

Environmental Standards for Inputs of Radioactive Substances into Groundwater

Consultation

February 2025 Version 0.1



If you would like this document in an accessible format, such as large print, audio recording or braille, please contact SEPA by emailing equalities@sepa.org.uk

Environmental Standards for Inputs of Radioactive Substances into Groundwater

1. Purpose and scope

This policy statement sets out the environmental standards which apply to inputs of radioactive substances into groundwater. It applies only to radioactive substances activities authorised via registrations or permits under the *Environmental Authorisations (Scotland) Regulations 2018* (EASR), in accordance with Schedule 8. It should be applied alongside [SEPA's guidance relevant to the radioactive substances activity or activities](#).

This statement supersedes section 6.2 of SEPA's *Position Statement Assigning Groundwater Assessment Criteria for Pollutant Inputs WAT-PS-10-01* (SEPA 2014).

This statement does not apply to the regulation of radioactive contaminated land under the *Radioactive Contaminated Land (Scotland) Regulations 2007*. However, if radioactive contaminated land is remediated in a way which involves radioactive substances activities which must be authorised via registration or permit under EASR, then this statement may apply to those activities.

2. Legislative background

An EASR permit or registration, for any activity liable to cause indirect discharge into groundwater of any hazardous substance, is a relevant authorisation for the purposes of the *Water Environment (Controlled Activities) (Scotland) Regulations 2011* (CAR), in accordance with Schedule 10 of CAR.

In accordance with Schedule 2 of CAR, we have identified radioactive substances as hazardous substances in our *List of groundwater hazardous substances* (SEPA 2023).

When we determine an application for a relevant authorisation, we must ensure all measures necessary are taken to prevent inputs of hazardous substances into groundwater, as required by Article 6.1.(a) of *Directive 2006/118/EC of the European Parliament and of the Council on the protection of groundwater against pollution and deterioration* (the Groundwater Directive).

Article 6.3.(b) of the Groundwater Directive enables inputs of hazardous substances to be exempted from these measures if they are:

- “*considered by the competent authorities to be of a quantity and concentration so small as to obviate any present or future danger of deterioration in the quality of the receiving groundwater;*”

Furthermore, the Scottish Government has issued *The Scotland River Basin District (Standards) Directions 2024* and *The Solway Tweed River Basin District (Standards) Directions 2024*. These Directions set out environmental standards that we must use when regulating under CAR.

We have therefore set environmental standards for inputs of radioactive substances into groundwater to be consistent with both Article 6.3.(b) of the Groundwater Directive and with the Directions.

If a radioactive substances activity, which is liable to cause indirect discharge of radioactive substances to groundwater, can be shown to satisfy the following environmental standards, we will be able to authorise that activity, provided all our other relevant regulatory requirements can be met.

3. Environmental standards for inputs of radioactive substances into groundwater

3.1. Application of the environmental standards

The following environmental standards apply only to radioactive substances activities authorised under EASR in accordance with Schedule 8.

These standards apply during our determination of an application for, or a variation or surrender of, a permit for any radioactive substances activity that may cause indirect discharge of radioactive substances to groundwater. Registrations for radioactive substances activities are already underpinned by generic assessments, which show these standards can be met.

The standards for protection of the public apply only to authorised activities which give rise to planned exposure situations, involving the deliberate introduction or operation of radioactive sources. Planned exposure situations may cause:

- normal exposures, which are expected to occur under normal operating conditions during the period of authorisation, or
- potential exposures, which may or may not occur in the period after authorisation has ceased.

The standards for protection of wild animal and plant species apply only to authorised activities which cause exposures, during the period of authorisation, of populations of wild animals and plants that depend upon the following types of protected habitats:

- Special Protection Areas and Special Areas of Conservation designated under the *Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019*; and
- Special Sites of Scientific Interest designated under the *Nature Conservation (Scotland) Act 2004*.

3.2. Assessment against the environmental standards

Assessment against the environmental standards must be made in terms of exposures of:

- the representative person, which is a hypothetical member of the public representative of those most exposed or at risk, or
- reference animals and plants, which are hypothetical and selected to reflect populations of wild animal and plant species which depend upon protected habitats such as groundwater dependant terrestrial ecosystems.

3.3. The environmental standards

3.3.1. Normal exposures of members of the public

When determining applications for, or variations of permits, and assessing normal exposures of members of the public, SEPA must have regard to the following maximum doses to the representative person which may result from the planned carrying on of a radioactive substances activity, for use at the planning stage in radiation protection:

- 0.3 millisieverts per year from any source from which radioactive discharges are first made on, or after, 13th May 2000; or

- 0.5 millisieverts per year from the discharges from any single site.

3.3.2. Potential exposures of members of the public

When determining applications for surrender of permits, and assessing potential exposures of members of the public, SEPA must have regard to the following:

- for nuclear sites or radioactive waste disposal facilities, the risk guidance level of one-in-one-million per year (10^{-6} /year) to the representative person of developing a fatal cancer or hereditary defect; or
- for other authorised places, the conditional dose corresponding to the risk guidance level of 10 microsieverts per year.

3.3.3. Exposures of wild animal and plant species

When determining applications for, or variations of permits, and assessing exposures of wild animal and plant species, SEPA should have regard to the following guideline dose rates to reference animals and plants:

- for terrestrial animal populations: 1 milligrays / day (or around 40 micrograys / hour);
- for terrestrial plant populations: 10 milligrays / day (or around 400 micrograys / hour); and
- for freshwater and coastal organisms: 10 milligrays / day (or around 400 micrograys / hour).

4. Basis for the environmental standards and assessment approach

Schedule 8 of EASR gives effect to SEPA's obligations to adequately protect the public and the environment from exposure to ionising radiation from radioactive substances activities.

Our approach is in accordance with domestic legislation and policy and consistent with international recommendations and standards, including:

- UK policy framework for managing radioactive substances and nuclear decommissioning May 2024 (DESNZ et al 2024)

- ICRP Publication 103: The 2007 Recommendations of the International Commission on Radiological Protection (ICRP 2007),
- ICRP Publication 124: Protection of the Environment under Different Exposure Situations (ICRP 2014) and
- Radiation protection and safety of radiation sources: International Basic Safety Standards, General Safety Requirements Part 3 (IAEA 2014).

5. Assessment approach

Schedule 8, paragraph 28 of EASR requires SEPA to make arrangements for estimating doses to members of the public from radioactive substances activities, and to specify when and how assessments should be carried out.

Where SEPA has specified that an assessment must be carried out in a realistic way, assessments are to be made for the representative person, taking into account the effective pathways for transmission of radioactive substances.

The representative person is a hypothetical individual receiving a dose that is representative of the doses to the more highly exposed individuals in the population (ICRP 2007 and IAEA 2014).

Dose estimates must include assessments of external exposure, and of internal exposure from food, drinking water and other environmental media. This means that:

- Members of the public are the receptors, so the assessment point(s) for exposures to a representative person from a radioactive substances activity:
 - for normal exposures, will be located outwith the boundary of the authorised place during the period of authorisation, and
 - for potential exposures, may be located outwith or within the former boundary after the period of authorisation has ceased.
- The time period for assessment must encompass the time(s) at which maximum exposure occurs, which may be some considerable time after radioactive substances first enter groundwater.

- From points 1. and 2. above it follows that the assessments point(s), at which maximum exposures occur may be at different locations and times from where and when radioactive substances first enter groundwater.
- Exposures from a given source of radioactivity must be estimated and summed across all credible pathways, for example, via direct exposure to a source, inhalation and deposition of vapour and dust, ingestion of foodstuffs, as well as consumption of, or immersion in, groundwater. Groundwater may therefore form one of, and play a role in, a number of exposure pathways.
- The concentrations and quantities of individual radioactive substances in any food, drink or environmental media are relevant only in so far as they contribute to the totality of exposures from a given source via all relevant pathways.

5.1. Normal exposures of members of the public

The standard for normal exposures at section 3.3 is stipulated in Schedule 8, paragraph 27 of EASR.

Normal exposures are those expected to occur under normal operating conditions, during the period of authorisation under Schedule 8 of EASR. They may include, for example, exposures due to an authorised discharge of radioactive substances to atmosphere from a stack, or to sea from an outfall.

5.2. Potential exposures of members of the public

The standard for potential exposures at section 3.4 is stipulated in Appendix 3 of DESNZ 2024, and must be satisfied so that SEPA can grant an application for surrender of a permit.

Potential exposures are those that may or may not occur, after the period of authorisation under EASR, in accordance with Schedule 8, has ceased. They may include, for example, exposures in the distant future due to migration of radioactive substances from a closed solid radioactive waste disposal facility or from a cleaned-up former nuclear site, where large uncertainties apply to timescales, probabilities, magnitudes, pathways and receptors.

5.3. Exposures of wild animal and plant species

The standards for protection during the period of authorisation of populations of wild animals and plants and their habitats are derived from ICRP 2014.

This describes a framework for protecting the environment from ionising radiation, based upon assessing radiation doses to reference animals and plants, and comparing those doses with derived consideration reference levels.

6. References

DESNZ et al 2024: UK policy framework for managing radioactive substances and nuclear decommissioning, May 2024. Department of Energy Security & Net Zero (DESNZ), Scottish Government, Welsh Government and Northern Ireland.

ICRP 2007: The 2007 Recommendations of the International Commission on Radiological Protection (ICRP 103) International Commission on Radiological Protection.

IAEA 2014: Radiation protection and safety of radiation sources: International Basic Safety Standards (General Safety Requirements Part 3) International Atomic Energy Agency.

ICRP 2014: Protection of the Environment under Different Exposure Situations (ICRP 124) International Commission on Radiological Protection.

SEPA 2014: SEPA's Position Statement Assigning Groundwater Assessment Criteria for Pollutant Inputs WAT-PS-10-01

SEPA 2023: List of groundwater hazardous substances determined in accordance with Schedule 2 of the Water Environment (Controlled Activities) (Scotland) Regulations.