

# Geurie Floodplain Risk Management Study

Draft Report

Volume 2

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Prepared for  
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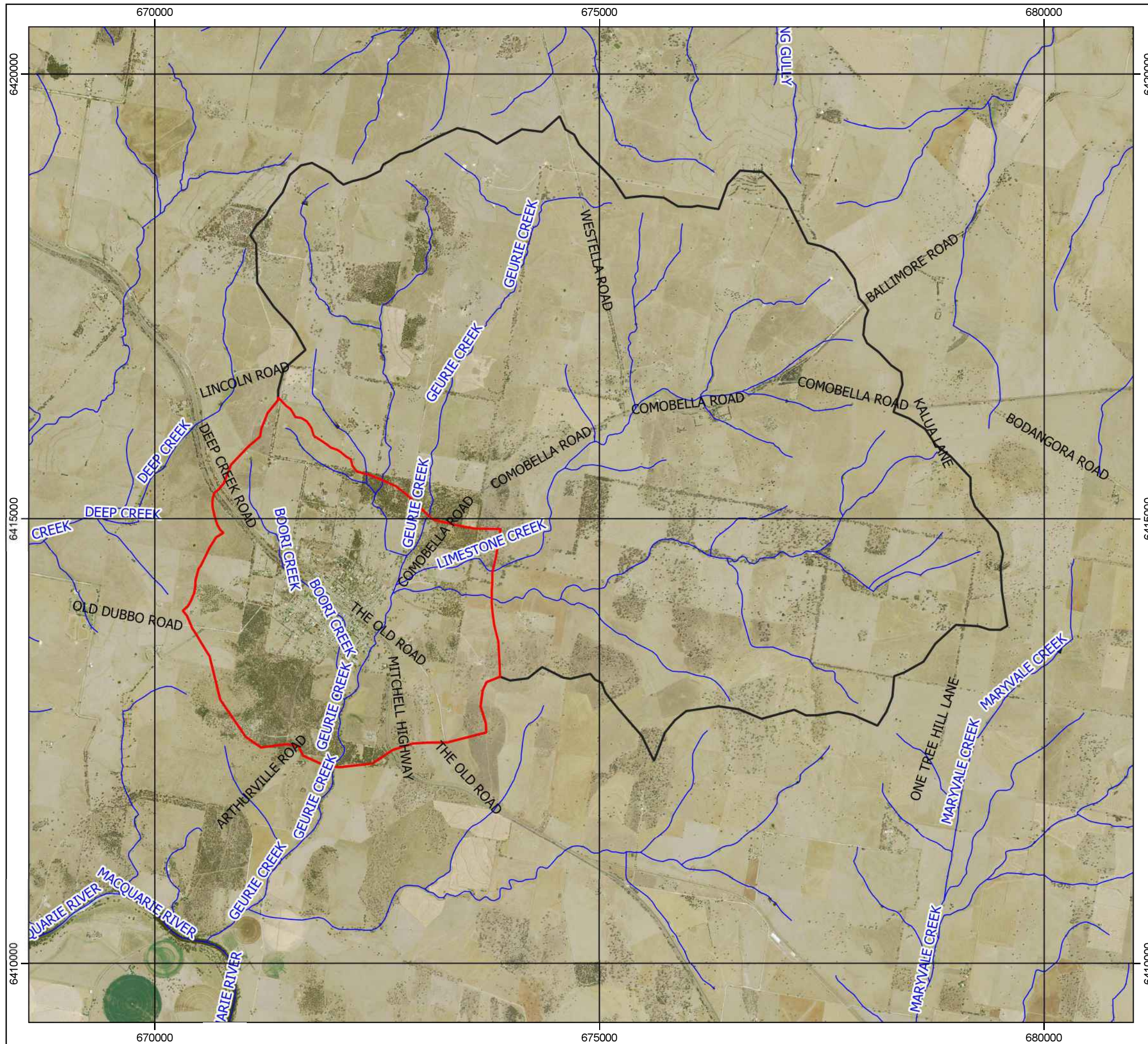
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
## APPENDIX B

### EXISTING CATCHMENT CHARACTERISTICS

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-  Catchment Area
-  Study Area
-  Waterways

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0 0.5 1 1.5 2 2.5 km



Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

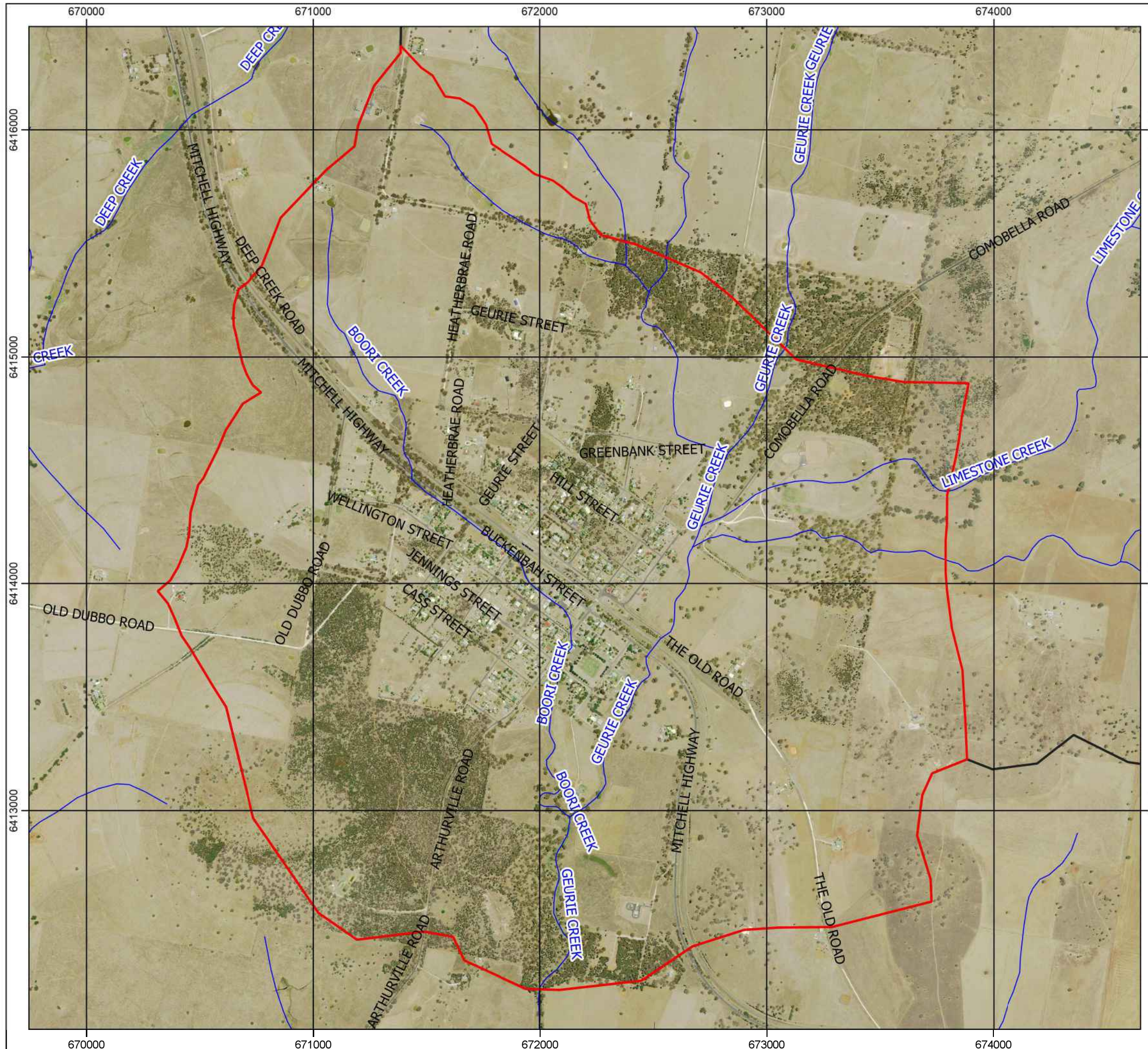


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

### FIGURE B01A STUDY AREA





- Catchment Area
- Study Area
- Waterways

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### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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**FIGURE B01B**  
**STUDY AREA**





- Study Area
- Vulnerable and Infrastructure Sites
- Waterways

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

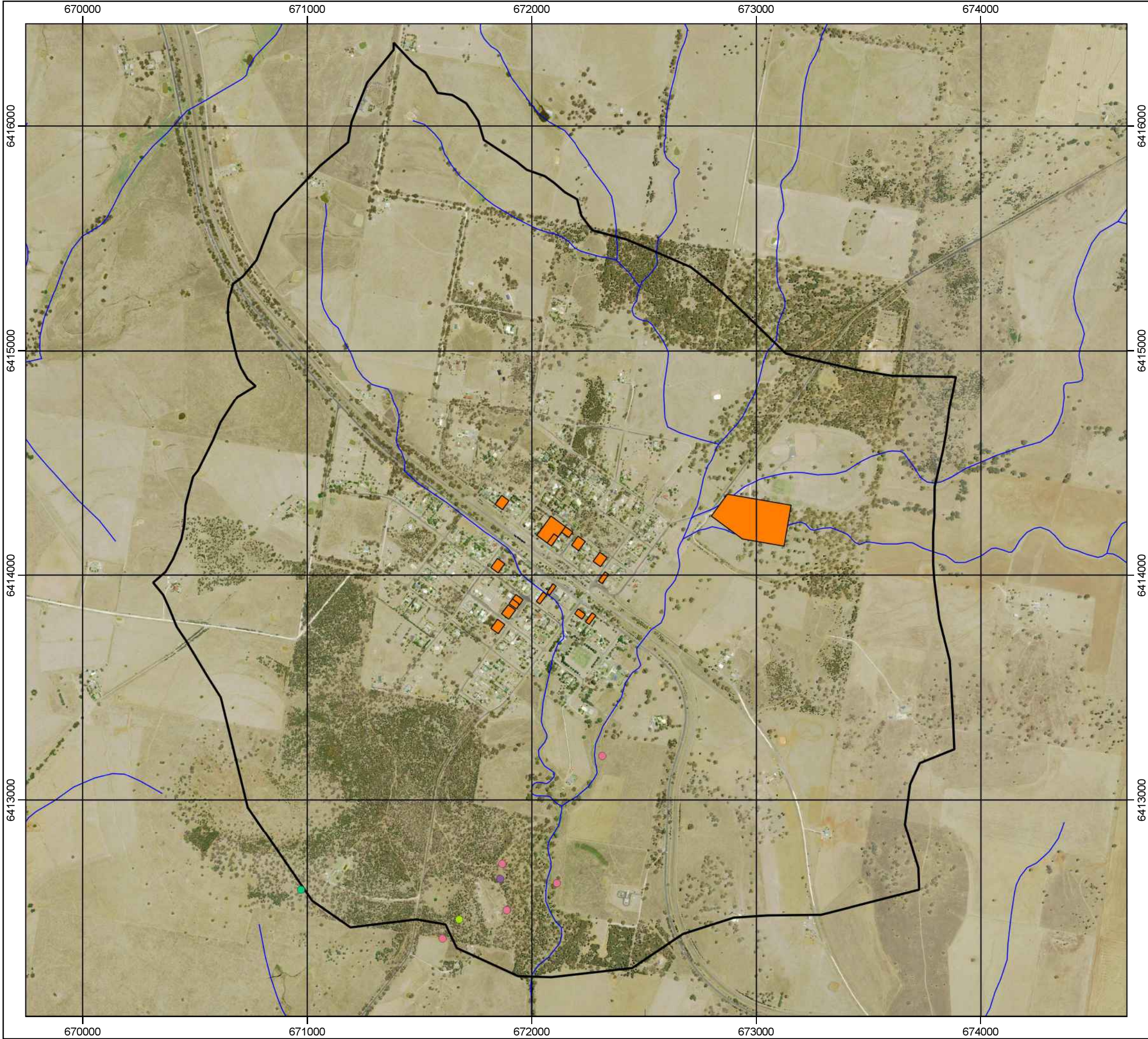


**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

**FIGURE B02  
VULNERABLE FACILITIES AND  
INFRASTRUCTURE LOCATIONS**





- Study Area
- Waterways
- Indigenous Australian Heritage Sites
  - Artefact
  - Resource Gathering
  - Scarred Tree
  - Camp Site
- Non-Indigenous Australian Heritage Sites

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

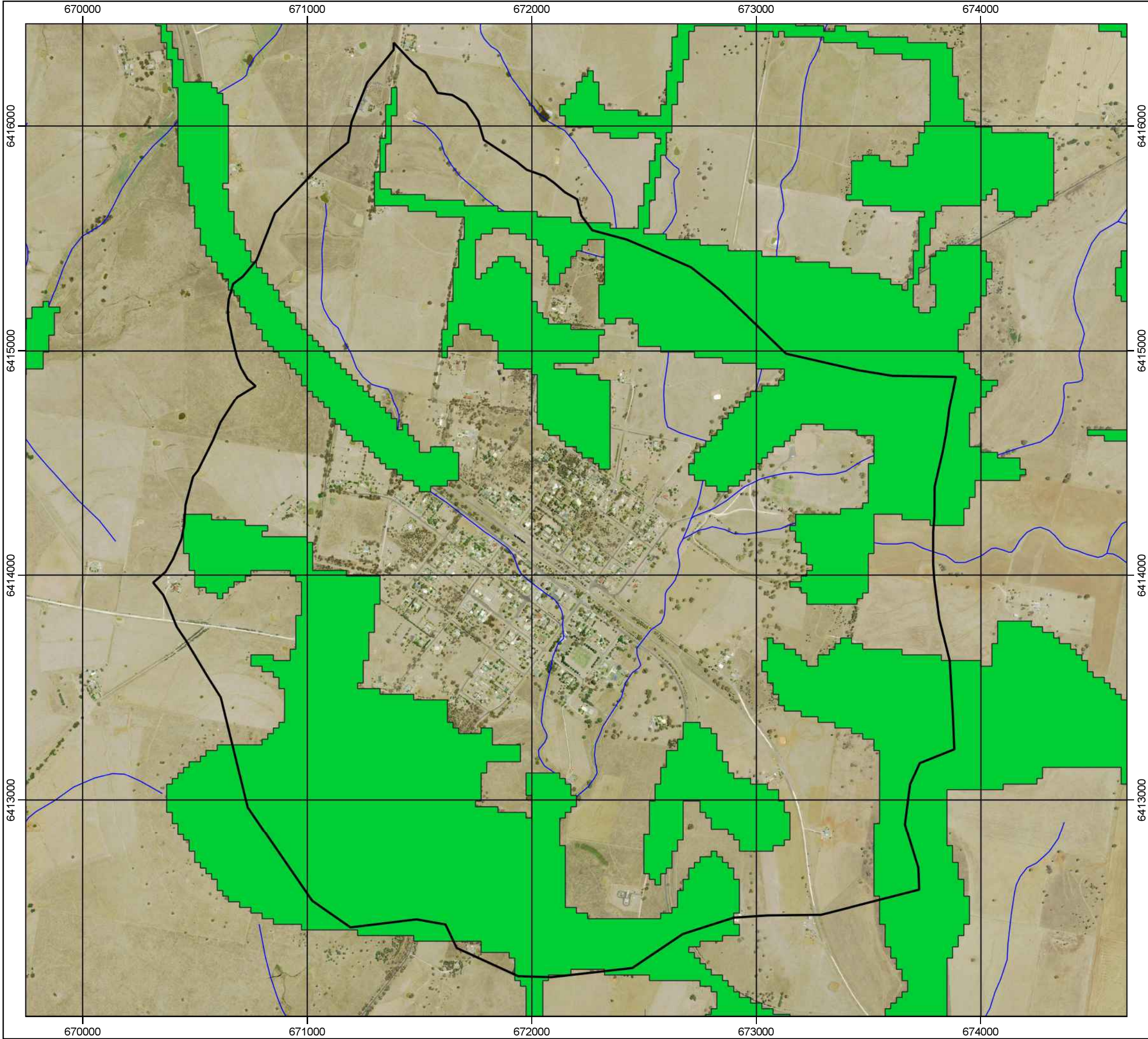





**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

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**FIGURE B03  
CULTURALLY AND HISTORICALLY  
SIGNIFICANT AREAS**





-  Study Area
-  Waterways
-  Environmentally Sensitive Area

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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### FIGURE B04 ENVIRONMENTALLY SENSITIVE AREAS





- Study Area
- Structural Capacity
- > 20% AEP
  - > 10% AEP
  - > 5% AEP
  - > 2% AEP
  - > 1% AEP
  - > 0.5% AEP
  - > PMF
  - < PMF

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN

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FIGURE B05  
BRIDGE AND CULVERT CAPACITY





Study Area

Time to Peak

- >2.00 hours
- >2.50 hours
- >3.00 hours
- >3.50 hours
- >4.00 hours
- >4.50 hours
- >5.00 hours
- >5.50 hours
- >6.00 hours
- >6.50 hours
- >7.00 hours
- >7.50 hours
- >8.00 hours

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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**FIGURE B06A**  
**TIME TO PEAK**  
**20% AEP EVENT**





Study Area

Time to Peak

- >2 hours
- >2.5 hours
- >3 hours
- >3.5 hours
- >4 hours
- >4.5 hours
- >5 hours
- >5.5 hours
- >6 hours
- >6.5 hours
- >7 hours
- >7.5 hours
- >8 hours

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

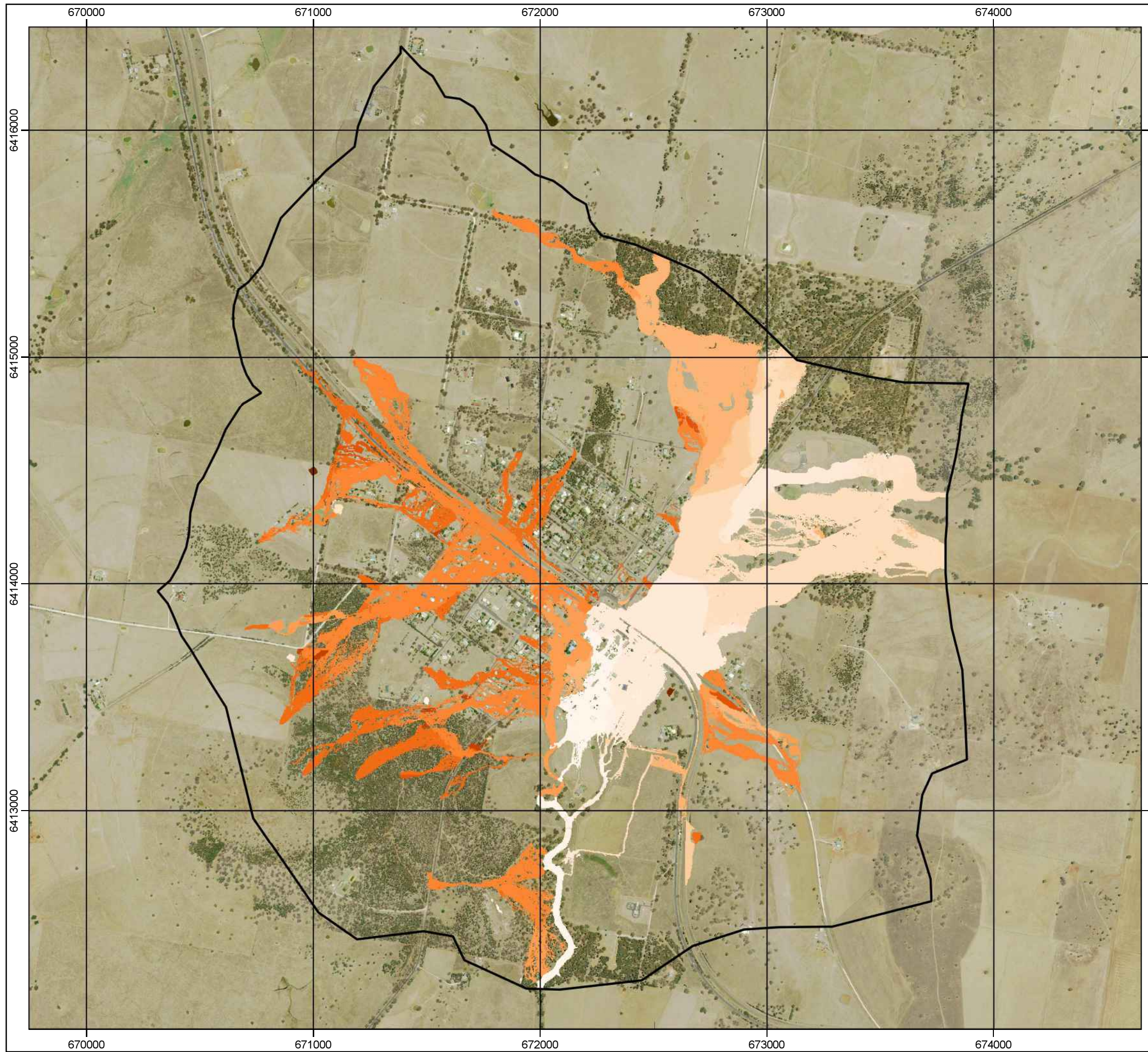


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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FIGURE B06B  
TIME TO PEAK  
5% AEP EVENT





Study Area

Time to Peak

- >0.25 hours
- >0.50 hours
- >0.75 hours
- >1.00 hour
- >1.25 hours
- >1.50 hours
- >1.75 hours
- >2.00 hours
- >2.25 hours
- >2.50 hours
- >2.75 hours
- >3.00 hours

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

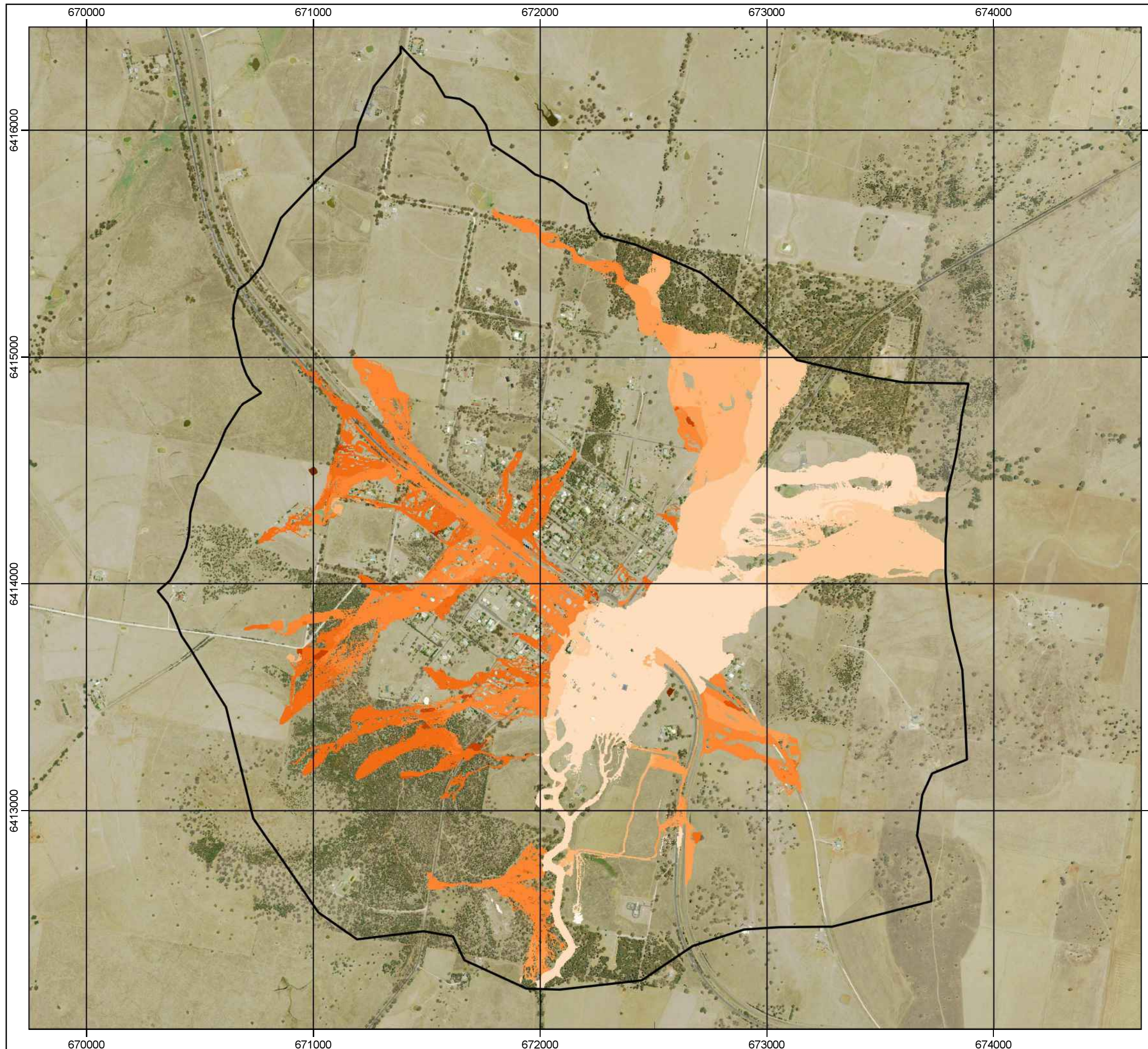


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

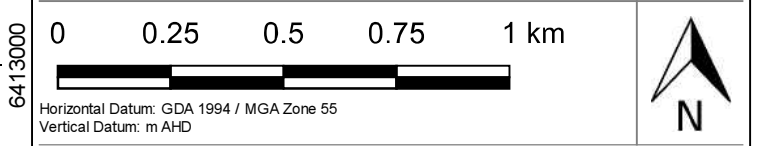
**FIGURE B06C**  
**TIME TO PEAK**  
**1% AEP EVENT**





- Study Area
- Time to Peak
- >0.25 hours
  - >0.50 hours
  - >0.75 hours
  - >1.00 hour
  - >1.25 hours
  - >1.50 hours
  - >1.75 hours
  - >2.00 hours
  - >2.25 hours
  - >2.50 hours
  - >2.75 hours
  - >3.00 hours

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### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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**FIGURE B06D**  
**TIME TO PEAK**  
**0.2% AEP EVENT**





- Study Area
- Event First Flooding Above Floor Level
- Not Flooded
  - PMF
  - 0.50%
  - 1.00%
  - 2.00%
  - 5.00%
  - 10.00%
  - 20.00%

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

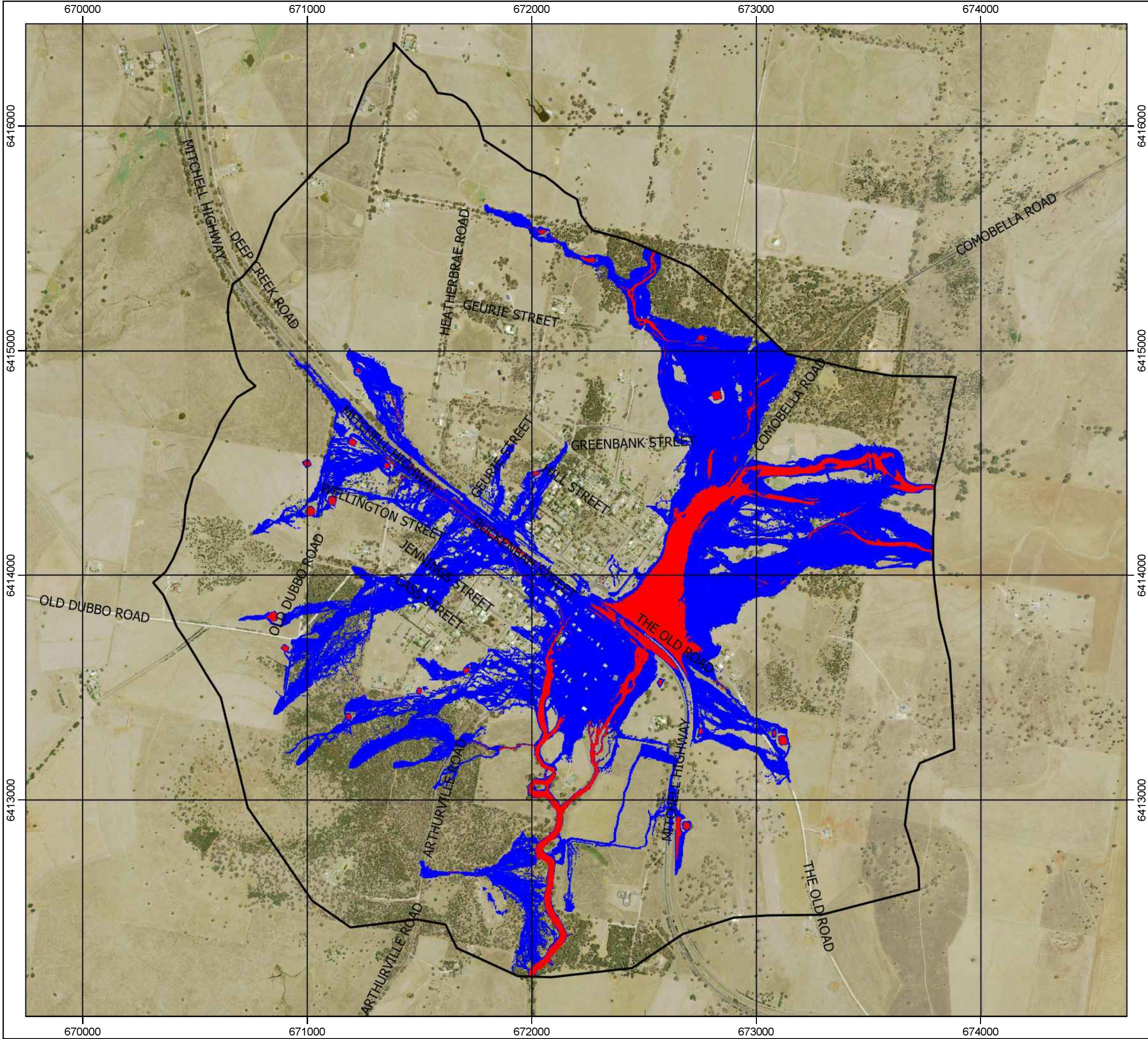


GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

FIGURE B08  
FIRST FLOODING EVENT ABOVE FLOOR  
LEVEL





- Study Area
- True Flood Hazard
- Low Hazard
- High Hazard

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

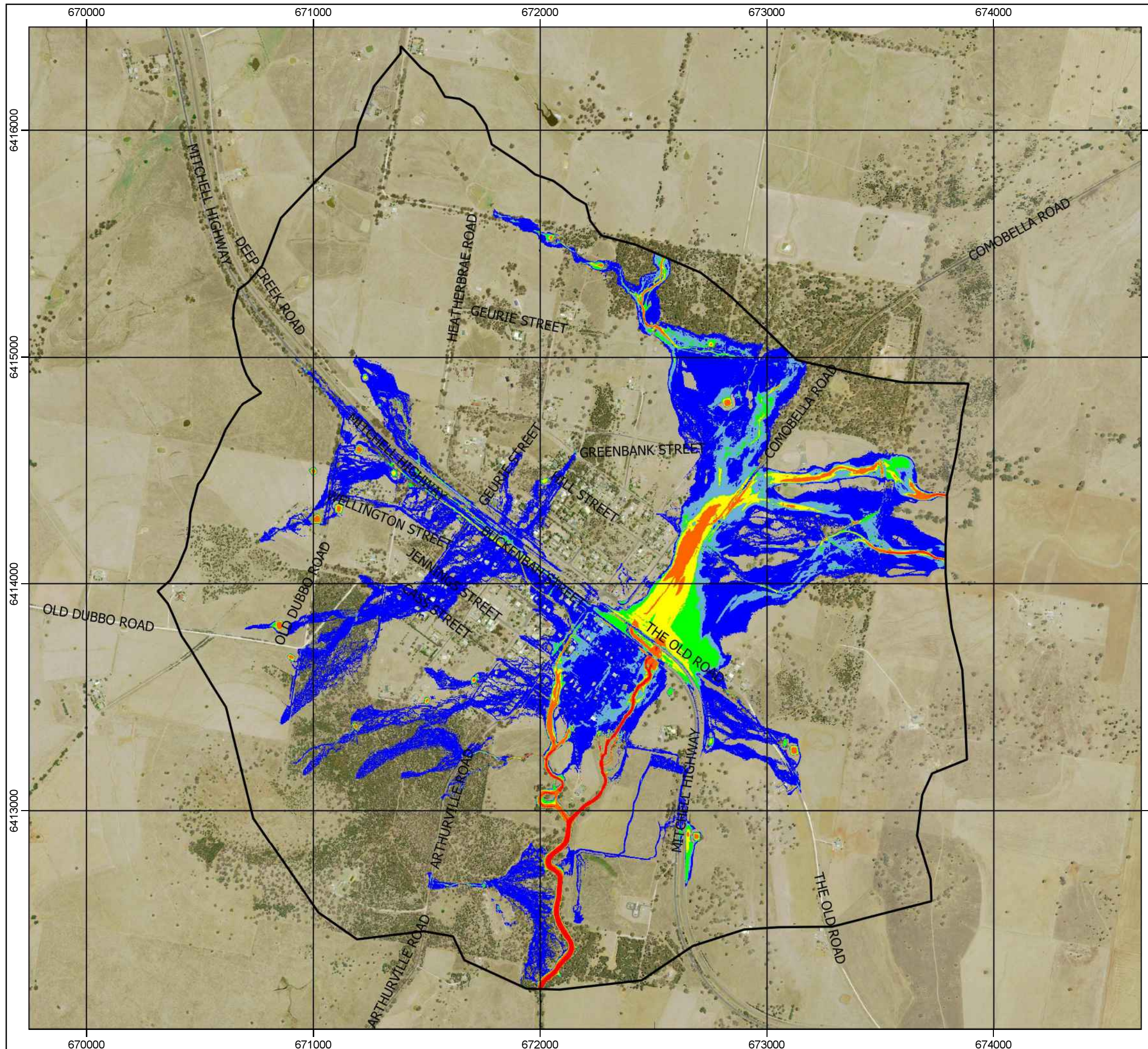


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

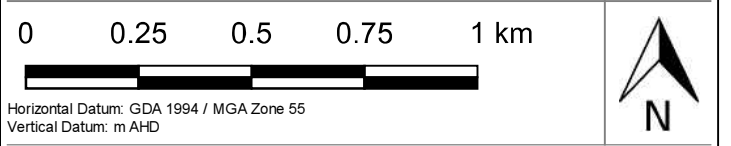
FIGURE B09  
FDM FLOOD HAZARD  
1% AEP EVENT





- Study Area
- Flood Hazard
- H1 - Generally safe for vehicles people and buildings.
  - H2 - Unsafe for small vehicles.
  - H3 - Unsafe for vehicles children and the elderly.
  - H4 - Unsafe for vehicles and people.
  - H5 - Unsafe for vehicles and people. All building types vulnerable to structural damage.
  - H6 - Unsafe for vehicles and people. All building types vulnerable to failure.

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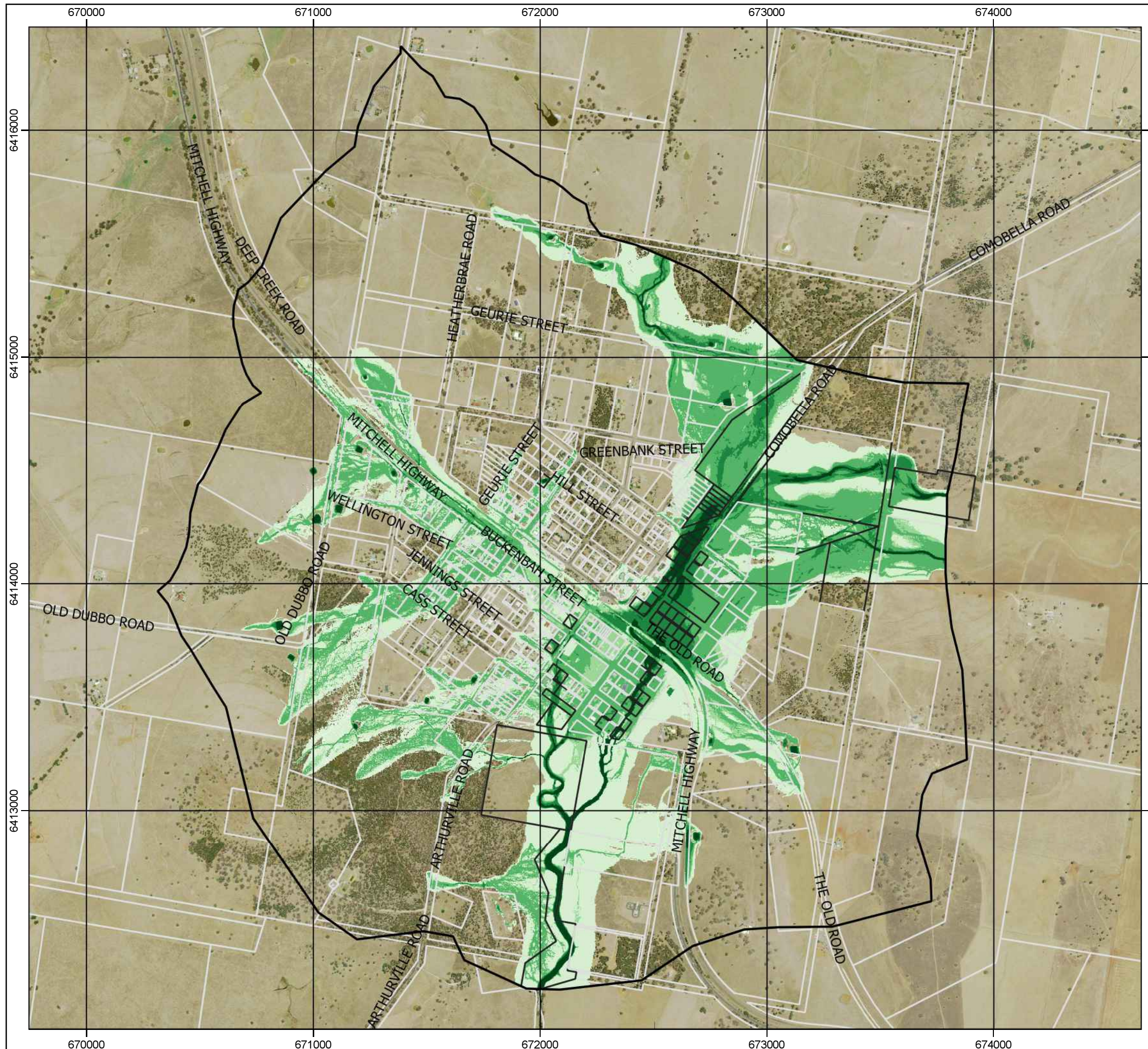


### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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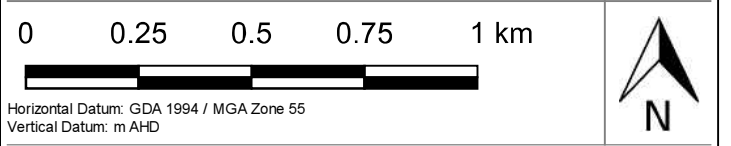
FIGURE B10  
ARR FLOOD HAZARD  
1% AEP EVENT





- Study Area
- Properties
  - High Risk
  - Medium/Low Risk
- Flood Risk
  - Z1 - Free from Flooding
  - Z2 - Very Low Flood Risk
  - Z3 - Low Flood Risk
  - Z4 - Medium Flood Risk
  - Z5 - High Flood Risk
  - Z6 - Extreme Flood Risk

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## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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**FIGURE B11**  
**FLOOD RISK**  
**PROPERTY AFFECTATION**



## APPENDIX C

### POTENTIAL FLOODPLAIN RISK MANAGEMENT MEASURES

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- Study Area
- Detention Basin
- Embankment

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

**FIGURE C01  
MODIFICATION MEASURE FM01  
SCHEMATISATION**





- Study Area
- Underground Detention Basin
- Additional Pipes

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



# GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

## FIGURE C02 MODIFICATION MEASURE FM02 SCHEMATISATION





- Study Area
- Detention Basin
- Additional Pipes
- Embankment
- Swales

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

**FIGURE C03  
MODIFICATION MEASURE FM03  
SCHEMATISATION**





- Study Area
- Detention Basin
- Additional Pipes

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

**FIGURE C04  
MODIFICATION MEASURE FM04  
SCHEMATISATION**





- Study Area
- Detention Basin
- Additional Pipes

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

**FIGURE C05  
MODIFICATION MEASURE FM05  
SCHEMATISATION**





- Study Area
- Additional Culvert
- Embankment
- Detention Basins

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

**FIGURE C06  
MODIFICATION MEASURE FM06  
SCHEMATISATION**





- Study Area
- Additional Culverts

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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### FIGURE C07 MODIFICATION MEASURE FM07 SCHEMATISATION





- Study Area
- Additional Culverts

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

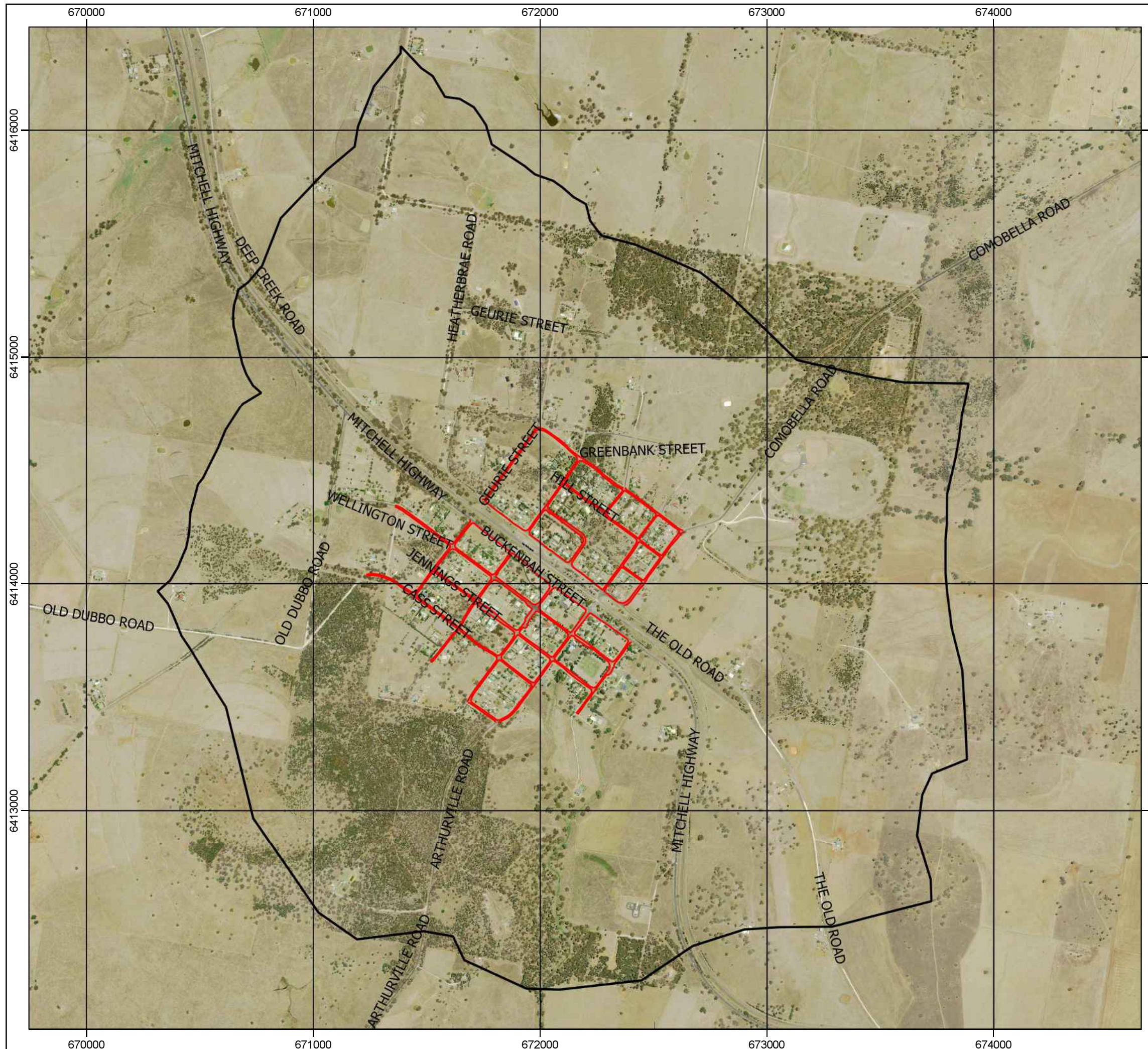


**GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN**

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FRMSP

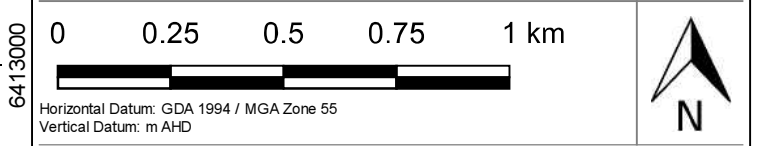
**FIGURE C08  
MODIFICATION MEASURE FM08  
SCHEMATISATION**





- Study Area
- Swales

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### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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**FIGURE C09**  
**MODIFICATION MEASURE FM09**  
**SCHEMATISATION**





- Study Area
- Additional Pipes
- Widened Creek
- Levees

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



# GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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## FIGURE C10 MODIFICATION MEASURE FM10 SCHEMATISATION



## APPENDIX D

### ESTIMATE OF BENEFITS

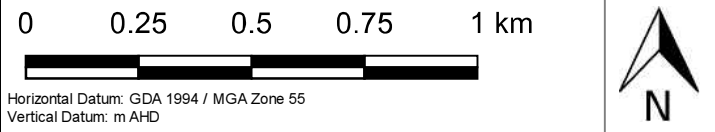
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- Hydraulic Area
- Peak Flood Level Difference (m)
  - <= -0.10
  - 0.10 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.10
  - 0.10 to 0.30
  - > 0.30
- No Longer Flooded
- Newly Flooded

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GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D1  
MODIFICATION MEASURE FM01  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

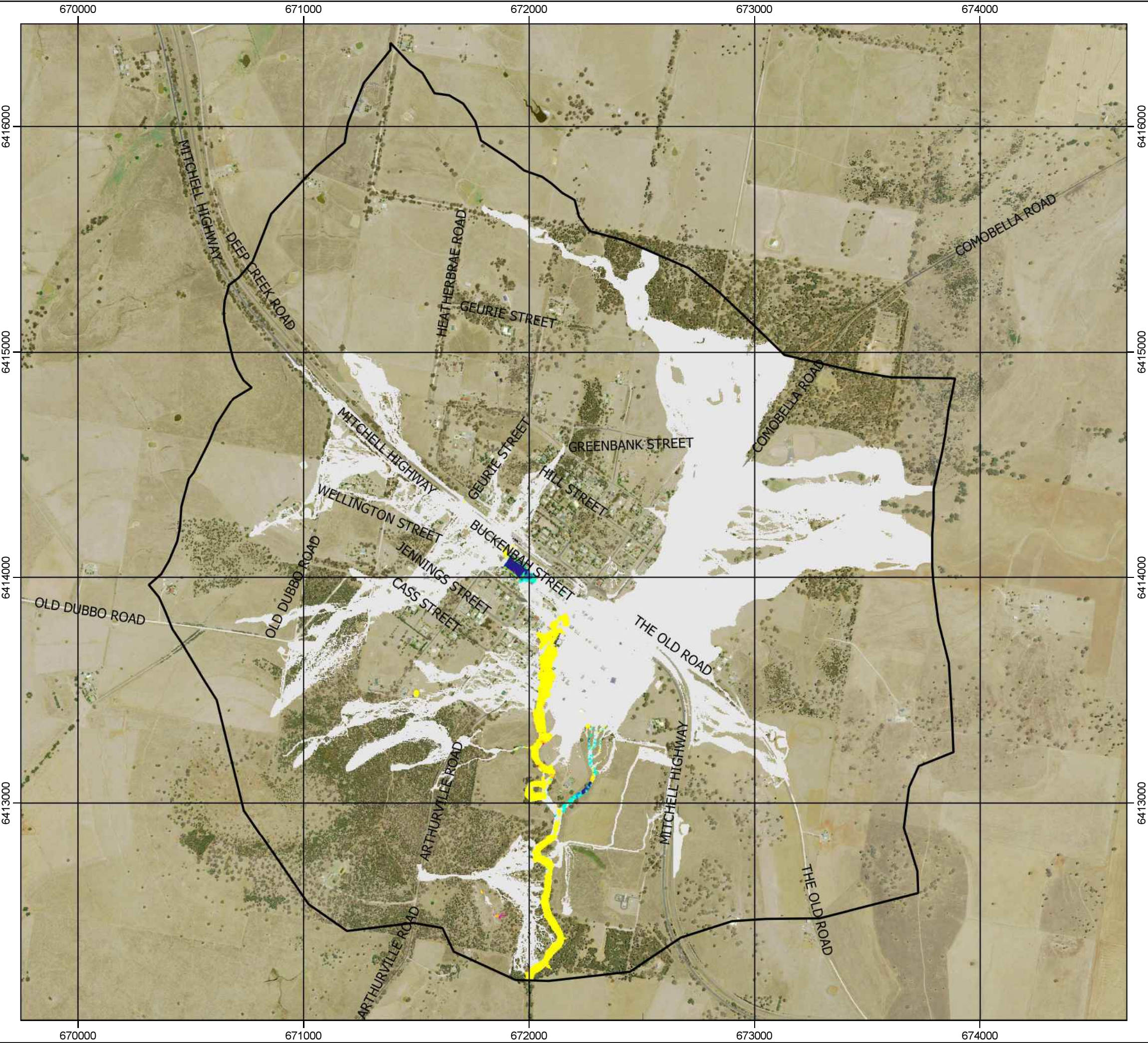


GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D2  
MODIFICATION MEASURE FM01  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D3  
MODIFICATION MEASURE FM01  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

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FIGURE D4  
MODIFICATION MEASURE FM02  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D5  
MODIFICATION MEASURE FM02  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

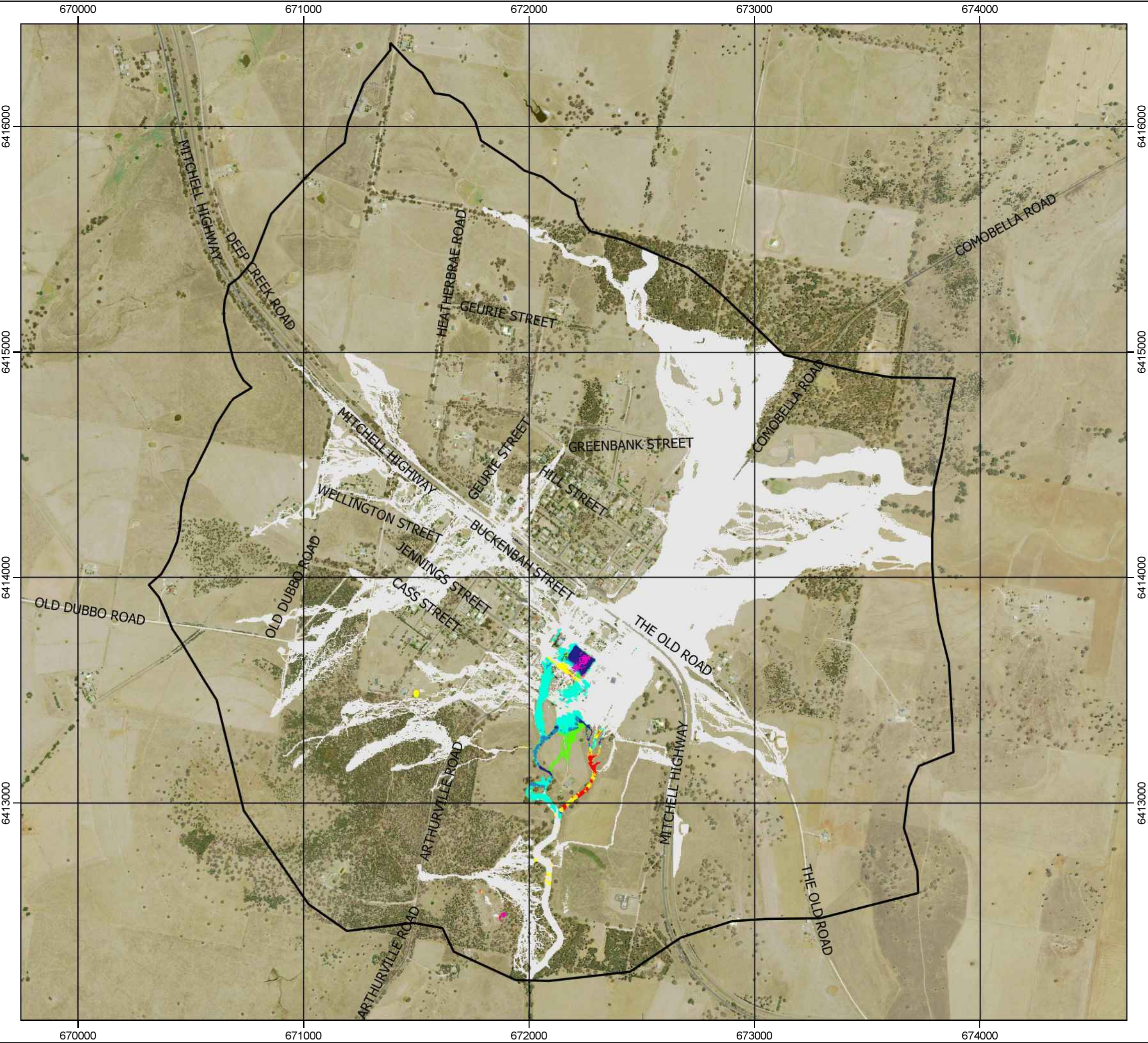


### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D6  
MODIFICATION MEASURE FM02  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

Disclaimer: The material contained herein is provided for general information purposes only. Any action you take based upon the information contained herein is strictly at your own risk. Professional advice should be sought in relation to your own specific circumstances.

0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

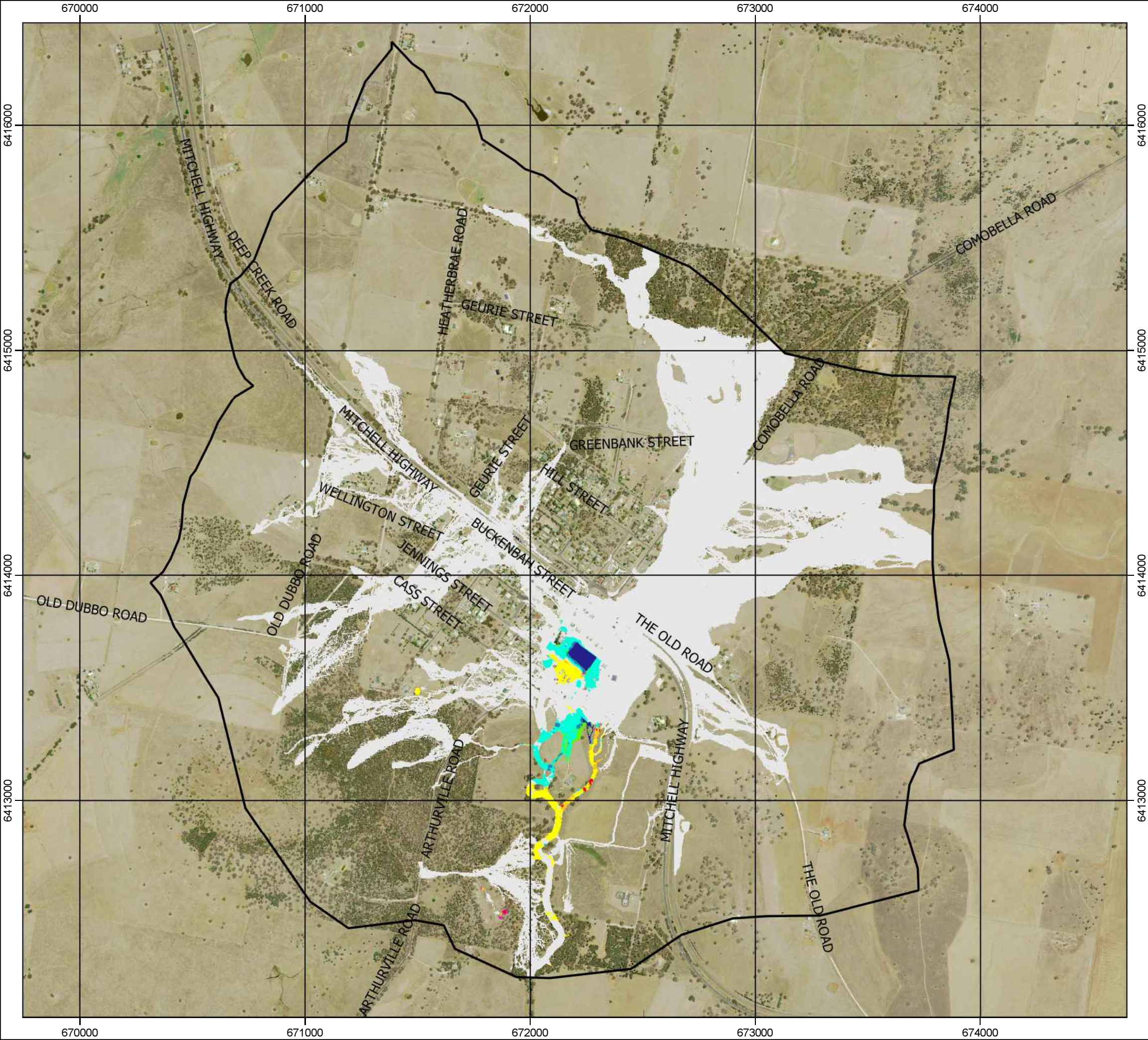


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D7  
MODIFICATION MEASURE FM03  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

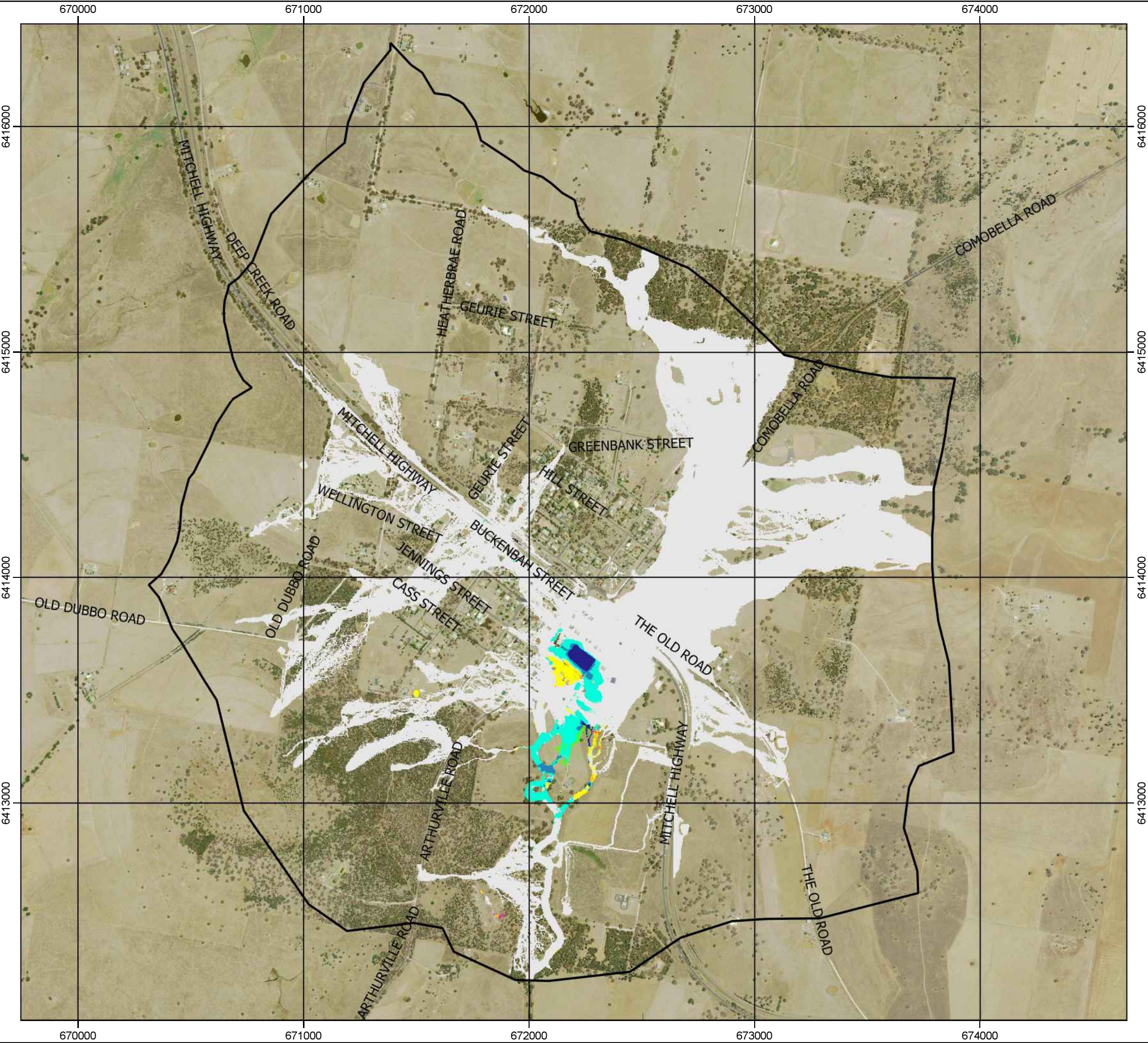


### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D8  
MODIFICATION MEASURE FM03  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

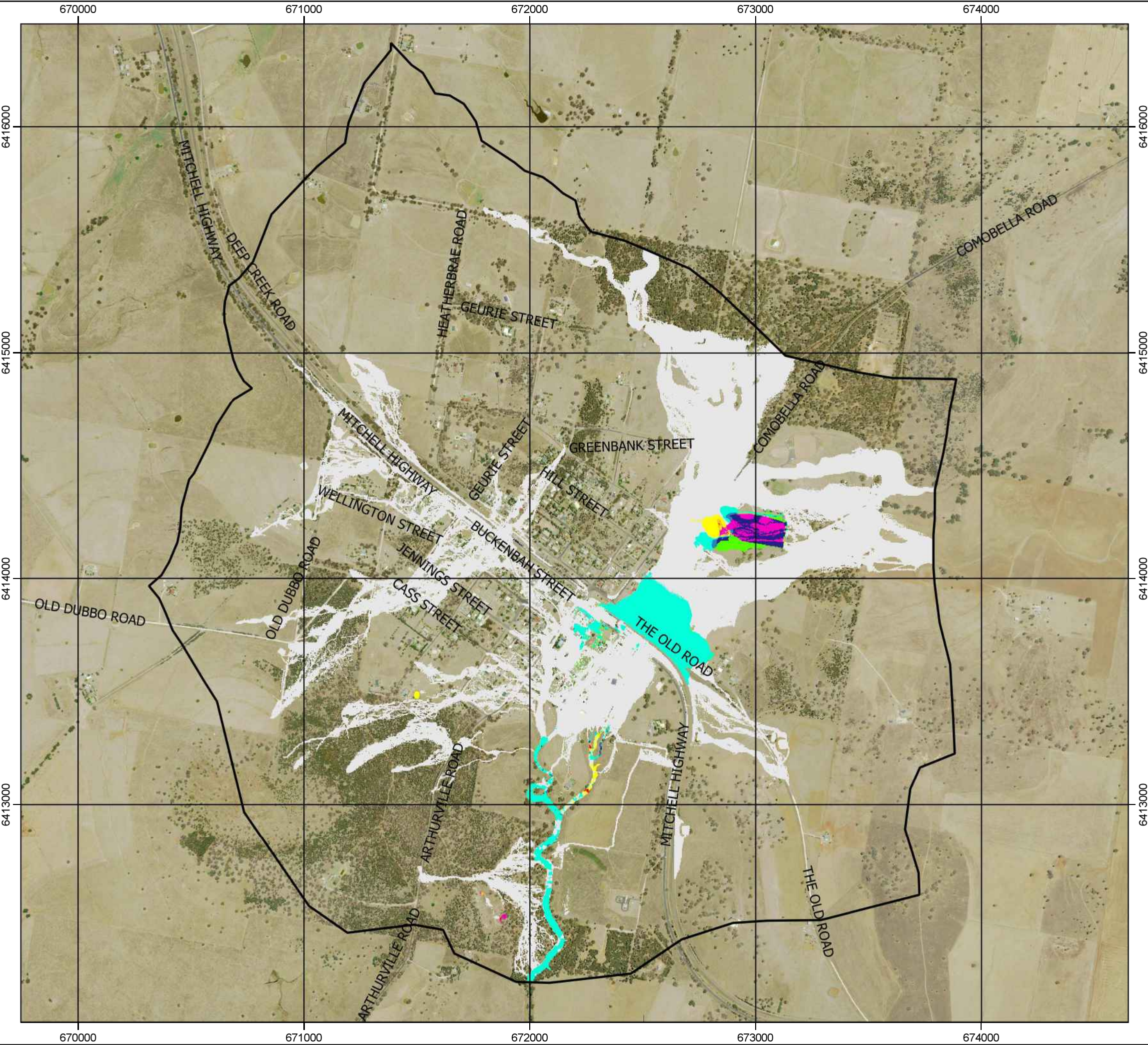


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D9  
MODIFICATION MEASURE FM03  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

Disclaimer: The material contained herein is provided for general information purposes only. Any action you take based upon the information contained herein is strictly at your own risk. Professional advice should be sought in relation to your own specific circumstances.

0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

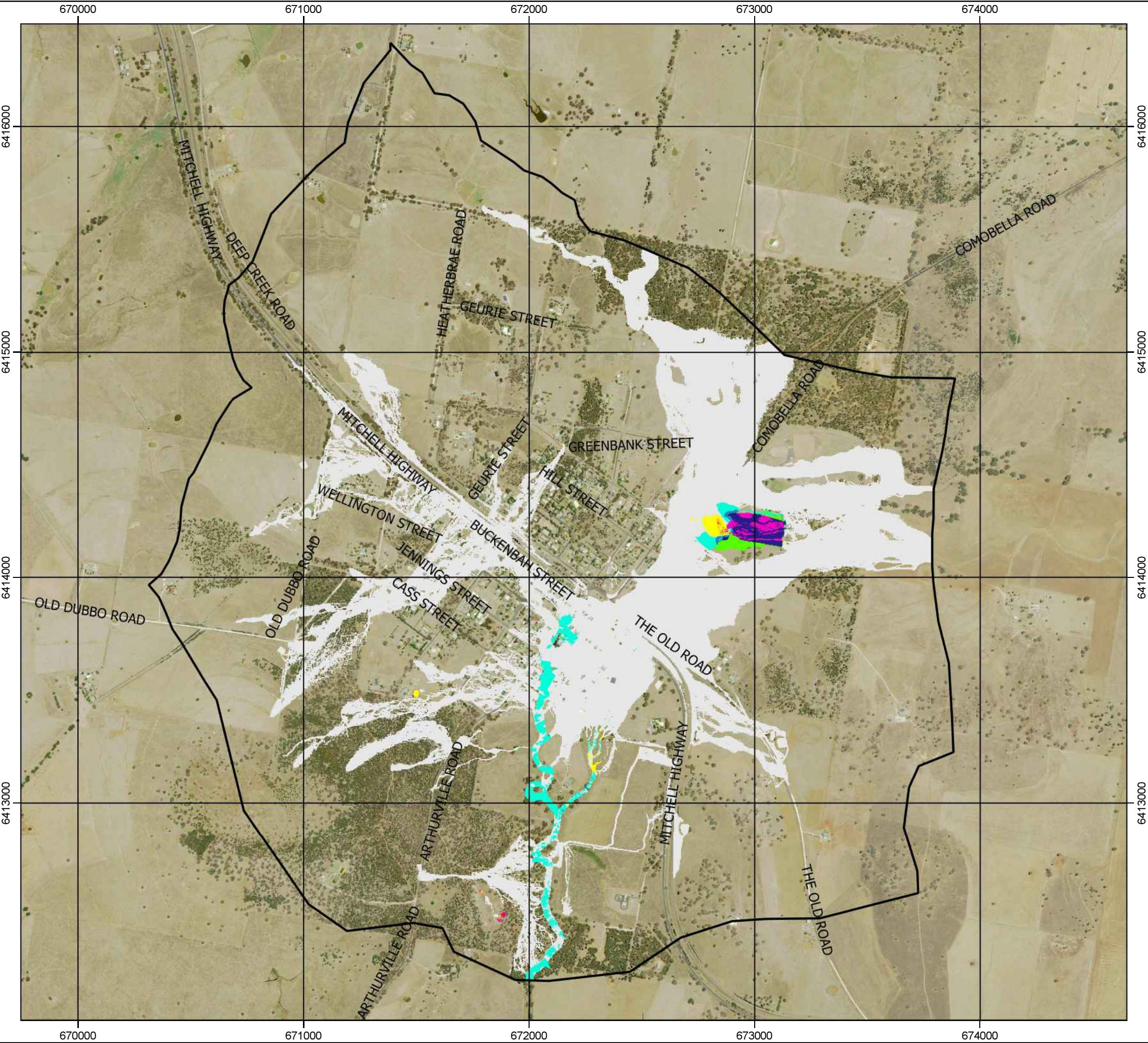


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D10  
MODIFICATION MEASURE FM04  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

Disclaimer: The material contained herein is provided for general information purposes only. Any action you take based upon the information contained herein is strictly at your own risk. Professional advice should be sought in relation to your own specific circumstances.

0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

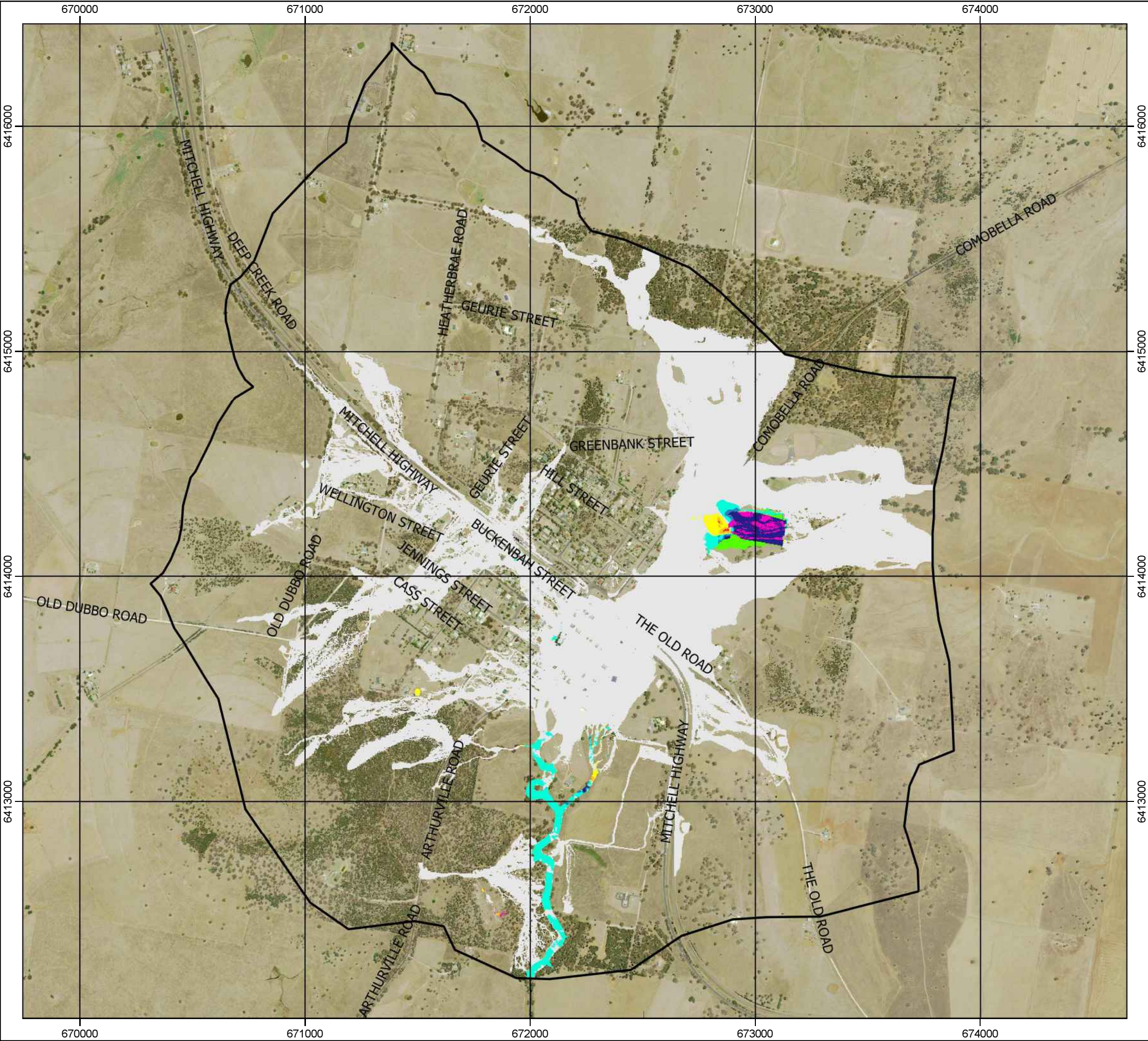


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D11  
MODIFICATION MEASURE FM04  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

- <= -0.10
- 0.10 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.10
- 0.10 to 0.30
- > 0.30

- No Longer Flooded
- Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



### GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D12  
MODIFICATION MEASURE FM04  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

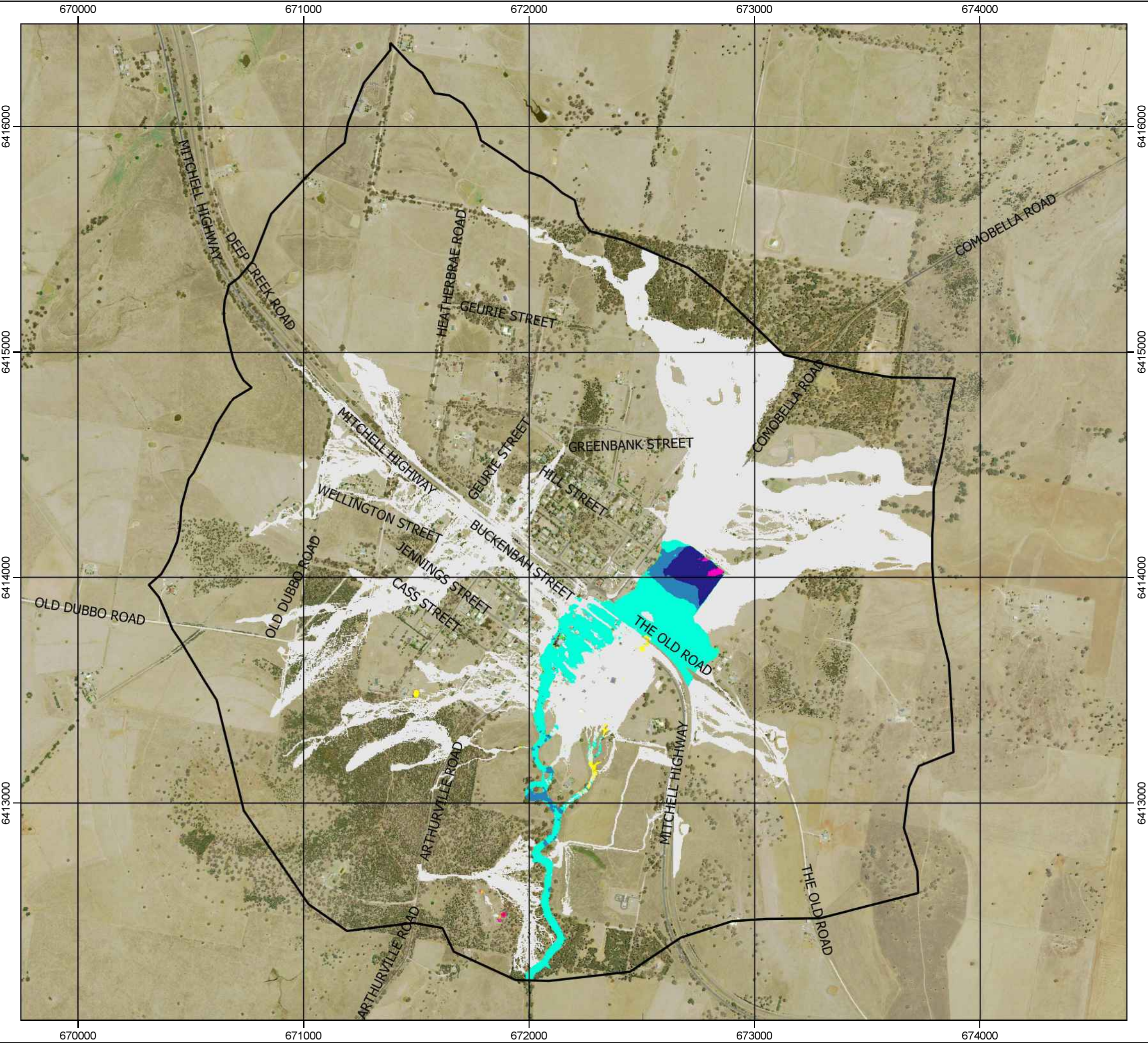


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D13  
MODIFICATION MEASURE FM05  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

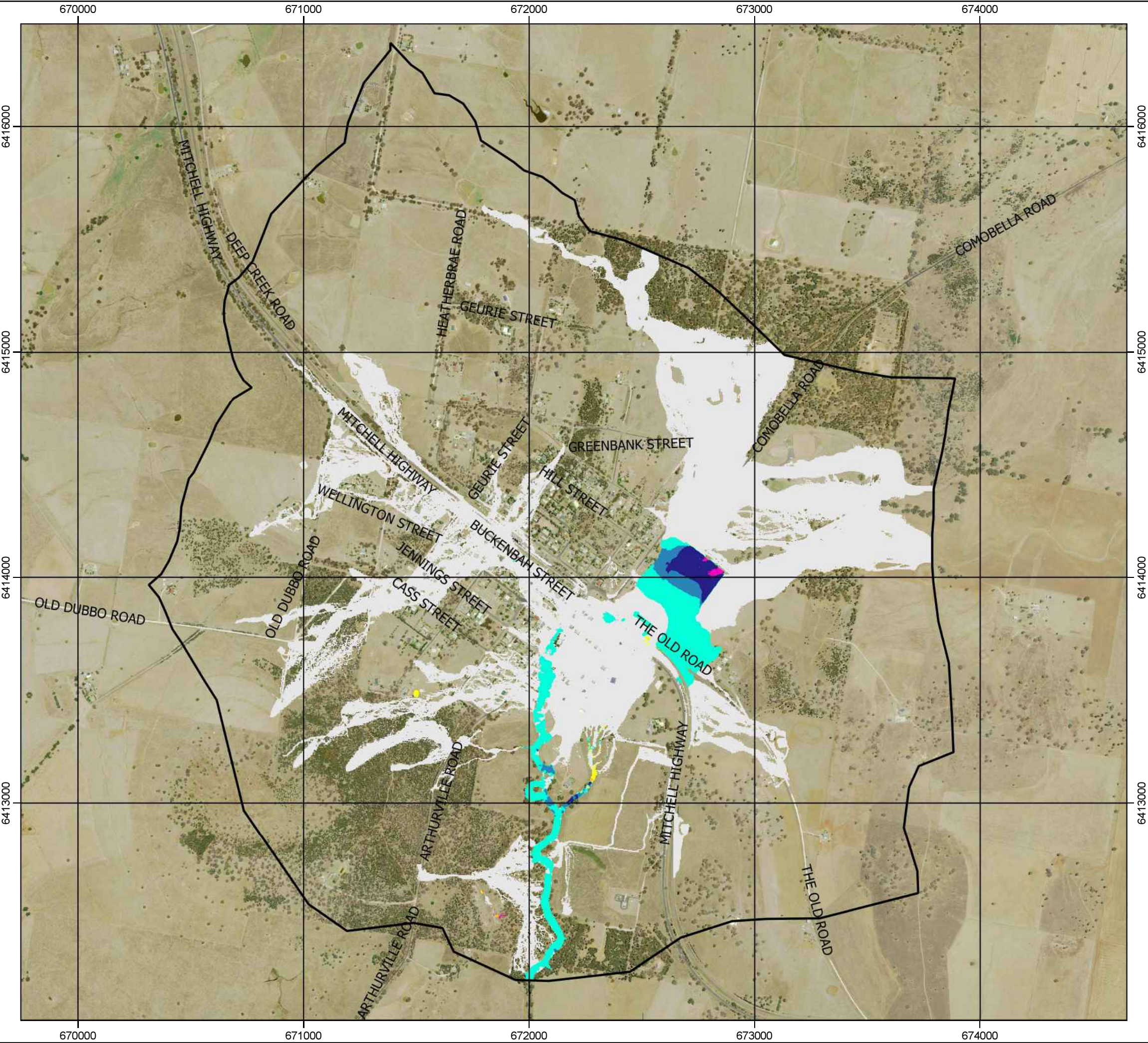


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

**FIGURE D14**  
**MODIFICATION MEASURE FM05**  
**PEAK FLOOD LEVEL DIFFERENCE**  
**1% AEP EVENT**





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D15  
MODIFICATION MEASURE FM05  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D16  
MODIFICATION MEASURE FM06  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D17  
MODIFICATION MEASURE FM06  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D18  
MODIFICATION MEASURE FM06  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

- <= -0.10
- 0.10 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.10
- 0.10 to 0.30
- > 0.30

- No Longer Flooded
- Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

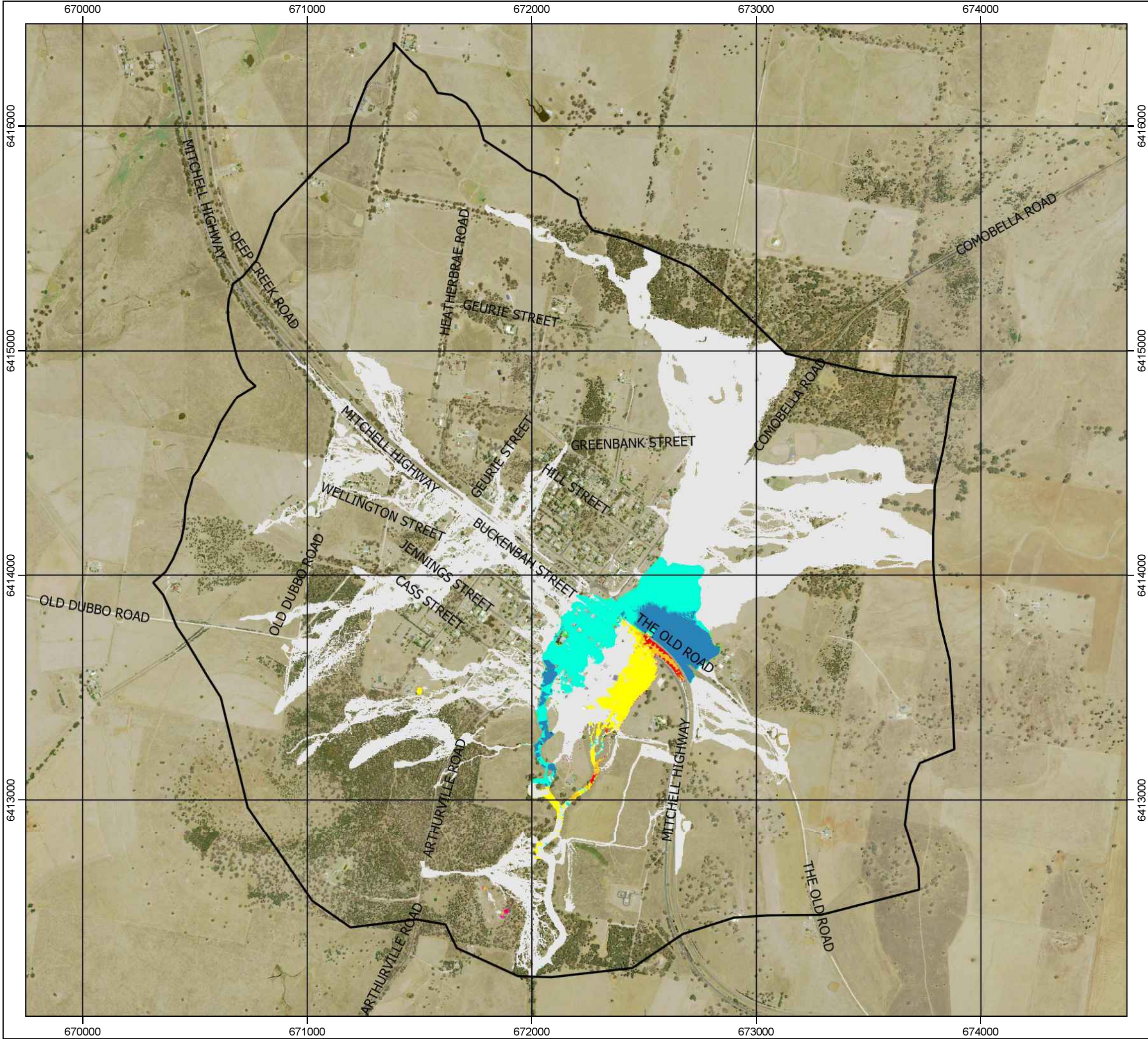


GEURIE FLOODPLAIN RISK  
MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D19  
MODIFICATION MEASURE FM07  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

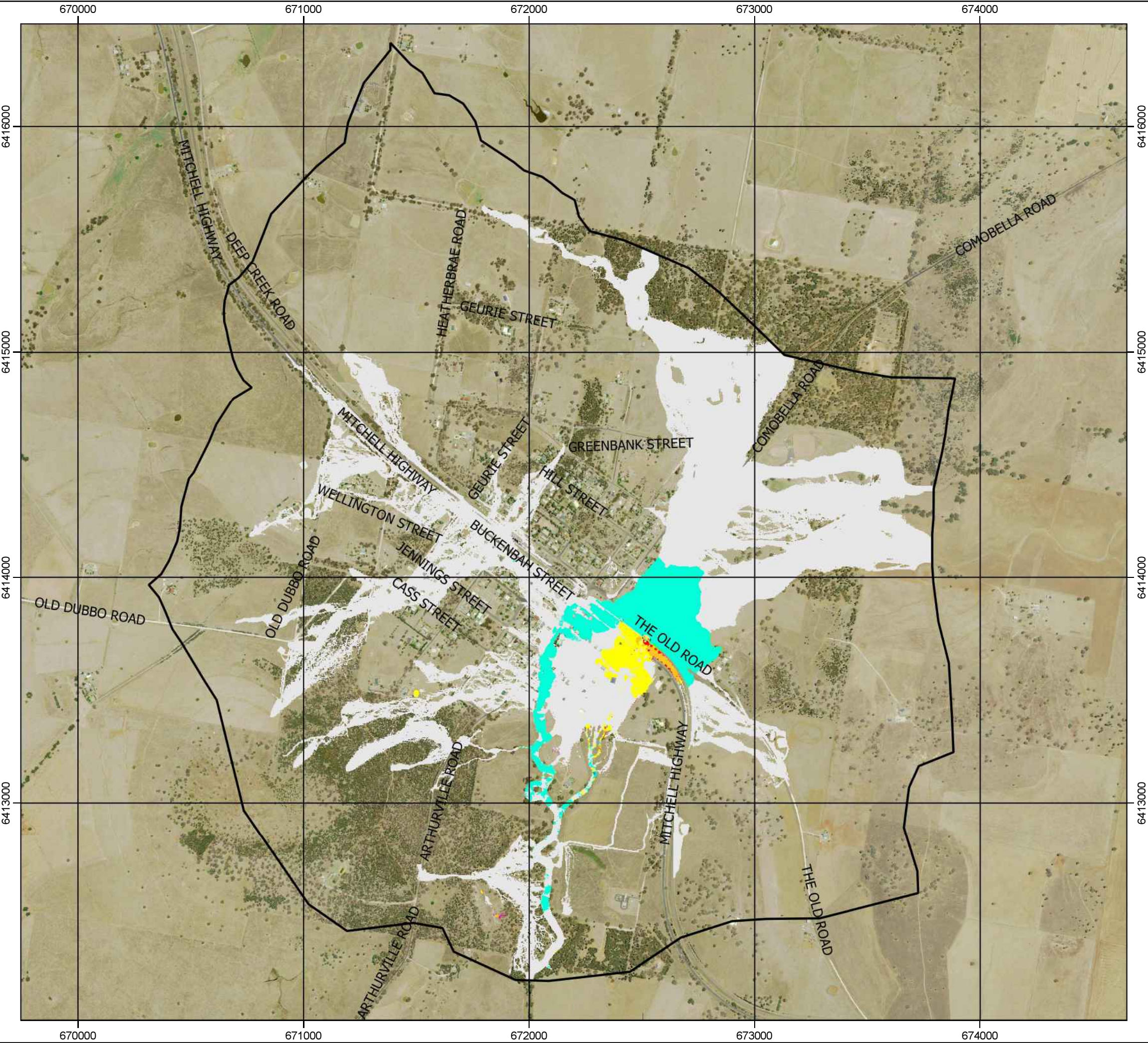


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D20  
MODIFICATION MEASURE FM07  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D21  
MODIFICATION MEASURE FM07  
PEAK FLOOD LEVEL DIFFERENCE  
0.5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D22  
MODIFICATION MEASURE FM08  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D23  
MODIFICATION MEASURE FM08  
PEAK FLOOD LEVEL DIFFERENCE  
1% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

**FIGURE D24**  
**MODIFICATION MEASURE FM08**  
**PEAK FLOOD LEVEL DIFFERENCE**  
**0.5% AEP EVENT**





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D25  
MODIFICATION MEASURE FM09  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

**FIGURE D26**  
**MODIFICATION MEASURE FM09**  
**PEAK FLOOD LEVEL DIFFERENCE**  
**1% AEP EVENT**





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

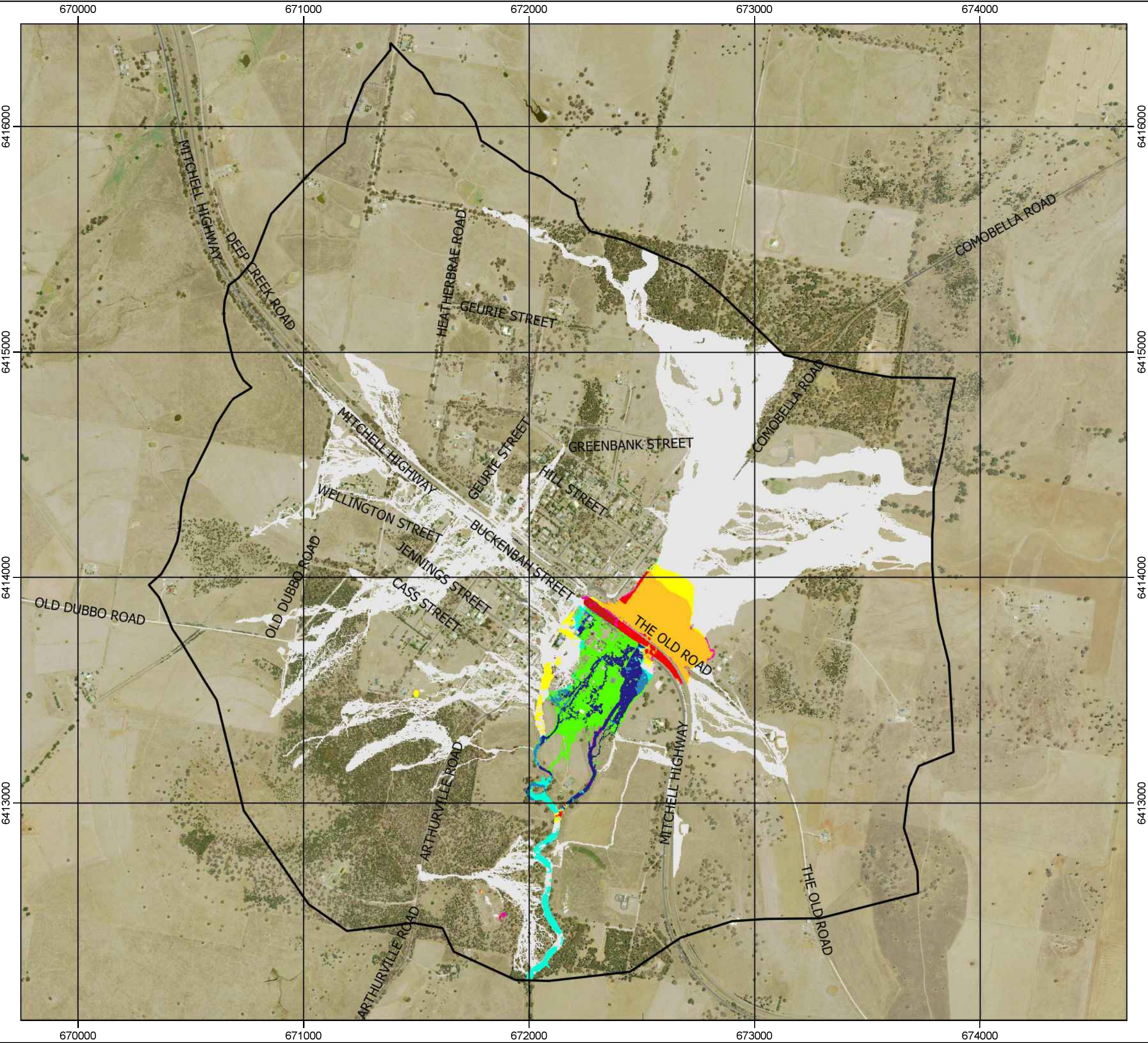


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

**FIGURE D27**  
**MODIFICATION MEASURE FM09**  
**PEAK FLOOD LEVEL DIFFERENCE**  
**0.5% AEP EVENT**





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

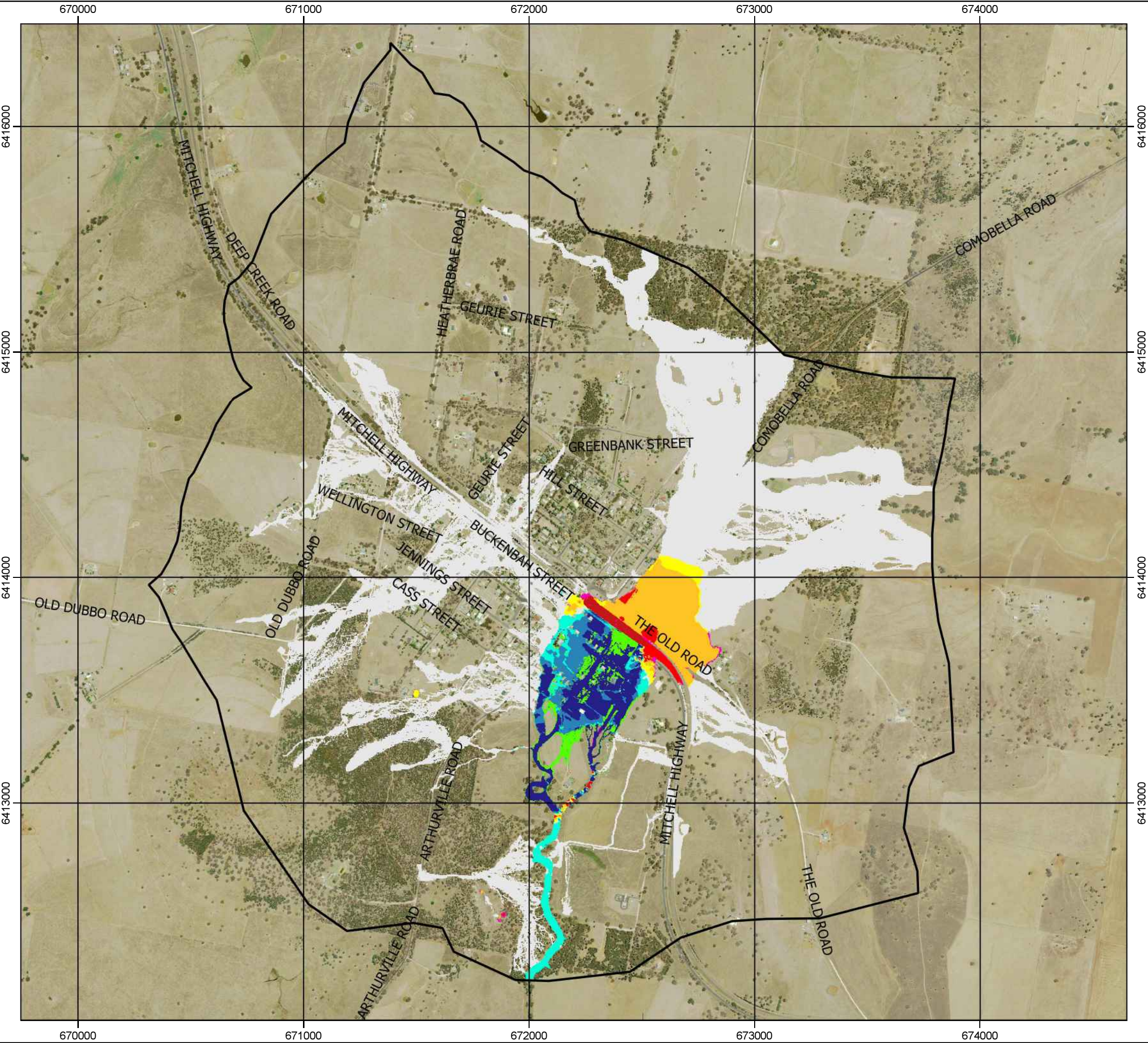


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

FIGURE D28  
MODIFICATION MEASURE FM10  
PEAK FLOOD LEVEL DIFFERENCE  
5% AEP EVENT





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD

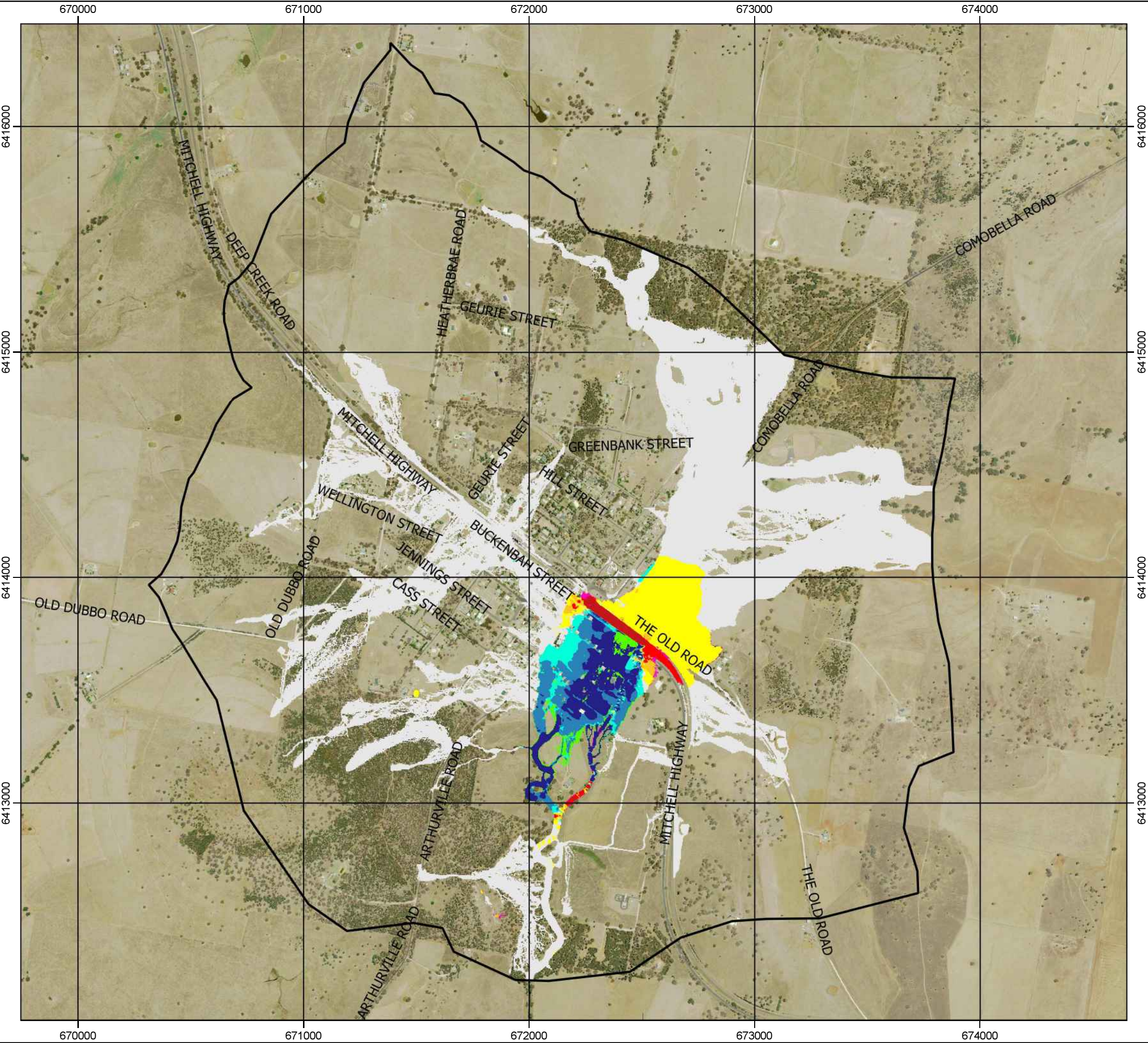


## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

**FIGURE D29**  
**MODIFICATION MEASURE FM10**  
**PEAK FLOOD LEVEL DIFFERENCE**  
**1% AEP EVENT**





Hydraulic Area

Peak Flood Level Difference (m)

<= -0.10

-0.10 to -0.05

-0.05 to -0.01

-0.01 to 0.01

0.01 to 0.05

0.05 to 0.10

0.10 to 0.30

> 0.30

No Longer Flooded

Newly Flooded

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0 0.25 0.5 0.75 1 km

Horizontal Datum: GDA 1994 / MGA Zone 55  
Vertical Datum: m AHD



## GEURIE FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Map Location: 18020\_Geurie\_FS\_FRMSP\GIS\Maps\Reporting\_FS

**FIGURE D30**  
**MODIFICATION MEASURE FM10**  
**PEAK FLOOD LEVEL DIFFERENCE**  
**0.5% AEP EVENT**



## APPENDIX E

### ESTIMATE OF COSTS

---



## E.1 Flood Modification Measures

### E.1.1 FM01 - Detention basin within Wise Park

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$15,033.54
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	4375.51	sq.m	\$0.59	\$2,581.55
2.2	Strip topsoil & stockpile for re-use	2625.31	cu.m	\$3.67	\$9,638.36
2.3	Excavate clay layer	3709.69	cu.m	\$3.67	\$13,619.48
2.4	Dispose of excess topsoil and clay	5065.89	cu.m	\$1.22	\$6,199.51
	SUBTOTAL				\$32,038.90
3.0	EARTHWORKS				
3.1	Level clay footing	4375.51	sq.m	\$3.60	\$15,751.84
3.2	Place and compact backfill	1058.27	cu.m	\$8.20	\$8,677.77
	SUBTOTAL				\$24,429.61
4.0	MINOR LANDSCAPING				
4.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	4375.51	sq.m	\$10.00	\$43,755.10
	SUBTOTAL				\$43,755.10
	CONSTRUCTION SUBTOTAL				\$115,257.16
6.0	CONTINGENCIES				
6.1	50% construction cost				\$57,628.58
	CONSTRUCTION TOTAL, excluding GST				\$172,885.74
	GST				\$17,288.57
	CONSTRUCTION TOTAL, including GST				\$190,174.31
	CONSTRUCTION TOTAL, rounded				\$191,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



## E.1.2 FM02 - Detention basin under Geurie Tennis Courts

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL*				\$17,945.72
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Demolish tennis courts	2	item	\$15,000.00	\$30,000.00
2.2	Strip topsoil & stockpile for re-use	1178.2767	cu.m	\$3.67	\$4,325.84
2.3	Excavate clay layer	1900.8	cu.m	\$3.67	\$6,978.46
2.4	Dispose of excess topsoil and clay	2764.8	cu.m	\$1.22	\$3,383.50
	SUBTOTAL				\$44,687.80
3.0	EARTHWORKS				
3.1	Level clay footing	1900.8	cu.m	\$3.60	\$6,842.88
3.2	Place and compact backfill	276.48	cu.m	\$8.20	\$2,267.14
	SUBTOTAL				\$6,842.88
4.0	PIPES				
4.1	Install pipe system	125.989	m	\$110.45	\$13,915.49
	SUBTOTAL				\$13,915.49
5.0	DETENTION BASIN				
5.1	Install detention tank	2764.8	L	\$2.50	\$6,912.00
	SUBTOTAL				\$6,912.00
6.0	TENNIS COURTS				
6.1	Install tennis hard court	2	item	\$15,000.00	\$30,000.00
	SUBTOTAL				\$30,000.00
7.0	MINOR LANDSCAPING				
7.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	1728	sq.m	\$10.00	\$17,280.00
	SUBTOTAL				\$17,280.00
	CONSTRUCTION SUBTOTAL				\$137,583.89
8.0	CONTINGENCIES				
8.1	50% construction cost				\$68,791.94



Item Number	Description of works	Quantity	Unit	Rate	Cost
	CONSTRUCTION TOTAL, excluding GST				\$206,375.83
	GST				\$20,637.58
	CONSTRUCTON TOTAL, including GST				\$227,013.42
	CONSTRUCTION TOTAL, rounded				\$228,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



### E.1.3 FM03 - Detention basin within Tom Culkin Oval

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$39,502.58
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	10603.44	sq.m	\$0.59	\$6,256.03
2.2	Strip topsoil & stockpile for re-use	6562.94	cu.m	\$3.67	\$24,094.72
2.3	Demolish asphalt and gravel layers	1.1	m	\$9.00	\$9.90
2.4	Excavate clay layer	4157.11	cu.m	\$3.67	\$15,262.10
2.5	Dispose of excess topsoil and clay	9052.31	cu.m	\$1.22	\$11,078.01
	SUBTOTAL				\$56,700.76
3.0	PIPES				
3.1	Install pipe system	470.87	m	\$110.45	\$52,008.03
	SUBTOTAL				\$52,008.03
4.0	ROAD CONSTRUCTION				
4.1	Lay subbase	12.48	sq.m	\$129.00	\$1,609.47
4.2	Lay asphalt	12.48	sq.m	\$100.00	\$1,247.65
4.3	Seal road	12.48	sq.m	\$26.70	\$333.12
	SUBTOTAL				\$3,190.24
5.0	EARTHWORKS				
5.1	Build embankment clay layer	6.75	cu.m	\$4.43	\$29.91
5.2	Level clay footing	10368.00	sq.m	\$3.60	\$37,324.80
5.3	Place and compact backfill	948.32	cu.m	\$8.20	\$7,776.21
	SUBTOTAL				\$45,130.91
6.0	CRICKET PITCH				
6.1	Install cricket pitch	60	sq.m	\$55.00	\$3,300.00
6.2	Lay turf grass	8740.00	sq.m	\$0.67	\$5,830.80
	SUBTOTAL				\$9,130.80
7.0	MINOR LANDSCAPING				



Item Number	Description of works	Quantity	Unit	Rate	Cost
7.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	10368	sq.m	\$10.00	\$103,680.00
	SUBTOTAL				\$103,680.00
	CONSTRUCTION SUBTOTAL				\$306,153.08
8.0	CONTINGENCIES				
8.1	50% construction cost				\$153,076.54
	CONSTRUCTION TOTAL, excluding GST				\$459,229.63
	GST				\$45,922.96
	CONSTRUCTION TOTAL, including GST				\$505,152.59
	CONSTRUCTION TOTAL, rounded				\$506,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



#### E.1.4 FM04 - Detention basin within 72 Severne Street

ITEM NO.	DESCRIPTION OF WORK	QUANTITY	UNIT	RATE	COST
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$128,986.40
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	31371.83	sq.m	\$0.59	\$18,509.38
2.2	Strip topsoil & stockpile for re-use	18823.10	cu.m	\$3.67	\$69,105.78
2.3	Excavate clay layer	55011.14	cu.m	\$3.67	\$201,963.99
2.4	Dispose of excess topsoil and clay	70249.81	cu.m	\$1.22	\$85,970.05
	SUBTOTAL				\$375,549.21
3.0	PIPES				
3.1	Install pipe system	234.50	m	\$110.45	\$25,899.97
	SUBTOTAL				\$25,899.97
4.0	EARTHWORKS				
4.1	Level clay footing	31254.59	sq.m	\$3.60	\$112,516.51
4.2	Place and compact backfill	4072.91	cu.m	\$8.20	\$33,397.83
	SUBTOTAL				\$145,914.33
5.0	MINOR LANDSCAPING				
5.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	31254.59	sq.m	\$10.00	\$312,545.85
	SUBTOTAL				\$312,545.85
	CONSTRUCTION SUBTOTAL				\$988,895.77
6.0	CONTINGENCIES				
6.1	50% construction cost				\$494,447.88
	CONSTRUCTION TOTAL, excluding GST				\$1,483,343.65
	GST				\$148,334.37
	CONSTRUCTION TOTAL, including GST				\$1,631,678.02
	CONSTRUCTION TOTAL, rounded				\$1,632,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



#### E.1.5 FM05 - Detention basin on Geurie Creek upstream of the railway embankment

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$309,182.93
2.0	PROPERTY PURCHASE				
2.1	Purchase of Existing Properties			Pending property valuation	
	SUBTOTAL				
3.0	DEMOLITION, CLEARING AND GRUBBING				
3.1	Clearing & grubbing	76324.32	sq.m	\$0.59	\$45,031.35
3.2	Strip topsoil & stockpile for re-use	45794.59	cu.m	\$3.67	\$168,127.00
3.3	Excavate clay layer	131148.95	cu.m	\$3.67	\$481,490.90
3.4	Dispose of excess topsoil and clay	164985.92	cu.m	\$1.22	\$201,905.84
	SUBTOTAL				\$896,555.08
4.0	PIPES				
4.1	Install pipe system	64.01	m	\$110.45	\$7,069.35
	SUBTOTAL				\$7,069.35
5.0	EARTHWORKS				
5.1	Level clay footing	76292.32	sq.m	\$3.60	\$274,652.34
5.2	Place and compact backfill	14636.54	cu.m	\$8.20	\$120,019.60
	SUBTOTAL				\$394,671.94
6.0	MINOR LANDSCAPING				
6.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	76292.32	sq.m	\$10.00	\$762,923.17
	SUBTOTAL				\$762,923.17
	CONSTRUCTION SUBTOTAL				\$2,370,402.48
7.0	CONTINGENCIES				
7.1	50% construction cost				\$1,185,201.24
	CONSTRUCTION TOTAL, excluding GST				\$3,555,603.72
	GST				\$355,560.37
	CONSTRUCTON TOTAL, including GST				\$3,911,164.09



Item Number	Description of works	Quantity	Unit	Rate	Cost
	CONSTRUCTION TOTAL, rounded				\$3,912,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



#### E.1.6 FM06 - Cascading detention basins alongside railway

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$28,225.78
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	7706.15	sq.m	\$0.59	\$4,546.63
2.2	Strip topsoil & stockpile for re-use	4065.81	cu.m	\$3.67	\$14,926.93
2.3	Demolish asphalt and gravel layers	2	m	\$9.00	\$18.00
2.4	Dispose of excess topsoil	2148.22	cu.m	\$1.22	\$2,628.94
	SUBTOTAL				\$22,120.50
3.0	PIPES				
3.1	Install pipe system	18.16	m	\$110.45	\$2,005.99
	SUBTOTAL				\$2,005.99
4.0	ROAD CONSTRUCTION				
4.1	Lay subbase	20	sq.m	\$129.00	\$2,580.00
4.2	Lay asphalt	20	sq.m	\$100.00	\$2,000.00
4.3	Seal road	20	sq.m	\$26.70	\$534.00
	SUBTOTAL				\$5,114.00
5.0	EARTHWORKS				
5.2	Level clay footing	7601.88	sq.m	\$3.60	\$27,366.77
5.1	Build embankment clay layer	61.02	cu.m	\$4.43	\$270.32
5.3	Place and compact backfill	7490.48	cu.m	\$8.20	\$61,421.90
	SUBTOTAL				\$89,058.98
6.0	MINOR LANDSCAPING				
6.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	7498.64	sq.m	\$10.00	\$74,986.37
	SUBTOTAL				\$74,986.37
	CONSTRUCTION SUBTOTAL				\$216,397.62
7.0	CONTINGENCIES				
7.1	50% construction cost				\$108,198.81



Item Number	Description of works	Quantity	Unit	Rate	Cost
	CONSTRUCTION TOTAL, excluding GST				\$324,596.44
	GST				\$32,459.64
	CONSTRUCTON TOTAL, including GST				\$357,056.08
	CONSTRUCTION TOTAL, rounded				\$358,000.00



#### E.1.7 FM07 - Additional culverts along Geurie Creek through the railway embankment

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Construction setout & survey	1	item		
1.3	Work as executed survey & documentation	1	item		
1.4	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$31,479.66
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	58.56	sq.m	\$4.50	\$263.52
2.2	Demolish track and gravel	25.62	m	\$18.00	\$461.16
2.3	Strip topsoil & stockpile for re-use	58.56	sq.m	\$3.67	\$214.99
2.4	Excavate clay layer	72.03	cu.m	\$3.67	\$264.44
2.5	Dispose of excess topsoil and clay	85.73184	cu.m	\$1.22	\$104.92
	SUBTOTAL				\$724.68
3.0	CULVERTS				
3.1	Installation of additional culverts	7.32	m	\$26,755.00	\$195,846.60
	SUBTOTAL				\$195,846.60
4.0	RAIL CONSTRUCTION				
4.1	Reconstruct track	25.62	m	\$496.00	\$12,707.52
	SUBTOTAL				\$12,707.52
5.0	MINOR LANDSCAPING				
5.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	58.56	sq.m	\$10.00	\$585.60
	SUBTOTAL				\$585.60
	CONSTRUCTION SUBTOTAL				\$241,344.06
6.0	CONTINGENCIES				
6.1	50% construction cost				\$120,672.03
	CONSTRUCTION TOTAL, excluding GST				\$362,016.09
	GST				\$36,201.61
	CONSTRUCTION TOTAL, including GST				\$398,217.70
	CONSTRUCTION TOTAL, rounded				\$400,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



#### E.1.8 FM08 - Additional culverts along Geurie Creek under the Mitchell Highway

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Construction setout & survey	1	item		
1.3	Work as executed survey & documentation	1	item		
1.4	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$12,737.30
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	145.92	sq.m	\$4.50	\$656.64
2.2	Demolish asphalt and gravel layers	12.16	m	\$9.00	\$109.44
2.3	Strip topsoil & stockpile for re-use	145.92	sq.m	\$3.67	\$535.72
2.4	Excavate clay layer	87.552	cu.m	\$3.67	\$321.43
2.5	Dispose of excess topsoil and clay	0.96	cu.m	\$1.22	\$1.17
	SUBTOTAL				\$1,624.41
3.0	CULVERTS				
3.1	Installation of additional culverts	4	item	\$11,130.00	\$44,520.00
	SUBTOTAL				\$44,520.00
4.0	ROAD CONSTRUCTION				
4.1	Lay subbase	145.92	sq.m	\$129.00	\$18,823.68
4.2	Lay asphalt	145.92	sq.m	\$100.00	\$14,592.00
4.3	Seal road	145.92	sq.m	\$26.70	\$3,896.06
	SUBTOTAL				\$37,311.74
5.0	MINOR LANDSCAPING				
5.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	145.92	sq.m	\$10.00	\$1,459.20
	SUBTOTAL				\$1,459.20
	CONSTRUCTION SUBTOTAL				\$97,652.65
6.0	CONTINGENCIES				
6.1	50% construction cost				\$48,826.33
	CONSTRUCTION TOTAL, excluding GST				\$146,478.98
	GST				\$14,647.90
	CONSTRUCTION TOTAL, including GST				\$161,126.88
	CONSTRUCTION TOTAL, rounded				\$162,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



#### E.1.9 FM09 - Construct swales adjacent to the roadway edges

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$48,473.17
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	19344.14	sq.m	\$0.59	\$11,413.04
2.2	Strip topsoil & stockpile for re-use	5803.24	cu.m	\$3.67	\$21,305.61
2.3	Dispose of excess topsoil	2900.00	cu.m	\$1.22	\$3,548.95
	SUBTOTAL				\$36,267.60
3.0	EARTHWORKS				
3.1	Level soil footing	19344.14	sq.m	\$3.60	\$69,638.90
3.2	Place and compact backfill	2903.24	cu.m	\$8.20	\$23,806.58
	SUBTOTAL				\$93,445.49
4.0	MINOR LANDSCAPING				
4.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	19344.14	sq.m	\$10.00	\$193,441.40
	SUBTOTAL				\$193,441.40
	CONSTRUCTION SUBTOTAL				\$371,627.66
5.0	CONTINGENCIES				
5.1	50% construction cost				\$185,813.83
	CONSTRUCTION TOTAL, excluding GST				\$557,441.50
	GST				\$55,744.15
	CONSTRUCTION TOTAL, including GST				\$613,185.65
	CONSTRUCTION TOTAL, rounded				\$620,000.00

\* General and preliminary work subtotal was calculated as 15% of the construction value (excluding contingencies).



#### E.1.10 FM10 - Earthen Levee along the Mitchell Highway

Item Number	Description of works	Quantity	Unit	Rate	Cost
1.0	GENERAL AND PRELIMINARIES				
1.1	Site establishment, security fencing, facilities & disestablishment	1	item		
1.2	Provision of sediment & erosion control	1	item		
1.3	Construction setout & survey	1	item		
1.4	Work as executed survey & documentation	1	item		
1.5	Geotechnical supervision, testing & certification	1	item		
	SUBTOTAL				\$42,334.00
2.0	DEMOLITION, CLEARING AND GRUBBING				
2.1	Clearing & grubbing	3338.43	sq.m	\$0.59	\$1,969.67
2.2	Strip topsoil & stockpile for re-use	143.04	cu.m	\$3.67	\$525.13
2.3	Demolish asphalt and gravel layers	25	m	\$9.00	\$225.00
	SUBTOTAL				\$2,719.80
3.0	CULVERTS				
3.1	Installation of additional culverts	338.545	m	\$110.45	\$37,392.30
	SUBTOTAL				\$37,392.30
4.0	Creek Widening				
4.1	Clearing & grubbing	14356.035	m	\$0.59	\$8,470.06
4.2	Excavate clay layer	20431.557	cu.m	\$1.22	\$25,003.65
	SUBTOTAL				\$33,473.71
5.0	ROAD CONSTRUCTION				
5.1	Lay subbase	16.25	sq.m	\$129.00	\$2,096.25
5.2	Lay asphalt	16.25	sq.m	\$100.00	\$1,625.00
5.3	Seal road	16.25	sq.m	\$26.70	\$433.88
	SUBTOTAL				\$4,155.13
6.0	EARTHWORKS				
6.1	Level soil footing	3322.18	sq.m	\$3.60	\$11,959.85
6.2	Build embankment clay layer	20431.56	cu.m	\$4.43	\$90,511.80
6.3	Place and compact backfill	11.05	cu.m	\$8.20	\$90.58
	SUBTOTAL				\$102,562.22
7.0	MINOR LANDSCAPING				
7.1	Repair disturbed areas in accordance with landscape architects requirements (nominal allowance)	17694.46	sq.m	\$10.00	\$176,944.64
	SUBTOTAL				\$176,944.64



Item Number	Description of works	Quantity	Unit	Rate	Cost
	CONSTRUCTION SUBTOTAL				\$324,560.67
8.0	CONTINGENCIES				
8.1	50% construction cost				\$162,280.33
	CONSTRUCTION TOTAL, excluding GST				\$486,841.00
	GST				\$48,684.10
	CONSTRUCTON TOTAL, including GST				\$535,525.10
	CONSTRUCTION TOTAL, rounded				\$536,000.00