



## **Culvert Advice Note**

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# Culverts Advice Note

## Revisions

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## 1. Purpose

Wigan Council, as the lead local flood authority, became responsible for ordinary watercourse consent applications under Section 23 of the Drainage Act 1991 on 6 April 2012.

Before this date, the Environment Agency dealt with works of this nature, therefore this advice note has been adapted from the Environment Agency's 'Culvert Policy' documents. It provides a detailed explanation of the Council's views on works to watercourses, with particular regard to culverts. It is intended for use by planning authorities, landowners and developers.

## 2. Introduction and Context

Watercourses fulfil many roles in today's environment. They provide drainage for developed and agricultural land and are vital water resources, whilst some have important recreational value. They are important features of the landscape and provide habitats for a wide variety of wildlife. It is therefore important that



watercourses and their associated habitats are protected and enhanced for the benefit of present and future generations.

The Council considers it beneficial for watercourses to remain open wherever possible, for both flood defence and environmental purposes. Culverting can exacerbate the risk of flooding, increase maintenance requirements and create difficulty in pollution detection. It also destroys wildlife habitats, damages natural amenity and interrupts the continuity of a watercourse due to:

- The loss of and / or adverse effects on environmental features and wildlife habitat;
- The increased likelihood of flooding due to blockage;
- Increased impact of flooding;
- Loss of floodwater storage;
- Increased difficulties in providing for drainage connections;
- Difficulties in the repair, maintenance and replacement of culverts;

- Increased health and safety hazards;
- Reduced groundwater recharge;
- Increased difficulty in detecting the origins of pollution; and
- Increased difficulty in monitoring of water quality.

A more detailed explanation of can be found in Appendix A.

In considering any development proposals, the objective is to retain open watercourses with a corridor of open land on both sides. Thus, maintaining a flood channel which provides additional storage capacity during a flood event. It also creates a valuable environmental feature which can enhance the site and be easily maintained. The Council encourages developers to incorporate existing open watercourses, or create new ones within their site designs. Such features are of particular importance to wildlife, through the provision of valuable open land in developed areas. Where possible, the removal of culverts will be encouraged to restore a more natural river environment in both urban and rural settings.

When the Council receives a planning proposal where there is a natural watercourse, it will not consider culverting until other options have been thoroughly explored, for example:



- Clear open span bridge with existing banks and river / stream bed retained;

- Revision of site layout to incorporate open watercourse;
- Diversion of the watercourse in an environmentally sympathetic manner.



### 3. Council Statement on Culverts

The Council is generally opposed to the culverting of watercourses because of the adverse ecological impact, through increased flood risk, risk of drowning, and asphyxiation due to the build-up of dangerous gasses and aesthetic impacts. Watercourses are important linear features of the landscape and should be maintained as continuous corridors to maximise their benefits to society.



The Council will consider each application to culvert a watercourse on its own merits and in accordance with a risk-based approach to permitting. The Council will only approve a culvert if there is no other reasonably practical alternative, or if the detrimental effects of culverting are considered to be so minor that a more costly alternative

could not be justified.

In all cases where it is appropriate to do so, applicants must provide adequate mitigation measures; accept sole ownership and full responsibility for its future maintenance and as riparian owner (the owner of the land through which the culvert flows) maintain the culvert in such a condition that the free-flow of water is not impeded. Riparian owners are also responsible for accepting and dealing with the natural flows from adjoining land and must not create or allow an obstruction to that natural flow to occur.

The Council will normally object to proposals to build over existing culverts because of health and safety considerations, increased maintenance costs, and because this would preclude future options to restore the watercourse.

The Council will actively pursue the restoration of culverted watercourses to open channels due to the increased flood risk and the detrimental effect on the environment and the habitat(s) and species present.

#### 4. Legal Requirements and Watercourse Consent

Under Section 23 of the Land Drainage Act 1991 (LDA 1991), as amended by the Flood and Water Management Act 2010 (WMA 2010), the following activities on an Ordinary (non-main river) Watercourse require consent from the Council as the Lead Local Flood Authority:

- The erection or alteration of any mill dam, weir or other like obstruction to the flow of any watercourse;
- The erection or alteration of any culvert that would be likely to affect the flow of any watercourse.

Under Section 24, of the LDA 1991, as amended and FWMA 2010, if works are executed without first obtaining formal written consent, the Council, have the power to serve legal notice requiring that the nuisance is abated within a specified timescale.

Failure to abide by such a notice is an offence under the LDA 1991, and can result in the Council carrying out the necessary remedial works and seeking to recover costs.

Consent application forms and guidance notes can be found at:

<http://www.wigan.gov.uk/Resident/Environmental-Problems/land-drainage.aspx>

For works affecting main rivers prior to the written consent of the Environment Agency is required, under Section 109, the WRA 1991, the Environment Act 1995, the FWMA 2010, and Environment Agency byelaws.

The length of any culvert should be restricted to the minimum necessary to meet the applicant's objective. The proposal must include appropriate assessment of flood risk and environmental impact. The applicant should take into account the possible effects of climate change and future development in the catchment of the watercourse when calculating the capacity of the culvert. Mitigation measures such as mammal ledges must be incorporated within the design, and the work must be carried out using best working practice to minimise environmental impact.

## 5. Exceptions

The Council recognises that watercourses pass through a number of land use types, from rural to industrial etc. Consequently accepts and recognises that in certain situations the use of culverts may be unavoidable, for example:

- The culverting of short lengths of watercourses and ditches for access purposes.



- Where highways cross watercourses.

Applicants will be required to prove why culverting is both necessary and the only reasonable and practicable alternative, and to provide information to show that it will not have a detrimental effect on flood risk and the habitat(s) and species present, or that mitigation measures can be put in place to reduce these effects.

## 6. Design Considerations

Where a culvert is deemed to be acceptable, the Council recommends that the detailed hydraulic and structural design of any culverting work is carried out by a suitably qualified engineer and should follow the principles and guidelines as contained within the CIRIA C689 – Culvert Design and Operation Guide 2010.

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## 7. Environmental Considerations

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 Council when determining a consent application for culverting.

Additional advice on environmental consideration is available from the Environment Agency.

The following options for environmental mitigation measures may be appropriate:

- Make the culvert slightly larger than needed to accommodate the design flood 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 500mm wide and 300mm above the 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.)
- The provision of appropriately located mammal underpasses close to the culvert. Usually, stock-proof fencing will be required to guide wildlife into the underpass. This should be an integral part of 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 that 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.
- The provision of structures to encourage bat roosting and bird nesting as appropriate. (Note: This applies to larger culverts only.)
- Proposed suitable environmental enhancements, for example, opening up a length of a previously culverted watercourse elsewhere on site, enhancing other lengths of the watercourse, the creation of a pond / marsh area, scrub / hedge planting. (This does not compensate for the loss of aquatic habitats).
- Ensure that the watercourse is not canalised, upstream or downstream of culverts. Artificial bank reinforcement should be avoided wherever possible.

- The construction of headwalls and wing walls should be in materials and style which are in keeping with the character of the locality and respect of the landscape setting.



### Detrimental effects of culverting

#### Loss of environmental features

The culverting of a watercourse has a detrimental impact on the environment. There is a complete loss environmental features that are associated with that section of watercourse. The continuity of the river corridor is broken, adversely affecting the landscape and ecological value of the watercourse and inhibiting the migration of some species. An existing or potential amenity is lost.

Culverting results in the removal of species and river features such as pools, riffles, gravel, cobble, sand, silt, marginal / aquatic vegetation, earth-banks with associated vegetation, invertebrate communities and fish. Even seasonally dry watercourses provide valuable habitats for many species, such as amphibians and invertebrates. Therefore, culverting is contrary to the Council's duty to further conservation in relation to its flood defence responsibilities and its aim to contribute to sustainable development.

#### Increased likelihood of blockages

In comparison to an open channel, the installation of a culvert increases the risk of blockage. If the blockage is within the culvert, there is a much greater difficulty in removing it. For this reason many culverts have screens installed at the upstream end.



These screens themselves are often prone to blockage and require frequent clearance and robust emergency procedures in place to ensure that they do not in themselves cause, flooding.

The case is sometime argued that the installation of a culvert will reduce the problem of open channels being subject to rubbish deposition. However, the Council considers that in the majority of cases such short-term advantages are outweighed by the overall disadvantages of culverting and that alternative means should be pursued to address the rubbish problem.



### **Increased impact of flooding**

The impact of overland flooding, that occurs when a culvert cannot cope with all the water flow reaching it is potentially more serious than flooding from an open watercourse breaking its banks.

### **Loss of flood water storage**

Open channels generally provide more storage capacity, than a culvert, and therefore the detriment will be more significant in relation to longer lengths of culverts.

### **Increased difficulties in providing drainage for connections**

Drainage can be provided more easily with open watercourses, into which drain connections can be readily made and the performance of drainage systems can be visually monitored. Outfalls within culverts are prone to blockage or, in the case of flapped outfalls can seize up. The maintenance of outfalls is considerably easier in open channels.

### **Difficulties in the repair, maintenance and replacement of culverts**

Culverts conceal the presence of a watercourse, and can lead to unacceptable development or land-use above or near them. In many urban areas, buildings have been constructed above or adjacent to culverts.

This means that improving standards of flood protection or accommodating run-off



from future developments could be impossible or uneconomic due to the cost of replacing or enlarging existing culverts. There have recently been cases of service flooding caused by culverts collapsing due to large amounts of material stockpiled above them.



In urban areas consideration must be given to the need to provide alternative means to deal with flood water over and above that which can be accommodated by the culvert under design conditions. This will also provide contingency arrangements in the event of the culvert becoming blocked, and thereby minimising the risk of flooding to property.

The responsibility for the condition and maintenance of a culvert lies with the riparian owner (the owner of the land through which the culvert flows). The responsible party, must therefore, ensure that the culvert and any screens remain in such a condition that the free-flow of water is not impeded. Failure to do so could result in liability for any damage caused as a result of flooding.

Access to culverts is generally safe, only with the use of special procedures and equipment, making inspection and maintenance both difficult and costly.

### **Health and Safety hazards**

There are dangers associated with natural open watercourses; however, culverted watercourses are equally as dangerous. Culverting a watercourse does not remove the risk of injury or drowning. The risks of such instances are increased as the water levels within the culvert can rise suddenly without notice preventing escape, or there can be a build-up of potentially toxic explosive gasses within the culvert. There have been many instances where people have suffered injury or have died after entering culverts as a result of such occurrences. These hazards are a danger to both the public and to operatives undertaking maintenance.

### **Effect on recharge to groundwater**

The installation of a culvert creates an impermeable bed to a watercourse and therefore increases the speed of water flow, in turn this reduces the recharge to groundwater, which can have particularly serious impacts on large nearby developments and / or areas of permeable geology.

### **Pollution and the effect on water quality**

The culverting of a watercourse makes the early detection and tracing of pollution sources more difficult, and therefore resulting in the adverse impacts of pollution being more serious.

There is further impact on water quality due to the loss of biological processes, which are essential for river purification, resulting in a reduction in oxygenation of the water that flows through the culvert. Culverting can increase the likelihood of water that would normally flow becoming stagnant, particularly where culvert levels are poorly designed and / or constructed.

### References and Drivers

#### Nature Conservation

EU Habitats (Council Directive 92/43/EEC) and the Water Framework Directives (WFD 2000/60EC) seek to protect water bodies; conserve and enhance habitats for species dependant on water. Article 10, of the Habitats Directive, paragraph 12 of Planning Policy Statement 9 and paragraphs 3.2.2 and 5.5.3 of Technical Advice Note 5 (Welsh and English Government Policy on biodiversity) to encourage the protection and enhancement of natural wildlife corridors as they can link habitats and the provision of routes for the migration, dispersal and genetic exchange of species in the wider environment. The WFD requires the restoration of watercourses to good ecological status or good ecological potential and to prevent their deterioration; the maintenance of sediment transport and morphological variability is a key component of this.

The Council and other organisation should aim to maintain networks of linked habitats by avoiding or repairing fragmentation, the protection of wildlife corridors from development and where possible, strengthening or integrating them. This will minimise the impact on wildlife and help wildlife to adapt to the effect of climate change.

Under the Environment Act 1995 (EA 1995), Wildlife and Countryside Act 1981 (WCA 1981) and the Natural Environment and Rural Communities Act 2006 (NERCA 2006) there is a requirement to further and promote the conservation and enhancement of flora and fauna dependent on the aquatic environment.

#### Conservation of Biological Diversity

The UK is a signatory to the Rio Convention on the Conservation of Biological Diversity, which includes a commitment toward the conservation of watercourses. Under the UK's Biodiversity Action Plan (UK BAP), rivers are a priority habitat and as such the Council have lead responsibility for the water and wetlands work stream within the Borough (England Biodiversity Strategy).

#### Flood Risk

The National Planning Policy Framework (NPPF) actively promotes sustainable development in England. The NPPF states that local planning authorities should adopt proactive strategies in order to mitigate and adapt to climate change, taking full account of flood risk, costal change; water supply and demand considerations.

**CIRIA** – Construction Industry Research and Information Association, 6 Storey's Gate, Westminster, London, SW1P 3AU

### Definitions

<b>Bridge</b>	An open structure that carries a road, footpath, railway, etc. over a watercourse.
<b>Climate change</b>	A significant and lasting change in the statistical distribution of weather patterns over time ranging from decades to millions of years.
<b>Culvert</b>	A covered channel or pipeline used to continue a watercourse or drainage path under an artificial obstruction.
<b>Cutwater</b>	The wedge-shaped streamlined head of a bridge pier or other structure within a watercourse channel.
<b>Flood channel</b>	An increased cross-sectional area of a river, stream or watercourse carrying water during a flood event.
<b>Invert</b>	The lowest internal surface or the floor of a culvert.
<b>Main river</b>	All watercourses shown as such on the statutory main river maps held by the Environment Agency and the Ministry of Agriculture, Fisheries and Food, as appropriate. A main river can include any structure or appliance for controlling or regulating the flow of water in or out of the channel.
<b>Ordinary watercourse</b>	A watercourse which does not form part of a main river.
<b>Sustainable development</b>	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 future generations to meet their own needs'.
<b>Watercourse</b>	Includes all rivers, streams, ditches, drains, cuts, dykes, sluices, sewers (other than public sewers) and passages through which water flows.