Water Use

Regulatory Method (WAT-RM-46)

Regulation of Animal Carcass Burial

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Copyright and Legal Information

Update Summary

Version	Description
v1	First issue for Water Use reference using approved content from the following documents: *RM_46_Carcass Burial270713post DC.doc*
v2	Now references BGS drift map for site selection
v2.1	Correction to Appendix 1, Note A

Notes

References: Linked references to other documents have been disabled in this web version of the document. See the References section for details of all referenced documents.

Printing the Document: This document is uncontrolled if printed and is only intended to be viewed online.

If you do need to print the document, the best results are achieved using Booklet printing or else double-sided, Duplex (2-on-1) A4 printing (both four pages per A4 sheet).

Always refer to the online document for accurate and up-to-date information.

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1. Introduction and Summary

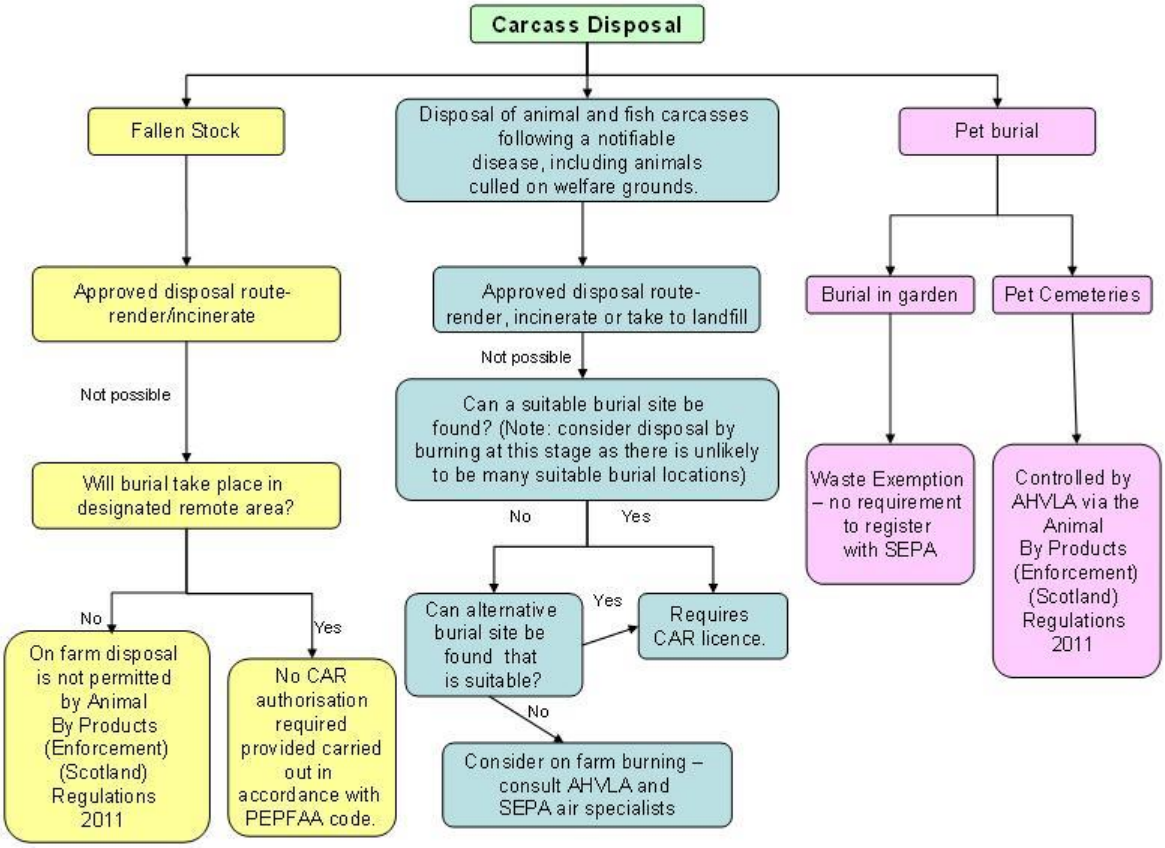
This guidance is intended to provide advice to SEPA staff on the disposal, by burial, of animal carcasses. This includes how this burial is regulated under the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) and the Animal By-Products Regulations. It covers the burial of:

- fallen stock (including routine fish farm mortalities);
- animal and fish carcasses following a notifiable disease outbreak;
- pets.

The flow chart below summarises the approach taken to the burial of carcasses falling into each type of category and is set out in more detail in the following sections.

The guidance does not cover the disposal to land of disinfectant and detergent washing used to clean farm building after a disease outbreak. This can be found in *WAT-RM-33: Disposal to Land - New Applications*.

Figure 1 Summary of disposal options and legislative control required



2. Regulating the Burial of Fallen Stock

The routine burial of fallen stock is not generally permitted by the Animal By-Products Regulations (ABPR). This is because these regulations only permit the on-farm disposal of fallen stock within the designated remote area and only then where no other approved disposal route (i.e. rendering or incineration) is available. The Scottish Islands, including mainland Orkney, and most of the Highlands including Caithness, Sutherland, Easter Ross and the Black Isle have been classified as "the designated remote area" and this area is shown in the *PEPFAA Code of Good Practice* and as a map in *Animal By-Products Disposal Guidance*. Fallen stock may also be buried where access would only be possible under circumstances (related to geographical or climate reasons or due to a natural disaster) which would pose a health and safety risk to the personnel carrying out the collection or where access would necessitate the use of disproportionate means of collection.

A CAR authorisation is not required to bury fallen stock[1] provided the PEPFAA code is followed.

Local Authorities (LAs), SGRPID and Animal and Plant Health Agency (APHA) hold the enforcement responsibilities for various aspects of the ABPR.

Where SEPA have reason to believe that good practice is not being followed or fall outwith the ABPR, then we must inform APHA.

The burial of wild animals or parts of wild animals, e.g. gralloch (the entrails of a dead deer) are not subject to the Animal By-Products Regulations although the potential impact of this activity can be considered using similar principles to those described for fallen stock.

[1] Note that the numbers of animals requiring burial may vary seasonality (e.g. ewe deaths peak during lambing).

3. Regulating the Burial of Animal Carcasses Following a Notifiable Disease Outbreak

The burial of animal carcasses following a notifiable[2] disease outbreak should only be considered where rendering, incineration or landfilling options are not possible. This burial requires an authorisation under the emergency provisions of the Water Environment (Controlled Activities) (Scotland) Regulations.

Due to the hydrogeological conditions in Scotland it is unlikely that many suitable burial sites will be found. **A CAR authorisation is therefore unlikely to be granted in many cases and burning the animal carcasses may be a better environmental option**.

In the event of a notifiable disease outbreak, on-farm burial or burning is permitted under the ABPR. All animals caught up in the disease outbreak are eligible to be culled and buried/burnt on farm (this will include cast ewes, even if they are not infected, but are within the disease outbreak zones and culled upon suspicion or contiguous culling).

APHA is responsible for the disposal of carcasses from infected premises; they will choose the disposal method and take responsibility for this. However, they will liaise with the Local Authority, Police and SEPA staff in coming to that decision. The NDDC (National Disease Control Centre) will coordinate the task of finding disposal capacity.

If carcase burial is planned an APHA representative (or another suitable person) must apply to SEPA for a CAR authorisation which will be fast tracked using CAR emergency provisions. The SEPA staff member authorising the disposal (usually a member of the Compliance and Beyond Team) should liaise with the Water Resource Unit, who will provide scientific advice where needed. Guidance on the fast track licensing process is provided in Annex 1.

If, as a result of movement restrictions arising from an outbreak, animals have to be culled on welfare grounds due to insufficient feed, bedding or housing, farmers will need to organise carcass disposal themselves with advice from AHPA and SEPA and an application for a CAR authorisation will need to be made by the farmer/landowner.

APHA will also use approved disinfectants at the affected premises in controlling the spread of disease. Information on the management of slurry can be found in *Contingency Plan for the Outbreak of a Notifiable Disease*. Information on the disposal to land of disinfectant and detergent washing used to clean farm building after a disease outbreak can be found in *WAT-RM-33*.

A CAR licence will include conditions relating to site engineering, leachate management and ongoing monitoring of the water environment. Where the burial is <50 tonnes SEPA will expect the site to be engineered so that there is leachate management, capping, basal drainage and gas management in place. In addition to this SEPA will expect engineered containment for burials >50 tonnes.

[2] Information on the diseases classed as “notifiable” may be found in*Notifiable Diseases in Animals*. The more common notifiable diseases include foot and mouth, avian influenza, swine fever and scrapie. In most cases an outbreak will result in mass culling of affected animals.

4. Pet Burial

The burial of a dead domestic pet in the garden of a domestic property where the pet lived is subject to a waste exemption and does not need to be registered with SEPA. Therefore, SEPA will not normally control the private burial of individual pets or need to visit the site.

Larger scale burial of pets in pet cemeteries is regulated by APHA. Further guidance is available on the *Animal and Plant Health Agency* website.

Annex 1: Fast Track Licensing – Notifiable Disease

Table 1 and the accompanying notes set out the process of how to deal with a fast track CAR application for carcase burial in the event of a notifiable disease.

Table 1 Fast track CAR application process for carcase burial in the event of a notifiable disease

Step 1: Initial Assessment		
Discussion with applicant		
1.1	Can burial be avoided?	If "yes" then no further consideration required. If "no" then proceed to step 1.2
1.2	Can a potentially suitable site be found: • areas that are covered by superficial deposits (see note A), are >50m from surface waters and >250m from abstractions • site previously identified in a PPC contingency plan for a notifiable disease?	If a potentially suitable site is identified move to step 2. If not application need not be continued. An alternative disposal method should be considered.
Step 2: Desk Study		
Applicant completes as far as possible the carcass burial application form using desk based information. They must confirm the number and types of carcasses and any other equipment to be buried as a result of disease control measures. Applicant does not undertake site investigation.		
2.1	Check the site meets the minimum requirements in Box1 (see note B).	If a potentially suitable site is identified move to step 3. If not application need not be continued. Alternative disposal method should be considered.
2.2	Consider suitability of any disposal of non-animal carcasses e.g. potential damage to any containment or control measures.	
Step 3: Site Investigation		
Applicant completes application form using site inspection/further investigation to confirm details including the proximity to water features and via digging at least 3x5m deep trial pits.		
3.1	Check if the site meets the minimum requirements in Box1 (see note B).	If <50 tonnes (see note C) and a suitable site a CAR licence will be issued (see note D). If >50 tonnes (see note C) and potentially suitable move to step 4. If site not suitable go to step 5.
3.2	Confirm details of site engineering including leachate management, capping, basal drainage and gas management and that it complies with the guidelines in Annex 3.	

Step 4: Further Risk Assessment for sites >50 tonnes		
4.1	Confirm details of engineered containment are suitable for disposals >50 tonnes (see A3.2 of Annex 3).	If site is suitable CAR licence will be issued (see note D).
4.2	Pass details to Water Resource Unit to determine if risk to water environment is acceptable. A simple quantitative assessment using data in Annex 2 along with site specific information in the application form will be undertaken.	If site not suitable go to step 5.
Step 5: Determination		
Applicability of Exemption (see note E)		
5.1	Can a pyre be constructed and operated following SEPA guidance on pyre construction and is it considered that the risks to human health or the environment posed by pyres are less than that from burial?	If yes, disposal by burning should be undertaken. A CAR application is not required (see note F). If no, a CAR licence will be issued (see note D).

Note A. Map of potentially suitable areas

Area with no superficial deposits can be found on the BGS 1:50k superficial deposits map *https://map.environment.gov.scot/sewebmap/*

Information on abstractions can be obtained from local knowledge and the DWQR map *https://dwqr.scot/private-supply/pws-location-map/*

Information on authorised abstractions can be obtained from SEPA.

Note B. Minimum site requirements

Box 1 Guidelines for the identification of possible suitable burial sites as identified by the farmer*

A burial site must **not** be located as a minimum:within 250 metres of any well, borehole or spring used for abstraction; (check any local by-laws);

- within 250 metres of any drinking water supply;
- within 50 meters of any watercourse, wetland etc;
- within 10 meters of a field drain;
- in areas where the water table is close to the surface, such as, low lying or boggy ground;
- in areas where the soils are highly permeable, for example, sands and gravels;
- in areas where the soils are of low permeability, for example, clay;
- in areas where the land is prone to flooding.

There must be at least two metres of unsaturated soils below the base of the pit (confirmed by trial pitting where necessary) and one metre of soil covering the carcasses. So, depending on what needs to be buried, any proposed location would need to have nearly 3.5m of unsaturated soils before it is suitable. In some locations, this will rule out burial or severely limit the number of carcasses that can be buried. Note that in summer or drought conditions a safety factor is required when determining the thickness of the unsaturated soils and a therefore a thickness of 5m of unsaturated soil below the groundwater surface may be required at these times.

*Adapted from *Contingency Plan for the Outbreak of a Notifiable Disease*

Note C. 50 tonnes equivalents (average)

Cattle

Dairy cow	77
Beef cow	100
Calf	500
Store cattle	125
Finishing cattle	100

Pigs

Maiden gilt	385
1 sow & litter	222
Weaner	2778
Growers, dry meal	1429
Light cutter, meal fed	588
Baconers	476

Poultry

Laying hen	22727
Broiler places	22727
Broiler breeders	14706
Replacement pullets	31250

Sheep

Sheep	1575

Cattle, poultry and pigs figures adapted from *PEPFAA Code of Good Practice*. Sheep figures based on data in *Foot & Mouth Disease Epidemic. Disposal of culled stock by burial: Guidance and Reference Data for the Protection of Controlled Waters April 2003*)

Note D. CAR licence

A CAR licence will contain conditions on site engineering, ongoing maintenance, leachate management and water monitoring.

Note E. Determination of applicability of exemption

Very few sites in Scotland are likely to be suitable for large scale carcass burial. However, where other disposal options are not feasible and a location which will fully protect the water environment can't be found then the burial may take place under the terms of an exemption from the CAR requirement to take all measures necessary to prevent and limit the input of pollutants to groundwater. In these cases the best possible burial location should be found, appropriate engineering, leachate management and monitoring of the site should be put in place. Any decision must be made by Compliance and Beyond following advice from the Water Resource Unit and other relevant specialists.

Information gained from the 2001 foot and mouth disease outbreak indicates that pyres did not have an adverse impact on human health or the environment. For example, pollutants were either lower than air quality standards or within the range of urban background standards. The impacts from burial were also low. This was thought to be due to careful burial site selection by the Agencies. However, there were some incidents of water pollution recorded as a result of burial, some water supplies were disrupted and complaints of odour were received. This information suggests that provided best practice is followed in the siting and operation of pyres that in general pyres pose a lower risk to human health and the quality of the environment as a whole than burial. It is perhaps also worthy to note that pyres have a short term effect while the impacts from burial may take many months to become apparent and are likely to persist for many years.

For this reason where a carcass burial site is likely to cause pollution of the water environment a CAR authorisation should only be issued where:

- Any unacceptable risks to the water environment can be mitigated by sustainable artificial means (e.g. liner) or
- Burning is not a better environmental option because:
  - a pyre cannot be constructed and operated following SEPA Guidance on pyre construction. (Described in *Contingency Plan for the Outbreak of a Notifiable Disease*, Section 10)
  - the risks to human health and the environment as a result of the burial and pyres have been evaluated (e.g. likelihood of pollution to groundwater (including water supplies) verses populations effected by air emissions from pyres) and it is considered that the risks to human health or the environment posed by pyres are greater than that from burial.

Note F. Disposal of Ash

If incineration on farm is carried out following a notifiable disease them the ash should be collected and stored pending disposal at an appropriate landfill.

Annex 2: Quantitative Assessment Input Parameters

Table 2 Default Values for Hydrogeological and Contaminant Properties

Description	Values		Comment
Hydraulic conductivity (K)	m/s	m/d	Typical aquifer type
High	>1.16E-04	10	Gravels
Moderate	>1.16E-05	1	Intergranular flow sandstone, sand and gravel
Mod. Low	>1.16E-06	0.1	Silty sand, fracture-flow sandstone
Low	>1.16E-07	0.01	Sandy clay,
Very Low	>1.16E-08	0.001	Silt
	<1.16E-09	0.0001	Silty clay, till, 'hard' rock,
Hydraulic gradient (i)			
Range of likely values			
High	>0.1		**Note: high hydraulic gradient and high K are not likely to be found together**
Mod. High	>0.01		
Moderate	>0.05		
Mod. Low	>0.001		
Low	>0.0005		
Very Low	>0.0001		
Infiltration Rate			
Low		0.000411	Equivalent to 150 mm/yr
Moderate		0.000548	Equivalent to 200 mm/yr
High		0.000822	Equivalent to 300 mm/yr
Mixing Zone			
Thickness			Equal to aquifer thickness if aquifer <5 m thick or 5 m elsewhere
Dispersivity			Use Xu and Eckstein but reduce vertical dispersivity in thin aquifers.
Partition coefficients for Ammoniacal Nitrogen			
Lithology	Min	Max	
Coal Measures clay	0.018	0.18	

Sand and gravel (no fines)	0	0.9	
Sand and gravel (fines)	0.4	0.9	
Boulder clay (cohesive)	2	4	
Engineered clay	0.1	5	
Effective Porosity (dimensionless)	Min	Max	
Surface soils	0.2	0.5	
Sub soils	0.2	0.3	
Intergranular aquifer (sandstone)	0.2	0.3	
Fissured aquifer	<0.01	0.04	
Bulk Density (g/cm3)	Min	Max	
Value	1.3	2.3	Related to porosity (high porosity gives low bulk density and vice-versa)
Partition Coefficient for Avian Flu Virus (l/kg)			
No reliable data – use Koc value for naphthalene (1300) and foc of 0.1%		1.3	Check for latest guidance – this is an area of active research.

Table 3 Default values for source terms

Source Term Leachate quality from bird carcasses	Value	Unit	Comments
Ammoniacal Nitrogen	1000-7000, Mean, 4000	mg/l	From Cumulative Nitrogen and Phosphorus Loadings to Groundwater, ENTEC, 2010
Avian bird flu total	1.00E+18	virus /tonne	From Avian influenza reference guide*
Avian bird flu released per year	1.00E+17	virus/ tonne /year	Assumes 10% of total virus released per year over 10 year period Avian influenza reference guide*
Density	0.6	Tonnes/m 3	Based on information from FMD disposals based on porosity of 30% and carcass density of 0.9 tonnes/m^3 - should be checked on site
Fate			
Virus half life	75	Days	Conservative value for UK conditions from Avian influenza reference guide*
Virus Partition coefficient (koc)	1300	l/kg	Assumes viral transport can be described using partition coefficients for naphthalene. This assumption should be checked against latest guidance.

**Avian Influenza Reference Guide* Version 1.0 2006 (EA code: LIT 3143), Environment Agency (www.environment-agency.gov.uk/)

Table 4 Rate of Release of Ammoniacal Nitrogen and Avian Flu Virus

Rate of release Year	NH4 (kg/ tonne)	NH4 as N	Avian Flu Virus numbers / tonne[4]	
1	2.9	2.26	1.00E+17	No available information for bird disposals NH4 values based on Cumulative Nitrogen and Phosphorus Loadings to Groundwater, ENTEC, 2010 Birds are likely to degrade faster as they are much smaller and therefore have a high surface area to volume ratio
2	1.2	0.93	1.00E+17	
3	0.6	0.47	1.00E+17	
4	0.3	0.23	1.00E+17	
5	0.2	0.16	1.00E+17	
6	0.1	0.08	1.00E+17	
7	0.1	0.08	1.00E+17	
8	0.1	0.08	1.00E+17	
9	0.1	0.08	1.00E+17	
10	0.08	0.06	1.00E+17	

Annex 3: General site engineering

A3.1 General precautions

The guidelines below apply to the burial of animal carcass following a notifiable disease outbreak (whether less than or greater than 50 tonnes):

- Leachate management and its disposal are important considerations as a large amount of fluids are released from carcasses, particularly in the first few months following burial. This will be especially important for sites in low permeability ground. Note that capping is likely to result in squeezing of fluids from carcasses and an initial increase in leachate levels.
- Subsurface field drains within 10m of the boundaries and hydraulically down gradient of the burial pit should be removed.
- Capping should allow for subsidence of the buried carcasses and may need to be restored where surface depressions have formed. It should also have a lower permeability than the base of the site to prevent leachate build up and should be sufficiently robust to avoid impact from vermin.
- The base of the burial pit should ensure even drainage e.g. include a layer of crushed stone.
- Gas management should be considered. Note that gas management may be difficult to enforce under CAR unless a direction is issued by the Scottish Government. However, if the burial site is causing a nuisance or poses a risk to health the local authorities have powers under the Environmental Protection Act 1990 Part III (and amended by the Public Health (Scotland) Act 2008). Further information is available on the Scottish Government website under *Statutory Nuisance*. The Health and Safety Executive would have powers where emissions are posing a threat to life.

A3.2 Engineering for disposals of >50 tonnes

For large burials (greater than 50 tonnes) engineered containment will be required.

The table below provides some guidelines on the engineering measures likely to be required. These will need to be considered on a site specific basis and designed by an experienced geotechnical engineer.

Table 5 Engineering measures required for burial >50 tonnes.

Engineering Measure		Requirements
Supervision and QC		An experienced geotechnical engineer should be involved in the design and construction of the works. There is unlikely to be time for QC testing and this can be done at a later date if possible. If possible a brief method statement should be produced before burial starts.
Leachate disposal/treatment/storage		This should be established prior to burial with contingencies in place
Site preparation		Site specific e.g. remove sand lens and drains. Installing drainage to minimise infiltration of surface run-off.
Liner type	Natural/enhanced in-situ containment	Site investigation to determine conditions of subsurface necessary. Enhancement may be required e.g. digging out sand lens, or compaction of base.
	Engineered clay liner	Thickness should be 0.5-1m on base and sides. Clay should be from well characterised source, be compacted wet, be in a plastic state and strong enough to be trafficked over (e.g.>40KPa). Samples should be taken to confirm permeability (can be reported later).
	Geosynthetic Clay Liner (GCL)	These are good where time is limited and easy to install. To be installed in line with manufacturers specifications There should be adequate protection for puncture e.g. geotextile protection, especially where a crushed stone or angular aggregate is to be used as the drainage layer. The liner must be hydrated with clean water after installation of drainage layer and before carcasses are deposited.
	Flexible membrane liners (FMLs)	Welds should be tested both constructively and destructively on site. Manufacturers data sheets should be provided. Factor welded thinner, more flexible products could be used if protected from puncture to speed up works.
Drainage layers		Basal gradient should be sufficient to promote flow of leachate to collection point for extraction To avoid clogging a full basal drainage blanket should be installed with perforated pipe within the blanket and a sump for pumping and monitoring. Consideration should be given to side slope drainage. Recommended stone drainage layer min 300mm thick, preferably 500mm using competent stone of min 16mm diameter. Drainage layer and pipe collection system should be chemical resistant and have sufficient strength to withstand loading and cope with predicted flow rates.
Capping		Cap as early as possible. Due to settlement consider initial temporary cap (e.g. geosynthetics) followed by permanent cap. Should be shaped to allow surface water run-off. Gas management systems should be considered. Final cap should be in line with that for a normal landfill. Geosynthetics may require protection.
Monitoring		For very large sites or where there is doubt or concern about risks to receptors monitoring may be required as a condition of the authorisation. This may include drilling monitoring boreholes, but more commonly monitoring existing receptors such as springs, groundwater fed ditches/watercourses or water supplies.

Annex 4: Potential Environmental Impacts

Carcasses release breakdown products following burial which can infiltrate through the soil and subsoil into groundwater. This can cause groundwater pollution, may give rise to impacts on dependent rivers or wetlands and pose a threat to drinking water supplies. It is therefore essential that potential environmental impacts are considered and minimised.

Information on the decomposition of animal carcasses suggests that there is rapid fluid generation (within 48 hours) equating to 170 litres per cow and 16 litres per sheep (50% within 1 week and remainder within 2 months).

As there is no absorptive capacity within the waste, the generated leachate may rapidly migrate into groundwater in the days following disposal. After the initial couple of months the leachate production will be more closely related to the infiltration rate through the cap. The carcasses may have fully decomposed after about 10 years.

Initial leachate from burials will be rich in ammonium, (typically 2,000 - 4,000 mg/l expressed as N) and potassium, (400 - 1,500 mg/l as K+) with a very high COD (30,000 - 200,000 mg/l). Initial pH is neutral to slightly acidic.

There is little evidence from the 2001 FMD outbreak that sheep dip chemicals are present in leachate generated at mass disposal sites that have received sheep carcasses. This may in part be due to the outbreak occurring sometime after the autumn dipping.

In addition to polluting substances there is a risk of transmission of pathogens via groundwater to sensitive receptors. While assessors should assume that the foot and mouth and avian flu virus are persistent in water, a 50 day travel time in groundwater should be sufficient to provide a high degree of protection to receptors for these and most other pathogens. (While accurate at the time of production of this guidance, there may be more up to date information regarding risks from pathogens and advice should be sought from the relevant authorities in the event of a disease outbreak.)

References

NOTE: Linked references to other documents have been disabled in this web version of the document.

See the Water >Guidance pages of the SEPA website for Guidance and other documentation (www.sepa.org.uk/regulations/water/guidance/).

All references to external documents are listed on this page along with an indicative URL to help locate the document. The full path is not provided as SEPA can not guarantee its future location.

SEPA Internal Documents

WAT-PS-10-01: Assigning Groundwater Assessment Criteria for Pollutant Inputs

WAT-RM-33: Disposal to Land - New Applications

WAT-RM-49: CAR 2011 Emergency Provisions and Accelerated Determination

Reference Documents

Animal and Plant Health Agency APHA (https://www.gov.uk/)

Animal By-Products Disposal Guidance Scottish Government (www.gov.scot)

Avian Influenza Reference Guide Version 1.0 2006 (EA code: LIT 3143), Environment Agency (www.environment-agency.gov.uk/)

Biosecurity Guidance for SEARS Staff (Internal SEPA Doc No: ATT/04/03)

Cemeteries and burials: prevent groundwater pollution (https://www.gov.uk)

Contingency Plan for the Outbreak of a Notifiable Disease, Section 10: Carcass disposal, SEARS (https://www.gov.scot)

Exotic Diseases of Animals: Contingency Framework Plan Oct 2017 Scottish Government (https://www.gov.scot)

Notifiable Diseases in Animals APHA (www.gov.uk/)

PEPFAA Code of Good Practice Prevention of Environmental Pollution From Agricultural Activity, Scottish Government (www.gov.scot/)

Statutory Nuisance Scottish Government (www.gov.scot)

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