Guide for the determination of waterways using the spatial data layer *Queensland waterways* for waterway barrier works
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Disclaimer

While every care is taken to ensure the accuracy of the spatial data layer *Queensland Waterways for Waterway Barrier Works*, 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 be prosecuted under provisions of the *Sustainable Planning Act 2009* and the *Fisheries Act 1994*. Any apparent discrepancy should first be checked with the Department of Agriculture, Fisheries and Forestry.
1 Introduction

Waterway barrier works are regulated under the Fisheries Act 1994 and the Sustainable Planning Act 2009 when barriers to fish movement, including partial barriers, are installed across waterways. Barrier works include construction, raising, replacement and some maintenance works on structures such as culvert crossings, bed level and low level crossings, weirs and dams, both permanent and temporary.

The Sustainable Planning Act allows for self-assessment for low impact minor, temporary and some regularly rebuilt waterway barriers. Works that adhere to the standards and requirements of Fisheries Queensland’s self-assessable codes are able to proceed without having to gain development approval.

All other waterway barrier works are subject to the development approval process. This entails submission by the developer of application forms, fees and further information as requested, in order to get a development approval.

The definition of a waterway under the Fisheries Act is broad and a Queensland-wide data layer has been developed to better delineate this. The spatial data layer Queensland Waterways for Waterway Barrier Works shows the furthest extent of the Fisheries Act interest in barrier works on waterways. On the data layer, these waterways are depicted as a coloured stream network from the upstream limit, downstream to the tidal or wetland conclusion.

Streams that are not coloured on the data layer are not considered waterways. Waterway barrier works on these streams do not require approvals or assessment under the Fisheries Act. However barrier works within freshwater wetlands are subject to other state and federal legislation.

Purpose

The data layer will assist in the determination of whether the site of proposed waterway barrier works requires assessment and approval under the Fisheries Act. In addition, waterways have been colour-coded along their length to show the risk of adverse impact from instream barriers on fish movement. These coloured zones also indicate whether a waterway barrier works can potentially proceed under the relevant Fisheries Queensland self-assessable code or whether the works will require a development approval.
2 Background

Development of data layer

A number of processes were undertaken in the development of the data layer to classify and categorise waterways important to fisheries in Queensland. These included a review of existing GIS data sets relating to stream network mapping products. This review found that existing data sets were not suitable for analysis due to incomplete or missing data and different scaled areas of mapping quality. For this reason several pre-existing datasets were combined and analysed to produce the current mapping product.

Data products used include:

- 1 second SRTM Derived Hydrological Digital Elevation Model (DEM-H) Version 1.0. The 1 second SRTM derived DEM-H Version 1.0 is a 1 arc second (~30m) gridded digital elevation model (DEM). The DEM-H captures flow paths based on SRTM elevations and mapped stream lines, and supports delineation of catchments and related hydrological attributes.

- Ordered Drainage 100K—Queensland. This dataset is based on the GeoScience Australia 1:100,000 drainage network of Queensland (where 1:100,000 coverage exists) and has streams connected and directionalised, and ordered using the Strahler method of stream ordering.

- Queensland Wetland Data Version 3.0—wetland areas. This dataset provides mapping of the 2009 extent and type of wetlands at 1:100,000 scale across Queensland.

The information contained in these data sets were then analysed in various GIS products to derive the appropriate categorisation suitable for the mapping product.

GIS mapping software products used included:

- ArcGIS (ESRI)—to perform analysis and mapping.

- Global Mapper—to enable a detailed analysis of the slope characteristics of the all waterways in Queensland.

- RivEX—to achieve the quality control of river networks, to apply attributes to the network (including stream order) and for analysis of the network.

The output from the GIS analysis produced two layers that were combined to create the Queensland Waterways for Waterway Barrier Works data layer.

The two layers are:

- All Queensland waterways with fish passages
  - This layer contains categorised lines of the streams that form the basis for the level of assessment required for any proposed waterway barrier works.

- Queensland estuaries
This layer contains areas that define the estuary habitat that is considered important to fisheries.

Format
The two layers used to produce the Queensland Waterways for Waterway Barrier Works data layer are in a digital vector ESRI shapefile format.

Scale
Data used to build the data layer varied in scale from 1:25,000 to 1:100,000. However, corrections have been applied in order to equalise the data. The most appropriate scale to use this data is at 1:100,000.

Waterway classification
Risk evaluation for fisheries values
In Queensland, the number of fish species that require free passage along any particular waterway is determined by a number of biological and physical factors. Many fish species require free passage in a waterway for spawning migrations, dispersal, feeding, or for seeking refuge during dry periods. These movements can occur seasonally and during low or flood flows.

The presence and abundance of fish within a given location is also determined by the amount of available habitat, flow regime and the geographical location of the waterway (e.g. climate, elevation, distance along a stream, slope).

Generally, streams higher in the catchment with a reduced habitat area and steeper slopes will have smaller populations of fish. Fish present in these areas often have strong swimming or even climbing abilities. Streams lower in the catchment typically have large areas of available habitats and low slopes. These streams have larger populations of fish, including species with weak swimming abilities. In addition headwater streams that flow all year round or maintain dry season pools will usually have greater fish populations than those that dry up.

The classification of 1.4 million kilometres of streams in Queensland required the analysis of a combination of factors to produce a categorisation appropriate for the mapping product. This classification was determined by using the established knowledge of fish species distributions within Queensland and their biological requirements, in conjunction with a number of physical characteristics (derived from the GIS data sets).
Characteristics that were analysed included:

- **Stream order**
  - Headwater streams of orders 1-2 have the lowest number of fish and smallest habitats. These were deemed to be of a lower risk than lowland streams of orders greater than 3.

- **Stream slope**
  - Steep-sloped streams were deemed to be of a lower risk than low-sloped streams as they generally had less habitat and fish than low-sloped streams.

- **Flow regime**
  - Headwater streams that flow all year round or maintained dry season pools were deemed a higher risk than those that dry up rapidly after rain events.

- **Number of fish species present**
  - Streams with lower fish diversity, especially when low diversity is caused by the stream drying out completely, were deemed to be of a lower risk.

- **Fish swimming ability**
  - Streams that contained fish with strong swimming or even climbing abilities and able to migrate past significant barriers were deemed a lower priority than those where the fish species present have a weak swimming ability.

The combined analysis of these characteristics allowed all Queensland streams to be classified according to the risk of impact from waterway barrier works on fish movement and fish communities (Table 1). Ground-truthing of the classification system was undertaken at a wide range of both coastal and inland waterway sites to ensure accurate representation of risk.

**Colour coding**

The streams are coloured according to their level of risk. The colours used in the waterway mapping represent the risk of adverse impact on fish movement that is likely from barrier works (Table 1). The data layer uses a traffic light colour scheme to indicate risk, with green being least risk and red being highest risk, for self-assessable works.

Two other colours are used—purple for higher order waterways and grey for tidal areas. These generally require approval assessment. However, where the barriers are bed-level, works on purple waterways may be self-assessable. Where the works are temporary, works on purple or grey waterways may be self-assessable (Table 1).

Self-assessable codes, in conjunction with the data layer, have been developed for minor waterway barriers (culverts, bed-level crossings and low impact dams and
weirs) and temporary barriers\(^1\). All other types of waterway barriers require approval assessment.

### Table 1: Assessment requirements for minor works

<table>
<thead>
<tr>
<th>Waterway zoning colour</th>
<th>Risk of impact</th>
<th>Development Type</th>
<th>Bed-level crossing</th>
<th>Culvert crossing</th>
<th>Low impact dam/weir</th>
<th>Temporary works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Low</td>
<td>Self-assessable</td>
<td>Self-assessable</td>
<td>Self-assessable</td>
<td>Self-assessable</td>
<td>Self-assessable</td>
</tr>
<tr>
<td>Amber</td>
<td>Moderate</td>
<td>Self-assessable</td>
<td>Self-assessable</td>
<td>Development approval</td>
<td>Self-assessable</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>High</td>
<td>Self-assessable</td>
<td>Self-assessable</td>
<td>Development approval</td>
<td>Self-assessable</td>
<td></td>
</tr>
<tr>
<td>Purple</td>
<td>Major</td>
<td>Self-assessable</td>
<td>Development Approval</td>
<td>Development approval</td>
<td>Self-assessable</td>
<td></td>
</tr>
<tr>
<td>Grey</td>
<td>Major</td>
<td>Development Approval</td>
<td>Development Approval</td>
<td>Development approval</td>
<td>Self-assessable</td>
<td></td>
</tr>
</tbody>
</table>

#### Spatial extent

The data layer covers the whole State of Queensland and all waterways and catchments within the state.

State jurisdiction extends into coastal waters and offshore islands\(^2\). Tidal waters, including beyond the landward edge of the mapping, should be considered as grey zoned waters, where waterway barrier works require approval under the Fisheries Act.

#### Accuracy and data quality

All care has been taken to ensure that the data analysis and interpretation is of the highest quality, however as the mapping has been derived from pre-existing products, there may be inaccuracies that have continued from these base layers.

The stream polyline shown on the data layer represents the centreline of a waterway (not the full lateral extent). If the location of proposed works does not appear to be on a marked waterway, all care should be taken to ensure that this is indeed the case.

In Figure 1, for example, the green polyline bypasses a bend in a stream and the proposed structure is located at that exact spot. You should proceed as if the works are in fact located on the green polyline, and refer to the Fisheries self-assessable codes for guidance on how to carry out the works.

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\(^1\) Fisheries self-assessable codes can be accessed on the [Fisheries Queensland website](https://www.fisheries.qld.gov.au)

\(^2\) Commonwealth Fisheries Management Act 1991
A similar approach should be taken where there are isolated stream segments within the mapped network, as these may be due to a waterway traversing a wetland. Likewise, coastal sites that are located on the layer beyond the tidal (grey) zone but which, on ground, have tidal features, such as marine plants (mangroves, seagrass or salt marsh), marine fauna, salt or brackish water, or tidal ebb and flow, should be treated as tidal (grey zone) waterways. If in doubt, contact Fisheries Queensland before undertaking any works at the site.

**How to register an error**

Inconsistencies may occur where mapping is done over a large (whole of Queensland) scale. If you believe that there is an error in the mapping (e.g. a waterway is not showing on the data layer or is drawn beyond the accuracy margins described above), you should contact Fisheries Queensland before undertaking any works at the site.

**Currency of data layer**

It is important that the most recent version of the data layer is used when making a determination on a waterway and assessment requirements for works.

**Availability**

The most recent version of the data layer Queensland Waterways for Waterway Barrier Works is available from the Queensland Government Information Service website. A version number and date is included in the data layer title.
Special software is required to use data from this site:

- Downloads are all compressed (zipped) and require software to unzip.
- Downloads as spatial data files require GIS software to view.
- Downloads as image files require no special software.

The data is owned and maintained by Fisheries Queensland.
3 How to use the data layer

1. Confirm that the proposed works are considered waterway barrier works. Refer to the Fisheries policy document *FHMOP008 Waterway barrier works approvals and fishway assessment* or contact Fisheries Queensland for advice.

2. Locate the site of works using the *Queensland Waterways for Waterway Barrier Works* spatial data layer.

3. If the site of works is not located on a marked waterway and this has been confirmed using satellite imagery and ground-truthing, then no assessment is required and the works can proceed.

4. If the site is located on (or is adjacent to) a marked waterway or zone, use the waterway zone colour and Table 1 to determine what assessment is required for the works (self-assessable or development approval).

5. For self-assessable works, refer to the relevant self-assessable code to confirm that the planned works meet the requirements and standards of that code.

6. If a development approval is required for the works, an application for a development approval is to be lodged for assessment by Fisheries Queensland. Contact Fisheries Queensland for further details on the development assessment process.

The code allows for an alternative determination to be made on the impact risk to purple and grey zoned waterways, in acknowledgement that:

- the mapping may incorrectly capture lower-risk waterways within these zones
- or risks to fish movement and fish communities at the site can be adequately addressed by the standards set out in the code.

Contact Fisheries Queensland for instruction on how to propose an alternative risk determination for a site.
4 Fisheries contact details

For further information visit the Fisheries Queensland website or contact the relevant regional centre.

**Fisheries Queensland**

Website: [www.fisheries.qld.gov.au](http://www.fisheries.qld.gov.au)
Customer service centre: 13 25 23 or (07) 3404 6999

**Regional centre contacts**

<table>
<thead>
<tr>
<th>If you are north of and including the Gladstone Regional Council area, contact:</th>
<th>If you are south of the Gladstone Regional Council area, contact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Fisheries Facility – Cairns Department of Agriculture, Fisheries and Forestry Manager (Planning and Assessment) PO Box 5396, Cairns Qld 4870 Email: <a href="mailto:idasnfc@daff.qld.gov.au">idasnfc@daff.qld.gov.au</a> Telephone: (07) 4057 3700 Facsimile: (07) 4057 3811</td>
<td>Maroochy Research Facility – Nambour Department of Agriculture, Fisheries and Forestry Manager (Planning and Assessment) PO Box 5083 SCMC, Nambour Qld 4560 Email: <a href="mailto:idassfc@daff.qld.gov.au">idassfc@daff.qld.gov.au</a> Telephone: (07) 5453 5860 Facsimile: (07) 5453 5921</td>
</tr>
</tbody>
</table>
For further information call 13 25 23 or visit our website at www.fisheries.qld.gov.au