

20th November 2018

To Hannes Bezuidenhout

Copy to Timothy Fichera

From David Fulton

Subject Drainage Issues at No. 177 Tantitha Road, Gooburrum **Personal Information**

1. Introduction

Council has received numerous complaints from the owners of No. 177 Tantitha Road regarding longstanding water within their property following periods of significant rainfall. The owners of No. 177 Tantitha Road, **Personal Information**, claim that a large portion of their property is inundated for many days, causing damage to cattle pastures and fencing. The owners have suggested that free drainage of the property is inhibited by overgrown vegetation and narrowing of the flow path within the large open drain on the downstream side of the major culverts crossing Fairymead Road. The location of the property and its proximity to the major culverts beneath Fairymead Road is shown below in Figure 1.



Figure 1 – Property Locality

Photos taken in September 2018 shown below in Figure 2 demonstrate the overgrown vegetation and narrowed flow path downstream of the major culverts. Figure 3 below provides photos at the upstream side of the major culverts.



Figure 2 – Photos: Downstream of Fairymead Road Culverts (September, 2018)



Figure 3 – Photos: Upstream of Fairymead Road Culverts (September, 2018)

Following a meeting with **Personal Information** (No. 177 Tantitha Road, Gooburrum) on the 11th of September 2018, a high level drainage study of the Tantitha Creek catchment area has been undertaken. The purpose of the drainage study has been to investigate the effects of clearing the overgrown vegetation and widening the open drain downstream of the major culverts crossing Fairymead Road.

2. Tantitha Creek Catchment

The Tantitha Creek catchment is approximately 2,918 hectares and is shown in attached Figure A-1. The catchment extent has also been overlaid on the 2015 BRC Planning Scheme Zoning shown in attached Figure A-2.

The catchment area is comprised of predominately rural and rural residential land use and is characterised by extremely flat topography.

The Overland Flow Path Study indicates that No. 177 Tantitha Road is located within a floodplain upstream of Fairymead Road. The Overland Flow Path Study and the relative location of No. 177 Tantitha Road is shown below in Figure 4.

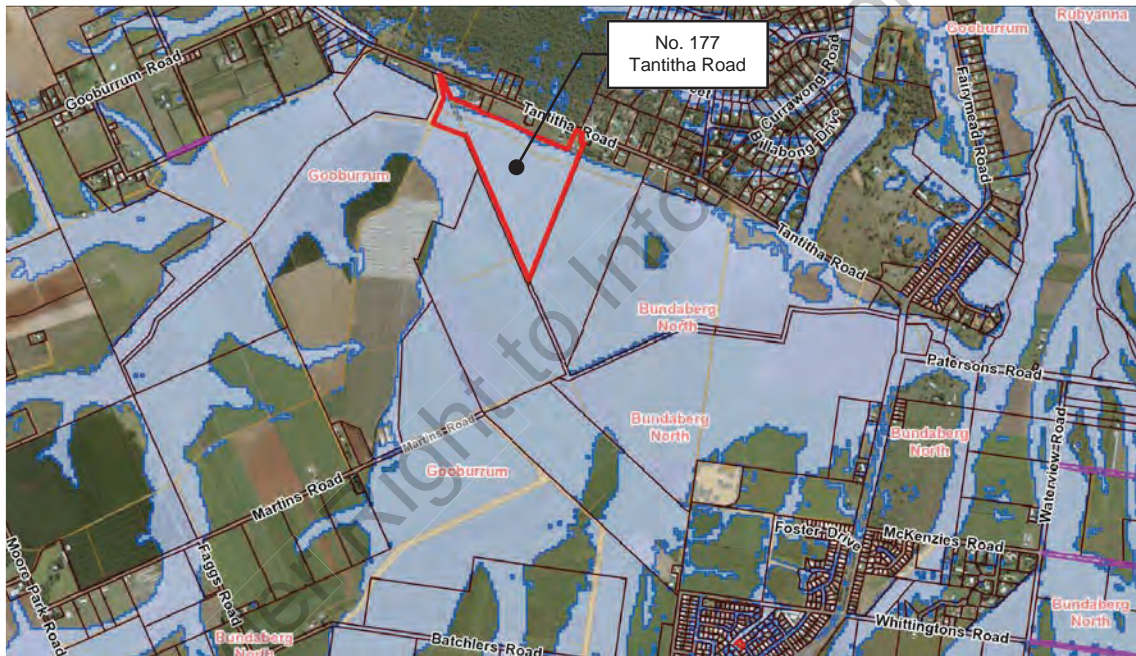


Figure 4 – Overland Flow Path Study

3. Hydrologic/Hydraulic Modelling

Hydrologic and hydraulic modelling has been undertaken using the XPRAFTS and XPSWMM software packages respectively. The modelling has been undertaken for the 0.5 EY (2 Year ARI or Q2), 0.2 EY (5 Year ARI or Q5) and the 10% AEP (10 Year ARI or Q10) design storm events using ARR2016 IFD factors, temporal patterns and areal reduction factors. The critical storm duration (peak flow) for each of these design storms is generally 6 hours. From the hydrologic model, a single representative temporal pattern was selected for each design storm to be run within the 2D hydraulic model in accordance with the recommendations in ARR2016 (i.e. mean temporal pattern).

The critical storm hydrographs from the hydrologic model at the major culverts crossing Fairymead Road are shown below in Figure 5.

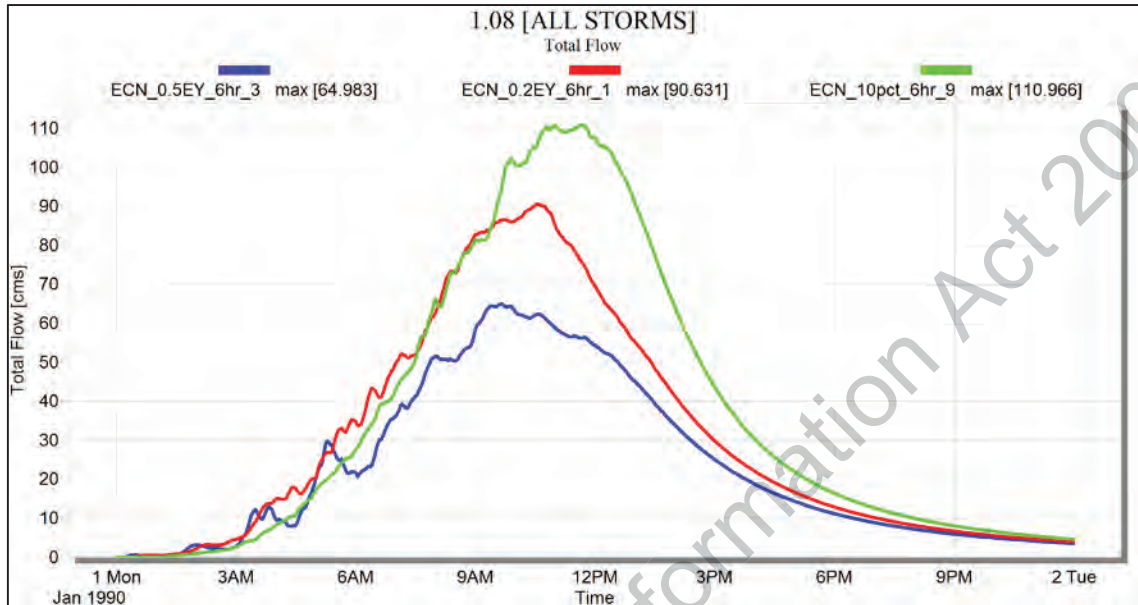


Figure 5 – Critical Storm Hydrographs at Major Culverts (Fairymead Road)

Inflow hydrographs from the hydrologic model were applied to the 2D hydraulic model at strategic points. The 1D/2D hydraulic model utilised a computational 10m grid superimposed over triangulated surfaces derived from a combination of 1m LiDAR, 5m LiDAR and design data. A 2D outfall boundary was applied to the 2D hydraulic model at a sufficient distance downstream of the major culverts to have no significant effect on the model results within the area of interest. This 2D outfall boundary represented a tailwater level equivalent to Mean High Water Spring (MHWS).

4. Existing Condition Flood Behaviour

Hydraulic mapping results of the existing condition for each of the design storms are shown in the attached Figures B-1, B-2, C-1, C-2, D-1 and D-2. These figures show the maximum flood depth and the depth 24 hours after the beginning of the design storm (i.e. 18 hours following the conclusion of a 6 hour storm event).

Key observations from the existing condition model are as follows:

- In the 0.5 EY (2 Year ARI or Q2), 0.2 EY (5 Year ARI or Q5) and the 10% AEP (10 Year ARI or Q10) design storm events, the majority of No. 177 Tantitha Road is inundated by water greater than 300mm deep; and
- There is minimal difference between the maximum and 24 hour flood depth maps, indicating slow drainage from the Tantitha Creek floodplain.

The above results confirm the residents' observations.

5. Effects of Clearing and Widening Open Drain (Option 1)

As suggested by the owners of No. 177 Tantitha Road, the upstream effects of clearing the overgrown vegetation and widening the open drain downstream of the major culverts has been investigated. The extents of clearing and widening adopted within the hydraulic model is shown below in Figure 6.



Figure 6 – Drain Clearing and Widening

Widening of the open drain has been achieved by adopting a trapezoidal cross section with a 10m wide base and 1 on 4 batters. An example cross section downstream of the major culverts is shown below in Figure 7.

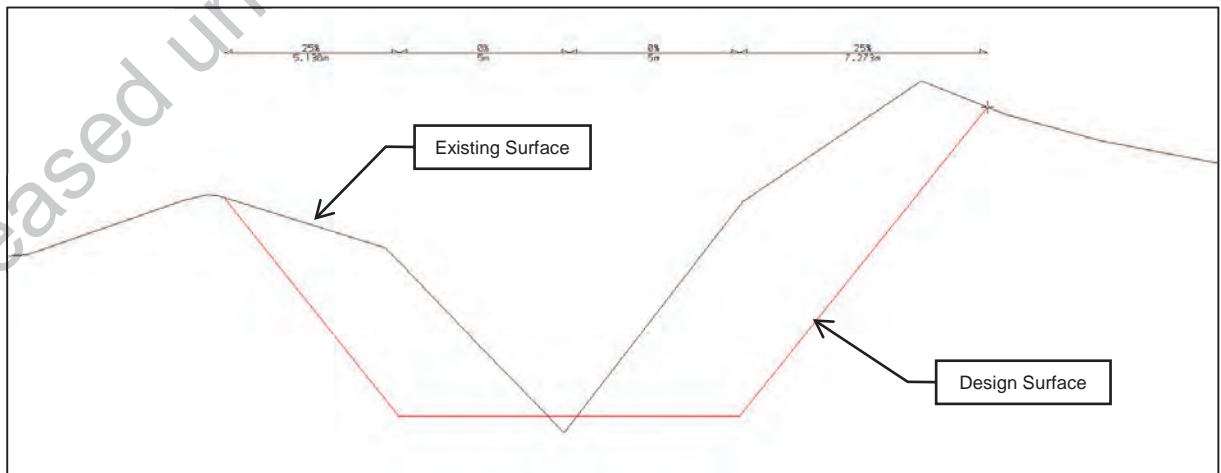


Figure 7 – Option 1 Cross Section

The extent of the widened open drain has also been modelled within the 2D hydraulic model using a Manning's n value of 0.035 to reflect a well maintained drain with minimal vegetation.

Hydraulic mapping results (change in depth 24hrs after the beginning of the design storm) for Option 1 are shown in the attached Figures B-3, C-3 and D-3 for the 0.5 EY (2 Year ARI or Q2), 0.2 EY (5 Year ARI or Q5) and the 10% AEP (10 Year ARI or Q10) design storm events respectively.

A water level comparison within No. 177 Tantitha Road is also included in attached Appendix A showing the existing condition water level and the water level due to the proposed clearing and drain widening (Option 1).

The results indicate that clearing of overgrown vegetation and widening of the open drain provides minimal benefits for property owners upstream of Fairymead Road. Minor reductions in water level are observed 18 hours after the conclusion of the design storm (i.e. 24 hours from the beginning) but are limited to within approximately 500m of the major culverts at Fairymead Road. The water level comparison (Appendix A) indicates almost no difference in the water level over time within No. 177 Tantitha Road for all modelled storm events. Clearing and widening of the downstream open drain therefore has a very limited effect on the time of inundation and free draining capacity of the upstream properties within the floodplain.

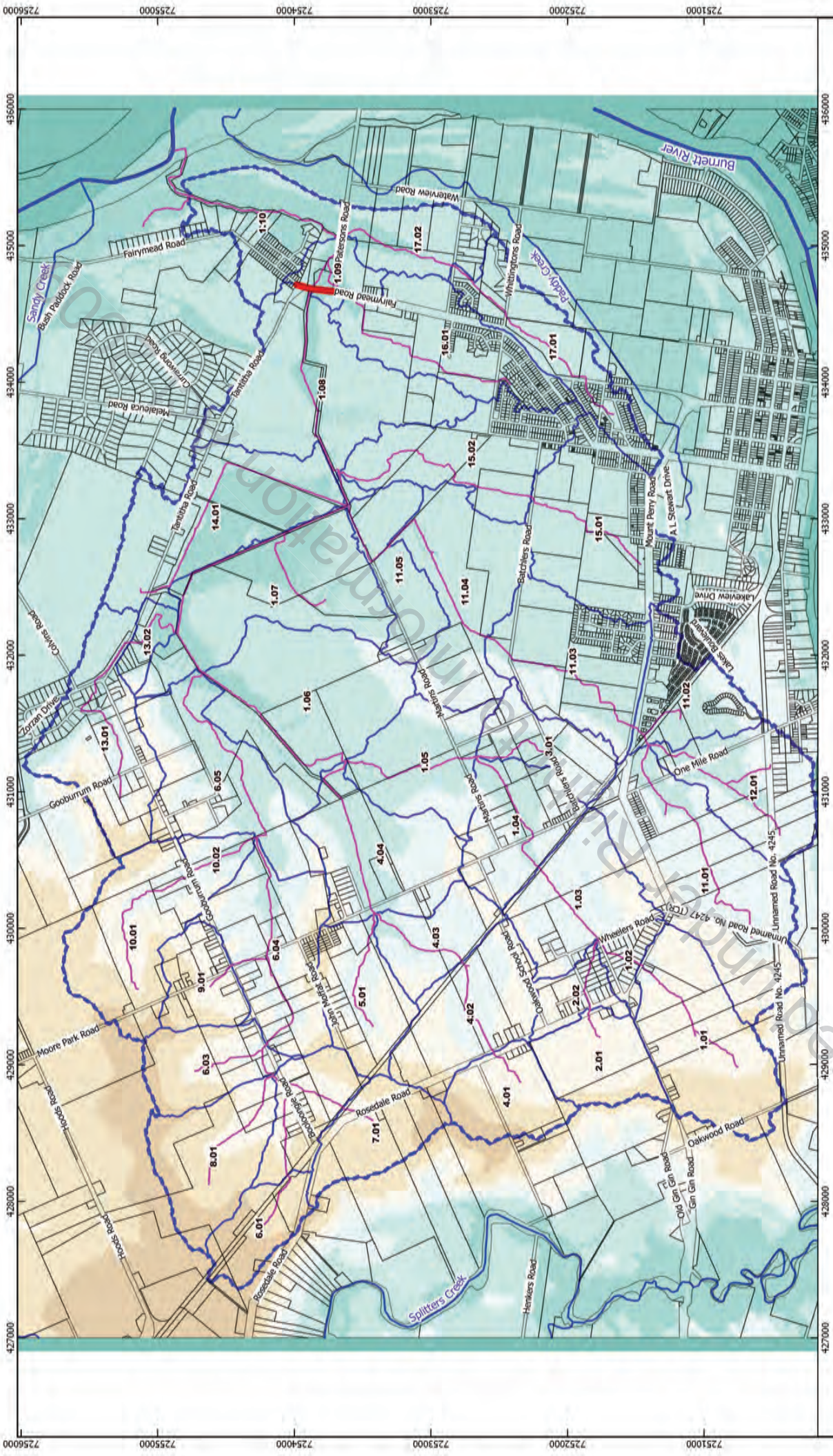
The results therefore indicate that the proposed mitigation works provide no benefit to the property owners of No. 177 Tantitha Road.

6. Recommendations

The hydraulic models developed as part of this high level drainage study indicate that clearing of overgrown vegetation and widening of the open drain downstream of Fairymead Road (Option 1) provides no benefit to No. 177 Tantitha Road. Clearing and widening of this drain over the extents shown in Figure 6 for the purpose of providing benefits to No. 177 Tantitha Road is therefore not recommended.

The results of this high level drainage study also indicate that the existing floodplain inundation upstream of Fairymead Road does not cause floor level flooding or residential access impacts. Consequently, the priority of further investigations and alternative mitigation options should be considered in conjunction with other drainage issues from around the Bundaberg region.

It is therefore recommended that the concerns raised by **Personal Information** of No. 177 Tantitha Road formulate a capital works project request and be listed for prioritisation and further future investigations.



ISD3080.2018 - Tantitha Creek
Drainage Improvements
**Topographic 2016 LIDAR Data &
Subcatchment Layout Plan
Figure A-1**

Date | October 2018

0 200 400 600 800 1000
Metres
1:27,000 on A3 Paper Size

Horizontal Datum | GDA 1994
Grid | GDA 1994 MGA Zone 56

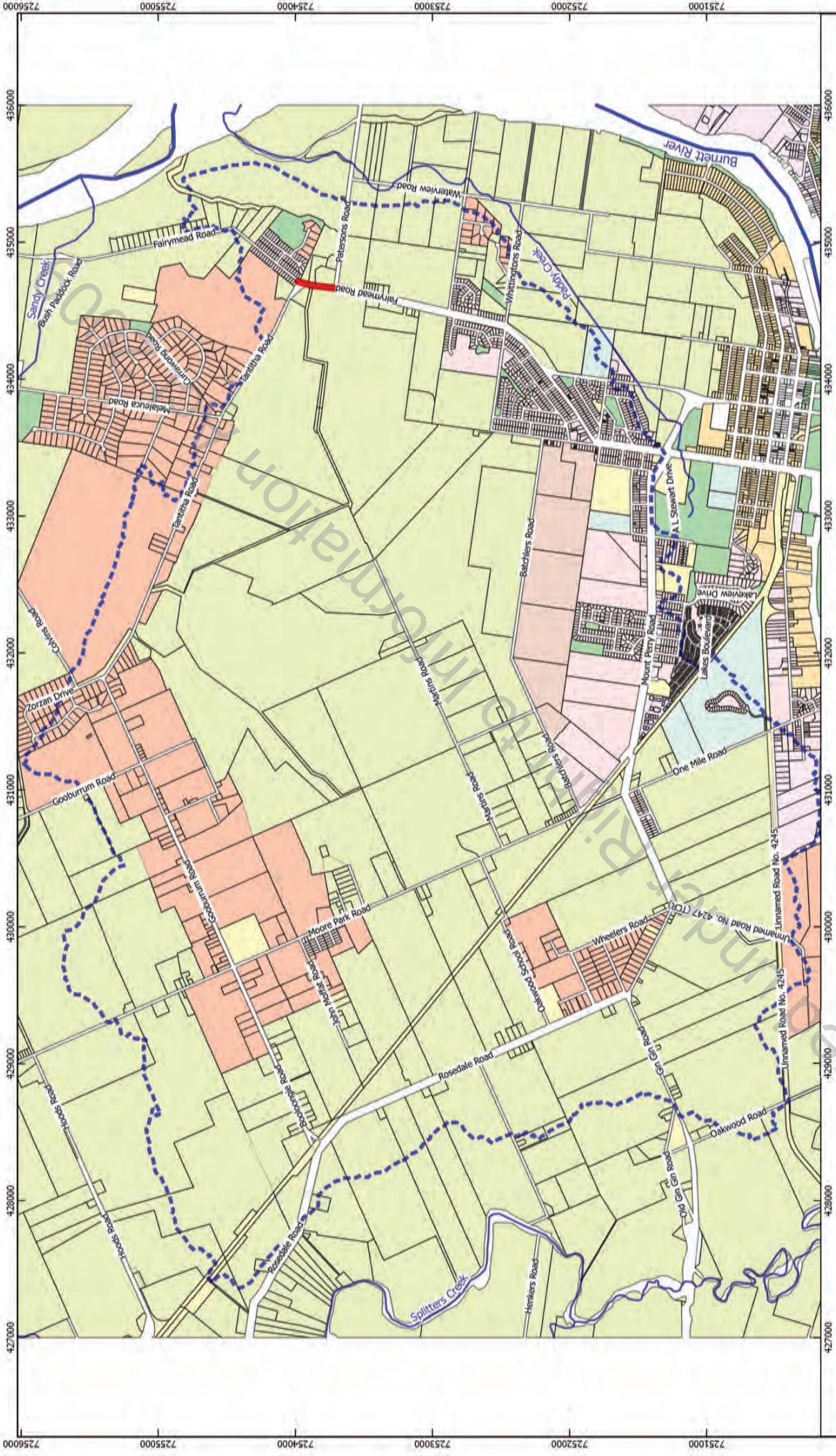
Legend

	10 - 15		Catchment Extent
	15 - 20		Sub-Catchment
	20 - 25		Stream Network
	25 - 30		Fairmead Road Crossing
	> 30		

	< 0
	0 - 5
	5 - 10

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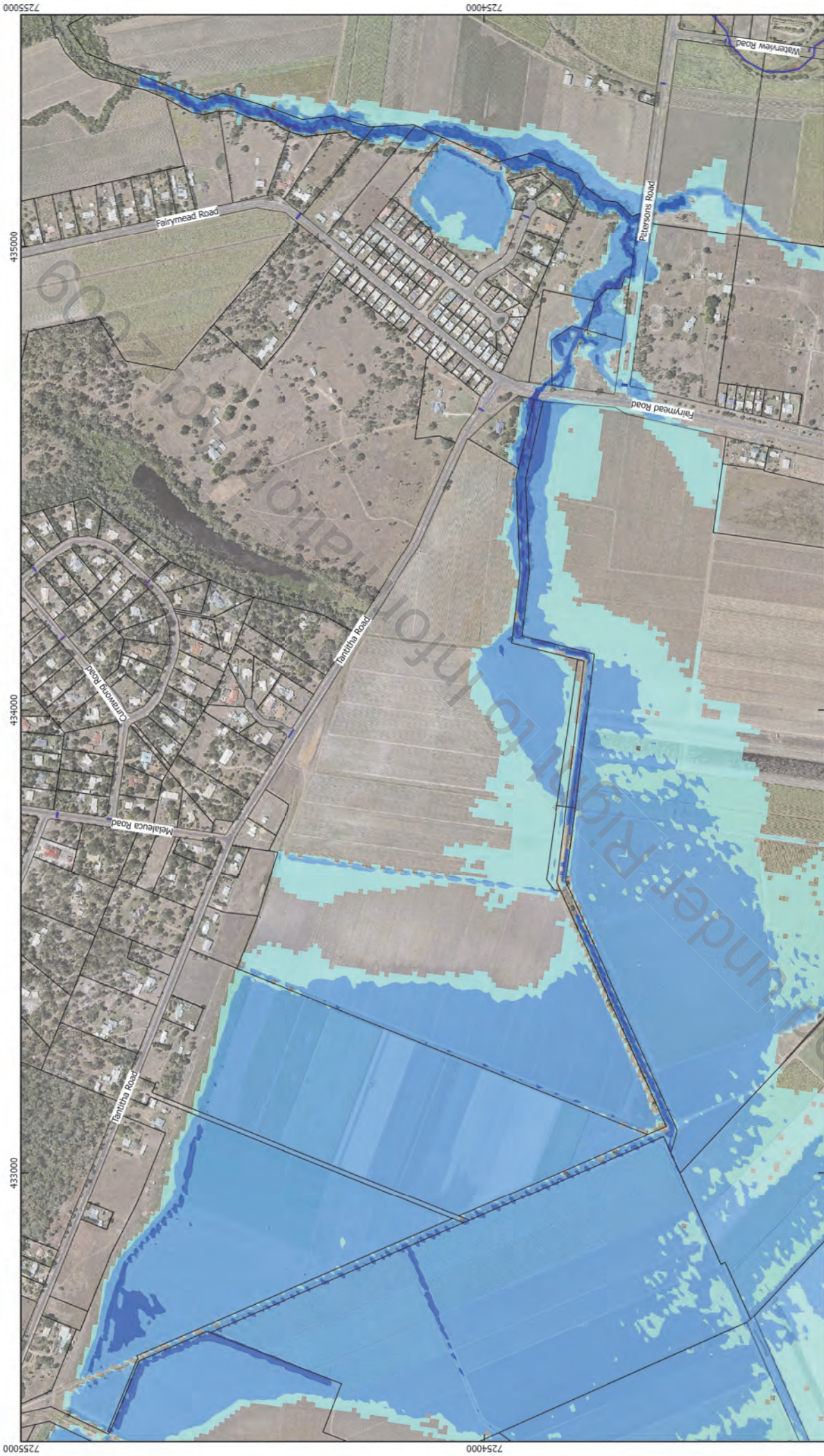


ISD3080.2018 - Tantitha Creek
Drainage Improvements
BRC Planning Scheme 2015
Zoning
Figure A-2
Date | October 2018



- Legend**
- Catchment Extent
 - Fairmead Road Crossing
 - Open Space
 - Low Density Residential
 - High Impact Industry
 - Specialised Centre
 - Sport and Recreation
 - Major Centre
 - Principal Centre
 - Limited Development
 - Medium Density Residential
 - Emerging Communities
 - Rural
 - Community Facilities
 - District Centre
 - Industry
 - Rural Residential


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Horizontal Datum | GDA 1994
Grid | GDA 1994 MGA Zone 56



0 50 100 150 200 250
Metres

1:8,000 on A3 Paper Size

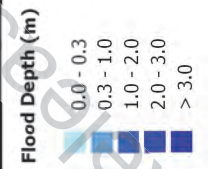
ISD3080.2018 - Tantitha Creek
Drainage Improvements

**Existing Condition - 0.5EY (Q2)
Maximum Flood Depth
Figure B-1**

Date | October 2018



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ISD3080.2018 - Tantitha Creek
Drainage Improvements
Existing Condition - 0.5EY (Q2)
Depth at 24hr
Figure B-2

0 50 100 150 200 250
Metres
1:8,000 on A3 Paper Size

Date | October 2018



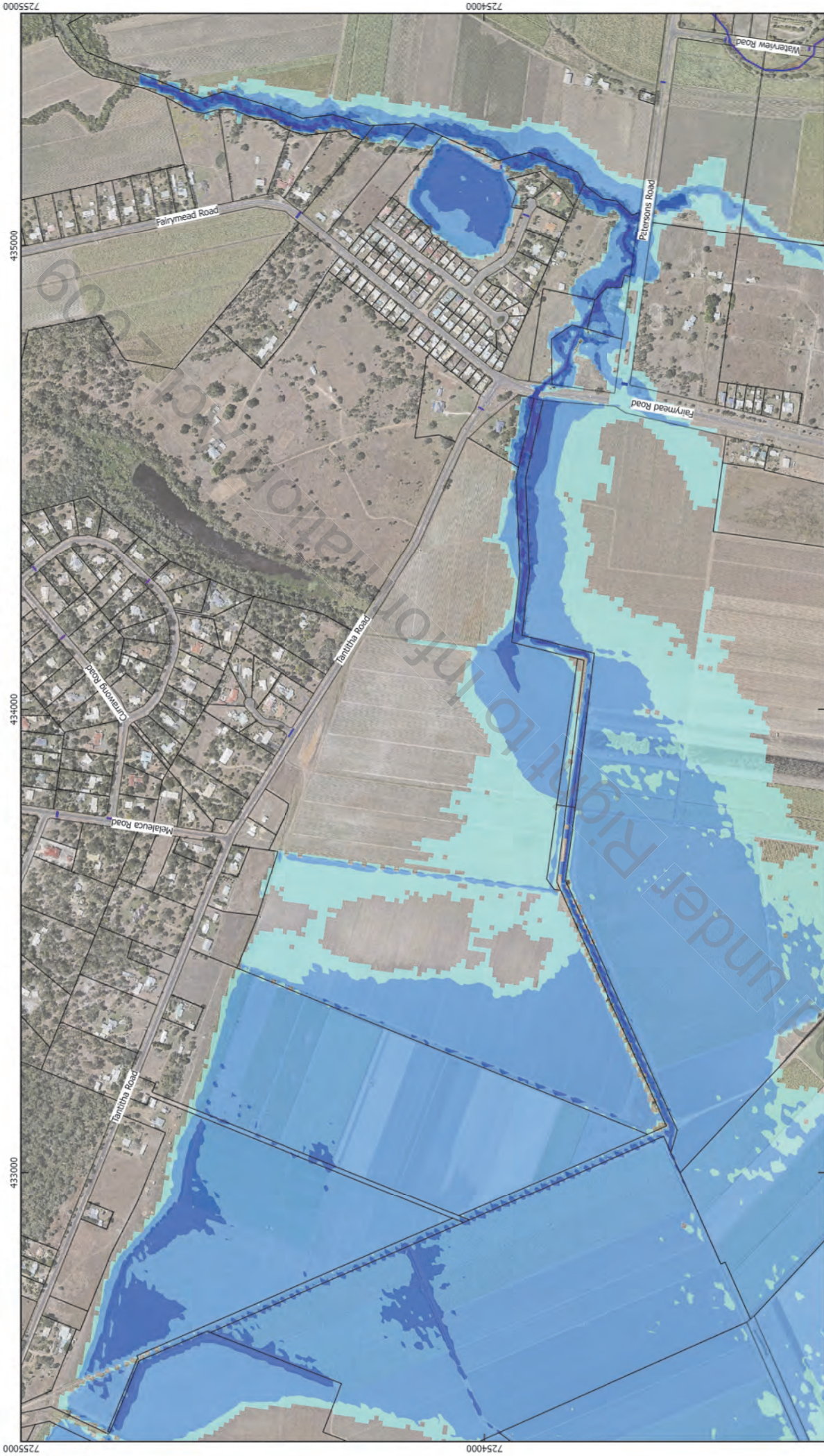
7255000 435000 434000 433000 7254000 7254000 435000 434000 433000

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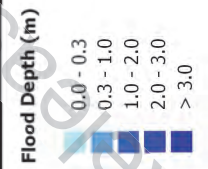


ISD3080.2018 - Tantitha Creek
Drainage Improvements
Option 1 - 0.5EY (Q2)
Change in Depth at 24hrs
Figure B-3

Date | October 2018



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North Arrow

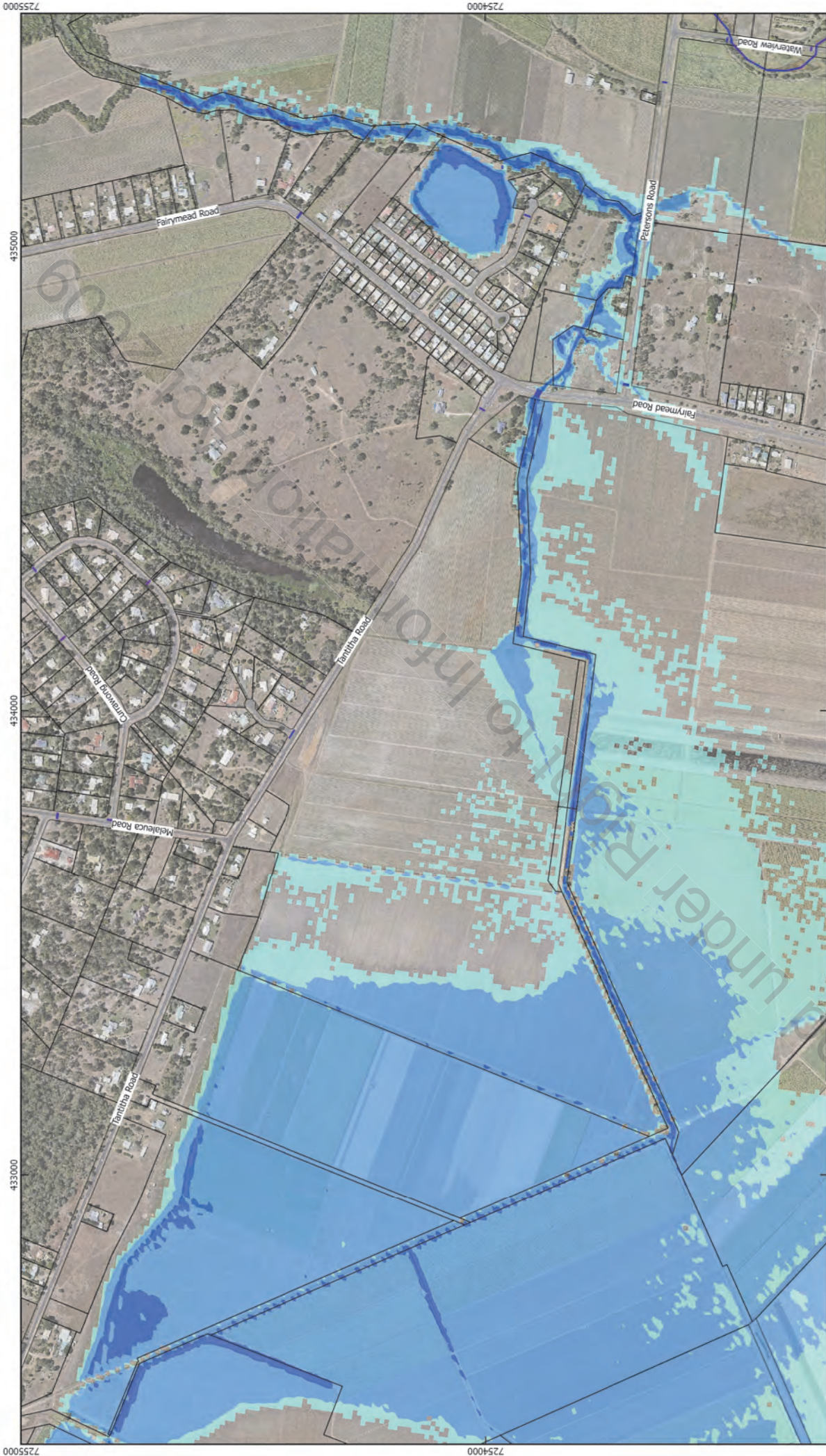
Horizontal Datum | GDA 1994
Grid | GDA 1994 MGA Zone 56



**ISD3080.2018 - Tantitha Creek
Drainage Improvements**

**Existing Condition - 0.2EY (Q5)
Maximum Flood Depth
Figure C-1**

Date | October 2018



ISD3080.2018 - Tantitha Creek
Drainage Improvements
**Existing Condition - 0.2EY (Q5)
Depth at 24hr
Figure C-2**

Date | October 2018

0 50 100 150 200 250
Metres
1:8,000 on A3 Paper Size

Horizontal Datum | GDA 1994
Grid | GDA 1994 MGA Zone 56

Flood Depth (m)

0.0 - 0.3	Light Blue
0.3 - 1.0	Medium Blue
1.0 - 2.0	Dark Blue
2.0 - 3.0	Very Dark Blue
> 3.0	Black

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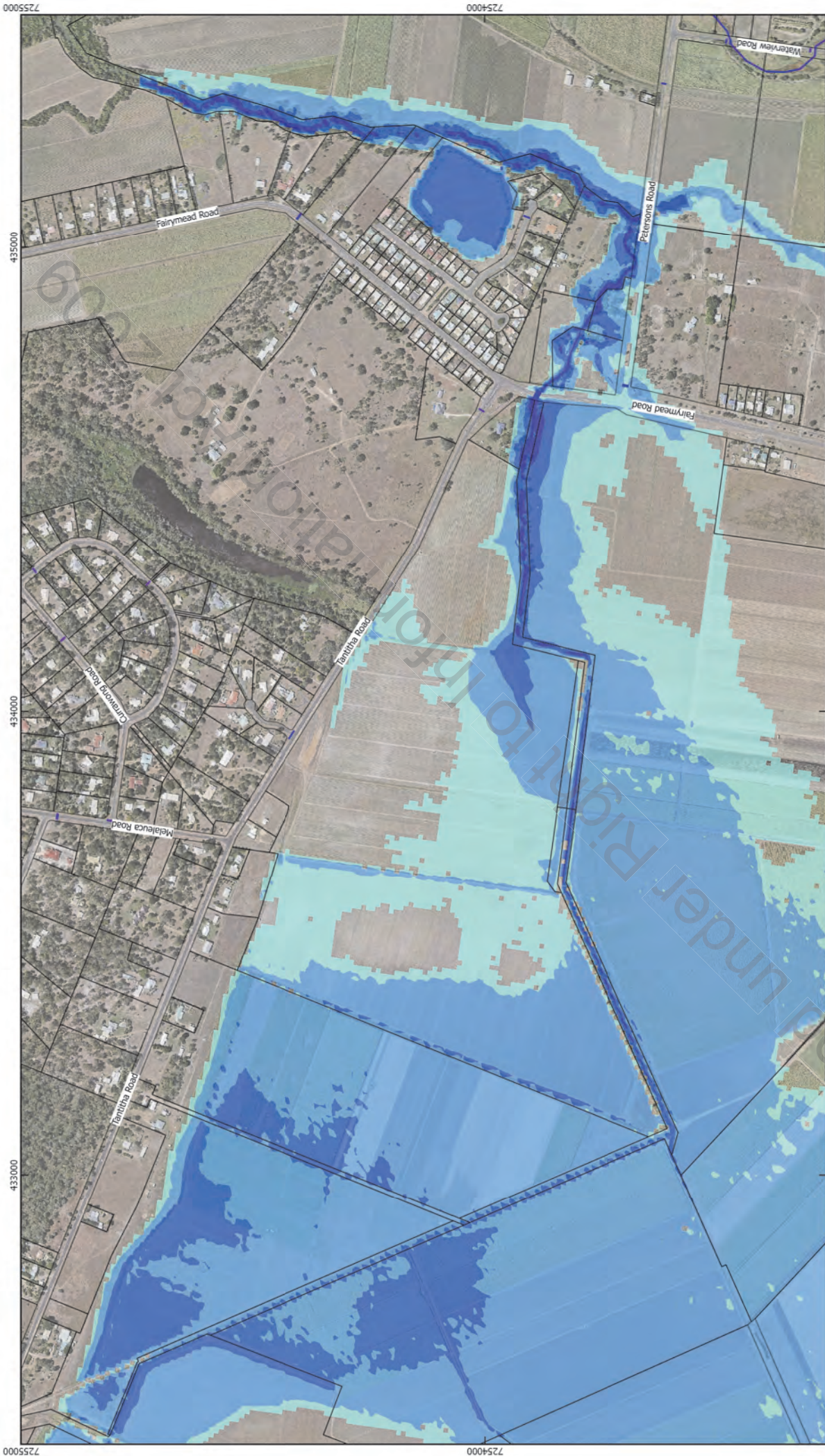
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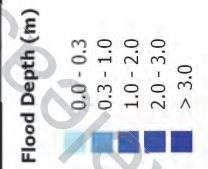
ISD3080.2018 - Tantiha Creek
Drainage Improvements
Option 1 - 0.2EY (Q5)
Change in Depth at 24hrs
Figure C-3

Date | October 2018



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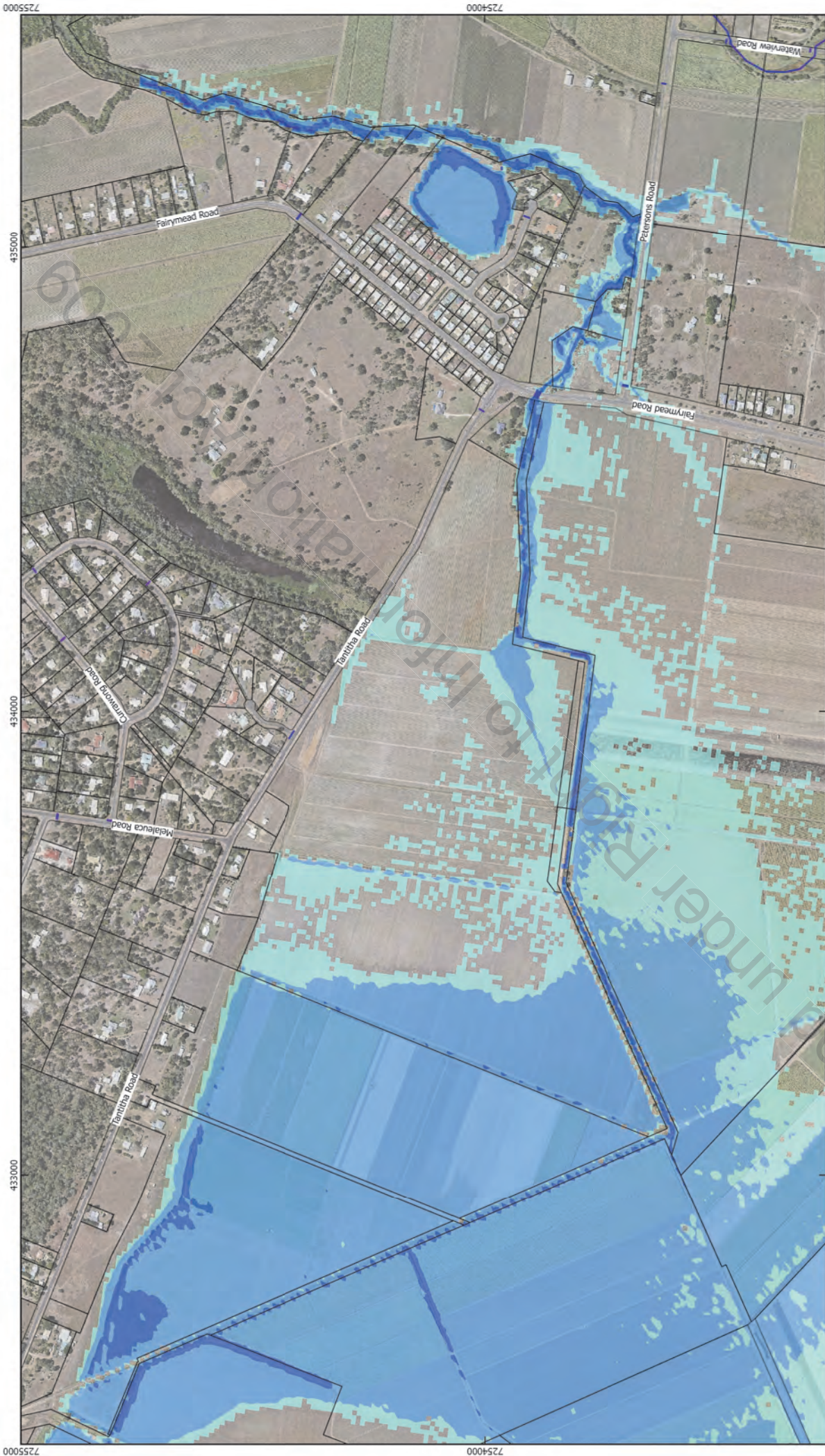
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ISD3080.2018 - Tantitha Creek
Drainage Improvements

**Existing Condition - 10% AEP
Maximum Flood Depth
Figure D-1**

Date | October 2018



7255000

7254000

435000

435000

434000

434000

433000

433000

7255000

7254000

ISD3080.2018 - Tantitha Creek
Drainage Improvements
**Existing Condition - 10% AEP
Depth at 24hr
Figure D-2**
Date | October 2018

0 50 100 150 200 250
Metres
1:8,000 on A3 Paper Size

Horizontal Datum | GDA 1994
Grid | GDA 1994 MGA Zone 56

Flood Depth (m)

0.0 - 0.3	Lightest Blue
0.3 - 1.0	Light Blue
1.0 - 2.0	Medium Blue
2.0 - 3.0	Dark Blue
> 3.0	Darkest Blue

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ISD3080.2018 - Tantitha Creek
Drainage Improvements

Option 1 - 10% AEP
Change in Depth at 24hrs
Figure D-3

Date | October 2018

Appendix A: Water Level Comparison: No. 177 Tantitha Road, Gooburrum

