Figures

FIGURE A1
STUDY AREA

Stockinbingal Rd
Berthong Rd
Tempora St
W Jindalee Rd
MUTTAMA CREEK
Cootamundra Lake Cargelligo Railway
JINDALEE CREEK
Rodeo Dr
Olympic Hwy
Boundary Rd
Temora St
McGowan St
Adams St
Cutler Ave
Scott Ave
Rinkin St
Suttons Ln
MacKay St
Hurley St
Poole St
Olney St
Margaret St
Ursula St
Parker St
Murray St
Bourke St
Wallendoon St
Main Southern Railway
Bradman St
Barley St
Byrne St
Meagher St
Richards St
Francis St
Thompson St
Sutton St
Howell St
Lloyd Conkey Ln
Centenary Ave
Cowcumbla St
COOTAMUNDRY CREEK
Dimaseer Rd
Olympic Hwy
DEEP GULLY
Back Brawlin Rd
Cootamundra Tumut Railway
Nashs Ln
COOTAMUNDRY CREEK
Gundagai Rd
mut1
Jugiong Rd

N

Creeks
Cootamundra Railway Lines
Study Area
Southee Circle

0 0.5 1 2 km

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

FIGURE A2
AVAILABLE LiDAR DATA

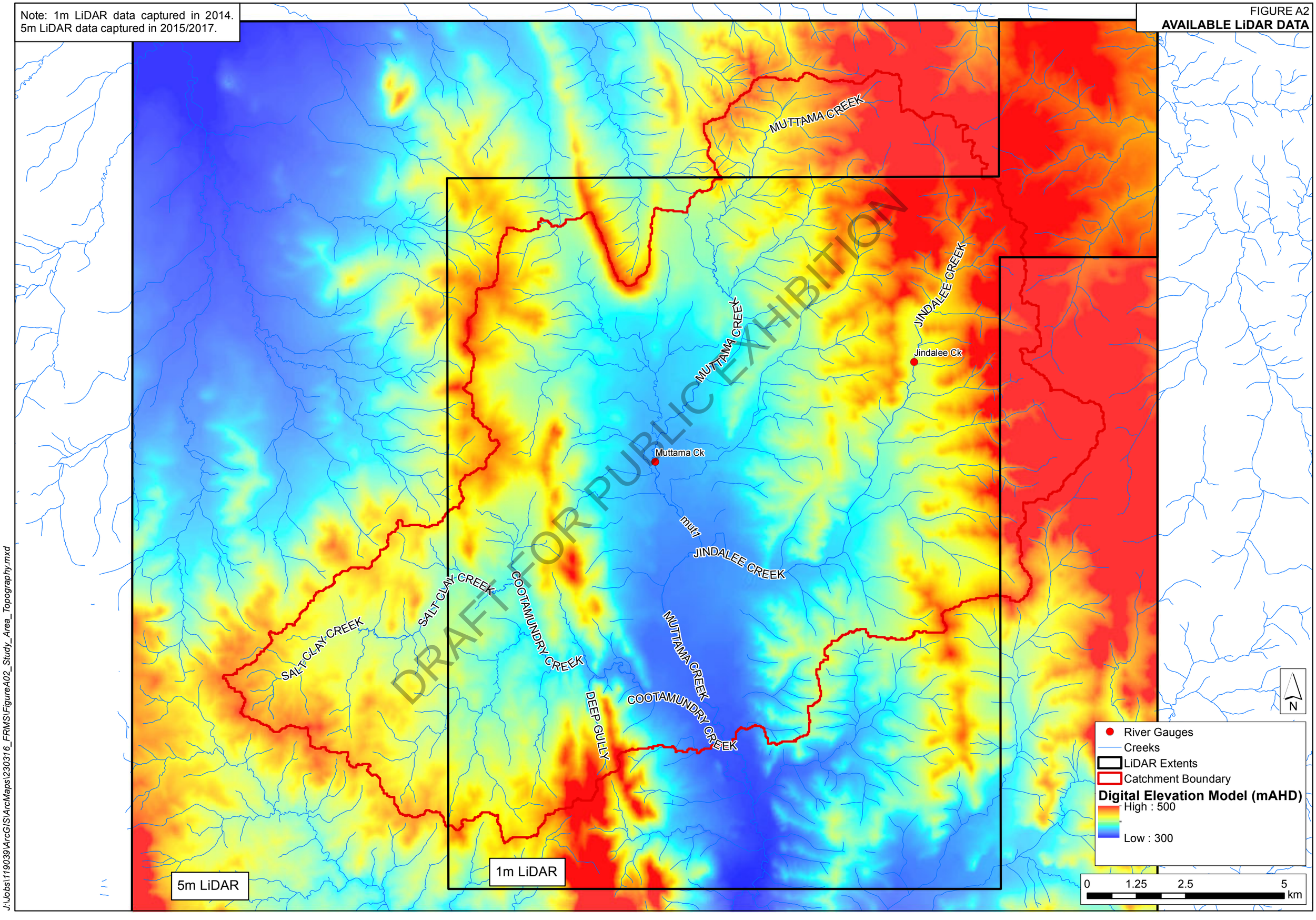

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FIGURE A3
RAINFALL GAUGE LOCATION AND WBNM MODE

STOCKINBINGAL
(SUNNYDALE)
(1949-Today)

MUTTAMA CREEK

MUTTAMA CREEK

Berthong Rd

MUTTAMA CREEK AT
BERTHONG ROAD
(2004-Today)

JINDALEE CREEK
AT JINDALEE
(1975-Today)

JINDALEE CREEK

W Jindalee Rd

Sutttons Ln

Temora St

COOTAMUNDRA
AIRPORT
(1995-Today)

COOTAMUNDRA
POST OFFICE
(1889-2000)

Bradman St

Rinkin St

SALT CLAY CREEK

SALT CLAY CREEK

Byrne St

Cowcumbla St

Dirnasser Rd

Olympic Hwy

DEEP GULLY

Cootamundra Tumut Railway

Gundagai Rd

Muttama Rd

Jugiong Rd

COOTAMUNDRA
(LANDGROVE)
(1891-Today)

N

Creeks
Cootamundra Railway Lines
Pluviometer and Streamflow Station
Daily Station
Catchment Boundary
WBNM Subcatchments

0 2.5 5 10
km

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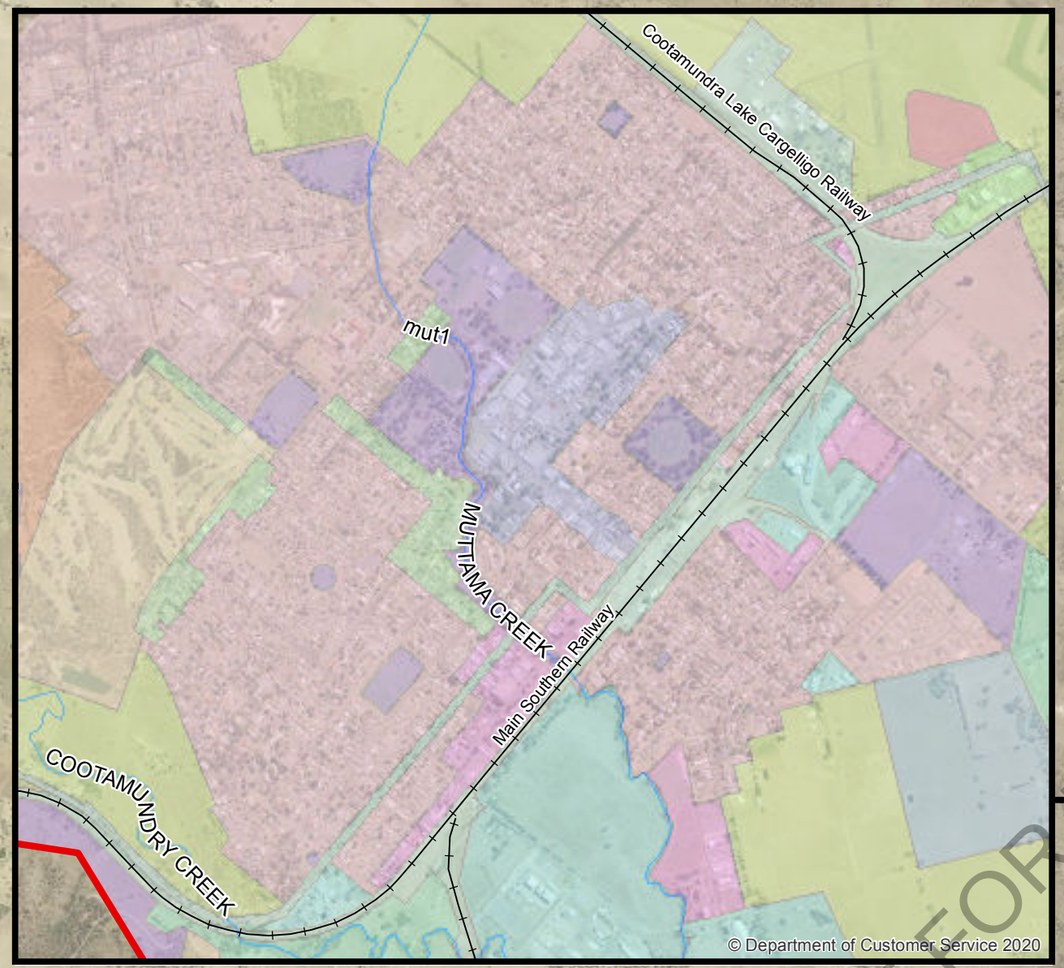
FIGURE A4
LANDUSE ZONES



N

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

0 1 2 4 km

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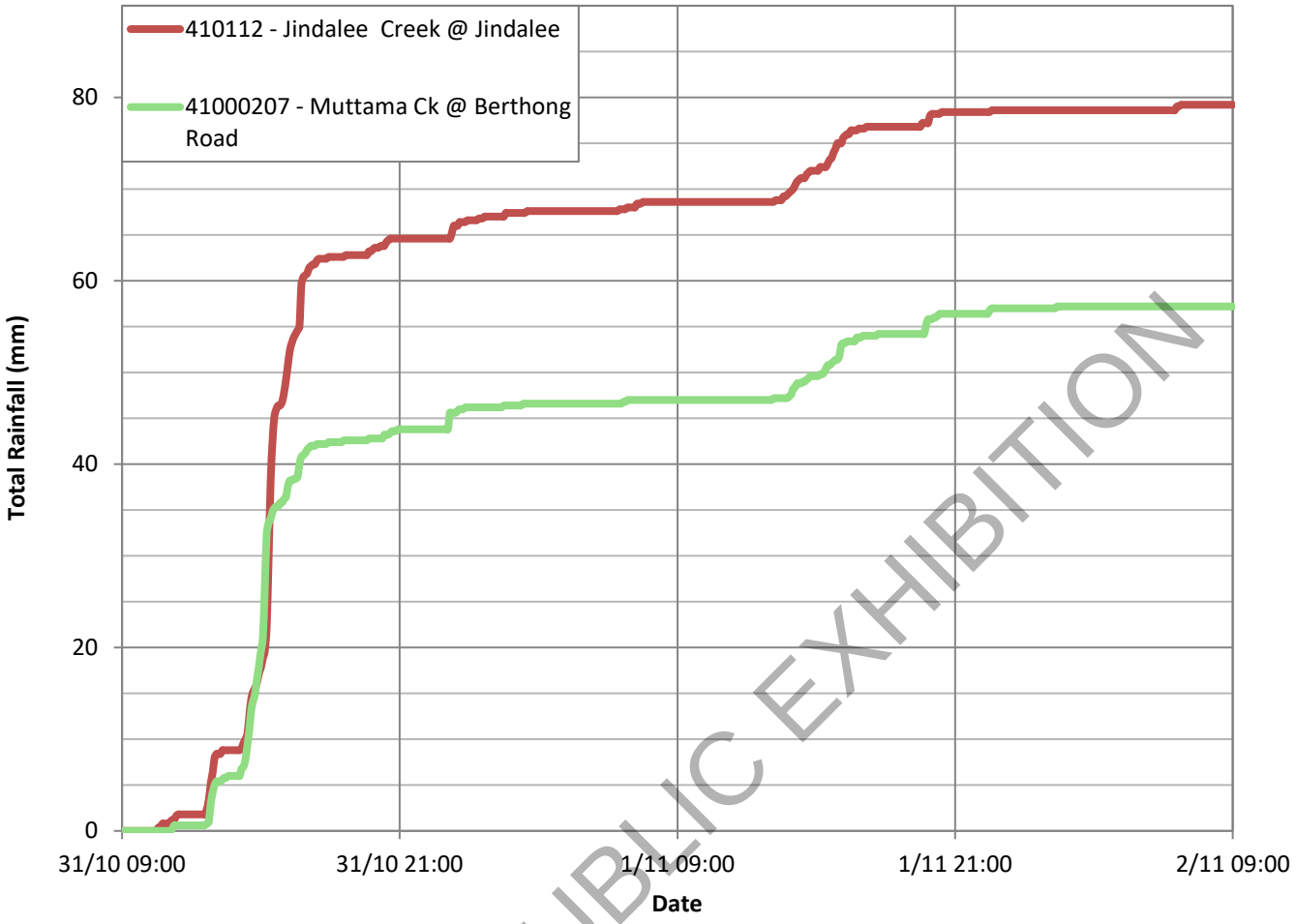
FIGURE A5
CUMULATIVE RAINFALL DATA
OCTOBER 2022 EVENT



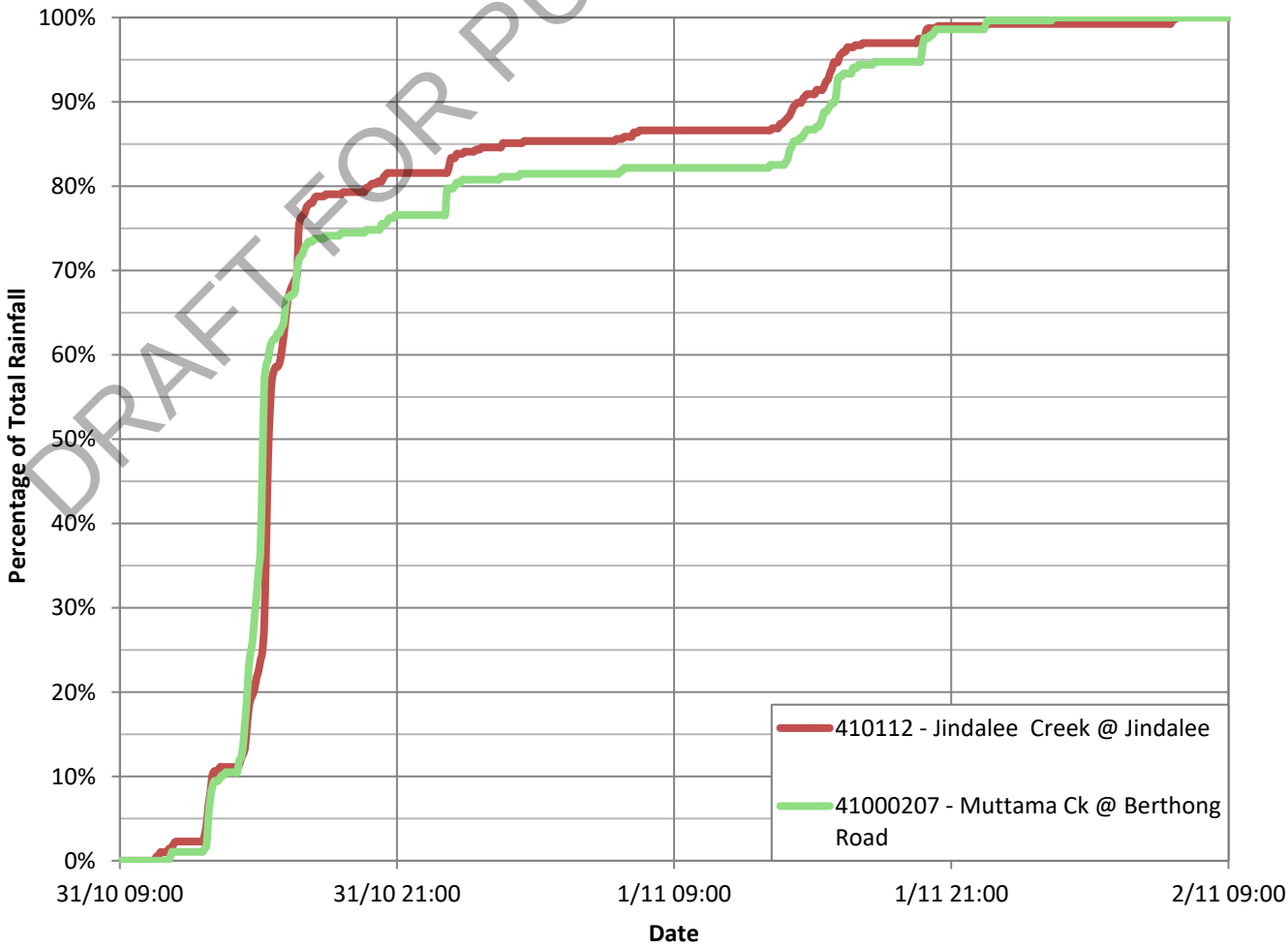


FIGURE A6

BURST INTENSITIES AND FREQUENCIES
BERTHONG GAUGE AT MUTTAMA CREEK

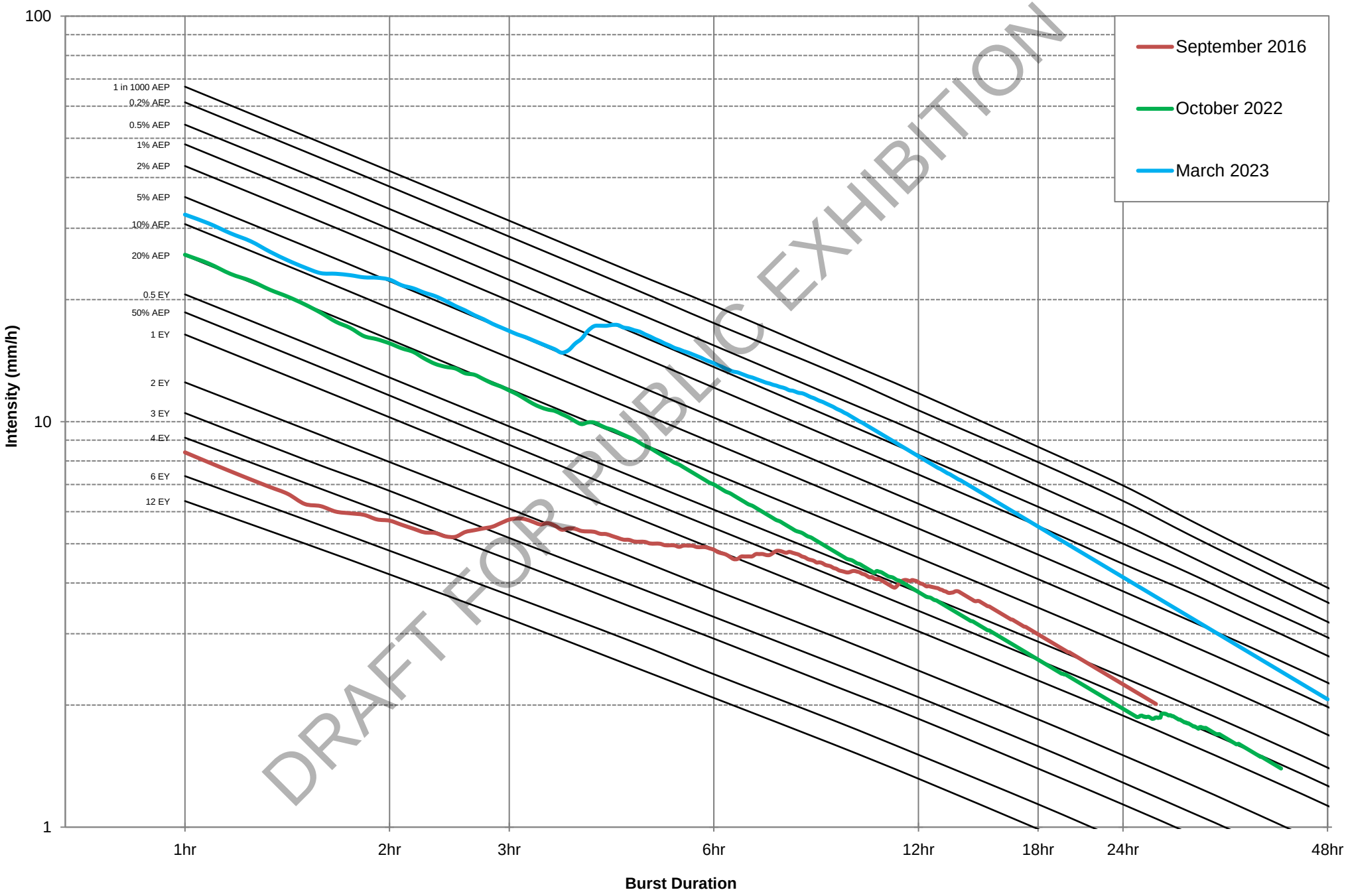
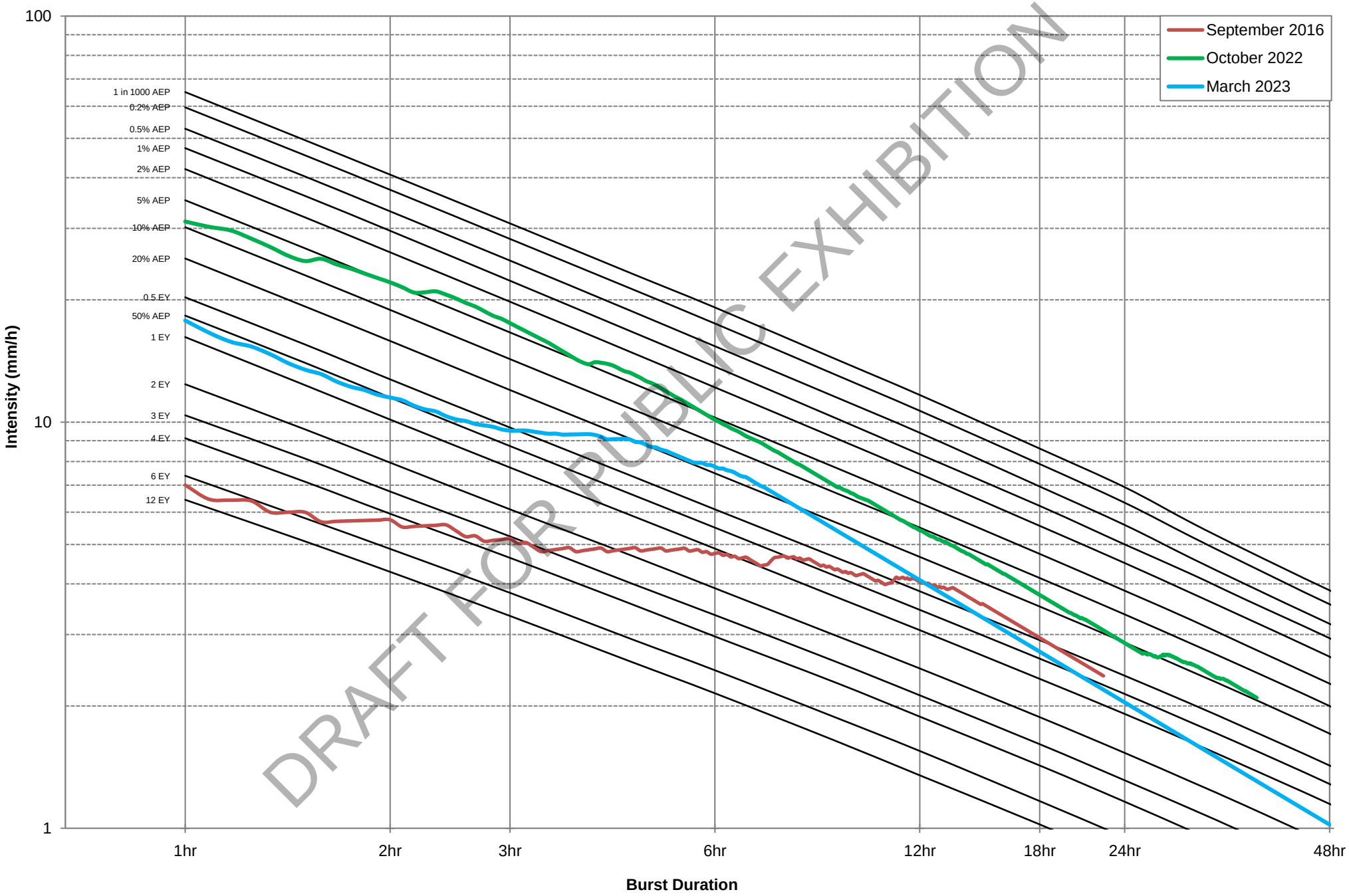


FIGURE A7

BURST INTENSITIES AND FREQUENCIES
JINDALEE AT JINDALEE CREEK



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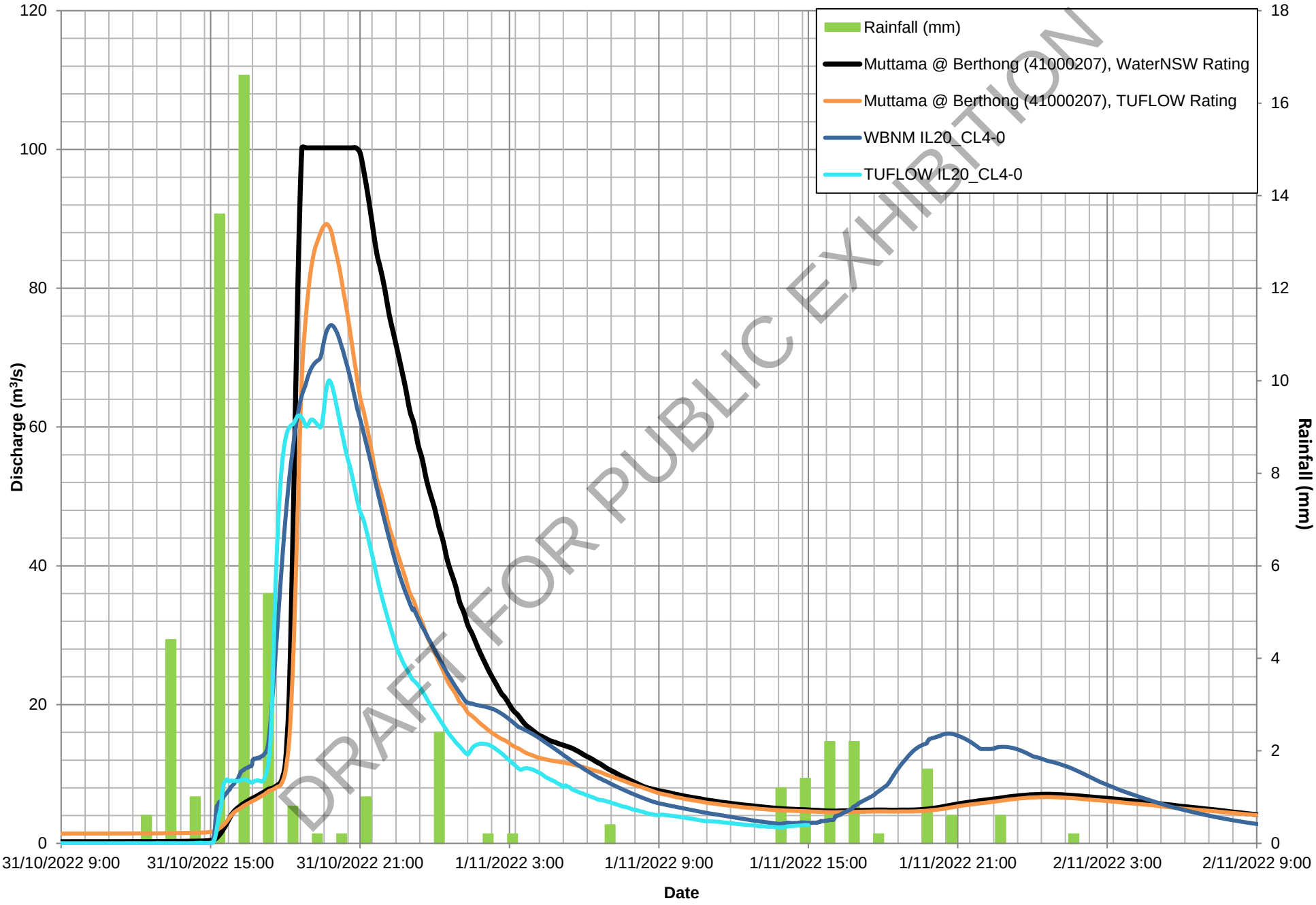

FIGURE A8A
HYDROGRAPH - MUTTAMA CREEK AT BERTHONG ROAD STATION
OCTOBER 2022 - MODELLED VS RECORDED HYDROGRAPH

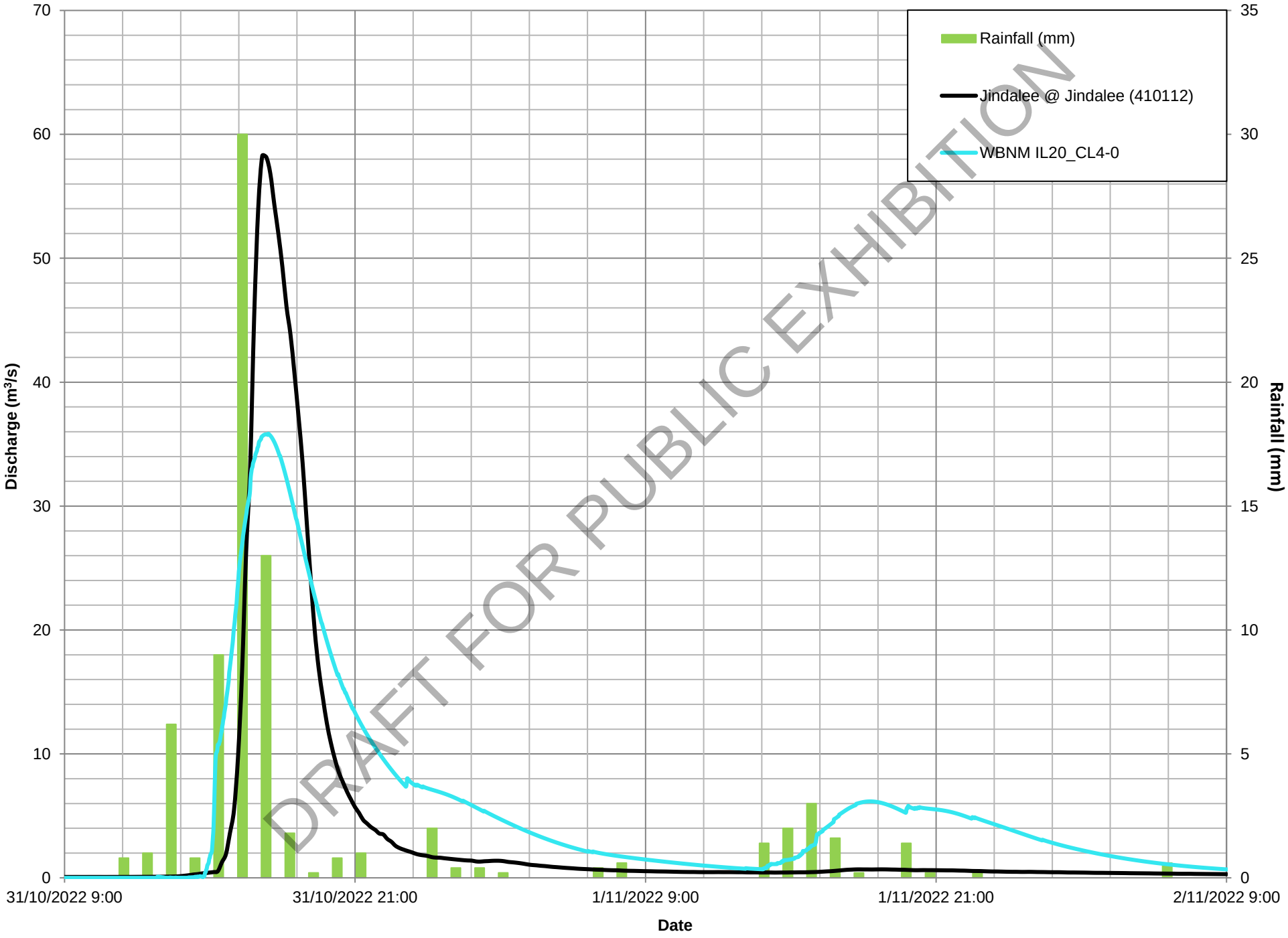

FIGURE A8B
HYDROGRAPH AT JINDALEE CREEK AT JINDALEE STATION
WBNM MODEL VS RECORDED HYDROGRAPH

FIGURE A9A

MODELLED FLOOD DEPTHS

OCTOBER 2022 FLOOD AND 5% AEP EVENT

OCTOBER 2022 EVENT

5% AEP EVENT

Berthong Rd
W Jindalee Rd
Cootamundra Lake Cargelligo Railway
Temora St
Boundary Rd
Cutler Ave
Adams St
MacKay St
Hurley St
Wallendoon St
Bourke St
Main Southern Railway
Olympic Hwy
Rodeo Dr
Bradman St
Bartley St
Rinkin St
Byrne St
Ursula St
Centenary Ave
Sutton St
Hovell St
Olympic Hwy
Cowcumbla St
Nashs Ln
Gundagai Rd
Jugiong Rd
Muttama Rd

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.

N

Study Area

Peak Flood Depth (m)

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

0 0.5 1 2 Kilometers

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FIGURE A9B

SURVEYED FLOOD MARKS FOR OCTOBER 2022 FLOOD EVENT
MODELLED FLOOD DEPTHS

Adams Street was cut.

Temora Street was cut with approximately 600mm depth of inundation.

It was reported in the media that approximately 1.5 m of flood water went through the childcare centre located on Poole Street.

Nicholson Park and Fisher Park were flooded. Approximately, 500mm depth of inundation was reported in the Nicholson Park amenities/change rooms.

Flood water came down onto Parker Street from Bourke Street. The kerb was filled up to building frontages. Some flow was observed across the middle of the Parker Street and Bourke street intersection.

Wallendoon Bridge, Parker Street Bridge, Sutton Street Bridge and Mackay Street Bridge were cut and could not be used to travel across Muttama Creek, splitting the town into two halves.

The Men's Shed located on Hovell Street was inundated by approximately 900 mm deep flood water.

Other affected regions included: Hovell Street, MurrayStreet, Southee Circle, Ursula Street, Temora Street, Adams Street, Cutler Avenue, Parts of O'Donnell St and Queen Street, Short Street and Crown Street.

-0.04
0.29
0.52
0.05
0.7
-0.19
0.56
0
0
-0.29
-0.26
-0.17
0.06
-0.02
0
-0.05
0.16
0
0.03
0.03
0.17
0.11
0
0.03
0.14
0.07
0.2
0.21
0
0.2
0.26
0.13
0.1
-0.19
0.08
0.03
0.06
-0.07
0.11
0.32
-0.01
0.15
0.2
0.16
0.23
0.04
0.33
0.25
0.06

Boundary Rd
Cutler Ave
Scott Ave
McGowan St
Adams St
Temora St
Coptamundra Lake
Wallendoon St
Murray St
Bourke St
Poole St
Olney St
MacKay St
Hurley St
Margaret St
Ursula St
Parker St
Thompson St
French St
Philip St
Cowcumbla St
Meagher St
Ursula St
Francis St
Centenary Ave
Sutton St
Richards St
Hovell St
Main Southern Rail
Lloyd

DRAFT FOR PUBLIC EXHIBITION

N

Study Area
Difference (m) Modelled to Surveyed

Peak Flood Depth (m)
0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

0 250 500 1,000 Meters

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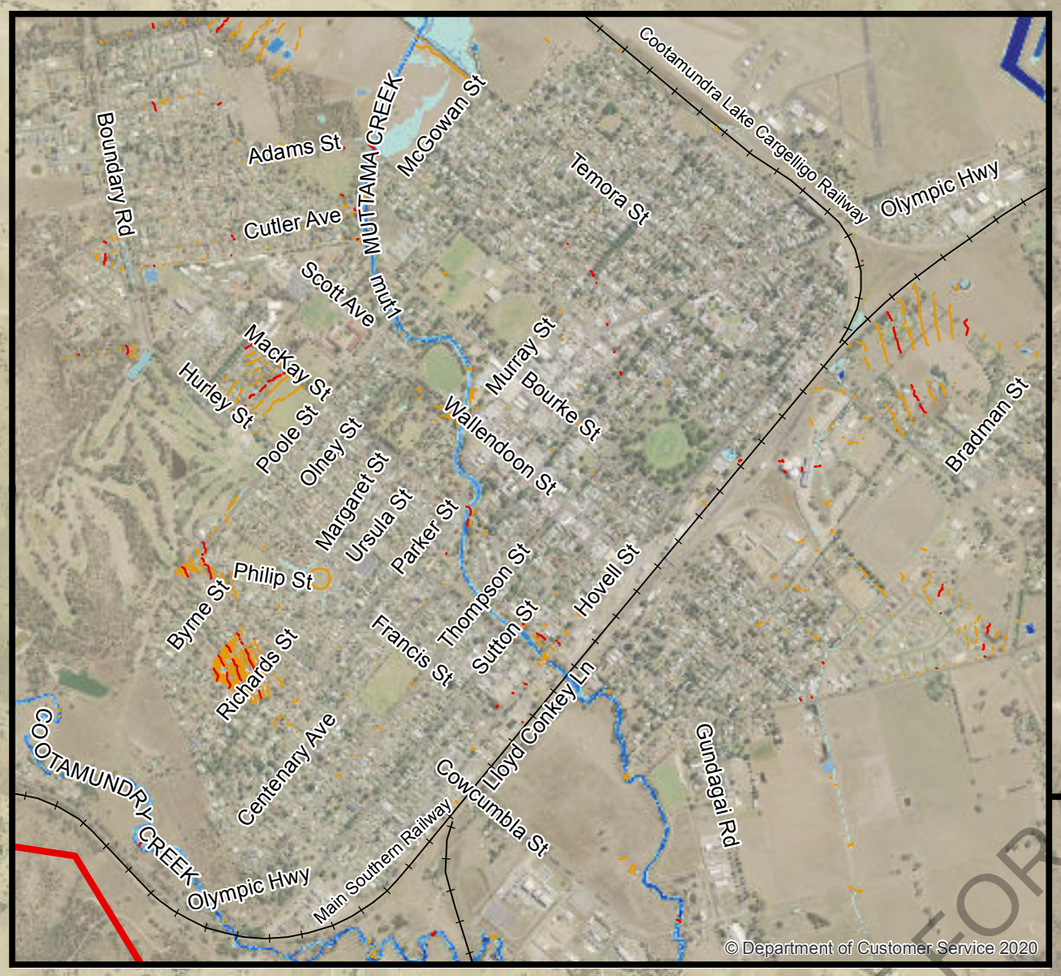
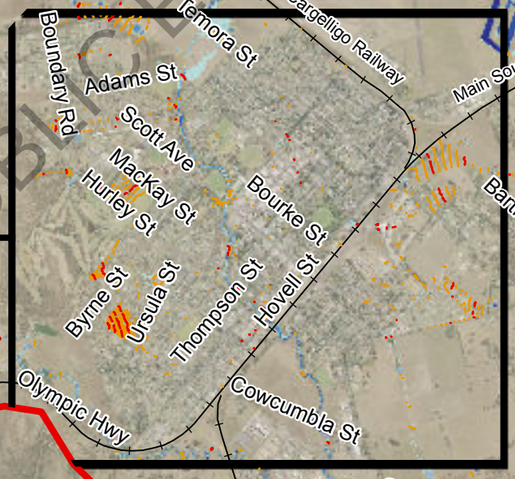
FIGURE A10
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
50% AEP DESIGN EVENT





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.

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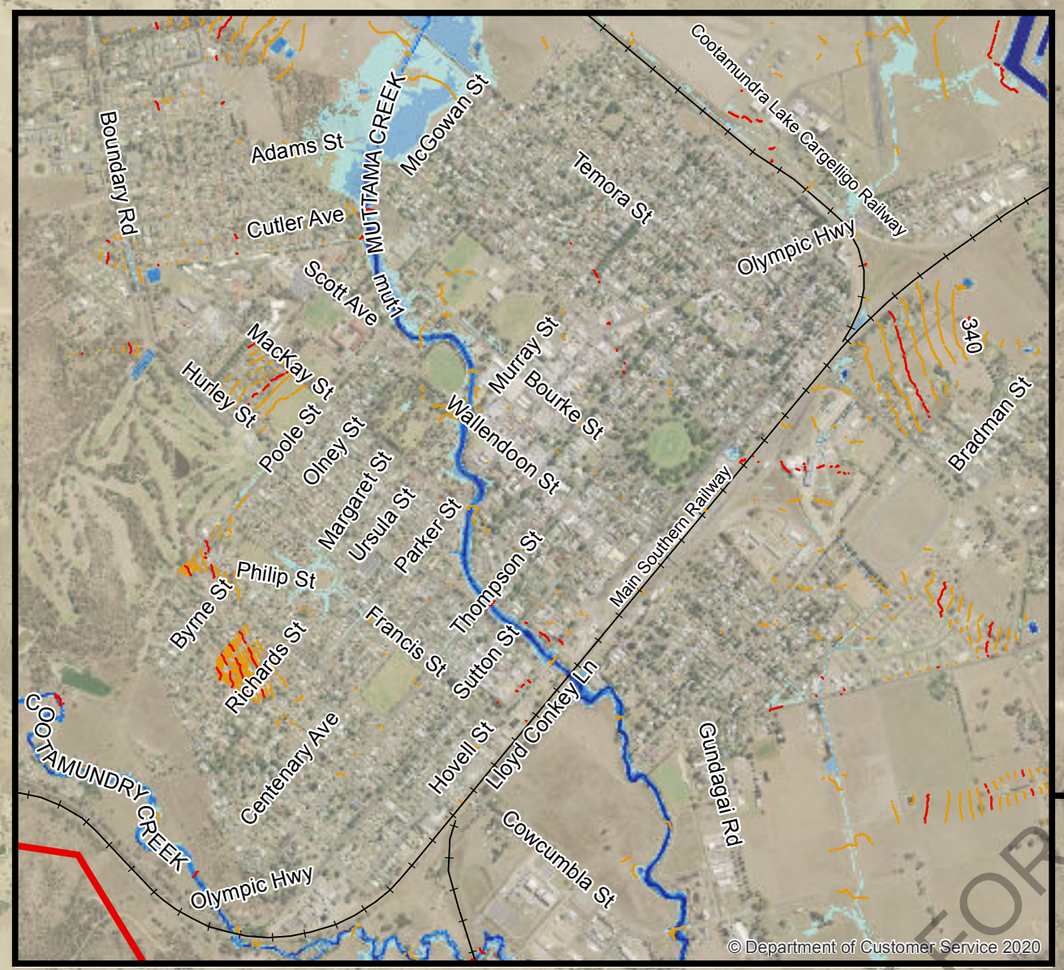
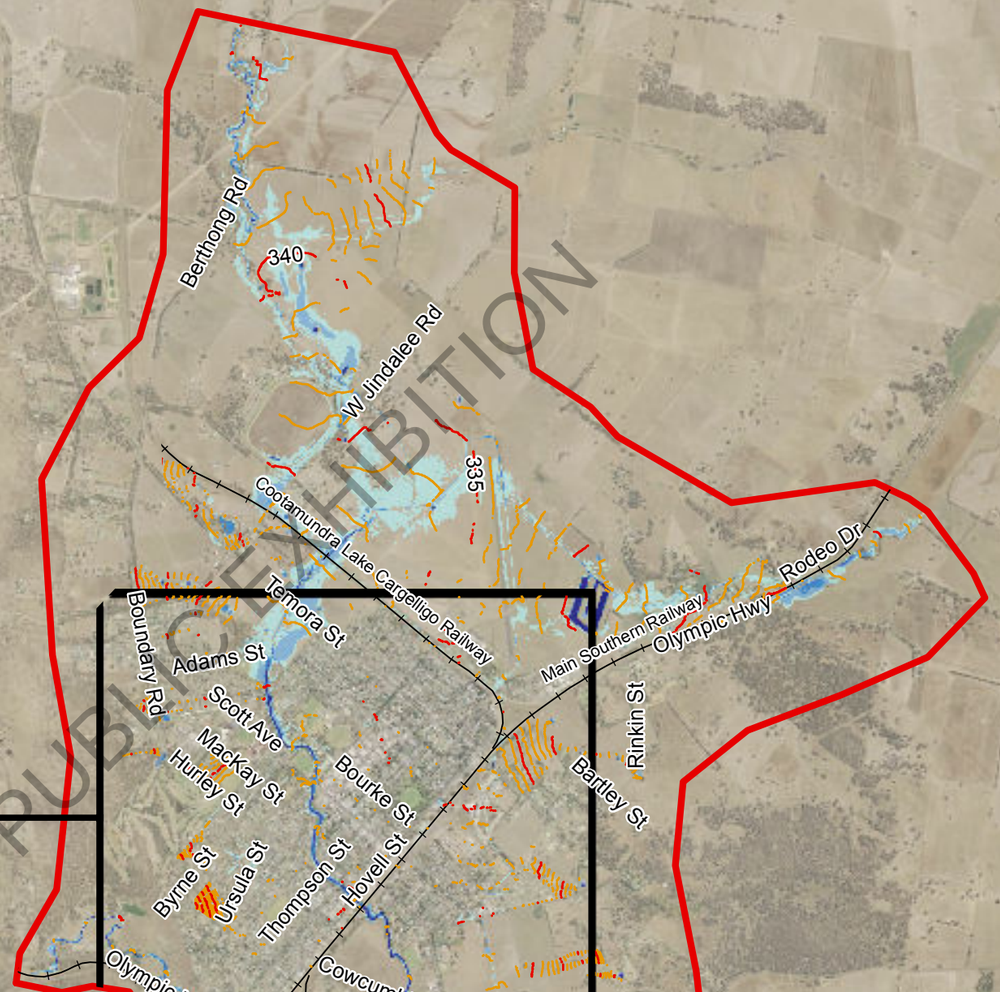
FIGURE A11

PEAK FLOOD DEPTHS AND LEVEL CONTOURS
20% AEP DESIGN EVENT





N

- Study Area
- Cootamundra Railways Lines
- Contours (5m interval)
- Contours (1m interval)

Peak Flood Depth (m)

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

0 1 2 4 km

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.

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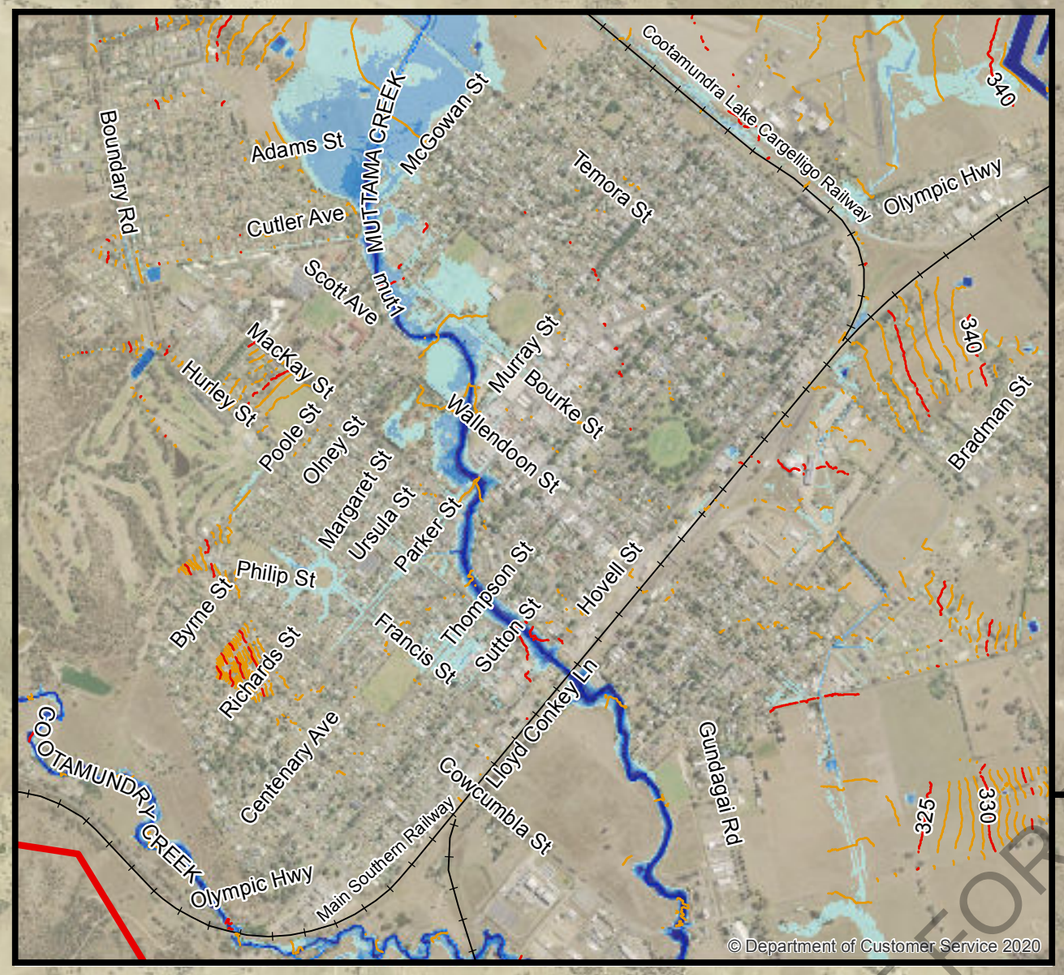
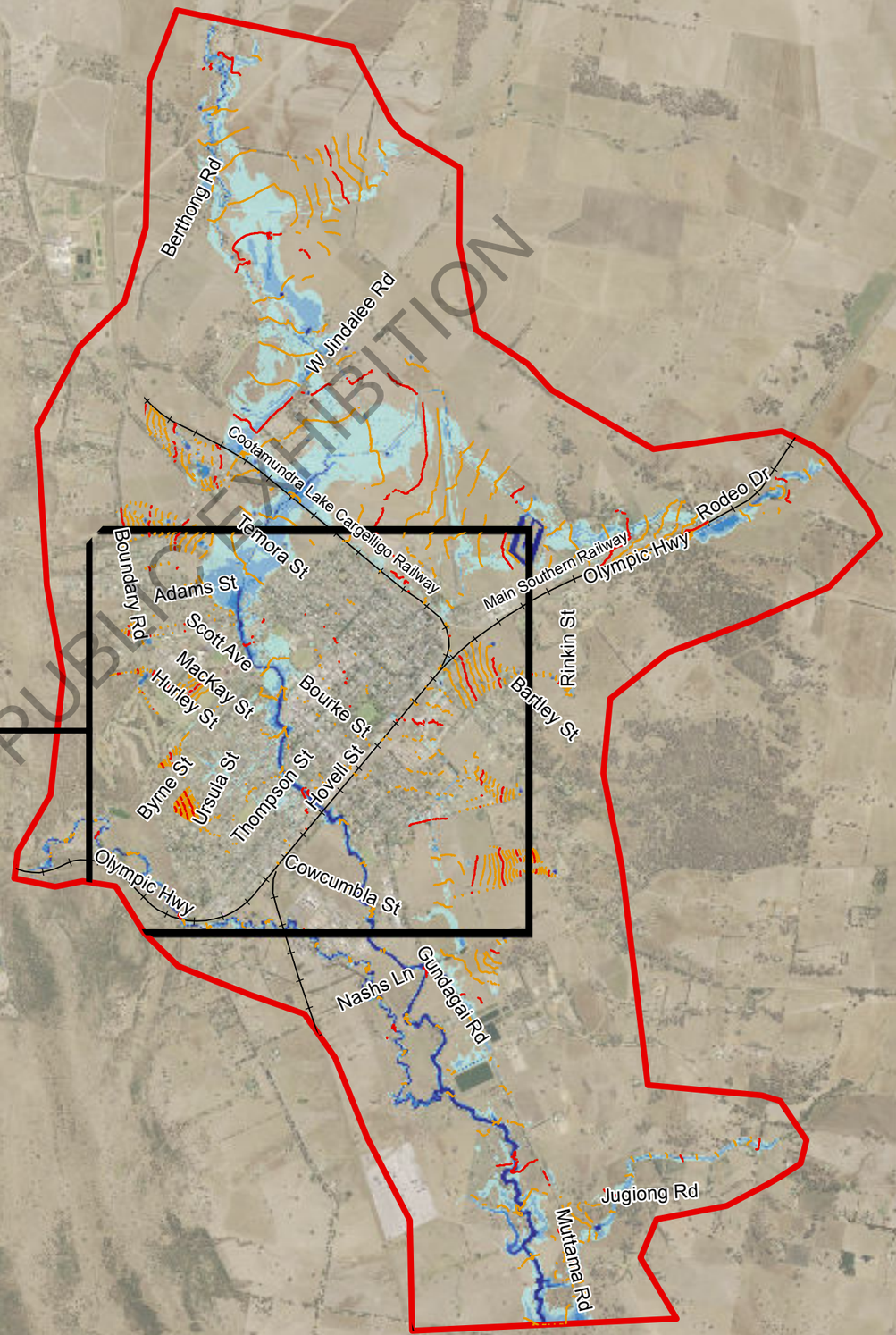
FIGURE A12

PEAK FLOOD DEPTHS AND LEVEL CONTOURS
10% AEP DESIGN EVENT





N

- Study Area
- Cootamundra Railways Lines
- Contours (5m interval)
- Contours (1m interval)

Peak Flood Depth (m)

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

0 1 2 4 km

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.

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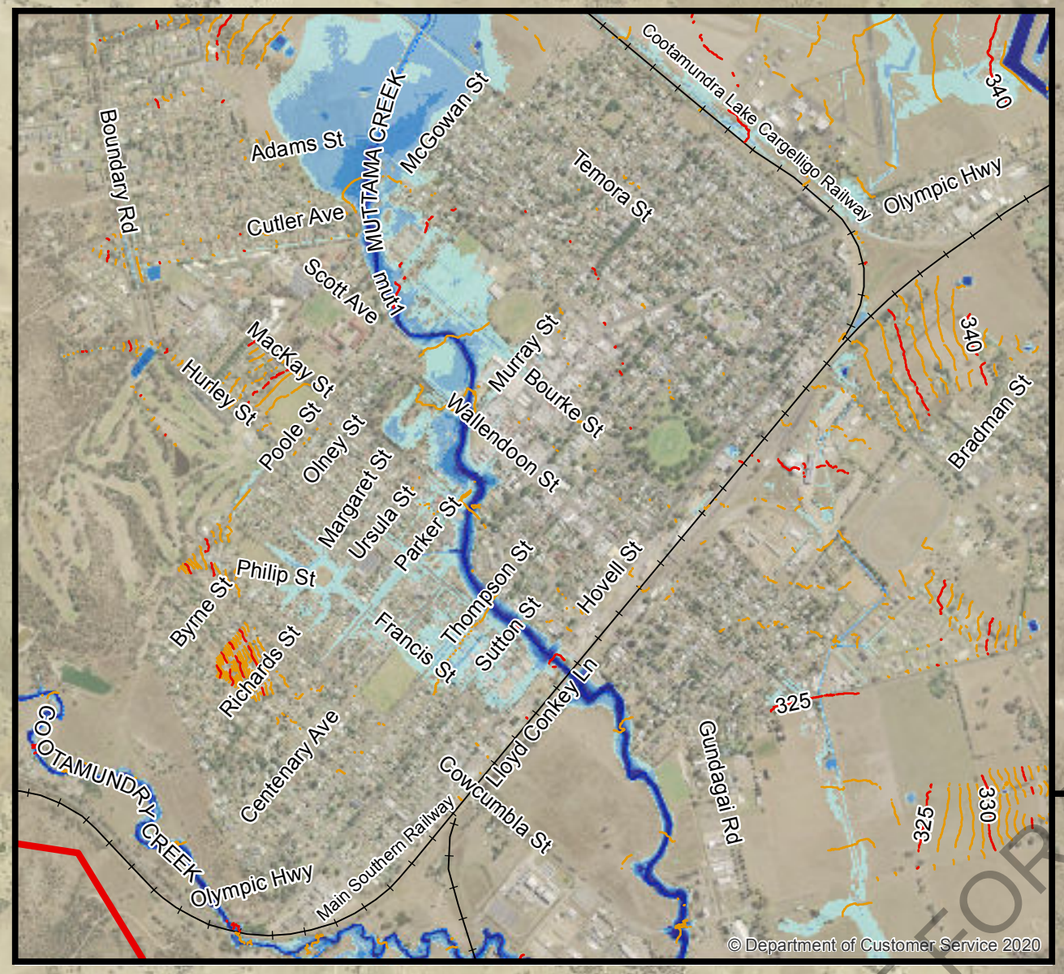
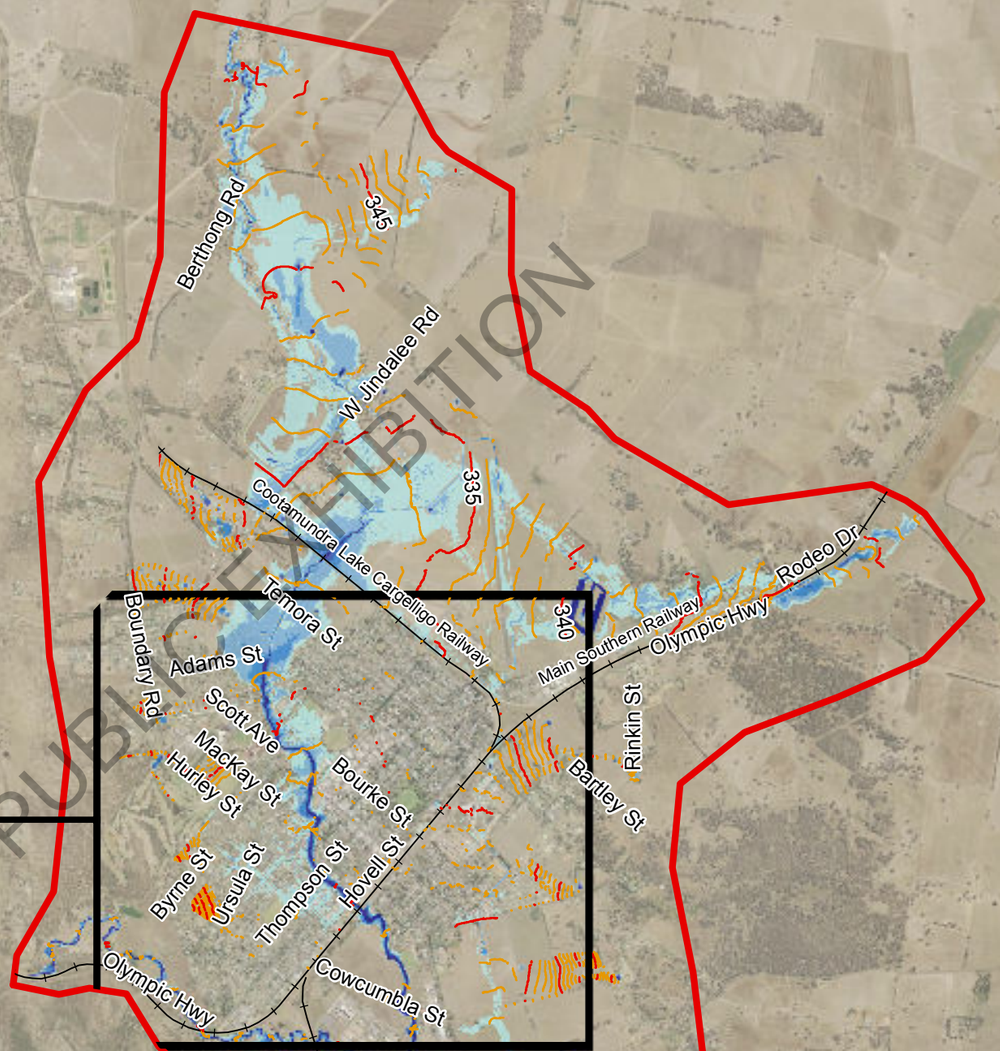
FIGURE A13

PEAK FLOOD DEPTHS AND LEVEL CONTOURS
5% AEP DESIGN EVENT





N

Study Area
Cootamundra Railways Lines
Contours (5m interval)
Contours (1m interval)

Peak Flood Depth (m)
0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

0 1 2 4 km

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.

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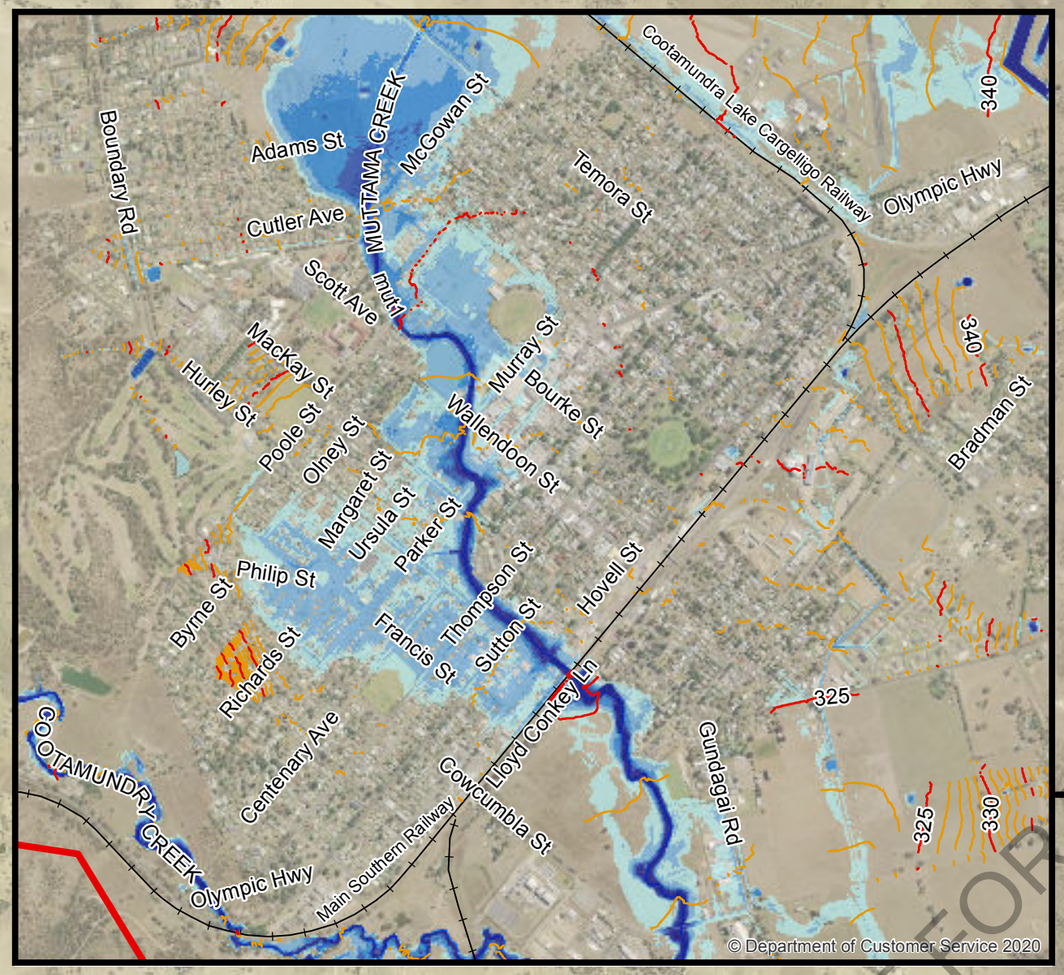
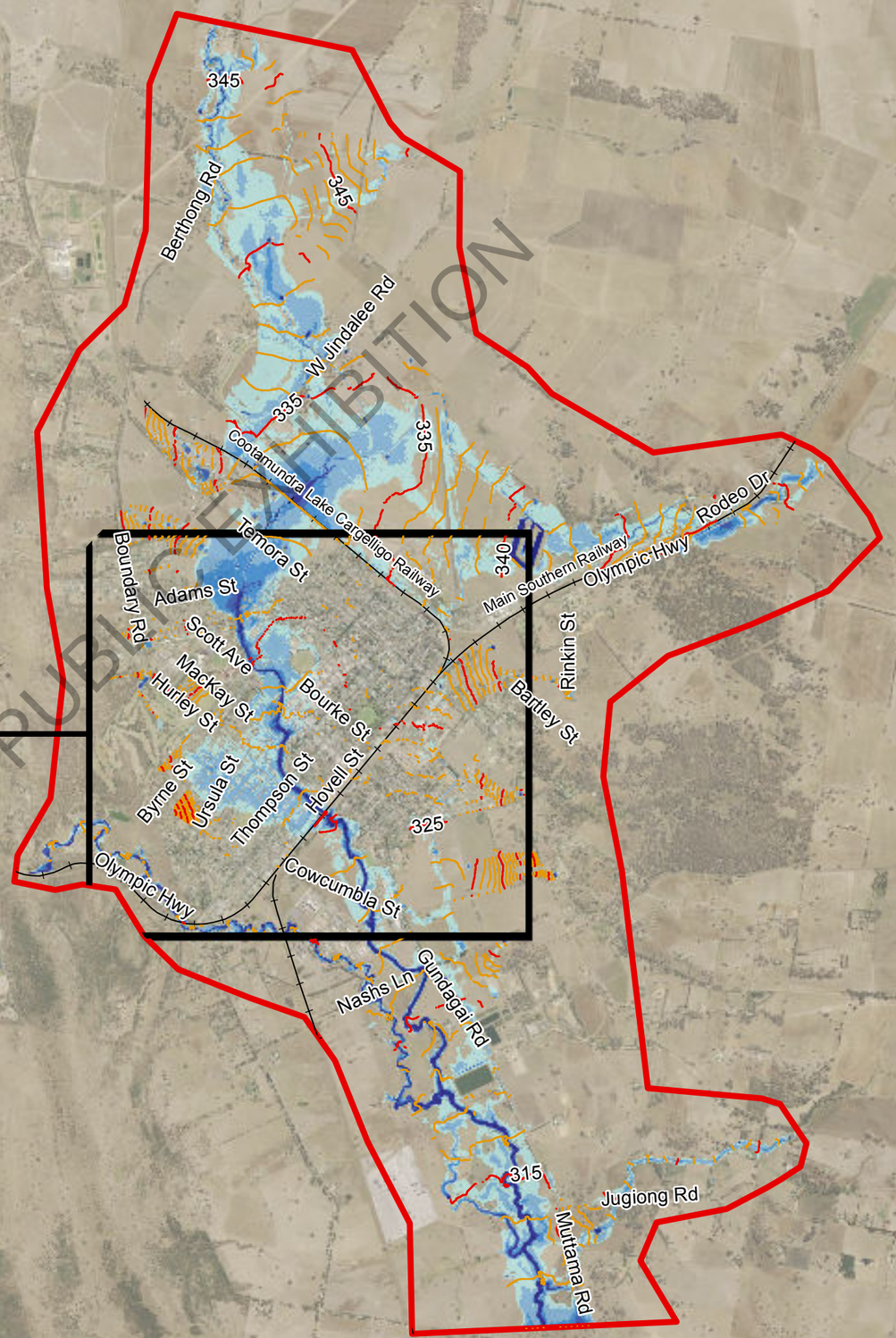
FIGURE A14
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
2% AEP DESIGN EVENT





N

- Study Area
- Cootamundra Railways Lines
- Contours (5m interval)
- Contours (1m interval)

Peak Flood Depth (m)

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

0 1 2 4 km

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.

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FIGURE A15

PEAK FLOOD DEPTHS AND LEVEL CONTOURS
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 Railways Lines
Contours (5m interval)
Contours (1m interval)

Peak Flood Depth (m)
0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

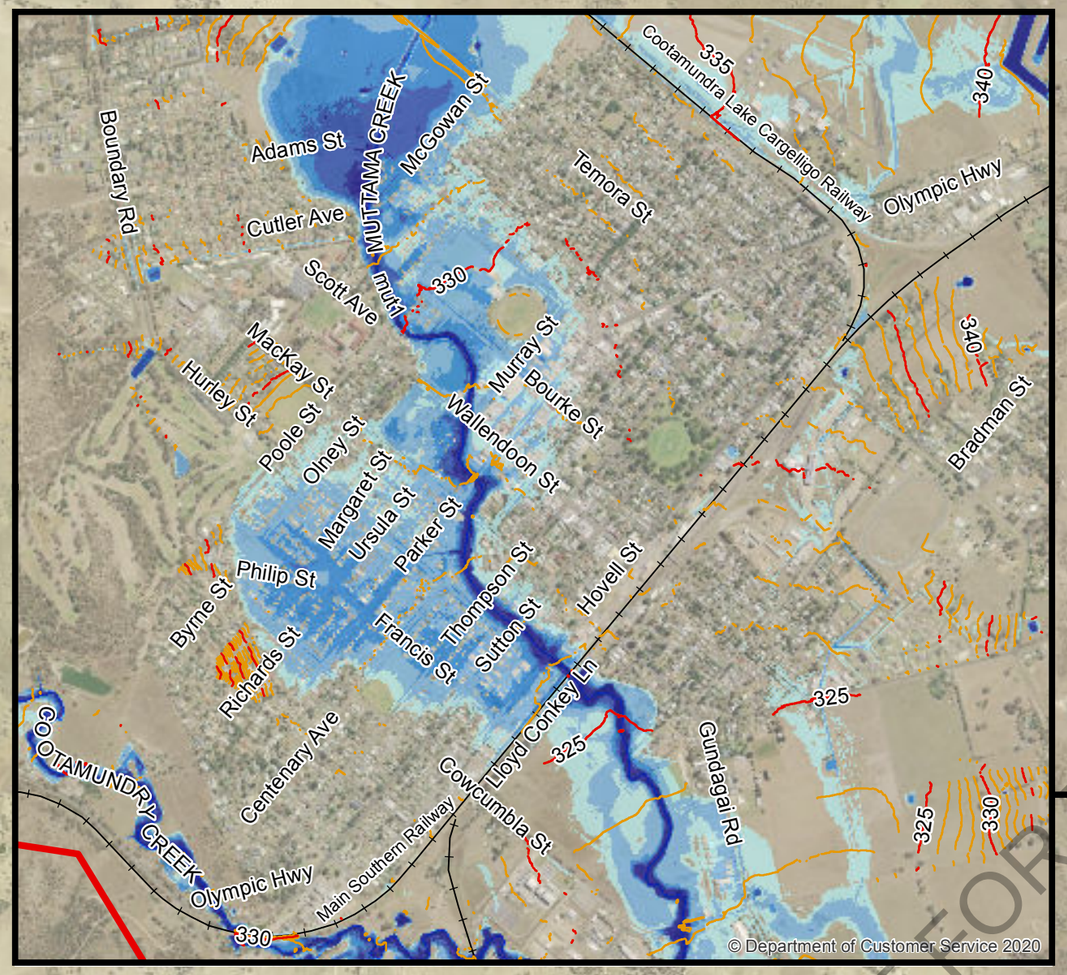
N

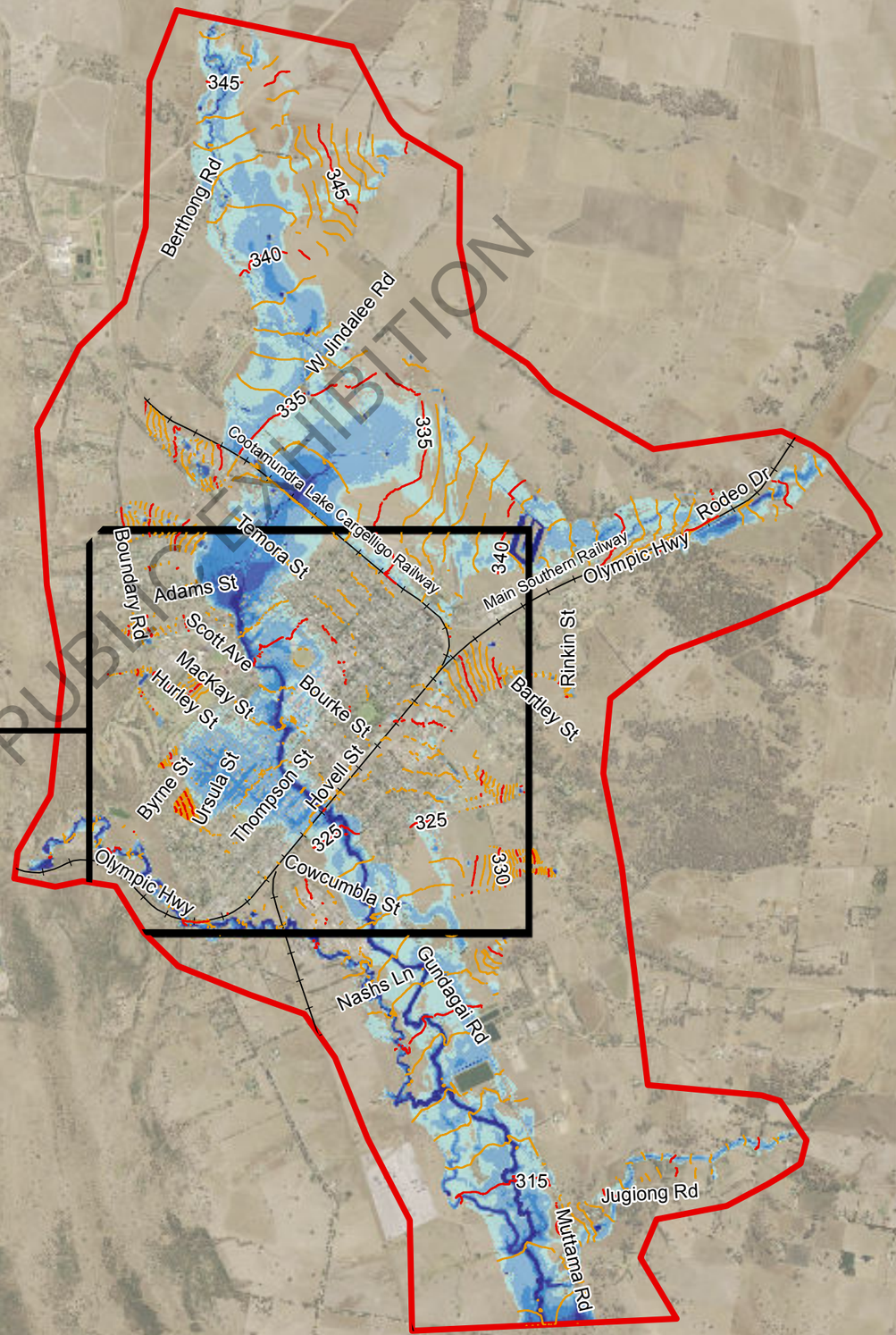
0 1 2 4 km

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\FigureA15_Peak_Flood_Depths_and_Level_Contours_1pctAEP.mxd

FIGURE A16

PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.5% AEP DESIGN EVENT





N

Study Area
Cootamundra Railways Lines
Contours (5m interval)
Contours (1m interval)

Peak Flood Depth (m)
0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

0 1 2 4 km

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.

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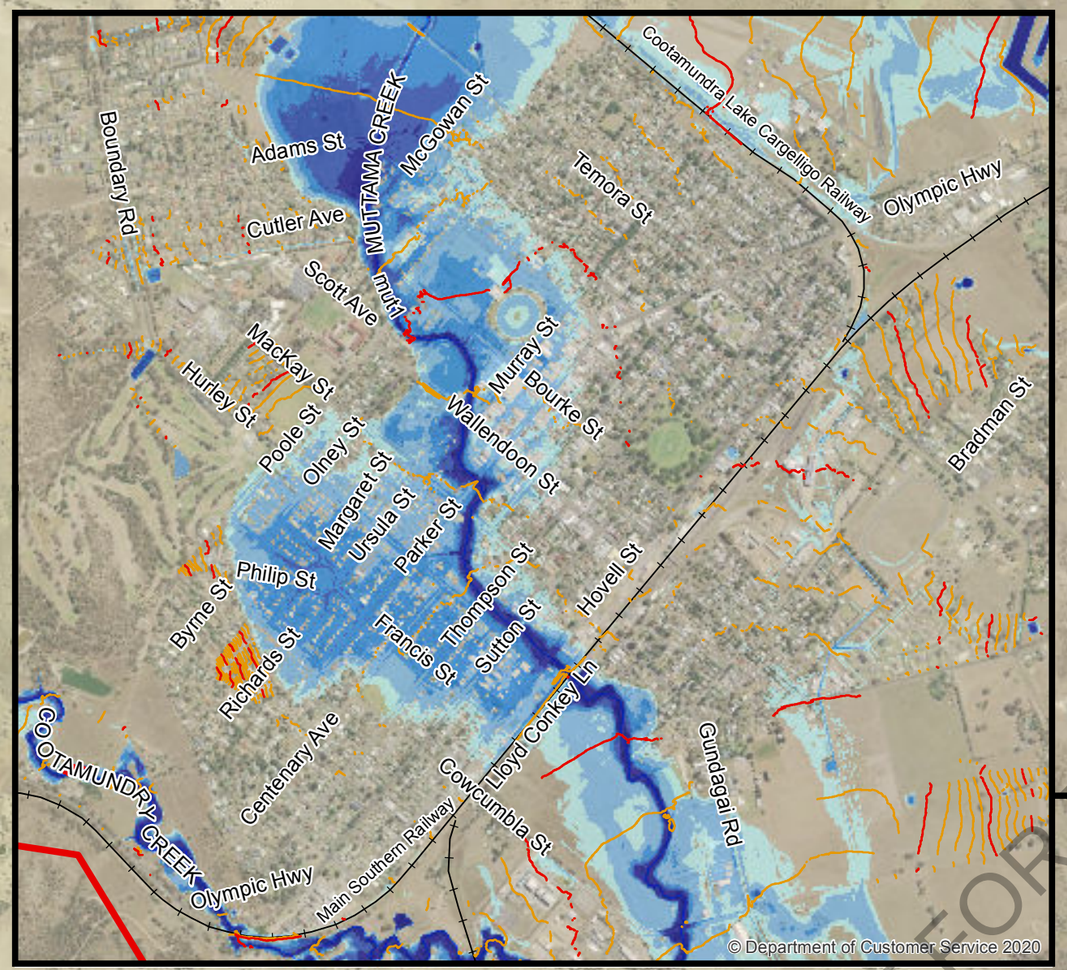
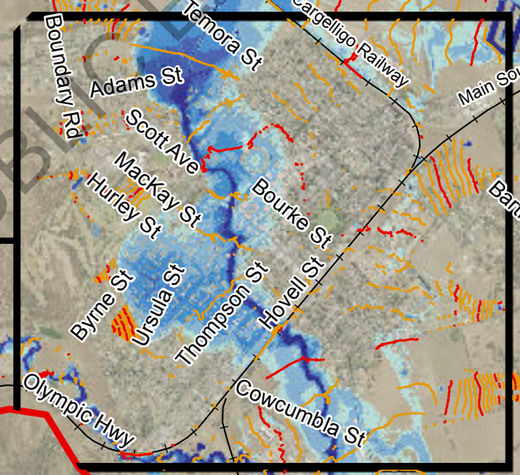
FIGURE A17

PEAK FLOOD DEPTHS AND LEVEL CONTOURS
0.2% AEP DESIGN EVENT





N

Study Area
Cootamundra Railways Lines
Contours (5m interval)
Contours (1m interval)

Peak Flood Depth (m)
0.2 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
> 2.0

0 1 2 4 km

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.

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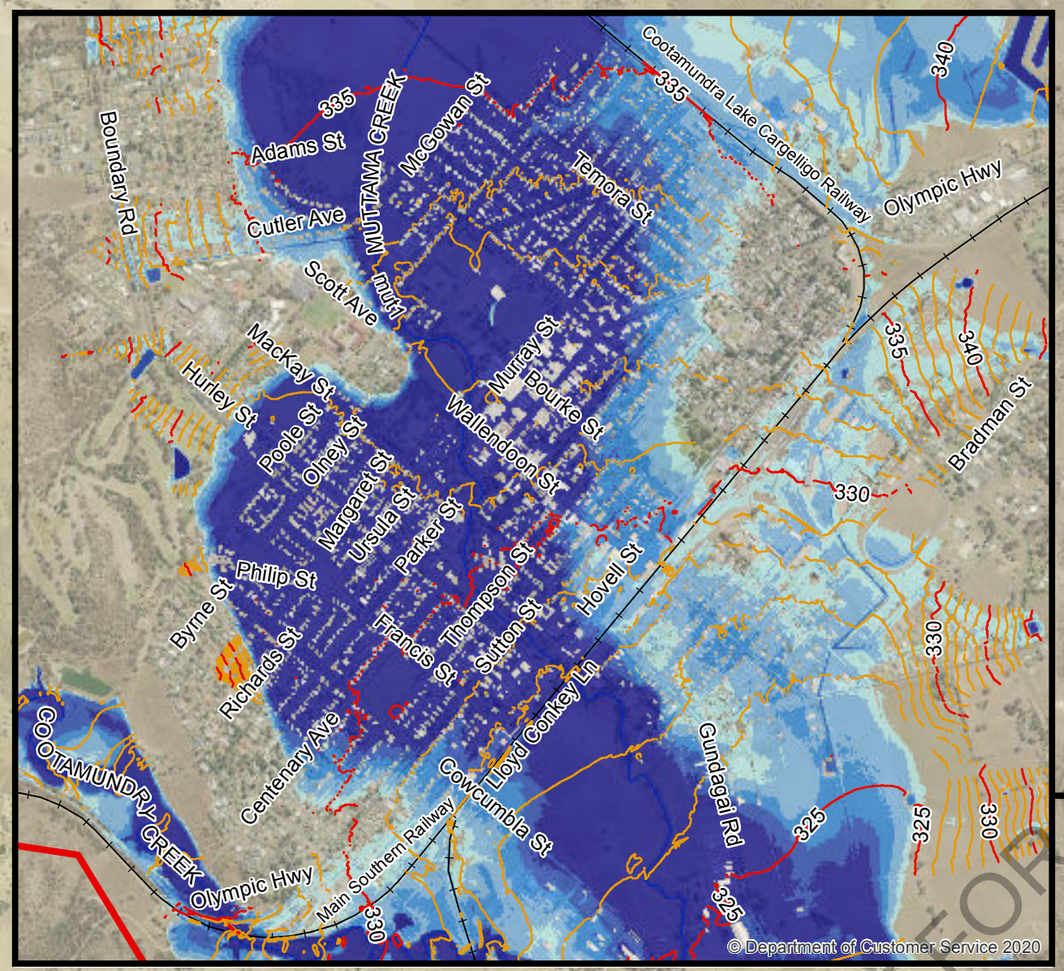
FIGURE A18
PEAK FLOOD DEPTHS AND LEVEL CONTOURS
PMF DESIGN EVENT



N

- Study Area
- Cootamundra Railways Lines
- Contours (5m interval)
- Contours (1m interval)

Peak Flood Depth (m)

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

0 1 2 4 km

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.

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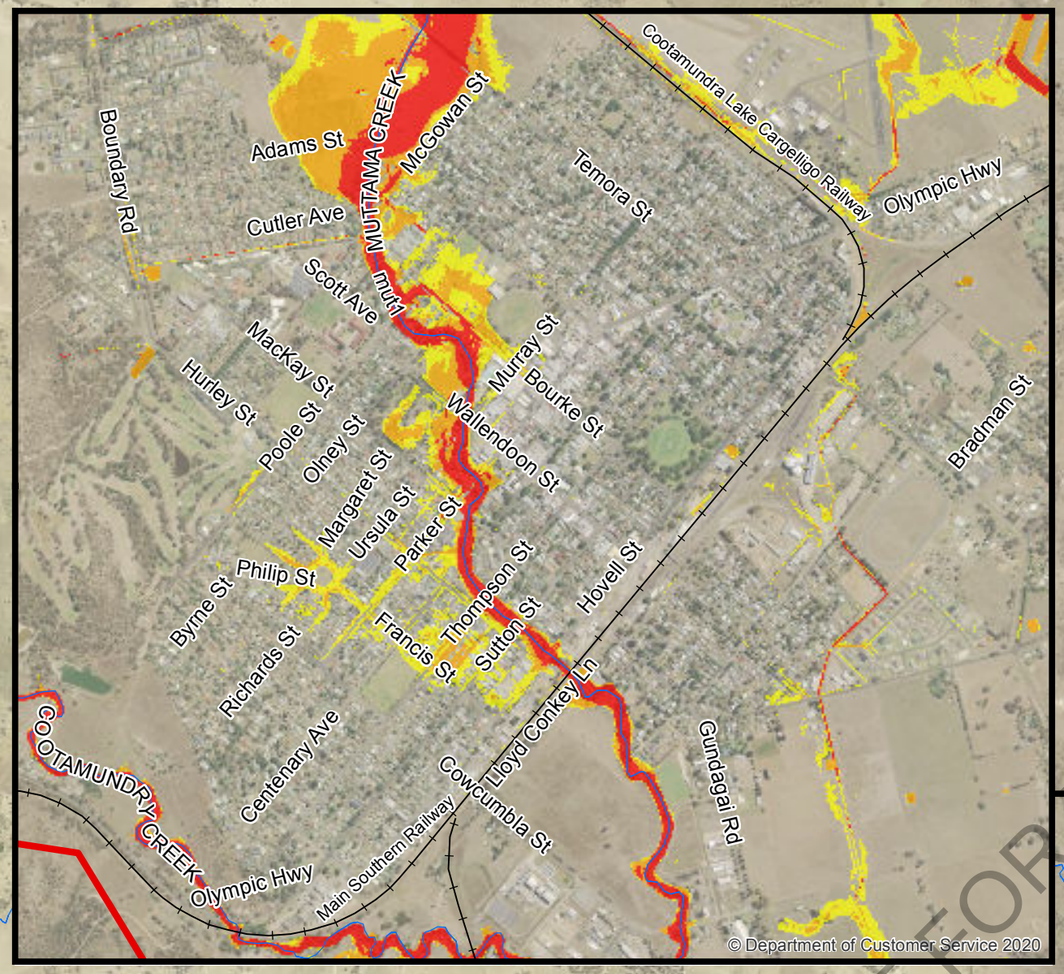
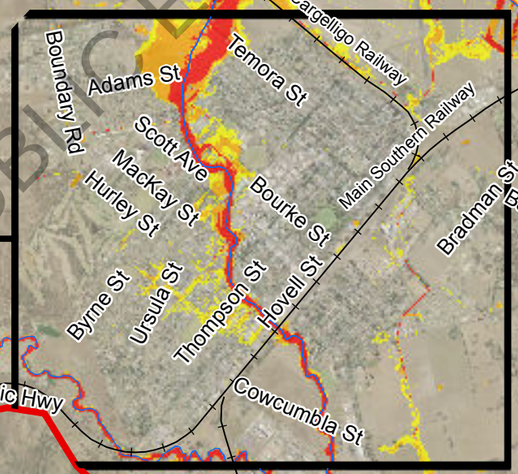
FIGURE A19
HYDRAULIC CATEGORIES
5% AEP DESIGN EVENT





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.

N

Study Area
Cootamundra Railway Lines

Hydraulic Categorisation
Floodway
Flood Storage
Flood Fringe

0 1 2 4 km

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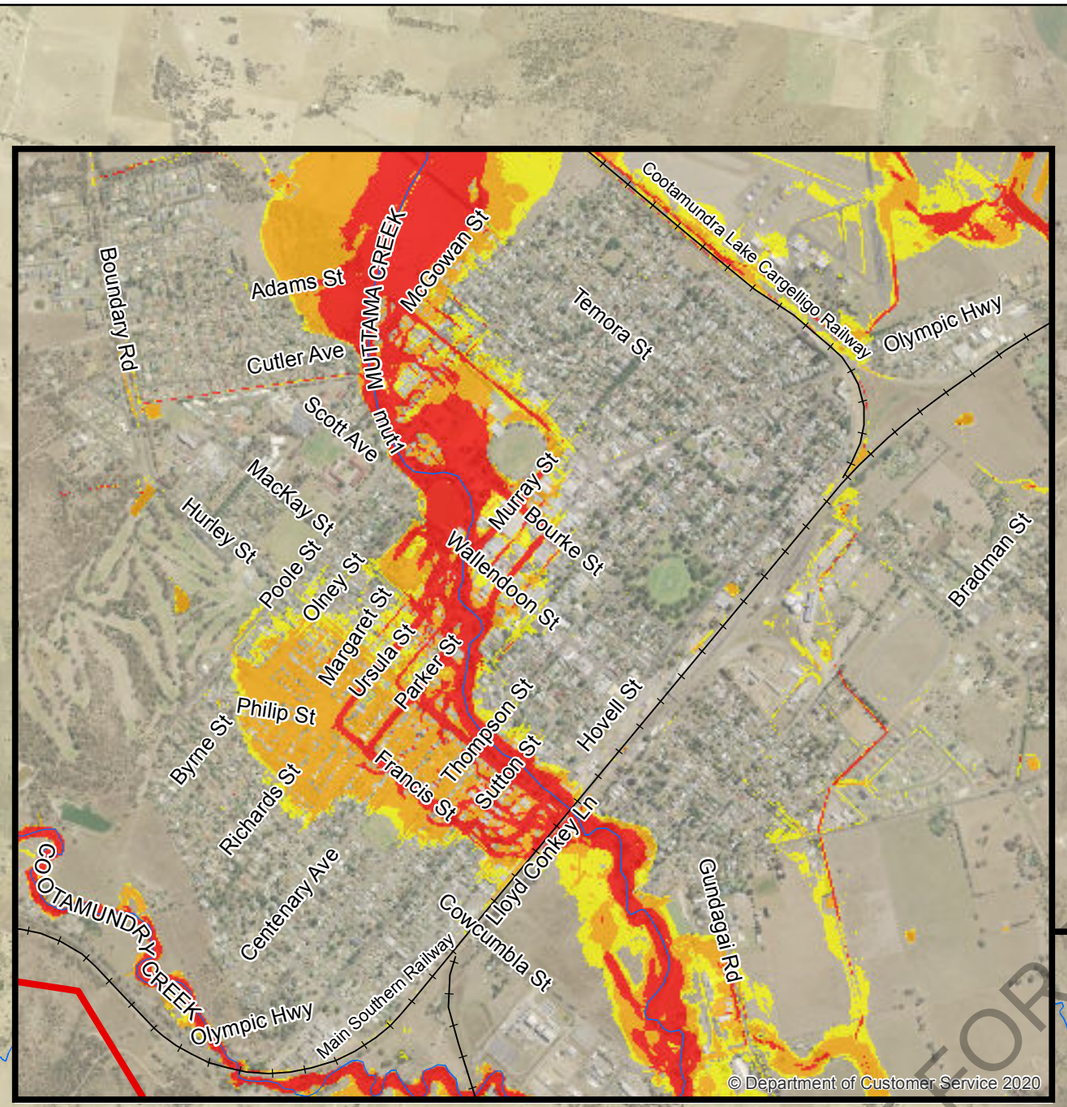
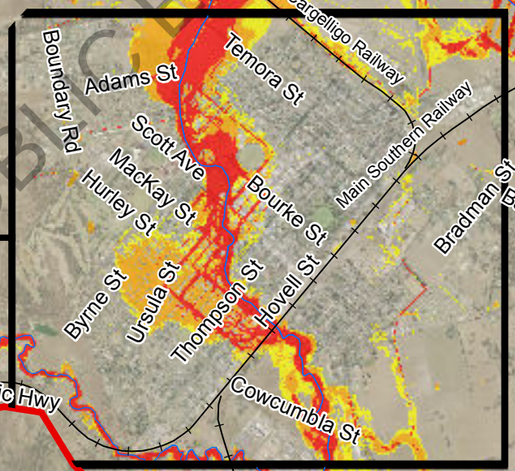
FIGURE A20
HYDRAULIC CATEGORIES
1% AEP DESIGN EVENT





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.

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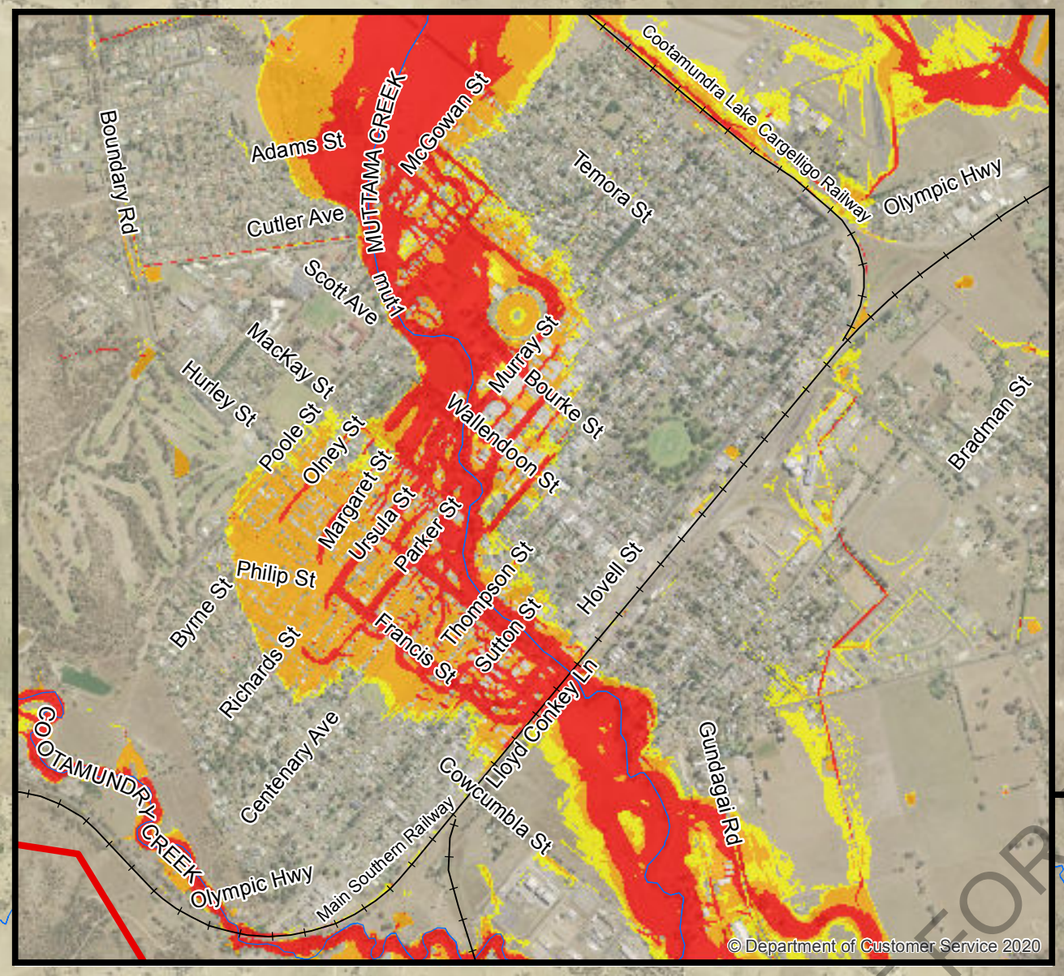
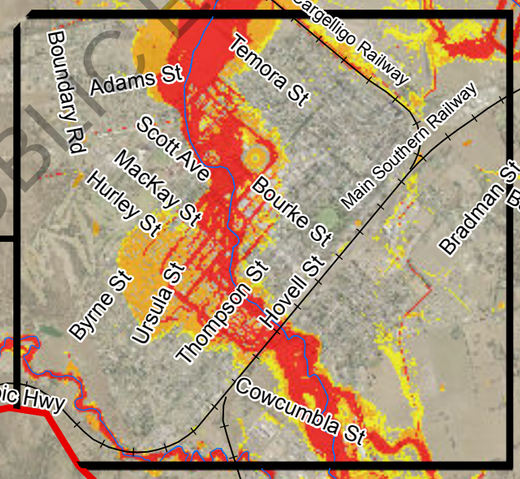
FIGURE A21
HYDRAULIC CATEGORIES
0.2% AEP DESIGN EVENT





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.

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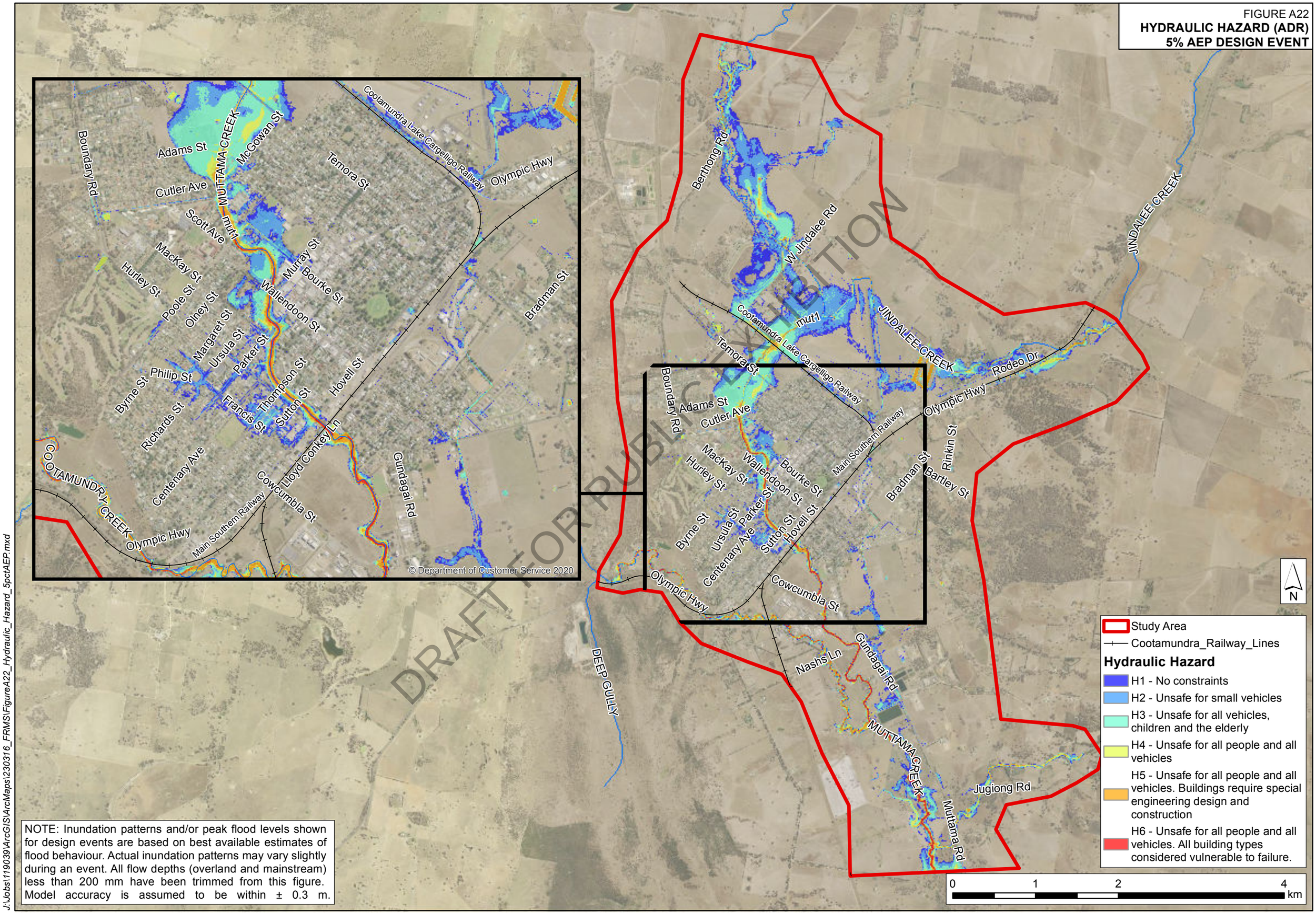
FIGURE A22
HYDRAULIC HAZARD (ADR)
5% AEP DESIGN EVENT



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.

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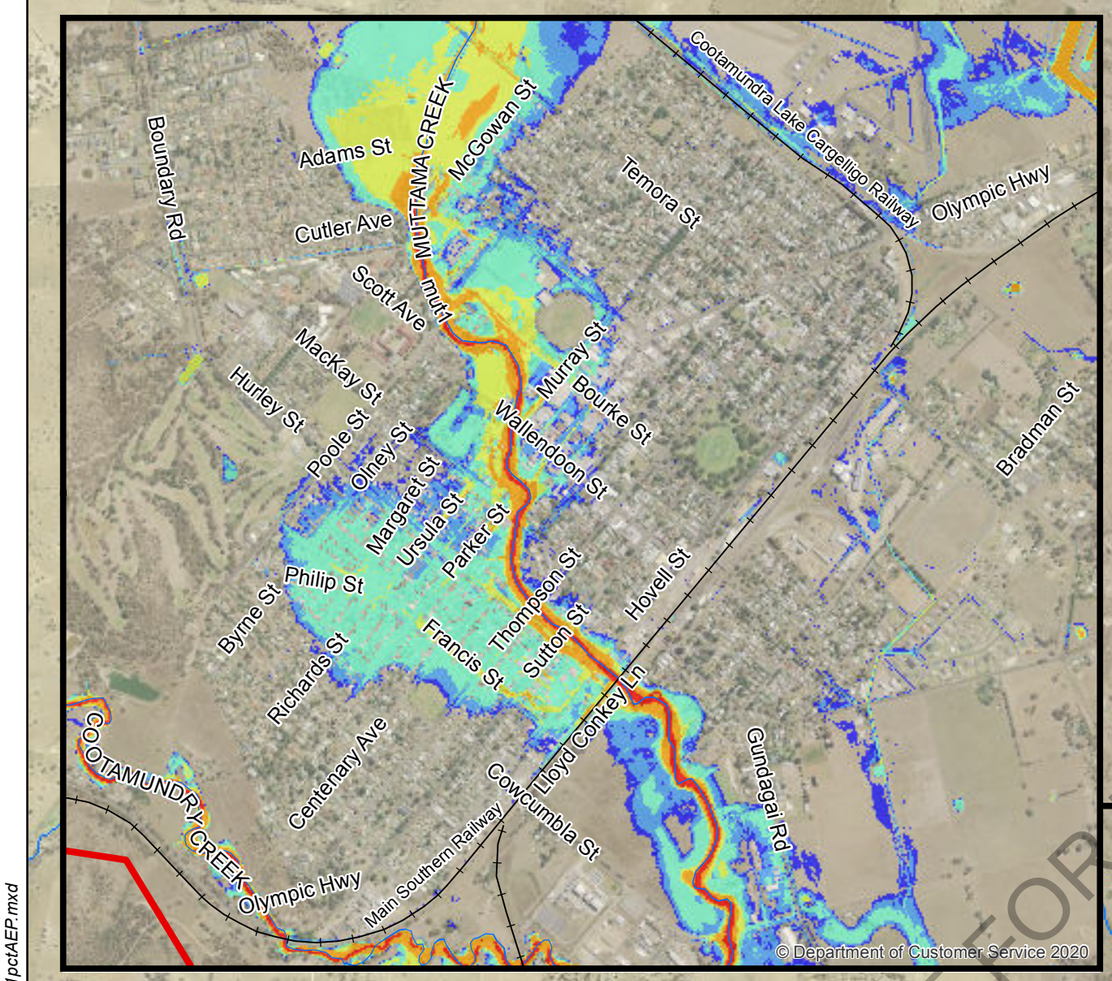
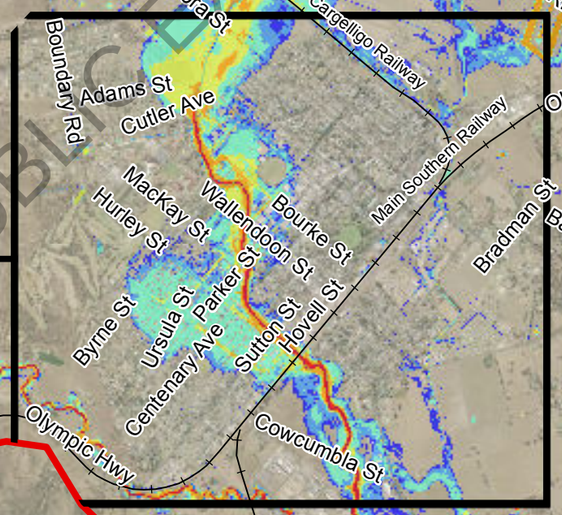
FIGURE A23
HYDRAULIC HAZARD (ADR)
1% AEP DESIGN EVENT





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.

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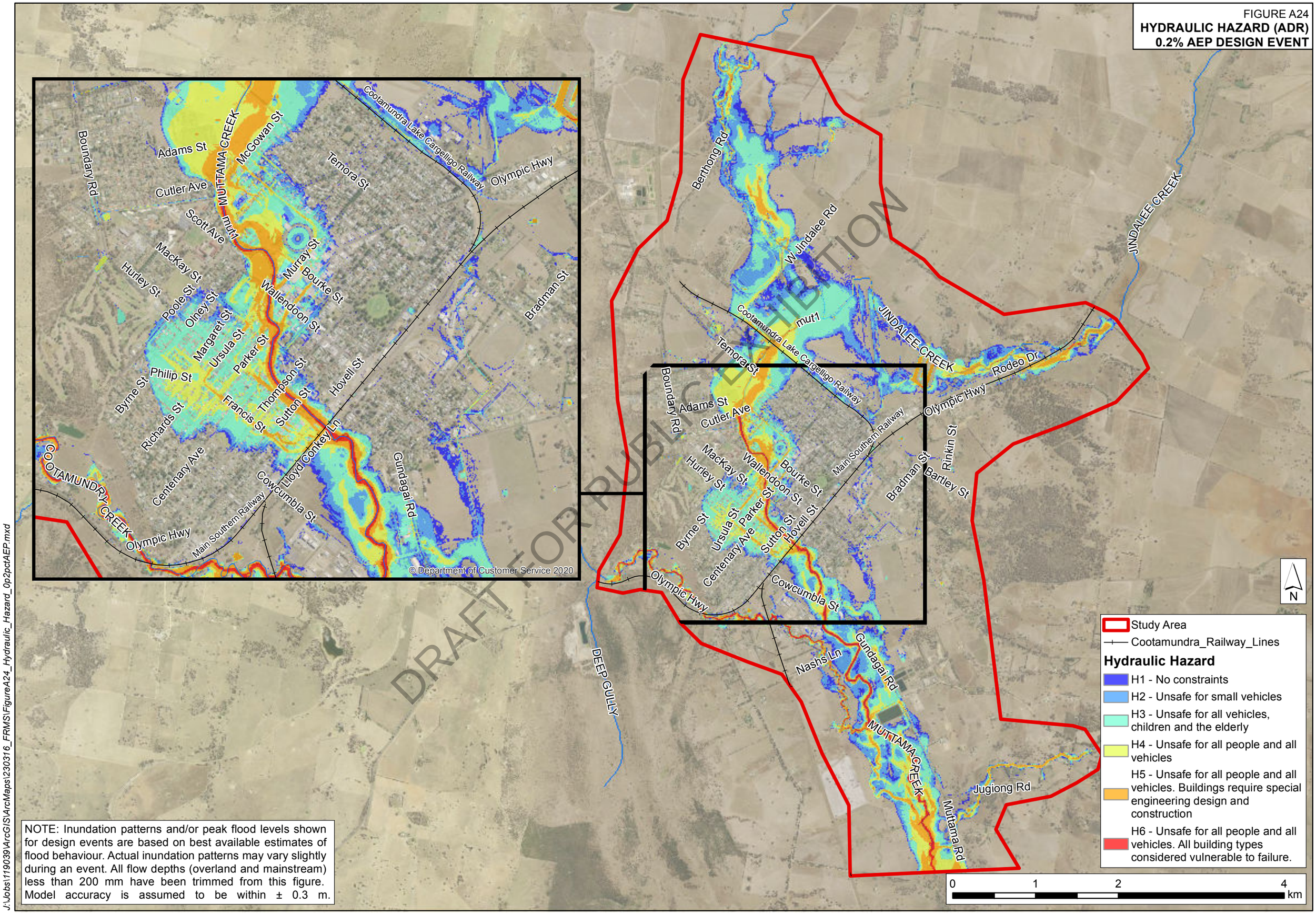
FIGURE A24
HYDRAULIC HAZARD (ADR)
0.2% AEP DESIGN EVENT



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.

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FIGURE A25

FLOOD EMERGENCY RESPONSE CLASSIFICATION (FERC)

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

0 0.5 1 2 km

N

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FIGURE A26
ABOVE FLOOD FLOOR AFFECTATION
FIRST EVENT FLOODED

NOTE: The property affectation 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.

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

N

0 0.5 1 2 km

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FIGURE A27
FLOODING HOTSPOTS

Adam Street
Cutler Ave
Cutler Avenue
Poole St
Cootamundra West
CBD
Thompson St
Adams St
Boundary Rd
Cutler Ave
Scott Ave
Temora St
Olympic Hwy
mut1
Murray St
Bourke St
Hurley St
Poole St
Olney St
MacKay St
Wallendoon St
MUTTAMA CREEK
Margaret St
Ursula St
Parker St
Philip St
Southie Cir
Meagher St
Byrne St
Francis St
Thompson St
Sutton St
Hovell St
Richards St
Lawrence St
Centenary Ave
Cowcumbla St
Lloyd Conkey Ln
Main Southern Railway
Gundagai Rd
© Department of Customer Service 2020

Berthong Rd
W Jindalee Rd
JINDALEE CREEK
Coolamundra Lake Cargelligo Railway
Rodeo Dr
Rinkin St
Bradman St
Bartley St
Nashs Ln
DEEP GULLY
Jugiong Rd
Muttama Rd

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 reviewof 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.

N

0 1 2 4 km

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FIGURE A28
FUTURE REDEVELOPMENT AREAS

Cootamundra Lake Cargelligo Railway

MUTTAMA CREEK mut1

N

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

0 1 2 4 km

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FIGURE A29
FLOOD PLANNING AREA

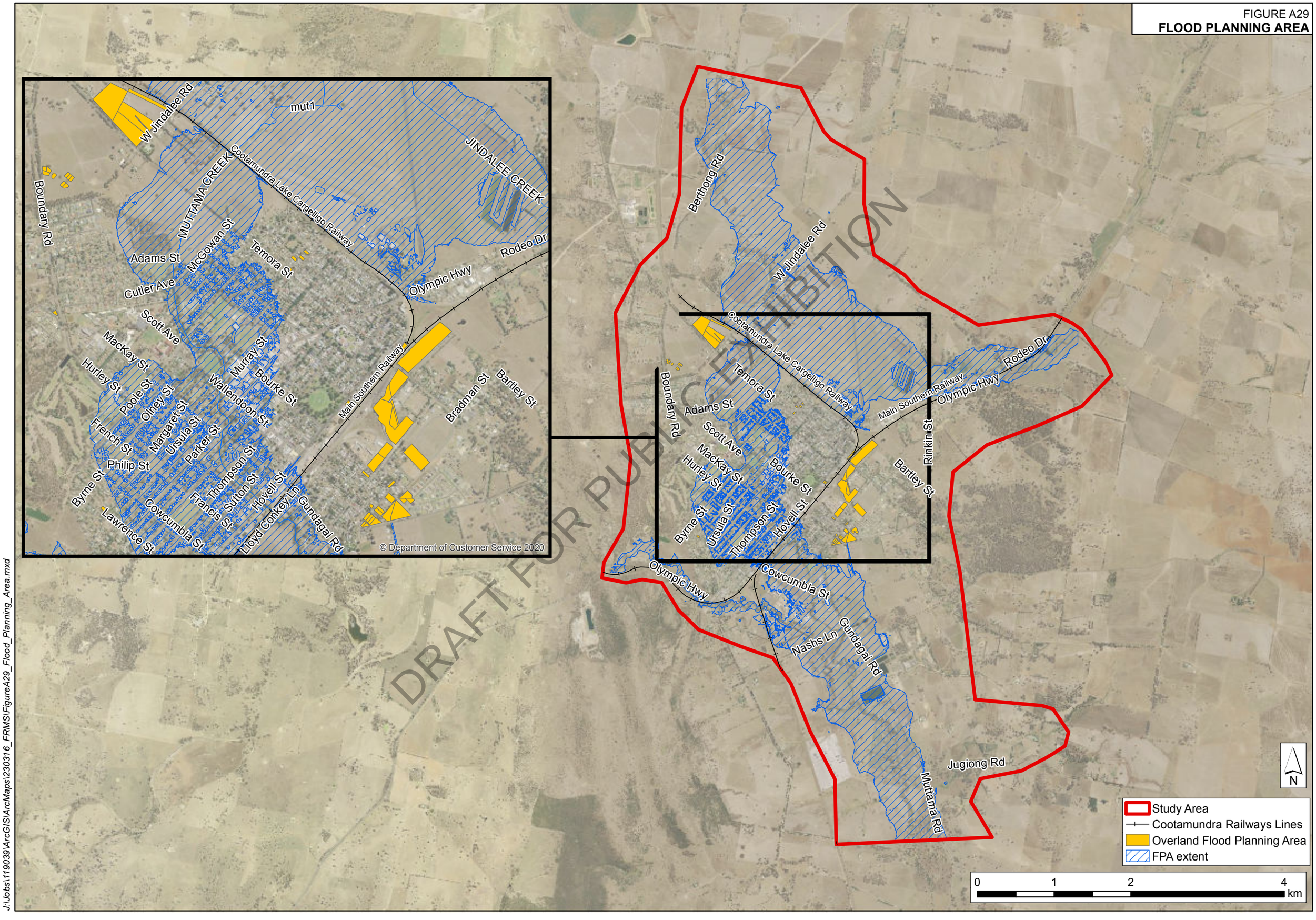

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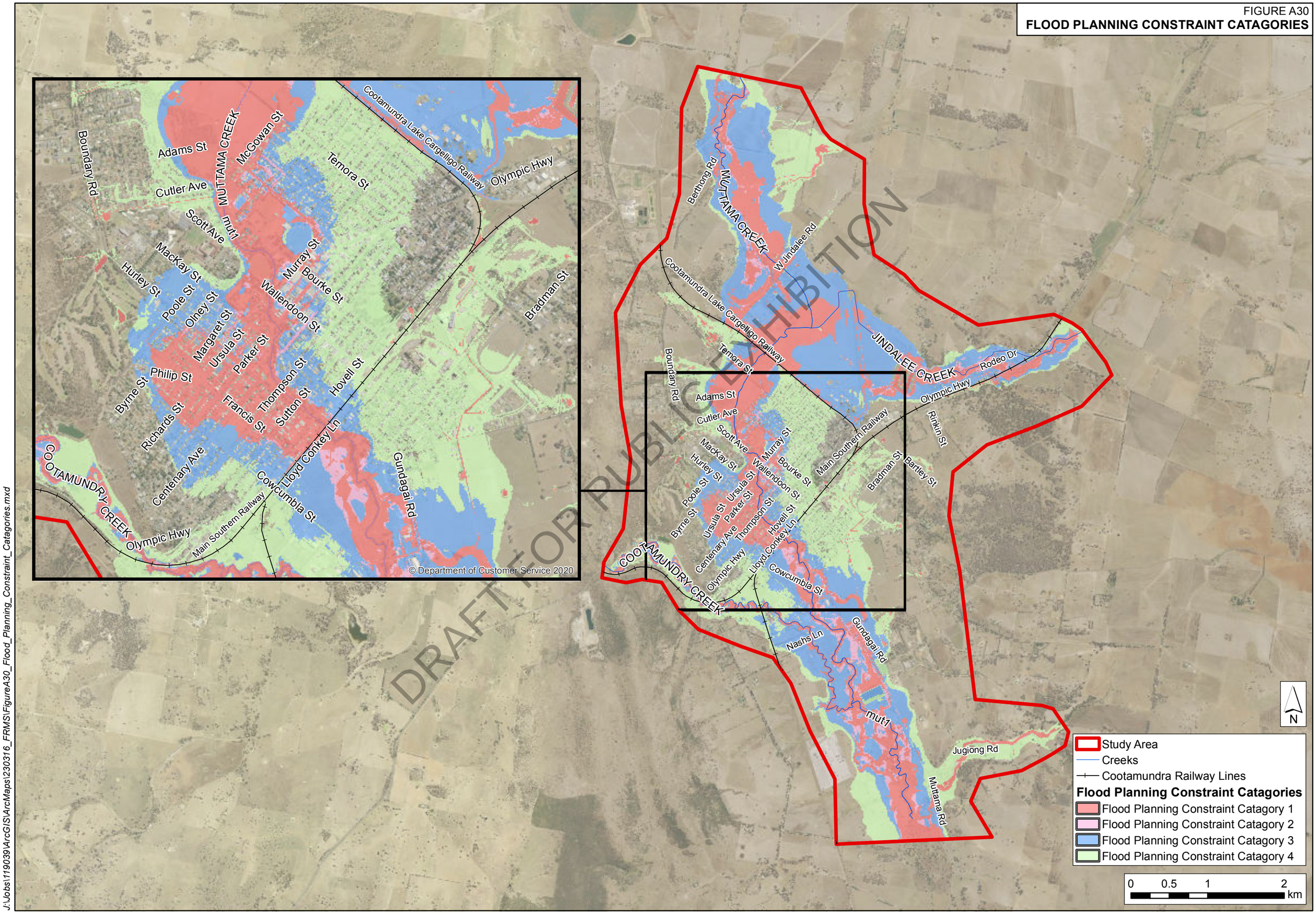
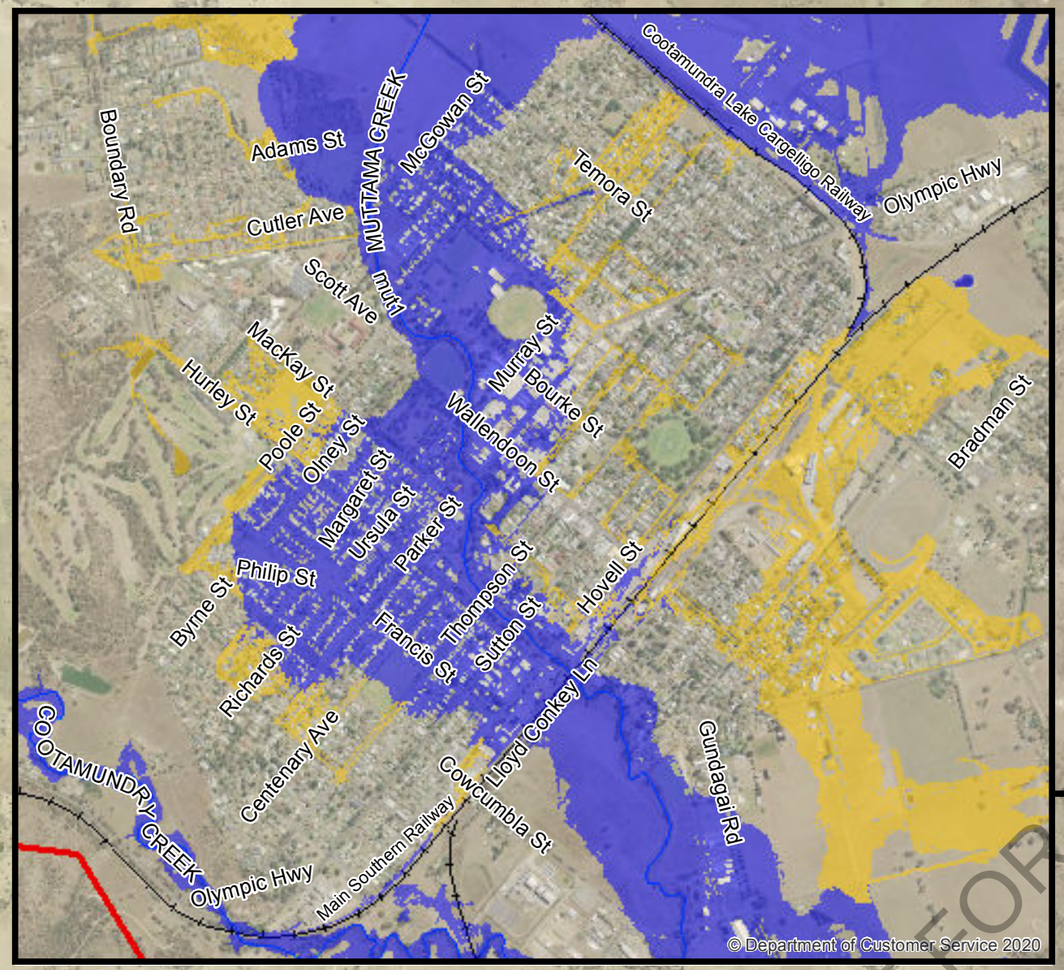
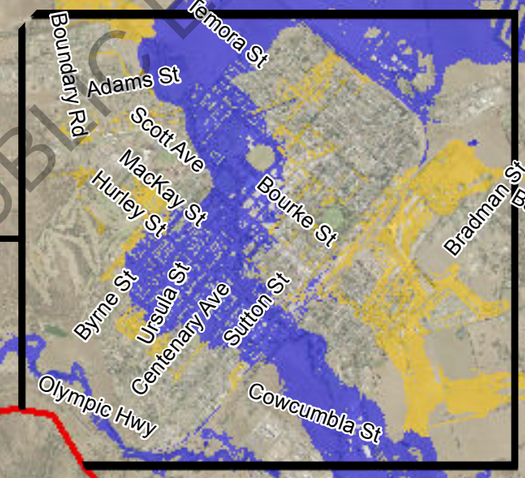
FIGURE A30
FLOOD PLANNING CONSTRAINT CATAGORIES



J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\FigureA30_Flood_Planning_Constraint_Catagories.mxd

FIGURE A31
MAINSTREAM AND OVERLAND FLOODING AREAS

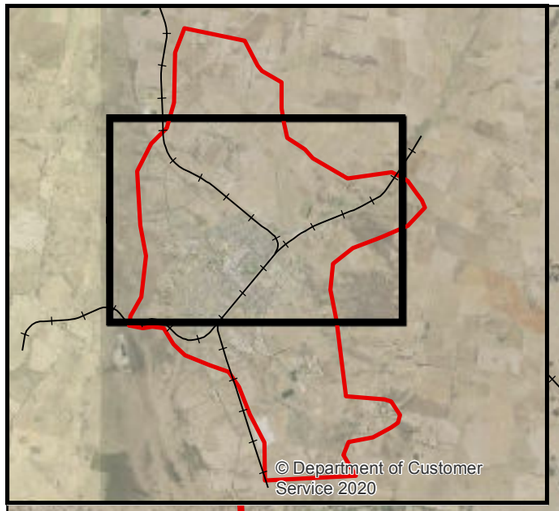




NOTE: The categorisation of mainstream and overland flooding areas has been defined by modelled flood behaviour in the 1% AEP design event. The categorisation may vary for larger events or for real flood events, which can differ from design flood events in the timing and flood behaviour observed

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\FigureA31_Mainstream_and_Overland_flooding_areas.mxd

FIGURE B1
INVESTIGATED OPTIONS OVERVIEW



TURF CLUB RETENTION BASIN

AIRPORT BASIN

SWALE

JINDALEE CREEK LEVEE

MCGOWEN STREET LEVEE

ADAMS ST UPGRADE

MUTTAMA CK WIDENING

CUTLER AVENUE UPGRADE

EAST CBD LEVEE

WEST CBD LEVEE

DRAINAGE UPGRADE

HOVELL ST UPGRADE

W Jindalee Rd
Cootamundra Lake Cargelligo Railway
Boundary Rd
Temora
McGowan St
Rodeo Dr
Olympic Hwy
Main Southern Railway
Cutler Ave
Adams St
Scott Ave
Murray
Bourke St
Wallendoon St
Hurley St
Poole St
Olney St
MacKay St
Margaret St
Ursula St
Parker St
French St
Philip St
Thompson St
Sutton St
Hovell St
Francis St
Lawrence St
Centenary Ave
Cowcumbla St
Lloyd Conkey Ln
Gundagai Rd
Rinkin St
Bradman St
Bartley St

N

0 0.5 1 2 km

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FIGURE B2

CHANGE IN PEAK FLOOD LEVEL

OPTION FM01 - RETENTION BASIN AROUND COOTAMUNDRA TURF CLUB

5% AEP EVENT

Stockinbingal Rd
Berthong Rd
Jindalee Rd
JINDALEE CREEK
Cootamundra Lake Cargelligo Railway
Suttons Ln
Boundary Rd
Temora St
Olympic Hwy
Rodeo Dr
Bartley St
Bourke St
Hurley St
Cowcumbla St
Main Southern Railway
Olympic Hwy
Back Brawlin Rd
DEEP GULLY
Cootamundra Tumut Railway
Gundagai Rd
Jugiong Rd
© Department of Customer Service 2020

Cootamundra Lake Cargelligo Railway
Main Southern Railway
Main Southern Railway

N

Study Area
Properties
Turf Club Basin
Cootamundra Railways Lines

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 0.5 1 2 km

J:\Jobs\1190391\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB02_Peak_Flood_Level_Impacts_5pctAEP_OptionFM01.mxd

FIGURE B3
CHANGE IN PEAK FLOOD LEVEL
OPTION FM01 - RETENTION BASIN AROUND COOTAMUNDRA TURF CLUB
1% AEP EVENT

Stockinbingal Rd
Berthong Rd
Jindalee Rd
JINDALEE CREEK
Cootamundra Lake Cargelligo Railway
Suttons Ln
Boundary Rd
Temora St
Olympic Hwy
Rodeo Dr
Bartley St
Bourke St
Hurley St
Cowcumbla St
Main Southern Railway
Olympic Hwy
DEEP GULLY
Back Brawlin Rd
Cootamundra Tumut Railway
Gundagai Rd
Jugiong Rd
© Department of Customer Service 2020

Cootamundra Lake Cargelligo Railway
Main Southern Railway
Main Southern Railway

N

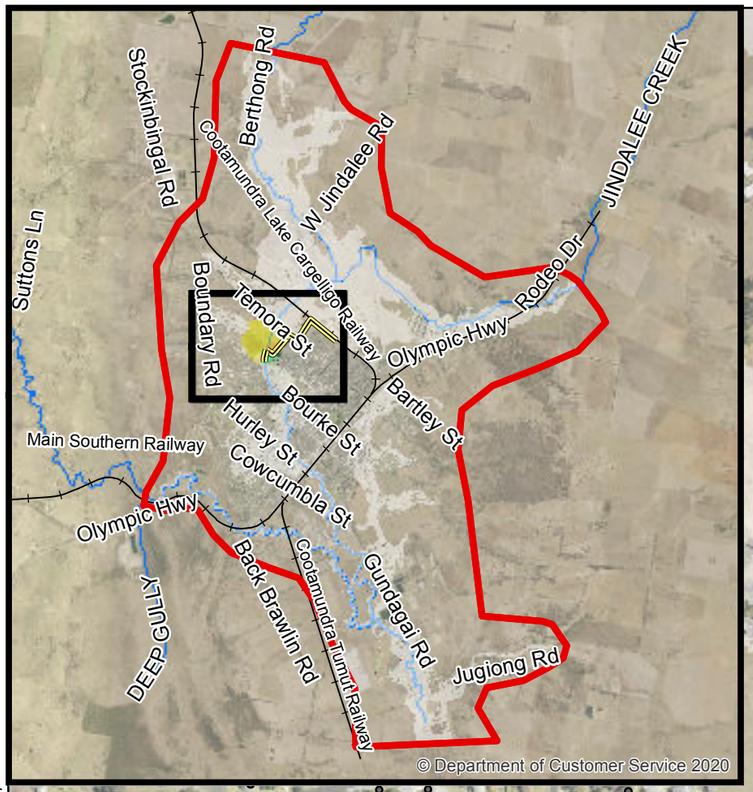
Study Area
Properties
Turf Club Basin
Cootamundra Railways Lines

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 0.5 1 2 km

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB03_Peak_Flood_Level_Impacts_1pctAEP_OptionFM01.mxd

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



Cootamundra Lake Cargelligo Railway

N

- Study Area
- Properties
- Cootamundra Railways Lines
- McGowan Street Levee

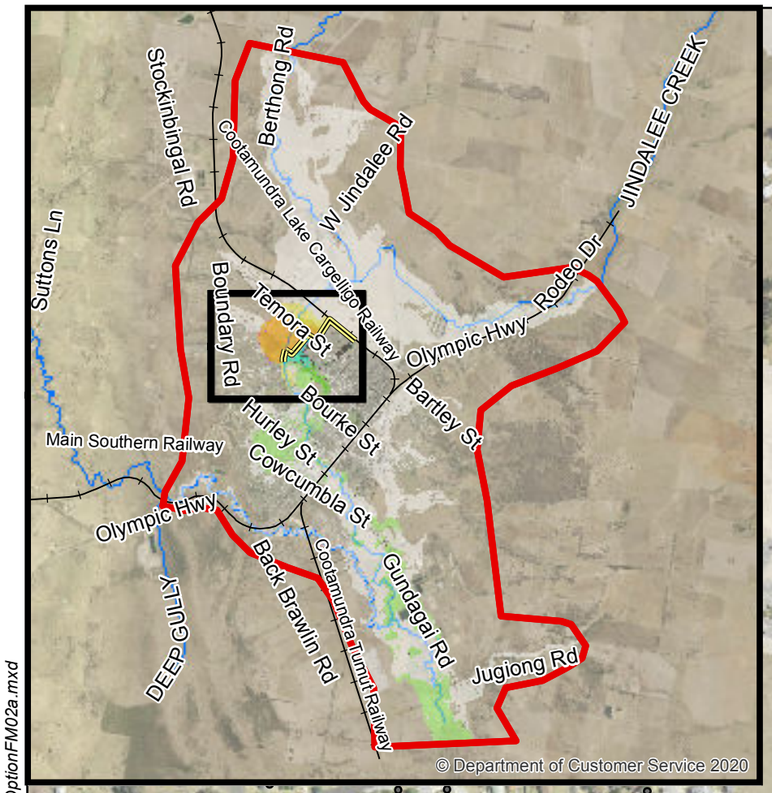
Impact (m)

- < -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

0 100 200 400 Meters

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB04_Peak_Flood_Level_Impacts_5pctAEP_OptionFM02a.mxd

FIGURE B5
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02a - MCGOWAN STREET LEVEE
1% AEP EVENT



Cootamundra Lake Cargelligo Railway

N

Study Area
Properties
Cootamundra Railways Lines
McGowan Street Levee

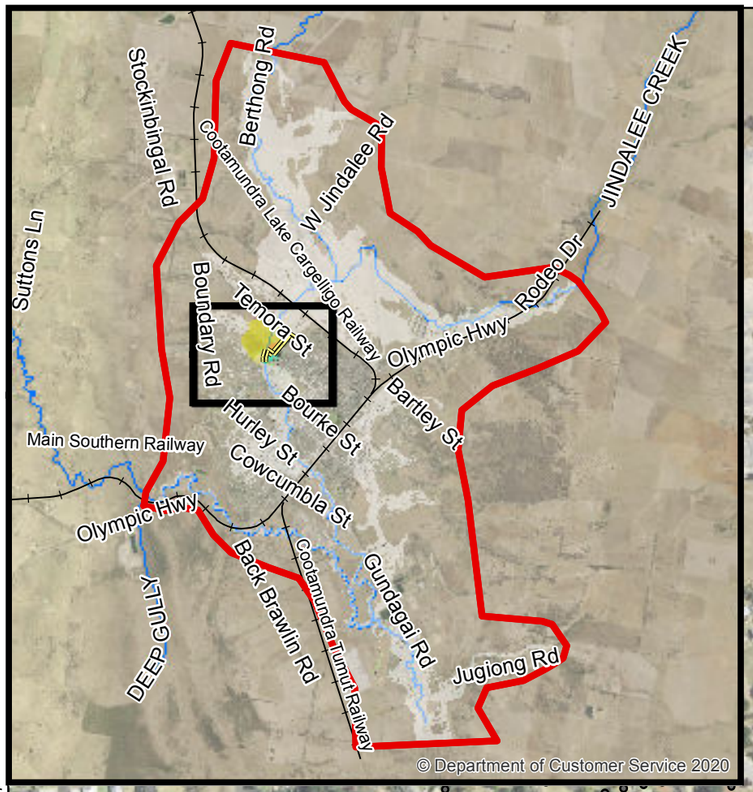
Impact (m)

- < -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

0 100 200 400 Meters

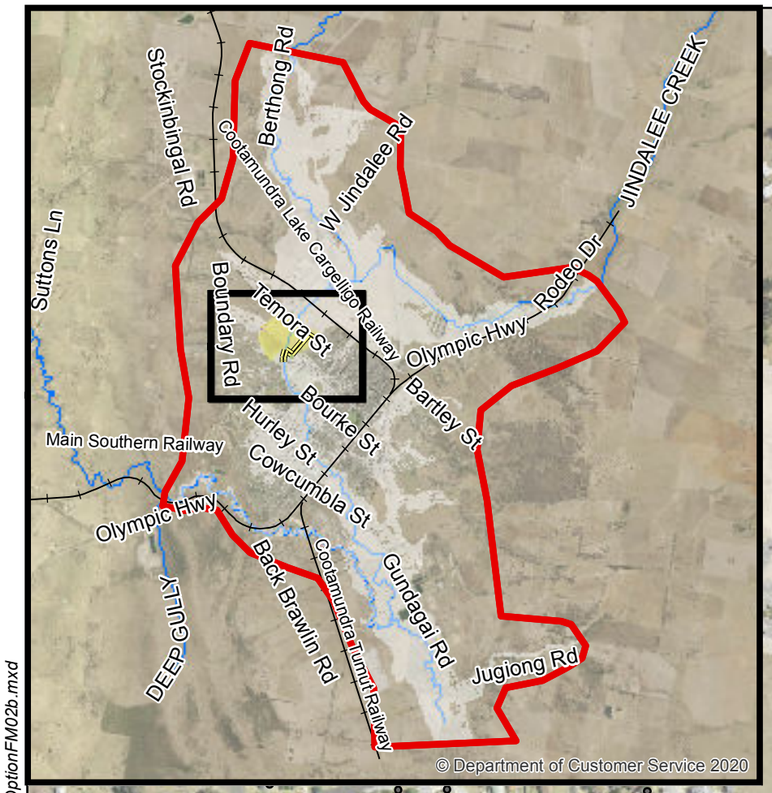
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB05_Peak_Flood_Level_Impacts_1pctAEP_OptionFM02a.mxd

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



J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB06_Peak_Flood_Level_Impacts_5pctAEP_OptionFM02b.mxd

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



Cootamundra Lake Cargelligo Railway

N

- Study Area
- Properties
- Cootamundra Railways Lines
- McGowan Street Levee

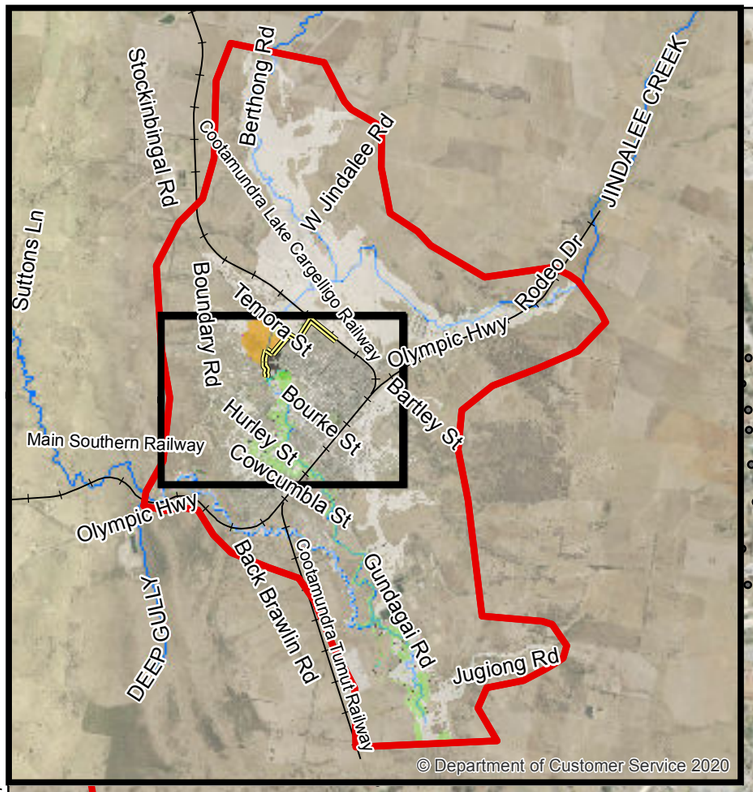
Impact (m)

- < -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

0 100 200 400 Meters

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB07_Peak_Flood_Level_Impacts_1pctAEP_OptionFM02b.mxd

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



J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB08_Peak_Flood_Level_Impacts_5pctAEP_OptionFM02c.mxd

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

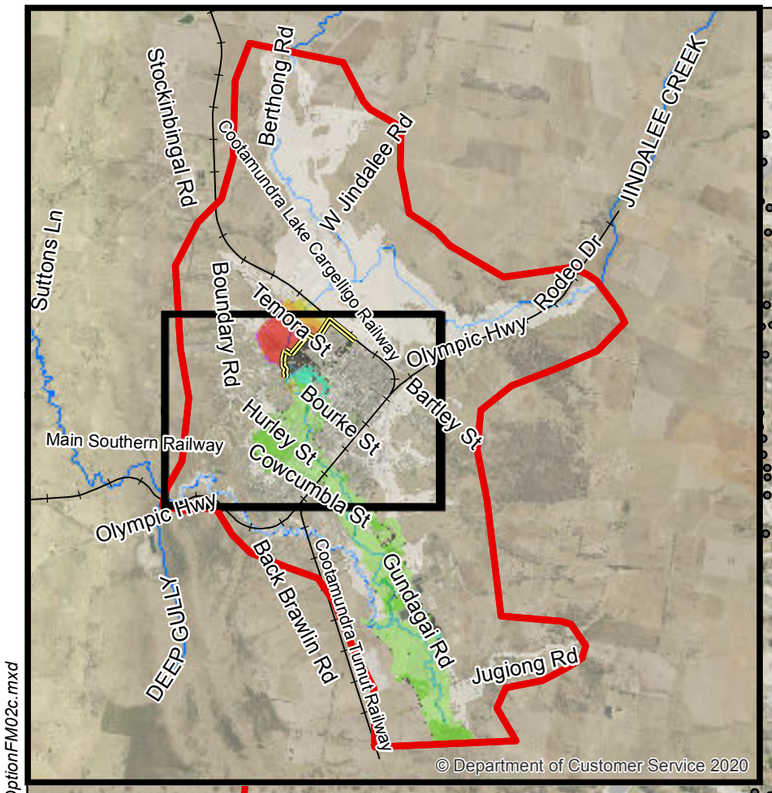


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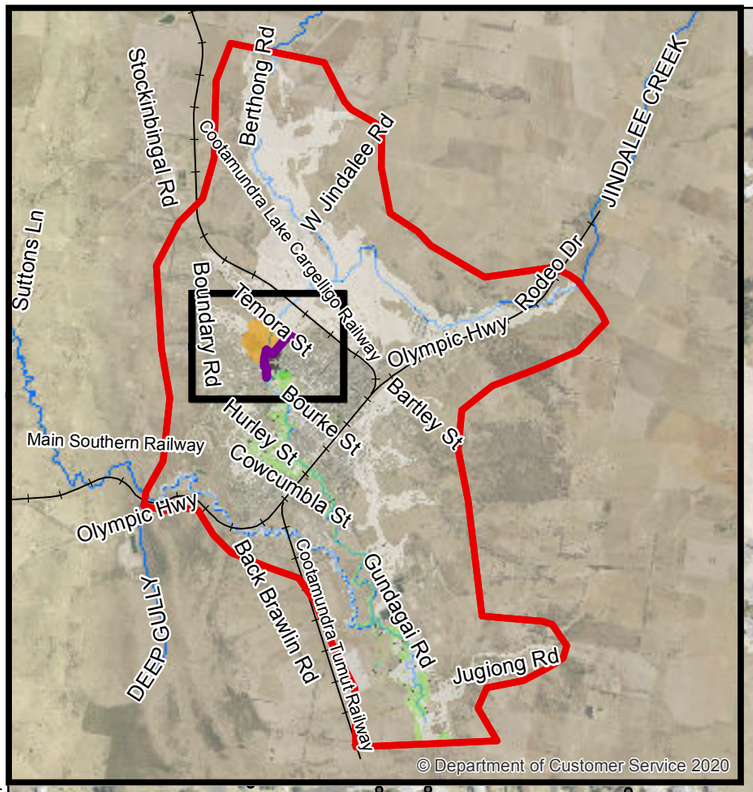
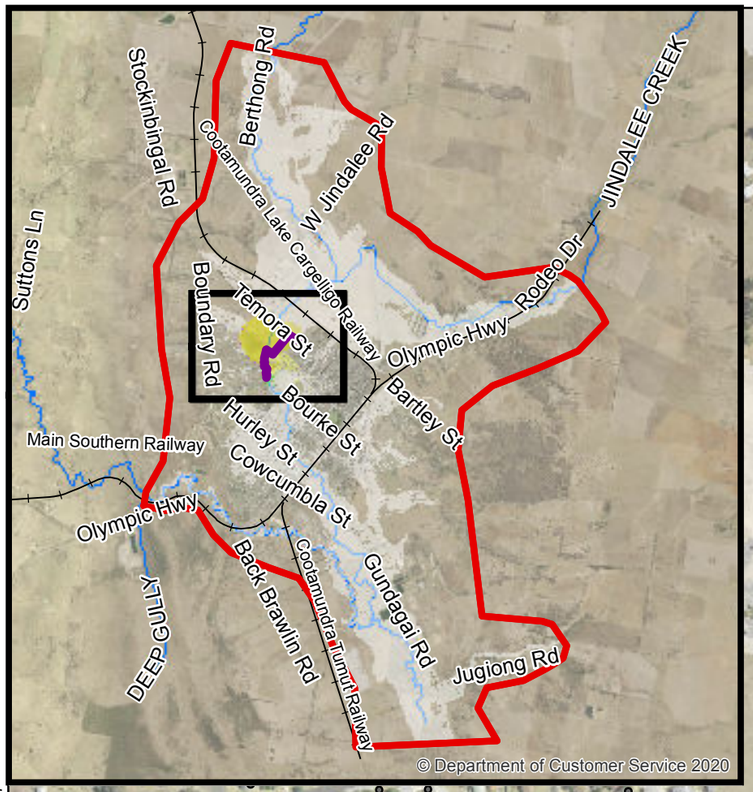
FIGURE B10
CHANGE IN PEAK FLOOD LEVEL
OPTION FM02d - MCGOWAN STREET LEVEE
5% AEP EVENT



J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB10_Peak_Flood_Level_Impacts_5pctAEP_OptionFM02d.mxd

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



Cootamundra Lake Cargelligo Railway

N

Study Area
Properties
Cootamundra Railways Lines
McGowan Street Levee

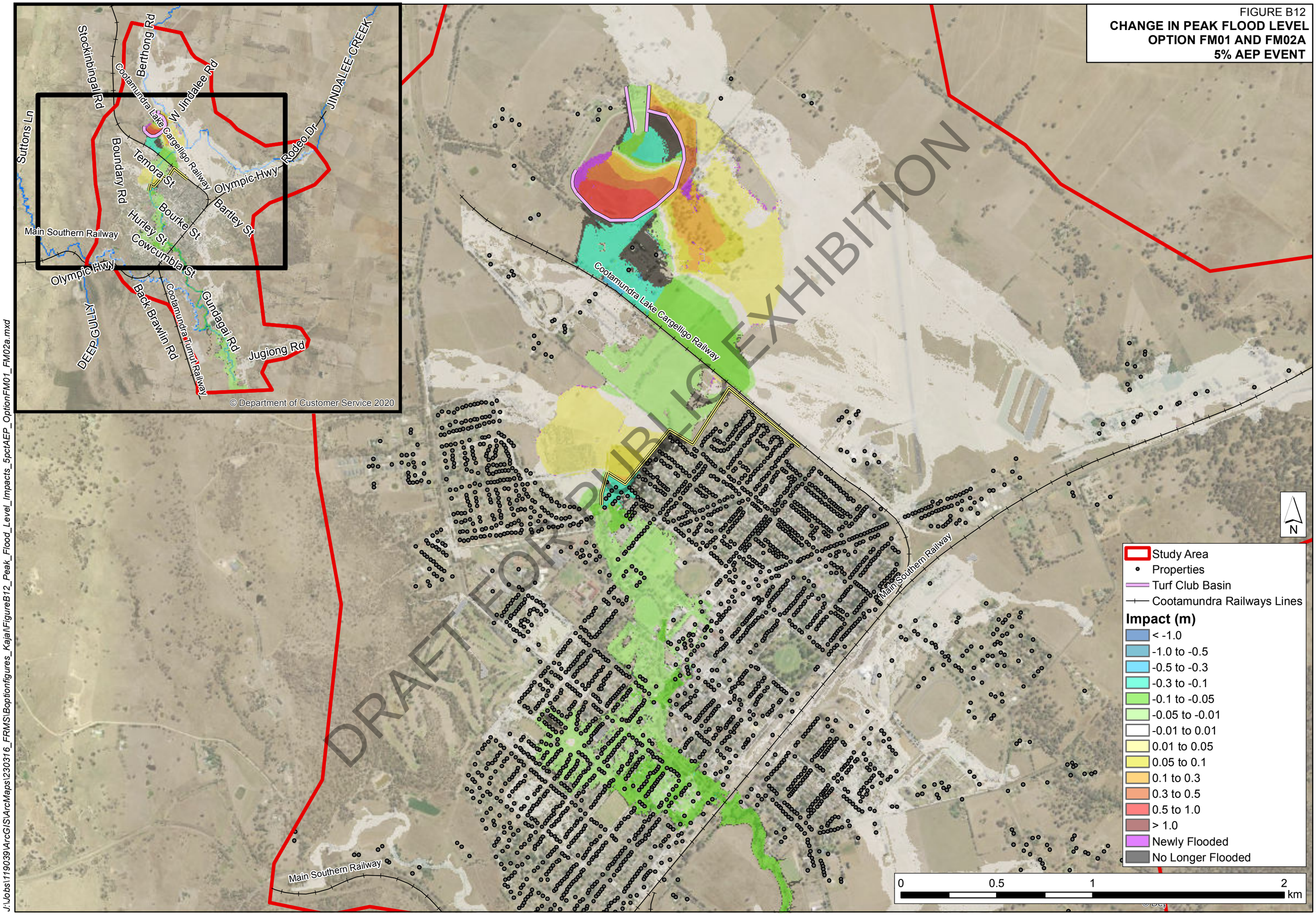
Impact (m)

< -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

0 100 200 400 Meters

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB11_Peak_Flood_Level_Impacts_1pctAEP_OptionFM02d.mxd

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



J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB12_Peak_Flood_Level_Impacts_5pctAEP_OptionFM01_FM02a.mxd

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

Study Area
Properties
Turf Club Basin
McGowan Street Levee
Cootamundra Railways Lines

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 0.5 1 2 km

N

Cootamundra Lake Cargelligo Railway
Main Southern Railway
Olympic Hwy
Stockinbingal Rd
Berthong Rd
Jindalee Rd
JINDALEE CREEK
Rodeo Dr
Suttons Ln
Boundary Rd
Temora St
Bourke St
Bartley St
Hurley St
Cowcumbla St
Gundagai Rd
Jugiong Rd
Back Brawlin Rd
DEEP GULLY
Cootamundra Tumut Railway

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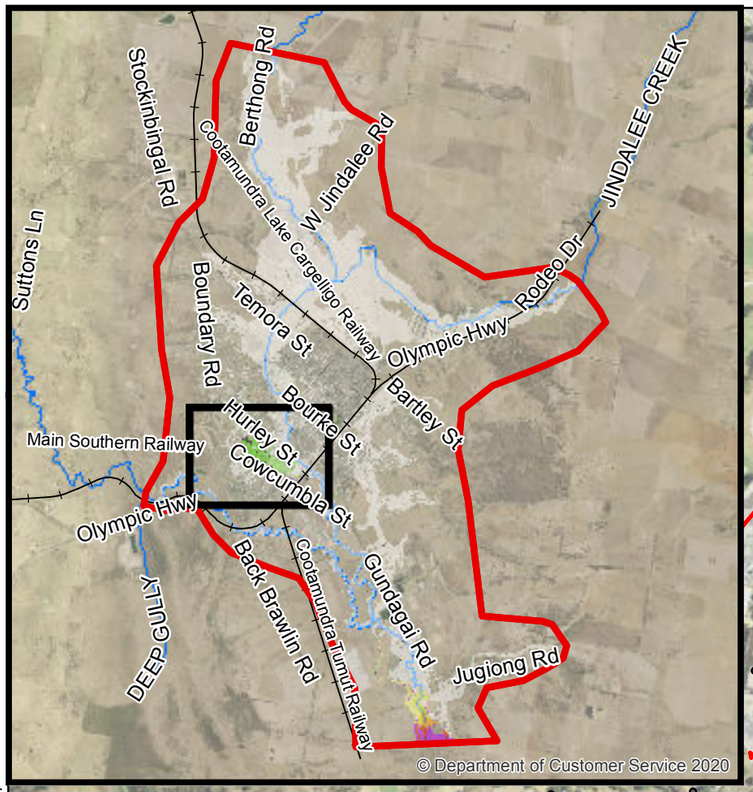
FIGURE B14
CHANGE IN PEAK FLOOD LEVEL
OPTION FM03a- DRAINAGE UPGRADE
5% AEP EVENT



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

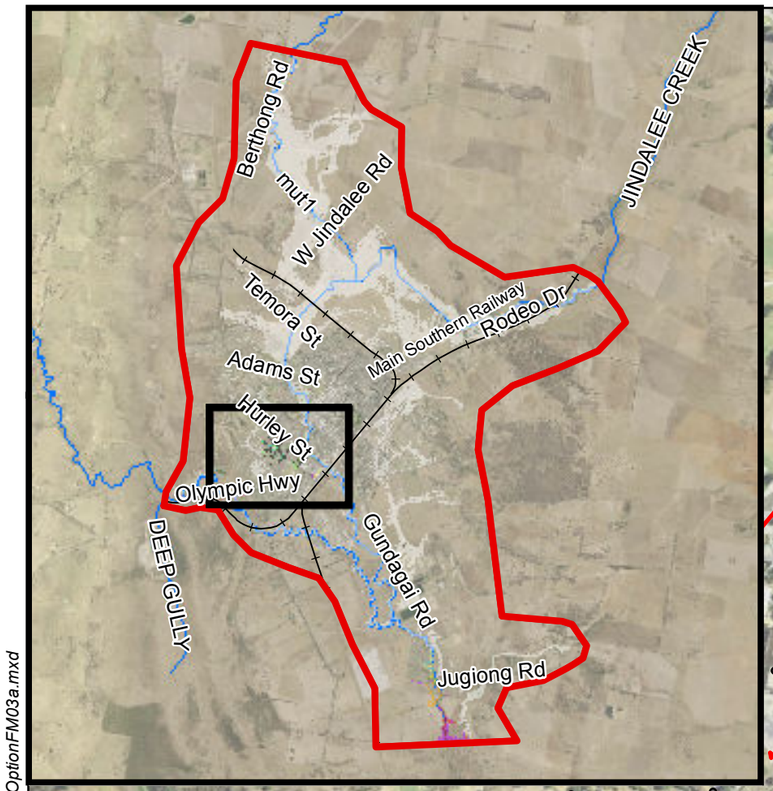
N

0 100 200 400 Meters

Main Southern Railway

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB14_Peak_Flood_Level_Impacts_5pctAEP_OptionFM03a.mxd

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

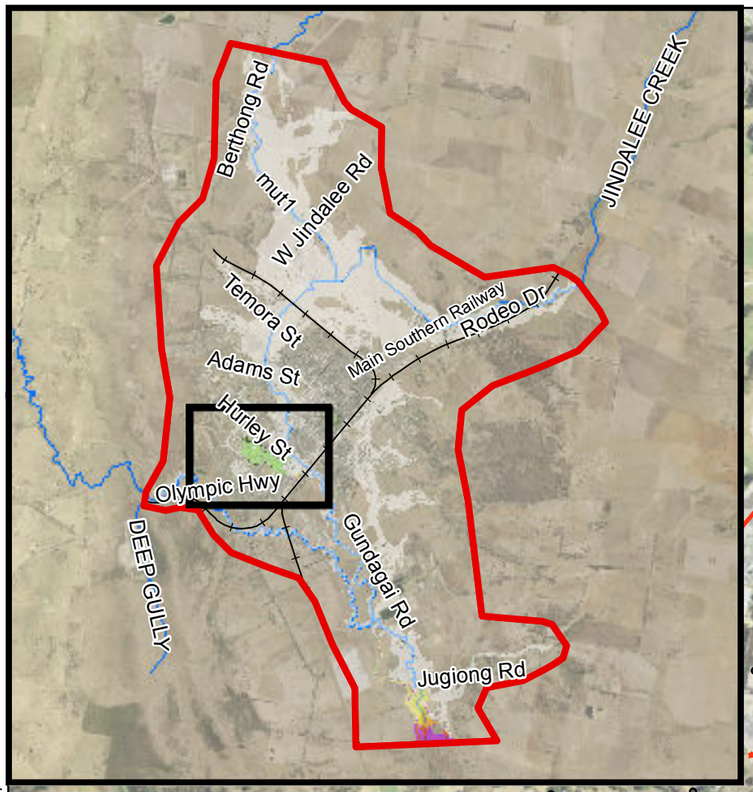
N

0 100 200 400 Meters

Main Southern Railway

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\BoptionFigures_Kaja\FigureB15_Peak_Flood_Level_Impacts_20pctAEP_OptionFM03a.mxd

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



Study Area
Properties
Cootamundra Railways Lines
New pipe
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

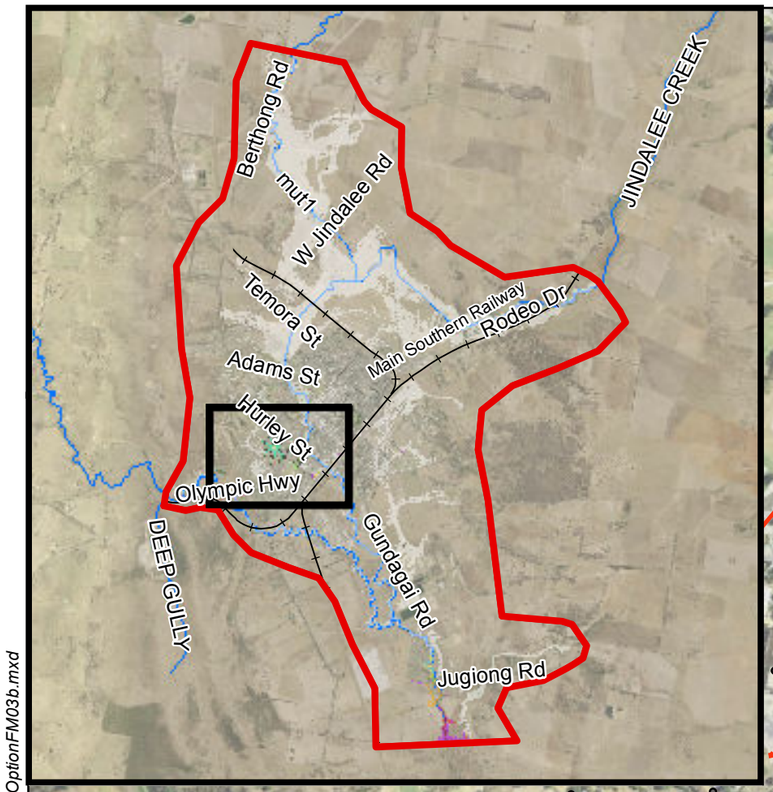
Main Southern Railway

N

0 100 200 400 Meters

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB16_Peak_Flood_Level_Impacts_5pctAEP_OptionFM03b.mxd

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



Study Area
Properties
Cootamundra Railways Lines
New pipe
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

N

0 100 200 400 Meters

Main Southern Railway

Main Southern Railway

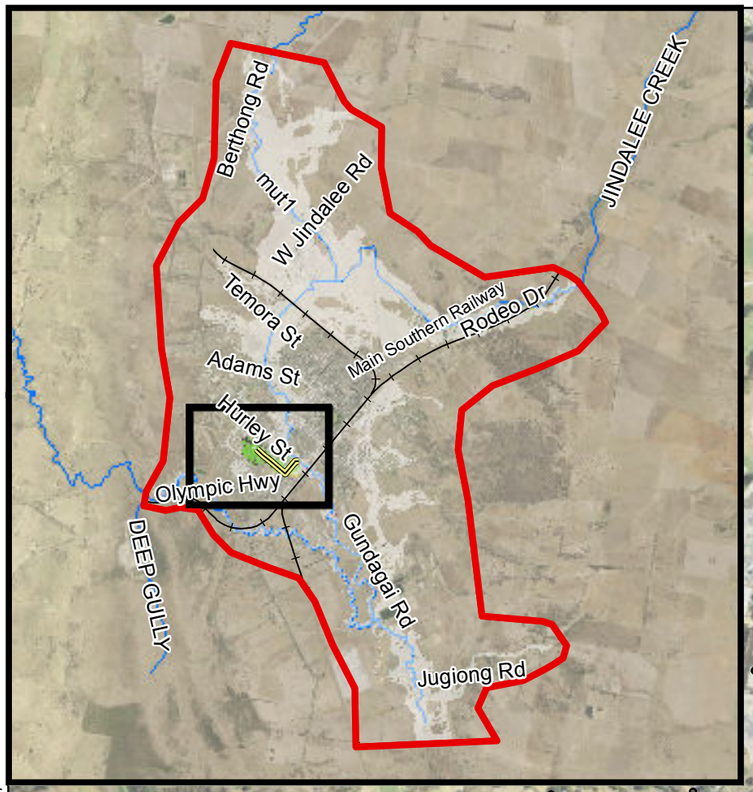
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB17_Peak_Flood_Level_Impacts_20pctAEP_OptionFM03b.mxd

FIGURE B18

CHANGE IN PEAK FLOOD LEVEL

FM04 - FRANCIS STREET REGRADED TO ALLOW OVERLAND FLOW

5% AEP EVENT



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

N

Main Southern Railway

Main Southern Railway

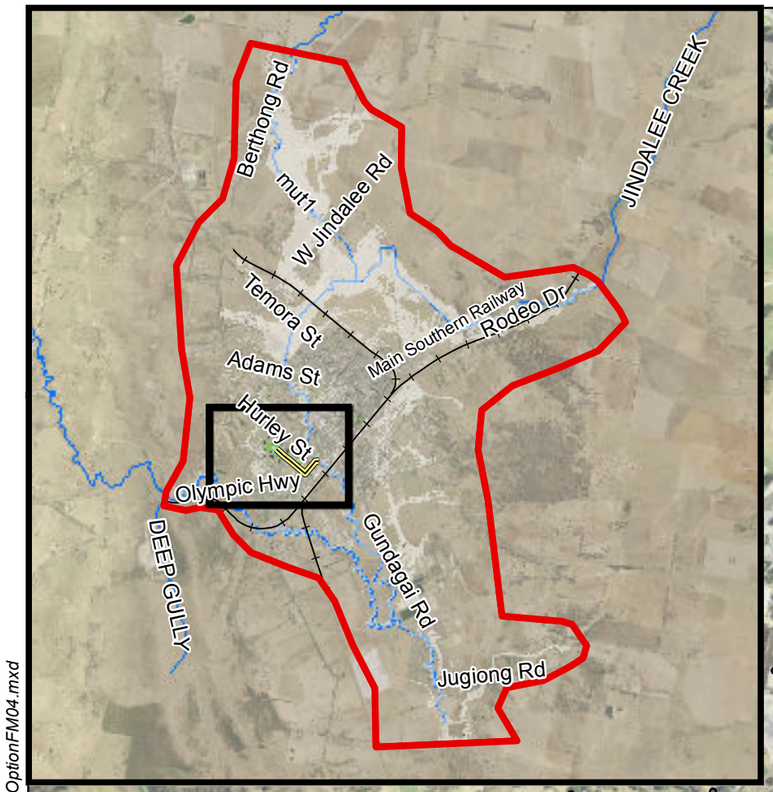
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB18_Peak_Flood_Level_Impacts_5pctAEP_OptionFM04.mxd

FIGURE B19

CHANGE IN PEAK FLOOD LEVEL

FM04 - FRANCIS STREET REGRADED TO ALLOW OVERLAND FLOW

20% AEP EVENT



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

N

0 100 200 400 Meters

Main Southern Railway

Main Southern Railway

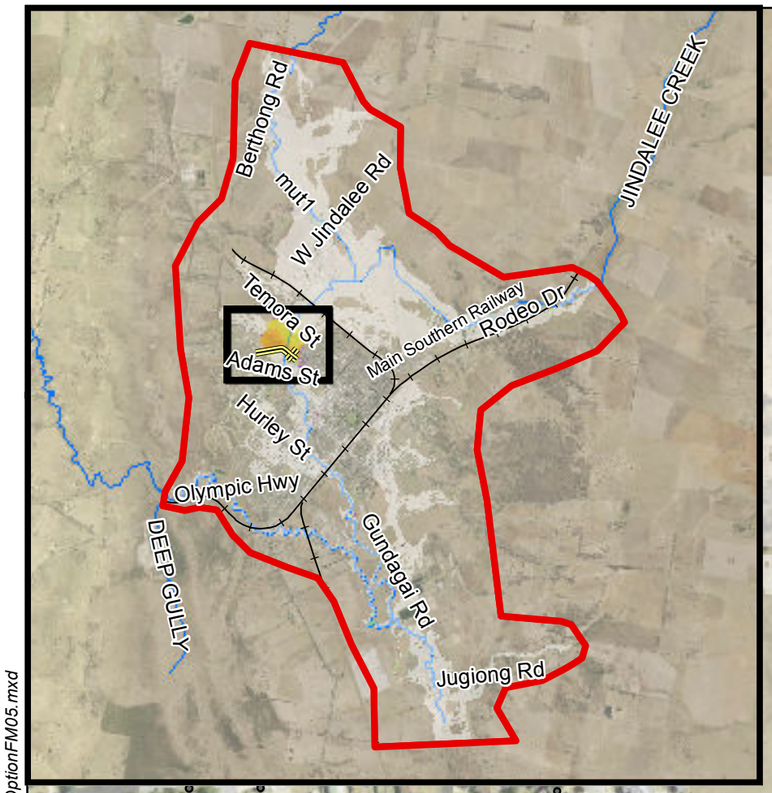
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB19_Peak_Flood_Level_Impacts_20pctAEP_OptionFM04.mxd

FIGURE B20

CHANGE IN PEAK FLOOD LEVEL

OPTION FM05 - ADAM STREET RAISED ABOVE 10% AEP WITH BRIDGES

5% AEP EVENT



N

Study Area
Properties
Cootamundra Railways Lines
Road Raised
Proposed Bridge

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 50 100 200 Meters

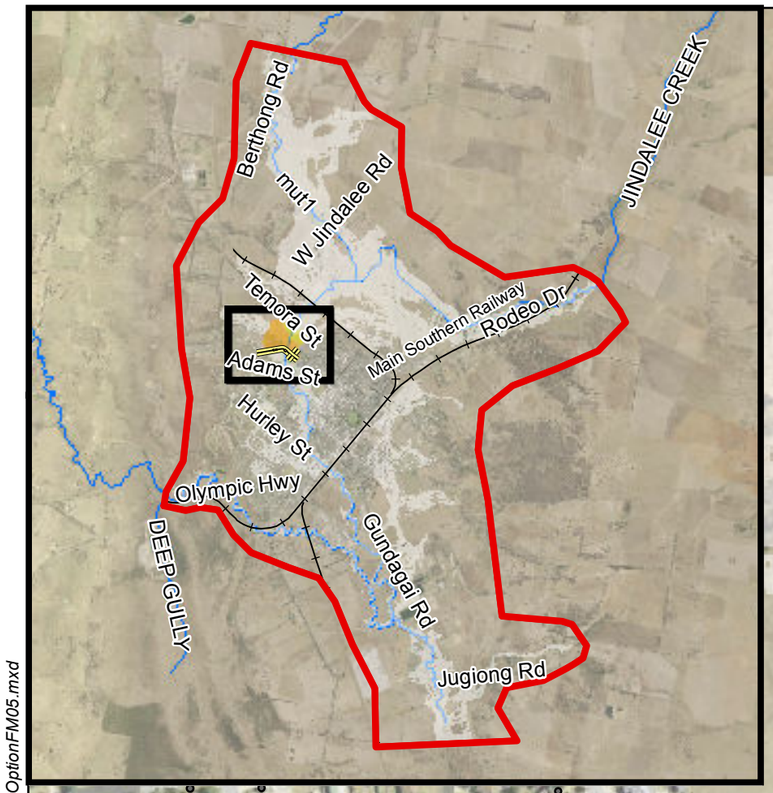
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB20_Peak_Flood_Level_Impacts_5pctAEP_OptionFM05.mxd

FIGURE B21

CHANGE IN PEAK FLOOD LEVEL

OPTION FM05 - ADAM STREET RAISED ABOVE 10% AEP WITH BRIDGES

10% AEP EVENT



N

- Study Area
- Properties
- Cootamundra Railways Lines
- Road Raised
- Proposed Bridge

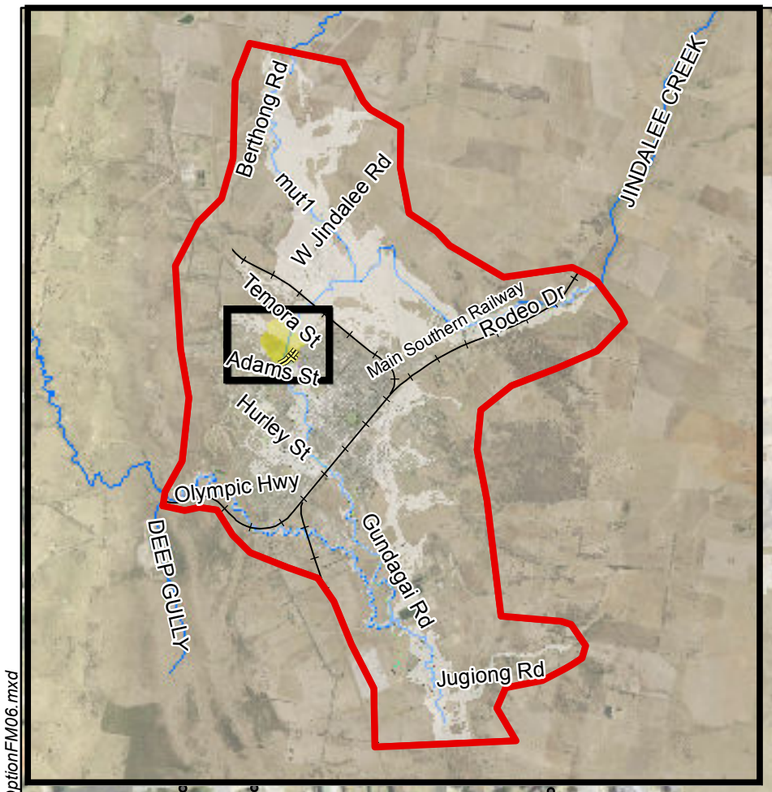
Impact (m)

- < -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 50 100 200 Meters

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB21_Peak_Flood_Level_Impacts_10pctAEP_OptionFM05.mxd

FIGURE B22
CHANGE IN PEAK FLOOD LEVEL
OPTION FM06 - CUTLER RAISED TO 10% WITH BRIDGE
5% AEP EVENT



DRAFT FOR PUBLIC EXHIBITION

N

Study Area
Properties
Cootamundra Railways Lines
Road raised at 10% AEP
Bridge

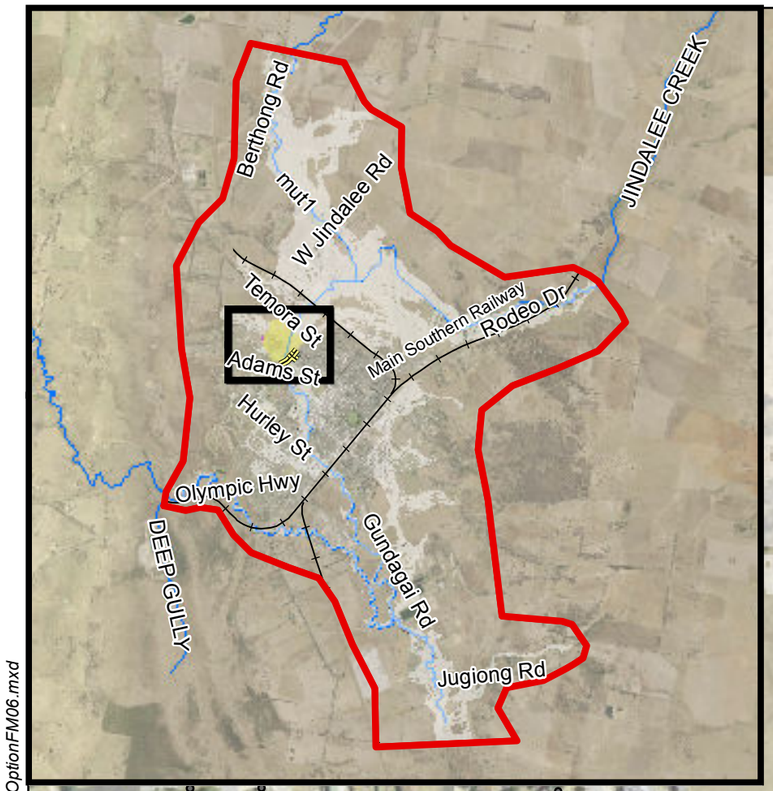
Impact (m)

< -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 50 100 200 Meters

J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB22_Peak_Flood_Level_Impacts_5pctAEP_OptionFM06.mxd

FIGURE B23
CHANGE IN PEAK FLOOD LEVEL
OPTION FM06 - CUTLER RAISED TO 10% WITH BRIDGE
10% AEP EVENT



DRAFT FOR PUBLIC EXHIBITION

N

Study Area
Properties
Cootamundra Railways Lines
Road raised at 10% AEP
Bridge

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 50 100 200 Meters

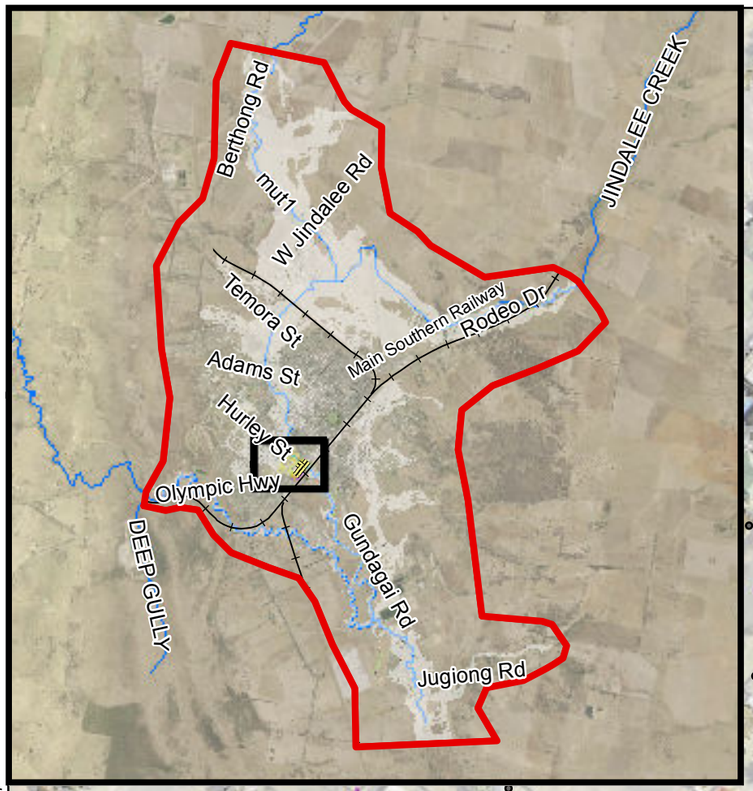
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kaja\FigureB23_Peak_Flood_Level_Impacts_10pctAEP_OptionFM06.mxd

FIGURE B24

CHANGE IN PEAK FLOOD LEVEL

OPTION FM07 - HOVELL STREET AND HURLEY STREET RAISED TO 10% WITH BRIDGE

5% AEP EVENT



Main Southern Railway

N

Study Area
Properties
Cootamundra Railways Lines
Road raised at 10% AEP
Bridge

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 50 100 200 Meters

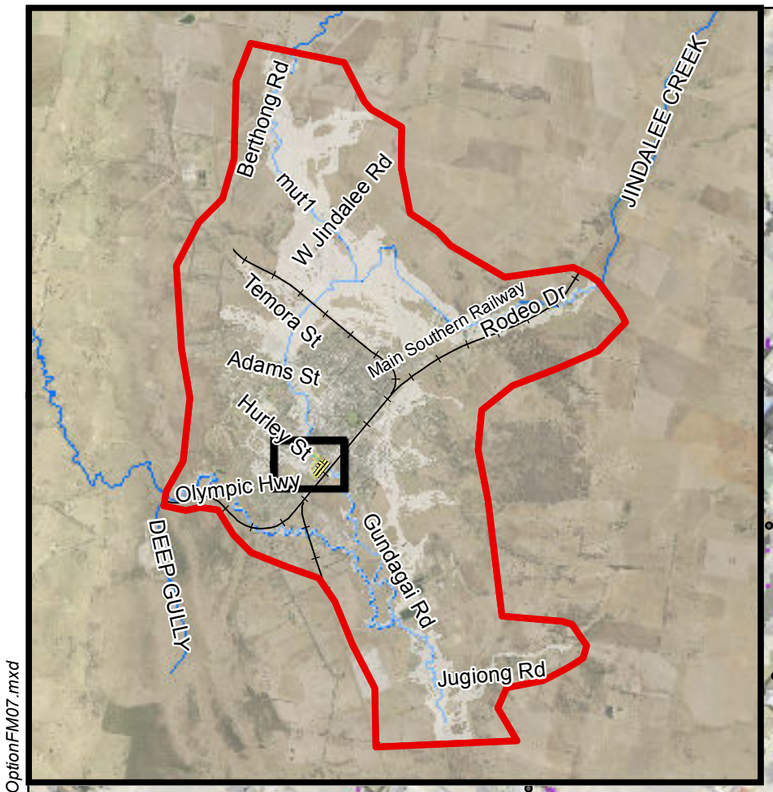
J:\Jobs\119039\ArcGIS\ArcMaps\230316_FRMS\Boptionfigures_Kajal\FigureB24_Peak_Flood_Level_Impacts_5pctAEP_OptionFM07.mxd

FIGURE B25

CHANGE IN PEAK FLOOD LEVEL

OPTION FM07 - HOVELL STREET AND HURLEY STREET RAISED TO 10% WITH BRIDGE

10% AEP EVENT



Study Area
Properties
Cootamundra Railways Lines
Road raised at 10% AEP
Bridge

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

N

0 50 100 200 Meters

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Appendix A

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

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	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
Culvert Upgrade	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 Upgrad	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

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
	Concessional	F2, F4, F6	B1	S1	FA2	E2 or E3	M2, M3
Outside FPA	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

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

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
	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
Low flood risk	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