



# The Environment Agency's approach to groundwater protection

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We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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# Foreword

This document updates *Groundwater protection: Principles and practice (GP3)*. It contains position statements which provide information about the Environment Agency's approach to managing and protecting groundwater. They detail how the Environment Agency delivers government policy for groundwater and adopts a risk-based approach where legislation allows. Many of the approaches set out in the position statements are not statutory but may be included in, or referenced by, statutory guidance and legislation.

This document will be of interest to developers, planners, environmental permit applicants and holders, abstractors, operators and anyone whose current or proposed activities have an impact on, or are affected by groundwater. Each section is focused on different activities or sectors.

Environment Agency staff will use these position statements as a framework to make decisions. This clear approach aims to remove uncertainty and potentially inconsistent decision-making.

The Environmental Permitting (England and Wales) Regulations 2010 (EPR) require [permitting of activities](#) that may lead to the input into groundwater of [hazardous substances](#) or [non-hazardous pollutants](#). Groundwater resources are primarily managed by [abstraction licensing](#).

The primary aim of all of the position statements is the prevention of pollution of groundwater and protection of it as a resource. Groundwater protection is long term, so these principles and position statements aim to protect and enhance this valuable resource for future generations.

## Important note

The Environment Agency may, under the right circumstances, consider a relaxation from a position statement – if this is supported by suitable evidence and a risk assessment. Any local decision would not set a precedent for the general application of the position statements. You should always discuss any proposals that conflict with a position statement with the Environment Agency first.

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# A. General approach to groundwater protection

Section A covers the overarching groundwater protection principles and approaches that will apply to the activities described in later position statements. Section A should be referred to first before reading the sector-specific position statements.

## A1 - Risk-based approach

Wherever legislation allows, the Environment Agency will use a tiered, risk-based approach to regulate activities that may impact groundwater resources and to prevent and limit pollution.

## A2 - Precautionary principle

Development must be appropriate to the sensitivity of the site. Where the potential consequences of a development or activity are serious or irreversible the Environment Agency will adopt the [precautionary principle](#) to manage and protect groundwater. The Environment Agency will also apply this principle in the absence of adequate information with which to conduct an assessment.

## A3 - Risk-based approach

The Environment Agency encourages everyone whose activities may impact upon groundwater to consider the [groundwater protection hierarchy](#) in their strategic plans when proposing new development or activities. The aim is to avoid potentially polluting activities being located in the most sensitive locations for groundwater. A sensitive location with respect to groundwater would depend on the hazard from the proposed activity and importance of the receptor.

## A4 - Responsibility for assessments

The Environment Agency expects developers and operators to assess the area of influence of their activities and to take account of all current and future groundwater uses and dependent ecosystems. Developers and operators are expected to assess and mitigate the potential impact on groundwater, throughout planning, construction, operation, and decommissioning phases of the development or operation.

## A5 - Supply of adequate information

The Environment Agency expects developers and operators to provide adequate information to statutory bodies, including the Environment Agency, when submitting their proposals. This is so that the potential impact on groundwater resources and quality can be adequately assessed. In particular, where new techniques, operations, products or substances are involved, developers or operators should be prepared to supply specific relevant data to allow the risk to groundwater to be assessed.

## A6 - Compliance with guidance

The Environment Agency expects site owners, developers and operators to comply with any relevant:

- government or Environment Agency guidance
- other standards and guidance, eg British Standards, International Organisation for Standardisation (ISO)

This applies particularly to the handling, use, storage and treatment of substances that can potentially result in pollution of groundwater.

### A7 - Enforcement

If necessary, the Environment Agency will use its powers to serve notices:

- to prevent or stop unacceptable inputs to groundwater arising from an activity that is not subject to a permit, or
- to require a permit.

In the event of actual pollution, the Environment Agency will consider whether the operator is complying with any relevant government guidance before taking further action.

### A8 - Building and decommissioning of structures

During development or backfilling of any shaft, well, borehole, tunnel or adit, to prevent pollution or loss of water resources, the Environment Agency expects operators to adopt appropriate engineering standards.

If you discover any contamination during decommissioning or related work you should deal with it in accordance with the position statements on [land contamination](#).

### A9 - Restoration of groundwater

Where existing groundwater conditions have been adversely affected by human activity so that pollution or over abstraction has occurred, the Environment Agency aims to ensure that any new development, abstraction or discharge will seek to restore and improve groundwater to natural conditions.

# B. Protection of water intended for human consumption

This section contains the position statements on [source protection zones \(SPZs\)](#), areas identified as [Drinking Water Protected Areas \(DrWPAs\)](#) and [aquifer designations](#). The Environment Agency adopts a risk based approach using a hierarchy of SPZs, DrWPAs and aquifer designations.

The Environment Agency may object in principle to, or refuse to permit, some activities or developments if they have potential to adversely affect groundwater. However, note that SPZs and aquifer designation are not site-specific risk assessments. The Environment Agency uses them as generic indicators of risk. Developers or operators may need to supply site specific information to demonstrate that the risks are acceptable and can be mitigated.

SPZs are not statutory designations but recognised within EPR as zones where certain activities cannot take place (for example, in certain standard rule permits specified activities are not permitted under those roles).

All abstractions, including [private water supplies](#), that are used for drinking water supply or food production purposes are by default in an SPZ1 or SPZ2. Table 1 indicates the position statements (including restrictions or extra controls) applicable to certain activities within a SPZ1, including default zones used for private water supplies. If you undertake any activity in SPZ1 you should refer to the relevant position statement.

Note: Local councils are the lead regulators for private water supplies. The pollution prevention responsibilities for private water supplies are available from the [Drinking Water Inspectorate](#). Owners or users of any private water supplies should notify their local council of the supply.

For more information on SPZs, see the guidance on [SPZs designations](#). For more detailed information see [Groundwater SPZs: Review of methods](#). You can view [SPZs on interactive maps](#).

## B1 - Initial screening tools

The Environment Agency will use SPZs, DrWPAs and aquifer designations as initial screening tools to show:

- areas where it would object in principle to certain potentially polluting activities, or other activities that could damage groundwater
- areas where additional controls or restrictions on activities may be needed to protect water intended for human consumption
- how it prioritises responses to incidents

Note: For some high risk activities, the presence of an SPZ will be a deciding factor in the response to a development proposal or permit application. For other activities, additional investigation may show that a proposal is or is not acceptable regardless of the requirements set out in the position statements in this document.

## B2 - Designation of SPZs around groundwater abstractions

SPZs and the associated position statements apply to the area around any groundwater abstraction intended for human consumption, as defined in the [Drinking Water Directive 98/83/EC](#). However, for production of bespoke SPZs the Environment Agency have prioritised:

- public drinking water supplies
- other commercial potable supplies (including mineral and bottled-water)
- groundwater abstractions used in commercial food and drink production\*
- other sources where additional protection is required

\* This does not relate to groundwater that is used solely for the irrigation of crops.

### B3 - Default source protection zones for private water supplies

All groundwater abstractions intended for human consumption or food production purposes have a default SPZ1 with a minimum radius of 50 metres. In some cases depending on the volumes abstracted, a default SPZ2 with a minimum radius of 250 metres applies.

**Table 1. Summary of the position statements that apply to developments and activities in SPZ1**

Topic	Position statement
<b>Infrastructure</b>	<a href="#">C2 - Non-nationally significant infrastructure schemes</a> <a href="#">C4 - Transport developments</a> <a href="#">C5 - Pipelines and high voltage fluid filled cables</a> <a href="#">C6 - Underground coal gasification, coal bed methane and shale gas extraction</a> <a href="#">C7 - Oil and conventional gas exploration and extraction</a>
<b>Storage of pollutants</b>	<a href="#">D2 - Underground storage (and associated pipework)</a> <a href="#">D3 - Sub water table storage</a>
<b>Landfill</b>	<a href="#">E1 - Landfill location</a>
<b>Non-landfill waste activities</b>	<a href="#">F1 - Non-landfill waste activities</a>
<b>Discharge of liquid effluents into the ground</b>	<a href="#">G2 - Sewage effluent discharges inside SPZ1</a> <a href="#">G4 - Trade effluent and other discharges inside SPZ1</a> <a href="#">G6 - Cesspools and cesspits</a> <a href="#">G8 - Sewerage pipework</a> <a href="#">G12 - Discharge of clean roof water to ground</a> <a href="#">G13 - Sustainable drainage systems</a>
<b>Diffuse sources</b>	<a href="#">H6 - Landspreading</a> <a href="#">H7 - Livestock housing</a> <a href="#">H8 - Storage of organic manures on farms</a>
<b>Cemetery developments</b>	<a href="#">L1 - Siting cemeteries close to a water supply used for human consumption</a> <a href="#">L2 - Mass casualty emergencies</a> <a href="#">L3 - Cemeteries: protecting groundwater in highly sensitive locations</a>
<b>Burial of animal carcasses</b>	<a href="#">M1 - Burials close to water supply used for human consumption or farm dairies</a> <a href="#">M2 - On-farm carcass burials</a> <a href="#">M3 - Risk-based approach</a> <a href="#">M4 - Animal carcasses: protecting groundwater in highly sensitive locations</a>
<b>Managing groundwater resources</b>	<a href="#">N8 - Physical disturbance of aquifers in SPZ1</a>





## C. Infrastructure

The position statements in this section are specifically tailored to cover the infrastructure developments listed below, but the Environment Agency will apply them to any new infrastructure or technologies not specifically identified here where there is a significant potential for groundwater pollution.

Specific infrastructure developments are as follows:

- transport infrastructure such as major roads, railways, airports, industrial parks and large parking areas for commercial vehicles
- tunnels
- oil and other pipelines, fluid-filled electricity cables, substations and infrastructure
- oil industry facilities associated with oil exploration, production, manufacturing (including refineries), distribution (including pipelines) and storage
- industrial activities storing and handling significant quantities of hazardous substances
- petrol and/or diesel retail filling stations
- large-scale agricultural developments
- underground coal gasification (UCG), coal bed methane (CBM) and shale gas exploration and extraction

The development of these activities should be directed towards less sensitive groundwater locations.

There is no specific position statement in relation to car park location, but the Environment Agency encourages the use of sustainable drainage systems (see [section G](#) and [section N](#)) as the best means of managing the quality and quantity of run-off. However, it remains vital to pay close attention to commercial parking and hard standing areas where contaminated run-off could cause pollution of soils, surface or groundwater.

The Environment Agency can influence the siting and construction of many activities through its role as a consultee to the development planning process and via its role in permitting ([parallel tracking](#)) these activities.

If national need for the provision and location of major developments overrides Environment Agency objections, the Environment Agency will raise its concerns and make every use of environmental impact assessment in addition to other measures to achieve environmental protection. Where developments receive approval against Environment Agency advice, it will apply [section A - general protection position statements](#).

The planning system may not always be able to give the level of control over land use necessary for a high standard of groundwater protection. Many infrastructure developments also require an environmental permit or may be eligible for an exemption under EPR. The Environment Agency will apply a risk-based approach. Within SPZ1 there is a presumption against development that involves activities posing an inherent hazard to groundwater; where appropriate, the Environment Agency will oppose such new developments via the development planning system or refuse a permit application.

Where developments involve discharges to ground, please refer to [section G](#).

Regulated sites are also required to implement pollution prevention measures that must meet the requirements of [best available techniques \(BAT\)](#) and should set a standard of good practice. Where developments pose comparable levels of risk outside this regime, the Environment Agency will expect BAT principles to be applied. The Environment Agency is able to serve a notice to prohibit an activity altogether, where the risks and consequences of failure of good practice are unacceptable. This process runs in parallel to any planning response for new developments or change of use.

### C1 - Nationally or regionally significant schemes

The Environment Agency requires the promoters of schemes of national or regional significance to [protect groundwater](#) when choosing the location for their activity or development. In the cases where this

is not possible due to national or regional interests, the Environment Agency expects to be fully involved in the scheme development to mitigate groundwater risks via EPR where applicable. Promoters are expected (via the environmental impact assessment process) to identify all the potential pollution linkages and apply best available techniques to mitigate the risks.

## C2 - Non-nationally significant infrastructure schemes

In SPZ1 and SPZ2, the Environment Agency will only agree to proposals for infrastructure developments of non-national significance where they do not have the potential to cause pollution or harmful disturbance to groundwater flow or where these risks can be reduced to an acceptable level via EPR if applicable.

## C3 - On-going groundwater monitoring

Where a new infrastructure development presents a significant risk to groundwater, the Environment Agency may require a programme of groundwater monitoring to be designed, agreed, installed and undertaken to give early warning of any developing groundwater pollution and/or interference to groundwater flow. This programme may include off-site locations if necessary to identify pollution and to allow monitoring in the event that the site becomes inaccessible. Where appropriate, the Environment Agency will use its powers to require this at existing sites.

## C4 - Transport developments

When planning proposals are brought forward for major new road, rail or airport developments the Environment Agency will require that:

- drainage is via sustainable drainage systems (SuDS) designed and maintained to current good practice standards, including the provision of suitable treatment or pollution prevention measures. The point of discharge of such systems should normally be outside SPZ1 and ideally outside SPZ2
- where there is an existing or unavoidable need to discharge in SPZ1, the Environment Agency requires a detailed risk assessment to demonstrate that pollution of groundwater will not occur

See also position statements [G11](#) and [G12](#).

## C5 - Pipelines and high voltage fluid filled cables

The Environment Agency will normally object to pipelines or fluid filled cables that transport pollutants, particularly hazardous substances that:

- pass through SPZ1 or SPZ2 where this is avoidable
- are below the water table\* in principal or secondary aquifers

Where there is an existing or unavoidable need for pipelines or fluid filled cables to pass through SPZ1 or SPZ2, operators are expected to adopt BAT and operate in accordance with the [Energy Networks Association guidance](#).

Where existing pipelines or fluid filled cables are already below the water table or if the water level subsequently rises, the Environment Agency will work with operators to mitigate the risks. The Environment Agency will only agree to any redevelopment scheme with sub water table pipelines or fluid filled cables for the transport of hazardous substances where there are substantial mitigating factors.

When the opportunity to replace existing fluid filled cables in SPZ1 and SPZ2 arises the Environment Agency will work with the operators to agree the best environmental option.

The Environment Agency expects operators to carry out a site-specific risk assessment prior to the decommissioning of pipelines or fluid filled cables in SPZ1 and SPZ2. It will then work with operators to agree the best available environmental option.

Please note that this position statement applies to underground and on-ground cables but not aerial cables.

\* For the purposes of this position statement, the term 'water table' is taken to mean any laterally continuous groundwater including perched groundwater. Operators should consider the lifetime of the pipeline or cable in their assessment of the depth to groundwater.

Further position statements in [section D](#) may also apply.

## Onshore oil and gas activities

Hydraulic fracturing (or 'fracking') may be used in underground coal gasification (UCG), coal bed methane (CBM), shale gas extraction and in conventional hydrocarbon activities. It is used to increase the reservoir permeability and thus increase oil or gas production. Because of the potential impacts to groundwater, any hydraulic fracturing activity requires a permit from the Environment Agency under EPR.

Groundwater may under some circumstances be impacted by:

- pollutants in the injected fracture fluid
- the introduction or displacement of natural and introduced pollutants (including gas) during drilling or operation
- effects on groundwater flows

The withdrawal of water for example, from CBM operations, may depress groundwater levels in overlying aquifers over a large area and affect groundwater flow. Works at the surface may lead to inputs to groundwater (for example, from spillages and leakage through the drilling pad). The re-injection of waters arising from the extraction processes also has the potential to cause groundwater pollution and will therefore require a groundwater activity permit to manage and control the potential risks.

In view of the potential risks associated with exploration and production of both conventional and unconventional sources of oil and gas, it is essential operators apply the highest environmental standards so that groundwater pollution does not occur. Industry are encouraged to begin communications with regulators early to understand the appropriate planning and permitting controls.

In all cases, the Environment Agency will work with the relevant planning authority during the planning consultation process to ensure the necessary controls are put in place through the planning and permitting processes.

The use of permits, together with the controls available to other regulators (for example Department of Business, Energy & Industrial Strategy, Health & Safety Executive and local planning authorities) helps to provide the framework for this.

### C6 - Underground coal gasification (UCG), coal bed methane (CBM) and shale gas extraction

The Environment Agency will, where appropriate, work in partnerships on initiatives to facilitate development of sustainable sources of energy. However, it will normally object to UCG, CBM or shale gas extraction infrastructure or activity within a SPZ1. This includes subsurface SPZ1 areas which are confined by impermeable strata at the surface.

Outside SPZ1, the Environment Agency will also normally object when the activity would have an unacceptable effect on groundwater. Where development does proceed and where any associated drilling or operation of the boreholes/shafts passes through a groundwater resource, the Environment Agency expects [best available techniques](#) (BAT) and pollution prevention measures to be applied to protect groundwater.

The Environment Agency will expect a detailed hydrogeological risk assessment to be produced for any onshore oil or gas site activity. The assessment must include potential impacts to all groundwater which could be affected, such as any groundwater bearing strata even at depth. Mitigation measures to protect all groundwater will be expected to reflect the sensitivity of that groundwater and any associated receptors. The receptors may include drinking water sources, surface waters and wetlands; as well as the potential uses of deeper groundwater (for example, artificial storage and recovery or geothermal uses).

## C7 - Oil and conventional gas exploration and extraction

The Environment Agency will normally object to such hydrocarbon exploration, extraction infrastructure or activity within SPZ1, which will also include any subsurface SPZ1 areas which are confined by impermeable strata at the surface.

Outside SPZ1, the Environment Agency will also normally object when the activity would have an unacceptable effect on groundwater. Where development does proceed, the Environment Agency expects BAT and pollution prevention to protect groundwater to be applied where any associated drilling or operation of the boreholes passes through a groundwater resource.

The Environment Agency will expect a detailed hydrogeological risk assessment to be produced for any onshore oil or gas activity. The assessment must include potential impacts to all groundwater which could be affected, such as any groundwater bearing strata even at depth. Mitigation measures to protect all groundwater will be expected to reflect the sensitivity of that groundwater and any associated receptors. The receptors may include drinking water sources, surface waters and wetlands as well as the potential uses of deeper groundwater (for example, artificial storage and recovery, or geothermal uses).

Where oil and gas activities already exist, the Environment Agency will work with operators to assess and if necessary mitigate the risks. It will normally object to any redevelopment scheme involving retention of oil exploration, extraction infrastructure or activity within SPZ1 unless there are substantial mitigating factors.

# D. Pollutant storage and transmission

The position statements in this section apply to:

- industrial activities involving storing and handling significant quantities of [hazardous substances](#)
- petrol and/or diesel retail filling stations
- fuel storage and dispensing facilities used for transport infrastructure (for example, associated with airports, railways or ports), emergency services or large machinery or plant (for example, at mines and quarries, road haulage/bus and coach depots)
- storage and handling of hazardous substances and other pollutants that present a significant and on-going potential for groundwater pollution through accidents, vandalism, theft, poor practice, and the deterioration of storage vessels and associated infrastructure such as pipelines

The Environment Agency has a statutory role to ensure hazardous substances are prevented from being released into groundwater and the input of non-hazardous pollutants is limited so as to not cause pollution.

The Environment Agency expects relevant government guidance and relevant industry standards to be complied with as a minimum. Higher levels of protection may be needed in more vulnerable groundwater locations.

The Environment Agency recognise that some sectors, such as petrol retailing, have made considerable improvements to the standards of underground storage, and will reflect that in its approach.

## Storage of radioactive substances

The storage of radioactive substances on sites licensed under the Nuclear Installations Act 1965 is regulated by HSE's Office for Nuclear Regulation (ONR) and not the Environment Agency. Therefore, this guidance does not apply to such storage. The ONR expects licensees to protect groundwater by complying with the relevant nuclear site licence conditions. Under these circumstances the Environment Agency requires the operator to take all necessary and reasonable measures to prevent inputs of hazardous substances to groundwater.

## General principles – all storage facilities

### D1 - General principles of pollutant storage and transmission

You must design and maintain storage and transmission facilities, such as tanks, lagoons and pipework, in such a way that hazardous substances are prevented from being released to the environment and the input of non-hazardous pollutants to groundwater is limited so as to not cause pollution. The Environment Agency expects operators to adopt appropriate engineering standards, taking into account the nature and volume of materials stored and the sensitivity of the groundwater. For petrol filling stations, systems should meet the specifications within the accepted industry standards in design, construction and operation ([Blue Book](#)).

Where the Environment Agency judges there to be an unacceptable risk to groundwater from the storage of pollutants or their transmission through associated pipework, it will normally oppose such storage or transmission. If other material planning considerations determine that the development should proceed, the Environment Agency expects [best available techniques](#) (BAT) to be applied.

Where storage already exists the Environment Agency will work with operators to assess and if necessary mitigate the risks to groundwater, with an aim to meet the objective set by this position statement. Re-use of existing facilities for new applications must be accompanied by a thorough assessment to demonstrate that the facilities are adequately designed and fit for purpose for the proposed new use, and that there will be no unacceptable input of pollutants to groundwater.

## Existing facilities

Hazardous substances stored in SPZ1 are of particular concern because of potential consequences to supplies of water abstracted for domestic or food production purposes. The Environment Agency expects

operators of existing storage and transmission facilities to reduce the risk of groundwater pollution as far as practicable and reasonable, by making improvements to:

- minimise the likelihood of a release
- be able to identify and stop a release as soon as it occurs
- adopt accepted industry standards in design, construction and operation (eg [Blue Book for filling stations](#))
- have effective environmental management, maintenance and monitoring systems in place

Operators must decommission, replace or effectively repair at the earliest opportunity any facilities that leak or are at risk of causing the input of hazardous substances or non-hazardous pollutants to groundwater. Operators may also require an environmental permit to continue their operations or may be subject to a prohibition notice to stop operations if the risk is unacceptable. Operators have a responsibility to investigate, assess and mitigate the impact caused by any leaks or spills. This may result in a requirement for the remediation of the groundwater and surrounding soils along with robust monitoring programmes.

## New Facilities

The Environment Agency will oppose any new development involving large-scale above or below ground storage of hazardous substances (as may occur at a chemical works or at a petrol filling station) within SPZ1. Position statements D1 to D4 apply for all developments.

## Underground storage

### D2 - Underground storage (and associated pipework)

The Environment Agency will normally object to new and increased underground\* storage of hazardous substances in SPZ1.

The Environment Agency will agree to such storage in principal and secondary aquifers outside SPZ1 only if there is evidence of overriding reasons why the:

- activity cannot take place within unproductive strata
- storage must be underground (for example public safety), in which case it is expected that the risks are appropriately mitigated

Where such storage already exists the Environment Agency will work with operators to assess and if necessary mitigate the risks, including an aim to change to above ground storage.

The Environment Agency will normally object to any redevelopment scheme involving retention of underground storage of hazardous substances in SPZ1 unless it can be demonstrated that risks to groundwater can be adequately mitigated.

For all storage of pollutants underground (hazardous substances and non-hazardous pollutants), the Environment Agency expects operators to adopt appropriate engineering standards and have effective management systems in place. These should take into account the nature and volume of the materials stored and the sensitivity of groundwater, including the location with respect to SPZs.

\* Underground storage constitutes storage whereby the tank is not wholly visible on a permanent basis and is not wholly accessible from ground level. Any tank that is partially set in the ground in a secondary containment and is totally accessible and wholly visible will be considered to be an above ground tank. Any oil storage tank that is not wholly underground will need to comply with the [Oil Storage Regulations](#).

The Environment Agency adopts the [precautionary principle](#) with respect to protecting groundwater due to the:

- difficulties associated with observing and remediating leaks from underground storage and transmission facilities
- previous history of pollution from such facilities

In principal and secondary aquifers the Environment Agency expects the storage of hazardous substances to be within above ground tanks. The Environment Agency recognises that this may not always be reasonable when other risks (such as health and safety) are taken into account. Position statement [D2 -](#)

[underground storage](#) therefore allows for underground storage of hazardous substances outside SPZ1 where there is sufficient evidence to justify such an approach. This should include both site-specific and generic data on the performance of installations (providing this is appropriate to the materials being stored). However, the Environment Agency will normally object to all new underground storage within SPZ1.

In situations where redevelopment or refurbishment of underground storage is unavoidable, the Environment Agency will review the risks and any contamination history and take account of the proposed improvements. The Environment Agency encourages improvements that reduce the risk of contamination of groundwater. It will not object to below ground storage in such situations provided there is evidence that:

- there are no suitable alternatives to below ground storage
- redevelopment will maintain a low risk or significantly reduce an existing risk to groundwater
- proposals comply with appropriate engineering standards and BAT
- effective management systems will be in place
- redevelopment does not bring the below ground storage nearer to any groundwater abstraction source, surface water or spring

Substantial evidence and justification are required for any retention of underground storage of hazardous substances in SPZ1, detailing how risks to groundwater can be adequately mitigated. In such circumstances an environmental permit may be required.

The Environment Agency would expect proposals for underground storage of pollutants in principal and secondary aquifers to be accompanied by a risk assessment appropriate to the volume and type of pollutants being stored and the hydrogeological situation. More detailed risk assessments and an infrastructure design method statement that meets BAT would be expected for storage within SPZs or close to other vulnerable receptors.

## Sub water table storage

Sub water table storage is more problematic than above ground or underground storage, as a leak is more likely to contravene EPR. Position statements D1 and D2 apply to all sub water table storage. In addition, by implementing position statement D3 on sub water table storage, the Environment Agency is trying, as far as possible, to minimise the development of such storage facilities.

### D3 - Sub water table storage

For all storage of pollutants underground (hazardous substances and non-hazardous pollutants), operators are expected to adopt appropriate engineering standards and have effective management systems in place. These should take into account the nature and volume of the materials stored and the sensitivity of groundwater, including the location with respect to SPZs.

#### New sites

The Environment Agency will normally object to any proposed new storage and transmission of hazardous substances below the water table\* in groundwater SPZ1. For all other proposed locations, a risk assessment must be conducted based on the nature and quantity of the hazardous substances and the physical nature of the location. Where this assessment demonstrates that there is a high risk of groundwater pollution, the Environment Agency will normally object to storage below the water table:

- in any strata where the groundwater provides an important contribution to drinking water supply, river flow or other sensitive surface waters or wetlands
- within SPZ2 or 3
- in a principal aquifer

#### Existing sites

For existing sites that store or transmit hazardous substances or non-hazardous pollutants below the water table, or where the water level subsequently rises, the Environment Agency will work with operators to mitigate the risks. The aim is eventually to change to above ground storage (notwithstanding the position statements above and in particular [D2](#)).



The Environment Agency will normally object to any redevelopment scheme involving retention of sub water table storage of hazardous substances unless it can be demonstrated that risks to groundwater can be adequately mitigated.

\* For the purposes of this position statement this should include any laterally continuous groundwater in these aquifers including 'perched' groundwater. Operators should consider the lifetime of the storage in their assessment of the depth to groundwater.

In situations where retaining an existing sub water table underground storage site is proposed following redevelopment or refurbishment, the Environment Agency will not object provided there is evidence that:

- there are no suitable alternatives to below ground sub water table storage
- redevelopment will significantly reduce the existing risk to groundwater
- proposals comply with appropriate enhanced engineering standards and BAT
- effective management systems will be in place
- redevelopment does not bring any sub water table underground storage tank nearer to any groundwater abstraction source, surface water or spring

## Enforcement

### D4 - Use of notices

Where the Environment Agency consider that other forms of control or voluntary action do not give sufficient protection to groundwater, it may serve EPA groundwater activity notices to avoid or restrict inputs of pollutants to groundwater including from, for example, underground storage and distribution facilities.

The Environment Agency may serve a notice on any person who is carrying out or intends to carry out an activity on or in the ground that may lead to a discharge of pollutants to groundwater. The notice can either prohibit the activity or require the person making the discharge to hold an environmental permit. Notices may also be served on holders of environmental permits in specified circumstances to avoid or remedy pollution (enforcement and suspension notices).

# E. Landfill

This section primarily applies to landfills and their location. Groundwater can be at serious risk of pollution unless landfills are located in the right place and subject to the right operational controls. The nature of the hazard to groundwater from landfill will depend on the types and quantities of pollutants in the waste disposed. Unless the whole of the waste mass is inert, landfills represent a store of pollutants, some of which will inevitably find their way into the environment.

The Environment Agency's approach is to steer the development of landfills into less sensitive hydrogeological locations such as [unproductive strata](#). The aim is to protect existing water supplies and to avoid the situation where the presence of a landfill constrains future development of the most important groundwater resources for future generations.

To protect groundwater, the Environment Agency will consider the whole lifecycle of the landfill. It will offer its advice on the location of landfill. It is responsible for issuing permits under EPR to regulate landfill construction, monitoring, operation and aftercare. A formal permit review throughout the operational life of the landfill, including the supporting hydrogeological risk assessment, is undertaken periodically, to verify that groundwater is protected, or to identify where mitigation may be needed.

EPR requires permitting of activities that may lead to the input into groundwater of hazardous substances or non-hazardous pollutants. Permits must only be issued after there has been adequate assessment of the risks to groundwater (prior examination) and activities must be subject to monitoring where necessary (requisite surveillance). The need for a [geological barrier to prevent pollution is a requirement of the Landfill Directive](#).

For more information [read landfill sector technical guidance](#).

The Environment Agency will rigorously apply the [E1 - landfill location](#) position statement in its consultee role under the Town & Country Planning Act 1990 and in its permitting role. To assist with this process, the Environment Agency will work with planners and landfill developers at the appropriate stage to provide advice on geology and hydrogeology and the significance of water resources. The Environment Agency will also work with landfill developers and operators to help improve understanding of the issues and look for practical solutions.

This approach will complement the Environment Agency's strong role in promoting the government's waste hierarchy of prevention, preparing for re-use, recycling, other recovery and finally disposal so as to reduce the need for landfill. The approach should also influence the appraisal of options for new landfills. In particular, local councils' waste planning development documents should include or be based on an evaluation of:

- sustainable waste strategies
- the locations chosen for landfills – these must satisfy the terms of E1 - landfill location so that environmentally sensitive locations are avoided

Planners have a number of ways to identify acceptable environmental locations for landfill sites. These may include criteria based on location, which would encourage consistency with [E1 - landfill location](#) position statement.

The Environment Agency provides risk-based advice to waste planning authorities (WPAs) and developers. This is to ensure that, in vulnerable areas, groundwater protection measures will be viable for the entire duration that a landfill remains a pollution risk.

Permit surrender is not possible unless a landfill meets [specific criteria](#).

[Parallel tracking](#) is helpful to both the Environment Agency and the developer. The hydrogeological risk assessment submitted with a landfill permit application can be used to determine how [E1 - landfill location](#) position statement applies to the planning application. This should include an assessment of all risks from the proposed development, with its managed reduction through engineering and management controls. Such an assessment must address the long-term viability of pollution control measures over the whole life of the proposed site. This includes any aftercare period and the consequences of site-specific failure scenarios.

## E1 - Landfill location

The Environment Agency will normally object to any proposed landfill site in groundwater SPZ1.

For all other proposed landfill site locations, a risk assessment must be conducted based on the nature and quantity of the wastes and the natural setting and properties of the location.

Where this risk assessment demonstrates that active long-term site management is essential to prevent long-term groundwater pollution, the Environment Agency will object to sites:

- below the water table in any strata where the groundwater provides an important contribution to river flow, or other sensitive receptors
- within SPZ2 or 3
- on or in a principal aquifer

## E2 - Extension of landfill location position statement to radioactive wastes

Whilst recognising that radioactive waste disposal sites are not landfills as defined under the Landfill Directive, the Environment Agency considers that the principles in the E1 position statement should be applied equally to proposals for new surface and near-surface disposals of radioactive waste and they will apply this position to such proposals.

Position statement E1 will guide the Environment Agency's advice and comments on planning proposals for landfill. Where the designation for an aquifer has changed, the Environment Agency will not retrospectively apply the landfill location position statement E1 to any development for which there is written prior agreement. All new developments and extensions to existing facilities, for which there has been no such prior agreement, should comply with E1.

Note that this interpretation guidance refers to the deposit of landfill waste and that the [CL:AIRE definition of waste: development industry code of practice](#) is entirely separate and therefore covered by its own specific guidance.

E1 - landfill location has the following general objectives:

- to provide a risk-based framework for waste planning authorities and developers that steers landfill developments that require active long term site management into less sensitive locations
- to ensure that groundwater protection measures will be viable for the entire duration of the pollution risk from landfilling

These objectives apply to all stages, from initially seeking permission through to development of a new landfill. E1 does not apply to landfills that were already in operation on 15 June 2002 or had not been brought into operation by that date, but where the permit was granted before that date. Any new areas (that were not already permitted on 15 June 2002) will not benefit from the transitional arrangements and therefore the position statement will be applied to applications for an environmental permit for those areas.

## Decision framework

The starting point for the decision framework for position statement E1 is whether or not a proposed landfill site poses a potential hazard to groundwater, based on consideration of the waste types proposed for disposal and the natural geology of the site.

An inert landfill does not pose a potential hazard to groundwater (and hence it is not necessary to collect leachate and no drainage system is required). The Environment Agency will not object in principle to such a landfill on the basis of the location position statement E1, unless the site falls within a SPZ1.

If a landfill site does pose a potential hazard to groundwater, you will be required to collect leachate as part of the permit conditions. The Environment Agency will consider if leachate collection and other active pollution prevention controls will be needed over the long term to prevent pollution. If so, unless [mitigating](#)

[factors apply](#), the Environment Agency would normally object to a landfill development where the proposed site meets any one of the following criteria, namely the site is:

- below the water table in any strata where the groundwater provides an important contribution to river flow or other sensitive surface waters
- within SPZ2 or 3
- on or in a principal aquifer

## **SPZ 1**

Where a conceptual model or risk screening identifies that a proposed landfill is situated inside a SPZ1, then position statement E1 will apply whether the site is for inert, non-hazardous or hazardous wastes.

## **SPZ2, SPZ3 and principal aquifers**

As well as considering the nature and quantity of the wastes, you must base the risk assessment for a proposed landfill on the natural setting and the properties of the location. Designated source protection zones and principal aquifers represent areas and groundwater resources that are critical to existing or future public water supplies. In these areas, the Environment Agency would normally wish to preserve the high quality of the groundwater immediately under a proposed landfill site. Risk screening should identify the aquifer and SPZ designation.

Proposed sites will be dealt with on a case-by-case basis, using an appropriate level of evidence to support any planning or permitting decision. As an example, if no active long term management is proposed, the applicant will need to provide a detailed body of supporting evidence that gives high confidence that long term active management is not required. This will be particularly relevant for any proposal that falls within SPZ2, and especially if the site lies within a 400-day travel time from the abstraction. In practical terms, this is likely to mean that the Environment Agency will resist landfill developments within this time-of-travel zone, unless the landfill will contain wastes types presenting only a short-term risk of generating polluting leachate.

Mitigating factors such as the presence of thick, low permeability sediments (substantial drift cover or a natural geological barrier) overlying the aquifer are considered in the next paragraphs.

### **Circumstances where an SPZ2, SPZ3 or principal aquifers may be a suitable landfill location**

There may be cases where substantial, natural low permeability geological barriers overlie a SPZ2, SPZ3 or principal aquifer at a proposed landfill location. In such cases, the natural barrier must be sufficient to prevent long-term pollution from the proposed landfill, and satisfy the requirements of the Landfill Directive. Uncertainties in the longevity of artificial liners, leachate collection systems and other active long-term site management must be considered when assessing proposed landfill location and risk to groundwater.

For example, a principal aquifer may be shown on the aquifer designation bedrock maps, but the aquifer may actually be known to be overlain by a significant thickness of low permeability clay drift.

The Environment Agency will only take such circumstances into consideration when reviewing a landfill's planning and permit application, where all of the following are met:

- the proposed landfill site is located outside any designated SPZ1 or 2
- the presence of natural low-permeability geological barriers can be demonstrated, where necessary by site-specific investigation
- the proposed landfill site is above the water table in situations where groundwater provides an important contribution to river flow or other sensitive receptors such as surface waters and groundwater dependent terrestrial ecosystems
- Where it can be shown that a natural geological barrier exists, the applicant will need to demonstrate (where necessary by quantitative risk assessment) that the vulnerability of the groundwater to pollution can be considered lessened by the presence of the barrier, and adequately compensates for the risk of long-term degradation of artificial sealing layers, leachate collection systems and other active management control systems. In some cases, it may be appropriate to consider the natural geological barrier in conjunction with an artificial enhancement (eg an engineered mineral barrier). However, in these cases there must be a predominant natural component to the barrier, a 'substantial' natural barrier cannot be created just by the use of an artificially placed mineral barrier.

Whether or not a natural geological barrier overlying an aquifer is 'substantial' for the purposes of dis-applying position statement E1 will depend on the outcome of the quantitative risk assessment.

You will need to take into account the thickness, permeability and uniformity of the natural geological barrier. A barrier will not be considered 'substantial' for a landfill development if there is unpredictable variability in its layers, or if there are natural or artificial by-pass routes that could compromise its overall protective integrity. There should be a minimum of several metres of natural material in a substantial barrier, such that:

- any variations in its thickness over a site are insignificant in terms of the performance of the barrier
- any construction/excavation activity at the site poses no risk of breaching the integrity of the barrier
- it is clear that the geological barrier is substantial from a basic assessment of the site, which may include confirmatory site investigation data but without the necessity of very detailed site investigation or detailed quantitative risk assessment.

**Note:** The Environment Agency will not normally regard the aquifer materials themselves as forming part of a low permeability geological barrier when considering a proposed landfill on or within an SPZ3 or a principal aquifer. A landfill in these locations is only potentially acceptable where a separate, natural, low permeability geological barrier is acting to protect the aquifer.

In position statement E1, a simple distinction has been made between SPZ2 and 3, a principal aquifer and all other groundwater. However, there could be areas shown on the aquifer designation maps as principal aquifers, where the Environment Agency judge that circumstances of poor natural groundwater quality or geological structure mean that local significance to water resources is very limited. For example, this might include areas of natural saline intrusion or where the strata involved only occupy a small isolated, faulted block. These local circumstances in a principal aquifer may be taken into consideration when considering landfill proposals, providing there is adequate evidence to justify the planning and permitting decisions – where necessary supported by a quantitative risk assessment.

**Note:** the Environment Agency will only consider poor groundwater quality as a justification for locating a landfill on a principal aquifer, if the poor quality is a result of the natural hydrogeochemistry of the aquifer, and not due to existing or historic land uses such as landfill.

## Secondary aquifers and unproductive strata outside SPZs

Position statement E1 does not apply to proposed landfill sites on secondary aquifers or unproductive strata (unless either [D3 - sub water table](#) position statement also applies or the site also falls within a source protection zone). Position statement E1 takes account of the fact that these formations are variable in terms of their local significance for water supply and occur in a wide range of strata with differing natural groundwater quality, hydraulic properties and ability to attenuate contaminants. In these locations, it may be possible to place greater reliance on natural geological barriers and/or artificial mineral barriers for long-term protection of groundwater, depending on the particular geological and hydrogeological circumstances. Potential landfill sites on secondary aquifers or unproductive strata should be considered on the basis of tiered risk assessment. This should take into account the long-term degradation of artificial sealing layers and management control systems, and ensure protection of groundwater in accordance with the EPR.

## Sites below the water table

Groundwater to varying degrees supports the baseflow of rivers – in some cases having a dominant influence on river flows and quality, particularly in dry periods. Groundwater may also support sensitive ecological sites such as wetlands where small changes in quality or level could be detrimental.

The decision as to whether the proposed landfill is below the water table and whether groundwater provides an important contribution to river flow or other sensitive surface waters would generally be achieved by the initial risk screening.

Position statement E1 uses the terms 'important contribution' and 'sensitive receptors', which must be defined by site specific professional hydrogeological judgement.

The relevant factors to be considered in 'important contribution' and 'sensitive' include:

- proximity of the surface water
- directness of the hydraulic connection

- quality and quantity of both the groundwater and the receiving surface water
- the consequences of the potential impact on the surface water quality of any landfill development
- the consequences of the potential impact on the ecology of the surface water due to changes in quality or level from any landfill development.

For example, in some cases there may be close proximity of the proposed landfill to ecologically sensitive sites such as wetlands or rivers. These may be in direct continuity with groundwater and sensitive to water quality or water level changes. In other cases, the close proximity of a river to a proposed landfill site may raise concern about the potential for rapid or high volume flow connection or impacts on the headwaters to important, high-quality catchments.

The Environment Agency does not, however, object to sub water table landfill developments on the basis of small-scale, distant or trivial hydraulic connections, or where natural geological barriers mitigate against the risk. In such cases, the Environment Agency will require more detailed risk assessment based on site-specific information prior to making a decision on a permit or responding to a planning consultation.

For simplicity, the general term 'water table' has been used in position statement E1. When considering a landfill development, this term also applies to a piezometric head within a confining layer, where there is sufficient connectivity to the underlying aquifer to allow water to flow into the landfill void. The first consideration when reviewing such situations should be whether or not the underlying aquifer provides an important contribution to river flow or other sensitive surface waters. If it does, position statement E1 will apply unless site-specific investigation and quantitative risk assessment demonstrates that natural connectivity to the underlying aquifer is sufficiently low to prevent a risk of long-term pollution.

## F. Non-landfill waste activities

This section applies to non-landfill waste activities.

The storage, treatment and processing of potentially polluting waste materials can present risks to groundwater. Leachate or other polluting substances may leak from storage and processing areas. Materials or waste may be hazardous or contain hazardous substances (for example, oils in cars and machinery, and chemical waste stored in drums).

Most of the waste activities covered here are controlled by the [Waste Framework Directive 2008/98/EC](#).

The Environment Agency will grant a permit to store, treat or process potentially polluting waste if operators have put appropriate measures in place to mitigate the risks satisfactorily. However, the Environment Agency discourages activities with a high potential groundwater pollution risk from being located close to drinking water supplies, due to the potential severity of the consequences of such pollution.

Waste management activities are controlled via [environmental permits, standard rules permits or exemptions](#). Groundwater protection would normally be achieved via these controls as a risk based approach is applied to regulation.

When responding to some planning applications for waste facilities, the Environment Agency will need to give more detailed consideration and, where appropriate, recommend parallel tracking if a proposed development includes an activity which will require detailed risk assessment, stringent control and additional mitigation in order to manage risks to groundwater and obtain a permit.

When submitting a proposal for a waste facility, you must include sufficient evidence to demonstrate that the risk to groundwater can be satisfactorily managed. Where a proposed development would present an unacceptable risk to groundwater that could not be managed by planning conditions, an environmental permit or registered exemption, the Environment Agency will object to the development when responding to the planning application consultation.

Where a groundwater activity is not controlled by a permit, the Environment Agency may serve a notice to either prohibit or control the activity via an environmental permit. The Environment Agency may also apply the position statements in [section G](#) to some waste activities.

The Environment Agency's role in the disposal of landspreading, sludge and slurry is outlined in [section H](#).

This approach complements the Environment Agency's strong role in promoting the government's waste hierarchy of prevention, preparing for re-use, recycling, other recovery and finally disposal, so as to reduce the need for landfill.

In general, non-landfill waste operations pose fewer hazards to groundwater than landfill operations. With the exception of 'deposit for recovery' activities, these hazards can – unlike landfill – be removed if necessary if groundwater pollution is expected to occur, eg by clearing the material deposited.

### Radioactive waste

Waste management activities involving radioactive materials are controlled via EPR. However, radioactive waste disposal facilities and radioactive facilities are not covered by position statement F1. See the specific guidance for [radioactive waste disposal](#). See also [position statement E2](#).

#### F1 - Non-landfill waste activities

Inside SPZ1 the Environment Agency will only object to proposals for new development of non-landfill waste operations where it believes the operation poses an intrinsic hazard to groundwater. For example, deposit of waste for recovery activities. The Environment Agency will oppose such new developments via the development planning system.

For any other non-landfill waste operations that are proposed in SPZ1, when considering any environmental permit application, the Environment Agency will usually require a detailed risk assessment, and mitigation measures to be put in place to manage all risks to groundwater. Accordingly, the Environment Agency will raise concerns when responding to any planning application consultation, as to

whether a permit could be granted. In sensitive groundwater locations, the Environment Agency will therefore strongly encourage parallel tracked environmental permit applications with planning applications.

Outside SPZ1 the Environment Agency will agree to proposals for new developments of non-landfill waste operations where risks can be appropriately controlled by an environmental permit or a relevant waste exemption.

Note: the requirement for a risk assessment for the purposes of position statement F1 - non-landfill waste activities could be satisfied by the generic risk assessment that supports the application for an EPR standard rules permit, where these are applicable.



# G. Discharge of liquid effluents into the ground

This section applies to the millions of litres of sewage effluent, surface water run-off, industrial effluent and waste waters that are released into the ground every year. These discharges, if not properly managed could result in pollution of groundwater.

It explains how the Environment Agency will respond to different types and methods of disposal of liquid effluents to the ground. The position statements apply principally to:

- direct discharges to groundwater
- discharges of effluents to ground
- surface water run-off

## Regulation and permitting of discharges

You must not cause or knowingly permit the discharge of hazardous substances or non-hazardous pollutants that might lead to an input of that substance into groundwater without an environmental permit unless the discharge qualifies for an exemption (in which case the discharge must meet the conditions relating to that exemption) or exclusion. If necessary, the Environment Agency may serve a notice to prohibit or bring into control, activities that may result in pollution.

The Environment Agency adopts a risk based approach to all discharges (see also [position statement A1](#)) and will not allow those which cannot be mitigated. If discharging to ground, you must be able to comply with the conditions for an exemption or permit. Where planning applications and permits are required, it is recommended that parallel tracking is used.

For certain specified groundwater discharge activities where sufficient information is supplied with the application, the Environment Agency may be able to undertake an initial risk assessment, but generally operators must also assess the environmental impact of their proposal to demonstrate an acceptable environmental outcome at the proposed discharge site.

## Exempt small sewage discharges

Discharge of treated sewage of 2 metres cubed per day or less to ground/groundwater are called small sewage discharges (SSDs). The majority of SSDs do not require an environmental permit if they comply with certain qualifying conditions called [general binding rules](#) (GBRs). A permit is required however for all SSDs in source protection zone 1 (SPZ1). See the [small sewage discharge guidance](#).

## Direct inputs

### G1 - Direct inputs into groundwater

The Environment Agency must take all necessary measures to:

- prevent the input of any hazardous substance to groundwater
- limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater

The Environment Agency will only agree to the [direct input](#) of non-hazardous pollutants into groundwater if all of the following apply:

- it will not result in pollution of groundwater
- there are clear and overriding reasons why the discharge cannot reasonably be made indirectly
- there is adequate evidence to show that the increased pollution risk from direct inputs will be mitigated

Direct input into groundwater presents a significantly increased risk of pollution. Discharges that concentrate the flow of effluent at one location and bypass some of the soil layers will limit the ability of the ground to attenuate pollutants and protect groundwater.

The Environment Agency is seeking to stop direct discharges to groundwater through wells, boreholes and shafts ([position statement G9](#)). The Environment Agency will only allow them if they meet the criteria in position statement G1.

## Sewage and trade effluent

For treated sewage effluent discharges, the Environment Agency encourages the use of shallow infiltration systems, which maximise attenuation within the drainage blanket and the underlying unsaturated zone. [British Standard 6297:2007+A1:2008](#) (or latest version) provides guidance on the design and installation of drainage fields for use in wastewater treatment and should be used to determine if a shallow infiltration system is a feasible option.

### G2 - Sewage effluent discharges inside SPZ1

Inside SPZ1 all sewage effluent discharges to ground must have an environmental permit.

All permit applications will be considered on the basis of risk assessment and the appropriateness of the discharge with respect to the local environmental setting. For new discharges you should contact the Environment Agency to discuss whether or not it is likely to grant a permit.

#### *Existing\* small sewage discharges in SPZ1*

If there is no evidence of pollution or significant risk of pollution associated with the discharge from an existing single sewage treatment system then the Environment Agency will normally grant a permit.

If an unpermitted discharge is discovered in a SPZ1 and there is evidence of pollution or a significant risk of pollution, the Environment Agency will work with the operator to address the issue on a site specific basis. Where necessary, the Environment Agency may use a notice to deal with any unacceptable discharge.

\*An existing small sewage discharge is one that was in place before 1 January 2015.

### G3 - Cumulative impact from sewage effluent discharges

The Environment Agency will only agree to developments where the addition of new sewage effluent discharges to ground in an area of existing discharges is unlikely to lead to an unacceptable cumulative impact. This will apply especially to sewage effluent in areas where concentrations of non-mains drainage to ground have given rise to known surface water or groundwater pollution.

Whilst some sewage effluent discharges may not pose a risk to groundwater quality individually, the cumulative risk of pollution from aggregations of discharges can be significant. Improvement or pre-operational conditions may be imposed before granting an environmental permit.

### G4 - Trade effluent and other discharges inside SPZ1

Inside SPZ1 the Environment Agency will object to any new trade effluent, storm overflow from sewerage system or other significantly contaminated discharges to ground where the risk of groundwater pollution is high and cannot be adequately mitigated. If necessary, the Environment Agency will use a prohibition notice to stop any such existing discharge.

### G5 - Connection to public foul sewer

Generally, the Environment Agency will only agree to developments involving release of sewage effluent, trade effluent or other contaminated discharges to ground if it is satisfied that it is not reasonable to make a connection to the public foul sewer. You will have to provide evidence of why your proposed development cannot connect to the foul sewer via your planning application. This position will not

normally apply to surface water run-off via sustainable drainage systems and discharges from sewage treatment works operated by sewerage undertakers with appropriate treatment and discharge controls

### G6 - Cesspools and cesspits

The Environment Agency does not encourage the use of cesspools or cesspits, other than in exceptional circumstances. A cesspool or cesspit is a sealed unit that is used for the storage of untreated sewage. There must be no discharge to the environment. Poorly managed cesspools and cesspits present a considerable risk of causing pollution, which can be difficult to monitor and correct.

### G7 - Evidence of pollution from liquid effluent

The Environment Agency will work with dischargers to seek solutions to pollution arising from liquid effluent. Where necessary it may use its notice powers to require or vary permits or to prohibit further discharge.

### G8 - Sewerage pipework

The Environment Agency will require the use of the highest specification pipework and designs for schemes involving new sewerage systems in SPZ1 to minimise leakage.

## Sewage effluent discharges to deep infiltration systems

Deep infiltration systems include deep pit based systems such as boreholes, shafts, concrete rings or other structures that bypass the soil layers. The Environment Agency does not regard the use of boreholes or other deep structures for the discharge of sewage effluent as routinely appropriate disposal options because they concentrate the flow of effluent at one location and bypass the soil layers. This limits the ability of the ground to attenuate pollutants and presents a greater risk of groundwater pollution. For this reason all such discharges require an environmental permit and are not eligible for an exemption from permitting requirements. A detailed risk assessment is a prerequisite for any permit application.

### G9 - Use of deep infiltration systems for surface water or sewage effluent disposal

The Environment Agency will only agree to the use of deep infiltration systems for surface water or sewage effluent disposal if the developer can show that all of the following apply:

- there are no other feasible disposal options such as shallow infiltration systems or drainage fields/mounds that can be operated in accordance with the appropriate current [British Standard 6297:2007+A1:2008](#)
- the system is no deeper than is required to obtain sufficient soakage
- acceptable pollution control measures are in place
- risk assessment demonstrates that no unacceptable discharge to groundwater will take place – in particular inputs of hazardous substances to groundwater will be prevented
- there are sufficient mitigating factors or measures to compensate for the increased risk arising from the use of deep structures

For new effluent discharges that meet the above criteria, secondary treatment is required.

The Environment Agency will apply [position statement G1](#) to any deep infiltration systems potentially involving the discharge of non-hazardous pollutants. The Environment Agency will encourage operators of existing deep infiltration systems to alter their facilities so that direct inputs of pollutants are avoided, particularly where there is potential for hazardous substances to enter groundwater.

Mitigating factors for deep infiltration systems may include additional levels of effluent treatment, but for all proposed new systems the depth of the structure must be no deeper than required to obtain sufficient

soakage. This will maximise attenuation in the unsaturated zone. Position statement G1 will also apply if the input to groundwater is direct.

While the Environment Agency cannot prevent the use of boreholes or other deep structures for sewage effluent disposal, their use must not be regarded as a routinely appropriate disposal option. BS: 6297 makes it clear that drainage fields are considered to be an important component of a non-mains wastewater treatment system. The British Standard states that deep pit based systems should not be used for sewage effluent disposal, as they do not provide sufficient treatment. This is because the effluent would not be distributed so as to minimise the hydraulic loading and maximise the beneficial effects of biological action around infiltration systems. The deep infiltration system will also not maximise attenuation in the soils and unsaturated zone.

BS: 6297 does not specifically refer to the use of boreholes for disposal but the principles are the same; a borehole may bypass even more of the available attenuation capacity of the soils and unsaturated zone and allow direct input of pollutants to groundwater. It is also possible that bio-fouling within the borehole will diminish the efficiency of the system with time.

The level of prior examination required to support a proposal to use a borehole may be significantly greater than required for near surface infiltration systems, since the Environment Agency cannot make the basic assumptions about the effectiveness of drainage fields that normally form part of our risk-based approach.

The extent of examination is site-specific and a matter for local judgement by Environment Agency staff based on local groundwater sensitivity. In general, the larger the proposed discharge and the more vulnerable the location, the more likely it is that a detailed quantitative risk assessment is required. This may need to be supported by site-specific data on the aquifer properties, seasonal variation in depth to water table and baseline groundwater quality.

## Potentially polluting discharges

### G10 - Developments posing an unacceptable risk of pollution

The Environment Agency will normally object to new developments that pose an unacceptable risk of pollution to groundwater from sewage effluent, trade effluent or contaminated surface water.

This applies if the source of pollution is an individual discharge or the combined effects of several discharges, or where the discharge will cause pollution by mobilising contaminants already in the ground. In all cases the Environment Agency will normally object to any proposal to discharge untreated sewage\* to ground and will use its notice powers to ensure treatment of any existing discharges.

\* A sewage treatment system means a septic tank, infiltration system, drainage field and/or a package treatment plant or any other additional treatment in place. It does not include cesspools or cesspits.

### G11 - Discharges from areas subject to contamination

Discharges of surface water run-off to ground at sites affected by land contamination, or from sites used for the storage of potential pollutants are likely to require an environmental permit.

This applies especially to sites where storage, handling or use of hazardous substances occurs (for example, garage forecourts, coach and lorry parks/turning areas and metal recycling/vehicle dismantling facilities). These sites will need to be subject to risk assessment with acceptable effluent treatment provided.

See also [position statement C4](#).

## Discharge of clean water

Some discharges to ground (such as clean roof drainage or highway drainage) may not require permits. However, they can still have the potential to cause pollution if the discharge is not carefully designed or managed.

### G12 - Discharge of clean roof water to ground

The discharge of clean roof water to ground is acceptable both within and outside SPZ1, provided that all roof water down-pipes are sealed against pollutants entering the system from surface run-off, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminants already in the ground. No permit is required, if the above criteria can be met.

See also [position statement C4](#).

## Sustainable drainage systems

### G13 - Sustainable drainage systems

The [Government's expectation](#) is that sustainable drainage systems (SuDS) will be provided in new developments wherever this is appropriate. The Environment Agency supports this expectation.

Where infiltration SuDS are to be used for surface run-off from roads, car parking and public or amenity areas, they should:

- be suitably [designed](#)
- meet [Governments non-statutory technical standards](#) for sustainable drainage systems – these standards should be used in conjunction with the [National Planning Policy Framework and Planning Practice Guidance](#)
- use a SuDS management treatment train – that is, use drainage components in series to achieve a robust surface water management system that does not pose an unacceptable risk of pollution to groundwater

Where infiltration SuDS are proposed for anything other than clean roof drainage (see G12) in a SPZ1, a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply.

This position statement G13 needs to be read in conjunction with [position statement G10](#).

The design of infiltration SuDS schemes and of their treatment stages needs to be appropriate to the sensitivity of the location and subject to a relevant risk assessment, considering the types of pollutants likely to be discharged, design volumes and the dilution and attenuation properties of the aquifer.

Unless the supporting risk assessments show that SuDS schemes in SPZ1 will not pose an unacceptable risk to the drinking water abstraction, the Environment Agency will object to the use of infiltration SuDS under [position statement G10](#).

# H. Diffuse (rural) sources of pollution

This section focuses on diffuse sources of pollution (the cumulative effects of many individual, ill-defined and dispersed pollutants) in and from rural areas. Urban diffuse sources are covered in [section A](#) and [section G](#).

Most new groundwater pollution in England is from diffuse sources, mainly nitrate and pesticides, with the largest proportion arising from agriculture. Other locally significant sources of nitrate or pesticide pollution include graveyards, amenity land uses, sewage and industrial discharges, landfill, woodland, direct deposition to water and urban run-off and leaching. Chemical products such as pesticides and fertilisers are approved for use by the Foods Standards Agency, Chemicals Regulation Directorate or other regulatory bodies. However, they are not specifically approved for use in groundwater so they can still pollute it. You should make sure that if you use pesticides and other chemical products you do not pollute groundwater.

The law requires controls on diffuse sources of pollution and sets status and protected area objectives for groundwater. Measures to meet these objectives, include protecting water that is used for human consumption and are set out in [river basin management plans](#) (RBMPs). River basin planning is an iterative process. Voluntary measures (eg land use change or changing product usage) need to supplement existing regulatory methods to reduce diffuse pollution and prevent deterioration of groundwater quality. Where voluntary measures are not working or are not appropriate to achieve this, the Environment Agency will consider additional regulatory measures.

The Nitrates Directive aims to reduce nitrate concentrations from agriculture entering water systems and is implemented by the Nitrate Pollution Prevention Regulations 2015, which include:

- a requirement to designate nitrate vulnerable zones (NVZs)
- a requirement to plan nitrogen applications on agricultural land
- the setting of limits on nitrogen fertiliser applications
- the establishment of closed periods for spreading
- controls on the application and storage of organic manure

The Environment Agency is responsible for assessing farmers' compliance with measures in nitrate vulnerable zones.

If you claim rural payments you must follow a set of rules called [cross compliance](#). Ensuring your activity does not pollute groundwater is part of these rules (GAEC 3).

Activities clearly leading to an input of pollutants to groundwater require an environmental permit. Such activities include cattle corrals, runoff from hard standing that is contaminated by manure and soaks into the ground, and land spreading activities that fall outside the "agricultural benefit" clause within the [waste exemptions](#). The Environment Agency may serve a notice to either stop the activity or determine it to be a groundwater activity and thereby require a permit.

## H1 - Mechanisms for controlling diffuse pollution

The Environment Agency seeks to control diffuse pollution of groundwater through working in partnership with others, advice, incentives and regulation. To do this it will promote practices that protect groundwater quality and highlight areas of particular susceptibility to groundwater diffuse pollution. Areas particularly susceptible to groundwater pollution are shown by the use of groundwater vulnerability maps, source protection zones and safeguard zones.

## H2 - Use of water protection zones

Where partnership working and all existing controls are insufficient, the Environment Agency can seek to control pollution within a groundwater body through its designation as a [water protection zone \(WPZ\)](#). However, these zones need significant evidence and external support for designation in order to obtain approval from the Secretary of State for Environment, Food and Rural Affairs, who designates WPZs and makes the Order containing measures to prevent and control pollution in the WPZ.

### H3 - Safeguard zones

Where appropriate the Environment Agency will work in partnership with abstractors to establish [safeguard zones](#). Safeguard zones are established around abstractions used for human consumption that are at a high risk of deteriorating raw groundwater quality. Both existing and new measures to control diffuse pollution will be targeted within safeguard zones.

### H4 - Water company led catchment schemes

The Environment Agency will support the use of water company led catchment management schemes in water company Asset Management Plan periods. The aim of these schemes is to reduce pollution in the catchments in order to reduce the level of drinking water treatment required at public supply abstractions.

Through water company-led catchment management schemes, the water industry is working closely with farmers and other stakeholders to reduce the amount of nitrate and pesticides in raw groundwater supplies. In the long-term these schemes will reduce the cost of drinking water treatment and help secure compliance with drinking water standards. In addition, the schemes will deliver a range of broader environmental and social benefits such as reduced pollution and energy consumption. They are therefore more cost-beneficial and sustainable than expensive conventional water treatment solutions.

### H5 - Land use change through voluntary measures

The Environment Agency will work with farmers, farming organisations, industry and government to encourage compliance where applicable with relevant government guidance, such as [Water For Life](#), to protect water sources. It will also encourage beneficial land use change by working with others through for example:

- agri-environment schemes ([Countryside Stewardship](#))
- water company led catchment schemes
- [England Catchment Sensitive Farming Project](#)
- [Campaign for the Farmed Environment](#)
- [The Voluntary Initiative](#)
- [Amenity Forum](#)
- [Agriculture and Horticulture Development Board](#) (AHDB)
- market-led schemes such as [Farm Assurance](#)

Position statements H6, H7 and H8 relate to farm activities and developments. They are primarily intended to address risks from new developments and major expansions. Where a development is for the improvement of an existing farm, the Environment Agency will make every effort to agree to the proposals. Improvements could include but are not limited to providing additional slurry storage to improve management or replacing existing stock housing.

### H6 - Landspreading

The Environment Agency will oppose the landspreading of sludge or liquid waste containing significant concentrations of pollutants within SPZ1 or within 50 metres of any borehole, well or spring. The Environment Agency will maintain its opposition unless it agrees to site-specific mitigation measures that minimise the risk to drinking water supplies.

### H7 - Livestock housing

The Environment Agency will normally oppose the establishment of substantial additional livestock housing within SPZ1 or within 50 metres of any borehole, well or spring. The Environment Agency will

maintain its opposition unless it agrees to site-specific mitigation measures that minimise the pollution risk to drinking water supplies.

## H8 - Storage of organic manures on farms

The Environment Agency will normally oppose the establishment of new storage areas for organic manures (farm yard manure, sewage sludge, slurry and other organic manures) within SPZ1 or within 50 metres of any borehole, well or spring. The Environment Agency will maintain its opposition unless it agrees to site-specific mitigation measures that minimise the risk to drinking water supplies.

See also [D2 - underground storage](#), [D3 - sub water table storage](#) and [D4 - use of notices](#).

In karstic areas (landscapes formed when water passing through the rock dissolves it, to such an extent that rapid flow paths/conduits are created for example limestones with cave features), a small number of SPZ1s are very large. Where this is the case, the Environment Agency will consider a risk-based and sympathetic approach on a site specific basis to the application of position statements H6, H7 and H8.

The Environment Agency's position is that certain activities within SPZ1 present a hazard to drinking water sources. An alternative location for such proposed activities should be found by the applicant so that risks to drinking water supplies are minimised.

In some cases there may be no alternative and the Environment Agency will work with the applicant to identify the location on their landholding for the proposed activity that is of lowest risk to drinking water supplies. It may also require additional mitigation measures to be put in place to protect drinking water.

## H9 - Nitrate and crop requirements

Outside nitrate vulnerable zones the Environment Agency encourages farmers and other operators to ensure that the application of all organic manures is

1. undertaken as part of a crop nutrient plan, and
2. the nutrient requirement of the crop is not exceeded

to avoid the excessive leaching of nitrate. Organic manures include livestock manure and slurry, sewage sludge, and all other materials spread onto land for nutrient recovery.

## H10 - Land use change around drinking water abstractions

The Environment Agency encourages, where appropriate, the wider use of a payment for ecosystems services approach for farmers who provide clean groundwater recharge from their land, which can be considered a service. The Environment Agency will encourage schemes that result in cost effective land use change, which are beneficial to the environment and the consumer.

In the context of protecting drinking water abstractions from agricultural pollution, the 'polluter pays' principle (where the person who caused the pollution pays to rectify it) may not always produce the required outcome. This is because some farmers in sensitive catchments may comply with all appropriate measures but still cause pollution. Therefore, rigorously applying the 'polluter pays principle' is not practical. If farmers are complying, the Environment Agency encourages where appropriate, wider use of payments for ecosystems services. Payment for ecosystem services is where farmers or land managers are paid for the service of providing environmental benefits, for example clean groundwater recharge.



# J. Land contamination

This section applies to [land contamination](#), which can be a significant source of groundwater pollution and can impact on drinking water abstractions and rivers.

The Environment Agency's first priority is to prevent any new land contamination occurring by effective influencing and regulatory control of potentially polluting activities. Voluntary remediation or remediation under the planning regime is strongly encouraged. Where this is not possible the Environment Agency may require remediation using anti-pollution works notices or a remediation notice.

The concept that a site should be 'suitable for use' underlies the Environment Agency's approach to remediation of historic contamination. 'Suitable for use' means suitable for the environment as a whole, not just for use by people. Protecting groundwater and surface water may mean carrying out work on land affected by pollution over and above that required to make the land suitable for the proposed development and to protect human health.

The principle of causing 'no deterioration' often applies to new contamination via spills and accidents. Effective pollution prevention measures are expected to be adopted, maintained and monitored by developers and operators to prevent new land contamination from occurring. The Environment Agency expects developers, operators and land owners to act responsibly for cleaning up historic land contamination and preventing new pollution, in accordance with guidance.

The Environment Agency concentrates its effort in dealing with land affected by contamination by focusing on:

- the highest risk cases and those that will deliver the greatest environmental benefits upon remediation
- sites posing the greatest environmental hazard
- sites located close to the most sensitive receptors, these may include human or environmental uses

The Environment Agency addresses existing land contamination through the following approaches:

- encouraging people and businesses who hold land potentially affected by contamination to proactively assess and take action to manage the risks voluntarily
- as a consultee, working with local planning authorities under the town and country planning regime to require the investigation and remediation of land contamination where it may affect ground or surface waters
- collaborating with others to develop a [framework](#), tools and guidance that help identify and sustainably deal with land contamination set out in [Model procedures for the management of land contamination](#) (CLR11)
- promoting the safe development of housing on land affected by contamination
- serving [anti-pollution works notices](#) to prevent or remediate water pollution (though it may also carry out the work itself and recover the cost)
- assisting local councils to identify [contaminated land](#) under the Environmental Protection Act 1990 Part 2A by advising on ground or surface water issues
- being the enforcing authority for any formally identified contaminated land designated as a special site

## J1 - Promptly clean up new contamination

The Environment Agency requires those who cause new land or water contamination (for example, contamination from an accident or incident) to manage it promptly and effectively. They should identify and secure the source and remediate the contamination and any effects it has caused, to ensure groundwater quality is protected and where necessary restored.

## J2 - Risk-based prioritisation

The Environment Agency applies a risk-based approach to prioritise its effort in dealing with land contamination so that those sites causing pollution or harm, or posing the greatest environmental risk, are given the highest priority for action.

### **J3 - Take responsibility and adopt good practice**

The Environment Agency may provide generic advice on key objectives and approaches to dealing with land contamination to ensure groundwater is protected or remediated. It expects this advice to be followed, and the good practice produced by industry adopted, so that risks from contamination are managed appropriately. This should be normal practice and developers, land owners and operators should not rely on the Environment Agency being directly involved in a particular project.

### **J4 - Working with planning authorities and local communities**

The Environment Agency helps planning authorities and local communities understand the problem of groundwater pollution from land contamination. It encourages them to acknowledge the need to reduce and manage groundwater pollution as part of sustainable development in their strategies and plans.

### **J5 - Working with local decision-makers**

The Environment Agency provides guidance, and in higher risk cases site-specific advice, to local decision-makers on development involving land contamination, to ensure groundwater is protected or is remediated.

### **J6 - Support to local planning authorities**

The Environment Agency supports local planning authorities who require developers to investigate and monitor land and groundwater contamination. This may be by providing advice on a planning application or by assessing satisfactory compliance with planning conditions where appropriate. Local planning authorities should require remediation by developers where it is necessary and ensure that it is carried out and verified. The Environment Agency may recommend the refusal of a planning application where it judges the risk of groundwater pollution is too high or has been inadequately assessed.

### **J7 - Promote appropriate sustainable remediation**

The Environment Agency encourages the use of sustainable and effective remedial measures to prevent or address groundwater pollution from sites affected by contamination. This includes the recycling of water and soils where appropriate. However, these operations must not result in an unacceptable release to groundwater and must where necessary have appropriate permits and controls.

## **CL:AIRE definition of waste: development industry code of practice**

The [CL:AIRE definition of waste: development industry code of practice](#) provides a voluntary framework for determining whether or not excavated soil materials used in land development and remediation projects are waste.

The code sets out good practice and an auditable system of records for the development industry to follow. It applies to the reuse of both uncontaminated and contaminated soil based materials on the site of origin either with or without treatment as part of a development. It also applies to the transport and reuse of contaminated soils between development sites following treatment; and to the reuse of clean, naturally occurring soils.

The Environment Agency support the use of the code of practice and will take it into account when it regulates development activities.

## J8 – Definition of waste code of practice

The Environment Agency encourages the appropriate remediation of brownfield land and the reuse of soils. It will take account of the [CL:AIRE definition of waste: development industry code of practice](#) in deciding whether to regulate excavated materials to be used in development and remediation projects as waste. If materials are dealt with in accordance with the code of practice, it is considered that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development and remediation.

The code relies upon an audit of the development proposals for the material re-use, by a qualified person. If the qualified person is satisfied that the materials to be reused is in line with the code, they issue a declaration of compliance which is supplied via CL:AIRE to the Environment Agency.

To ensure continued protection of the environment and human health, the Environment Agency will, from time to time, undertake a random audit of decisions made by the qualified person. The success of this approach requires a high level of professional integrity by those involved. If audit findings indicate that the code of practice is being used improperly and that human health or the environment is being put at risk, the Environment Agency will withdraw this position and revert to case by case decision making.

For more information see the [legal definition of waste](#).

This position does not apply to the following activities which will remain subject to waste regulatory control:

- contaminated materials that go off site for direct use at another site without treatment, as the Environment Agency still considers such materials to be waste
- the control of landspreading activities
- the management of extractive wastes if they fall under the control of the Mining Waste Directive 2006/21/EC

### Re-injection of effluent and re-use of soils during remediation

Under certain circumstances effluent generated by remediation may be re-injection into the ground, and soils may be reused during site remediation. Contact the Environment Agency for details of the remediation position statements and for the regulatory approach on a variety of remediation technologies and techniques.

Certain clean-up schemes involve promoting in situ treatment of soils and groundwater by injecting substances such as nutrients or chemical oxidants into the contaminated ground or water. In small quantities, such groundwater activities may be eligible for a [registered exemption](#) from permitting. Waste soil treatment activities are otherwise usually permitted under EPR standard rules mobile treatment or bespoke permits.

### Achieving sustainable remediation

Sustainable remediation seeks to manage unacceptable risks to human health and the environment (including groundwater), while optimising the environmental, economic and social benefits.

The industry-led Sustainable Remediation Forum UK (SuRF-UK) has produced a [framework for assessing the sustainability of soil and groundwater remediation](#). The framework document sets out why sustainability issues associated with remediation need to be factored in from the outset of a project and identifies opportunities for considering sustainability at a number of key points in a site's redevelopment or risk management process. SuRF-UK has also published supporting guidance and tools.

### Guiding principles for land contamination

The [Guiding principles for land contamination](#) (GPLC) are a package of three documents providing generic guidance for holders of land affected by contamination and their expert advisors and consultants.

The main aims of GPLC are to:

- clarify roles and responsibilities related to land affected by contamination
- promote compliance with the requirements of, or avoid the need for regulation

The documents also provide links to more detailed guidance.

### **Passive releases and groundwater activities**

It is an offence to cause or knowingly permit a [groundwater activity](#) without a permit. However, a passive release of pollutants from land where the original activity that led to the contamination has ceased is not considered to be a discharge to groundwater that needs an environmental permit, as there is no surface activity to control.

A discharge to groundwater that potentially requires an environmental permit in such circumstances only occurs if an activity that disturbs land causes a release of pollutants.

# K. Mining induced pollution

This section deals with the potential pollution due to mines and historic mining activities.

Historic mining activities have left large areas with polluted land, groundwater and rivers. When mines are abandoned, groundwater levels begin to rise so that groundwater within the mine workings becomes contaminated. Over time, this contaminated mine water will discharge to either rivers or overlying aquifers. Contamination can also occur via rainfall infiltration and runoff from abandoned waste spoil heaps.

Typical pollutants from mining activities are metals such as iron, lead, zinc, copper and cadmium, as well as chloride and sulphate. In surface waters these can have a direct toxic effect. Iron for example, characterised by orange 'ochre' (iron hydroxide) deposits, can smother the river bed and harm the aquatic flora and fauna. The concentrations of zinc, cadmium and lead in rivers frequently exceed environmental quality standards. Contamination of groundwater by sulphate or chloride means that additional treatment is required to allow abstraction for drinking water supply.

Up to 1,700km of rivers in England are impacted by metals leaching from abandoned metal mines. Estimates suggest abandoned metal mines contribute up to 50% of the metal loads in surface waters, and cause over 110 water bodies in 6 River Basin Districts to fail to achieve good status under the Water Framework Directive (WFD).

Polluted groundwater from abandoned mines discharge as much lead, cadmium and zinc into rivers each year as arises from all permitted industrial discharges.

Abandoned coal mines cause significant, but more localised, pollution of rivers and groundwater bodies - including threatening drinking water supplies. This type of mine does cause WFD status failures for some groundwater bodies, but rarely for rivers.

[Abandoned mines and the water environment](#) explains the scale of pollution caused by abandoned mines.

No-one can be held liable for knowingly permitting water pollution from mines abandoned before 31 December 1999. It's only since this date that the operator of a mine has had an obligation to deal with the consequences of abandonment which they have permitted. An operator who has caused pollution from any mine whenever abandoned is liable for the consequences.

The Environment Agency is working in partnership with the [Coal Authority](#) to address mine water pollution. The Water Framework Directive and the Mining Waste Directive have brought about improvements in regulatory control of working mines. This builds on existing water quality protection measures and supporting regulations such as the Mines (Notice of Abandonment) Regulations 1998.

Since 1994, the Coal Authority has built 70 treatment schemes to deal with pollution from abandoned coal mines in the UK with funding from DECC. This prevents over 4,000 tonnes of iron and other metals from entering our rivers every year, protecting over 200km of rivers and drinking water aquifers. The Environment Agency has prioritised over 100 existing mine water discharges which also need to be cleaned up, and is working with the Coal Authority to identify where schemes are needed to prevent new pollution of rivers and groundwater.

In recognition of the seriousness of pollution from abandoned metal mines, the Water and Abandoned Metal Mines (WAMM) programme was set up in 2011. This is a partnership programme between the Environment Agency and the Coal Authority to investigate the extent of the problem across England.

The WAMM programme has investigated 38 water bodies, reviewed treatment feasibility options at 21 sites, and started remedial treatment at 2 sites: [Saltburn Gill](#), in the North East, and [Force Crag mine](#), in the North West. The Environment Agency has also published an [inventory of closed mining waste facilities causing serious environmental harm](#) and, with funding from Defra, has commissioned research projects looking at [innovative treatment technologies](#), in partnership with academia and industry experts.

The Environment Agency's priority is to ensure that no new pollution of groundwater or surface waters occurs from active or closed mines.

The [Mining Waste Directive](#) requires extractive waste to be managed in a manner that prevents harm to human health and the environment. It also recognises the impacts of historic mining and requires an inventory of closed and abandoned mine waste facilities. The disposal or re-disposal of mining waste at other sites may become a groundwater activity and therefore require an [environmental permit](#). This is only if the disposal and re-disposal is to ground and there is a risk of a direct or indirect discharge to groundwater. This includes re-working and relocating existing spoil heaps.

The Environment Agency is a statutory consultee for planning applications for mineral exploitation.

The Conservation of Habitats and Species Regulations 2010 require that any proposed abstractions or discharges to surface, ground or groundwater must be assessed and must not have an adverse effect on protected sites and/or habitats and species.

The Water Resources Act 1991 gives the Environment Agency a mechanism to control mines that are abandoned in future. Mine de-watering is currently exempt from control by abstraction licence but should be brought into the licensing regime in 2017.

Under the [Part 2A](#) contaminated land regime the Environment Agency can force the remediation of some aspects of historic mining pollution.

### **K1 - Environmental impacts on mining**

The Environment Agency works with government, other regulators, agencies and landowners to control and remediate the environmental impacts of mining. In particular it:

- continues to resolve polluting discharges from abandoned coal and metal mines into groundwater and surface water, in collaboration with the Coal Authority subject to funding
- maintains an inventory of closed and abandoned mining waste facilities causing serious environmental impacts
- integrates measures to tackle these problems within the Water Framework Directive and to fulfil the requirements of the Mining Waste Directive and the Habitats Directive

### **K2 - Future environmental impacts**

The Environment Agency aims to prevent future environmental impacts from mining activities. To do this it will:

- work with the Coal Authority to ensure that where groundwater is still rebounding in closed mines it does not pollute groundwater or surface waters
- review water management plans for mines closed after 1 January 2000 and enforce monitoring and pollution prevention plans as required
- use the range of regulatory tools at its disposal to ensure that new pollution is not caused, and water resources are not compromised at working mines
- ensure that the disposal or re-disposal of mining spoil or mineral preparation wastes complies with relevant European and domestic legislation

The water resources implications of mining and other activities that may affect groundwater flow are covered in [section N](#) and specifically position statements N7, N8, N9 and N11.

# L. Cemetery developments

This section contains the position statements on the development of new cemeteries or the extension or redevelopment of existing cemeteries.

For further information see the [guidance for cemeteries and burials](#).

For burial of animal carcasses see [section M - burial of animal carcasses](#).

Burials are covered by the requirements of EPR as they can discharge hazardous substances and non-hazardous pollutants to groundwater.

For individual burials that are spaced out over time, the risks to groundwater are likely to be low and the [de minimis exclusion in EPR applies](#).

Large numbers of burials in a short time, or the cumulative effects of many individual burials, may cause or have the potential to cause groundwater pollution. In general, the shorter the time over which burials occur and the higher the number of burials, the greater the risk of groundwater pollution. In these cases the Environment Agency will, where appropriate, use its powers under EPR to control or prohibit the burials.

The European Commission has indicated that, for ethical reasons, human corpses cannot be defined as waste. As a consequence, the Waste Framework Directive 2008/98/EC which defines waste, and basic waste management principles, does not apply, and burials are not controlled by waste legislation in England. The Environment Agency can therefore only control groundwater pollution from burials as a consultee on planning applications, or through environmental permitting and water resources legislation where risks of pollution are greatest.

## L1 - Locating cemeteries close to a water supply used for human consumption

The Environment Agency will normally object to the locating of any new cemetery or the extension of any existing cemetery, within SPZ1, or 250 metres from a well, borehole or spring used to supply water that is used for human consumption, whichever is the greater distance.

## L2 - Mass casualty emergencies

The Environment Agency will normally object to or may refuse to permit new or existing cemeteries planned for use in mass casualty emergencies if they are in SPZ1 or within 250 metres of an abstraction point, whichever is the greater distance. Where there is a risk of disease transmission into groundwater the Environment Agency will extend its objection to SPZ2.

## L3 - Cemeteries: protecting groundwater in highly sensitive locations

The Environment Agency will apply a risk-based approach to assessing the suitability of sites for cemeteries outside of the zones noted in position statements L1 and L2. A high priority is placed on protecting groundwater within principal aquifers and groundwater catchments used for drinking water supply, and new larger cemetery developments in such areas might not be appropriate. Proposals for new cemetery developments for greater than 100 burials per year are considered to be high risk even in a lower sensitivity groundwater scenario. Such proposals will only be agreed by the Environment Agency where a developer can demonstrate through detailed risk assessment that, given the site specific setting and the engineering methods proposed, groundwater pollution will be avoided.

Note that all cemetery developments and burials must maintain an unsaturated zone below the level of the base of the grave(s). The Environment Agency will work with the local authorities to identify alternative site and burial options where necessary.

## L4 - Home burials

The Environment Agency would not expect to be consulted on home burials or sites used for single burials, but would expect that the site should conform to the requirements set out in the [cemeteries guidance](#).



# M. Burial of animal carcasses

This section contains the position statements for emergency disposal of animal carcasses, either on-farm or in similar locations and circumstances.

EPR requires permitting of activities that may lead to the input into groundwater of hazardous substances or non-hazardous pollutants, unless the proposed activity meets the requirement of the [de minimis exclusion](#). Larger burials of animal carcasses and pet cemeteries require a permit.

Under normal circumstances, the burial of fallen stock is prohibited by the Animal By-Products Regulations 2013, although certain derogations apply in more isolated areas such as the Isles of Scilly. The preferred disposal options are rendering/commercial incineration or disposal at a fully engineered and appropriately permitted landfill. In an emergency, if these options are not available, burial may be allowed by notice from the Secretary of State.

The government updates its [contingency plans for exotic notifiable diseases of animals](#) annually – this document takes precedence over these position statements.

The burial of carcasses presents a potential hazard to surface water and groundwater quality from putrefaction, veterinary medicines and pathogens. Disposals need to be adequately assessed and controlled to prevent pollution. This applies equally under emergency conditions.

The Animal Health Act 2002 provides powers for the control of outbreaks of avian influenza, Newcastle disease, and foot and mouth disease.

The Avian Influenza Directive 2005/94/EC provides specific measures to regulate, control and prevent avian influenza.

There is limited available data on the fate and transport of viruses in groundwater. The data suggests extended survival times in groundwater and so disposal involving diseased or potentially diseased carcasses demands that the Environment Agency adopt the [precautionary principle](#).

Even with precautions to prevent pollution, burial in unlined pits under emergency conditions (and the pressures for burial capacity that this entails) will impact on groundwater quality. It may be necessary to restrict the new development of groundwater supplies around these burial sites; the larger the burial, the greater the hazard and the likely need for investigations, engineering design and long-term site management. In practice, this will mean that larger disposals must go to suitably engineered and currently permitted landfill sites.

The risk of groundwater pollution from animal burial is site-specific and depends on a number of factors including:

- the volume and type of carcasses
- the method of burial
- the surrounding geology
- the depth to the water table

When making decisions about animal burial, the Environment Agency must consider all the pollution risks over the time that the burial may remain an active source of contamination. This includes existing and potential future uses of groundwater for drinking water abstractions and natural discharges of groundwater to the surface through springs and river baseflow. Where viruses are a potential hazard, additional consideration may be needed to protect uses such as stock watering.

In an emergency situation the Environment Agency still has to protect the environment and meet the requirements of EPR. In such situations the role of the Environment Agency is to:

- support assessment of potential disposal locations to determine the risks to people and the environment
- issue an environmental permit if burial is justified and will not cause harm to people or the environment
- review the results from requisite surveillance of the burial
- provide advice and support to the government's contingency planning
- support any emergency response if a serious disease outbreak occurs

The Environment Agency aims to protect all groundwater from pollution from carcass burial, but its immediate priority in any emergency is to safeguard existing supplies of drinking water. The areas of highest permeability, and where there is the greatest concentration of public water supply catchments, are the principal aquifers. Within these areas a high level of confidence is required that a burial is suitable. This may demand a level of quantified risk assessment for which data and time are not available in emergency conditions. For this reason, it is particularly important that the appropriate authorities work with the Environment Agency to plan for alternative disposal capacity for carcasses in areas of principal aquifer and SPZs.

Pet cemeteries constitute landfills in terms of the Landfill Directive 99/31/EC. In practice the Environment Agency does not consider it appropriate to apply the [E1 landfill location](#) position statement to pet cemeteries, and therefore position statements M1, M2 and M3 should apply.

Disposal of ash from the cremation of animals needs to be considered on a site-specific risk basis if it does not meet the requirements of the de minimis exclusion.

#### **M1 - Burials close to water supply used for human consumption or farm dairies**

The Environment Agency will normally object to the burial of carcasses within SPZ1 or 250 metres from a well, borehole or spring used for water supply that is used for human consumption or farm dairies, whichever is the greater distance. Where carcasses present a risk of disease transmission into groundwater, any objection will be extended to SPZ2.

#### **M2 - On-farm carcass burials**

Outside the zones noted in position statement M1, the Environment Agency may consider on-farm carcass burial provided the operator can demonstrate that no alternative disposal options are available. It will only agree to a burial exceeding 50 tonnes per farm unit if the operator can further demonstrate that the disposal will be subject to appropriate engineered containment and associated site management controls.

#### **M3 - Risk-based approach**

Outside the zones noted in position statement M1, the Environment Agency will apply a risk-based approach to assessing the suitability of sites for carcass burial.

#### **M4 - Animal carcasses: protecting groundwater in highly sensitive locations**

Outside of the zones noted in position statement M1, the Environment Agency will place a high priority on protecting groundwater within principal aquifers and groundwater supply catchments. It will seek to avoid burial in these areas and will work with others to identify alternative disposal options.

# N. Groundwater resources

This section contains the position statements on how the Environment Agency protects and manages groundwater resources.

The Environment Agency is responsible for the management of groundwater resources in England and for the control of groundwater abstractions.

Many activities result in physical disturbance of aquifers and groundwater resources. Examples include:

- mining, quarrying and gravel extraction
- oil exploration
- ground source heat pumps
- construction of cuttings and tunnels
- new road schemes
- developments that require piling
- foundation development
- basement excavations
- installation of impermeable barriers such as bentonite or concrete slurry walls and lined landfills

These activities can artificially lower or raise groundwater levels, alter groundwater flow paths, or even cut off groundwater flow completely. Some activities (for example, tunnels and open boreholes) can also interconnect aquifers that were previously separate. This can all result in resource and quality problems.

Other activities such as field drainage and large areas of concrete, asphalt or other impermeable material can intercept water that otherwise would have become groundwater and divert it into surface watercourses. Changes in land use, such as large scale planting of crops with a high water demand, can also affect the volume of water recharging the ground. These can reduce the available groundwater resource.

The primary tool used for water resources management is [abstraction licensing](#) which is used to:

- prevent the loss of future resources by over-abstraction
- protect groundwater-dependent environmental features
- prevent the deterioration of groundwater quality

This applies to all types of abstraction licence.

The framework for managing abstractions is set out in [abstraction licensing strategies](#) (previously known as catchment abstraction management strategies or CAMS). The national position and regulatory framework within which abstraction licensing strategies operate is set out in [managing water abstraction](#).

Over abstraction is unsustainable. The Environment Agency reviews time limited licences as they expire and will only renew licences on a sustainable basis. The Environment Agency may vary or revoke permanent abstraction licences without compensation if they are causing serious damage to the environment.

Where it appears that an abstraction licence is unsustainable and licensed abstraction rates are causing environmental damage, or could cause damage, the Environment Agency will work with the licence holder(s) to investigate and where necessary implement a solution. Solutions include:

- restoring sustainable abstraction (RSA) - a programme to manage the historic impact at Habitats Directive sites, SSSIs, biodiversity action plan (BAP) sites and undesignated sites of local importance, which is closing in 2020
- the Water Framework Directive (WFD) River Basin Planning process - [river basin management plans](#) containing a programme of measures to ensure sustainable abstraction in the future

All abstractors are responsible for not letting their abstraction cause loss or damage to others. Under section 48A of the Water Resource Act 1991 anyone who suffers loss or damage (such as subsidence) caused by abstraction can bring a claim against the abstractor. This is a matter between the abstractor and the third party.

In some circumstances, the Environment Agency may wish to see groundwater resources augmented to increase the available water resources. Techniques include the following:

- infiltration sustainable drainage systems ([SuDS](#)), see position statements [G12](#) and [G13](#)
- returning treated effluent from wastewater treatment plants to the ground, see [section G](#)
- river augmentation, see [section P](#)
- managed aquifer recharge and recovery, see [section Q](#)

Under the right conditions, water can be recharged into the ground to augment resources or for storage. The main constraint is usually water quality. If the run-off, treated effluent or injection water is poor quality, the aim of enhancing resources can conflict with the need to protect the groundwater from pollution. On land that is contaminated, there are also risks around mobilising contaminants into groundwater by undertaking these recharge techniques (see [G11](#)).

Groundwater rebound can adversely affect underground structures that were built when abstractions rates were higher. Although it is not the responsibility of the Environment Agency to manage groundwater rebound, where possible it will work with the relevant bodies (for example water companies or local councils) on the issue.

Any groundwater abstraction can cause movement of an existing pollution plume in a connected aquifer. However, this may be acceptable if [position statement N5 - protecting groundwater resources](#) is met.

## Applying to use groundwater

An operator must apply for [groundwater investigation consent](#) (GIC) from the Environment Agency if they plan to abstract more than 20 cubic metres per day, or operate a ground source heating and cooling system (see [section R](#)). They must apply before they drill and test pump a borehole and before applying for a [full abstraction licence](#).

When making decisions on groundwater abstraction licences, the Environment Agency will work with others to manage the environmental implications of the abstraction, for example on surface water flows, and will consider the social and economic implications and the impacts on natural resources.

### N1 - Sustainable catchments

Abstraction licensing strategies ([formerly CAMS](#)) aim to ensure that the total authorised abstraction from any groundwater management unit does not exceed the long-term annual average available resource, after environmental needs have been accounted for. They will also ensure that groundwater abstraction does not have an unacceptable impact upon rivers and wetlands which depend on groundwater, or cause problems of saline intrusion in the aquifers. This will support achievement of the good groundwater quantitative status requirements of the WFD.

### N2 - Reducing unsustainable abstractions

The Environment Agency will take action on unsustainable abstractions that are:

- causing environmental problems (with priority given to the most seriously damaging) in excess of the available resource
- threatening to cause environmental problems if fully utilised

### N3 - Time-limited licences and tests for renewal

All new abstraction licences and most variations will be time-limited. Time-limited licences will carry a presumption of renewal where licence holders can satisfy the Environment Agency that all of the following three tests are met:

- environmental sustainability is not in question
- there is continued justification of need

- the licence holder can demonstrate that water used as a resource is being used in an efficient manner

#### **N4 - Water resource management arrangements**

The Environment Agency will take steps to secure the proper management of water resources. Where appropriate, it will enter into water resources management arrangements with abstraction licence holders to protect or enhance the water environment or to secure the proper management of water resources.

#### **N5 - Protecting groundwater resources**

The Environment Agency will only authorise abstractions if it can be shown that:

- there will be no derogation of existing protected rights
- there will be no unacceptable detriment to any groundwater-dependent environmental features such as rivers, lakes or wetlands
- the abstractions can be managed so that they will not cause pollution
- there will be no environmentally significant upward trends of pollutants through the intrusion of saline or polluted waters due to abstraction

#### **N6 - Water and development planning**

The Environment Agency will work with local planning authority to ensure that water resources and quality are considered at all stages of the planning system. The Environment Agency will work to influence the planning system, and to make representations on any developments where it is consulted as part of the planning process. This is to protect groundwater resources by seeking to incorporate sustainable water management approaches into planning guidance, strategies, and development frameworks and plans.

#### **N7 - Hydrogeological risk assessment**

Developers proposing schemes that present a hazard to groundwater resources, quality or abstractions must provide an acceptable hydrogeological risk assessment (HRA) to the Environment Agency and the planning authority. Any activities that can adversely affect groundwater must be considered, including physical disturbance of the aquifer. If the HRA identifies unacceptable risks then the developer must provide appropriate mitigation. If this is not done or is not possible the Environment Agency will recommend that the planning permission is conditioned, or it will object to the proposal.

#### **N8 - Physical disturbance of aquifers in SPZ1**

Within SPZ1, the Environment Agency will normally object in principle to any planning application for a development that may physically disturb an aquifer.

#### **N9 - Obstruction of flow**

The Environment Agency will only agree to proposals that could obstruct groundwater flow where mitigation measures can be agreed. There must be not be an unacceptable change in groundwater levels or flow due to the proposal.

#### **N10 - Augmenting groundwater resources**

Providing there is no pollution or risk of groundwater flooding, the Environment Agency will encourage the augmentation of groundwater resources through techniques such as SuDS (where the scheme meets the

[SuDS non-statutory technical standards](#) or has a relevant environmental permit) and artificial recharge, particularly where resources are scarce, or where such activities would reduce the flood risk from development.

#### **N11 - Protection of resources and the environment from changes to aquifer conditions**

For any proposal that would physically disturb aquifers, lower groundwater levels, or impede or intercept groundwater flow, the Environment Agency will seek to achieve equivalent protection for water resources and the related groundwater-dependent environment as if the effect were caused by a licensable abstraction.

#### **N12 - Rising groundwater levels**

Where rising groundwater levels are causing or are likely to cause problems, the Environment Agency will encourage increased abstraction within the relevant abstraction licensing framework. See also position statement [S1 flooding from groundwater](#).

# P. River augmentation

This section applies to river augmentation which is the discharge of groundwater into a river to augment its flow. Its purpose may be a combination of:

- supporting downstream surface water abstraction which would otherwise be limited at times of low flow
- to meet environmental (ecological or water quality) objectives

Schemes for supporting downstream abstraction can vary widely in scale; ranging from large scale schemes to support strategic water supplies to those that operate locally and benefit a few abstractors.

The Environment Agency has a duty to conserve, redistribute and otherwise augment water resources and it works with others to find sustainable solutions to low flows in rivers. It is essential to understand how surface water and groundwater interact in order to quantify how sustainable a groundwater discharge to a river will be.

If you are proposing a river augmentation scheme and the volume of groundwater abstracted will be greater than 20 cubic metres per day, you will need:

- a [groundwater investigation consent](#) (GIC)
- an [abstraction licence](#)

Discharges of groundwater to augment a river may also need an environmental permit, which you will need to apply for.

Groundwater augmentation schemes, depending on the size and scale of development, are covered by Schedules 1 and 2 of the [Town and Country Planning \(EIA\) Regulations 2011](#).

## P1 - Design of river augmentation

The Environment Agency will insist that the design of a river augmentation scheme is based on a robust understanding of the groundwater and surface water systems and their interaction, with a realistic assessment of the long-term net gain.

Long-term net gain refers to increase in river flows as a result of the augmentation scheme compared to the situation without the scheme. While some consideration is needed of long-term average recharge and annual abstraction, current recharge and current abstraction (if one year is higher than another) also needs to be considered, together with predictions of climate change.

## P2 - Operating rules and responsibilities for augmentation

The Environment Agency will require the objectives of a river augmentation scheme to be clearly defined, with agreed operating rules and clear responsibilities for meeting the on-going operating and maintenance costs.

## P3 - Assessing groundwater abstraction for river augmentation

The Environment Agency will assess the groundwater abstraction component of a river augmentation scheme in the same way as any other groundwater abstraction to ensure that there are no unacceptable impacts on the groundwater-dependent environment and that there is no derogation of existing protected rights.

## P4 - Assessing discharge for river augmentation

The discharge component of a river augmentation scheme will be assessed in the same way as any other discharge to ensure that the water quality of the discharge is compatible with the receiving water quality and that the natural flow variability of the receiving river is not adversely compromised.

Groundwater-fed headwater streams have natural patterns of wetting and drying and often have developed specific flora and fauna which require such conditions. The Environment Agency would not normally support schemes which cause extensive alteration of natural wetting and drying patterns, including making streams flow when they would naturally be dry.

#### **P5 - Cost–benefit for river augmentation**

The Environment Agency will require full cost–benefit analysis for a river augmentation scheme, and will accept the use of other tools (such as life-cycle analysis, multi-criteria decision analysis, qualitative approaches and efficiency analysis of proposed river augmentation schemes) within the context of the government's approach to sustainable development and the need to minimise greenhouse gas emissions. The Environment Agency will also encourage regular reviews of the effectiveness of existing schemes.



# Q. Managed aquifer recharge and recovery schemes

This section applies to the potential to utilise aquifers for managed aquifer recharge (MAR) and recovery schemes. Stored groundwater can then be used when other supplies are not available.

A subset of MAR, termed aquifer storage and recovery (ASR), involves water being injected to form a lens or 'bubble' of fresh or drinking quality water within the body of groundwater which is of different quality (for example, saline).

The concept of ASR is that the developer is effectively creating a 'below ground reservoir' in which to store high quality groundwater. The technique has so far only been trialled on a small scale in England. The main challenges for ASR are the uniqueness of each individual site and the complex hydrogeological investigations needed to establish the viability of a scheme.

In favourable conditions, MAR can be used instead of surface reservoirs that occupy potentially large tracts of land and can disrupt natural river flow.

The artificial recharge of water into aquifers and the subsequent abstraction of this groundwater is technically complex.

Drilling through contaminated soil or ground must be avoided; schemes should also investigate impacts on water quality.

The Environment Agency is responsible for making sure that water abstractions and discharges do not damage the environment. MAR is seen as an option for increasing water availability, particularly at peak demand periods and as an alternative to small- and medium-sized surface reservoirs. The use of MAR projects is encouraged as an option for redressing previously unsustainable water resources abstractions under the Restoring Sustainable Abstractions programme.

Developers of proposed MAR schemes are encouraged to liaise with the Environment Agency at the outset and throughout the development of any MAR scheme.

All MAR (including ASR) schemes require:

- an abstraction licence or a groundwater investigation consent for the abstraction of water from an aquifer or surface water
- an environmental permit or exemption for the discharge of any water to surface water or groundwater

Pre-application discussions are encouraged to ensure all parties understand what is intended.

## Q1 - Control of MAR schemes

The Environment Agency will regulate all managed aquifer recharge and subsequent re-abstraction over 20 cubic metres per day, to ensure effective development of water resources while at the same time protecting the environment and other abstractors. In particular, schemes must be sustainable in terms of quantities recharged and re-abstracted.

## Q2 - Detailed investigation for MAR schemes

The Environment Agency requires developers to undertake appropriate investigation for MAR schemes. This will include a hydrogeological risk assessment at the pre-abstraction licence stage and method statements for their construction and operation.

# R. Ground source heating and cooling

Ground source heating and cooling (GSHC) systems utilise a renewable energy source, namely the warming of the ground by solar radiation that keeps 'shallow' groundwater at its constant temperature.

Heat from deep in the Earth's interior can also warm groundwater, but this is not normally significant within 100 metres of the surface. For the purposes of these position statements, any schemes that use heat from the Earth's interior will be called '[deep geothermal schemes](#)' and not GSHC systems.

There are two types of GSHC systems:

- closed loop – these are not regulated (however, they must not leak circulation fluid. Non-hazardous pollutants should be used as a precaution)
- open loop – these are regulated by the Environment Agency

The [Environmental good practice guide for ground source heating and cooling \(EGPG\)](#) explains the types of systems in more detail.

All open loop schemes require:

- a [groundwater investigation consent](#) (GIC)
- an [abstraction licence](#), if the volume of water abstracted is greater than 20 cubic metres per day
- an [environmental permit](#) for the discharge, if it does not satisfy conditions to be [registered as exempt](#)

Developers of open loop GSHC schemes should contact the Environment Agency at an early stage to discuss the proposed design, intended location and operation of their system.

Both closed and open loop systems can:

- result in changes in groundwater flow and quality – this can also happen during drilling and installation
- mobilise contaminants if installed inappropriately on contaminated sites
- result in undesirable temperature changes in the groundwater and for example, impact on ecology

In addition, open loop systems give rise to concerns about the:

- availability of groundwater to abstract without having impacts on existing water users or the environment – this may not be an issue if water is available, and providing the groundwater is returned to the same aquifer (this is called non-consumptive). It may be an issue if groundwater is discharged to rivers or sewers (this is called consumptive)
- adverse impacts of returning water into an aquifer, including localised mounding of groundwater levels causing flooding or impacting on adjacent structures such as scheduled ancient monuments

The Environment Agency takes into account protected species and ecosystems when considering permit applications for open loop GSHC systems.

Discharge of water to ground or surface water with a significantly changed temperature may cause pollution and so an environmental permit will be required. Where necessary to prevent pollution, temperature limits on environmental permits will be set. This allows the Environment Agency to ensure that schemes comply with the Water Framework Directive and EPR, which both recognise that heat can cause pollution and should be controlled.

If the water discharged contains any added substances to the abstracted water, an environmental permit will be required.

The risks indicated above need to be balanced against the environmental advantages of GSHC in potentially cutting greenhouse gas emissions. Where the risks and environmental advantages are not balanced, high densities of GSHC systems may not be sustainable. In the long term, they may alter the local ground or groundwater temperature resulting in impacts to the efficiency of the system or adjacent systems, and therefore alter their greenhouse gas emission savings. Ground source heat is however a technology that could help achieve UK climate change targets.

## Deep geothermal schemes

Deep geothermal schemes utilise the heat from deep in the earth's crust and these types of scheme require

- a GIC and abstraction licence
- an environmental permit

See the [deep geothermal energy regulation](#) guidance for more information.

### R1 - Encouraging sustainable renewable energy

The Environment Agency is committed to facilitating and enabling the deployment of sustainable renewable energy, including ground source heating and cooling (GSHC) systems.

### R2 - Regulation of GSHC

GSHC systems can, in some circumstances, have negative impacts on the environment or on other users of water. The Environment Agency takes a proportionate and risk-based approach to schemes that are regulated to mitigate these impacts where they occur. Where schemes are non-consumptive of water resources and present a low risk to the environment, the aim is to reduce the regulatory burden for these schemes.

If a developer proposes to use hazardous substances for a GSHC system in a sensitive location such as a SPZ1, the Environment Agency may serve a notice to prevent pollution.

### R3 - Balanced systems

The Environment Agency considers that the most sustainable type of GSHC system, or group of systems, balances heating and cooling demand across a year. For example the system should provide cooling in summer and heating in winter in equal proportions. This will avoid unacceptable heating of the ground or groundwater.

### R4 - Environmental risks

The Environment Agency expects all developers to follow the [environmental good practice guide](#) (EGPG) in developing GSCH systems, which details the environmental risks of all types of schemes and how these can and should be mitigated. The Environment Agency will require a risk assessment for both the abstraction and discharge from the schemes it regulates. The Environment Agency expects developers to assess risks for schemes it does not regulate.

Developers should make the Environment Agency aware of closed-loop GSHC proposals on land potentially affected by contamination (eg landfills) or in a SPZ1.

### R5 - Serving notices

An environmental permit is not required to construct or operate a closed loop system. However, if the system uses hazardous substances the Environment Agency will if necessary, serve a notice to prevent pollution. It is strongly recommended that closed loop systems do not use hazardous substances.

### R6 - Operator's responsibilities

It is the developer's responsibility to consider the fact that the ground and groundwater can eventually warm or cool to a point where a GSHC system may not operate efficiently. The developer should also consider the impact of their system on the ground and groundwater, such as causing ground instability or groundwater flooding throughout the lifetime of the scheme. Developers should also be aware that even when schemes are not regulated they may be liable for any pollution resulting from their activity or impacts on third party assets.

# S. Flooding from groundwater

Groundwater flooding happens when groundwater emerges at surface level or rises into underground infrastructure (such as cellars) when the 'normal' range of groundwater levels and groundwater flows is exceeded. Groundwater flooding is infrequent and, whilst it's of longer duration than flooding from rivers, it is a part of the natural water cycle.

Flooding from groundwater is most common in areas where the underlying bedrock is chalk, but it can also happen in locations with other geological settings, including other limestones, sandstones and sands and gravels in river valleys.

The Environment Agency has a strategic overview role for flooding from all sources including rivers, the sea, groundwater, reservoirs and surface waters in England. It is empowered (but has no duty) to provide warning services for any source of flooding. However, it has taken responsibility for providing the groundwater warning services that have been set up in certain locations (those with a history of groundwater flooding).

The Environment Agency does not have powers, duties or resources to control groundwater levels to prevent flooding of land, property or infrastructure.

Lead local flood authorities (LLFAs) (namely unitary authorities or county councils) have responsibilities for local flood risk (including groundwater) under the Flood and Water Management Act 2010. This Act gives LLFAs duties to prepare local flood risk management strategies and to co-operate with other risk management authorities, and powers to carry out local flood risk management.

## S1 - Flooding from groundwater

The Environment Agency provides a risk-based groundwater flood warning service for those locations at highest risk which have experienced flooding from groundwater in the past.

The Environment Agency however, does not provide specific advice on, or implement solutions to groundwater flooding and it cannot provide a warning service for each individual property, but it has produced some practical advice to help you reduce the impact of [flooding from groundwater](#).

LLFAs have powers to carry out risk management activities associated with flooding from groundwater. LLFAs are either the unitary authority or the county council for the area. LLFAs work with other organisations, including the Environment Agency, to manage this risk.

If you would like further information about flooding from groundwater you should contact your lead local flood authority.

Please also see [N12 - rising groundwater levels](#).

# Legal framework

## Animal By-Products (Enforcement) (England) Regulations 2013

Prohibits livestock and wild game burials at the place they die, with exceptions for disease outbreak and pet animals, including horses. These laws do not apply to burying culled wild animals.

## Animal Health Act 2002

Provides powers for the control of outbreaks of avian influenza, Newcastle disease, and foot and mouth disease.

## Conservation of Habitats and Species Regulations 2010

Require that abstractions or discharges must not have an adverse effect on protected sites and/or habitats and species

## Control of Major Accident Hazards Regulations 2015

Requires measures to prevent a major accident to the environment.

## Drinking Water Directive 98/83/EC

Concerns the quality of water intended for human consumption.

## Environmental Damage (Prevention and Remediation) Regulations 2015

Apply to serious environmental damage, to species/habitats, to the water environment and to land.

## Environmental Permitting (England and Wales) Regulations 2010 (EPR)

EPR replaced the Groundwater Regulations and controls inputs into groundwater via permits or exemptions.

## Flood and Water Management Act 2010

Lead local flood authorities are responsible for groundwater flooding under this Act.

## Groundwater Daughter Directive 2006/118/EC

Clarifies requirements of the Water Framework Directive on the protection of groundwater against pollution and deterioration.

## Infrastructure Act 2015

Makes provision for nationally significant infrastructure projects, onshore petroleum and geothermal energy (including provision for protected groundwater source areas).

## Landfill Directive 1999/31/EC

Covers: location, waste types, technical and engineering requirements, protection of soil and water, landfill gas, and ensures long term financial controls are in place.

## Mines (Notice of Abandonment) Regulations 1998

Covers the consequences of mine abandonment and the information a mine operator is obliged to provide.

## Mining Waste Directive 2006/21/EC

Requires the management of extractive waste to prevent harm to human health and the environment.

## Nitrate Pollution Prevention Regulations 2015

Implements the Nitrates Directive, 1991 to reduce nitrates from agriculture entering water systems.

## Part 2A of the Environmental Protection Act 1990

Requires local authorities to identify contaminated land to assess the risks to human health and the environment.

## REACH Regulation EC 1907/2006

Concerns registration, evaluation, authorisation and restriction of chemical substances.

## Town and Country Planning Acts and Regulations (various dates)

Influences the location of developments through development plans and specific planning applications.

## Waste Framework Directive 2008/98/EC

Overarching legislative framework for the collection, transport, recovery and disposal of waste.

## Water Framework Directive 2000/60/EC

Overarching Directive that establishes an integrated approach to the protection, improvement and sustainable use of Europe's groundwater and surface waters.

## Water Resources Act 1991

Regulates abstractions over 20 cubic metres per day (as amended by the Water Act 2003) and allows water protection zones to be designated. Provides powers to the Environment Agency under section 161A and the Anti-Pollution Works Regulations 1999 to serve works notices to prevent or remedy pollution of controlled waters.

## Water Supply (Water Quality) Regulations 2016 and Private Water Supplies (England) Regulations 2016

Requires water companies and local authorities to adopt a risk-based drinking water safety planning approach to public and private water supplies respectively.

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