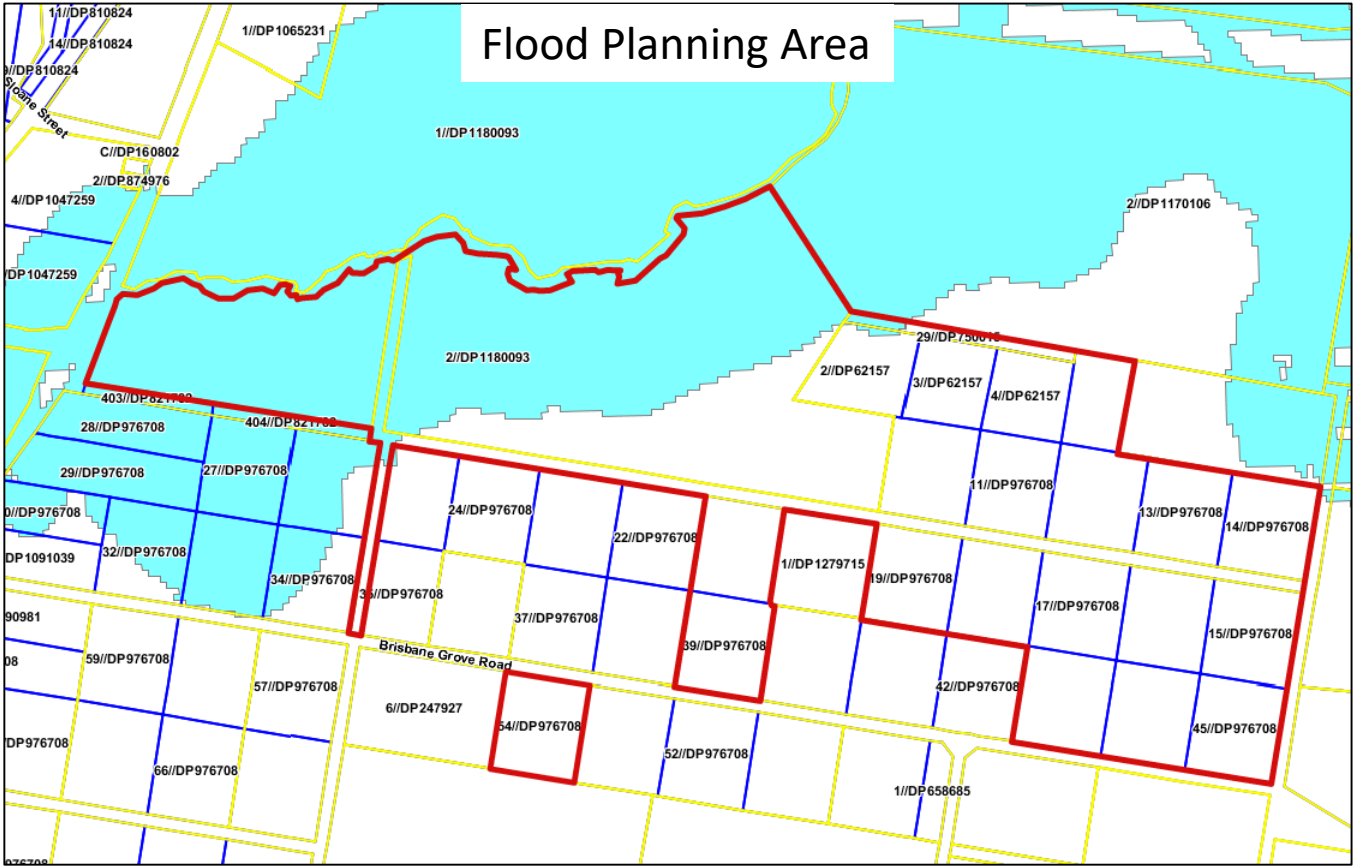
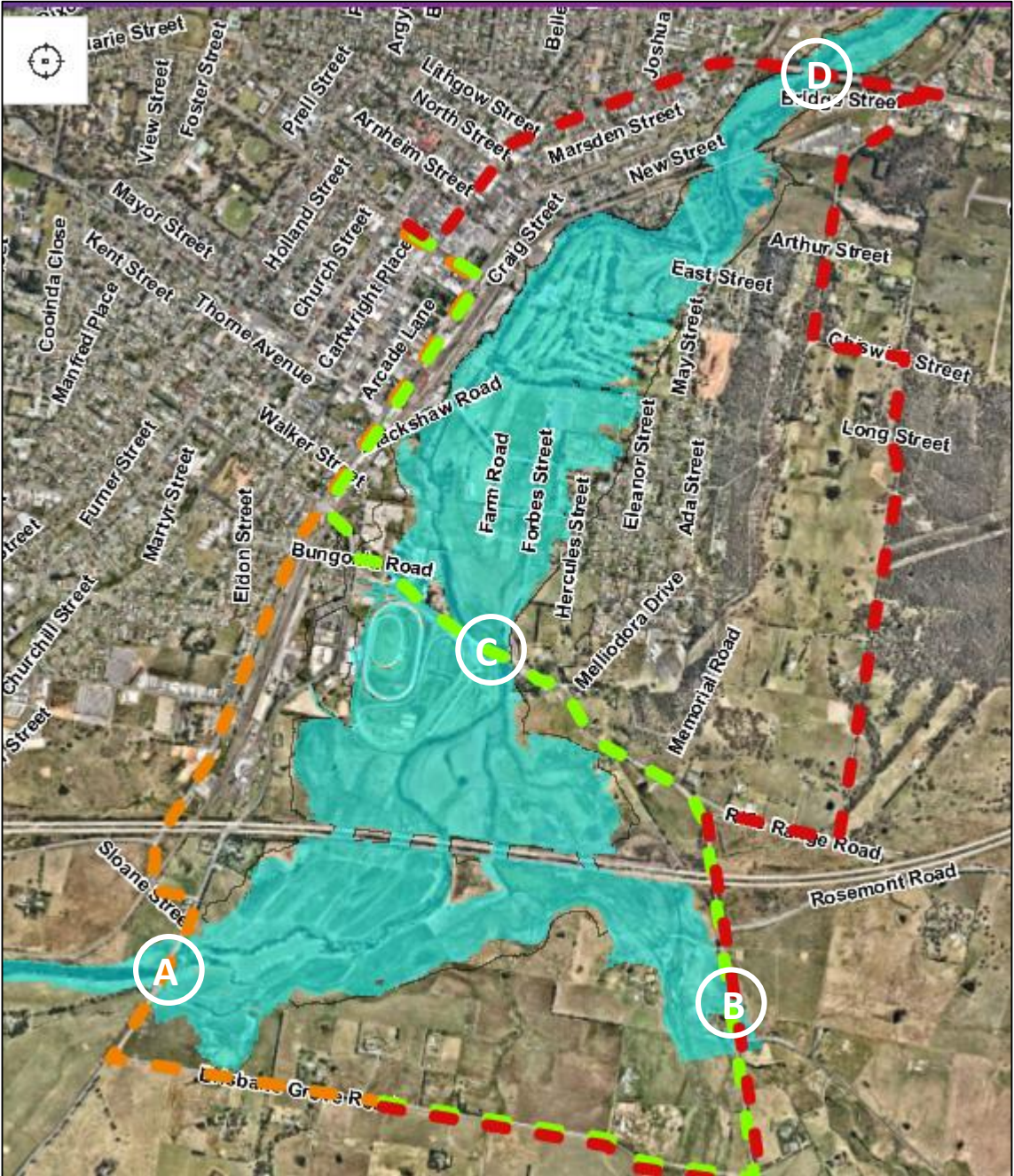


137 Brisbane Grove Evacuation Route Mapping & Pinch Point Analysis



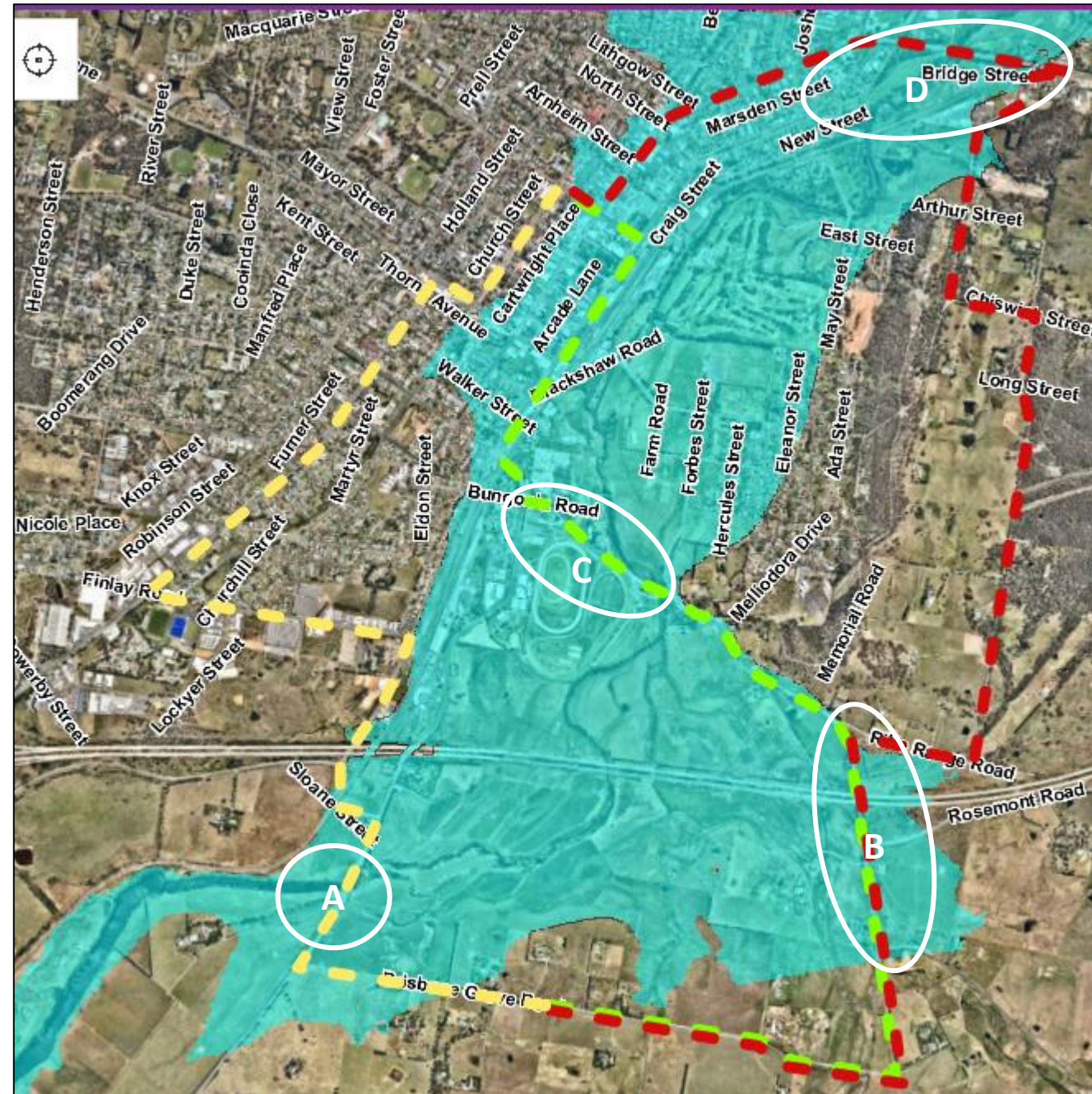
Evacuation Routes to Council
Office- Riverine-5% AEP



Evacuation Routes to Council
Office- Riverine- 1% AEP

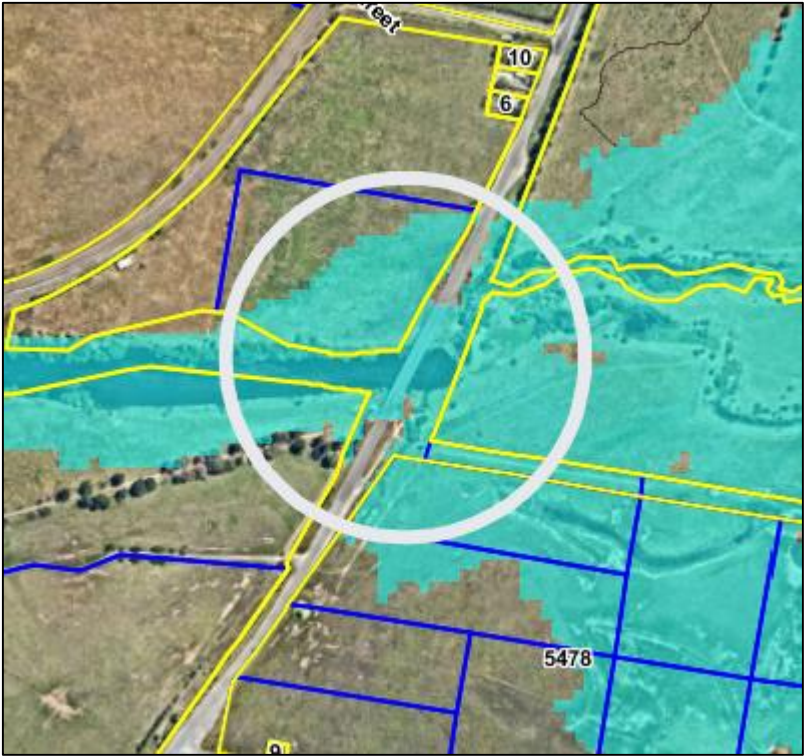


Evacuation Routes to Council Office- Riverine-PMF

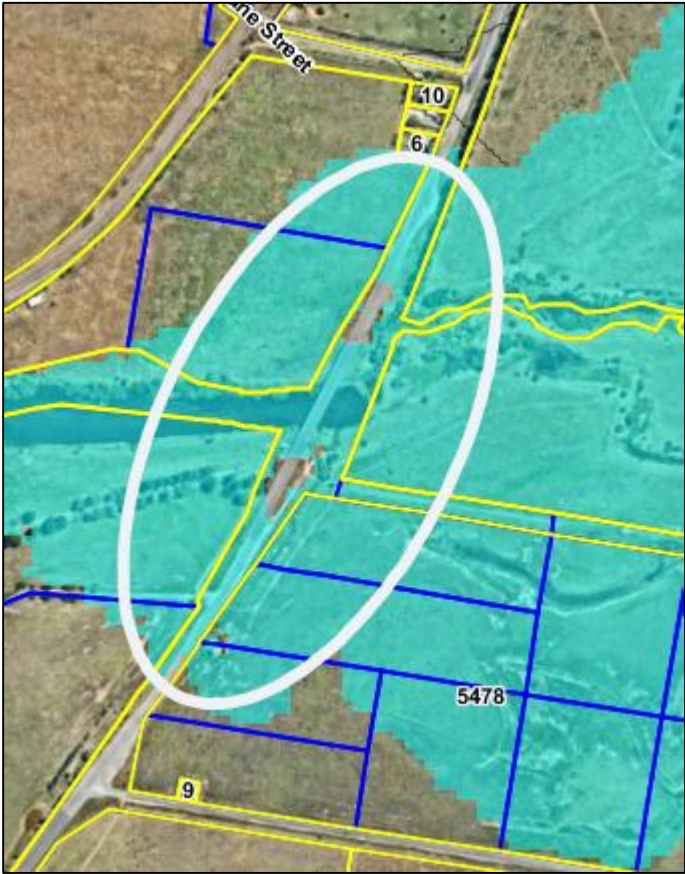


Riverine Pinch Point Area- Detailed Maps- Area A- Flood Extents

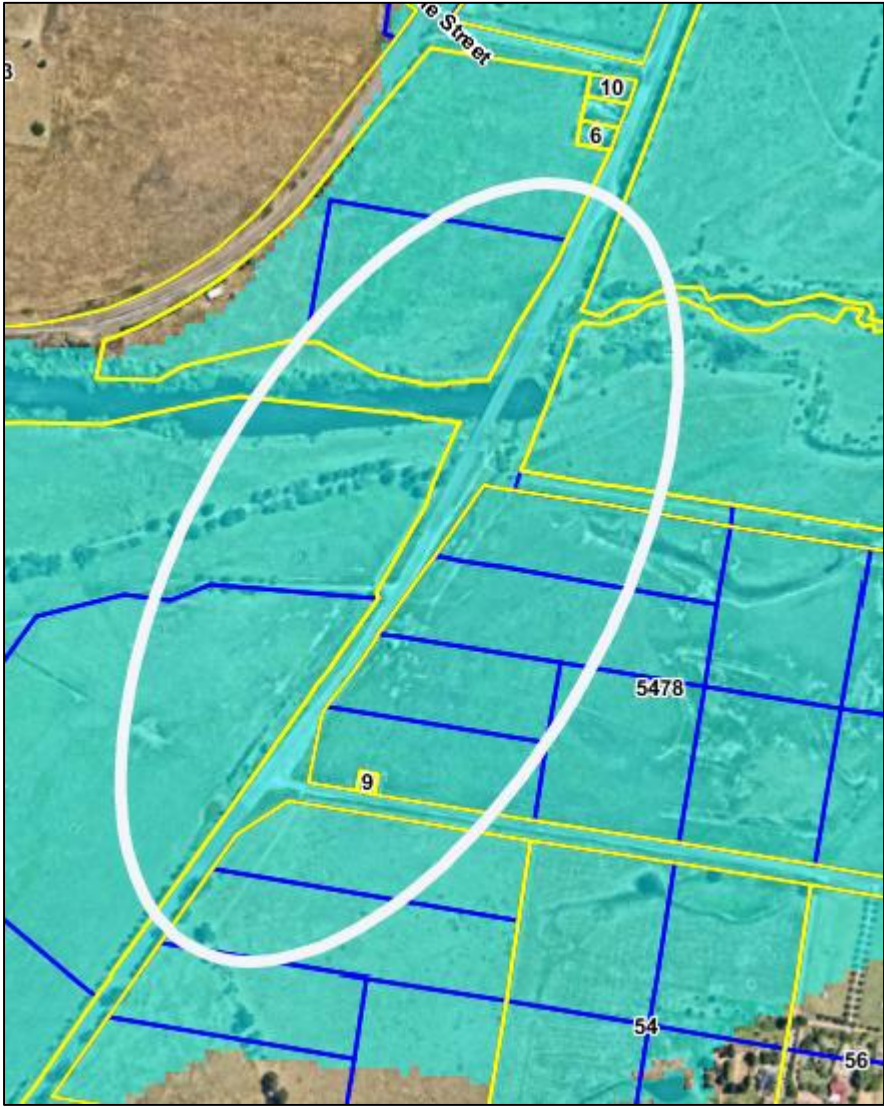
Area A- 5% AEP



Area A- 1% AEP

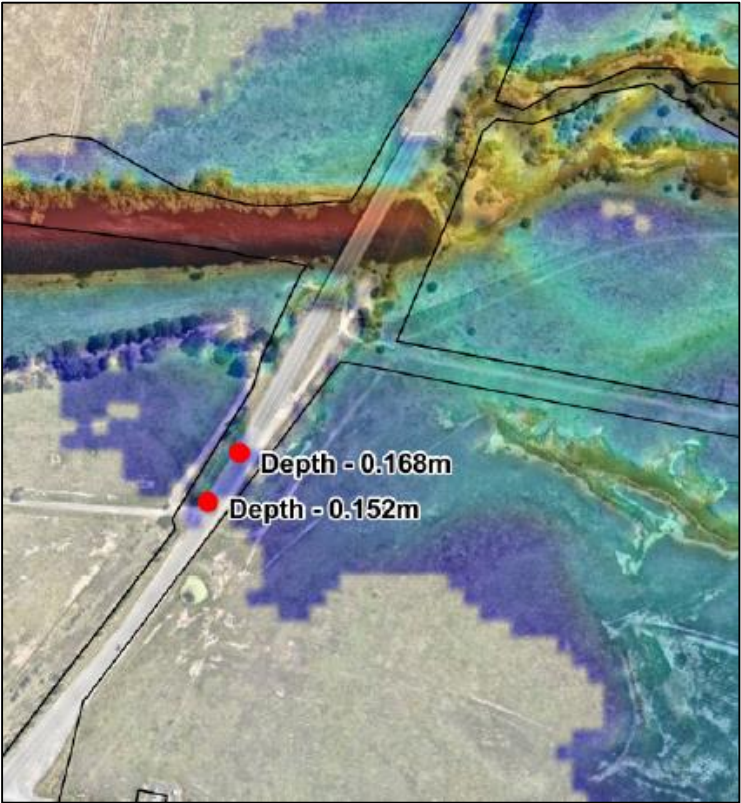


Area A- PMF

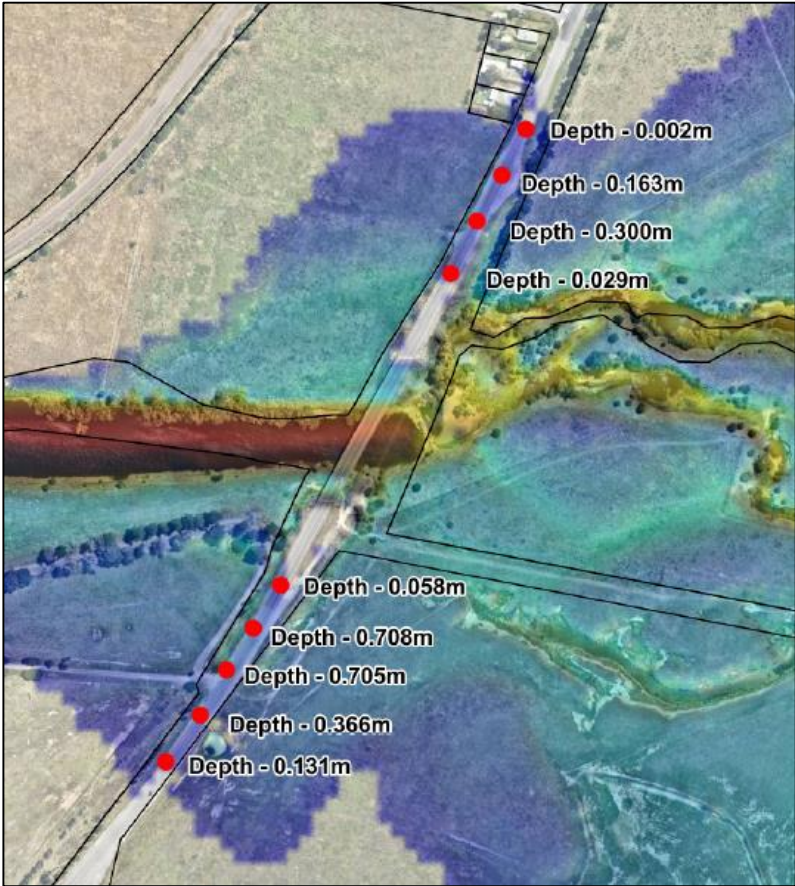


Riverine Pinch Point Area- Detailed Maps- Area A- Flood Depths

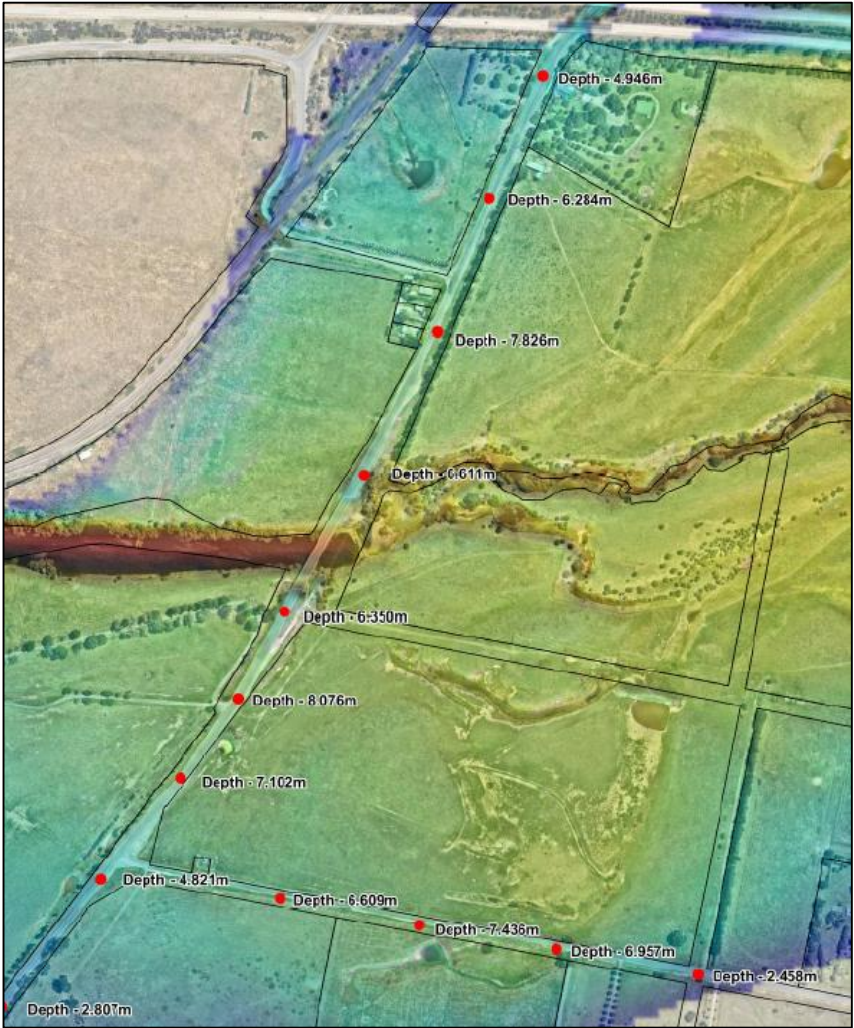
Area A- 5% AEP



Area A- 1% AEP

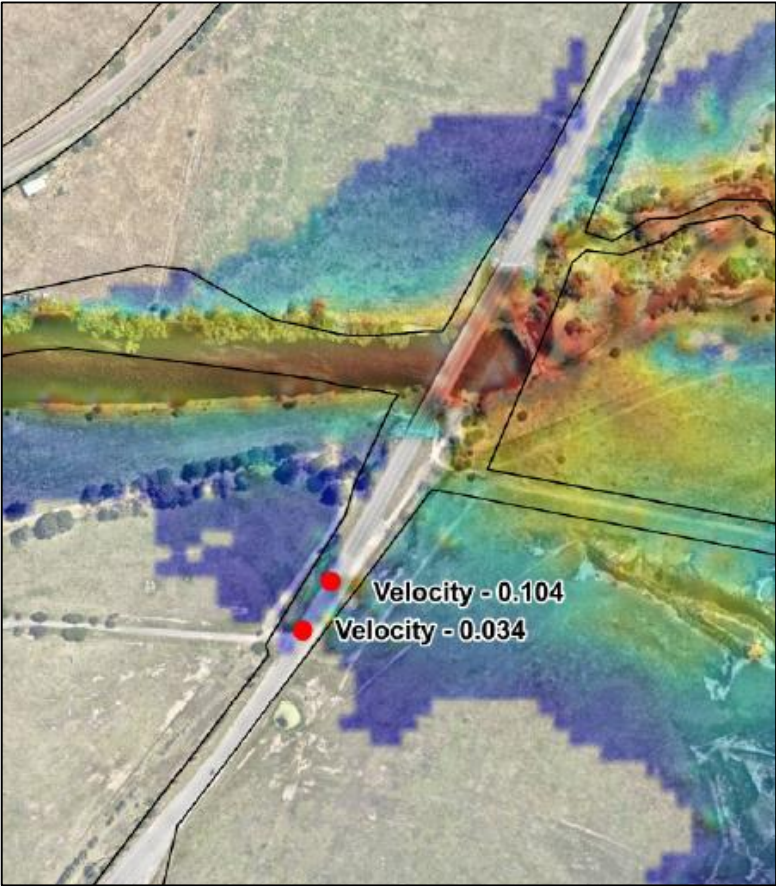


Area A- PMF

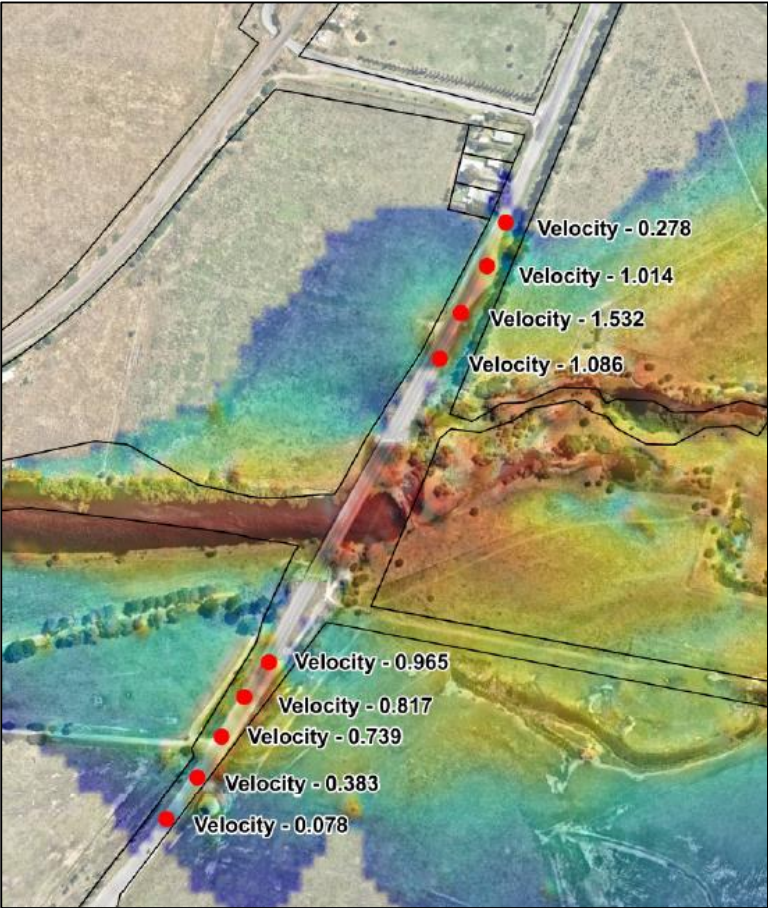


Riverine Pinch Point Area- Detailed Maps- Area A- Flood Velocities

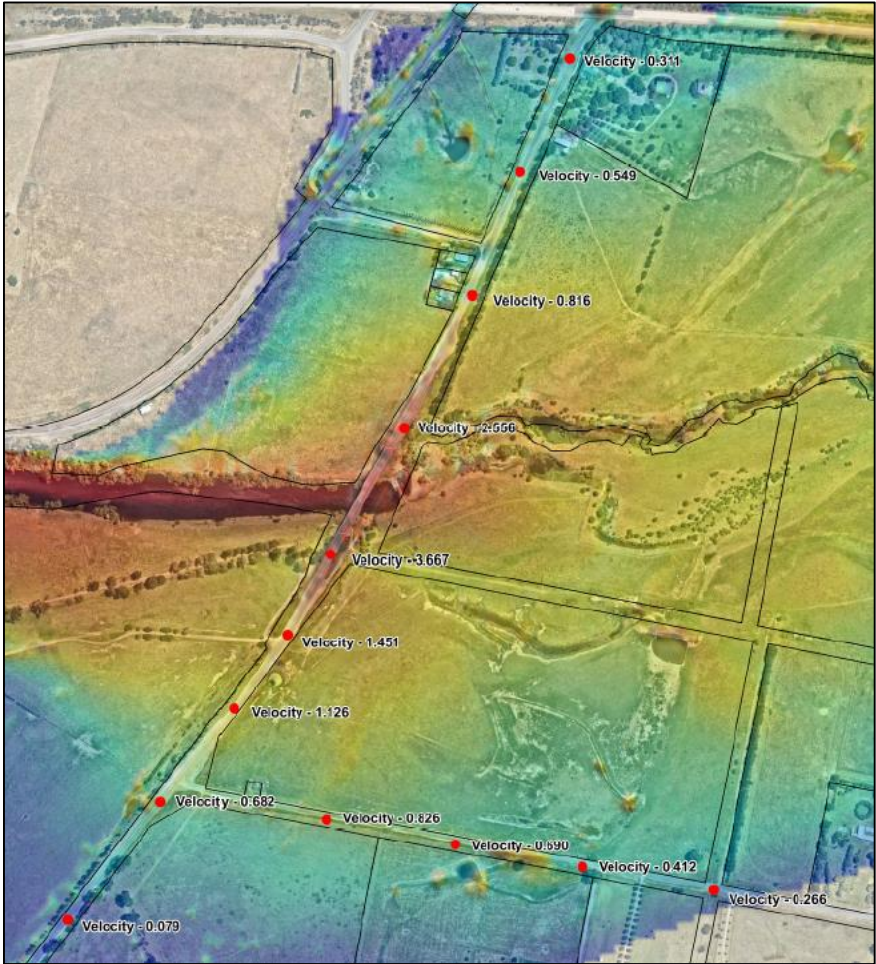
Area A- 5% AEP



Area A- 1% AEP

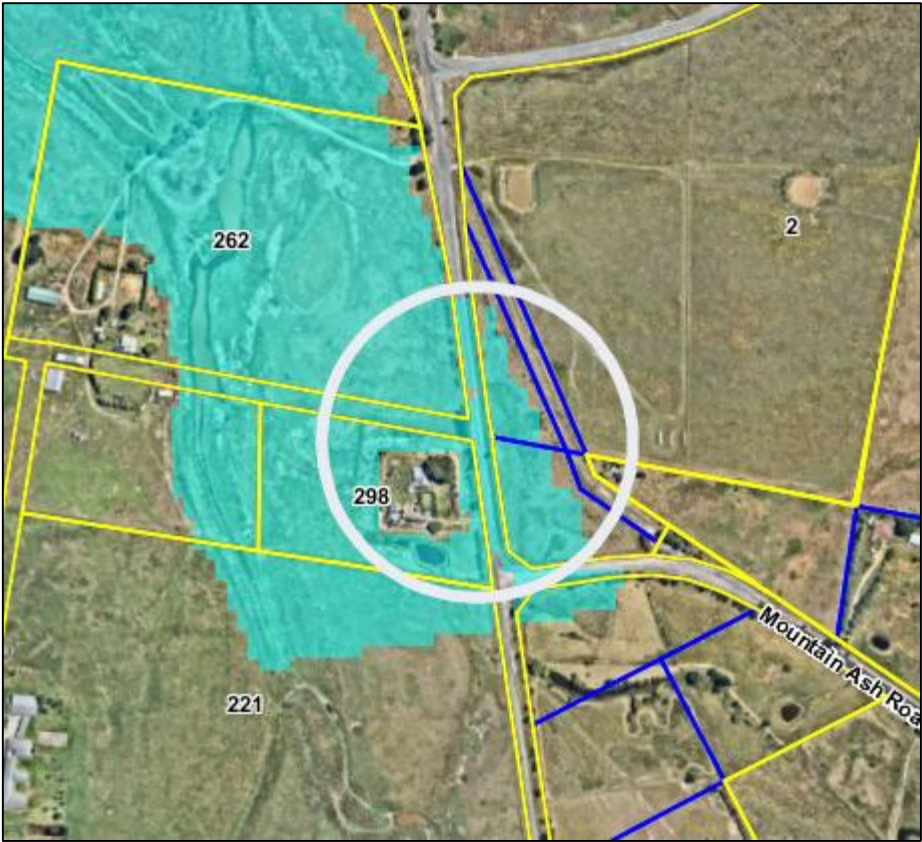


Area A- PMF

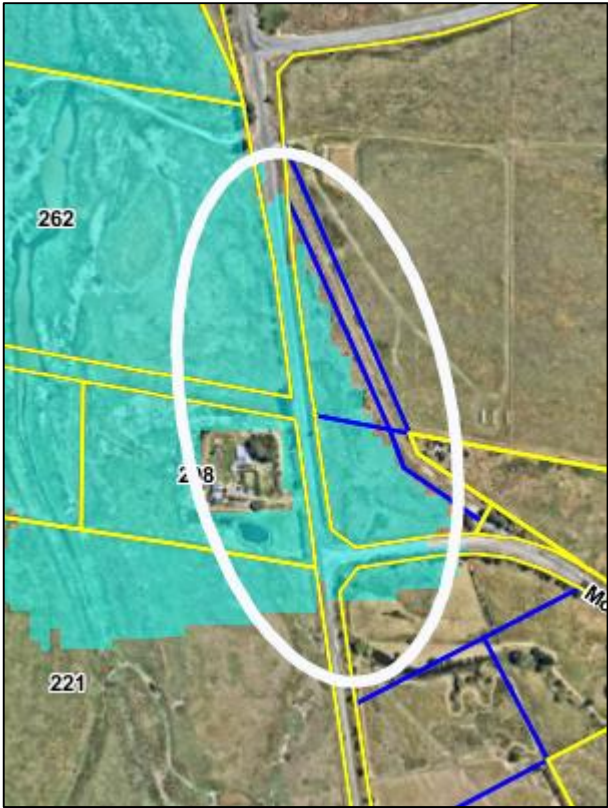


Riverine Pinch Point Area- Detailed Maps- Area B

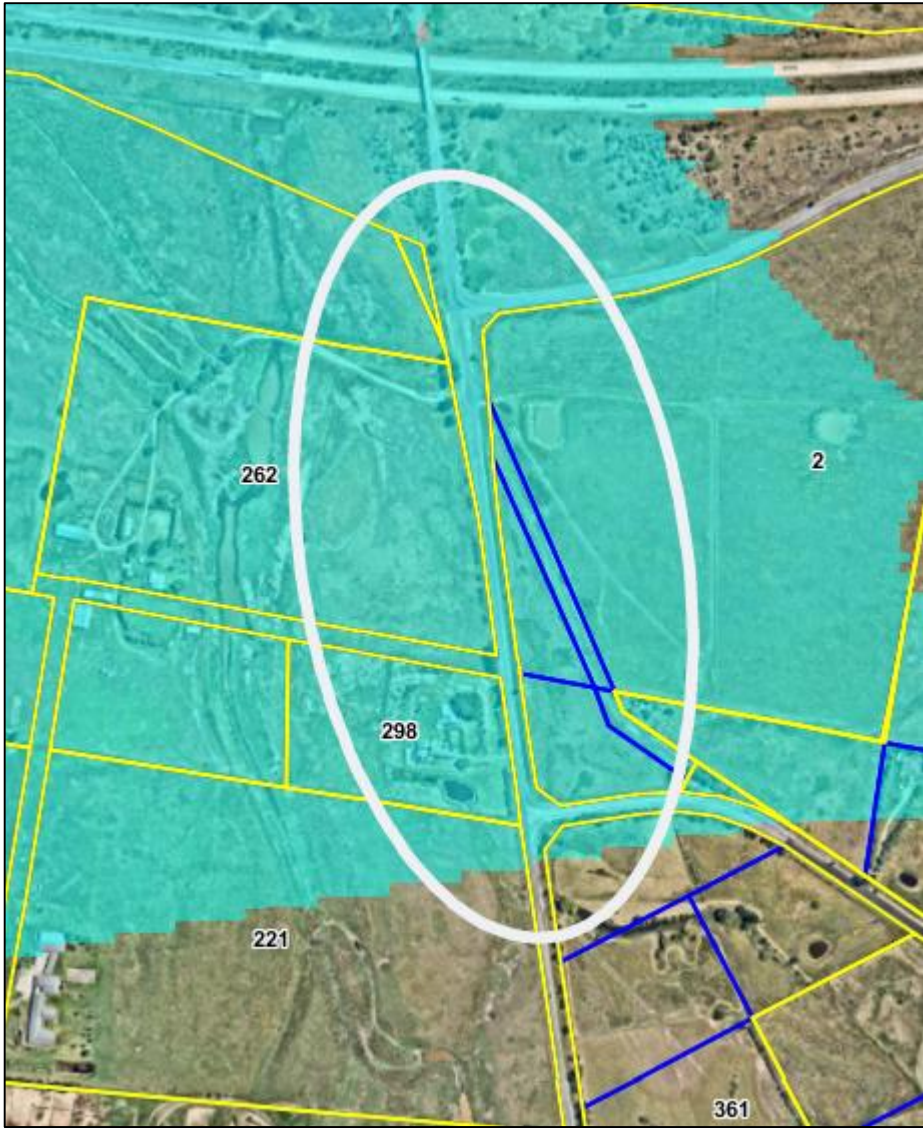
Area B- 5% AEP



Area B- 1% AEP



Area B- PMF

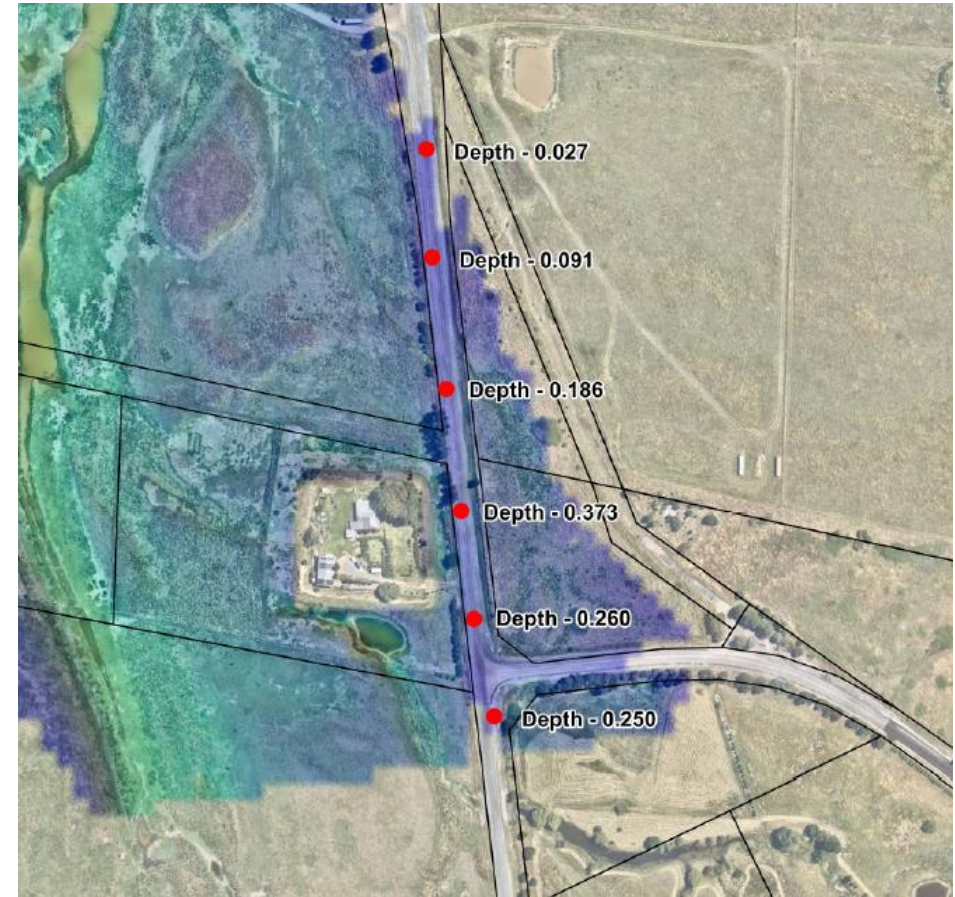


Riverine Pinch Point Area- Detailed Maps- Area B- Flood Depths

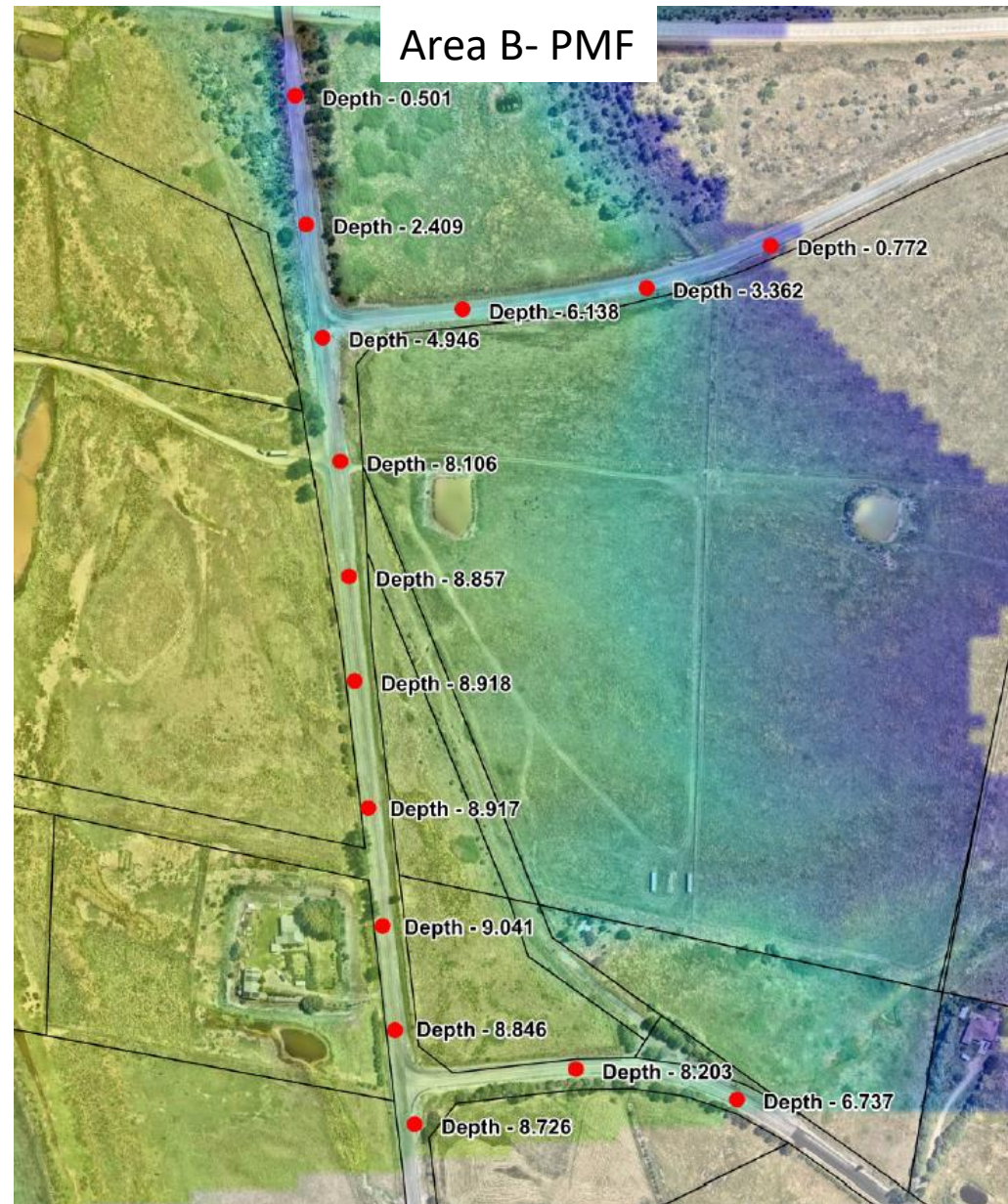
Area B- 5% AEP



Area B- 1% AEP

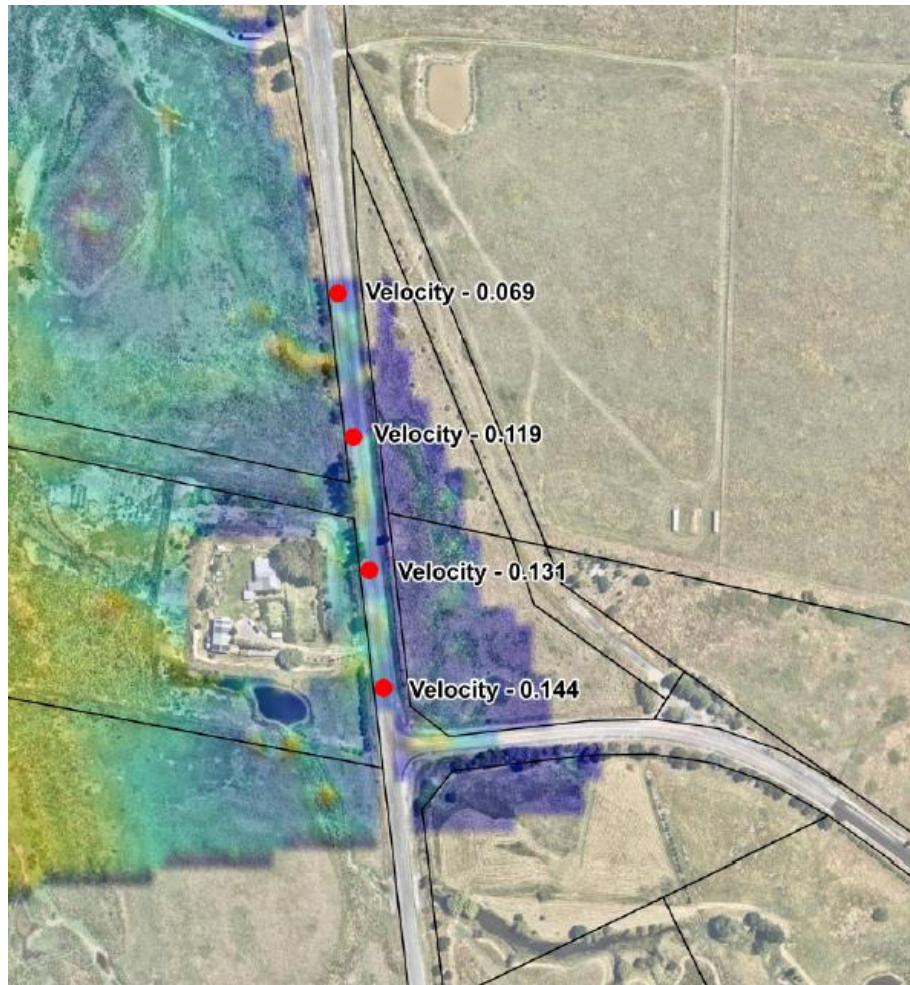


Riverine Pinch Point Area- Detailed Maps- Area B- Flood Depths

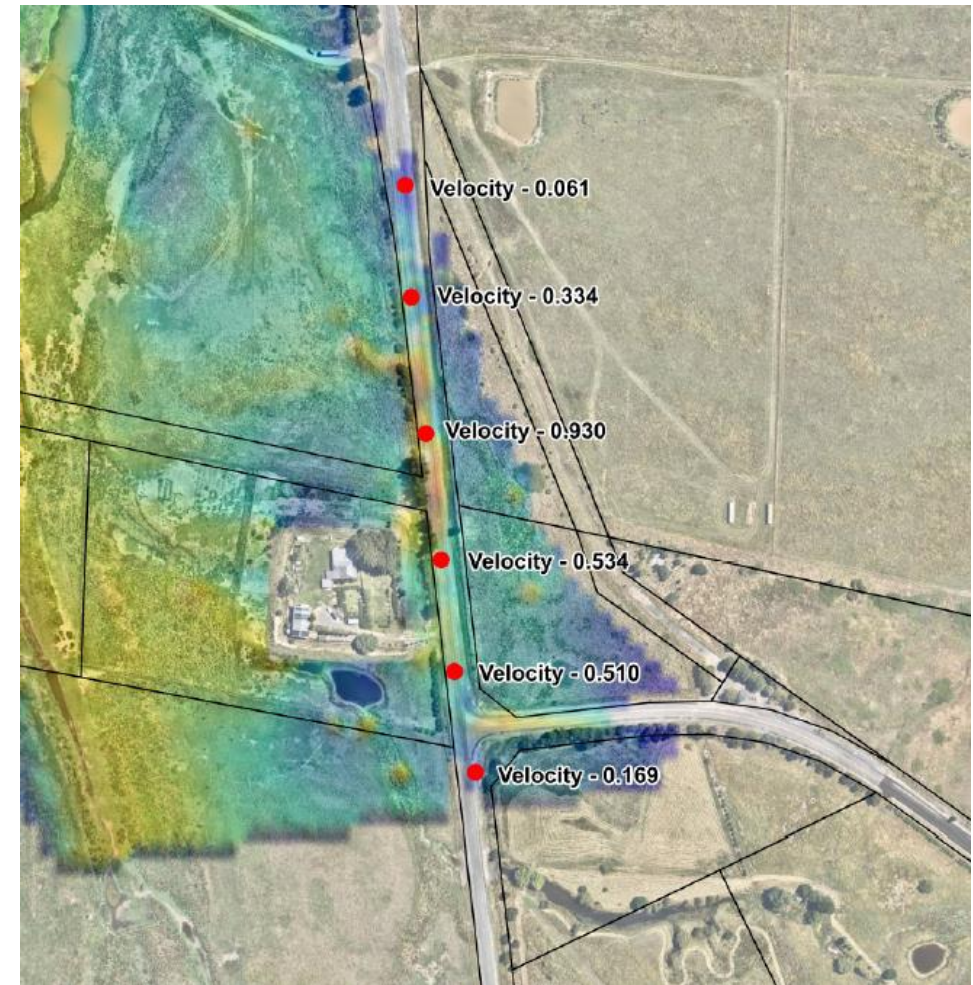


Riverine Pinch Point Area- Detailed Maps- Area B- Flood Velocities

Area B- 5% AEP

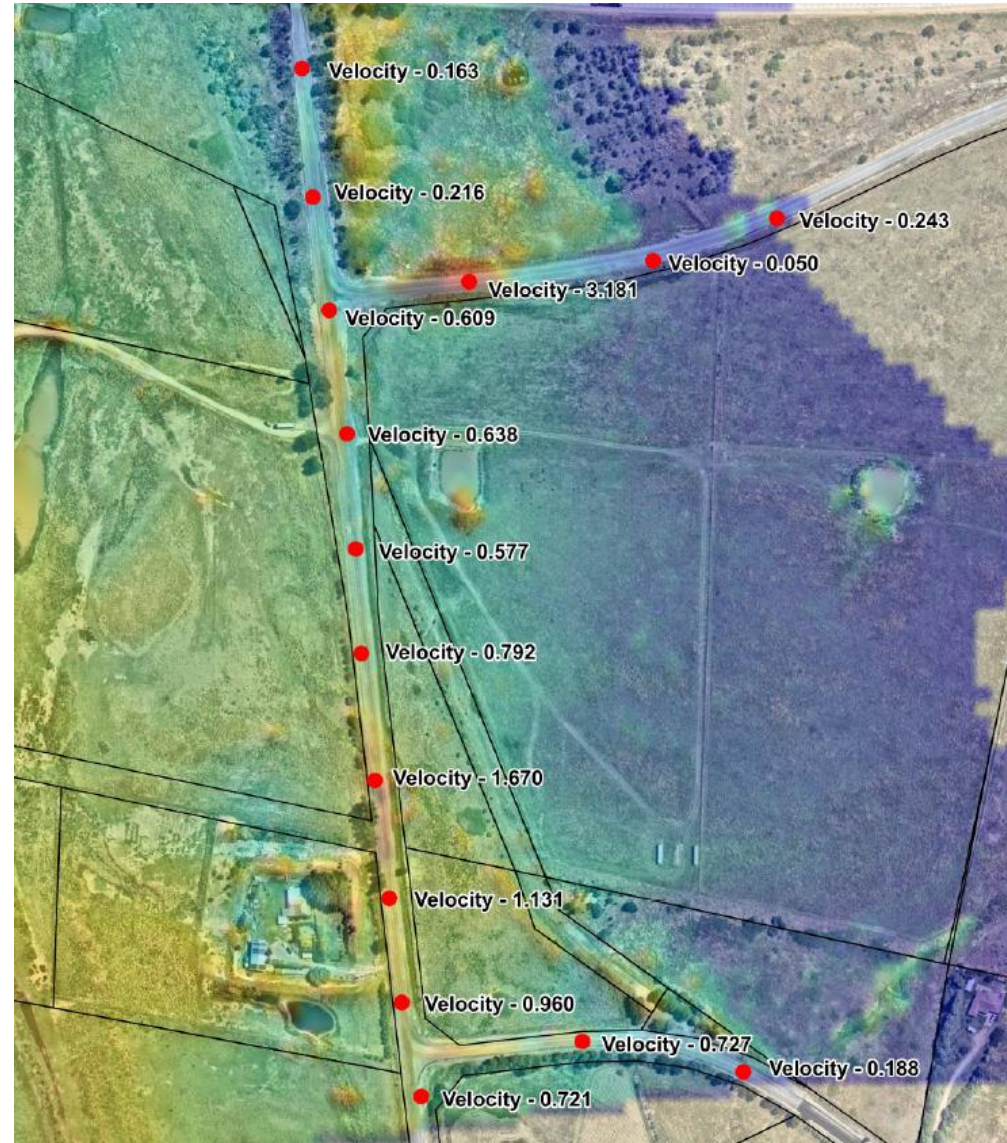


Area B- 1% AEP



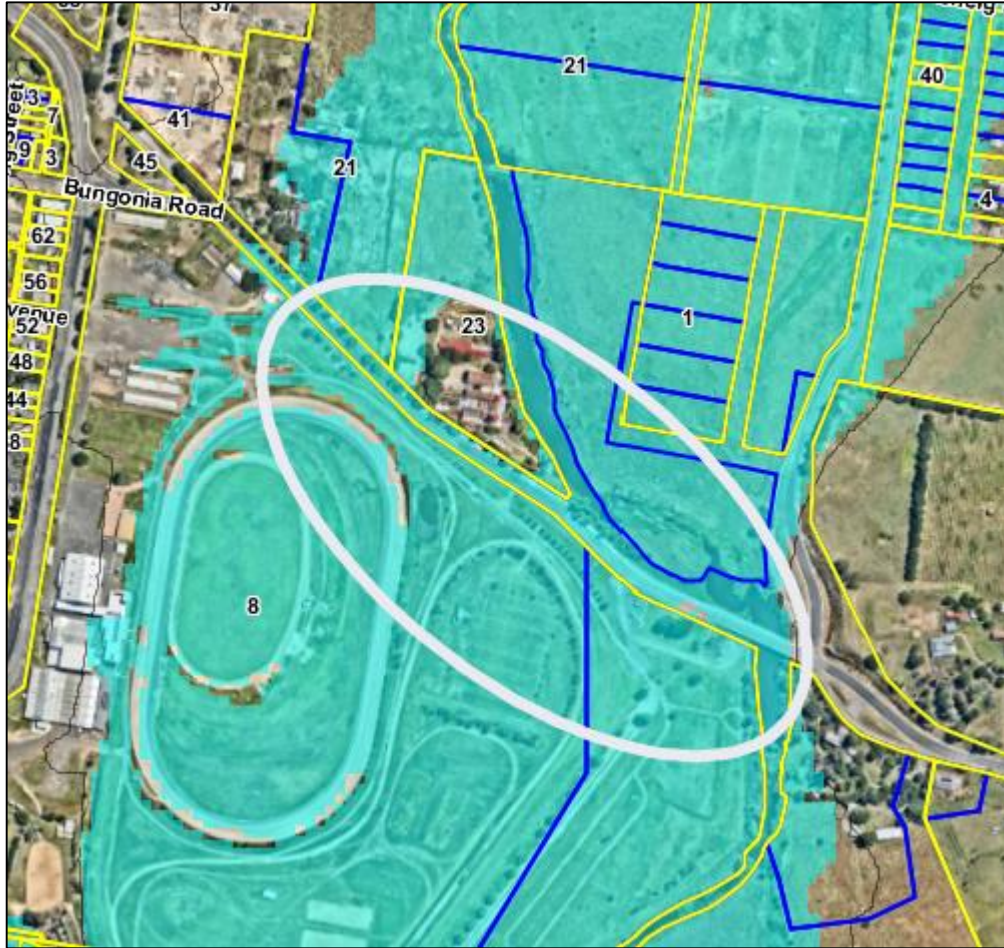
Riverine Pinch Point Area- Detailed Maps- Area B- Flood Velocities

Area B- PMF

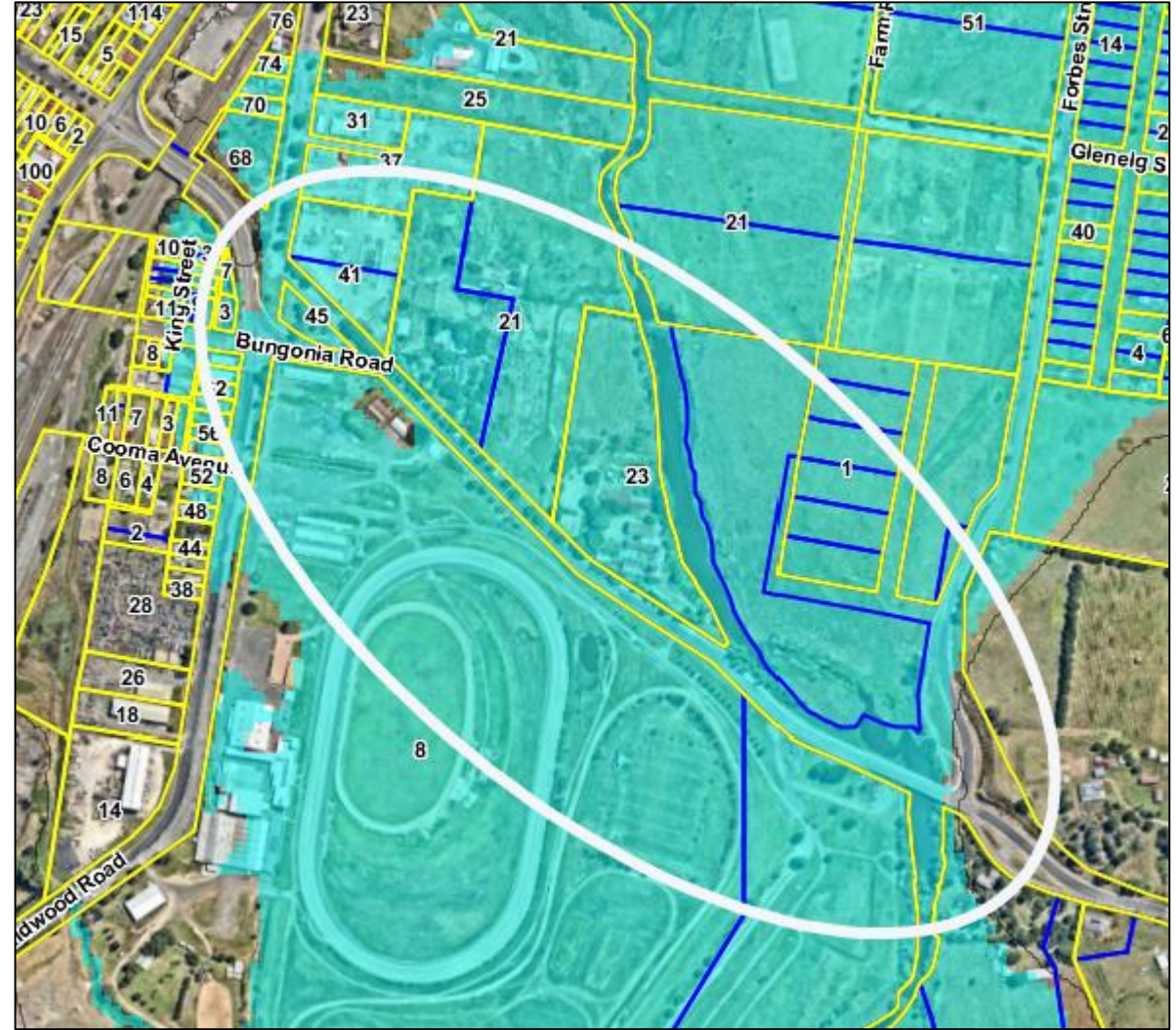


Riverine Pinch Point Area- Detailed Maps- Area C

Area C- 5% AEP

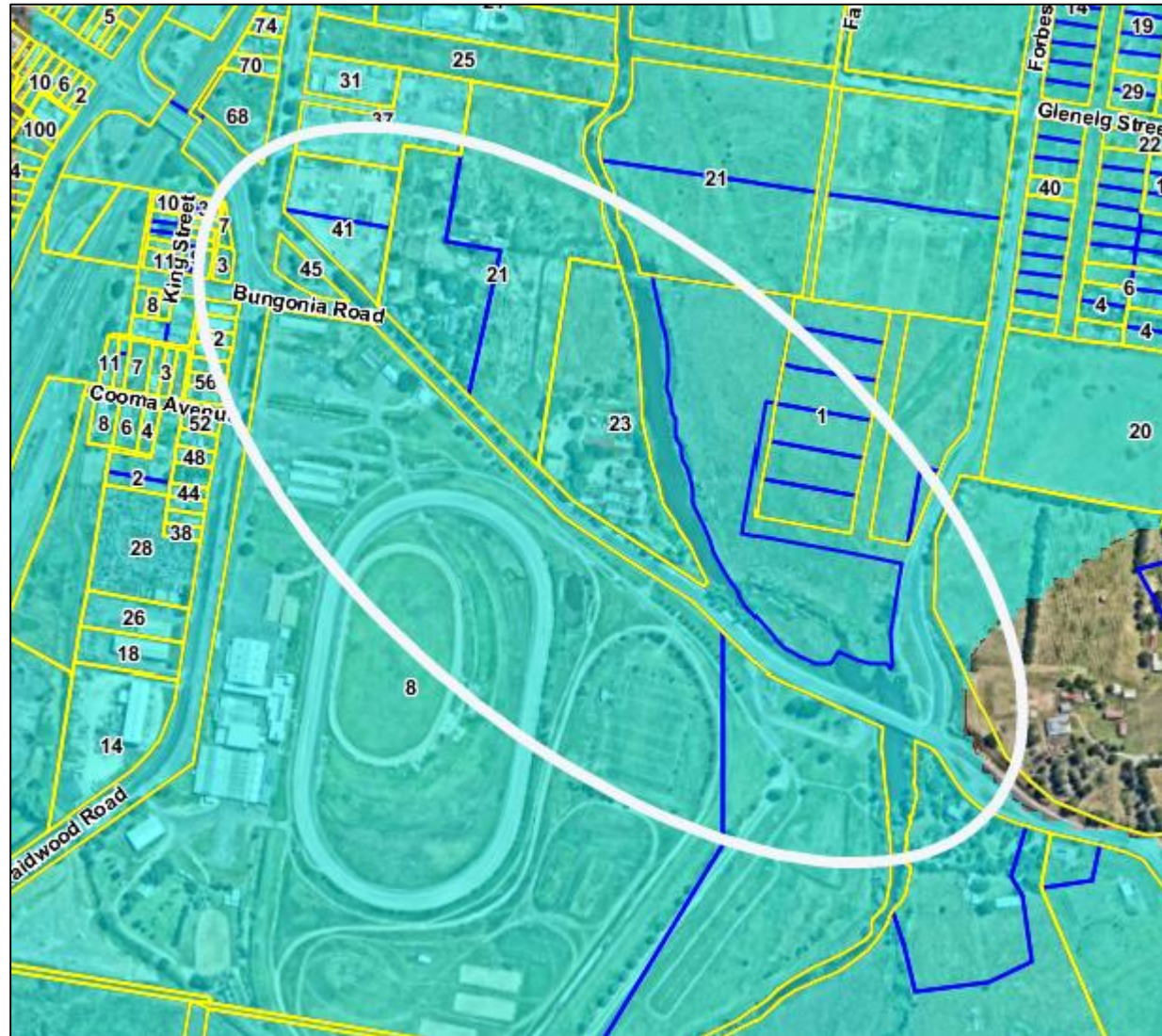


Area C- 1% AEP



Riverine Pinch Point Area- Detailed Maps- Area C

Area C- PMF



Riverine Pinch Point Area- Detailed Maps- Area C- Flood Depths

Area C- 5% AEP



Area C- 1% AEP



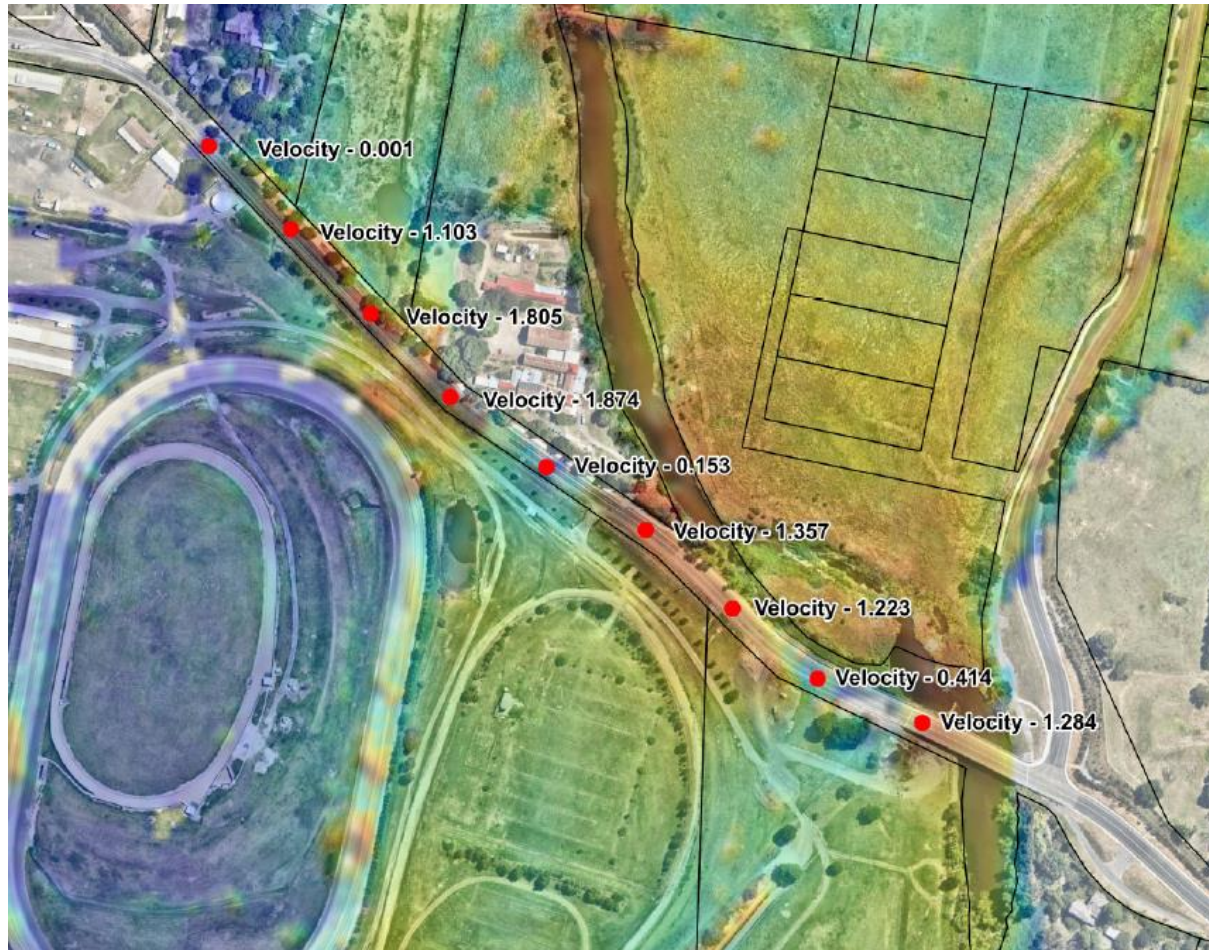
Riverine Pinch Point Area- Detailed Maps- Area C- Flood Depths

Area C- PMF

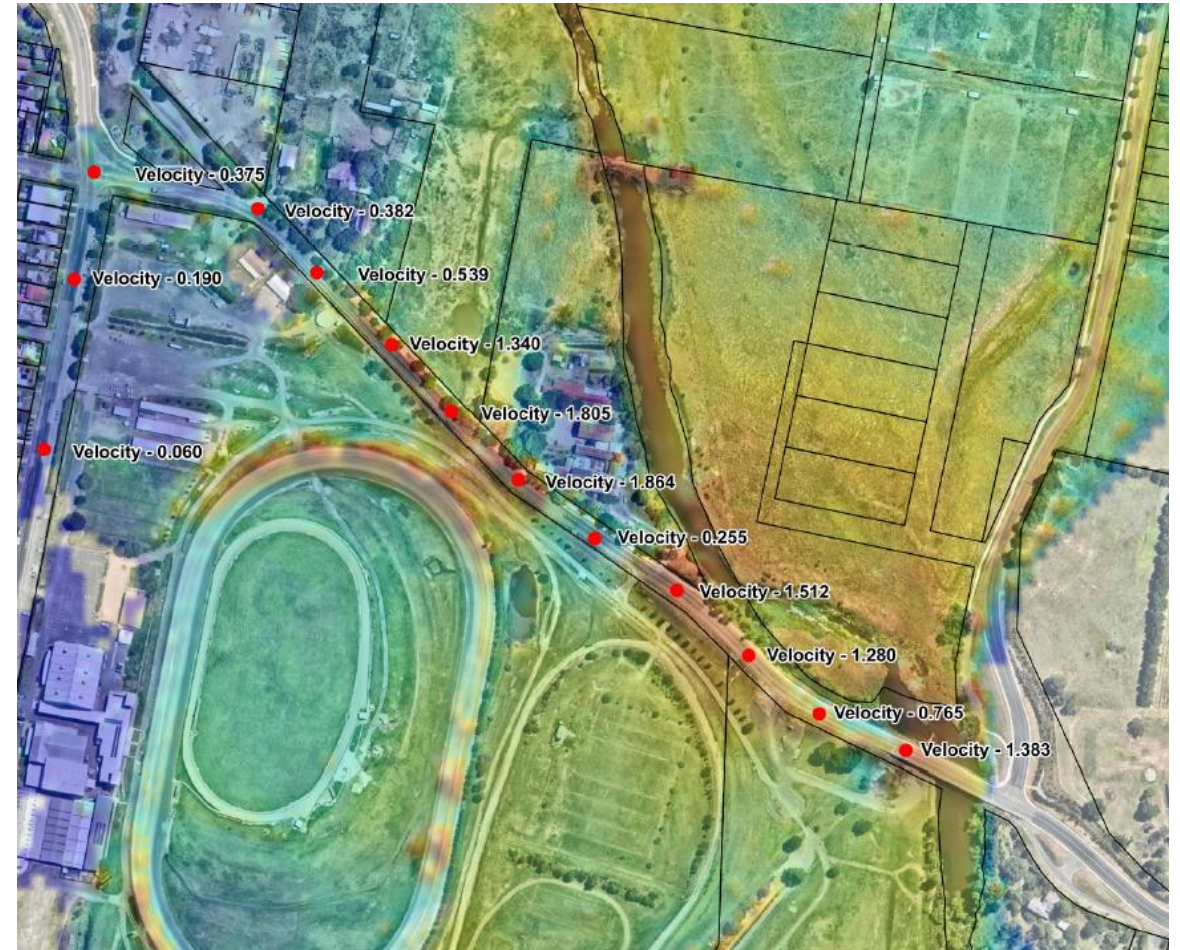


Riverine Pinch Point Area- Detailed Maps- Area C- Flood Velocities

Area C- 5% AEP



Area C- 1% AEP



Riverine Pinch Point Area- Detailed Maps- Area C- Flood Velocities

Area C- PMF

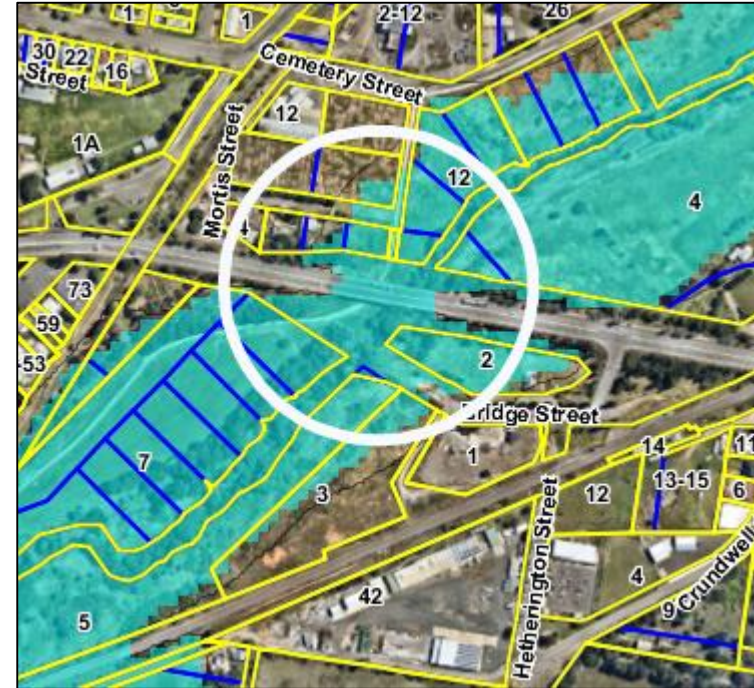


Riverine Pinch Point Area- Detailed Maps- Area D

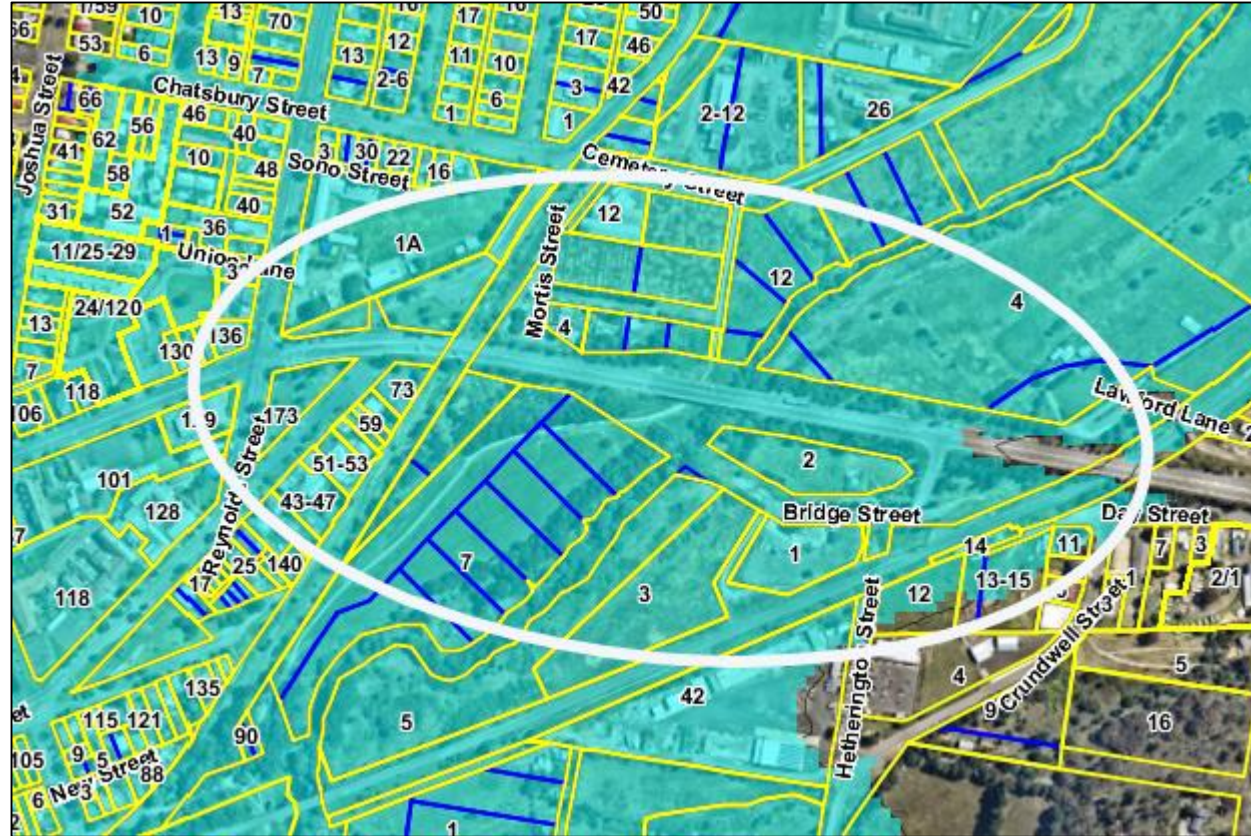
Area D- 5% AEP



Area D- 1% AEP



Area D- PMF

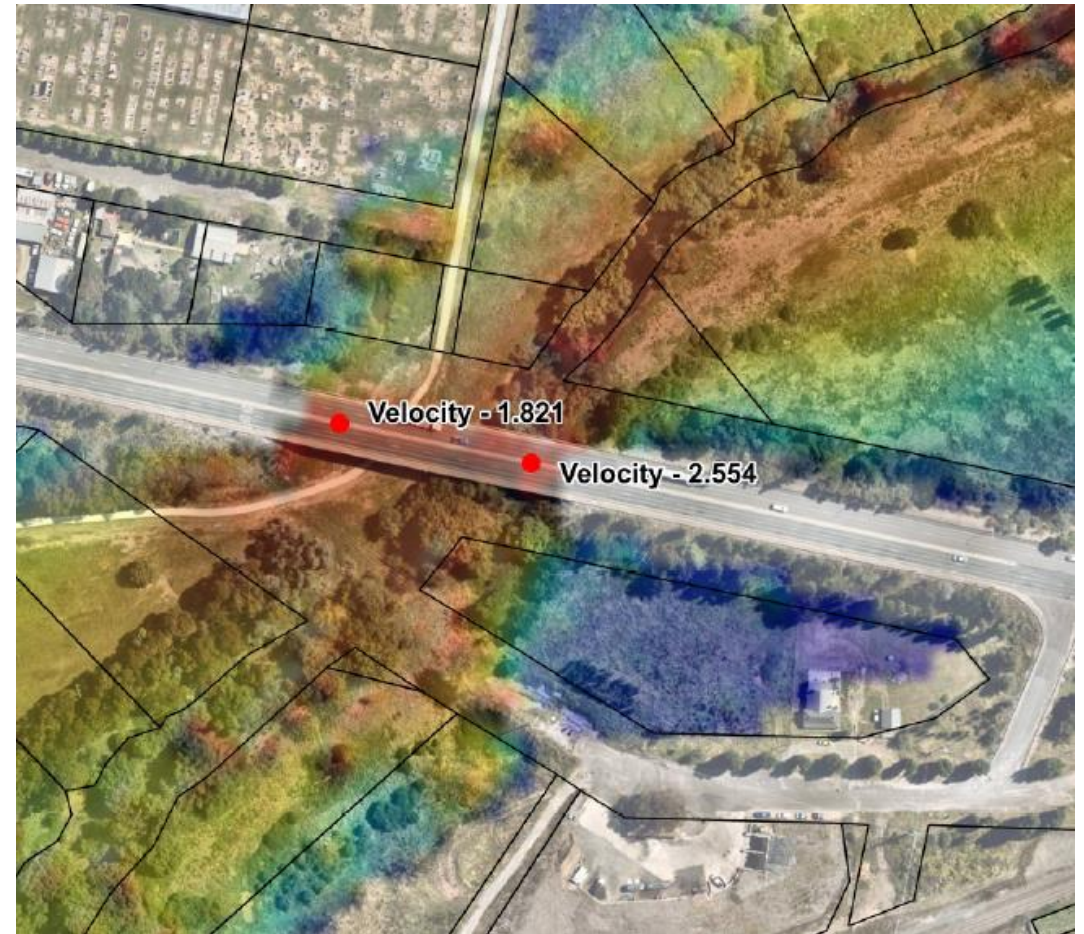


Riverine Pinch Point Area- Detailed Maps- Area D- Flood Depths

Area D- 5% AEP



Area D- 1% AEP



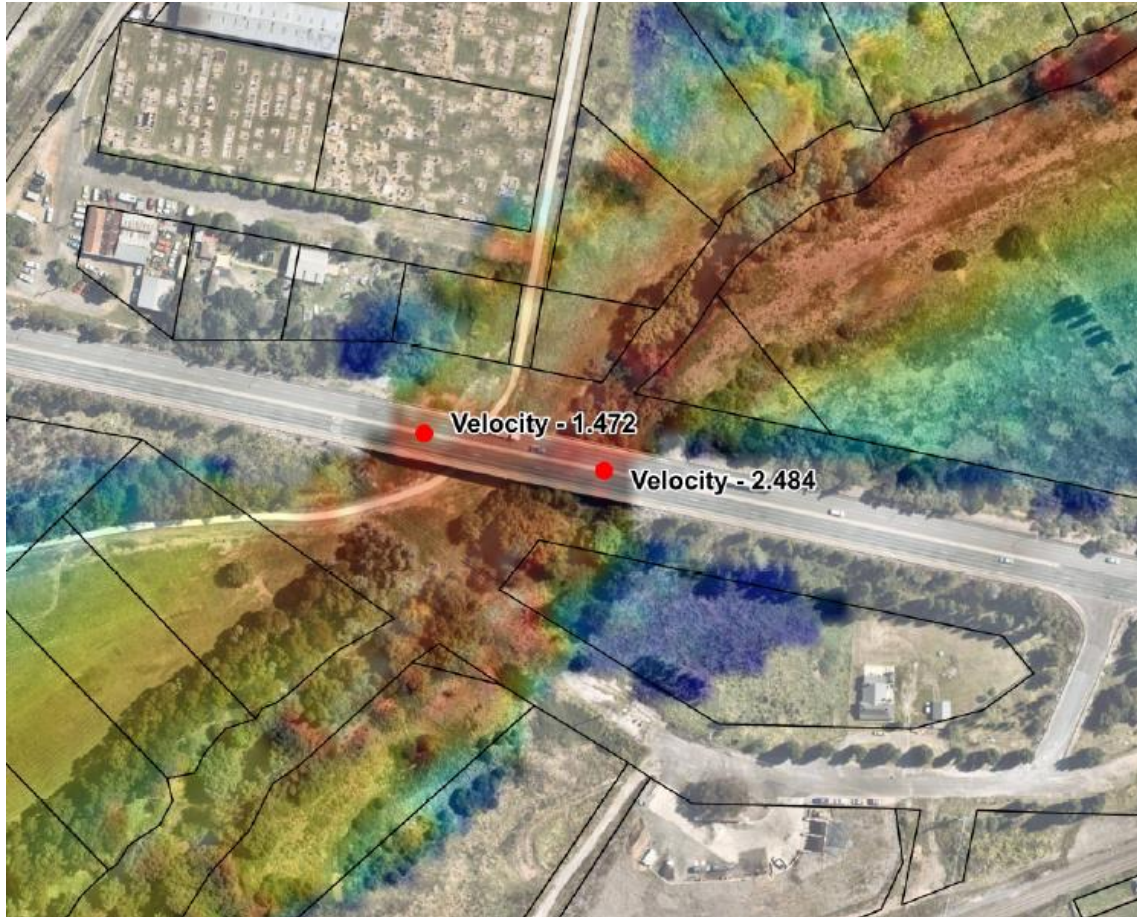
Riverine Pinch Point Area- Detailed Maps- Area D- Flood Depths

Area D- PMF

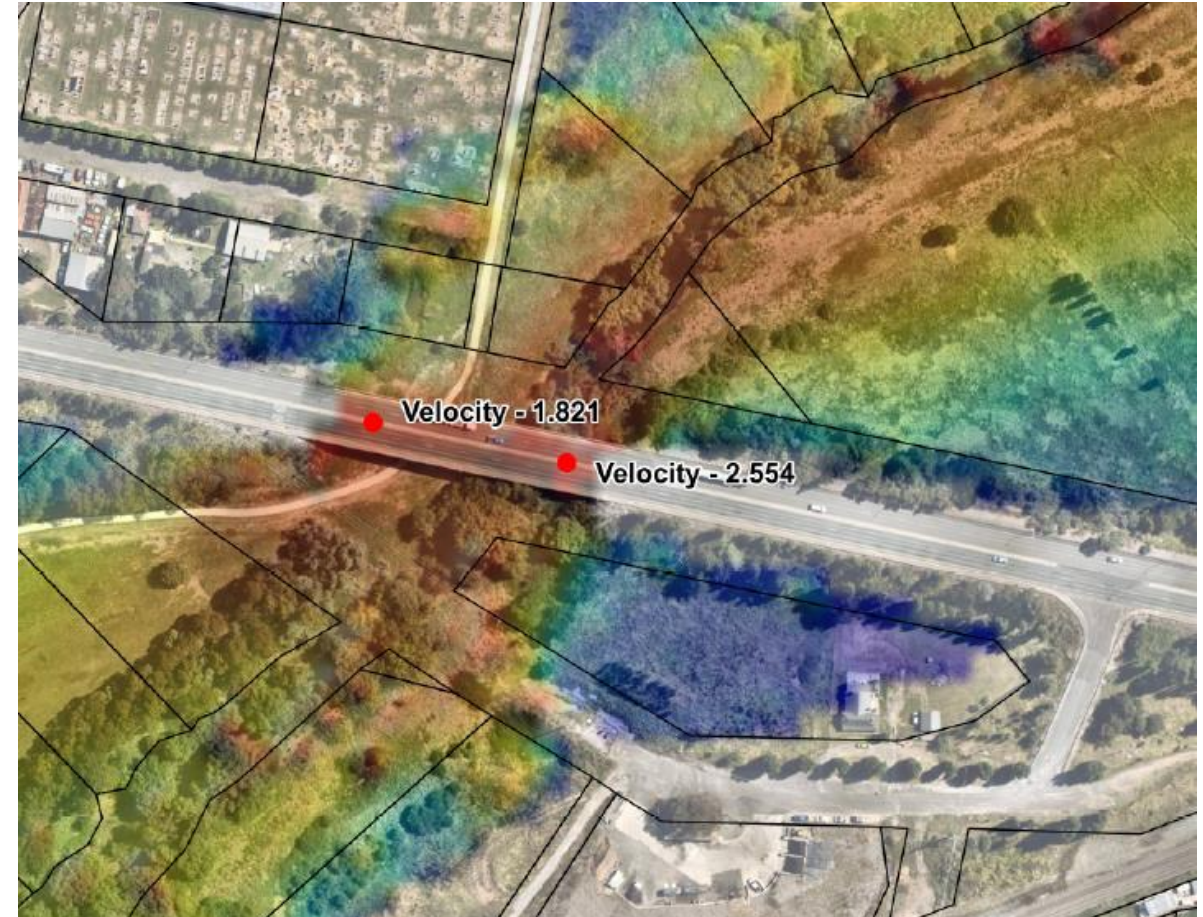


Riverine Pinch Point Area- Detailed Maps- Area D- Flood Velocities

Area D- 5% AEP

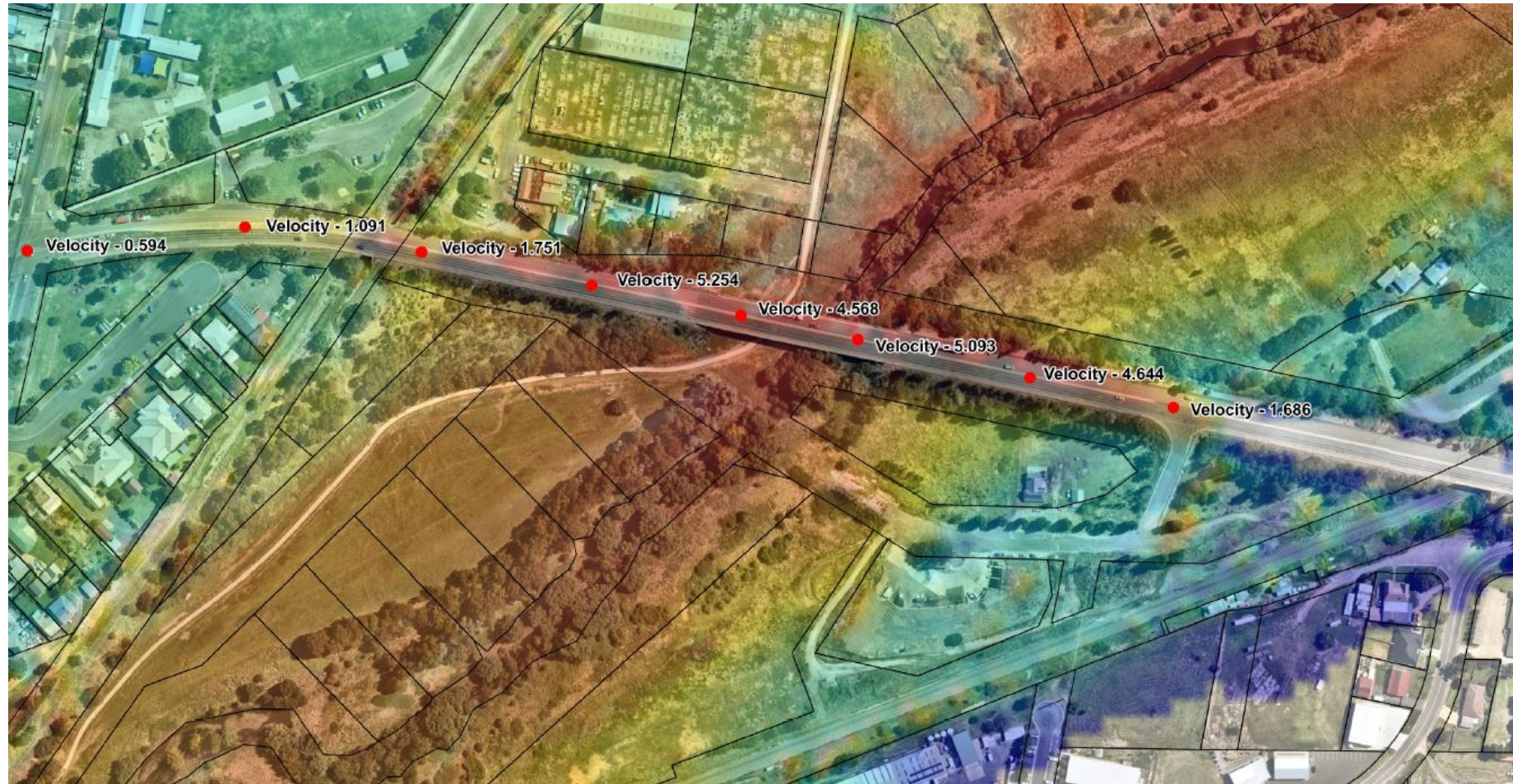


Area D- 1% AEP

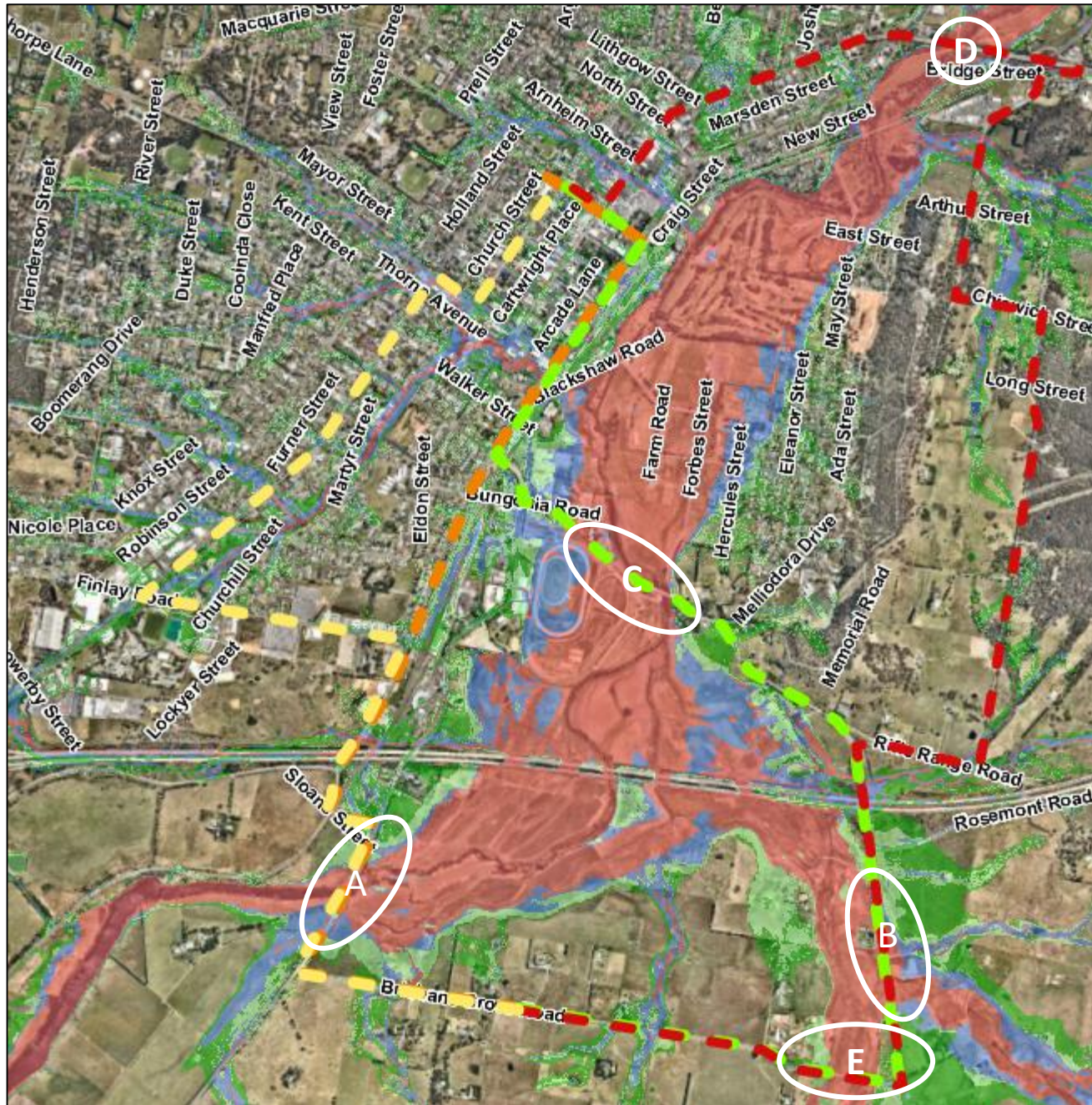


Riverine Pinch Point Area- Detailed Maps- Area D- Flood Velocities

Area D- PMF



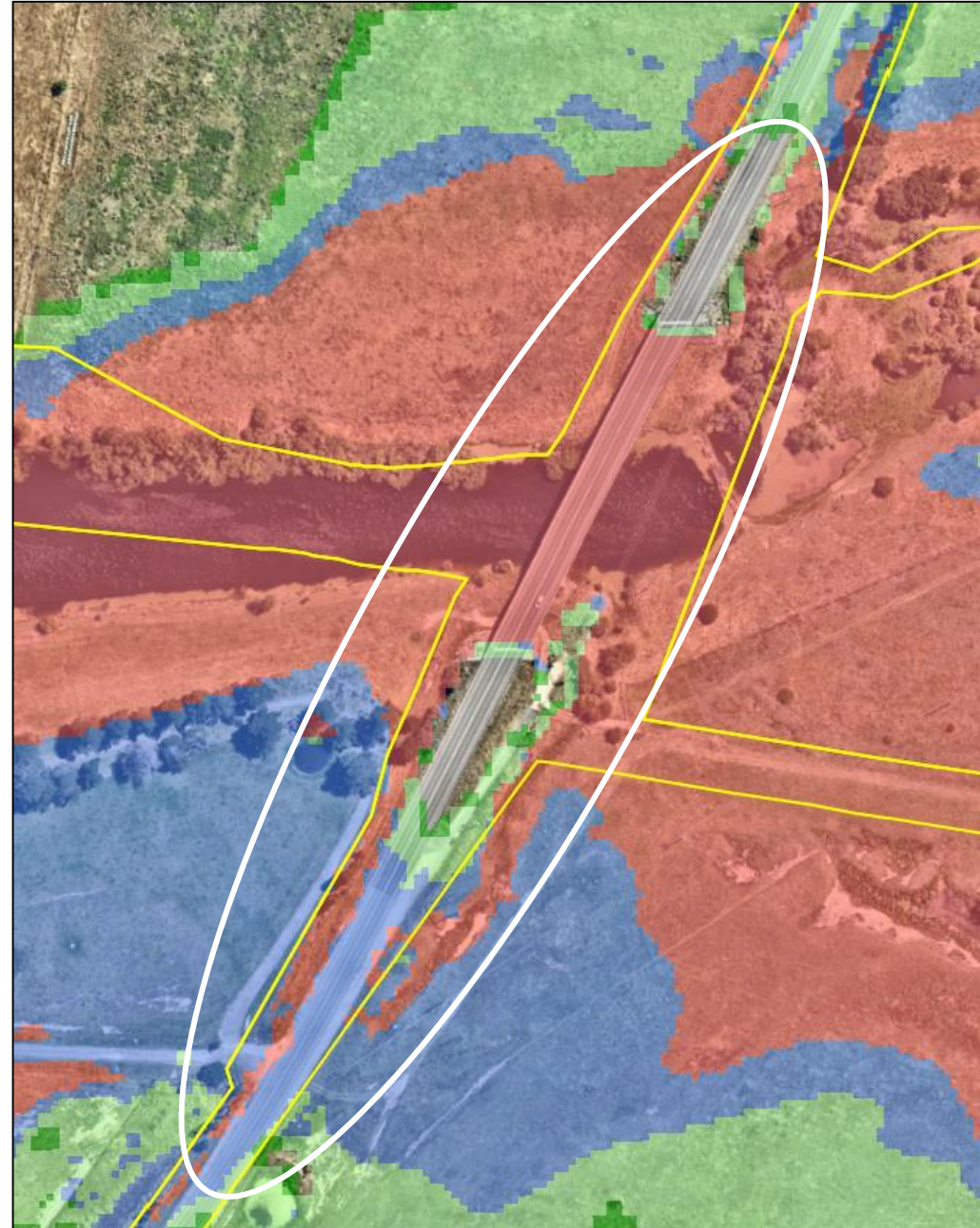
Evacuation Routes to Council Office- Overland flow Modelling



- Most significantly constrained areas, high hazard, significant flow
- Next least suitable for intensification of land use or development
- Areas suitable for most types of development
- Few flood related development constraints applicable

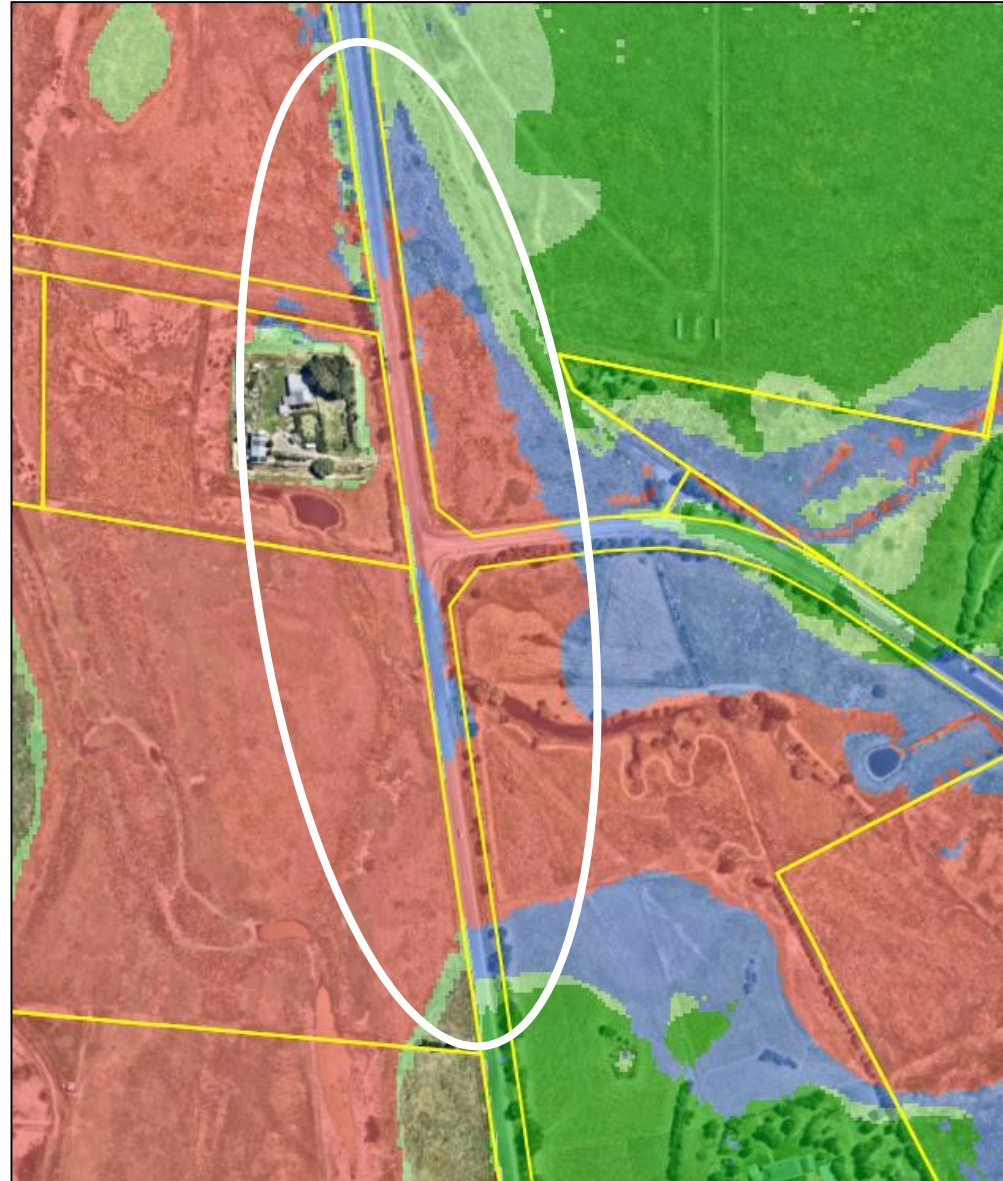
Overland Flow Pinch Point Area- Detailed Maps- Area A

- Most significantly constrained areas, high hazard, significant flow
- Next least suitable for intensification of land use or development
- Areas suitable for most types of development
- Few flood related development constraints applicable



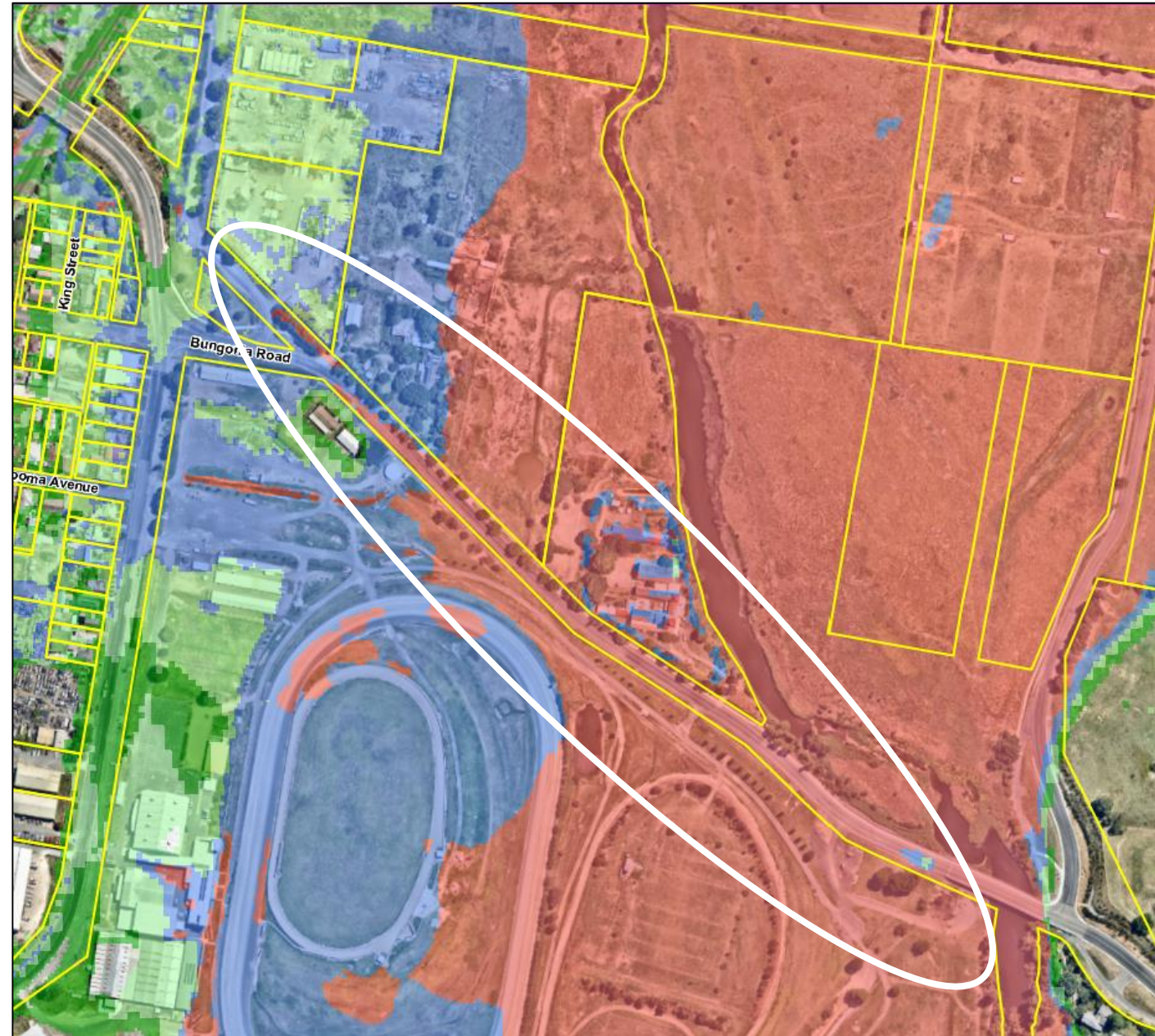
Overland Flow Pinch Point Area- Detailed Maps- Area B

- Most significantly constrained areas, high hazard, significant flow
- Next least suitable for intensification of land use or development
- Areas suitable for most types of development
- Few flood related development constraints applicable



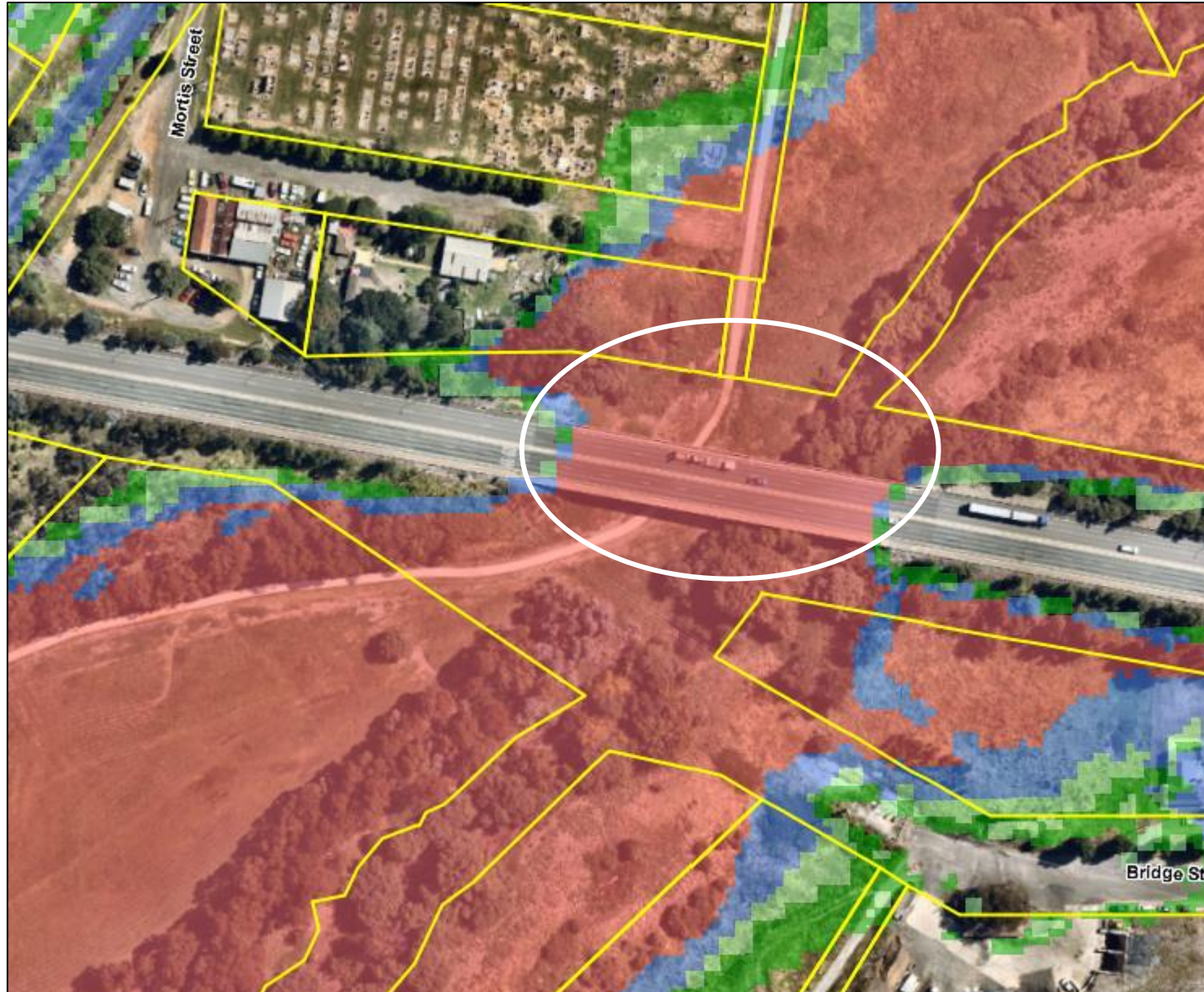
Overland Flow Pinch Point Area- Detailed Maps- Area C

- Most significantly constrained areas, high hazard, significant flow
- Next least suitable for intensification of land use or development
- Areas suitable for most types of development
- Few flood related development constraints applicable



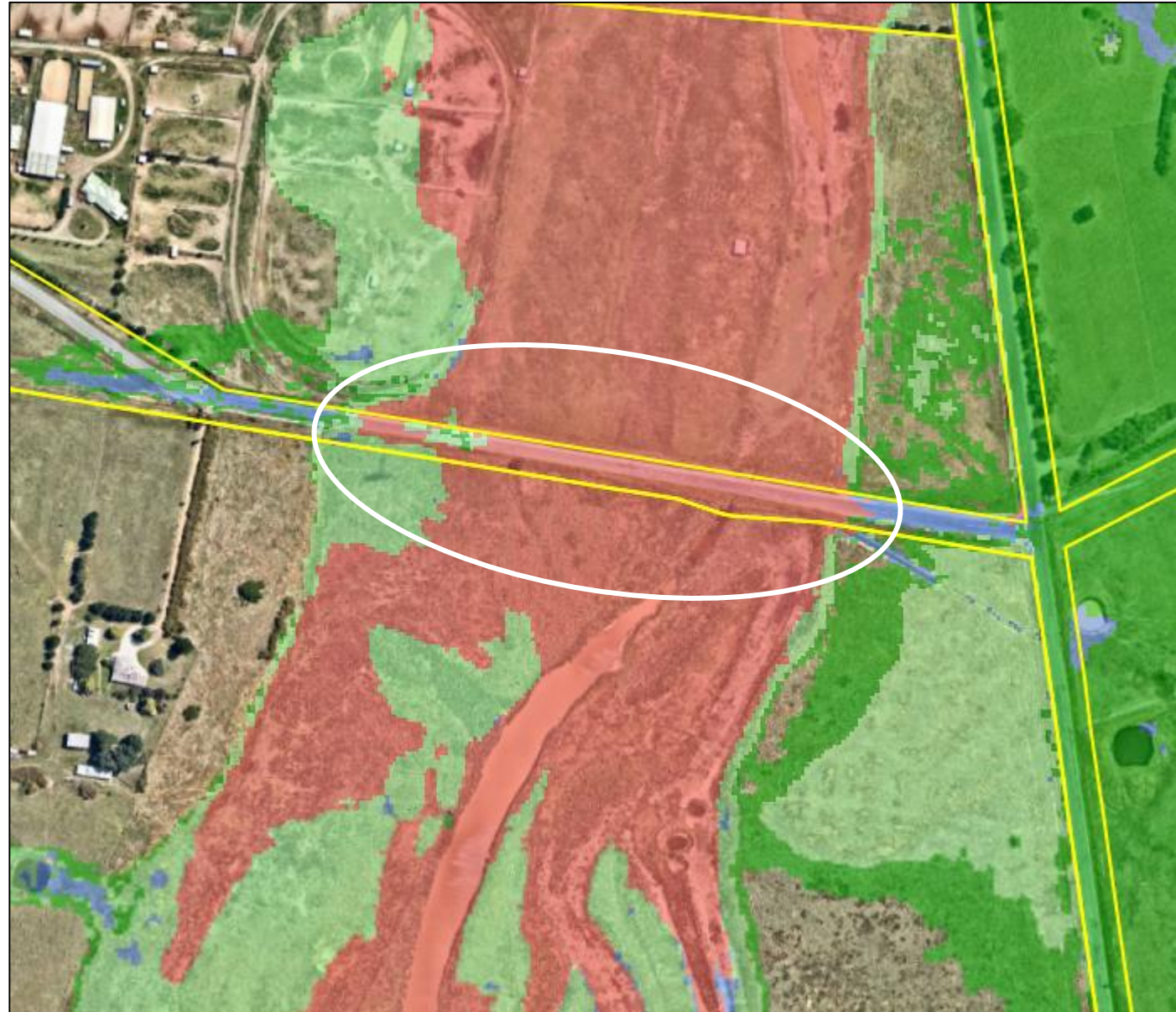
Overland Flow Pinch Point Area- Detailed Maps- Area D

- Most significantly constrained areas, high hazard, significant flow
- Next least suitable for intensification of land use or development
- Areas suitable for most types of development
- Few flood related development constraints applicable



Overland Flow Pinch Point Area- Detailed Maps- Area E

- Most significantly constrained areas, high hazard, significant flow
- Next least suitable for intensification of land use or development
- Areas suitable for most types of development
- Few flood related development constraints applicable



Evacuation Pinch Point Analysis- Area A

Pinch Point Area	Flood Type	Depth Range			Velocity Range			Evaluation
		5%	1%*	PMF	5%	1%	PMF	
A	Riverine	0.152m to 0.168m	0.002m to 0.708m	2.458m to 8.076m	0.034m/s to 0.104m/s	0.278m/s to 1.532m/s	0.266m/s to 3.667m/s	Pinch point A relates to the Braidwood Bridge and its approaches north and south along Braidwood Road. It also includes the Braidwood Road/Brisbane Grove Road intersection. The Braidwood Rd bridge provides the south western access into the Goulburn urban area. Pinch point A is not is not considered to be flood affected within a 5% AEP event. The bridge deck is illustrated as inundated during a 5% event however the approach roads which stand lower than the bridge are not illustrated as inundated with the exception of a limited extent and depth of water overlaying the lower part of the southern approach road which also has a very low velocity range. Whilst the flood modelling accounted for bridge heights, the mapping did not delineate between the bride and the river. Braidwood Road bridge is not considered to become inundated during a 5% AEP event. The flood mapping illustrates that Pinch point A suffers from some flood inundation of the lower sections of the Braidwood Road approaches to the bridge during a 1% AEP event with a depth reaching a maximum of 70cm with a maximum corresponding velocity of 0.817m/s in the deepest location. Velocities are higher on the northern approach road, compared to the southern, reaching a maximum of 1.532m/s with a depth of 30cm. *Whilst the flood mapping illustrates flood inundation over parts of the approach roads to the bridge, the LiDAR data did not account for improvements to Braidwood Road and the Bridge undertaken since 2011. Table 15 of the Flood Study has account for these improvements in their summary of first flood events in which Braidwood Bridge first becomes inundated at a flood event of 0.2% AEP. The Braidwood Road bridge deck is not considered to become inundated during a 1% AEP event. Pinch point A is significantly inundated during a PMF event encompassing the Braidwood Rd/Brisbane Grove Rd intersection, the northern and southern approach along Braidwood Road and the bridge deck. Flood water depth reaches over 8 metres with a velocity of 1.45m/s in that location with velocities increasing to 3.66m/s closer to the river.

Evacuation Pinch Point Analysis- Area B

Pinch Point Area	Flood Type							Evaluation
		5%	1%	PMF	5%	1%	PMF	
B	Riverine	0.018m to 0.164m	0.027m to 0.373m	0.501m to 9.041m	0.069m/s to 0.144m/s	0.061m/s to 0.930m/s	0.163m/s to 1.670m/s	Pinch point B relates to the stretch of Windellama Rd from the Brisbane Grove Rd/Windellama intersection to the Hume Highway underpass. It also includes the Windellama Rd/Mountain Ash Rd intersection and the Windellama Rd/Rosemont Rd intersection. A 250m stretch of Windellama Road becomes inundated during a 5% AEP event starting at the Windellama/Mountain Ash Rd intersection and progresses northward. The depth range is low reaching a maximum depth of 16cm with a low velocity of 0.131m/s in the deepest location. The road intersections are largely unaffected by a 5% AEP food event for riverine flooding. The stretch of inundated Windellama Road increases to 375m during a 1% AEP event and encompasses the Windellama Rd/Mountain Ash Rd intersection. The depth of flood inundation around the Windellama Rd/Mountain Ash Rd intersection is approximately 26cm with a velocity of 0.510m/s in that location. Velocities increase northward to 0.930m/s with a depth of 37cm. The Windellama Rd/Rosemont Rd intersection is unaffected by a 1% AEP flood event for riverine flooding. Pinch point B is significantly inundated during a PMF event encompassing over 1000m of Windellama Road from just south of the Windellama Rd/Mountain Ash Rd intersection to the Windellama Rd/Rifle Range Rd intersection north of the Hume Highway. Both the Rosemont and Mountain Ash Road intersections with Windellama Road become fully inundated during a PMF flood event. The stretch of Windellama Rd between the Mountain Ash Rd and Rosemont Rd intersections is the most severely affected area with flood depths standing between 8 to 9 metres with velocities reaching a maximum of 1.670m/s. The Rosemont Rd intersection experiences flood depths of just below 5 metres with a velocity of 0.609m/s. The Mountain Ash Rd intersection experiences a greater depth of 8.7 metres with a corresponding velocity of 0.721m/s.

Evacuation Pinch Point Analysis- Area C

Pinch Point Area	Flood Type							Evaluation
		5%	1%	PMF	5%	1%	PMF	
C	Riverine	0.039m to 1.183m	0.585m to 3.558m	10.212m to 11.968m	0.001m/s to 1.874m/s	0.375m/s to 0.382m/s	0.596m/s To 2.392m/s	Pinch point C relates to the area around Lansdowne Bridge including the Bungonia Road approach and the Braidwood Rd/Bungonia Rd intersection. Lansdowne bridge provides the eastern access point into the Goulburn urban area. Pinch Point C is significantly affected by riverine flood inundation during a 5% AEP event with a 590m stretch of Bungonia Road on the western side of the bridge becoming inundated. Flood depths area greatest on the roadway adjacent the bridge at a depth of 2.4metres with corresponding velocity of 1.284m/s. On this section of Bungonia Rd velocities reach a maximum of 1.874m/s. The Bungonia Rd/Braidwood Rd intersection is unaffected by a 5% AEP flood event for riverine flooding. Whilst the flood mapping illustrates Lansdowne bridge deck as inundated during a 5% AEP event, local knowledge indicates that the bridge deck remains flood free but the western approach road becomes inundated. This is confirmed by Council's Flood Study which identifies the inundation of Lansdowne Bridge at a flood event greater than the 5% AEP. Pinch point C is significantly affected by riverine flood inundation during a 1% AEP event with 800m of Bungonia Rd inundated on the western side of the bridge with a maximum depth of 3.5 metres adjacent the river and generally dropping along Bungonia Road toward the Braidwood Rd intersection. The deepest flood depth point has a corresponding velocity of 1.383m/s. Velocities are the highest toward the centre of Bungonia Rd reaching 1.864m/s. The Bungonia Rd/Braidwood Rd intersection becomes inundated during a 1% AEP flood event with a depth of 0.585m and a corresponding velocity of 0.375m/s. Pinch point C and adjacent approach roads are entirely inundated during a PMF event. The full length of Bungonia Road becomes inundated from the Windellama Rd/Mountain Ash Rd intersection in the south east to the Braidwood Rd/Bungonia Rd intersection in the north west. Flood water depths are significant at a maximum depth of over 13m with a corresponding velocity of 1.284m/s in the deepest location. Lansdowne bridge deck is considered to become inundated during a PMF riverine flood event.

Evacuation Pinch Point Analysis- Area D

Pinch Point Area	Flood Type							Evaluation
		5%	1%	PMF	5%	1%	PMF	
D	Riverine	4.099m to 7.613m	5.956m to 9.459m	1.118m to 19.382m	1.472m/s to 2.484m/s	1.821m/s to 2.554m/s	0.594m/s To 5.254m/s	Pinch Point D relates to the area around Fitzroy Bridge providing the north eastern entry into the Goulburn urban area. Pinch point D is not is not considered to be flood affected within a 5% AEP event. The bridge deck is illustrated as inundated during a 5% event however the approach roads which stand lower than the bridge are not illustrated as inundated. Whilst the flood modelling accounted for bridge heights, the mapping did not delineate between the bride and the river. Fitzroy bridge is not considered to become inundated during a 5% AEP event. Pinch point D is not considered to be flood affected within the 1% AEP event. Sydney Road forms the approach road to the bridge which does not become inundated during a 1% AEP riverine flood event. The Fitzroy bridge deck is not considered to become inundated during a 1% AEP event. Pinch point D is significantly inundated during a PMF event encompassing the Sydney Rd approach east and west, the Fitzroy bridge deck and subsequent roads leading into Goulburn CBD. The maximum flood water depth at over 19 metres is considered significant with a corresponding velocity of 5.093m/s.

Evacuation Pinch Point Analysis- Area E

Pinch Point Area	Flood Type							Evaluation
		5%	1%	PMF	5%	1%	PMF	
E	Overland Flow	N/a	N/a	N/a	N/a	N/a	N/a	Pinch point E relates to the eastern section of Brisbane Grove Rd just before the intersection with Windellama Road. Gunday Creek runs south to north into the Mulwaree River, roughly parallel with Windellama Rd and crosses under the eastern part of Brisbane Grove Road. The overland flow modelling illustrates a significant inundation risk with a 300m section of Brisbane Grove Road affected by Flood Planning Constraint category 1 (red) which is defined as the “<i>most significantly constrained areas, high hazard, significant flow</i>” Pinch point E experiences inundation during most flood inundation events although the exact depths and velocities of such inundation are unknown. However the length of the roadway within the most constrained red category indicates the unsuitability of a potential eastern evacuation route.