

**BLACKWATTLE BAY CATCHMENT – FLOOD STUDY MODEL UPDATE ARR2019 HYDROLOGY**

**VOLUME 2 – APPENDIX B/C/D**

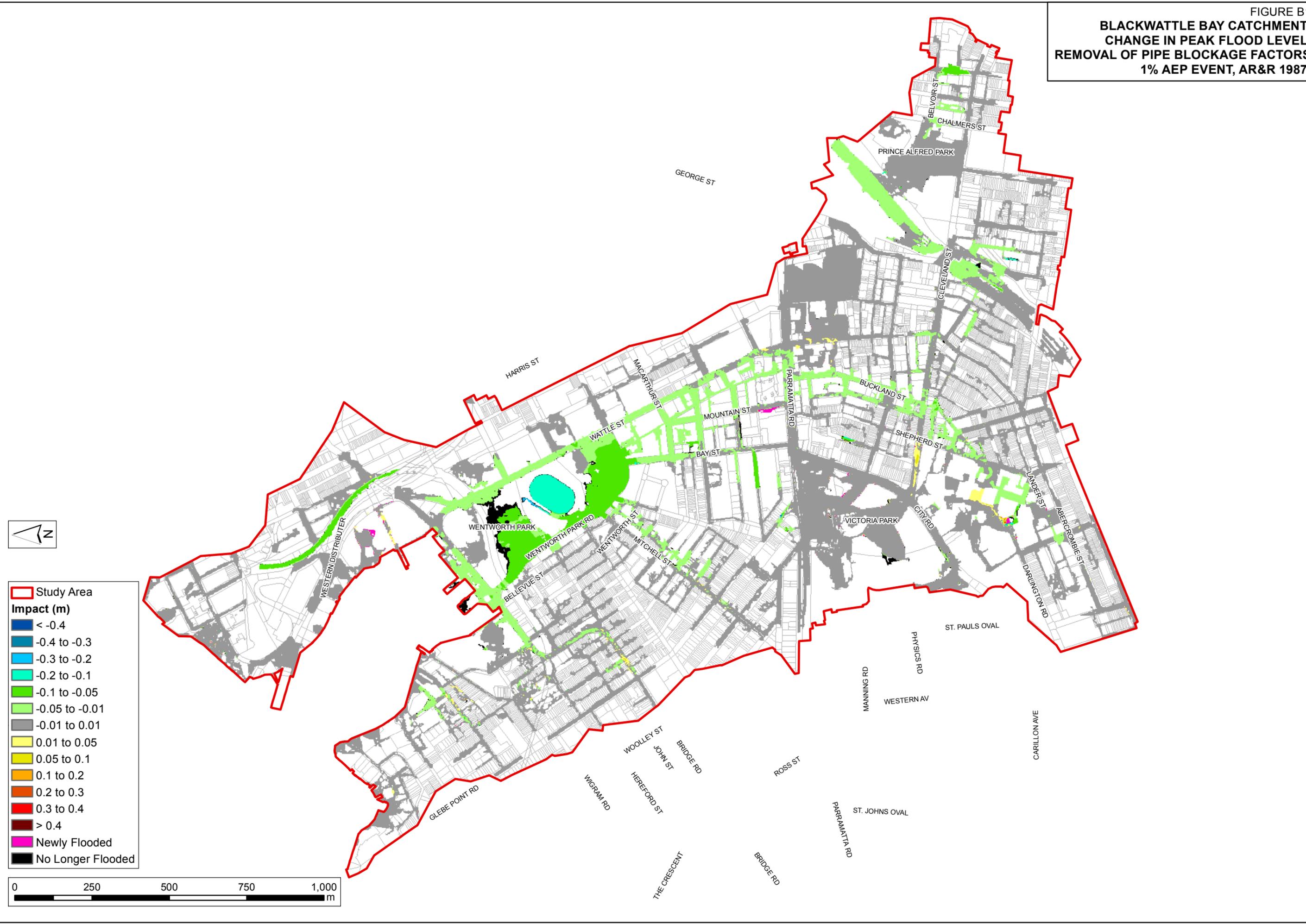
FINAL REPORT

## APPENDIX B. Changes in Peak Flood Level from Model Updates



FIGURE B1  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**REMOVAL OF PIPE BLOCKAGE FACTORS**  
**1% AEP EVENT, AR&R 1987**

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- Study Area
- Impact (m)**
- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded

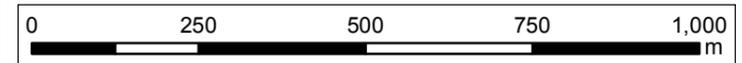
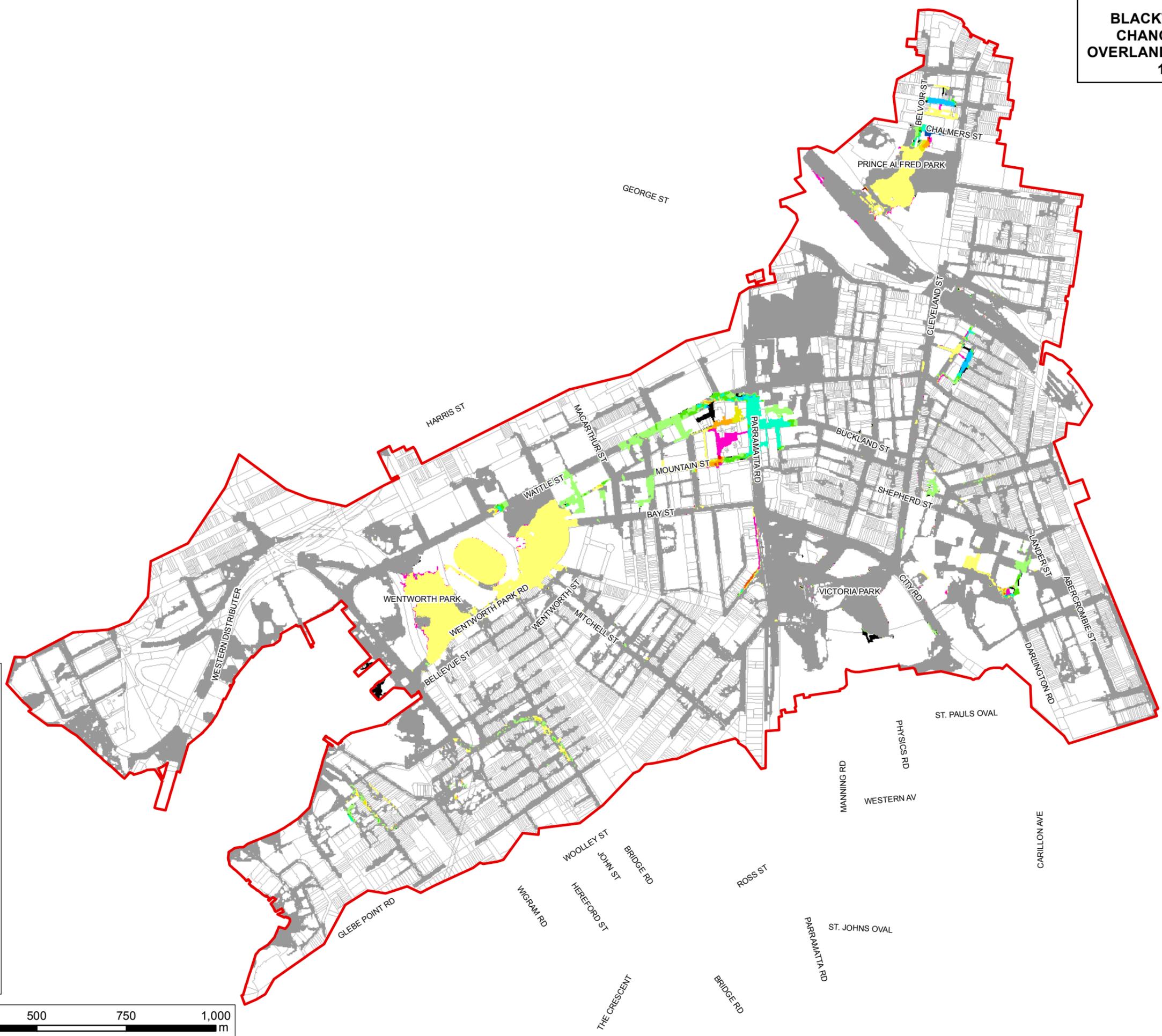


FIGURE B2  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**LIDAR 2013 DEM UPDATE**  
**1% AEP EVENT, AR&R 1987**



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FIGURE B3  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**OVERLAND FLOWPATH REFINEMENT**  
**1% AEP EVENT, AR&R 1987**



**Study Area**

**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded

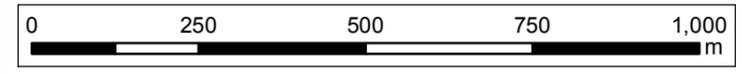
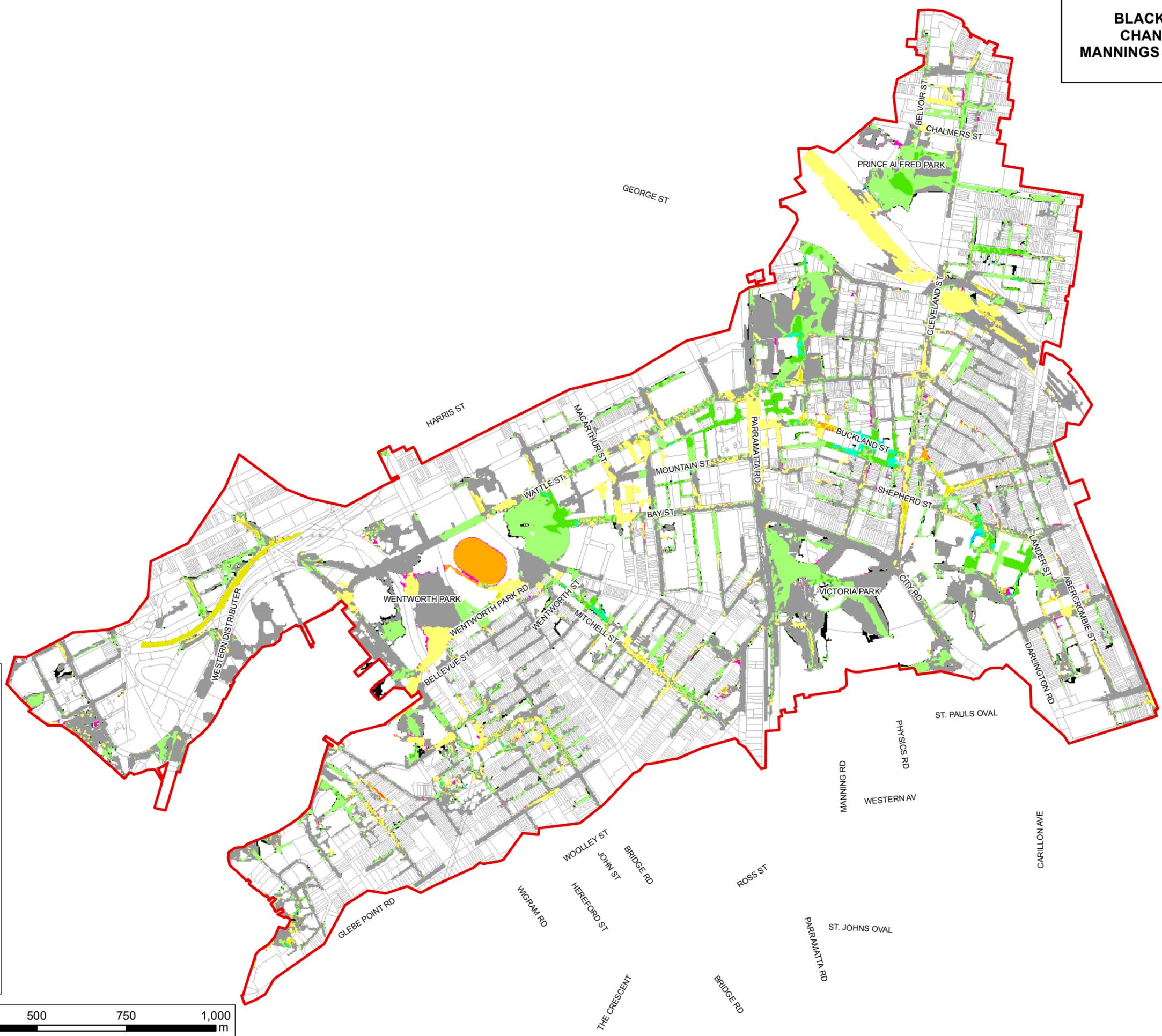
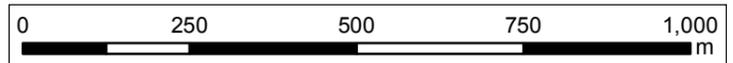


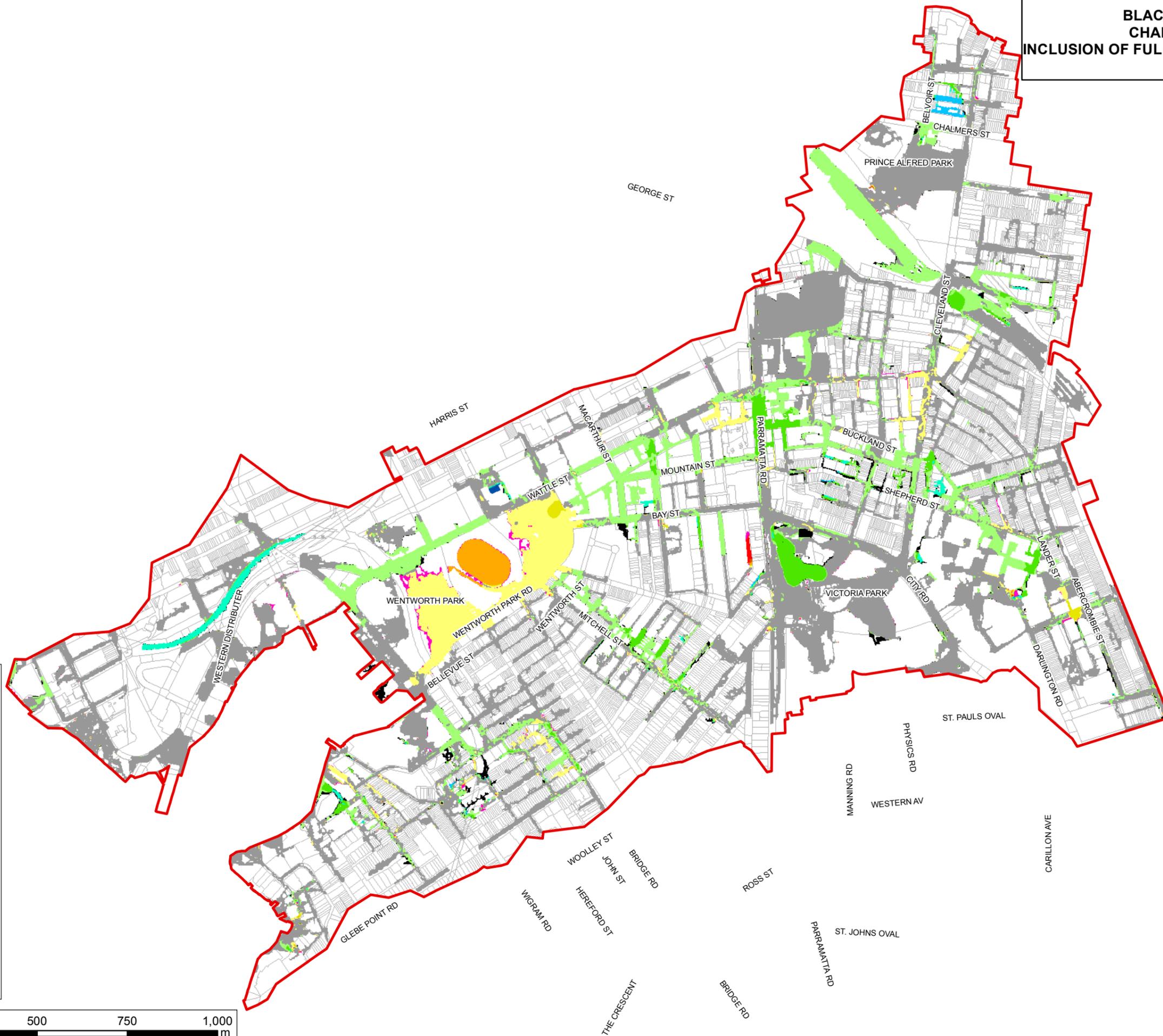
FIGURE B4  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**MANNINGS ROUGHNESS REFINEMENT**  
**1% AEP EVENT, AR&R 1987**



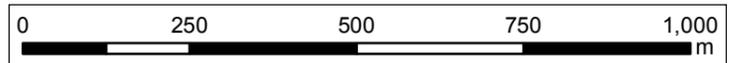
- Study Area
- Impact (m)**
- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



**BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
INCLUSION OF FULL STORMWATER DATABASE  
1% AEP EVENT, AR&R 1987**



- Study Area
- Impact (m)**
- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



**BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
REVISED GUTTER SCHEMATISATION  
1% AEP EVENT, AR&R 1987**

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**Study Area**

**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded

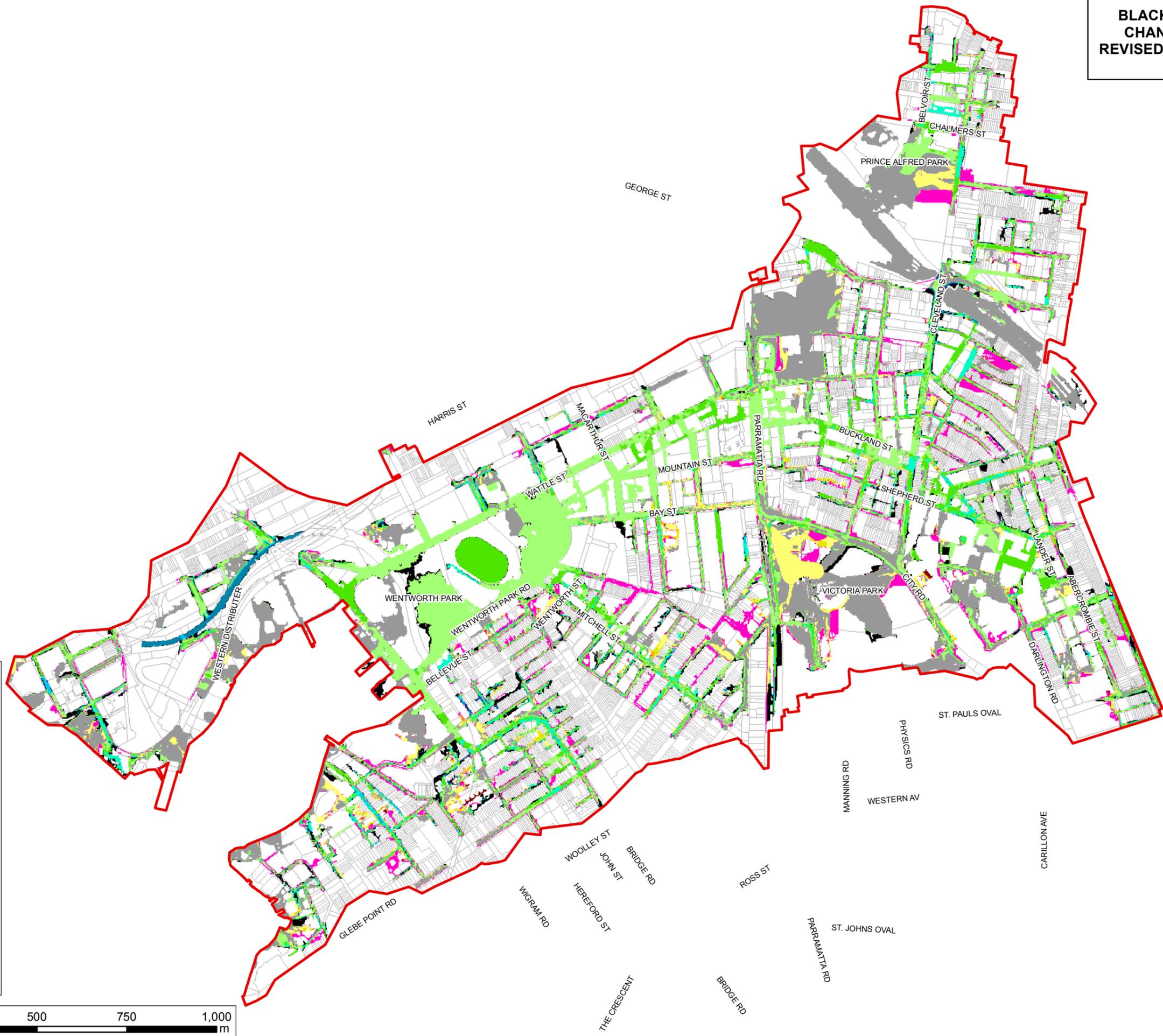


FIGURE B7  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**CHANGE OF TUFLOW VERSION**  
**1% AEP EVENT, AR&R 1987**



**Study Area**

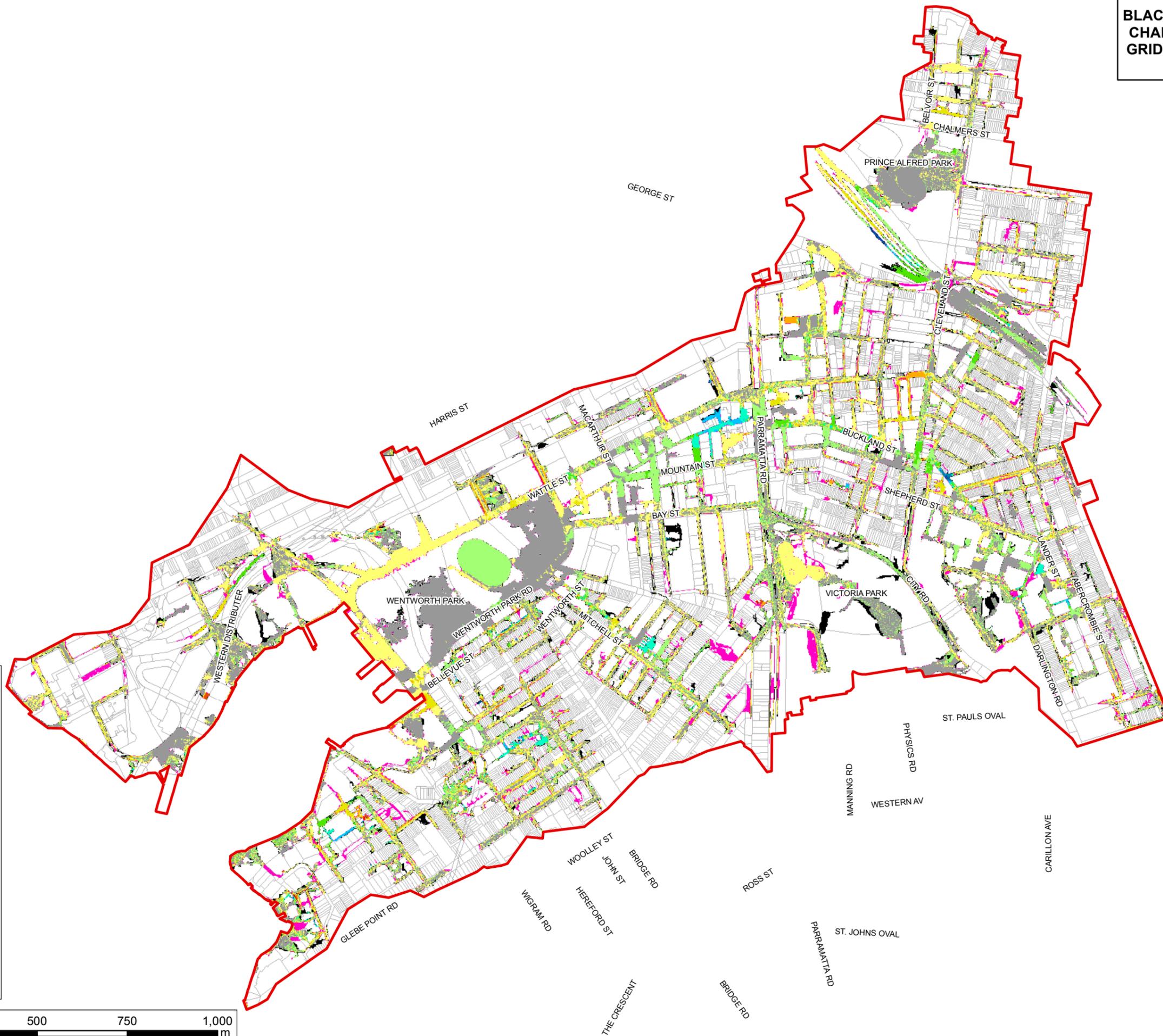
**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



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**BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
GRID RESOLUTION REFINEMENT  
1% AEP EVENT, AR&R 1987**

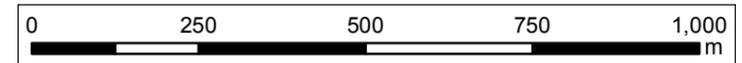


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**Study Area**

**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



**BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
COMBINED EFFECT OF UPDATES  
1% AEP EVENT, AR&R 1987**

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**Study Area**

**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded

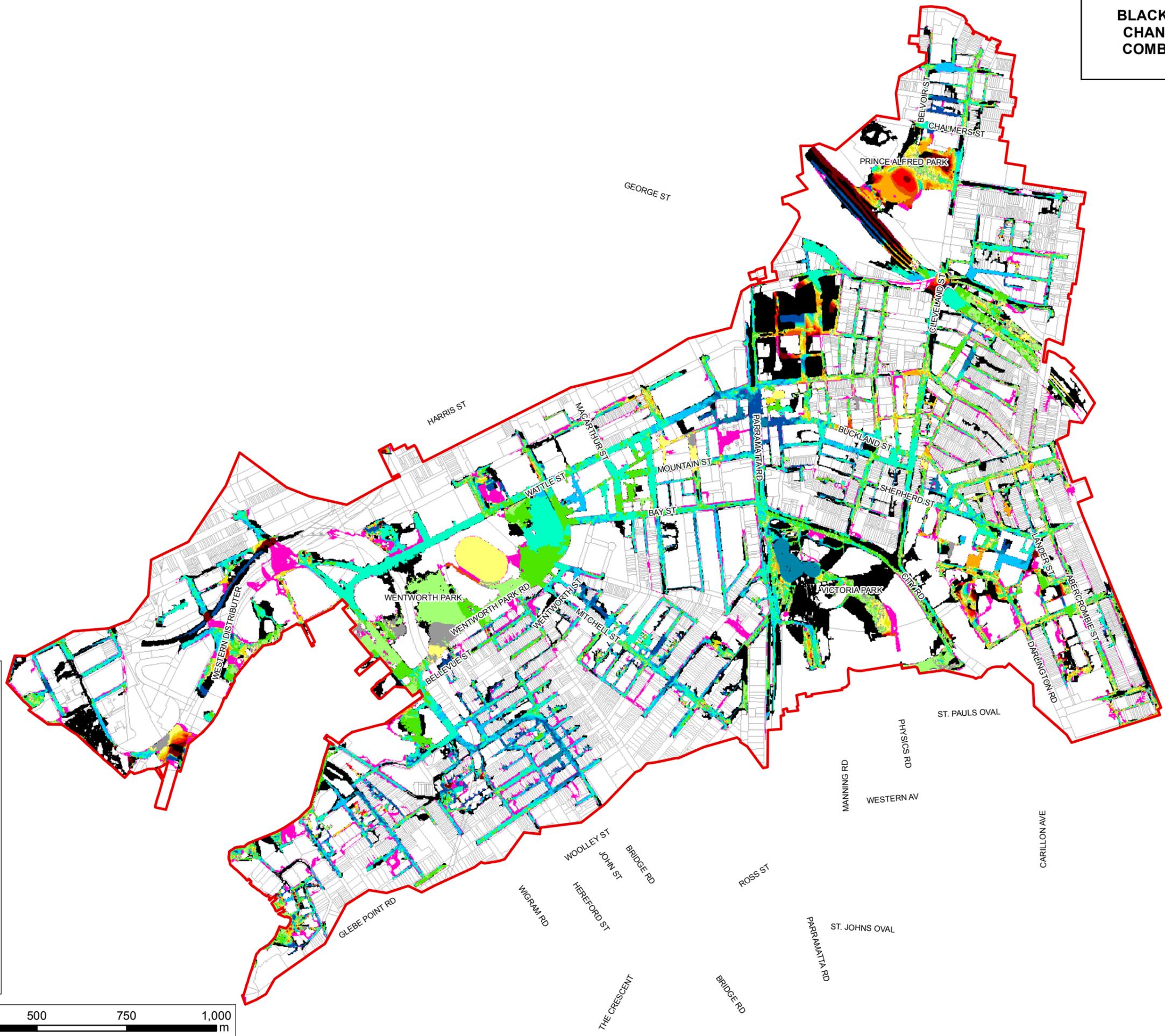
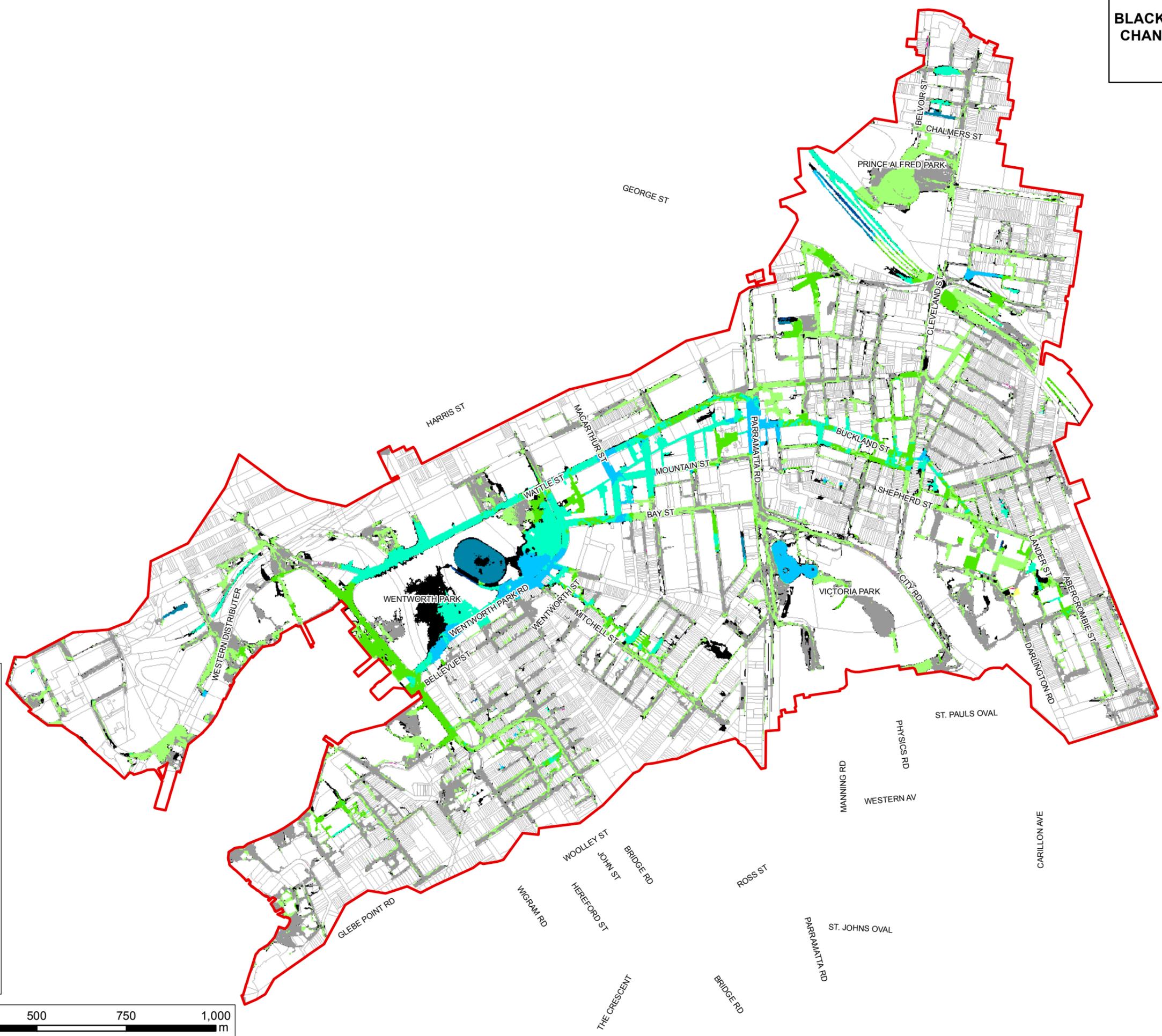


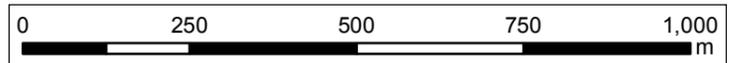
FIGURE B10  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**2019 AR&R vs 1987 AR&R**  
**1% AEP EVENT**



**Study Area**

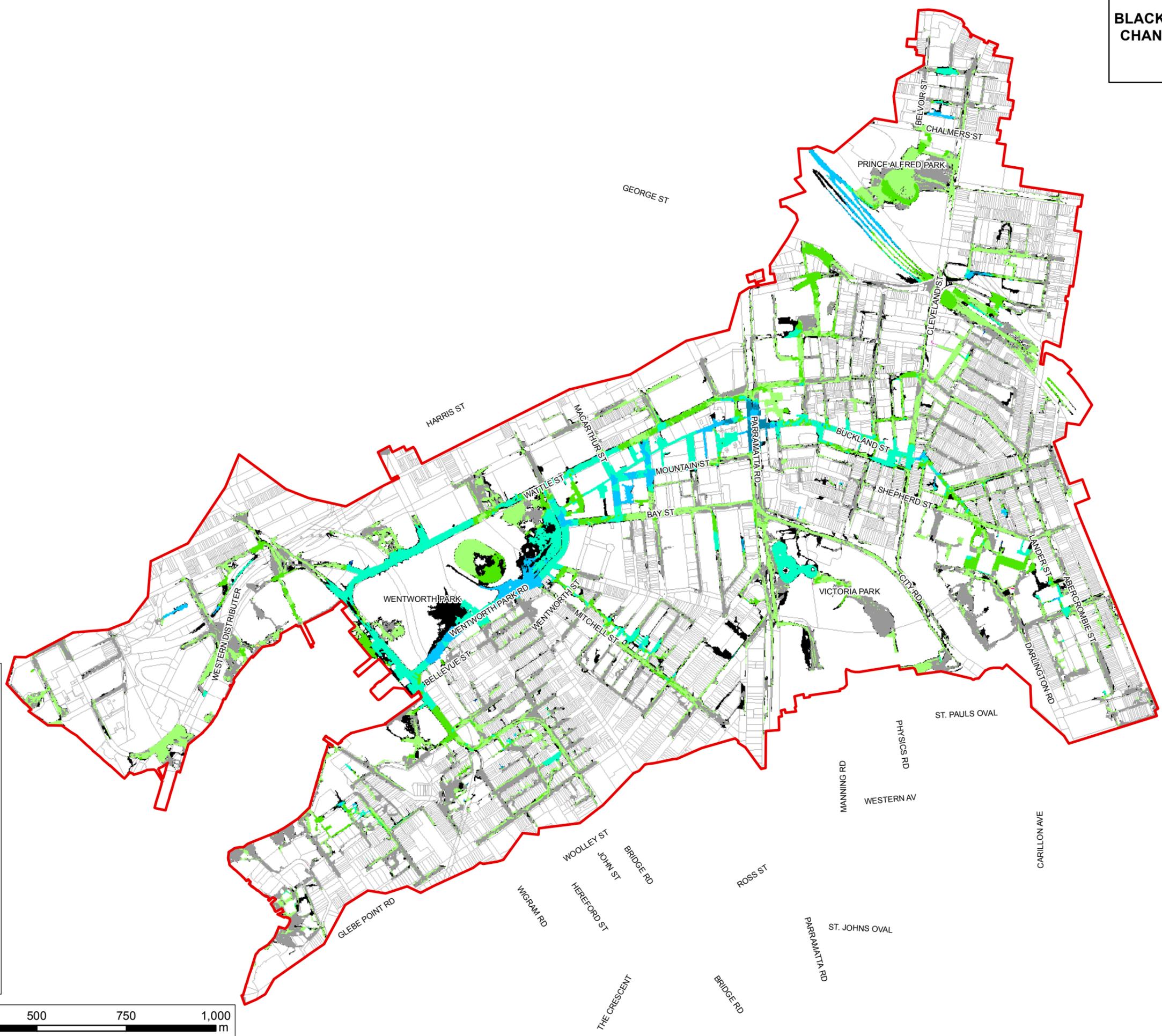
**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



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FIGURE B11  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**2019 AR&R vs 1987 AR&R**  
**5% AEP EVENT**



**Study Area**

**Impact (m)**

- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded

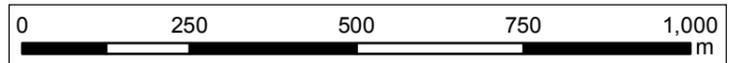
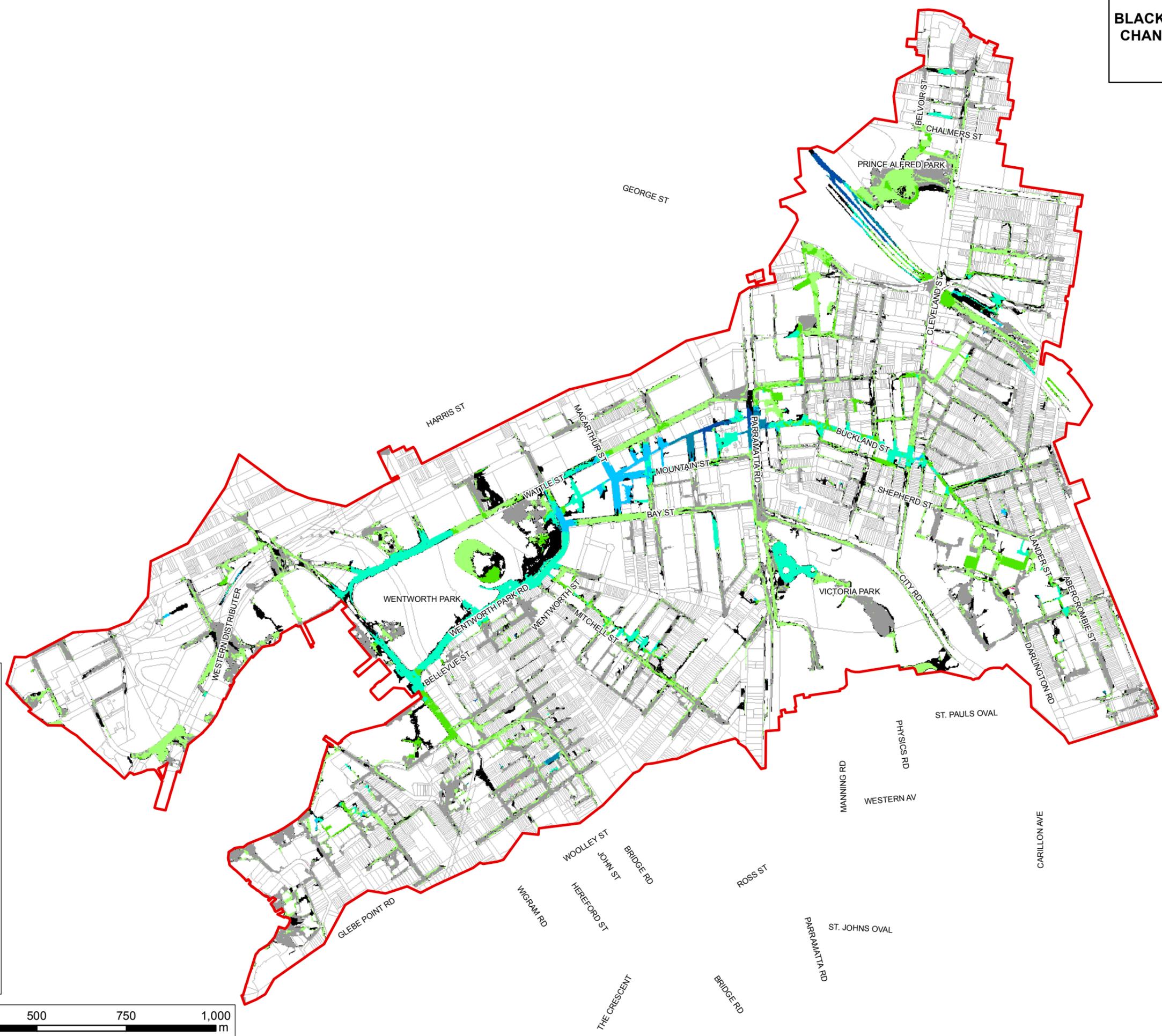
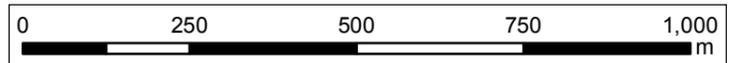


FIGURE B12  
**BLACKWATTLE BAY CATCHMENT**  
**CHANGE IN PEAK FLOOD LEVEL**  
**2019 AR&R vs 1987 AR&R**  
**20% AEP EVENT**



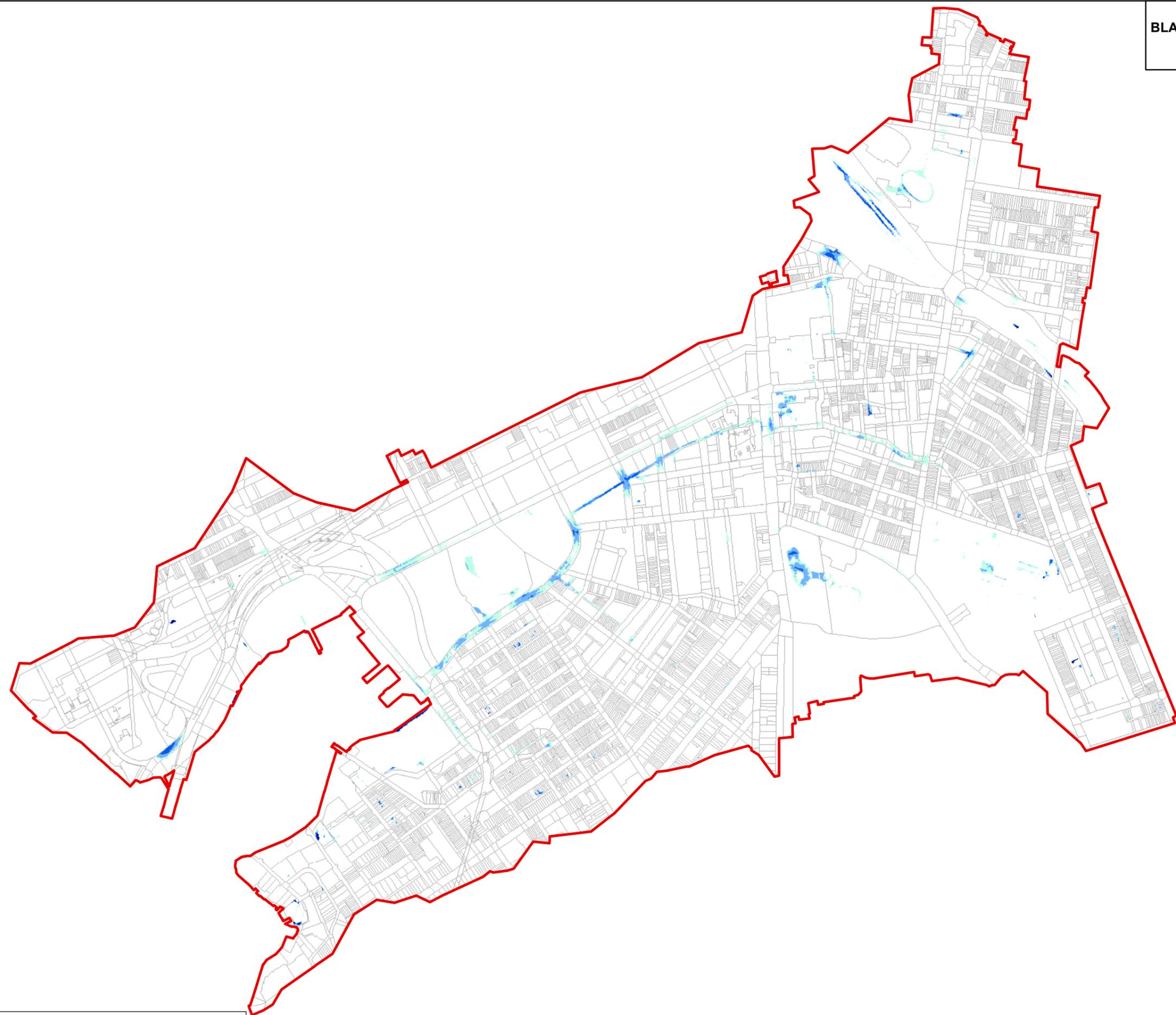
- Study Area
- Impact (m)**
- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



## APPENDIX C. Design Flood Mapping



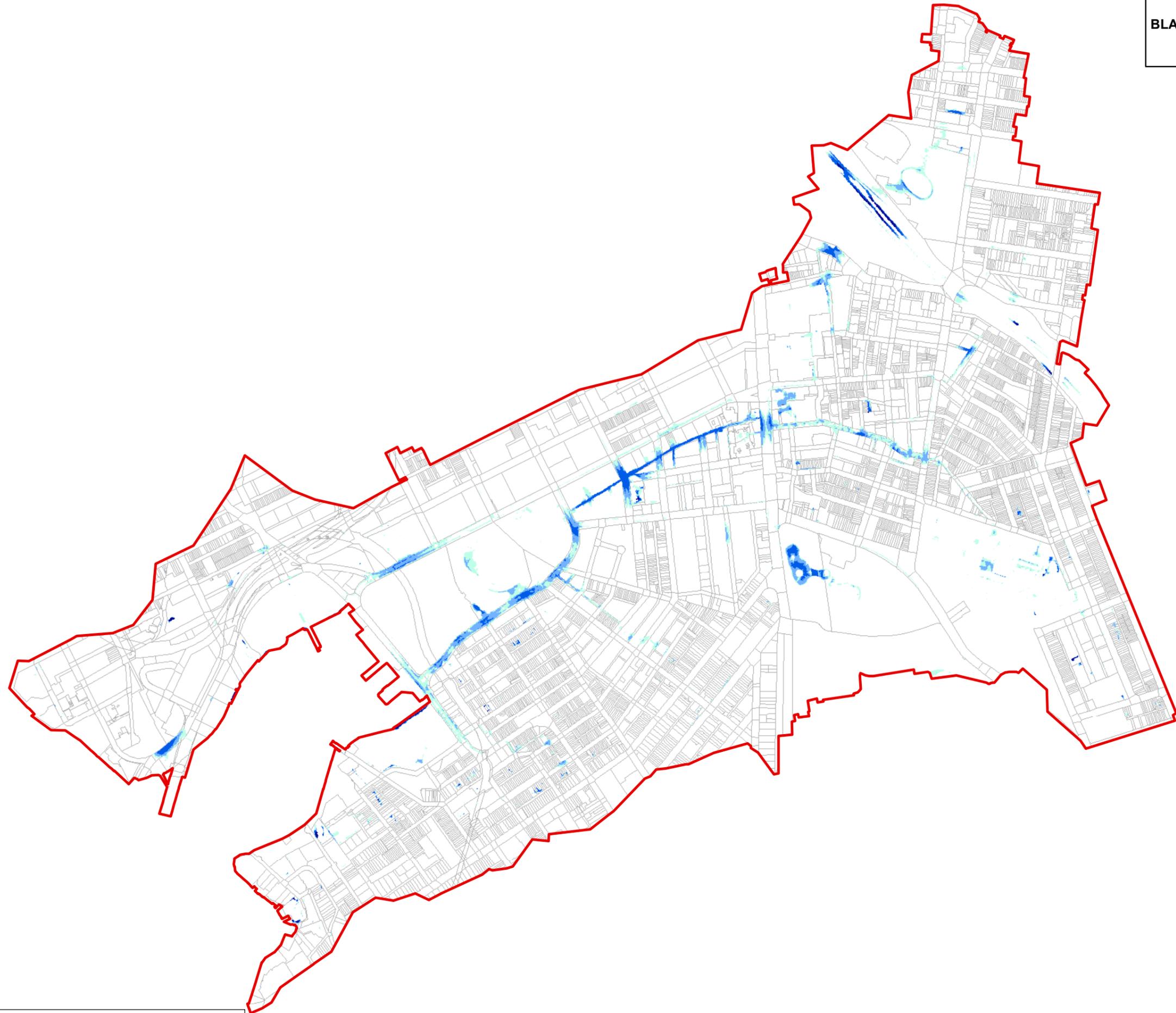
FIGURE C1  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
50% AEP EVENT



- Study Area
- Depth (m)
- 0 to 0.15
- 0.15 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0



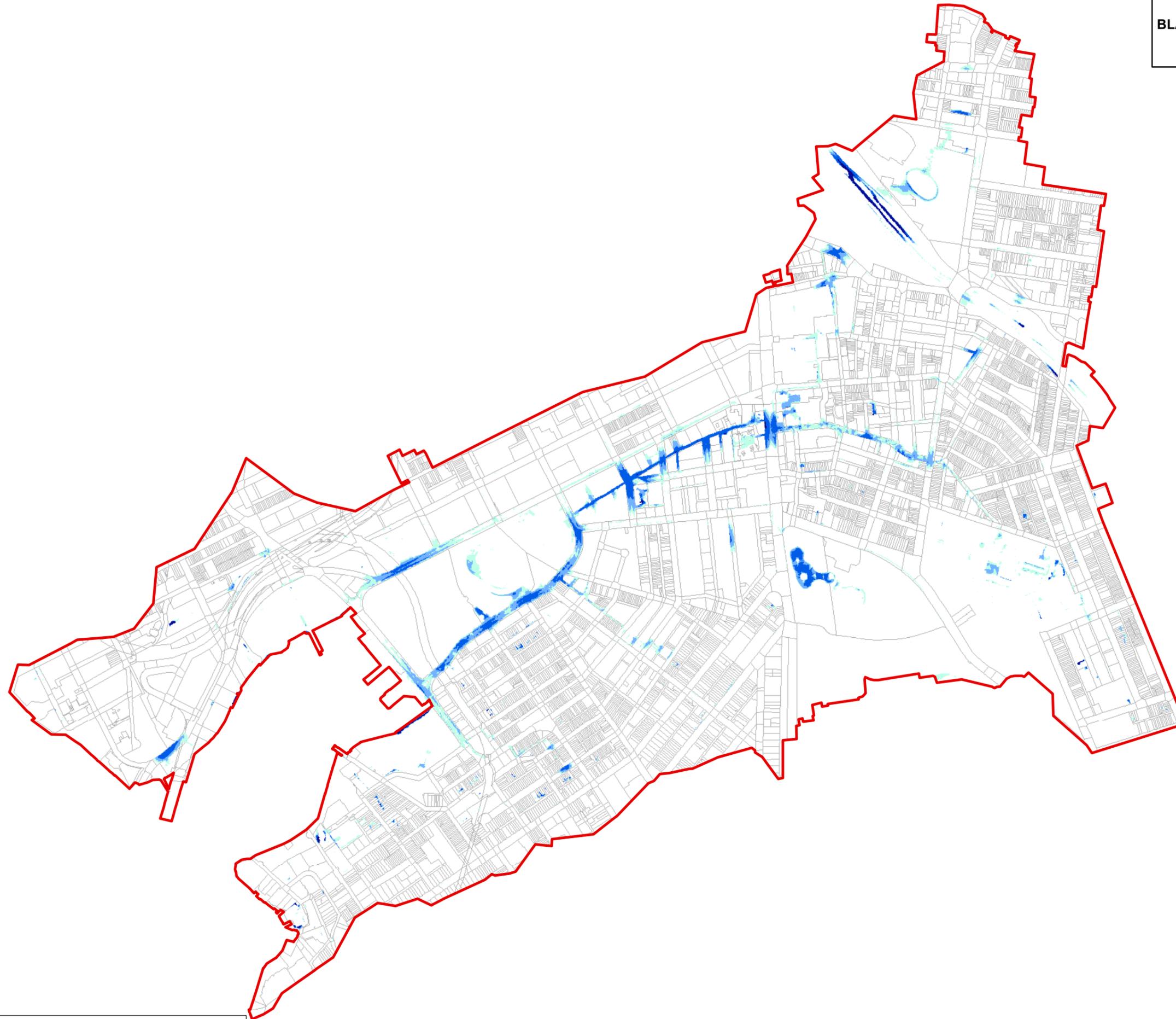
FIGURE C2  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
20% AEP EVENT



- Study Area
- Depth (m)
- 0 to 0.15
- 0.15 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0



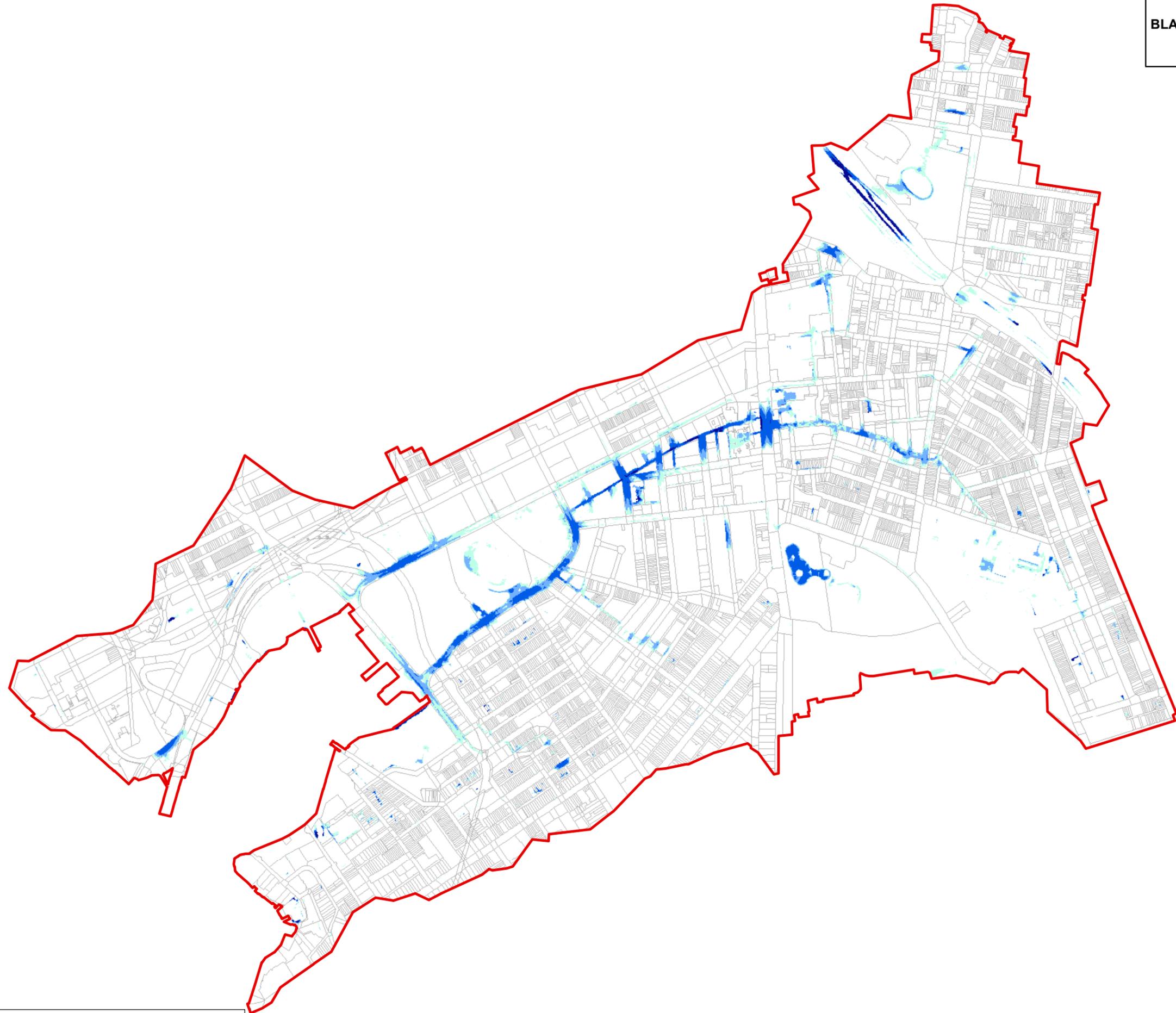
FIGURE C3  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
10% AEP EVENT



- Study Area
- Depth (m)
- 0 to 0.15
- 0.15 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0



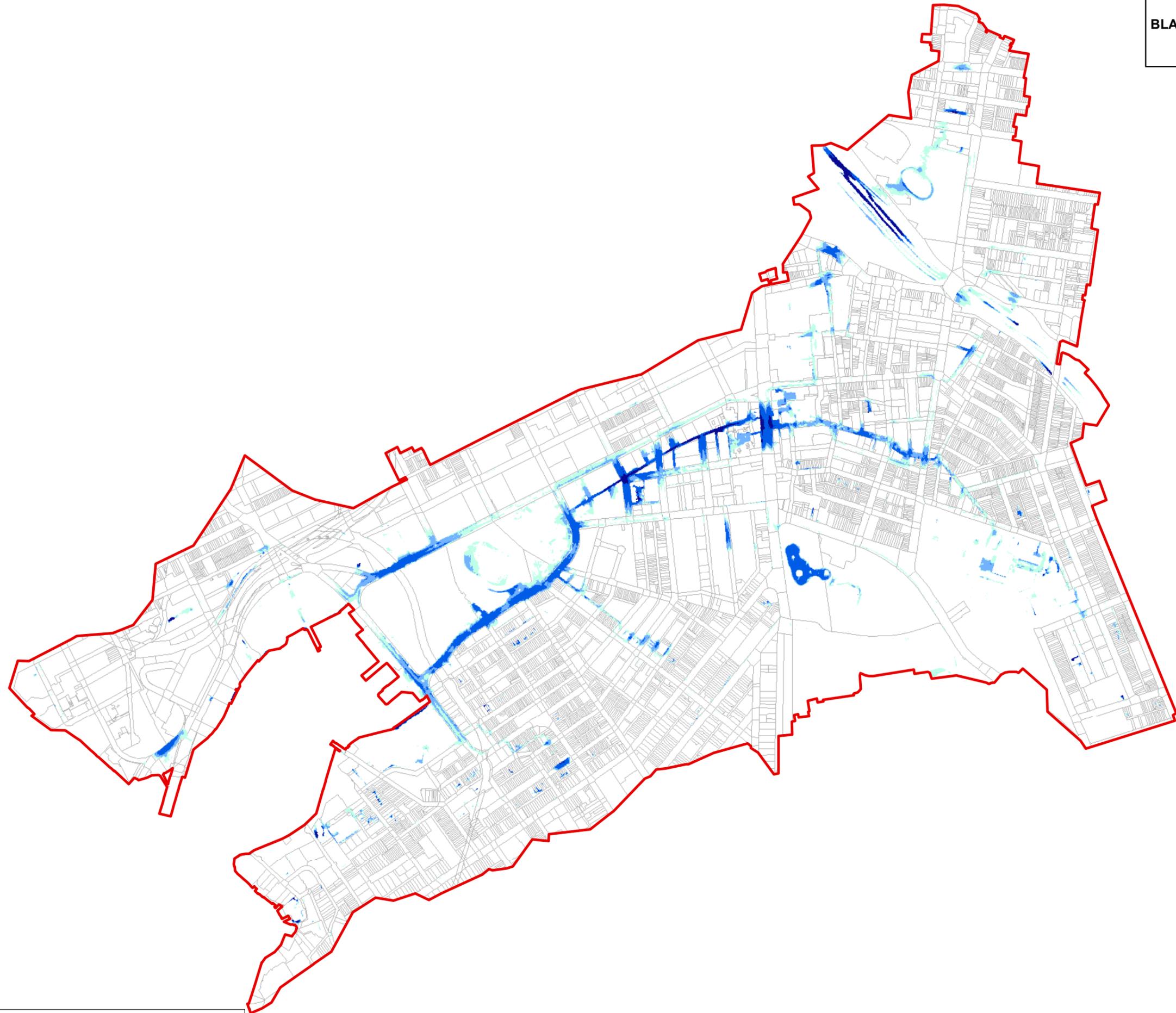
FIGURE C4  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
5% AEP EVENT



- Study Area
- Depth (m)
  - 0 to 0.15
  - 0.15 to 0.3
  - 0.3 to 0.5
  - 0.5 to 1.0
  - > 1.0



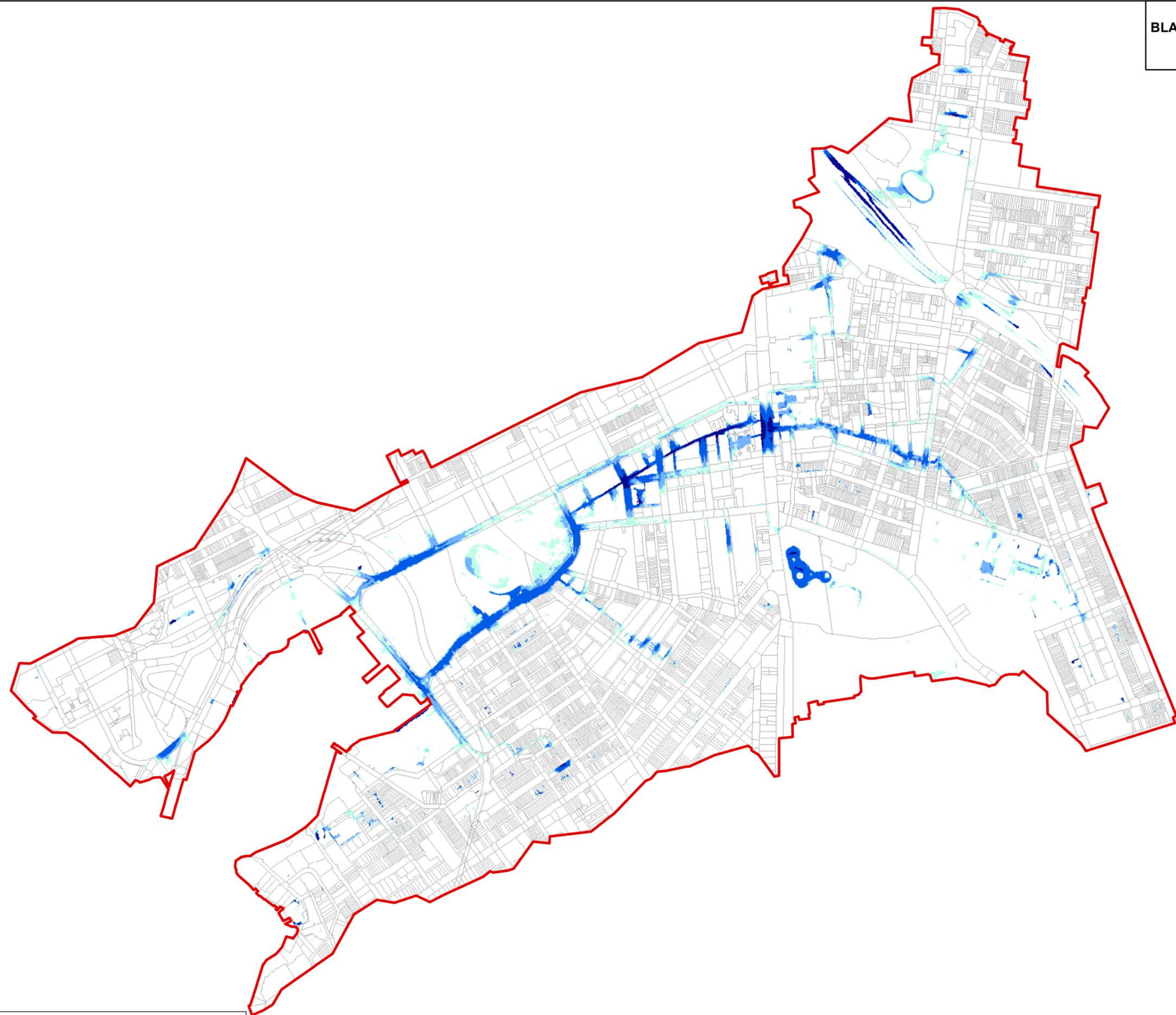
FIGURE C5  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
2% AEP EVENT



- Study Area
- Depth (m)
  - 0 to 0.15
  - 0.15 to 0.3
  - 0.3 to 0.5
  - 0.5 to 1.0
  - > 1.0



FIGURE C6  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
1% AEP EVENT



- Study Area
- Depth (m)
  - 0 to 0.15
  - 0.15 to 0.3
  - 0.3 to 0.5
  - 0.5 to 1.0
  - > 1.0

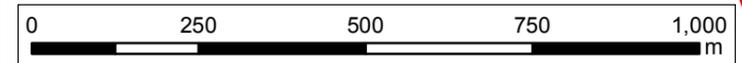
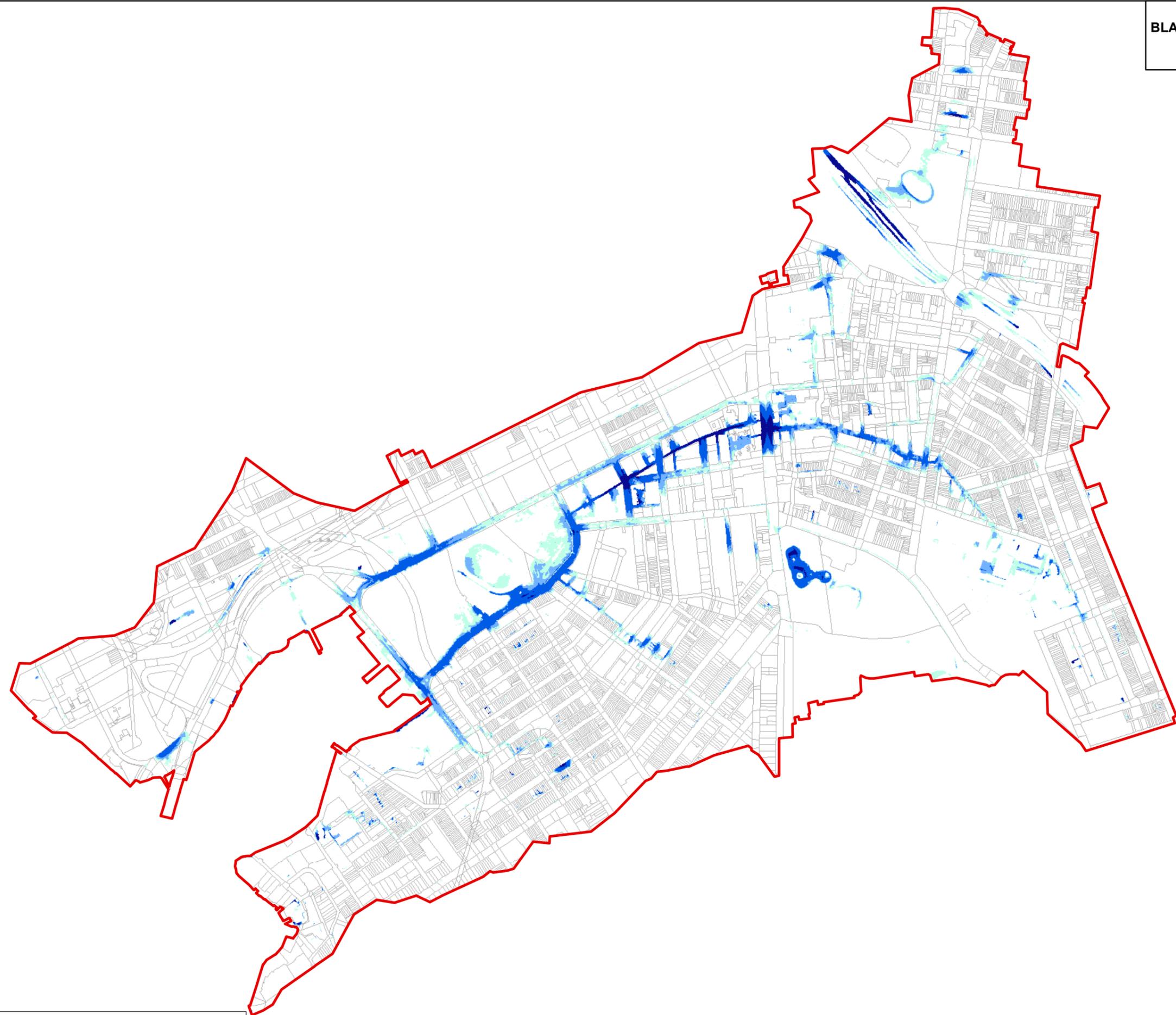


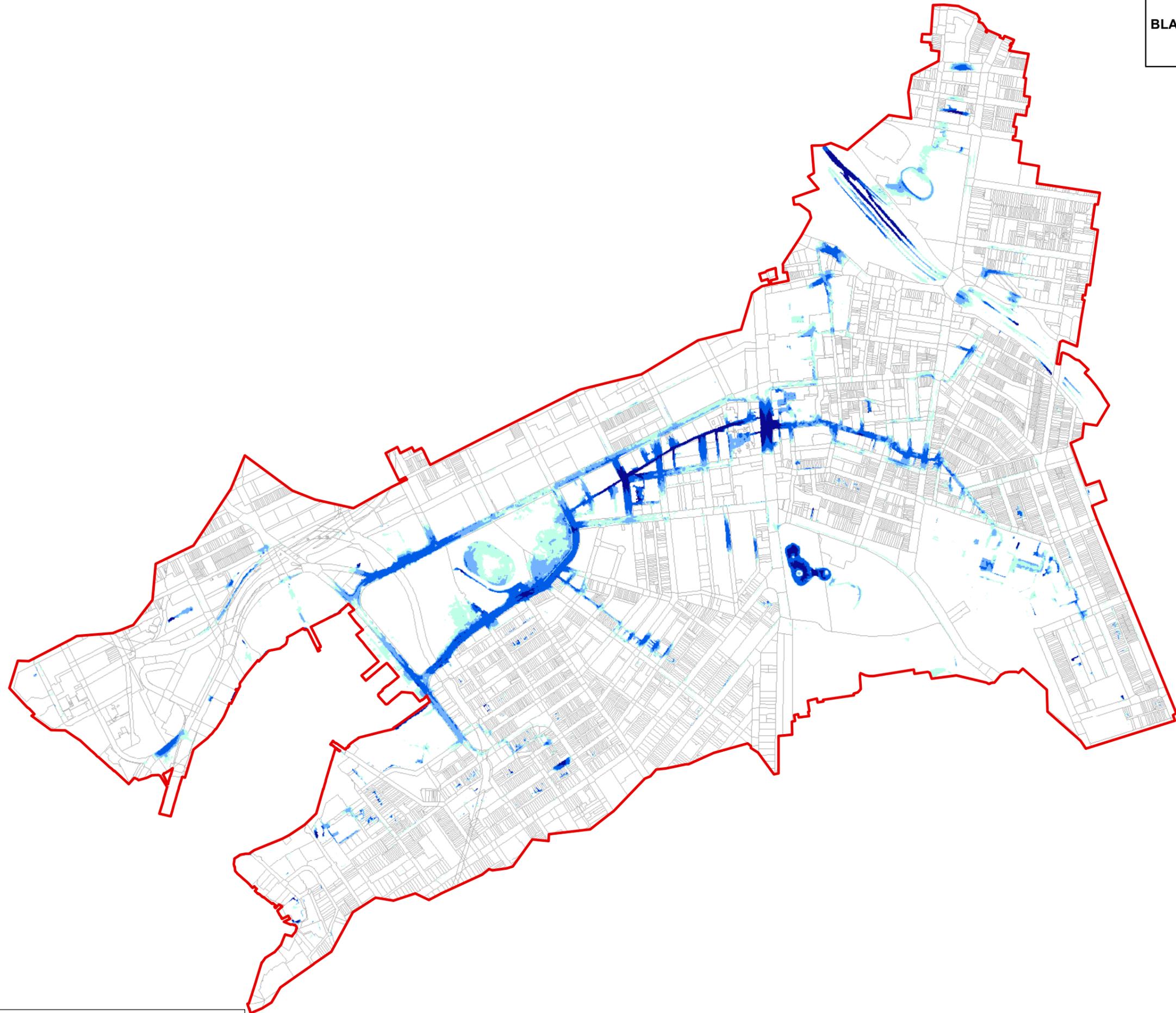
FIGURE C7  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
0.5% AEP EVENT



- Study Area
- Depth (m)
- 0 to 0.15
- 0.15 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0



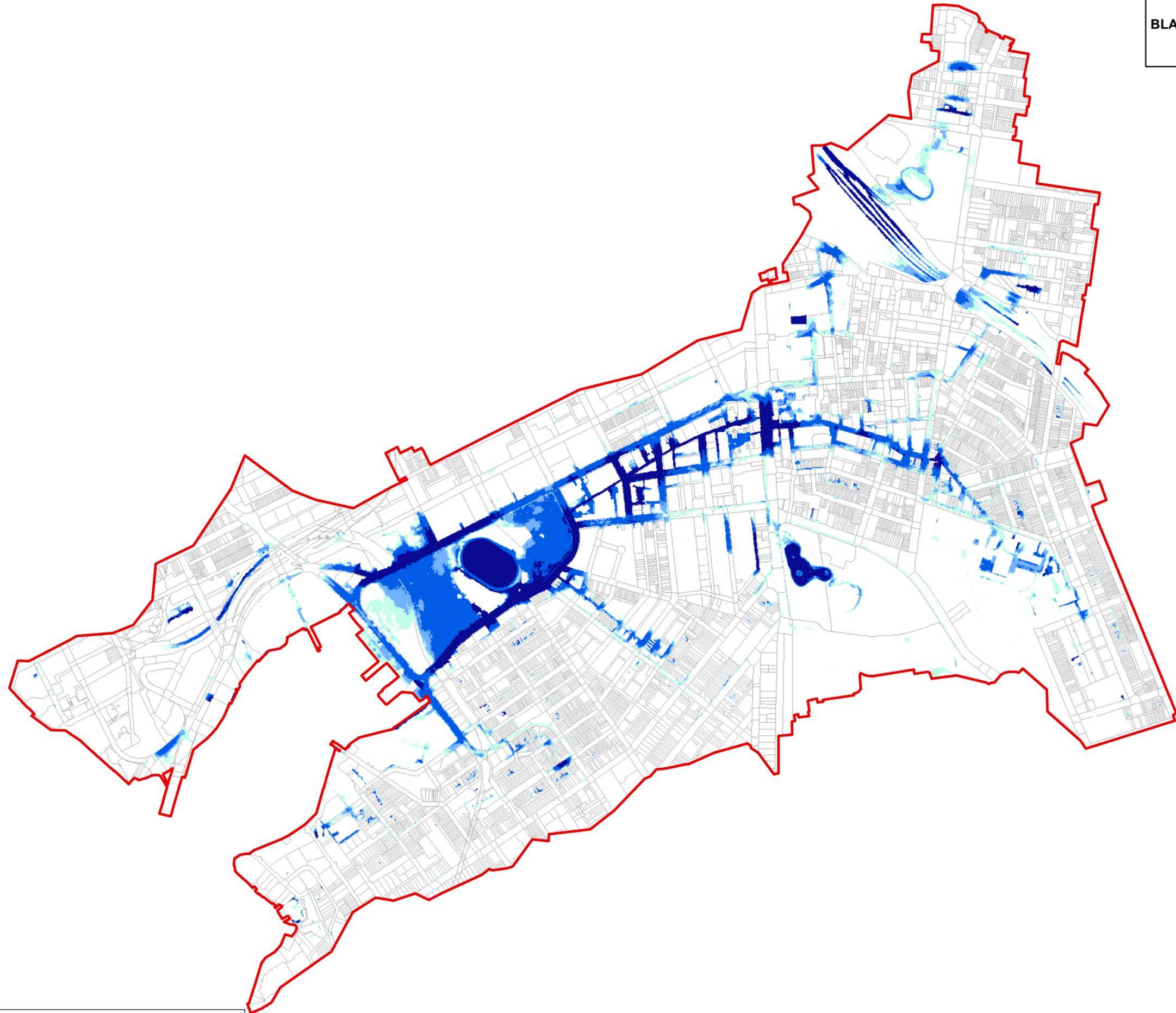
FIGURE C8  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
0.2% AEP EVENT



- Study Area
- Depth (m)
  - 0 to 0.15
  - 0.15 to 0.3
  - 0.3 to 0.5
  - 0.5 to 1.0
  - > 1.0



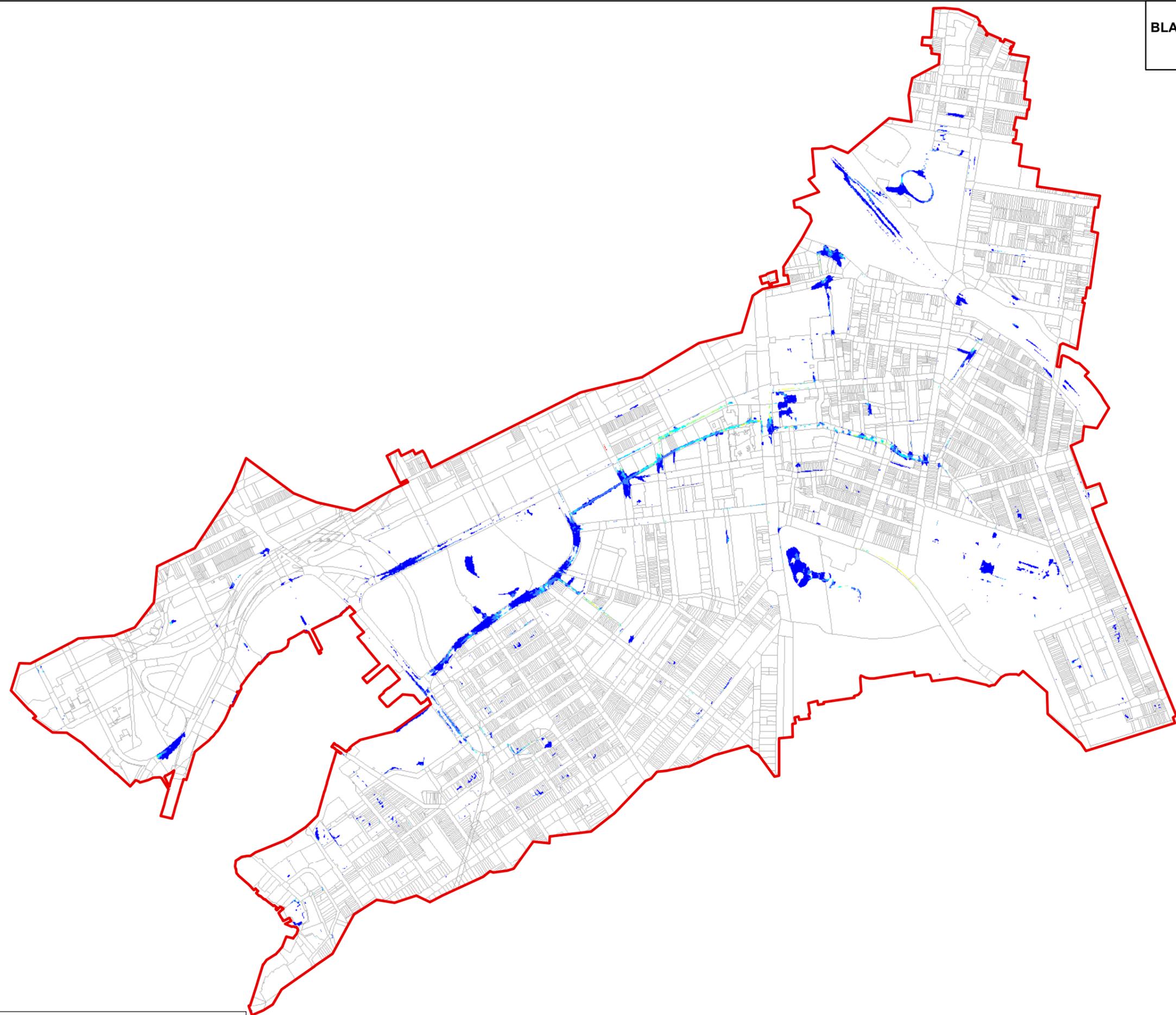
FIGURE C9  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD DEPTH  
PMF EVENT



- Study Area
- Depth (m)**
- 0 to 0.15
- 0.15 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0



FIGURE C10  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
50% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

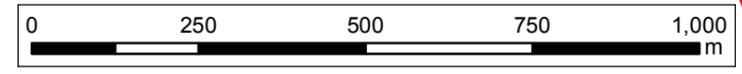
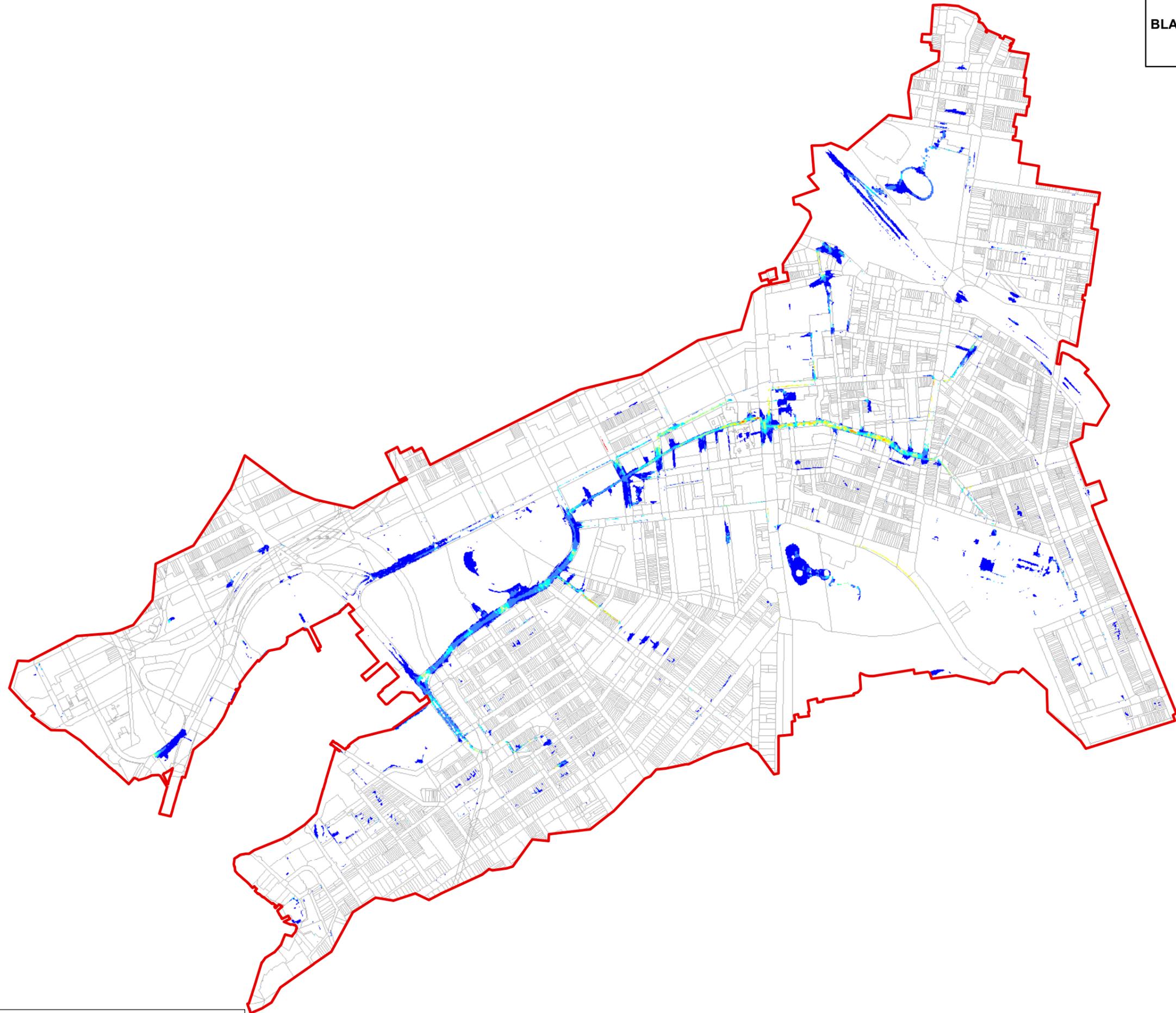


FIGURE C11  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
20% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

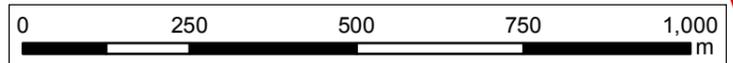
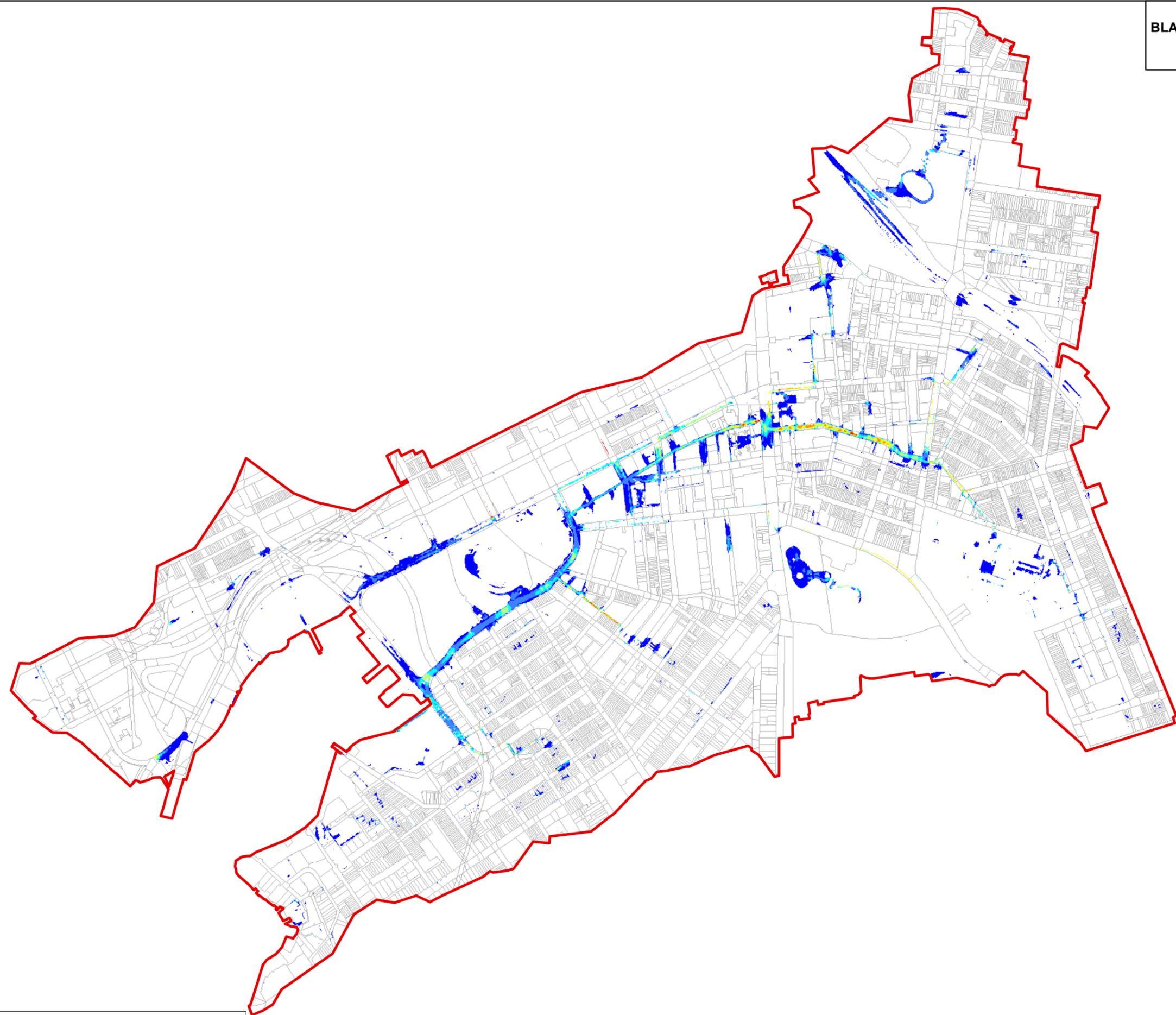


FIGURE C12  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
10% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

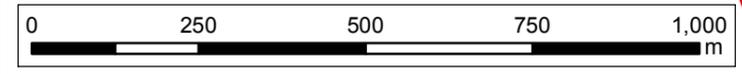
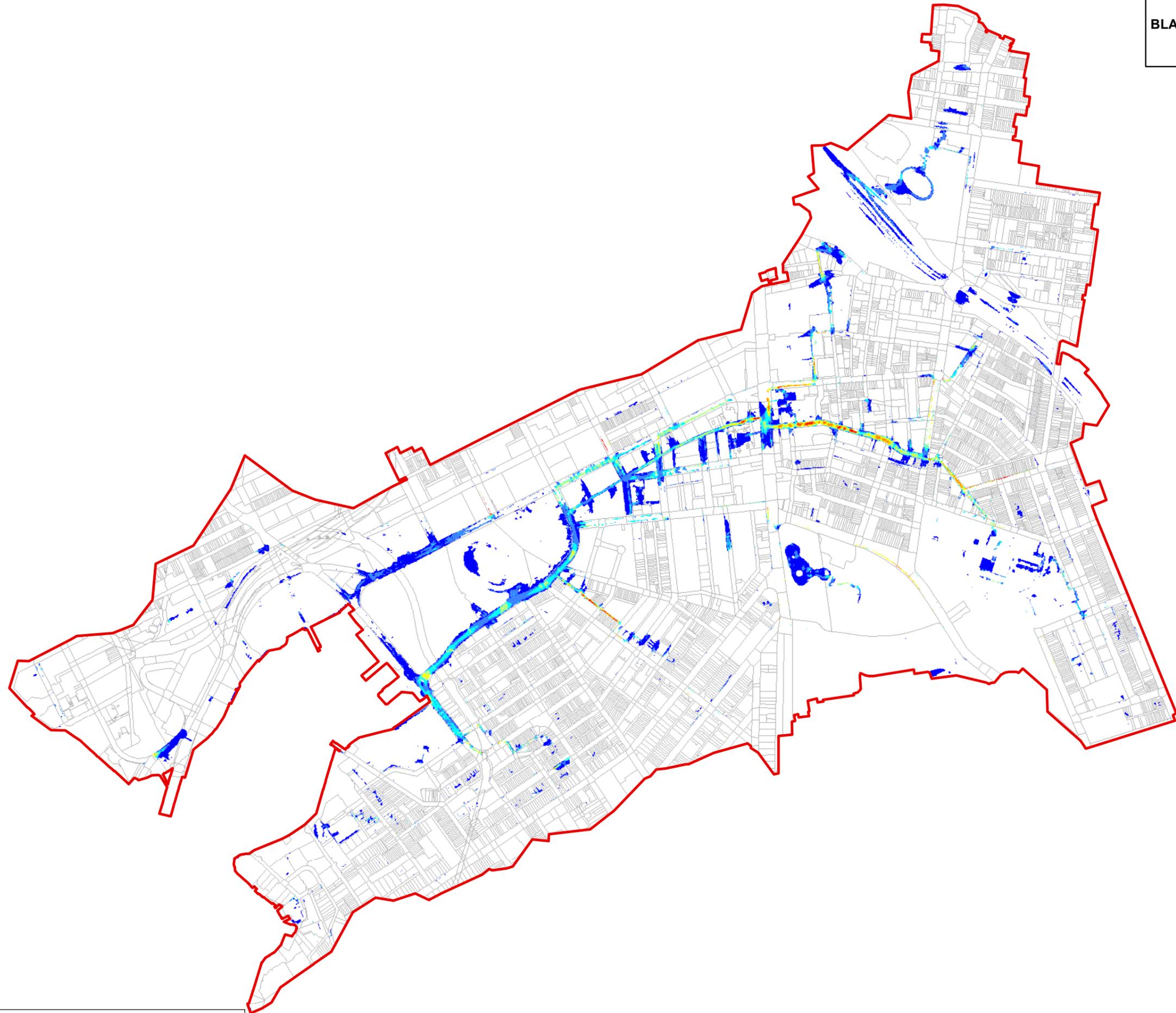


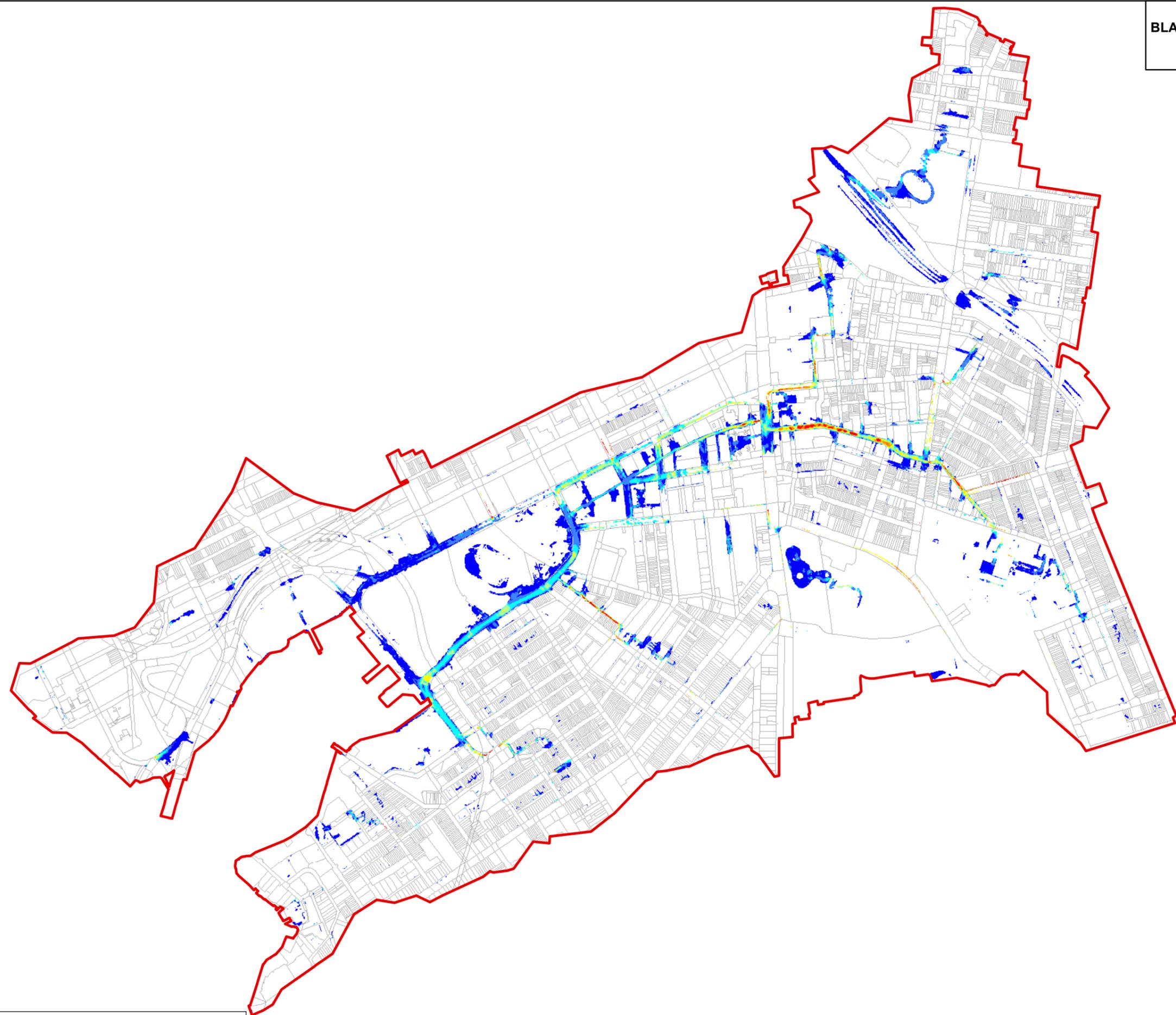
FIGURE C13  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
5% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



FIGURE C14  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
2% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

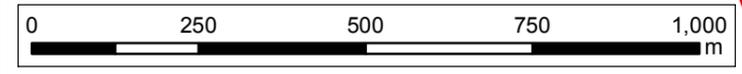
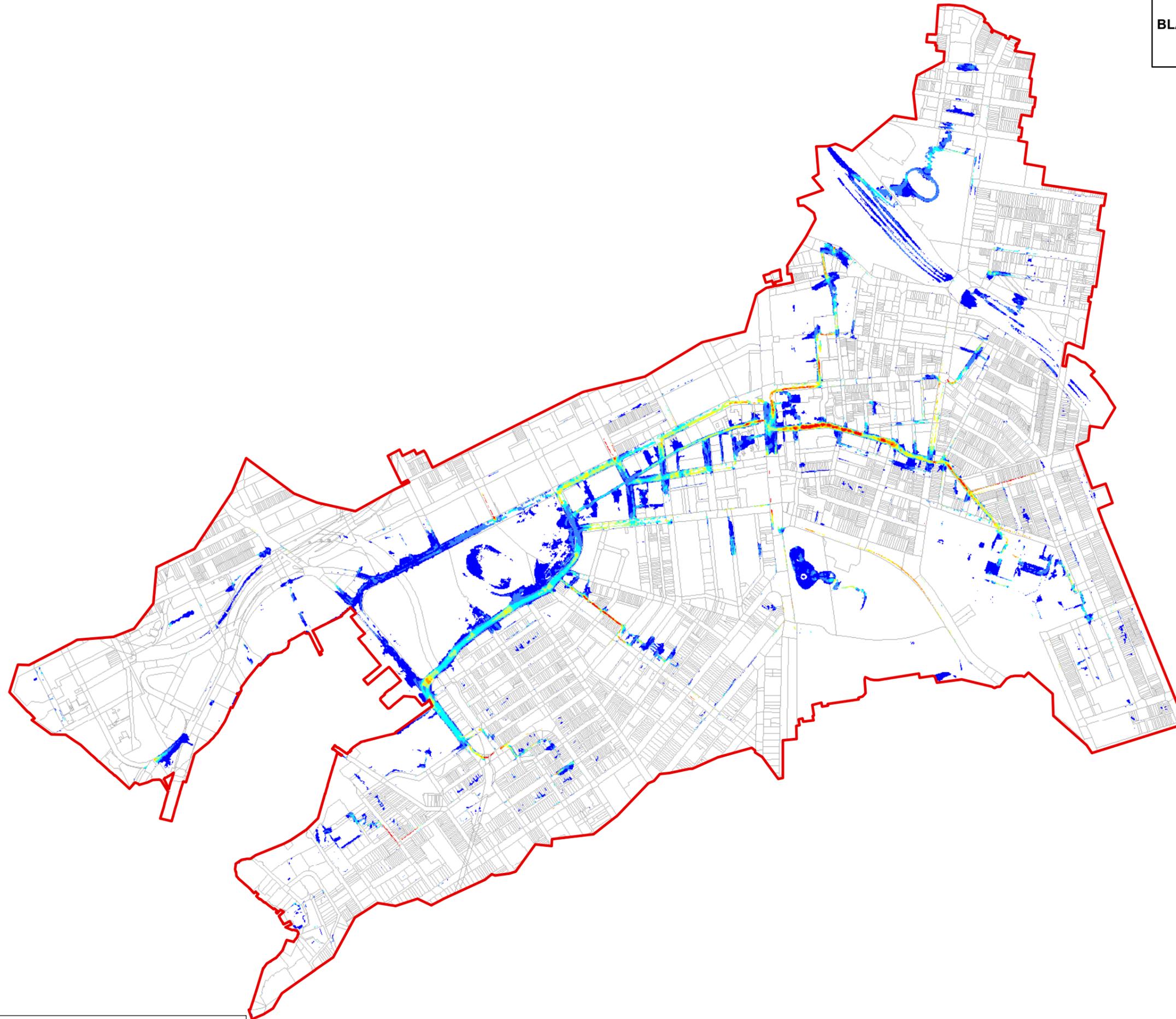


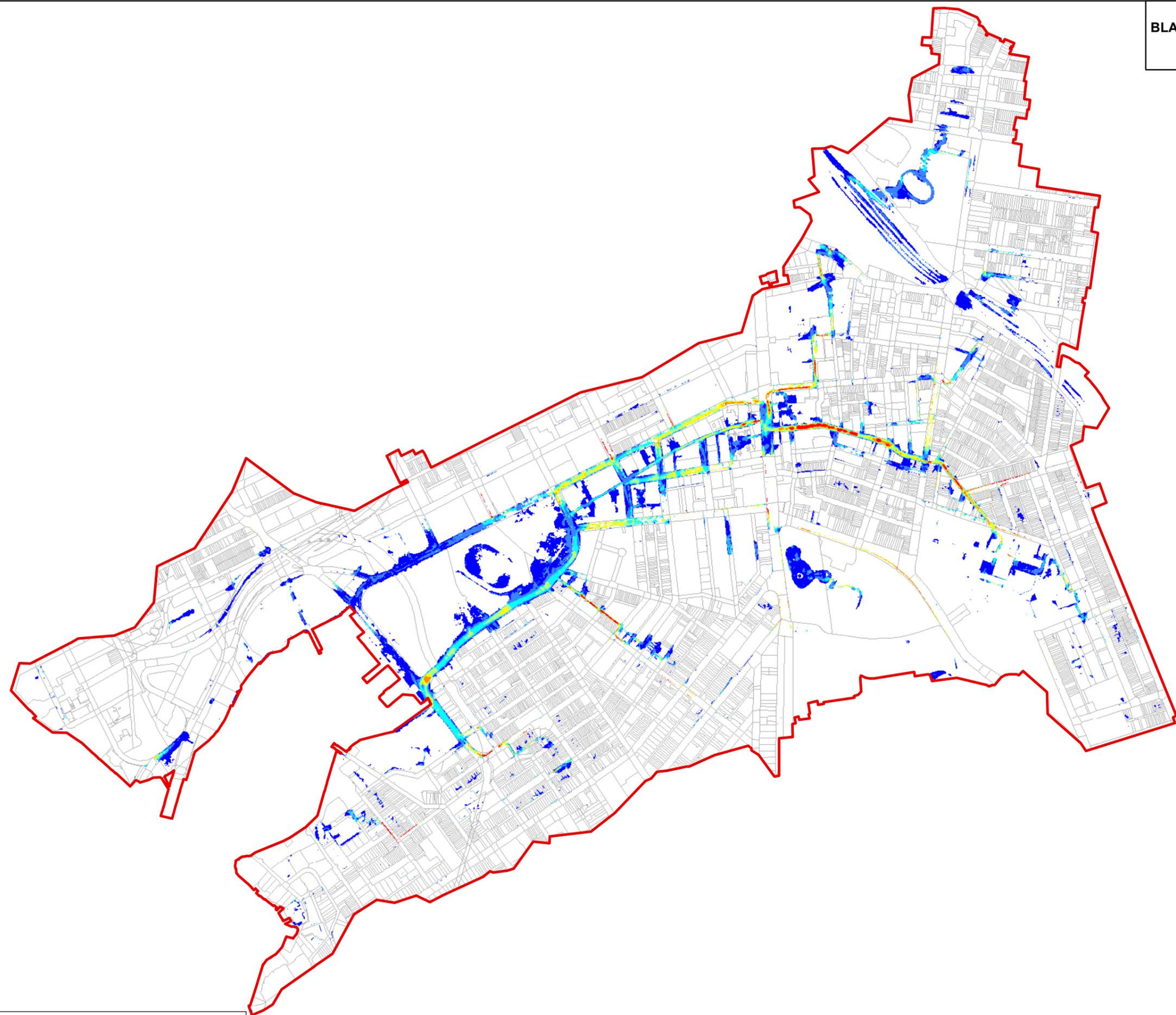
FIGURE C15  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
1% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



FIGURE C16  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
0.5% AEP EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

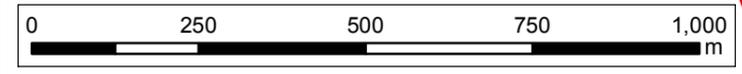
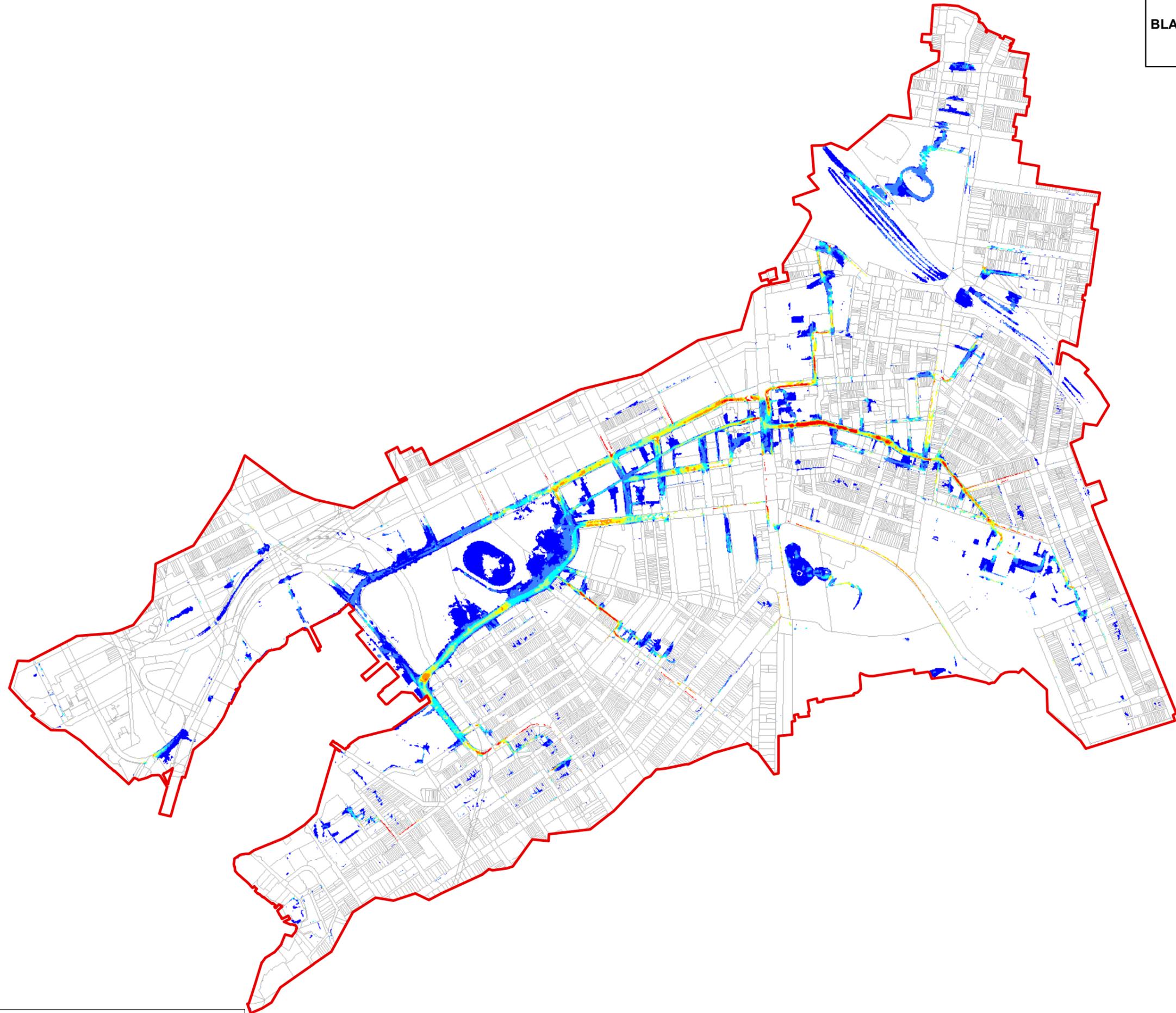


FIGURE C17  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
0.2% AEP EVENT



- Study Area
- Velocity (m/s)**
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3

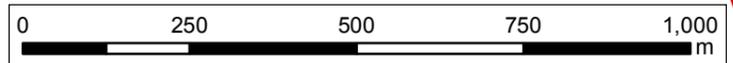
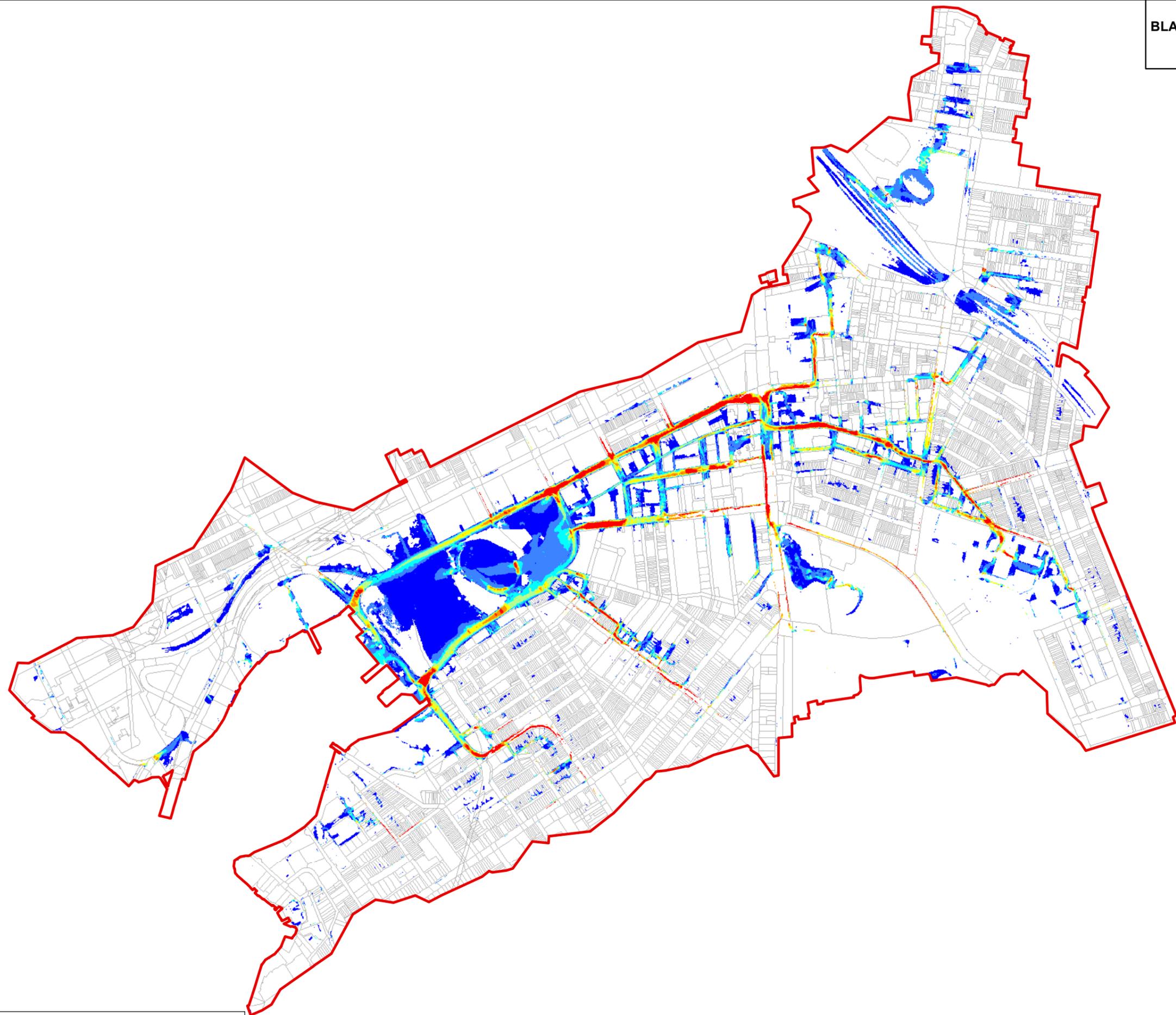


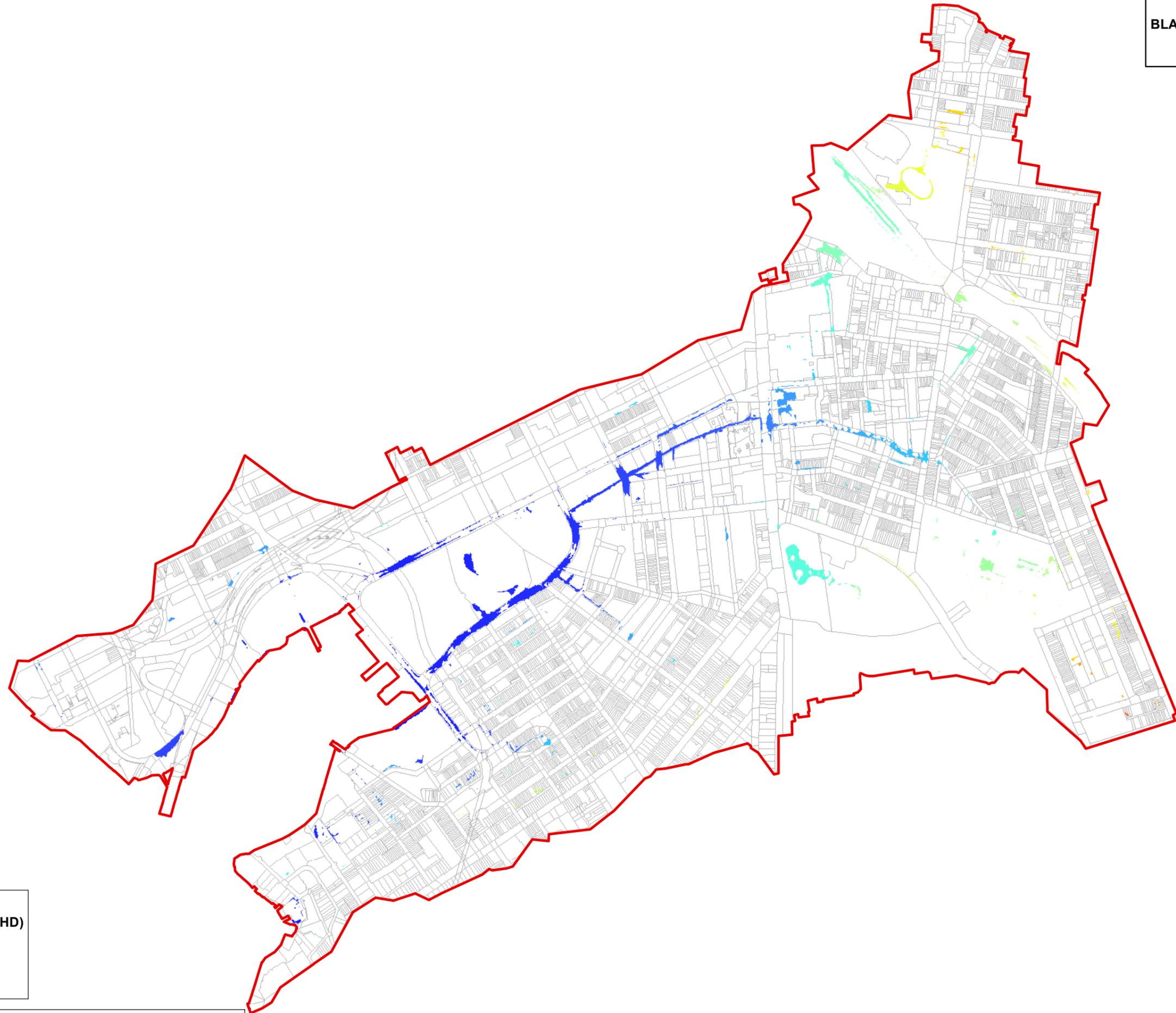
FIGURE C18  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD VELOCITY  
PMF EVENT



- Study Area
- Velocity (m/s)
- 0 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- > 3



FIGURE C19  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
50% AEP EVENT



Study Area

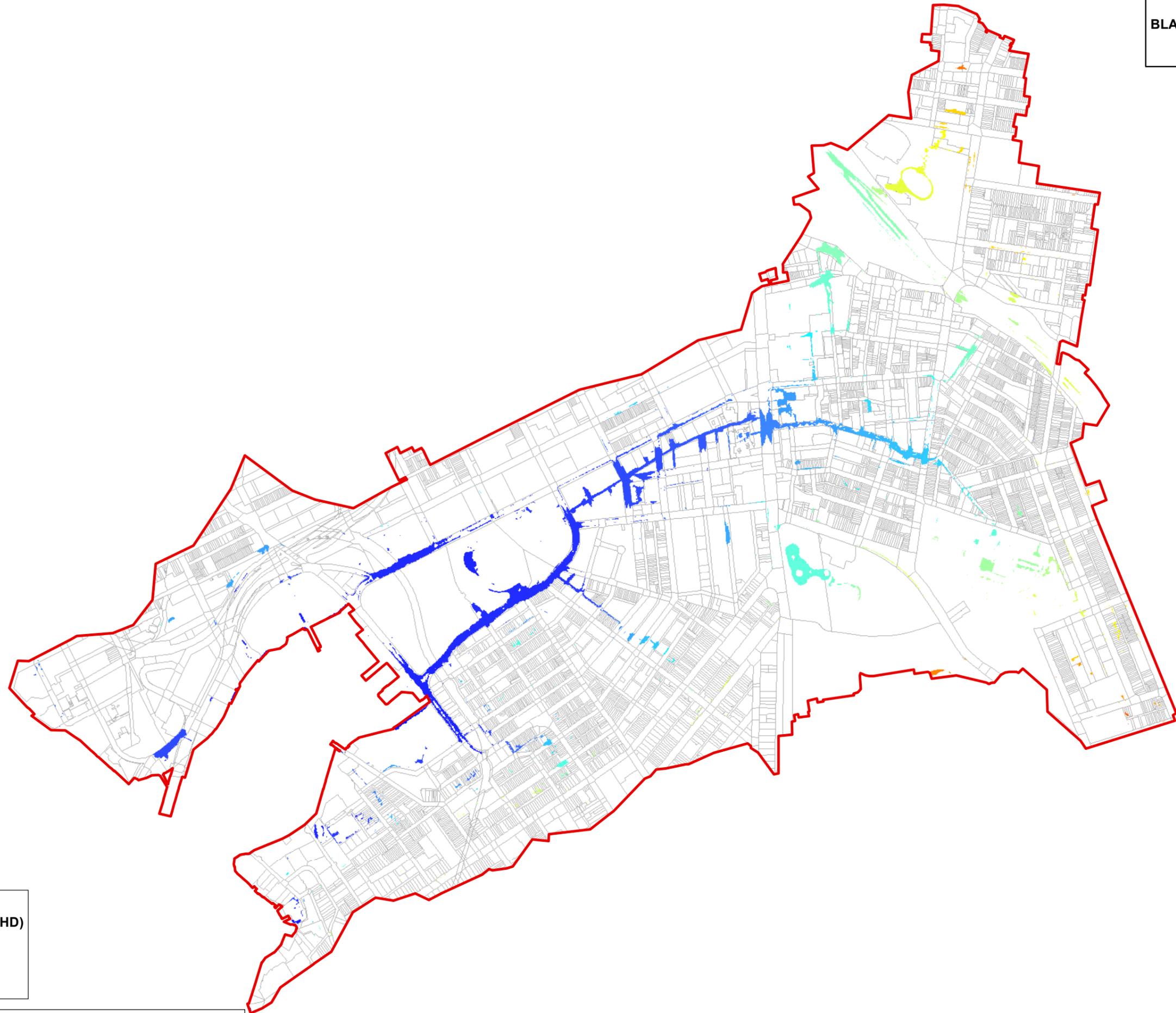
**Peak Flood Level (mAHD)**

High : 41

Low : 1



FIGURE C20  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
20% AEP EVENT

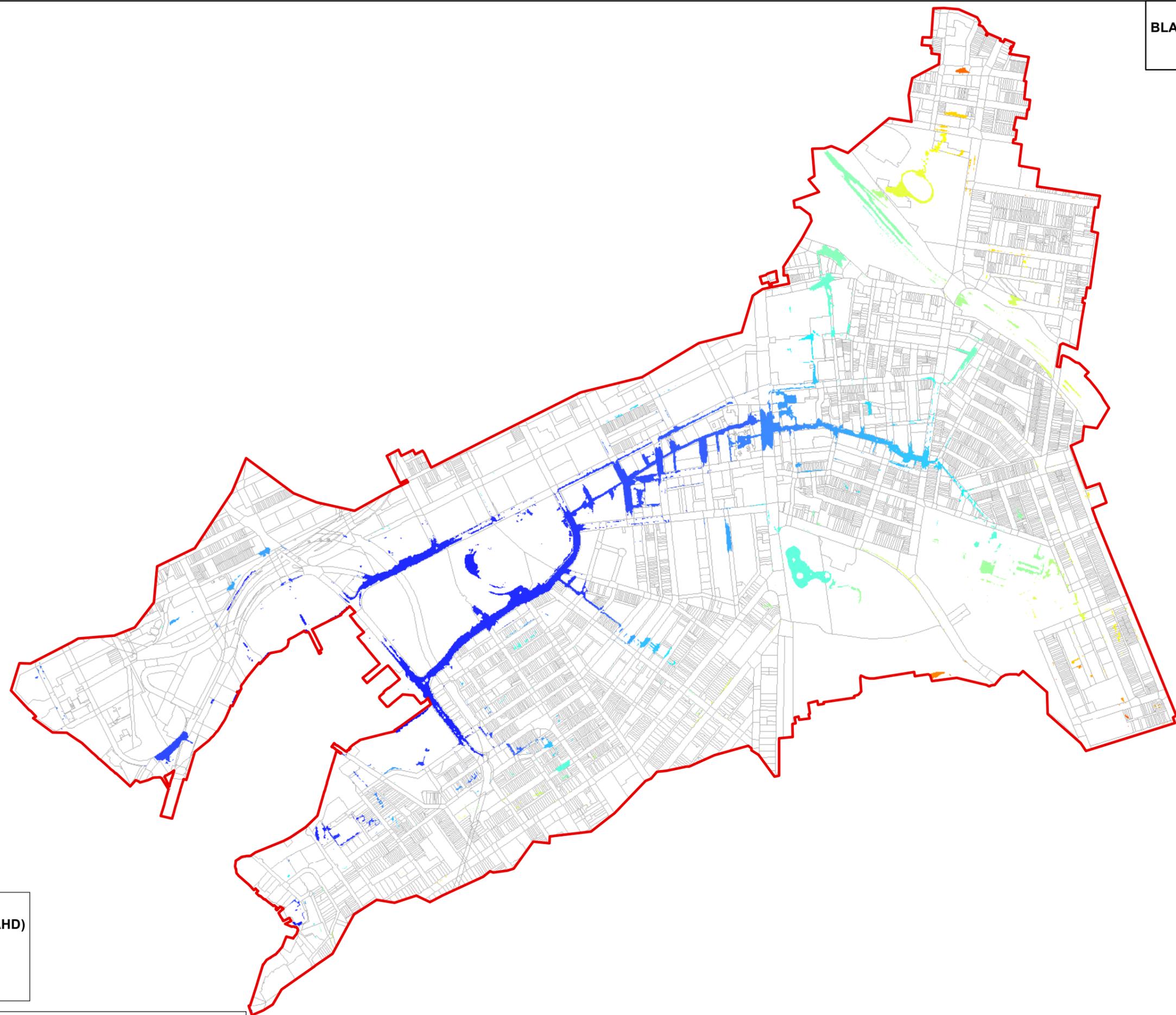


Study Area

**Peak Flood Level (mAHd)**  
High : 41  
Low : 1

0 250 500 750 1,000  
m

FIGURE C21  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
10% AEP EVENT



Study Area

Peak Flood Level (mAHD)

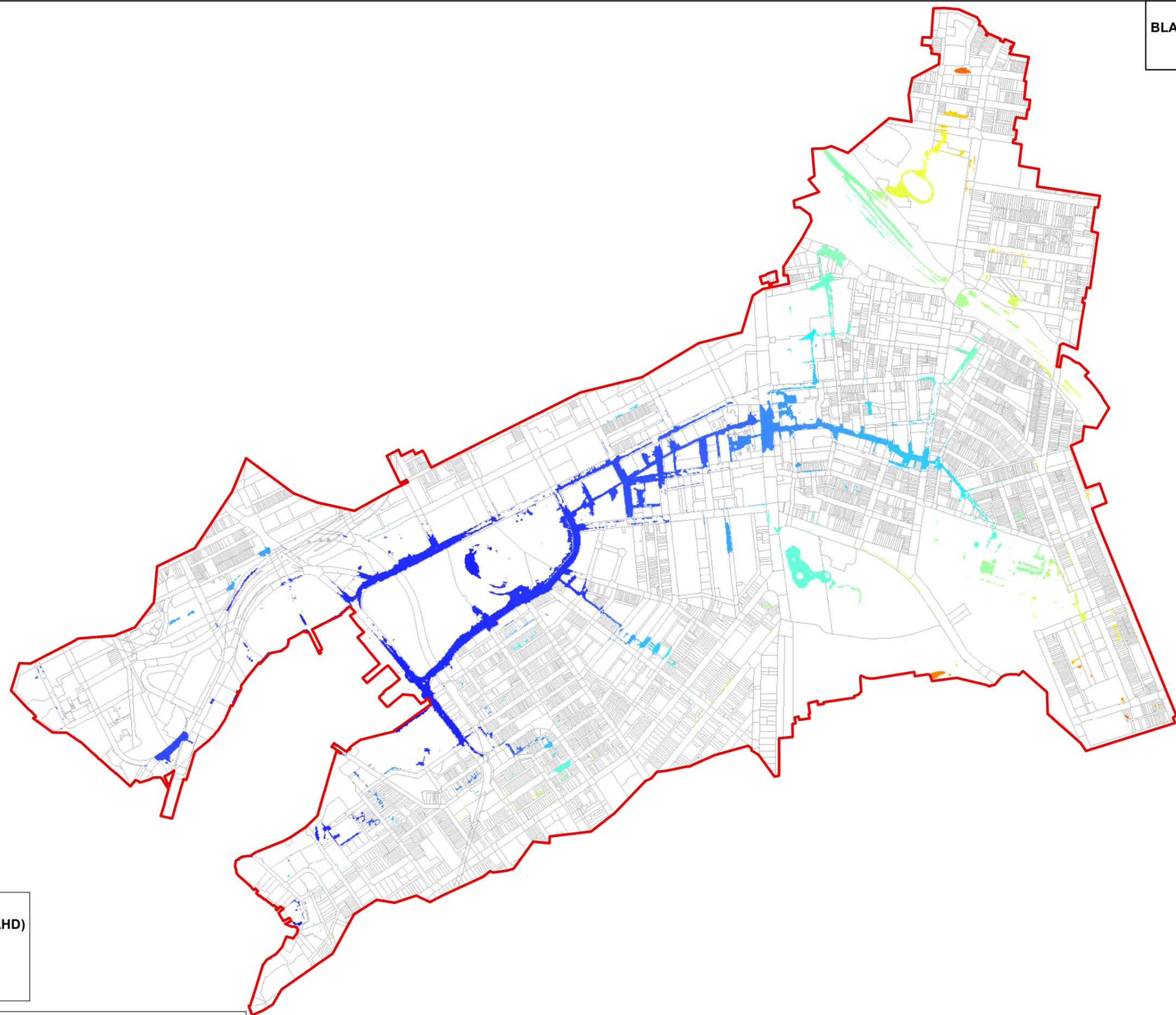
High : 41

Low : 1



J:\Jobs\119072\Arcgis\ArcMap\Report\Appendix\_C\FigureC21\_BW\_Level\_010y.mxd

FIGURE C22  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
5% AEP EVENT



Study Area

**Peak Flood Level (mAHD)**  
High : 41  
Low : 1

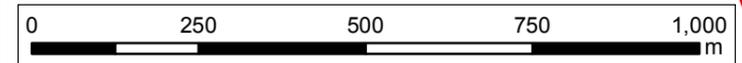
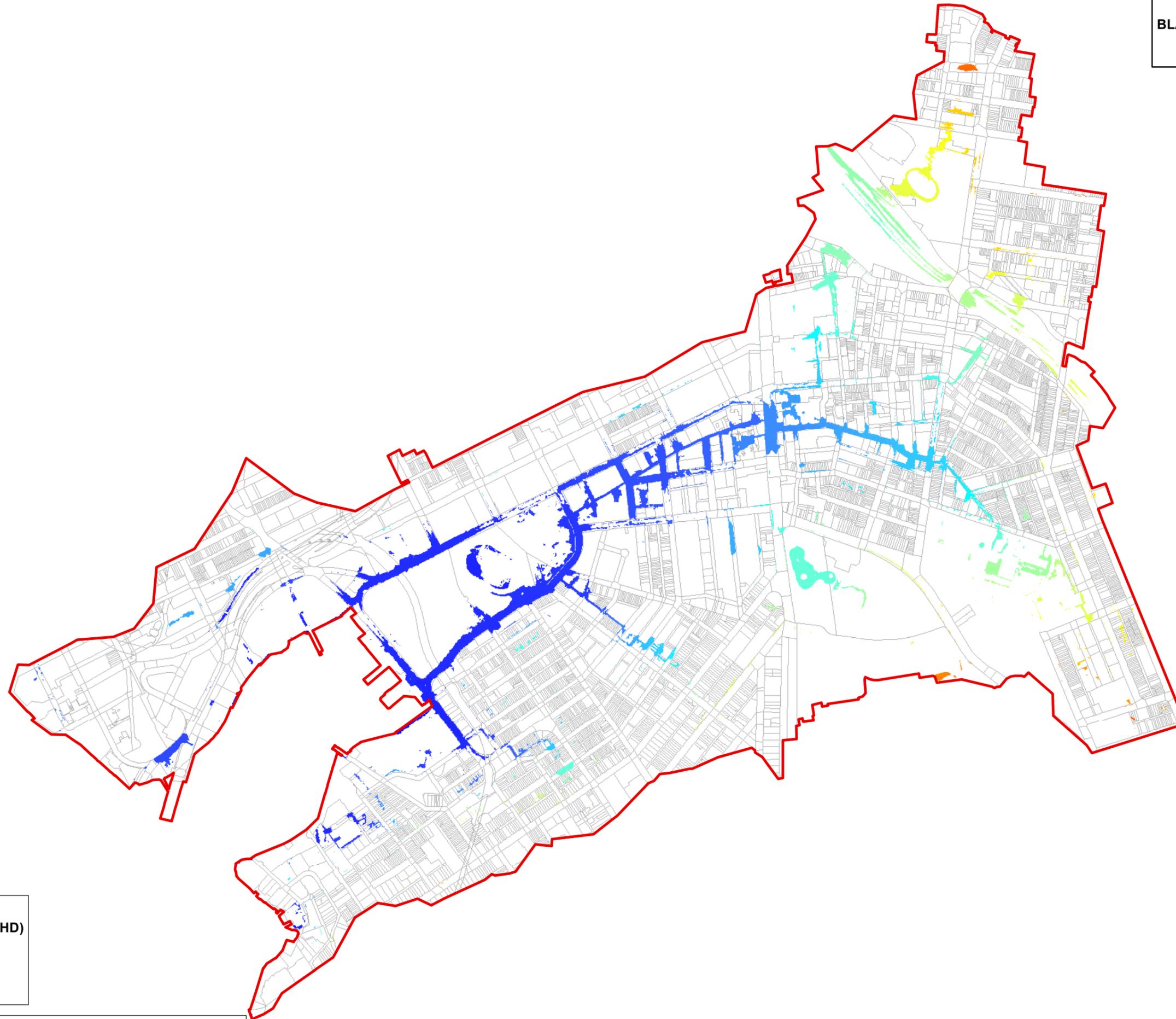


FIGURE C23  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
2% AEP EVENT

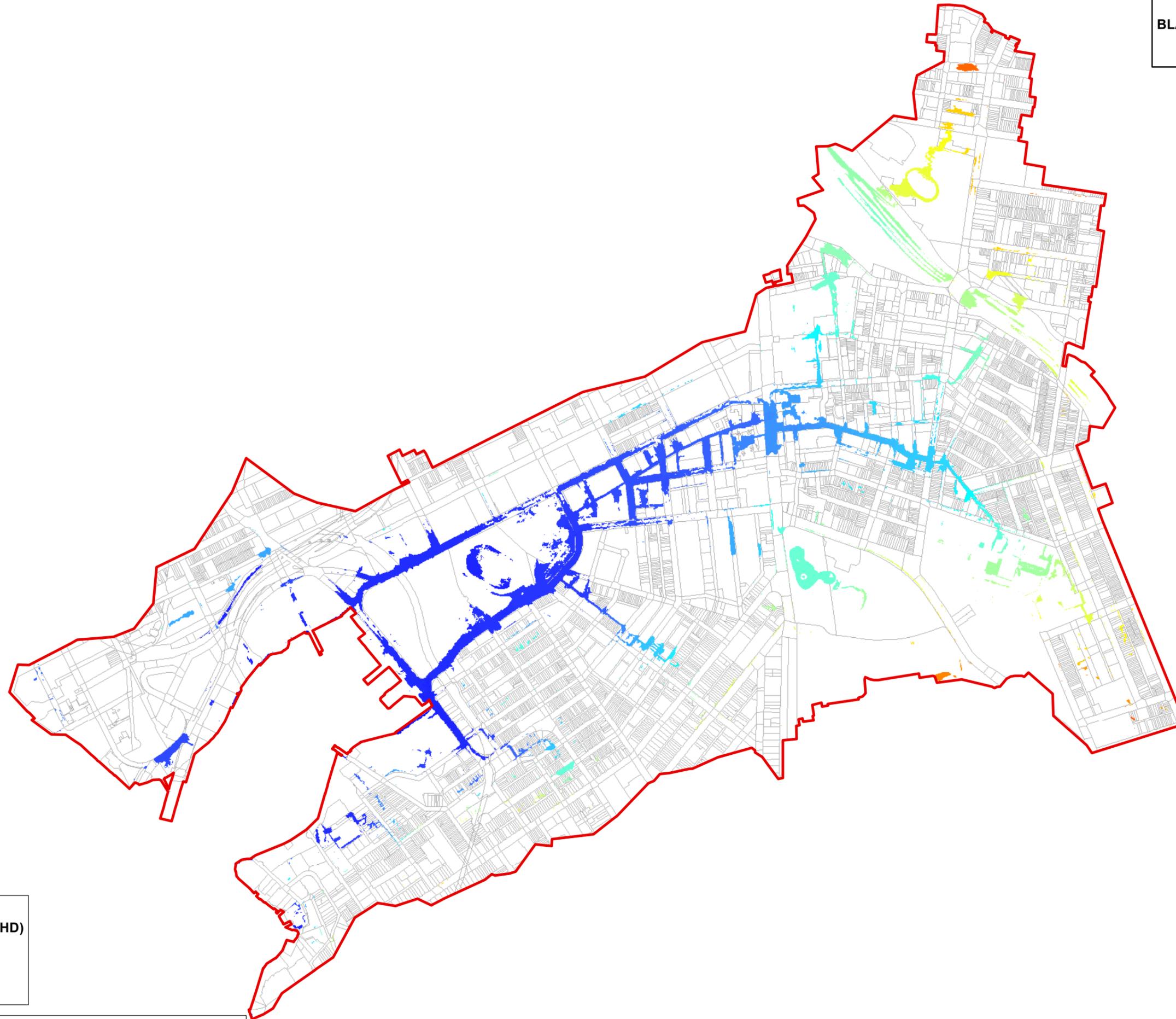


Study Area

**Peak Flood Level (mAHD)**  
High : 41  
Low : 1



FIGURE C24  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
1% AEP EVENT

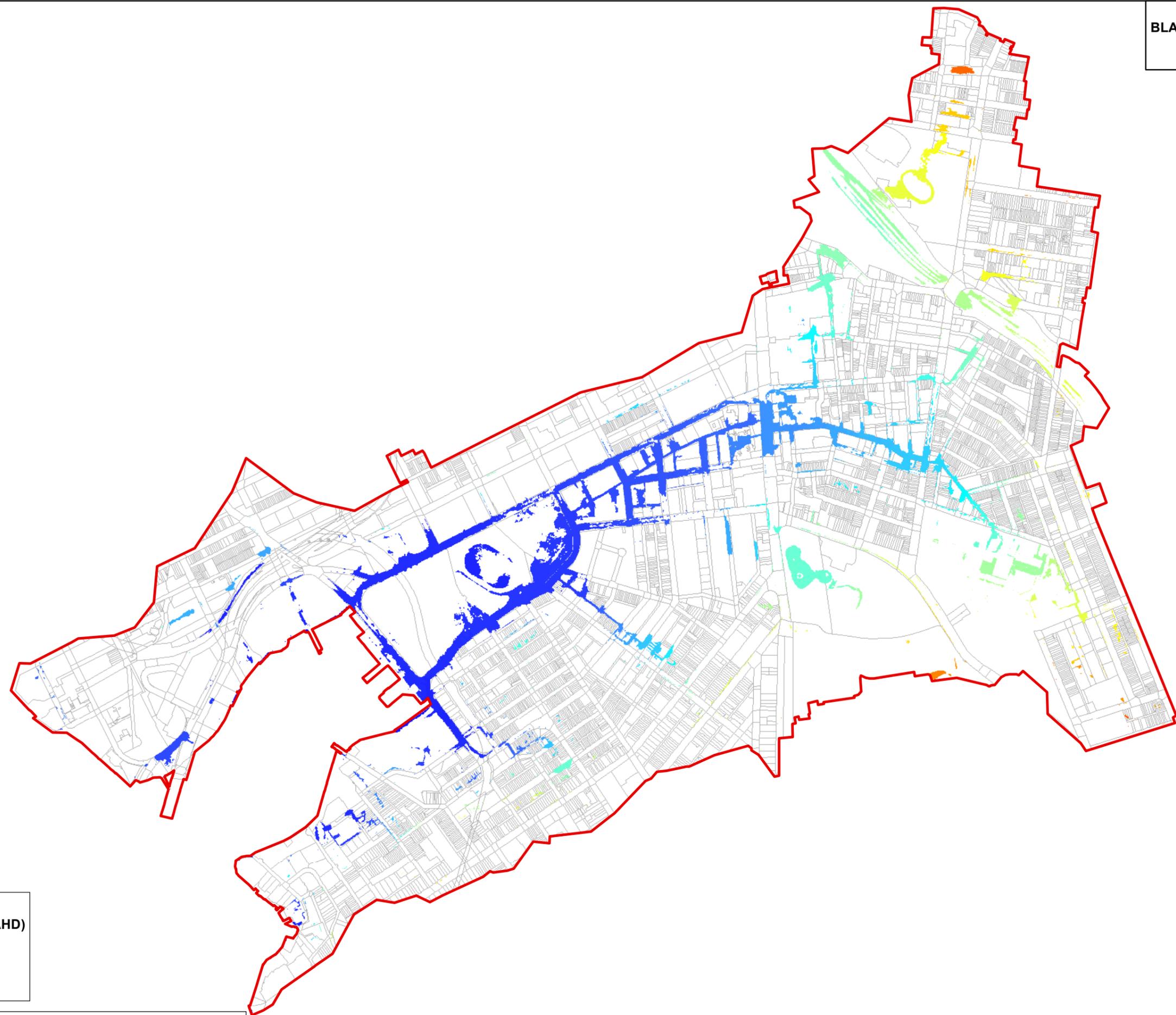


Study Area

**Peak Flood Level (mAHD)**  
High : 41  
Low : 1



FIGURE C25  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
0.5% AEP EVENT

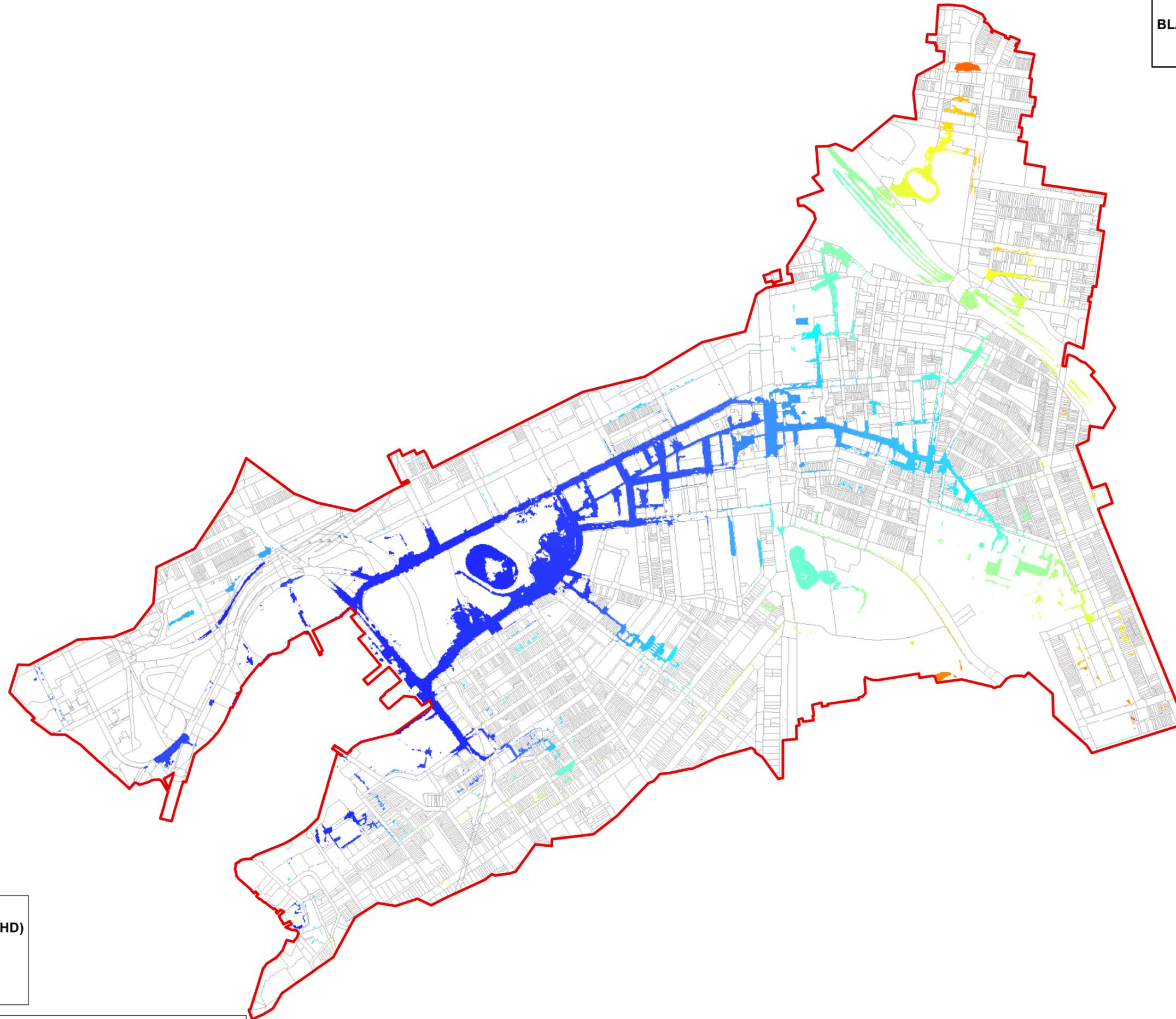


Study Area

**Peak Flood Level (mAHD)**  
High : 41  
Low : 1



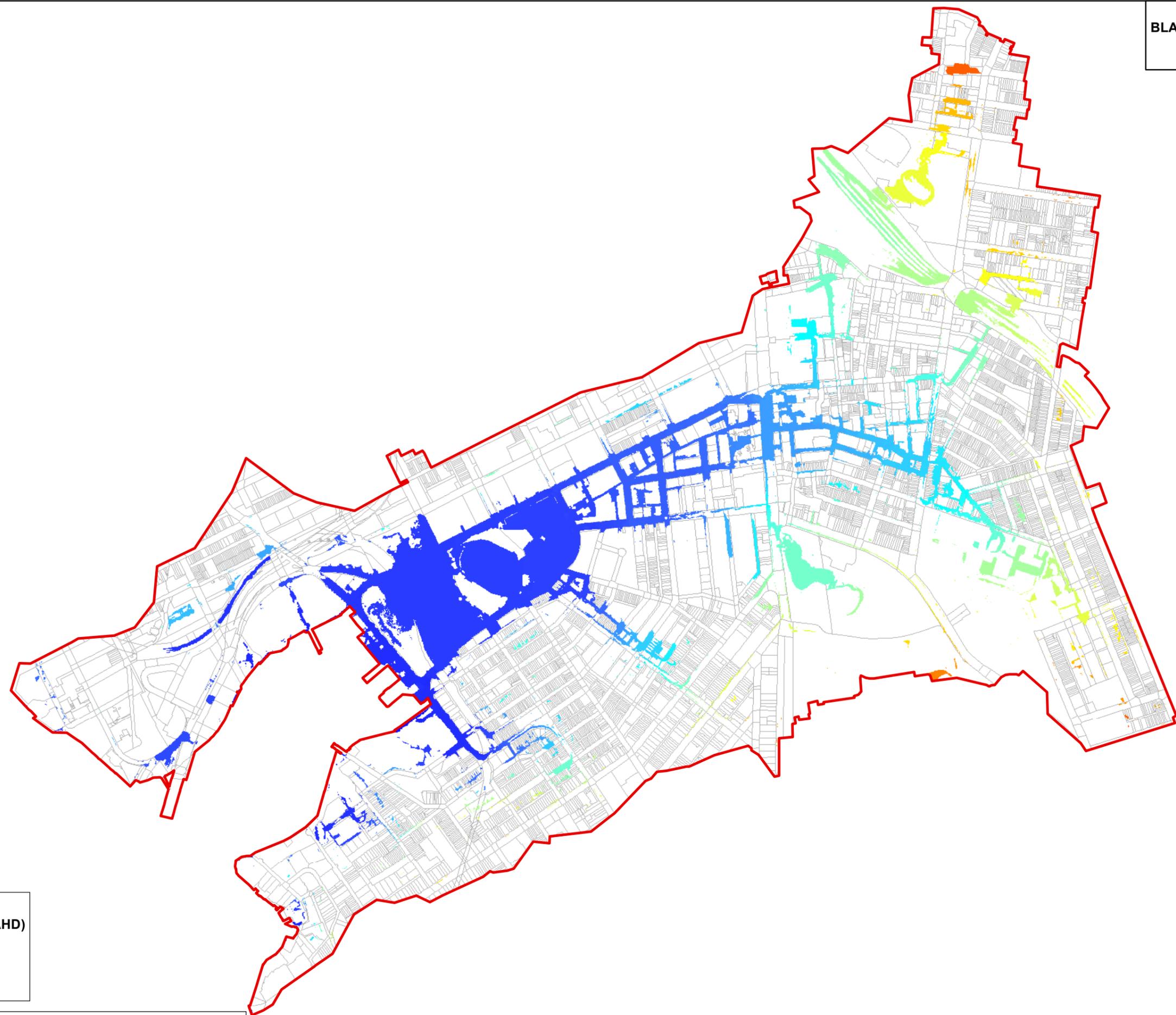
FIGURE C26  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
0.2% AEP EVENT



Study Area  
Peak Flood Level (mAHd)  
High : 41  
Low : 1



FIGURE C27  
BLACKWATTLE BAY CATCHMENT  
PEAK FLOOD LEVEL  
PMF EVENT



Study Area

**Peak Flood Level (mAHD)**  
High : 41  
Low : 1

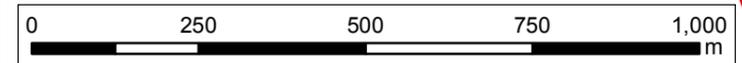
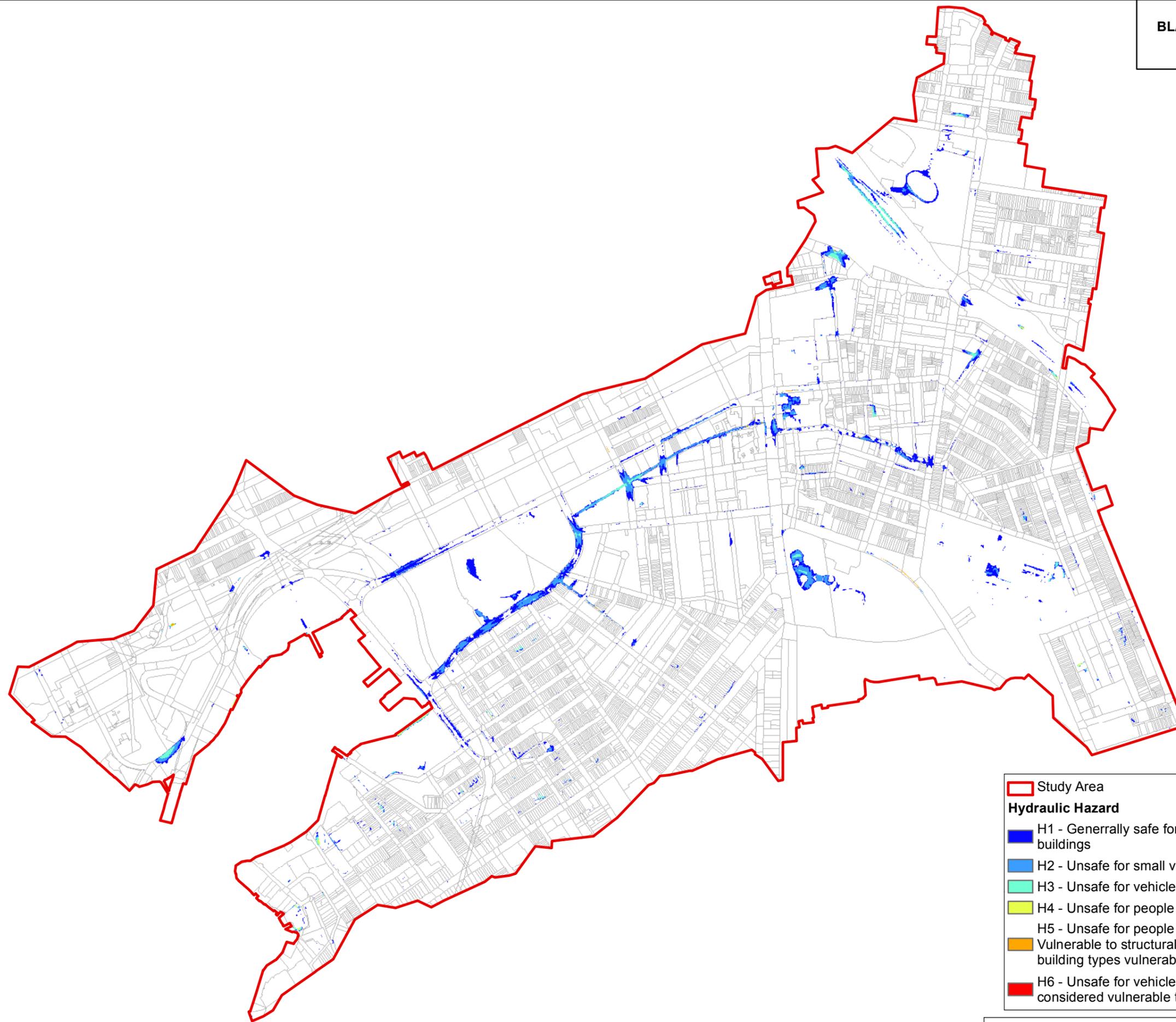


FIGURE C28  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
50% AEP EVENT



**Study Area**

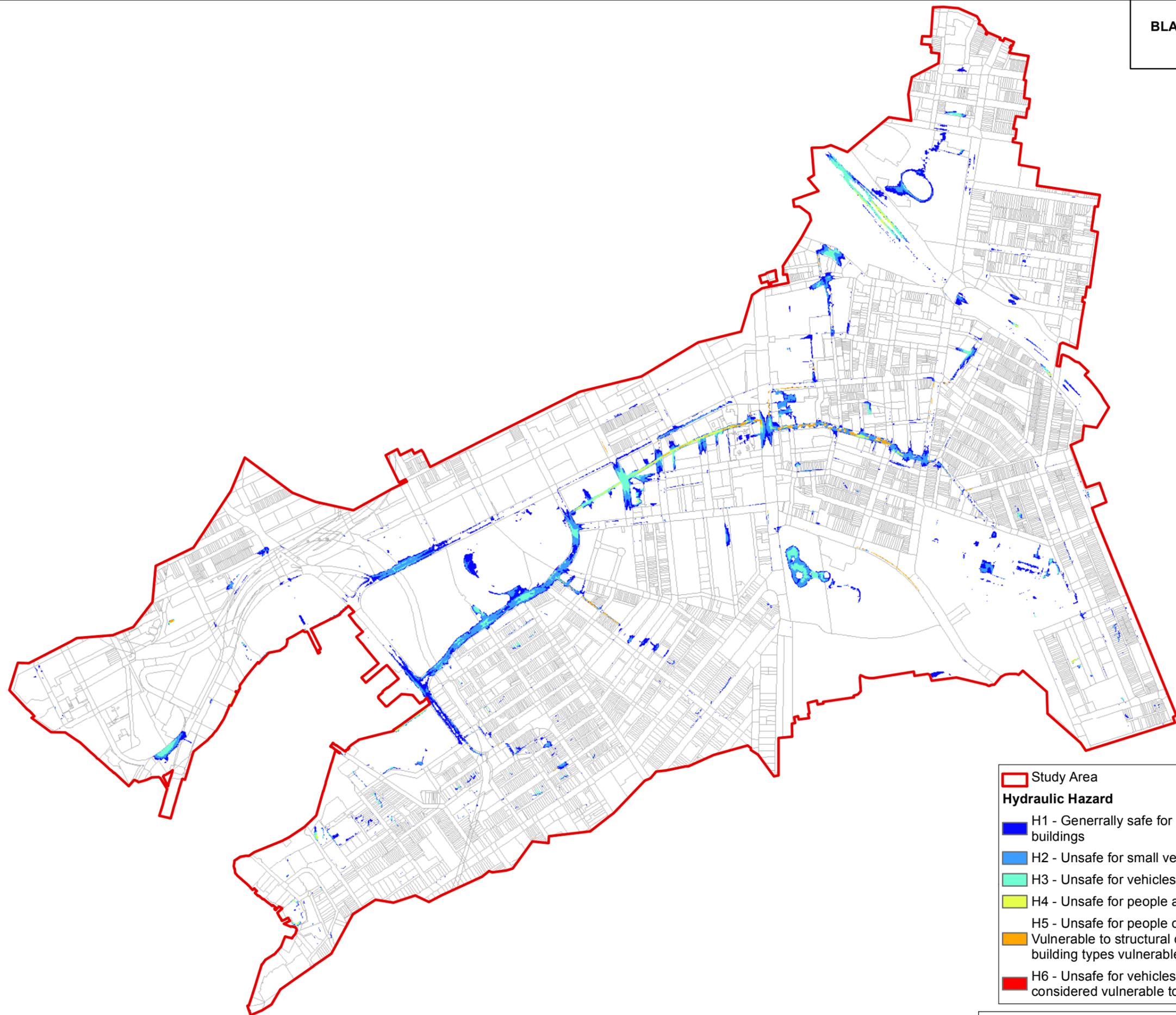
- Study Area

**Hydraulic Hazard**

- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure



FIGURE C29  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
20% AEP EVENT



**Study Area**

**Hydraulic Hazard**

- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

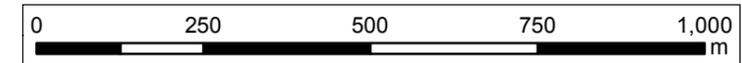


FIGURE C30  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
10% AEP EVENT

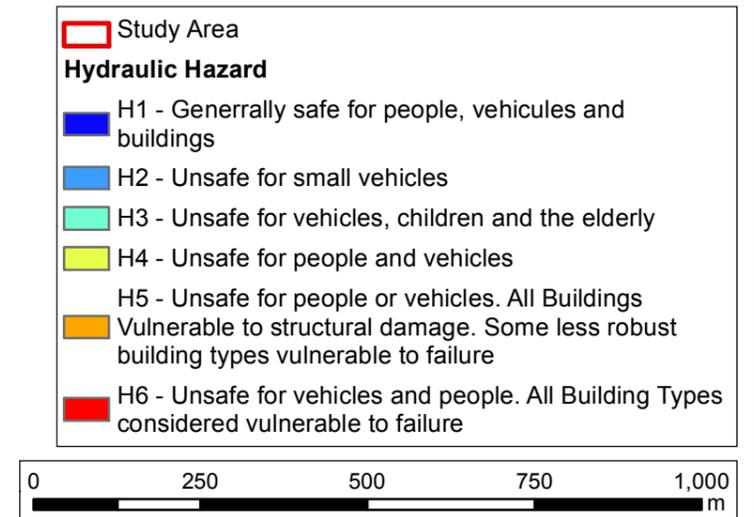
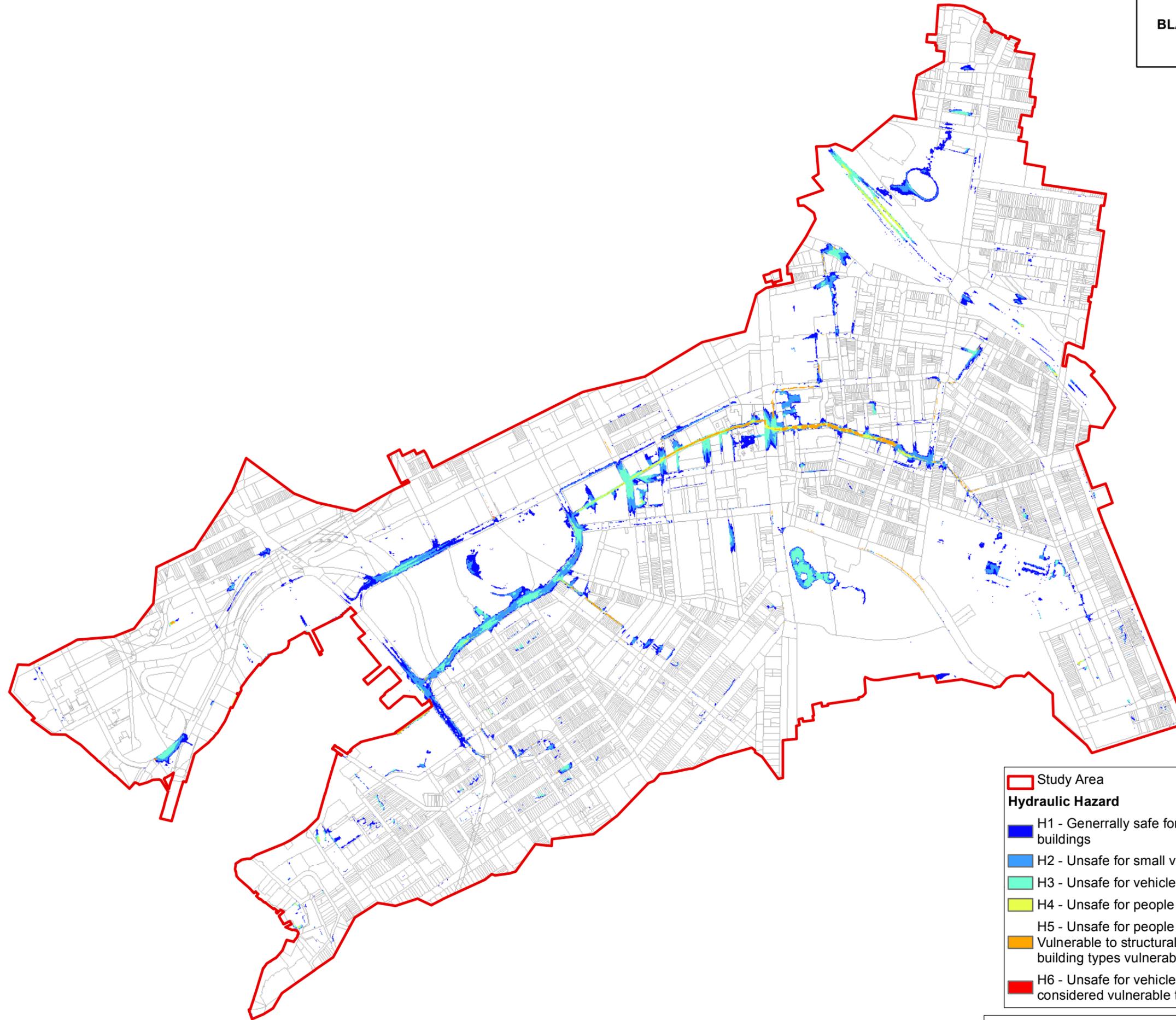
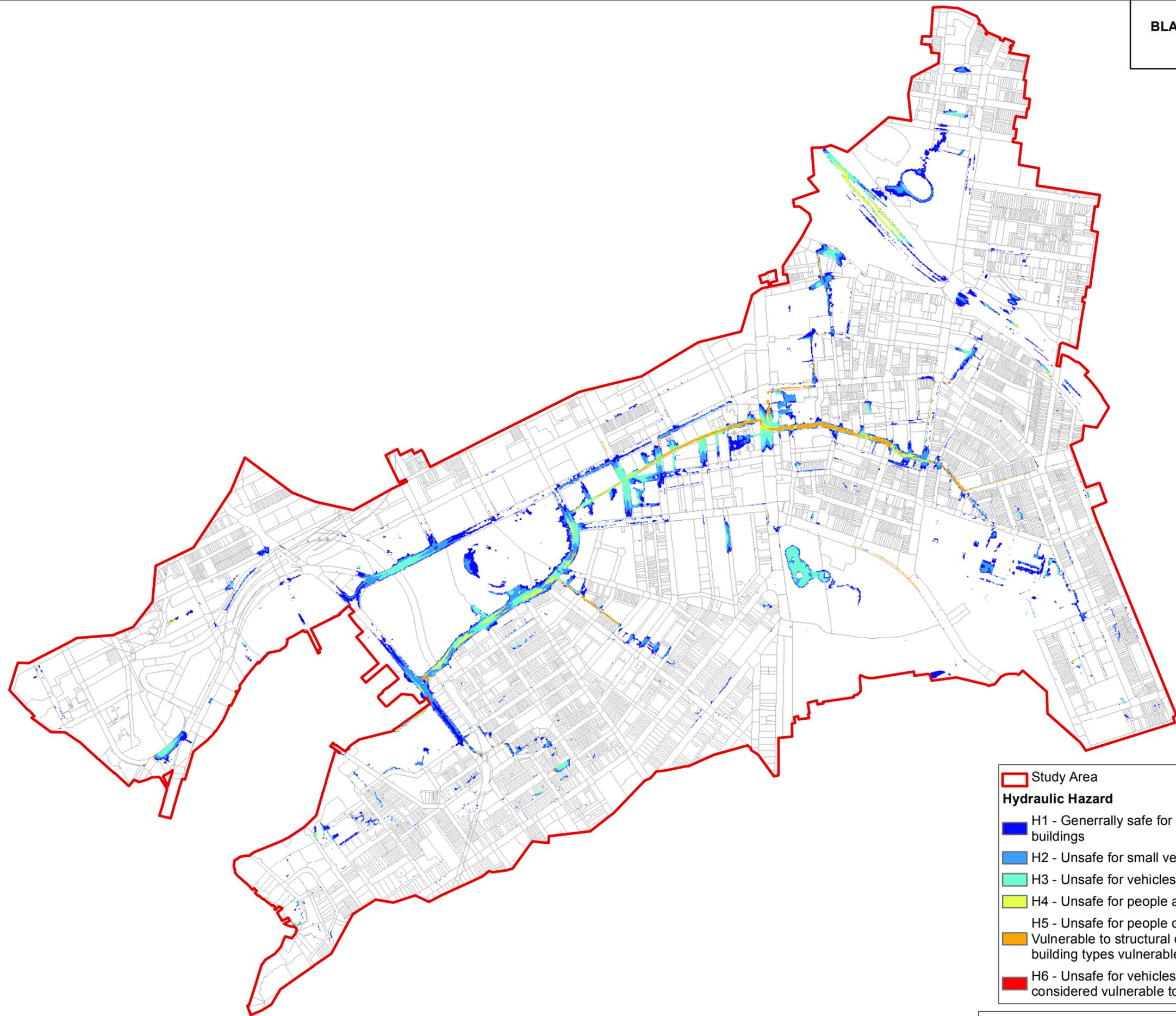


FIGURE C31  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
5% AEP EVENT



**Study Area**

- Study Area

**Hydraulic Hazard**

- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

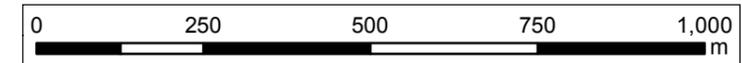
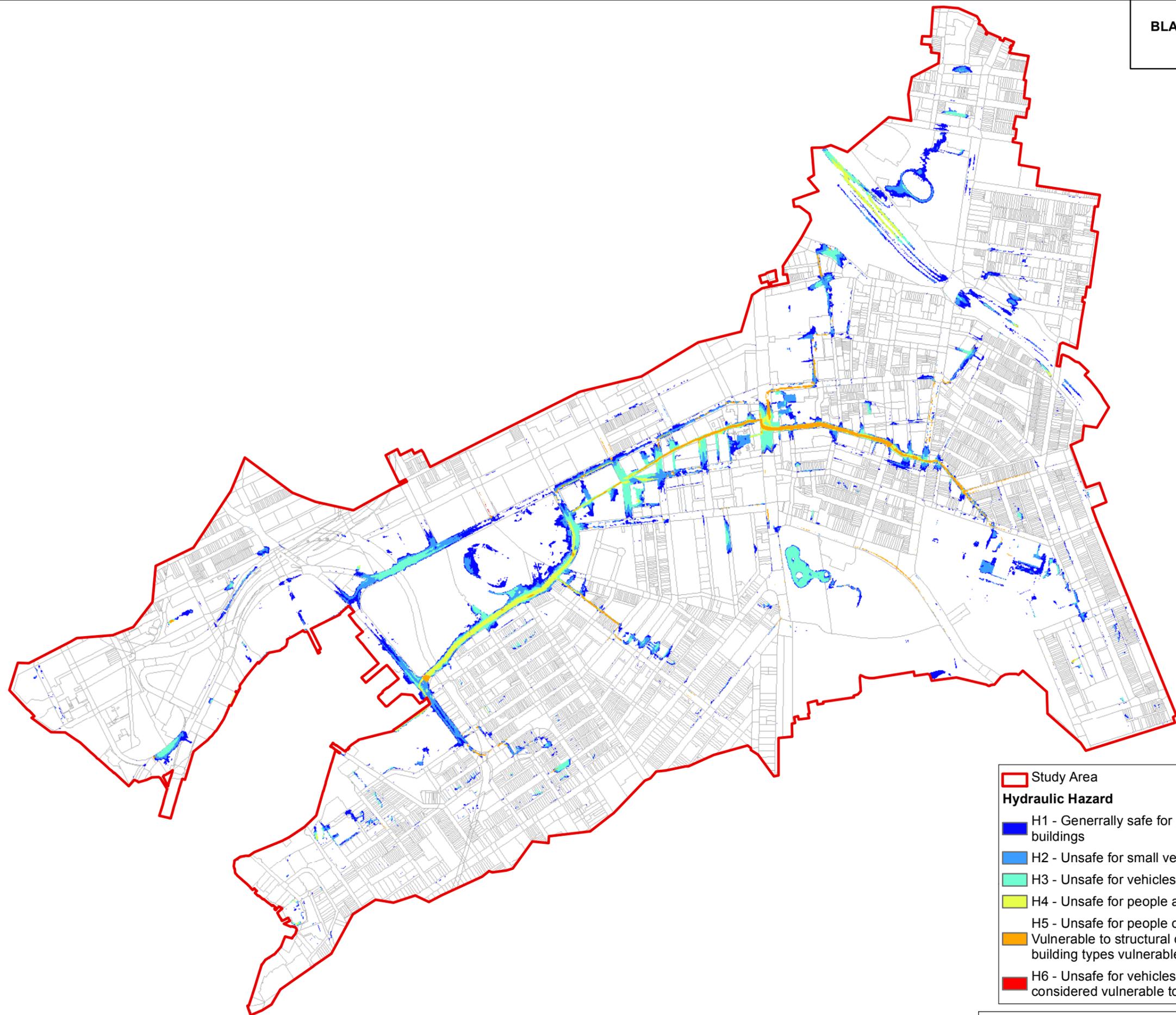


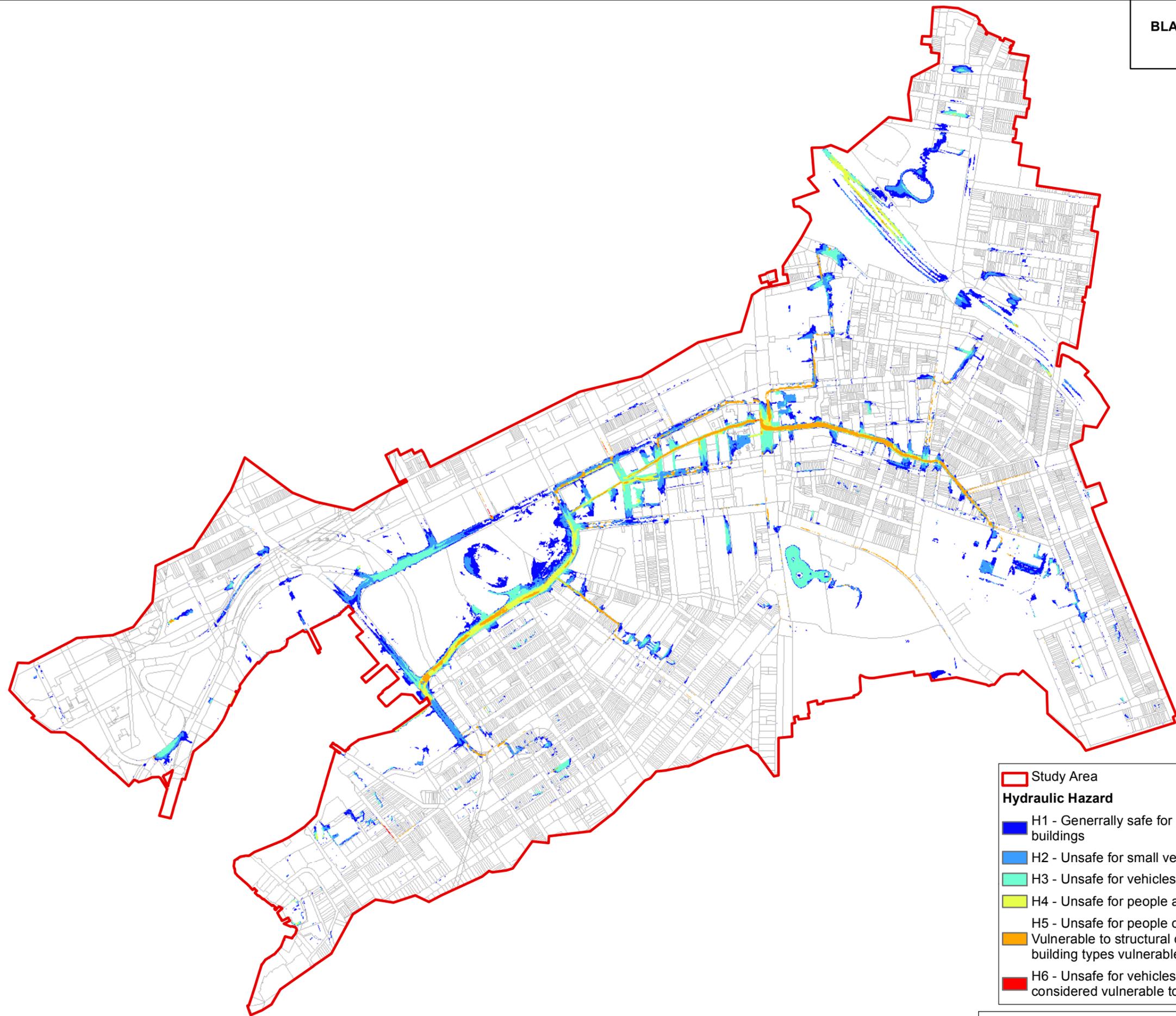
FIGURE C32  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
2% AEP EVENT



- Study Area
- Hydraulic Hazard**
- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure



FIGURE C33  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
1% AEP EVENT



- Study Area
- Hydraulic Hazard**
- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

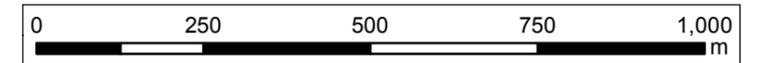
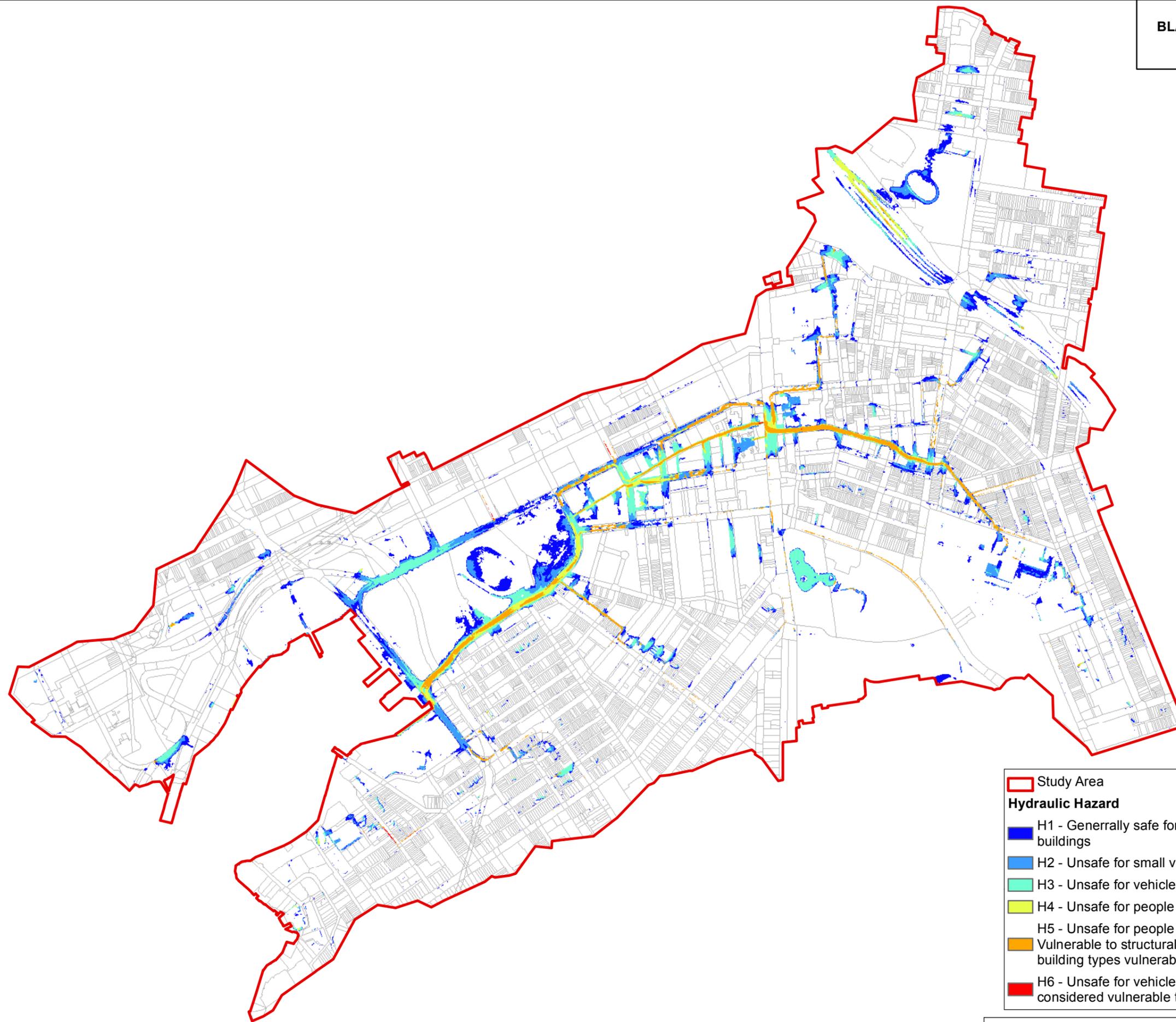


FIGURE C34  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
0.5% AEP EVENT



**Study Area**

- Study Area

**Hydraulic Hazard**

- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

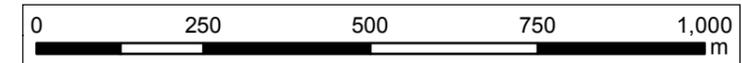
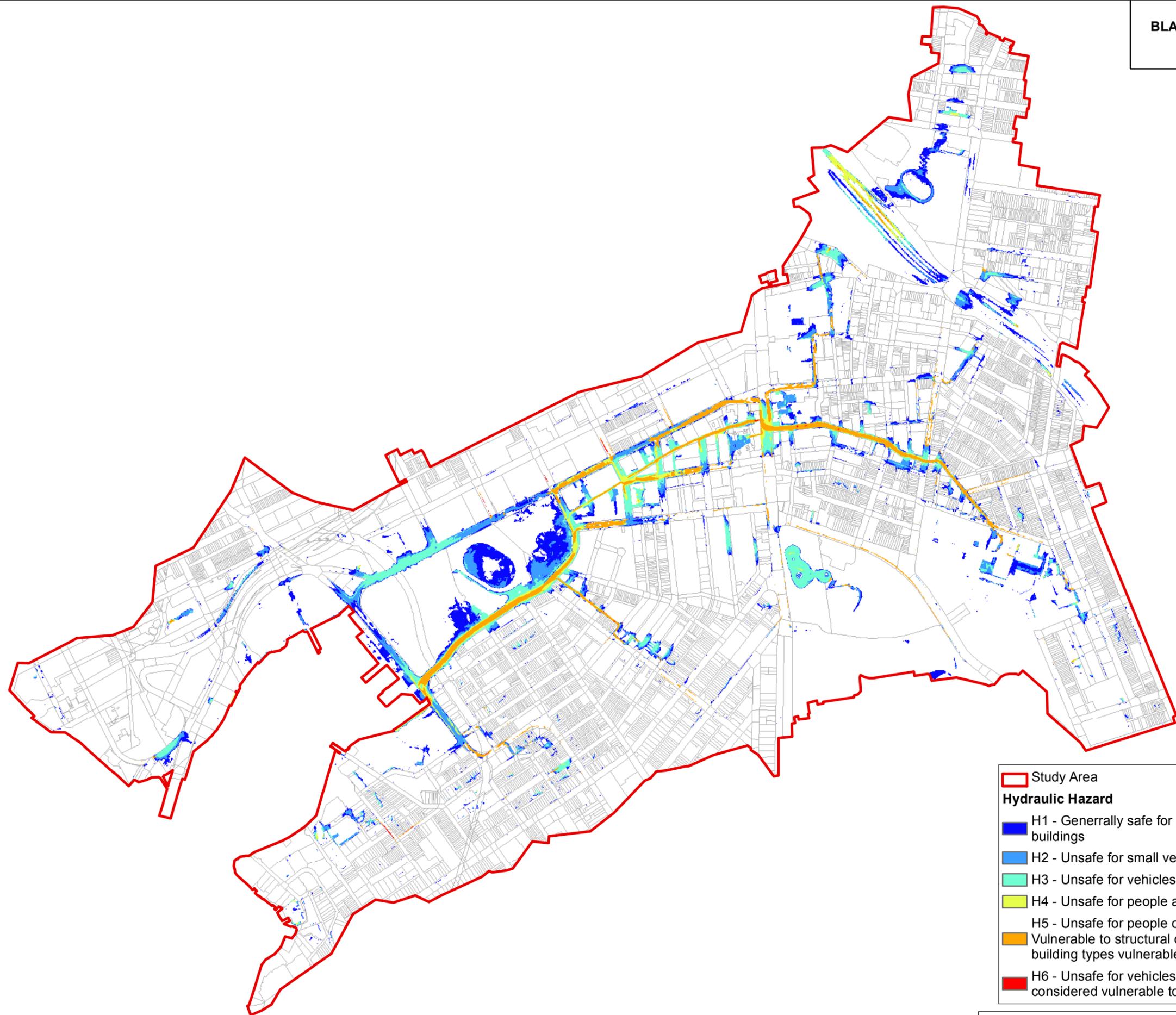


FIGURE C35  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
0.2% AEP EVENT



**Study Area**

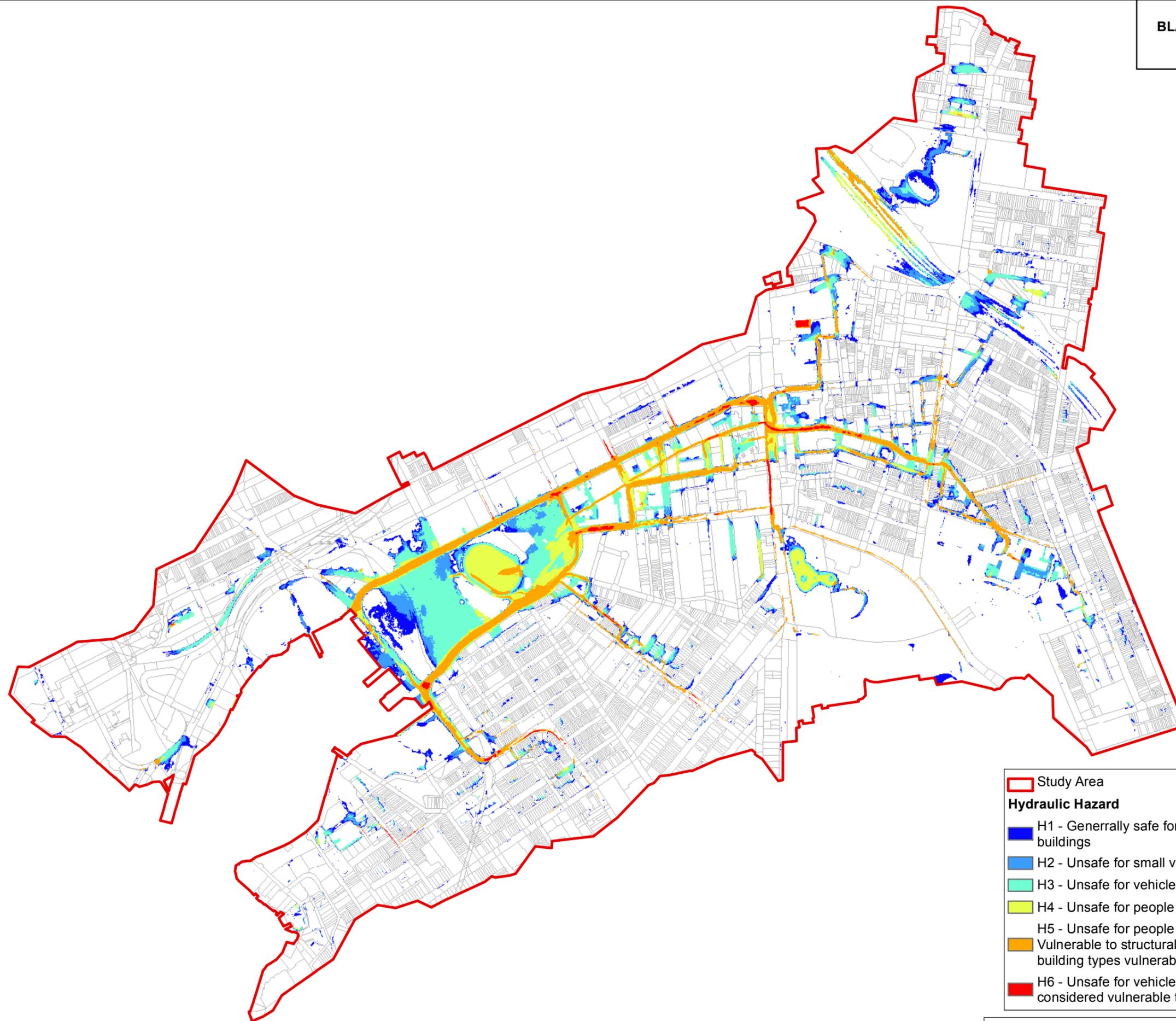
- Study Area

**Hydraulic Hazard**

- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings
- Vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure



FIGURE C36  
BLACKWATTLE BAY CATCHMENT  
HYDRAULIC HAZARD (ADR)  
PMF EVENT



**Study Area**

- Study Area

**Hydraulic Hazard**

- H1 - Generally safe for people, vehicles and buildings
- H2 - Unsafe for small vehicles
- H3 - Unsafe for vehicles, children and the elderly
- H4 - Unsafe for people and vehicles
- H5 - Unsafe for people or vehicles. All Buildings
- Vulnerable to structural damage. Some less robust building types vulnerable to failure
- H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

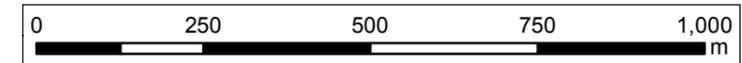
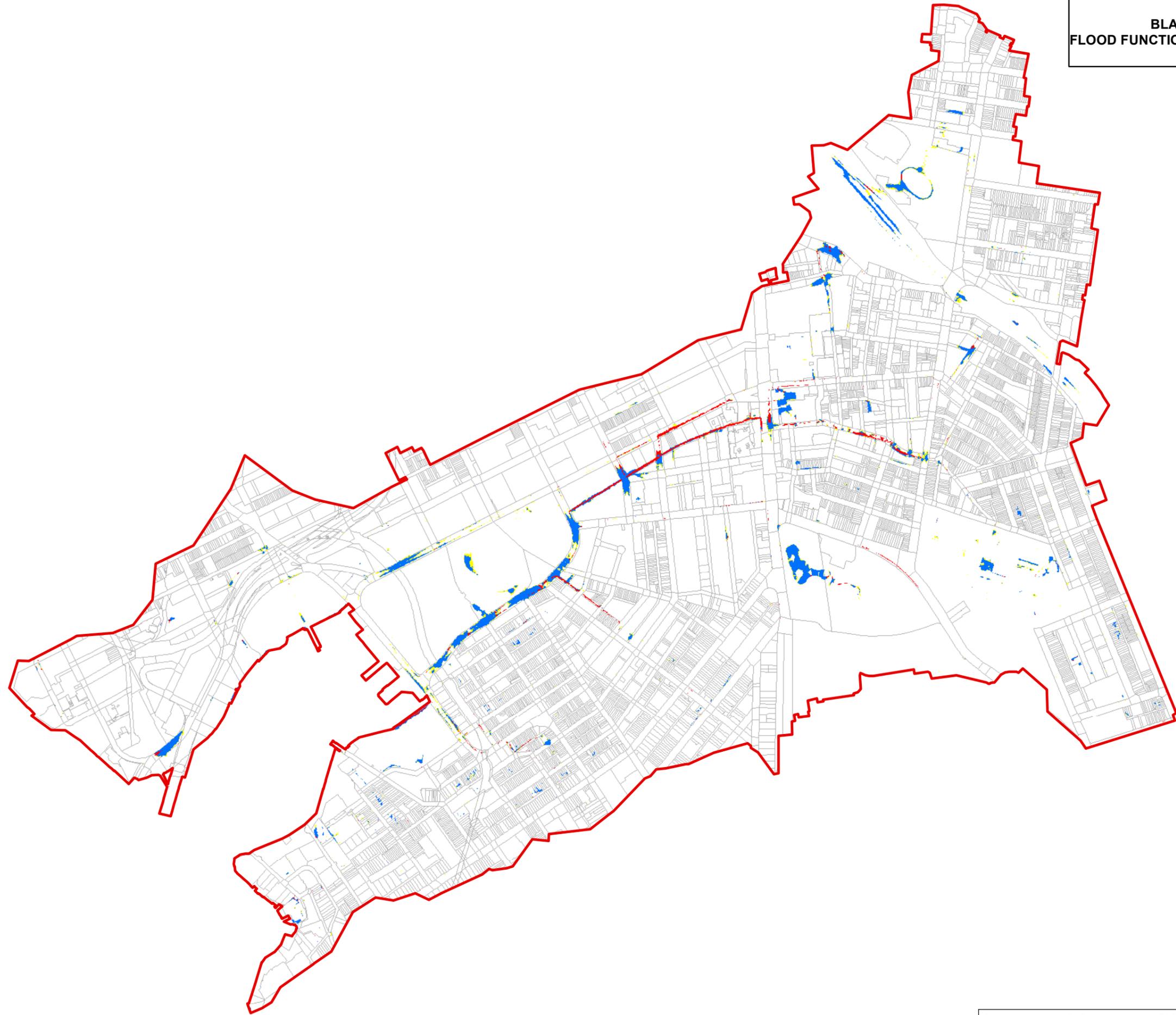


FIGURE C37  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
50% AEP EVENT



Legend:

- Study Area
- Flood Fringe
- Flood Storage
- Floodway

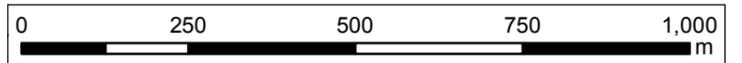
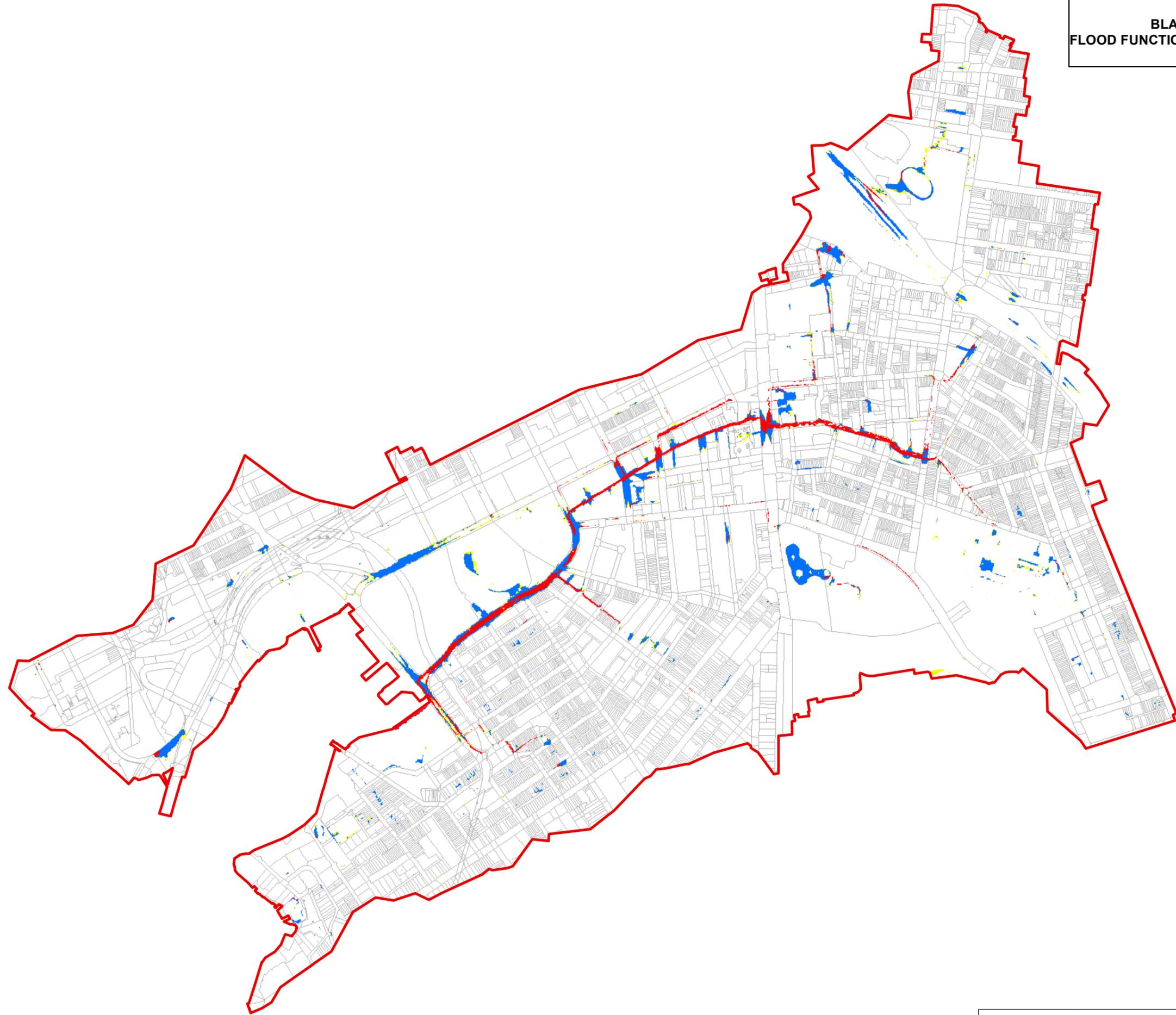


FIGURE C38  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
20% AEP EVENT



- Study Area
- Flood Fringe
- Flood Storage
- Floodway

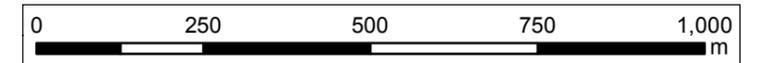
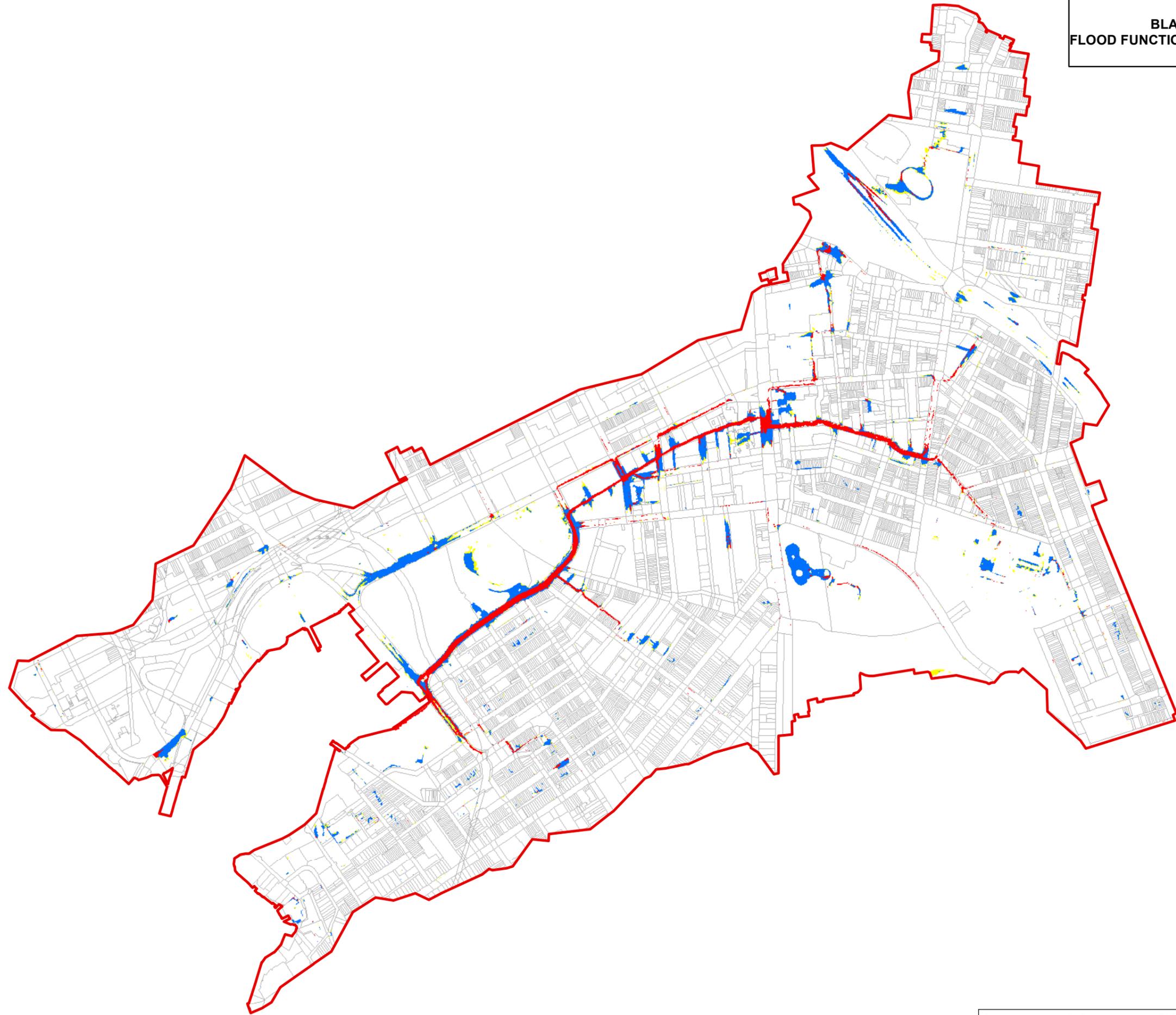


FIGURE C39  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
10% AEP EVENT



- Study Area
- Flood Fringe
- Flood Storage
- Floodway

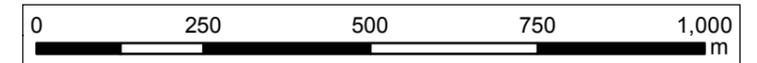
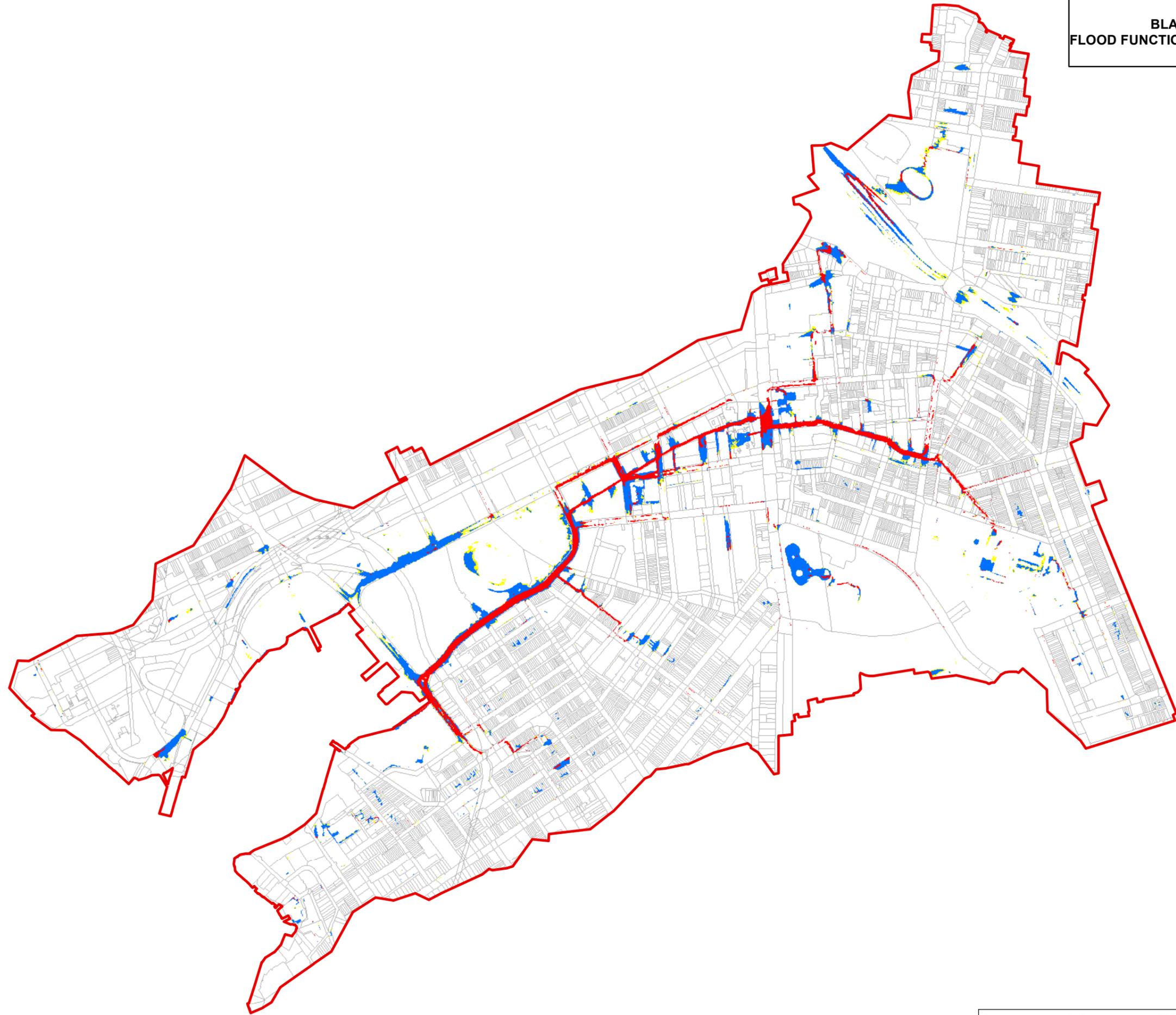


FIGURE C40  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
5% AEP EVENT



- Study Area
- Flood Fringe
- Flood Storage
- Floodway

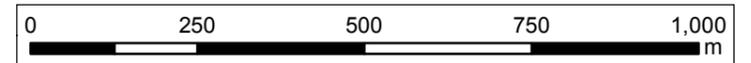
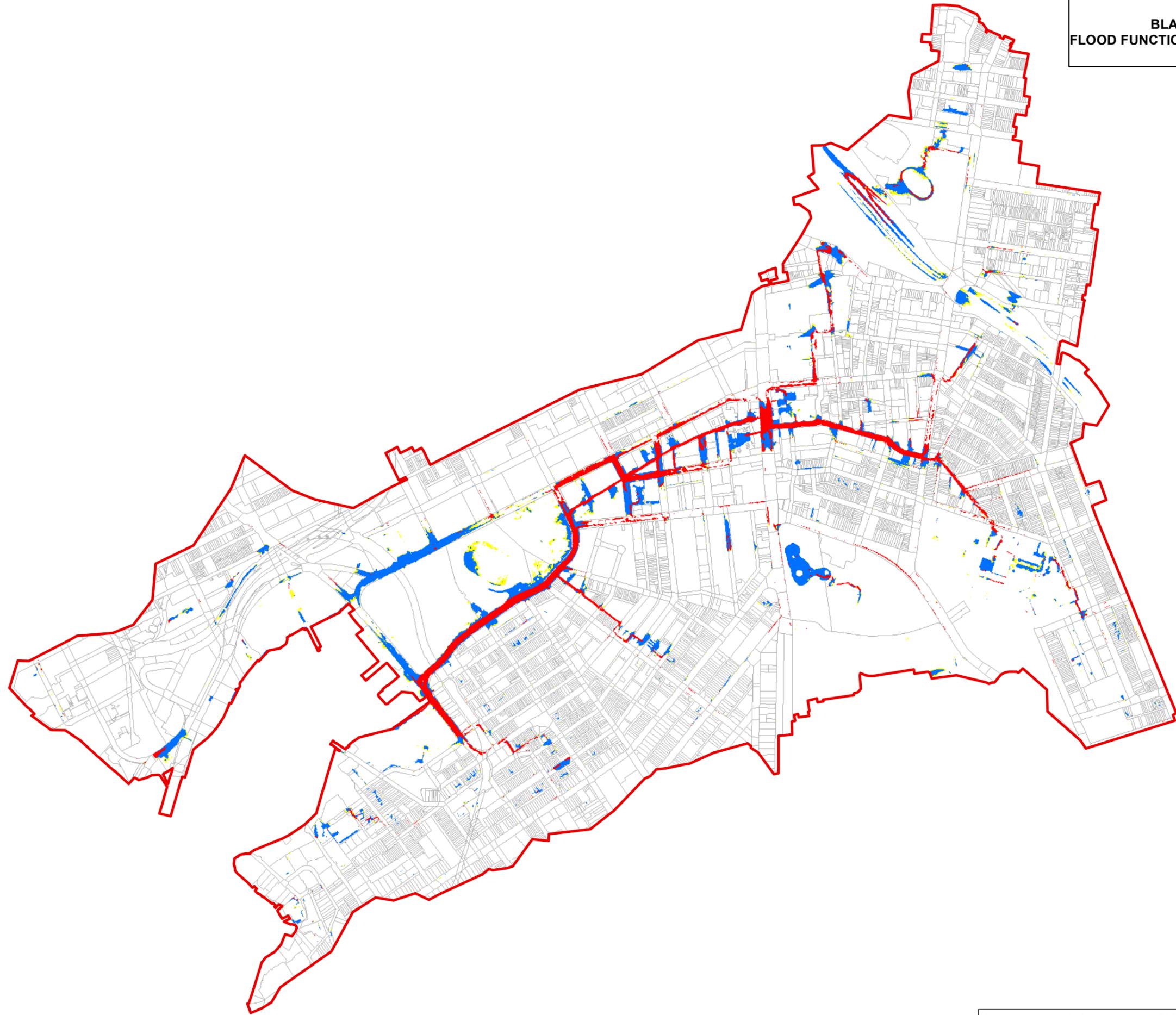


FIGURE C41  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
2% AEP EVENT



Legend:

- Study Area
- Flood Fringe
- Flood Storage
- Floodway

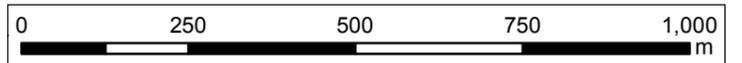
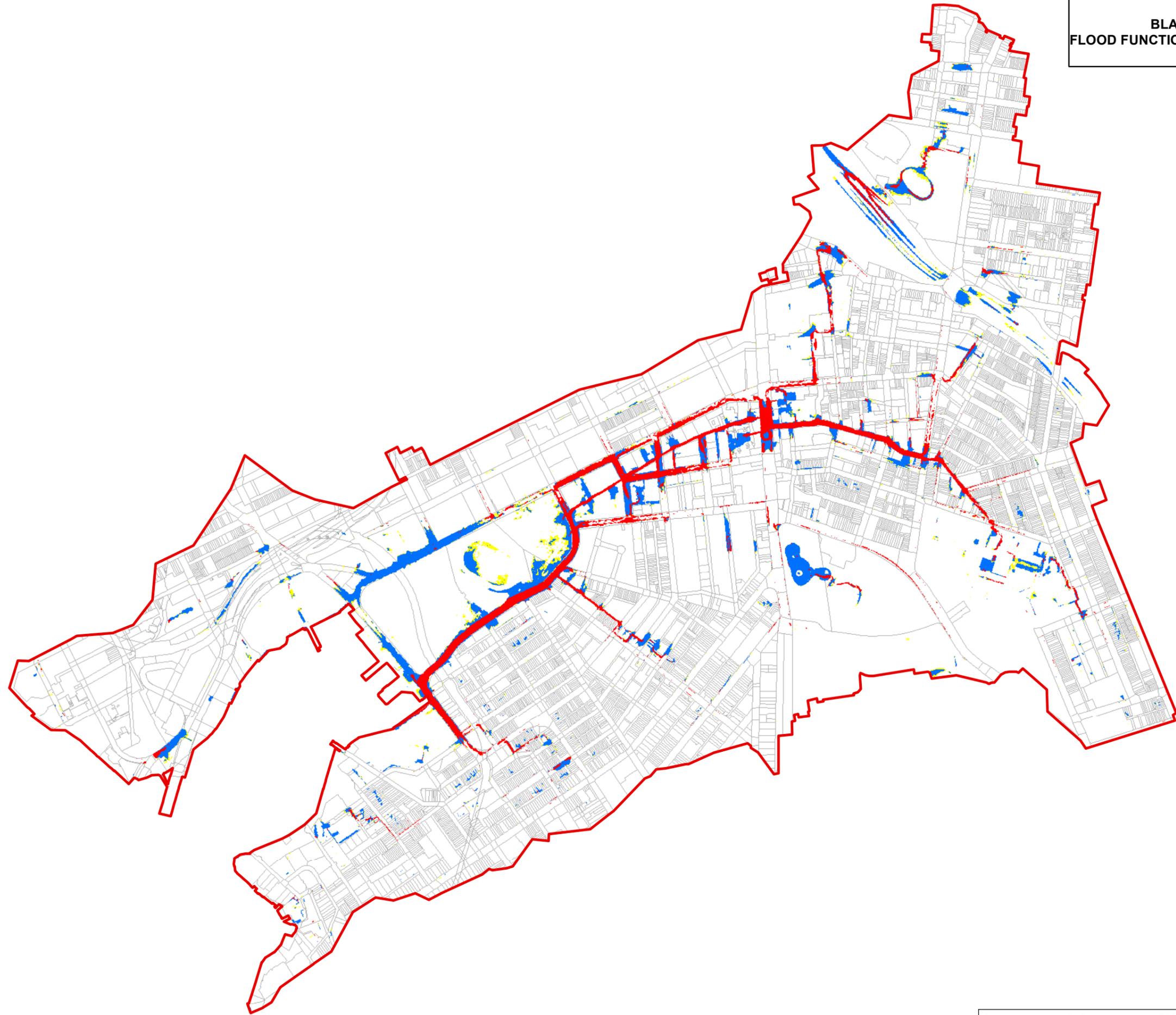


FIGURE C42  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
1% AEP EVENT



Legend:

- Study Area
- Flood Fringe
- Flood Storage
- Floodway

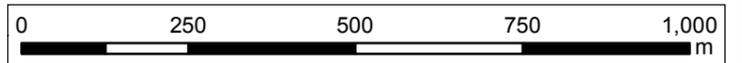
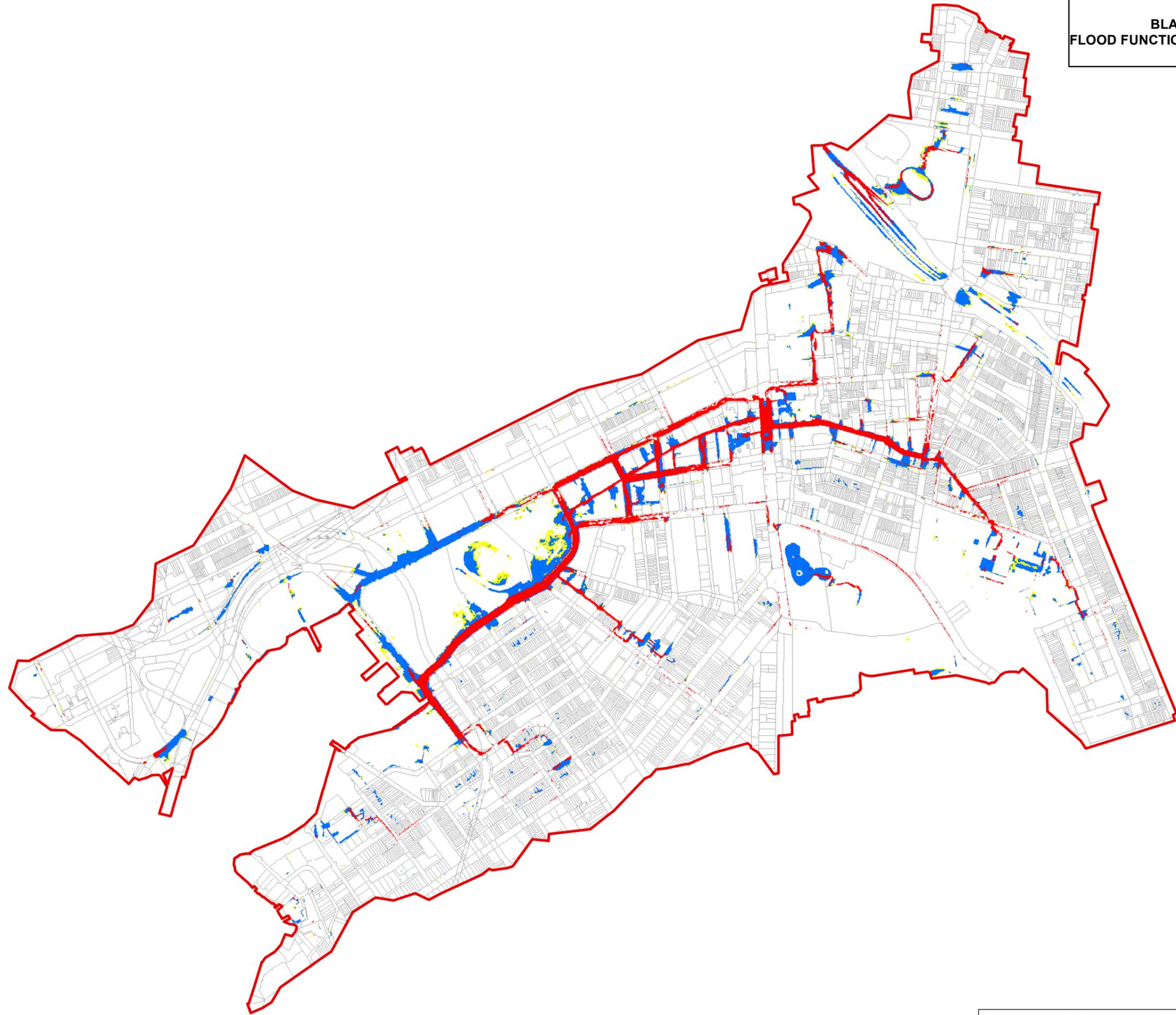


FIGURE C43  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
0.5% AEP EVENT



Legend:

- Study Area
- Flood Fringe
- Flood Storage
- Floodway

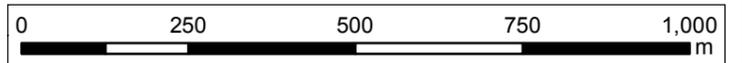
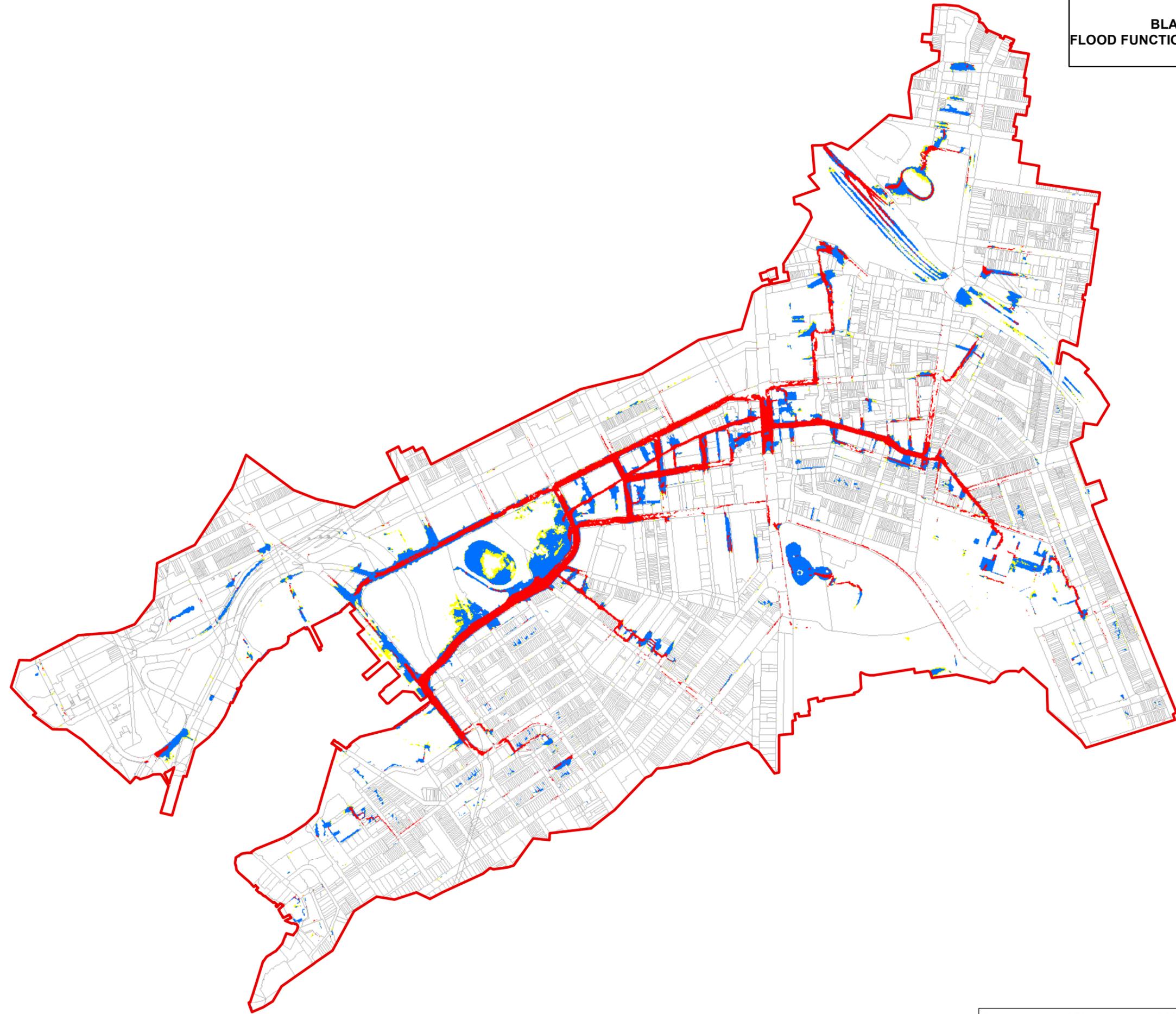


FIGURE C44  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
0.2% AEP EVENT



- Study Area
- Flood Fringe
- Flood Storage
- Floodway

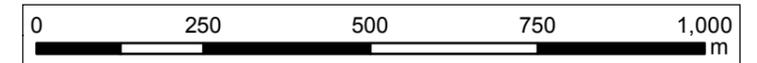
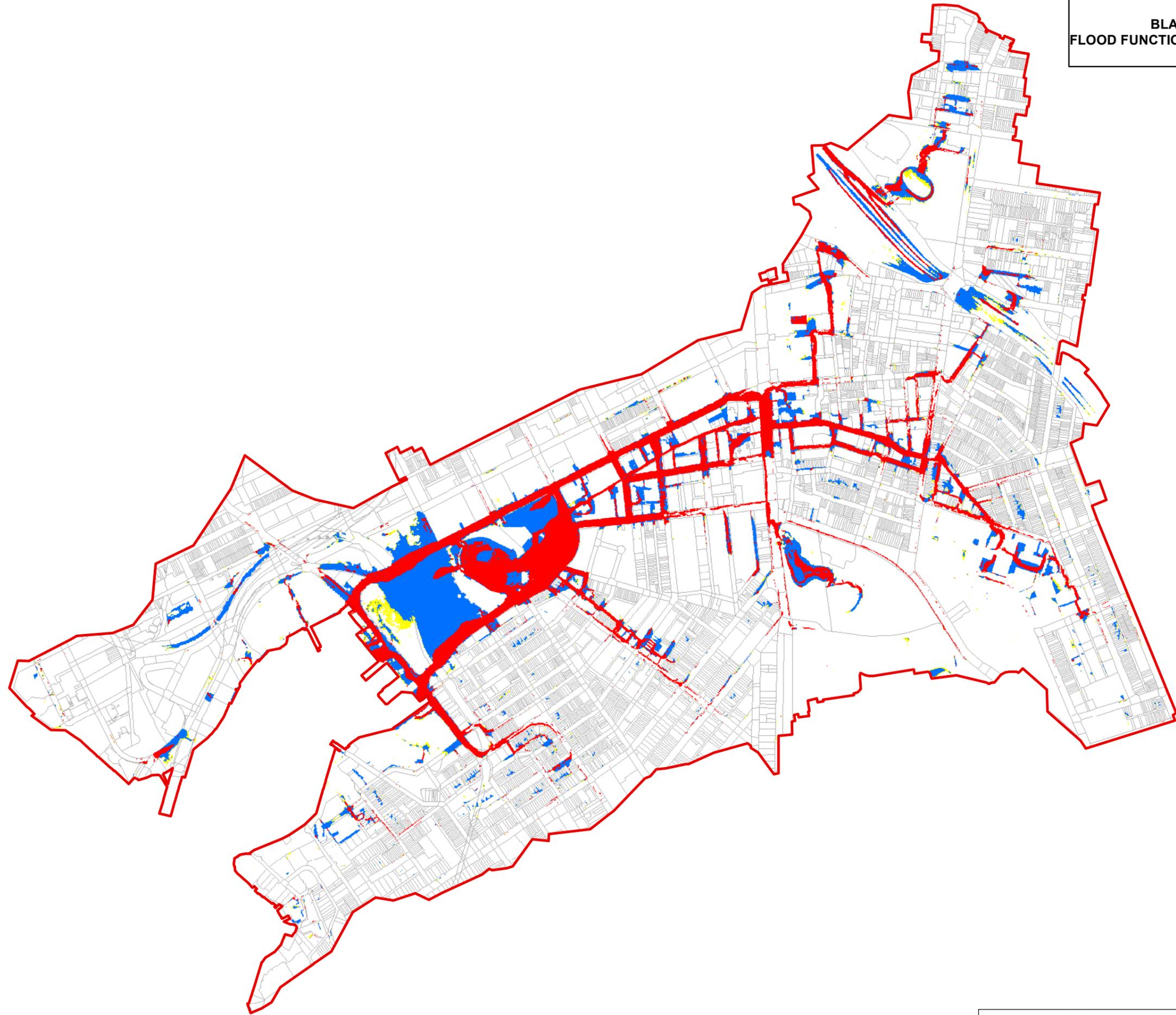
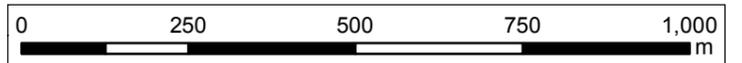


FIGURE C45  
BLACKWATTLE BAY CATCHMENT  
FLOOD FUNCTION (HYDRAULIC CATEGORIES)  
PMF EVENT



North Arrow

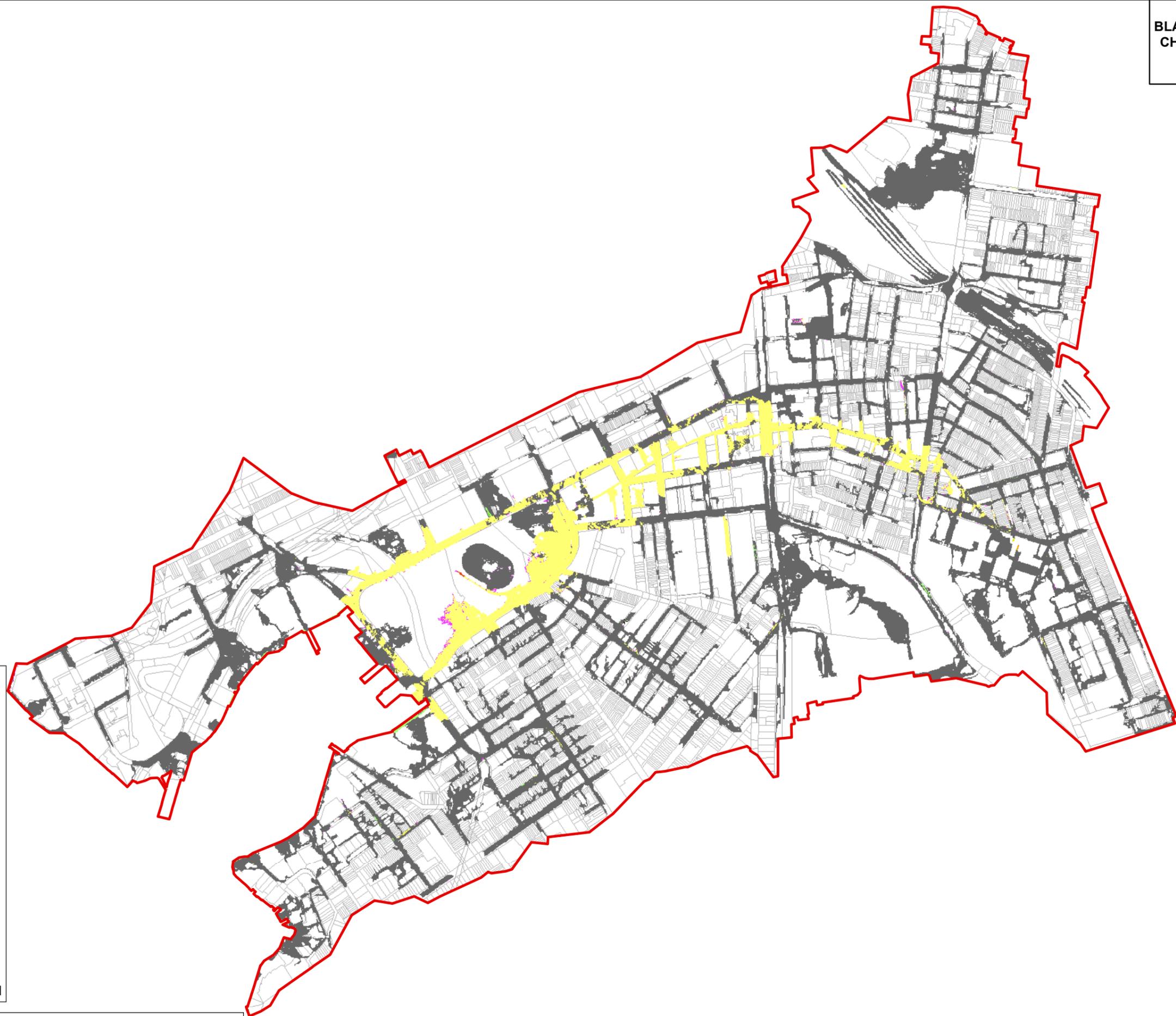
- Study Area
- Flood Fringe
- Flood Storage
- Floodway



## APPENDIX D. Model Sensitivity Mapping



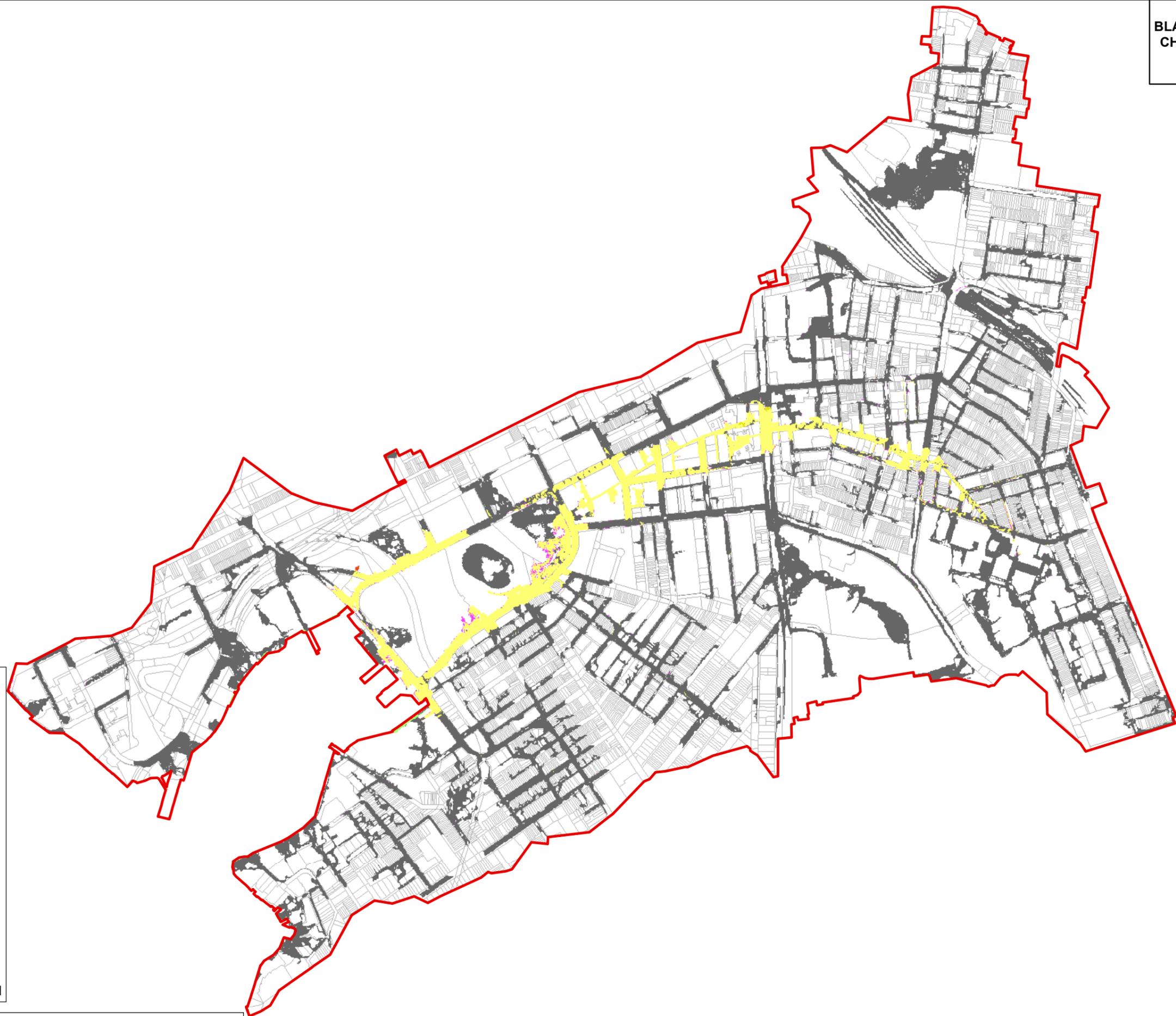
FIGURE D1  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PIPE BLOCKED 10%  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D2  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PIPE BLOCKED 10%  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

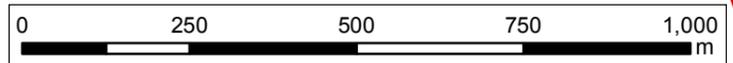
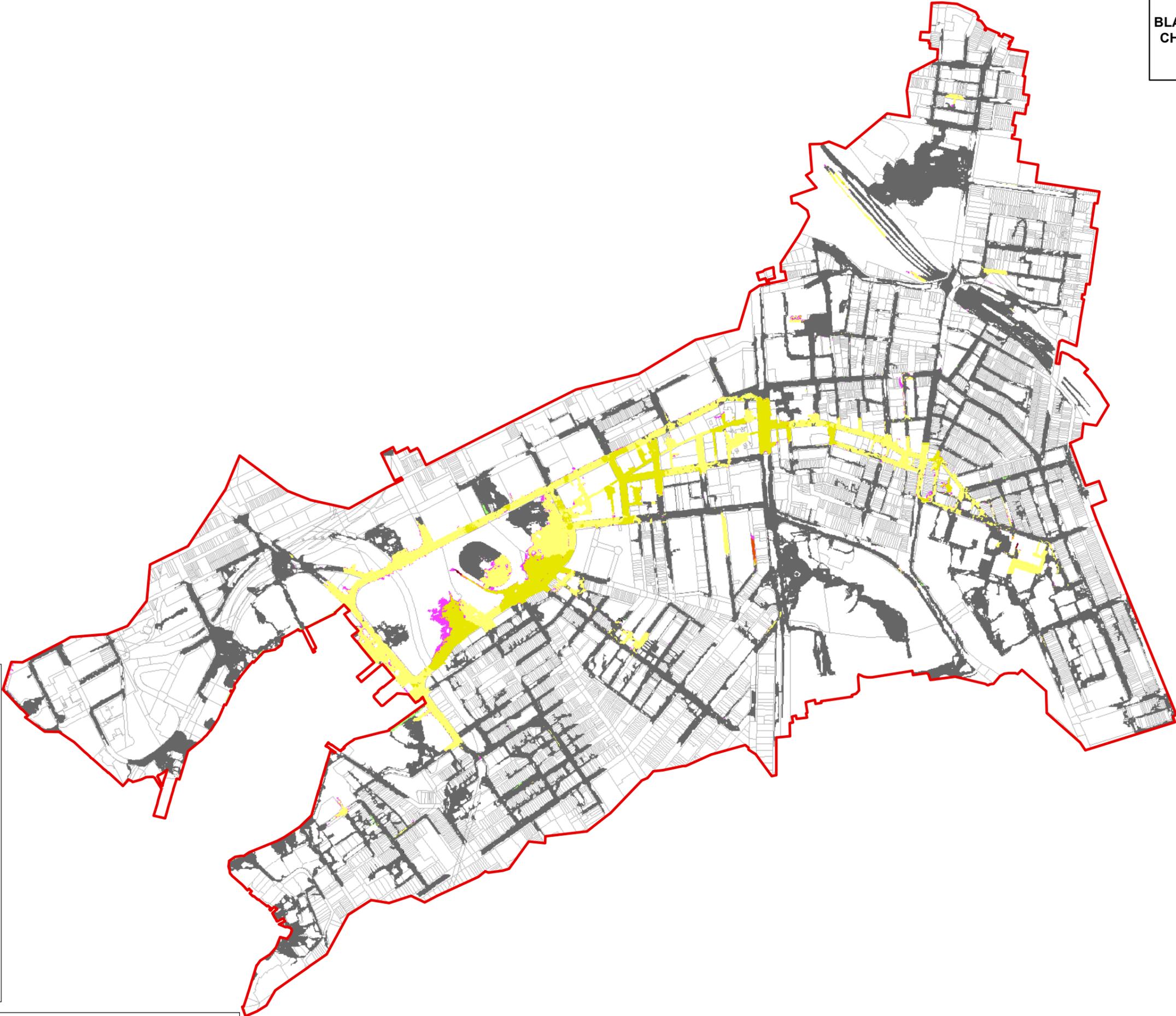


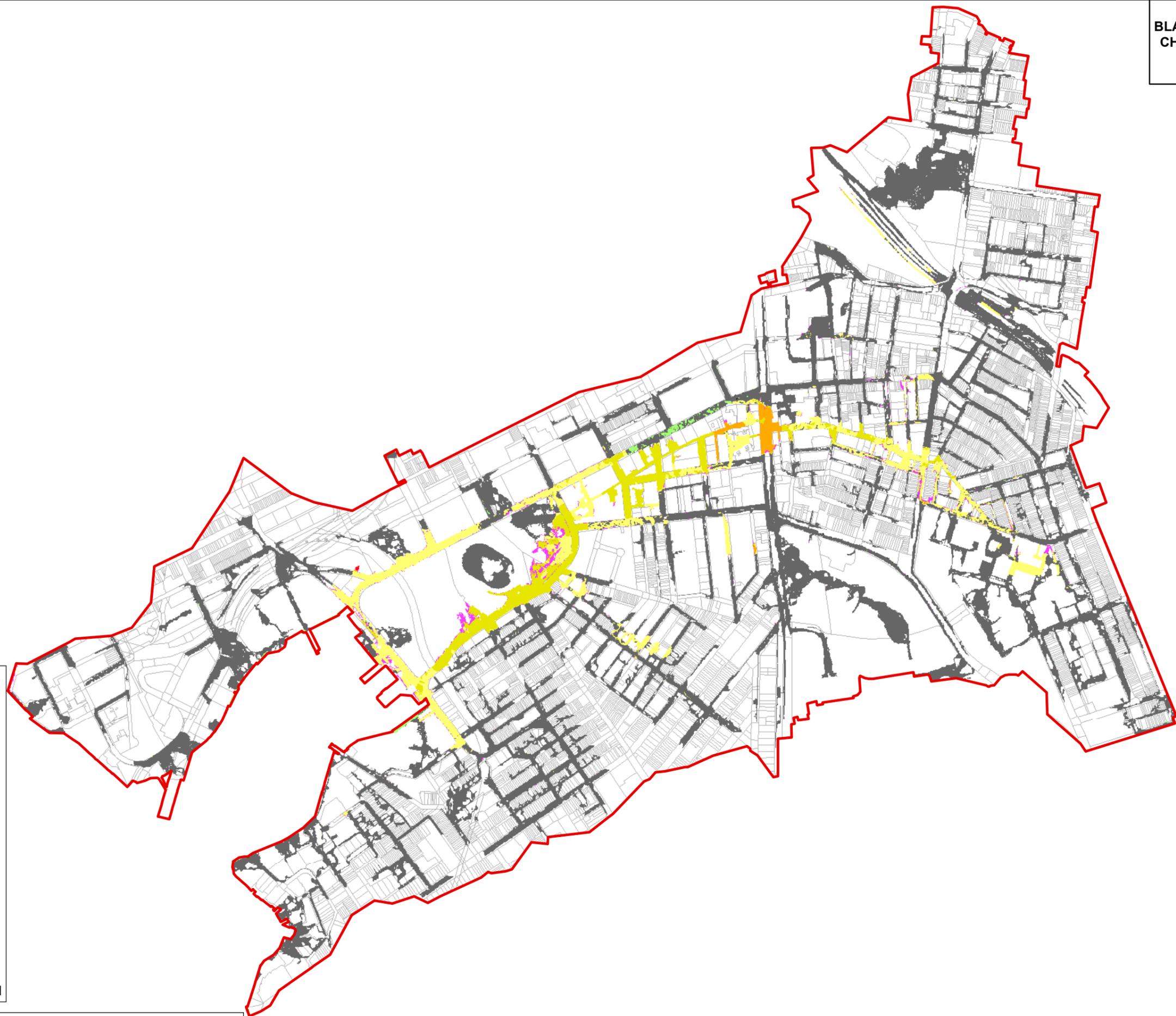
FIGURE D3  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PIPE BLOCKED 25%  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D4  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PIPE BLOCKED 25%  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
  - Newly Flooded
  - No Longer Flooded

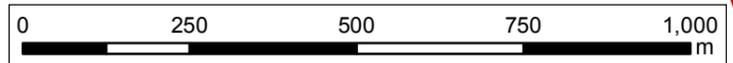
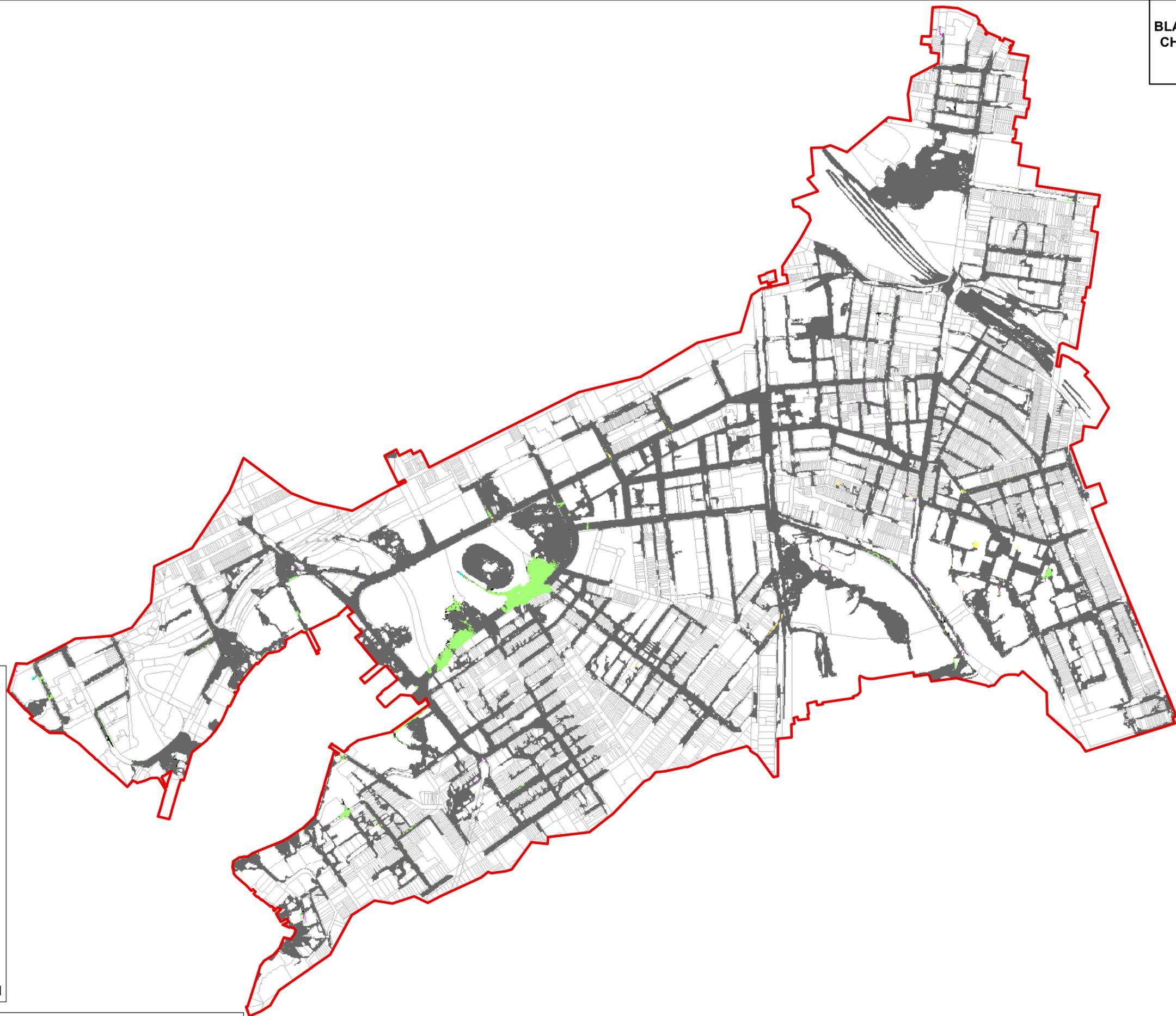


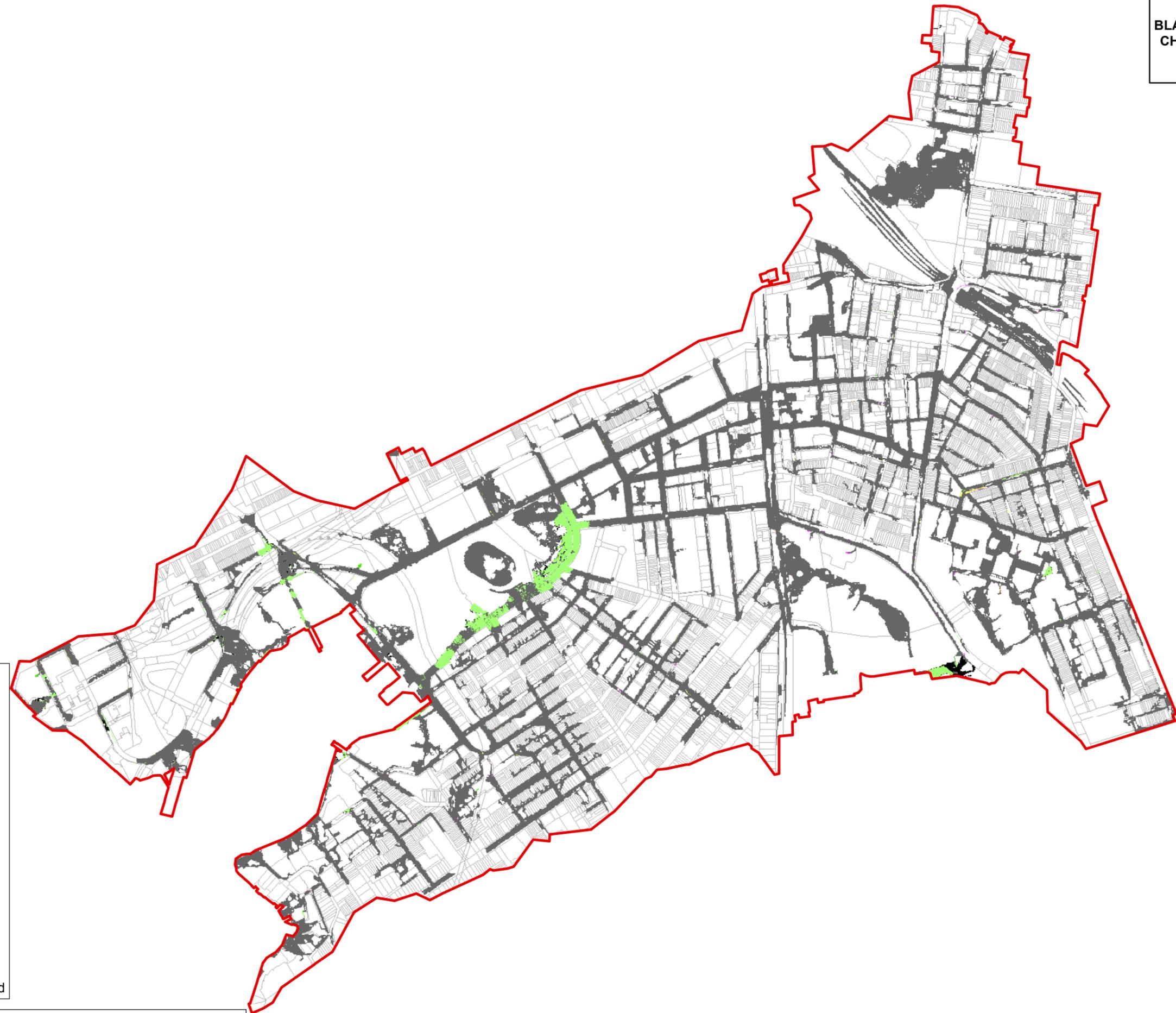
FIGURE D5  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PITS UNBLOCKED  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D6  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PITS UNBLOCKED  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

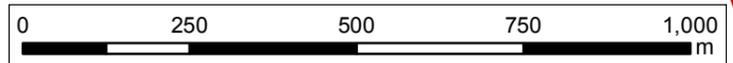
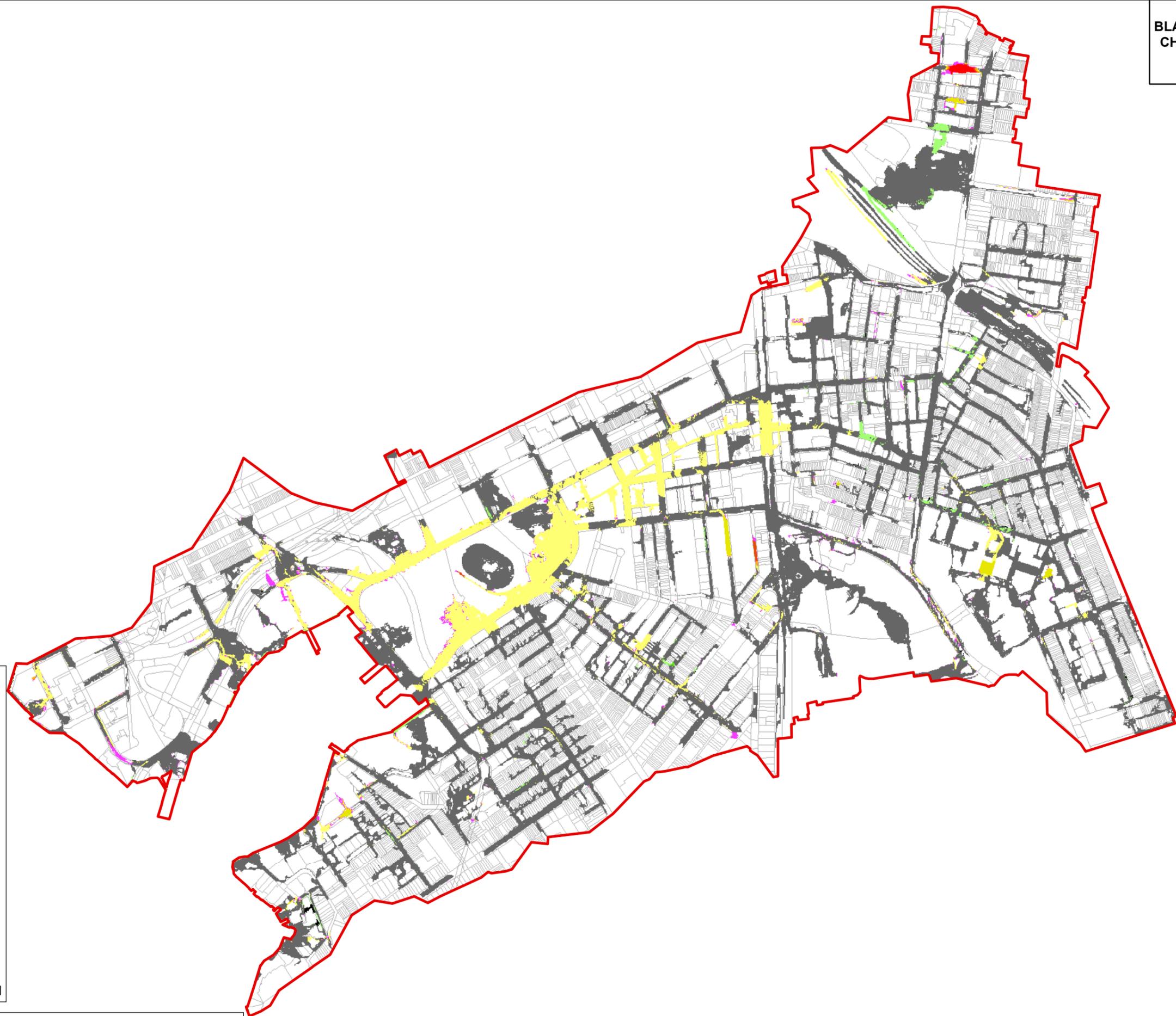


FIGURE D7  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PITS BLOCKAGE INCREASED  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

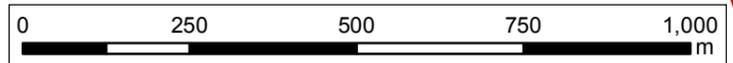
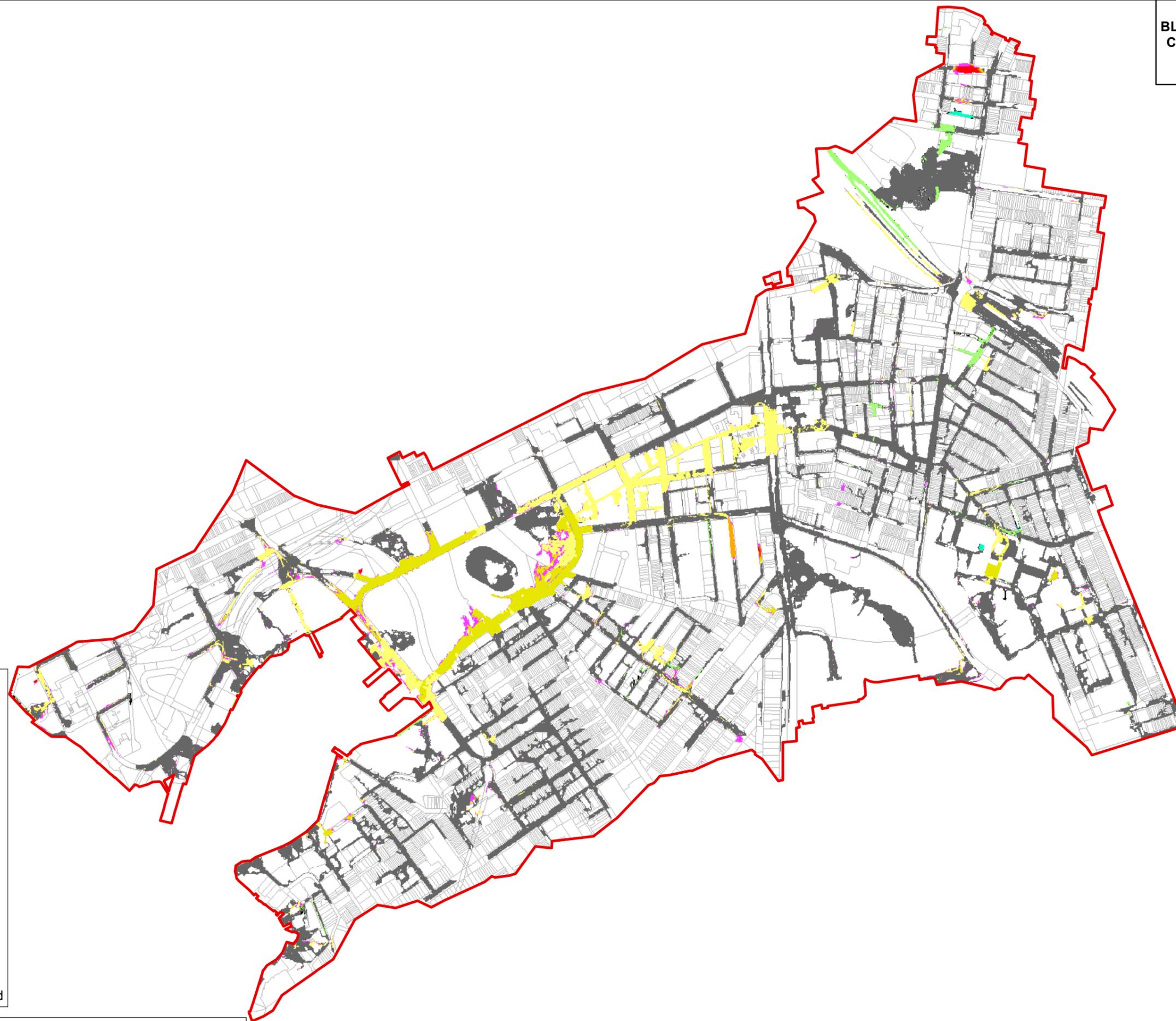


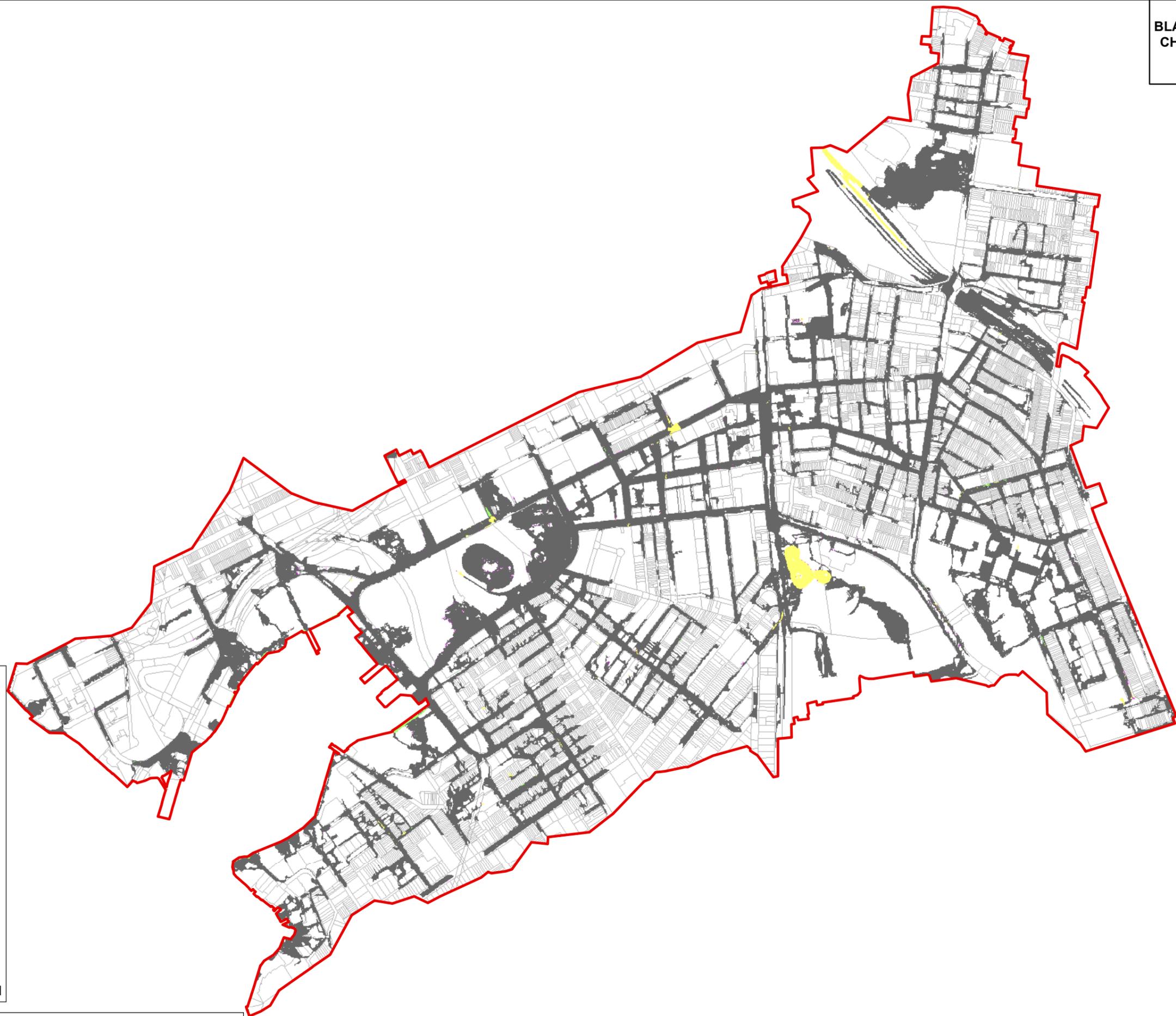
FIGURE D8  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
PITS BLOCKAGE INCREASED  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)**
- < -0.4
- 0.4 to -0.3
- 0.3 to -0.2
- 0.2 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded



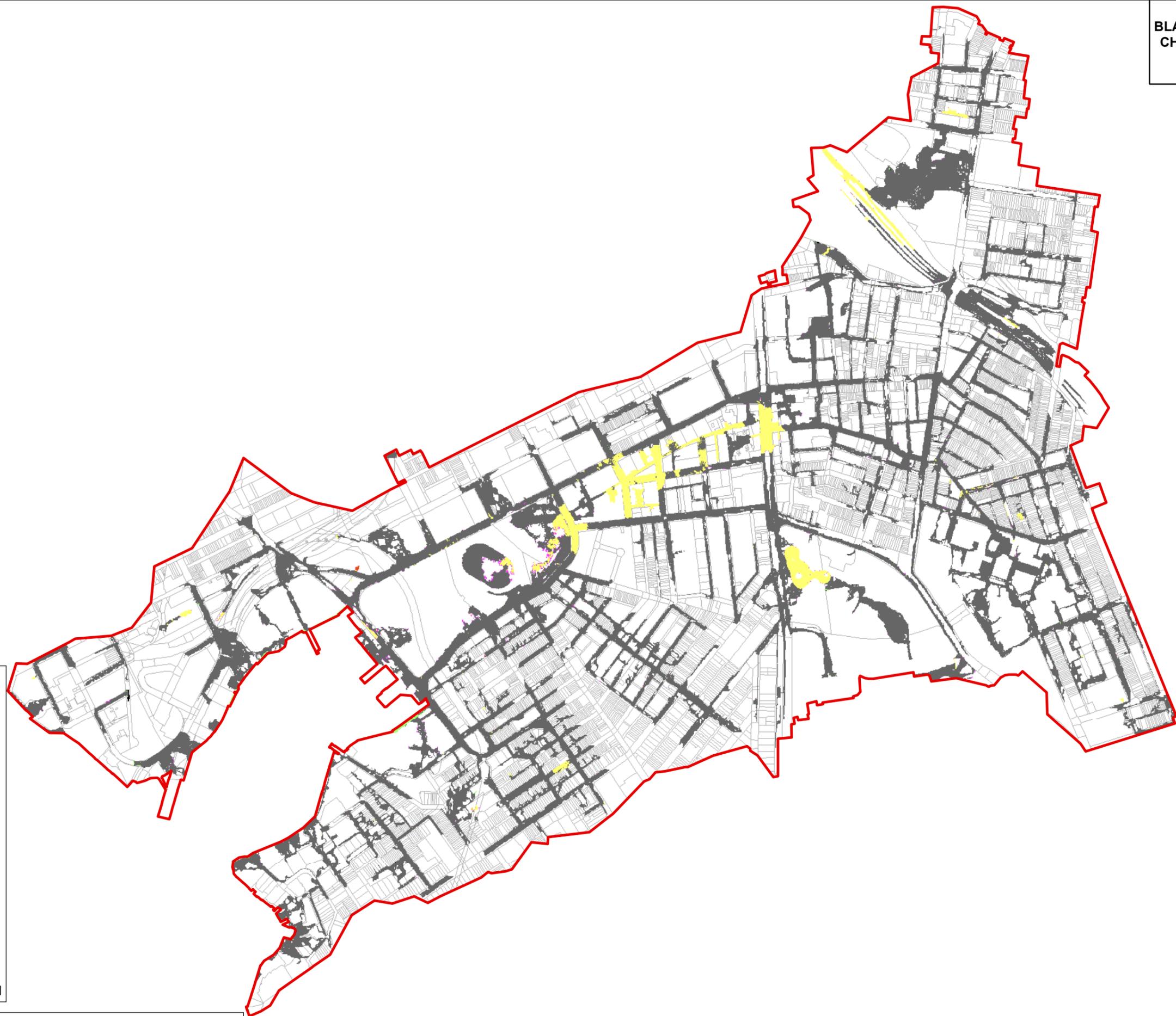
FIGURE D9  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
INITIAL LOSS - 50%  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D10  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
INITIAL LOSS - 50%  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
  - Newly Flooded
  - No Longer Flooded



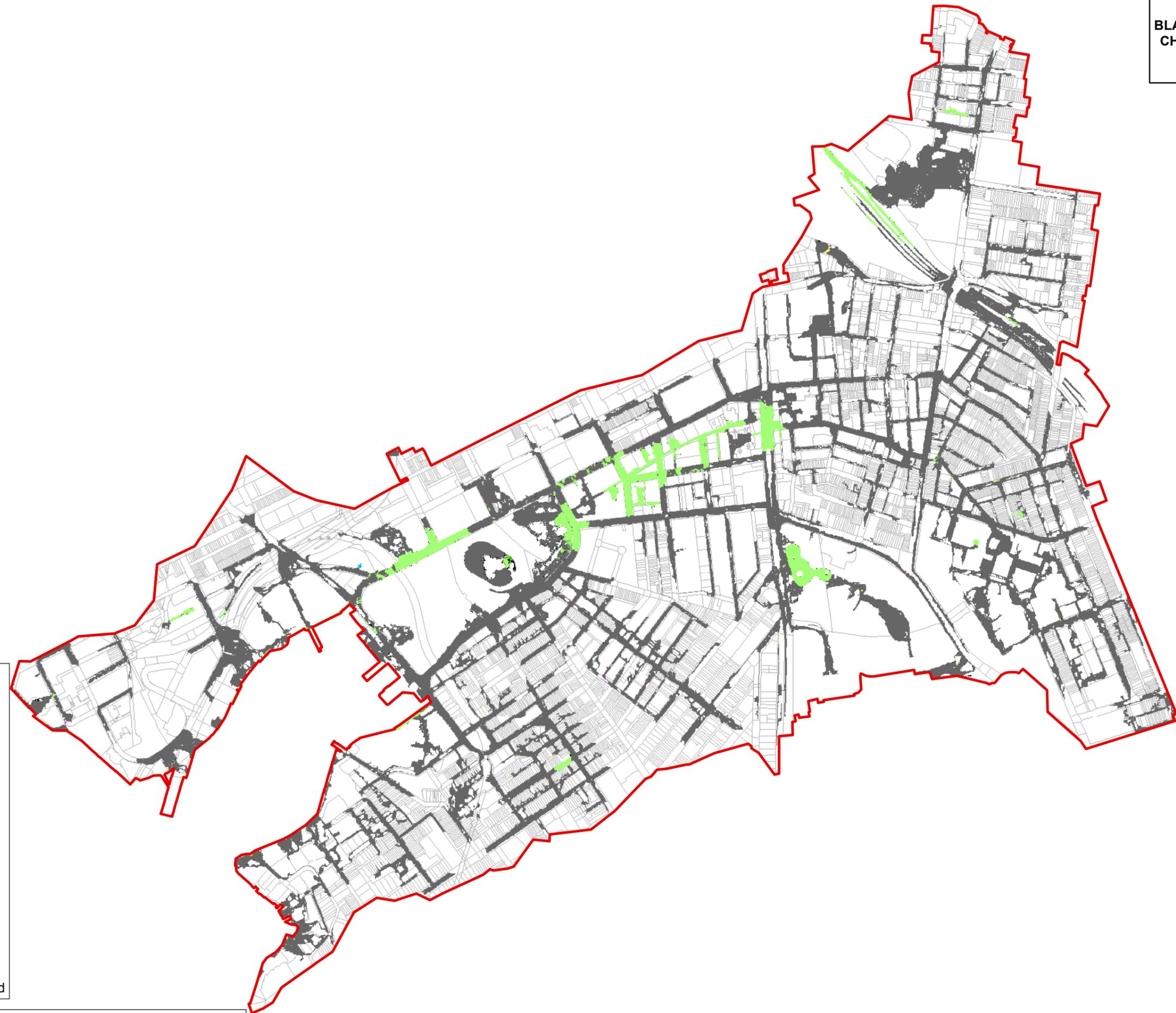
FIGURE D11  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
INITIAL LOSS + 50%  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



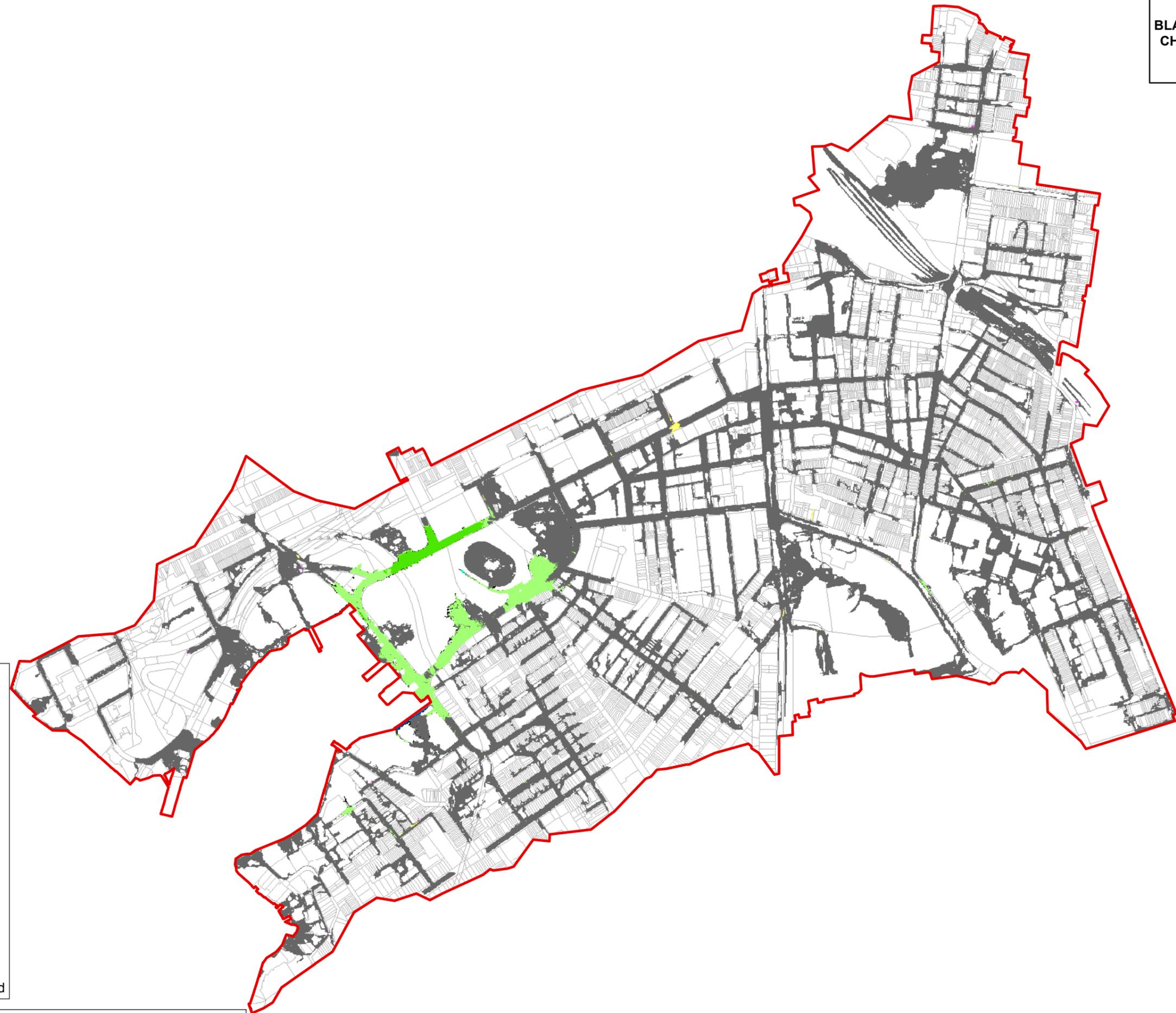
FIGURE D12  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
INITIAL LOSS + 50%  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D13  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
-0.5 M TO TAILWATER  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

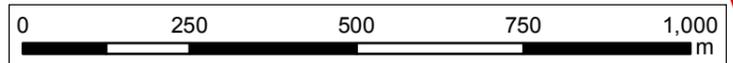
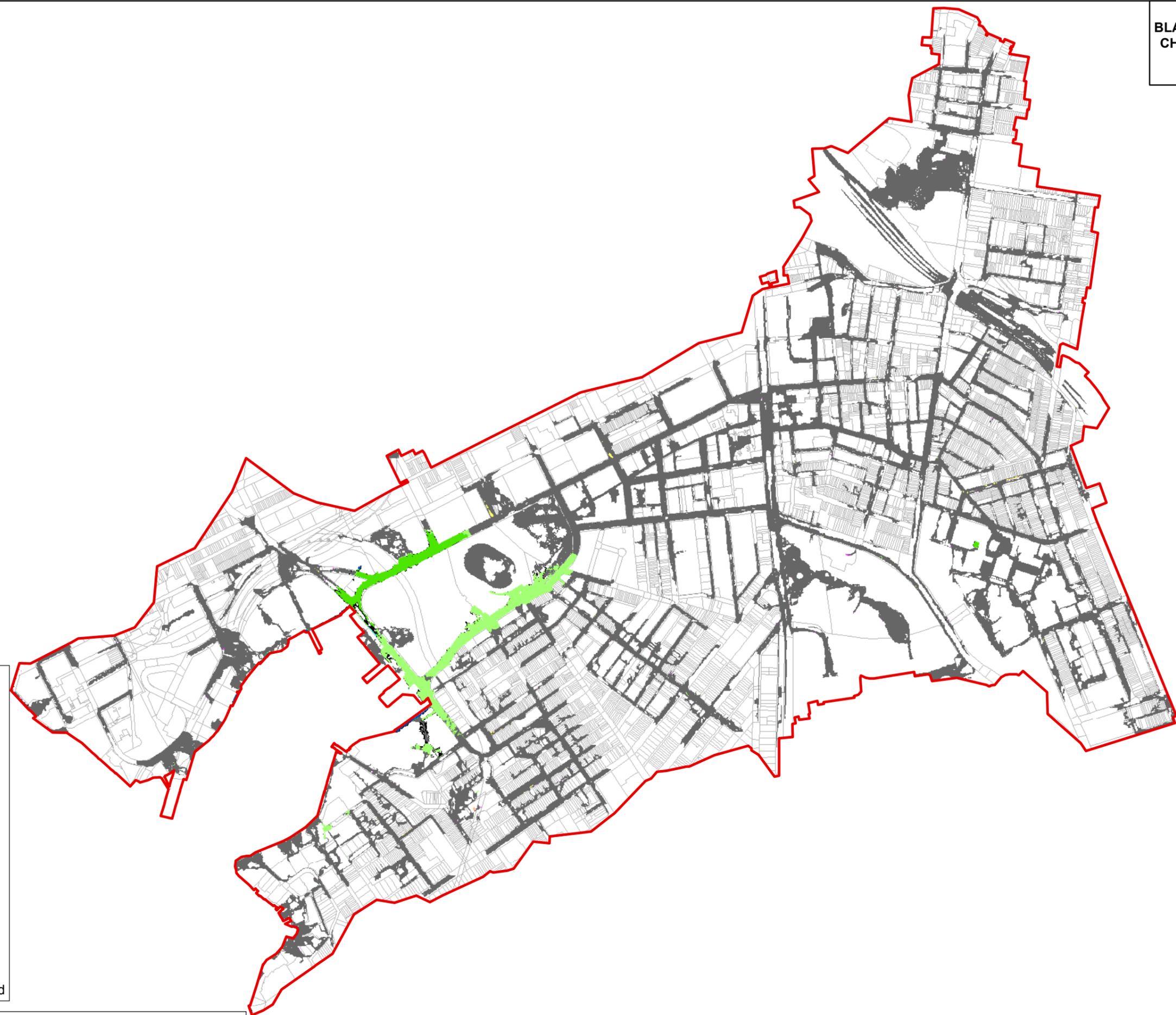


FIGURE D14  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
-0.5 M TO TAILWATER  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

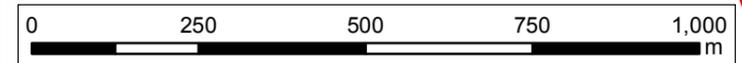
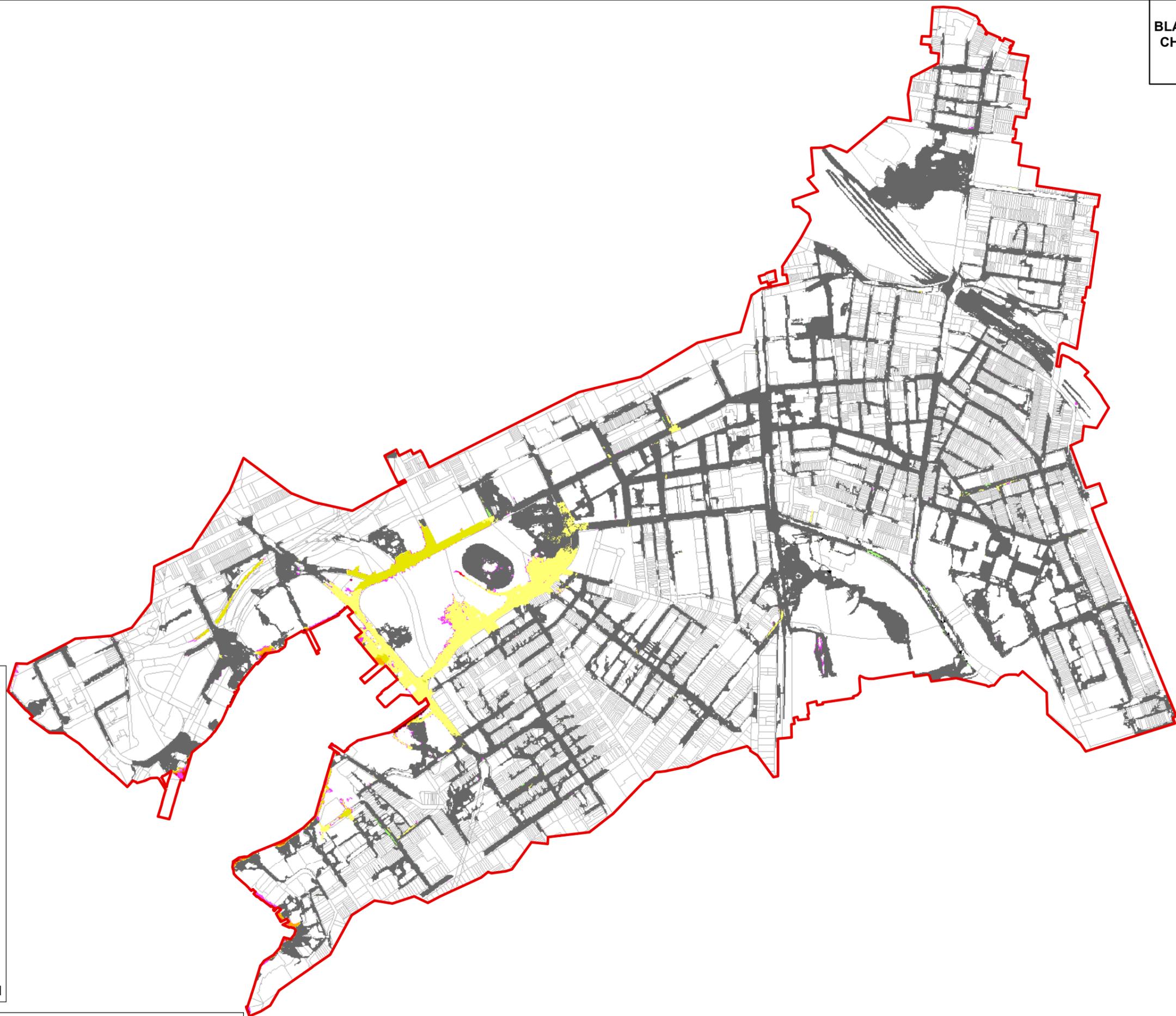


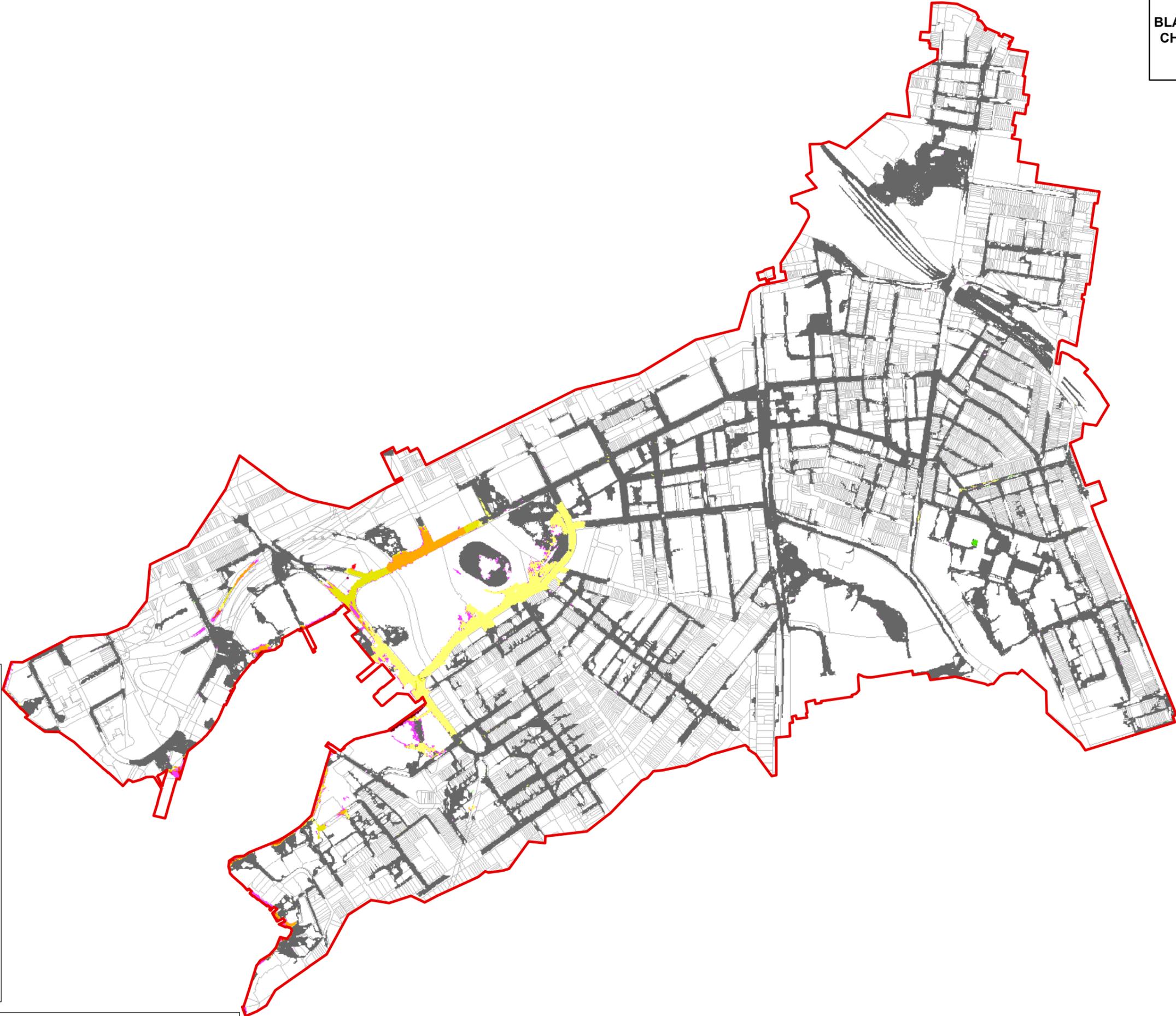
FIGURE D15  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
+0.5 M TO TAILWATER  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D16  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
+0.5 M TO TAILWATER  
5% AEP EVENT, AR&R 2019

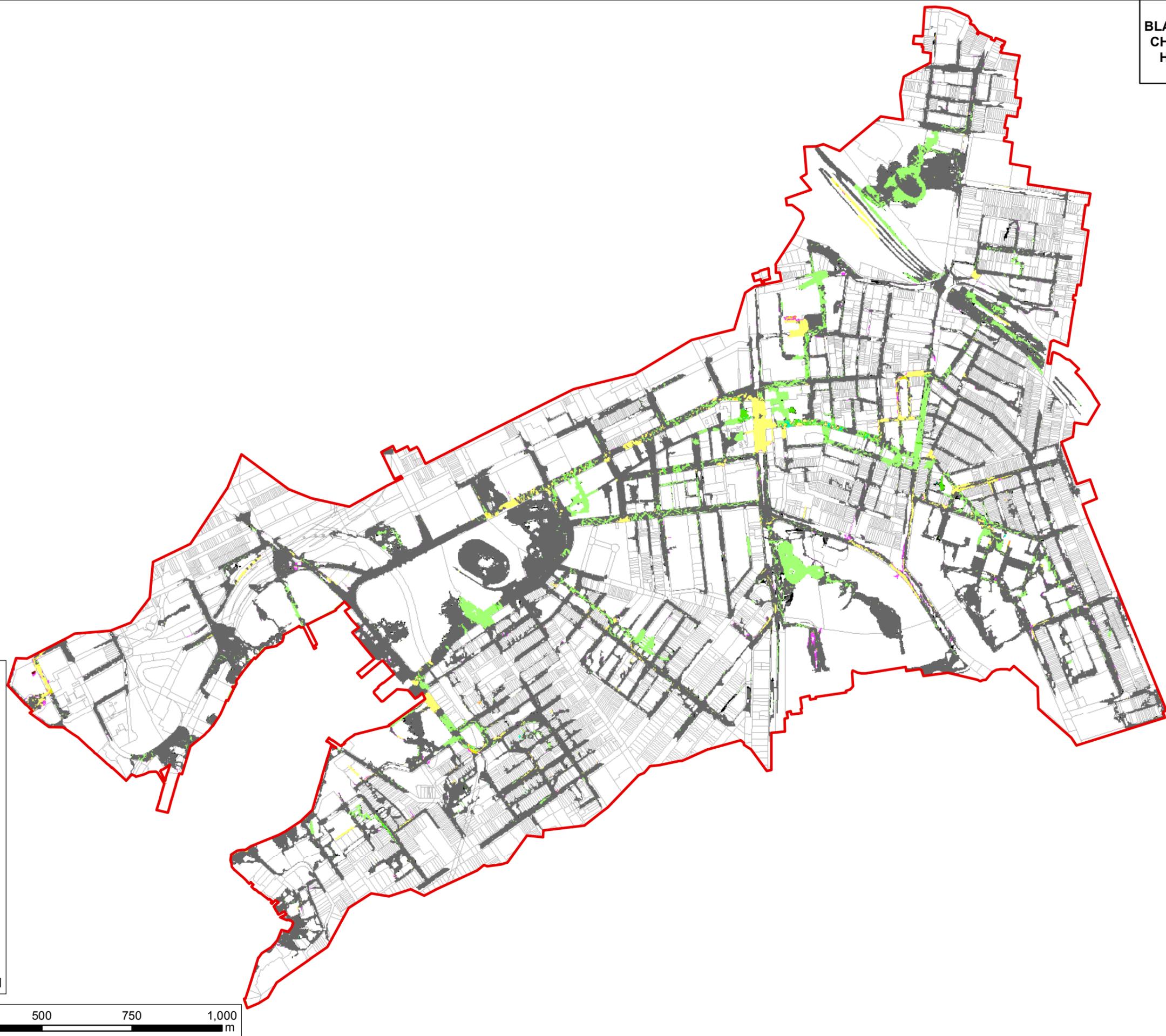


- ▭ Study Area
- Impact (m)**
- ▭ < -0.4
- ▭ -0.4 to -0.3
- ▭ -0.3 to -0.2
- ▭ -0.2 to -0.1
- ▭ -0.1 to -0.05
- ▭ -0.05 to -0.01
- ▭ -0.01 to 0.01
- ▭ 0.01 to 0.05
- ▭ 0.05 to 0.1
- ▭ 0.1 to 0.2
- ▭ 0.2 to 0.3
- ▭ 0.3 to 0.4
- ▭ > 0.4
- ▭ Newly Flooded
- ▭ No Longer Flooded



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FIGURE D17  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
HYDRAULIC ROUGHNESS -20%  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

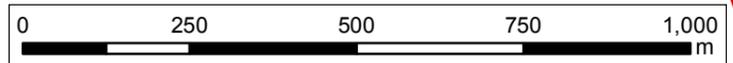
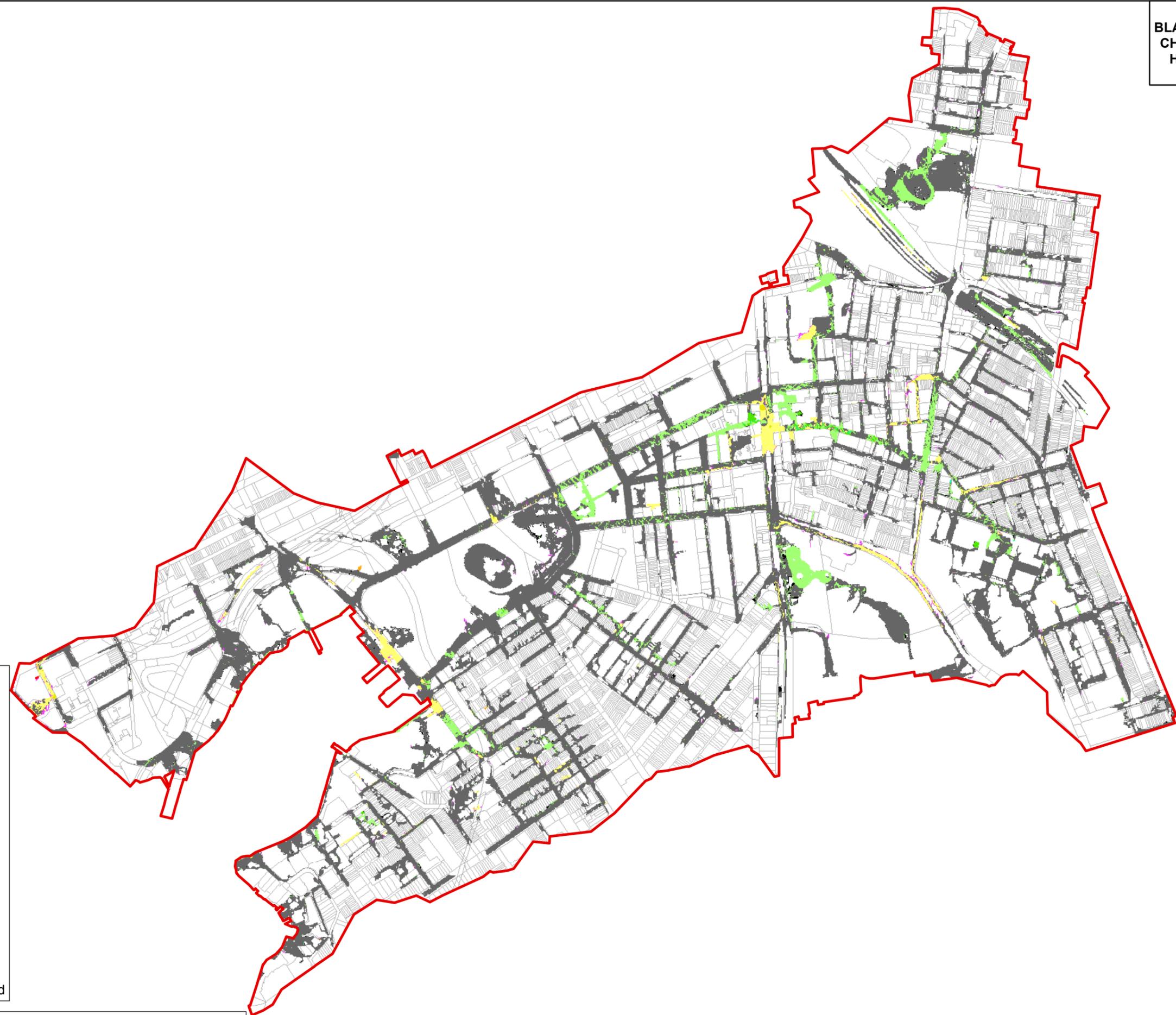
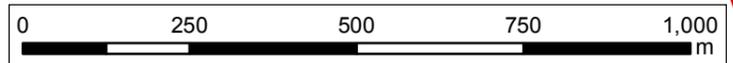


FIGURE D18  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
HYDRAULIC ROUGHNESS -20%  
5% AEP EVENT, AR&R 2019



- ▬ Study Area
- Impact (m)**
- ▬ < -0.4
- ▬ -0.4 to -0.3
- ▬ -0.3 to -0.2
- ▬ -0.2 to -0.1
- ▬ -0.1 to -0.05
- ▬ -0.05 to -0.01
- ▬ -0.01 to 0.01
- ▬ 0.01 to 0.05
- ▬ 0.05 to 0.1
- ▬ 0.1 to 0.2
- ▬ 0.2 to 0.3
- ▬ 0.3 to 0.4
- ▬ > 0.4
- ▬ Newly Flooded
- ▬ No Longer Flooded



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FIGURE D19  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
HYDRAULIC ROUGHNESS +20%  
1% AEP EVENT, AR&R 2019

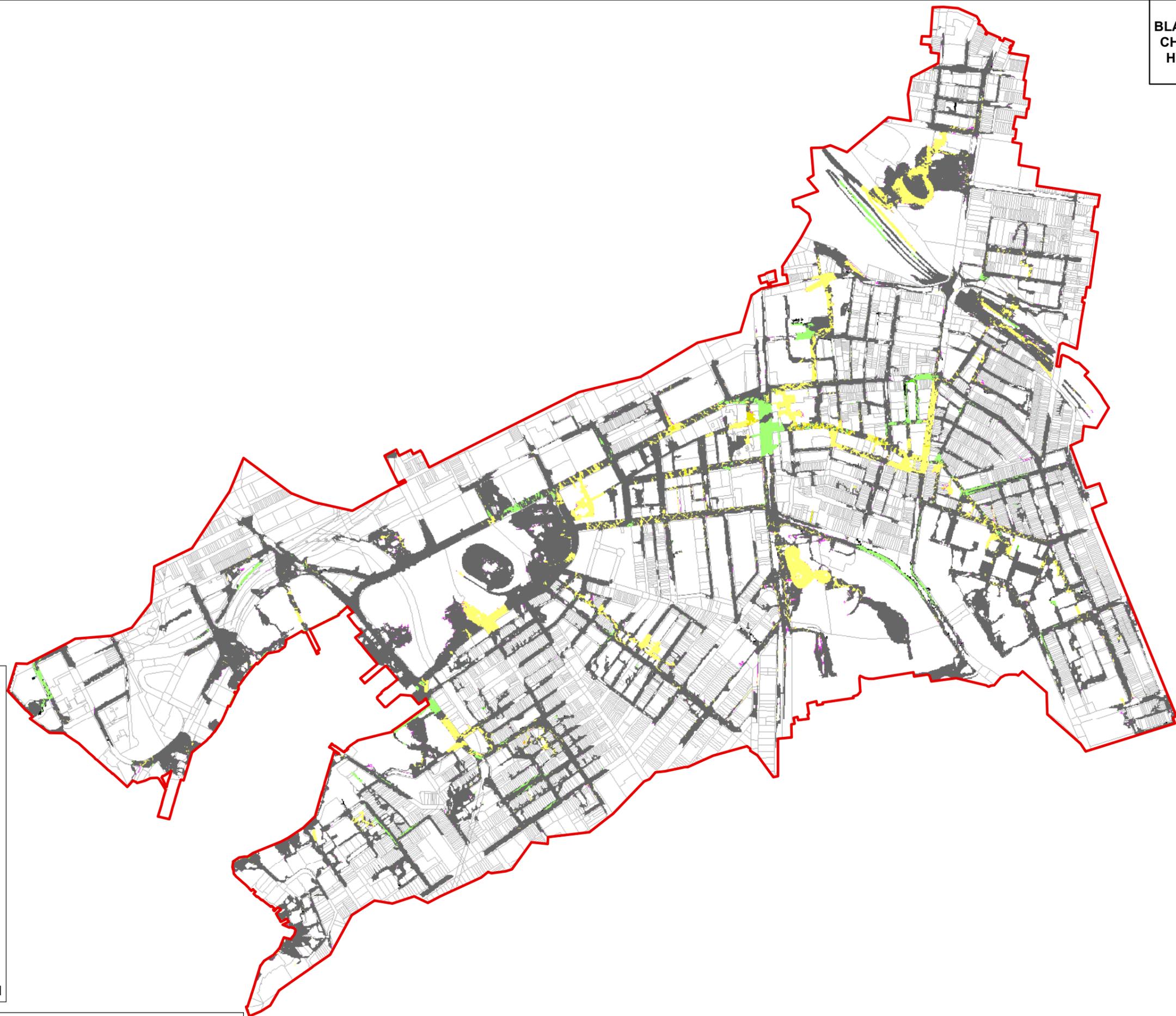
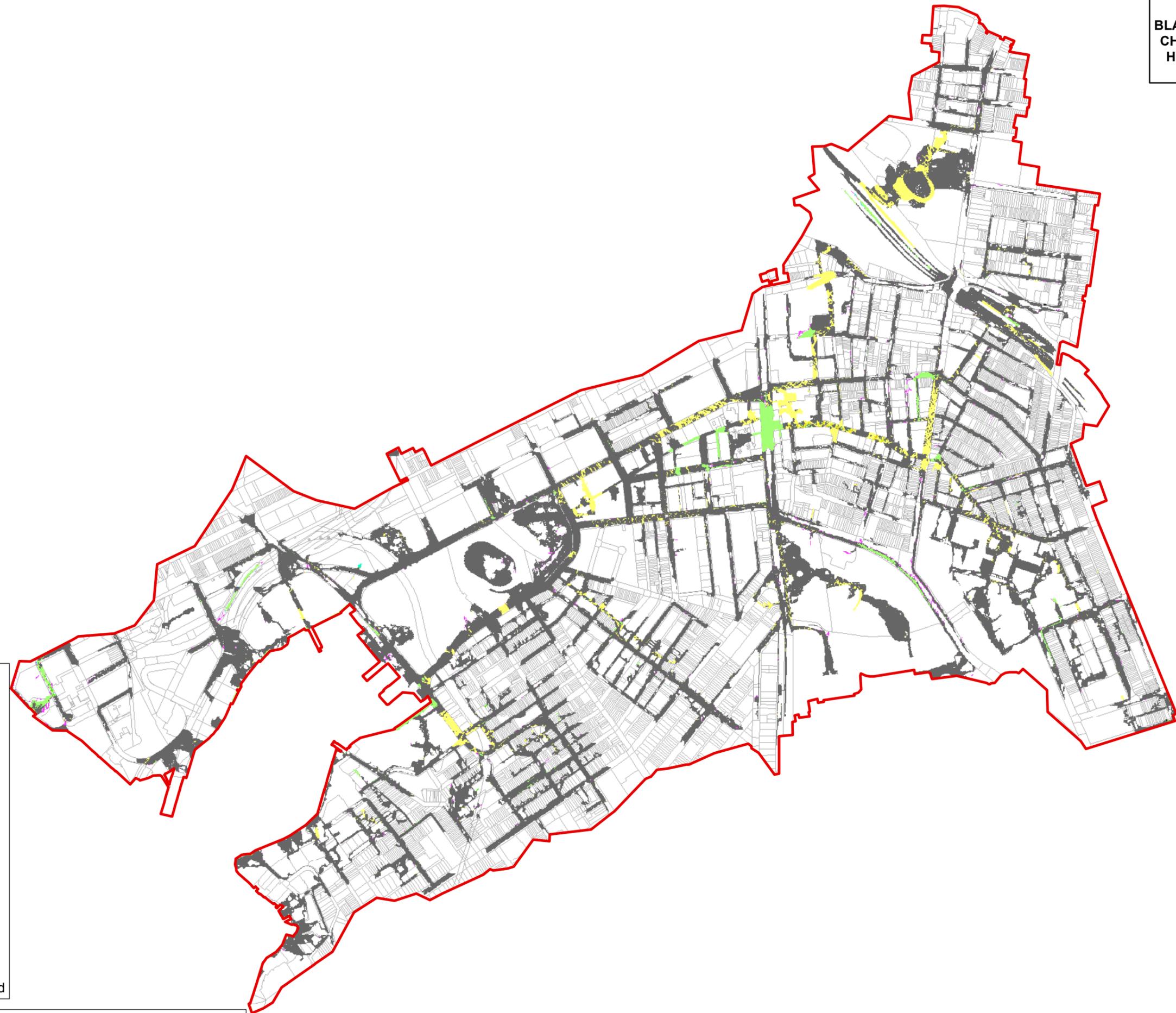


FIGURE D20  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
HYDRAULIC ROUGHNESS +20%  
5% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

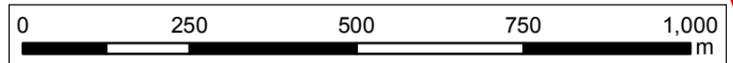
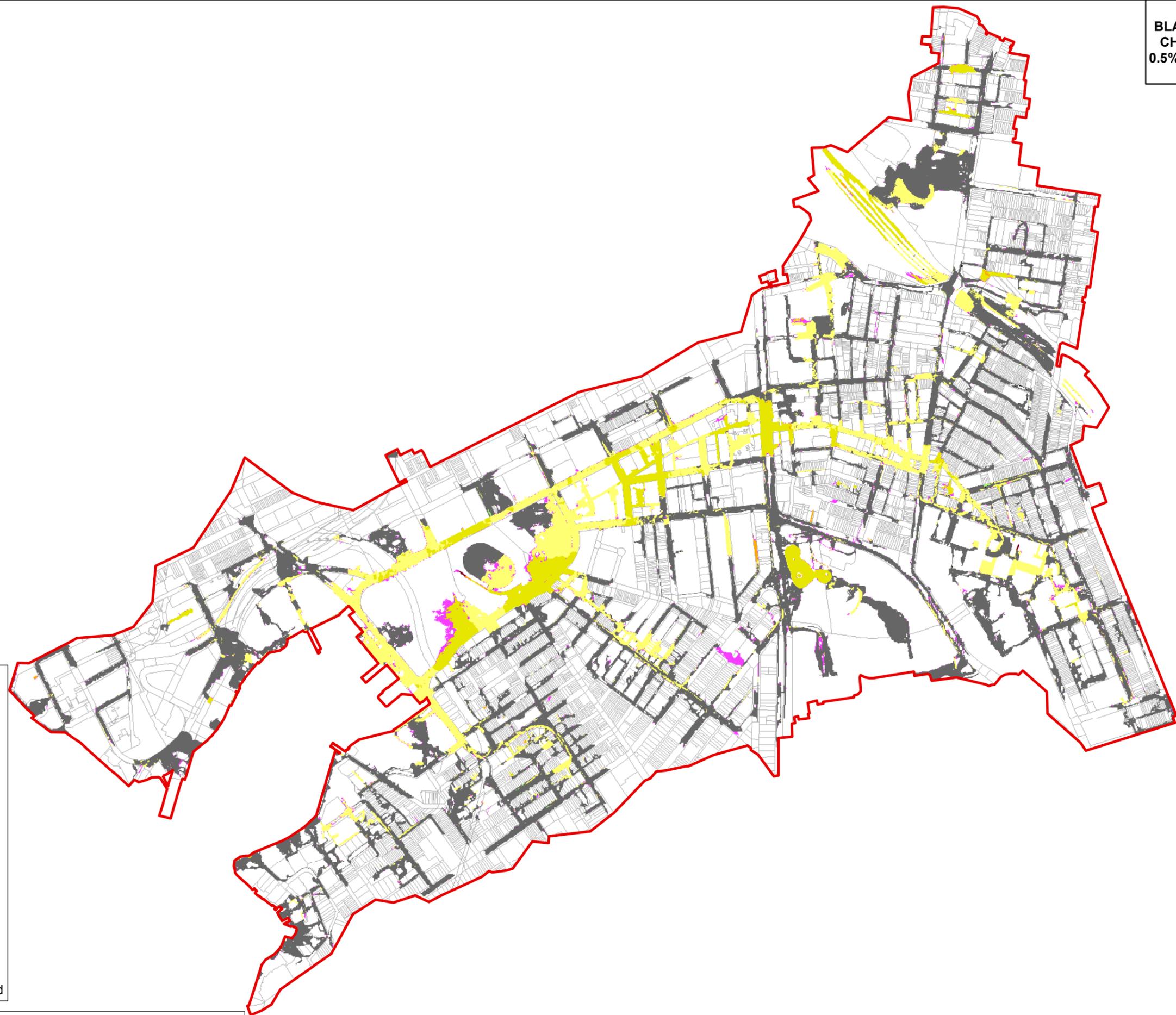


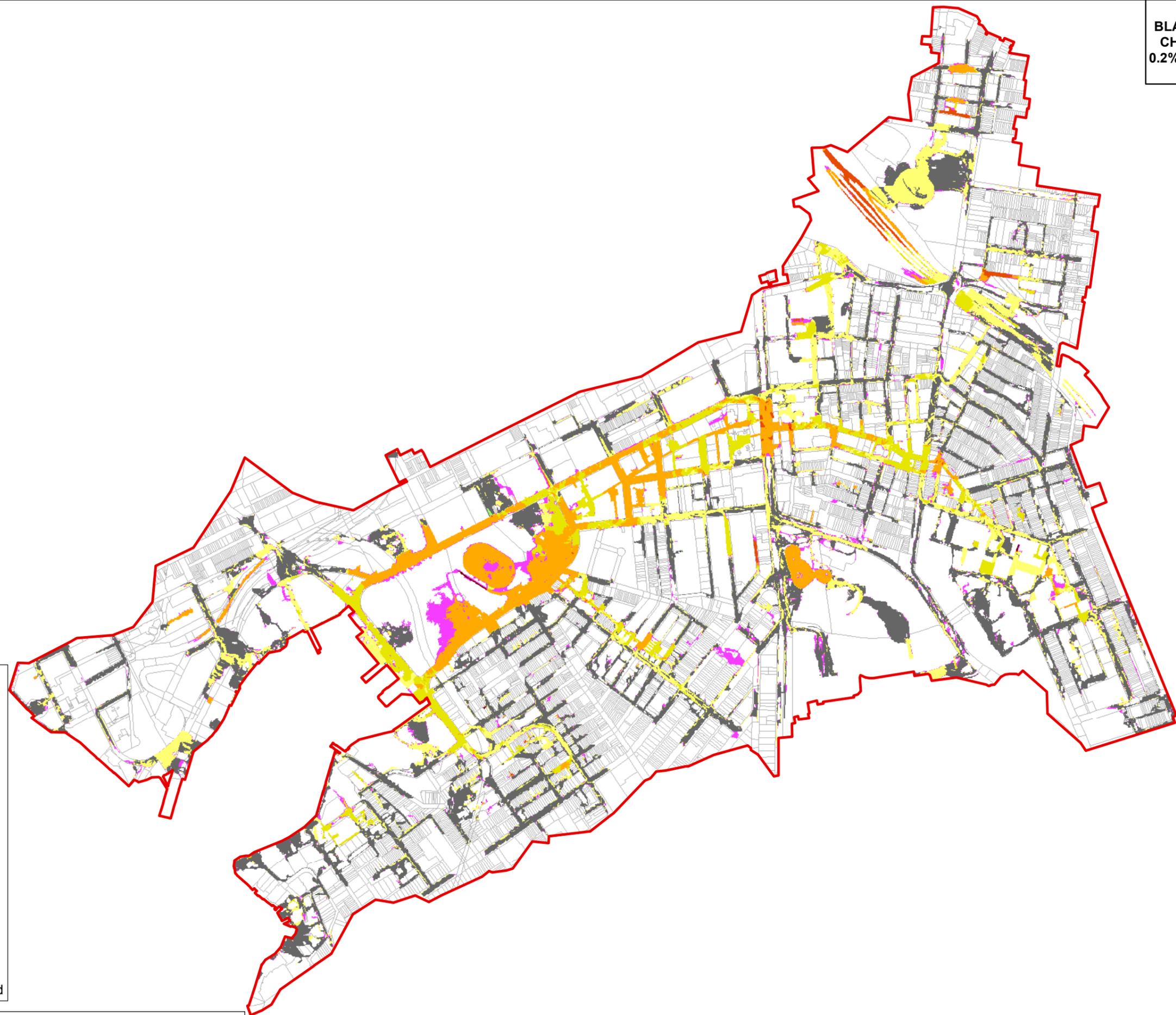
FIGURE D21  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
0.5% AEP EVENT V 1% AEP EVENT  
AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



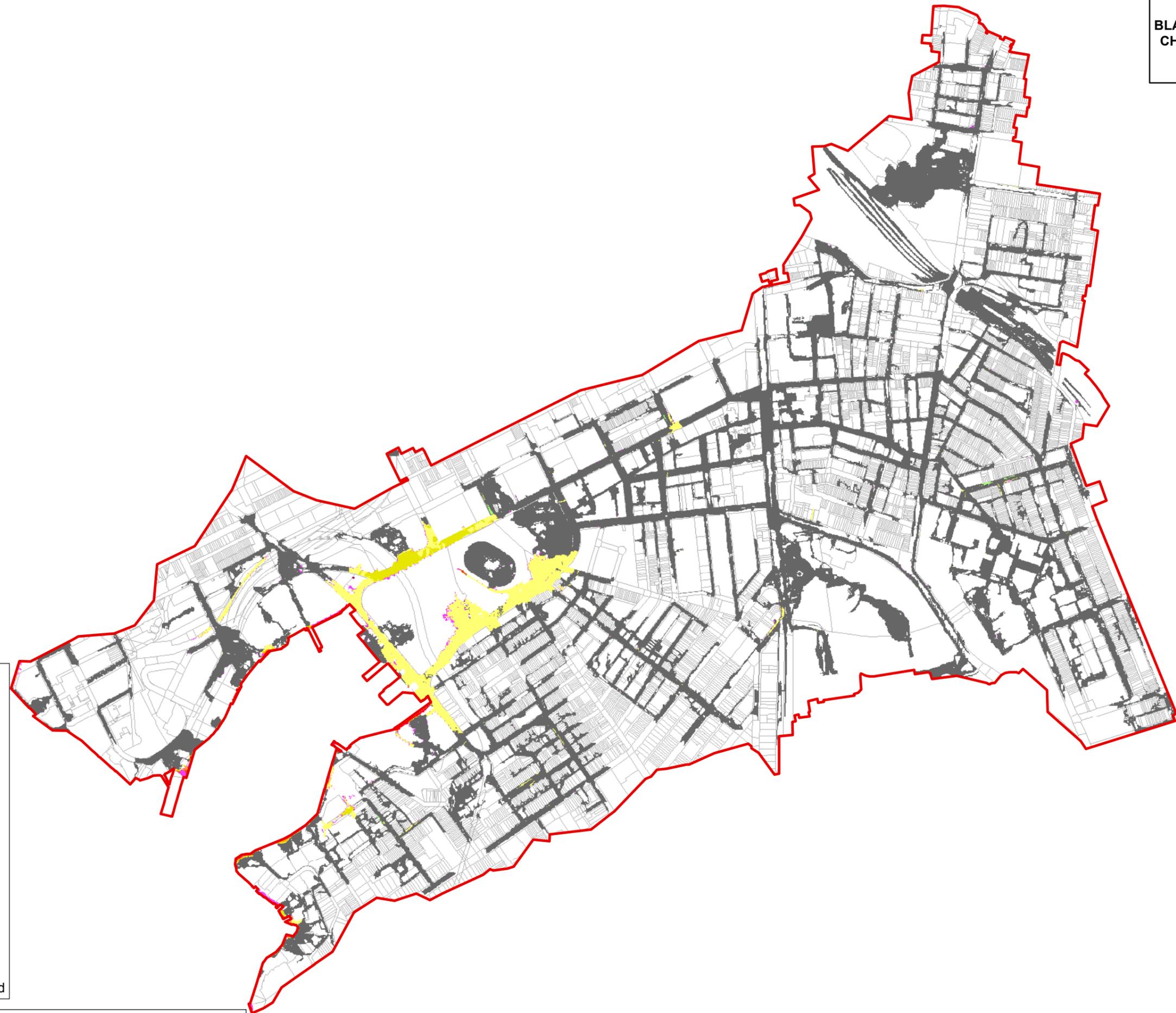
FIGURE D22  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
0.2% AEP EVENT V 1% AEP EVENT  
AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded



FIGURE D23  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
SEA LEVEL RISE 2050  
1% AEP EVENT, AR&R 2019



- Study Area
- Impact (m)
  - < -0.4
  - 0.4 to -0.3
  - 0.3 to -0.2
  - 0.2 to -0.1
  - 0.1 to -0.05
  - 0.05 to -0.01
  - 0.01 to 0.01
  - 0.01 to 0.05
  - 0.05 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - > 0.4
- Newly Flooded
- No Longer Flooded

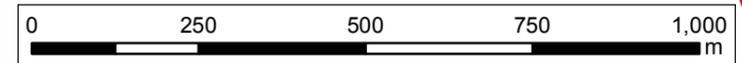
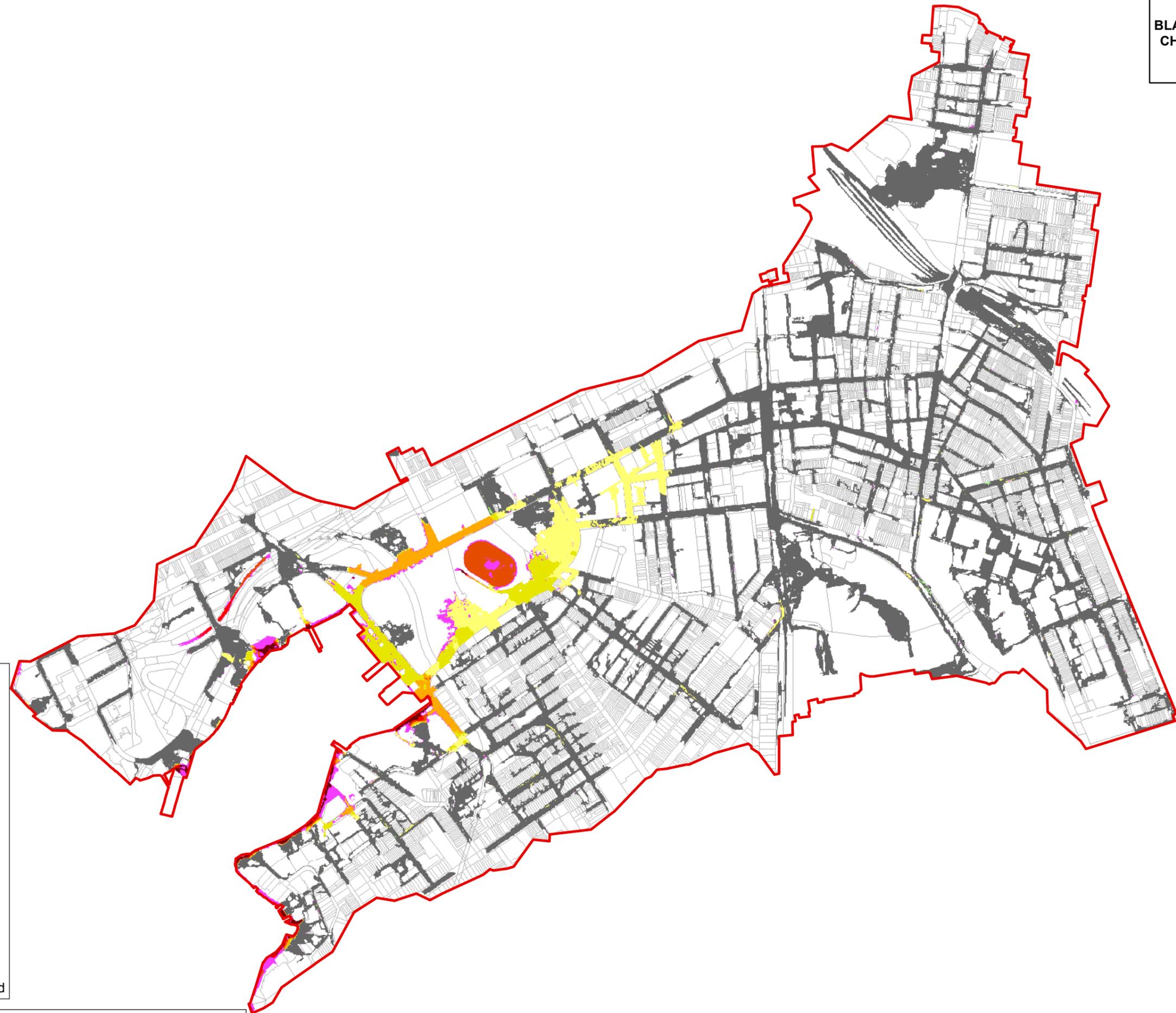


FIGURE D24  
BLACKWATTLE BAY CATCHMENT  
CHANGE IN PEAK FLOOD LEVEL  
SEA LEVEL RISE 2100  
1% AEP EVENT, AR&R 2019



- ▬ Study Area
- Impact (m)**
- < -0.4
- -0.4 to -0.3
- -0.3 to -0.2
- -0.2 to -0.1
- -0.1 to -0.05
- -0.05 to -0.01
- -0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- > 0.4
- Newly Flooded
- No Longer Flooded

