Temporary Watercourse Crossing: Fords

DRAINAGE CONTROL TECHNIQUE

Low Gradient		Velocity Control		Short Term	✓
Steep Gradient		Channel Lining		Medium-Long Term	✓
Outlet Control		Soil Treatment		Permanent	[1]

[1] This fact sheet does not discuss all the issues requiring consideration in the design of permanent ford crossings.

Symbol

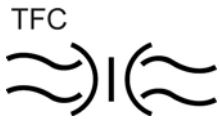

Photo 1 – Ford crossing of sandy creek

Photo 2 – Ford crossing of alluvial (gravel) stream

Key Principles

1. Significant bank damage can occur during construction of the access ramps; therefore, extreme care must to be taken to minimise such damage.
2. It is important to minimise the risk of sediment-laden runoff from the access ramps being allowed to discharge directly into the watercourse without passing through an appropriate sediment trap or vegetative filter.
3. Critical design parameter is the stability of the road surface crossing the streambed. Typically, ford crossings are only suitable for dry-bed, alluvial streams (i.e. streams with a bed primarily consisting of sand, gravel, and/or cobbles), or rocky streambeds.
4. Critical operational issue is the minimisation of harm to the watercourse, including sediment accumulation on the streambed.

Design Information

Temporary ford crossings require very little hydraulic design because they effectively make use of an existing stable streambed.

Ideally, the road surface should follow the natural cross-sectional profile of the streambed; however, it may be necessary for safety reasons to fill any deep holes with individually placed rock.

Most of the hydraulic design will be directed to appropriately managing stormwater runoff from the approach roads and access ramps cut down the stream banks.

Approach roads:

Approaches to the crossing should be stabilised and should have overland flow diversions to prevent runoff from entering the stream directly from the access road.

Ideally, the approach road should be straight for at least 10 metres each side of the crossing and should desirably cross the watercourse at right angles.

Where appropriate, access ramps should be stabilised with geotextile overlaid with minimum 150mm rock.

The watercourse should not have a base flow greater than 75mm in depth over the crossing. However, in most cases ford crossing should only be used to cross "dry" channel beds.

If a temporary crossing is to be made of a wide, sandy riverbed, then a suitable, trafficable road surface may be formed by stabilising the riverbed with either a geogrid (refer to the fact sheet on *Geosynthetics*), or *Cellular Confinement System* (refer to separate fact sheet).

Photo 3 – Geogrid

Photo 4 – Cellular confinement system

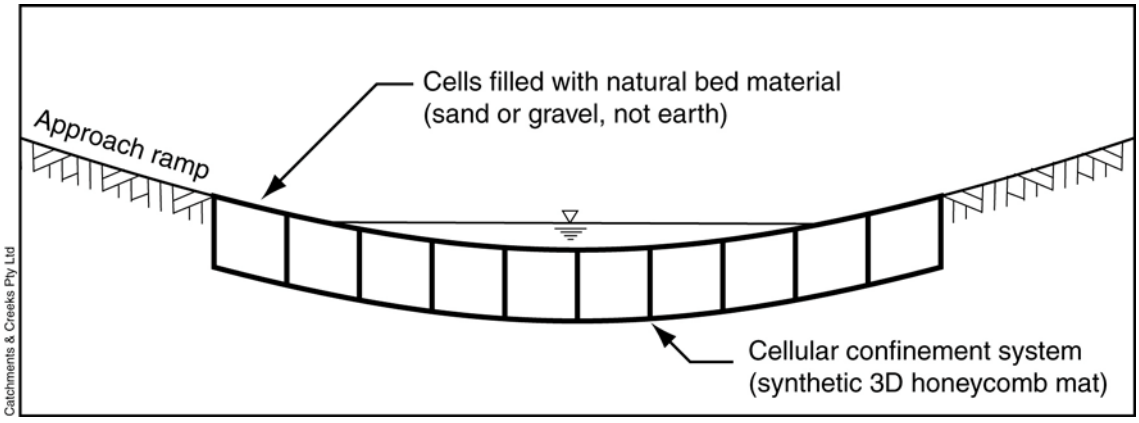

Figure 1 – Stabilisation of a temporary ford crossing in sandy bed stream using a *Cellular Confinement System*

On medium to high-speed roads, the access ramps usually need to be placed along a relatively straight alignment for safety reasons. In such cases, good vegetation coverage is highly desirable on the recessed banks to avoid erosion caused by turbulent eddies. Another benefit of this layout is that the recessed ramps help to create low velocity backwater areas that can be used by fish migrating upstream during flood events as resting areas.

If access ramps need to be cut into the channel banks (Figure 2 and Photo 6), and these ramps cannot be cut perpendicular to the channel, then wherever practicable align the ramps such that they fall to the waterway in an upstream direction. The reason for this is to minimise bank erosion caused by eddies resulting from flood flows moving past access ramps that are cut into the channel banks. Pointing the ramps upstream will usually allow a gradual expansion of the stream flow followed by a sudden contraction of the flow at the ramp (which is the preferred hydraulic condition).

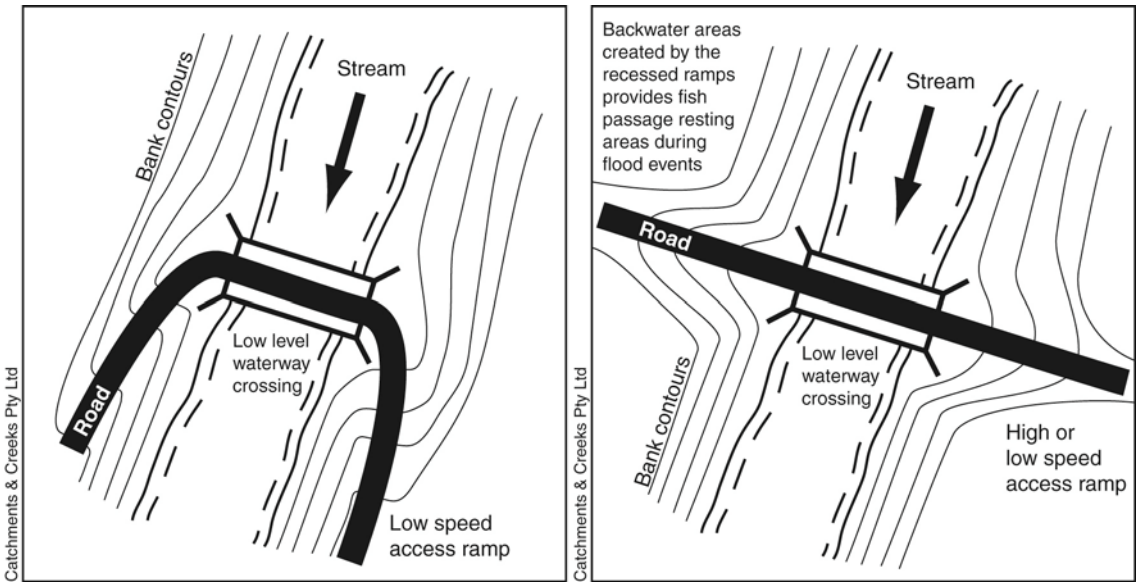

Figure 2 – Preferred alignment of access ramps

It is noted that if an access ramp's design results in a sudden expansion in the channel width, then eddies may form in the water during flood events and these eddies can then move downstream to locations where they can cause bank erosion. To avoid such erosion problems, sudden expansions in flow should be avoided.

The use of concrete to stabilise ford crossings should be avoided if crossing an alluvial stream because the fixed concrete slab can interfere with the natural downstream movement of the bed material. Concrete stabilised fords are best used when crossing clay-based streams in dry weather, such as shown in Photo 5.

Photo 5 – Stabilised ford crossing of tidal backwater

Photo 6 – Ford crossing of newly constructed stormwater drain

Legislative Requirements:

Legislative requirements, permits and approvals vary from state to state, and region to region. Typical permit and approval requirements include:

- Approval for works within a watercourse (typically a department of water resources or natural resources)
- Approval for disturbance to bed, banks, or riparian vegetation.
- Approval for works that may interfere with fish passage (typically a fisheries authority)

Description

A ford is a shallow place in a stream where the bed may be crossed by traffic. By definition the crossing is a natural bed level.

Purpose

Used to provide very low traffic volume, dry weather access to a construction site. Fords are generally impassable during wet weather.

Fords provide a useful and affordable means of crossing dry creeks that have a solid rock bed, or wide sandy riverbeds during the dry season.

Limitations

Typically only suitable for crossing dry-bed, alluvial streams (i.e. streams with a bed primarily consisting of sand, gravel, and/or cobbles), or rocky streambeds.

They must only be used for very low traffic volumes.

Temporary ford crossing provide limited value during periods of significant stream flow.

Advantages

In the right environment, a ford crossing can cause the least amount of disturbance to the channel due to the absence of any construction works within the channel except the formation of access ramps.

Ford crossings are generally cheaper than causeways, culverts or bridges.

Fords potentially have the least impact on fish passage.

Disadvantages

Temporary ford crossings are generally impassable during periods of significant stream flow.

When used in a flowing stream, any sediment from the wheels of vehicles will be discharged directly into the stream.

Location

Ideally, temporary ford crossing should be located on a straight section of a watercourse, well downstream of a sharp bend.

In any case, all crossings should be located in an area that will cause the least overall disturbance, especially to those areas that are required to remain in a “natural” state.

Site Inspection

Temporary ford crossings should be inspected with great care because they can promote the discharge of sediment directly into a stream and can cause significant environmental harm during construction, flood events and during decommissioning.

Check for erosion cause by overland flow moving down the approach ramps.

Check for appropriate flow diversions on the approach ramps to direct sediment runoff into a suitable sediment trap or grass filter.

Installation

1. Prior to commencing any works, obtain all necessary approvals and permits required to construct the temporary watercourse crossing, including permits for the disturbance of bank vegetation, aquatic vegetation (e.g. mangroves) and any temporary instream flow diversion barriers or sediment control measures.
2. Refer to approved plans for location and construction details. If there are questions or problems with the location or method of installation, contact the engineer or responsible on-site officer for assistance.
3. Ensure that the location of the crossing will not interfere with future construction works.
4. Prior to significant land clearing or construction of the approach ramps, establish all necessary sediment control measures and flow diversion works (instream and off-stream as required), clearing only those areas necessary for installation of these measures.
5. To the maximum degree practicable, construction activities and equipment shall not operate within open flowing waters.
6. Maintain clearing and excavation of the watercourse bed and banks to a minimum. Initially clear only the area necessary to allow access for construction. Clear the remainder of the approach ramps only when adequate drainage and sediment controls are in place.
7. If flow diversion systems cannot be installed, then conduct bank excavations by pulling the soil away from the channel.

8. Where practicable, construct the crossing perpendicular to the channel.
9. Where practicable, the approach ramps should be straight for at least 10 metres and should be aligned with the crossing.
10. Stabilise the streambed crossing as required for the given bed conditions, expected stream flow, and vehicular traffic.
11. Depressions in the rock bed should be filled with clean, graded rock.
12. Where practicable, direct stormwater runoff from the approach ramps into stable drains, adjacent vegetation, or appropriate sediment traps to minimise the release of sediment into the watercourse.
13. Take all reasonable measures to prevent debris and construction material from entering the watercourse, especially any still or flowing water.
14. If highly erosive soils are detected, then appropriately stabilise such soils as soon as practicable.
15. Appropriately stabilise disturbed watercourse banks.
16. Finish construction and stabilisation of the approach ramps each side of the crossing.
17. If it is not practicable to stabilise the access ramps against erosion, then install flow diversion banks across the width of each access ramp adjacent the top of the channel bank, and at regular intervals down the ramps (as required) to prevent or minimise sediment-laden runoff flowing directly into the watercourse.

Maintenance

1. Temporary watercourse crossings should be inspected weekly and after any significant change in stream flow.
2. Debris trapped on or upstream of the crossing should be removed.
3. Repair any damage caused by construction traffic. If traffic has exposed bare soil, stabilised as appropriate.
4. Check for erosion of abutments, channel scour, or rock displacement. Make all necessary repairs immediately.
5. Check for excessive erosion on the approach ramps.
6. Check the conditions of any flow diversion channels/banks and the operating conditions of associated sediment traps.

Removal

1. Temporary watercourse crossings should be removed, or the area appropriately rehabilitated, as soon as possible after alternative access is achieved or the crossing is no longer needed.
2. If the removal of the crossing is required, then remove all specified materials and dispose of in a suitable manner that will not cause an erosion or pollution hazard.
3. Restore the watercourse channel to its original cross-section, and smooth and appropriately stabilise and revegetate all disturbed areas.