Accepted development requirements for operational work that is constructing or raising waterway barrier works

Date effective 1st October 2018

Queensland Government

Does this document apply to the proposal?

These accepted development requirements are for operational work that is constructing or raising waterway barrier works as specified in this document.

For the purpose of this document, a waterway is defined in the *Fisheries Act 1994*. In many parts of Queensland, the spatial data layer and guideline, *Queensland waterways for waterway barrier works* will assist with waterway determination. Refer to Appendix 2 for further information.

This document does not apply for new works or maintenance within declared Fish Habitat Areas.

This document does not address other legislative requirements such as other development triggers or the need for other approvals e.g. tenure under the *Land Act 1994*, development approval under the *Planning Act 2016*, approvals under the *Queensland Heritage Act 1992* or marine park legislation etc. These must be obtained separately.

It is the responsibility of the proponent when undertaking accepted development, to obtain tenure or otherwise meet requirements to lawfully access land where the accepted development is proposed. Accepted development may only occur in a place where a person or entity has a lawful right to undertake that work.

Where development involves operational work that is the removal, destruction or damage of a marine plant or operational work completely or partly within in a declared fish habitat area or a material change of use for aquaculture, see the accepted development requirements in the following documents:

- *Accepted development requirements for operational work that is the removal, destruction or damage of marine plants*
- *Accepted development requirements for operational work that is completely or partly within a declared fish habitat area*
- *Accepted development requirements for material change of use that is aquaculture*

If the proposed work does not comply with the accepted development requirements, the work is not accepted development. Work that is not accepted development is assessable development and requires development approval.

For assessable development that is operational work that is constructing or raising waterway barrier works please contact the State Assessment and Referral Agency (SARA) of the Department of State Development, Manufacturing, Infrastructure and Planning (SDMIP) to obtain pre-lodgement advice involving all relevant agencies[1]. This will include the Department of Agriculture and Fisheries.

Information on how to lodge a development application for assessable development, including the use of the online preparation and lodgement system MyDAS2, is available on the SDMIP website.

[1] Note that some state agencies also operate outside of the SARA process (e.g. Department of Environment and Science)

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1 Version control

Version	Date	Comment
1	3 July 2017	Transition (including some minor changes) from previous self-assessable codes (WWBW01, WWBW02) into accepted development requirements to align with the release of the *Planning Act 2016.*
1.1	14 September 2017	Minor change to temporarily revert to previous provisions for retro-fitting of inverts and re-sleeving of culverts under the self-assessable code until 1 July 2018 (refer to work types 4.1 and 4.2).
1.2	15th December 2017	Update of departmental names due to Machinery of Government changes. Removal of link for online notification. Link is expected to go live in 2018 and will be included in subsequent version.
1.3	1st October 2018	Revision of work types 4.1 and 4.2 and inclusion of online notification.

2 How to use this document

When operational work that is constructing or raising waterway barrier works complies with the requirements within this document, the work is accepted development. This document states the requirements that must be complied with and provides guidance.

Guidance material will be provided in a shaded box that appears like this.

The glossary at the end of the document defines specific terms that are used within this document. Terms that are defined in the glossary are underlined throughout the document. If a term is not included in the glossary, it may be defined in the *Fisheries Act 1994* (Fisheries Act) or the *Planning Act 2016* (Planning Act).

Read and understand section 4 in addition to the specific work type and its requirements. Work types are categorised as follows:

- 5.1 New or replacement culvert crossings
- 5.2 New or replacement bed level crossings
- 5.3 New dams and weirs
- 6.1 Maintenance of an existing lawful culvert crossing
- 6.2 Maintenance of an existing lawful bed-level crossing
- 6.3 Maintenance of an existing lawful floodgate
- 7 Temporary waterway barrier works

Note that additional accepted development requirements for recovery in and immediately following disaster situations declared under the *Disaster Management Act 2003* are contained in section 8. Other resources that are referred to in this document and will assist compliance with the requirements include:

- *Fisheries Act 1994*
- *Fisheries Regulation 2008*
- *Planning Act 2016*
- *Planning Regulation 2017.* These resources are available at www.legislation.qld.gov.au.
- Spatial data layer, *Queensland waterways for waterway barrier works*[2] – available at https://planning.dilgp.qld.gov.au/maps, to be used in conjunction with:
- The Guide for the determination of waterways using the spatial data layer *Queensland waterways for waterway barrier works*

This document is reviewed periodically and may be amended. Ensure the current version of the document is used.

For enquiries on technical matters refer to section 9 of this document.

[2] This data layer will assist in determining the colour of mapped waterway where the works are proposed. This must be known in order to determine which section(s) of this document to comply with.

3 Introduction

This document is prepared under the Planning Act and the Fisheries Act and specifies the requirements when development that is operational work that is constructing or raising waterway barrier works is accepted development.

For development to be accepted development it must comply with all of the requirements for accepted development. Ensure that the development complies with all requirements before proceeding.

Waterway barrier works may inhibit the free movement of fish along waterways and onto floodplains. Fish passage is an essential requirement for the survival and productivity of many species of Queensland fish. Many species must move into different habitats for breeding or rearing of young, or to access critical habitats for food and protection.

Thousands of instream structures such as dams and culverts have been built on waterways throughout Queensland. The loss of access to habitat has caused the decline in distribution of native fish populations. It is therefore essential that the development of new, or raising of existing waterway barriers are designed to provide adequate fish passage.

The Planning Act makes it an offence to carry out assessable development without a development permit. Penalties apply.

4 Requirements for all work

4.1 Notification

Notification must be submitted prior to, but no more than twenty (20) business days before work commences.

Pre-work notification can be submitted through the online notification system at http://adr.fisheries.qld.gov.au.

If you are having trouble accessing the online system, notification forms (found in section 11) can be completed and submitted to Fisheries Queensland, Department of Agriculture and Fisheries (DAF) by email to **acceptedevelopment@daf.qld.gov.au.**

If notifying by email, a map of the location of the works is to be submitted with the pre-works and post-works notification forms and all sections of the relevant notification forms must be completed in full. Post-works notification must be completed and submitted within 15 business days of the completion of the works.

For entities undertaking a program of works, a single pre-works and post-works notification can be made for the waterway barriers.

4.2 Site access

Sites where accepted development is occurring must be open for inspection by DAF staff during business hours, during works and on request.

4.3 Standards

The following standards apply under these accepted development requirements:

1. Development work minimises impacts to waterways and fish habitats.
2. In tidal waterways, tidal exchange and flow at the site must not be impeded for more than 21 days. After 21 days, tidal flushing[3] must be restored.
3. Excavation work in un-bunded tidal areas is to be scheduled to occur within two hours either side of low tide.
4. Works do not commence during times of elevated flow and in un-bunded tidal areas is to be scheduled to occur within two hours either side of low tide.
5. Where works are for the replacement of an existing waterway barrier work, the defunct waterway barrier work is to be completely removed as soon as possible and within four weeks of the completion of the replacement works.
6. Replacement of existing structures complies with the requirements for the construction of a new structure, under the relevant section of this code.
7. Other than spoil deliberately used for re-profiling to restore bed and banks to natural profiles, spoil from excavation is removed from tidal land and other wetlands and waterways.

[3] Tidal flushing is recommended for a minimum of 48 hours.

8. Soil and sediment must not be removed from areas subject to quarantine restrictions e.g. declared fire ant areas.
9. All material used in the works are acid sulfate soil (ASS) free and potential acid sulfate soils (PASS) free or have been treated to accepted standards to prevent movement of sediment, runoff and leachate to fish habitats[4].
10. Impacts on water quality are to be minimised by undertaking the works to the standard set out in the current version of the *Best Practice Erosion and Sediment Control*, published by the International Erosion Control Association, Australasia.
11. Provisions are made to minimise the risk of fish kills arising from the works e.g. through entrapment of fish upstream or between works.
12. In the event that fish that have been trapped by the works, fish salvage activities in accordance with the Fisheries Queensland *Guidelines for Fish Salvage* (available at www.daf.qld.gov.au) are implemented immediately.
13. Fish kills must be reported to the Department of Environment and Science on 1300 130 372.
14. For any part of the waterway bed or banks adjacent to the works that has been altered by the waterway barrier works, the site is restored and/or rehabilitated so that as a minimum:
    - Stability and profiles of the bed and banks are re-instated to natural stream profiles and stability within five (5) business days of the completion of the works
    - The waterway bed is retained with natural substrate or reconstructed with substrate comparable to the natural substrate size and consistency
    - Site conditions allow the rapid re-establishment of native vegetation and cover or native species are replanted to re-establish the natural plant community
15. Maintenance works on culverts that are for re-sleeving can only be undertaken once on any given culvert cell.

[4] Guidance for current accepted standards can be found in the *Queensland Acid Sulfate Soil Technical Manual: Soil management guidelines*, prepared by the Department of Science, Information, Technology, Innovation and the Arts, 2014.

4.4 Guidance to minimise impacts

Minimise impacts to fisheries resources and fish habitats by taking the following actions:

- Minimise disturbance to the instream bed and banks e.g. use geofabric as a work base, or construct a work platform above the substrate
- If it is necessary to remove vegetation, aim to cut vegetation no lower than ground level and leave the root in the ground to aid in stabilisation. If deep excavation is required during construction the roots may only be removed within the construction footprint area.
- Minimise the area of land disturbed or compacted e.g. construct a work platform above the substrate
- Ensure the least volume of soil or sediment is disturbed
- Limit the use of machinery within waterways
- Use machinery no greater than the capacity required for the purpose
- Implement sediment and erosion protection measures
- Undertake works at times that minimise disruption to fish migration and the flowering and fruiting of marine plants

Works should be managed to avoid fish stress. Signs of distressed fish may include gasping at the surface, rapid breathing, rolling or lethargy.

5 Requirements for new work

5.1 New or replacement culvert crossings

Table 1 lists the requirements for accepted development including the duration, dimensions and design for new or replacement waterway barrier works that are culverts.

The construction of new or replacement of existing culverts crossings on tidal (grey) waterways and major impact (purple) waterways is not accepted development. This is assessable development and requires a development approval under the Planning Act.

Section 5.1 does not apply to intentional duplications or for the purposes of partially or completely storing or confining water, or regulating water flow.

Table 1 – Accepted development requirements for new or replacement culvert crossings

Work type	Requirements for accepted development
1.1 Construction of new or replacement of existing culvert crossing on a high impact (red) waterway Where aprons and stream bed scour protection are incorporated on red waterways, design complies with work type 1.4.	**Duration** All instream works commence and finish within 180 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[5]. **Culvert crossing dimensions and design** All new and replacement culvert crossings (single or multi-celled) must meet the following culvert dimensions and design, in addition to one of the three culvert crossing configurations below: • The width of a culvert cell aperture or the width of a culvert array, must span a minimum of 100% of the low flow channel width (Appendix 1, Figures 1 and 2). • The culvert must be installed at no steeper gradient than the waterway bed gradient. • The outermost culvert cells must incorporate roughening elements such as baffles on their bankside sidewalls. For a single cell culvert crossing, roughening elements must be on both sidewalls. These must be installed to a minimum of 95% of the full height of the vertical extent of the culvert sidewalls with a gap of no greater than 30mm at the bottom. • Roughening elements must be installed on the upstream wingwalls on both banks to the height of the upstream obvert or the full height of the wingwall. • If roughening elements are baffles, the design must be as follows (Appendix 1, Figure 3): – maximum 150 mm horizontal protrusion (width) into the flow

[5] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	– maximum 10 mm thick (leading edge) – Within 1.2m upstream and downstream of the upstream culvert inlet, baffles must be spaced at twice the horizontal protrusion (width) of the baffle (i.e. maximum 300mm centres) – Throughout the rest of the structure, baffles must be spaced at 4 x horizontal protrusion (width) of the baffle (i.e. maximum 600mm centres) • New culvert cells must be aligned parallel (within 10°) to the direction of water flow to minimise turbulence. Roughening elements aim to achieve a contiguous lower velocity zone (no greater than 0.3 m/sec) for at least 100 mm width from the wall through the length of the culvert. **Culvert crossing configuration** Culvert crossing configurations **must** meet one of the following options: • Option 1 (Appendix 1, Figure 6) – The width of the culvert cell aperture or culvert array must span a minimum of 75% of the main channel width. – The obvert (internal roof) of the culvert cell(s) must be a minimum of 600 mm above the commence to flow water level (or bed level, for ephemeral waterways). – If the culvert crossing is designed with a flood immunity of an Average Recurrence Interval (ARI) of less than 50 years: ▪ the depth of cover is no greater than 750 mm; or ▪ the culvert commences full flow at or greater than a 2 year ARI[6]. – All culverts in the crossing are set at a minimum of 300 mm below bed level unless installed on bedrock, where the natural bed surface is maintained through the culvert. • Option 2 (Appendix 1, Figure 7) – The width of the culvert cell aperture or culvert array must span a minimum of 75% of the main channel width. – The obvert (internal roof) of the culvert cell(s) must be a minimum of 600mm above the commence to flow water level (or bed level, for ephemeral waterways). – If the culvert crossing is designed with a flood immunity ARI less than 50 years: – The depth of cover over the culvert(s) is no greater than 750 mm; or

[6] Where this option is chosen, hydrological modelling that clearly demonstrates compliance with this requirement must be completed prior to the commencement of works and produced to Fisheries Queensland upon request.

	– The culvert commences full flow at or greater than a 2 year ARI[5]. – At least one culvert in the crossing is set a minimum of 300 mm below bed level, unless installed on bedrock where the natural bed surface is maintained, and has minimum dimensions of: ▪ 1200mm width for a box culvert ▪ 1500mm diameter for a pipe culvert ▪ the obvert of the cell set below bed level must be no lower than the obvert of the highest culvert cell in the array, except where slab links are incorporated and the obvert of the slab link barrel is no higher than the top of the adjacent box culvert • the cell must be aligned with the low flow channel of the waterway. – All other culverts in the crossing are: ▪ at or below bed level; and ▪ roughened throughout the culvert floor to approximately simulate natural bed conditions. Option 3 may be beneficial to use for red mapped waterways that are shallow and wide in nature and where it is likely to be unfeasible to construct culvert cells along the full width of the main channel. • Option 3 (Appendix 1, Figures 8-10) – The maximum deck height (pavement) of the crossing is 1400mm at the lowest point of the natural stream bed. – All culverts are installed a minimum of 300 mm below bed level unless installed on bedrock where the natural bed surface is maintained. – The obvert of the culvert cell(s) must be a minimum of 300mm above the commence to flow water level (or bed level, for ephemeral waterways). – The depth of cover is no greater than 300 mm. – The crossing incorporates a minimum combined culvert aperture width of 3.6 m or 100% of the main channel width. – The crossing incorporates at least one culvert with a minimum width of 1200 mm for a box culvert; or 2 x 900 mm diameter pipe culverts. – Adjacent to each bank (or bankside culverts if the culverts are located adjacent to the bank) on the downstream side, construct a rock chute at a slope no greater than 1 in 20 (5% grade). – The width of each rock chute is a minimum of 3 m, or the combined culvert cell aperture and rock chute width spans 100% of the main channel width. – As a minimum the toe of the rock chute is to extend down to a level that is half-way between bed level and the level of the obvert of the culverts.

	All culvert crossings are to be regularly inspected and kept clear of blockages in order to retain fish passage. For the life of the culvert crossing, relative levels of the culvert invert, apron and scour protection and the stream bed must be kept so that there are no drops in elevation at their respective joins.
1.2 Construction of new or replacement of existing culvert crossing on a moderate impact (amber) waterway For requirements regarding aprons and stream bed scour protection on amber waterways, refer to work type 1.4.	**Duration** Works must commence and finish within a maximum time of 360 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[7]. **Culvert crossing dimensions and design** The culvert crossing **must** meet the following (Appendix 1, Figure 11): • Have a minimum (combined) culvert aperture width of 2.4m and be placed within the low flow channel; or • Have a combined culvert aperture width that spans 100% of the main channel width. • All new or replacement culvert cells must be installed at or below bed level. • The obvert (internal roof) of the culvert cell(s) must be a minimum of 300 mm above the commence to flow water level (or bed level, for ephemeral waterways). • Where the cell is installed at less than 300 mm below bed level, the culvert floor must be roughened throughout to approximately simulate natural bed conditions, unless installed on bedrock where the natural bed surface is maintained. Where the cell is installed 300 mm or more below bed level, no roughening is required on the culvert floor. • The culvert must be installed at no steeper gradient than the waterway bed gradient. • New culvert cells must be aligned parallel (within 10°) to the direction of water flow to minimise turbulence. All culvert crossings are to be regularly inspected and kept clear of blockages in order to retain fish passage. For the life of the culvert crossing, relative levels of the culvert invert, apron and scour protection and the stream bed must be kept so that there are no drops in elevation at their respective joins.

[7] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

1.3 Construction of new or replacement of existing culvert crossing on a low impact (green) waterway For requirements regarding aprons and stream bed scour protection on green waterways, refer to work type 1.4.	**Duration** Works must commence and finish within a maximum time of 360 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[8]. **Culvert crossing dimensions and design** The culvert crossing must meet the following (Appendix 1, Figure 12): • Have a minimum (combined) culvert aperture width of 1.2m and be placed within the low flow channel; or • Have a combined culvert aperture width that spans 100% of the main channel width. • All new or replacement culvert cells must be installed at or below bed level. • The obvert (internal roof) of the culvert cell(s) must be a minimum of 300 mm above the commence to flow water level (or bed level, for ephemeral waterways). • The culvert must be installed at no steeper gradient than the waterway bed gradient. • New culvert cells must be aligned parallel (within 10°) to the direction of water flow to minimise turbulence. All culvert crossings are to be regularly inspected and kept clear of blockages in order to retain fish passage. For the life of the culvert crossing, relative levels of the culvert invert, apron and scour protection and the stream bed must be kept so that there are no drops in elevation at their respective joins.
1.4 Aprons and stream bed scour protection on high impact (red), moderate impact (amber) and low impact (green) waterways	**Where aprons are incorporated**, they must: • Not be steeper than the waterway bed gradient • Abut culvert inverts (including buried culverts) at the same level to ensure that there is no drop in elevation at the join (Appendix 1, Figures 4 and 5) • Where aprons are at bed level, they are roughened throughout to approximately simulate natural bed conditions (desirable but not mandatory for green waterways). **Where stream bed scour protection is incorporated,** it must: • Not be steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper

[8] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	• Incorporate a low flow channel • Use clean rocks (minimal fine material), at least 100 mm diameter • Ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher) • Abut the apron (including buried aprons) at the same level to ensure that there is no drop in elevation at the join (Appendix 1, Figures 4 and 5). The stream bed must abut the scour protection or the apron at the same level to ensure that there is no drop in elevation at the join (Appendix 1, Figures 4 and 5).

5.2 New or replacement bed level crossings

Table 2 lists the requirements for accepted development including the duration, dimensions and design for new or replacement waterway barrier works that are bed level crossings.

The construction of new or replacement bed level crossings on tidal (grey) waterways is not accepted development and is assessable development requiring a development approval under the Planning Act.

Table 2 – Accepted development requirements for new or replacement bed level crossings

Work type	Requirements for accepted development
2.1 Construction of new or replacement of an existing bed level crossing on a major impact (purple) or high impact (red) waterway	**Duration** Works must commence and finish within a maximum time of 180 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[9]. **Bed level crossing dimensions and design** In all bed level crossing constructions: • The bed level crossing must be no greater than 15 metres wide in an upstream/downstream direction (not including stream bed scour protection). • New bed level crossings must be aligned perpendicular (within 10°) to the water flow. • Where the bed level crossing is to be constructed from rocks, use clean rocks (minimal fine material) that are an equivalent or larger size than the natural bed material at the site, and at least 50 mm diameter. • The surface is to be left rough and not to be over compacted (e.g. track-rolled finish or rougher). **Bed level crossing configurations** Bed level crossing configurations **must** adhere to one of the following options: • Option 1 (Appendix 1, Figures 13 and 14) – The lowest point of the bed level crossing must be installed at the level of the lowest point of the natural stream bed (pre-construction), within the footprint of the proposed crossing. – There must be a height difference of at least 100 mm from the lowest point of the crossing to the edges of the low flow section of the crossing (Figure 13). – If the crossing is constructed from concrete or introduced rock: outside of the low flow channel, the level of the crossing must be

[9] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	at or below the level of the natural stream bed at any given point (Figure 14a and 14b). – If the crossing is constructed from natural bed material: outside of the low flow channel, the remainder of the crossing must be at or below the highest point of the natural stream bed at any given point (Figure 14c). • Option 2 (Figures 15 and 16) – The deck height (pavement surface) of the bed level crossing can be built up to a maximum of 300 mm above the lowest point of the natural stream bed (pre-construction), within the footprint of the proposed crossing. – Adjacent to the low flow section of the crossing (Figure 15) or in-line with the low flow channel of the waterway (Figure 16), construct a rock chute at a slope no greater than 1 in 30 slope (3.3% grade). – The width of the low flow rock chute is a minimum of 100% of the low flow channel width. – Rock chutes are constructed on the downstream side of the crossing. – Adjacent to each bank, construct a rock chute at a slope no greater than 1 in 30 slope (3.3% grade). – The width of each bankside rock chute is a minimum of 3 m or 100% of the main channel width. – Where concrete is the construction material for the crossing, then the surface of the crossing must be roughened for the width of each rock chute, e.g. using a rough broom finish, exposed aggregate etc. **Stream bed scour protection** Where scour protection is incorporated (see Figure 17): • Scour protection must abut the surface edge of the crossing at the same level (this is to ensure that there is no drop in elevation at the join). If the crossing is set below bed level then the surface of the scour protection must also be below bed level. • The stream bed must abut the scour protection at the same level (this is to ensure that there is no drop in elevation at the join). • The scour protection is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper. • Scour protection must incorporate a low flow channel. • Use clean rocks (minimal fine material), at least 100 mm diameter. • Ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher). All bed level crossings constructed or replaced must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage.

	For the life of the crossing, relative elevation levels of the crossing invert and stream bed scour protection and the stream bed must be retained so that there are no drops in elevation at their respective joins.
2.2 Construction of new or replacement of an existing bed level crossing on a moderate impact (amber) or low impact (green) waterway	**Duration** Works must commence and finish within a maximum time of 360 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[10]. **Bed level crossing dimensions and design** In all bed level crossing constructions: • The bed level crossing must be no greater than 15 metres wide in an upstream/downstream direction (not including stream bed scour protection). • New bed level crossings must be aligned perpendicular (within 10°) to the water flow. • Where the bed level crossing is to be constructed from rocks, use clean rocks (minimal fine material) that are an equivalent or larger size than the natural bed material at the site, and at least 50 mm diameter. • The surface is to be left rough and not to be over compacted (e.g. track-rolled finish or rougher). **Bed level crossing configurations** Bed level crossing configurations **must** adhere to one of the following options: • Option 1 (Figures 13 and 14) – The lowest point of the bed level crossing must be installed at the level of the lowest point of the natural stream bed (pre-construction), within the footprint of the proposed crossing. – There must be a height difference of at least 100 mm from the lowest point of the crossing to the edges of the low flow section of the crossing (see Figure 13). – If the crossing is constructed from concrete or introduced rock: outside of the low flow channel, the level of the crossing must be at or below the level of the natural stream bed at any given point (Figure 14a and 14b). – If the crossing is constructed from natural bed material: outside of the low flow channel, the remainder of the crossing must be at or below the highest point of the natural stream bed at any given point (Figure 14c).

[10] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	• Option 2 (Figures 18-19 (amber mapped waterways) and 20-21 (green mapped waterways) – The deck height (pavement surface) of the bed level crossing can be built up to a maximum of 300 mm above the lowest point of the natural stream bed (pre-construction), within the footprint of the proposed crossing. – Adjacent to the low flow section of the crossing (Figures 19 21) or in-line with the low flow channel of the waterway (Figures 18 and 20), construct a rock chute at a slope no greater than 1 in 30 slope (3.3% grade). – The width of the low flow rock chute is a minimum of 100% of the low flow channel width. – Rock chutes are constructed on the downstream side of the crossing. – Adjacent to one bank, construct a rock chute at a slope no greater than 1 in 30 slope (3.3% grade)[11]. – The width of the bankside rock chute is a minimum of 3 m or 100% of the main channel width[5]. – Where concrete is the construction material for the crossing, the surface of the crossing is roughened for the width of each rock chute, e.g. using a rough broom finish, exposed aggregate etc. **Stream bed scour protection** Where scour protection is incorporated (Figure 17): • Scour protection must abut the surface edge of the crossing at the same level (this is to ensure that there is no drop in elevation at the join). If the crossing is set below bed level then the surface of the scour protection must also be below bed level. • The stream bed must abut the scour protection at the same level (this is to ensure that there is no drop in elevation at the join). • The scour protection is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper. • Scour protection must incorporate a low flow channel. • Use clean rocks (minimal fine material), at least 100 mm diameter. • Ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher). All bed level crossings constructed or replaced must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage. For the life of the crossing, relative elevation levels of the crossing invert and stream bed scour protection and the stream bed must be retained so that there are no drops in elevation at their respective joins.

[11] This requirement does not apply for low impact (green) waterways. Refer to Figures 20 and 21.

5.3 New dams and weirs

Table 3 lists the requirements for accepted development including the duration, dimensions and design for new, raised, or replacement waterway barrier works that are dams or weirs.

The construction, raising or replacement of a dam or weir on a tidal (grey), major impact (purple), high impact (red) or moderate impact (amber) waterway is not accepted development and is assessable development requiring a development approval under the Planning Act.

Table 3 – Accepted development requirements for new dams and weirs

Work type	Requirements for accepted development
3.1 Construction, raising or replacement of a dam or weir on a low impact (green) waterway	**Duration** Works must commence and finish within a maximum time of 360 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[12]. **Spillway design** • A spillway channel must be incorporated into the design of all weirs and dams on the downstream side. • The spillway channel must be constructed with a continuous slope, with no sudden vertical drops in the face of the spillway. • There must be no vertical drop in elevation where the spillway channel structure enters the natural stream bed • Spillway channels meet the following requirements: – For weirs and dams with a spillway height less than 3 metres above the waterway bed level, the spillway channel has a maximum grade of 5% (1 in 20 slope) and is concave in shape (Figure 22). – For weirs and dams with a spillway height greater than 3 metres above the waterway bed level, the design must incorporate a spillway channel and adhere to one of the following options: ▪ Option 1 (Figure 23): ▫ a rock-lined channel that is concave in shape and constructed on a maximum grade of 5% (1 in 20 slope) with a minimum width of 3 metres ▫ The channel must incorporate a 3 m diameter pool at 20 m intervals along the channel, and ▫ The invert of the pool must be a minimum of 300 mm depth below the bed of the channel. ▪ Option 2 (Figure 24): ▫ a rock-lined channel constructed on a maximum 2.5% grade (1 in 40 slope) with a minimum width of 3 metres.

[12] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	All weirs, dams, and associated spillways constructed or replaced must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage. For the life of the structure, relative elevation levels of the structure and associated spillway requirements must be retained to ensure that adequate resting pools are provided where required, and there are no vertical drops in elevation where the spillway channel enters the natural stream bed.

6 Requirements for maintenance works

6.1 Maintenance of an existing lawful culvert crossing

Table 4 lists the requirements for accepted development including the duration, dimensions and design for maintenance of waterway barrier works that are culverts.

Section 6.1 does not apply to intentional duplications.

Table 4 – Accepted development requirements for maintenance of an existing lawful culvert crossing

Work type	Requirements for accepted development
4.1 Maintenance of existing culvert crossings and associated infrastructure within tidal (grey), major impact (purple) and high impact (red) waterways	**Duration** Maintenance works must commence and finish within a maximum time of 180 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[13]. Maintenance works within tidal waterways must adhere to the work standards in section 4.3. Lengthening of culvert cells in tidal (grey) and major impact (purple) waterways is ***not*** permitted under the accepted development requirements. **Aprons and stream bed scour protection** Where aprons and/or stream bed scour protection are installed/replaced/modified as part of maintenance activities: • Aprons must abut culvert inverts (including buried culverts) at the same level (this is to ensure that there is no drop in elevation at the join) (Appendix 1, Figure 4). • Scour protection must abut the apron (including buried aprons) at the same level (this is to ensure that there is no drop in elevation at the join) (Appendix 1, Figures 4 and 5). • The stream bed must abut the scour protection or the apron at the same level (this is to ensure that there is no drop in elevation at the join) (Appendix 1, Figures 4 and 5). • Where aprons are at bed level they must be must be roughened throughout to approximately simulate natural bed conditions. • Aprons must be installed at no steeper gradient than the waterway bed gradient. Stream bed scour protection must: • be installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper

[13] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	• incorporate a low flow channel • use clean rocks (minimal fine material), at least 100 mm diameter • ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher). **End wall, headwall and wing wall replacement** Replacement of end walls, headwalls and wing walls must: • not raise the base of the culvert; and • not reduce the culvert cell cross-sectional area. **Concrete inverts retrofitted to steel culverts** For grey and purple waterways, retrofitting works are limited to structures that were built under a development approval for operational works that is constructing or raising waterway barrier works. For red waterways, retrofitting works are limited to structures that: • were built under a development approval for operational works that is constructing or raising waterway barrier works; self-assessable code; or accepted development requirements; or • meet the culvert dimensions and design requirements, including one of the three configurations, for new or replacement culvert crossings in work type 1.1, with the exception of: – burial to 300mm below bed level; and – roughening of sidewalls. New (raised) concrete inverts must: • be a maximum of 200mm thick; and • be no more than 300mm above bed level; and • be roughened e.g. by spray-crete, shot-crete, grooves etc.; and • not cause a drop in elevation between the new culvert base level and any joins to the natural stream bed, associated aprons, or stream bed scour protection Where there is a drop between the raised culvert invert and the scour protection or natural bed level, this must be remediated by a ramped apron that is: • roughened; and • not steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper

	Re-sleeving existing culvert cell For grey and purple waterways, re-sleeving works are limited to structures that were built under a development approval for operational works that is constructing or raising waterway barrier works. For red waterways, re-sleeving works are limited to structures that: • were built under a development approval for operational works that is constructing or raising waterway barrier works; self-assessable code; or accepted development requirements; or • meet the culvert dimensions and design requirements, including one of the three configurations, for new or replacement culvert crossings in work type 1.1, with the exception of: – burial to 300mm below bed level; and – roughening of sidewalls. Re-sleeving works must comply with all of the following: • The invert of the re-sleeved pipe must only be raised the minimum amount practicable; • The overall cross-sectional area of the culvert array must be maintained or increased through installation of additional culverts cell(s); • Additional culvert cells must: – not result in widening of the natural waterway; and – be located within or adjacent to the low flow channel; and – be installed at bed level and roughened; or – be installed 300mm below bed level. • The finished culvert array must not result in afflux impacts greater than that which was existing; • Ensure there are no drops in elevation between the new culvert invert(s) and any joins to the natural stream bed, associated aprons, or stream bed scour protection; • Where there is a drop between the raised culvert invert and the scour protection or bed level, this must be remediated by a ramped apron that is: – roughened; and – not steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper • Culvert invert (floor) and sidewalls of the re-sleeved cell(s) are roughened* e.g. by spray-crete, shot-crete, baffles, vertical grooves etc. • If baffles are used they must be as follows (see Figure 3): – maximum 150 mm horizontal protrusion into the flow

	– maximum 10 mm thick (leading edge) – within 1.2m upstream and downstream of the upstream culvert inlet, baffles must be spaced at twice the horizontal protrusion (width) of the baffle (i.e. maximum 300mm centres) – throughout the rest of the structure, baffles must be spaced at 4 x horizontal protrusion (width) of the baffle (i.e. maximum 600mm centres) *Where re-sleeving is for existing arch culvert(s), the invert is not required to be roughened where: • The culvert invert is not modified; and • The structure otherwise complies with the re-sleeving requirements. **Lengthening of existing culvert cells on high impact (red) waterways only** Increasing the length of a culvert cell (upstream-downstream) is considered waterway barrier works. Culvert cell lengthening must: • not result in intentional duplication of the existing culvert crossing; and • not raise the base of the culvert cell; and • not reduce the culvert cell cross-sectional area of the existing culvert configuration. All culvert crossings constructed or replaced must be kept clear of blockages through a regular inspection program in order to retain fish passage. For the life of the culvert crossing, relative levels of the culvert invert, apron and scour protection and the stream bed must be kept so that there are no drops in elevation at their respective joins.
4.2 Maintenance of existing culvert crossings and associated infrastructure within a moderate impact (amber) and low impact (green) waterway	**Duration** Maintenance works must commence and finish within a maximum time of 360 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[14]. **Aprons and stream bed scour protection** Where aprons and or stream bed scour protection are installed/replaced/modified as part of maintenance activities: • Aprons must abut culvert inverts (including buried culverts) at the same level (this is to ensure that there is no drop in elevation at the join) (Appendix 1, Figure 4).

[14] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

	• Scour protection must abut the apron (including buried aprons) at the same level (this is to ensure that there is no drop in elevation at the join) (Figures 4 and 5). • The stream bed must abut the scour protection or the apron at the same level (this is to ensure that there is no drop in elevation at the join) (Figures 4 and 5). • Where aprons are at bed level they must be must be roughened throughout to approximately simulate natural bed conditions (desirable but not mandatory for green waterways). • Aprons must be installed at no steeper gradient than the waterway bed gradient. Stream bed scour protection must: • be installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper; and • incorporate a low flow channel; and • use clean rocks (minimal fine material), at least 100 mm diameter; and • ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher). **End wall, headwall and wing wall replacement** Replacement of end walls, headwalls and wing walls must: • not raise the base of the culvert; and • not reduce the culvert cell cross-sectional area. **Concrete inverts retrofitted to steel culverts** Retrofitting works are limited to structures that: • were built under a development approval for operational works that is constructing or raising waterway barrier works; self-assessable code; or accepted development requirements; or • meet the culvert dimensions and design requirements for new or replacement culvert crossings in work type 1.2, with the exception of: – burial to 300mm below bed level; and – roughening of sidewalls New (raised) concrete inverts must: • be a maximum of 200mm thick; and • be no more than 300mm above bed level; and

	• be roughened e.g. by spray-crete, shot-crete, grooves etc. (desirable but not mandatory for green waterways); and • not cause a drop in elevation between the new culvert base level and any joins to the natural stream bed, associated aprons, or stream bed scour protection Where there is a drop between the raised culvert invert and the scour protection or bed level, this must be remediated by a ramped apron that is: • roughened; and • not steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper **Re-sleeving existing culvert cell** Re-sleeving works are limited to structures that either: • were built under a development approval for operational works that is constructing or raising waterway barrier works; self-assessable code; or accepted development requirements or • meet the culvert dimensions and design requirements in work type 1.1, with the exception of: – burial to 300mm below bed level; and – roughening of sidewalls. Re-sleeving works must comply with all of the following: • The invert of the re-sleeved pipe must only be raised the minimum amount practicable; • The overall cross-sectional area of the culvert array must be maintained or increased through installation of additional culvert cell(s) unless the invert is raised no more than 100mm from the existing invert level; • Additional culvert cell(s) must: – not result in widening of the natural waterway; and – be located within or adjacent to the low flow channel; and – be installed at bed level and roughened, or – be installed 300mm below bed level • The finished culvert array must not result in afflux impacts greater than that which was existing; • Ensure there are no drops in elevation between the raised invert level and any joins to the natural stream bed, associated aprons, or stream bed scour protection; • Where there is a drop between the raised culvert invert and the scour protection or bed level, this must be remediated by a ramped apron that is:

	– roughened; and – not steeper than a 1 in 20 gradient or the natural channel gradient, whichever is steeper • culvert invert (floor) and sidewalls of the re-sleeved cells(s) are roughened* e.g. by spray-crete, shot-crete, baffles, vertical grooves etc. (desirable but not mandatory for green waterways) • If baffles are used they must be as follows (see Figure 3): – maximum 150 mm horizontal protrusion into the flow – maximum 10 mm thick (leading edge) – within 1.2m upstream and downstream of the upstream culvert inlet, baffles must be spaced at twice the horizontal protrusion (width) of the baffle (i.e. maximum 300mm centres) – throughout the rest of the structure, baffles must be spaced at 4 x horizontal protrusion (width) of the baffle (i.e. maximum 600mm centres) *Where re-sleeving is for existing arch culvert(s), the invert is not required to be roughened where: • The culvert invert is not modified; and • The structure otherwise complies with the re-sleeving requirements. **Lengthening of existing culvert cells** Increasing the length of a culvert cell (upstream-downstream) is considered waterway barrier works. Culvert cell lengthening must: • not result in an intentional duplication of the existing culvert crossing; and • not raise the base of the culvert cell; and • not reduce the culvert cell cross-sectional area of the existing culvert configuration. All culvert crossings constructed or replaced must be kept clear of blockages through a regular inspection program in order to retain fish passage. For the life of the culvert crossing, relative levels of the culvert invert, apron and scour protection and the stream bed must be kept so that there are no drops in elevation at their respective joins.

6.2 Maintenance of an existing lawful bed level crossing

Table 5 lists the requirements for accepted development including the duration, dimensions and design for maintenance of waterway barrier works that are bed level crossings.

Table 5 – Accepted development requirements for maintenance of an existing lawful bed level crossing

Work type	Requirements for accepted development
5.1 Maintenance of an existing bed level crossing	**Duration** Maintenance works on grey (tidal), purple and red waterways must commence and finish within a maximum time of 180 calendar days. Maintenance works on amber and green waterways must commence and finish within a maximum time of 360 calendar days. Instream temporary waterway barriers (which may include sediment control measures) must meet the requirements of section 7 of these accepted development requirements[15]. **Stream bed scour protection** Where scour protection is incorporated (Appendix 1, Figure 17): • Scour protection must abut the surface edge of the crossing at the same level (this is to ensure that there is no drop in elevation at the join). If the crossing is set below bed level then the surface of the scour protection must also be below bed level. • The stream bed must abut the scour protection at the same level (this is to ensure that there is no drop in elevation at the join). • The scour protection is installed at a gradient no steeper than 1 in 20 or the natural channel gradient, whichever is steeper. • Scour protection must incorporate a low flow channel. • Use clean rocks (minimal fine material), at least 100 mm diameter. • Ensure the rock armouring is not over compacted but left proud and uneven (track-rolled finish or rougher). All bed level crossings constructed or replaced must be inspected at least annually and reinstated to original design specifications if required, in order to maintain fish passage. For the life of the crossing, relative elevation levels of the crossing invert and stream bed scour protection and the stream bed must be retained so that there are no drops in elevation at their respective joins.

[15] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

6.3 Maintenance of an existing lawful floodgate

Table 6 lists the requirements for accepted development including the duration, dimensions and design for work that is the maintenance of existing lawful waterway barrier works that is replacement or maintenance of an existing lawful floodgate and / or headwall.

Table 6 – Accepted development requirements for maintenance of an existing lawful floodgate

Work type	Requirements for accepted development
6.1 Replacement, modification or maintenance of an existing lawful floodgate and / or headwall on tidal (grey) waterways	**Duration** Maintenance works must commence and finish within 60 days. Instream temporary waterway barriers (including sediment control measures) must meet the requirements of section 7 of these accepted development requirements[16]. Replacement and/or maintenance may only occur on structures that are located within in a tidal waterway and where the bankfull width at the works site is no greater than six metres. **Disturbance of bed and banks during works** During construction, disturbance to the instream bed and bank sediment of the waterway beyond the barrier footprint[17] is confined to a disturbance zone that is a *total* length (upstream and/or downstream) of 10 metres. **Floodgate type** • The floodgate must be vertical when in the closed position. • The floodgate must be designed and operated as a tidally activated automatic floodgate. • The automatic floodgate must be open to allow water exchange and fish movement up to the 80% bankfull water level at the floodgate headwall. This means the automatic floodgate must only be fully closed preventing water inflow when the water level is above the 80% natural bankfull water level at the floodgate headwall (Figure 25). **Floodgate headwall replacement specifications** • For floodgate headwall replacement, the floodgate headwall height is a maximum of 10% higher than the bankfull level at the location of the headwall (see Figure 26). • The total face area of the floodgate apertures (holes) in the replacement headwall must be a minimum of 40% of the headwall face area**.**

[16] Where temporary waterway barrier works comply with section 7 and form part of the same works, additional notification is not required.

[17] The barrier footprint includes the base of the structure, apron, headwall, wingwalls, abutments and any associated scour protection.

Multiple floodgates may be needed to achieve this requirement. Having more and larger floodgate apertures reduces the duration and extent of flooding behind the floodgate.

- The floodgate aperture height(s) must be at least 80% of the replacement headwall height (Figure 27).
- For floodgate headwall replacement, the base of the floodgate apertures in the headwall must be built no higher than 100mm above the waterway bed (Figure 27).
- Headwall width (upstream/downstream) is no greater than 1m (Figure 27).

For floodgate headwall replacement, square or rectangular apertures (holes) and floodgates are the preferred shape for flood mitigation, water quality and fish movement requirements.

Floodgate flap replacement and operation

For floodgate flap replacement, all floodgates, including multiple floodgates in one headwall, must meet one of the following options:

- ***Option 1 – side-hinged***

A side-hinged floodgate flap (Figure 28) may be used where:

- It allows water exchange and fish movement up to the 80% bankfull water level at the floodgate headwall (Figure 25); and
- It is designed and operated to be tidally activated.

- ***Option 2 – top-hinged***

A top-hinged floodgate flap (Figure 29) may be used where:

- It allows water exchange and fish movement up to the 80% bankfull water level at the floodgate headwall (Figure 25); and
- It is designed to incorporate a tidally activated (automatic) mini-gate or other tidally activated design.

Where a tidally activated automatic mini-gate is incorporated in a top hinged floodgate, it meets the following:

- The mini-gate opening height must be a minimum of 75% of the floodgate flap height.
- The mini-gate opening area must be a minimum of 40% of the floodgate flap area**.**
- The tidally activated mini-gate must be positioned no higher than 50mm above the bottom of the floodgate flap.

Monitoring floodgate function

Floodgate operation must be monitored and necessary adjustments made to ensure the floodgate is allowing or capable of allowing water exchange to the 80% bankfull water level at the floodgate headwall at all times (see Figure 25).

	Address changes in water quality If the floodgate operational regime is altered by replacing the floodgate flap, and results in: • large scale die-off of aquatic vegetation and/or • increased export of acid water, resulting from the floodgate operation, then actions must be taken to prevent sudden and significant reductions in water quality at the site or upstream or downstream of the site. Actions include but are not limited to: • The gradual implementation of the tidal flushing regime over several weeks (allowing monitoring of the possible changes, such as acid export and/or declines in water quality). • The removal of dying or dead aquatic vegetation from the waterway and floodplain.

7 Temporary waterway barrier works

Table 7 lists the requirements for accepted development including the duration, dimensions and design for waterway barrier works that are temporary, including but not limited to: bunds, culvert crossings, bed level crossings, floodways, coffer dams etc. Works are temporary if they comply with the maximum duration specified in the table.

Table 7 – Accepted development requirements for temporary waterway barrier works

Work type	**Requirements for accepted development**
7.1 Constructing or raising temporary waterway barrier works within a tidal (grey) waterway	**Duration** Works must commence and finish within a maximum time of 180 calendar days. Instream sediment control measures associated with the works must be removed within this period. Works within tidal waterways must adhere to the work standards in section 4.3. **Waterway barrier work construction and design** • The dimensions of the temporary barrier are limited to the minimum practicable for the site and purpose • Areas containing marine plants must be kept free of ponded water to prevent stress and possible mortality of marine plants. • The method of draining the water must not cause fish to become trapped or stranded or have detrimental impacts on the wellbeing of fish.[18] **Removal of temporary waterway barrier** • If there is more than one temporary waterway barrier in the location, the most downstream waterway barrier must be removed first. • All waterway barrier material must be removed from within the waterway and disposed of at least 50m away from the waterway.
7.2 Temporary waterway barrier works within a major impact (purple), high impact (red), moderate impact (amber) or low impact (green) waterway	**Duration** For works in purple and red waterways, works must commence and finish within a maximum time of 180 calendar days. For works in amber and green waterways, works must commence and finish within a maximum timeframe of 360 days. Instream sediment control measures associated with the works must be removed within these periods.

[18] Refer to the State of Queensland, Department of Agriculture and Fisheries *Guidelines for Fish Salvage* (2018).

	Waterway barrier work construction and design • The dimensions of the temporary barrier are limited to the minimum practicable for the site and purpose. **Removal of temporary waterway barrier** • If there is more than one temporary waterway barrier in the location, the most downstream waterway barrier must be removed first. • All waterway barrier material must be removed from within the waterway and disposed of at least 50m away from the waterway.

8 Amendments to accepted development requirements for recovery in and immediately following disaster situations declared under the *Disaster Management Act 2003*

In addition to the above accepted development requirements (which are still available for use), these provisions apply to otherwise lawful clean up, replacement, and repair works (recovery works) within a declared area. These provisions:

- apply to otherwise lawful replacement and/or repair to public and private infrastructure that have been damaged by a disaster and occur within a declared area
- are in effect for one year from the date of declaration of a disaster situation
- apply to all individuals and organisations lawfully undertaking recovery works on a lawful work
- allow that where recovery works have commenced without pre-works notification, notification is to be lodged with Fisheries Queensland, Department of Agriculture and Fisheries, as soon as practicable after the commencement of the recovery works
- allow that post-works notification is provided within 20 business days of the completion of the recovery works
- allow that normal restrictions on disturbance zones around a structure are relaxed, but only to that which is necessary to undertake the recovery works because of the disaster situation
- require that any disturbance to waterways and fish habitats associated with recovery works is minimised
- allow that recovery works may be undertaken under any tidal or other flow conditions

A like-for-like replacement of infrastructure lost or damaged will comply with the accepted development requirements provided the recovery works:

- are of an existing lawful work and to the pre-disaster design criteria and standard
- are in accordance with current engineering standards and requirements / building codes and guidelines as required by legislation
- will reinstate the lawful work within the existing footprint and will provide the same function. Where the lawful work is a revetment wall or bridge, the existing footprint means a similar footprint in relation to the location of the bank alignment post-disaster.

Table 8 – Accepted development – Temporary amendments for waterway barrier works

Waterway barrier work	Temporary amendments
8.1 Culvert crossings	Like-for-like replacement with the requirement to upgrade fish passage provisions at the works within two (2) years of the completion of the works. The upgrades must meet the accepted development requirements for a new culvert crossing as per section 5.1 of this document, or a development approval issued under the Planning Act.

8.2 Bed level crossings	Like-for-like replacement with the requirement to upgrade fish passage provisions at the works within two (2) years of the completion of the works. The upgrades must meet the accepted development requirements for a new bed level crossing as per section 5.2 of this document, or a development approval issued under the Planning Act.
8.3 Floodgate repair	Repair and replacement of floodgates must meet the accepted development requirements for floodgate maintenance as per section 6.3 of this document, or a development approval issued under the Planning Act.
8.4 Dams and weirs	Repair and replacement of dams or weirs must meet the accepted development requirements for new dams and weirs as per section 5.3 of this document, or a development approval issued under the Planning Act.
8.5 Bridges	Repair and replacement of bridges may be undertaken provided the construction or repair work is like-for-like and the replacement occurs within the same or similar footprint of the damaged structure.
8.6 Fishways	Repair and replacement of fishways should be carried out as soon as practicable. Fish ways must cater for the whole fish community, taking into account seasonal biomass, species, size classes, life stages, and swimming abilities.
8.7 Temporary waterway barrier works	For temporary waterway barrier works built for the repair and replacement of flood damaged infrastructure, there is no restriction on the dimensions of the temporary waterway barrier works. Temporary waterway barriers may be in place for the durations specified in Table 7.
8.8 Other waterway barrier works	For all other authorised waterway barrier works, replacement and repairs can be carried out on a like-for-like basis and within the footprint of the damaged structure.

A person exercising powers under section 77 of the *Disaster Management Act 2003* is considered to be acting lawfully for the purposes of section 123 of the *Fisheries Act 1994.*

Works carried out due to an emergency

Where works are to be carried out due to an emergency, the exemptions in section 166 of the Planning Act are applicable. Works carried out due to an emergency under the exemptions must comply with all relevant provisions of section 166 of the Planning Act.

9 Contacts and further information

Additional information is available from Fisheries Queensland, Department of Agriculture and Fisheries:

Website: www.daf.qld.gov.au/fisheries

Email: planningassessment@daf.qld.gov.au

Customer service centre: 13 25 23

Online notification system: http://adr.fisheries.qld.gov.au

10 Glossary

Accepted development is development for which a development approval is not required. (Refer to s.44(4) of the Planning Act).

Aperture is the internal (open) width of the culvert cell or culvert array.

ARI is the average recurrence interval. ARI expresses the likely period (in years) between floods of a given volume (or greater) occurring, based on the long term average.

In this context, culvert capacity is generally designed to pass flood discharge up to a given ARI.

Assessable development is development for which a development approval is required.

(Refer to s.44 (3) of the Planning Act).

Automatic floodgate is a floodgate that is designed and operated (through a device, design or modification) to allow bi-directional water exchange and fish movement to occur up to the 80% bank full level at the floodgate headwall without manual intervention. The automatic floodgate may only be closed at water levels above the 80% bank full level at the site of the floodgate headwall to prevent high water inundation.

Automatic floodgates include:

- **Top hinged** (vertical) floodgate (square, round or other shape) with a tidally activated automatic mini-gate or another type of automated device incorporated to allow bi-directional water exchange and fish movement to the 80% bank full water level at the floodgate headwall.
- **Side hinged** floodgate designed with a modification to the hinge, spring, latch or device to delay / retard closing and assist with opening thereby allowing water exchange and fish movement to the 80% bank full water level at the floodgate headwall.

Bankfull level is the bank level measured at the site of the waterway barrier works at which overtopping of the waterway bank begins to occur. This level will be determined by the topography of the surrounding land and the height of the bank.

Bankfull width is the width of the waterway at the bankfull level.

Bankside is the side of a structure adjacent to the waterway bank.

Barrier material is the material used to construct or raise a waterway barrier.

Bed gradient is the slope, rise or fall of a waterway. This is usually dependent on the location along the waterway.

Bed level is the lowest point of the natural stream bed (pre-construction) within the footprint of the proposed crossing.

Bed level crossing is a crossing of a waterway that does not include low flow pipes or culverts. Bed level crossings may be known as fords, causeways, splash level road crossing, etc. Bed level crossings may be constructed with any compressed or hardened material e.g. rocks, gravel or concrete.

Culvert array is the collective term for culvert cells, where more than one culvert is used in a crossing to span the waterway. The culvert array is the total width of all culvert cell apertures combined. For pipe culverts the aperture is taken to be the diameter of the cell.

Culvert cell is a support structure for a crossing over a waterway. Common culvert cell types include bottomless, box and pipe.

Culvert crossing is a structure that incorporates culvert cells for the purpose of providing vehicle or pedestrian access across a waterway.

Dam is a structure built for the primary purpose of impounding water.

Declared area means—

- for a disaster situation declared under section 64(1) of the *Disaster Management Act 2003*—the disaster district, or the part of the disaster district, for which the disaster situation is declared; or
- for a disaster situation declared under section 69 of the *Disaster Management Act 2003*—the State or, if the disaster situation is declared for a part of the State, the part.

(Refer s.11, schedule dictionary of the *Disaster Management Act 2003*).

Deck height is the height of the road / pavement above the stream bed at the point where a measurement is taken.

Depth of cover is the height of fill measured from the obvert of the culvert cell to the surface of the road / pavement.

Development is defined in schedule 2 of the Planning Act.

Development approval is:

- A preliminary approval; or
- A development permit; or
- A combination of a preliminary approval and a development permit.

(Refer s. 49(1) of the Planning Act).

Disaster is a serious disruption in a community, caused by the impact of an event that requires a significant coordinated response by the State and other entities to help the community recover from the disruption.

(Refer to s.13(1) of the *Disaster Management Act 2003*).

Disaster situation means a disaster situation declared under section 64(1) or section 69 of the *Disaster Management Act 2003.*

(Refer to s.11, schedule dictionary of the *Disaster Management Act 2003*).

Elevated flow means flows other than no flow, base flow or low flow conditions.

Emergency means an event or situation that involves an imminent and definite threat requiring immediate action (whether before, during or after the event or situation), other that routine maintenance due to wear and tear.

(Refer to s.165 (8) of the Planning Act).

Fish habitat includes land, waters and plants associated with the life cycle of fish, and includes land and waters not presently occupied by fisheries resources (refer s.4, schedule dictionary of the Fisheries Act).

Floodgate is a top hinged or side hinged gate designed to regulate the flow of water in order to prevent flooding in one direction.

Full flow is when the water level reaches the obvert of all culvert cells in the array.

Infrastructure does not include land, facilities, services or works for an environmental offset.

(Refer to schedule 2 Dictionary of the Planning Act).

Intentional duplication means purposefully making a copy of an existing structure, e.g. a single lane is duplicated to form a dual lane.

Invert is the bottom floor of the culvert cell.

Lawful work is work that was constructed in compliance with all of the requirements, under any Act, relating to a work of that type at the time of construction. A lawful work may be owned by a public or private entity.

Leading edge is the edge of the roughening element that is perpendicular to flow.

Like-for-like means a structure that provides the purpose of the original authorised structure, mainly in the design of the original structure, but may include improved engineering and ecological outcomes.

Like-for-like replacement includes replacement within the footprint of the existing structure, or in the case of revetment walls and bridges, a similar footprint at, and in relation to, the location of the current bank alignment.

Low flow for perennial waterways are base flow volumes or levels. Low flow for ephemeral waterways are commence to flow levels up to the level or volume of a one in one year flow event.

Main channel is the active component of the flow channel characterised by a distinct change in appearance or structure at the upper limit of the channel such as undercutting, changes in vegetation density, sudden changes in bank slope, boundary levels for water marks, mosses or lichens, changes in sediment particle size. Approximate Q values of Q1 – Q2 or AEP equivalent.

Where the main channel width is variable, use an average width for the site.

See Appendix 4 for examples.

Maintenance is limited to the works described in the tables of this document.

Marine plant includes:

- a plant that usually grows on, or adjacent to tidal land, whether it is living, dead, standing or fallen;
- material of a tidal plant, or other plant material on tidal land
- a plant, or material of a plant, prescribed under a regulation or management plan to be a marine plant.

A marine plant does not include a plant that is a declared pest under the (a) *Biosecurity Act 2014;* or *(b)* controlled biosecurity matter under the *Biosecurity Act 2014.* (Refer s.8 of the Fisheries Act).

Monitoring includes low impact collection of baseline sampling data, survey and investigation works associated with the impacts of development.

Obvert is the interior top of the culvert cell.

Re-sleeving includes lining, sleeving, or re-sleeving any part of an existing culvert cell.

Rock chute is a section of stream bed or channel that has been armoured with rock, generally for erosion protection. In this context the rock chute is constructed within a waterway, adjacent to a bank, culvert or low flow section of a crossing in order to provide a level of fish passage at the crossing prior to drownout.

Scour protection is a stream bed structure installed to prevent or remediate destabilisation and removal of substrate by the action of water flows on the waterway bed, adjacent to the hard structures of a waterway barrier work.

Substrate is the underlying hard or soft surface of sediment, soils, sand, rock or mud.

Tidal land includes reefs, shoals and other land permanently or periodically submerged by waters subject to tidal influence (refer s.4, schedule dictionary of the Fisheries Act).

Waterway includes a river, creek, stream watercourse or inlet of the sea (refer s.4, schedule dictionary of the Fisheries Act).

Waterway barrier works means a dam, weir or other barrier across a waterway if the barrier limits fish stock access and movement along a waterway.

Weir is a structure built fully or partially across a waterway for the primary purposes of storing or confining water, or regulating water flow.

Works includes building work, operational work, plumbing work and drainage work. (Refer to Schedule 2 of the Planning Act).

11 Notification forms for accepted development

11.1 Pre-works notification form

Pre-works notification can be submitted through the online notification system at http://adr.fisheries.qld.gov.au.

If you are having trouble accessing the online system, this notification form can be used instead. You are required to complete all sections of this form and email it to Fisheries Queensland, Department of Agriculture and Fisheries at **acceptedevelopment@daf.qld.gov.au.**

All applicable fields must be completed. Incomplete forms will not be registered and your works will not be lawful. It is your responsibility to ensure the work complies with all accepted development requirements.

You may be required to obtain approvals from other agencies prior to commencing work.

PART 1. PRE-WORKS NOTIFICATION FORM

Pre-works notification must be provided prior to but no more than 20 business days before commencing works (unless Section 7 Disaster provisions apply and then it must be provided as soon as practicable after commencement).

1. **Contact details of person undertaking the works**
   This person must be contactable and may be contacted by Fisheries Queensland for monitoring purposes.

Name and organisation (if applicable):

Physical address:

Postal address:

Email: Telephone:

2. Work Details ☐ Private or ☐ Public

Attach additional sheet if more space is required

Ensure site photos are attached as per Appendix 4, and a map of the location of the works. ***Ensure a work type from one of the tables in this document is specified below.***

Date works to commence and expected timeframe *e.g. 26/06/17, 220 days*	Lot on Plan or adjacent Lot on Plan; and street address	Co-ordinates (decimal degrees) and datum system used (GDA94 or WGS84)	Colour and name of mapped waterway and specify if tidal	New work or maintenance *(e.g. new work)*	**Work type*** *(e.g. 2.2 replacement of bed level crossing)* ***For work types 4.1 and 4.2, complete Part 2 of the table***	Work size (dimensions), description (including option chosen if applicable) and method

PART 2. WORK TYPES 4.1 AND 4.2 - ADDITIONAL DETAILS FORM

For retrofitting inverts or re-sleeving existing culvert cells, please provide additional information as requested below.

Are works for retrofitting inverts on existing culvert cell(s)? ☐ Yes ☐ No	Are works for re-sleeving existing culvert cell(s)? ☐ Yes ☐ No
If yes: Total number of culvert cells in the array _____. Number of culvert cells to be retrofitted: _____. Number of culvert cells requiring ramped apron: _____.	If yes: Existing number of culvert cells in the array: _____. Number of culvert cells to be re-sleeved: _____. Number of culvert cells requiring ramped apron: _____. Number of additional culvert cells to be installed: _____.

3. Declaration

In completing the pre-works notification form, I confirm the following:

☐ This document has been read ☐ This document has been understood ☐ The proposed works meet the work standards and the requirements for accepted development
Name and organisation of person notifying: *Name to be provided in full* **Date of notification:**

You must keep a copy of the pre-works notification form and evidence of the notification date and any reference number you are provided. You must be able to provide this information if requested.

11.2 Post-works notification form

Post-works notification can be submitted through the online notification system at http://adr.fisheries.qld.gov.au.

If you are having trouble accessing the online system, this notification form can be used instead. You are required to complete all sections of this form and email to Fisheries Queensland, Department of Agriculture and Fisheries at **acceptеddevelopment@daf.qld.gov.au.**

It is your responsibility to ensure the work complies with all requirements for accepted development.

POST-WORKS NOTIFICATION FORM

Post-works notification must be provided within 15 business days of completion of works.

1. Reference number(s) for works:

2. Name and organisation of person notifying:

3. Date of notification:

4. Work Details: ☐ Private or ☐ Public

Attach additional sheet if more space is required.

Ensure site photos are attached as per Appendix 4, and a map of the location of the works.

Location of works Decimal degrees and Lot on Plan	**Date works completed**	**Work type** *(e.g. 2.2 replacement of bed level crossing)*	**Colour of mapped waterway**

You must keep a copy of the post-works notification form and evidence of the notification date. You must be able to provide this information if requested.

12 Appendices

Appendix 1 – Figures

Figure 1 – Example of waterway cross section showing <u>main channel</u> and low flow channel

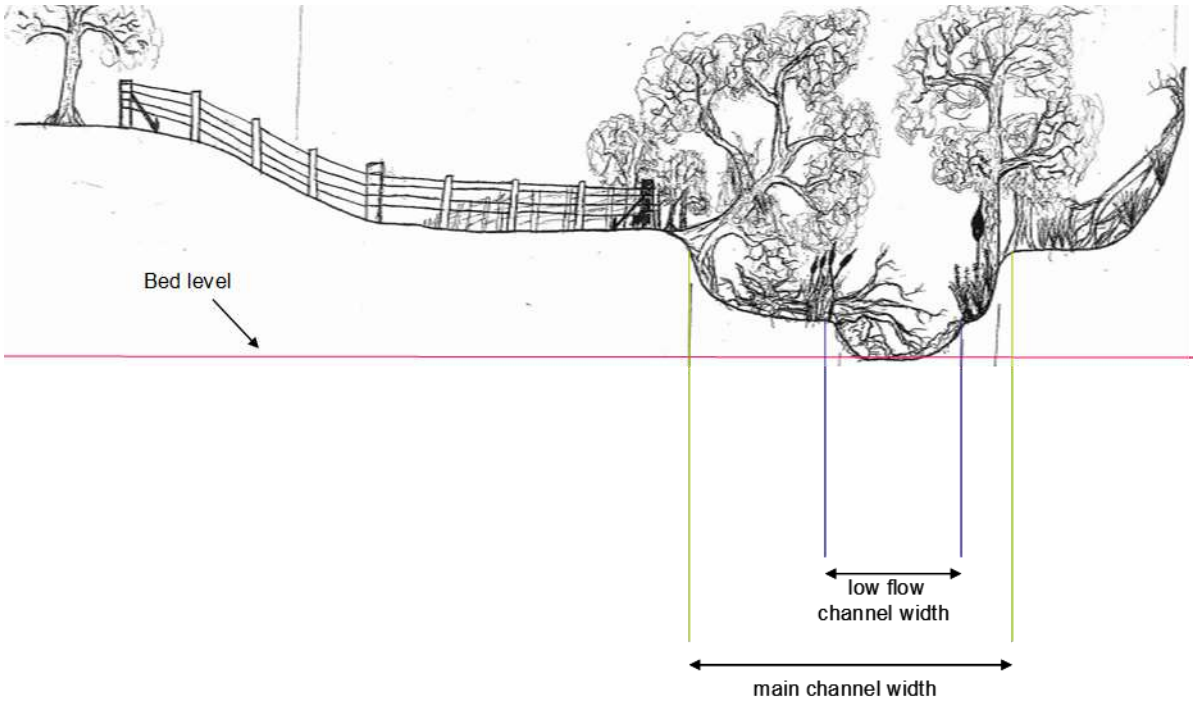


Figure 2 – Key culvert design elements

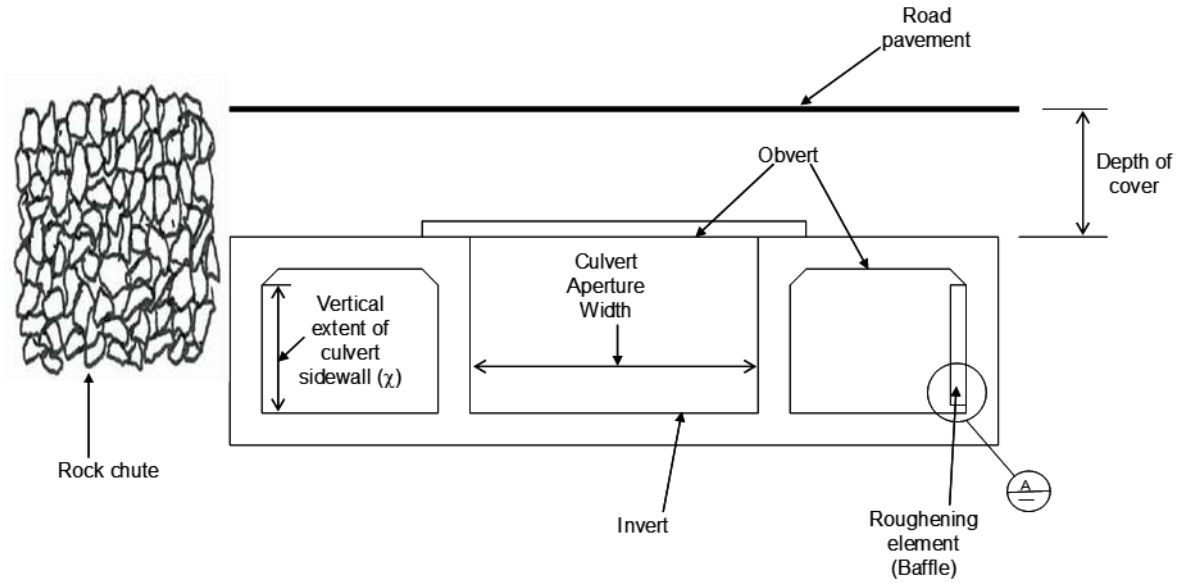
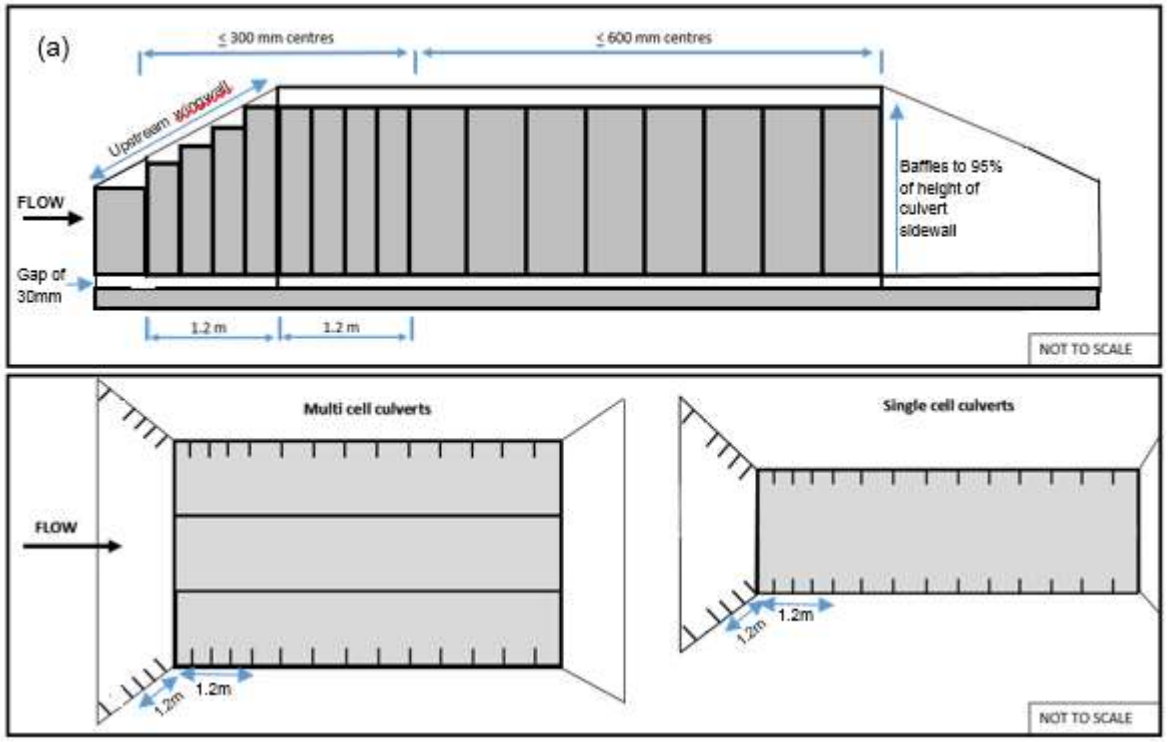
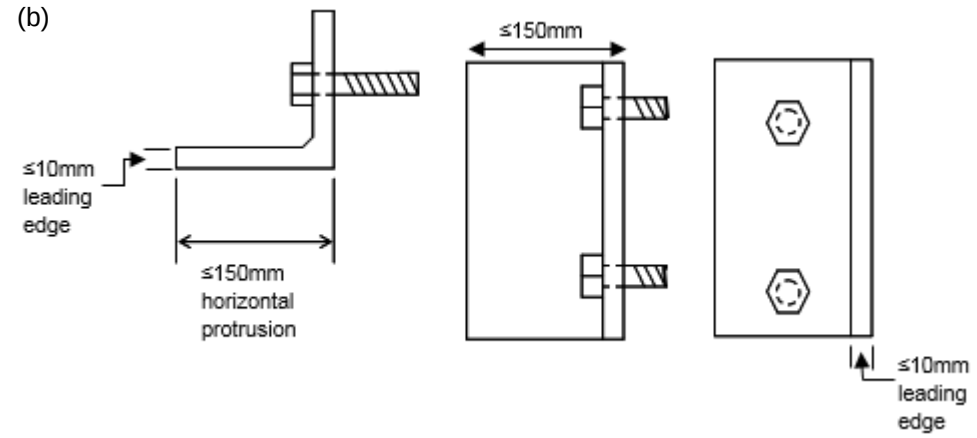


Figure 3 – (a) Baffle Configuration; (b) Baffle Detail; and (c) Baffle section





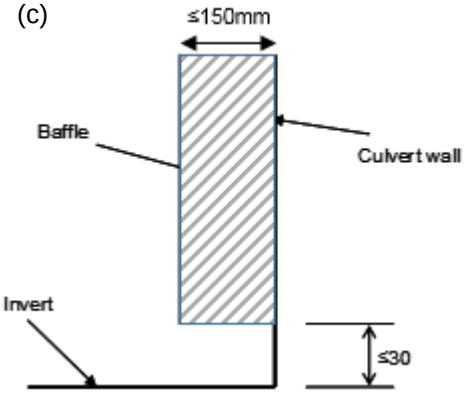


Figure 4 – Section view of relative levels of scour protection, apron and culvert <u>invert</u>

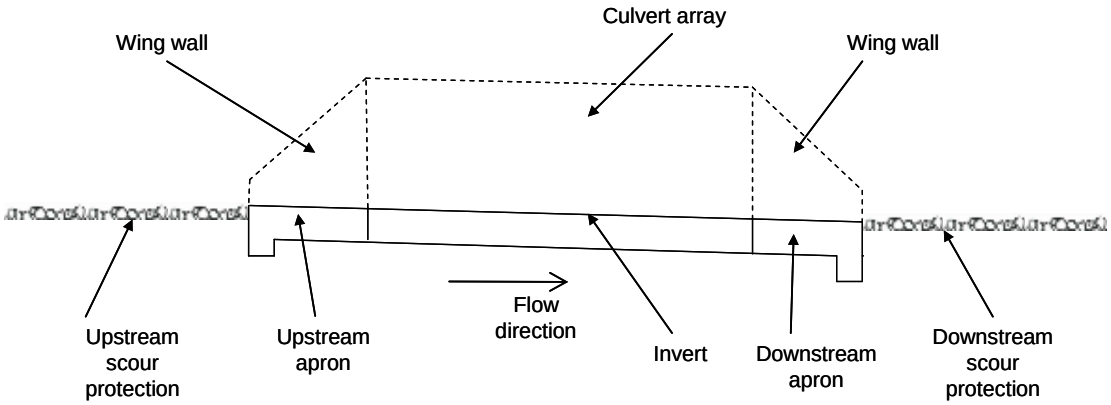
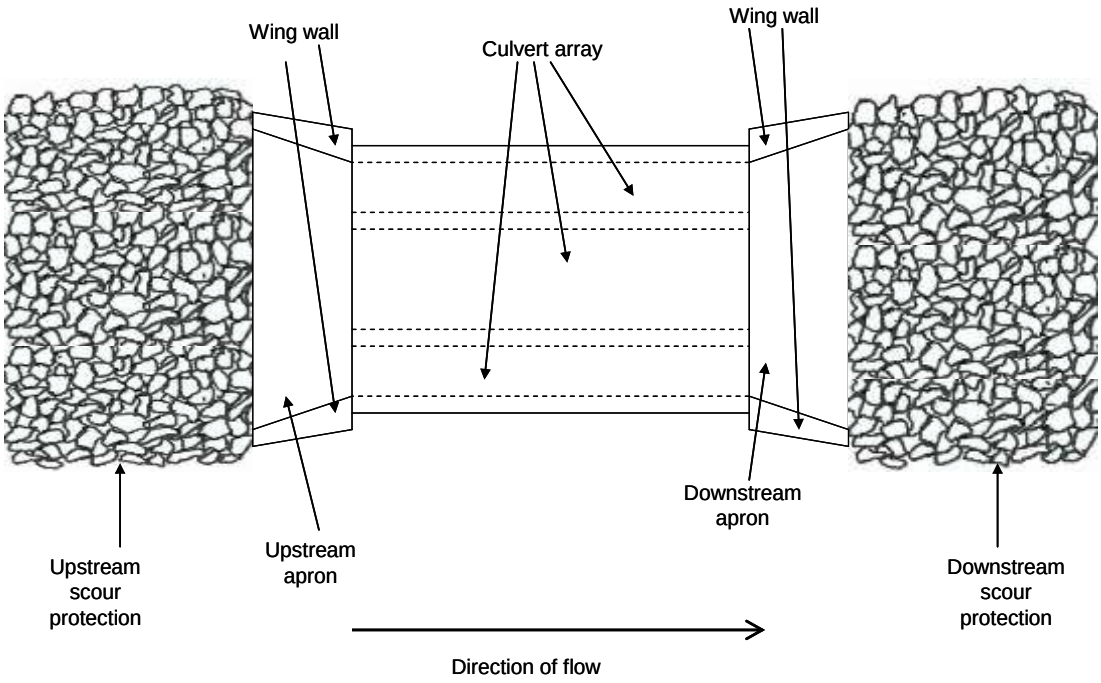


Figure 5 – Plan view of relative levels of scour protection, apron and culvert <u>invert</u>



Culvert Design Options

The following figures are examples of acceptable culvert configurations for the different waterway zones. Other configurations may be applicable, providing they meet the design parameters set out in the tables of this document. The number of culvert cells needed to meet the minimum required aperture will vary according to the site.

Figure 6 – Option 1 for red mapped waterways – example of compliance with design requirements

- ✓ Culvert array spans 100% low flow channel and ≥75% main channel width
- ✓ Outermost cells have roughening to ≥ 95% of height of sidewalls with gap of ≤ 30mm at bottom
- ✓ Roughening on upstream wingwalls
- ✓ All culverts ≥ 300mm below bed level unless on natural bed rock
- ✓ Obvert ≥ 600mm above commence to flow (or bed level for ephemeral waterways)
- ✓ Depth of cover ≤750mm when ARI <50 years

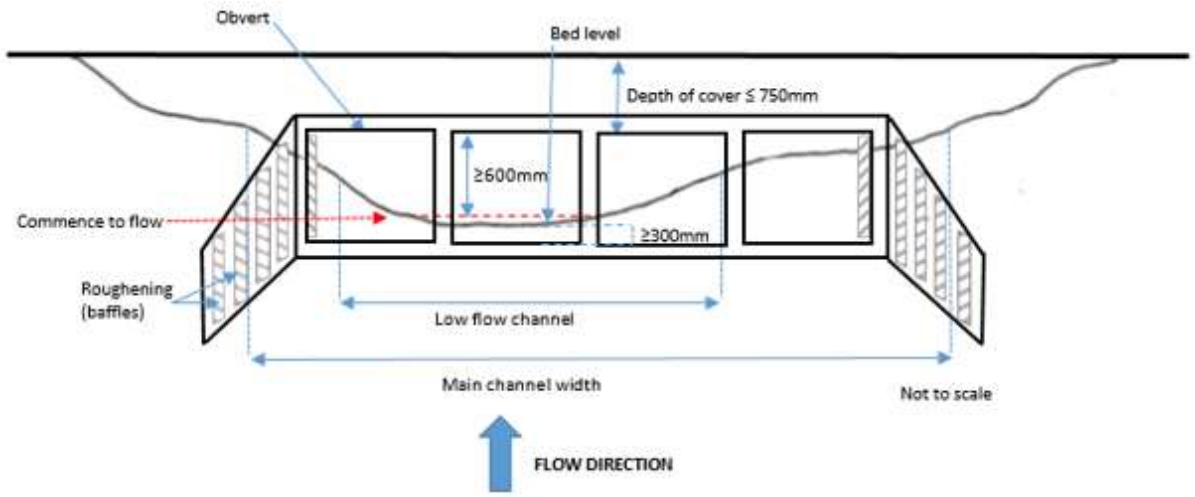


Figure 7 – Option 2 for red mapped waterways – example of compliance with design requirements

- ✓ Culvert array spans 100% low flow channel and ≥75% main channel width
- ✓ Outermost cells have roughening to ≥ 95% of height of sidewalls with gap of ≤ 30mm at bottom
- ✓ At least one cell set ≥ 300mm below bed level unless installed on bedrock
- ✓ Cell set ≥ 300mm below bed level is aligned with the low flow channel and has width ≥ 1200mm and obvert no lower than highest obvert in array except where slab link is incorporated and then no higher than top of adjacent cell
- ✓ Roughening on upstream wingwalls and floor of cells that are not on bedrock or set ≥ 300mm below bed level
- ✓ Obvert ≥ 600mm above commence to flow (or bed level for ephemeral waterways)
- ✓ Depth of cover ≤750mm when ARI <50 years

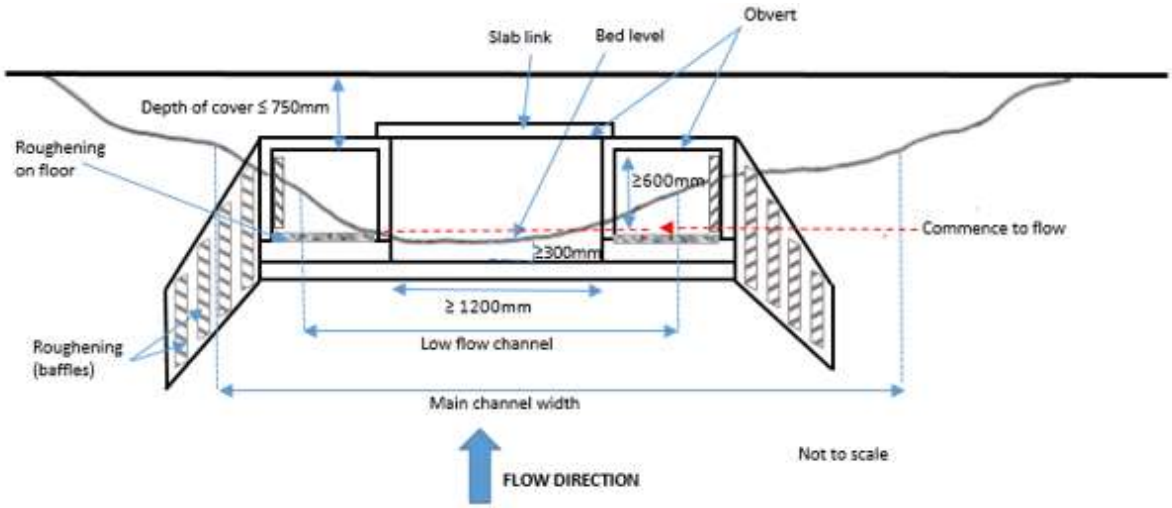


Figure 8 – Option 3 for red mapped waterways – example of compliance with design requirements

- ✓ Culvert array spans 100% low flow channel
- ✓ Culvert array spans ≥ 3.6m or 100% of main channel width
- ✓ Outermost cells have roughening to ≥ 95% of height of sidewalls with gap of ≤ 30mm at bottom
- ✓ Maximum deck height of 1.2m at lowest point of crossing
- ✓ All culverts set ≥ 300mm below bed level unless on natural bedrock
- ✓ Obvert ≥ 300mm above commence to flow (or bed level for ephemeral waterways)
- ✓ At least one culvert ≥ 1200mm wide
- ✓ Rock chute(s) is adjacent to bank(s) and culvert apertures + chute(s) = 100% main channel width

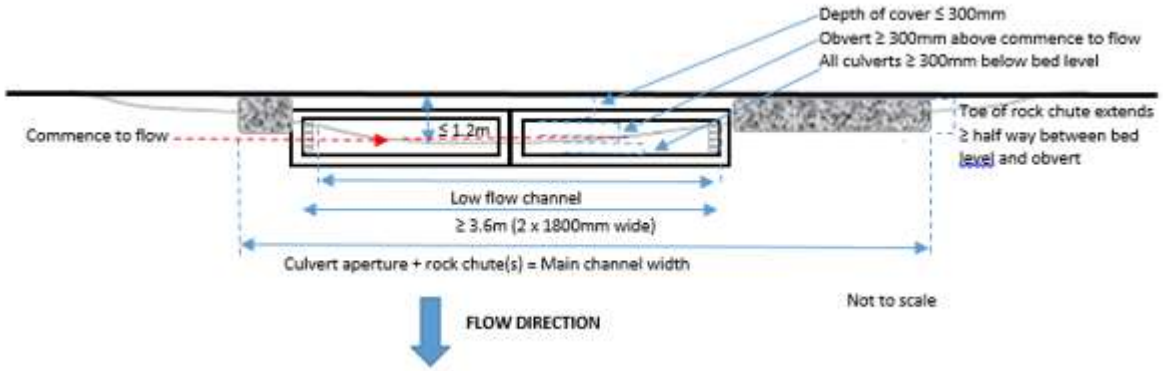


Figure 9 – Option 3 for red mapped waterways – example of compliance with design requirements

- ✓ Culvert array spans 100% low flow channel
- ✓ Culvert array spans ≥ 3.6m or 100% of main channel width
- ✓ Outermost cells have roughening to ≥ 95% of height of sidewalls with gap of ≤ 30mm at bottom
- ✓ Maximum deck height of 1.2m at lowest point of crossing
- ✓ All culverts set ≥ 300mm below bed level unless on natural bedrock
- ✓ Obvert ≥ 300mm above commence to flow (or bed level for ephemeral waterways)
- ✓ At least one culvert ≥ 1200mm wide
- ✓ Rock chute adjacent to each bank and width of each rock chute is ≥ 3m

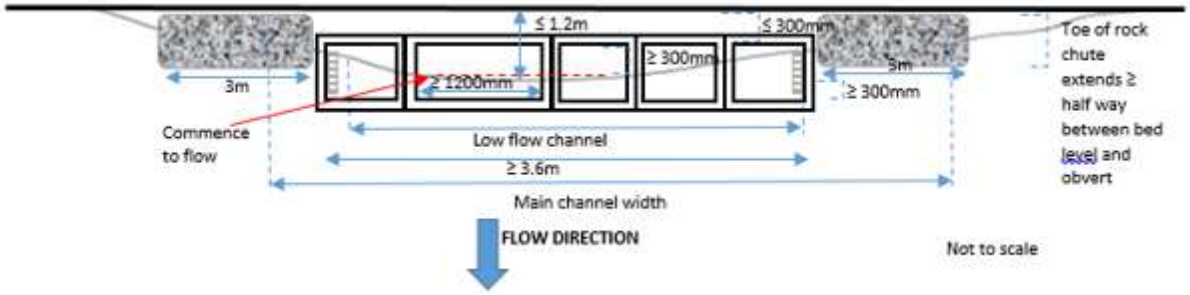


Figure 10 – Option 3 for red mapped waterways – example of compliance with design requirements

- ✓ Culvert array spans 100% low flow channel
  - ✓ Culvert array spans ≥ 3.6m or 100% of main channel width
  - ✓ Outermost cells have roughening to ≥ 95% of height of sidewalls with gap of ≤ 30mm at bottom
  - ✓ Maximum deck height of 1.2m at lowest point of crossing
  - ✓ All culverts set ≥ 300mm below bed level unless on natural bedrock
  - ✓ Obvert ≥ 300mm above commence to flow (or bed level for ephemeral waterways)
  - ✓ At least one culvert ≥ 1200mm wide
  - ✓ One rock chute adjacent to bank and one rock chute adjacent to bankside culverts and width of rock chutes is ≥ 3m

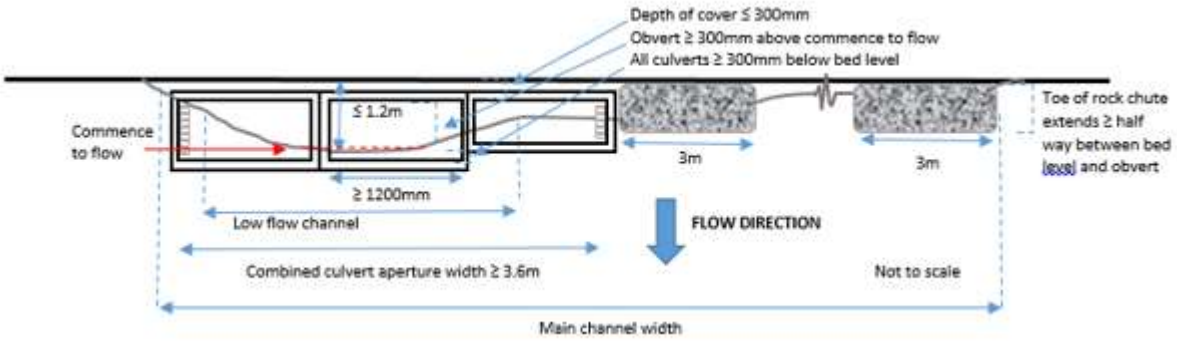


Figure 11 – Example of compliance with design requirements for amber mapped waterway

- ✓ Culvert array spans 100% of the low flow channel
- ✓ Culvert array spans ≥ 2.4m or 100% of main channel width
- ✓ Cells at or below bed level
- ✓ Roughening required where <300mm below bed level
- ✓ Obvert ≥ 300mm above commence to flow

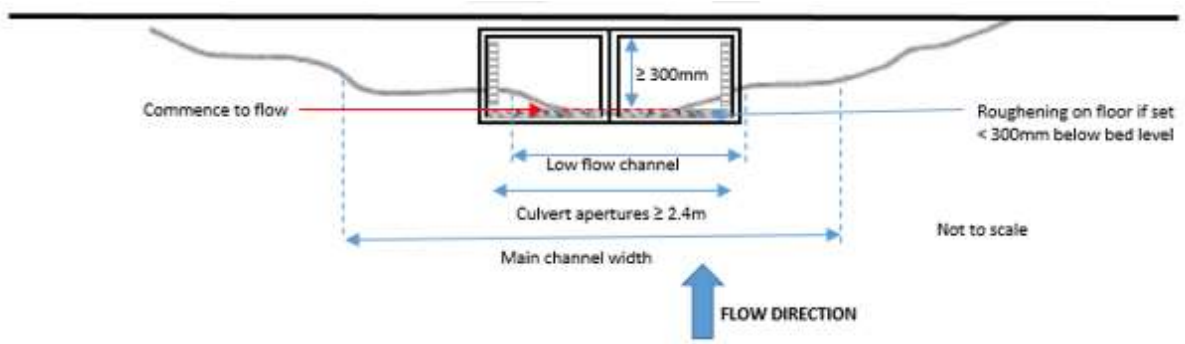


Figure 12 – Example of compliance with design requirements for green mapped waterway

- ✓ Culvert array spans 100% of the low flow channel
- ✓ Culvert array spans ≥ 1.2m or 100% of main channel width
- ✓ Cells at or below bed level
- ✓ Obvert ≥ 300mm above commence to flow

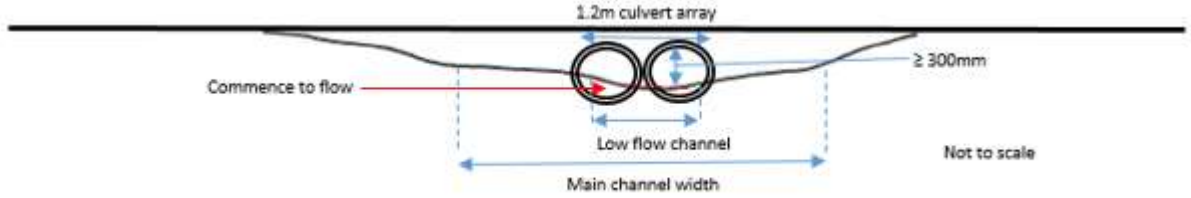


Figure 13 – Option 1— purple and red mapped waterways - minimum height difference across the bed level crossing

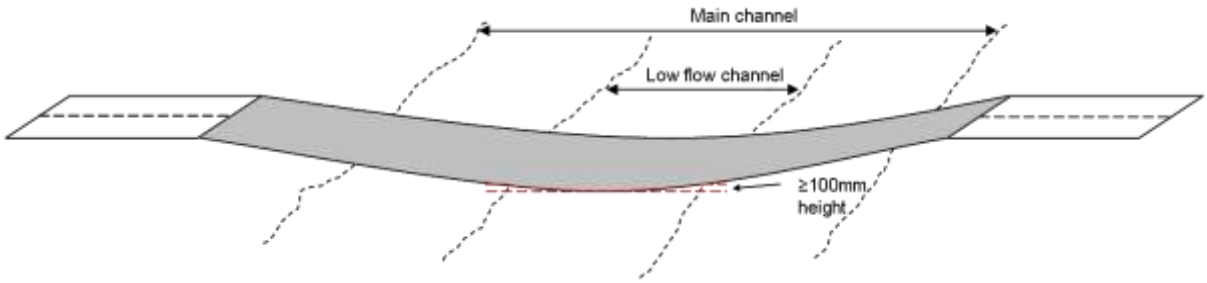


Figure 14 – Major impact (purple) and high impact (red) Option 1—possible crossing alignments

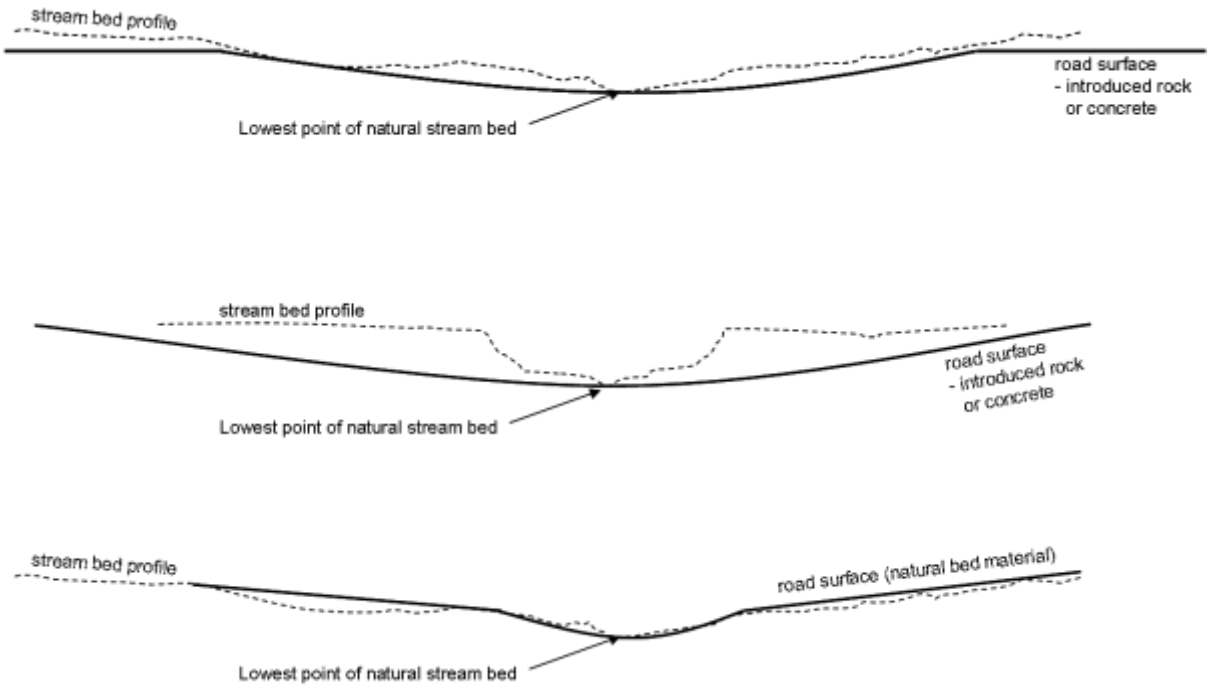


Figure 15 – Major impact (purple) and high impact (red) Option 2 with no low flow section incorporated—cross section and plan view

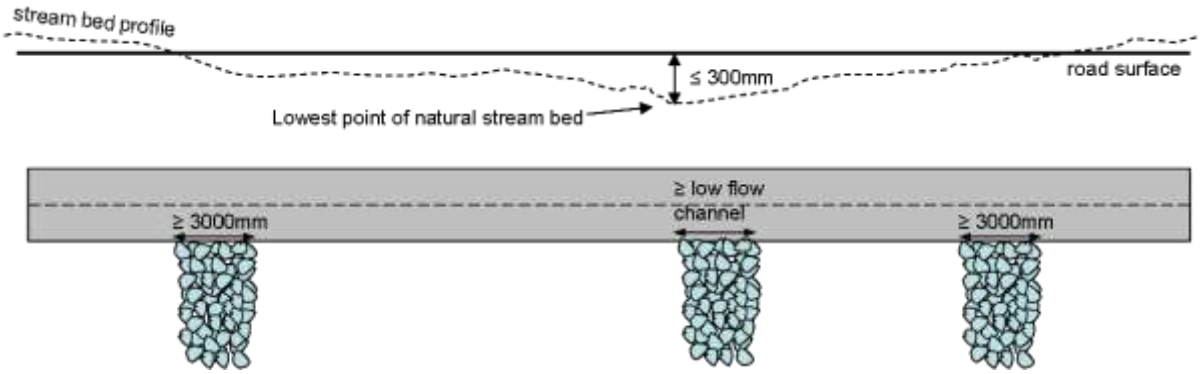


Figure 16 – Major impact (purple) and high impact (red) Option 2 with low flow section incorporated—cross section and plan view

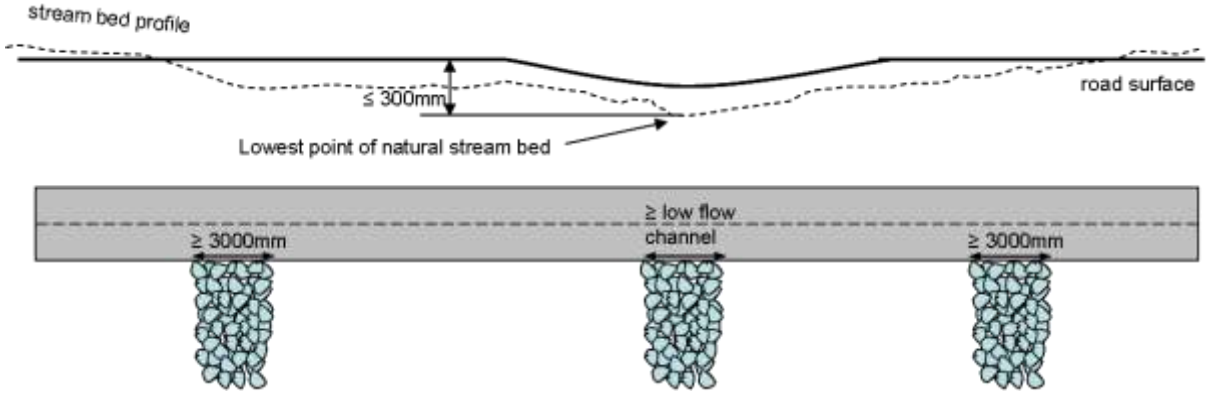


Figure 17– Scour protection levels for a bed level crossing

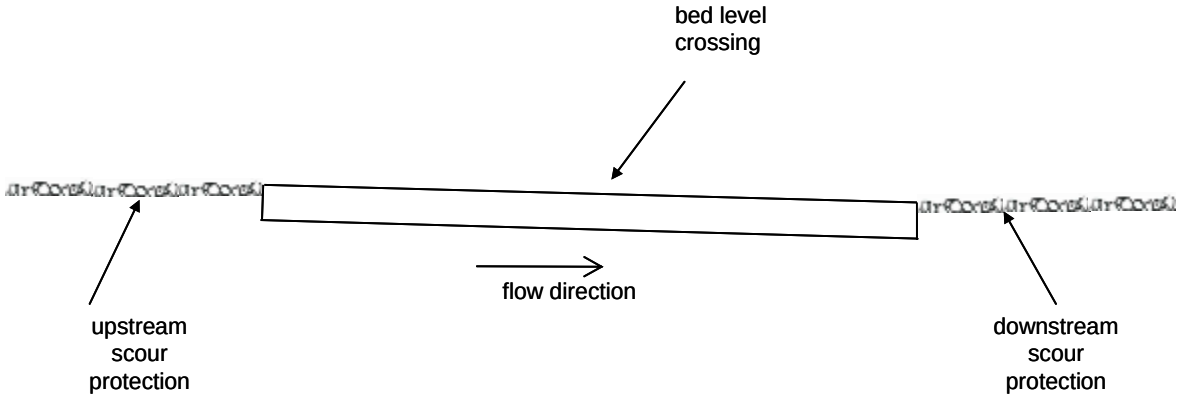


Figure 18 – Moderate impact (amber) Option 2 with no low flow section incorporated— cross section and plan view

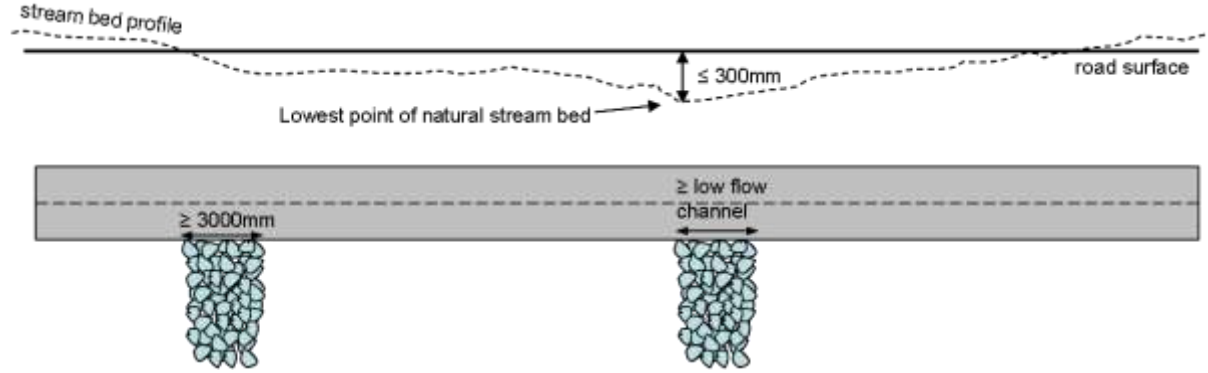


Figure 19 – Moderate impact (amber) Option 2 with low flow section incorporated—cross section and plan view

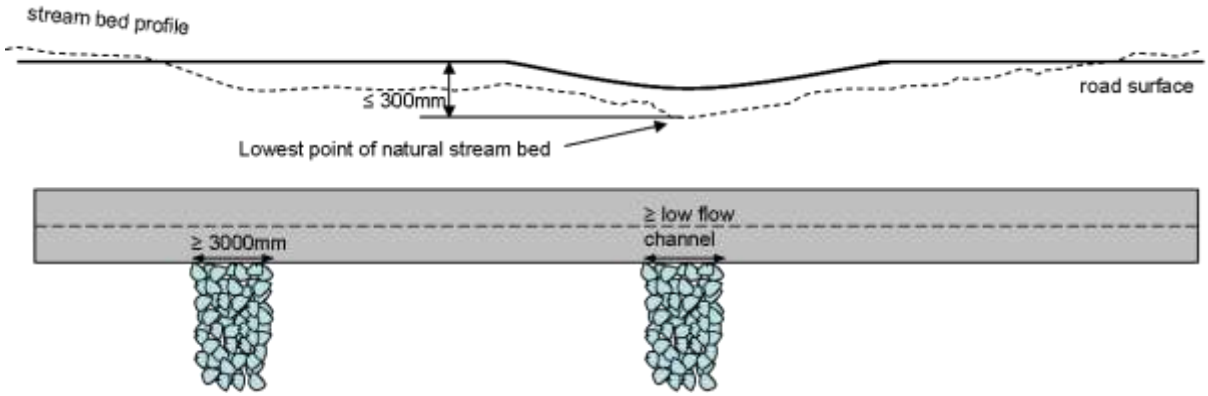


Figure 20 – Low impact (green) waterway Option 2 with no low flow section incorporated—cross section and plan view

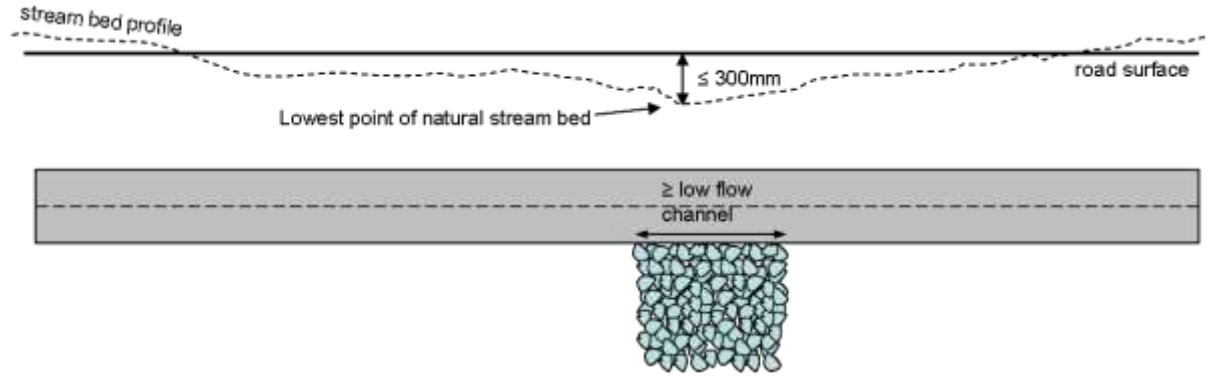


Figure 21 – Low impact (green) waterway Option 2 with low flow section incorporated—cross section and plan view

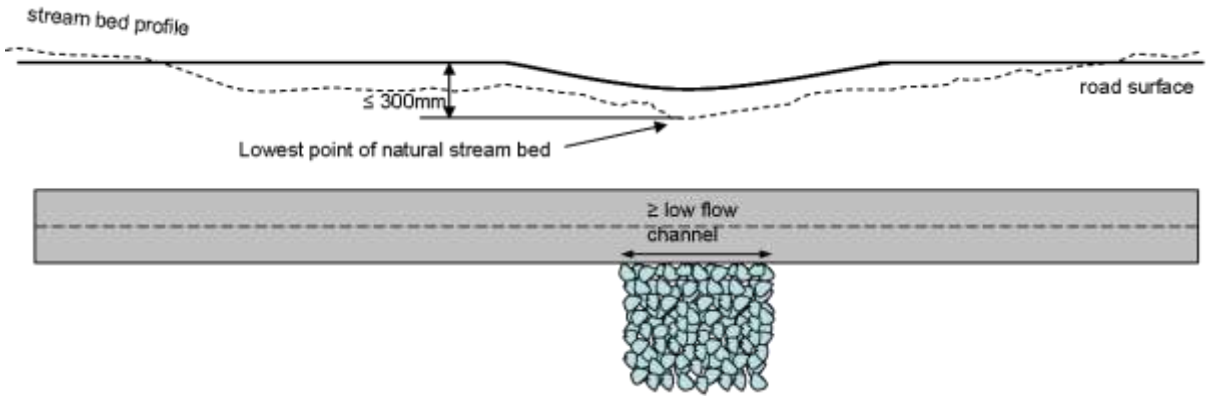


Figure 22 – Concept design elements for a spillway height less than 3 metres above waterway bed level

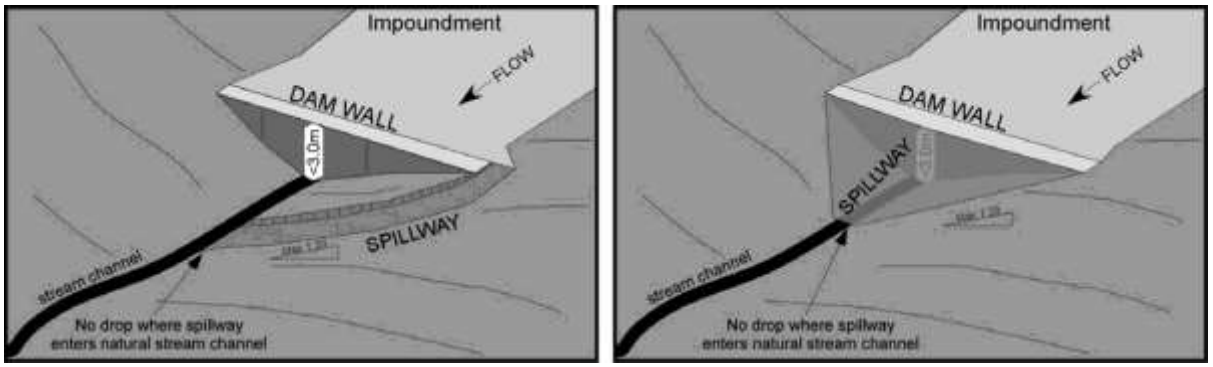


Figure 23 – Concept design where spillway height is greater than 3 metres above waterway bed level and on a maximum grade of 5% (option 1)

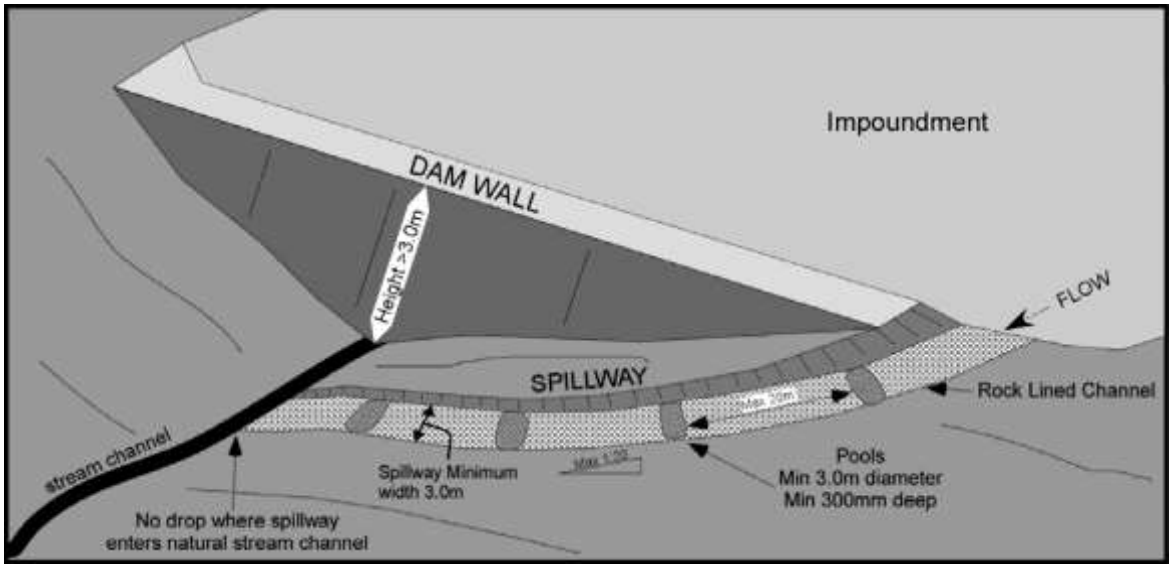


Figure 24 – Concept design where spillway height is greater than 3 metres above waterway bed level and on a maximum grade of 2.5% (option 2)

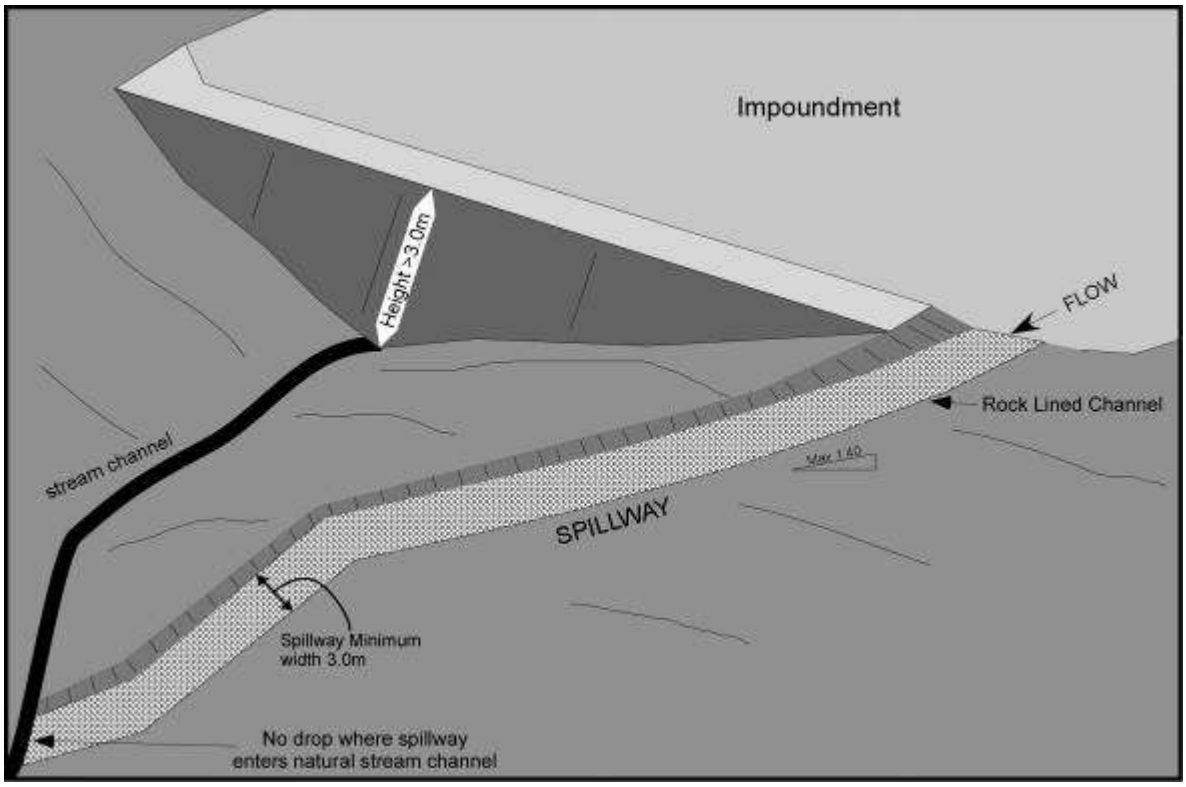


Figure 25 – 80% bankfull water level at floodgate headwall

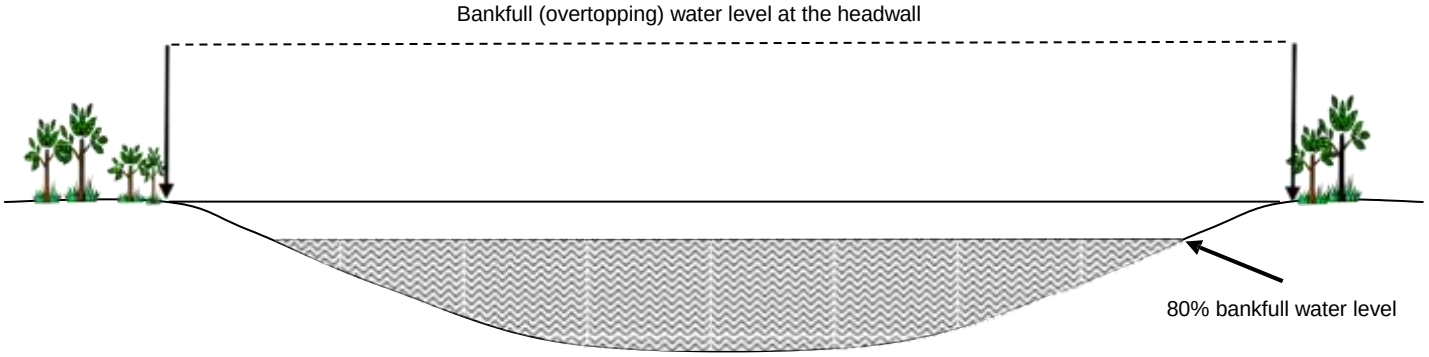


Figure 26 – Floodgate headwall height

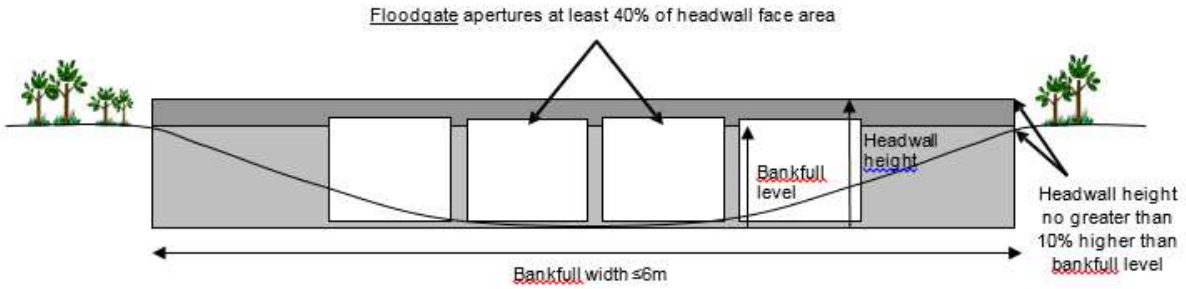


Figure 27 – Headwall specifications

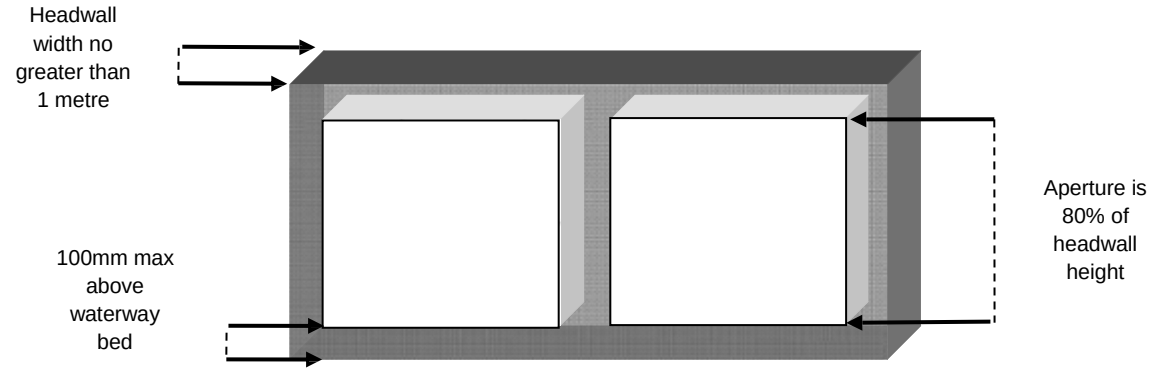


Figure 28 – Side-hinged floodgate on a tidal (grey) waterway

Figure 29 – Mini-gates on top-hinged floodgates

Appendix 2 – Queensland Waterways for Waterway Barrier Works spatial data layer

Queensland Waterways for Waterway Barrier Works spatial data layer

Disclaimer for the spatial data layer

While every care is taken to ensure the accuracy of the spatial data layer, all data custodians and/or the State of Queensland makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs to which the user might incur as a result of the data being inaccurate or incomplete in any way and for any reason.

While the best available data has been used in generating the layer *Queensland Waterways for Waterway Barrier Works*, waterways are dynamic systems and in a constant state of change which may not be reflected in the data. The information portrayed is therefore subject to revision.

Where the fitness of the data layer in representing the site on the ground is in question, the burden for ensuring that the appropriate procedures are employed at the site rests solely with the user. Therefore the data layer should not be the only source for determining the relation of a site to a waterway. Insufficient site-waterway determinations for barrier works by the user may result in prosecution under provisions of the *Planning Act 2016* and the *Fisheries Act 1994*. Any apparent discrepancy should first be checked with the Department of Agriculture and Fisheries.

Availability

The most current version of the data layer *Queensland Waterways for Waterway Barrier Works* can be downloaded from the Queensland Government Information Service website.

User guide

For further information on how to make adequate waterway determinations refer to the *Guide for the determination of waterways using the spatial data layer Queensland Waterways for Waterway Barrier Works* available from www.daf.qld.gov.au.

Appendix 3 – Main channel

The main channel of a given waterway is the active component of the flow channel. The extent of the main channel is also referred to as the bankfull level.

The majority of creeks and rivers display geomorphological features indicative of the main (active) channel. This may include more than one active channel for a given waterway, especially in low gradient waterways with sand and gravel sediments. A small number of waterways may not display indicators for the main channel, such as those incised in bedrock.

Many features can be used to help identify the limits of the main channel (bankfull level) and significant work has been done on this in the United States of America (USA). Elements of the studies conducted in the eastern USA can provide useful information for determining main channels in Queensland. Videos detailing their determination of bankfull level (main channel extent) can be viewed online at http://www.stream.fs.fed.us/publications/videos.html.

The furthest extent of the main channel can be characterised by a distinct change in the appearance of the bank at a certain level, including:

- undercutting
- changes in vegetation density
- sudden changes in bank slope
- boundary levels for water marks
- mosses or lichens
- changes in sediment particle size
- and the height of a point bar on the inside of a meander bend.

These features may be used to identify the main channel of the waterway.

The determination of the main channel should be made in an area of the waterway that is relatively stable and not severely altered by localised scouring and erosion. Where the main channel width is variable at a given site, an average width for the site may be used for determining dimensions of the waterway.

Overseas studies have found that the dominant active channel forming flow (bankfull discharge) occurs at an average recurrence interval between 1 and 2 years.[19] [20] This modest flow forms and maintains the main channel of a given waterway, with larger flow events potentially altering its course and flow path.[21] Knowledge of the bankfull flow levels can help in identifying the main channel.

The following photos are examples of waterways throughout Queensland and show the main and low flow channels. The titles refer to the colour coding used in the *Queensland Waterways for Waterway Barrier Works* data layer. In some waterways the low flow and main channels may be difficult to differentiate such as the waterhole sections of wallum and low slope western waterways.

[19] Dunne, T. and L.B. Leopold. 1978. Water in Environmental Planning. W.H. Freeman & Co. New York. 818pp.

[20] Q1 – Q2 or annual exceedance probability (AEP) equivalent.

[21] Water and Rivers Commission, 2000. *Stream Channel Processes: Fluvial Geomorphology.* Waters and Rivers Commission River Restoration Report No. RR6.

Image 1 – Major impact (purple) waterway—Leichardt River (Coolullah Station)

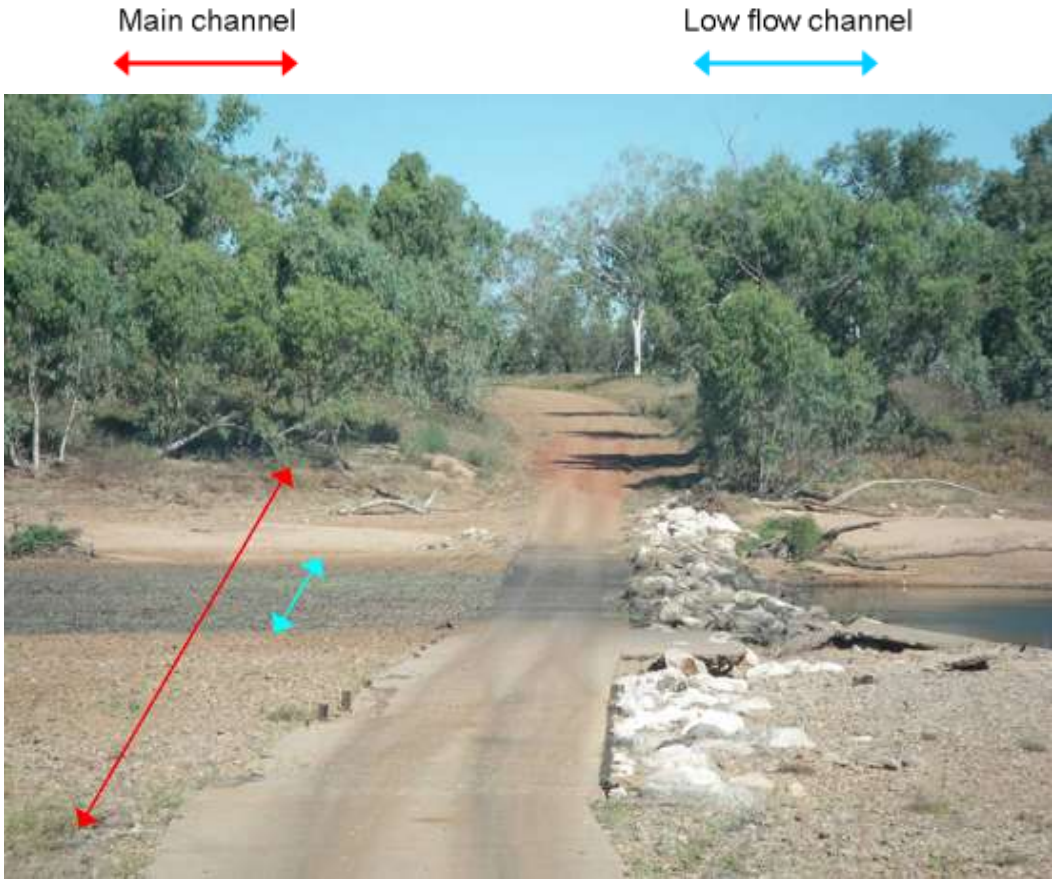


Image 2 – Major impact (purple) waterway —Bottle Creek (Rosedale)

Image 3 – Major impact (purple) waterway—Elizabeth Creek (Burketown)

Image 4 – Major impact (purple) waterway—Gilliat River (Julia Creek)

Image 5 – Major impact (purple) waterway—Splitters Creek (Bundaberg).

Note, the blue line indicates the cease to flow level for this waterhole

Image 6 – Major impact (purple) waterway—Thomson River (Stonehenge).

Note, the blue line indicates the cease to flow level for this waterhole.

Image 7 – High impact (red) waterway—Un-named Tributary (Rosedale)

Image 8 – High impact (red) waterway—Splitters creek (Bundaberg)

Image 9 – Moderate impact (amber) waterway—Un-named Tributary (Baffle Creek)

Image 10 – Moderate impact (amber) waterway—Magowra Creek (Normanton)

Image 11 – Moderate impact (amber) waterway—Un-named tributary (Condamine)

Image 12 – Low impact (green) waterway—Butha Creek (Great Sandy Straits)

Image 13 – Low impact (green) waterway—Un-named Tributary (Deepwater National Park)

Appendix 4 – Site photograph instructions

Site photograph instructions

Figures 1 and Figure 2 depict where the photographs need to be taken at a given waterway for pre- and post-works notification.

Figure 1 – The location and direction of pre- and post-works photos at a site of proposed barrier works

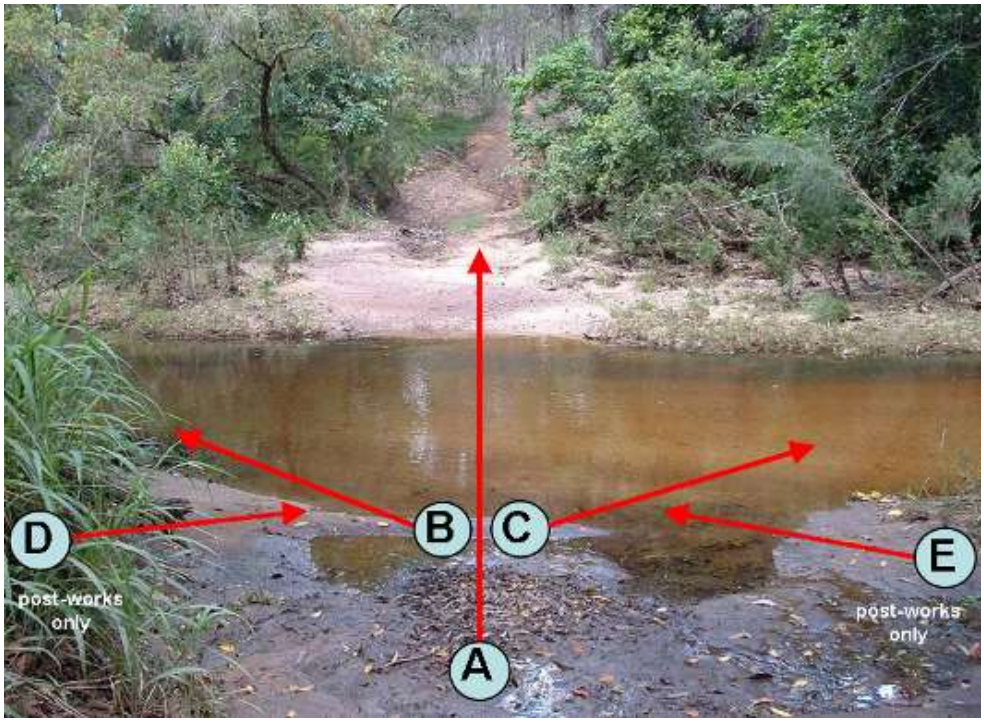
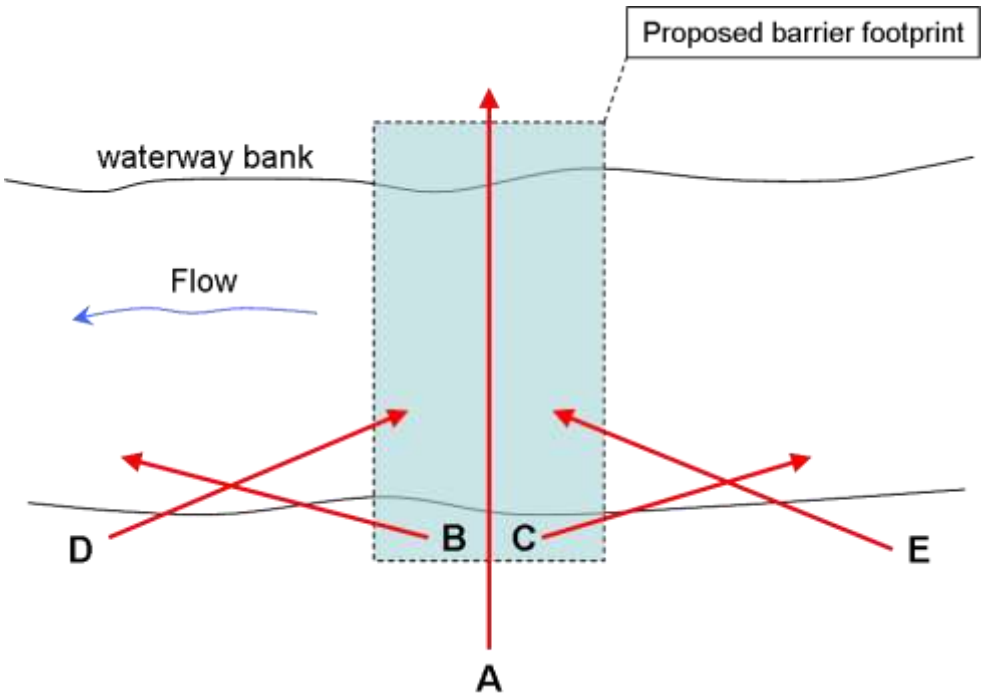


Figure 2 – Generalised plan view of a site showing the location of photos to be taken for pre- and post-works notification (D and E – post-works only)



Pre-works notification photos

A minimum of three pre-works photographs need to be taken of the waterway at the site of proposed works.

Photo A—looking across the waterway at the proposed site of works.

Photo B—looking downstream of the proposed site of works.

Photo C—Looking upstream of the proposed site of works.

Photo A – Looking across the waterway

Photo B – Looking downstream

Photo C – Looking upstream

Post-works notification photos

A minimum of five post-works photographs need to be taken of the waterway after the works are completed. This includes the same photo locations for the pre-works notification and two additional photos looking at the completed barrier works from an upstream and downstream position.

Photo A—looking across the waterway at the completed works.

Photo B—looking downstream of the completed site of works.

Photo C—looking upstream of the completed site of works.

Photo D—looking at the completed barrier works from a downstream position.

Photo E—looking at the completed barrier works from an upstream position.

Photo A – Looking across the waterway

Photo B – Looking downstream (after waterway barrier works)

Photo C – Looking upstream (after waterway barrier works)

Photo D – Looking at the completed waterway barrier works from a downstream position

Photo E – Looking at the completed waterway barrier works from an upstream position