SEPA Position Statement to support the implementation of the Water Environment (Controlled Activities) (Scotland) Regulations 2011:

WAT-PS-06-02: Culverting of Watercourses - Position Statement and Supporting Guidance

THESE DOCUMENTS OUTLINE SEPA'S POSITION ON RIVER ENGINEERING ACTIVITIES. THEY PROVIDE A BASIS FOR INTERPRETING SEPA'S OBJECTIVES UNDER THE CONTROLLED ACTIVITY REGULATIONS (CAR), AND A BASIS FOR INTERPRETING AND IMPLEMENTING SEPA'S GOOD PRACTICE GUIDANCE. THEY PROVIDE A SUMMARY OF THE KEY REGULATORY ISSUES BUT DO NOT REPLACE DETAILED GOOD PRACTICE GUIDANCE.

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1 POSITION STATEMENT

1.1 POSITION STATEMENT: THE CULVERTING OF WATERCOURSES: RESPONDING TO LICENCE APPLICATIONS AND PLANNING CONSULTATIONS OR OTHER ENQUIRIES

Culverts are used to create artificial channels of varying length and purpose. They can either be open channels with artificial bed and banks, or they may be totally enclosed (example designs are shown at the end of this document). The following provides a summary of SEPA's position on culverting of watercourses.

- SEPA will use its statutory powers and duties under CAR and other legislation to actively promote the retention of existing open water habitat.
- SEPA is opposed to the enclosed culverting of watercourses for land gain and will actively seek to discourage such proposals.
- SEPA will presume against unjustified enclosed culverting (box or cylinder) of watercourses as bridging structures for transport routes.
- SEPA will presume against other forms of unjustified open culverting of watercourses (e.g. brick, stone or concrete open channels).
- SEPA will seek improvements to existing culverts in line with this position statement when replacement or significant maintenance works are proposed.
- When assessing new proposals, SEPA will consider any over-riding social, economic and technical constraints. However, SEPA will exercise its powers and duties to prevent unnecessary and unjustified damage to river channels. Where it has been demonstrated that culverting is the only viable option, SEPA will seek adoption of mitigation measures to protect habitats, passage of fauna, and river form and flow.

Notes:

- Section 2 will provide regulatory guidance for this position statement.
- Specific Good Practice for river crossings can be found at: *http://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/*

1.2 POSITION STATEMENT AIMS

Culverts have a range of harmful local and system-wide impacts on the environment. The aim of this position statement is specifically to:

- Protect existing local open water habitat in Scotland.
- Protect valuable open water habitats from piecemeal cumulative loss.
- Protect the physical character, habitat, transport of sediment, free passage of fauna, establishment of other ecology, access to light, and chemical quality in small and urban watercourses from the harmful effects of culverting.
- Protect open water habitat for local amenity value.
- Protect the potential of previously modified waters to be restored or enhanced in the future.
- Ensure that room is made for rivers in all new development.
- Mitigate flood risk associated with poorly designed culverts.

1.3 CULVERTING ACTIVITIES SUMMARY

Culverting includes the enclosure of waters in pipes, burial for land gain, enclosure in manmade channels and various crossing structures. A significant length of rivers is culverted each year as a result of urban development and agricultural/forestry activities.

Culverting of watercourses is a controlled activity under CAR and requires authorisation from SEPA. There are broadly four categories of culverts (see example diagrams at the end of this document); piped or cylindrical, boxed, bottomless arch or open. There are two broad reasons for culverting of watercourses: land gain for development, or to provide a bridging structure for transport routes. These are generally used on small or urban watercourses. In many cases, the watercourse may have significant ecological value. Culverting can severely degrade this ecological value and restrict options for future recovery of watercourses. Further details of the environmental risks associated with culverting are provided in the following section.

1.4 IMPACTS OF CULVERTING

Piecemeal losses of small watercourses can create wider cumulative impacts on the water environment, including ecology, channel form, flow regime and chemistry. Specific impacts are described below.

Ecology

Badly designed and poorly installed culverts can be impassable to riverine fauna. Increased water velocities combined with shallow water depth, “stepped” culvert entrances and smooth uniform surfaces all create barriers to fish passage. For example, in 1996 the River Tweed Foundation identified 1000 culverts in the River Tweed catchment which were impassable to fish on watercourses otherwise capable of supporting salmonid species.

Culverting results in the loss of natural in-stream and bank-side habitats through direct removal and loss of daylight. Piecemeal enclosure of watercourses leads to fragmentation and loss of wildlife corridors in urban environments. These corridors and habitats can be important for mammals, bird species and fish, along with other biodiversity interests such as vegetation.

A number of priority species identified by the UK Biodiversity Action Plan such as otters and voles depend on good quality river corridor habitats. The installation of culverting is not consistent with Government Policy which seeks to improve the quality of habitats for these species.

Pollution

Enclosed culverted urban watercourses are often highly polluted due to misconnected foul sewers, overflows from blocked sewers or discharges of contaminated surface water. These culverts create serious practical access difficulties in exercising effective pollution control duties, and also maintenance by the riparian owner.

SEPA believes that unjustified and inappropriate enclosure of watercourses within culverts hinders both its own efforts and those of other organisations to reduce pollutant inputs into watercourses and to improve the chemical biological and physical quality of running waters in Scotland.

Morphology and Erosion

Culverted sections may create or exacerbate downstream or upstream bank and bed erosion as well as sediment deposition, as a result of altered water velocities and disruption to the natural transport of sediment. This in turn drives demand for further hard engineering responses (e.g. gabion baskets, concrete banks) which may create additional erosion and deposition problems, and the need to carry out sediment removal.

Flooding

Culverts are prone to blockage by debris, both natural wood and litter, leading to localised flooding during periods of high river flow. Badly designed or undersized culverts also form restrictions to high flows causing upstream flooding. Once installed, if flood flows increase due to climate change or upstream development, it is very difficult to change the amount of water a culvert can carry and therefore avoid flooding.

Restoration

Hard engineering structures, such as a concrete culvert, can hinder future restoration options if removal of such structures and other enhancements to the watercourse are being considered. This is particularly significant where urban development causes the burial of once open watercourses beneath housing or commercial centres, or where new development is placed on top of existing culverted watercourses which

otherwise might be available for restoration.

SEPA will take the opportunity to promote the restoration of culverts back to open water habitat during discussion of development proposals, and will encourage and support appropriate river restoration techniques.

Landscape and Amenity

Culverting of urban waters leads to the loss and degradation of distinctive components of the local landscape. Culverting leads to the loss of green amenity space along river banks and reduced access for recreational opportunities, such as angling, walking or canoeing.

Human Health and Safety

Health and safety considerations are often cited as a reason for culverting in urban areas. However, culverts can create health and safety problems. Closed culverts increase local flood risk due to problems outlined above. Open culverts increase flow velocities during periods of high flow due to their confined nature. A more natural watercourse as part of a wider green corridor can dissipate flows during periods of flood over a larger area therefore reducing velocities and potential health and safety issues. However, issues of public health and safety and the building standards for new developments (which are subject to planning controls) are within the remit of the local authorities.

2 REGULATORY GUIDANCE FOR THE POSITION STATEMENT

2.1 INTRODUCTION

The following guidance is not a detailed Good Practice guide, but represents interim advice before full good practice guidance is available. This guidance is an overview of how the position statement should be interpreted and provides high level summaries of particular regulatory issues with culverts and the mitigation of their impacts.

2.2 CAR AND CULVERTING

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) define culverting of a watercourse as a controlled activity. As such, authorisation must be obtained from SEPA for all culverting works.

Under Regulation 5 of CAR it is the duty of those carrying out a controlled activity to "secure efficient and sustainable water use." For the purposes of engineering works, efficient water use equates to using Good Practice.

2.3 REGULATORY DECISION GUIDANCE

Each site will vary in the specific reasons for a culverting proposal, whether for land gain or transport crossings. There may be various reasons for the proposal but broad examples of acceptable and unacceptable justifications are given in the following table. **Hard and fast rules do not exist** – this guide is an attempt to provide practical guidance in support of the position statement. For licence applications the coordinating officer should expect a full justification for the proposed culvert when assessing good practice.

Culvert Crossings	
Closed culverts used for river crossings would normally only be justified for single track roads over small watercourses (<2m in width). For all other crossings, the use of span bridges and bottomless arch structures should be pursued, where practicable.	
Potentially Unjustified	**Potentially Justified**
• For convenience alone. • No other options assessed e.g. span structures, or bridges. • High costs or technical infeasibility of other options is argued, but not satisfactorily demonstrated. • Associated culvert mitigation measures are deemed inadequate to protect the watercourse or offset culvert impacts.	• Demonstrated disproportionate costs of other options. • Demonstrated technical infeasibility (e.g. geology or inappropriate ground conditions) of other options due to site specific difficulties (e.g. space, access etc). • Impact negligible due to size/location/typology of watercourse. • Mitigation measures ensure impacts and risks become no greater than other crossing structures.
Culverts for Land Gain	
Enclosed culverts for land gain would normally only be justified for developments that carry with them over-riding public interest, provided no other practical option exists that would allow the watercourse to remain open.	
Potentially Unjustified	**Potentially Justified**
• For convenience alone, and no demonstration of overriding issues. • No other options assessed e.g. diverting existing watercourse or incorporating it within site design. • High costs or technical infeasibility of other options is argued, but not satisfactorily	• Demonstrated disproportionate costs of other options. • Demonstrated infeasibility of other options due to site specific difficulties. • Demonstrated overriding public interest e.g. flood risk, the need for space at the expense of open water or a health and

demonstrated. • Associated culvert mitigation measures are deemed inadequate to protect the watercourse. • Mitigation elsewhere is not investigated to offset loss of open water.	safety justification (NB developer must ensure that development site designs do not cause the need for culvert e.g. by raising land to an unsafe degree up to the existing riverbank.) • Mitigation elsewhere is proposed to offset loss of open water i.e. a similar length of enclosed water is reopened, or other enhancements are planned.

Mitigation Principles for Authorised Culverts

Detailed guidance on good practice for culverts and other crossing structures is found at:
http://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/

The following is a summary of the principles for culvert design:

- The developer must ensure that natural low flow depths are maintained through the culvert base e.g. by use of a two stage channel.
- The culvert base should be of natural substrate (e.g. by burying the culvert invert well below the natural bed level). The culvert base should be sufficiently buried below the existing bed to allow a naturalised culvert bed to be maintained during the scour associated with high flows.
- The culvert should be at least the same width as the natural active channel width, with consideration to low flows and channel migration.
- The soffit of the culvert should be greater than the natural bank height.
- Culvert alignment should match alignment of the watercourse i.e. in a parallel direction to flow, and in a straight reach.
- The slope of the culvert base should match the slope of the bed of the watercourse, with consideration to the stability of the watercourse.
- Associated erosion and scour controls must be suitably sized and sensitively engineered e.g. soft engineering options where appropriate. The culvert should be designed to prevent creation or exacerbation of downstream and upstream bank and bed erosion.
- The culvert must not present a barrier to fauna by (i) creating a step or ‘hydraulic drop’ at the culvert inlet or outlet which will hinder the passage of fish and other fauna, or (ii) any additional restrictions at the site of installation to the free passage of migratory fish and other fauna at all times e.g. mammal and fish access through the internal culvert length.
- If fences or screens are fitted on the inlet or outlet of the culvert, these must be designed so that there is at least 230mm of space between the bars of the screen or fence, up to the high water level. Where livestock fences are used they must be designed to rise with the water flow.
- The culvert must not exacerbate or create flooding.
- Practical enhancement measures along the affected stretch should be considered to offset loss of morphological capacity e.g. replanting denuded riparian vegetation, removal of other existing and unnecessary man-made structures.
- The culvert should be designed to allow access for appropriate necessary maintenance, and the assessment of pollution sources under investigation.

2.4 OTHER CONTROLS OVER CULVERTING

LA Planning Departments

Existing planning law will still involve SEPA as a statutory consultee for proposals which involve the carrying out of "*works or operations in the bed of on the banks of rivers and streams*" [Town and Country Planning (Scotland) Act 1997]. *Planning departments must consider our views on the merits of any such proposals which will eventually require authorisation from SEPA before work can begin*. SEPA's response should highlight the need for application for Registration or Licence level activities and should be viewed as an opportunity to begin pre-application discussions and to gain support for SEPA's requirements.

SEPA will ask planning authorities to include policies within Structure Plans and Local Plans addressing the environmental damage associated with culverting. The intention is to encourage developers to protect, restore or enhance the natural heritage value of running waters, and maintain open watercourses.

Local Authorities also have a duty to protect public health and safety when new developments are proposed and designed.

LA Roads Departments/Network Rail

Previously culverting work associated with existing road and rail routes was often carried out by Roads Departments or Network Rail with little consultation with SEPA. Under CAR it is now a legal requirement to comply with the requirements of the Regulations, which means that authorisation from SEPA must be obtained before work can begin.

Environmental Impact Assessment (EIA)

Crossings associated with new trunk roads or rail links or other major developments are subject to a formal environmental assessment stage under the Environmental Assessment (Scotland) Regulations 1988, to which SEPA may contribute. SEPA's response may simply highlight the need for application for Registration or Licence level activities rather than issuing an opinion or approval on the matters contained. This may also be an opportunity to begin pre-application discussions, and to gain support for SEPA requirements.

Forestry and Agriculture

SEPA supported the production of the Forest and Water Guidelines, which includes advice to foresters on road construction and bridging structures. However, CAR now requires an application to be made to SEPA for all long term or permanent culverts. Although SEPA should be pragmatic, this position statement and supporting guidance will take precedence over external guides.

Culverting of watercourses by agricultural businesses now also comes within the remit of CAR and authorisation by SEPA.

River Basin Management Planning

Area Advisory groups may identify areas for restoration or where culverting causes particular flooding, ecological damage or pollution issues. RBMP may be the best mechanism of initiating a catchment approach to the management and enhancement of small or urban waters over the long term (2009 onwards).

Other Biodiversity Duties

Apart from SEPA's statutory duty to consult SNH when designated species and habitats are at risk (see WAT-RM-20: Consultation and Advertisement and section 6.2 of WAT-RM-02:Regulation of Engineering Activities on *www.sepa.org.uk*) SEPA has general duties under different environmental acts to promote and protect the ecology of the water environment;

1. Secretary of State's statutory guidance on Sustainable Development

2. UK Biodiversity Action Plan and resultant Local Biodiversity Action Plans

3. Environment Act 1995

- Section 32: SEPA must have regard to the desirability of conserving and enhancing the natural heritage of Scotland when carrying out its functions
- Section 34: SEPA has statutory duties to promote the conservation and enhancement of the natural beauty and amenity of controlled waters and associated land, and the conservation of dependent fauna and flora.

4. Nature Conservation (Scotland) Act 2004: It is the duty of every public body and officeholder, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions.

2.5 USEFUL LINKS AND DOCUMENTS

- Culvert design and operation guide (C689) (supersedes R168), CIRIA, April 2010, *www.ciria.org*
- Design Manual for Roads and Bridges - See Volume 10 Section 4 (Nature Conservation) *http://www.standardsforhighways.co.uk/dmrb/index.htm*
- Forests and water (UKFS Guidelines), Forestry Commission 5th Ed. 2011 *www.forestry.gov.uk*
- Managing River Habitats for Fisheries, SEPA *www.sepa.org.uk/regulations/water/engineering/engineering-guidance/*
- River Crossings and Migratory Fish: Design Guidance, Scottish Government (Feb 2012). *www.gov.scot/Publications/Recent*
- The River Restoration Centre Manual of Techniques, *www.therrc.co.uk*
- WAT-RM-02:Regulation of Engineering Activities (section 6.2), *www.sepa.org.uk/regulations/water/engineering/engineering-guidance/*
- WAT-RM-20: Consultation and Advertisement *http://www.sepa.org.uk/regulations/water/guidance/*
- WAT-SG-25: Good Practice Guide – River Crossings, *www.sepa.org.uk/regulations/water/engineering/engineering-guidance/*

3 EXAMPLES OF TYPICAL CULVERT DESIGN