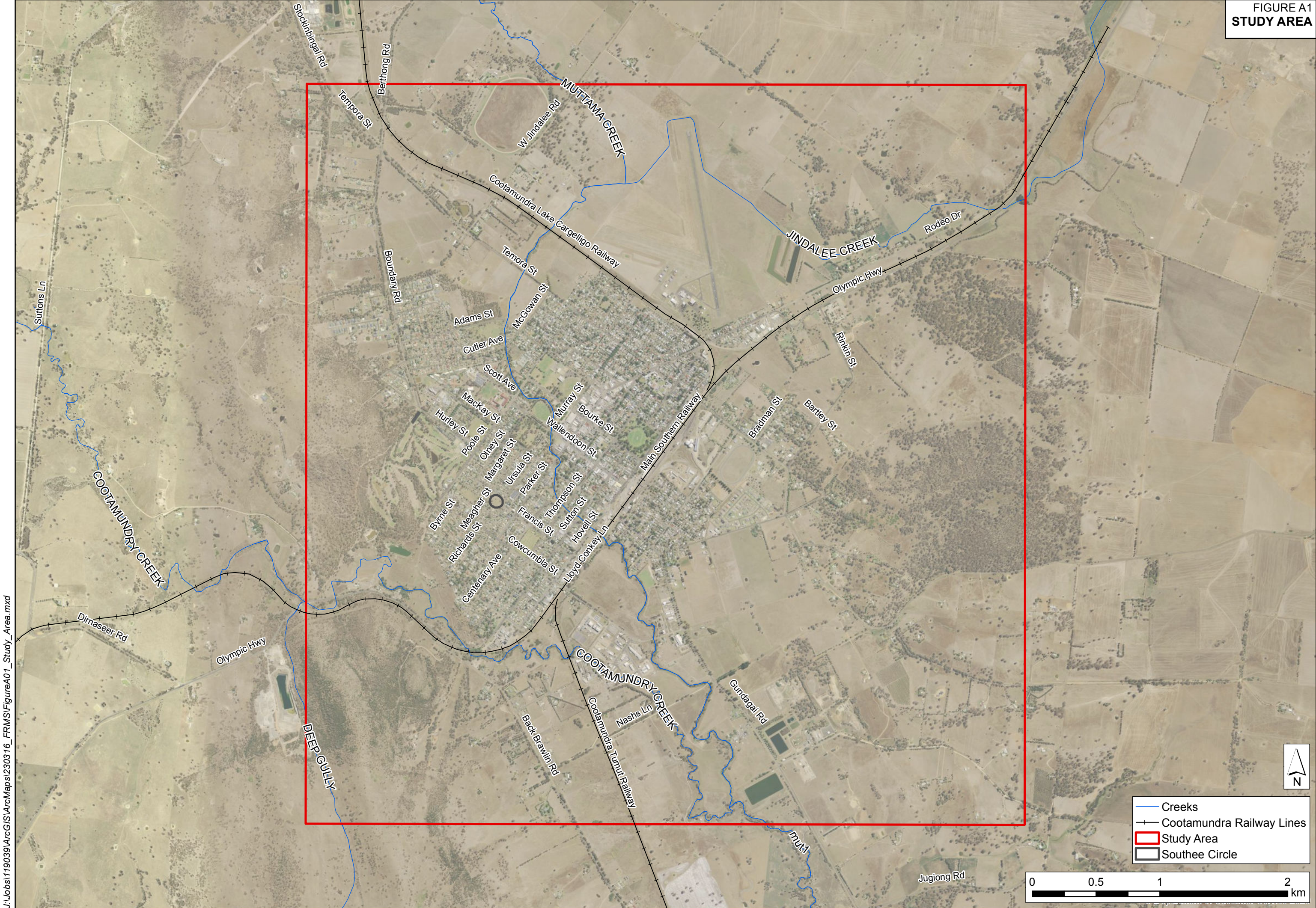




FIGURE A1
STUDY AREA



Note: 1m LiDAR data captured in 2014.
5m LiDAR data captured in 2015/2017.

FIGURE A2
AVAILABLE LiDAR DATA

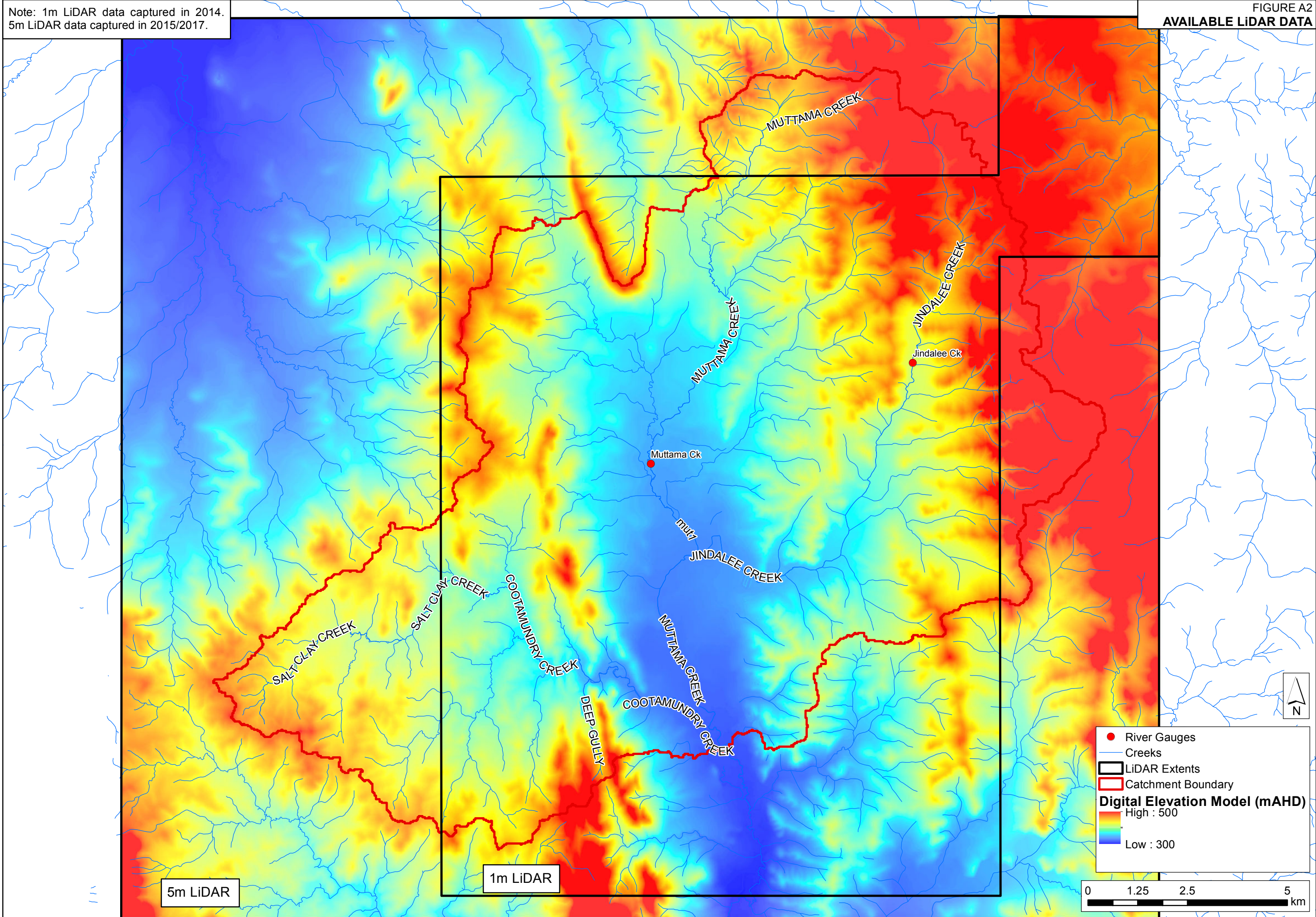
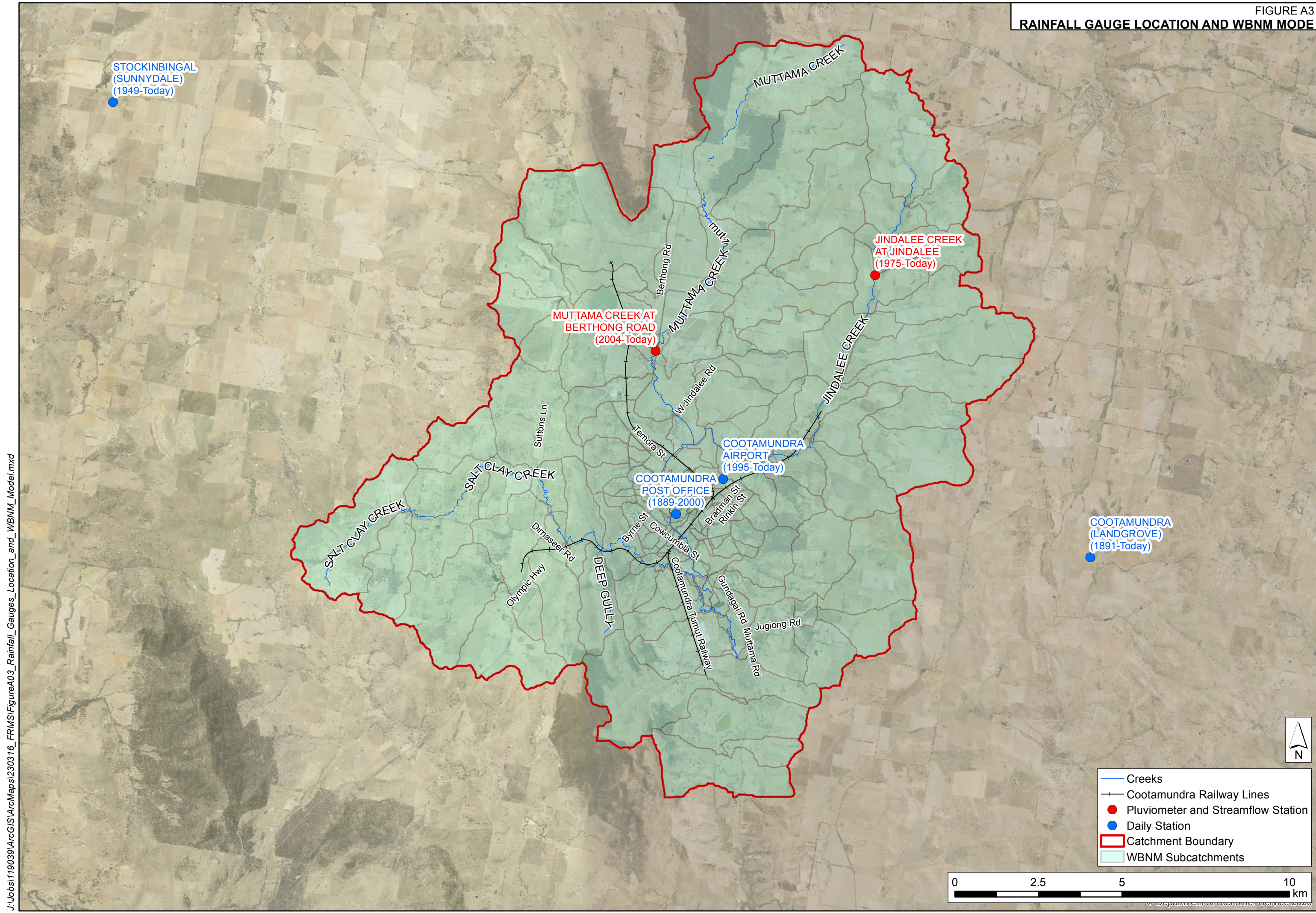
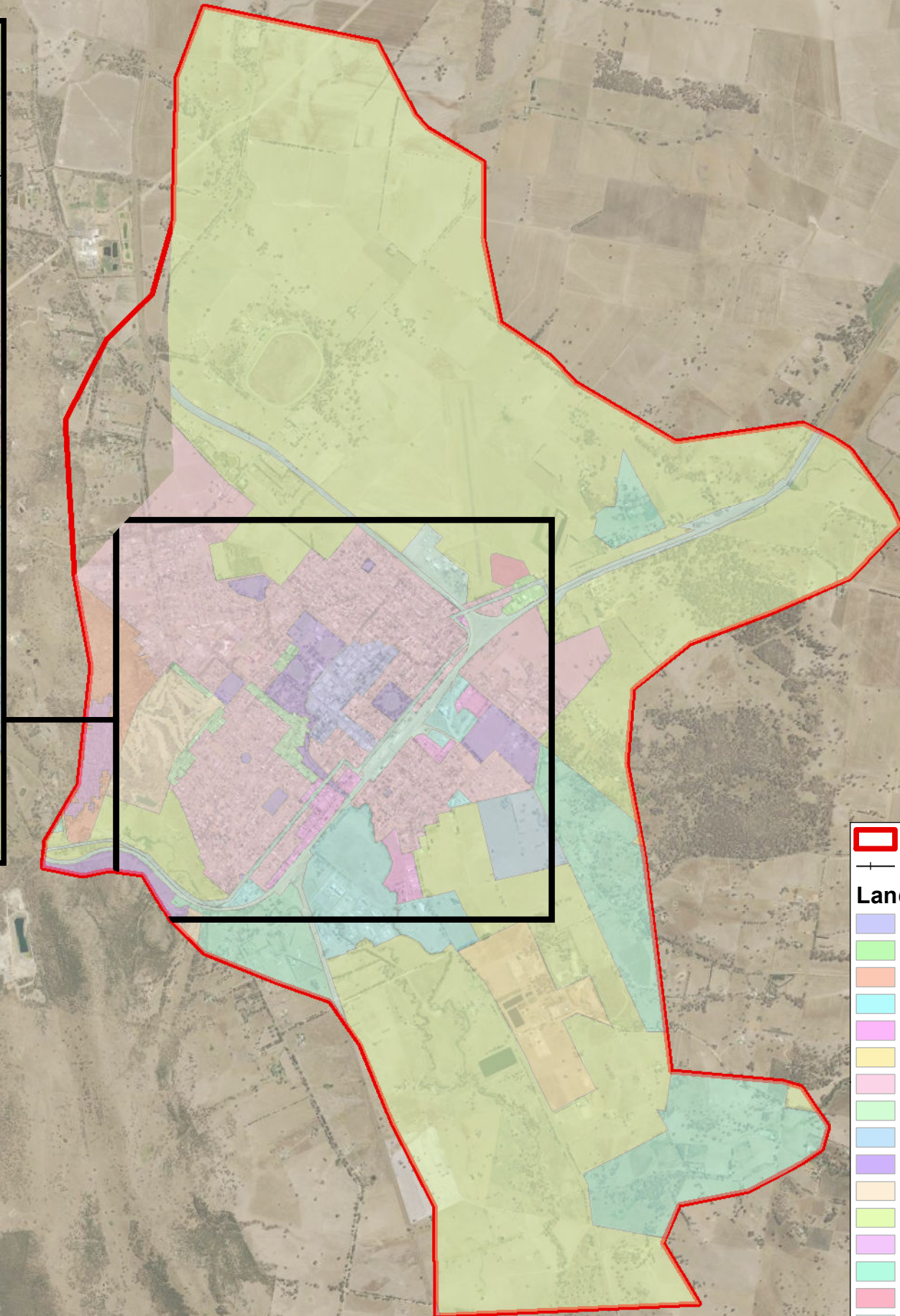
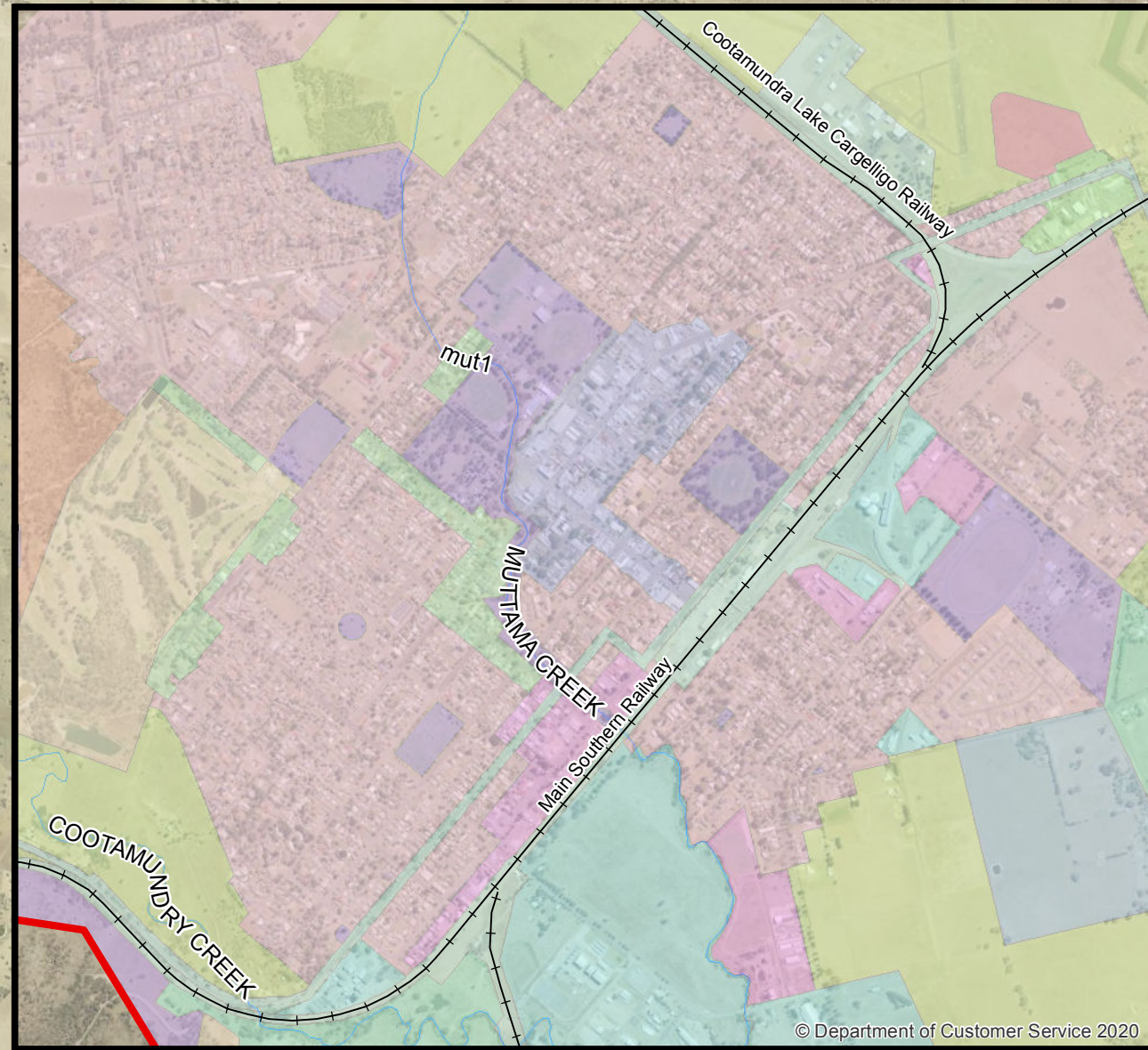


FIGURE A3
RAINFALL GAUGE LOCATION AND WBNM MODE



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FIGURE A4
LANDUSE ZONES



- Study Area**
- Cootamundra Railways Lines
- Land Use Zones**
- B3 - Commercial Centre
 - B6 - Enterprise Corridor
 - E3 - Environmental Management
 - IN1 - General Industrial
 - IN2 - Light Industrial
 - IN3 - Heavy Industrial
 - R1 - General Residential
 - R3 - Medium Density Residential
 - R5 - Large Lot Residential
 - RE1 - Public Recreation
 - RE2 - Private Recreation
 - RU1 - Primary Production
 - RU2 - Rural Landscape
 - RU4 - Primary Production Small Lots
 - SP1 - Special Activities
 - SP2 - Infrastructure

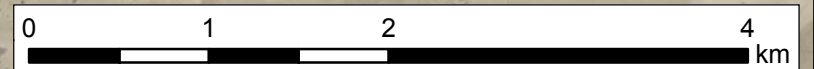


FIGURE A5
CUMULATIVE RAINFALL DATA
OCTOBER 2022 EVENT

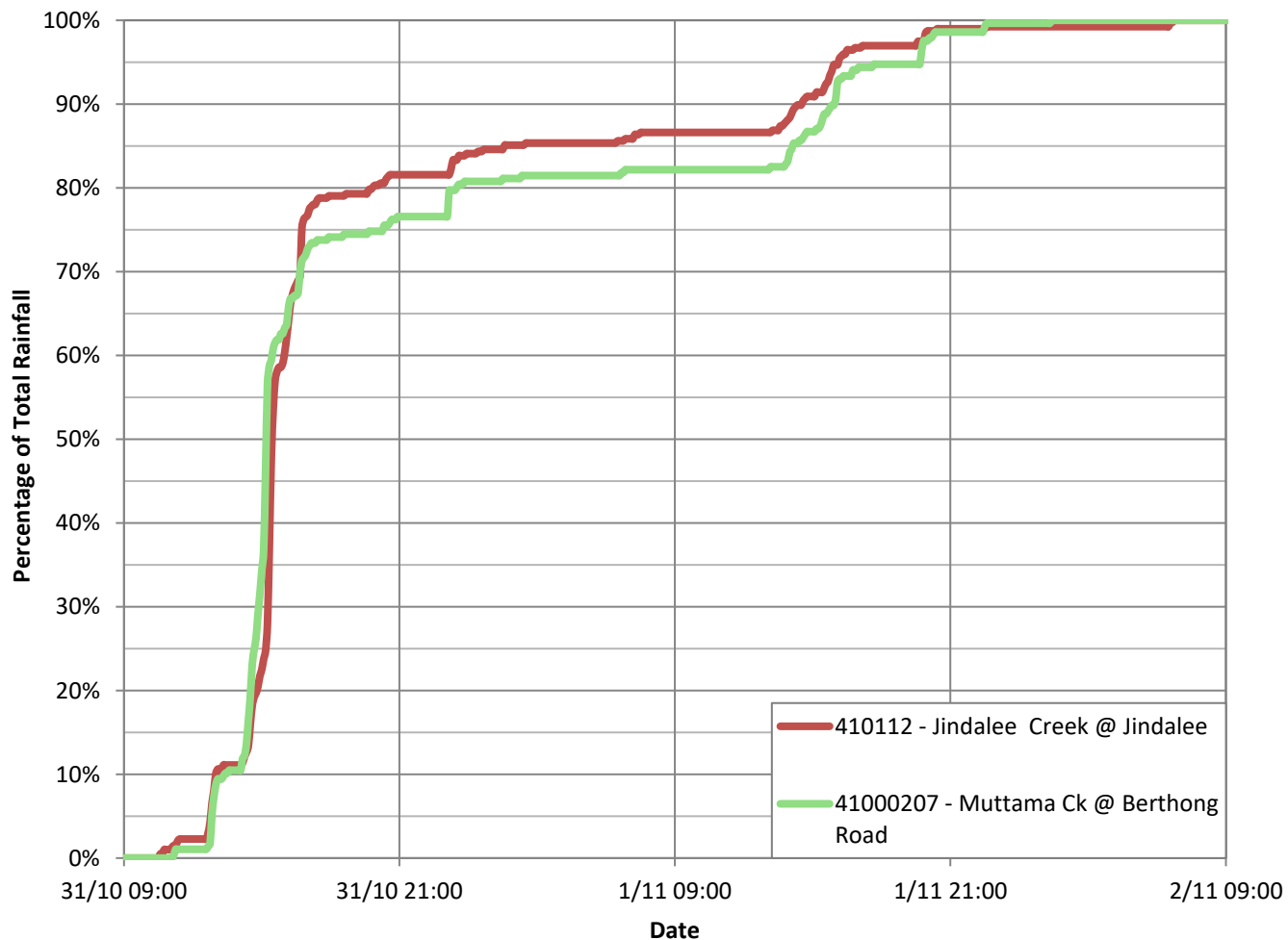
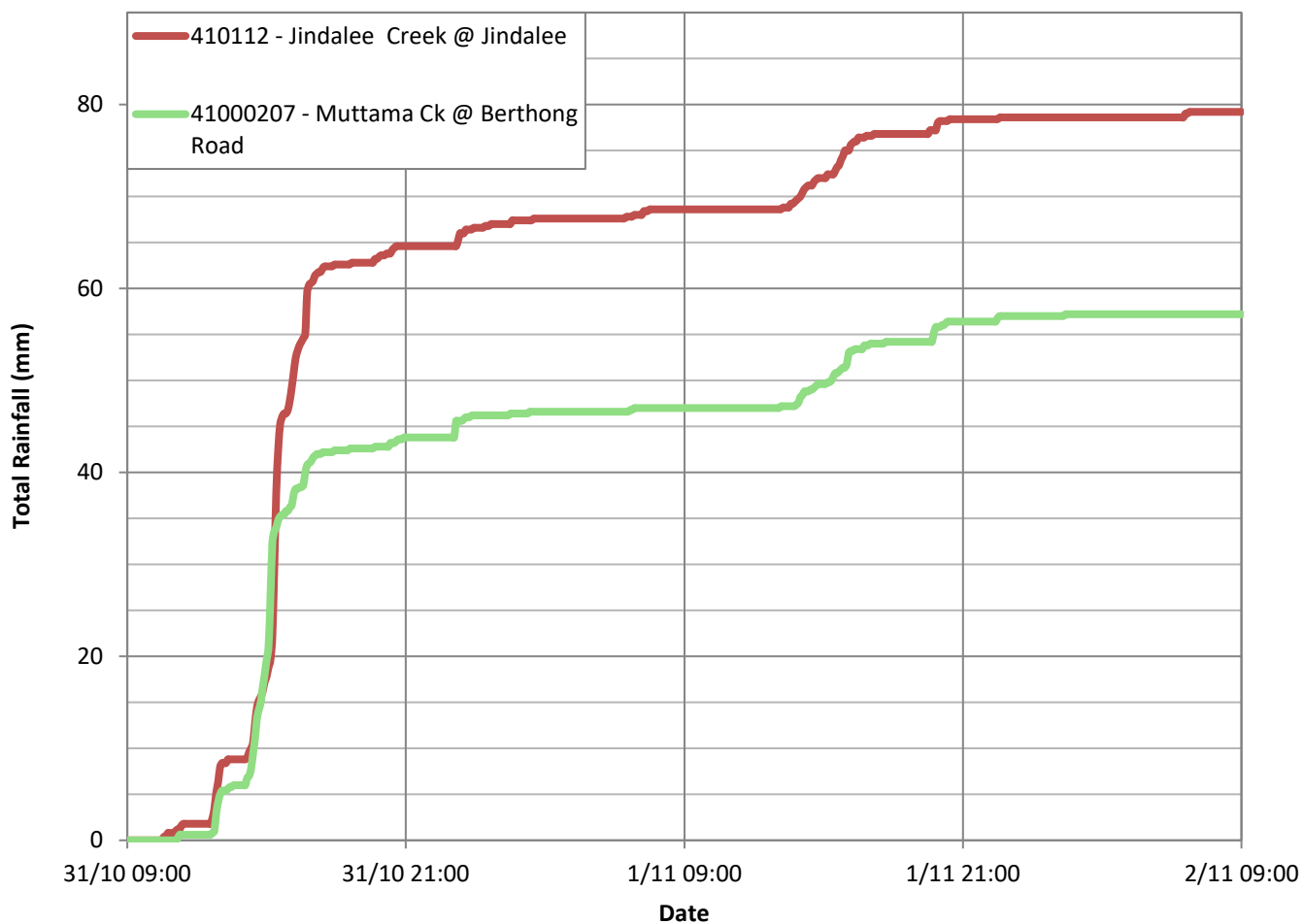


FIGURE A6
BURST INTENSITIES AND FREQUENCIES
BERTHONG GAUGE AT MUTTAMA CREEK

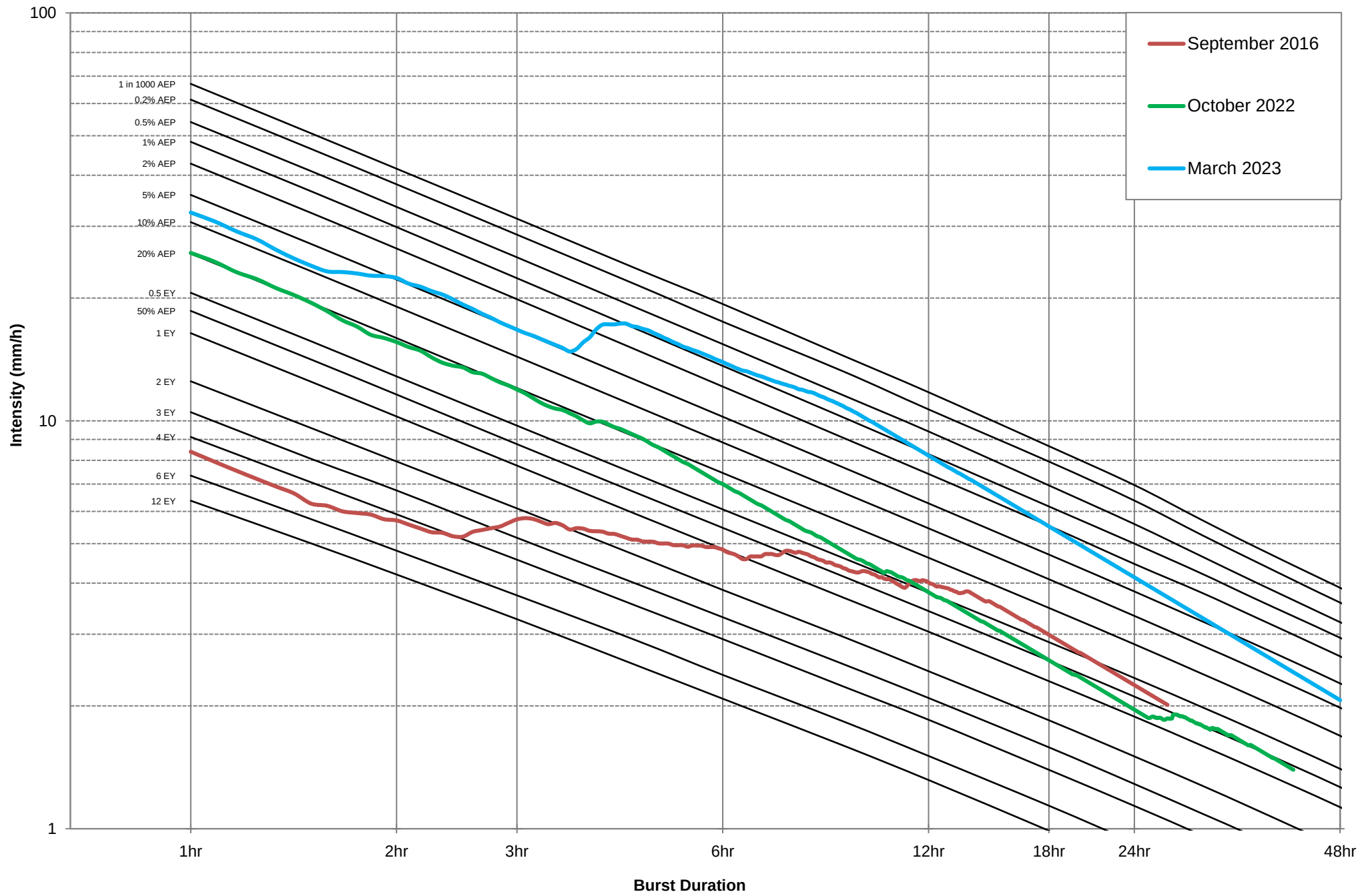
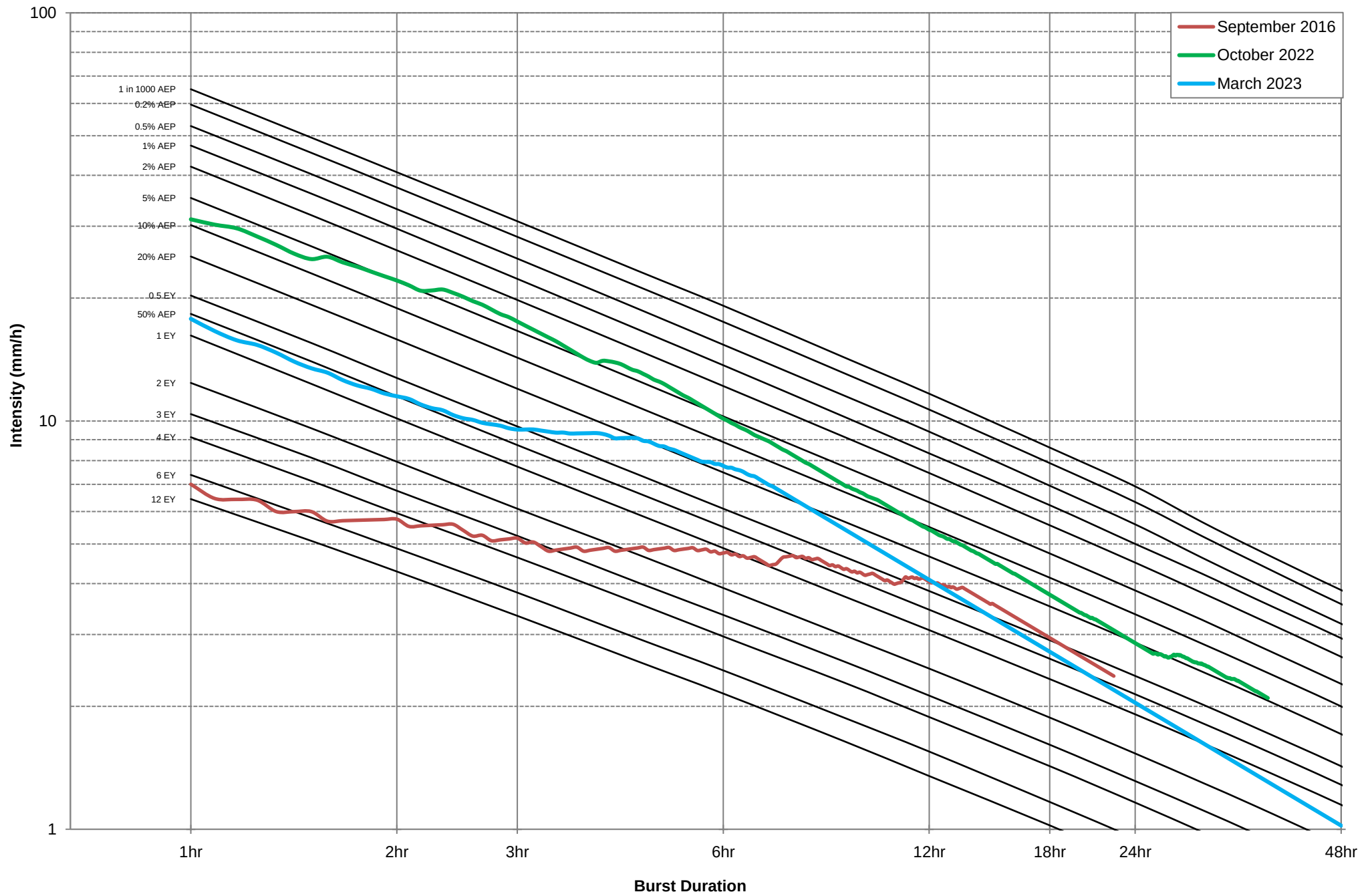


FIGURE A7
BURST INTENSITIES AND FREQUENCIES
JINDALEE AT JINDALEE CREEK



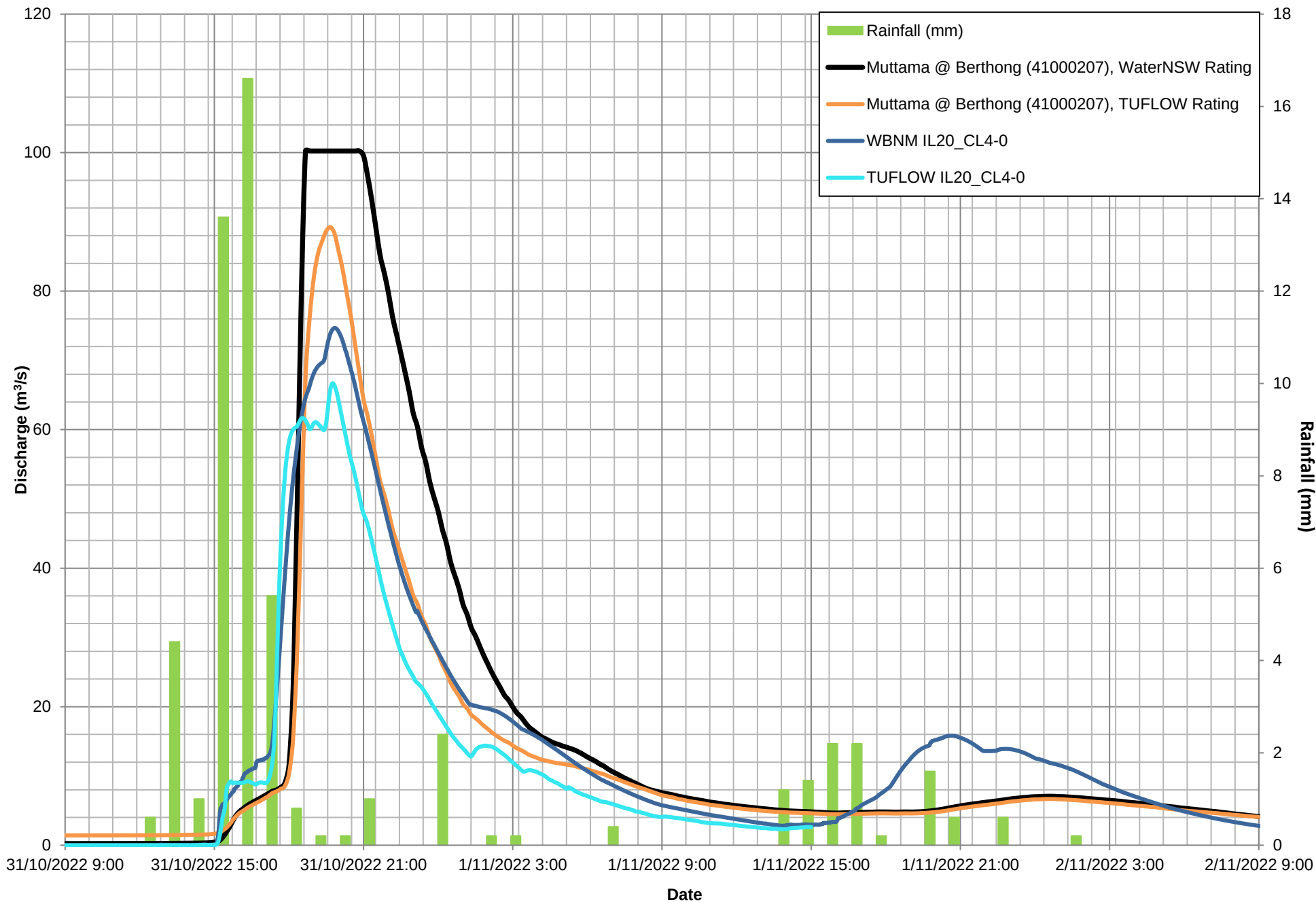


FIGURE A8A
HYDROGRAPH - MUTTAMA CREEK AT BERTHONG ROAD STATION
OCTOBER 2022 - MODELLED VS RECORDED HYDROGRAPH

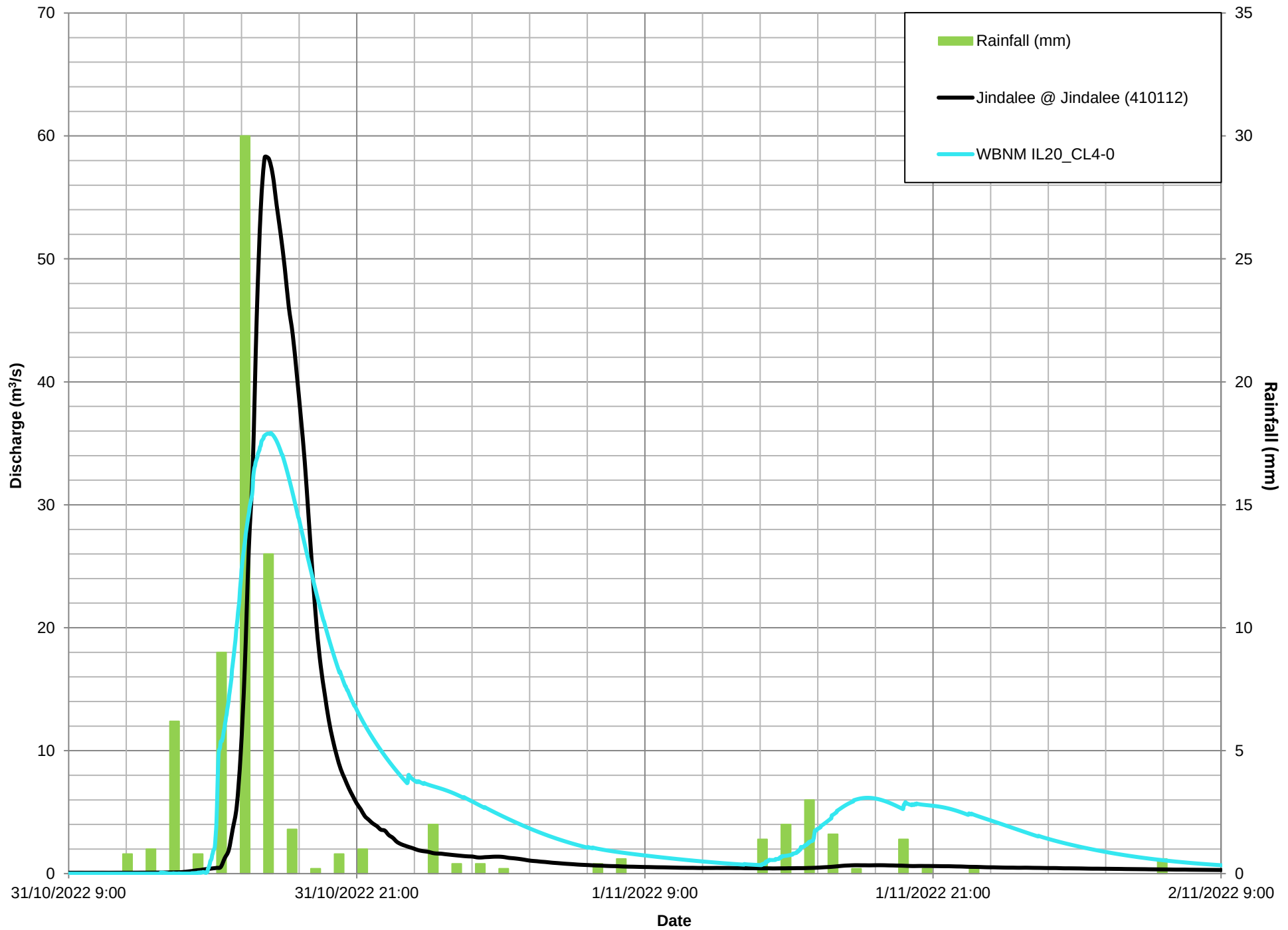
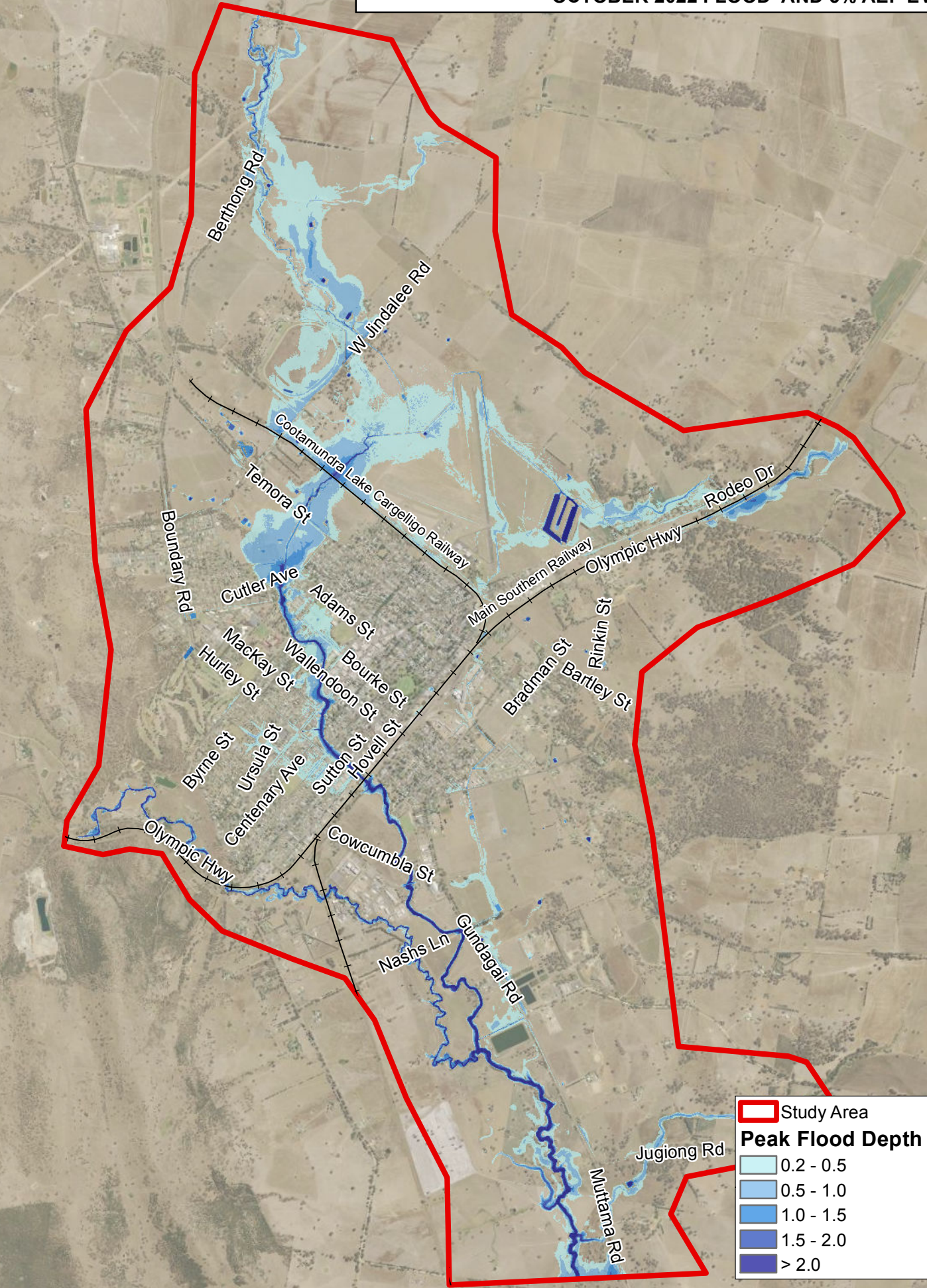
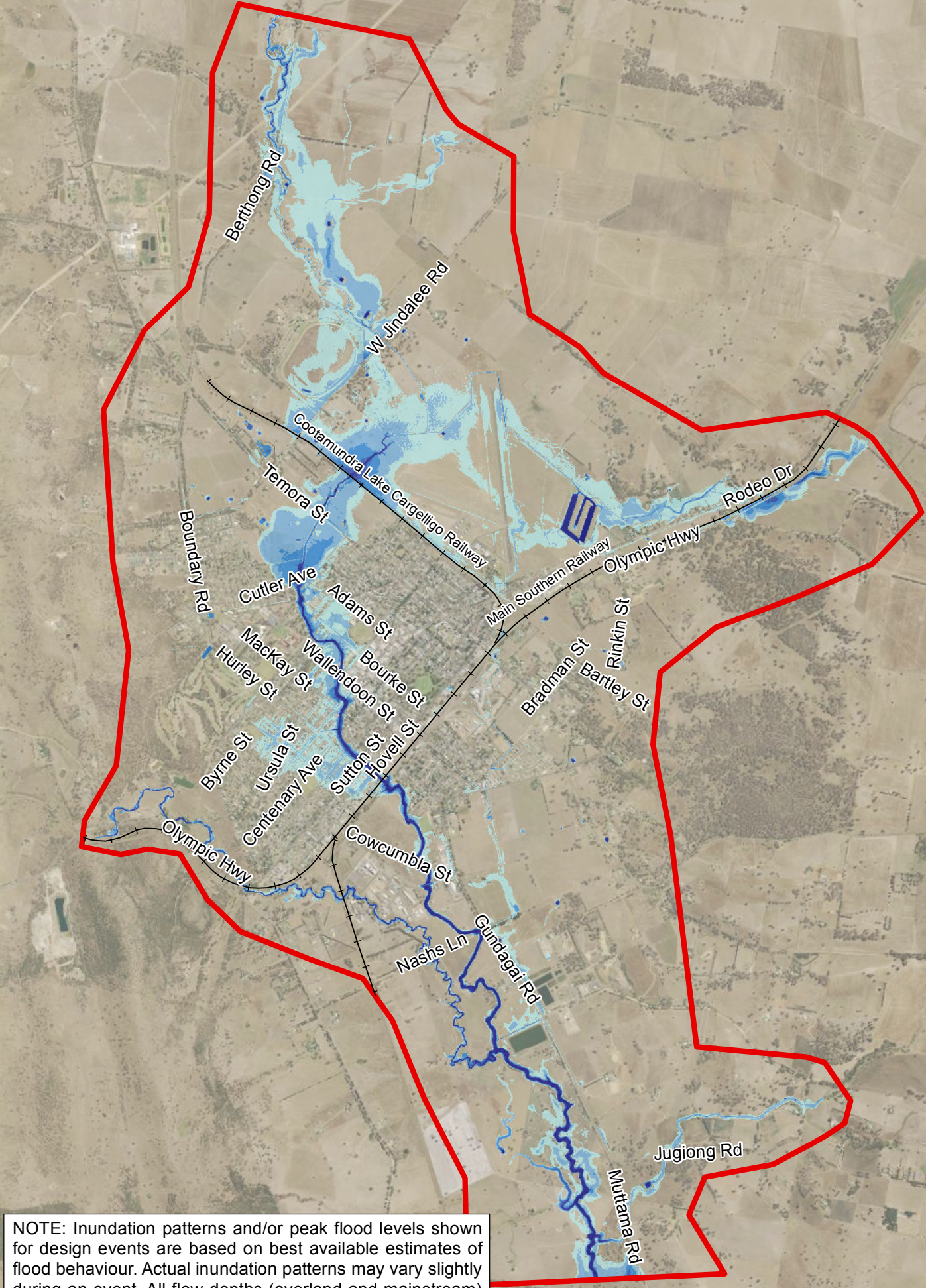


FIGURE A8B
HYDROGRAPH AT JINDALEE CREEK AT JINDALEE STATION
WBNM MODEL VS RECORDED HYDROGRAPH

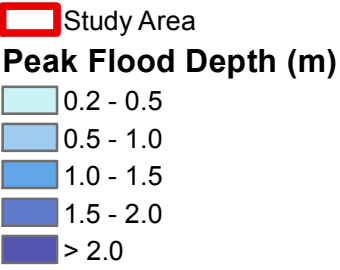
OCTOBER 2022 EVENT

5% AEP EVENT

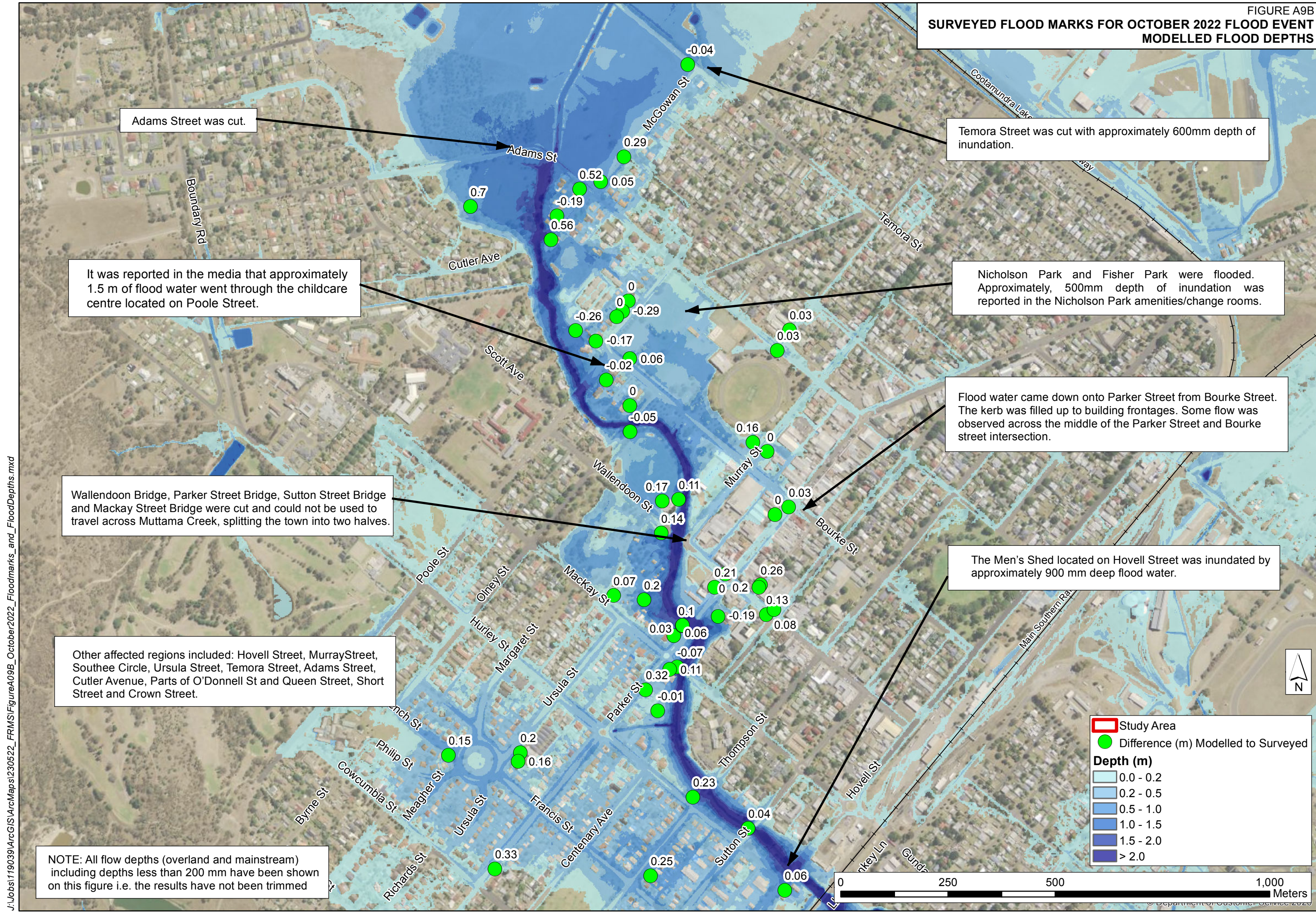
FIGURE A9A
MODELLLED FLOOD DEPTHS
OCTOBER 2022 FLOOD AND 5% AEP EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

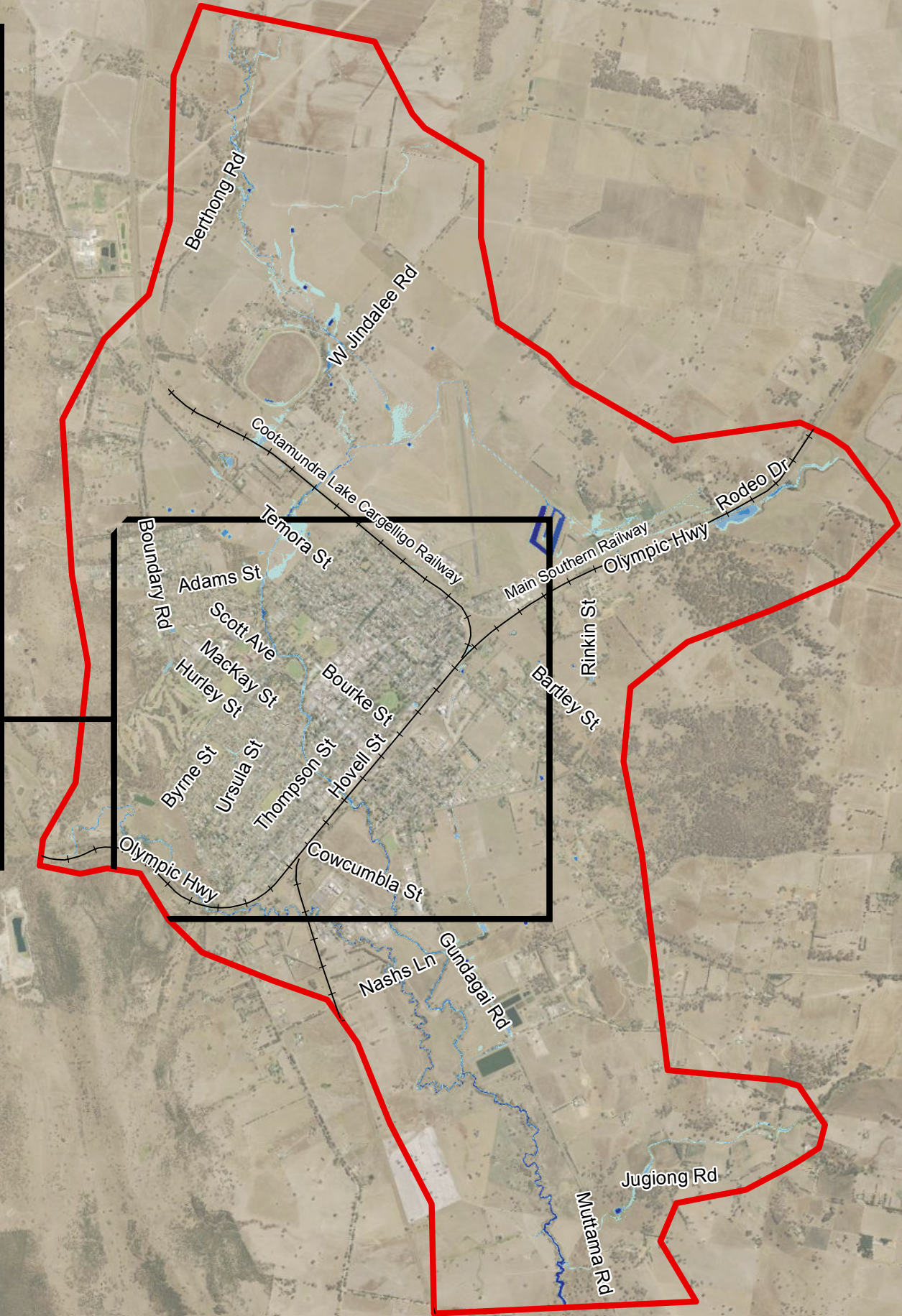
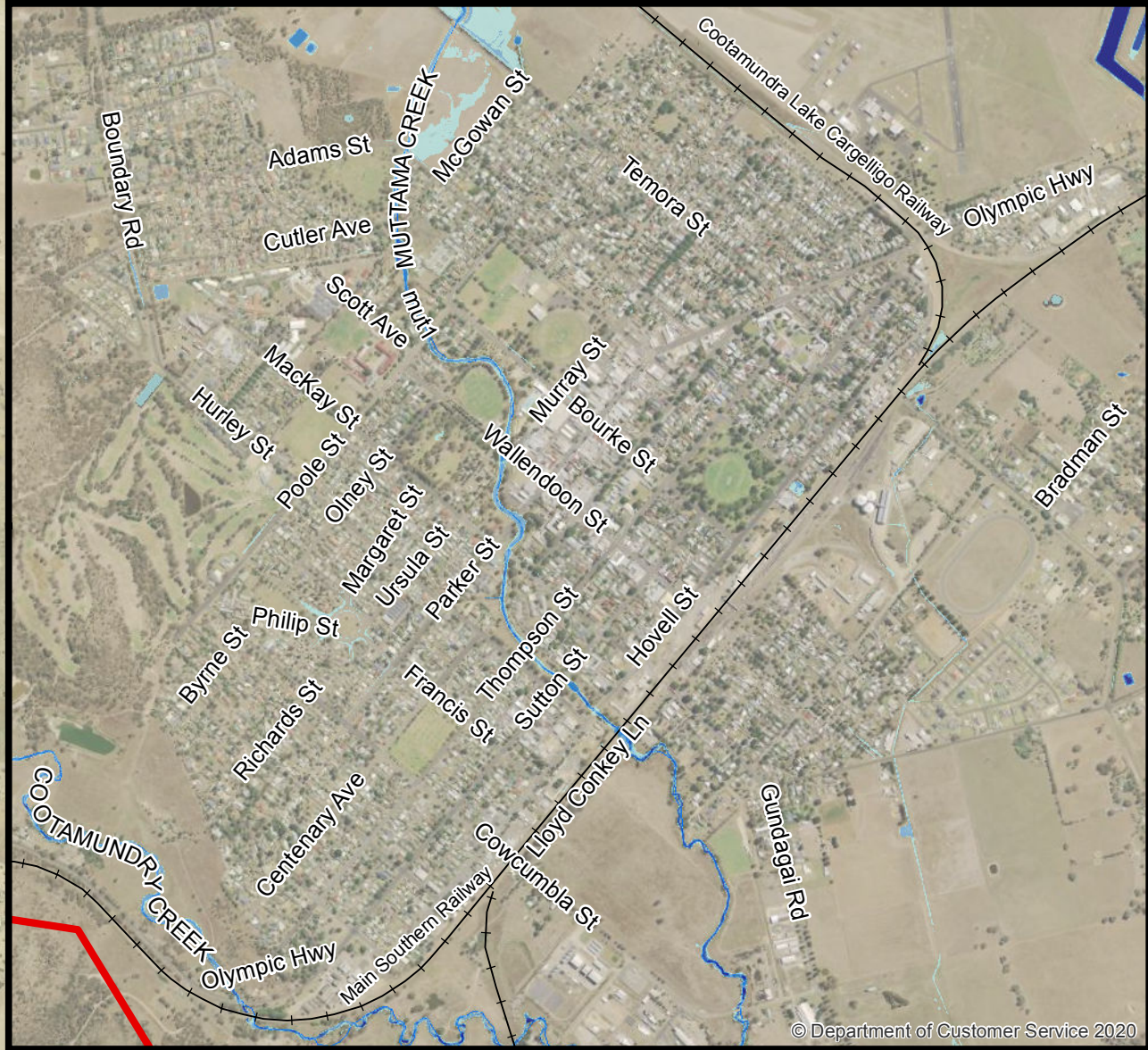


**SURVEYED FLOOD MARKS FOR OCTOBER 2022 FLOOD EVENT
MODELLLED FLOOD DEPTHS**



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FIGURE A10
PEAK FLOOD DEPTHS
50% AEP DESIGN EVENT



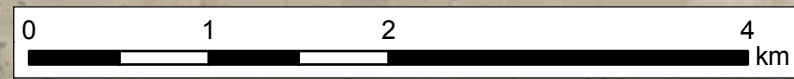
NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

Study Area

Cootamundra Railways Lines

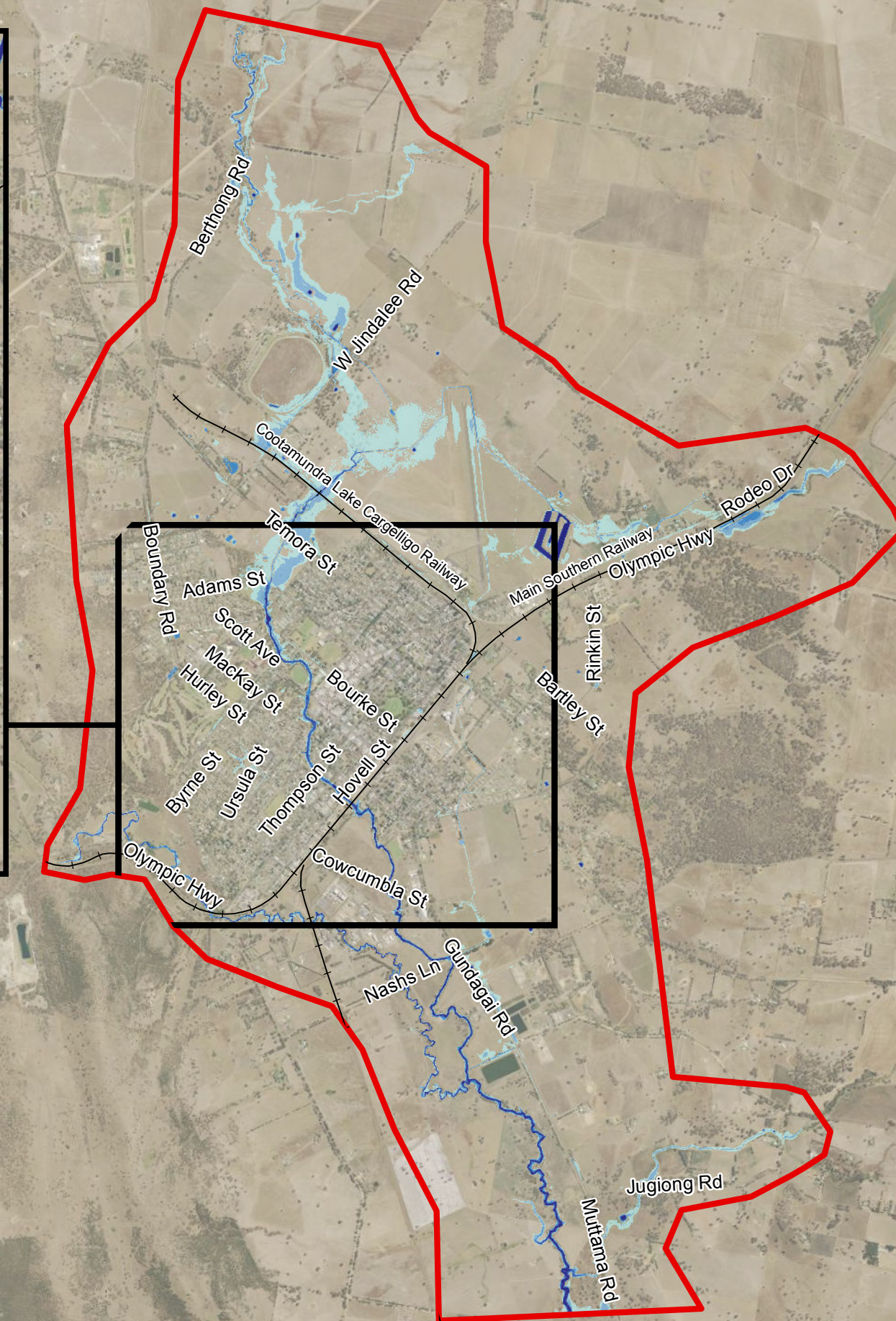
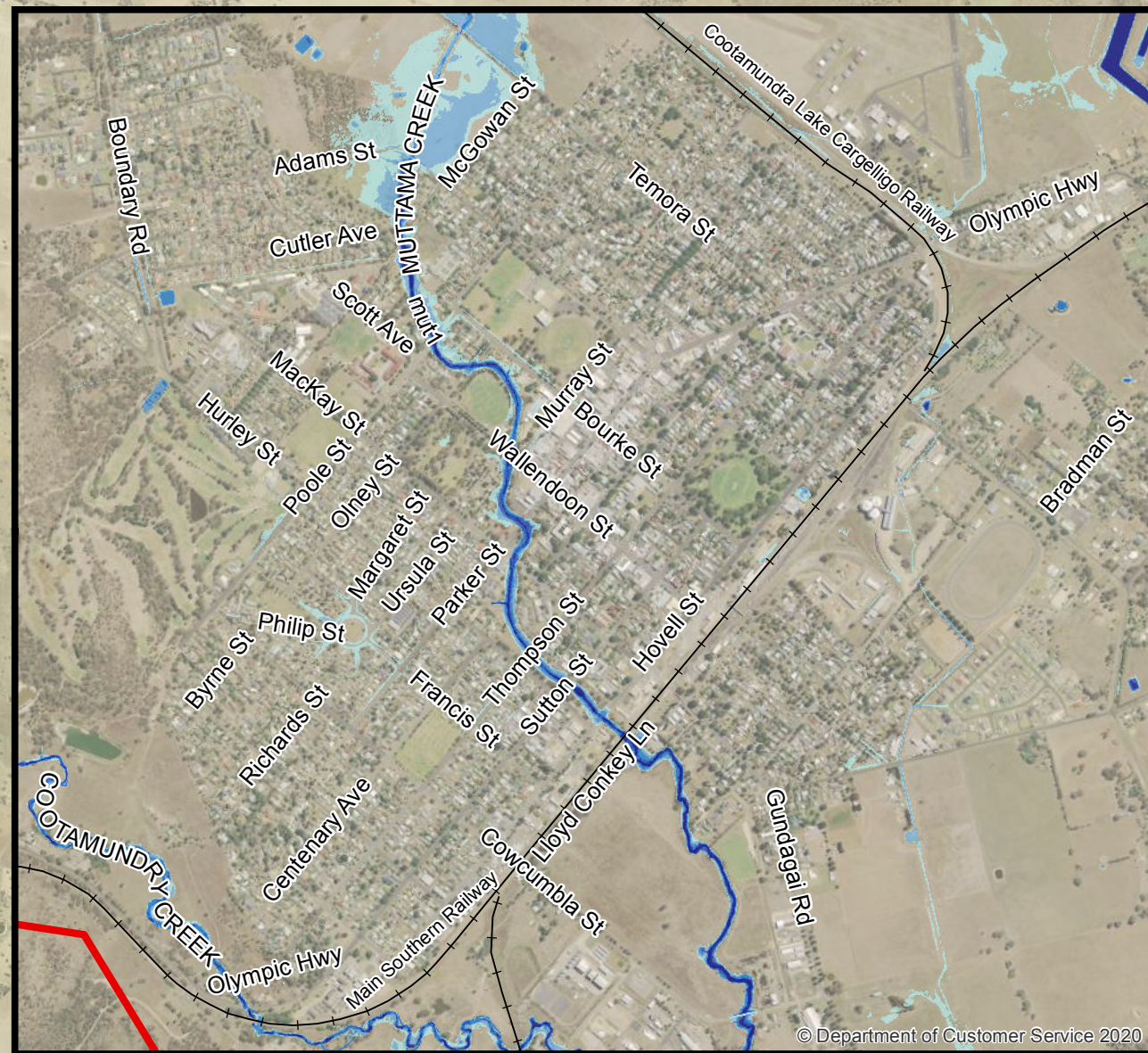
Peak Flood Depth (m)

0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0



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FIGURE A11
PEAK FLOOD DEPTHS
20% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

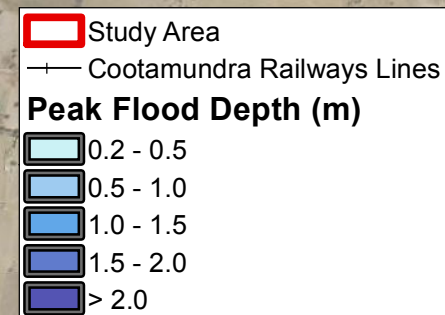
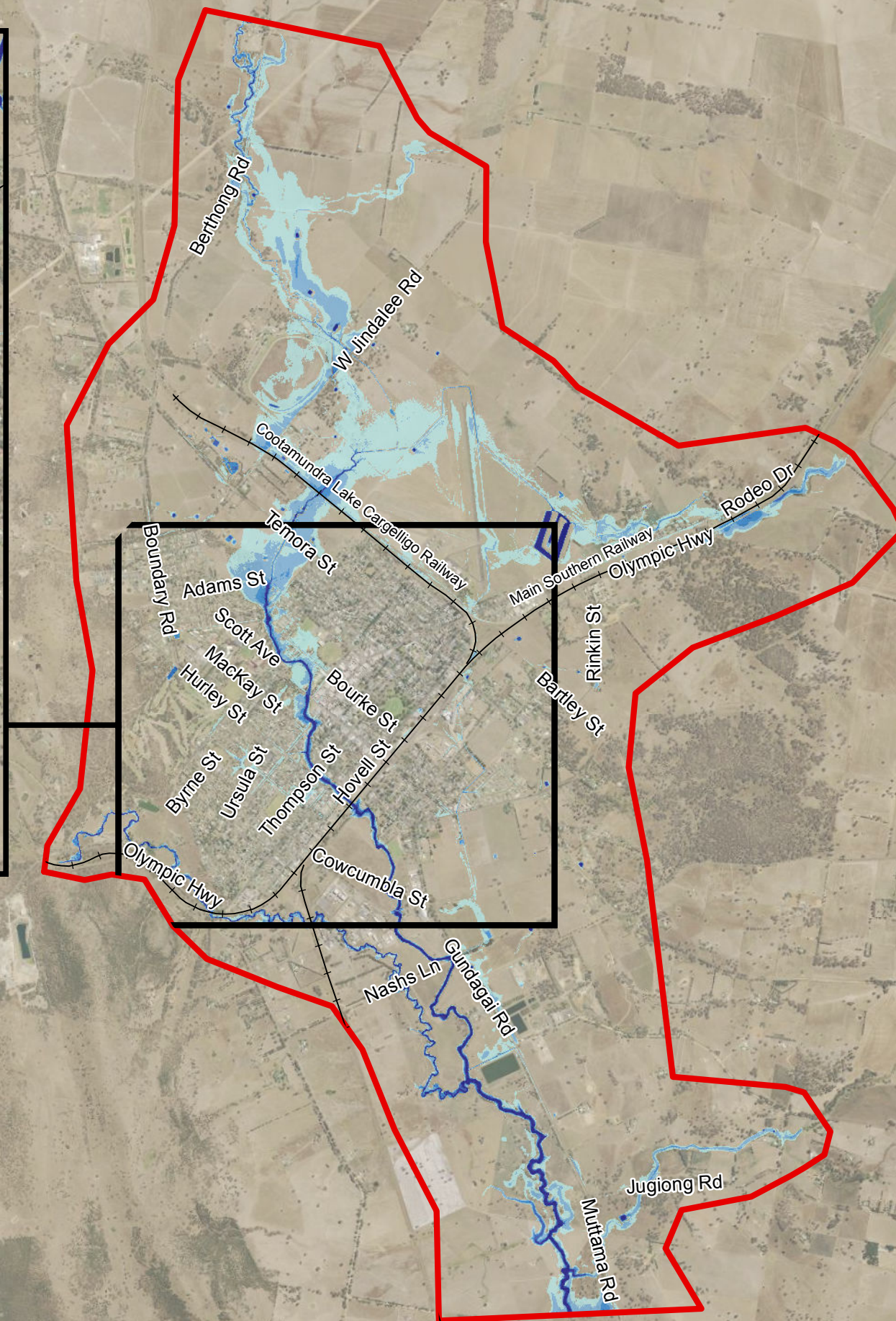
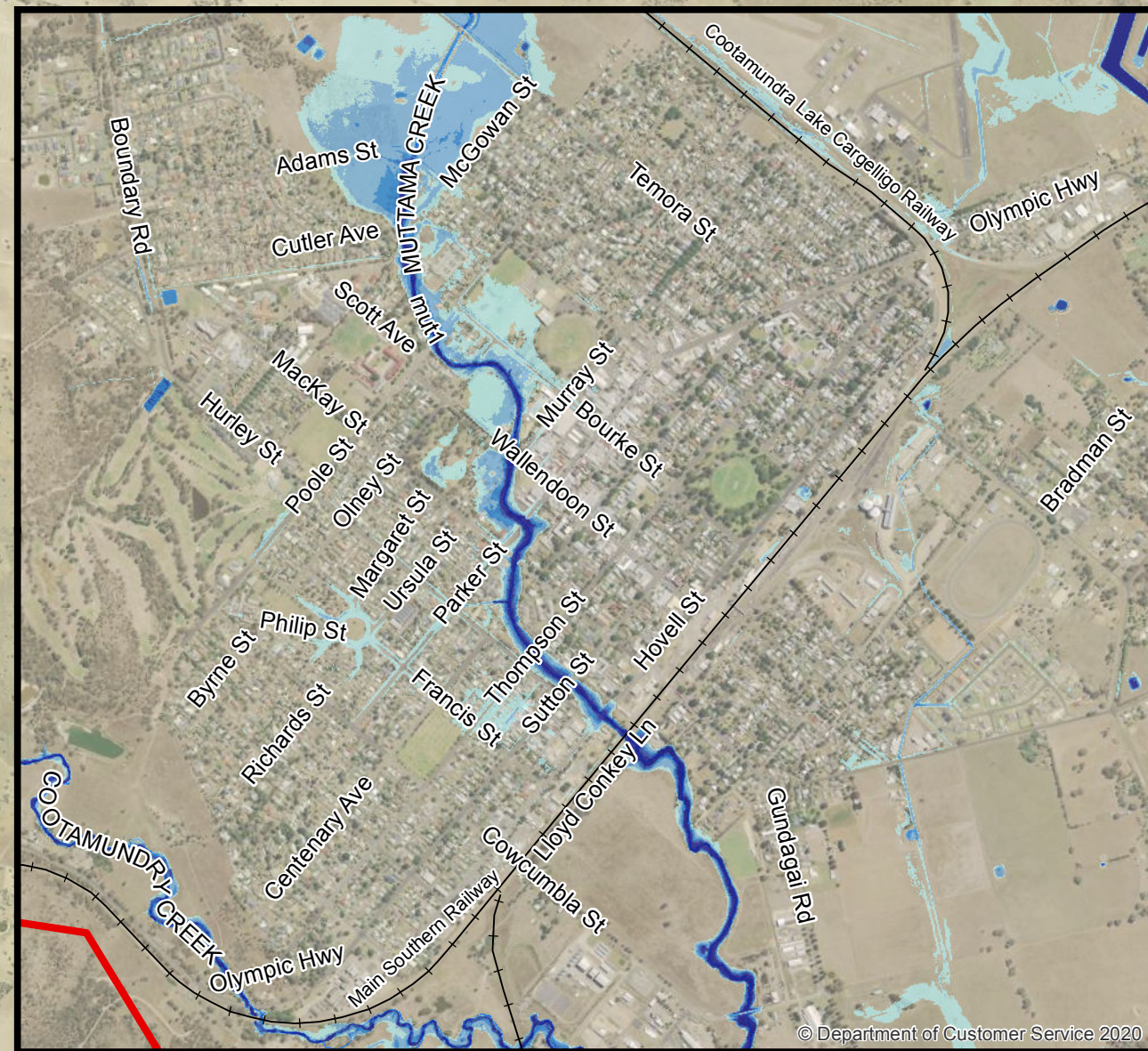


FIGURE A12
PEAK FLOOD DEPTHS
10% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

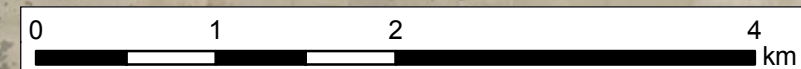
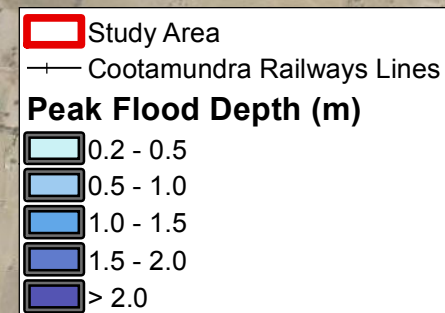


FIGURE A13
PEAK FLOOD DEPTHS
5% AEP DESIGN EVENT

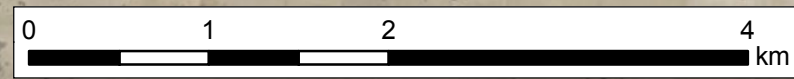
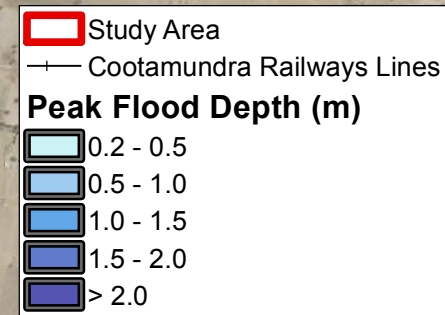
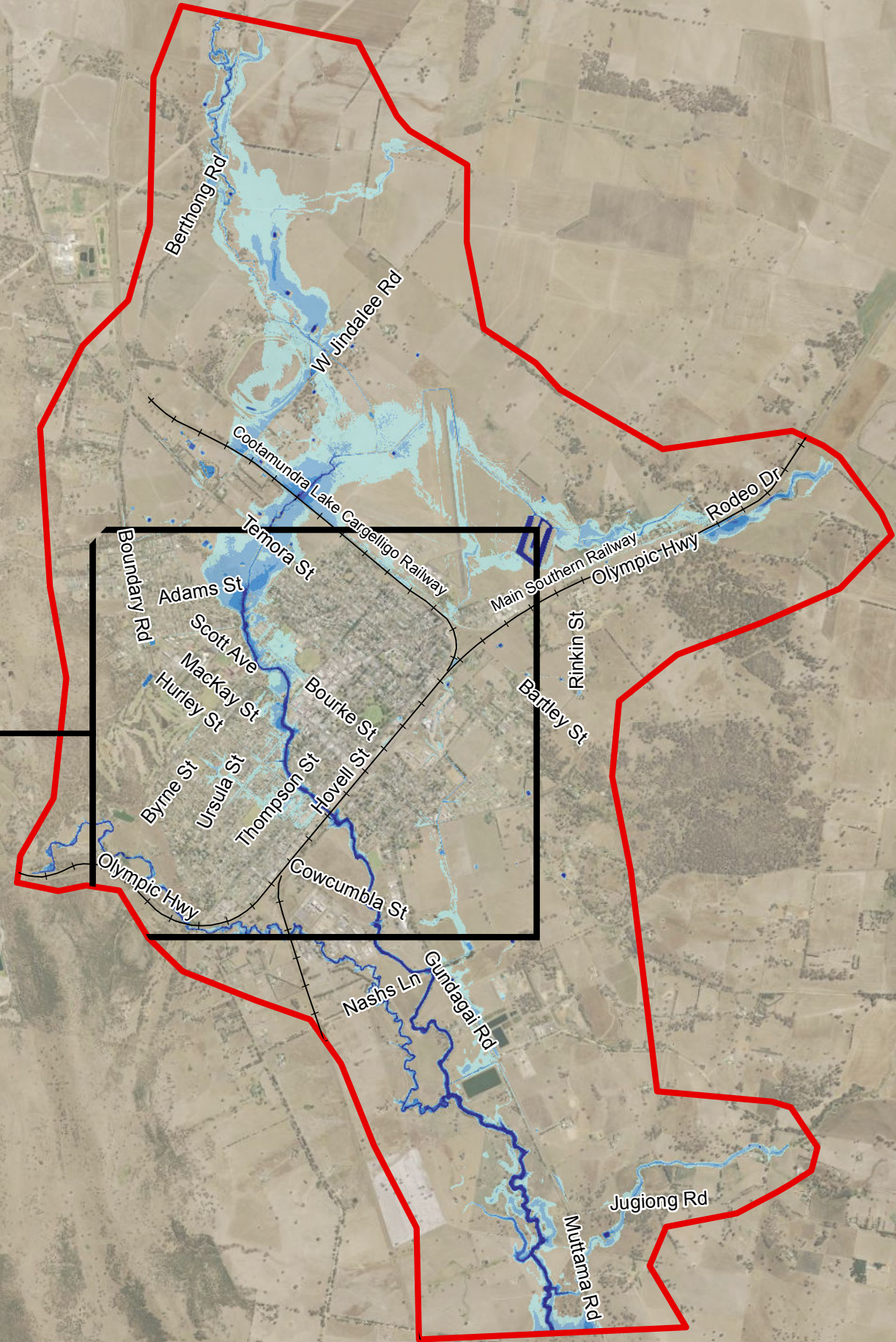
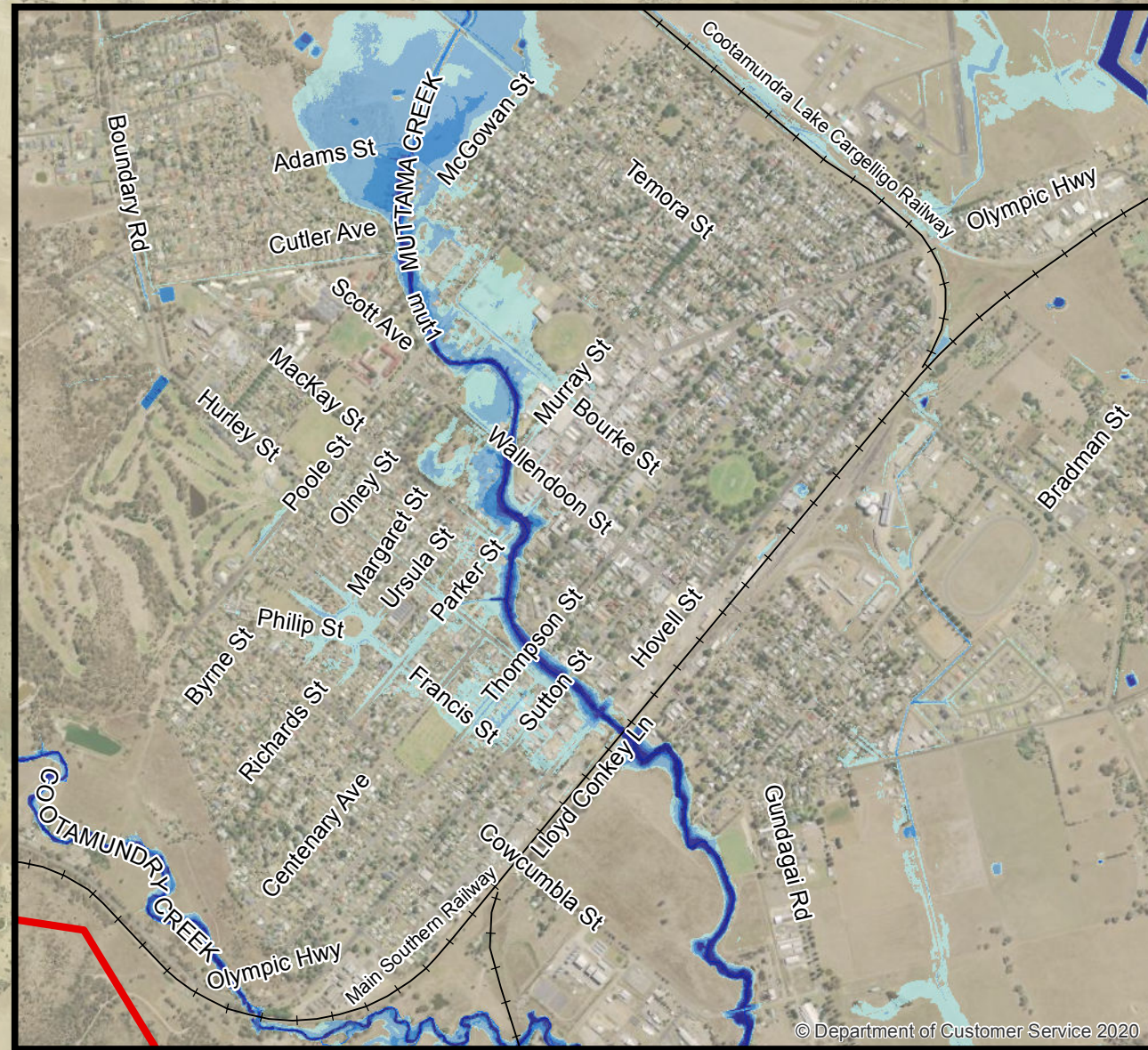
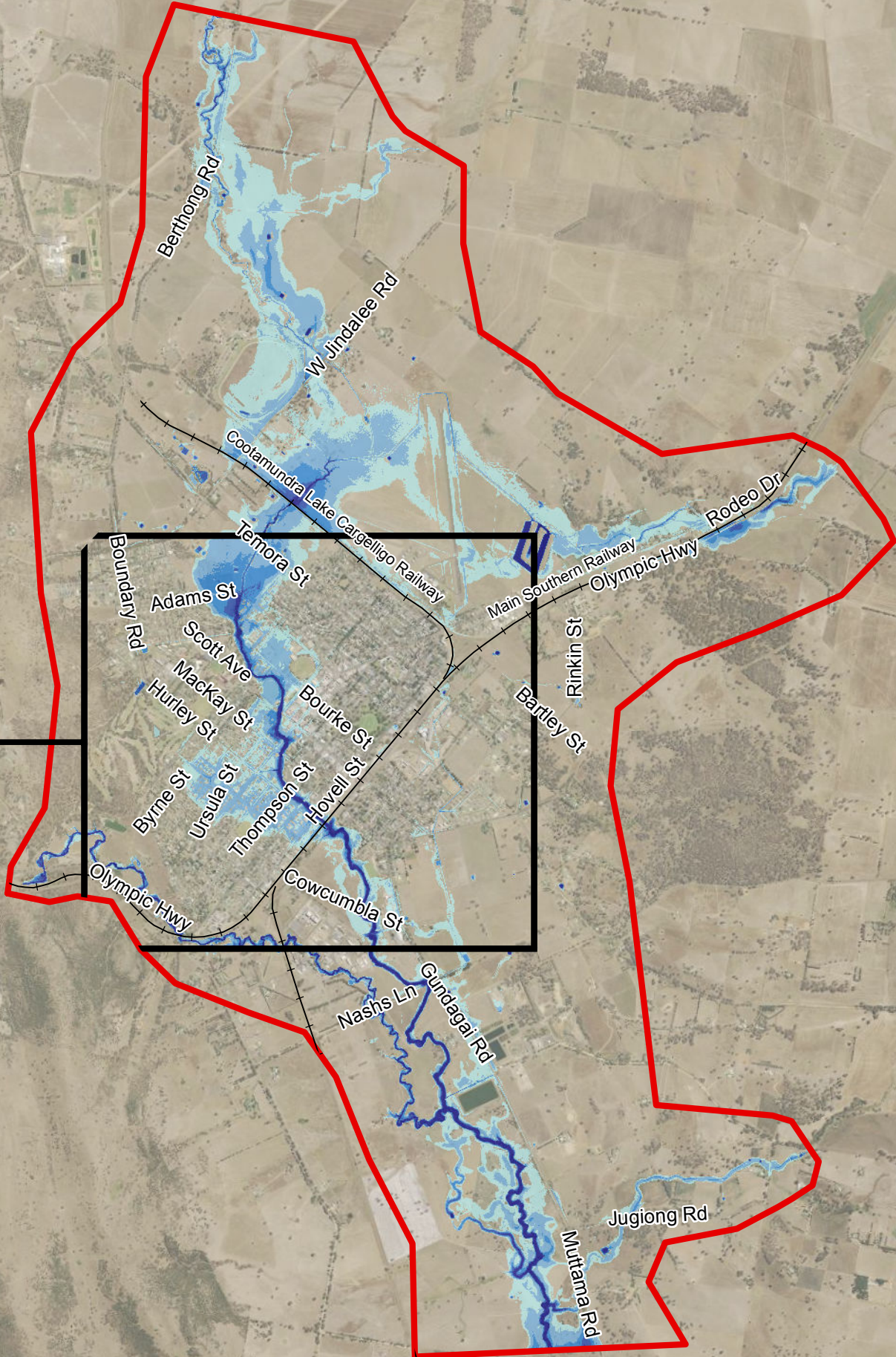
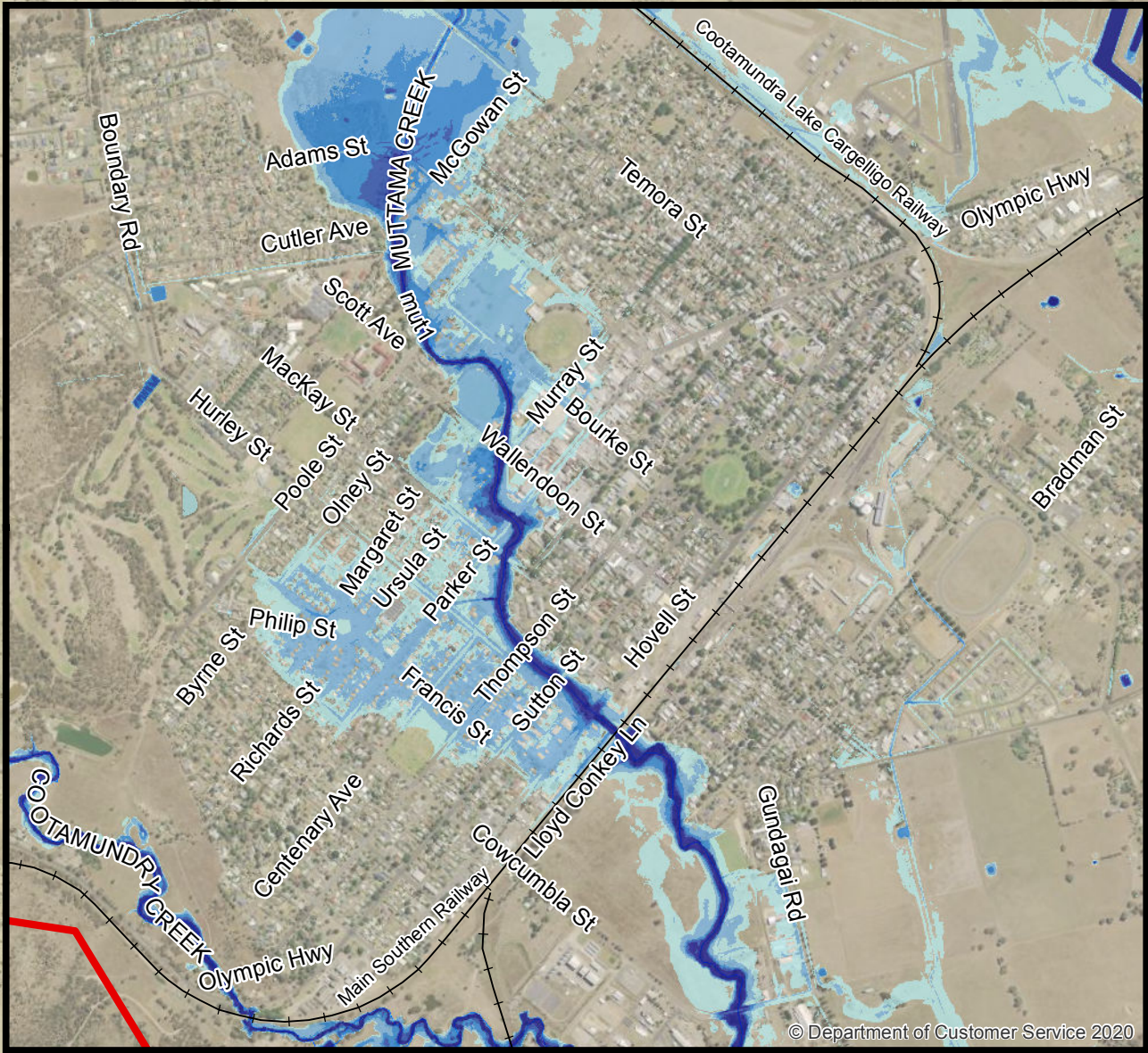


FIGURE A14
PEAK FLOOD DEPTHS
2% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

Study Area

Cootamundra Railways Lines

Peak Flood Depth (m)

0.2 - 0.5

0.5 - 1.0

1.0 - 1.5

1.5 - 2.0

> 2.0

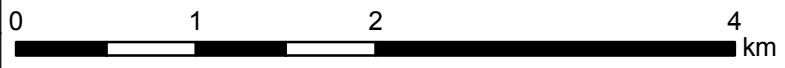
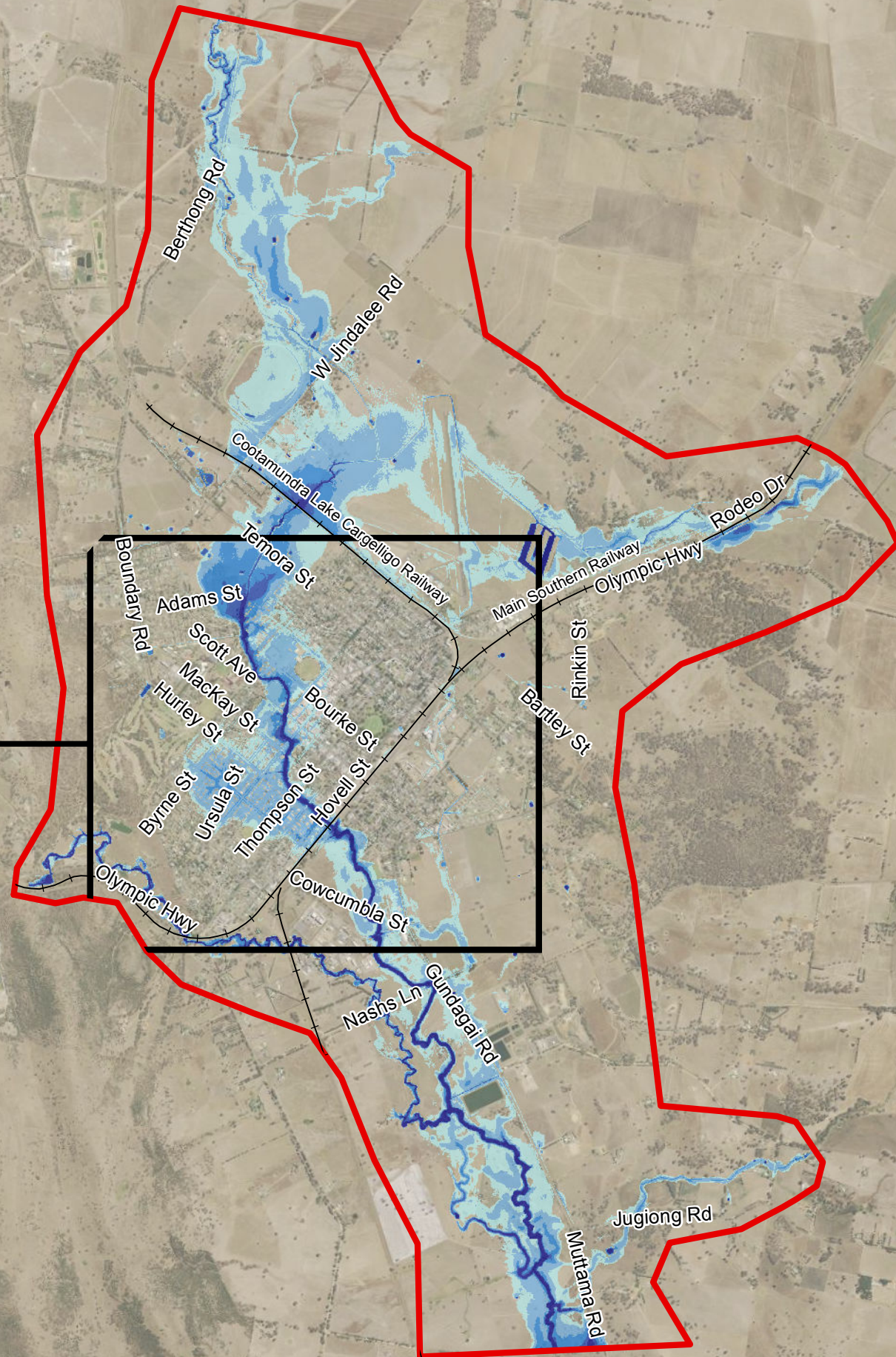
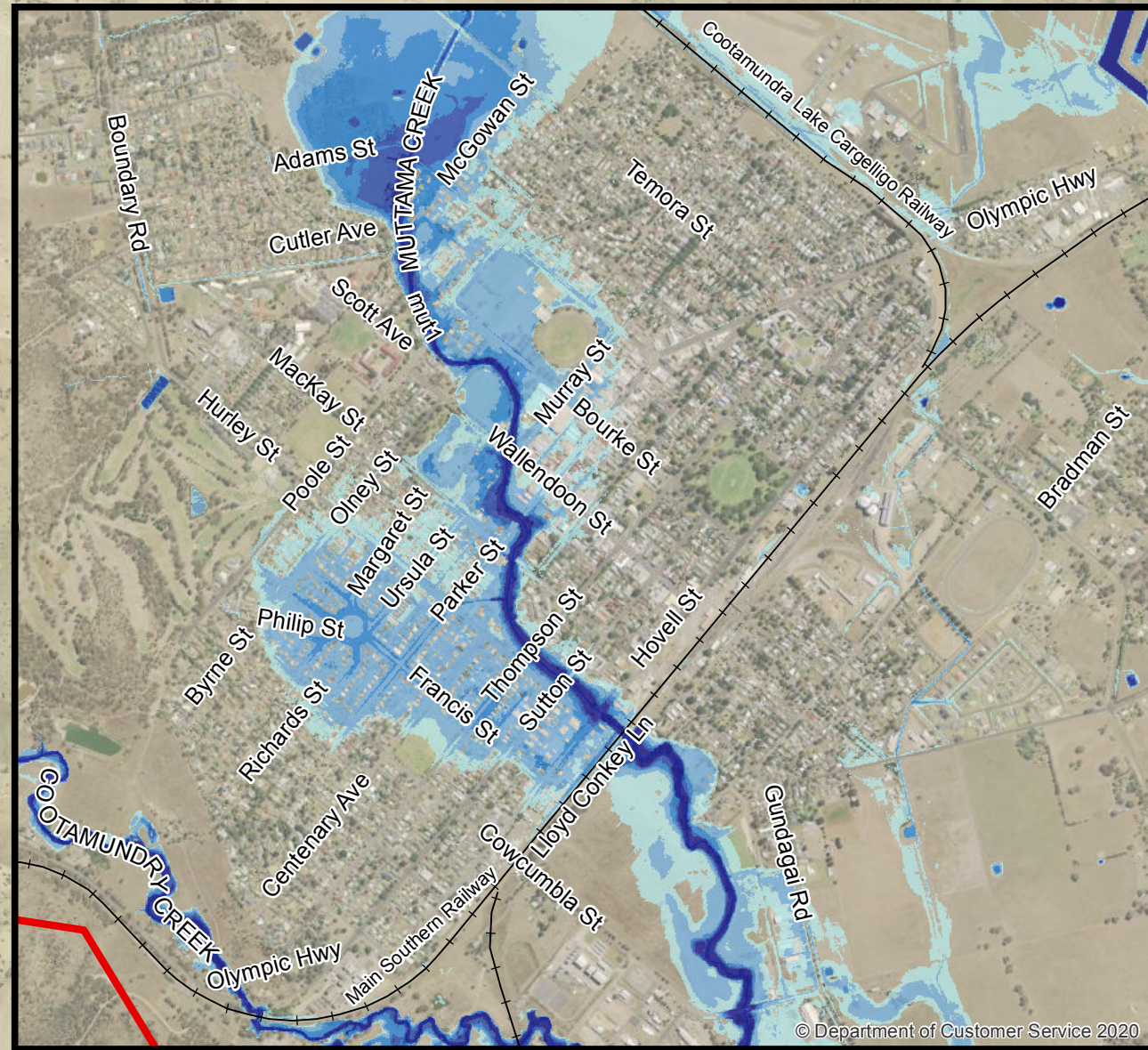


FIGURE A15
PEAK FLOOD DEPTHS
1% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

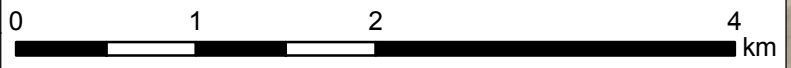
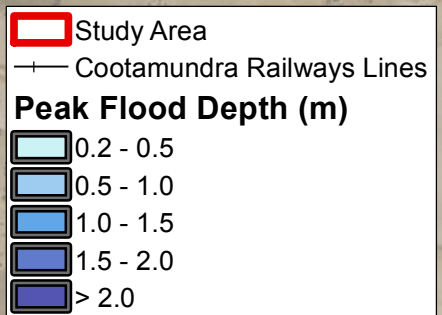
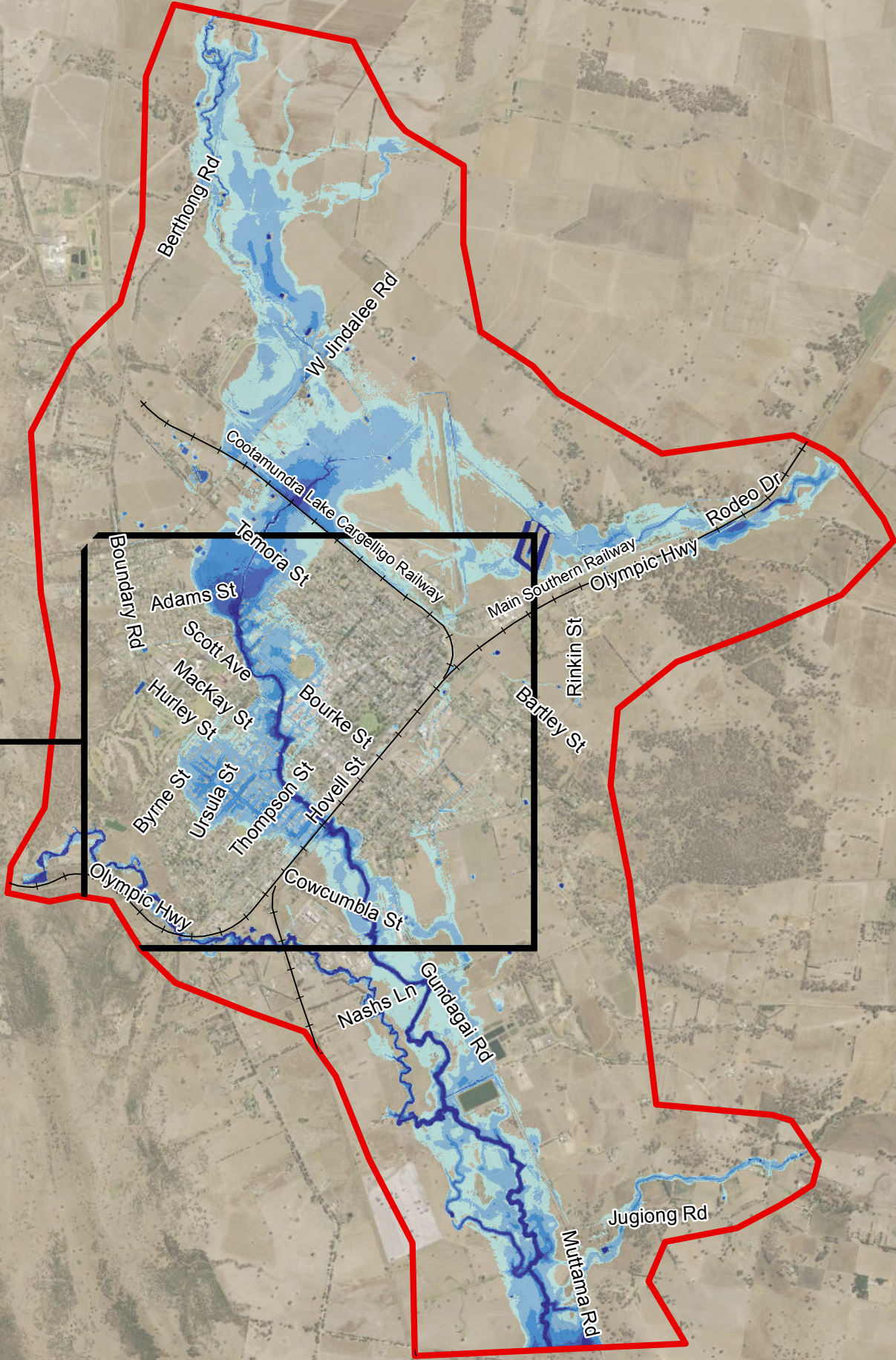
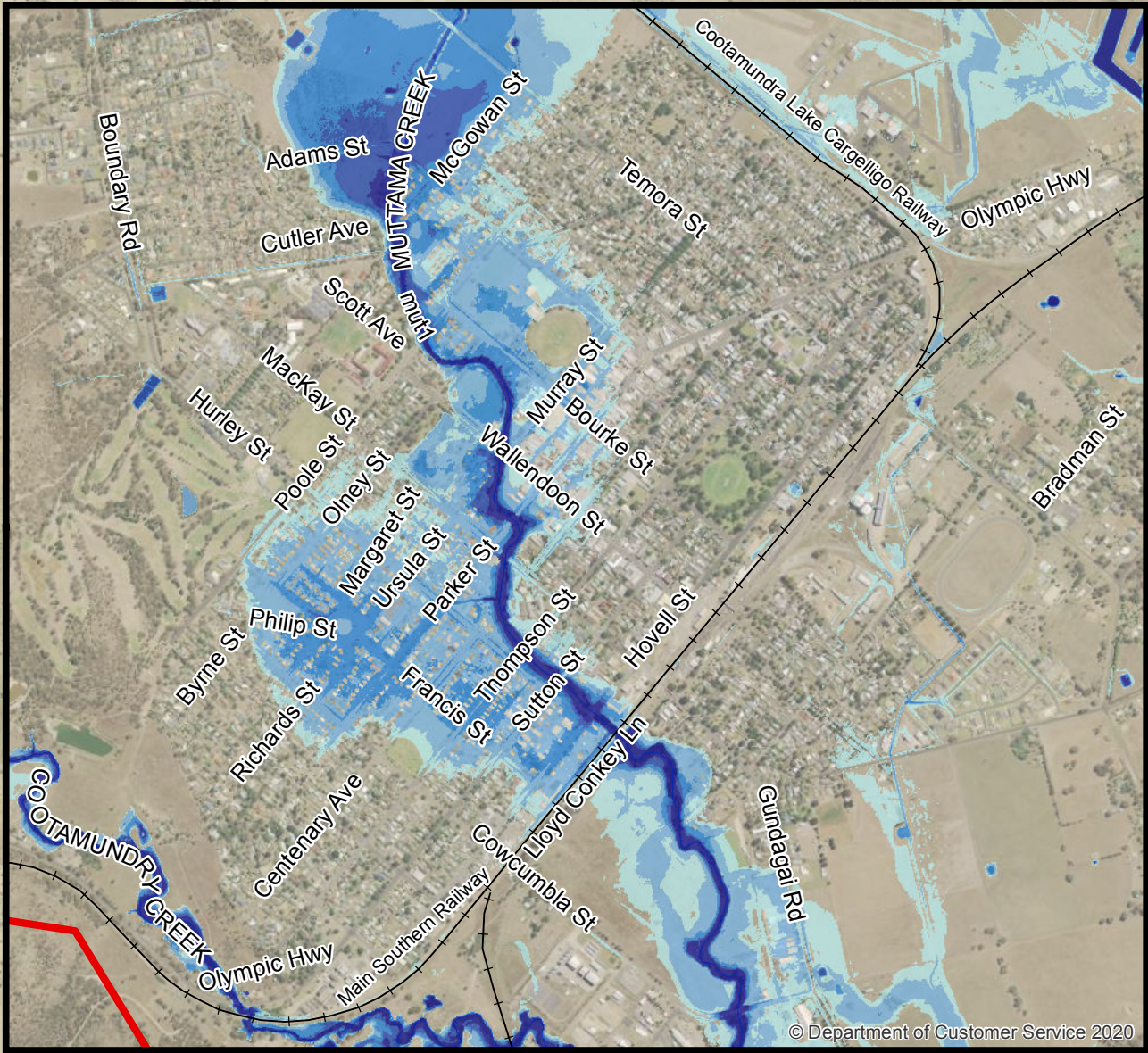


FIGURE A16
PEAK FLOOD DEPTHS
0.5% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

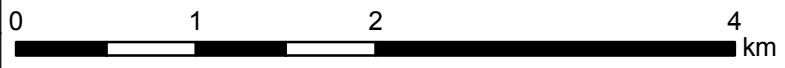
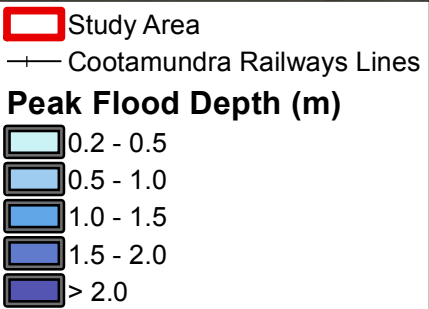
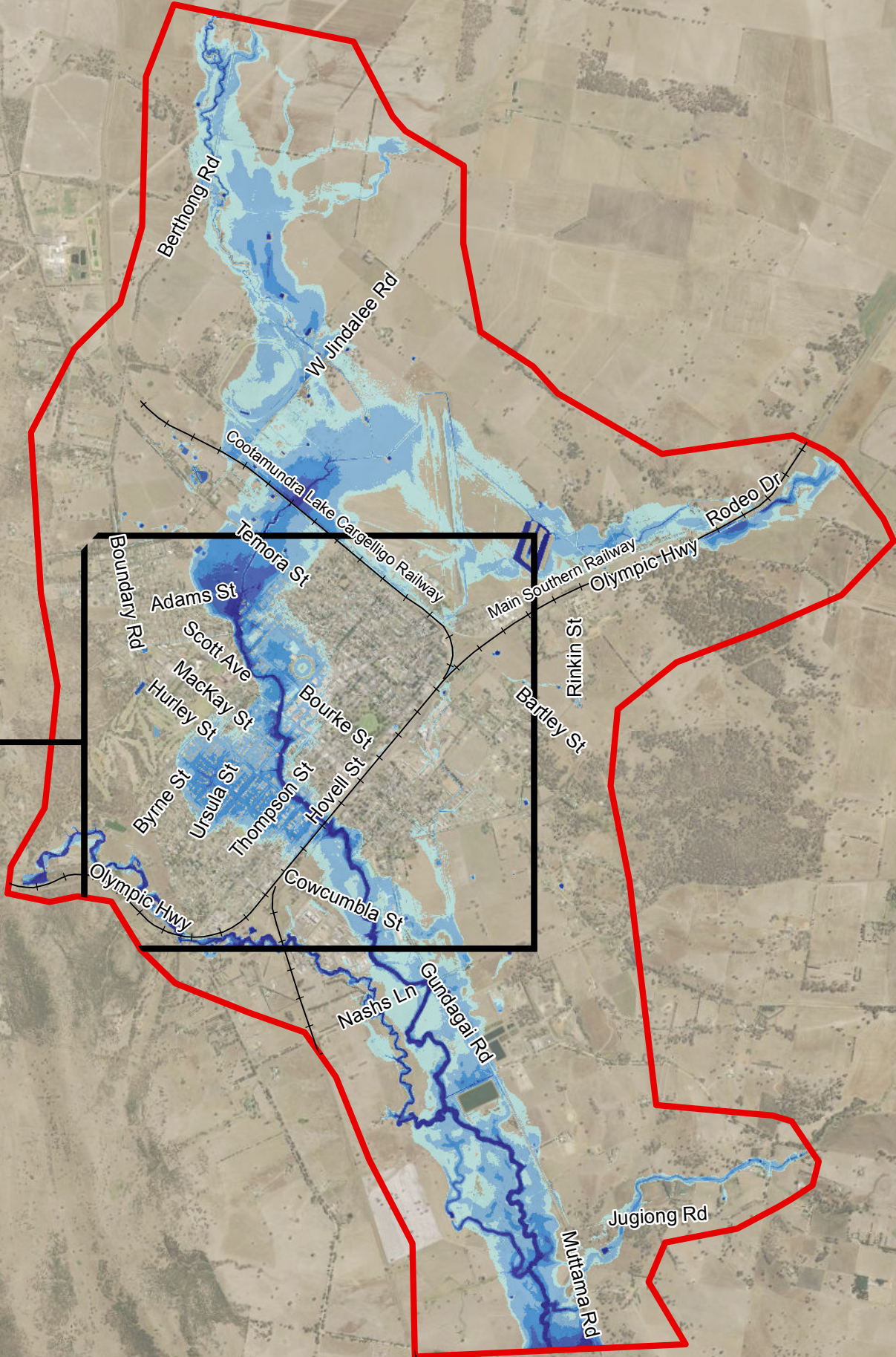
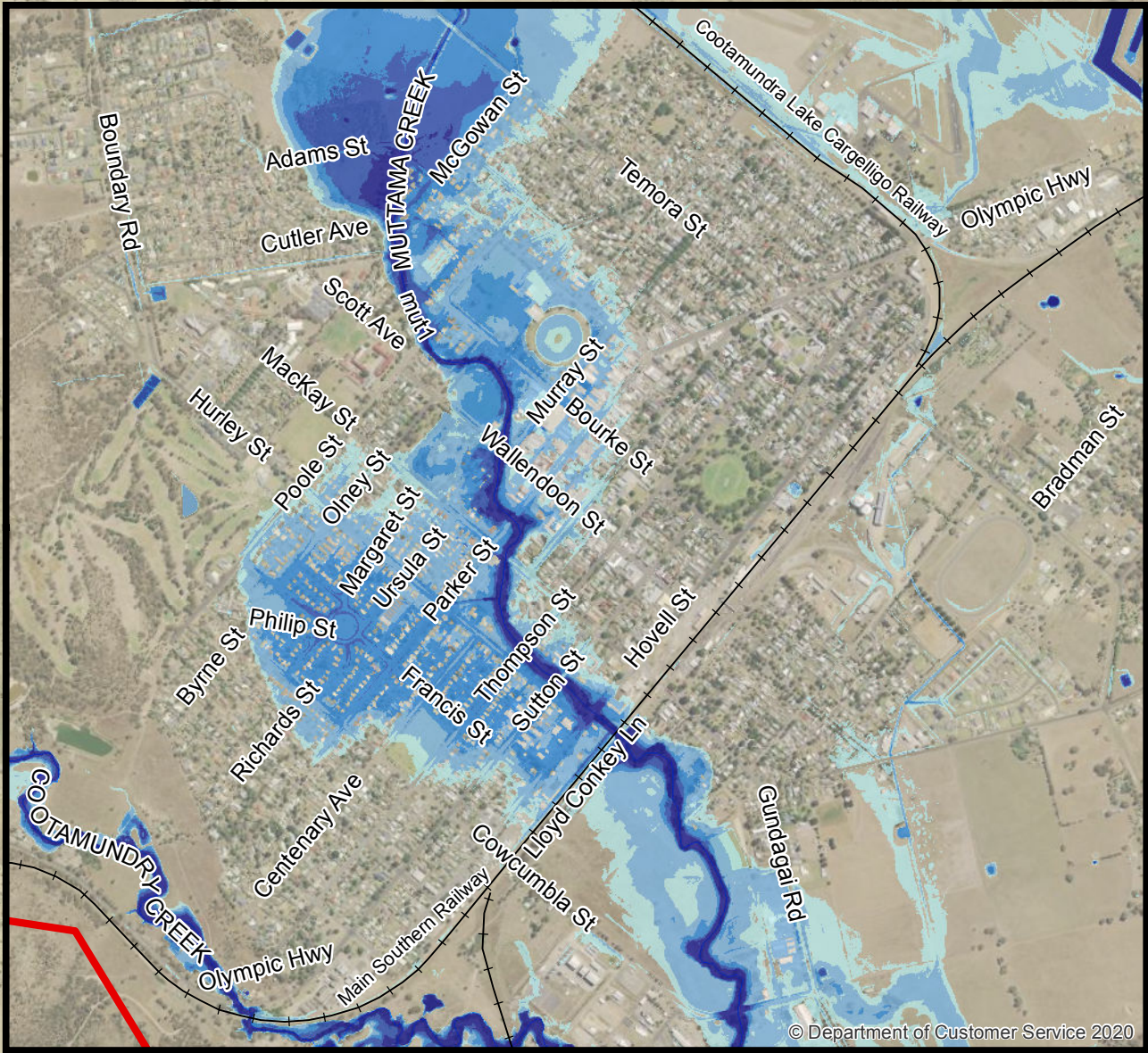


FIGURE A17
PEAK FLOOD DEPTHS
0.2% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

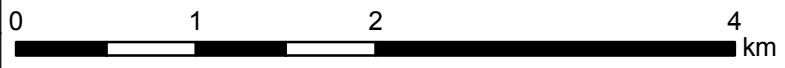
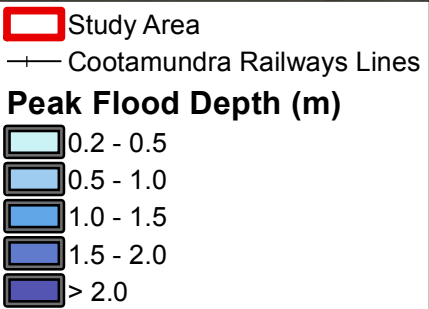
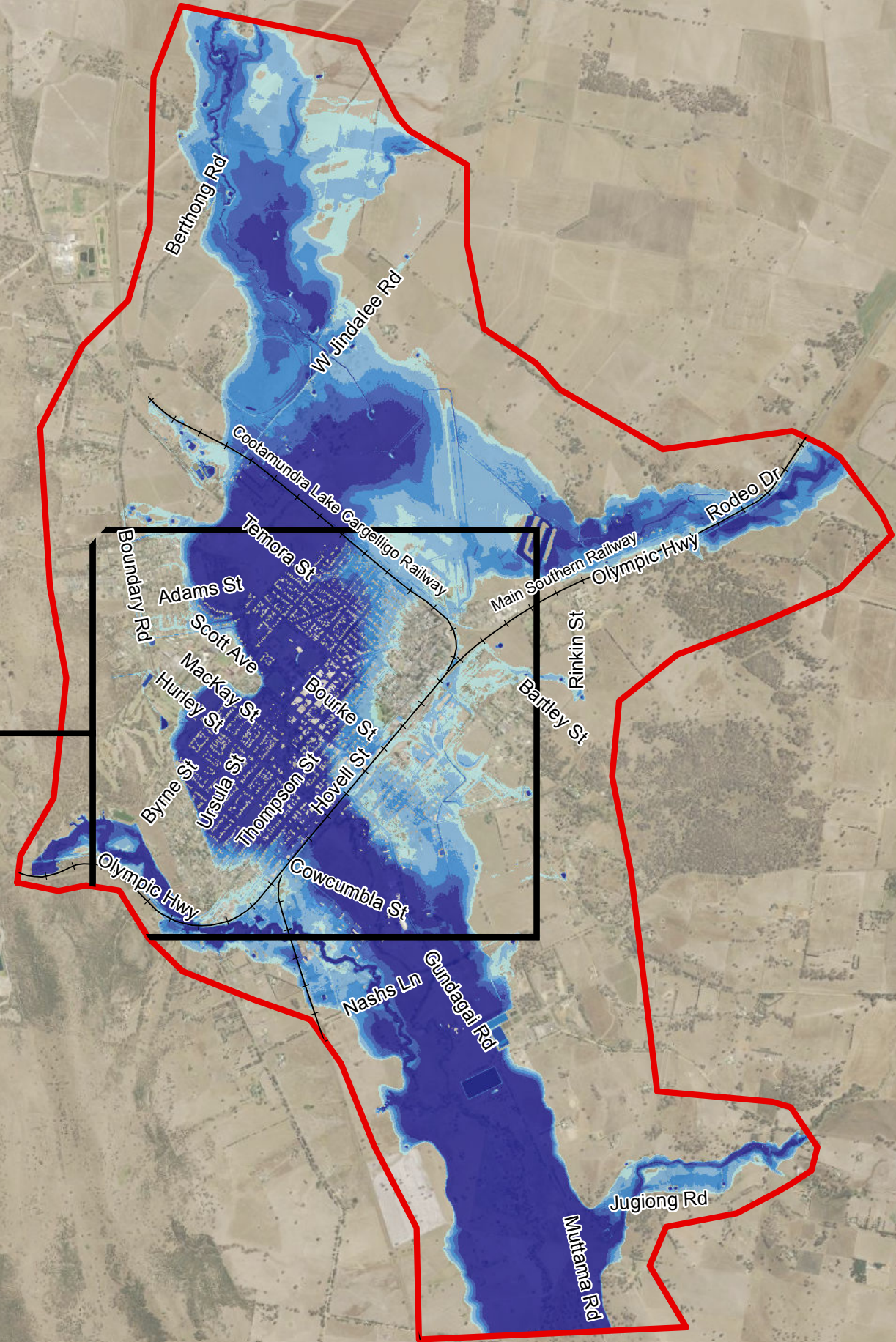
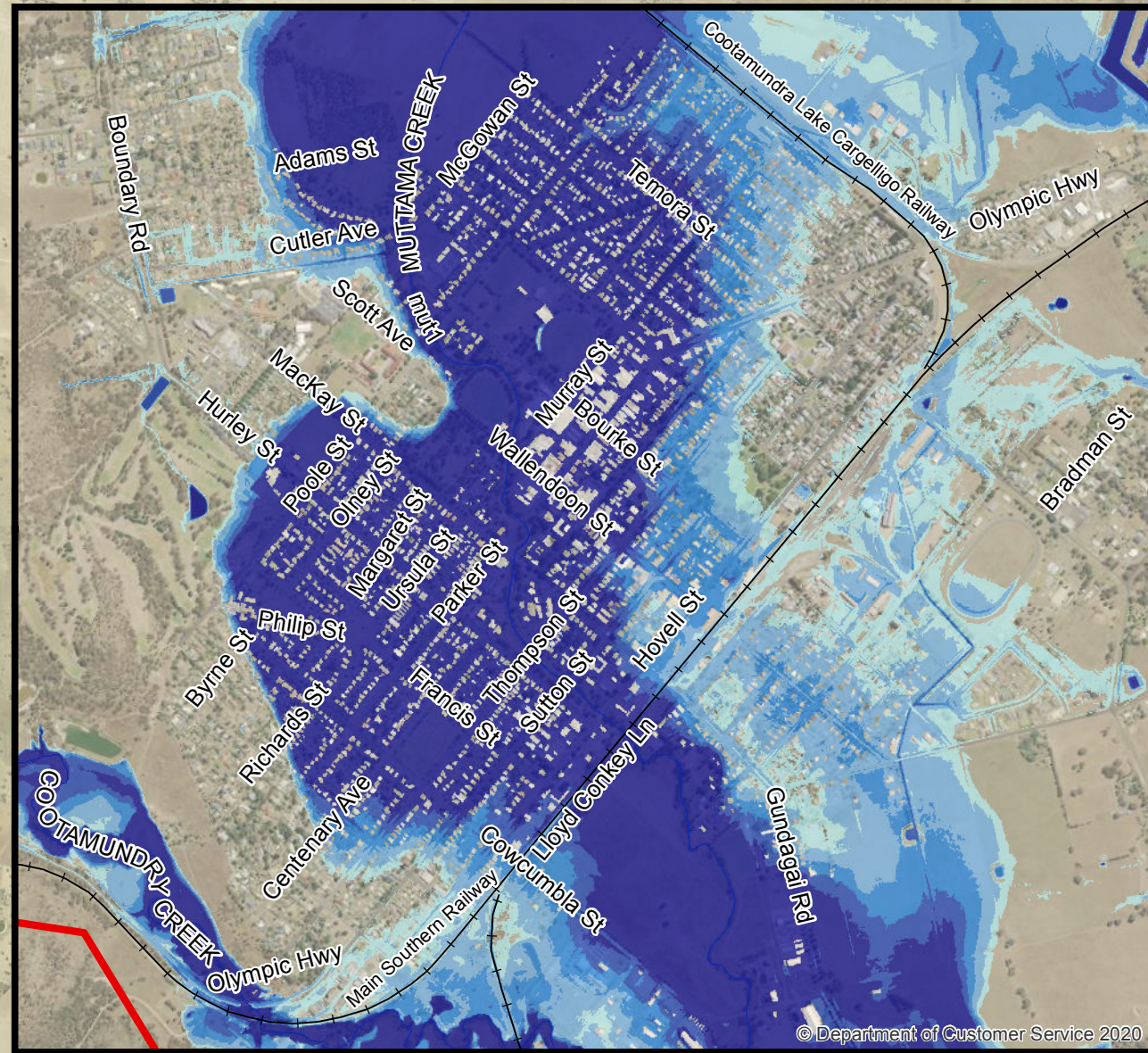


FIGURE A18
PEAK FLOOD DEPTHS
PMF DESIGN EVENT



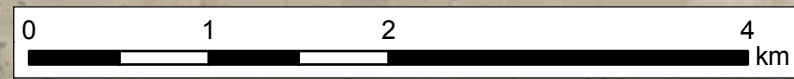
NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

Study Area

Cootamundra Railways Lines

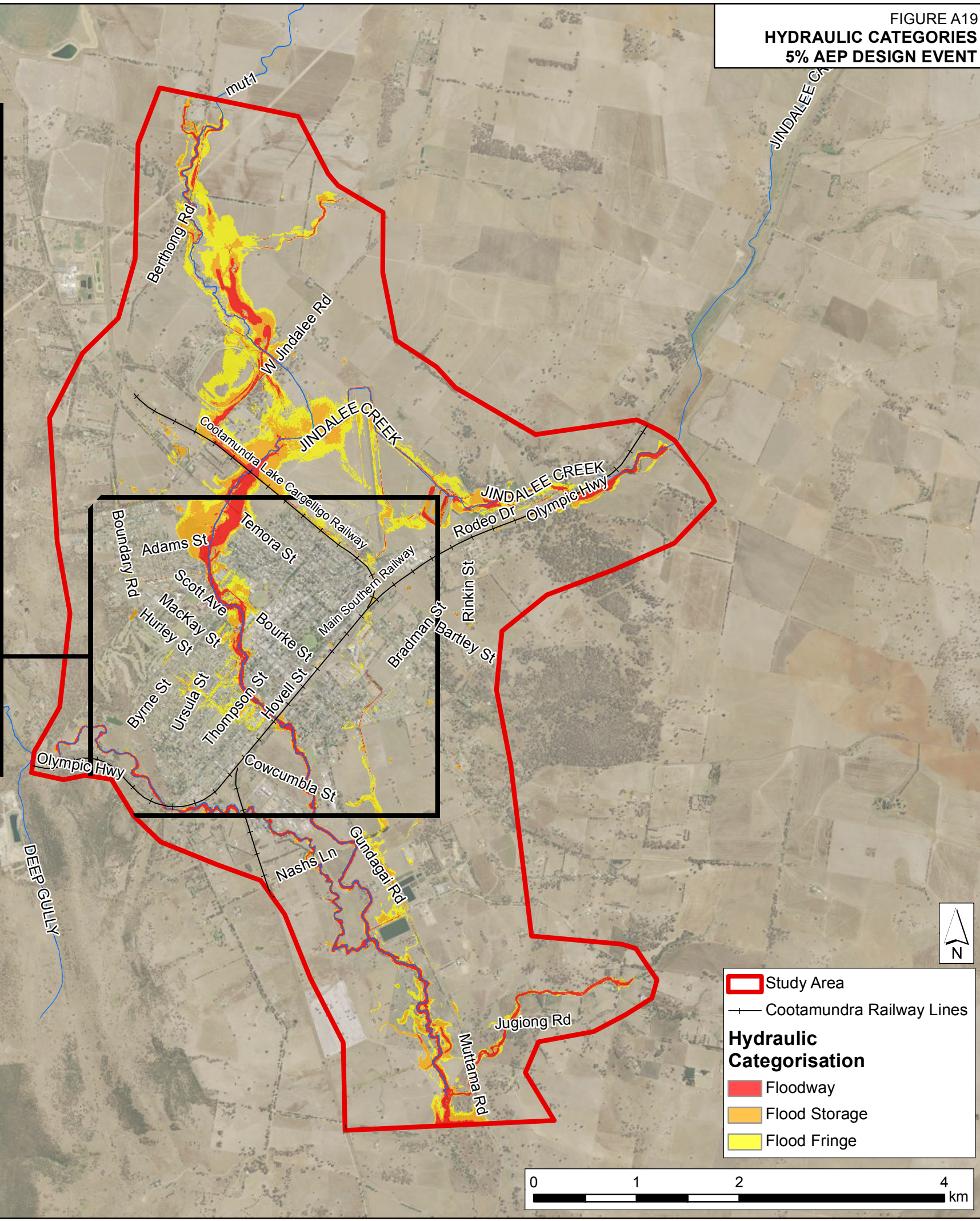
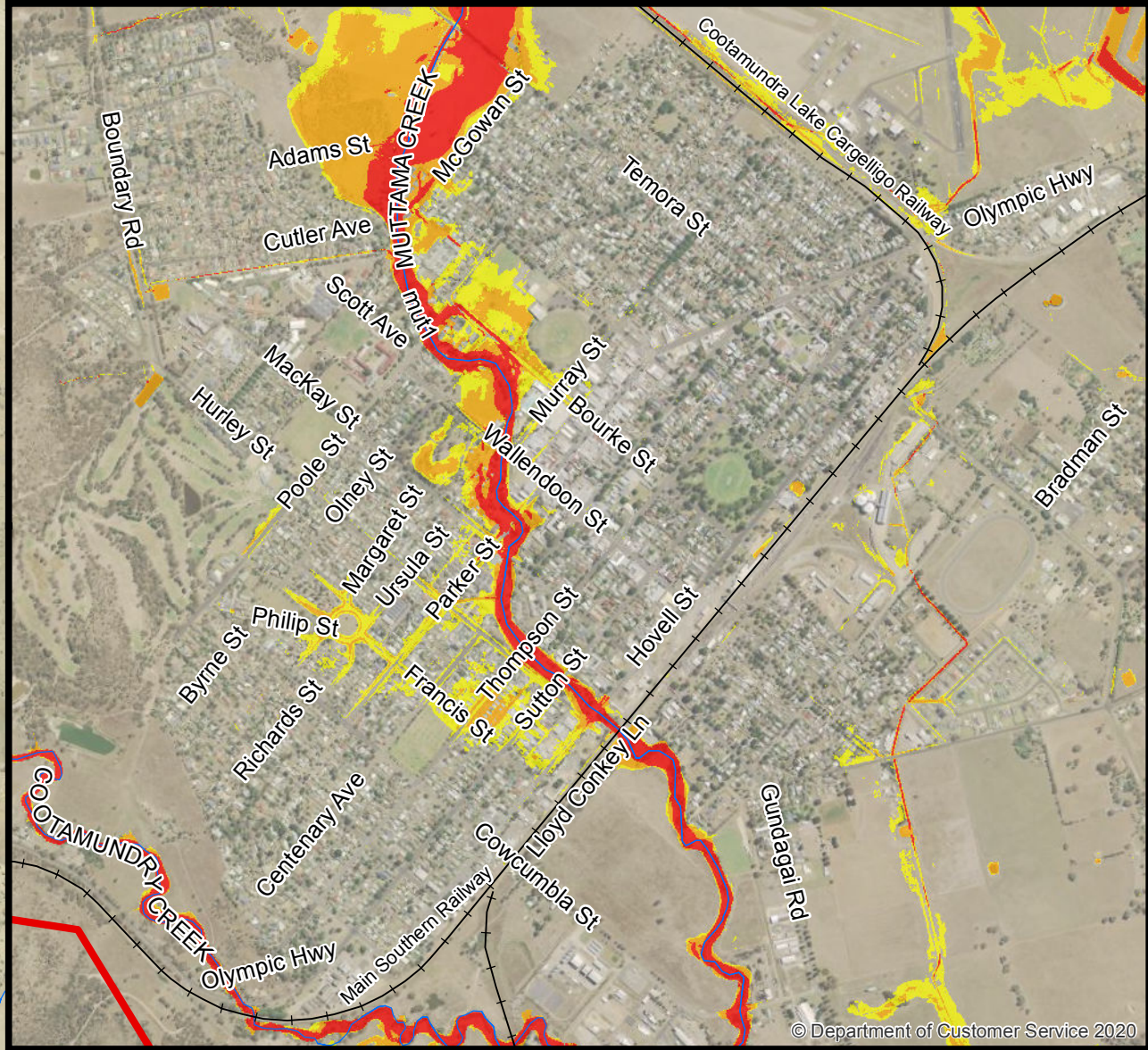
Peak Flood Depth (m)

0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0



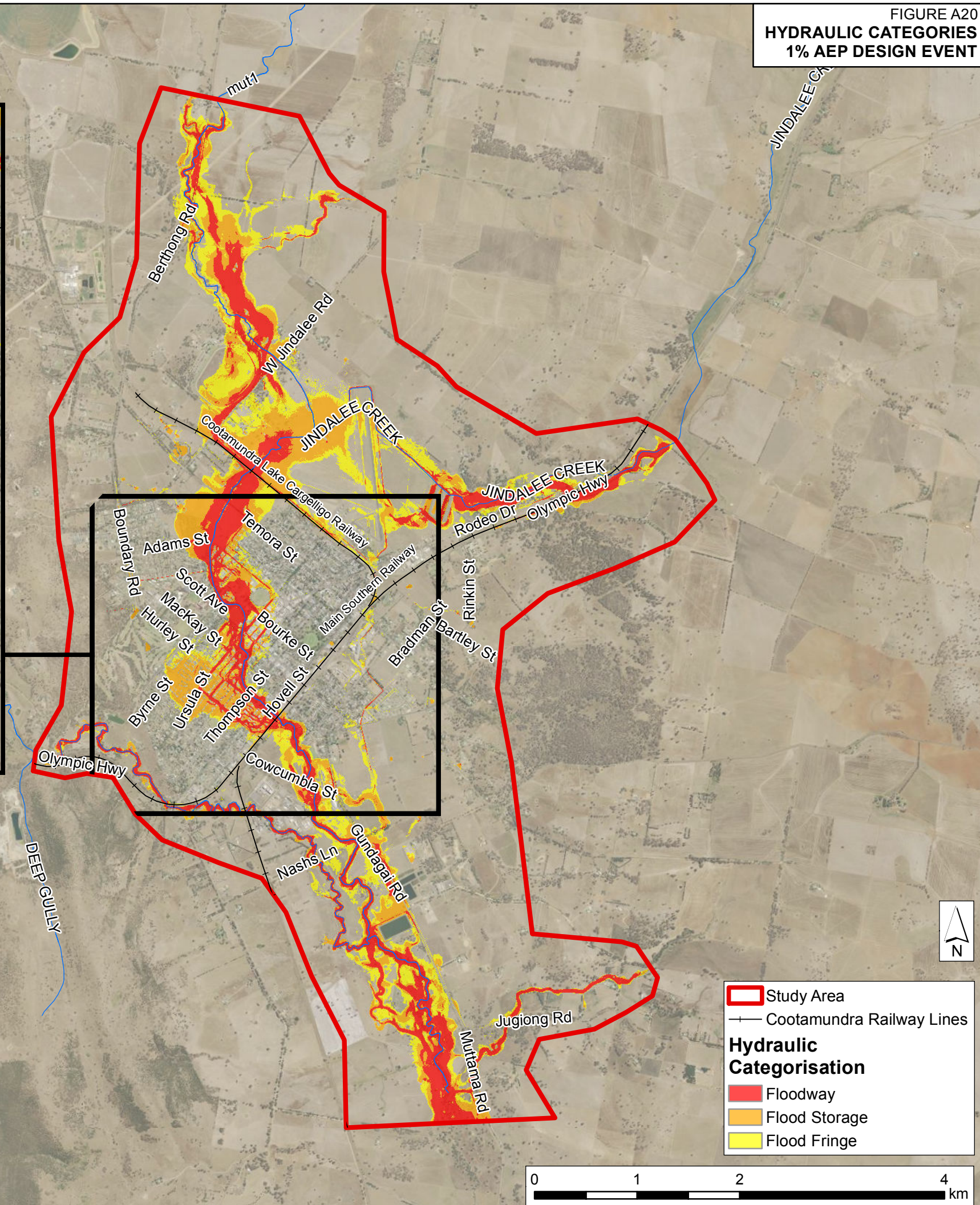
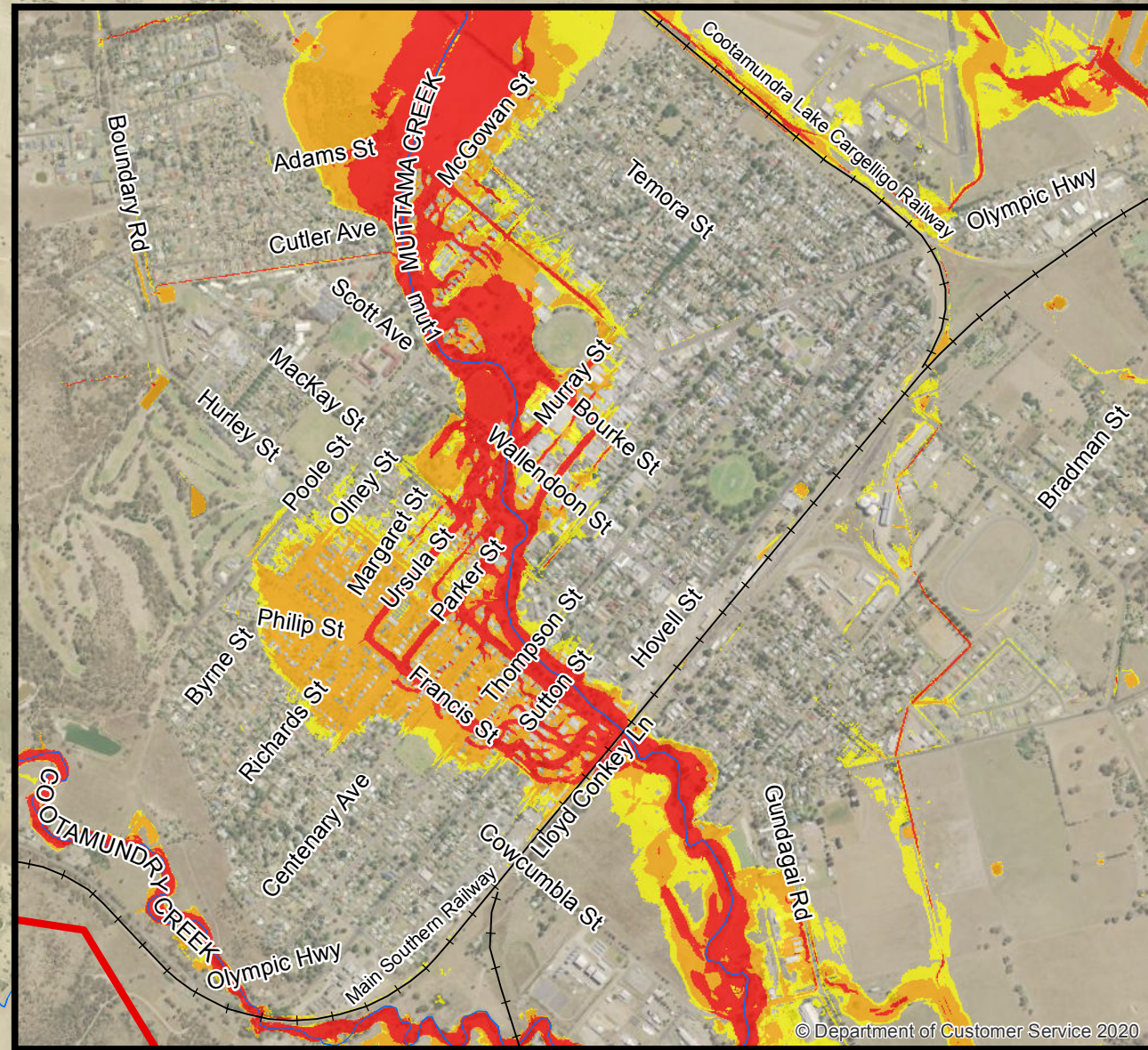
J:\Jobs\119039\ArcGIS\ArcMaps\230522_FRMS\FigureA18_Peak_Flood_Depths_and_Level_Contours_PMF.mxd

FIGURE A19
HYDRAULIC CATEGORIES
5% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

FIGURE A20
HYDRAULIC CATEGORIES
1% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

Study Area

— Cootamundra Railway Lines

Hydraulic Categorisation

- Floodway
- Flood Storage
- Flood Fringe

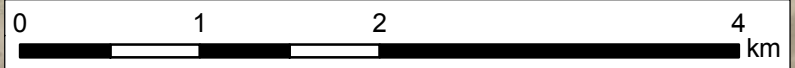
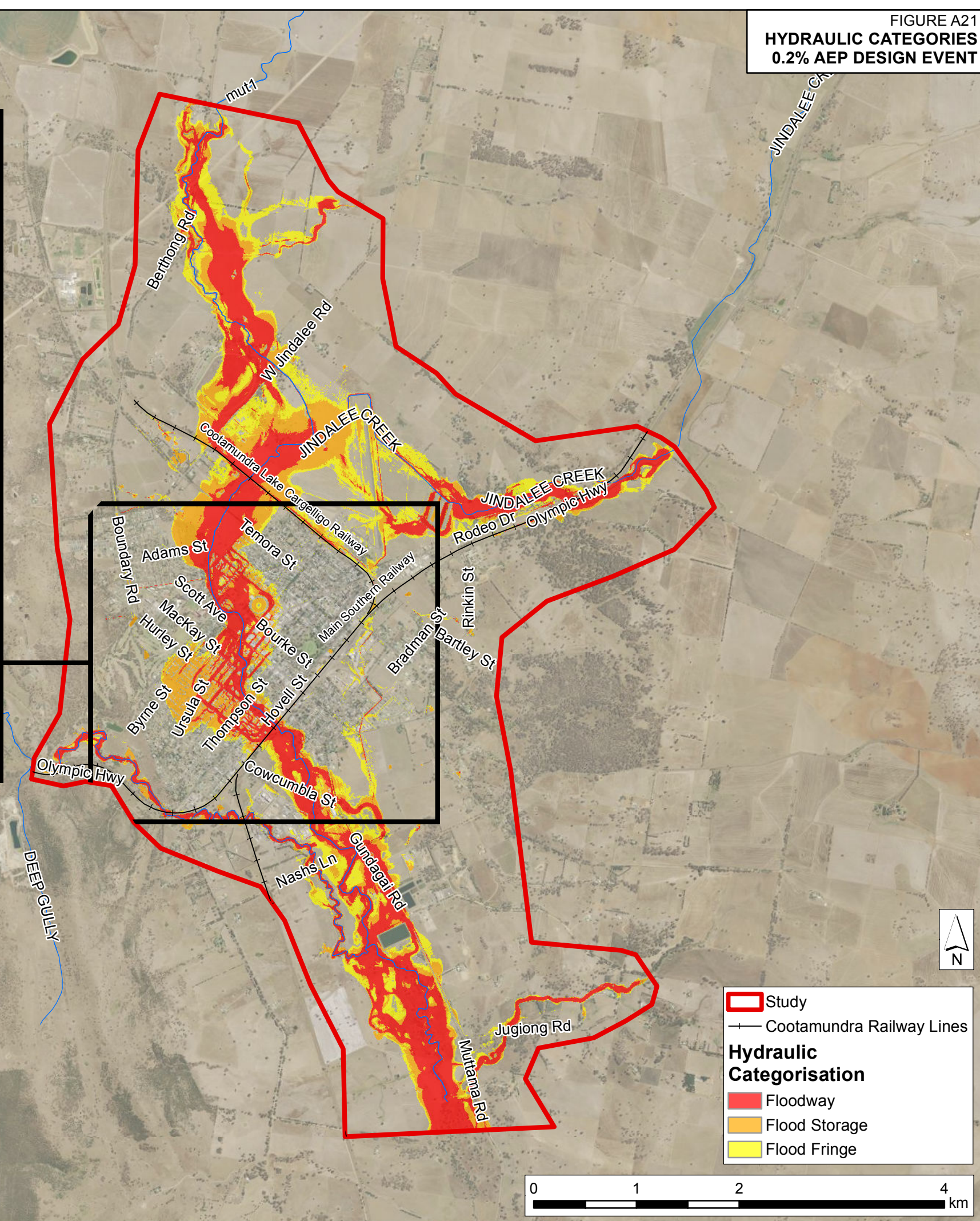
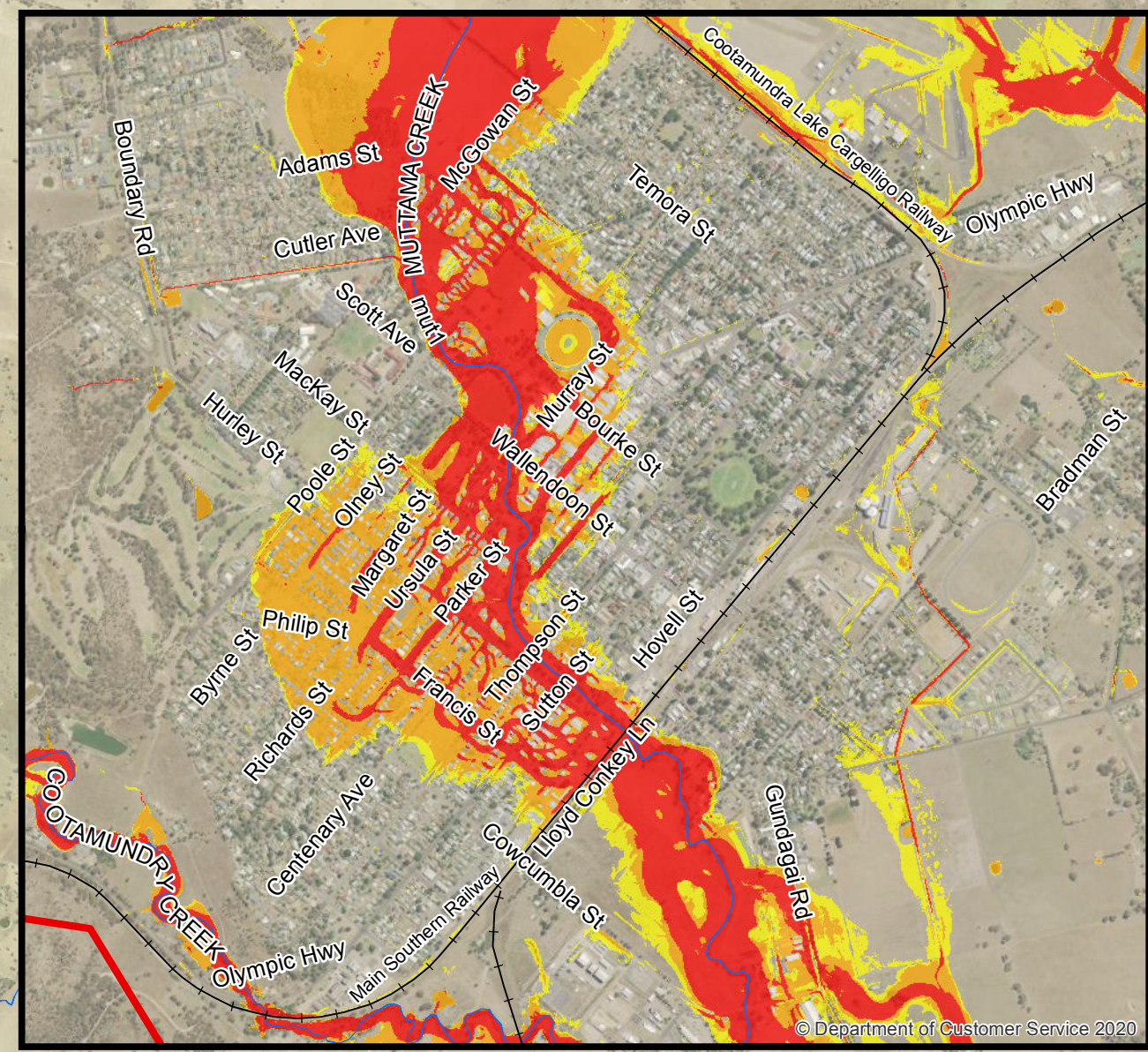
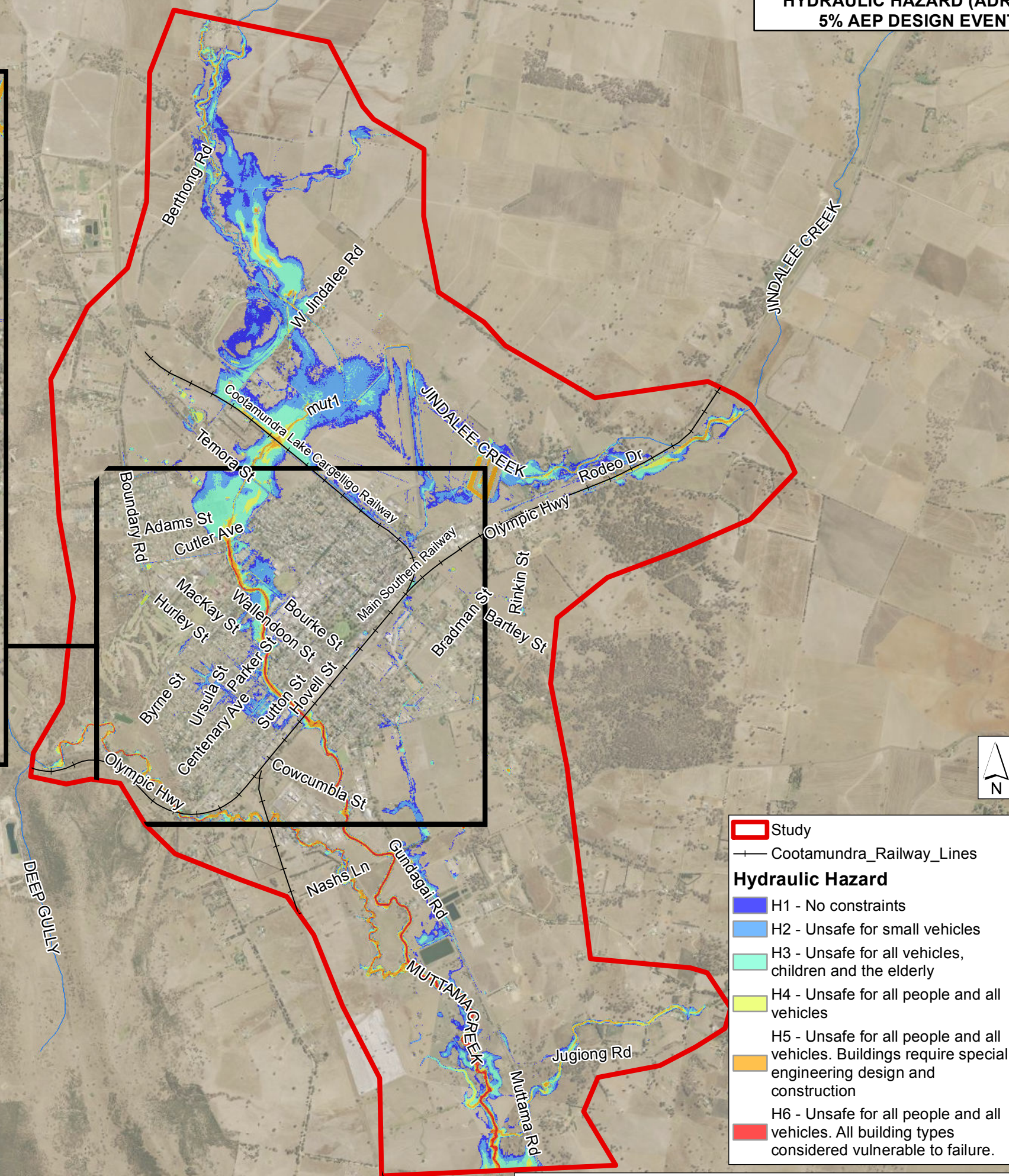
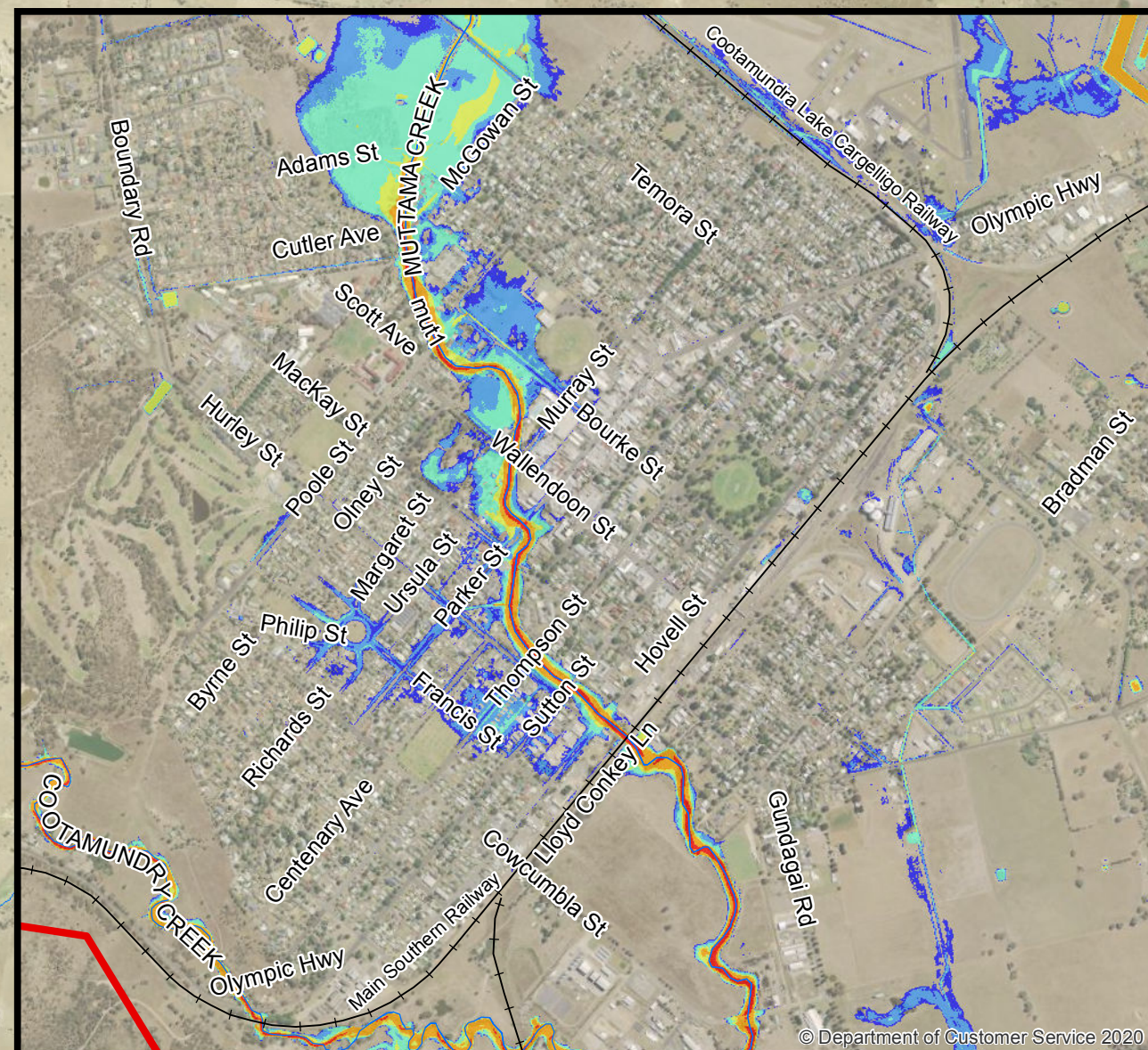


FIGURE A21
HYDRAULIC CATEGORIES
0.2% AEP DESIGN EVENT



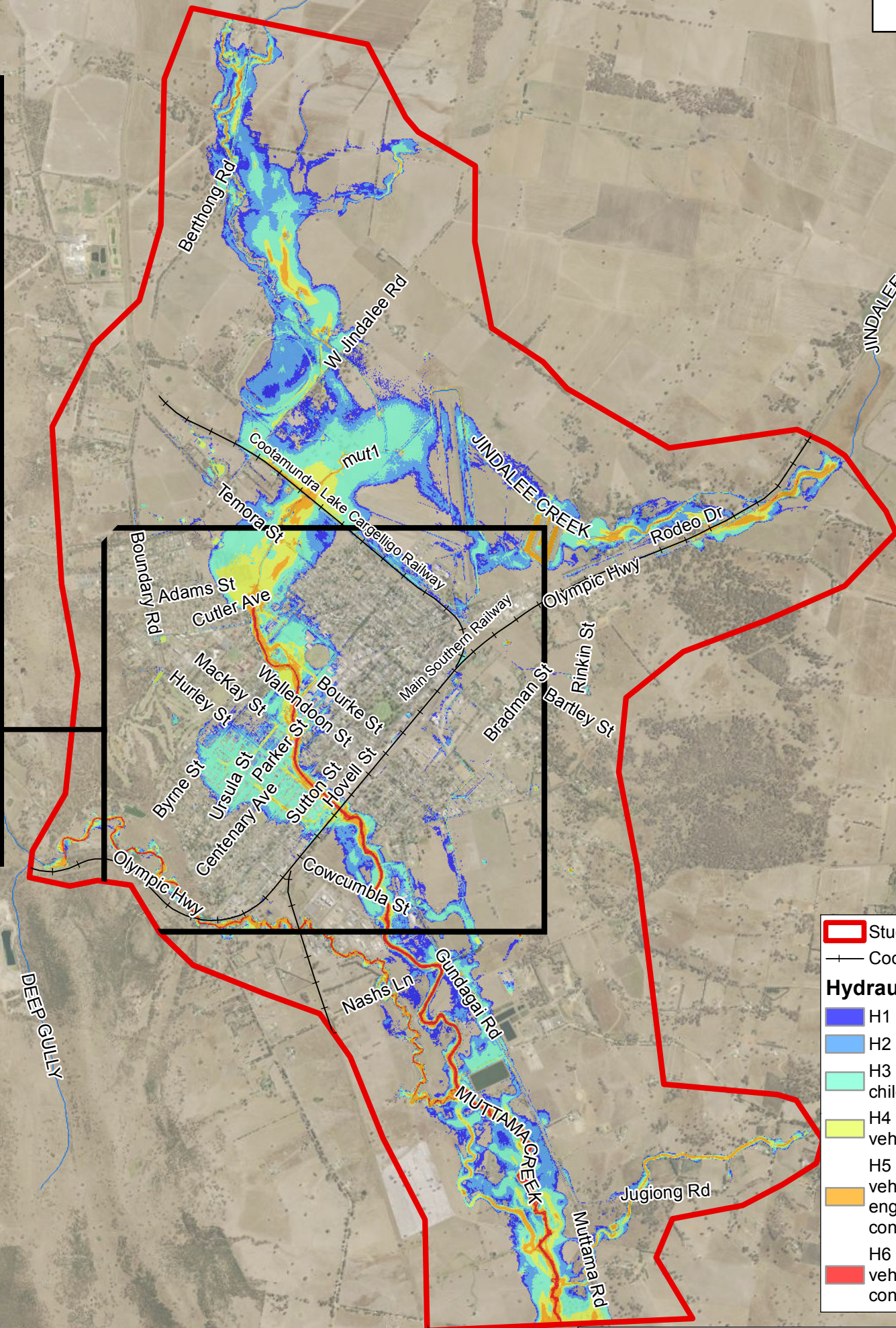
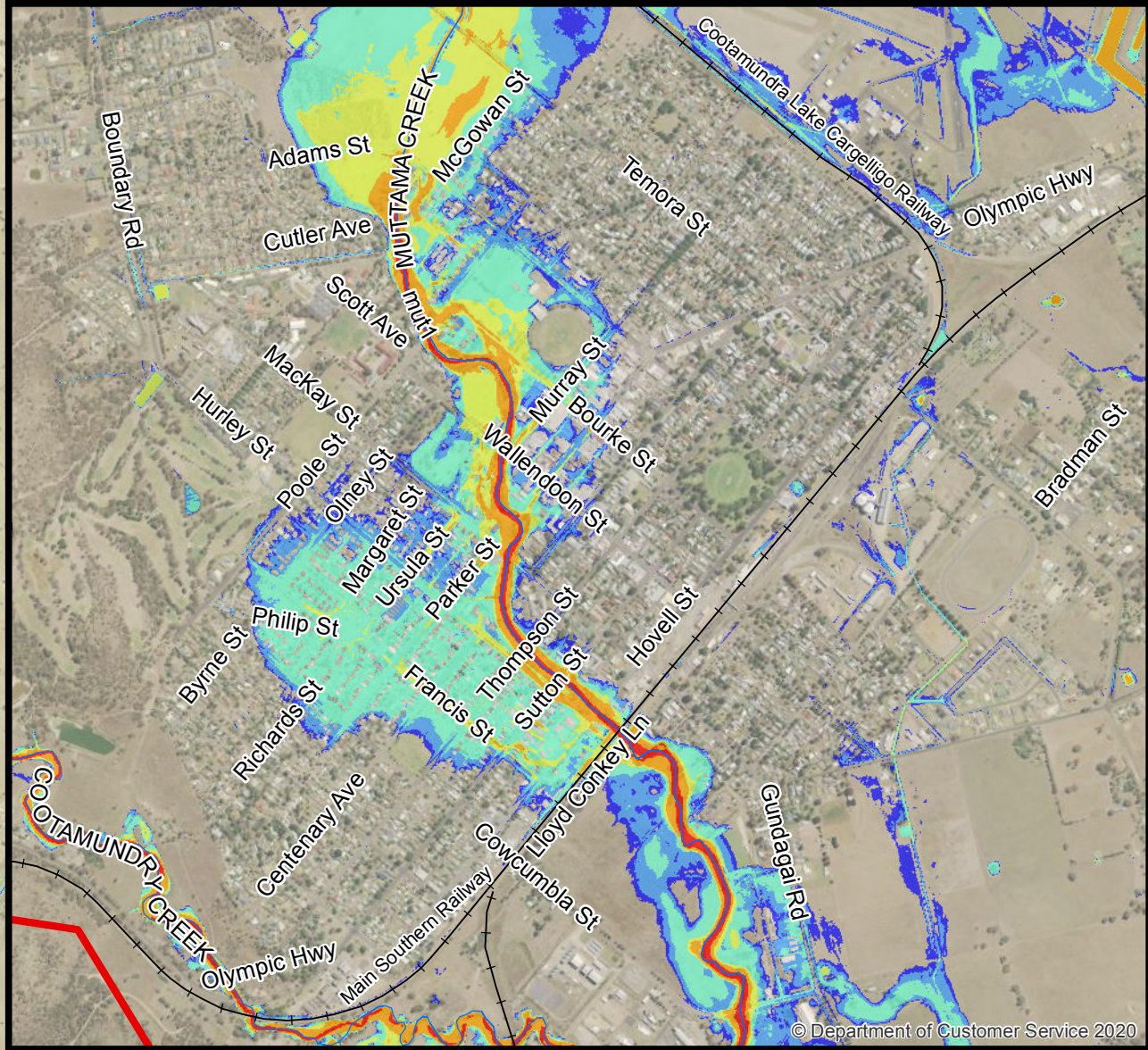
NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

FIGURE A22
HYDRAULIC HAZARD (ADR)
5% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

FIGURE A23
HYDRAULIC HAZARD (ADR)
1% AEP DESIGN EVENT



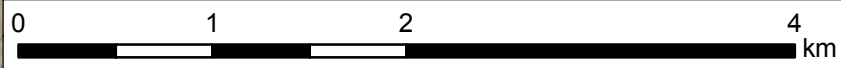
Study Area

- Study Area
- Cootamundra_Railway_Lines

Hydraulic Hazard

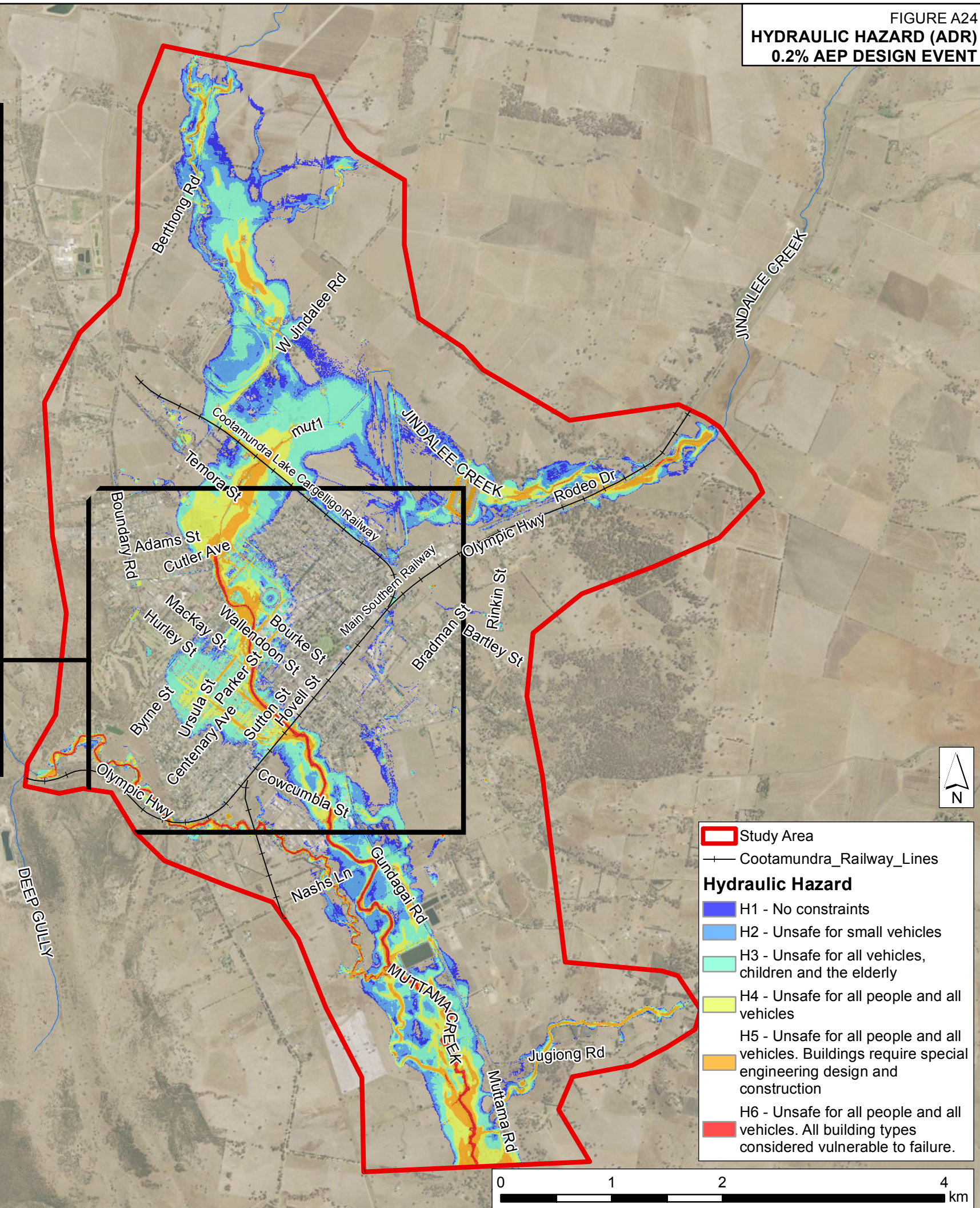
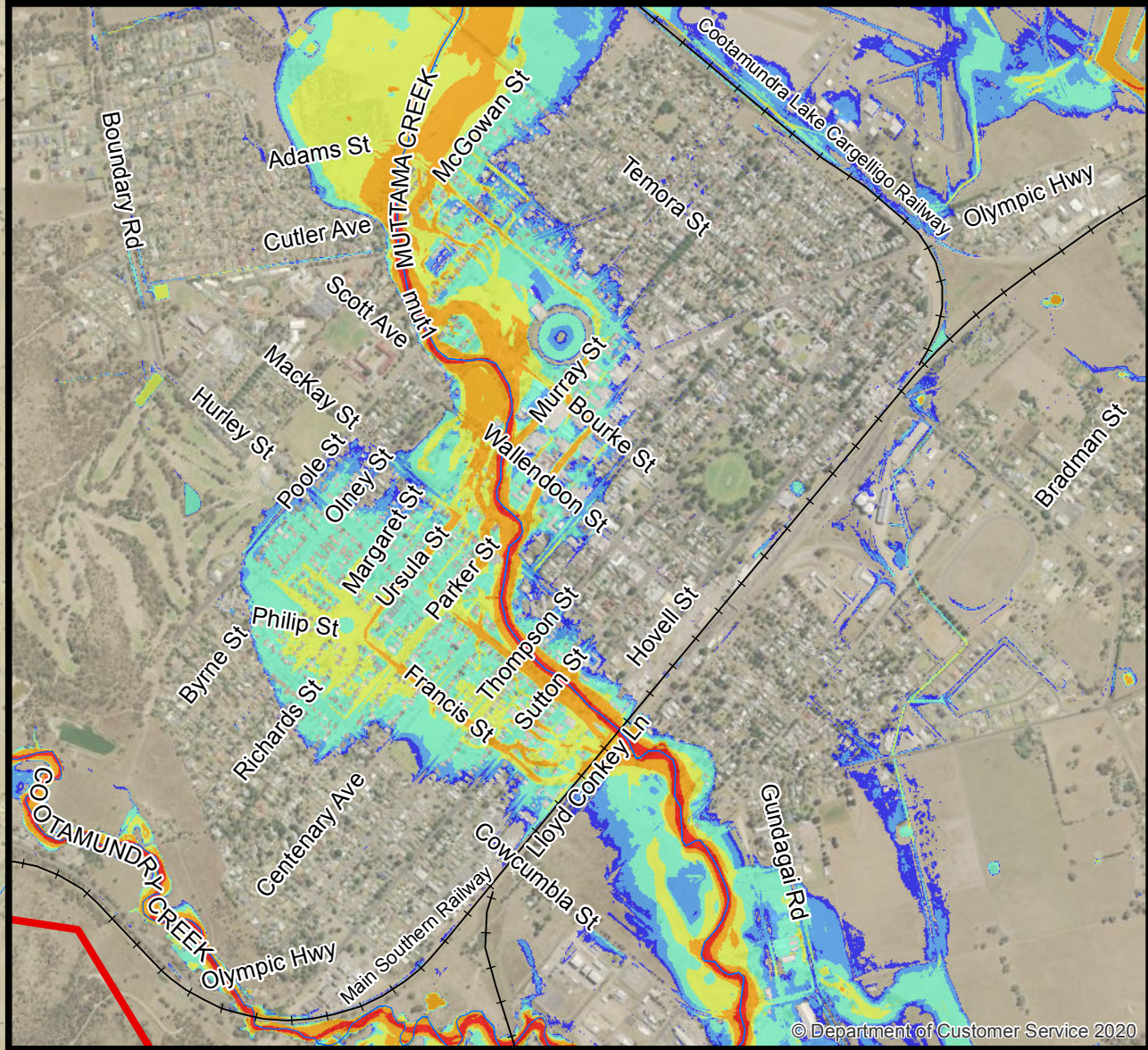
- H1 - No constraints
- H2 - Unsafe for small vehicles
- H3 - Unsafe for all vehicles, children and the elderly
- H4 - Unsafe for all people and all vehicles
- H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction
- H6 - Unsafe for all people and all vehicles. All building types considered vulnerable to failure.

NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.



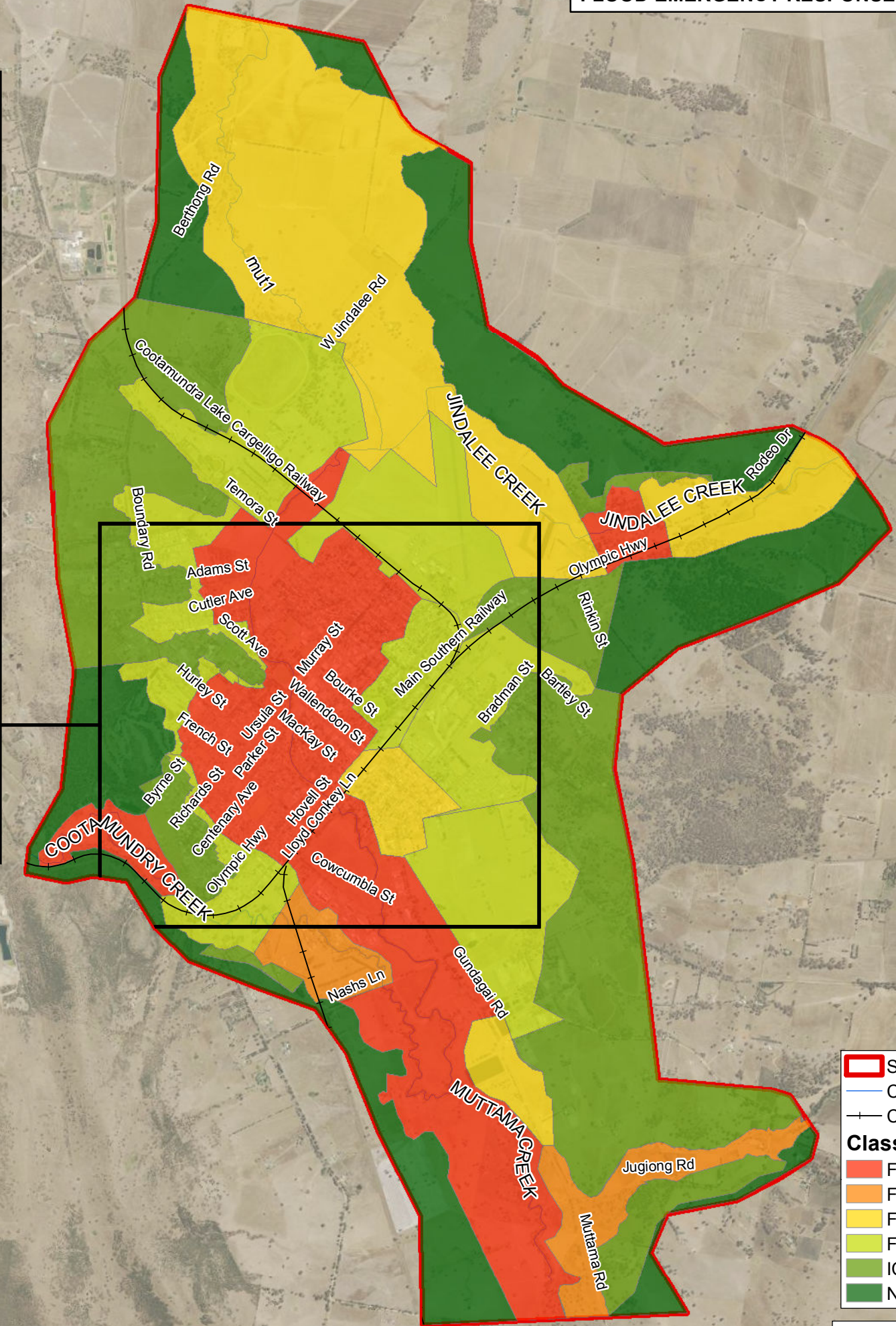
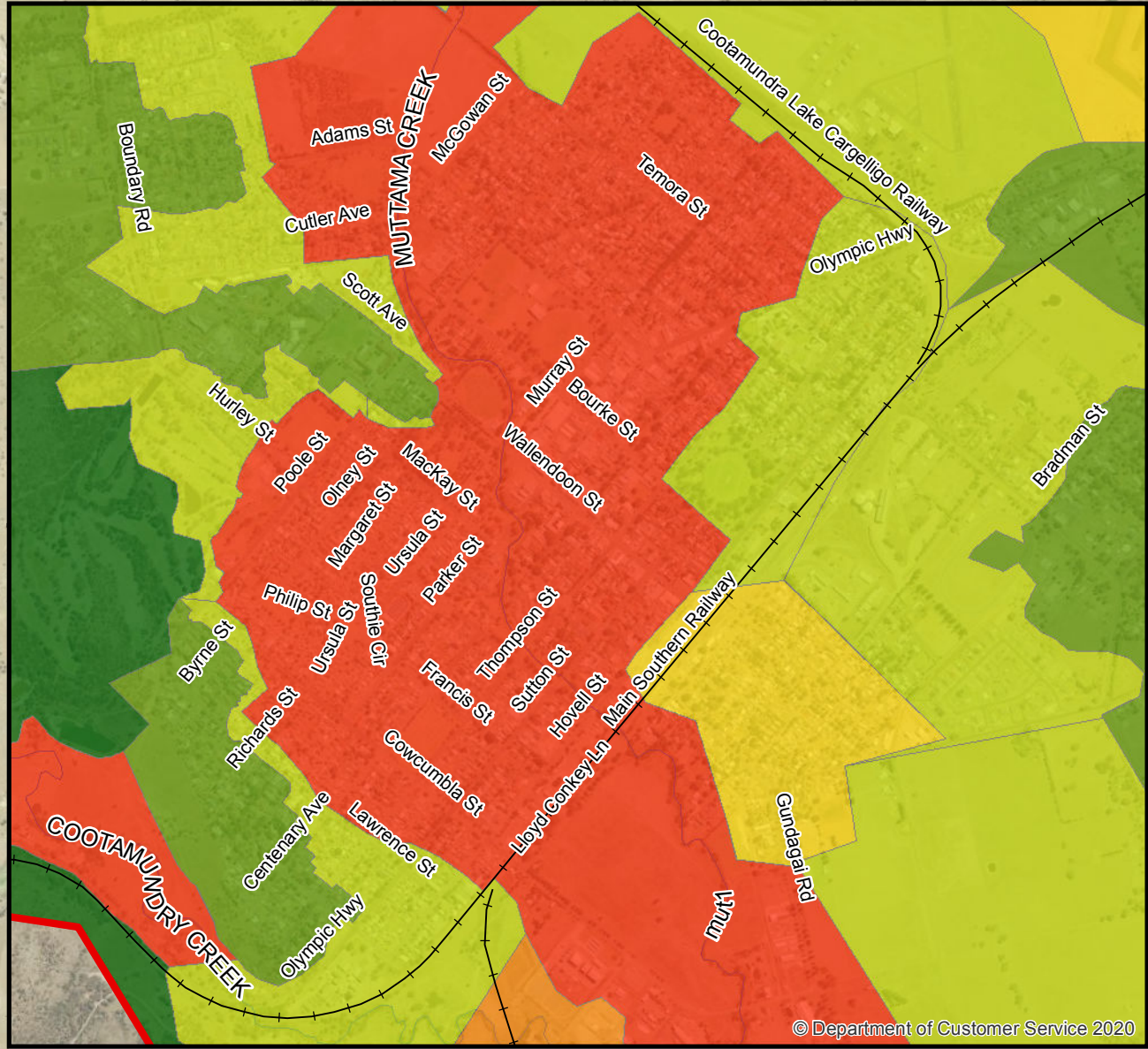
J:\Jobs\119039\ArcGIS\ArcMaps\230522_FRMS\FigureA23_Hydraulic_Hazard_1pctAEP.mxd

FIGURE A24
HYDRAULIC HAZARD (ADR)
0.2% AEP DESIGN EVENT



NOTE: Inundation patterns and/or peak flood levels shown for design events are based on best available estimates of flood behaviour. Actual inundation patterns may vary slightly during an event. All flow depths (overland and mainstream) less than 200 mm have been trimmed from this figure. Model accuracy is assumed to be within ± 0.3 m.

FIGURE A25
FLOOD EMERGENCY RESPONSE CLASSIFICATION (FERC)



Study Area

- Study Area
- Creeks
- Cootamundra Railway Lines

Classification

- FIS - Submerged
- FIE - Elevated
- FEO - Overland Escape Route
- FER - Rising Road Egress
- IC - Indirect Consequences
- No Flood Impact

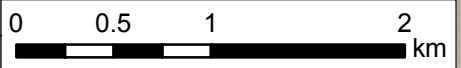
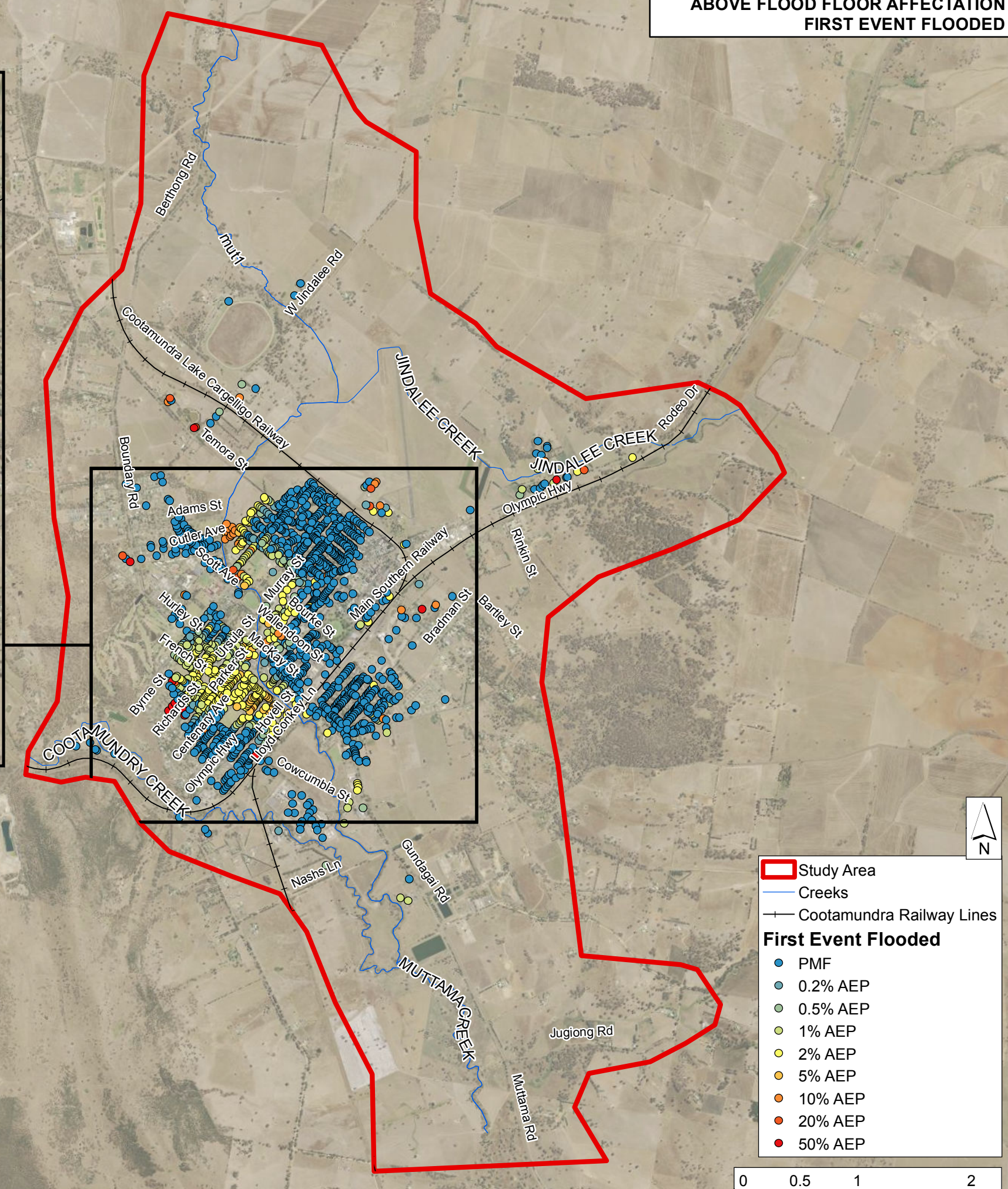
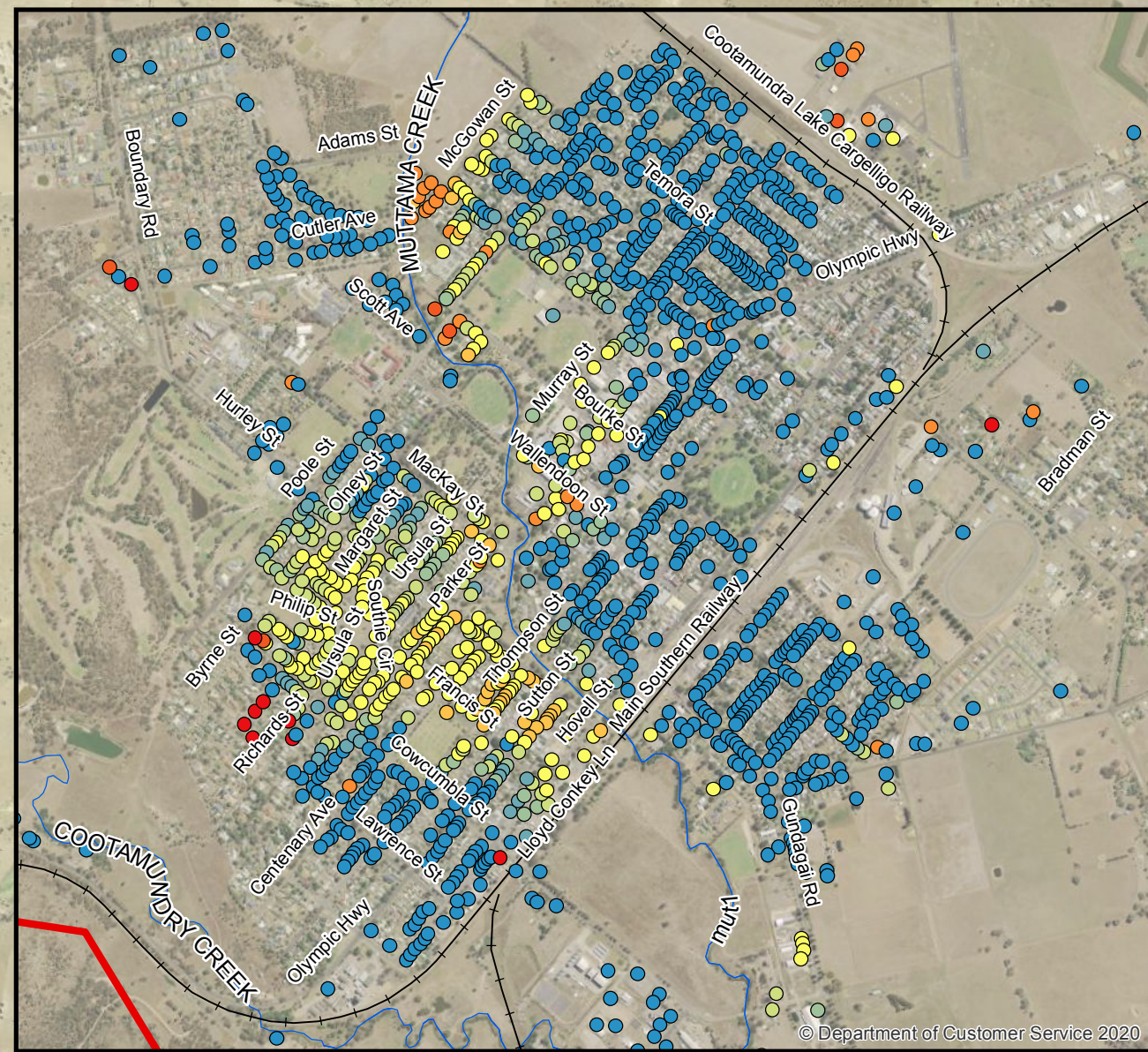
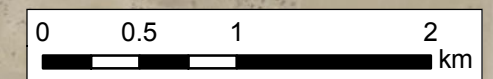


FIGURE A26
**ABOVE FLOOD FLOOR AFFECTATION
 FIRST EVENT FLOODED**



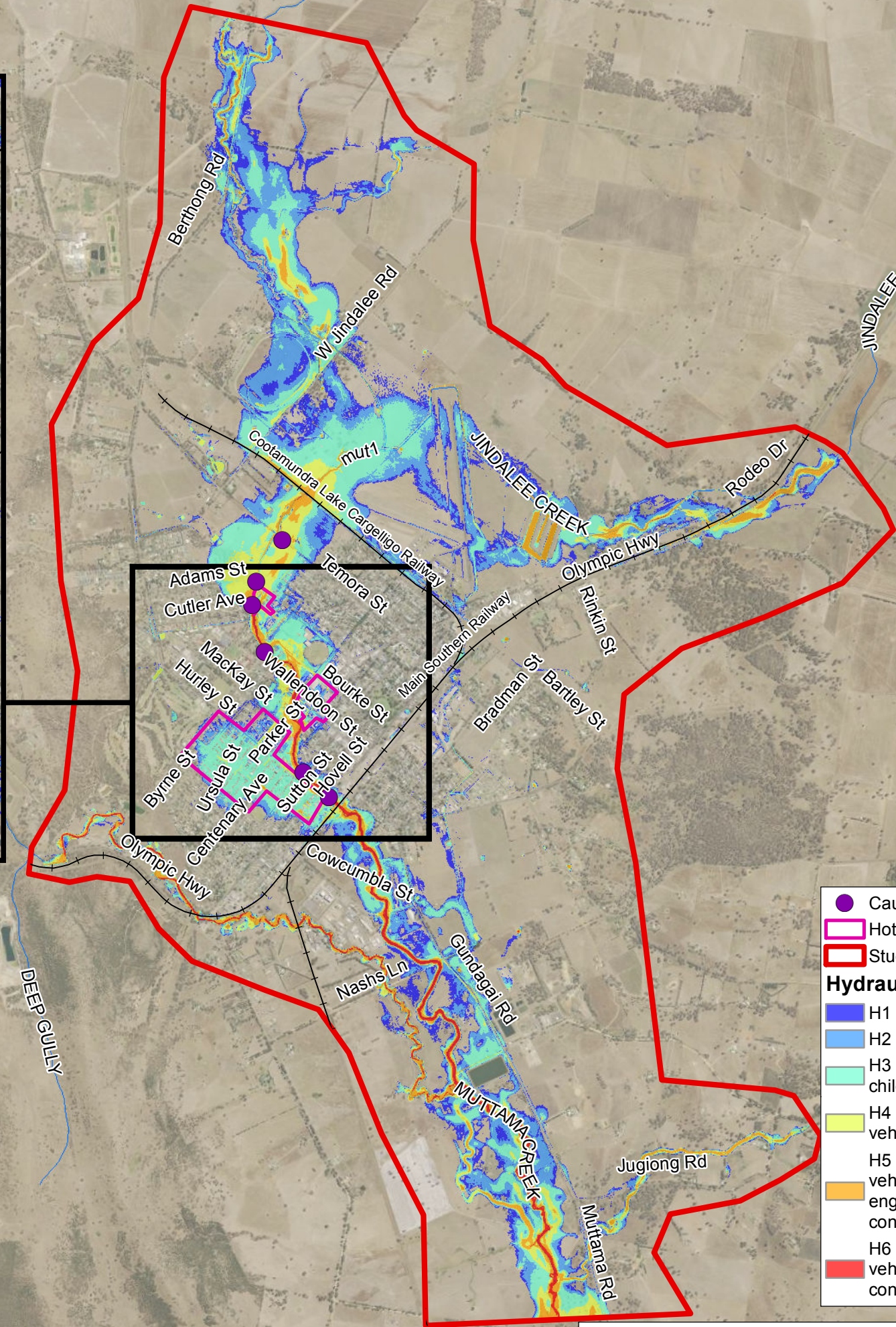
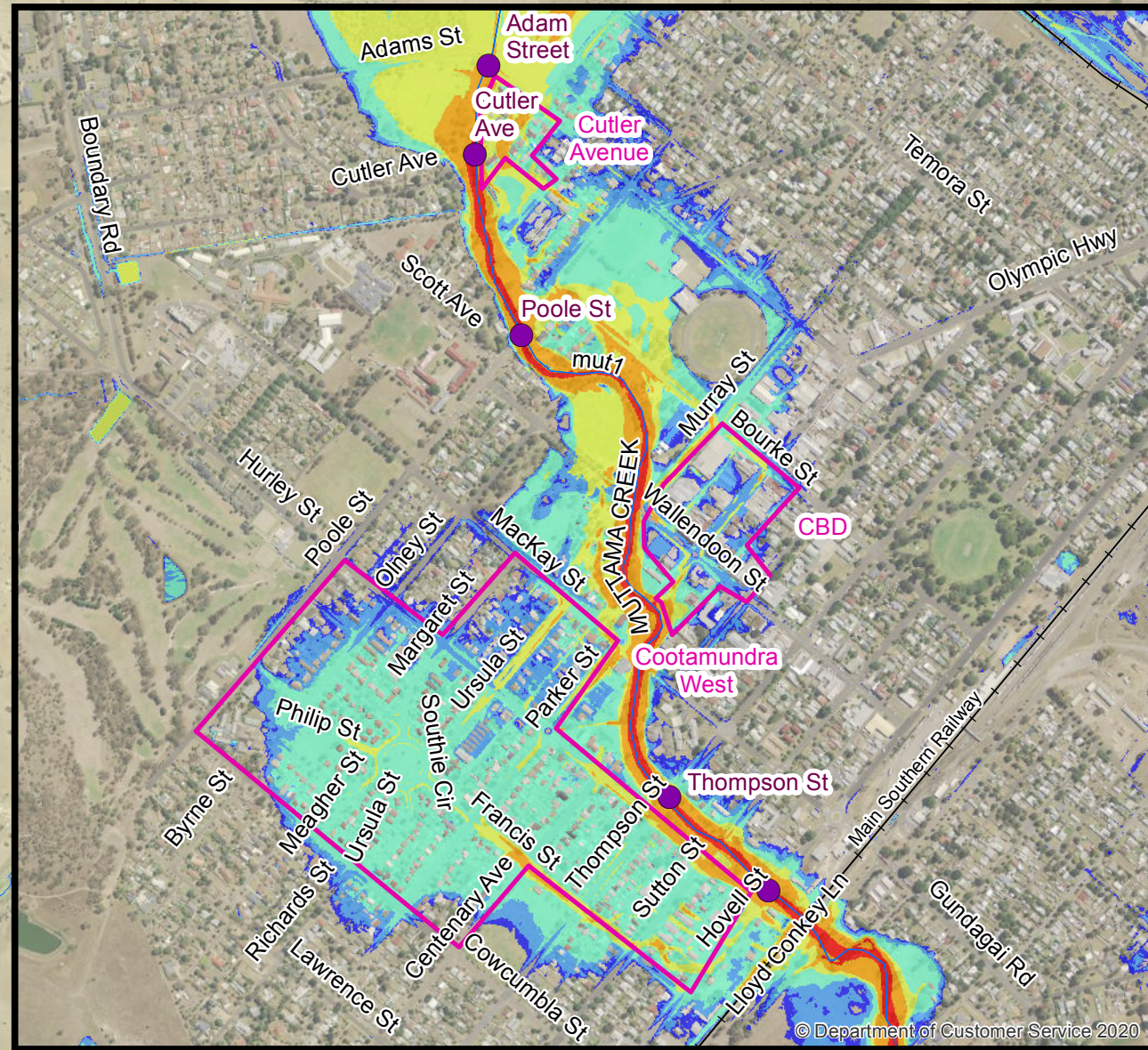
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- Study Area
- Creeks
- +— Cootamundra Railway Lines
- First Event Flooded**
- PMF
- 0.2% AEP
- 0.5% AEP
- 1% AEP
- 2% AEP
- 5% AEP
- 10% AEP
- 20% AEP
- 50% AEP



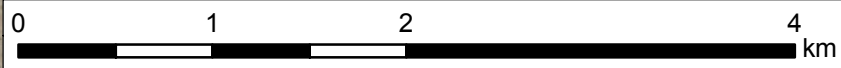
NOTE: The property affection shown on this map is not an indicator of individual flood risk exposure but part of aregional assessment of flood risk exposure to give a feel for the magnitude of the flood problem.

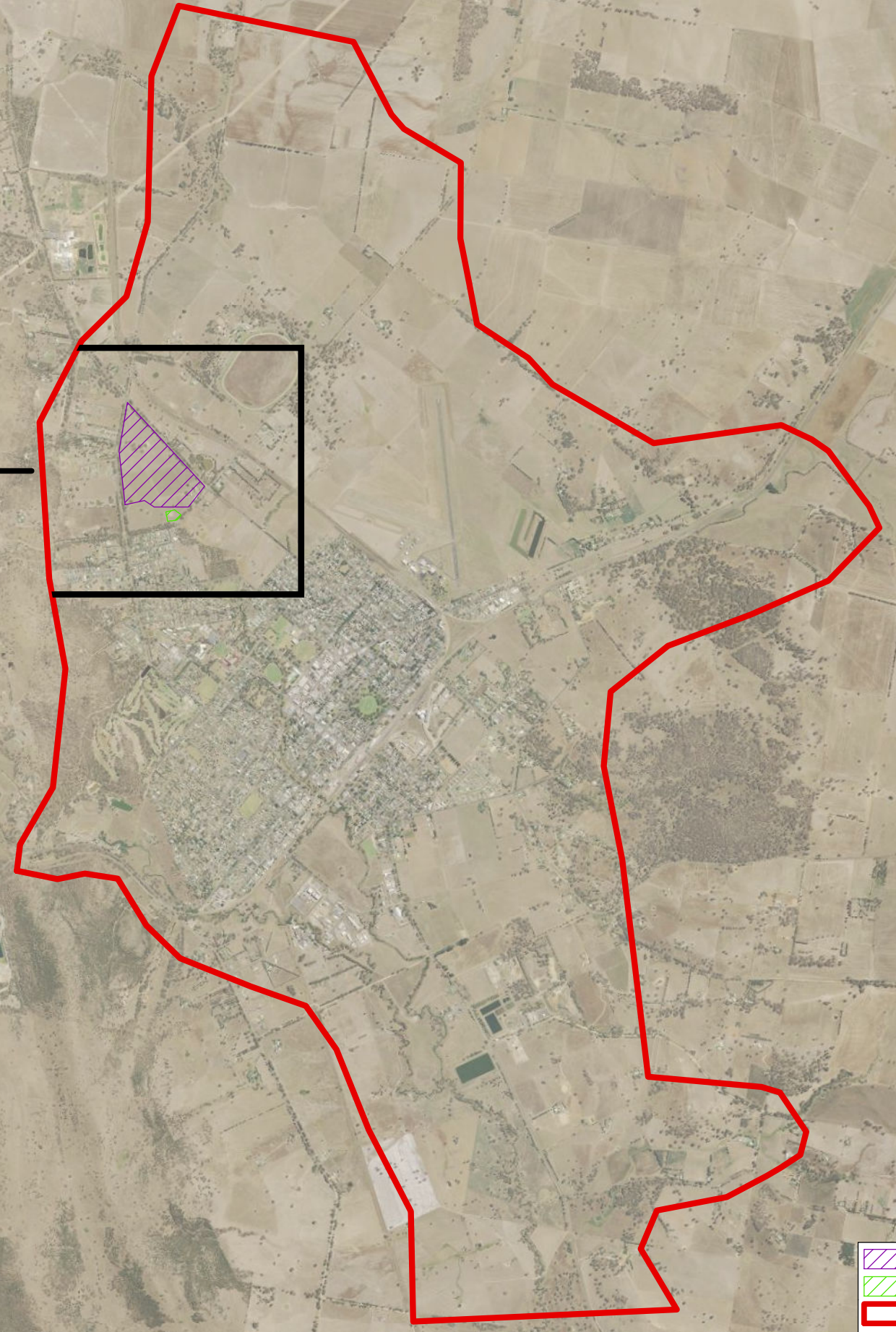
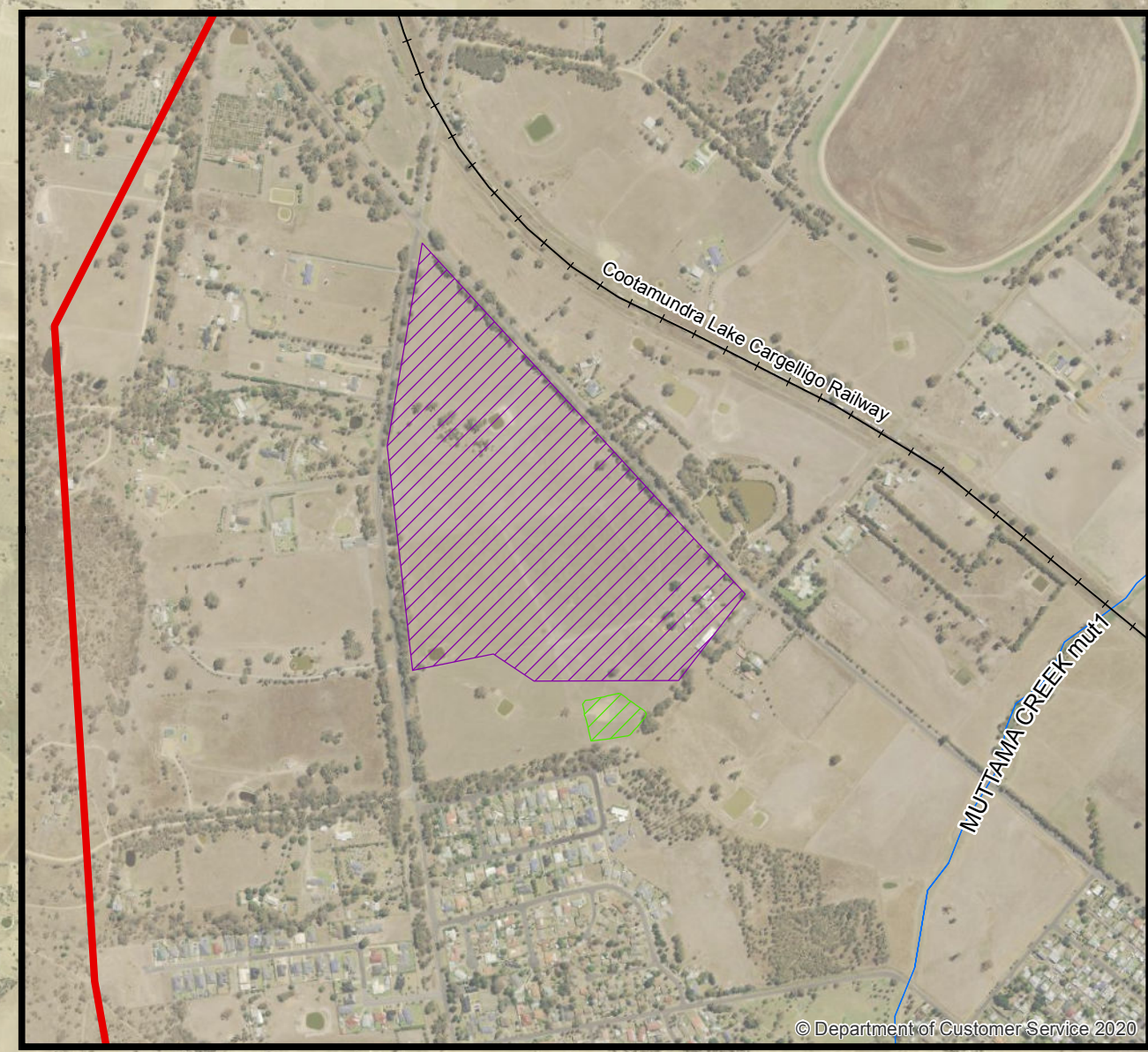
FIGURE A27
FLOODING HOTSPOTS



Flooding hotspots are identified as areas where there is a cluster of flood risk, this may include a number of properties which are frequently inundated (either yard or building inundation), or where high hazard flooding moves through properties, or where road trafficability is reduced due to flooding, such as at the causeways through town. Flooding hotspots are identified based on a review of the modelled flood information developed as part of this report, and the property floor level database, in addition to community feedback (including that from the Floodplain Risk Management Committee).

- Causeway
 - Hotspot Location
 - Study Area
- Hydraulic Hazard**
- H1 - No constraints
 - H2 - Unsafe for small vehicles
 - H3 - Unsafe for all vehicles, children and the elderly
 - H4 - Unsafe for all people and all vehicles
 - H5 - Unsafe for all people and all vehicles. Buildings require special engineering design and construction
 - H6 - Unsafe for all people and all vehicles. All building types considered vulnerable to failure.





- Future land to subdivide
- Boundary Road Dentention Basin
- Study Area
- Cootamundra Railways Lines

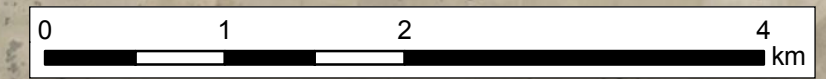
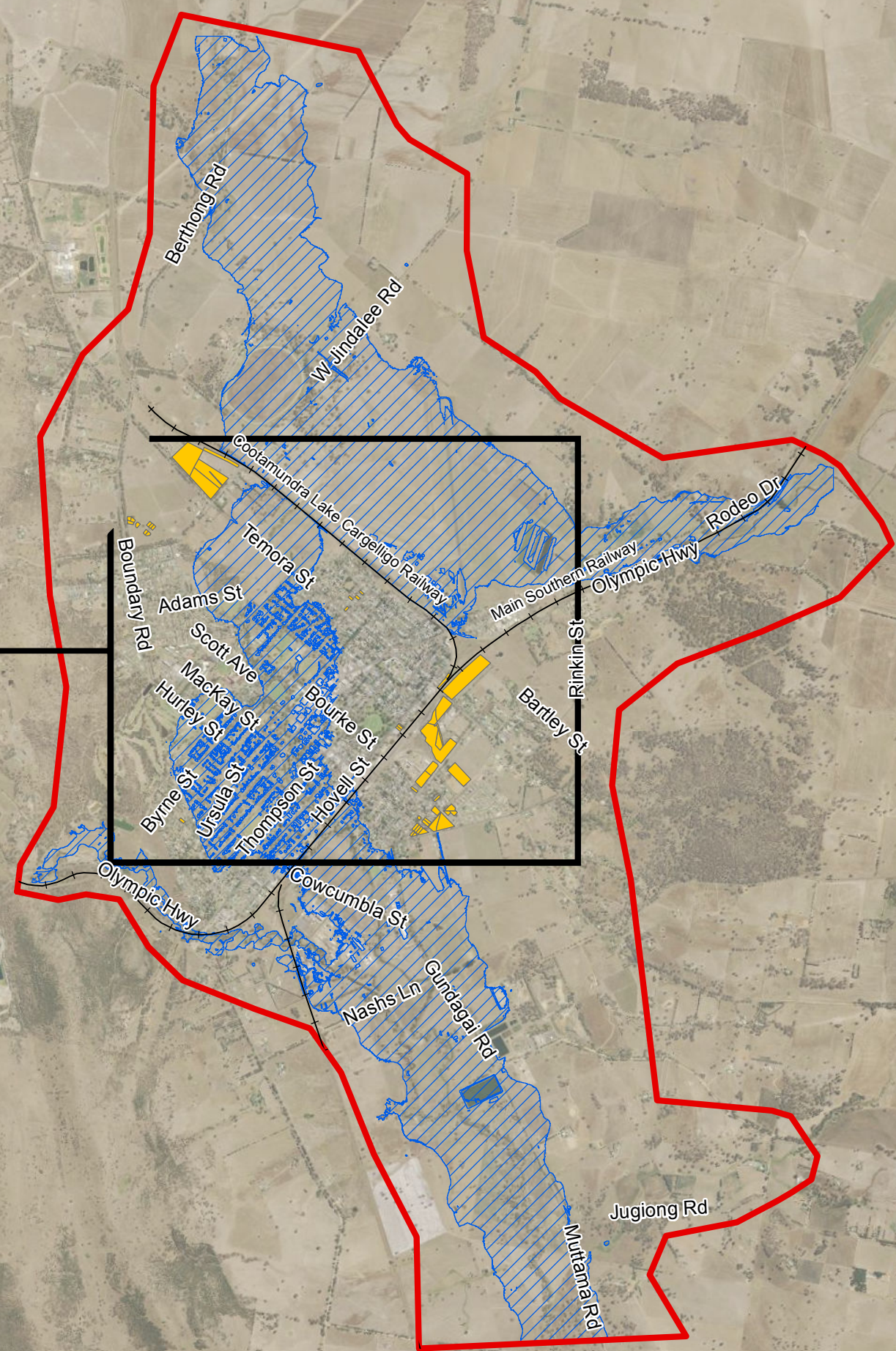
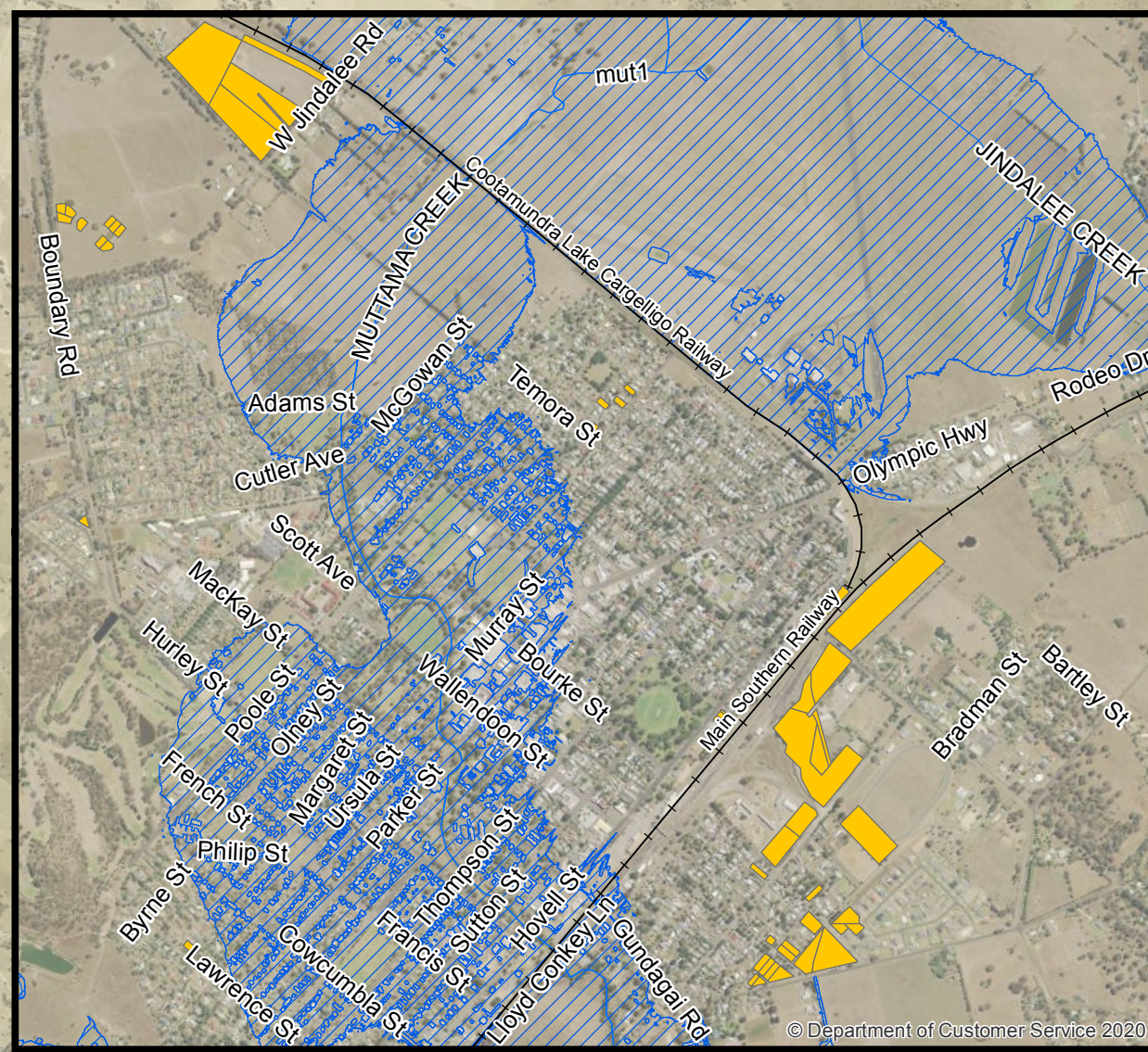


FIGURE A29
FLOOD PLANNING AREA



- Study Area
- Cootamundra Railways Lines
- Overland Flood Planning Area
- FPA extent

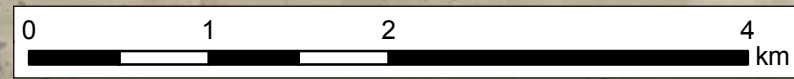
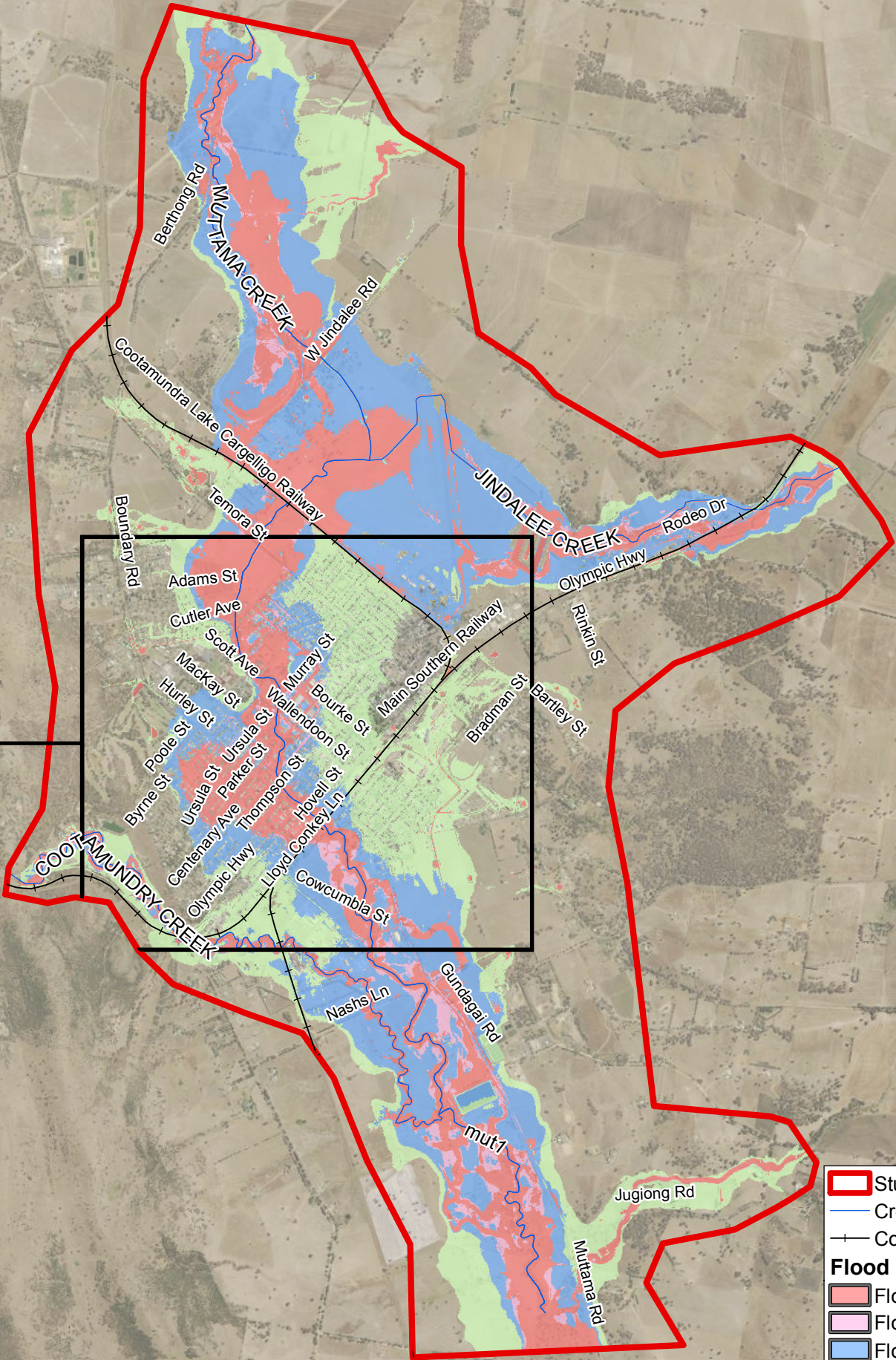
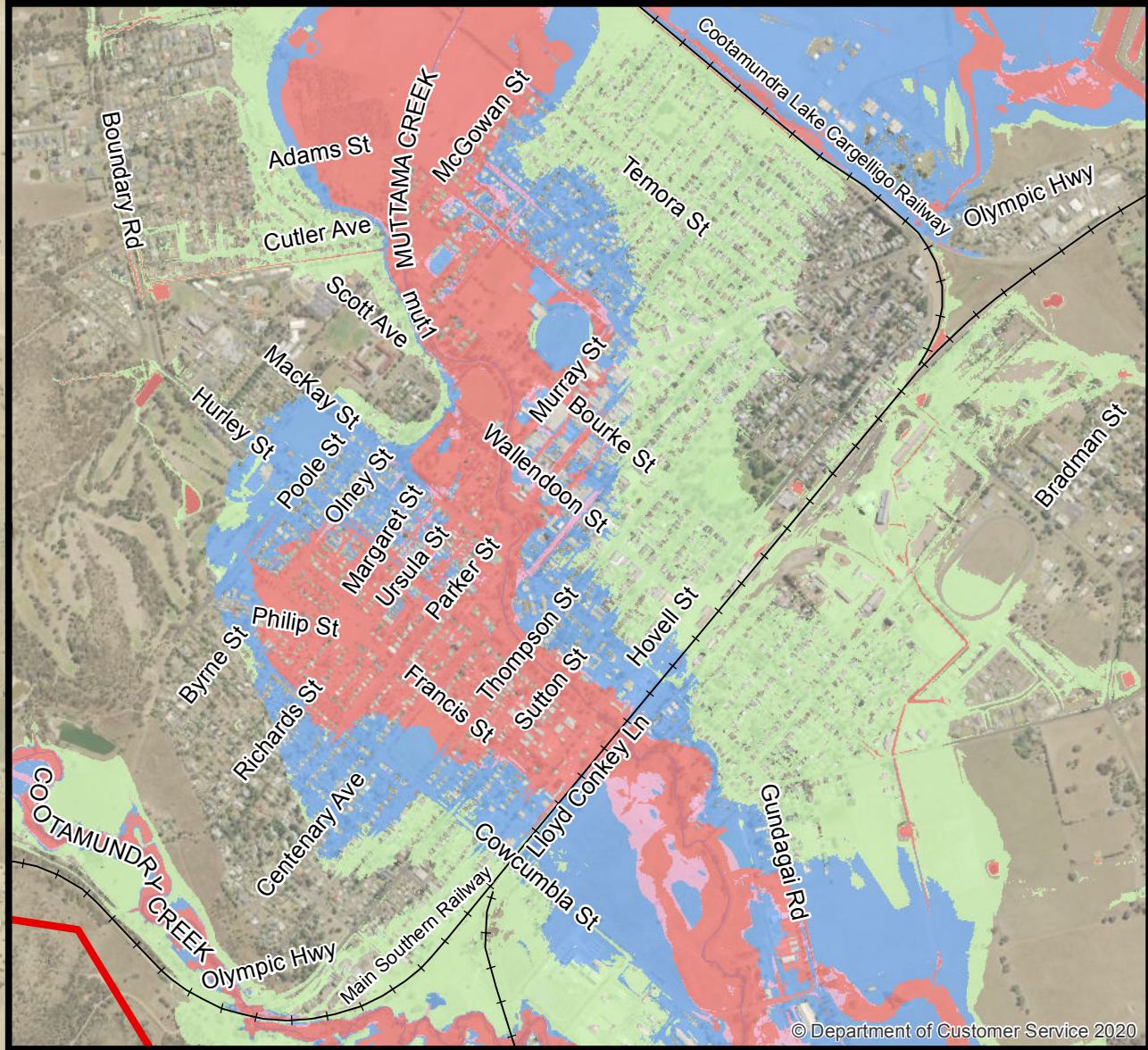
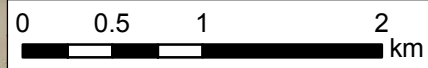
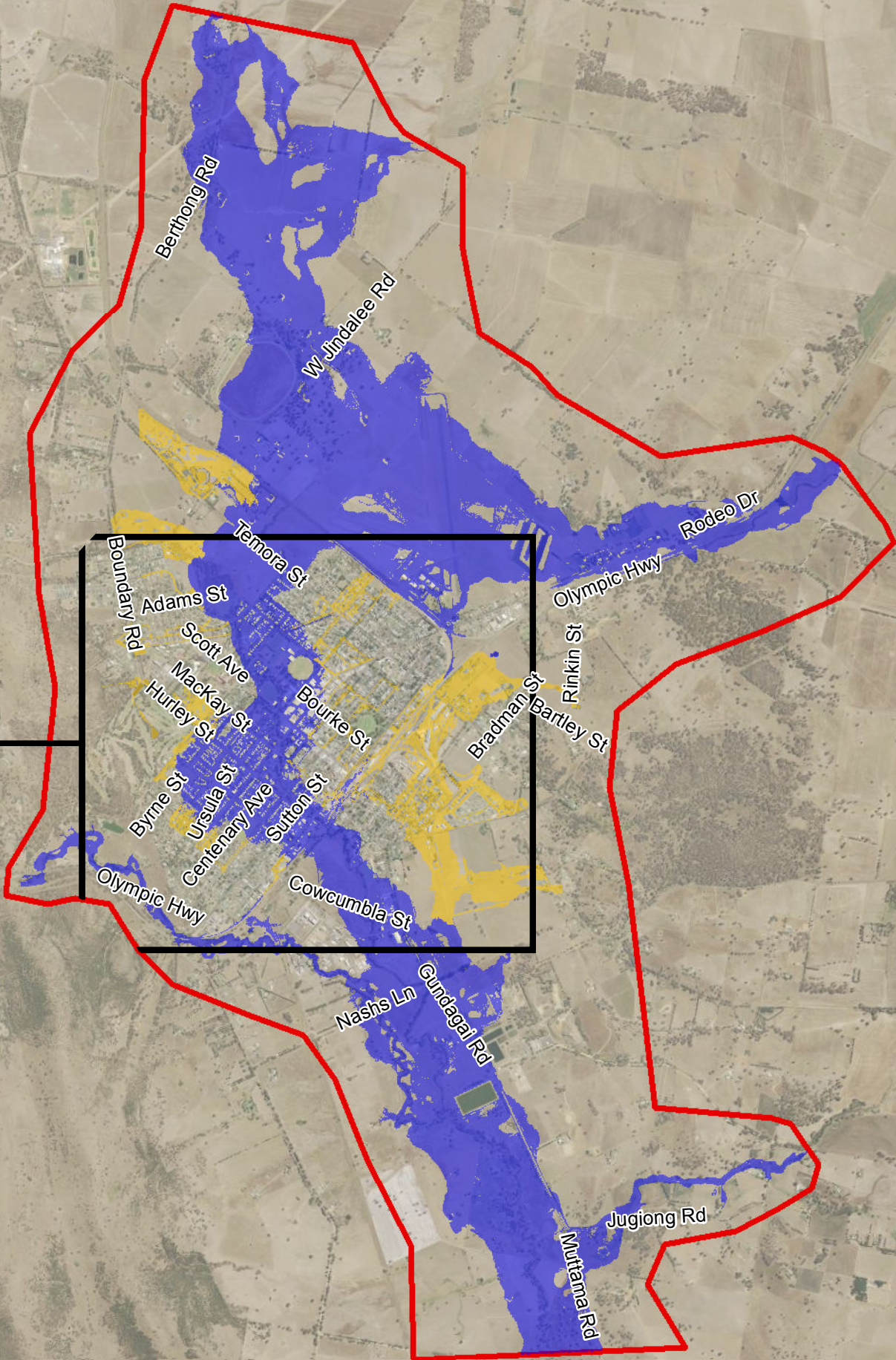
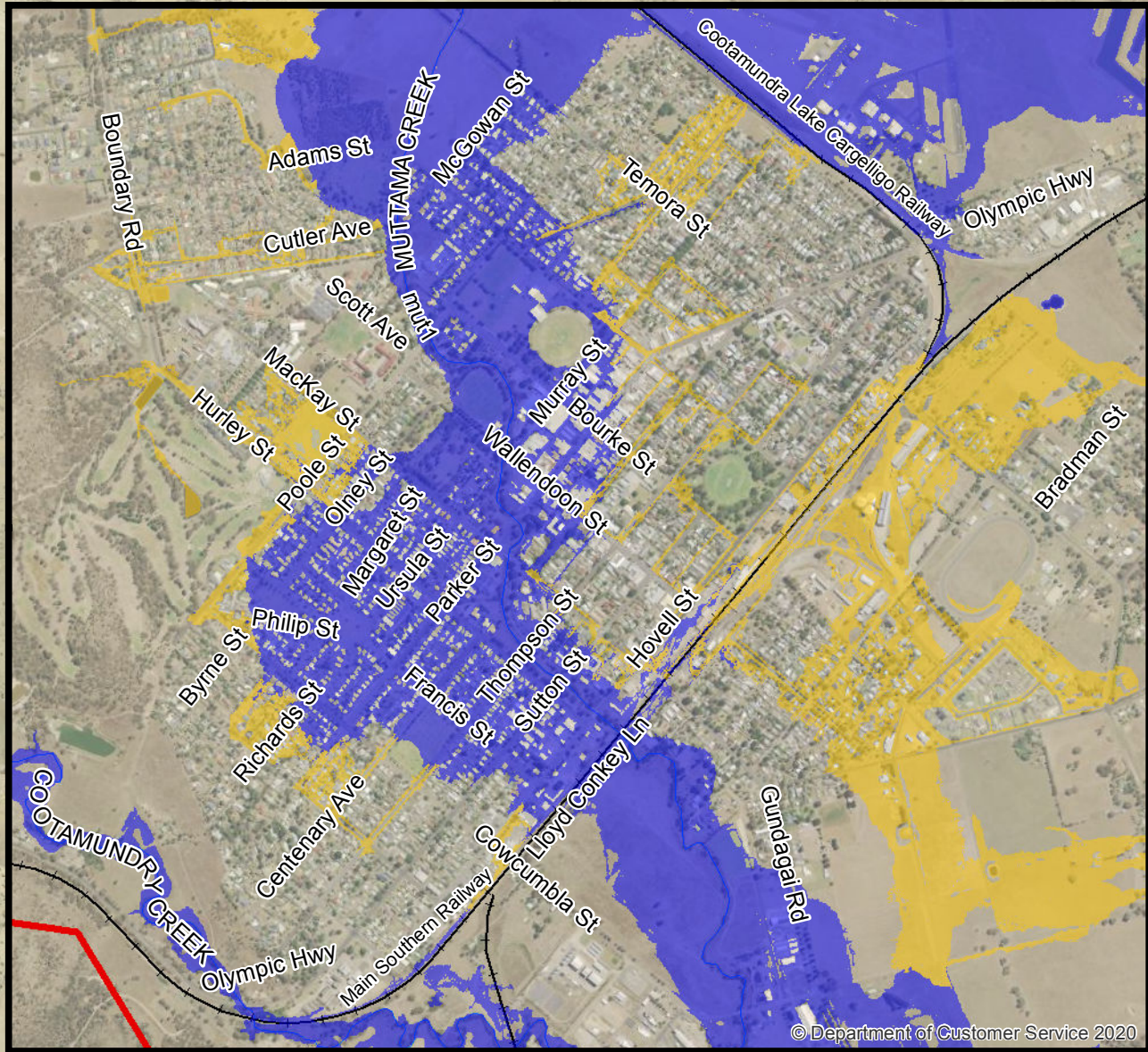


FIGURE A30
FLOOD PLANNING CONSTRAINT CATAGORIES



- Study Area
- Creeks
- Cootamundra Railway Lines
- Flood Planning Constraint Catagories**
- Flood Planning Constraint Category 1
- Flood Planning Constraint Category 2
- Flood Planning Constraint Category 3
- Flood Planning Constraint Category 4





NOTE: The categorisation of mainstream and overland flooding areas has been defined by modelled flood behaviour in the 1% AEP design event. The categorisation may vary for larger events or for real flood events, which can differ from design flood events in the timing and flood behaviour observed

Study Area

Flooding Mechanism

Overland

Mainstream

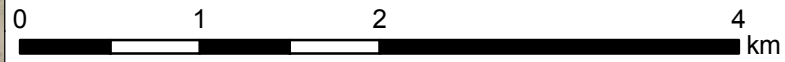
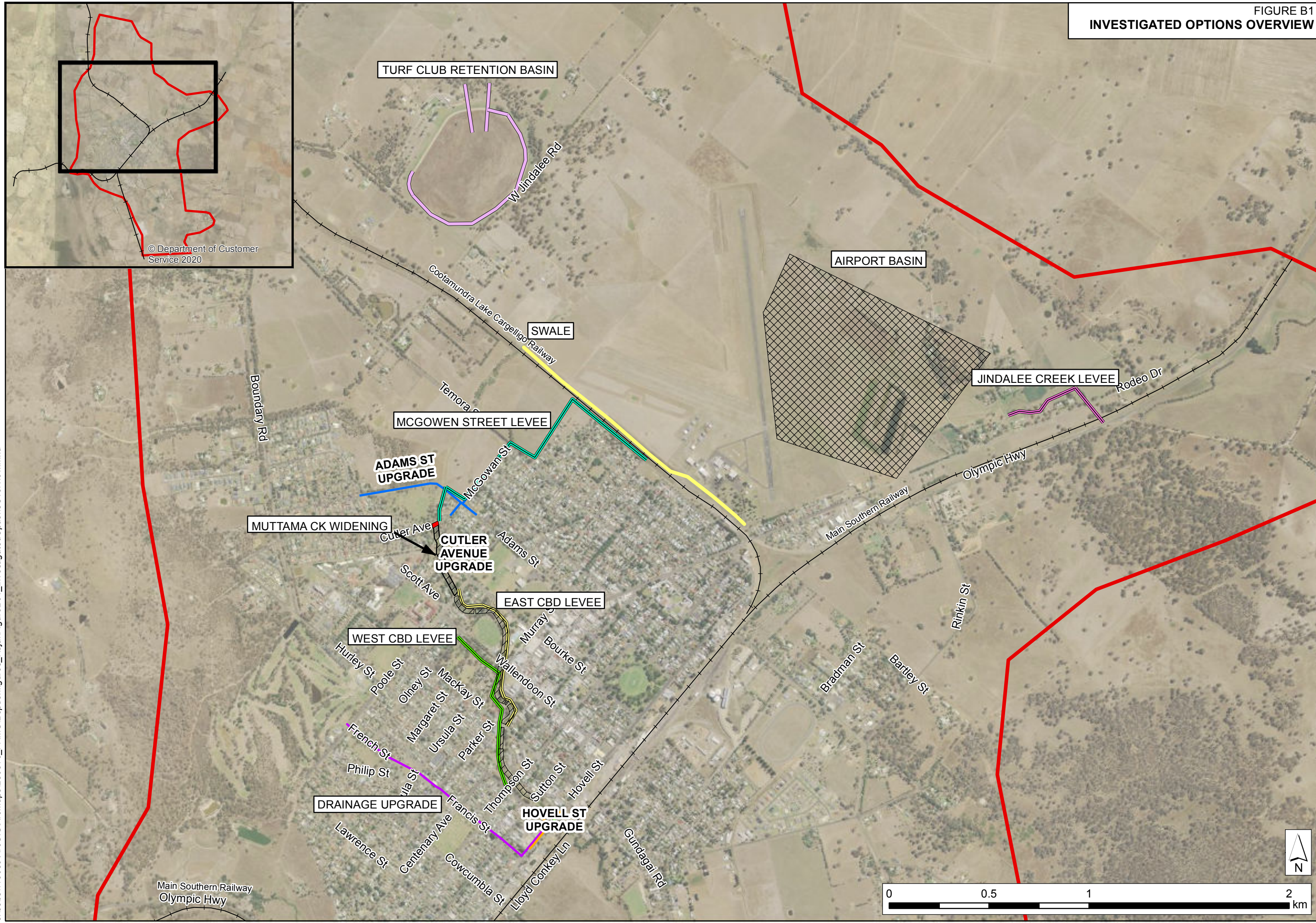


FIGURE B1
INVESTIGATED OPTIONS OVERVIEW

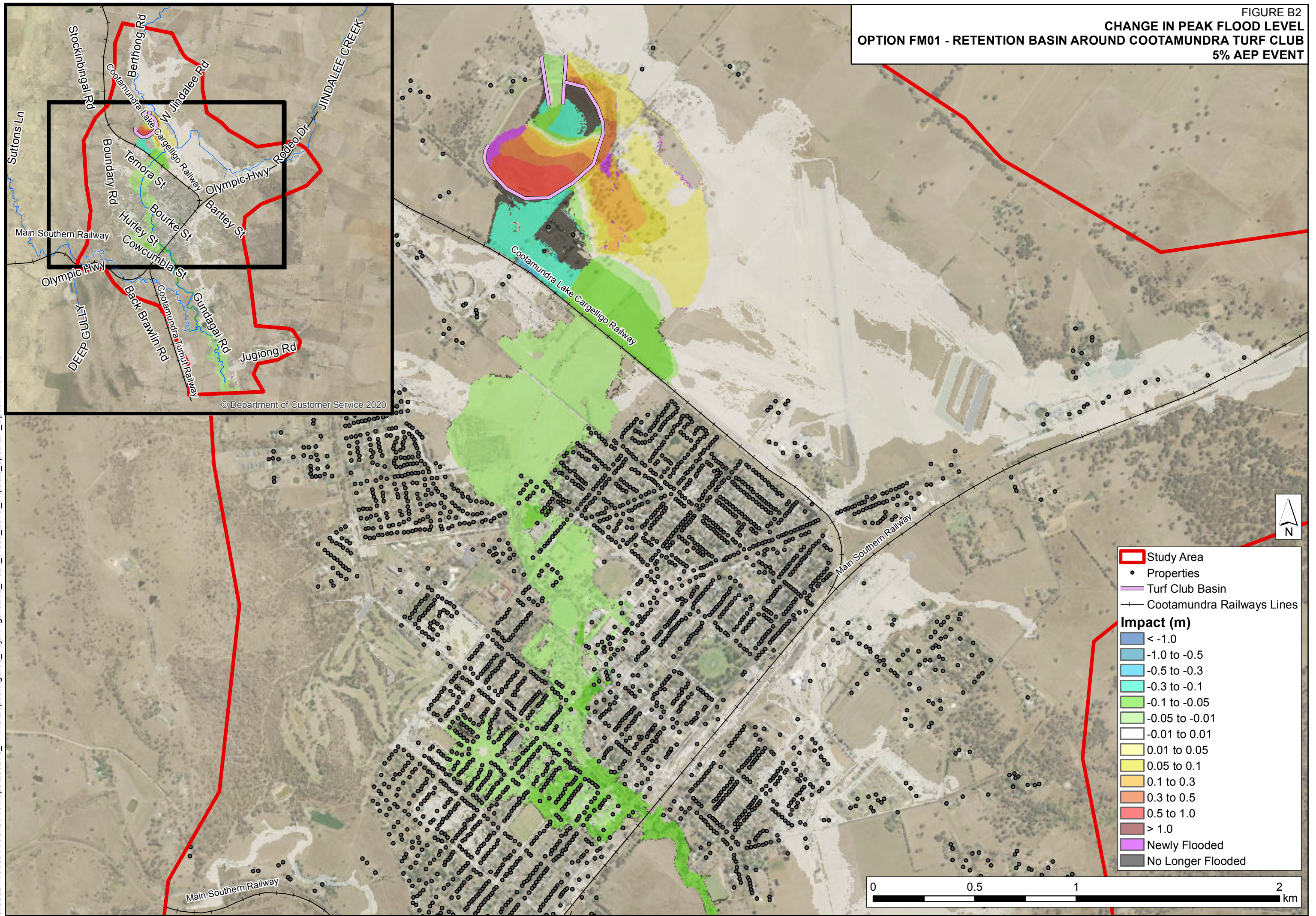


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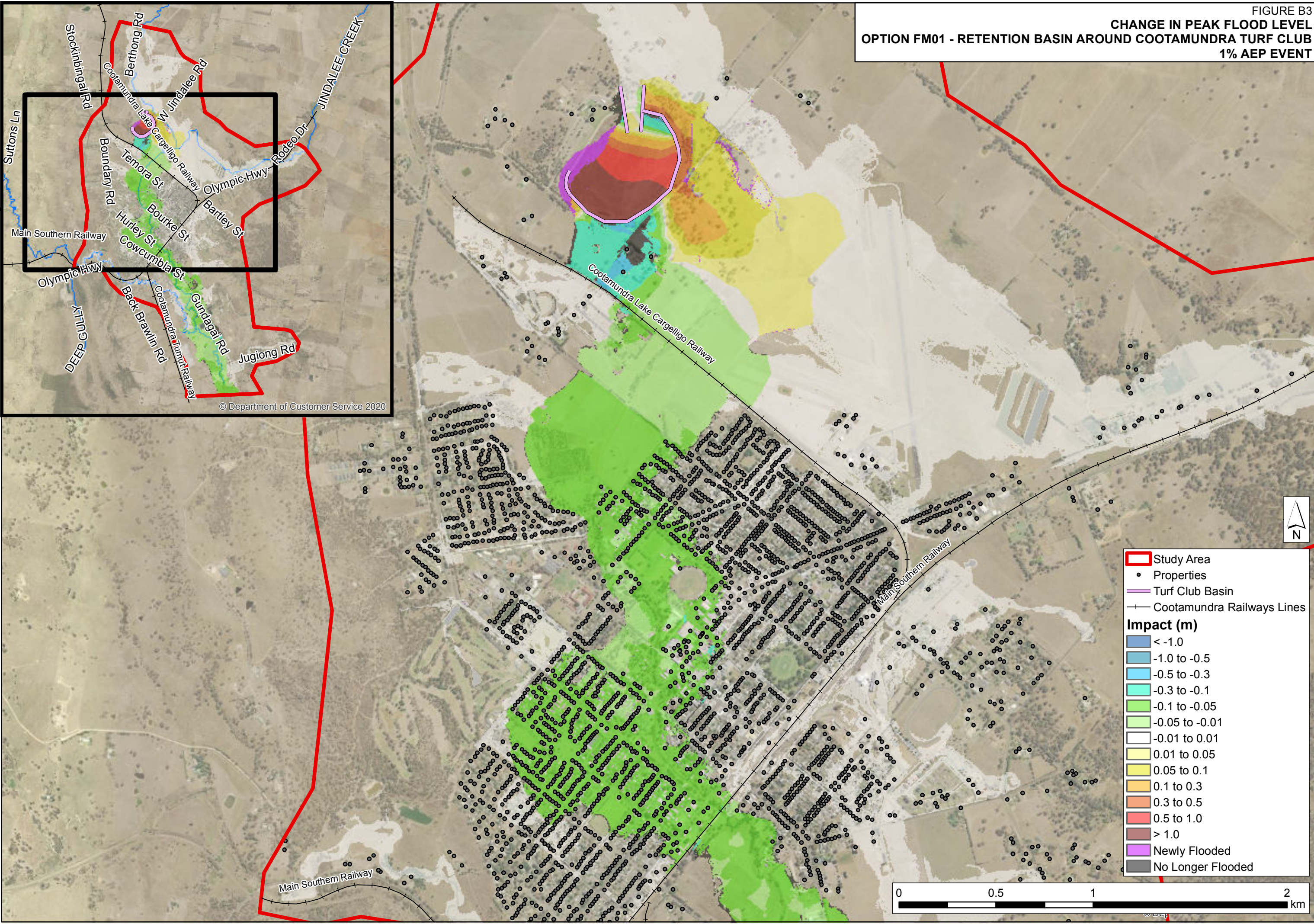
CHANGE IN PEAK FLOOD LEVEL
OPTION FM01 - RETENTION BASIN AROUND COOTAMUNDRA TURF CLUB
5% AEP EVENT

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CHANGE IN PEAK FLOOD LEVEL
OPTION FM01 - RETENTION BASIN AROUND COOTAMUNDRA TURF CLUB
1% AEP EVENT



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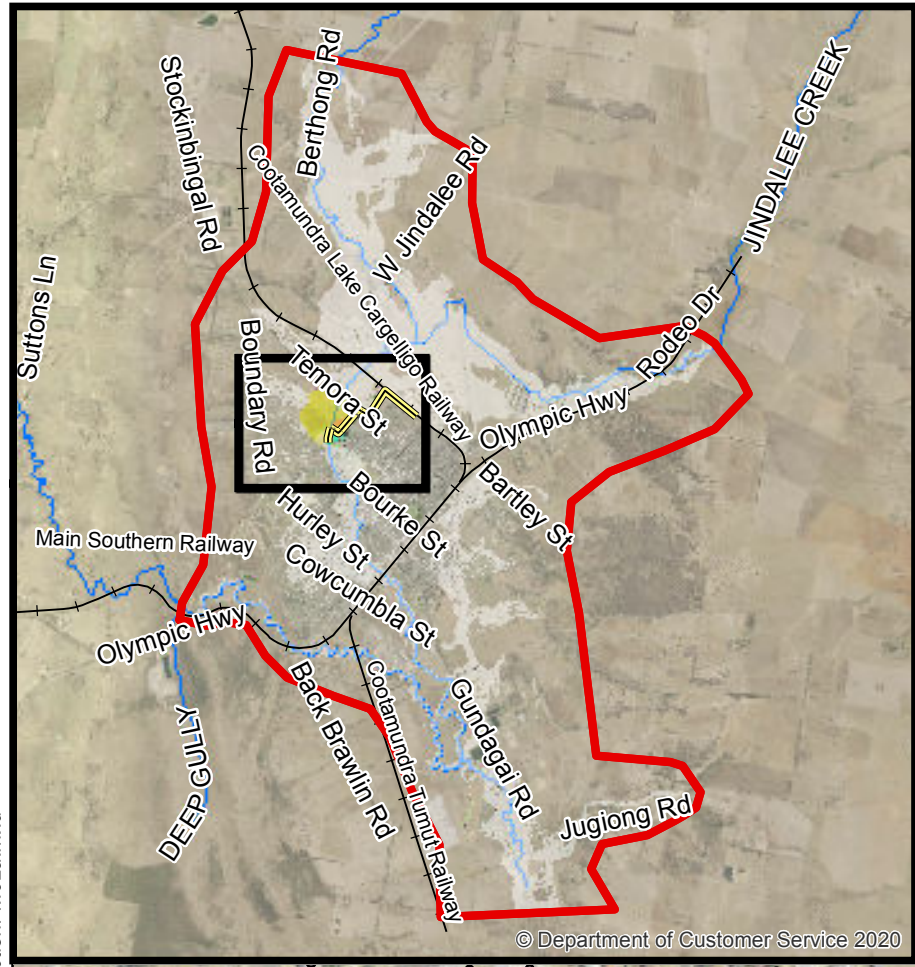
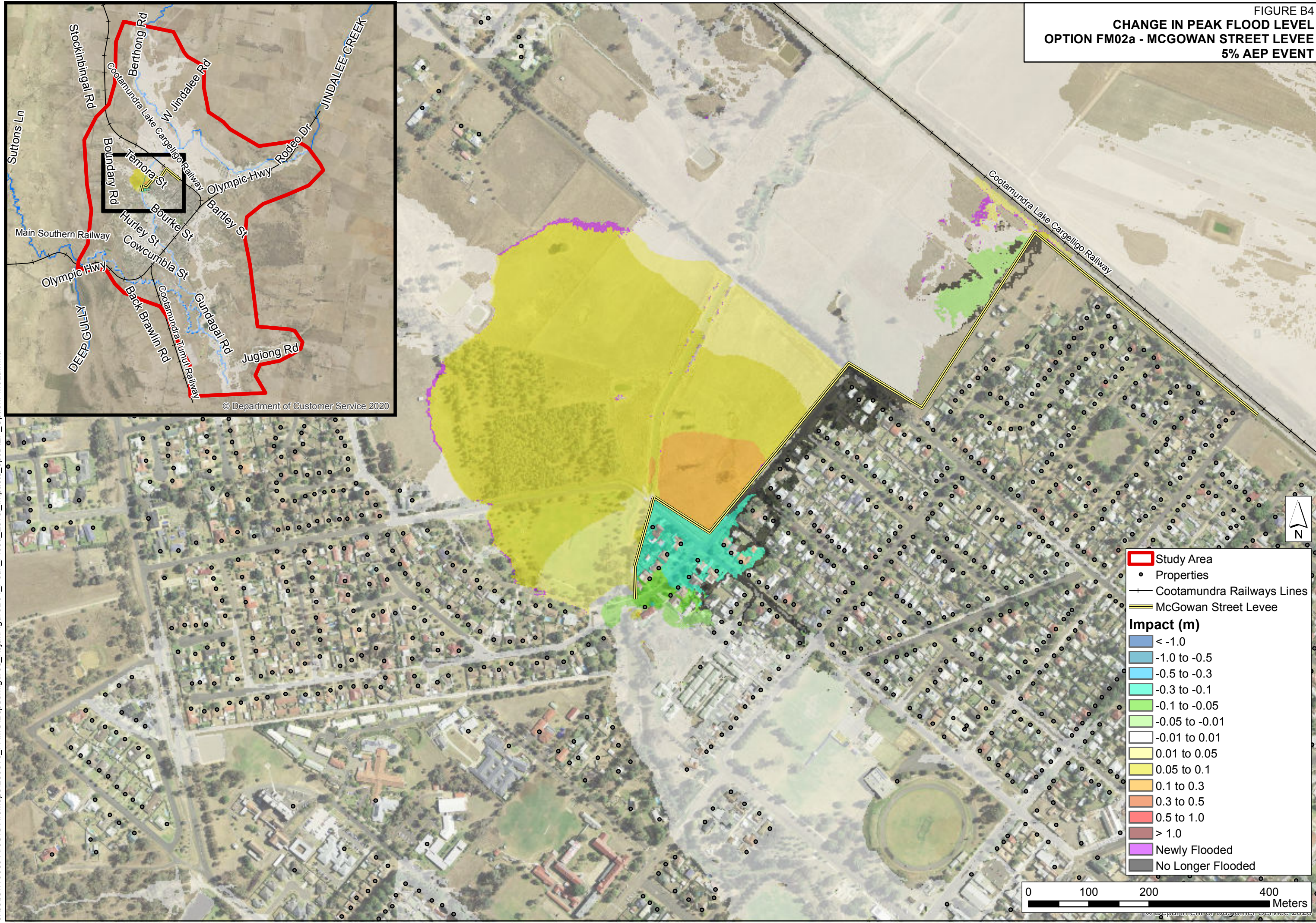


FIGURE B4
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02a - MCGOWAN STREET LEVEL
5% AEP EVENT



Study Area

- Properties
- Cootamundra Railways Lines
- McGowan Street Levee

Impact (m)

< -1.0
-1.0 to -0.5
-0.5 to -0.3
-0.3 to -0.1
-0.1 to -0.05
-0.05 to -0.01
-0.01 to 0.01
0.01 to 0.05
0.05 to 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1.0
> 1.0
Newly Flooded
No Longer Flooded

CHANGE IN PEAK FLOOD LEVEL
OPTION FM02a - MCGOWAN STREET LEVEL
1% AEP EVENT

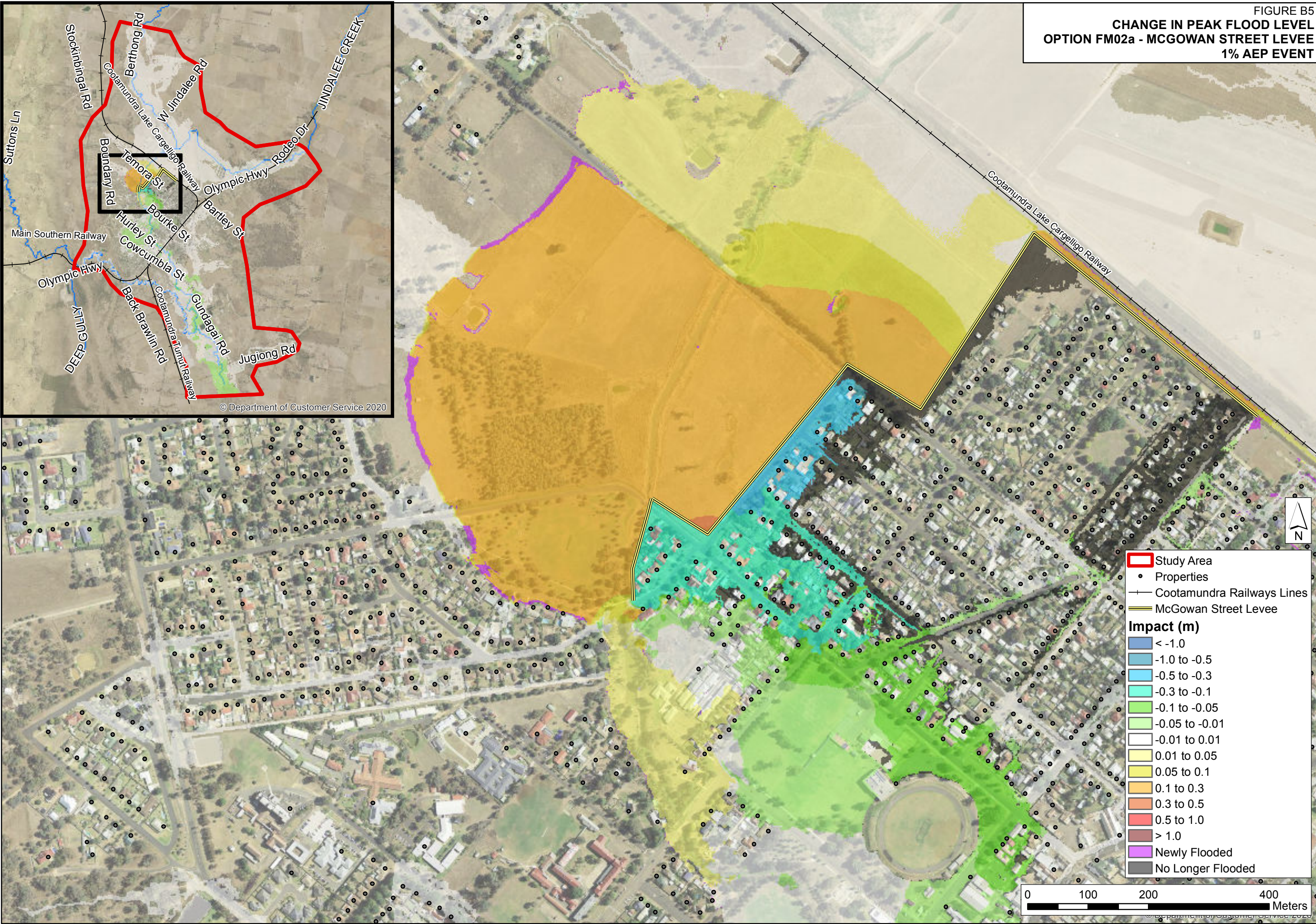
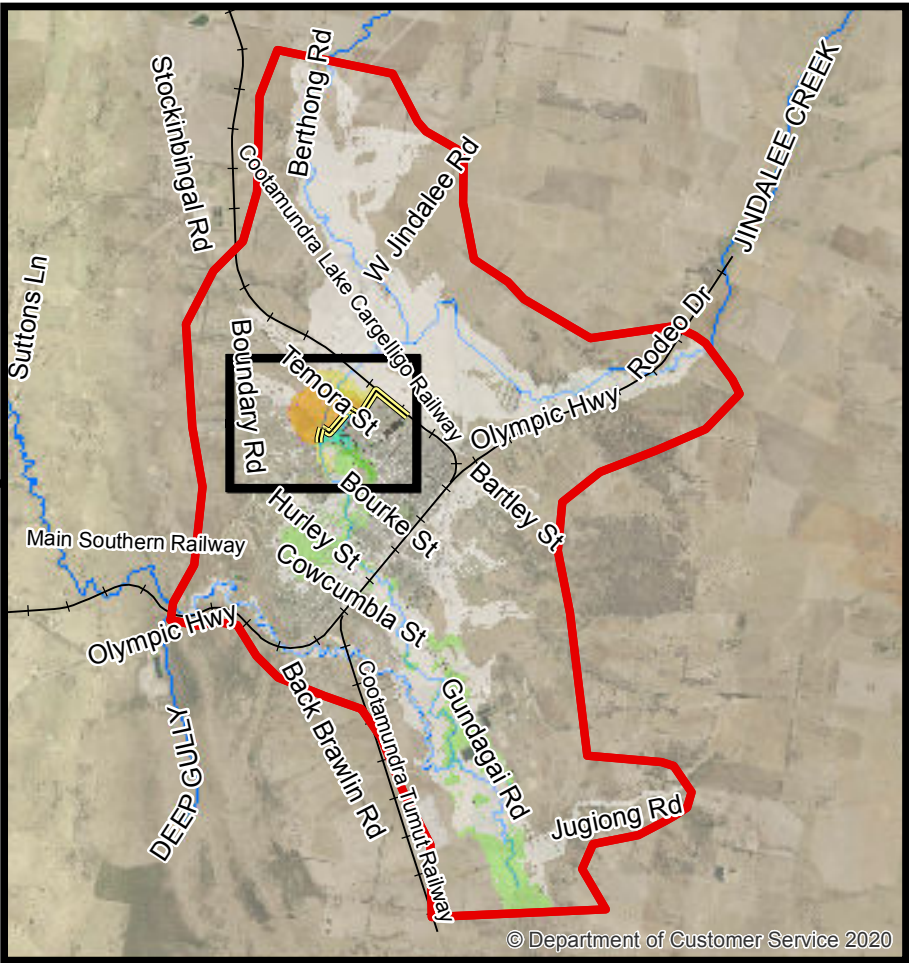
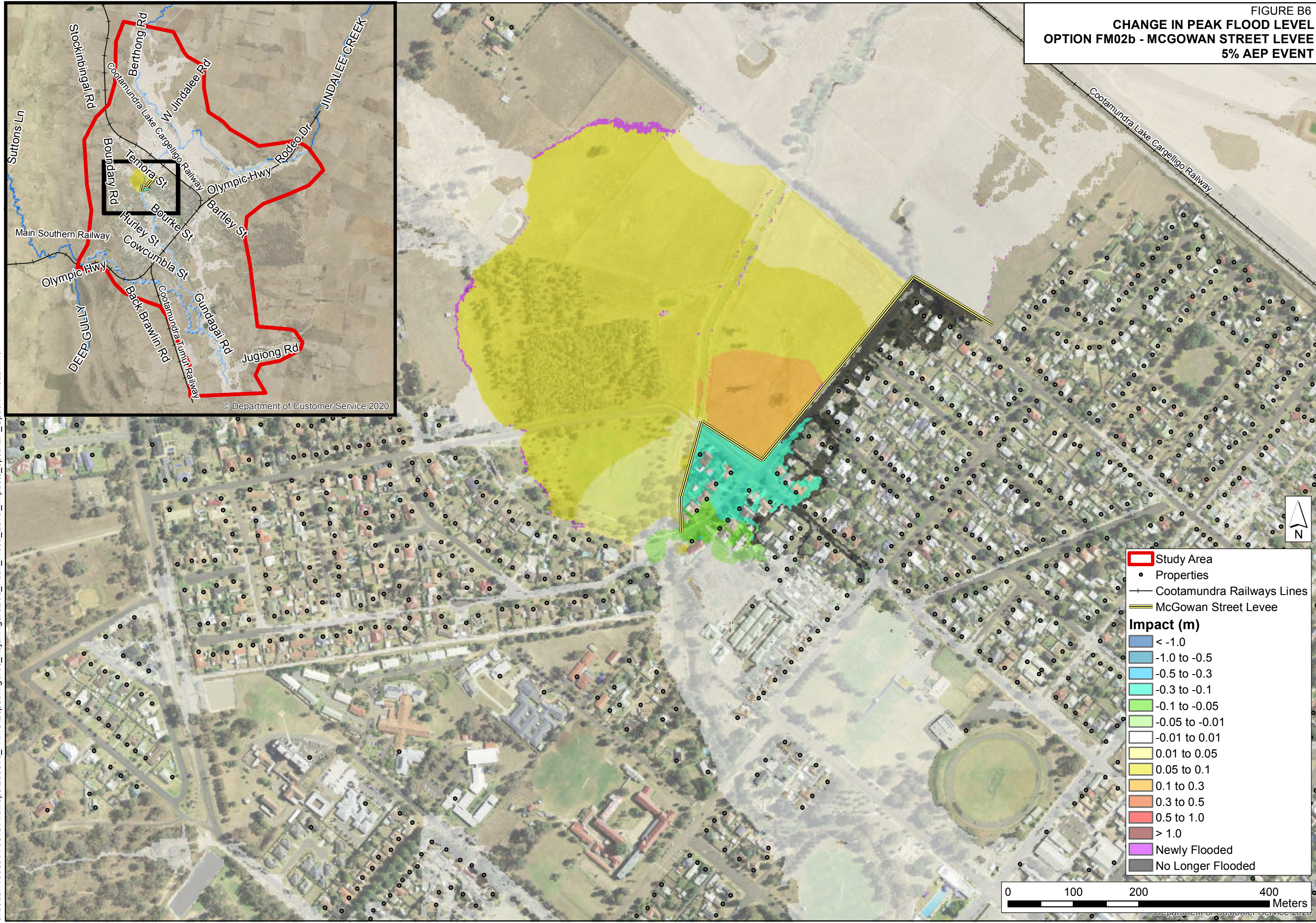


FIGURE B6
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02b - MCGOWAN STREET LEVEL
5% AEP EVENT

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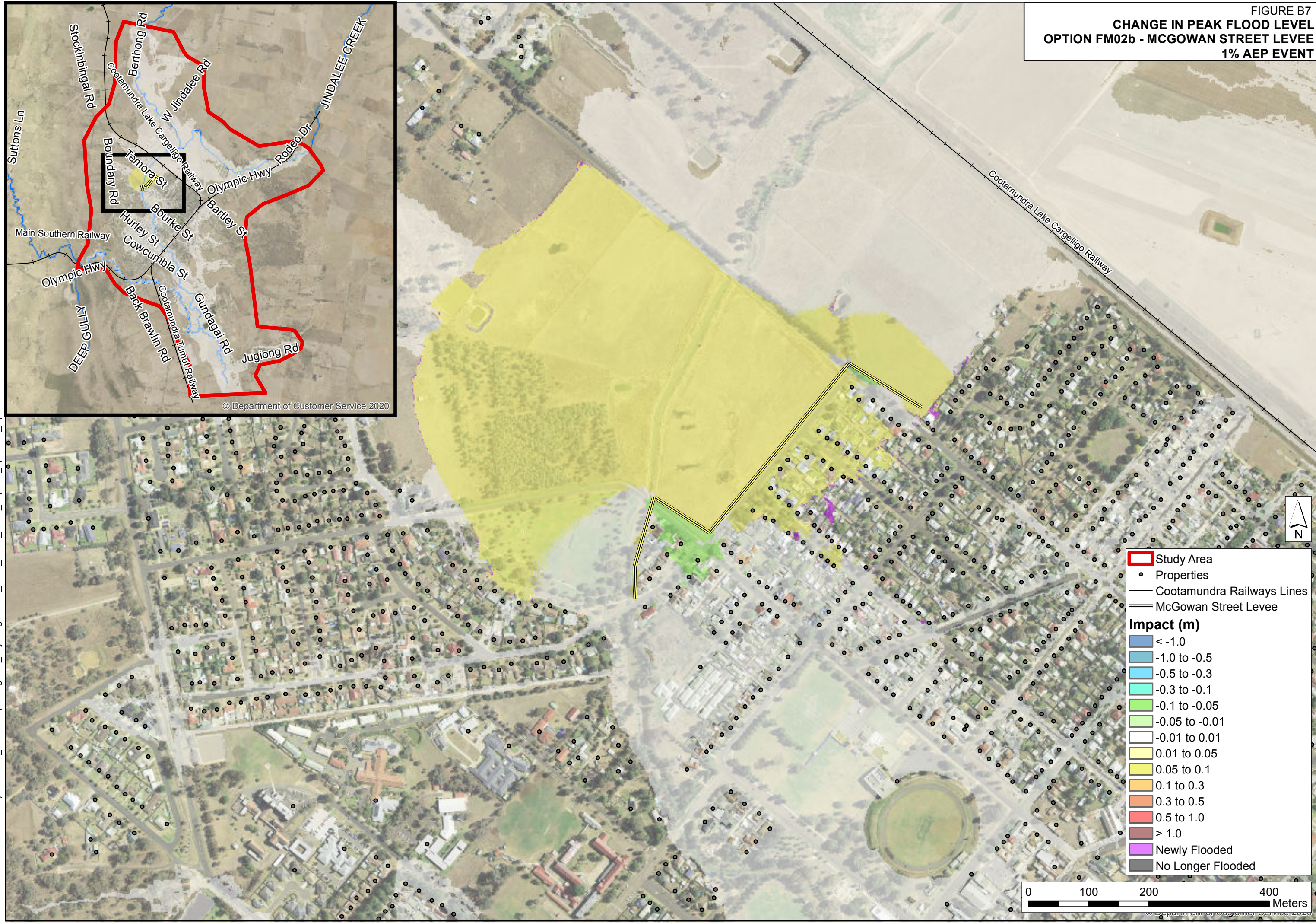


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FIGURE B7
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02b - MCGOWAN STREET LEVEL
1% AEP EVENT

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Study Area

- Properties
- Cootamundra Railways Lines
- McGowan Street Levee

Impact (m)

- < -1.0
- 1.0 to -0.5
- 0.5 to -0.3
- 0.3 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0
- Newly Flooded
- No Longer Flooded

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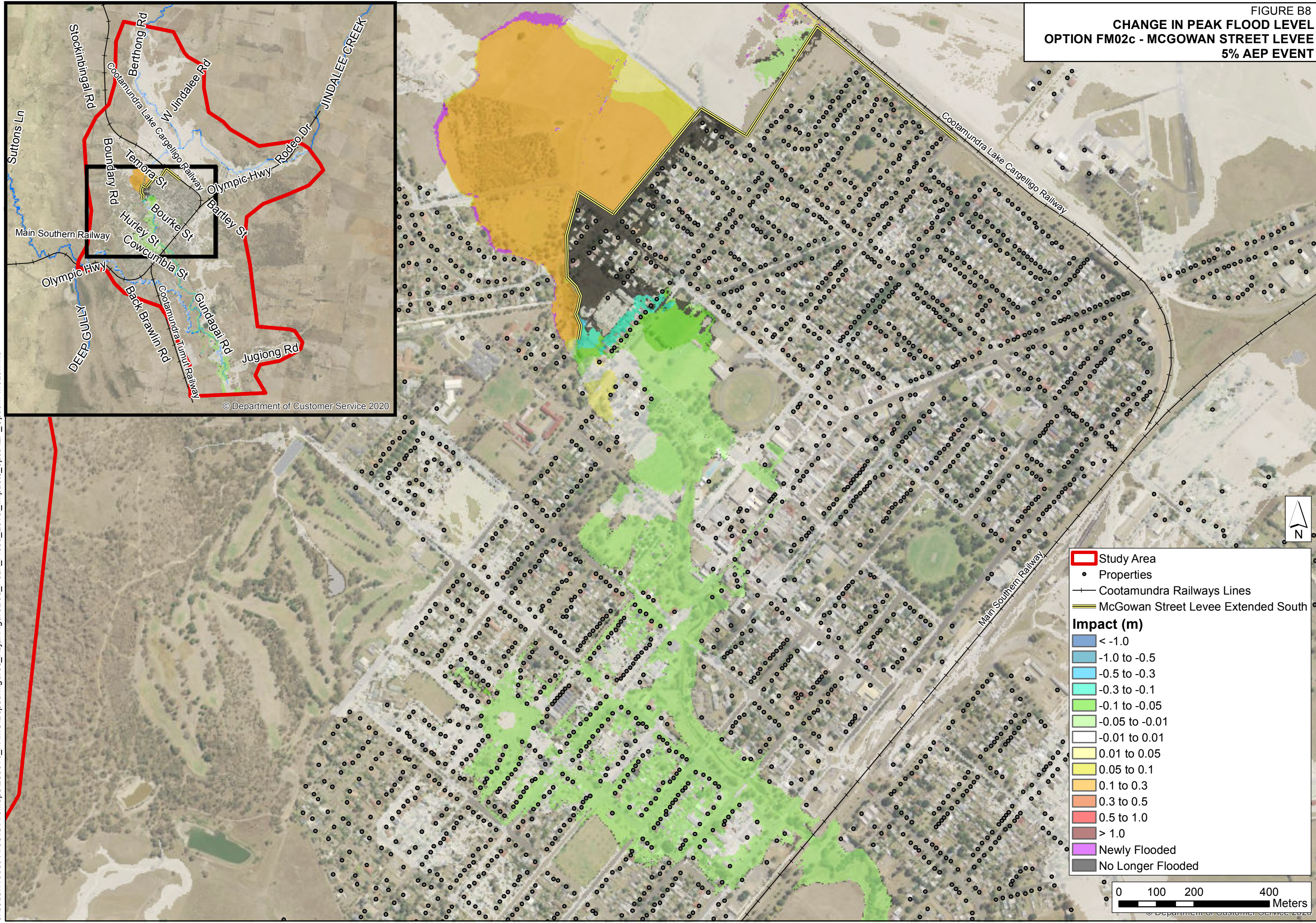


FIGURE B8
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02c - MCGOWAN STREET LEVEE
5% AEP EVENT

FIGURE B9
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02c - MCGOWAN STREET LEVEL
1% AEP EVENT

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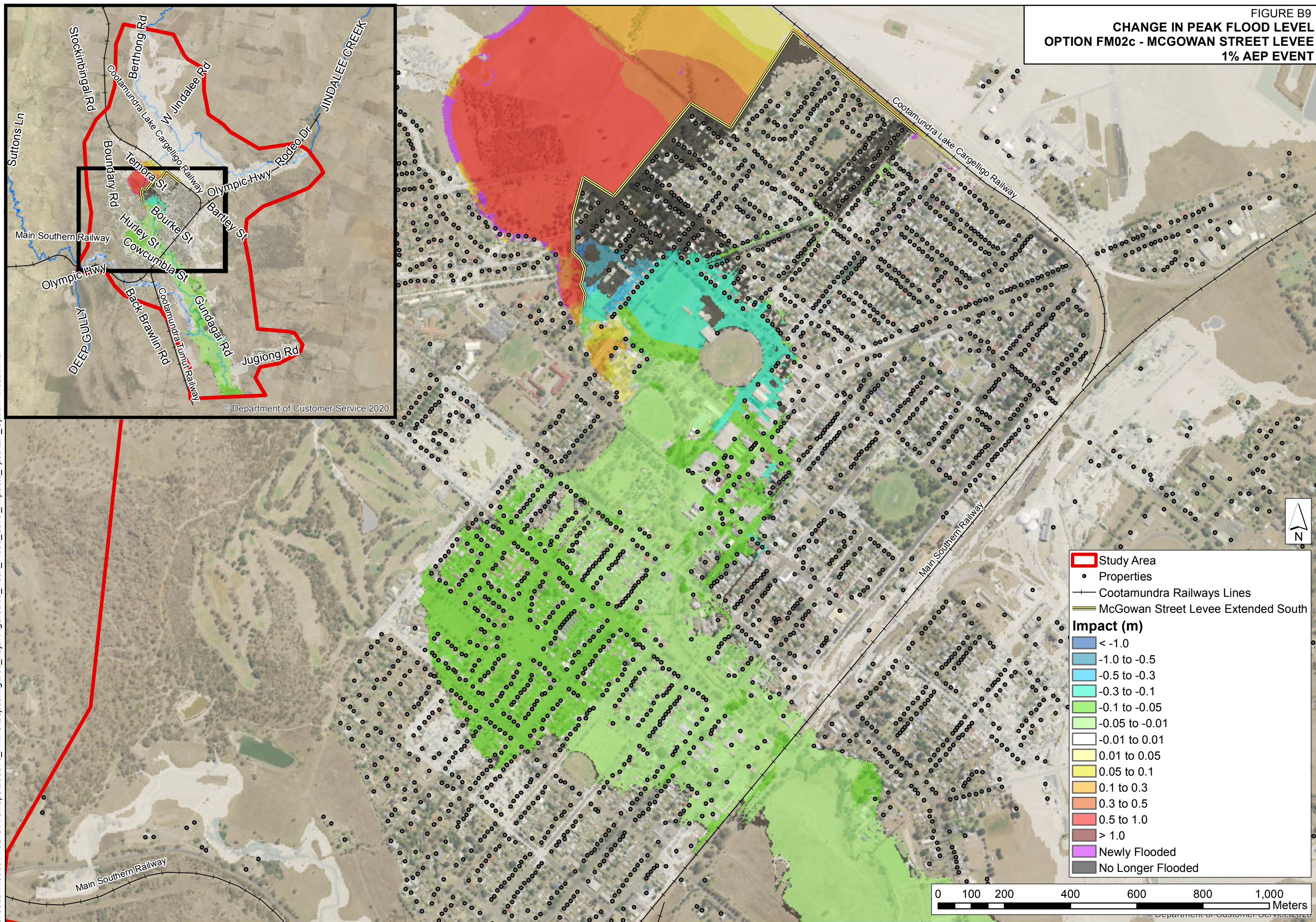
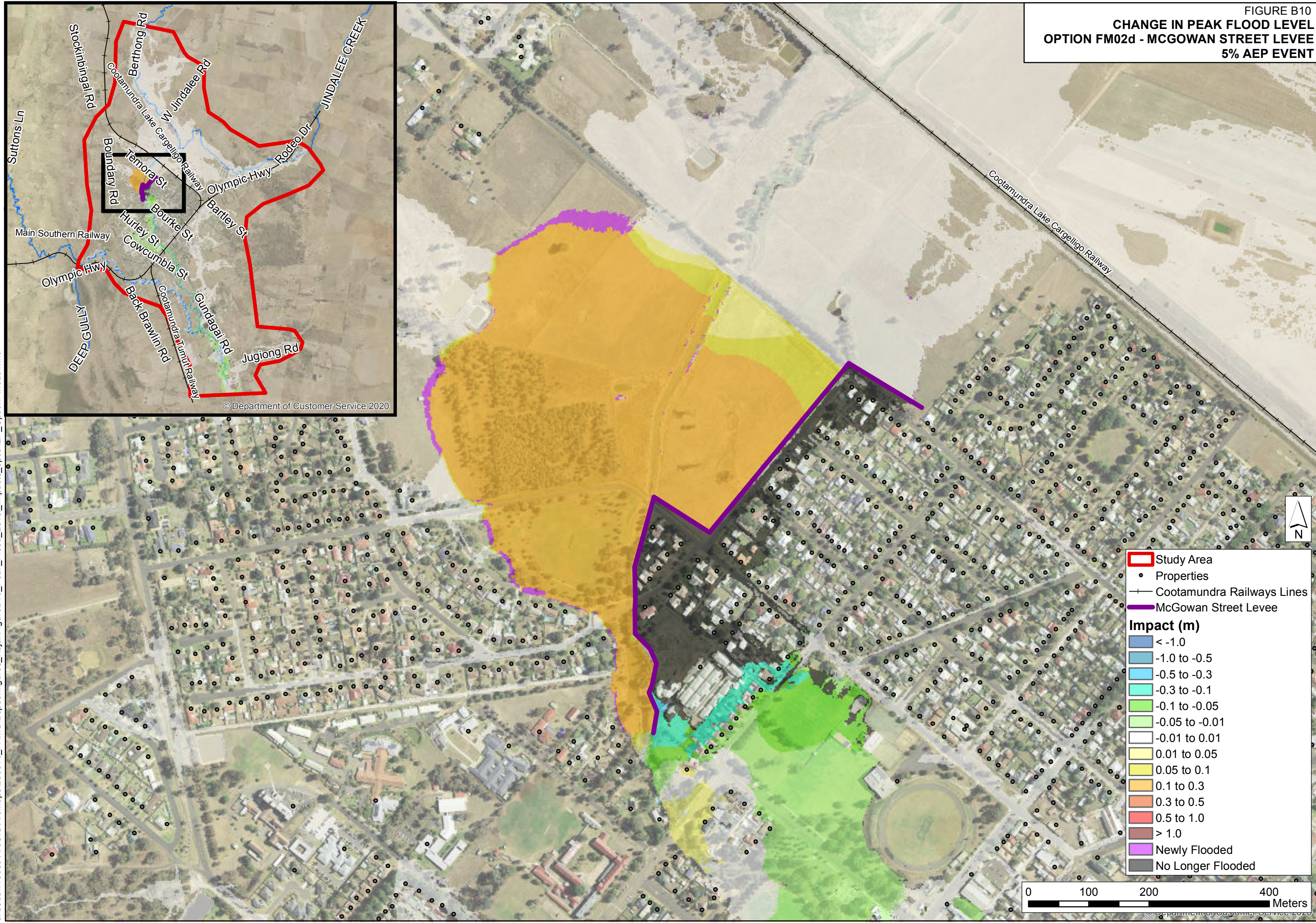


FIGURE B10
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02d - MCGOWAN STREET LEVEL
5% AEP EVENT

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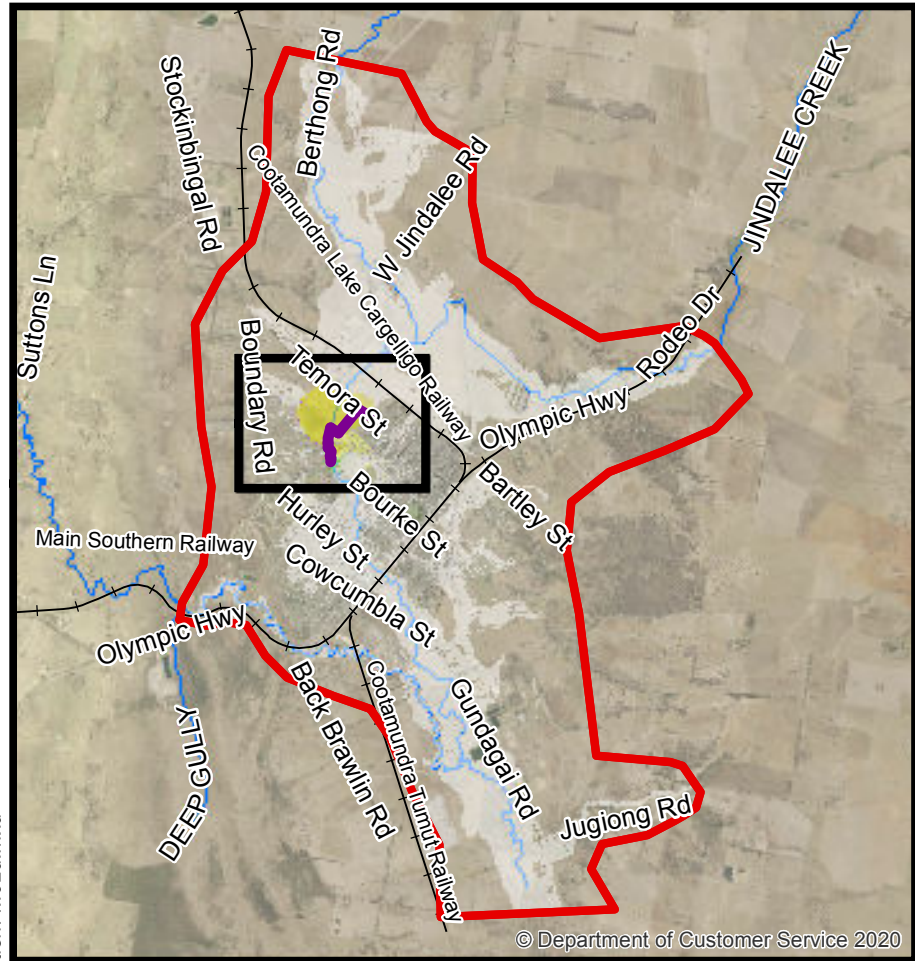


FIGURE B11
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02d - MCGOWAN STREET LEVEE
1% AEP EVENT

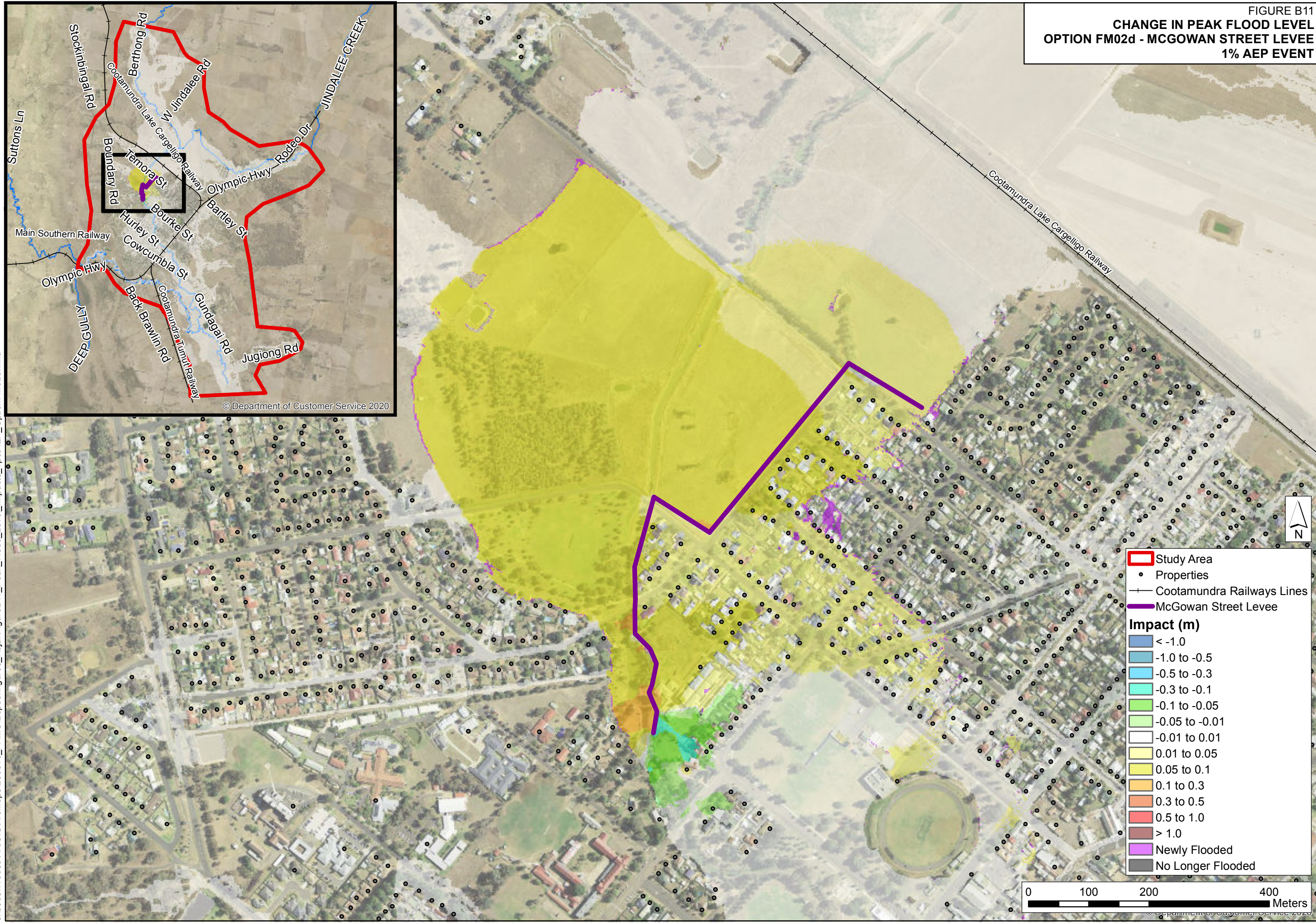


FIGURE B12
CHANGE IN PEAK FLOOD LEVEL
OPTION FM01 AND FM02A
5% AEP EVENT

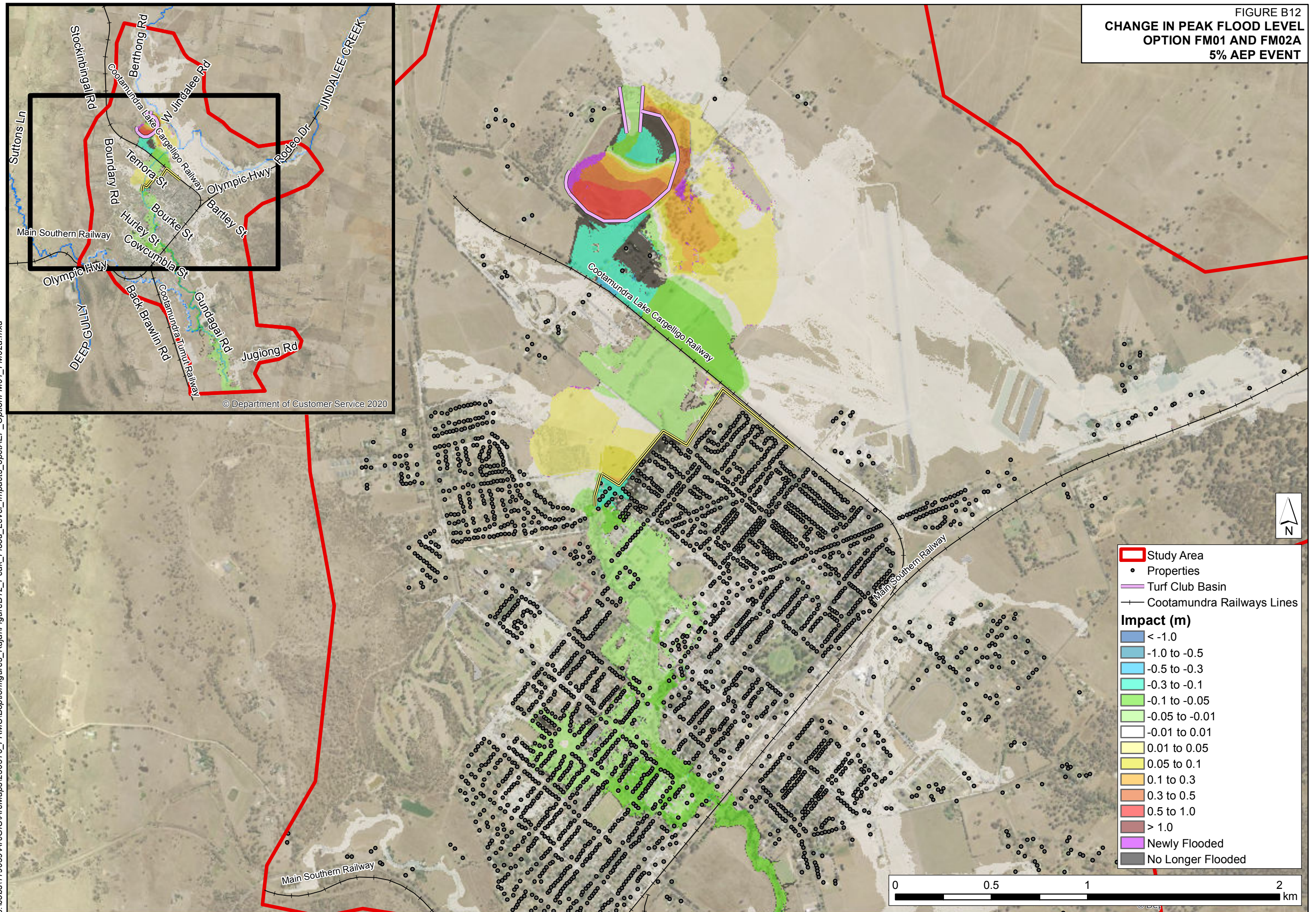


FIGURE B13
CHANGE IN PEAK FLOOD LEVEL
OPTION FM01 AND FM02A
1% AEP EVENT

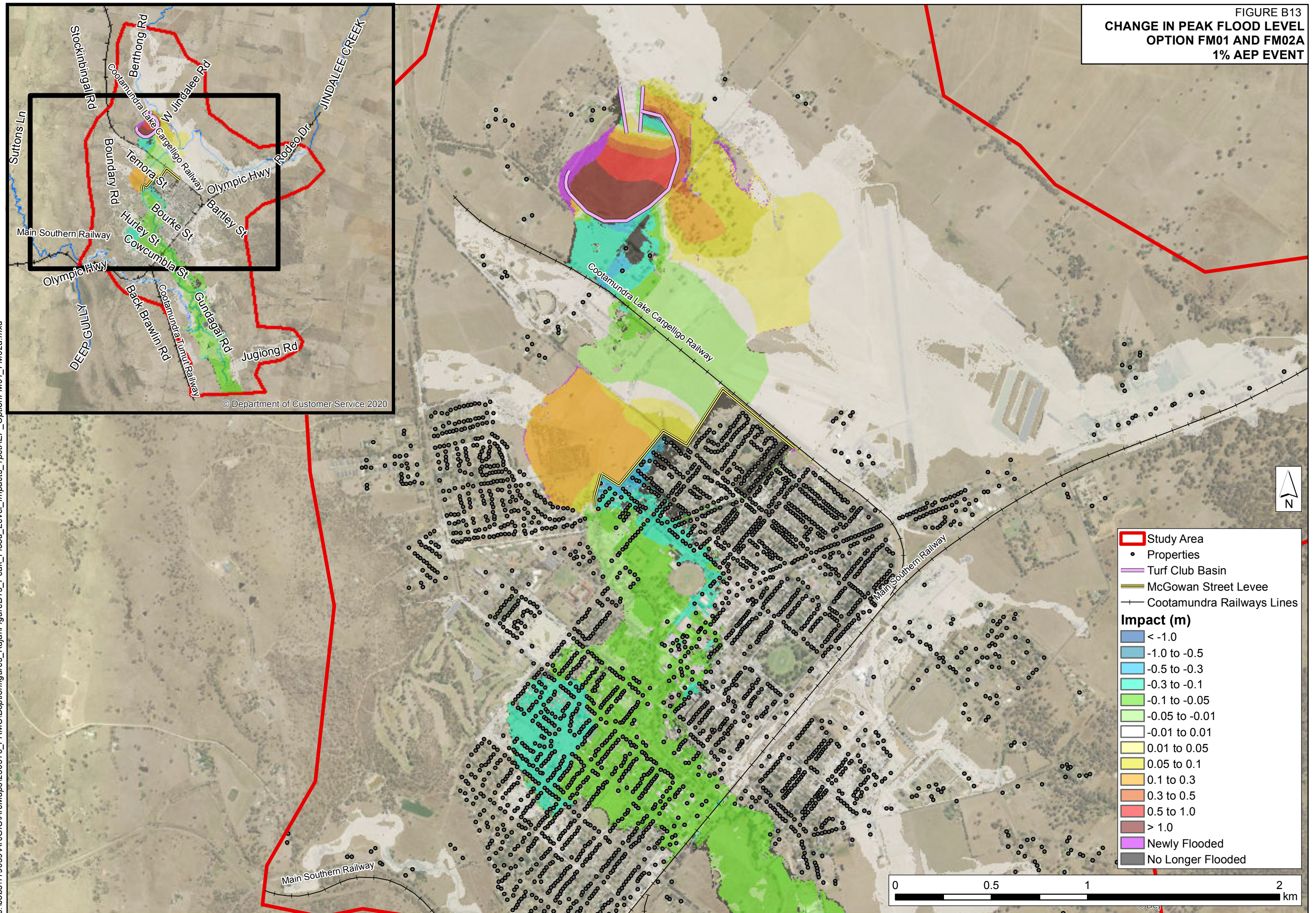
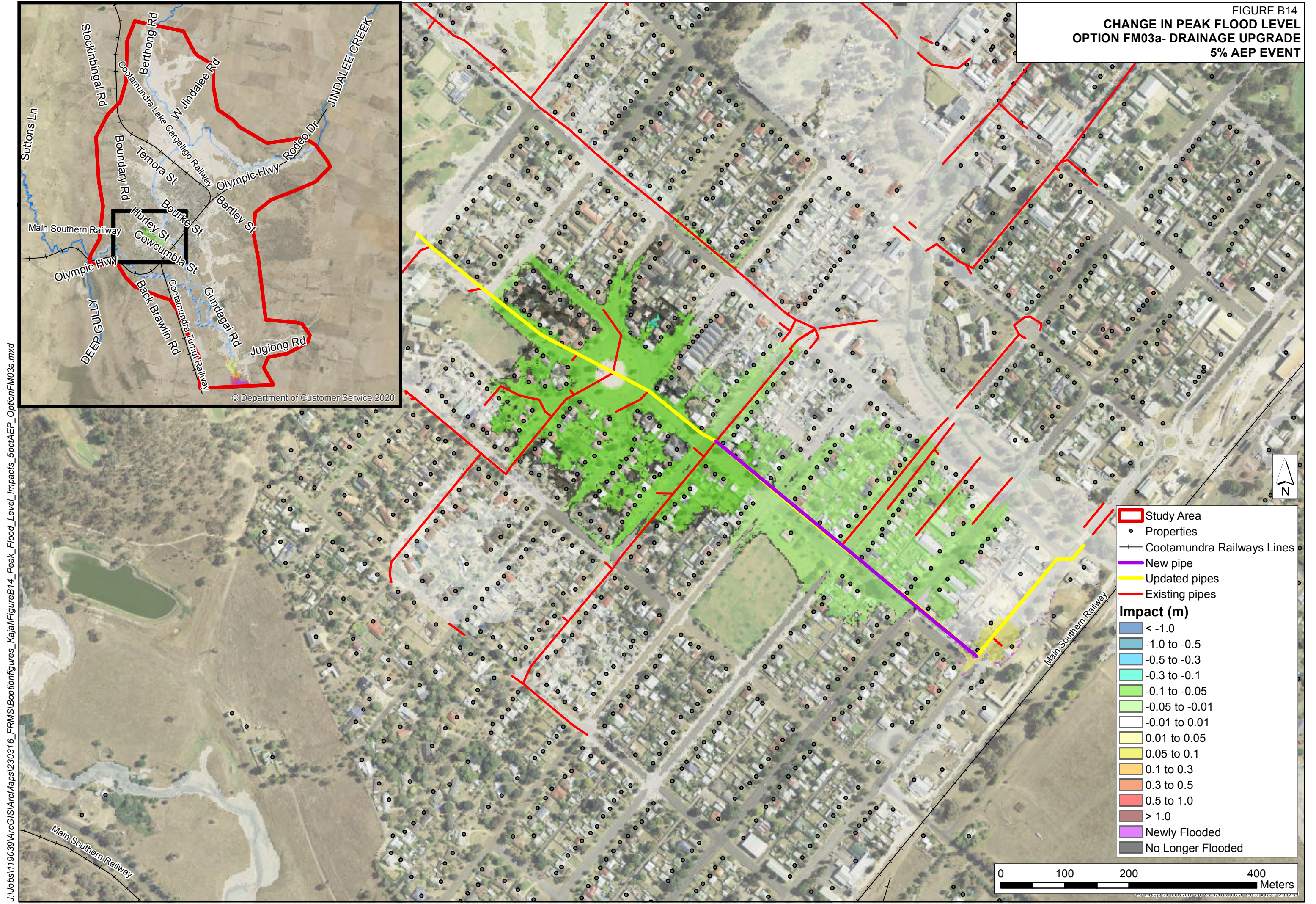


FIGURE B14
CHANGE IN PEAK FLOOD LEVEL
OPTION FM03a- DRAINAGE UPGRADE
5% AEP EVENT

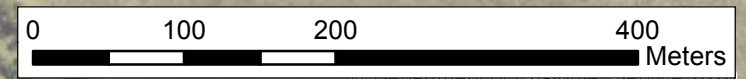


Study Area

- Properties
- Cootamundra Railways Lines
- New pipe
- Updated pipes
- Existing pipes

Impact (m)

< -1.0
-1.0 to -0.5
-0.5 to -0.3
-0.3 to -0.1
-0.1 to -0.05
-0.05 to -0.01
-0.01 to 0.01
0.01 to 0.05
0.05 to 0.1
0.1 to 0.3
0.3 to 0.5
0.5 to 1.0
> 1.0
Newly Flooded
No Longer Flooded



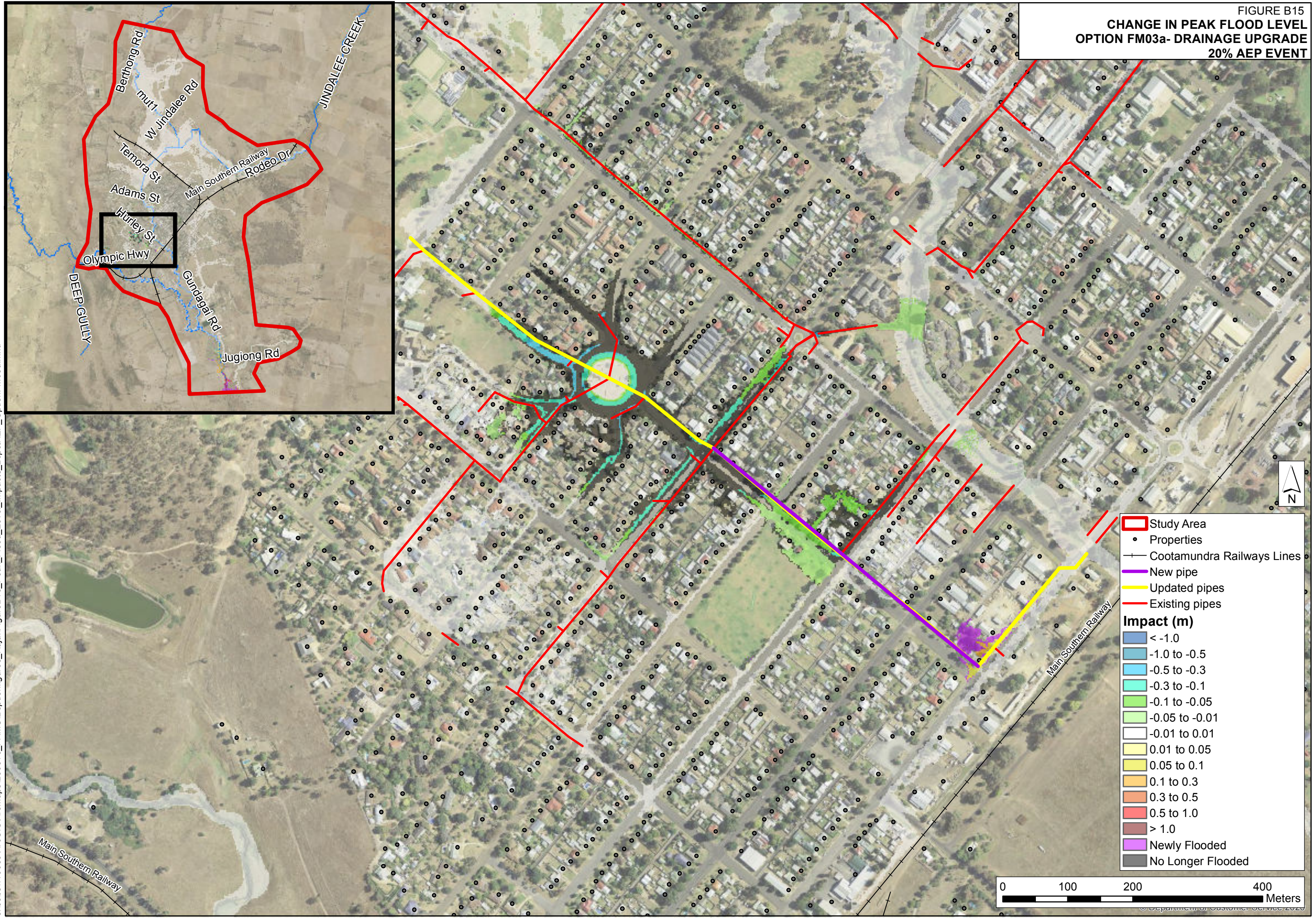
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FIGURE B15
CHANGE IN PEAK FLOOD LEVEL
OPTION FM03a- DRAINAGE UPGRADE
20% AEP EVENT

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Study Area

- Properties
- Cootamundra Railways Lines
- New pipe
- Updated pipes
- Existing pipes

Impact (m)

- < -1.0
- 1.0 to -0.5
- 0.5 to -0.3
- 0.3 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0
- Newly Flooded
- No Longer Flooded

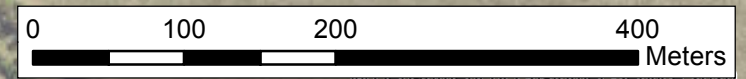


FIGURE B16
CHANGE IN PEAK FLOOD LEVEL
OPTION FM03b- DRAINAGE UPGRADE
5% AEP EVENT

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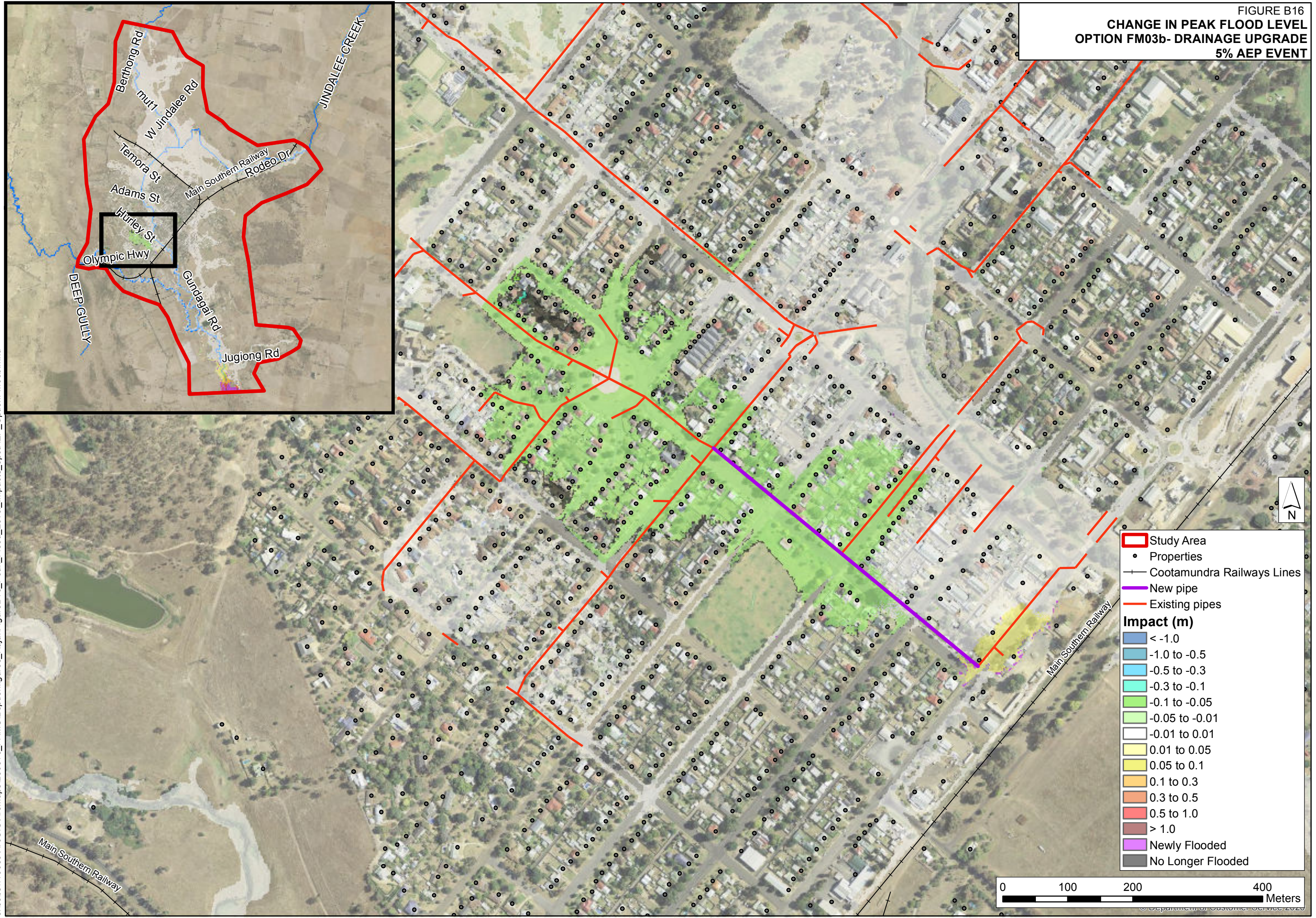
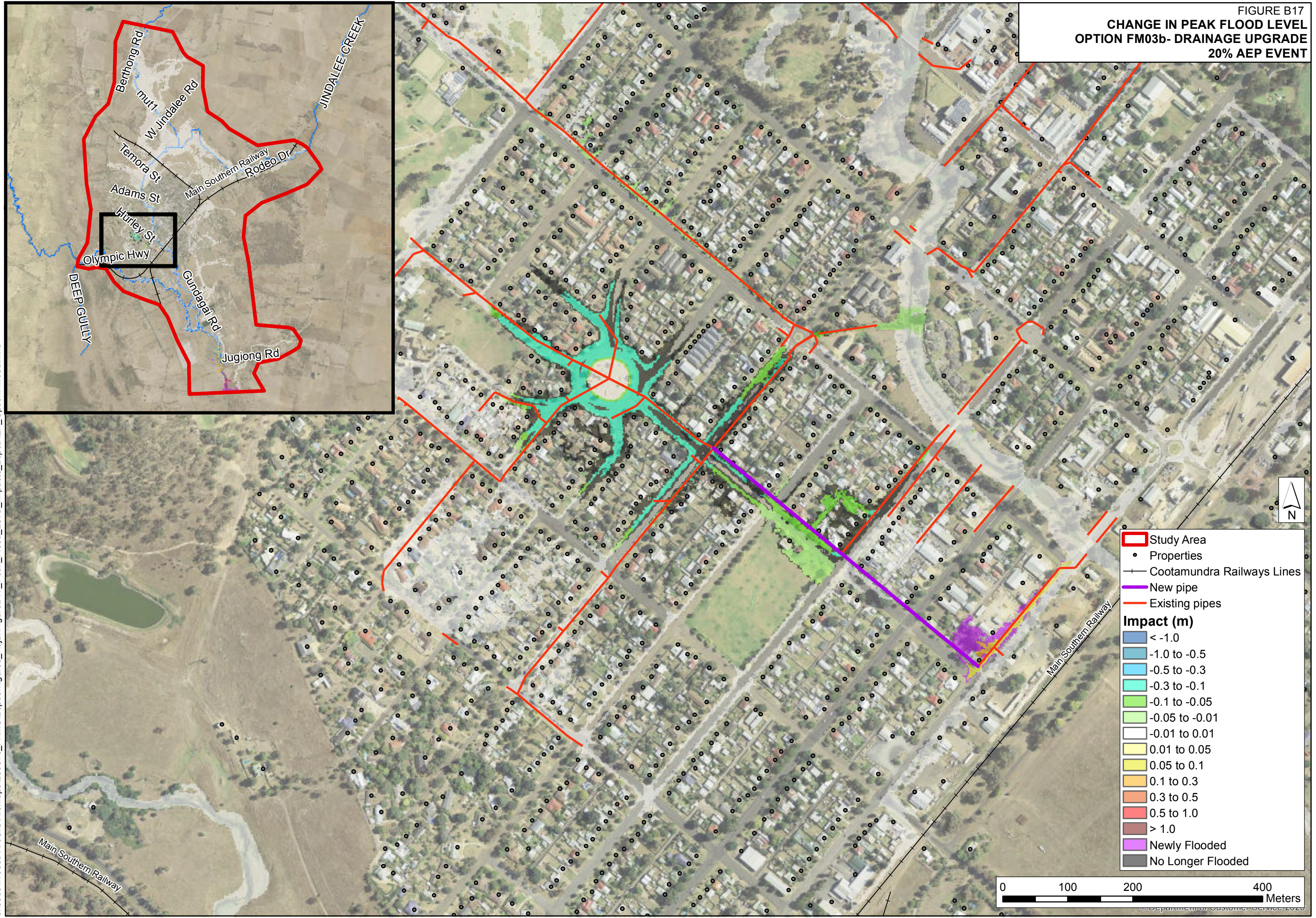


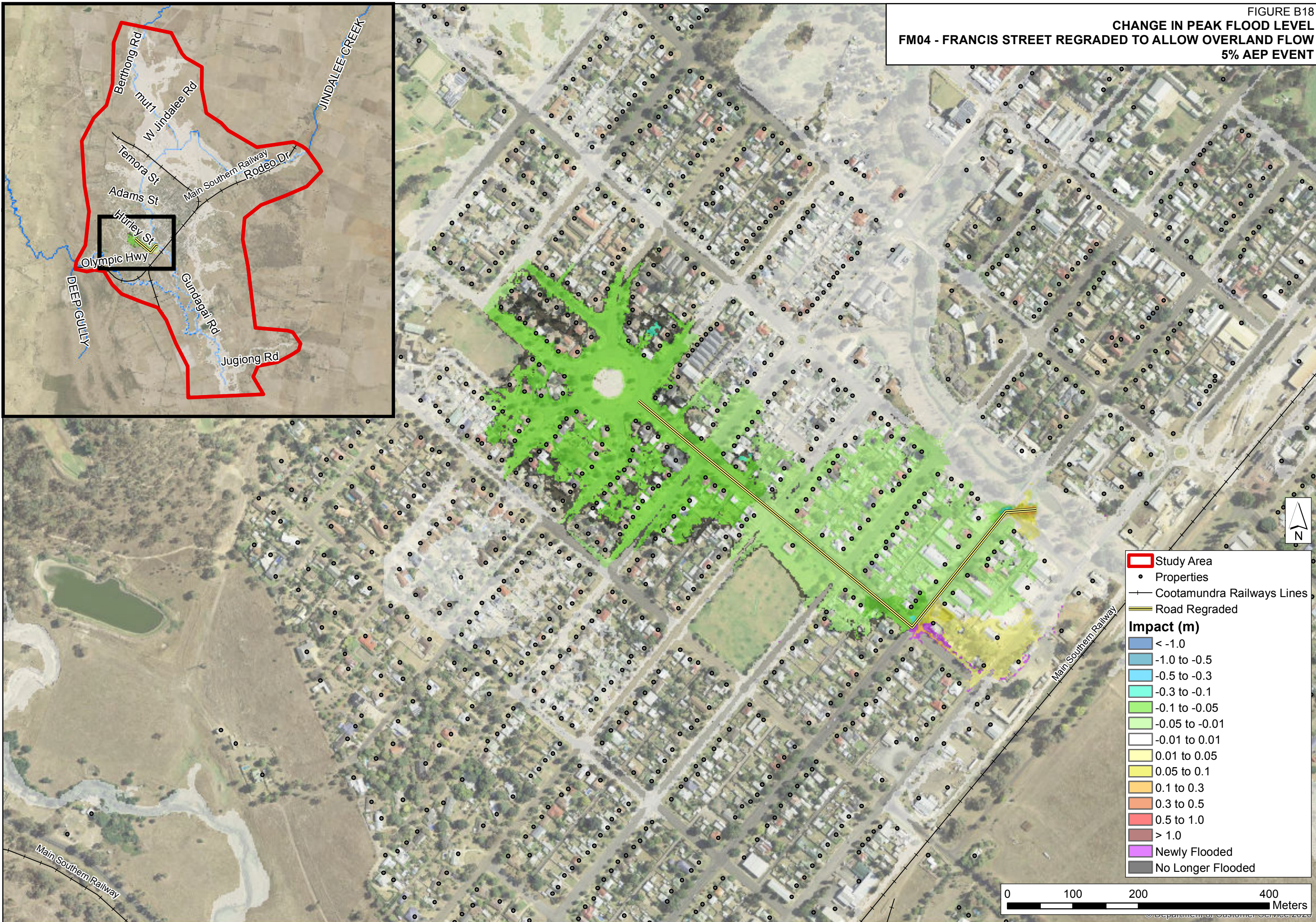
FIGURE B17
CHANGE IN PEAK FLOOD LEVEL
OPTION FM03b- DRAINAGE UPGRADE
20% AEP EVENT

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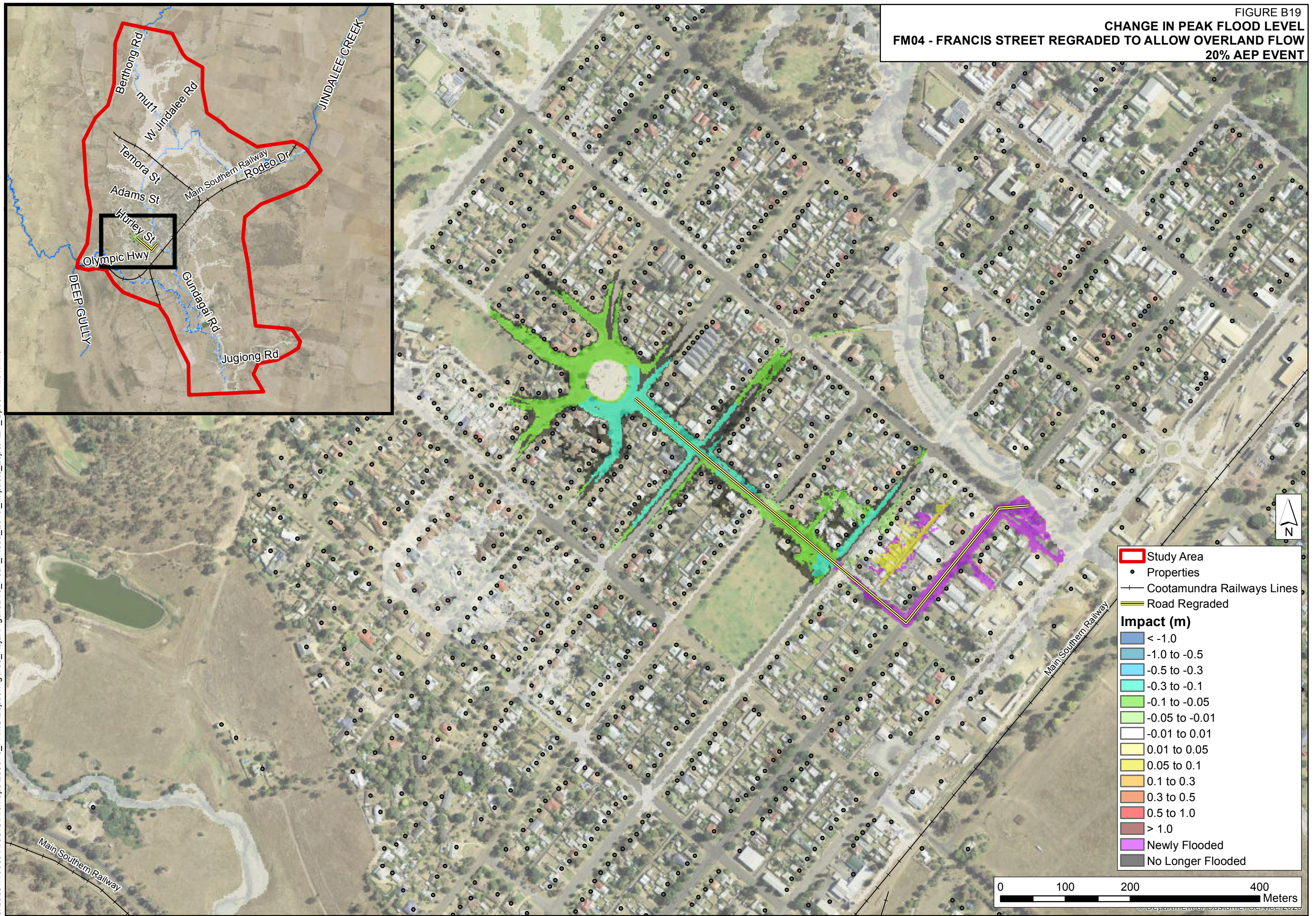
CHANGE IN PEAK FLOOD LEVEL
FM04 - FRANCIS STREET REGRADED TO ALLOW OVERLAND FLOW
5% AEP EVENT

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CHANGE IN PEAK FLOOD LEVEL
FM04 - FRANCIS STREET REGRADED TO ALLOW OVERLAND FLOW
20% AEP EVENT

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Study Area

- Properties
- Cootamundra Railways Lines
- Road Regraded

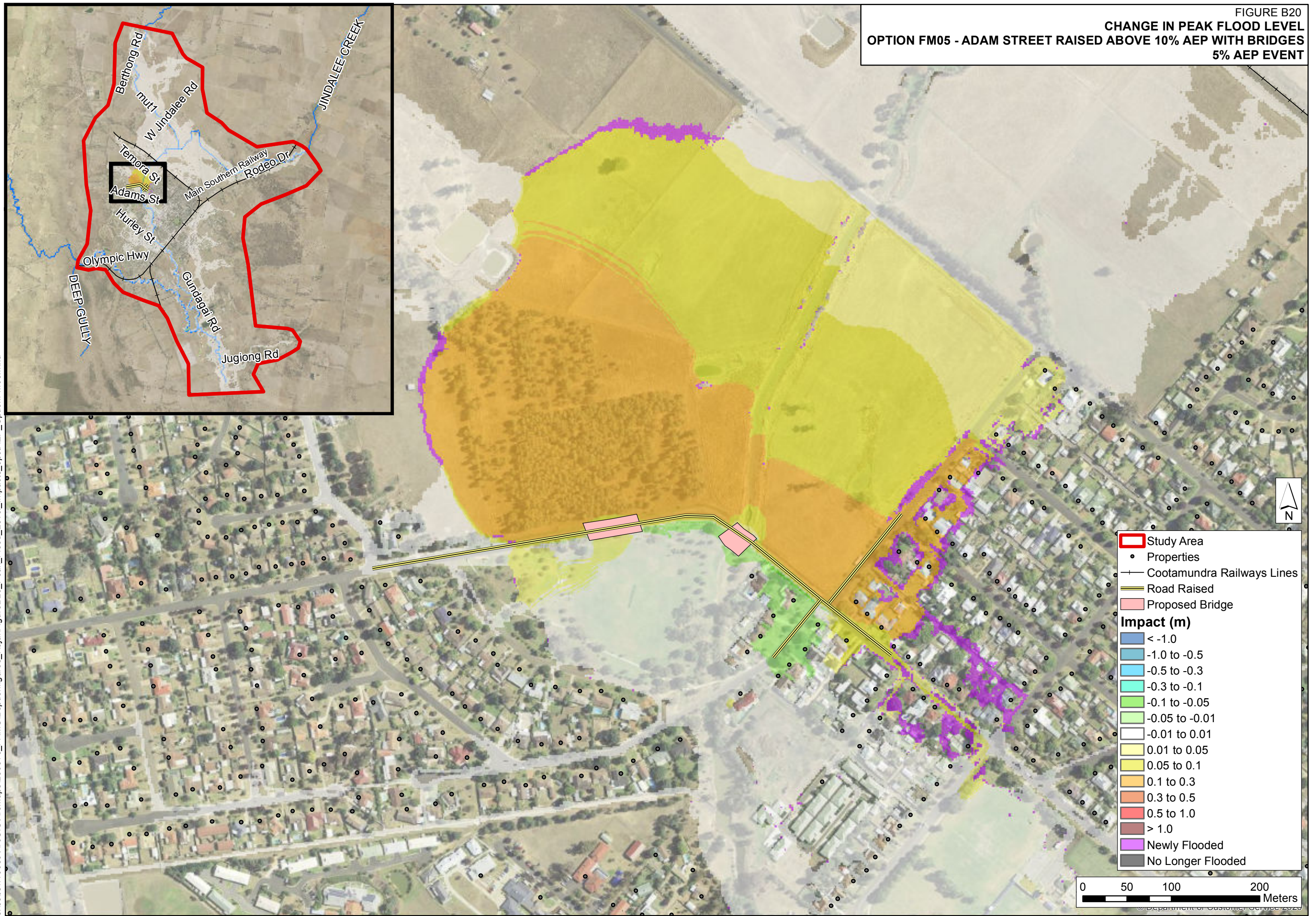
Impact (m)

- < -1.0
- 1.0 to -0.5
- 0.5 to -0.3
- 0.3 to -0.1
- 0.1 to -0.05
- 0.05 to -0.01
- 0.01 to 0.01
- 0.01 to 0.05
- 0.05 to 0.1
- 0.1 to 0.3
- 0.3 to 0.5
- 0.5 to 1.0
- > 1.0
- Newly Flooded
- No Longer Flooded

0 100 200 400 Meters

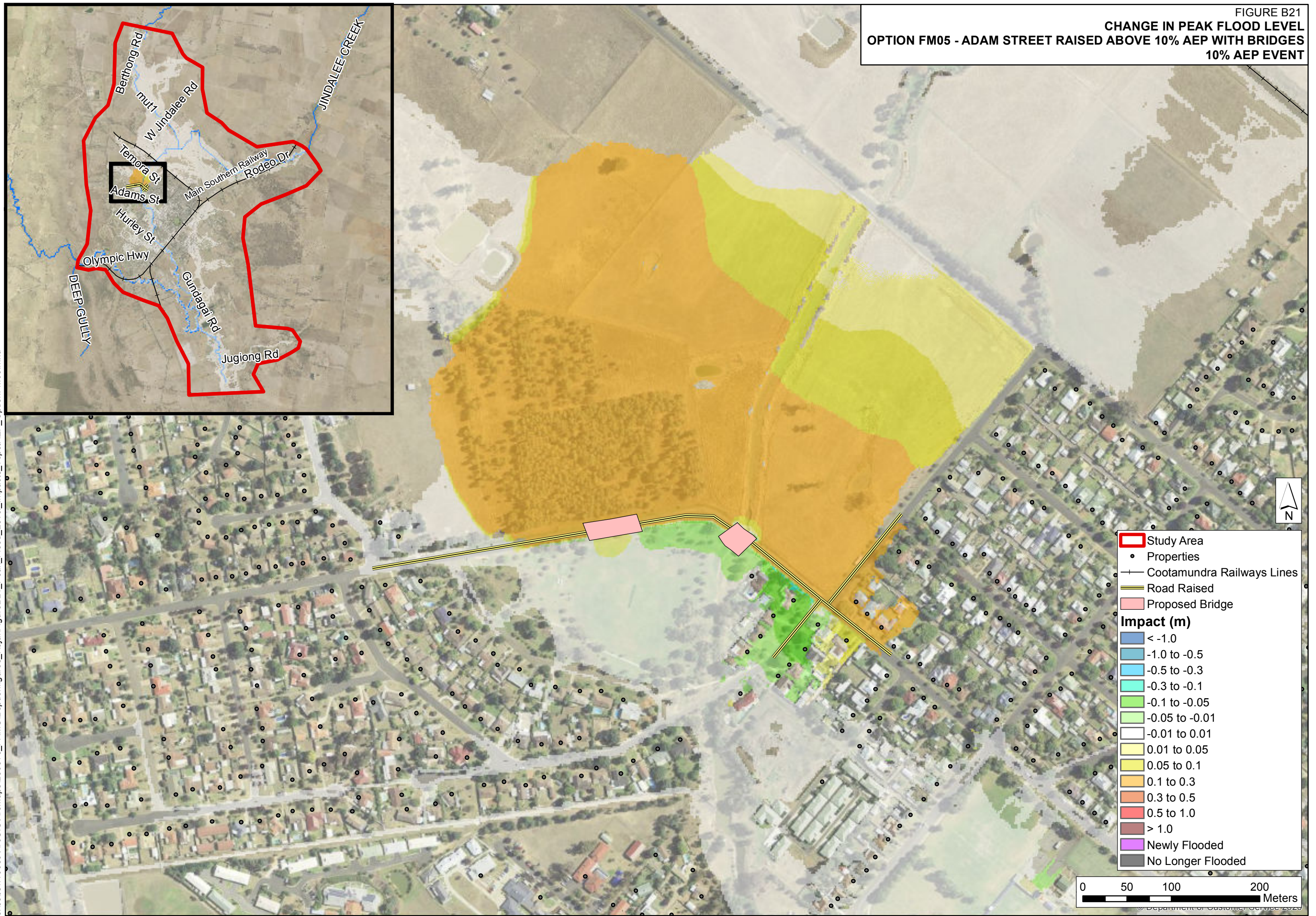
CHANGE IN PEAK FLOOD LEVEL
OPTION FM05 - ADAM STREET RAISED ABOVE 10% AEP WITH BRIDGES
5% AEP EVENT

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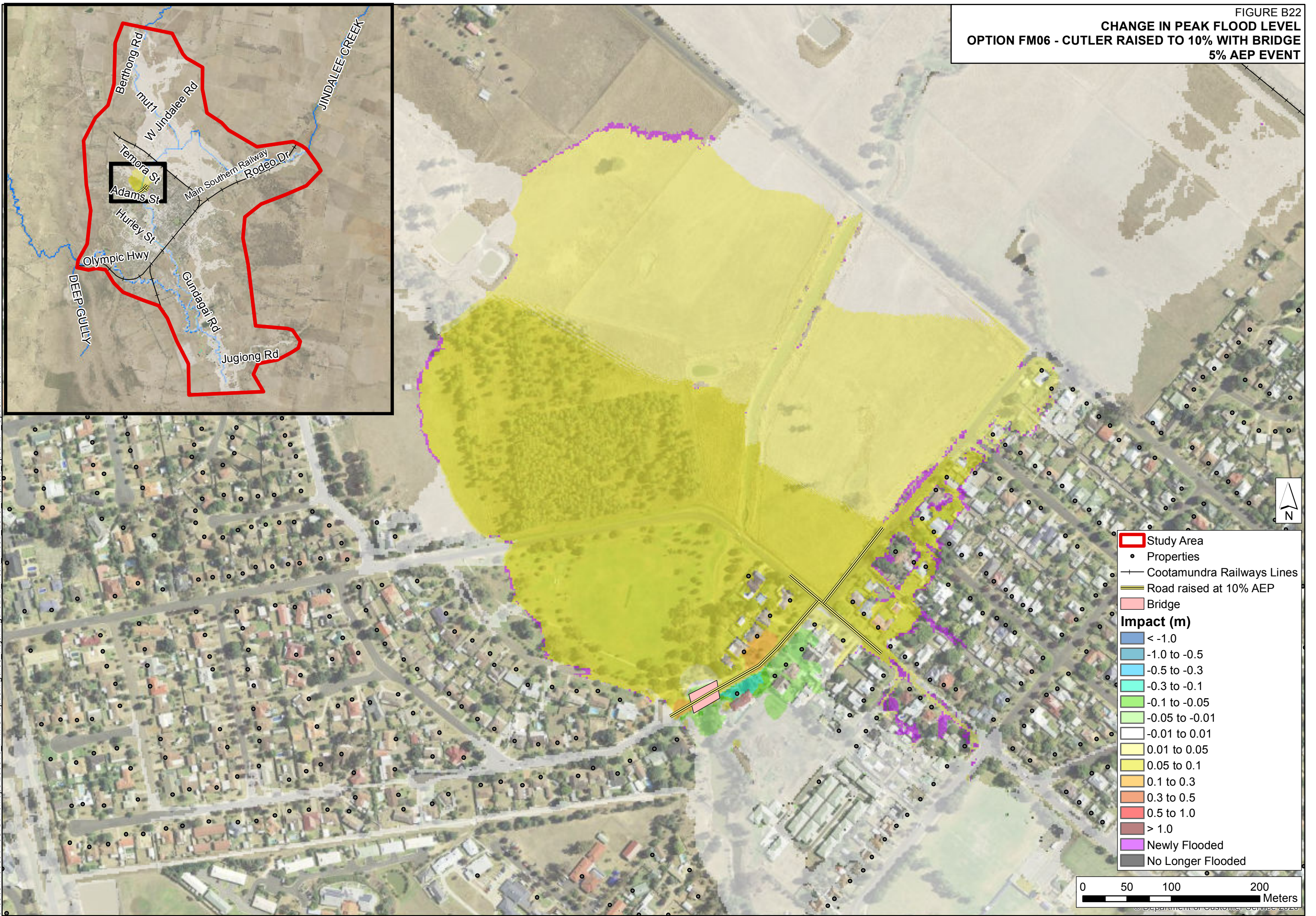
CHANGE IN PEAK FLOOD LEVEL
OPTION FM05 - ADAM STREET RAISED ABOVE 10% AEP WITH BRIDGES
10% AEP EVENT

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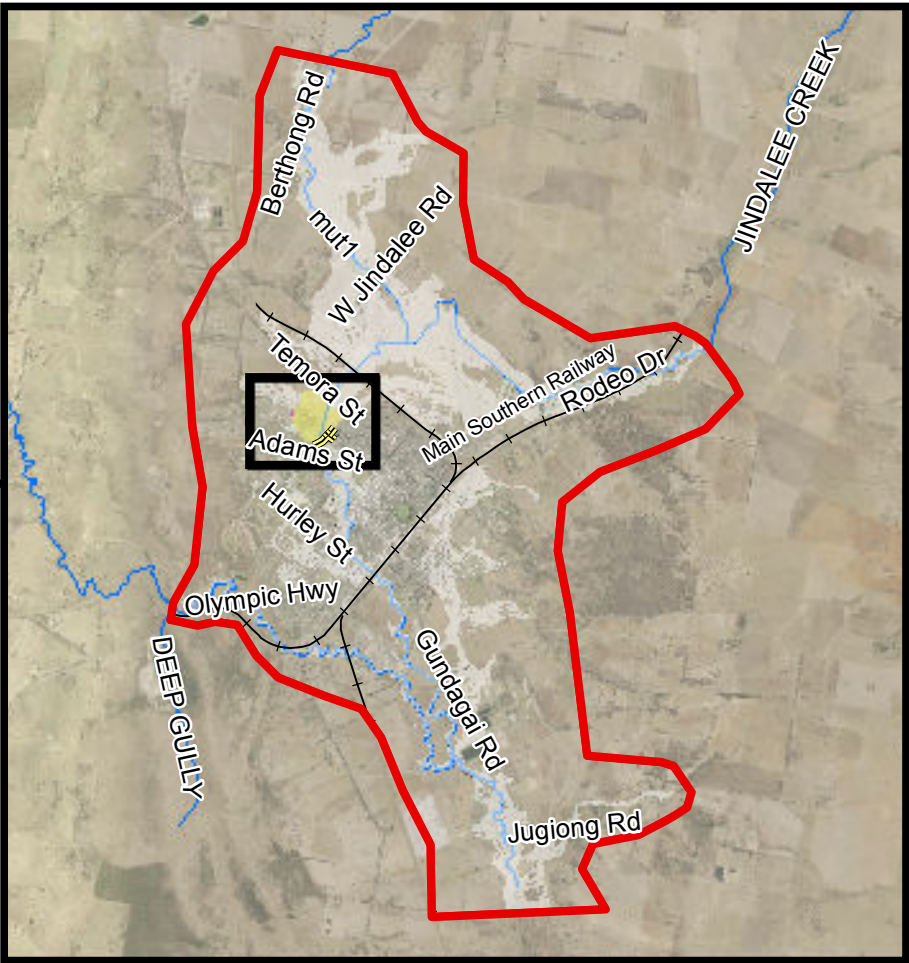


**CHANGE IN PEAK FLOOD LEVEL
OPTION FM06 - CUTLER RAISED TO 10% WITH BRIDGE
5% AEP EVENT**

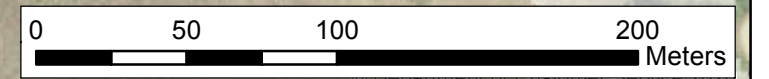
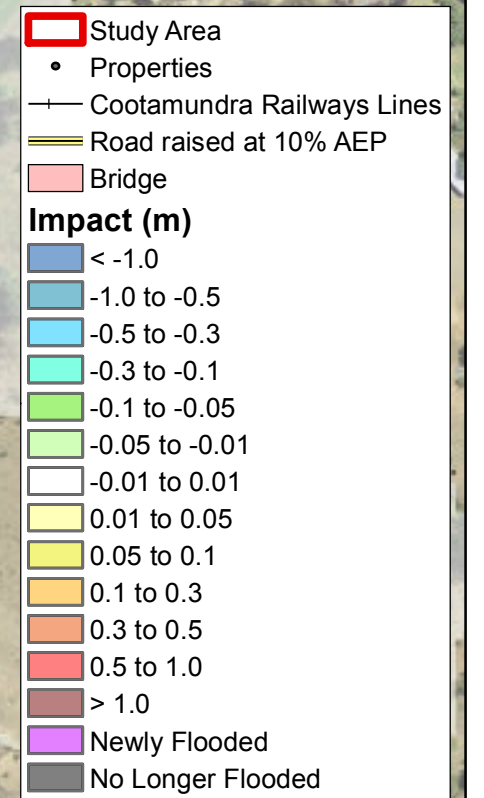
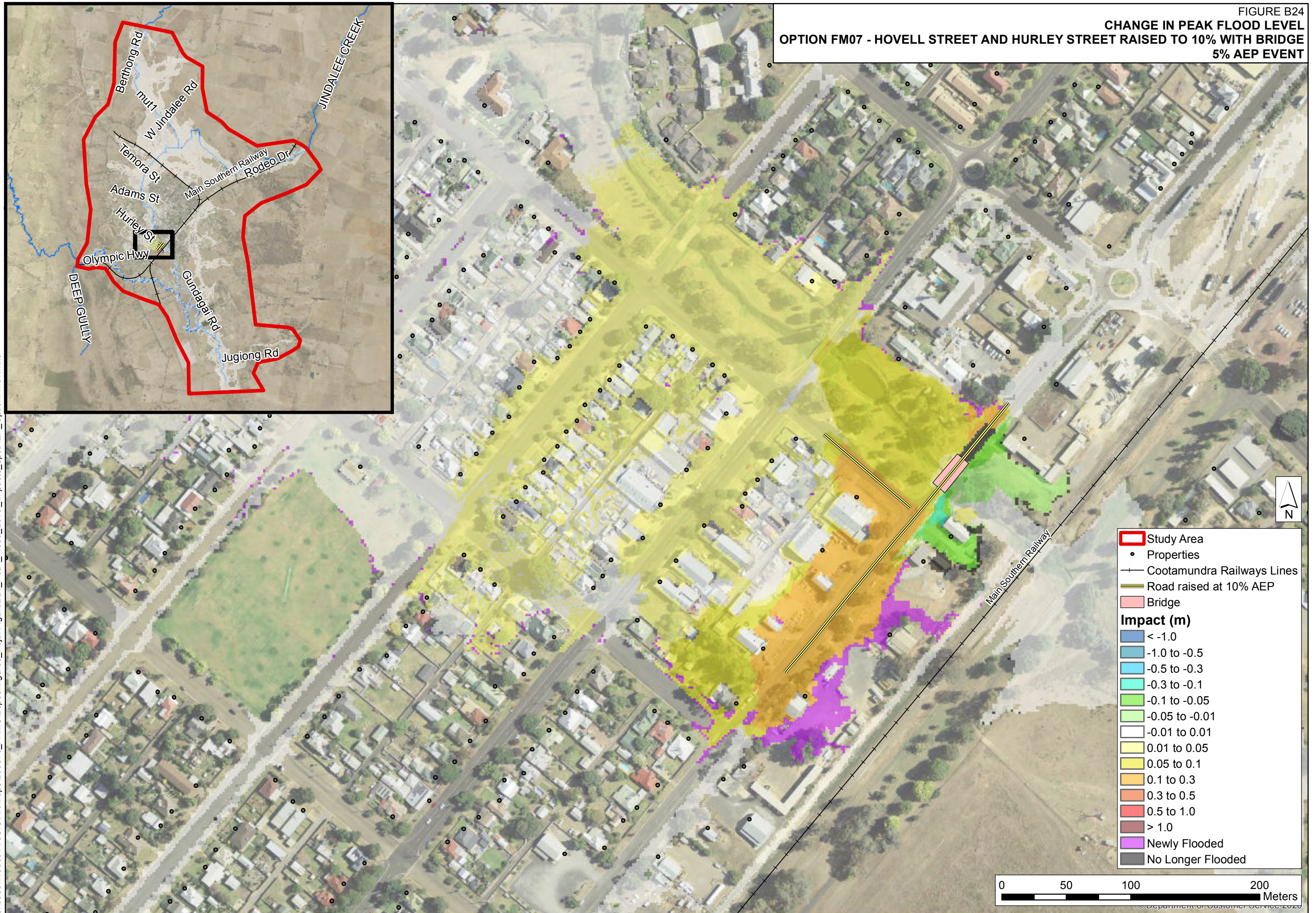
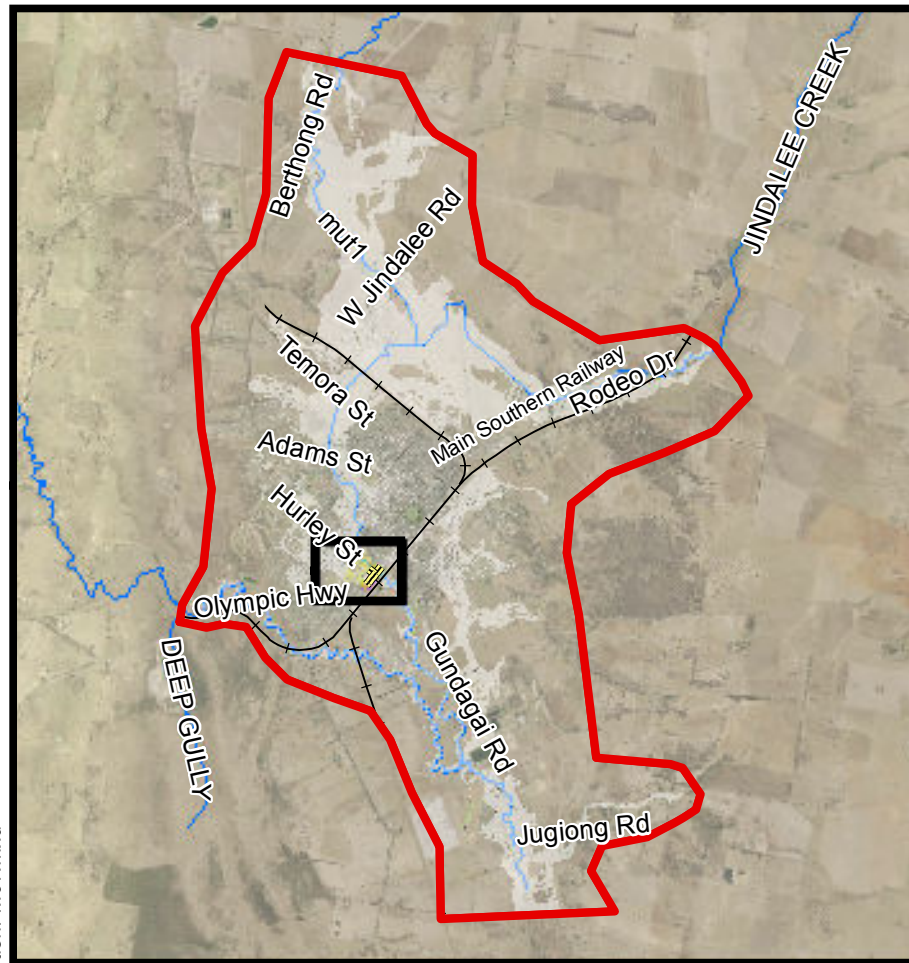
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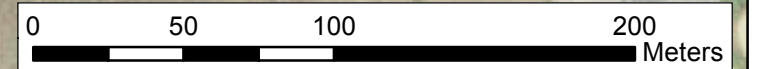
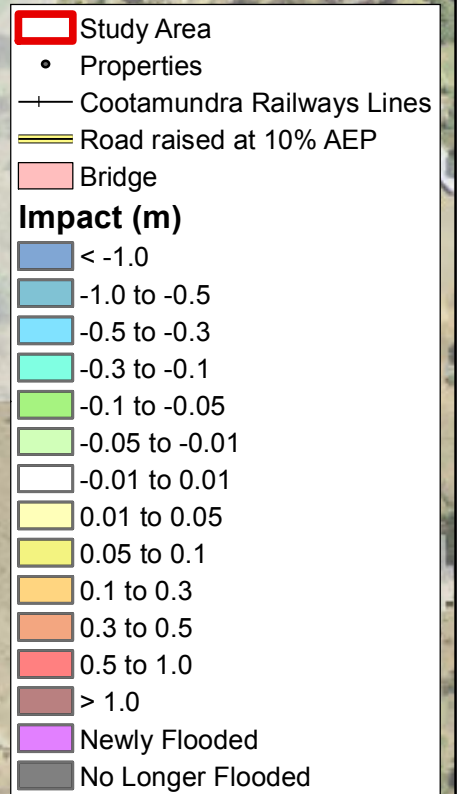
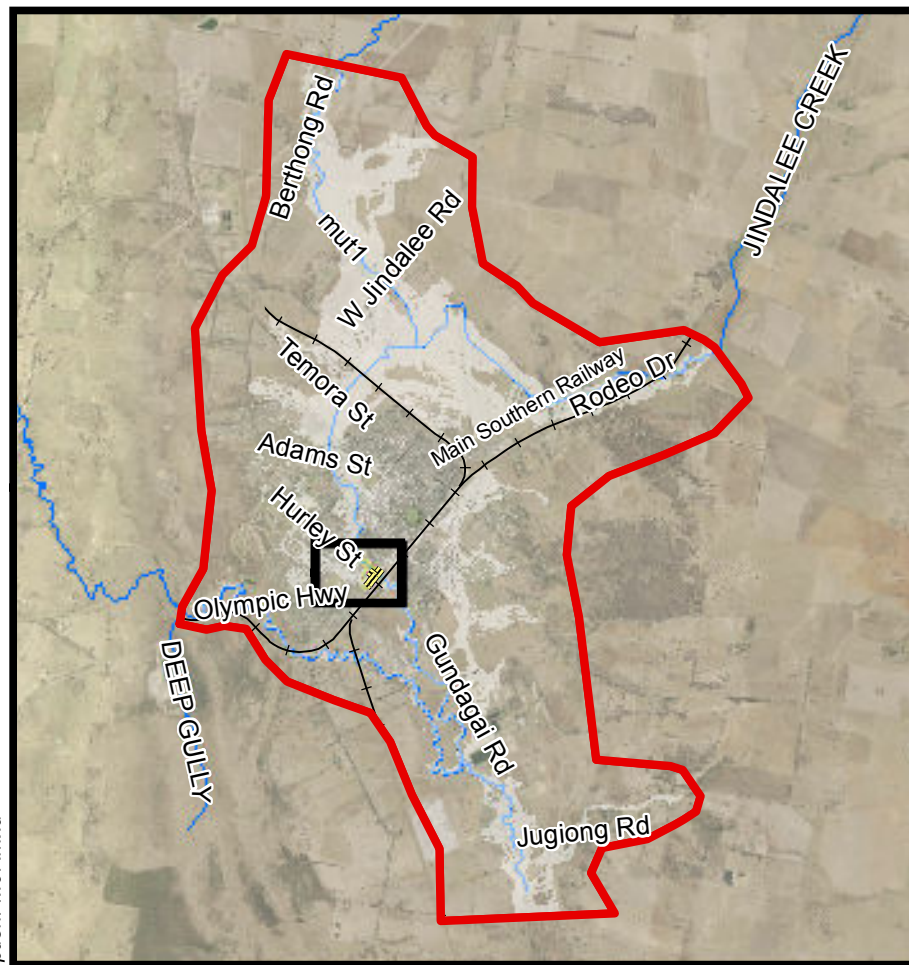
CHANGE IN PEAK FLOOD LEVEL
OPTION FM06 - CUTLER RAISED TO 10% WITH BRIDGE
10% AEP EVENT



CHANGE IN PEAK FLOOD LEVEL
OPTION FM07 - HOVELL STREET AND HURLEY STREET RAISED TO 10% WITH BRIDGE
5% AEP EVENT



CHANGE IN PEAK FLOOD LEVEL
OPTION FM07 - HOVELL STREET AND HURLEY STREET RAISED TO 10% WITH BRIDGE
10% AEP EVENT





APPENDIX A. GLOSSARY

Taken from the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m ³ /s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m ³ /s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, Government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act). infill development: refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development. new development: refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power. redevelopment: refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.
disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.
discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m ³ /s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.

effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves and their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.
flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the flood liable land concept in the 1986 Manual.
Flood Planning Levels (FPLs)	FPLs are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the standard flood event in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below. existing flood risk: the risk a community is exposed to as a result of its location on the floodplain.

	future flood risk: the risk a community may be exposed to as a result of new development on the floodplain. continuing flood risk: the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.
freeboard	Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
habitable room	in a residential situation: a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. in an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to the community. Definitions of high and low hazard categories are provided in the Manual.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
local drainage	Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.
mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
major drainage	Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves: - the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or - water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or - major overland flow paths through developed areas outside of defined drainage reserves; and/or - the potential to affect a number of buildings along the major flow path.
mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
merit approach	The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains.

	The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.
minor, moderate and major flooding	Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood: minor flooding: causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded. moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered. major flooding: appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
modification measures	Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 with further discussion in the Manual.
peak discharge	The maximum discharge occurring during a flood event.
Probable Maximum Flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to water level. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.



APPENDIX B. COST ESTIMATES

Option ID:

FM01

Turf Club Basin

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 156,792.90
	Contingency	item	1	20%	\$ 209,057.21
Site Works	Site Preparation	m²	3,520	\$ 40.00	\$ 140,800.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 49,775.53
Earthworks	Removal of top soil and vegetation (100 mm)	m³	3,520	\$ 16.00	\$ 56,320.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Fill in embankment	m³	9,964	\$ 55.00	\$ 548,042.00
	Fuel	l/m³	9,964	\$ 0.75	\$ 7,473.30
	Compaction	m³	9,964	\$ 8.00	\$ 79,715.20
	Top soil placement/seeding	m²	3,520	\$ 15.00	\$ 52,800.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$1.41 M

Option ID: FM02a

McGowan Street Levee

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 136,532.81
	Contingency	item	1	20%	\$ 182,043.75
Site Works	Site Preparation	m²	3,240	\$ 40.00	\$ 129,600.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 43,343.75
Earthworks	Removal of top soil and vegetation (100 mm)	m³	3,240	\$ 16.00	\$ 51,840.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Fill in embankment	m³	8,180	\$ 55.00	\$ 449,900.00
	Fuel	l/m³	8,180	\$ 0.75	\$ 6,135.00
	Compaction	m³	8,180	\$ 8.00	\$ 65,440.00
	Top soil placement/seeding	m²	3,240	\$ 15.00	\$ 48,600.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$1.23 M

Option ID: FM02b

McGowan Street Levee for 5% AEP event

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 60,375.11
	Contingency	item	1	20%	\$ 80,500.14
Site Works	Site Preparation	m²	1,582	\$ 40.00	\$ 63,280.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 19,166.70
Earthworks	Removal of top soil and vegetation (100 mm)	m³	1,582	\$ 16.00	\$ 25,312.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Fill in embankment	m³	2,442	\$ 55.00	\$ 134,288.00
	Fuel	l/m³	2,442	\$ 0.75	\$ 1,831.20
	Compaction	m³	2,442	\$ 8.00	\$ 19,532.80
	Top soil placement/seeding	m²	1,582	\$ 15.00	\$ 23,730.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$0.54 M

Option ID: FM02c

Extended McGowan Street Levee

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 187,103.42
	Contingency	item	1	20%	\$ 249,471.23
Site Works	Site Preparation	m²	3,750	\$ 40.00	\$ 150,000.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 59,397.91
Earthworks	Removal of top soil and vegetation (100 mm)	m³	3,750	\$ 16.00	\$ 60,000.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Fill in embankment	m³	12,649	\$ 55.00	\$ 695,673.00
	Fuel	l/m³	12,649	\$ 0.75	\$ 9,486.45
	Compaction	m³	12,649	\$ 8.00	\$ 101,188.80
	Top soil placement/seeding	m²	3,750	\$ 15.00	\$ 56,250.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$1.68 M

Option ID: FM02d

Extended McGowan Street Levee 5% AEP event

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 78,251.41
	Contingency	item	1	20%	\$ 104,335.22
Site Works	Site Preparation	m²	2,070	\$ 40.00	\$ 82,800.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 24,841.72
Earthworks	Removal of top soil and vegetation (100 mm)	m³	2,070	\$ 16.00	\$ 33,120.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Fill in embankment	m³	3,679	\$ 55.00	\$ 202,317.50
	Fuel	l/m³	3,679	\$ 0.75	\$ 2,758.88
	Compaction	m³	3,679	\$ 8.00	\$ 29,428.00
	Top soil placement/seeding	m²	2,070	\$ 15.00	\$ 31,050.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$0.70 M

Option ID: FM03a

DU1- Drainage Upgrade in Southee Circle

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 388,059.46
	Contingency	item	1	20%	\$ 517,412.61
Site Works	Site Preparation	m²	3,243	\$ 40.00	\$ 129,720.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	185	\$ 500.00	\$ 92,500.00
	Reinstate Road Surface	m²	2,430	\$ 40.00	\$ 97,200.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 123,193.48
Earthworks Culvert Upgrade	Removal of top soil and vegetation (100 mm)	m³	3,243	\$ 16.00	\$ 51,888.00
	Top soil placement/seeding	m²	3,243	\$ 15.00	\$ 48,645.00
	Pipe 750 x 2.44 RJ Class 4	m	291	\$ 279.81	\$ 81,424.71
	Pipe 900 x 2.44 RJ Class 4	m	563	\$ 256.00	\$ 144,128.00
	Pipe 1050 x 2.44 RJ Class 5	m	127	\$ 436.79	\$ 55,472.33
	Pipe 1200 x 2.44 RJ Class 4	m	125	\$ 670.08	\$ 83,760.00
	Pipe 1350 x 2.44 RJ Class 4	m	1,056	\$ 534.67	\$ 564,611.52
	Drainage Pit	item	1	\$ 5,000.00	\$ 5,000.00
	Junction Pit	item	2	\$ 5,000.00	\$ 10,000.00
	Install Culvert	m	2,162	\$ 280.00	\$ 605,360.00
	Backfill and Site Remediation	m	2,162	\$ 180.00	\$ 389,160.00
	Install new outlet structure, including erosion protection as required	item	1	\$ 5,000.00	\$ 5,000.00
	Total				\$3.49 M

Option ID: FM03b

DU2 - Drainage Upgrade in Southee Circle

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 132,325.29
	Contingency	item	1	20%	\$ 176,433.72
Site Works	Site Preparation	m²	795	\$ 40.00	\$ 31,800.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	185	\$ 500.00	\$ 92,500.00
	Reinstate Road Surface	m²	1,426	\$ 40.00	\$ 57,034.80
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 42,008.03
Culvert Upgrade Earthworks	Removal of top soil and vegetation (100 mm)	m³	795		
				\$ 16.00	\$ 12,720.00
	Pipe 1350 x 2.44 RJ Class 4	m	528	\$ 534.67	\$ 282,305.76
	Drainage Pit	item	1	\$ 5,000.00	\$ 5,000.00
	Junction Pit	item	2	\$ 5,000.00	\$ 10,000.00
	Install Culvert	m	530	\$ 280.00	\$ 148,400.00
	Backfill and Site Remediation	m	530	\$ 180.00	\$ 95,400.00
	Install new outlet structure, including erosion protection as required	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$1.19 M

Option ID:

FM04

Re-Gradation of Francis and Sutton Street

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 252,451.61
	Contingency	item	1	20%	\$ 336,602.15
Site Works	Site Preparation	m²	11,423	\$ 40.00	\$ 456,920.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Reinstate Road Surface	m²	11,423	\$ 40.00	\$ 456,920.00
	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 80,143.37
Earthworks	Removal of top soil and vegetation (100 mm)	m³	11,423	\$ 16.00	\$ 182,768.00
	Excavation	m³	2,120	\$ 50.00	\$ 106,000.00
	Improvement of Excavated material	m³	2,120	\$ 18.00	\$ 38,160.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Disposal of Contaminated Spoil	m³	848	\$ 80.00	\$ 67,840.00
	Fill in embankment	m³	119	\$ 55.00	\$ 6,517.50
	Fuel	l/m³	119	\$ 0.75	\$ 88.88
	Compaction	m³	119	\$ 8.00	\$ 948.00
	Top soil placement/seeding	m²	11,423	\$ 15.00	\$ 171,345.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$2.27 M

Option ID:

FM05

Adam Street Upgrade

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 472,569.86
	Contingency	item	1	20%	\$ 630,093.15
Site Works	Site Preparation	m²	8,630	\$ 40.00	\$ 345,200.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Reinstate Road Surface	m²	8,630	\$ 40.00	\$ 345,200.00
	Area of Bridge	m²	919	\$ 1,905.50	\$ 1,751,154.50
Earthworks	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 66,633.87
	Removal of top soil and vegetation (100 mm)	m³	8,630	\$ 16.00	\$ 138,080.00
	Excavation	m³	798	\$ 50.00	\$ 39,905.00
	Improvement of Excavated material	m³	798	\$ 18.00	\$ 14,365.80
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Disposal of Contaminated Spoil	m³	319	\$ 80.00	\$ 25,539.20
	Fill in embankment	m³	2,817	\$ 55.00	\$ 154,929.50
	Fuel	l/m³	2,817	\$ 0.75	\$ 2,112.68
	Compaction	m³	2,817	\$ 8.00	\$ 22,535.20
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$4.25 M

Option ID:

FM06

Cutler Avenue Road Upgrade

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 287,574.27
	Contingency	item	1	20%	\$ 383,432.36
Site Works	Site Preparation	m²	4,617	\$ 40.00	\$ 184,680.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Reinstate Road Surface	m²	4,617	\$ 40.00	\$ 184,680.00
	Area of Bridge	m²	556	\$ 1,905.50	\$ 1,059,458.00
Earthworks	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 40,843.04
	Removal of top soil and vegetation (100 mm)	m³	4,617	\$ 16.00	\$ 73,872.00
	Excavation	m³	436	\$ 50.00	\$ 21,800.00
	Improvement of Excavated material	m³	436	\$ 18.00	\$ 7,848.00
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Disposal of Contaminated Spoil	m³	174	\$ 80.00	\$ 13,952.00
	Fill in embankment	m³	2,281	\$ 55.00	\$ 125,455.00
	Fuel	l/m³	2,281	\$ 0.75	\$ 1,710.75
	Compaction	m³	2,281	\$ 8.00	\$ 18,248.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$2.59 M

Option ID: FM07

Hovell Street Road Upgrade

	Fixed Costs	UNIT	QUANTITY	Rate (ex GST)	COST
Design	Design, Consultations, Approvals and Construction Management	item	1	\$ 100,000.00	\$ 100,000.00
General	Project Management & General Construction Cost (15% of subtotal)	item	1	15%	\$ 305,959.86
	Contingency	item	1	20%	\$ 407,946.48
Site Works	Site Preparation	m²	5,500	\$ 40.00	\$ 220,000.00
	Control of traffic during works (nominal allowance) (assumed \$500 per lin.m)	lin.m	10	\$ 500.00	\$ 5,000.00
	Reinstate Road Surface	m²	4,995	\$ 40.00	\$ 199,800.00
	Area of Bridge	m²	456	\$ 1,905.50	\$ 867,955.25
Earthworks	Adjustment of existing services (nominal allowance) (assumed 5% of subtotal)	item	1	5%	\$ 55,798.91
	Removal of top soil and vegetation (100 mm)	m³	5,500	\$ 16.00	\$ 88,000.00
	Excavation	m³	736	\$ 50.00	\$ 36,805.00
	Improvement of Excavated material	m³	736	\$ 18.00	\$ 13,249.80
	Haulage of imported Fill	km	20	\$ 18.00	\$ 360.00
	Disposal of Contaminated Spoil	m³	294	\$ 80.00	\$ 23,555.20
	Fill in embankment	m³	2,175	\$ 55.00	\$ 119,625.00
	Fuel	l/m³	2,175	\$ 0.75	\$ 1,631.25
	Compaction	m³	2,175	\$ 8.00	\$ 17,400.00
	Top soil placement/seeding	m²	5,500	\$ 15.00	\$ 82,500.00
	Erosion Protection/ RipRap/ Site Remediation	item	1	\$ 5,000.00	\$ 5,000.00
	Install new outlet structure, including erosion protection as required	item	1	\$ 5,000.00	\$ 5,000.00
Total					\$2.75 M



APPENDIX C. EXAMPLE PLANNING MATRIX

Taken from Reference 18

Appendix B Example considerations for development control plans

DCPs are often used by councils to provide guidance on more location and development type specific controls to consider in meeting the requirements of an LEP.

A DCP may contain advice on:

- FRM objectives of council. These high level objectives may be included to provide an understanding of the broad objectives that council is aiming to achieve within the floodplain. They generally relate to the LEP and policy
- the objectives of the specific development controls. These may include, for example, aspects such as minimising the risk to life due to flooding, maintaining the function and capacity of floodways, and allowing for adaptability to climate change
- considerations for the assessment of development applications in the floodplain, as discussed in Section 3.4.9
- the different types of flood related controls used in the DCP. Table 11 provides examples of the controls used to manage flood risks to development. Note that this is not exhaustive and may contain additional advice for particular categories of development as needed; for example, controls related to fencing or similar. General advice on controls is provided in FRM Guide MM01
- where different flood related development controls may apply. Application of controls may vary with:
 - land-use categories. The broad land-use categories used may require a separate land-use table that identifies the specific uses incorporated into the different categories considering land-use vulnerability to flooding as discussed in Table 6
 - the breakdown of the floodplain considering varying flood constraints on land. Different approaches may be used as discussed in Section 3.4.8. These include: floodways, FPA and the floodplain, or FPCCs 1–4 (Table 13) or different flood risk precincts, Table 14
 - Tables 12–14 are only examples and should not be used directly without testing whether they are fit for purpose for the intended use, the flood constraints in the area, and the information available
- where to access related flood information and mapping. However, note that not all flood-affected areas are generally mapped and controls may apply in unmapped areas. In these areas, development requirements may include the need to provide relevant flood information to enable council to apply the relevant controls to the proposed development.

Table 11 Examples of flood related development controls

Management considerations	No.	Example controls
Floor level		
Allows for varying floor levels for different development types and parts of a development considering flood	F1	All floor levels to be equal to or greater than the ___% AEP flood level plus freeboard unless justified by site-specific assessment
	F2	Habitable floor levels to be equal to or greater than the FPL
	F3	All floor levels to be equal to or greater than the PMF level

Management considerations	No.	Example controls
constraints (Table 2), the additional factors (Table 3) as well as the cost of future flood damages and disruption	F4	Floor levels to be as close to the design floor level as practical and no lower than the existing floor level when undertaking alterations or additions in excess of ___ sqm
	F5	Floor levels of shops to be as close to the design floor level as practical. Where below the design floor level, more than ___% of the floor area to be above the design floor level or premises to be flood proofed below the design floor level
	F6	Garage floor level to be above finished adjacent ground
	F7	Garage floor level to be no lower than the ___% AEP flood level minus ___ mm or ___ mm above finished adjacent ground (whichever is greater)
Building components and method		
Flood compatible building considerations for varying development types Encourages a means of reducing flood damages to individual properties	B1	All structures to have flood compatible building components below or at the FPL
	B2	All structures to have flood compatible building components below or at the PMF level
Structural soundness		
Identifies the scale of assessment required to demonstrate structural soundness to minimise cost of future damages and potential for development components to become floating debris	S1	FIRA required that includes certification that any structure can withstand the forces of floodwater, debris and buoyancy up to and including the DFE and applied to the FPL
	S2	Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a DFE (and applied to the FPL) or PMF if required to satisfy emergency response criteria (see below)
	S3	Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including a PMF flood
Flood affectation		
Identifies how the impacts of the development are to be managed and the risks to the development and its users are to be assessed and considered based on the scale and type of development, its impacts on the existing community and the risk	FA1	FIRA required to certify the development will not increase flood affectation elsewhere
	FA2	The impacts of the development on flooding are to be addressed
Emergency response		
Considers the availability of existing	E1	Reliable access and egress for pedestrians required during a ___ flood

Management considerations	No.	Example controls
EM arrangements including flood warning, evacuation routes, evacuation capacity, etc. and potential impacts of the development on evacuation capability of existing development	E2	Reliable access and egress for pedestrians and vehicles required during a PMF
	E3	Reliable egress is required from the lowest habitable floor of the building to an area of refuge above the PMF level
	E4	The emergency response strategy of the development is consistent with any relevant local or state flood plan developed by the flood combat and flood EM lead agency
	E5	Applicant to demonstrate that evacuation of any proposed development proposal can be undertaken in accordance with the relevant local or state flood plan developed by the flood combat and flood EM lead agency
Management and design		
Considers additional factors needed to manage ongoing flood risk	M1	Applicant to demonstrate that potential development as a consequence of a subdivision or development proposal can be undertaken in accordance with the relevant DCP and / or FIRA
	M2	Site FloodSafe plan (home or business or farmhouse) to address safety and property damage issues (including goods storage and stock management) considering the full range of flood risk
	M3	Materials that may cause pollution or be potentially hazardous during a flood should be contained or not be stored below the ____ flood level

Table 12 Example of applying controls from Table 11 using floodways, FPA and outside the FPA

Flood category	Land-use category	Planning controls					
		Floor level	Building components	Structural soundness	Flood affectation	Emergency response	Management and design
Floodway	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	U	U	U	U	U	U
	Residential	U	U	U	U	U	U
	Commercial and industrial	U	U	U	U	U	U
	Tourist related	U	U	U	U	U	U
	Recreation & non-urban	F1	B1	S1	FA1	E4	M2, M3
	Concessional	F2, F4, F6	B1	S1	FA1	E2 or E3	M2, M3
FPA	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	N	N	N	FA1	E4, E5	M1
	Residential	F2, F6 or F7	B1	S1	FA2	E3, E4	N
	Commercial and industrial	F2 or F5	B1	S1	FA1	E2, E4	M2, M3
	Tourist related	F2	B1	S1 or S3	FA1	E3, E4	M2, M3
	Recreation & non-urban	F1, F2	B1	S1, S2	FA1	E4,	M2, M3

Flood category	Land-use category	Planning controls					
		Floor level	Building components	Structural soundness	Flood affectation	Emergency response	Management and design
Outside FPA	Concessional	F2, F4, F6	B1	S1	FA2	E2 or E3	M2, M3
	Critical use and facilities	F3	B2	S3	FA1	E2 or E3, E4	M2, M3
	Sensitive use and facilities	F3	B2	S3	FA1	N	M2, M3
	Subdivision	N	N	N	FA1	E4, E5	M1
	Residential	N	N	N			M2
	Commercial and industrial	N	N	N	FA1	E4	M2, M3
	Tourist related	N	N	N	FA1	E4	M2, M3
	Recreation & non-urban	N	N	N	N	N	M2
	Concessional	N	N	N	N	E4	M2

Legend

N	Not relevant	U	Unsuitable land use
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Table 13 An example of applying controls from Table 11 using flood planning constraint categories 1 to 4

Flood category	Land-use category	Planning controls					
		Floor level	Building components	Structural soundness	Flood affectation	Emergency response	Management and design
FPCC 1	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	U	U	U	U	U	U
	Residential	U	U	U	U	U	U
	Commercial and industrial	U	U	U	U	U	U
	Tourist related	U	U	U	U	U	U
	Recreation & non-urban	F1	B1	S1	FA1	E4	M2, M3
	Concessional	F2, F4, F6	B1	S1	FA1	E2 or E3	M2, M3
FPCC 2	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	N	N		FA1	E4, E5	M1
	Residential	F2, F6 or F7	B1	S1	FA2	E3, E4	M2
	Commercial and industrial	F2 or F5	B1	S1	FA1	E2, E4	M2, M3
	Tourist related	F2	B1	S1 or S3	FA1	E3, E4, E5	M2, M3
	Recreation & non-urban	F1	B1	S1, S2	FA1	E4	M2, M3
	Concessional	F2, F4, F6	B1	S1	FA2	E2 or E3	M2, M3

Flood category	Land-use category	Planning controls					
		Floor level	Building components	Structural soundness	Flood affectation	Emergency response	Management and design
FPCC 3	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	N	N	N	FA1	E4, E5	M1
	Residential	F2, F6 or F7	B1	S1	FA2	E4	M2
	Commercial and industrial	F2 or F5	B1	S1	FA1	E4	M2, M3
	Tourist related	F2	B1	S1	FA1	E4	M2, M3
	Recreation & non-urban	F1	B1	S1, S2	FA1	E4	M2
	Concessional	F2, F4, F6	B1	S1	FA2	E2 or E3	M2, M3
Areas in FPCC 4	Critical use and facilities	F3	B2	S3	FA1	E2 or E3, E4	M2, M3
	Sensitive use and facilities	F3	B2	S3	FA1	N	M3
	Subdivision	N	N	N	FA1	E4, E5	M1
	Residential	N	N	N	N	N	M2
	Commercial and industrial	N	N	N	FA1	E4	M2, M3
	Tourist related	N	N	N	FA1	E4	M2, M3
	Recreation & non-urban	N	N	N	N	N	M2
	Concessional	N	N	N	N	E4	M2

Legend

N	Not relevant	U	Unsuitable land use
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Table 14 Example of applying controls from Table 11 using flood risk precincts

Flood category	Land-use category	Planning controls					
		Floor level	Building components	Structural soundness	Flood affectation	Emergency response	Management and design
High flood risk	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	U	U	U	U	U	U
	Residential	U	U	U	U	U	U
	Commercial and industrial	U	U	U	U	U	U
	Tourist related	U	U	U	U	U	U
	Recreation & non-urban	F1	B1	S1	FA1	E4	M2, M3
	Concessional	F2, F4, F6	B1	S1	FA1	E2 or E3	M2, M3
Medium flood risk	Critical use and facilities	U	U	U	U	U	U
	Sensitive use and facilities	U	U	U	U	U	U
	Subdivision	N	N	N	FA1	E4, E5	M1
	Residential	F2, F6 or F7	B1	S1	FA2	E3, E4	N
	Commercial and industrial	F2 or F5	B1	S1	FA1	E2, E4	M2, M3

Flood category	Land-use category	Planning controls					
		Floor level	Building components	Structural soundness	Flood affectation	Emergency response	Management and design
Low flood risk	Tourist related	F2	B1	S3	FA1	E3, E4	M2, M3
	Recreation & non-urban	F1, F2	B1	S1, S2	FA1	E4, E5	M2, M3
	Concessional	F2, F4, F6	B1	S1	FA2	E2 or E3	M2, M3
	Critical use and facilities	F3	B2	S3	FA1	E2 or E3, E4	M2, M3
	Sensitive use and facilities	F3	B2	S3	FA1	N	M2, M3
	Subdivision	U	U	U	FA1	E4, E5	M1
	Residential	U	U	U	N	N	M2
	Commercial and industrial	U	U	U	FA1	E4	M2, M3
	Tourist related	U	U	U	FA1	E4	M2, M3
	Recreation & non-urban	U	U	U	N	N	M2
	Concessional	U	U	U	N	E4	M2

Legend

N	Not relevant	U	Unsuitable land use
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**APPENDIX D.
RESPONSE**

PUBLIC EXHIBITION SUBMISSION THEMES AND

Theme	Specific Comments	How this has been considered	Changes in Report
Vegetation and silt build up in the creek	A significant number of submissions indicated support for clearing vegetation from Muttama Creek for the purposes of clearing a path for water and reducing flood levels through Cootamundra. Submissions referred to debris and other garbage, excess non native vegetation and dense shrubs and trees. Other submissions suggested widening the creek. Some submissions also acknowledged that the resulting reduction in flood levels may be minor, and this would still benefit the community. An opposing view was also presented, supporting the need for vegetation for habitat and bank stability purposes.	The impact of vegetation and debris on the visual capacity of the Muttama Creek channel was a common theme discussed with the community and the floodplain risk management committee. As a result, a range of options were considered as part of the study including broadscale clearing and widening of the Muttama Creek channel (Option FM08). While these scenarios slightly reduced flood levels in small events, generally contained to the channel; they did not significantly improve flood impacts to properties in events larger than a 10% AEP event. In addition, vegetation and natural creek banks provide visual and community amenity, structural stability, environmental and habitat benefits. These aspects would be lost if an extreme broad scale clearing and widening option was adopted. The small scale of flood benefits would also limit the options viability as a flood risk measures and its ability to attract funding through the NSW Government Floodplain Management Program. It is however important for the creek to be maintained at an appropriate level of vegetation, with the removal of garbage, clearing of structures and appropriate replacement of non native vegetation to ensure bank stability and habitat is maintained. The FRMS&P makes a recommendation considering these aspects (FM08).	Clarification of recommendation FM08.
Local drainage issues (many locations including Southee Circle), including maintenance of Council's drainage infrastructure	Submissions report incidences of ineffective drainage, including water sitting following rainfall events (Southee Circle), the need for better drainage, and inability for runoff to drain away.	Typically, drainage infrastructure is designed to cater for a 10% AEP event with the overflow conveyed through overland flow paths. The focus of the NSW Government Flood Prone Land Policy is to reduce private losses in flood size events and therefore drainage options are not usually recommended as part of a FRMS&P as they convey a relatively small proportion of the total flow during a reasonable sized flood event. However, the FRMS&P considered a number of options for the Southee Circle area including drainage works between Francis Street and Sutton Street and re-gradation of Francis Street, to provide a defined overland flow path. Two options have been recommended for further investigation (FM03b and FM04). In addition, given the significance of this issue to the community, a recommendation has been added regarding ongoing maintenance of Council drainage infrastructure (FM09) to reduce negative impacts in small rainfall events.	Recommendation for regular maintenance of drainage infrastructure has been included in the FRMS&P under Section. 8.4.11 (FM09)
Areas perceived not to be included in the study	Two submissions noted that specific areas (Hume and Florence Street and Jindalee Creek (Rodeo Drive)) were not acknowledged or included in the study.	A primary objective of the NSW Government's Floodplain Management Program is to reduce private losses resulting from floods. In this regard, the intent of the Program is not to remove flood risk in its entirety, but to effectively manage it. Acknowledging that structural mitigation options often have limited efficacy in developed environments, and that there is not infinite funds available for the implementation, the investigation of structural options is targeted to the most at risk locations or those with the broadest benefit. Following that, Council aims to manage flood risk and damage by the implementation of development control policies and response measures. Properties in the Hume and Florence Street area have been included in the Flood Planning Area for the application of flood related development controls for future development. An extension of the Jindalee levee was also considered as part of the FRMS&P and was not found to be viable.	Nil
Concern around impacts of recommended options	Turf Club Detention Basin (FM01) - submissions raised concerns, that the basin may overflow or back up water to unwanted or unexpected locations, and to where basin outlet would direct flow, specifically West Jindalee Road, loss of current commercial operations utilising internal track, and land ownership, the Turf Club is currently a Crown Land site.	Recommendation FM01 is for further detailed investigation via a feasibility study. This would consider all constraints related to the basin and these concerns have been included as items for consideration. There are no negative property impacts with the current concept design that has been assessed as part of the FRMS&P.	Section 8.4.2 has been amended to include the concerns raised.
	McGowen Street Levee (FM02a) - submissions raised concerns about increased flood levels for areas not protected by the proposed alignment, specifically Northcott Avenue, Adams Street, Temora Street and Cutler Avenue. One submission suggests that this measure is not enough to reduce flood risk, if implemented alone.	Recommendation FM02a is for further detailed investigation via a feasibility study. This would consider all constraints related to the levee and these concerns have been included as items for consideration. Assessment of the current concept design as part of the FRMS&P shows no building impacts but some minor lot impacts. These minor impacts will be the focus of the design optimisation as part of the feasibility study.	Section 8.4.3 has been amended to include the concerns raised.
	Drainage Upgrade at Southee Circle (FM03) - a submission raised concerns for greater impacts on Francis ad Sutton Streets.	Recommendation FM03b is for further detailed investigation via a feasibility study. This would consider all constraints related to the levee and these concerns have been included as items for consideration. Assessment of the current concept design as part of the FRMS&P shows very minor impacts on Hovell Street. These minor impacts will be the focus of the design optimisation as part of the feasibility study.	Section 8.4.5 has been amended to include the concerns raised.

Theme	Specific Comments	How this has been considered	Changes in Report
Development or changes in the catchment and its impacts on flooding	A number of submissions raised concerns about the increased runoff from developments in town, the concerns also extended to changes in the catchment area upstream of town. In reference to the development in town, one submission noted an observation of increases in water levels at Poole Street of 20cm, 25 to 30 minutes prior to the arrival of the flood wave from the upstream catchment. A number of submissions indicated that Council needs to implement policies and strategies to address the impacts of development.	Council controls the impacts of development on flooding through the application of the Local Environment Plan and Development Control Plan. The FRMS&P has assessed Council's existing development controls regarding flooding and makes recommendations for improvements. As part of the development application process Council requires developments to consider the impacts of flooding. In some cases, Council has required that developments include mitigation strategies to offset the impacts of more hard surfaces. The suite of mapping provided with the FRMS&P allows Council and developers to have a detailed understanding of the flood risks across the study area and make informed decisions about development and its compatibility to the existing and future flood risk.	Nil
Responsibilities during a flood event, and suitability of evacuation centres	One submission mentioned that the SES has provided information during flood events and Council had not. Another indicated that the evacuation centre established during the October 2022 was not appropriate, as it was eventually inundated.	The SES is the state's combat agency for flood and is legislatively responsible for the coordination of evacuations (including warnings and orders) which includes the collation, assessment, and public dissemination of local flood advice during events. A clear hierarchy is established and needs to be maintained during flood events to ensure that clear directions are given. The SES remain responsible for disseminating these messages. Recommendation RM02: Community Flood Education and Awareness, includes a recommendation to communicate the roles and responsibilities during flood events. The SES Local Flood Plan indicates that the evacuation centre in Cootamundra is the Cootamundra Showground, however the Cootamundra-Gundagai Regional Council Local Emergency Management Plan lists an evacuation centre at the Cootamundra Ex-Servicemen's and Citizens Memorial Club. RM04 Amend Local Flood Plans with Information Derived from this Study, includes ensuring consistency between the various response documents. At the time of writing Council had commenced a review of these aspects.	Nil
Lack of support of response options with a preference for more flood modification/built options	A number of submissions suggested that there is a preference for complete removal of flood risk and a belief that flood response measures will not reduce flood risk. E.g. "Maybe preventing flooding in the first place would assist the community better", "Meetings will not stop flooding. Prevention by removing the hazards which cause the flood".	The FRMS&P considers and recommends a range of measures to reduce flood risk to properties. Flood risk is the interaction of flood waters with human occupation of the floodplain. This can be a challenging exercise in urbanised catchments due to the existing constraints. For example, to contain the mainstream flow from the October 2022 event within the creek and its immediate corridor would require a channel 200m wide, necessitating the removal of 200 properties, which is not considered to be viable. A primary objective of the NSW Government's Floodplain Management Program is to reduce private losses resulting from floods. In this regard, the intent of the Program is not to remove flood risk completely, but to effectively manage it. Implementing structural measures, to alter the flood behaviour, where possible, and to manage the residual risk, with planning controls and response measures. Flood education and awareness is a key element of this, to improve the community's understanding of the full range of flood risk.	Nil
Voluntary Purchase (VP) Scheme	The submissions indicated significant support for the implementation of a VP Scheme for the most flood impacted properties. Concerns around sale price, Council's short sightedness in not previously progressing, and Council's ability to cover the proportional cost. Feedback also indicated queries around how properties have been selected for inclusion in the scheme. Two submissions indicated they did not support the VP scheme as property buyers should have undertaken due diligence before purchase.	The support for this option is noted. VP aims to reduce the risk to life of residents in high hazard locations. There are no other viable strategies to reduce the hazardous conditions and subsequent risk to life to residents and rescuers at the properties identified within the VP scheme. VP is therefore the only viable option to reduce this risk to life at these properties. The removal of these properties also assists in the movement of the flood waters through the floodplain. A feasibility study has been undertaken to progress the investigation of this option.	Nil
Other options	Flood warning - a submission indicated a comprehensive electronic flood warning system should be investigated.	The mechanism of flooding in Cootamundra presents several challenges in the implementation of a flood warning system using current technologies. Flooding in Cootamundra can occur as a result of intense rainfall in either the Muttama or Jindalee Creek catchments. Both have relatively short response times, with the Jindalee Creek portion (the major contributor of the October 2022 event), the shorter of the two. Effective flood warnings require around 6 hours to receive, analyse and disseminate messaging that leads to tangible increases in available warning time. This is the approximate response time of the Muttama Creek catchment to Cootamundra. In recent years technology is evolving and the Bureau of Meteorology is investing significantly in improving flood warning across the country. With that in mind, an additional recommendation has been added to the FRMS&P to undertake a review of the current flood warning infrastructure and determine the infrastructure requirements and system triggers for an effective system.	Recommendation for improvements to the flood warning system for Cootamundra has been included in the FRMS&P under Section. 8.2.5 (RM05)

Theme	Specific Comments	How this has been considered	Changes in Report
	Additional detention basins - a submission suggested an additional detention basin between Adams and Temora Street or in farmland to the north of Cootamundra.	The FRMS&P considered and assessed a range of strategies, including similar options upstream of Adams Street and Cutler Avenue, which were formed by the road embankments. Both options presented significant challenges and were not recommended. Smaller structures may however complement the existing recommendation FM01 at the Turf Club and therefore this aspect has been added as a consideration for the recommended feasibility study.	Section 8.4.2 has been amended to include consideration of the potential complementary works.
	Flood gates and pumps on drainage infrastructure - the submission suggested this approach was used in other towns.	The FRMS&P considered and assessed a range of strategies, including the inclusion of one way flap gates on drainage infrastructure at Southee Circle. Due to the complexities of the flood behaviour, where the most significant impacts occur when floodwaters break from Muttama Creek, rather than from overland flow, the one way flap gates were ineffective in reducing the impacts of flooding.	Nil
	Contour banks at the height of the worst imaginable flood from Wattle Grove, following along the creek and include temporary barriers at bridges.	The FRMS&P considered and assessed a range of strategies, including levee structures at a range of locations. The majority were found to not be viable due to the heights required or unacceptable impacts in unprotected areas. The Probable Maximum Flood (PMF) is the largest flood that could conceivably occur and at Wallendoon Street the PMF level is almost 4 m higher than the October 2022 flood. The levee alignment would also be required to extend for over 5 km along both sides of Muttama Creek. This is not considered to be a viable option. Additionally, the limited warning time, would provide insufficient time to close the temporary barriers at the bridges.	Nil
	Cut out areas near the RSL club and Scout Hall to capture more water.	The FRMS&P considered and assessed a range of strategies, including a number of scenarios that aimed to increase the conveyance of the Muttama Creek channel. The volume of water carried by the creek in large flood events represents only 5-15% of the total volume of water within the floodplain. The rest of the floodwater is carried on the wider floodplain. Therefore, small localised changes to the creek are unlikely to have significant benefits in reducing flood levels in events that impact properties.	Nil
Lack of funding to move forward with recommendations	Some submissions indicated a concern that Council does not have funding to progress the recommendations.	The NSW Flood Prone Land Policy sets out the Floodplain Risk Management process to assist Councils in meeting their obligations under the policy. The process allows for the definition of flood behaviour, identification and assessment of potential mitigation strategies and design and implementation of viable strategies. The NSW Government provides technical and generous financial support to Councils at each of these stages.	Nil
Duration of Floodplain Management Process	A few submissions raised concerns around the length of time it has taken for strategies to be implemented, referencing the 2016 event as the trigger point from which action should have progressed.	The NSW Flood Prone Land Policy sets out the Floodplain Risk Management process to assist Councils in meeting their obligations under the policy. The process allows for the definition of flood behaviour, identification and assessment of potential mitigation strategies and design and implementation of viable strategies, through 5 stages. The process ensures appropriate assessment is undertaken to identify strategies that will result in tangible change to flood risk. Council commenced the process shortly after the 2016 flood event, seeking grant funding in the annual round of funding for commencement of the Cootamundra Flood Study.	Nil
Lived experience of flooding compared to that predicted on mapping	A number of submissions referenced previous flooding events as the largest which can occur in Cootamundra, including commentary that houses flooded in the October 2022 had never flooded before.	The FRMS&P considers the impacts of flooding across a range of flood event sizes. Typically planning is undertaken for a 1% AEP event, which in a 70 year period, you have a better than even chance of experiencing a flood of this size. It is not uncommon for long term residents to have not experienced an event of the magnitude of the 1% AEP. The 2022 flood event was the biggest flood event that has occurred in Cootamundra in the recent past, and resulted from intense rainfall in the Jindalee and Muttama Creek catchments. The event is estimated to be around a 5% AEP event, and the impacts during the October 2022 event align with that estimated for a 5% AEP event in the FRMS&P. It is also probable that larger events will occur in the future impacting other areas of the floodplain. The FRMS&P reinforces the importance of the community understanding the full range of potential flood impacts that may occur in Cootamundra.	Nil