



HAY SHIRE COUNCIL

**HAY AND MAUDE
FLOOD RISK MANAGEMENT STUDY AND PLAN**

MARCH 2025

VOLUME 2 – FIGURES

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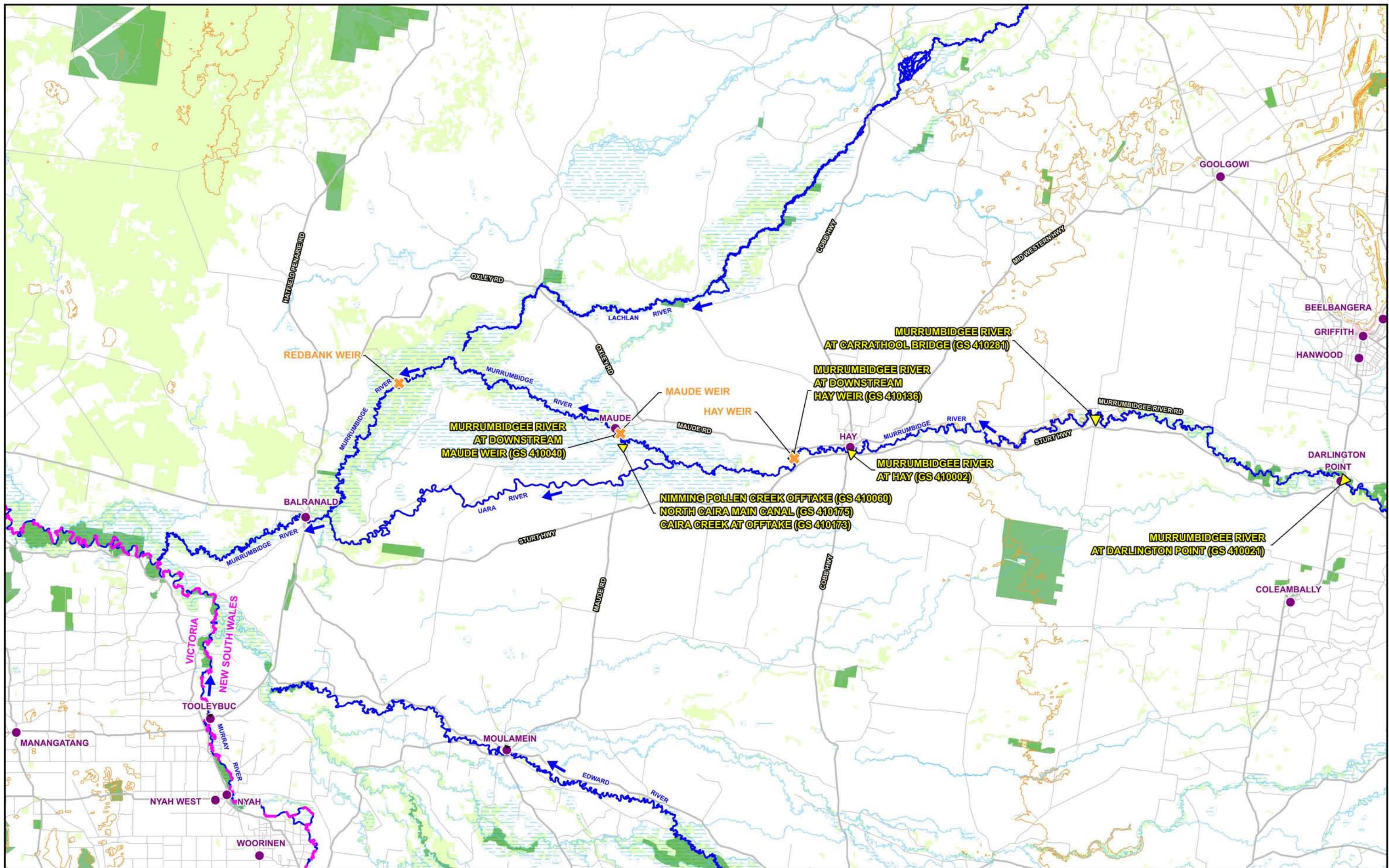
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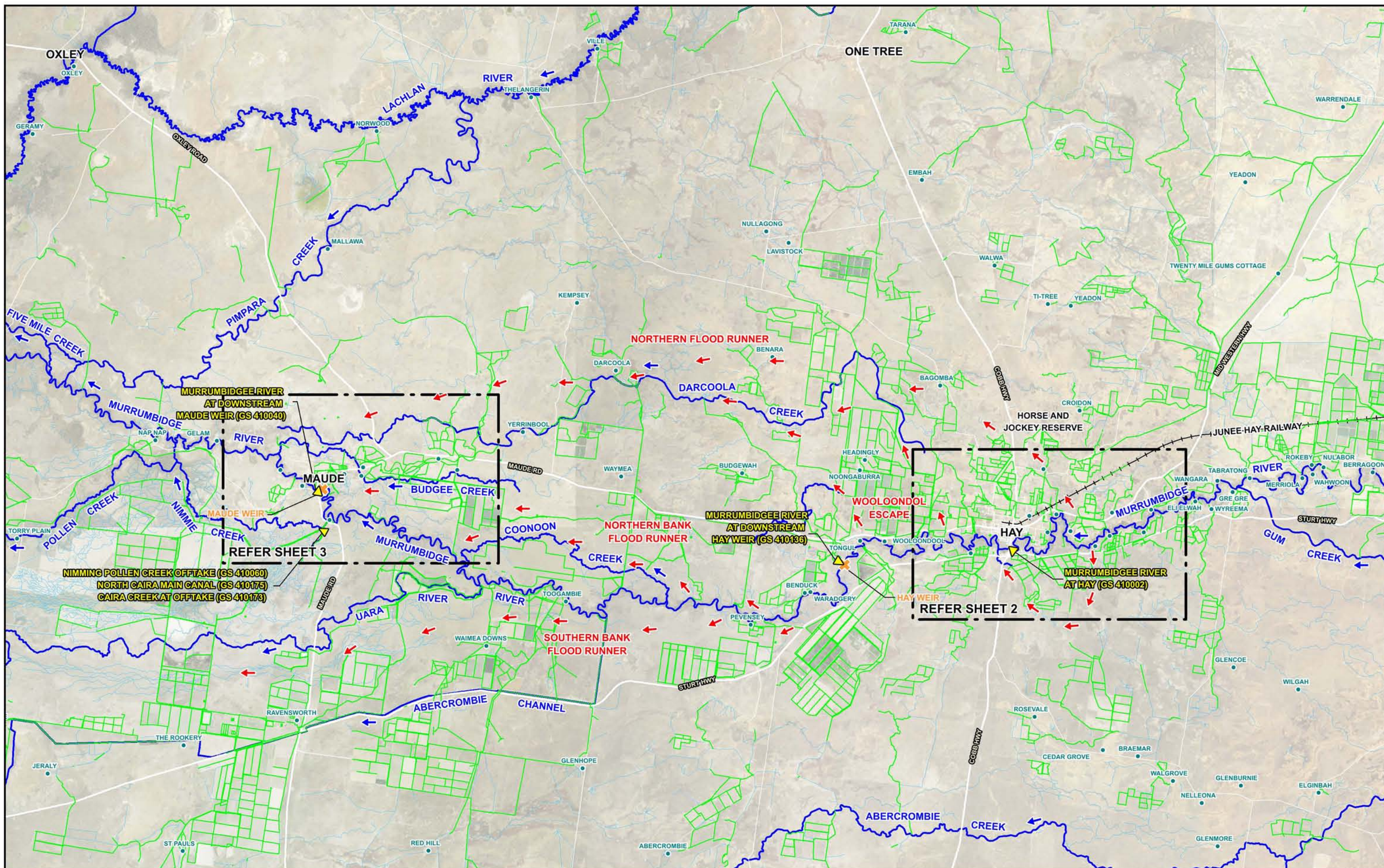
LIST OF FIGURES (MAIN REPORT)

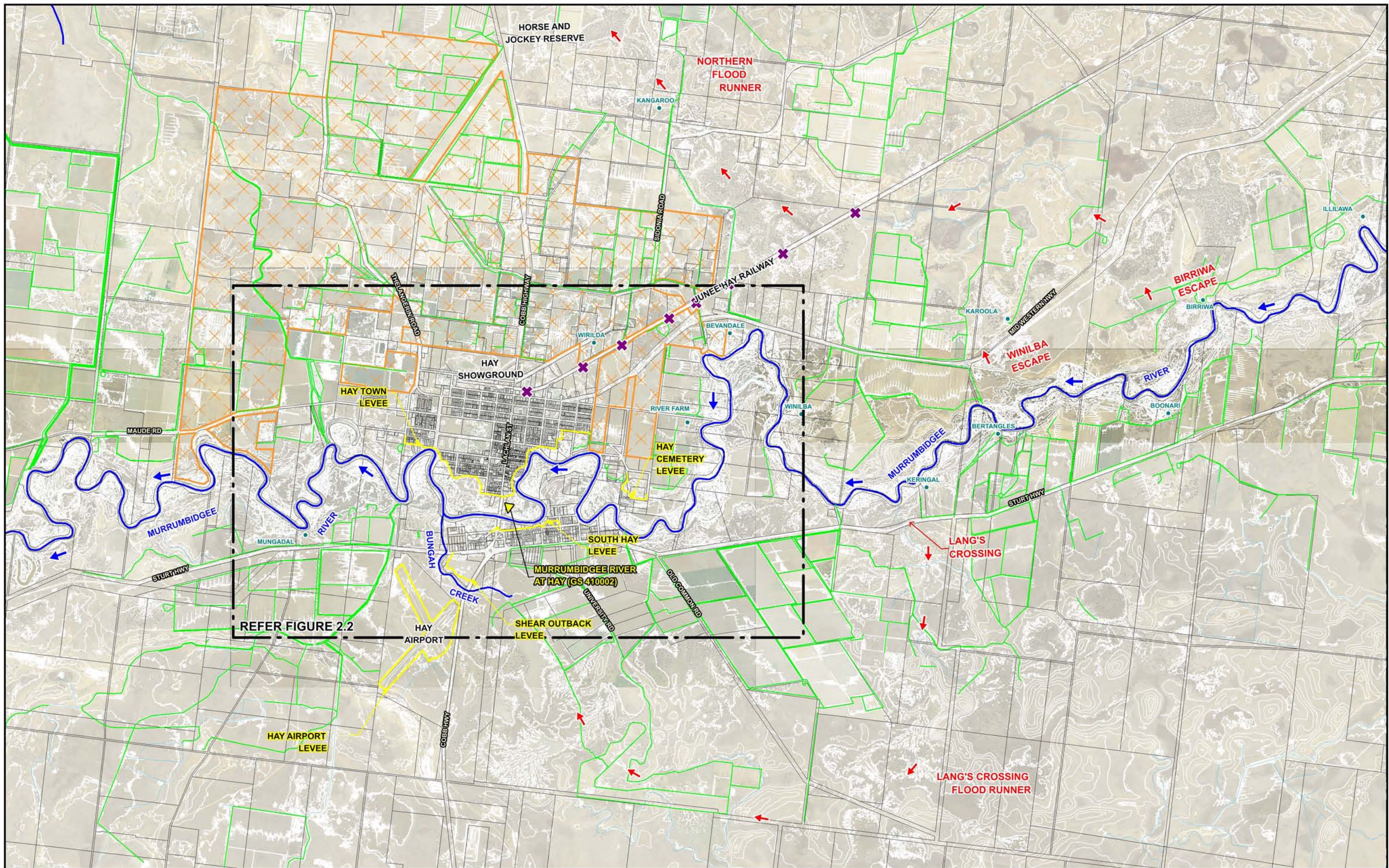
- 1.1 Location Plan

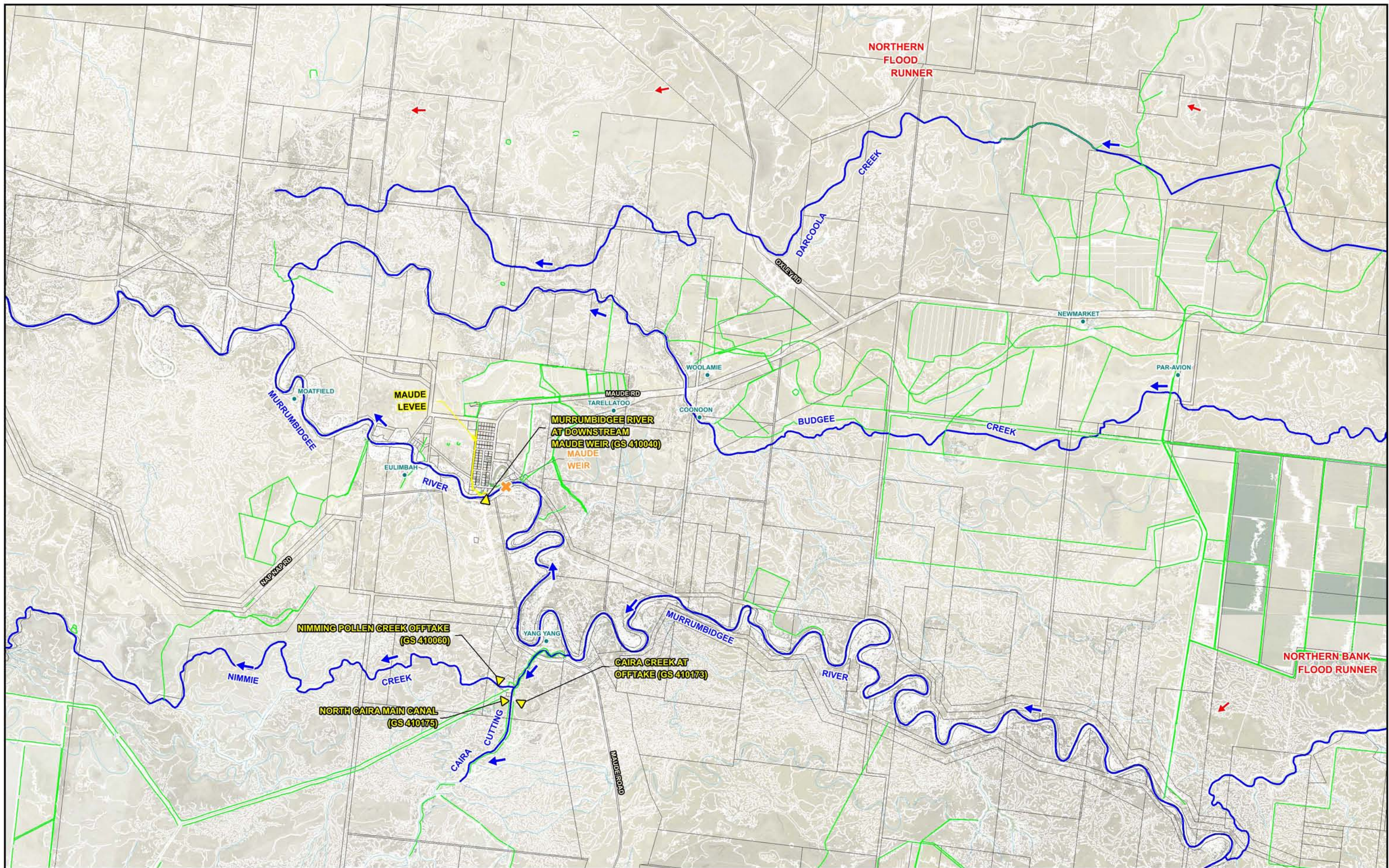
- 2.1 Murrumbidgee River Drainage System in Vicinity of Hay and Maude (3 Sheets)
- 2.2 Existing Drainage System at Hay (3 Sheets)
- 2.3 Existing Drainage System at Maude
- 2.4 Longitudinal Sections along Crest of Existing Levees (4 Sheets)
- 2.5 Indicative Extent and Depths of Inundation at Hay and Maude– 1% AEP Murrumbidgee River Flood (8 Sheets)
- 2.6 Indicative Extent and Depths of Inundation at Hay and Maude – Extreme Murrumbidgee River Flood (8 Sheets)
- 2.7 Murrumbidgee River Water Surface Profiles – Design Flood Events
- 2.8 Indicative Extent and Depths of Inundation – Flood Gates Fully Open – 1% AEP Local Catchment Flood at Hay (3 Sheets)
- 2.9 Indicative Extent and Depths of Inundation – Flood Gates Fully Closed – 1% AEP Local Catchment Flood at Hay (3 Sheets)
- 2.10 Impact of Closure of Flood Gates on Local Catchment Flood Behaviour at Hay – 1% AEP Local Catchment Flood at Hay (3 Sheets)
- 2.11 Indicative Extent and Depths of Inundation – 1% AEP Local Catchment Flood at Maude
- 2.12 Indicative Extent of Inundation and Location of Vulnerable Development and Critical Infrastructure – Murrumbidgee River Flooding (2 Sheets)
- 2.13 Indicative Extent of Inundation and Location of Vulnerable Development and Critical Infrastructure – Local Catchment Flooding (2 Sheets)
- 2.14 Sensitivity of Flood Behaviour to 20% Increase in Hydraulic Roughness Values – 1% AEP Murrumbidgee River Flood (5 Sheets)
- 2.15 Sensitivity of Flood Behaviour to Partial Blockage of Hydraulic Structures - 1% AEP Murrumbidgee River (5 Sheets)
- 2.16 Impact of a Potential 10% Increase in Rainfall Intensities on Flooding and Drainage Patterns – 1% AEP Murrumbidgee River Flood (5 Sheets)
- 2.17 Impact of a Potential 30% Increase in Rainfall Intensities on Flooding and Drainage Patterns – 1% AEP Murrumbidgee River Flood (5 Sheets)
- 2.18 Impact of Increased Rainfall Intensities on Extent of Flooding - 1% AEP Murrumbidgee River Flood (5 Sheets)
- 2.19 Potential Impact of Partial Failure of the Hay Town Levee on Flood Behaviour – 1% AEP Murrumbidgee River Flood
- 2.20 Potential Impact of Partial Failure of the South Hay Levee on Flood Behaviour – 1% AEP Murrumbidgee River Flood
- 2.21 Potential Impact of Partial Failure of the Maude Levee on Flood Behaviour – 1% AEP Murrumbidgee River Flood
- 2.22 Flood Hazard Vulnerability Classification – 1% AEP Murrumbidgee River Flood (5 Sheets)
- 2.23 Flood Hazard Vulnerability Classification – Extreme Murrumbidgee River Flood (5 Sheets)
- 2.24 Flood Hazard Vulnerability Classification – Flood Gates Fully Open – 1% AEP Local Catchment Flood at Hay (3 Sheets)
- 2.25 Flood Hazard Vulnerability Classification – 1% AEP Local Catchment Flood at Maude
- 2.26 Hydraulic Categorisation of Floodplain – 1% AEP Murrumbidgee River Flood (2 Sheets)
- 2.27 Hydraulic Categorisation of Floodplain – Extreme Murrumbidgee River Flood (2 Sheets)
- 2.28 Hydraulic Categorisation of Floodplain – Flood Gates Fully Open – 1% AEP Local Catchment Flood at Hay (3 Sheets)
- 2.29 Hydraulic Categorisation of Floodplain – 1% AEP Local Catchment Flood at Maude
- 2.30 Hay Shire LEP 2011 Zoning at Hay (2 Sheets)
- 2.31 Hay Shire LEP 2011 Zoning at Maude

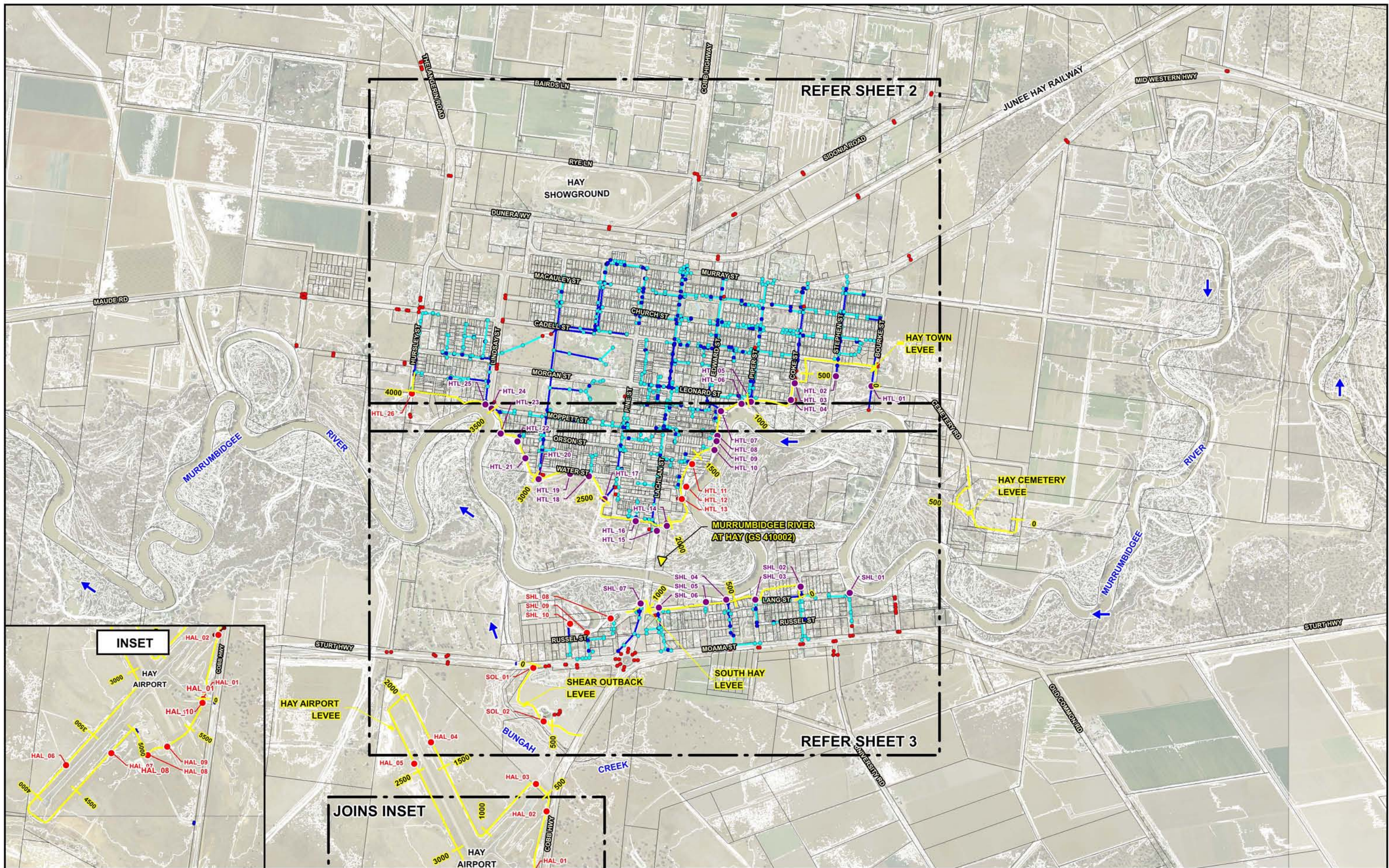
- 3.1 Upgraded Levee Alignments at Hay (4 Sheets)
- 3.2 Longitudinal Sections along Crest of Upgraded Hay Town Levee (3 Sheets)
- 3.3 Longitudinal Sections along Crest of Upgraded South Hay Levee (2 Sheets)
- 3.4 Impact of Upgraded Hay Town and South Hay Levees on Flood Behaviour – 1% AEP Murrumbidgee River Flood
- 3.5 Upgraded Levee Alignment at Maude (2 Sheets)
- 3.6 Longitudinal Sections along Crest of Upgraded Maude Levee
- 3.7 Impact of Upgraded Maude Levee on Flood Behaviour – 1% AEP Murrumbidgee River Flood











INSET

JOINS INSET

LEGEND

— Pipe < 450 mm Diameter	● HTL_01 Gated Drainage Outlet
— Pipe ≥ 450 mm Diameter	● HTL_26 Ungated Drainage Outlet
● Headwall	● Inlet Pit
	● Junction Pit

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**

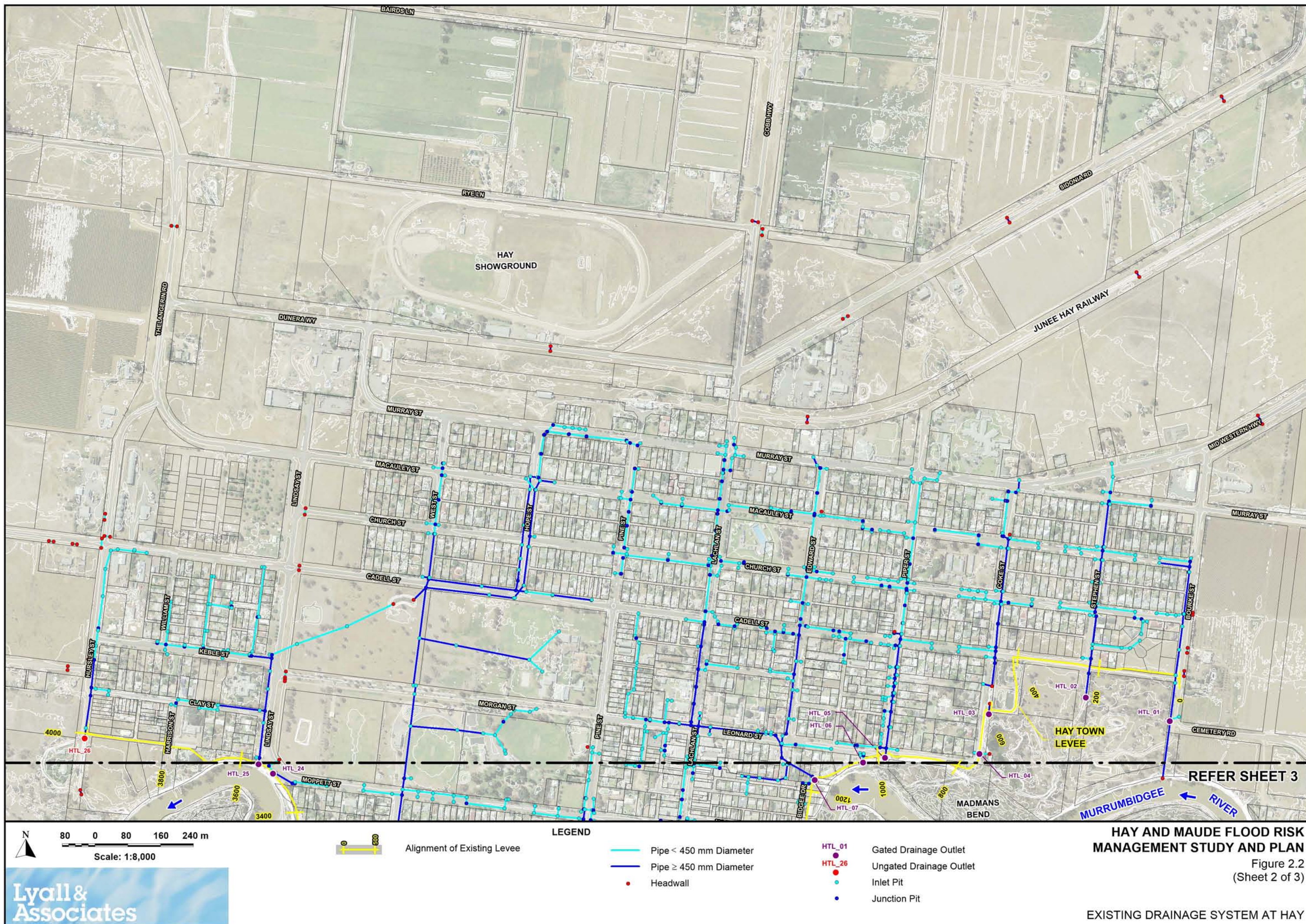
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(Sheet 1 of 3)

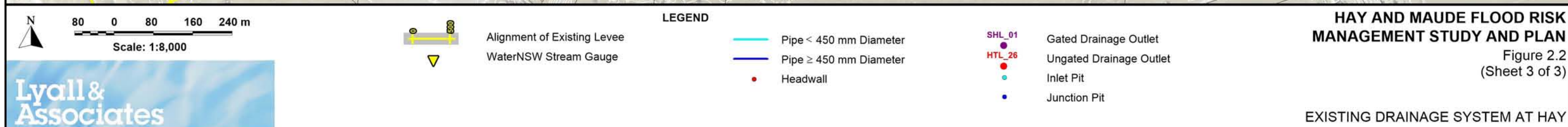
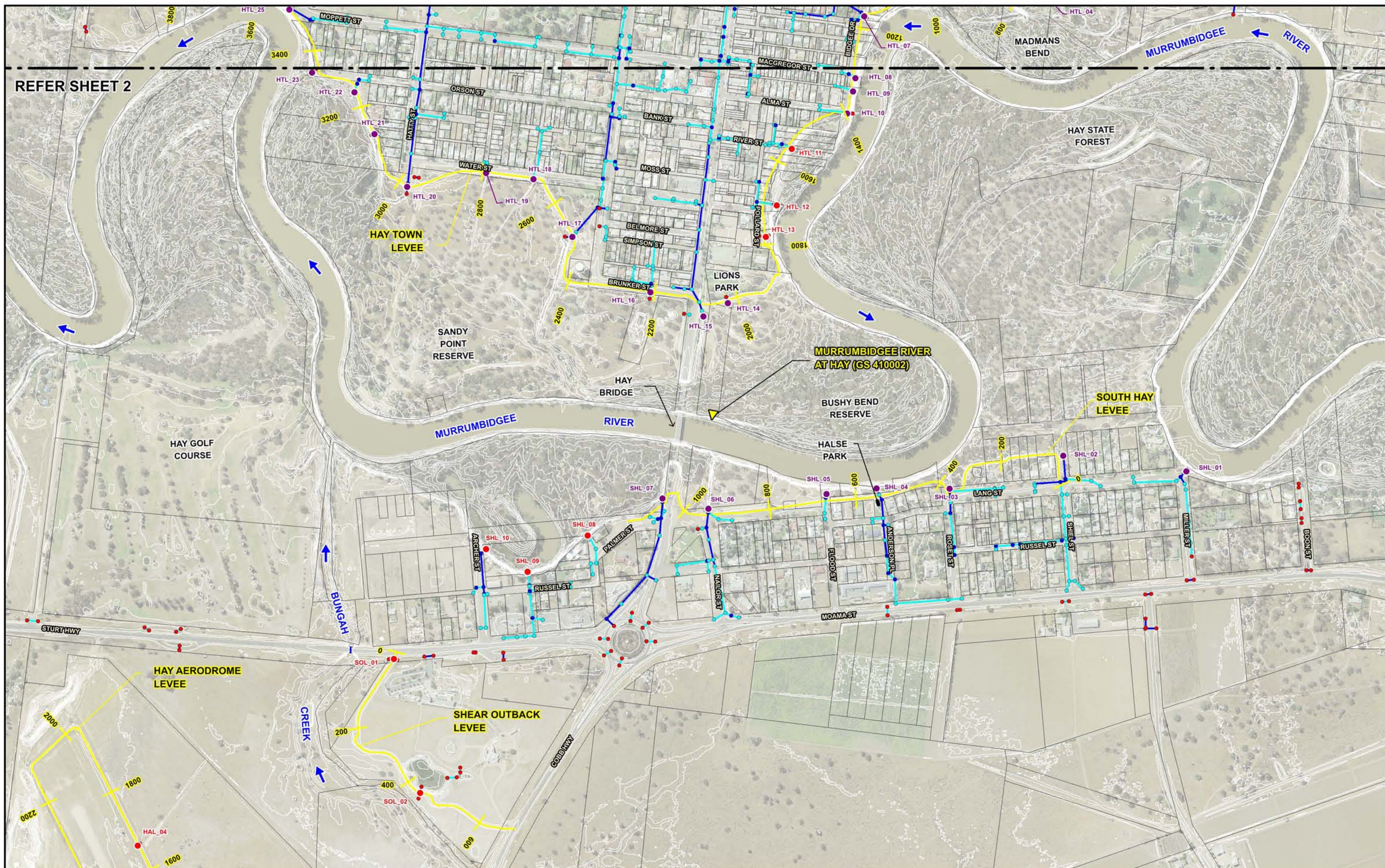
EXISTING DRAINAGE SYSTEM AT HAY

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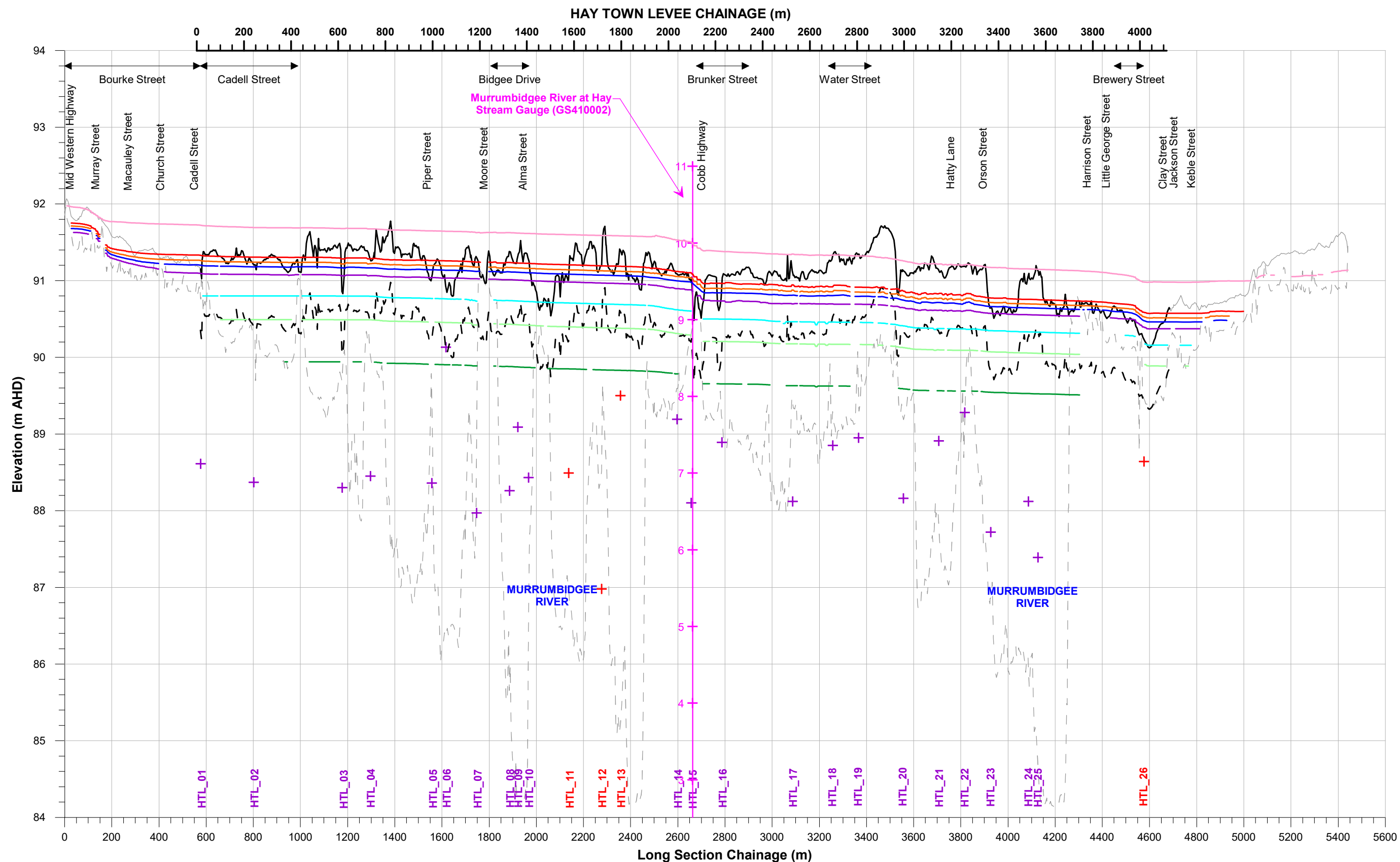
200 0 200 400 600 m

Lyall & Associates









NOTE:
1. Gauge zero on the Hay stream gauge is RL 81.49 m AHD.

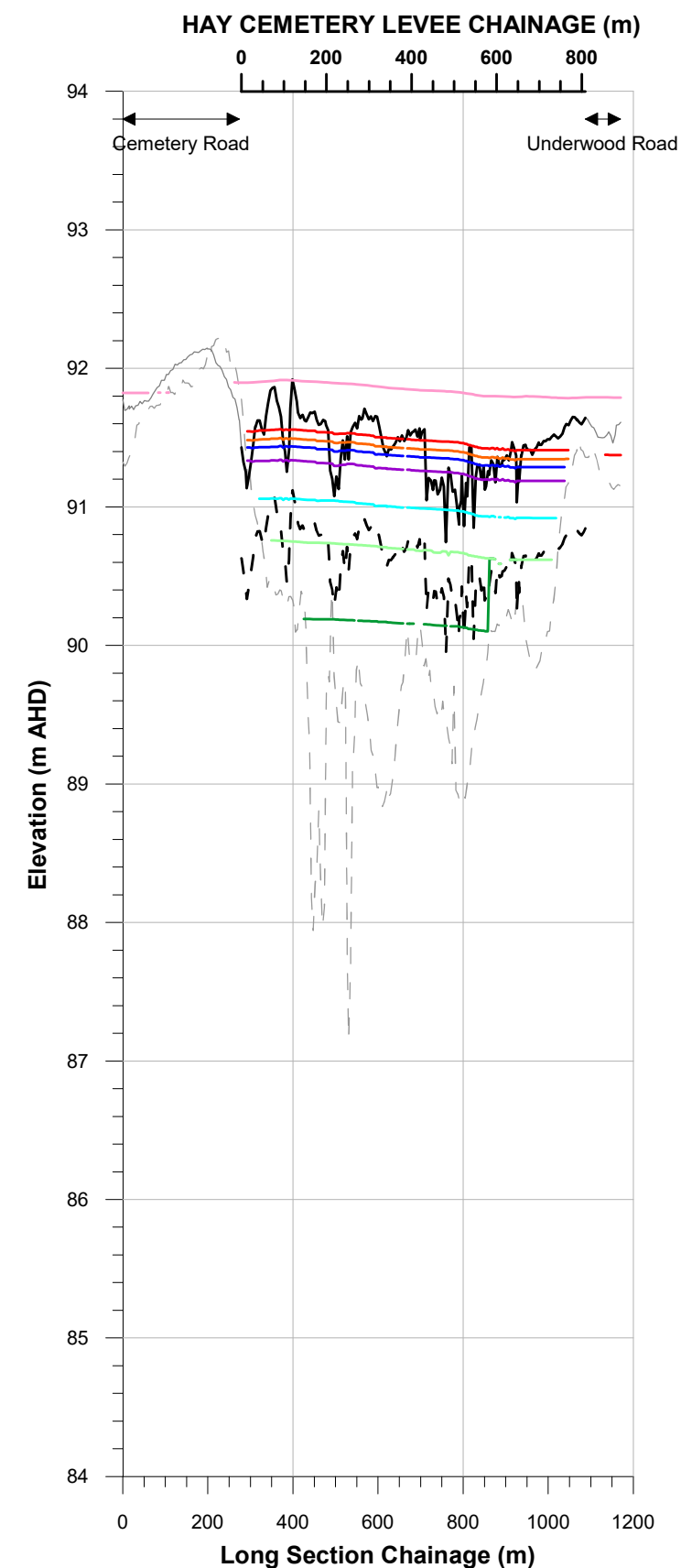
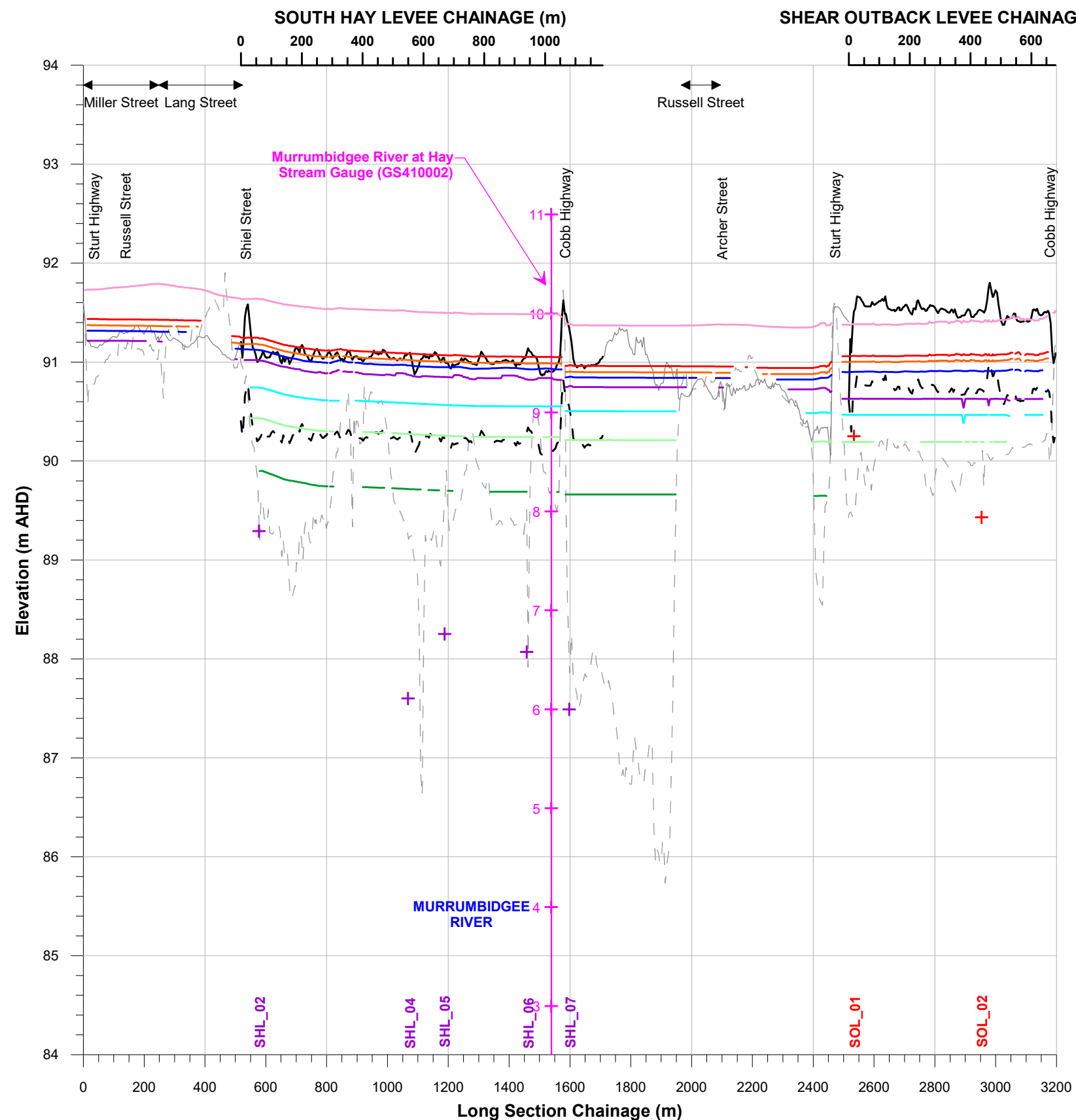
- GROUND PROFILES**
- Crest of Existing Levee
 - Natural Surface Elevation
 - - - Imminent Failure Flood Level (0.8 m)
 - - - Toe of Levee (River Side)
 - + Gated Drainage Outlets
 - + Ungated Drainage Outlets

- WATER SURFACE PROFILES**
- Extreme Flood
 - 0.2% AEP
 - 0.5% AEP
 - 1% AEP
 - 2% AEP
 - 5% AEP
 - 10% AEP
 - 20% AEP

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.4
(Sheet 1 of 4)

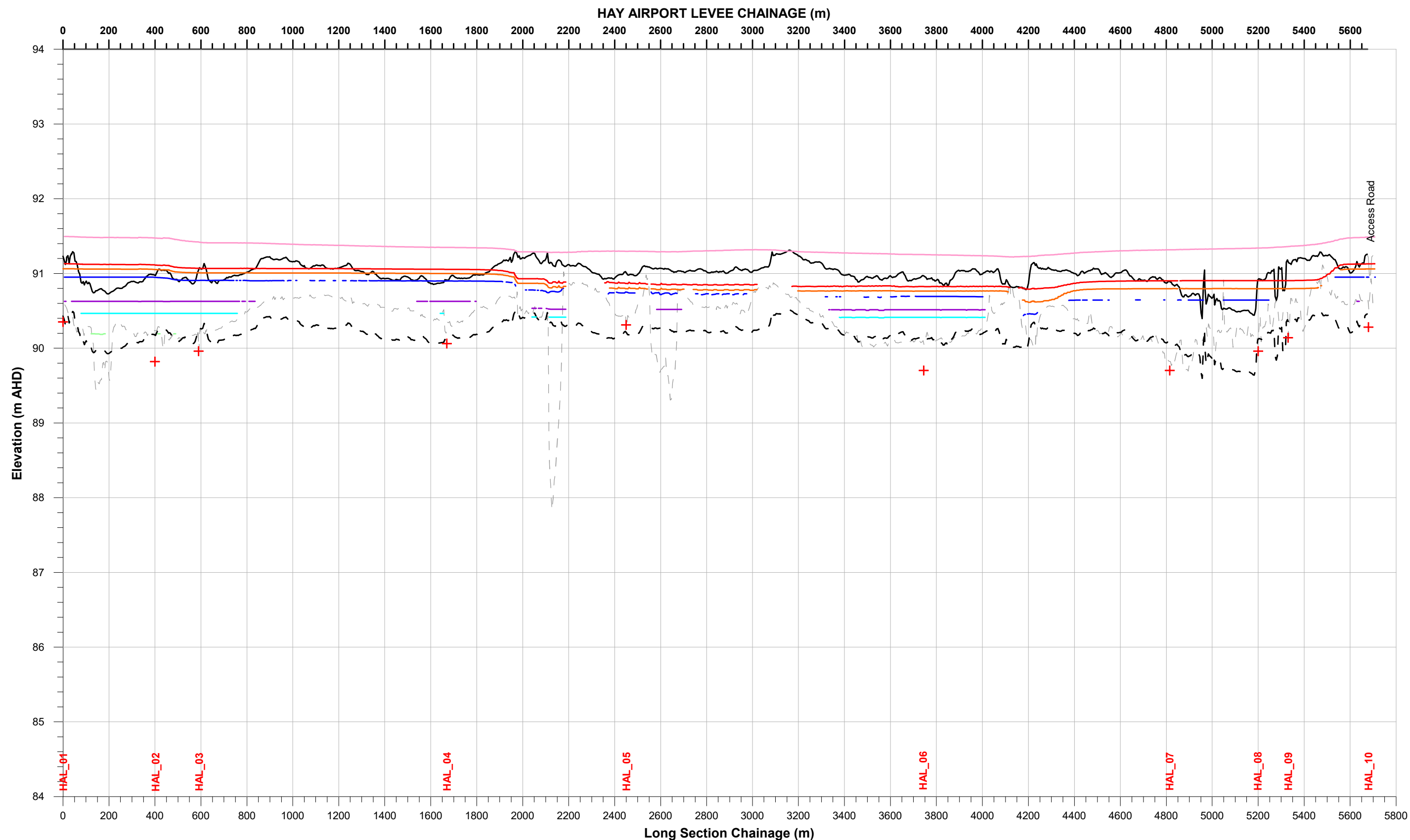
LONGITUDINAL SECTIONS ALONG CREST OF EXISTING LEVEES

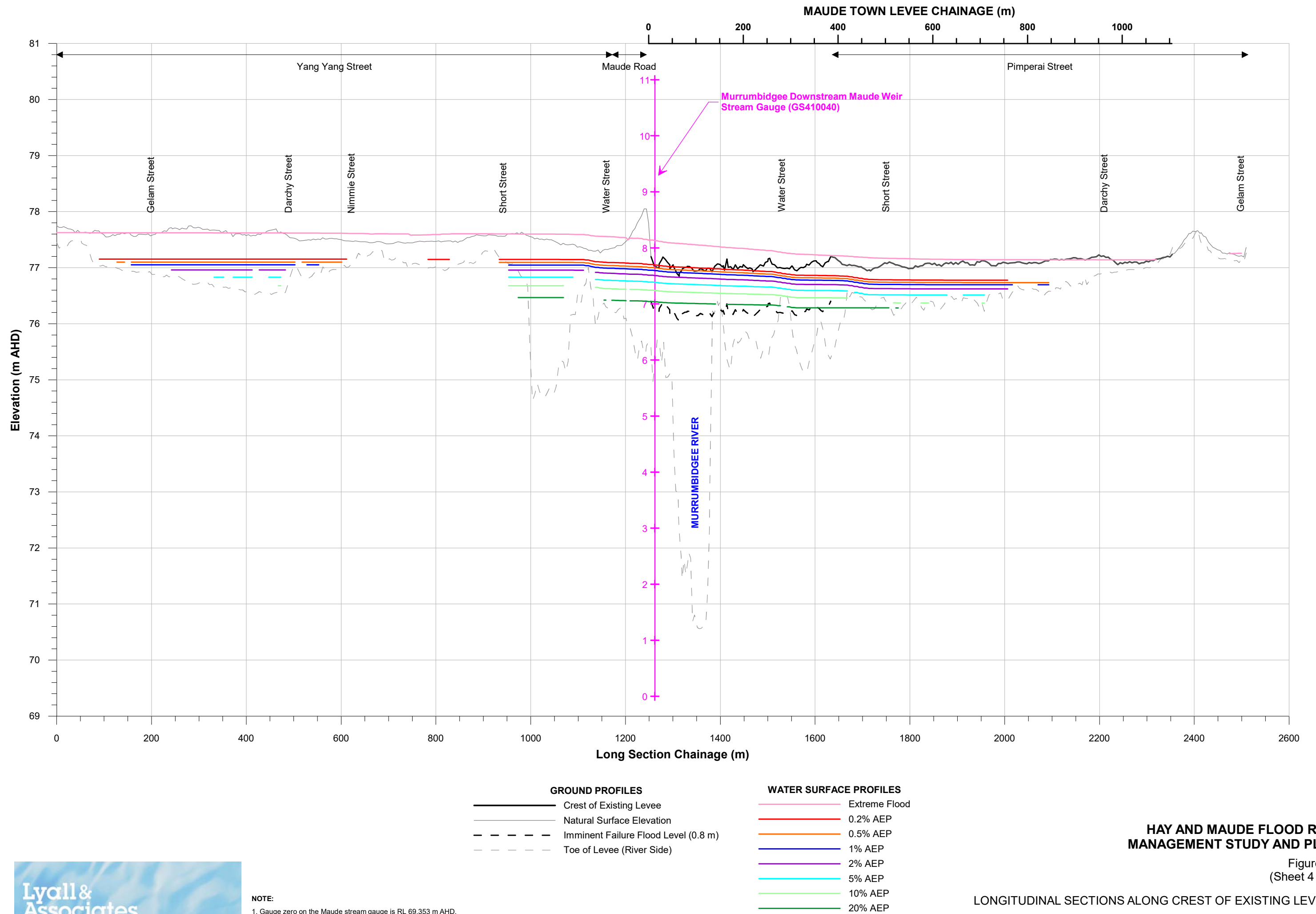


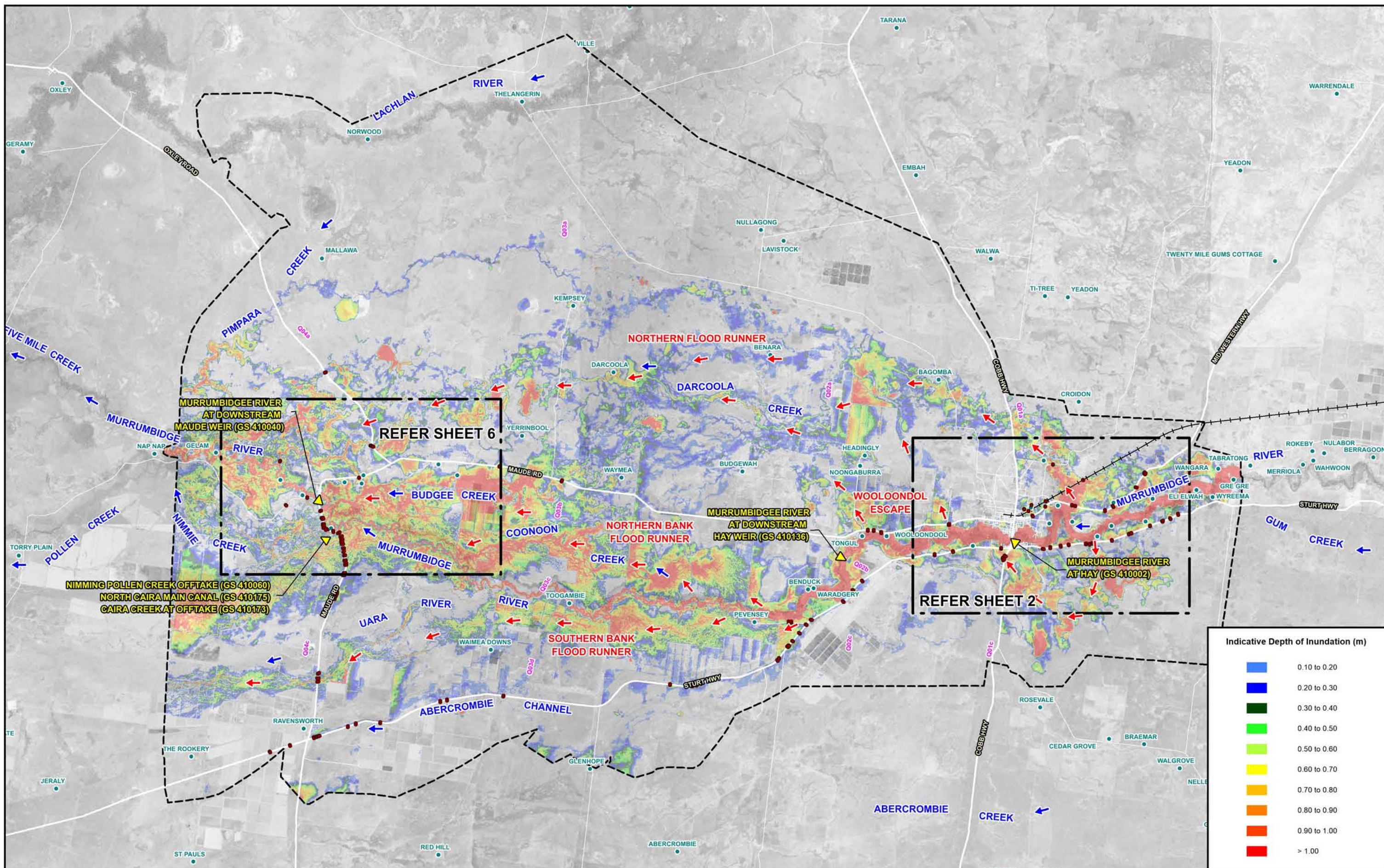
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

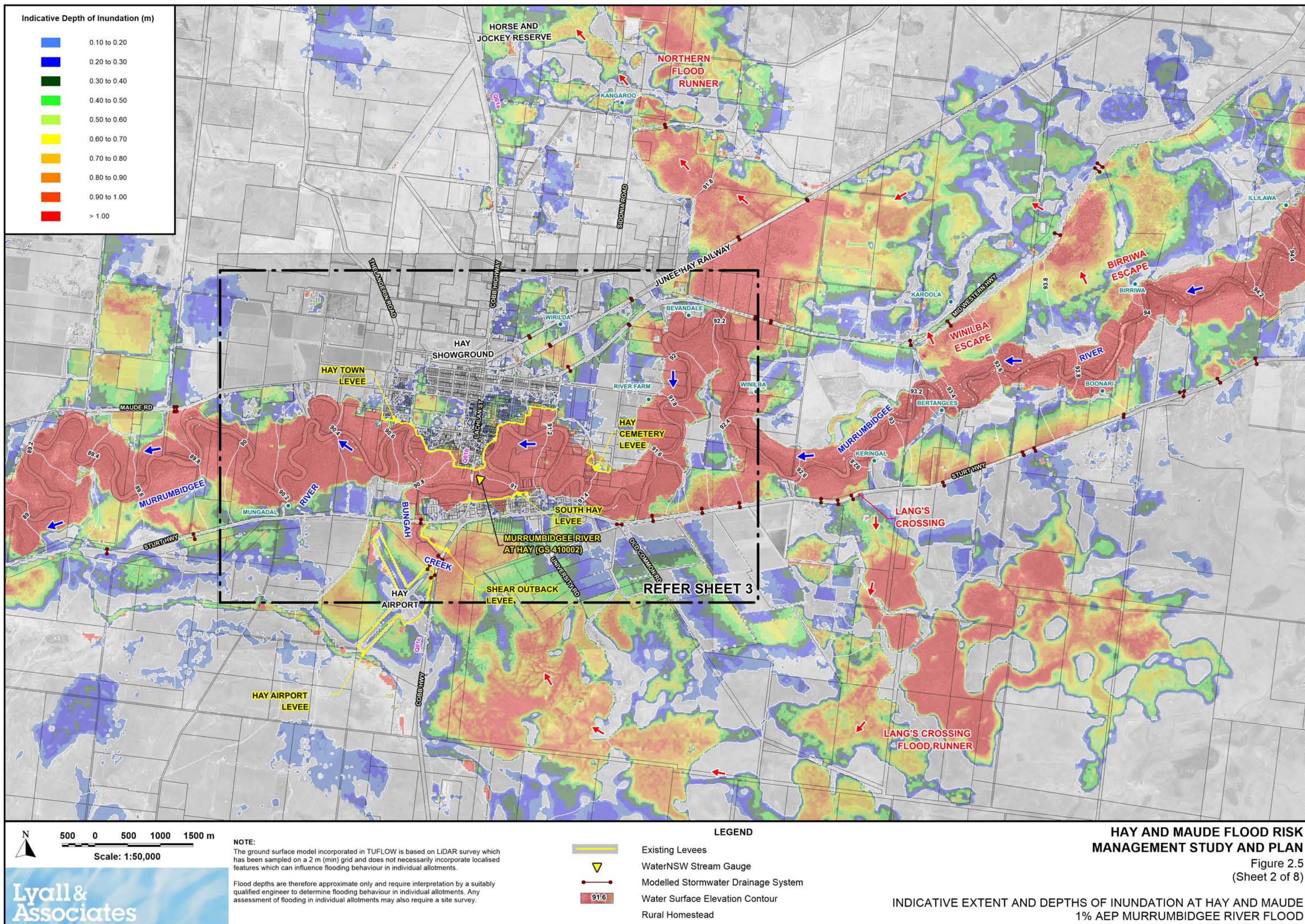
Figure 2.4
(Sheet 2 of 4)

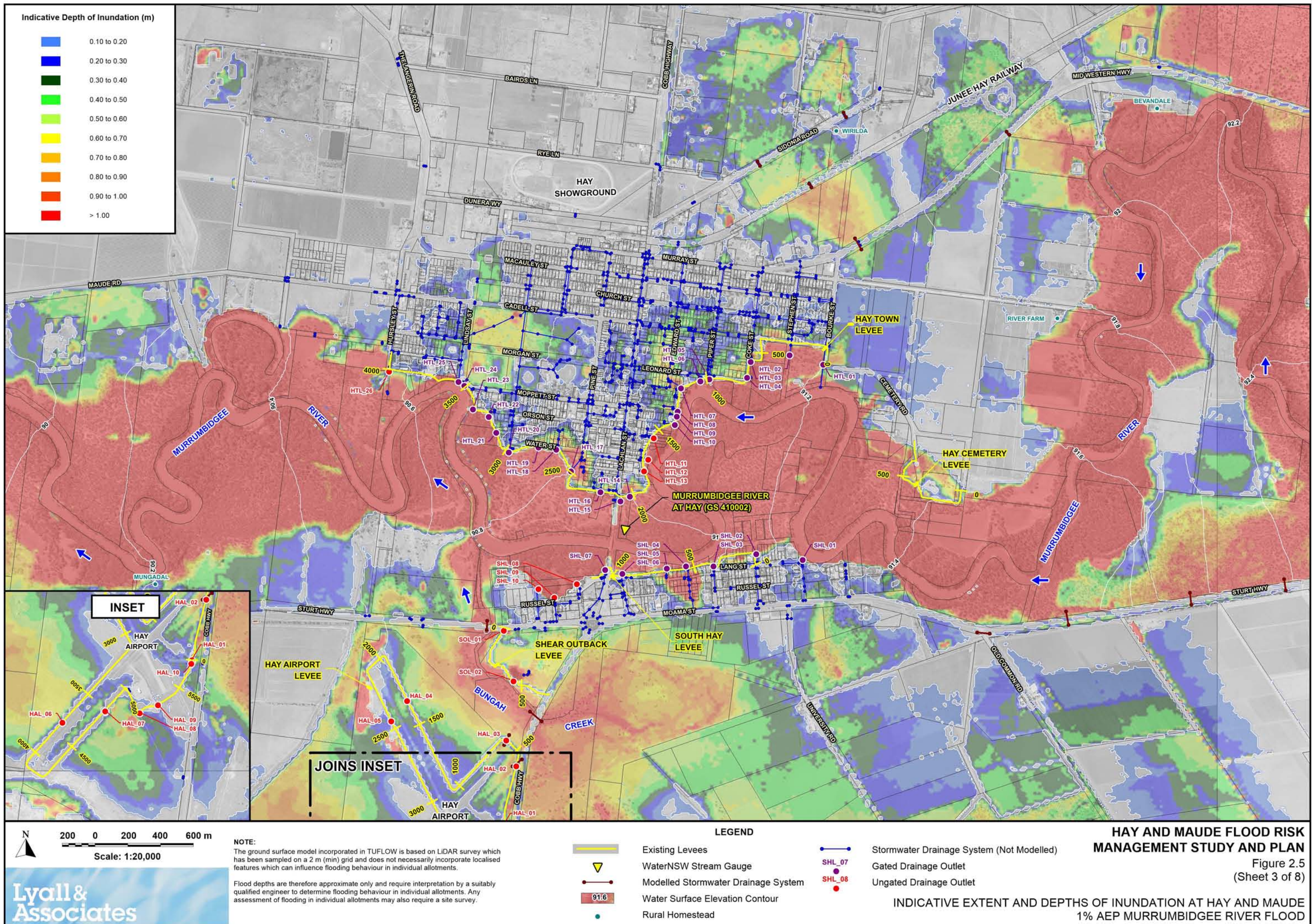
LONGITUDINAL SECTIONS ALONG CREST OF EXISTING LEVEES

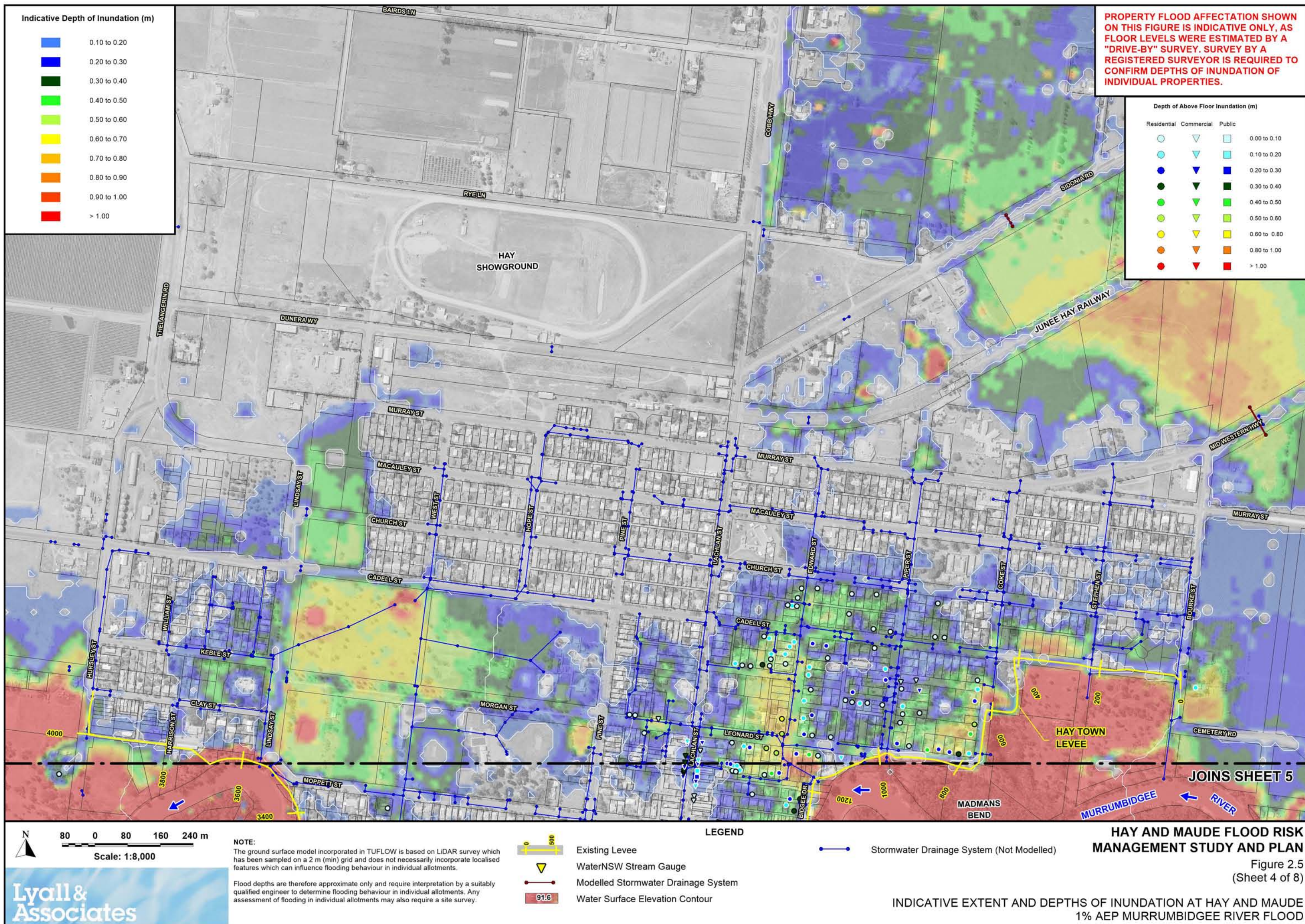


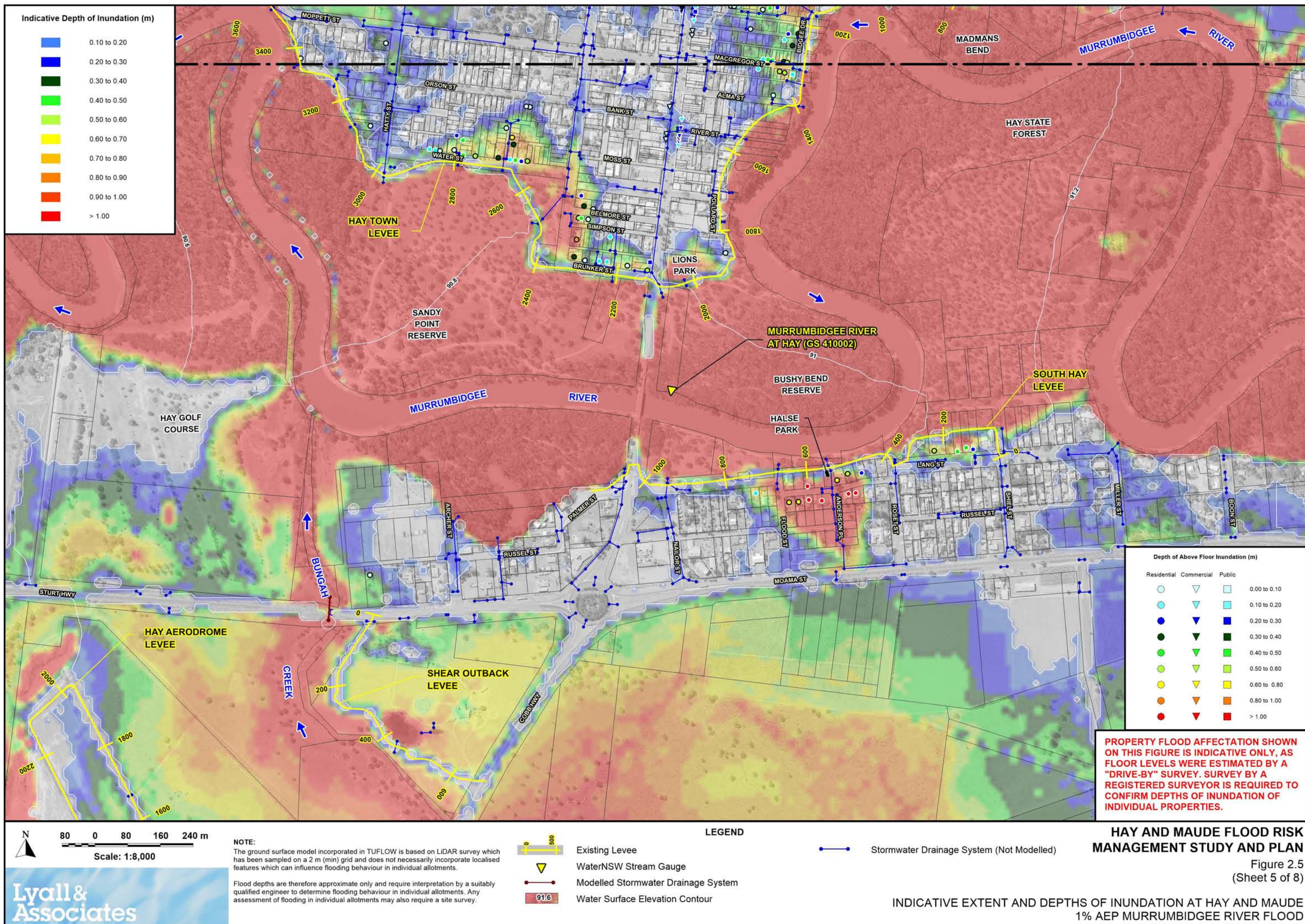


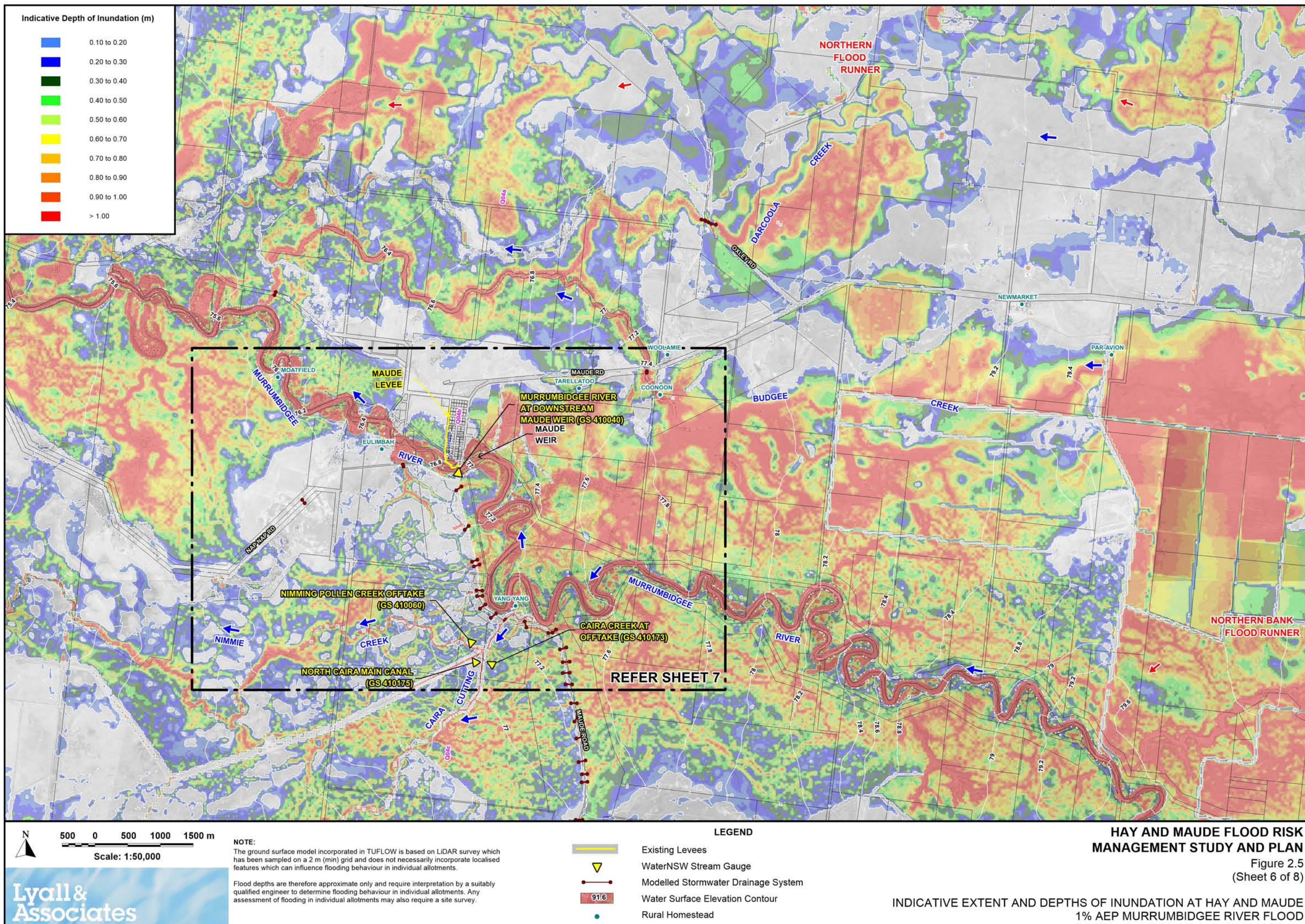


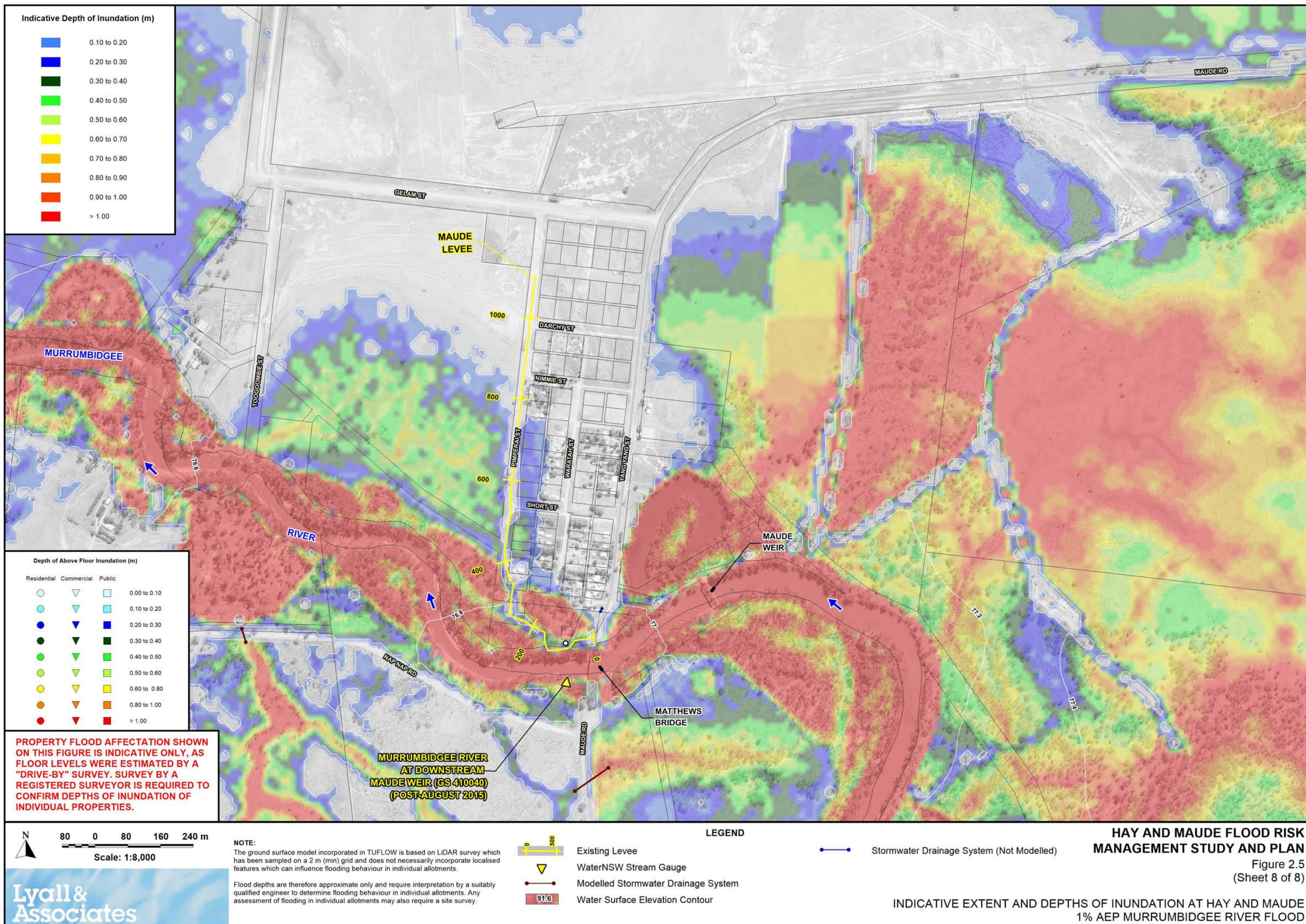


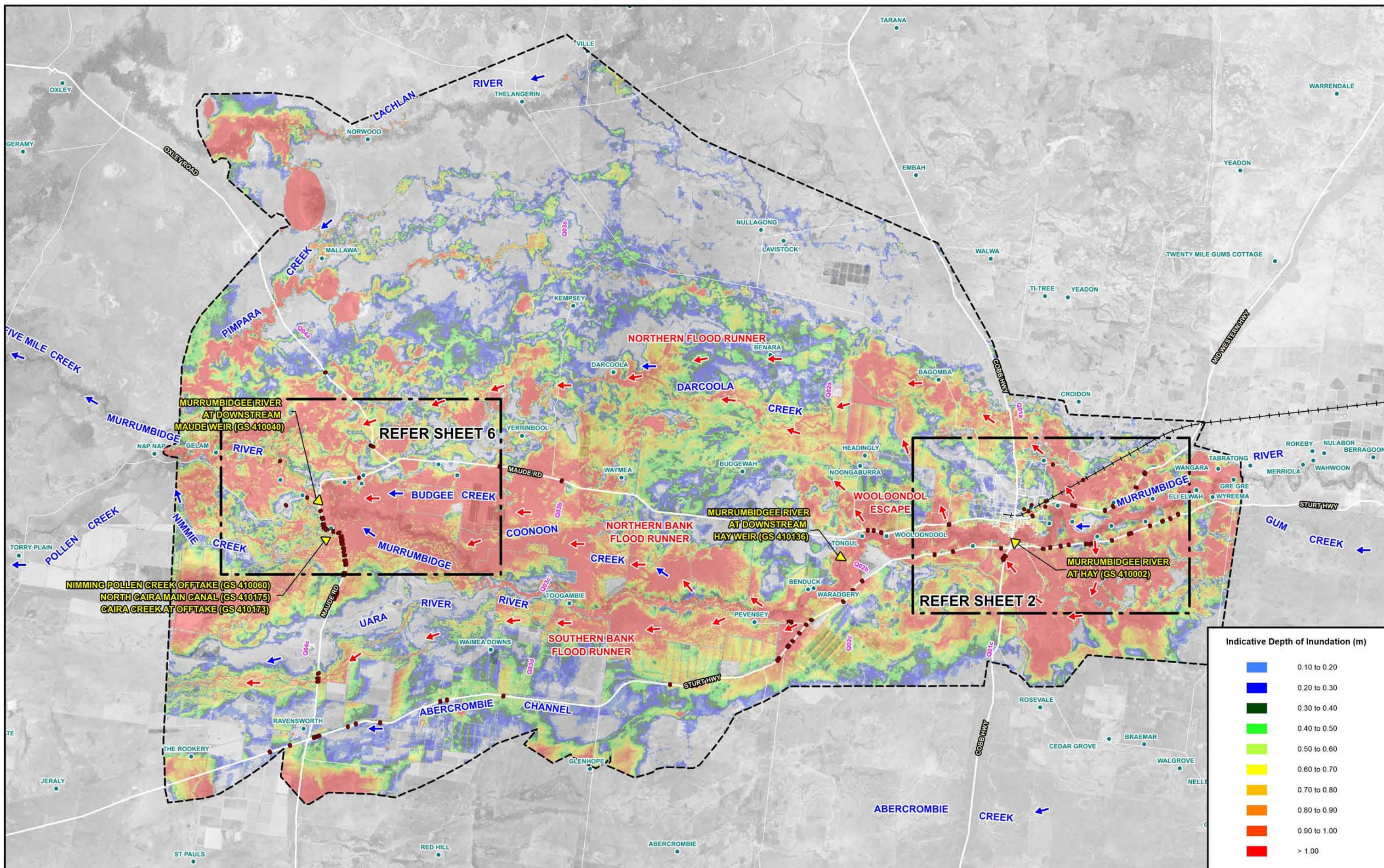


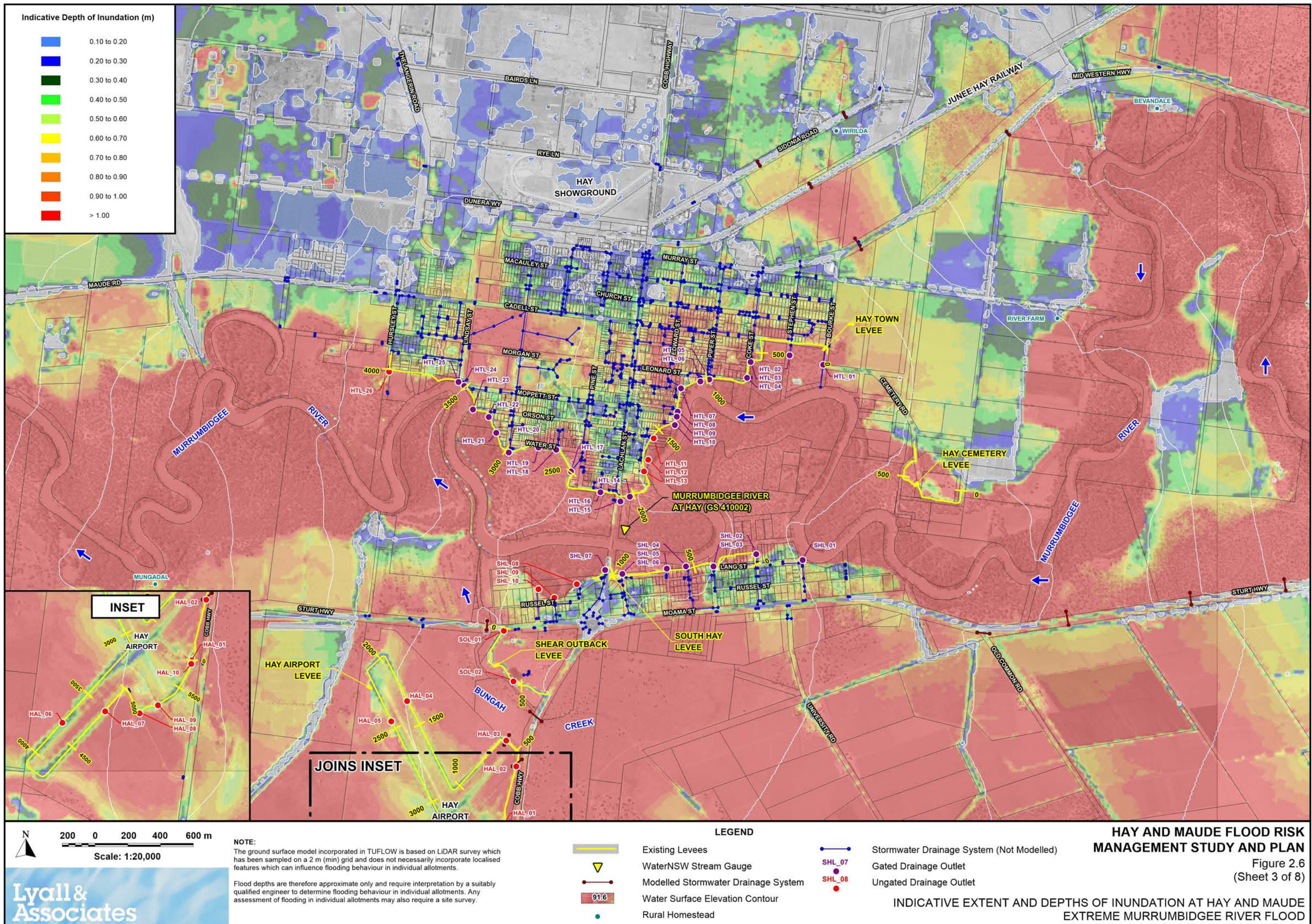


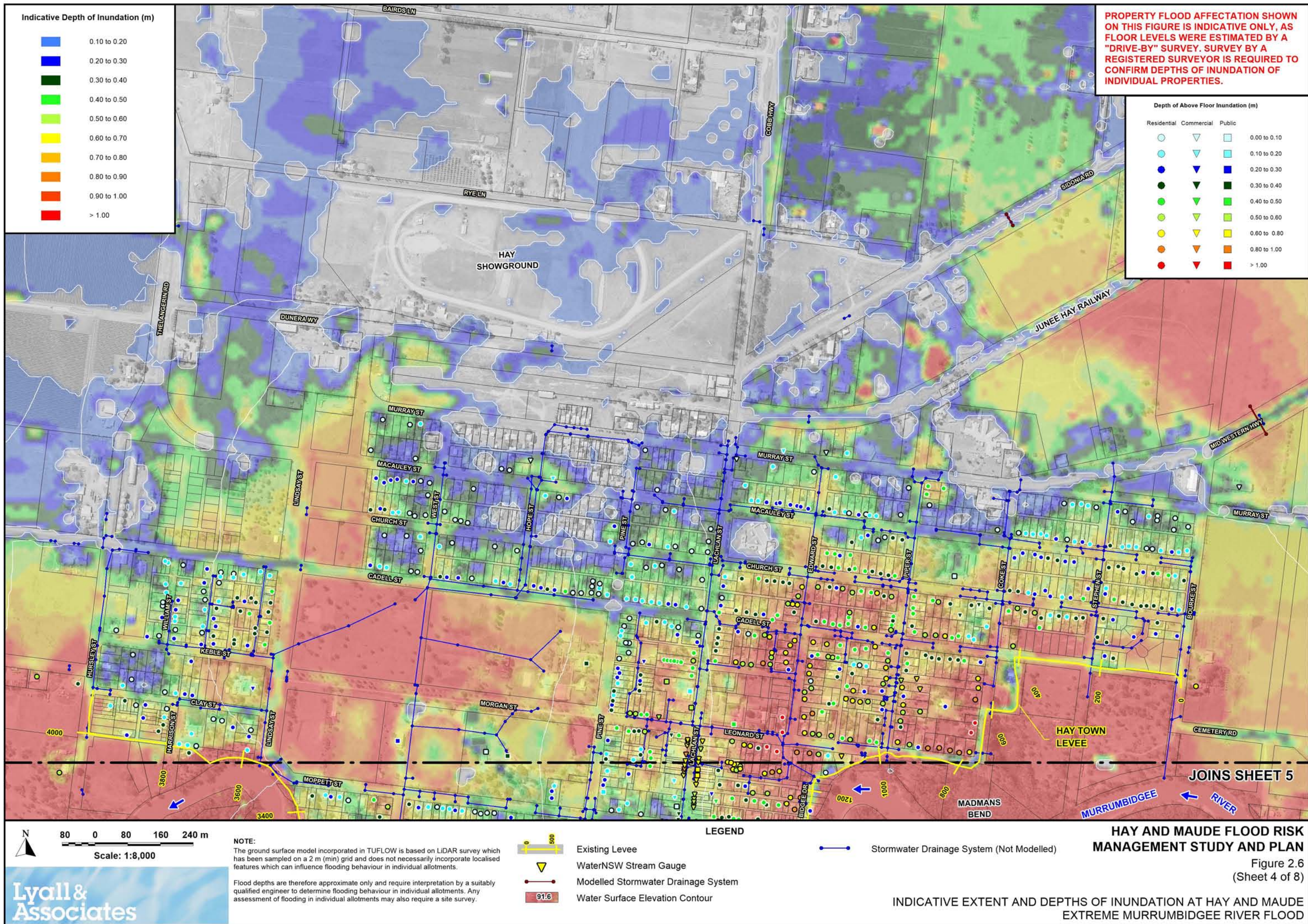


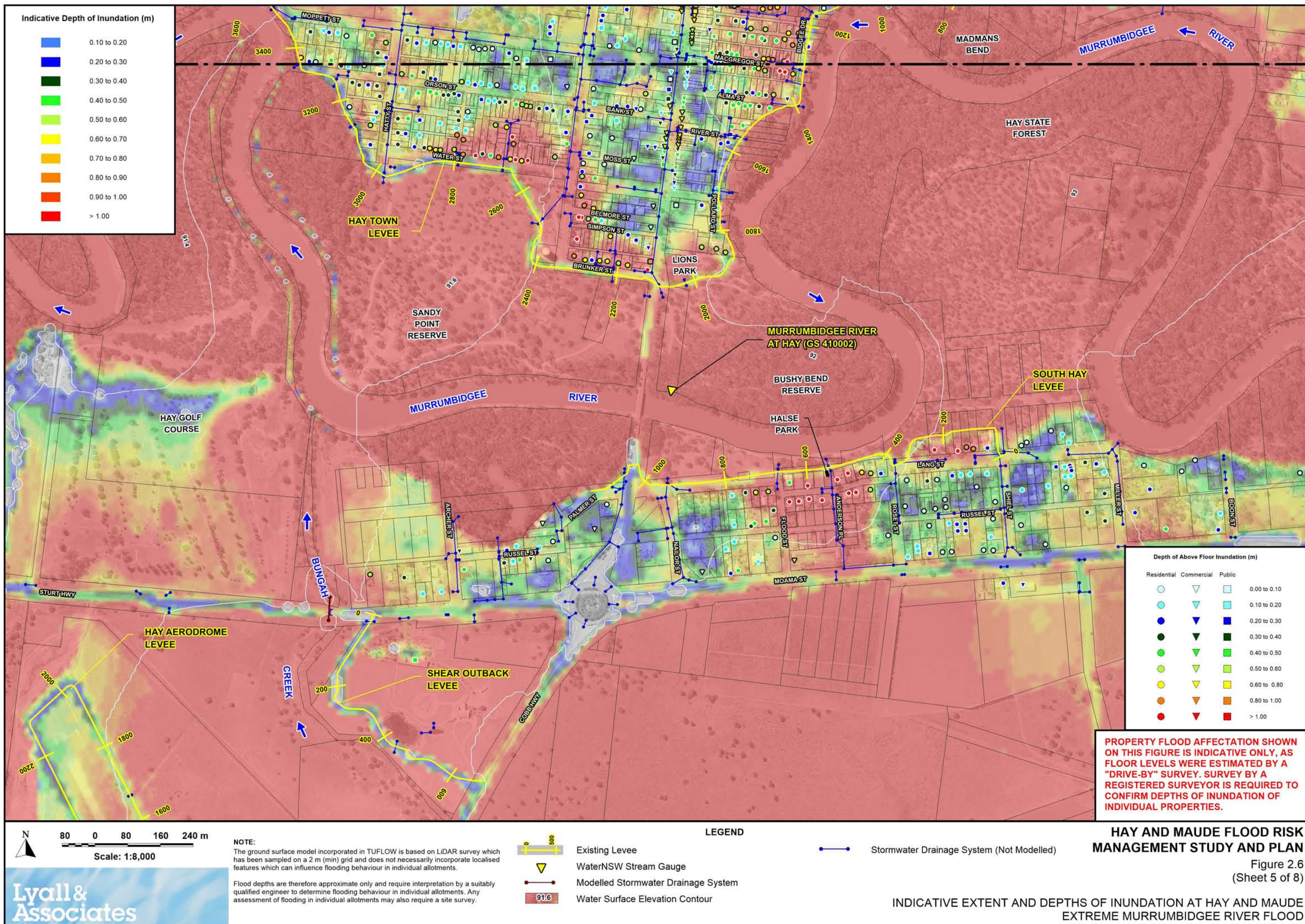


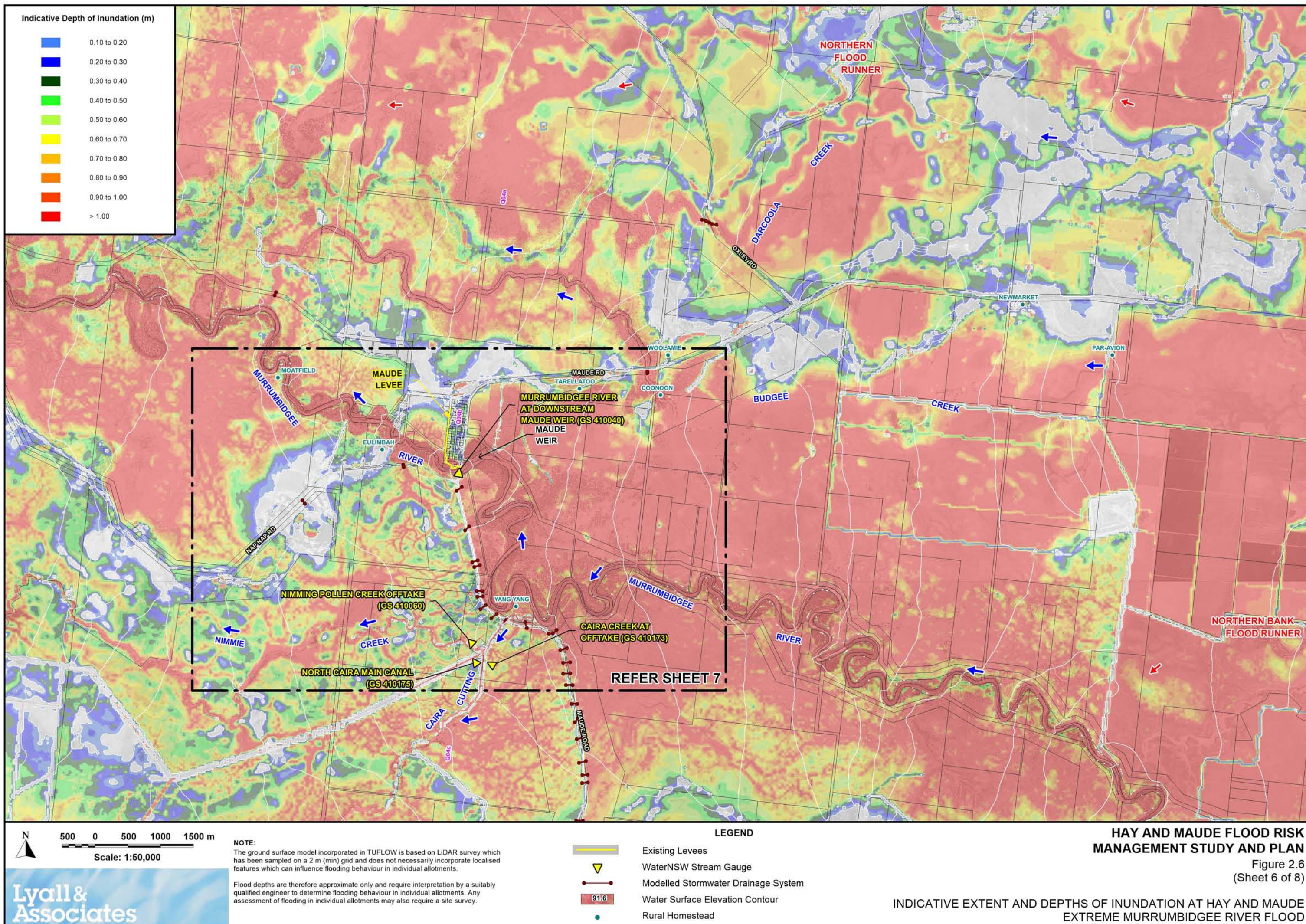


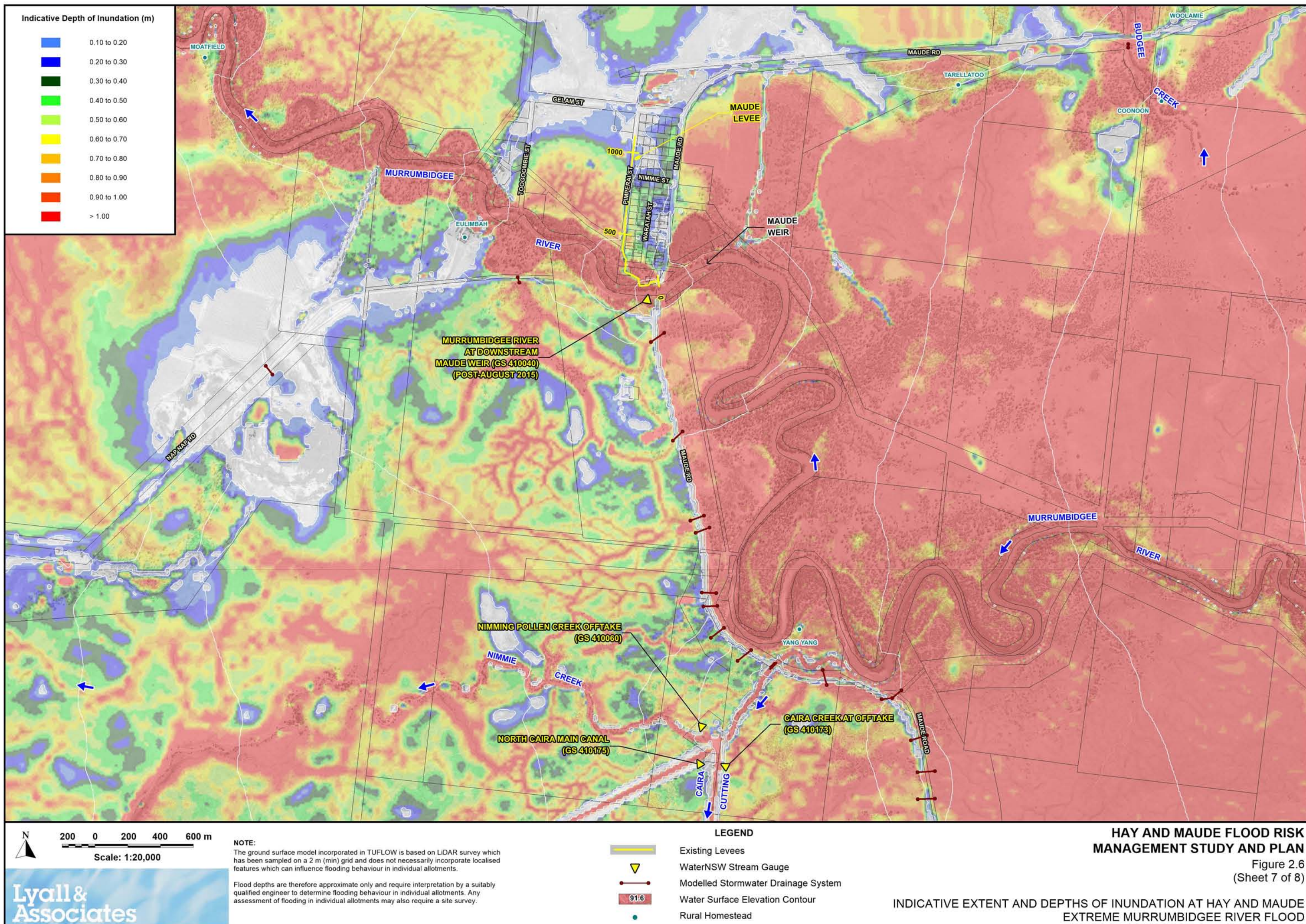


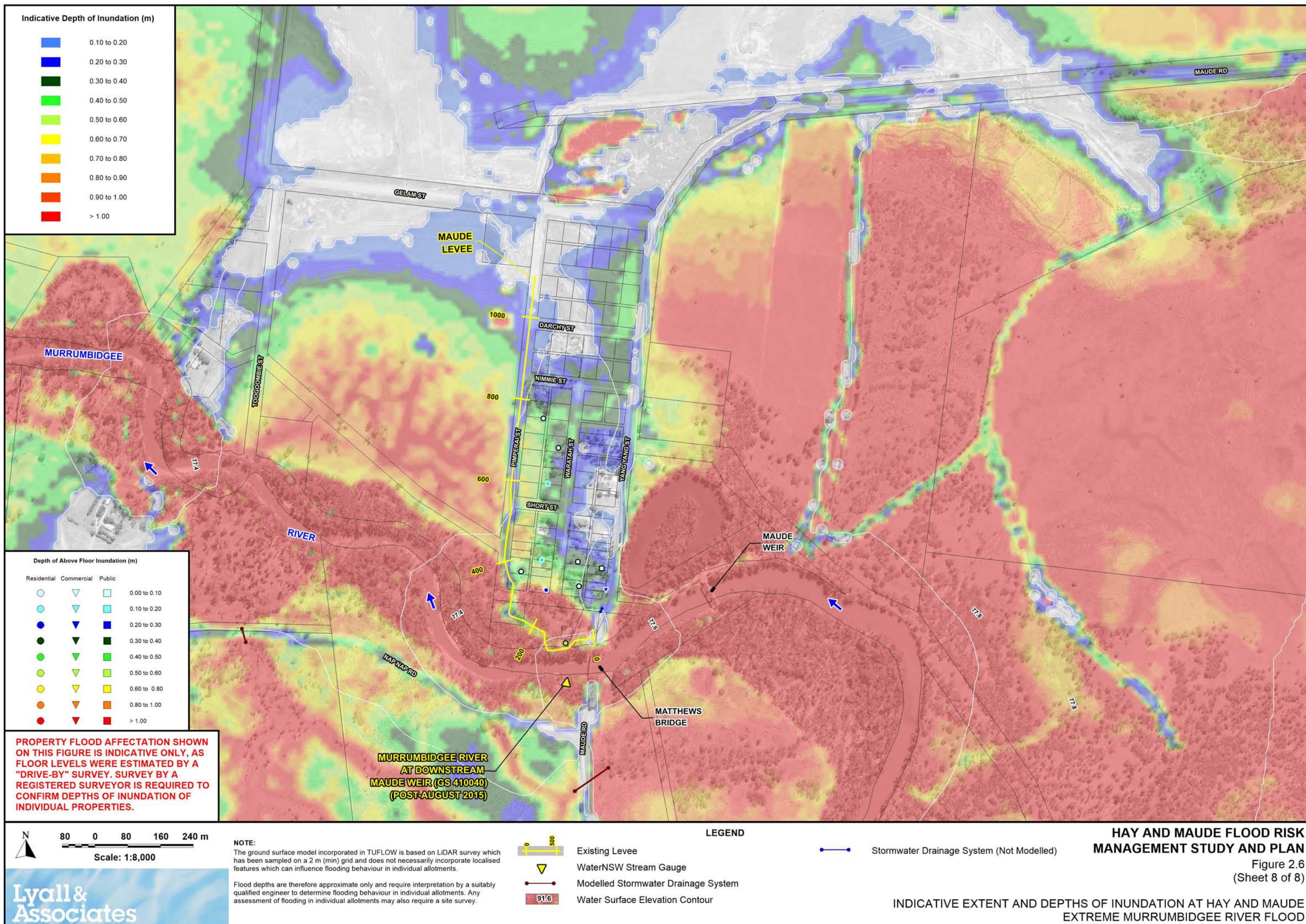


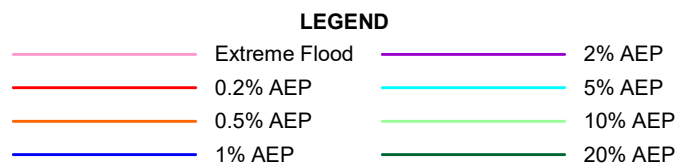








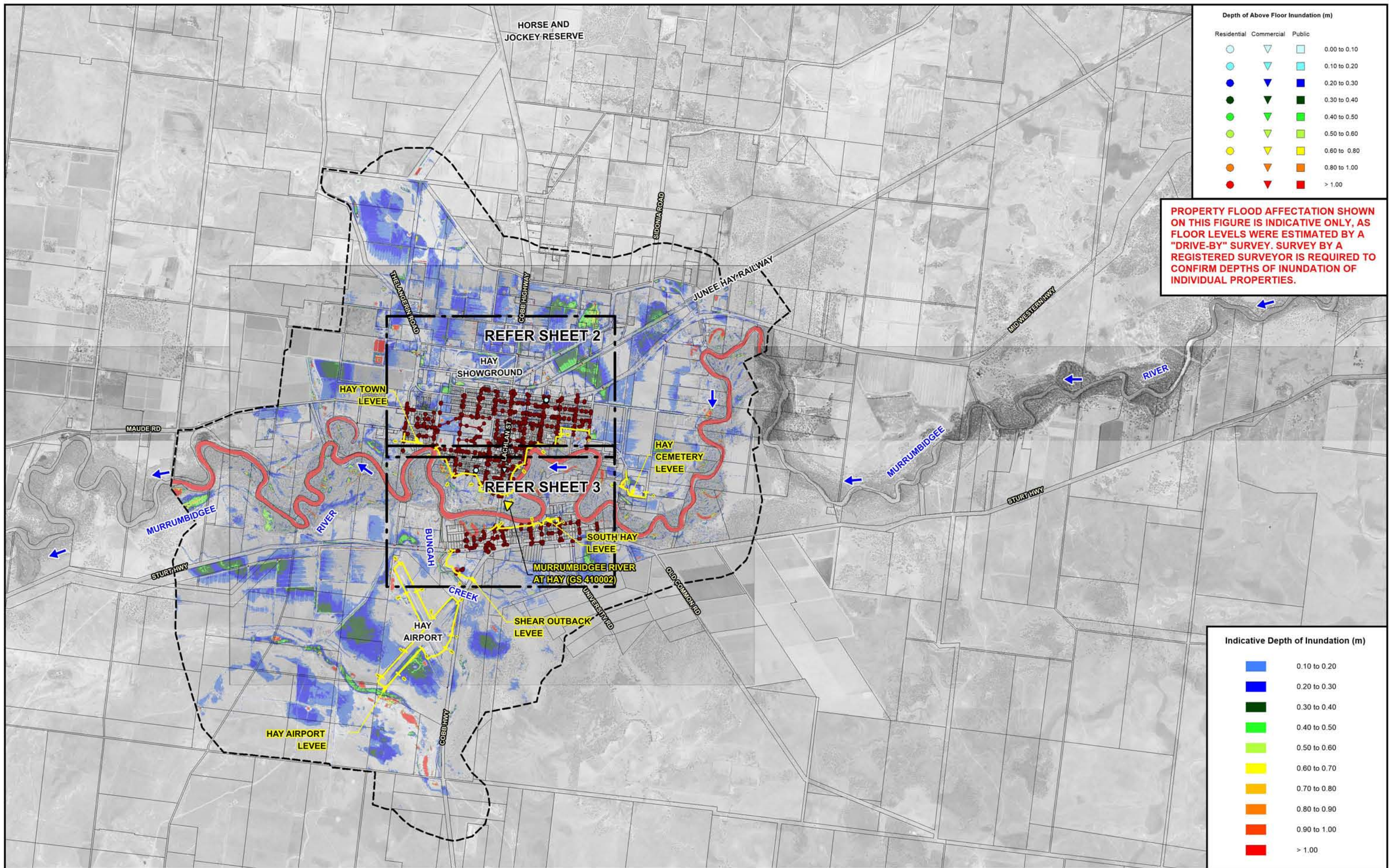


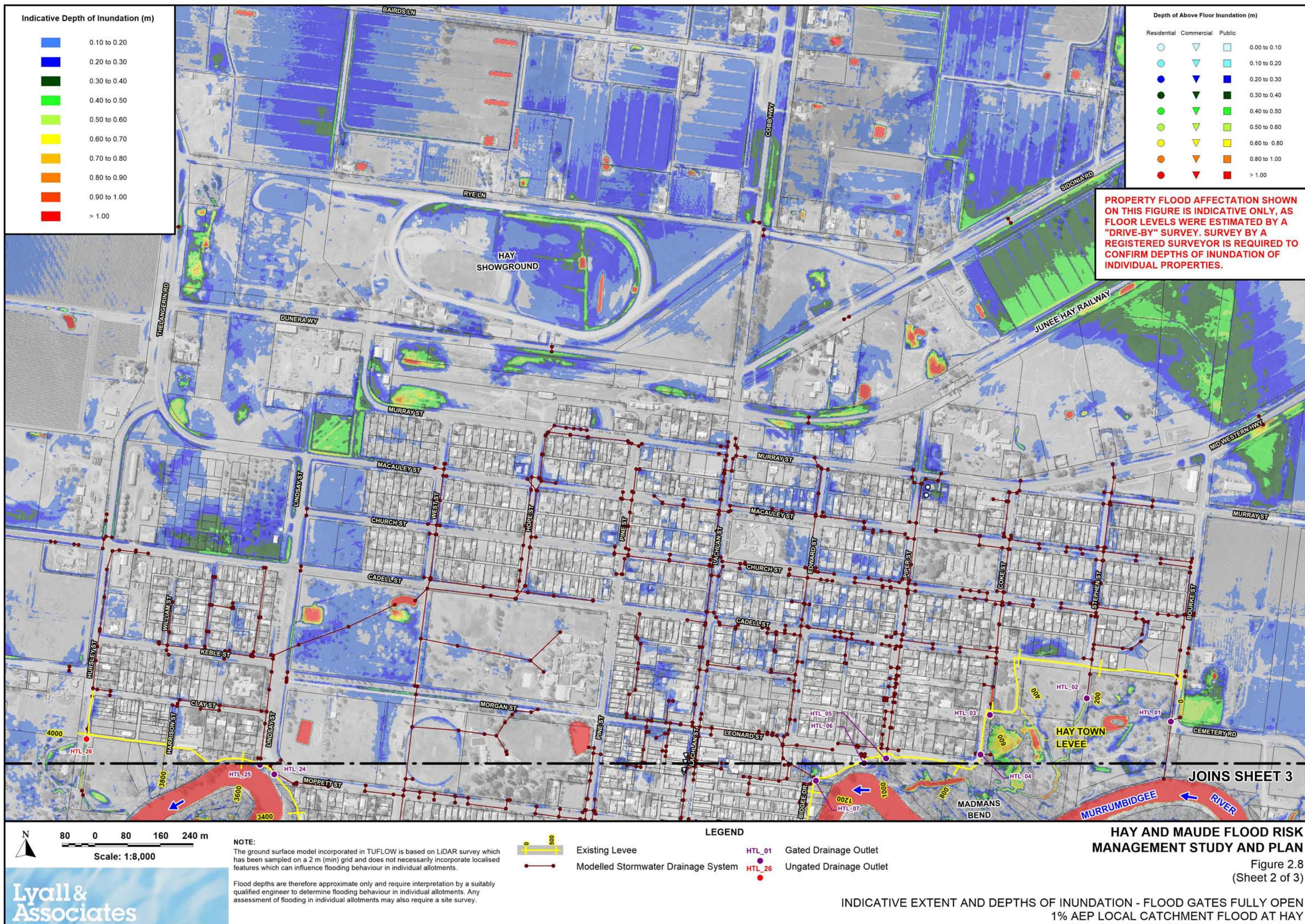


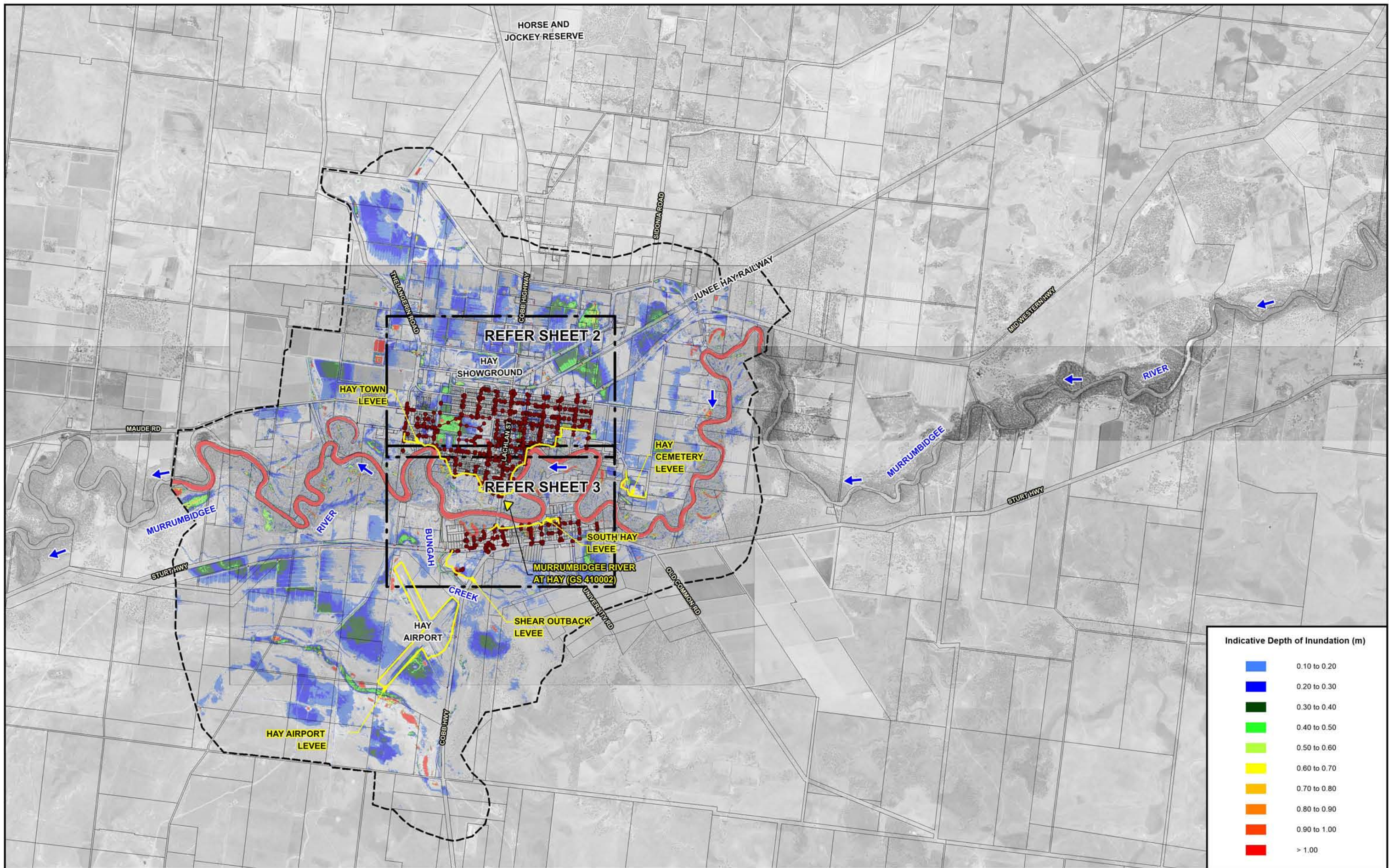
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.7

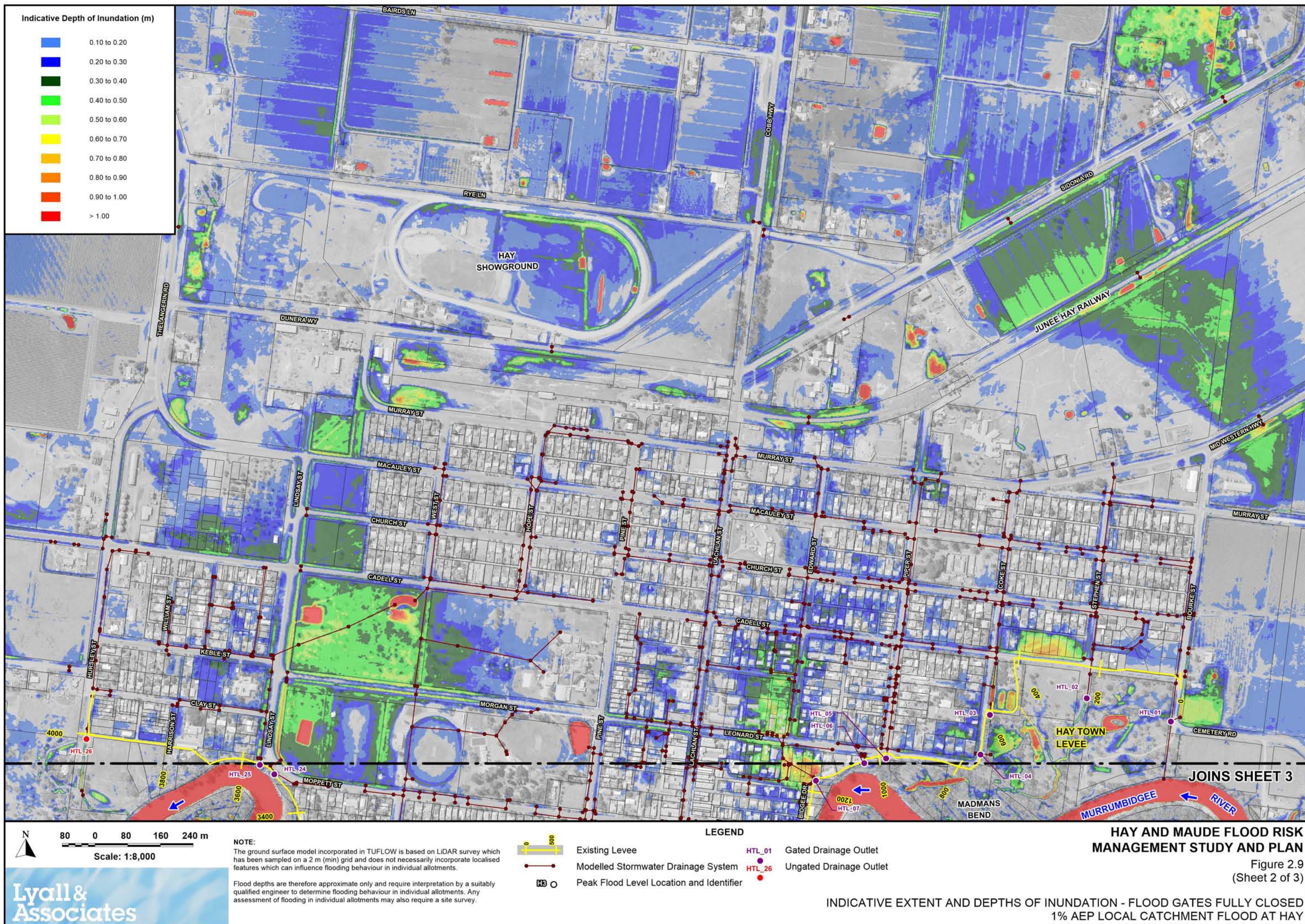
MURRUMBIDGEE RIVER WATER SURFACE PROFILES
DESIGN FLOOD EVENTS

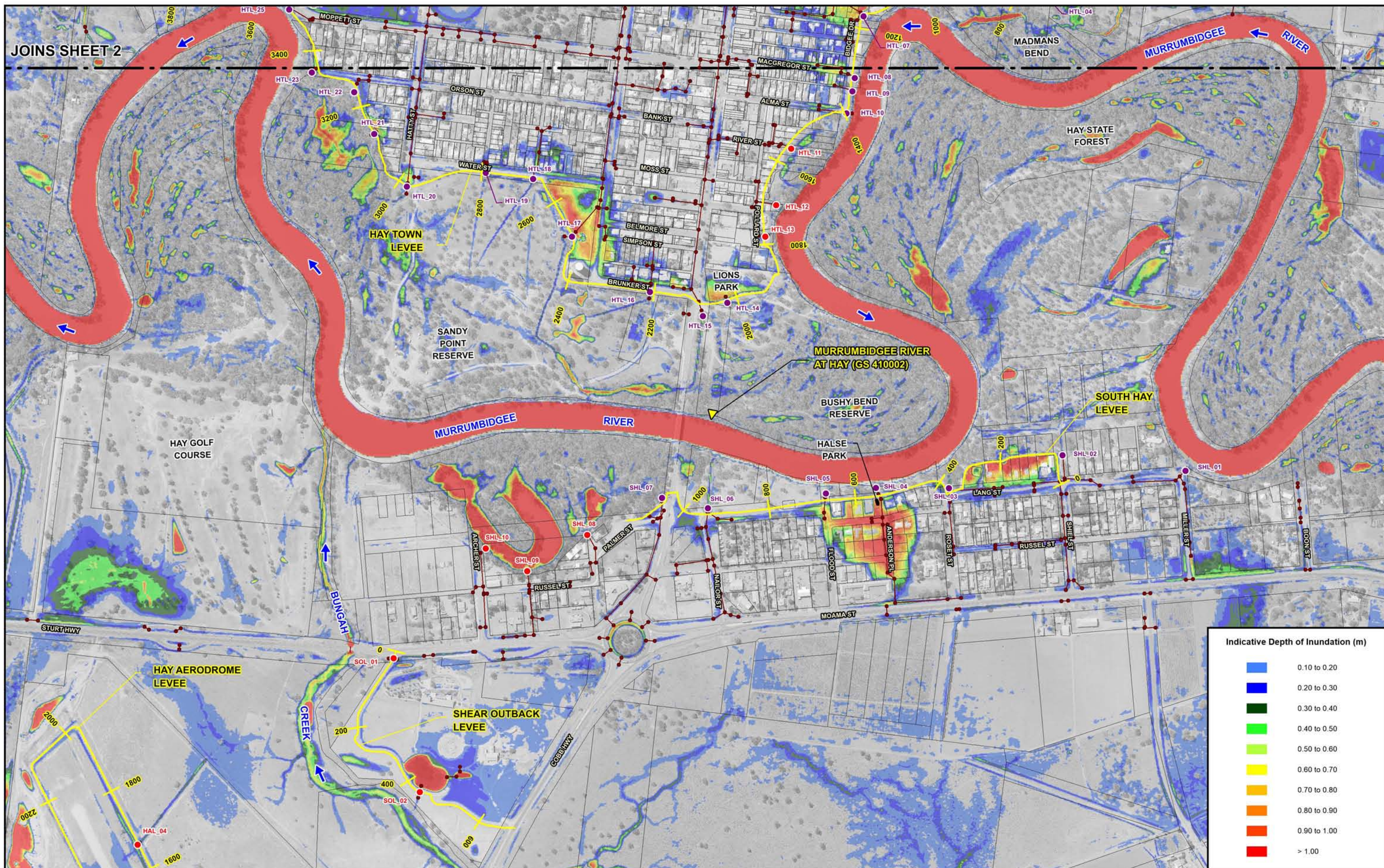


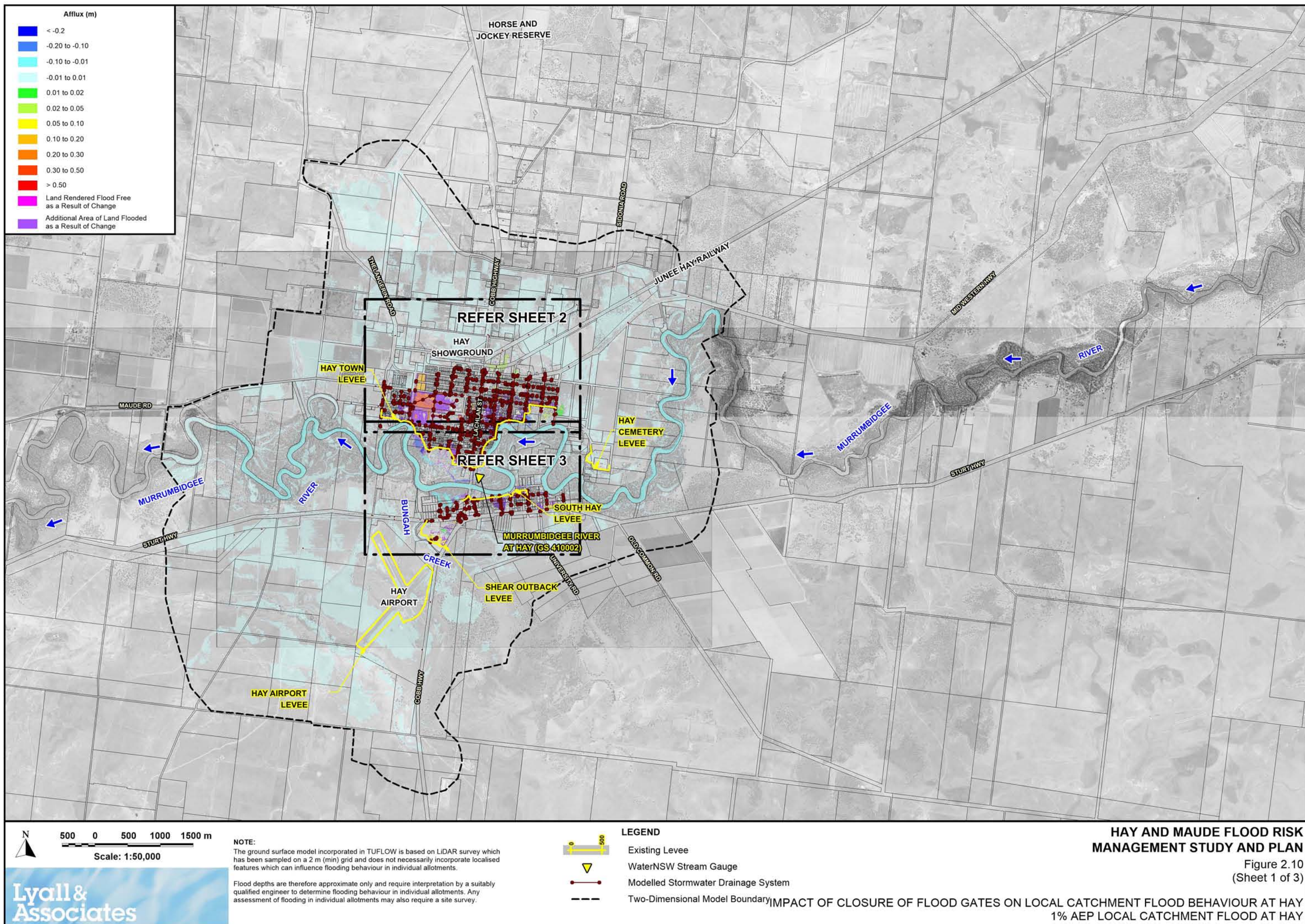


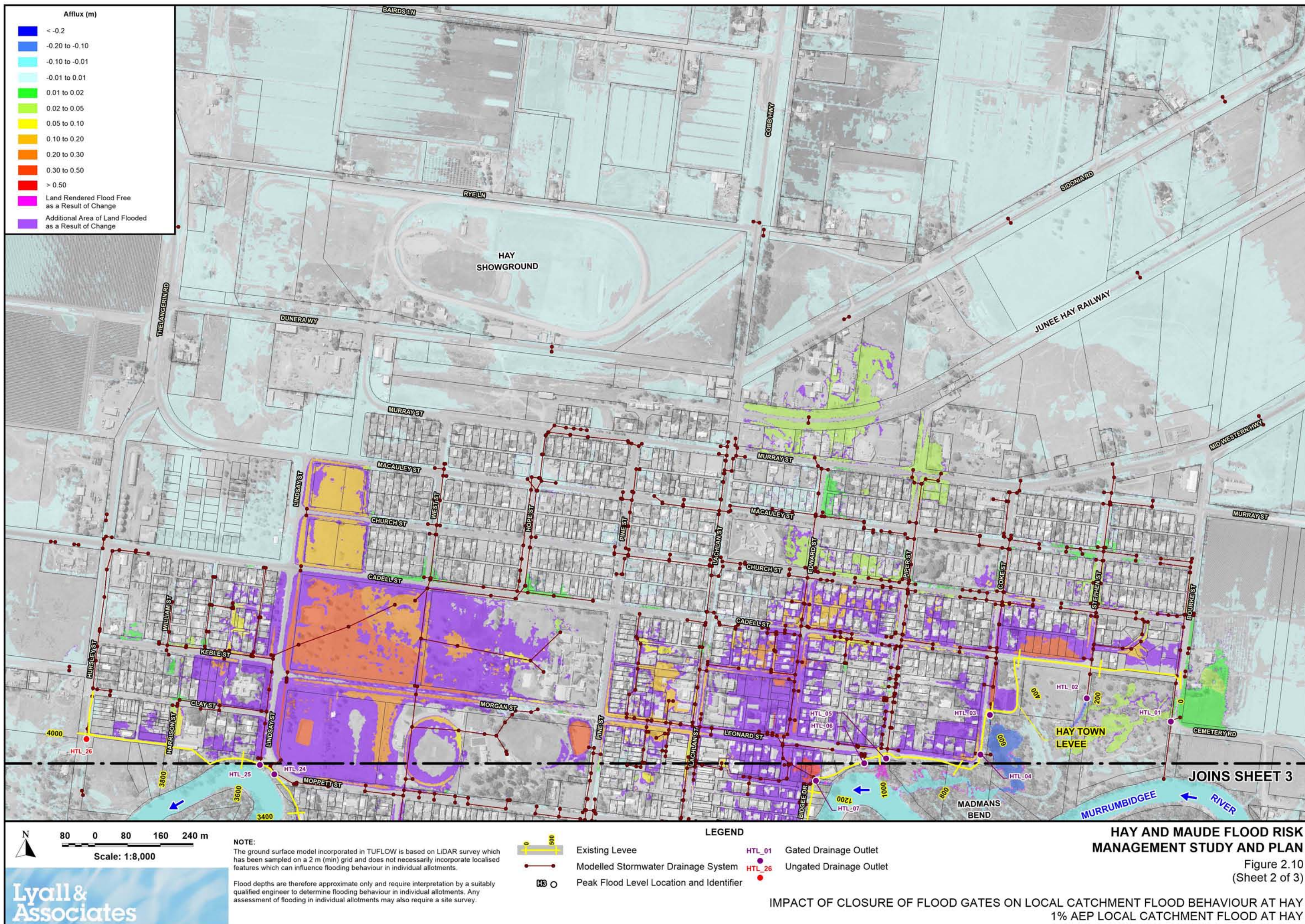


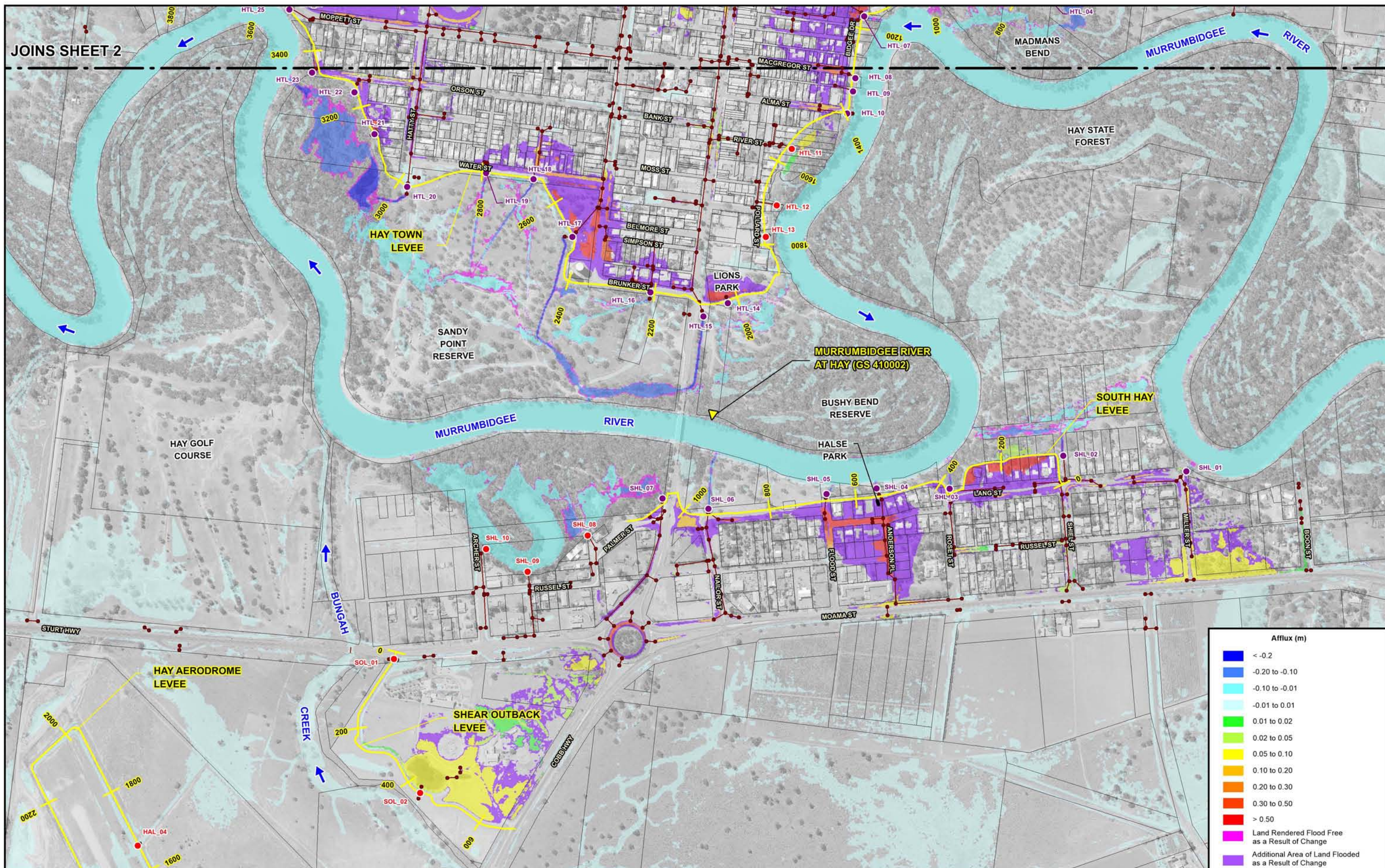
Indicative Depth of Inundation (m)	
■	0.10 to 0.20
■	0.20 to 0.30
■	0.30 to 0.40
■	0.40 to 0.50
■	0.50 to 0.60
■	0.60 to 0.70
■	0.70 to 0.80
■	0.80 to 0.90
■	0.90 to 1.00
■	> 1.00

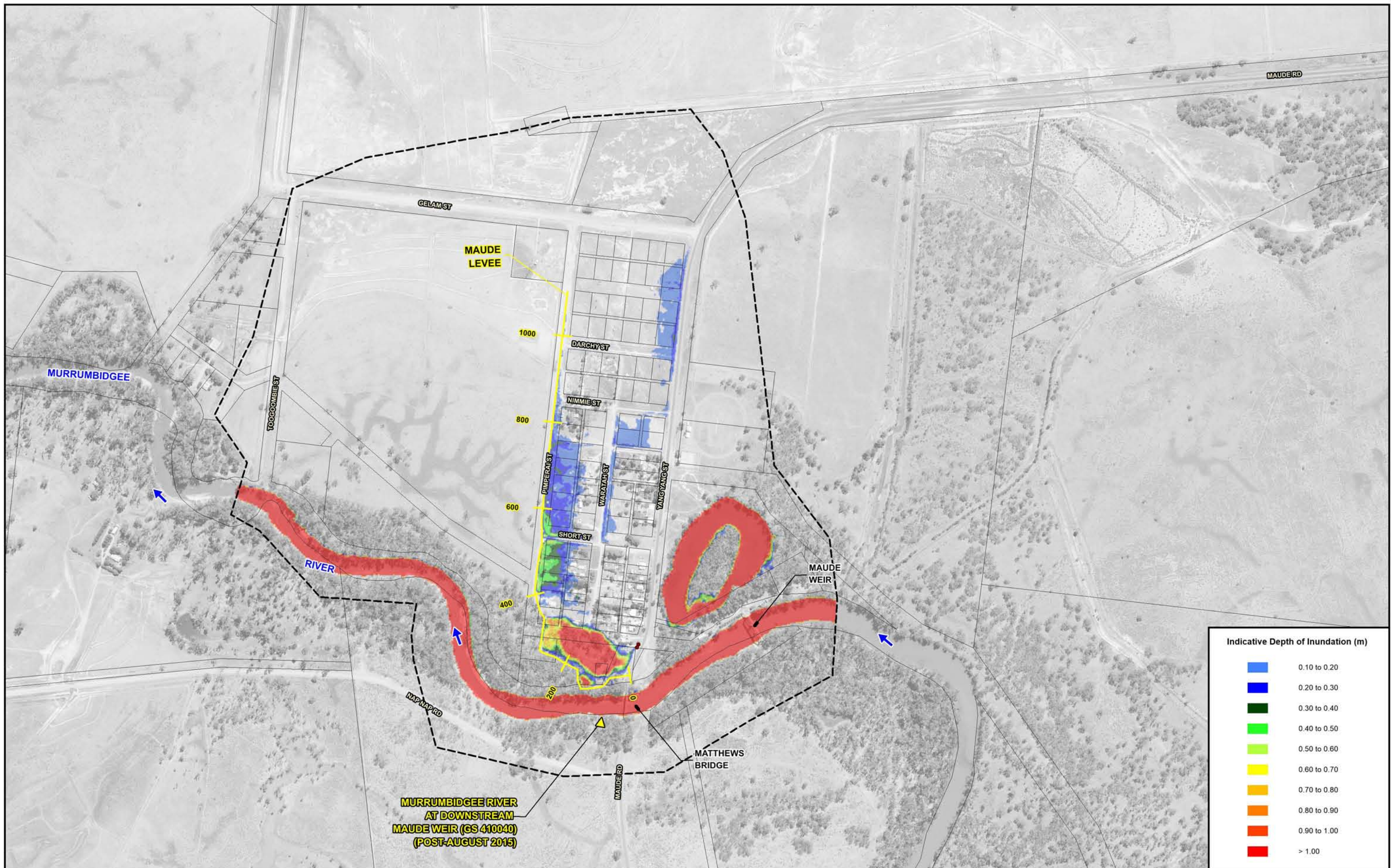




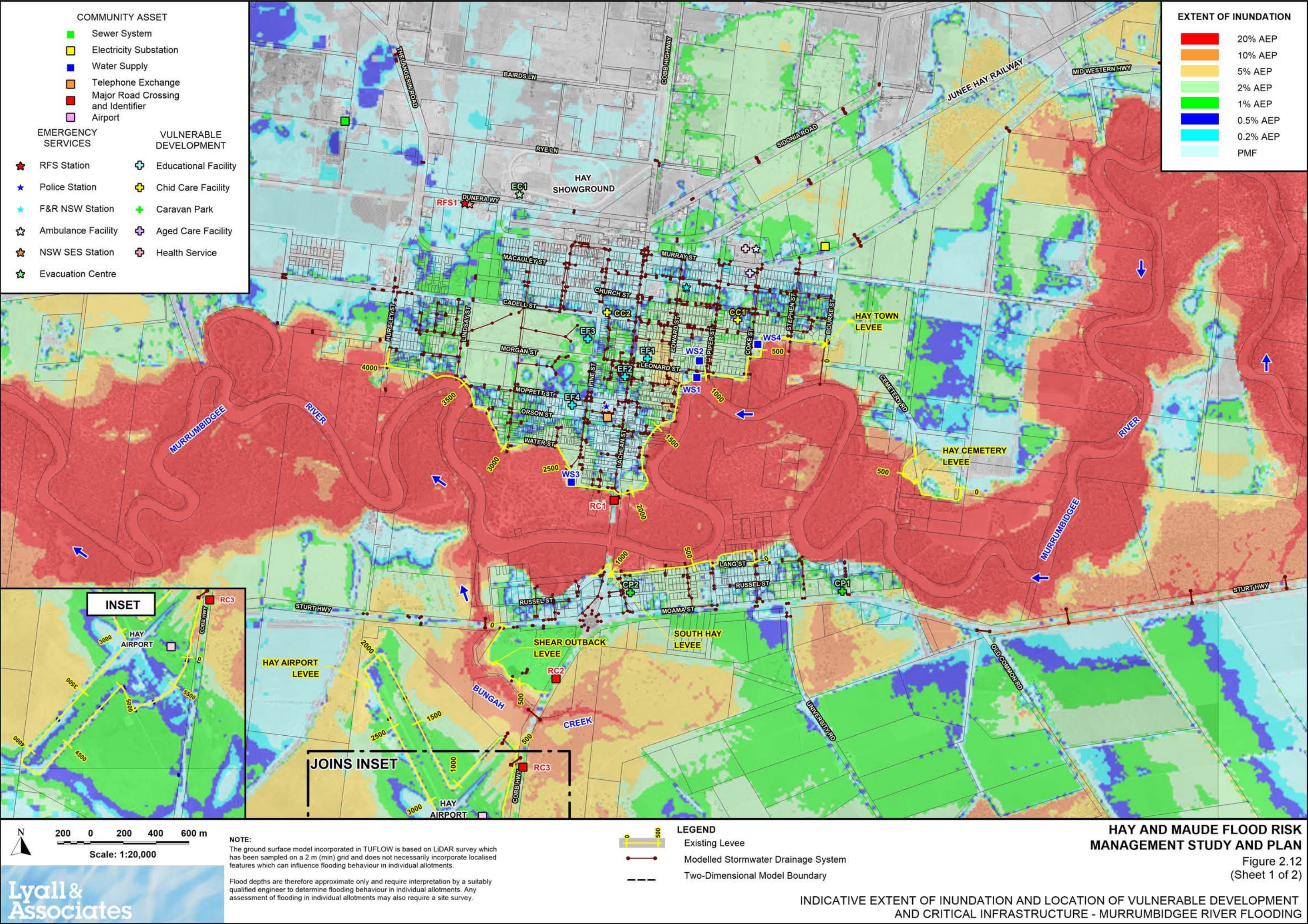


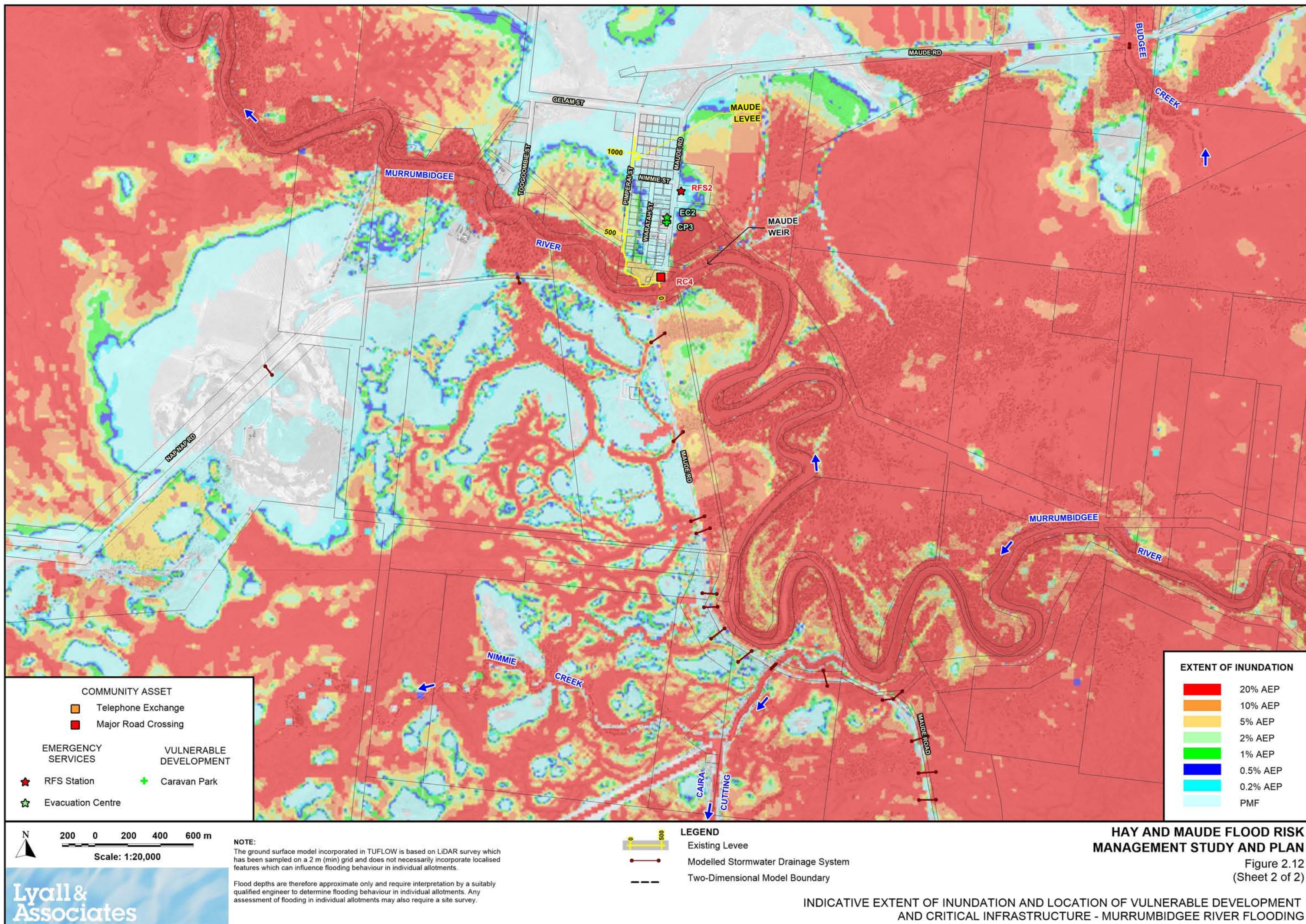


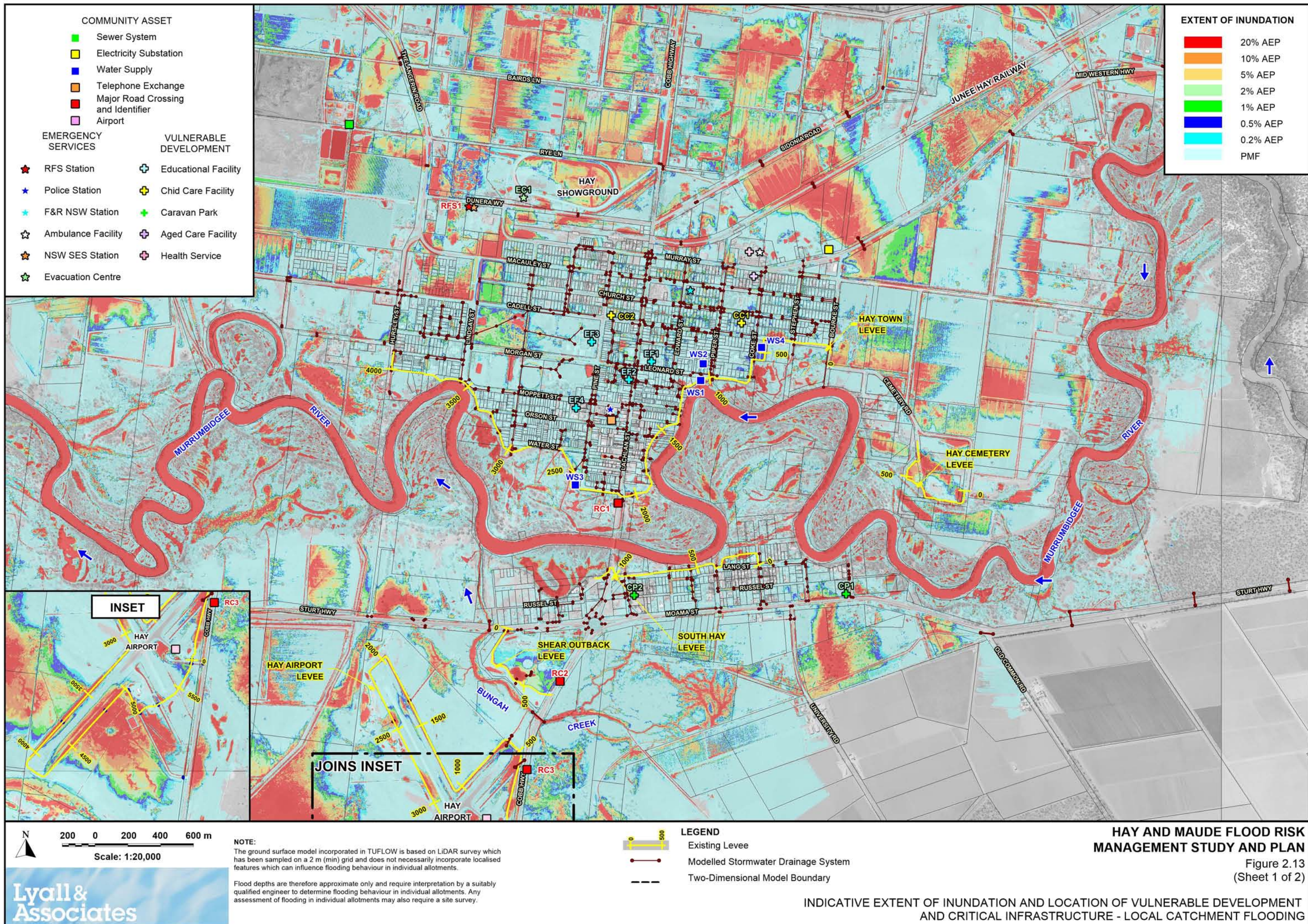


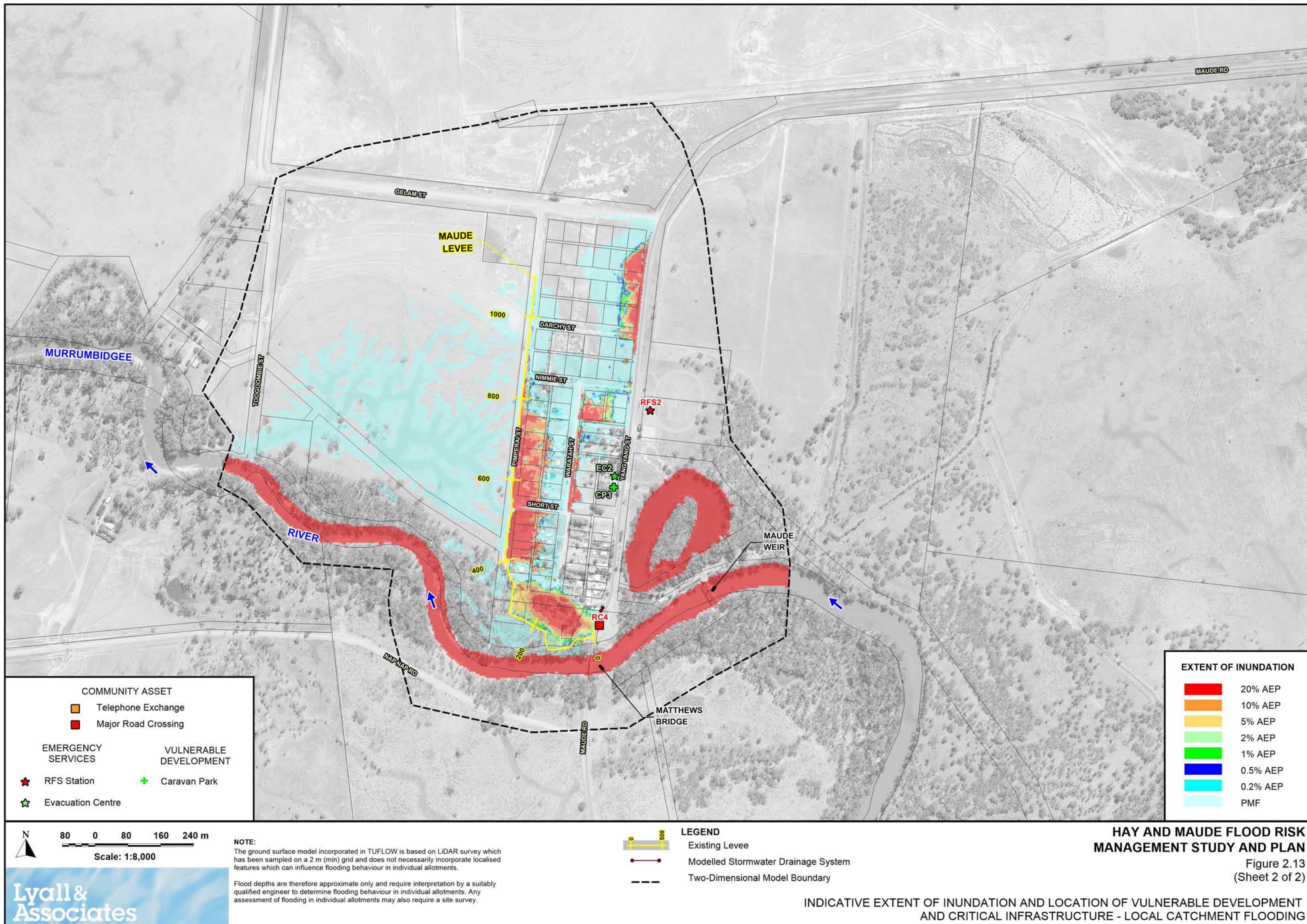


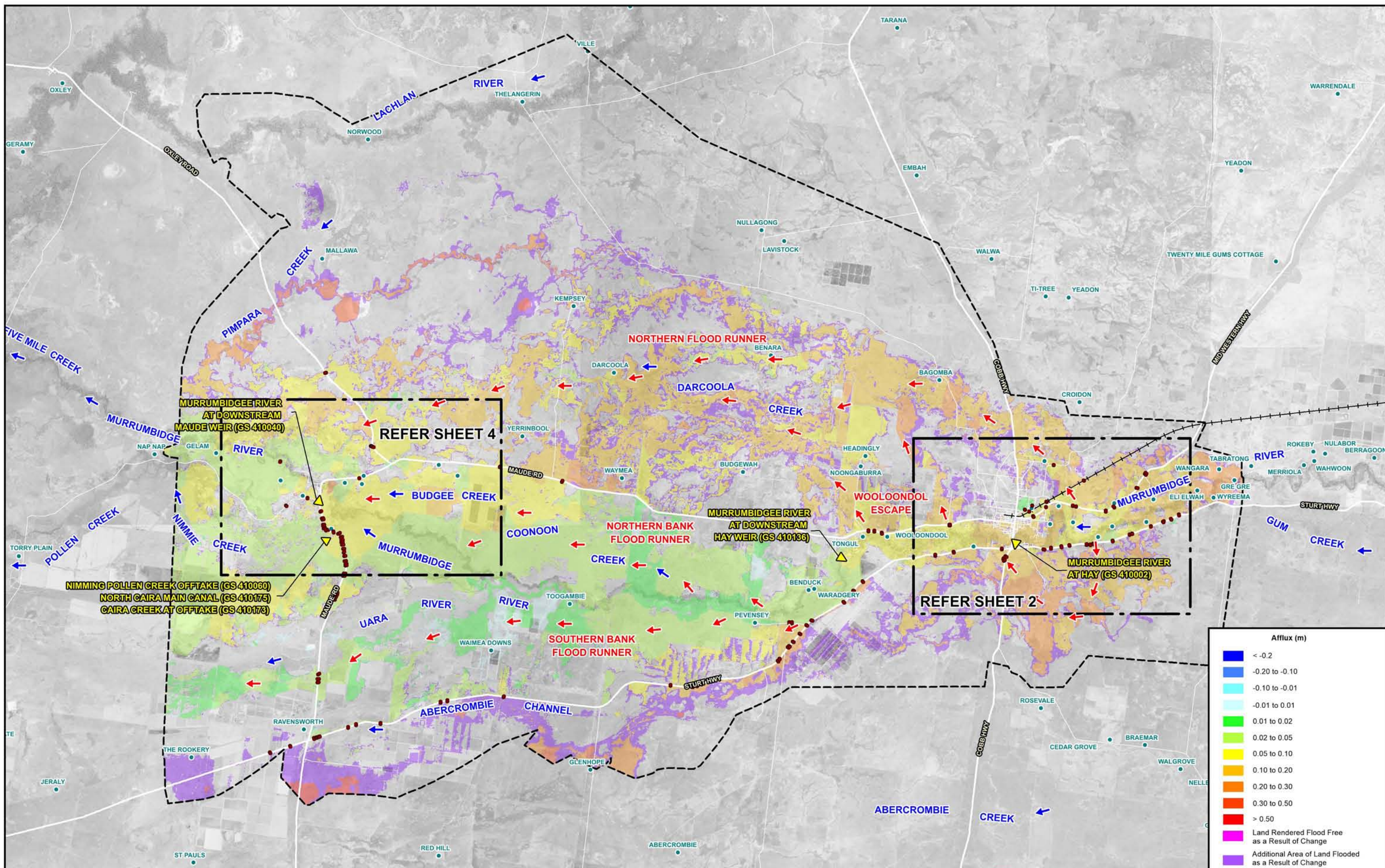
Indicative Depth of Inundation (m)	
■	0.10 to 0.20
■	0.20 to 0.30
■	0.30 to 0.40
■	0.40 to 0.50
■	0.50 to 0.60
■	0.60 to 0.70
■	0.70 to 0.80
■	0.80 to 0.90
■	0.90 to 1.00
■	> 1.00

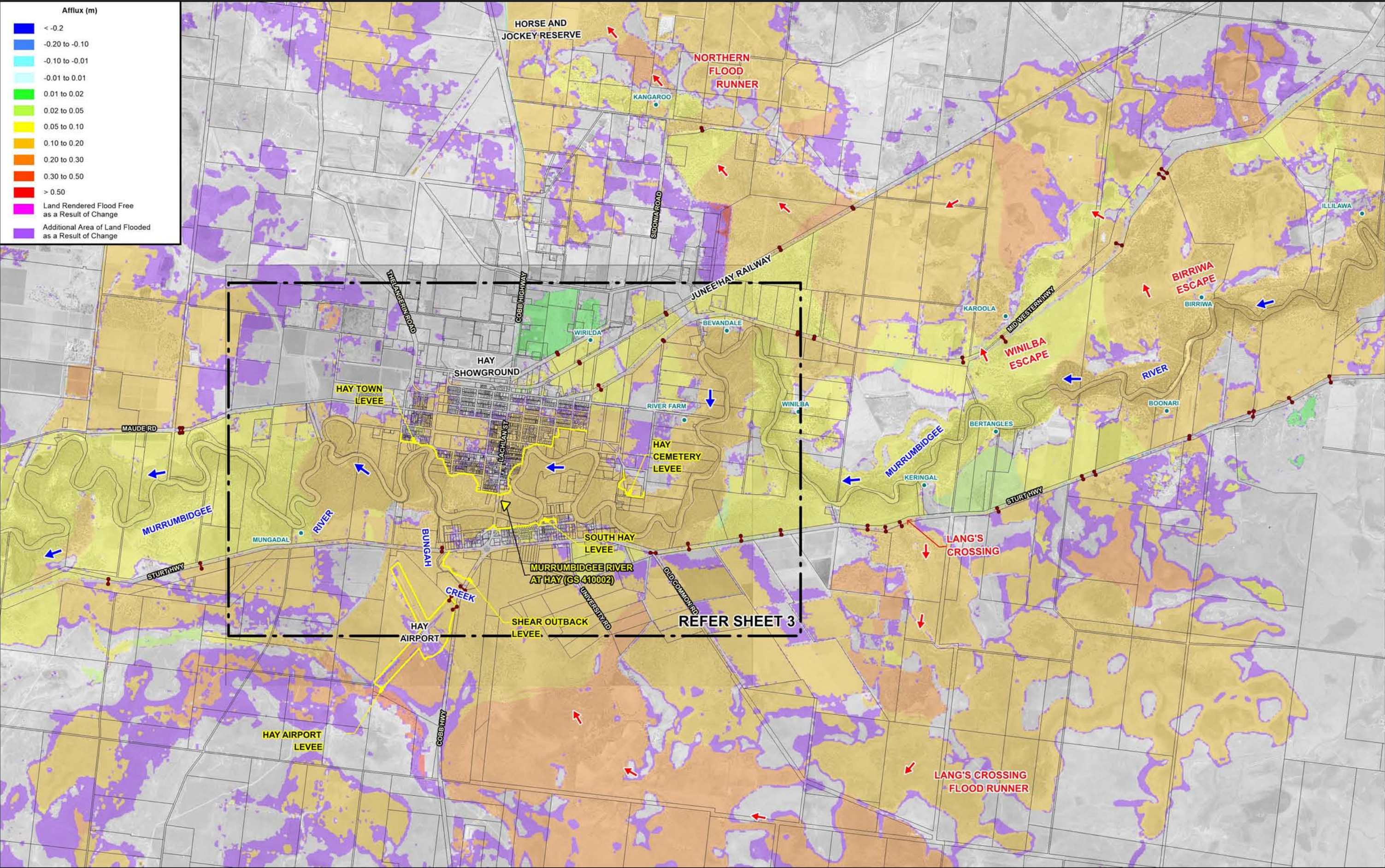


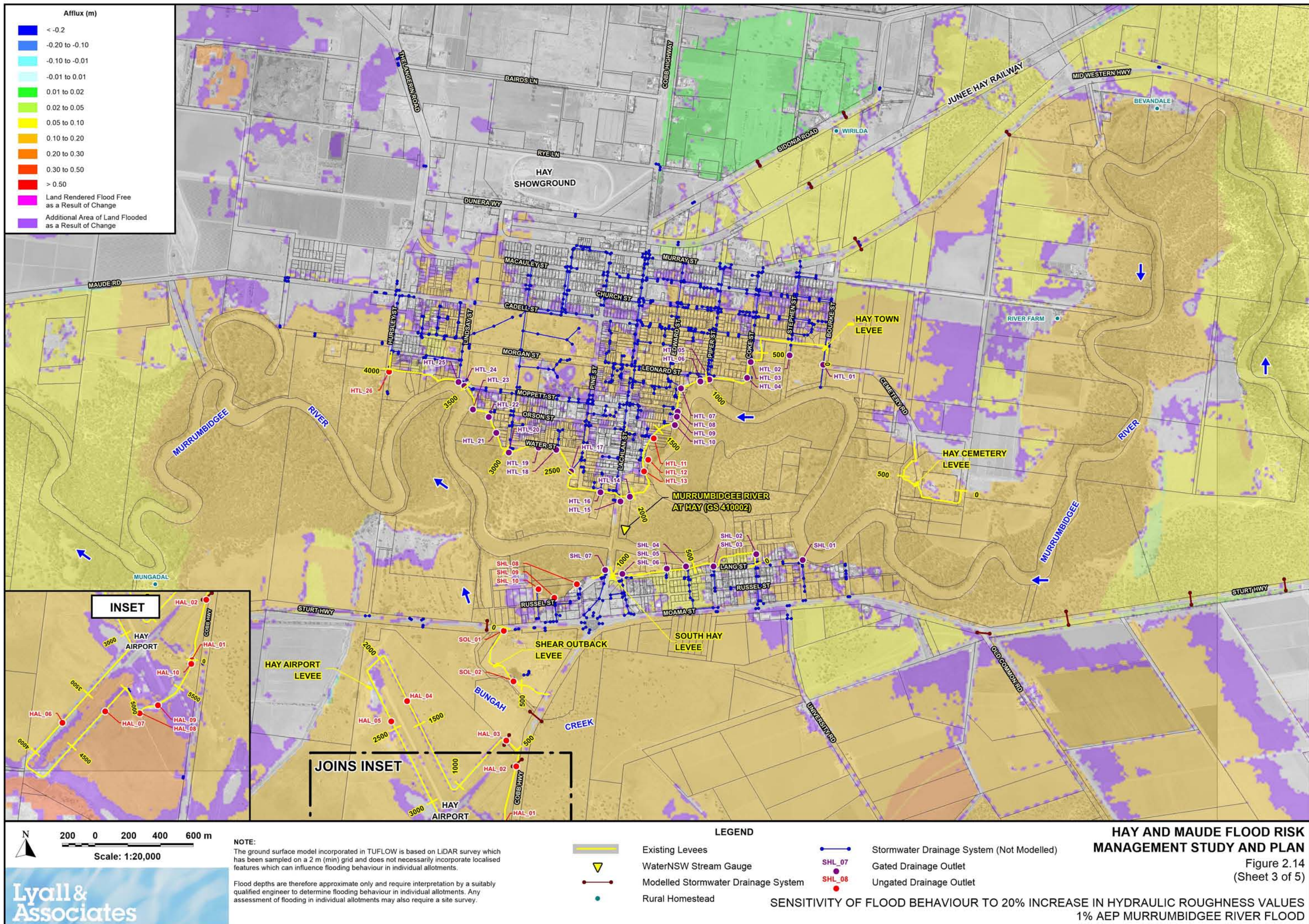


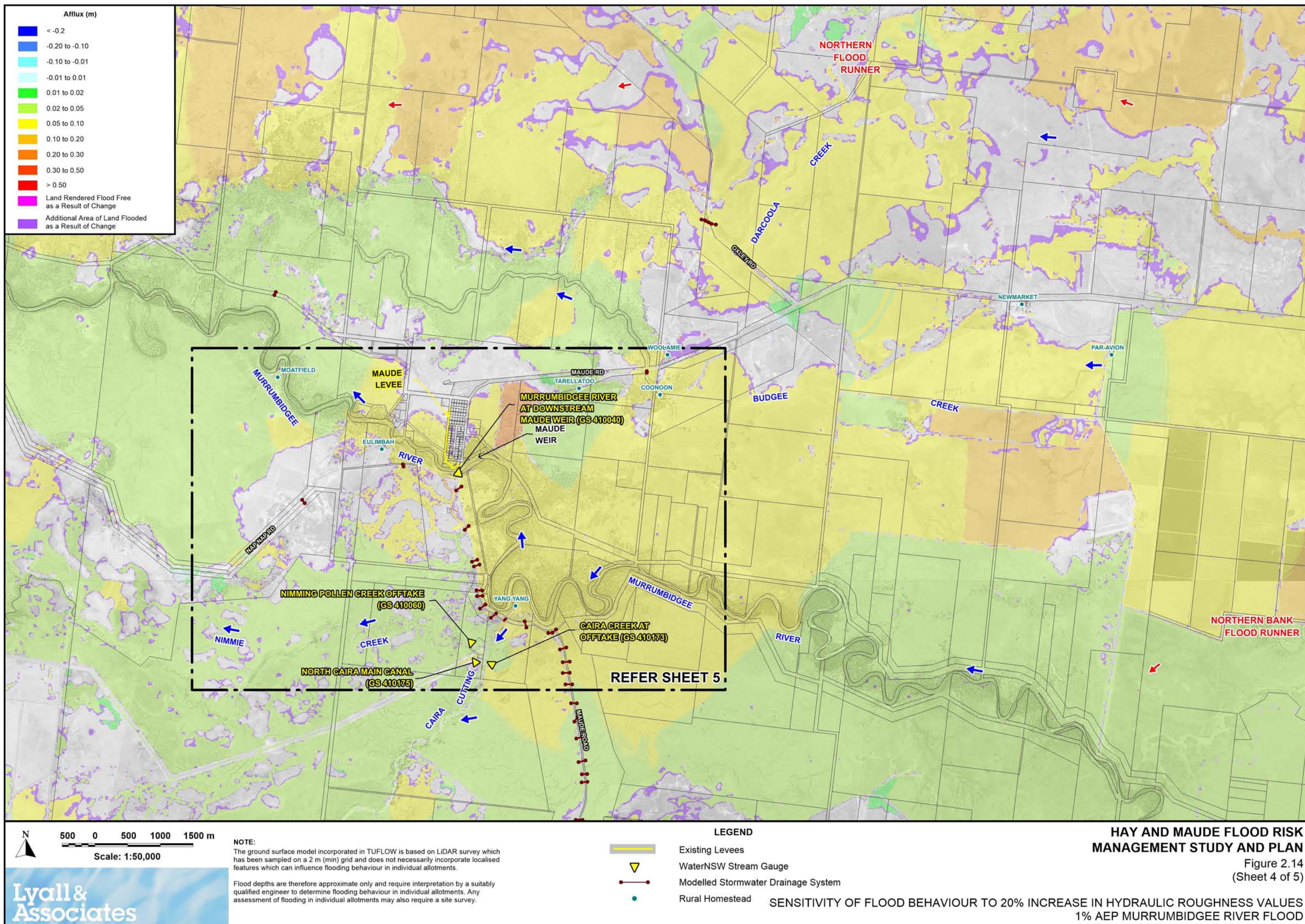


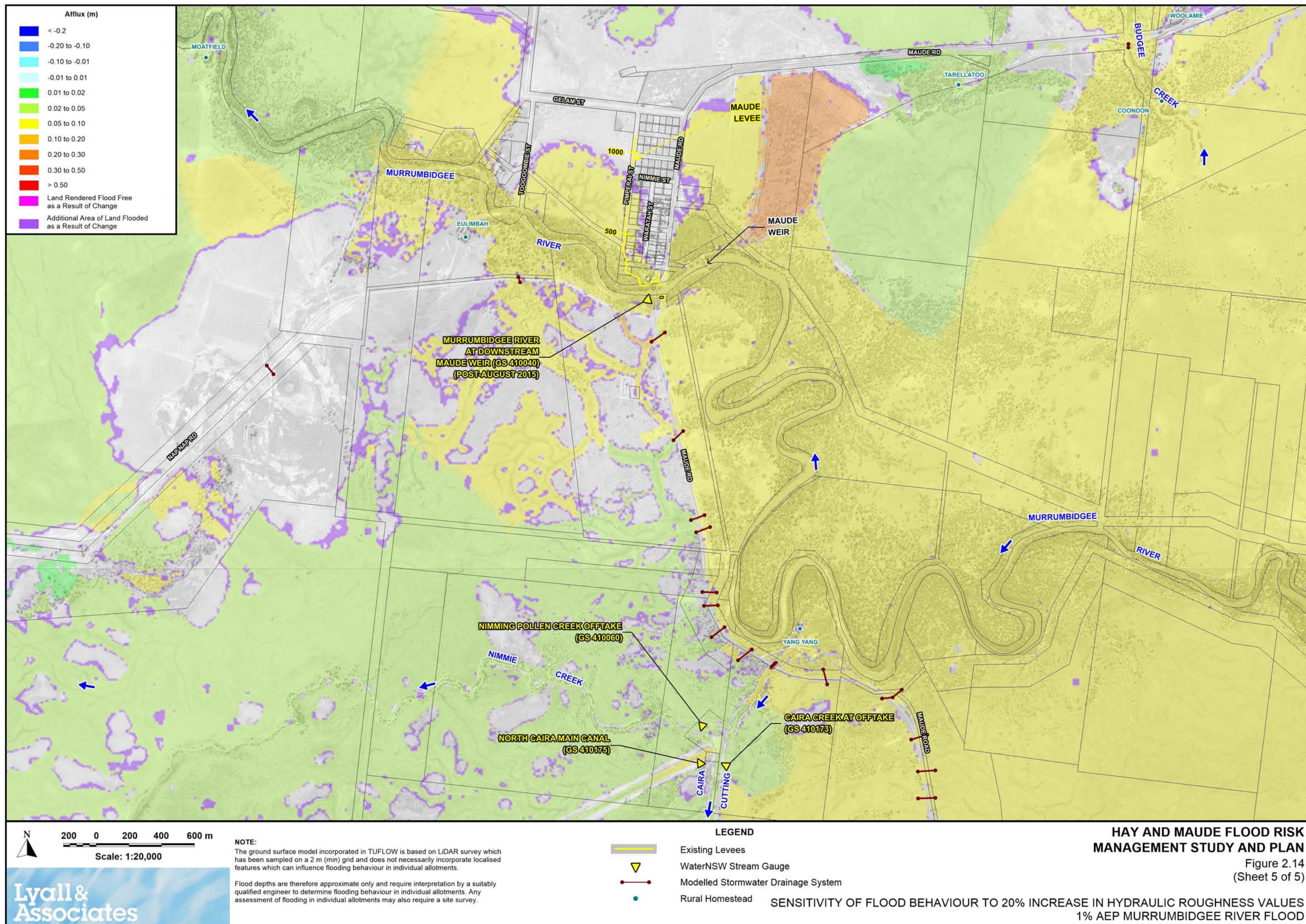


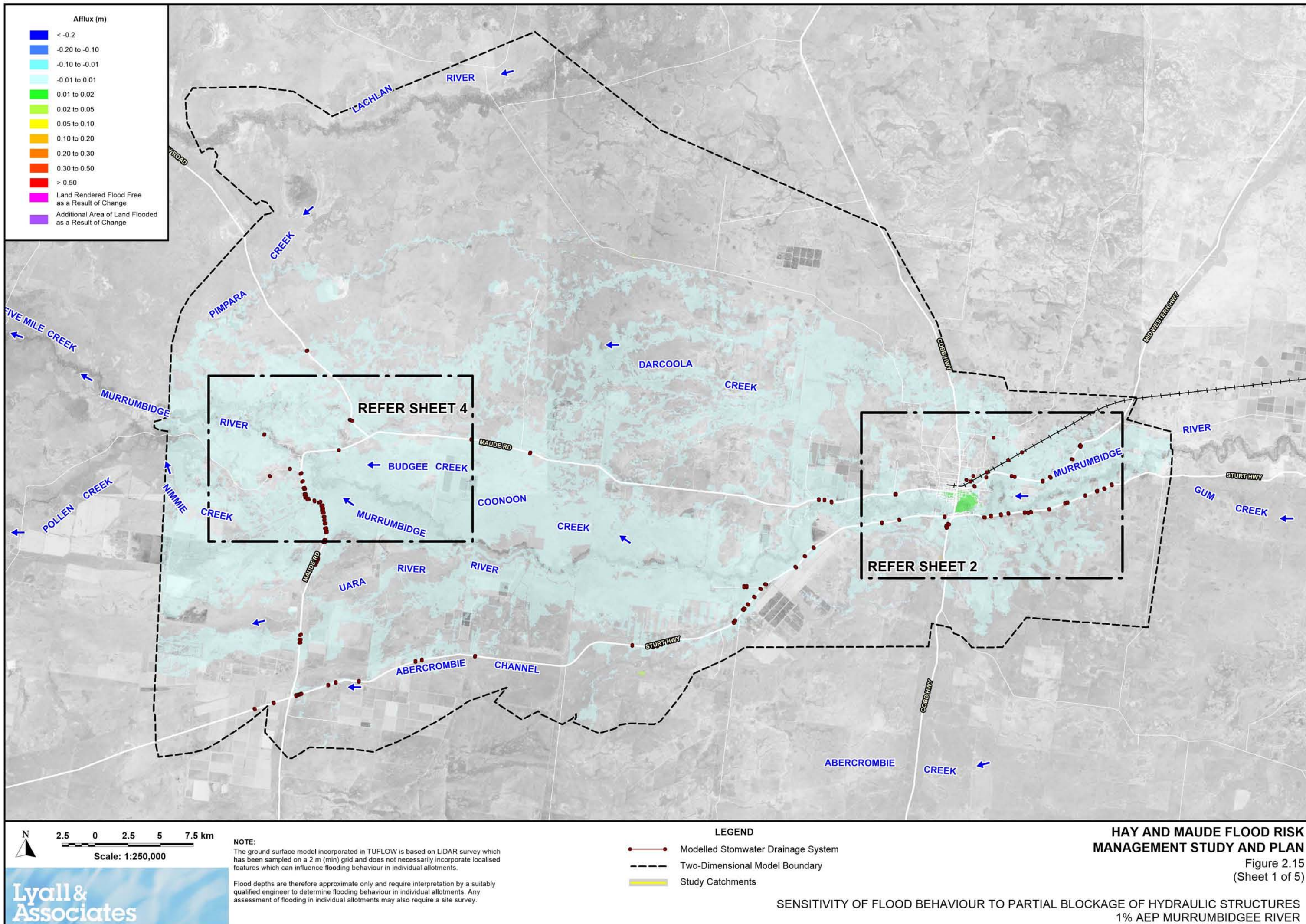


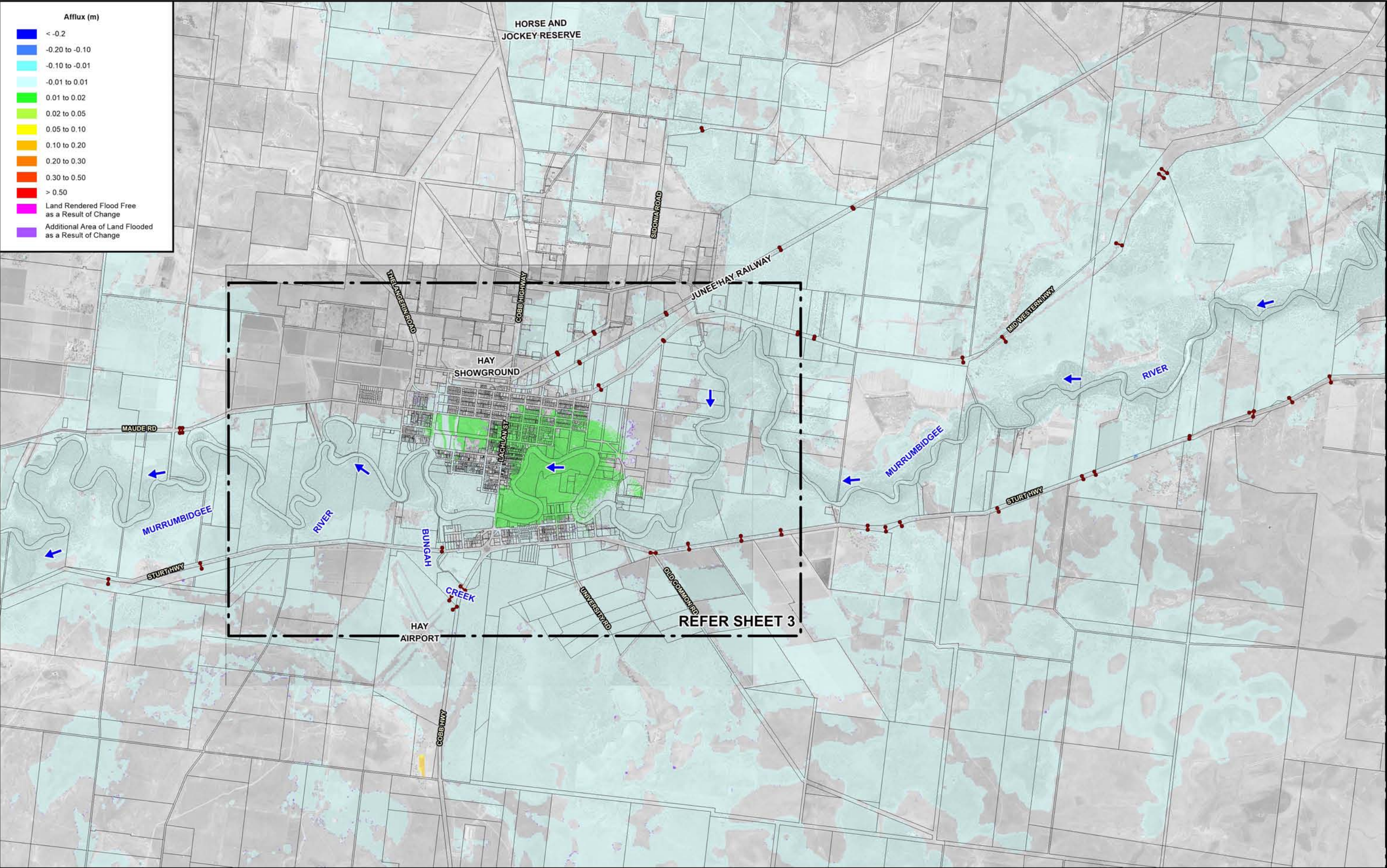


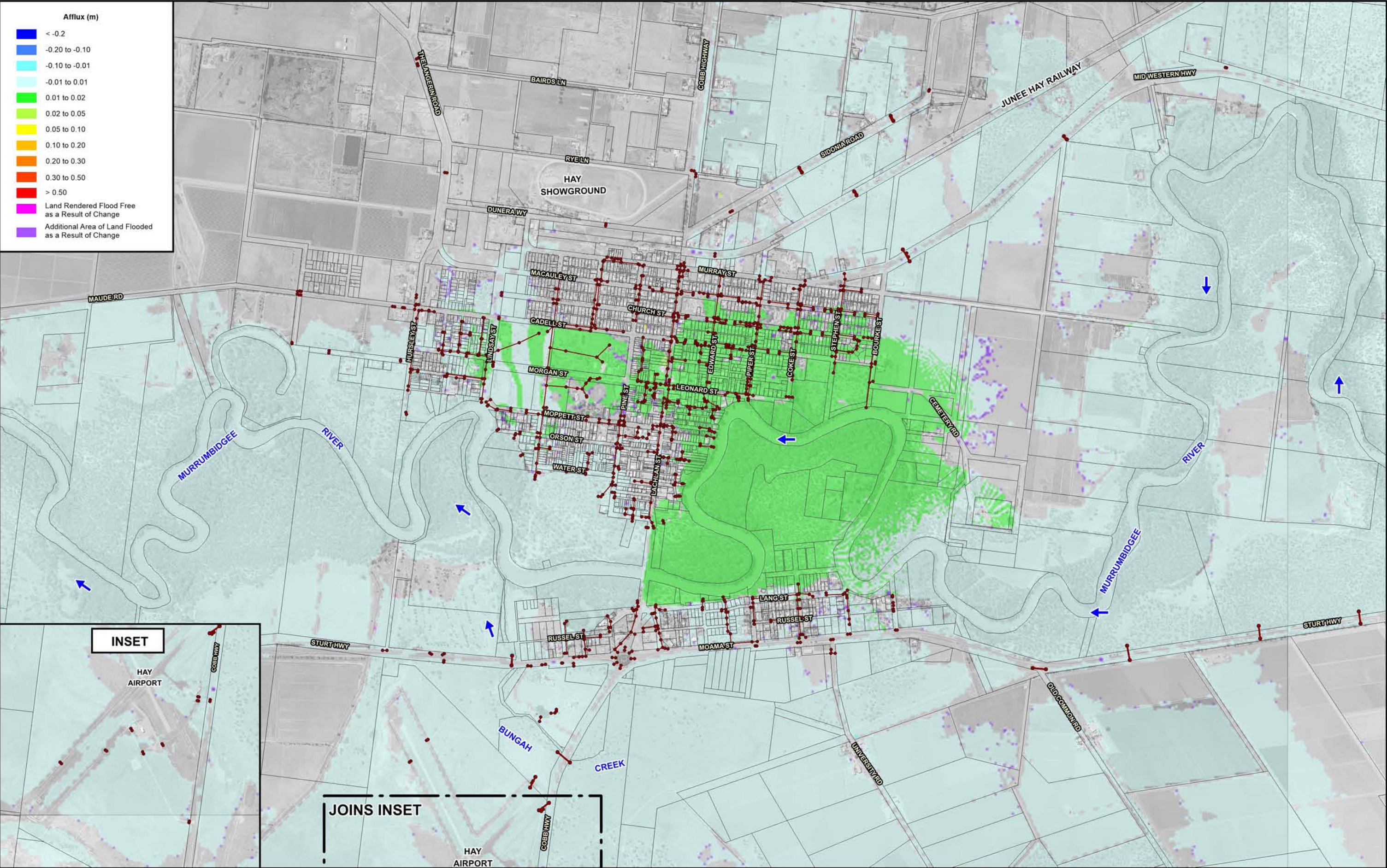


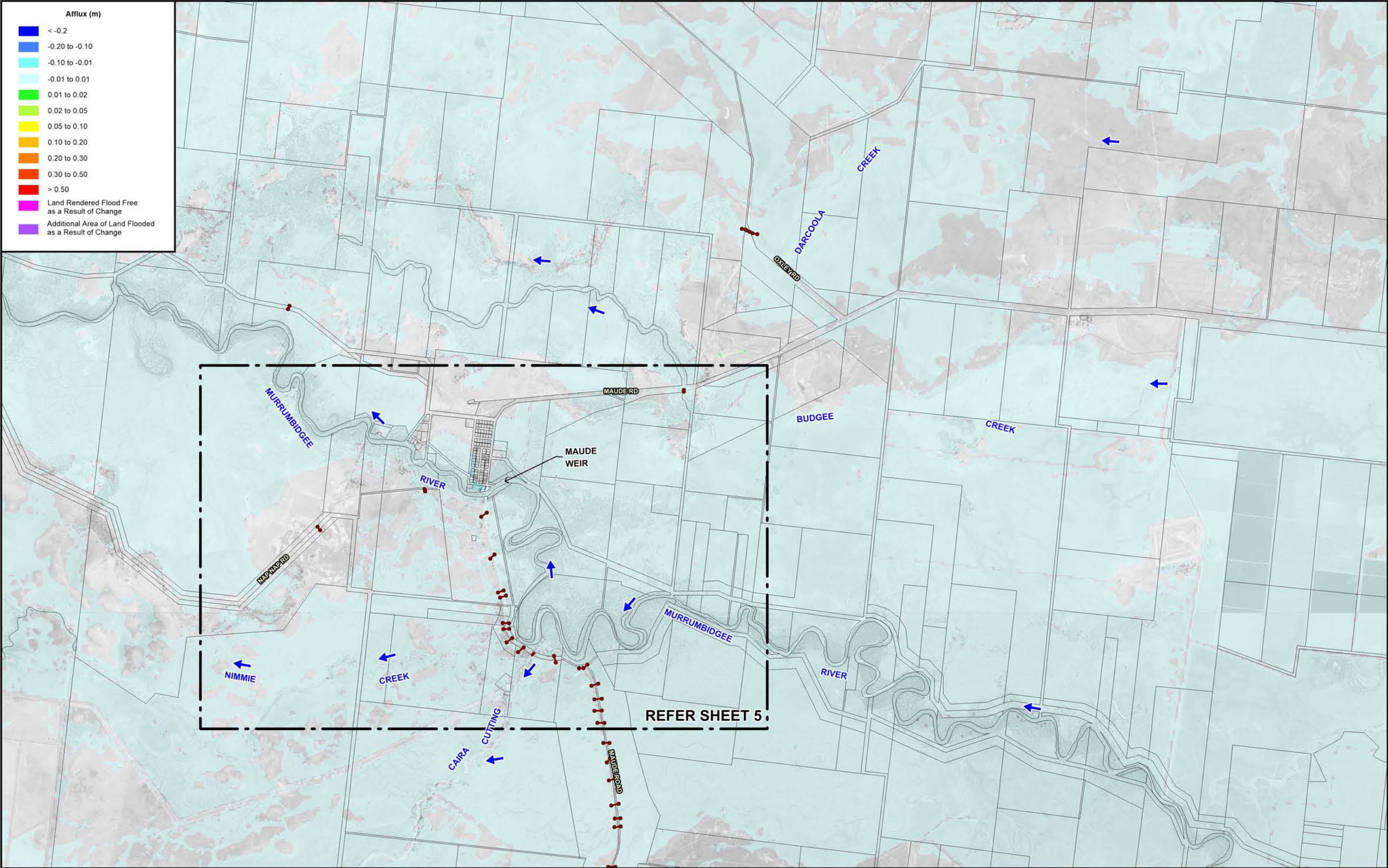








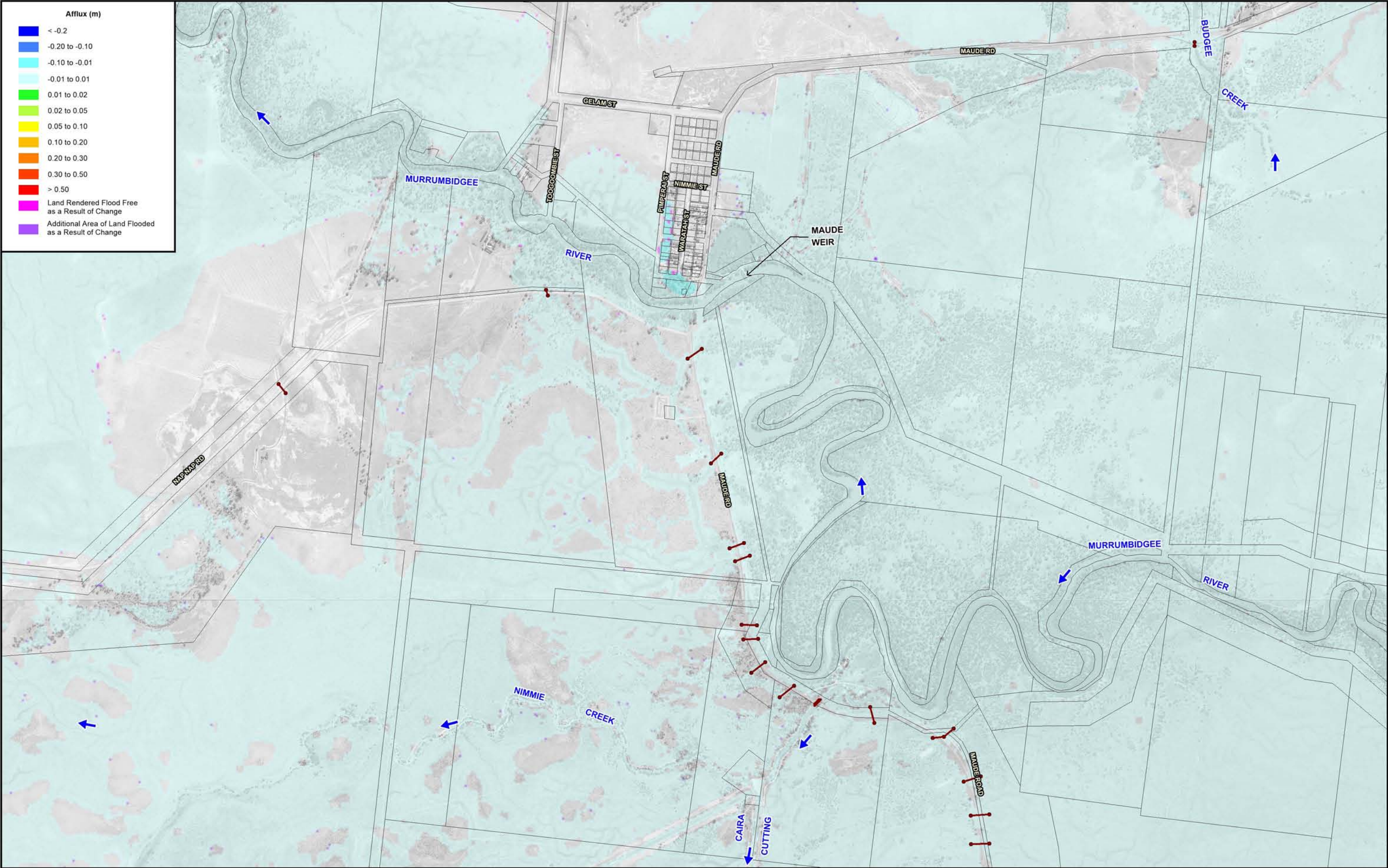




NOTE:
The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

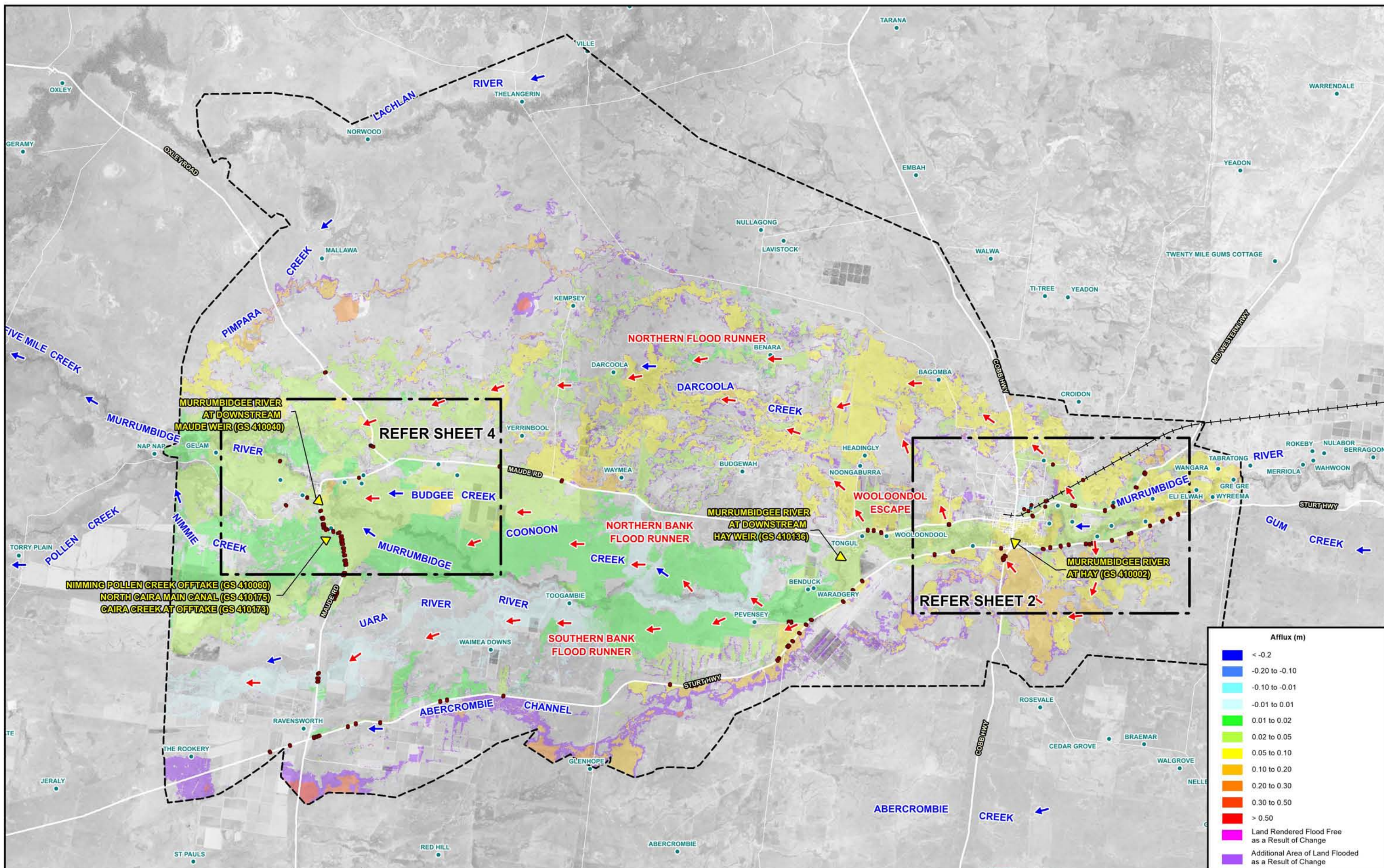
- LEGEND**
- Modelled Stormwater Drainage System
 - Two-Dimensional Model Boundary
 - Study Catchments

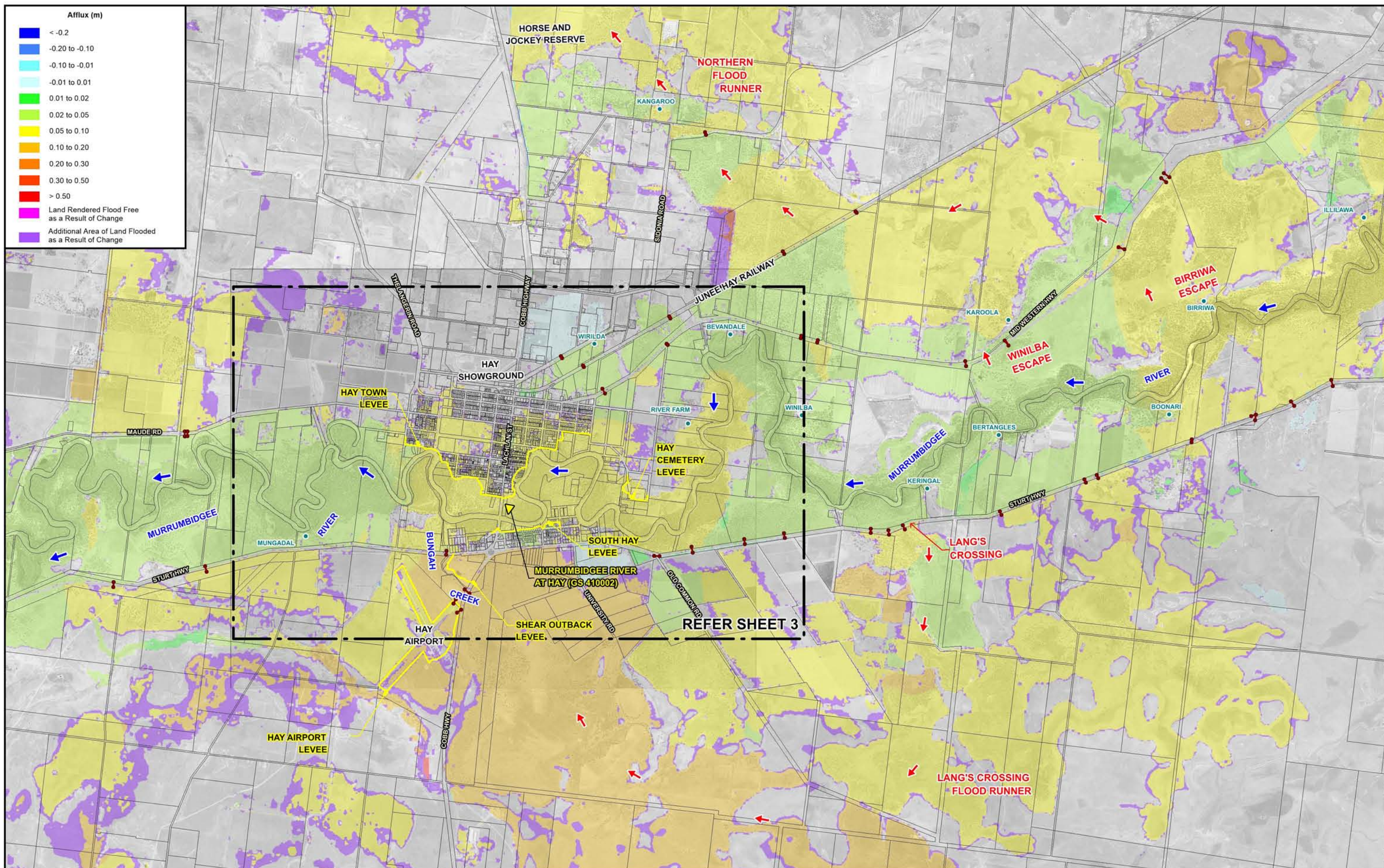


NOTE:
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- LEGEND**
- Modelled Stomwater Drainage System
 - Two-Dimensional Model Boundary
 - Study Catchments





Afflux (m)

- < -0.2
- 0.20 to -0.10
- 0.10 to -0.01
- 0.01 to 0.01
- 0.01 to 0.02
- 0.02 to 0.05
- 0.05 to 0.10
- 0.10 to 0.20
- 0.20 to 0.30
- 0.30 to 0.50
- > 0.50
- Land Rendered Flood Free as a Result of Change
- Additional Area of Land Flooded as a Result of Change

LEGEND

Existing Levees

WaterNSW Stream Gauge

Modelled Stormwater Drainage System

Rural Homestead

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.16
(Sheet 2 of 5)

NOTE:

The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

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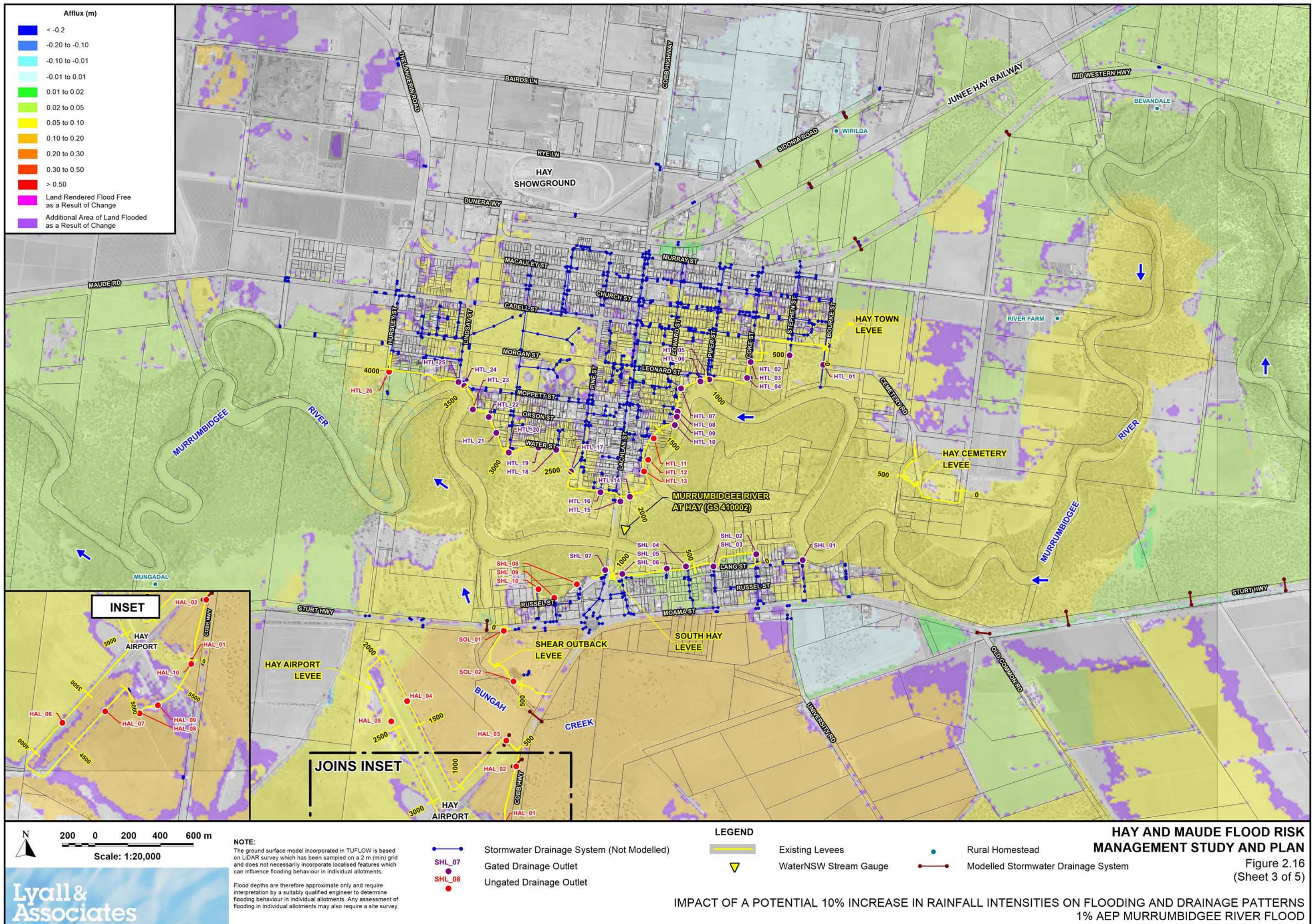
IMPACT OF A POTENTIAL 10% INCREASE IN RAINFALL INTENSITIES ON FLOODING AND DRAINAGE PATTERNS

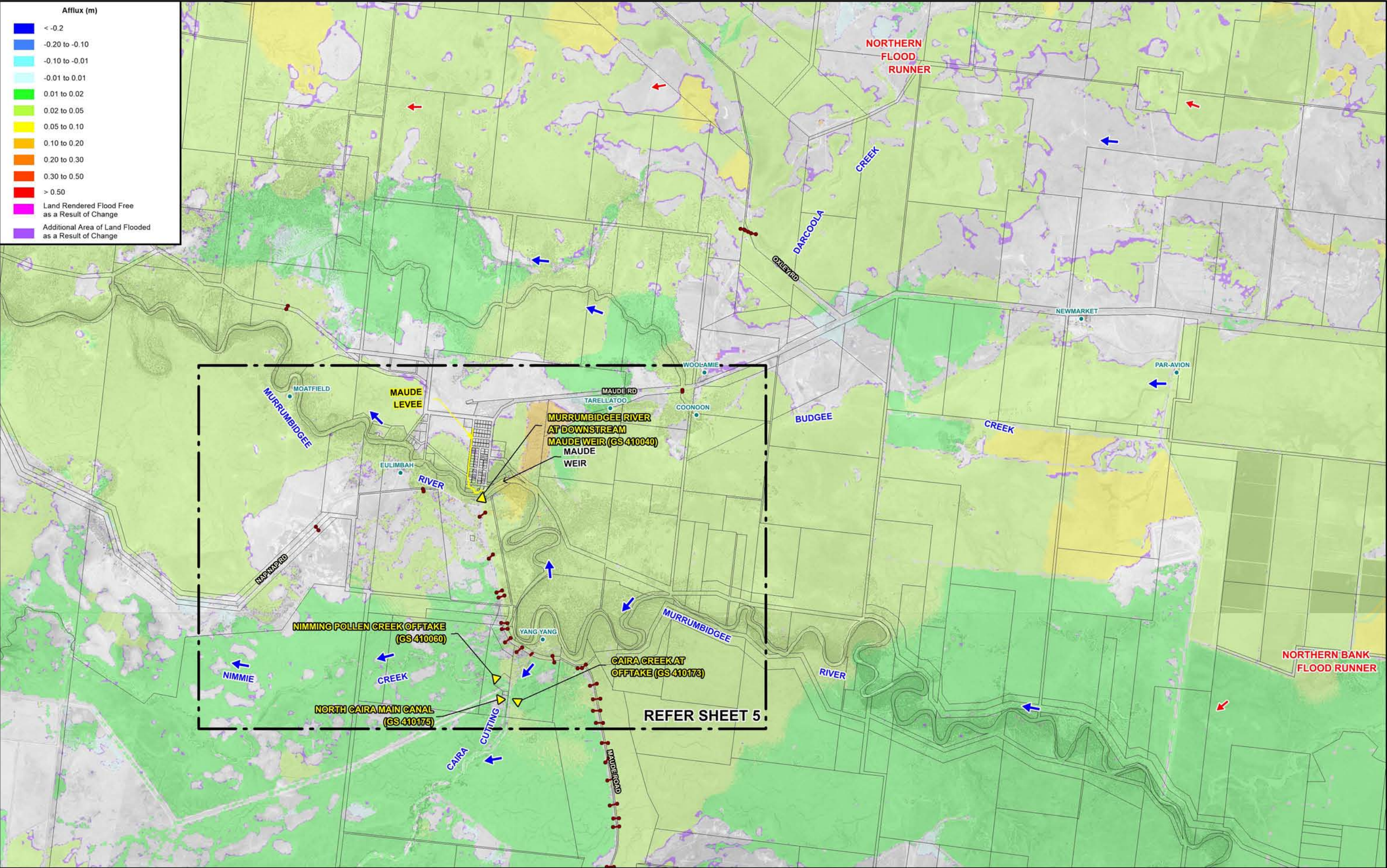
1% AEP MURRUMBIDGEE RIVER FLOOD

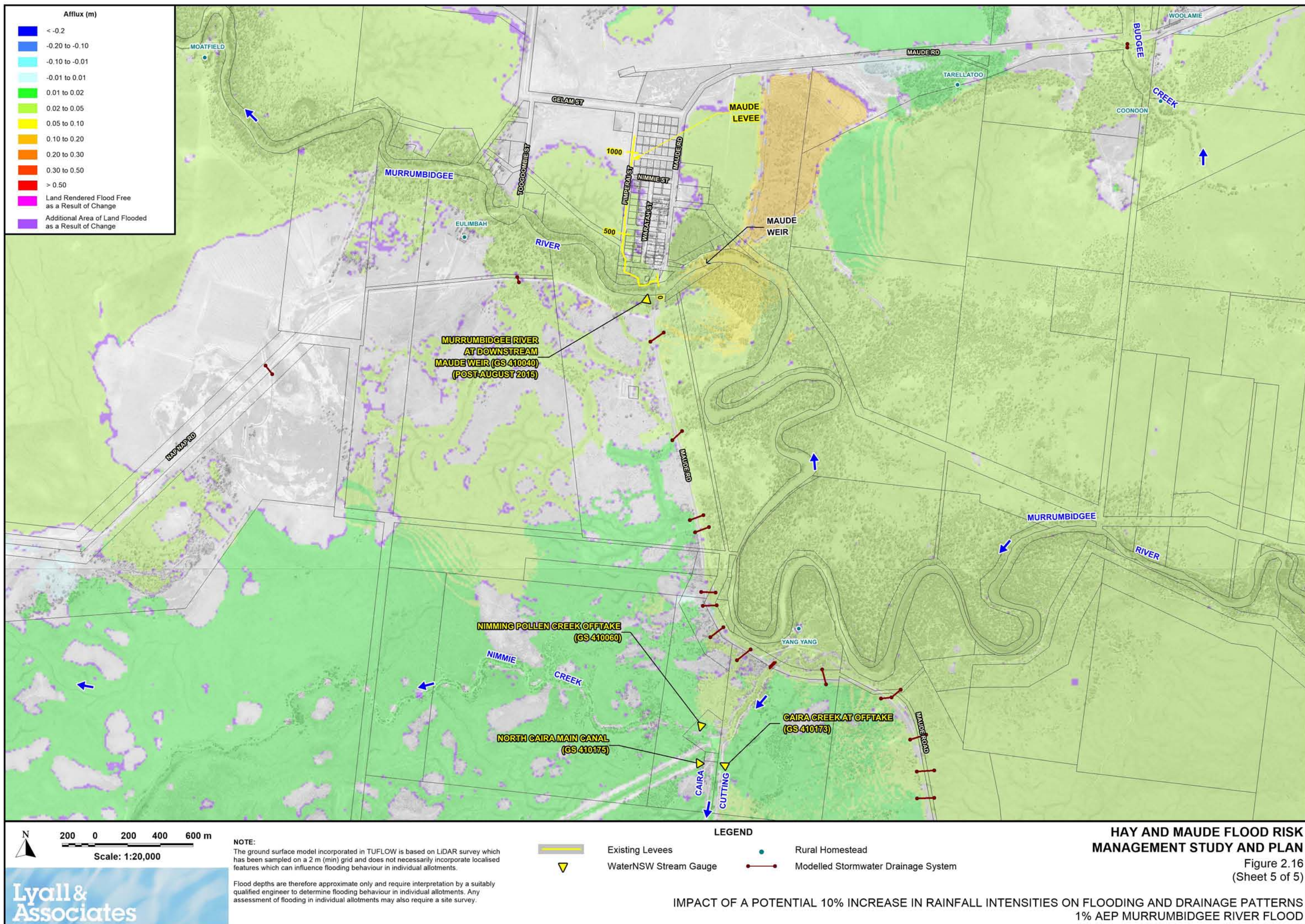
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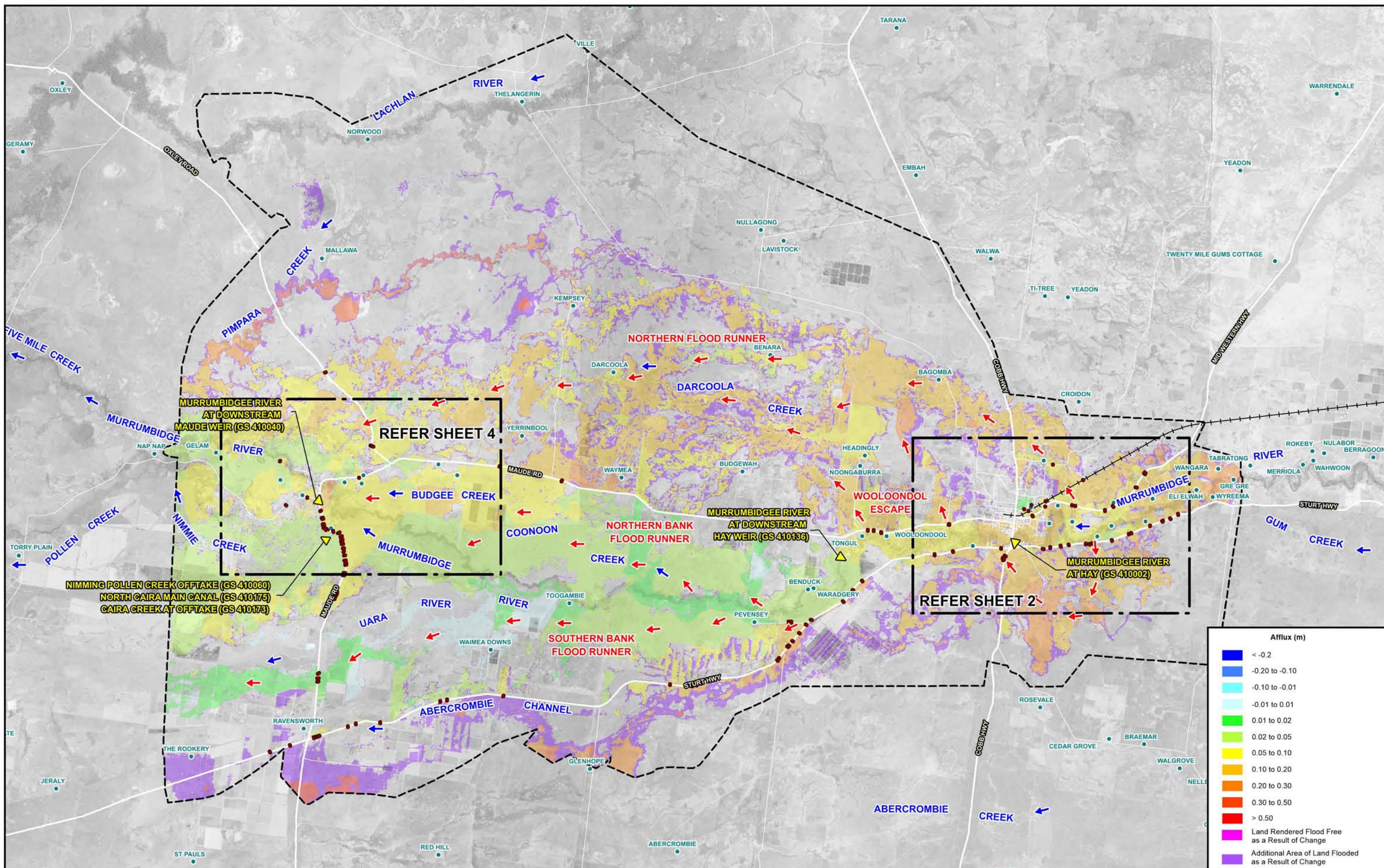
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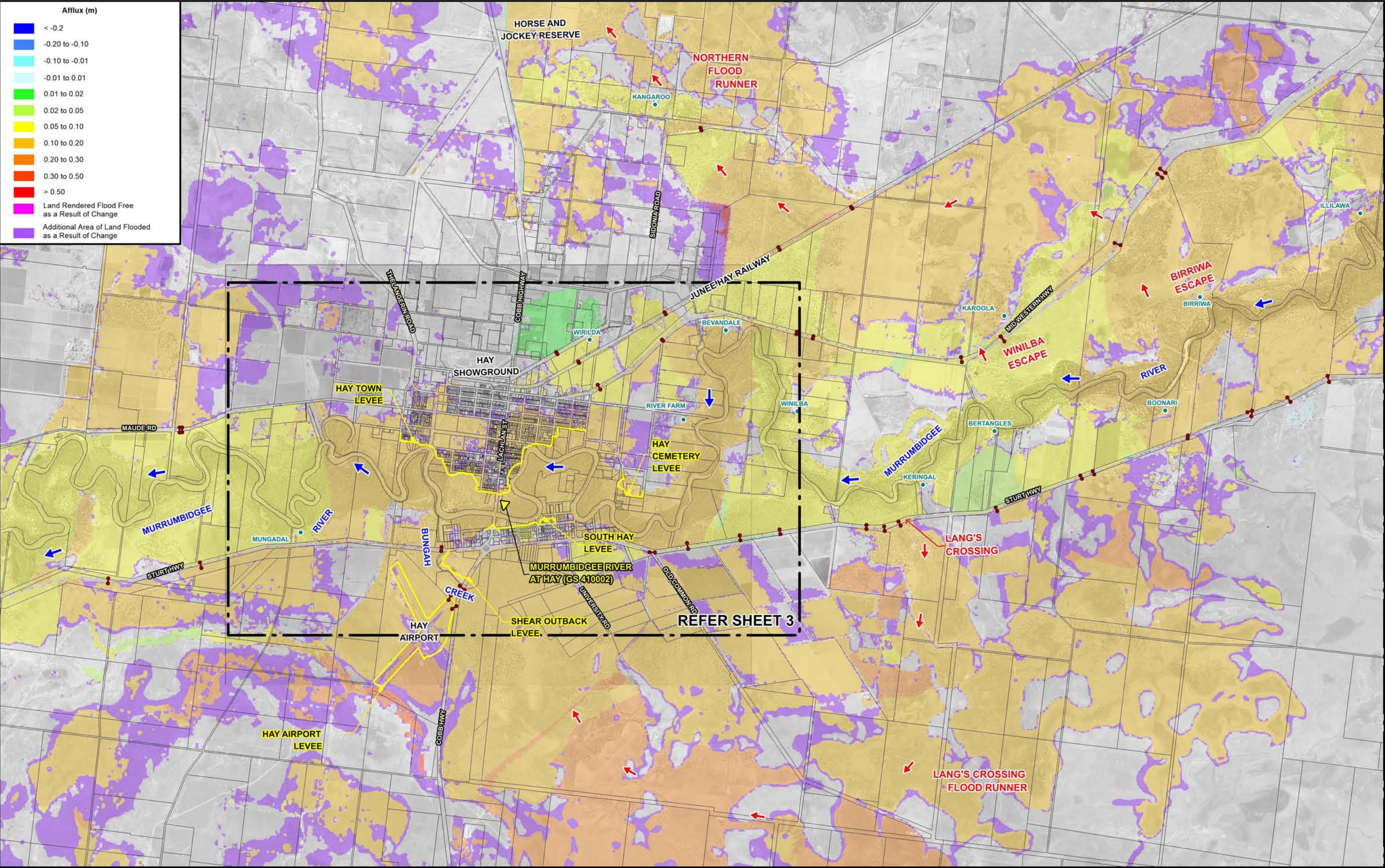
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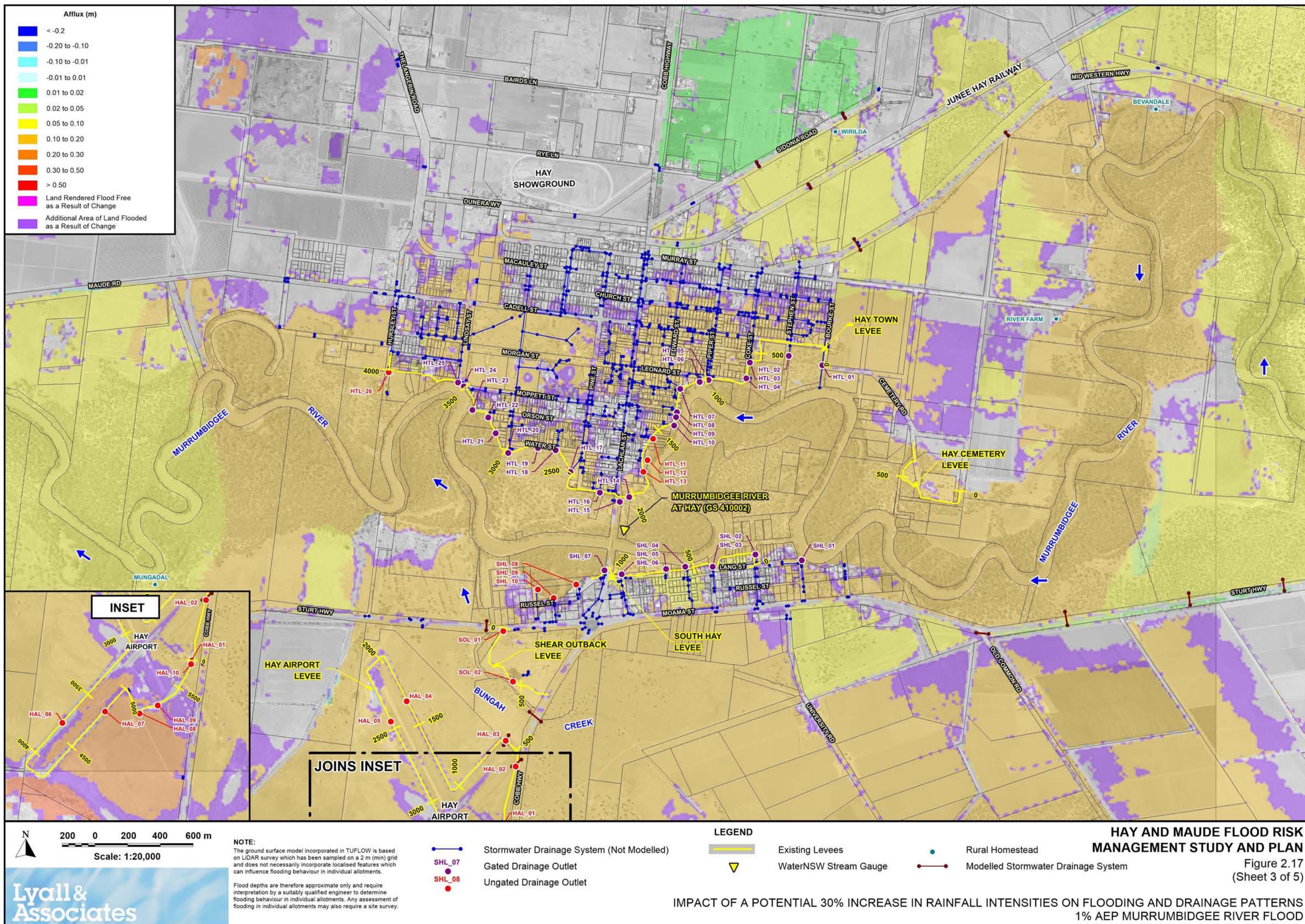


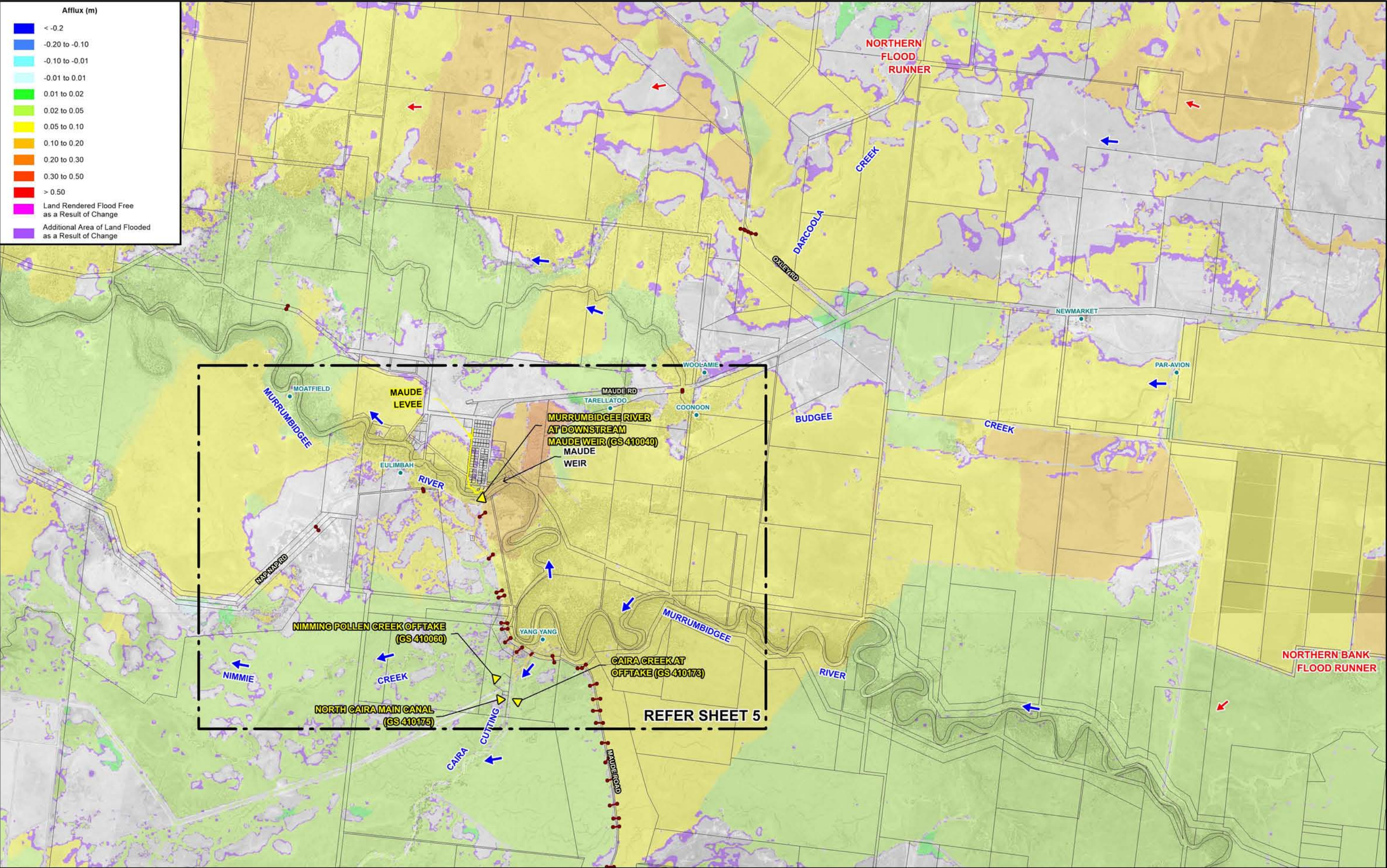


Scale: 1:50,000

Lyll & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.
Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

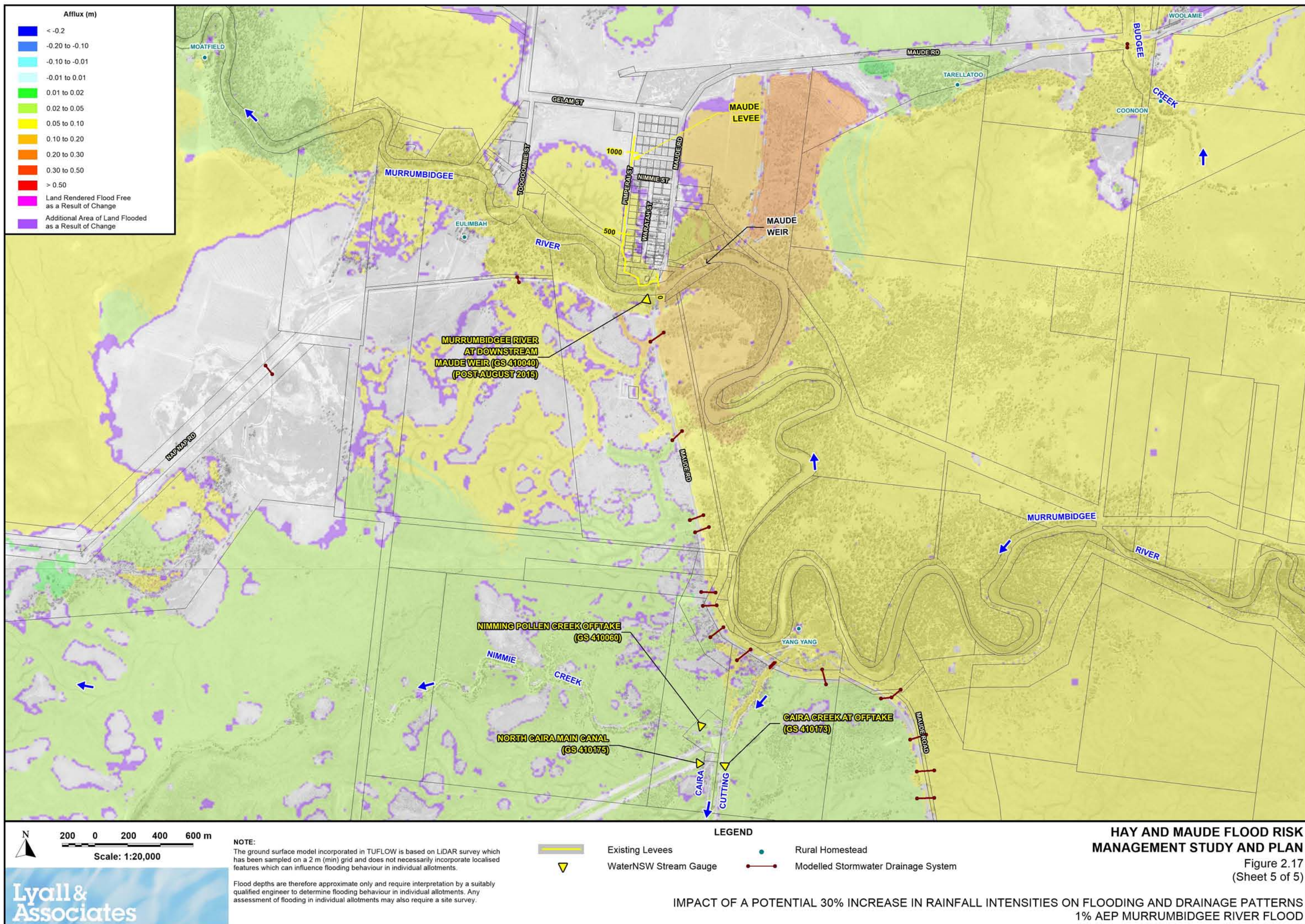


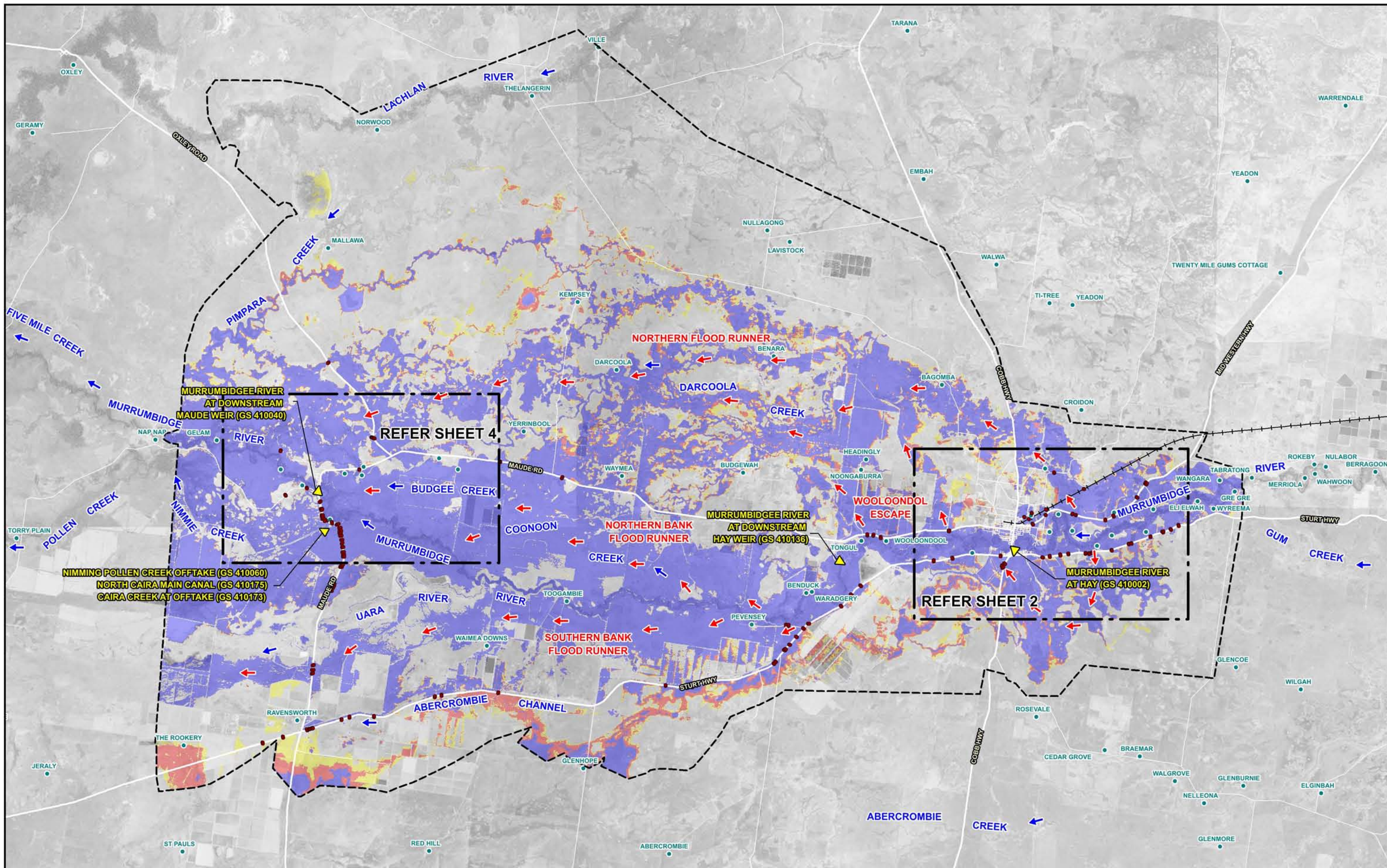


NOTE:
The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

Existing Levees	Rural Homestead
WaterNSW Stream Gauge	Modelled Stormwater Drainage System





Scale: 1:250,000

0 2.5 5 7.5 km

NOTE:

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LEGEND

- WaterNSW Stream Gauge
- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Rural Homestead

1% AEP

1% AEP

1% AEP Rainfall Increased by 10%

1% AEP Rainfall Increased by 30%

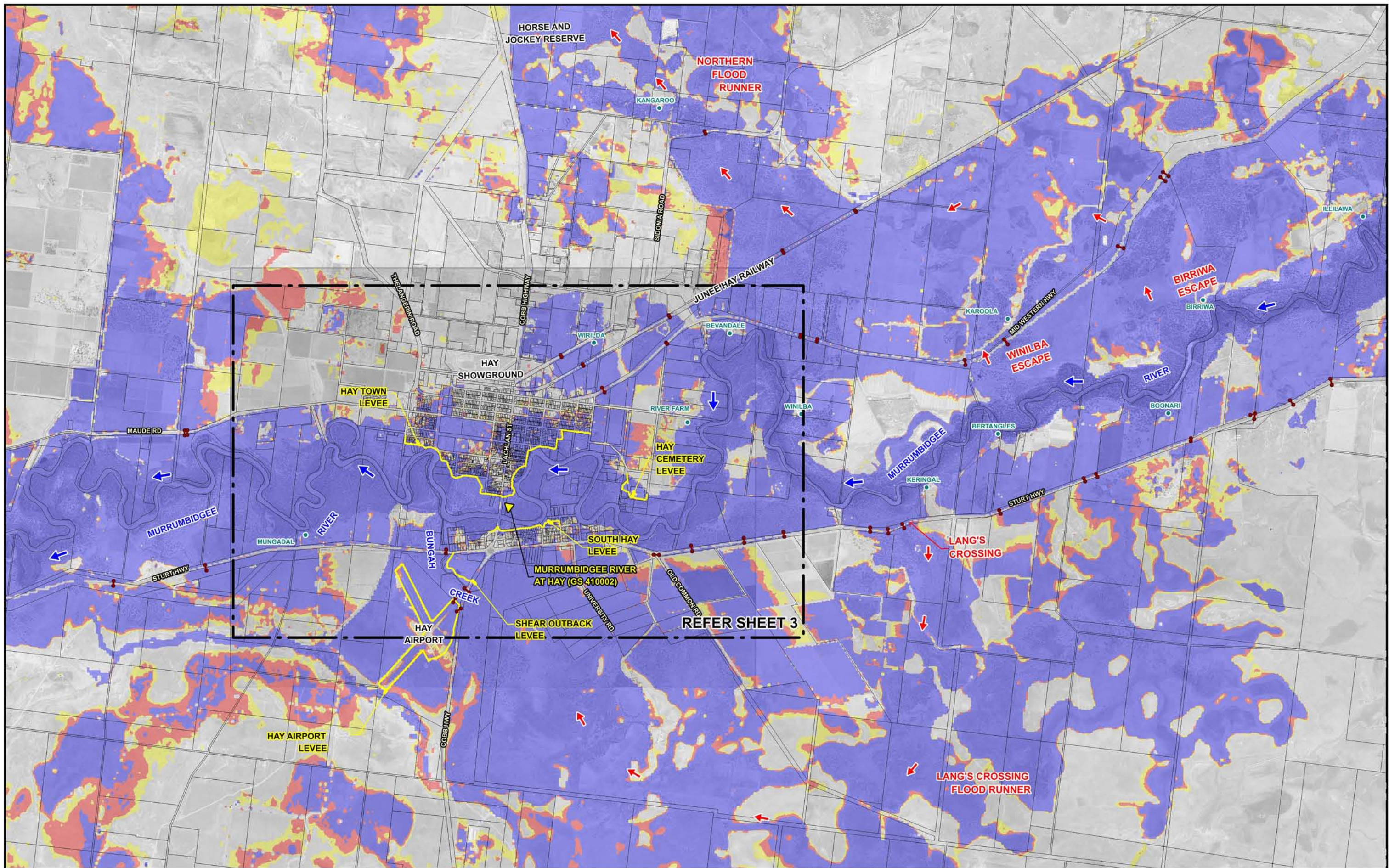
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.18 (Sheet 1 of 5)

IMPACT OF INCREASED RAINFALL INTENSITIES ON EXTENT OF FLOODING

1% AEP MURRUMBIDGEE RIVER FLOOD

Lyall & Associates



Scale: 1:50,000

500 0 500 1000 1500 m

Lyall & Associates

NOTE:

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LEGEND

- WaterNSW Stream Gauge
- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Rural Homestead

1% AEP

1% AEP

1% AEP Rainfall Increased by 10%

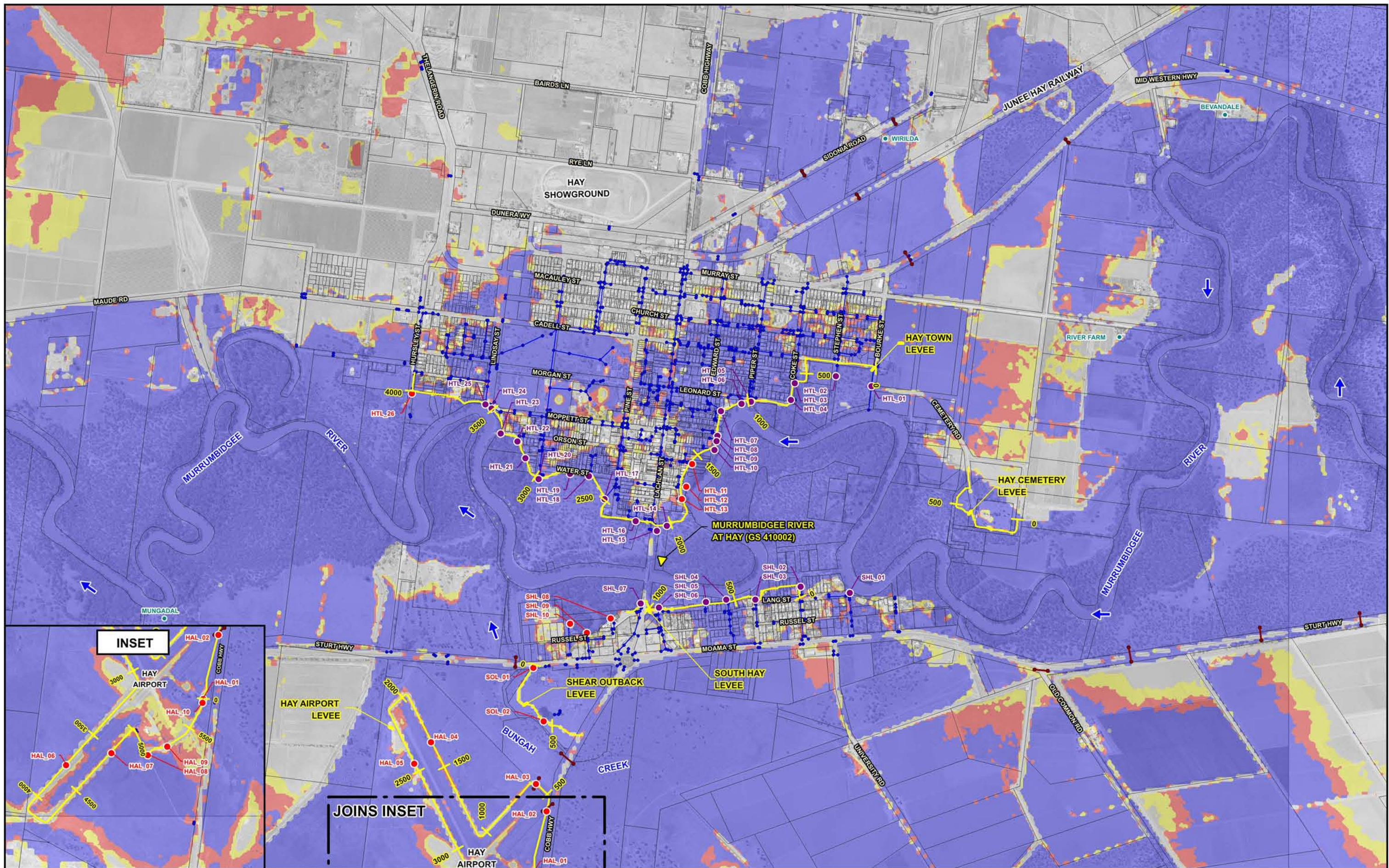
1% AEP Rainfall Increased by 30%

IMPACT OF INCREASED RAINFALL INTENSITIES ON EXTENT OF FLOODING

1% AEP MURRUMBIDGEE RIVER FLOOD

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.18
(Sheet 2 of 5)



INSET

HAY AIRPORT

COBB HWY

HAL_01

HAL_02

HAL_03

HAL_04

HAL_05

HAL_06

HAL_07

HAL_08

HAL_09

HAL_10

Scale: 1:20,000

NOTE:

The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

	Existing Levees		Stormwater Drainage System (Not Modelled)		1% AEP
	WaterNSW Stream Gauge		Gated Drainage Outlet		1% AEP Rainfall Increased by 10%
	Modelled Stormwater Drainage System Rural Homestead		Ungated Drainage Outlet		1% AEP Rainfall Increased by 30%

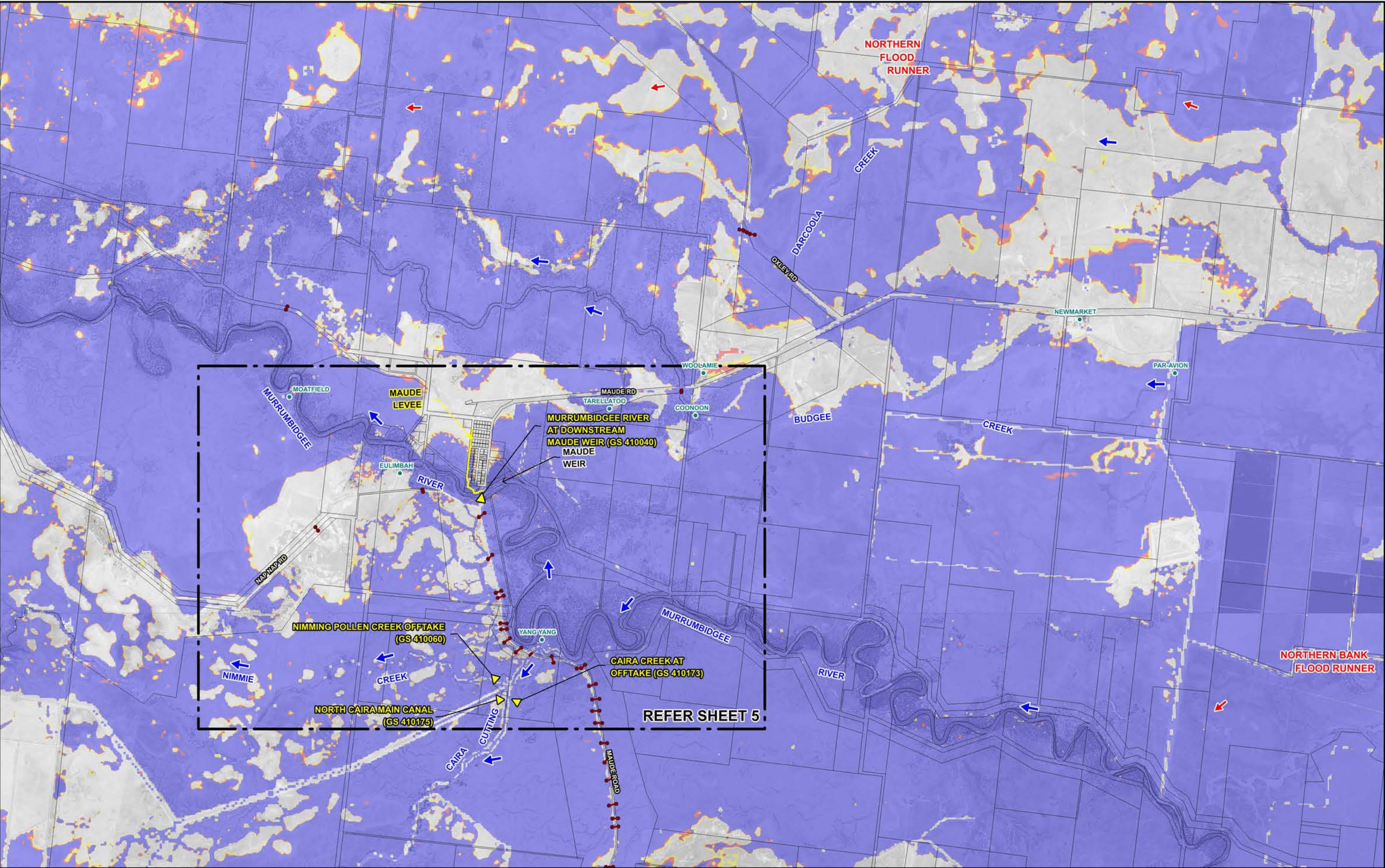
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.18

(Sheet 3 of 5)

IMPACT OF INCREASED RAINFALL INTENSITIES ON EXTENT OF FLOODING

1% AEP MURRUMBIDGEE RIVER FLOOD



Lyall & Associates

NOTE:
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Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

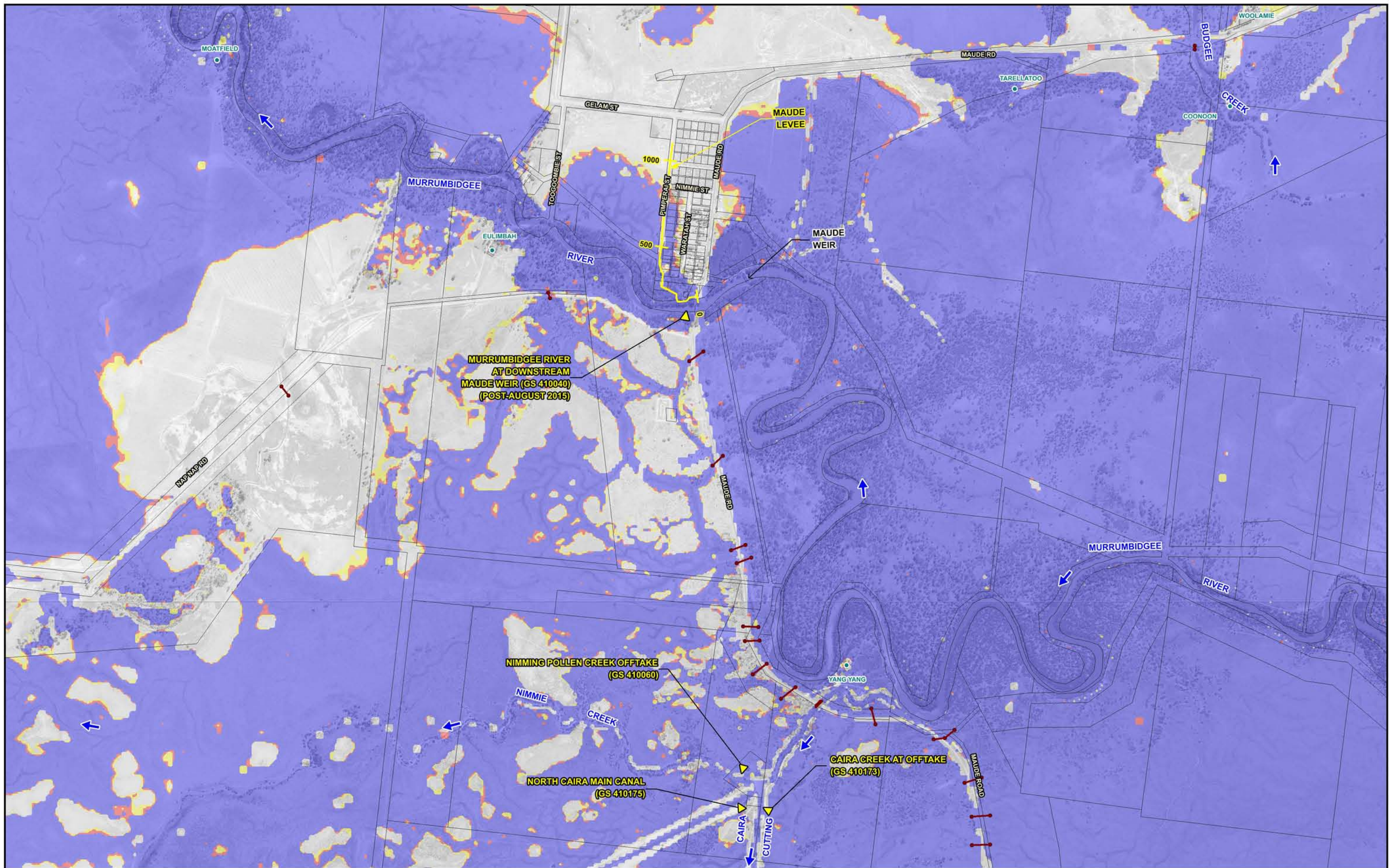
LEGEND

- WaterNSW Stream Gauge
- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Rural Homestead

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN
Figure 2.18
(Sheet 4 of 5)

IMPACT OF INCREASED RAINFALL INTENSITIES ON EXTENT OF FLOODING
1% AEP MURRUMBIDGEE RIVER FLOOD

- 1% AEP
- 1% AEP Rainfall Increased by 10%
- 1% AEP Rainfall Increased by 30%



Scale: 1:20,000

200 0 200 400 600 m

NOTE:

The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- ▼ WaterNSW Stream Gauge
- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Rural Homestead

1% AEP

■ 1% AEP

■ 1% AEP Rainfall Increased by 10%

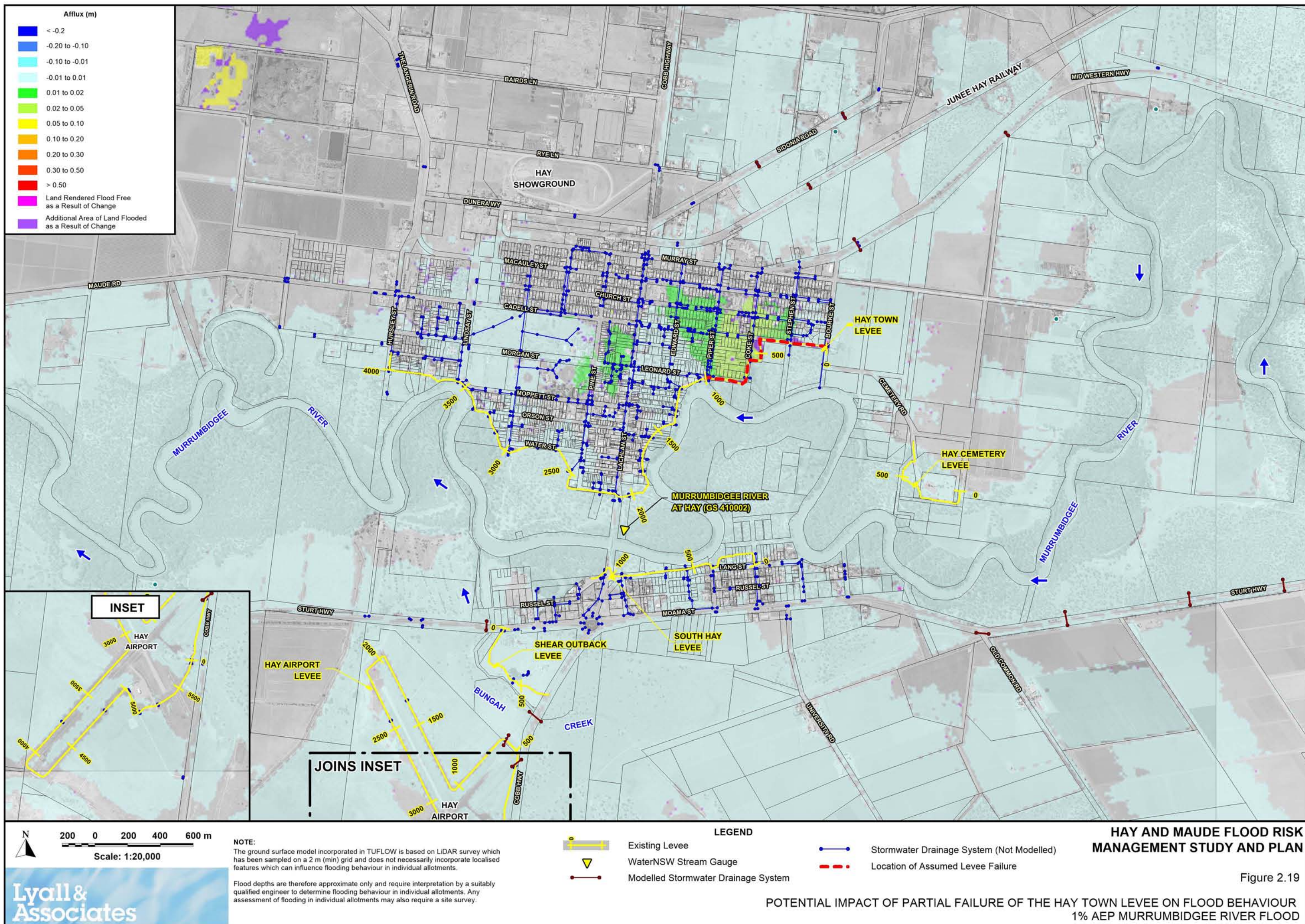
■ 1% AEP Rainfall Increased by 30%

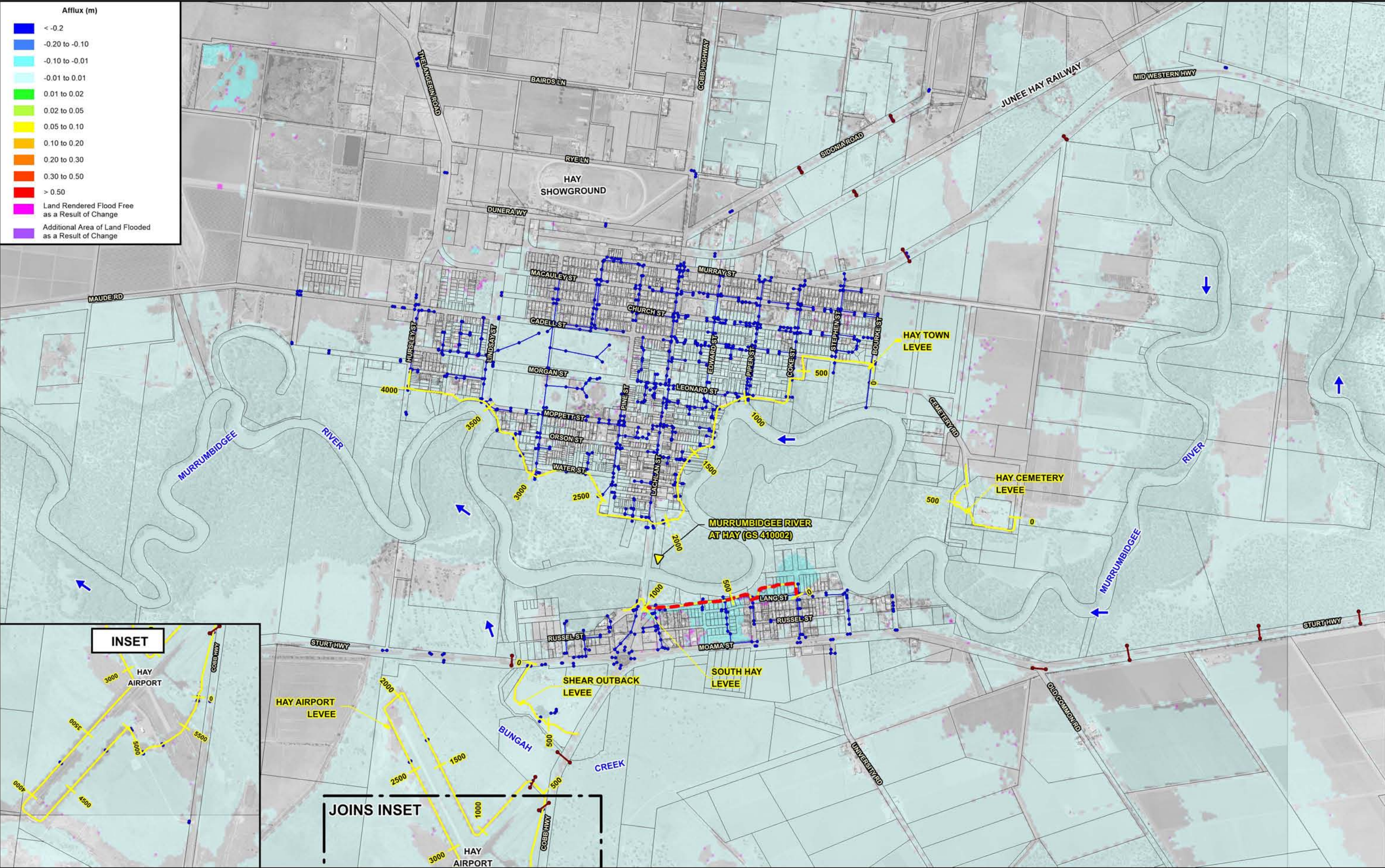
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

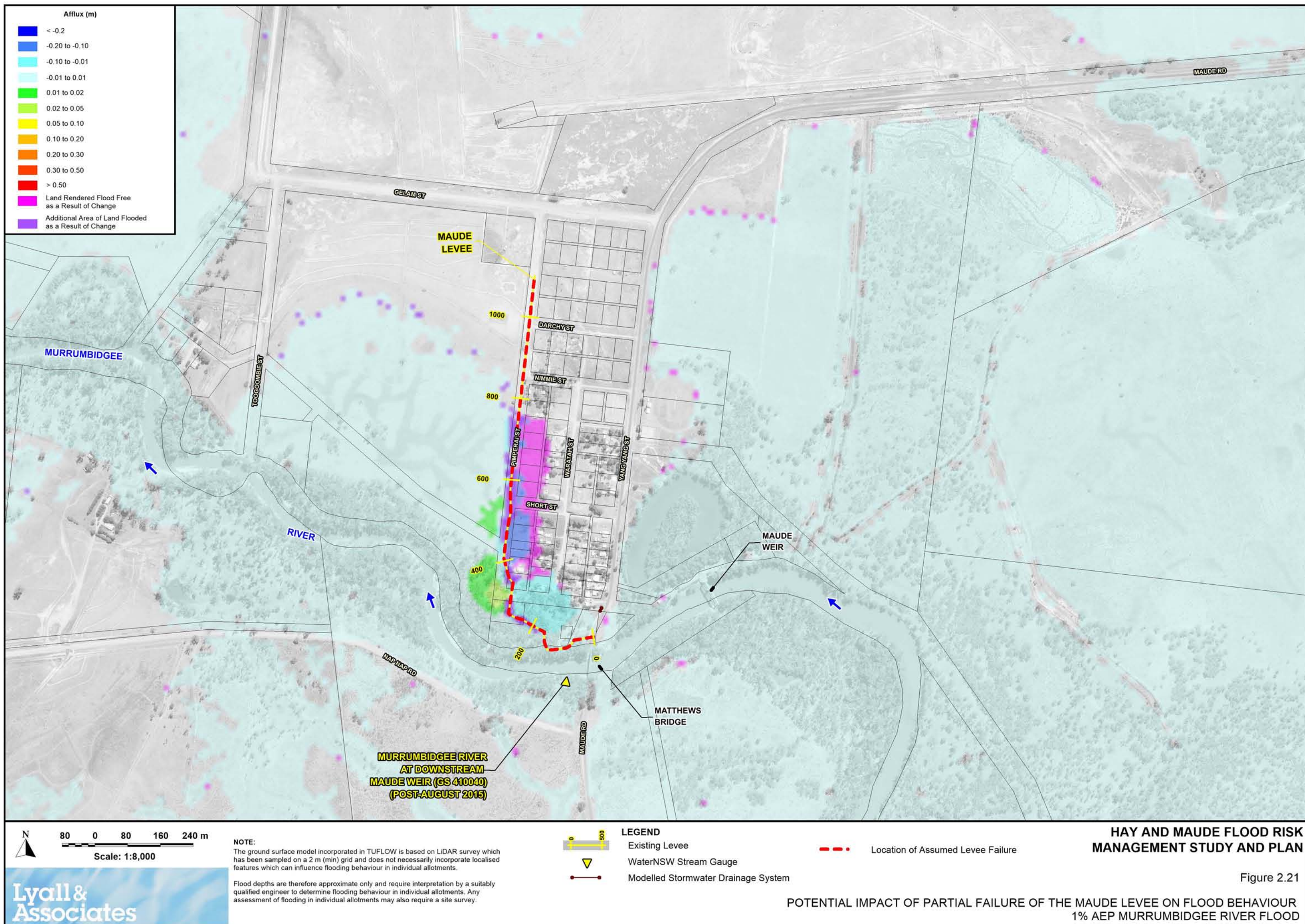
Figure 2.18
(Sheet 5 of 5)

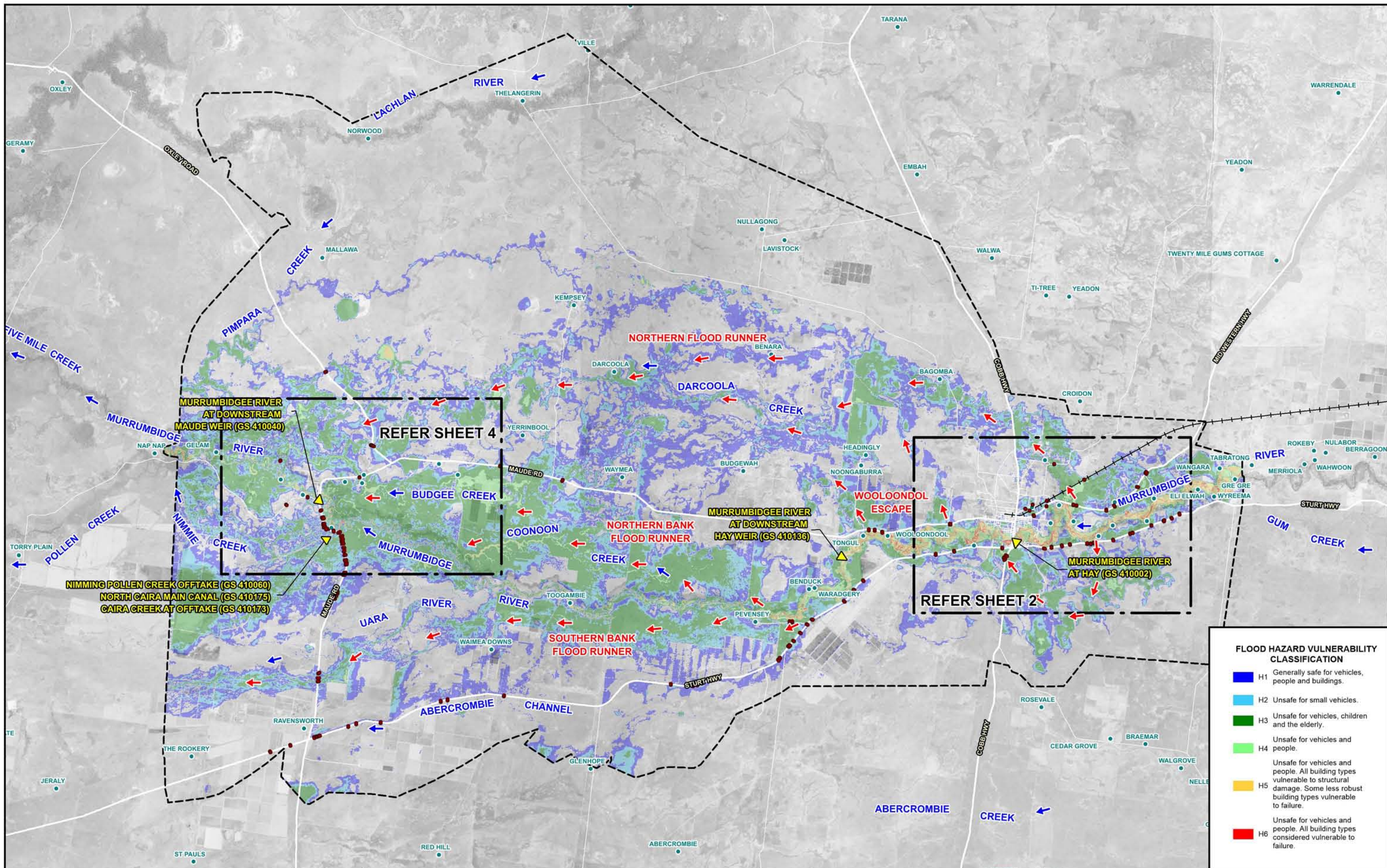
IMPACT OF INCREASED RAINFALL INTENSITIES ON EXTENT OF FLOODING
1% AEP MURRUMBIDGEE RIVER FLOOD

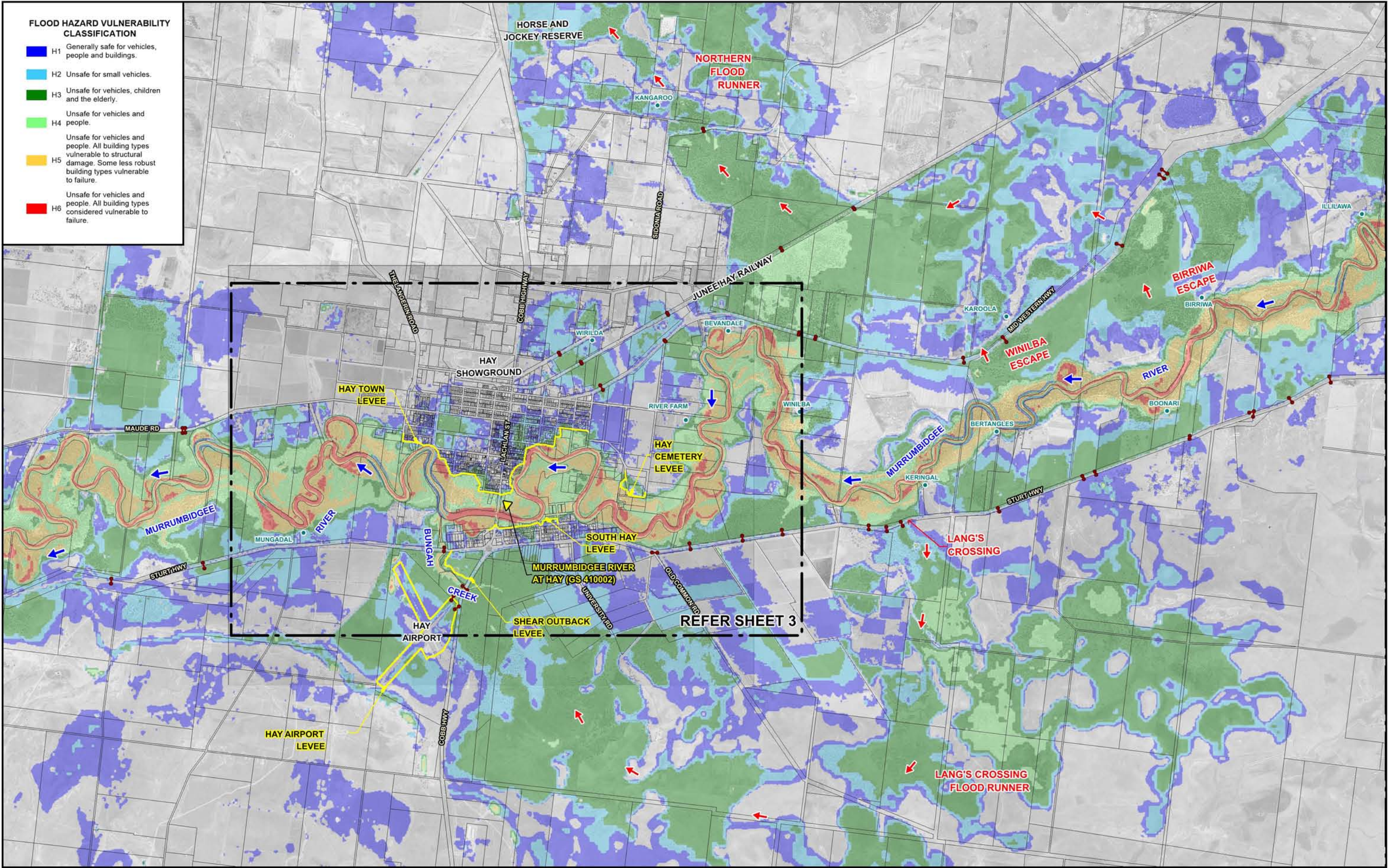
Lyall & Associates

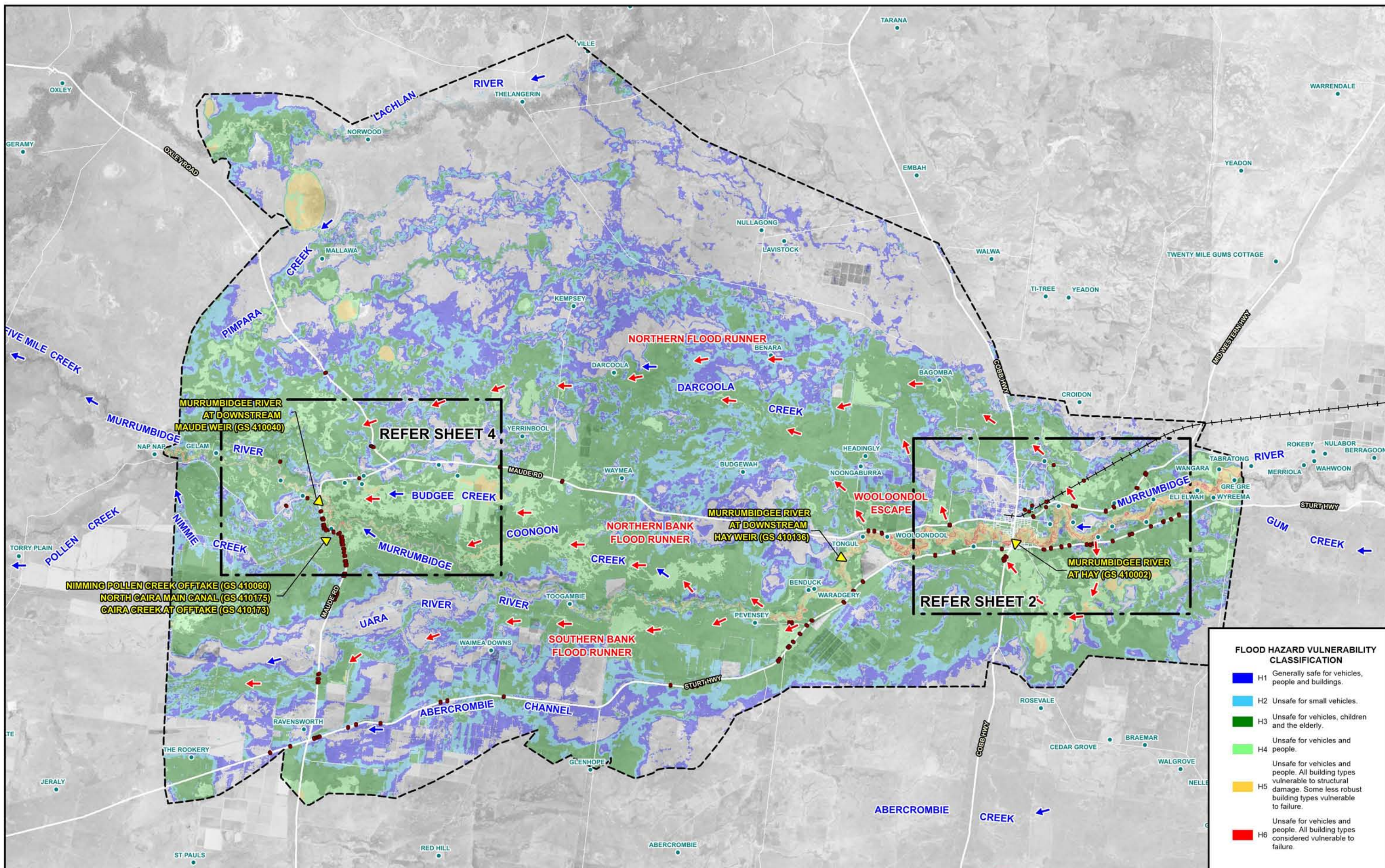


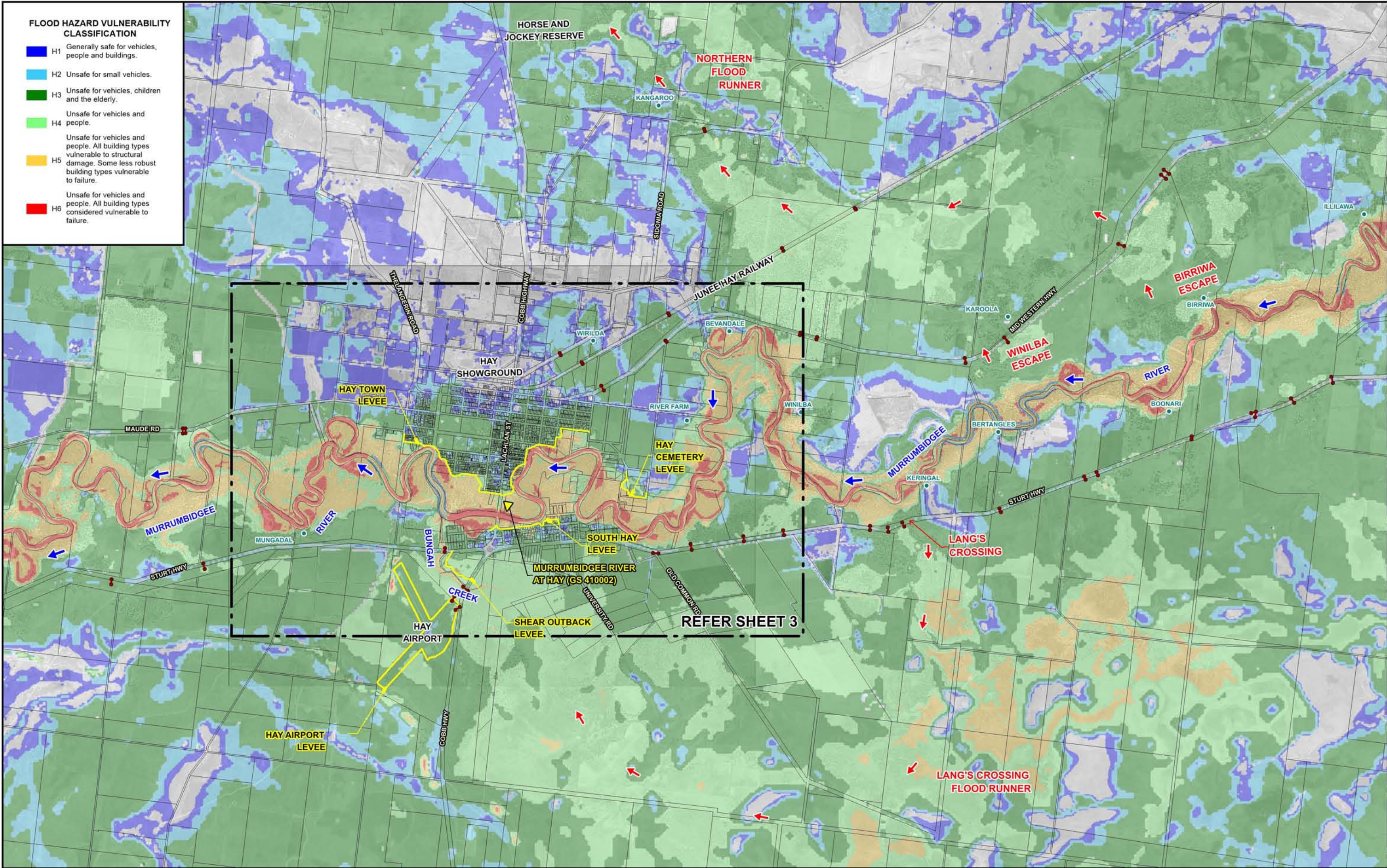


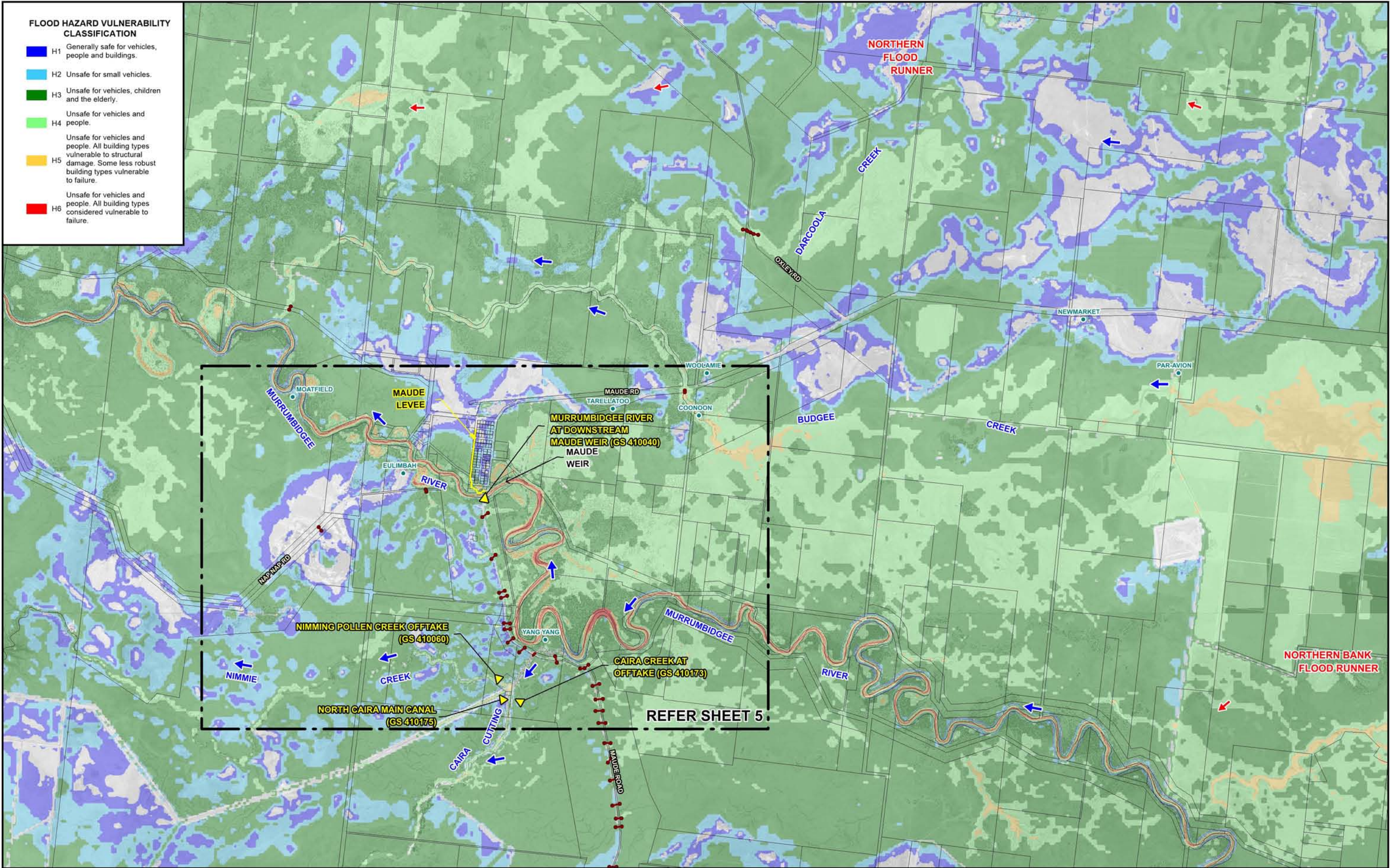






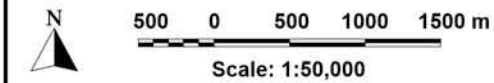






FLOOD HAZARD VULNERABILITY CLASSIFICATION

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



Lyall & Associates

NOTE:
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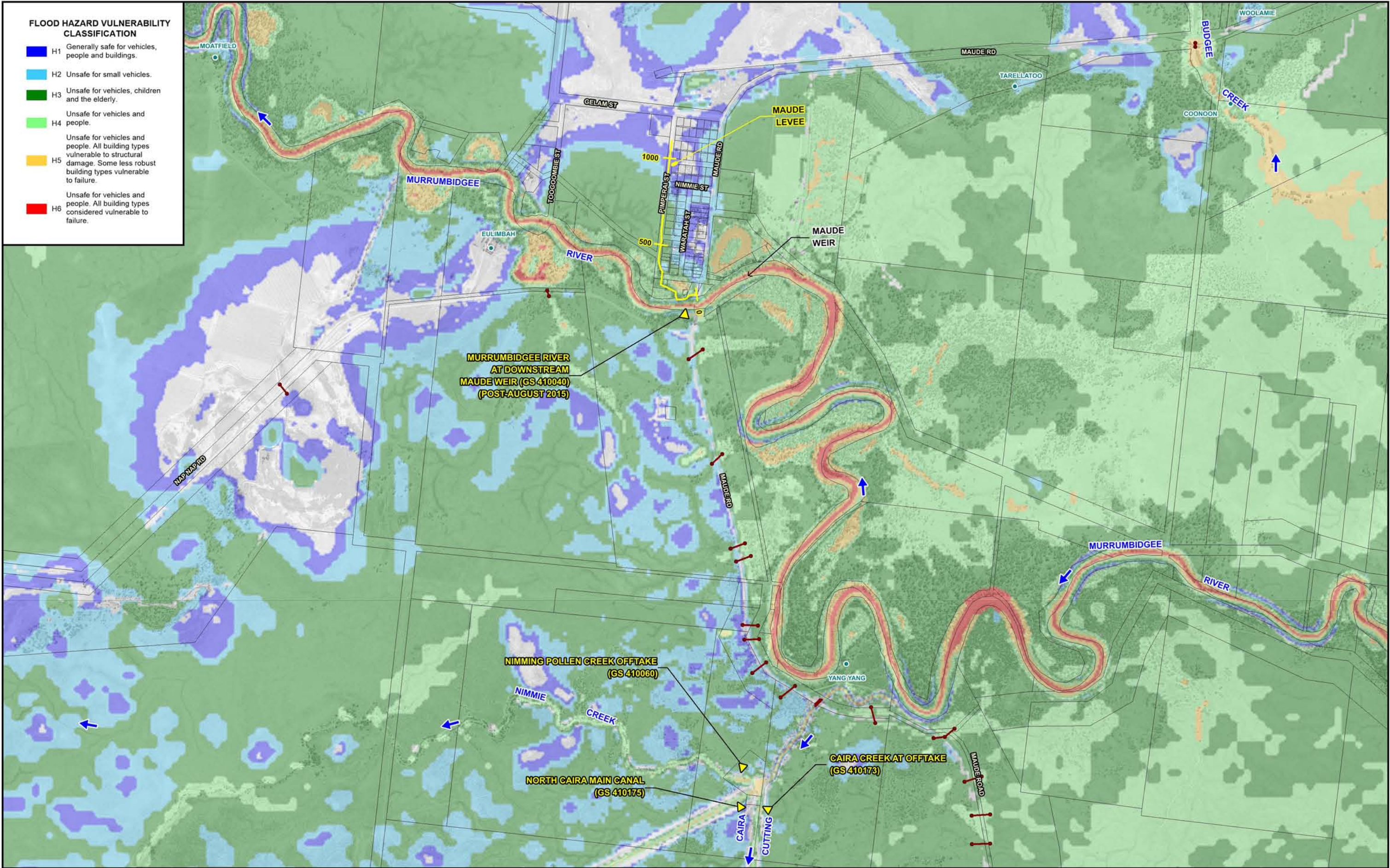
LEGEND

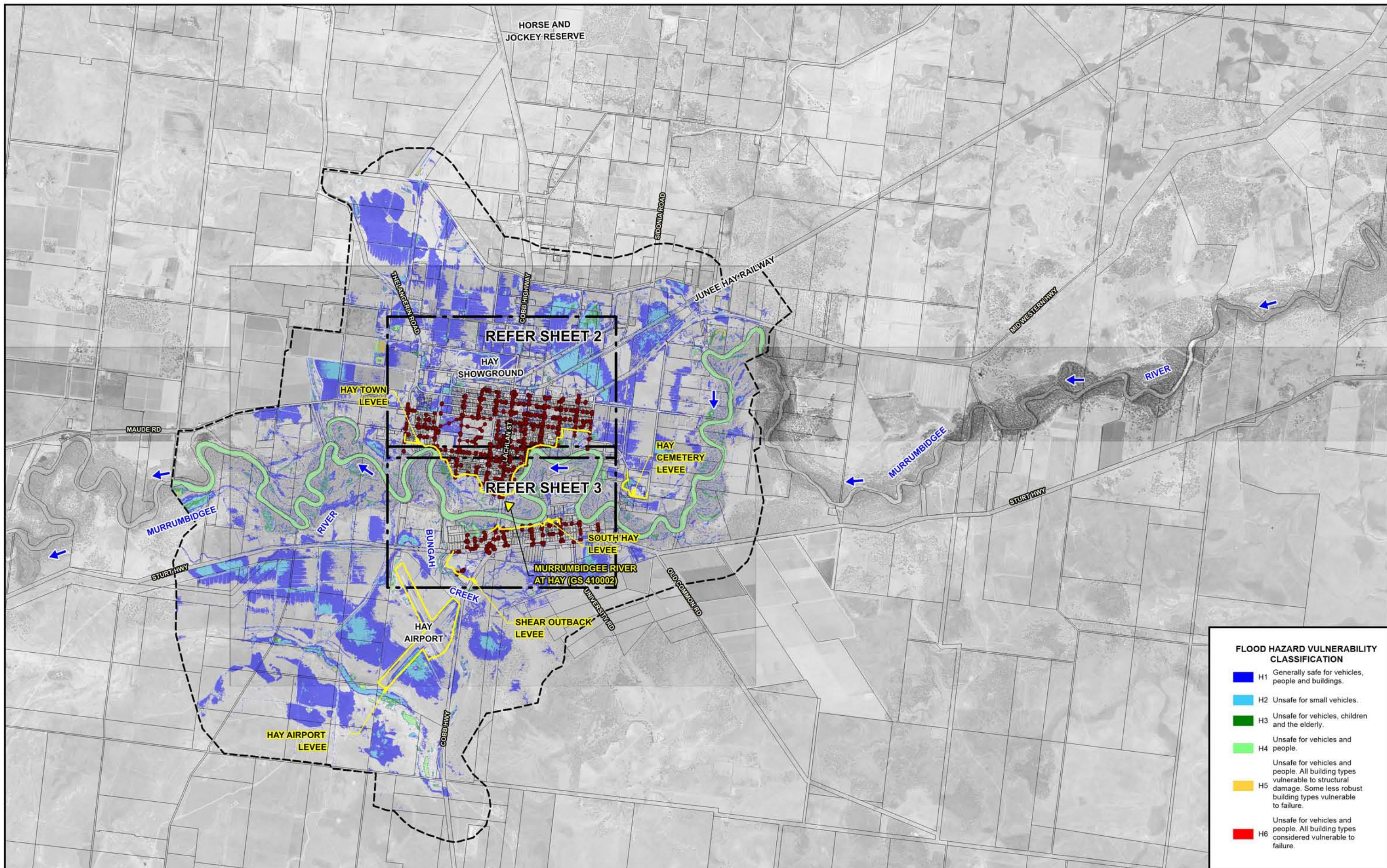
- Existing Levees
- WaterNSW Stream Gauge
- Modelled Stormwater Drainage System
- Rural Homestead

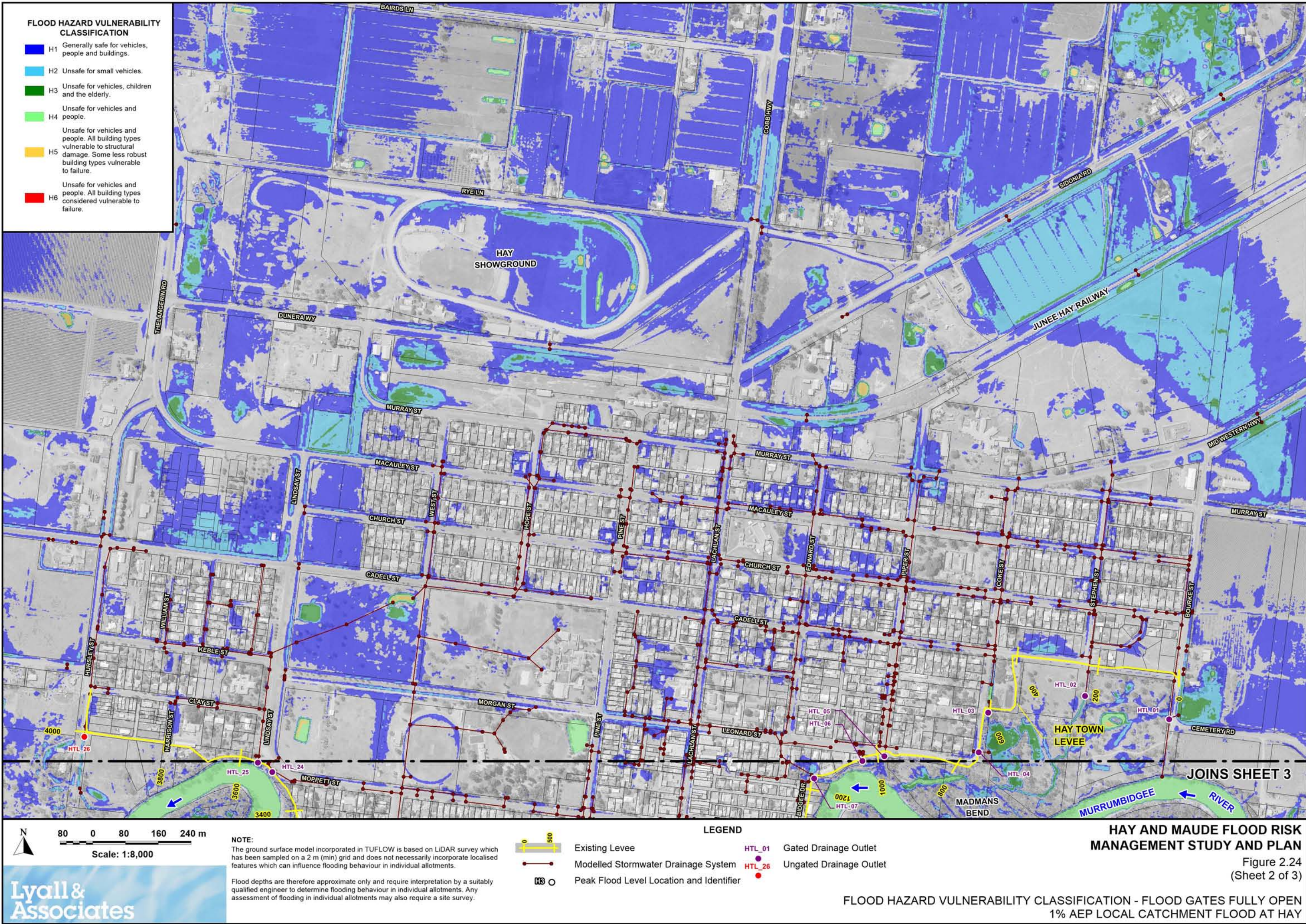
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

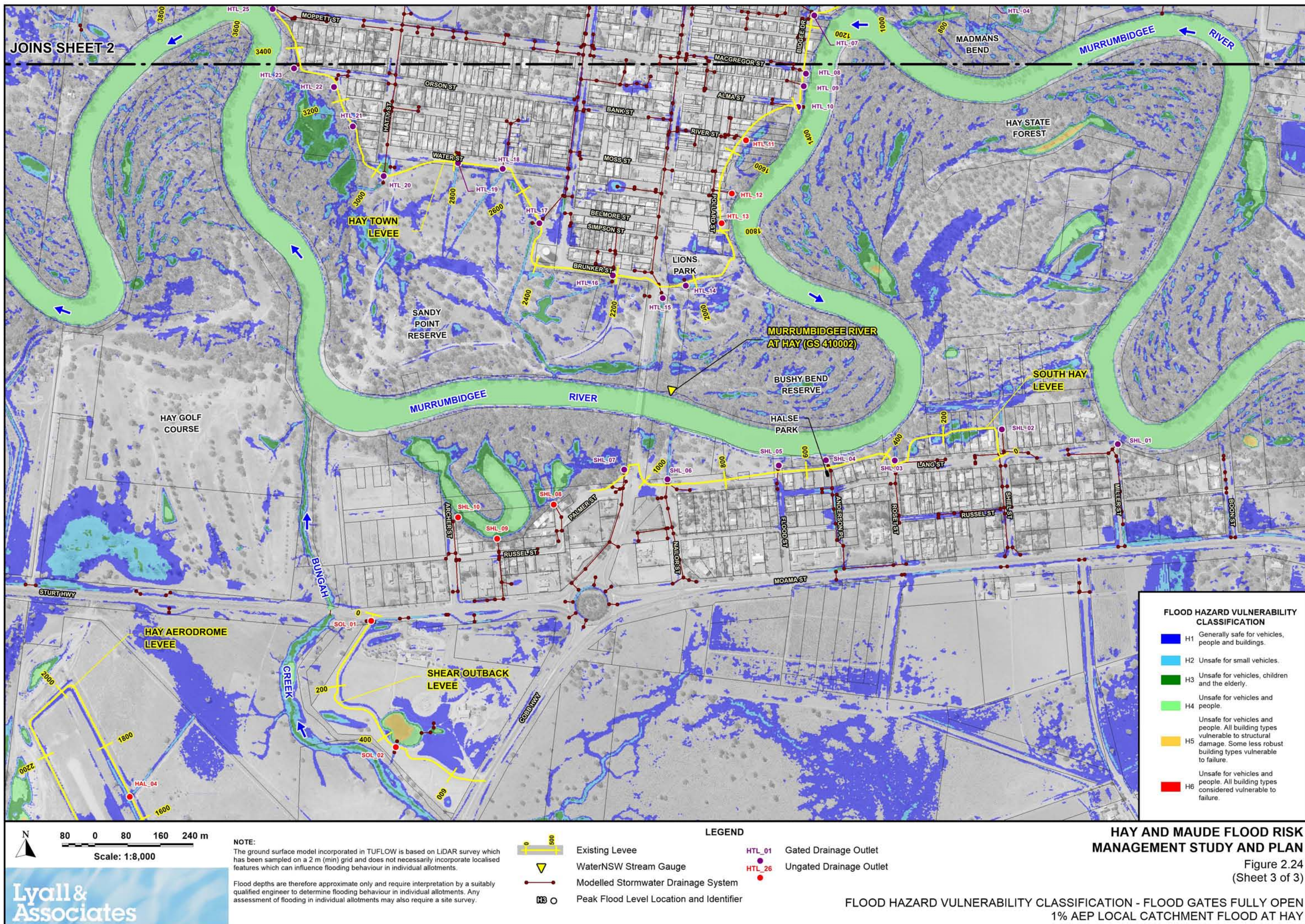
Figure 2.23
(Sheet 4 of 5)

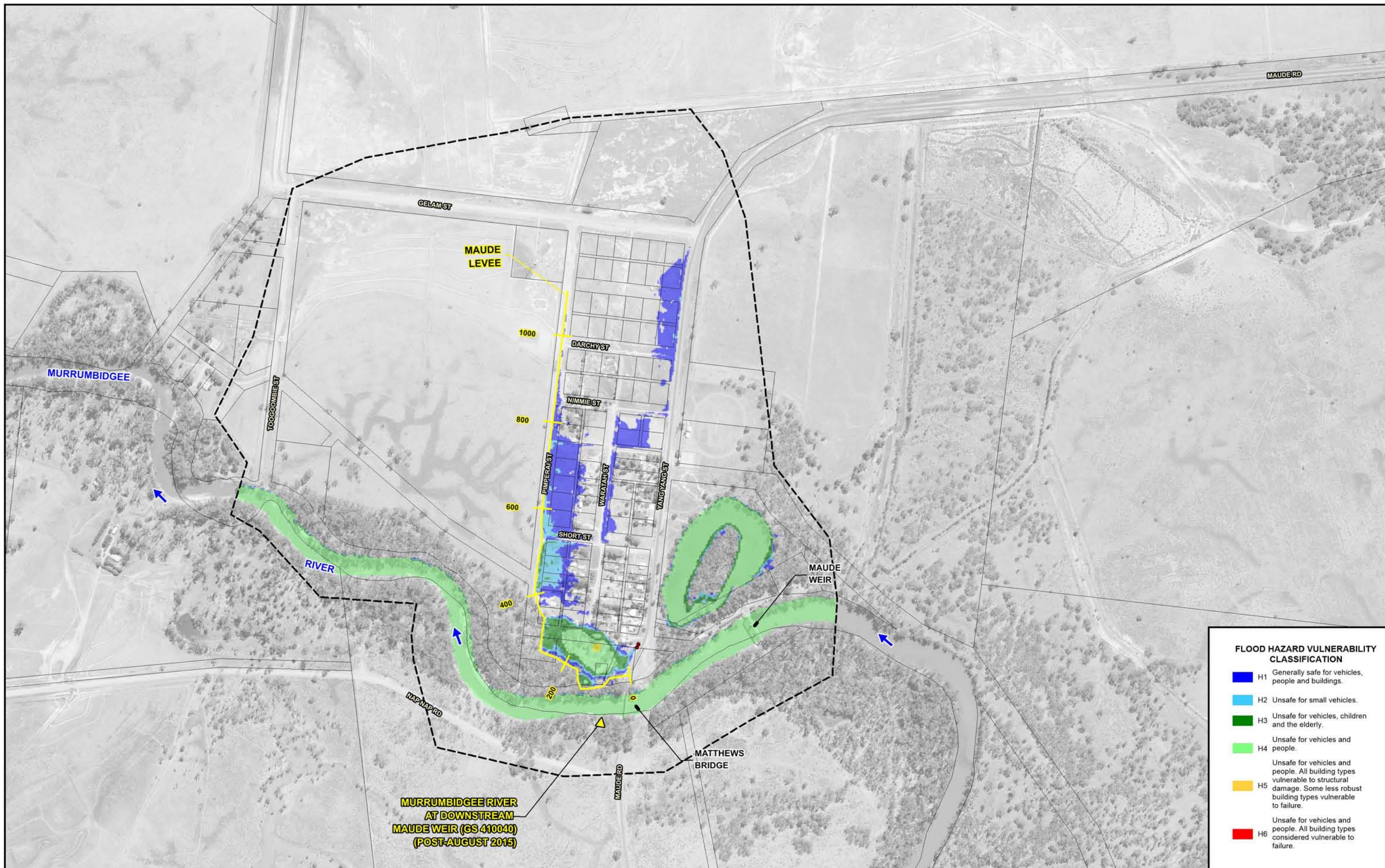
FLOOD HAZARD VULNERABILITY CLASSIFICATION
EXTREME MURRUMBIDGEE RIVER FLOOD











FLOOD HAZARD VULNERABILITY CLASSIFICATION

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

LEGEND

- Existing Levee
- ▲ WaterNSW Stream Gauge
- Modelled Stormwater Drainage System
- - - Two-Dimensional Model Boundary

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.25

FLOOD HAZARD VULNERABILITY CLASSIFICATION
1% AEP LOCAL CATCHMENT FLOOD AT MAUDE



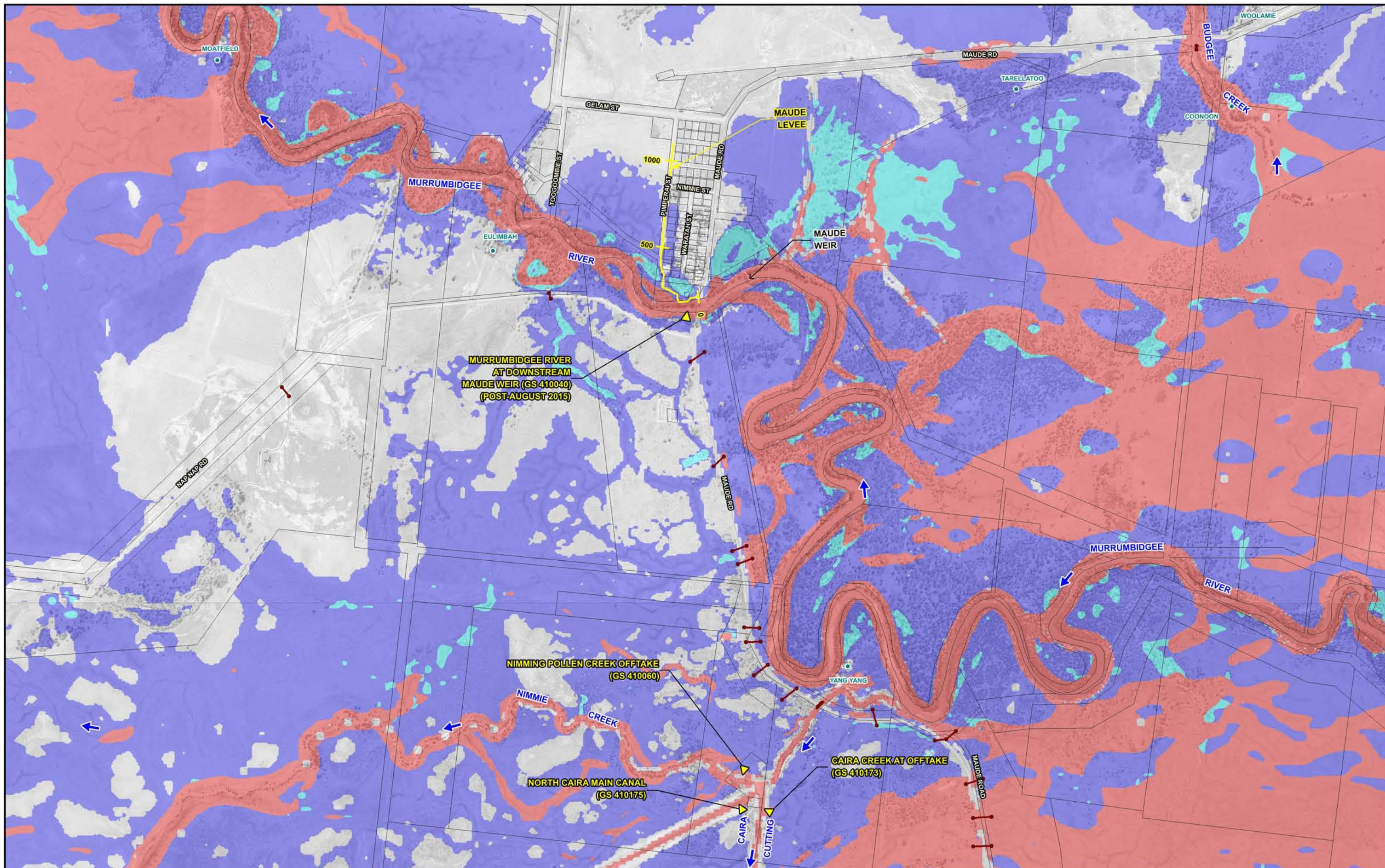
80 0 80 160 240 m
Scale: 1:8,000

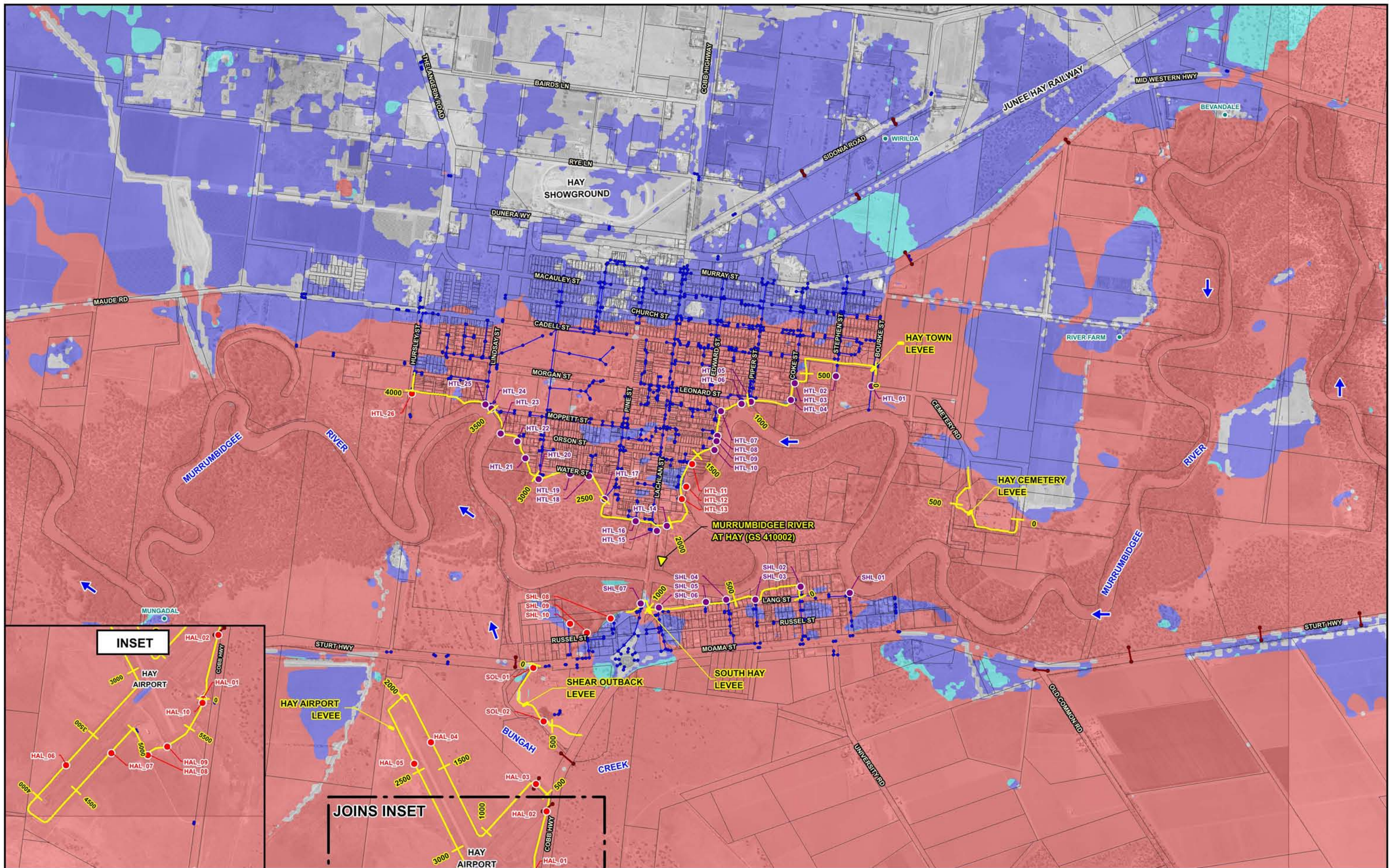
Lyll & Associates

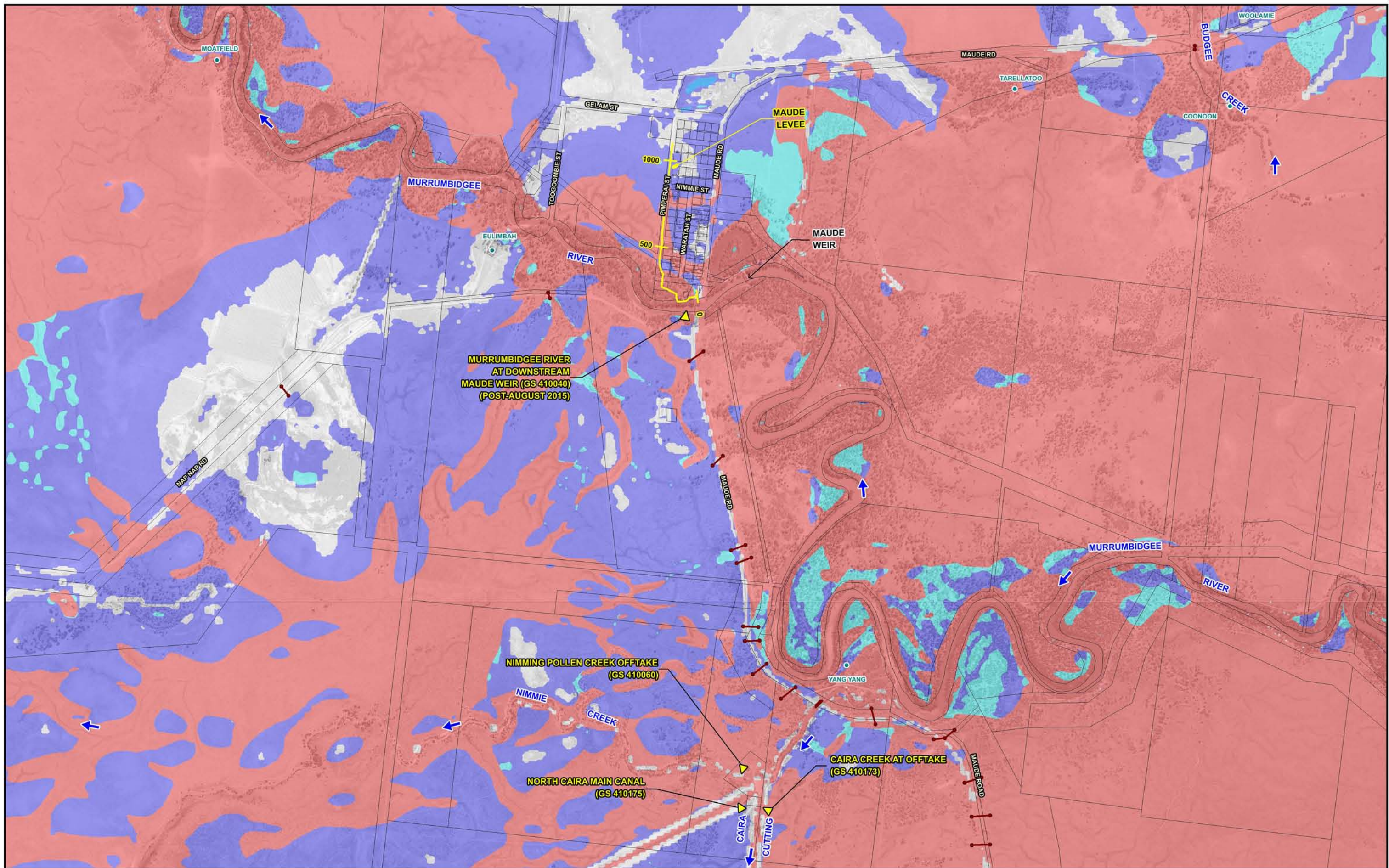
NOTE:

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Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.







Lyall & Associates

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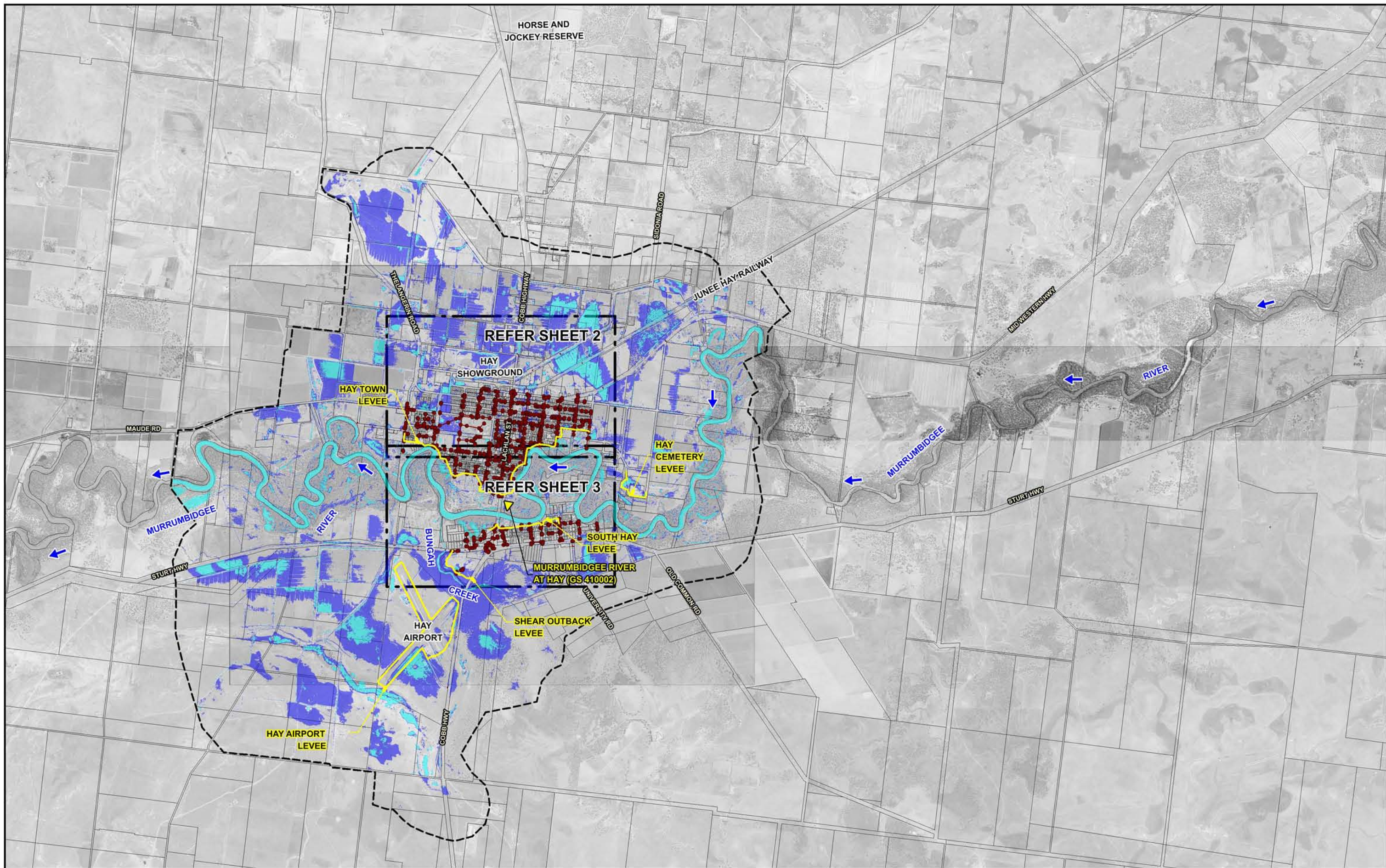
LEGEND

	WaterNSW Stream Gauge		Floodway
	Two-Dimensional Model Boundary		Flood Storage
	Modelled Stormwater Drainage System		Flood Fringe
	Rural Homestead		

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**

Figure 2.27
(Sheet 2 of 2)

**HYDRAULIC CATEGORISATION OF FLOODPLAIN
EXTREME MURRUMBIDGEE RIVER FLOOD**



Scale: 1:50,000

500 0 500 1000 1500 m

NOTE:

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LEGEND

- Existing Levee
- WaterNSW Stream Gauge
- Modelled Stormwater Drainage System
- Two-Dimensional Model Boundary

HYDRAULIC CATEGORISATION OF FLOODPLAIN - FLOOD GATES FULLY OPEN

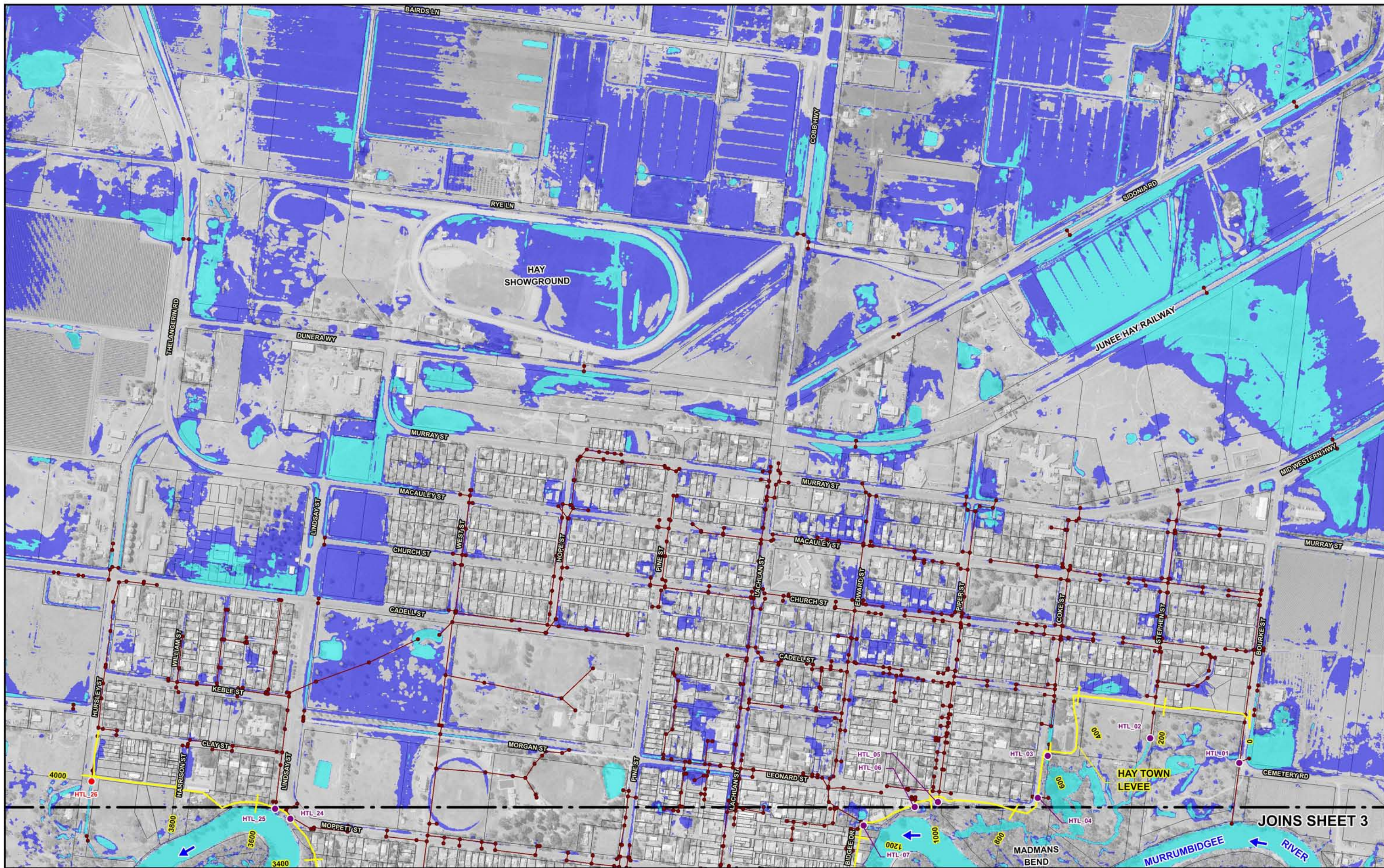
1% AEP LOCAL CATCHMENT FLOOD AT HAY

- Flood Storage
- Flood Fringe

Lyall & Associates

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.28
(Sheet 1 of 3)



Scale: 1:8,000

80 0 80 160 240 m

Lyall & Associates

NOTE:

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LEGEND

Existing Levee	HTL_01 Gated Drainage Outlet	Flood Storage
Modelled Stormwater Drainage System	HTL_26 Ungated Drainage Outlet	Flood Fringe
Peak Flood Level Location and Identifier		

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.28
(Sheet 2 of 3)

HYDRAULIC CATEGORISATION OF FLOODPLAIN - FLOOD GATES FULLY OPEN
1% AEP LOCAL CATCHMENT FLOOD AT HAY



Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

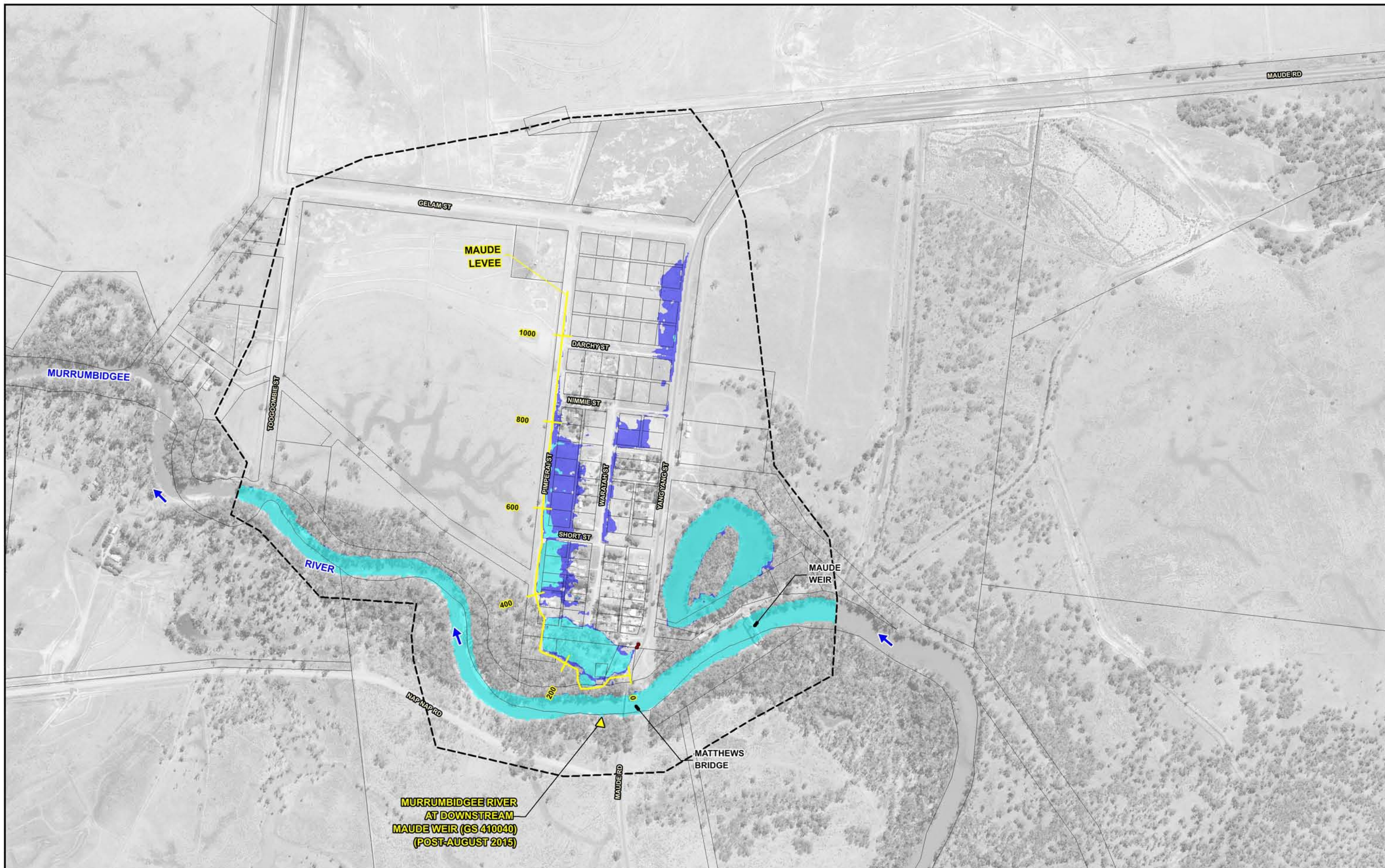
Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

Existing Levee	HTL_01 Gated Drainage Outlet	Flood Storage
WaterNSW Stream Gauge	HTL_26 Ungated Drainage Outlet	Flood Fringe
Modelled Stormwater Drainage System		
Peak Flood Level Location and Identifier		

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN
Figure 2.28
(Sheet 3 of 3)

HYDRAULIC CATEGORISATION OF FLOODPLAIN - FLOOD GATES FULLY OPEN
1% AEP LOCAL CATCHMENT FLOOD AT HAY



Lyall & Associates

NOTE:
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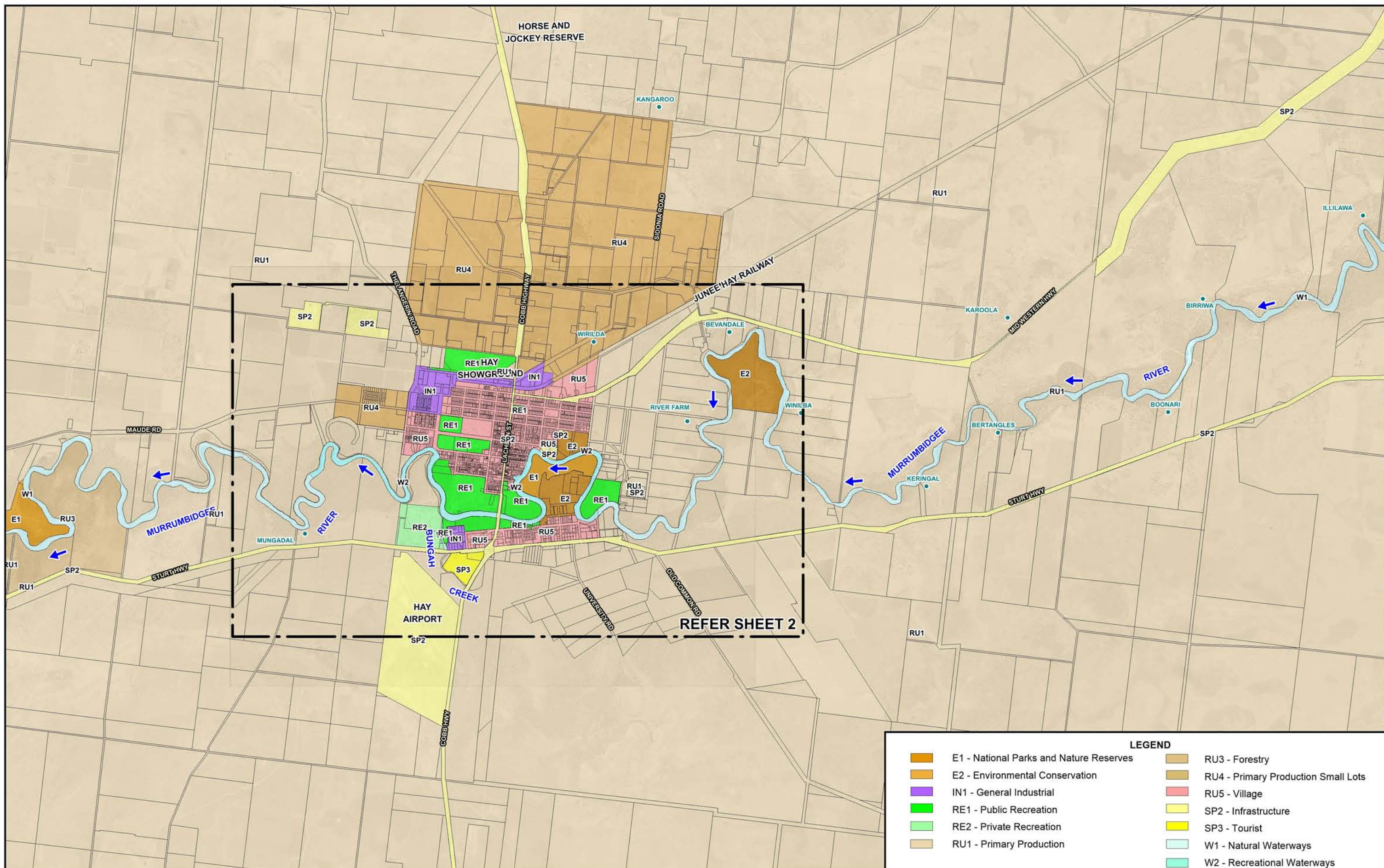
LEGEND

- Existing Levee
- WaterNSW Stream Gauge
- Modelled Stormwater Drainage System
- Two-Dimensional Model Boundary
- Flood Storage
- Flood Fringe

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**

Figure 2.29

**HYDRAULIC CATERGORISATION OF FLOODPLAIN
1% AEP LOCAL CATCHMENT FLOOD AT MAUDE**



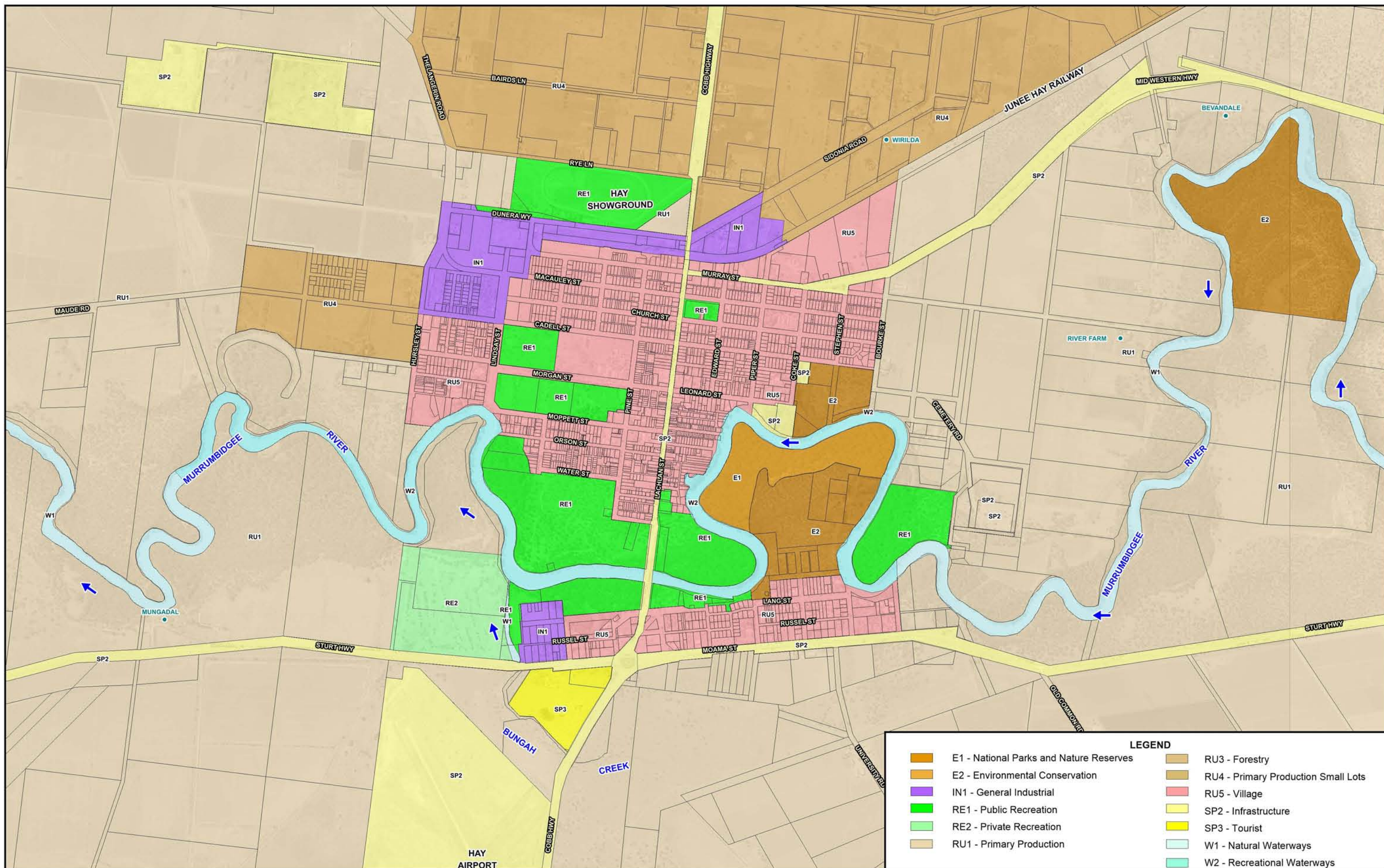
500 0 500 1000 1500 m
Scale: 1:50,000

Lyall & Associates

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**

Figure 2.30
(Sheet 1 of 2)

HAY SHIRE LEP 2011 ZONING AT HAY



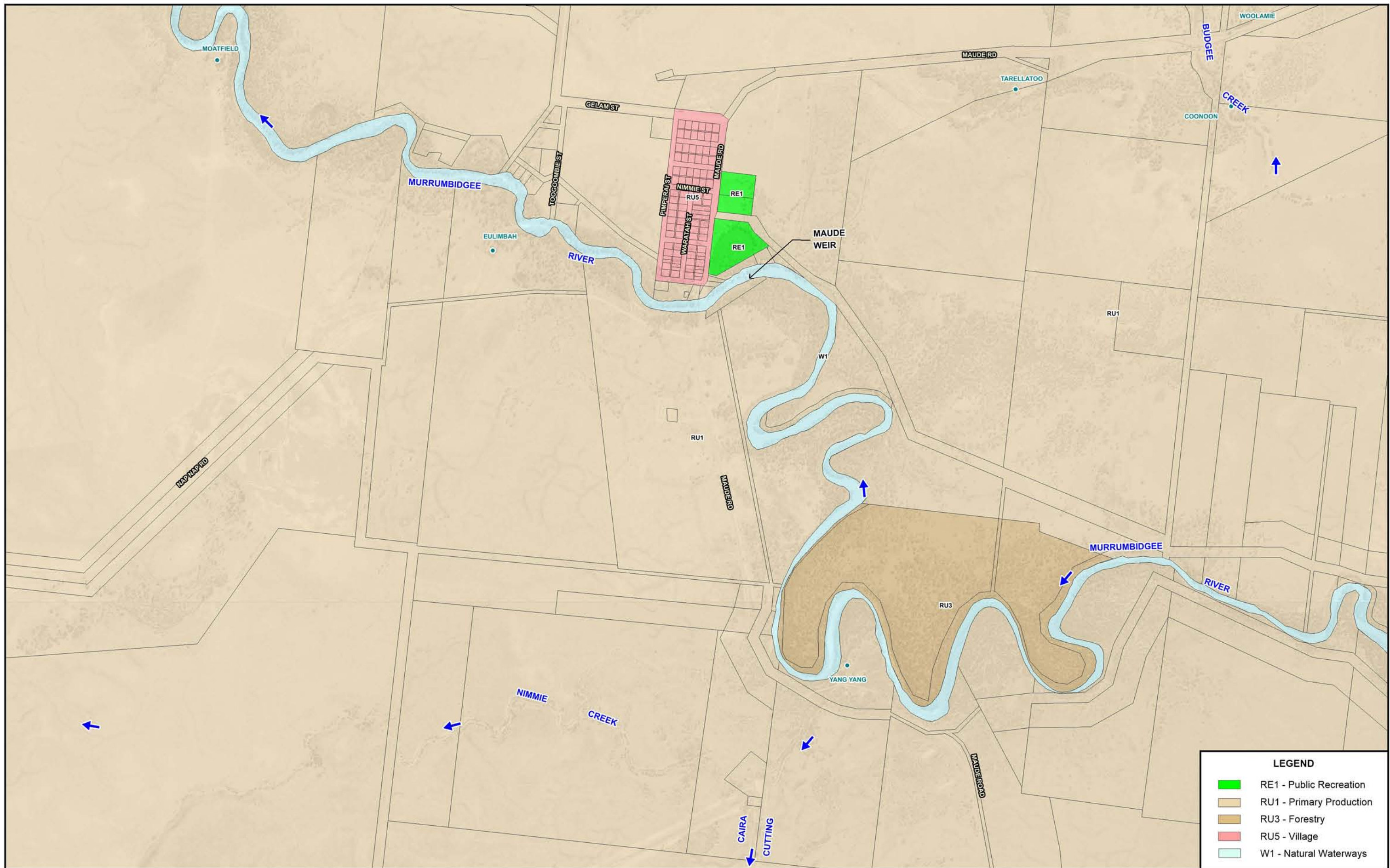
200 0 200 400 600 m
Scale: 1:20,000

Lyall & Associates

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.30
(Sheet 2 of 2)

HAY SHIRE LEP 2011 ZONING AT HAY



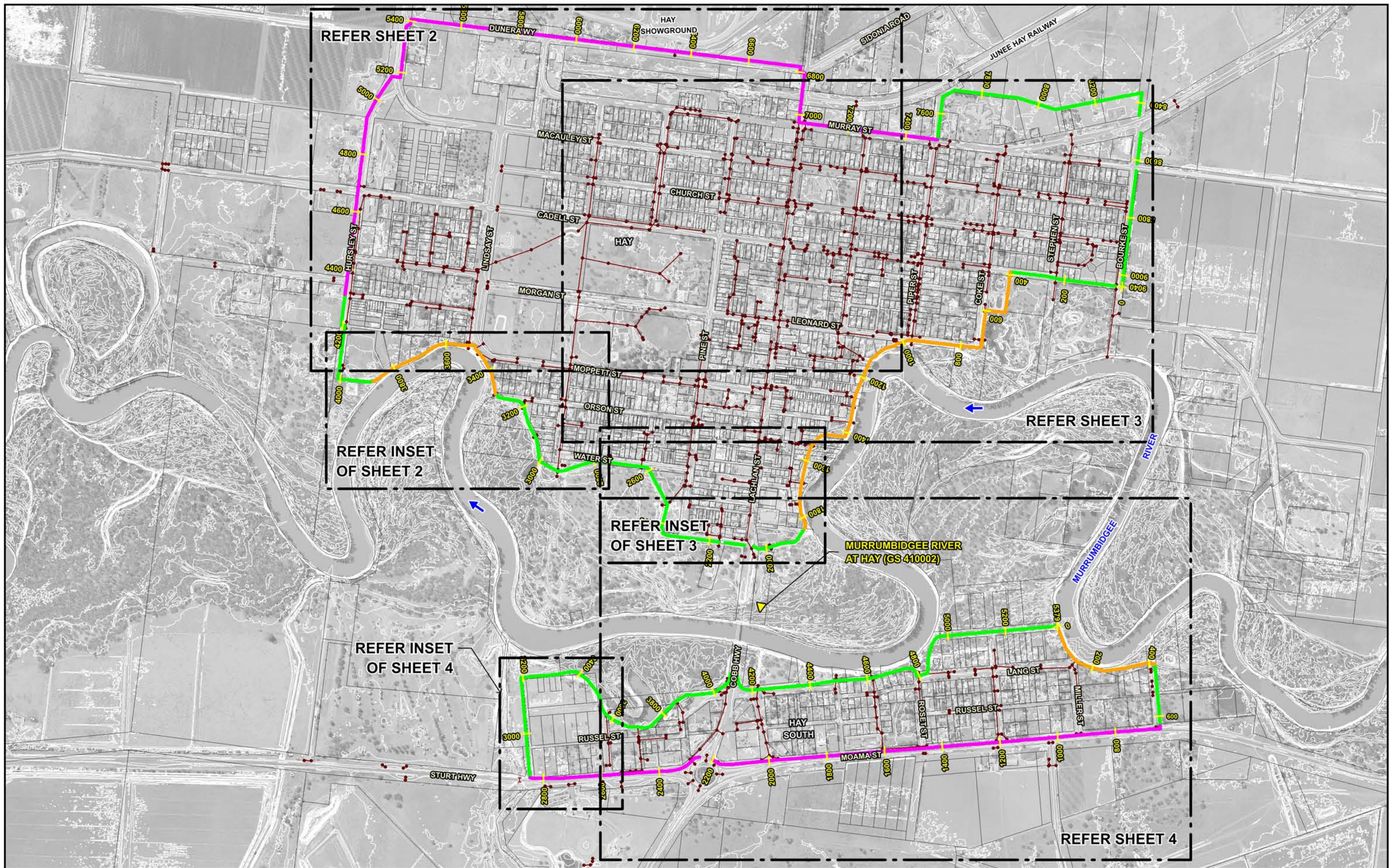
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200 0 200 400 600 m
Scale: 1:20,000

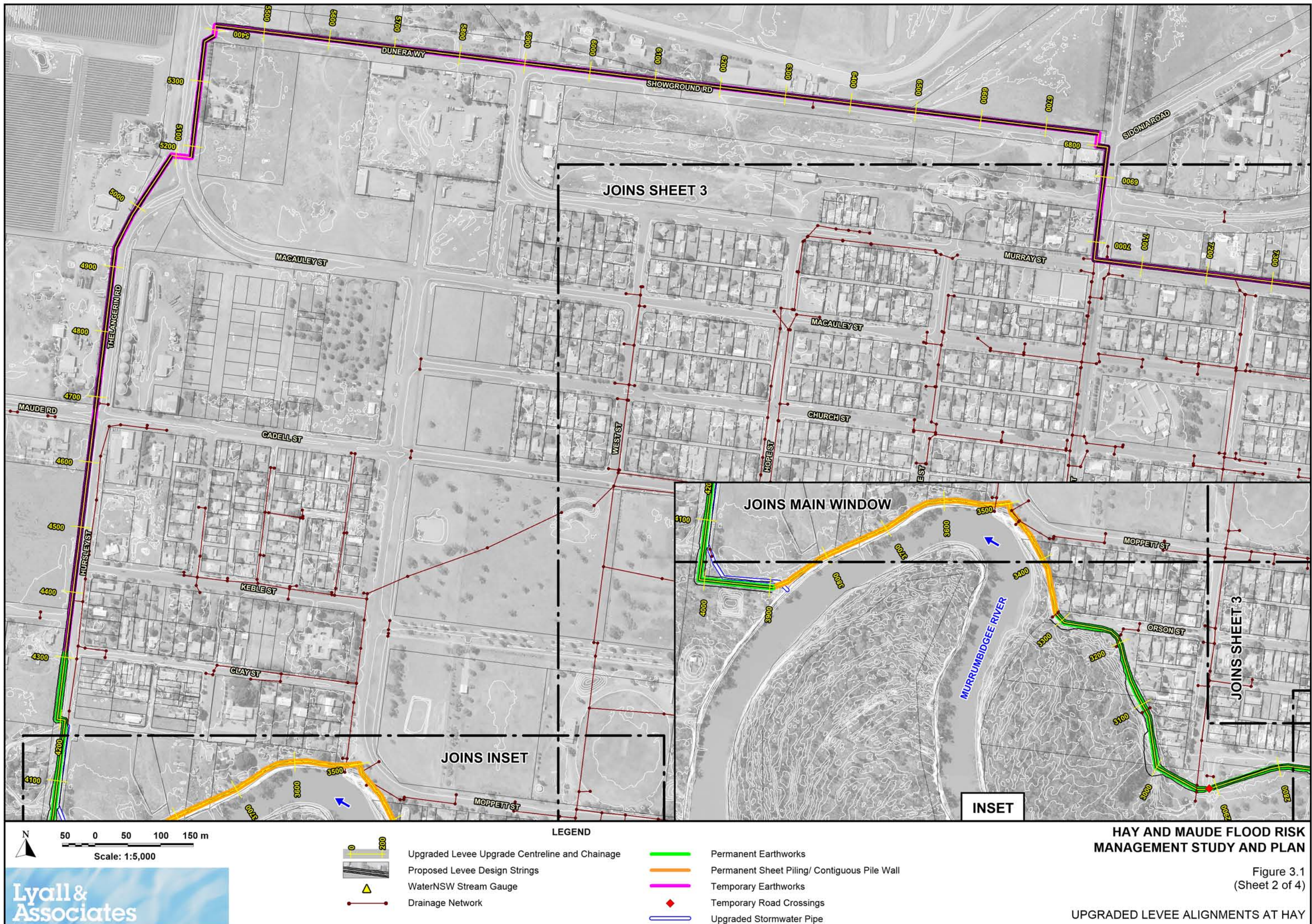
Lyall & Associates

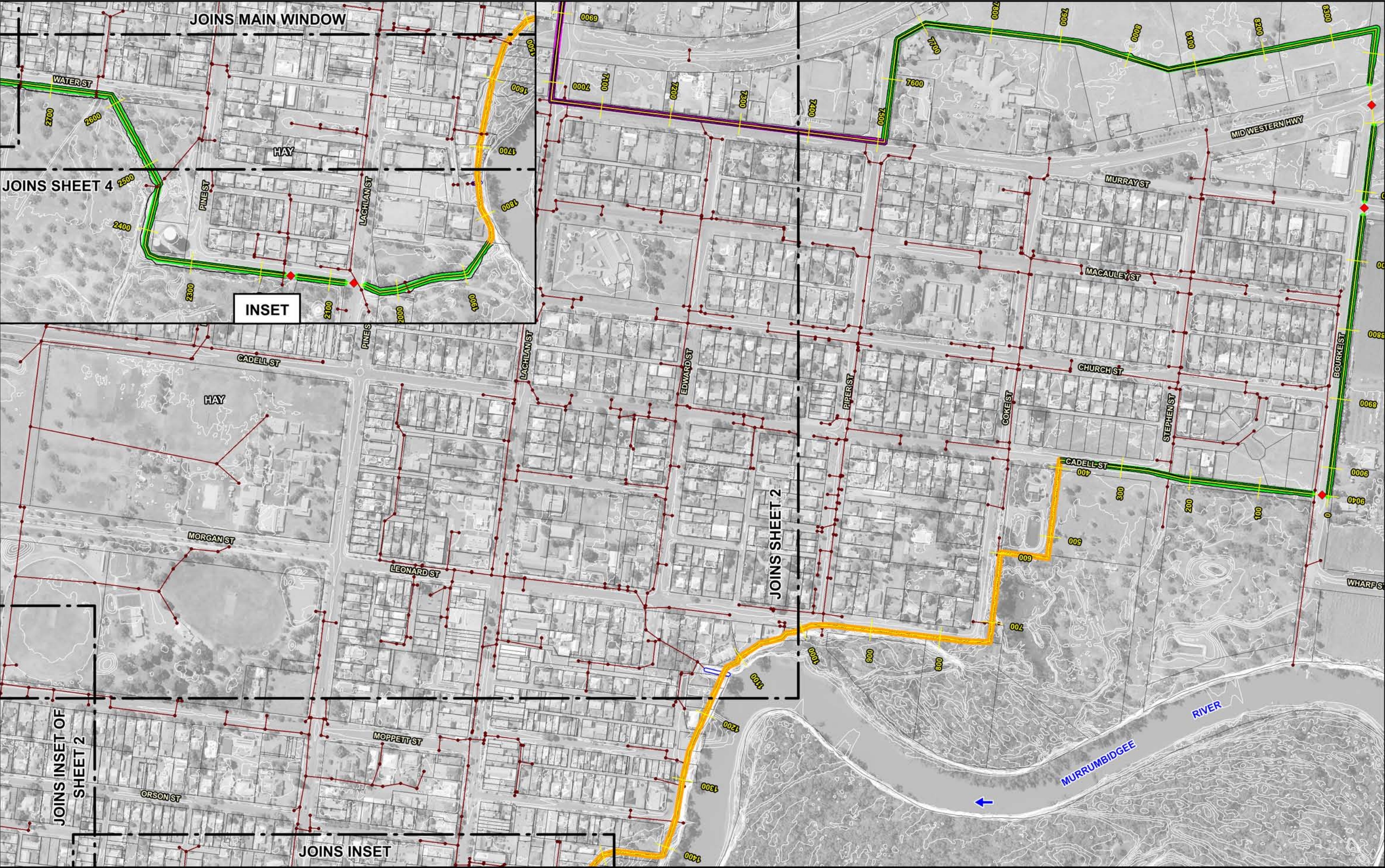
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 2.31

HAY SHIRE LEP 2011 ZONING AT MAUDE





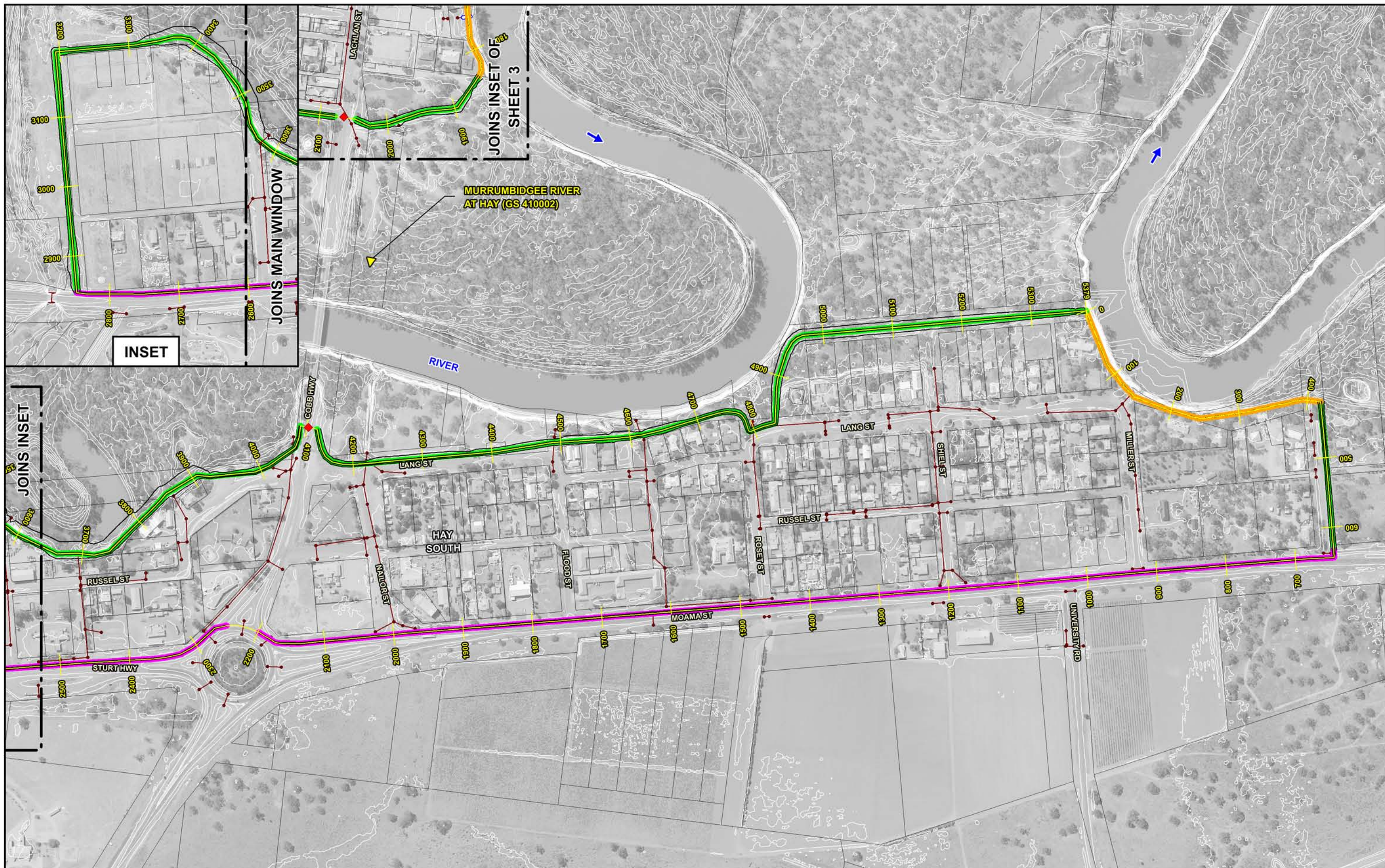


Scale: 1:5,000

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 3.1
(Sheet 3 of 4)

UPGRADED LEVEE ALIGNMENTS AT HAY



Lyall & Associates

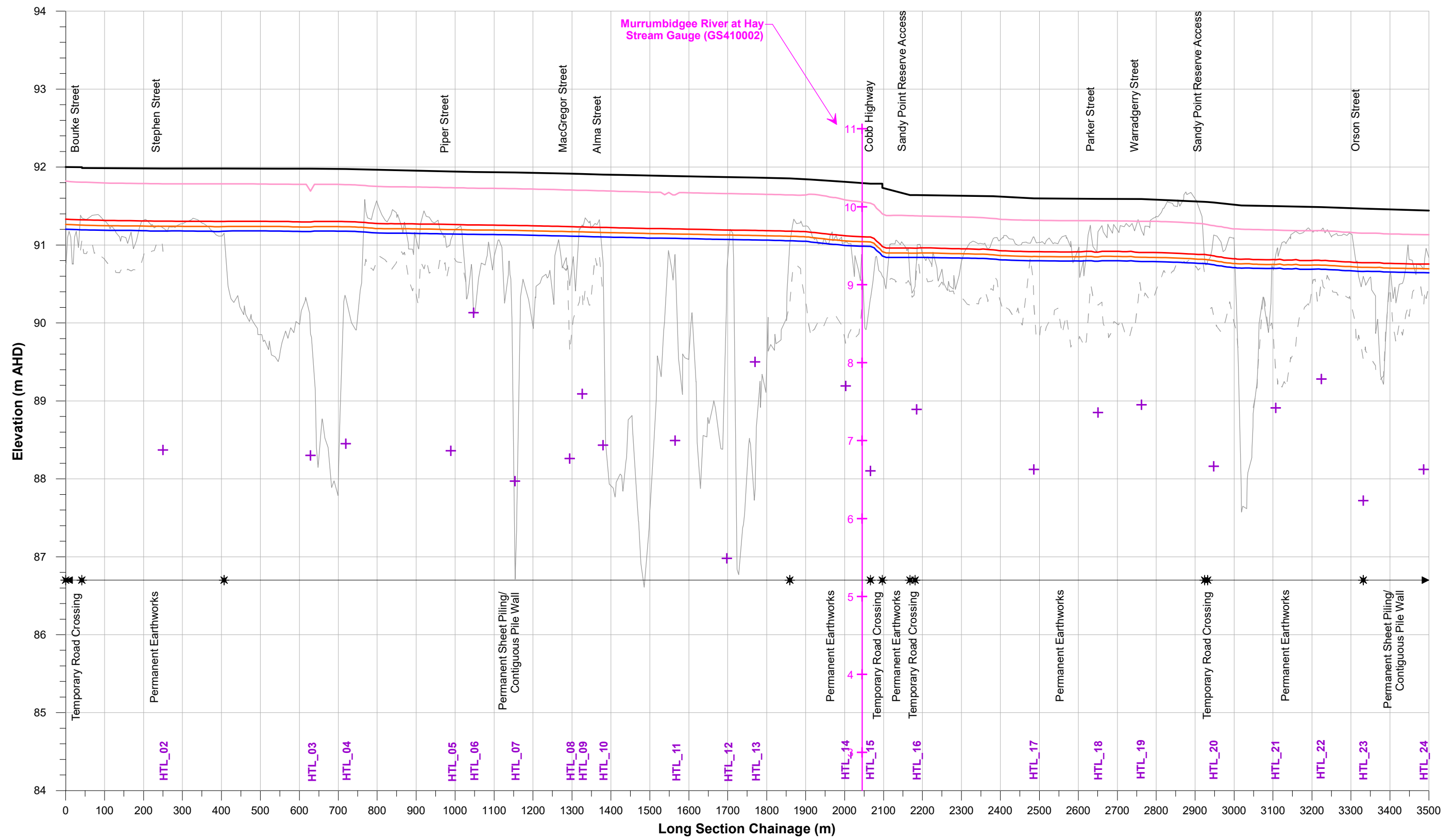
LEGEND

	Upgraded Levee Upgrade Centreline and Chainage		Permanent Earthworks
	Proposed Levee Design Strings		Permanent Sheet Piling/ Contiguous Pile Wall
	WaterNSW Stream Gauge		Temporary Earthworks
	Drainage Network		Temporary Road Crossings
			Upgraded Stormwater Pipe

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**

Figure 3.1
(Sheet 4 of 4)

UPGRADED LEVEE ALIGNMENTS AT HAY



- GROUND PROFILES**

 - Crest of Upgraded Levee
 - Existing Natural Surface Level
 - - - Ground Level Once Existing Levee Removed
 - + + + Drainage Outlets
- WATER SURFACE PROFILES**

 - Extreme Flood
 - 0.2% AEP
 - 0.5% AEP
 - 1% AEP

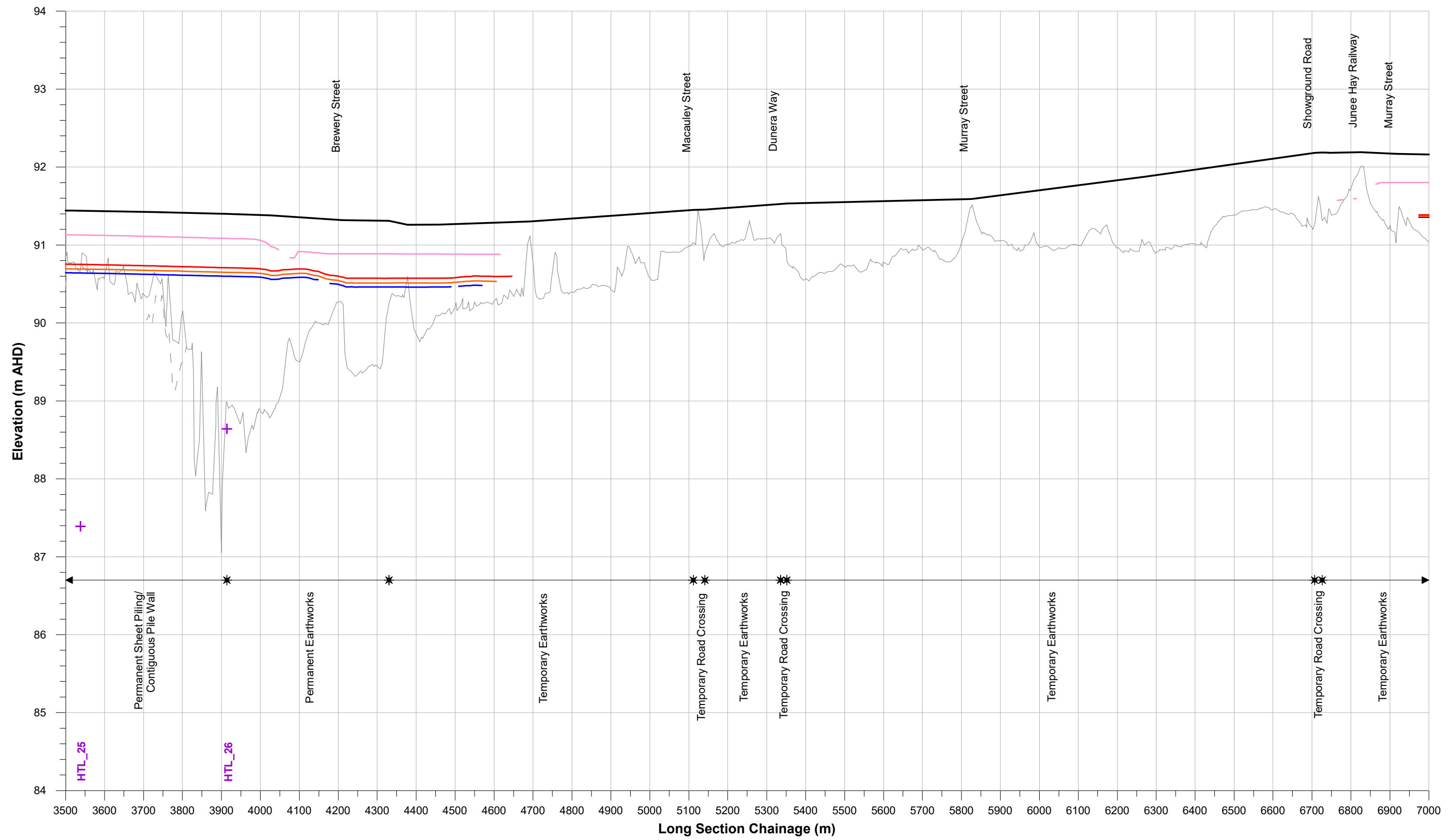
NOTE:
1. Gauge zero on the Hay stream gauge is RL 81.49 m AHD.



**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**

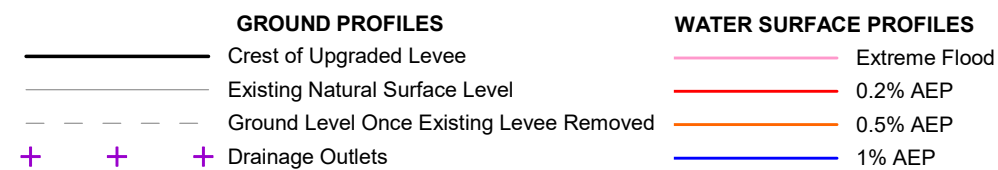
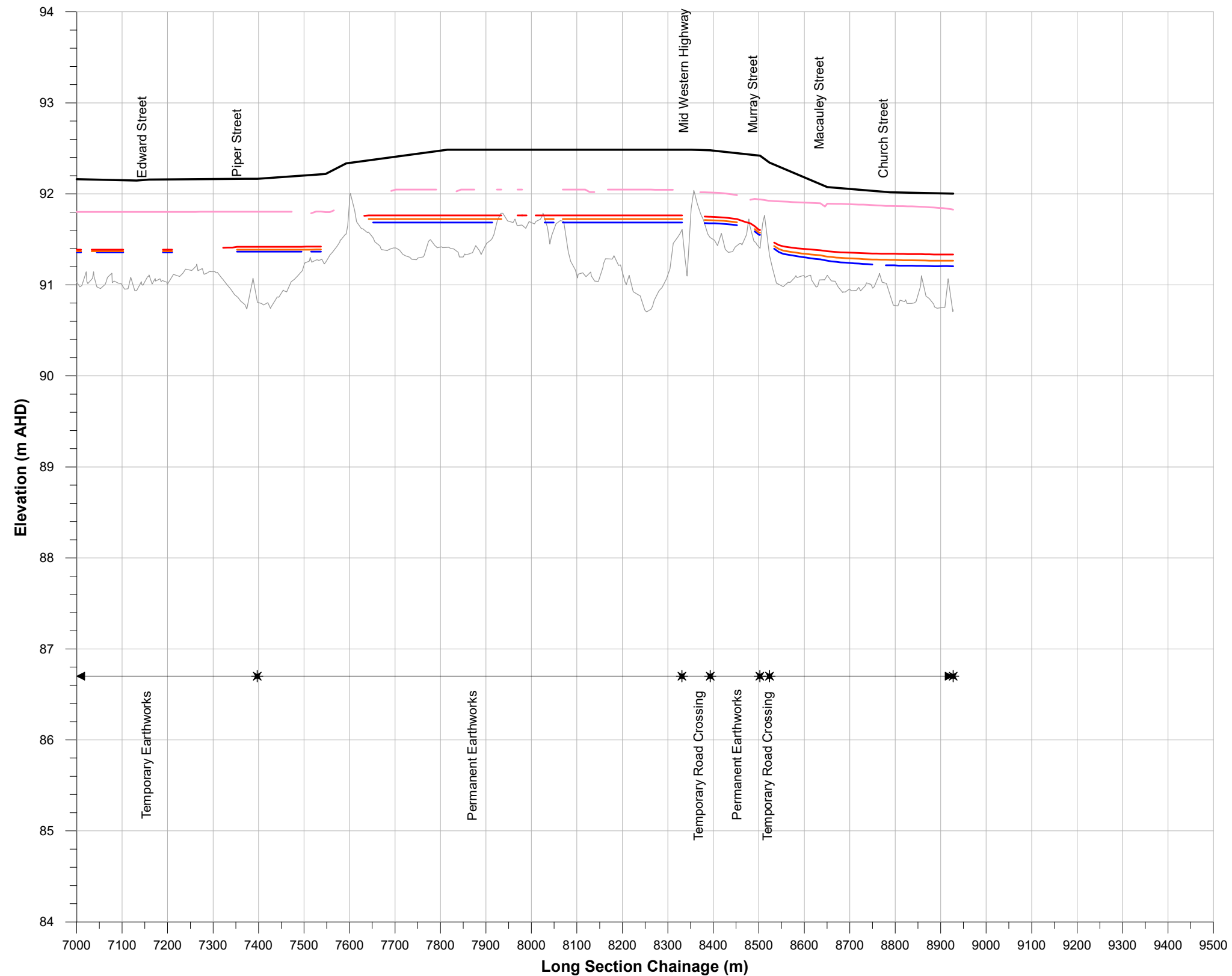
Figure 3.2
(Sheet 1 of 3)

LONGITUDINAL SECTION ALONG CREST OF UPGRADED HAY TOWN LEVEE



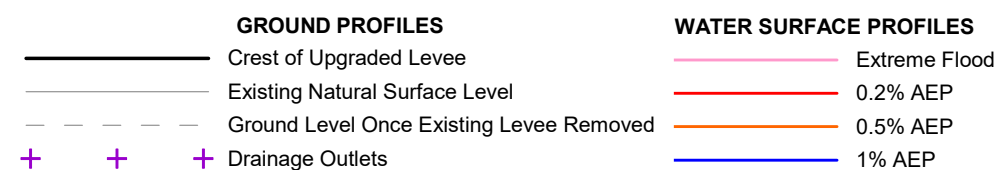
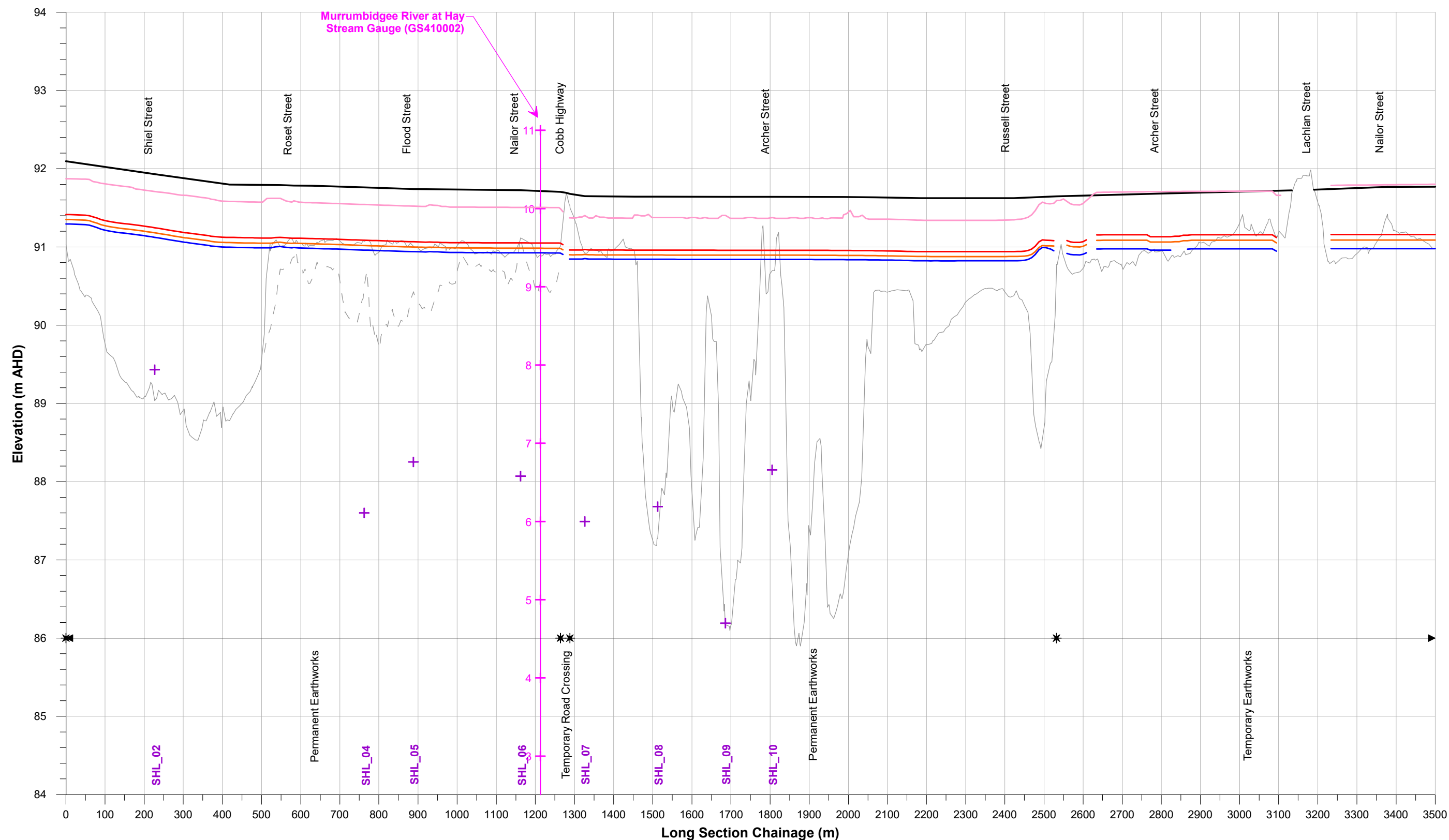
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 3.2
(Sheet 2 of 3)



HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

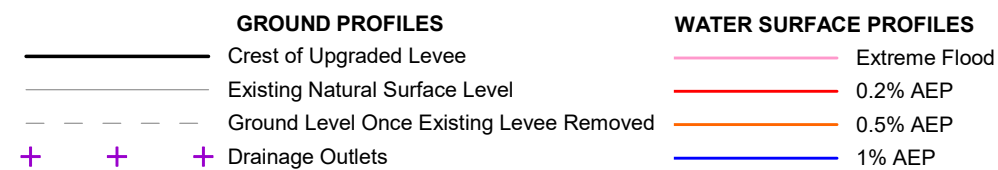
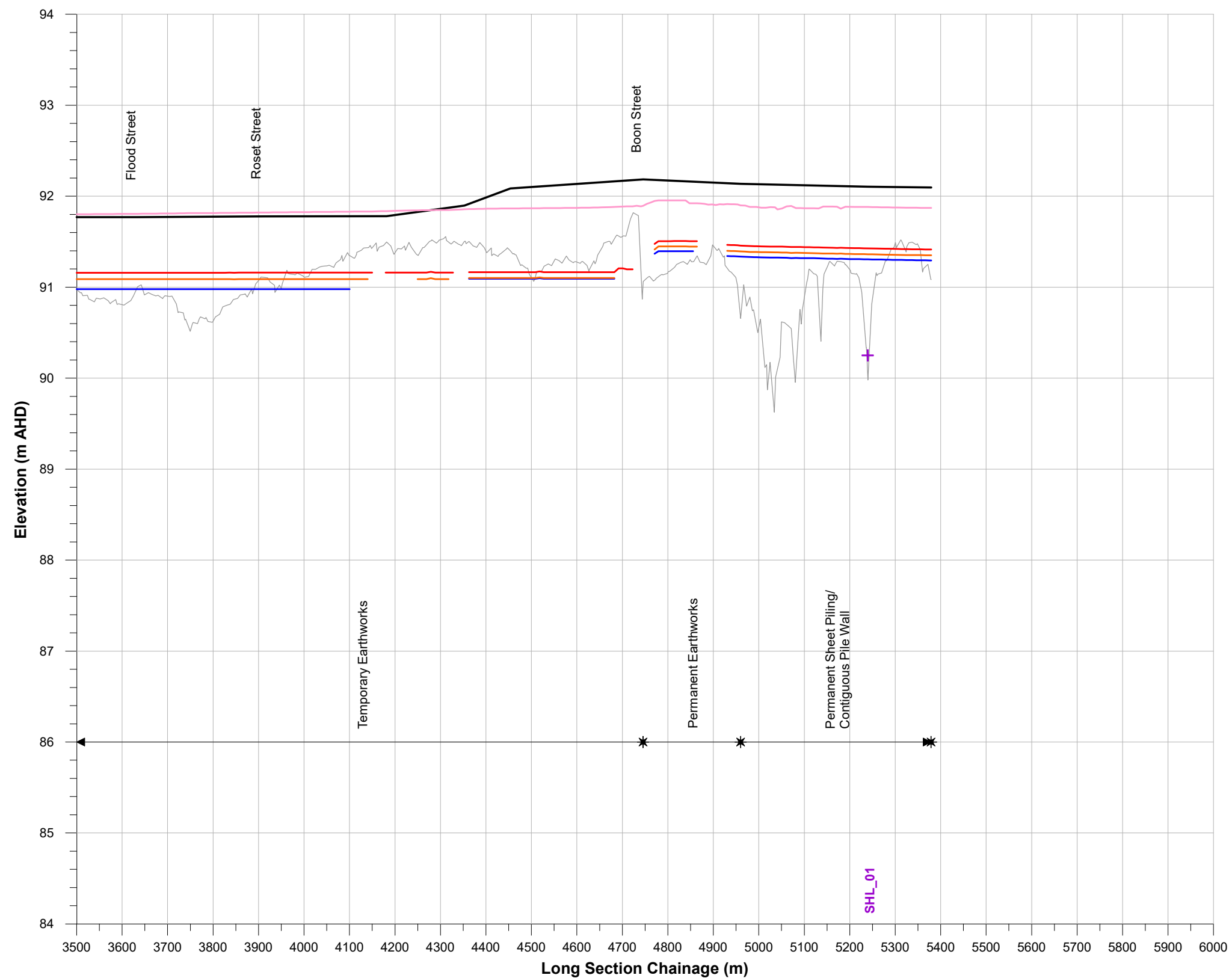
Figure 3.2
(Sheet 3 of 3)



NOTE:
1. Gauge zero on the Hay stream gauge is RL 81.49 m AHD.

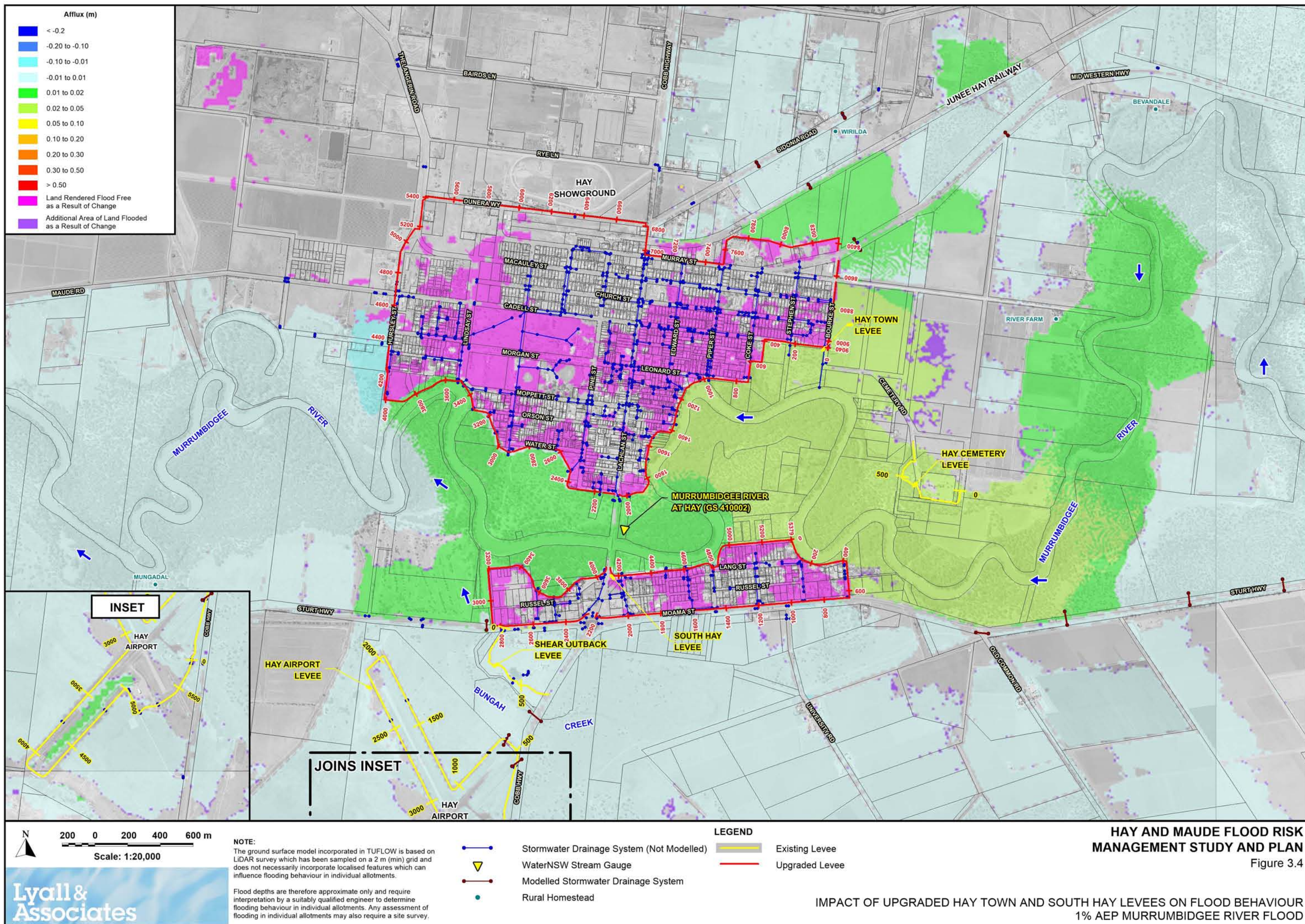
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

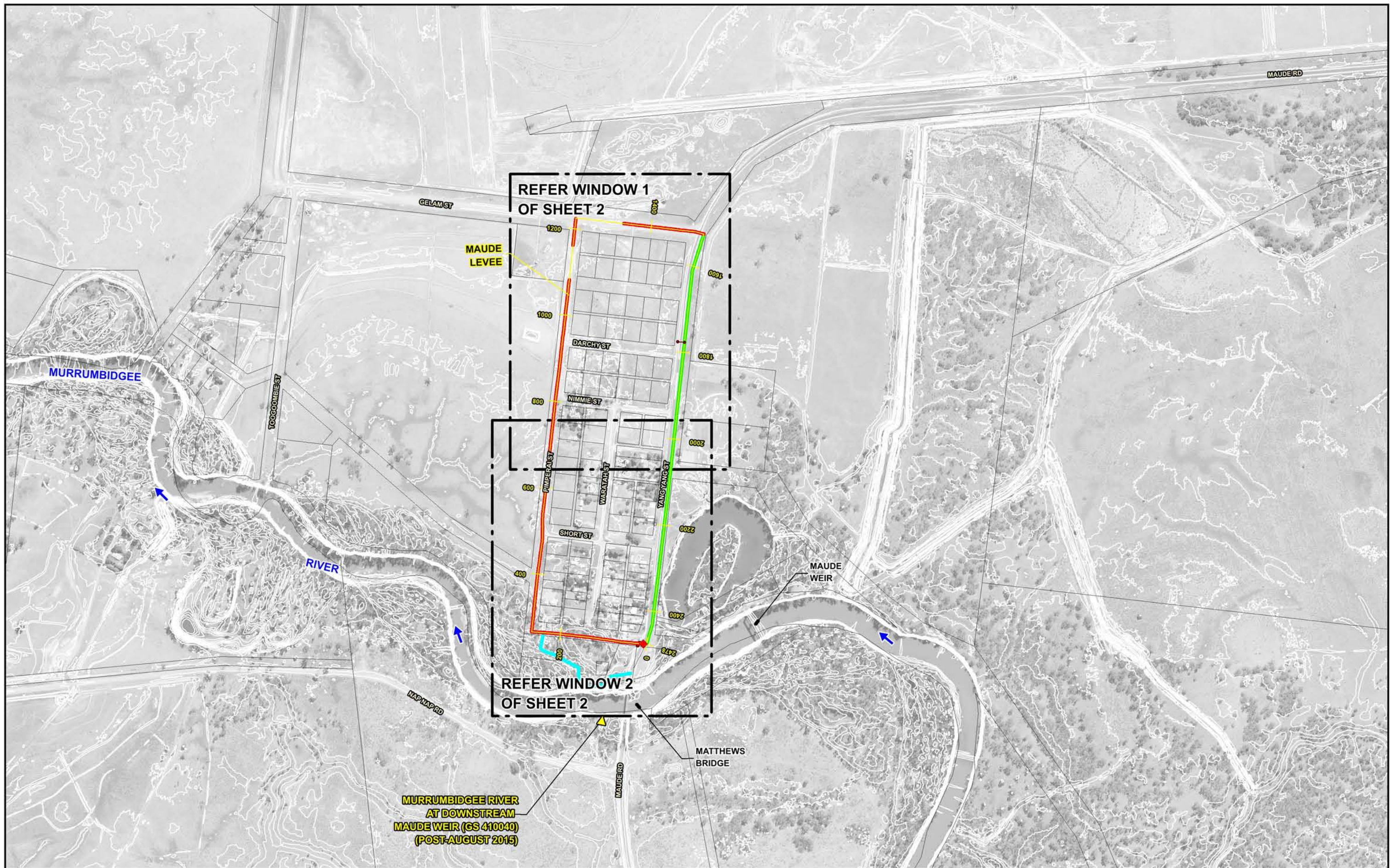
Figure 3.3
(Sheet 1 of 2)



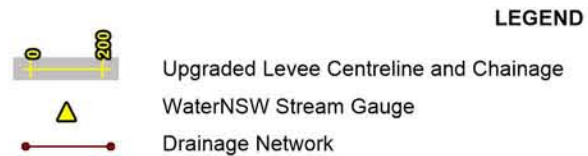
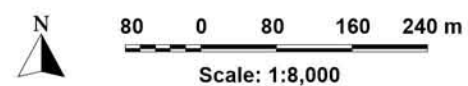
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

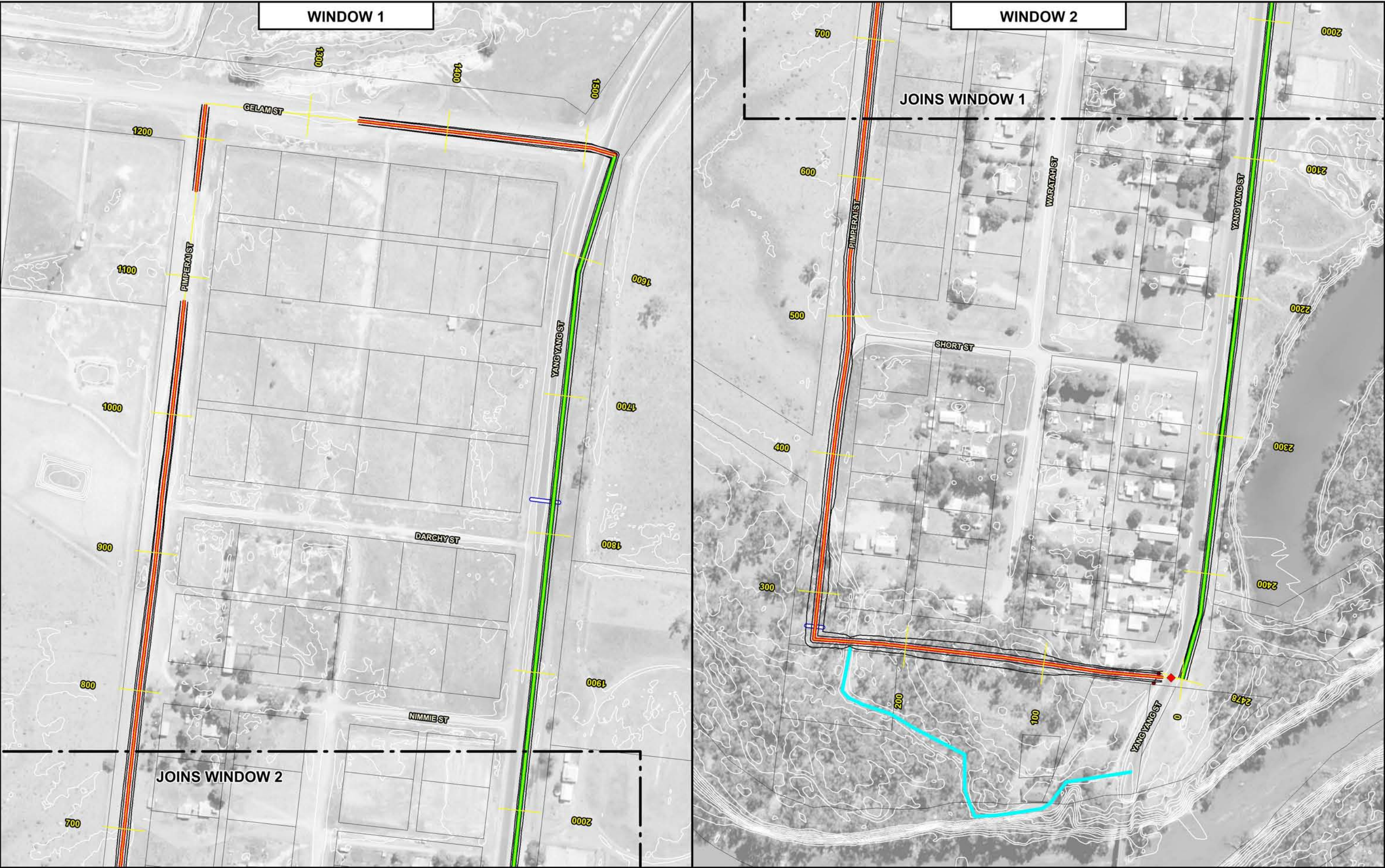
Figure 3.3
(Sheet 2 of 2)





MURRUMBIDGEE RIVER
AT DOWNSTREAM
MAUDE WEIR (GS 410040)
(POST-AUGUST 2015)





WINDOW 1

WINDOW 2

JOINS WINDOW 1

JOINS WINDOW 2

LEGEND

- Permanent Earthworks
- Permanent Road Raising
- Temporary Road Crossings
- Residual Portion of Existing Levee
- New/Upgraded Stormwater Pipe

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

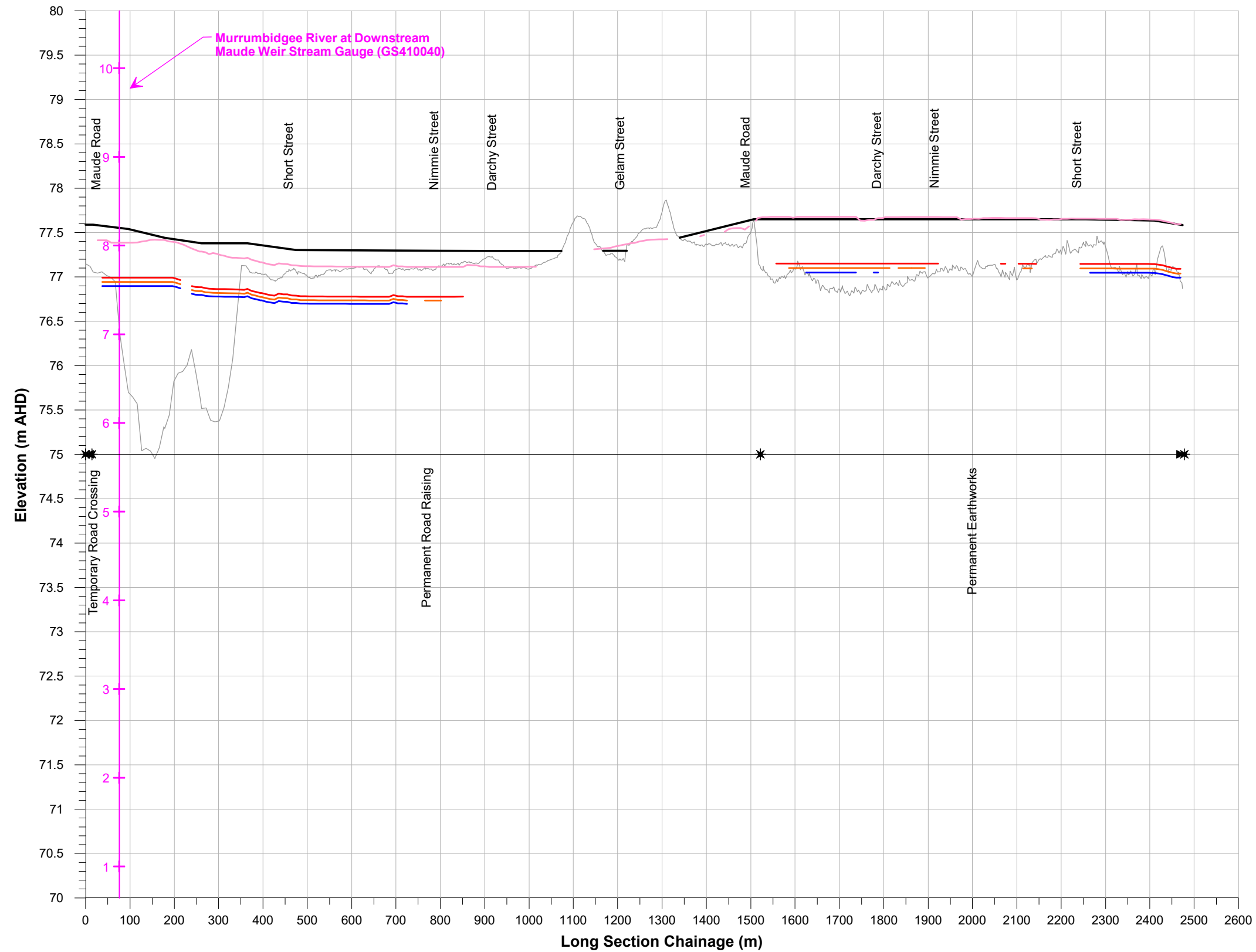
Figure 3.5
(Sheet 2 of 2)

UPGRADED LEVEE ALIGNMENT AT MAUDE

Scale: 1:2,500

25 0 25 50 75 m

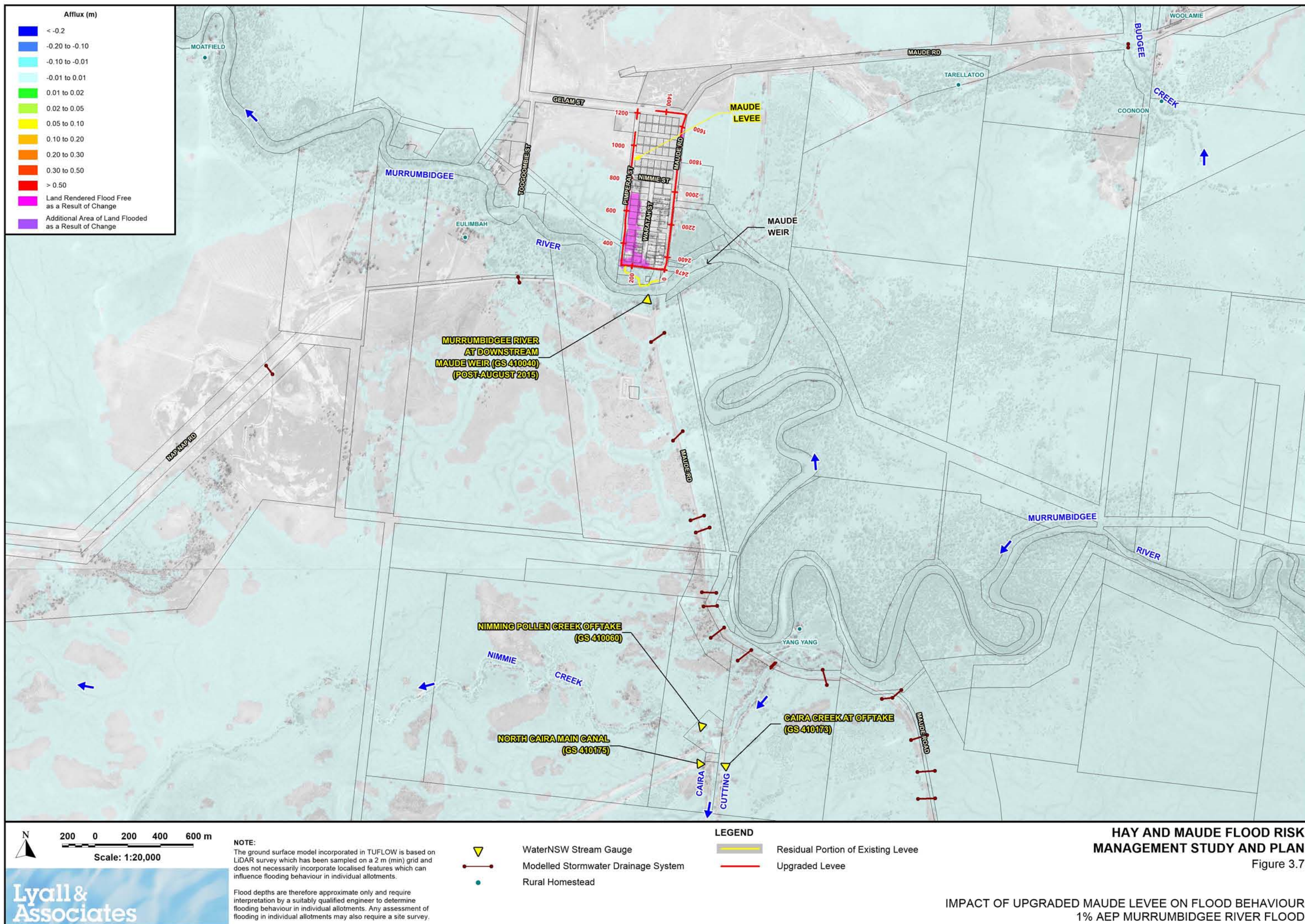
Lyall & Associates



HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure 3.6

LONGITUDINAL SECTION ALONG CREST OF UPGRADED MAUDE LEVEE

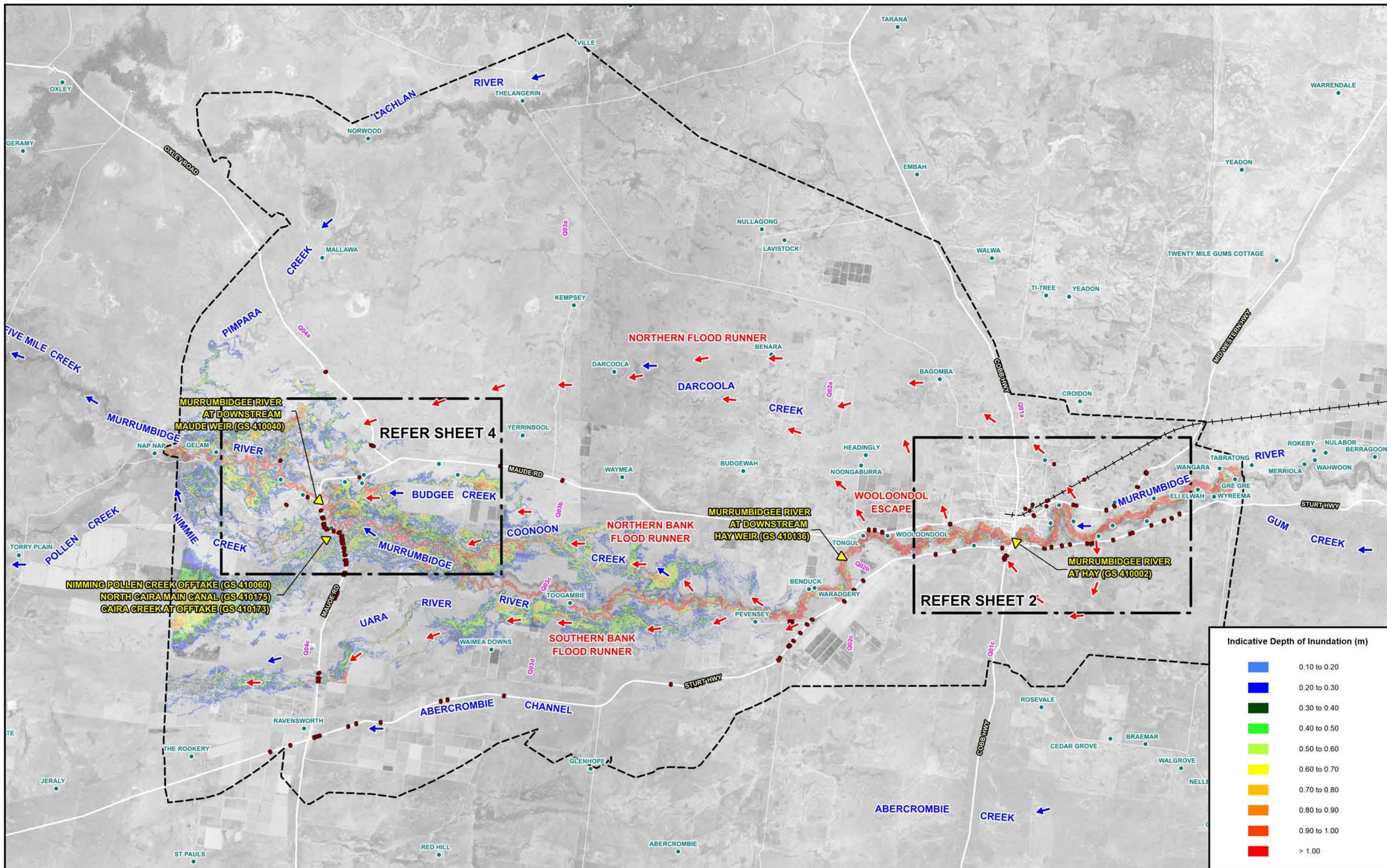


APPENDIX D

FIGURES SHOWING DESIGN MURRUMBIDGEE RIVER FLOOD BEHAVIOUR AT HAY AND MAUDE

LIST OF FIGURES (APPENDIX D)

- D1.1 Indicative Extent and Depths of Inundation – 20% AEP Murrumbidgee River Flood (5 Sheets)
- D1.2 Indicative Extent and Depths of Inundation – 10% AEP Murrumbidgee River Flood (5 Sheets)
- D1.3 Indicative Extent and Depths of Inundation – 5% AEP Murrumbidgee River Flood (7 Sheets)
- D1.4 Indicative Extent and Depths of Inundation – 2% AEP Murrumbidgee River Flood (7 Sheets)
- D1.5 Indicative Extent and Depths of Inundation – 0.5% AEP Murrumbidgee River Flood (8 Sheets)
- D1.6 Indicative Extent and Depths of Inundation – 0.2% AEP Murrumbidgee River Flood (8 Sheets)



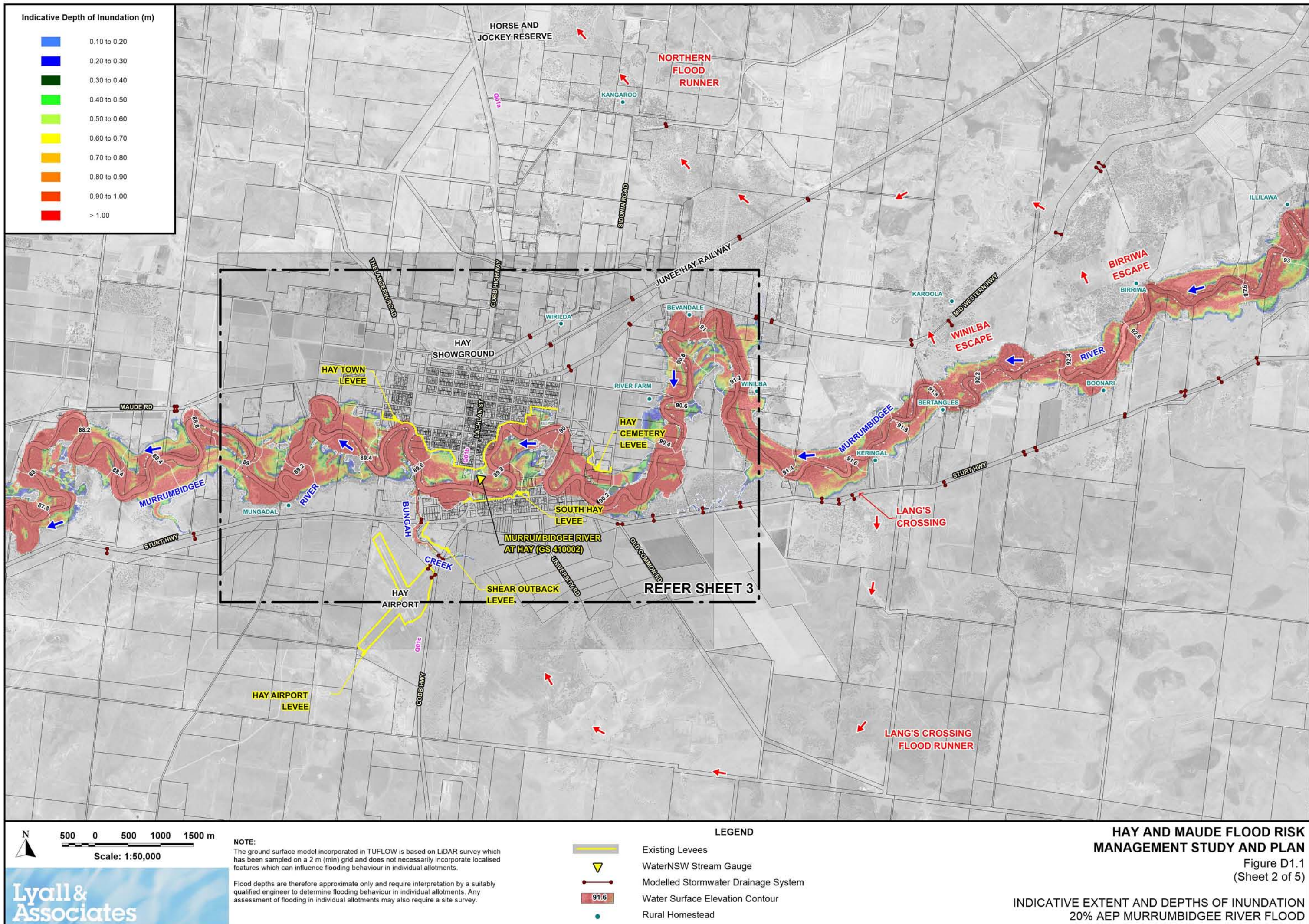
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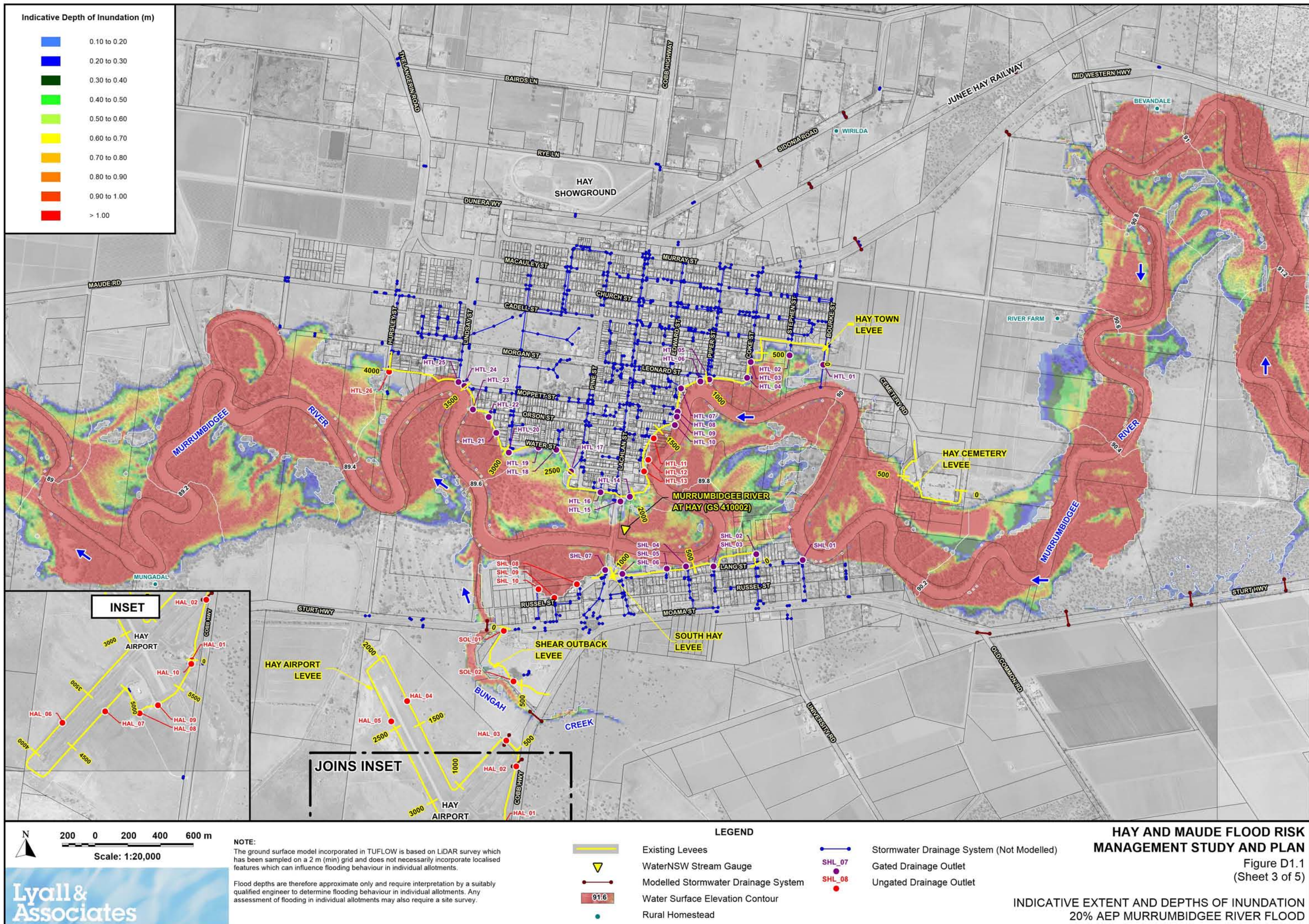
Lyall & Associates

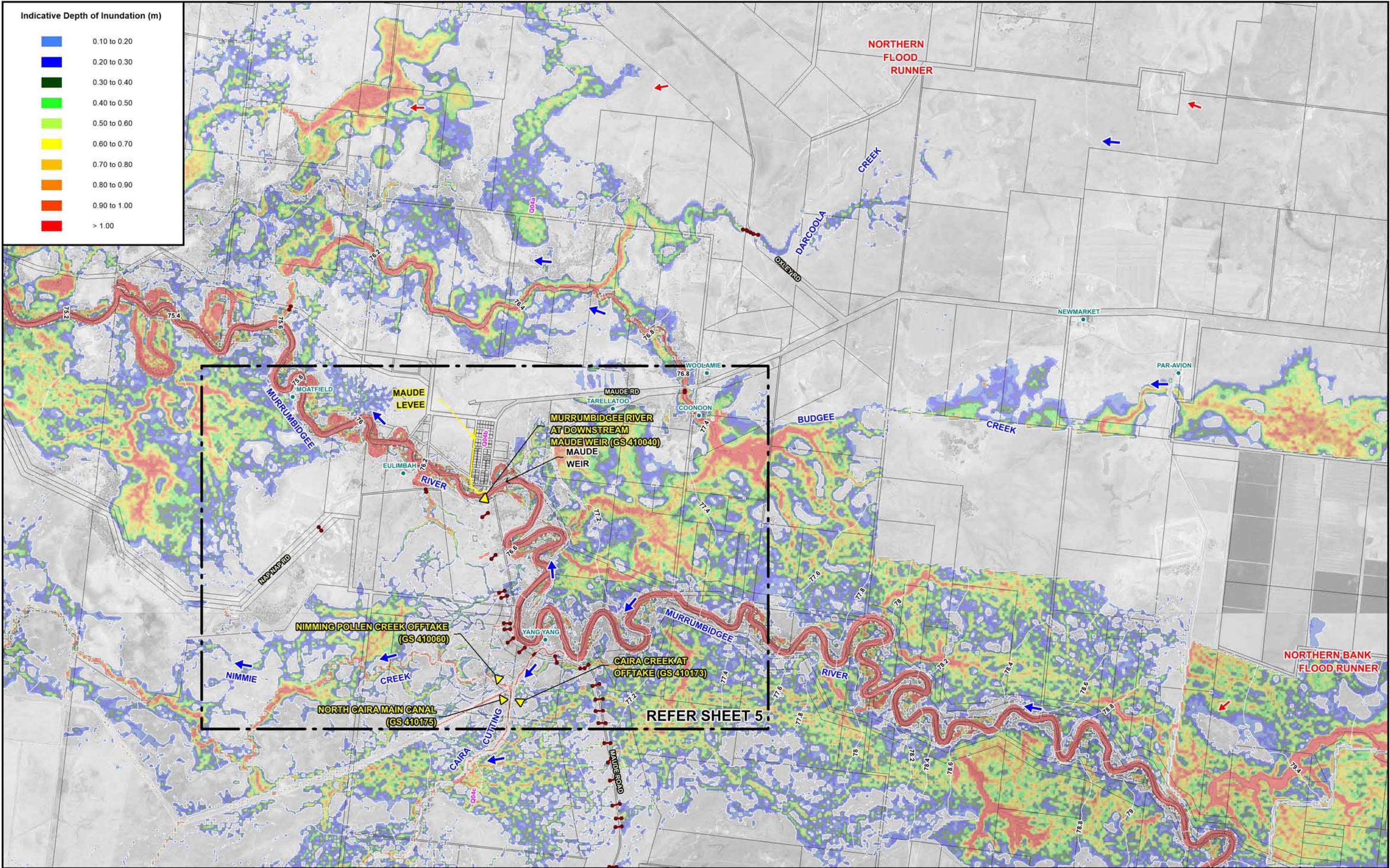
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure D1.1
(Sheet 1 of 5)

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
20% AEP MURRUMBIDGEE RIVER FLOOD







Indicative Depth of Inundation (m)

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

NOTE:

The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

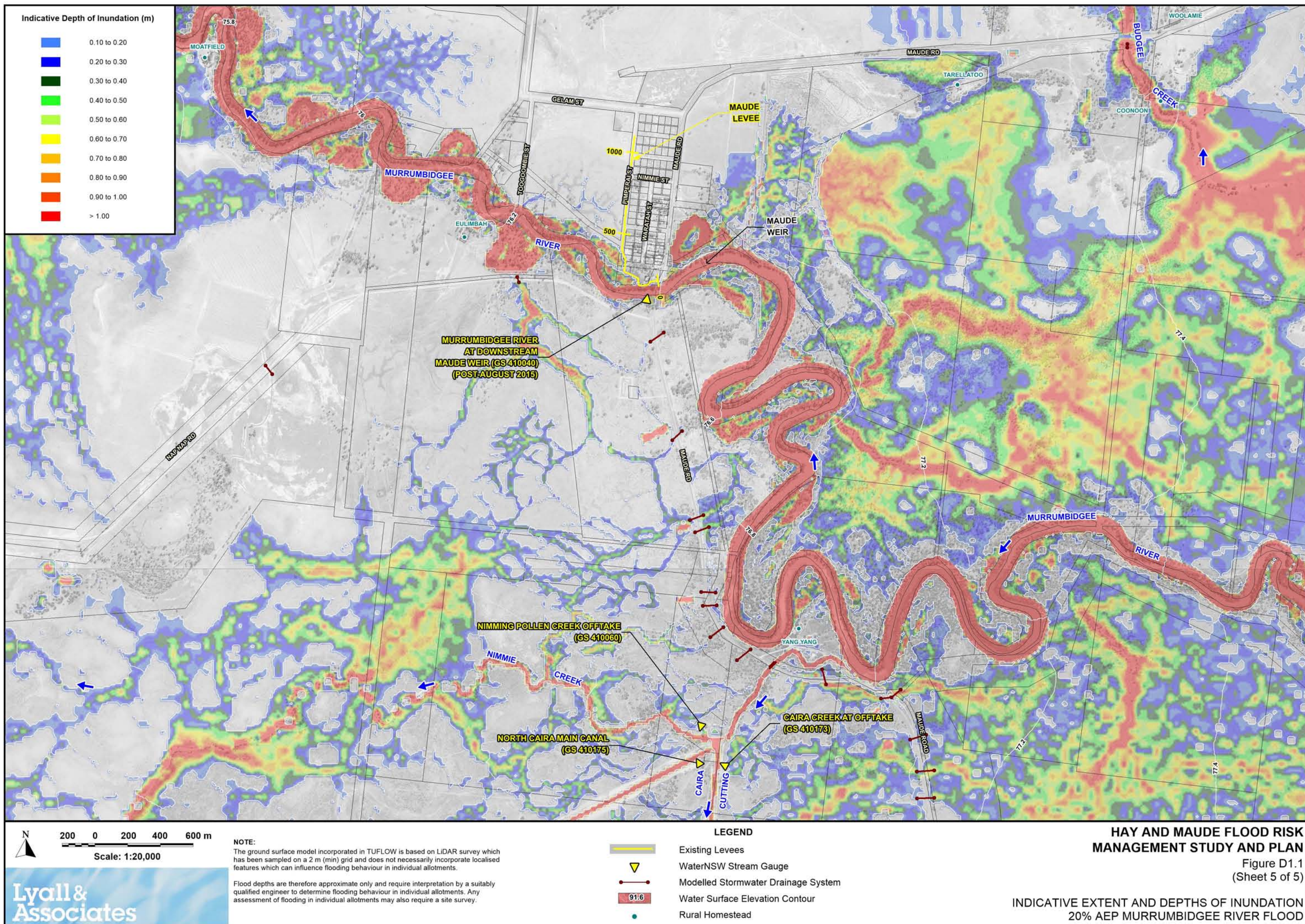
LEGEND

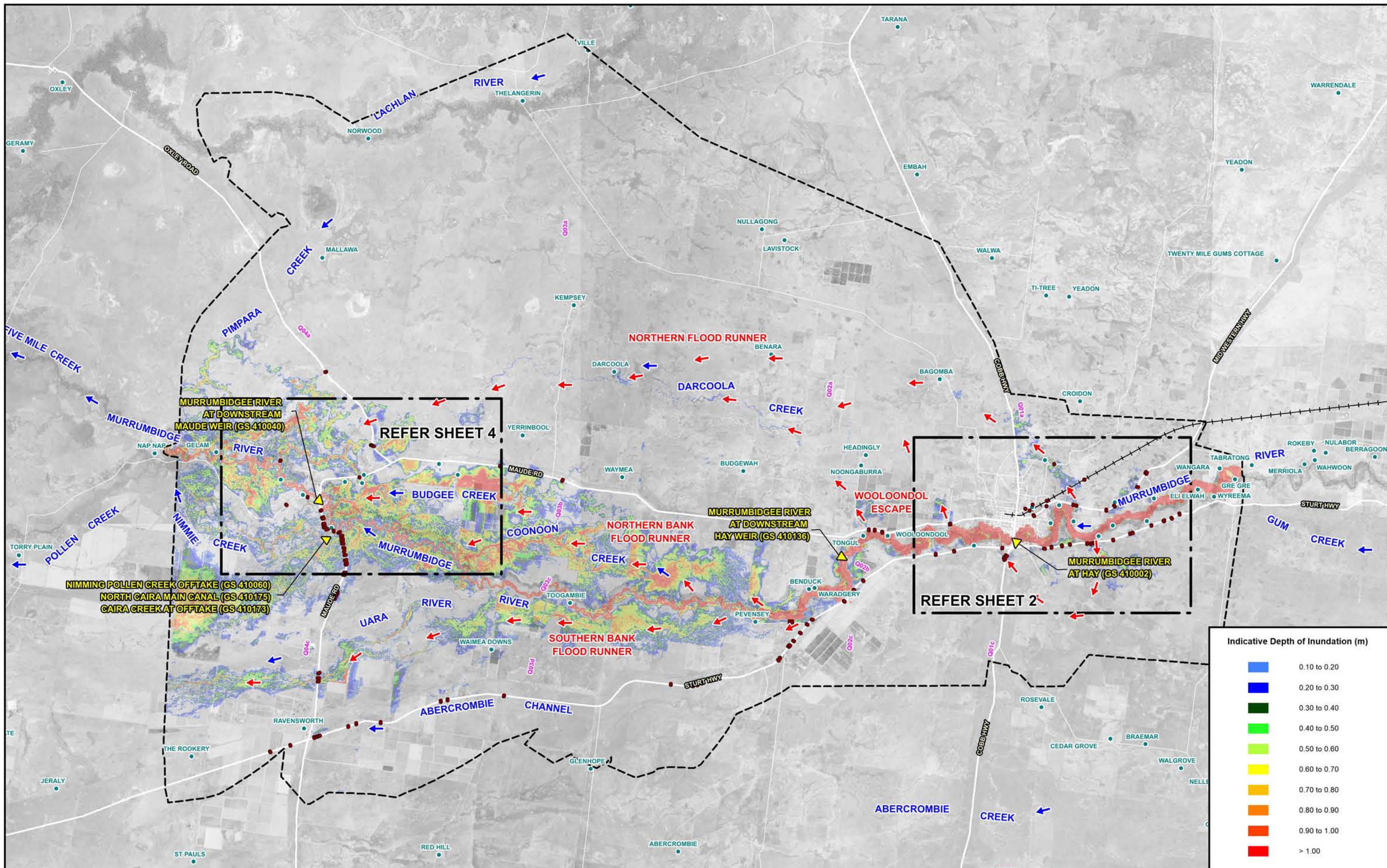
Existing Levees
WaterNSW Stream Gauge
Modelled Stormwater Drainage System
Water Surface Elevation Contour
Rural Homestead

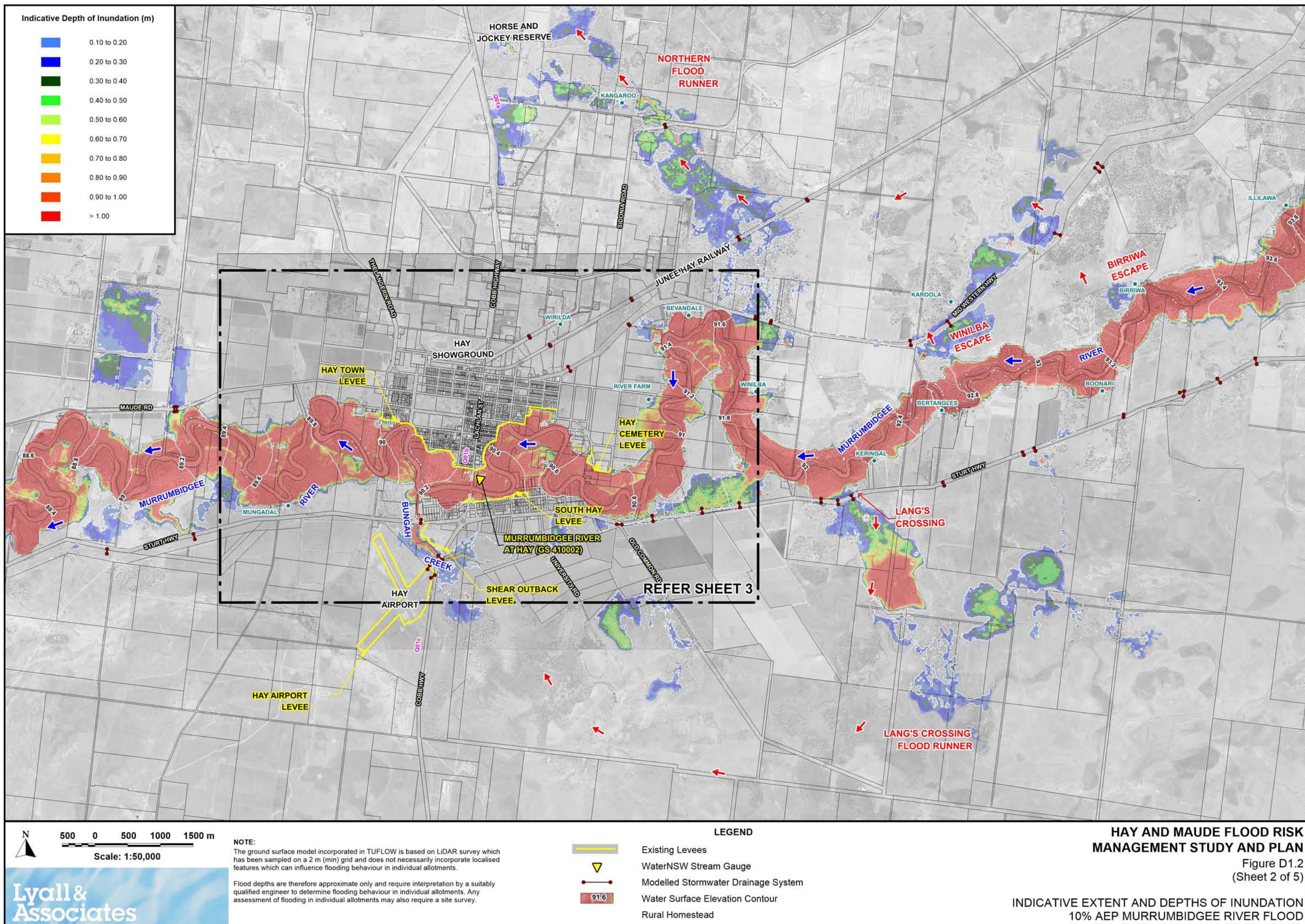
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

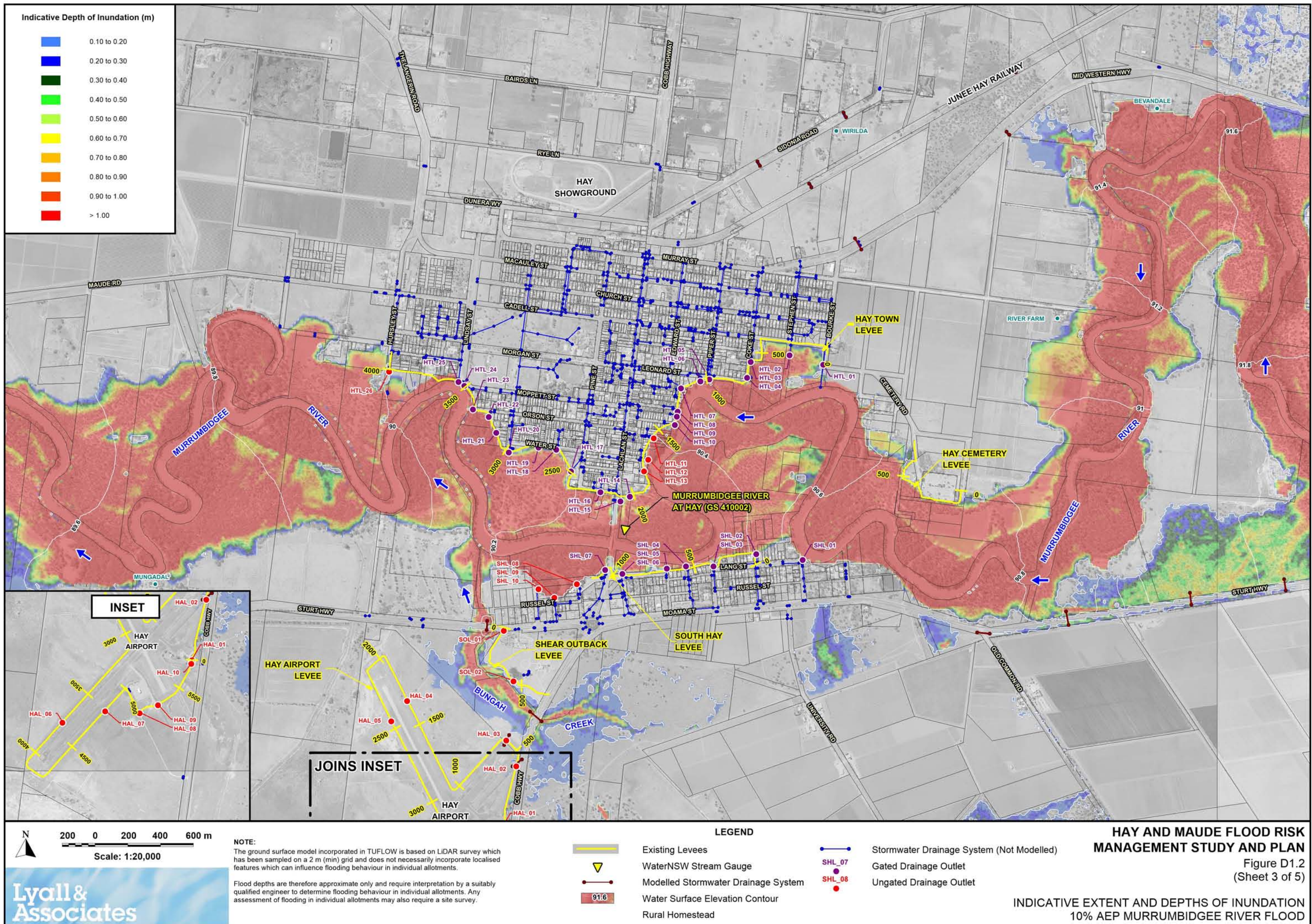
Figure D1.1
(Sheet 4 of 5)

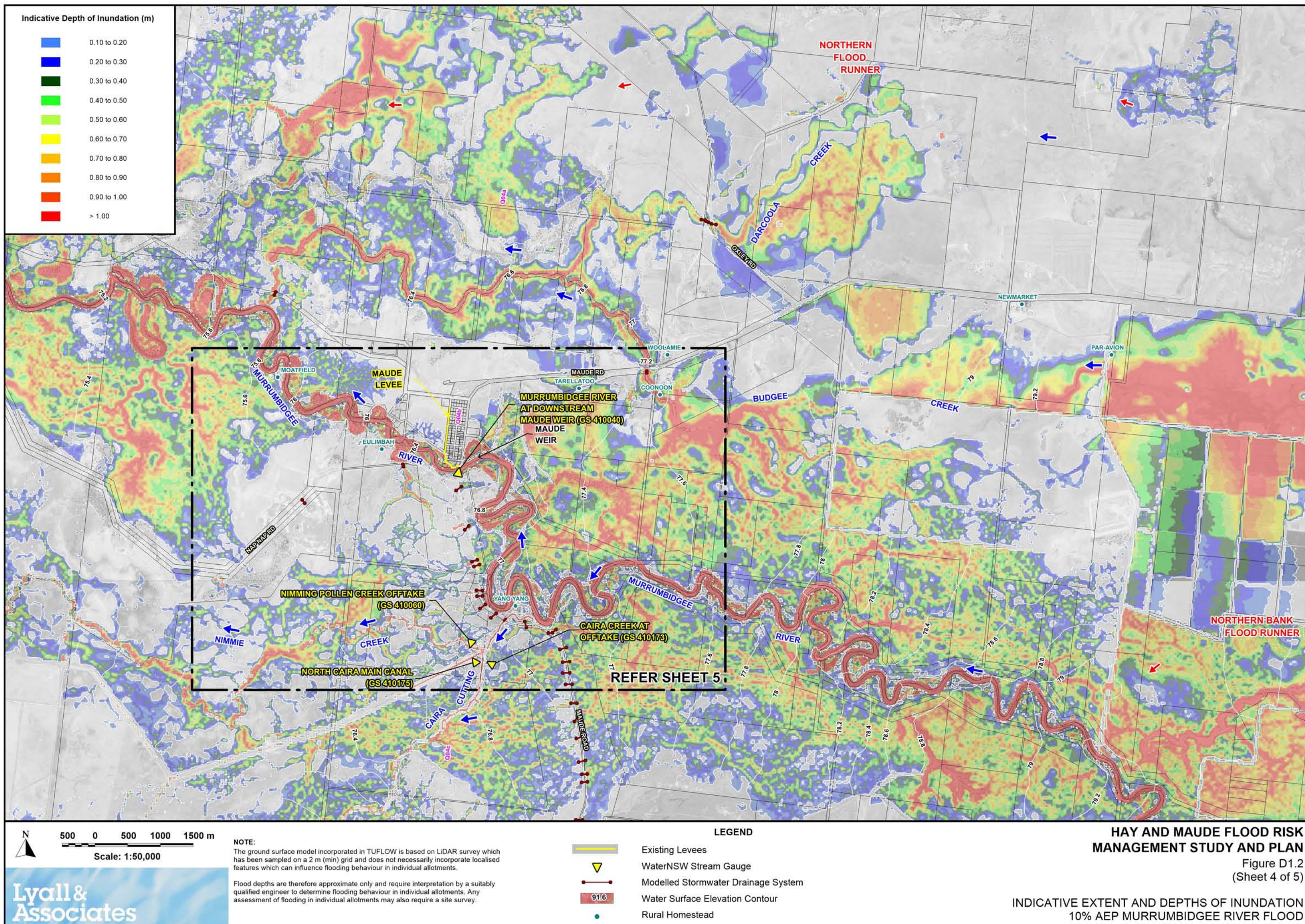
**INDICATIVE EXTENT AND DEPTHS OF INUNDATION
20% AEP MURRUMBIDGEE RIVER FLOOD**

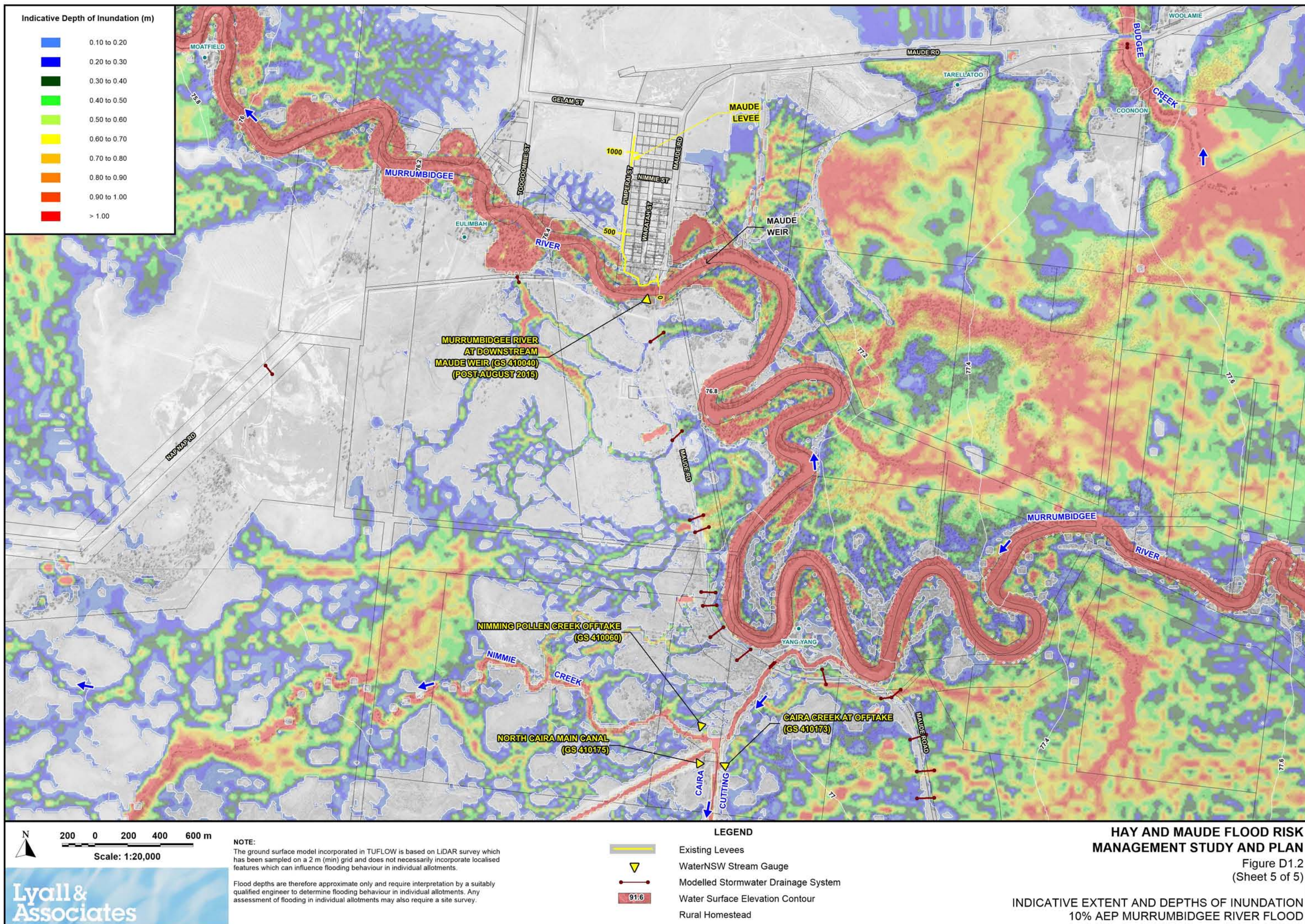


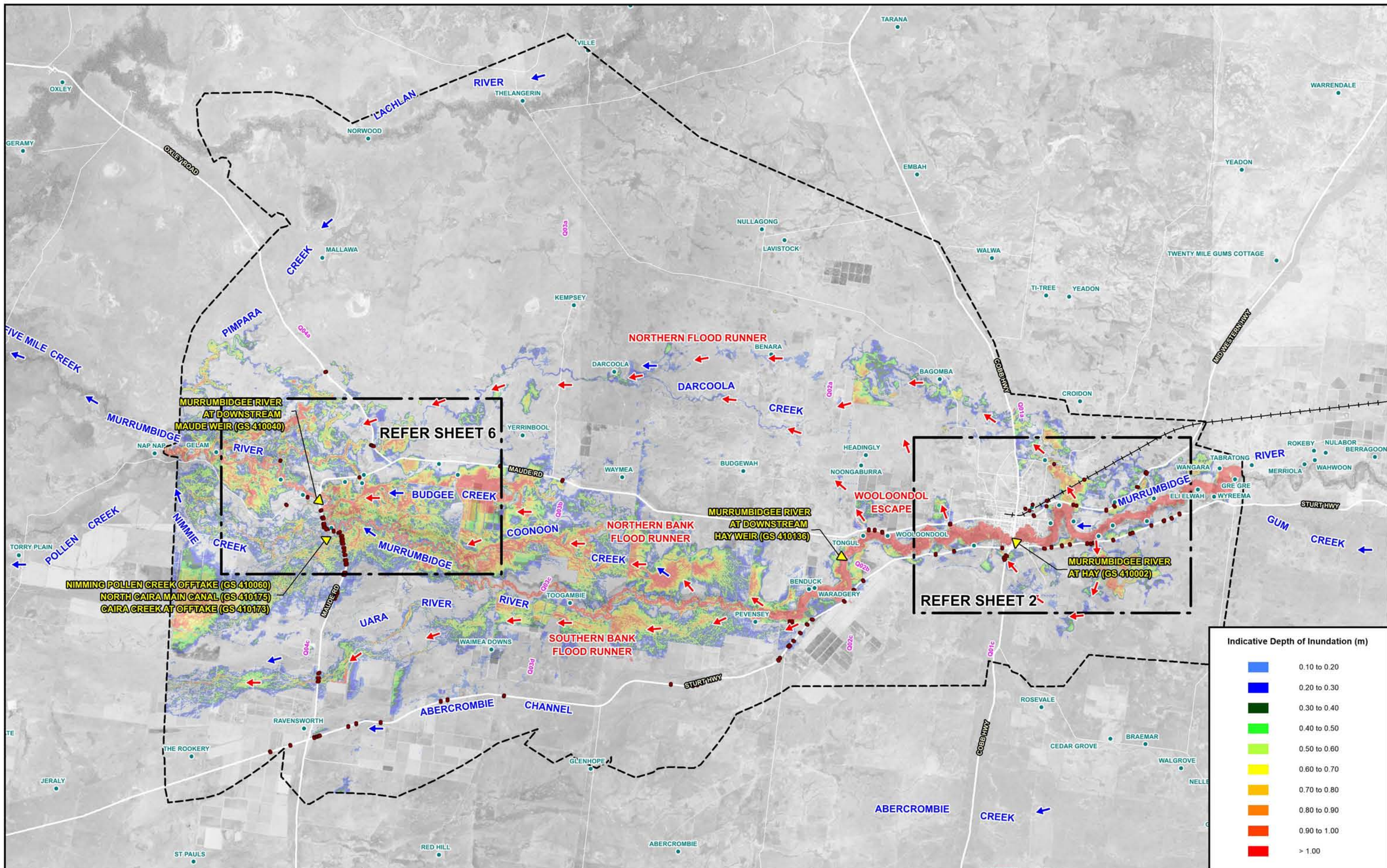


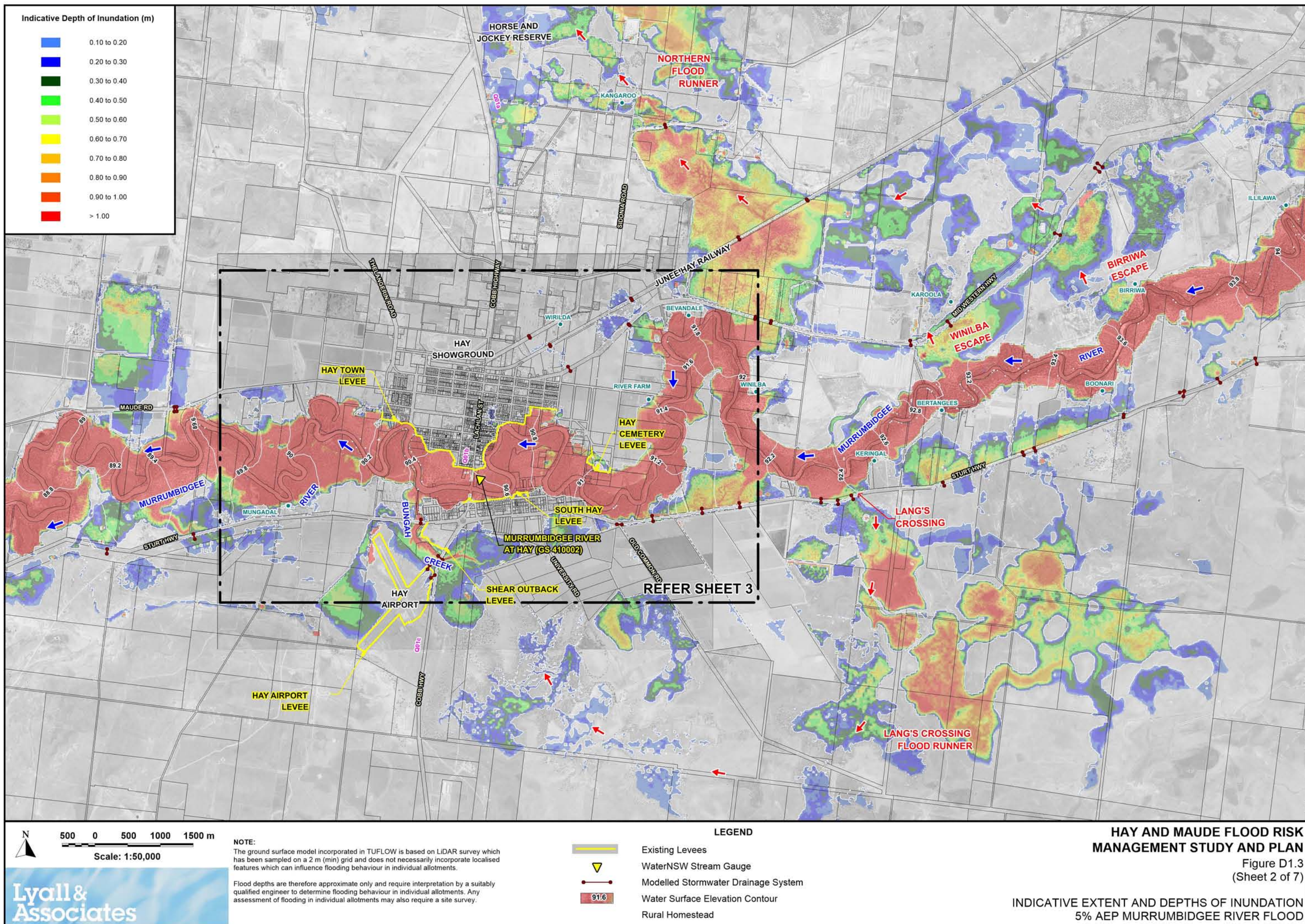


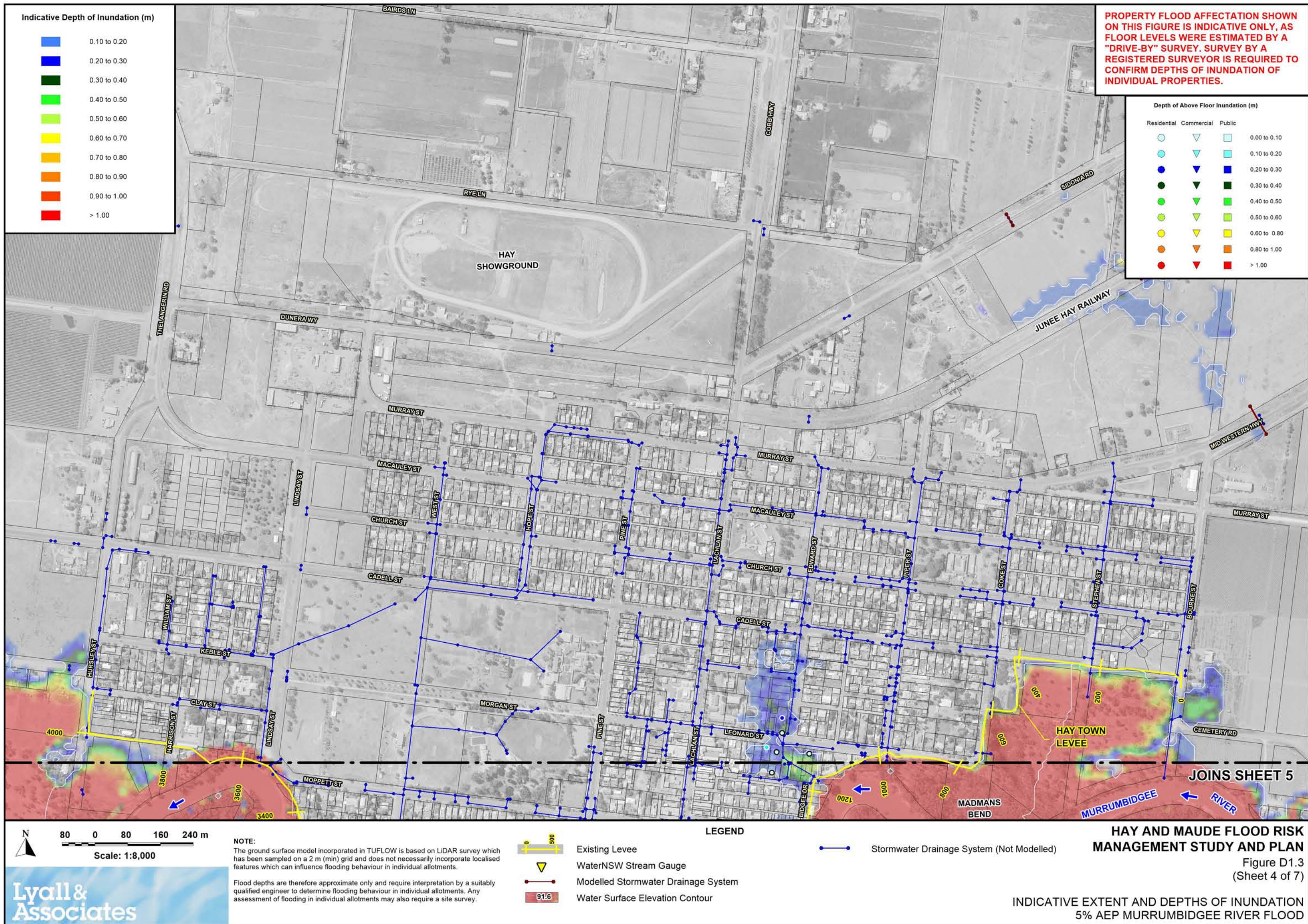


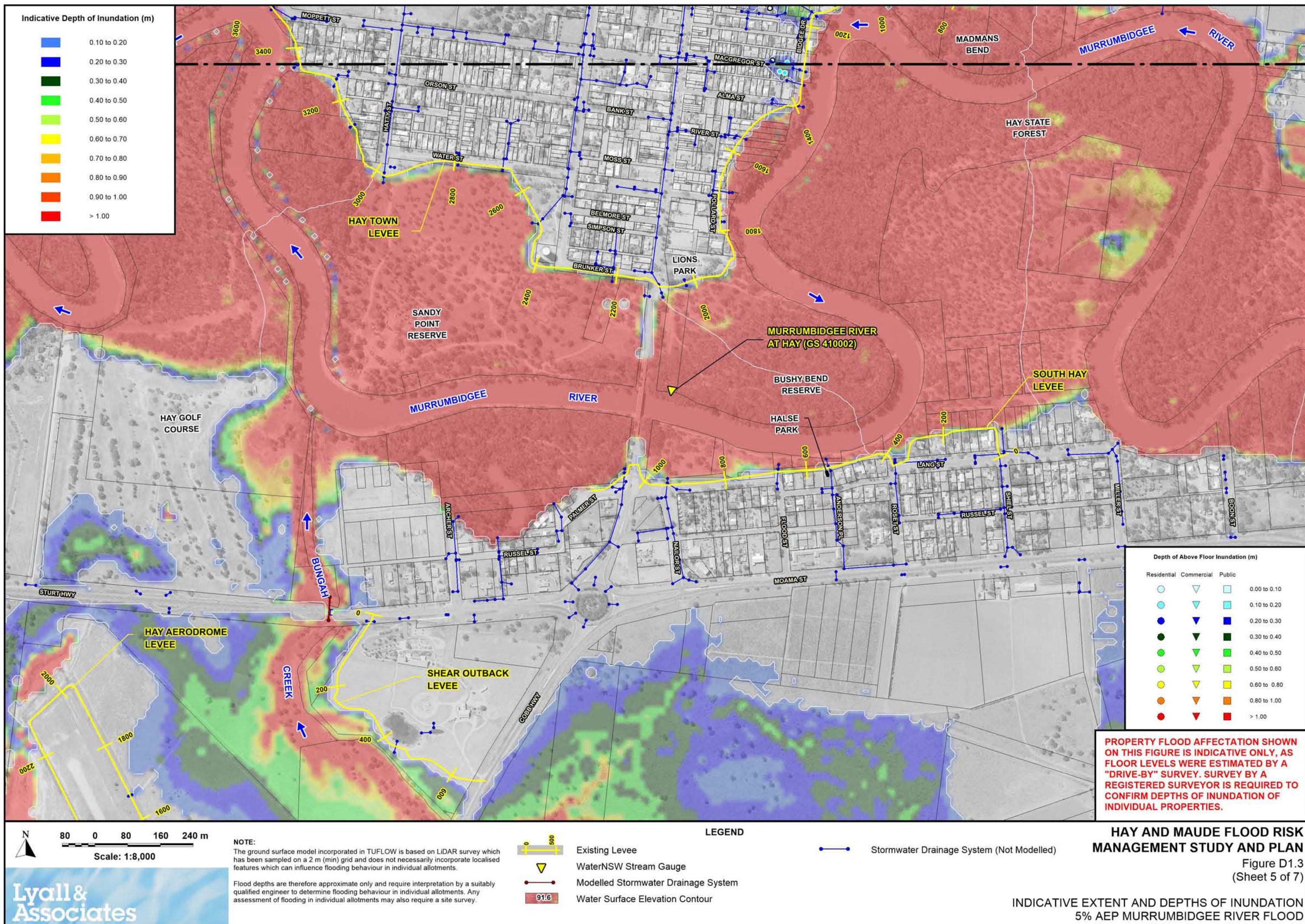


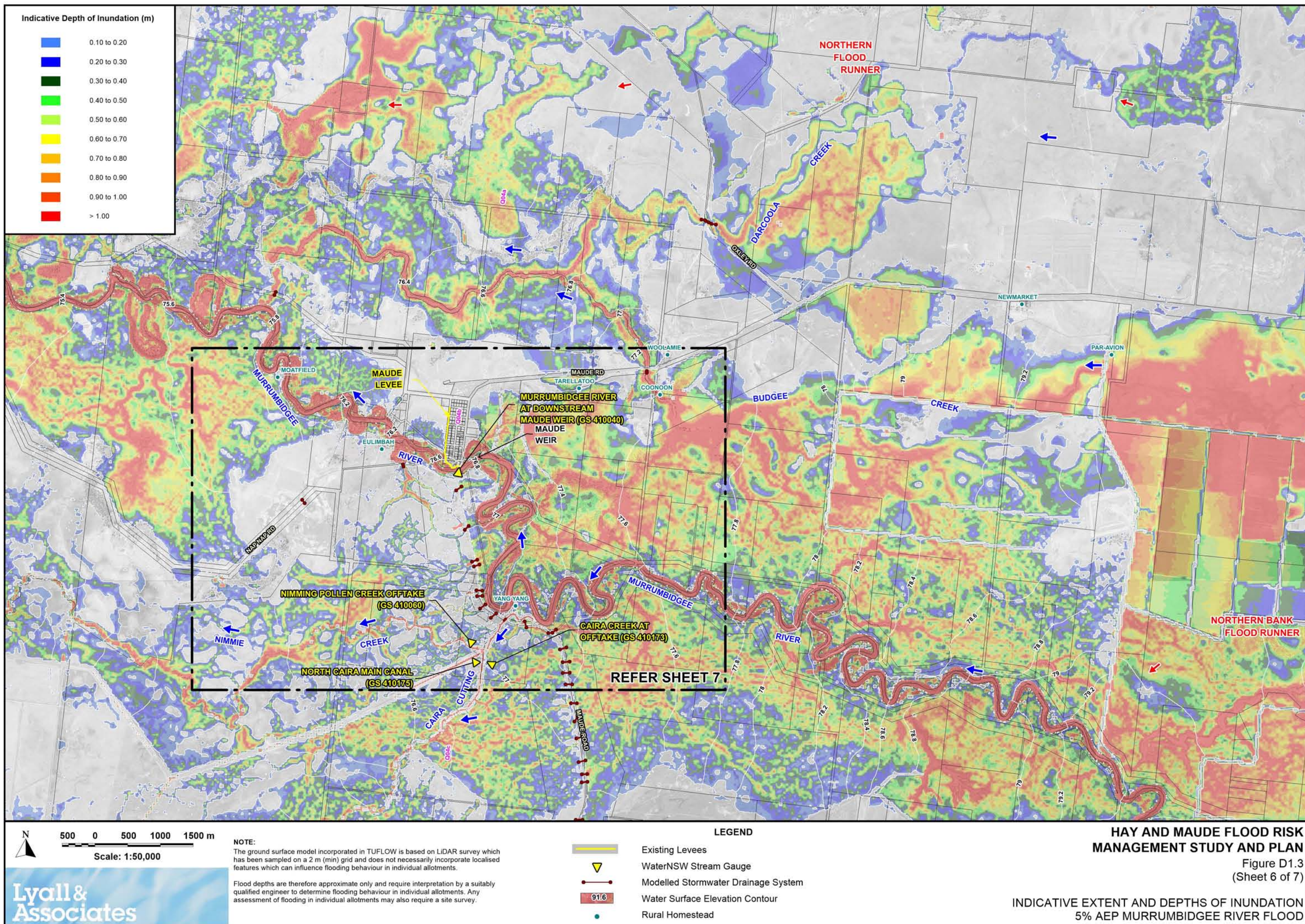


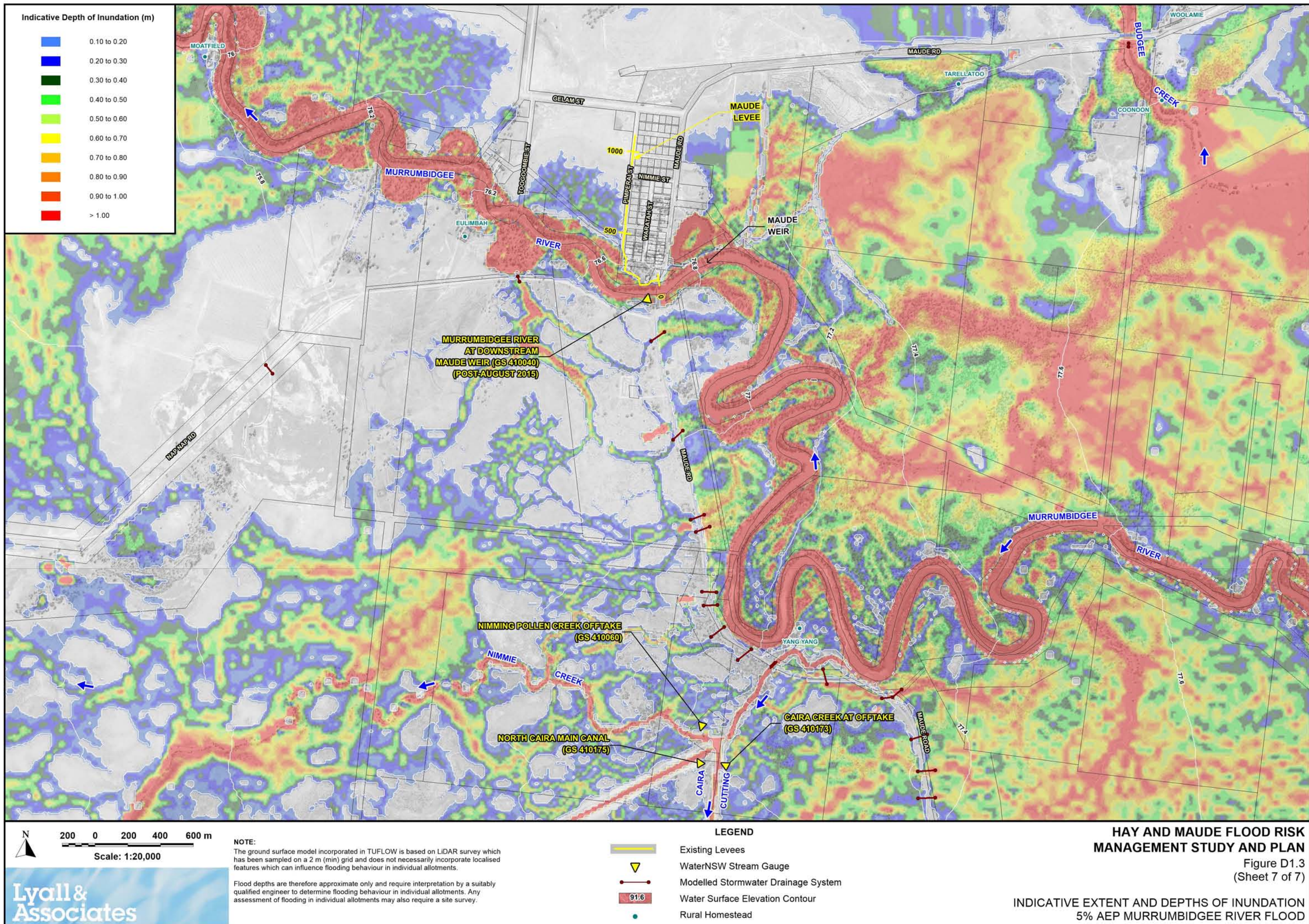


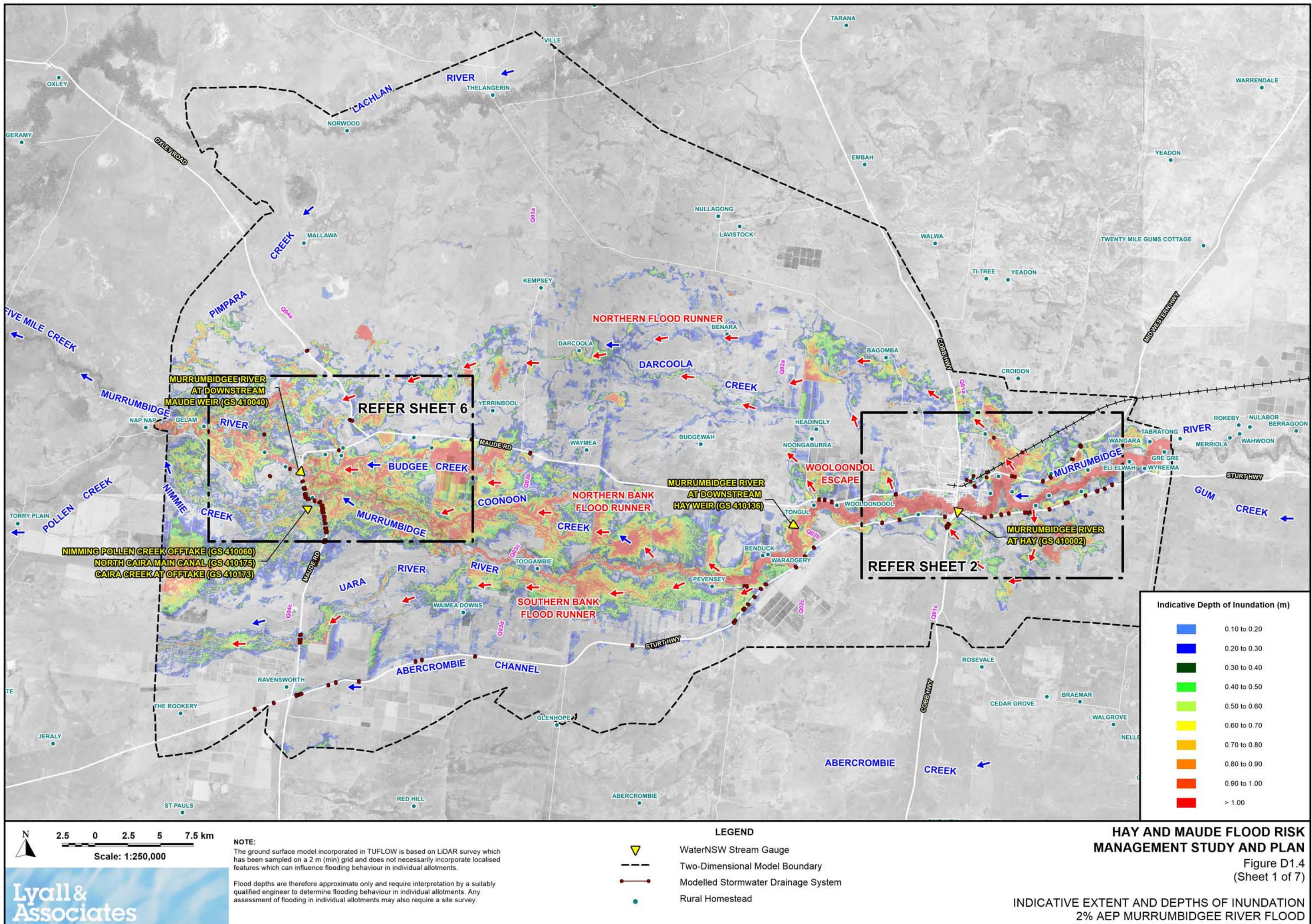


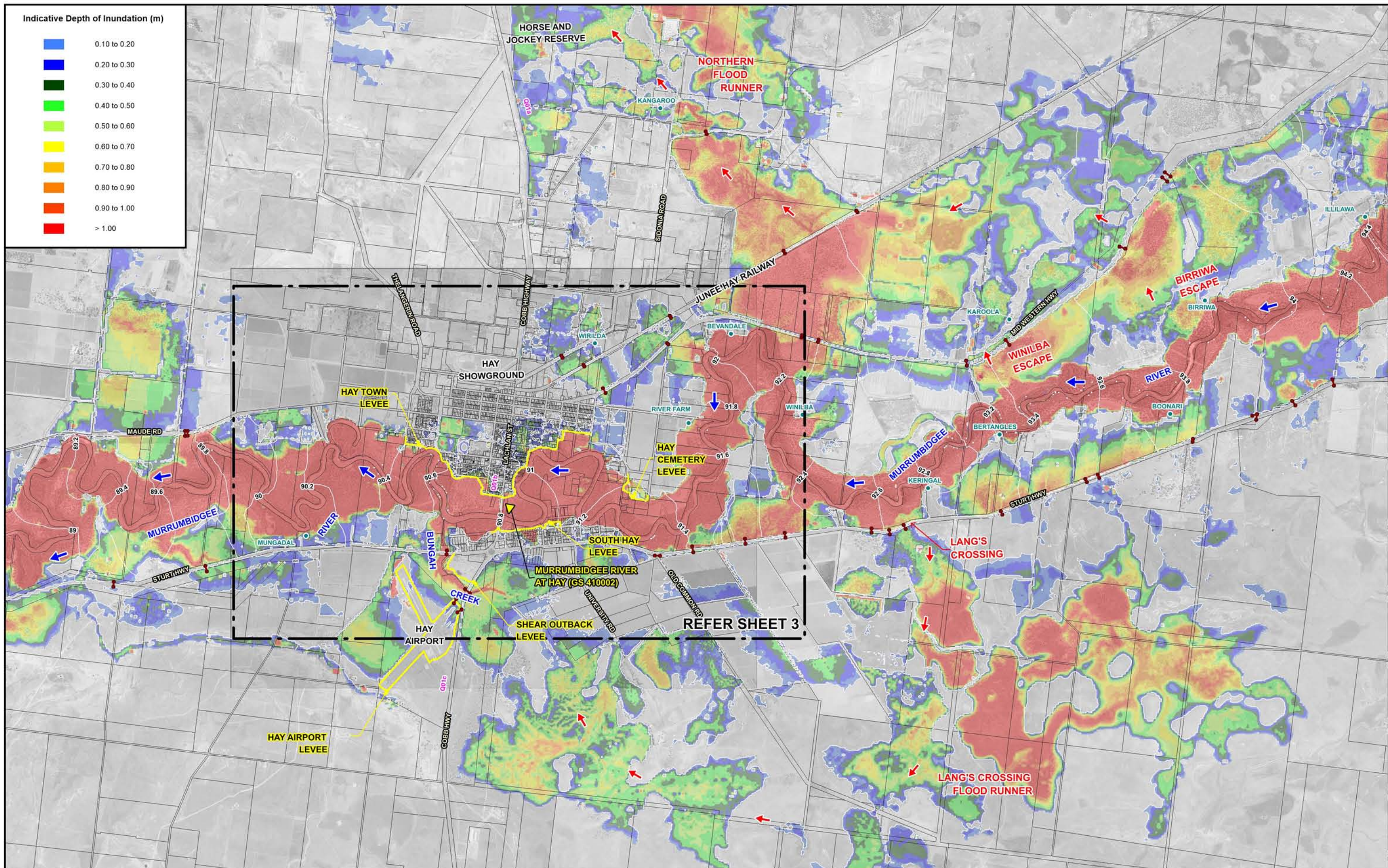


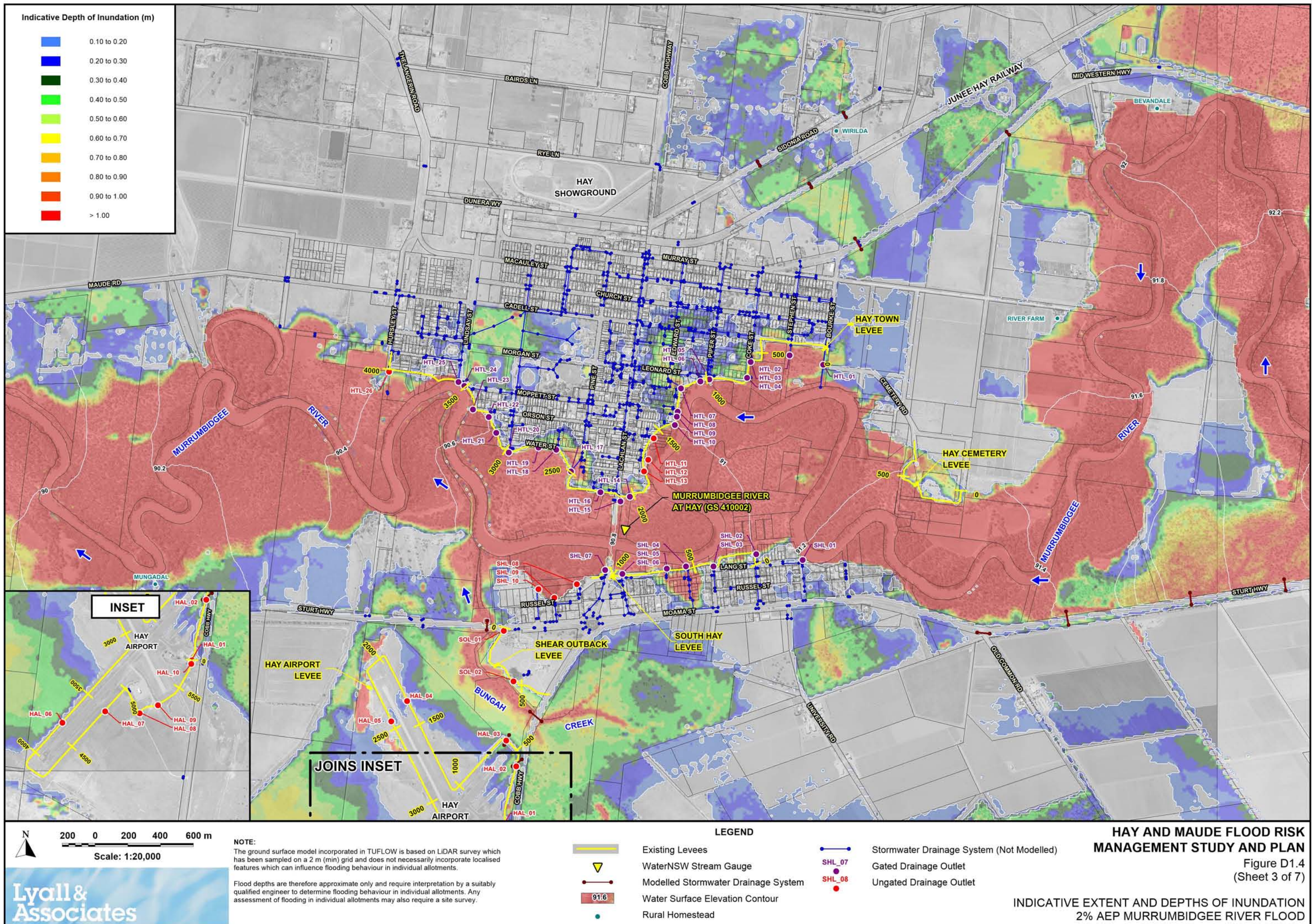


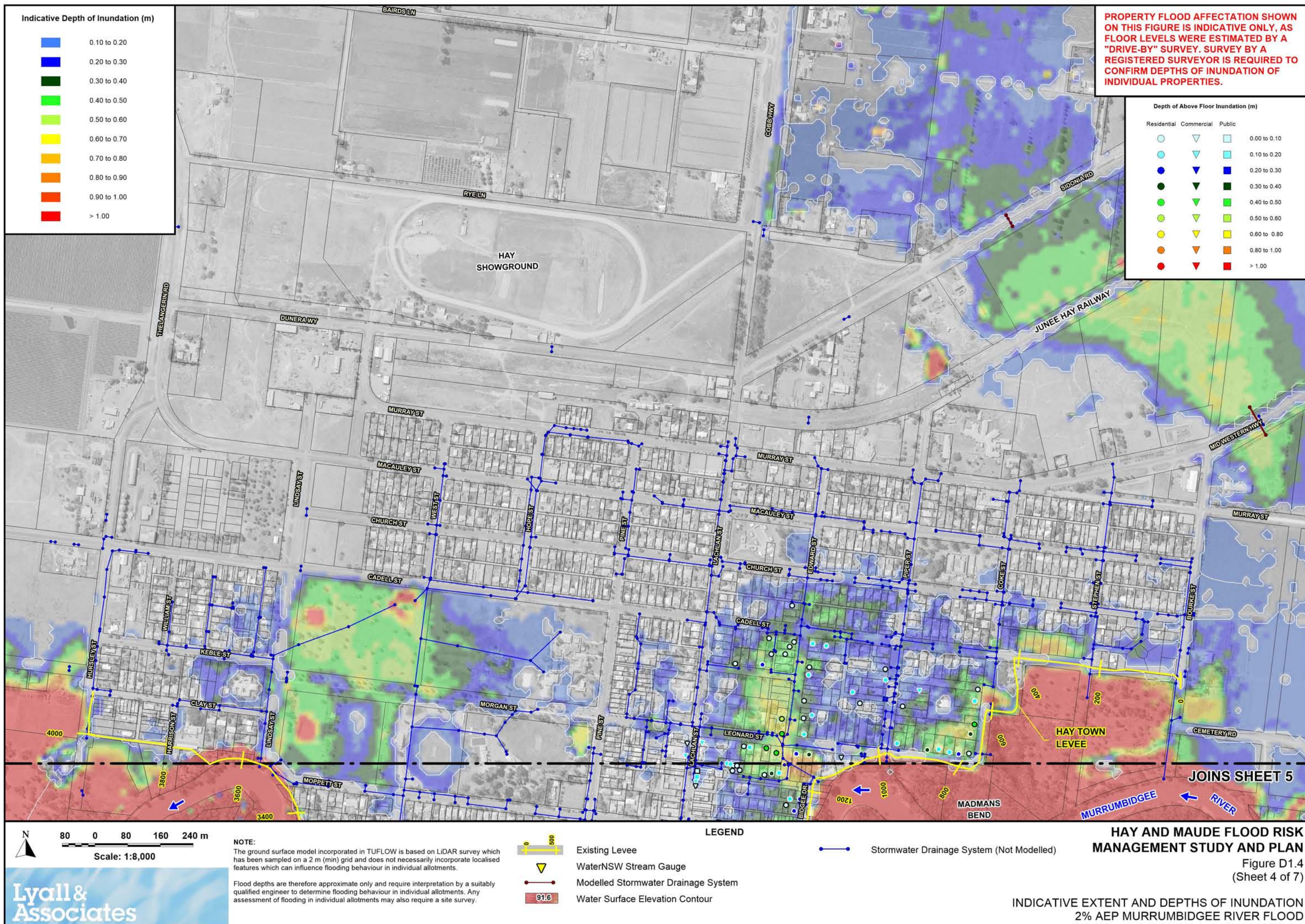


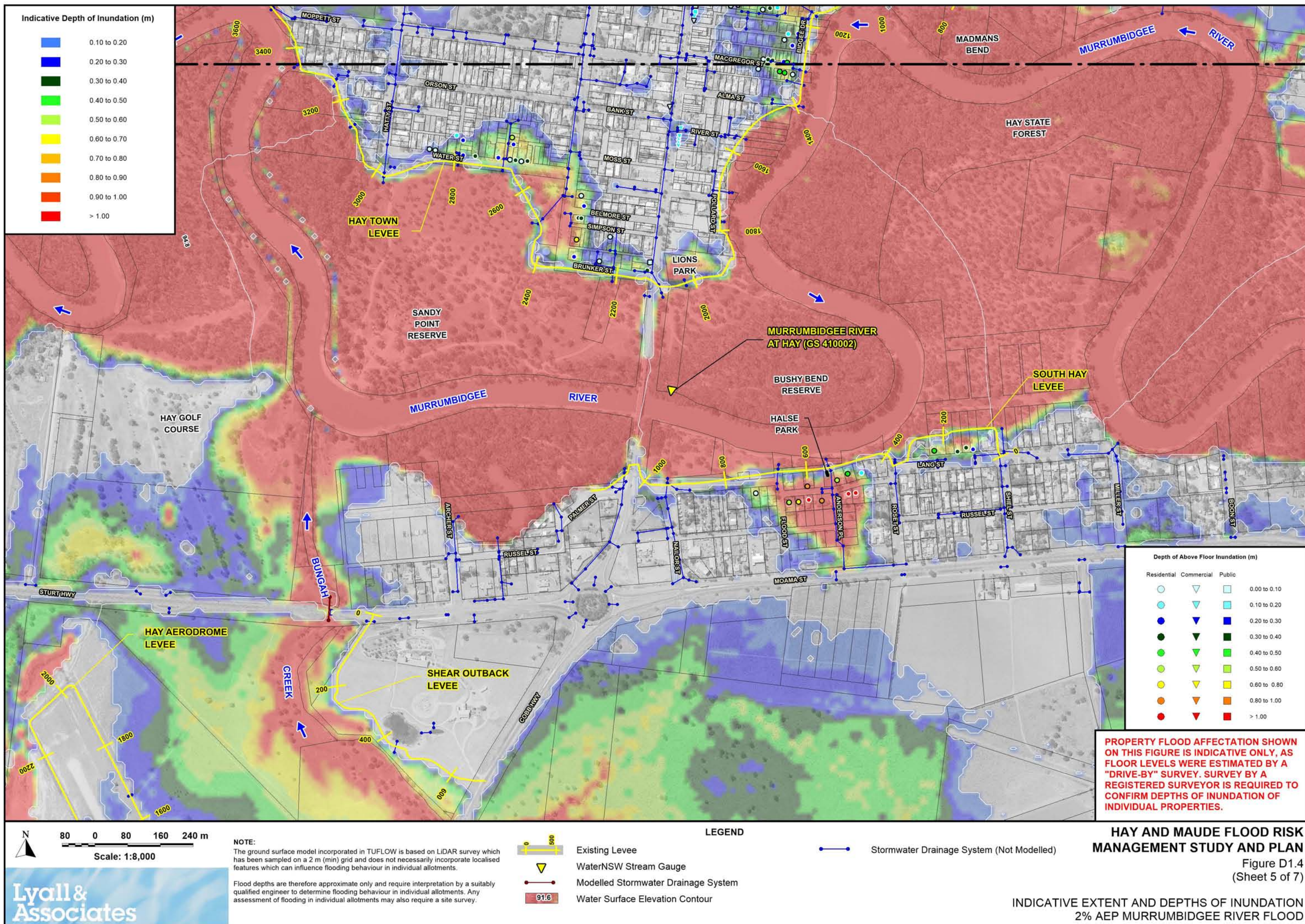


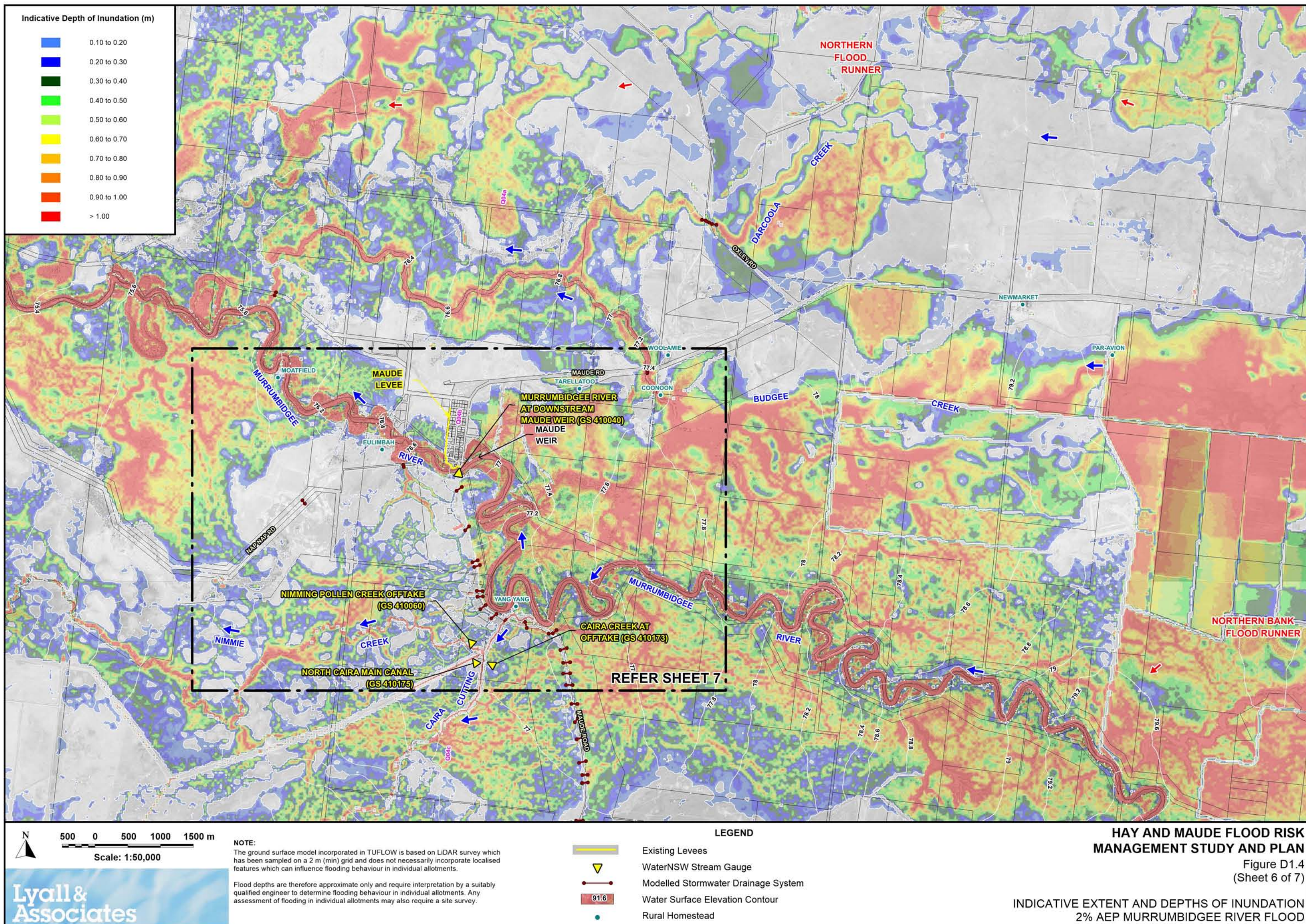


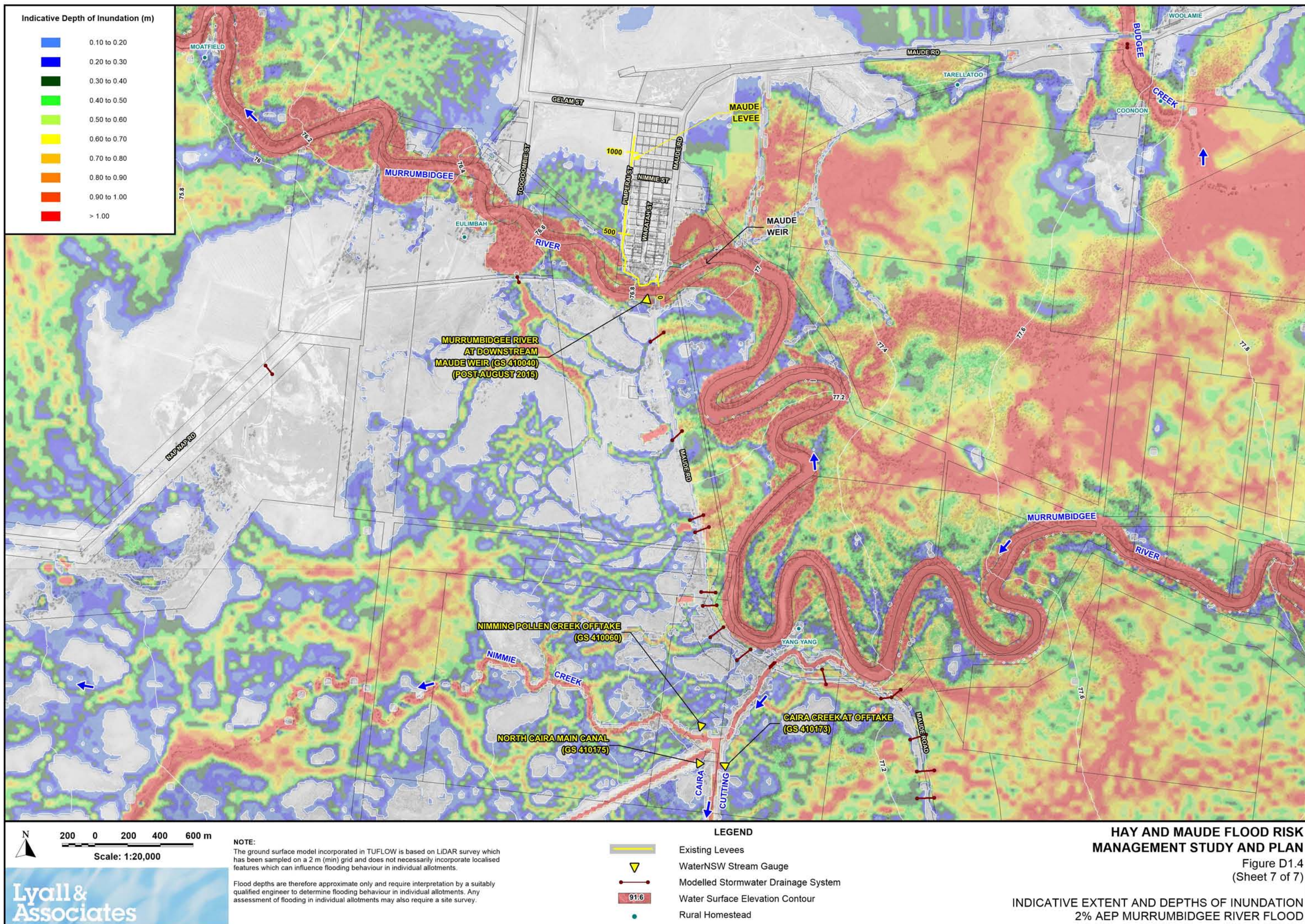


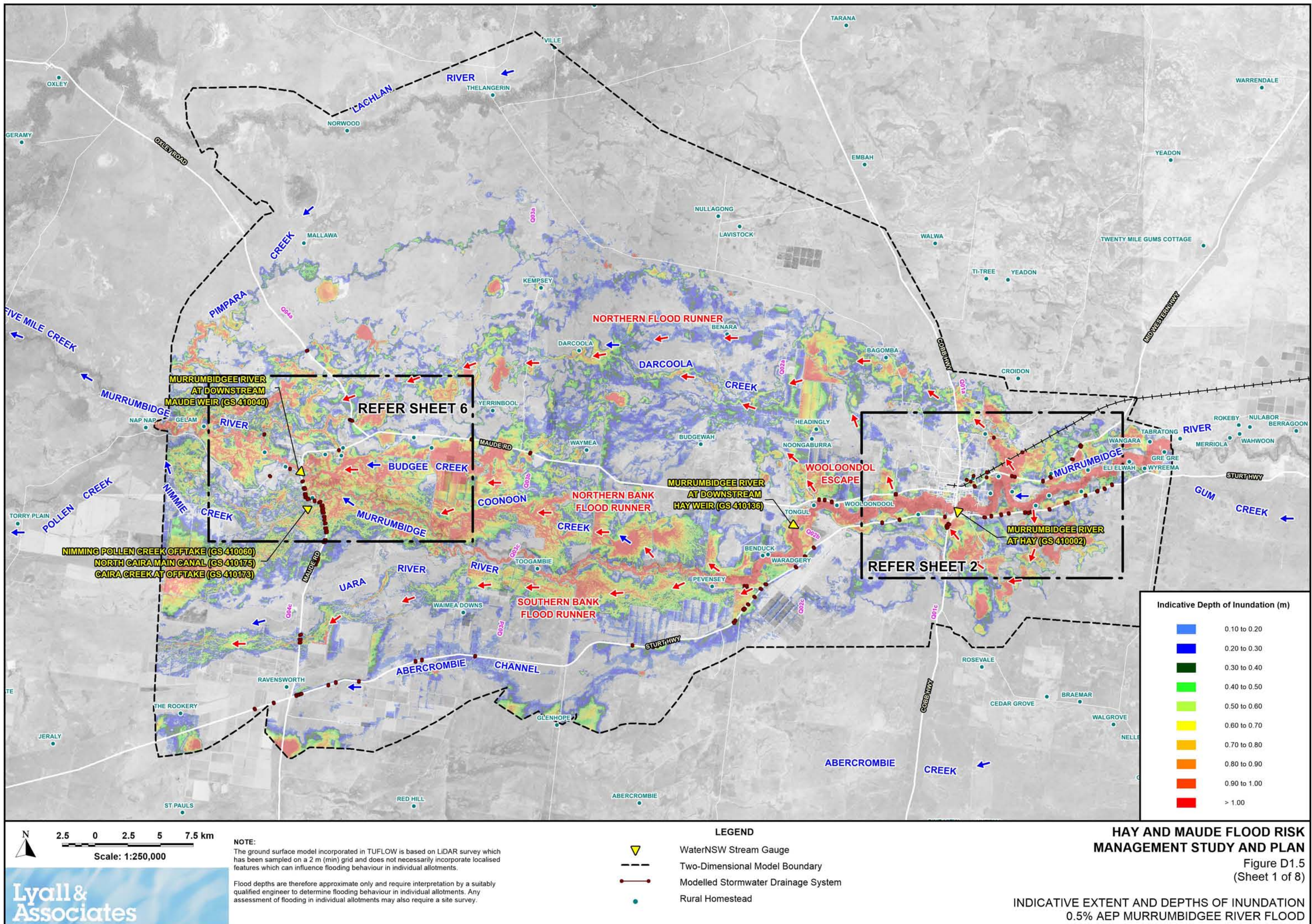


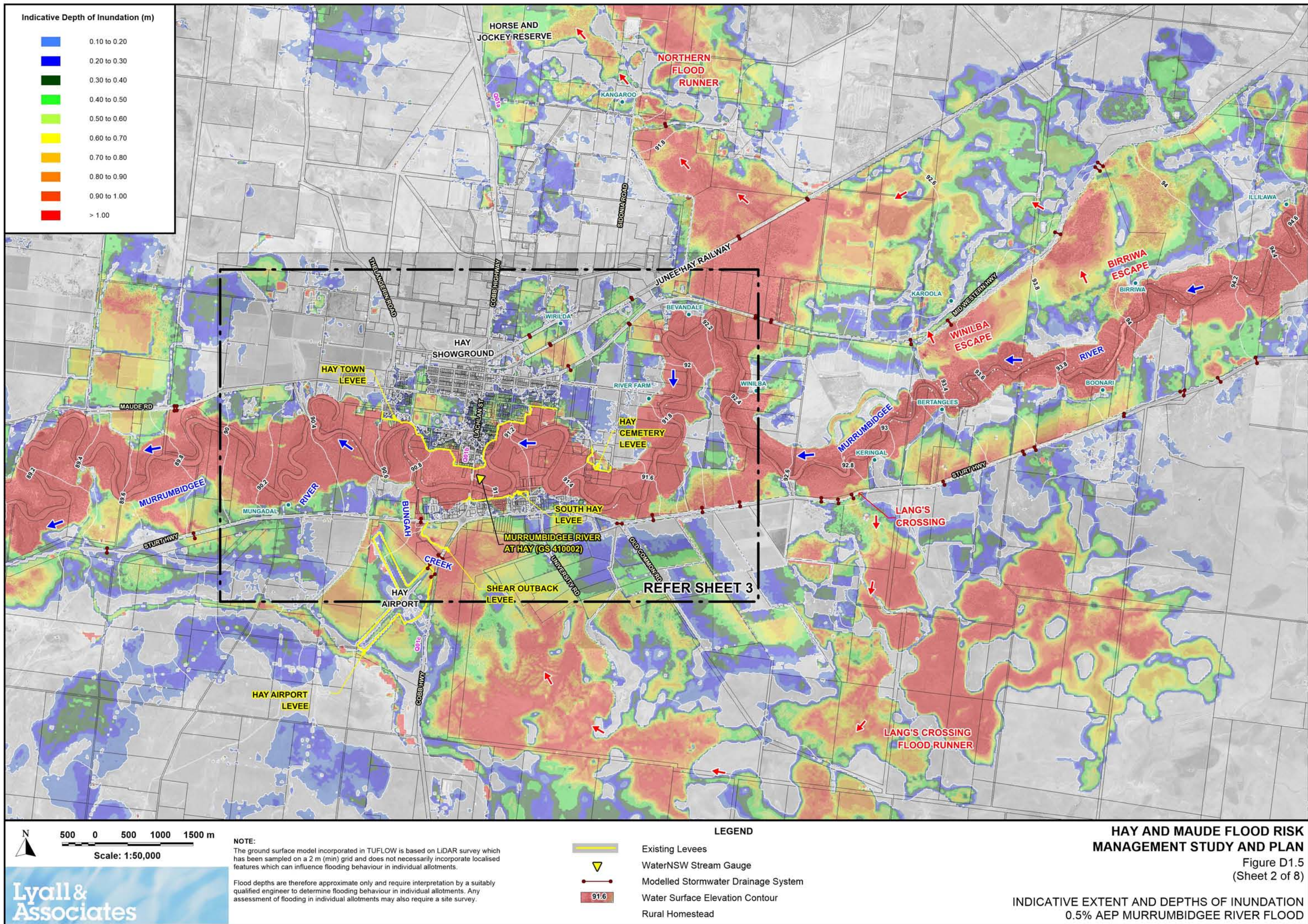


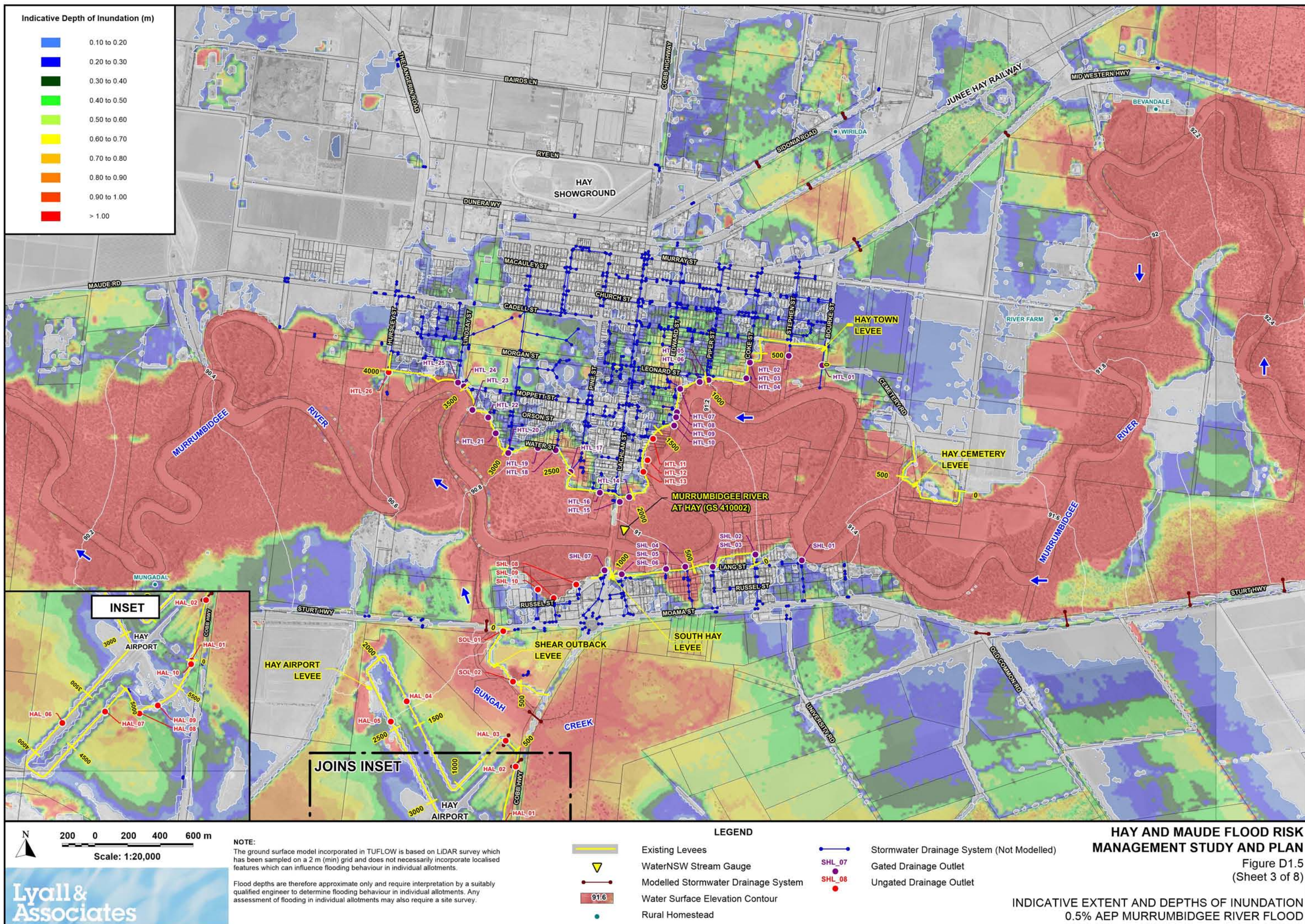


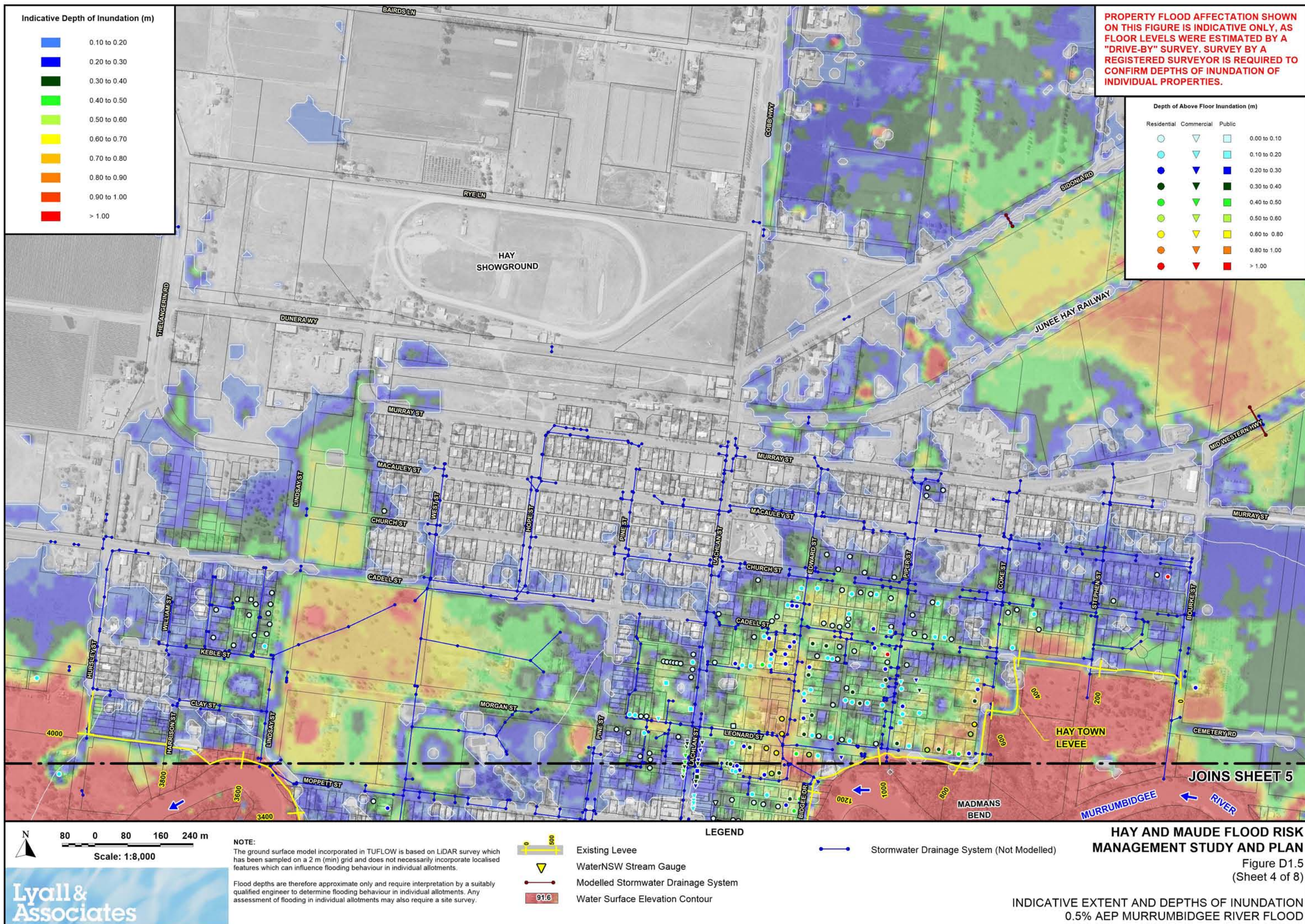


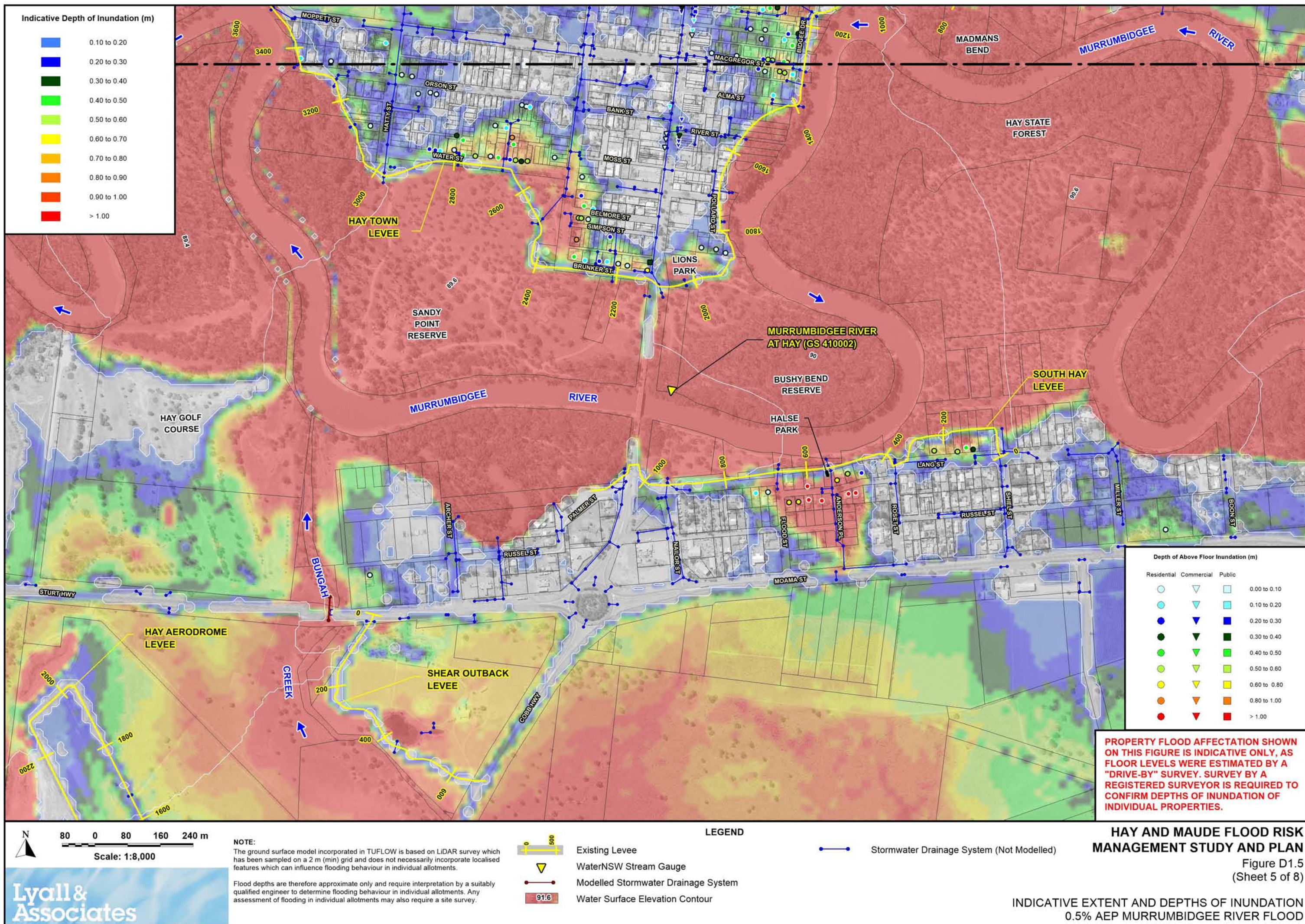


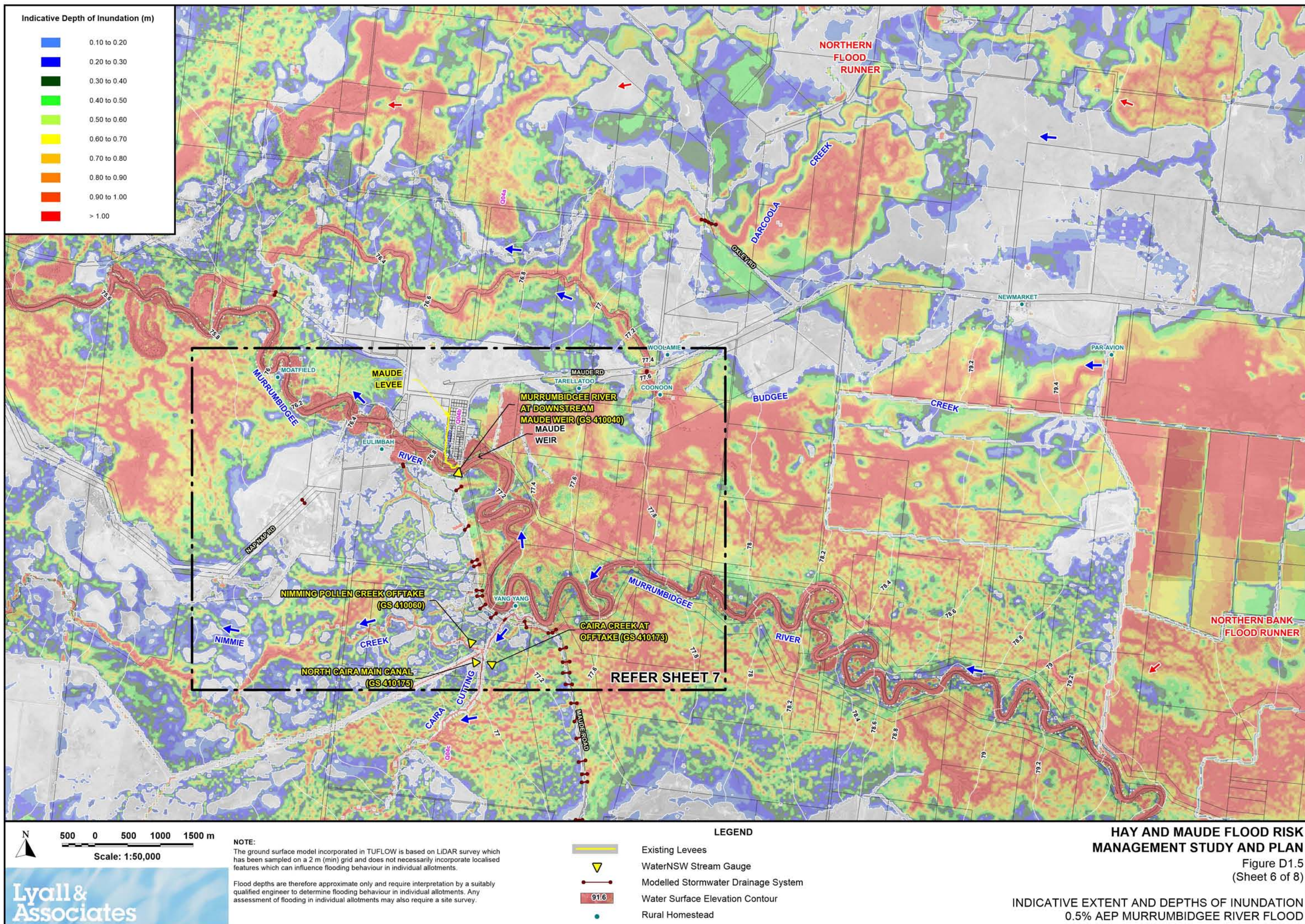


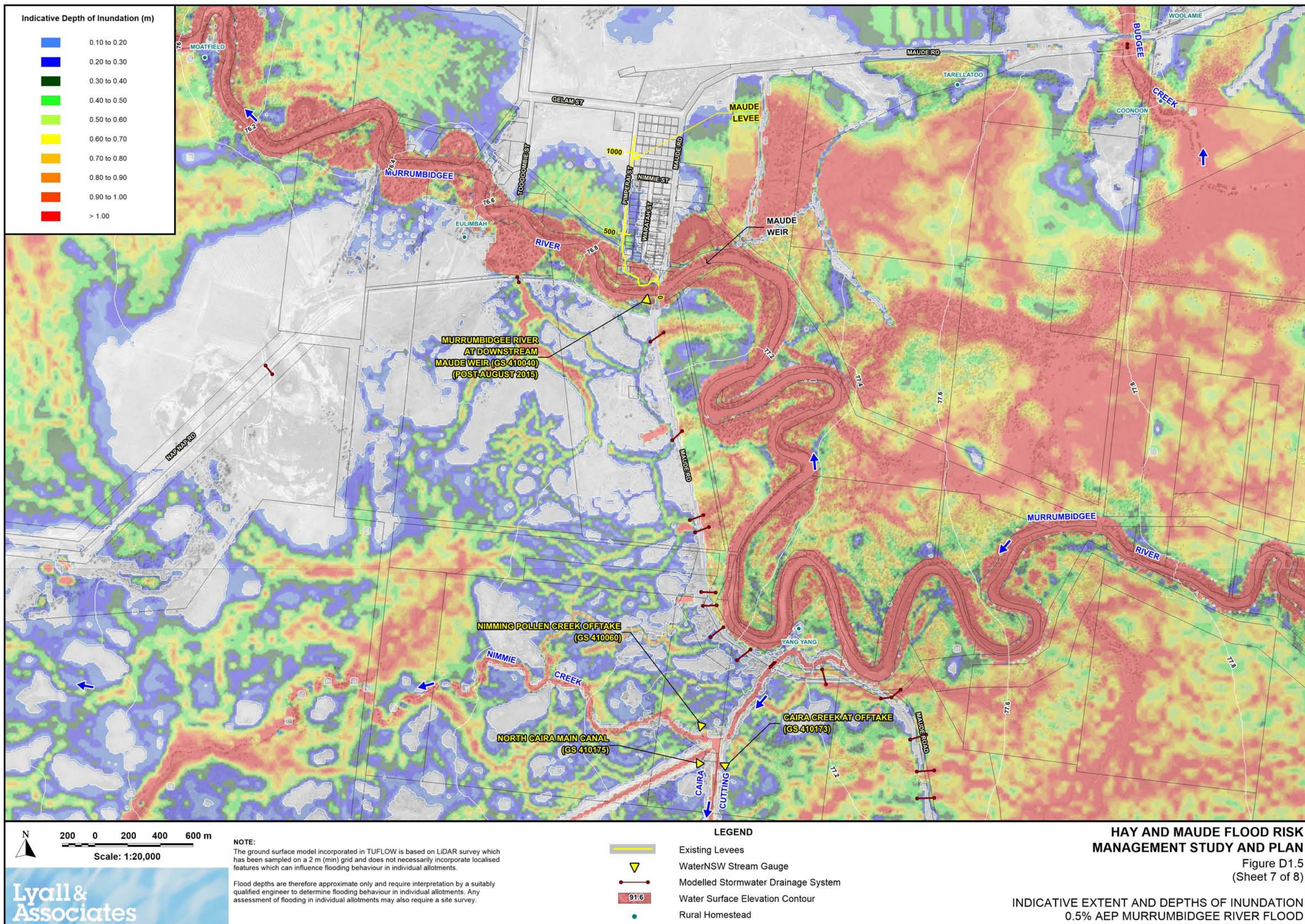


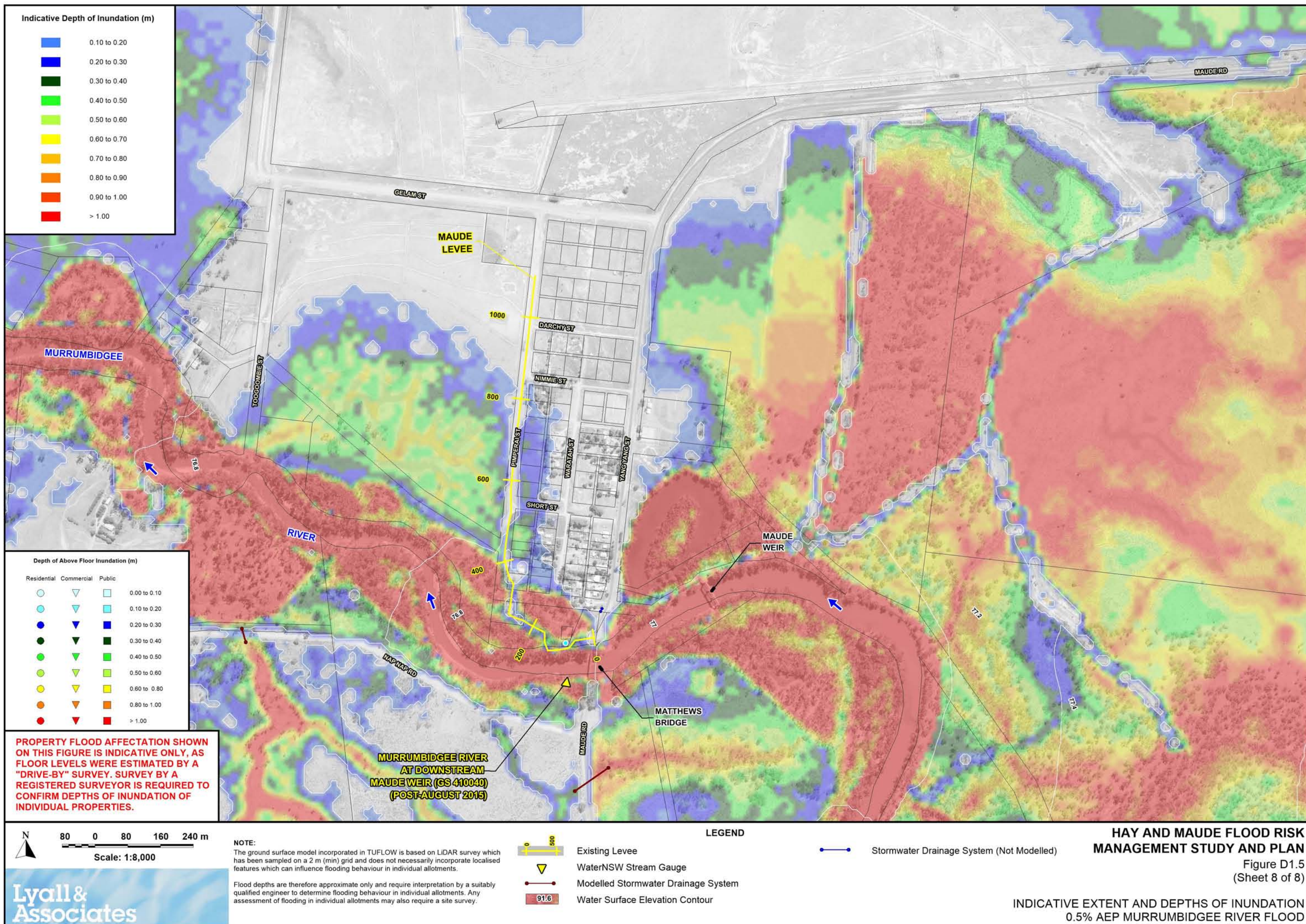


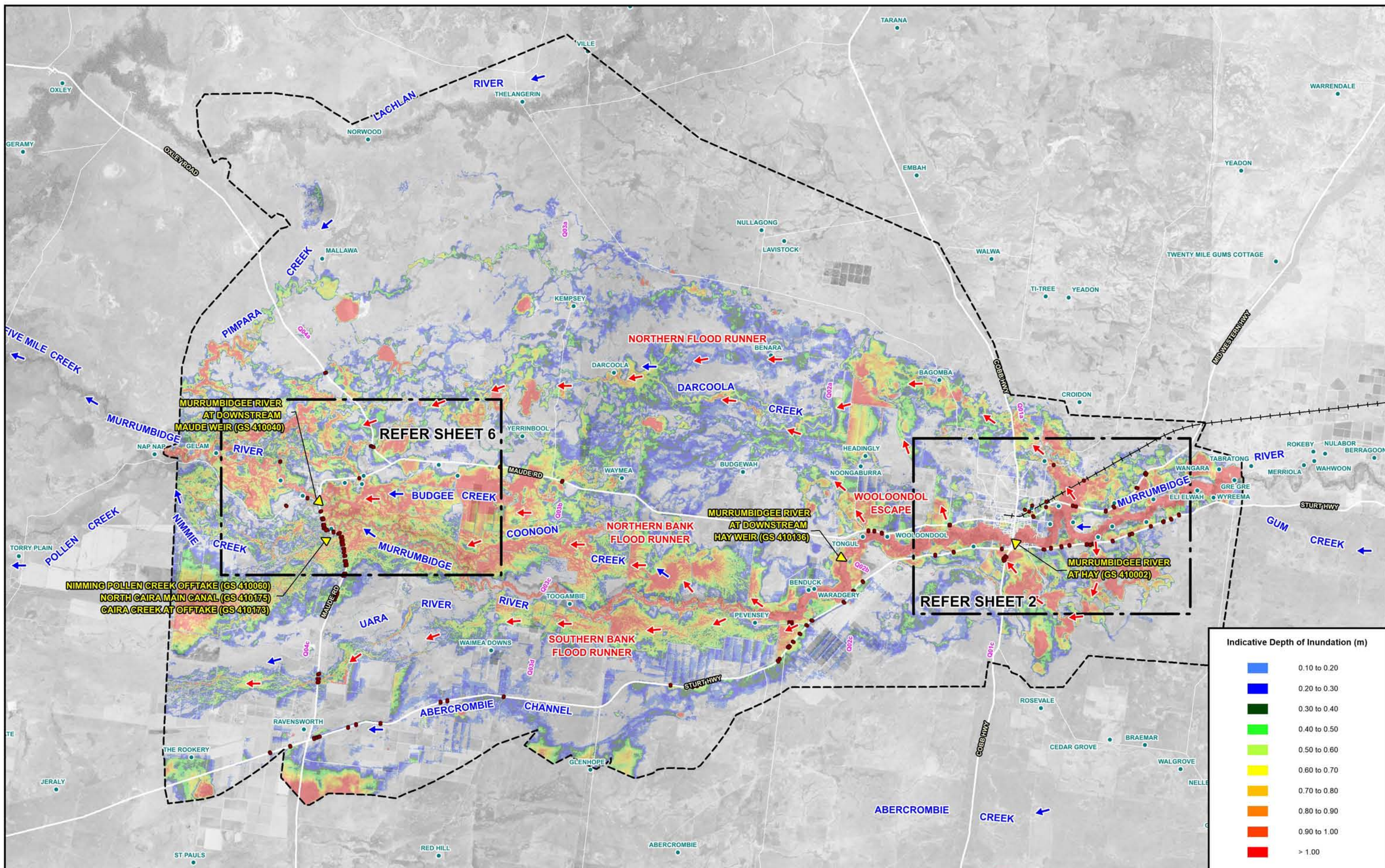


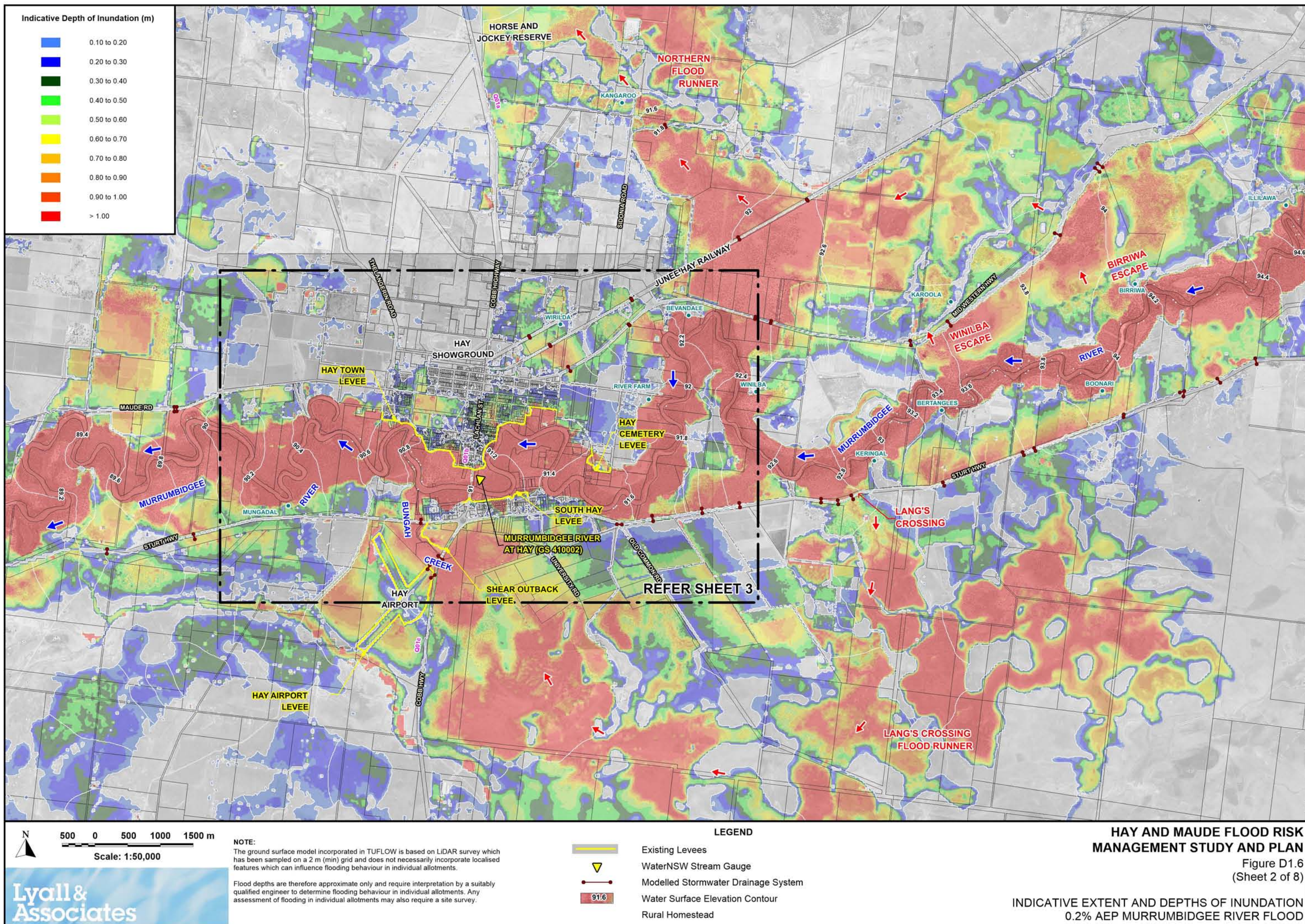


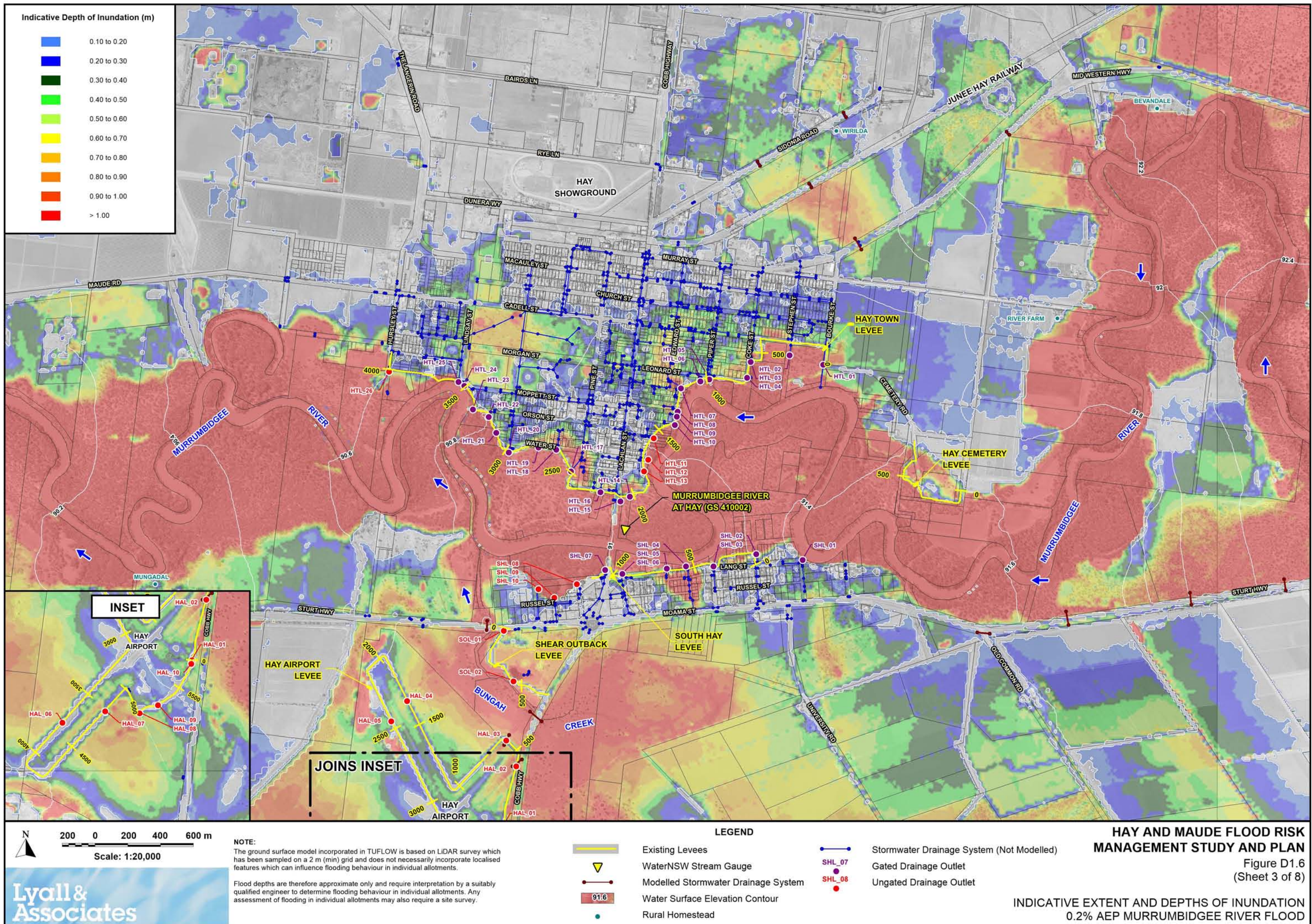


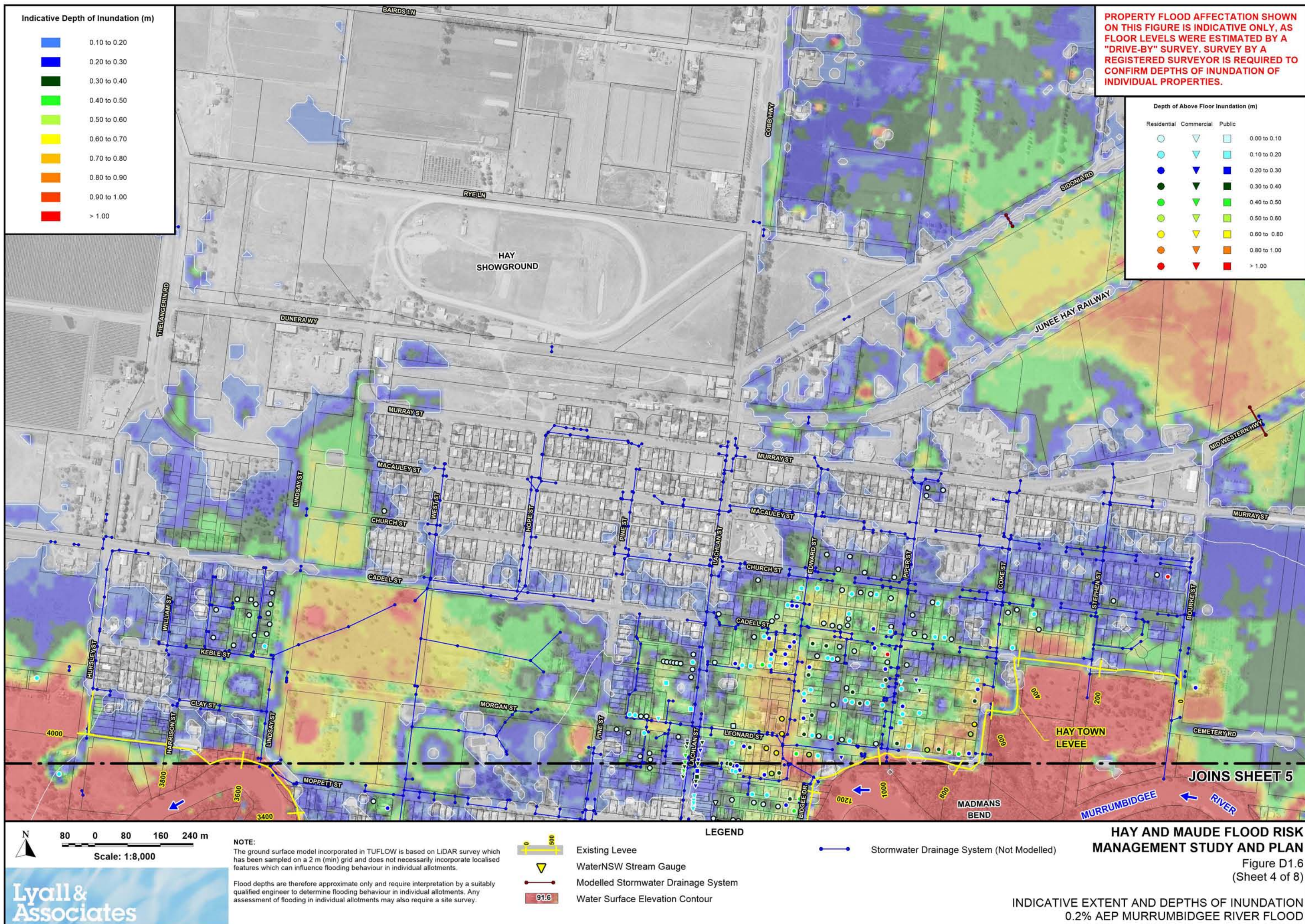


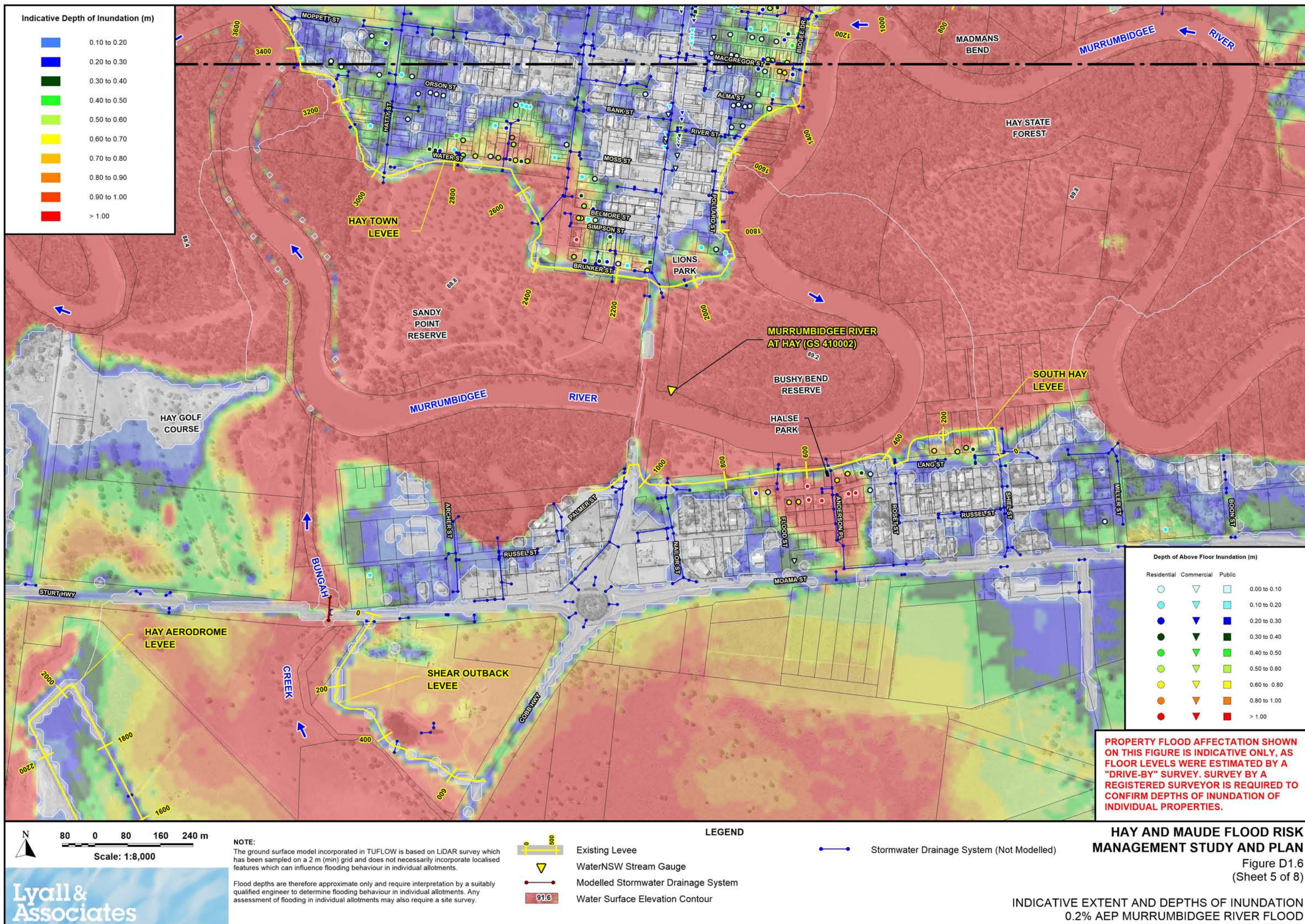


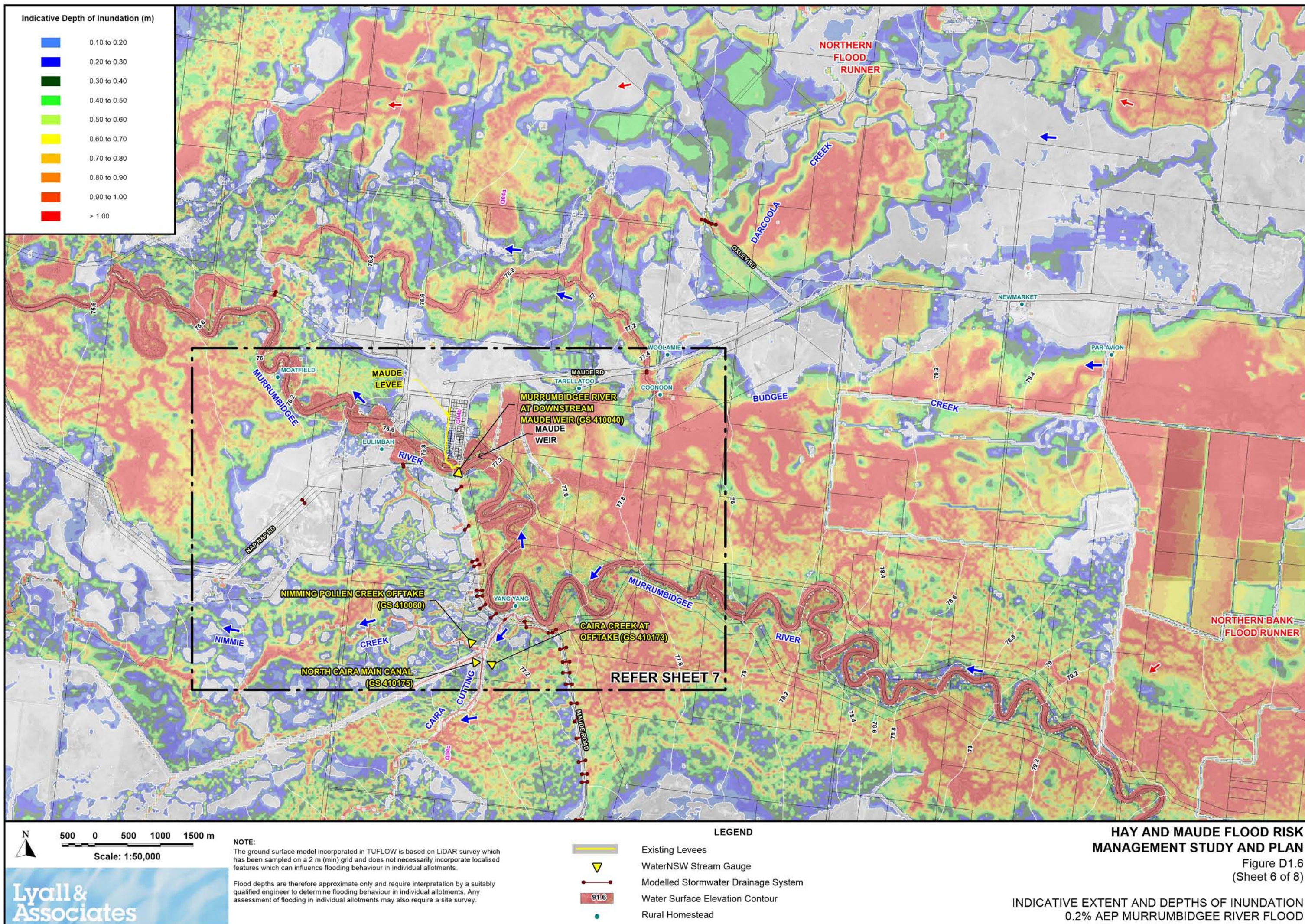


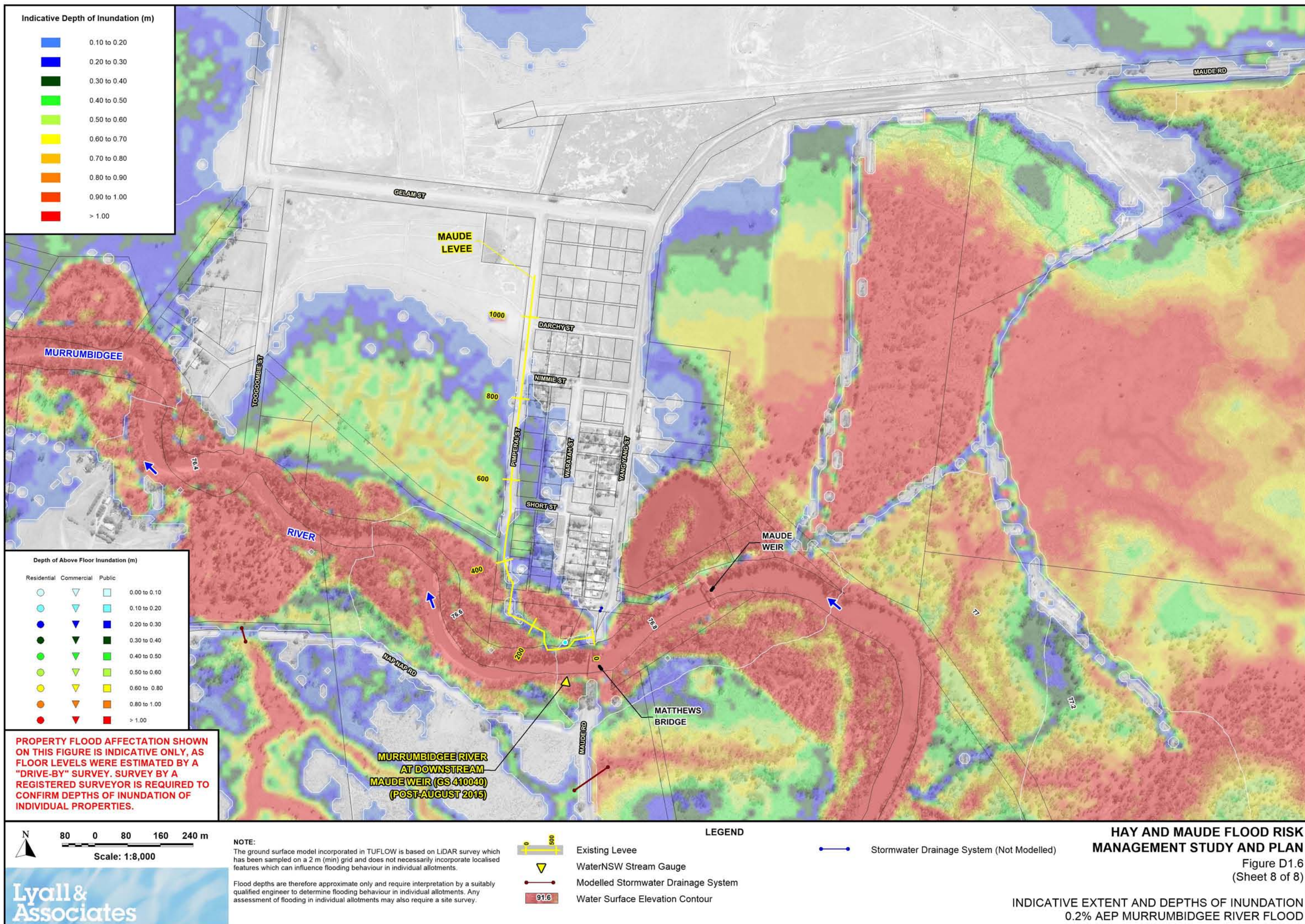










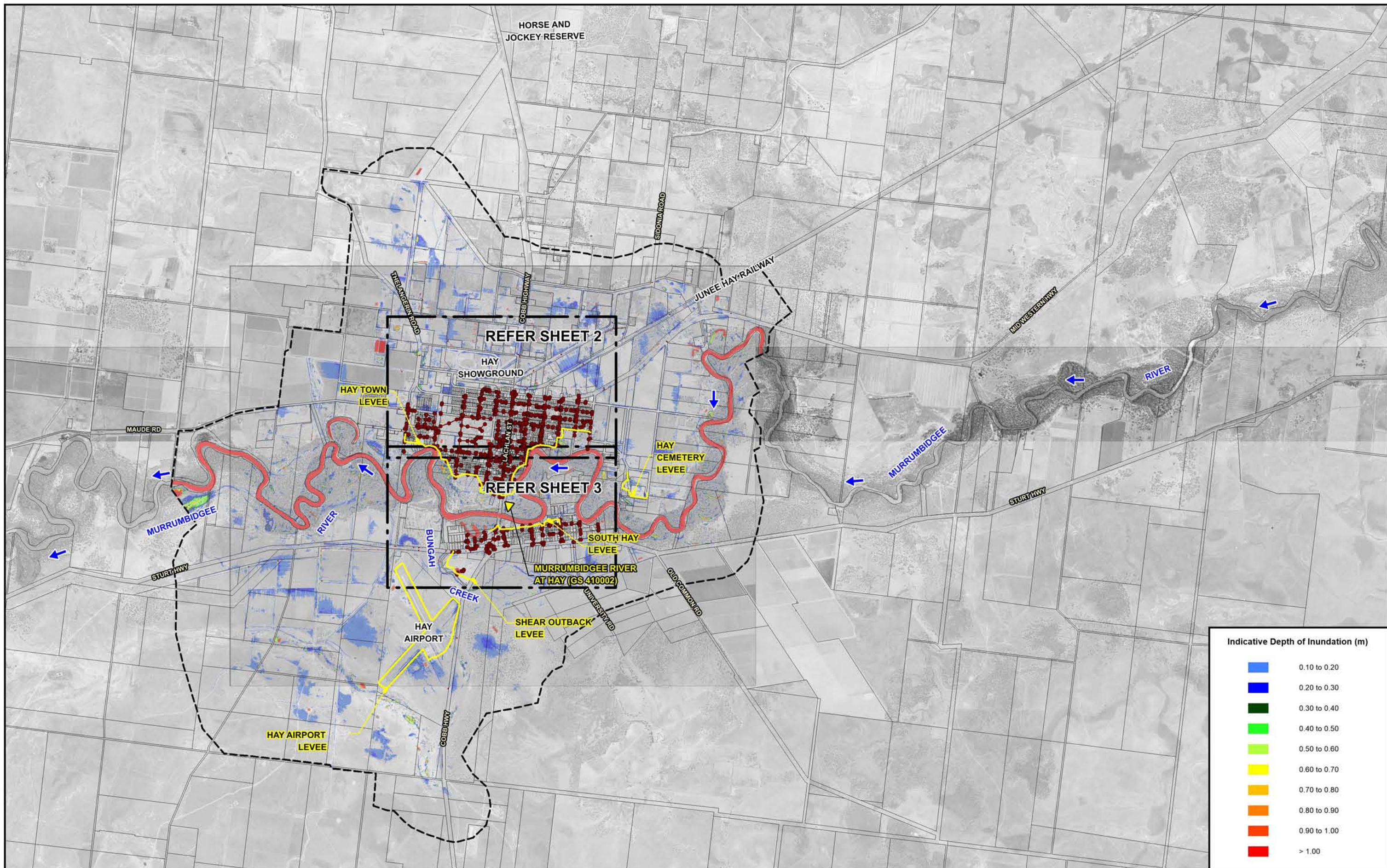


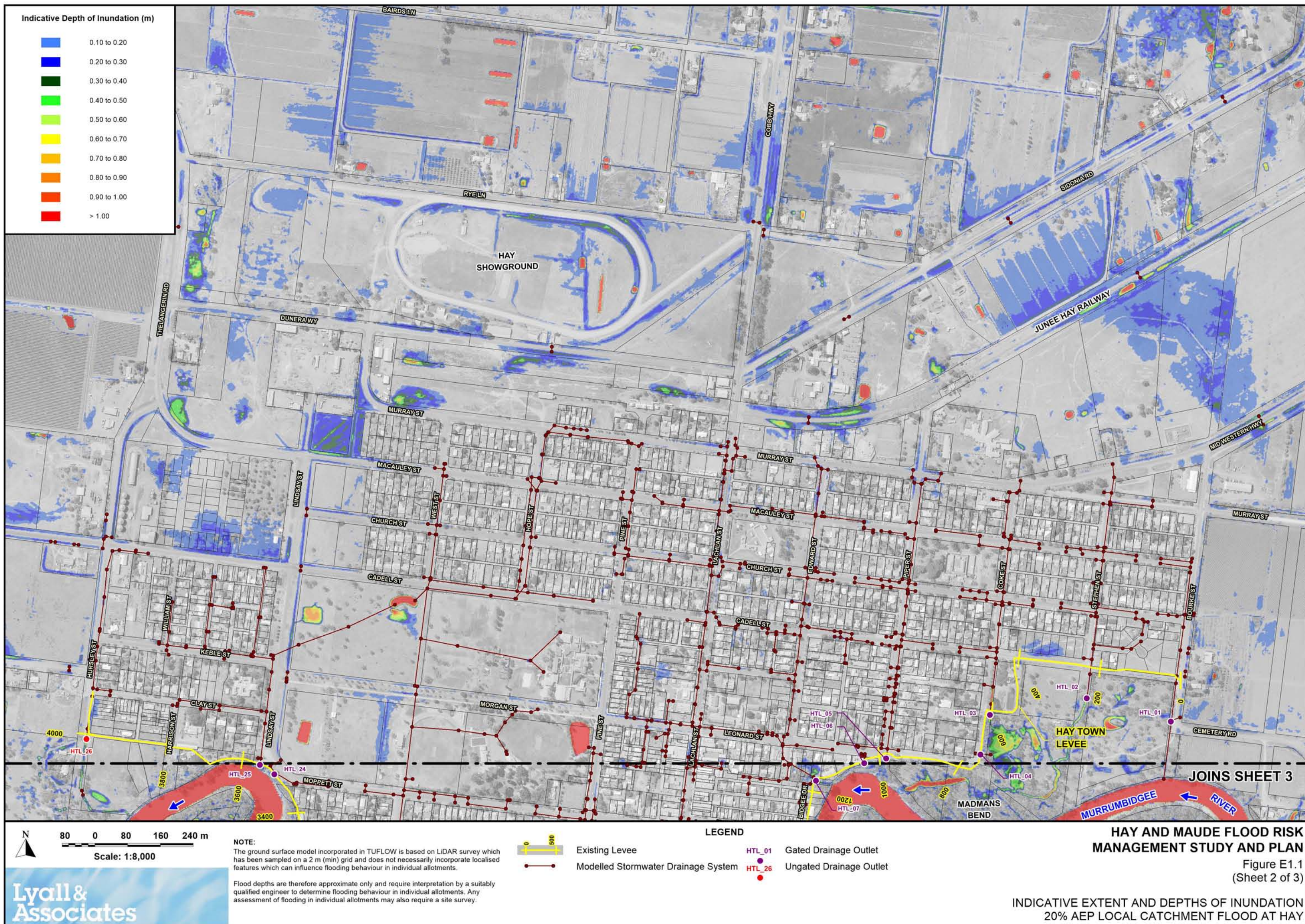
APPENDIX E

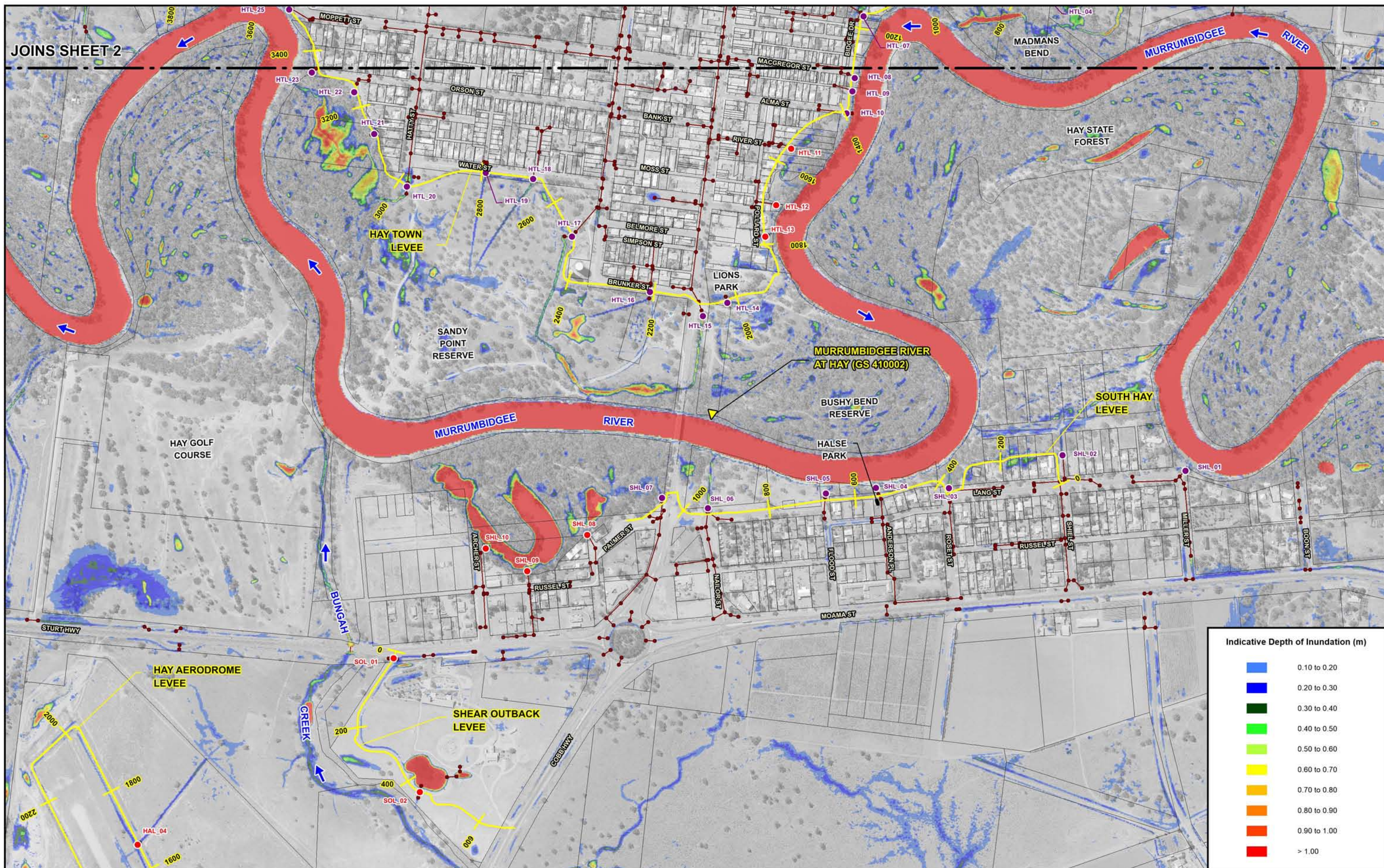
FIGURES SHOWING DESIGN LOCAL CATCHMENT FLOOD BEHAVIOUR AT HAY

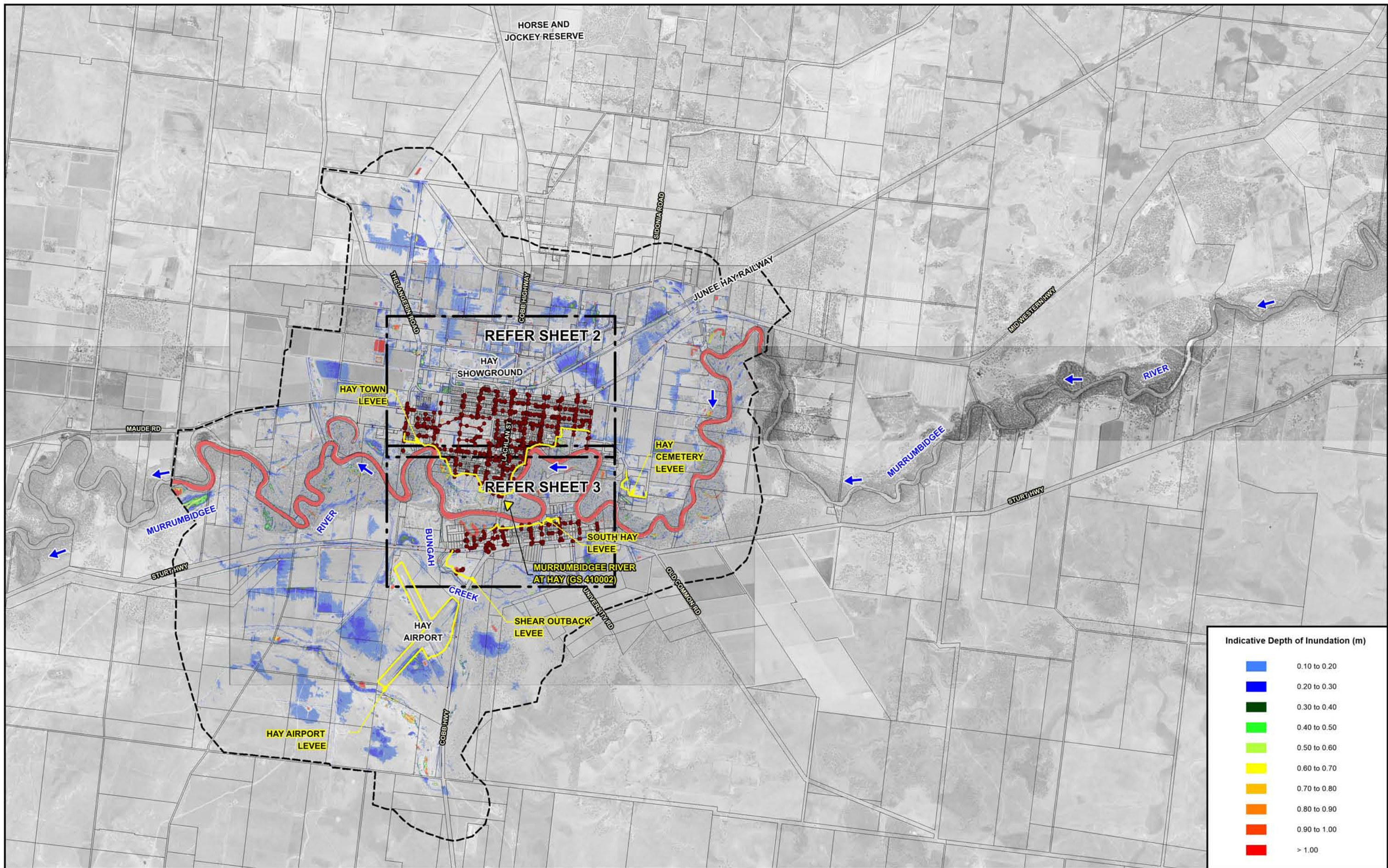
LIST OF FIGURES (APPENDIX E)

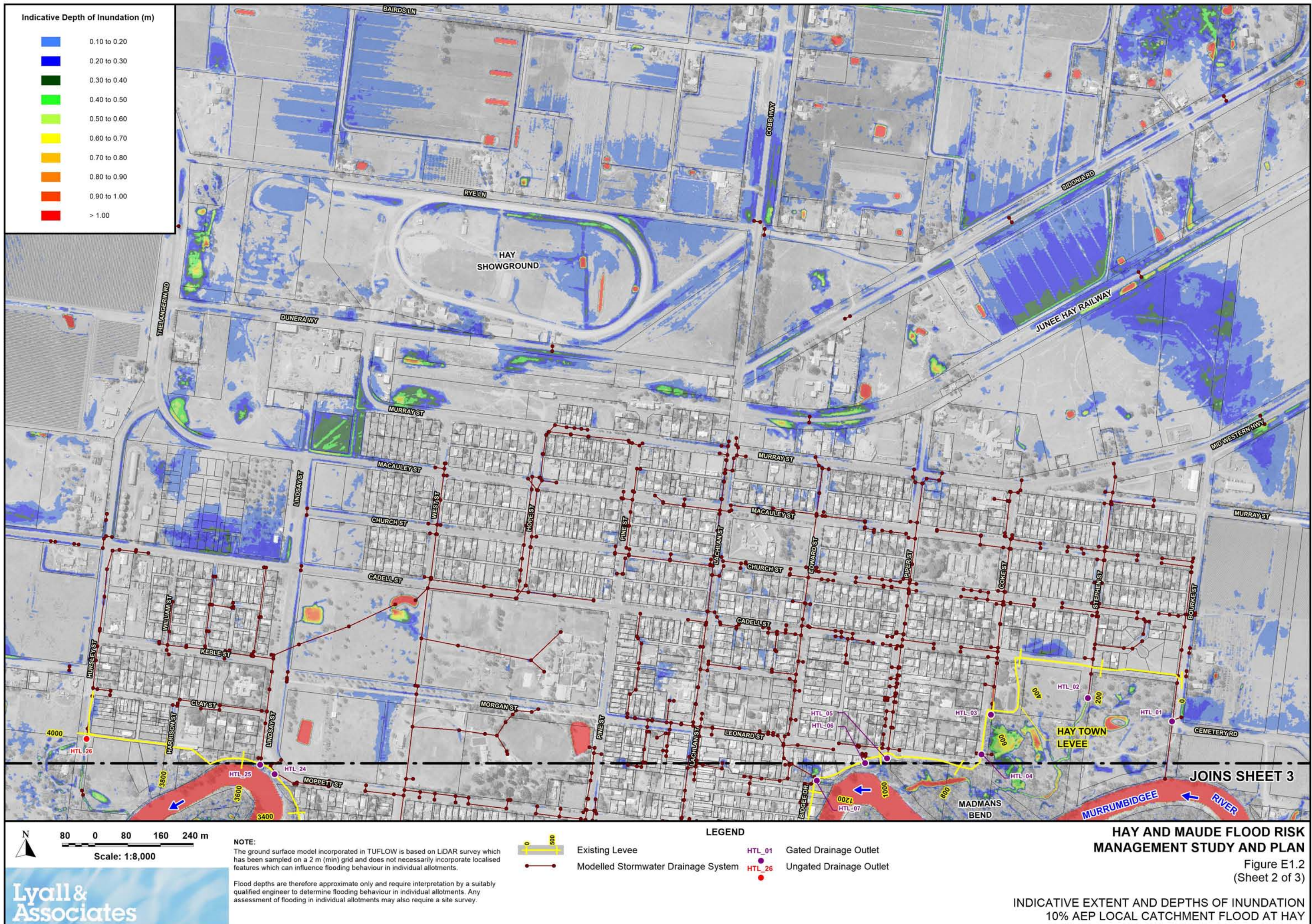
- E1.1 Indicative Extent and Depths of Inundation – 20% AEP Local Catchment Flood at Hay (3 Sheets)
- E1.2 Indicative Extent and Depths of Inundation – 10% AEP Local Catchment Flood at Hay (3 Sheets)
- E1.3 Indicative Extent and Depths of Inundation – 5% AEP Local Catchment Flood at Hay (3 Sheets)
- E1.4 Indicative Extent and Depths of Inundation – 2% AEP Local Catchment Flood at Hay (3 Sheets)
- E1.5 Indicative Extent and Depths of Inundation – 0.5% AEP Local Catchment Flood at Hay (3 Sheets)
- E1.6 Indicative Extent and Depths of Inundation – 0.2% AEP Local Catchment Flood at Hay (3 Sheets)
- E1.7 Indicative Extent and Depths of Inundation – PMF Local Catchment Flood at Hay (3 Sheets)

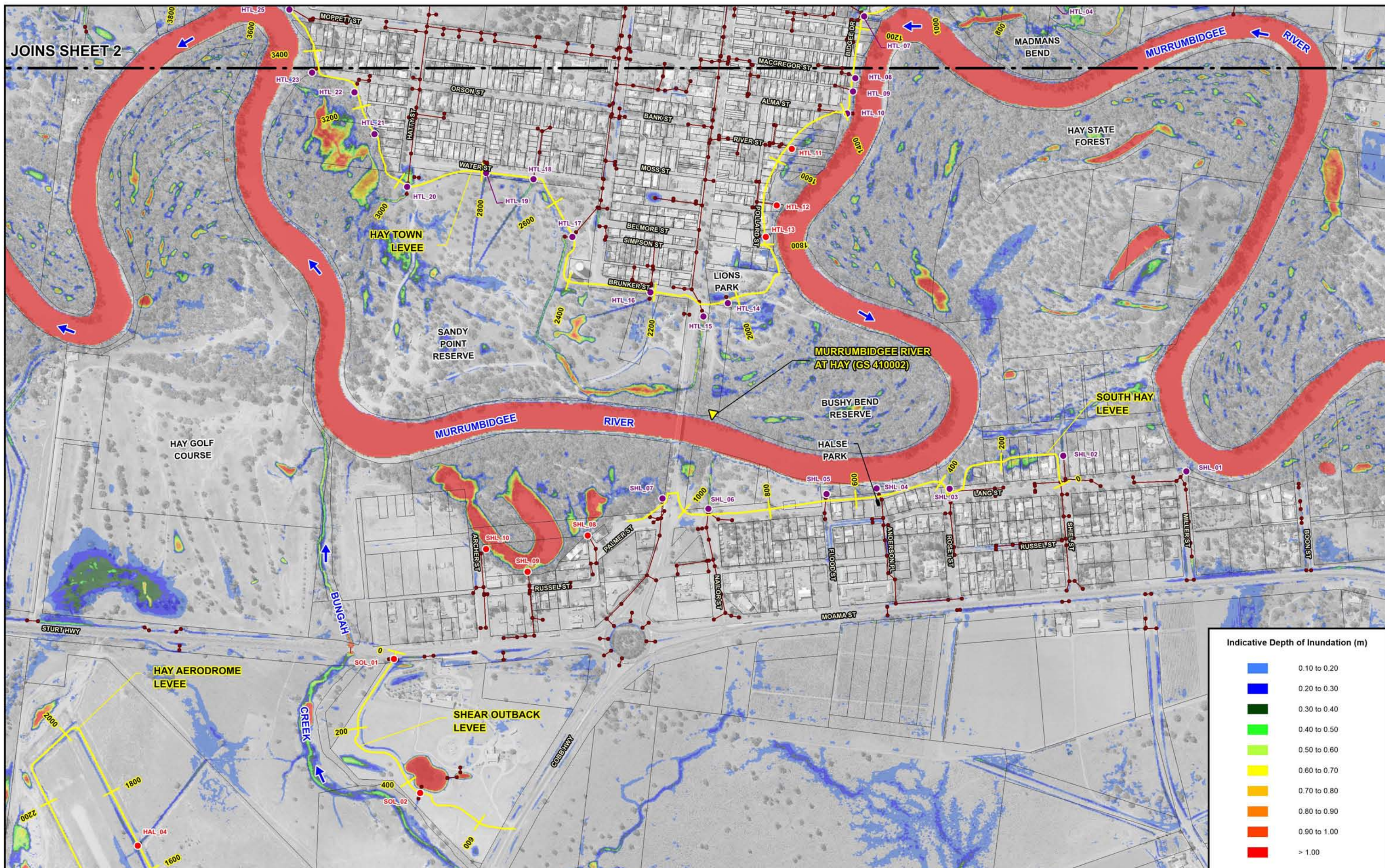










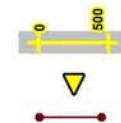


Scale: 1:8,000

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NOTE:
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Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.



Existing Levee
WaterNSW Stream Gauge
Modelled Stormwater Drainage System

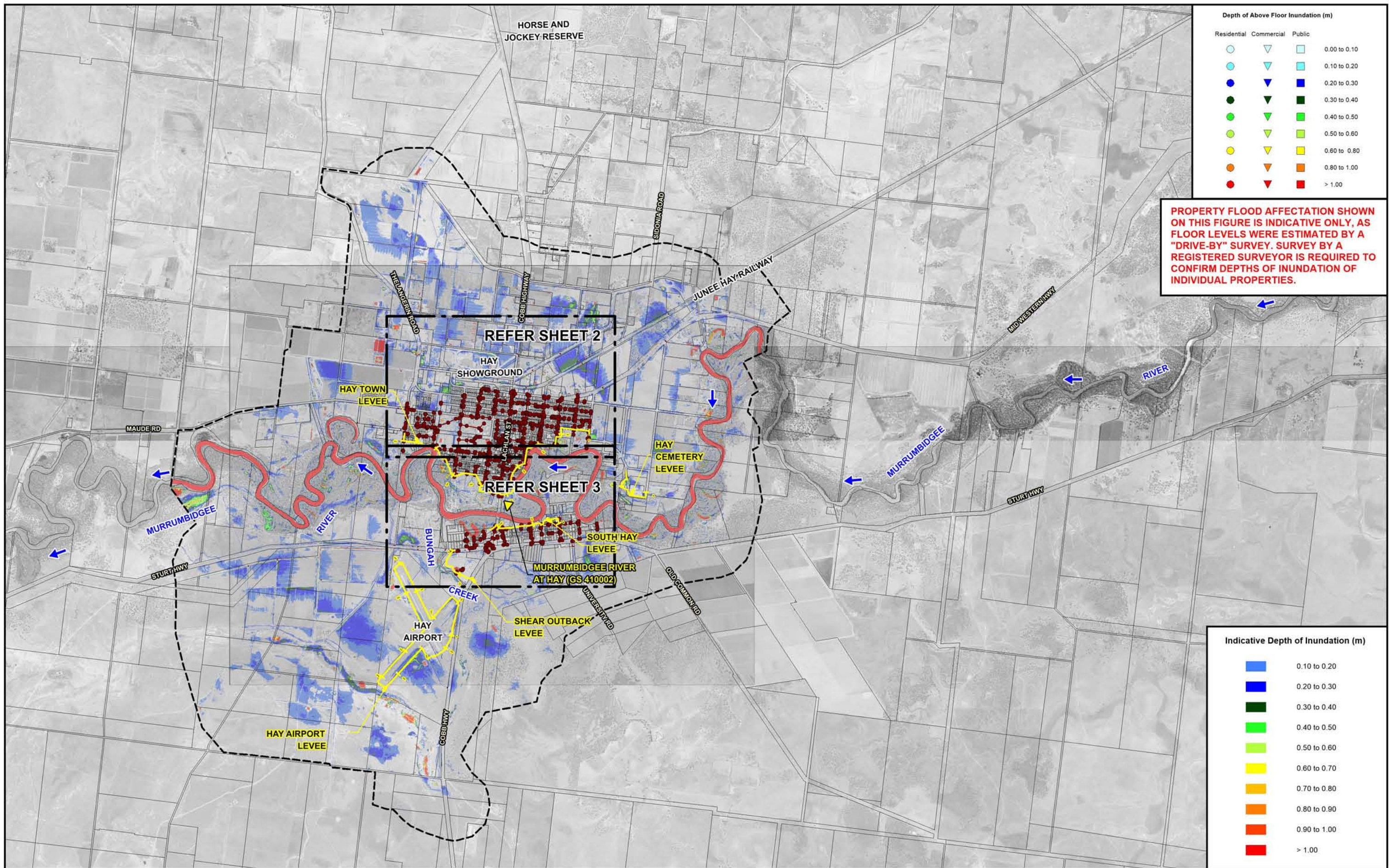
LEGEND

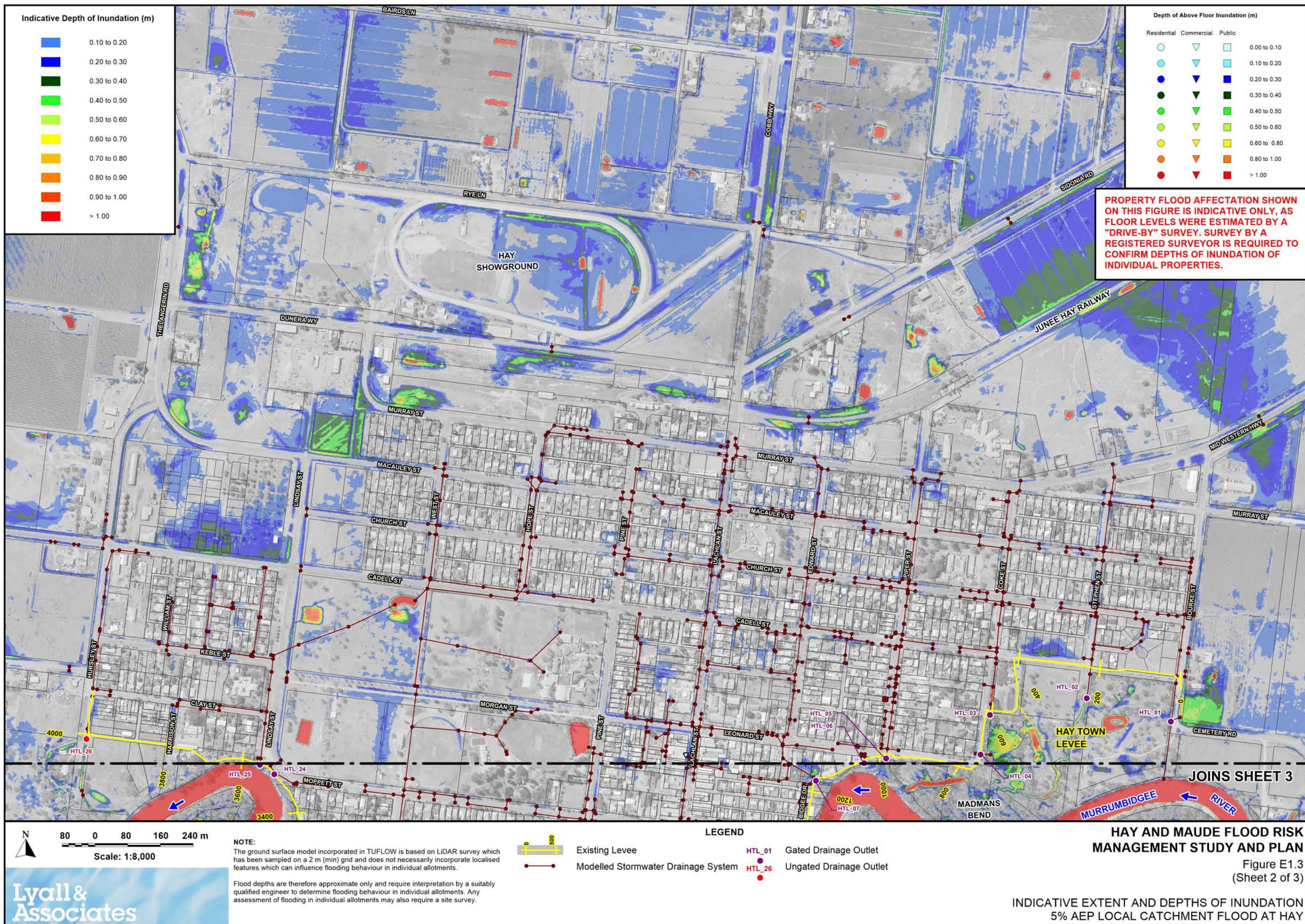
HTL_01 Gated Drainage Outlet
HTL_26 Ungated Drainage Outlet

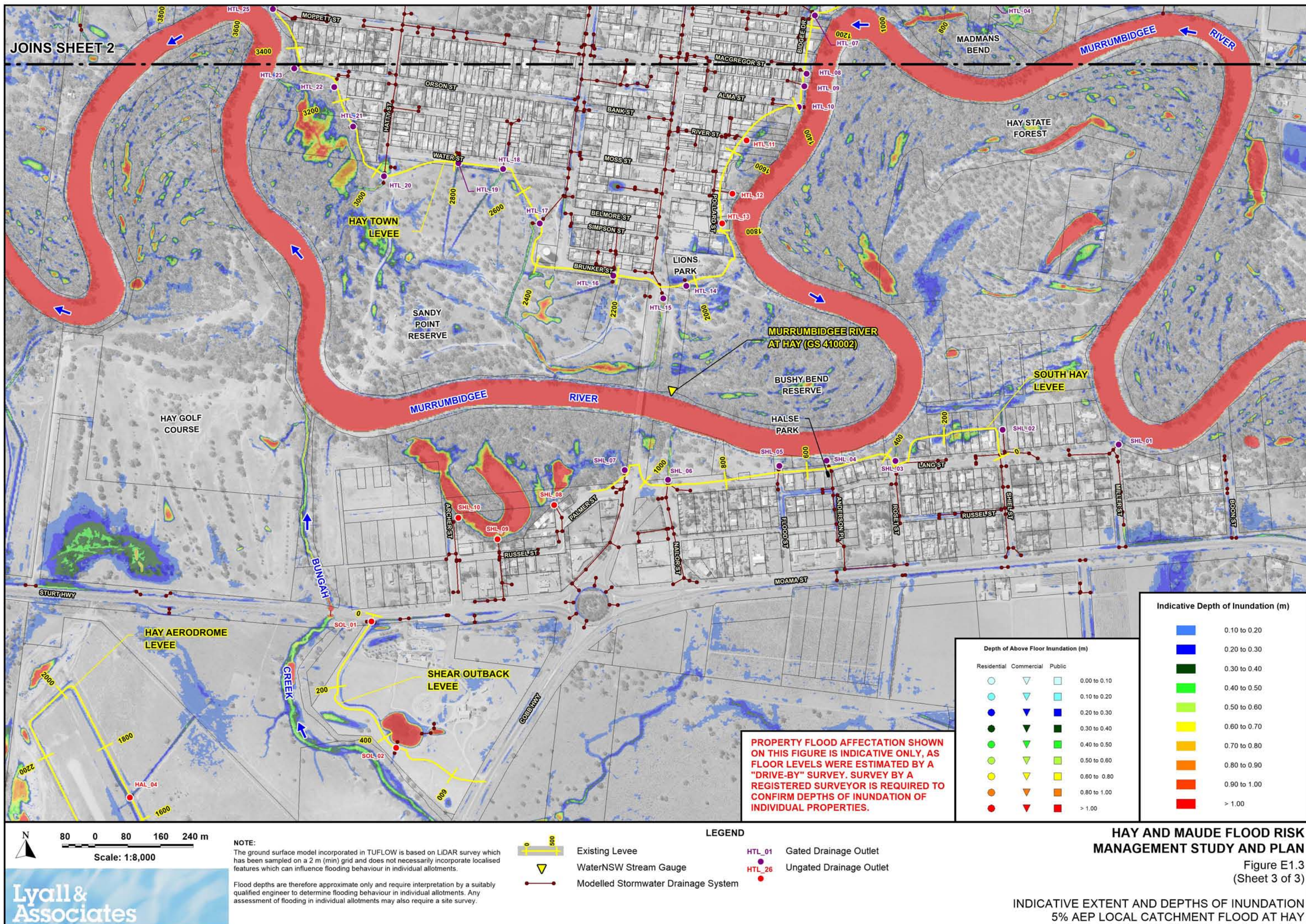
HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

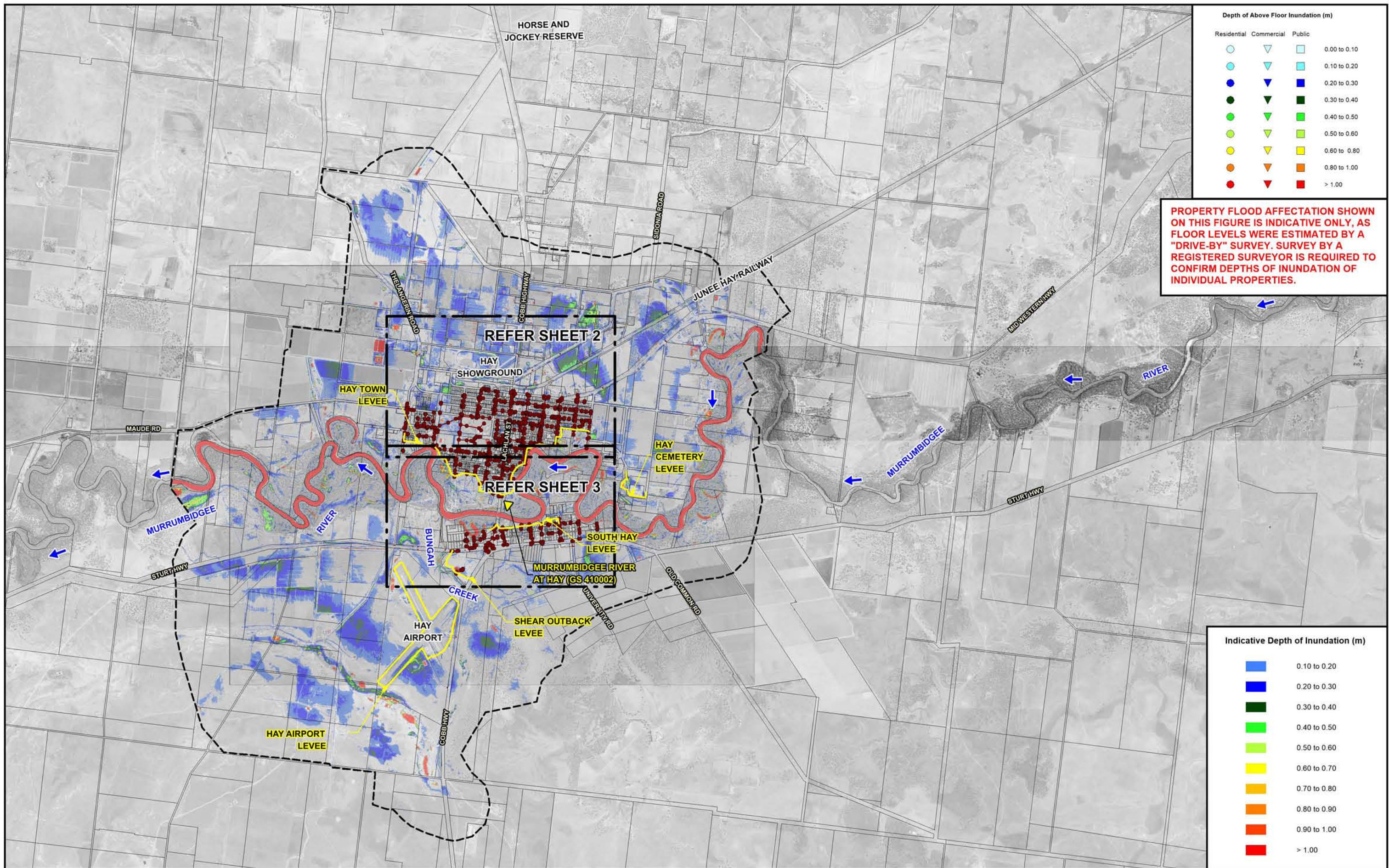
Figure E1.2
(Sheet 3 of 3)

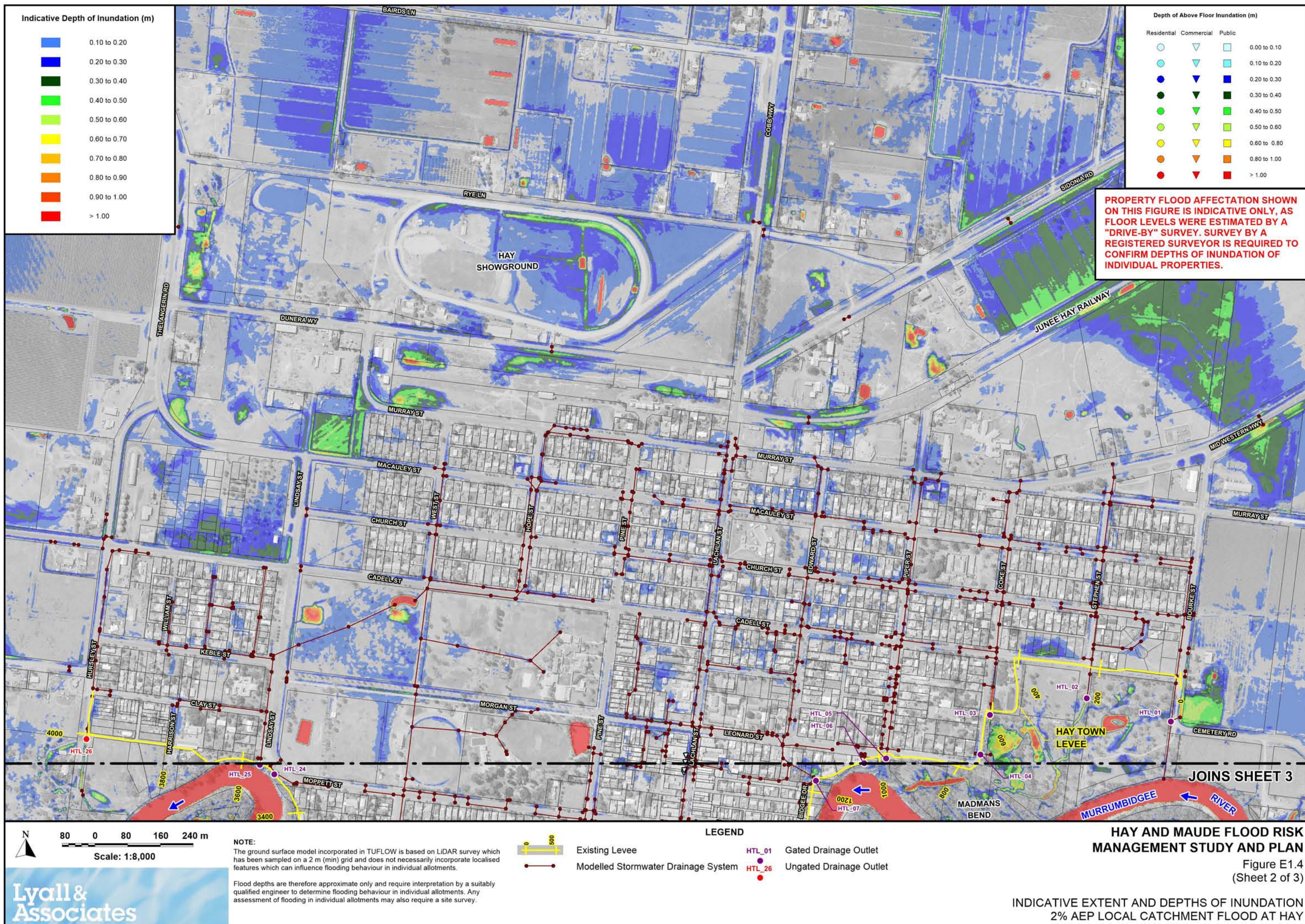
INDICATIVE EXTENT AND DEPTHS OF INUNDATION
10% AEP LOCAL CATCHMENT FLOOD AT HAY

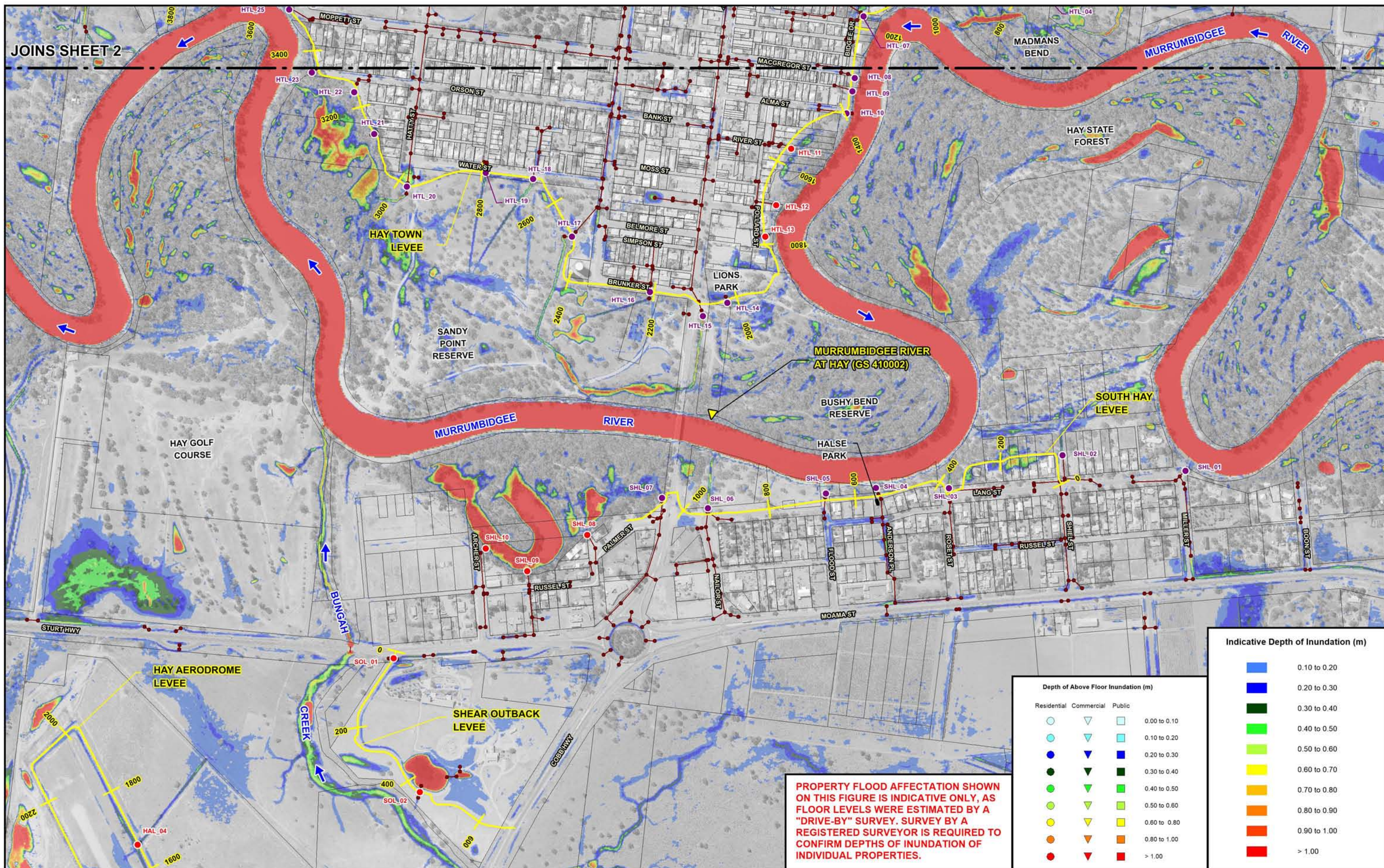


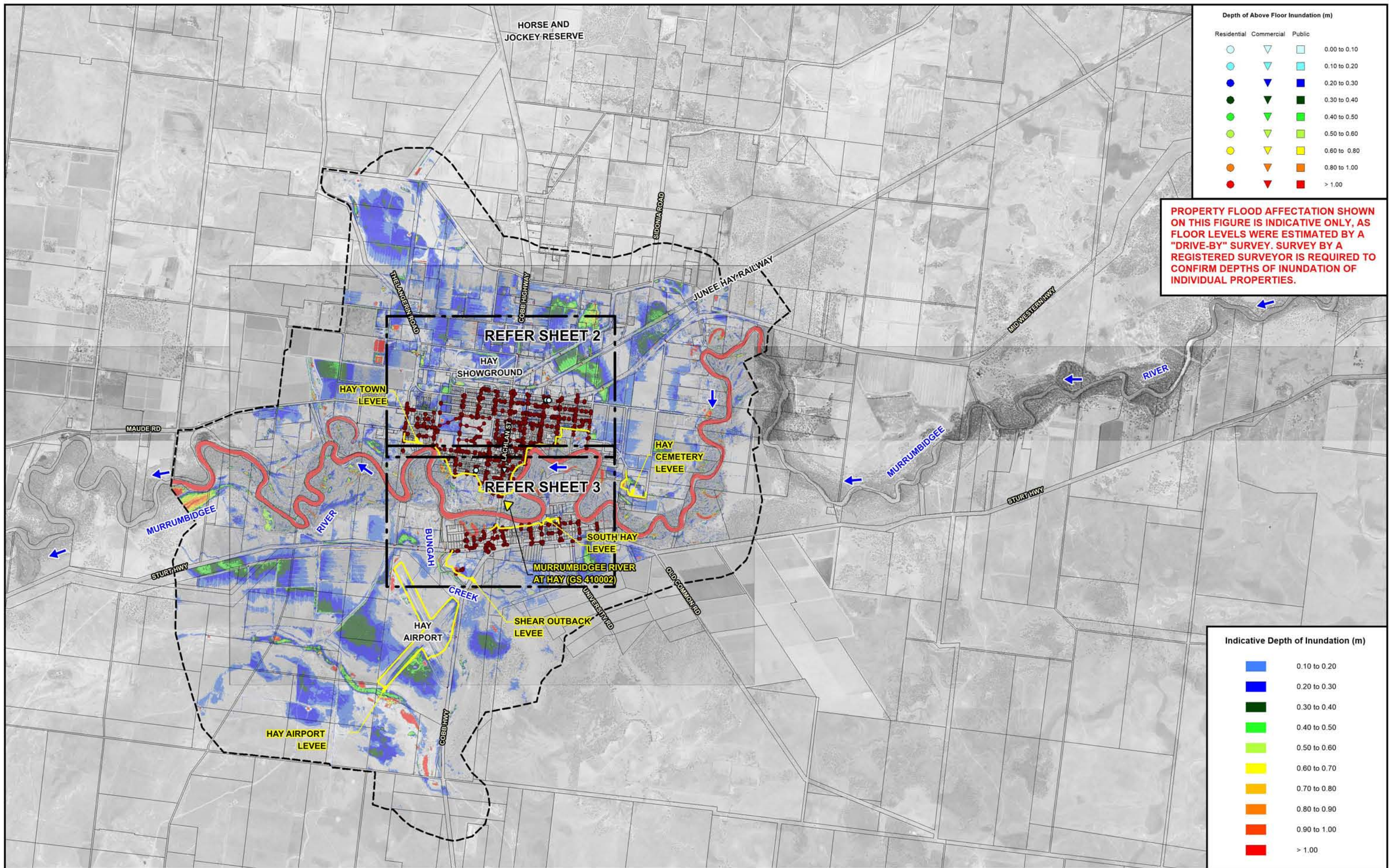


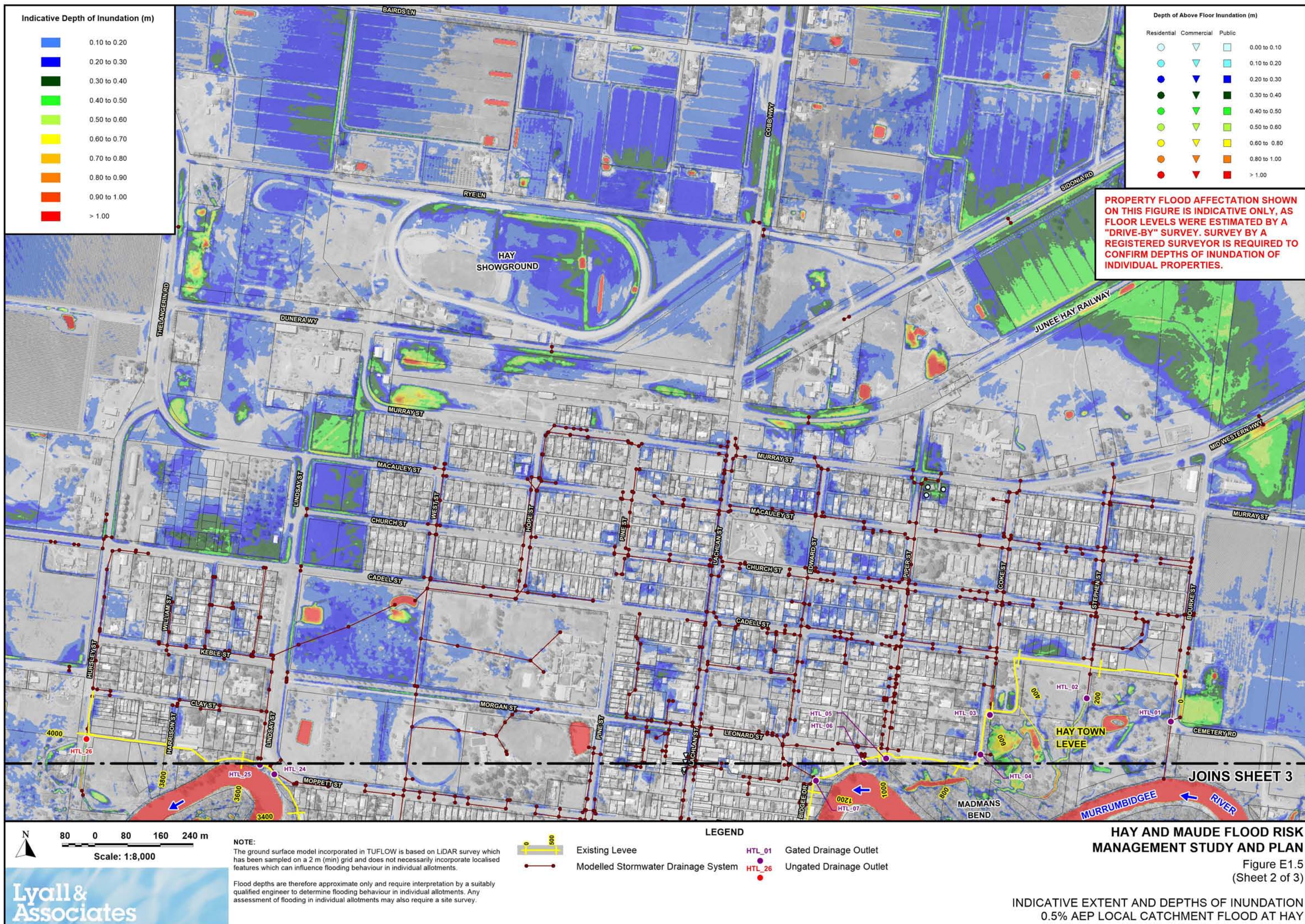


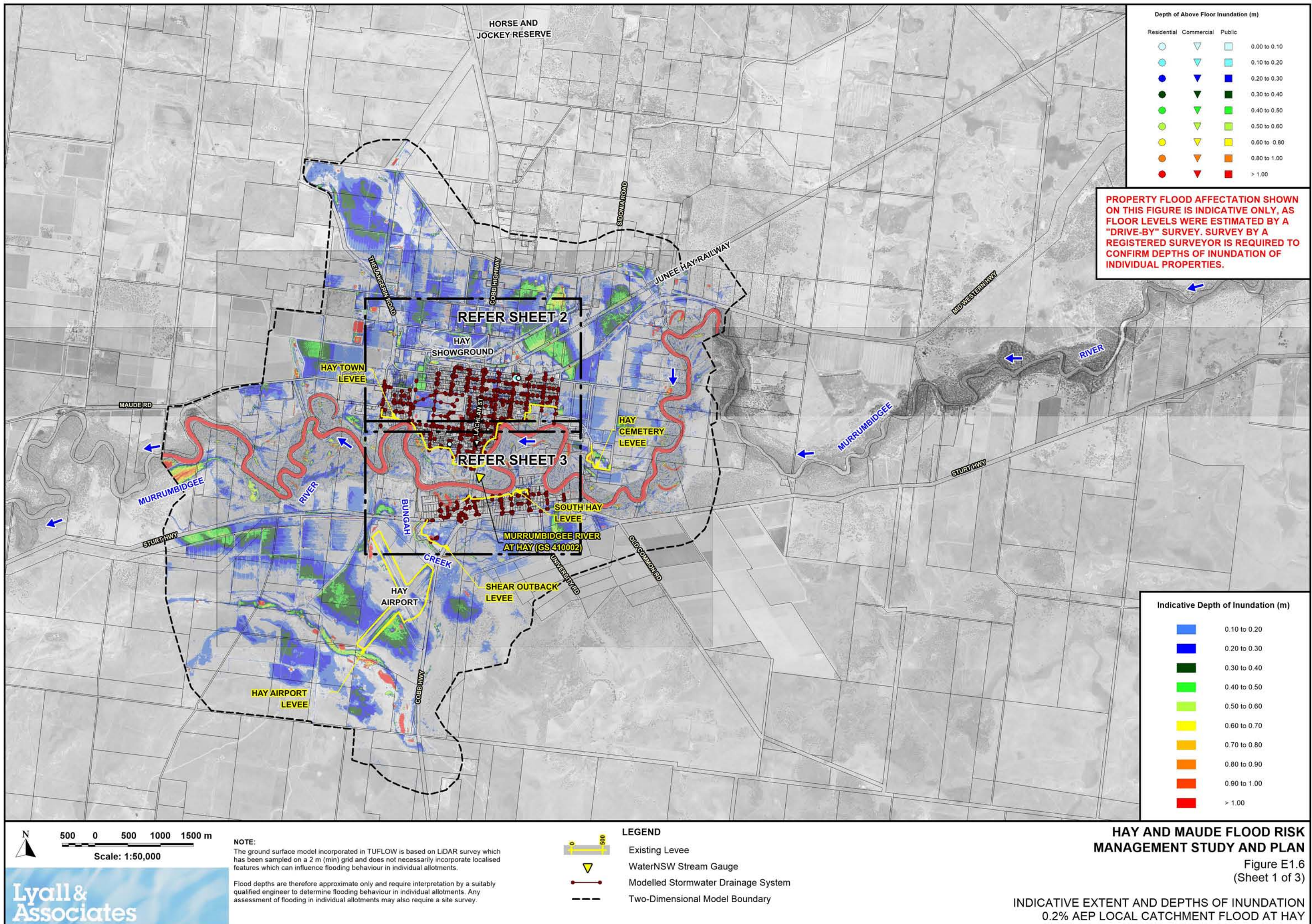


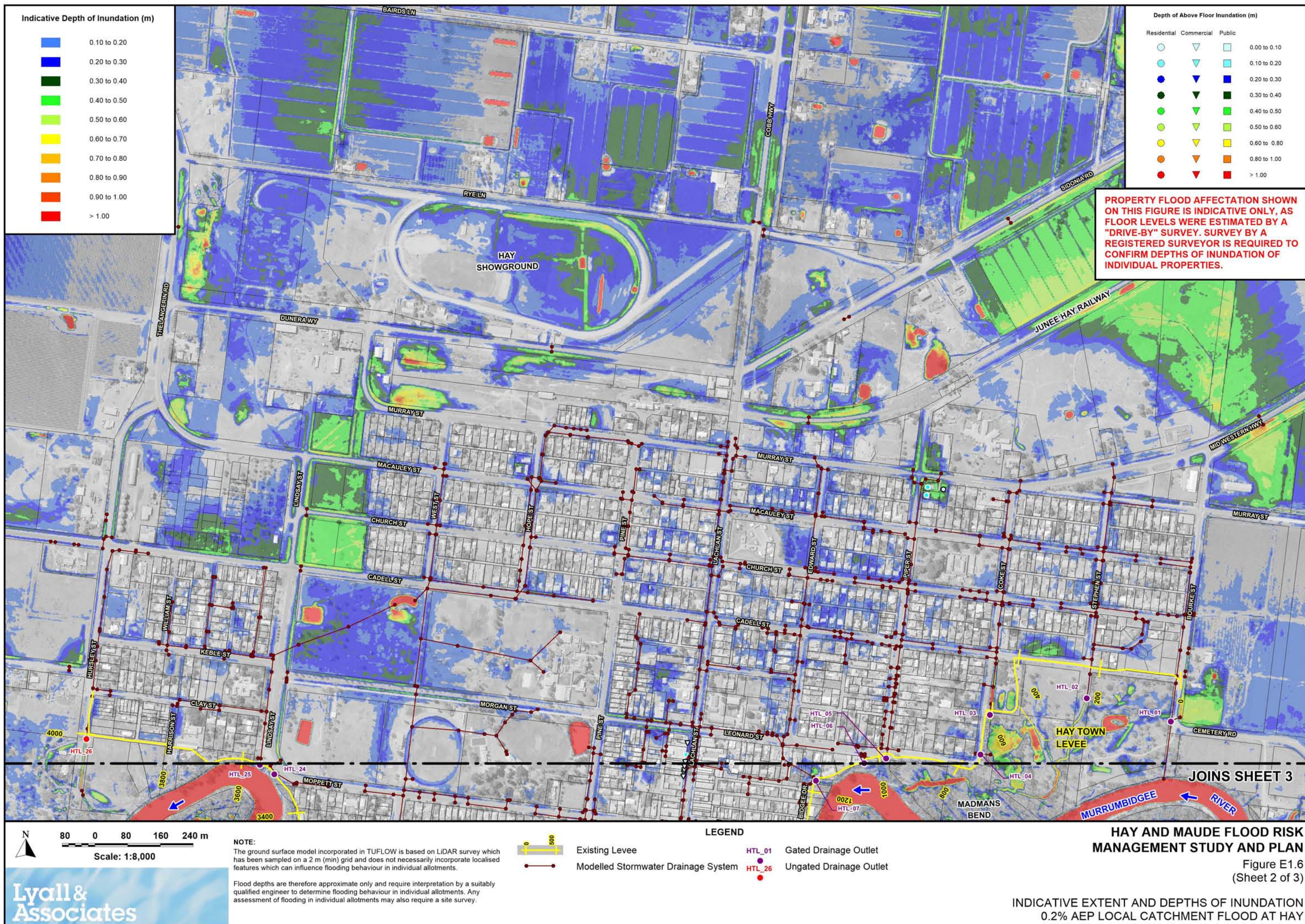


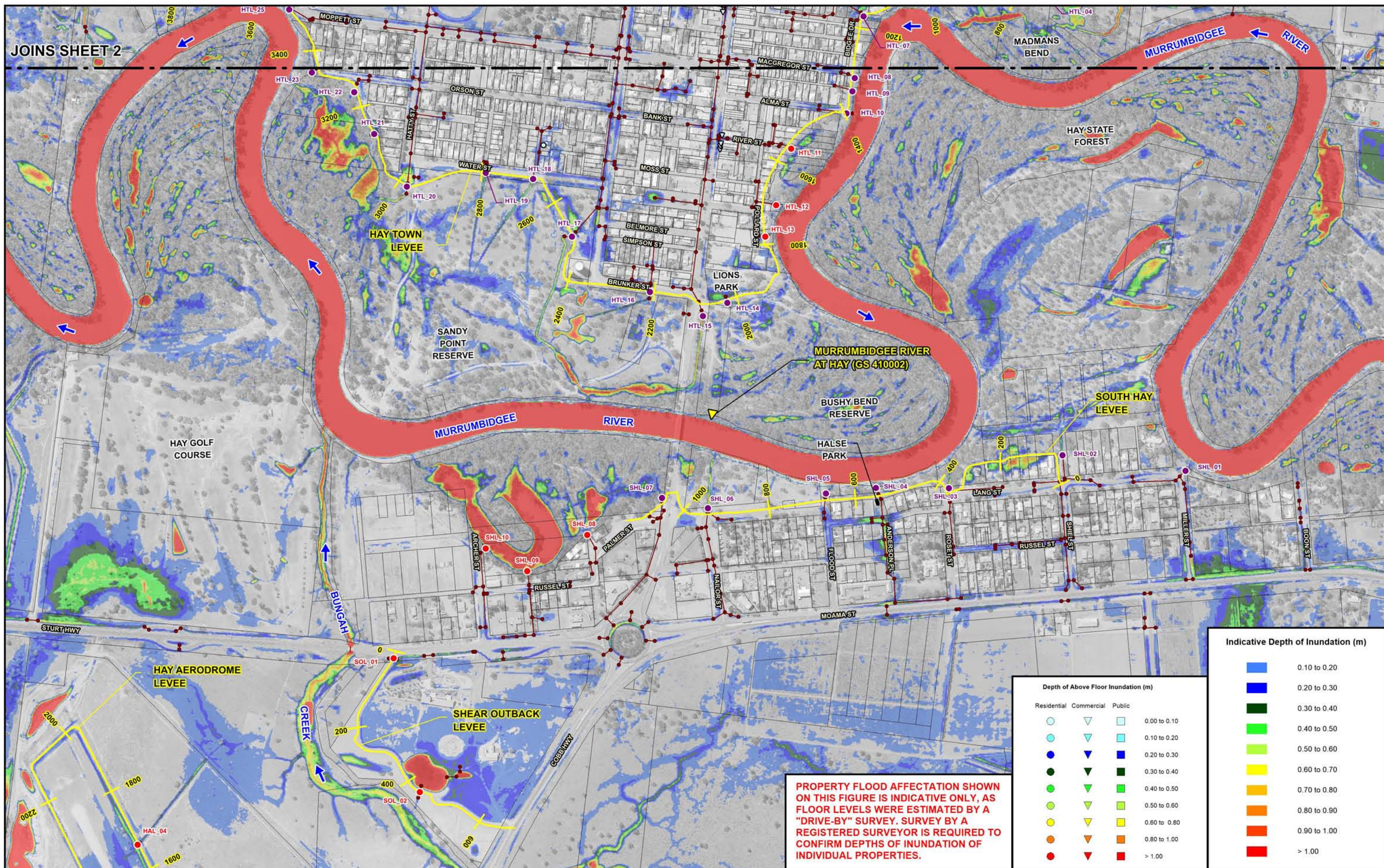


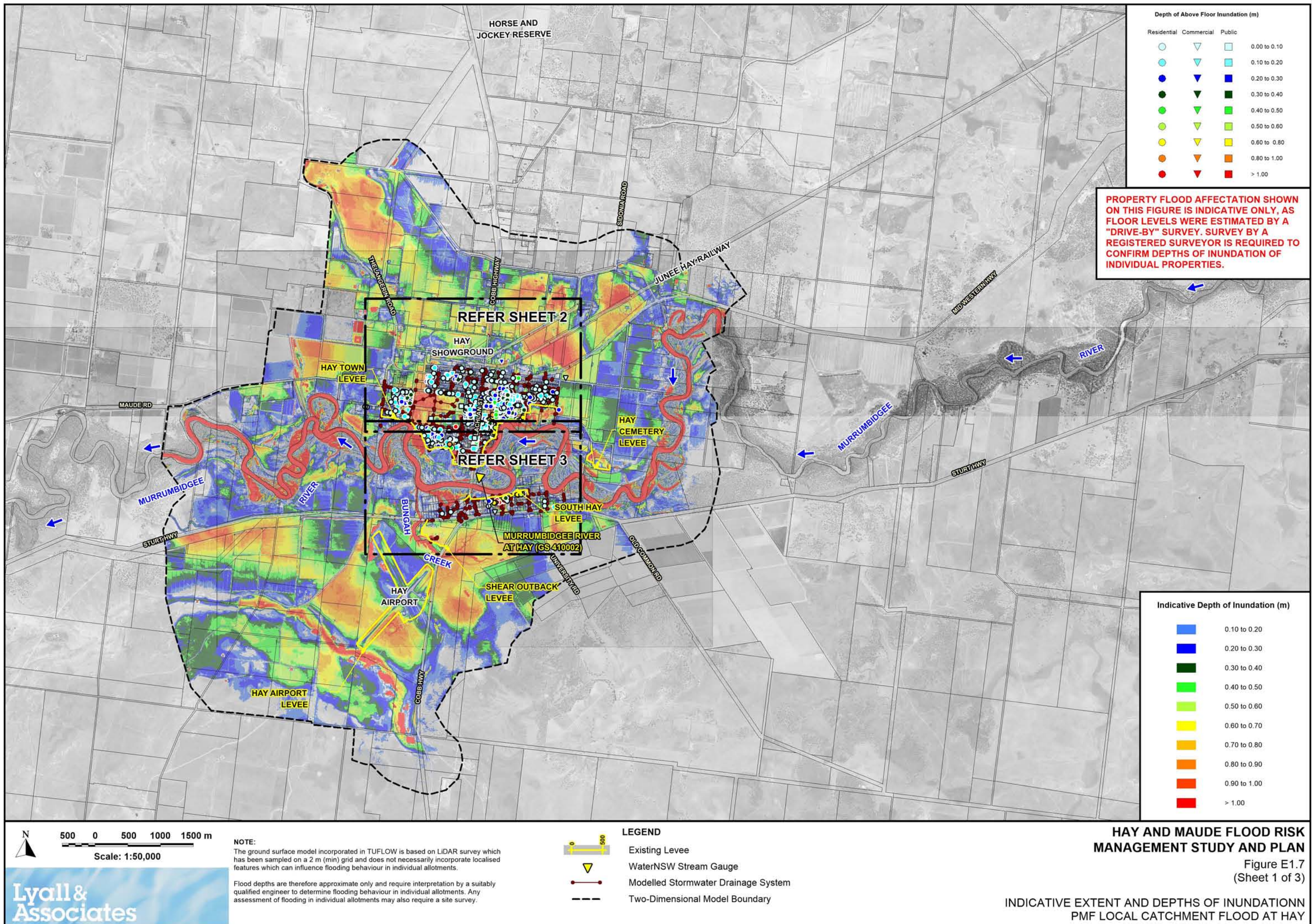


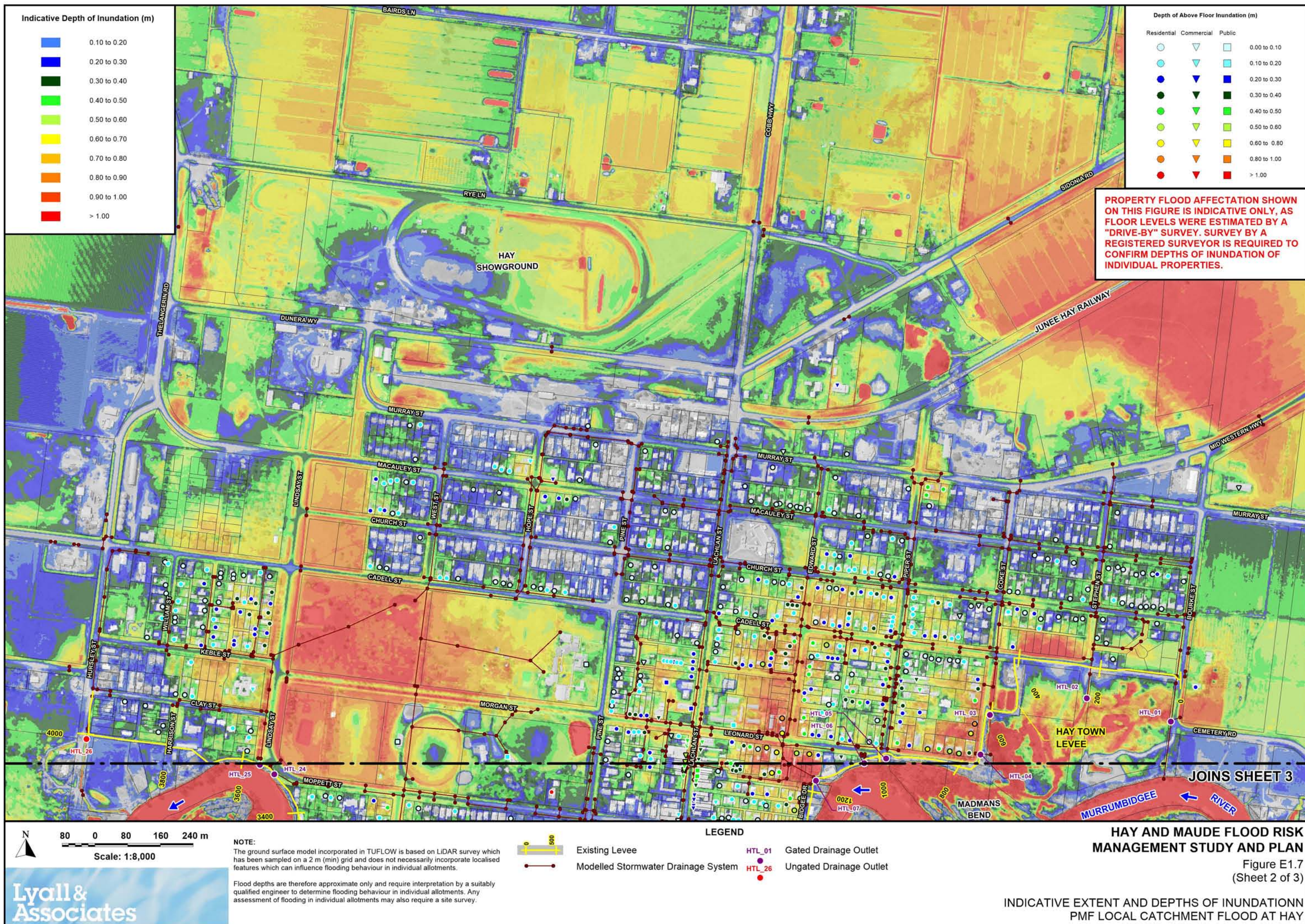


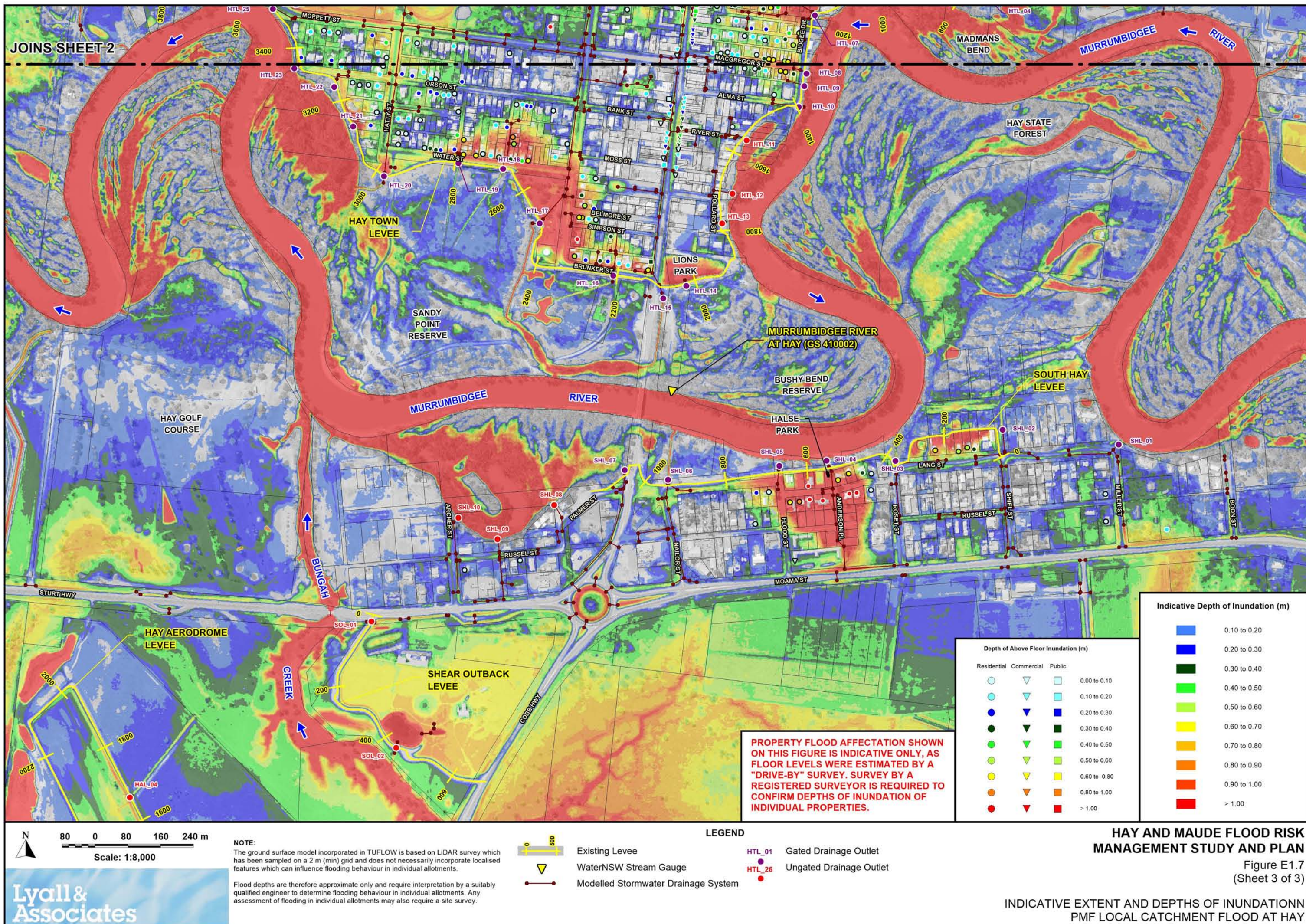










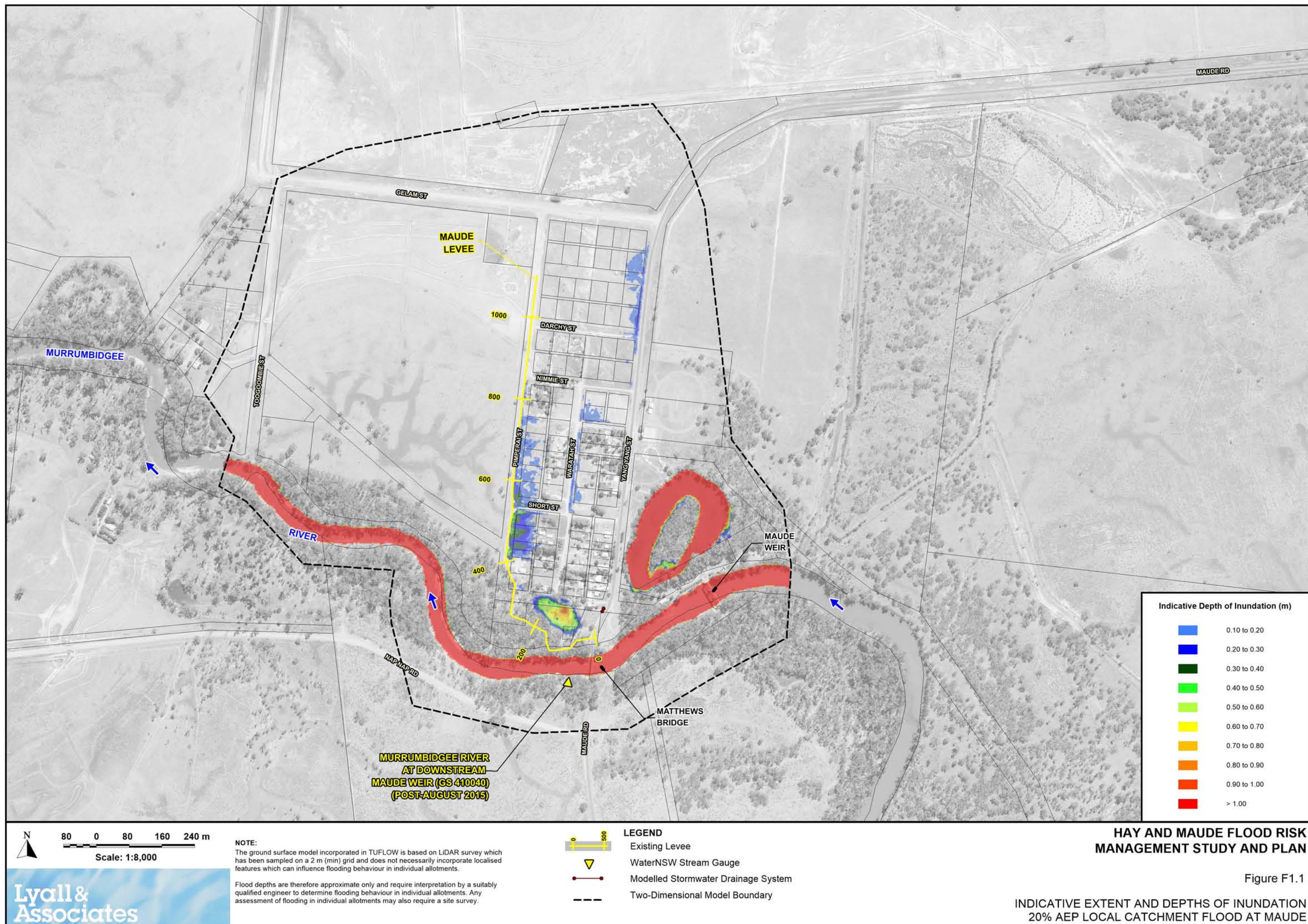


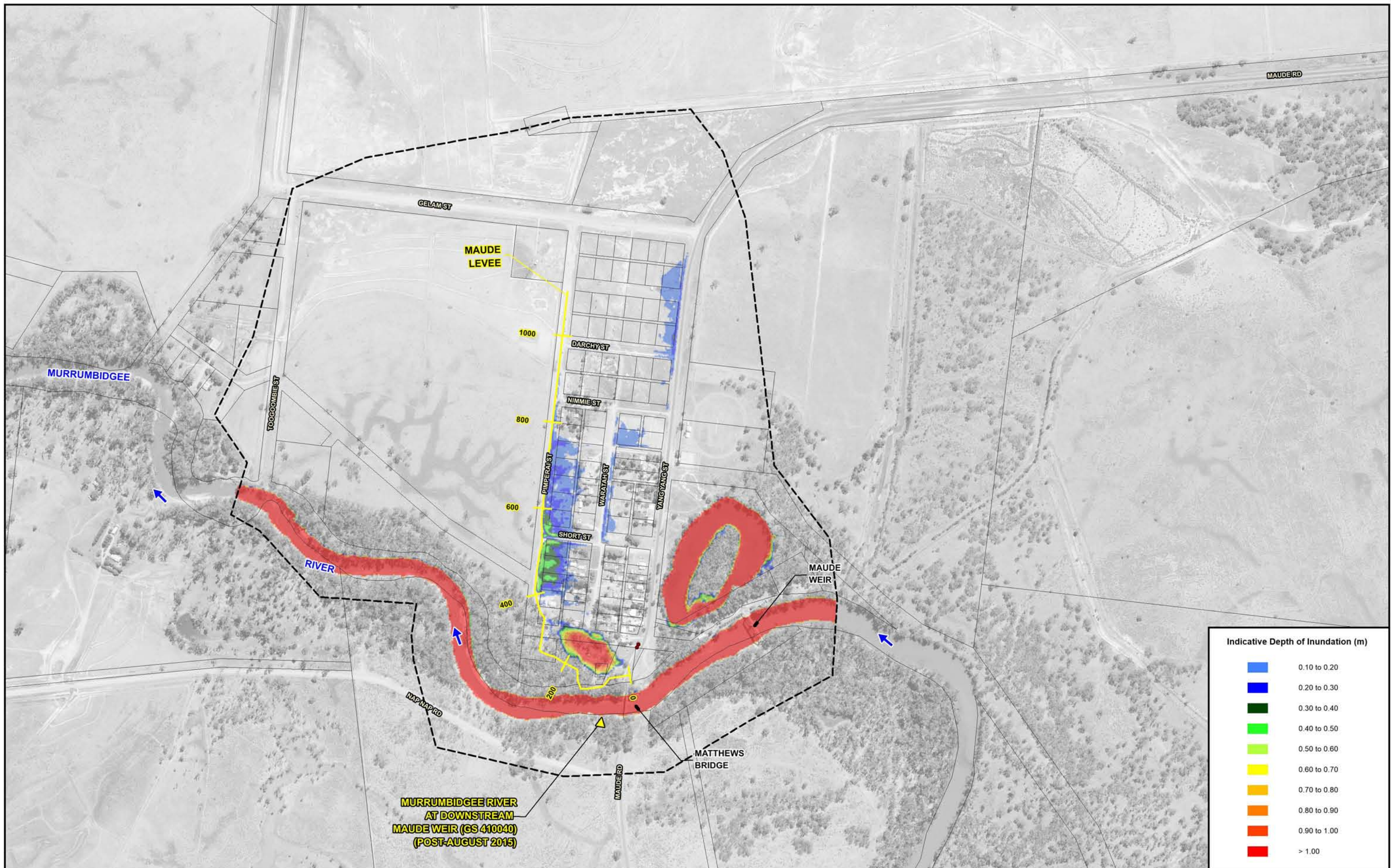
APPENDIX F

FIGURES SHOWING DESIGN LOCAL CATCHMENT FLOOD BEHAVIOUR AT MAUDE

LIST OF FIGURES (APPENDIX F)

- F1.1 Indicative Extent and Depths of Inundation – 20% AEP Local Catchment Flood at Maude
- F1.2 Indicative Extent and Depths of Inundation – 10% AEP Local Catchment Flood at Maude
- F1.3 Indicative Extent and Depths of Inundation – 5% AEP Local Catchment Flood at Maude
- F1.4 Indicative Extent and Depths of Inundation – 2% AEP Local Catchment Flood at Maude
- F1.5 Indicative Extent and Depths of Inundation – 0.5% AEP Local Catchment Flood at Maude
- F1.6 Indicative Extent and Depths of Inundation – 0.2% AEP Local Catchment Flood at Maude
- F1.7 Indicative Extent and Depths of Inundation – PMF Local Catchment Flood at Maude





Indicative Depth of Inundation (m)	
■	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

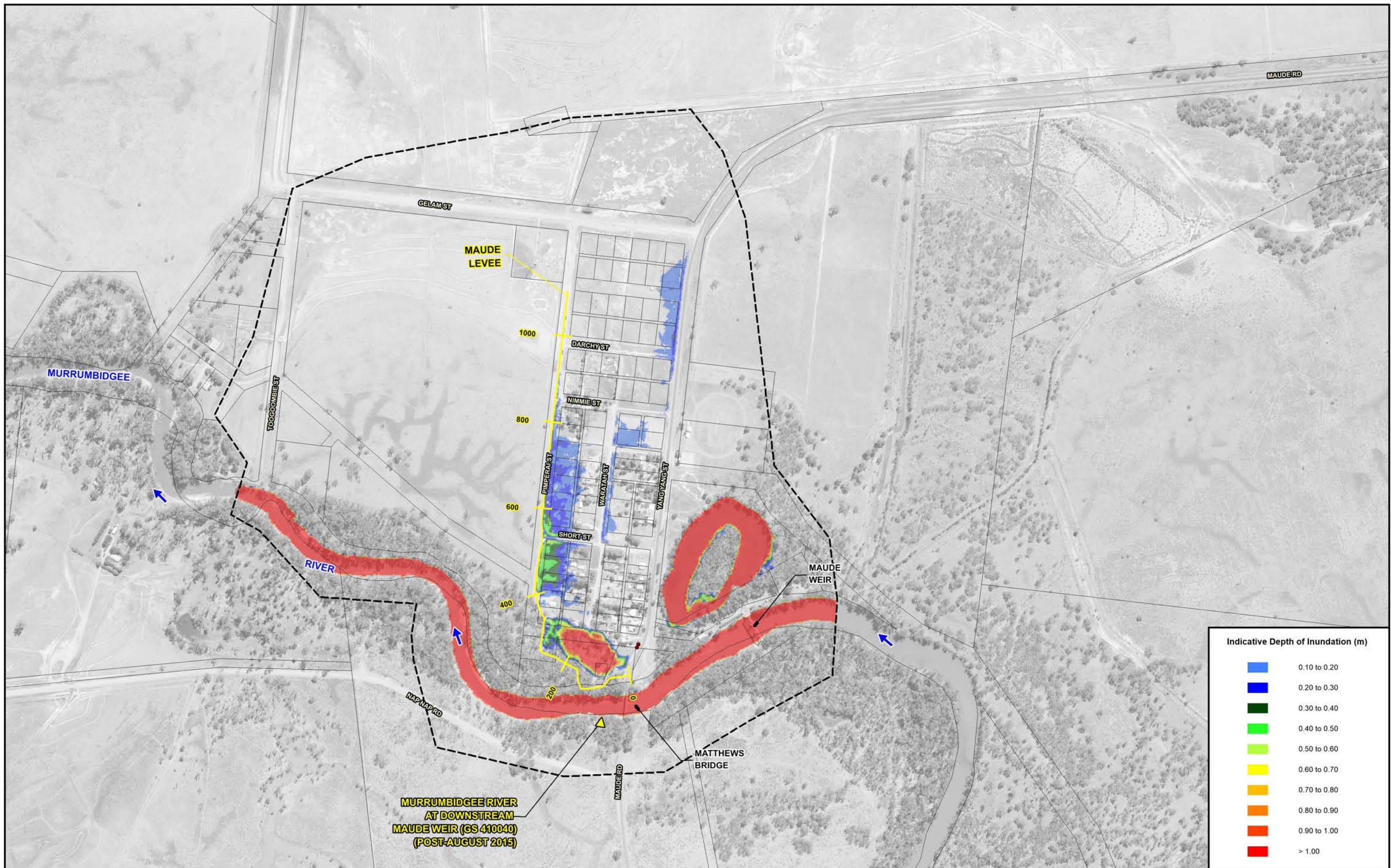
NOTE:
 The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.
 Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

- LEGEND**
-  Existing Levee
 -  WaterNSW Stream Gauge
 -  Modelled Stormwater Drainage System
 -  Two-Dimensional Model Boundary

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure F1.2

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
 10% AEP LOCAL CATCHMENT FLOOD AT MAUDE



Indicative Depth of Inundation (m)	
■	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

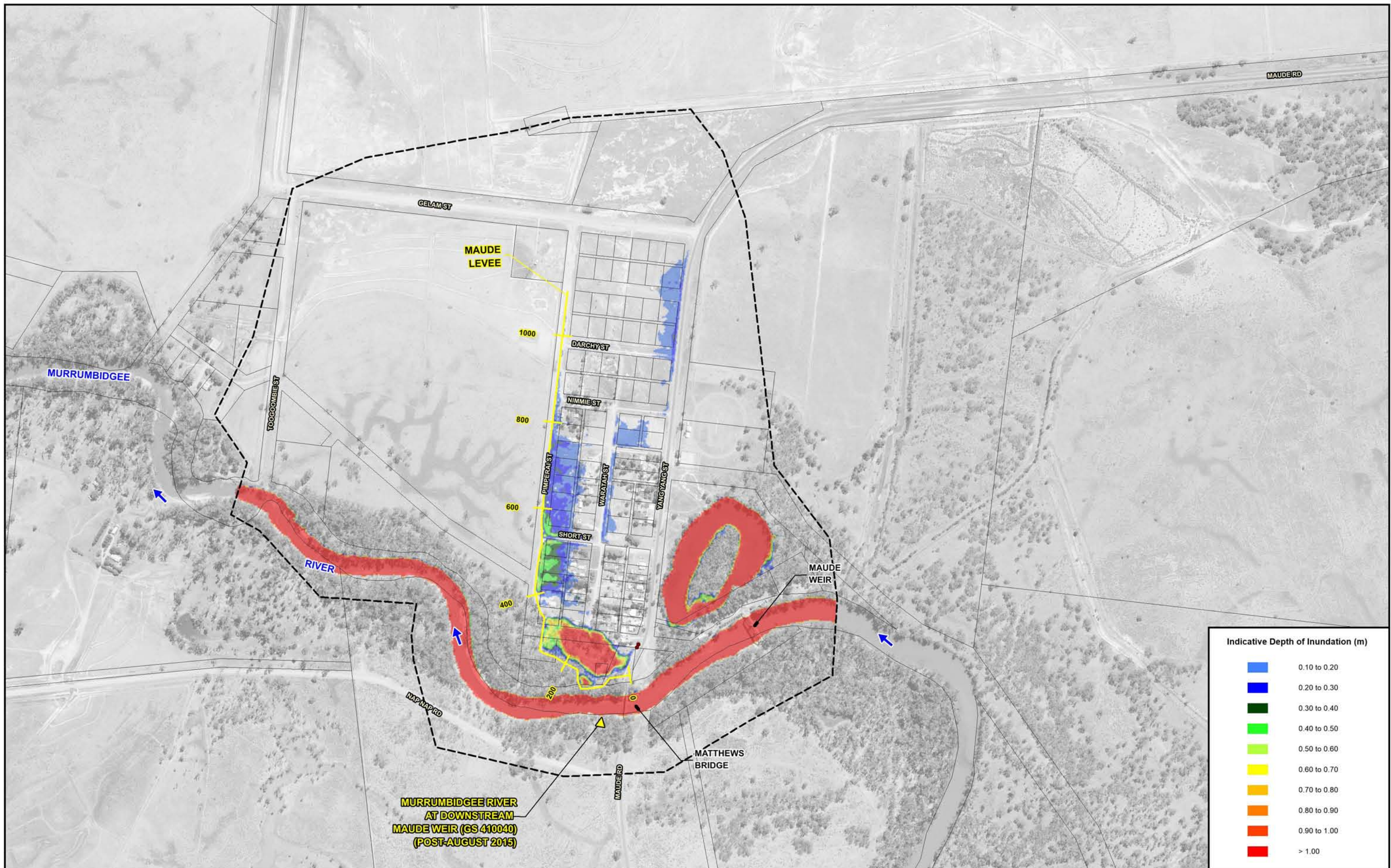
NOTE:
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 Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

- LEGEND**
-  Existing Levee
 -  WaterNSW Stream Gauge
 -  Modelled Stormwater Drainage System
 -  Two-Dimensional Model Boundary

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure F1.3

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
 5% AEP LOCAL CATCHMENT FLOOD AT MAUDE



Indicative Depth of Inundation (m)	
■	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

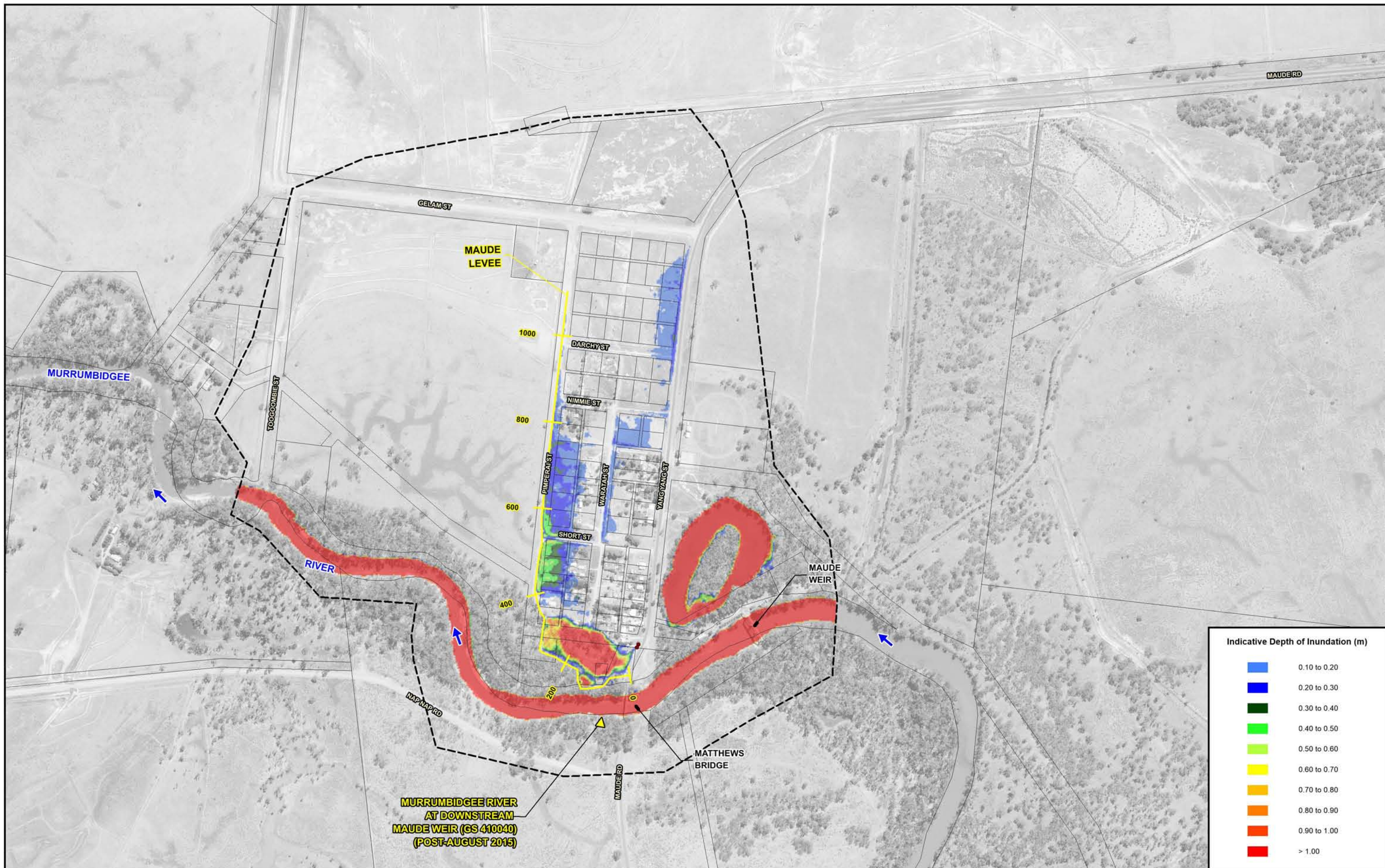
NOTE:
 The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.
 Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

- LEGEND**
- Existing Levee
 - ▲ WaterNSW Stream Gauge
 - Modelled Stormwater Drainage System
 - Two-Dimensional Model Boundary

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure F1.4

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
 2% AEP LOCAL CATCHMENT FLOOD AT MAUDE



Indicative Depth of Inundation (m)	
■	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

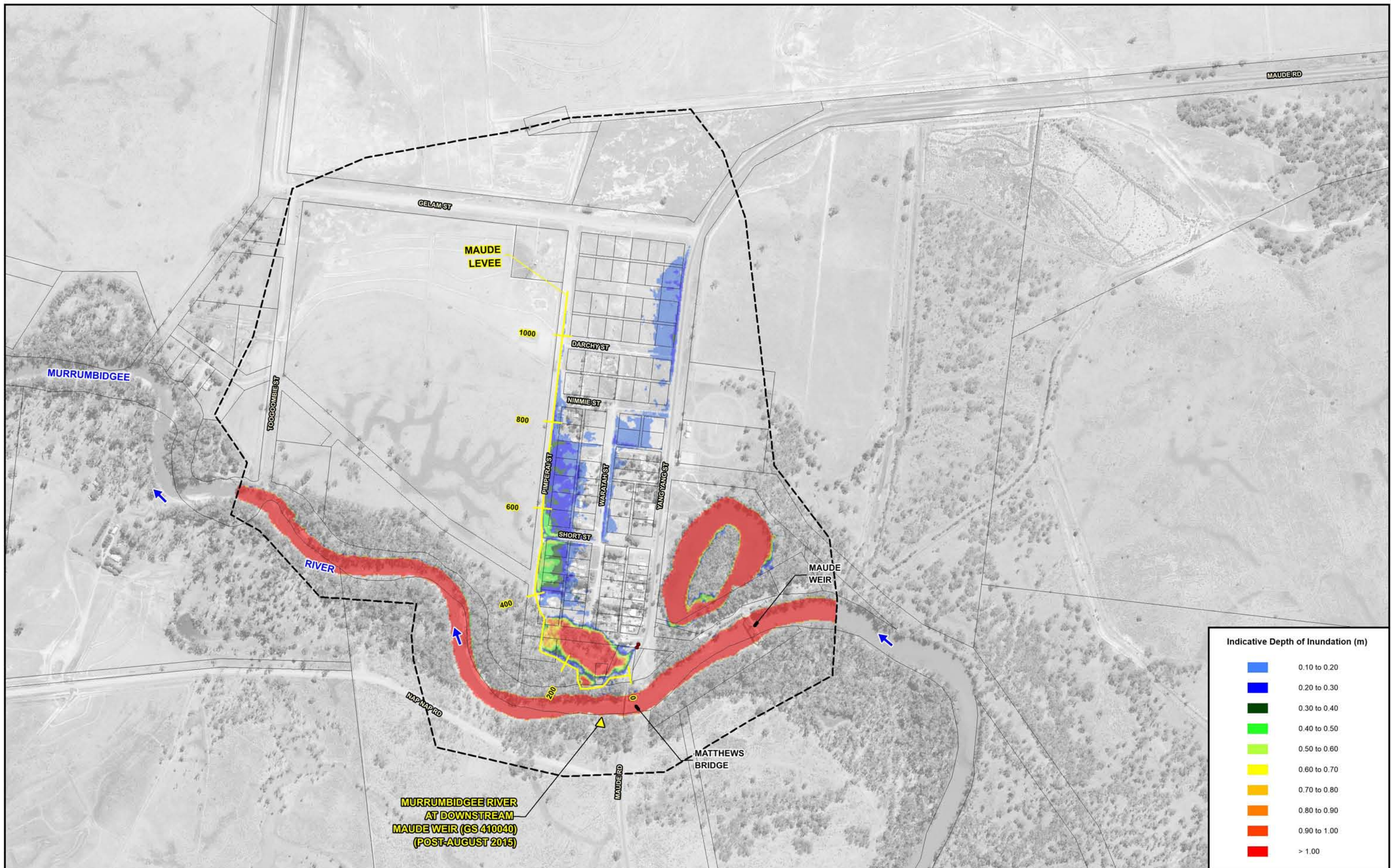
NOTE:
 The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.
 Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

- LEGEND**
- Existing Levee
 - ▲ WaterNSW Stream Gauge
 - Modelled Stormwater Drainage System
 - Two-Dimensional Model Boundary

HAY AND MAUDE FLOOD RISK MANAGEMENT STUDY AND PLAN

Figure F1.5

INDICATIVE EXTENT AND DEPTHS OF INUNDATION
 0.5% AEP LOCAL CATCHMENT FLOOD AT MAUDE



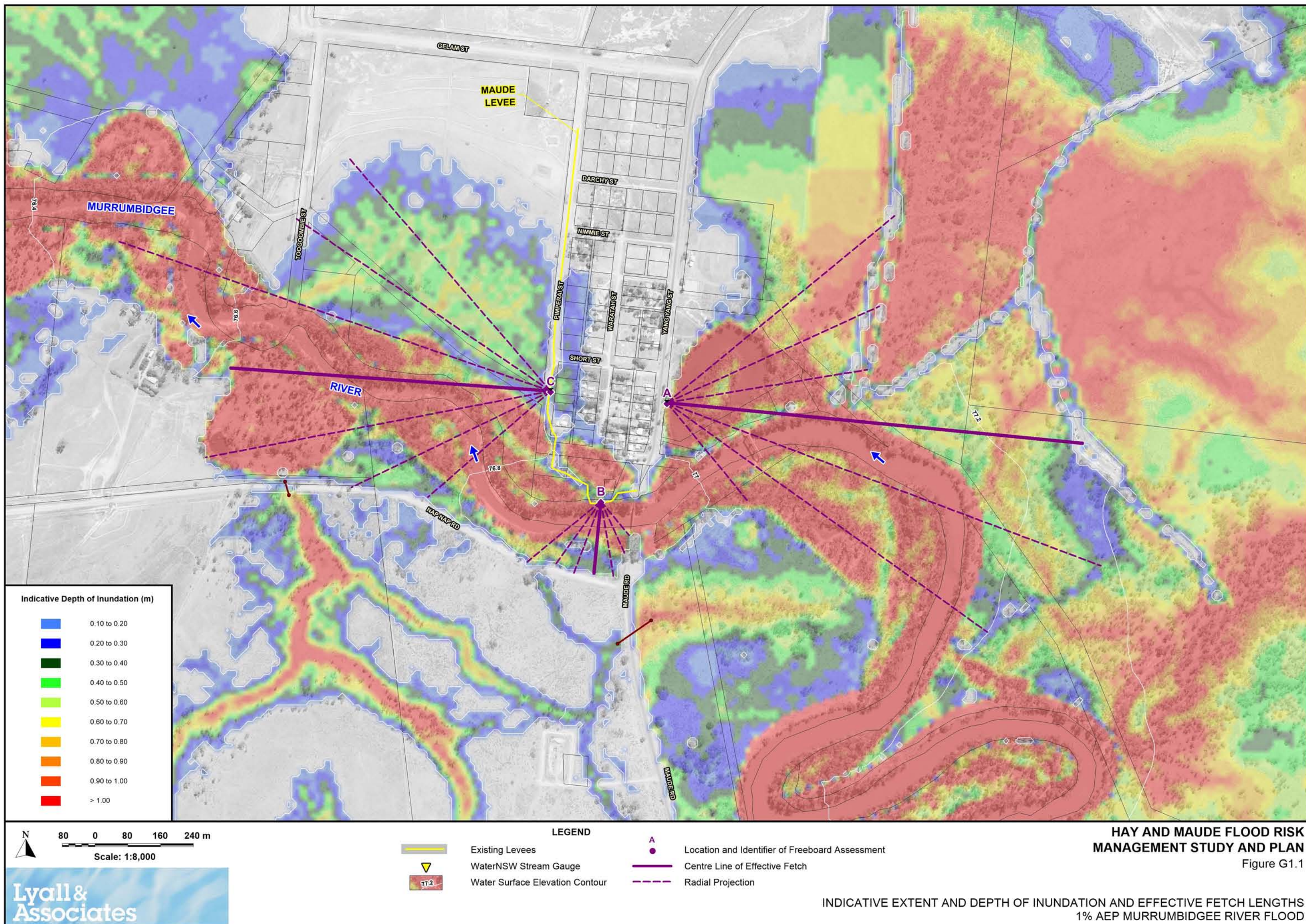
Indicative Depth of Inundation (m)	
■	0.10 to 0.20
■	0.20 to 0.30
■	0.30 to 0.40
■	0.40 to 0.50
■	0.50 to 0.60
■	0.60 to 0.70
■	0.70 to 0.80
■	0.80 to 0.90
■	0.90 to 1.00
■	> 1.00

APPENDIX G

PRELIMINARY LEVEE FREEBOARD ANALYSIS AT MAUDE

LIST OF FIGURES (APPENDIX G)

G1.1 Indicative Extent and Depth of Inundation and Effective Fetch Lengths at Maude – 1% AEP Murrumbidgee River Flood

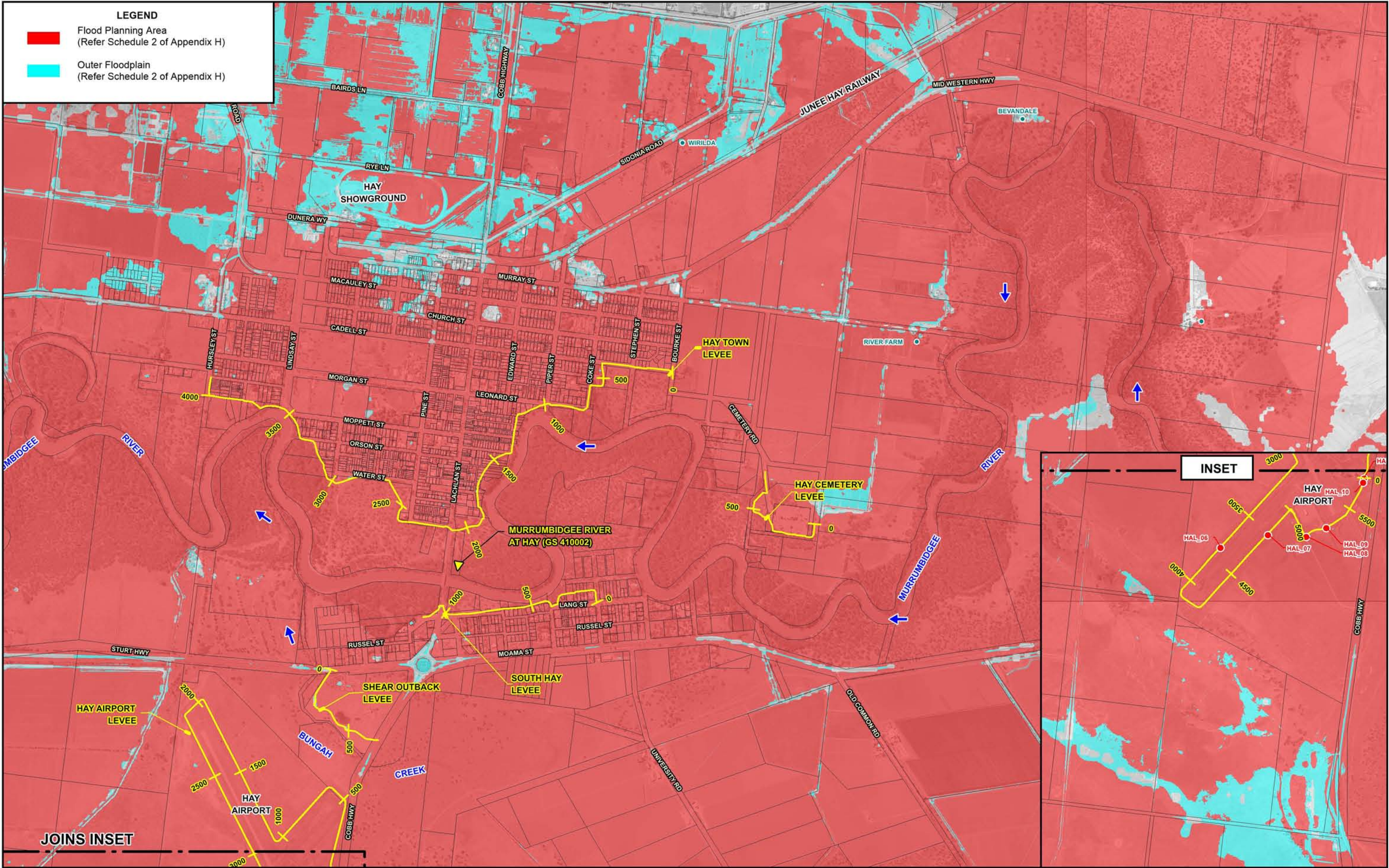


APPENDIX H

SUGGESTED WORDING FOR INCLUSION IN HAY SHIRE DEVELOPMENT CONTROL PLAN

LIST OF FIGURES (APPENDIX H)

- H1.1 Extract of Hay Shire Flood Planning Map at Hay
- H1.2 Extract of Hay Shire Flood Planning Map at Maude
- H1.3 Extract of Hay Shire Flood Planning Constraint Category Map at Hay
- H1.4 Extract of Hay Shire Flood Planning Constraint Category Map at Maude



LEGEND

■ Flood Planning Area
(Refer Schedule 2 of Appendix H)

■ Outer Floodplain
(Refer Schedule 2 of Appendix H)

Scale: 1:20,000

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

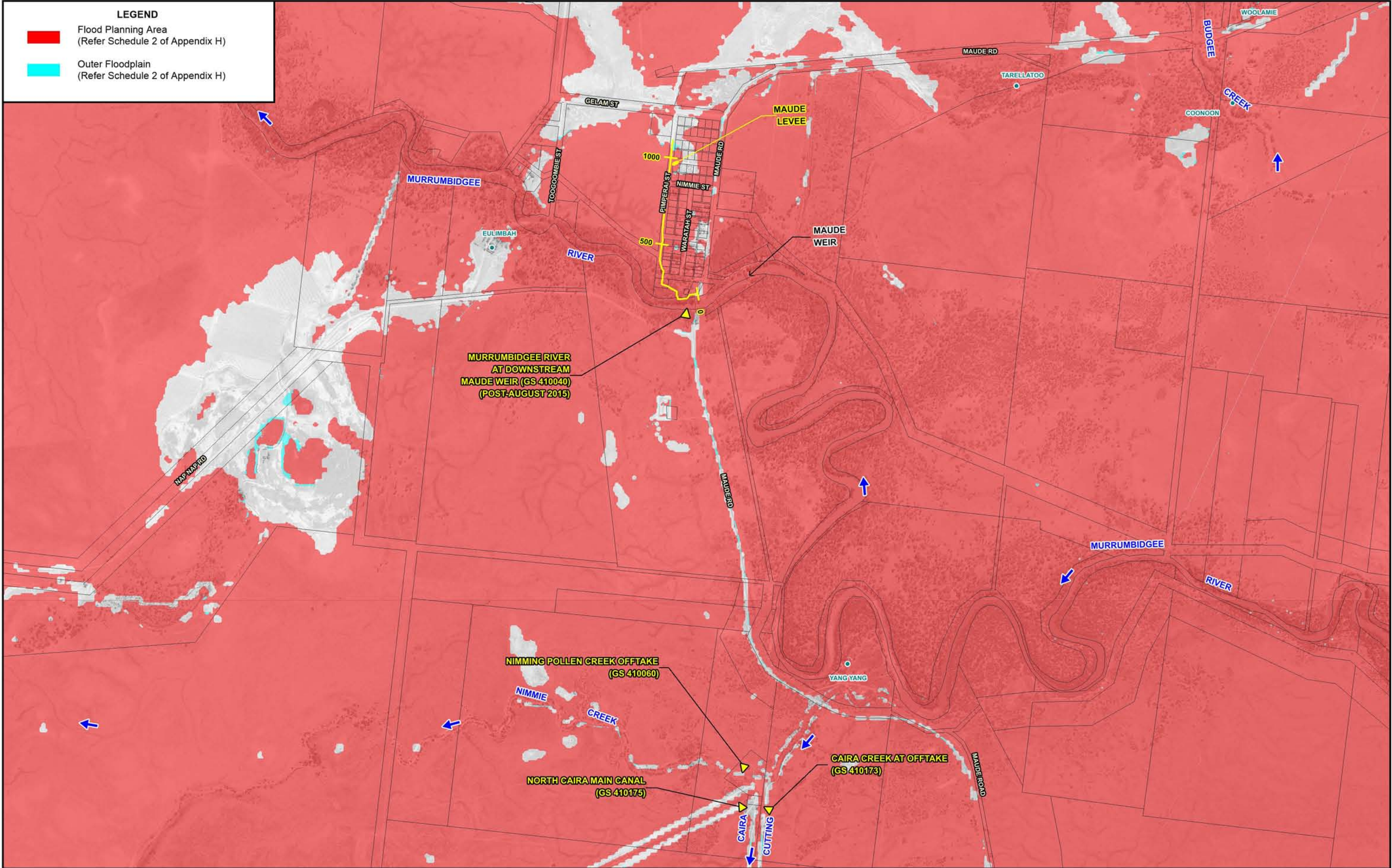
— Existing Levees

▼ WaterNSW Stream Gauge

● Rural Homestead

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**
Figure H1.1

EXTRACT OF HAY SHIRE FLOOD PLANNING
AREA MAP AT HAY



LEGEND

■ Flood Planning Area
(Refer Schedule 2 of Appendix H)

■ Outer Floodplain
(Refer Schedule 2 of Appendix H)

Scale: 1:20,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

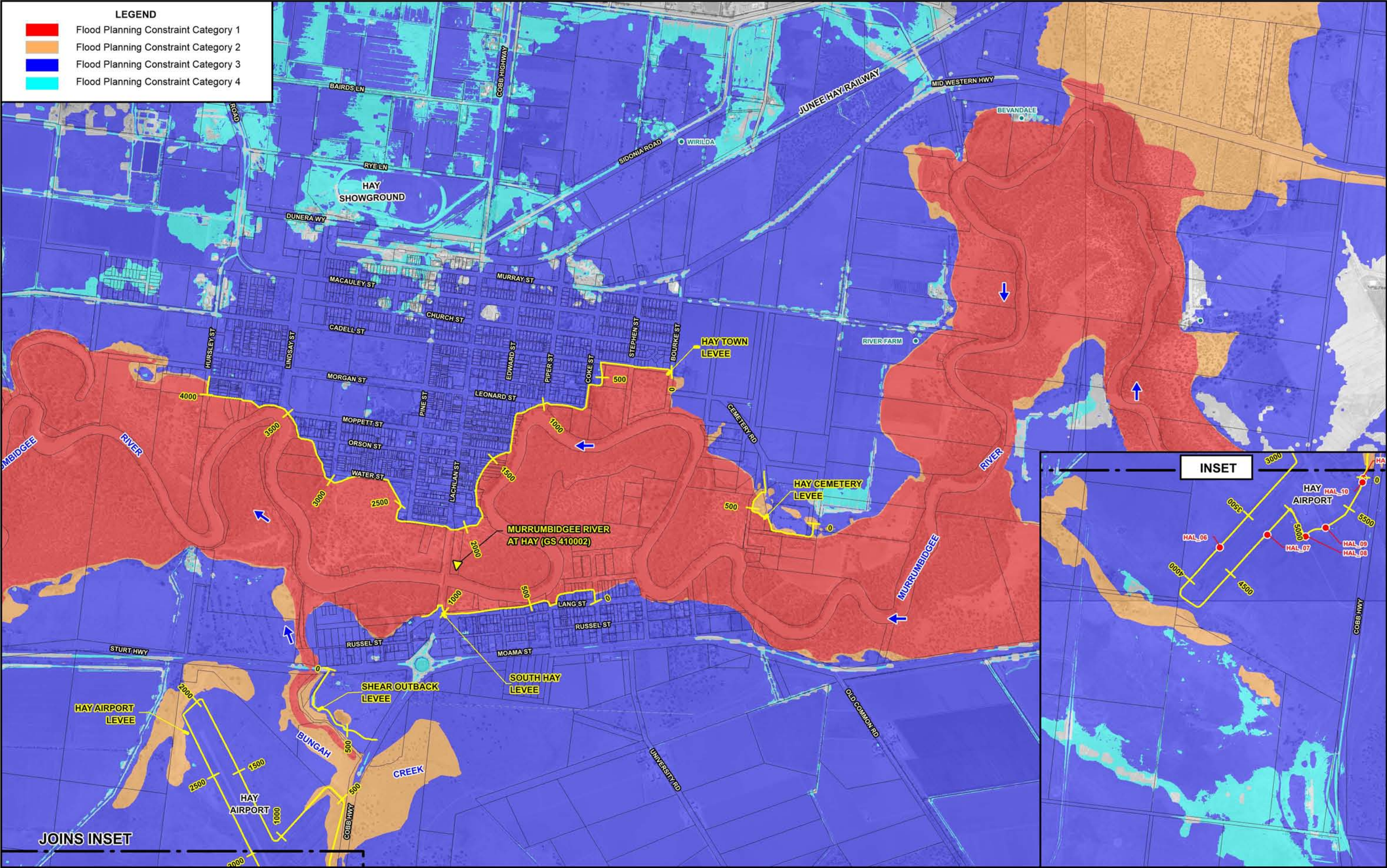
— Existing Levee

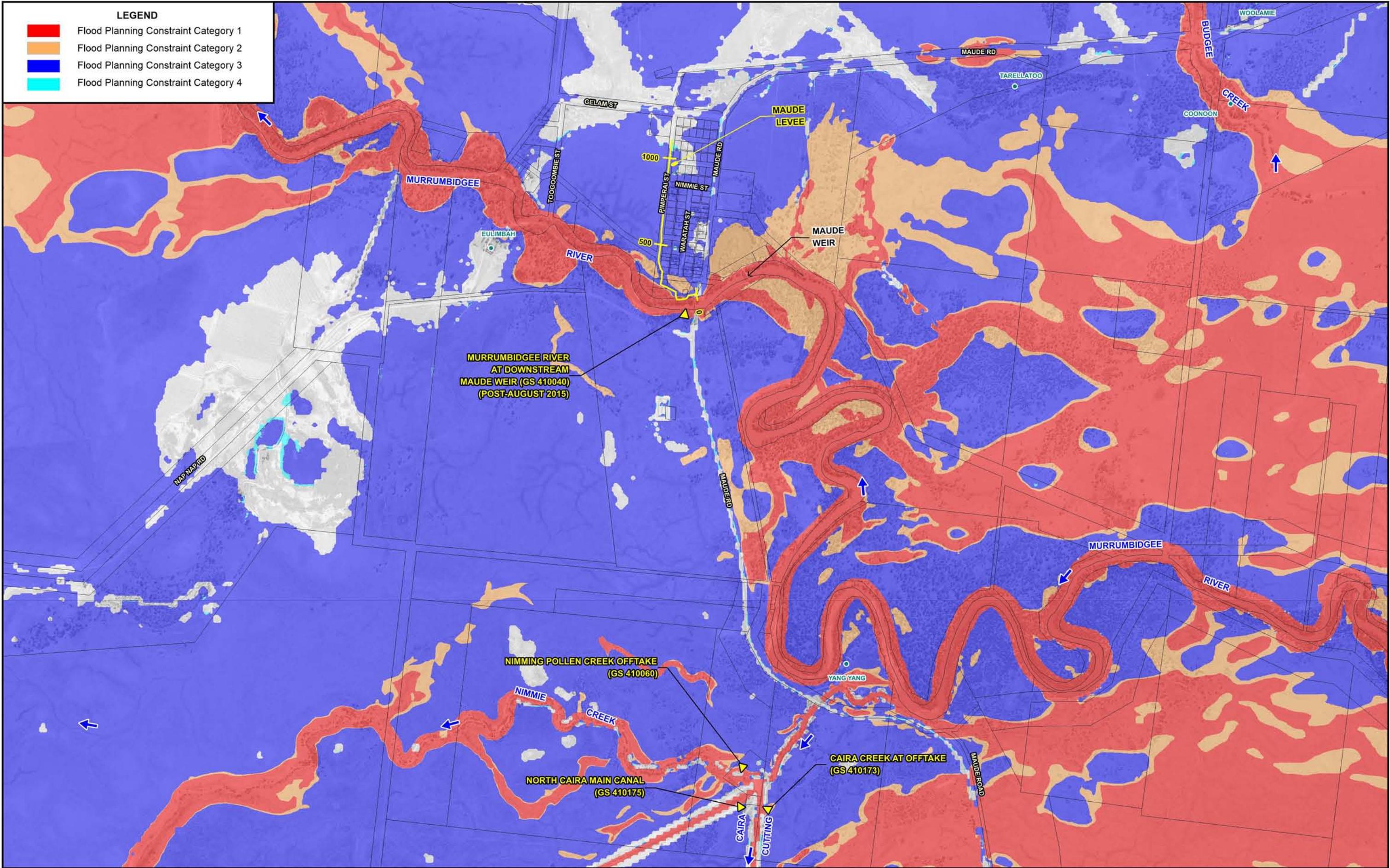
▼ WaterNSW Stream Gauge

● Rural Homestead

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**
Figure H1.2

EXTRACT OF HAY SHIRE FLOOD PLANNING
AREA MAP AT MAUDE





LEGEND

- Flood Planning Constraint Category 1
- Flood Planning Constraint Category 2
- Flood Planning Constraint Category 3
- Flood Planning Constraint Category 4

MURRUMBIDGEE RIVER
AT DOWNSTREAM
MAUDE WEIR (GS 410040)
(POST-AUGUST 2015)

NIMMING POLLEN CREEK OFFTAKE
(GS 410060)

NORTH CAIRA MAIN CANAL
(GS 410175)

CAIRA CREEK AT OFFTAKE
(GS 410173)

200 0 200 400 600 m
Scale: 1:20,000



NOTE:
The ground surface model incorporated in TUFLOW is based on LIDAR survey which has been sampled on a 2 m (min) grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Existing Levee
- WaterNSW Stream Gauge
- Rural Homestead

**HAY AND MAUDE FLOOD RISK
MANAGEMENT STUDY AND PLAN**
Figure H1.4

EXTRACT OF HAY SHIRE FLOOD PLANNING
CONSTRAINT CATEGORY MAP AT MAUDE