

Alternative Watering for Field Grazed Livestock I – Abstraction Systems

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SUMMARY

- Mains or private water supply should be considered as the first choice to supply drinking water to livestock.
- Alternative watering systems provide an option for consideration for grazing livestock at remote sites, subject to water quality.
- Construction of an 'abstraction point' reduces the risk of disruption to supply through changes in water levels.
- A constructed abstraction point could form part of a larger gravity fed system to supply a number of drinking troughs.
- Keeping livestock out of wet and boggy water margins could reduce the risk from liver fluke.
- Abstractions from a watercourse will need to adhere to the Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 (CAR).
- Observe health and safety requirements when carrying out abstraction and installation work near watercourses.
- Poaching caused by livestock within 5m of a watercourse is no longer acceptable under the Water Environment (Diffuse Pollution) (Scotland) Regulations 2008.



This Technical Note presents two different abstraction point designs to supply an alternative watering system, based on findings from Scottish Government funded trial work on three farms in Scotland.

A second Technical Note TN666 Alternative Watering for Field Grazed Livestock II – Pumping Systems considers three different

systems to supply drinking water troughs and should be read in conjunction with this Technical Note. It is available at www.fas.scot/publications/technical-notes/ or www.farmingandwaterscotland.org

All installations will differ, depending on site specific conditions. Therefore this Technical Note is intended as a guide only.



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Introduction

Following the introduction of the Diffuse Pollution General Binding Rules (DP GBRs) in 2008, significant livestock poaching and erosion within 5m of a watercourse is no longer acceptable (DP GBR 19) (Box 1).

On sites susceptible to heavy poaching by livestock, fencing can be used to protect the watercourse, with troughs supplied by mains or a private drinking water supply.

At more remote sites, piping mains or private water to supply drinking troughs for field grazed livestock may be neither cost effective nor practical, requiring a different approach.

'Alternative drinking water systems' describes various options to abstract water from a watercourse to supply an in-field drinking trough or bowl. Examples of alternative watering systems include:

- Livestock operated pump (pasture or nose pump).
- Off-stream gravity fed water troughs.
- Electrically powered pump (either mains, battery or powered by renewables).
- Ram or "papa" pump - using no external power source other than energy within the flow of water.
- Wind powered pump.

A dedicated abstraction system and abstraction point is a practical way of supplying water to the drinking trough, meeting the needs of livestock and protecting the watercourse.

Abstraction design 1 - permeable sump type

The permeable sump design is suitable for mechanical pumped systems such as a solar pumped or stock operated system such as a pasture pump.

Box 1 - Why is poaching a problem?

Poaching in and around watercourses gives rise to erosion, soil loss and introduces nutrients and faecal bacteria into the water, degrading water quality.

This increase in diffuse pollution can negatively affect habitats and amenity for water users further downstream, including an increase in faecal pollution at designated bathing water beaches. Although poaching at one site may seem to be a small source of diffuse pollution, the impact can be significant when coming from numerous sites along the length of a watercourse. Land managers are required to prevent erosion of the banks of water courses and watering points from overgrazing or heavy poaching by livestock as part of GAEC 5 Cross Compliance requirements.

Previously managed or constructed drinking points in watercourses are now no longer recommended; these have been demonstrated to concentrate poaching and dunging in one area, which can be easily mobilised during high water flows (creating a diffuse pollution 'hotspot').



The design requires the 'off-stream' installation of a permeable sump, forming an abstraction sump chamber. The chamber houses the pump and/or pump inlet assembly (Figure 1).

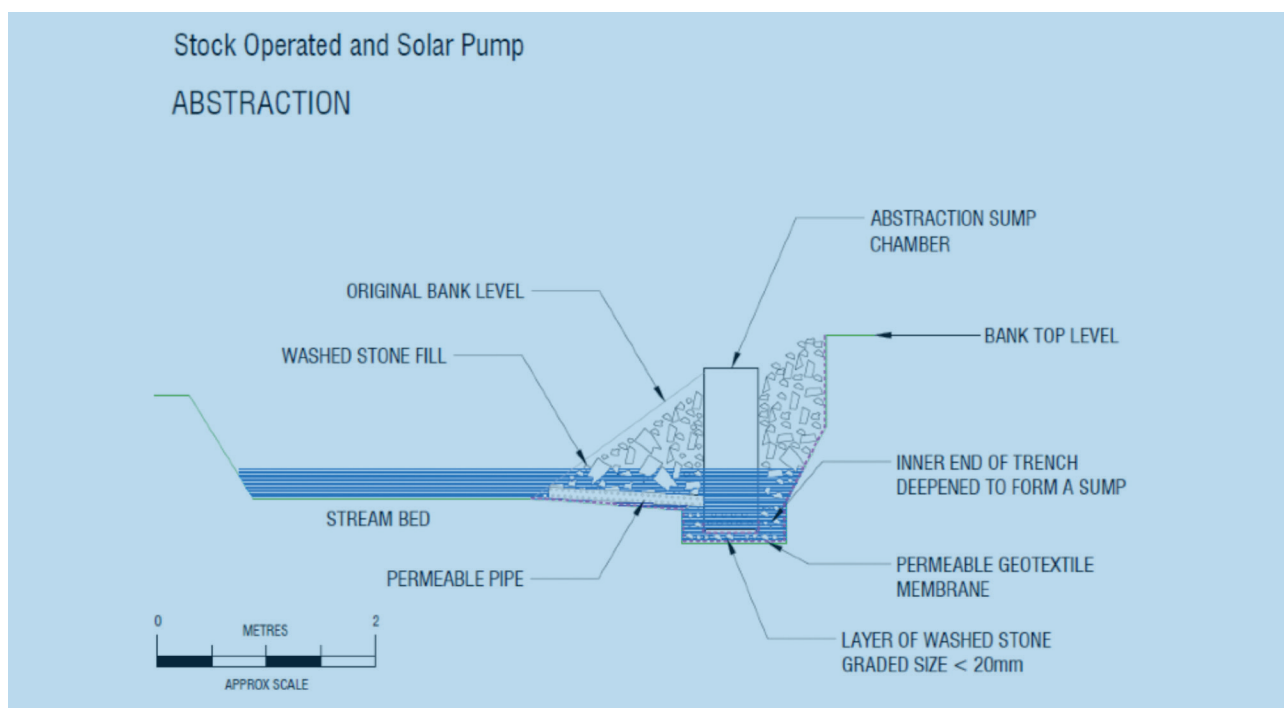


Figure 1: Permeable sump abstraction design

There is no 'one design fits all' as all installations will be site specific.

Figure 1: suggests a design for a permeable sump type abstraction point, with the following points to consider.

Water inlet trench

- The inner end of the excavated trench containing the permeable inlet pipe should be deepened to form the 'sump' within the abstraction chamber. Making this deeper than the trench will provide water cover at all times for the inlet hose or pump.
- The excavated trench should be lined throughout (both base and sides) with permeable geotextile membrane and then covered with washed stone (graded size <20mm).
- A minimum of 1m geotextile membrane should be left above the trench top on both sides. This allows the membrane to be folded over the top of the stone after filling and prevent soil and stone fill from the excavated trench and surround entering the abstraction.

Water inlet pipe

- A reinforced permeable inlet pipe, placed in the geotextile lined trench with stone backfill, takes water from the intersection with the watercourse to the sump position at the lower side wall of the abstraction sump chamber.
- The inlet pipe from the watercourse to the chamber should be made permeable throughout its length by pre drilling 20mm holes at 50mm spacing all around the pipe. Pipes can typically be 100mm diameter.
- The inner end of the transfer pipe should be open and butted against the sump chamber wall. A removable end cap ('internal bung') fitted to the end of the pipe adjacent to stream will help to prevent blockages.

Abstraction sump chamber

- The excavation for the abstraction sump chamber should be at distance from the watercourse where the bank becomes entirely stable.
- The design should allow an adequate water level to be maintained at the abstraction point to ensure water enters the system at all times.
- The excavated depth for the abstraction chamber will depend on the stream depth and the range of water levels within the stream during dry weather (low level) and to 'full flow' (high level) conditions.
- Large diameter rigid pipe can be used to form a vertical chamber extending to 100mm above ground level at the bank top. Pipe diameter for the chamber will depend on abstraction equipment and will vary from site to site (Figures 2 and 3).
- The lower end of the chamber should be made 'permeable' by the installation of 20mm holes at 50mm spacing all round the pipe and extending up to 500mm from the lower end of the pipe.
- A series of 'V' notches cut into the bottom of the vertical abstraction sump chamber pipe will also aid water transfer.

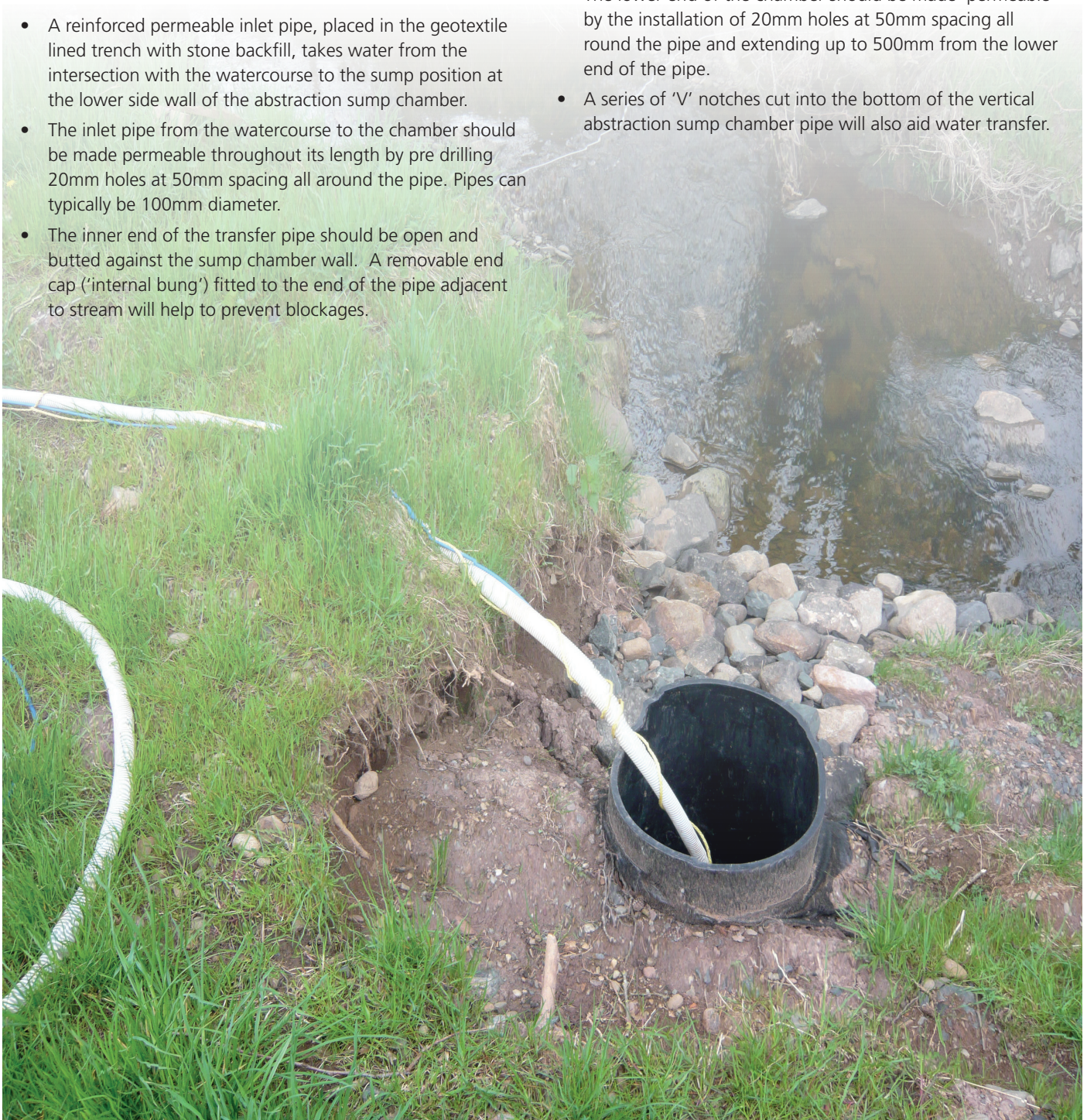




Figure 2: Abstraction point supplying a pasture pump. Pump inlet hose going into abstraction chamber fitted with a removable inlet screen. Abstraction sump chamber formed from pipe with diameter 150mm.



Figure 3: Abstraction point under construction to support a submersible pump with low level float switch. Abstraction sump chamber formed from pipe with diameter 450mm.

Completing the abstraction point

- The area outside the abstraction chamber and around the permeable inlet pipe (inside the geotextile) should be filled with clean washed stone (40mm to 100mm) to a height 200mm below existing ground/bank level.
- The 1m geotextile excess can be folded across the placed stone and overlapped to prevent soil entering the stone from the trench or surround. Larger stone can be used to fill over/cover the geotextile and meet existing bank/field surface levels (Figure 4).
- A lid or cover for the abstraction chamber is required. Mesh screening covering any small gaps around external pipework going through the lid is also advised. This will prevent small mammal access which could compromise pump operation.



Figure 4: View from the watercourse of the completed abstraction point seen in Figure 3.

Abstraction design 2 - permeable collector type

The main difference in creating an abstraction point for a water powered pump such as a ram pump, is that the abstraction is based on an 'off stream' permeable collector, providing a direct connection between the piped water supply system and the pump (Figure 5), rather than installation of a sump chamber. Otherwise, installation and finishing of these abstraction points is broadly similar to abstraction design 1.

A permeable collector type system could also be used to supply an intermediate sump or tank, for subsequent transfer and distribution either through a gravity supply or mechanically pumped system.

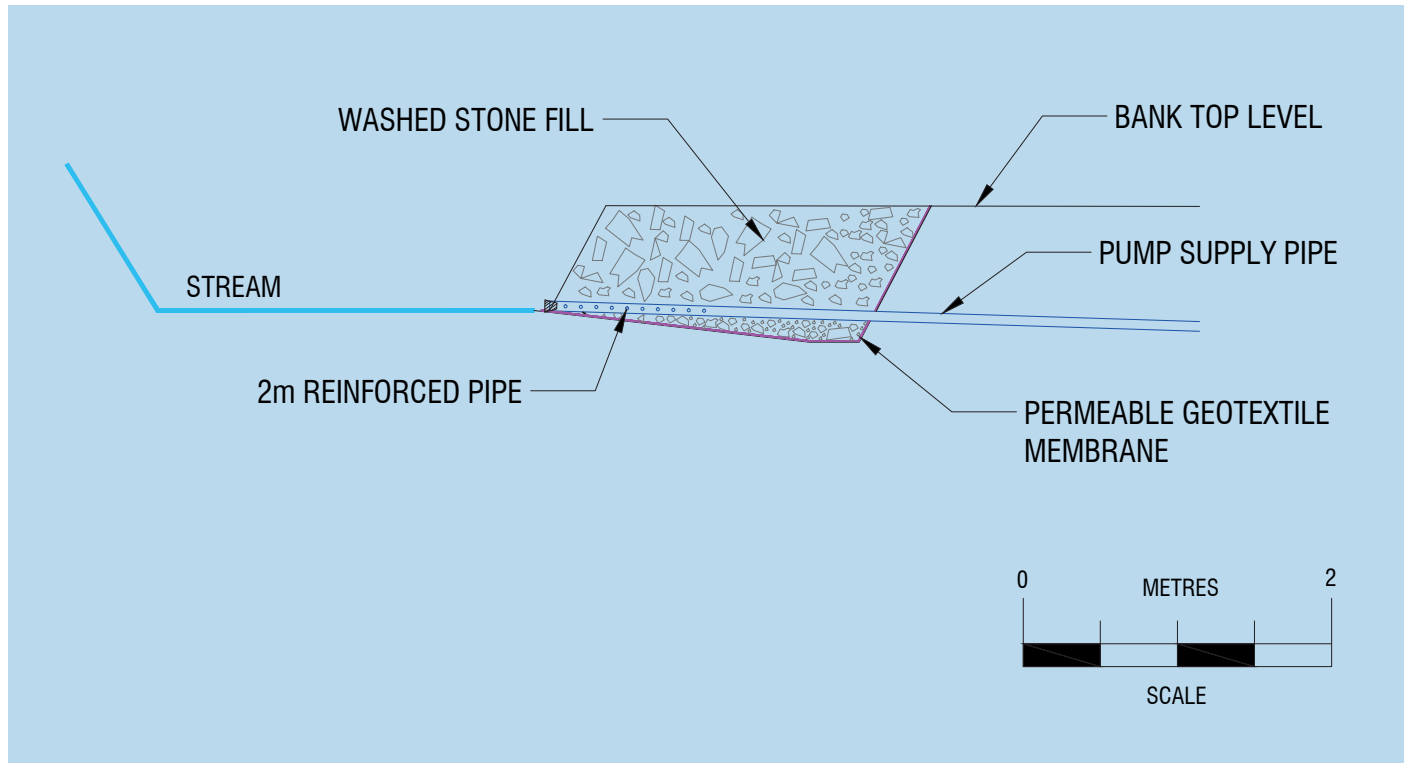


Figure 5: Design for permeable collector type abstraction. In this example, the approximate excavation dimensions for the abstraction part is 750mm depth x 750mm width x 2m length. Note depth will depend on height of bank and depth of stream bed.

Again, installations will be site specific. Figure 5. suggests a design for a permeable collector type abstraction point, with the following points to consider.

Abstraction

- The first 2m length of reinforced permeable pipe collects the abstracted water. The pipe is placed onto a prepared stone layer. This links to the pump system supply pipe.
- The first 2m of pipe (measured from the watercourse) should be made permeable throughout its length by pre drilling 20mm holes at 50mm spacing all around the pipe.
- The abstraction pipe should be housed in an excavated trench, lined and finished as per abstraction design 1 (permeable sump type).
- A removable end cap ('internal bung') fitted to the end of the pipe adjacent to stream will help to prevent blockages.

Pipe transfer system

- Following the 2m abstraction pipe, the transfer system to the pump must include 'sealed' couplings to prevent any leakage of abstracted water during transfer.
- Transfer pipe diameter will depend on the system flow rate required (typically pipe size may be 100mm or 160mm). This will vary from system to system; see manufacturer's guidance.
- The reinforced pipe with the top end terminating at stream bed level (or base of specified excavation), should fall at the stream intersection (1:10) for 2m to meet the lower system components as required.
- A 'downhill' flow should be maintained when designing and installing the abstraction pipework to assist the flow of water into the transfer pipe and avoid air locks.



Figure 6: Completed abstraction point. Arrow indicates abstraction point inlet. Transfer pipe used at this site was 100mm diameter; this will vary from site to site.



Figure 7: Completed abstraction point as seen in Figure 6, viewed from the watercourse.

Completing the abstraction point

- As with the previous abstraction construction, the geotextile excess should be folded across the placed stone and overlapped to prevent soil entering the stone from the trench or surround. Larger stone can be graded and placed to finish and meet the existing field surface levels (examples in Figures 6 and 7).

General considerations when installing an abstraction system

- Is your site suitable? Would the intended watercourse be able to support the planned abstraction? Box 2 outlines the levels of SEPA authorisation required.

Box 2 - Authorisation of abstractions

Under the Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 (CAR), if you intend to carry out any activity which may affect the water environment, you need authorisation to do so. It should be noted that water that is abstracted to drive a papa or ram pump and subsequently returned to a watercourse will require authorisation.

An authorisation for abstraction is based on the quantity of water abstracted over a 24hr period and its use. It should be noted that water that is abstracted to drive a papa or ram pump and subsequently returned to a watercourse will require authorisation. There are three categories of authorisation:

- Water abstractions of less than 10m³ per day do not require an application for authorisation; however they should be carried out in accordance with a General Binding Rule (GBR 2). Section 4.3 of the CAR Practical Guide gives further details.
- Water abstractions of more than 10m³ per day, need authorisation via a registration (for up to 50m³ per day). This requires a one-off application to SEPA plus administration fee (currently £130).
- Water abstraction that will remove more than 50m³ per day will require a licence. This is more complex and fees will vary depending on the amount of water taken on a daily basis.

All proposed abstractions must be considered with regard to the 'authorisation' framework under the CAR (Controlled Activity Regulations).

Information, guidance and where applicable, application forms and fees can be found at www.sepa.org.uk/water/water_regulation/car_application_forms.aspx. If in doubt, it is worth early discussion with your local SEPA office.

- **Consider site access.** Steeply sloping fields, heavy troughs and machinery required for ground works coupled with wet weather could make the site difficult to access, increase erosion risk and damage farm soils.
- **Flooding risk.** Is your intended site at risk of flooding; is the bank stable enough to support the abstraction installation?
- **Impact on the watercourse.** Abstraction points must be installed in such a way that they don't negatively affect the existing watercourse system. Points to note include:
 - Minimise any interference and effect on the 'riverbank'
 - Avoid all interference with the river bed.
 - Abstraction systems must not impede the 'sectional' area and characteristics of the watercourse, at or adjacent to, the abstraction location.
 - Avoidance of any temporary or fixed installation into the watercourse.
 - Systems and abstraction rates must make full consideration to appropriate levels of CAR authorisation (GBRs, registration and licensing) and any specific requirements under these authorisations.

- All installation works including 'finishing', to be carried out in a manner and in site conditions, which will prevent consequential risk of water pollution from associated access, earth works and residues (including excavated materials).
- Groundworks. Employ safe working practices and limit disruption to the watercourse (Box 3). Site any excavated material away from the watercourse during construction.
- Timing of installation. Care should be taken to avoid installation at times of poor weather and/or ground conditions.
- Siting drinking troughs in relation to abstraction point.
 - The distance and height to which troughs can be located will depend on establishing the pump performance characteristics
 - Once a system had been designed, it is important to make sure that the location of the drinking trough and subsequent poaching at the site does not create a new source of diffuse pollution.
- Maintenance. All systems should be checked on a regular basis to ensure that water is freely available in line with livestock demand.

Box 3 - Safe Working Practices – Applicable to all works, installations and activities

The installation of water abstraction systems associated with open watercourses gives rise to a number of risks related to the site and associated works. Specific risks should be assessed and protocols adopted to ensure and maintain safe working practices at all times.

It is the responsibility of the person/persons carrying out the works to ensure all appropriate guidelines and protocols are known and adhered to at all times.

The risks can include:

- Work carried out on sites in association with excavations and earth moving activities.
- Work carried out on sites in association with excavations where ground can be unstable due to the presence and/or proximity of running water.
- Work adjacent to deep and running water.
- Work associated with trenches.
- Work associated with the placement of fixed installations and assemblies in excavations.
- Poor weather conditions increasing risk of earth movement or flooding.
- Protection of excavations and works from unauthorised persons. Personnel must not enter the excavation at any time.

The arrangements described in this and associated documents are intended to be installed and finished, without any person entering any part of an excavation.

Further information

- Controlled Activities Regulations (CAR) - The Water Environment (Controlled Activities) (Scotland) Amendment Regulations 2013 www.legislation.gov.uk/ssi/2011/209/contents/made
- CAR Practical Guide; includes requirements for authorisation under CAR
www.sepa.org.uk/water/water_regulation/regimes.aspx
- Grazing Animals Project (2007). Watering stock on sites – information leaflet 13
www.grazinganimalsproject.org.uk/stock_management.html
- Papa Pump (version at July 2013) www.papapump.com.
- Sniffer (2002). Off stream water provision for livestock. Report number SR(02)01F
www.fwr.org/snifrprt.htm
- SRUC Technical Note TN 666. Alternative Watering for Field Grazed Livestock II – Pumping Systems.
www.fas.scot/publications/technical-notes/
- Farming and Water Scotland. Website hosting information on Alternative Watering plus a range of information to help reduce diffuse pollution risks.
www.farmingandwaterscotland.org

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