

Erosion and Sediment Control Measures

2.4 Road Drainage (Stormwater) Culverts



A road drainage *culvert* drains water from a *water table* to the outside of a road. It is often made of corrugated PVC. It is also common practice to construct a *sediment trap* immediately before a *culvert* inlet.

Culverts used to cross *rivers* are described in FPG Crossings series (1–6).

Road drainage *culvert* outlets that drain onto stable non-modified ground require no additional erosion and *sediment* controls, although using *slash* to armour the *culvert* outlet from potential erosion is good practice. Road drainage *culverts* may have additional *sediment* control and stormwater measures down slope of their outlet including *flumes*, *sediment traps*, soak holes or *sediment* retention ponds.



This guide is provided as a reference document and does not constitute a statutory obligation under the Resource Management Act 1991 or the National Environmental Standards for Plantation Forestry.

Please refer to the 'how to use' section of the introduction at <http://docs.nzfoa.org.nz/forest-practice-guides/> for advice on how to use this guide.

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A Where and when to use

1. Use road drainage *culverts* to convey stormwater under a road.

B Where not to use

Not applicable to this FPG.

C Design

1. Aim to install a road drainage *culvert* a short distance up gradient and river crossings to minimise stormwater being directly discharged into a *river*.
2. Space and locate road drainage *culverts* correctly. *Culvert* spacing is often determined by topographical requirements as *culvert* outlets are best located on solid ground and not on *fill*. *Culvert* spacing is also dependent on the location of the road, for example a mid-slope road would require more *culverts* than a road on a ridge.
3. Intensity of rainfall should also be taken into account. A greater frequency of *culverts*, deeper *water tables* and larger *culvert* sizes may be required.
4. Use *culverts* of the correct size for the location.

D Construction

1. Provide the contractor with details on the required road drainage *culvert* specifications and location as part of the overall construction specification (prescription).
2. Install to the pipe manufacturer's specifications.
3. Install road drainage *culverts* during road construction and prior to metalling the carriageway.
4. Consider building *culvert* inlet *bunds* so that water does not bypass the entrance.
5. Consider building *culvert* inlet protection to stop *slash* and debris blocking the *culvert*.
6. Armour *culvert* inlets and outlets if necessary.

7. Construct *culvert* inlets with associated silt traps so they are easy to clean out with an excavator. Make sure the dimensions allow easy bucket access so that the *culvert* mouth does not accidentally get damaged when collected *sediment* is removed.
8. *Compact* the *culvert* bed and ensure there are no rocks or objects sharp enough to damage the pipe in the backfill. *Compact* soil around and on top of the pipe.
9. Do not use untreated wood or pine logs on permanent road drainage *culverts*.
10. It is recommended to use a *culvert* marker or scrape a clear identifier in the cut *batter* and GPS their location (to enable them be easily relocated when the road verges are overgrown).

E Maintenance

1. Prepare a routine maintenance plan including heavy rainfall response measures.
2. Road drainage *culverts* need regular maintenance, especially on new construction as the inlets can easily block. Blockage may occur with deposited material or soil that has eroded from a cut slope.
3. Check *culverts* for functionality after heavy rain.
4. Check that the *culvert* spacing is sufficient to adequately drain the stormwater *run-off*. If not, consider constructing additional *culverts*.

F Other methods

1. For low volume roads, other construction practices such as the use of water bars or broad-based rolling dips can effectively move water from the cut bank side of the road to the outside edge.
2. For sensitive receiving environments, use *sediment* and/or stormwater control measures such as rock armouring, *slash* filters, *flumes*, *sediment* traps or soak holes or, if necessary, a combination of these.
3. Consider larger pipes and rock armouring at *culvert* inlets and outlets where *culvert* spacing is wider than ideal due to topographical constraints.

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G Technical specification guidelines

Culvert spacing guide:

Grade	Soil or rock erodibility and distance spacing guide (m)			
	High	Moderate	Low	Non-erosive rock
18% (1 in 6)	40	80	120	200
14% (1 in 7)	50	90	140	220
12% (1 in 8)	55	100	160	240
11% (1 in 9)	60	115	180	260
10% (1 in 10)	65	130	210	300
8% (1 in 12)	80	165	250	350

1. Use *culverts* of the correct size:
 - 325 mm internal diameter minimum for NES-PF zones green, yellow or orange < 25°
 - 375 mm internal diameter minimum for NES-PF zone red or orange > 25°.
2. Set the *culvert* at a minimum 20 degrees across the road or at the same/similar road grade.
3. Ensure the *culvert* has a minimum 3% cross-fall to reduce the risk of blockage.

National Environmental Standards for Plantation Forestry

Relevant regulations for *sedimentation* are 26, 27, 31, 33, 56.

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Examples



Culvert inlet with batter cut back to allow for maintenance.

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Culvert installation



Constructing the inlet.



Digging the trench at an angle to the road.



Bedding in the culvert.



Compacting fill around and over the culvert.

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Contact



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Other Practice Guides in this series

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-  2.2 Cut-outs
-  2.3 Berms
-  **2.4 Road Drainage (Stormwater) Culverts**
-  2.5 Flumes
-  2.6 Sediment Traps and Soak Holes
-  2.7 Silt Fences
-  2.8 Sediment Retention Ponds

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