LOWER FITZROY RIVER
INFRASTRUCTURE PROJECT

Appendix Q3

Traffic and transport supporting material

Part 3 Roads and bridges concept design

Part 4 References

SunWater
MAKING WATER WORK

Gladstone Area Water Board

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Part 3 – Roads and bridges concept design

3.1 Design scope and qualifications

The Project is expected to be staged in response to demand triggers (Chapter 1 Introduction), however the immunity levels for road and/or bridge design criteria considered the impacts associated with the upper limits of development, namely Eden Bann Weir Stage 3 and Rookwood Weir Stage 2 as applicable:

- Eden Bann Weir
  - Raising Eden Bann Weir to Stage 2 will trigger construction of a new low level bridge at Glenroy Crossing. To avoid the need for further upgrades to accommodate impoundment impacts associated with raising Eden Bann Weir to Stage 3, the low level bridge at Glenroy Crossing has been designed to accommodate Stage 3 impoundment impacts and no further upgrades of the bridge would be required for raising Eden Bann Weir to Stage 3.
- Rookwood Weir
  - Construction of Rookwood Weir Stage 1 will trigger construction of a new low level bridge at Riverslea Crossing. To avoid the need for further upgrades to accommodate impoundment impacts associated with raising Rookwood Weir to Stage 2, the low level bridge at Riverslea Crossing has been designed to accommodate Stage 2 impoundment impacts and no further upgrades of the bridge would be required for raising Rookwood Weir to Stage 2
  - Construction of Rookwood Weir Stage 1 does not impact Foleyvale Crossing. Raising Rookwood Weir to Stage 2 will trigger construction of a new low level bridge at Foleyvale Crossing to accommodate impoundment impacts
  - Operation of Rookwood Weir Stage 1 will trigger upgrading of Hanrahan Crossing to accommodate operational water releases. To avoid the need for further upgrades to accommodate operational releases associated with Rookwood Stage 2 Hanrahan Crossing has been designed to accommodate Stage 2 releases and no further upgrades would be required for the raised Rookwood Weir Stage 2.

Opportunistic and internal property crossings are not included within the transport assessment. Consideration of the potential impacts on individual properties is provided in Chapter 18 Social impact

Consideration has been given to the connectivity and function of the existing road network in relation to inundation and flood immunity as a result of the Project.

The following qualifications are made with regard to the design of road and bridge infrastructure for the Project:

- The road and bridge design is provided at a preliminary level
- Mapped road reserves and the locations of existing roads accordingly to survey and aerial photographs do not always consistently align
- It is considered that road pavement design is arbitrary. The road pavement will be designed based on geotechnical reporting during detailed design

- The design is based on aerial laser survey (dated November 2009) which does not clearly show road details such as road crowns, shoulder edges, table drains and so on. The accuracy of the preliminary design and quantities used is limited to the accuracy of the survey
- Local and private roads are unsealed
- The design speed is 60 km/hour (however, where design is based on existing parameters the design speed may be lowered)
- The final arrangements for bridge substructures will be contingent upon the results of geotechnical investigations. Specifically:
  - For Glenroy Crossing, it is expected that cast in place piles will not be appropriate due to the predicted presence of very hard rock. It is anticipated that a rock anchoring system will be require
  - For Riverslea Crossing and Foleyvale Crossing, it is expected that cast in place piles will be appropriate. However if very hard rock is encountered at high levels a rock anchoring system will be required
- It is anticipated that construction will occur during the dry season when river flows are at their lowest
- Further assessments of the local road network and Project logistical requirements will be undertaken (revised and refined) during detailed design to determine the suitability of transport of 35 m long girders to the sites

3.2 Road design criteria

The objective of the road construction for the Project is:

- To maintain the connectivity and function of the existing road network
- To provide roads with at least the same or similar flood immunity as the existing roads (that is, like for like)

The basis of the road design comprises the following:

- For construction access roads a low loader semitrailer was used as the basis of design for ground clearance of the vertical geometry
- Based on the design traffic, the pavements for the reconstructed or new roads would be designed for a 20 year life
- Council owned and maintained roads:
  - Roads are designed to RRC standards. Where no standard exists the roads are designed to Austroads' (2003) or ARRB's (2009) standards
  - Hydraulic immunity for existing roads and new roads is designed with the same or better flood immunity (during operations) to replace or upgrade those roads impacted by the Project. Where the length of time of inundation of a road during a flood event was only marginally worsened (for example by an additional one day), upgrades to these roads were not included in the design as the road network in the area is such that floods would limit access in other areas
- DTMR owned and operated roads:
  - Roads are designed to DTMR (2004) standards.

  - Hydraulic immunity of existing roads was assessed. New roads are deigned to at least (or better) flood immunity levels
- Private roads:
  - Design of private roads, for example access roads, is to enable construction traffic to access the weir sites
  - Austroads' (2003) or ARRB's (2009) standards were used
  - Impacts to other roads (and tracks) on private property will be subject to compensation negotiated with individual landholders and have not been considered in the road design
  - The hydraulic immunity of private roads was assessed based on levels of inundation as a result of the Project and risk of access to the structures in an emergency
- Where appropriate road closures may occur, such that the road network function and access to dwellings on properties is maintained.

3.2.1 Eden Bann Weir new site access

Figure 3-1 shows the proposed upgrades to the existing northern bank access road at Eden Bann Weir. Figure 3-2 shows the proposed layout of the new southern bank access at Eden Bann Weir.

3.2.2 Thirsty Creek Road upgrade

Figure 3-3 shows the preliminary road layout plan for upgrades proposed to Thirsty Creek Road for the provision of access to Rookwood. Upgrades comprise regrading, and upgrading and installing new culverts.

3.3 Bridge design criteria

General criteria used for the basis of design for bridges proposed for the Project are as follows:

- Preliminary design was undertaken in accordance with the Australian Standard for Bridge Design (AS5100) and other relevant manuals as detailed:
  - Geometry – AS5100.1: Scope and General Requirements and DTMR's Road Planning and Design Manual (2004)
  - Design loads – AS5100.2: Design Loads (SM1600 traffic loading adopted)
  - Footings and retaining walls – AS5100.3: Foundations and Soil Supporting Structures and AS2159: Piling Code
  - Bearings and joints – AS5100.4: Bearings and deck joints
  - Concrete Elements, prestressed and reinforced – AS5100.5: Concrete
- Specified bridge carriageway widths as per Table 3-1 taken from DTMR's Road Planning and Design Manual (specifically Chapter 7) (2004).

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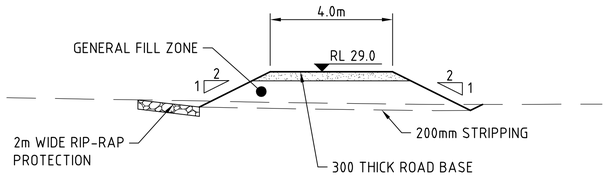

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SCALE 1:1000 AT ORIGINAL SIZE

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SCALE 1:10,000 AT ORIGINAL SIZE

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Client Reference Number

Gladstone Area Water Board
147 Goondoon Street
Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 F 07 4972 5632

SunWater
Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

GHD CLIENTS | PEOPLE | PERFORMANCE
Level 4, 201 Charlotte St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 F 61 7 3316 3333
E bnemail@ghd.com.au W www.ghd.com.au

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Drafting Check	D.BOBILAK*	Design Check	M.BARKER*
Approved			
Date			
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Client: GLADSTONE AREA WATERBOARD AND SUNWATER
Project: LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title: EDEN BANN WEIR
PROPOSED ACCESS ROAD OVER FLOOD RUNNER

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Rev: B

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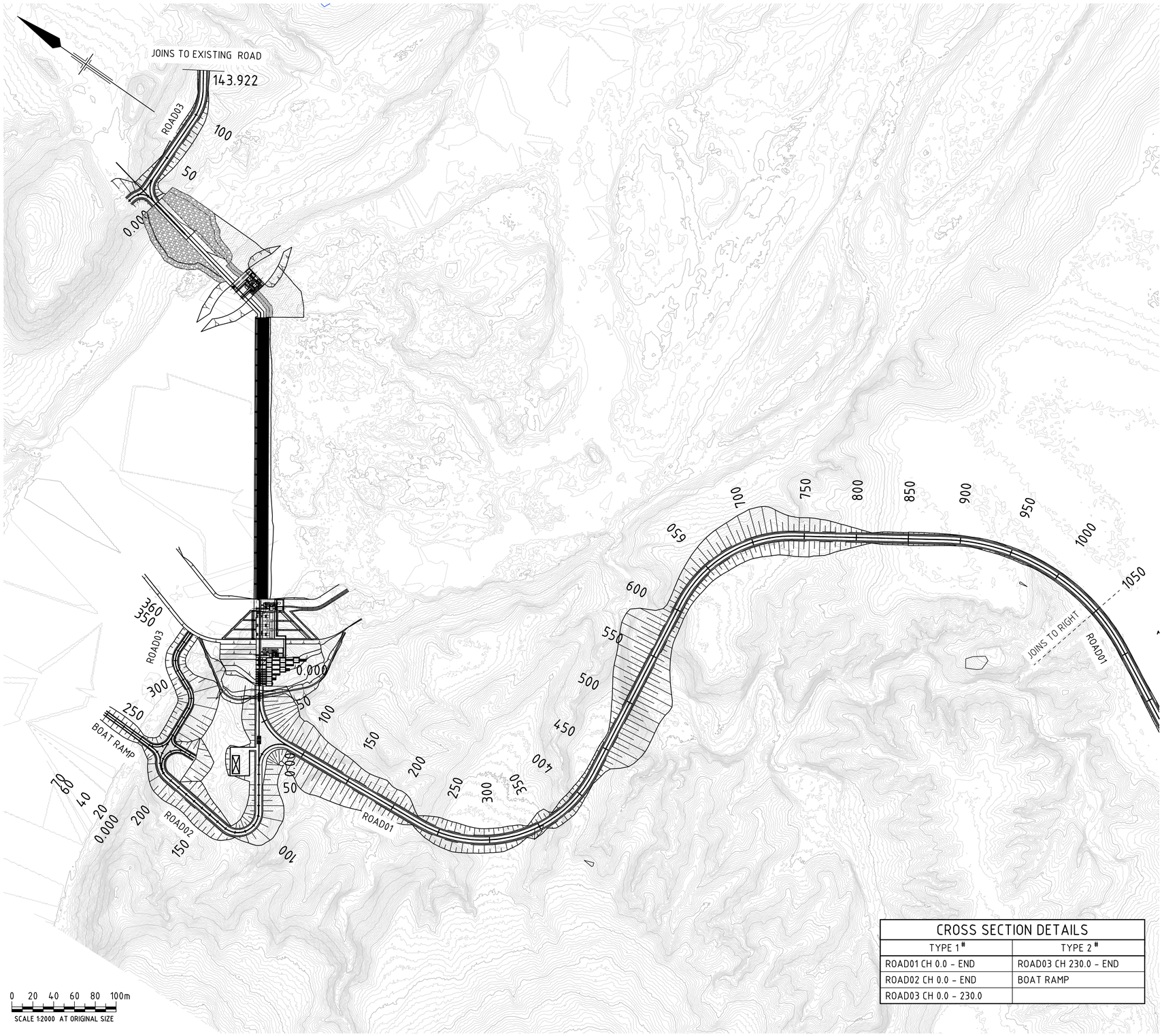

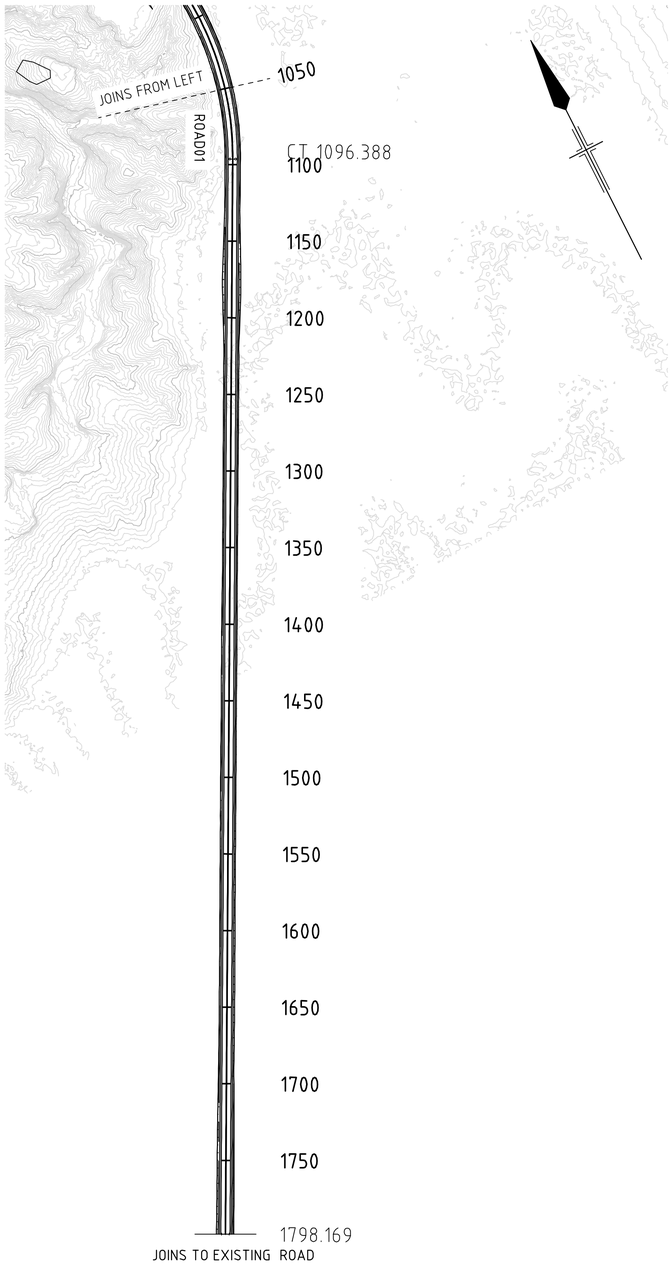

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ROAD02 CH 0.0 - END	BOAT RAMP
ROAD03 CH 0.0 - 230.0	

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A	ISSUED FOR DISCUSSION	BB	JW*	CBG*	09.06.10

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Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 F 07 4972 5632

Level 10, 179 Turbot Street
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T 07 3120 0000

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T 61 7 3316 3000 F 61 7 3316 3333
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Date			
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Project: LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title: EDEN BANN WEIR ACCESS ROADS LAYOUT PLAN

Original Size A1
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Rev: C

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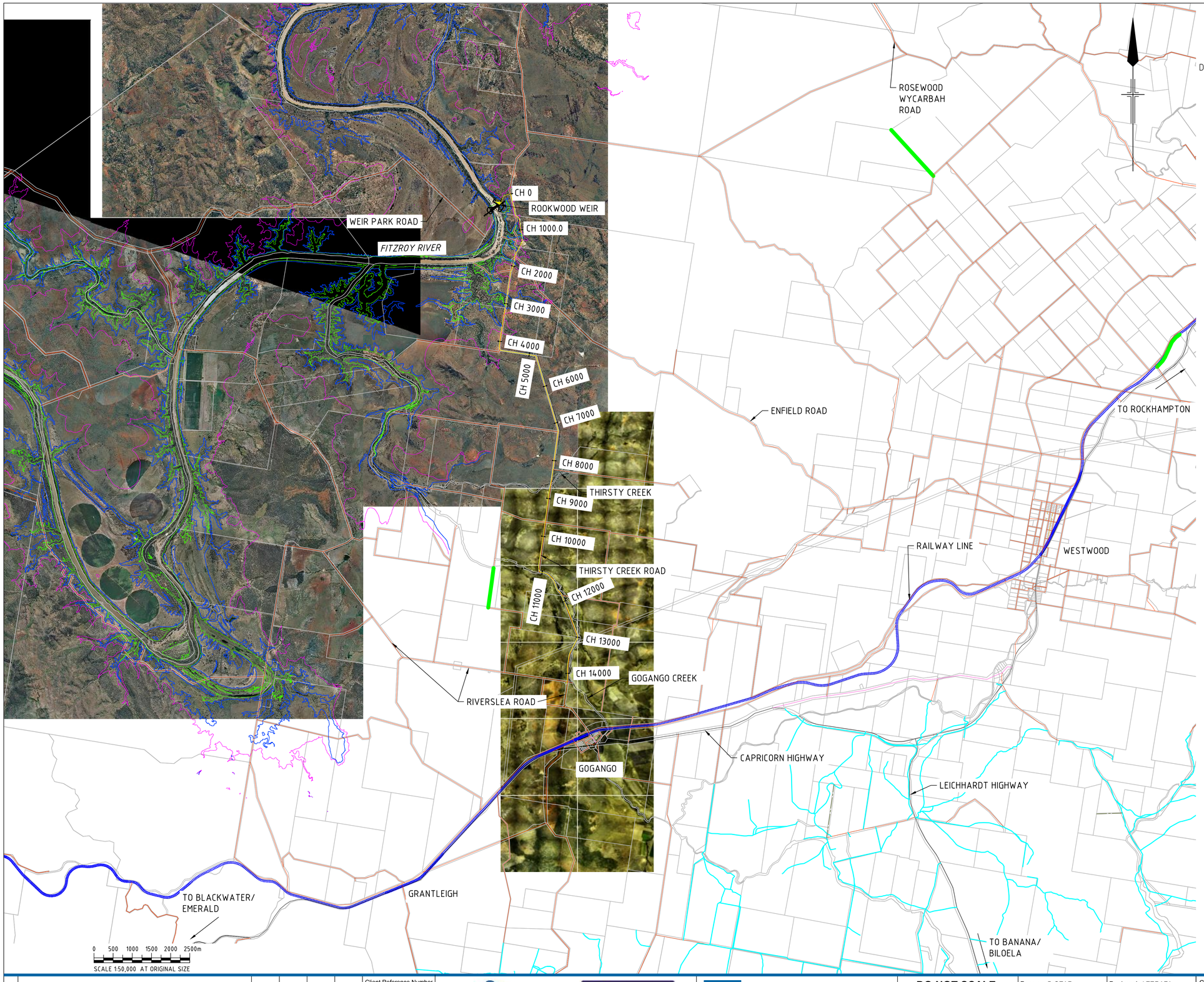

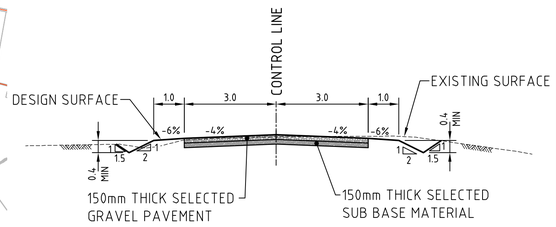

TYPICAL CROSS SECTION - UPGRADE

NTS

NOTE:

THESE DRAWINGS ARE DESIGNED TO HIGHLIGHT AREA'S OF CONCERN FOR CONSTRUCTION EQUIPMENT ie. LOW LOADERS FOR THE CONSTRUCTION OF ROOKWOOD WEIR. AS THIS ROAD IS SUB-STANDARD, THE VARIOUS PORTIONS RECOMMENDED FOR UP-GRADE (VERTICAL GEOMETRY) REPRESENT 20% WITH (HORIZONTAL GEOMETRY) REPRESENT 10%. DRAINAGE UP-GRADE IS REQUIRED TO PROVIDE A HIGHER IMMUNITY AT Q20 EVENTS

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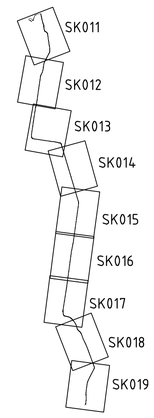

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- STATE CONTROLLED ROADS (HIGHWAYS)
- CLOSED ROADS
- LOCAL ROADS
- MAIN ROADS
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147 Goondoon Street
Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 F 07 4972 5632

Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

145 Ann St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 F 61 7 3316 3333
E bnemail@ghd.com.au W www.ghd.com.au

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Client: GLADSTONE AREA WATERBOARD AND SUNWATER
Project: LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title: THIRSTY CREEK ROAD UPGRADE LAYOUT PLAN

Original Size A1 | Drawing No: 41-20736-04-SK010 | Rev: B

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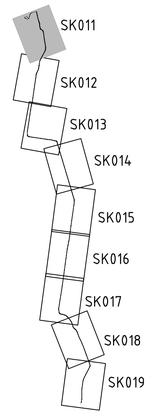

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Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 F 07 4972 5632

SunWater
Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

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145 Ann St Brisbane QLD 4000 Australia
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T 61 7 3316 3000 F 61 7 3316 3333
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Title: THIRSTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 1 OF 9

Original Size A1

Drawing No: 41-20736-04-SK011 Rev: B

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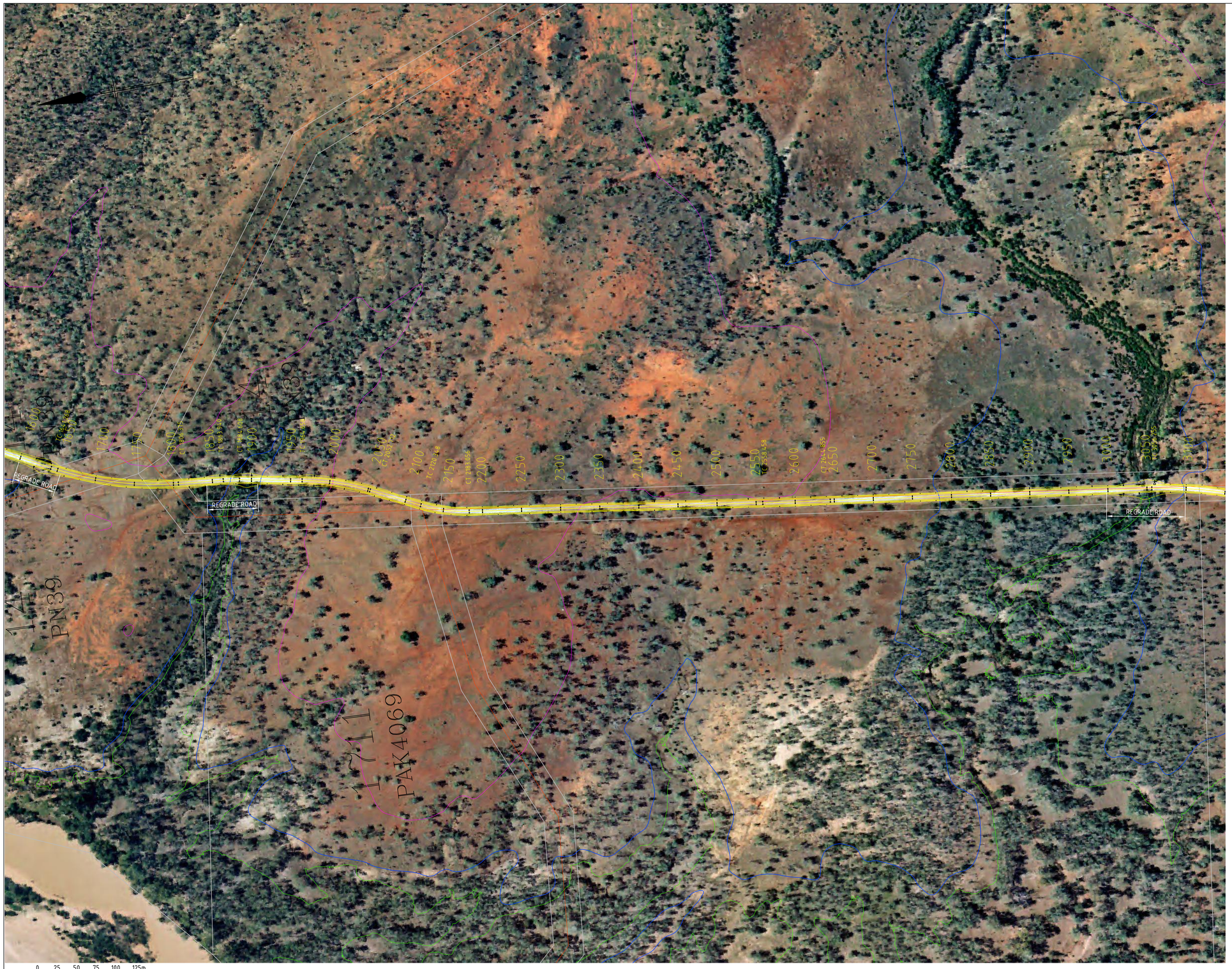

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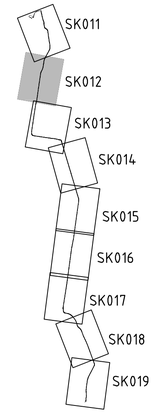

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PO Box 15536, City East Qld 4002
T 07 3120 0000

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GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 F 61 7 3316 3333
E bnemail@ghd.com.au W www.ghd.com.au

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LAYOUT PLAN - SHEET 2 OF 9

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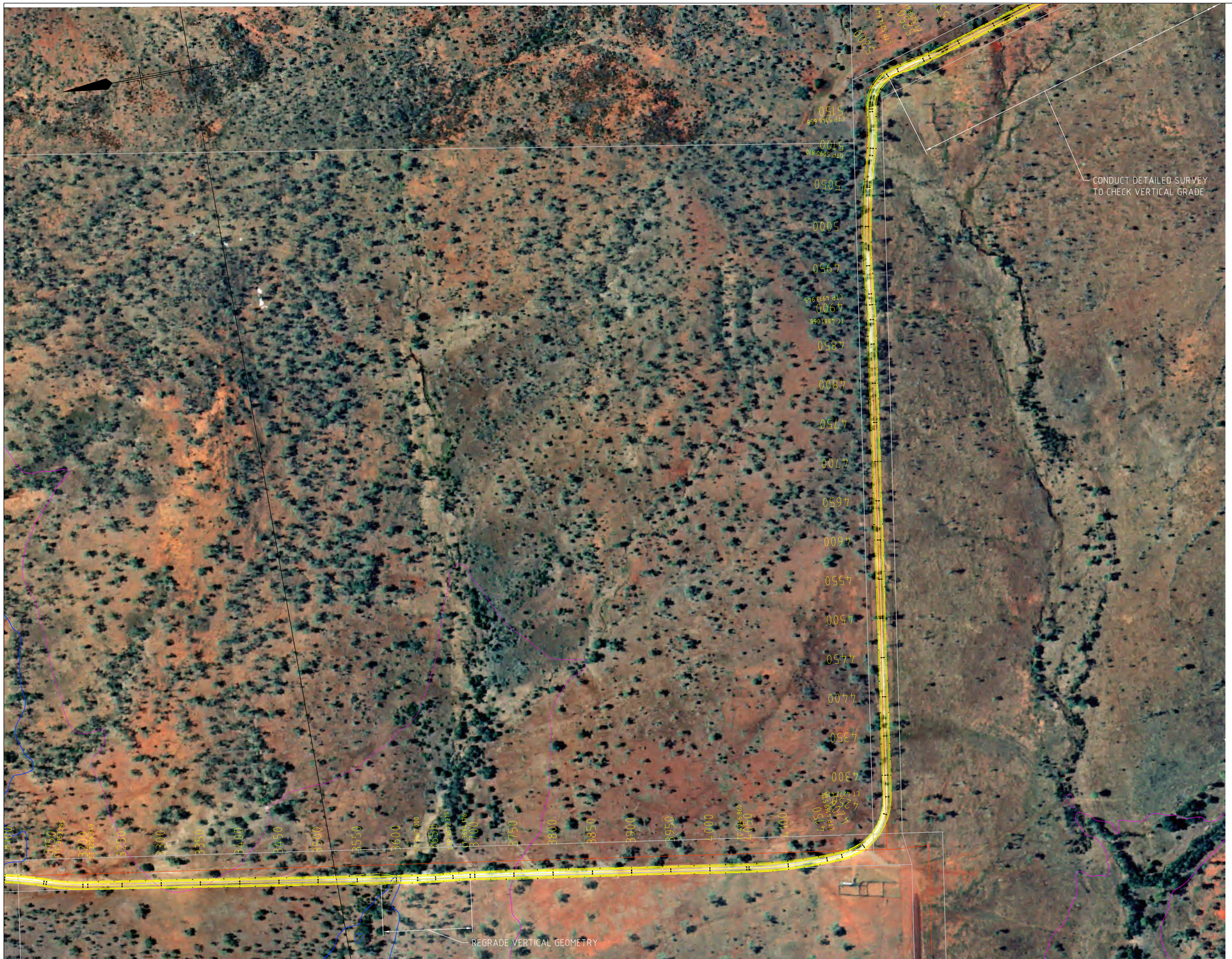

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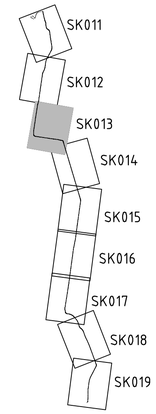

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Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 **F** 07 4972 5632

SunWater
Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

GHD
145 Ann St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 **F** 61 7 3316 3333
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Client: GLADSTONE AREA WATERBOARD AND SUNWATER
Project: LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title: THIRSTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 3 OF 9

Original Size: A1
Drawing No: 41-20736-04-SK013
Rev: B

Plot Date: 5 February 2013 - 4:14 PM
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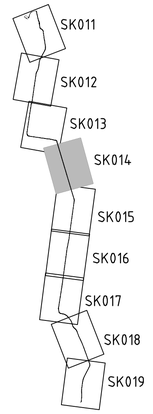

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PO Box 15536, City East Qld 4002
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T 61 7 3316 3000 **F** 61 7 3316 3333
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Project **LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS**
Title **THIRSTY CREEK ROAD UPGRADE LAYOUT PLAN - SHEET 4 OF 9**

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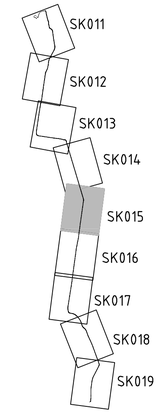

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- MAINTENANCE TRACKS
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E bnemail@ghd.com.au W www.ghd.com.au

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Drafting Check		Design Check	
Approved			
Date			
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Client: GLADSTONE AREA WATERBOARD AND SUNWATER
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Title: THRISTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 5 OF 9

Original Size A1 | Drawing No: 41-20736-04-SK015 | Rev: B

Plot Date: 5 February 2013 - 4:16 PM Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK015.dwg

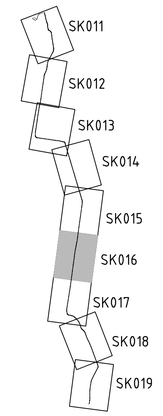
THIRTY CREEK

CONDUCT DETAILED SURVEY TO CHECK VERTICAL GRADE

0 25 50 75 100 125m

SCALE 1:2500 AT ORIGINAL SIZE

KEY PLAN:



LEGEND

- FLOOD EXTENT BORDER (100 YEAR EVENT)
- FLOOD EXTENT BORDER (5 YEAR EVENT)
- STAGE 3 INUNDATION
- RAILWAY
- PRIVATE ROADS
- STATE CONTROLLED ROADS (HIGHWAYS)
- CLOSED ROADS
- LOCAL ROADS
- MAIN ROADS
- MAINTENANCE TRACKS
- UNCONSTRUCTED ROADS

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
B	FOR BUSINESS CASE		AM	RF*	WT*	12.12.12
A	ISSUED FOR DISCUSSION		BG	RF*	WHT*	13.06.12

Client Reference Number

Gladstone Area Water Board
147 Goondoon Street
Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 **F** 07 4972 5632

Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

145 Ann St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 **F** 61 7 3316 3333
E bnemail@ghd.com.au **W** www.ghd.com.au

Drawn	B.GEAR	Designed	J. ZERAFA
Drafting Check		Design Check	
Approved			
Date			
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client: GLADSTONE AREA WATERBOARD AND SUNWATER

Project: LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS

Title: THIRSTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 6 OF 9

Original Size: A1

Drawing No: 41-20736-04-SK016 Rev: B

Plot Date: 5 February 2013 - 4:17 PM

Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK016.dwg

REGRADE VERTICAL ALIGNMENT

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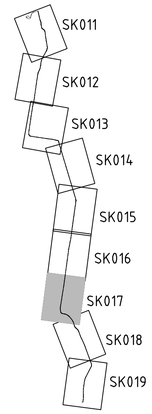
SCALE 1:2500 AT ORIGINAL SIZE

KEY PLAN:



LEGEND

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- FLOOD EXTENT BORDER (5 YEAR EVENT)
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- RAILWAY
- PRIVATE ROADS
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PO Box 15536, City East Qld 4002
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T 61 7 3316 3000 **F** 61 7 3316 3333
E bnemail@ghd.com.au **W** www.ghd.com.au

Drawn B.GEAR		Designed J.ZERAFA	
Drafting Check		Design Check	
Approved			
Date			
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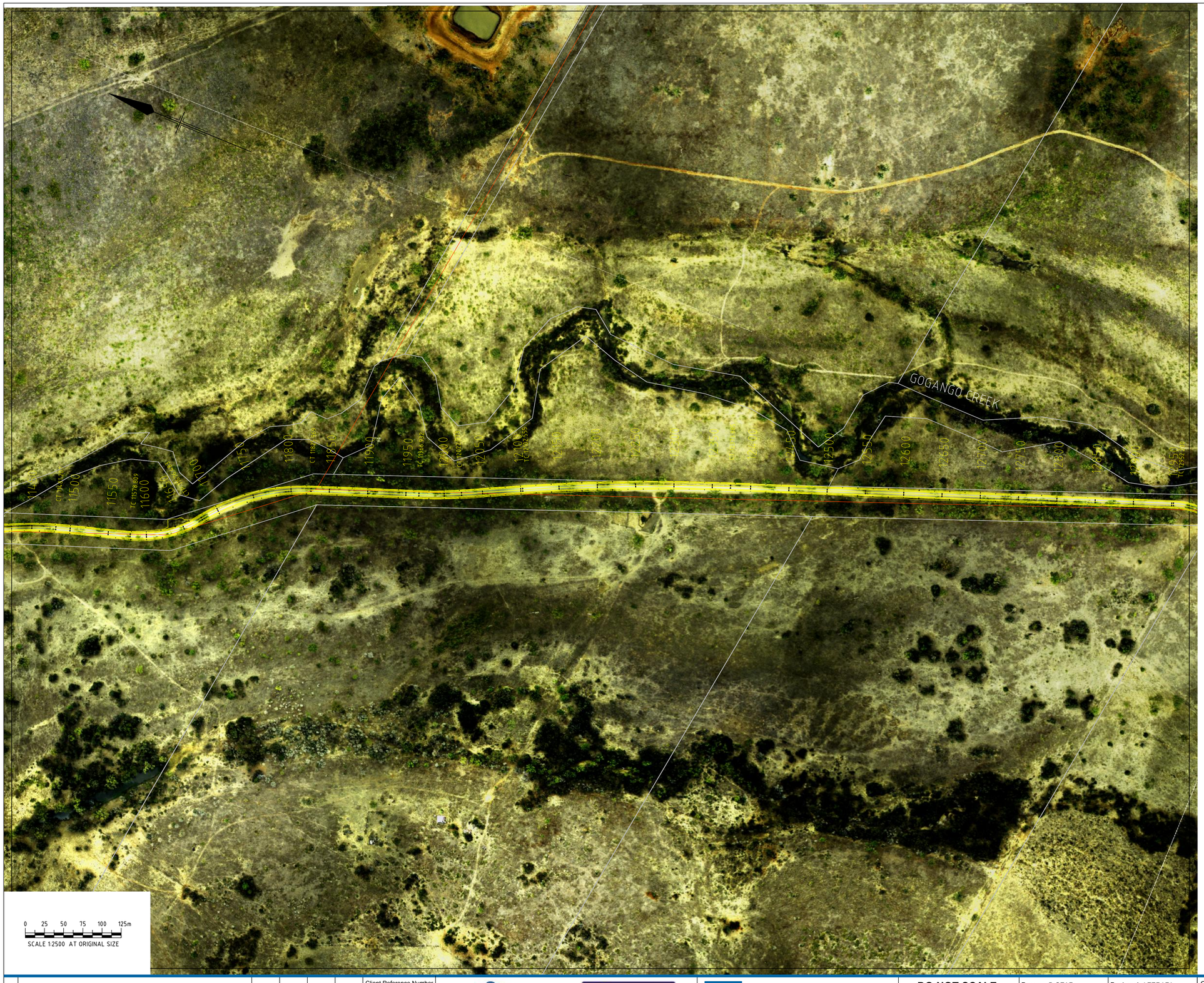
Client GLADSTONE AREA WATERBOARD AND SUNWATER
Project LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title THIRSTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 7 OF 9

Original Size A1
Drawing No: 41-20736-04-SK017 **Rev:** B

Plot Date: 5 February 2013 - 4:19 PM
Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK017.dwg



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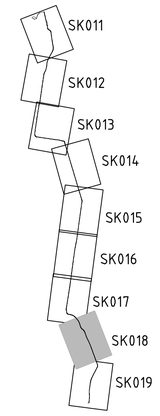

LEGEND

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- FLOOD EXTENT BORDER (5 YEAR EVENT)
- STAGE 3 INUNDATION
- RAILWAY
- PRIVATE ROADS
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145 Ann St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 F 61 7 3316 3333
E bnemail@ghd.com.au W www.ghd.com.au

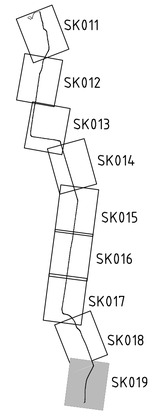
Drawn B.GEAR	Designed J.ZERAFA
Drafting Check	Design Check
Approved	
Date	
Scale AS SHOWN	This Drawing must not be used for Construction unless signed as Approved

Client GLADSTONE AREA WATERBOARD AND SUNWATER
Project LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title THIRSTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 8 OF 9

Original Size A1
Drawing No: 41-20736-04-SK018
Rev: B

Plot Date: 5 February 2013 - 4:20 PM
Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK018.dwg

KEY PLAN:



LEGEND

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- FLOOD EXTENT BORDER (5 YEAR EVENT)
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- RAILWAY
- PRIVATE ROADS
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Drawn	B.GEAR	Designed	J.ZERAFA
Drafting Check		Design Check	
Approved			
Date			
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client GLADSTONE AREA WATERBOARD AND SUNWATER
Project LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title THIRSTY CREEK ROAD UPGRADE
LAYOUT PLAN - SHEET 9 OF 9

Original Size A1
Drawing No: 41-20736-04-SK019
Rev: B

Plot Date: 5 February 2013 - 4:21 PM
Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK019.dwg

Table 3-1 Bridge carriageway widths – other than national highways

Bridge		Two way – two lane				Two way – single lane				One way – two lane			
Length (m)	AADT	Shoulder (m)	Lanes (m)	Shoulder (m)	Width (m)	Shoulder (m)	Lanes (m)	Shoulder (m)	Width (m)	Shoulder (m)	Lanes (m)	Shoulder (m)	Width (m)
Any	<100	1.0	6.0	1.0	8.0	0.6	3.0	0.6	4.2	-	-	-	
Any	100-500	1.0	6.0	1.0	8.0	2.0	3.0	1.0	6.0	-	-	-	
Any	500-1000	1.0	6.5	1.0	8.5	2.0	3.25	1.0	6.25	-	-	-	
<20	1000-2000	1.5	6.5	1.5	9.5	2.0	3.25	1.0	6.25	-	-	-	
>20	1000-2000	1.0	6.5	1.0	8.5	2.0	3.25	1.0	6.25	-	-	-	
<20	>2000	2.0	7.0	2.0	11.0	2.0	3.5	1.0	6.5	2.0	7.0	1.0	10.
>20	>2000	1.0	7.0	1.0	9.0	2.0	3.5	1.0	6.5	1.0	7.0	1.0	9.0

Notes:

1. Wherever possible, bridge carriageway widths should equal the approach carriageway widths.
2. Use 3.0 m shoulders adjacent to a barrier centreline marking or consider further widening to provide for auxiliary lane/s.
3. Add appropriate lane widths to the two lane configurations to determine multi-lane bridge widths.
4. All culverts are to be designed for dull width of formation.
5. AADTs are within 20 years.
6. If a bridge is a part of cycle route and/or is in a built-up area, extra shoulder width will be required to allow adequate cyclist access, and pedestrian facilities will be required.

Source: Chapter 7, Road Planning and Design Manual (DTMR 2004)

Specific considerations for local road river crossings, namely the Glenroy Crossing and Riverslea Crossing bridges, include:

- A single lane bridge to align with existing single land approaches to the river crossing
- A kerb to kerb width of 4.2 m[1] providing a 3.0 m traffic lane and 0.6 m shoulders each side, based on the following parameters:
  - Two-way traffic flow
  - A single lane
  - AADT values of less than 100 vehicles/day
  - A bridge of any length.

Specific considerations for the Foleyvale Crossing on the Duaringa-Apis Creek Road (a state-controlled road) include:

- A kerb to kerb width of 8.0 m providing two 3.0 m wide traffic lanes and 1 m shoulders each side, based on the following parameters:
  - Two-way traffic flow
  - A double lane
  - AADT values of less than 100 vehicles/day
  - A bridge of any length.

3.3.1 Glenroy Crossing

The bedrock geology at Glenroy Crossing consists of basaltic lavas with a vesicular texture and some quartz veining with green and in places pinkish colour and appear to be metamorphosed to some extent and could be referred to as metabasalts. The grain size is generally fine but occasionally coarse and the surface unweathered rocks have a high strength. The metabasalts are located at or near to the existing ground surface level, and have an allowable bearing capacity of 10 MPa.

Based on current flood immunity levels (annual average time of closure (AATOC) is 11.8 days) and road usage (low at AADT 53 vehicles per day) the new bridge level at Glenroy Road is set at the 1 in 2 AEP event (reducing the AATOC to 5.3 days). The preliminary design is based on flood loading on the bridge structure from a 1 in 2000 AEP event as required by AS5100.1, regardless of the flood immunity (ie deck level) selected.

3.3.2 Riverslea Crossing

Large areas of rock outcropping are present in the river channel at the Riverslea Crossing. The bedrock geology consists of interbedded sandstones and shales generally dipping at approximately 35° in the direction 75° so that the strata strike at approximately 165°. Perpendicular to the bridge structure which has a direction of approximately 285°, the apparent dip of the bedding is 22° towards the downstream direction. General bedrock elevation is RL 34.0 m to RL 34.5 m. The sandstones and shales appear to be slightly metamorphosed to quartzites and slates. They are moderately weathered and high to medium strength.

[1] RRC has accepted a 4.2 m width for the Riverslea Road Bridge (Minutes of meeting held 15 June 2009) and this has been carried to the Glenroy Road Bridge.

For bridge piers which will require full moment fixity, it is proposed to show cast in place piles at this stage of the design in the absence of further information. It seems unlikely that precast driven piles will be an option due to the competence and high level of the rock. Where the rock is of sufficient strength and very near surface, the use of ground anchors may be required in lieu of cast in place piles. This may occur in a number of locations, so a combination of both piles and anchors may be present in the final design. It is noted that the abutments will be founded in alluvium, with the bedrock level presumably at similar depth to the base of the river channel. Further investigation will be undertaken during detailed design. If full moment fixity is required at the abutments, cast in place piles should be feasible. If full moment fixity is not required, a driven steel pile should be feasible.

Preliminary hydraulic analyses using HEC-RAS modelling indicate that at the crossing the hydraulics will be controlled by the weir, resulting in fairly low average flow velocities (between 0.45 m/s in a 1 in year AEP event peaking at 1.56 m/s during a 1 in 10 year AEP event and reducing to 1.16 m/s for a 1 in 20 year event) and afflux impacts.

Peak flow velocities (of 1.56 m/s) in the river channel occur around the 1 in 10 AEP event. This is because floods larger than the 1 in 10 AEP event have broken the banks of the river and have spread out across a large area of the landscape, lowering the flow speeds. Peak velocities can be expected to be 30 per cent larger than the average flow velocities. For the purposes of design, an ultimate flow velocity (Vu) of 2.0 m/s was adopted. As the return interval for this event is only 10 years, and not the 1 in 2000 AEP event flow velocity as required by AS5100, an additional Ultimate Load Factor (yWF) of 2.0 was required.

Debris mat loading was also applied to the structure. In the absence of further information at the time of the preliminary design, a debris mat height of 3 m was adopted.

Current AATOC at Riverslea is 11.8 days. A deck level at the 1 in 5 AEP event plus 300 mm is proposed reducing the AATOC to 1.7 days. The favoured location for siting the bridge is approximately at the same location as the existing causeway. The design intent is for the existing causeway to remain open during the construction of the bridge.

3.3.3 Foleyvale Crossing

The bedrock geology in the river channel at the Foleyvale Crossing site consists of interbedded sandstones and shales dipping at approximately 40° in the direction 055° so that the strata strike at approximately 145°. Perpendicular to the bridge structure, which has a direction of approximately 350°, the apparent dip of the bedding is 28° towards the downstream direction. The rocks are slightly to moderately weathered and medium to high strength. General bedrock elevation is RL 46.0 m to RL 47.0 m.

For bridge piers which will require full moment fixity, it is proposed to show cast in place piles at this stage of the design in the absence of further information. It seems unlikely that precast driven piles will be an option due to the competence and high level of the rock. It is possible that if the rock is of sufficient strength and very near surface, the use of ground anchors will be required in lieu of cast in place piles. This may occur in a number of locations, so a combination of both piles and anchors may be present in the final design. It is noted that the abutments will be founded in alluvium, with the bedrock level presumably at similar depth to the base of the river channel. Further investigation will be undertaken during detailed design. If full moment fixity is required at the abutments, cast in place piles should be feasible. If full moment fixity is not required, a driven steel pile should be feasible.

Preliminary hydraulic analyses using HEC-RAS modelling indicate that at the Foleyvale Crossing the hydraulics will be controlled by the weir, resulting in fairly low average flow velocities (from 1.22 m/s during a 1 in 1 year event, peaking at 1.89 during a 1 in 10 year event) and afflux impacts.

Peak flow velocities in the river channel occur around the 1 in 10 year AEP event. This is because larger floods than the 1 in 10 AEP event have broken the banks of the river and have spread out across a large area of the landscape, lowering the flow speeds. Peak velocities can be expected to be 30 per cent larger than the average flow velocities. For the purposes of preliminary design, a flow velocity of 2 m/s was adopted. As the return interval for this event is only 10 years, and not the 1 in 2000 AEP event flow velocity as required by AS5100, an additional Ultimate Load Factor (yWF) of 2.0 was required.

Debris mat loading was also applied to the structure. In the absence of further information at the time of the preliminary design, a debris mat height of 3 m was adopted.

Current AATOCV at the Foleyvale Crossing is 16.4 days. A deck level of approximately 61.5 m is proposed reducing the AATOC to 2.5 days.

A number of crossing locations were investigated as part of the alignment development. The favoured option adopted for the purposes of preliminary design is 330 m downstream from the existing causeway location. Investigation of the contours of the banks in this part of the river shows that the top of the natural levee banks both sides of the river are at the 1 in 5 AEP event level.

3.3.4 Hanrahan Crossing

The Hanrahan Crossing is currently a low level paved road with pipe culvert. Erosion protection comprises grouted rockfill placed both sides of the crossing. The crossing is currently inundated every year and is impassable for long periods. This crossing provides the primary access to properties.

Although this crossing is not directly impacted by the construction of Rookwood Weir, the flow of water out of the control flow outlets (environmental flow outlets or fishway) and flow over the crest through gates will occasionally inundate the crossing. Additionally, should the flow out of Rookwood Weir occur quickly, inundation of the crossing may present a risk to potential users. Although this risk is low (due to the very low traffic volumes using this crossing), the design of the crossing will accommodate flows for most release scenarios and be inundated slowly such that the rate of rise over the crest of the crossing to inundation is low and persons have sufficient warning time to avoid the crossing during high flow release scenarios.

The results indicated that the peak water level at the crossing (about 13 km downstream of the proposed Rookwood Weir) occurs roughly 12 to 18 hours after the start of the release. The rate of rise indicates that the crossing is not inundated by a wave or 'flash flood' type event.

Based on these results, the design accommodated 50 m^3/s through culverts under the road with larger flows inundating the road. It is estimated that the level of service provided by the crossing will be significantly improved with all low flows (50 m^3/s and less) passing under the crossing.

It is recommended that a system of page, email, and /or telephone be used to warn potentially affected residents when releases commence, or are about to commence from Rookwood Weir.

The existing road used at the crossing represents a speed environment that is lower than 40 km/hr. The road was therefore assessed at a speed of 40 km/h (rather than the design criteria of 60 km/hr).The current vertical geometry has gradients up to approximately 13 per cent on the eastern side of the Fitzroy River and 15 per cent on the western bank of the river. The existing horizontal geometry is as low as 20 m radius which is only slightly better than many turning movements at major urban intersections.

The design adopted is a 'fish friendly' 50 m long culvert crossing which will allow for greater flood immunity then the present system. This will allow for operational and environmental flow releases from Rookwood Weir to pass through the culverts.

During times of spillway flows, the culvert will gradually be inundated and road closure signage on high ground will be required. Poor sight distances to the crossing and poor vertical and horizontal geometry are the reasons for early warning signs as it would be difficult to reverse back up the road if the crossing is impassable. Signage can be either permanent, using a flap to state whether the road is closed or open or temporary signage. The signage would be operated by council or contractors and located where a turnaround facility can be built on high ground on both sides of the river. Such signage would be in addition to other early warning systems such as telephone, text messages and/or emailing those in the local area as suggested previously.

The single lane culvert crossing should include 200 mm high barrier kerbs to maintain vehicles on the culverts. Guardrail or other vehicle type barriers are not suitable due to maintenance issues created from debris and high velocities in the river when the gates are opened during a flood event.

The culverts size selected will provide satisfactory conditions for fishway passage. Final design should consider road safety, hydrology and environmental concerns based on more detailed survey. Detailed survey will be required to ensure that the levels of the concrete crossing and not the water flowing over the top are measured, along with width of existing structure and the road system connected to the existing structure.

3.4 Road network impact assessment

The potential impacts on the road network as a result of the operation of Eden Bann Weir as a result of inundation and under existing and flood conditions, along with a comparison of potential mitigation options, is presented in Table 3-2 and Table 3-3, respectively and shown on Figure 3-4.

The potential impacts on the road network as a result of the operation of Rookwood Weir (Stage 2) as a result of inundation and under existing and flood conditions, along with a comparison of potential mitigation options, is presented in Table 3-4 and Table 3-5, respectively and shown on Figure 3-5.

Table 3-6 and Table 3-7 show estimated peak water levels at select locations and the potential estimated increase in flood duration across a range of flood events (namely 1 in 2, 1 in 5, 1 in 10, 1 in 20, 1 in 50 and 1 in 100 year AEP events) for pre- and post-development conditions.

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					KBR								
ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
1	Glenavon Crossing (internal property access)	Princhester Creek	Private Fitzroy River AMTD 153.5		1	64	As required	0	64	Nil	Car and trucks including heavy cattle and grain trucks	Concrete culvert	• Crossing is the primary road access point to Glenavon property. • Landholder indicated that the crossing is currently un-trafficable approximately two to three weeks at a time during the wet season, although noted that this was less in drought conditions. • Landholder indicated no alternate vehicle access to the property and that horseback was used when the crossing was un-trafficable. • Landholder stated he had discussed a desired solution for the crossing with NRW at an earlier stage of the weir planning and the only solution was for NRW to resume the property. Ideally, the landholder would like to see NRW 'leave the property alone' since if the crossing was to be inundated it would be unworkable. Landholder stated that he thought a bridge over the current crossing would be unfeasible due to costs. • Landholder believes their property will be the most affected by the weir raising.
2	Coorumburra Road (Glenroy-Marlborough Road) Green Creek	Green Creek	Fitzroy Shire (now RRC?) Fitzroy River AMTD 180-183		1	5	5	0	10	Nil	Cars and light trucks	Earth embankment, no culvert	The Green Creek crossing was the only one of these three Glenroy–Marlborough Road crossings identified as being used by a landholder in the study. No landholder mentioned use of any of the other Glenroy–Marlborough Road crossings. It could be extrapolated that while many landholders in the area use this road, they do not identify these low lying crossings as actual river crossings. Thus the traffic volumes for the Glenroy–Marlborough determined from the landholder consultation are not likely to be representative of actual traffic volumes. Councils were contacted to obtain traffic count data, however there were no data available for this road.
3	Coorumburra Road (Glenroy- Marlborough Road) The Islands Flood Runner	The Islands Flood Runner	Fitzroy Shire (now RRC?) Fitzroy River AMTD 180-184		Refer to traffic counts	Refer to traffic counts	Refer to traffic counts	Refer to traffic counts	Refer to traffic counts	Nil	Cars and light trucks	Earth embankment, no culvert	Refer above
4	Coorumburra Road (Glenroy- Marlborough Road) Ten Mile Creek	Ten Mile Creek	Fitzroy Shire (now RRC?) Fitzroy River AMTD 180-185		Refer to traffic counts	Refer to traffic counts	Refer to traffic counts	Refer to traffic counts	Refer to traffic counts	Nil	Cars and light trucks	Concrete causeway	Refer above

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					DNR	GHD							
ID	**Crossing Name**	**Watercourse**	**Comments**	**KBR Preliminary Option**	**Mike Keane Preliminary Option**	**Inundated by FSL?**		**Level increase (m) for Eden Bann Raise**					
						FSL 18.2	**FSL 20.2**	**2 Yr ARI**	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**
1	Glenavon Crossing (internal property access)	Princhester Creek	The landholder didn't specify how often they take trucks over this crossing.	Raise, reroute, or resume	New alternative track	Yes	Yes						
2	Coorumburra Road (Glenroy-Marlborough Road) Green Creek	Green Creek	The usage of this river crossing is best ascertained by referring to traffic counts, as many respondents appeared to use the Glenroy-Marlborough Road but do not recognise this as a crossing.	Raise (as long as costs <$0.7 million)	To maintain the existing flood immunity along the Glenroy to Marlborough Road the above three causeways would need to be raised if Eden Bann Weir was raised. As these existing crossings are essentially on the natural surface, raising these crossings would involve a substantial structure at each location. This structure might consist of box or pipe culverts under a raised concrete slab, with concreted rock pitching on the banks to withstand the erosive flows experienced here. As an alternative, this 2 kilometres section of the Glenroy to Marlborough Road might be shifted to the immediate west to avoid these three crossings. The country here is higher and flood free but very broken, hence a new road here would be expensive. There may however be some value in considering this case further. Rerouting the road even further west would locate it in more undulating country, but would involve a long length of new road to connect up with the road to the north.								
3	Coorumburra Road (Glenroy- Marlborough Road) The Islands Flood Runner	The Islands Flood Runner	The usage of this river crossing is best ascertained by referring to traffic counts, as many respondents appeared to use the Glenroy-Marlborough Road but do not acknowledge this as a crossing.	Raise (as long as costs <$0.7 million)	To maintain the existing flood immunity along the Glenroy to Marlborough Road the above three causeways would need to be raised if Eden Bann Weir was raised. As these existing crossings are essentially on the natural surface, raising these crossings would involve a substantial structure at each location. This structure might consist of box or pipe culverts under a raised concrete slab, with concreted rock pitching on the banks to withstand the erosive flows experienced here. As an alternative, this 2 kilometres section of the Glenroy to Marlborough Road might be shifted to the immediate west to avoid these three crossings. The country here is higher and flood free but very broken, hence a new road here would be expensive. There may however be some value in considering this case further. Rerouting the road even further west would locate it in more undulating country, but would involve a long length of new road to connect up with the road to the north.								
4	Coorumburra Road (Glenroy- Marlborough Road) Ten Mile Creek	Ten Mile Creek	The usage of this river crossing is best ascertained by referring to traffic counts, as many respondents appeared to use this road but not acknowledge this as a crossing.	Raise (as long as costs <$0.7 million)	To maintain the existing flood immunity along the Glenroy to Marlborough Road the above three causeways would need to be raised if Eden Bann Weir was raised. As these existing crossings are essentially on the natural surface, raising these crossings would involve a substantial structure at each location. This structure might consist of box or pipe culverts under a raised concrete slab, with concreted rock pitching on the banks to withstand the erosive flows experienced here. As an alternative, this 2 kilometres section of the Glenroy to Marlborough Road might be shifted to the immediate west to avoid these three crossings. The country here is higher and flood free but very broken, hence a new road here would be expensive. There may however be some value in considering this case further. Rerouting the road even further west would locate it in more undulating country, but would involve a long length of new road to connect up with the road to the north.								

EDEN BANN

			GHD										
ID	Crossing Name	Watercourse	Increase in Duration of Flooding (days) for Eden Bann Raise						Traffic Count	Fish Passage Required?	Comments	GHD Recommendation	Further Work
			2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI					
1	Glenavon Crossing (internal property access)	Princhester Creek								Potentially	Bridge crossing would be required to maintain property access.	Resume Glenarvon. Property approx $12M. Upgrades approx $3M (KBR). Bridge over Princhester Creek approx $7M (KBR)	Reassess compensation during negotiations with landowner.
2	Coorumburra Road (Glenroy-Marlborough Road) Green Creek	Green Creek										Refer below	Refer below - no action recommended
3	Coorumburra Road (Glenroy- Marlborough Road) The Islands Flood Runner	The Islands Flood Runner										Refer below	Refer below - no action recommended
4	Coorumburra Road (Glenroy- Marlborough Road) Ten Mile Creek	Ten Mile Creek										Refer below	Refer below - no action recommended

EDEN BANN

					KBR									
ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
5	Redbank Crossing	Fitzroy River	Private Fitzroy River AMTD 183.3		1	10	10	4	25	Glenroy Crossing	Cars, light trucks, cattle trucks and mustering cattle	Ford - stabilised with 30m line of sheet piling.	• Crossing is used to work the property, which extends over both sides of the river. • Landholder indicated that the crossing is currently un-trafficable two to three months per year. • The alternate route to Redbank Crossing is the Glenroy Crossing, which the landholder stated was an approximately an extra 30 km each way, or in higher floods, more than 200 km via Marlborough/Rockhampton. • Landholder was concerned that if the crossing was permanently inundated they would be required to truck cattle back and forth across the Glenroy Crossing (approximately 12–13 trips each 60 km) since they currently muster cattle across the Redbank crossing. • The landholder's desired solution was to build a bridge/causeway over the crossing, although he didn't feel this would be feasible due to the high cost involved. Landholder instead suggested compensation for having to use the Glenroy Crossing. • The landholder indicated that the foundation at Redbank Crossing consists of deep gravel beds. Also, the landholder indicated it would be better to build a bridge downstream of the existing ford to avoid the requirement for a second bridge over a tributary on the west bank.
6	Melrose Bottom Crossing	Fitzroy River	Private Property: 'Melrose' Fitzroy River AMTD 191.5						Twice a year	Glenroy		Natural Ford	Natural ford approximately 1 1/2 kilometres north of the Glenroy Crossing.
7	Glenroy Crossing	Fitzroy River	Fitzroy Shire (nor RRC?) Fitzroy River AMTD 193		10	237	78	4	319	Glenroy - Marlborough Road and Bruce Highway (adds 2.5 hours drive one way)	Cars, heavy cattle and grain trucks (including B-Doubles)	190m causeway, 4.9m wide, 2x3.6x2.4m culverts, 20x1.2 diameter pipes + a number of smaller pipes.	12-14 properties access to Rockhampton • This crossing is used for multiple purposes, with the most common purpose being to access/work property on the other side of the river. It is only listed as the primary road access for two of the nine landholders. However, this is the main access to Rockhampton for a number of properties on the western side of the river. • Landholders indicated the Glenroy Crossing is un-trafficable around six weeks a year dependant on the seasons. • Alternate access to Rockhampton for this crossing is via Marlborough, which landholders indicated adds more than 200 kilometres to their journey (up to an extra two and a half hours). • All but one landholder (whose property is located on the eastern side of the Fitzroy River) indicated a desire to see an improved crossing at Glenroy. Reasons given included: providing all weather access to Rockhampton, for emergency access, and to improve the safety of using the crossing.

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ID	Crossing Name	Watercourse	Comments	KBR Preliminary Option	DNR Mike Keane Preliminary Option	GHD Inundated by FSL?		Level increase (m) for Eden Bann Raise					
						FSL 18.2	FSL 20.2	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI
5	Redbank Crossing	Fitzroy River		Remediation or Resumption Stabilised river ford provided for existing Eden Bann. Also involved stabilisation of ford across Ten Mile Creek	A bridge would be the only way to maintain a crossing over the Fitzroy River here. The channel of the Fitzroy River is quite narrow here, perhaps because of the flood breakout immediately upstream along "The Islands" flood runner. At the narrowest point the riverbed is less than 100 metre wide, but after allowing for a minimum deck level 4 metres above FSL, a 220 metre long bridge would be required here, which is likely to cost over $3 million. Installing a bridge to replace Redbank Crossing is not economically feasible, as the crossing would cost far more than the value of the land it serves.								
6	Melrose Bottom Crossing	Fitzroy River	Usually a few inches deep with water—rarely flooded. Untrafficable 1 to 2 months a year. When the weir is full (as it is currently), crossing is accessible for both cattle and bull dozer. So long as can get across Glenroy Crossing, losing access to the Bottom Crossing is not a significant issue—however having Bottom Crossing affected would be an inconvenience and an expense.	Remediation or Resumption									
7	Glenroy Crossing	Fitzroy River	One landholder only used this crossing in the month that their internal crossing was untrafficable.	Raise with box culverts or new bridge	Option 1. Raise Existing Glenroy Crossing with Box Culverts Box culverts could be anchored on the existing causeway deck. An existing crossing over Roper Creek was raised in this way when Bingegang Weir was raised in 1998. The issues with adopting a similar arrangement to raise the deck level of Glenroy Crossing are: • the crossing would still be single lane, • provides only minor improvement to the flood immunity of the existing crossing, • requires a temporary crossing during raising construction work, • increased risk of drowning the occupants of any vehicle that goes off the crossing and into deep water (public risk and liability issues), • the guardrails would be subject to frequent damage from high debris loads, and • the raised crossing itself would be subject to potential structure damage from large trees, logs and debris loads in Fitzroy River floods. This is a lower cost option, but results in the unsatisfactory aspects listed above which precluded it as an acceptable option. Option 2. Construct a New Glenroy Crossing Bridge The advantages of constructing a new bridge here over installing box culverts on the existing crossing are: • provide for two lanes of traffic, • meet current guidelines for bridges (potential liability considerations), • allow for passage of flood debris under bridge, • can use the existing crossing during construction so would not require a temporary crossing during construction, and • improve the flood immunity of this crossing (meeting community aspirations). A new bridge here is estimated to cost $3.12 million for a minimum deck level 4 metres above the Stage 2 FSL and $3.29 million for the Stage 3 level, based on work undertaken for Riverslea crossing (Ref.18). This deck level is based on a 2.5 metre allowance for headroom under the bridge beams when the weir is full. There would likely be requests for an even higher deck level for an even greater improvement in flood immunity. The additional funding required for such an arrangement is outside the scope of this planning report.			0.31	0.04	0.03	0.02	0.02	0.00

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			GHD										
ID	Crossing Name	Watercourse	Increase in Duration of Flooding (days) for Eden Bann Raise						Traffic Count	Fish Passage Required?	Comments	GHD Recommendation	Further Work
			2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI					
5	Redbank Crossing	Fitzroy River										Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
6	Melrose Bottom Crossing	Fitzroy River										Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
7	Glenroy Crossing	Fitzroy River	No Data	1.0	0.1	0.1	0.1	0.1		YES	Glenroy Crossing is the only access to the 'Glenroy' property. Although expensive, access to the property must be maintained.	**New bridge**	Detailed design of bridge crossing

EDEN BANN

					KBR									
ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
8	Craiglee Crossing	Fitzroy River	Property: 'Craiglee' Private Fitzroy River AMTD 205.2		2	32	4	1	37	Glenroy Crossing	Cars, light trucks, cattle trucks and mustering cattle	Low level concrete crossing, ~70m long across low flow part of river, appears to have good rock foundation.	• Crossing is an internal property access for land on western side of river. The crossing is used by the second landholder to retrieve cattle that crossed the river into neighbouring properties. • Landholders indicated that the crossing is currently un-trafficable approximately six to eight weeks of the year during the wet season, 'only when the river's up'. • Craiglee landholder said there is no alternate vehicle access to the property on that side of the river and they would use a boat to cross, but if taking a vehicle they would use Glenroy Crossing which is approximately 40 minutes (40 km) extra each way. • When queried regarding their desired solution for the crossing, the Craiglee landholder stated they needed to keep the crossing, and that it would be very inconvenient to have to travel to Glenroy to access part of their property. The second landholder said their mail delivery would be cut off from their property without this crossing and that a new crossing at Craiglee would be required if the weir inundated the current crossing.
9	Hanrahan Road Crossing	Fitzroy River	Fitzroy Shire (nor RRC?) Fitzroy River AMTD 248.7		1	62	3	Unspecified	65	Nil	Cars, cattle trucks, visiting campers	600m along bed of river, concrete causeway over low flow.	• Crossing is main property access. • Landholder indicated that the crossing is currently un-trafficable 'a few weeks a year' and in the past has been cut off for four or five months. • Landholder indicated no alternate vehicle access to the property and that occupants would boat across if the crossing was inundated, or follow tracks through neighbouring properties (adding approximately two hours to the journey in each direction). • Landholder was concerned about the effect the loss of Hanrahan Road Crossing would have on their ability to run their property effectively. • The landholder's desired solution was to build a causeway or small bridge at the crossing site. The deck level of the crossing should be raised by an amount equal to the water level rise should the weir be raised. Would be happy to have the same accessibility as currently, but would not like the crossing to be un-trafficable any more than at present.
22	Proposed high level crossing of the Fitzroy River downstream of Eden Bann	Fitzroy River										Does not currently exist. Proposed high flood immunity crossing bypassing Rockhampton. Also proposed as access for PDA 5 by the FIIS.	
23	Wattlebank	Fitzroy River	Approx 1.6kms downstream of Eden Bann Weir. Property: 'Marble Ridges'		N/A	N/A	N/A	N/A	Very occasional for retriving cattle from the other side of the river	Via Rockhampton			

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					DNR	GHD							
ID	Crossing Name	Watercourse	Comments	KBR Preliminary Option	Mike Keane Preliminary Option	Inundated by FSL?		Level increase (m) for Eden Bann Raise					
						FSL 18.2	FSL 20.2	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI
8	Craiglee Crossing	Fitzroy River	Services access bwteen two neighouring properties (Craiglee and Homehill) for cattle retrieval, mail delivery	No action	An Eden Bann Weir Stage 3 would require the raising of **Glenroy Crossing??**, thereby improving its flood immunity. During moderate river flows this would improved the access to this upstream left bank property over the existing situation.								
9	Hanrahan Road Crossing	Fitzroy River	Legal acces to 2 properties and visiting campers Recreational users also use this crossing—however frequency was not specified	Raise	The existing crossing utilises the only natural ford along the river for some 10 kilometres both upstream and downstream. This location therefore provides the only real opportunity for a low cost crossing of the Fitzroy River for some considerable distance This crossing is located at the eastern extent of a sharp river bend. The road from the east is located in the narrow corridor between the steep rocky hills to the north and the Emu Creek flood pondage area to the south. This terrain therefore dictates that the same basic alignment as Hanrahan Road needs to be followed. A new bridge over the Fitzroy River could be installed here that utilise the existing sections of Hanrahan Road on each side of the river. However the Fitzroy River channel here is particularly wide and would need a 400 metres long bridge, costing $6 million, just to clear the weir storage. This prohibitive cost rules out bridging the Fitzroy here as a viable option to provide access to these properties. A low cost Fitzroy River crossing, consisting of a low level crossing or causeway could be construct below a proposed weir site. To keep costs down, this needs to be located on a rock bar or natural control, similar to the existing Hanrahan Road Crossing which it is seeking to replace.	No	No	0.00	0.00	0.00	0.00	0.00	0.00
22	Proposed high level crossing of the Fitzroy River downstream of Eden Bann	Fitzroy River		Without connecting roads along the northern side of the Fitzroy this proposed connection provides little benefit for properties on the west bank. Will provide a good connection for PDA 5 should that development proceed. No costs for this connection are included in this study.		No	No						
23	Wattlebank	Fitzroy River	Located approximately 1 mile south of weir. Landholder stated that this crossing would not be an issue as stock would not be able to cross the river once weir was raised.	Downstream of Eden Bann, so not affected by ponding or flood effects (assuming gradual deflation of rubber bags). Increased operational releases may reduce opportunity to use, but little current use, so no action assumed.		No	No						

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			GHD										
ID	**Crossing Name**	**Watercourse**	**Increase in Duration of Flooding (days) for Eden Bann Raise**						**Traffic Count**	**Fish Passage Required?**	**Comments**	**GHD Recommendation**	**Further Work**
			2 Yr ARI	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**					
8	Craiglee Crossing	Fitzroy River										Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
9	Hanrahan Road Crossing	Fitzroy River	No Data	0.00	0.00	0.00	0.00	0.00		YES	Impacted by Rookwood. Refer to Rookwood Master Sheet	Upgrade crossing with culverts due to increase in flows due to outlet works	Detailed design of culvert crossing
22	Proposed high level crossing of the Fitzroy River downstream of Eden Bann	Fitzroy River										None	None
23	Wattlebank	Fitzroy River										Private crossing. Addressed as compensation	Assess downstream flow increase and the effect on this crossing

EDEN BANN

					KBR									
ID	**Crossing Name**	**Watercourse**	**Location / Owner**	**Photo (if available)**	**No respondents using crossing**	**Total Frequency of Use**				**Typical alternate route (if crossing is untrafficable)**	**Vehicles Utilised**	**Type/Dimensions**	**Description**
						Car/4WD	**Truck**	**Stock/Walking**	**Overall**				
25	Embankment on 5 small gullies running between 143 and 151 AMTD		Property: 'Eden Bann'		N/A	N/A	N/A	N/A	30 times a year (twice a month)	No alternate vehicle access. Alternate horseback/walking access around top of property along electrical ines clearing then along minor watercourse (finishing at AMTD 151)			
24	Internal access road from Eden Bann property to Eden Bann Weir		Property: 'Eden Bann'		N/A	N/A	N/A	N/A	2-3 times per year for landowner. SunWater employee access	No alternate route	cars, trucks		
27	Crossing over lower section of Boggy Creek		Property: 'Glenarvon'		N/A	N/A	N/A	N/A	3-4 days per week	No alternate vehicle access.			Basic concrete culvert located where the Glenavon track meets Boggy Creek. Currently, when weir is full this crossing is trafficable.
26	Crossing over Princhester Creek		Property: 'Glenarvon'		N/A	N/A	N/A	N/A	3-4 days per week	No alternate vehicle access.			Road over dirt—located upstream from the Glenavon Access Track and is used when the Glenavon Access Track is flooded.
28	Two crossings—at AMTD 163 and between AMTD 161 and 160		Property: 'Mt Fairview'		N/A	N/A	N/A	N/A	12 times a year	No alternate route			Low level road on dirt crossing. Major gully at AMTD 160-161 and minor gully at 163.
29	Crossings on the horseshoe lagoon		Property: Coorumburra'		N/A	N/A	N/A	N/A	1 day per week	No alternate route			Embankment pushed up on western side of lagoon (off track).
30	Internal Marlborough Creek crossing		Property: Coorumburra'		N/A	N/A	N/A	N/A	Twice a day	No alternate route			General property access Cleared road across creek. Currently, this crossing is approximately 1 to 2 metres higher than water level when dam is full.
42	Commanche Road	Fitzroy River											
43A	Coorumburra Road A	Anabranch 032											
43B	Coorumburra Road B	Anabranch 032											
43C	Coorumburra Road C	Anabranch 032											
43D	Coorumburra Road D	Anabranch 032											

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					DNR	GHD							
ID	**Crossing Name**	**Watercourse**	**Comments**	**KBR Preliminary Option**	**Mike Keane Preliminary Option**	**Inundated by FSL?**		**Level increase (m) for Eden Bann Raise**					
						FSL 18.2	**FSL 20.2**	**2 Yr ARI**	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**
25	Embankment on 5 small gullies running between 143 and 151 AMTD		The only access to the area to poison the weeds—would adversely affect the property if they could not access these gullies to poison. When the weir is full the gullies are all still accessible but are underwater during heavy flooding.	Reroute road along new edge of FSL, or use boat to access for weed spraying.									
24	Internal access road from Eden Bann property to Eden Bann Weir		Used by Sun Water employees only, not Eden Bann property landholders.	Appears will be little impact on this road aside from the end right near the weir. Likely to be construction access for weir - any costs assumed included in weir construction costs.									
27	Crossing over lower section of Boggy Creek		Used to access parts of property for work. Crossing can be out for 2-3 weeks at a time during the wet season	Costs of re-routing covered by costs estimated for crossing ID1.									
26	Crossing over Princhester Creek		Used to access parts of property for work. Crossing can be out for 2-3 weeks at a time during the wet season	Costs of re-routing covered by costs estimated for crossing ID1.									
28	Two crossings—at AMTD 163 and between AMTD 161 and 160		Primary Road Access. Crossing can be out up to a week per year - seasonally dependent. If these crossings are inundated there will be no vehicle access to the property. Landholder suggested that the desired solution would be to create an alternate access route at a higher point on the property.	Reroute road on higher ground - may need to go slightly through neighbouring Aricia State Forest.									
29	Crossings on the horseshoe lagoon			For EL18.5 option out of ponded area, assume no action. For EL20.5 option raise existing embankment to maintain access.									
30	Internal Marlborough Creek crossing		Route untrafficable approx 3-weeks to a month per year	Likely a moderate sized culvert will be required, or alternatively a 4-5km re-route.									
42	Commanche Road	Fitzroy River						0.06	0.01	0.01	0.00	0.00	0.00
43A	Coorumburra Road A	Anabranch 032						0.58	0.07	0.04	0.02	0.04	0.04
43B	Coorumburra Road B	Anabranch 032						0.51	0.07	0.05	0.03	0.03	0.04
43C	Coorumburra Road C	Anabranch 032						0.66	0.07	0.05	0.03	0.04	0.04
43D	Coorumburra Road D	Anabranch 032						0.65	0.07	0.05	0.03	0.04	0.05

EDEN BANN

			GHD										
ID	Crossing Name	Watercourse	Increase in Duration of Flooding (days) for Eden Bann Raise						Traffic Count	Fish Passage Required?	Comments	GHD Recommendation	Further Work
			2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI					
25	Embankment on 5 small gullies running between 143 and 151 AMTD											Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
24	Internal access road from Eden Bann property to Eden Bann Weir											Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
27	Crossing over lower section of Boggy Creek											Resume Glenarvon. Property approx $12M. Upgrades approx $3M (KBR). Bridge over Princhester Creek approx $7M (KBR)	
26	Crossing over Princhester Creek											Resume Glenarvon. Property approx $12M. Upgrades approx $3M (KBR). Bridge over Princhester Creek approx $7M (KBR)	
28	Two crossings—at AMTD 163 and between AMTD 161 and 160											Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
29	Crossings on the horseshoe lagoon											Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
30	Internal Marlborough Creek crossing											Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
42	Commanche Road	Fitzroy River	No Data	0.5	0.00	0.00	0.00	0.00			Minor increase in duration of flooded road.	No change to existing condition	None
43A	Coorumburra Road A	Anabranch 032	No Data	1.3	0.2	0.1	0.1	0.1			Minor increase in duration of flooded road.	No change to existing condition	None
43B	Coorumburra Road B	Anabranch 032	No Data	1.3	0.2	0.1	0.1	0.1			Minor increase in duration of flooded road.	No change to existing condition	None
43C	Coorumburra Road C	Anabranch 032	No Data	1.4	0.2	0.1	0.1	0.1			Minor increase in duration of flooded road.	No change to existing condition	None
43D	Coorumburra Road D	Anabranch 032	No Data	1.3	0.2	0.1	0.1	0.1			Minor increase in duration of flooded road.	No change to existing condition	None

Impact locations identified

Road	Description of change (extent)	Previous analysis	Comment
Glenroy Marlborough Road A (Near Green Creek)	2 yr ARI - greater extent (11 m)	Covered in spreadsheet	Covered in spreadsheet
Glenroy Marlborough Road A (Fitzroy River Near Green Creek)	2 yr ARI - greater extent (20 m) and 40 m of deeper flooding (1.5 - 3 m)	Covered in spreadsheet	Covered in spreadsheet
Unnamed Local Road 7	2 yr ARI - greater extent (40 m) and depth	Unsure	End of road - impact not significant

All roads assessed

Roads	Location (metres)	2 yr ARI	5 yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI
Blanche Road (corner)	213170, 7439327	Not affected	Not affected	No change	No change	No change	No change
Ellrot Road 1	212197, 7438340	Not affected	Not affected	No change	No change	No change	No change
Unnnamed Local Road 1A	210458, 7441478	No change	No change	No change	No change	No change	No change
Unnnamed Local Road 1B	210458, 7441478	Not affected	No change	No change	No change	No change	No change
Ellrot Road 2	210458, 7434057	Not affected	Not affected	Not affected	No change	No change	No change
Unnamed Local Road 2	209907, 7434921	No change	No change	No change	No change	No change	No change
Unnamed Local Road 3	206843, 7435536	No change	No change	No change	No change	No change	No change
Edan Bann Road	207716, 7446328	No change	No change	No change	No change	No change	No change
Unnamed Local Road 4	204014, 7444962	No change	No change	No change	No change	No change	No change
Esplanade	185424, 7447924	No change	No change	No change	No change	No change	No change
Unnamed Local Road 5	187535, 7447762	Not affected	No change	No change	No change	No change	No change
Glenroy Marlborough Road	180127, 7448919	Crossing slight increase	No change	No change	No change	No change	No change
Unnamed Local Road 6	182664, 7445286	Not affected	No change	No change	No change	No change	No change
Unnamed Local Road 7	186013, 7443885	40 m increase extent	No change	No change	No change	No change	No change
Unnamed Local Road 8	177704, 7440044	No change	No change	No change	No change	No change	No change
Glenroy Road	186924, 7434793	Not affected	Not affected	Not affected	Not affected	No change	No change
Commanche Road 1	182871, 7432428	Not affected	No change	No change	No change	No change	No change
Craigilee Road	190460, 7427963	No change	No change	No change	No change	No change	No change
Unnamed Local Road 9	190182, 7426910	No change	No change	No change	No change	No change	No change
Rosewood Road	189149, 7422162	Not affected	Not affected	No change	No change	No change	No change
Unnamed Local Road 10	188474, 7423234	No change	No change	No change	No change	No change	No change
Unnamed Local Road 11	187977, 7420811	Not affected	Not affected	Not affected	No change	No change	No change
Commanche Road 2	180189, 7419539	Not affected	Not affected	No change	No change	No change	No change
Unnamed Local Road 12	186280, 7417649	Not affected	No change	No change	No change	No change	No change
Unnamed Local Road 13	187214, 7413128	Not affected	No change	No change	No change	No change	No change
Commanche Road 3	182233, 7412440	Not affected	Not affected	Not affected	No change	No change	No change
Hanrahan Road 1	187277, 7402317	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected
Hanrahan Road 2	191180, 7402562	No change	No change	No change	No change	No change	No change
Local Road off Barrett Road	190813, 7406732	No change	No change	No change	No change	No change	No change
Thirsty Creek Road 1	196454, 7399517	No change	No change	No change	No change	No change	No change
Thirsty Creek Road 2	195804, 7392998	No change	No change	No change	No change	No change	No change
Thirsty Creek Road 3	195727, 7392000	Not affected	No change	No change	No change	No change	No change
Enfield Road	197410, 7390481	Not affected	Not affected	No change	No change	No change	No change
Local Road off Thirsty Creek 1	194188, 7389763	Not affected	Not affected	Not affected	No change	No change	No change
Local Road off Thirsty Creek 2	194331, 7387793	No change	No change	No change	No change	No change	No change
Local Road off Thirsty Creek 3	194311, 7386007	Not affected	No change	No change	No change	No change	No change
Weir Park Road	193305, 7394134	Not affected	Not affected	No change	No change	No change	No change
Rookwood Road Crossing	186697, 7391220						
Riverslea Road Crossing	188458, 7389311						
Yarra Road Crossing	185651, 7388573						
Jackson Road	189662, 7380157	No change	No change	No change	No change	No change	No change
Local Road off Jackson (east)	190091, 7379694	No change	No change	No change	No change	No change	No change
Local Road off Jackson (west) 1	186934, 7380963	No change	No change	No change	No change	No change	No change
Smith Road 1	178013, 7389010	No change	No change	No change	No change	No change	No change
Smith Road Crossing	175199, 7387997						

ATKINSONS ROAD

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

NINE MILE ROAD TO BE AFFECTED BY Q5 EVENT

HORSESHOE LAGOON

WOODVILLE

GLEN GEDDES

ATKINSONS ROAD

GLENROY - MARLBOROUGH ROAD TO BE AFFECTED BY Q5 EVENT

ESPLANADE TO BE AFFECTED BY Q5 EVENT

CANOONA

UNCONSTRUCTED ROAD TO BE AFFECTED BY Q5 EVENT

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

FAIRVIEW ROAD TO BE AFFECTED BY Q5 EVENT

EDEN BANN WEIR

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

BRUCE HIGHWAY

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

REDBANK ROAD TO BE AFFECTED BY Q5 EVENT

MORINISH

GLENROY CROSSING

RIDGELANDS ROAD

GARNANT

UNCONSTRUCTED ROAD TO BE AFFECTED BY Q5 EVENT

COMMANCHE ROAD TO BE AFFECTED BY Q5 EVENT

CRAIGLEE ROAD TO BE AFFECTED BY Q5 EVENT

FITZROY RIVER

RIDGELANDS ROAD

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

LOCAL ROAD TO BE AFFECTED BY Q5 EVENT

0 1000 2000 3000 4000 5000m

SCALE 1:100,000 AT ORIGINAL SIZE

LEGEND

- FLOOD EXTENT BORDER (100 YEAR EVENT)
- FLOOD EXTENT BORDER (5 YEAR EVENT)
- STAGE 3 INUNDATION
- RAILWAY
- PRIVATE ROADS
- STATE CONTROLLED ROADS (HIGHWAYS)
- CLOSED ROADS
- LOCAL ROADS
- MAIN ROADS
- MAINTENANCE TRACKS
- UNCONSTRUCTED ROADS

PRELIMINARY

No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date
B	FOR BUSINESS CASE		A.M	RF*	WHT*	12.12.12
A	ISSUED FOR DISCUSSION		APK	RF*	WHT*	13.06.12

Client Reference Number

Gladstone Area Water Board
147 Goondoon Street
Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 F 07 4972 5632

SunWater
Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

GHD
145 Ann St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 F 61 7 3316 3333
E bnemail@ghd.com.au W www.ghd.com.au

Drawn	A.KELLY	Designed	J. ZERAFA
Drafting Check		Design Check	
Approved			
Date			
Scale	AS SHOWN	This Drawing must not be used for Construction unless signed as Approved	

Client: GLADSTONE AREA WATERBOARD AND SUNWATER
Project: LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title: AFFECTED ROAD LAYOUT PLAN EDEN BANN WEIR

Original Size A1

Drawing No: 41-20736-04-SK004 Rev: B

Plot Date: 13 February 2013 - 4:16 PM

Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK004.dwg

ROOKWOOD

KBR

ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
7	Glenroy Crossing	Fitzroy River	Rockhampton Regional Council Fitzroy River AMTD 193		10	237	78	4	319	Glenroy - Marlborough Road and Bruce Highway (adds 2.5 hours drive one way)	Cars, heavy cattle and grain trucks (including B-Doubles)	190m causeway, 4.9m wide, 2x3.6x2.4m culverts, 20x1.2 diameter pipes + a number of smaller pipes.	12-14 properties access to Rockhampton • This crossing is used for multiple purposes, with the most common purpose being to access/work property on the other side of the river. It is only listed as the primary road access for two of the nine landholders. However, this is the main access to Rockhampton for a number of properties on the western side of the river. • Landholders indicated the Glenroy Crossing is un-trafficable around six weeks a year dependant on the seasons. • Alternate access to Rockhampton for this crossing is via Marlborough, which landholders indicated adds more than 200 kilometres to their journey (up to an extra two and a half hours). • All but one landholder (whose property is located on the eastern side of the Fitzroy River) indicated a desire to see an improved crossing at Glenroy. Reasons given included: providing all weather access to Rockhampton, for emergency access, and to improve the safety of using the crossing.
9	Hanrahan Road Crossing	Fitzroy River	Rockhampton Regional Council Fitzroy River AMTD 248.7		1	62	3	Unspecified	65	Nil	Cars, cattle trucsk, visiting campers	600m along bed of river, concrete causeway over low flow.	• Crossing is main property access. • Landholder indicated that the crossing is currently un-trafficable 'a few weeks a year' and in the past has been cut off for four or five months. • Landholder indicated no alternate vehicle access to the property and that occupants would boat across if the crossing was inundated, or follow tracks through neighbouring properties (adding approximately two hours to the journey in each direction). • Landholder was concerned about the effect the loss of Hanrahan Road Crossing would have on their ability to run their property effectively. • The landholder's desired solution was to build a causeway or small bridge at the crossing site. The deck level of the crossing should be raised by an amount equal to the water level rise should the weir be raised. Would be happy to have the same accessibility as currently, but would not like the crossing to be un-trafficable any more than at present.
10A	Thirsty Creek Road	Fitzroy River Tributaries	Rockhampton Regional Council Fitzroy River AMTD 265-268 37PN536 808422.2 739863.4									Gravel road	Weir access, no river crossing
10B	Thirsty Creek Road	Fitzroy River Tributaries	Rockhampton Regional Council Fitzroy River AMTD 265-268 808372.6 7392295.7									Gravel road	Weir access, no river crossing
10C	Thirsty Creek Road	Fitzroy River Tributaries	Rockhampton Regional Council Fitzroy River AMTD 265-268 808305.9 73919398									Gravel road	Weir access, no river crossing
10D	Thirsty Creek Road	Fitzroy River Tributaries	Rockhampton Regional Council Fitzroy River AMTD 265-268 808115.6 7390777.9									Gravel road	Weir access, no river crossing Inundation almost on road

ROOKWOOD

					DNR
ID	**Crossing Name**	**Watercourse**	**Comments**	**KBR Preliminary Option**	**Mike Keane Preliminary Option**
7	Glenroy Crossing	Fitzroy River	One landholder only used this crossing in the month that their internal crossing was untrafficable.	Raise with box culverts or new bridge	N/A for Rookwood
9	Hanrahan Road Crossing	Fitzroy River	Legal acces to 2 properties and visiting campers Recreational users also use this crossing—however frequency was not specified	Raise	The existing crossing utilises the only natural ford along the river for some 10 kilometres both upstream and downstream. This location therefore provides the only real opportunity for a low cost crossing of the Fitzroy River for some considerable distance This crossing is located at the eastern extent of a sharp river bend. The road from the east is located in the narrow corridor between the steep rocky hills to the north and the Emu Creek flood pondage area to the south. This terrain therefore dictates that the same basic alignment as Hanrahan Road needs to be followed. A new bridge over the Fitzroy River could be installed here that utilise the existing sections of Hanrahan Road on each side of the river. However the Fitzroy River channel here is particularly wide and would need a 400 metres long bridge, costing $6 million, just to clear the weir storage. This prohibitive cost rules out bridging the Fitzroy here as a viable option to provide access to these properties. A low cost Fitzroy River crossing, consisting of a low level crossing or causeway could be construct below a proposed weir site. To keep costs down, this needs to be located on a rock bar or natural control, similar to the existing Hanrahan Road Crossing which it is seeking to replace.
10A	Thirsty Creek Road	Fitzroy River Tributaries	Road does not follow road reserve Actual road above Stage 2 inundation	No action (costs included elsewhere)	Not addressed
10B	Thirsty Creek Road	Fitzroy River Tributaries	Road does not follow road reserve Actual road above Stage 2 inundation	No action (costs included elsewhere)	Not addressed
10C	Thirsty Creek Road	Fitzroy River Tributaries	Road does not follow road reserve Actual road above Stage 2 inundation	No action (costs included elsewhere)	Not addressed
10D	Thirsty Creek Road	Fitzroy River Tributaries	Road follows reserve. Inundation in reserve area and almost on road Non-perennial watercourse crosses here	No action (costs included elsewhere)	Not addressed

ROOKWOOD

			GHD																	
ID	**Crossing Name**	**Watercourse**	**Inundated by FSL?**		**Hydrology - Level increase (m) for Rookwood**						**Increase in Duration of Flooding (days) for Rookwood**						**Traffic Count**	**Fish Passage Required?**	**Comments**	**GHD Recommendation**	**Further Work**
			FSL 45.5	**FSL 49.0**	**2 Yr ARI**	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**	**2 Yr ARI**	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**					
7	Glenroy Crossing	Fitzroy River	Yes/no Depth Widespread single or multiple impacts		-0.07 negative implies improved immunity	0.02	0.01	0.00	0.00	0.00	No Data	0.00	0.00	0.00	0.00	0.00	N/A	YES	Road already inundated in existing condition. No lengthening of time of inundation. No impact of outlets at this location.	If Rookwood is constructed there is no worsening of the crossing and therefore no requirement to do anything at Glenroy Crossing. If Eden Bann weir is raised, there will be a requirement for an upgrade to this crossing (refer to Eden Bann page for details)	Refer to Eden Bann page.
9	Hanrahan Road Crossing	Fitzroy River	No	No	-0.08	0.02	0.01	0.00	0.00	0.00	No Data	0.00	0.00	0.00	0.00	0.00		YES	Road already inundated in existing condition. No lengthening of time of inundation. Impacted by outlet works at Rookwood. Up to 50cumecs may be released from the weir which will inundate the existing crossing.	**New culvert crossing**	Detailed design for new culvert crossing
10A	Thirsty Creek Road	Fitzroy River Tributaries	No	No	4.72	1.09	0.60	0.33	0.15	0.12	No Data	5.7	2.1	1.6	1.4	1.3		NO	Road worsened by flood effects.	**New upgrades to road - refer to GHD sketches.**	Detailed design for road upgrades
10B	Thirsty Creek Road	Fitzroy River Tributaries	No	No														NO		**New upgrades to road - refer to GHD sketches.**	Detailed design for road upgrades
10C	Thirsty Creek Road	Fitzroy River Tributaries	No	No														NO		**New upgrades to road - refer to GHD sketches.**	Detailed design for road upgrades
10D	Thirsty Creek Road	Fitzroy River Tributaries	No	No														NO		**New upgrades to road - refer to GHD sketches.**	Detailed design for road upgrades

ROOKWOOD

KBR

ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
11	Rookwood Crossing	Fitzroy River	Private Fitzroy River AMTD 266		4	65	Unspecified	0	65	Riverslea Crossing	Cattle, 16-tonne truck, car	Natural Ford	• Work is the primary purpose for the use of this crossing, with two landholders using it to access their property (or a neighbouring property) and one landholder using it to retrieve cattle that cross the river when low into neighbouring properties. The final landholder only used the crossing for social purposes. • One landholder stated that the crossing was un-trafficable up to eight months a year, dependent on season. Others suggested that in the past 12 months the crossing was un-trafficable approximately two to four months. • Riverslea Crossing is the alternate access for Rookwood Crossing; however, two landholders suggested that they would reschedule their journey if this crossing was un-trafficable. • The desired solutions offered by landholders for this crossing included: – retention of the crossing for private access to the Weir Park property, which crosses the river. – construction of a road across the Rookwood Crossing, but this may be unlikely due to cost – something put in place at the bottom of the weir (landholder indicated they had no need for the Rookwood Crossing should the weir be constructed).
12	Riverslea Crossing	Fitzroy River	Rockhampton Regional Council Fitzroy River AMTD 276		17	297	34	0	331	Nil- boat access	Cars, cattle trucks, grain trucks	120m gravity causeway, bridge over low flow.	• This crossing is used for multiple purposes, with the most common purpose being to access workplace/property on the other side of the river. It is listed as the primary road access for six of the seventeen properties—it is also the main access to Rockhampton for a number of properties on the western side of the river. • Landholders indicated the Riverslea Crossing is un-trafficable up to three months a year, but a few suggested it was more like two to four weeks during the recent drought. • Most landholders do not have alternate access to Rockhampton for this crossing and boat across or use non-shire tracks through neighbouring properties when the crossing is flooded. Some properties can travel via Marlborough; however, it was highlighted that this alternate route is too long to be feasible. • Landholders indicated a strong desire to see an improved crossing at Riverslea if the weir is raised. – One landholder would like to see a bridge over Riverslea that was passable even in flood conditions. – One landholder said it was not an issue as long as a crossing to Rockhampton with the same flood immunity as the Riverslea has currently is retained. – One landholder said NRW was aware that they will have to upgrade the crossing and would like to see this done. – One landholder said the Riverslea Crossing must be maintained to current accessibility level once weir goes in. – One landholder proposed that a bridge at roundabout (Riverslea Crossing) should be 15–20 m high (approximately 60 feet). – ‘Have a bridge over Riverslea or another major access for other properties around Rookwood Weir’. – ‘I would like to see a usable crossing maintained at Riverslea. If the weir goes in and Riverslea crossing is flooded, every time we go to town we would need a boat’.
13	The Pocket 4wd Access	Melaleuca Creek (modelled by GHD as Tributary 2 (Section 7))	Private Fitzroy River AMTD 276.5		2	156	8	0	164	Smith Road Crossing - extra 15 kms	Cars, fuel trucks, cattle trucks	Rock bar, site inspection indicates ordinary car could cross	• Crossing is primary road access point to The Pocket property. But KBR page 4-3 conflicts - says that this is a short-cut access to 2 properties • Landholders indicated that the crossing is currently un-trafficable approximately two to three months a year or less. • Landholders stated their alternate access was via Riverslea Crossing, approximately 17 km extra distance each trip. • One landholder’s desired solution was to maintain access across the crossing, as it is inconvenient to travel around via Smith Rd to Riverslea. The second landholder said they would like to keep the crossing but doesn’t see it happening.

ROOKWOOD

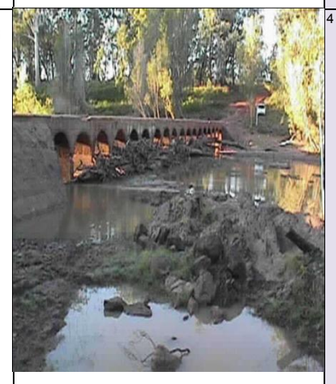
					DNR
ID	Crossing Name	Watercourse	Comments	KBR Preliminary Option	Mike Keane Preliminary Option
11	Rookwood Crossing	Fitzroy River	One landholder stated he used this crossing 'when it was low enough' but did not give a more specific timeframe, so was excluded from frequency. One landholder stated they took 16-tonne trucks across this crossing—but did not specify frequency.	Remediation or Resumption	Would require Riverslea Crossing to be raised, which is highly desired by all left bank properties, including Weir Park, as the existing crossing is highly flood prone. A downstream weir would also largely inundate the left bank Camping Reserve and the adjoining sand deposits. Replacing Rookwood Crossing with a bridge would involve unwarranted high costs. As a consequence, this study has considered that no action would be taken to replace a flooded Rookwood Crossing.
12	Riverslea Crossing	Fitzroy River	One landholder stated he took 16-tonne tucks across this crossing—but did not specify frequency. The landholder also stated they have taken stock across this crossing in the past but not in the past 12—24 months.	Raise	a new bridge alignment upstream of the existing crossing, which aligns with the Riverslea approach road from Gogango and curves around to the top of the ridge above the western bank of the river. In accordance with Queensland Main Roads Department practice, this would achieve an 80 kilometres per hour design speed in both vertical and horizontal alignment. The location of a high level bridge in this vicinity is an important issue for the selection of a preferred weir location along this section of the Fitzroy River. Locating a high level bridge elsewhere would impact greatly on the Fitzroy Shire road network, which provides the only access to eleven properties on the western (left) bank of the Fitzroy River.
13	The Pocket 4wd Access	Melaleuca Creek (modelled by GHD as Tributary 2 (Section 7))	Landholders consider this crossing is the primary access road to The Pocket.	Raise, remediate, or resume	Not addressed

ROOKWOOD

			GHD																		
ID	Crossing Name	Watercourse	Inundated by FSL?		Hydrology - Level increase (m) for Rookwood						Increase in Duration of Flooding (days) for Rookwood						Traffic Count	Fish Passage Required?	Comments	GHD Recommendation	Further Work
			FSL 45.5	FSL 49.0	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI					
11	Rookwood Crossing	Fitzroy River	Yes	Yes														N/A	Crossing opportunistic. Immediately upstream of weir location. Owners do not want public access to weir structure - operational safety reasons. Riverslea access nearby.	Close access. Access via Riverslea nearby.	None
12	Riverslea Crossing	Fitzroy River	Yes	Yes	3.77	0.80	0.43	0.22	0.06	0.04	No Data	4.5	1.4	1.0	0.9	0.8		YES	Important network access. Consultation with community suggests that this is an access where, if good immunity from floods were provided, it would make the project a positive impact.	**New bridge.**	Detailed design for new bridge
13	The Pocket 4wd Access	Melaleuca Creek (modelled by GHD as Tributary 2 (Section 7))									No Data	0.00	0.00	0.00	0.00	0.00		?	For example only: alternative access is available, opportunistic crossing, can use XYZ, recommend road closure. Landholder negotiation, compensation etc.		

ROOKWOOD

KBR

ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
14	Smith Road Crossing	Melaleuca Creek (modelled by GHD as Tributary 2 (Section 7))	Rockhampton Regional Council Fitzroy River AMTD 276.5		1	31	Unspecified	0	31	Nil- boat access	Cars, 16-tonne trucks	Bridge	Despite being a shire road crossing, this crossing was only identified by one landholder in the course of consultation. Like the Glenroy—Marlborough Road crossings, it is possible that this crossing was not highlighted by landholders as they do not acknowledge this as a Fitzroy River crossing as the crossing is located some distance up Melaleuca Creek. Also, the potential users of this crossing seem to use The Pocket 4WD access as their main access as it is a significant short cut. • Landholder indicated that the crossing is currently un-trafficable approximately three weeks to a month per year. • Landholder stated their alternate access was via the Rookwood or Riverslea crossings, approximately 10 minutes extra travel time each trip. • Landholder seemed satisfied that this crossing would be required to be maintained as it is located on a shire road. Services 5 properties
15	Island Camp Island	Fitzroy River	Private Fitzroy River AMTD 283-285		1	62	Unspecified	62	124	Nil	Cars, cattle trucks, 'heavy' trucks		• Crossing is used to access grazing land on the Island Camp property. • Landholder indicated that the crossing is currently un-trafficable approximately three months a year, up to six months dependent on season. • Landholder stated there was no alternate access for this crossing. • Landholder would like to see the internal crossings (there are a number of small islands on the property, as well as Island Camp Island) built up as business and lifestyle would be affected if the property could not use these crossings to access paddocks with vehicles. 200ha island cleared and developed.
16	Jackson Road	Fitzroy River Tributaries	Rockhampton Regional Council Fitzroy River AMTD 286-292									Proposed Access to PDA 9. This road does not currently extend to the area of the gullies near the Fitzroy River, although there is a road reserve.	
17	Yarra - Tarrawong crossing	Fitzroy River	Private Property: 'Yarra' Fitzroy River AMTD 296		N/A	N/A	N/A	N/A	8 trips per week	Riverslea Crossing		Low lying road over dirt, 100m wide across river.	This crossing is located over the Fitzroy River between the Yarra and Tarrawong properties at around AMTD 296. It was described as a low lying road over dirt approximately 100 metres wide.
18	Separation-Slatey Creek Crossing	Fitzroy River	Private Property: '?' Fitzroy River AMTD 307.5		2	24	19	Unspecified	43	Foleyvale / Capricorn Highway	Cars, heavy machinery, stock	Low Crossing	• Crossing is used for share-farming and to traffic heavy machinery between Separation and Slatey-Creek properties. • Landholders indicated that the crossing is currently un-trafficable one to two months per year. • Landholder stated their alternate access was via Foleyvale Crossing through Duaringa. • In regards to a desired solution for this crossing, both landholders suggested that it would be preferable to keep the crossing but unfeasible to build a bridge or causeway over the crossing and that if the crossing was cut off 'they just wouldn't be able to use it'. One landholder suggested they may lose out financially
19	Foleyvale Crossing	Mackenzie River	DTMR Fitzroy River AMTD323.5		4	129	15	1	145	Duringa / Apis Creek Road, Bruce Highway and Capricorn Highway	Cars, cattle trucks, stock	18 semi-circular arches, 1.8m diameter with casueways either side.	• This crossing is the primary road access for the Foleyvale and Stoney Creek properties, and is used for work related purposes for the other landholders. • Foleyvale property landholder stated that the crossing was un-trafficable 'whenever there is heavy rain'—two or three times a year for up to eight weeks. Other landholders supported that this crossing can be untrafficable for between one and three months a year. • Three landholders stated that alternate access for the Foleyvale crossing is via the Riverslea crossing and through Marlborough (approximately 1 hour extra travel time each trip); however, one landholder stated they had to use a boat if the Foleyvale Crossing was unavailable. • Landholders expressed their desire to see the Foleyvale crossing raised should the weir be built. One landholder also stated that it would be good if they opened a road up from Riverslea crossing to the Foleyvale crossing as it would significantly reduce travel for people in that area. He indicated that there is currently a track through there but it hasn't been up kept by the Council. Note: One landholder outside of the core consultation scope sourced the consultation contact details from a neighbour and contacted us to discuss their usage of Foleyvale crossing. This landholder stated that they would be using this crossing up to four times a day from 2008, and that the crossing was their main access to town and to their working property. An alternate route is via Riverslea crossing; however, the landholder indicated that if Foleyvale Crossing is un-trafficable Riverslea is un-trafficable a short time after, which leaves the Duaringa-Apis Creek Road to the north as the only access.The landholder stated that this detour was not a long term viable option as it is a significant distance to travel (approximately three hours extra travel time each way). The landholder stated the 'most practical outcome would be to combine the Riverslea and Foleyvale crossings into one good high-level crossing'. This landholder also expressed concern that they, as members of the community outside of the consultation scope, would not be involved with the project planning even though the potential inundation of the crossing could impact their future business planning.

ROOKWOOD

					DNR
ID	**Crossing Name**	**Watercourse**	**Comments**	**KBR Preliminary Option**	**Mike Keane Preliminary Option**
14	Smith Road Crossing	Melaleuca Creek (modelled by GHD as Tributary 2 (Section 7))	One landholder stated they took trucks across this crossing—but did not specify frequency.	Raise	Not addressed
15	Island Camp Island	Fitzroy River	Landholder stated they took 'heavy trucks' across this crossing—but did not specify frequency.	Raise, or provide remediation cots based on reduction in value of land.	Not addressed
16	Jackson Road	Fitzroy River Tributaries		No action	Not addressed
17	Yarra - Tarrawong crossing	Fitzroy River	Landholder said it would likely be too costly to place a bridge over the crossing, instead suggesting compensation as the only option if the crossing was inundated.	No action	Not addressed
18	Separation-Slatey Creek Crossing	Fitzroy River	One landholder used the crossing at higher frequencies during farming periods.**	No action	Not addressed
19	Foleyvale Crossing	Mackenzie River	An additional landholder, outside of the consultation list, advised they were planning to use this crossing up to 4 times a day in future. This landholder's figures are not included in the values to the left.	Raise	Not addressed

ROOKWOOD

			GHD																	
ID	**Crossing Name**	**Watercourse**	**Inundated by FSL?**		**Hydrology - Level increase (m) for Rookwood**						**Increase in Duration of Flooding (days) for Rookwood**						**Traffic Count**	**Fish Passage Required?**	**Comments**	**GHD Recommendation**	**Further Work**
			FSL 45.5	**FSL 49.0**	**2 Yr ARI**	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**	**2 Yr ARI**	**5 Yr ARI**	**10 Yr ARI**	**20 Yr ARI**	**50 Yr ARI**	**100 Yr ARI**					
14	Smith Road Crossing	Melaleuca Creek (modelled by GHD as Tributary 2 (Section 7))	No	No	0.16	0.25	0.12	0.04	0.01	0.01	No Data	2.1	0.4	0.3	0.2	0.2	N/A	No		Minor increase in level and flood duration. No upgrade recommended, but compensation may be required	Reassess compensation during negotiations with landowner.
15	Island Camp Island	Fitzroy River																		Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
16	Jackson Road	Fitzroy River Tributaries																	Not formed road	No changes. Not formed road	None
17	Yarra - Tarrawong crossing	Fitzroy River																		Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
18	Separation-Slatey Creek Crossing	Fitzroy River																		Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
19	Foleyvale Crossing	Mackenzie River																YES	Main Road. Must maintain access.	**New bridge**	Detailed design for new bridge

ROOKWOOD

KBR

ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
20	Mourangee Dawson River Crossing	Dawson River	Private Property: 'Mourangee' Dawson River AMTD 10		N/A	N/A	N/A	N/A	Once or twice a year for a month	Boolburra Crossing. Adds extra 30mins to trip		Low lying crossing over pipes in the river, betweeen Mourangee and RP 1K405.	Crossing is pipes in the creek—low lying.
21	Boolburra Crossing	Dawson River	Dauring Shire Dawson River AMD 15.6		6	52	27	0	79	Capricorn Highway	Cars, grain trucks, heavy machinery	Earth track across stream, single pipe below poorly maintained concrete causeway.	• This crossing was stated as having been used primarily for work purposes by landholders, including travelling to and from work in Duaringa or to access other properties owned by the landholders. • Landholder's responses to the untrafficability of this crossing owing to flooding were particularly variable, from a couple of times per year up to six months of the year dependant on season and climate. • Alternate access for this crossing is via the Capricorn Highway, which runs parallel to the road on which the crossing is located (10–15 km difference in distance). • Five landholders expressed their desire to see the Boolburra crossing raised or a culvert put in place should the weir be raised, although one said they were indifferent as long as their internal crossing was not affected by the weir raising. The final landholder said not having the Boolburra crossing wouldn't have a significant effect on their property.
31	Two internal crossings at north and south areas of property		Property: 'The Ranch'		N/A	N/A	N/A	N/A	4 to 5 days per week	No alternate route			Low level crossing—road over dirt.
32	2 tributary crossings on north section of property		Property: 'Riverview'		N/A	N/A	N/A	N/A	Once a month	No alternate route			Northern crossing is laneway with trough and pipeline.
32	Tributary crossing on south of property		Property: 'Riverview'		N/A	N/A	N/A	N/A	1 to 2 days per week	No alternate route			
33	Melaleuca Creek crossing within property		Property: 'Fitzroy Pocket'		N/A	N/A	N/A	N/A	Once a month	No alternate route			No description offered.
34	Island between AMTD 281 and 282												
35	The pocket Island												
36	The Pocket Point Island												
37	Series of internal gully crossings to the west of the property (AMTD 287—290)		Property: 'Island Camp'		N/A	N/A	N/A	N/A	3-4 days per week	No alternate access. Have to use horseback or neighbours property			
38	Slatey Ck Island	Slately Creek											
39	Internal crossing over Bone Creek, parallel to boundary between property 8KM36		Property: 'Duaringa Station'		N/A	N/A	N/A	N/A	2 or 3 times per week while farming in the area	Via Aroona Road			Gravelled road over dirt crossing that is at least 90 foot wide (the width of the machinery transported over it).

ROOKWOOD

					DNR
ID	**Crossing Name**	**Watercourse**	**Comments**	**KBR Preliminary Option**	**Mike Keane Preliminary Option**
20	Mourangee Dawson River Crossing	Dawson River	Used to shift grain within property. Located between Mourangee and property number 1k405. Half a meter of water in crossing and it is untrafficable.	No action	Not addressed
21	Boolburra Crossing	Dawson River	One landholder used the crossing at higher frequencies during farming periods.**	Raise	Not needed
31	Two internal crossings at north and south areas of property		Used to access paddocks across the east side of the river. Inundated approx up to a week per year Property has pumps on both sides of the creek.	For EL47 option out of ponded area, assume no action. For EL49 option small culverts, or re-route around upper end with remediation.	Not addressed
32	2 tributary crossings on north section of property		Used to check fences in northern section of property. Never untrafficable. Landholder stated that NRW proposed that they would put in a bank if crossing were inundated and the bank would service both northern and southern parts of property.	Small embankments or a short distance re-route likely to be suitable.	Not addressed
32	Tributary crossing on south of property		Used to check fences in northern section of property. Never untrafficable. Landholder stated that NRW proposed that they would put in a bank if crossing were inundated and the bank would service both northern and southern parts of property.	Small embankments or a short distance re-route likely to be suitable.	Not addressed
33	Melaleuca Creek crossing within property		Used to access for weed control and check cattle Unable to access approx 5 days per year existing Landholder expressed concern that once weir is raised, this crossing may be inundated and they will not be able to access country across the other side of Melaleuca Creek.	Smith Road provides a reasonable alternative. Assume no action.	Not addressed
34	Island between AMTD 281 and 282		25ha total, not cleared	No action - crown land.	Not addressed
35	The pocket Island		10ha island	Resume (Restricted access grazing land)	Not addressed
36	The Pocket Point Island		15ha island created by weir, uncleared and undeveloped	Resume	Not addressed
37	Series of internal gully crossings to the west of the property (AMTD 287—290)		Used to access grazing land and to check on cattle Landholder stated that at 50 to 55 feet of water all these crossings are out. Landholder would like to see these internal crossings retained as their business and lifestyle would be affected if they couldn't use these crossings to access paddocks with vehicles.	Small embankments or short distance re-routes around each affected gully likely to be suitable.	Not addressed
38	Slatey Ck Island	Slately Creek	40+ha, vitually isolated	Resume (Restricted access grazing land)	Not addressed
39	Internal crossing over Bone Creek, parallel to boundary between property 8KM36		Untrafficable only in serious rainfall events (once in 4 years)	Upstream of ponds for both options. Flood impacts assumed minimal, so no action assumed.	Not addressed

ROOKWOOD

			GHD																	
ID	Crossing Name	Watercourse	Inundated by FSL?		Hydrology - Level increase (m) for Rookwood						Increase in Duration of Flooding (days) for Rookwood						Traffic Count	Fish Passage Required?	Comments	GHD Recommendation	Further Work
			FSL 45.5	FSL 49.0	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI					
20	Mourangee Dawson River Crossing	Dawson River																		Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
21	Boolburra Crossing	Dawson River																		TBA	Assess more closely for GHD recommendation
31	Two internal crossings at north and south areas of property																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
32	2 tributary crossings on north section of property																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
32	Tributary crossing on south of property																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
33	Melaleuca Creek crossing within property																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
34	Island between AMTD 281 and 282																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
35	The pocket Island																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
36	The Pocket Point Island																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
37	Series of internal gully crossings to the west of the property (AMTD 287—290)																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
38	Slatey Ck Island	Slately Creek																		Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.
39	Internal crossing over Bone Creek, parallel to boundary between property 8KM36																			Private crossing. Addressed as compensation	Reassess compensation during negotiations with landowner.

ROOKWOOD

KBR

ID	Crossing Name	Watercourse	Location / Owner	Photo (if available)	No respondents using crossing	Total Frequency of Use				Typical alternate route (if crossing is untrafficable)	Vehicles Utilised	Type/Dimensions	Description
						Car/4WD	Truck	Stock/Walking	Overall				
40	Central Railway Crossing	Dawson River	Queensland Rail		No information provided	No information provided	No information provided	No information provided	No information provided	No information provided	No information provided	No information provided	No information provided
41	Capricorn Highway Dawson River Bridge	Dawson River	DTMR Fitzroy River AMTD ?		No information provided	No information provided	No information provided	No information provided	No information provided	No information provided	No information provided	No information provided	No information provided
42	Commanche Road	Fitzroy River	RRC		Not addressed	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed	Not addressed

ROOKWOOD

					DNR
ID	**Crossing Name**	**Watercourse**	**Comments**	**KBR Preliminary Option**	**Mike Keane Preliminary Option**
40	Central Railway Crossing	Dawson River	High level Railway bridge	Unlikely to be affected, as very high compared to the Rookwood pond.	Not addressed
41	Capricorn Highway Dawson River Bridge	Dawson River	High level highway bridge	Unlikely to be affected, as very high and some distance upstream of the Rookwood pond.	Not addressed
42	Commanche Road	Fitzroy River	Not addressed	Not addressed	Not addressed

ROOKWOOD

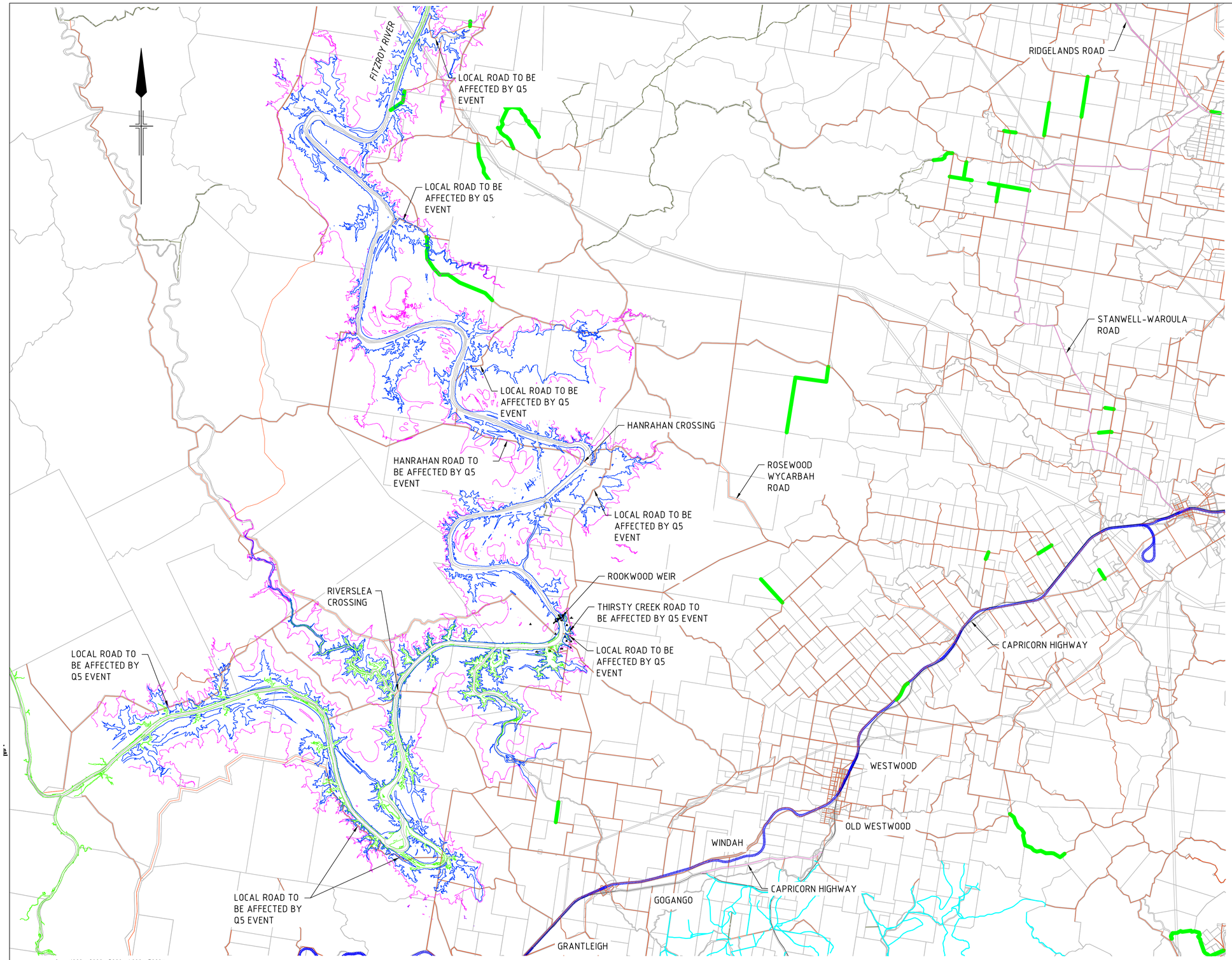
			GHD																	
ID	Crossing Name	Watercourse	Inundated by FSL?		Hydrology - Level increase (m) for Rookwood						Increase in Duration of Flooding (days) for Rookwood						Traffic Count	Fish Passage Required?	Comments	GHD Recommendation	Further Work
			FSL 45.5	FSL 49.0	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI					
40	Central Railway Crossing	Dawson River	No	No	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not applicable	No	Crossing not affected by weir inundation at FSL or flooding.	Not affected. No change to existing condition	None
41	Capricorn Highway Dawson River Bridge	Dawson River	No	No	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not affected	Not applicable	No	Crossing not affected by weir inundation at FSL or flooding.	Not affected. No change to existing condition	None
42	Commanche Road	Fitzroy River	No	No	-0.08	0.02	0.01	0.00	0.00	0.00	No Data	0.00	0.00	0.00	0.00	0.00	Not available	No	Road already inundated in existing condition. No lengthening of time of inundation.	No change to existing condition	None

Impact locations identified

Road	Description of change (extent)	Previous analysis	Comment
Thirsty Creek Road (195804, 7392998) (195727, 7392000)	Change in extent 2, 5, 10 and 20 yr ARI. 2 yr ARI - 190 m change. Change decrease 5, 10, 20 yr ARI.	Covered in spreadhseet - weir access, no crossing. GHD recommend road upgrading	No further action
Weir Park Road (193517, 7393958)	10 yr ARI slightly greater extent (80 m) 10 yr ARI slightly greater extent (120 m)	Road leading to Rookwood crossing in spreadsheet - Close access. Access via Riverslea nearby.	Change is insignificant - road closure would lead to reduced usage as traffic diverted to Riverslea Road
Jackson Road (189662, 7380157)	2 yr ARI - greater extent (435 m)	Spreadsheet. Not a formed road. No changes recommended.	No further action
Local road west off Jackson Road Point A (186101, 7381354) parallel to Fitzroy River	2 yr ARI - slightly greater extent (14 m) increased depth (from 1.5-3 m to 3- 6 m) 5 yr ARI - slightly greater extent and depth (22 m)		Road not formed
Local road west off Jackson Road Point B (186002, 7381838) parallel to Fitzroy River	2 yr ARI - slightly greater extent (64 m) increased depth (from 1.5-3 m to 3- 6 m) 5 yr ARI - slightly greater extent and depth (15 m)		Road not formed
Local road west off Jackson Road Point C (185146, 7382589) parallel to Fitzroy River	2 yr ARI - new affected area (46 m)		Road not formed
Local road west off Jackson Road Point D (184525, 7383334) parallel to Fitzroy River	2 yr ARI - slightly greater extent (20 m) increased depth (from less than to 1.5-3 m)		Road not formed
Local road west off Jackson Road Point E (183912, 7384125) parallel to Fitzroy River	2 yr ARI - slightly greater extent and depth (32 m)		Road not formed
Local road west off Jackson Road Point F (183801, 7384548) parallel to Fitzroy River	2 yr ARI - slightly greater extent and depth (73 m)		Road not formed
Smith Road 1 (parallel to Fitzroy) (178023, 389032)	2 and 5 yr ARI very minor changes (less than 20 m change)		Change is not significant. Increased extent of flooding is minor and would not be noticable
Smith Road 2 (parallel to Fitzroy) (178023, 389032)	5 yr ARI very minor changes (less than 10 m change)		Change is not significant. Increased extent of flooding is minor and would not be noticable
Smith Road 3 (parallel to Fitzroy) (175221, 7387840)	2 and 5 yr ARI very minor changes (less than 10 m change)		Change is not significant. Increased extent of flooding is minor and would not be noticable

All roads assessed

Downstream to Upstream	Location (metres)	2 yr ARI	5 yr ARI	10 yr ARI	20 yr ARI	50 yr ARI	100 yr ARI
Blanche Road (corner)	213170, 7439327	Not affected	Not affected	No change	No change	No change	No change
Ellrot Road 1	212197, 7438340	Not affected	Not affected	No change	No change	No change	No change
Unnnamed Local Road 1A	210458, 7441478	No change	No change	No change	No change	No change	No change
Unnnamed Local Road 1B	210458, 7441478	No change	No change	No change	No change	No change	No change
Ellrot Road 2	210458, 7434057	Not affected	Not affected	Not affected	No change	No change	No change
Unnamed Local Road 2	209907, 7434921	No change	No change	No change	No change	No change	No change
Unnamed Local Road 3	206843, 7435536	No change	No change	No change	No change	No change	No change
Edan Bann Road	207716, 7446328	No change	No change	No change	No change	No change	No change
Unnamed Local Road 4	204014, 7444962	No change	No change	No change	No change	No change	No change
Esplanade	185424, 7447924	No change	No change	No change	No change	No change	No change
Unnamed Local Road 5	187535, 7447762	Not affected	No change	No change	No change	No change	No change
Glenroy Marlborough Road	180127, 7448919	Crossing slight increase	No change	No change	No change	No change	No change
Unnamed Local Road 6	182664, 7445286	Not affected	No change	No change	No change	No change	No change
Unnamed Local Road 7	186013, 7443885	No change	No change	No change	No change	No change	No change
Unnamed Local Road 8	177704, 7440044	No change	No change	No change	No change	No change	No change
Glenroy Road	186924, 7434793	Not affected	Not affected	Not affected	Not affected	No change	No change
Commanche Road 1	182871, 7432428	Not affected	No change	No change	No change	No change	No change
Craigilee Road	190460, 7427963	No change	No change	No change	No change	No change	No change
Unnamed Local Road 9	190182, 7426910	No change	No change	No change	No change	No change	No change
Rosewood Road	189149, 7422162	Not affected	Not affected	No change	No change	No change	No change
Unnamed Local Road 10	188474, 7423234	No change	No change	No change	No change	No change	No change
Unnamed Local Road 11	187977, 7420811	Not affected	Not affected	Not affected	No change	No change	No change
Commanche Road 2	180189, 7419539	Not affected	Not affected	No change	No change	No change	No change
Unnamed Local Road 12	186280, 7417649	Not affected	No change	No change	No change	No change	No change
Unnamed Local Road 13	187214, 7413128	Not affected	No change	No change	No change	No change	No change
Commanche Road 3	182233, 7412440	Not affected	Not affected	Not affected	No change	No change	No change
Hanrahan Road 1	187277, 7402317	Not affected	Not affected	Not affected	Not affected	Not affected	No change
Hanrahan Road 2	191180, 7402562	No change	No change	No change	No change	No change	No change
Local Road off Barrett Road	190813, 7406732	No change	No change	No change	No change	No change	No change
Thirsty Creek Road 1	196454, 7399517	No change	No change	No change	No change	No change	No change
Thirsty Creek Road 2	195804, 7392998	190 m change in extent	56 m change	10 m	10 m	No change	No change
Thirsty Creek Road 3	195727, 7392000	58 m (1.5-3) 84 m (1.5)	46 m	18 m	Small change	No change	10 m change
Enfield Road	197410, 7390481	Not affected	Not affected	No change	No change	No change	No change
Local Road off Thirsty Creek 1	194188, 7389763	Not affected	Not affected	Not affected	No change	No change	No change
Local Road off Thirsty Creek 2	194331, 7387793	No change	No change	No change	No change	No change	No change
Local Road off Thirsty Creek 3	194311, 7386007	Not affected	No change	No change	No change	No change	No change
Weir Park Road	193517, 7393958	Not affected	Not affected	80 m (less than 1.5m)	120 m	No change	No change
Rookwood Road Crossing	186697, 7391220						
Riverslea Road Crossing	188458, 7389311						
Yarra Road Crossing	185651, 7388573						
Jackson Road	189662, 7380157	435 m	No change	No change	No change	No change	No change
Local Road off Jackson (east)	190091, 7379694	No change	20 m	No change	No change	No change	No change
Local Road off Jackson (west)	186934, 7380963	Slighty more	No change	No change	No change	No change	No change
Smith Road	178013, 7389010	Slighty more	Slighty more	No change	No change	No change	No change
Smith Road Crossing	175199, 7387997						



LEGEND

- FLOOD EXTENT BORDER (100 YEAR EVENT)
- FLOOD EXTENT BORDER (5 YEAR EVENT)
- STAGE 3 INUNDATION
- RAILWAY
- PRIVATE ROADS
- STATE CONTROLLED ROADS (HIGHWAYS)
- CLOSED ROADS
- LOCAL ROADS
- MAIN ROADS
- MAINTENANCE TRACKS
- UNCONSTRUCTED ROADS

PRELIMINARY

No	Revision	Drawn	Checked	Approved	Date
B	FOR BUSINESS CASE	A.M	RF*	WT*	12.12.12
A	ISSUED FOR DISCUSSION	APK	RF*	WHT*	13.06.12

Note: * indicates signatures on original issue of drawing or last revision of drawing

Client Reference Number

Gladstone Area Water Board
147 Goondoon Street
Gladstone Qld 4680
PO Box 466, Gladstone Qld 4680
T 07 4976 3000 F 07 4972 5632

SunWater
Level 10, 179 Turbot Street
Brisbane Qld 4001
PO Box 15536, City East Qld 4002
T 07 3120 0000

GHD
145 Ann St Brisbane QLD 4000 Australia
GPO Box 668 Brisbane QLD 4001
T 61 7 3316 3000 F 61 7 3316 3333
E bnemail@ghd.com.au W www.ghd.com.au

Drawn A.KELLY | Designed J. ZERAFA
Drafting Check | Design Check
Approved
Date
Scale AS SHOWN

This Drawing must not be used for Construction unless signed as Approved

Client GLADSTONE AREA WATERBOARD AND SUNWATER
Project LOWER FITZROY RIVER INFRASTRUCTURE PROJECTS
Title AFFECTED ROAD LAYOUT PLAN ROOKWOOD WEIR

Original Size A1
Drawing No: 41-20736-04-SK005 Rev: B

Plot Date: 5 February 2013 - 4:09 PM
Cad File No: G:\41\20736\CADD\Drawings\Roads\Sketches\41-20736-04-SK005.dwg

Lower Fitzroy Infrastructure Project
41-20736-28
Data contained in these tables are derived from other pages in this workbook containing the hydraulic model simulation water level traces.

The values in the green-shaded cells are the adopted peak water levels at the points of interest.
Data in this table is linked to N:\AU\Toowoomba\Projects\41\20736\Tech\Hydraulics\GHD\Detailed Design\Mike 11\Working Model\res11\Design Events - Peak Water Levels.xlsx

Estimated Peak Water Levels (m)

Location			Existing						Raise Eden Bann Weir Option					
Name	Watercourse	Chainage (m)	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI
Riverslea Crossing	Fitzroy River	29338.17	46.23	53.55	56.37	59.26	61.53	62.43	46.23	53.55	56.37	59.26	61.53	62.43
		30484.71	45.86	53.22	56.02	58.88	61.07	61.87	45.86	53.22	56.02	58.88	61.07	61.87
		30345	45.90	53.26	56.06	58.92	61.13	61.94	45.90	53.26	56.06	58.92	61.13	61.94
Thirsty Creek Road	Fitzroy River	38318.62	44.67	51.84	54.59	57.31	59.45	60.20	44.67	51.84	54.59	57.31	59.45	60.20
		40860.7	44.18	51.36	54.06	56.69	58.76	59.48	44.18	51.36	54.06	56.69	58.76	59.48
		38958	44.55	51.72	54.45	57.15	59.28	60.02	44.55	51.72	54.45	57.15	59.28	60.02
Hanrahan Crossing	Fitzroy River	57533.5	41.53	48.27	50.94	53.24	55.06	55.86	41.53	48.27	50.94	53.24	55.06	55.86
Commanche Road	Fitzroy River	101540.52	31.47	37.77	40.26	42.59	45.11	46.86	31.53	37.78	40.27	42.60	45.11	46.87
Glenroy Crossing	Fitzroy River	112855.48	27.24	33.08	35.18	37.02	38.95	40.39	27.53	33.12	35.21	37.03	38.96	40.41
		114499.85	26.84	32.73	34.79	36.56	38.40	39.79	27.18	32.78	34.81	36.57	38.42	39.81
		113515	27.08	32.94	35.02	36.83	38.72	40.15	27.39	32.98	35.05	36.85	38.74	40.17
Gogano Creek	Gogano (Secn 22)	5974.96	45.06	52.25	54.99	57.72	59.72	60.42	45.06	52.25	54.99	57.72	59.72	60.42
		7489.5	45.06	52.25	54.99	57.72	59.72	60.42	45.06	52.25	54.99	57.72	59.72	60.42
		7169	45.06	52.25	54.99	57.72	59.72	60.42	45.06	52.25	54.99	57.72	59.72	60.42
Smith Road	Tributary 2 (Secn 7)	3381.89	56.83	58.38	60.75	63.04	64.93	65.90	56.83	58.38	60.75	63.04	64.93	65.90
		5096.06	51.13	58.38	60.75	63.04	64.93	65.90	51.13	58.38	60.75	63.04	64.93	65.90
		3632	56.00	58.38	60.75	63.04	64.93	65.90	56.00	58.38	60.75	63.04	64.93	65.90
Corrumburra Road - A	Anabranch 32	3168.91	25.33	31.04	32.95	34.46	35.88	37.01	25.91	31.11	32.99	34.48	35.92	37.05
Corrumburra Road - B	Anabranch 32	4471.6	25.32	30.98	32.89	34.40	35.81	36.91	25.83	31.05	32.93	34.43	35.85	36.96
Corrumburra Road - C	Anabranch 32	5346.07	24.93	30.94	32.85	34.36	35.77	36.87	25.58	31.02	32.89	34.39	35.81	36.92
Corrumburra Road - D	Anabranch 32	6504.86	24.93	30.91	32.81	34.32	35.71	36.82	25.58	30.98	32.86	34.34	35.75	36.86

Location			Rookwood Weir Option						Level Increase (m) - Raise Eden Bann Weir Option						Level Increase (m) - Rookwood Weir Option					
Name	Watercourse	Chainage (m)	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI	2 Yr ARI	5 Yr ARI	10 Yr ARI	20 Yr ARI	50 Yr ARI	100 Yr ARI
Riverslea Crossing	Fitzroy River	29338.17	49.77	54.31	56.77	59.46	61.58	62.46												
		30484.71	49.66	54.03	56.45	59.10	61.14	61.91												
		30345	49.67	54.06	56.49	59.14	61.19	61.98	0.00	0.00	0.00	0.00	0.00	0.00	3.77	0.80	0.43	0.22	0.06	0.04
Thirsty Creek Road	Fitzroy River	38318.62	49.29	52.90	55.17	57.63	59.59	60.31												
		40860.7	49.18	52.53	54.70	57.05	58.94	59.65												
		38958	49.27	52.81	55.05	57.49	59.42	60.14	0.00	0.00	0.00	0.00	0.00	0.00	4.72	1.09	0.60	0.33	0.15	0.12
Hanrahan Crossing	Fitzroy River	57533.5	41.45	48.29	50.94	53.25	55.06	55.86	0.00	0.00	0.00	0.00	0.00	0.00	-0.08	0.02	0.01	0.00	0.00	0.00
Commanche Road	Fitzroy River	101540.52	31.39	37.79	40.27	42.59	45.11	46.86	0.06	0.01	0.01	0.00	0.00	0.00	-0.08	0.02	0.01	0.00	0.00	0.00
Glenroy Crossing	Fitzroy River	112855.48	27.17	33.10	35.19	37.02	38.95	40.39												
		114499.85	26.77	32.75	34.79	36.56	38.40	39.79												
		113515	27.01	32.96	35.03	36.84	38.73	40.15	0.31	0.04	0.03	0.02	0.02	0.02	-0.07	0.02	0.01	0.00	0.00	0.00
Gogano Creek	Gogano (Secn 22)	5974.96	49.40	53.23	55.52	58.00	59.83	60.51												
		7489.5	49.40	53.23	55.52	58.00	59.83	60.51												
		7169	49.40	53.23	55.52	58.00	59.83	60.51	0.00	0.00	0.00	0.00	0.00	0.00	4.33	0.98	0.53	0.29	0.11	0.09
Smith Road	Tributary 2 (Secn 7)	3381.89	56.83	58.62	60.87	63.09	64.95	65.91												
		5096.06	52.21	58.62	60.87	63.09	64.95	65.91												
		3632	56.16	58.62	60.87	63.09	64.95	65.91	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.25	0.12	0.04	0.01	0.01
Corrumburra Road - A	Anabranch 32	3168.91	25.25	31.06	32.96	34.47	35.90	37.03	0.58	0.07	0.04	0.02	0.04	0.04	-0.07	0.02	0.01	0.01	0.02	0.02
Corrumburra Road - B	Anabranch 32	4471.6	25.25	31.01	32.90	34.41	35.82	36.92	0.51	0.07	0.05	0.03	0.03	0.04	-0.07	0.03	0.02	0.01	0.01	0.01
Corrumburra Road - C	Anabranch 32	5346.07	24.85	30.97	32.86	34.37	35.78	36.88	0.66	0.07	0.05	0.03	0.04	0.04	-0.07	0.02	0.01	0.01	0.01	0.01
Corrumburra Road - D	Anabranch 32	6504.86	24.85	30.94	32.83	34.33	35.73	36.83	0.65	0.07	0.05	0.03	0.04	0.05	-0.07	0.02	0.02	0.02	0.02	0.01

Rookwood Weir option is likely to only have an impact at the following crossings:
Riverslea
Thristy Creek Road
Gogano Creek
Smith Road
The small differences in levels at the other crossings is due to numerical modelling, there should not be any change in the peak water levels as these are downstream of Rookwood Weir.

Raise Eden Bann Weir option is likely to only have an impact at the following crossings:
Commanche Road
Glenroy Crossing
The influence of the raised weir option appears to be dissipated at the Hanrahan Crossing.

Estimated Increase in Flooding Duration

Data contained in these tables are derived from other pages in this workbook containing the hydraulic model simulation water level traces.

Data in this table is linked to N:\AU\Toowoomba\Projects\41\20736\Tech\Hydraulics\GHD\Detailed Design\Mike 11\Working Model\res11\Design Events - Peak Water Levels.xlsx

Location	Watercourse	5 Year ARI Peak	Existing Duration (h) of Flooding Above 5 Year ARI Peak				Increase in Duration (h) of Flooding - Raised Eden Bann Weir					Increase in Duration (h) of Flooding - Rookwood Weir				
		WL (m)	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI	5 Year ARI	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI	5 Year ARI	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI
Riverslea	Fitzroy River	53.26	165.4	242.4	301.6	332.2	0.0	0.0	0.0	0.0	0.0	107.4	32.7	24.2	20.6	19.1
Thirsty Creek Road	Fitzroy River	51.72	165.9	243.0	302.5	333.4	0.0	0.0	0.1	0.0	0.0	136.8	50.8	38.6	33.0	30.5
Hanrahan Crossing	Fitzroy River	48.27	166.4	243.7	303.4	334.5	0.0	0.1	0.1	0.0	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Commanche Road	Fitzroy River	37.77	46.2	246.0	306.4	338.3	12.0	0.8	0.5	0.4	0.4	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Glenroy Crossing	Fitzroy River	32.94	169.6	248.3	309.2	341.9	22.9	2.2	1.6	1.4	1.3	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Gogano Creek	Gogano Creek	52.25	165.7	242.9	302.3	333.3	0.0	0.0	0.0	0.0	0.0	127.0	44.4	33.4	28.6	26.6
Smith Road	Tributary of Fitzroy River	58.38	163.7	239.7	297.5	326.9	0.0	0.0	0.0	0.0	0.0	50.6	8.4	6.0	5.1	4.6
Coorumburra Rd A	Annabranch 032	31.04	170.9	250.1	311.7	345.0	31.5	3.8	3.0	2.6	2.4	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Coorumburra Rd B	Annabranch 032	30.98	170.8	250.1	311.6	345.0	31.0	3.9	3.0	2.6	2.4	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Coorumburra Rd C	Annabranch 032	30.94	171.1	250.3	311.9	345.3	32.6	4.0	3.0	2.6	2.5	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Coorumburra Rd D	Annabranch 032	30.91	170.9	250.2	311.8	345.2	31.7	3.9	3.0	2.6	2.5	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Values in italics are assumed to be zero as these locations are downstream of Rookwood Weir

Location	Watercourse	5 Year ARI Peak	Existing Duration (d) of Flooding Above 5 Year ARI Peak				Increase in Duration (d) of Flooding - Raised Eden Bann Weir					Increase in Duration (d) of Flooding - Rookwood Weir				
		WL (m)	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI	5 Year ARI	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI	5 Year ARI	10 Year ARI	20 Year ARI	50 Year ARI	100 Year ARI
Riverslea	Fitzroy River	53.26	6.9	10.1	12.6	13.8	0.0	0.0	0.0	0.0	0.0	4.5	1.4	1.0	0.9	0.8
Thirsty Creek Road	Fitzroy River	51.72	6.9	10.1	12.6	13.9	0.0	0.0	0.0	0.0	0.0	5.7	2.1	1.6	1.4	1.3
Hanrahan Crossing	Fitzroy River	48.27	6.9	10.2	12.6	13.9	0.0	0.0	0.0	0.0	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Commanche Road	Fitzroy River	37.77	1.9	10.2	12.8	14.1	0.5	0.0	0.0	0.0	0.0	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Glenroy Crossing	Fitzroy River	32.94	7.1	10.3	12.9	14.2	1.0	0.1	0.1	0.1	0.1	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Gogano Creek	Gogano Creek	52.25	6.9	10.1	12.6	13.9	0.0	0.0	0.0	0.0	0.0	5.3	1.9	1.4	1.2	1.1
Smith Road	Tributary of Fitzroy River	58.38	6.8	10.0	12.4	13.6	0.0	0.0	0.0	0.0	0.0	2.1	0.4	0.3	0.2	0.2
Coorumburra Rd A	Annabranch 032	31.04	7.1	10.4	13.0	14.4	1.3	0.2	0.1	0.1	0.1	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Coorumburra Rd B	Annabranch 032	30.98	7.1	10.4	13.0	14.4	1.3	0.2	0.1	0.1	0.1	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Coorumburra Rd C	Annabranch 032	30.94	7.1	10.4	13.0	14.4	1.4	0.2	0.1	0.1	0.1	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Coorumburra Rd D	Annabranch 032	30.91	7.1	10.4	13.0	14.4	1.3	0.2	0.1	0.1	0.1	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*

Values in italics are assumed to be zero as these locations are downstream of Rookwood Weir

Part 4 - References

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