

ENVIRONMENT AGENCY

POLICY REGARDING CULVERTS

TECHNICAL GUIDANCE ON
CULVERTING PROPOSALS

MARCH 1999



ENVIRONMENT
AGENCY

1.0 | Purpose

This leaflet provides technical guidance for people applying for Environment Agency consent to culvert a watercourse or to modify an existing culvert.

2.0 | Introduction

- 2.1 Any culverting of a watercourse, or alterations to an existing culvert, requires land drainage consent. On main rivers the prior written consent of the Agency is required under the Water Resources Act 1991. On all other watercourses, except within the district of an internal drainage board (IDB), the Agency's consent is required under the Land Drainage Act 1991. In an IDB district the consent of the IDB is required, again under the Land Drainage Act 1991. Works either within or which would affect a Site of Special Scientific Interest (SSSI) as a result of changes in flow regimes or water levels also require the approval of English Nature or the Countryside Council for Wales, as appropriate.

(Note: Information on main rivers and the location of IDBs can be obtained from all Agency offices. Applicants should also check with their local authority whether their culverting proposals require planning permission under the Town and Country Planning Act 1990 and/or consent under the Public Health Act 1936.)

- 2.2 The Agency is opposed to unnecessary culverting of watercourses. Culverting can increase the risk of flooding and the maintenance requirements for a watercourse. Also it can destroy wildlife habitats, damage a natural amenity and interrupt the continuity of the linear habitat of a watercourse.

- 2.3 Agency policy on culverting is as follows:

The Agency is in general opposed to the culverting of watercourses because of the adverse ecological, flood defence and other effects that are likely to arise.

The Agency will therefore only approve an application to culvert a watercourse if there is no reasonably practicable alternative or if the detrimental effects of culverting would be so minor that they would not justify a more costly alternative. In all cases where it is

appropriate to do so adequate mitigation must be provided for damage caused.

Wherever practical the Agency will seek to have culverted watercourses restored to open channels.

- 2.4 Further clarification of the Agency's culverting policy and a detailed explanation of the reasons for it are contained within the Agency publications entitled Environment Agency Policy Regarding Culverts: Policy Statement and Environment Agency Policy Regarding Culverts: Explanation of Policy.
- 2.5 Those proposing to culvert a watercourse are encouraged to find alternatives which retain the open watercourse as a feature. Where there appears to be no viable alternative to culverting, the following guidance should be followed before applying for consent to carry out the works.

3.0 | General requirements

- 3.1 Always consult the Agency or internal drainage board (as appropriate) prior to making a formal application for consent. This can save you time and expense.
- 3.2 The applicant should consider the environmental implications of all options for the works to determine the least environmentally damaging solution.
- 3.3 The proposed culvert length should be as short as possible.
- 3.4 Culverts must be designed so they do not cause a restriction to flood flow. They must not increase the risk of flooding or prevent maintenance of the adjacent open watercourse. All culverts should be designed and constructed to accommodate flood flows in the watercourse to at least the minimum standard specified for the location by the Agency. The design should ensure that the required hydraulic capacity is available above riverbed level at all times.
- 3.5 The shape of the culvert and the materials used for construction should be chosen to satisfy site-specific requirements in terms of channel hydraulics, strength and durability, and should be appropriate to the local environment.

3.6 The use of differently shaped pipes or different cross-sectional details within a culvert length should be avoided unless adequate hydraulic transitions are incorporated into the design. Such transitions are also essential where works to extend an existing culvert are proposed.

3.7 Appropriate inlet and outlet structures should be provided in order to ensure smooth hydraulic transition and avoid erosion. Headwall arrangements at the upstream and downstream ends of a culvert should be suitably keyed into the bed and banks of the watercourse, and should be appropriate to the local environment.

3.8 The responsibility for future maintenance and clearance of a culvert must be considered. The responsibility for the maintenance of a culvert lies with the land owner or the person who owns the culvert.

3.9 Suitable access arrangements for maintenance should be included in the design. Access chambers must be provided at each change of direction if the culverting is not straight. Sharp bends should be avoided. Manhole spacing should be in accord with the guidance in CIRIA Report 168 Culvert Design Guide but, due to the nature of watercourses and to facilitate maintenance, the maximum spacing between access chambers should not exceed 100 metres.

3.10 Inlet and outlet screens may be appropriate to prevent debris entering the culvert and causing clogging, or where there is a danger to public safety. If screens are included, they need to be sized and designed to reduce the risks of blocking, make provision for adequate cleansing and maintenance, and be sized to permit the passage of fish and other fauna (for example bats) where appropriate.

(Note: Further guidance on the design of screens can be obtained from the Agency.)

3.11 Over-sized pipes or box culverts should be used wherever possible to maximise the cross-section and capacity. Allowance should be made in the hydraulic design for freeboard. The minimum recommended culvert size will vary according to the size of the watercourse but culverts smaller than a 450 mm diameter pipe or equivalent are particularly prone to blockage and their use should be avoided. For long culverts under embankments or similar structures, culverts with at least 1,050 mm of headroom above bed level should be used to facilitate access for inspection and maintenance.

3.12 In most situations it is appropriate for the inverts of culverts to be set below the existing bed level to allow for future maintenance or other works on the watercourse. It also aids the provision of a more “natural” bed to the culvert.

3.13 Multiple culverts should be avoided wherever possible. Multiple small culvert arrangements are prone to blockage by accumulation of waterborne debris at the inlet. The Agency does recognise, however, that site conditions may prevent a single-pipe or box-culvert option being practical, in which case a single-span bridge design is recommended. Where multiple culverts are unavoidable, a minimum number of culverts should be used and cutwaters should be provided between pipes at the culvert inlet. The design should also incorporate:

- depression of the invert of one culvert to carry low flows;
- facilities to enable temporary diversion of flows to allow inspection or maintenance of each culvert;
- use of the higher “flood” culvert as a wildlife corridor.

3.14 Siphons are a source of continuous maintenance problems and should be avoided.

3.15 Culverts and outfall structures should be designed so that the exit velocities do not create erosion problems at the outlet and downstream.

3.16 On watercourses subject to severe erosion and siltation problems consideration should be given to the provision of silt traps upstream of the culvert.

3.17 Services (for example sewers, water mains etc) should not impinge into the cross-section of the culvert.

3.18 Provision of an overland flood flow route should be made to cater for situations where the capacity of the culvert is exceeded due to blockages etc.

4.0 | Environmental considerations

4.1 Each application for consent is considered on its own merits. Mitigation works to reduce the impact on the environment will be taken into account by the Agency when determining a consent application for culverting.

4.2 Advice on environmental considerations is available from Agency staff.

4.3 The following options for environmental mitigation measures may be appropriate:

- Make the culvert slightly larger than that needed to accommodate the design flow and then position the invert of the culvert below the natural bed of the watercourse, to enable some “natural” bed features to form. Where flow conditions are such that the natural stream has a gravel bed, the lowered invert could be dressed with appropriately sized gravel. Actively introducing gravel will speed up the process of substrate replenishment, although velocities may need to be controlled to prevent washouts.
- Provide ledges running through the culvert (approximately 500 mm wide and 300 mm above normal water level) to allow for the passage of mammals. These should link to the banks upstream and downstream of the culvert.
(Note: This will only be applicable for larger culverts.)
- Make provision for appropriately located mammal underpasses close to the culvert. Usually, stock-proof fencing will be required to guide wildlife into the underpass. This should be integral to any scheme irrespective of whether ledges are provided within the culvert. An alternative design utilising bridges should be considered, particularly where a road crosses a watercourse valley.
- Ensure water velocities are not too fast to prevent the movement of the resident or migratory fish populations. The height of the invert should not pose an obstruction to fish movement. Baffles or other features providing shelter for fish as they pass upstream through the culvert may be incorporated into the design of a culvert base.
(Note: Further information on this should be sought from the Agency.)
- Provide structures to encourage bat roosting and bird nesting as appropriate.
(Note: This applies to larger culverts only. Further guidance is available from the Agency.)
- Propose suitable environmental enhancements, for example opening up a length of previously culverted watercourse elsewhere on the site, enhancing other lengths of the watercourse, creation of a pond/marshy area, scrub/hedge planting. (This does not compensate for the loss of aquatic habitats.)
- Ensure watercourses are not canalised, upstream or downstream of culverts. Artificial bank reinforcement should be avoided wherever possible.
- Construct headwalls and wingwalls in materials and style which are in keeping with the character of the locality and respect the landscape setting.

5.0 Detailed design

5.1 The Agency recommends that the detailed hydraulic and structural design of any culverting works is carried out by a suitably qualified engineer.

5.2 Clear and concise guidelines for the hydraulic design of culverts are contained within the publication CIRIA Report

168 - Culvert Design Guide published in 1997 by the Construction Industry Research and Information Association, 6 Storey’s Gate, Westminster, London SW1P 3AU.

6.0 Development proposals and building over

- 6.1 Agency consent is required for any culverting of a watercourse (except in an IDB area which will require the consent of the IDB). This consent is independent of the need for planning permission and the granting of planning permission does not necessarily imply that Agency consent will be granted.
- 6.2 The Agency will normally oppose planning consent and refuse land drainage consent on conservation grounds for a development which proposes a culvert where there are reasonable alternatives. Such alternative solutions might include a revised site layout or an ecologically acceptable diversion of an open channel.
- 6.3 Agency consent is required for the erection of any structure in, over or under a main river, and consent for buildings over a culvert will usually be refused. In exceptional circumstances, consent may be granted subject to site-specific requirements.
- 6.4 Buildings should not be sited over the top of new or existing culverts. The Agency will normally oppose planning consent for any building over a culvert and, in addition, may recommend restrictions on land use (for example stockpiling) above a culvert to secure structural integrity. The culvert may, in the future, need to be repaired, replaced or up-rated if conditions in the catchment change. There is also the need to maintain an overland flow route if the culvert is blocked or its capacity exceeded.
- 6.5 Consent is also required for development within a specified distance of the outer walls on either side of a culverted main river in accordance with Agency bylaws. Applicants should obtain a copy of the relevant Agency Region or IDB bylaw information covering building lines etc.

- 6.6 The Agency will normally oppose planning consent for the construction of buildings or other works within a specified distance of the outer walls on either side of a culverted watercourse. Where appropriate, the foundations of adjacent buildings should be taken down to below the invert of a culverted watercourse.

7.0 | Consent procedures

- 7.1 Land drainage consent application forms and further information are obtainable from all Agency offices.
- 7.2 Landowners and developers are encouraged to consult the Agency as early as possible. Identifying and resolving possible problems before plans reach an advanced stage will minimise costs to all parties.
- 7.3 Applications for consent to culvert should include calculations to demonstrate the hydraulic capacity of the culvert, and also longitudinal sections of the watercourse upstream and downstream of the proposed culvert in order to demonstrate the effect on the watercourse.
- 7.4 On receipt of a complete and valid application the Agency has two months in which to determine it.
- 7.5 Each application will be treated on its merits, in accordance with the Agency's duties and responsibilities under the Environment Act 1995, including the impact on the environment. The Agency acknowledges that the establishment of its policy regarding culverts is not in itself sufficient grounds for refusal of an application for consent to culvert a watercourse.
- 7.6 The above notes are for guidance only. The Agency does not accept any responsibility for the design and construction of any works subject to its consent, or accept any liability for any loss or damage which may arise out of the design, construction, maintenance or use of such works.

8.0 | Definitions

Bridge

An open span structure that carries a road, footpath, railway etc over a watercourse.

Culvert

A covered channel or pipeline used to continue a watercourse or drainage path under an artificial obstruction.

Cutwater

The wedge-shaped streamlined head of a bridge pier or other structure within a watercourse channel.

Invert

The lowest internal surface or the floor of a culvert.

Internal drainage board

A board elected by ratepayers and established for designated, particularly low-lying, areas of England and Wales where flood protection and land drainage are necessary to sustain agricultural and developed land use. The functions of the IDBs and the Agency are separate.

Main river

All watercourses shown as such on the statutory main river maps held by the Agency and the Ministry of Agriculture, Fisheries and Food or Welsh Office, as appropriate. Main river can include any structure or appliance for controlling or regulating the flow of water in or out of the channel.

Ordinary watercourse

A watercourse which does not form part of a main river.

Sustainable development

Defined in the 1987 Report of the World Commission on Environment and Development (the Brundtland Report) as "Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs".

Watercourse

Includes all rivers, streams, ditches, drains, cuts, dykes, sluices, sewers (other than public sewers) and passages through which water flows.

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