



**TARCUTTA, LADYSMITH AND URANQUINTY  
FLOOD STUDIES**

**DEVELOPMENT AND TESTING  
OF FLOOD MODELS**

**VOLUME 2 – FIGURES AND APPENDICES**

**FINAL REPORT**

**MARCH 2014**

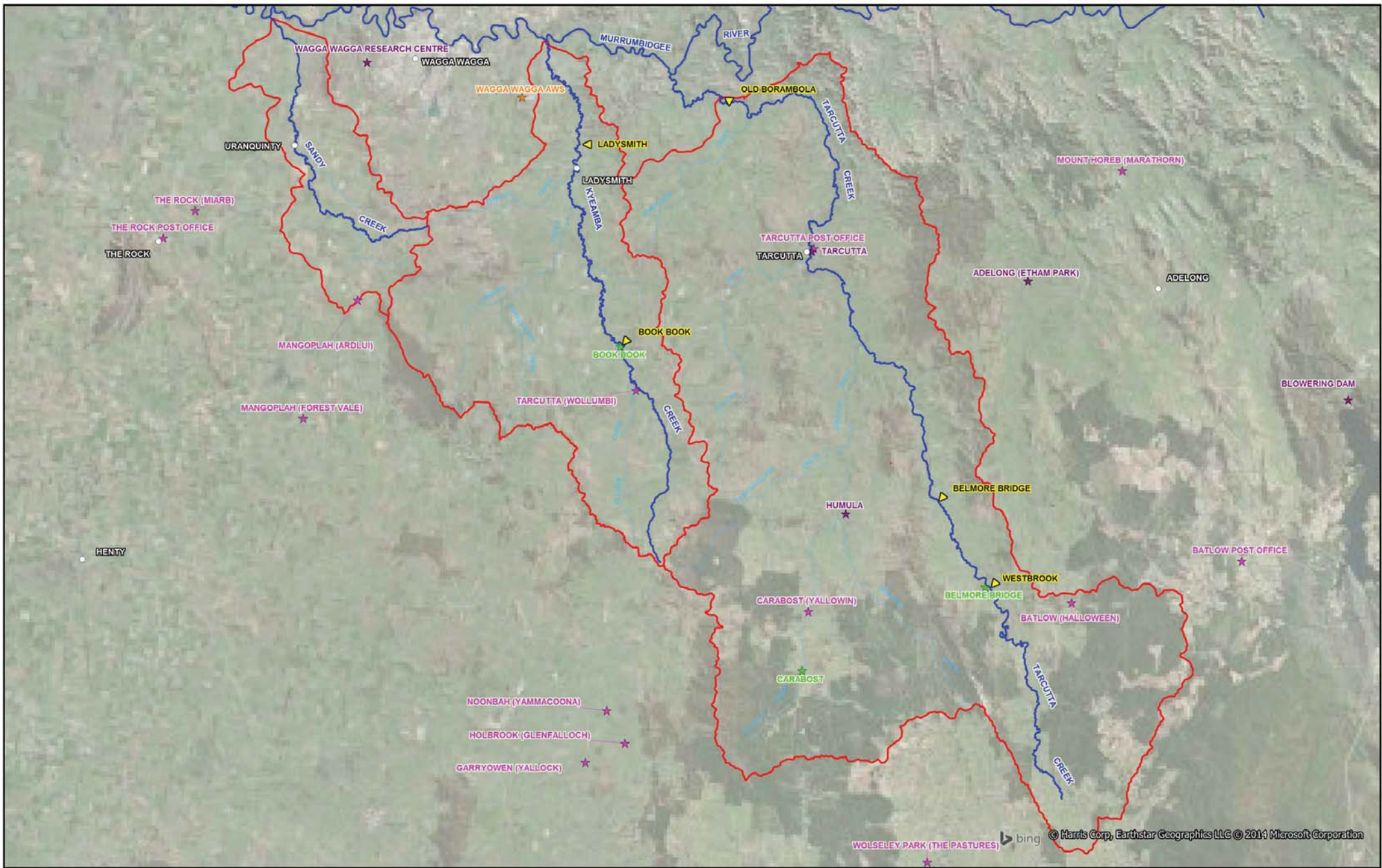
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Date: *March 2014*  
Rev No: 2.1

Principal: SAB  
Authors: SAB/BWL

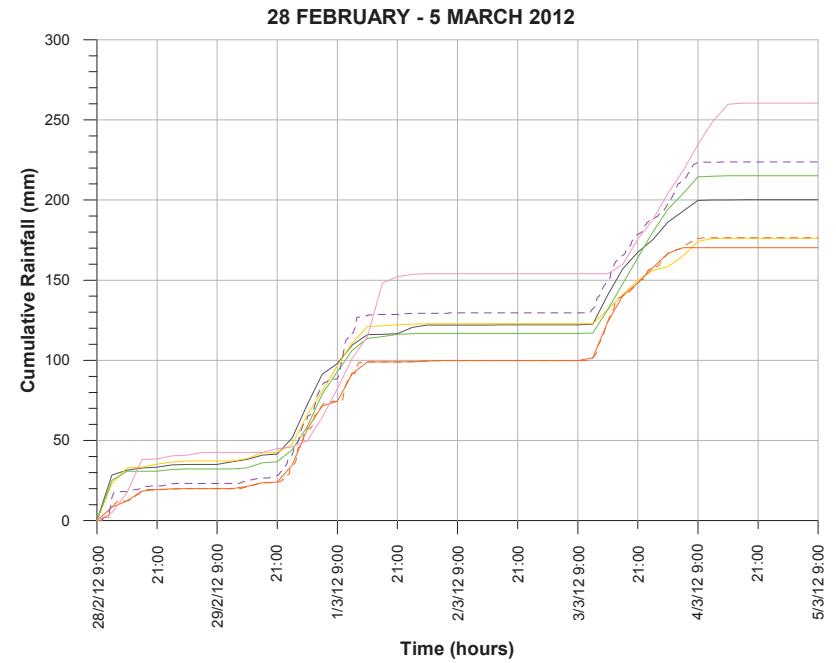
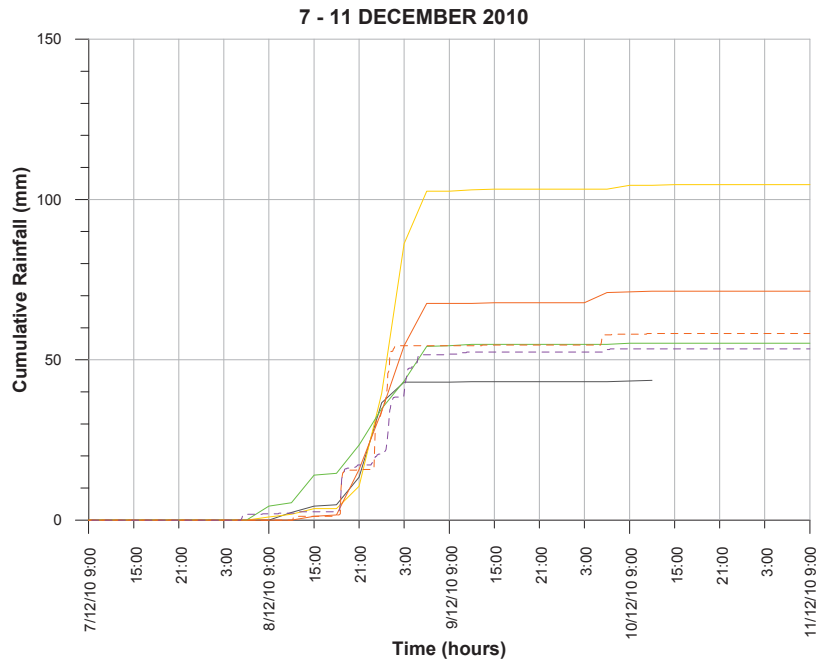
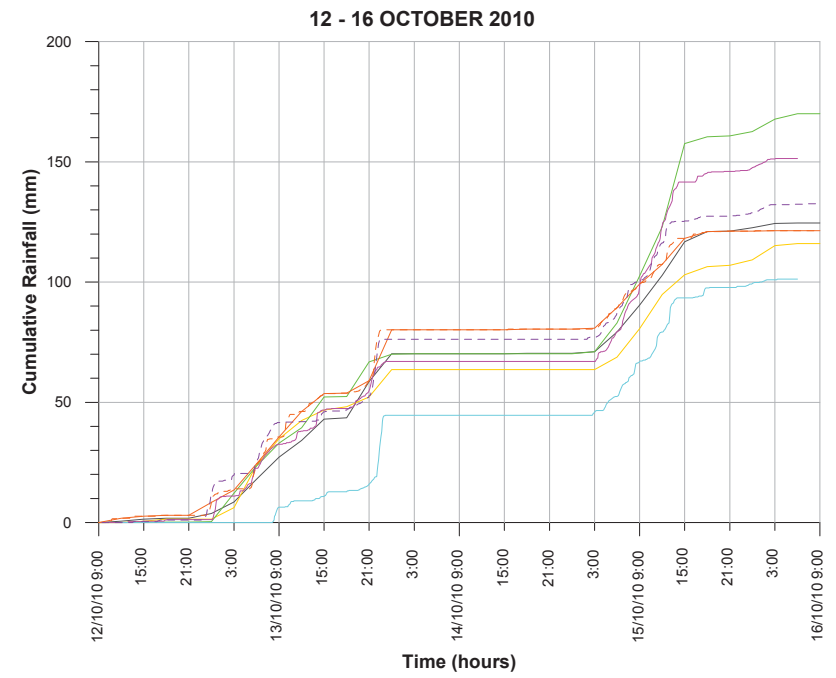
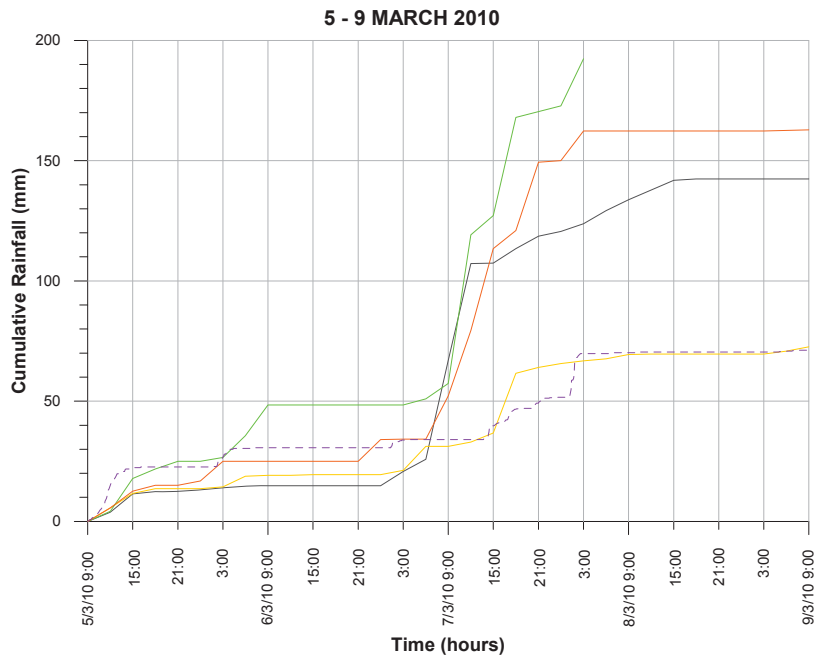
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**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 1.1



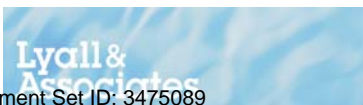
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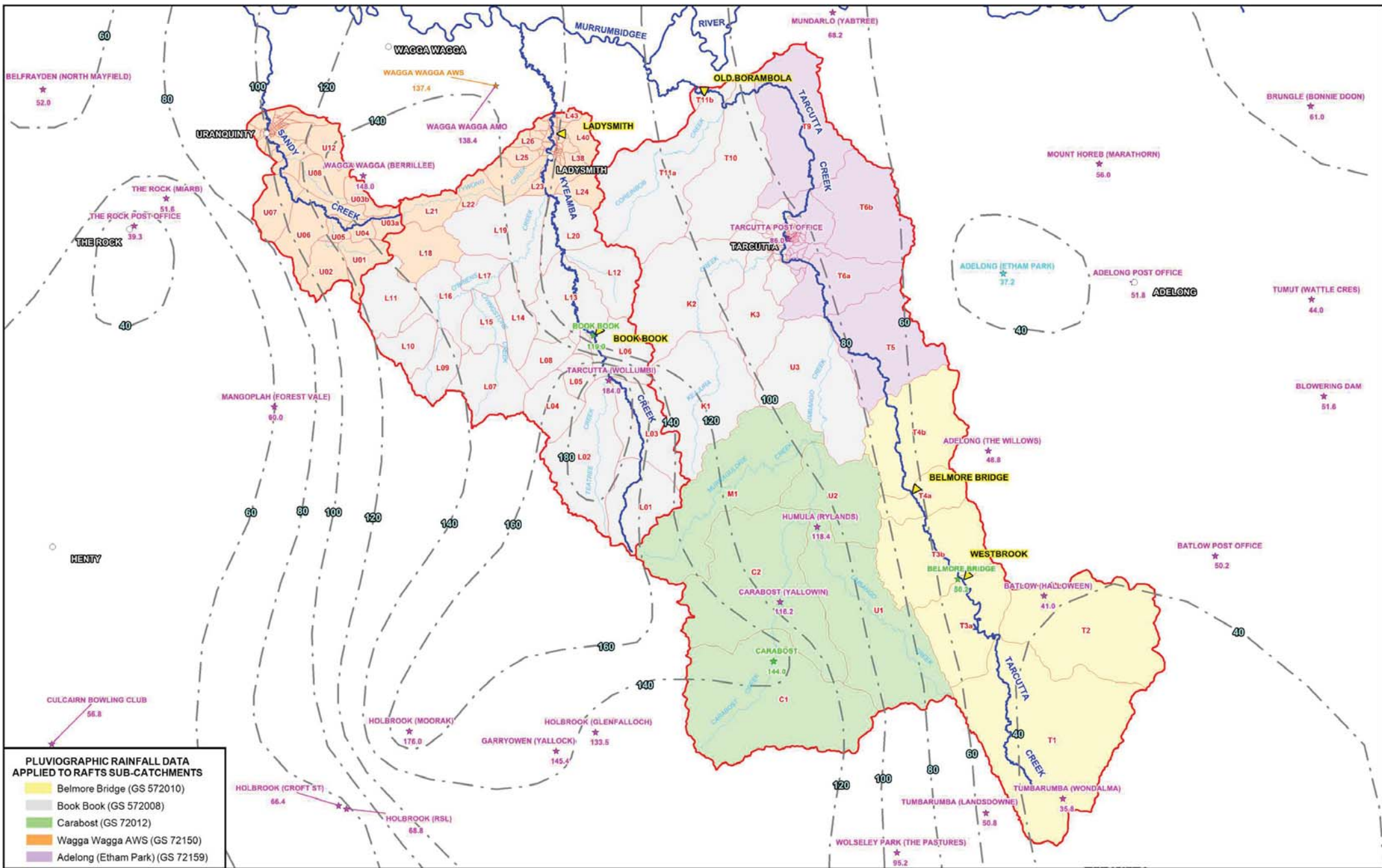
- Tarcutta (RMS)
- Humula (RMS)
- Wagga Wagga AWS (5 minute Data) (GS 72150)
- Wagga Wagga AWS (3 hourly Data) (GS 72150)
- Adelong (Etham Park) (GS 72159)
- Book Book (GS 572008)
- Belmore Bridge (GS 572010)
- Carabost (GS 72012)
- Batlow (GS 72004)

**TAR CUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.1

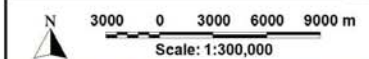
CUMULATIVE STORM RAINFALLS





**PLUVIOGRAPHIC RAINFALL DATA APPLIED TO RAFTS SUB-CATCHMENTS**

- Belmore Bridge (GS 572010)
- Book Book (GS 572008)
- Carabost (GS 72012)
- Wagga Wagga AWS (GS 72150)
- Adelong (Etham Park) (GS 72159)



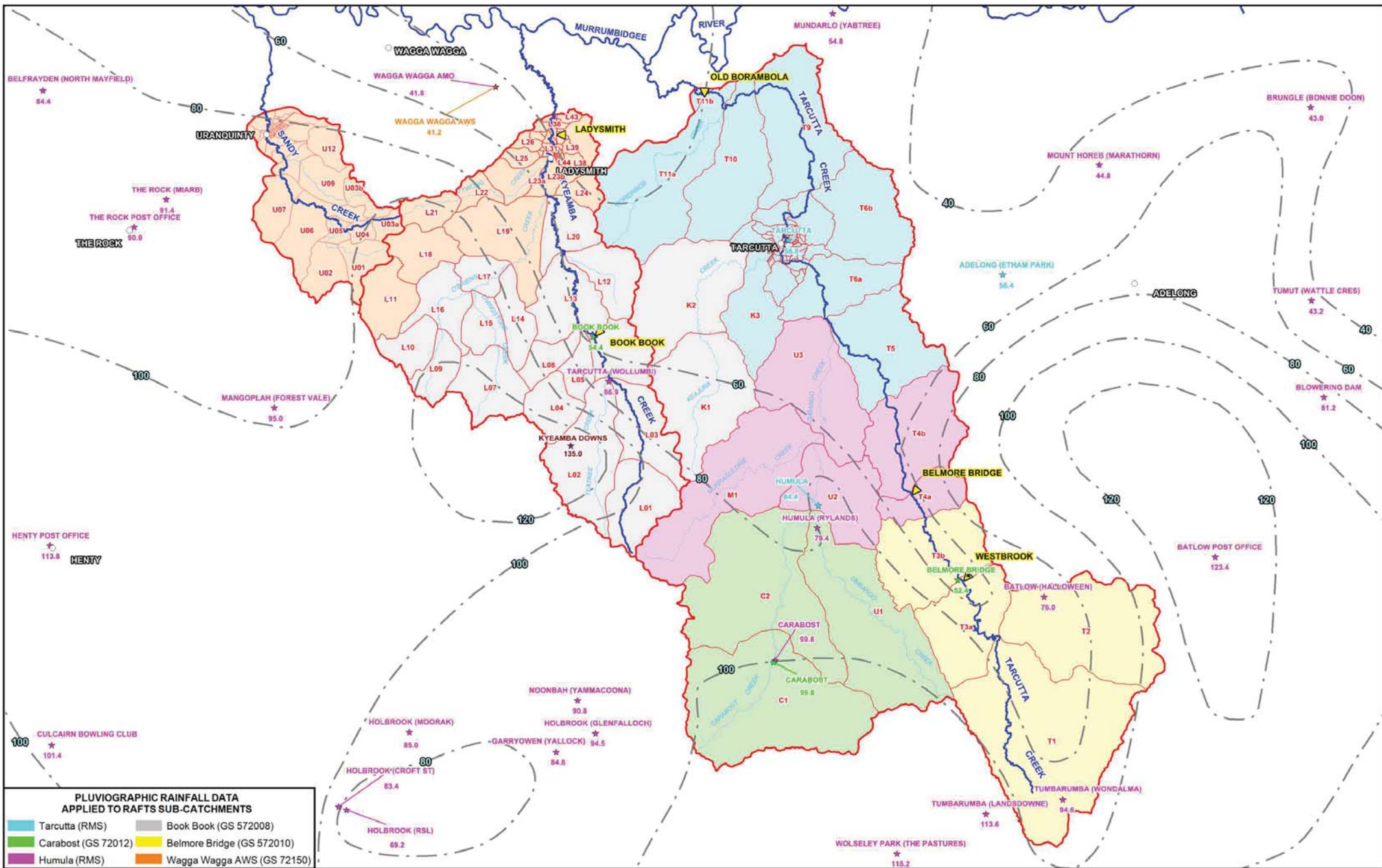
- LEGEND**
- ★ BoM Daily Rainfall Station and Recorded Depth (mm)
  - ★ BoM All Weather Station (AWS) and Recorded Depth (mm)
  - ★ BoM Pluviograph and Recorded Depth (mm)
  - ★ BoM Flood Warning Station and Recorded Depth (mm)
  - 120 — 48 Hour Depth of Rainfall (mm)
  - Catchment Boundary
  - T1 Sub-Catchment and Identifier
  - ▼ Stream Gauge

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.2

ISOHYETAL MAP  
RAIN DAYS OF 7-8 MARCH 2010

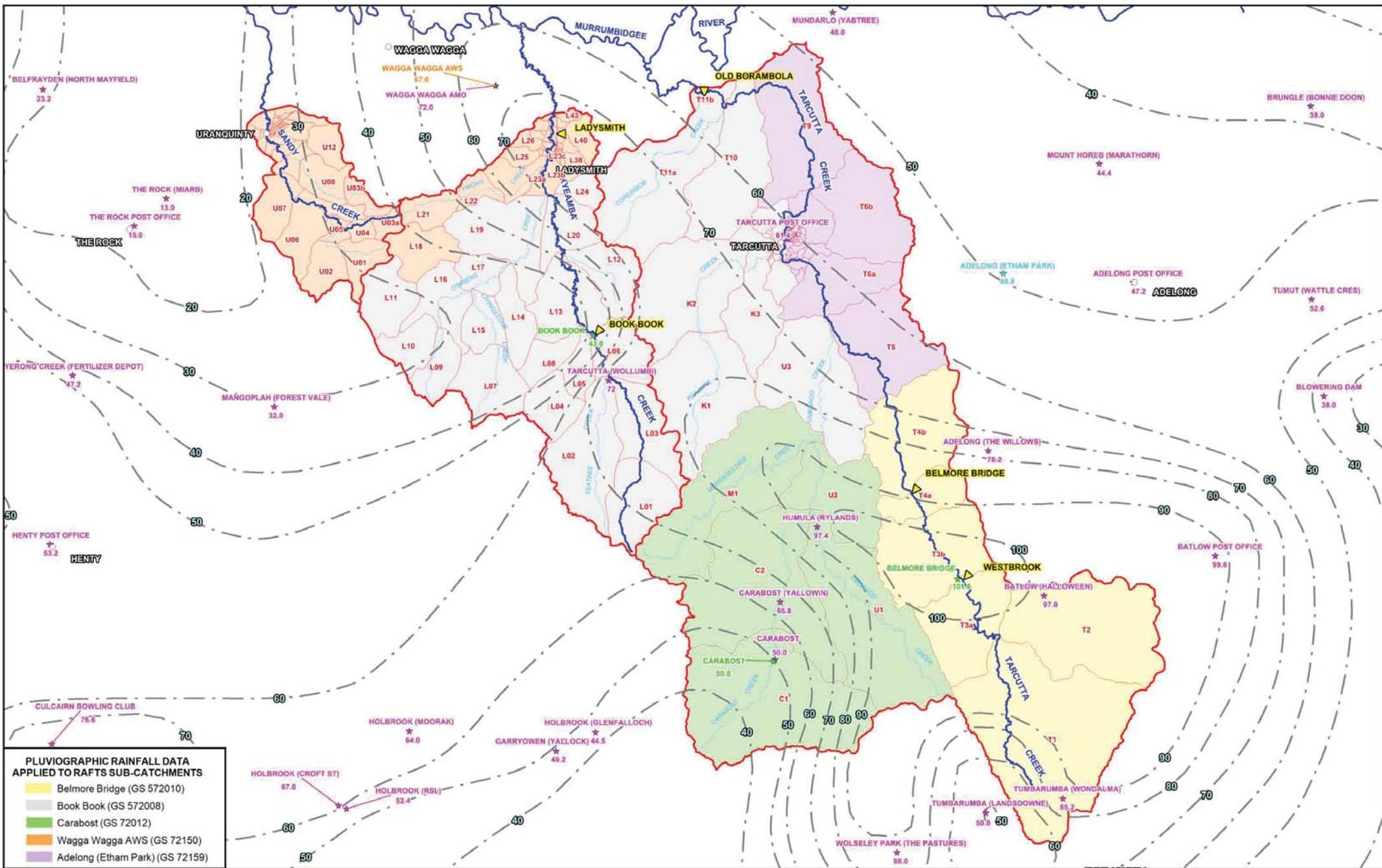




**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.3

ISOHYETAL MAP  
RAIN DAYS OF 15-16 OCTOBER 2010



**PLUVIOGRAPHIC RAINFALL DATA APPLIED TO RAFTS SUB-CATCHMENTS**

- Belmore Bridge (GS 572010)
- Book Book (GS 572008)
- Carabost (GS 72012)
- Wagga Wagga AWS (GS 72150)
- Adelong (Etham Park) (GS 72159)

Scale: 1:300,000

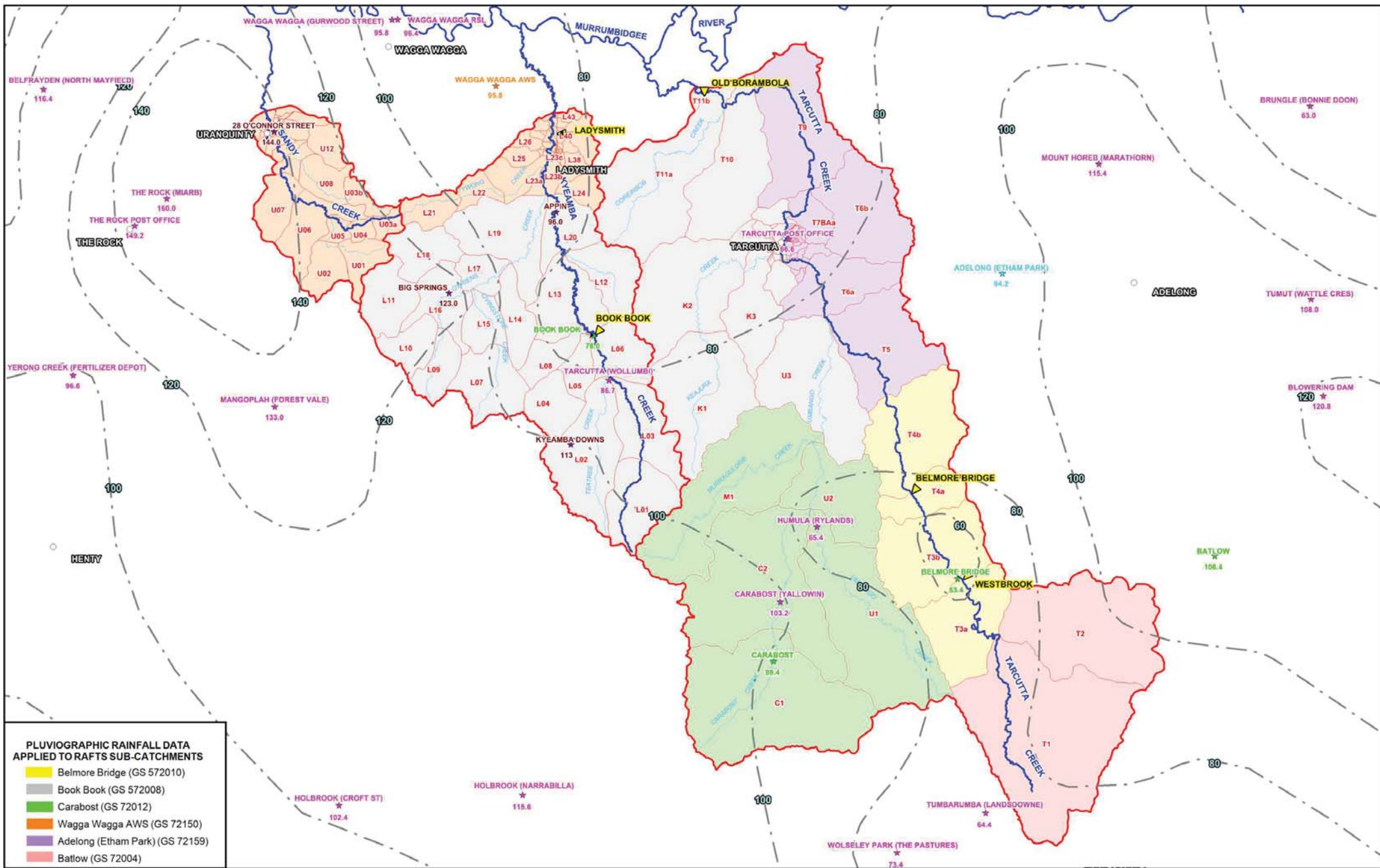


**LEGEND**

- ★ BoM Daily Rainfall Station and Recorded Depth (mm)
- ★ BoM All Weather Station (AWS) and Recorded Depth (mm)
- ★ BoM Pluviograph and Recorded Depth (mm)
- ★ BoM Flood Warning Station and Recorded Depth (mm)
- 70 --- 24 Hour Depth of Rainfall (mm)
- Catchment Boundary
- T1 Sub-Catchment and Identifier
- ▼ Stream Gauge

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.4  
ISOHYETAL MAP  
RAIN DAY OF 9 DECEMBER 2010



**PLUVIOGRAPHIC RAINFALL DATA APPLIED TO RAFTS SUB-CATCHMENTS**

- Belmore Bridge (GS 572010)
- Book Book (GS 572008)
- Carabost (GS 72012)
- Wagga Wagga AWS (GS 72150)
- Adelong (Etham Park) (GS 72159)
- Batlow (GS 72004)

Scale: 1:300,000



**LEGEND**

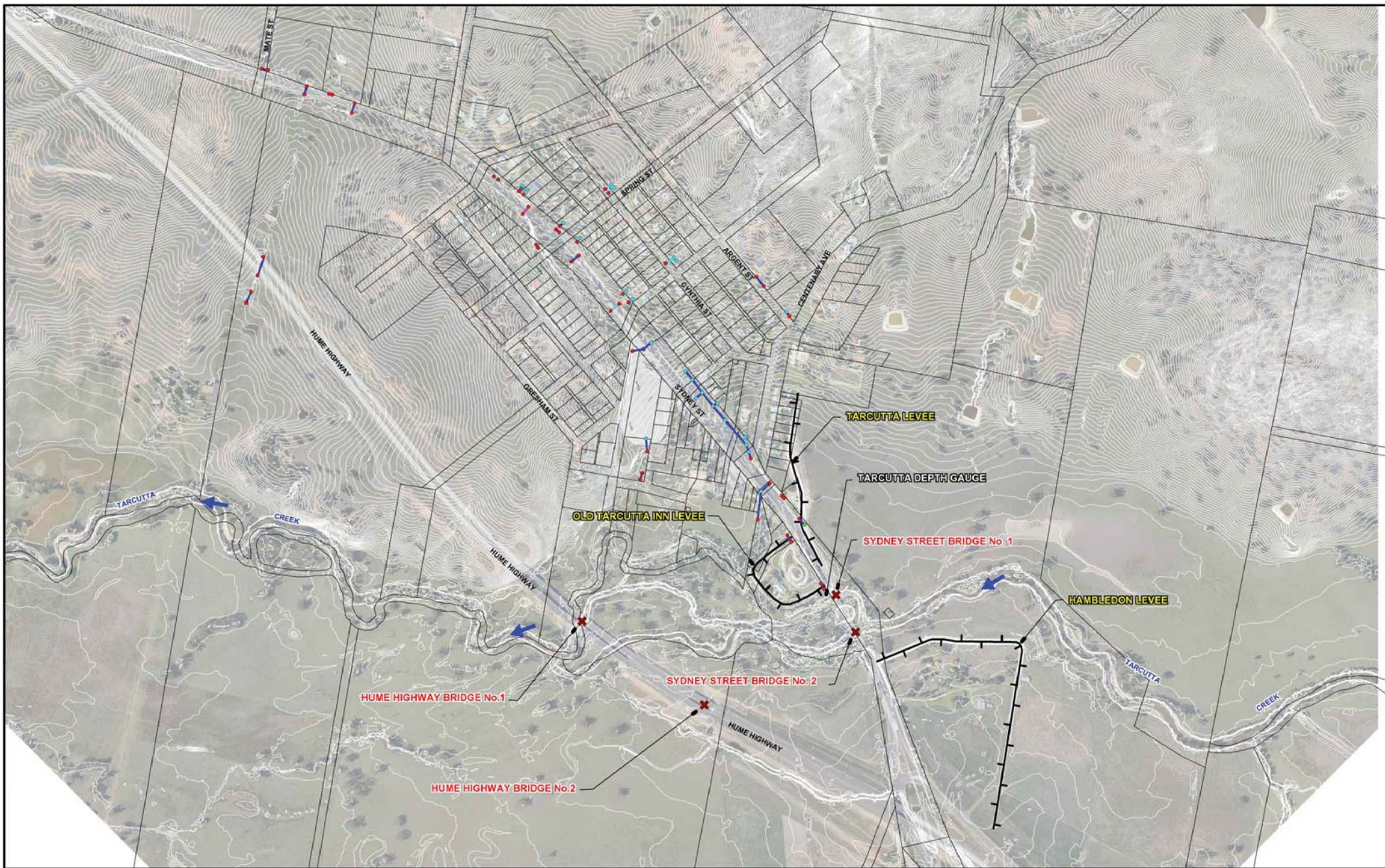
- ★ BoM Daily Rainfall Station and Recorded Depth (mm)
- ★ BoM All Weather Station (AWS) and Recorded Depth (mm)
- ★ BoM Pluviograph and Recorded Depth (mm)
- ★ BoM Flood Warning Station and Recorded Depth (mm)
- ★ SES FIR Location of Reported Depth (mm)
- 120 — 48 Hour Depth of Rainfall (mm)
- Catchment Boundary
- T1 Sub-Catchment and Identifier
- ▽ Stream Gauge

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.5

ISOHYETAL MAP RAIN DAYS OF 4-5 MARCH 2012





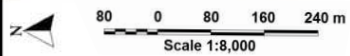
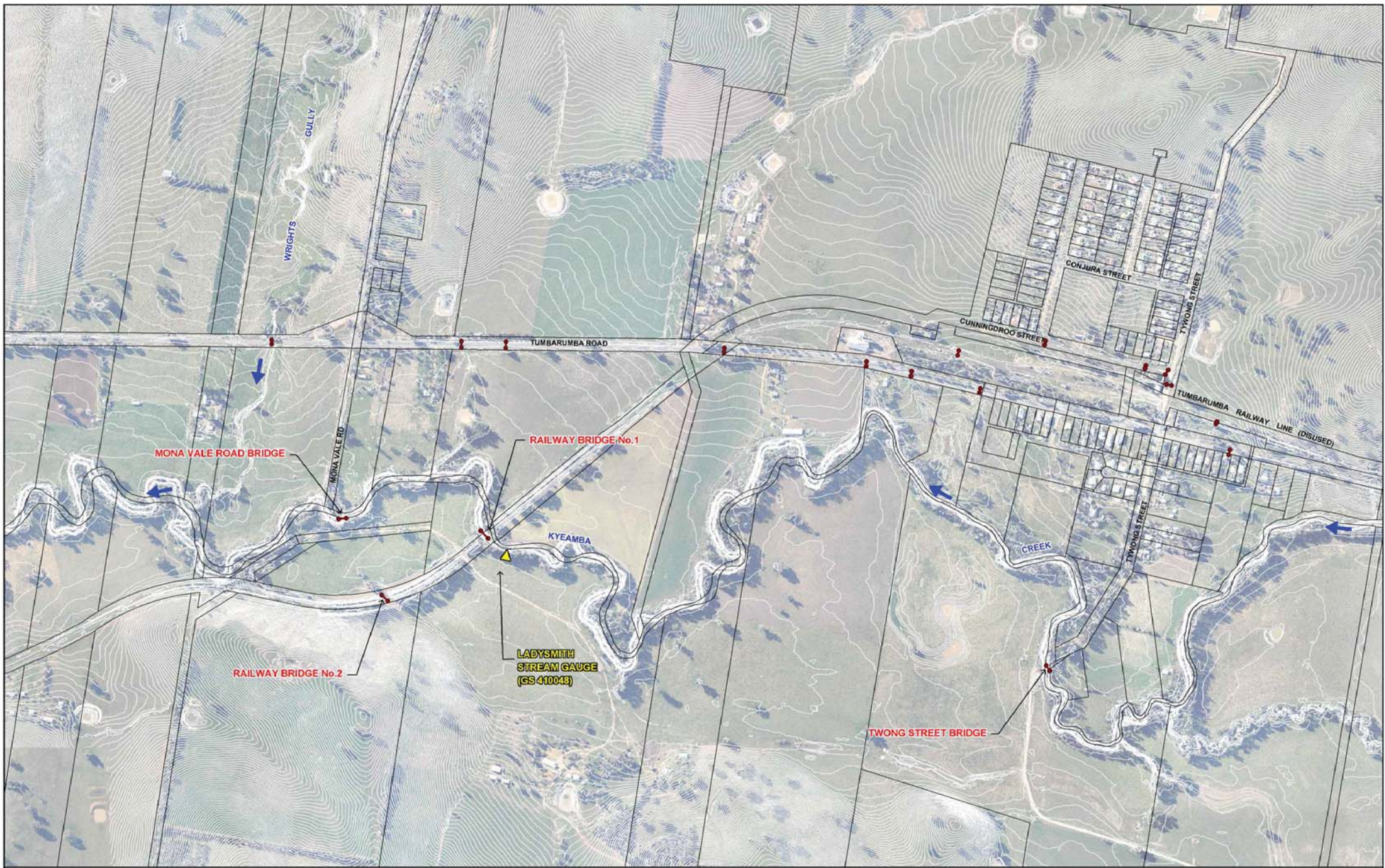
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Scale 1:8,000

LEGEND	
	Pipe 450 mm Diameter
	Pipe 450 mm Diameter
	Box Culvert
	Bridge
	Inlet Pit
	Junction Pit
	Headwall
	Flood Gate
	Levee

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.6

TARCUTTA DRAINAGE PLAN

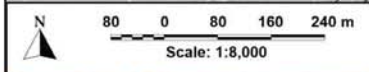
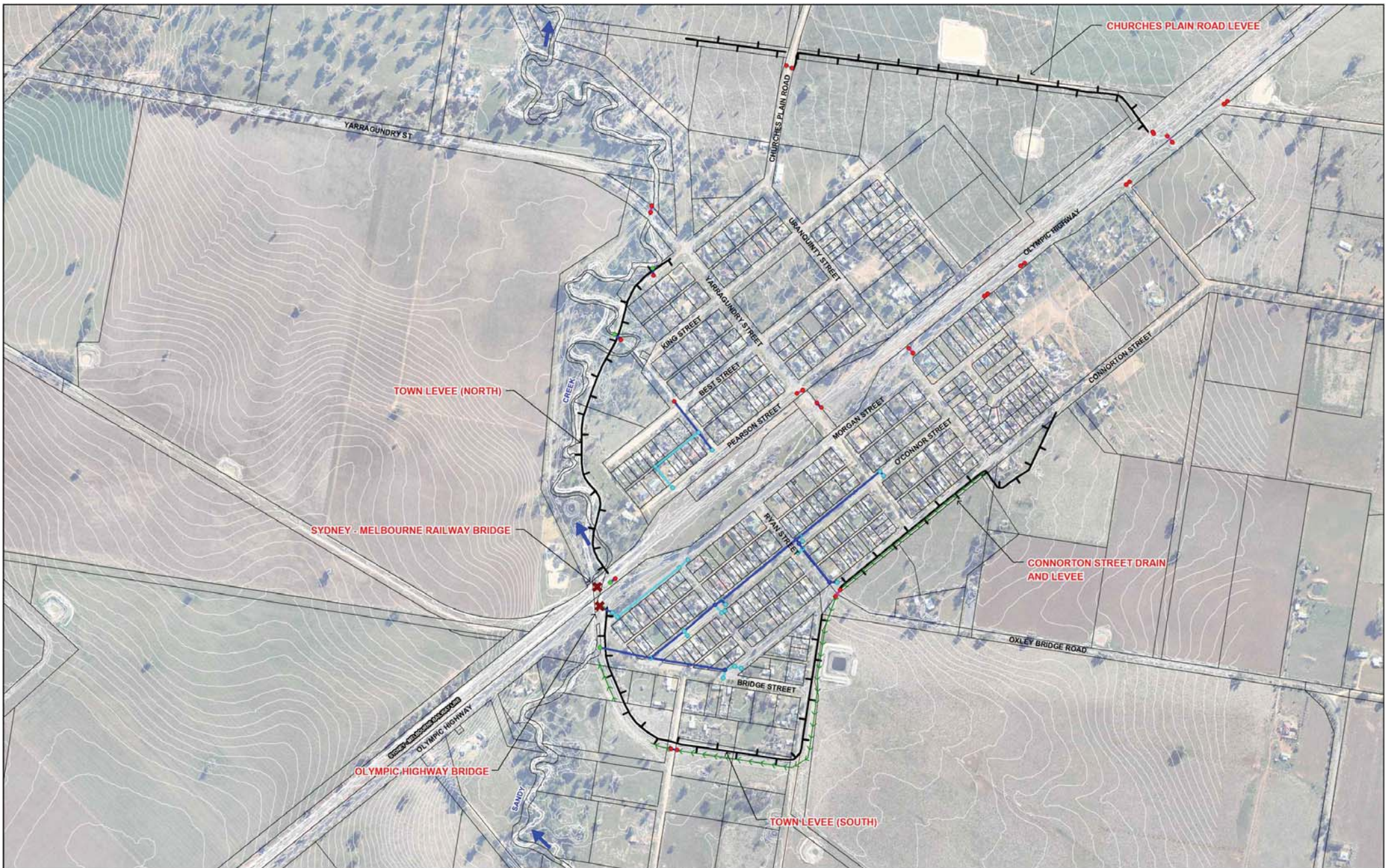


**LEGEND**

—●— Surveyed Stormwater Network

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.7

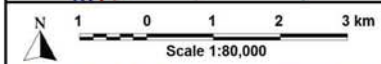
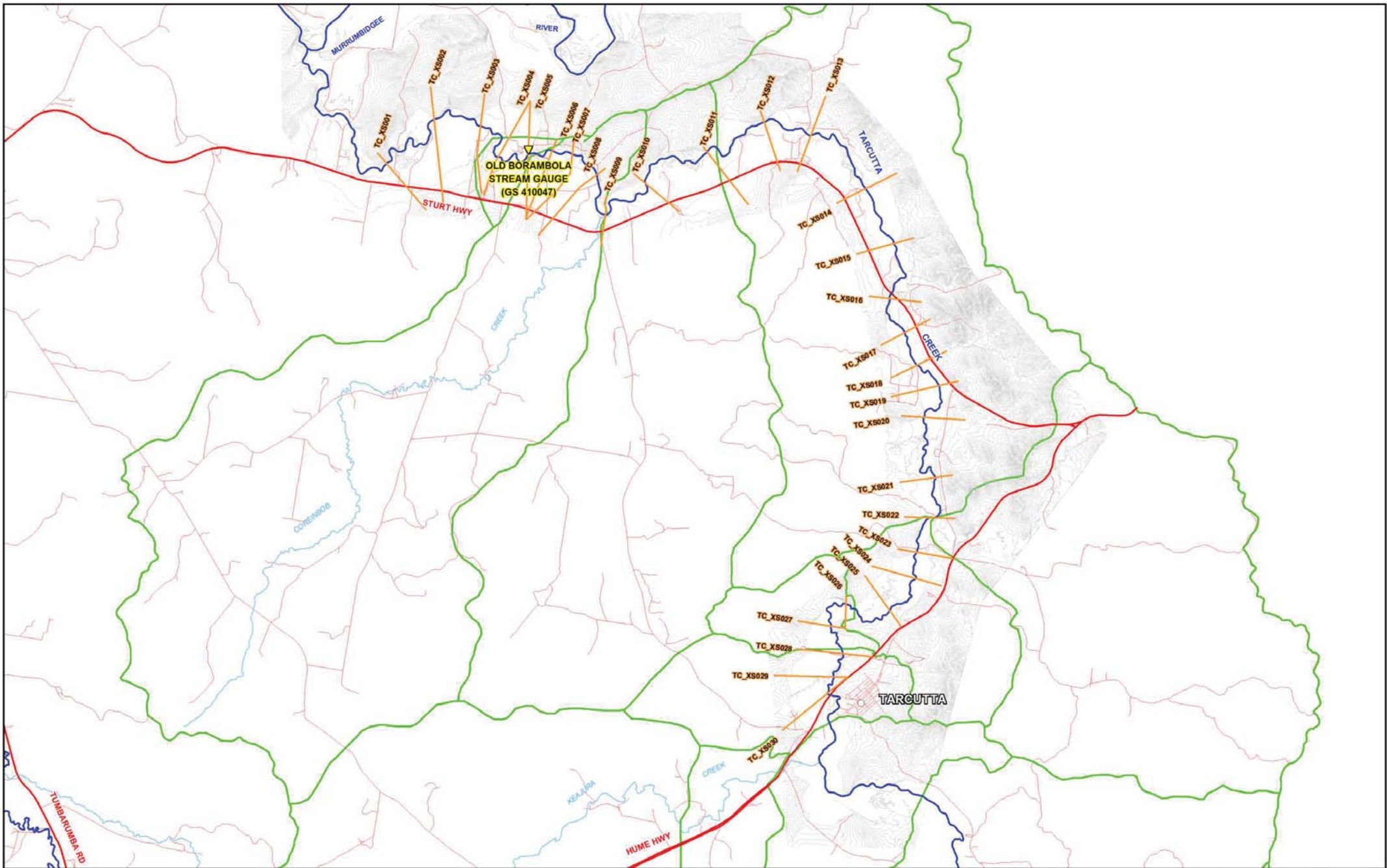


	Pipe < 450 mm Diameter		Inlet Pit
	Pipe ≥ 450 mm Diameter		Junction Pit
	Box Culvert		Headwall
	Levee		Flood Gate
	Engineered Channel/ Drain		Bridge






**LEGEND**

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.8



**LEGEND**

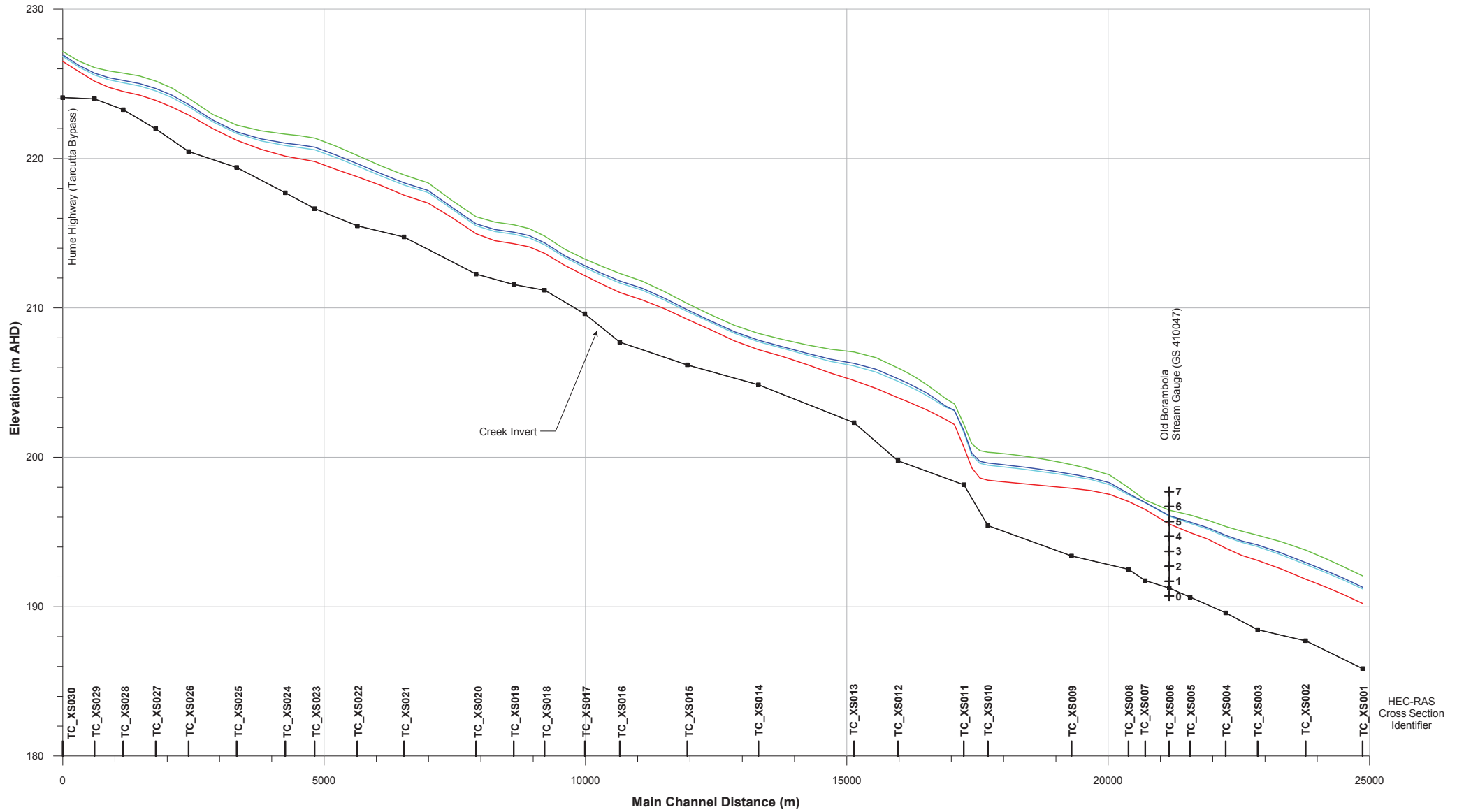
	Major Road		TC_XS01	HEC-RAS Cross Section and Identifier
	Minor Road			Stream Gauge
	Sub-catchment Boundary			

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.9

TARCUTTA CREEK UNET MODEL LAYOUT





**HISTORIC WATER SURFACE PROFILE**

- March 2010 Flood
- October 2010 Flood
- December 2010 Flood
- March 2012 Flood

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

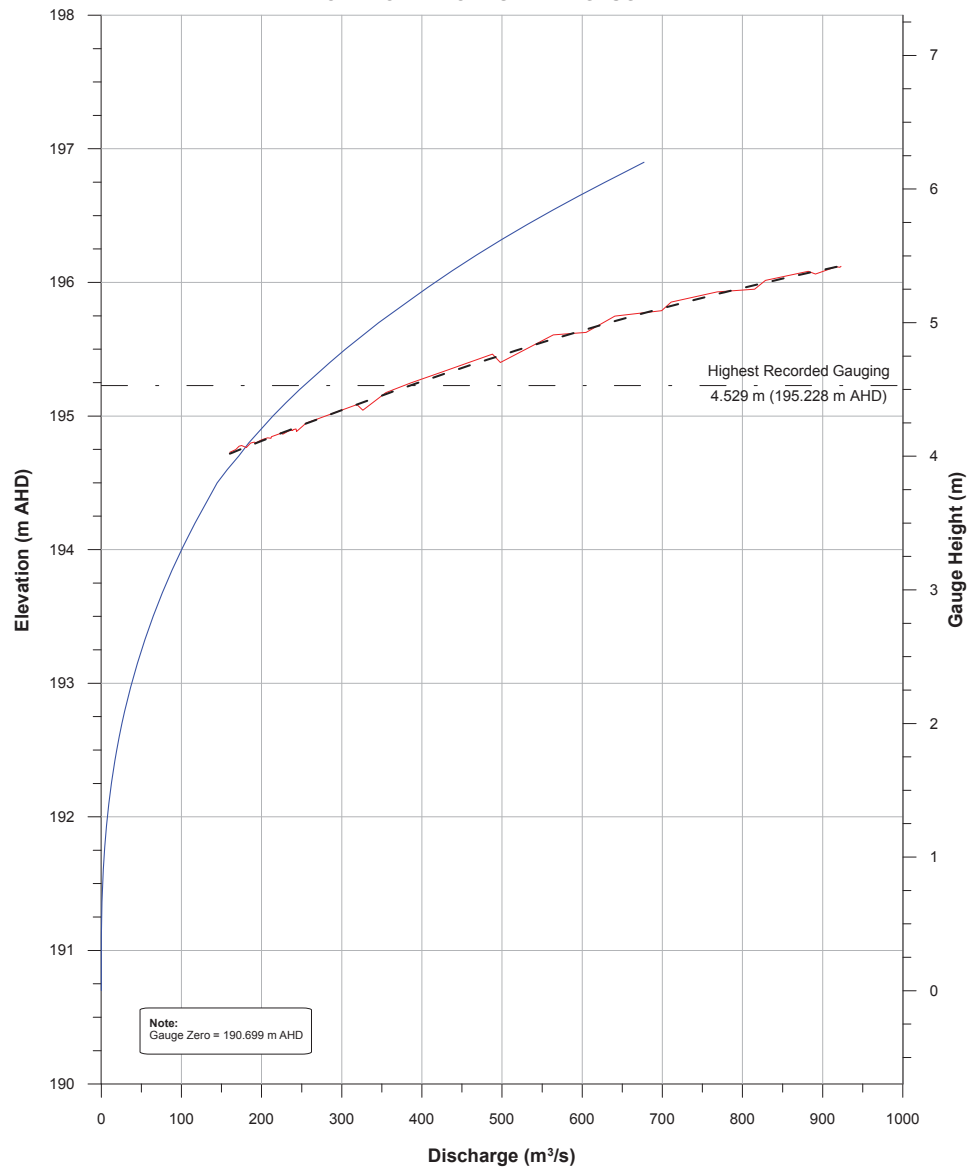
Figure 2.10

HISTORIC WATER SURFACE PROFILES  
TARCUTTA CREEK DOWNSTREAM OF TARCUTTA

**NOTE:**  
Refer Table 3.1 for comparison of recorded and modelled flood levels at Old Borambola Stream Gauge.

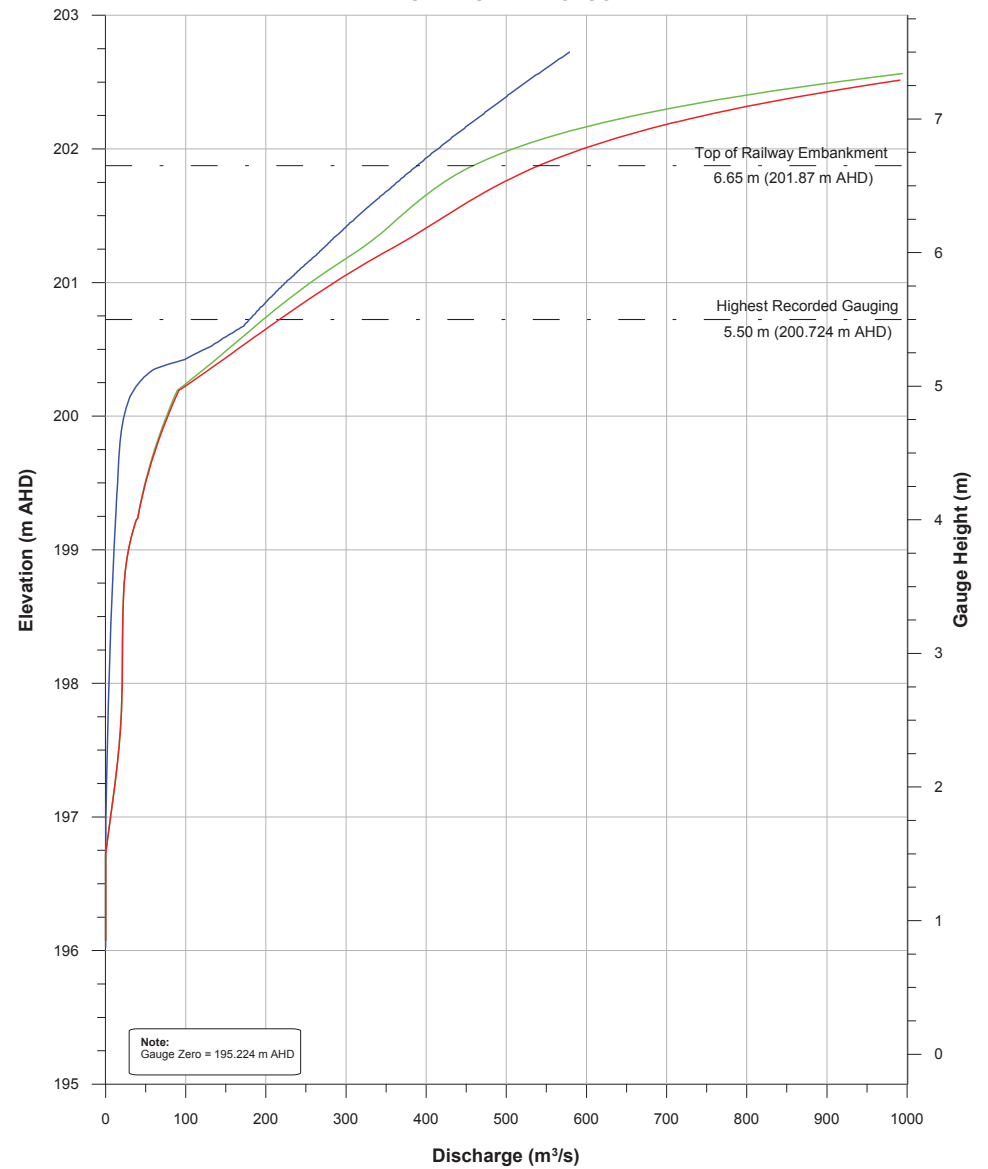


**TARCUTTA CREEK AT  
OLD BORAMBOLA STREAM GAUGE**



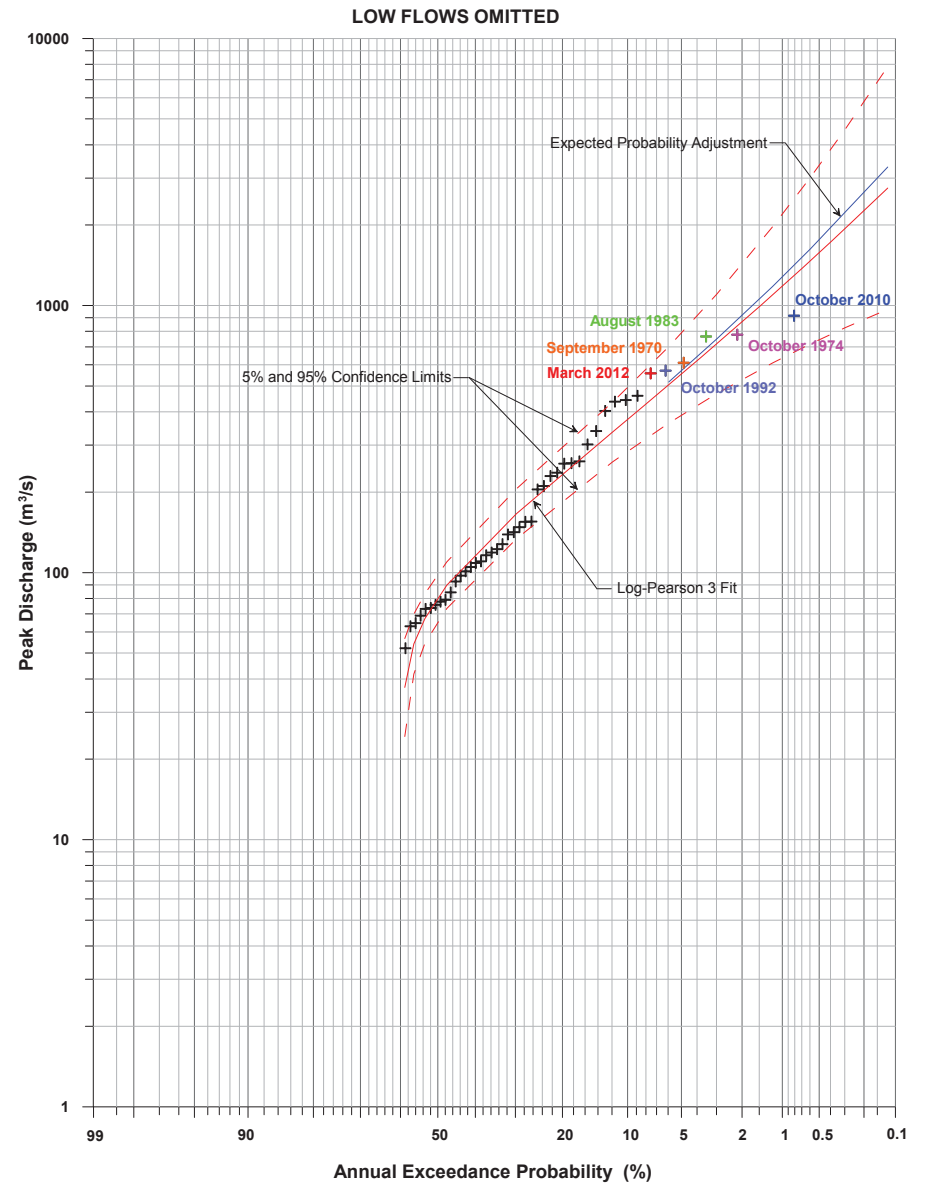
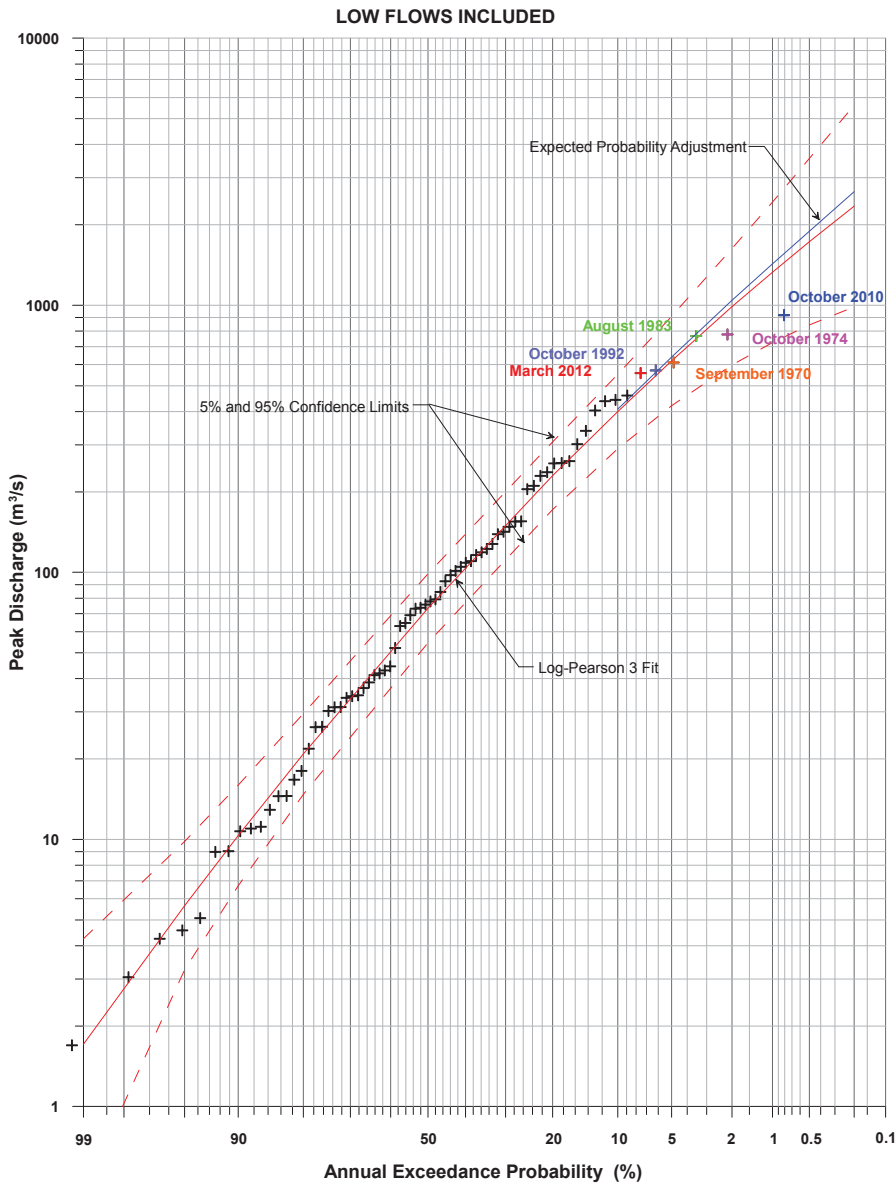
- LEGEND**
- DPIOW Rating Curve
  - UNET Derived Rating Curve
  - - - Second Order Polynomial Fit to High Flow Portion of Rating Curve

**KYEAMBA CREEK AT  
LADYSMITH STREAM GAUGE**



- LEGEND**
- DPIOW Rating Curve
  - Pre-Scour Conditions
  - Post-Scour Conditions



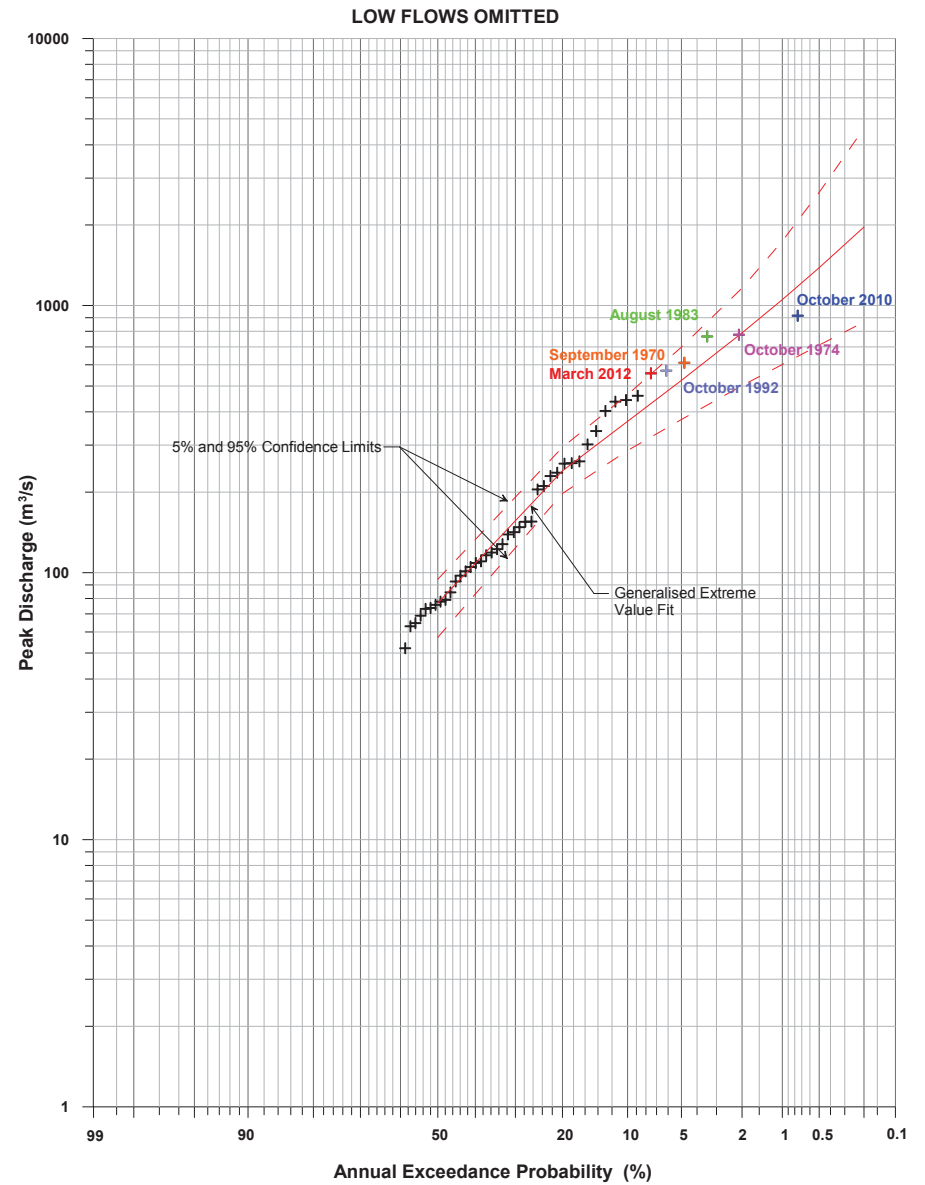
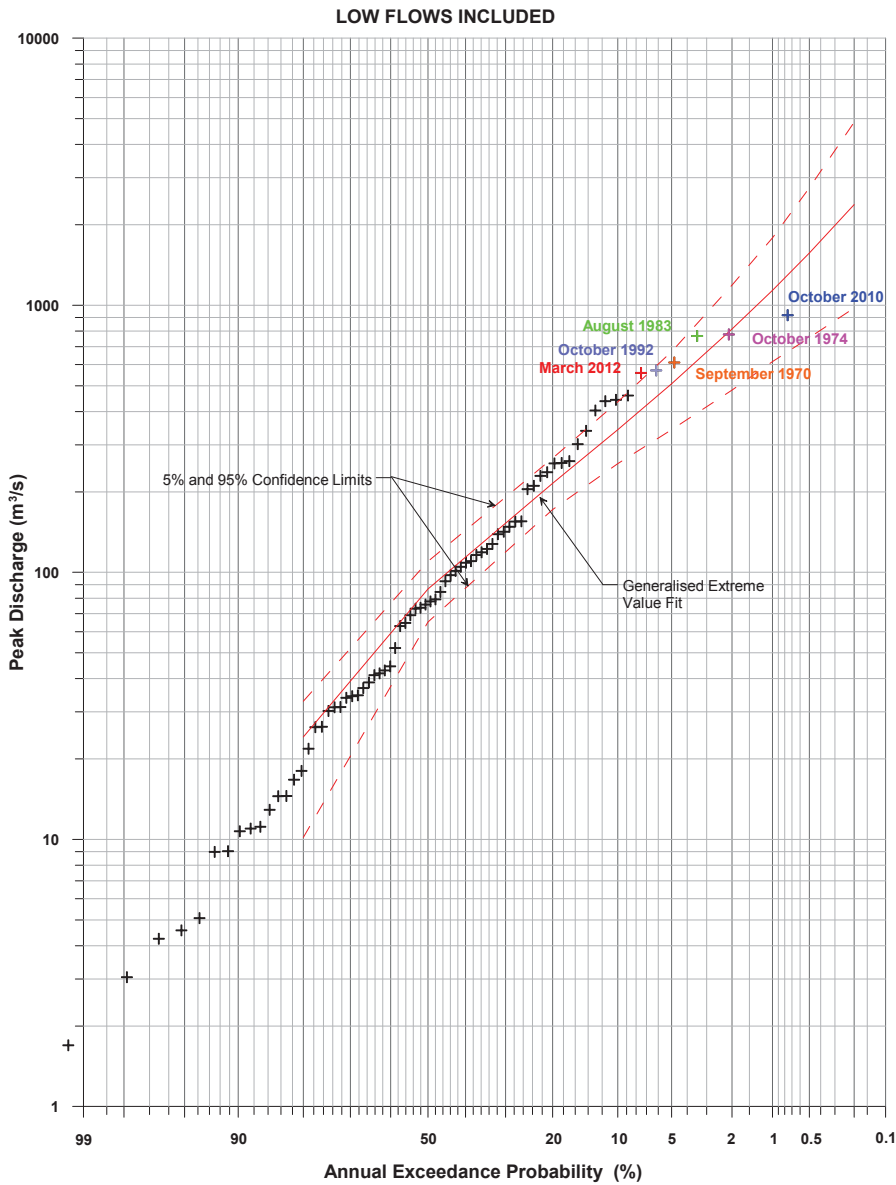


**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.12

FLOOD FREQUENCY RELATIONSHIP  
LOG-PEARSON 3 ANNUAL SERIES  
TARCUTTA CREEK AT OLD BORAMBOLA STREAM GAUGE (GS 410047)





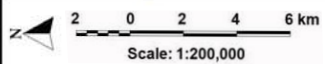
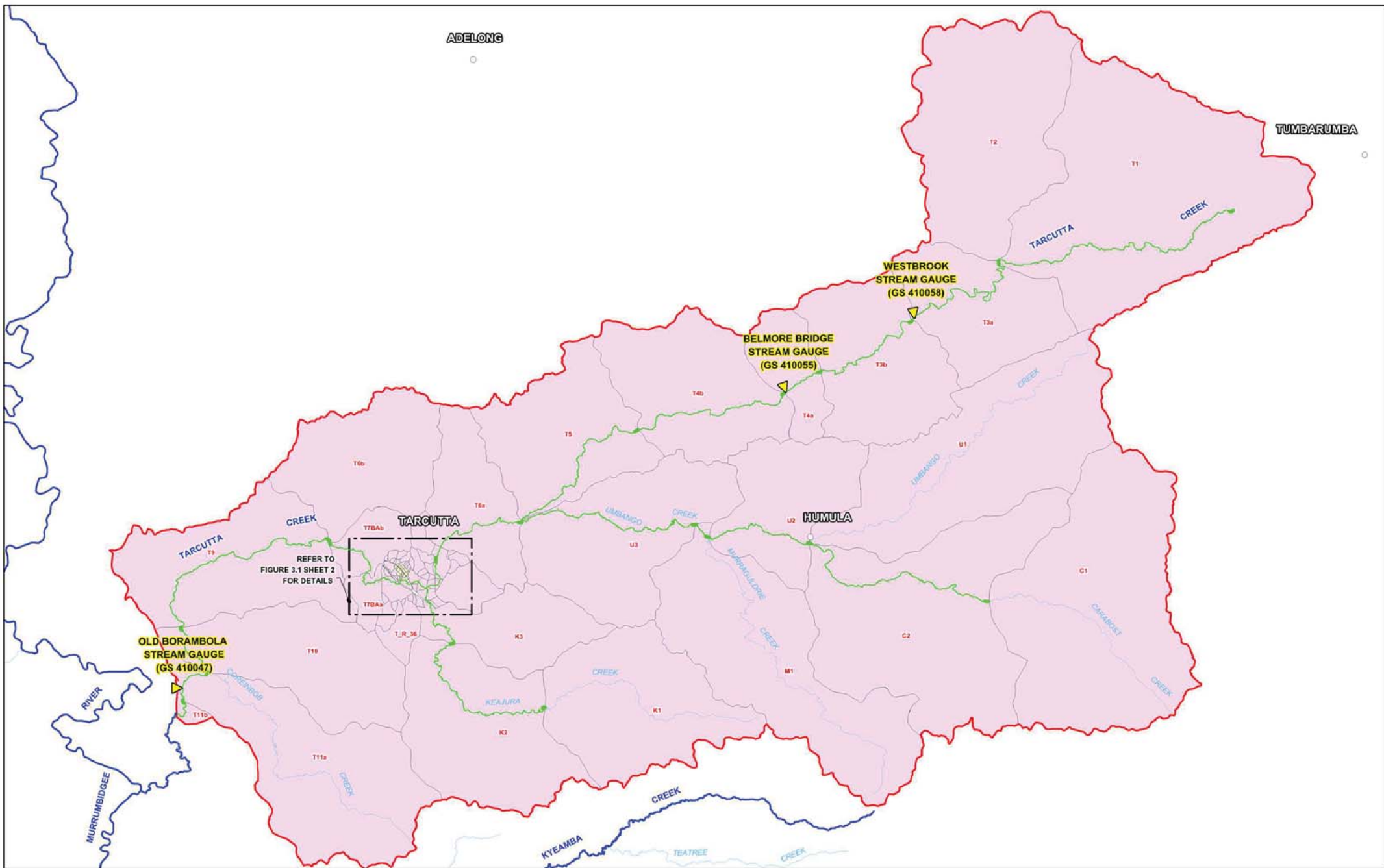
**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 2.13






FLOOD FREQUENCY RELATIONSHIP  
GENERALISED EXTREME VALUE ANNUAL SERIES  
TARCUTTA CREEK AT OLD BORAMBOLA STREAM GAUGE (GS 410047)





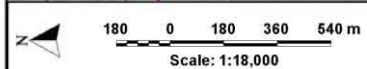
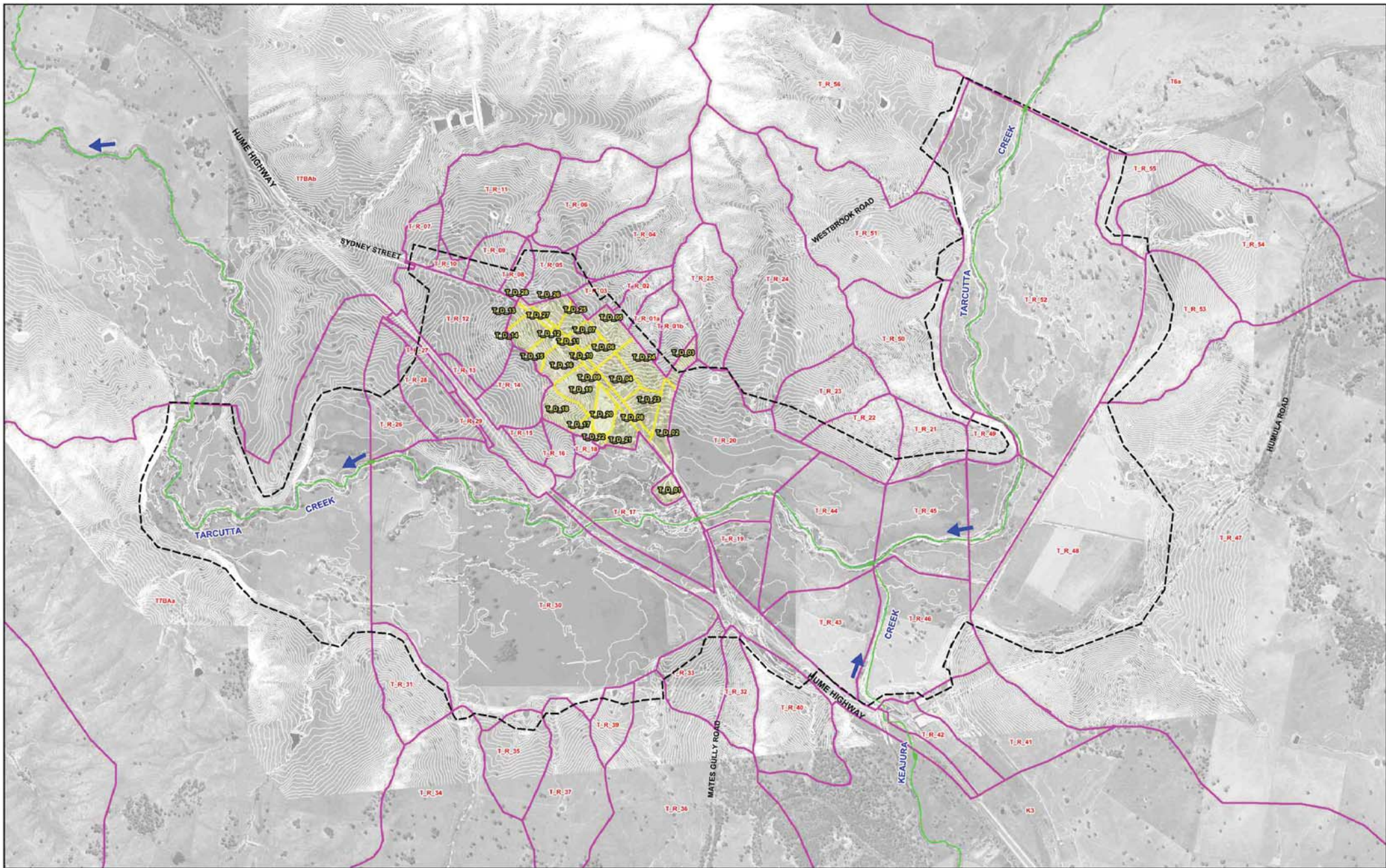


**LEGEND**

-  DRAINS Sub-Catchment
-  RAFTS Sub-Catchment and Identifier
-  RAFTS Sub-Catchment Link
-  Study Catchment
-  Stream Gauge

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 3.1  
Sheet 1 of 2



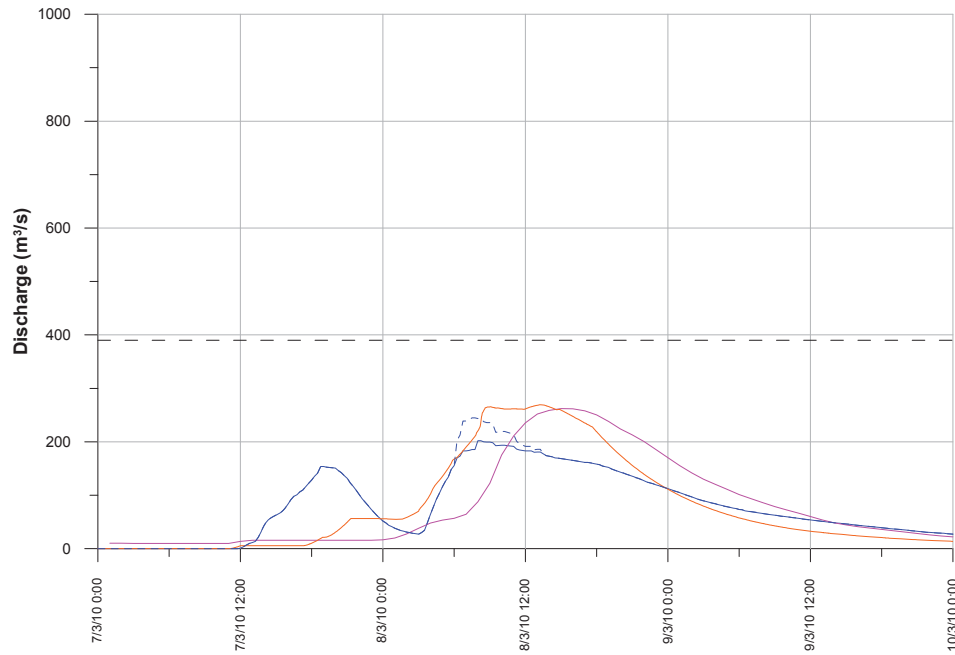
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- T.R.33 RAFTS Sub-Catchment and Identifier
- RAFTS Sub-Catchment Link
- Two-Dimensional Model Boundary

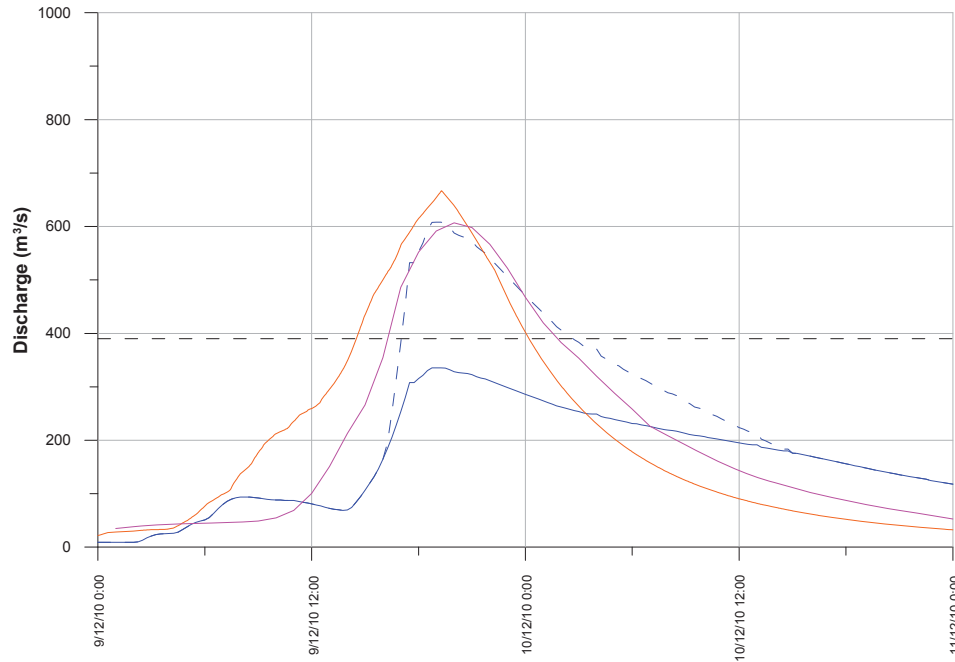
**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 3.1  
Sheet 2 of 2

MARCH 2010

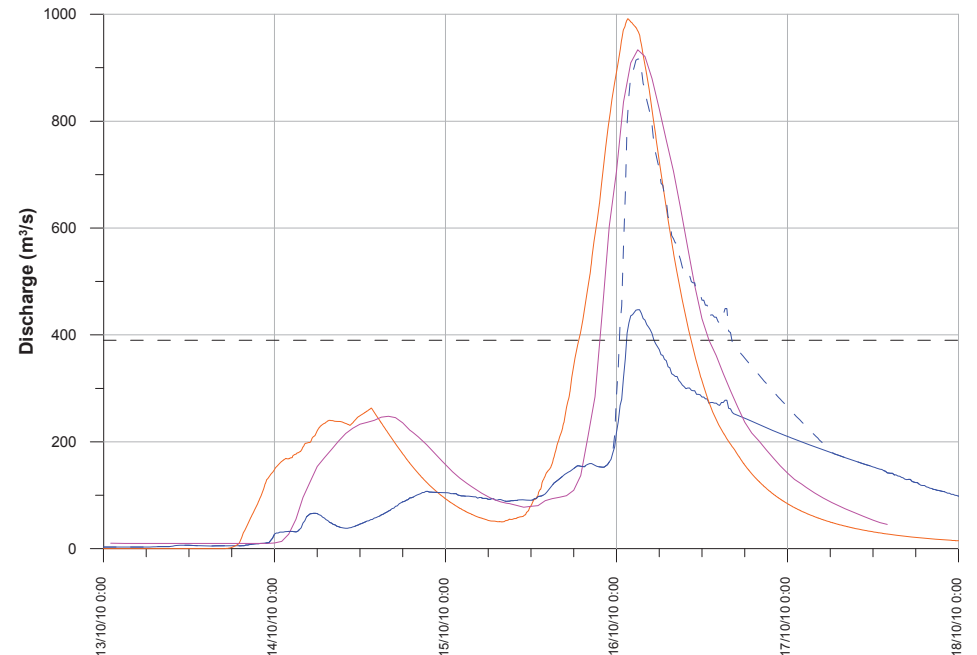


Date and Time  
DECEMBER 2010

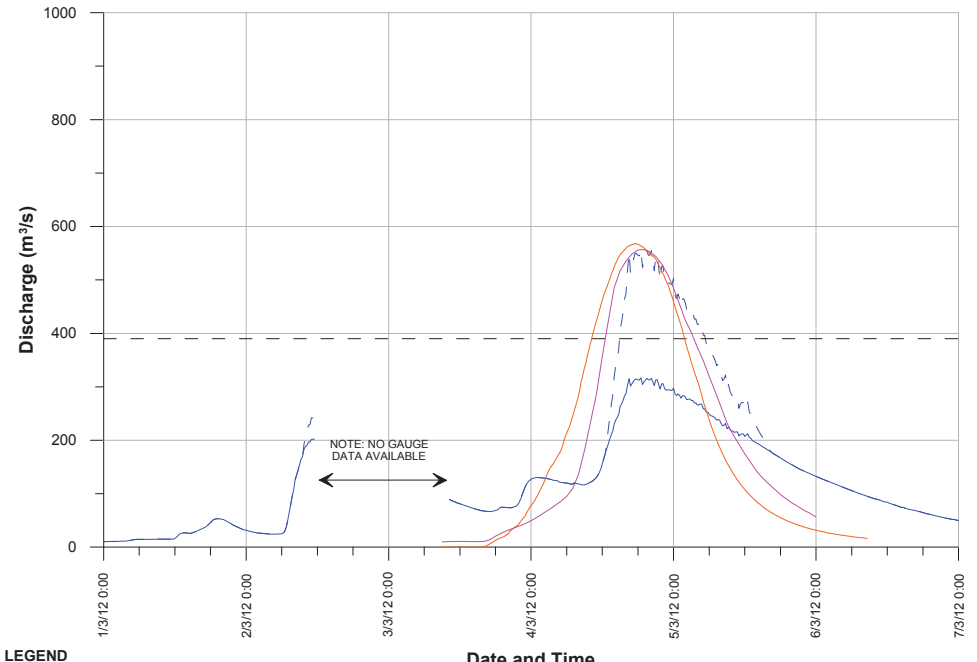


Date and Time

OCTOBER 2010



Date and Time  
MARCH 2012

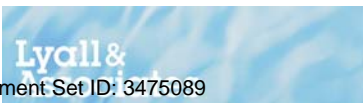


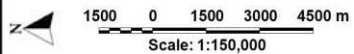
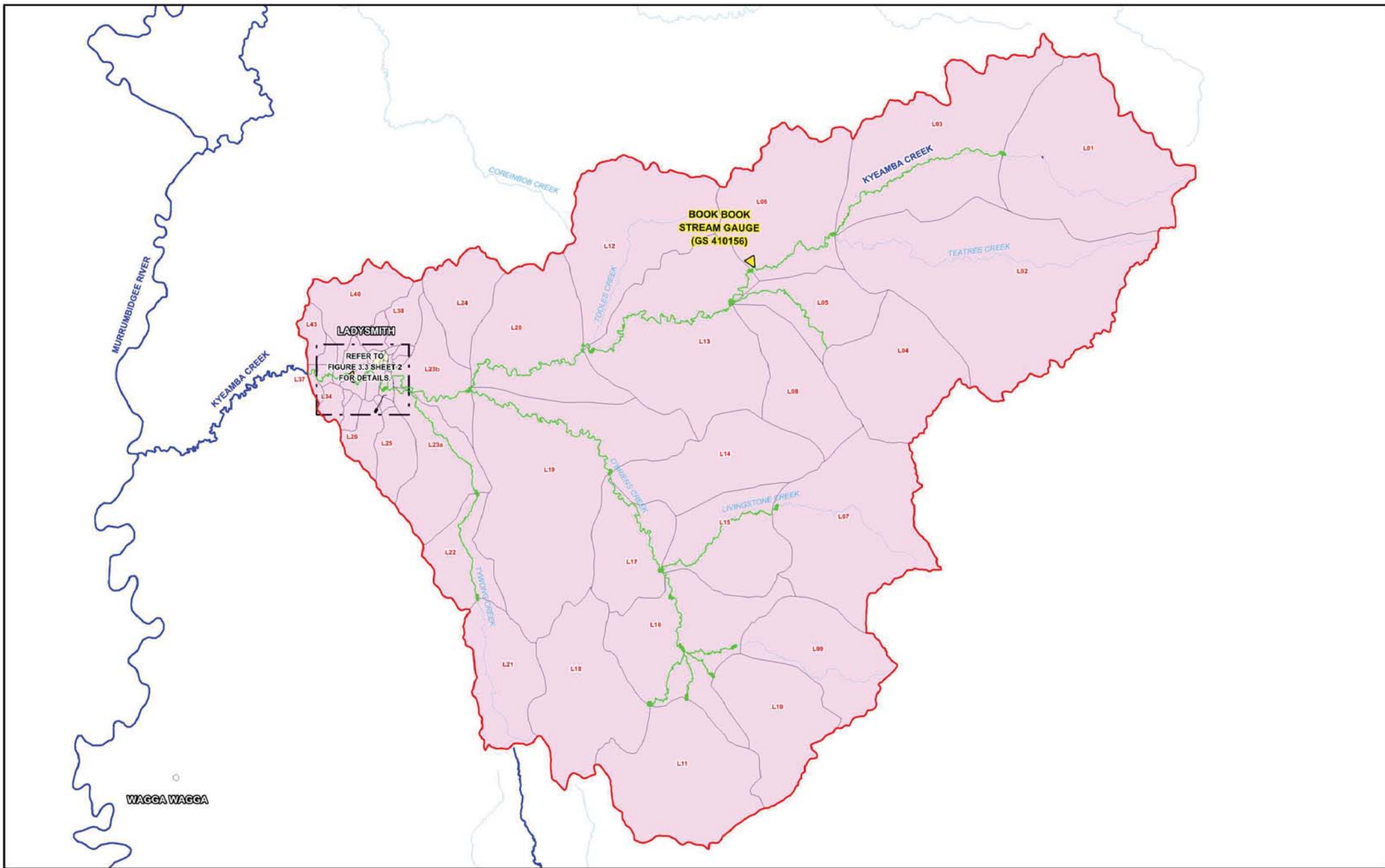
Date and Time  
TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

- LEGEND**
- Recorded Hydrograph (DPIOW Rating Curve)
  - - - Recorded Hydrograph (Adjusted Rating Curve)
  - Modelled Hydrograph (RAFTS)
  - Modelled Hydrograph (UNET)
  - - - Max. Gauged Discharge






Figure 3.2

TARCUTTA CREEK HISTORIC FLOWS AT OLD BORAMBOLA GAUGE (GS 410047)





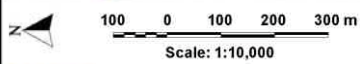
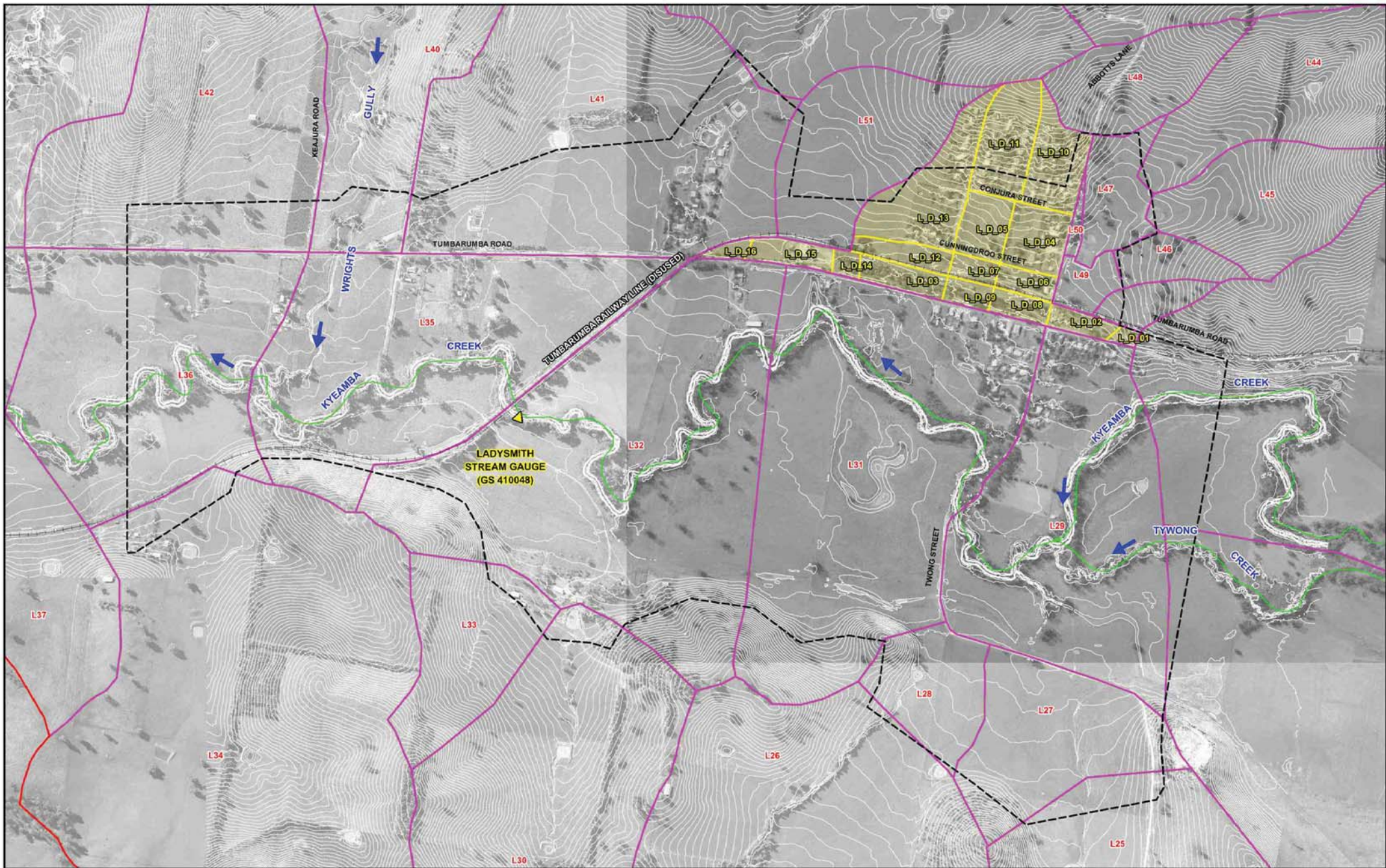
**LEGEND**

-  DRAINS Sub-Catchment
-  RAFTS Sub-Catchment and Identifier
-  RAFTS Sub-Catchment Link
-  Study Catchment
-  Stream Gauge

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 3.3  
Sheet 1 of 2

KYEAMBA CREEK HYDROLOGIC MODEL LAYOUT



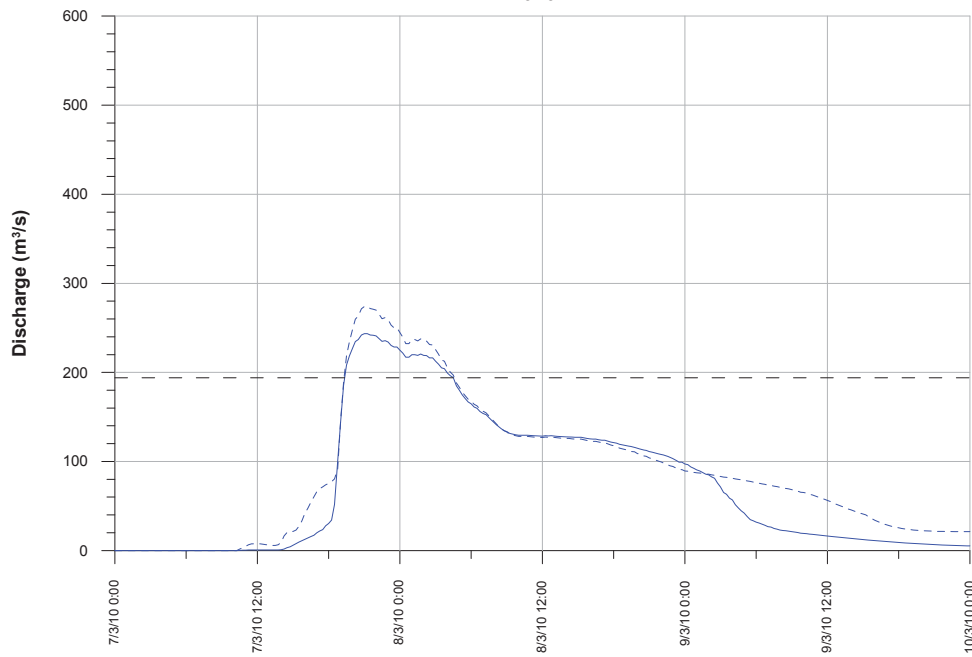
**LEGEND**

- Study Catchment
- Two-Dimensional Model Boundary
- ▼ Stream Gauge
- L.D.02 DRAINS Sub-Catchment and Identifier
- L27 RAFTS Sub-Catchment and Identifier
- RAFTS Sub-Catchment Link

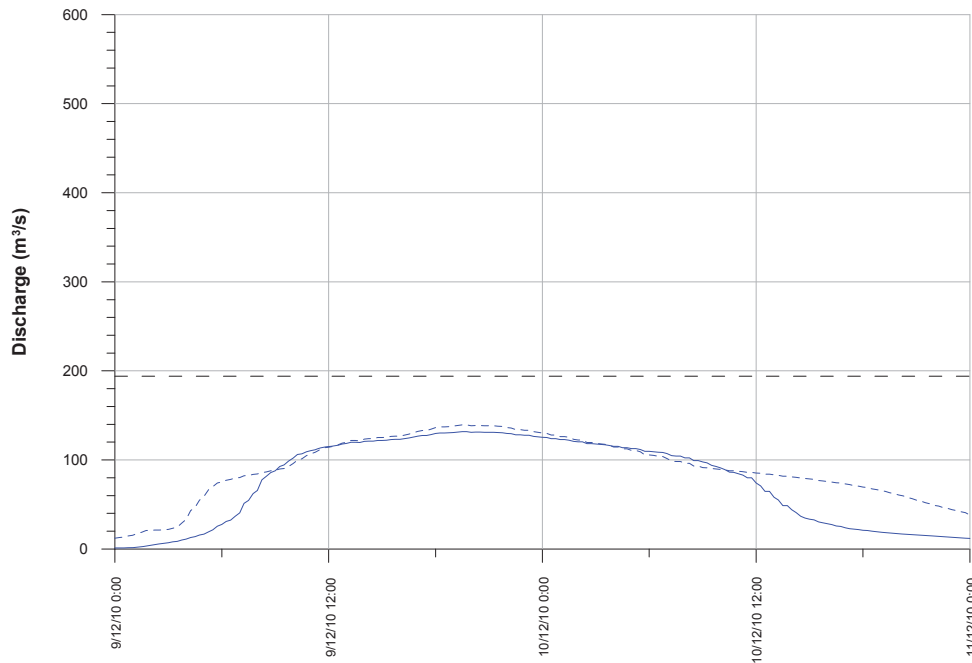
**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 3.3  
Sheet 2 of 2

MARCH 2010

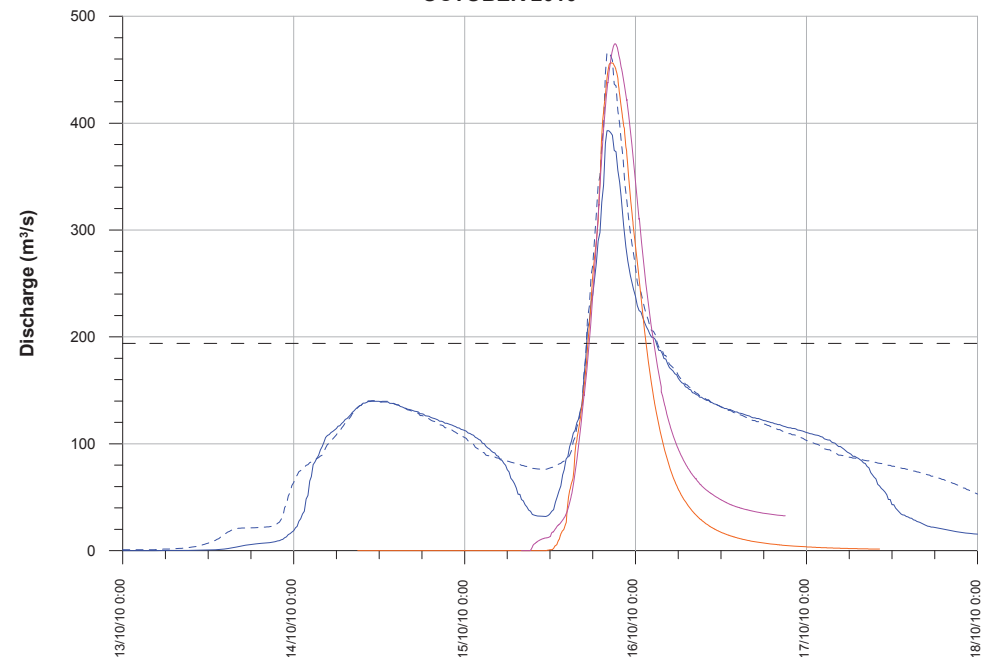


Date and Time  
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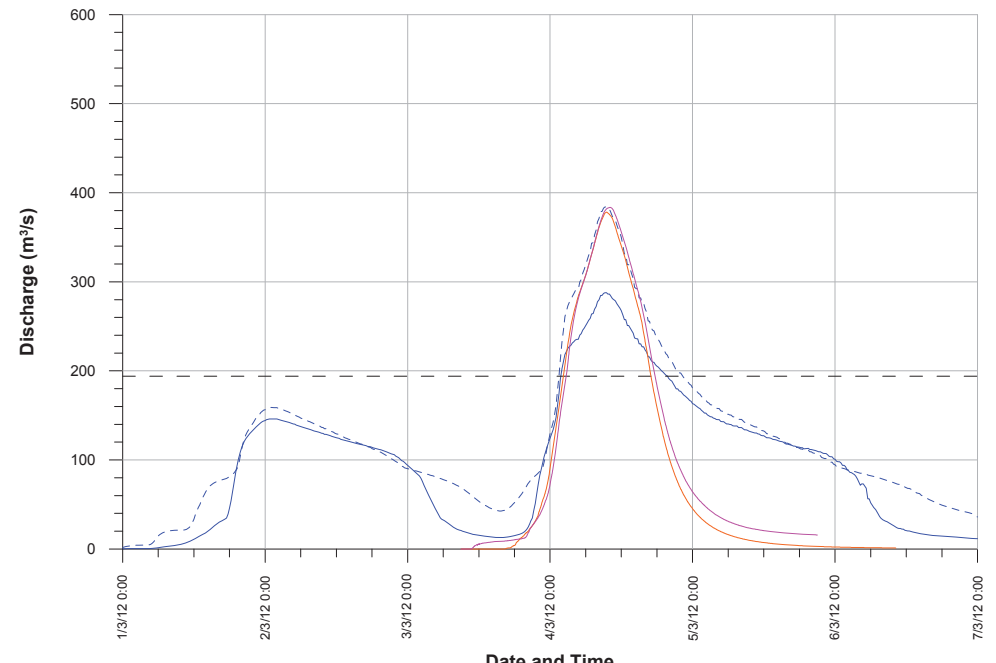


Date and Time

OCTOBER 2010



Date and Time  
MARCH 2012



Date and Time

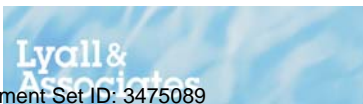
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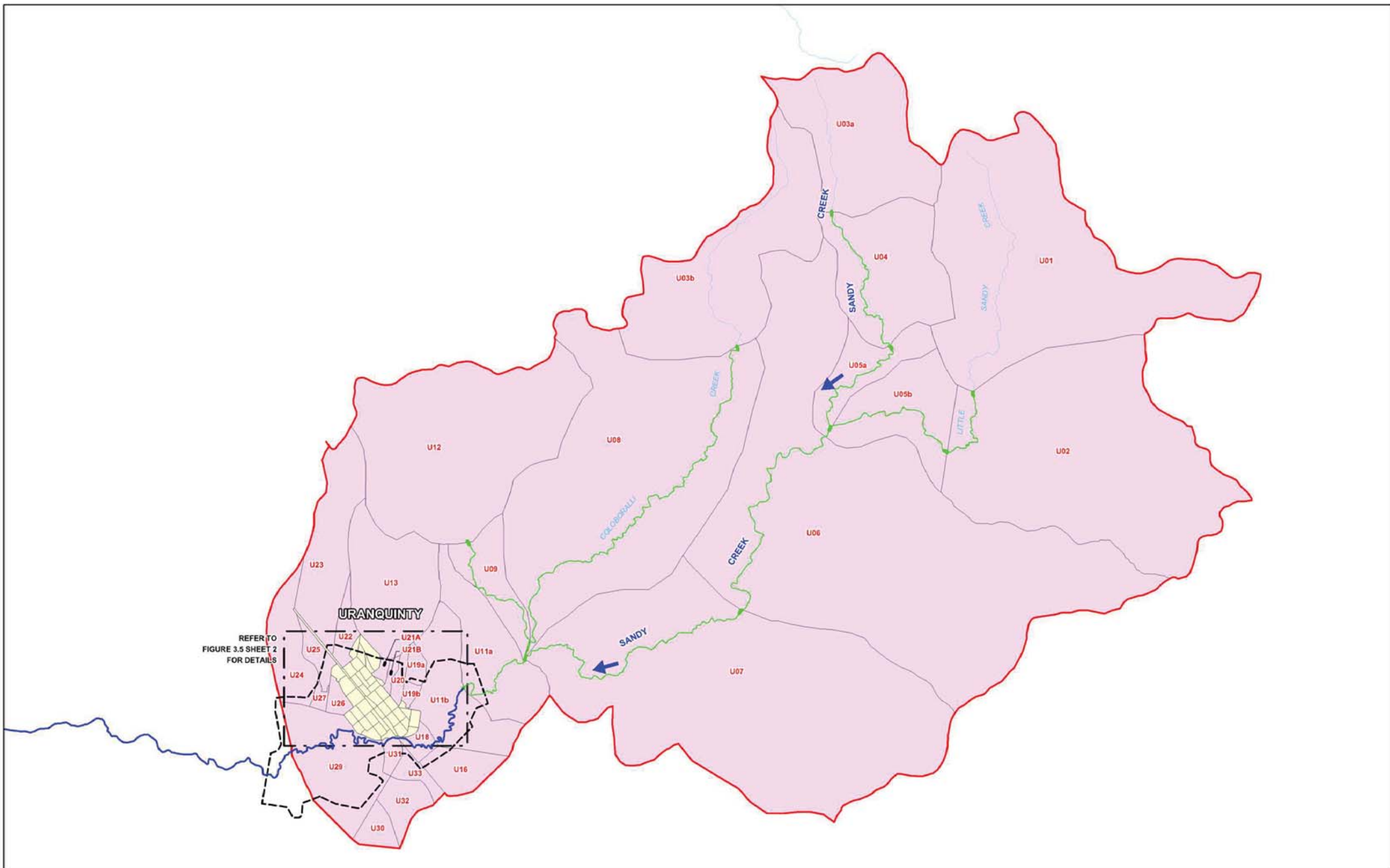
- Recorded Hydrograph (DPIOW Rating Curve)
- - - Adjusted Hydrograph (Adjusted Rating Curve)
- Modelled Hydrograph (RAFTS)
- TUFLOW Hydrograph (TUFLOW)
- - - Max. Gauge Discharge

TARCUTTA, LADYSMITH AND URANQUITY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 3.4

KYEAMBA CREEK HISTORIC FLOWS AT LADYSMITH GAUGE (GS 410048)





REFER TO  
FIGURE 3.5 SHEET 2  
FOR DETAILS

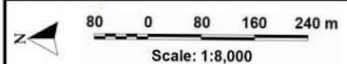
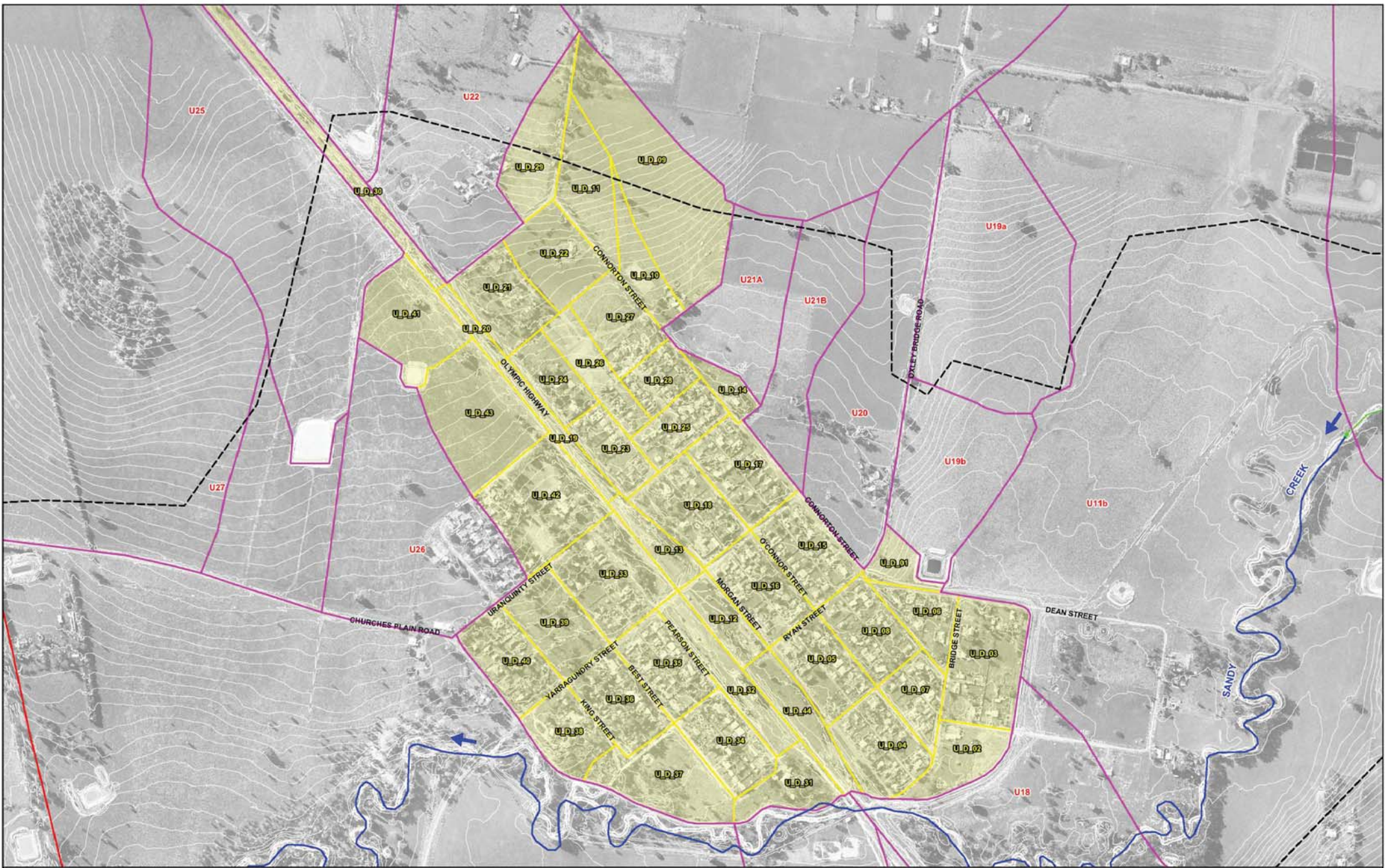
URANQUINTY

LEGEND

- Study Catchment
- - - Two-Dimensional Boundary
- DRAINS Sub-Catchment
- RAFTS Sub-Catchment and Identifier
- RAFTS Sub-Catchment Link

TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 3.5  
Sheet 1 of 2



**LEGEND**

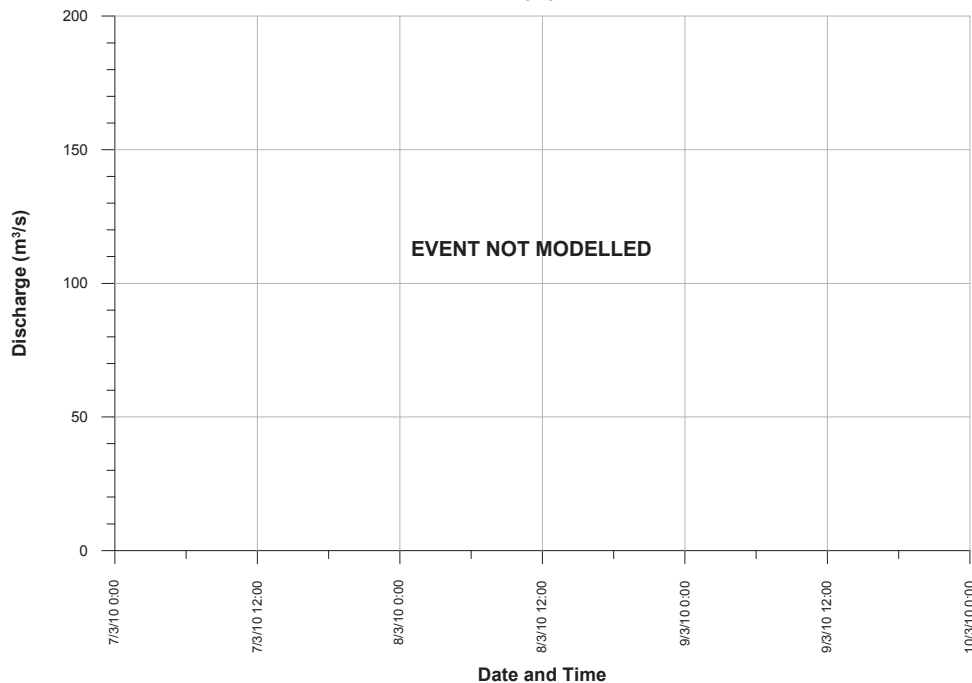
- Study Catchment
- Two-Dimensional Model Boundary
- U.D.00 DRAINS Sub-Catchment and Identifier
- U18 RAFTS Sub-Catchment and Identifier
- RAFTS Sub-Catchment Link

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

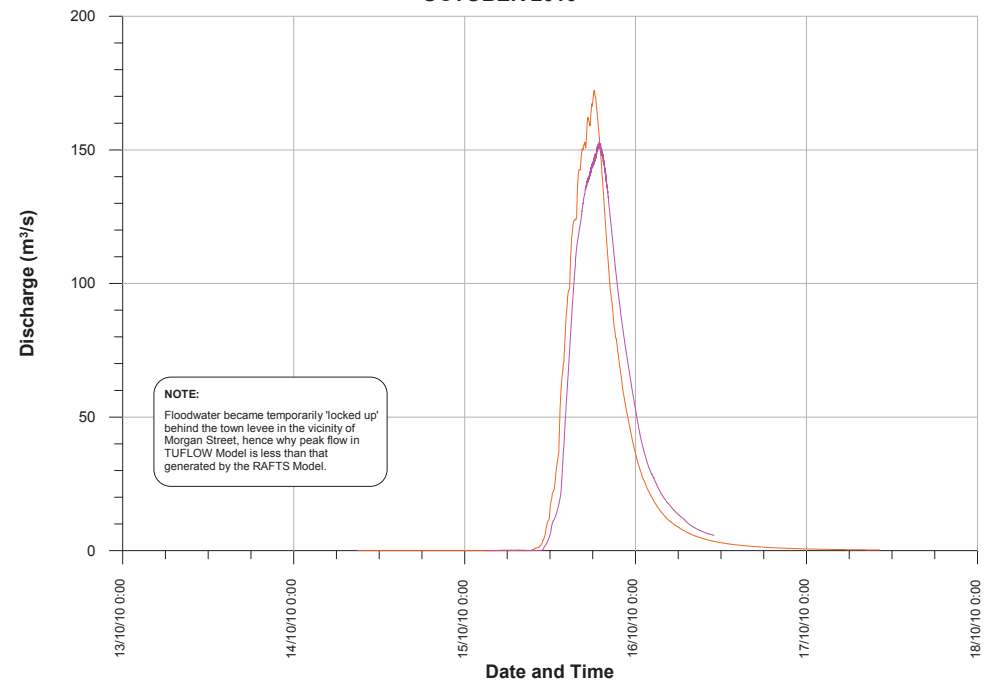
Figure 3.5  
Sheet 2 of 2



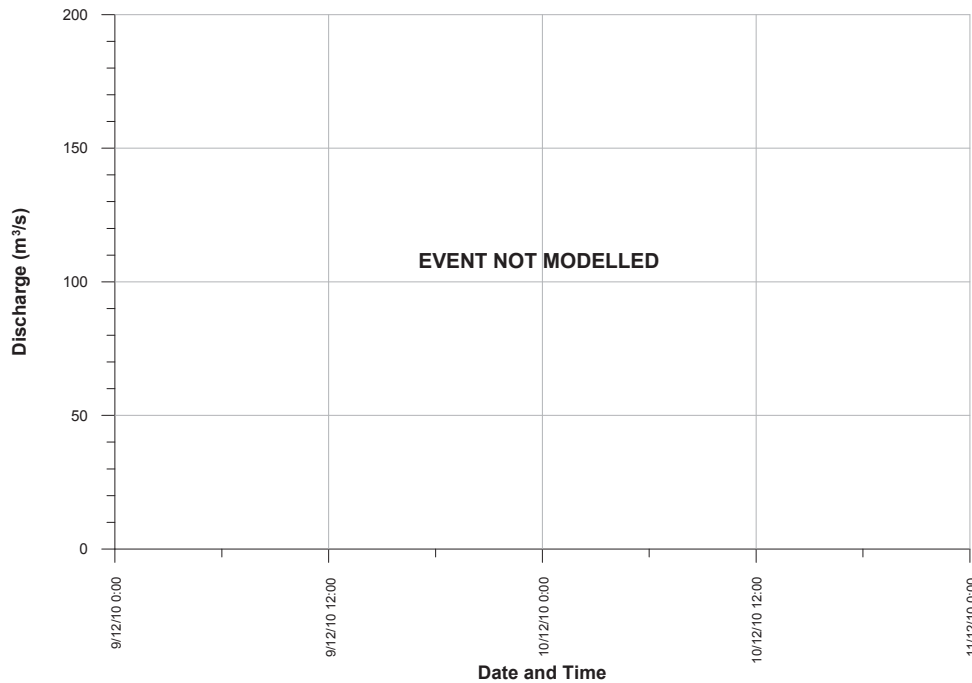
### MARCH 2010



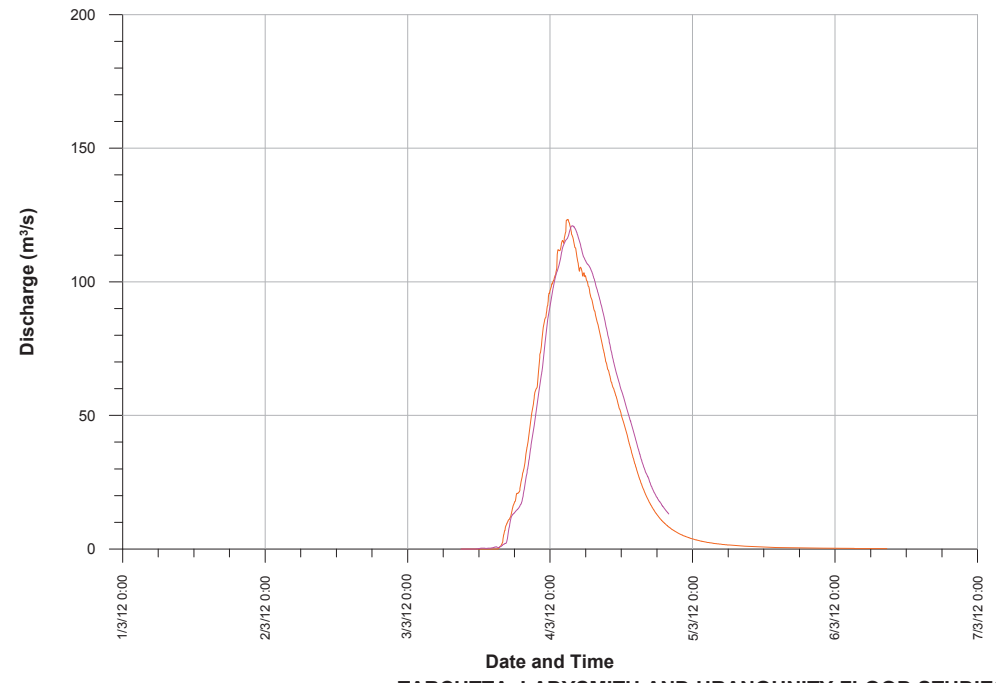
### OCTOBER 2010



### DECEMBER 2010



### MARCH 2012



LEGEND

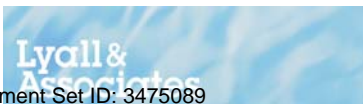
— Modelled Hydrograph (RAFTS)

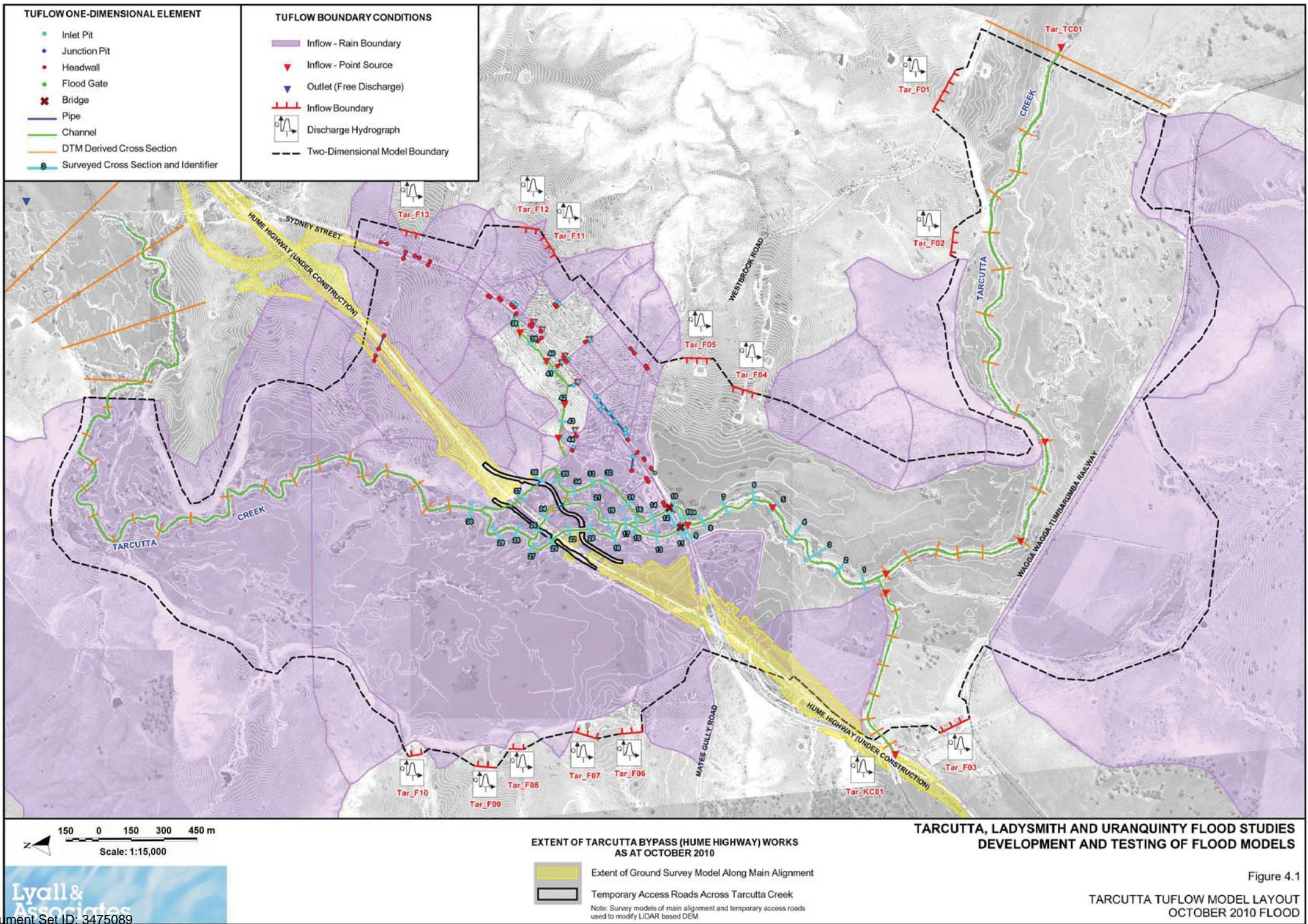
— Modelled Hydrograph (TUFLOW)

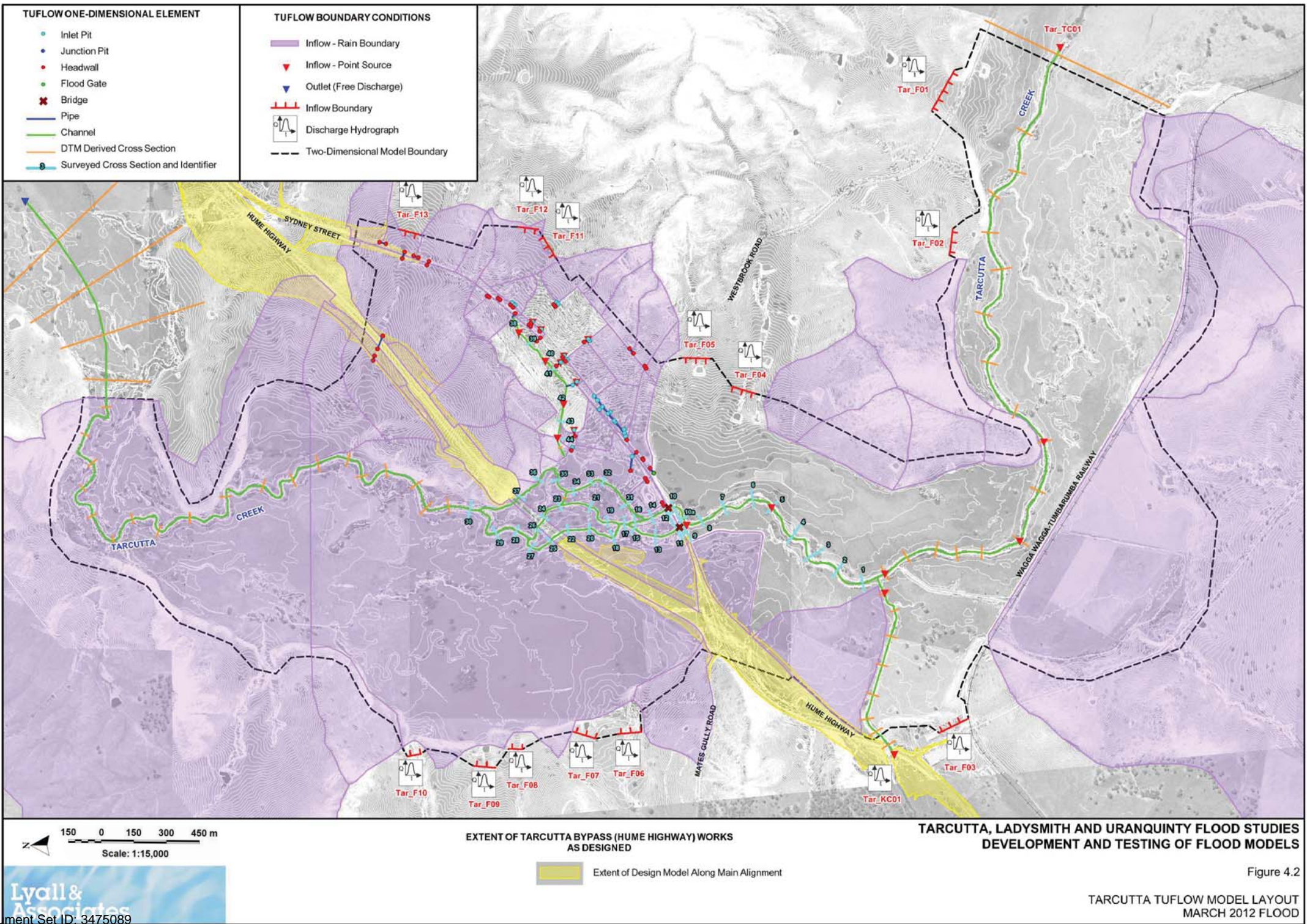
### TARCUTTA, LADYSMITH AND URANQUITY FLOOD STUDIES DEVELOPMENT AND TESTING OF FLOOD MODELS

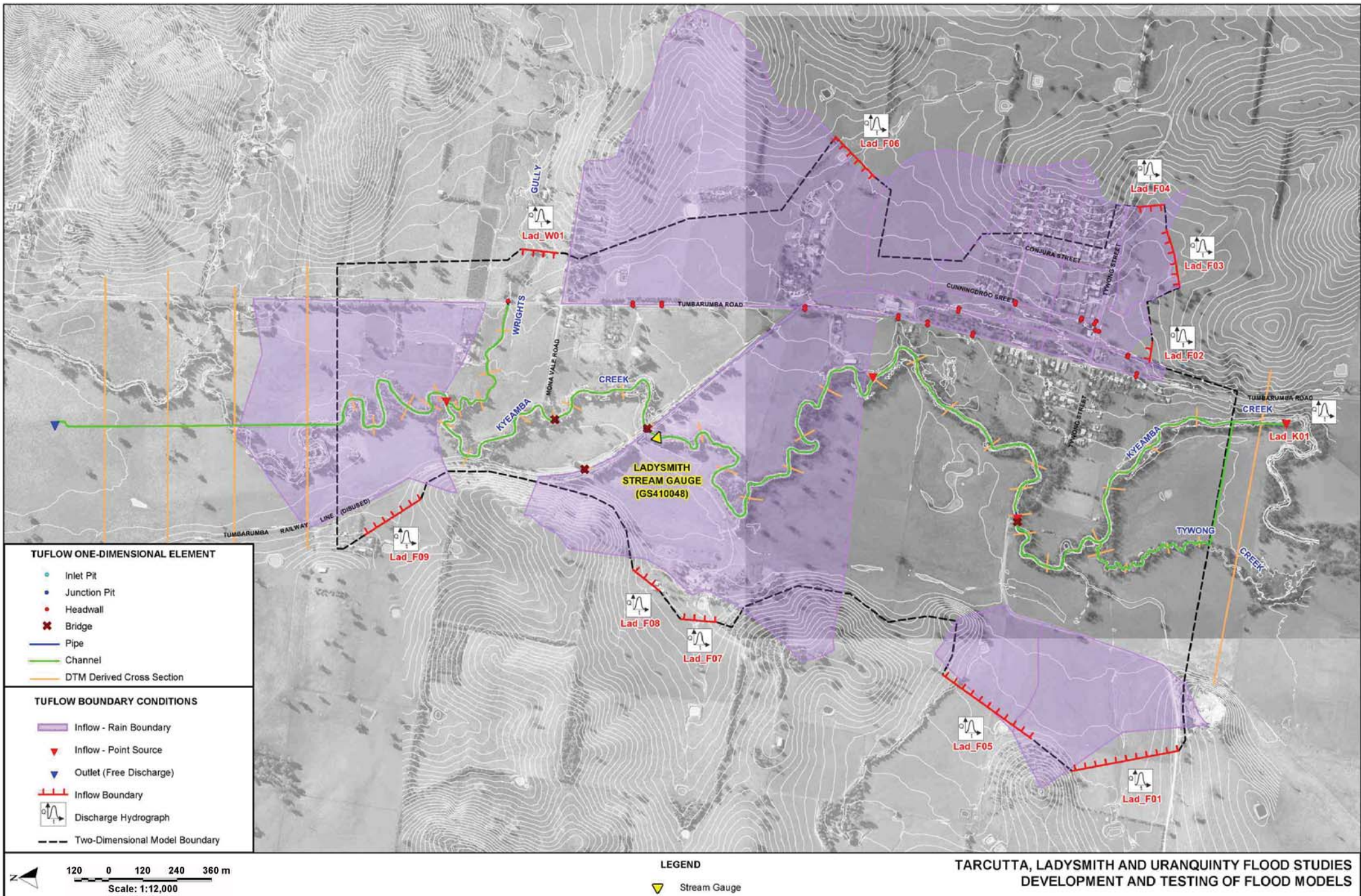
Figure 3.6

SANDY CREEK HISTORIC FLOWS AT OLYMPIC HIGHWAY





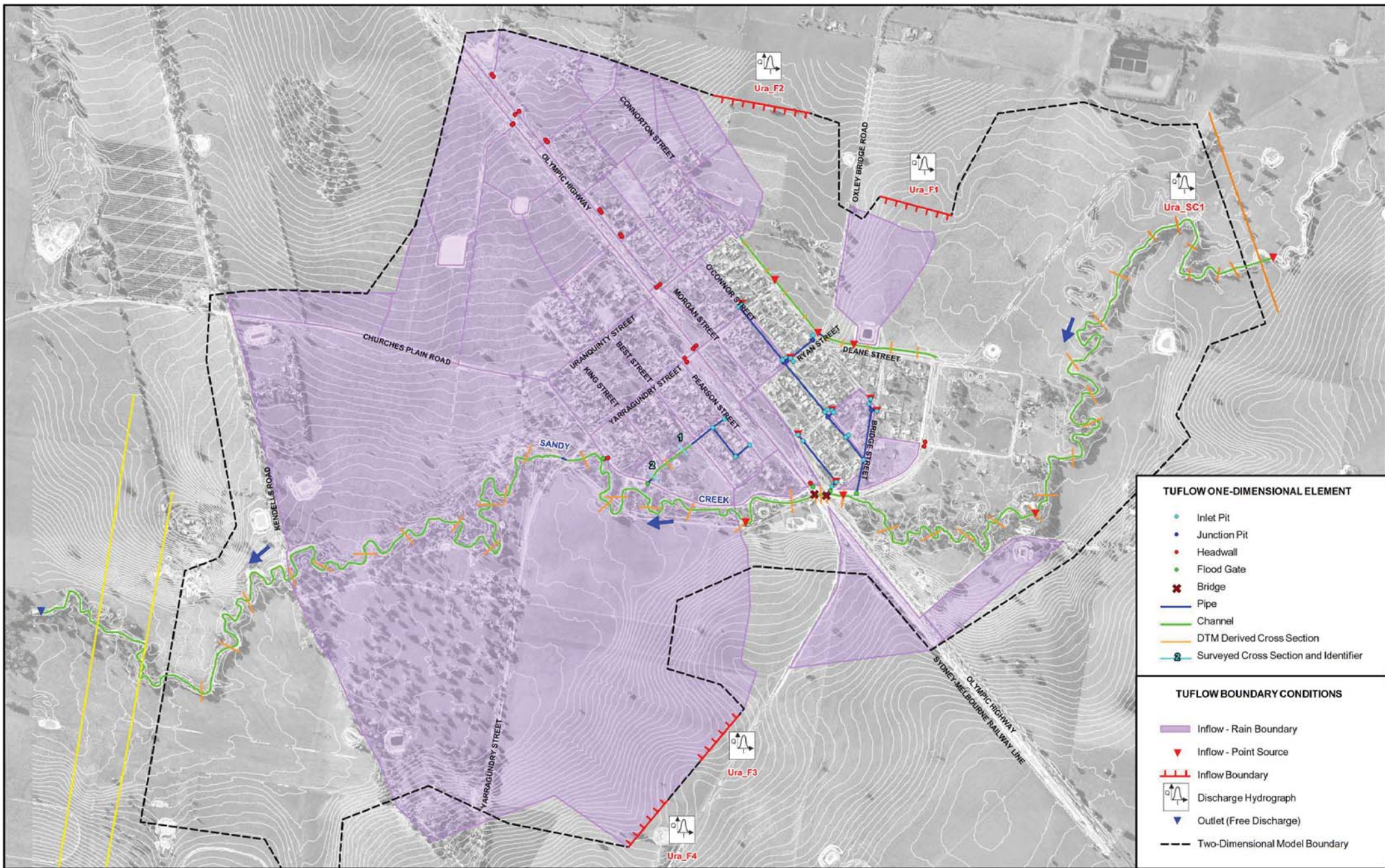




TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.3

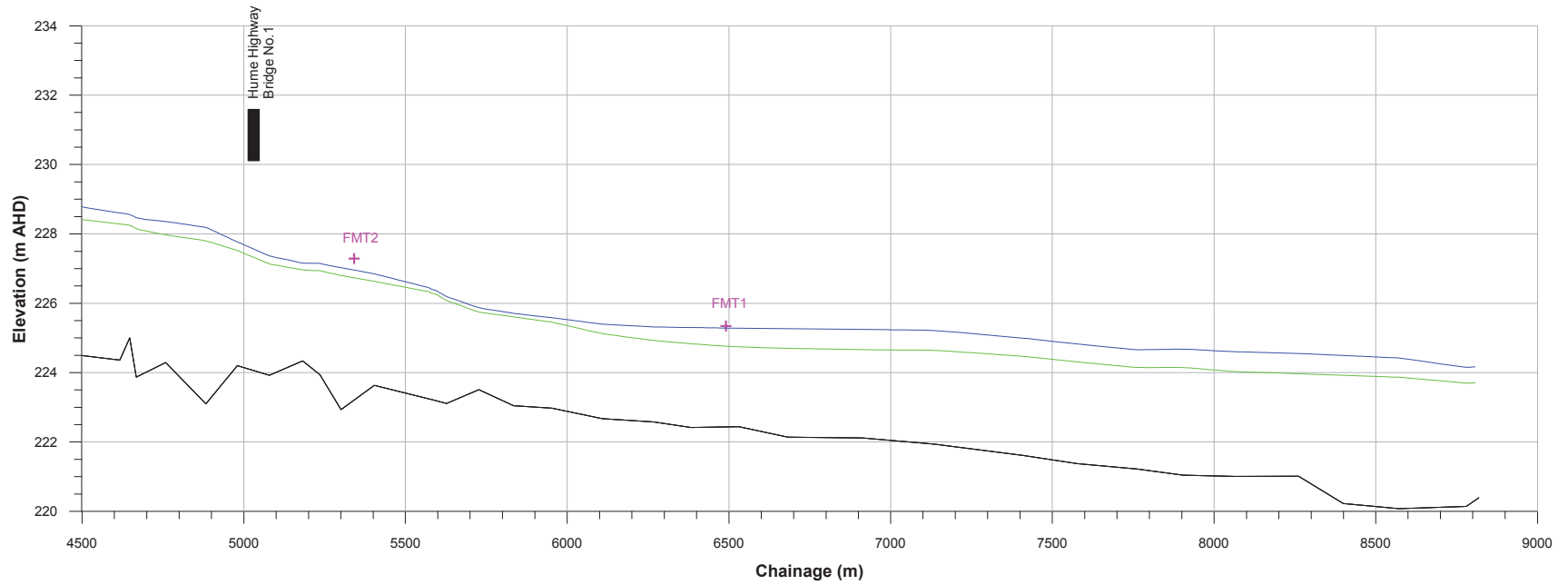
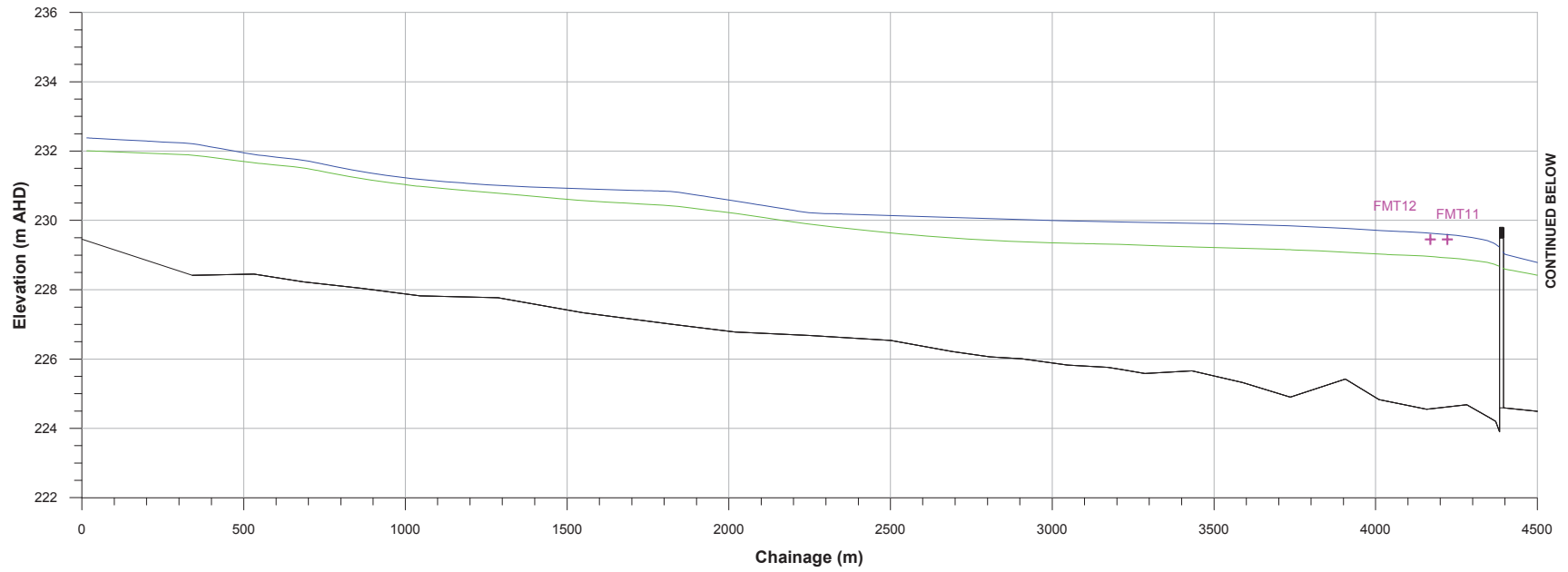




TAR CUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.4

URANQUINTY TUFLOW MODEL LAYOUT



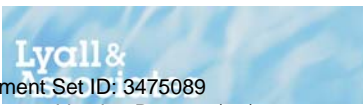
- LEGEND**
- + October 2010 Flood Marks
  - October 2010 Flood
  - March 2012 Flood

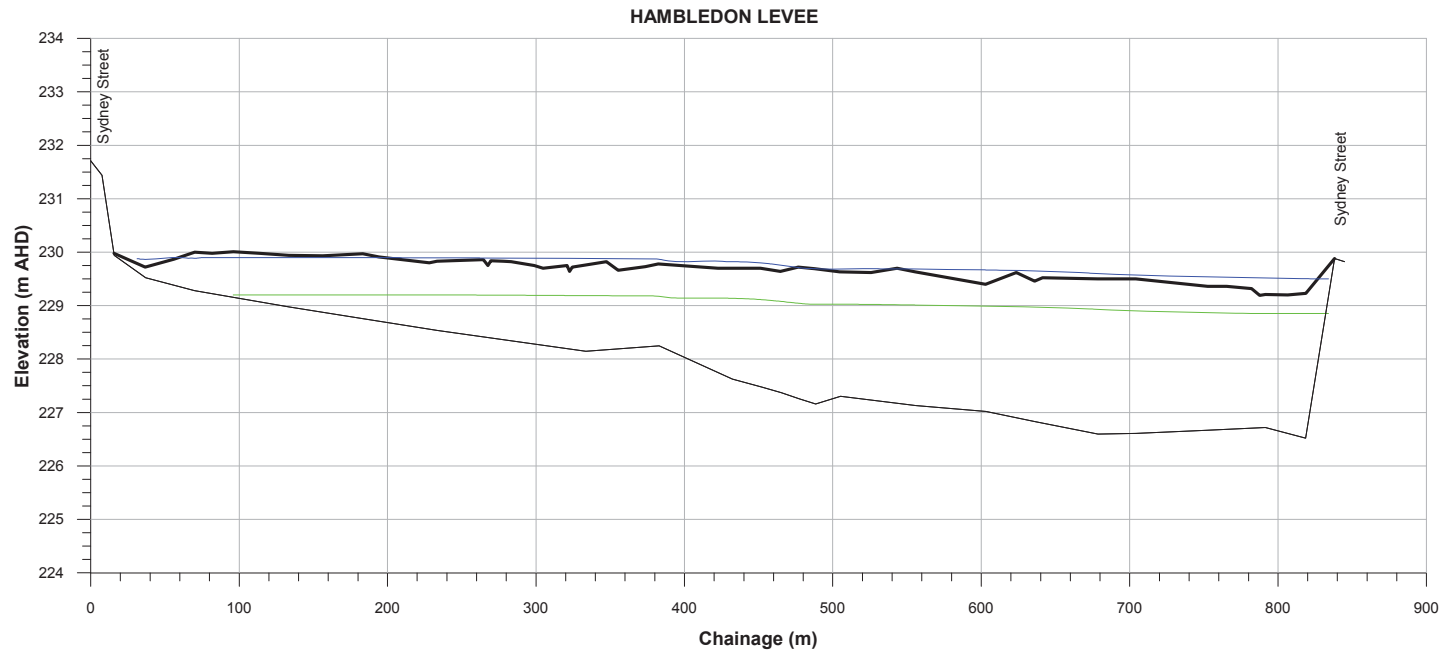
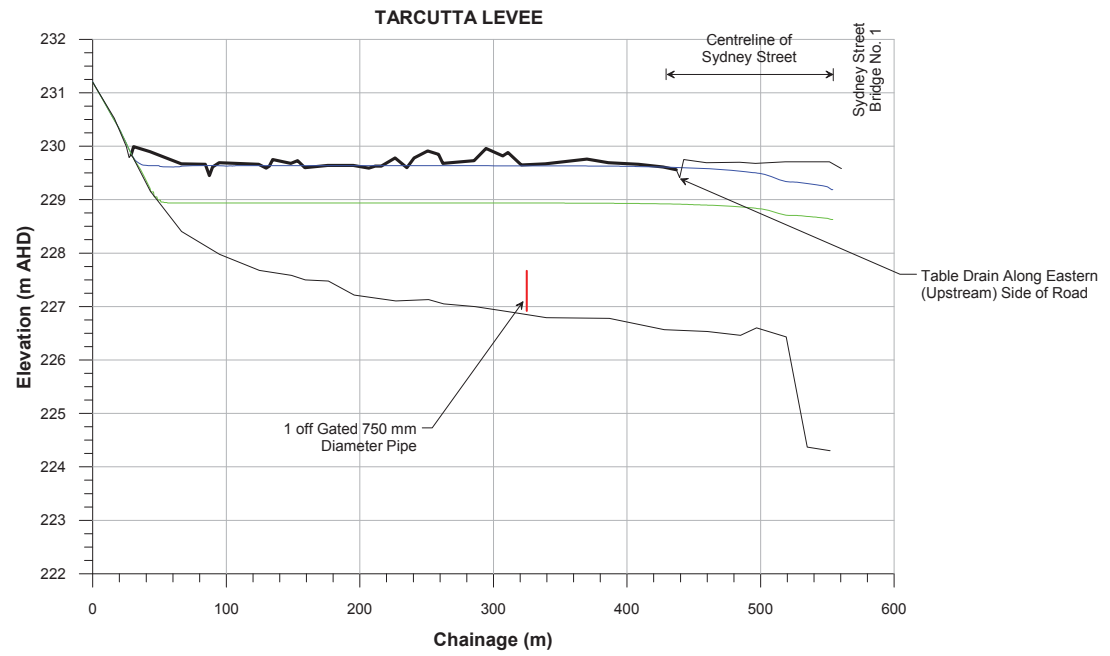
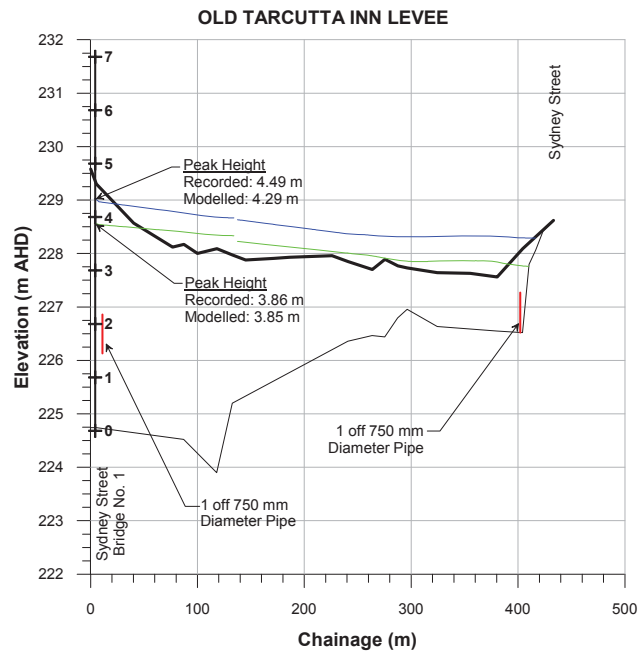
**NOTE:**  
Only flood marks located along the main arm of Tarcutta Creek shown.

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.5  
Sheet 1 of 2

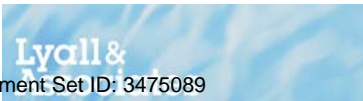
TARCUTTA CREEK HISTORIC WATER SURFACE PROFILES

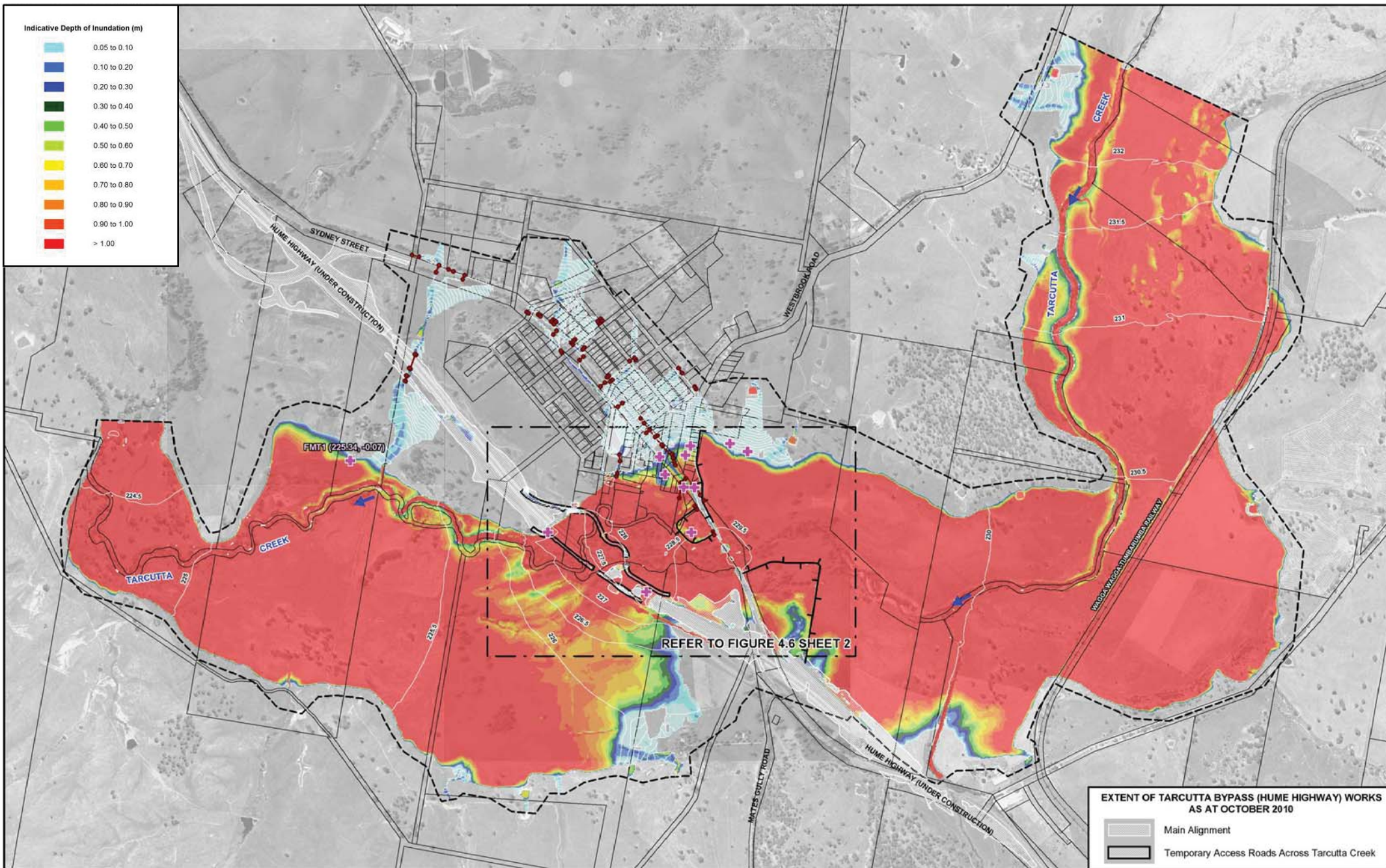




**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.5  
Sheet 2 of 2





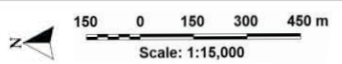
Indicative Depth of Inundation (m)

- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

REFER TO FIGURE 4.6 SHEET 2

**EXTENT OF TARCUTTA BYPASS (HUME HIGHWAY) WORKS AS AT OCTOBER 2010**

- Main Alignment
- Temporary Access Roads Across Tarcutta Creek



LEGEND

- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- Alignment of Existing Levee
- Flood Mark Location [NOTE: Negative difference indicates modelled level lower than recorded]

**NOTE:**  
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

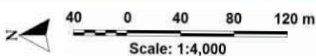
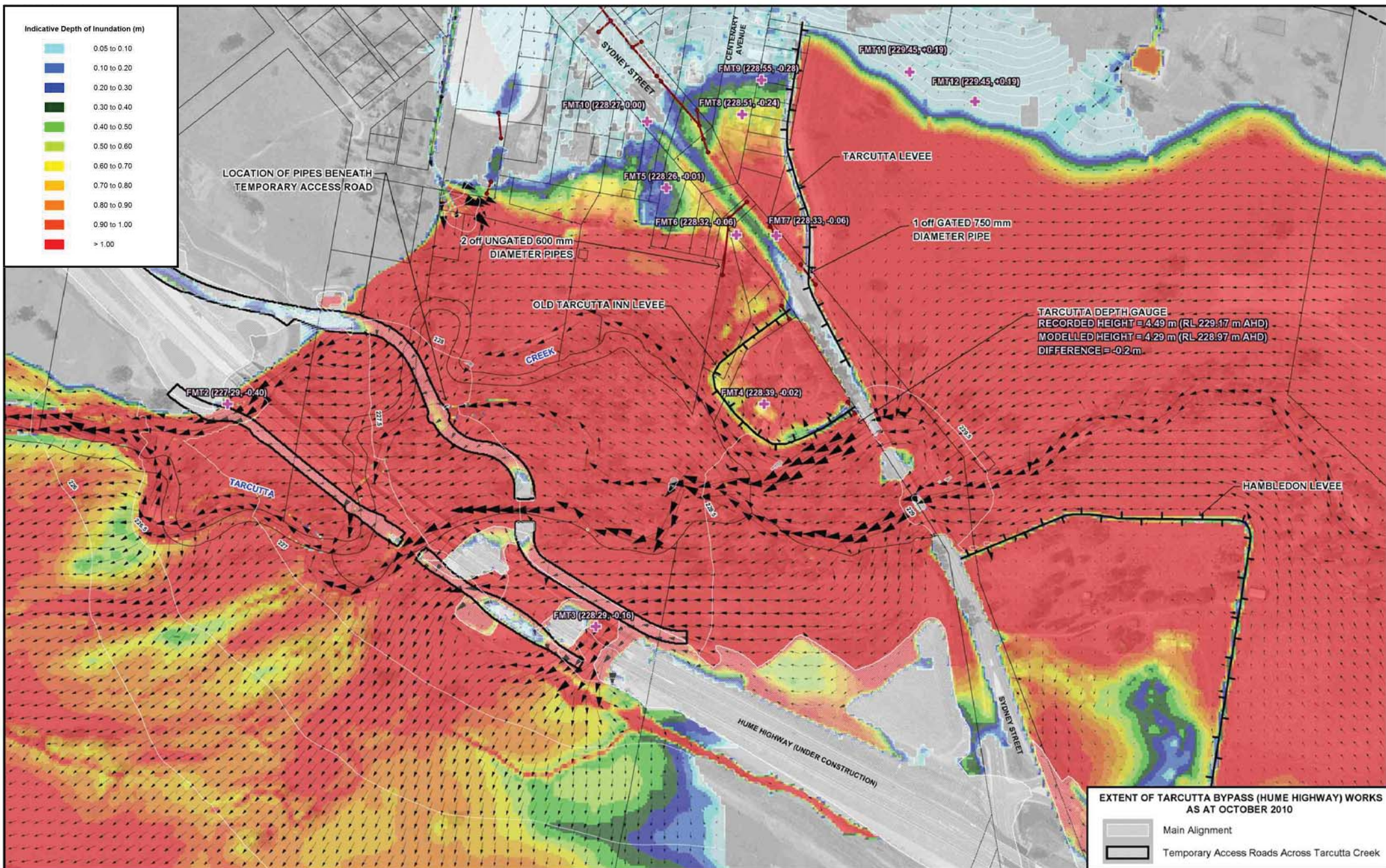
**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.6  
Sheet 1 of 2

TARCUTTA TUFLOW MODEL RESULTS  
OCTOBER 2010 FLOOD





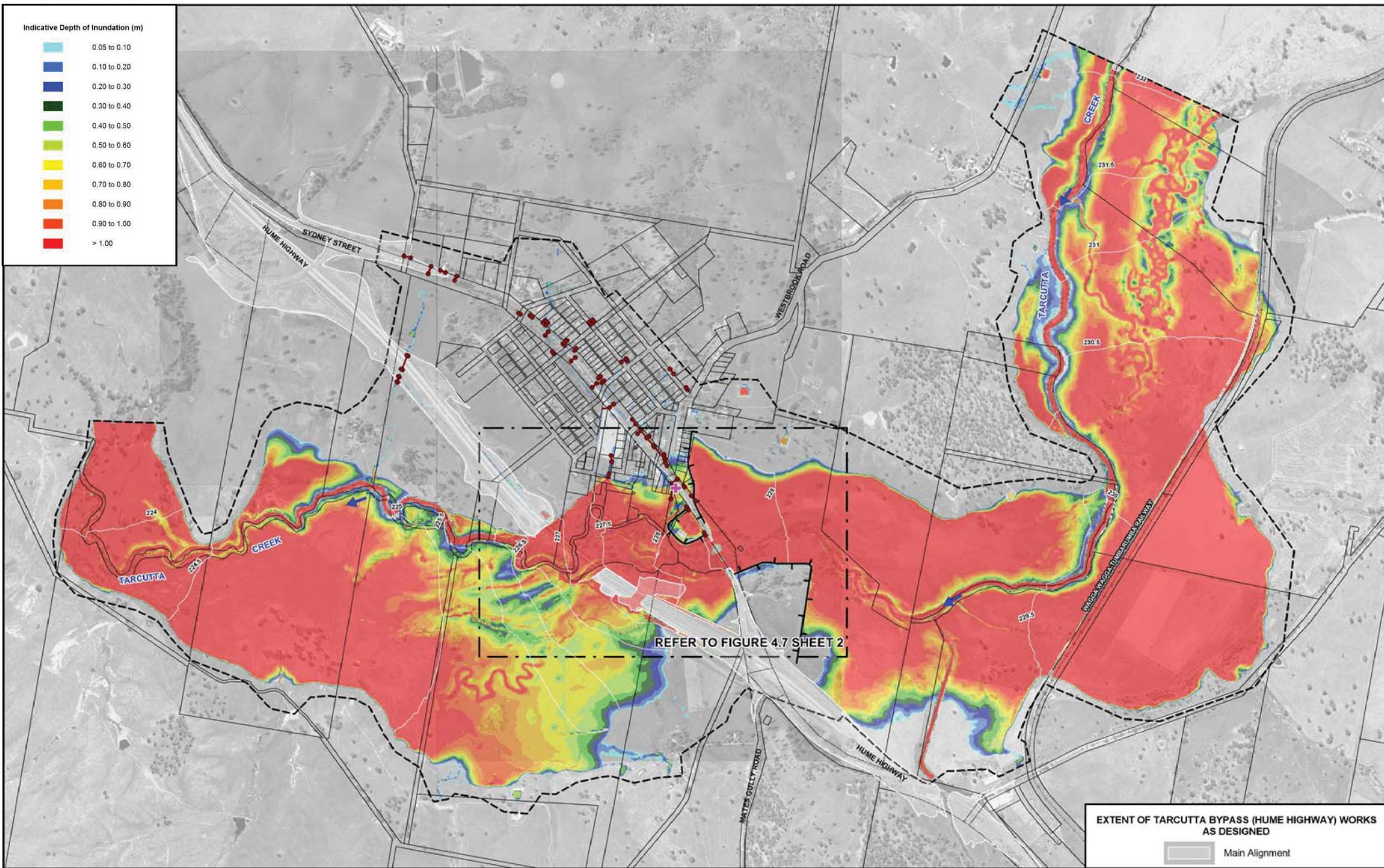


**NOTE:**  
 The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

- LEGEND**
- Modelled Stormwater Network
  - Two-Dimensional Model Boundary
  - Water Surface Contours (m AHD) (Mainstream Flooding Only)
  - Alignment of Existing Levee
  - [Surveyed Flood Level (m AHD), Modelled Difference(m)]
  - Flood Mark Location
  - [Note: Negative difference indicates modelled level lower than recorded]

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.6  
 Sheet 2 of 2



Indicative Depth of Inundation (m)

- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

REFER TO FIGURE 4.7 SHEET 2

EXTENT OF TARCUTTA BYPASS (HUME HIGHWAY) WORKS AS DESIGNED

Main Alignment

Scale: 1:15,000

LEGEND

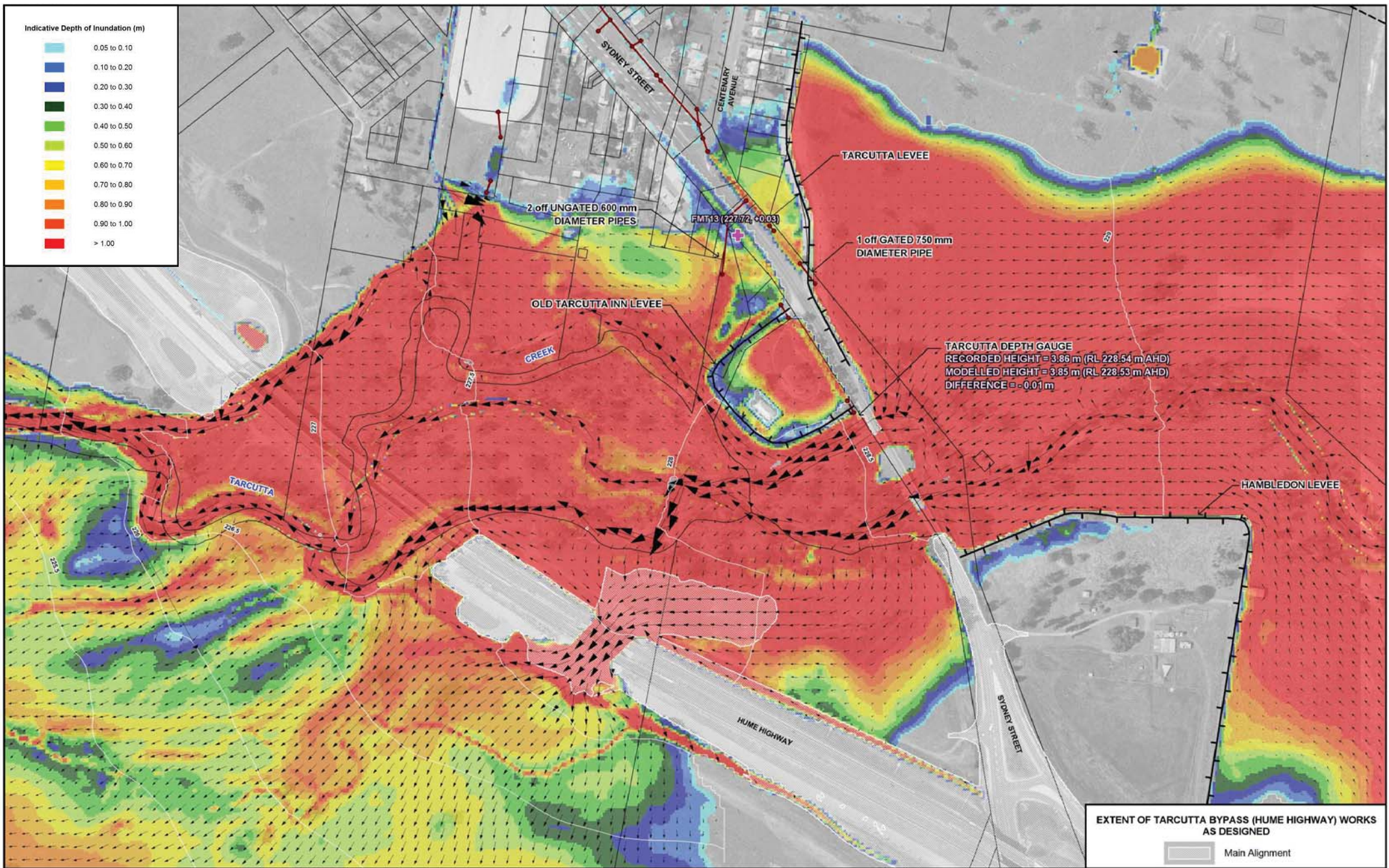
- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- Flood Mark Location
- Alignment of Existing Levee

TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.7 Sheet 1 of 2

TARCUTTA TUFLOW MODEL RESULTS MARCH 2012 FLOOD

NOTE:  
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

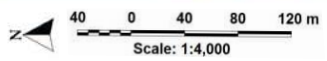


Indicative Depth of Inundation (m)

- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

TARCUTTA DEPTH GAUGE  
 RECORDED HEIGHT = 3.86 m (RL 228.54 m AHD)  
 MODELLED HEIGHT = 3.85 m (RL 228.53 m AHD)  
 DIFFERENCE = - 0.01 m

EXTENT OF TARCUTTA BYPASS (HUME HIGHWAY) WORKS AS DESIGNED  
 Main Alignment



LEGEND

- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- Alignment of Existing Levee
- Flood Mark Location [Note: Negative difference indicates modelled level lower than recorded]

NOTE:

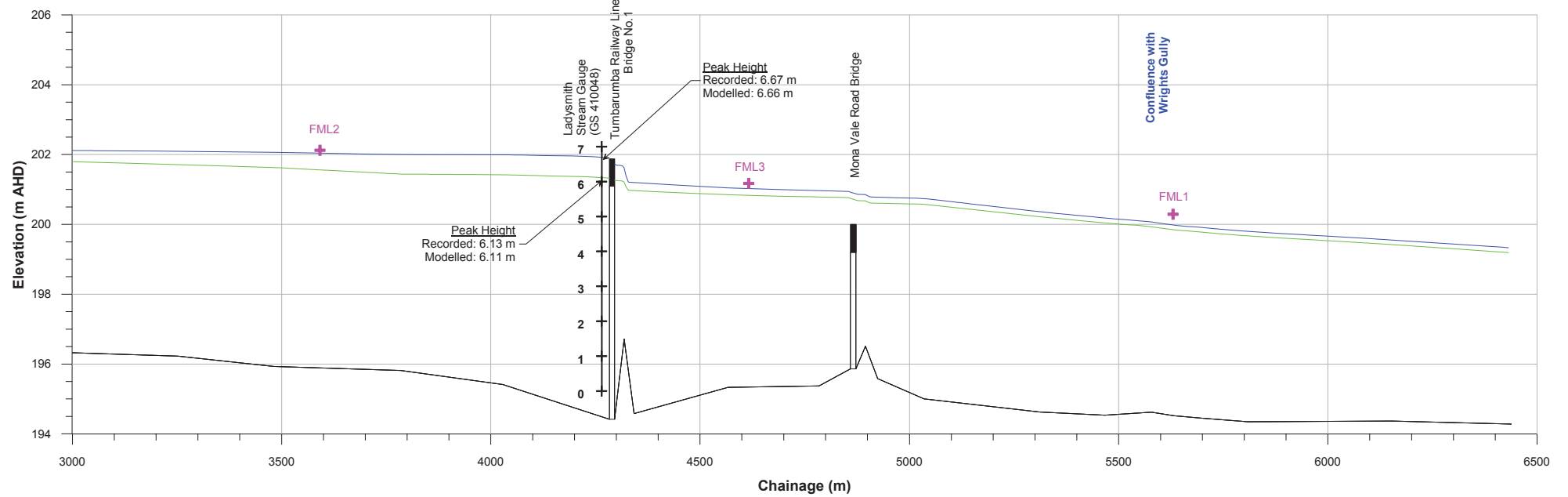
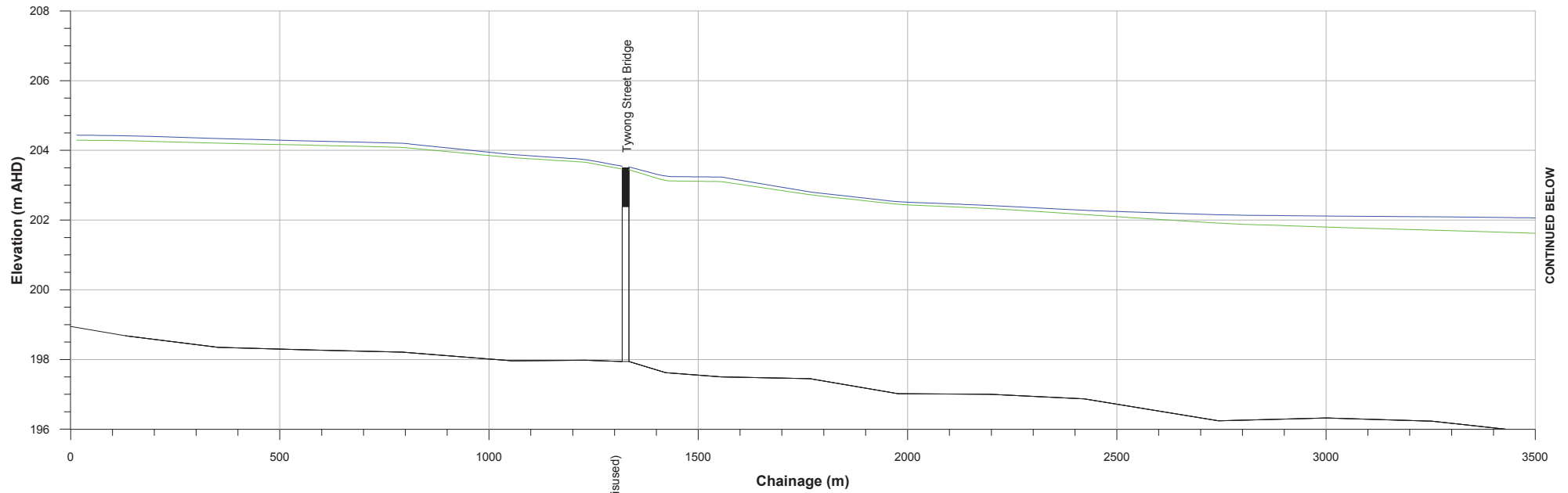
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
 DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.7  
 Sheet 2 of 2

TARCUTTA TUFLOW MODEL RESULTS  
 MARCH 2012 FLOOD





**LEGEND**

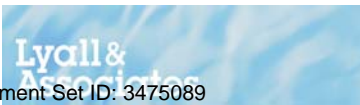
+	October 2010 Flood Mark
— (blue)	October 2010 Flood
— (green)	March 2012 Flood

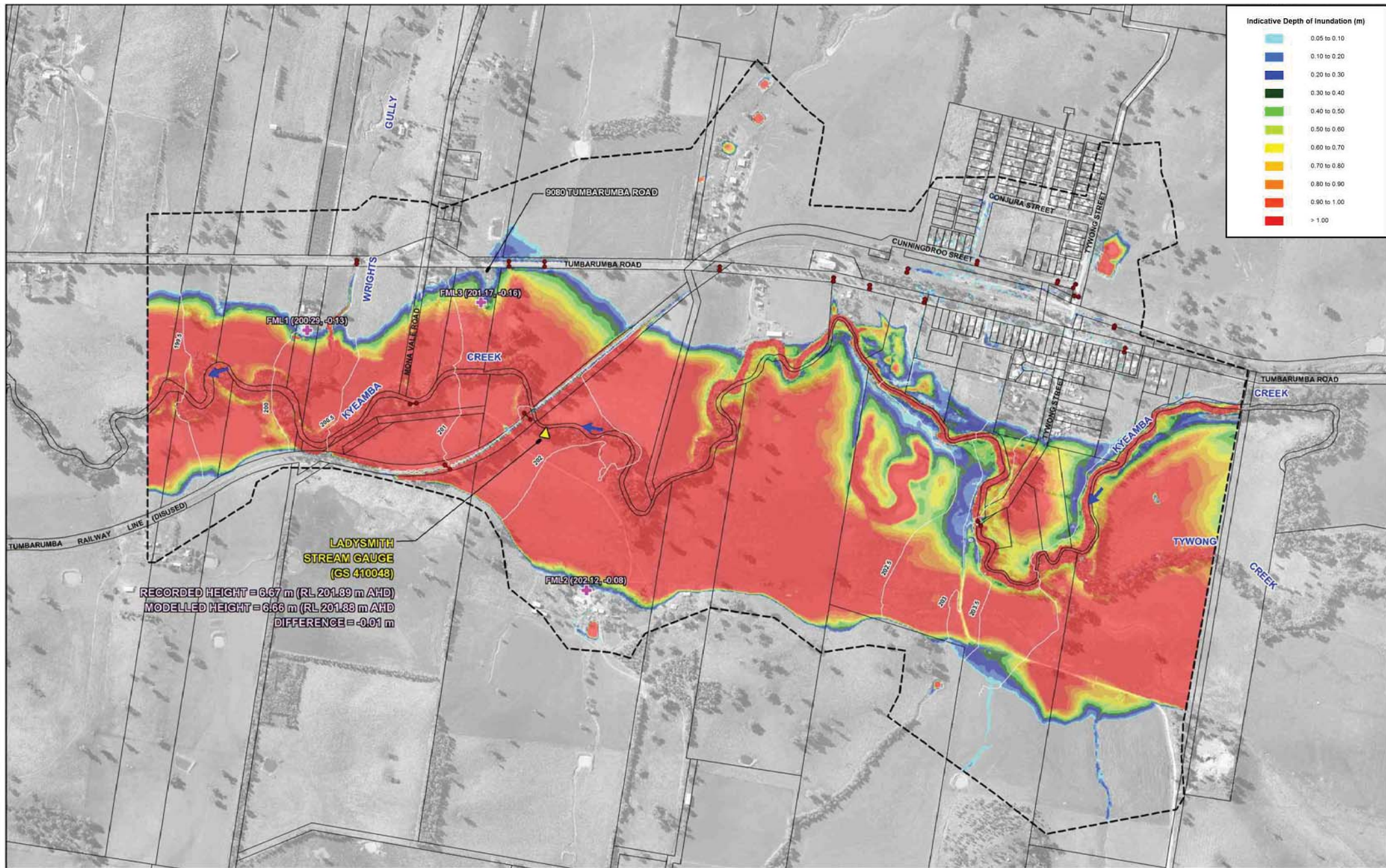
- NOTES:**
1. Only flood marks located along main arm of Kyeamba Creek shown.
  2. Location of Ladysmith stream gauge approximate only.
  3. Gauge zero on Ladysmith stream gauge = 195.224 m AHD

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.8

KYEAMBA CREEK HISTORIC WATER SURFACE PROFILES

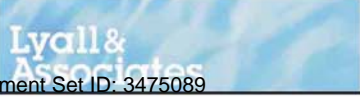
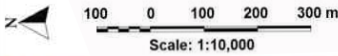




Indicative Depth of Inundation (m)

Light Blue	0.05 to 0.10
Blue	0.10 to 0.20
Dark Blue	0.20 to 0.30
Green	0.30 to 0.40
Light Green	0.40 to 0.50
Yellow	0.50 to 0.60
Orange	0.60 to 0.70
Red-Orange	0.70 to 0.80
Red	0.80 to 0.90
Dark Red	0.90 to 1.00
Red	> 1.00

**LADYSMITH  
STREAM GAUGE  
(GS 410048)**  
 RECORDED HEIGHT = 6.67 m (RL 201.89 m AHD)  
 MODELLED HEIGHT = 6.66 m (RL 201.88 m AHD)  
 DIFFERENCE = -0.01 m



**NOTE:**  
 The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

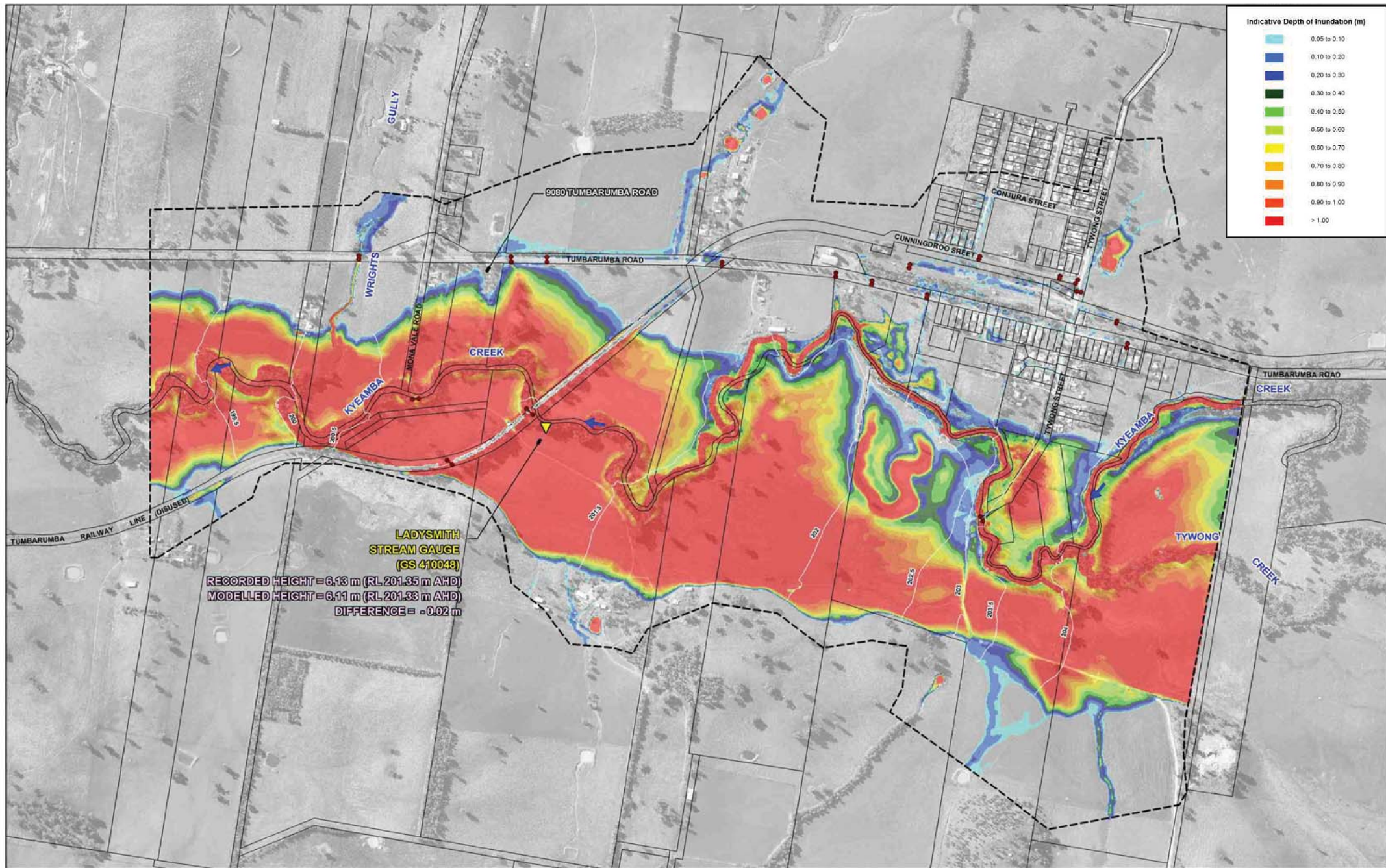
**LEGEND**

- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- FML2 (202.92, -0.00) [Surveyed Flood Level (m AHD), Modelled Difference(m)]
- Flood Mark Location [Note: Negative difference indicates modelled level lower than recorded]

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
 DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.9

LADYSMITH TUFLOW MODEL RESULTS  
 OCTOBER 2010 FLOOD



Indicative Depth of Inundation (m)	
Light Blue	0.05 to 0.10
Blue	0.10 to 0.20
Dark Blue	0.20 to 0.30
Green	0.30 to 0.40
Light Green	0.40 to 0.50
Yellow	0.50 to 0.60
Orange	0.60 to 0.70
Dark Orange	0.70 to 0.80
Red	0.80 to 0.90
Dark Red	0.90 to 1.00
Red	> 1.00

**LADYSMITH  
 STREAM GAUGE  
 (GS 410048)**  
 RECORDED HEIGHT = 6.13 m (RL 201.35 m AHD)  
 MODELLED HEIGHT = 6.11 m (RL 201.33 m AHD)  
 DIFFERENCE = -0.02 m

100 0 100 200 300 m  
 Scale: 1:10,000

**LEGEND**

- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
 DEVELOPMENT AND TESTING OF FLOOD MODELS**

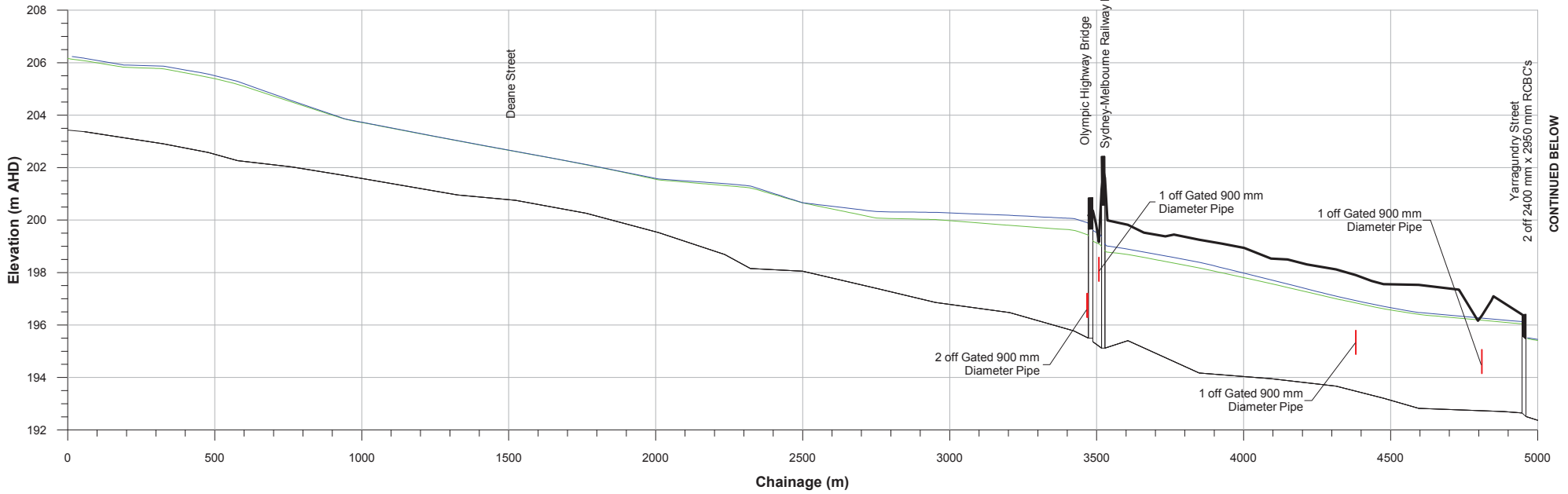
Figure 4.10

LADYSMITH TUFLOW MODEL RESULTS  
 MARCH 2012 FLOOD

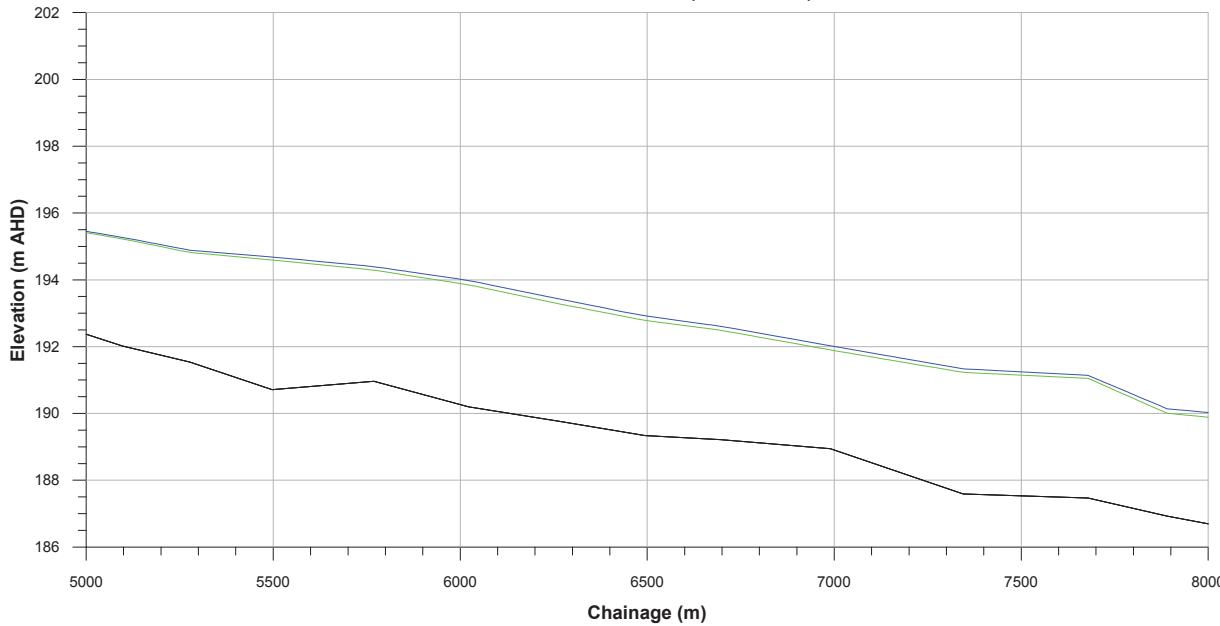
**NOTE:**  
 The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.



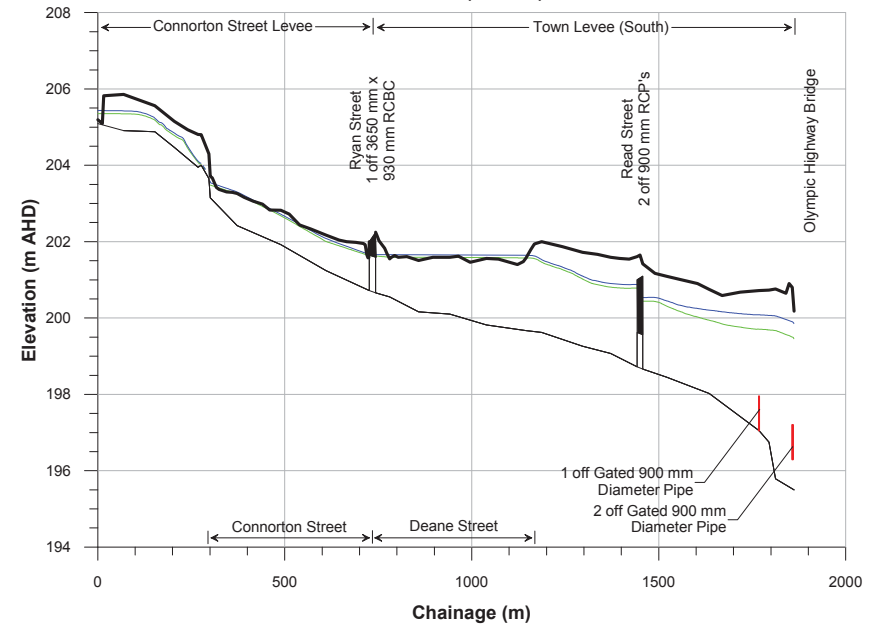
MAIN ARM OF SANDY CREEK



MAIN ARM OF SANDY CREEK (CONTINUED)



CONNORTON STREET LEVEE AND TOWN LEVEE (SOUTH)



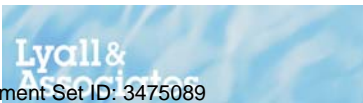
LEGEND

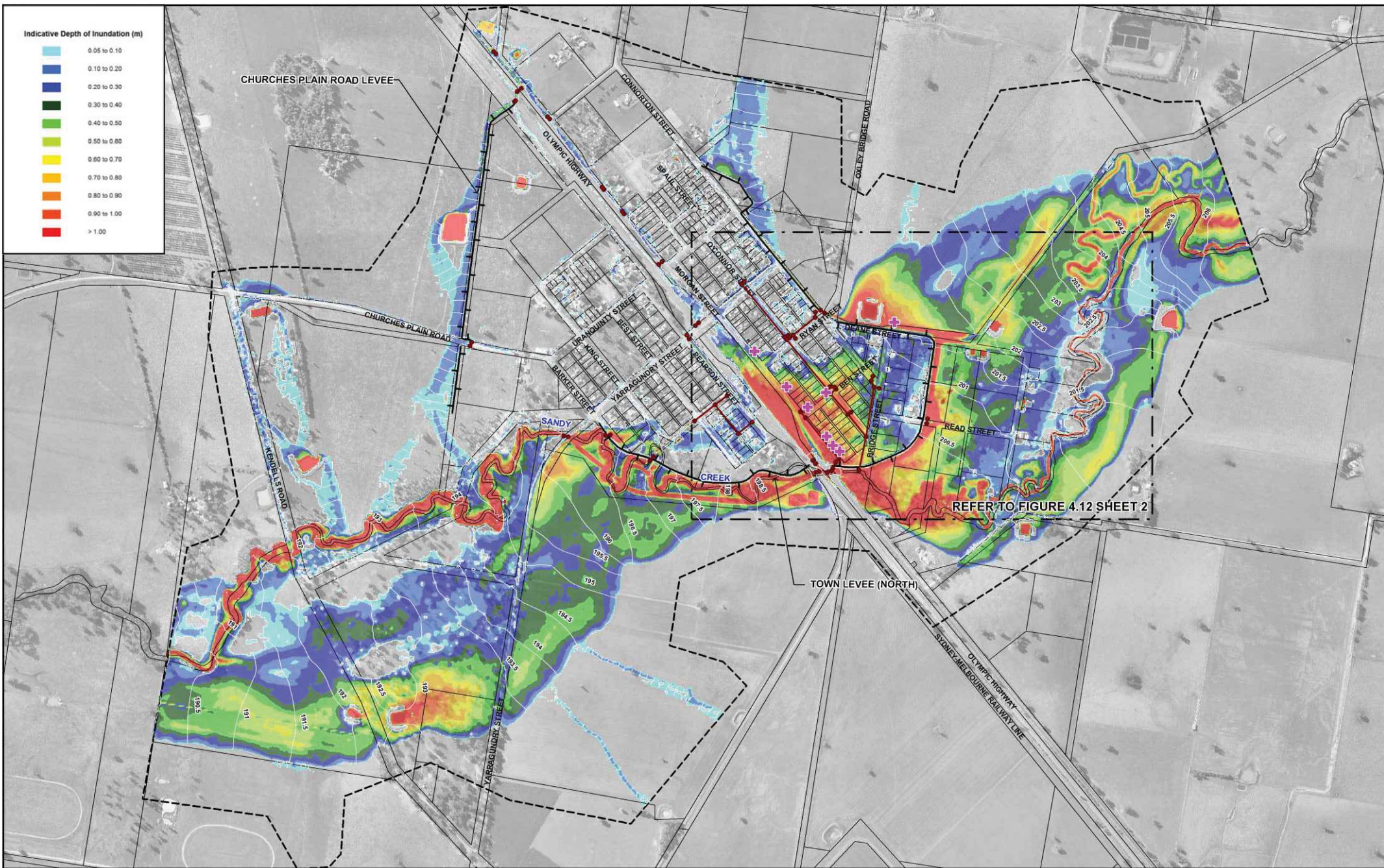
- October 2010 Flood
- March 2012 Flood
- Crest Level of Adjacent Levee

TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.11

SANDY CREEK HISTORIC WATER SURFACE PROFILES





Indicative Depth of Inundation (m)

- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.40
- 0.40 to 0.50
- 0.50 to 0.60
- 0.60 to 0.70
- 0.70 to 0.80
- 0.80 to 0.90
- 0.90 to 1.00
- > 1.00

CHURCHES PLAIN ROAD LEVEE

CHURCHES PLAIN ROAD

KENDALL'S ROAD

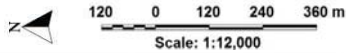
SANDY CREEK

CREEK

REFER TO FIGURE 4.12 SHEET 2

TOWN LEVEE (NORTH)

OLYMPIC HIGHWAY



LEGEND

- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- Flood Mark Location
- Alignment of Existing Levee

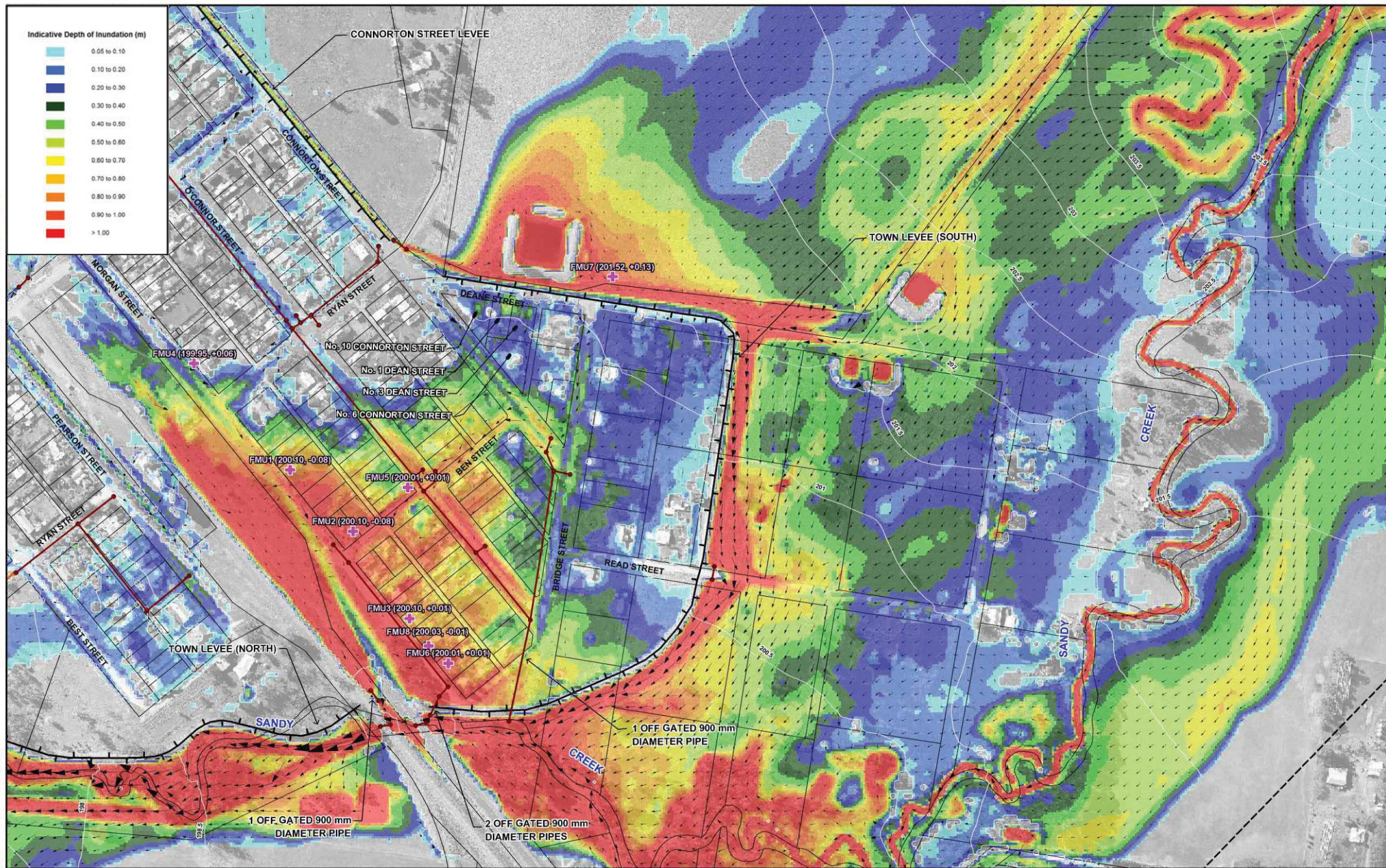
NOTE:  
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

TAR CUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.12  
Sheet 1 of 2

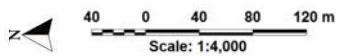






Indicative Depth of Inundation (m)

Light Blue	0.05 to 0.10
Blue	0.10 to 0.20
Dark Blue	0.20 to 0.30
Green	0.30 to 0.40
Light Green	0.40 to 0.50
Yellow-Green	0.50 to 0.60
Yellow	0.60 to 0.70
Orange	0.70 to 0.80
Red-Orange	0.80 to 0.90
Red	0.90 to 1.00
Dark Red	> 1.00



LEGEND

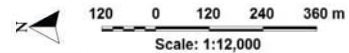
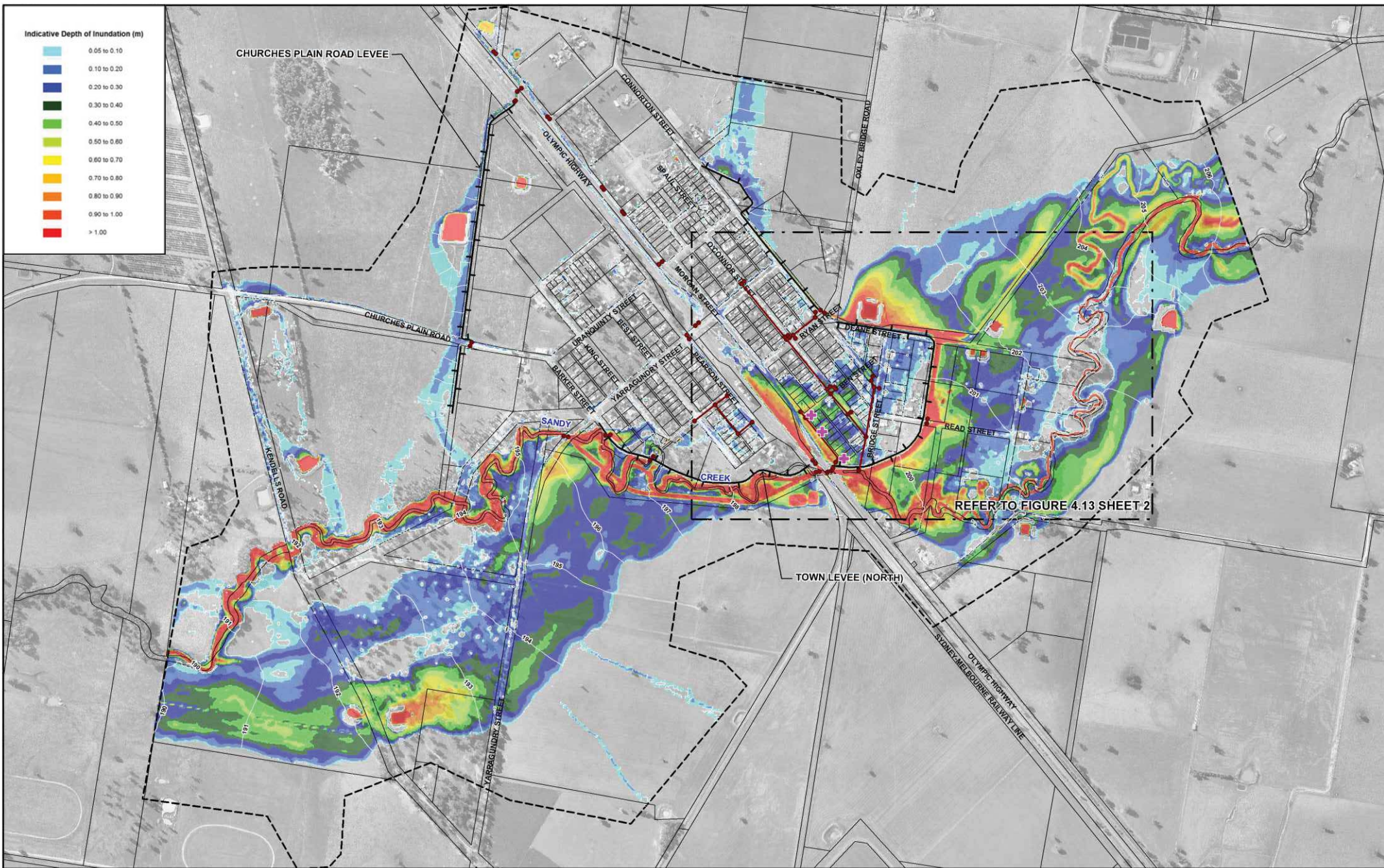
- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- Alignment of Existing Levee
- [Surveyed Flood Level (m AHD), Modelled Difference(m)]
- Flood Mark Location
- [Note: Negative difference indicates modelled level lower than recorded]

NOTE:  
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure 4.12  
Sheet 2 of 2





**NOTE:**  
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.



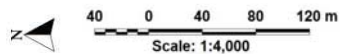
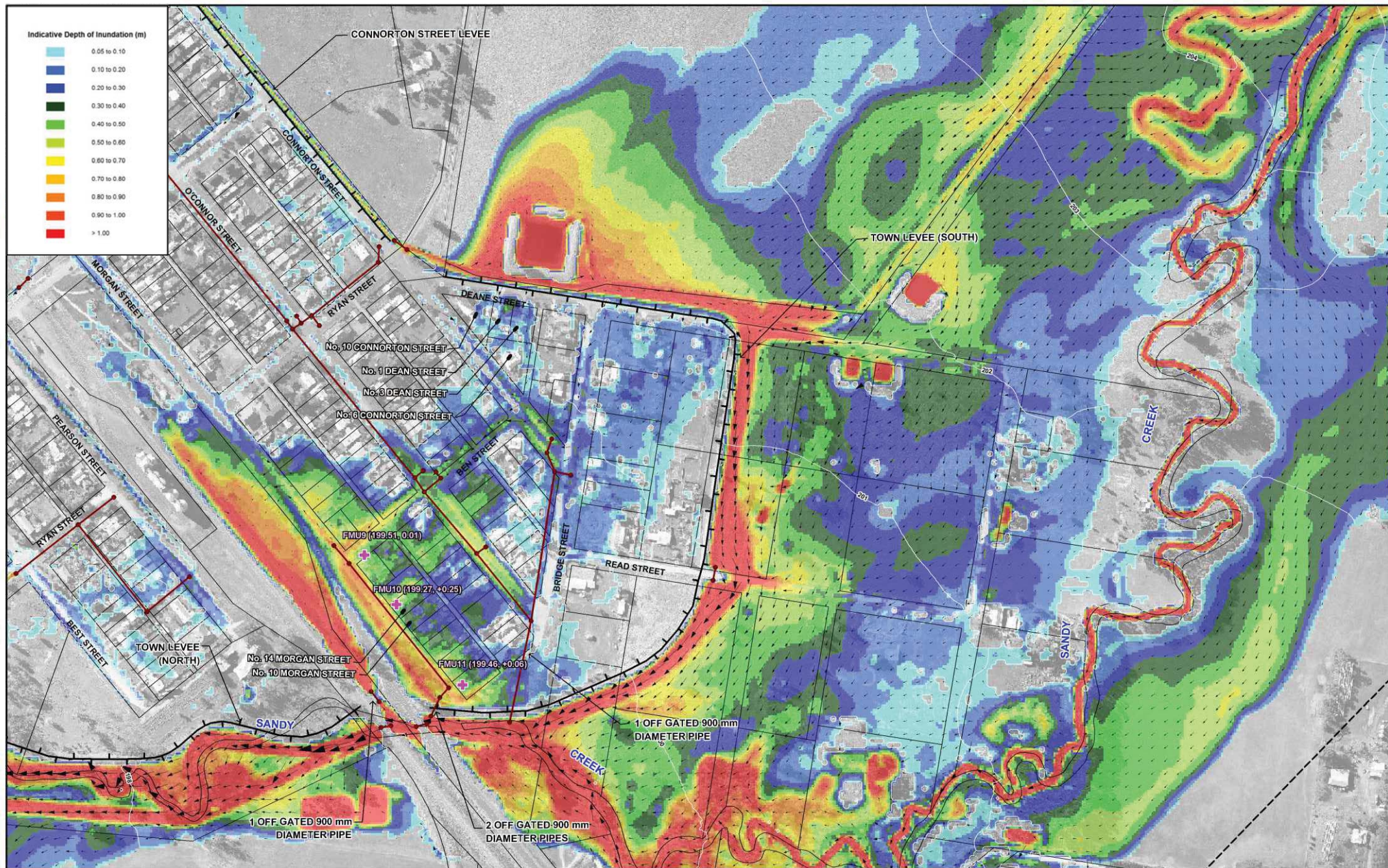
**LEGEND**

- Modelled Stormwater Network
- Flood Mark Location
- Two-Dimensional Model Boundary
- Alignment of Existing Levee
- Water Surface Contours (m AHD) (Mainstream Flooding Only)

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.13  
(Sheet 1 of 2)

URANQUINTY TUFLOW MODEL RESULTS  
MARCH 2012 FLOOD



**LEGEND**

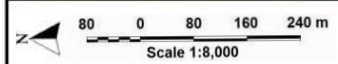
- Modelled Stormwater Network
- Two-Dimensional Model Boundary
- Water Surface Contours (m AHD) (Mainstream Flooding Only)
- Alignment of Existing Levee
- [Surveyed Flood Level (m AHD), Modelled Difference(m)] Flood Mark Location [Note: Negative difference indicates modelled level lower than recorded]

**NOTE:**  
The extent and depths of flooding shown were determined from airborne laser scanning survey and are approximate only. The extent of inundation in individual allotments near the flood fringe should be confirmed by site specific survey.

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure 4.13  
Sheet 2 of 2

## **APPENDIX A – FIGURES SHOWING EXTENT OF FIELD SURVEY DATA**

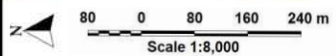
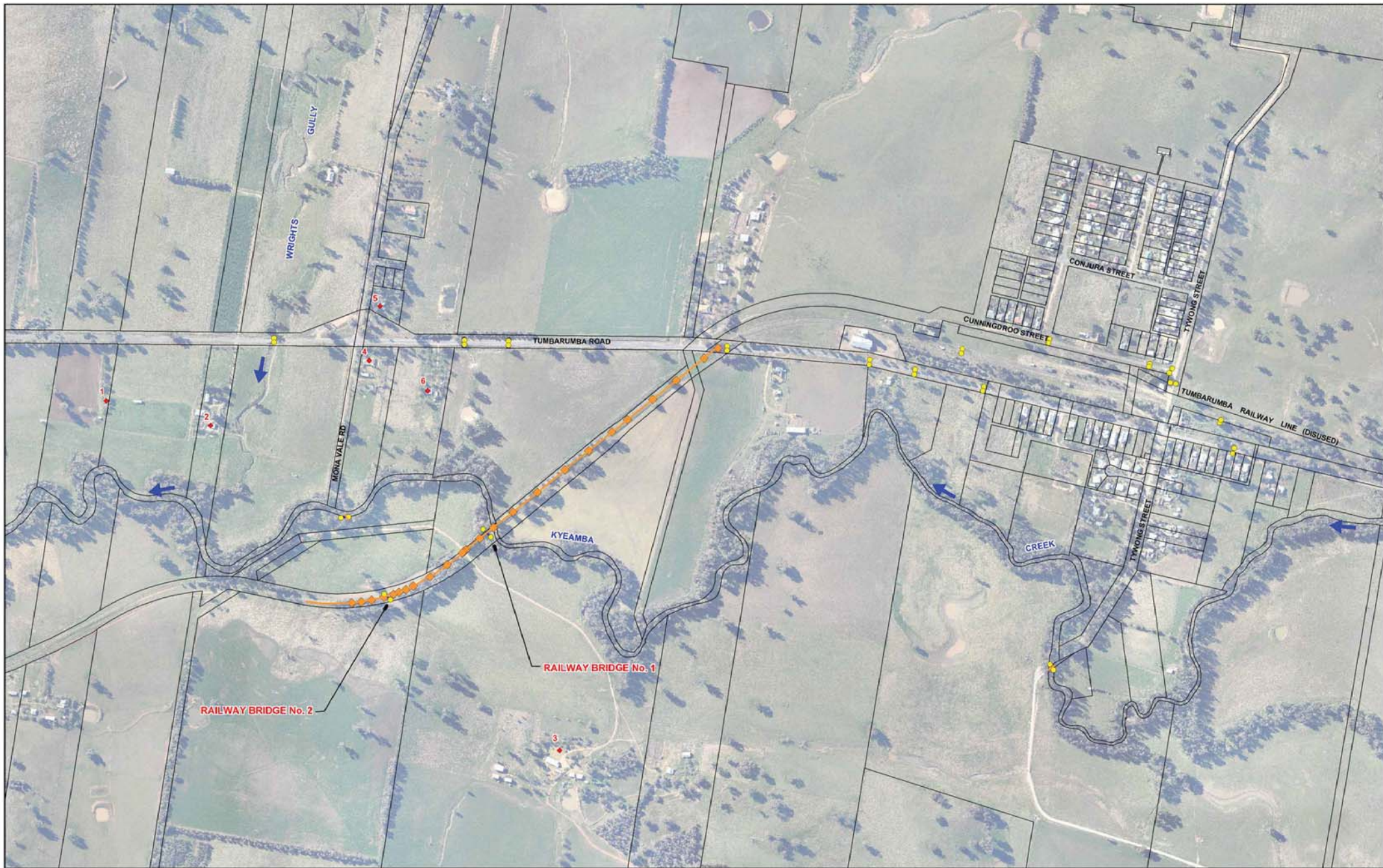


- LEGEND**
- FMT1 - Surveyed Flood Marks (RMS) - October 2010
  - Stormwater Drainage Network (Not Surveyed)
  - Levee
  - Surveyed Property and Identifier
  - Surveyed Drainage Structure
  - Surveyed Cross-section

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure A1

SURVEY DATA AT TARCUTTA



**LEGEND**

- ◆ 1-6 Surveyed Property and Identifier
- Surveyed Drainage Structure
- Surveyed Cross-section

**TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS**

Figure A2

SURVEY DATA AT LADYSMITH



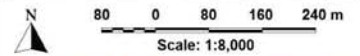
LEGEND

- Stormwater Drainage Network (Not Surveyed)
- ◆ 17 Surveyed Property and Identifier
- Levee
- Surveyed Drainage Structure
- Surveyed Flood Mark (WWCC)  
October 2010 Flood
- Surveyed Cross-section

TARCUTTA, LADYSMITH AND URANQUINTY FLOOD STUDIES  
DEVELOPMENT AND TESTING OF FLOOD MODELS

Figure A3

SURVEY DATA AT URANQUINTY



## **APPENDIX B – PLATES SHOWING HISTORIC FLOODING IN TARCUTTA**



 <p>Southern side of Tarcutta Creek Bridge, Tarcutta 7:57am, Sat. 16.10.2010</p>	 <p>7:57am, Saturday, 16.10.2010 Therese Noonan's Lucerne Flats, under water.</p>	 <p>Tarcutta Hotel, Saturday 16.10.2010</p>	
<p><b>Plate 1</b> - Southern Side of Tarcutta Creek Bridge (16/10/10 07:57) (Source: Alma Anderson)</p>	<p><b>Plate 2</b> - Therese Noonan's Lucerne Flats Under Water (16/10/10 07:57) (Source: Alma Anderson)</p>	<p><b>Plate 3</b> – Tarcutta Hotel (16/10/10 08:02) (Source: Alma Anderson)</p>	<p><b>Plate 4</b> - Peak Flood Level in Horse and Jockey Hotel, Sydney Street (228.317 m AHD) (16/10/10) (Source: Leonie Anderson)</p>
	 <p>Highway Closed at Tarcutta, Sat 16.10.2010</p>	 <p>Road Closed in Tarcutta, 8.02 am, Sat. 16.10.2010</p>	
<p><b>Plate 5</b> - Floodwaters Behind Horse and Jockey Hotel, Sydney Street (16/10/10) (Source: Leonie Anderson)</p>	<p><b>Plate 6</b> - Highway Closed at Tarcutta (16/10/10 07:58) (Source: Alma Anderson)</p>	<p><b>Plate 7</b> - Highway Closed in Tarcutta (16/10/10 08:02) (Source: Alma Anderson)</p>	<p><b>Plate 8</b> - Floodwater in Riverina Water Treatment Plant (16/10/10) (Source: Leonie Anderson)</p>
			
<p><b>Plate 9</b> – Tarcutta Creek Upstream of Sydney Street Bridge No. 1 (16/10/10) (Source: Leonie Anderson)</p>	<p><b>Plate 10</b> – Tarcutta Creek Downstream of Sydney Street Bridge No. 1 (16/10/10) (Source: Leonie Anderson)</p>	<p><b>Plate 11</b> – Floodwater on Floodplain South of Tarcutta Levee (06/12/10 06:35) (Source: Corey Parnaby)</p>	<p><b>Plate 12</b> - Pumping Out at Tarcutta Hotel (06/12/10 06:54) (Source: Corey Parnaby)</p>

<p><b>Plate 13</b> – Tarcutta Manual Gauge at Flood Peak                  (01/03/12 22:46)                  (Source: Matt Burgess)</p>	<p><b>Plate 14</b> – Tarcutta Manual Gauge Between Flood Peaks                  (02/03/12 14:49)                  (Source: Matt Burgess)</p>	<p><b>Plate 15</b> - Downstream of Hume Highway Bridge No. 2                  (02/03/12 12:20)                  (Source: Corey Parnaby)</p>	<p><b>Plate 16</b> - Behind Tarcutta Hotel (02/03/12 14:43)                  (Source: Corey Parnaby)</p>
<p><b>Plate 17</b> - Tarcutta Creek, Upstream Side of Sydney Street from Right Bank (02/03/12 15:19)                  (Source: Corey Parnaby)</p>	<p><b>Plate 18</b> - Water Ponding in Front of No. 6 Centenary Avenue (04/03/12 12:38)                  (Source: Corey Parnaby)</p>	<p><b>Plate 19</b> - Water Ponding in No. 6 Centenary Avenue (04/03/12 12:39)                  (Source: Corey Parnaby)</p>	<p><b>Plate 20</b> - Tarcutta Manual Gauge Just After Flood Peak (04/03/12 14:03)                  (Source: Matt Burgess)</p>
<p><b>Plate 21</b> - Water Ponding in front of Tarcutta Hotel (04/03/12 13:53)                  (Source: Matt Burgess)</p>	<p><b>Plate 22</b> – Water Ponding in Riverina Water Treatment Plant (04/03/12 13:56)                  (Source: Matt Burgess)</p>	<p><b>Plate 23</b> – Floodwater Surrounding Former 'Tarcutta Inn' (04/03/12 13:59)                  (Source: Matt Burgess)</p>	<p><b>Plate 24</b> - Downstream of Sydney Street Bridge No. 1 Towards Former 'Tarcutta Inn' (04/03/12 14:32)                  (Source: Matt Burgess)</p>



**Plate 25** - Upstream of Sydney Street Bridges No. 1 and 2  
(04/03/12 14:04)  
(Source: Matt Burgess)



**Plate 26** - Floodplain Between Sydney Street and Hume Highway (04/03/12 14:31)  
(Source: Matt Burgess)



**Plate 27** - Floodplain Downstream of Hume Highway  
(04/03/12 14:29)  
(Source: Matt Burgess)



**Plate 28** - Downstream Side of Hume Highway Bridge No. 2  
(04/03/12 11:51)  
(Source: Corey Parnaby)



**Plate 29** - Overland Flow in Argent Street (No Date)  
(Source: Bob Belling)

## **APPENDIX C – PLATES SHOWING HISTORIC FLOODING IN URANQUINTY**

<p><b>Plate 1</b> - Water Behind Deane Street Dam (15/10/10 16:50)                  (Source: Mick Baker)</p>	<p><b>Plate 2</b> - View Across Deane Street (Levee) Opposite No. 10 Connorton Street (15/10/10 17:40)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 3</b> - Key Street and Deane Street Intersection Looking South (15/10/10)                  (Source: Belinda McMahon)</p>	<p><b>Plate 4</b> - View Northwest from Deane Street Towards No. 1 Deane Street (15/10/10 17:35)                  (Source: Bewsher, 2011)</p>
<p><b>Plate 5</b> - View Southwest Towards No. 3 Deane Street (15/10/10 17:40)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 6</b> - Ponding in Front of No. 10 Connorton Street (15/10/10 17:00)                  (Source: Mick Baker)</p>	<p><b>Plate 7</b> - View Southwest Towards No. 10 Connorton Street, Showing Flow from Deane Street at Rear of House to Connorton Street at Front of House (15/10/10 18:30)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 8</b> - Connorton Street and Ben Street Intersection (15/10/10)                  (Source: Owen Kelly)</p>
<p><b>Plate 9</b> - Looking North Along Bridge Street Towards Deane Street (15/10/10)                  (Source: Terry Micahalanney)</p>	<p><b>Plate 10</b> - Ponding in Front of No. 22 Bridge Street (15/10/10)                  (Source: Terry Micahalanney)</p>	<p><b>Plate 11</b> - Backyard of No. 4 Ben Street (15/10/10)                  (Source: Owen Kelly)</p>	<p><b>Plate 12</b> - View Northeast Along Connorton Street from Corner of Ben and Connorton Streets (15/10/10 16:55)                  (Source: Bewsher, 2011)</p>

<p><b>Plate 13</b> - View Northwest Along Ben Street from Corner of Ben and Connorton Streets (15/10/10 16:55)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 14</b> - View Southwest Along O'Connor Street from Corner of O'Connor and Ryan Streets at Flood Peak (No Date)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 15</b> - Peak Water Level on Fence of No. 2 Morgan Street (15/10/10)                  (Source: Jenny Azar)</p>	<p><b>Plate 16</b> - Peak Water Level on No. 2 Morgan Street (15/10/10)                  (Source: Jenny Azar)</p>
<p><b>Plate 17</b> - Olympic Highway and Yarragundry Street Intersection looking East (17/10/10 approx 14:00)                  (Source: Dean Heffernan)</p>	<p><b>Plate 18</b> - On Footpath in Front of Uranquinty Hotel Looking West (No Date)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 19</b> - Flooding at No. 24 Morgan Street to About Floor Level; Note Bow Wave Caused by Boat (15/10/10 approx. 16:40)                  (Source: Bewsher, 2011)</p>	<p><b>Plate 20</b> - Flooding at No. 12 Ben Street to About Up to Base of Windows, Even Though Floor is Well Raised (15/10/10 approx. 16:40)                  (Source: Bewsher, 2011)</p>
<p><b>Plate 21</b> - Connorton Street Looking South Along Channel Next to Levee Around Neighbourhood Centre (15/10/10)                  (Source: Belinda McMahon)</p>	<p><b>Plate 22</b> - Channel on Southern Side and Running Parallel to Connorton Street (15/10/10)                  (Source: Belinda McMahon)</p>	<p><b>Plate 23</b> - Front Yard of No. 37 Connorton Street Looking North (15/01/10 14:00 (After Peak))                  (Source: Mark Burge)</p>	<p><b>Plate 24</b> - Front Yard of No. 37 Connorton Street Looking South (15/01/10 14:00 (After Peak))                  (Source: Mark Burge)</p>

<p><b>Plate 25</b> - Water Ponding in Backyard of No. 37 Connorton Street (15/01/10 14:00 (After Peak))                  (Source: Mark Burge)</p>	<p><b>Plate 26</b> - Receding Floodwaters in Sandy Creek at Olympic Highway (04/03/12 18:00)                  (Source: Greg Gilmour)</p>	<p><b>Plate 27</b> - Upstream Side of Olympic Highway Bridge Over Sandy Creek (04/03/12 08:50)                  (Source: Greg Gilmour)</p>	<p><b>Plate 28</b> - Railway Bridge Over Sandy Creek (04/03/12 08:50)                  (Source: Greg Gilmour)</p>
<p><b>Plate 29</b> - Olympic Highway Bridge Looking South (04/03/12 09:00)                  (Source: Jenny Azar)</p>	<p><b>Plate 30</b> - Levee Next to Bridge Street and O'Connor Street Intersection Looking South (04/03/12 08:50)                  (Source: Greg Gilmour)</p>	<p><b>Plate 31</b> - Reid Street Looking East Along Levee (04/03/12 08:50)                  (Source: Greg Gilmour)</p>	<p><b>Plate 32</b> - 1 Key Street Looking South Across Floodplain (04/03/12 05:00)                  (Source: Mick Baker)</p>
<p><b>Plate 33</b> - Uranquinty Hotel Looking South Along Olympic Highway (04/03/12 07:05)                  (Source: Mick Baker)</p>	<p><b>Plate 34</b> - Ryan Street and Olympic Highway Intersection Looking South (04/03/12 07:05)                  (Source: Mick Baker)</p>	<p><b>Plate 35</b> - Deane Street and Bridge Street Intersection Looking South (04/03/12 08:30)                  (Source: Greg Gilmour)</p>	<p><b>Plate 36</b> - Deane Street and Bridge Street Intersection Looking North (04/03/12 08:30)                  (Source: Greg Gilmour)</p>

<p><b>Plate 37</b> - O'Connor Street and Bridge Street Intersection Looking North (04/03/12 08:40)                  (Source: Greg Gilmour)</p>	<p><b>Plate 38</b> - Backwater Along Morgan Street Towards O'Connor Street (04/03/12 08:40)                  (Source: Greg Gilmour)</p>	<p><b>Plate 39</b> - Water Ponding in Morgan Street (04/03/12 08:50)                  (Source: Greg Gilmour)</p>	<p><b>Plate 40</b> - Flooding in Morgan Street (04/03/12 09:00)                  (Source: Jenny Azar)</p>
<p><b>Plate 41</b> - In Front of No. 2 Morgan Street Looking West (04/03/12 09:30)                  (Source: Jenny Azar)</p>	<p><b>Plate 42</b> - In Front of No. 2 Morgan Street Looking North (04/03/12 09:30)                  (Source: Jenny Azar)</p>	<p><b>Plate 43</b> - Ponding Behind Levee in Morgan Street (04/03/12 09:45)                  (Source: Jenny Azar)</p>	<p><b>Plate 44</b> - Water Behind Dam East of Key Street (04/03/12 10:05)                  (Source: Mick Baker)</p>
<p><b>Plate 45</b> - Sandbags Along Deane Street Looking East (04/03/12 10:20)                  (Source: Mick Baker)</p>	<p><b>Plate 46</b> - Sandbags Across Deane Street (04/03/12 10:25)                  (Source: Mick Baker)</p>	<p><b>Plate 47</b> - Temporary Levee Constructed on Deane Street (04/03/12 10:26)                  (Source: Mick Baker)</p>	<p><b>Plate 48</b> - Key Street Culvert Looking South (04/03/12 10:10)                  (Source: Mick Baker)</p>





**Plate 49** - O'Connor Street and Bridge Street Intersection  
Looking North (04/03/12 10:35)  
(Source: Mick Baker)



**Plate 50** - O'Connor Street and Ben Street Intersection  
Looking West (04/03/12 10:45)  
(Source: Mick Baker)



**Plate 51** - O'Connor Street and Ben Street Intersection  
Uranquity Looking South (04/03/2012 10:25)  
(Source: Dean Heffernan)



**Plate 52** - Corner O'Connor and Ben Streets Uranquity  
Looking West (04/03/2012 10:25)  
(Source: Dean Heffernan)