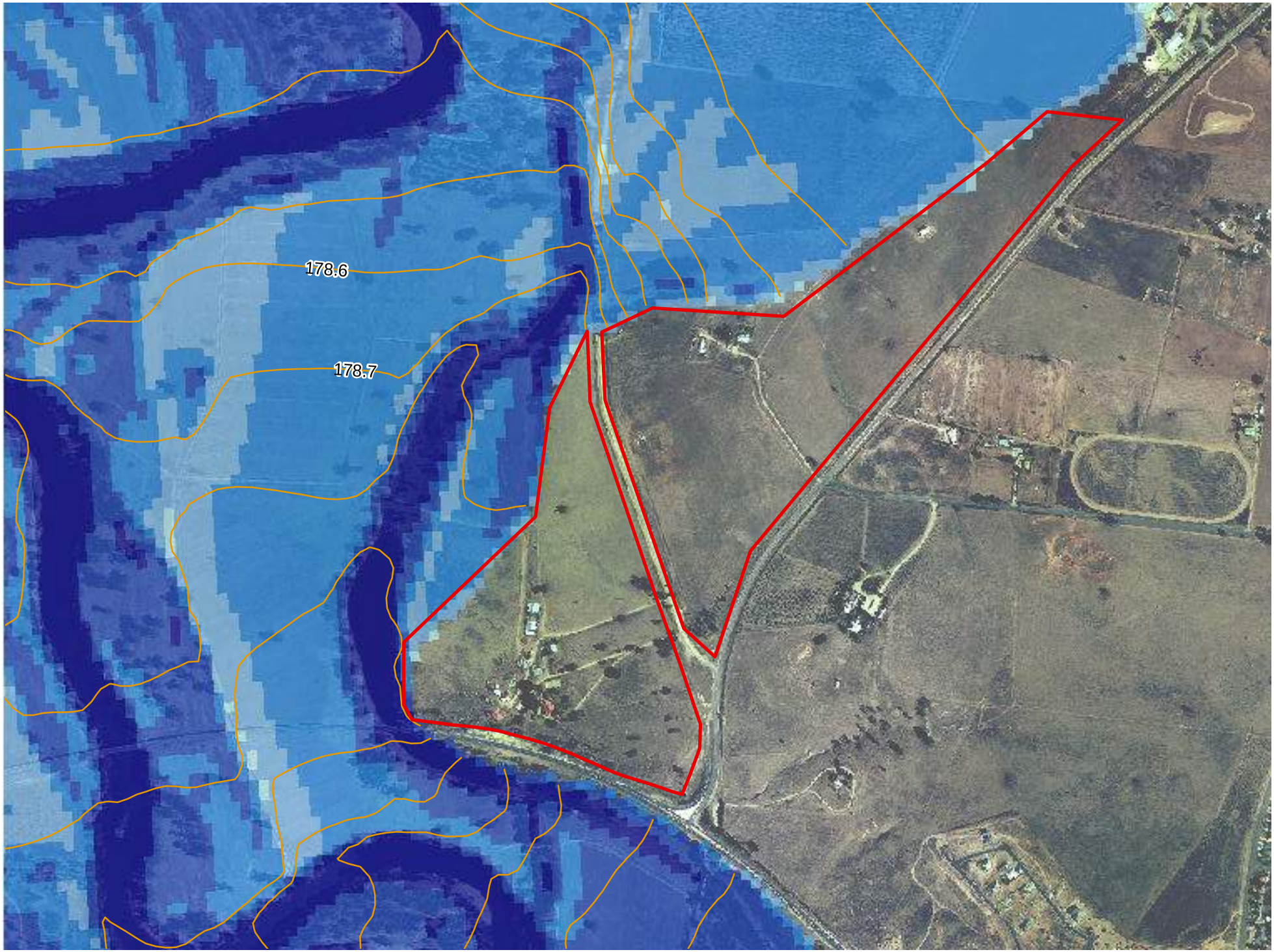
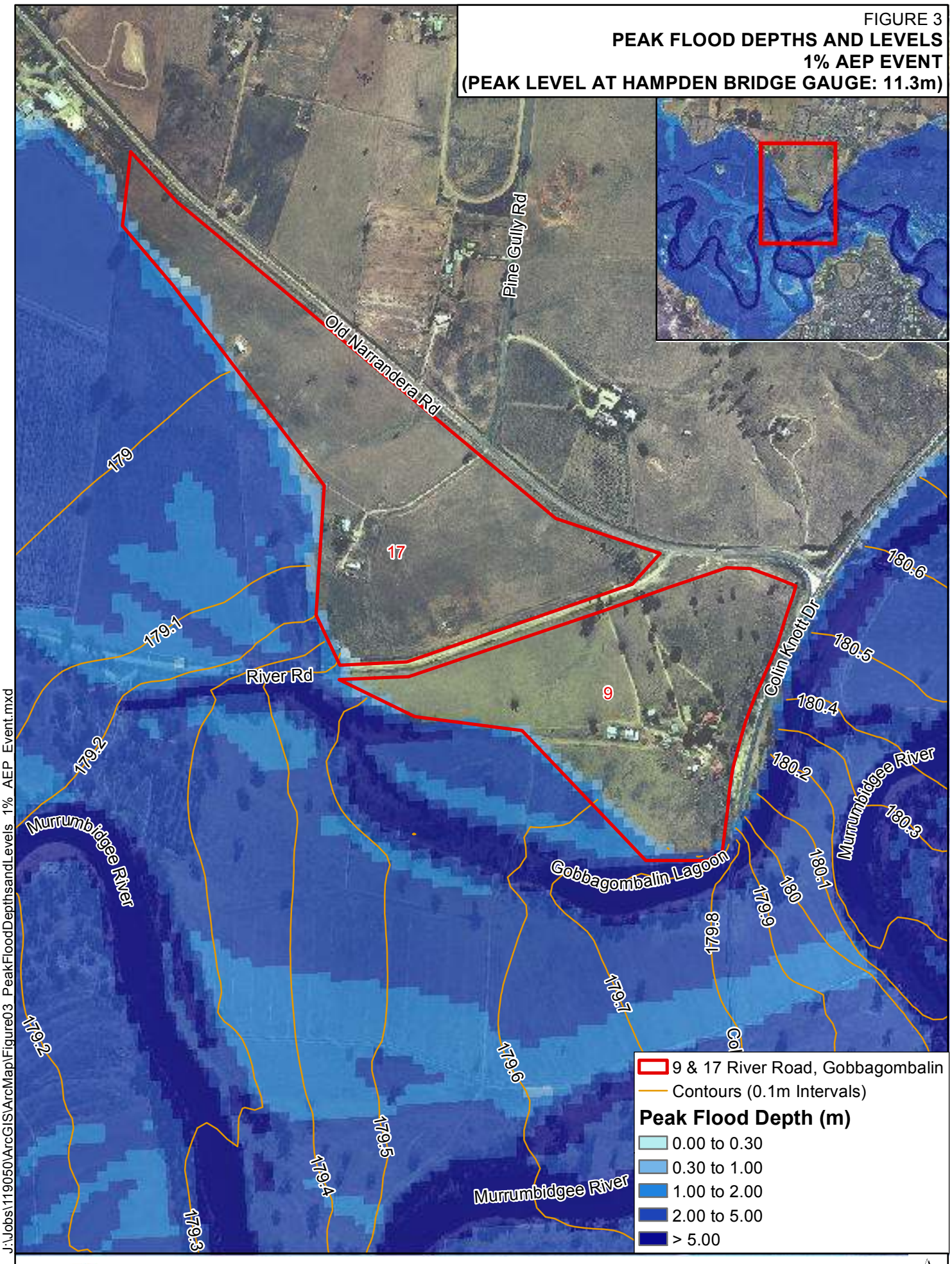

178.6
178.7

FIGURE 3

PEAK FLOOD DEPTHS AND LEVELS
1% AEP EVENT
(PEAK LEVEL AT HAMPDEN BRIDGE GAUGE: 11.3m)



9 & 17 River Road, Gobbagombalin
Contours (0.1m Intervals)

Peak Flood Depth (m)

- 0.00 to 0.30
- 0.30 to 1.00
- 1.00 to 2.00
- 2.00 to 5.00
- > 5.00

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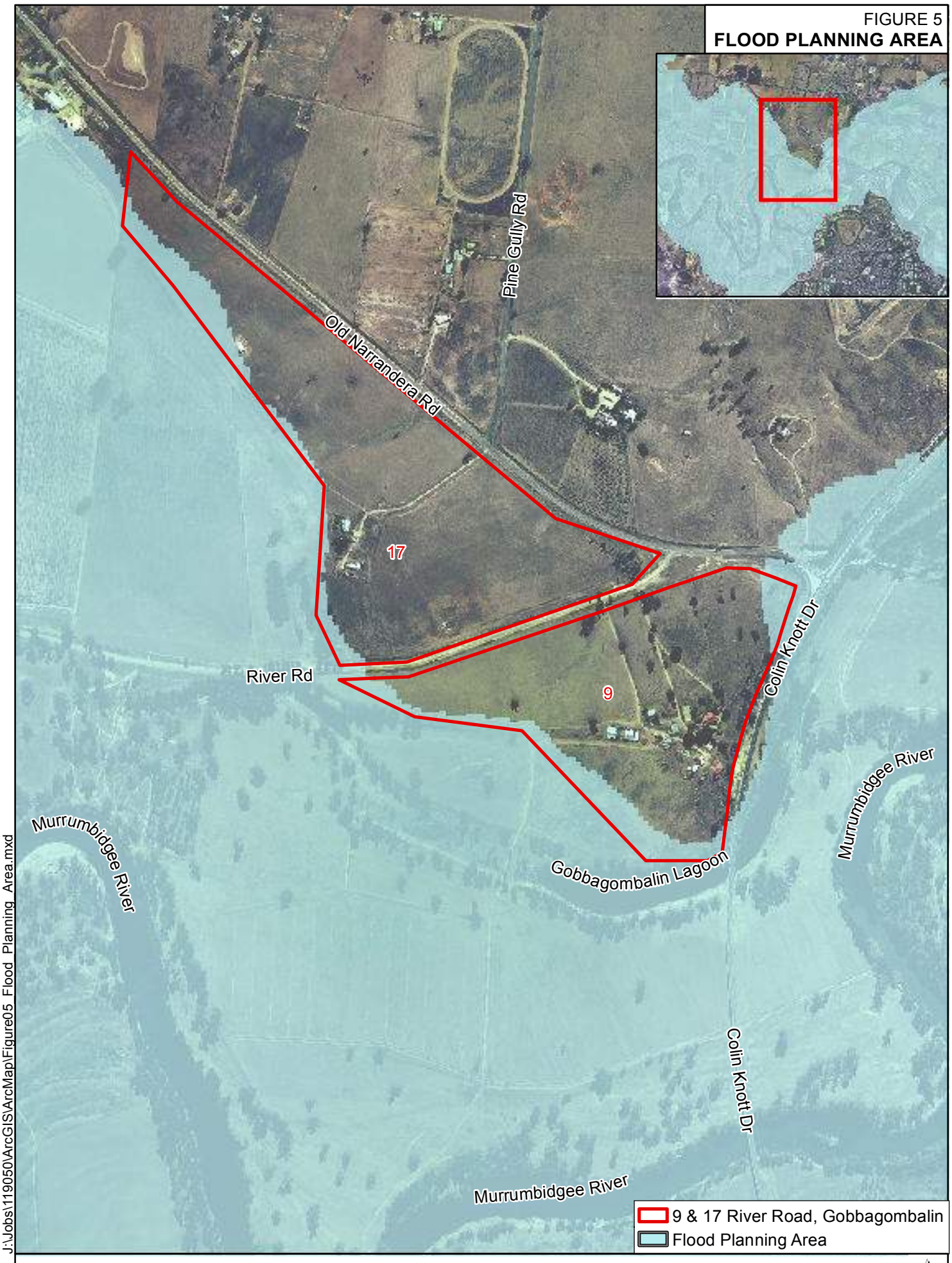
wma water

JOB NO. 119050
DATE 26 JUNE 2019
MODEL WAGGA WAGGA REVISED MURRUMBIDGEE RIVER FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

N

0 250 500 m

FIGURE 5
FLOOD PLANNING AREA



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wma water

JOB NO. 119050
DATE 26 JUNE 2019
MODEL WAGGA WAGGA REVISED MURRUMBIDGEE RIVER FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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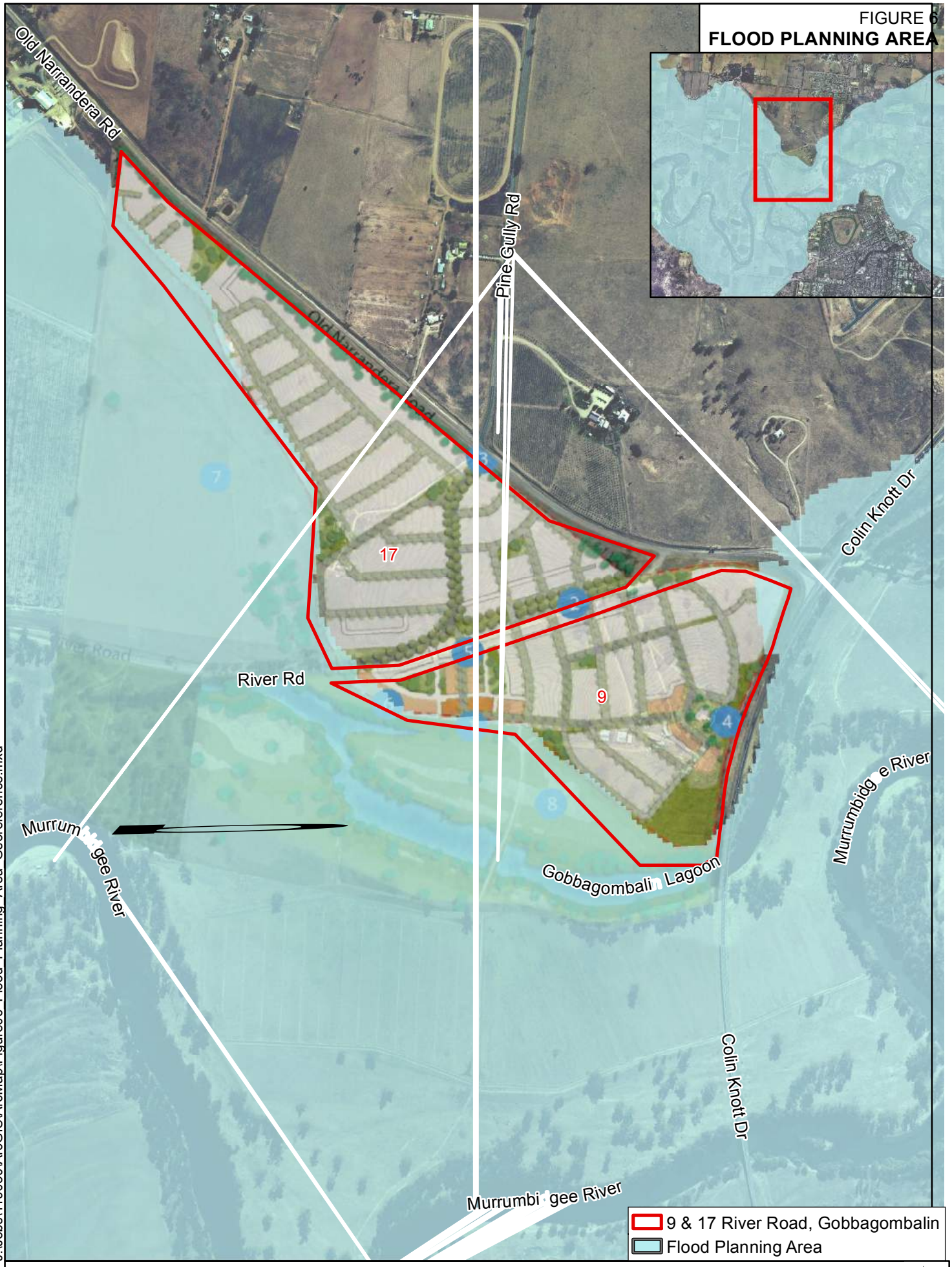
0 250 500 m



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JOB NO. 119050
DATE 26 JUNE 2019
MODEL WAGGA WAGGA REVISED MURRUMBIDGEE RIVER FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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0 250 500 m

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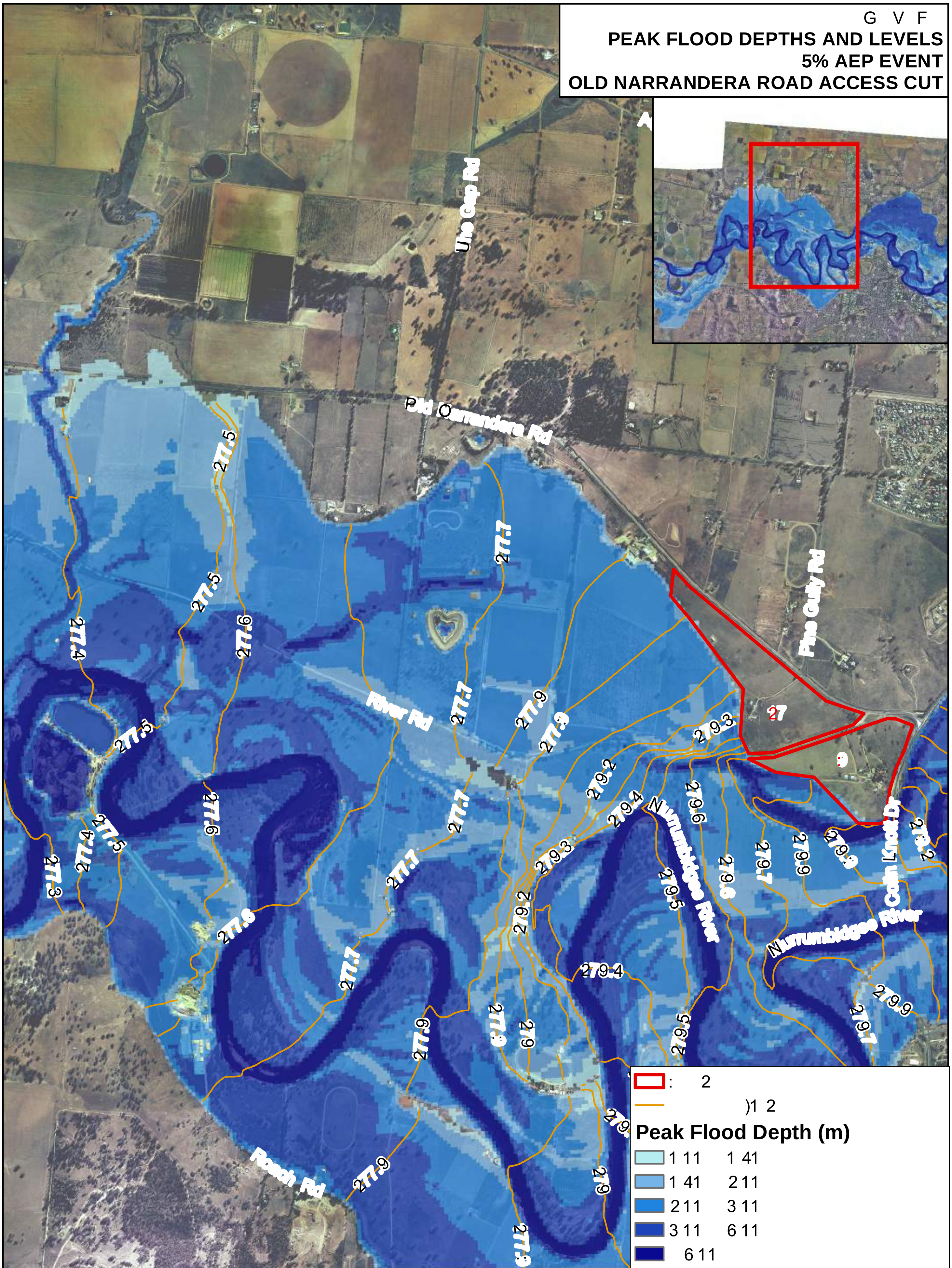
PEAK FLOOD DEPTHS AND LEVELS
5% AEP EVENT
OLD NARRANDERA ROAD ACCESS CUT



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22: 161

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P OP 22: 161
UF 3 VOF 312:
NP FM
FWTF N V VN FF WF
GMPP M O TL N O FNFOU
TUV O M O

1 611 2111 2611

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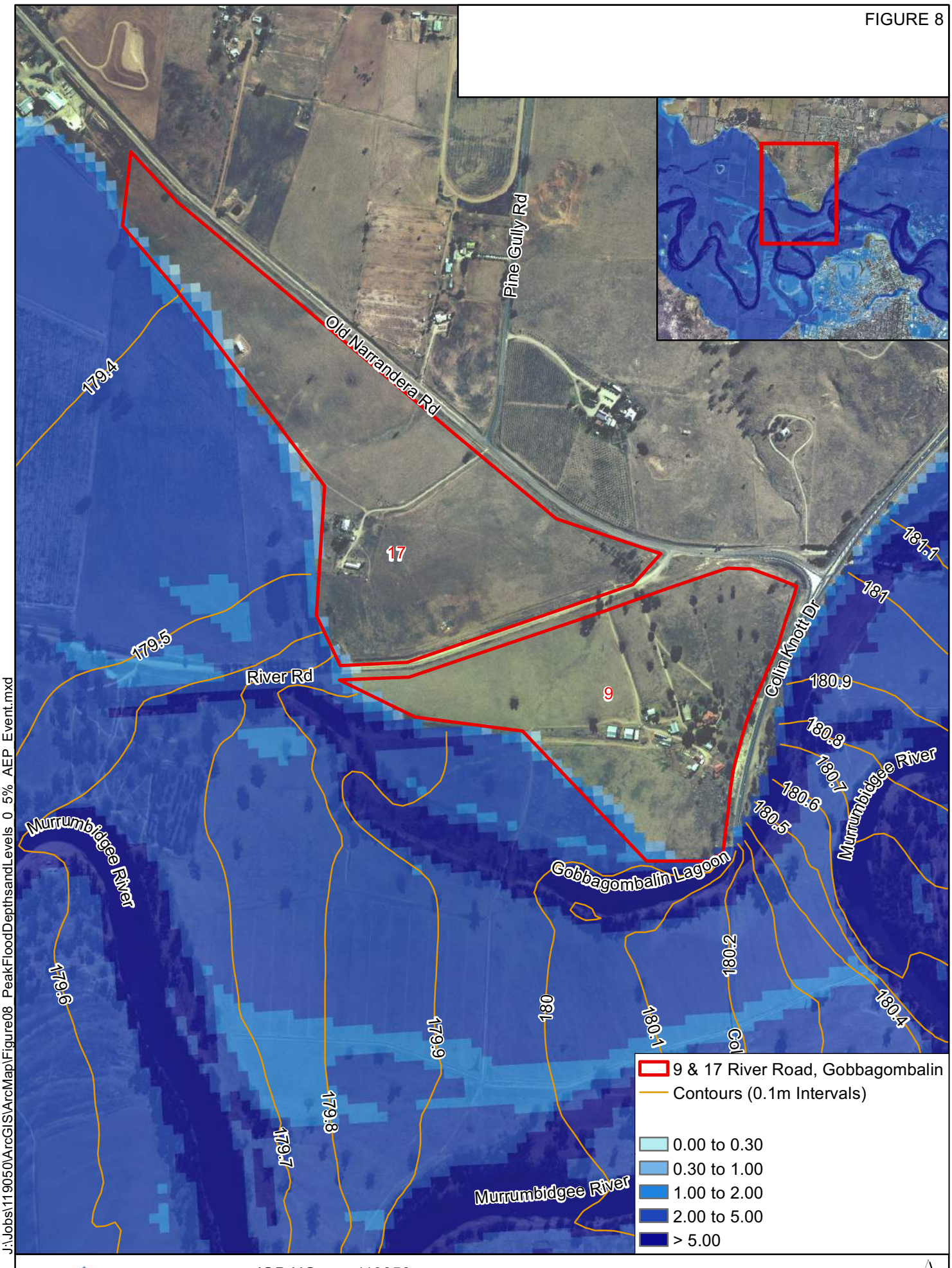
FIGURE 8



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wma water

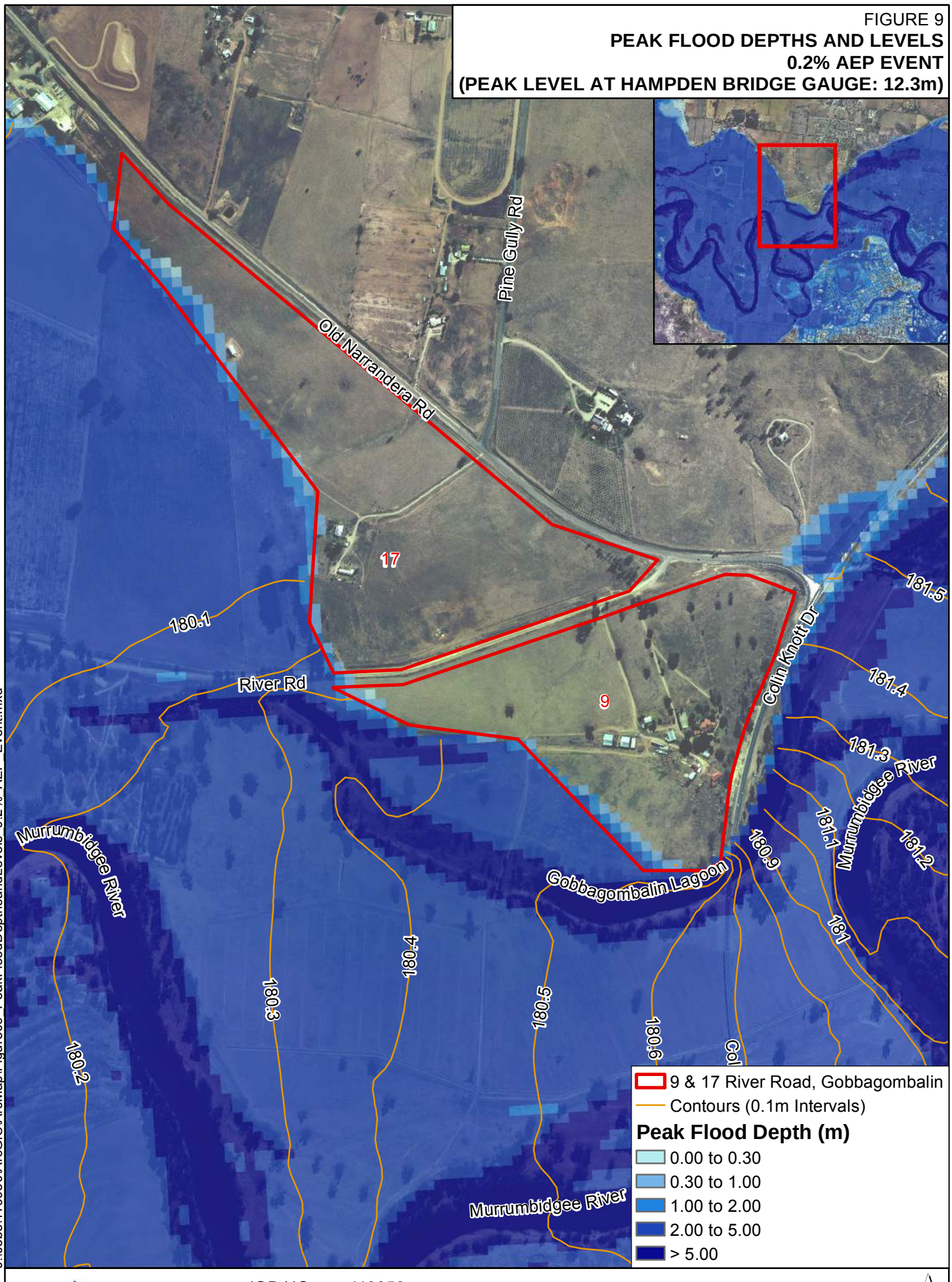
JOB NO. 119050
DATE 11 SEPTEMBER 2019
MODEL WAGGA WAGGA REVISED MURRUMBIDGEE RIVER FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

N

0 250 500 m

FIGURE 9

PEAK FLOOD DEPTHS AND LEVELS
0.2% AEP EVENT
(PEAK LEVEL AT HAMPDEN BRIDGE GAUGE: 12.3m)



9 & 17 River Road, Gobbagombalin
Contours (0.1m Intervals)

Peak Flood Depth (m)

- 0.00 to 0.30
- 0.30 to 1.00
- 1.00 to 2.00
- 2.00 to 5.00
- > 5.00

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wma water

JOB NO. 119050
DATE 11 SEPTEMBER 2019
MODEL WAGGA WAGGA REVISED MURRUMBIDGEE RIVER FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

N

0 250 500 m

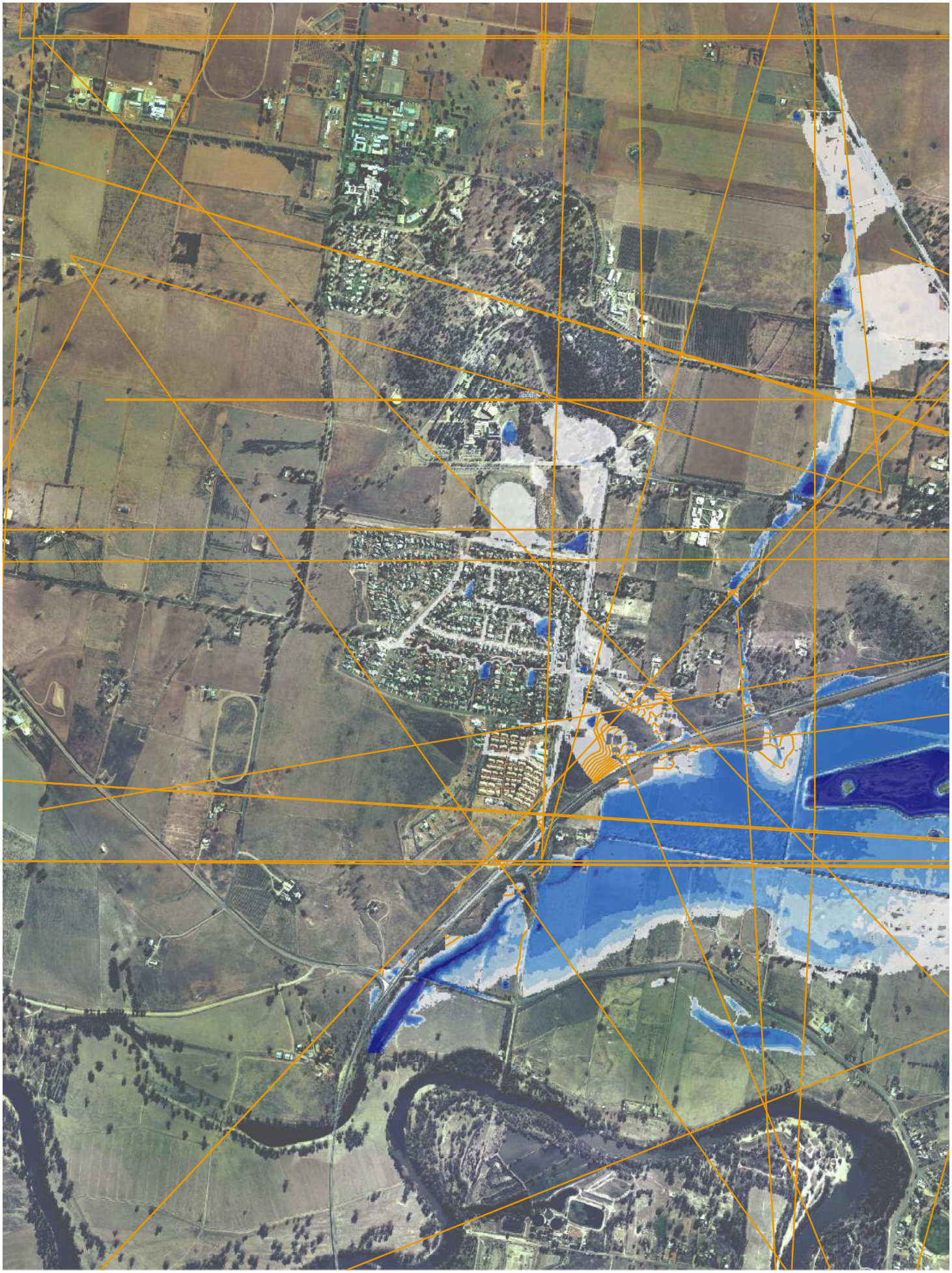
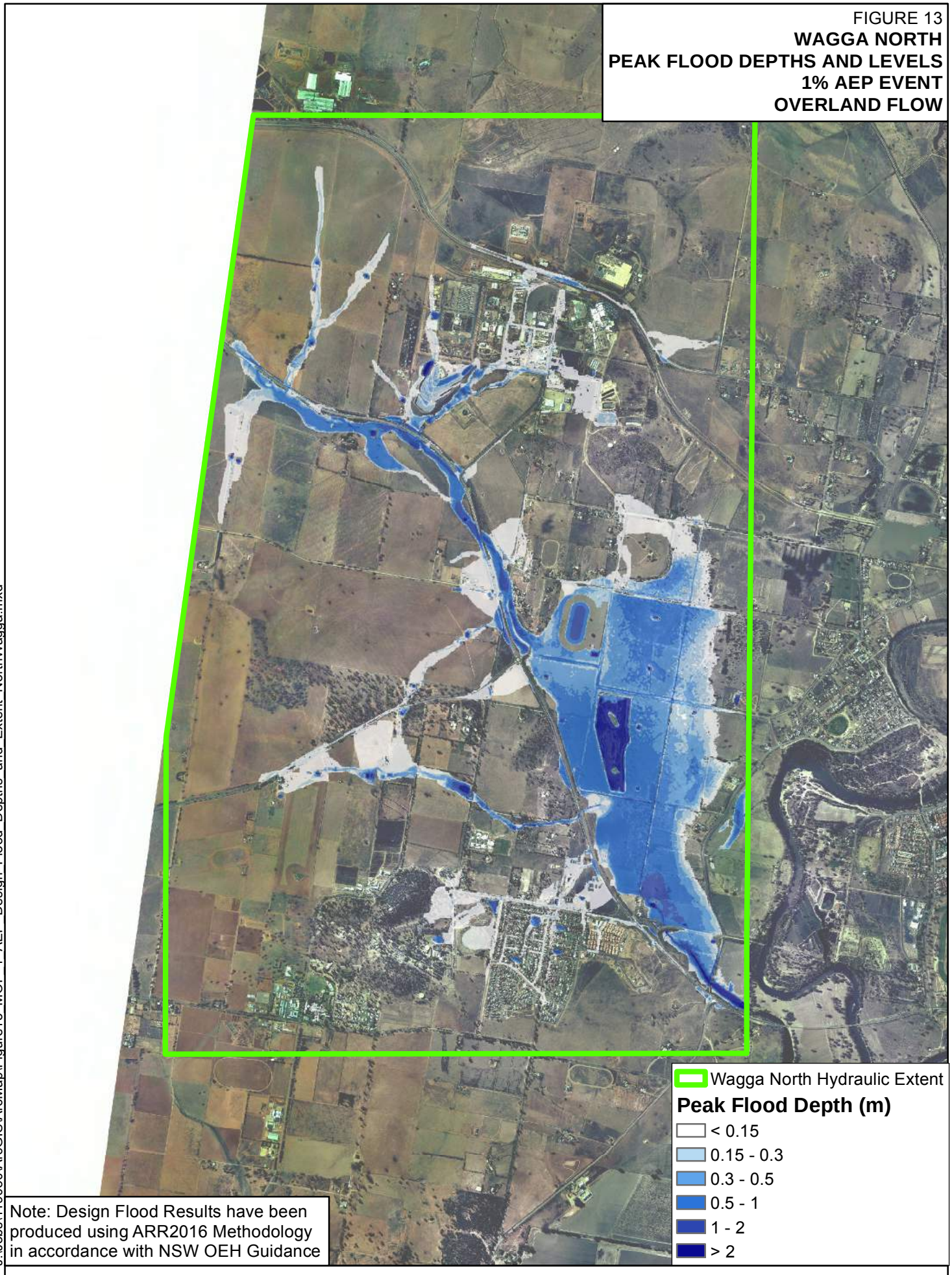


FIGURE 13
WAGGA NORTH
PEAK FLOOD DEPTHS AND LEVELS
1% AEP EVENT
OVERLAND FLOW



Note: Design Flood Results have been produced using ARR2016 Methodology in accordance with NSW OEH Guidance

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wma water

JOB NO. 119050
DATE 28 OCTOBER 2019
MODEL WAGGA WAGGA DRAFT MAJOR OVERLAND FLOW FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

N

0 500 1,000 m

Attachment A
Proposed Concept Layout
(Provided by Salvestro Planning, 22/5/2019

1. MIXED USE COMMUNITY HEART
2. LINEAR GREEN SPACE/ ACTIVE TRAVEL SPINE
3. REALIGNED ENTRY
4. HILLTOP PARK
5. MAIN STREET
6. PEDESTRIAN PROMENADE
7. STEWARDSHIP LOTS
8. AGRARIAN/ ECO TOURISM OPPORTUNITY