Environment Agency

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Habitats assessment for radioactive substances

Better regulation science programme
Science report: SC060083/SR1

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or by telephoning 08708 506506.

Author(s):
R. Allott, D. Copplestone, P. Merrill & S. Oliver

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Environment Agency's Project Manager:
Claire Cailes

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Steve Killeen

Head of Science

Executive summary

The UK has a duty to comply with the EU Birds and Habitats Directives (Council Directives 79/409/EEC on the conservation of wild birds and 92/43/EEC on the conservation of natural habitats and wild flora and fauna) when planning and undertaking all of its regulatory and operational activities. These European Directives were introduced into UK legislation by the Conservation (Natural Habitats & c.) Regulations 1994. These Directives established and protect a network of conservation areas across the EU called 'Natura 2000'. Natura 2000 is made up of sites designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

Under the Habitats Regulations, the Environment Agency has obligations to review relevant existing authorisations, permits, consents, licences and permissions (collectively referred to as permits) to ensure that no Environment Agency authorised activity or permission results in an adverse effect, either directly or indirectly, on the integrity of Natura 2000 sites. The Environment Agency is also required to ensure that any new or varied permits do not have an adverse effect on the integrity of the Natura 2000 sites. The Environment Agency has adopted a staged approach to reviewing existing permits:

- Stage 1 – identify the relevant permits.
- Stage 2 – determine which permits have a potential significant effect.
- Stage 3 – undertake appropriate assessment for permits with significant effects.
- Stage 4 – revise permits to ensure no adverse effects (e.g. by changing the type, amount and location of discharges).

The Environment Agency authorises discharges of radioactive waste to the environment (including discharges to air and water), under the Radioactive Substances Act 1993, from a variety of premises. The Environment Agency has assessed the impact of these discharges on Natura 2000 sites (Stage 3 assessment). These assessments have involved the calculation of dose rates to organisms in coastal, freshwater and terrestrial environments, taking account of the combined impact of discharges from multiple authorised releases and cautiously assuming that discharges occur at the authorisation limits. All discharges authorised under the Radioactive Substances Act 1993 that could have an impact on the Natura 2000 sites were included in the assessment. The total dose rates, calculated in the Stage 3 assessments, were compared to a threshold of 40 microgray/h, below which the Environment Agency, Natural England and the Countryside Council for Wales agreed there would be no adverse affect to the integrity of a Natura 2000 site

The total dose rates to the worst affected organism are less than 40 microgray/h for all but two Natura 2000 sites (Ribble and Alt Estuaries SPA and Drigg Coast SAC). The calculated total dose rate to the worst affected organism for the Ribble and Alt Estuaries SAC was 520 microgray/h. This was significantly in excess of the agreed threshold and so this Natura 2000 site was included in Stage 4 of the Habitats Regulations implementation process. A separate report is available for the Ribble and Alt Estuaries which concluded that previously agreed new authorisation limits for the Springfields Fuels Ltd site (in effect from January 2008) would ensure that the dose rates to reference organisms and feature species will be less than 40 microgray/h.

The total dose rate for the Drigg Coast SAC is just greater than the 40 microgray/h threshold. The assessment methodology is generally cautious, in particular compared to a new assessment methodology resulting from an EC funded project (ERICA assessment tool). The dose rate to the worst affected organism (phytoplankton) is 20 microgray/h using the dose rate per unit concentration data from the ERICA assessment tool. The

Drigg Coast SAC was also considered in an ERICA project case study which concluded that there was no indication of significant impact from ionising radiation on the sand dune biota. This Natura 2000 site will be kept under review.

It is recommended that the current assessment methodology is revised to include data from the ERICA assessment tool. The results using this new data should be reviewed. Refining assessment data for phytoplankton should also be considered, in light of the Ribble and Alt Estuaries report. The assessments for Natura 2000 sites should be kept under review where the assessed dose rates approach the agreed threshold.

Contents

1 Introduction

The UK has a duty to comply with the EU Birds and Habitats Directives (Council Directives 79/409/EEC on the conservation of wild birds and 92/43/EEC on the conservation of natural habitats and wild flora and fauna) when planning and undertaking all of its regulatory and operational activities. These European Directives were introduced into UK legislation by the Conservation (Natural Habitats & c.) Regulations 1994. The aim of the Habitats Directive is to contribute towards ensuring biodiversity through conserving natural habitats and wild fauna and flora. It provides measures to maintain or restore, at favourable conservation status, natural habitats and species of European Community interest.

These Directives established and protect a network of conservation areas across the EU called 'Natura 2000'. Natura 2000 is made up of sites designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). SACs can be aquatic or terrestrial and support rare, endangered or vulnerable natural habitats, plant and animal species. SPAs support significant numbers of wild birds, for example wintering wildfowl, and their habitats. The designation of SAC or SPA shows the conservation or ecological value of the site on an international level.

Natural England and the Countryside Council for Wales (CCW) are responsible for reporting the condition of Natura 2000 sites and providing advice on conservation objectives to government. Competent authorities, including the Environment Agency, have duties to protect Natura 2000 sites under the Habitats Regulations.

Under the Habitats Regulations the Environment Agency has obligations to review relevant existing authorisations, permits, consents, licences and permissions (collectively referred to as permits) to ensure that no Environment Agency authorised activity or permission results in an adverse effect, either directly or indirectly, on the integrity of Natura 2000 sites. The Environment Agency is also required to ensure that any new or varied permits do not have an adverse effect on the integrity of the Natura 2000 sites.

The Environment Agency has adopted a staged approach to reviewing existing permits:

- Stage 1 – identify the relevant permits.
- Stage 2 – determine which permits have a potential significant effect.
- Stage 3 – undertake appropriate assessment for permits with significant effects.
- Stage 4 – revise permits to ensure no adverse effects (e.g. by changing the type, amount and location of discharges).

Natura 2000 sites were categorised as either high, medium or low priority for the Stage 3 assessment. This categorisation was not driven by potential effects from radioactive substances but was based on the sites' value to conservation. The timescales to complete Stages 3 and 4 for high, medium and low priority Natura 2000 sites are as follows:

Site priority	**Complete Stage 3 by:**	**Complete Stage 4 by:**
High	March 2004	March 2006
Medium	March 2006	March 2008
Low	March 2008	March 2010

The conservation objectives for Natura 2000 sites in England and Wales are recorded by Natural England and the Countryside Council for Wales. They set out the targets that need to be met to maintain each site in a favourable condition.

The Environment Agency authorises discharges of radioactive waste to the environment under the Radioactive Substances Act 1993 (RSA 93) from a variety of premises, including hospitals, universities, pharmaceutical companies and nuclear licensed sites. These disposals include discharges to air and water.

The Environment Agency completed Stages 1 and 2 of the permit review process in 2003 to identify the RSA 93 authorisations that could have a significant effect on Natura 2000 sites. However, as a result of a review of the criteria used for these stages, it was concluded that some criteria were slightly optimistic (e.g. no impact from releases to air if greater than a distance of 1 km from a Natura 2000 site) or probably inappropriate (e.g. use of human drinking water standards). Also, more scientific information became available which needed to be taken into account. For these reasons, it was decided to include all RSA 93 authorisations in the Stage 3 assessment. Revised criteria were established to select whether these RSA 93 authorisations could have an impact on Natura 2000 sites (see Section 2.5).

The Environment Agency has now completed Stage 3 assessments for the impact of discharges of authorised radioactive substances to air and water on Natura 2000 sites and the results are recorded in this report.

This report presents the results of the assessments for the low priority sites which have been sent to Natural England and the Countryside Council for Wales for consultation. It also includes a reassessment of the high and medium priority Natura 2000 sites using current RSA 93 authorisations. These high and medium priority sites were originally assessed in 2004 and 2006.

2 Assessment method

2.1 Overview

The Stage 3 assessment methodology involves the calculation of dose rates to reference organisms and feature species from exposure to authorised discharges of radioactive substances at Natura 2000 sites in England and Wales. Dose rate is an indicator of potential harm to the organism from this exposure and is calculated or measured in units of microgray/h. The dose rates for reference organisms can be related to effects data (e.g. mortality, morbidity, reproductive effects) (Woodhead and Zinger 2003).

Reference organisms are defined as:

> *A series of entities that provide a basis for the estimation of radiation dose rate to a range of organisms which are typical, or representative, of a contaminated environment. These estimates, in turn, would provide a basis for assessing the likelihood and degree of radiation effects.* (Larsson et al. 2002).

The feature species are those species listed in legislation which are protected at each Natura 2000 site in England and Wales. The reference organisms are used in the assessment to represent prey species for the feature species.

The Stage 3 assessment methodology has been based on Environment Agency Science (Copplestone et al. 2001, 2003), which was developed as part of the Euratom FP5 Project 'FASSET' (Larsson et al. 2004), and the Environment Agency and Natural England have agreed this methodology. It involves the calculation of dose rates to organisms from the total discharges of radionuclides at RSA 93 authorisation limits which may affect a Natura 2000 site multiplied by dose rate per unit release factors.

The Environment Agency, Natural England and the Countryside Council for Wales have agreed a dose rate threshold of 40 microgray/h, below which it has been concluded that there will be no adverse effect on the integrity of a Natura 2000 site. This has been derived as follows:

- Research from the Euratom FP5 Project 'FASSET' (Larsson et al. 2004) indicated that, in general and from the available data, there appear to be no significant adverse effects in biota exposed at levels of up to 100 microgray/h.
- A review paper from the FASSET Project (Brown et al. 2004) indicated that wildlife might receive up to 60 microgray/h from natural sources in European ecosystems.
- The threshold of 40 microgray/h for authorised discharges of radioactive substances is the difference between these two values.

This threshold of 40 microgray/h is the same as the lower 1992 guideline level for terrestrial animals published by the International Atomic Energy Agency (IAEA 1992). The IAEA stated that it is unlikely that there would be any significant effect on populations of terrestrial animals which are chronically exposed at these levels.

2.2 RSA 93 authorisation limits

RSA 93 authorisations for the disposal of radioactive waste to the environment were collated and the authorisation limits for individual radionuclides and radionuclide groups were entered into a Microsoft Access database. These were all authorisations in force in September 2007. A total of 700 authorisations and nearly 4000 authorisation limits were included in the high, medium and low priority assessments.

The authorisation limits may be over a time period of a week, month, year, rolling 12 months or more than one of these. The different types of limits were converted to annual limits for the purpose of the assessment and the most restrictive value selected. For example, an annual limit may be lower than 12 lots of monthly limits, in which case the annual limit was selected.

Dose rate per unit release data were not available for the full range of radionuclides or radionuclide groups in the authorisations. Hence, it was necessary to assign some authorisation limits to a surrogate radionuclide or radionuclide category for which there were dose rate per unit release data available (e.g. other alpha represented by plutonium-239, other beta/gamma (t1/2 >10 days) represented by caesium-137) (see Appendix 1).

In some cases, information has been obtained on the realistic radionuclides which will be discharged in order to use these radionuclides or groups of radionuclides in the assessment (see Appendix 1). For example, some authorisations have a limit for ‘other radionuclides’, when in reality the registrations for using radioactive substances under the RSA 93 only allow the organisation to use beta/gamma-emitting radionuclides and not alpha-emitting radionuclides. Hence, ‘other beta/gamma-emitting radionuclides’ was assigned to this authorisation limit as this is a more realistic group of radionuclides. The Environment Agency has noted that there is a need to improve the description of some of the permit limits in its authorisations, and will review this issue.

A few ‘total alpha-emitting radionuclides’ and ‘total beta-emitting radionuclides’ authorisation limits were excluded from the assessment as they would double count with other limits on specific radionuclides (see Appendix 1).

Information on the waste type (i.e. aqueous, gaseous, organic liquid, solid) and release route type (e.g. release to air, sewage treatment works, river, estuary, etc.) were obtained. Also, for releases which would ultimately discharge into a water body, information on the release point for that discharge was obtained. In many cases this was the relevant sewage treatment works and its associated outfall. Grid reference data for the site with the RSA 93 authorisation were recorded as this was used to determine the distance to Natura 2000 sites for the terrestrial assessment.

2.3 Natura 2000 sites

The Natura 2000 sites in England and Wales (as of September 2007) are listed in Appendix 2 and shown in Figure 1. Also, given in Appendix 2 are details of whether the Natura 2000 site has protected marine/coastal, freshwater or terrestrial features.

2.4 Dose rate per unit release factors

Dose rate per unit release factors for marine, freshwater and terrestrial environments have been calculated for different radionuclides and organisms from dose rate per unit concentration data in air, soil and water combined with simple dispersion modelling factors (concentration per unit release).

The dose rate per unit concentration factors have been derived for reference organisms and feature species based on Environment Agency Science (Copplestone et al. 2003). These were weighted to take account of the likely effects of different radiation types. Hence, all calculated dose rates reported are weighted dose rates. The calculation of dose rate per unit release factors is described in more detail in Appendix 3.

The dose rate per unit release factors can be modified to take account of site-specific dispersion parameters. These are the water exchange rate for releases to coastal waters, the river flow for releases to freshwaters, and a scaling factor for the effective release height for releases to air. This is described in Appendix 3.

A radioactive substance habitats assessment spreadsheet tool was developed to assess the dose rates to terrestrial, freshwater and coastal organisms. The Environment Agency agreed with English Nature (now Natural England) and the Countryside Council for Wales that the spreadsheet tool would be used for Stage 3 radioactive substance habitats assessments. The spreadsheet tool includes the dose rate per unit release data and allows authorisation limits and site-specific dispersion parameters to be entered.

2.5 Selection of RSA 93 authorisations

For each coastal, freshwater and terrestrial Natura 2000 site, the RSA 93 authorisations were selected where their releases to air or water could lead to an impact on the Natura 2000 sites.

For coastal and freshwater Natura 2000 sites, these were releases to water which could ultimately flow through the Natura 2000 site. For terrestrial sites, these were releases to air which were within 10 km of the Natura 2000 site. A distance of 10 km was chosen as atmospheric dispersion will mean that any sites further away will have only a minor contribution to the total dose to organisms on a Natura 2000 site.

2.6 Calculation of coastal, freshwater and terrestrial dose rates

For each Natura 2000 site, the total releases of radionuclides at RSA 93 authorisation limits, which could affect the Natura 2000 site, were summed and multiplied by dose rate per unit release values to calculate the dose rates. The radioactive substance habitats assessment spreadsheet tool was used to perform these calculations and the assessment methods are described in more detail in the following appendices:

- Appendix 4 – Dose rates to coastal Natura 2000 sites from releases which ultimately flow to coastal waters (e.g. via sewage treatment works, pipeline to sea). For releases to coastal waters, dose rates were assessed for releases in the immediate vicinity of the Natura 2000 site (local compartment) and from

releases which are further away but could be transported to the Natura site as a result of marine dispersion (regional compartment).
- Appendix 5 – Dose rates to freshwater Natura 2000 sites from releases to freshwater (e.g. via sewage treatment works, outfall into river).
- Appendix 6 – Dose rates to terrestrial Natura 2000 sites from releases to air.

The radioactive substance habitat assessment tool calculates the dose rate to all reference organisms and feature species for releases to coastal waters, freshwater and air. The spreadsheet identifies the dose rate to the worst affected organism(s) for each of these release routes. It is these dose rates to the worst affected organism which are generally recorded in this report.

The freshwater dose rate has also been used to represent the dose rate to the worst affected organism from flooding of terrestrial sites as this has been shown to be a worst case scenario (see Appendix 7).

2.7 Calculation of total dose rates

The total dose rate for the worst affected organism has been calculated from the:

sum of the terrestrial dose rate and maximum water dose rate for worst affected organism, where the;

a. maximum water dose rate is the maximum of the freshwater dose rate (worst affected organism) and the coastal water dose rate (worst affected organism), and where the;
b. coastal water dose rate (worst affected organism) is the sum of the dose rate from a local and a regional compartment.

This was a cautious calculation, as the worst affected organism for the terrestrial and water aspects of a Natura 2000 site will not necessarily be the same in each case.

2.8 Summary of key assumptions

The key assumptions in the Stage 3 radioactive substances assessment are as follows:

- ***Discharges at authorisation limits*** – The assessments have been made on the basis that discharges are at RSA 93 authorisation limits. Actual discharges will be lower than the discharge limits, and often less than 50% of the discharge limit.

- ***Dose rate per unit concentration data*** – The dose rate per unit concentration data has been sourced from an Environment Agency Science project (P3-101/SP1a) which was based on the EC FASSET project. In the intervening period, there has been a successor project, EC ERICA (Beresford et al. 2007), which has extended the work of FASSET. The ERICA project has delivered an assessment tool[1] which is now 'good practice' for radioactive substance habitat assessments. Dose rate per concentration data have been compared in Appendix 8 for reference organisms. There is a tendency for the P3-101/SP1a data to be more cautious than the ERICA data for the marine assessments.

[1]Available from http://www.project.facilia.se/erica/download.html

This conclusion is also valid for estuarine environments where both coastal and freshwater assessments were undertaken. This is because most of the P3-101/SP1a coastal water values are either similar to or higher than the freshwater ERICA values. However, there were radionuclides for which ERICA dose rate per unit concentrations were significantly higher than those for P3-101/SP1a (e.g. phytoplankton). Whether doses will be higher for a particular Natura 2000 site will depend upon the mix of radionuclides discharged. For this reason, it will be necessary to use the ERICA data for future habitats assessments.

- ***Generic modelling approach*** – Dose rate per unit release data have been derived using generic modelling approaches with cautious assumptions. Monitoring data have not been used in the assessments. However, coastal water modelling results are compared to monitoring results in Appendix 9 for four locations. This shows that although there is some variability in the monitoring data, the modelling is either close to the average monitored results or more cautious. The only exception is where there are residual concentrations in the environment of long-lived radionuclides where discharges were much higher in the past. It has not been possible to compare modelled and monitored data for the terrestrial and freshwater environments, due to the lack of comparable monitoring data.

- ***Surrogate radionuclides*** – Dose rate per unit release data are only available for a limited range of radionuclides. Where there is no data for radionuclides with authorisation limits, a surrogate (generally cautious) radionuclide has been selected (Appendix 1).

- ***Realistic radionuclides*** – Where there is information on the most likely radionuclide or group of radionuclides which can be discharged, this more realistic radionuclide (or group) has been used for the assessment.

- ***Realistic dispersion data*** – Where appropriate, more realistic site-specific data have been included in the assessments, including effective release height of releases to air, river flow rate for releases to rivers, and exchange rate for releases to estuaries/coastal areas (Appendix 1).

- ***Historical discharges not included*** – The assessments are based on modelling of discharges at current authorisation limits. The assessments do not include concentrations of radionuclides which may have been discharged when historical limits were significantly higher. This will only be an issue for radionuclides with longer radioactive half-lives and which concentrate in the local environment. The Sellafield site in Cumbria is the one site in England and Wales which had significantly higher historical discharges of longer-lived radionuclides compared to the current authorisation limits. Dose rates to reference organisms from Sellafield's historical discharges and naturally occurring radionuclides have been assessed for the nearest Natura 2000 site, the Drigg Coast SAC (see Appendix 10). The reference organism dose rates for both Sellafield's historical discharges and naturally occurring radionuclides are well within the 60 microgray/h assumed for background, with the exception of phytoplankton. Since Sellafield is the one source of radioactive discharges where discharges were much higher in the past, this indicates that the exclusion of the impact of historical discharges which are higher than current limits is unlikely to affect the conclusions of the Stage 3 assessment. However, some targeted monitoring of phytoplankton would help to reduce the uncertainty in the assessment of dose rates for this reference organism.

- ***Flooding of terrestrial sites*** – One of the potential routes for contamination of a Natura 2000 site with terrestrial feature species is by flooding of that site with river water containing discharged radionuclides. Appendix 7 shows it is cautious to use the freshwater assessment methodology for assessing the dose rate to the worst affected organism as a result of flooding of terrestrial sites.

- ***Total dose rate*** – The total dose rate from releases to air and releases to water to the worst affected organism has been calculated from the terrestrial dose rate and water environment dose rate for the worst affected organism. This is a cautious assumption, as the worst affected organism may not be the same for the terrestrial and water environments.

3 Results

The total dose rates to worst affected organisms for all the Natura 2000 sites are summarised in Table 1. Included in the table are the dose rates from discharges to the local and regional compartment for the coastal assessment; dose rates from the freshwater assessment; the maximum of the freshwater and coastal dose rates; and the dose rate for the terrestrial assessment.

Of the 429 Natura 2000 sites in England and Wales, four have not been assessed as the Natura site status has not been confirmed. There are no RSA 93 authorisations affecting 148 of the Natura 2000 sites. For the remaining Natura 2000 sites, the total dose rates ranged from 7.7 10^{-8} to 520 microgray/h. There were two Natura 2000 sites with dose rates greater than the agreed threshold of 40 microgray/h:

- Ribble and Alt Estuaries SPA – 520 microgray/h.
- Drigg Coast SAC – 41 microgray/h.

The frequency distribution of dose rates is shown in Figure 2. Most of the Natura 2000 sites had dose rates less than 20 microgray/h. Sixteen Natura 2000 sites have dose rates greater than 20 microgray/h. The locations of sites with dose rates less than 20 microgray/h (green), 20–40 microgray/h (amber) and >40 microgray/h (red) are shown in Figure 3.

The two Natura 2000 sites with dose rates greater than 40 microgray/h, along with the Teesmouth and Cleveland Coast SPA which had the next highest dose rate of 31 microgray/h, are discussed in more detail below.

3.1 Ribble and Alt Estuaries SPA

The dose rates to reference organisms for the marine/coastal, freshwater and terrestrial Stage 3 assessments for the Ribble and Alt Estuaries SPA are shown in Figures 4 to 6. For the marine/coastal assessment, the reference organisms with the highest dose rates were the seabird (500 microgray/h), seal and whale (520 microgray/h). For the freshwater assessment the reference organisms with the highest dose rate were amphibian (260 microgray/h) and duck (130 microgray/h). The reference organism with the highest dose rate for the terrestrial assessment was fungi (3.6 microgray/h).

The radionuclides which provide the greatest contribution to the dose rates to the seabird and seal for the coastal/marine assessment are thorium-234 and other alpha-emitting radionuclides (Figure 7). These radionuclides are also dominant contributors to the amphibian and duck total dose rates in the freshwater assessment (Figure 8). The dose rate for the terrestrial assessments arises from uranium isotopes. The source of the discharges of these radionuclides is the Springfields Fuels Ltd site.

The total dose rate for the Ribble and Alt Estuaries SPA is significantly in excess of the agreed threshold of 40 microgray/h. This Natura 2000 site went forward into the Stage 4 process, which is the subject of a separate report (Allott and Copplestone 2009).

In summary, new, lower authorisation limits for Springfields Fuels Ltd came into effect from January 2008. These lower authorisation limits came about for operational reasons on site and were agreed before the results of this habitats assessment were available.

The dose rates to reference organisms and feature species were recalculated using the ERCIA assessment tool and monitoring data for sediment and biota which equated to discharges at these new limits. The revised calculated dose rates were all less than 40 microgray/h, due to the lower limits and use of more realistic data in the ERICA assessment tool. An uncertainty analysis showed that under certain circumstances dose rates to phytoplankton could exceed 40 microgray/h, and some monitoring of phytoplankton will be undertaken if this is practicable.

3.2 Drigg Coast SAC

The dose rates to reference organisms for the marine/coastal and terrestrial assessments for the Drigg Coast SAC are shown in Figures 9 and 10. For the marine/coastal assessment, the reference organisms with the highest dose rates were the seabird (41 microgray/h), seal and whale (40 microgray/h). The reference organisms with the highest dose rates for the terrestrial assessment were carnivorous mammal (0.13 microgray/h) and fungi (0.12 microgray/h).

The radionuclides which provide the greatest contribution to the dose rates to the seabird and seal for the coastal/marine assessment are plutonium-alpha-emitting isotopes, americium-241 and other alpha-emitting radionuclides (Figure 11). Krpton-85, other alpha-emitting radionuclides and other beta/gamma-emitting radionuclides with half-lives greater than 10 days were the radionuclides which dominated the total dose rates to the carnivorous mammal and fungi in the terrestrial assessment (Figure 12). The source of the discharges of these radionuclides is the Sellafield Limited site.

The total dose rate for the Drigg Coast SAC is just above the agreed threshold of 40 microgray/h. The coastal assessment methodology is generally cautious compared to the new ERICA assessment tool (see Appendix 8). The dose rate to the worst affected organism (phytoplankton) is 20 microgray/h (see Table 2) using the dose rate per unit concentration data from the ERICA assessment tool. The Drigg Coast SAC was also considered in an ERICA project case study, which concluded that there was no indication of significant impact from ionising radiation on the sand dune biota (Wood et al. 2008).

3.3 Teesmouth and Cleveland Coast SPA

The dose rates to reference organisms for the marine/coastal and terrestrial assessments for the Teesmouth and Cleveland Coast SPA are shown in Figures 13 and 14. For the marine/coastal assessment, the reference organisms and feature species with the highest dose rates were bittern (12 microgray/h), seabird (9.6 microgray/h) and seal (6.2 microgray/h). The reference organisms with the highest dose rates for the terrestrial assessment were carnivorous mammal (19 microgray/h) and reptile (16 microgray/h).

The radionuclides which provide the greatest contribution to the dose rates to the seabird and seal for the coastal/marine assessment are sulphur-35, caesium-137 and other beta/gamma-emitting radionuclides with half-lives greater than 10 days (Figure 15). Other beta/gamma-emitting radionuclides with half-lives greater than 10 days dominated the total dose rates to the carnivorous mammal and reptile in the terrestrial assessment (Figure 16). The source of the discharges of these radionuclides is a combination of the Hartlepool power station and agrochemical industry, in particular Blychem, which produces radio-labelled tracers. Blychem has a limit on discharges of radionuclides in the category of ‘carbon-14 and other beta emitters’, which has been assessed as other beta/gamma-emitting radionuclides with half-lives greater than 10 days. The main radionuclide discharged by Blychem in this category is carbon-14 (Environment Agency

Pollution Inventory[2]). Blychem's discharge limit for 'carbon-14 and other beta emitters' is about 45% of the total limits on discharges of other beta/gamma-emitting radionuclides with half-lives greater than 10 days, which can affect the Teesmouth and Cleveland Coast SPA.

[2] http://maps.environmentagency.gov.uk/wiyby/dataSearchController?topic=pollution&lang=_e

4 Conclusions

Dose rates to wildlife arising from discharges to the environment from authorisations granted by the Environment Agency under RSA 93 have been assessed for Natura 2000 sites in England and Wales. Dose rates have been calculated for organisms in coastal, freshwater and terrestrial environments. These radioactive substance habitats assessments have considered the combined impact of discharges from multiple authorised releases and have cautiously assumed that discharges occur at the permit limits.

The total dose rates to the worst affected organism are less than the agreed threshold of 40 microgray/h for all but two Natura 2000 sites (Ribble and Alt Estuaries SPA and Drigg Coast SAC). This threshold represents the level below which it is accepted that there will be no adverse affect on the integrity of a Natura 2000 site. The total dose rate to the worst affected organism for the Ribble and Alt Estuaries SPA was 520 microgray/h. This was significantly in excess of the agreed threshold, and this Natura 2000 site was included in the Stage 4 process (determination of permissions) of the Habitats Regulations implementation. A separate report is available for this determination process (Allott and Copplestone 2009), which concluded that new, lower authorisation limits for the Springfields site (which came into effect from January 2008 in response to operational changes on site) would ensure that the dose rates to reference organisms and feature species will be less than 40 microgray/h.

The total dose rate for the Drigg Coast SAC is just greater than 40 microgray/h. However, the current assessment methodology is generally cautious, in particular when compared with the new ERICA assessment tool. The dose rate to the worst affected organism (phytoplankton) is 20 microgray/h using the dose rate per unit concentration data from the ERICA assessment tool. The Drigg Coast SAC was also considered in an ERICA project case study which concluded that there was no indication of significant impact from ionising radiation on the sand dune biota. The potential impacts on this Natura 2000 site will be kept under review.

5 Recommendations

Recommendations arising from this report are:

- Revise the assessment methodology to include more realistic data on radionuclide transfer to biota and for a wider range of radionuclides from the ERICA assessment tool. The results using this new data should be reviewed.
- Review ERICA assessment methodology for phytoplankton, using monitoring data or laboratory studies if practicable in light of the findings at the Ribble and Alt Estuary Natura 2000 site.
- Keep assessments for Natura 2000 sites under review where the assessed dose rates approach the agreed threshold. This will need to ensure that the effects of new or varied authorisations are considered.

6 References

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Table 1: Results of Stage 3 radioactive substances habitats assessments

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
A01	Abberton Reservoir SPA	M	**2.3E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
A02	Alde-Ore Estuary SPA	M	**9.3E+00**	1.3E-01	1.3E-02	1.4E-01	3.1E-01	3.1E-01	9.0E+00
A03	Alde, Ore and Butley Estuaries cSAC	M	**1.2E+01**	1.3E-01	1.3E-02	1.4E-01	0.0E+00	1.4E-01	1.2E+01
A04	Barnack Hills & Holes cSAC	L	**3.0E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-01
A05	Baston Fen cSAC	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A06	Benacre to Easton Bavents SPA	M	**1.3E-01**	6.8E-02	1.3E-02	8.1E-02	1.3E-01	1.3E-01	0.0E+00
A07	Benacre to Easton Bavents Lagoons cSAC	M	**1.3E-01**	6.8E-02	1.3E-02	8.1E-02	1.3E-01	1.3E-01	0.0E+00
A08	Benfleet & Southend Marshes SPA	M	**8.0E+00**	6.6E+00	1.5E-03	6.6E+00	7.8E+00	7.8E+00	2.3E-01
A09	Breckland cSAC	M	**7.2E-01**	0.0E+00	0.0E+00	0.0E+00	7.2E-01	7.2E-01	0.0E+00
A10	Breckland pSPA	M	**7.2E-01**	0.0E+00	0.0E+00	0.0E+00	7.2E-01	7.2E-01	0.0E+00
A11	Breydon Water SPA	L	**1.4E+00**	4.7E-01	1.3E-02	4.8E-01	1.4E+00	1.4E+00	0.0E+00
A12	The Broadland – SPA	M	**8.4E+00**	2.8E+00	1.3E-02	2.8E+00	8.4E+00	8.4E+00	8.1E-03
A13	Deben Estuary SPA	M	**1.2E+01**	0.0E+00	1.3E-02	1.3E-02	0.0E+00	1.3E-02	1.2E+01
A14	Devils Dyke cSAC	L	**3.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E-01
A15	Dews Pond cSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A16	Essex Estuaries –cSAC	M	**1.2E+01**	1.5E-01	1.3E-02	1.6E-01	3.7E-01	3.7E-01	1.2E+01
A17	Mid Essex Coast SPA – Phase 1 – Dengie	M	**1.2E+01**	1.5E-01	1.3E-02	1.6E-01	3.7E-01	3.7E-01	1.2E+01
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	M	**1.2E+01**	1.5E-01	1.3E-02	1.6E-01	3.7E-01	3.7E-01	1.2E+01
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	M	**6.0E-01**	1.5E-01	1.3E-02	1.6E-01	3.7E-01	3.7E-01	2.3E-01
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	M	**1.2E+01**	1.5E-01	1.3E-02	1.6E-01	3.7E-01	3.7E-01	1.2E+01
A21	Mid Essex Coast SPA – Phase 5 – Foulness	M	**1.2E+01**	1.5E-01	1.3E-02	1.6E-01	3.7E-01	3.7E-01	1.2E+01
A22	Eversden and Wimpole Woods pSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A23	Fenland cSAC	M	**3.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E-01
A24	Gibraltar Point SPA	M	**4.3E-01**	3.1E-01	1.3E-02	3.2E-01	4.3E-01	4.3E-01	0.0E+00
A25	Great Yarmouth North Denes SPA	L	**1.5E-01**	1.4E-01	1.3E-02	1.5E-01	0.0E+00	1.5E-01	0.0E+00
A26	Grimsthorpe cSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A27	Hamford Water SPA	L	**1.2E+01**	0.0E+00	1.3E-02	1.3E-02	0.0E+00	1.3E-02	1.2E+01
A28	Minsmere to Walberswick SPA	M	**9.3E+00**	1.3E-01	1.3E-02	1.4E-01	3.1E-01	3.1E-01	9.0E+00
A29	Minsmere to Walberswick Heaths and Marshes cSAC	M	**9.1E+00**	1.3E-01	1.3E-02	1.4E-01	0.0E+00	1.4E-01	9.0E+00

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
A30	Nene Washes SPA	H	**6.2E-01**	0.0E+00	0.0E+00	0.0E+00	6.2E-01	6.2E-01	0.0E+00
A31	Nene Washes cSAC	H	**6.5E-01**	0.0E+00	0.0E+00	0.0E+00	6.2E-01	6.2E-01	2.5E-02
A32	Norfolk Valley Fens – cSAC	M	**1.8E+00**	0.0E+00	0.0E+00	0.0E+00	1.8E+00	1.8E+00	0.0E+00
A33	North Norfolk Coast SPA	M	**4.4E-01**	3.1E-01	1.3E-02	3.2E-01	4.3E-01	4.3E-01	8.1E-03
A34	North Norfolk Coast cSAC	M	**4.4E-01**	3.1E-01	1.3E-02	3.2E-01	4.3E-01	4.3E-01	8.1E-03
A35	Orfordness – Shingle Street cSAC	L	**1.5E+00**	1.5E+00	1.3E-02	1.5E+00	0.0E+00	1.5E+00	0.0E+00
A36	Orton Pit cSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A37	Ouse Washes cSAC	H	**7.5E+00**	0.0E+00	0.0E+00	0.0E+00	7.5E+00	7.5E+00	0.0E+00
A38	Ouse Washes SPA	H	**7.9E+00**	0.0E+00	0.0E+00	0.0E+00	7.5E+00	7.5E+00	3.5E-01
A39	Overstrand Cliffs cSAC	L	**1.3E-02**	0.0E+00	1.3E-02	1.3E-02	0.0E+00	1.3E-02	0.0E+00
A40	Paston Great Barn cSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A41	Portholme cSAC	M	**1.9E+00**	0.0E+00	0.0E+00	0.0E+00	1.9E+00	1.9E+00	2.5E-02
A42	Rex Graham Reserve cSAC	L	**1.6E-07**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-07
A43	River Wensum cSAC	M	**8.1E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.1E-03
A44	Roydon Common & Dersingham Bog cSAC	M	**6.4E-07**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.4E-07
A45	Rutland Water SPA	H	**3.0E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-01
A46	Sandlings pSPA	L	**1.6E+01**	1.5E+00	1.3E-02	1.5E+00	3.6E+00	3.6E+00	1.2E+01
A47	Saltfleetby – Theddlethorpe Dunes and Gibraltar Point cSAC	M	**2.3E+00**	2.3E+00	1.3E-02	2.3E+00	0.0E+00	2.3E+00	0.0E+00
A48	Staverton Park & The Thicks, Wantisden cSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
A49	Stour and Orwell Estuaries – SPA	M	**1.2E+01**	9.8E-02	1.3E-02	1.1E-01	7.9E-02	1.1E-01	1.2E+01
A50	The Broads – cSAC	M	**8.4E+00**	2.8E+00	1.3E-02	2.8E+00	8.4E+00	8.4E+00	8.1E-03
A51	The Wash SPA	M	**3.2E-01**	3.1E-01	1.3E-02	3.2E-01	0.0E+00	3.2E-01	6.4E-07
A52	The Wash and North Norfolk Coast cSAC	M	**3.3E-01**	3.1E-01	1.3E-02	3.2E-01	0.0E+00	3.2E-01	8.1E-03
A53	Upper Nene Valley Gravel Pits pSPA	-	No assessment yet						
A54	Waveney and Little Ouse Valley Fens cSAC	H	**3.1E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E-05
A55	Winterton – Horsey Dune cSAC	L	**1.3E-02**	0.0E+00	1.3E-02	1.3E-02	0.0E+00	1.3E-02	0.0E+00
M01	Bees Nest and Green Clay Pits	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M02	Birklands and Bilhaugh	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M03	Bredon Hill	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M04	Brown Moss	H	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M05	Cannock Chase	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M06	Cannock Extension Canal	M	**3.2E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-02
M07	Coedydd Llawr-y-glyn	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M08	Cotswolds Beechwoods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
M09	Dixton Wood	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M10	Downton Gorge	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M11	Ensors Pool	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M12	Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M13	Fens Pools	L	**3.2E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-02
M14	Gang Mine	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M15	Granllyn	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M16	Hatfield Moor	H	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M17	Lyppard Grange Ponds	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M18	Montgomery Canal	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M19	Mottey Meadows	L	**3.5E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E-02
M20	Pasturefields Salt Marsh	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M21	Peak District Dales	M	**7.5E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.5E-03
M22	River Clun	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M23	River Mease	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M24	Rodborough Common	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M25	The Stiperstones and the Hollies	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M26	Tanat & Vyrnwy Bat Sites	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M27	Thorne and Hatfield Moors	H	**3.5E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
M28	Thorne Moor	H	**9.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E-01
M29	Walmore Common	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
M30	Wye Valley and Forest of Dean Bat sites/Safleoedd Ystlumod Dyffryn Gwy	M	**4.3E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E+00
NE01	Arnecliff & Park Hole Woods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE02	Beast Cliff to Whitby (Robin Hood's Bay)	L	**6.6E-02**	6.7E-03	5.9E-02	6.6E-02	0.0E+00	6.6E-02	0.0E+00
NE03	Berwickshire & N Northumberland Coast	M	**7.0E-02**	0.0E+00	5.9E-02	5.9E-02	0.0E+00	5.9E-02	1.1E-02
NE04	Castle Eden Dene	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE05	Coquet Island	L	**5.9E-02**	0.0E+00	5.9E-02	5.9E-02	0.0E+00	5.9E-02	0.0E+00
NE06	Craven Limestone Complex	M	**7.8E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E-01
NE07	Denby Grange Colliery Ponds	M	**6.8E-07**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E-07
NE08	Durham Coast	L	**5.0E+00**	4.9E+00	5.8E-02	5.0E+00	0.0E+00	5.0E+00	4.3E-05
NE09	Ellers Wood & Sand Dale	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE10	Farne Islands	L	**5.9E-02**	0.0E+00	5.9E-02	5.9E-02	0.0E+00	5.9E-02	0.0E+00
NE11	Fen Bog	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE12	Flamborough Head	M	**6.1E-02**	1.5E-03	5.9E-02	6.1E-02	0.0E+00	6.1E-02	4.3E-05

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
NE13	Flamborough Head and Bempton Cliffs	M	**6.1E-02**	1.5E-03	5.9E-02	6.1E-02	0.0E+00	6.1E-02	0.0E+00
NE14	Ford Moss	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE15	Harbottle Moors	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE16	Holburn Lake and Moss	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE17	Hornsea Mere	H	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE18	Humber Estuary	M	**2.5E+01**	2.3E+01	5.4E-02	2.3E+01	2.1E+01	2.3E+01	1.7E+00
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	M	**2.5E+01**	2.3E+01	5.4E-02	2.3E+01	2.1E+01	2.3E+01	1.7E+00
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	M	**2.5E+01**	2.3E+01	5.4E-02	2.3E+01	2.1E+01	2.3E+01	1.7E+00
NE21	Kirk Deighton	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE22	Lindisfarne	H	**8.3E-02**	1.3E-02	5.9E-02	7.2E-02	0.0E+00	7.2E-02	1.1E-02
NE23	Lower Derwent	H	**4.7E-01**	0.0E+00	0.0E+00	0.0E+00	4.6E-01	4.6E-01	6.8E-03
NE24	Lower Derwent Valley	H	**4.7E-01**	0.0E+00	0.0E+00	0.0E+00	4.6E-01	4.6E-01	6.8E-03
NE25	Moor House Upper Teesdale	H	**1.4E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-04
NE26	Newham Fen	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE27	N Northumberland Dunes	L	**5.9E-02**	0.0E+00	5.9E-02	5.9E-02	0.0E+00	5.9E-02	0.0E+00
NE28	North Pennine Dales Meadows	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE29	North Pennine Moors	H	**1.9E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
NE30	North Pennine Moors	H	**1.9E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
NE31	North York Moors	L	**1.9E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
NE32	North York Moors	L	**1.9E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
NE33	Northumbria Coast	L	**8.7E-02**	1.7E-02	5.9E-02	7.6E-02	0.0E+00	7.6E-02	1.1E-02
NE34	Ox Close	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE35	River Derwent	H	**4.7E-01**	0.0E+00	0.0E+00	0.0E+00	4.6E-01	4.6E-01	6.8E-03
NE36	River Tweed	M	**1.1E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02
NE37	Roman Wall Loughs	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE38	Simonside Hill	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE39	Skipwith Common	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NE40	South Pennine Moors	H	**3.5E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
NE41	South Pennine Moors Phase 2	H	**7.8E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E-01
NE42	South Pennine Moors Phase 1 (Peak District Moors)	H	**3.5E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
NE43	Strensall Common	L	**6.8E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.8E-03
NE44	Teesmouth and Cleveland Coast	H	**3.1E+01**	1.2E+01	5.9E-02	1.2E+01	0.0E+00	1.2E+01	1.9E+01
NE45	Thrislington	L	**1.9E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E+01
NE46	Tweed Estuary	M	**5.9E-02**	0.0E+00	5.9E-02	5.9E-02	0.0E+00	5.9E-02	0.0E+00
NE47	Tyne & Allen River Gravels	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
NE48	Tyne & Nent	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW01	Asby Complex	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW02	Border Mires, Kielder – Butterburn	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW03	Borrowdale Woodland Complex	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW04	Bowland Fells	L	**3.6E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E+00
NW05	Calf Hill and Cragg Woods	L	**3.0E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00
NW06	Clints Quarry	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW07	Cumbrian Marsh Fritillary Site	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW08	Drigg Coast	L	**4.1E+01**	4.1E+01	1.5E-04	4.1E+01	0.0E+00	4.1E+01	1.3E-01
NW09	Duddon Estuary	M	**1.0E+01**	2.1E-02	8.5E+00	8.5E+00	0.0E+00	8.5E+00	1.8E+00
NW10	Duddon Mosses	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW11	Helbeck andSwindale Woods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW12	Ingleborough Complex	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW13	Lake District High Fells	L	**1.3E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-01
NW14	Leighton Moss	L	**1.7E+01**	0.0E+00	1.4E+01	1.4E+01	0.0E+00	1.4E+01	3.0E+00
NW15	Liverpool Bay / Bae Lerpwl pSPA	-	No assessment yet						
NW16	Manchester Mosses	M	**5.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.5E-01
NW17	Martin Mere	M	**7.2E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.2E-05
NW18	Mersey Estuary	M	**2.4E+01**	7.8E+00	1.4E+01	2.2E+01	0.0E+00	2.2E+01	2.6E+00
NW19	Mersey Narrows and North Wirral Foreshore	-	No assessment yet						
NW20	Morecambe Bay – cSAC	M	**1.9E+01**	1.7E+00	1.4E+01	1.6E+01	1.3E+00	1.6E+01	3.6E+00
NW21	Morecambe Bay – SPA	M	**1.9E+01**	1.7E+00	1.4E+01	1.6E+01	1.3E+00	1.6E+01	3.0E+00
NW22	Morecambe Bay Pavements	L	**3.0E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00
NW23	Naddle Forest	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW24	Oak Mere	L	**2.6E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E+00
NW25	Ribble/Alt Estuaries	M	**5.2E+02**	5.1E+02	1.6E+00	5.1E+02	2.6E+02	5.1E+02	3.6E+00
NW26	River Derwent & Bassenthwaite Lake	M	**1.3E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-01
NW27	River Eden	H	**2.5E-01**	0.0E+00	0.0E+00	0.0E+00	2.5E-01	2.5E-01	1.4E-04
NW28	River Ehen	M	**1.3E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-01
NW29	River Kent	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW30	Rixton Clay Pits	L	**5.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.5E-01
NW31	Rochdale Canal	L	**8.1E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.1E-01
NW32	Roudsea Wood and Mosses	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW33	Sefton Coast	M	**2.5E+01**	7.7E+00	1.4E+01	2.2E+01	0.0E+00	2.2E+01	3.6E+00
NW34	Solway Firth	L	**8.6E+00**	1.3E-03	8.5E+00	8.5E+00	2.5E-03	8.5E+00	1.3E-01
NW35	Solway Moss	L	**2.6E-03**	0.0E+00	0.0E+00	0.0E+00	2.5E-03	2.5E-03	1.4E-04
NW36	South Solway Mosses	M	**1.4E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-04

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
NW37	Subberthwaite Blawith & Torver Low Commons	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW38	Tarn Moss	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW39	Ullswater Oak Woods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW40	Upper Solway Flats & Marshes	L	**8.6E+00**	1.3E-03	8.5E+00	8.5E+00	2.5E-03	8.5E+00	1.3E-01
NW41	Bolton Fell/Walton Moss	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW42	Wast Water	L	**1.3E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-01
NW43	West Midlands Mosses	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW44	Witherslack Mosses	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
NW45	Yewbarrow Woods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S01	Arun Valley	M	**7.2E-01**	0.0E+00	0.0E+00	0.0E+00	7.1E-01	7.1E-01	9.7E-03
S02	Ashdown Forest	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S03	Ashdown Forest	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S04	Butser Hill	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S05	Briddlesford Copses	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S06	Castle Hill	L	**1.5E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-03
S07	Chichester & Langstone Harbours	H	**3.6E-01**	3.6E-01	2.7E-03	3.6E-01	0.0E+00	3.6E-01	0.0E+00
S08	Dover to Kingsdown Cliffs	L	**1.3E-02**	0.0E+00	1.3E-02	1.3E-02	0.0E+00	1.3E-02	0.0E+00
S09	Duncton to Bignor Escarpment	L	**9.7E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.7E-03
S10	Dungeness	M	**8.2E+00**	3.7E-02	2.0E-03	3.9E-02	0.0E+00	3.9E-02	8.2E+00
S11	Dungeness to Pett Level	M	**8.2E+00**	3.7E-02	2.0E-03	3.9E-02	0.0E+00	3.9E-02	8.2E+00
S12	Ebernoe Common	L	**9.7E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.7E-03
S13	Emer Bog	L	**6.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.5E-01
S14	Folkestone to Etchinghill Escarpments	L	**1.0E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
S15	Hastings Cliffs (to Pett Beach)	L	**4.0E-02**	3.8E-02	2.0E-03	4.0E-02	0.0E+00	4.0E-02	0.0E+00
S16	Isle of Wight Downs	L	**1.6E-01**	1.6E-01	9.9E-04	1.6E-01	0.0E+00	1.6E-01	0.0E+00
S17	Kingley Vale	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S18	Lewes Downs	L	**1.2E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-04
S19	Lydden and Temple Ewell Downs	L	**7.6E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.6E-02
S20	Medway Estuary & Marshes	M	**4.0E+00**	4.0E+00	1.2E-02	4.0E+00	0.0E+00	4.0E+00	4.0E-04
S21	Mottisfont Bats	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S22	The New Forest – SPA	M	**3.5E+00**	0.0E+00	2.8E-03	2.8E-03	0.0E+00	2.8E-03	3.5E+00
S23	The New Forest – cSAC	M	**3.5E+00**	0.0E+00	2.8E-03	2.8E-03	0.0E+00	2.8E-03	3.5E+00
S24	North Downs Woodlands	L	**7.2E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.2E-05
S25	Pagham Harbour	M	**2.8E-03**	0.0E+00	2.8E-03	2.8E-03	0.0E+00	2.8E-03	0.0E+00
S26	Parkgate Down	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S27	Peter's Pit	L	**7.2E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.2E-05
S28	Portsmouth Harbour	H	**3.8E+00**	3.4E-01	2.7E-03	3.4E-01	0.0E+00	3.4E-01	3.5E+00
S29	Queendown Warren	L	**2.0E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-04

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
S30	River Itchen	H	**3.5E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E+00
S31	Rook Clift	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S32	Sandwich Bay	M	**1.3E-01**	4.2E-02	1.3E-02	5.5E-02	0.0E+00	5.5E-02	7.6E-02
S33	Singleton and Cocking Tunnels	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
S34	Solent & Isle of Wight Lagoons	H	**1.6E-01**	1.6E-01	9.9E-04	1.6E-01	0.0E+00	1.6E-01	0.0E+00
S35	Solent & Southampton Water	H	**5.5E+00**	2.0E+00	9.9E-04	2.0E+00	0.0E+00	2.0E+00	3.5E+00
S36	Solent Maritime	H	**3.7E+00**	1.6E-01	9.9E-04	1.6E-01	1.7E-01	1.7E-01	3.5E+00
S37	South Wight Maritime	M	**3.5E+00**	0.0E+00	2.8E-03	2.8E-03	0.0E+00	2.8E-03	3.5E+00
S38	Stodmarsh – SPA	M	**2.3E+00**	0.0E+00	0.0E+00	0.0E+00	2.2E+00	2.2E+00	7.6E-02
S39	Stodmarsh – cSAC	M	**2.3E+00**	0.0E+00	0.0E+00	0.0E+00	2.2E+00	2.2E+00	7.6E-02
S40	Thames Estuary and Marshes	M	**7.6E+00**	6.6E+00	1.5E-03	6.6E+00	0.0E+00	6.6E+00	1.0E+00
S41	Thanet Coast	M	**1.0E-01**	1.3E-02	1.3E-02	2.6E-02	0.0E+00	2.6E-02	7.6E-02
S42	Thanet Coast & Sandwich Bay	M	**1.0E-01**	1.3E-02	1.3E-02	2.6E-02	0.0E+00	2.6E-02	7.6E-02
S43	The Blean Complex	L	**8.2E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.2E-03
S44	The Mens	L	**9.7E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.7E-03
S45	The Swale	M	**1.0E+00**	1.7E-03	1.3E-02	1.5E-02	0.0E+00	1.5E-02	1.0E+00
S46	Wye & Crundale Downs	L	**1.0E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E+00
SW01	Avon Gorge Woodlands	L	**2.1E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E+00
SW02	Avon Valley (Bickton to Christchurch)	M	**1.6E+00**	0.0E+00	0.0E+00	0.0E+00	4.9E-01	4.9E-01	1.1E+00
SW03	Bath and Bradford-upon-Avon Bats	L	**1.6E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-05
SW04	Beer Quarry and Caves	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW05	Blackstone Point	L	**6.4E-01**	6.3E-01	5.7E-03	6.4E-01	0.0E+00	6.4E-01	7.8E-04
SW06	Bracket's Coppice	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW07	Braunton Burrows	M	**6.3E-01**	1.8E-03	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
SW08	Breney Common and Goss & Tregoss Moors	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW09	Carrine Common	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW10	Cerne and Sydling Downs	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW11	Chesil & the Fleet	M	**1.8E-01**	3.2E-05	6.0E-03	6.0E-03	2.5E-05	6.0E-03	1.7E-01
SW12	Chesil Beach & the Fleet	M	**6.0E-03**	3.2E-05	6.0E-03	6.0E-03	0.0E+00	6.0E-03	0.0E+00
SW13	Chew Valley Lakes	L	**9.1E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.1E-02
SW14	Chilmark Quarries	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW15	Crookhill Brickpit pSAC	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW16	Crowdy Marsh	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW17	Culm Grasslands	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW18	Dartmoor	M	**7.8E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E-04
SW19	Dawlish Warren	L	**8.9E-02**	8.3E-02	6.0E-03	8.9E-02	0.0E+00	8.9E-02	9.6E-07
SW20	Dorset Heaths	H	**6.1E+00**	2.6E+00	2.8E-03	2.6E+00	0.0E+00	2.6E+00	3.5E+00

Table 1 Continued

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SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	H	**3.7E+00**	2.6E+00	2.8E-03	2.6E+00	2.2E+00	2.6E+00	1.1E+00
SW22	Dorset Heathlands	H	**6.1E+00**	2.6E+00	2.8E-03	2.6E+00	0.0E+00	2.6E+00	3.5E+00
SW23	East Devon Pebblebed Heaths	M	**4.5E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-05
SW24	East Devon Heaths	L	**4.5E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-05
SW25	Exe Estuary	M	**7.1E-01**	2.8E-01	6.0E-03	2.9E-01	7.1E-01	7.1E-01	4.5E-05
SW26	Exmoor and Quantock Oakwoods	L	**1.5E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+01
SW27	Exmoor Heaths	M	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	4.5E-04
SW28	Fal and Helford	M	**4.3E+00**	3.7E+00	6.2E-01	4.3E+00	3.5E+00	4.3E+00	0.0E+00
SW29	Fontmell and Melbury Downs	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW30	Godrevy Head to St. Agnes	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
SW31	Great Yews	L	**6.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.5E-01
SW32	Hestercombe House	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW33	Holme Moor and Clean Moor	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW34	Holnest pSAC	-	No assessment yet						
SW35	Isle of Portland to Studland Cliffs	L	**2.1E+00**	9.6E-01	3.2E-04	9.6E-01	0.0E+00	9.6E-01	1.1E+00
SW36	Isles of Scilly Complex	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
SW37	Isles of Scilly	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
SW38	Lower Bostraze & Leswidden	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW39	Lundy	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
SW40	Marazion Marsh	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW41	Mells Valley	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW42	Mendip Limestone Grasslands	L	**9.1E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.1E-02
SW43	Mendip Woodlands	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW44	Newlyn Downs	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW45	North Somerset & Mendip Bats	L	**9.1E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.1E-02
SW46	Penhale Dunes	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW47	Pewsey Downs	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW48	Phoenix United Mine and Crows Nest	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW49	Plymouth Sound & Estuaries	H	**6.7E-01**	6.3E-01	5.7E-03	6.4E-01	6.7E-01	6.7E-01	7.8E-04
SW50	Polruan to Polperro	M	**6.0E-03**	0.0E+00	6.0E-03	6.0E-03	0.0E+00	6.0E-03	0.0E+00
SW51	Poole Harbour	M	**9.7E+00**	8.6E+00	4.9E-03	8.6E+00	0.0E+00	8.6E+00	1.1E+00
SW52	Porton Down	L	**6.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.5E-01
SW53	Prescombe Down	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW54	Quants	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW55	River Avon	H	**1.9E+00**	0.0E+00	0.0E+00	0.0E+00	1.2E+00	1.2E+00	6.5E-01
SW56	River Axe	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW57	River Camel	H	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW58	Rooksmoor	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
SW59	Salisbury Plain	L	**6.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.5E-01
SW60	Salisbury Plain	L	**6.5E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.5E-01
SW61	Severn Estuary – pSAC	M	**2.0E+01**	4.1E+00	4.2E-01	4.5E+00	0.0E+00	4.5E+00	1.5E+01
SW62	Severn Estuary – SPA	M	**1.9E+01**	4.0E+00	4.2E-01	4.4E+00	0.0E+00	4.4E+00	1.5E+01
SW63	Sidmouth to West Bay	L	**8.9E-02**	8.3E-02	6.0E-03	8.9E-02	0.0E+00	8.9E-02	0.0E+00
SW64	Somerset Levels and Moors	L	**2.2E+01**	0.0E+00	0.0E+00	0.0E+00	1.6E+01	1.6E+01	5.6E+00
SW65	South Dartmoor Woods	L	**7.8E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.8E-04
SW66	South Devon Shore Dock	M	**6.0E-03**	0.0E+00	6.0E-03	6.0E-03	0.0E+00	6.0E-03	0.0E+00
SW67	South Hams	L	**8.9E-02**	8.3E-02	6.0E-03	8.9E-02	0.0E+00	8.9E-02	9.6E-07
SW68	St Austell Clay Pits	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW69	St. Albans Head to Durlston Head	L	**9.0E-01**	9.0E-01	3.2E-04	9.0E-01	0.0E+00	9.0E-01	0.0E+00
SW70	Tamar Estuaries Complex	M	**6.4E-01**	6.3E-01	5.7E-03	6.4E-01	0.0E+00	6.4E-01	7.8E-04
SW71	The Lizard	L	**6.0E-03**	0.0E+00	6.0E-03	6.0E-03	0.0E+00	6.0E-03	0.0E+00
SW72	Tintagel-Marsland-Clovelly Coast	M	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
SW73	Tregonning Hill	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
SW74	West Dorset Alder Woods	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T01	Aston Rowant	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T02	Burnham Beeches	H	**5.1E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E+00
T03	Chiltern Beechwoods (new features in existing cSAC)	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T04	Cothill Fen (new features in existing cSAC)	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T05	East Hampshire Hangars	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T06	Epping Forest	M	**2.5E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+01
T07	Hackpen Hill	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T08	Hartslock Wood	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T09	Kennet and Lambourn Floodplain	M	**1.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E+00
T10	Kennet Valley Alderwoods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T11	Lee Valley	M	**2.9E+01**	0.0E+00	0.0E+00	0.0E+00	3.6E+00	3.6E+00	2.5E+01
T12	Little Wittenham	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T13	Mole Gap to Reigate Escarpment	M	**2.6E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E-01
T14	North Meadow and Clattinger Farm	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T15	Oxford Meadows	M	**4.4E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.4E-02
T16	Richmond Park	L	**1.1E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E+00
T17	River Lambourn	M	**2.3E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
T18	Shortheath Common	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T19	South West London Waterbodies	L	**2.2E+01**	0.0E+00	0.0E+00	0.0E+00	2.1E+01	2.1E+01	1.1E+00
T20	Thames Basin Heaths	H	**1.3E+01**	0.0E+00	0.0E+00	0.0E+00	1.3E+01	1.3E+01	6.4E-03

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
T21	Thursley, Ash, Pirbright & Chobham	M	**5.5E+00**	0.0E+00	0.0E+00	0.0E+00	5.5E+00	5.5E+00	9.7E-03
T22	Wealden Heaths Phase 1 (Thursley, Hankley and Frensham Commons)	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T23	Wealden Heaths Phase II	L	**9.7E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.7E-03
T24	Wimbledon Common	M	**2.5E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E+01
T25	Windsor Forest and Great Park	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
T26	Woolmer Forest (also part of Wealden Heaths Phase 2)	L	**7.7E-08**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-08
T27	Wormley Hoddesdon Park Woods	L	**8.5E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.5E-02
W001	Aber Afon Dyfi/Dyfi Estuary	L	**2.5E-01**	2.5E-01	1.6E-03	2.5E-01	2.1E-01	2.5E-01	3.6E-05
W002	Aberbargoed Grasslands	L	**1.5E+01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E+01
W003	Abergavenny Woodlands (Sugar Loaf Woodlands)	L	**5.1E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E-05
W004	Afon Eden/River Eden – Cors GochTrawsfynydd	M	**2.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
W005	Afon Gwyrfai a Llyn Cwellyn	L	**1.3E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-04
W006	Afon TeifiRiver Teifi	M	**1.8E-03**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	0.0E+00
W007	Afon Tywi/River Tywi	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W008	Afonydd Cleddau/Cleddau Rivers	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W009	Alyn Valley Woods/Coedwigoedd Dyffryn Alun	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W010	Bae Cemlyn/Cemlyn Bay	L	**8.8E-02**	8.8E-02	8.8E-05	8.8E-02	0.0E+00	8.8E-02	0.0E+00
W011	Berwyn	L	**2.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
W012	Berwyn a Mynyddoedd de Clwyd / Berwyn & South Clwyd Mountains	L	**2.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
W013	Blackmill Woodlands	L	**8.0E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.0E-05
W014	Blaen Cynon	L	**4.9E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E-05
W015	Brecon Beacons/Bannau Brycheiniog	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W016	Burry Inlet	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	1.1E-03
W017	Cadair Idris	L	**2.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
W018	Caeau Mynydd Mawr	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W019	Cardiff Beech Woods	L	**2.1E+01**	0.0E+00	0.0E+00	0.0E+00	6.3E+00	6.3E+00	1.5E+01
W020	Cardigan Bay/Bae Ceredigion	M	**3.0E+00**	2.5E-01	1.6E-03	2.5E-01	2.1E-01	2.5E-01	2.7E+00
W021	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	1.1E-03
W022	Carmarthen Bay Dunes/Twyni Bae Caerfyrddin	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	1.1E-03

Table 1 Continued

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W023	Carmarthen Bay	L	**6.5E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	1.5E-02
W024	Castlemartin Coast	L	**2.5E+00**	1.9E+00	6.3E-01	2.5E+00	0.0E+00	2.5E+00	1.5E-02
W025	Cernydd Carmel	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W026	Clogwyni Pen Llyn/Seacliffs of Lleyn	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	0.0E+00
W027	Coed Cwm Einion	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W028	Coed y Cerrig	L	**5.1E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E-05
W029	Coedwigoedd Dyffryn Elwy/Elwy Valley Woods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W030	Coedwigoedd Penrhyn Creuddyn/Creuddyn Peninsula Woods	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W031	Coedydd a Cheunant Rheidol/Rheidol Woods and Gorge	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W032	Coedydd Aber/Aber Woods	L	**1.3E-04**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-04
W033	Coedydd Derw a Safleoedd Ystlumd Meirion/Meirionydd Oakwoods & Bat Sites	L	**9.3E+00**	0.0E+00	0.0E+00	0.0E+00	6.6E+00	6.6E+00	2.7E+00
W034	Coedydd Nedd a Mellte	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W035	Coetiroedd Cwm Elan/Elan Valley Woodlands	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W036	Cors Caron	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W037	Cors Fochno	M	**3.6E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-05
W038	Corsydd Eifionydd/Eifionydd Fens	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W039	Corsydd Llyn/Lleyn Fens	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W040	Corsydd Mon/Anglesey Fens	M	**6.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.7E+00
W041	Craig yr Aderyn/Bird's Rock	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W042	Crymlyn Bog/Cors Crymlyn	H	**4.9E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E-01
W043	Cwm Cadlan	M	**4.9E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E-05
W044	Cwm Clydach Woodlands/Coedydd Cwm Clydach	L	**5.1E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E-05
W045	Cwm Doethie – Mynydd Mallaen	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W046	Dee Estuary – SPA	M	**2.2E+01**	5.2E+00	1.4E+01	1.9E+01	4.3E+00	1.9E+01	2.6E+00
W047	Dee Estuary – pSAC	M	**2.2E+01**	5.2E+00	1.4E+01	1.9E+01	4.3E+00	1.9E+01	2.6E+00
W048	Deeside and Buckley Newt Sites	M	**5.8E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.8E-01
W049	Drostre Bank	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W050	Dunraven Bay	L	**4.7E+00**	3.6E+00	6.2E-01	4.2E+00	0.0E+00	4.2E+00	4.9E-01
W051	Elenydd	M	**3.6E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-05

Table 1 Continued

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W052	Elenydd-Mallaen	M	**3.6E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-05
W053	Eryri/Snowdonia (inc Llyn Idwal)	L	**6.7E+00**	0.0E+00	0.0E+00	0.0E+00	6.4E-05	6.4E-05	6.7E+00
W054	Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island	L	**1.8E-03**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	0.0E+00
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	L	**1.7E-02**	1.2E-02	1.8E-03	1.4E-02	0.0E+00	1.4E-02	3.4E-03
W056	Glannau Ynys Gybi/Holy Island Coast	L	**1.1E-04**	0.0E+00	1.1E-04	1.1E-04	0.0E+00	1.1E-04	0.0E+00
W057	Glannau Ynys Gybi/Holy Island Coast	L	**1.1E-04**	0.0E+00	1.1E-04	1.1E-04	0.0E+00	1.1E-04	0.0E+00
W058	Glan-traeth	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W059	Glaswelltiroedd Cefn Cribwr/Cefn Cribwr Grasslands	L	**4.9E-01**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E-01
W060	Glynllifon	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W061	Gower Ash Woods/Coedydd Ynn Gwyr	L	**1.1E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-03
W062	Gower Commons/Tiroedd Comin Gwyr	L	**6.3E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	1.1E-03
W063	Grassholm	L	**1.8E-03**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	0.0E+00
W064	Great Orme's Head/Pen y Gogarth	L	**1.1E-02**	1.1E-02	9.9E-05	1.1E-02	0.0E+00	1.1E-02	0.0E+00
W065	Grogwynion	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W066	Gweunydd Blaencleaddau	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W067	Halkyn Mountain/Mynydd Helygain	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W068	Johnstown Newt Sites	M	**1.4E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-05
W069	Kenfig/Cynffig	M	**3.1E+00**	2.0E+00	6.2E-01	2.6E+00	1.7E+00	2.6E+00	4.9E-01
W070	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym	L	**6.5E-01**	0.0E+00	6.3E-01	6.3E-01	0.0E+00	6.3E-01	1.5E-02
W071	Llangorse Lake/Llyn Syfaddan	L	**5.1E-05**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E-05
W072	Llwyn	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W073	Llyn Dinam	M	**3.4E-03**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-03
W074	Migneint- Arenig-Dduallt	L	**2.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
W075	Migneint- Arenig-Dduallt	L	**2.7E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.7E+00
W076	Morfa Harlech a Morfa Dyffryn	L	**2.8E+00**	5.1E-02	1.8E-03	5.3E-02	0.0E+00	5.3E-02	2.7E+00
W077	Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
W078	Mynydd Cilan, Trwyn y Wylfa ac Ynsoedd Sant Tudwal	L	**1.8E-03**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	0.0E+00
W079	Mynydd Epynt	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W080	North Pembrokeshire Woodlands/Coeddyd Gogledd Sir Benfro	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W081	North West Pembrokeshire Commons/Comins Gogledd Orllewin Sir Benfro	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W082	Pembrokeshire Bat Sites and Bosherton Lakes/Safleoedd Ystlum Sir Benfro	L	**1.5E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-02
W083	Pembrokeshire Marine/Sir Benfro Forol	M	**1.9E+00**	1.9E+00	2.5E-04	1.9E+00	1.6E+00	1.9E+00	1.5E-02
W084	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau	M	**2.7E+00**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	2.7E+00
W085	Preseli	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W086	Ramsey and St. Davids Peninsula Coast	L	**1.8E-03**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	0.0E+00
W087	Rhinog	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W088	Rhos Goch	M	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W089	Rhos Llawr-cwrt	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W090	Rhos Talglas	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W091	River Dee and Bala Lake	M	**3.0E+00**	0.0E+00	0.0E+00	0.0E+00	2.5E-01	2.5E-01	2.7E+00
W092a	River Usk/Afon Wysg (river)	H	**8.6E-02**	0.0E+00	0.0E+00	0.0E+00	8.6E-02	8.6E-02	0.0E+00
W092b	River Usk/Afon Wysg (estuary)	H	**6.6E-01**	2.9E-02	6.3E-01	6.6E-01	9.7E-02	6.6E-01	0.0E+00
W093	River Wye/Afon Gwy	M	**6.6E+00**	3.4E-02	6.3E-01	6.6E-01	8.7E-02	6.6E-01	5.9E+00
W094	Skokholm & Skomer	L	No Radioactive Substances Act 1993 authorisations affect this Natura site						
W095	St David's/Ty Ddewi	L	**1.8E-03**	0.0E+00	1.8E-03	1.8E-03	0.0E+00	1.8E-03	0.0E+00
W096	Traeth Lafan/Lavan Sands, Conway Bay	M	**1.4E-02**	1.1E-02	9.9E-05	1.1E-02	0.0E+00	1.1E-02	3.4E-03
W097	Usk Bat Sites/Safleodd Ystlumod Wysg	L	**8.6E-02**	0.0E+00	0.0E+00	0.0E+00	8.6E-02	8.6E-02	5.1E-05
W098	Wye Valley Woodlands/Coetiroedd Dyffryn Gwy	L	**4.3E+00**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.3E+00
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	M	**6.7E+00**	1.2E-02	9.9E-05	1.2E-02	0.0E+00	1.2E-02	6.7E+00
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	L	**3.6E-02**	1.2E-02	1.8E-03	1.4E-02	3.3E-02	3.3E-02	3.4E-03

Table 1 Continued

EA Site Code	Site name	Priority	Total dose rate [a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
W101	Yerbeston Tops	L	**1.5E-02**	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-02
W102	Ynys Feurig, Cemlyn Bay and the Skerries	L	**2.6E-02**	2.6E-02	8.8E-05	8.8E-05	0.0E+00	8.8E-05	0.0E+00
W103	Ynys Seiriol/Puffin Island	L	**1.1E-02**	1.1E-02	9.9E-05	1.1E-02	0.0E+00	1.1E-02	0.0E+00

[a]See Section 2.7 for description of how total dose rate has been calculated.

Table 2 Revised results of Stage 3 RSR habitats assessments for Drigg Coast SAC using ERICA data

EA Site Code	Site name	Priority	Total dose rate[a] (microgray/h)	Coastal dose rate – Local compartment (microgray/h)	Coastal dose rate – Regional compartment (microgray/h)	Total coastal (microgray/h)	Freshwater dose rate (microgray/h)	Maximum water dose rate (microgray/h)	Terrestrial dose rate (microgray/h)
NW08	Drigg Coast	L	**2.00E+01**	2.00E+01	1.90E-04	2.00E+01	0.00E+00	2.00E+01	1.30E-01

[a]See Section 2.7 for description of how total dose rate has been calculated.

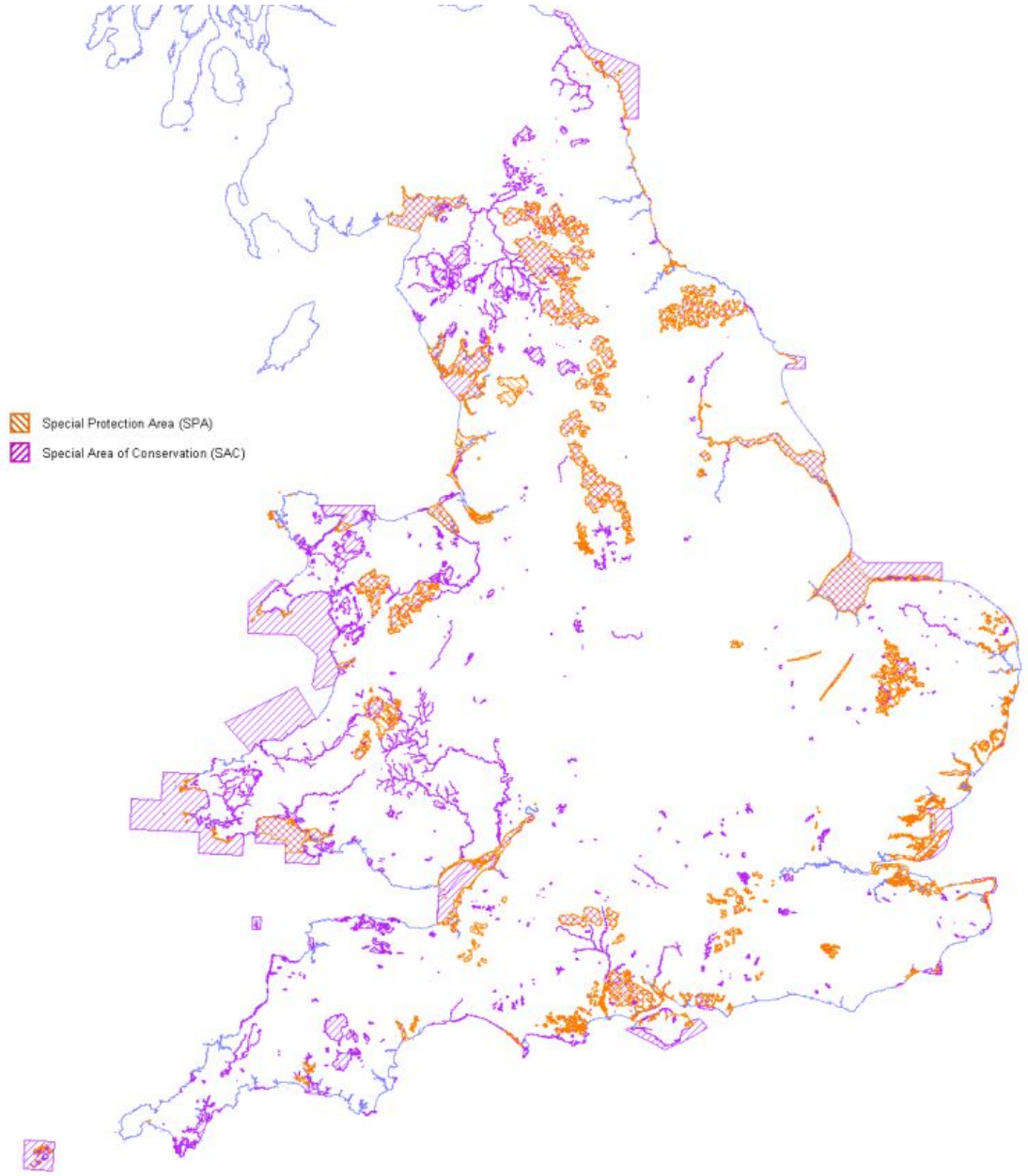


Figure 1: Natura 2000 sites in England and Wales

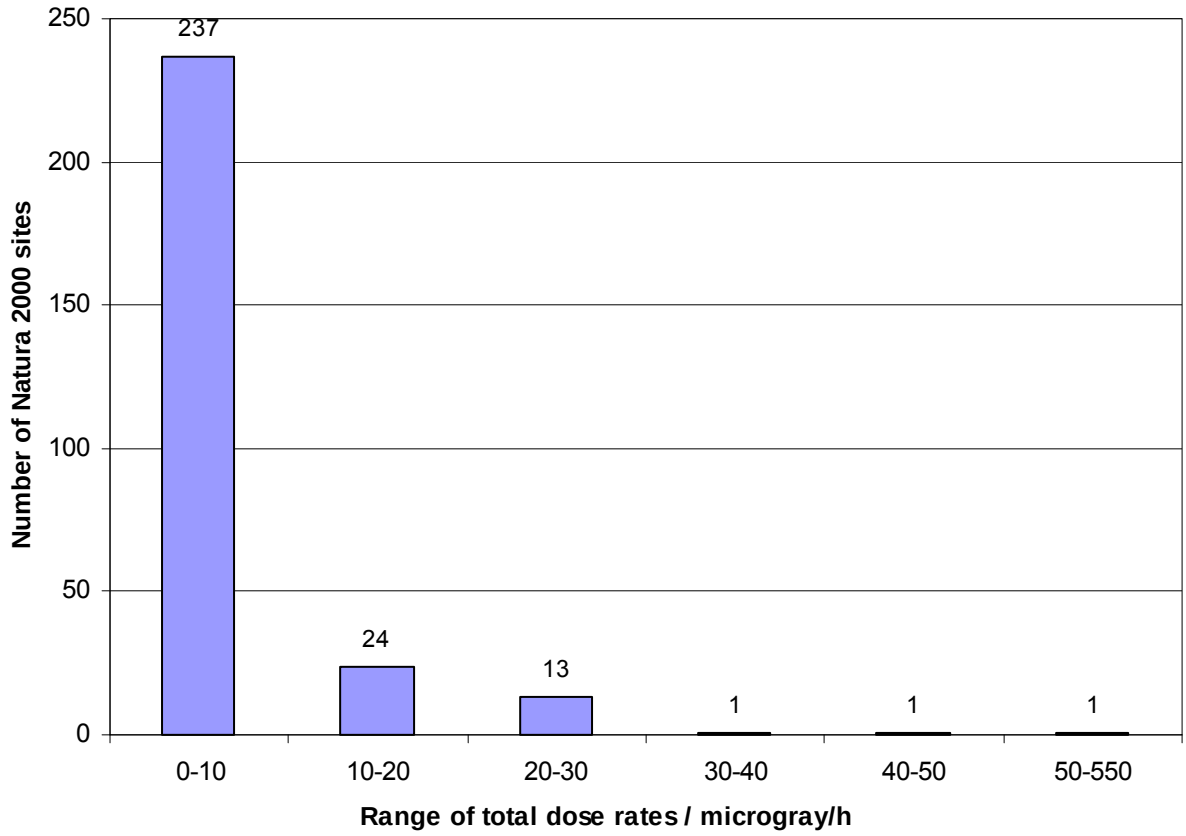


Figure 2: Summary of total dose-rate ranges for Natura 2000 sites

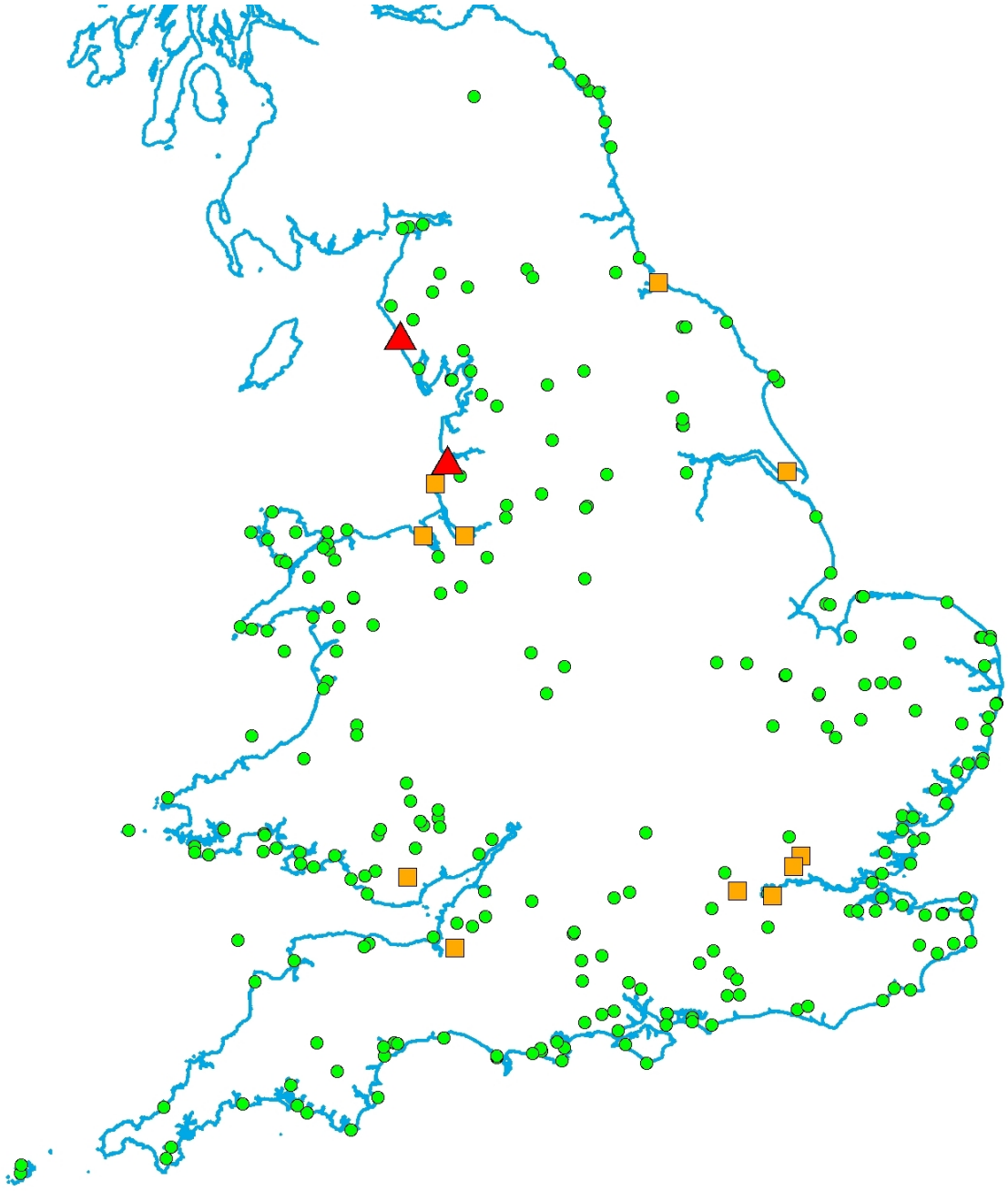


Figure 3: Natura 2000 sites in England and Wales
Key – dose rates less than 20 microgray/h (green circles), 20–40 microgray/h (amber squares) and >40 microgray/h (red triangles)

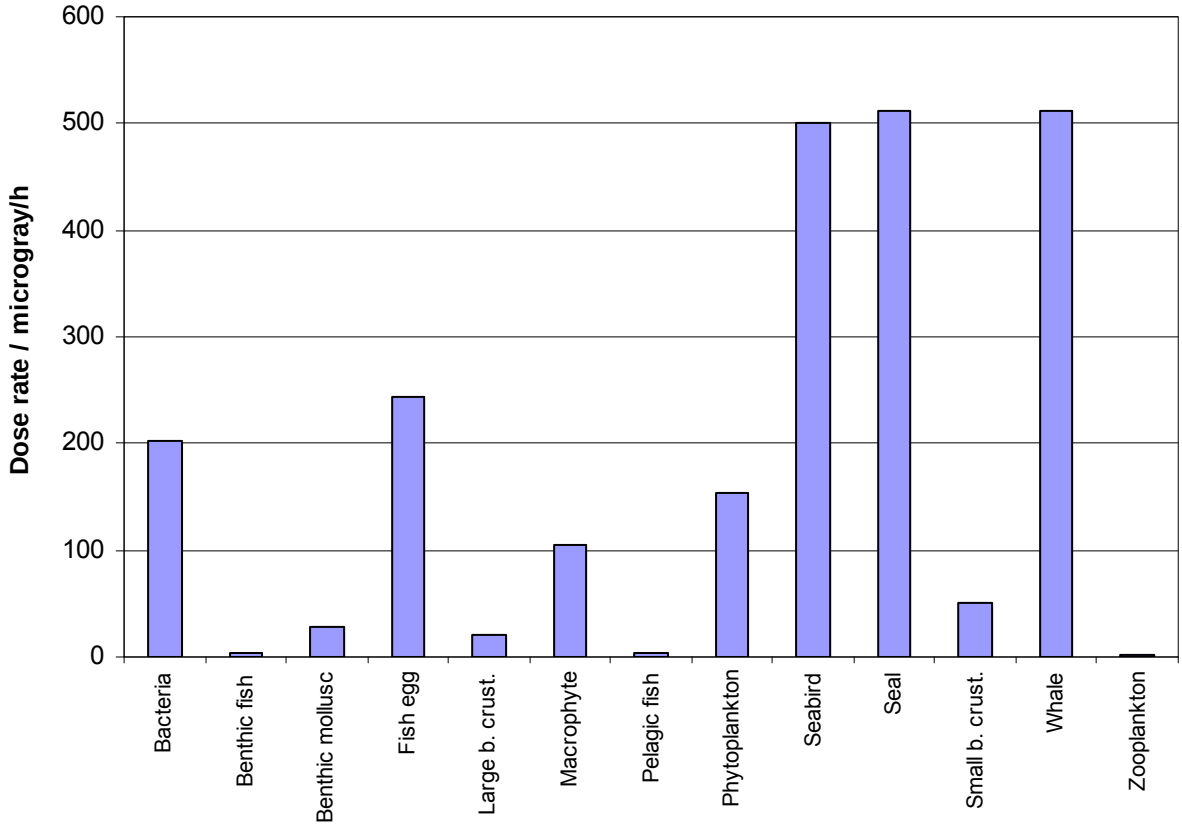


Figure 4: NW25 Ribble/Alt Estuaries SPA – Marine assessment – Total dose rates to reference organisms

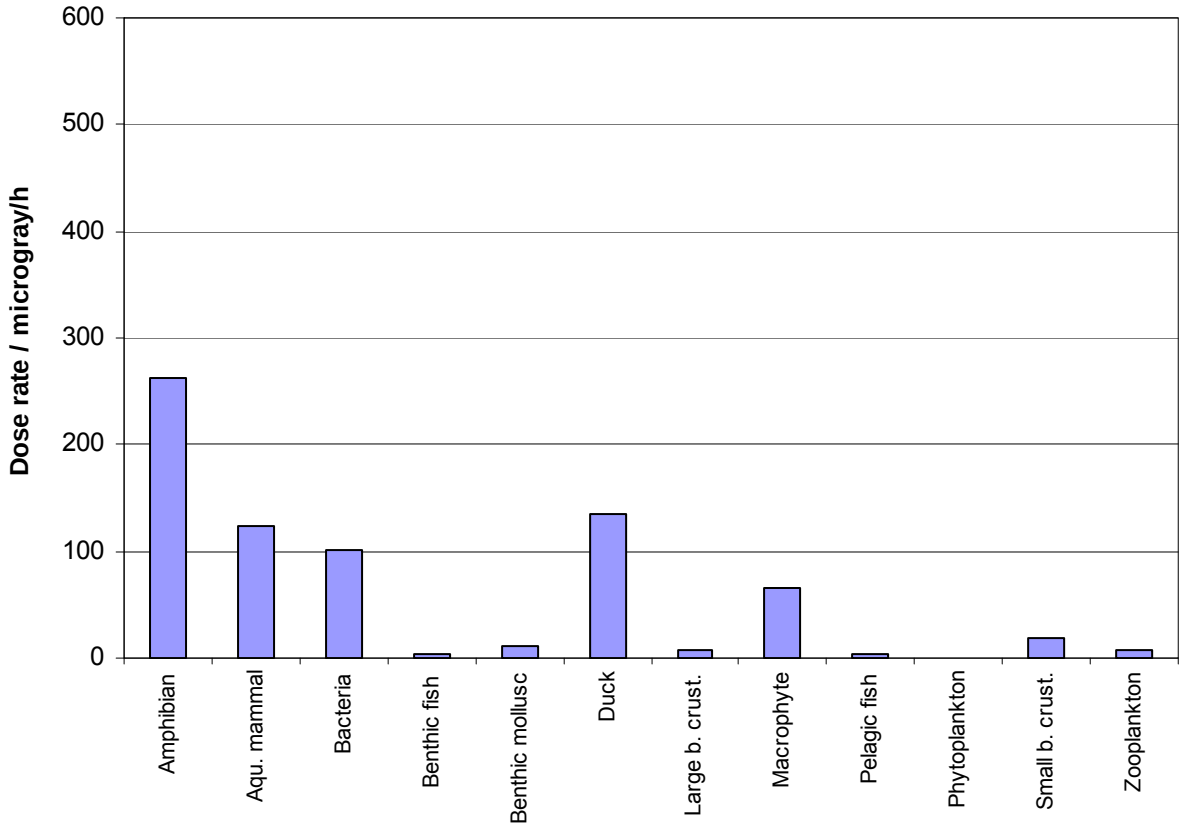


Figure 5: NW25 Ribble/Alt Estuaries SPA – Freshwater assessment – Total dose rates to reference organisms

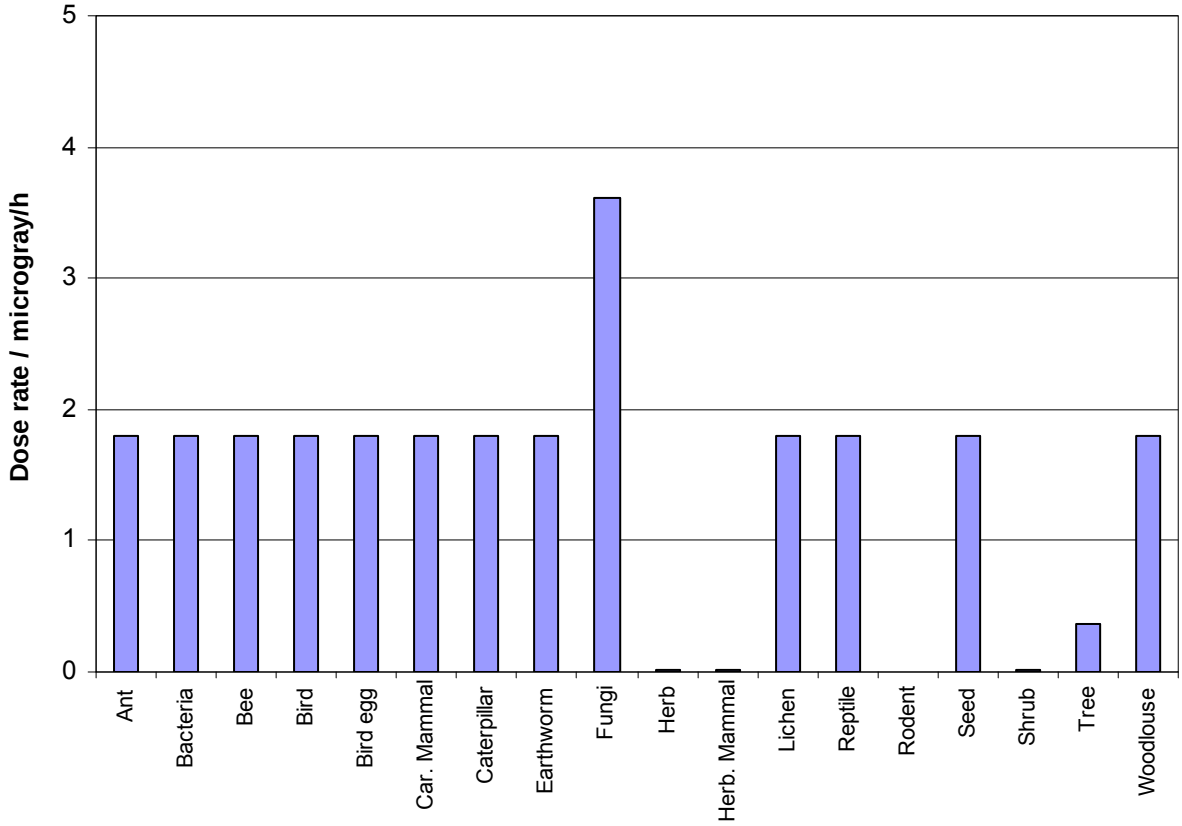


Figure 6: NW25 Ribble/Alt Estuaries SPA –Terrestrial assessment – Total dose rates to reference organisms

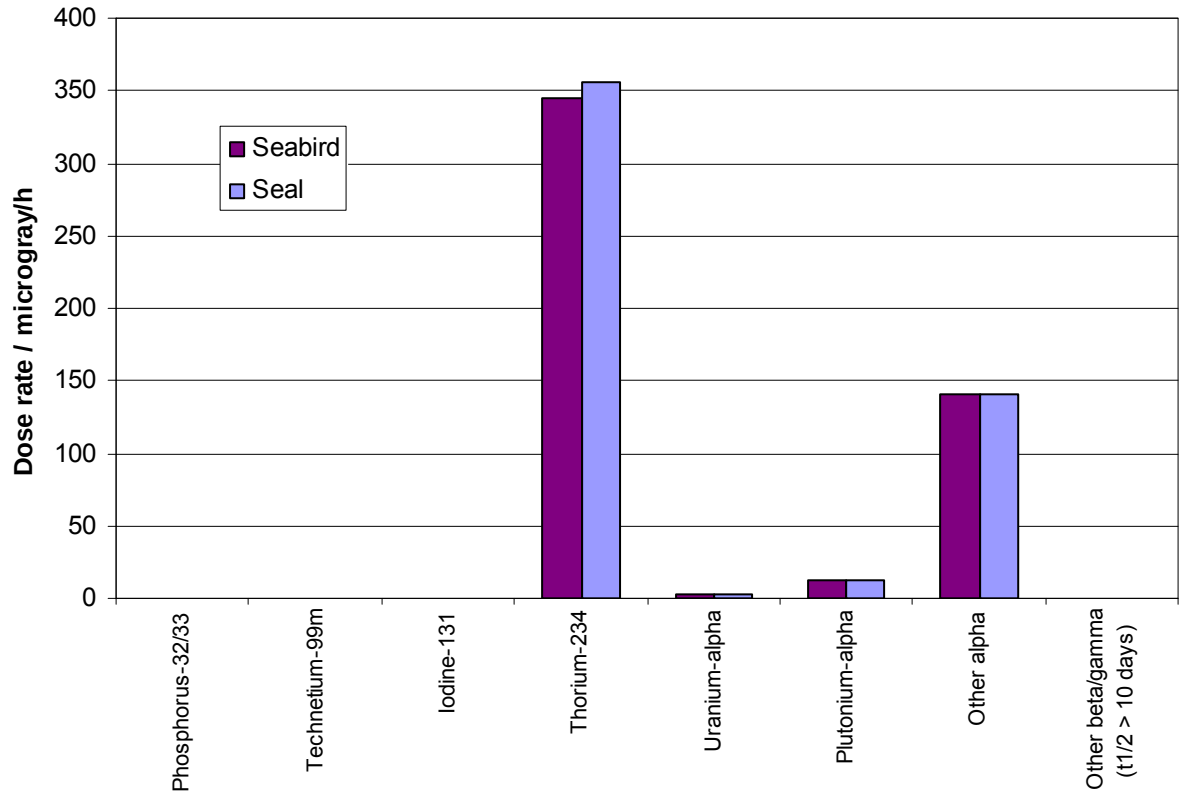


Figure 7: NW25 Ribble/Alt Estuaries SPA – Marine assessment – Radionuclide contribution to dose rates

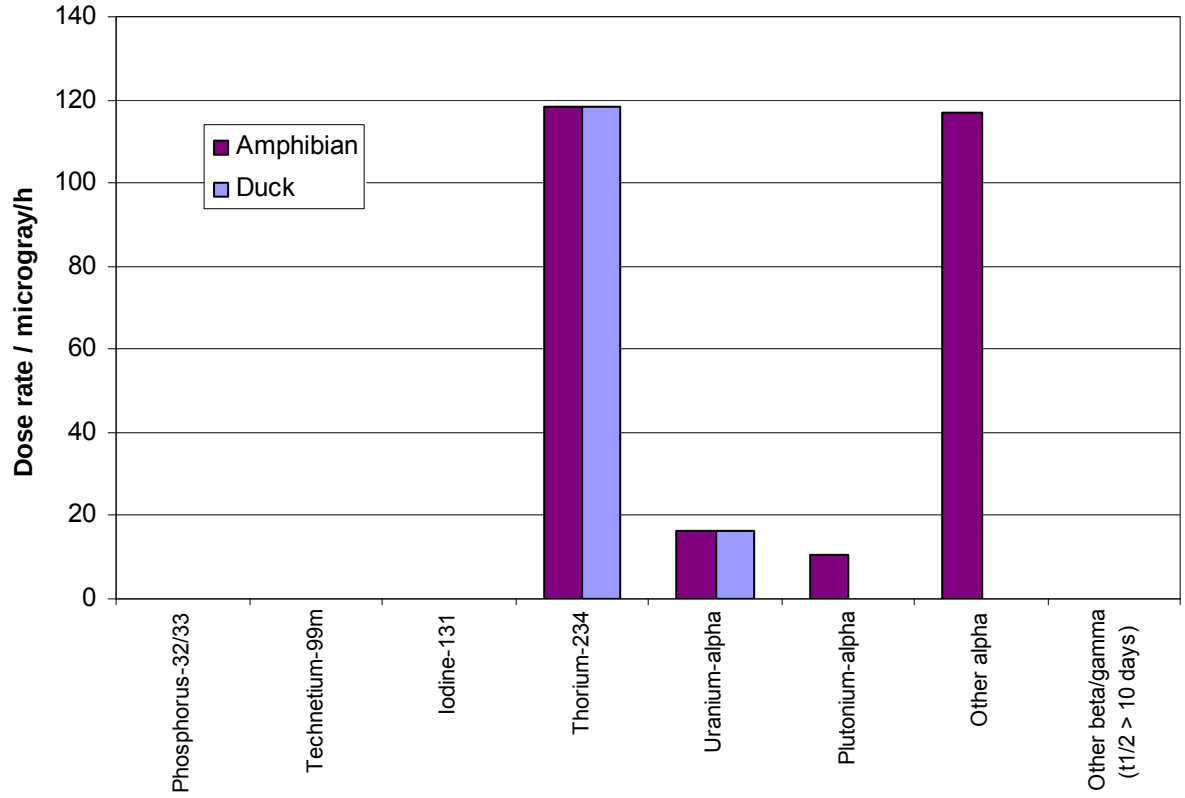


Figure 8: NW25 Ribble/Alt Estuaries SPA – Freshwater assessment – Radionuclide contribution to dose rates

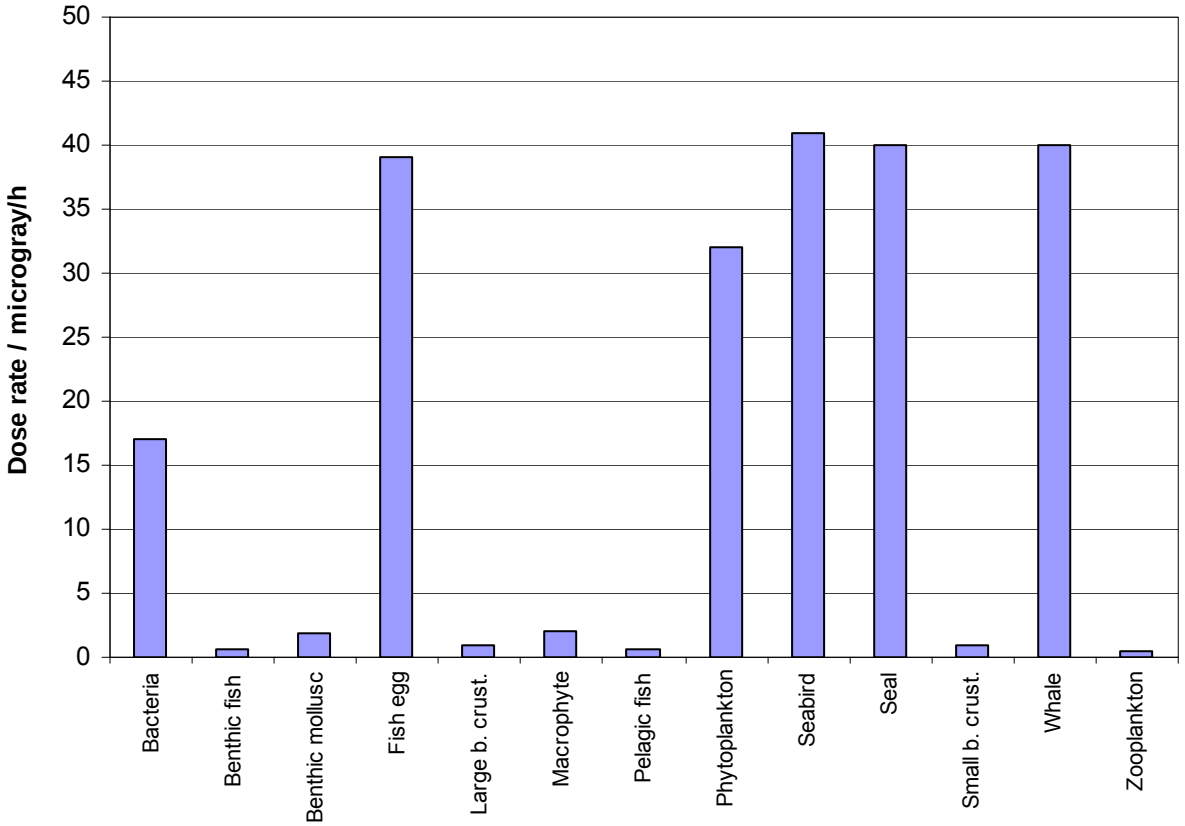


Figure 9: NW08 Drigg Coast SAC – Marine assessment – Total dose rates to reference organisms

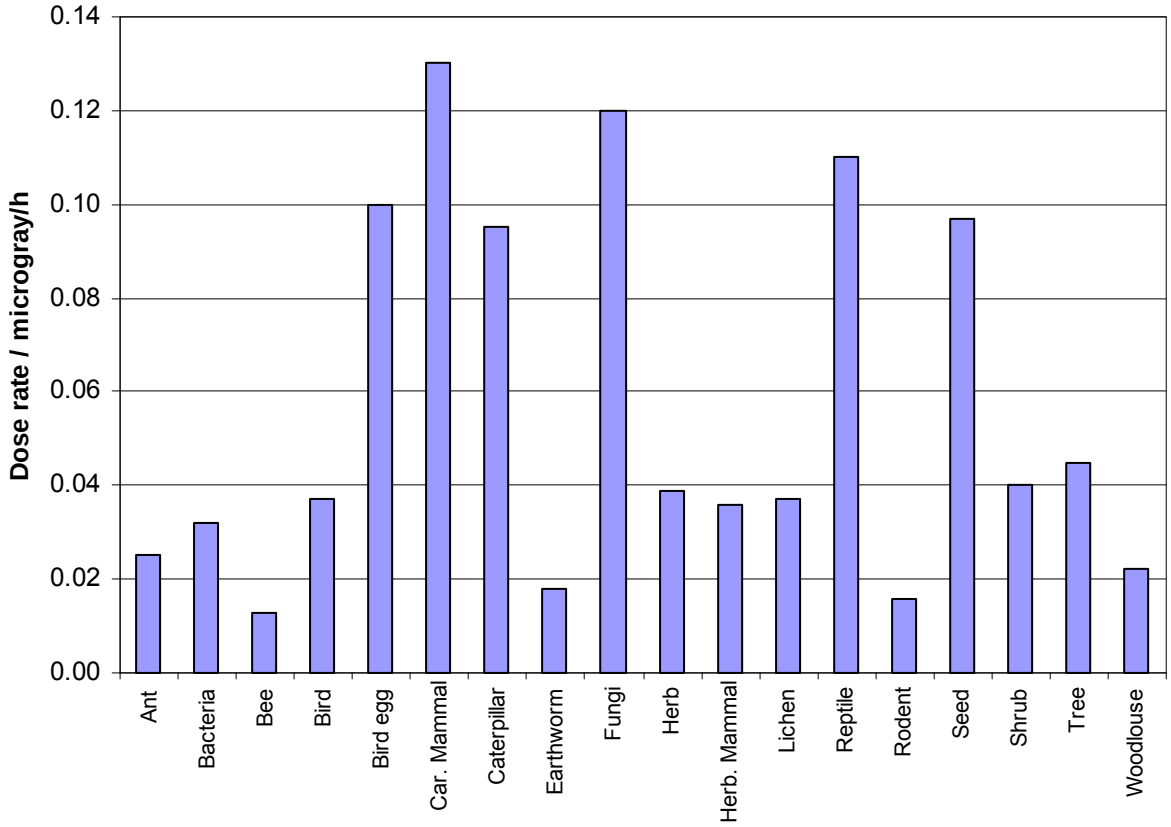


Figure 10: NW08 Drigg Coast SAC – Terrestrial assessment – Total dose rates to reference organisms

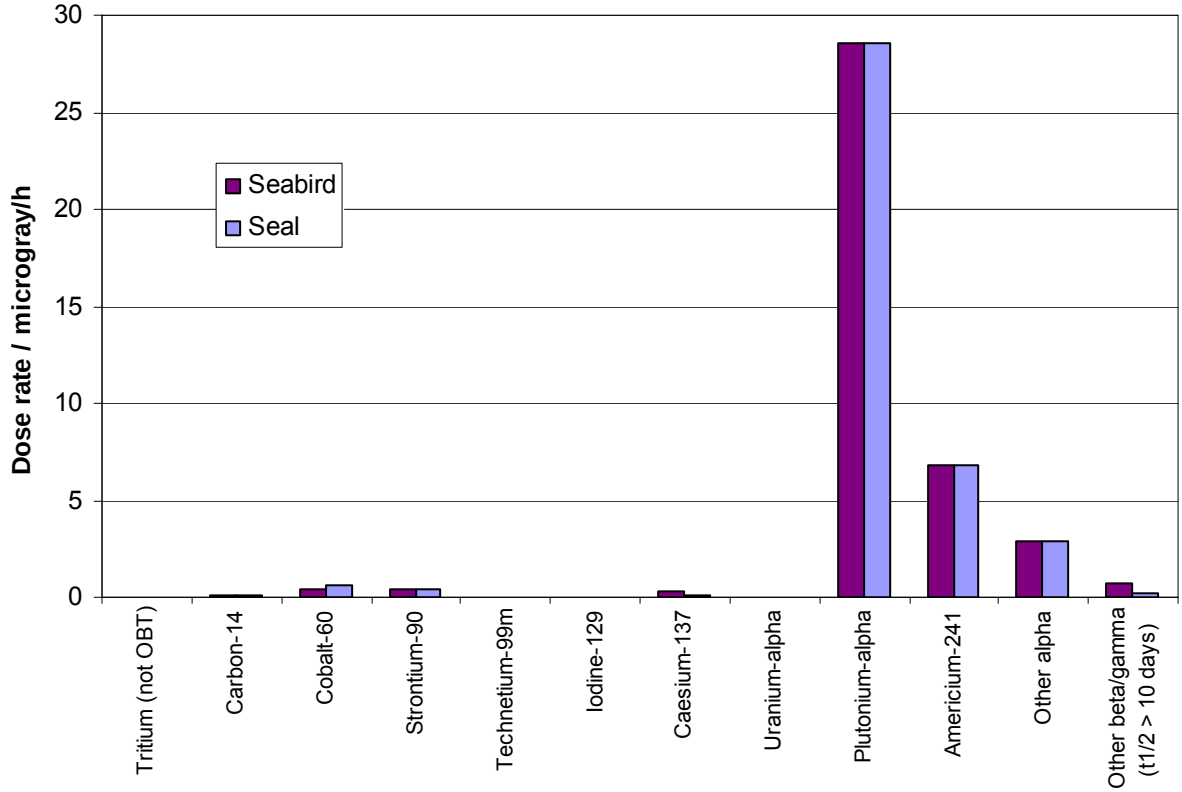


Figure 11: NW08 Drigg Coast SAC – Marine assessment – Radionuclide contribution to dose rates

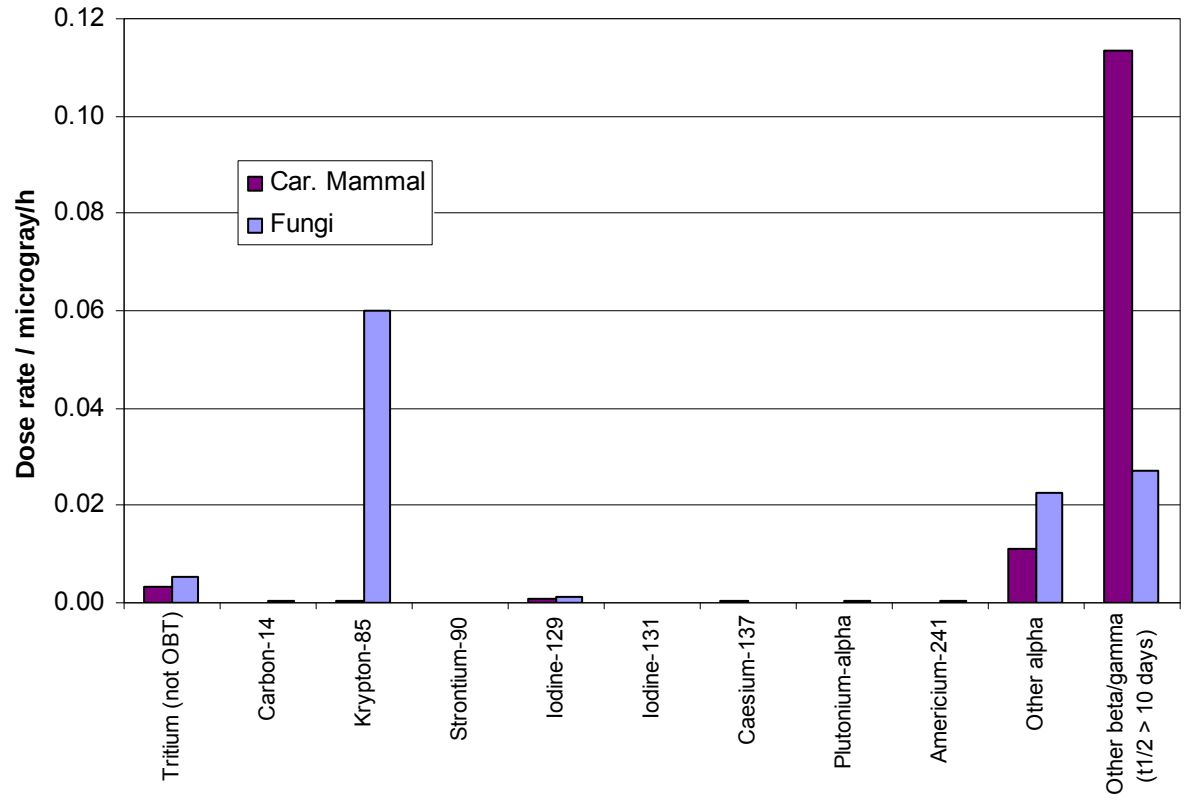


Figure 12: NW08 Drigg Coast SAC – Terrestrial assessment – Radionuclide contribution to dose rates

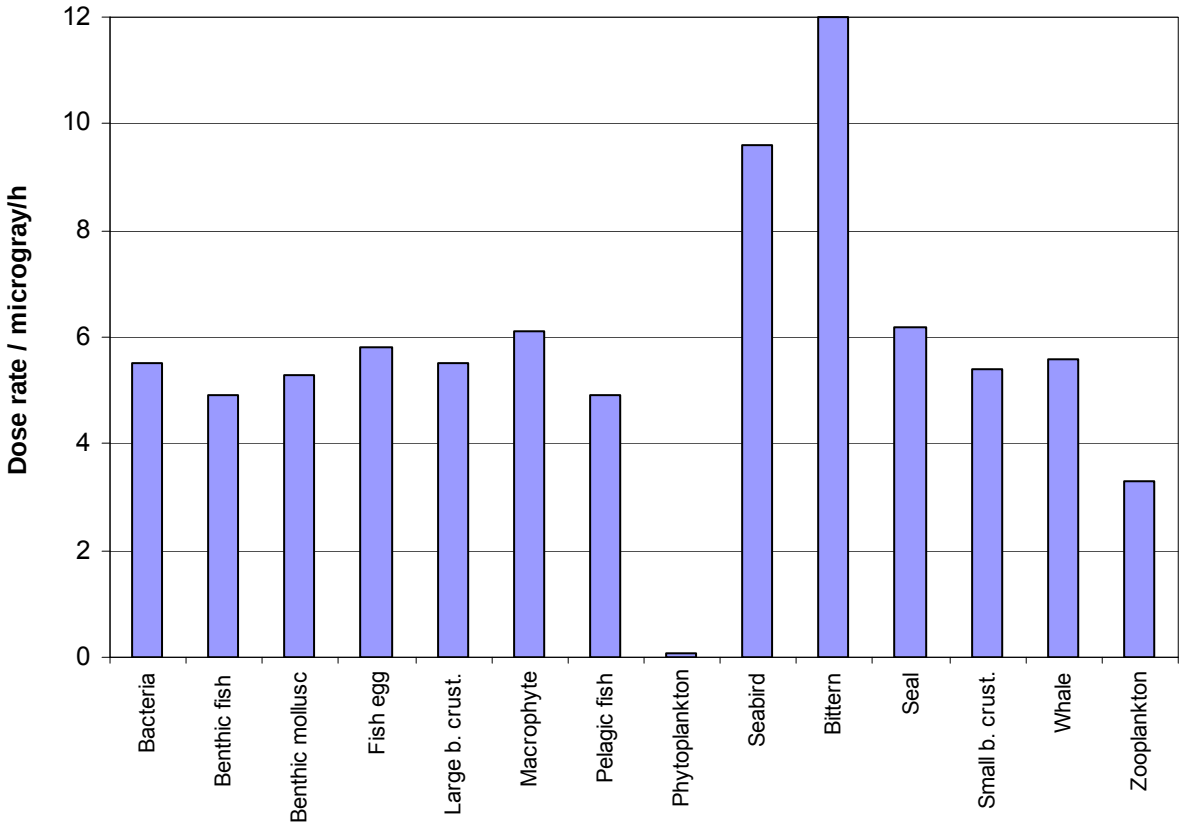


Figure 13: NE44 Teesmouth and Cleveland Coast SPA – Marine assessment – Total dose rates to reference organisms

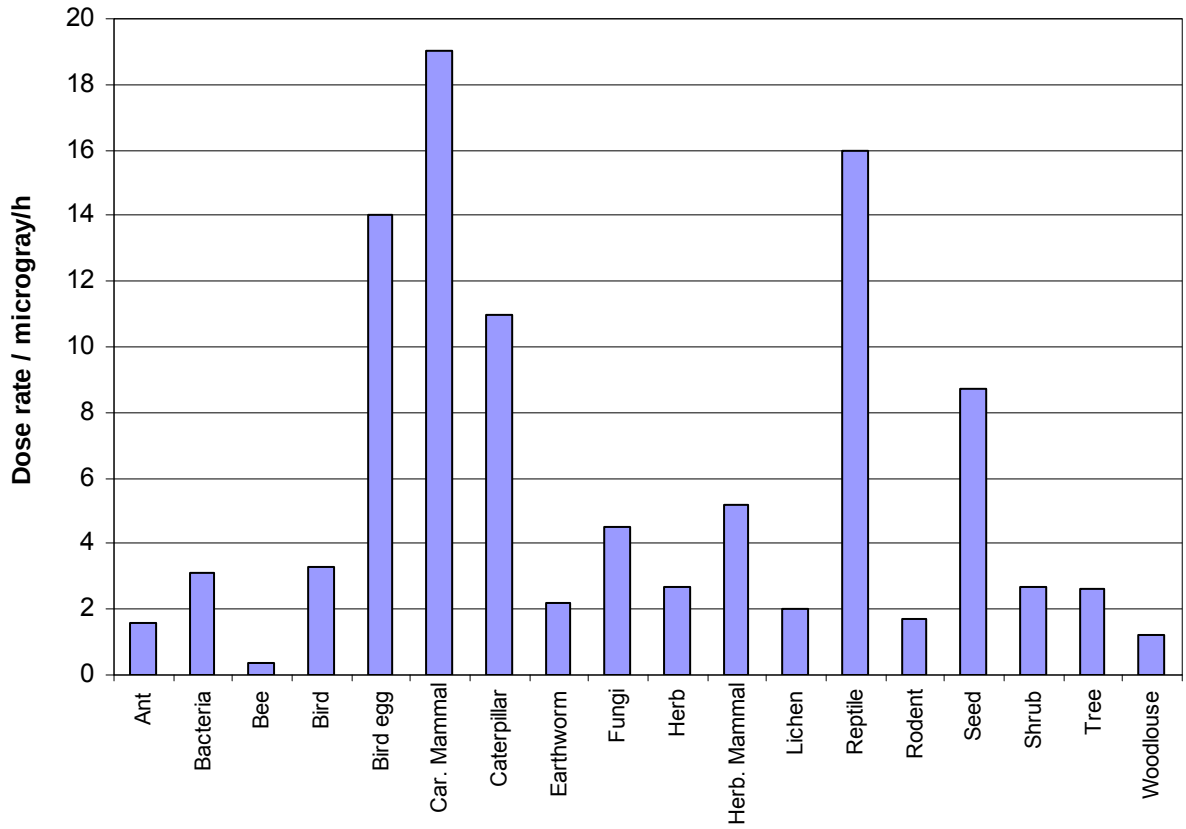


Figure 14: NE44 Teesmouth and Cleveland Coast SPA – Terrestrial assessment – Total dose rates to reference organisms

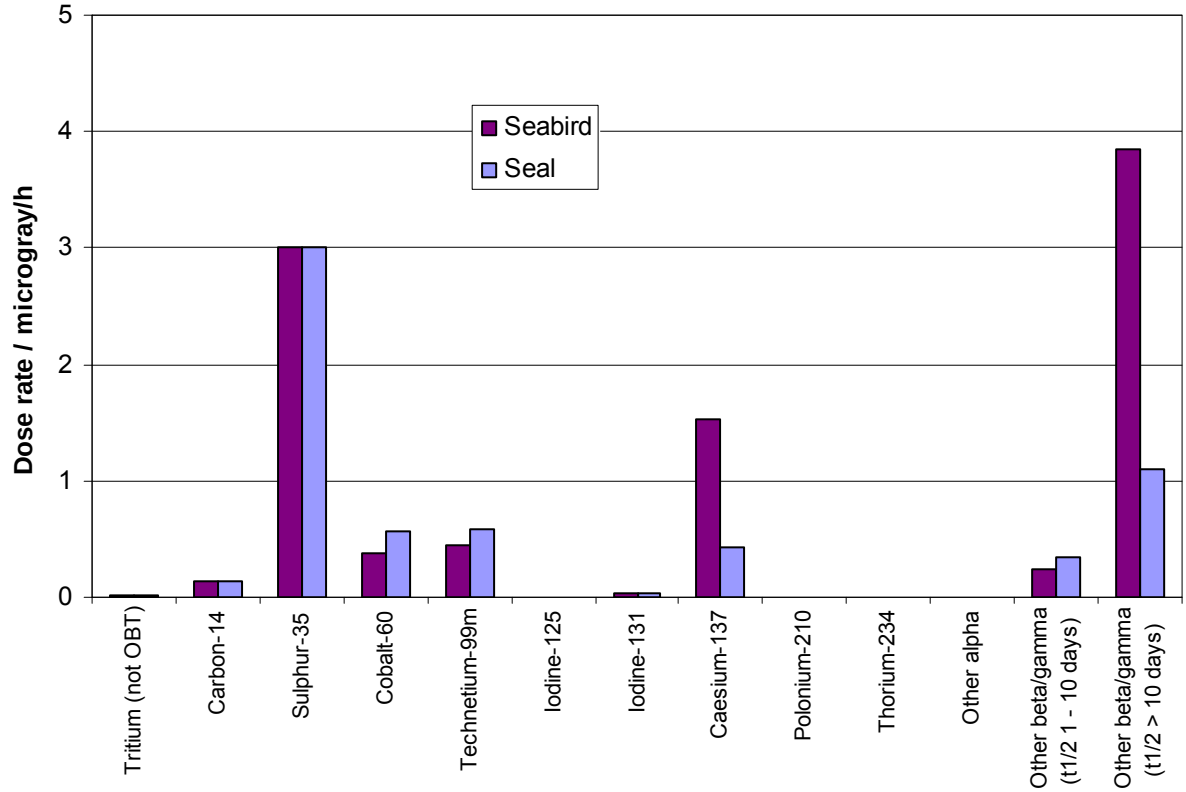


Figure 15: NE44 Teesmouth and Cleveland Coast SPA – Marine assessment – Radionuclide contribution to dose rates

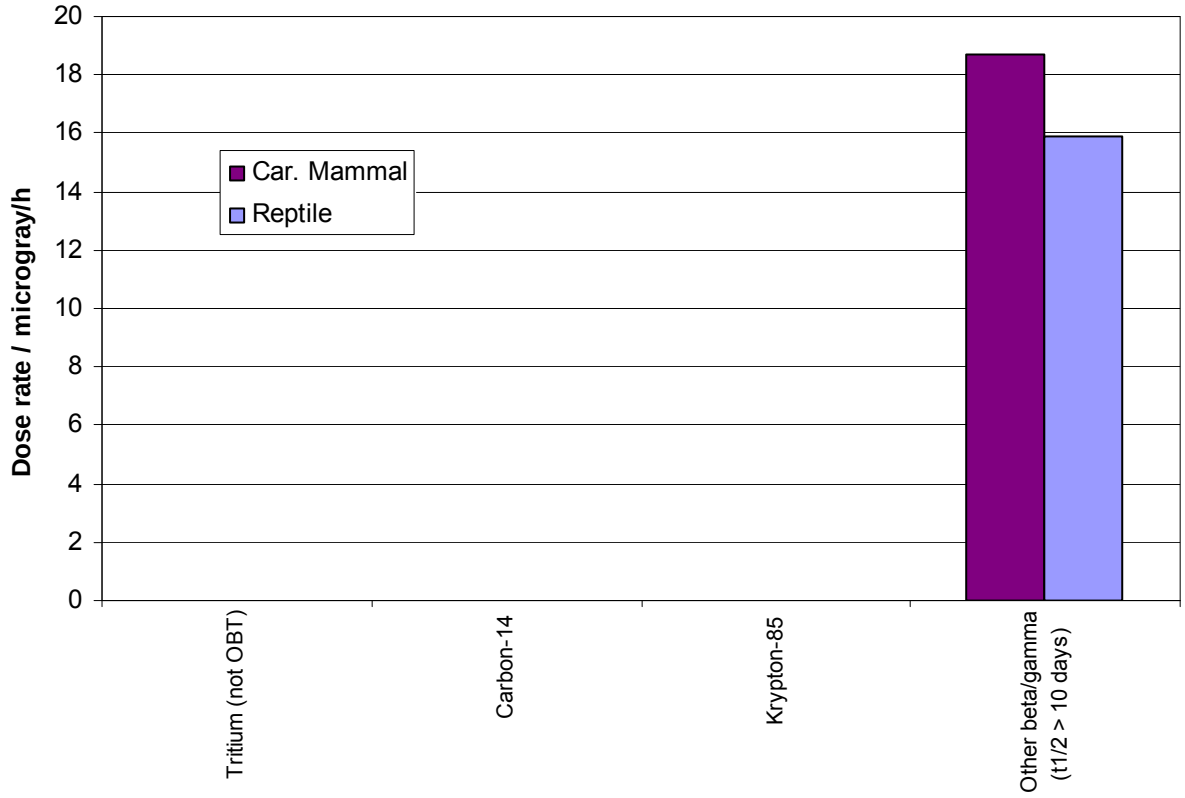


Figure 16: NE44 Teesmouth and Cleveland Coast SPA – Terrestrial assessment – Radionuclide contribution to dose rates

Appendix 1 – Surrogate and realistic radionuclides

Radionuclides or radionuclide groups in RSA 93 authorisations in England and Wales, along with the radionuclide (or surrogate radionuclide) used in the habitats assessment are shown in Table A1.1.

More realistic radionuclides used for certain groups of radionuclides in particular authorisations are shown in Table A1.2.

A few groups of radionuclide limits were excluded as these would double count with other specific radionuclide limits (see Table A1.3).

Table A1.1 Radionuclides (or groups) in authorisations and those used in assessment

Radionuclide in authorisation	Radionuclide in assessment[a]	Radionuclide in authorisation	Radionuclide in assessment[a]
Activation products – short-lived gaseous	Argon-41	Chromium-57	Other beta/gamma (t1/2 >10 days)
Americium-241	Americium-241	Cobalt-55	Other beta/gamma (t1/2 1–10 days)
Argon	Argon-41	Cobalt-56	Other beta/gamma (t1/2 >10 days)
Argon and krypton	Argon-41	Cobalt-56, cobalt-57, cobalt-58, manganese-52 & manganese-54	Other beta/gamma (t1/2 >10 days)
Argon-37	Argon-41	Cobalt-56, cobalt-57, cobalt-58, manganese-52 & manganese-54	Other beta/gamma (t1/2 >10 days)
Argon-41	Argon-41	Cobalt-57	Other beta/gamma (t1/2 >10 days)
Astatine-211	Other beta/gamma (t1/2 >10 days)	Cobalt-57 & cobalt-58	Other beta/gamma (t1/2 >10 days)
Barium-137m	Caesium-137	Cobalt-57 & cobalt-59	Other beta/gamma (t1/2 >10 days)
Bismuth-210	Other beta/gamma (t1/2 >10 days)	Cobalt-58	Other beta/gamma (t1/2 >10 days)
Bromine-76, 77 & 82	Other beta/gamma (t1/2 >10 days)	Cobalt-60	Cobalt-60
Bromine-82	Other beta/gamma (t1/2 >10 days)	Copper-64	Other beta/gamma (t1/2 1–10 days)
Bromine-82 & sodium-24	Other beta/gamma (t1/2 >10 days)	Copper-67	Other beta/gamma (t1/2 1–10 days)
Cadmium-109	Other beta/gamma (t1/2 >10 days)	Curium-244	Other alpha
Caesium-134	Caesium-137	Europium-152	Other beta/gamma (t1/2 1–10 days)
Caesium-137	Caesium-137	Fluorine-18	Other beta/gamma (t1/2 <1 day)
Calcium-45	Other beta/gamma (t1/2 >10 days)	Gallium-67	Other beta/gamma (t1/2 >10 days)
Californium-252	Other alpha	Gallium-67, indium-111, thallium-201 & iodine-131	Other beta/gamma (t1/2 1–10 days)
Carbon-11	Other beta/gamma (t1/2 <1 day)	Gallium-68	Other beta/gamma (t1/2 <1 day)
Carbon-14	Carbon-14	Gold-195	Other beta/gamma (t1/2 >10 days)
Carbon-14 & other beta-emitting radionuclides	Other beta/gamma (t1/2 >10 days)	Holmium-166	Other beta/gamma (t1/2 1–10 days)
Carbon-14 & sulphur-35	Carbon-14	Indium-111	Other beta/gamma (t1/2 >10 days)
Carbon-14 and other beta emitters	Other beta/gamma (t1/2 >10 days)	Indium-111, gallium-67, chromium-51, selenium-75 & thallium-201	Other beta/gamma (t1/2 >10 days)
Carbon-14, cobalt-57 & cobalt-58	Other beta/gamma (t1/2 >10 days)	Indium-113	Other beta/gamma (t1/2 >10 days)
Cerium-144	Caesium-137	Indium-113m	Other beta/gamma (t1/2 <1 day)
Chlorine-36	Other beta/gamma (t1/2 >10 days)	Indium-113m, bromine-82 & sodium-24	Other beta/gamma (t1/2 <1 day)
Chromium-51	Other beta/gamma (t1/2 >10 days)	Indium-113m, iodine-123, erbium-171, gallium-67, sodium-24, potassium-42, gold-198, yterrbium-69/175 & iron-59	Other beta/gamma (t1/2 >10 days)
Chromium-51, rubidium-86 & indium-111	Other beta/gamma (t1/2 >10 days)	Inidium-111	Other beta/gamma (t1/2 >10 days)

Table A1.1 Continued

Radionuclide in authorisation	Radionuclide in assessment[a]	Radionuclide in authorisation	Radionuclide in assessment[a]
Iodine isotopes	Other beta/gamma (t1/2 >10 days)	Low energy (<0.3 MeV) beta-emitting radionuclides	Carbon-14
Iodine isotopes (excluding iodine-131)	Iodine-125	Lutetium-177	Other beta/gamma (t1/2 >10 days)
Iodine-121	Other beta/gamma (t1/2 <1 day)	Manganese-54	Other beta/gamma (t1/2 >10 days)
Iodine-122	Other beta/gamma (t1/2 <1 day)	Manganese-56	Other beta/gamma (t1/2 <1 day)
Iodine-123	Other beta/gamma (t1/2 >10 days)	Mercury-203	Other beta/gamma (t1/2 >10 days)
Iodine-123 & iodine-125	Other beta/gamma (t1/2 >10 days)	Mixed radionuclides including americium-241	Other alpha
Iodine-123 & iodine-131	Other beta/gamma (t1/2 1–10 days)	Molybdenum-99 & technetium-99m	Technetium-99m
Iodine-123, iodine-125 & iodine-131	Other beta/gamma (t1/2 >10 days)	Neptunium-237	Plutonium-alpha
Iodine-123, iodine-125, iodine-129 & iodine-131	Other beta/gamma (t1/2 >10 days)	Nickel-63	Other beta/gamma (t1/2 >10 days)
Iodine-124	Other beta/gamma (t1/2 >10 days)	Nitrogen-13	Other beta/gamma (t1/2 <1 day)
Iodine-125	Iodine-125	Non-uranium alpha-emitting radionuclides	Other alpha
Iodine-125 & iodine-131	Other beta/gamma (t1/2 >10 days)	Other alpha-emitting radionuclides	Other alpha
Iodine-125 & other iodine isotopes	Other beta/gamma (t1/2 >10 days)	Other beta/gamma-emitting radionuclides	Other beta/gamma (t1/2 >10 days)
Iodine-129	Iodine-129	Other beta/gamma-emitting radionuclides – half-life <8 days	Other beta/gamma (t1/2 1–10 days)
Iodine-131	Iodine-131	Other beta/gamma-emitting radionuclides – half-life >8 days	Other beta/gamma (t1/2 >10 days)
Iodine-131 & other radionuclides (excluding alpha emitters)	Other beta/gamma (t1/2 >10 days)	Other beta/gamma-emitting radionuclides (excluding alpha emitters)	Other beta/gamma (t1/2 >10 days)
Iron-52	Other beta/gamma (t1/2 1–10 days)	Other beta-emitting radionuclides	Other beta/gamma (t1/2 >10 days)
Iron-55	Other beta/gamma (t1/2 >10 days)	Other beta-emitting radionuclides with max beta energy > than 0.4 MeV	Other beta/gamma (t1/2 >10 days)
Iron-59	Other beta/gamma (t1/2 >10 days)	Other gamma-emitting radionuclides	Other beta/gamma (t1/2 >10 days)
Krypton-75	Krypton-85	Other gases	Argon-41
Krypton-79	Krypton-85	Other noble gases	Argon-41
Krypton-81	Krypton-85	Other radionuclides	Other alpha
Krypton-81m	Other beta/gamma (t1/2 <1 day)	Other radionuclides – half-life <1 day	Other beta/gamma (t1/2 <1 day)
Krypton-85	Krypton-85	Other radionuclides – half-life <8 hours	Other alpha
Krypton-85m	Krypton-85	Other radionuclides – half-life >8 hours	Other alpha
Lanthanum-140	Other beta/gamma (t1/2 1–10 days)	Other radionuclides – transuranics	Other alpha
Lanthanum-140 & sodium-24	Other beta/gamma (t1/2 1–10 days)	Other radionuclides (excluding alpha emitters)	Other beta/gamma (t1/2 >10 days)
Lead-210	Other beta/gamma (t1/2 >10 days)	Other radionuclides (excluding alpha emitters & iodine-125)	Other beta/gamma (t1/2 >10 days)
Other radionuclides (excluding alpha emitters & strontium-90)	Other beta/gamma (t1/2 >10 days)	Radium-224	Other alpha

Table A1.1 Continued

Radionuclide in authorisation	Radionuclide in assessment[a]	Radionuclide in authorisation	Radionuclide in assessment[a]
Other radionuclides (excluding alpha emitters)	Other beta/gamma (t1/2 >10 days)	Radium-224 & daughters	Other alpha
Other radionuclides (excluding alpha emitters) – half-life <2 hours	Other beta/gamma (t1/2 <1 day)	Radium-226	Other alpha
Other radionuclides (excluding cobalt-60)	Other alpha	Radium-226 & daughters	Other alpha
Other radionuclides (excluding tritium & caesium-137)	Other alpha	Radium-226 & thorium-232	Other alpha
Other radionuclides (including strontium-90)	Strontium-90	Radium-227 & Thorium-232	Other alpha
Oxygen-15	Other beta/gamma (t1/2 <1 day)	Radium-227 + Thorium-232	Other alpha
Oxygen-15, carbon-11, nitrogen-13 & fluorine-18	Other beta/gamma (t1/2 <1 day)	Radium-228	Other beta/gamma (t1/2 >10 days)
Phosphorus isotopes	Phosphorus-32/33	Radium-228 & daughters	Other alpha
Phosphorus-32	Phosphorus-32/33	Radium-233	Other alpha
Phosphorus-32 & phosphorus-33	Phosphorus-32/33	Radon-220	Radon-222
Phosphorus-32 & strontium-89	Phosphorus-32/33	Radon-222	Radon-222
Phosphorus-32 & sulphur-35	Phosphorus-32/33	Rhenium-186	Other beta/gamma (t1/2 >10 days)
Phosphorus-32, chlorine-36 & sulphur-35	Phosphorus-32/33	Rhenium-188	Other beta/gamma (t1/2 >10 days)
Phosphorus-32, phosphorus-33 & sulphur-35	Phosphorus-32/33	Rubidium-81 & krypton-81m	Other beta/gamma (t1/2 <1 day)
Phosphorus-33	Phosphorus-32/33	Rubidium-81, rubidium-82m, rubidium-83 & rubidium-84	Other beta/gamma (t1/2 >10 days)
Plutonium isotopes	Plutonium-alpha	Rubidium-82	Other beta/gamma (t1/2 <1 day)
Plutonium-238	Plutonium-alpha	Rubidium-83	Other beta/gamma (t1/2 >10 days)
Plutonium-239	Plutonium-alpha	Rubidium-83 & rubidium-84	Other beta/gamma (t1/2 >10 days)
Plutonium-240	Plutonium-alpha	Rubidium-84	Other beta/gamma (t1/2 >10 days)
Plutonium-241	Other beta/gamma (t1/2 >10 days)	Rubidium-86	Other beta/gamma (t1/2 >10 days)
Plutonium-alpha	Plutonium-alpha	Ruthenium-103	Other beta/gamma (t1/2 >10 days)
Polonium-210	Polonium-210	Ruthenium-106	Other beta/gamma (t1/2 >10 days)
Polonium-210 & lead-210	Polonium-210	Ruthenium-106 & other radionuclides (excluding alpha emitters)	Other beta/gamma (t1/2 >10 days)
Potassium-42	Other beta/gamma (t1/2 1–10 days)	Samarium-151	Other beta/gamma (t1/2 >10 days)
Protactinium-233	Other beta/gamma (t1/2 >10 days)	Samarium-153	Other beta/gamma (t1/2 >10 days)
Protactinium-234	Other beta/gamma (t1/2 <1 day)	Selenium-75	Other beta/gamma (t1/2 >10 days)
Radium-223	Other alpha	Silver-110m & cobalt-60	Cobalt-60
Sodium-22	Other beta/gamma (t1/2 >10 days)	Total alpha-emitting radionuclides	Other alpha
Sodium-24	Other beta/gamma (t1/2 1–10 days)	Total alpha-emitting radionuclides – half-life <3 months	Other alpha
Strontium isotopes & alpha-emitting radionuclides	Other alpha	Total alpha-emitting radionuclides – half-life >3 months	Other alpha

Table A1.1 Continued

Radionuclide in authorisation	Radionuclide in assessment[a]	Radionuclide in authorisation	Radionuclide in assessment[a]
Strontium-85	Other beta/gamma (t1/2 >10 days)	Total alpha-emitting radionuclides (excluding uranium)	Other alpha
Strontium-89	Other beta/gamma (t1/2 >10 days)	Total alpha-emitting radionuclides (non-uranic)	Other alpha
Strontium-90	Strontium-90	Total beta/gamma-emitting radionuclides	Other beta/gamma (t1/2 >10 days)
Strontium-90 & alpha-emitting radionuclides	Other alpha	Total beta-emitting radionuclides	Other beta/gamma (t1/2 >10 days)
Sulphur isotopes	Sulphur-35	Total beta-emitting radionuclides – half-life <3 months	Other beta/gamma (t1/2 >10 days)
Sulphur-35	Sulphur-35	Total beta-emitting radionuclides – half-life <8 hours	Other beta/gamma (t1/2 <1 day)
Sulphur-35 & iodine-125	Sulphur-35	Total beta-emitting radionuclides – half-life >8 hours	Other beta/gamma (t1/2 >10 days)
Sulphur-35, carbon-14, chromium-51 & phosphorus-33	Other beta/gamma (t1/2 >10 days)	Total beta-emitting radionuclides (>0.4 MeV)	Other beta/gamma (t1/2 >10 days)
Tantalum-182	Other beta/gamma (t1/2 >10 days)	Total beta-emitting radionuclides (excluding tritium)	Other beta/gamma (t1/2 >10 days)
Technetium-99	Technetium-99	Total beta-emitting radionuclides associated with particulate matter	Other beta/gamma (t1/2 >10 days)
Technetium-99m	Technetium-99m	Total halogens	Other beta/gamma (t1/2 >10 days)
Technetium-99m & molybdenum-99	Technetium-99m	Total noble gases	Argon-41
Thallium-201	Other beta/gamma (t1/2 >10 days)	Total positron-emitting radionuclides	Other beta/gamma (t1/2 <1 day)
Thallium-207	Other beta/gamma (t1/2 >10 days)	Total positron-emitting radionuclides – half-life <2 hours	Other beta/gamma (t1/2 <1 day)
Thorium – natural	Other alpha	Total positron-emitting radionuclides – half-life <2 hours	Other beta/gamma (t1/2 <1 day)
Thorium isotopes	Other alpha	Total radionuclides	Other alpha
Thorium natural	Other alpha	Total radionuclides – half-life <1 day	Other beta/gamma (t1/2 1–10 days)
Thorium-230	Other alpha	Total radionuclides – half-life <10 hours	Other beta/gamma (t1/2 >10 days)
Thorium-232	Other alpha	Total radionuclides – half-life <30 minutes	Other beta/gamma (t1/2 <1 day)
Thorium-232 & daughters	Other alpha	Total radionuclides – half-life <5 days	Other beta/gamma (t1/2 >10 days)
Thorium-234	Thorium-234	Total radionuclides – half-life <8 hours	Other beta/gamma (t1/2 <1 day)
Tin-117m	Other beta/gamma (t1/2 >10 days)	Total radionuclides – half-life >3 hours	Other beta/gamma (t1/2 >10 days)
Total radionuclides – half-life >400 days	Other beta/gamma (t1/2 >10 days)	Uranium – enriched	Uranium-alpha
Total radionuclides – half-life >8 hours	Other beta/gamma (t1/2 >10 days)	Uranium – natural	Uranium-alpha
Total radionuclides – half-life 30 minutes – 3 hours	Other beta/gamma (t1/2 <1 day)	Uranium & thorium – natural	Other alpha
Total radionuclides – half-life between 5 and 400 days	Other beta/gamma (t1/2 >10 days)	Uranium daughters	Other alpha
Total radionuclides (excluding alpha emitters & strontium-90)	Other beta/gamma (t1/2 >10 days)	Uranium isotopes	Uranium-alpha

Table A1.1 Continued

Radionuclide in authorisation	Radionuclide in assessment[a]	Radionuclide in authorisation	Radionuclide in assessment[a]
Total radionuclides (excluding alpha emitters)	Other beta/gamma (t1/2 >10 days)	Uranium-234	Uranium-alpha
Tritium	Tritium (not OBT)	Uranium-235	Uranium-alpha
Tritium – organically bound tritium	Tritium (Organically Bound)	Uranium-238	Uranium-alpha
Tritium – tritiated water	Tritium (not OBT)	Uranium-238 & daughters	Uranium-alpha
Tritium & carbon-14	Carbon-14	Vanadium-48	Other beta/gamma (t1/2 >10 days)
Tritium & carbon-14 (and iodine-131)	Carbon-14	Xenon isotopes	Krypton-85
Tritium (OBT)	Carbon-14	Xenon-131m	Krypton-85
Tritium, carbon-14 & sulphur-35	Carbon-14	Xenon-133	Krypton-85
Tritium, krypton-85 & krypton-79	Tritium (not OBT)	Yttrium-90	Other beta/gamma (t1/2 >10 days)
Tungsten-181	Other beta/gamma (t1/2 >10 days)	Zinc-65	Other beta/gamma (t1/2 >10 days)
Uranium – depleted	Uranium-alpha	Zinc-72	Other beta/gamma (t1/2 1–10 days)
Uranium – depleted or natural	Uranium-alpha	Zirconium-95 & niobium-95	Caesium-137

[a]Other alpha represented by plutonium-239; other beta/gamma (t1/2 <1 day) represented by technetium-99m; other beta/gamma (t1/2 1–10 days) represented by iodine-131 and other beta/gamma (t1/2 >10 days) represented by caesium-137.

Table A1.2 Realistic radionuclides used in assessment for certain authorisations

New Permit No.	Original Permit No.	Operator	Premises Address	Postcode	Waste Type	Release Route Type	Radionuclide in authorisation	Realistic radionuclide
AC6573	AE5764	EAST SOMERSET NHS TRUST	Yeovil District Hospital, Higher Kingston	BA21 4RT	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)
AI8145	AJ0388	ICI CHEMICALS AND POLYMERS LTD		TS23 1LB	Aqueous	River	Other beta/gamma-emitting radionuclides – half-life >8 days	Caesium-137
AK9909	AK9909	UNIVERSITY OF OXFORD	University of Oxford Research Institute, Churchill Hospital, Headington	OX3 7LJ	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)
AM8121	AK9895	UNIVERSITY OF OXFORD	University Clinical Departments, John Radcliffe Hospital, Headington	OX3 9DU	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)
AS3528	AS3528	BRITISH ENERGY GENERATION LTD	Hartlepool Nuclear Power Station	TS25 2BZ	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
AS3587	AS3587	BRITISH ENERGY GENERATION LTD	Hinkley Point B Power Station	TA5 1UD	Aqueous	Estuary	Other radionuclides	Other beta/gamma-emitting radionuclides
AS3676	AS3676	BRITISH ENERGY GENERATION LTD	Dungeness B Power Station	TN29 9PX	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
AS3714	AS3714	BRITISH ENERGY GENERATION LTD	Heysham 2 Power Station	LA3 2XH	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
AS3781	AS3781	BRITISH ENERGY GENERATION LTD	Heysham Power Station	LA3 2XQ	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BA5660	BA5660	BRITISH NUCLEAR FUELS PLC	Berkeley Power Station, Berkeley, Gloucestershire	GL13 9PA	Aqueous	Estuary	Other radionuclides	Other radionuclides (excluding alpha emitters)
BA5660	AB3056	BRITISH NUCLEAR FUELS PLC	Berkeley Power Station, Berkeley, Gloucestershire	GL13 9PA	Solid	On-site Incineration	Total radionuclides	Total beta/gamma-emitting radionuclides
BA5694	BA5694	British Nuclear Fuels Plc	Berkeley Centre, Gloucestershire	GL13 9PB	Aqueous	Estuary	Other Radionuclides	Other beta/gamma-emitting radionuclides
BA5694	BA5694	British Nuclear Fuels Plc	Berkeley Centre, Gloucestershire	GL13 9PB	Solid	On-site Incineration	Total radionuclides	Total radionuclides (excluding alpha emitters & strontium-90)
BE9241	BE9241	GE Healthcare (Amersham)	Amersham Laboratories, St. Georges Industrial Estate, White Lion Road	HP7 9LL	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)

Table A1.2 Continued

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Waste Type	Release Route Type	Radionuclide in authorisation	Realistic radionuclide
BE9241	BE9241	GE Healthcare (Amersham)	Amersham Laboratories, St. Georges Industrial Estate, White Lion Road	HP7 9LL	Aqueous	Sewage treatment works	Total alpha-emitting radionuclides	Americium-241
BL8147	BL8147	PETROPLUS REFINING TEESSIDE LTD	North Tees Site, Mibblesbrough	TS2 1TT	Aqueous	River	Other radionuclides (excluding alpha emitters)	Caesium-137
BM7308	BM7308	HUNTSMAN POLYURETHANES (UK) LTD	PO Box 99, Wilton, Redcar, Cleveland	TS10 4YAS	Aqueous	River	Other radionuclides (excluding alpha emitters)	Caesium-137
BW8283	AK9917	UNIVERSITY OF OXFORD	University Clinical Department, Radcliffe Infirmary, Woodstock Road	OX2 6HE	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)
BW8291	AK9925	UNIVERSITY OF OXFORD	Institute of Molecular Medicine, John Radcliffe Hospital	OX3 9DU	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)
BW8308	AK9933	UNIVERSITY OF OXFORD	Nuffield Dept of Orthopaedic Surgery and Bone Research, Nuffield Orthopaedic Centre, Windmill Road, Headington	OX3 7LD	Aqueous	Sewage treatment works	Other radionuclides	Other radionuclides (excluding alpha emitters)
BX3872	BU4619	INVISTA (UK) LTD	PO Box 401, Wilton Site, Middlesbrough, Cleveland	TS6 8JJ	Aqueous	Estuary	Other radionuclides (excluding alpha emitters)	Caesium-137
BY6869	BX0075	Springfields Fuel Ltd	Springfields, Salwick, Preston, Lancashire	PR4 0XJ	Aqueous	Estuary	Total beta-emitting radionuclides	Thorium-234
BZ6538	BA5333	Magno Electric Limited-Sizewell 'A	Sizewell A Power Station, Leiston, Suffolk	IP16 4UE	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ6848	BA5384	Magnox Electric Ltd – Bradwell Power Station	Bradwell-on-Sea	CM0 7HP	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ6848	BA5384	Magnox Electric Ltd – Bradwell Power Station	Bradwell-on-Sea	CM0 7HP	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ7054	BA5619	Magnox Electric Ltd – Hinkley Point 'A	Hinkley Point A Power Station, Hinkley Point, Bridgwater, Somerset	TA5 1UD	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ7747	BA5449	Magnox Electric Ltd - Dungeness 'A	Dungeness 'A Power Station, Romney Marsh, Kent.	TN 29 9PP	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ7836	BA5660	Magnox Electric Limited	Berkeley power Station	GL13 9PA	Aqueous	Estuary	Other Radionuclides	Other beta/gamma-emitting radionuclides

Table A1.2 Continued

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Waste Type	Release Route Type	Radionuclide in authorisation	Realistic radionuclide
BZ9529	BZ9529	British Energy Generation Limited	Sizewell B Power Station, Leiston, Suffolk	IP16 4UR	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9529	BZ9529	British Energy Generation Limited	Sizewell B Power Station, Leiston, Suffolk	IP16 4UR	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9537	BZ9537	British Energy Generation Limited	Hinkley point B Power Station, Nr Bridgwater, Somerset	TA5 1UD	Solid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9537	BZ9537	British Energy Generation Limited	Hinkley point B Power Station, Nr Bridgwater, Somerset	TA5 1UD	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9537	BZ9537	British Energy Generation Limited	Hinkley point B Power Station, Nr Bridgwater, Somerset	TA5 1UD	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9545	BZ9545	British Energy Generation Limited	Hartlepool Power Station, Tees Road	TS25 2BZ	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9545	BZ9545	British Energy Generation Limited	Hartlepool Power Station, Tees Road	TS25 2BZ	Solid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9545	BZ9545	British Energy Generation Limited	Hartlepool Power Station, Tees Road	TS25 2BZ	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9553	BZ9553	BRITISH ENERGY GENERATION LTD	Heysham Nuclear Power Station	LA3 2XQ	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9553	BZ9553	BRITISH ENERGY GENERATION LTD	Heysham Nuclear Power Station	LA3 2XQ	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9561	BZ9561	British Energy Generation Ltd	Heysham 2 Power Station, Heysham, Lancashire	LA3 2XN	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9561	BZ9561	British Energy Generation Ltd	Heysham 2 Power Station, Heysham, Lancashire	LA3 2XN	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
BZ9910	BK3328	GE Healthcare Ltd (Cardiff)	The Maynard Centre. Forest Farm, Cardiff	CF14 7YT	Aqueous	Sewage treatment works	Tritium	Tritium – organically bound tritium
BZ9910	BK3328	GE Healthcare Ltd (Cardiff)	The Maynard Centre. Forest Farm, Cardiff	CF14 7YT	Aqueous	Sewage treatment works	Other Radionuclides	Other beta/gamma-emitting radionuclides
BZ9910	BK3328	GE Healthcare Ltd (Cardiff)	The Maynard Centre. Forest Farm, Cardiff	CF14 7YT	Gaseous	Gaseous disposal to air	Other Radionuclides	Sulphur-35
CA2959	BW2536	United Kindom Atomic Energy Authority	UKAEA Winfrith Site, DORCHESTER, DORSET.	DT2 8WG	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
CA2959	BW2536	United Kindom Atomic Energy Authority	UKAEA Winfrith Site, DORCHESTER, DORSET.	DT2 8WG	Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides
CA6806	BA5732	Magnox Electric PLC	Wylfa Power Station, Cemaes Bay, Anglesey		Aqueous	Sea	Other radionuclides	Other beta/gamma-emitting radionuclides

Table A1.2 Continued

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Waste Type	Release Route Type	Radionuclide in authorisation	Realistic radionuclide
CA9538	BA5546	Magnox Electric Limited – Oldbury	Oldbury-on-Severn Power Station, Thornbury, South Gloucestershire	BS35 1RQ	Aqueous	Sewage treatment works	Other radionuclides	Other beta/gamma-emitting radionuclides
CA9538	BA5546	Magnox Electric Limited – Oldbury	Oldbury-on-Severn Power Station, Thornbury, South Gloucestershire	BS35 1RQ	Solid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides
CA9538	BA5546	Magnox Electric Limited – Oldbury	Oldbury-on-Severn Power Station, Thornbury, South Gloucestershire	BS35 1RQ	Organic liquid	On-site incineration	Other radionuclides	Other beta/gamma-emitting radionuclides

Table A1.3 Radionuclide limits excluded to avoid double counting

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Waste Type	Release Route Type	Radionuclide in authorisation	Realistic radionuclide	Comment
BY6869	BX0075	Springfields Fuel Ltd	Springfields, Salwick, Preston, Lancashire	PR4 0XJ	Aqueous	Estuary	Total alpha-emitting radionuclides	Total alpha-emitting radionuclides	Annual Limit of 0.55 TBq not entered as will double count with other alpha limits
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria	CA20 1PG	Aqueous	Sea	Total beta-emitting radionuclides	Total beta-emitting radionuclides	Annual limit of 220 TBq not entered as double counts specific nuclide limits
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria	CA20 1PG	Aqueous	Sea	Total alpha-emitting radionuclides	Total alpha-emitting radionuclides	Annual limit of 1 TBq not entered as double counts specific nuclide limits

Appendix 2 – Natura 2000 sites

Details of Natura 2000 sites, including whether there are protected coastal, freshwater and terrestrial features, are shown in Table A2.1.

Table A2.1 Natura 2000 site details

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
A01	Anglian	Abberton Reservoir SPA	SPA	M	UK9009141	TL 979182	7.30	No	Yes	No
A02	Anglian	Alde-Ore Estuary SPA	SPA	M	UK9009112	TM 322711	24.20	Yes	Yes	No
A03	Anglian	Alde, Ore and Butley Estuaries SAC	SAC	M	UK0030076	TM444509	15.60	Yes	No	No
A04	Anglian	Barnack Hills & Holes SAC	SAC	L	UK0030031	TF075046	23.27	No	No	Yes
A05	Anglian	Baston Fen SAC	SAC	M	UK0030085	TF136171	0.02	No	Yes	No
A06	Anglian	Benacre to Easton Bavents SPA	SPA	M	UK0013104	TM 524830	5.20	Yes	Yes	Yes
A07	Anglian	Benacre to Easton Bavents Lagoons SAC	SAC	M	UK0013104	TM524830	3.70	Yes	Yes	Yes
A08	Anglian	Benfleet & Southend Marshes SPA	SPA	M	UK0013104	TQ 861845	22.50	Yes	Yes	No
A09	Anglian	Breckland SAC	SAC	M	UK9009201	TL862948	75.50	No	Yes	Yes
A10	Anglian	Breckland SPA	SPA	M	UK9009201	TL 760940	399.90	No	Yes	Yes
A11	Anglian	Breydon Water SPA	SPA	L	UK9009181	TG 453047	1202.94	Yes	Yes	No
A12	Anglian	The Broadland SPA	SPA	M	UK0030067	TG 430211	54.60	Yes	Yes	Yes
A13	Anglian	Deben Estuary SPA	SPA	M	UK9009261	TM 294435	9.80	Yes	Yes	No
A14	Anglian	Devils Dyke SAC	SAC	L	UK0030037	TL611622	8.02	No	No	Yes
A15	Anglian	Dews Pond SAC	SAC	L	UK0030133	TM387718	6.74	No	Yes	No
A16	Anglian	Essex Estuaries SAC	SAC	M	UK0013690	TM103048	461.40	Yes	Yes	No
A17	Anglian	Mid Essex Coast SPA – Phase 1 – Dengie	SPA	M	UK0030204	TM 045033	31.30	Yes	Yes	No
A18	Anglian	Mid Essex Coast SPA – Phase 2 – Colne Estuary	SPA	M	UK0030204	TM 040172	27.00	Yes	Yes	No
A19	Anglian	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	SPA	M	UK0030204	TQ 881970	17.40	Yes	Yes	No
A20	Anglian	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	SPA	M	UK0030204	TL 978100	44.00	Yes	Yes	No
A21	Anglian	Mid Essex Coast SPA – Phase 5 – Foulness	SPA	M	UK0030204	TR 024902	109.70	Yes	Yes	No
A22	Anglian	Eversden and Wimpole Woods SAC	SAC	L	UK0030331	TL340526	66.48	No	No	Yes
A23	Anglian	Fenland SAC	SAC	M	UK0014782	TL554701	6.20	No	Yes	Yes
A24	Anglian	Gibraltar Point SPA	SPA	M	UK9008022	TF 565585	4.10	Yes	Yes	No
A25	Anglian	Great Yarmouth North Denes SPA	SPA	L	UK9009271	TG 488216	149.19	Yes	No	No
A26	Anglian	Grimsthorpe SAC	SAC	L	UK0030043	TF033205	0.35	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
A27	Anglian	Hamford Water SPA	SPA	L	UK9009131	TM 230251	2187.21	Yes	Yes	No
A28	Anglian	Minsmere to Walberswick SPA	SPA	M	UK0012809	TM 476748	20.20	Yes	Yes	Yes
A29	Anglian	Minsmere to Walberswick Heaths and Marshes SAC	SAC	M	UK0012809	TM468682	12.70	Yes	No	Yes
A30	Anglian	Nene Washes SPA	SPA	H	UK0030222	TL302990	88.19	No	Yes	No
A31	Anglian	Nene Washes SAC	SAC	H	UK9008031	TL 304996	1517.49	No	Yes	No
A32	Anglian	Norfolk Valley Fens SAC	SAC	M	UK0012892	TL937960	616.21	No	Yes	Yes
A33	Anglian	North Norfolk Coast SPA	SPA	M	UK9009031	TF 745446	78.90	Yes	Yes	No
A34	Anglian	North Norfolk Coast SAC	SAC	M	UK9009031	TF752445	32.10	Yes	Yes	No
A35	Anglian	Orfordness – Shingle Street SAC	SAC	L	UK0014780	TM440486	901.19	Yes	No	No
A36	Anglian	Orton Pit SAC	SAC	L	UK0030053	TL163944	74.47	No	Yes	No
A37	Anglian	Ouse Washes SAC	SAC	H	UK0013011	TL498895	311.35	No	Yes	No
A38	Anglian	Ouse Washes SPA	SPA	H	UK9008041	TL 498888	2447.26	No	Yes	No
A39	Anglian	Overstrand Cliffs SAC	SAC	L	UK0030232	TG235414	30.02	Yes	No	No
A40	Anglian	Paston Great Barn SAC	SAC	L	UK0030235	TG322345	0.95	No	No	Yes
A41	Anglian	Portholme SAC	SAC	M	UK0030054	TL237708	0.90	No	Yes	Yes
A42	Anglian	Rex Graham Reserve SAC	SAC	L	UK0019866	TL737746	2.67	No	No	Yes
A43	Anglian	River Wensum SAC	SAC	M	UK0012647	TG022176	3.80	No	Yes	Yes
A44	Anglian	Roydon Common & Dersingham Bog SAC	SAC	M	UK0019834	TF686224	3.50	No	No	Yes
A45	Anglian	Rutland Water SPA	SPA	H	UK9008051	SK 903064	1556.87	No	Yes	No
A46	Anglian	Sandlings SPA	SPA	L	UK9020286	TM 359479	3391.80	Yes	Yes	Yes
A47	Anglian	Saltfleetby – Theddlethorpe Dunes and Gibraltar Point SAC	SAC	M	UK9011102	TF480906	9.60	Yes	No	Yes
A48	Anglian	Staverton Park & The Thicks, Wantisden SAC	SAC	L	UK0012741	TM356509	81.45	No	No	Yes
A49	Anglian	Stour and Orwell Estuaries SPA	SPA	M	UK0030067	TM 171332	36.80	Yes	Yes	No
A50	Anglian	The Broads SAC	SAC	M	UK0030067	TG438209	58.70	Yes	Yes	No
A51	Anglian	The Wash SPA	SPA	M	UK0030067	TF 537403	622.10	Yes	No	No
A52	Anglian	The Wash and North Norfolk Coast SAC	SAC	M	UK0030067	TF558403	1077.60	Yes	No	No
A53	Anglian	Upper Nene Valley Gravel Pits SPA	Provisional	-				No	Yes	No
A54	Anglian	Waveney and Little Ouse Valley Fens SAC	SAC	H	UK0012882	TM054799	193.18	No	No	Yes
A55	Anglian	Winterton – Horsey Dune SAC	SAC	L	UK0013043	TG491204	425.94	Yes	No	No

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
M01	Midlands	Bees Nest and Green Clay Pits SAC	SAC	L	UK0030087	SK240545	14.76	No	No	Yes
M02	Midlands	Birklands and Bilhaugh SAC	SAC	L	UK0012740	SK618679	271.84	No	No	Yes
M03	Midlands	Bredon Hill SAC	SAC	L	UK0012587	SO965406	359.86	No	No	Yes
M04	Midlands	Brown Moss SAC	SAC	H	UK0030100	SJ561394	32.03	No	No	Yes
M05	Midlands	Cannock Chase SAC	SAC	M	UK0030107	SJ982188	12.40	No	Yes	Yes
M06	Midlands	Cannock Extension Canal SAC	SAC	M	UK0012672	SK020058	0.10	No	Yes	No
M07	Midlands	Coedydd Llawr-y-glyn SAC	SAC	L	UK0030119	SN927904	100.68	No	No	Yes
M08	Midlands	Cotswolds Beechwoods SAC	SAC	L	UK0013658	SO898134	585.85	No	No	Yes
M09	Midlands	Dixton Wood SAC	SAC	L	UK0030135	SO979313	13.14	No	No	Yes
M10	Midlands	Downton Gorge SAC	SAC	L	UK0012735	SO443743	69.30	No	Yes	Yes
M11	Midlands	Ensors Pool SAC	SAC	L	UK0012646	SP348903	3.80	No	Yes	No
M12	Midlands	Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses SAC	SAC	M	UK0012912	SJ487364	9.50	No	No	Yes
M13	Midlands	Fens Pools SAC	SAC	L	UK0030150	SO920888	20.40	No	Yes	No
M14	Midlands	Gang Mine SAC	SAC	L	UK0012817	SK286557	8.26	No	No	Yes
M15	Midlands	Granllyn SAC	SAC	L	UK0030158	SJ224117	20.99	No	No	Yes
M16	Midlands	Hatfield Moor SAC	SAC	H	UK0030166	SE699057	1363.55	No	No	Yes
M17	Midlands	Lyppard Grange Ponds SAC	SAC	L	UK0030198	SO879556	1.09	No	Yes	No
M18	Midlands	Montgomery Canal SAC	SAC	L	UK0030213	SJ245100	55.89	No	Yes	No
M19	Midlands	Mottey Meadows SAC	SAC	L	UK0030051	SJ840134	43.87	No	No	Yes
M20	Midlands	Pasturefields Salt Marsh SAC	SAC	M	UK0012789	SJ992249	0.10	No	No	Yes
M21	Midlands	Peak District Dales SAC	SAC	M	UK0019859	SK142550	23.30	No	Yes	Yes
M22	Midlands	River Clun SAC	SAC	M	UK0030250	SO393754	0.10	No	Yes	No
M23	Midlands	River Mease SAC	SAC	M	UK0030258	SK260114	0.20	No	Yes	No
M24	Midlands	Rodborough Common SAC	SAC	L	UK0012826	SO849036	104.26	No	No	Yes
M25	Midlands	The Stiperstones and the Hollies SAC	SAC	L	UK0012810	SJ375006	601.46	No	No	Yes
M26	Midlands	Tanat & Vyrnwy Bat Sites SAC	SAC	L	UK0014783	SJ047259	11.78	No	No	Yes
M27	Midlands	Thorne and Hatfield Moors SPA	SPA	H	UK9005171	SE 728163	2449.20	No	No	Yes
M28	Midlands	Thorne Moor SAC	SAC	H	UK0012915	SE728163	1909.38	No	No	Yes
M29	Midlands	Walmore Common SPA	SPA	L	UK9007051	SO 745150	52.85	No	No	Yes
M30	Midlands	Wye Valley and Forest of Dean Bat sites/Safleoedd Ystlumod Dyffryn Gwy SAC	SAC	M	UK0030067	SO605044	1.40	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
NE01	North East	Arnecliff & Park Hole Woods SAC	SAC	L	UK0030142	NZ786049	52.49	No	No	Yes
NE02	North East	Beast Cliff to Whitby (Robin Hood's Bay) SAC	SAC	L	UK0030086	NZ962031	260.20	Yes	No	No
NE03	North East	Berwickshire & N Northumberland Coast SAC	SAC	M	UK0030088	NU206401	653.30	Yes	Yes	No
NE04	North East	Castle Eden Dene SAC	SAC	L	UK0012768	NZ435397	194.40	No	No	Yes
NE05	North East	Coquet Island SPA	SPA	L	UK9006031	NU 294047	22.28	Yes	No	No
NE06	North East	Craven Limestone Complex SAC	SAC	M	UK0014776	SD924673	53.30	No	Yes	Yes
NE07	North East	Denby Grange Colliery Ponds SAC	SAC	M	UK0030036	SE271153	0.20	No	Yes	No
NE08	North East	Durham Coast SAC	SAC	L	UK0030140	NZ455407	393.63	Yes	No	No
NE09	North East	Ellers Wood & Sand Dale SAC	SAC	M	UK0030039	SE858849	0.04	No	No	Yes
NE10	North East	Farne Islands SPA	SPA	L	UK9006021	NU 221364	101.86	Yes	No	No
NE11	North East	Fen Bog SAC	SAC	L	UK0030332	SE851974	27.49	No	No	Yes
NE12	North East	Flamborough Head SAC	SAC	M	UK0013036	TA257701	63.10	Yes	No	No
NE13	North East	Flamborough Head and Bempton Cliffs SPA	SPA	M	UK9006101	TA 234723	2.10	Yes	No	No
NE14	North East	Ford Moss SAC	SAC	L	UK0030151	NT970377	61.14	No	No	Yes
NE15	North East	Harbottle Moors SAC	SAC	L	UK0030333	NT907041	936.30	No	No	Yes
NE16	North East	Holburn Lake and Moss SPA	SPA	L	UK9006041	NU 051365	28.03	No	Yes	No
NE17	North East	Hornsea Mere SPA	SPA	H	UK9006171	TA 188469	231.20	No	Yes	No
NE18	North East	Humber Estuary SAC	SAC	M	UK0012791	TA 315170	152.00	Yes	Yes	Yes
NE19	North East	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	SPA	M	UK9006111	TA 315170	152.00	Yes	Yes	Yes
NE20	North East	Humber Flats, Marshes and Coast SPA (Phase I and II) UK9006112 (Phase 2 only)	SPA	M	UK0012791	TA 315170	152.00	Yes	Yes	Yes
NE21	North East	Kirk Deighton SAC	SAC	L	UK0030178	SE396501	4.03	No	No	Yes
NE22	North East	Lindisfarne SPA	SPA	H	UK9006011	NU 137424	3679.22	Yes	No	No
NE23	North East	Lower Derwent Valley SPA	SPA	H	UK9006092	SE706437	915.45	No	Yes	No
NE24	North East	Lower Derwent Valley SAC	SAC	H	UK0012844	SE703441	915.91	No	Yes	Yes
NE25	North East	Moor House Upper Teesdale SAC	SAC	H	UK0014774	NY799358	38795.99	No	Yes	Yes
NE26	North East	Newham Fen SAC	SAC	L	UK0012890	NU169295	13.49	No	No	Yes
NE27	North East	N Northumberland Dunes SAC	SAC	L	UK0017097	NU126435	1147.56	Yes	No	No
NE28	North East	North Pennine Dales Meadows SAC	SAC	L	UK0014775	NY931256	497.09	No	No	Yes
NE29	North East	North Pennine Moors SAC	SAC	H	UK0030033	SE137749	103109.42	No	No	Yes
NE30	North East	North Pennine Moors SPA	SPA	H	UK9006272	NY 841291	147246.41	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
NE31	North East	North York Moors SAC	SAC	L	UK0030228	NZ711021	44082.25	No	No	Yes
NE32	North East	North York Moors SPA	SPA	L	UK9006161	NZ 725006	44087.68	No	No	Yes
NE33	North East	Northumbria Coast SPA	SPA	L	UK9006131	NU 260192	1107.98	Yes	No	No
NE34	North East	Ox Close SAC	SAC	L	UK0030234	SD984903	141.25	No	No	Yes
NE35	North East	River Derwent SAC	SAC	H	UK0030253	SE704474	411.23	No	Yes	No
NE36	North East	River Tweed SAC	SAC	M	UK0012691	NT503338	38.00	No	Yes	Yes
NE37	North East	Roman Wall Loughs SAC	SAC	L	UK0030267	NY775695	684.26	No	Yes	No
NE38	North East	Simonside Hill SAC	SAC	L	UK0030336	NY982970	2082.60	No	No	Yes
NE39	North East	Skipwith Common SAC	SAC	L	UK0030276	SE668362	295.20	No	No	Yes
NE40	North East	South Pennine Moors SAC	SAC	H	UK9007021	SK 157668	45270.52	No	Yes	Yes
NE41	North East	South Pennine Moors Phase 2 SPA	SPA	H	UK9007022	SD 953349	20936.53	No	No	Yes
NE42	North East	South Pennine Moors Phase 1 (Peak District Moors) SPA	SPA	H	UK0030280	SK144960	64983.13	No	No	Yes
NE43	North East	Strensall Common SAC	SAC	L	UK0030284	SE651598	569.63	No	No	Yes
NE44	North East	Teesmouth and Cleveland Coast SPA	SPA	H	UK9006061	NZ 569265	1247.31	Yes	No	No
NE45	North East	Thrislington SAC	SAC	L	UK0012838	NZ317328	22.58	No	No	Yes
NE46	North East	Tweed Estuary SAC	SAC	M	UK0030067	NT993531	1.60	Yes	No	No
NE47	North East	Tyne & Allen River Gravels SAC	SAC	L	UK0012816	NY689624	36.84	No	No	Yes
NE48	North East	Tyne & Nent SAC	SAC	L	UK0030293	NY715448	36.84	No	No	Yes
NW01	North West	Asby Complex SAC	SAC	L	UK0014778	NY598112	3122.23	No	Yes	Yes
NW02	North West	Border Mires, Kielder – Butterburn SAC	SAC	L	UK0012923	NT684013	11851.77	No	No	Yes
NW03	North West	Borrowdale Woodland Complex SAC	SAC	L	UK0012745	NY235129	667.83	No	No	Yes
NW04	North West	Bowland Fells SPA	SPA	L	UK9005151	SD 631547	16002.31	No	Yes	Yes
NW05	North West	Calf Hill and Cragg Woods SAC	SAC	L	UK0030106	SD543614	34.43	No	No	Yes
NW06	North West	Clints Quarry SAC	SAC	L	UK0030035	NY161357	12.03	No	Yes	No
NW07	North West	Cumbrian Marsh Fritillary Site SAC	SAC	L	UK0030126	NY400409	22.96	No	No	Yes
NW08	North West	Drigg Coast SAC	SAC	L	UK0013031	SD071960	1397.44	Yes	No	No
NW09	North West	Duddon Estuary SPA	SPA	M	UK9005031	SD 180765	68.10	Yes	No	No
NW10	North West	Duddon Mosses SAC	SAC	M	UK0019833	SD223853	313.07	No	No	Yes
NW11	North West	Helbeck andSwindale Woods SAC	SAC	L	UK0030167	NY784164	136.38	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
NW12	North West	Ingleborough Complex SAC	SAC	L	UK0012782	SD756739	5769.28	No	No	Yes
NW13	North West	Lake District High Fells SAC	SAC	L	UK0012960	NY303318	26999.36	No	Yes	Yes
NW14	North West	Leighton Moss SPA	SPA	L	UK9005091	SD 483749	128.61	Yes	Yes	Yes
NW15	North West	Liverpool Bay / Bae Lerpwl SPA	Provisional	-				Yes	No	No
NW16	North West	Manchester Mosses SAC	SAC	M	UK0030200	SJ691973	1.70	No	No	Yes
NW17	North West	Martin Mere SPA	SPA	M	UK9005111	SD 420145	1.20	No	Yes	No
NW18	North West	Mersey Estuary SPA	SPA	M	UK9005131	SJ 451 800	50.20	Yes	No	No
NW19	North West	Mersey Narrows and North Wirral Foreshore SPA	Provisional	-	UK9020287	SJ 250920	2089.41	No	No	Yes
NW20	North West	Morecambe Bay SAC	SAC	M	UK9005081	SD371697	615.10	Yes	Yes	No
NW21	North West	Morecambe Bay SPA	SPA	M	UK9005081	SD 375700	374.00	Yes	Yes	No
NW22	North West	Morecambe Bay Pavements SAC	SAC	L	UK0014777	SD440869	2609.69	No	Yes	Yes
NW23	North West	Naddle Forest SAC	SAC	L	UK0030335	NY494144	360.89	No	No	Yes
NW24	North West	Oak Mere SAC	SAC	L	UK0012970	SJ573679	68.82	No	Yes	Yes
NW25	North West	Ribble/Alt Estuaries SPA	SPA	M	UK9005103	SD 348237	124.10	Yes	Yes	No
NW26	North West	River Derwent & Bassenthwaite Lake SAC	SAC	M	UK0030253	NY262207	18.30	No	Yes	No
NW27	North West	River Eden SAC	SAC	H	UK0012643	NY462237	2463.23	No	Yes	Yes
NW28	North West	River Ehen SAC	SAC	M	UK0030057	NY031144	0.20	No	Yes	No
NW29	North West	River Kent SAC	SAC	M	UK0030256	SD508953	1.10	No	Yes	No
NW30	North West	Rixton Clay Pits SAC	SAC	L	UK0030265	SJ684901	13.99	No	Yes	No
NW31	North West	Rochdale Canal SAC	SAC	L	UK0030266	SD893038	25.55	No	Yes	No
NW32	North West	Roudsea Wood and Mosses SAC	SAC	L	UK0019834	SD347807	470.45	No	No	Yes
NW33	North West	Sefton Coast SAC	SAC	M	UK0013076	SD281099	45.60	Yes	No	No
NW34	North West	Solway Firth SAC	SAC	L	UK0013025	NY144648	43687.99	Yes	Yes	No
NW35	North West	Solway Moss SAC	SAC	L	N/A 3	NY203597	652.60	No	Yes	Yes
NW36	North West	South Solway Mosses SAC	SAC	M	UK0030310	NY203597	19.60	No	Yes	Yes
NW37	North West	Subberthwaite Blawith & Torver Low Commons SAC	SAC	L	UK0030285	SD269896	1865.17	No	No	Yes
NW38	North West	Tarn Moss SAC	SAC	L	UK0030339	NY400274	17.03	No	No	Yes
NW39	North West	Ullswater Oak Woods SAC	SAC	L	UK0030295	NY399128	122.31	No	No	Yes
NW40	North West	Upper Solway Flats & Marshes SPA	SPA	L	UK9005012	NY 087577	43636.73	Yes	Yes	No
NW41	North West	Bolton Fell/Walton Moss SAC	SAC	L	UK0030093	NY504665	285.89	Yes	No	Yes
NW42	North West	Wast Water SAC	SAC	L	UK0030063	NY164062	286.21	No	Yes	No

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
NW43	North West	West Midlands Mosses SAC	SAC	M	UK0030067	SK026282	1.80	No	No	Yes
NW44	North West	Witherslack Mosses SAC	SAC	L	UK0030302	SD457826	486.53	No	No	Yes
NW45	North West	Yewbarrow Woods SAC	SAC	L	UK0030306	SD347872	112.89	No	No	Yes
S01	Southern	Arun Valley SPA	SPA	M	UK9020281	TQ 035143	5.30	No	Yes	No
S02	Southern	Ashdown Forest SPA	SPA	L	UK0030080	TQ451306	2729.00	No	No	Yes
S03	Southern	Ashdown Forest SAC	SAC	L	UK9012181	TQ 450313	3207.08	No	No	Yes
S04	Southern	Butser Hill SAC	SAC	L	UK0030103	SU716197	238.66	No	No	Yes
S05	Southern	Briddlesford Copses SAC	SAC	L	UK0030328	SZ548907	167.22	No	No	Yes
S06	Southern	Castle Hill SAC	SAC	L	UK0012836	TQ372066	114.68	No	No	Yes
S07	Southern	Chichester & Langstone Harbours SPA	SPA	H	UK9011011	SU 761014	5810.03	Yes	No	No
S08	Southern	Dover to Kingsdown Cliffs SAC	SAC	L	UK0030330	TR372448	183.85	Yes	No	Yes
S09	Southern	Duncton to Bignor Escarpment SAC	SAC	L	UK0030138	SU965137	214.47	No	No	Yes
S10	Southern	Dungeness SAC	SAC	M	UK0013059	TR075175	32.20	Yes	No	Yes
S11	Southern	Dungeness to Pett Level SPA	SPA	M	UK9012091	TQ 932182	14.70	Yes	No	No
S12	Southern	Ebernoe Common SAC	SAC	L	UK0012715	SU978273	133.94	No	No	Yes
S13	Southern	Emer Bog SAC	SAC	L	UK0030147	SU394214	37.50	No	No	Yes
S14	Southern	Folkestone to Etchinghill Escarpments SAC	SAC	L	UK0012835	TR183388	181.94	No	No	Yes
S15	Southern	Hastings Cliffs (to Pett Beach) SAC	SAC	L	UK0030165	TQ866111	183.72	Yes	No	No
S16	Southern	Isle of Wight Downs SAC	SAC	L	UK0016254	SZ373857	461.80	Yes	No	Yes
S17	Southern	Kingley Vale SAC	SAC	L	UK0012767	SU824110	208.05	No	No	Yes
S18	Southern	Lewes Downs SAC	SAC	L	UK0012832	TQ441093	146.86	No	No	Yes
S19	Southern	Lydden and Temple Ewell Downs SAC	SAC	L	UK0012834	TR277454	61.70	No	No	Yes
S20	Southern	Medway Estuary & Marshes SPA	SPA	M	UK0012952	TQ 862703	46.80	Yes	No	No
S21	Southern	Mottisfont Bats SAC	SAC	L	UK0030334	SU322297	196.88	No	No	Yes
S22	Southern	The New Forest SPA	SPA	M	UK0030067	SU 242030	280.00	Yes	Yes	Yes
S23	Southern	The New Forest SAC	SAC	M	UK0030067	SU225075	292.60	Yes	No	No
S24	Southern	North Downs Woodlands SAC	SAC	L	UK0030225	TQ674629	287.58	No	No	Yes
S25	Southern	Pagham Harbour SPA	SPA	M	UK9012041	SZ 874968	6.40	Yes	No	No
S26	Southern	Parkgate Down SAC	SAC	L	UK0030338	TR168459	6.94	No	No	Yes
S27	Southern	Peter's Pit SAC	SAC	L	UK0030237	TQ717628	28.30	No	No	Yes
S28	Southern	Portsmouth Harbour SPA	SPA	H	UK9011051	SU 616036	1248.77	Yes	No	No

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
S29	Southern	Queendown Warren SAC	SAC	L	UK0012833	TQ827629	14.28	No	No	Yes
S30	Southern	River Itchen SAC	SAC	H	UK0012599	SU467174	309.26	No	Yes	No
S31	Southern	Rook Clift SAC	SAC	L	UK0030058	SU820182	10.82	No	No	Yes
S32	Southern	Sandwich Bay SAC	SAC	M	UK0013077	TR354617	11.40	Yes	No	No
S33	Southern	Singleton and Cocking Tunnels SAC	SAC	L	UK0030337	SU872144	2.45	No	No	Yes
S34	Southern	Solent & Isle of Wight Lagoons SAC	SAC	H	UK0017073	SZ608977	36.24	Yes	No	No
S35	Southern	Solent & Southampton Water SPA	SPA	H	UK9011061	SZ 335936	5505.86	Yes	No	No
S36	Southern	Solent Maritime SAC	SAC	H	UK0030059	SU756003	11325.09	Yes	Yes	No
S37	Southern	South Wight Maritime SAC	SAC	M	UK0030061	SZ462771	198.60	Yes	No	Yes
S38	Southern	Stodmarsh SPA	SPA	M	UK0030067	TR211612	5.60	No	Yes	No
S39	Southern	Stodmarsh SAC	SAC	M	UK0030067	TR 211610	4.80	No	Yes	No
S40	Southern	Thames Estuary and Marshes SPA	SPA	M	UK0030067	TQ 802795	48.40	Yes	No	No
S41	Southern	Thanet Coast SAC	SAC	M	UK0030067	TR348711	28.00	Yes	No	No
S42	Southern	Thanet Coast & Sandwich Bay SPA	SPA	M	UK0030067	TR 355617	18.70	Yes	No	No
S43	Southern	The Blean Complex SAC	SAC	L	UK0013697	TR111603	520.62	No	No	Yes
S44	Southern	The Mens SAC	SAC	L	UK0012716	TQ023234	203.28	No	No	Yes
S45	Southern	The Swale SPA	SPA	M	UK0030067	TQ 976663	65.10	Yes	No	No
S46	Southern	Wye & Crundale Downs SAC	SAC	L	UK0012831	TR084444	112.24	No	No	Yes
SW01	South West	Avon Gorge Woodlands SAC	SAC	L	UK0012734	ST560741	152.35	No	No	Yes
SW02	South West	Avon Valley (Bickton to Christchurch) SPA	SPA	M	UK9011091	SZ 144983	13.90	No	Yes	No
SW03	South West	Bath and Bradford-upon-Avon Bats SAC	SAC	L	UK0012584	ST834688	107.16	No	No	Yes
SW04	South West	Beer Quarry and Caves SAC	SAC	L	UK0012585	SY215892	31.10	No	No	Yes
SW05	South West	Blackstone Point SAC	SAC	L	UK0030091	SX535462	7.38	Yes	No	No
SW06	South West	Bracket's Coppice SAC	SAC	L	UK0030095	ST516071	53.66	No	No	Yes
SW07	South West	Braunton Burrows SAC	SAC	M	UK0012570	SS451348	13.50	Yes	No	No
SW08	South West	Breney Common and Goss & Tregoss Moors SAC	SAC	M	UK0030097	SW951598	8.20	No	Yes	Yes
SW09	South West	Carrine Common SAC	SAC	L	UK0012795	SW798438	45.86	No	No	Yes
SW10	South West	Cerne and Sydling Downs SAC	SAC	L	UK0030115	ST670021	369.08	No	No	Yes
SW11	South West	Chesil & the Fleet SAC	SAC	M	UK0030070	SY630795	16.30	Yes	Yes	Yes
SW12	South West	Chesil Beach & the Fleet SPA	SPA	M	UK0017076	SY 633792	7.50	Yes	No	No
SW13	South West	Chew Valley Lakes SPA	SPA	L	UK9010041	ST 569597	575.73	No	Yes	No

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
SW14	South West	Chilmark Quarries SAC	SAC	L	UK0016373	ST974310	10.41	No	No	Yes
SW15	South West	Crookhill Brickpit SAC	SAC	L	UK0030349	SY643797	4.71	No	Yes	No
SW16	South West	Crowdy Marsh SAC	SAC	L	UK0030329	SX150834	92.65	No	No	Yes
SW17	South West	Culm Grasslands SAC	SAC	M	UK0012679	SS843214	7.70	No	Yes	Yes
SW18	South West	Dartmoor SAC	SAC	M	UK0012929	SX590864	231.70	No	Yes	Yes
SW19	South West	Dawlish Warren SAC	SAC	L	UK0030130	SX984792	58.84	Yes	No	No
SW20	South West	Dorset Heaths SAC	SAC	H	UK0019857	SY887835	5730.73	Yes	No	Yes
SW21	South West	Dorset Heaths (Purbeck and Wareham) and Studland Dunes SAC	SAC	H	UK0030038	SZ024839	2221.94	Yes	Yes	Yes
SW22	South West	Dorset Heathlands SPA	SPA	H	UK9010101	SY 887834	8168.79	Yes	No	Yes
SW23	South West	East Devon Pebblebed Heaths SAC	SAC	M	UK0012602	SY 040867	11.20	No	No	Yes
SW24	South West	East Devon Heaths SPA	SPA	L	UK0012602	SY040868	1119.94	No	No	Yes
SW25	South West	Exe Estuary SPA	SPA	M	UK9010081	SX 980841	23.50	Yes	Yes	No
SW26	South West	Exmoor and Quantock Oakwoods SAC	SAC	L	UK0030148	SS894440	1895.17	No	Yes	Yes
SW27	South West	Exmoor Heaths SAC	SAC	M	UK0030040	SS864419	107.10	Yes	No	Yes
SW28	South West	Fal and Helford SAC	SAC	M	UK0013112	SW747261	63.90	Yes	Yes	No
SW29	South West	Fontmell and Melbury Downs SAC	SAC	L	UK0012550	ST900193	260.75	No	No	Yes
SW30	South West	Godrevy Head to St. Agnes SAC	SAC	L	UK0012549	SW700496	128.07	Yes	No	Yes
SW31	South West	Great Yews SAC	SAC	L	UK0012770	SU119232	28.71	No	No	Yes
SW32	South West	Hestercombe House SAC	SAC	L	UK0030168	ST240287	0.08	No	No	Yes
SW33	South West	Holme Moor and Clean Moor SAC	SAC	L	UK0012883	ST094260	7.58	No	No	Yes
SW34	South West	Holnest SAC	Provisional	-	N/A 4	ST658094	-	No	Yes	Yes
SW35	South West	Isle of Portland to Studland Cliffs SAC	SAC	L	UK0019861	SY840802	1447.50	Yes	No	Yes
SW36	South West	Isles of Scilly Complex	SAC	L	UK0013694	SV883111	26850.95	Yes	No	No
SW37	South West	Isles of Scilly SPA	SPA	L	UK9020288	SV 884 161	401.64	Yes	No	No
SW38	South West	Lower Bostraze & Leswidden SAC	SAC	L	UK0030064	SW384310	2.33	No	No	Yes
SW39	South West	Lundy SAC	SAC	L	UK0013114	SS136465	3064.53	Yes	No	No
SW40	South West	Marazion Marsh SPA	SPA	M	UK9020289	SW 517 319	0.50	No	Yes	No
SW41	South West	Mells Valley SAC	SAC	L	UK0012658	ST657476	28.22	No	No	Yes
SW42	South West	Mendip Limestone Grasslands SAC	SAC	L	UK0030203	ST401557	417.47	No	No	Yes
SW43	South West	Mendip Woodlands SAC	SAC	L	UK0030048	ST706454	253.92	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
SW44	South West	Newlyn Downs SAC	SAC	L	UK0030065	SW835544	115.71	No	No	Yes
SW45	South West	North Somerset & Mendip Bats SAC	SAC	L	UK0030052	ST480544	561.19	No	No	Yes
SW46	South West	Penhale Dunes SAC	SAC	L	UK0012559	SW769572	621.34	Yes	No	No
SW47	South West	Pewsey Downs SAC	SAC	L	UK0012552	SU106637	153.87	No	No	Yes
SW48	South West	Phoenix United Mine and Crows Nest SAC	SAC	L	UK0030238	SX265723	48.72	No	No	Yes
SW49	South West	Plymouth Sound & Estuaries SAC	SAC	H	UK0013111	SX472506	6402.03	Yes	Yes	No
SW50	South West	Polruan to Polperro SAC	SAC	M	UK0030241	SX161512	2.10	Yes	No	Yes
SW51	South West	Poole Harbour SPA	SPA	M	UK9010111	SY 982869	22.70	Yes	No	No
SW52	South West	Porton Down SPA	SPA	L	UK9011101	SU 242368	1237.04	No	No	Yes
SW53	South West	Prescombe Down SAC	SAC	L	UK0012553	ST986254	76.14	No	No	Yes
SW54	South West	Quants SAC	SAC	L	UK0030242	ST186178	20.29	No	No	Yes
SW55	South West	River Avon SAC	SAC	H	UK0013016	SU124339	498.24	No	Yes	Yes
SW56	South West	River Axe SAC	SAC	M	UK0030248	SY267961	0.30	No	Yes	No
SW57	South West	River Camel SAC	SAC	H	UK0030056	SX061708	621.17	No	Yes	Yes
SW58	South West	Rooksmoor SAC	SAC	L	UK0012681	ST740110	61.36	No	No	Yes
SW59	South West	Salisbury Plain SAC	SAC	L	UK0012683	SU077497	21438.10	No	No	Yes
SW60	South West	Salisbury Plain SPA	SPA	L	UK9011102	SU 079506	19688.88	No	No	Yes
SW61	South West	Severn Estuary SAC	SAC	M	UK9015022	ST 267479	246.60	Yes	No	No
SW62	South West	Severn Estuary SPA	SPA	M	UK9015022	ST 267479	246.60	Yes	No	No
SW63	South West	Sidmouth to West Bay SAC	SAC	L	UK0019864	SY326912	897.30	Yes	No	Yes
SW64	South West	Somerset Levels and Moors SPA	SPA	L	UK9010031	ST 394417	6388.49	No	Yes	Yes
SW65	South West	South Dartmoor Woods SAC	SAC	L	UK0012749	SX710701	2157.15	No	Yes	Yes
SW66	South West	South Devon Shore Dock SAC	SAC	M	UK0030060	SX787362	3.40	Yes	No	No
SW67	South West	South Hams SAC	SAC	L	UK0012650	SX942565	129.53	Yes	No	Yes
SW68	South West	St Austell Clay Pits SAC	SAC	L	UK0030282	SX022549	0.61	No	No	Yes
SW69	South West	St. Albans Head to Durlston Head SAC	SAC	L	UK0019863	SZ006770	287.22	Yes	No	Yes
SW70	South West	Tamar Estuaries Complex SPA	SPA	M	UK0030067	SX 441 621	19.60	Yes	No	No
SW71	South West	The Lizard SAC	SAC	L	UK0012799	SW690174	3257.11	Yes	Yes	Yes
SW72	South West	Tintagel-Marsland-Clovelly Coast SAC	SAC	M	UK0030067	SS225234	24.30	Yes	No	No
SW73	South West	Tregonning Hill SAC	SAC	L	UK0012604	SW600300	5.21	No	No	Yes
SW74	South West	West Dorset Alder Woods SAC	SAC	M	UK0030067	SY538968	3.30	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
T01	Thames	Aston Rowant SAC	SAC	M	UK0030082	SU727972	127.75	No	No	Yes
T02	Thames	Burnham Beeches SAC	SAC	H	UK0030034	SU949855	382.76	No	No	Yes
T03	Thames	Chiltern Beechwoods (new features in existing SAC)	SAC	M	UK0012724	SP975134	1276.48	No	No	Yes
T04	Thames	Cothill Fen (new features in existing SAC)	SAC	L	UK0012889	SU463999	43.55	No	No	Yes
T05	Thames	East Hampshire Hangars SAC	SAC	L	UK0012723	SU739268	569.68	No	No	Yes
T06	Thames	Epping Forest SAC	SAC	M	UK0012720	TQ399959	16.00	No	No	Yes
T07	Thames	Hackpen Hill SAC	SAC	L	UK0030162	SU352847	35.83	No	No	Yes
T08	Thames	Hartslock Wood SAC	SAC	L	UK0030164	SU619789	34.24	No	No	Yes
T09	Thames	Kennet and Lambourn Floodplain SAC	SAC	M	UK0030044	SU313704	1.10	No	No	Yes
T10	Thames	Kennet Valley Alderwoods SAC	SAC	L	UK0030175	SU398675	56.77	No	No	Yes
T11	Thames	Lee Valley SPA	SPA	M	UK9012111	TQ 351887	4.50	No	Yes	No
T12	Thames	Little Wittenham SAC	SAC	L	UK0030184	SU572929	68.76	No	No	Yes
T13	Thames	Mole Gap to Reigate Escarpment SAC	SAC	M	UK0012804	TQ199533	8.90	No	No	Yes
T14	Thames	North Meadow and Clattinger Farm SAC	SAC	M	UK0016372	SU014934	1.00	No	No	Yes
T15	Thames	Oxford Meadows SAC	SAC	M	UK0012845	SP492090	2.70	No	No	Yes
T16	Thames	Richmond Park SAC	SAC	L	UK0030246	TQ199728	846.68	No	No	Yes
T17	Thames	River Lambourn SAC	SAC	M	UK0030257	SU398739	0.30	No	Yes	No
T18	Thames	Shortheath Common SAC	SAC	M	UK0030275	SU774367	0.60	No	Yes	Yes
T19	Thames	South West London Waterbodies SPA	SPA	L	UK9012171	TQ 025747	828.14	No	Yes	Yes
T20	Thames	Thames Basin Heaths SPA	SPA	H	UK9012141	SU 878644	8274.72	No	Yes	Yes
T21	Thames	Thursley, Ash, Pirbright & Chobham (see RAMSAR) SAC	SAC	M	UK0030067	SU914411	51.40	No	Yes	No
T22	Thames	Wealden Heaths Phase 1 (Thursley, Hankley and Frensham Commons) SPA	SPA	M	UK9012131	SU 910412	1869.95	No	No	Yes
T23	Thames	Wealden Heaths Phase II SPA	SPA	L	UK9012132	SU 805326	2053.83	No	No	Yes
T24	Thames	Wimbledon Common SAC	SAC	M	UK0030067	TQ227719	3.50	No	No	Yes
T25	Thames	Windsor Forest and Great Park SAC	SAC	M	UK0012586	TQ023784	1687.26	No	No	Yes
T26	Thames	Woolmer Forest (also part of Wealden Heaths Phase 2) SAC	SAC	L	UK0030304	SU805325	666.68	No	Yes	Yes
T27	Thames	Wormley Hoddesdon Park Woods	SAC	L	UK0013696	TL320059	335.53	No	No	Yes
W001	Wales	Aber Afon Dyfi/Dyfi Estuary SPA	SPA	L	UK9020284	SN 655959	2048.11	Yes	Yes	No

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
W002	Wales	Aberbargoed Grasslands SAC	SAC	L	UK0030071	ST163992	39.78	No	No	Yes
W003	Wales	Abergavenny Woodlands (Sugar Loaf Woodlands) SAC	SAC	L	UK0030072	SO295166	173.84	No	No	Yes
W004	Wales	Afon Eden/River Eden – Cors GochTrawsfynydd SAC	SAC	M	UK0030075	SH720271	2.80	No	Yes	Yes
W005	Wales	Afon Gwyrfai a Llyn Cwellyn SAC	SAC	L	UK0030046	SH547561	114.29	No	Yes	No
W006	Wales	Afon TeifiRiver Teifi SAC	SAC	M	UK0012670	SN515508	7.20	Yes	Yes	No
W007	Wales	Afon Tywi/River Tywi SAC	SAC	M	UK0013010	SN687263	3.60	No	Yes	No
W008	Wales	Afonydd Cleddau/Cleddau Rivers SAC	SAC	M	UK0030074	SM938249	7.50	No	Yes	Yes
W009	Wales	Alyn Valley Woods/Coedwigoedd Dyffryn Alun SAC	SAC	L	UK0030078	SJ196630	168.30	No	Yes	Yes
W010	Wales	Bae Cemlyn/Cemlyn Bay SAC	SAC	L	UK0030114	SH331934	43.43	Yes	No	No
W011	Wales	Berwyn SPA	SPA	L	UK9013111	SH 919280	24187.53	No	No	Yes
W012	Wales	Berwyn a Mynyddoedd de Clwyd / Berwyn & South Clwyd Mountains SAC	SAC	L	UK0012926	SH917280	27221.21	No	No	Yes
W013	Wales	Blackmill Woodlands SAC	SAC	L	UK0030090	SS929859	71.01	No	No	Yes
W014	Wales	Blaen Cynon SAC	SAC	L	UK0030092	SN946066	66.83	No	No	Yes
W015	Wales	Brecon Beacons/Bannau Brycheiniog SAC	SAC	L	UK0030096	SO024211	269.67	No	No	Yes
W016	Wales	Burry Inlet SPA	SPA	L	UK9015011	SS 494 967	6627.99	Yes	Yes	No
W017	Wales	Cadair Idris SAC	SAC	L	UK0030104	SH704132	3785.05	No	Yes	Yes
W018	Wales	Caeau Mynydd Mawr SAC	SAC	L	UK0030105	SN575121	25.06	No	No	Yes
W019	Wales	Cardiff Beech Woods SAC	SAC	L	UK0030109	ST118824	115.62	No	Yes	Yes
W020	Wales	Cardigan Bay/Bae Ceredigion SAC	SAC	M	UK0012712	SN214641	958.60	Yes	Yes	No
W021	Wales	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	SAC	L	UK0020020	SS357991	66101.16	Yes	Yes	No
W022	Wales	Carmarthen Bay Dunes/Twyni Bae Caerfyrddin	SAC	L	UK0020019	SN285074	1206.32	Yes	No	Yes
W023	Wales	Carmarthen Bay SPA	SPA	L	UK9014091	SS 280972	33411.27	Yes	No	No
W024	Wales	Castlemartin Coast SPA	SPA	L	UK9014061	SR 885999	1122.32	Yes	No	No
W025	Wales	Cernydd Carmel SAC	SAC	L	UK0030070	SN592161	361.14	No	Yes	Yes
W026	Wales	Clogwyni Pen Llyn/Seacliffs of Lleyn SAC	SAC	L	UK0030271	SH216257	1048.40	Yes	No	No
W027	Wales	Coed Cwm Einion SAC	SAC	L	UK0030117	SN690947	21.01	No	No	Yes
W028	Wales	Coed y Cerrig SAC	SAC	L	UK0012766	SO291210	9.10	No	No	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
W029	Wales	Coedwigoedd Dyffryn Elwy/Elwy Valley Woods SAC	SAC	L	UK0030146	SJ020691	83.01	No	No	Yes
W030	Wales	Coedwigoedd Penrhyn Creuddyn/Creuddyn Peninsula Woods SAC	SAC	L	UK0030124	SH797790	118.86	No	No	Yes
W031	Wales	Coedydd a Cheunant Rheidol/Rheidol Woods and Gorge SAC	SAC	L	UK0012748	SN748789	229.19	No	No	Yes
W032	Wales	Coedydd Aber/Aber Woods SAC	SAC	L	UK0030118	SH664713	346.20	No	Yes	Yes
W033	Wales	Coedydd Derw a Safleoedd Ystlumd Meirion/Meirionydd Oakwoods & Bat Sites SAC	SAC	L	UK0014789	SH660386	1832.55	No	Yes	Yes
W034	Wales	Coedydd Nedd a Mellte SAC	SAC	L	UK0030141	SN919093	378.18	No	Yes	Yes
W035	Wales	Coetiroedd Cwm Elan/Elan Valley Woodlands SAC	SAC	M	UK0030145	SN923638	4.40	No	No	Yes
W036	Wales	Cors Caron SAC	SAC	L	UK0014790	SN691638	862.03	No	Yes	Yes
W037	Wales	Cors Fochno SAC	SAC	M	UK0014791	SN631913	6.50	No	Yes	Yes
W038	Wales	Corsydd Eifionydd/Eifionydd Fens SAC	SAC	L	UK0030121	SH460478	144.32	No	Yes	Yes
W039	Wales	Corsydd Llyn/Lleyn Fens SAC	SAC	L	UK0030187	SH313366	283.68	No	No	Yes
W040	Wales	Corsydd Mon/Anglesey Fens SAC	SAC	M	UK0012884	SH470820	4.70	No	Yes	Yes
W041	Wales	Craig yr Aderyn/Bird's Rock SPA	SPA	L	UK9020283	SH 646068	89.26	No	No	Yes
W042	Wales	Crymlyn Bog/Cors Crymlyn SAC	SAC	H	UK0012885	SS694947	299.45	No	No	Yes
W043	Wales	Cwm Cadlan SAC	SAC	M	UK0013585	SN961098	0.80	No	No	Yes
W044	Wales	Cwm Clydach Woodlands/Coedydd Cwm Clydach SAC	SAC	L	UK0030127	SO207123	28.81	No	No	Yes
W045	Wales	Cwm Doethie – Mynydd Mallaen	SAC	L	UK0030128	SN747458	4122.29	No	Yes	Yes
W046	Wales	Dee Estuary SPA	SPA	M	UK9009261	SJ 211800	130.80	Yes	Yes	No
W047	Wales	Dee Estuary SAC	SAC	M	UK9009261	SJ 211800	130.80	Yes	Yes	No
W048	Wales	Deeside and Buckley Newt Sites SAC	SAC	M	UK0030132	SJ291678	2.10	No	Yes	Yes
W049	Wales	Drostre Bank SAC	SAC	L	UK0012878	SO096312	12.66	No	No	Yes
W050	Wales	Dunraven Bay SAC	SAC	L	UK0030139	SS886727	6.47	Yes	No	Yes
W051	Wales	Elenydd SAC	SAC	M	UK0012928	SN824704	86.10	No	Yes	Yes
W052	Wales	Elenydd-Mallaen SPA	SPA	M	UK9014111	SN 821648	300.20	No	Yes	Yes
W053	Wales	Eryri/Snowdonia (inc Llyn Idwal) SAC	SAC	L	UK0012946	SH695658	19737.60	No	Yes	Yes
W054	Wales	Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island SPA	SPA	L	UK9013121	SH 152271	505.03	Yes	No	No

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
W055	Wales	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh SAC	SAC	L	UK0020025	SH380655	1058.00	Yes	No	No
W056	Wales	Glannau Ynys Gybi/Holy Island Coast SAC	SAC	L	UK0013046	SH208817	464.27	Yes	No	Yes
W057	Wales	Glannau Ynys Gybi/Holy Island Coast SPA	SPA	L	UK9013101	SH 209817	608.04	Yes	No	Yes
W058	Wales	Glan-traeth SAC	SAC	L	UK0030042	SH417666	14.10	Yes	No	No
W059	Wales	Glaswelltiroedd Cefn Cribwr/Cefn Cribwr Grasslands SAC	SAC	L	UK0030113	SS870830	58.35	No	No	Yes
W060	Wales	Glynllifon SAC	SAC	L	UK0012661	SH456550	189.27	No	Yes	No
W061	Wales	Gower Ash Woods/Coedydd Ynn Gwyr SAC	SAC	L	UK0030157	SS574882	233.15	No	No	Yes
W062	Wales	Gower Commons/Tiroedd Comin Gwyr SAC	SAC	L	UK0012685	SS497900	1776.72	Yes	Yes	Yes
W063	Wales	Grassholm SPA	SPA	L	UK9014041	SN 289065	10.73	Yes	No	No
W064	Wales	Great Orme's Head/Pen y Gogarth SAC	SAC	L	UK0014788	SH765833	302.63	Yes	No	Yes
W065	Wales	Grogwynion SAC	SAC	L	UK0030160	SN708719	42.11	No	Yes	Yes
W066	Wales	Gweunydd Blaencleaddau SAC	SAC	L	UK0030144	SN155317	150.11	No	No	Yes
W067	Wales	Halkyn Mountain/Mynydd Helygain SAC	SAC	M	UK0030163	SJ196715	6.10	No	No	Yes
W068	Wales	Johnstown Newt Sites SAC	SAC	M	UK0030173	SJ310466	0.70	No	Yes	No
W069	Wales	Kenfig/Cynffig SAC	SAC	M	UK0012566	SS790813	11.90	Yes	Yes	Yes
W070	Wales	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym SAC	SAC	L	UK0014787	SR885969	1594.53	Yes	Yes	Yes
W071	Wales	Llangorse Lake/Llyn Syfaddan SAC	SAC	L	UK0012985	SO131262	215.64	No	Yes	Yes
W072	Wales	Llwyn SAC	SAC	M	UK0030185	SJ083642	0.20	No	No	Yes
W073	Wales	Llyn Dinam SAC	SAC	M	UK0030186	SH310774	0.40	No	Yes	Yes
W074	Wales	Migneint- Arenig-Dduallt SAC	SAC	L	UK0030205	SH816440	19968.23	No	Yes	Yes
W075	Wales	Migneint- Arenig-Dduallt SPA	SPA	L	UK9013131	SH 804443	19968.23	No	Yes	Yes
W076	Wales	Morfa Harlech a Morfa Dyffryn SAC	SAC	L	UK0030049	SH567328	1062.57	Yes	No	No
W077	Wales	Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	SAC	L	UK0030161	SH795578	39.75	No	No	Yes
W078	Wales	Mynydd Cilan, Trwyn y Wylfa ac Ynsoedd Sant Tudwal SPA	SPA	L	UK9020282	SH 307247	373.55	Yes	No	No
W079	Wales	Mynydd Epynt SAC	SAC	L	UK0030221	SN883400	40.12	No	No	Yes
W080	Wales	North Pembrokeshire Woodlands/Coeddyd Gogledd Sir Benfro SAC	SAC	L	UK0030227	SN046345	315.68	No	Yes	Yes

Table A2.1 Continued

Site Ref	Region	Natura 2000 Site Name	Designation	Priority	UK Site Code	Grid Ref	Area (km^2)	Protected coastal feature	Protected freshwater feature	Protected terrestrial feature
W081	Wales	North West Pembrokeshire Commons/Comins Gogledd Orllewin Sir Benfro SAC	SAC	L	UK0030229	SM776273	248.89	No	No	Yes
W082	Wales	Pembrokeshire Bat Sites and Bosherton Lakes/Safleoedd Ystlum Sir Benfro SAC	SAC	L	UK0014793	SR966954	122.44	No	Yes	Yes
W083	Wales	Pembrokeshire Marine/Sir Benfro Forol SAC	SAC	M	UK0013116	SM503093	1380.70	Yes	Yes	No
W084	Wales	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	SAC	M	UK0013117	SH401130	1460.20	Yes	Yes	No
W085	Wales	Preseli SAC	SAC	L	UK0012598	SN110320	2705.90	No	Yes	Yes
W086	Wales	Ramsey and St. Davids Peninsula Coast SPA	SPA	L	UK9014062	SM 728285	845.63	Yes	No	No
W087	Wales	Rhinog	SAC	L	UK0012945	SH649297	3144.53	No	Yes	Yes
W088	Wales	Rhos Goch SAC	SAC	M	UK0014792	SO197483	0.70	No	No	Yes
W089	Wales	Rhos Llawr-cwrt SAC	SAC	L	UK0012680	SN411497	46.13	No	No	Yes
W090	Wales	Rhos Talglas SAC	SAC	L	UK0030245	SN552634	53.55	No	No	Yes
W091	Wales	River Dee and Bala Lake SAC	SAC	M	UK0030251	SJ423503	13.10	No	Yes	Yes
W092a	Wales	River Usk/Afon Wysg (river) SAC	SAC	H	UK0013007	SO301113	1007.71	No	Yes	Yes
W092b	Wales	River Usk/Afon Wysg (estuary) SAC	SAC	H	UK0013007	SO301113	1007.71	Yes	Yes	Yes
W093	Wales	River Wye/Afon Gwy SAC	SAC	M	UK0012642	SO109369	22.30	Yes	Yes	Yes
W094	Wales	Skokholm & Skomer SPA	SPA	L	UK9014051	SM 728093	427.71	Yes	No	No
W095	Wales	St David's/Ty Ddewi SAC	SAC	L	UK0013045	SM728285	935.47	Yes	No	Yes
W096	Wales	Traeth Lafan/Lavan Sands, Conway Bay SPA	SPA	M	UK0030067	SH 654755	26.40	Yes	No	No
W097	Wales	Usk Bat Sites/Safleodd Ystlumod Wysg SAC	SAC	L	UK0014784	SO190145	1686.40	No	Yes	Yes
W098	Wales	Wye Valley Woodlands/Coetiroedd Dyffryn Gwy SAC	SAC	L	UK0012727	ST530957	916.24	No	No	Yes
W099	Wales	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	SAC	M	UK0030067	SH629728	264.80	Yes	No	No
W100	Wales	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes SAC	SAC	L	UK0020021	SH413642	1871.03	Yes	Yes	Yes
W101	Wales	Yerbeston Tops SAC	SAC	L	UK0030305	SN057099	18.81	No	No	Yes
W102	Wales	Ynys Feurig, Cemlyn Bay and the Skerries SPA	SPA	L	UK9013061	SH 331935	85.66	Yes	No	No
W103	Wales	Ynys Seiriol/Puffin Island SPA	SPA	L	UK9020285	SH 651820	31.21	Yes	No	No

Appendix 3 – Derivation of dose rate per unit release factors

Overview

Dose rate per unit release factors for marine, freshwater and terrestrial environments have been calculated for different radionuclides and organisms from dose rate per unit concentration in air, soil and water data and concentration per unit release factors.

Dose rate per unit concentration factors

The dose rate per unit concentration factors have been derived for reference organisms and feature species based on Environment Agency Science (Copplestone et al. 2001, 2003), which was developed in parallel with the early stages of the Euratom FP5 Project 'FASSET' (Larsson et al. 2004). The factors used in the assessment were the total weighted dose rate per unit concentration factors, which include contributions from external and internal dose rate. The weighting takes account of the expected differences in harm from different types of radiation (i.e. alpha, beta and gamma radiation).

The dose rate per unit concentration factors were not available for a few key radionuclides and these factors were derived as follows:

Marine/coastal waters and freshwater:

- Sulphur-35 – Internal and external weighted dose rate factors were assumed to be the same as carbon-14 for all organisms.
- Technetium-99m – Internal weighted dose rate factor was calculated from the ratio of the technetium concentration factors to the caesium concentration factors for each organism (see Tables A3.1 and A3.2), multiplied by the caesium-137 internal dose rate factor. The external weighted dose rate factor was assumed to be the same as for caesium-137.
- Uranium-alpha – Assumed to be uranium-238.
- Plutonium-alpha – Assumed to be plutonium-239.

Terrestrial:

- Technetium-99m – Assumed to be the same as caesium-137.
- Iodine-125 – Assumed to be the same as iodine-129.
- Radon-222 – A separate Environment Agency Science study was commissioned to derive dose rate per unit air concentration factors for radon and its daughters (Vives i Batlle and Jones 2007).
- Uranium-alpha – Assumed to be uranium-238.
- Plutonium-alpha – Assumed to be plutonium-239.

The dose rate per unit concentration factors for releases into the marine/coastal, freshwater and terrestrial environments are shown in Tables A3.3–A3.11.

Concentration per unit release factors

Coastal waters

Coastal water concentrations per unit release data have been calculated using the DORIS module within the PC CREAM code (Mayall et al. 1997). These data were calculated as intermediate data when developing initial radiological assessment data for members of the public (Allott and Titley 2005). However, these data were not reported as part of that work.

A local compartment based on Springfields (i.e. Ribble Estuary) default data was selected (see Table A3.12). This was modified with a suspended sediment concentration for Morecambe Bay (Heysham), as this was found to give worse water concentrations (Environment Agency 2006b). The volumetric exchange rate was adjusted to 100 m^3/s. This minimum exchange rate was selected since it has been shown (Environment Agency 2006b) that the water concentrations predicted by PC CREAM (DORIS module) are not linearly dependent upon the exchange rate for lower values of the exchange rate. This is important to enable scaling of water concentrations for different exchange rates.

Three sets of PC CREAM runs were undertaken to separate out the water concentration contribution from radionuclides such as americium-241 which will have a unit release, plus an in-growth from a unit release of plutonium-241. The input parameters for the DORIS runs are shown in Table A3.12.

Coastal water concentrations per unit release for a water exchange rate of 100 m^3/s are shown in Table A3.13.

Freshwater

Freshwater concentrations per unit release for a river flow of 1 m^3/s were sourced from Allott and Titley (2005) and are shown in Table A3.14.

Terrestrial

The air concentration per unit release for all radionuclides was assumed to be 8.8 10^{-5} Bq/m^3 per Bq/s (Titley et al. 2000a) or 2.8 10^{-12} Bq/m^3 per Bq/y. This is for an effective release height of 1m at a distance of 100 m.

Soil concentrations per unit release (see Table A3.15) were calculated from the deposition rate per unit release (Titley et al. 2000a) multiplied by the 50th year soil concentration per unit deposition rate (Allott and Titley 2005).

Dose rate per unit release factors

Dose rate per unit release factors were calculated by multiplying the dose rate per unit concentration data by concentration per unit release data for the different radionuclides and organisms (see Tables A3.16–A3.18).

Other radionuclide categories were derived as follows:

- Other alpha – assumed to be the same as plutonium-alpha.
- Other beta/gamma ($t_{1/2}$ <1 day) – assumed to be the same as technetium-99m.

- Other beta/gamma ($t_{1/2}$ 1–10 days) – assumed to be the same as iodine-31.
- Other beta/gamma ($t_{1/2}$ >10 days) – assumed to be the same as caesium-137.

Modifying dose rate per unit release factors

The dose rate per unit release factors have been derived for specific dispersion conditions:

- Coastal waters – water exchange rate of 100 m^3/s.
- Freshwaters – river flow of 1 m^3/s.
- Terrestrial – effective release height of 1 m with an exposure distance of 100 m.

The dose rate per unit release factors can be modified to take account of different dispersion conditions:

- Coastal waters – the dose rate per unit release factors can be multiplied by 100 m^3/s and divided by the site-specific water exchange rate.
- Freshwaters – the dose rate per unit release factors can be divided by the site-specific river flow rate. A similar approach has been adopted for the initial radiological assessment methodology for assessing dose rates to members of the public (Allott and Titley 2005; Environment Agency 2006a). This methodology recommends a maximum river flow rate of 100 m^3/s.
- Terrestrial – The dose rate factors can be multiplied by a scaling factor to take account of different effective release heights. As the effective release height increases, the location of maximum exposure will be at a greater distance from the release point (see Table A3.19). Scaling factors have been derived from the ratio of the maximum air concentration per unit release for a particular effective release height to the air concentration per unit release for a ground-level release (see Table A3.19 and Figure A3.1).

Table A3.1 Marine concentration factor ratios

Organism	Reference organism for concentration factors	Technetium concentration factor (Bq/kg per Bq/m^3)	Caesium concentration factor (Bq/kg per Bq/m^3)	Ratio of Tc CF to Cs CF
Allis shad	Pelagic fish	3.0E-02	1.0E-01	3.0E-01
Atlantic salmon	Pelagic fish	3.0E-02	1.0E-01	3.0E-01
Avocet	Seabird	8.0E+00	3.0E+00	2.7E+00
Bacteria	Bacteria	1.0E-01	3.0E+00	3.3E-02
Bar-tailed godwit	Seabird	8.0E+00	3.0E+00	2.7E+00
Benthic fish	Benthic fish	3.0E-02	1.0E-01	3.0E-01
Benthic mollusc	Benthic mollusc	1.0E+00	3.0E-02	3.3E+01
Bewicks swan	Seabird	8.0E+00	3.0E+00	2.7E+00
Bittern	Seabird	8.0E+00	3.0E+00	2.7E+00
Black-tailed godwit	Seabird	8.0E+00	3.0E+00	2.7E+00
Brent goose	Seabird	8.0E+00	3.0E+00	2.7E+00
Chough	Seabird	8.0E+00	3.0E+00	2.7E+00
Common scoter	Seabird	8.0E+00	3.0E+00	2.7E+00
Common seal	Seal	8.0E+00	4.9E-01	1.6E+01
Common Tern	Seabird	8.0E+00	3.0E+00	2.7E+00
Cormorant	Seabird	8.0E+00	3.0E+00	2.7E+00
Curlew	Seabird	8.0E+00	3.0E+00	2.7E+00
Dunlin	Seabird	8.0E+00	3.0E+00	2.7E+00
Fish egg	Fish egg	8.0E+00	3.0E+00	2.7E+00
Gadwall	Seabird	8.0E+00	3.0E+00	2.7E+00
Gannet	Seabird	8.0E+00	3.0E+00	2.7E+00
Golden plover	Seabird	8.0E+00	3.0E+00	2.7E+00
Great crested grebe	Seabird	8.0E+00	3.0E+00	2.7E+00
Grey plover	Seabird	8.0E+00	3.0E+00	2.7E+00
Grey seal	Seal	8.0E+00	4.9E-01	1.6E+01
Gulliemot	Seabird	8.0E+00	3.0E+00	2.7E+00
Hen harrier (male and female)	Seabird	8.0E+00	3.0E+00	2.7E+00
Kittewake	Seabird	8.0E+00	3.0E+00	2.7E+00
Knot	Seabird	8.0E+00	3.0E+00	2.7E+00
Lapwing	Seabird	8.0E+00	3.0E+00	2.7E+00
Large b. crust.	Large b. crust.	8.0E+00	3.0E-02	2.7E+02
Lesser black-backed gull (male and female)	Seabird	8.0E+00	3.0E+00	2.7E+00
Little tern	Seabird	8.0E+00	3.0E+00	2.7E+00
Macrophyte	Macrophyte	1.0E+00	5.0E-02	2.0E+01
Manx shearwater	Seabird	8.0E+00	3.0E+00	2.7E+00
Marsh harrier	Seabird	8.0E+00	3.0E+00	2.7E+00
Mediterranean gull	Seabird	8.0E+00	3.0E+00	2.7E+00
Otter (female)	Seabird	8.0E+00	3.0E+00	2.7E+00
Otter (male)	Seal	8.0E+00	4.9E-01	1.6E+01
Oystercatcher	Seabird	8.0E+00	3.0E+00	2.7E+00
Pelagic fish	Benthic fish	3.0E-02	1.0E-01	3.0E-01
Peregrine	Seabird	8.0E+00	3.0E+00	2.7E+00
Phytoplankton	Phytoplankton	5.0E-03	2.0E-02	2.5E-01
Pink-footed goose	Seabird	8.0E+00	3.0E+00	2.7E+00
Pintail	Seabird	8.0E+00	3.0E+00	2.7E+00
Puffin	Seabird	8.0E+00	3.0E+00	2.7E+00
Razorbill	Seabird	8.0E+00	3.0E+00	2.7E+00
Redshank	Seabird	8.0E+00	3.0E+00	2.7E+00
Ringed plover	Seabird	8.0E+00	3.0E+00	2.7E+00

Table A3.1 Continued

Organism	Reference organism for concentration factors	Technetium concentration factor (Bq/kg per Bq/m^3)	Caesium concentration factor (Bq/kg per Bq/m^3)	Ratio of Tc CF to Cs CF
River lamprey	Pelagic fish	3.0E-02	1.0E-01	3.0E-01
Ruff	Seabird	8.0E+00	3.0E+00	2.7E+00
Sanderling	Seabird	8.0E+00	3.0E+00	2.7E+00
Sandwich tern	Seabird	8.0E+00	3.0E+00	2.7E+00
Scaup	Seabird	8.0E+00	3.0E+00	2.7E+00
Sea lamprey	Pelagic fish	3.0E-02	1.0E-01	3.0E-01
Seabird	Seabird	8.0E+00	3.0E+00	2.7E+00
Seal	Seal	8.0E+00	4.9E-01	1.6E+01
Shelduck (female)	Seabird	8.0E+00	3.0E+00	2.7E+00
Shelduck (male)	Seabird	8.0E+00	3.0E+00	2.7E+00
Small b. crust.	Small b. crust.	1.0E+00	3.0E-02	3.3E+01
Snipe	Seabird	8.0E+00	3.0E+00	2.7E+00
Storm petrel	Seabird	8.0E+00	3.0E+00	2.7E+00
Teal	Seabird	8.0E+00	3.0E+00	2.7E+00
Tufted duck (female)	Seabird	8.0E+00	3.0E+00	2.7E+00
Tufted duck (male)	Seabird	8.0E+00	3.0E+00	2.7E+00
Turnstone	Seabird	8.0E+00	3.0E+00	2.7E+00
Twaite shad	Pelagic fish	3.0E-02	1.0E-01	3.0E-01
Whale	Whale	8.0E+00	1.9E-01	4.2E+01
White-fronted goose	Seabird	8.0E+00	3.0E+00	2.7E+00
Whooper swan	Seabird	8.0E+00	3.0E+00	2.7E+00
Wigeon	Seabird	8.0E+00	3.0E+00	2.7E+00
Zooplankton	Zooplankton	1.0E-01	3.0E-02	3.3E+00

Table A3.2 Freshwater concentration factor ratios

Organism	Reference organism for concentration factors	Technetium concentration factor (Bq/kg per Bq/m^3)	Caesium concentration factor (Bq/kg per Bq/m^3)	Ratio of Tc CF to Cs CF
Allis shad	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
Amphibian	Amphibian	1.3E+00	1.1E+01	1.2E-01
Aqu. mammal	Aqu. mammal	1.3E+00	1.1E+01	1.2E-01
Atlantic salmon	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
Avocet	Duck	1.3E+00	1.1E+01	1.2E-01
Bacteria	Bacteria	5.0E-03	1.0E+00	5.0E-03
Bar-tailed godwit	Duck	1.3E+00	1.1E+01	1.2E-01
Benthic fish	Benthic fish	4.5E-02	1.1E+01	4.1E-03
Benthic mollusc	Benthic mollusc	2.4E-02	5.8E-01	4.1E-02
Bewicks swan	Duck	1.3E+00	1.1E+01	1.2E-01
Bittern	Duck	1.3E+00	1.1E+01	1.2E-01
Black-tailed godwit	Duck	1.3E+00	1.1E+01	1.2E-01
Brent goose	Duck	1.3E+00	1.1E+01	1.2E-01
Brook lamprey	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
Bullhead	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
Common scoter	Duck	1.3E+00	1.1E+01	1.2E-01
Cormorant	Duck	1.3E+00	1.1E+01	1.2E-01
Curlew	Duck	1.3E+00	1.1E+01	1.2E-01
Desmoulins whorl snail	Benthic mollusc	2.4E-02	5.8E-01	4.1E-02
Duck	Duck	1.3E+00	1.1E+01	1.2E-01
Dunlin	Duck	1.3E+00	1.1E+01	1.2E-01
Early gentian	Macrophyte	1.3E+00	2.3E+00	5.7E-01
Fen orchid	Macrophyte	1.3E+00	2.3E+00	5.7E-01
Gadwall	Duck	1.3E+00	1.1E+01	1.2E-01
Golden plover	Duck	1.3E+00	1.1E+01	1.2E-01
Great crested grebe	Duck	1.3E+00	1.1E+01	1.2E-01
Great crested newt	Amphibian	1.3E+00	1.1E+01	1.2E-01
Grey plover	Duck	1.3E+00	1.1E+01	1.2E-01
Hen harrier (female)	Duck	1.3E+00	1.1E+01	1.2E-01
Hen harrier (male)	Duck	1.3E+00	1.1E+01	1.2E-01
Knot	Duck	1.3E+00	1.1E+01	1.2E-01
Lapwing	Duck	1.3E+00	1.1E+01	1.2E-01
Large b. crust.	Large b. crust.	1.3E-02	6.3E-01	2.1E-02
Lesser black-backed gull (female)	Duck	1.3E+00	1.1E+01	1.2E-01
Lesser black-backed gull (male)	Duck	1.3E+00	1.1E+01	1.2E-01
Macrophyte	Macrophyte	1.3E+00	2.3E+00	5.7E-01
Marsh harrier	Duck	1.3E+00	1.1E+01	1.2E-01
Mediterranean gull	Duck	1.3E+00	1.1E+01	1.2E-01
Natterjack toad	Amphibian	1.3E+00	1.1E+01	1.2E-01
Otter (male and female)	Aqu. mammal	1.3E+00	1.1E+01	1.2E-01
Oystercatcher	Duck	1.3E+00	1.1E+01	1.2E-01
Pelagic fish	Benthic fish	4.5E-02	1.1E+01	4.1E-03
Phytoplankton	Phytoplankton	8.0E-03	1.8E-01	4.4E-02
Pink-footed goose	Duck	1.3E+00	1.1E+01	1.2E-01
Pintail	Duck	1.3E+00	1.1E+01	1.2E-01
Redshank	Duck	1.3E+00	1.1E+01	1.2E-01
Ringed plover	Duck	1.3E+00	1.1E+01	1.2E-01
River lamprey	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
Ruff	Duck	1.3E+00	1.1E+01	1.2E-01

Table A3.2 Continued

Organism	Reference organism for concentration factors	Technetium concentration factor (Bq/kg per Bq/m^3)	Caesium concentration factor (Bq/kg per Bq/m^3)	Ratio of Tc CF to Cs CF
Sanderling	Duck	1.3E+00	1.1E+01	1.2E-01
Scaup	Duck	1.3E+00	1.1E+01	1.2E-01
Sea lamprey	Benthic fish	4.5E-02	1.1E+01	4.1E-03
Shelduck (female)	Duck	1.3E+00	1.1E+01	1.2E-01
Shelduck (male)	Duck	1.3E+00	1.1E+01	1.2E-01
Shoveler	Duck	1.3E+00	1.1E+01	1.2E-01
Small b. crust.	Small b. crust.	1.3E-02	5.2E+00	2.5E-03
Snipe	Duck	1.3E+00	1.1E+01	1.2E-01
Southern damselfly	Amphibian	1.3E+00	1.1E+01	1.2E-01
Spined loach	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
Teal (female)	Duck	1.3E+00	1.1E+01	1.2E-01
Teal (male)	Duck	1.3E+00	1.1E+01	1.2E-01
Tufted duck (female)	Duck	1.3E+00	1.1E+01	1.2E-01
Tufted duck (male)	Duck	1.3E+00	1.1E+01	1.2E-01
Turnstone	Duck	1.3E+00	1.1E+01	1.2E-01
Twaite shad	Pelagic fish	4.5E-02	1.1E+01	4.1E-03
White-fronted goose	Duck	1.3E+00	1.1E+01	1.2E-01
Whooper swan	Duck	1.3E+00	1.1E+01	1.2E-01
Wigeon	Duck	1.3E+00	1.1E+01	1.2E-01
Zooplankton	Zooplankton	2.0E-02	2.0E-02	1.0E+00

Table A3.3 Coastal weighted internal dose rate per unit concentration factors

Organism	Weighted internal dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Allis shad	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.1E-04	1.3E-06	1.8E-06	5.4E-06	1.5E-06	3.6E-07	5.2E-07	1.4E-06	1.8E-05	1.2E-01	3.0E-04	1.0E-04	2.4E-03	3.2E-03
Atlantic salmon	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.1E-04	1.3E-06	1.8E-06	5.4E-06	1.5E-06	3.6E-07	5.2E-07	1.4E-06	1.8E-05	1.2E-01	3.0E-04	1.0E-04	2.4E-03	3.2E-03
Avocet	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Bacteria	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Bar-tailed godwit	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Benthic fish	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.0E-04	1.2E-06	1.7E-06	5.2E-06	1.5E-06	3.1E-07	5.0E-07	1.3E-06	1.7E-05	1.2E-01	2.9E-04	1.0E-04	2.4E-03	3.2E-03
Benthic mollusc	9.8E-09	5.7E-04	2.4E-03	5.7E-04	3.5E-04	4.5E-07	5.8E-05	1.3E-04	7.6E-04	2.5E-07	4.7E-07	1.1E-06	4.0E-06	6.1E-01	3.6E-04	3.1E-03	1.8E-01	1.3E+00
Bewicks swan	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Bittern	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Black-tailed godwit	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Brent goose	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Chough	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Common scoter	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Common seal	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	1.2E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Common tern	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Cormorant	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Curlew	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Dunlin	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Fish egg	9.8E-09	5.5E-04	7.7E-04	5.5E-04	1.0E-02	1.7E-04	4.1E-04	7.0E-04	1.6E-02	7.1E-05	1.3E-04	2.4E-04	2.6E-04	1.2E+03	2.5E-01	1.0E-01	5.9E+00	1.3E+02
Gadwall	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Gannet	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Golden plover	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Great crested grebe	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Grey plover	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Grey seal	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.6E-01	6.5E-04	4.7E-04	2.6E-03	1.8E-01	1.3E-04	1.7E-04	7.0E-04	1.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Gulliemot	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Hen harrier (male and female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Kittewake	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Knot	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Lapwing	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Large b. crust.	9.8E-09	5.7E-04	2.5E-03	5.7E-04	3.8E-04	9.8E-07	4.6E-04	1.1E-03	4.5E-05	2.6E-07	4.7E-07	1.1E-06	4.1E-06	3.1E+00	3.9E-04	1.0E-03	1.8E-02	3.2E-02
Lesser black-backed gull (male and female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Little tern	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Macrophyte	9.8E-09	2.8E-04	9.8E-04	2.8E-04	5.5E-04	1.0E-06	5.2E-05	9.5E-05	2.2E-04	2.4E-05	4.5E-05	8.6E-05	4.8E-06	6.1E-02	3.1E-05	1.0E-02	1.2E-01	5.1E-01
Manx shearwater	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Marsh harrier	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Mediterranean gull	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Otter (female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Otter (male)	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	1.2E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Oystercatcher	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Pelagic fish	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.0E-04	1.2E-06	1.7E-06	5.2E-06	1.5E-06	3.1E-07	5.0E-07	1.3E-06	1.7E-05	1.2E-01	2.9E-04	1.0E-04	2.4E-03	3.2E-03
Peregrine	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Phytoplankton	1.7E-09	1.7E-06	8.5E-08	1.7E-06	1.0E-06	3.7E-10	6.4E-10	2.1E-09	9.6E-05	7.9E-06	4.7E-06	1.5E-07	8.5E-09	1.8E+00	1.7E-05	2.1E-03	5.9E+00	1.3E+01
Pink-footed goose	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Pintail	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Puffin	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Razorbill	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02

Table A3.3 Continued

Organism	Weighted internal dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Redshank	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Ringed plover	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
River lamprey	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.0E-04	1.2E-06	1.7E-06	5.2E-06	1.5E-06	3.1E-07	5.0E-07	1.3E-06	1.7E-05	1.2E-01	2.9E-04	1.0E-04	2.4E-03	3.2E-03
Ruff	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Sanderling	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Sandwich tern	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Scaup	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Sea lamprey	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.1E-04	1.3E-06	1.8E-06	5.4E-06	1.5E-06	3.6E-07	5.2E-07	1.4E-06	1.8E-05	1.2E-01	3.0E-04	1.0E-04	2.4E-03	3.2E-03
Seabird	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Seal	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	1.2E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Shelduck (female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Shelduck (male)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Small b. crust.	9.8E-09	5.5E-04	1.1E-03	5.5E-04	2.7E-04	4.4E-07	5.3E-05	9.9E-05	1.2E-05	2.4E-07	4.5E-07	8.8E-07	3.0E-06	3.1E+00	1.7E-04	1.0E-03	1.8E-02	3.2E-02
Snipe	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Storm Petrel	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Teal	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Tufted duck (female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Tufted duck (male)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Turnstone	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Twaite shad	9.8E-09	5.7E-04	3.1E-03	5.7E-04	2.1E-04	1.3E-06	1.8E-06	5.4E-06	1.5E-06	3.6E-07	5.2E-07	1.4E-06	1.8E-05	1.2E-01	3.0E-04	1.0E-04	2.4E-03	3.2E-03
Whale	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.6E-01	6.5E-04	4.7E-04	2.5E-03	1.8E-01	1.3E-04	1.7E-04	7.0E-04	6.0E-05	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
White-fronted goose	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.2E-02	6.3E-04	4.7E-04	1.4E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.4E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Whooper swan	9.8E-09	5.7E-04	3.2E-03	5.7E-04	9.5E-02	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Wigeon	9.8E-09	5.7E-04	3.1E-03	5.7E-04	3.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.2E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Zooplankton	9.8E-09	5.5E-04	2.7E-04	5.5E-04	1.1E-04	2.2E-07	5.3E-06	9.9E-06	3.7E-03	7.1E-05	1.4E-04	2.6E-04	3.0E-06	1.8E+00	1.7E-03	5.2E-04	5.9E-02	1.3E-01

Table A3.4 Coastal weighted external dose rate per unit concentration factors

Organism	Weighted external dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Allis shad	1.9E-13	6.3E-10	1.8E-06	6.3E-10	5.2E-03	5.1E-07	2.7E-10	1.8E-05	1.2E-06	1.6E-08	1.0E-08	2.6E-07	1.8E-05	1.7E-06	1.2E-03	6.4E-07	2.2E-07	4.7E-04
Atlantic salmon	1.9E-13	6.3E-10	1.8E-06	6.3E-10	5.2E-03	5.1E-07	2.7E-10	1.8E-05	1.2E-06	1.6E-08	1.0E-08	2.6E-07	1.8E-05	1.7E-06	1.2E-03	6.4E-07	2.2E-07	4.7E-04
Avocet	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Bacteria	9.8E-09	2.3E-05	1.3E-03	2.3E-05	1.2E-01	2.6E-04	2.4E-06	5.6E-04	1.1E-04	4.1E-07	5.2E-07	2.8E-06	5.6E-04	4.9E+02	4.2E-01	4.2E-02	2.4E+00	5.1E+01
Bar-tailed godwit	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Benthic fish	3.0E-13	1.1E-08	2.1E-05	1.1E-08	4.7E-02	5.4E-06	3.0E-09	1.6E-04	9.8E-06	6.4E-08	3.9E-08	7.8E-07	1.6E-04	1.6E-05	1.3E-02	6.4E-06	3.8E-06	4.9E-03
Benthic mollusc	6.9E-13	5.5E-08	1.7E-04	5.5E-08	5.7E-02	4.1E-05	1.8E-08	2.0E-04	3.3E-05	9.5E-08	5.7E-08	9.5E-07	2.0E-04	1.9E-05	6.7E-02	3.4E-05	6.1E-06	6.7E-03
Bewicks swan	1.1E-14	2.8E-10	1.7E-06	2.8E-10	1.2E-02	5.0E-07	1.1E-10	3.9E-05	1.9E-06	1.8E-08	1.1E-08	2.5E-07	3.9E-05	4.0E-06	1.8E-03	9.5E-07	7.4E-07	1.0E-03
Bittern	7.6E-15	6.5E-10	4.0E-06	6.5E-10	2.9E-02	1.1E-06	2.4E-10	9.2E-05	4.4E-06	3.2E-08	1.9E-08	4.3E-07	9.2E-05	9.4E-06	4.2E-03	2.2E-06	1.7E-06	2.3E-03
Black-tailed godwit	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Brent goose	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Chough	1.0E-14	1.9E-10	1.1E-06	1.9E-10	8.2E-03	3.3E-07	7.7E-11	2.6E-05	1.3E-06	1.4E-08	8.2E-09	1.9E-07	2.6E-05	2.7E-06	1.2E-03	6.3E-07	5.0E-07	6.7E-04
Common scoter	1.3E-13	1.9E-09	5.5E-06	1.9E-09	1.5E-02	1.5E-06	6.1E-10	5.2E-05	3.1E-06	2.1E-08	1.4E-08	3.5E-07	5.2E-05	5.2E-06	3.6E-03	1.8E-06	6.7E-07	1.4E-03
Common seal	1.3E-14	4.6E-10	2.8E-06	4.6E-10	2.0E-02	8.2E-07	1.8E-10	6.5E-05	3.2E-06	2.7E-08	1.6E-08	3.7E-07	6.5E-05	6.7E-06	3.0E-03	1.6E-06	1.2E-06	1.7E-03
Common tern	1.3E-13	1.9E-09	5.5E-06	1.9E-09	1.5E-02	1.5E-06	6.1E-10	5.2E-05	3.1E-06	2.1E-08	1.4E-08	3.5E-07	5.2E-05	5.2E-06	3.6E-03	1.8E-06	6.7E-07	1.4E-03
Cormorant	1.1E-14	2.8E-10	1.7E-06	2.8E-10	1.2E-02	5.0E-07	1.1E-10	3.9E-05	1.9E-06	1.8E-08	1.1E-08	2.5E-07	3.9E-05	4.0E-06	1.8E-03	9.5E-07	7.4E-07	1.0E-03
Curlew	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Dunlin	1.2E-13	1.2E-09	3.7E-06	1.2E-09	1.0E-02	9.8E-07	4.3E-10	3.5E-05	2.1E-06	1.6E-08	1.1E-08	2.6E-07	3.5E-05	3.5E-06	2.4E-03	1.2E-06	4.4E-07	9.3E-04
Fish egg	1.2E-11	1.1E-09	3.0E-07	1.1E-09	1.4E-06	4.8E-07	6.9E-09	3.8E-07	8.6E-07	2.4E-08	1.5E-08	2.5E-07	3.8E-07	4.9E-12	4.0E-07	4.0E-07	4.4E-10	1.9E-08
Gadwall	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Gannet	1.2E-13	1.2E-09	3.7E-06	1.2E-09	1.0E-02	9.8E-07	4.3E-10	3.5E-05	2.1E-06	1.6E-08	1.1E-08	2.6E-07	3.5E-05	3.5E-06	2.4E-03	1.2E-06	4.4E-07	9.3E-04
Golden plover	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Great crested grebe	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Grey Plover	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Grey seal	5.4E-13	2.7E-09	1.5E-06	2.7E-09	1.4E-02	3.3E-07	5.4E-10	4.5E-05	1.8E-06	1.1E-08	7.5E-09	2.6E-07	4.5E-05	4.5E-06	1.7E-03	8.7E-07	2.5E-09	8.5E-04
Gulliemot	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Hen harrier (male and female)	3.3E-13	2.4E-09	4.7E-06	2.4E-09	1.0E-02	1.2E-06	7.4E-10	3.6E-05	2.3E-06	2.2E-08	1.3E-08	2.7E-07	3.6E-05	3.5E-06	2.8E-03	1.4E-06	8.5E-07	1.1E-03
Kittewake	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Knot	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Lapwing	7.6E-15	6.5E-10	4.0E-06	6.5E-10	2.9E-02	1.1E-06	2.4E-10	9.2E-05	4.4E-06	3.2E-08	1.9E-08	4.3E-07	9.2E-05	9.4E-06	4.2E-03	2.2E-06	1.7E-06	2.3E-03
Large b. crust.	7.1E-13	4.8E-08	1.3E-04	4.8E-08	5.7E-02	3.3E-05	1.5E-08	2.0E-04	2.9E-05	9.3E-08	5.6E-08	9.5E-07	2.0E-04	1.9E-05	5.5E-02	2.8E-05	5.7E-06	6.6E-03
Lesser black-backed gull (male and female)	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Little tern	1.3E-13	1.9E-09	5.5E-06	1.9E-09	1.5E-02	1.5E-06	6.1E-10	5.2E-05	3.1E-06	2.1E-08	1.4E-08	3.5E-07	5.2E-05	5.2E-06	3.6E-03	1.8E-06	6.7E-07	1.4E-03
Macrophyte	1.3E-11	8.2E-07	8.9E-04	8.2E-07	1.2E-01	1.8E-04	2.4E-07	4.5E-04	1.0E-04	2.0E-07	1.3E-07	2.1E-06	4.5E-04	3.9E-05	3.0E-01	1.5E-04	1.6E-05	1.5E-02
Manx Shearwater	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Marsh harrier	3.3E-13	2.4E-09	4.7E-06	2.4E-09	1.0E-02	1.2E-06	7.4E-10	3.6E-05	2.3E-06	2.2E-08	1.3E-08	2.7E-07	3.6E-05	3.5E-06	2.8E-03	1.4E-06	8.5E-07	1.1E-03
Mediterranean gull	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Otter (female)	1.5E-13	3.1E-09	9.2E-06	3.1E-09	2.6E-02	2.4E-06	9.9E-10	8.7E-05	5.2E-06	3.2E-08	2.1E-08	5.1E-07	8.7E-05	8.7E-06	6.0E-03	3.1E-06	1.1E-06	2.3E-03
Otter (male)	1.3E-14	4.6E-10	2.8E-06	4.6E-10	2.0E-02	8.2E-07	1.8E-10	6.5E-05	3.2E-06	2.7E-08	1.6E-08	3.7E-07	6.5E-05	6.7E-06	3.0E-03	1.6E-06	1.2E-06	1.7E-03
Oystercatcher	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Pelagic fish	3.0E-13	1.1E-08	2.1E-05	1.1E-08	4.7E-02	5.4E-06	3.0E-09	1.6E-04	9.8E-06	6.4E-08	3.9E-08	7.8E-07	1.6E-04	1.6E-05	1.3E-02	6.4E-06	3.8E-06	4.9E-03
Peregrine	1.2E-13	1.2E-09	3.7E-06	1.2E-09	1.0E-02	9.8E-07	4.3E-10	3.5E-05	2.1E-06	1.6E-08	1.1E-08	2.6E-07	3.5E-05	3.5E-06	2.4E-03	1.2E-06	4.4E-07	9.3E-04
Phytoplankton	8.2E-09	2.8E-08	4.0E-07	2.8E-08	1.5E-06	6.5E-07	5.8E-08	4.7E-07	9.3E-07	4.0E-08	5.5E-08	3.3E-07	4.7E-07	5.0E-12	5.2E-07	5.4E-07	5.7E-09	5.3E-08
Pink-footed goose	7.6E-15	6.5E-10	4.0E-06	6.5E-10	2.9E-02	1.1E-06	2.4E-10	9.2E-05	4.4E-06	3.2E-08	1.9E-08	4.3E-07	9.2E-05	9.4E-06	4.2E-03	2.2E-06	1.7E-06	2.3E-03
Pintail	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Puffin	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Razorbill	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03

Table A3.4 Continued

Organism	Weighted external dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Redshank	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Ringed plover	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
River lamprey	3.0E-13	1.1E-08	2.1E-05	1.1E-08	4.7E-02	5.4E-06	3.0E-09	1.6E-04	9.8E-06	6.4E-08	3.9E-08	7.8E-07	1.6E-04	1.6E-05	1.3E-02	6.4E-06	3.8E-06	4.9E-03
Ruff	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Sanderling	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Sandwich tern	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Scaup	1.1E-14	2.8E-10	1.7E-06	2.8E-10	1.2E-02	5.0E-07	1.1E-10	3.9E-05	1.9E-06	1.8E-08	1.1E-08	2.5E-07	3.9E-05	4.0E-06	1.8E-03	9.5E-07	7.4E-07	1.0E-03
Sea lamprey	1.1E-13	5.6E-09	1.6E-05	5.6E-09	4.6E-02	4.4E-06	1.7E-09	1.6E-04	9.2E-06	4.8E-08	3.1E-08	7.7E-07	1.6E-04	1.6E-05	1.1E-02	5.5E-06	2.0E-06	4.2E-03
Seabird	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Seal	1.3E-14	4.6E-10	2.8E-06	4.6E-10	2.0E-02	8.2E-07	1.8E-10	6.5E-05	3.2E-06	2.7E-08	1.6E-08	3.7E-07	6.5E-05	6.7E-06	3.0E-03	1.6E-06	1.2E-06	1.7E-03
Shelduck (female)	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Shelduck (male)	1.3E-13	1.9E-09	5.5E-06	1.9E-09	1.5E-02	1.5E-06	6.1E-10	5.2E-05	3.1E-06	2.1E-08	1.4E-08	3.5E-07	5.2E-05	5.2E-06	3.6E-03	1.8E-06	6.7E-07	1.4E-03
Small b. crust.	5.6E-12	3.6E-07	4.3E-04	3.6E-07	5.8E-02	8.7E-05	1.1E-07	2.2E-04	4.9E-05	1.0E-07	6.4E-08	1.0E-06	2.2E-04	2.0E-05	1.4E-01	7.2E-05	8.4E-06	7.4E-03
Snipe	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Storm Petrel	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Teal	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Tufted duck (female)	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Tufted duck (male)	1.3E-13	1.9E-09	5.5E-06	1.9E-09	1.5E-02	1.5E-06	6.1E-10	5.2E-05	3.1E-06	2.1E-08	1.4E-08	3.5E-07	5.2E-05	5.2E-06	3.6E-03	1.8E-06	6.7E-07	1.4E-03
Turnstone	2.5E-13	8.5E-09	1.6E-05	8.5E-09	3.7E-02	4.2E-06	2.3E-09	1.2E-04	7.6E-06	5.0E-08	3.1E-08	6.1E-07	1.2E-04	1.2E-05	9.7E-03	5.0E-06	3.0E-06	3.8E-03
Twaite shad	1.9E-13	6.3E-10	1.8E-06	6.3E-10	5.2E-03	5.1E-07	2.7E-10	1.8E-05	1.2E-06	1.6E-08	1.0E-08	2.6E-07	1.8E-05	1.7E-06	1.2E-03	6.4E-07	2.2E-07	4.7E-04
Whale	7.2E-13	1.3E-11	1.8E-09	1.3E-11	6.9E-07	3.3E-09	5.1E-11	1.5E-07	5.9E-08	4.1E-09	2.8E-09	9.7E-08	1.5E-07	2.3E-12	8.7E-09	8.7E-09	2.5E-13	4.3E-09
White-fronted goose	9.1E-14	4.3E-09	1.3E-05	4.3E-09	3.6E-02	3.4E-06	1.3E-09	1.2E-04	7.1E-06	3.7E-08	2.4E-08	6.0E-07	1.2E-04	1.2E-05	8.4E-03	4.3E-06	1.6E-06	3.3E-03
Whooper swan	1.1E-14	2.8E-10	1.7E-06	2.8E-10	1.2E-02	5.0E-07	1.1E-10	3.9E-05	1.9E-06	1.8E-08	1.1E-08	2.5E-07	3.9E-05	4.0E-06	1.8E-03	9.5E-07	7.4E-07	1.0E-03
Wigeon	3.6E-13	3.6E-09	7.1E-06	3.6E-09	1.6E-02	1.8E-06	1.1E-09	5.3E-05	3.4E-06	2.9E-08	1.8E-08	3.5E-07	5.3E-05	5.3E-06	4.2E-03	2.2E-06	1.3E-06	1.6E-03
Zooplankton	1.2E-11	9.2E-10	2.7E-07	9.2E-10	1.4E-06	4.3E-07	5.4E-09	3.7E-07	8.1E-07	2.4E-08	1.5E-08	2.4E-07	3.7E-07	4.9E-12	3.6E-07	3.6E-07	4.2E-10	1.9E-08

Table A3.5 Coastal weighted total dose rate per unit concentration factors

Organism	Weighted total dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Allis shad	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.4E-03	1.8E-06	1.8E-06	2.3E-05	2.7E-06	3.7E-07	5.3E-07	1.6E-06	3.6E-05	1.2E-01	1.5E-03	1.0E-04	2.4E-03	3.6E-03
Atlantic salmon	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.4E-03	1.8E-06	1.8E-06	2.3E-05	2.7E-06	3.7E-07	5.3E-07	1.6E-06	3.6E-05	1.2E-01	1.5E-03	1.0E-04	2.4E-03	3.6E-03
Avocet	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Bacteria	9.8E-09	2.3E-05	1.3E-03	2.3E-05	1.2E-01	2.6E-04	2.4E-06	5.6E-04	1.1E-04	4.1E-07	5.2E-07	2.8E-06	5.6E-04	4.9E+02	4.2E-01	4.2E-02	2.4E+00	5.1E+01
Bar-tailed godwit	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Benthic fish	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.7E-02	6.6E-06	1.8E-06	1.6E-04	1.1E-05	3.8E-07	5.4E-07	2.1E-06	1.8E-04	1.2E-01	1.3E-02	1.1E-04	2.4E-03	8.0E-03
Benthic mollusc	9.8E-09	5.7E-04	2.5E-03	5.7E-04	5.8E-02	4.1E-05	5.8E-05	3.4E-04	8.0E-04	3.5E-07	5.2E-07	2.0E-06	2.1E-04	6.1E-01	6.7E-02	3.1E-03	1.8E-01	1.3E+00
Bewicks swan	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.1E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Bittern	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.2E-01	6.5E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	8.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Black-tailed godwit	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Brent goose	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Chough	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.0E-01	6.4E-04	4.7E-04	2.0E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.8E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Common scoter	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.7E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.0E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Common seal	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.2E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	1.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Common tern	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.7E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.0E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Cormorant	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.1E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Curlew	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Dunlin	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.2E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.8E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Fish egg	9.8E-09	5.5E-04	7.7E-04	5.5E-04	1.0E-02	1.7E-04	4.1E-04	7.0E-04	1.6E-02	7.1E-05	1.3E-04	2.4E-04	2.6E-04	1.2E+03	2.5E-01	1.0E-01	5.9E+00	1.3E+02
Gadwall	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Gannet	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.2E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.8E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Golden plover	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Great crested grebe	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Grey plover	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Grey seal	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.8E-01	6.5E-04	4.7E-04	2.6E-03	1.8E-01	1.3E-04	1.7E-04	7.0E-04	2.0E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Gulliemot	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Hen harrier (male and female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.6E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Kittewake	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Knot	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Lapwing	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.2E-01	6.5E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	8.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Large b. crust.	9.8E-09	5.7E-04	2.7E-03	5.7E-04	5.7E-02	3.4E-05	4.6E-04	1.3E-03	7.4E-05	3.5E-07	5.3E-07	2.0E-06	2.0E-04	3.1E+00	5.5E-02	1.1E-03	1.8E-02	3.8E-02
Lesser black-backed gull (male and female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Little tern	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.7E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.0E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Macrophyte	9.8E-09	2.8E-04	1.9E-03	2.8E-04	1.2E-01	1.8E-04	5.3E-05	5.4E-04	3.2E-04	2.4E-05	4.5E-05	8.8E-05	4.5E-04	6.1E-02	3.0E-01	1.0E-02	1.2E-01	5.2E-01
Manx Shearwater	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Marsh harrier	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.9E-02	6.2E-04	4.7E-04	1.4E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.6E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Mediterranean gull	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Otter (female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	6.8E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.3E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Otter (male)	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.2E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	1.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Oystercatcher	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Pelagic fish	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.7E-02	6.6E-06	1.8E-06	1.6E-04	1.1E-05	3.8E-07	5.4E-07	2.1E-06	1.8E-04	1.2E-01	1.3E-02	1.1E-04	2.4E-03	8.0E-03
Peregrine	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.2E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	5.8E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Phytoplankton	9.8E-09	1.8E-06	4.9E-07	1.8E-06	2.5E-06	6.5E-07	5.9E-08	4.7E-07	9.7E-05	7.9E-06	4.8E-06	4.8E-07	4.8E-07	1.8E+00	1.8E-05	2.1E-03	5.9E+00	1.3E+01
Pink-footed goose	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.2E-01	6.5E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	8.5E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Pintail	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Puffin	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Razorbill	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02

Table A3.5 Continued

Organism	Weighted total dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Redshank	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Ringed plover	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
River lamprey	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.7E-02	6.6E-06	1.8E-06	1.6E-04	1.1E-05	3.8E-07	5.4E-07	2.1E-06	1.8E-04	1.2E-01	1.3E-02	1.1E-04	2.4E-03	8.0E-03
Ruff	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Sanderling	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Sandwich tern	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Scaup	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.1E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Sea lamprey	9.8E-09	5.7E-04	3.1E-03	5.7E-04	4.7E-02	5.6E-06	1.8E-06	1.6E-04	1.1E-05	4.0E-07	5.5E-07	2.1E-06	1.7E-04	1.2E-01	1.1E-02	1.1E-04	2.4E-03	7.4E-03
Seabird	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Seal	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.2E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	1.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Shelduck (female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Shelduck (male)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.7E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.0E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Small b. crust.	9.8E-09	5.5E-04	1.5E-03	5.5E-04	5.8E-02	8.7E-05	5.3E-05	3.2E-04	6.1E-05	3.4E-07	5.2E-07	1.9E-06	2.3E-04	3.1E+00	1.4E-01	1.1E-03	1.8E-02	3.9E-02
Snipe	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Storm petrel	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Teal	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Tufted duck (female)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Tufted duck (male)	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.7E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.0E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Turnstone	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.6E-02	6.3E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	6.5E-04	1.2E+03	9.9E-01	1.0E-01	5.9E+00	1.3E+02
Twaite shad	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.4E-03	1.8E-06	1.8E-06	2.3E-05	2.7E-06	3.7E-07	5.3E-07	1.6E-06	3.6E-05	1.2E-01	1.5E-03	1.0E-04	2.4E-03	3.6E-03
Whale	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.6E-01	6.5E-04	4.7E-04	2.5E-03	1.8E-01	1.3E-04	1.7E-04	7.0E-04	6.0E-05	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
White-fronted goose	9.8E-09	5.7E-04	3.1E-03	5.7E-04	7.8E-02	6.3E-04	4.7E-04	1.6E-03	1.5E-01	1.1E-04	1.6E-04	4.1E-04	6.6E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Whooper swan	9.8E-09	5.7E-04	3.2E-03	5.7E-04	1.1E-01	6.4E-04	4.7E-04	2.1E-03	1.7E-01	1.1E-04	1.6E-04	5.7E-04	7.9E-04	1.2E+03	1.0E+00	1.0E-01	5.9E+00	1.3E+02
Wigeon	9.8E-09	5.7E-04	3.1E-03	5.7E-04	5.5E-02	6.2E-04	4.7E-04	1.5E-03	1.5E-01	9.4E-05	1.5E-04	4.0E-04	5.8E-04	1.2E+03	9.8E-01	1.0E-01	5.9E+00	1.3E+02
Zooplankton	9.8E-09	5.5E-04	2.7E-04	5.5E-04	1.1E-04	6.5E-07	5.3E-06	1.0E-05	3.7E-03	7.1E-05	1.4E-04	2.6E-04	3.3E-06	1.8E+00	1.7E-03	5.2E-04	5.9E-02	1.3E-01

Table A3.6 Freshwater weighted internal dose rate per unit concentration factors

Organism	Weighted internal dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Allis shad	9.8E-09	1.3E-04	1.9E-02	1.3E-04	6.3E-05	2.7E-05	2.6E-06	8.1E-06	7.7E-06	1.4E-06	2.1E-06	5.5E-06	2.0E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
Amphibian	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	5.9E+00	2.5E+00
Aqu. mammal	9.8E-09	2.1E-04	1.8E-02	2.1E-04	4.9E-04	6.6E-04	7.6E-05	1.9E-04	5.7E-03	1.7E-05	2.9E-05	6.9E-05	1.6E-03	6.2E+00	4.4E-03	6.7E-01	1.3E-02	2.5E+00
Atlantic salmon	9.8E-09	1.3E-04	1.9E-02	1.3E-04	6.3E-05	2.7E-05	2.6E-06	8.1E-06	7.7E-06	1.4E-06	2.1E-06	5.5E-06	2.0E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
Avocet	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Bacteria	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Bar-tailed godwit	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Benthic fish	9.8E-09	1.3E-04	1.9E-02	1.3E-04	5.9E-05	2.7E-05	2.6E-06	7.8E-06	7.6E-06	1.3E-06	2.0E-06	5.3E-06	1.9E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
Benthic mollusc	9.8E-09	2.1E-04	1.5E-02	2.1E-04	1.4E-04	1.1E-04	1.4E-06	3.2E-06	3.8E-03	4.3E-06	7.9E-06	1.8E-05	7.8E-05	6.2E+00	3.6E-05	1.9E-02	4.9E-02	6.3E-03
Bewicks swan	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Bittern	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Black-tailed godwit	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Brent goose	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Brook lamprey	9.8E-09	1.3E-04	1.9E-02	1.3E-04	6.3E-05	2.7E-05	2.6E-06	8.1E-06	7.7E-06	1.4E-06	2.1E-06	5.5E-06	2.0E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
Bullhead	9.8E-09	1.3E-04	1.9E-02	1.3E-04	4.3E-05	2.6E-05	2.6E-06	7.2E-06	7.4E-06	1.2E-06	2.0E-06	5.0E-06	1.8E-03	3.1E-03	4.8E-05	1.0E-03	4.1E-03	1.9E-03
Common scoter	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Cormorant	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Curlew	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Desmoulins whorl snail	9.8E-09	2.1E-04	1.5E-02	2.1E-04	1.4E-04	1.1E-04	1.4E-06	3.2E-06	3.8E-03	4.3E-06	7.9E-06	1.8E-05	7.8E-05	6.2E+00	3.6E-05	1.9E-02	4.9E-02	6.3E-03
Duck	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Dunlin	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Early gentian	9.8E-09	1.3E-04	1.2E-03	1.3E-04	5.5E-05	2.4E-04	6.8E-05	1.3E-04	1.1E-03	9.6E-06	1.8E-05	3.4E-05	2.2E-04	8.6E-02	4.6E-04	6.7E-01	1.1E-01	1.9E-01
Fen orchid	9.8E-09	1.3E-04	1.2E-03	1.3E-04	5.5E-05	2.4E-04	6.8E-05	1.3E-04	1.1E-03	9.6E-06	1.8E-05	3.4E-05	2.2E-04	8.6E-02	4.6E-04	6.7E-01	1.1E-01	1.9E-01
Gadwall	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Golden plover	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Great crested grebe	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Great crested newt	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	5.9E+00	2.5E+00
Grey Plover	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Hen harrier (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Hen harrier (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Knot	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Lapwing	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Large b. crust.	9.8E-09	2.1E-04	1.6E-02	2.1E-04	1.5E-04	1.3E-04	7.2E-07	1.8E-06	4.5E-03	4.4E-06	8.0E-06	1.9E-05	8.7E-05	6.2E+00	3.9E-05	1.9E-02	8.1E-03	6.3E-03
Lesser black-backed gull (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Lesser black-backed gull (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Macrophyte	9.8E-09	1.3E-04	1.2E-03	1.3E-04	5.5E-05	2.4E-04	6.8E-05	1.3E-04	1.1E-03	9.6E-06	1.8E-05	3.4E-05	2.2E-04	8.6E-02	4.6E-04	6.7E-01	1.1E-01	1.9E-01
Marsh harrier	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Mediterranean gull	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Natterjack toad	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	5.9E+00	2.5E+00
Otter (male and female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.3E-02	2.5E+00
Oystercatcher	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Pelagic fish	9.8E-09	1.3E-04	1.9E-02	1.3E-04	5.9E-05	2.7E-05	2.6E-06	7.8E-06	7.6E-06	1.3E-06	2.0E-06	5.3E-06	1.9E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
Phytoplankton	1.7E-09	3.5E-07	8.5E-08	3.5E-07	2.1E-07	4.9E-09	1.0E-09	3.4E-09	4.8E-06	1.6E-06	9.5E-07	3.1E-08	7.6E-08	3.7E-01	3.5E-06	4.1E-04	1.1E-02	2.5E+00
Pink-footed goose	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Pintail	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Redshank	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Ringed plover	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
River lamprey	9.8E-09	1.3E-04	1.8E-02	1.3E-04	2.9E-05	2.4E-05	2.6E-06	6.6E-06	5.7E-06	1.1E-06	1.9E-06	4.6E-06	1.6E-03	3.1E-03	4.4E-05	1.0E-03	4.1E-03	1.9E-03

Table A3.6 Continued

Organism	Weighted internal dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Ruff	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Sanderling	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Scaup	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Sea lamprey	9.8E-09	1.3E-04	1.9E-02	1.3E-04	6.3E-05	2.7E-05	2.6E-06	8.1E-06	7.7E-06	1.4E-06	2.1E-06	5.5E-06	2.0E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
Shelduck (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Shelduck (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Shoveler	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Small b. crust.	9.8E-09	2.0E-04	6.7E-03	2.0E-04	1.1E-04	5.8E-05	6.6E-07	1.3E-06	1.2E-03	4.0E-06	7.7E-06	1.5E-05	5.2E-04	6.2E+00	1.7E-05	1.9E-02	8.1E-03	6.3E-03
Snipe	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Southern damselfly	9.8E-09	2.1E-04	1.5E-02	2.1E-04	3.5E-04	5.4E-04	7.5E-05	1.7E-04	3.8E-03	1.5E-05	2.8E-05	6.5E-05	1.5E-03	6.2E+00	3.6E-03	6.7E-01	5.9E+00	2.5E+00
Spined loach	9.8E-09	1.3E-04	1.9E-02	1.3E-04	4.3E-05	2.6E-05	2.6E-06	7.2E-06	7.4E-06	1.2E-06	2.0E-06	5.0E-06	1.8E-03	3.1E-03	4.8E-05	1.0E-03	4.1E-03	1.9E-03
Teal (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Teal (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Tufted duck (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Tufted duck (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Turnstone	9.8E-09	2.1E-04	1.9E-02	2.1E-04	7.1E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Twaite shad	9.8E-09	1.3E-04	1.9E-02	1.3E-04	6.3E-05	2.7E-05	2.6E-06	8.1E-06	7.7E-06	1.4E-06	2.1E-06	5.5E-06	2.0E-03	3.1E-03	4.9E-05	1.0E-03	4.1E-03	1.9E-03
White-fronted goose	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Whooper swan	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.0E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Wigeon	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.5E-04	7.6E-05	2.2E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Zooplankton	9.8E-09	1.1E-04	2.7E-04	1.1E-04	2.2E-05	4.4E-06	1.1E-06	2.0E-06	7.4E-04	1.4E-05	2.7E-05	5.3E-05	2.0E-06	3.7E-01	3.4E-04	1.0E-04	1.2E-03	2.5E-02

Table A3.7 Freshwater weighted external dose rate per unit concentration factors

Organism	Weighted external dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Allis shad	1.9E-13	6.3E-10	1.1E-05	6.3E-10	1.3E-04	5.1E-07	9.6E-11	2.5E-08	4.9E-07	1.4E-08	8.8E-09	2.2E-07	6.0E-06	2.4E-10	6.0E-06	5.9E-08	2.2E-07	1.2E-06
Amphibian	7.2E-13	1.9E-08	2.0E-04	1.9E-08	1.5E-03	8.2E-06	3.9E-10	8.0E-06	4.5E-06	4.7E-08	2.9E-08	5.8E-07	6.8E-05	2.7E-09	8.9E-05	4.8E-07	3.9E-06	1.5E-05
Aqu. mammal	4.2E-13	4.5E-09	9.6E-05	4.5E-09	2.8E-04	4.0E-06	3.1E-10	1.5E-06	1.7E-06	2.1E-08	1.3E-08	2.3E-07	1.3E-05	5.2E-10	3.4E-05	2.3E-07	1.0E-06	3.1E-06
Atlantic salmon	1.9E-13	6.3E-10	1.1E-05	6.3E-10	1.3E-04	5.1E-07	9.6E-11	2.5E-08	4.9E-07	1.4E-08	8.8E-09	2.2E-07	6.0E-06	2.4E-10	6.0E-06	5.9E-08	2.2E-07	1.2E-06
Avocet	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
Bacteria	9.8E-09	2.3E-05	8.0E-03	2.3E-05	3.0E-03	2.6E-04	1.5E-07	9.4E-07	3.8E-05	2.2E-07	2.8E-07	1.5E-06	1.9E-04	6.6E-02	2.1E-03	2.1E-03	2.4E+00	1.3E-01
Bar-tailed godwit	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
Benthic fish	3.0E-13	1.1E-08	1.3E-04	1.1E-08	1.2E-03	5.4E-06	2.1E-10	2.2E-07	3.3E-06	3.5E-08	2.1E-08	4.3E-07	5.3E-05	2.2E-09	6.3E-05	3.3E-07	3.8E-06	1.2E-05
Benthic mollusc	6.9E-13	5.5E-08	1.1E-03	5.5E-08	1.4E-03	4.1E-05	1.2E-09	2.8E-06	1.1E-05	5.1E-08	3.1E-08	5.1E-07	6.7E-05	2.6E-09	3.3E-04	1.7E-06	6.1E-06	1.7E-05
Bewicks swan	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Bittern	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Black-tailed godwit	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
Brent goose	2.5E-13	8.5E-09	1.0E-04	8.5E-09	9.1E-04	4.2E-06	1.6E-10	4.9E-06	2.6E-06	2.8E-08	1.7E-08	3.4E-07	4.1E-05	1.7E-09	4.9E-05	2.6E-07	3.0E-06	9.5E-06
Brook lamprey	1.1E-13	5.6E-09	1.0E-04	5.6E-09	1.2E-03	4.4E-06	1.2E-10	2.1E-07	3.1E-06	2.6E-08	1.7E-08	4.2E-07	5.2E-05	2.1E-09	5.4E-05	2.9E-07	2.0E-06	1.1E-05
Bullhead	4.7E-13	1.5E-08	1.7E-04	1.5E-08	1.2E-03	6.7E-06	2.8E-10	2.3E-07	3.7E-06	3.6E-08	2.2E-08	4.5E-07	5.5E-05	2.2E-09	7.3E-05	3.9E-07	3.2E-06	1.2E-05
Common scoter	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Cormorant	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Curlew	2.5E-13	8.5E-09	1.0E-04	8.5E-09	9.1E-04	4.2E-06	1.6E-10	4.9E-06	2.6E-06	2.8E-08	1.7E-08	3.4E-07	4.1E-05	1.7E-09	4.9E-05	2.6E-07	3.0E-06	9.5E-06
Desmoulins whorl snail	8.3E-13	1.1E-08	2.1E-04	1.1E-08	2.9E-04	8.3E-06	6.8E-10	5.6E-07	2.5E-06	2.1E-08	1.3E-08	2.1E-07	1.4E-05	5.3E-10	6.7E-05	4.3E-07	1.2E-06	3.4E-06
Duck	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Dunlin	1.2E-13	1.2E-09	2.3E-05	1.2E-09	2.6E-04	9.8E-07	7.1E-11	1.4E-06	7.7E-07	1.2E-08	7.4E-09	1.9E-07	1.2E-05	4.7E-10	1.2E-05	7.8E-08	4.4E-07	2.3E-06
Early gentian	1.9E-11	8.2E-07	5.6E-03	8.2E-07	2.9E-03	1.8E-04	1.9E-08	8.5E-05	3.4E-05	1.2E-07	7.6E-08	1.2E-06	1.5E-04	5.3E-09	1.5E-03	7.8E-06	1.6E-05	3.7E-05
Fen orchid	1.9E-11	8.2E-07	5.6E-03	8.2E-07	2.9E-03	1.8E-04	1.9E-08	8.5E-05	3.4E-05	1.2E-07	7.6E-08	1.2E-06	1.5E-04	5.3E-09	1.5E-03	7.8E-06	1.6E-05	3.7E-05
Gadwall	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Golden plover	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Great crested grebe	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Great crested newt	6.0E-13	1.4E-08	1.5E-04	1.4E-08	1.1E-03	6.0E-06	3.0E-10	5.8E-06	3.3E-06	3.5E-08	2.2E-08	4.4E-07	4.9E-05	2.0E-09	6.5E-05	3.5E-07	2.8E-06	1.1E-05
Grey plover	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Hen harrier (female)	3.3E-13	2.4E-09	2.9E-05	2.4E-09	2.6E-04	1.2E-06	1.2E-10	1.4E-06	8.2E-07	1.6E-08	9.5E-09	1.9E-07	1.2E-05	4.8E-10	1.4E-05	9.1E-08	8.5E-07	2.7E-06
Hen harrier (male)	5.1E-13	3.4E-09	3.7E-05	3.4E-09	2.7E-04	1.5E-06	1.7E-10	1.5E-06	9.1E-07	1.6E-08	9.9E-09	2.0E-07	1.2E-05	5.0E-10	1.6E-05	1.1E-07	7.1E-07	2.8E-06
Knot	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Lapwing	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Large b. crust.	7.1E-13	4.8E-08	8.4E-04	4.8E-08	1.4E-03	3.3E-05	9.8E-10	1.4E-06	9.8E-06	5.0E-08	3.0E-08	5.1E-07	6.6E-05	2.6E-09	2.7E-04	1.4E-06	5.7E-06	1.6E-05
Lesser black-backed gull (female)	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
Lesser black-backed gull (male)	2.5E-13	8.5E-09	1.0E-04	8.5E-09	9.1E-04	4.2E-06	1.6E-10	4.9E-06	2.6E-06	2.8E-08	1.7E-08	3.4E-07	4.1E-05	1.7E-09	4.9E-05	2.6E-07	3.0E-06	9.5E-06
Macrophyte	1.3E-11	8.2E-07	5.6E-03	8.2E-07	2.9E-03	1.8E-04	1.6E-08	8.5E-05	3.4E-05	1.1E-07	6.8E-08	1.1E-06	1.5E-04	5.3E-09	1.5E-03	7.7E-06	1.6E-05	3.6E-05
Marsh harrier	3.3E-13	2.4E-09	2.9E-05	2.4E-09	2.6E-04	1.2E-06	1.2E-10	1.4E-06	8.2E-07	1.6E-08	9.5E-09	1.9E-07	1.2E-05	4.8E-10	1.4E-05	9.1E-08	8.5E-07	2.7E-06
Mediterranean gull	5.5E-13	5.1E-09	5.6E-05	5.1E-09	4.1E-04	2.2E-06	2.0E-10	2.2E-06	1.3E-06	2.0E-08	1.2E-08	2.4E-07	1.9E-05	7.5E-10	2.4E-05	1.5E-07	1.1E-06	4.2E-06
Natterjack toad	6.0E-13	1.4E-08	1.5E-04	1.4E-08	1.1E-03	6.0E-06	3.0E-10	5.8E-06	3.3E-06	3.5E-08	2.2E-08	4.4E-07	4.9E-05	2.0E-09	6.5E-05	3.5E-07	2.8E-06	1.1E-05
Otter (male and female)	1.5E-13	3.1E-09	5.7E-05	3.1E-09	6.5E-04	2.4E-06	1.1E-10	3.4E-06	1.8E-06	2.0E-08	1.3E-08	3.2E-07	2.9E-05	1.2E-09	3.0E-05	1.7E-07	1.1E-06	5.8E-06
Oystercatcher	2.5E-13	8.5E-09	1.0E-04	8.5E-09	9.1E-04	4.2E-06	1.6E-10	4.9E-06	2.6E-06	2.8E-08	1.7E-08	3.4E-07	4.1E-05	1.7E-09	4.9E-05	2.6E-07	3.0E-06	9.5E-06
Pelagic fish	3.0E-13	1.1E-08	1.3E-04	1.1E-08	1.2E-03	5.4E-06	2.1E-10	2.2E-07	3.3E-06	3.5E-08	2.1E-08	4.3E-07	5.3E-05	2.2E-09	6.3E-05	3.3E-07	3.8E-06	1.2E-05
Phytoplankton	8.2E-09	2.8E-08	4.0E-07	2.8E-08	1.5E-06	6.5E-07	5.8E-08	2.1E-08	9.3E-07	4.0E-08	5.5E-08	3.3E-07	4.7E-07	5.0E-12	5.2E-07	5.4E-07	5.7E-09	5.3E-08
Pink-footed goose	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Pintail	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Redshank	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
Ringed plover	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
River lamprey	3.3E-13	2.0E-08	4.3E-04	2.0E-08	1.3E-03	1.8E-05	4.6E-10	2.4E-07	6.6E-06	4.3E-08	2.6E-08	4.7E-07	5.8E-05	2.3E-09	1.5E-04	8.1E-07	4.5E-06	1.4E-05

Table A3.7 Continued

Organism	Weighted external dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Ruff	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Sanderling	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Scaup	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Sea lamprey	1.1E-13	5.6E-09	1.0E-04	5.6E-09	1.2E-03	4.4E-06	1.2E-10	2.1E-07	3.1E-06	2.6E-08	1.7E-08	4.2E-07	5.2E-05	2.1E-09	5.4E-05	2.9E-07	2.0E-06	1.1E-05
Shelduck (female)	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Shelduck (male)	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Shoveler	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Small b. crust.	5.6E-12	3.6E-07	2.7E-03	3.6E-07	1.4E-03	8.7E-05	6.9E-09	1.9E-07	1.6E-05	5.4E-08	3.4E-08	5.6E-07	7.4E-05	2.7E-09	7.1E-04	3.7E-06	8.4E-06	1.8E-05
Snipe	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Southern damselfly	9.0E-13	3.8E-08	7.4E-04	3.8E-08	1.0E-03	2.9E-05	1.1E-09	5.6E-06	8.0E-06	4.2E-08	2.5E-08	4.2E-07	4.7E-05	1.8E-09	2.3E-04	1.3E-06	4.2E-06	1.2E-05
Spined loach	8.1E-13	1.7E-09	1.9E-05	1.7E-09	1.4E-04	7.8E-07	2.3E-10	2.6E-08	5.9E-07	1.9E-08	1.2E-08	2.3E-07	6.4E-06	2.5E-10	8.2E-06	8.0E-08	3.5E-07	1.4E-06
Teal (female)	5.5E-13	5.1E-09	5.6E-05	5.1E-09	4.1E-04	2.2E-06	2.0E-10	2.2E-06	1.3E-06	2.0E-08	1.2E-08	2.4E-07	1.9E-05	7.5E-10	2.4E-05	1.5E-07	1.1E-06	4.2E-06
Teal (male)	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Tufted duck (female)	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Tufted duck (male)	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Turnstone	3.8E-13	1.2E-08	1.3E-04	1.2E-08	9.5E-04	5.2E-06	2.3E-10	5.1E-06	2.9E-06	2.8E-08	1.8E-08	3.5E-07	4.3E-05	1.7E-09	5.7E-05	3.0E-07	2.5E-06	9.7E-06
Twaite shad	1.9E-13	6.3E-10	1.1E-05	6.3E-10	1.3E-04	5.1E-07	9.6E-11	2.5E-08	4.9E-07	1.4E-08	8.8E-09	2.2E-07	6.0E-06	2.4E-10	6.0E-06	5.9E-08	2.2E-07	1.2E-06
White-fronted goose	9.1E-14	4.3E-09	8.0E-05	4.3E-09	9.0E-04	3.4E-06	9.4E-11	4.8E-06	2.4E-06	2.1E-08	1.3E-08	3.3E-07	4.0E-05	1.6E-09	4.2E-05	2.2E-07	1.6E-06	8.2E-06
Whooper swan	1.3E-13	1.9E-09	3.4E-05	1.9E-09	3.9E-04	1.5E-06	8.3E-11	2.1E-06	1.1E-06	1.4E-08	9.2E-09	2.3E-07	1.7E-05	7.1E-10	1.8E-05	1.1E-07	6.7E-07	3.5E-06
Wigeon	3.6E-13	3.6E-09	4.4E-05	3.6E-09	3.9E-04	1.8E-06	1.5E-10	2.1E-06	1.2E-06	1.9E-08	1.2E-08	2.4E-07	1.8E-05	7.2E-10	2.1E-05	1.3E-07	1.3E-06	4.1E-06
Zooplankton	1.2E-11	9.2E-10	2.7E-07	9.2E-10	1.4E-06	4.3E-07	5.4E-09	3.7E-07	8.1E-07	2.4E-08	1.5E-08	2.4E-07	3.7E-07	4.9E-12	3.6E-07	3.6E-07	4.2E-10	1.9E-08

Table A3.8 Freshwater weighted total dose rate per unit concentration factors

Organism	Weighted total dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Allis shad	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.9E-04	2.7E-05	2.6E-06	8.1E-06	8.2E-06	1.4E-06	2.1E-06	5.7E-06	2.0E-03	3.1E-03	5.5E-05	1.0E-03	4.1E-03	1.9E-03
Amphibian	9.8E-09	2.1E-04	1.9E-02	2.1E-04	2.2E-03	7.5E-04	7.6E-05	2.2E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	5.9E+00	2.5E+00
Aqu. mammal	9.8E-09	2.1E-04	1.8E-02	2.1E-04	7.7E-04	6.7E-04	7.6E-05	1.9E-04	5.7E-03	1.7E-05	2.9E-05	7.0E-05	1.6E-03	6.2E+00	4.4E-03	6.7E-01	1.3E-02	2.5E+00
Atlantic salmon	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.9E-04	2.7E-05	2.6E-06	8.1E-06	8.2E-06	1.4E-06	2.1E-06	5.7E-06	2.0E-03	3.1E-03	5.5E-05	1.0E-03	4.1E-03	1.9E-03
Avocet	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Bacteria	9.8E-09	2.3E-05	8.0E-03	2.3E-05	3.0E-03	2.6E-04	1.5E-07	9.4E-07	3.8E-05	2.2E-07	2.8E-07	1.5E-06	1.9E-04	6.6E-02	2.1E-03	2.1E-03	2.4E+00	1.3E-01
Bar-tailed godwit	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Benthic fish	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.2E-03	3.2E-05	2.6E-06	8.0E-06	1.1E-05	1.3E-06	2.0E-06	5.7E-06	2.0E-03	3.1E-03	1.1E-04	1.0E-03	4.1E-03	1.9E-03
Benthic mollusc	9.8E-09	2.1E-04	1.6E-02	2.1E-04	1.6E-03	1.5E-04	1.4E-06	6.0E-06	3.8E-03	4.4E-06	8.0E-06	1.9E-05	1.4E-04	6.2E+00	3.7E-04	1.9E-02	4.9E-02	6.3E-03
Bewicks swan	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Bittern	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Black-tailed godwit	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Brent goose	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.9E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Brook lamprey	9.8E-09	1.3E-04	2.0E-02	1.3E-04	1.2E-03	3.1E-05	2.6E-06	8.3E-06	1.1E-05	1.4E-06	2.1E-06	5.9E-06	2.0E-03	3.1E-03	1.0E-04	1.0E-03	4.1E-03	1.9E-03
Bullhead	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.3E-03	3.3E-05	2.6E-06	7.5E-06	1.1E-05	1.3E-06	2.0E-06	5.4E-06	1.8E-03	3.1E-03	1.2E-04	1.0E-03	4.1E-03	1.9E-03
Common scoter	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Cormorant	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Curlew	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.9E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Desmoulins whorl snail	9.8E-09	2.1E-04	1.5E-02	2.1E-04	4.3E-04	1.2E-04	1.4E-06	3.8E-06	3.8E-03	4.4E-06	8.0E-06	1.9E-05	9.1E-05	6.2E+00	1.0E-04	1.9E-02	4.9E-02	6.3E-03
Duck	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Dunlin	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.3E-03	7.5E-04	7.6E-05	2.3E-04	7.7E-03	2.1E-05	3.1E-05	8.2E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Early gentian	9.8E-09	1.3E-04	6.8E-03	1.3E-04	2.9E-03	4.2E-04	6.8E-05	2.1E-04	1.1E-03	9.7E-06	1.8E-05	3.6E-05	3.7E-04	8.6E-02	1.9E-03	6.7E-01	1.1E-01	1.9E-01
Fen orchid	9.8E-09	1.3E-04	6.8E-03	1.3E-04	2.9E-03	4.2E-04	6.8E-05	2.1E-04	1.1E-03	9.7E-06	1.8E-05	3.6E-05	3.7E-04	8.6E-02	1.9E-03	6.7E-01	1.1E-01	1.9E-01
Gadwall	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Golden plover	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Great crested grebe	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Great crested newt	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.8E-03	7.4E-04	7.6E-05	2.2E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	5.9E+00	2.5E+00
Grey plover	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Hen harrier (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.2E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Hen harrier (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	9.8E-04	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.8E-03	6.7E-01	1.2E-04	2.5E+00
Knot	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Lapwing	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Large b. crust.	9.8E-09	2.1E-04	1.7E-02	2.1E-04	1.6E-03	1.6E-04	7.2E-07	3.2E-06	4.5E-03	4.4E-06	8.0E-06	1.9E-05	1.5E-04	6.2E+00	3.1E-04	1.9E-02	8.1E-03	6.3E-03
Lesser black-backed gull (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Lesser black-backed gull (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.9E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Macrophyte	9.8E-09	1.3E-04	6.8E-03	1.3E-04	2.9E-03	4.2E-04	6.8E-05	2.1E-04	1.1E-03	9.7E-06	1.8E-05	3.5E-05	3.7E-04	8.6E-02	1.9E-03	6.7E-01	1.1E-01	1.9E-01
Marsh harrier	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.2E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Mediterranean gull	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.1E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Natterjack toad	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.8E-03	7.4E-04	7.6E-05	2.2E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	5.9E+00	2.5E+00
Otter (male and female)	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.7E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.3E-02	2.5E+00
Oystercatcher	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.9E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Pelagic fish	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.2E-03	3.2E-05	2.6E-06	8.0E-06	1.1E-05	1.3E-06	2.0E-06	5.7E-06	2.0E-03	3.1E-03	1.1E-04	1.0E-03	4.1E-03	1.9E-03
Phytoplankton	9.8E-09	3.8E-07	4.9E-07	3.8E-07	1.7E-06	6.6E-07	5.9E-08	2.4E-08	5.8E-06	1.6E-06	1.0E-06	3.6E-07	5.5E-07	3.7E-01	4.0E-06	4.1E-04	1.1E-02	2.5E+00
Pink-footed goose	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Pintail	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Redshank	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Ringed plover	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
River lamprey	9.8E-09	1.3E-04	1.8E-02	1.3E-04	1.3E-03	4.1E-05	2.6E-06	6.8E-06	1.2E-05	1.2E-06	1.9E-06	5.1E-06	1.7E-03	3.1E-03	2.0E-04	1.0E-03	4.1E-03	1.9E-03

Table A3.8 Continued

Organism	Weighted total dose rates (microgray/h per Bq/m^3 water)																	
	H-3	C-14	P-32	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Ruff	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Sanderling	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Scaup	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Sea lamprey	9.8E-09	1.3E-04	2.0E-02	1.3E-04	1.2E-03	3.1E-05	2.6E-06	8.3E-06	1.1E-05	1.4E-06	2.1E-06	5.9E-06	2.0E-03	3.1E-03	1.0E-04	1.0E-03	4.1E-03	1.9E-03
Shelduck (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Shelduck (male)	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Shoveler	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Small b. crust.	9.8E-09	2.0E-04	9.4E-03	2.0E-04	1.6E-03	1.5E-04	6.7E-07	1.5E-06	1.2E-03	4.1E-06	7.7E-06	1.6E-05	5.9E-04	6.2E+00	7.3E-04	1.9E-02	8.1E-03	6.3E-03
Snipe	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Southern damselfly	9.8E-09	2.1E-04	1.5E-02	2.1E-04	1.4E-03	5.7E-04	7.5E-05	1.8E-04	3.8E-03	1.5E-05	2.8E-05	6.5E-05	1.5E-03	6.2E+00	3.8E-03	6.7E-01	5.9E+00	2.5E+00
Spined loach	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.8E-04	2.7E-05	2.6E-06	7.3E-06	7.9E-06	1.3E-06	2.0E-06	5.2E-06	1.8E-03	3.1E-03	5.6E-05	1.0E-03	4.1E-03	1.9E-03
Teal (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.1E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Teal (male)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Tufted duck (female)	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Tufted duck (male)	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Turnstone	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.7E-03	7.4E-04	7.6E-05	2.1E-04	7.4E-03	1.9E-05	3.0E-05	7.5E-05	1.8E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Twaite shad	9.8E-09	1.3E-04	1.9E-02	1.3E-04	1.9E-04	2.7E-05	2.6E-06	8.1E-06	8.2E-06	1.4E-06	2.1E-06	5.7E-06	2.0E-03	3.1E-03	5.5E-05	1.0E-03	4.1E-03	1.9E-03
White-fronted goose	9.8E-09	2.1E-04	2.0E-02	2.1E-04	2.0E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Whooper swan	9.8E-09	2.1E-04	2.0E-02	2.1E-04	1.4E-03	7.6E-04	7.6E-05	2.4E-04	7.7E-03	2.1E-05	3.1E-05	8.3E-05	2.0E-03	6.2E+00	5.0E-03	6.7E-01	1.2E-04	2.5E+00
Wigeon	9.8E-09	2.1E-04	1.9E-02	2.1E-04	1.4E-03	7.5E-04	7.6E-05	2.3E-04	7.6E-03	1.9E-05	3.0E-05	8.0E-05	1.9E-03	6.2E+00	4.9E-03	6.7E-01	1.2E-04	2.5E+00
Zooplankton	9.8E-09	1.1E-04	2.7E-04	1.1E-04	2.3E-05	4.8E-06	1.1E-06	2.3E-06	7.4E-04	1.4E-05	2.7E-05	5.3E-05	2.3E-06	3.7E-01	3.4E-04	1.0E-04	1.2E-03	2.5E-02

Table A3.9 Terrestrial weighted internal dose rate per unit concentration factors

Organism	Weighted internal dose rates (microgray/h per Bq/m^3 air)							Weighted internal dose rates (microgray/h per Bq/kg soil)												
	H-3	C-14	P-32	S-35	Ar-41	Kr-85	Rn-222	Co-60	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Ant	1.6E-03	7.8E-03	4.4E-02	1.4E-03	0.0E+00	0.0E+00	4.3E-02	2.1E-07	1.2E-03	1.4E-06	5.6E-07	4.5E-05	4.5E-05	9.2E-05	1.4E-06	3.7E-01	1.9E-06	7.2E-02	8.1E-04	8.9E-04
Bacteria	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Bechsteins bat	1.4E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	1.3E-03	9.1E-04	4.8E-05	4.8E-05	1.2E-04	1.3E-03	3.7E-01	4.5E-06	7.3E-02	4.2E-02	4.4E-02
Bee	1.5E-03	1.2E-02	1.3E-01	1.4E-03	0.0E+00	0.0E+00	1.6E-02	2.8E-07	2.5E-03	2.2E-07	1.7E-06	4.7E-05	4.7E-05	1.1E-04	2.2E-07	3.7E-01	3.9E-06	7.2E-02	1.1E-04	1.3E-04
Bewicks swan	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	3.3E-04	1.2E-03	5.1E-05	5.1E-05	1.6E-04	3.3E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Bird	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	3.1E-03	1.7E-04	3.2E-03	2.9E-04	1.2E-03	5.2E-05	5.2E-05	1.4E-04	2.9E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Bird egg	1.5E-03	8.0E-03	1.0E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	1.3E-03	9.1E-04	4.8E-05	4.8E-05	1.2E-04	1.3E-03	3.7E-01	4.5E-06	7.3E-02	4.2E-02	4.4E-02
Black-tailed godwit	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Brent goose	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Car. mammal	1.4E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	1.9E-03	1.2E-03	5.1E-05	5.1E-05	1.6E-04	1.9E-03	3.7E-01	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Caterpillar	1.5E-03	1.2E-02	1.1E-01	1.4E-03	0.0E+00	0.0E+00	1.9E-02	2.5E-07	2.1E-03	1.2E-03	1.3E-06	4.7E-05	4.7E-05	1.1E-04	1.2E-03	3.7E-01	3.3E-06	7.2E-02	4.2E-02	4.4E-02
Chough	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	3.3E-04	1.2E-03	5.1E-05	5.1E-05	1.6E-04	3.3E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Curlew	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Dartford warbler	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Desmoulins whorl snail	1.5E-03	1.2E-02	1.1E-01	1.4E-03	0.0E+00	0.0E+00	1.9E-02	2.5E-07	2.1E-03	1.2E-03	1.3E-06	4.7E-05	4.7E-05	1.1E-04	1.2E-03	3.7E-01	3.3E-06	7.2E-02	4.2E-02	4.4E-02
Dormouse	1.4E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	1.9E-06	9.1E-04	4.8E-05	4.8E-05	1.2E-04	1.9E-06	7.8E-03	4.5E-06	2.1E-04	3.0E-05	1.7E-05
Dunlin	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	3.1E-03	1.7E-04	3.2E-03	2.9E-04	1.2E-03	5.2E-05	5.2E-05	1.4E-04	2.9E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Early gentian	1.2E-03	1.6E-02	6.9E-02	4.1E-03	0.0E+00	0.0E+00	7.8E-02	5.4E-07	1.0E-03	1.4E-05	1.6E-04	4.5E-05	4.5E-05	8.6E-05	1.4E-05	6.5E-02	1.5E-06	2.1E-04	1.2E-04	6.3E-06
Earthworm	1.5E-03	9.9E-03	9.6E-02	1.4E-03	0.0E+00	0.0E+00	1.4E-02	5.5E-05	2.1E-03	1.7E-06	5.2E-04	4.7E-05	4.7E-05	1.1E-04	1.7E-06	3.7E-01	3.3E-06	7.2E-02	1.5E-03	1.3E-03
Fen orchid	1.2E-03	1.6E-02	6.9E-02	4.1E-03	0.0E+00	0.0E+00	7.8E-02	5.4E-07	1.0E-03	1.4E-05	1.6E-04	4.5E-05	4.5E-05	8.6E-05	1.4E-05	6.5E-02	1.5E-06	2.1E-04	1.2E-04	6.3E-06
Fungi	1.6E-03	1.1E-02	1.2E-01	1.4E-03	0.0E+00	0.0E+00	7.8E-02	6.0E-05	2.4E-06	1.4E-04	7.1E-04	4.7E-05	4.7E-05	1.1E-04	1.4E-04	3.7E-01	4.0E-06	7.2E-02	4.2E-02	4.4E-02
Gadwall	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Golden plover	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	3.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	3.1E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Great crested newt	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	1.6E-03	1.1E-03	5.1E-05	5.1E-05	1.3E-04	1.6E-03	3.7E-01	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Greater horseshoe bat	1.4E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	1.3E-03	9.1E-04	4.8E-05	4.8E-05	1.2E-04	1.3E-03	3.7E-01	4.5E-06	7.3E-02	4.2E-02	4.4E-02
Grey plover	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	3.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	3.1E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Hen harrier (male and female)	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Herb	1.2E-03	1.6E-02	6.9E-02	4.1E-03	0.0E+00	0.0E+00	7.8E-02	5.4E-07	1.0E-03	1.4E-05	1.6E-04	4.5E-05	4.5E-05	8.6E-05	1.4E-05	6.5E-02	1.5E-06	2.1E-04	1.2E-04	6.3E-06
Herb. mammal	1.3E-03	2.1E-02	2.9E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	4.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	4.1E-04	3.7E-01	5.0E-08	4.1E-04	5.9E-06	9.5E-06
Honey buzzard	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Kittewake	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Knot	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	3.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	3.1E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Lapwing	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	3.3E-04	1.2E-03	5.1E-05	5.1E-05	1.6E-04	3.3E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Lesser black-backed gull (male and female)	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Lesser horseshoe bat	1.4E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	1.3E-03	9.1E-04	4.8E-05	4.8E-05	1.2E-04	1.3E-03	3.7E-01	4.5E-06	7.3E-02	4.2E-02	4.4E-02
Lichen	1.6E-03	1.1E-03	8.7E-03	4.2E-03	0.0E+00	0.0E+00	7.8E-02	5.1E-05	1.8E-03	9.4E-05	3.9E-04	4.6E-05	4.6E-05	1.0E-04	9.4E-05	3.4E-02	2.8E-06	7.2E-02	3.9E-02	4.4E-02
Marsh harrier	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Mediterranean gull	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Natterjack toad	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	1.6E-03	1.1E-03	5.1E-05	5.1E-05	1.3E-04	1.6E-03	3.7E-01	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Nightjar	1.3E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	2.4E-04	9.1E-04	4.8E-05	4.8E-05	1.2E-04	2.4E-04	2.0E-02	4.5E-06	7.3E-02	4.2E-02	4.4E-02
Otter (male and female)	1.4E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	1.9E-03	1.2E-03	5.1E-05	5.1E-05	1.6E-04	1.9E-03	3.7E-01	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Oystercatcher	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Peregrine	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	3.1E-03	1.7E-04	3.2E-03	2.9E-04	1.2E-03	5.2E-05	5.2E-05	1.4E-04	2.9E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Petal wort	1.2E-03	1.6E-02	6.9E-02	4.1E-03	0.0E+00	0.0E+00	7.8E-02	5.4E-07	1.0E-03	1.4E-05	1.6E-04	4.5E-05	4.5E-05	8.6E-05	1.4E-05	6.5E-02	1.5E-06	2.1E-04	1.2E-04	6.3E-06
Pink-footed goose	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	3.3E-04	1.2E-03	5.1E-05	5.1E-05	1.6E-04	3.3E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Pintail	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Redshank	1.3E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	2.4E-04	9.1E-04	4.8E-05	4.8E-05	1.2E-04	2.4E-04	2.0E-02	4.5E-06	7.3E-02	4.2E-02	4.4E-02

Table A3.9 Continued

Organism	Weighted internal dose rates (microgray/h per Bq/m^3 air)							Weighted internal dose rates (microgray/h per Bq/kg soil)												
	H-3	C-14	P-32	S-35	Ar-41	Kr-85	Rn-222	Co-60	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Reptile	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	1.6E-03	1.1E-03	5.1E-05	5.1E-05	1.3E-04	1.6E-03	3.7E-01	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Ringed plover	1.3E-03	2.0E-02	2.5E-01	1.4E-03	0.0E+00	0.0E+00	9.7E-03	7.5E-05	2.8E-03	2.4E-04	9.1E-04	4.8E-05	4.8E-05	1.2E-04	2.4E-04	2.0E-02	4.5E-06	7.3E-02	4.2E-02	4.4E-02
Rodent	1.4E-03	2.0E-02	2.4E-01	1.4E-03	0.0E+00	0.0E+00	8.7E-03	7.4E-05	2.8E-03	1.9E-06	8.7E-04	4.8E-05	4.8E-05	1.2E-04	1.9E-06	7.8E-03	4.4E-06	2.1E-04	3.0E-05	1.7E-05
Ruff	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	3.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	3.1E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Sand lizard	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	1.6E-03	1.1E-03	5.1E-05	5.1E-05	1.3E-04	1.6E-03	3.7E-01	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Sanderling	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Seed	8.8E-05	1.3E-01	2.8E-01	1.3E-03	0.0E+00	0.0E+00	7.8E-02	4.7E-07	5.9E-04	6.4E-04	7.1E-05	4.4E-05	4.4E-05	6.7E-05	6.4E-04	3.7E-01	8.9E-08	7.2E-02	4.2E-02	6.3E-06
Shore dock	1.2E-03	1.6E-02	6.9E-02	4.1E-03	0.0E+00	0.0E+00	7.8E-02	5.4E-07	1.0E-03	1.4E-05	1.6E-04	4.5E-05	4.5E-05	8.6E-05	1.4E-05	6.5E-02	1.5E-06	2.1E-04	1.2E-04	6.3E-06
Short-eared owl	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	3.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	3.1E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Shoveler	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Shrub	1.5E-03	1.2E-02	5.2E-02	4.1E-03	0.0E+00	0.0E+00	7.8E-02	5.4E-07	3.5E-06	1.5E-05	1.6E-04	4.5E-05	4.5E-05	8.6E-05	1.5E-05	7.4E-02	1.5E-06	2.1E-04	1.2E-04	6.3E-06
Smooth snake	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	1.6E-03	1.1E-03	5.1E-05	5.1E-05	1.3E-04	1.6E-03	3.7E-01	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Snipe	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	3.0E-03	2.0E-04	3.2E-03	3.1E-04	1.2E-03	5.1E-05	5.1E-05	1.5E-04	3.1E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Stag beetle	1.4E-03	1.6E-02	2.0E-01	1.4E-03	0.0E+00	0.0E+00	8.7E-03	7.4E-05	2.8E-03	5.3E-06	8.7E-04	4.8E-05	4.8E-05	1.2E-04	5.3E-06	3.7E-01	4.4E-06	7.3E-02	2.7E-03	2.3E-03
Stone curlew	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Teal	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Tree	1.1E-03	3.4E-02	1.5E-01	4.1E-03	0.0E+00	0.0E+00	7.8E-02	4.3E-05	2.1E-04	3.8E-06	1.6E-04	4.5E-05	4.5E-05	8.6E-05	3.8E-06	3.7E-02	1.5E-06	1.4E-02	2.2E-02	9.5E-03
White-fronted goose	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	3.1E-03	1.7E-04	3.2E-03	2.9E-04	1.2E-03	5.2E-05	5.2E-05	1.4E-04	2.9E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Whooper swan	1.3E-03	2.0E-02	2.8E-01	1.4E-03	0.0E+00	0.0E+00	2.3E-03	2.3E-04	3.2E-03	3.3E-04	1.2E-03	5.1E-05	5.1E-05	1.6E-04	3.3E-04	2.0E-02	5.0E-06	7.3E-02	4.2E-02	4.4E-02
Wigeon	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Woodlark	1.3E-03	2.0E-02	2.7E-01	1.4E-03	0.0E+00	0.0E+00	2.9E-03	1.5E-04	3.1E-03	2.8E-04	1.1E-03	5.1E-05	5.1E-05	1.3E-04	2.8E-04	2.0E-02	4.8E-06	7.3E-02	4.2E-02	4.4E-02
Woodlouse	1.4E-03	1.6E-02	1.2E-01	1.4E-03	0.0E+00	0.0E+00	2.8E-02	4.8E-05	1.7E-03	4.2E-06	3.7E-04	4.6E-05	4.6E-05	1.0E-04	4.2E-06	3.7E-01	2.6E-06	7.2E-02	2.7E-03	2.3E-03

Table A3.10 Terrestrial weighted external dose rate per unit concentration factors

Organism	Weighted external dose rates (microgray/h per Bq/m^3 air)							Weighted external dose rates (microgray/h per Bq/kg soil)												
	H-3	C-14	P-32	S-35	Ar-41	Kr-85	Rn-222	Co-60	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Ant	2.9E-07	8.8E-04	3.1E-01	2.3E-05	2.5E-04	1.1E-05	1.0E-03	6.8E-04	1.9E-04	1.7E-04	3.7E-04	6.9E-06	6.9E-06	1.1E-04	1.7E-04	9.3E-04	1.6E-04	1.6E-04	1.9E-07	8.6E-06
Bacteria	5.3E-04	5.4E-02	7.5E-01	1.4E-03	1.0E-07	1.5E-08	1.3E-03	1.1E-03	4.6E-04	3.3E-04	6.5E-04	4.2E-05	4.2E-05	2.3E-04	3.3E-04	2.4E-01	3.7E-04	7.3E-02	4.2E-02	4.4E-02
Bechsteins bat	6.8E-10	1.5E-05	1.0E-02	4.3E-07	6.1E-04	4.1E-06	8.4E-04	1.2E-04	7.7E-06	2.8E-05	2.9E-05	1.0E-06	1.0E-06	1.9E-05	2.8E-05	1.4E-04	6.8E-06	6.9E-06	1.7E-08	1.3E-06
Bee	4.6E-09	3.5E-05	2.5E-02	1.0E-06	6.0E-04	6.7E-06	8.9E-04	1.6E-04	1.8E-05	3.8E-05	5.4E-05	1.5E-06	1.5E-06	2.5E-05	3.8E-05	1.9E-04	1.5E-05	1.5E-05	3.1E-08	1.9E-06
Bewicks swan	1.5E-09	4.7E-06	3.1E-03	1.3E-07	3.4E-04	8.9E-07	6.9E-04	1.8E-04	2.4E-06	3.9E-05	2.0E-05	1.4E-06	1.4E-06	2.6E-05	3.9E-05	2.0E-04	3.5E-06	3.6E-06	3.6E-08	1.8E-06
Bird	1.6E-09	6.0E-06	5.3E-03	1.6E-07	4.2E-04	1.1E-06	7.4E-04	2.8E-04	4.2E-06	6.3E-05	3.4E-05	1.7E-06	1.7E-06	4.2E-05	6.3E-05	3.0E-04	5.8E-06	5.9E-06	2.4E-08	2.6E-06
Bird egg	2.2E-08	5.9E-05	4.1E-02	1.5E-06	3.1E-04	2.0E-06	8.4E-04	4.9E-04	3.1E-05	1.1E-04	1.2E-04	4.1E-06	4.1E-06	7.5E-05	1.1E-04	5.4E-04	2.7E-05	2.8E-05	6.7E-08	5.1E-06
Black-tailed godwit	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Brent goose	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Car. mammal	6.5E-09	1.5E-05	1.0E-02	4.0E-07	1.6E-04	4.1E-07	6.9E-04	5.9E-04	7.9E-06	1.3E-04	6.7E-05	4.5E-06	4.5E-06	8.4E-05	1.3E-04	6.5E-04	1.1E-05	1.2E-05	1.2E-07	6.0E-06
Caterpillar	2.2E-09	5.3E-05	3.1E-02	1.5E-06	6.6E-04	1.2E-05	9.3E-04	1.3E-04	2.1E-05	3.0E-05	5.2E-05	1.2E-06	1.2E-06	2.0E-05	3.0E-05	1.5E-04	1.7E-05	1.7E-05	2.8E-08	1.5E-06
Chough	1.5E-09	4.7E-06	3.1E-03	1.3E-07	3.4E-04	8.9E-07	6.9E-04	1.8E-04	2.4E-06	3.9E-05	2.0E-05	1.4E-06	1.4E-06	2.6E-05	3.9E-05	2.0E-04	3.5E-06	3.6E-06	3.6E-08	1.8E-06
Curlew	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Dartford warbler	4.1E-09	1.4E-05	1.1E-02	3.7E-07	4.3E-04	1.6E-06	7.6E-04	2.9E-04	8.4E-06	6.5E-05	4.6E-05	2.0E-06	2.0E-06	4.3E-05	6.5E-05	3.1E-04	8.9E-06	9.0E-06	3.0E-08	2.8E-06
Desmoulins whorl snail	3.8E-08	1.3E-04	7.6E-02	3.5E-06	4.9E-04	8.9E-06	9.3E-04	3.1E-04	5.3E-05	7.4E-05	1.3E-04	3.0E-06	3.0E-06	4.9E-05	7.4E-05	3.8E-04	4.3E-05	4.3E-05	7.0E-08	3.7E-06
Dormouse	2.7E-08	7.2E-05	5.0E-02	1.9E-06	2.5E-04	1.6E-06	8.4E-04	6.0E-04	3.8E-05	1.4E-04	1.4E-04	5.0E-06	5.0E-06	9.2E-05	1.4E-04	6.6E-04	3.3E-05	3.4E-05	8.2E-08	6.3E-06
Dunlin	1.6E-09	6.0E-06	5.3E-03	1.6E-07	4.2E-04	1.1E-06	7.4E-04	2.8E-04	4.2E-06	6.3E-05	3.4E-05	1.7E-06	1.7E-06	4.2E-05	6.3E-05	3.0E-04	5.8E-06	5.9E-06	2.4E-08	2.6E-06
Early gentian	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
Earthworm	1.4E-07	4.1E-04	2.4E-01	1.1E-05	7.9E-08	1.4E-09	9.3E-04	1.0E-03	1.6E-04	2.4E-04	4.1E-04	9.5E-06	9.5E-06	1.6E-04	2.4E-04	1.2E-03	1.3E-04	1.4E-04	2.3E-07	1.2E-05
Fen orchid	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
Fungi	5.3E-04	5.7E-02	8.0E-01	1.5E-03	4.2E-04	6.1E-05	8.9E-04	1.1E-03	4.9E-04	3.5E-04	7.0E-04	4.4E-05	4.4E-05	2.5E-04	3.5E-04	2.4E-01	3.9E-04	7.3E-02	4.2E-02	4.4E-02
Gadwall	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Golden plover	2.0E-09	6.8E-06	6.7E-03	1.8E-07	2.4E-04	6.7E-07	1.5E-04	3.2E-04	5.5E-06	7.0E-05	4.1E-05	2.3E-06	2.3E-06	4.7E-05	7.0E-05	3.5E-04	7.0E-06	7.2E-06	5.6E-08	3.2E-06
Great crested newt	8.7E-09	2.4E-05	1.9E-02	6.3E-07	2.6E-04	9.7E-07	7.6E-04	5.1E-04	1.5E-05	1.1E-04	8.1E-05	3.5E-06	3.5E-06	7.6E-05	1.1E-04	5.4E-04	1.6E-05	1.6E-05	5.3E-08	4.9E-06
Greater horseshoe bat	6.8E-10	1.5E-05	1.0E-02	4.3E-07	6.1E-04	4.1E-06	8.4E-04	1.2E-04	7.7E-06	2.8E-05	2.9E-05	1.0E-06	1.0E-06	1.9E-05	2.8E-05	1.4E-04	6.8E-06	6.9E-06	1.7E-08	1.3E-06
Grey plover	2.0E-09	6.8E-06	6.7E-03	1.8E-07	2.4E-04	6.7E-07	1.5E-04	3.2E-04	5.5E-06	7.0E-05	4.1E-05	2.3E-06	2.3E-06	4.7E-05	7.0E-05	3.5E-04	7.0E-06	7.2E-06	5.6E-08	3.2E-06
Hen harrier (male and female)	4.1E-09	1.4E-05	1.1E-02	3.7E-07	4.3E-04	1.6E-06	7.6E-04	2.9E-04	8.4E-06	6.5E-05	4.6E-05	2.0E-06	2.0E-06	4.3E-05	6.5E-05	3.1E-04	8.9E-06	9.0E-06	3.0E-08	2.8E-06
Herb	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
Herb. mammal	4.2E-09	1.4E-05	1.4E-02	3.7E-07	1.3E-04	3.7E-07	1.5E-04	6.5E-04	1.1E-05	1.5E-04	8.4E-05	4.8E-06	4.8E-06	9.7E-05	1.5E-04	7.2E-04	1.4E-05	1.5E-05	1.2E-07	6.6E-06
Honey buzzard	4.1E-09	1.4E-05	1.1E-02	3.7E-07	4.3E-04	1.6E-06	7.6E-04	2.9E-04	8.4E-06	6.5E-05	4.6E-05	2.0E-06	2.0E-06	4.3E-05	6.5E-05	3.1E-04	8.9E-06	9.0E-06	3.0E-08	2.8E-06
Kittewake	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Knot	2.0E-09	6.8E-06	6.7E-03	1.8E-07	2.4E-04	6.7E-07	1.5E-04	3.2E-04	5.5E-06	7.0E-05	4.1E-05	2.3E-06	2.3E-06	4.7E-05	7.0E-05	3.5E-04	7.0E-06	7.2E-06	5.6E-08	3.2E-06
Lapwing	3.3E-09	8.0E-06	5.2E-03	2.1E-07	2.3E-04	6.2E-07	6.9E-04	3.1E-04	4.1E-06	6.7E-05	3.5E-05	2.3E-06	2.3E-06	4.4E-05	6.7E-05	3.4E-04	5.9E-06	6.2E-06	6.2E-08	3.1E-06
Lesser black-backed gull (male and female)	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Lesser horseshoe bat	6.8E-10	1.5E-05	1.0E-02	4.3E-07	6.1E-04	4.1E-06	8.4E-04	1.2E-04	7.7E-06	2.8E-05	2.9E-05	1.0E-06	1.0E-06	1.9E-05	2.8E-05	1.4E-04	6.8E-06	6.9E-06	1.7E-08	1.3E-06
Lichen	1.3E-07	3.5E-04	1.6E-01	9.1E-06	3.4E-04	8.6E-06	9.7E-04	5.0E-04	1.0E-04	1.2E-04	2.4E-04	4.9E-06	4.9E-06	8.0E-05	1.2E-04	6.4E-04	8.6E-05	8.6E-05	1.2E-07	6.1E-06
Marsh harrier	4.1E-09	1.4E-05	1.1E-02	3.7E-07	4.3E-04	1.6E-06	7.6E-04	2.9E-04	8.4E-06	6.5E-05	4.6E-05	2.0E-06	2.0E-06	4.3E-05	6.5E-05	3.1E-04	8.9E-06	9.0E-06	3.0E-08	2.8E-06
Mediterranean gull	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Natterjack toad	8.7E-09	2.4E-05	1.9E-02	6.3E-07	2.6E-04	9.7E-07	7.6E-04	5.1E-04	1.5E-05	1.1E-04	8.1E-05	3.5E-06	3.5E-06	7.6E-05	1.1E-04	5.4E-04	1.6E-05	1.6E-05	5.3E-08	4.9E-06
Nightjar	1.1E-08	3.7E-05	2.5E-02	9.9E-07	4.6E-04	3.1E-06	8.4E-04	3.1E-04	1.9E-05	7.0E-05	7.2E-05	2.6E-06	2.6E-06	4.7E-05	7.0E-05	3.4E-04	1.7E-05	1.7E-05	4.2E-08	3.2E-06
Otter (male and female)	6.9E-09	1.7E-05	1.1E-02	4.3E-07	1.3E-04	3.4E-07	6.9E-04	6.3E-04	8.5E-06	1.4E-04	7.2E-05	4.8E-06	4.8E-06	9.0E-05	1.4E-04	7.0E-04	1.2E-05	1.3E-05	1.3E-07	6.5E-06
Oystercatcher	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Peregrine	1.6E-09	6.0E-06	5.3E-03	1.6E-07	4.2E-04	1.1E-06	7.4E-04	2.8E-04	4.2E-06	6.3E-05	3.4E-05	1.7E-06	1.7E-06	4.2E-05	6.3E-05	3.0E-04	5.8E-06	5.9E-06	2.4E-08	2.6E-06
Petal wort	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
Pink-footed goose	3.3E-09	8.0E-06	5.2E-03	2.1E-07	2.3E-04	6.2E-07	6.9E-04	3.1E-04	4.1E-06	6.7E-05	3.5E-05	2.3E-06	2.3E-06	4.4E-05	6.7E-05	3.4E-04	5.9E-06	6.2E-06	6.2E-08	3.1E-06
Pintail	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Redshank	1.6E-08	4.3E-05	2.9E-02	1.1E-06	2.8E-04	1.8E-06	8.4E-04	3.6E-04	2.2E-05	8.1E-05	8.4E-05	3.0E-06	3.0E-06	5.4E-05	8.1E-05	3.9E-04	2.0E-05	2.0E-05	4.8E-08	3.7E-06

Table A3.10 Continued

Organism	Weighted external dose rates (microgray/h per Bq/m^3 air)							Weighted external dose rates (microgray/h per Bq/kg soil)												
	H-3	C-14	P-32	S-35	Ar-41	Kr-85	Rn-222	Co-60	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Reptile	1.1E-08	3.1E-05	2.5E-02	8.1E-07	1.7E-04	6.5E-07	7.6E-04	6.6E-04	1.9E-05	1.5E-04	1.0E-04	4.5E-06	4.5E-06	9.9E-05	1.5E-04	7.0E-04	2.0E-05	2.1E-05	6.9E-08	6.3E-06
Ringed plover	1.6E-08	4.3E-05	2.9E-02	1.1E-06	2.8E-04	1.8E-06	8.4E-04	3.6E-04	2.2E-05	8.1E-05	8.4E-05	3.0E-06	3.0E-06	5.4E-05	8.1E-05	3.9E-04	2.0E-05	2.0E-05	4.8E-08	3.7E-06
Rodent	3.9E-08	1.1E-04	7.3E-02	2.7E-06	1.2E-04	8.9E-07	8.5E-04	7.9E-04	5.5E-05	1.8E-04	2.0E-04	6.7E-06	6.7E-06	1.2E-04	1.8E-04	8.8E-04	4.8E-05	4.9E-05	1.3E-07	8.6E-06
Ruff	2.0E-09	6.8E-06	6.7E-03	1.8E-07	2.4E-04	6.7E-07	1.5E-04	3.2E-04	5.5E-06	7.0E-05	4.1E-05	2.3E-06	2.3E-06	4.7E-05	7.0E-05	3.5E-04	7.0E-06	7.2E-06	5.6E-08	3.2E-06
Sand lizard	9.4E-09	2.6E-05	2.1E-02	6.9E-07	2.3E-04	8.6E-07	7.6E-04	5.5E-04	1.6E-05	1.2E-04	8.8E-05	3.8E-06	3.8E-06	8.3E-05	1.2E-04	5.9E-04	1.7E-05	1.7E-05	5.8E-08	5.3E-06
Sanderling	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Seed	1.1E-06	3.8E-03	6.8E-01	1.0E-04	3.9E-04	3.2E-05	1.2E-03	1.1E-03	4.0E-04	3.0E-04	6.6E-04	1.2E-05	1.2E-05	2.0E-04	3.0E-04	1.6E-03	3.2E-04	3.3E-04	3.6E-07	1.4E-05
Shore dock	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
Short-eared owl	1.5E-09	5.9E-06	5.8E-03	1.6E-07	4.0E-04	1.1E-06	1.5E-04	2.7E-04	4.7E-06	6.1E-05	3.5E-05	2.0E-06	2.0E-06	4.0E-05	6.1E-05	3.0E-04	6.0E-06	6.2E-06	4.9E-08	2.8E-06
Shoveler	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Shrub	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
Smooth snake	9.4E-09	2.6E-05	2.1E-02	6.9E-07	2.3E-04	8.6E-07	7.6E-04	5.5E-04	1.6E-05	1.2E-04	8.8E-05	3.8E-06	3.8E-06	8.3E-05	1.2E-04	5.9E-04	1.7E-05	1.7E-05	5.8E-08	5.3E-06
Snipe	2.0E-09	6.8E-06	6.7E-03	1.8E-07	2.4E-04	6.7E-07	1.5E-04	3.2E-04	5.5E-06	7.0E-05	4.1E-05	2.3E-06	2.3E-06	4.7E-05	7.0E-05	3.5E-04	7.0E-06	7.2E-06	5.6E-08	3.2E-06
Stag beetle	2.7E-08	7.3E-05	5.0E-02	1.9E-06	2.8E-04	2.0E-06	8.5E-04	5.4E-04	3.8E-05	1.2E-04	1.4E-04	4.6E-06	4.6E-06	8.3E-05	1.2E-04	6.1E-04	3.3E-05	3.3E-05	8.9E-08	5.9E-06
Stone curlew	5.6E-09	1.6E-05	1.2E-02	4.2E-07	2.6E-04	9.7E-07	7.6E-04	3.3E-04	9.8E-06	7.5E-05	5.3E-05	2.3E-06	2.3E-06	5.0E-05	7.5E-05	3.6E-04	1.0E-05	1.0E-05	3.5E-08	3.2E-06
Teal	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Tree	5.8E-07	1.9E-03	5.6E-01	4.9E-05	3.7E-04	1.9E-05	1.1E-03	1.1E-03	3.3E-04	2.8E-04	6.2E-04	1.1E-05	1.1E-05	1.8E-04	2.8E-04	1.5E-03	2.7E-04	2.8E-04	3.1E-07	1.4E-05
White-fronted goose	2.2E-09	6.9E-06	6.1E-03	1.8E-07	2.5E-04	6.7E-07	7.4E-04	3.3E-04	4.9E-06	7.3E-05	4.0E-05	2.0E-06	2.0E-06	4.9E-05	7.3E-05	3.4E-04	6.7E-06	6.8E-06	2.8E-08	3.0E-06
Whooper swan	1.5E-09	4.7E-06	3.1E-03	1.3E-07	3.4E-04	8.9E-07	6.9E-04	1.8E-04	2.4E-06	3.9E-05	2.0E-05	1.4E-06	1.4E-06	2.6E-05	3.9E-05	2.0E-04	3.5E-06	3.6E-06	3.6E-08	1.8E-06
Wigeon	2.5E-09	9.4E-06	7.3E-03	2.5E-07	3.7E-04	1.4E-06	7.6E-04	2.0E-04	5.7E-06	4.4E-05	3.1E-05	1.3E-06	1.3E-06	2.9E-05	4.4E-05	2.1E-04	6.0E-06	6.1E-06	2.0E-08	1.9E-06
Woodlark	4.1E-09	1.4E-05	1.1E-02	3.7E-07	4.3E-04	1.6E-06	7.6E-04	2.9E-04	8.4E-06	6.5E-05	4.6E-05	2.0E-06	2.0E-06	4.3E-05	6.5E-05	3.1E-04	8.9E-06	9.0E-06	3.0E-08	2.8E-06
Woodlouse	1.9E-07	4.5E-04	1.7E-01	1.2E-05	3.4E-04	1.0E-05	9.8E-04	5.0E-04	1.1E-04	1.2E-04	2.4E-04	5.0E-06	5.0E-06	8.1E-05	1.2E-04	6.5E-04	9.1E-05	9.2E-05	1.3E-07	6.3E-06

Table A3.11 Terrestrial weighted total dose rate per unit concentration factors

Organism	Weighted total dose rates (microgray/h per Bq/m^3 air)							Weighted total dose rates (microgray/h per Bq/kg soil)												
	H-3	C-14	P-32	S-35	Ar-41	Kr-85	Rn-222	Co-60	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Ant	1.6E-03	8.7E-03	3.5E-01	1.4E-03	2.5E-04	1.1E-05	4.4E-02	6.8E-04	1.4E-03	1.7E-04	3.7E-04	5.2E-05	5.2E-05	2.0E-04	1.7E-04	3.7E-01	1.6E-04	7.3E-02	8.1E-04	8.9E-04
Bacteria	5.3E-04	5.4E-02	7.5E-01	1.4E-03	1.0E-07	1.5E-08	1.5E-07	1.1E-03	4.6E-04	3.3E-04	6.5E-04	4.2E-05	4.2E-05	2.3E-04	3.3E-04	2.4E-01	3.7E-04	7.3E-02	4.2E-02	4.4E-02
Bechsteins bat	1.4E-03	2.0E-02	2.6E-01	1.4E-03	6.1E-04	4.1E-06	1.1E-02	2.0E-04	2.8E-03	1.4E-03	9.4E-04	4.9E-05	4.9E-05	1.3E-04	1.4E-03	3.7E-01	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Bee	1.5E-03	1.2E-02	1.6E-01	1.4E-03	6.0E-04	6.7E-06	1.7E-02	1.6E-04	2.5E-03	3.8E-05	5.6E-05	4.8E-05	4.8E-05	1.4E-04	3.8E-05	3.7E-01	1.9E-05	7.3E-02	1.1E-04	1.3E-04
Bewicks swan	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.4E-04	8.9E-07	2.7E-03	4.1E-04	3.2E-03	3.7E-04	1.2E-03	5.2E-05	5.2E-05	1.8E-04	3.7E-04	2.1E-02	8.5E-06	7.3E-02	4.2E-02	4.4E-02
Bird	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.2E-04	1.1E-06	3.7E-03	4.5E-04	3.2E-03	3.5E-04	1.2E-03	5.4E-05	5.4E-05	1.8E-04	3.5E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Bird egg	1.5E-03	8.1E-03	1.4E-01	1.4E-03	3.1E-04	2.0E-06	1.0E-02	5.7E-04	2.9E-03	1.5E-03	1.0E-03	5.2E-05	5.2E-05	1.9E-04	1.5E-03	3.7E-01	3.2E-05	7.3E-02	4.2E-02	4.4E-02
Black-tailed godwit	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Brent goose	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Car. mammal	1.4E-03	2.0E-02	2.8E-01	1.4E-03	1.6E-04	4.1E-07	2.5E-03	8.2E-04	3.2E-03	2.0E-03	1.3E-03	5.5E-05	5.5E-05	2.4E-04	2.0E-03	3.7E-01	1.6E-05	7.3E-02	4.2E-02	4.4E-02
Caterpillar	1.5E-03	1.2E-02	1.4E-01	1.4E-03	6.6E-04	1.2E-05	2.0E-02	1.3E-04	2.1E-03	1.2E-03	5.4E-05	4.8E-05	4.8E-05	1.3E-04	1.2E-03	3.7E-01	2.0E-05	7.2E-02	4.2E-02	4.4E-02
Chough	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.4E-04	8.9E-07	2.7E-03	4.1E-04	3.2E-03	3.7E-04	1.2E-03	5.2E-05	5.2E-05	1.8E-04	3.7E-04	2.1E-02	8.5E-06	7.3E-02	4.2E-02	4.4E-02
Curlew	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Dartford warbler	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.3E-04	1.6E-06	3.4E-03	4.4E-04	3.1E-03	3.4E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.4E-04	2.1E-02	1.4E-05	7.3E-02	4.2E-02	4.4E-02
Desmoulins whorl snail	1.5E-03	1.2E-02	1.9E-01	1.4E-03	4.9E-04	8.9E-06	2.0E-02	3.1E-04	2.1E-03	1.2E-03	1.3E-04	4.9E-05	4.9E-05	1.6E-04	1.2E-03	3.7E-01	4.6E-05	7.2E-02	4.2E-02	4.4E-02
Dormouse	1.4E-03	2.0E-02	3.0E-01	1.4E-03	2.5E-04	1.6E-06	1.0E-02	6.8E-04	2.9E-03	1.4E-04	1.0E-03	5.3E-05	5.3E-05	2.1E-04	1.4E-04	8.4E-03	3.8E-05	2.4E-04	3.0E-05	2.3E-05
Dunlin	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.2E-04	1.1E-06	3.7E-03	4.5E-04	3.2E-03	3.5E-04	1.2E-03	5.4E-05	5.4E-05	1.8E-04	3.5E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Early gentian	1.2E-03	1.7E-02	6.2E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	1.3E-03	2.9E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.9E-04	6.7E-02	2.8E-04	4.8E-04	1.2E-04	2.0E-05
Earthworm	1.5E-03	1.0E-02	3.3E-01	1.4E-03	7.9E-08	1.4E-09	1.4E-02	1.1E-03	2.3E-03	2.4E-04	9.3E-04	5.6E-05	5.6E-05	2.6E-04	2.4E-04	3.7E-01	1.4E-04	7.3E-02	1.5E-03	1.3E-03
Fen orchid	1.2E-03	1.7E-02	6.2E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	1.3E-03	2.9E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.9E-04	6.7E-02	2.8E-04	4.8E-04	1.2E-04	2.0E-05
Fungi	2.1E-03	6.8E-02	9.2E-01	2.9E-03	4.2E-04	6.1E-05	7.8E-02	1.2E-03	4.9E-04	4.9E-04	1.4E-03	9.1E-05	9.1E-05	3.6E-04	4.9E-04	6.1E-01	3.9E-04	1.5E-01	8.3E-02	8.9E-02
Gadwall	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Golden plover	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.4E-04	6.7E-07	3.3E-03	5.2E-04	3.2E-03	3.8E-04	1.2E-03	5.3E-05	5.3E-05	1.9E-04	3.8E-04	2.1E-02	1.2E-05	7.3E-02	4.2E-02	4.4E-02
Great crested newt	1.3E-03	2.0E-02	2.9E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	6.5E-04	3.1E-03	1.7E-03	1.2E-03	5.4E-05	5.4E-05	2.1E-04	1.7E-03	3.7E-01	2.0E-05	7.3E-02	4.2E-02	4.4E-02
Greater horseshoe bat	1.4E-03	2.0E-02	2.6E-01	1.4E-03	6.1E-04	4.1E-06	1.1E-02	2.0E-04	2.8E-03	1.4E-03	9.4E-04	4.9E-05	4.9E-05	1.3E-04	1.4E-03	3.7E-01	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Grey plover	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.4E-04	6.7E-07	3.3E-03	5.2E-04	3.2E-03	3.8E-04	1.2E-03	5.3E-05	5.3E-05	1.9E-04	3.8E-04	2.1E-02	1.2E-05	7.3E-02	4.2E-02	4.4E-02
Hen harrier (male and female)	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.3E-04	1.6E-06	3.4E-03	4.4E-04	3.1E-03	3.4E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.4E-04	2.1E-02	1.4E-05	7.3E-02	4.2E-02	4.4E-02
Herb	1.2E-03	1.7E-02	6.2E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	1.3E-03	2.9E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.9E-04	6.7E-02	2.8E-04	4.8E-04	1.2E-04	2.0E-05
Herb. mammal	1.3E-03	2.1E-02	3.1E-01	1.4E-03	1.3E-04	3.7E-07	3.2E-03	8.6E-04	3.2E-03	5.6E-04	1.2E-03	5.6E-05	5.6E-05	2.4E-04	5.6E-04	3.7E-01	1.4E-05	4.3E-04	6.0E-06	1.6E-05
Honey buzzard	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.3E-04	1.6E-06	3.4E-03	4.4E-04	3.1E-03	3.4E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.4E-04	2.1E-02	1.4E-05	7.3E-02	4.2E-02	4.4E-02
Kittewake	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Knot	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.4E-04	6.7E-07	3.3E-03	5.2E-04	3.2E-03	3.8E-04	1.2E-03	5.3E-05	5.3E-05	1.9E-04	3.8E-04	2.1E-02	1.2E-05	7.3E-02	4.2E-02	4.4E-02
Lapwing	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.3E-04	6.2E-07	2.6E-03	5.4E-04	3.2E-03	4.0E-04	1.2E-03	5.3E-05	5.3E-05	2.0E-04	4.0E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Lesser black-backed gull (male and female)	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Lesser horseshoe bat	1.4E-03	2.0E-02	2.6E-01	1.4E-03	6.1E-04	4.1E-06	1.1E-02	2.0E-04	2.8E-03	1.4E-03	9.4E-04	4.9E-05	4.9E-05	1.3E-04	1.4E-03	3.7E-01	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Lichen	1.6E-03	1.4E-03	1.7E-01	4.2E-03	3.4E-04	8.6E-06	7.8E-02	5.5E-04	1.9E-03	2.2E-04	6.3E-04	5.1E-05	5.1E-05	1.8E-04	2.2E-04	3.4E-02	8.8E-05	7.3E-02	3.9E-02	4.4E-02
Marsh harrier	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.3E-04	1.6E-06	3.4E-03	4.4E-04	3.1E-03	3.4E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.4E-04	2.1E-02	1.4E-05	7.3E-02	4.2E-02	4.4E-02
Mediterranean gull	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Natterjack toad	1.3E-03	2.0E-02	2.9E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	6.5E-04	3.1E-03	1.7E-03	1.2E-03	5.4E-05	5.4E-05	2.1E-04	1.7E-03	3.7E-01	2.0E-05	7.3E-02	4.2E-02	4.4E-02
Nightjar	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.6E-04	3.1E-06	1.0E-02	3.8E-04	2.8E-03	3.1E-04	9.8E-04	5.1E-05	5.1E-05	1.6E-04	3.1E-04	2.1E-02	2.2E-05	7.3E-02	4.2E-02	4.4E-02
Otter (male and female)	1.4E-03	2.0E-02	2.8E-01	1.4E-03	1.3E-04	3.4E-07	2.4E-03	8.7E-04	3.2E-03	2.0E-03	1.3E-03	5.6E-05	5.6E-05	2.5E-04	2.0E-03	3.7E-01	1.7E-05	7.3E-02	4.2E-02	4.4E-02
Oystercatcher	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Peregrine	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.2E-04	1.1E-06	3.7E-03	4.5E-04	3.2E-03	3.5E-04	1.2E-03	5.4E-05	5.4E-05	1.8E-04	3.5E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Petal wort	1.2E-03	1.7E-02	6.2E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	1.3E-03	2.9E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.9E-04	6.7E-02	2.8E-04	4.8E-04	1.2E-04	2.0E-05
Pink-footed goose	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.3E-04	6.2E-07	2.6E-03	5.4E-04	3.2E-03	4.0E-04	1.2E-03	5.3E-05	5.3E-05	2.0E-04	4.0E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Pintail	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Redshank	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.8E-04	1.8E-06	1.0E-02	4.3E-04	2.8E-03	3.2E-04	9.9E-04	5.1E-05	5.1E-05	1.7E-04	3.2E-04	2.1E-02	2.4E-05	7.3E-02	4.2E-02	4.4E-02

Table A3.11 Continued

Organism	Weighted total dose rates (microgray/h per Bq/m^3 air)							Weighted total dose rates (microgray/h per Bq/kg soil)												
	H-3	C-14	P-32	S-35	Ar-41	Kr-85	Rn-222	Co-60	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Reptile	1.3E-03	2.0E-02	2.9E-01	1.4E-03	1.7E-04	6.5E-07	3.1E-03	8.0E-04	3.1E-03	1.7E-03	1.2E-03	5.5E-05	5.5E-05	2.3E-04	1.7E-03	3.7E-01	2.5E-05	7.3E-02	4.2E-02	4.4E-02
Ringed plover	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.8E-04	1.8E-06	1.0E-02	4.3E-04	2.8E-03	3.2E-04	9.9E-04	5.1E-05	5.1E-05	1.7E-04	3.2E-04	2.1E-02	2.4E-05	7.3E-02	4.2E-02	4.4E-02
Rodent	1.4E-03	2.0E-02	3.2E-01	1.4E-03	1.2E-04	8.9E-07	8.9E-03	8.6E-04	2.8E-03	1.8E-04	1.1E-03	5.5E-05	5.5E-05	2.4E-04	1.8E-04	8.7E-03	5.2E-05	2.6E-04	3.0E-05	2.6E-05
Ruff	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.4E-04	6.7E-07	3.3E-03	5.2E-04	3.2E-03	3.8E-04	1.2E-03	5.3E-05	5.3E-05	1.9E-04	3.8E-04	2.1E-02	1.2E-05	7.3E-02	4.2E-02	4.4E-02
Sand lizard	1.3E-03	2.0E-02	2.9E-01	1.4E-03	2.3E-04	8.6E-07	3.2E-03	7.0E-04	3.1E-03	1.7E-03	1.2E-03	5.5E-05	5.5E-05	2.2E-04	1.7E-03	3.7E-01	2.2E-05	7.3E-02	4.2E-02	4.4E-02
Sanderling	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Seed	8.9E-05	1.3E-01	9.6E-01	1.4E-03	3.9E-04	3.2E-05	7.8E-02	1.1E-03	9.9E-04	9.4E-04	7.3E-04	5.6E-05	5.6E-05	2.6E-04	9.4E-04	3.7E-01	3.2E-04	7.3E-02	4.2E-02	2.1E-05
Shore dock	1.2E-03	1.7E-02	6.2E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	1.3E-03	2.9E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.9E-04	6.7E-02	2.8E-04	4.8E-04	1.2E-04	2.0E-05
Short-eared owl	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.0E-04	1.1E-06	3.5E-03	4.8E-04	3.2E-03	3.7E-04	1.2E-03	5.3E-05	5.3E-05	1.9E-04	3.7E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Shoveler	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Shrub	1.5E-03	1.4E-02	6.1E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	3.4E-04	2.9E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.9E-04	7.6E-02	2.8E-04	4.8E-04	1.2E-04	2.0E-05
Smooth snake	1.3E-03	2.0E-02	2.9E-01	1.4E-03	2.3E-04	8.6E-07	3.2E-03	7.0E-04	3.1E-03	1.7E-03	1.2E-03	5.5E-05	5.5E-05	2.2E-04	1.7E-03	3.7E-01	2.2E-05	7.3E-02	4.2E-02	4.4E-02
Snipe	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.4E-04	6.7E-07	3.3E-03	5.2E-04	3.2E-03	3.8E-04	1.2E-03	5.3E-05	5.3E-05	1.9E-04	3.8E-04	2.1E-02	1.2E-05	7.3E-02	4.2E-02	4.4E-02
Stag beetle	1.4E-03	1.6E-02	2.5E-01	1.4E-03	2.8E-04	2.0E-06	9.1E-03	6.2E-04	2.8E-03	1.3E-04	1.0E-03	5.3E-05	5.3E-05	2.0E-04	1.3E-04	3.7E-01	3.7E-05	7.3E-02	2.7E-03	2.3E-03
Stone curlew	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.6E-04	9.7E-07	3.2E-03	4.8E-04	3.1E-03	3.5E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.5E-04	2.1E-02	1.5E-05	7.3E-02	4.2E-02	4.4E-02
Teal	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Tree	1.1E-03	3.6E-02	7.1E-01	4.1E-03	3.7E-04	1.9E-05	7.8E-02	1.1E-03	5.5E-04	2.8E-04	7.8E-04	5.6E-05	5.6E-05	2.7E-04	2.8E-04	3.9E-02	2.8E-04	1.5E-02	2.2E-02	9.5E-03
White-fronted goose	1.3E-03	2.0E-02	2.8E-01	1.4E-03	2.5E-04	6.7E-07	3.5E-03	4.9E-04	3.2E-03	3.6E-04	1.2E-03	5.4E-05	5.4E-05	1.9E-04	3.6E-04	2.1E-02	1.2E-05	7.3E-02	4.2E-02	4.4E-02
Whooper swan	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.4E-04	8.9E-07	2.7E-03	4.1E-04	3.2E-03	3.7E-04	1.2E-03	5.2E-05	5.2E-05	1.8E-04	3.7E-04	2.1E-02	8.5E-06	7.3E-02	4.2E-02	4.4E-02
Wigeon	1.3E-03	2.0E-02	2.8E-01	1.4E-03	3.7E-04	1.4E-06	3.4E-03	3.4E-04	3.1E-03	3.2E-04	1.1E-03	5.2E-05	5.2E-05	1.6E-04	3.2E-04	2.1E-02	1.1E-05	7.3E-02	4.2E-02	4.4E-02
Woodlark	1.3E-03	2.0E-02	2.8E-01	1.4E-03	4.3E-04	1.6E-06	3.4E-03	4.4E-04	3.1E-03	3.4E-04	1.1E-03	5.3E-05	5.3E-05	1.8E-04	3.4E-04	2.1E-02	1.4E-05	7.3E-02	4.2E-02	4.4E-02
Woodlouse	1.4E-03	1.6E-02	2.9E-01	1.4E-03	3.4E-04	1.0E-05	2.9E-02	5.5E-04	1.8E-03	1.3E-04	6.1E-04	5.1E-05	5.1E-05	1.8E-04	1.3E-04	3.7E-01	9.4E-05	7.2E-02	2.7E-03	2.3E-03

Table A3.12 Parameter assumptions for deriving water concentrations per unit release for releases to estuary or coastal waters

Parameter	Value	Comment
Volume (m^3)	2.00E+08	RP 72[a] – Springfields
Depth (m)	1.00E+01	RP 72[a] – Springfields
Actual coastline length (m)	1.00E+04	Default data from DORIS (PCCREAM98 marine dispersion model)[b]
Coastline length entered into DORIS (m)	1.00E+04	Default data from DORIS (PCCREAM98 marine dispersion model)[b]
Volumetric exchange (m^3/y)	3.20E+09	RP 72[a] – Equates to 100 m^3/s
Suspended sediment load (t/m^3)	1.00E-05	RP 72[a] – Heysham
Sedimentation rate ($t/m^2/y$)	5.00E-03	RP 72[a] – Springfields
Dry sediment density (t/m^3)	2.60E+00	RP 72[a] – Default value
Bioturbation rate (lakes and coastal waters) (m^2/y)	3.60E-05	RP 72[a] – Default value
Diffusion rate (sediment diffusion coefficient) (m^2/y)	3.15E-02	RP 72[a] – Default value
Regional compartment used	Liverpool and Morecambe Bays Regional Marine Compartment	RP 72[a] – Springfields or Heysham

[a]Simmonds et al. (1995).
[b]Mayall et al. (1997).

Table A3.13 Coastal water concentrations per unit release

Radionuclide	Water concentration per unit release for exchange rate of 100 m^3/s		
	Bq/l per TBq/y	Bq/m^3 per TBq/y	Bq/m^3 per Bq/y
H-3	3.2E-01	3.2E+02	3.2E-10
C-14	3.0E-01	3.0E+02	3.0E-10
P-32	1.5E-01	1.5E+02	1.5E-10
S-35	2.7E-01	2.7E+02	2.7E-10
Co-60	3.6E-02	3.6E+01	3.6E-11
Sr-90	3.1E-01	3.1E+02	3.1E-10
Tc-99	3.2E-01	3.2E+02	3.2E-10
Tc-99m	4.9E-03	4.9E+00	4.9E-12
Ru-106	3.0E-01	3.0E+02	3.0E-10
I-125	2.5E-01	2.5E+02	2.5E-10
I-129	3.2E-01	3.2E+02	3.2E-10
I-131	1.1E-01	1.1E+02	1.1E-10
Cs-137	2.9E-01	2.9E+02	2.9E-10
Po-210	3.0E-04	3.0E-01	3.0E-13
Th-234	3.2E-03	3.2E+00	3.2E-12
U-238	3.1E-01	3.1E+02	3.1E-10
Pu-239	7.1E-02	7.1E+01	7.1E-11
Am-241	4.5E-03	4.5E+00	4.5E-12

Table A3.14 Freshwater concentrations per unit release

Radionuclide	Water concentration per unit release for river flow rate of 1 m^3/s	
	Bq/l per Bq/y[a]	Bq/m^3 per Bq/y
H-3	3.2E-11	3.2E-08
C-14	2.9E-11	2.9E-08
P-32	3.1E-11	3.1E-08
S-35	2.8E-11	2.8E-08
Co-60	1.8E-11	1.8E-08
Sr-90	2.9E-11	2.9E-08
Tc-99	3.1E-11	3.1E-08
Tc-99m	3.1E-11	3.1E-08
Ru-106	2.5E-11	2.5E-08
I-125	3.1E-11	3.1E-08
I-129	3.1E-11	3.1E-08
I-131	3.1E-11	3.1E-08
Cs-137	2.9E-11	2.9E-08
Po-210	2.5E-11	2.5E-08
Th-234[b]	2.3E-11	2.3E-08
U-238	3.2E-11	3.2E-08
Pu-239	5.9E-12	5.9E-09
Am-241	1.8E-12	1.8E-09

[a]Allott and Titley (2005).
[b]Assumed to be the same as thorium-230.

Table A3.15 Soil concentrations per unit release

Radionuclide	Deposit rate per unit release[a] ($Bq/m^2/s$ per Bq/s)	Deposit rate per unit release ($Bq/m^2/y$ per Bq/y)	50th year soil conc. per unit deposit[b] (Bq/kg per $Bq/m^2/y$)	50th year soil conc. per unit release (Bq/kg per Bq/y)
Co-60	9.0E-08	9.0E-08	2.1E-01	1.9E-08
Sr-90	9.0E-08	9.0E-08	1.6E-01	1.4E-08
Tc-99m	9.0E-08	9.0E-08	8.7E-05	7.8E-12
Ru-106	9.0E-08	9.0E-08	8.6E-02	7.7E-09
I-125	8.1E-07	8.1E-07	1.8E-02	1.5E-08
I-129	8.1E-07	8.1E-07	3.3E-01	2.7E-07
I-131	8.1E-07	8.1E-07	2.5E-03	2.0E-09
Cs-137	9.0E-08	9.0E-08	3.0E-01	2.7E-08
Ra-226	9.0E-08	9.0E-08	3.2E-01	2.9E-08
Th-234	9.0E-08	9.0E-08	7.5E-03	6.8E-10
U-238	9.0E-08	9.0E-08	3.2E-01	2.9E-08
Pu-239	9.0E-08	9.0E-08	3.3E-01	3.0E-08
Am-241	9.0E-08	9.0E-08	3.3E-01	3.0E-08

[a]Titley et al. (2000a).
[b]Allott and Titley (2005) (Table A4.6 in this reference).

Table A3.16 Marine/coastal waters dose rate per unit release factors (microgray/h per Bq/y)

Organism	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta/ gamma ($t_{1/2}$ <1 day)	Other beta/ gamma ($t_{1/2}$ 1–10 days)	Other beta/ gamma ($t_{1/2}$ >10 days)
Worst affected	**3.1E-18**	**1.7E-13**	**1.7E-13**	**4.8E-13**	**1.5E-13**	**6.3E-12**	**2.0E-13**	**1.5E-13**	**1.3E-14**	**5.3E-11**	**3.3E-14**	**5.5E-14**	**7.4E-14**	**2.4E-13**	**3.6E-10**	**3.6E-10**	**3.3E-12**	**3.2E-11**	**4.2E-10**	**5.7E-10**	**4.2E-10**	**1.3E-14**	**7.4E-14**	**2.4E-13**
Allis shad	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.9E-13	5.4E-16	5.6E-16	1.1E-16	8.2E-16	9.3E-17	1.7E-16	1.7E-16	1.0E-14	3.6E-14	3.6E-14	4.8E-15	3.2E-14	1.7E-13	1.6E-14	1.7E-13	1.1E-16	1.7E-16	1.0E-14
Atlantic salmon	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.9E-13	5.4E-16	5.6E-16	1.1E-16	8.2E-16	9.3E-17	1.7E-16	1.7E-16	1.0E-14	3.6E-14	3.6E-14	4.8E-15	3.2E-14	1.7E-13	1.6E-14	1.7E-13	1.1E-16	1.7E-16	1.0E-14
Avocet	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Bacteria	3.1E-18	6.8E-15	6.8E-15	1.9E-13	6.1E-15	4.3E-12	8.0E-14	7.6E-16	2.7E-15	3.4E-14	1.0E-16	1.7E-16	3.0E-16	1.6E-13	1.4E-10	1.4E-10	1.3E-12	1.3E-11	1.7E-10	2.3E-10	1.7E-10	2.7E-15	3.0E-16	1.6E-13
Bar-tailed godwit	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Benthic fish	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.7E-12	2.0E-15	5.6E-16	8.0E-16	3.4E-15	9.4E-17	1.7E-16	2.2E-16	5.1E-14	3.6E-14	3.6E-14	4.1E-14	3.4E-14	1.7E-13	3.6E-14	1.7E-13	8.0E-16	2.2E-16	5.1E-14
Benthic mollusc	3.1E-18	1.7E-13	1.7E-13	3.8E-13	1.5E-13	2.1E-12	1.3E-14	1.8E-14	1.6E-15	2.4E-13	8.7E-17	1.7E-16	2.1E-16	5.9E-14	1.8E-13	1.8E-13	2.2E-13	9.7E-13	1.3E-11	5.7E-12	1.3E-11	1.6E-15	2.1E-16	5.9E-14
Bewicks swan	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	3.9E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.3E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.3E-13
Bittern	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	4.4E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.4E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.4E-13
Black-tailed godwit	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Brent goose	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Chough	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	3.7E-12	2.0E-13	1.5E-13	9.9E-15	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.2E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	9.9E-15	6.0E-14	2.2E-13
Common scoter	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.1E-12	1.9E-13	1.5E-13	7.3E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.3E-15	4.3E-14	1.7E-13
Common seal	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	4.2E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	5.4E-14	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	5.4E-14
Common tern	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.1E-12	1.9E-13	1.5E-13	7.3E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.3E-15	4.3E-14	1.7E-13
Cormorant	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	3.9E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.3E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.3E-13
Curlew	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Dunlin	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.9E-12	1.9E-13	1.5E-13	7.2E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.2E-15	4.3E-14	1.7E-13
Fish egg	3.1E-18	1.6E-13	1.6E-13	1.2E-13	1.5E-13	3.7E-13	5.2E-14	1.3E-13	3.4E-15	4.8E-12	1.8E-14	4.3E-14	2.5E-14	7.6E-14	3.6E-10	3.6E-10	8.2E-13	3.2E-11	4.2E-10	5.7E-10	4.2E-10	3.4E-15	2.5E-14	7.6E-14
Gadwall	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Gannet	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.9E-12	1.9E-13	1.5E-13	7.2E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.2E-15	4.3E-14	1.7E-13
Golden plover	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Great crested grebe	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Grey plover	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Grey seal	3.1E-18	1.7E-13	1.7E-13	4.8E-13	1.5E-13	6.3E-12	2.0E-13	1.5E-13	1.3E-14	5.3E-11	3.3E-14	5.5E-14	7.4E-14	5.8E-14	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.3E-14	7.4E-14	5.8E-14
Gulliemot	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Hen harrier (male and female)	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.8E-12	1.9E-13	1.5E-13	7.0E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.6E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.0E-15	4.2E-14	1.6E-13
Kittewake	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Knot	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Lapwing	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	4.4E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.4E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.4E-13
Large b. crust.	3.1E-18	1.7E-13	1.7E-13	4.0E-13	1.5E-13	2.1E-12	1.0E-14	1.5E-13	6.3E-15	2.2E-14	8.8E-17	1.7E-16	2.1E-16	5.8E-14	9.0E-13	9.0E-13	1.8E-13	3.3E-13	1.3E-12	1.7E-13	1.3E-12	6.3E-15	2.1E-16	5.8E-14
Lesser black-backed gull (male and female)	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Little tern	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.1E-12	1.9E-13	1.5E-13	7.3E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.3E-15	4.3E-14	1.7E-13
Macrophyte	3.1E-18	8.2E-14	8.2E-14	2.8E-13	7.4E-14	4.2E-12	5.6E-14	1.7E-14	2.7E-15	9.6E-14	6.1E-15	1.4E-14	9.2E-15	1.3E-13	1.8E-14	1.8E-14	9.5E-13	3.2E-12	8.4E-12	2.3E-12	8.4E-12	2.7E-15	9.2E-15	1.3E-13

Table A3.16 Continued

Organism	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
Manx shearwater	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Marsh harrier	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.8E-12	1.9E-13	1.5E-13	7.0E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.6E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.0E-15	4.2E-14	1.6E-13
Mediterranean gull	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Otter (female)	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.4E-12	1.9E-13	1.5E-13	7.5E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.8E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.5E-15	4.3E-14	1.8E-13
Otter (male)	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	4.2E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	5.4E-14	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	5.4E-14
Oystercatcher	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Pelagic fish	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.7E-12	2.0E-15	5.6E-16	8.0E-16	3.4E-15	9.4E-17	1.7E-16	2.2E-16	5.1E-14	3.6E-14	3.6E-14	4.1E-14	3.4E-14	1.7E-13	3.6E-14	1.7E-13	8.0E-16	2.2E-16	5.1E-14
Peregrine	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.9E-12	1.9E-13	1.5E-13	7.2E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.2E-15	4.3E-14	1.7E-13
Phytoplankton	3.1E-18	5.2E-16	5.2E-16	7.2E-17	4.7E-16	9.1E-17	2.0E-16	1.9E-17	2.3E-18	2.9E-14	2.0E-15	1.5E-15	5.1E-17	1.4E-16	5.4E-13	5.4E-13	5.7E-17	6.4E-13	4.2E-10	5.7E-11	4.2E-10	2.3E-18	5.1E-17	1.4E-16
Pink-footed goose	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	4.4E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.4E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.4E-13
Pintail	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Puffin	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Razorbill	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Redshank	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Ringed plover	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
River lamprey	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.7E-12	2.0E-15	5.6E-16	8.0E-16	3.4E-15	9.4E-17	1.7E-16	2.2E-16	5.1E-14	3.6E-14	3.6E-14	4.1E-14	3.4E-14	1.7E-13	3.6E-14	1.7E-13	8.0E-16	2.2E-16	5.1E-14
Ruff	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Sanderling	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Sandwich tern	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Scaup	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	3.9E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.3E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.3E-13
Sea lamprey	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	1.7E-12	1.7E-15	5.6E-16	7.8E-16	3.2E-15	1.0E-16	1.8E-16	2.2E-16	5.0E-14	3.6E-14	3.6E-14	3.6E-14	3.4E-14	1.7E-13	3.3E-14	1.7E-13	7.8E-16	2.2E-16	5.0E-14
Seabird	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Seal	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	4.2E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	5.4E-14	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	5.4E-14
Shelduck (female)	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Shelduck (male)	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.1E-12	1.9E-13	1.5E-13	7.3E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.3E-15	4.3E-14	1.7E-13
Small b. crust.	3.1E-18	1.6E-13	1.6E-13	2.2E-13	1.5E-13	2.1E-12	2.7E-14	1.7E-14	1.6E-15	1.9E-14	8.5E-17	1.6E-16	2.0E-16	6.5E-14	9.0E-13	9.0E-13	4.6E-13	3.4E-13	1.3E-12	1.8E-13	1.3E-12	1.6E-15	2.0E-16	6.5E-14
Snipe	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Storm petrel	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Teal	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Tufted duck (female)	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Tufted duck (male)	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.1E-12	1.9E-13	1.5E-13	7.3E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.3E-15	4.3E-14	1.7E-13
Turnstone	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.7E-12	1.9E-13	1.5E-13	7.4E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.4E-15	4.2E-14	1.9E-13
Twaite shad	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	1.9E-13	5.4E-16	5.6E-16	1.1E-16	8.2E-16	9.3E-17	1.7E-16	1.7E-16	1.0E-14	3.6E-14	3.6E-14	4.8E-15	3.2E-14	1.7E-13	1.6E-14	1.7E-13	1.1E-16	1.7E-16	1.0E-14
Whale	3.1E-18	1.7E-13	1.7E-13	4.8E-13	1.5E-13	5.8E-12	2.0E-13	1.5E-13	1.2E-14	5.3E-11	3.3E-14	5.5E-14	7.4E-14	1.7E-14	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.2E-14	7.4E-14	1.7E-14
White-fronted goose	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	2.8E-12	1.9E-13	1.5E-13	7.6E-15	4.6E-11	2.7E-14	5.0E-14	4.3E-14	1.9E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.6E-15	4.3E-14	1.9E-13
Whooper swan	3.1E-18	1.7E-13	1.7E-13	4.7E-13	1.5E-13	3.9E-12	2.0E-13	1.5E-13	1.0E-14	5.0E-11	2.8E-14	5.2E-14	6.0E-14	2.3E-13	3.6E-10	3.6E-10	3.3E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	1.0E-14	6.0E-14	2.3E-13
Wigeon	3.1E-18	1.7E-13	1.7E-13	4.6E-13	1.5E-13	2.0E-12	1.9E-13	1.5E-13	7.1E-15	4.6E-11	2.4E-14	4.8E-14	4.2E-14	1.7E-13	3.6E-10	3.6E-10	3.2E-12	3.2E-11	4.2E-10	5.7E-10	4.2E-10	7.1E-15	4.2E-14	1.7E-13
Zooplankton	3.1E-18	1.6E-13	1.6E-13	4.0E-14	1.5E-13	4.0E-15	2.0E-16	1.7E-15	5.0E-17	1.1E-12	1.8E-14	4.3E-14	2.8E-14	9.5E-16	5.4E-13	5.4E-13	5.4E-15	1.6E-13	4.2E-12	5.7E-13	4.2E-12	5.0E-17	2.8E-14	9.5E-16

Table A3.17 Freshwater dose rate per unit release factors (microgray/h per Bq/y)

Organism	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta/ gamma ($t_{1/2}$ <1 day)	Other beta/ gamma ($t_{1/2}$ 1–10 days)	Other beta/ gamma ($t_{1/2}$ >10 days)
Worst affected	**3.1E-16**	**6.1E-12**	**6.1E-12**	**6.0E-10**	**5.9E-12**	**5.3E-11**	**2.2E-11**	**2.4E-12**	**7.5E-12**	**1.9E-10**	**6.7E-13**	**9.8E-13**	**2.6E-12**	**5.9E-11**	**1.6E-07**	**1.6E-07**	**1.1E-10**	**2.1E-08**	**3.5E-08**	**4.5E-09**	**3.5E-08**	**7.5E-12**	**2.6E-12**	**5.9E-11**
Allis shad	3.1E-16	3.9E-12	3.9E-12	5.9E-10	3.7E-12	3.4E-12	8.0E-13	8.3E-14	2.5E-13	2.0E-13	4.5E-14	6.6E-14	1.8E-13	5.8E-11	7.7E-11	7.7E-11	1.3E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.5E-13	1.8E-13	5.8E-11
Amphibian	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.9E-11	2.2E-11	2.4E-12	6.8E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.4E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	3.5E-08	4.5E-09	3.5E-08	6.8E-12	2.4E-12	5.4E-11
Aqu. mammal	3.1E-16	6.1E-12	6.1E-12	5.4E-10	5.9E-12	1.3E-11	2.0E-11	2.4E-12	6.0E-12	1.4E-10	5.2E-13	9.0E-13	2.2E-12	4.8E-11	1.6E-07	1.6E-07	1.0E-10	2.1E-08	7.9E-11	4.5E-09	7.9E-11	6.0E-12	2.2E-12	4.8E-11
Atlantic salmon	3.1E-16	3.9E-12	3.9E-12	5.9E-10	3.7E-12	3.4E-12	8.0E-13	8.3E-14	2.5E-13	2.0E-13	4.5E-14	6.6E-14	1.8E-13	5.8E-11	7.7E-11	7.7E-11	1.3E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.5E-13	1.8E-13	5.8E-11
Avocet	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
Bacteria	3.1E-16	6.7E-13	6.7E-13	2.4E-10	6.5E-13	5.3E-11	7.7E-12	4.8E-15	3.0E-14	9.4E-13	6.8E-15	8.6E-15	4.8E-14	5.5E-12	1.7E-09	1.7E-09	4.7E-11	6.8E-11	1.4E-08	2.3E-10	1.4E-08	3.0E-14	4.8E-14	5.5E-12
Bar-tailed godwit	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
Benthic fish	3.1E-16	3.9E-12	3.9E-12	5.9E-10	3.7E-12	2.2E-11	9.4E-13	8.3E-14	2.5E-13	2.7E-13	4.0E-14	6.3E-14	1.8E-13	5.7E-11	7.7E-11	7.7E-11	2.5E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.5E-13	1.8E-13	5.7E-11
Benthic mollusc	3.1E-16	6.1E-12	6.1E-12	4.8E-10	5.9E-12	2.7E-11	4.5E-12	4.3E-14	1.9E-13	9.5E-11	1.4E-13	2.5E-13	5.9E-13	4.2E-12	1.6E-07	1.6E-07	8.4E-12	5.9E-10	2.9E-10	1.1E-11	2.9E-10	1.9E-13	5.9E-13	4.2E-12
Bewicks swan	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Bittern	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Black-tailed godwit	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
Brent goose	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.3E-11	2.2E-11	2.4E-12	7.2E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.7E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	7.2E-12	2.5E-12	5.7E-11
Brook lamprey	3.1E-16	3.9E-12	3.9E-12	6.0E-10	3.7E-12	2.1E-11	9.1E-13	8.3E-14	2.6E-13	2.7E-13	4.5E-14	6.6E-14	1.8E-13	5.9E-11	7.7E-11	7.7E-11	2.3E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.6E-13	1.8E-13	5.9E-11
Bullhead	3.1E-16	3.9E-12	3.9E-12	5.9E-10	3.7E-12	2.2E-11	9.7E-13	8.2E-14	2.3E-13	2.7E-13	4.0E-14	6.3E-14	1.7E-13	5.4E-11	7.7E-11	7.7E-11	2.8E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.3E-13	1.7E-13	5.4E-11
Common scoter	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Cormorant	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Curlew	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.3E-11	2.2E-11	2.4E-12	7.2E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.7E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	7.2E-12	2.5E-12	5.7E-11
Desmoulins whorl snail	3.1E-16	6.1E-12	6.1E-12	4.6E-10	5.9E-12	7.5E-12	3.6E-12	4.3E-14	1.2E-13	9.5E-11	1.4E-13	2.5E-13	5.8E-13	2.7E-12	1.6E-07	1.6E-07	2.3E-12	5.9E-10	2.9E-10	1.1E-11	2.9E-10	1.2E-13	5.8E-13	2.7E-12
Duck	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Dunlin	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.3E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Early gentian	3.1E-16	3.7E-12	3.7E-12	2.1E-10	3.6E-12	5.2E-11	1.2E-11	2.1E-12	6.6E-12	2.8E-11	3.0E-13	5.7E-13	1.1E-12	1.1E-11	2.1E-09	2.1E-09	4.4E-11	2.1E-08	6.3E-10	3.4E-10	6.3E-10	6.6E-12	1.1E-12	1.1E-11
Fen orchid	3.1E-16	3.7E-12	3.7E-12	2.1E-10	3.6E-12	5.2E-11	1.2E-11	2.1E-12	6.6E-12	2.8E-11	3.0E-13	5.7E-13	1.1E-12	1.1E-11	2.1E-09	2.1E-09	4.4E-11	2.1E-08	6.3E-10	3.4E-10	6.3E-10	6.6E-12	1.1E-12	1.1E-11
Gadwall	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Golden plover	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Great crested grebe	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Great crested newt	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.1E-11	2.2E-11	2.4E-12	6.8E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	3.5E-08	4.5E-09	3.5E-08	6.8E-12	2.4E-12	5.3E-11
Grey plover	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Hen harrier (female)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.2E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Hen harrier (male)	3.1E-16	6.1E-12	6.1E-12	5.8E-10	5.9E-12	1.7E-11	2.2E-11	2.4E-12	6.6E-12	1.8E-10	5.8E-13	9.3E-13	2.3E-12	5.2E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	6.6E-12	2.3E-12	5.2E-11
Knot	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Lapwing	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Large b. crust.	3.1E-16	6.1E-12	6.1E-12	5.1E-10	5.9E-12	2.8E-11	4.8E-12	2.3E-14	1.0E-13	1.1E-10	1.4E-13	2.5E-13	6.1E-13	4.5E-12	1.6E-07	1.6E-07	7.1E-12	5.9E-10	4.8E-11	1.1E-11	4.8E-11	1.0E-13	6.1E-13	4.5E-12
Lesser black-backed gull (female)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
Lesser black-backed gull (male)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.3E-11	2.2E-11	2.4E-12	7.2E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.7E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	7.2E-12	2.5E-12	5.7E-11
Macrophyte	3.1E-16	3.7E-12	3.7E-12	2.1E-10	3.6E-12	5.2E-11	1.2E-11	2.1E-12	6.6E-12	2.8E-11	3.0E-13	5.7E-13	1.1E-12	1.1E-11	2.1E-09	2.1E-09	4.4E-11	2.1E-08	6.3E-10	3.4E-10	6.3E-10	6.6E-12	1.1E-12	1.1E-11

Table A3.17 Continued

Organism	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta/ gamma ($t_{1/2}$ <1 day)	Other beta/ gamma ($t_{1/2}$ 1–10 days)	Other beta/ gamma ($t_{1/2}$ >10 days)
Marsh harrier	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.2E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Mediterranean gull	3.1E-16	6.1E-12	6.1E-12	5.8E-10	5.9E-12	2.0E-11	2.2E-11	2.4E-12	6.6E-12	1.8E-10	5.8E-13	9.3E-13	2.3E-12	5.2E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	6.6E-12	2.3E-12	5.2E-11
Natterjack toad	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.1E-11	2.2E-11	2.4E-12	6.8E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	3.5E-08	4.5E-09	3.5E-08	6.8E-12	2.4E-12	5.3E-11
Otter (male and female)	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.0E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.9E-11	4.5E-09	7.9E-11	7.4E-12	2.6E-12	5.9E-11
Oystercatcher	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	3.3E-11	2.2E-11	2.4E-12	7.2E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.7E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	7.2E-12	2.5E-12	5.7E-11
Pelagic fish	3.1E-16	3.9E-12	3.9E-12	5.9E-10	3.7E-12	2.2E-11	9.4E-13	8.3E-14	2.5E-13	2.7E-13	4.0E-14	6.3E-14	1.8E-13	5.7E-11	7.7E-11	7.7E-11	2.5E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.5E-13	1.8E-13	5.7E-11
Phytoplankton	3.1E-16	1.1E-14	1.1E-14	1.5E-14	1.1E-14	3.0E-14	1.9E-14	1.9E-15	7.6E-16	1.4E-13	5.0E-14	3.1E-14	1.1E-14	1.6E-14	9.2E-09	9.2E-09	9.0E-14	1.3E-11	6.3E-11	4.5E-09	6.3E-11	7.6E-16	1.1E-14	1.6E-14
Pink-footed goose	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Pintail	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Redshank	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
Ringed plover	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
River lamprey	3.1E-16	3.9E-12	3.9E-12	5.5E-10	3.7E-12	2.3E-11	1.2E-12	8.2E-14	2.1E-13	3.1E-13	3.6E-14	6.1E-14	1.6E-13	4.9E-11	7.7E-11	7.7E-11	4.5E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.1E-13	1.6E-13	4.9E-11
Ruff	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Sanderling	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Scaup	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Sea lamprey	3.1E-16	3.9E-12	3.9E-12	6.0E-10	3.7E-12	2.1E-11	9.1E-13	8.3E-14	2.6E-13	2.7E-13	4.5E-14	6.6E-14	1.8E-13	5.9E-11	7.7E-11	7.7E-11	2.3E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.6E-13	1.8E-13	5.9E-11
Shelduck (female)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Shelduck (male)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Shoveler	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Small b. crust.	3.1E-16	5.9E-12	5.9E-12	2.9E-10	5.7E-12	2.7E-11	4.3E-12	2.1E-14	4.6E-14	3.1E-11	1.3E-13	2.4E-13	4.9E-13	1.7E-11	1.6E-07	1.6E-07	1.7E-11	5.9E-10	4.8E-11	1.1E-11	4.8E-11	4.6E-14	4.9E-13	1.7E-11
Snipe	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Southern damselfly	3.1E-16	6.1E-12	6.1E-12	4.7E-10	5.9E-12	2.4E-11	1.7E-11	2.3E-12	5.6E-12	9.5E-11	4.8E-13	8.8E-13	2.1E-12	4.4E-11	1.6E-07	1.6E-07	8.6E-11	2.1E-08	3.5E-08	4.5E-09	3.5E-08	5.6E-12	2.1E-12	4.4E-11
Spined loach	3.1E-16	3.9E-12	3.9E-12	5.8E-10	3.7E-12	3.1E-12	7.9E-13	8.2E-14	2.3E-13	2.0E-13	3.9E-14	6.3E-14	1.6E-13	5.2E-11	7.7E-11	7.7E-11	1.3E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.3E-13	1.6E-13	5.2E-11
Teal (female)	3.1E-16	6.1E-12	6.1E-12	5.8E-10	5.9E-12	2.0E-11	2.2E-11	2.4E-12	6.6E-12	1.8E-10	5.8E-13	9.3E-13	2.3E-12	5.2E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	6.6E-12	2.3E-12	5.2E-11
Teal (male)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Tufted duck (female)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Tufted duck (male)	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Turnstone	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.9E-11	2.2E-11	2.4E-12	6.7E-12	1.8E-10	5.8E-13	9.3E-13	2.4E-12	5.3E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.2E-13	4.5E-09	7.2E-13	6.7E-12	2.4E-12	5.3E-11
Twaite shad	3.1E-16	3.9E-12	3.9E-12	5.9E-10	3.7E-12	3.4E-12	8.0E-13	8.3E-14	2.5E-13	2.0E-13	4.5E-14	6.6E-14	1.8E-13	5.8E-11	7.7E-11	7.7E-11	1.3E-12	3.3E-11	2.4E-11	3.4E-12	2.4E-11	2.5E-13	1.8E-13	5.8E-11
White-fronted goose	3.1E-16	6.1E-12	6.1E-12	6.0E-10	5.9E-12	3.4E-11	2.2E-11	2.4E-12	7.5E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.9E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.5E-12	2.6E-12	5.9E-11
Whooper swan	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.5E-11	2.2E-11	2.4E-12	7.4E-12	1.9E-10	6.7E-13	9.8E-13	2.6E-12	5.8E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.4E-12	2.6E-12	5.8E-11
Wigeon	3.1E-16	6.1E-12	6.1E-12	5.9E-10	5.9E-12	2.4E-11	2.2E-11	2.4E-12	7.1E-12	1.9E-10	5.9E-13	9.4E-13	2.5E-12	5.6E-11	1.6E-07	1.6E-07	1.1E-10	2.1E-08	7.1E-13	4.5E-09	7.1E-13	7.1E-12	2.5E-12	5.6E-11
Zooplankton	3.1E-16	3.2E-12	3.2E-12	8.2E-12	3.1E-12	4.1E-13	1.4E-13	3.4E-14	7.4E-14	1.8E-11	4.5E-13	8.5E-13	1.7E-12	6.9E-14	9.2E-09	9.2E-09	7.6E-12	3.3E-12	7.0E-12	4.5E-11	7.0E-12	7.4E-14	1.7E-12	6.9E-14

Table A3.18 Terrestrial dose rate per unit release factors (microgray/h per Bq/y)

Organism	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta/ gamma ($t_{1/2}$ <1 day)	Other beta/ gamma ($t_{1/2}$ 1–10 days)	Other beta/ gamma ($t_{1/2}$ >10 days)
Worst affected	**5.9E-15**	**3.6E-13**	**3.6E-13**	**2.7E-12**	**1.2E-14**	**1.8E-15**	**2.2E-11**	**1.7E-16**	**4.6E-11**	**1.6E-14**	**1.1E-11**	**1.3E-12**	**2.4E-11**	**7.2E-13**	**5.4E-11**	**1.8E-08**	**1.7E-13**	**1.8E-08**	**2.7E-13**	**4.2E-09**	**2.5E-09**	**2.6E-09**	**2.5E-09**	**1.6E-14**	**7.2E-13**	**5.4E-11**
Ant	4.4E-15	2.4E-14	2.4E-14	9.9E-13	3.9E-15	7.0E-16	1.3E-11	2.9E-17	2.1E-11	1.4E-15	2.9E-12	7.6E-13	1.4E-11	4.1E-13	4.7E-12	1.1E-08	1.7E-13	1.1E-08	1.1E-13	2.1E-09	2.4E-11	2.7E-11	2.4E-11	1.4E-15	4.1E-13	4.7E-12
Bacteria	1.5E-15	1.5E-13	1.5E-13	2.1E-12	3.9E-15	2.8E-19	2.0E-11	4.1E-20	6.6E-12	2.6E-15	5.1E-12	6.1E-13	1.1E-11	4.7E-13	8.9E-12	6.9E-09	1.7E-13	6.9E-09	2.5E-13	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.6E-15	4.7E-13	8.9E-12
Bechsteins bat	3.8E-15	5.5E-14	5.5E-14	7.2E-13	3.9E-15	1.7E-15	3.7E-12	1.1E-17	4.1E-11	1.1E-14	7.3E-12	7.2E-13	1.3E-11	2.7E-13	3.7E-11	1.1E-08	1.7E-13	1.1E-08	7.6E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.1E-14	2.7E-13	3.7E-11
Bee	4.2E-15	3.4E-14	3.4E-14	4.5E-13	3.9E-15	1.7E-15	3.1E-12	1.9E-17	3.6E-11	3.0E-16	4.3E-13	7.1E-13	1.3E-11	2.7E-13	1.0E-12	1.1E-08	1.7E-13	1.1E-08	1.3E-14	2.1E-09	3.3E-12	4.0E-12	3.3E-12	3.0E-16	2.7E-13	1.0E-12
Bewicks swan	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	9.4E-16	7.8E-12	2.5E-18	4.6E-11	2.9E-15	9.4E-12	7.6E-13	1.4E-11	3.7E-13	9.9E-12	5.9E-10	1.7E-13	5.9E-10	5.7E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.7E-13	9.9E-12
Bird	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.5E-12	3.1E-18	4.6E-11	2.8E-15	9.3E-12	7.9E-13	1.4E-11	3.6E-13	9.5E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.6E-13	9.5E-12
Bird egg	4.2E-15	2.2E-14	2.2E-14	3.9E-13	3.9E-15	8.6E-16	1.1E-11	5.7E-18	4.1E-11	1.1E-14	7.9E-12	7.6E-13	1.4E-11	3.9E-13	3.9E-11	1.1E-08	1.7E-13	1.1E-08	2.1E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.1E-14	3.9E-13	3.9E-11
Black-tailed godwit	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Brent goose	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Car. mammal	3.8E-15	5.5E-14	5.5E-14	7.8E-13	3.9E-15	4.3E-16	1.6E-11	1.2E-18	4.6E-11	1.6E-14	9.8E-12	8.1E-13	1.5E-11	4.9E-13	5.4E-11	1.1E-08	1.7E-13	1.1E-08	1.1E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.6E-14	4.9E-13	5.4E-11
Caterpillar	4.2E-15	3.3E-14	3.3E-14	4.0E-13	3.9E-15	1.8E-15	2.4E-12	3.3E-17	3.0E-11	9.4E-15	4.2E-13	7.0E-13	1.3E-11	2.5E-13	3.2E-11	1.1E-08	1.7E-13	1.1E-08	1.4E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	9.4E-15	2.5E-13	3.2E-11
Chough	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	9.4E-16	7.8E-12	2.5E-18	4.6E-11	2.9E-15	9.4E-12	7.6E-13	1.4E-11	3.7E-13	9.9E-12	5.9E-10	1.7E-13	5.9E-10	5.7E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.7E-13	9.9E-12
Curlew	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Dartford warbler	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.2E-12	4.5E-18	4.4E-11	2.7E-15	8.8E-12	7.7E-13	1.4E-11	3.6E-13	9.2E-12	5.9E-10	1.7E-13	5.9E-10	9.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.7E-15	3.6E-13	9.2E-12
Desmoulins whorl snail	4.2E-15	3.4E-14	3.4E-14	5.3E-13	3.9E-15	1.4E-15	5.9E-12	2.5E-17	3.0E-11	9.7E-15	1.0E-12	7.2E-13	1.3E-11	3.1E-13	3.4E-11	1.1E-08	1.7E-13	1.1E-08	3.1E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	9.7E-15	3.1E-13	3.4E-11
Dormouse	3.8E-15	5.5E-14	5.5E-14	8.3E-13	3.9E-15	6.9E-16	1.3E-11	4.5E-18	4.1E-11	1.1E-15	8.1E-12	7.8E-13	1.4E-11	4.2E-13	3.8E-12	2.4E-10	1.7E-13	2.4E-10	2.6E-14	6.9E-12	8.8E-13	6.9E-13	8.8E-13	1.1E-15	4.2E-13	3.8E-12
Dunlin	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.5E-12	3.1E-18	4.6E-11	2.8E-15	9.3E-12	7.9E-13	1.4E-11	3.6E-13	9.5E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.6E-13	9.5E-12
Early gentian	3.2E-15	4.9E-14	4.9E-14	1.7E-12	1.2E-14	1.0E-15	2.0E-11	5.4E-17	1.9E-11	2.3E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.9E-12	1.9E-09	1.7E-13	1.9E-09	1.9E-13	1.4E-11	3.5E-12	6.0E-13	3.5E-12	2.3E-15	5.4E-13	7.9E-12
Earthworm	4.1E-15	2.9E-14	2.9E-14	9.3E-13	3.9E-15	2.2E-19	2.0E-11	3.9E-21	3.2E-11	1.9E-15	7.2E-12	8.2E-13	1.5E-11	5.3E-13	6.4E-12	1.1E-08	1.7E-13	1.1E-08	9.3E-14	2.1E-09	4.6E-11	3.8E-11	4.6E-11	1.9E-15	5.3E-13	6.4E-12
Fen orchid	3.2E-15	4.9E-14	4.9E-14	1.7E-12	1.2E-14	1.0E-15	2.0E-11	5.4E-17	1.9E-11	2.3E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.9E-12	1.9E-09	1.7E-13	1.9E-09	1.9E-13	1.4E-11	3.5E-12	6.0E-13	3.5E-12	2.3E-15	5.4E-13	7.9E-12
Fungi	5.9E-15	1.9E-13	1.9E-13	2.6E-12	8.1E-15	1.2E-15	2.2E-11	1.7E-16	7.0E-12	3.8E-15	1.1E-11	1.3E-12	2.4E-11	7.2E-13	1.3E-11	1.8E-08	1.7E-13	1.8E-08	2.7E-13	4.2E-09	2.5E-09	2.6E-09	2.5E-09	3.8E-15	7.2E-13	1.3E-11
Gadwall	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Golden plover	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.7E-16	9.8E-12	1.9E-18	4.5E-11	2.9E-15	9.3E-12	7.7E-13	1.4E-11	3.9E-13	1.0E-11	5.9E-10	1.7E-13	5.9E-10	8.1E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.9E-13	1.0E-11
Great crested newt	3.7E-15	5.6E-14	5.6E-14	8.0E-13	3.9E-15	7.1E-16	1.2E-11	2.7E-18	4.4E-11	1.3E-14	9.1E-12	7.9E-13	1.5E-11	4.2E-13	4.5E-11	1.1E-08	1.7E-13	1.1E-08	1.4E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.3E-14	4.2E-13	4.5E-11
Greater horseshoe bat	3.8E-15	5.5E-14	5.5E-14	7.2E-13	3.9E-15	1.7E-15	3.7E-12	1.1E-17	4.1E-11	1.1E-14	7.3E-12	7.2E-13	1.3E-11	2.7E-13	3.7E-11	1.1E-08	1.7E-13	1.1E-08	7.6E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.1E-14	2.7E-13	3.7E-11
Grey plover	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.7E-16	9.8E-12	1.9E-18	4.5E-11	2.9E-15	9.3E-12	7.7E-13	1.4E-11	3.9E-13	1.0E-11	5.9E-10	1.7E-13	5.9E-10	8.1E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.9E-13	1.0E-11
Hen harrier (male and female)	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.2E-12	4.5E-18	4.4E-11	2.7E-15	8.8E-12	7.7E-13	1.4E-11	3.6E-13	9.2E-12	5.9E-10	1.7E-13	5.9E-10	9.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.7E-15	3.6E-13	9.2E-12
Herb	3.2E-15	4.9E-14	4.9E-14	1.7E-12	1.2E-14	1.0E-15	2.0E-11	5.4E-17	1.9E-11	2.3E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.9E-12	1.9E-09	1.7E-13	1.9E-09	1.9E-13	1.4E-11	3.5E-12	6.0E-13	3.5E-12	2.3E-15	5.4E-13	7.9E-12
Herb. mammal	3.7E-15	6.0E-14	6.0E-14	8.6E-13	3.9E-15	3.7E-16	1.6E-11	1.0E-18	4.6E-11	4.4E-15	9.6E-12	8.1E-13	1.5E-11	4.9E-13	1.5E-11	1.1E-08	1.7E-13	1.1E-08	9.8E-15	1.2E-11	1.8E-13	4.8E-13	1.8E-13	4.4E-15	4.9E-13	1.5E-11
Honey buzzard	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.2E-12	4.5E-18	4.4E-11	2.7E-15	8.8E-12	7.7E-13	1.4E-11	3.6E-13	9.2E-12	5.9E-10	1.7E-13	5.9E-10	9.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.7E-15	3.6E-13	9.2E-12
Kittewake	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Knot	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.7E-16	9.8E-12	1.9E-18	4.5E-11	2.9E-15	9.3E-12	7.7E-13	1.4E-11	3.9E-13	1.0E-11	5.9E-10	1.7E-13	5.9E-10	8.1E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.9E-13	1.0E-11
Lapwing	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.5E-16	1.0E-11	1.7E-18	4.6E-11	3.1E-15	9.5E-12	7.8E-13	1.4E-11	4.1E-13	1.1E-11	5.9E-10	1.7E-13	5.9E-10	7.4E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	3.1E-15	4.1E-13	1.1E-11
Lesser black-backed gull (male and female)	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Lesser horseshoe bat	3.8E-15	5.5E-14	5.5E-14	7.2E-13	3.9E-15	1.7E-15	3.7E-12	1.1E-17	4.1E-11	1.1E-14	7.3E-12	7.2E-13	1.3E-11	2.7E-13	3.7E-11	1.1E-08	1.7E-13	1.1E-08	7.6E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.1E-14	2.7E-13	3.7E-11

Table A3.18 Continued

Organism	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta/ gamma ($t_{1/2}$ <1 day)	Other beta/ gamma ($t_{1/2}$ 1–10 days)	Other beta/ gamma ($t_{1/2}$ >10 days)
Lichen	4.4E-15	3.9E-15	3.9E-15	4.7E-13	1.2E-14	9.4E-16	1.0E-11	2.4E-17	2.7E-11	1.7E-15	4.9E-12	7.4E-13	1.4E-11	3.7E-13	5.8E-12	9.9E-10	1.7E-13	9.9E-10	6.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.7E-15	3.7E-13	5.8E-12
Marsh harrier	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.2E-12	4.5E-18	4.4E-11	2.7E-15	8.8E-12	7.7E-13	1.4E-11	3.6E-13	9.2E-12	5.9E-10	1.7E-13	5.9E-10	9.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.7E-15	3.6E-13	9.2E-12
Mediterranean gull	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Natterjack toad	3.7E-15	5.6E-14	5.6E-14	8.0E-13	3.9E-15	7.1E-16	1.2E-11	2.7E-18	4.4E-11	1.3E-14	9.1E-12	7.9E-13	1.5E-11	4.2E-13	4.5E-11	1.1E-08	1.7E-13	1.1E-08	1.4E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.3E-14	4.2E-13	4.5E-11
Nightjar	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.3E-15	7.2E-12	8.5E-18	4.1E-11	2.4E-15	7.6E-12	7.4E-13	1.4E-11	3.3E-13	8.3E-12	5.9E-10	1.7E-13	5.9E-10	1.5E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.4E-15	3.3E-13	8.3E-12
Otter (male and female)	3.8E-15	5.5E-14	5.5E-14	7.9E-13	3.9E-15	3.6E-16	1.6E-11	9.6E-19	4.6E-11	1.6E-14	9.8E-12	8.1E-13	1.5E-11	5.0E-13	5.4E-11	1.1E-08	1.7E-13	1.1E-08	1.2E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.6E-14	5.0E-13	5.4E-11
Oystercatcher	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Peregrine	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.5E-12	3.1E-18	4.6E-11	2.8E-15	9.3E-12	7.9E-13	1.4E-11	3.6E-13	9.5E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.6E-13	9.5E-12
Petal wort	3.2E-15	4.9E-14	4.9E-14	1.7E-12	1.2E-14	1.0E-15	2.0E-11	5.4E-17	1.9E-11	2.3E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.9E-12	1.9E-09	1.7E-13	1.9E-09	1.9E-13	1.4E-11	3.5E-12	6.0E-13	3.5E-12	2.3E-15	5.4E-13	7.9E-12
Pink-footed goose	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.5E-16	1.0E-11	1.7E-18	4.6E-11	3.1E-15	9.5E-12	7.8E-13	1.4E-11	4.1E-13	1.1E-11	5.9E-10	1.7E-13	5.9E-10	7.4E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	3.1E-15	4.1E-13	1.1E-11
Pintail	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Redshank	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.7E-16	8.2E-12	5.1E-18	4.1E-11	2.5E-15	7.7E-12	7.5E-13	1.4E-11	3.4E-13	8.6E-12	6.0E-10	1.7E-13	6.0E-10	1.6E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.4E-13	8.6E-12
Reptile	3.7E-15	5.6E-14	5.6E-14	8.2E-13	3.9E-15	4.7E-16	1.5E-11	1.8E-18	4.4E-11	1.3E-14	9.2E-12	8.1E-13	1.5E-11	4.7E-13	4.6E-11	1.1E-08	1.7E-13	1.1E-08	1.7E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.3E-14	4.7E-13	4.6E-11
Ringed plover	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.7E-16	8.2E-12	5.1E-18	4.1E-11	2.5E-15	7.7E-12	7.5E-13	1.4E-11	3.4E-13	8.6E-12	6.0E-10	1.7E-13	6.0E-10	1.6E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.4E-13	8.6E-12
Rodent	3.8E-15	5.5E-14	5.5E-14	8.8E-13	3.9E-15	3.4E-16	1.6E-11	2.5E-18	4.1E-11	1.4E-15	8.3E-12	8.0E-13	1.5E-11	4.8E-13	4.9E-12	2.5E-10	1.7E-13	2.5E-10	3.5E-14	7.4E-12	8.8E-13	7.6E-13	8.8E-13	1.4E-15	4.8E-13	4.9E-12
Ruff	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.7E-16	9.8E-12	1.9E-18	4.5E-11	2.9E-15	9.3E-12	7.7E-13	1.4E-11	3.9E-13	1.0E-11	5.9E-10	1.7E-13	5.9E-10	8.1E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.9E-13	1.0E-11
Sand lizard	3.7E-15	5.6E-14	5.6E-14	8.1E-13	3.9E-15	6.3E-16	1.3E-11	2.4E-18	4.4E-11	1.3E-14	9.1E-12	8.0E-13	1.5E-11	4.4E-13	4.6E-11	1.1E-08	1.7E-13	1.1E-08	1.5E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.3E-14	4.4E-13	4.6E-11
Sanderling	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Seed	2.5E-16	3.6E-13	3.6E-13	2.7E-12	3.9E-15	1.1E-15	2.0E-11	8.8E-17	1.4E-11	7.3E-15	5.7E-12	8.2E-13	1.5E-11	5.3E-13	2.5E-11	1.1E-08	1.7E-13	1.1E-08	2.2E-13	2.1E-09	1.2E-09	6.1E-13	1.2E-09	7.3E-15	5.3E-13	2.5E-11
Shore dock	3.2E-15	4.9E-14	4.9E-14	1.7E-12	1.2E-14	1.0E-15	2.0E-11	5.4E-17	1.9E-11	2.3E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.9E-12	1.9E-09	1.7E-13	1.9E-09	1.9E-13	1.4E-11	3.5E-12	6.0E-13	3.5E-12	2.3E-15	5.4E-13	7.9E-12
Short-eared owl	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.1E-15	9.0E-12	3.1E-18	4.5E-11	2.9E-15	9.3E-12	7.7E-13	1.4E-11	3.8E-13	9.9E-12	5.9E-10	1.7E-13	5.9E-10	7.4E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.8E-13	9.9E-12
Shoveler	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Shrub	4.2E-15	3.8E-14	3.8E-14	1.7E-12	1.2E-14	1.0E-15	2.0E-11	5.4E-17	4.9E-12	2.3E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.9E-12	2.2E-09	1.7E-13	2.2E-09	1.9E-13	1.4E-11	3.5E-12	6.0E-13	3.5E-12	2.3E-15	5.4E-13	7.9E-12
Smooth snake	3.7E-15	5.6E-14	5.6E-14	8.1E-13	3.9E-15	6.3E-16	1.3E-11	2.4E-18	4.4E-11	1.3E-14	9.1E-12	8.0E-13	1.5E-11	4.4E-13	4.6E-11	1.1E-08	1.7E-13	1.1E-08	1.5E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	1.3E-14	4.4E-13	4.6E-11
Snipe	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	6.7E-16	9.8E-12	1.9E-18	4.5E-11	2.9E-15	9.3E-12	7.7E-13	1.4E-11	3.9E-13	1.0E-11	5.9E-10	1.7E-13	5.9E-10	8.1E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.9E-13	1.0E-11
Stag beetle	3.9E-15	4.5E-14	4.5E-14	6.9E-13	3.9E-15	7.7E-16	1.2E-11	5.6E-18	4.0E-11	1.0E-15	7.8E-12	7.7E-13	1.4E-11	4.0E-13	3.5E-12	1.1E-08	1.7E-13	1.1E-08	2.5E-14	2.1E-09	7.9E-11	7.0E-11	7.9E-11	1.0E-15	4.0E-13	3.5E-12
Stone curlew	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	7.1E-16	9.1E-12	2.7E-18	4.4E-11	2.8E-15	8.8E-12	7.8E-13	1.4E-11	3.7E-13	9.5E-12	6.0E-10	1.7E-13	6.0E-10	1.0E-14	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.7E-13	9.5E-12
Teal	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Tree	2.9E-15	1.0E-13	1.0E-13	2.0E-12	1.2E-14	1.0E-15	2.1E-11	5.4E-17	7.9E-12	2.2E-15	6.0E-12	8.2E-13	1.5E-11	5.4E-13	7.6E-12	1.1E-09	1.7E-13	1.1E-09	1.9E-13	4.2E-10	6.5E-10	2.8E-10	6.5E-10	2.2E-15	5.4E-13	7.6E-12
White-fronted goose	3.7E-15	5.6E-14	5.6E-14	7.9E-13	3.9E-15	7.0E-16	9.3E-12	1.9E-18	4.6E-11	2.8E-15	9.3E-12	7.9E-13	1.4E-11	3.8E-13	9.8E-12	5.9E-10	1.7E-13	5.9E-10	7.9E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.8E-15	3.8E-13	9.8E-12
Whooper swan	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	9.4E-16	7.8E-12	2.5E-18	4.6E-11	2.9E-15	9.4E-12	7.6E-13	1.4E-11	3.7E-13	9.9E-12	5.9E-10	1.7E-13	5.9E-10	5.7E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.9E-15	3.7E-13	9.9E-12
Wigeon	3.7E-15	5.6E-14	5.6E-14	7.7E-13	3.9E-15	1.0E-15	6.5E-12	3.9E-18	4.4E-11	2.5E-15	8.7E-12	7.6E-13	1.4E-11	3.3E-13	8.7E-12	5.9E-10	1.7E-13	5.9E-10	7.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.5E-15	3.3E-13	8.7E-12
Woodlark	3.7E-15	5.6E-14	5.6E-14	7.8E-13	3.9E-15	1.2E-15	8.2E-12	4.5E-18	4.4E-11	2.7E-15	8.8E-12	7.7E-13	1.4E-11	3.6E-13	9.2E-12	5.9E-10	1.7E-13	5.9E-10	9.3E-15	2.1E-09	1.2E-09	1.3E-09	1.2E-09	2.7E-15	3.6E-13	9.2E-12
Woodlouse	3.9E-15	4.5E-14	4.5E-14	8.2E-13	3.9E-15	9.6E-16	1.0E-11	2.8E-17	2.6E-11	9.9E-16	4.7E-12	7.4E-13	1.4E-11	3.7E-13	3.4E-12	1.1E-08	1.7E-13	1.1E-08	6.3E-14	2.1E-09	7.9E-11	7.0E-11	7.9E-11	9.9E-16	3.7E-13	3.4E-12

Table A3.19 Derivation of scaling factors for releases to air

Effective release height (m)	Maximum air concentration per unit release[a] (Bq/m^3 per Bq/s)	Distance to point of maximum exposure (to nearest 100 m) (m)	Scaling factor[b]
Ground-level	8.8E-05	(specified as 100 m)	1.0E+00
10	1.5E-05	100	1.7E-01
20	2.8E-06	200	3.2E-02
30	1.0E-06	200	1.1E-02
40	5.0E-07	300	5.7E-03
50	3.0E-07	400	3.4E-03
60	2.0E-07	500	2.3E-03
70	1.3E-07	700	1.5E-03
80	9.0E-08	900	1.0E-03

[a]Titley et al. (2000a) for ground-level release and Clarke (1979) for all other effective release heights.
[b]Ratio of maximum air concentration per unit release to the air concentration per unit release for a ground-level release.

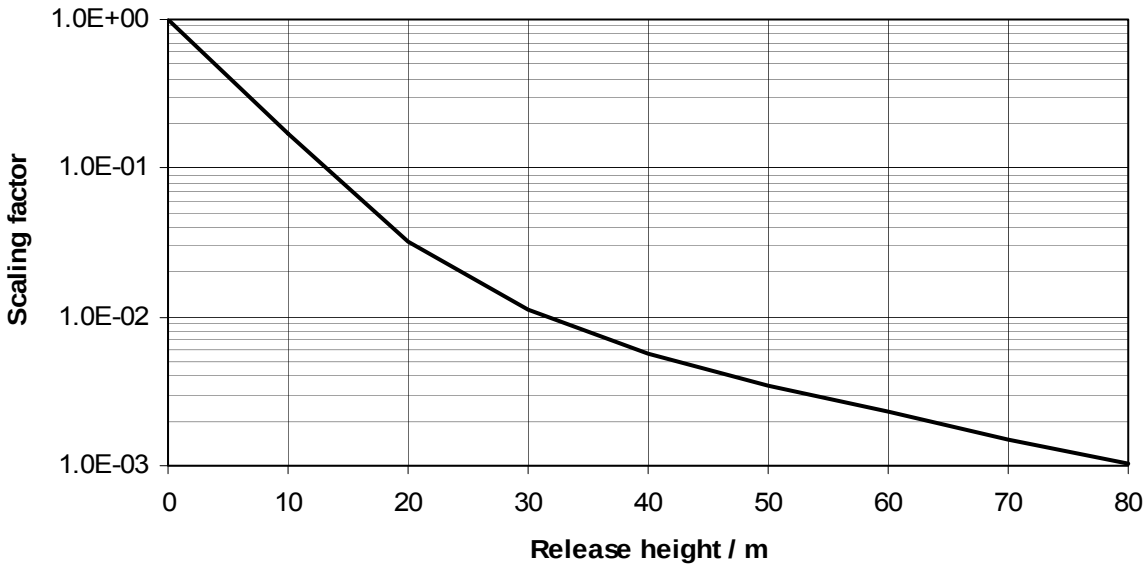


Figure A3.1 Scaling factors for dose rate per unit release factors for releases to air

Appendix 4 – Assessing dose rates for releases to coastal waters

Selecting RSA 93 authorisations

The RSA 93 authorisations which could impact on Natura 2000 sites with protected coastal features were identified as follows:

a. Release points (e.g. sewage treatment works outfalls, pipelines into coastal waters, etc.), watercourses and Natura 2000 sites were displayed using GIS mapping.
b. The route from a release point down a watercourse to the coastal environment was followed on the GIS map to the point where the release ultimately enters the sea.
c. It was assumed that some releases would be channelled into the locality of a particular coastal Natura 2000 site and these were assumed to be within a local water modelling compartment around that Natura 2000 site. Discharges further away from the Natura 2000 site could also be dispersed into the Natura 2000 site, but would be diluted to a greater extent. These discharges were assumed to fall within a regional modelling compartment (regional compartment) (see Figure A4.1). Thus, for each coastal Natura 2000 site, the RSA 93 permits which could lead to a discharge into the local compartment were identified, as were permits which could lead to a discharge into the regional compartment. For example, discharges into the Humber Estuary are considered to be within the Humber Estuary SAC local compartment. Account is also taken of authorised releases in the North East which could ultimately flow into the North Sea Central regional compartment.

Hence for each coastal Natura 2000 site, the release points which could lead to releases impacting on that site were identified. The database of RSA 93 authorisations was used to select the RSA 93 authorisations which can impact on each Natura 2000 site using the release point linkage information. The authorisation limits for each RSA 93 authorisation were entered into the radioactive substance habitats assessment spreadsheet tool, along with a coding for whether the release is into the local or regional compartment and whether it is via a sewage treatment works. The spreadsheet tool used this coding to sum up the following releases for each radionuclide:

a. Local compartment, not via a sewage treatment works.
b. Local compartment, via a sewage treatment works.
c. Regional compartment, not via a sewage treatment works.
d. Regional compartment, via a sewage treatment works.

These total releases are shown in Table A4.1. The releases via a sewage treatment works were multiplied by factors to take account of partitioning of some of the radionuclides onto sewage sludge and hence removal from the treated effluent and also radioactive decay as the effluent passes through the sewage treatment works (see Table A4.2).

Calculating dose rates

The spreadsheet tool contains dose rate per unit release values and allows the exchange rate in the local and regional compartments to be entered, and these were used to modify the dose rate per unit release values. The dose rate per unit releases values for the coastal waters are for an exchange rate of 100 m^3/s.

Exchange rates for local compartments used in the assessment are shown in Table A4.3. The guidance in Environment Agency (2006a) has been used for selecting default exchange rates. This states that a default exchange rate of 100 m^3/s may be used for large estuaries and coastal areas, particularly on the west coast of Britain (where tidal height changes are greater). However, for small estuaries, particularly on the east coast of Britain, a default exchange rate of 30 m^3/s will be more appropriate. Where total dose rates to the worst affected organism were greater than 10 microgray/h, efforts were made to source or calculate more realistic local exchange rates (see Table A4.3).

The regional compartments are shown in Figure A4.1 and the exchange rates which were derived from Simmonds et al. (1995) are shown in Table A4.3. The North Sea South East compartment has a small coastal section compared to the other compartments and was combined with the North Sea South West compartment. The exchange rates for these compartments were summed. The Irish Sea West compartment was combined with the Irish Sea South East compartment for similar reasons and the exchange rates were summed.

The part of the coast in the Celtic Sea compartment was assumed to be the Irish Sea South compartment and the Irish Sea South compartment exchange rate was used. The part of the coast in the Irish Sea North East compartment was assumed to be the Cumbrian Waters compartment and the exchange rate for this latter compartment was used.

The dose rates to organisms affected by releases into the local and regional compartments were calculated in the spreadsheet tool as follows:

a. Dose rate to an organism from a particular radionuclide in the local compartment was calculated by multiplying the total release of that radionuclide into the local compartment, multiplied by the dose rate per unit release values, multiplied by 100 m^3/s and divided by the local compartment exchange rate.
b. Total dose rate to an organism from releases into the local compartment was calculated by summing the radionuclide dose rates.
c. Dose rate to an organism from a particular radionuclide in the regional compartment was calculated by multiplying the total release of that radionuclide into the regional compartment, multiplied by the dose rate per unit release values, multiplied by 100 m^3/s and divided by the regional compartment exchange rate.
d. Total dose rate to an organism from releases into the regional compartment was calculated by summing the radionuclide dose rates.

Summary total dose rates to the worst affected organism from releases to the local and regional compartments were then identified.

Table A4.1 Total releases at authorised limits to coastal waters

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A02	Alde-Ore Estuary SPA	L	No	9.1E+13													1.0E+12										8.3E+11
A02	Alde-Ore Estuary SPA	R	No	7.0E+12		4.0E+10	2.8E+10	8.5E+09						6.2E+09			7.0E+11										7.2E+11
A02	Alde-Ore Estuary SPA	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A03	Alde, Ore and Butley Estuaries cSAC	L	No	9.1E+13													1.0E+12										8.3E+11
A03	Alde, Ore and Butley Estuaries cSAC	R	No	7.0E+12		4.0E+10	2.8E+10	8.5E+09						6.2E+09			7.0E+11										7.2E+11
A03	Alde, Ore and Butley Estuaries cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A06	Benacre to Easton Bavents SPA	L	No	1.2E+10		3.0E+09																					1.2E+08
A06	Benacre to Easton Bavents SPA	L	Yes	3.1E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												2.3E+08			4.8E+11
A06	Benacre to Easton Bavents SPA	R	No	9.8E+13		3.7E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A06	Benacre to Easton Bavents SPA	R	Yes	6.4E+12		1.8E+12	1.3E+12	8.0E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A07	Benacre to Easton Bavents Lagoons cSAC	L	No	1.2E+10		3.0E+09																					1.2E+08
A07	Benacre to Easton Bavents Lagoons cSAC	L	Yes	3.1E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												2.3E+08			4.8E+11
A07	Benacre to Easton Bavents Lagoons cSAC	R	No	9.8E+13		3.7E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A07	Benacre to Easton Bavents Lagoons cSAC	R	Yes	6.4E+12		1.8E+12	1.3E+12	8.0E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A08	Benfleet & Southend Marshes SPA	L	No	2.4E+09		2.2E+10	2.2E+10	2.4E+09																			3.6E+08
A08	Benfleet & Southend Marshes SPA	L	Yes	2.0E+12		1.5E+12	1.1E+12	5.9E+11			6.0E+11	6.1E+13		2.0E+12		6.0E+12	6.0E+09			2.9E+06	5.8E+06		3.0E+08	4.5E+10		9.6E+10	2.1E+13
A08	Benfleet & Southend Marshes SPA	R	No	9.8E+13		1.8E+10	6.8E+09	6.1E+09						6.2E+09			1.7E+12										1.5E+12
A08	Benfleet & Southend Marshes SPA	R	Yes	4.7E+12		3.5E+11	3.4E+11	2.4E+11			5.4E+11	1.6E+13		9.0E+10		4.9E+12	6.0E+08	9.6E+04					3.6E+03	3.3E+09		4.0E+09	2.5E+12
A11	Breydon Water SPA	L	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
A11	Breydon Water SPA	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A11	Breydon Water SPA	R	Yes	6.5E+12		1.8E+12	1.3E+12	8.0E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A12	The Broadland - SPA	L	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
A12	The Broadland - SPA	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A12	The Broadland - SPA	R	Yes	6.5E+12		1.8E+12	1.3E+12	8.0E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A13	Deben Estuary SPA	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A13	Deben Estuary SPA	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A16	Essex Estuaries - cSAC	L	No	7.0E+12													7.0E+11										7.0E+11
A16	Essex Estuaries - cSAC	L	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A16	Essex Estuaries - cSAC	R	No	9.1E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.0E+12										8.5E+11
A16	Essex Estuaries - cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.3E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A17	Mid Essex Coast SPA - Phase 1 - Dengie	L	No	7.0E+12													7.0E+11										7.0E+11
A17	Mid Essex Coast SPA - Phase 1 - Dengie	L	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A17	Mid Essex Coast SPA - Phase 1 - Dengie	R	No	9.1E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.0E+12										8.5E+11
A17	Mid Essex Coast SPA - Phase 1 - Dengie	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.3E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A18	Mid Essex Coast SPA - Phase 2 - Colne Estuary	L	No	7.0E+12													7.0E+11										7.0E+11
A18	Mid Essex Coast SPA - Phase 2 - Colne Estuary	L	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A18	Mid Essex Coast SPA - Phase 2 - Colne Estuary	R	No	9.1E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.0E+12										8.5E+11
A18	Mid Essex Coast SPA - Phase 2 - Colne Estuary	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.3E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A19	Mid Essex Coast SPA - Phase 3 - Crouch and Roach Estuaries	L	No	7.0E+12													7.0E+11										7.0E+11
A19	Mid Essex Coast SPA - Phase 3 - Crouch and Roach Estuaries	L	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A19	Mid Essex Coast SPA - Phase 3 - Crouch and Roach Estuaries	R	No	9.1E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.0E+12										8.5E+11
A19	Mid Essex Coast SPA - Phase 3 - Crouch and Roach Estuaries	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.3E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A20	Mid Essex Coast SPA - Phase 4 - Blackwater Estuary	L	No	7.0E+12													7.0E+11										7.0E+11
A20	Mid Essex Coast SPA - Phase 4 - Blackwater Estuary	L	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A20	Mid Essex Coast SPA - Phase 4 - Blackwater Estuary	R	No	9.1E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.0E+12										8.5E+11
A20	Mid Essex Coast SPA - Phase 4 - Blackwater Estuary	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.3E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A21	Mid Essex Coast SPA - Phase 5 - Foulness	L	No	7.0E+12													7.0E+11										7.0E+11
A21	Mid Essex Coast SPA - Phase 5 - Foulness	L	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A21	Mid Essex Coast SPA - Phase 5 - Foulness	R	No	9.1E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.0E+12										8.5E+11
A21	Mid Essex Coast SPA - Phase 5 - Foulness	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.3E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A24	Gibraltar Point SPA	L	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A24	Gibraltar Point SPA	L	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A24	Gibraltar Point SPA	R	No	9.8E+13		2.7E+10	2.2E+10	2.4E+09									1.7E+12										1.5E+12
A24	Gibraltar Point SPA	R	Yes	2.5E+12		1.6E+12	1.2E+12	6.4E+11			1.1E+12	7.0E+13		2.1E+12		8.7E+12	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.8E+10		9.7E+10	2.3E+13
A25	Great Yarmouth North Denes SPA	L	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
A25	Great Yarmouth North Denes SPA	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A25	Great Yarmouth North Denes SPA	R	Yes	6.5E+12		1.8E+12	1.3E+12	8.0E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A27	Hamford Water SPA	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A27	Hamford Water SPA	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A28	Minsmere to Walberswick SPA	L	No	9.1E+13													1.0E+12										8.3E+11
A28	Minsmere to Walberswick SPA	R	No	7.0E+12		4.0E+10	2.8E+10	8.5E+09						6.2E+09			7.0E+11										7.2E+11
A28	Minsmere to Walberswick SPA	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A29	Minsmere to Walberswick Heaths and Marshes cSAC	L	No	9.1E+13													1.0E+12										8.3E+11
A29	Minsmere to Walberswick Heaths and Marshes cSAC	R	No	7.0E+12		4.0E+10	2.8E+10	8.5E+09						6.2E+09			7.0E+11										7.2E+11
A29	Minsmere to Walberswick Heaths and Marshes cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A33	North Norfolk Coast SPA	L	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A33	North Norfolk Coast SPA	L	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A33	North Norfolk Coast SPA	R	No	9.8E+13		2.7E+10	2.2E+10	2.4E+09									1.7E+12										1.5E+12
A33	North Norfolk Coast SPA	R	Yes	2.5E+12		1.6E+12	1.2E+12	6.4E+11			1.1E+12	7.0E+13		2.1E+12		8.7E+12	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.8E+10		9.7E+10	2.3E+13
A34	North Norfolk Coast cSAC	L	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A34	North Norfolk Coast cSAC	L	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A34	North Norfolk Coast cSAC	R	No	9.8E+13		2.7E+10	2.2E+10	2.4E+09									1.7E+12										1.5E+12
A34	North Norfolk Coast cSAC	R	Yes	2.5E+12		1.6E+12	1.2E+12	6.4E+11			1.1E+12	7.0E+13		2.1E+12		8.7E+12	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.8E+10		9.7E+10	2.3E+13
A35	Orfordness - Shingle Street cSAC	L	No	9.1E+13													1.0E+12										8.3E+11
A35	Orfordness - Shingle Street cSAC	R	No	7.0E+12		4.0E+10	2.8E+10	8.5E+09						6.2E+09			7.0E+11										7.2E+11
A35	Orfordness - Shingle Street cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A39	Overstrand Cliffs cSAC	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A39	Overstrand Cliffs cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A46	Sandlings pSPA	L	No	9.1E+13													1.0E+12										8.3E+11
A46	Sandlings pSPA	R	No	7.0E+12		4.0E+10	2.8E+10	8.5E+09						6.2E+09			7.0E+11										7.2E+11
A46	Sandlings pSPA	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A47	Saltfleetby - Theddlethorpe Dunes and Gibraltar Point cSAC	L	Yes															9.0E+09						1.8E+10			2.7E+10
A47	Saltfleetby - Theddlethorpe Dunes and Gibraltar Point cSAC	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A47	Saltfleetby - Theddlethorpe Dunes and Gibraltar Point cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A49	Stour and Orwell Estuaries - SPA	L	Yes			1.2E+09						8.4E+11				4.8E+11		9.6E+04									3.8E+09
A49	Stour and Orwell Estuaries - SPA	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A49	Stour and Orwell Estuaries - SPA	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.0E+13	6.6E+09			2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
A50	The Broads - cSAC	L	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
A50	The Broads - cSAC	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A50	The Broads - cSAC	R	Yes	6.5E+12		1.8E+12	1.3E+12	8.0E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.3E+13
A51	The Wash SPA	L	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A51	The Wash SPA	L	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A51	The Wash SPA	R	No	9.8E+13		2.7E+10	2.2E+10	2.4E+09									1.7E+12										1.5E+12

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A51	The Wash SPA	R	Yes	2.5E+12		1.6E+12	1.2E+12	6.4E+11			1.1E+12	7.0E+13		2.1E+12		8.7E+12	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.8E+10		9.7E+10	2.3E+13
A52	The Wash and North Norfolk Coast cSAC	L	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A52	The Wash and North Norfolk Coast cSAC	L	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A52	The Wash and North Norfolk Coast cSAC	R	No	9.8E+13		2.7E+10	2.2E+10	2.4E+09									1.7E+12										1.5E+12
A52	The Wash and North Norfolk Coast cSAC	R	Yes	2.5E+12		1.6E+12	1.2E+12	6.4E+11			1.1E+12	7.0E+13		2.1E+12		8.7E+12	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.8E+10		9.7E+10	2.3E+13
A55	Winterton - Horsey Dune cSAC	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
A55	Winterton - Horsey Dune cSAC	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
NE02	Beast Cliff to Whitby (Robin Hood's Bay)	L	Yes									2.4E+11		2.4E+06		2.4E+10											1.2E+09
NE02	Beast Cliff to Whitby (Robin Hood's Bay)	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE02	Beast Cliff to Whitby (Robin Hood's Bay)	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NE03	Berwickshire & N Northumberland Coast	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE03	Berwickshire & N Northumberland Coast	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NE05	Coquet Island	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE05	Coquet Island	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.2E+10		3.6E+10	1.1E+13
NE08	Durham Coast	L	No	1.9E+15				6.0E+12	4.0E+10								1.0E+11										3.8E+11
NE08	Durham Coast	L	Yes	1.5E+11		7.5E+10	2.5E+09	2.5E+09				3.0E+12		4.8E+09										8.4E+09		3.6E+10	4.7E+11
NE08	Durham Coast	R	No	2.8E+13		1.2E+08						1.6E+13					2.0E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.2E+12
NE08	Durham Coast	R	Yes	1.0E+13		1.6E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		3.8E+13		2.4E+10		4.6E+12	4.8E+11	9.0E+09						6.8E+10			1.1E+13
NE10	Farne Islands	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE10	Farne Islands	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.2E+10		3.6E+10	1.1E+13
NE12	Flamborough Head	L	Yes									2.4E+11		2.4E+06		2.4E+10											1.2E+09
NE12	Flamborough Head	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE12	Flamborough Head	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NE13	Flamborough Head and Bempton Cliffs	L	Yes									2.4E+11		2.4E+06		2.4E+10											1.2E+09
NE13	Flamborough Head and Bempton Cliffs	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE13	Flamborough Head and Bempton Cliffs	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NE18	Humber Estuary	L	No	4.5E+11								2.4E+09					2.2E+10									1.1E+11	3.4E+11
NE18	Humber Estuary	L	Yes	1.0E+12		1.2E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		2.8E+13		2.3E+10		2.7E+12	6.5E+08							5.0E+10			5.4E+12
NE18	Humber Estuary	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.7E+12	1.2E+12
NE18	Humber Estuary	R	Yes	9.4E+12		4.4E+11	8.5E+09	2.5E+09	4.8E+06			1.3E+13		5.4E+09		1.9E+12	4.8E+11	9.0E+09						2.7E+10		3.6E+10	5.9E+12
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	L	No	4.5E+11								2.4E+09					2.2E+10									1.1E+11	3.4E+11
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	L	Yes	1.0E+12		1.2E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		2.8E+13		2.3E+10		2.7E+12	6.5E+08							5.0E+10			5.4E+12
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.7E+12	1.2E+12
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	R	Yes	9.4E+12		4.4E+11	8.5E+09	2.5E+09	4.8E+06			1.3E+13		5.4E+09		1.9E+12	4.8E+11	9.0E+09						2.7E+10		3.6E+10	5.9E+12

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	L	No	4.5E+11								2.4E+09					2.2E+10									1.1E+11	3.4E+11
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	L	Yes	1.0E+12		1.2E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		2.8E+13		2.3E+10		2.7E+12	6.5E+08							5.0E+10			5.4E+12
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.7E+12	1.2E+12
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	R	Yes	9.4E+12		4.4E+11	8.5E+09	2.5E+09	4.8E+06			1.3E+13		5.4E+09		1.9E+12	4.8E+11	9.0E+09						2.7E+10		3.6E+10	5.9E+12
NE22	Lindisfarne	L	Yes	1.2E+11		9.6E+10																					1.2E+10
NE22	Lindisfarne	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE22	Lindisfarne	R	Yes	1.0E+13		1.6E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NE27	N Northumberland Dunes	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE27	N Northumberland Dunes	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.2E+10		3.6E+10	1.1E+13
NE33	Northumbria Coast	L	Yes	1.2E+11		9.6E+10																					1.2E+10
NE33	Northumbria Coast	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE33	Northumbria Coast	R	Yes	1.0E+13		1.6E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NE44	Teesmouth and Cleveland Coast	L	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	1.2E+05		3.0E+08				2.5E+05		1.7E+12	8.6E+11
NE44	Teesmouth and Cleveland Coast	L	Yes	9.2E+12		2.7E+11			4.8E+06			9.3E+12		4.8E+08		2.6E+11	4.8E+11										5.2E+12
NE44	Teesmouth and Cleveland Coast	R	No	4.5E+11								2.4E+09					2.2E+10	3.2E+11						2.0E+11		1.1E+11	7.0E+11
NE44	Teesmouth and Cleveland Coast	R	Yes	1.3E+12		1.4E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		3.2E+13		2.8E+10		4.4E+12	6.5E+08	9.0E+09						7.7E+10		3.6E+10	6.1E+12
NE46	Tweed Estuary	R	No	1.9E+15		1.2E+08		6.0E+12	4.0E+10			1.6E+13					2.1E+12	3.2E+11		3.0E+08				2.0E+11		1.8E+12	1.6E+12
NE46	Tweed Estuary	R	Yes	1.0E+13		1.7E+12	1.2E+11	5.5E+10	1.2E+08	1.2E+07		4.1E+13		2.8E+10		4.6E+12	4.8E+11	9.0E+09						7.7E+10		3.6E+10	1.1E+13
NW08	Drigg Coast	L	No	2.0E+16		2.1E+13			3.6E+12	4.8E+13		1.0E+13			2.0E+12		4.3E+13				2.0E+06	1.7E+12	3.0E+11	1.7E+11			8.8E+13
NW08	Drigg Coast	L	Yes	6.8E+10																				3.0E+08			6.1E+09
NW08	Drigg Coast	R	Yes				4.4E+08					3.9E+11				7.2E+10								7.3E+05			5.8E+10
NW09	Duddon Estuary	L	Yes	2.4E+10								3.6E+11															2.4E+10
NW09	Duddon Estuary	R	No	2.0E+16		2.1E+13			3.6E+12	4.8E+13		1.0E+13			2.0E+12		4.3E+13				2.0E+06	1.7E+12	3.0E+11	1.7E+11			8.8E+13
NW09	Duddon Estuary	R	Yes	6.8E+10			4.4E+08					3.9E+11				7.2E+10								3.0E+08			6.4E+10
NW14	Leighton Moss	R	No	3.7E+15				9.1E+12	8.0E+10		1.0E+09	6.0E+11					2.0E+11			1.4E+14	1.0E+11	4.0E+10		4.4E+11			7.6E+11
NW14	Leighton Moss	R	Yes	4.4E+12		4.7E+11	4.8E+10	4.4E+09	2.4E+07	5.3E+08		1.1E+13		3.1E+11		1.6E+12	1.2E+07				2.9E+10			1.8E+11			8.2E+12
NW18	Mersey Estuary	L	No	4.4E+12							1.0E+09										7.5E+08			1.8E+09			3.7E+09
NW18	Mersey Estuary	L	Yes	3.9E+12		4.7E+11	3.6E+10	4.4E+09	2.4E+07	5.3E+08		7.8E+12		3.1E+11		1.5E+12	1.2E+07				2.9E+10			8.4E+10			8.0E+12
NW18	Mersey Estuary	R	No	3.7E+15				9.1E+12	8.0E+10			6.0E+11					2.0E+11			1.4E+14	1.0E+11	4.0E+10		4.4E+11			7.6E+11
NW18	Mersey Estuary	R	Yes	4.7E+11		1.9E+09	1.2E+10			2.4E+05		3.5E+12		6.0E+08		1.1E+11								9.7E+10			2.2E+11
NW20	Morecambe Bay - cSAC	L	No	3.7E+15				9.1E+12	8.0E+10								2.0E+11										7.6E+11
NW20	Morecambe Bay - cSAC	L	Yes	2.4E+10		6.6E+08	5.0E+08			2.4E+05		1.2E+12												7.2E+09			4.9E+10
NW20	Morecambe Bay - cSAC	R	No	4.4E+12							1.0E+09	6.0E+11								1.4E+14	1.0E+11	4.0E+10		4.4E+11			3.7E+09
NW20	Morecambe Bay - cSAC	R	Yes	4.4E+12		4.7E+11	4.8E+10	4.4E+09	2.4E+07	5.3E+08		1.0E+13		3.1E+11		1.6E+12	1.2E+07				2.9E+10			1.7E+11			8.1E+12
NW21	Morecambe Bay - SPA	L	No	3.7E+15				9.1E+12	8.0E+10								2.0E+11										7.6E+11

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
NW21	Morecambe Bay - SPA	L	Yes	2.4E+10		6.6E+08	5.0E+08			2.4E+05		1.2E+12												7.2E+09			4.9E+10
NW21	Morecambe Bay - SPA	R	No	4.4E+12							1.0E+09	6.0E+11								1.4E+14	1.0E+11	4.0E+10		4.4E+11			3.7E+09
NW21	Morecambe Bay - SPA	R	Yes	4.4E+12		4.7E+11	4.8E+10	4.4E+09	2.4E+07	5.3E+08		1.0E+13		3.1E+11		1.6E+12	1.2E+07				2.9E+10			1.7E+11			8.1E+12
NW25	Ribble/Alt Estuaries	L	No									6.0E+11								1.4E+14	1.0E+11	4.0E+10		4.4E+11			
NW25	Ribble/Alt Estuaries	L	Yes				1.2E+10					1.9E+12				1.1E+11											1.7E+11
NW25	Ribble/Alt Estuaries	R	No	3.7E+15				9.1E+12	8.0E+10		1.0E+09						2.0E+11				7.5E+08			1.8E+09			7.6E+11
NW25	Ribble/Alt Estuaries	R	Yes	4.4E+12		4.7E+11	3.6E+10	4.4E+09	2.4E+07	5.3E+08		9.3E+12		3.1E+11		1.5E+12	1.2E+07				2.9E+10			1.8E+11			8.0E+12
NW33	Sefton Coast	L	Yes	3.9E+12		4.7E+11	4.8E+10	4.4E+09	2.4E+07	5.3E+08		9.7E+12		3.1E+11		1.6E+12	1.2E+07				2.9E+10			8.4E+10			8.1E+12
NW33	Sefton Coast	R	No	3.7E+15				9.1E+12	8.0E+10		1.0E+09	6.0E+11					2.0E+11			1.4E+14	1.0E+11	4.0E+10		4.4E+11			7.6E+11
NW33	Sefton Coast	R	Yes	4.7E+11		2.1E+09	6.0E+07			2.4E+05		1.6E+12		6.0E+08										9.7E+10			5.0E+10
NW34	Solway Firth	L	Yes									3.0E+10				1.2E+10											3.1E+09
NW34	Solway Firth	R	No	2.0E+16		2.1E+13			3.6E+12	4.8E+13		1.0E+13			2.0E+12		4.3E+13				2.0E+06	1.7E+12	3.0E+11	1.7E+11			8.8E+13
NW34	Solway Firth	R	Yes	6.8E+10			4.4E+08					3.6E+11				6.0E+10								3.0E+08			6.1E+10
NW40	Upper Solway Flats & Marshes	L	Yes									3.0E+10				1.2E+10											3.1E+09
NW40	Upper Solway Flats & Marshes	R	No	2.0E+16		2.1E+13			3.6E+12	4.8E+13		1.0E+13			2.0E+12		4.3E+13				2.0E+06	1.7E+12	3.0E+11	1.7E+11			8.8E+13
NW40	Upper Solway Flats & Marshes	R	Yes	6.8E+10			4.4E+08					3.6E+11				6.0E+10								3.0E+08			6.1E+10
S07	Chichester & Langstone Harbours	L	Yes	3.0E+10		2.0E+09	2.1E+10	6.0E+09				2.4E+12		2.4E+08		1.6E+11								1.2E+08		7.2E+09	1.6E+11
S07	Chichester & Langstone Harbours	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
S07	Chichester & Langstone Harbours	R	Yes	2.1E+12		3.0E+10	2.4E+10	8.9E+09				3.4E+12		6.0E+09		1.2E+12								6.0E+06		5.5E+11	2.8E+12
S08	Dover to Kingsdown Cliffs	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
S08	Dover to Kingsdown Cliffs	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
S10	Dungeness	L	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S10	Dungeness	R	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S10	Dungeness	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.8E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S11	Dungeness to Pett Level	L	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S11	Dungeness to Pett Level	R	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S11	Dungeness to Pett Level	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.8E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S15	Hastings Cliffs (to Pett Beach)	L	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S15	Hastings Cliffs (to Pett Beach)	L	Yes									4.2E+11															4.2E+09
S15	Hastings Cliffs (to Pett Beach)	R	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S15	Hastings Cliffs (to Pett Beach)	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.4E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S16	Isle of Wight Downs	L	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S16	Isle of Wight Downs	L	Yes	1.7E+11		2.4E+10	4.3E+10	1.4E+10				3.8E+12		6.0E+09		8.6E+11								1.3E+08		5.6E+11	2.5E+12
S16	Isle of Wight Downs	R	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S16	Isle of Wight Downs	R	Yes	1.9E+12		8.4E+09	1.6E+09	5.4E+08				2.0E+12		2.4E+08		4.9E+11											4.7E+11
S20	Medway Estuary & Marshes	L	Yes	4.8E+10		3.6E+09					5.4E+11	1.3E+12				8.4E+11							3.6E+03	2.5E+09			1.4E+11
S20	Medway Estuary & Marshes	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
S20	Medway Estuary & Marshes	R	Yes	6.7E+12		1.9E+12	1.4E+12	8.3E+11			6.0E+11	7.5E+13		2.1E+12		1.0E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.6E+10		1.0E+11	2.4E+13
S22	The New Forest - SPA	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
S22	The New Forest - SPA	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.8E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S23	The New Forest - cSAC	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
S23	The New Forest - cSAC	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.8E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S25	Pagham Harbour	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
S25	Pagham Harbour	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.8E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S28	Portsmouth Harbour	L	Yes	3.0E+10		2.0E+09	2.1E+10	6.0E+09				1.8E+12		2.4E+08		1.6E+11								1.2E+08			1.5E+11
S28	Portsmouth Harbour	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
S28	Portsmouth Harbour	R	Yes	2.1E+12		3.0E+10	2.4E+10	8.9E+09				4.0E+12		6.0E+09		1.2E+12								6.0E+06		5.6E+11	2.8E+12
S32	Sandwich Bay	L	Yes	4.4E+10		1.2E+10	4.8E+10					4.8E+11		1.2E+10		2.4E+11											1.0E+11
S32	Sandwich Bay	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
S32	Sandwich Bay	R	Yes	6.7E+12		1.8E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
S34	Solent & Isle of Wight Lagoons	L	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S34	Solent & Isle of Wight Lagoons	L	Yes	1.7E+11		2.4E+10	4.3E+10	1.4E+10				3.8E+12		6.0E+09		8.6E+11								1.3E+08		5.6E+11	2.5E+12
S34	Solent & Isle of Wight Lagoons	R	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S34	Solent & Isle of Wight Lagoons	R	Yes	1.9E+12		8.4E+09	1.6E+09	5.4E+08				2.0E+12		2.4E+08		4.9E+11											4.7E+11
S35	Solent & Southampton Water	L	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S35	Solent & Southampton Water	L	Yes	1.7E+11		2.4E+10	4.3E+10	1.4E+10				3.8E+12		6.0E+09		8.6E+11								1.3E+08		5.6E+11	2.5E+12
S35	Solent & Southampton Water	R	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S35	Solent & Southampton Water	R	Yes	1.9E+12		8.4E+09	1.6E+09	5.4E+08				2.0E+12		2.4E+08		4.9E+11											4.7E+11
S36	Solent Maritime	L	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S36	Solent Maritime	L	Yes	1.7E+11		2.4E+10	4.3E+10	1.4E+10				3.8E+12		6.0E+09		8.6E+11								1.3E+08		5.6E+11	2.5E+12
S36	Solent Maritime	R	No	6.6E+14				2.0E+12	3.0E+10								1.1E+12										1.1E+12
S36	Solent Maritime	R	Yes	1.9E+12		8.4E+09	1.6E+09	5.4E+08				2.0E+12		2.4E+08		4.9E+11											4.7E+11
S37	South Wight Maritime	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
S37	South Wight Maritime	R	Yes	2.1E+12		3.2E+10	4.5E+10	1.5E+10				5.8E+12		6.2E+09		1.4E+12								1.3E+08		5.6E+11	3.0E+12
S40	Thames Estuary and Marshes	L	No	2.4E+09		2.4E+10	2.2E+10	2.4E+09																			3.6E+08
S40	Thames Estuary and Marshes	L	Yes	2.1E+12		1.5E+12	1.1E+12	5.9E+11			6.0E+11	6.1E+13		2.0E+12		6.0E+12	6.0E+09			2.9E+06	5.8E+06		3.0E+08	4.5E+10		9.6E+10	2.1E+13
S40	Thames Estuary and Marshes	R	No	9.8E+13		1.6E+10	6.8E+09	6.1E+09						6.2E+09			1.7E+12										1.5E+12
S40	Thames Estuary and Marshes	R	Yes	4.7E+12		3.5E+11	3.4E+11	2.4E+11			5.4E+11	1.5E+13		9.0E+10		4.9E+12	6.0E+08	9.6E+04					3.6E+03	3.3E+09		4.0E+09	2.5E+12
S41	Thanet Coast	L	Yes	4.7E+10		1.2E+10	4.8E+10					1.3E+12		1.2E+10		2.6E+11											1.2E+11
S41	Thanet Coast	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
S41	Thanet Coast	R	Yes	6.7E+12		1.8E+12	1.4E+12	8.3E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
S42	Thanet Coast & Sandwich Bay	L	Yes	4.7E+10		1.2E+10	4.8E+10					1.3E+12		1.2E+10		2.6E+11											1.2E+11
S42	Thanet Coast & Sandwich Bay	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
S42	Thanet Coast & Sandwich Bay	R	Yes	6.7E+12		1.8E+12	1.4E+12	8.3E+11			1.1E+12	7.5E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
S45	The Swale	L	Yes			3.6E+09																					
S45	The Swale	R	No	9.8E+13		4.0E+10	2.8E+10	8.5E+09						6.2E+09			1.7E+12										1.5E+12
S45	The Swale	R	Yes	6.8E+12		1.9E+12	1.4E+12	8.3E+11			1.1E+12	7.6E+13		2.1E+12		1.1E+13	6.6E+09	9.6E+04		2.9E+06	5.8E+06		3.0E+08	4.9E+10		1.0E+11	2.4E+13
SW05	Blackstone Point	L	Yes	5.7E+10		1.1E+10	7.2E+09	2.2E+09	1.0E+07			1.2E+12		6.0E+06		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			3.9E+11
SW05	Blackstone Point	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW05	Blackstone Point	R	Yes	1.8E+14		1.5E+09	9.7E+09	3.0E+09				1.0E+12		1.1E+09		1.2E+10						3.6E+06	1.2E+04	6.0E+09			3.6E+11
SW07	Braunton Burrows	L	Yes			1.8E+09																					1.2E+09
SW07	Braunton Burrows	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW07	Braunton Burrows	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
SW11	Chesil & the Fleet	L	Yes	1.2E+09		2.1E+08	1.2E+07							1.2E+07													

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
SW11	Chesil & the Fleet	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW11	Chesil & the Fleet	R	Yes	1.8E+14		1.2E+10	1.7E+10	5.2E+09	1.0E+07			2.2E+12		1.0E+09		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			7.5E+11
SW12	Chesil Beach & the Fleet	L	Yes	1.2E+09		2.1E+08	1.2E+07							1.2E+07													
SW12	Chesil Beach & the Fleet	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW12	Chesil Beach & the Fleet	R	Yes	1.8E+14		1.2E+10	1.7E+10	5.2E+09	1.0E+07			2.2E+12		1.0E+09		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			7.5E+11
SW19	Dawlish Warren	L	Yes	2.7E+09		1.3E+09	7.3E+09	3.0E+09				4.2E+11		1.0E+09									1.2E+04	3.7E+04			3.4E+11
SW19	Dawlish Warren	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW19	Dawlish Warren	R	Yes	1.8E+14		1.1E+10	9.6E+09	2.2E+09	1.0E+07			1.8E+12		1.8E+07		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			4.2E+11
SW20	Dorset Heaths	L	Yes	1.8E+14		4.8E+09	3.7E+09	5.4E+08				1.4E+12		1.2E+08		2.3E+11						3.6E+06		6.0E+09			1.7E+11
SW20	Dorset Heaths	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
SW20	Dorset Heaths	R	Yes	2.1E+12		2.7E+10	4.4E+10	1.4E+10				5.1E+12		6.1E+09		1.1E+12								1.3E+08		5.6E+11	2.9E+12
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	L	Yes	1.8E+14		4.8E+09	3.7E+09	5.4E+08				1.4E+12		1.2E+08		2.3E+11						3.6E+06		6.0E+09			1.7E+11
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	R	Yes	2.1E+12		2.7E+10	4.4E+10	1.4E+10				5.1E+12		6.1E+09		1.1E+12								1.3E+08		5.6E+11	2.9E+12
SW22	Dorset Heathlands	L	Yes	1.8E+14		4.8E+09	3.7E+09	5.4E+08				1.4E+12		1.2E+08		2.3E+11						3.6E+06		6.0E+09			1.7E+11
SW22	Dorset Heathlands	R	No	6.6E+14		7.2E+12		2.0E+12	3.0E+10								1.1E+12							6.0E+06		6.4E+10	1.2E+12
SW22	Dorset Heathlands	R	Yes	2.1E+12		2.7E+10	4.4E+10	1.4E+10				5.1E+12		6.1E+09		1.1E+12								1.3E+08		5.6E+11	2.9E+12
SW25	Exe Estuary	L	Yes	2.7E+09		1.3E+09	7.3E+09	3.0E+09				4.2E+11		1.0E+09									1.2E+04	3.7E+04			3.4E+11
SW25	Exe Estuary	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW25	Exe Estuary	R	Yes	1.8E+14		1.1E+10	9.6E+09	2.2E+09	1.0E+07			1.8E+12		1.8E+07		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			4.2E+11
SW27	Exmoor Heaths	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW27	Exmoor Heaths	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
SW28	Fal and Helford	L	Yes				6.8E+09					5.0E+11				2.4E+11								2.4E+09			3.6E+11
SW28	Fal and Helford	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW28	Fal and Helford	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.2E+10	1.9E+10				9.0E+12		3.2E+10		1.4E+12	7.0E+11						4.8E+05	8.8E+11		1.4E+10	3.7E+12
SW30	Godrevy Head to St. Agnes	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW30	Godrevy Head to St. Agnes	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
SW35	Isle of Portland to Studland Cliffs	L	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW35	Isle of Portland to Studland Cliffs	L	Yes	1.8E+14		2.4E+08	3.1E+09					1.0E+12		1.2E+07		2.3E+11						3.6E+06		6.0E+09			1.3E+11
SW35	Isle of Portland to Studland Cliffs	R	Yes	6.0E+10		1.2E+10	1.4E+10	5.2E+09	1.0E+07			1.6E+12		1.0E+09		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			7.3E+11
SW36	Isles of Scilly Complex	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW36	Isles of Scilly Complex	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
SW37	Isles of Scilly	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW37	Isles of Scilly	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
SW39	Lundy	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW39	Lundy	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
SW49	Plymouth Sound & Estuaries	L	Yes	5.7E+10		1.1E+10	7.2E+09	2.2E+09	1.0E+07			1.2E+12		6.0E+06		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			3.9E+11
SW49	Plymouth Sound & Estuaries	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW49	Plymouth Sound & Estuaries	R	Yes	1.8E+14		1.5E+09	9.7E+09	3.0E+09				1.0E+12		1.1E+09		1.2E+10						3.6E+06	1.2E+04	6.0E+09			3.6E+11
SW50	Polruan to Polperro	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
SW50	Polruan to Polperro	R	Yes	1.8E+14		1.2E+10	1.7E+10	5.2E+09	1.0E+07			2.2E+12		1.1E+09		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			7.5E+11
SW51	Poole Harbour	L	No	7.5E+11																							
SW51	Poole Harbour	L	Yes	1.8E+14		2.4E+07	3.1E+09					1.4E+12				2.3E+11						3.6E+06		6.0E+09			1.6E+11
SW51	Poole Harbour	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW51	Poole Harbour	R	Yes	6.1E+10		1.2E+10	1.4E+10	5.2E+09	1.0E+07			1.6E+12		1.1E+09		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			7.3E+11
SW61	Severn Estuary - pSAC	L	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW61	Severn Estuary - pSAC	L	Yes	5.2E+12	1.3E+14	2.2E+12	4.1E+10	3.7E+10				1.0E+13		3.4E+10		1.9E+12	7.0E+11						4.8E+05	2.6E+11		1.5E+10	3.8E+12
SW61	Severn Estuary - pSAC	R	Yes			1.8E+09	6.8E+09					1.2E+12				2.4E+11								6.3E+11			3.7E+11
SW62	Severn Estuary - SPA	L	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW62	Severn Estuary - SPA	L	Yes	5.2E+12	1.3E+14	2.2E+12	4.1E+10	3.7E+10				1.0E+13		3.4E+10		1.9E+12	7.0E+11						4.8E+05	2.6E+11		1.5E+10	3.8E+12
SW62	Severn Estuary - SPA	R	Yes			1.8E+09	6.8E+09					1.2E+12				2.4E+11								6.3E+11			3.7E+11
SW63	Sidmouth to West Bay	L	Yes	3.9E+09		1.5E+09	7.3E+09	3.0E+09				4.2E+11		1.1E+09									1.2E+04	3.7E+04			3.4E+11
SW63	Sidmouth to West Bay	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW63	Sidmouth to West Bay	R	Yes	1.8E+14		1.1E+10	9.6E+09	2.2E+09	1.0E+07			1.8E+12		6.0E+06		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			4.2E+11
SW66	South Devon Shore Dock	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW66	South Devon Shore Dock	R	Yes	1.8E+14		1.2E+10	1.7E+10	5.2E+09	1.0E+07			2.2E+12		1.1E+09		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			7.5E+11
SW67	South Hams	L	Yes	2.7E+09		1.3E+09	7.3E+09	3.0E+09				4.2E+11		1.0E+09									1.2E+04	3.7E+04			3.4E+11
SW67	South Hams	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW67	South Hams	R	Yes	1.8E+14		1.1E+10	9.6E+09	2.2E+09	1.0E+07			1.8E+12		1.8E+07		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			4.2E+11
SW69	St. Albans Head to Durlston Head	L	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW69	St. Albans Head to Durlston Head	L	Yes	1.8E+14		2.4E+08	3.1E+09					1.0E+12		1.2E+07		2.3E+11						3.6E+06		6.0E+09			1.3E+11
SW69	St. Albans Head to Durlston Head	R	Yes	6.0E+10		1.2E+10	1.4E+10	5.2E+09	1.0E+07			1.6E+12		1.0E+09		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			7.3E+11
SW70	Tamar Estuaries Complex	L	Yes	5.7E+10		1.1E+10	7.2E+09	2.2E+09	1.0E+07			1.2E+12		6.0E+06		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			3.9E+11
SW70	Tamar Estuaries Complex	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW70	Tamar Estuaries Complex	R	Yes	1.8E+14		1.5E+09	9.7E+09	3.0E+09				1.0E+12		1.1E+09		1.2E+10						3.6E+06	1.2E+04	6.0E+09			3.6E+11
SW71	The Lizard	R	No	2.2E+14													2.0E+12							2.2E+10			1.0E+12
SW71	The Lizard	R	Yes	1.8E+14		1.2E+10	1.7E+10	5.2E+09	1.0E+07			2.2E+12		1.1E+09		3.7E+11	4.4E+07					2.8E+07	1.2E+07	7.2E+09			7.5E+11
SW72	Tintagel-Marsland-Clovelly Coast	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
SW72	Tintagel-Marsland-Clovelly Coast	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W001	Aber Afon Dyfi/Dyfi Estuary	L	Yes	2.4E+11		2.4E+09	2.4E+09							4.2E+09										6.0E+08			2.4E+09
W001	Aber Afon Dyfi/Dyfi Estuary	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W001	Aber Afon Dyfi/Dyfi Estuary	R	Yes			1.3E+08	8.9E+08							1.2E+08										2.4E+02			1.8E+10
W006	Afon TeifiRiver Teifi	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W006	Afon TeifiRiver Teifi	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W010	Bae Cemlyn/Cemlyn Bay	L	No	1.5E+13																							1.1E+11
W010	Bae Cemlyn/Cemlyn Bay	R	Yes	4.4E+10		4.3E+09	1.8E+09					9.9E+11		8.9E+08													4.7E+11
W016	Burry Inlet	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W016	Burry Inlet	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W020	Cardigan Bay/Bae Ceredigion	L	Yes	2.4E+11		2.4E+09	2.4E+09							4.2E+09										6.0E+08			2.4E+09
W020	Cardigan Bay/Bae Ceredigion	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
W020	Cardigan Bay/Bae Ceredigion	R	Yes			1.3E+08	8.9E+08							1.2E+08										2.4E+02			1.8E+10
W021	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W021	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W022	Carmarthen Bay Dunes/Twyni Bae Caerfyrddin	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W022	Carmarthen Bay Dunes/Twyni Bae Caerfyrddin	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W023	Carmarthen Bay	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W023	Carmarthen Bay	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W024	Castlemartin Coast	L	No	8.9E+11																				4.4E+09		1.8E+11	8.9E+10
W024	Castlemartin Coast	L	Yes																								1.8E+10
W024	Castlemartin Coast	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W024	Castlemartin Coast	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W026	Clogwyni Pen Llyn/Seacliffs of Lleyn	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W026	Clogwyni Pen Llyn/Seacliffs of Lleyn	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W046	Dee Estuary - SPA	L	Yes	4.5E+11		1.4E+10						1.1E+12		6.0E+08										9.0E+10			1.3E+11
W046	Dee Estuary - SPA	R	No	3.7E+15				9.1E+12	8.0E+10		1.0E+09	6.0E+11					2.0E+11			1.4E+14	1.0E+11	4.0E+10		4.4E+11			7.6E+11
W046	Dee Estuary - SPA	R	Yes	3.9E+12		4.6E+11	4.8E+10	4.4E+09	2.4E+07	5.3E+08		1.1E+13		3.1E+11		1.6E+12	1.2E+07				2.9E+10			9.1E+10			8.2E+12
W047	Dee Estuary - pSAC	L	Yes	4.5E+11		1.4E+10						1.1E+12		6.0E+08										9.0E+10			1.3E+11
W047	Dee Estuary - pSAC	R	No	3.7E+15				9.1E+12	8.0E+10		1.0E+09	6.0E+11					2.0E+11			1.4E+14	1.0E+11	4.0E+10		4.4E+11			7.6E+11
W047	Dee Estuary - pSAC	R	Yes	3.9E+12		4.6E+11	4.8E+10	4.4E+09	2.4E+07	5.3E+08		1.1E+13		3.1E+11		1.6E+12	1.2E+07				2.9E+10			9.1E+10			8.2E+12
W050	Dunraven Bay	L	Yes	2.4E+08		2.4E+08						1.5E+12		1.4E+08		4.8E+09								8.4E+09			2.7E+11
W050	Dunraven Bay	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W050	Dunraven Bay	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				8.0E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.8E+11		1.4E+10	3.8E+12
W054	Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W054	Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	L	Yes	4.4E+10		3.1E+09	2.7E+09					3.0E+11		1.0E+09										2.4E+02			4.3E+10
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	R	Yes	2.4E+11		2.4E+09	2.4E+09							4.2E+09										6.0E+08			2.0E+10
W056	Glannau Ynys Gybi/Holy Island Coast	R	No	1.5E+13																							1.1E+11
W056	Glannau Ynys Gybi/Holy Island Coast	R	Yes	4.4E+10		4.3E+09	1.8E+09					9.9E+11		8.9E+08													4.7E+11
W057	Glannau Ynys Gybi/Holy Island Coast	R	No	1.5E+13																							1.1E+11
W057	Glannau Ynys Gybi/Holy Island Coast	R	Yes	4.4E+10		4.3E+09	1.8E+09					9.9E+11		8.9E+08													4.7E+11

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
W062	Gower Commons/Tiroedd Comin Gwyr SAC	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W062	Gower Commons/Tiroedd Comin Gwyr SAC	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W063	Grassholm	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W063	Grassholm	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W064	Great Orme's Head/Pen y Gogarth	L	Yes	4.4E+10		3.0E+09	1.8E+09					3.0E+11		8.9E+08													4.3E+10
W064	Great Orme's Head/Pen y Gogarth	R	No	1.5E+13																							1.1E+11
W064	Great Orme's Head/Pen y Gogarth	R	Yes			1.3E+09						6.9E+11															4.2E+11
W069	Kenfig/Cynffig	L	Yes									7.2E+11				4.8E+09								4.8E+09			1.1E+10
W069	Kenfig/Cynffig	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W069	Kenfig/Cynffig	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				8.8E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.8E+11		1.4E+10	4.0E+12
W070	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W070	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.5E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W076	Morfa Harlech a Morfa Dyffryn	L	No	5.0E+11						2.2E+11							3.0E+10										
W076	Morfa Harlech a Morfa Dyffryn	R	No	8.9E+11																				4.4E+09		1.8E+11	8.9E+10
W076	Morfa Harlech a Morfa Dyffryn	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W078	Mynydd Cilan, Trwyn y Wylfa ac Ynsoedd Sant Tudwal	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W078	Mynydd Cilan, Trwyn y Wylfa ac Ynsoedd Sant Tudwal	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W083	Pembrokeshire Marine/Sir Benfro Forol	L	No	8.9E+11																				4.4E+09		1.8E+11	8.9E+10
W083	Pembrokeshire Marine/Sir Benfro Forol	L	Yes																								1.8E+10
W083	Pembrokeshire Marine/Sir Benfro Forol	R	No	5.0E+11						2.2E+11							3.0E+10										
W083	Pembrokeshire Marine/Sir Benfro Forol	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.8E+09
W084	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W084	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W086	Ramsey and St. Davids Peninsula Coast	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10

Table A4.1 Continued

Site code	Natura site	L or R[a]	Via STW[b]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
W086	Ramsey and St. Davids Peninsula Coast	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W092 b	River Usk/Afon Wysg	L	Yes									7.9E+11															3.0E+10
W092 b	River Usk/Afon Wysg	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W092 b	River Usk/Afon Wysg	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				8.7E+12		3.2E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W093	River Wye/Afon Gwy	L	Yes									3.6E+11		2.4E+09		1.8E+10											6.0E+10
W093	River Wye/Afon Gwy	R	No	1.3E+15				7.0E+12	4.3E+10								1.5E+12										1.6E+12
W093	River Wye/Afon Gwy	R	Yes	5.1E+12	1.3E+14	2.2E+12	3.9E+10	1.9E+10				9.1E+12		3.0E+10		1.6E+12	7.0E+11						4.8E+05	8.9E+11		1.4E+10	4.0E+12
W095	St David's/Ty Ddewi	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W095	St David's/Ty Ddewi	R	Yes	2.4E+11		2.5E+09	3.3E+09							4.3E+09										6.0E+08			2.1E+10
W096	Traeth Lafan/Lavan Sands, Conway Bay	L	Yes	4.4E+10		3.0E+09	1.8E+09					3.0E+11		8.9E+08													4.3E+10
W096	Traeth Lafan/Lavan Sands, Conway Bay	R	No	1.5E+13																							1.1E+11
W096	Traeth Lafan/Lavan Sands, Conway Bay	R	Yes			1.3E+09						6.9E+11															4.2E+11
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	L	Yes	4.4E+10		3.1E+09	2.7E+09					3.0E+11		1.0E+09										2.4E+02			4.3E+10
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	R	No	1.5E+13																							1.1E+11
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	R	Yes			1.3E+09						6.9E+11															4.2E+11
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	L	Yes	4.4E+10		3.1E+09	2.7E+09					3.0E+11		1.0E+09										2.4E+02			4.3E+10
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	R	No	1.4E+12						2.2E+11							3.0E+10							4.4E+09		1.8E+11	8.9E+10
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	R	Yes	2.4E+11		2.4E+09	2.4E+09							4.2E+09										6.0E+08			2.0E+10
W102	Ynys Feurig, Cemlyn Bay and the Skerries	L	No	1.5E+13																							1.1E+11
W102	Ynys Feurig, Cemlyn Bay and the Skerries	R	Yes	4.4E+10		4.3E+09	1.8E+09					9.9E+11		8.9E+08													4.7E+11
W103	Ynys Seiriol/Puffin Island	L	Yes	4.4E+10		3.0E+09	1.8E+09					3.0E+11		8.9E+08													4.3E+10
W103	Ynys Seiriol/Puffin Island	R	No	1.5E+13																							1.1E+11
W103	Ynys Seiriol/Puffin Island	R	Yes			1.3E+09						6.9E+11															4.2E+11

[a]L or R = Local or Regional.
[b]STW = Sewage Treatment Works.

Table A4.2 Modifying factors for discharges via sewage treatment works

Radionuclide	Fraction passing through STW[a]	Fraction remaining after decay[a]
Tritium (not OBT)	0.85	1
Tritium (Organically Bound)	0.85	1
Carbon-14	0.85	1
Phosphorus-32/33	0.2	0.98
Sulphur-35	0.9	1
Cobalt-60	0.2	1
Strontium-90	0.9	1
Technetium-99	0.9	1
Technetium-99m	0.9	0.21
Ruthenium-106	0.9	1
Iodine-125	0.8	1
Iodine-129	0.8	1
Iodine-131	0.8	0.95
Caesium-137	0.7	1
Polonium-210	0.1	1
Radium-226	0.5	1
Thorium-234	0.1	0.98
Uranium-alpha	0.9	1
Plutonium-alpha	0.5	1
Americium-241	0.1	1
Other alpha	1	1
Other beta/gamma (t1/2 <1 day)	1	0.65[b]
Other beta/gamma (t1/2 1–10 days)	1	0.96[b]
Other beta/gamma (t1/2 >10 days)	1	1[b]

[a]From Allott and Titley (2005).
[b]Calculated assuming 15 hours of decay for appropriate half-life (Titley et al. 2000a).

Table A4.3 Local and regional exchange rates

Site code	Natura 2000 site	Local exchange rate (m^3/s)	Reference for local exchange rate (Environment Agency 2006a for guidance on default assumptions)	Regional compartment	Regional exchange rate (m^3/s)
A02	Alde-Ore Estuary SPA	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A03	Alde, Ore and Butley Estuaries cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A06	Benacre to Easton Bavents SPA	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A07	Benacre to Easton Bavents Lagoons cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A08	Benfleet & Southend Marshes SPA	3.80E+02	Inner tidal Thames (Titley et al. 2000b)	North Sea South West and South East	2.20E+05
A11	Breydon Water SPA	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
A12	The Broadland – SPA	5.00E+00	See river flow rates (Appendix 5)	North Sea South West and South East	2.20E+05
A13	Deben Estuary SPA	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
A16	Essex Estuaries – cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A17	Mid Essex Coast SPA – Phase 1 – Dengie	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A21	Mid Essex Coast SPA – Phase 5 – Foulness	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A24	Gibraltar Point SPA	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A25	Great Yarmouth North Denes SPA	1.00E+02	Default large estuary/coastal water	North Sea South West and South East	2.20E+05
A27	Hamford Water SPA	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
A28	Minsmere to Walberswick SPA	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A29	Minsmere to Walberswick Heaths and Marshes cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A33	North Norfolk Coast SPA	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A34	North Norfolk Coast cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A35	Orfordness – Shingle Street cSAC	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
A39	Overstrand Cliffs cSAC	3.50E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A46	Sandlings SPA	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
A47	Saltfleetby – Theddlethorpe Dunes and Gibraltar Point cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A49	Stour and Orwell Estuaries – SPA	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05

Table A4.3 Continued

Site code	Natura 2000 site	Local exchange rate (m^3/s)	Reference for local exchange rate (Environment Agency 2006a for guidance on default assumptions)	Regional compartment	Regional exchange rate (m^3/s)
A50	The Broads – cSAC	5.00E+00	See river flow rates (Appendix 5)	North Sea South West and South East	2.20E+05
A51	The Wash SPA	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A52	The Wash and North Norfolk Coast cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)	North Sea South West and South East	2.20E+05
A55	Winterton – Horsey Dune cSAC	1.00E+02	Default large estuary/coastal water	North Sea South West and South East	2.20E+05
NE02	Beast Cliff to Whitby (Robin Hood's Bay)	3.00E+01	Default small estuary	North Sea Central	4.00E+05
NE03	Berwickshire & N Northumberland Coast	3.00E+01	Default small estuary	North Sea Central	4.00E+05
NE05	Coquet Island	3.00E+01	Default small estuary	North Sea Central	4.00E+05
NE08	Durham Coast	1.00E+02	Default large estuary/coastal water	North Sea Central	4.00E+05
NE10	Farne Islands	3.00E+01	Default small estuary	North Sea Central	4.00E+05
NE12	Flamborough Head	1.30E+02	Hartlepool Bay (Simmonds et al. 1995)	North Sea Central	4.00E+05
NE13	Flamborough Head and Bempton Cliffs	1.30E+02	Hartlepool Bay (Simmonds et al. 1995)	North Sea Central	4.00E+05
NE18	Humber Estuary	1.00E+02	Default large estuary/coastal water	North Sea Central	4.00E+05
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	1.00E+02	Default large estuary/coastal water	North Sea Central	4.00E+05
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	1.00E+02	Default large estuary/coastal water	North Sea Central	4.00E+05
NE22	Lindisfarne	1.30E+02	Hartlepool Bay (Simmonds et al. 1995)	North Sea Central	4.00E+05
NE27	N Northumberland Dunes	1.30E+02	Hartlepool Bay (Simmonds et al. 1995)	North Sea Central	4.00E+05
NE33	Northumbria Coast	1.00E+02	Default large estuary/coastal water	North Sea Central	4.00E+05
NE44	Teesmouth and Cleveland Coast	3.00E+01	Default small estuary	North Sea Central	4.00E+05
NE46	Tweed Estuary	3.00E+01	Default small estuary	North Sea Central	4.00E+05
NW08	Drigg Coast	2.50E+03	Sellafield (Simmonds et al. 1995)	Cumbrian Waters	1.20E+04
NW09	Duddon Estuary	3.00E+01	Default small estuary	Cumbrian Waters	1.20E+04
NW14	Leighton Moss	1.00E+02	Default large estuary/coastal water	Liverpool and Morecambe Bays	5.20E+03
NW18	Mersey Estuary	5.00E+02	See Table A4.4	Liverpool and Morecambe Bays	5.20E+03
NW20	Morecambe Bay – cSAC	2.54E+02	Heysham (Simmonds et al. 1995)	Liverpool and Morecambe Bays	5.20E+03
NW21	Morecambe Bay – SPA	2.54E+02	Heysham (Simmonds et al. 1995)	Liverpool and Morecambe Bays	5.20E+03
NW25	Ribble/Alt Estuaries	1.30E+02	Springfields (Simmonds et al. 1995)	Liverpool and Morecambe Bays	5.20E+03
NW33	Sefton Coast	5.00E+02	Same as Mersey see Table A4.4	Liverpool and Morecambe Bays	5.20E+03
NW34	Solway Firth	1.00E+02	Default large estuary/coastal water	Cumbrian Waters	1.20E+04
NW40	Upper Solway Flats & Marshes	1.00E+02	Default large estuary/coastal water	Cumbrian Waters	1.20E+04
S07	Chichester & Langstone Harbours	3.00E+01	Default small estuary	English Channel North East	1.10E+05
S08	Dover to Kingsdown Cliffs	1.00E+02	Default large estuary/coastal water	North Sea South West and South East	2.20E+05

Table A4.3 Continued

Site code	Natura 2000 site	Local exchange rate (m^3/s)	Reference for local exchange rate (Environment Agency 2006a for guidance on default assumptions)	Regional compartment	Regional exchange rate (m^3/s)
S10	Dungeness	2.54E+03	Dungeness (Simmonds et al. 1995)	English Channel North East	1.10E+05
S11	Dungeness to Pett Level	2.54E+03	Dungeness (Simmonds et al. 1995)	English Channel North East	1.10E+05
S15	Hastings Cliffs (to Pett Beach)	2.50E+03	Dungeness (Simmonds et al. 1995)	English Channel North East	1.10E+05
S16	Isle of Wight Downs	1.30E+03	Winfrith (Weymouth Bay) (Simmonds et al. 1995)	English Channel North East	1.10E+05
S20	Medway Estuary & Marshes	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
S22	The New Forest – SPA	3.00E+01	Default small estuary	English Channel North East	1.10E+05
S23	The New Forest – cSAC	3.00E+01	Default small estuary	English Channel North East	1.10E+05
S25	Pagham Harbour	3.00E+01	Default small estuary	English Channel North East	1.10E+05
S28	Portsmouth Harbour	3.00E+01	Default small estuary	English Channel North East	1.10E+05
S32	Sandwich Bay	1.00E+02	Default large estuary/coastal water	North Sea South West and South East	2.20E+05
S34	Solent & Isle of Wight Lagoons	1.30E+03	Winfrith (Weymouth Bay) (Simmonds et al. 1995)	English Channel North East	1.10E+05
S35	Solent & Southampton Water	1.00E+02	Default large estuary/coastal water	English Channel North East	1.10E+05
S36	Solent Maritime	1.30E+03	Winfrith (Weymouth Bay) (Simmonds et al. 1995)	English Channel North East	1.10E+05
S37	South Wight Maritime	1.00E+02	Default large estuary/coastal water	English Channel North East	1.10E+05
S40	Thames Estuary and Marshes	3.80E+02	Inner tidal Thames (Titley et al. 2000b)	North Sea South West and South East	2.20E+05
S41	Thanet Coast	3.80E+02	Inner tidal Thames (Titley et al. 2000b)	North Sea South West and South East	2.20E+05
S42	Thanet Coast & Sandwich Bay	3.80E+02	Inner tidal Thames (Titley et al. 2000b)	North Sea South West and South East	2.20E+05
S45	The Swale	3.00E+01	Default small estuary	North Sea South West and South East	2.20E+05
SW05	Blackstone Point	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW07	Braunton Burrows	3.00E+01	Default small estuary	Bristol Channel	6.30E+04
SW11	Chesil & the Fleet	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW12	Chesil Beach & the Fleet	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW19	Dawlish Warren	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW20	Dorset Heaths	1.00E+02	Default large estuary/coastal water	English Channel North East	1.10E+05
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	1.00E+02	Default large estuary/coastal water	English Channel North East	1.10E+05
SW22	Dorset Heathlands	1.00E+02	Default large estuary/coastal water	English Channel North East	1.10E+05
SW25	Exe Estuary	3.00E+01	Default small estuary	English Channel West	2.20E+05
SW27	Exmoor Heaths	3.00E+01	Default small estuary	Bristol Channel	6.30E+04
SW28	Fal and Helford	3.00E+01	Default small estuary	Bristol Channel	6.30E+04
SW30	Godrevy Head to St. Agnes	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
SW35	Isle of Portland to Studland Cliffs	1.30E+03	Winfrith (Weymouth Bay) (Simmonds et al. 1995)	English Channel West	2.20E+05

Table A4.3 Continued

Site code	Natura 2000 site	Local exchange rate (m^3/s)	Reference for local exchange rate (Environment Agency 2006a for guidance on default assumptions)	Regional compartment	Regional exchange rate (m^3/s)
SW36	Isles of Scilly Complex	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
SW37	Isles of Scilly	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
SW39	Lundy	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
SW49	Plymouth Sound & Estuaries	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW50	Polruan to Polperro	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW51	Poole Harbour	3.00E+01	Default small estuary	English Channel West	2.20E+05
SW61	Severn Estuary – SAC	3.17E+03	Hinkley Point (Bristol Channel) (Simmonds et al. 1995)	Bristol Channel	6.30E+04
SW62	Severn Estuary – SPA	3.17E+03	Hinkley Point (Bristol Channel) (Simmonds et al. 1995)	Bristol Channel	6.30E+04
SW63	Sidmouth to West Bay	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW66	South Devon Shore Dock	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW67	South Hams	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW69	St. Albans Head to Durlston Head	1.30E+03	Winfrith (Weymouth Bay) (Simmonds et al. 1995)	English Channel West	2.20E+05
SW70	Tamar Estuaries Complex	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW71	The Lizard	1.00E+02	Default large estuary/coastal water	English Channel West	2.20E+05
SW72	Tintagel-Marsland-Clovelly Coast	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+05
W001	Aber Afon Dyfi/Dyfi Estuary	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W006	Afon TeifiRiver Teifi	3.00E+01	Default small estuary	Irish Sea South	1.20E+05
W010	Bae Cemlyn/Cemlyn Bay	3.00E+01	Default small estuary	Irish Sea West and South East	1.30E+05
W016	Burry Inlet	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W020	Cardigan Bay/Bae Ceredigion	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W021	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W022	Carmarthen Bay Dunes/Twyni Bae Caerfyrddin	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W023	Carmarthen Bay	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W024	Castlemartin Coast	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W026	Clogwyni Pen Llyn/Seacliffs of Lleyn	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W046	Dee Estuary – SPA	7.30E+02	See Table A4.4	Liverpool and Morecambe Bays	5.20E+03
W047	Dee Estuary – SAC	7.30E+02	See Table A4.4	Liverpool and Morecambe Bays	5.20E+03
W050	Dunraven Bay	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W054	Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W056	Glannau Ynys Gybi/Holy Island Coast	3.00E+01	Default small estuary	Irish Sea West and South East	1.30E+05

Table A4.3 Continued

Site code	Natura 2000 site	Local exchange rate (m^3/s)	Reference for local exchange rate (Environment Agency 2006a for guidance on default assumptions)	Regional compartment	Regional exchange rate (m^3/s)
W057	Glannau Ynys Gybi/Holy Island Coast	3.00E+01	Default small estuary	Irish Sea West and South East	1.30E+05
W062	Gower Commons/Tiroedd Comin Gwyr	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W063	Grassholm	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W064	Great Orme's Head/Pen y Gogarth	1.00E+02	Default large estuary/coastal water	Irish Sea West and South East	1.30E+05
W069	Kenfig/Cynffig	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W070	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym	1.00E+02	Default large estuary/coastal water	Bristol Channel	6.30E+04
W076	Morfa Harlech a Morfa Dyffryn	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W078	Mynydd Cilan, Trwyn y Wylfa ac Ynsoedd Sant Tudwal	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W083	Pembrokeshire Marine/Sir Benfro Forol	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W084	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W086	Ramsey and St. Davids Peninsula Coast	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W092b	River Usk/Afon Wysg (estuary)	3.00E+01	Default small estuary	Bristol Channel	6.30E+04
W093	River Wye/Afon Gwy	4.70E+01	See river flow rates (Appendix 5)	Bristol Channel	6.30E+04
W095	St David's/Ty Ddewi	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W096	Traeth Lafan/Lavan Sands, Conway Bay	1.00E+02	Default large estuary/coastal water	Irish Sea West and South East	1.30E+05
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	1.00E+02	Default large estuary/coastal water	Irish Sea West and South East	1.30E+05
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	1.00E+02	Default large estuary/coastal water	Irish Sea South	1.20E+05
W102	Ynys Feurig, Cemlyn Bay and the Skerries	1.00E+02	Default large estuary/coastal water	Irish Sea West and South East	1.30E+05
W103	Ynys Seiriol/Puffin Island	1.00E+02	Default large estuary/coastal water	Irish Sea West and South East	1.30E+05

Table A4.4 Derivation of local compartment exchange rate

Location	Area[a] (m^2)	Annual average tidal range[b] (m)	Volume change each tide[c] (m^3)	Time for 1 tide (s)	Fraction flushing per tide[d]	Exchange rate[e] (m^3/s)
Mersey Estuary	6.95E+07	6.3 (Liverpool gauging station)	4.38E+08	43200	0.05	500
Dee Estuary	1.01E+08	6.3 (Liverpool gauging station)	6.33E+08	43200	0.05	730

[a]Calculated from GIS map printed at 1:25000 scale.
[b]Tidal data sourced from Proudman Oceanographic Laboratory (http://www.pol.ac.uk) and analysed to obtain annual average tidal range.
[c]Calculated from tidal range and area.
[d]Data from Tamar Estuary indicates complete flushing over 7–12 days (i.e. 14–24 tides) (Titley 1988). A value of complete flushing over 20 tides has been selected, equating to a flushing fraction of 0.05.
[e]Calculated from volume change each tide, multiplied by fraction flushing per tide and divided by time for 1 tide.

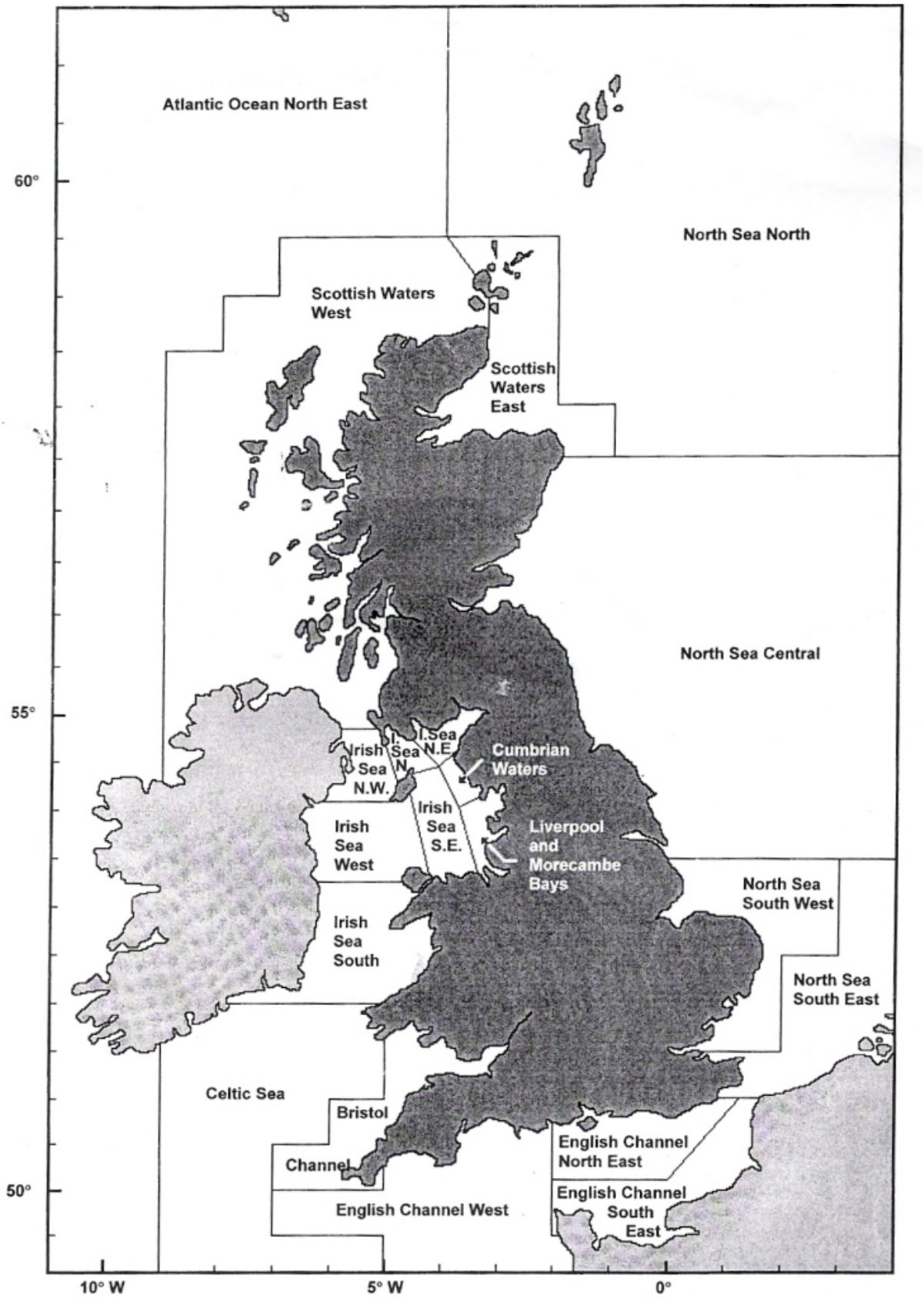


Figure A4.1 Regional compartments (from Bexon 1999)

Appendix 5 – Assessing dose rates for releases to freshwaters

Selecting RSA 93 authorisations

The RSA 93 authorisations which could impact on Natura 2000 sites with protected freshwater features were identified as follows:

a. Release points (e.g. sewage treatment works outfalls, pipelines into rivers, etc.), watercourses and Natura 2000 sites were displayed using GIS mapping.
b. The route from a release point down a watercourse was followed on the GIS map to the point where the release ultimately enters an estuary.
c. The freshwater Natura 2000 sites which are in hydraulic connection with the watercourse along this route were identified.
d. Natura 2000 sites in estuaries and coastal waters were also identified in a similar way as releases to coastal waters (see Appendix 4).

Hence for each freshwater Natura 2000 site, the release points which could lead to releases impacting on that site were identified. The database of RSA 93 authorisations was used to select the RSA 93 authorisations which can impact on each Natura 2000 site using the release point linkage information. The authorisation limits for each RSA 93 authorisation were entered into the radioactive substance habitats assessment spreadsheet tool, along with a coding for whether the release is via a sewage treatment works or not. The spreadsheet tool used this coding to sum up the following releases for each radionuclide:

a. Not via a sewage treatment works.
b. Via a sewage treatment works.

These total releases are shown in Table A5.1. The releases via a sewage treatment works were multiplied by factors to take account of partitioning of some of the radionuclides onto sewage sludge and hence removal from the treated effluent and also radioactive decay as the effluent passes through the sewage treatment works (see Table A4.2, Appendix 4).

Calculating dose rates

The spreadsheet tool contains dose rate per unit release values and allows the river flow rate to be entered, and these were used to modify the dose rate per unit release values. The dose rate per unit releases values for freshwaters were calculated for a flow rate of 1 m^3/s.

River flow rates used in the assessment are shown in Table A5.2. The guidance in Environment Agency (2006a) has been used for selecting default exchange rates. This states that a default exchange rate of 1 m^3/s may be used, but that a maximum flow rate of 100 m^3/s should be imposed. Where total dose rates to the worst affected organism were greater than 10 microgray/h, efforts were made to source or calculate more realistic river flow rates (see Table A5.2).

The dose rates to organisms affected by releases into freshwaters were calculated in the spreadsheet tool as follows:

a. Dose rate to an organism from a particular radionuclide in the river was calculated by multiplying the total release of that radionuclide into the river, multiplied by the dose rate per unit release values and divided by the river flow rate.
b. Total dose rate to an organism from releases into the local compartment was calculated by summing the radionuclide dose rates.

Summary total dose rates to the worst affected organism from releases to the river were then identified.

Table A5.1 Total releases at authorised limits to freshwaters

Site code	Natura site	Via STW [a]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A02	Alde-Ore Estuary SPA	No	9.1E+13													1.0E+12										8.3E+11
A06	Benacre to Easton Bavents SPA	No	1.2E+10		3.0E+09																					1.2E+08
A06	Benacre to Easton Bavents SPA	Yes	3.1E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												2.3E+08			4.8E+11
A07	Benacre to Easton Bavents Lagoons cSAC	No	1.2E+10		3.0E+09																					1.2E+08
A07	Benacre to Easton Bavents Lagoons cSAC	Yes	3.1E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												2.3E+08			4.8E+11
A08	Benfleet & Southend Marshes SPA	No	2.4E+09		2.2E+10	2.2E+10	2.4E+09																			3.6E+08
A08	Benfleet & Southend Marshes SPA	Yes	2.0E+12		1.5E+12	1.1E+12	5.9E+11			6.0E+11	6.1E+13		2.0E+12		6.0E+12	6.0E+09			2.9E+06	5.8E+06		3.0E+08	4.5E+10		9.6E+10	2.1E+13
A09	Breckland cSAC	No			2.2E+09																					
A09	Breckland cSAC	Yes	4.8E+10		7.4E+09	6.0E+08	6.0E+08				4.8E+11				1.2E+08											2.3E+10
A10	Breckland pSPA	No			2.2E+09																					
A10	Breckland pSPA	Yes	4.8E+10		7.4E+09	6.0E+08	6.0E+08				4.8E+11				1.2E+08											2.3E+10
A11	Breydon Water SPA	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
A12	The Broadland – SPA	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
A16	Essex Estuaries – cSAC	No	7.0E+12													7.0E+11										7.0E+11
A16	Essex Estuaries - cSAC	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A17	Mid Essex Coast SPA – Phase 1 – Dengie	No	7.0E+12													7.0E+11										7.0E+11
A17	Mid Essex Coast SPA – Phase 1 – Dengie	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	No	7.0E+12													7.0E+11										7.0E+11
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	No	7.0E+12													7.0E+11										7.0E+11
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	No	7.0E+12													7.0E+11										7.0E+11
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A21	Mid Essex Coast SPA – Phase 5 – Foulness	No	7.0E+12													7.0E+11										7.0E+11
A21	Mid Essex Coast SPA – Phase 5 – Foulness	Yes			1.4E+09	6.3E+09					3.2E+12		7.2E+08		7.1E+11											6.7E+11
A24	Gibraltar Point SPA	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A24	Gibraltar Point SPA	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A28	Minsmere to Walberswick SPA	No	9.1E+13													1.0E+12										8.3E+11
A30	Nene Washes SPA	Yes	4.4E+11		4.4E+10	4.8E+09	3.0E+09				8.6E+11		4.4E+09		1.6E+11											5.7E+10
A31	Nene Washes cSAC	Yes	4.4E+11		4.4E+10	4.8E+09	3.0E+09				8.6E+11		4.4E+09		1.6E+11											5.7E+10
A32	Norfolk Valley Fens – cSAC	Yes				2.4E+09					2.4E+11		7.2E+07		1.2E+10											1.9E+10
A33	North Norfolk Coast SPA	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10

Table A5.1 Continued

Site code	Natura site	Via STW [a]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A33	North Norfolk Coast SPA	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A34	North Norfolk Coast cSAC	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A34	North Norfolk Coast cSAC	Yes	4.2E+12		2.4E+11	1.8E+11	1.9E+11				7.2E+12		7.6E+10		3.8E+12								1.2E+09		3.0E+09	1.2E+12
A37	Ouse Washes cSAC	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A37	Ouse Washes cSAC	Yes	4.2E+12		2.4E+11	1.7E+11	1.9E+11				4.5E+12		7.4E+10		2.0E+12								6.1E+08		3.0E+09	8.9E+11
A38	Ouse Washes SPA	No	9.2E+09		1.3E+10	6.8E+09	6.1E+09						6.2E+09													1.7E+10
A38	Ouse Washes SPA	Yes	4.2E+12		2.4E+11	1.7E+11	1.9E+11				4.5E+12		7.4E+10		2.0E+12								6.1E+08		3.0E+09	8.9E+11
A41	Portholme cSAC	No	4.8E+09		8.4E+09	2.4E+09	1.7E+09						1.8E+09													7.9E+09
A41	Portholme cSAC	Yes			1.2E+11	1.8E+09	6.0E+08				6.5E+11		9.6E+07		5.4E+09								6.1E+08			2.4E+10
A46	Sandlings pSPA	No	9.1E+13													1.0E+12										8.3E+11
A49	Stour and Orwell Estuaries – SPA	Yes			1.2E+09						8.4E+11				4.8E+11		9.6E+04									3.8E+09
A50	The Broads – cSAC	Yes	3.0E+11		7.5E+10	9.8E+10	3.6E+10				9.8E+11												1.2E+05			4.8E+11
M13	Fens Pools	Yes									9.6E+11				4.8E+09											5.6E+10
NE18	Humber Estuary	No	4.5E+11								2.4E+09					2.2E+10									1.1E+11	3.4E+11
NE18	Humber Estuary	Yes	1.0E+12		1.2E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		2.8E+13		2.3E+10		2.7E+12	6.5E+08							5.0E+10			5.4E+12
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	No	4.5E+11								2.4E+09					2.2E+10									1.1E+11	3.4E+11
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	Yes	1.0E+12		1.2E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		2.8E+13		2.3E+10		2.7E+12	6.5E+08							5.0E+10			5.4E+12
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	No	4.5E+11								2.4E+09					2.2E+10									1.1E+11	3.4E+11
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	Yes	1.0E+12		1.2E+12	1.1E+11	5.2E+10	1.2E+08	1.2E+07		2.8E+13		2.3E+10		2.7E+12	6.5E+08							5.0E+10			5.4E+12
NE23	Lower Derwent	Yes	1.5E+09		1.9E+11	2.0E+09	4.4E+09				1.2E+12		1.2E+09													7.6E+10
NE24	Lower Derwent Valley	Yes	1.5E+09		1.9E+11	2.0E+09	4.4E+09				1.2E+12		1.2E+09													7.6E+10
NE35	River Derwent	Yes	1.5E+09		1.9E+11	2.0E+09	4.4E+09				1.2E+12		1.2E+09													7.6E+10
NW20	Morecambe Bay – cSAC	No	2.4E+15				5.1E+12	6.0E+10																		6.0E+11
NW20	Morecambe Bay – cSAC	Yes	2.4E+10		6.6E+08	5.0E+08			2.4E+05		1.2E+12												7.2E+09			4.9E+10
NW21	Morecambe Bay – SPA	No	2.4E+15				5.1E+12	6.0E+10																		6.0E+11
NW21	Morecambe Bay – SPA	Yes	2.4E+10		6.6E+08	5.0E+08			2.4E+05		1.2E+12												7.2E+09			4.9E+10
NW25	Ribble/Alt Estuaries	No									6.0E+11								1.4E+14	1.0E+11	4.0E+10		4.4E+11			
NW25	Ribble/Alt Estuaries	Yes				1.2E+10					1.9E+12				1.1E+11											1.7E+11
NW27	River Eden	Yes									3.0E+10				1.2E+10											3.1E+09
NW30	Rixton Clay Pits	Yes	2.6E+10		3.3E+11	3.5E+10	4.0E+09		5.3E+08		5.7E+12		3.1E+11		1.5E+12					2.9E+10			4.6E+10			5.7E+11
NW34	Solway Firth	Yes									3.0E+10				1.2E+10											3.1E+09
NW35	Solway Moss	Yes									3.0E+10				1.2E+10											3.1E+09
NW40	Upper Solway Flats & Marshes	Yes									3.0E+10				1.2E+10											3.1E+09
S01	Arun Valley	Yes	2.4E+10																							1.2E+10
S36	Solent Maritime	No	6.4E+11		7.2E+12																		6.0E+06		6.4E+10	1.4E+11
S36	Solent Maritime	Yes	1.7E+11		2.4E+10	4.3E+10	1.4E+10				3.8E+12		6.0E+09		8.6E+11								1.3E+08		5.6E+11	2.5E+12
S38	Stodmarsh – SPA	Yes	4.7E+10								1.1E+12		1.2E+07		2.4E+11											8.5E+10
S39	Stodmarsh – cSAC	Yes	4.7E+10								1.1E+12		1.2E+07		2.4E+11											8.5E+10

Table A5.1 Continued

Site code	Natura site	Via STW [a]	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Co-60	Sr-90	Tc-99	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
SW02	Avon Valley (Bickton to Christchurch)	Yes			4.8E+09	5.4E+08	5.4E+08						1.2E+08		2.4E+07											6.7E+09
SW11	Chesil & the Fleet	Yes	1.2E+09		2.1E+08	1.2E+07							1.2E+07													
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	Yes	1.8E+14		4.8E+09	3.7E+09	5.4E+08				1.4E+12		1.2E+08		2.3E+11						3.6E+06		6.0E+09			1.7E+11
SW25	Exe Estuary	Yes	2.7E+09		1.3E+09	7.3E+09	3.0E+09				4.2E+11		1.0E+09									1.2E+04	3.7E+04			3.4E+11
SW28	Fal and Helford	Yes				6.8E+09					5.0E+11				2.4E+11								2.4E+09			3.6E+11
SW49	Plymouth Sound & Estuaries	Yes	5.7E+10		1.1E+10	7.2E+09	2.2E+09	1.0E+07			1.2E+12		6.0E+06		3.6E+11	4.4E+07					2.4E+07	1.2E+07	1.2E+09			3.9E+11
SW55	River Avon	Yes			4.8E+09	5.4E+08	5.4E+08				3.6E+11		1.2E+08		2.4E+07											4.6E+10
SW64	Somerset Levels and Moors	Yes			2.4E+08						2.4E+11											4.8E+05				3.3E+11
T11	Lee Valley	Yes	9.9E+11		2.7E+11	6.5E+10	4.0E+10				1.0E+12		1.2E+12		1.2E+08											7.8E+10
T19	South West London Waterbodies	No	2.4E+09		2.4E+10	2.2E+10	2.4E+09																			3.6E+08
T19	South West London Waterbodies	Yes	1.8E+12		1.0E+12	4.0E+11	2.0E+11				3.8E+13		1.9E+12		2.9E+12	6.0E+09			2.9E+06	5.8E+06		3.0E+08	1.3E+10		7.2E+10	1.1E+13
T20	Thames Basin Heaths	Yes	1.9E+11		1.5E+11	1.2E+11	7.7E+10				2.5E+13		6.4E+10		1.5E+12							1.2E+04	6.8E+07			5.7E+12
T21	Thursley, Ash, Pirbright & Chobham	Yes			1.1E+10								1.2E+09													2.4E+10
W001	Aber Afon Dyfi/Dyfi Estuary	Yes	2.4E+11		2.4E+09	2.4E+09							4.2E+09										6.0E+08			2.4E+09
W019	Cardiff Beech Woods	Yes									1.8E+11												3.6E+09			8.4E+09
W020	Cardigan Bay/Bae Ceredigion	Yes	2.4E+11		2.4E+09	2.4E+09							4.2E+09										6.0E+08			2.4E+09
W033	Coedydd Derw a Safleoedd Ystlumd Meirion/Meirionydd Oakwoods & Bat Sites	No	5.0E+11						2.2E+11							3.0E+10										
W046	Dee Estuary – SPA	Yes	4.5E+11		1.4E+10						1.1E+12		6.0E+08										9.0E+10			1.3E+11
W047	Dee Estuary – pSAC	Yes	4.5E+11		1.4E+10						1.1E+12		6.0E+08										9.0E+10			1.3E+11
W053	Eryri/Snowdonia (inc Llyn Idwal)	Yes											1.2E+08													
W069	Kenfig/Cynffig	Yes									7.2E+11				4.8E+09								4.8E+09			1.1E+10
W083	Pembrokeshire Marine/Sir Benfro Forol	No	8.9E+11																				4.4E+09		1.8E+11	8.9E+10
W083	Pembrokeshire Marine/Sir Benfro Forol	Yes																								1.8E+10
W091	River Dee and Bala Lake	Yes			1.3E+09						3.3E+11															1.2E+11
W092 a	River Usk/Afon Wysg	Yes									4.3E+11															1.4E+10
W092 b	River Usk/Afon Wysg	Yes									7.9E+11															3.0E+10
W093	River Wye/Afon Gwy	Yes									3.6E+11		2.4E+09		1.8E+10											6.0E+10
W097	Usk Bat Sites/Safleodd Ystlumod Wysg	Yes									4.3E+11															1.4E+10
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	Yes	4.4E+10		3.1E+09	2.7E+09					3.0E+11		1.0E+09										2.4E+02			4.3E+10

[a]STW = Sewage Treatment Works.

Table A5.2 River flow rates

Site code	Natura 2000 site	Average river flow rate (m^3/s)	Reference for river flow rate (Environment Agency 2006a for guidance on default assumptions)
A02	Alde-Ore Estuary SPA	3.49E+02	Sizewell (Simmonds et al. 1995)
A06	Benacre to Easton Bavents SPA	3.49E+02	Sizewell (Simmonds et al. 1995)
A07	Benacre to Easton Bavents Lagoons cSAC	3.49E+04	Sizewell (Simmonds et al. 1995)
A08	Benfleet & Southend Marshes SPA	3.80E+02	Inner tidal Thames (Titley et al. 2000b)
A09	Breckland cSAC	3.00E+00	National River Flow Archive 33008 – Little Ouse at Thetford No1 Staunch (CEH)[a]
A10	Breckland SPA	3.00E+00	National River Flow Archive 33008 – Little Ouse at Thetford No1 Staunch (CEH)
A11	Breydon Water SPA	3.00E+01	Default small estuary
A12	The Broadland – SPA	5.00E+00	Confluence of four rivers: • 34004 – Wensum at Costessey Mill (4.04 m^3/s) • 34005 – Tud at Costessey Park (0.34 m^3/s) • 34001 – Yare at Colney (1.39 m^3/s) • 34002 – Tas at Shotesham (0.75 m^3/s) Cautious value of 5 m^3/s selected rather than sum of four rivers. (CEH)
A16	Essex Estuaries -cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)
A17	Mid Essex Coast SPA – Phase 1 – Dengie	3.49E+02	Sizewell (Simmonds et al. 1995)
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	3.49E+02	Sizewell (Simmonds et al. 1995)
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	3.49E+02	Sizewell (Simmonds et al. 1995)
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	3.49E+02	Sizewell (Simmonds et al. 1995)
A21	Mid Essex Coast SPA – Phase 5 – Foulness	3.49E+02	Sizewell (Simmonds et al. 1995)
A24	Gibraltar Point SPA	3.49E+02	Sizewell (Simmonds et al. 1995)
A28	Minsmere to Walberswick SPA	3.49E+02	Sizewell (Simmonds et al. 1995)
A30	Nene Washes SPA	9.30E+00	National River Flow Archive 32001 – Nene at Orton (CEH)
A31	Nene Washes cSAC	9.30E+00	National River Flow Archive 32001 – Nene at Orton (CEH)
A32	Norfolk Valley Fens – cSAC	1.00E+00	Default river
A33	North Norfolk Coast SPA	3.49E+02	Sizewell (Simmonds et al. 1995)
A34	North Norfolk Coast cSAC	3.49E+02	Sizewell (Simmonds et al. 1995)
A37	Ouse Washes cSAC	1.40E+01	National River Flow Archive 33026 – Bedford Ouse at Offord 13.8 m^3/s (CEH)
A38	Ouse Washes SPA	1.40E+01	National River Flow Archive 33026 – Bedford Ouse at Offord 13.8 m^3/s
A41	Portholme cSAC	1.40E+01	National River Flow Archive 33026 – Bedford Ouse at Offord 13.8 m^3/s (CEH)
A46	Sandlings SPA	3.00E+01	Default small estuary
A49	Stour and Orwell Estuaries – SPA	3.00E+01	Default small estuary
A50	The Broads – cSAC	5.00E+00	Confluence of four rivers: • 34004 – Wensum at Costessey Mill (4.04 m^3/s) • 34005 – Tud at Costessey Park (0.34 m^3/s) • 34001 – Yare at Colney (1.39 m^3/s) • 34002 – Tas at Shotesham (0.75 m^3/s) Cautious value of 5 m^3/s selected rather than sum of four rivers. (CEH)
NE18	Humber Estuary	1.00E+02	Default large estuary or coastal water. This is cautious as freshwater flow for River Trent at North Muskham is 90.5 m^3/s (National River Archive 28022) (CEH)

Table A5.2 Continued

Site code	Natura 2000 site	Average river flow rate (m^3/s)	Reference for river flow rate (Environment Agency 2006a for guidance on default assumptions)
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	1.00E+02	Default large estuary or coastal water. This is cautious as freshwater flow for River Trent at North Muskham is 90.5 m^3/s (National River Archive 28022) (CEH)
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	1.00E+02	Default large estuary or coastal water. This is cautious as freshwater flow for River Trent at North Muskham is 90.5 m^3/s (National River Archive 28022) (CEH)
NE23	Lower Derwent	1.60E+01	National River Flow Archive 27015 – Derwent at Stamford Bridge (CEH)
NE24	Lower Derwent Valley	1.60E+01	National River Flow Archive 27015 – Derwent at Stamford Bridge (CEH)
NE35	River Derwent	1.60E+01	National River Flow Archive 27015 – Derwent at Stamford Bridge (CEH)
NW20	Morecambe Bay – cSAC	2.54E+02	Heysham RP72 (Simmonds et al. 1995)
NW21	Morecambe Bay – SPA	2.54E+02	Heysham RP72 (Simmonds et al. 1995)
NW25	Ribble/Alt Estuaries	1.30E+02	Springfields (Simmonds et al. 1995)
NW27	River Eden	1.00E+00	Default river
NW34	Solway Firth	1.00E+02	Default large estuary or coastal water
NW35	Solway Moss	1.00E+02	Default large estuary or coastal water
NW40	Upper Solway Flats & Marshes	1.00E+02	Default large estuary or coastal water
S01	Arun Valley	1.00E+00	Default river
S36	Solent Maritime	1.30E+03	Winfrith (Weymouth Bay) (Simmonds et al. 1995)
S38	Stodmarsh – SPA	3.20E+00	National River Flow Archive 40011 – Great Stour at Horton (CEH)
S39	Stodmarsh – cSAC	3.20E+00	National River Flow Archive 40011 – Great Stour at Horton (CEH)
SW02	Avon Valley (Bickton to Christchurch)	1.00E+01	Default river
SW11	Chesil & the Fleet	1.00E+02	Default large estuary or coastal water
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	1.00E+02	Default large estuary or coastal water
SW25	Exe Estuary	3.00E+01	Default small estuary
SW28	Fal and Helford	3.00E+01	Default small estuary
SW49	Plymouth Sound & Estuaries	1.00E+02	Default large estuary or coastal water
SW55	River Avon	2.90E+00	National River Flow Archive 33026 43006 – Nadder at Wilton (CEH)
SW64	Somerset Levels and Moors	1.20E+00	National River Flow Archive 52007 – Parrett at Chiselborough (CEH)
T11	Lee Valley	4.40E+00	National River Flow Archive 38001 – Lee at Feildes Weir (CEH)
T19	South West London Waterbodies	5.50E+01	National River Flow Archive 39111 – Thames at Staines 55.5 m^3/s (CEH)
T20	Thames Basin Heaths	3.00E+01	Flooding risk only – Peak flow for 39079 – Wey at Weybridge in 2004 (CEH)
T21	Thursley, Ash, Pirbright & Chobham	2.70E-01	Environment Agency Stage 2 Habitats assessment. Lower than National River Flow Archive 39128 – Bourne (South) at Addlestone (0.9 m^3/s) (CEH)
W001	Aber Afon Dyfi/Dyfi Estuary	1.00E+02	Default large estuary or coastal water
W019	Cardiff Beech Woods	2.00E+01	River Taff (National River Flow Archive 57005 – Taff at Pontypridd) 19.8 m^3/s (CEH)
W020	Cardigan Bay/Bae Ceredigion	1.00E+02	Default large estuary or coastal water
W033	Coedydd Derw a Safleoedd Ystlumd Meirion/Meirionydd Oakwoods & Bat Sites	1.00E+00	Default river
W046	Dee Estuary – SPA	7.30E+02	See coastal exchange rates (Appendix 4)

Table A5.2 Continued

Site code	Natura 2000 site	Average river flow rate (m^3/s)	Reference for river flow rate (Environment Agency 2006a for guidance on default assumptions)
W047	Dee Estuary – SAC	7.30E+02	See coastal exchange rates (Appendix 4)
W053	Eryri/Snowdonia (inc Llyn Idwal)	1.00E+00	Default river
W069	Kenfig/Cynffig	1.00E+02	Default large estuary or coastal water
W083	Pembrokeshire Marine/Sir Benfro Forol	1.00E+02	Default large estuary or coastal water
W091	River Dee and Bala Lake	3.10E+01	National River Flow Archive 67015 – Dee at Manley Hall (CEH)
W092a	River Usk/Afon Wysg (river)	1.70E+01	National River Flow Archive 56004 – Usk at Llandetty (CEH)
W092b	River Usk/Afon Wysg (estuary)	3.00E+01	Default small estuary
W093	River Wye/Afon Gwy	4.70E+01	National River Flow Archive 55002 – Wye at Belmont (CEH)
W097	Usk Bat Sites/Safleodd Ystlumod Wysg	1.70E+01	National River Flow Archive 56004 – Usk at Llandetty (CEH)
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	1.00E+02	Default large estuary or coastal water

[a]CEH indicates reference data from the Centre for Ecology and Hydrology United Kingdom River Flow Archive (http://www.ceh.ac.uk/data/nrfa).

Appendix 6 – Assessing dose rates for releases to air

Selecting RSA 93 authorisations

All the premises with RSA 93 authorisations for releases to air were assigned to 10 km grid squares using the grid reference for the premises.

All 10 km grid squares within which a Natura 2000 site is located were identified using a GIS map of the Natura 2000 sites. A further band of 10 km grid squares around this block of grid squares was also identified (see Figure A6.1).

The RSA 93 authorisations within each 10 km grid square covered by the Natura 2000 site were assumed to impact on that 10 km grid square. The further band of grid squares around each Natura 2000 site ensured that any RSA 93 authorisation within 10 km of the Natura 2000 site will be considered for selection. In some cases it may lead to RSA authorisation for premises up to about 20 km from the boundary of the Natura 2000 site being considered (see Figure A6.1). The Stage 1 habitats screening approach assumed that permits which were further than 1 km from the Natura 2000 site would not give rise to an impact. However, it is now considered that a distance of 1 km is not sufficiently cautious and hence a minimum distance of 10 km from the release has been used by selecting 10 km grid squares.

The total release of radionuclides at authorisation limits were calculated for each 10 km grid square covered by a Natura 2000 site. It was possible to take account of different effective release heights for the radionuclides released to air using a scaling factor (see Appendix 3). Where total dose rates to the worst affected organism were greater than 10 microgray/h efforts were made to include a scaling factor to take account of more realistic effective release heights (see Table A6.1).

Calculating dose rates

The dose rates to the worst affected organism from the releases to air for all the RSA 93 authorisations in each of the 10 km grid squares covered by Natura 2000 sites were calculated as follows:

a. Dose rate to worst affected organism from a particular radionuclide released to air was calculated by multiplying the total release of that radionuclide into the 10 km grid square, multiplied by the dose rate per unit release value for the worst affected organism.
b. Total dose rate to the worst affected organism from releases to air in the 10 km grid square was calculated by summing the radionuclide dose rates.

Summary dose rates to worst affected organisms for each Natura 2000 site are provided in Table A6.2. For each Natura 2000 site, a 10 km grid square was identified which had the highest dose rate to the worst affected organism from releases to air in that grid square (see Table A6.2). For each of these 10 km grid squares, a more detailed assessment was made for all reference organisms and feature species.

The authorisation limits for the RSA 93 authorisation in each of the 10km grid squares with the maximum dose rate (see Table A6.3) were entered into the radioactive substance habitats assessment spreadsheet tool. The spreadsheet tool contains dose rate per unit release values for the reference organisms and feature species.

Dose rates to organisms were calculated in the spreadsheet tool as follows:

a. Dose rate to an organism from a particular radionuclide was calculated by multiplying the total release of that radionuclide to air in the 10 km grid square by the dose rate per unit release value.
b. Total dose rate to an organism from releases to air in the 10 km grid square was calculated by summing the radionuclide dose rates.

Summary total dose rates to the worst affected organism from releases to air were then identified.

Table A6.1 Scaling factors for releases to air

New Permit No.	Original Permit No.	Operator	Premises address	Postcode	Radionuclide in authorisation	Scaling factor
AS3595	AS3595	BRITISH ENERGY GENERATION LTD	Hinkley Point B Power Station	TA5 1UD	Other radionuclides	0.04
AS3595	AS3595	BRITISH ENERGY GENERATION LTD	Hinkley Point B Power Station	TA5 1UD	Sulphur-35	0.04
AS3595	AS3595	BRITISH ENERGY GENERATION LTD	Hinkley Point B Power Station	TA5 1UD	Total alpha-emitting radionuclides	0.04
AY4616	AI9737	BRUNNER MOND (UK) LTD	Lostock, Wallerscote and Winnington works,	CW8 4DT	Other radionuclides (excluding alpha emitters)	0.2
BA5694	BA5694	British Nuclear Fuels Plc	Berkeley Centre, Gloucestershire.	GL13 9PB	Total radionuclides	0.04
BA5929	AC5186	TERRA NITROGEN (UK) LTD	Severnside Fertilizer Works, Severn Road, Hallen	BS10 7SJ	Argon-41	0.2
BA5929	AC5186	TERRA NITROGEN (UK) LTD	Severnside Fertilizer Works, Severn Road, Hallen	BS10 7SJ	Krypton-75	0.2
BA5929	AC5186	TERRA NITROGEN (UK) LTD	Severnside Fertilizer Works, Severn Road, Hallen	BS10 7SJ	Krypton-85	0.2
BA5929	AC5186	TERRA NITROGEN (UK) LTD	Severnside Fertilizer Works, Severn Road, Hallen	BS10 7SJ	Other radionuclides (excluding alpha emitters)	0.2
BA5929	AC5186	TERRA NITROGEN (UK) LTD	Severnside Fertilizer Works, Severn Road, Hallen	BS10 7SJ	Tritium	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Iodine-125	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Other alpha-emitting radionuclides	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Other beta-emitting radionuclides with max beta energy >0.4 MeV	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Other noble gases	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Other radionuclides	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Radon-222	0.04
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Selenium-75	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Sulphur-35	0.2
BE9241	BE9241	AMERSHAM PLC	The Grove Centre, White Lion Road,	HP7 9LL	Tritium	0.2
BG3058	AM9608	ELF OIL UK LTD	Milford Haven Refinery, P O Box 10	SA73 3JD	Krypton-79	0.0005
BG3058	AM9608	ELF OIL UK LTD	Milford Haven Refinery, P O Box 10	SA73 3JD	Krypton-85	0.0005
BG3058	AM9608	ELF OIL UK LTD	Milford Haven Refinery, P O Box 10	SA73 3JD	Other radionuclides	0.0005
BG3058	AM9608	ELF OIL UK LTD	Milford Haven Refinery, P O Box 10	SA73 3JD	Tritium	0.0005
BL5458	BA6259	CORUS UK LTD	Scunthorpe Works, POB 1	DN16 1BP	Lead-210	0.001
BL5458	BA6259	CORUS UK LTD	Scunthorpe Works, POB 1	DN16 1BP	Polonium-210	0.001
BM7308	BM7308	HUNTSMAN POLYURETHANES (UK) LTD	PO Box 99, Wilton, Redcar, Cleveland	TS10 4YAS	Krypton-79	0.04

Table A6.1 Continued

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Radionuclide in authorisation	Scaling factor
BM7308	BM7308	HUNTSMAN POLYURETHANES (UK) LTD	PO Box 99, Wilton, Redcar, Cleveland	TS10 4YAS	Krypton-85	0.04
BM7308	BM7308	HUNTSMAN POLYURETHANES (UK) LTD	PO Box 99, Wilton, Redcar, Cleveland	TS10 4YAS	Other radionuclides (excluding alpha emitters)	0.04
BM7308	BM7308	HUNTSMAN POLYURETHANES (UK) LTD	PO Box 99, Wilton, Redcar, Cleveland	TS10 4YAS	Tritium – tritiated water	0.04
BQ3584	BA6321	CORUS UK LTD	Port Talbot Works	SA13 2NG	Lead-210	0.0005
BQ3584	BA6321	CORUS UK LTD	Port Talbot Works	SA13 2NG	Polonium-210	0.0005
BT2203	AR2384	TEXACO LTD	Pembroke Plant	SA71 5SJ	Argon-41	0.0008
BT2203	AR2384	TEXACO LTD	Pembroke Plant	SA71 5SJ	Krypton-85m	0.0008
BT2203	AR2384	TEXACO LTD	Pembroke Plant	SA71 5SJ	Other radionuclides	0.0008
BT2203	AR2384	TEXACO LTD	Pembroke Plant	SA71 5SJ	Tritium	0.0008
BV7095	BM5003	PETNET PHARMACEUTICALS	Mount Vernon Hospital, Rickmansworth Road	HA6 2RN	Other beta-emitting radionuclides	0.2
BW4903	BA6259	Corus UK Ltd	Teeside Site, Redcar, Cleveland.	TS10 5QW	Lead-210	0.001
BW4903	BA6259	Corus UK Ltd	Teeside Site, Redcar, Cleveland.	TS10 5QW	Polonium-210	0.001
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Americium-241	0.0008
BX9838	BX9838	Sellafield			Americium-241	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Antimony-125	0.0008
BX9838	BX9838	Sellafield			Antimony-125	0.0008
BX9838	BX9838	Sellafield			Argon-41	0.0008
BX9838	BX9838	Britich Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Caesium-137	0.0008
BX9838	BX9838	Sellafield			Caesium-137	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Carbon-14	0.0008
BX9838	BX9838	Sellafield			Carbon-14	0.0008
BX9838	BX9838	Sellafield			Cobalt-60	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Iodine-129	0.0008
BX9838	BX9838	Sellafield			Iodine-129	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Iodine-131	0.0008
BX9838	BX9838	Sellafield			Iodine-131	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Krypton-85	0.0008
BX9838	BX9838	Sellafield			Krypton-85	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Other alpha-emitting radionuclides	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Other beta-emitting radionuclides	0.0008
BX9838	BX9838	Sellafield			Plutonium isotopes	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Plutonium-241	0.0008
BX9838	BX9838	Sellafield			Plutonium-241	0.0008

Table A6.1 Continued

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Radionuclide in authorisation	Scaling factor
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Plutonium-alpha	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Ruthenium-106	0.0008
BX9838	BX9838	Sellafield			Ruthenium-106	0.0008
BX9838	BX9838	British Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Strontium-90	0.0008
BX9838	BX9838	Sellafield			Strontium-90	0.0008
BX9838	BX9838	Sellafield			Sulphur-35	0.0008
BX9838	BX9838	Britich Energy Group Sellafield Limited	Sellafield Site, Seascale, Cumbria.	CA20 1PG	Tritium	0.0008
BX9838	BX9838	Sellafield			Tritium	0.0008
BZ6759	AL5160	ONYX UK Ltd	Charleston Road, Hardley, Hythe	SO45 3ZA	Iodine-125 & iodine-131	0.006
BZ6759	AL5160	ONYX UK Ltd	Charleston Road, Hardley, Hythe	SO45 3ZA	Other alpha-emitting radionuclides	0.006
BZ6759	AL5160	ONYX UK Ltd	Charleston Raod, Hardley, Hythe	SO45 3ZA	Other radionuclides (excluding alpha emitters)	0.006
BZ6759	AL5160	ONYX UK Ltd	Charleston Raod, Hardley, Hythe	SO45 3ZA	Tritium & carbon-14	0.006
BZ7747	BA5449	Magnox Electric Ltd – Dungeness 'A	Dungeness 'A Power Station, Romney Marsh, Kent.	TN 29 9PP	Iron-55	0.2
BZ7747	BA5449	Magnox Electric Ltd – Dungeness 'A	Dungeness 'A Power Station, Romney Marsh, Kent.	TN 29 9PP	Other radionuclides	0.2
BZ7747	BA5449	Magnox Electric Ltd – Dungeness 'A	Dungeness 'A Power Station, Romney Marsh, Kent.	TN 29 9PP	Sulphur-35	0.2
BZ7747	BA5449	Magnox Electric Ltd – Dungeness 'A	Dungeness 'A Power Station, Romney Marsh, Kent.	TN 29 9PP	Tritium	0.2
BZ8409	AN1076	WHITE ROSE ENVIRONMENTAL LTD	Knostrop Clinical Waste Incinerator, Knostrop Treatment Works, Knowsthorpe Lane	LS9 0PJ	Carbon-14	0.001
BZ8409	AN1076	WHITE ROSE ENVIRONMENTAL LTD	Knostrop Clinical Waste Incinerator, Knostrop Treatment Works, Knowsthorpe Lane	LS9 0PJ	Other radionuclides	0.001
BZ8409	AN1076	WHITE ROSE ENVIRONMENTAL LTD	Knostrop Clinical Waste Incinerator, Knostrop Treatment Works, Knowsthorpe Lane	LS9 0PJ	Other radionuclides (excluding alpha emitters)	0.001
BZ8409	AN1076	WHITE ROSE ENVIRONMENTAL LTD	Knostrop Clinical Waste Incinerator, Knostrop Treatment Works, Knowsthorpe Lane	LS9 0PJ	Tritium	0.001
BZ9537	BZ9537	British Energy Generation Limited	Hinkley point B Power Station, Nr Bridgwater, Somerset	TA5 1UD	Other radionuclides	0.25
BZ9537	BZ9537	British Energy Generation Limited	Hinkley point B Power Station, Nr Bridgwater, Somerset	TA5 1UD	Tritium & carbon-14	0.25
CA6008	BK2810	KING'S COLLEGE LONDON	St Thomas' Hospital, Lambeth Palace Road	SE1 7EH	Other radionuclides (excluding alpha emitters)	0.004
CA6008	BK2810	KING'S COLLEGE LONDON	St Thomas' Hospital, Lambeth Palace Road	SE1 7EH	Oxygen-15, carbon-11, nitrogen-13 & fluorine-18	0.004
CA6806	BA5732	Magnox Electric PLC	Wylfa Power Station, Cemaes Bay, Anglesey		Chlorine-36	0.2

Table A6.1 Continued

New Permit No	Original Permit No	Operator	Premises Address	Postcode	Radionuclide in authorisation	Scaling factor
CA6806	BA5732	Magnox Electric PLC	Wylfa Power Station, Cemaes Bay, Anglesey		Iron-55	0.2
CA6806	BA5732	Magnox Electric PLC	Wylfa Power Station, Cemaes Bay, Anglesey		Other radionuclides	0.2
CA6806	BA5732	Magnox Electric PLC	Wylfa Power Station, Cemaes Bay, Anglesey		Sulphur-35	0.2
CA6806	BA5732	Magnox Electric PLC	Wylfa Power Station, Cemaes Bay, Anglesey		Tritium	0.2
CB2776	CB2776	Pyros Environmental Limited	Charleston Road, Hardley, Hythe	SO45 3ZA	Iodine-125 & iodine-131	0.01
CB2776	CB2776	Pyros Environmental Limited	Charleston Road, Hardley, Hythe	SO45 3ZA	Other alpha-emitting radionuclides	0.01
CB2776	CB2776	Pyros Environmental Limited	Charleston Road, Hardley, Hythe	SO45 3ZA	Other radionuclides (excluding alpha emitters)	0.01
CB2776	CB2776	Pyros Environmental Limited	Charleston Road, Hardley, Hythe	SO45 3ZA	Tritium & carbon-14	0.01
CB2954	AH9987	Grundon Waste Management Limited	Lakeside Road, Colnbrook, Slough, Berkshire.	SL3 0EG	Iodine isotopes	0.002
CB2954	AH9987	Grundon Waste Management Limited	Lakeside Road, Colnbrook, Slough, Berkshire.	SL3 0EG	Other beta/gamma-emitting radionuclides	0.002
CB2954	AH9987	Grundon Waste Management Limited	Lakeside Road, Colnbrook, Slough, Berkshire.	SL3 0EG	Phosphorus-32 & phosphorus-33	0.002
CB2954	AH9987	Grundon Waste Management Limited	Lakeside Road, Colnbrook, Slough, Berkshire.	SL3 0EG	Total alpha-emitting radionuclides	0.002
CB2954	AH9987	Grundon Waste Management Limited	Lakeside Road, Colnbrook, Slough, Berkshire.	SL3 0EG	Tritium & carbon-14	0.002

Table A6.2 Maximum and minimum dose rates to worst affected organism

Site code	Natura 2000 site	Number of 10 km grid squares	Maximum dose rate to worst affected organism in 10 km grid squares (microgray/h)	10 km grid square with maximum dose rate[a]	Minimum dose rate to worst affected organism in 10 km grid squares (microgray/h)
A01	Abberton Reservoir SPA	2	2.6E-01	60,20	3.2E-05
A02	Alde-Ore Estuary SPA	2	1.2E+01	64,26	3.1E-05
A03	Alde, Ore and Butley Estuaries cSAC	2	1.2E+01	62,23	1.2E+01
A04	Barnack Hills & Holes cSAC	1	3.0E-01	49,29	3.0E-01
A08	Benfleet & Southend Marshes SPA	4	2.6E-01	60,20	9.6E-05
A12	The Broadland – SPA	1	1.1E-02	61,30	1.1E-02
A13	Deben Estuary SPA	3	1.2E+01	62,23	1.7E+00
A14	Devils Dyke cSAC	1	4.0E-01	54,25	4.0E-01
A16	Essex Estuaries -cSAC	9	1.2E+01	62,23	3.2E-05
A17	Mid Essex Coast SPA – Phase 1 – Dengie	7	1.2E+01	62,23	3.2E-05
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	8	1.2E+01	62,23	3.2E-05
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	8	2.6E-01	60,20	3.2E-05
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	10	1.2E+01	62,23	3.2E-05
A21	Mid Essex Coast SPA – Phase 5 – Foulness	11	1.2E+01	62,23	3.2E-05
A23	Fenland cSAC	1	4.0E-01	54,25	4.0E-01
A27	Hamford Water SPA	2	1.2E+01	62,23	1.2E+01
A28	Minsmere to Walberswick SPA	1	1.2E+01	64,26	1.2E+01
A29	Minsmere to Walberswick Heaths and Marshes cSAC	1	1.2E+01	64,26	1.2E+01
A31	Nene Washes cSAC	2	2.6E-02	51,27	1.6E-07
A33	North Norfolk Coast SPA	2	1.1E-02	61,30	6.4E-07
A34	North Norfolk Coast cSAC	2	1.1E-02	61,30	6.4E-07
A38	Ouse Washes SPA	4	4.0E-01	54,25	1.6E-07
A41	Portholme cSAC	3	2.6E-02	51,27	1.6E-07
A42	Rex Graham Reserve cSAC	1	1.6E-07	58,26	1.6E-07
A43	River Wensum cSAC	1	1.1E-02	61,30	1.1E-02
A44	Roydon Common & Dersingham Bog cSAC	1	6.4E-07	56,32	6.4E-07
A45	Rutland Water SPA	1	3.0E-01	49,29	3.0E-01
A46	Sandlings pSPA	4	1.2E+01	62,23	1.7E+00
A49	Stour and Orwell Estuaries – SPA	9	1.2E+01	62,23	1.6E-07
A50	The Broads – cSAC	1	1.1E-02	61,30	1.1E-02
A51	The Wash SPA	1	6.4E-07	56,32	6.4E-07
A52	The Wash and North Norfolk Coast cSAC	3	1.1E-02	61,30	6.4E-07
A54	Waveney and Little Ouse Valley Fens cSAC	1	3.1E-05	61,27	3.1E-05
M06	Cannock Extension Canal	1	3.6E-02	39,29	3.6E-02
M13	Fens Pools	2	3.6E-02	39,29	9.5E-03
M19	Mottey Meadows	1	3.5E-02	37,31	3.5E-02
M21	Peak District Dales	1	7.5E-03	43,33	7.5E-03
M27	Thorne and Hatfield Moors	3	3.5E+00	44,44	9.5E-01
M28	Thorne Moor	1	9.5E-01	49,41	9.5E-01
M30	Wye Valley and Forest of Dean Bat sites/Safleoedd Ystlumod Dyffryn Gwy	1	6.2E+00	36,19	6.2E+00

Table A6.2 Continued

Site code	Natura 2000 site	Number of 10 km grid squares	Maximum dose rate to worst affected organism in 10 km grid squares (microgray/h)	10 km grid square with maximum dose rate[a]	Minimum dose rate to worst affected organism in 10 km grid squares (microgray/h)
NE03	Berwickshire & N Northumberland Coast	4	1.1E-02	41,61	5.3E-05
NE03	Berwickshire & N Northumberland Coast	4	1.1E-02	41,61	5.3E-05
NE06	Craven Limestone Complex	2	9.1E-01	42,43	9.4E-04
NE07	Denby Grange Colliery Ponds	1	6.8E-07	43,42	6.8E-07
NE08	Durham Coast	2	2.0E-04	44,53	8.8E-05
NE12	Flamborough Head	1	4.3E-05	50,48	4.3E-05
NE18	Humber Estuary	3	1.7E+00	51,41	1.5E-03
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	3	1.7E+00	51,41	1.5E-03
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	3	1.7E+00	51,41	1.5E-03
NE22	Lindisfarne	1	1.1E-02	41,61	1.1E-02
NE23	Lower Derwent Valley	1	6.9E-03	46,45	6.9E-03
NE24	Lower Derwent Valley	1	6.9E-03	46,45	6.9E-03
NE25	Moor House Upper Teesdale	3	1.8E-04	42,54	5.1E-05
NE29	North Pennine Moors	24	1.9E+01	44,52	6.8E-07
NE30	North Pennine Moors	24	1.9E+01	44,52	6.8E-07
NE31	North York Moors	14	1.9E+01	44,52	1.1E-05
NE32	North York Moors	14	1.9E+01	44,52	1.1E-05
NE33	Northumbria Coast	6	1.1E-02	41,61	5.3E-05
NE35	River Derwent	1	6.9E-03	46,45	6.9E-03
NE36	River Tweed	1	1.1E-02	41,61	1.1E-02
NE40	South Pennine Moors	26	3.5E+00	44,44	6.8E-07
NE41	South Pennine Moors Phase 2	11	9.1E-01	42,43	6.8E-07
NE42	South Pennine Moors Phase 1 (Peak District Moors)	15	3.5E+00	44,44	6.8E-07
NE43	Strensall Common	2	6.9E-03	46,45	1.1E-05
NE44	Teesmouth and Cleveland Coast	4	1.9E+01	44,52	3.1E-05
NE45	Thrislington	3	1.9E+01	44,52	1.8E-04
NW04	Bowland Fells	4	3.6E+00	34,43	1.3E-02
NW05	Calf Hill and Cragg Woods	2	3.2E+00	34,46	1.4E+00
NW08	Drigg Coast	1	2.0E-01	30,50	2.0E-01
NW09	Duddon Estuary	2	2.0E+00	33,45	8.6E-05
NW13	Lake District High Fells	3	2.0E-01	30,50	1.4E-04
NW14	Leighton Moss	1	3.2E+00	34,46	3.2E+00
NW16	Manchester Mosses	2	5.6E-01	37,40	5.6E-01
NW17	Martin Mere	1	7.2E-05	35,42	7.2E-05
NW18	Mersey Estuary	8	2.6E+00	34,37	1.4E-05
NW20	Morecambe Bay – cSAC	6	3.6E+00	34,43	8.6E-05
NW21	Morecambe Bay – SPA	5	3.2E+00	34,46	8.6E-05
NW22	Morecambe Bay Pavements	1	3.2E+00	34,46	3.2E+00
NW24	Oak Mere	1	2.6E+00	34,37	2.6E+00
NW25	Ribble/Alt Estuaries	7	3.6E+00	34,43	7.2E-05
NW26	River Derwent & Bassenthwaite Lake	1	2.0E-01	30,50	2.0E-01
NW27	River Eden	1	1.4E-04	33,55	1.4E-04
NW28	River Ehen	2	2.0E-01	30,50	4.3E-04
NW30	Rixton Clay Pits	2	5.6E-01	37,40	5.6E-01

Table A6.2 Continued

Site code	Natura 2000 site	Number of 10 km grid squares	Maximum dose rate to worst affected organism in 10 km grid squares (microgray/h)	10 km grid square with maximum dose rate[a]	Minimum dose rate to worst affected organism in 10 km grid squares (microgray/h)
NW31	Rochdale Canal	3	8.2E-01	38,39	1.4E-05
NW33	Sefton Coast	8	3.6E+00	34,43	7.2E-05
NW34	Solway Firth	3	2.0E-01	30,50	1.4E-04
NW35	Solway Moss	1	1.4E-04	33,55	1.4E-04
NW36	South Solway Mosses	1	1.4E-04	33,55	1.4E-04
NW40	Upper Solway Flats & Marshes	3	2.0E-01	30,50	1.4E-04
NW42	Wast Water	1	2.0E-01	30,50	2.0E-01
S01	Arun Valley	3	9.7E-03	50,11	1.6E-05
S06	Castle Hill	2	1.8E-03	52,10	1.2E-04
S09	Duncton to Bignor Escarpment	1	9.7E-03	50,11	9.7E-03
S10	Dungeness	2	1.1E+01	60,11	1.1E+00
S11	Dungeness to Pett Level	2	1.1E+01	60,11	1.1E+00
S12	Ebernoe Common	1	9.7E-03	50,11	9.7E-03
S13	Emer Bog	3	6.6E-01	42,13	2.2E-04
S14	Folkestone to Etchinghill Escarpments	1	1.1E+00	60,14	1.1E+00
S18	Lewes Downs	1	1.2E-04	53,10	1.2E-04
S19	Lydden and Temple Ewell Downs	2	7.8E-02	63,15	8.2E-03
S20	Medway Estuary & Marshes	4	4.6E-04	58,18	7.2E-05
S22	The New Forest – SPA	5	3.5E+00	44,10	2.2E-04
S23	The New Forest – cSAC	5	3.5E+00	44,10	2.2E-04
S24	North Downs Woodlands	2	7.2E-05	57,15	5.9E-05
S27	Peter's Pit	1	7.2E-05	57,15	7.2E-05
S28	Portsmouth Harbour	2	3.5E+00	44,10	2.2E-04
S29	Queendown Warren	2	2.0E-04	59,16	7.2E-05
S30	River Itchen	3	3.5E+00	44,10	2.2E-04
S32	Sandwich Bay	2	7.8E-02	63,15	8.2E-03
S35	Solent & Southampton Water	5	3.5E+00	44,10	2.2E-04
S36	Solent Maritime	5	3.5E+00	44,10	2.2E-04
S37	South Wight Maritime	1	3.5E+00	44,10	3.5E+00
S38	Stodmarsh – SPA	2	7.8E-02	63,15	8.2E-03
S39	Stodmarsh – cSAC	2	7.8E-02	63,15	8.2E-03
S40	Thames Estuary and Marshes	9	1.1E+00	60,14	5.9E-05
S41	Thanet Coast	2	7.8E-02	63,15	8.2E-03
S42	Thanet Coast & Sandwich Bay	2	7.8E-02	63,15	8.2E-03
S43	The Blean Complex	1	8.2E-03	61,15	8.2E-03
S44	The Mens	1	9.7E-03	50,11	9.7E-03
S45	The Swale	6	1.1E+00	60,14	7.2E-05
S46	Wye & Crundale Downs	2	1.1E+00	60,14	8.2E-03
SW01	Avon Gorge Woodlands	4	2.1E+00	35,18	4.2E-06
SW02	Avon Valley (Bickton to Christchurch)	2	1.1E+00	41,9	5.3E-02
SW03	Bath and Bradford-upon-Avon Bats	1	1.6E-05	37,16	1.6E-05
SW05	Blackstone Point	1	8.3E-04	24,5	8.3E-04
SW11	Chesil & the Fleet	1	1.7E-01	38,8	1.7E-01
SW13	Chew Valley Lakes	1	9.1E-02	34,16	9.1E-02
SW18	Dartmoor	2	8.3E-04	24,5	9.6E-07
SW19	Dawlish Warren	1	9.6E-07	28,6	9.6E-07
SW20	Dorset Heaths	6	3.5E+00	44,10	2.2E-04

Table A6.2 Continued

Site code	Natura 2000 site	Number of 10 km grid squares	Maximum dose rate to worst affected organism in 10 km grid squares (microgray/h)	10 km grid square with maximum dose rate[a]	Minimum dose rate to worst affected organism in 10 km grid squares (microgray/h)
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	3	1.1E+00	41,9	5.3E-02
SW22	Dorset Heathlands	6	3.5E+00	44,10	2.2E-04
SW23	East Devon Pebblebed Heaths	2	5.4E-05	29,9	9.6E-07
SW24	East Devon Heaths	1	5.4E-05	29,9	5.4E-05
SW25	Exe Estuary	2	5.4E-05	29,9	9.6E-07
SW26	Exmoor and Quantock Oakwoods	5	1.5E+01	31,18	9.0E-05
SW27	Exmoor Heaths	1	5.0E-04	31,17	5.0E-04
SW31	Great Yews	1	6.6E-01	42,13	6.6E-01
SW35	Isle of Portland to Studland Cliffs	2	1.1E+00	41,9	1.7E-01
SW42	Mendip Limestone Grasslands	1	9.1E-02	34,16	9.1E-02
SW45	North Somerset & Mendip Bats	1	9.1E-02	34,16	9.1E-02
SW49	Plymouth Sound & Estuaries	1	8.3E-04	24,5	8.3E-04
SW51	Poole Harbour	2	1.1E+00	41,9	1.7E-01
SW52	Porton Down	1	6.6E-01	42,13	6.6E-01
SW55	River Avon	1	6.6E-01	42,13	6.6E-01
SW59	Salisbury Plain	3	6.6E-01	42,13	1.6E-05
SW60	Salisbury Plain	2	6.6E-01	42,13	1.6E-05
SW61	Severn Estuary – pSAC	26	1.5E+01	31,18	1.4E-07
SW61	Severn Estuary – pSAC	26	1.5E+01	31,18	1.4E-07
SW62	Severn Estuary – SPA	26	1.5E+01	31,18	1.4E-07
SW62	Severn Estuary – SPA	26	1.5E+01	31,18	1.4E-07
SW64	Somerset Levels and Moors	5	7.1E+00	32,14	4.2E-06
SW65	South Dartmoor Woods	3	8.3E-04	24,5	9.6E-07
SW67	South Hams	1	9.6E-07	28,6	9.6E-07
SW70	Tamar Estuaries Complex	1	8.3E-04	24,5	8.3E-04
T02	Burnham Beeches	5	5.3E+00	49,19	8.6E-03
T06	Epping Forest	16	2.5E+01	53,18	4.0E-05
T09	Kennet and Lambourn Floodplain	3	1.8E+00	45,18	2.3E-01
T11	Lee Valley	6	2.5E+01	53,18	1.1E-03
T13	Mole Gap to Reigate Escarpment	3	2.7E-01	50,16	2.0E-05
T15	Oxford Meadows	1	5.1E-02	45,20	5.1E-02
T16	Richmond Park	7	1.3E+00	52,18	5.6E-04
T17	River Lambourn	1	3.0E-01	44,18	3.0E-01
T19	South West London Waterbodies	10	1.3E+00	52,18	2.0E-05
T20	Thames Basin Heaths	10	2.7E-01	50,16	8.1E-08
T21	Thursley, Ash, Pirbright & Chobham (see RAMSAR)	3	9.7E-03	50,11	8.1E-08
T23	Wealden Heaths Phase II	3	9.7E-03	50,11	8.1E-08
T24	Wimbledon Common	6	2.5E+01	53,18	5.6E-04
T26	Woolmer Forest (also part of Wealden Heaths Phase 2)	1	8.1E-08	49,14	8.1E-08
T27	Wormley Hoddesdon Park Woods	6	8.7E-02	54,20	4.0E-05
W001	Aber Afon Dyfi/Dyfi Estuary	1	3.6E-05	25,28	3.6E-05
W002	Aberbargoed Grasslands	3	1.5E+01	31,18	4.9E-05
W003	Abergavenny Woodlands (Sugar Loaf Woodlands)	1	5.1E-05	32,21	5.1E-05
W004	Afon Eden/River Eden – Cors GochTrawsfynydd	1	2.7E+00	26,33	2.7E+00
W005	Afon Gwyrfai a Llyn Cwellyn	1	1.3E-04	25,36	1.3E-04
W011	Berwyn	4	2.7E+00	26,33	1.4E-05

Table A6.2 Continued

Site code	Natura 2000 site	Number of 10 km grid squares	Maximum dose rate to worst affected organism in 10 km grid squares (microgray/h)	10 km grid square with maximum dose rate[a]	Minimum dose rate to worst affected organism in 10 km grid squares (microgray/h)
W012	Berwyn a Mynyddoedd de Clwyd / Berwyn & South Clwyd Mountains	4	2.7E+00	26,33	1.4E-05
W013	Blackmill Woodlands	1	9.0E-05	29,18	9.0E-05
W014	Blaen Cynon	1	4.9E-05	30,20	4.9E-05
W016	Burry Inlet	1	1.1E-03	26,19	1.1E-03
W017	Cadair Idris	1	2.7E+00	26,33	2.7E+00
W019	Cardiff Beech Woods	3	1.5E+01	31,18	5.0E-04
W020	Cardigan Bay/Bae Ceredigion	8	2.7E+00	26,33	3.6E-05
W021	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd	1	1.1E-03	26,19	1.1E-03
W023	Carmarthen Bay	1	1.5E-02	19,20	1.5E-02
W024	Castlemartin Coast	1	1.5E-02	19,20	1.5E-02
W028	Coed y Cerrig	1	5.1E-05	32,21	5.1E-05
W032	Coedydd Aber/Aber Woods	1	1.3E-04	25,36	1.3E-04
W033	Coedydd Derw a Safleoedd Ystlumd Meirion/Meirionydd Oakwoods & Bat Sites	2	2.7E+00	26,33	1.3E-04
W037	Cors Fochno	1	3.6E-05	25,28	3.6E-05
W040	Corsydd Mon/Anglesey Fens	2	7.4E+00	23,39	4.3E-03
W042	Crymlyn Bog/Cors Crymlyn	3	4.9E-01	27,18	6.8E-05
W043	Cwm Cadlan	1	4.9E-05	30,20	4.9E-05
W044	Cwm Clydach Woodlands/Coedydd Cwm Clydach	1	5.1E-05	32,21	5.1E-05
W046	Dee Estuary – SPA	6	2.6E+00	34,37	1.4E-05
W047	Dee Estuary – pSAC	6	2.6E+00	34,37	1.4E-05
W048	Deeside and Buckley Newt Sites	2	5.9E-01	33,37	1.4E-05
W050	Dunraven Bay	2	4.9E-01	27,18	9.0E-05
W051	Elenydd	1	3.6E-05	25,28	3.6E-05
W052	Elenydd-Mallaen	1	3.6E-05	25,28	3.6E-05
W053	Eryri/Snowdonia (inc Llyn Idwal)	4	7.4E+00	23,39	1.3E-04
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	1	4.3E-03	24,37	4.3E-03
W059	Glaswelltiroedd Cefn Cribwr/Cefn Cribwr Grasslands	3	4.9E-01	27,18	6.8E-05
W061	Gower Ash Woods/Coedydd Ynn Gwyr	1	1.1E-03	26,19	1.1E-03
W062	Gower Commons/Tiroedd Comin Gwyr	1	1.1E-03	26,19	1.1E-03
W068	Johnstown Newt Sites	1	1.4E-05	33,35	1.4E-05
W069	Kenfig/Cynffig	4	4.9E-01	27,18	6.8E-05
W070	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym	1	1.5E-02	19,20	1.5E-02
W071	Llangorse Lake/Llyn Syfaddan	1	5.1E-05	32,21	5.1E-05
W073	Llyn Dinam	1	4.3E-03	24,37	4.3E-03
W074	Migneint- Arenig-Dduallt	2	2.7E+00	26,33	1.3E-04
W075	Migneint- Arenig-Dduallt	2	2.7E+00	26,33	1.3E-04
W076	Morfa Harlech a Morfa Dyffryn	1	2.7E+00	26,33	2.7E+00
W082	Pembrokeshire Bat Sites and Bosherton Lakes/Safleoedd Ystlum Sir Benfro	1	1.5E-02	19,20	1.5E-02
W083	Pembrokeshire Marine/Sir Benfro Forol	1	1.5E-02	19,20	1.5E-02

Table A6.2 Continued

Site code	Natura 2000 site	Number of 10 km grid squares	Maximum dose rate to worst affected organism in 10 km grid squares (microgray/h)	10 km grid square with maximum dose rate[a]	Minimum dose rate to worst affected organism in 10 km grid squares (microgray/h)
W084	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau	3	2.7E+00	26,33	3.6E-05
W091	River Dee and Bala Lake	9	2.7E+00	26,33	1.4E-05
W093	River Wye/Afon Gwy	9	6.2E+00	36,19	1.4E-07
W096	Traeth Lafan/Lavan Sands, Conway Bay	2	4.3E-03	24,37	1.3E-04
W097	Usk Bat Sites/Safleodd Ystlumod Wysg	2	5.1E-05	32,21	4.9E-05
W098	Wye Valley Woodlands/Coetiroedd Dyffryn Gwy	2	6.2E+00	36,19	2.1E+00
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	4	7.4E+00	23,39	1.3E-04
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	2	4.3E-03	24,37	1.3E-04
W101	Yerbeston Tops	1	1.5E-02	19,20	1.5E-02

[a]The 10 km grid square is given a reference XX,YY, where XX is the first two digits of the six-digit Eastings value and YY is the first two digits of the six-digit Northings value.

Table A6.3 Total releases at authorised limits to air

Site code	Natura site	10 km grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A01	Abberton Reservoir SPA	60,20	1	1.5E+12		6.0E+11		2.0E+10																					6.0E+08
A02	Alde-Ore Estuary SPA	64,26	1	1.4E+13		3.1E+12		3.5E+11	3.0E+15								5.0E+08									1.8E+09			1.6E+10
A03	Alde, Ore and Butley Estuaries cSAC	62,23	1																6.8E+08										
A04	Barnack Hills & Holes cSAC	49,29	1	5.0E+13																									
A08	Benfleet & Southend Marshes SPA	60,20	1	1.5E+12		6.0E+11		2.0E+10																					6.0E+08
A12	The Broadland – SPA	61,30	1	3.1E+11		6.1E+09							1.0E+09																1.2E+08
A13	Deben Estuary SPA	62,23	1																6.8E+08										
A14	Devils Dyke cSAC	54,25	1	7.0E+10		7.9E+09	2.9E+09	5.0E+09			2.0E+10		7.2E+11		1.3E+10		3.2E+09												6.0E+09
A16	Essex Estuaries -cSAC	62,23	1																6.8E+08										
A17	Mid Essex Coast SPA – Phase 1 – Dengie	62,23	1																6.8E+08										
A18	Mid Essex Coast SPA – Phase 2 – Colne Estuary	62,23	1																6.8E+08										
A19	Mid Essex Coast SPA – Phase 3 – Crouch and Roach Estuaries	60,20	1	1.5E+12		6.0E+11		2.0E+10																					6.0E+08
A20	Mid Essex Coast SPA – Phase 4 – Blackwater Estuary	62,23	1																6.8E+08										
A21	Mid Essex Coast SPA – Phase 5 – Foulness	62,23	1																6.8E+08										
A23	Fenland cSAC	54,25	1	7.0E+10		7.9E+09	2.9E+09	5.0E+09			2.0E+10		7.2E+11		1.3E+10		3.2E+09												6.0E+09
A27	Hamford Water SPA	62,23	1																6.8E+08										
A28	Minsmere to Walberswick SPA	64,26	1	1.4E+13		3.1E+12		3.5E+11	3.0E+15								5.0E+08									1.8E+09			1.6E+10
A29	Minsmere to Walberswick Heaths and Marshes cSAC	64,26	1	1.4E+13		3.1E+12		3.5E+11	3.0E+15								5.0E+08									1.8E+09			1.6E+10
A31	Nene Washes cSAC	51,27	1	7.0E+10		7.0E+10		1.0E+09							2.0E+08														
A33	North Norfolk Coast SPA	61,30	1	3.1E+11		6.1E+09							1.0E+09																1.2E+08
A34	North Norfolk Coast cSAC	61,30	1	3.1E+11		6.1E+09							1.0E+09																1.2E+08
A38	Ouse Washes SPA	54,25	1	7.0E+10		7.9E+09	2.9E+09	5.0E+09			2.0E+10		7.2E+11		1.3E+10		3.2E+09												6.0E+09
A41	Portholme cSAC	51,27	1	7.0E+10		7.0E+10		1.0E+09							2.0E+08														
A42	Rex Graham Reserve cSAC	58,26	1										1.0E+07																
A43	River Wensum cSAC	61,30	1	3.1E+11		6.1E+09							1.0E+09																1.2E+08
A44	Roydon Common & Dersingham Bog cSAC	56,32	1										4.0E+07																
A45	Rutland Water SPA	49,29	1	5.0E+13																									
A46	Sandlings pSPA	62,23	1																6.8E+08										
A49	Stour and Orwell Estuaries – SPA	62,23	1																6.8E+08										

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
A50	The Broads – cSAC	61,30	1	3.1E+11		6.1E+09							1.0E+09																1.2E+08
A51	The Wash SPA	56,32	1										4.0E+07																
A52	The Wash and North Norfolk Coast cSAC	61,30	1	3.1E+11		6.1E+09							1.0E+09																1.2E+08
A54	Waveney and Little Ouse Valley Fens cSAC	61,27	1			8.5E+07																							
M06	Cannock Extension Canal	39,29	1																										6.0E+08
M13	Fens Pools	39,29	1																										6.0E+08
M19	Mottey Meadows	37,31	1	6.0E+12																									
M21	Peak District Dales	43,33	1																							3.0E+06			1.2E+05
M27	Thorne and Hatfield Moors	44,44	1								3.8E+12																		6.4E+10
M28	Thorne Moor	49,41	0.001																5.3E+10										2.9E+10
M30	Wye Valley and Forest of Dean Bat sites/Safleoedd Ystlumod Dyffryn Gwy	36,19	0.04																										3.0E+10
M30	Wye Valley and Forest of Dean Bat sites/Safleoedd Ystlumod Dyffryn Gwy	36,19	1	9.2E+12		4.0E+12		4.5E+11	5.0E+14		1.0E+12																		7.0E+10
NE03	Berwickshire & N Northumberland Coast	41,61	1			3.0E+10																							
NE03	Berwickshire & N Northumberland Coast	41,61	1			3.0E+10																							
NE06	Craven Limestone Complex	42,43	1	4.8E+13		1.0E+11					8.0E+11																		1.1E+10
NE07	Denby Grange Colliery Ponds	43,42	1								4.0E+09																		
NE08	Durham Coast	44,53	1								2.5E+11																		
NE12	Flamborough Head	50,48	1								2.5E+11																		
NE18	Humber Estuary	51,41	1	7.5E+11					4.0E+11		2.6E+12																	2.2E+09	3.2E+10
NE19	Humber Flats, Marshes and Coast SPA (Phase 1) UK9006111	51,41	1	7.5E+11					4.0E+11		2.6E+12																	2.2E+09	3.2E+10
NE20	Humber Flats, Marshes and Coast (Phase I and II) UK9006112 (Phase 2 only)	51,41	1	7.5E+11					4.0E+11		2.6E+12																	2.2E+09	3.2E+10
NE22	Lindisfarne	41,61	1			3.0E+10																							
NE23	Lower Derwent Valley	46,45	1	1.8E+10		1.9E+10		1.8E+08																					2.5E+05
NE24	Lower Derwent Valley	46,45	1	1.8E+10		1.9E+10		1.8E+08																					2.5E+05
NE25	Moor House Upper Teesdale	42,54	1	7.4E+09		2.0E+08					3.7E+11																		
NE29	North Pennine Moors	44,52	1	2.6E+12		3.9E+10					4.6E+12																		3.5E+11
NE30	North Pennine Moors	44,52	1	2.6E+12		3.9E+10					4.6E+12																		3.5E+11
NE31	North York Moors	44,52	1	2.6E+12		3.9E+10					4.6E+12																		3.5E+11

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
NE32	North York Moors	44,52	1	2.6E+12		3.9E+10					4.6E+12																		3.5E+11
NE33	Northumbria Coast	41,61	1			3.0E+10																							
NE35	River Derwent	46,45	1	1.8E+10		1.9E+10		1.8E+08																					2.5E+05
NE36	River Tweed	41,61	1			3.0E+10																							
NE40	South Pennine Moors	44,44	1								3.8E+12																		6.4E+10
NE41	South Pennine Moors Phase 2	42,43	1	4.8E+13		1.0E+11					8.0E+11																		1.1E+10
NE42	South Pennine Moors Phase 1 (Peak District Moors)	44,44	1								3.8E+12																		6.4E+10
NE43	Strensall Common	46,45	1	1.8E+10		1.9E+10		1.8E+08																					2.5E+05
NE44	Teesmouth and Cleveland Coast	44,52	1	2.6E+12		3.9E+10					4.6E+12																		3.5E+11
NE45	Thrislington	44,52	1	2.6E+12		3.9E+10					4.6E+12																		3.5E+11
NW04	Bowland Fells	34,43	1																				8.6E+08						
NW05	Calf Hill and Cragg Woods	34,46	1	1.6E+13		7.7E+12		3.5E+11	1.4E+14	1.0E+08							6.5E+09												1.0E+09
NW08	Drigg Coast	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW08	Drigg Coast	30,50	1																							8.4E+06			2.0E+09
NW09	Duddon Estuary	33,45	1	1.0E+13		4.5E+12		2.0E+11	1.5E+14	1.0E+08							1.5E+09												
NW13	Lake District High Fells	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW13	Lake District High Fells	30,50	1																							8.4E+06			2.0E+09
NW14	Leighton Moss	34,46	1	1.6E+13		7.7E+12		3.5E+11	1.4E+14	1.0E+08							6.5E+09												1.0E+09
NW16	Manchester Mosses	37,40	1			3.0E+10																							1.0E+10
NW17	Martin Mere	35,42	1			2.0E+08																							
NW18	Mersey Estuary	34,37	1	2.2E+12							1.9E+12																		4.8E+10
NW20	Morecambe Bay – cSAC	34,43	1																				8.6E+08						
NW21	Morecambe Bay – SPA	34,46	1	1.6E+13		7.7E+12		3.5E+11	1.4E+14	1.0E+08							6.5E+09												1.0E+09
NW22	Morecambe Bay Pavements	34,46	1	1.6E+13		7.7E+12		3.5E+11	1.4E+14	1.0E+08							6.5E+09												1.0E+09
NW24	Oak Mere	34,37	1	2.2E+12							1.9E+12																		4.8E+10
NW25	Ribble/Alt Estuaries	34,43	1																				8.6E+08						
NW26	River Derwent & Bassenthwaite Lake	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW26	River Derwent & Bassenthwaite Lake	30,50	1																							8.4E+06			2.0E+09
NW27	River Eden	33,55	1								8.0E+11																		
NW28	River Ehen	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW28	River Ehen	30,50	1																							8.4E+06			2.0E+09

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
NW30	Rixton Clay Pits	37,40	1			3.0E+10																							1.0E+10
NW31	Rochdale Canal	38,39	1	1.0E+10		1.0E+09					1.0E+09															1.2E+04			1.5E+10
NW33	Sefton Coast	34,43	1																				8.6E+08						
NW34	Solway Firth	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW34	Solway Firth	30,50	1																							8.4E+06			2.0E+09
NW35	Solway Moss	33,55	1								8.0E+11																		
NW36	South Solway Mosses	33,55	1								8.0E+11																		
NW40	Upper Solway Flats & Marshes	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW40	Upper Solway Flats & Marshes	30,50	1																							8.4E+06			2.0E+09
NW42	Wast Water	30,50	0.0008	1.1E+15		3.3E+12					4.4E+17	7.1E+08				7.0E+10	5.5E+10	5.8E+09						1.9E+08	1.2E+08	8.8E+08			7.3E+10
NW42	Wast Water	30,50	1																							8.4E+06			2.0E+09
S01	Arun Valley	50,11	1																										1.8E+08
S06	Castle Hill	52,10	1			3.6E+09																							9.0E+06
S09	Duncton to Bignor Escarpment	50,11	1																										1.8E+08
S10	Dungeness	60,11	0.2	6.0E+09																						7.8E+09			1.2E+10
S10	Dungeness	60,11	1	1.8E+13		1.0E+13		6.0E+11	1.9E+15								5.0E+09												5.5E+08
S11	Dungeness to Pett Level	60,11	0.2	6.0E+09																						7.8E+09			1.2E+10
S11	Dungeness to Pett Level	60,11	1	1.8E+13		1.0E+13		6.0E+11	1.9E+15								5.0E+09												5.5E+08
S12	Ebernoe Common	50,11	1																										1.8E+08
S13	Emer Bog	42,13	1			1.2E+10	1.3E+09	1.2E+09							1.2E+09														1.2E+10
S14	Folkestone to Etchinghill Escarpments	60,14	1			5.0E+10																							1.9E+10
S18	Lewes Downs	53,10	1	2.0E+10																									
S19	Lydden and Temple Ewell Downs	63,15	1	6.0E+10		4.8E+09																							1.4E+09
S20	Medway Estuary & Marshes	58,18	1			1.0E+09							6.0E+09																
S22	The New Forest – SPA	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
S22	The New Forest – SPA	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S23	The New Forest – cSAC	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
S23	The New Forest – cSAC	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S24	North Downs Woodlands	57,15	1			2.0E+08																							
S27	Peter's Pit	57,15	1			2.0E+08																							
S28	Portsmouth Harbour	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
S28	Portsmouth Harbour	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S29	Queendown Warren	59,16	1								1.2E+12																		
S30	River Itchen	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
S30	River Itchen	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S32	Sandwich Bay	63,15	1	6.0E+10		4.8E+09																							1.4E+09
S35	Solent & Southampton Water	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
S35	Solent & Southampton Water	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S36	Solent Maritime	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
S36	Solent Maritime	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S37	South Wight Maritime	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
S37	South Wight Maritime	44,10	1	6.4E+10							1.3E+13																		6.4E+10
S38	Stodmarsh – SPA	63,15	1	6.0E+10		4.8E+09																							1.4E+09
S39	Stodmarsh – cSAC	63,15	1	6.0E+10		4.8E+09																							1.4E+09
S40	Thames Estuary and Marshes	60,14	1			5.0E+10																							1.9E+10
S41	Thanet Coast	63,15	1	6.0E+10		4.8E+09																							1.4E+09
S42	Thanet Coast & Sandwich Bay	63,15	1	6.0E+10		4.8E+09																							1.4E+09
S43	The Blean Complex	61,15	1	1.5E+10																									1.5E+08
S44	The Mens	50,11	1																										1.8E+08
S45	The Swale	60,14	1			5.0E+10																							1.9E+10
S46	Wye & Crundale Downs	60,14	1			5.0E+10																							1.9E+10
SW01	Avon Gorge Woodlands	35,18	0.2	6.4E+11					1.3E+11		3.3E+12																		6.4E+10
SW01	Avon Gorge Woodlands	35,18	1			1.2E+11																							2.5E+10
SW02	Avon Valley (Bickton to Christchurch)	41,9	1			2.4E+10																							2.0E+10
SW03	Bath and Bradford-upon-Avon Bats	37,16	1												1.2E+07														
SW05	Blackstone Point	24,5	1	6.7E+08		2.2E+09		6.7E+08																1.1E+02	1.3E+04				
SW11	Chesil & the Fleet	38,8	1	2.4E+13		3.6E+10																				7.2E+06			1.0E+05
SW13	Chew Valley Lakes	34,16	1	1.5E+10		7.7E+08																							1.7E+09
SW18	Dartmoor	24,5	1	6.7E+08		2.2E+09		6.7E+08																1.1E+02	1.3E+04				
SW19	Dawlish Warren	28,6	1										6.0E+07																
SW20	Dorset Heaths	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
SW20	Dorset Heaths	44,10	1	6.4E+10							1.3E+13																		6.4E+10

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
SW21	Dorset Heaths (Purbeck and Wareham) and Studland Dunes	41,9	1			2.4E+10																							2.0E+10
SW22	Dorset Heathlands	44,10	0.01			1.7E+13																				1.2E+08			2.0E+10
SW22	Dorset Heathlands	44,10	1	6.4E+10							1.3E+13																		6.4E+10
SW23	East Devon Pebblebed Heaths	29,9	1	3.0E+07		3.0E+07																							8.0E+05
SW24	East Devon Heaths	29,9	1	3.0E+07		3.0E+07																							8.0E+05
SW25	Exe Estuary	29,9	1	3.0E+07		3.0E+07																							8.0E+05
SW26	Exmoor and Quantock Oakwoods	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
SW27	Exmoor Heaths	31,17	1			1.1E+09					6.1E+11																		
SW31	Great Yews	42,13	1			1.2E+10	1.3E+09	1.2E+09							1.2E+09														1.2E+10
SW35	Isle of Portland to Studland Cliffs	41,9	1			2.4E+10																							2.0E+10
SW42	Mendip Limestone Grasslands	34,16	1	1.5E+10		7.7E+08																							1.7E+09
SW45	North Somerset & Mendip Bats	34,16	1	1.5E+10		7.7E+08																							1.7E+09
SW49	Plymouth Sound & Estuaries	24,5	1	6.7E+08		2.2E+09		6.7E+08																1.1E+02	1.3E+04				
SW51	Poole Harbour	41,9	1			2.4E+10																							2.0E+10
SW52	Porton Down	42,13	1			1.2E+10	1.3E+09	1.2E+09							1.2E+09														1.2E+10
SW55	River Avon	42,13	1			1.2E+10	1.3E+09	1.2E+09							1.2E+09														1.2E+10
SW59	Salisbury Plain	42,13	1			1.2E+10	1.3E+09	1.2E+09							1.2E+09														1.2E+10
SW60	Salisbury Plain	42,13	1			1.2E+10	1.3E+09	1.2E+09							1.2E+09														1.2E+10
SW61	Severn Estuary – pSAC	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
SW61	Severn Estuary – pSAC	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
SW62	Severn Estuary – SPA	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
SW62	Severn Estuary – SPA	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
SW64	Somerset Levels and Moors	32,14	0.25			7.8E+10																							1.2E+11
SW64	Somerset Levels and Moors	32,14	1	4.4E+13		1.2E+13		7.5E+11	4.0E+14	1.0E+08							6.5E+09												1.2E+09
SW65	South Dartmoor Woods	24,5	1	6.7E+08		2.2E+09		6.7E+08																1.1E+02	1.3E+04				
SW67	South Hams	28,6	1										6.0E+07																
SW70	Tamar Estuaries Complex	24,5	1	6.7E+08		2.2E+09		6.7E+08																1.1E+02	1.3E+04				
T02	Burnham Beeches	49,19	0.04																	1.0E+13									
T02	Burnham Beeches	49,19	0.2	2.0E+12				1.0E+10	5.0E+12						5.0E+09											1.0E+10			2.1E+10
T02	Burnham Beeches	49,19	1	5.0E+04		5.0E+04																							5.0E+04
T06	Epping Forest	53,18	1	1.5E+10		9.0E+06					1.4E+10				7.4E+08											1.0E+10			5.4E+08

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
T09	Kennet and Lambourn Floodplain	45,18	1	7.2E+10		7.5E+10	3.1E+10	2.4E+10							2.6E+10														3.1E+10
T11	Lee Valley	53,18	1	1.5E+10		9.0E+06					1.4E+10				7.4E+08											1.0E+10			5.4E+08
T13	Mole Gap to Reigate Escarpment	50,16	1	1.7E+10		1.7E+10	2.4E+08	3.0E+08			4.0E+10				1.2E+08														4.8E+09
T15	Oxford Meadows	45,20	1	1.0E+12		1.2E+11		1.1E+09			2.3E+10				4.2E+08		2.4E+07												2.4E+07
T16	Richmond Park	52,18	1	4.2E+09							3.6E+12		9.0E+09		3.8E+07														2.1E+10
T17	River Lambourn	44,18	1	2.4E+12							6.0E+10									1.0E+12						1.5E+05			3.0E+07
T19	South West London Waterbodies	52,18	1	4.2E+09							3.6E+12		9.0E+09		3.8E+07														2.1E+10
T20	Thames Basin Heaths	50,16	1	1.7E+10		1.7E+10	2.4E+08	3.0E+08			4.0E+10				1.2E+08														4.8E+09
T21	Thursley, Ash, Pirbright & Chobham (see RAMSAR)	50,11	1																										1.8E+08
T23	Wealden Heaths Phase II	50,11	1																										1.8E+08
T24	Wimbledon Common	53,18	1	1.5E+10		9.0E+06					1.4E+10				7.4E+08											1.0E+10			5.4E+08
T26	Woolmer Forest (also part of Wealden Heaths Phase 2)	49,14	1	2.0E+05		2.0E+05		1.0E+05							5.0E+03														
T27	Wormley Hoddesdon Park Woods	54,20	1	2.4E+10		6.0E+09																							1.6E+09
W001	Aber Afon Dyfi/Dyfi Estuary	25,28	1			1.0E+08																							
W002	Aberbargoed Grasslands	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
W003	Abergavenny Woodlands (Sugar Loaf Woodlands)	32,21	1								3.0E+11																		
W004	Afon Eden/River Eden – Cors GochTrawsfynydd	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W005	Afon Gwyrfai a Llyn Cwellyn	25,36	1												1.0E+08														
W011	Berwyn	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W012	Berwyn a Mynyddoedd de Clwyd / Berwyn & South Clwyd Mountains	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W013	Blackmill Woodlands	29,18	1			6.2E+07					4.0E+11																		
W014	Blaen Cynon	30,20	1								2.9E+11																		
W016	Burry Inlet	26,19	1	2.0E+07			1.5E+07										2.0E+07												2.0E+07
W017	Cadair Idris	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W019	Cardiff Beech Woods	31,18	1	2.5E+15		1.4E+11	1.8E+09	3.7E+11			1.4E+11				6.6E+10														
W020	Cardigan Bay/Bae Ceredigion	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W021	Carmarthen Bay & Estuaries/ Bae Caerfyrddin ac Aberoedd	26,19	1	2.0E+07			1.5E+07										2.0E+07												2.0E+07
W023	Carmarthen Bay	19,20	0.0008	7.4E+10					1.1E+11		1.1E+11															7.4E+09			

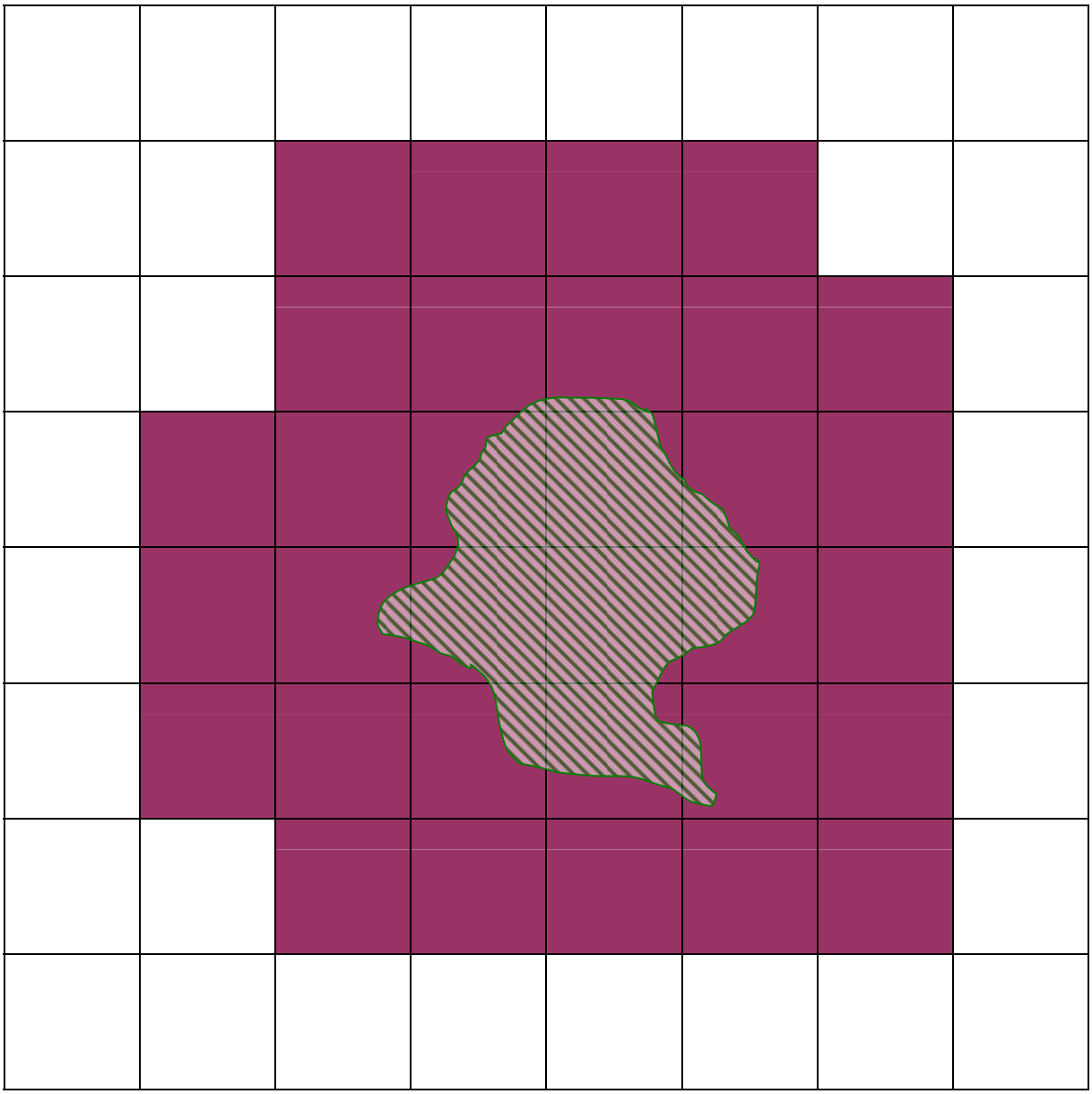
Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
W024	Castlemartin Coast	19,20	0.0008	7.4E+10					1.1E+11		1.1E+11															7.4E+09			
W028	Coed y Cerrig	32,21	1								3.0E+11																		
W032	Coedydd Aber/Aber Woods	25,36	1												1.0E+08														
W033	Coedydd Derw a Safleoedd Ystlumd Meirion/Meirionydd Oakwoods & Bat Sites	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W037	Cors Fochno	25,28	1			1.0E+08																							
W040	Corsydd Mon/Anglesey Fens	23,39	0.2	1.8E+11				1.2E+10																		1.2E+10			1.8E+10
W040	Corsydd Mon/Anglesey Fens	23,39	1	1.8E+13		2.3E+12		4.5E+11	1.0E+14																				7.0E+08
W042	Crymlyn Bog/Cors Crymlyn	27,18	0.0005																5.4E+10										3.0E+10
W043	Cwm Cadlan	30,20	1								2.9E+11																		
W044	Cwm Clydach Woodlands/Coedydd Cwm Clydach	32,21	1								3.0E+11																		
W046	Dee Estuary – SPA	34,37	1	2.2E+12							1.9E+12																		4.8E+10
W047	Dee Estuary – pSAC	34,37	1	2.2E+12							1.9E+12																		4.8E+10
W048	Deeside and Buckley Newt Sites	33,37	1	1.0E+08																						2.3E+08			3.4E+08
W050	Dunraven Bay	27,18	0.0005																5.4E+10										3.0E+10
W051	Elenydd	25,28	1			1.0E+08																							
W052	Elenydd-Mallaen	25,28	1			1.0E+08																							
W053	Eryri/Snowdonia (inc Llyn Idwal)	23,39	0.2	1.8E+11				1.2E+10																		1.2E+10			1.8E+10
W053	Eryri/Snowdonia (inc Llyn Idwal)	23,39	1	1.8E+13		2.3E+12		4.5E+11	1.0E+14																				7.0E+08
W055	Glannau Mon: Cors Heli/Anglesey Coast:Saltmarsh	24,37	1	6.0E+08			9.6E+08	2.0E+07																					3.2E+07
W059	Glaswelltiroedd Cefn Cribwr/Cefn Cribwr Grasslands	27,18	0.0005																5.4E+10										3.0E+10
W061	Gower Ash Woods/Coedydd Ynn Gwyr	26,19	1	2.0E+07			1.5E+07										2.0E+07												2.0E+07
W062	Gower Commons/Tiroedd Comin Gwyr	26,19	1	2.0E+07			1.5E+07										2.0E+07												2.0E+07
W068	Johnstown Newt Sites	33,35	1			3.8E+07																							
W069	Kenfig/Cynffig	27,18	0.0005																5.4E+10										3.0E+10
W070	Limestone Coast of South West Wales/Arfordir Calchfaen De Orllewin Cym	19,20	0.0008	7.4E+10					1.1E+11		1.1E+11															7.4E+09			
W071	Llangorse Lake/Llyn Syfaddan	32,21	1								3.0E+11																		
W073	Llyn Dinam	24,37	1	6.0E+08			9.6E+08	2.0E+07																					3.2E+07

Table A6.3 Continued

Site code	Natura site	10 km Grid[a]	Scale factor	H-3 (not OBT)	H-3 (OBT)	C-14	P-32/33	S-35	Ar-41	Co-60	Kr-85	Sr-90	Tc-99m	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Rn-222	Ra-226	Th-234	U-alpha	Pu-alpha	Am-241	Other alpha	Other beta / gamma ($t_{1/2}$ <1 day)	Other beta / gamma ($t_{1/2}$ 1–10 days)	Other beta / gamma ($t_{1/2}$ >10 days)
W074	Migneint- Arenig-Ddualllt	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W075	Migneint- Arenig-Ddualllt	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W076	Morfa Harlech a Morfa Dyffryn	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W082	Pembrokeshire Bat Sites and Bosherton Lakes/Safleoedd Ystlum Sir Benfro	19,20	0.0008	7.4E+10					1.1E+11		1.1E+11															7.4E+09			
W083	Pembrokeshire Marine/Sir Benfro Forol	19,20	0.0008	7.4E+10					1.1E+11		1.1E+11															7.4E+09			
W084	Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W091	River Dee and Bala Lake	26,33	1	7.5E+11		1.0E+10																							5.0E+10
W093	River Wye/Afon Gwy	36,19	0.04																										3.0E+10
W093	River Wye/Afon Gwy	36,19	1	9.2E+12		4.0E+12		4.5E+11	5.0E+14		1.0E+12																		7.0E+10
W096	Traeth Lafan/Lavan Sands, Conway Bay	24,37	1	6.0E+08			9.6E+08	2.0E+07																					3.2E+07
W097	Usk Bat Sites/Safleodd Ystlumod Wysg	32,21	1								3.0E+11																		
W098	Wye Valley Woodlands/Coetiroedd Dyffryn Gwy	36,19	0.04																										3.0E+10
W098	Wye Valley Woodlands/Coetiroedd Dyffryn Gwy	36,19	1	9.2E+12		4.0E+12		4.5E+11	5.0E+14		1.0E+12																		7.0E+10
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	23,39	0.2	1.8E+11				1.2E+10																		1.2E+10			1.8E+10
W099	Y Fenai a Bae Conwy/Menai Strait and Conwy Bay	23,39	1	1.8E+13		2.3E+12		4.5E+11	1.0E+14																				7.0E+08
W100	Y Twyni o Abermenai I Aberfraw/Abermenai to Aberfraw Dunes	24,37	1	6.0E+08			9.6E+08	2.0E+07																					3.2E+07
W101	Yerbeston Tops	19,20	0.0008	7.4E+10					1.1E+11		1.1E+11															7.4E+09			

[a]The 10 km grid square is given a reference XX,YY, where XX is the first two digits of the six-digit Eastings value and YY is the first two digits of the six-digit Northings value.



Legend

Natura 2000 site

Selected 10 km grid squares

Figure A6.1 Selection of 10 km grid squares for Natura 2000 sites

Appendix 7 – Assessing floodwater

Calculation of dose rate per unit release data for flooding

Floodwater may ingress on to a terrestrial site and radionuclides contained within the floodwater may be deposited on soil. Dose rate per unit release factors have been calculated for the terrestrial organism worst affected by floodwater to compare to the dose rate per unit release data for the worst affected freshwater organism.

Dose rate per unit soil concentration data have been calculated for terrestrial organisms (Copplestone et al. 2003) and these are shown in Table A7.1. These data are not available for all the radionuclides which are included in the freshwater habitats assessments and it has been necessary to select the data for another radionuclide which emits similar radiation type and energy and has a similar transfer into the organism. These assumptions are shown in Table A7.1.

Water concentrations per unit release for a default flow rate of 1 m^3/s are shown in Table A7.2 (Allott and Titley 2005). A flow rate of 1 m^3/s will be very low for flood conditions and is thus quite a cautious assumption, as a greater flow rate would provide greater dilution of the radionuclides.

Soil concentrations per unit deposition are shown in Table A7.3 (Environment Agency 2006b). It has been assumed that floodwater covers the terrestrial habitat with a total of 1 m depth of water per year. This is also a cautious assumption as total flooding depths per year are likely to be a lot lower. Soil concentrations per unit floodwater concentration have been calculated by multiplying the soil concentrations per unit deposition by 1 m/y of floodwater (see Table A7.3).

Soil concentrations per unit release of radionuclides to freshwater have then been calculated by multiplying the floodwater concentration per unit release data by the soil concentration per unit floodwater concentration data (Table A7.3).

Dose rate per unit release data for radionuclides discharged to freshwater which then deposit on to a terrestrial habitat site as a result of flooding have been calculated from dose rate per unit soil concentration data and soil concentration per unit release data (see Table A7.4).

Comparison of flooding and freshwater dose rate per unit release data

Dose rate per unit release data for the flooding of terrestrial sites and freshwater dose rate per unit release data are compared in Table A7.4. It can be seen that the freshwater dose rate per unit release values are all larger than the flooding dose rate per unit release data. Therefore, it is likely to be cautious to use the freshwater assessment methodology to cover the assessment of dose rate to the worst affected organism from flooding of terrestrial sites.

Table A7.1 Dose rate per unit soil concentration for worst affected terrestrial organism[a]

Nuclide	Comment	Total weighted dose rate (μGy/h per Bq/kg)
Co-60	-	1.2E-03
Sr-90	-	3.2E-03
Tc-99	Assumed equals I-129	9.1E-05
Tc-99m	Assumed equals Cs-137	2.0E-03
Ru-106	-	1.4E-03
I-125	Assumed equals I-129	9.1E-05
I-129	-	9.1E-05
I-131	-	3.6E-04
Cs-137	-	2.0E-03
Po-210	Assumed equals Ra-226	6.1E-01
Th-234	-	3.9E-04
U-238	-	1.5E-01
Pu-239	-	8.3E-02
Am-241	-	8.9E-02

[a]Copplestone et al. (2003).

Table A7.2 Water concentration per unit release into floodwater

Nuclide	Water concentration per unit release[a] for river flow of 1 m^3/s	Water concentration per unit release[b] for river flow of 1 m^3/s
	Bq/l per Bq/y	Bq/m^3 per Bq/y
Co-60	1.8E-11	1.8E-08
Sr-90	2.9E-11	2.9E-08
Tc-99	3.1E-11	3.1E-08
Tc-99m	3.1E-11	3.1E-08
Ru-106	2.5E-11	2.5E-08
I-125	3.1E-11	3.1E-08
I-129	3.1E-11	3.1E-08
I-131	3.1E-11	3.1E-08
Cs-137	2.9E-11	2.9E-08
Po-210	2.5E-11	2.5E-08
Th-234	2.3E-11	2.3E-08
U-238	3.2E-11	3.2E-08
Pu-239	5.9E-12	5.9E-09
Am-241	1.8E-12	1.8E-09

[a]Allott and Titley (2005).
[b]Units converted from Bq/l per Bq/y to Bq/m^3 per Bq/y.

Table A7.3 Soil concentration per unit release into floodwater

Nuclide	Soil concentration per unit deposition[a]	Soil concentration per unit deposition[b]	Soil concentration per unit floodwater concentration for 1 m/y of floodwater	Soil concentration per unit release for floodwater flow of 1 m^3/s and flood depth of 1 m/y
	Bq/kg per Bq/s/m^2	Bq/kg per Bq/y/m^2	Bq/kg per Bq/m^3	Bq/kg per Bq/y
Co-60	6.7E+06	2.1E-01	2.1E-01	3.8E-09
Sr-90	5.2E+06	1.6E-01	1.6E-01	4.8E-09
Tc-99	1.0E+07	3.2E-01	3.2E-01	9.8E-09
Tc-99m	2.7E+03	8.7E-05	8.7E-05	2.7E-12
Ru-106	2.7E+06	8.6E-02	8.6E-02	2.1E-09
I-125	5.7E+05	1.8E-02	1.8E-02	5.6E-10
I-129	1.0E+07	3.2E-01	3.2E-01	9.8E-09
I-131	8.0E+04	2.5E-03	2.5E-03	7.9E-11
Cs-137	9.5E+06	3.0E-01	3.0E-01	8.7E-09
Po-210	1.2E+06	3.8E-02	3.8E-02	9.5E-10
Th-234	2.3E+05	7.3E-03	7.3E-03	1.7E-10
U-238	1.0E+07	3.2E-01	3.2E-01	1.0E-08
Pu-239	1.0E+07	3.2E-01	3.2E-01	1.9E-09
Am-241	1.0E+07	3.2E-01	3.2E-01	5.7E-10

[a]Environment Agency (2006b).
[b]Units converted from Bq/kg per Bq/s/m^2 to Bq/kg per Bq/y/m^2.

Table A7.4 Comparison of flooding and freshwater dose per unit release data for worst affected organism

Nuclide	Dose rate per unit release as a result of release to water followed by flooding of terrestrial environment[a] (μGy/h per Bq/y)	Dose rate per unit release as a result of release to freshwater[b] (μGy/h per Bq/y)
Co-60	4.5E-12	5.3E-11
Sr-90	1.5E-11	2.2E-11
Tc-99	9.0E-13	2.4E-12
Tc-99m	5.4E-15	7.5E-12
Ru-106	3.0E-12	1.9E-10
I-125	5.1E-14	6.7E-13
I-129	9.0E-13	9.8E-13
I-131	2.8E-14	2.6E-12
Cs-137	1.7E-11	5.9E-11
Po-210	5.8E-10	1.6E-07
Th-234	6.6E-14	1.1E-10
U-238	1.5E-09	2.1E-08
Pu-239	1.6E-10	3.5E-08
Am-241	5.1E-11	4.5E-09

[a]Assumes water flow rate of 1 m^3/s and a flooding depth of 1 m/y.
[b]Assumes water flow rate of 1 m^3/s.

Appendix 8 – Comparison of Stage 3 habitats methodology with ERICA

Introduction

The Stage 3 assessment methodology has been based on Environment Agency Science (EA R&D128; Copplestone et al. 2001) and (P3-101/SP1a; Copplestone et al. 2003) which was developed as part of the Euratom FP5 Project 'FASSET' (Larsson et al. 2004). In the intervening period, there has been a successor project, EC ERICA (Beresford et al. 2007), which has extended the work of FASSET. The ERICA project has delivered an assessment tool (available from http://www.project.facilia.se/erica/download.html), which is now 'good practice' for radioactive substance habitat assessments.

A Biota Working Group (BWG) was formed by the International Atomic Energy Agency (IAEA) as part of the EMRAS (Environmental Modelling for Radiation Safety) programme in November 2004. The primary objective of the BWG was: 'to improve Member States' capabilities for protection of the environment by comparing and validating models being used, or developed, for biota dose assessment (that may be used) as part of regulatory process of licensing and compliance monitoring of authorised releases of radionuclides'. The BWG have produced a report (IAEA, in press), in which a total of 15 models and approaches are compared. These encompass those being developed and, in some instances applied in a regulatory context, in the USA, Canada, France, Belgium, Russia, Lithuania and England and Wales, as well as the outputs of international programmes. This included comparisons of Environment Agency Science (R&D P128; Copplestone et al. 2001) and the ERICA assessment tool. The conclusions of this review are summarised below.

A direct comparison of P3-101/SP1a dose per unit concentration factors used in the Stage 3 habitat assessments with equivalent ERICA values has also been made.

Biota Working Group model comparison

The BWG conducted two model–model comparisons to compare the basic components of the various participating models. These were comparisons of predicted: (i) unweighted absorbed dose rates; and (ii) biota whole body activity concentrations. Subsequently, the models were applied to two scenarios to allow the comparison of predictions to available data for a freshwater and a terrestrial site.

The exercise to compare the calculation of unweighted whole body absorbed dose rates, reported as Dose Conversion Coefficients (DCCs), for a selection of the proposed ICRP (International Commission on Radiological Protection) Reference Animal geometries demonstrated that all the 11 participating approaches generally estimated comparable internal dose rates even though different assumptions (including the use of default geometry DCCs, rather than estimation of bespoke values for this exercise) were made. The notable exception was as a consequence of different daughter products being included (e.g. EA R&D128 included uranium-234 in the estimation of the DCC for uranium-238). Variation was greater for the estimation of external dose rates, most notably for short-range alpha or beta-

emitting radiation (e.g. from tritium, plutonium and some naturally-occurring radionuclides). However, it is generally accepted that external exposure of biota to such emitters is of little radiological significance, due to their low range in matter.

The comparison of predicted activity concentrations in a range of freshwater and terrestrial biota by eight of the participating models assuming 1 Bq per unit media demonstrated considerably more variability than the comparison of unweighted dose estimates. For many radionuclide–reference organism combinations variability in predictions was by three or more orders of magnitudes. Predictions were often most variable for poorly studied organisms such as carnivorous mammal, fish egg, bird egg, duck, amphibian and aquatic mammals. Some of the more extreme variability could be explained by the use of 'guidance' methodology to provide values by a number of approaches when there were no data. However, this guidance methodology, used within EA R&D128, FASSET and the ERICA tool, is intended to be conservative if data are missing and in most instances it resulted in comparatively high (and hence conservative) predictions.

Comparison of dose rate per unit concentrations

Dose rate per unit concentration data have been calculated using the ERICA tool for coastal, freshwater and terrestrial environments to compare with the same data derived from P3-101/SP1a (see Appendix 3). These data have been calculated for reference organisms which are broadly equivalent to the reference organisms in P3-101/SP1a. It was not possible to match all organisms. Also, data were only compared where actual data were available for particular organisms rather than data derived from surrogate radionuclides.

The dose rate per unit concentration data for coastal environments are shown in Tables A8.1– A8.3, for freshwater environments in Tables A8.4–A8.6, and for terrestrial environments in Tables A8.7–A8.9.

Coastal environment

ERICA data for coastal environments are compared to those for P3-101/SP1a in Figure A8.1. The majority of the dose rate per unit concentration data agree within a factor of ten, but some of the values differ by many orders of magnitude. This is largely due to differences in concentration factors for organisms. It is notable that some of the P3-101/SP1a dose rate per unit concentration values are much higher than those from ERICA, in particular for seabirds, seals and whales. This is because highly cautious default concentration factors were used for these organisms in P3-101/SP1a. The ERICA project was able to invest more resources in sourcing more realistic concentration factors.

Dose rate per unit concentration data for phytoplankton are generally higher for ERICA compared to P3-101/SP1a. This may be due to caution in the concentration factors for phytoplankton.

Overall, P3-101/SP1data will give doses to the worst affected organism which are either higher than the ERICA data or within a factor of two, with the exception of phosphorus-32 and technetium-99 (see Figure A8.2). For phosphorus-32 the ERCIA maximum dose rate per unit concentration factor is a factor of 24 times higher than for P3-101-SP1a, and for technetium-99 the ERICA maximum is a factor of four times higher than P3-101-SP1a.

Freshwater environment

ERICA data for freshwater environments are compared to those for P3-101/SP1a in Figure A8.3. There is a similar range of variability as for coastal waters. The dose per unit

concentration data for P3-101/SP1a are generally much larger than ERICA for amphibians, aquatic mammals and ducks. Again, this is due to cautious default concentration factors.

Phytoplankton dose per unit concentration data are higher in ERICA than P3-101/SP1a, as for coastal waters. Also, thorium-234 data are generally higher for ERICA compared to P3-101/SP1a, as a result of higher concentration factors.

Overall, ERICA data will give doses to the worst affected organism which are more than a factor of two higher than P3-101/SP1a for cobalt-60, ruthenium-106, iodine-125, iodine-129, caesium-137 and thorium-234 (see Figure A8.4).

The Natura 2000 sites with the highest doses tend to be estuaries, and coastal assessments have been conducted as well as freshwater assessments. In these cases, the coastal water assessments using P3-101/SP1data will give doses to the worst affected organism which are either higher than the freshwater ERICA data or within a factor of two, with the exception of caesium-137 and thorium-234 (see Figure A8.4). For caesium-237 the ERCIA freshwater maximum dose rate per unit concentration factor is a factor of 40 times higher than the coastal P3-101-SP1a value, and for thorium-234 the ERICA maximum is a factor of three times higher than P3-101-SP1a.

Terrestrial environment

ERICA data for terrestrial environments are compared to those for P3-101/SP1a in Figure A8.5. The variability is not so great for the terrestrial data compared to the coastal and freshwater data. There are not many trends in the P3-101/SP1a dose rate per unit concentration factors which are much higher or lower than the ERICA values. Those trends that can be observed are that the P3-101/SP1a values tend to be much higher than ERICA for uranium-238, and two of the ERICA bird egg dose rate per unit concentration factors are much higher than those for P3-101/SP1a.

Overall, ERICA data will give doses to the worst affected organism which are more than a factor of two higher than P3-101/SP1a for strontium-90 (2.2 times higher), ruthenium-106 (3.3 times higher), iodine-129 (140 times higher) and iodine-131 (72 times higher) (see Figure A8.6).

Conclusions

The IAEA Biota Working Group concluded that the dose conversion coefficients for different models were broadly similar for the internal dosimetry. There was some variability for the external dosimetry, in particular for some alpha and beta-emitting radionuclides. This variability in the external dosimetry is not too important as the internal doses will dominate for alpha and beta-emitting radionuclides. There was large variability in the predicted organism activity concentrations per unit media (e.g. air, water) concentrations, due in some cases to cautious guidance concentration factors.

The comparison of P3-101/SP1a dose rate per unit concentration data with ERICA supported the general conclusions of the Biota Working Group. It showed that there was a tendency for the P3-101/SP1a data to be more cautious than the ERICA data for the marine assessments. This conclusion was also valid for estuarine environments where both coastal and freshwater assessments were undertaken. This is because most of the P3-101/SP1a coastal water values are either similar to or higher than the freshwater ERICA values.

However, there were radionuclides for which ERICA dose rate per unit concentrations were significantly higher than those for P3-101/SP1a. Whether doses will be higher for a particular

Natura 2000 site will depend upon the mix of radionuclides discharged. For this reason, it will be necessary to use the ERICA data for future habitats assessments.

Table A8.1 Coastal weighted internal dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted internal dose rates (microgray/h per Bq/l water)															
		H-3	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Benthic fish	Benthic fish	8.3E-06	3.5E-01	3.8E+01	9.5E-01	1.4E-02	1.8E-03	1.9E-02	1.2E-04	1.9E-04	4.7E-04	1.5E-02	5.3E+02	2.9E-01	3.4E-01	1.1E+02	1.8E+00
Benthic mollusc	Benthic mollusc	8.3E-06	2.9E-01	7.1E+00	5.0E-01	7.0E-02	5.2E-01	1.1E+00	3.9E-04	6.9E-04	1.7E-03	9.9E-03	1.1E+03	2.3E-01	7.7E-01	3.3E+01	2.6E+02
Large b. crust.	Large b. crust.	8.3E-06	3.0E-01	1.1E+01	3.8E-01	8.2E-03	1.3E+00	2.5E-01	1.3E-04	1.9E-04	5.0E-04	7.4E-03	1.9E+03	4.9E-01	2.4E-01	4.8E+00	4.1E+01
Macrophyte	Macrophyte	8.3E-06	2.3E-01	2.8E+00	1.4E-01	1.9E-02	1.7E+00	5.4E-01	1.0E-01	2.0E-01	4.1E-01	1.6E-02	3.1E+01	7.0E-01	2.9E+00	1.2E+02	2.6E+01
Pelagic fish	Pelagic fish	8.3E-06	3.5E-01	3.9E+01	1.1E+00	1.4E-02	1.8E-03	2.0E-02	1.2E-04	1.9E-04	4.7E-04	1.5E-02	5.3E+02	2.9E-01	3.4E-01	1.1E+02	1.8E+00
Phytoplankton	Phytoplankton	8.3E-06	1.5E-01	1.8E+00	1.4E-01	2.5E-02	1.7E-04	1.2E+01	2.2E-02	4.3E-02	6.0E-02	8.8E-03	8.1E+02	6.7E+01	3.4E+00	3.6E+03	6.7E+03
Seabird	Seabird	8.3E-06	5.0E-01	3.7E+01	1.2E-01	9.1E-04	1.8E-03	2.1E-02	2.5E-05	3.7E-05	9.5E-05	8.7E-02	3.1E+02	1.7E-02	9.6E-02	4.5E+00	4.8E+00
Seal	Seal	8.3E-06	5.0E-01	7.6E+01	3.9E-01	9.4E-04	1.4E-03	2.3E-02	3.1E-05	4.0E-05	1.6E-04	6.9E-02	3.1E+02	9.4E-02	9.6E-03	8.4E+00	8.9E+00
Small b. crust.	Small b. crust.	8.3E-06	3.0E-01	1.1E+01	3.8E-01	8.2E-03	1.3E+00	2.5E-01	1.3E-04	1.9E-04	5.0E-04	7.4E-03	1.9E+03	4.9E-01	2.4E-01	4.8E+00	4.1E+01
Whale	Whale	8.3E-06	5.0E-01	7.6E+01	3.9E-01	9.4E-04	1.4E-03	2.3E-02	3.1E-05	4.0E-05	1.6E-04	6.9E-02	3.1E+02	9.4E-02	9.6E-03	8.4E+00	8.9E+00
Zooplankton	Zooplankton	8.3E-06	2.9E-01	4.5E+00	2.7E-01	1.3E-03	5.6E-03	6.9E+00	7.2E-02	1.4E-01	2.9E-01	1.3E-02	2.4E+03	1.8E+00	7.2E-01	2.3E+02	1.3E+02

Table A8.2 Coastal weighted external dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted external dose rates (microgray/h per Bq/l water)															
		H-3	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Benthic fish	Benthic fish	8.0E-13	9.0E-06	8.8E-02	2.0E+02	2.3E-04	6.1E-06	4.4E+00	5.0E-04	3.3E-04	7.1E-03	6.0E-01	4.5E-02	7.7E+01	6.5E-05	5.0E-03	1.2E+01
Benthic mollusc	Benthic mollusc	2.9E-12	3.6E-05	1.5E-01	2.1E+02	3.5E-04	2.3E-05	5.6E+00	7.1E-04	4.3E-04	7.5E-03	6.4E-01	4.7E-02	1.1E+02	1.5E-04	9.5E-03	1.5E+01
Large b. crust.	Large b. crust.	7.4E-15	1.1E-05	4.4E-02	2.0E+02	1.0E-04	7.1E-06	3.2E+00	4.3E-04	2.8E-04	6.7E-03	5.8E-01	4.3E-02	4.7E+01	5.5E-05	4.4E-03	1.1E+01
Macrophyte	Macrophyte	2.6E-11	8.0E-05	4.4E-01	2.1E+02	9.0E-04	7.6E-05	9.8E+00	8.2E-04	4.6E-04	8.2E-03	6.8E-01	4.9E-02	2.6E+02	2.6E-04	1.5E-02	1.7E+01
Pelagic fish	Pelagic fish	8.3E-15	2.3E-08	1.3E-05	1.3E-03	2.7E-05	1.5E-07	1.7E-04	1.3E-05	8.5E-06	2.0E-04	2.9E-04	4.4E-09	3.4E-05	1.3E-07	9.7E-08	1.2E-05
Phytoplankton	Phytoplankton	3.4E-06	2.9E-05	4.0E-04	1.5E-03	6.5E-04	5.8E-05	9.4E-04	3.5E-05	5.1E-05	3.3E-04	4.7E-04	3.1E-03	5.3E-04	2.4E-03	3.0E-03	3.2E-03
Seabird	Seabird	3.6E-13	1.8E-08	9.8E-06	1.3E-03	2.0E-05	1.2E-07	1.5E-04	1.0E-05	7.1E-06	1.9E-04	2.8E-04	4.2E-09	2.8E-05	9.5E-08	7.7E-08	1.1E-05
Seal	Seal	3.3E-14	3.6E-09	2.1E-06	7.2E-04	4.2E-06	2.4E-08	6.1E-05	2.2E-06	1.6E-06	8.9E-05	1.4E-04	2.2E-09	9.4E-06	2.0E-08	2.1E-08	3.3E-06
Small b. crust.	Small b. crust.	7.4E-15	1.1E-05	4.4E-02	2.0E+02	1.0E-04	7.1E-06	3.2E+00	4.3E-04	2.8E-04	6.7E-03	5.8E-01	4.3E-02	4.7E+01	5.5E-05	4.4E-03	1.1E+01
Whale	Whale	3.3E-14	3.6E-09	2.1E-06	7.2E-04	4.2E-06	2.4E-08	6.1E-05	2.2E-06	1.6E-06	8.9E-05	1.4E-04	2.2E-09	9.4E-06	2.0E-08	2.1E-08	3.3E-06
Zooplankton	Zooplankton	1.6E-13	4.3E-07	2.0E-04	1.4E-03	3.6E-04	2.7E-06	7.4E-04	2.3E-05	1.4E-05	2.3E-04	3.5E-04	4.9E-09	3.0E-04	6.4E-07	3.6E-07	1.8E-05

Table A8.3 Coastal weighted total dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted total dose rates (microgray/h per Bq/l water)															
		H-3	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Benthic fish	Benthic fish	8.3E-06	3.5E-01	3.8E+01	2.0E+02	1.4E-02	1.8E-03	4.4E+00	6.2E-04	5.1E-04	7.6E-03	6.1E-01	5.3E+02	7.7E+01	3.4E-01	1.1E+02	1.4E+01
Benthic mollusc	Benthic mollusc	8.3E-06	2.9E-01	7.3E+00	2.1E+02	7.0E-02	5.2E-01	6.7E+00	1.1E-03	1.1E-03	9.1E-03	6.5E-01	1.1E+03	1.1E+02	7.7E-01	3.3E+01	2.7E+02
Large b. crust.	Large b. crust.	8.3E-06	3.0E-01	1.1E+01	2.0E+02	8.3E-03	1.3E+00	3.4E+00	5.6E-04	4.7E-04	7.2E-03	5.9E-01	1.9E+03	4.7E+01	2.4E-01	4.8E+00	5.2E+01
Macrophyte	Macrophyte	8.3E-06	2.3E-01	3.3E+00	2.1E+02	2.0E-02	1.7E+00	1.0E+01	1.0E-01	2.0E-01	4.2E-01	7.0E-01	3.1E+01	2.6E+02	2.9E+00	1.2E+02	4.3E+01
Pelagic fish	Pelagic fish	8.3E-06	3.5E-01	3.9E+01	1.1E+00	1.4E-02	1.8E-03	2.0E-02	1.3E-04	2.0E-04	6.7E-04	1.6E-02	5.3E+02	2.9E-01	3.4E-01	1.1E+02	1.8E+00
Phytoplankton	Phytoplankton	1.2E-05	1.5E-01	1.8E+00	1.4E-01	2.6E-02	2.3E-04	1.2E+01	2.2E-02	4.3E-02	6.1E-02	9.2E-03	8.1E+02	6.7E+01	3.4E+00	3.6E+03	6.7E+03
Seabird	Seabird	8.3E-06	5.0E-01	3.7E+01	1.2E-01	9.3E-04	1.8E-03	2.1E-02	3.5E-05	4.4E-05	2.9E-04	8.8E-02	3.1E+02	1.7E-02	9.6E-02	4.5E+00	4.8E+00
Seal	Seal	8.3E-06	5.0E-01	7.6E+01	3.9E-01	9.4E-04	1.4E-03	2.3E-02	3.3E-05	4.2E-05	2.5E-04	6.9E-02	3.1E+02	9.4E-02	9.6E-03	8.4E+00	8.9E+00
Small b. crust.	Small b. crust.	8.3E-06	3.0E-01	1.1E+01	2.0E+02	8.3E-03	1.3E+00	3.4E+00	5.6E-04	4.7E-04	7.2E-03	5.9E-01	1.9E+03	4.7E+01	2.4E-01	4.8E+00	5.2E+01
Whale	Whale	8.3E-06	5.0E-01	7.6E+01	3.9E-01	9.4E-04	1.4E-03	2.3E-02	3.3E-05	4.2E-05	2.5E-04	6.9E-02	3.1E+02	9.4E-02	9.6E-03	8.4E+00	8.9E+00
Zooplankton	Zooplankton	8.3E-06	2.9E-01	4.5E+00	2.7E-01	1.7E-03	5.6E-03	6.9E+00	7.2E-02	1.4E-01	2.9E-01	1.4E-02	2.4E+03	1.8E+00	7.2E-01	2.3E+02	1.3E+02
	Maximum ERICA	1.2E-05	5.0E-01	7.6E+01	2.1E+02	7.0E-02	1.7E+00	1.2E+01	1.0E-01	2.0E-01	4.2E-01	7.0E-01	2.4E+03	2.6E+02	3.4E+00	3.6E+03	6.7E+03
	Maximum P3-101/SP1a	9.8E-06	5.7E-01	3.2E+00	1.6E+02	6.5E-01	4.7E-01	1.8E+02	1.3E-01	1.7E-01	7.0E-01	6.6E-01	1.2E+06	1.0E+03	1.0E+02	5.9E+03	1.3E+05

Table A8.4 Freshwater weighted internal dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted internal dose rates (microgray/h per Bq/l water)															
		H-3	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Amphibian	Amphibian	8.3E-06	2.1E-01	2.3E+01	1.5E-02	1.0E-02	2.3E-03	1.4E-02	3.8E-03	6.4E-03	1.6E-02	1.4E+00	7.4E+00	5.1E-02	7.2E-01	6.9E+00	6.3E-02
Aqu. mammal	Mammal	8.3E-06	2.2E-01	2.4E+01	1.4E-01	1.1E-02	2.3E-03	1.6E-02	5.2E-03	7.3E-03	2.1E-02	2.0E+00	7.4E+00	5.5E-02	7.2E-01	6.9E+00	6.3E-02
Benthic fish	Benthic fish	8.3E-06	1.4E-01	2.4E+01	1.0E-01	1.1E-02	2.3E-03	1.6E-02	6.8E-03	9.7E-03	2.5E-02	1.2E+00	7.4E+00	5.5E-02	7.2E-01	1.8E+00	1.1E+01
Benthic mollusc	Bivalve mollusc	8.3E-06	2.1E-01	2.3E+01	6.6E-02	1.6E-01	1.4E-03	7.2E+00	7.5E-04	1.2E-03	3.0E-03	7.4E-02	1.2E+03	4.7E-02	4.3E+00	2.5E+01	1.5E+01
Duck	Bird	8.3E-06	2.2E-01	2.4E+01	1.0E-01	1.1E-02	2.3E-03	1.6E-02	4.8E-03	7.0E-03	1.8E-02	5.7E-01	7.4E+00	5.5E-02	7.2E-01	6.0E-02	6.3E-02
Large b. crust.	Crustacean	8.3E-06	2.1E-01	1.6E+00	7.7E-02	4.0E-02	6.9E-04	1.1E+00	9.8E-03	1.8E-02	3.4E-02	1.0E+00	3.1E+02	1.5E-02	1.2E+01	3.3E+01	3.1E+00
Macrophyte	Vascular plant	8.3E-06	1.3E-01	1.9E+00	1.7E-01	7.0E-02	6.6E-02	4.9E-01	7.3E-03	1.4E-02	2.5E-02	1.1E-01	1.2E+02	3.0E-01	7.0E+01	7.8E+01	1.3E+02
Pelagic fish	Pelagic fish	8.3E-06	1.4E-01	2.4E+01	9.2E-02	1.1E-02	2.3E-03	1.6E-02	6.5E-03	9.4E-03	2.5E-02	1.3E+00	7.4E+00	5.5E-02	7.2E-01	1.8E+00	5.7E-02
Phytoplankton	Phytoplankton	8.3E-06	4.8E-02	9.6E-02	4.4E-02	4.0E-03	3.6E-04	1.3E-02	5.2E-02	1.0E-01	1.4E-01	2.9E-01	8.4E+02	3.3E-01	2.9E+00	1.8E+02	1.3E+03
Small b. crust.	Crustacean	8.3E-06	2.1E-01	1.6E+00	7.7E-02	4.0E-02	6.9E-04	1.1E+00	9.8E-03	1.8E-02	3.4E-02	1.0E+00	3.1E+02	1.5E-02	1.2E+01	3.3E+01	3.1E+00
Zooplankton	Zooplankton	8.3E-06	1.1E-01	1.5E-01	3.4E-02	8.4E-03	1.0E-03	4.5E-01	3.2E-02	6.0E-02	9.4E-02	1.2E-01	8.4E+02	2.3E-01	1.2E+00	1.4E+01	1.3E+01

Table A8.5 Freshwater weighted external dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted external dose rates (microgray/h per Bq/l water)															
		H-3	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Amphibian	Amphibian	2.5E-12	5.9E-08	3.1E-05	1.4E-03	6.3E-05	3.7E-07	2.5E-04	1.9E-05	1.2E-05	2.1E-04	3.2E-04	4.7E-09	6.3E-05	2.7E-07	1.8E-07	1.4E-05
Aqu. mammal	Mammal	2.8E-13	1.2E-08	6.8E-06	1.2E-03	1.4E-05	8.5E-08	1.2E-04	7.5E-06	5.2E-06	1.7E-04	2.6E-04	3.9E-09	2.2E-05	6.6E-08	5.9E-08	8.9E-06
Benthic fish	Benthic fish	3.7E-13	5.1E-08	2.6E-04	6.9E+01	2.1E-02	3.3E-07	3.0E+00	1.7E-03	1.1E-03	2.9E-02	1.9E+01	4.3E-02	2.7E+02	2.4E-06	5.4E-02	2.9E+00
Benthic mollusc	Bivalve mollusc	1.5E-12	1.4E-07	6.1E-04	7.4E+01	4.9E-02	8.7E-07	4.4E+00	2.6E-03	1.7E-03	3.2E-02	2.1E+01	4.6E-02	4.7E+02	5.6E-06	1.0E-01	3.7E+00
Duck	Bird	3.6E-13	1.8E-08	9.8E-06	1.3E-03	2.0E-05	1.2E-07	1.5E-04	1.0E-05	7.1E-06	1.9E-04	2.8E-04	4.2E-09	2.8E-05	9.5E-08	7.7E-08	1.1E-05
Large b. crust.	Crustacean	2.5E-13	2.7E-06	7.1E-03	7.4E+01	4.5E-01	1.7E-05	1.7E+01	3.6E-03	2.3E-03	3.8E-02	2.5E+01	4.9E-02	3.5E+03	1.9E-05	2.8E-01	4.8E+00
Macrophyte	Vascular plant	3.7E-09	3.3E-06	5.4E-03	7.4E+01	3.7E-01	2.3E-05	1.4E+01	3.6E-03	2.3E-03	3.8E-02	2.5E+01	4.9E-02	2.8E+03	1.8E-05	2.8E-01	4.8E+00
Pelagic fish	Pelagic fish	3.6E-13	1.8E-08	1.1E-05	1.3E-03	2.4E-05	1.2E-07	1.6E-04	1.1E-05	7.7E-06	1.9E-04	2.9E-04	4.3E-09	3.1E-05	1.0E-07	8.2E-08	1.1E-05
Phytoplankton	Phytoplankton	3.4E-06	2.9E-05	4.0E-04	1.5E-03	6.5E-04	5.8E-05	9.4E-04	3.5E-05	5.1E-05	3.3E-04	4.7E-04	3.1E-03	5.3E-04	2.4E-03	3.0E-03	3.2E-03
Small b. crust.	Crustacean	2.5E-13	2.7E-06	7.1E-03	7.4E+01	4.5E-01	1.7E-05	1.7E+01	3.6E-03	2.3E-03	3.8E-02	2.5E+01	4.9E-02	3.5E+03	1.9E-05	2.8E-01	4.8E+00
Zooplankton	Zooplankton	1.4E-10	1.3E-06	3.3E-04	1.5E-03	5.1E-04	8.4E-06	8.7E-04	2.4E-05	1.5E-05	2.6E-04	3.9E-04	4.9E-09	4.2E-04	7.8E-07	4.2E-07	1.9E-05

Table A8.6 Freshwater weighted total dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted total dose rates (microgray/h per Bq/l water)															
		H-3	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Benthic fish	Benthic fish	8.3E-06	2.1E-01	2.3E+01	1.7E-02	1.0E-02	2.3E-03	1.4E-02	3.8E-03	6.4E-03	1.6E-02	1.4E+00	7.4E+00	5.1E-02	7.2E-01	6.9E+00	6.3E-02
Benthic mollusc	Benthic mollusc	8.3E-06	2.2E-01	2.4E+01	1.5E-01	1.1E-02	2.3E-03	1.7E-02	5.2E-03	7.3E-03	2.1E-02	2.0E+00	7.4E+00	5.5E-02	7.2E-01	6.9E+00	6.3E-02
Large b. crust.	Large b. crust.	8.3E-06	1.4E-01	2.4E+01	6.9E+01	3.2E-02	2.3E-03	3.0E+00	8.4E-03	1.1E-02	5.4E-02	2.0E+01	7.5E+00	2.7E+02	7.2E-01	1.9E+00	1.4E+01
Macrophyte	Macrophyte	8.3E-06	2.1E-01	2.3E+01	7.4E+01	2.1E-01	1.4E-03	1.2E+01	3.3E-03	2.9E-03	3.5E-02	2.1E+01	1.2E+03	4.7E+02	4.3E+00	2.5E+01	1.9E+01
Pelagic fish	Pelagic fish	8.3E-06	2.2E-01	2.4E+01	1.1E-01	1.1E-02	2.3E-03	1.6E-02	4.8E-03	7.0E-03	1.8E-02	5.7E-01	7.4E+00	5.5E-02	7.2E-01	6.0E-02	6.3E-02
Phytoplankton	Phytoplankton	8.3E-06	2.1E-01	1.6E+00	7.4E+01	4.9E-01	7.1E-04	1.8E+01	1.3E-02	2.1E-02	7.2E-02	2.6E+01	3.1E+02	3.5E+03	1.2E+01	3.3E+01	7.8E+00
Seabird	Seabird	8.3E-06	1.3E-01	1.9E+00	7.4E+01	4.4E-01	6.6E-02	1.5E+01	1.1E-02	1.6E-02	6.2E-02	2.5E+01	1.2E+02	2.8E+03	7.0E+01	7.8E+01	1.4E+02
Seal	Seal	8.3E-06	1.4E-01	2.4E+01	9.3E-02	1.1E-02	2.3E-03	1.6E-02	6.5E-03	9.5E-03	2.5E-02	1.3E+00	7.4E+00	5.5E-02	7.2E-01	1.8E+00	5.7E-02
Small b. crust.	Small b. crust.	1.2E-05	4.8E-02	9.6E-02	4.5E-02	4.7E-03	4.2E-04	1.4E-02	5.2E-02	1.0E-01	1.4E-01	2.9E-01	8.4E+02	3.3E-01	2.9E+00	1.8E+02	1.3E+03
Whale	Whale	8.3E-06	2.1E-01	1.6E+00	7.4E+01	4.9E-01	7.1E-04	1.8E+01	1.3E-02	2.1E-02	7.2E-02	2.6E+01	3.1E+02	3.5E+03	1.2E+01	3.3E+01	7.8E+00
Zooplankton	Zooplankton	8.3E-06	1.1E-01	1.5E-01	3.5E-02	8.9E-03	1.0E-03	4.5E-01	3.2E-02	6.0E-02	9.4E-02	1.2E-01	8.4E+02	2.3E-01	1.2E+00	1.4E+01	1.3E+01
Maximum ERICA		1.2E-05	2.2E-01	2.4E+01	7.4E+01	4.9E-01	6.6E-02	1.8E+01	5.2E-02	1.0E-01	1.4E-01	2.6E+01	1.2E+03	3.5E+03	7.0E+01	1.8E+02	1.3E+03
Maximum P3-101/SP1a		9.8E-06	2.1E-01	2.0E+01	2.9E+00	7.6E-01	7.6E-02	7.7E+00	2.1E-02	3.1E-02	8.3E-02	2.0E+00	6.2E+03	5.0E+00	6.7E+02	5.9E+03	2.5E+03

Table A8.7 Terrestrial weighted internal dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted internal dose rates (microgray/h per Bq/kg or Bq/m^3 air)				Weighted internal dose rates (microgray/h per Bq/kg soil)										
		H-3	C-14	P-32	S-35	Co-60	Sr-90	Ru-106	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Ant	Detritivorous invertebrate	1.2E-03	1.2E-02	1.0E-01	1.5E-03	2.1E-07	1.4E-04	1.7E-06	1.4E-05	3.0E-05	1.6E-05	1.2E-02	2.4E-06	2.1E-04	1.2E-03	3.2E-03
Bee	Flying insects	1.2E-03	1.2E-02	1.2E-01	1.4E-03	3.9E-07	2.7E-05	2.3E-06	1.4E-05	3.0E-05	7.7E-06	1.2E-02	2.9E-06	2.1E-04	5.1E-04	4.0E-03
Bird	Bird	1.2E-03	4.0E-02	5.2E-01	1.5E-03	7.1E-05	3.5E-04	9.5E-05	2.1E-05	5.6E-05	1.4E-04	5.2E-03	1.9E-07	1.3E-05	7.0E-04	1.3E-03
Bird egg	Bird egg	1.2E-03	2.5E-02	3.3E-01	1.5E-03	3.5E-05	8.2E-04	8.5E-05	7.9E-03	1.9E-02	4.8E-06	4.9E-03	1.8E-07	1.3E-05	7.0E-04	1.3E-03
Earthworm	Soil Invertebrate (worm)	1.2E-03	1.2E-02	1.4E-01	1.5E-03	4.7E-07	4.7E-06	3.4E-06	7.5E-06	1.7E-05	1.3E-05	1.2E-02	3.6E-06	2.1E-04	8.7E-04	3.2E-03
Herb	Grasses & herbs	1.2E-03	2.5E-02	2.9E-01	4.4E-03	1.0E-06	1.1E-04	1.0E-05	6.7E-06	1.5E-05	9.7E-05	5.4E-03	1.7E-05	3.5E-04	4.3E-04	1.6E-04
Herb. mammal	Mammal (deer)	1.2E-03	4.0E-02	5.4E-01	1.5E-03	2.5E-04	1.1E-03	1.1E-04	2.4E-05	1.0E-04	9.8E-04	3.7E-03	6.3E-08	2.6E-06	7.0E-04	1.3E-03
Lichen	Lichen & bryophytes	1.2E-03	2.5E-02	1.8E-01	4.4E-03	1.2E-05	2.5E-03	4.1E-03	1.7E-05	3.4E-05	6.2E-04	2.9E-02	2.4E-05	1.7E-03	3.1E-03	3.3E-03
Reptile	Reptile	1.2E-03	4.0E-02	5.1E-01	1.5E-03	4.4E-05	7.1E-03	8.6E-05	2.0E-05	5.2E-05	6.1E-04	4.9E-03	1.8E-07	1.2E-05	7.0E-04	1.3E-03
Rodent	Mammal (rat)	1.2E-03	4.0E-02	5.2E-01	1.5E-03	5.0E-05	1.1E-03	9.1E-05	2.1E-05	5.2E-05	4.9E-04	3.6E-03	6.0E-08	2.6E-06	7.0E-04	1.3E-03
Shrub	Shrub	1.2E-03	2.5E-02	2.9E-01	4.4E-03	5.6E-05	2.5E-05	2.5E-06	6.7E-06	1.5E-05	5.6E-04	3.3E-03	6.4E-06	1.7E-04	9.5E-04	1.6E-04
Tree	Tree	1.2E-03	3.8E-02	5.2E-01	4.4E-03	1.3E-05	3.2E-04	4.3E-06	8.4E-06	3.5E-05	5.2E-05	9.5E-05	5.6E-07	1.6E-04	9.5E-04	3.4E-06

Table A8.8 Terrestrial weighted external dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted external dose rates (microgray/h per Bq/kg or Bq/m^3 air)				Weighted external dose rates (microgray/h per Bq/kg soil)										
		H-3	C-14	P-32	S-35	Co-60	Sr-90	Ru-106	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Ant	Detritivorous invertebrate	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-03	1.6E-10	1.1E-04	3.6E-06	1.9E-04	3.1E-04	9.1E-04	1.1E-05	1.3E-07	8.6E-08	6.2E-06
Bee	Flying insects	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.0E-04	1.6E-11	4.2E-05	1.1E-06	7.8E-05	1.2E-04	3.5E-04	4.6E-06	5.0E-08	3.3E-08	2.6E-06
Bird	Bird	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E-04	1.6E-11	4.1E-05	1.1E-06	7.7E-05	1.1E-04	3.4E-04	4.6E-06	4.8E-08	3.2E-08	2.5E-06
Bird egg	Bird egg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.9E-04	1.6E-11	4.1E-05	1.1E-06	7.7E-05	1.1E-04	3.4E-04	4.6E-06	4.8E-08	3.2E-08	2.5E-06
Earthworm	Soil invertebrate (worm)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.3E-03	1.5E-10	1.1E-04	3.5E-06	1.9E-04	3.0E-04	9.0E-04	1.1E-05	1.2E-07	8.5E-08	6.1E-06
Herb	Grasses & herbs	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.8E-04	1.3E-10	4.1E-05	1.9E-06	7.7E-05	1.1E-04	3.3E-04	4.7E-06	1.0E-07	6.0E-08	3.3E-06
Herb. mammal	Mammal (deer)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E-04	4.6E-12	2.1E-05	4.0E-07	3.7E-05	5.6E-05	1.8E-04	2.2E-06	1.0E-08	9.5E-09	9.2E-07
Lichen	Lichen & bryophytes	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.6E-04	8.6E-12	2.2E-05	6.0E-07	4.0E-05	6.0E-05	1.8E-04	2.4E-06	2.5E-08	1.7E-08	1.3E-06
Reptile	Reptile	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E-04	1.5E-11	4.0E-05	1.1E-06	7.3E-05	1.1E-04	3.3E-04	4.4E-06	4.6E-08	3.1E-08	2.4E-06
Rodent	Mammal (rat)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-03	1.2E-10	1.0E-04	3.0E-06	1.8E-04	2.8E-04	8.5E-04	1.1E-05	1.0E-07	7.2E-08	5.5E-06
Shrub	Shrub	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-04	5.1E-11	3.9E-05	1.6E-06	7.2E-05	1.1E-04	3.2E-04	4.3E-06	4.0E-08	3.1E-08	2.7E-06
Tree	Tree	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E-04	5.9E-12	3.3E-05	8.8E-07	6.1E-05	9.0E-05	2.7E-04	3.7E-06	6.9E-09	1.1E-08	1.9E-06

Table A8.9 Terrestrial weighted total dose rate per unit concentration factors from ERICA

P3-101/SP1a organisms	ERICA organisms	Weighted total dose rates (microgray/h per Bq/kg or Bq/m^3 air)				Weighted total dose rates (microgray/h per Bq/kg soil)										
		H-3	C-14	P-32	S-35	Co-60	Sr-90	Ru-106	I-129	I-131	Cs-137	Ra-226	Th-234	U-238	Pu-239	Am-241
Ant	Detritivorous invertebrate	1.2E-03	1.2E-02	1.0E-01	1.5E-03	1.3E-03	1.4E-04	1.1E-04	1.8E-05	2.2E-04	3.3E-04	1.3E-02	1.3E-05	2.1E-04	1.2E-03	3.2E-03
Bee	Flying insects	1.2E-03	1.2E-02	1.2E-01	1.4E-03	5.0E-04	2.7E-05	4.4E-05	1.5E-05	1.1E-04	1.3E-04	1.3E-02	7.5E-06	2.1E-04	5.1E-04	4.0E-03
Bird	Bird	1.2E-03	4.0E-02	5.2E-01	1.5E-03	5.6E-04	3.5E-04	1.4E-04	2.3E-05	1.3E-04	2.5E-04	5.5E-03	4.8E-06	1.3E-05	7.0E-04	1.3E-03
Bird egg	Bird egg	1.2E-03	2.5E-02	3.3E-01	1.5E-03	5.3E-04	8.2E-04	1.3E-04	7.9E-03	1.9E-02	1.1E-04	5.2E-03	4.8E-06	1.3E-05	7.0E-04	1.3E-03
Earthworm	Soil invertebrate (worm)	1.2E-03	1.2E-02	1.4E-01	1.5E-03	1.3E-03	4.7E-06	1.1E-04	1.1E-05	2.1E-04	3.1E-04	1.3E-02	1.5E-05	2.1E-04	8.7E-04	3.2E-03
Herb	Grasses & herbs	1.2E-03	2.5E-02	2.9E-01	4.4E-03	4.8E-04	1.1E-04	5.1E-05	8.6E-06	9.2E-05	2.1E-04	5.7E-03	2.2E-05	3.5E-04	4.3E-04	1.6E-04
Herb. mammal	Mammal (deer)	1.2E-03	4.0E-02	5.4E-01	1.5E-03	5.1E-04	1.1E-03	1.3E-04	2.4E-05	1.4E-04	1.0E-03	3.9E-03	2.3E-06	2.6E-06	7.0E-04	1.3E-03
Lichen	Lichen & bryophytes	1.2E-03	2.5E-02	1.8E-01	4.4E-03	2.7E-04	2.5E-03	4.1E-03	1.7E-05	7.4E-05	6.8E-04	2.9E-02	2.7E-05	1.7E-03	3.1E-03	3.3E-03
Reptile	Reptile	1.2E-03	4.0E-02	5.1E-01	1.5E-03	5.1E-04	7.1E-03	1.3E-04	2.1E-05	1.3E-04	7.2E-04	5.2E-03	4.6E-06	1.2E-05	7.0E-04	1.3E-03
Rodent	Mammal (rat)	1.2E-03	4.0E-02	5.2E-01	1.5E-03	1.3E-03	1.1E-03	1.9E-04	2.4E-05	2.3E-04	7.7E-04	4.4E-03	1.1E-05	2.7E-06	7.0E-04	1.3E-03
Shrub	Shrub	1.2E-03	2.5E-02	2.9E-01	4.4E-03	5.1E-04	2.5E-05	4.1E-05	8.3E-06	8.7E-05	6.7E-04	3.6E-03	1.1E-05	1.7E-04	9.5E-04	1.6E-04
Tree	Tree	1.2E-03	3.8E-02	5.2E-01	4.4E-03	4.0E-04	3.2E-04	3.7E-05	9.3E-06	9.6E-05	1.4E-04	3.6E-04	4.3E-06	1.6E-04	9.5E-04	5.3E-06
Maximum ERICA		1.2E-03	4.0E-02	5.4E-01	4.4E-03	1.3E-03	7.1E-03	4.1E-03	7.9E-03	1.9E-02	1.0E-03	2.9E-02	2.7E-05	1.7E-03	3.1E-03	4.0E-03
Maximum P3-101/SP1a		1.6E-03	3.6E-02	7.1E-01	4.2E-03	1.1E-03	3.2E-03	1.2E-03	5.6E-05	2.7E-04	1.7E-03	3.7E-01	2.8E-04	7.3E-02	4.2E-02	4.4E-02

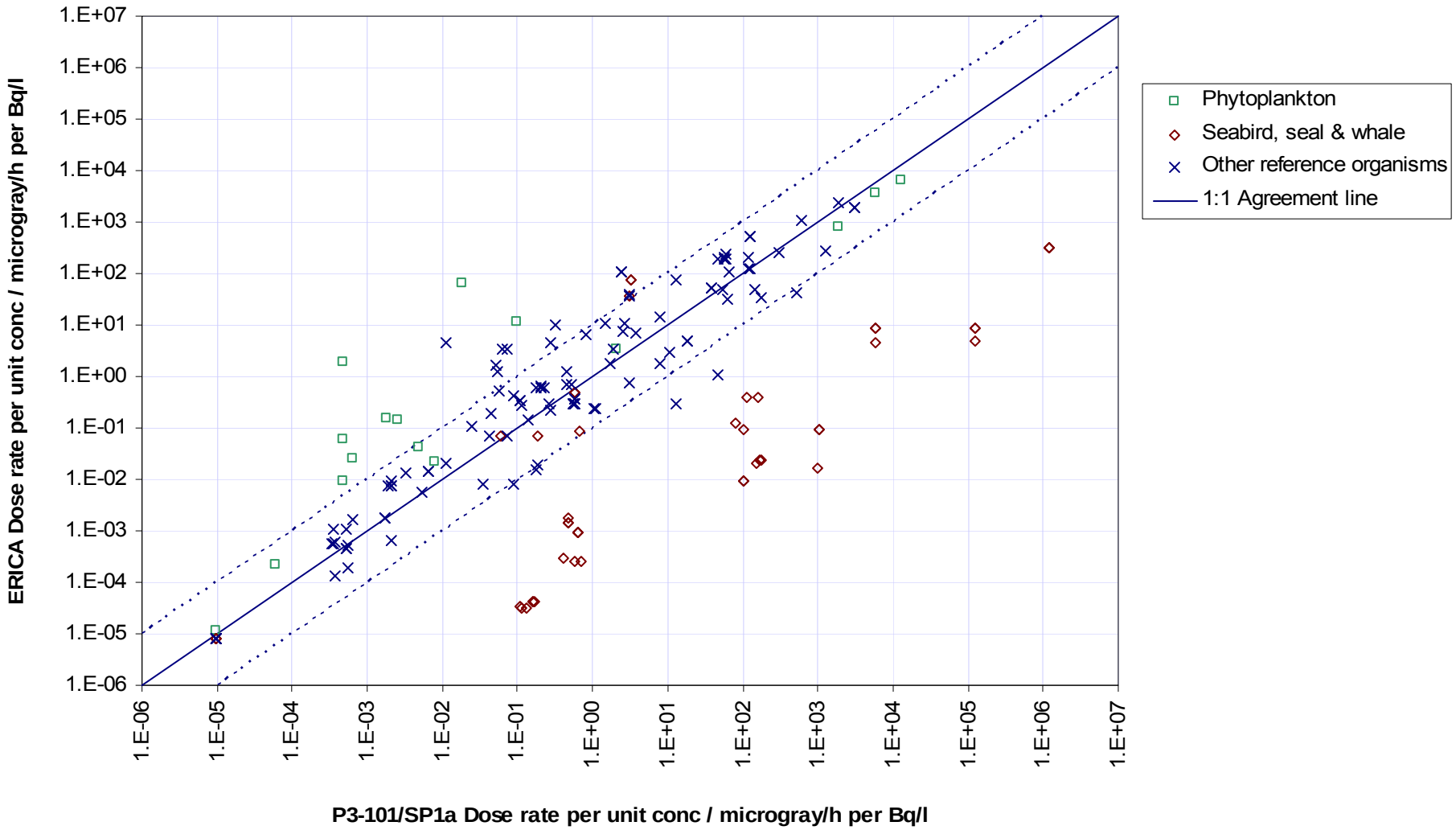


Figure A8.1 Comparison of ERICA and Environment Agency Science (P3-101/SP1a) dose rate per unit concentration data for coastal environments

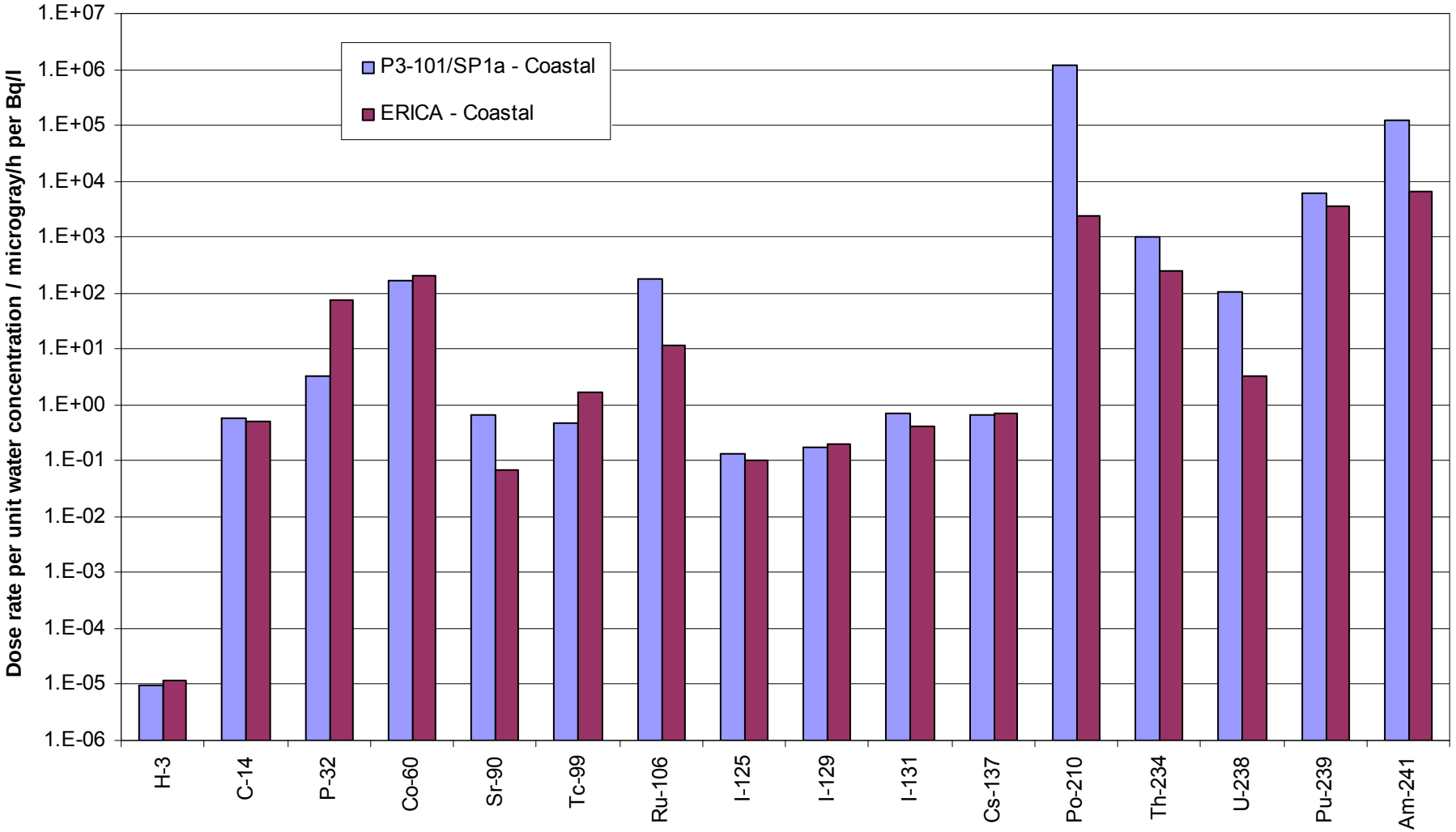


Figure A8.2 Comparison of ERICA and Environment Agency Science (P3-101/SP1a) dose rate per unit concentration data for coastal environments for worst affected organism

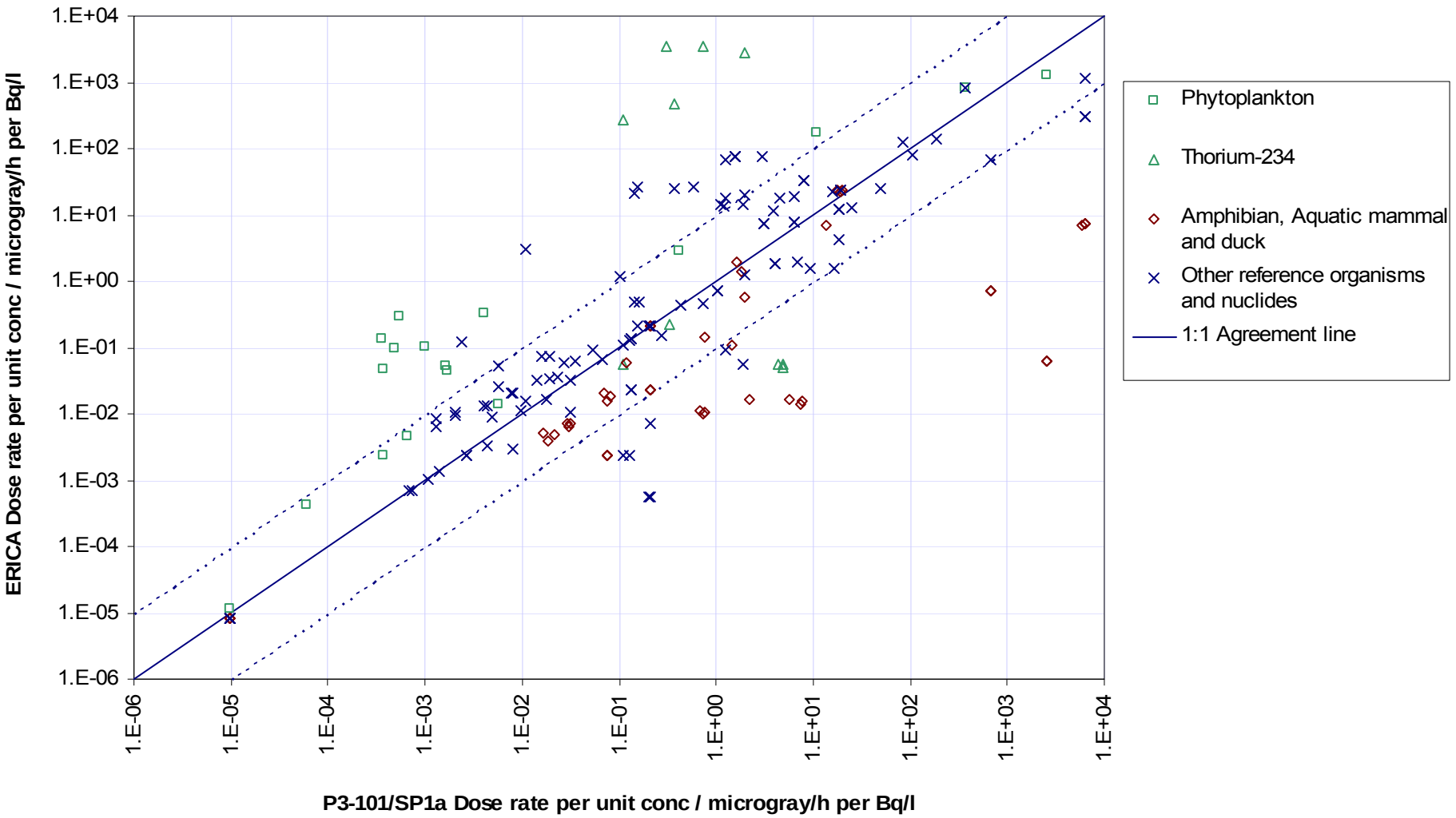


Figure A8.3 Comparison of ERICA and Environment Agency Science (P3-101/SP1a) dose rate per unit concentration data for freshwater environments

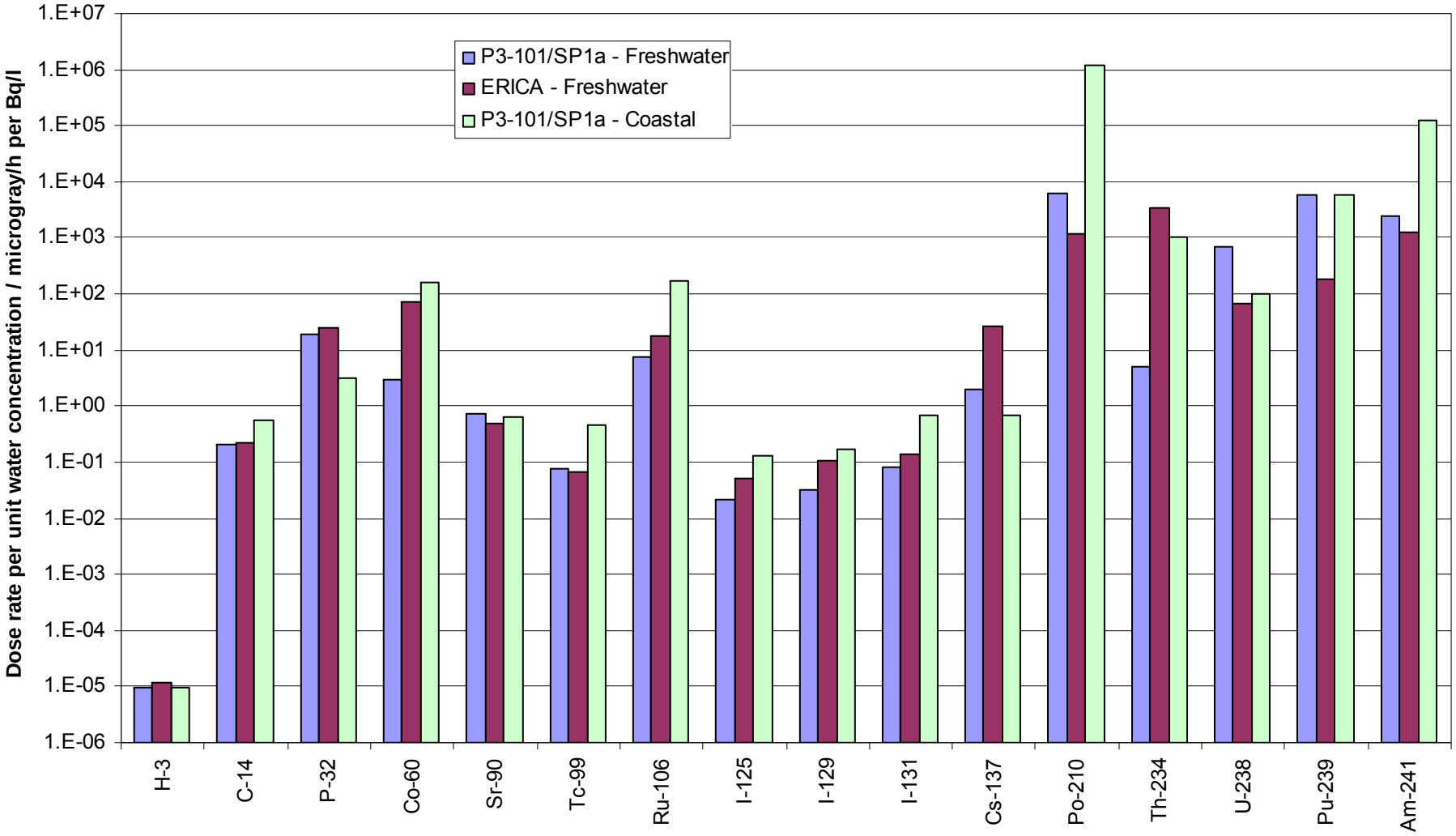


Figure A8.4 Comparison of ERICA and Environment Agency Science (P3-101/SP1a) dose rate per unit concentration data for freshwater environments for worst affected organism

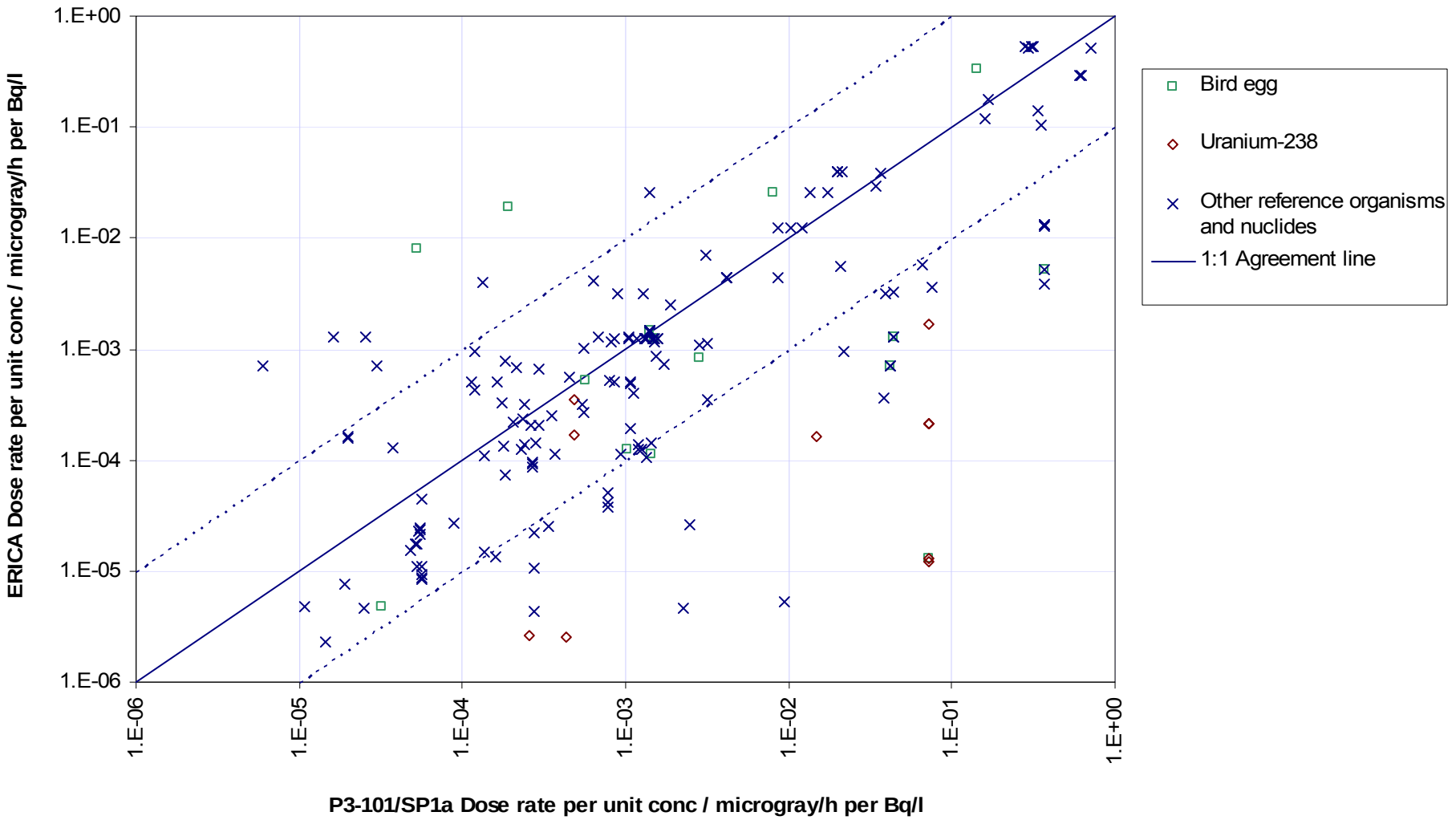


Figure A8.5 Comparison of ERICA and Environment Agency Science (P3-101/SP1a) dose rate per unit concentration data for terrestrial environments

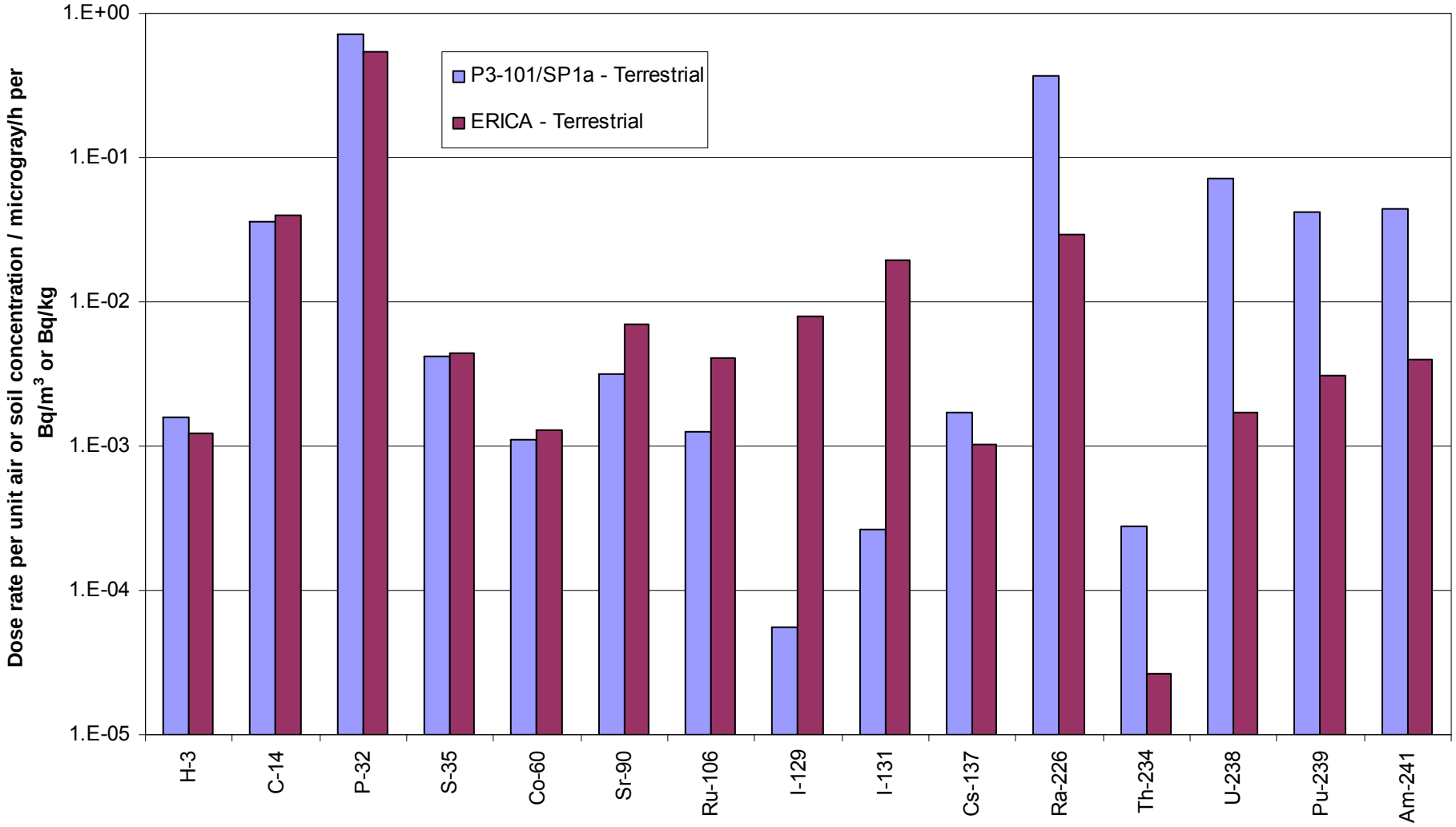


Figure A8.6 Comparison of ERICA and Environment Agency Science (P3-101/SP1a) dose rate per unit concentration data for terrestrial environments for worst affected organism

Appendix 9 – Comparison of coastal water modelling and monitoring results

Introduction

Coastal water concentrations per unit release have been calculated using a simple compartment dispersion model (see Appendix 3). These data have been combined with dose rate per unit water concentration data to give dose rate per unit release data which have been used in the habitat assessments.

The dose rate per unit water concentration data include modelling assumptions about the transfer of radionuclides from water to biota. These are in the form of concentration factors (Copplestone et al. 2003, see Table A9.1). Hence, for a particular Natura 2000 site it is possible to use reported discharges of radionuclides, water concentrations per unit release and unit exchange rate (see Appendix 3), Natura 2000 site-specific coastal water exchange rates (see Appendix 4), and biota concentration factors to predict biota concentrations. These can be compared to monitored biota concentrations.

Biota concentrations have been modelled for the three Natura 2000 sites with the highest dose rate to the worst affected organism (Ribble and Alt Estuaries SPA, Drigg Coast SAC, Teesmouth and Cleveland Coast SPA) and also the Severn Estuary SPA. Monitored biota concentrations have been obtained for comparison with the modelled data.

Ribble and Alt Estuaries SPA

The main discharges of radioactive substances in the Ribble Estuary are from the Springfields Fuels Ltd site (see Section 3.1). Discharges from this site in 2004–2006, along with modelled water and biota concentrations are shown in Table A9.2. The average discharges over 2004–2006 have been used to model the water and biota concentrations for 2006 as there can be a lag between discharges and transfer to biota. The discharge of thorium-234 in one year (2006) has been used due to its short radioactive half-life. Monitored biota concentrations for 2006 are shown in Table A9.3.

A comparison of modelled versus monitored data is shown in Figure A9.1. There are not many data for which there are both modelled and monitored radionuclide concentrations. The data which are available show that the modelled concentrations for the Ribble and Alt Estuaries are cautious. This is probably due to the fact that the cautious modelling approach adopted assumed a suspended sediment load typical of that in coastal waters which is much lower than the high sediment loads found in the Ribble Estuary. A high suspended solid load will tend to remove particle reactive radionuclides such as thorium-234 from the water column and reduce the availability of this radionuclide for uptake by biota.

Drigg Coast SAC

The main discharges of radioactive substances into the area near the Drigg Coast are from the Sellafield nuclear site (see Section 3.2). Discharges from this site in 2004–2006, along with modelled water and biota concentrations are shown in Table A9.4. The average discharges over 2004–2006 have been used to model the water and biota concentrations for 2006 as there can be a lag between discharges and transfer to biota. Monitored biota concentrations for 2006 are shown in Table A9.5. There is quite a lot of variability in the monitoring data. For example, technetium-99 in benthic mollusc ranges from 14 to 860 Bq/kg.

A comparison of modelled versus monitored data is shown in Figure A9.2. There are more data available for comparison at the Drigg Coast location due to the extent of the monitoring programmes around Sellafield. The radionuclides can be grouped as follows:

- Modelling results generally greater than monitoring – carbon-14, technetium-99 and ruthenium-106.
- Modelling results generally in agreement with monitoring – cobalt-60 and caesium-137.
- Modelling results generally less than monitoring – strontium-90, plutonium-239 and americium-241.

The reason that plutonium-239 and americium-241 monitoring results are higher than those modelled is that the concentrations in the environment are largely as a result of much higher historical discharges of these radionuclides, along with in-growth of americium-241 from plutonium-241 (Environment Agency et al. 2005, 2006, 2007). For all other radionuclides, except strontium-90, the modelling appears to be best estimate or cautious.

Teesmouth and Cleveland Coast SPA

The main discharges of radioactive substances into the Teesmouth estuary are from Blychem (agrochemical company) and Hartlepool Nuclear Power Station. Discharges from these sites in 2003–2005, along with modelled water and biota concentrations, are shown in Table A9.6. The average discharges over 2003–2005 have been used to model the water and biota concentrations for 2005 as there can be a lag between discharges and transfer to biota. The discharges from Blychem are via sewer and sewage treatment works. Factors have been used to take account of loss of radionuclides to sludge and radioactive decay during passage of effluent through the treatment works. Monitored biota concentrations for 2005 are shown in Table A9.7.

A comparison of modelled versus monitored data is shown in Figure A9.3. In general, the modelled data is more cautious than the monitored data. The caesium-137 modelled and monitored data have the best agreement, while the carbon-14 modelled data is about a factor of 100 higher than the monitored concentrations. The exchange rate assumed for the Teesmouth estuary is the lowest default value of 30 m^3/s. It is likely that this exchange rate is cautious. The better fit for the caesium-137 data may be due to there being additional sources of this radionuclide in biota (e.g. weapons fallout, Chernobyl fallout, Sellafield's discharges, etc.), which is counteracting the caution in the exchange rate.

Severn Estuary SPA

The main discharges of radioactive substances into the Severn Estuary are from the GE Healthcare site at Cardiff and the nuclear power stations at Hinkley Point, Oldbury and Berkeley. Discharges from these sites in 2004–2006, along with modelled water and biota concentrations, are shown in Table A9.8. The average discharges over 2004–2006 have been used to model the water and biota concentrations for 2006 as there can be a lag between discharges and transfer to biota. The discharges from the GE Healthcare site at Cardiff are via sewer and sewage treatment works. Factors have been used to take account of loss of radionuclides to sludge and radioactive decay during passage of effluent through the treatment works.

Monitored biota concentrations for 2006 are shown in Table A9.9. There is quite a lot of variability in the monitoring data for some radionuclides. For example, tritium in pelagic fish ranged from 45 Bq/kg (fresh weight) to 3300 Bq/kg (fresh weight).

A comparison of modelled versus monitored data is shown in Figure A9.4. The modelled data for carbon-14 and caesium-137 are consistent with the monitored data. The modelled data for organically bound tritium is greater than the monitored values and hence the modelling is cautious for this radionuclide.

Conclusions

The modelling for the Stage 3 assessments appears to be cautious (i.e. over-predicting the monitored concentrations) based on the evidence of comparisons of modelled and monitored biota concentrations at four Natura 2000 sites. Where there are cases of modelling data under-predicting the observed monitoring data, this can be explained in terms of previously higher historical discharges.

Table A9.1 Concentration factors for biota (Bq/kg fresh weight per Bq/l) (Copplestone et al. 2003)

Biota	H-3 (not OBT[a])	H-3 (OBT[a])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Pelagic fish	1.0E+00	2.0E+04	2.0E+04	8.0E+03	1.0E+03	2.0E+00	3.0E+01	2.0E+00	1.0E+01	1.0E+01	1.0E+01	1.0E+02	2.0E+03	6.0E+02	1.0E+00	4.0E+01	5.0E+01
Benthic fish	1.0E+00	2.0E+04	2.0E+04	8.0E+03	1.0E+03	2.0E+00	3.0E+01	2.0E+00	1.0E+01	1.0E+01	1.0E+01	1.0E+02	2.0E+03	6.0E+02	1.0E+00	4.0E+01	5.0E+01
Benthic mollusc	1.0E+00	2.0E+04	2.0E+04	8.0E+03	5.0E+03	1.0E+00	1.0E+03	2.0E+03	1.0E+01	1.0E+01	1.0E+01	3.0E+01	1.0E+04	1.0E+03	3.0E+01	3.0E+03	2.0E+04
Large benthic crustracean	1.0E+00	2.0E+04	2.0E+04	8.0E+03	5.0E+03	2.0E+00	8.0E+03	1.0E+02	1.0E+01	1.0E+01	1.0E+01	3.0E+01	5.0E+04	1.0E+03	1.0E+01	3.0E+02	5.0E+02
Small benthic crustracean	1.0E+00	2.0E+04	2.0E+04	8.0E+03	5.0E+03	2.0E+00	1.0E+03	1.0E+02	1.0E+01	1.0E+01	1.0E+01	3.0E+01	5.0E+04	1.0E+03	1.0E+01	3.0E+02	5.0E+02

[a]Organically bound tritium.

Table A9.2 Modelled water and biota concentrations for Ribble and Alt Estuaries SPA

Parameter	H-3 (not OBT[e])	H-3 (OBT[a])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Discharges:																	
Discharges from Springfields in 2004 (TBq)[a]							0.122								0.0461		
Discharges from Springfields in 2005 (TBq)[b]							0.063								0.036		
Discharges from Springfields in 2006 (TBq)[c]							0.065							20.7	0.026		
Mean annual discharges from Springfields (Bq)	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**8.3E+10**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**2.1E+13**	**3.6E+10**	**0.0E+00**	**0.0E+00**
Modelled concentrations[d]:																	
Water conc. (Bq/l)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E-02	8.6E-03	0.0E+00	0.0E+00
Pelagic fish (Bq/kg fresh weight)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E+01	8.6E-03	0.0E+00	0.0E+00
Benthic fish (Bq/kg fresh weight)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.1E+01	8.6E-03	0.0E+00	0.0E+00
Benthic mollusc (Bq/kg fresh weight)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E+01	2.6E-01	0.0E+00	0.0E+00
Large benthic crustracean (Bq/kg fresh weight)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E+01	8.6E-02	0.0E+00	0.0E+00
Small benthic crustacean (Bq/kg fresh weight)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E+01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.1E+01	8.6E-02	0.0E+00	0.0E+00

[a]Radioactivity in Food and Environment report for 2004 (Environment Agency et al. 2005).
[b]Radioactivity in Food and Environment report for 2005 (Environment Agency et al. 2006).
[c]Radioactivity in Food and Environment report for 2006 (Environment Agency et al. 2007).
[d]Based on water concentrations per unit release (see Appendix 3), coastal water exchange rate of 130 m^3/s (see Appendix 4) and concentration factors from Table A9.1.
[e]Organically bound tritium.

Table A9.3 Monitored biota concentrations for Ribble and Alt Estuaries SPA (2006) (Bq/kg wet weight)

Sample site / type	Data source	Date	H-3 (not OBT[c])	H-3 (OBT[c])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Benthic mollusc:																			
Ribble – mussels	SEMP[a]	Feb-06												2		41			1.15
Ribble – mussels	SEMP[a]	Sep-06												1.6		36			0.59
Ribble – mussels	RIFE[b]	2006					0.13			0.53				1.2					1.4
Small benthic crustracean:																			
Ribble – shrimp	SEMP[a]	Feb-06												2.4		12			0.58
Ribble – shrimp	SEMP[a]	Sep-06												3.1		18			0.8
Ribble – shrimp	RIFE[b]	2006					0.05		0.64	0.49				2.2				0.011	0.022

[a]Springfields Environmental Monitoring Programme (personal communication, Catherine Retberg, Springfields Fuels Ltd).
[b]Radioactivity in Food and Environment report for 2006 (Environment Agency et al. 2007).
[c]Organically bound tritium.

Table A9.4 Modelled water and biota concentrations for Drigg Coast SAC

Parameter	H-3 (not OBT[e])	H-3 (OBT[e])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Discharges:																	
Discharges from Sellafield in 2004 (TBq)[a]	3.2E+03		1.6E+01		7.8E-01	1.8E+01	1.4E+01	4.4E+00		6.5E-01		9.7E+00				2.9E-01	3.7E-02
Discharges from Sellafield in 2005 (TBq)[b]	1.6E+03		5.3E+00		6.6E-01	1.3E+01	6.7E+00	1.9E+00		3.0E-01		5.9E+00				2.0E-01	3.4E-02
Discharges from Sellafield in 2006 (TBq)[c]	1.1E+03		1.1E+01		1.4E-01	5.0E+00	5.6E+00	3.5E+00		2.0E-01		5.9E+00				1.5E-01	5.2E-02
Mean annual discharges from Sellafield (Bq)	**1.9E+15**		**1.1E+13**		**5.3E+11**	**1.2E+13**	**8.9E+12**	**3.3E+12**		**3.8E+11**		**7.2E+12**				**2.1E+11**	**4.1E+10**
Modelled concentrations[d]:																	
Water conc. (Bq/l)	2.5E+01	0.0E+00	1.3E-01	0.0E+00	7.6E-04	1.5E-01	1.1E-01	3.9E-02	0.0E+00	4.9E-03	0.0E+00	8.2E-02	0.0E+00	0.0E+00	0.0E+00	6.1E-04	7.4E-06
Pelagic fish (Bq/kg fresh weight)	2.5E+01	0.0E+00	2.6E+03	0.0E+00	7.6E-01	2.9E-01	3.4E+00	7.9E-02	0.0E+00	4.9E-02	0.0E+00	8.2E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-02	3.7E-04
Benthic fish (Bq/kg fresh weight)	2.5E+01	0.0E+00	2.6E+03	0.0E+00	7.6E-01	2.9E-01	3.4E+00	7.9E-02	0.0E+00	4.9E-02	0.0E+00	8.2E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-02	3.7E-04
Benthic mollusc (Bq/kg fresh weight)	2.5E+01	0.0E+00	2.6E+03	0.0E+00	3.8E+00	1.5E-01	1.1E+02	7.9E+01	0.0E+00	4.9E-02	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	1.8E+00	1.5E-01
Large benthic crustracean (Bq/kg fresh weight)	2.5E+01	0.0E+00	2.6E+03	0.0E+00	3.8E+00	2.9E-01	9.1E+02	3.9E+00	0.0E+00	4.9E-02	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-01	3.7E-03
Small benthic crustacean (Bq/kg fresh weight)	2.5E+01	0.0E+00	2.6E+03	0.0E+00	3.8E+00	2.9E-01	1.1E+02	3.9E+00	0.0E+00	4.9E-02	0.0E+00	2.5E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-01	3.7E-03

[a]Radioactivity in Food and Environment report for 2004 (Environment Agency et al. 2005).
[b]Radioactivity in Food and Environment report for 2005 (Environment Agency et al. 2006).
[c]Radioactivity in Food and Environment report for 2006 (Environment Agency et al. 2007).
[d]Based on water concentrations per unit release (see Appendix 3), coastal water exchange rate of 2500 m^3/s (see Appendix 4) and concentration factors from Table A9.1.
[e]Organically bound tritium.

Table A9.5 Monitored biota concentrations for Drigg Coast SAC (2006) (Bq/kg wet weight)

Sample site / type	Data source	Date	H-3 (not OBT[b])	H-3 (OBT[b])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Pelagic fish:																			
Ravenglass/cod	RIFE[a]	2006												8				0.0048	0.0079
Ravenglass/grey mullet	RIFE[a]	2006												6.4					
Benthic fish:																			
Ravenglass/plaice	RIFE[a]	2006												5.6				0.021	0.041
Benthic mollusc:																			
Drigg/winkles	RIFE[a]	2006			220		6		93	16				7.5				14	0.13
Ravenglass/winkles	RIFE[a]	2006					4.5			18				8.2					24
Ravenglass/cockles	RIFE[a]	2006					12	1.5	14	8.1				4				8.2	24
Ravenglass/mussels	RIFE[a]	2006					3.3		860	8.3				1.6				5.7	12
Large benthic crustracean:																			
Ravenglass/crabs	RIFE[a]	2006					1.3	0.45	18					1.4				0.36	1.5
Ravenglass/lobsters	RIFE[a]	2006					0.9	0.82	480					2.3				0.32	7.6

[a]Radioactivity in Food and Environment report for 2006 (Environment Agency et al. 2007).
[b]Organically bound tritium.

Table A9.6 Modelled water and biota concentrations for Teesmouth and Cleveland Coast SPA

Parameter	H-3 (not OBT[d])	H-3 (OBT[d])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Significant discharges:																	
Discharges from Blychem – 2003[a]			8.3E-01														
Discharges from Blychem – 2004[a]			6.8E-01														
Discharges from Blychem – 2005[a]			6.2E-01														
STW factor[b]	0.85	0.85	0.85	0.2	0.2	0.9	0.9	0.9	0.8	0.8	0.8	0.7	0.1	0.1	0.9	0.5	0.1
Decay factor[b]	1	1	1	0.98	1	1	1	1	1	1	0.95	1	1	0.98	1	1	1
Mean annual discharges from Blychem via STW (TBq)	**0.0E+00**	**0.0E+00**	**6.0E-01**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Discharges from Hartlepool – 2003[a]	3.6E+02		1.0E-03		1.7E-03							5.5E-03					
Discharges from Hartlepool – 2004[a]	2.3E+02		1.0E-03		1.4E-03							5.4E-03					
Discharges from Hartlepool – 2005[a]	2.4E+02		1.0E-03		1.0E-03							3.4E-03					
Mean annual discharges from Hartlepool direct to estuary (TBq)	**2.8E+02**	**0.0E+00**	**1.0E-03**	**0.0E+00**	**1.4E-03**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**4.8E-03**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Total mean annual discharges (Bq)	**2.8E+14**	**0.0E+00**	**6.0E+11**	**0.0E+00**	**1.4E+09**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**4.8E+09**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Modelled concentrations[c]:																	
Water conc. (Bq/l)	2.9E+02	0.0E+00	6.0E-01	0.0E+00	1.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.6E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pelagic fish (Bq/kg fresh weight)	2.9E+02	0.0E+00	1.2E+04	0.0E+00	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benthic fish (Bq/kg fresh weight)	2.9E+02	0.0E+00	1.2E+04	0.0E+00	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benthic mollusc (Bq/kg fresh weight)	2.9E+02	0.0E+00	1.2E+04	0.0E+00	8.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Large benthic crustracean (Bq/kg fresh weight)	2.9E+02	0.0E+00	1.2E+04	0.0E+00	8.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Small benthic crustacean (Bq/kg fresh weight)	2.9E+02	0.0E+00	1.2E+04	0.0E+00	8.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

[a]Environment Agency Pollution Inventory (http://maps.environmentagency.gov.uk/wiyby/dataSearchController?topic=pollution&lang=_e).
[b]Sewage treatment works factor to take account of loss to sludge and radioactive decay factor (see Appendix 4).
[c]Based on water concentrations per unit release (see Appendix 3), coastal water exchange rate of 30 m^3/s (see Appendix 4) and concentration factors from Table A9.1.
[d]Organically bound tritium.

Table A9.7 Monitored biota concentrations for Teesmouth and Cleveland Coast SPA (2005) (Bq/kg wet weight)

Sample site / type	Data source	Date	H-3 (not OBT[b])	H-3 (OBT[b])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Pelagic fish:																			
3 miles ENE Hartlepool / Whiting	RIFE[a]	2005		25	21.9		0.13			1.3				0.52	0.571		0.028		0.27
Benthic fish:																			
3 miles ENE Hartlepool / European plaice	RIFE[a]	2005		25	27.7		0.06			0.54				0.13	1.46		0.012		0.24
Benthic mollusc:																			
Paddys Hole (South Gare) / Blue (edible) mussel	RIFE[a]	2005	22	43	64.3		0.16			1.83				0.15	45.1				0.12
Power station / Blue (edible) mussel	RIFE[a]	2005	27	68	105		0.04			0.44				0.08	27.3	7.17	0.655		0.13
Seal sands / Edible winkle	RIFE[a]	2005		25	219		0.05			0.54				0.1	7.98	3.75	0.904		0.06
Large benthic crustracean:																			
3 miles ENE Hartlepool / Edible crab	RIFE[a]	2005		25	40.2		0.08			0.73				0.08	18.4		0.074		0.07

[a]Radioactivity in Food and Environment report for 2005 (Environment Agency et al. 2006).
[b]Organically bound tritium.

Table A9.8 Modelled water and biota concentrations for Severn Estuary SPA

Parameter	H-3 (not OBT[f])	H-3 (OBT[f])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Significant discharges:																	
Discharges from Cardiff in 2004[a] (TBq)		44.4	0.21	4.2E-06					2.1E-05								
Discharges from Cardiff in 2005[b] (TBq)		40.4	0.274	7.4E-08					1.4E-05								
Discharges from Cardiff in 2006[c] (TBq)		24.8	0.285	1.2E-06					1.9E-06								
STW factor[d]	0.85	0.85	0.85	2.0E-01	0.2	0.9	0.9	0.9	8.0E-01	0.8	0.8	0.7	0.1	0.1	0.9	0.5	0.1
Decay factor[d]	1	1	1	9.8E-01	1	1	1	1	1.0E+00	1	0.95	1	1	0.98	1	1	1
Mean annual discharges – Cardiff via STW (TBq)	**0.0E+00**	**3.1E+01**	**2.2E-01**	**3.6E-07**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**1.0E-05**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Discharges from Hinkley Point A in 2004[a] (TBq)	0.417											0.274					
Discharges from Hinkley Point A in 2005[b] (TBq)	0.379											0.193					
Discharges from Hinkley Point A in 2006[c] (TBq)	0.28											0.14					
Mean annual discharges – Hinkley Point A (TBq)	**3.6E-01**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**2.0E-01**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Discharges from Hinkley Point B in 2004[a] (TBq)	416				2.4E-04												
Discharges from Hinkley Point B in 2005[b] (TBq)	358				1.6E-04												
Discharges from Hinkley Point B in 2006[c] (TBq)	309				1.4E-04												
Mean annual discharges – Hinkley Point B (TBq)	**3.6E+02**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**1.8E-04**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Discharges from Oldbury in 2004[a] (TBq)	0.248											0.392					
Discharges from Oldbury in 2005[b] (TBq)	0.317											0.42					
Discharges from Oldbury in 2006[c] (TBq)	0.154											0.396					
Mean annual discharges – Oldbury (TBq)	**2.4E-01**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**4.0E-01**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Discharges from Berkeley in 2004[a] (TBq)	3.0E-04											1.4E-04					
Discharges from Berkeley in 2005[b] (TBq)	5.9E-04											6.7E-03					
Discharges from Berkeley in 2006[c] (TBq)	2.3E-04											7.2E-04					
Discharges from Berkeley (TBq)	**3.7E-04**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**2.5E-03**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Total mean annual discharges into Severn (Bq)	**3.6E+14**	**3.1E+13**	**2.2E+11**	**3.6E+05**	**1.8E+08**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**1.0E+07**	**0.0E+00**	**0.0E+00**	**6.1E+11**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**
Modelled concentrations[e]:																	
Water conc. (Bq/l)	3.6E+00	3.1E-01	2.0E-03	1.7E-09	2.0E-07	0.0E+00	0.0E+00	0.0E+00	7.9E-08	0.0E+00	0.0E+00	5.5E-03	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pelagic fish (Bq/kg fresh weight)	3.6E+00	6.2E+03	4.1E+01	1.3E-05	2.0E-04	0.0E+00	0.0E+00	0.0E+00	7.9E-07	0.0E+00	0.0E+00	5.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benthic fish (Bq/kg fresh weight)	3.6E+00	6.2E+03	4.1E+01	1.3E-05	2.0E-04	0.0E+00	0.0E+00	0.0E+00	7.9E-07	0.0E+00	0.0E+00	5.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benthic mollusc (Bq/kg fresh weight)	3.6E+00	6.2E+03	4.1E+01	1.3E-05	1.0E-03	0.0E+00	0.0E+00	0.0E+00	7.9E-07	0.0E+00	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Large benthic crustracean (Bq/kg fresh weight)	3.6E+00	6.2E+03	4.1E+01	1.3E-05	1.0E-03	0.0E+00	0.0E+00	0.0E+00	7.9E-07	0.0E+00	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Small benthic crustacean (Bq/kg fresh weight)	3.6E+00	6.2E+03	4.1E+01	1.3E-05	1.0E-03	0.0E+00	0.0E+00	0.0E+00	7.9E-07	0.0E+00	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

[a]Radioactivity in Food and Environment report for 2004 (Environment Agency et al. 2005).
[b]Radioactivity in Food and Environment report for 2005 (Environment Agency et al. 2006).
[c]Radioactivity in Food and Environment report for 2006 (Environment Agency et al. 2007).
[d]Sewage treatment works factor to take account of loss to sludge and radioactive decay factor (see Appendix 4).
[e]Based on water concentrations per unit release (see Appendix 3), coastal water exchange rate of 3200 m^3/s (see Appendix 4) and concentration factors from Table A9.1.
[f]Organically bound tritium.

Table A9.9 Monitored biota concentrations for Severn Estuary SPA (2006) (Bq/kg wet weight)

Sample site / type	Data source	Date	H-3 (not OBT[b])	H-3 (OBT[b])	C-14	P-32	Co-60	Sr-90	Tc-99	Ru-106	I-125	I-129	I-131	Cs-137	Po-210	Th-234	U-238	Pu-239	Am-241
Pelagic fish:																			
East of new pipeline / Cod	RIFE[a]	2006		780	52									0.54					
East of new pipeline / Mullet	RIFE[a]	2006		45	27									0.47					
Off Orchard Ledges / Dogfish	RIFE[a]	2006		3300	93									0.9					
Stolford / Cod	RIFE[a]	2006		120	27									0.72					
Bleachley / Salmon	RIFE[a]	2006												0.14					
River Severn / Bass	RIFE[a]	2006		870										3.6					
River Severn / Cod	RIFE[a]	2006												0.71					
Benthic fish:																			
East of new pipeline / Flounder	RIFE[a]	2006		4400	120									0.47					
East of new pipeline / Sole	RIFE[a]	2006		4600	100									0.31					
Off Orchard Ledges / Skates/Ray	RIFE[a]	2006		1100	71									1.2					
Benthic mollusc:																			
Orchard Ledges / Mussels	RIFE[a]	2006		2500	68									0.39					
Stolford / Whelks	RIFE[a]	2006		2000	60									0.36					
Small benthic crustracean:																			
Stolford / Shrimps	RIFE[a]	2006		200	36									0.36				0.0007	0.00079
Guscar / Shrimps	RIFE[a]	2006		380	38													0.0014	0.0012

[a]Radioactivity in Food and Environment report for 2006 (Environment Agency et al. 2007).
[b]Organically bound tritium.

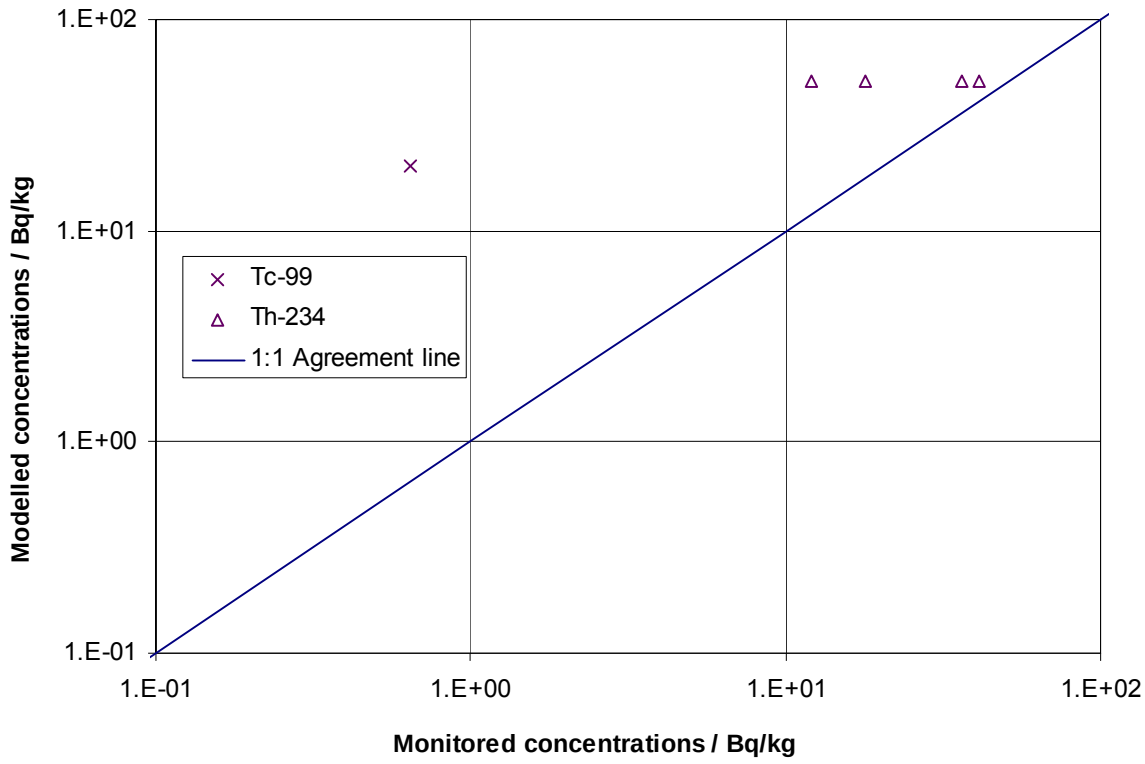


Figure A9.1 Modelled against monitored biota concentrations for Ribble and Alt Estuaries SPA (2006)

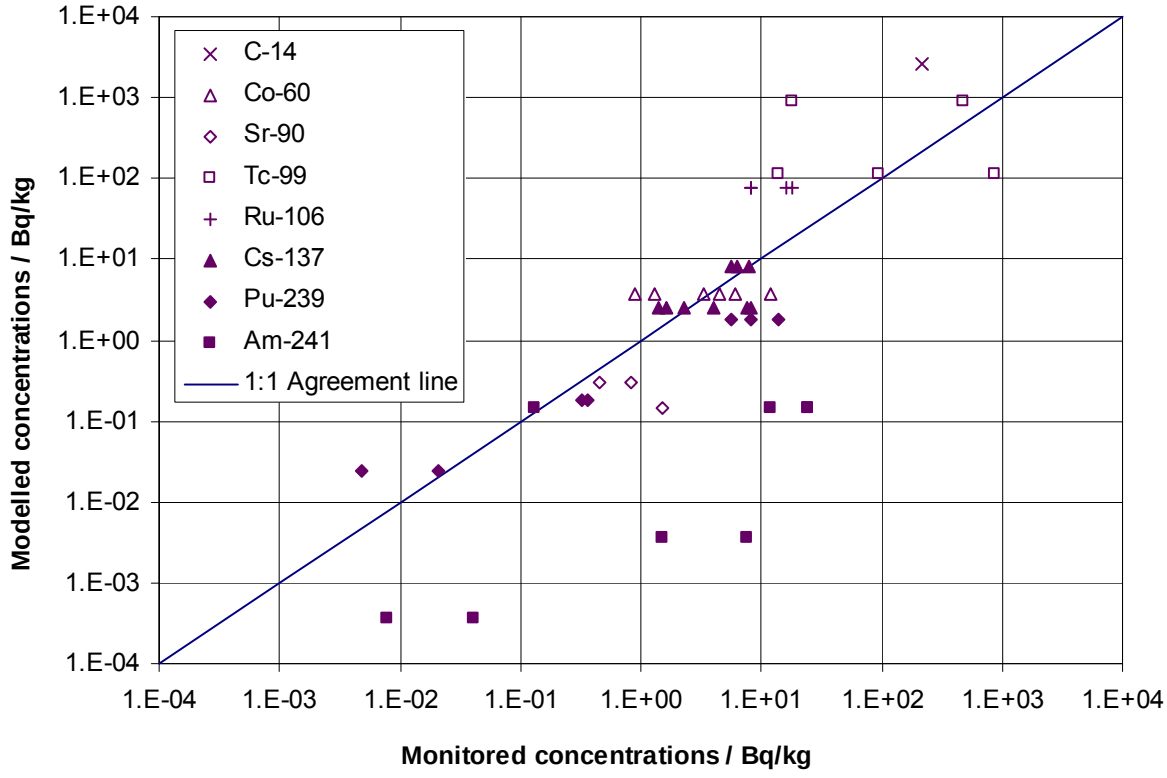


Figure A9.2 Modelled against monitored biota concentrations for Drigg Coast SPA (2006**)**

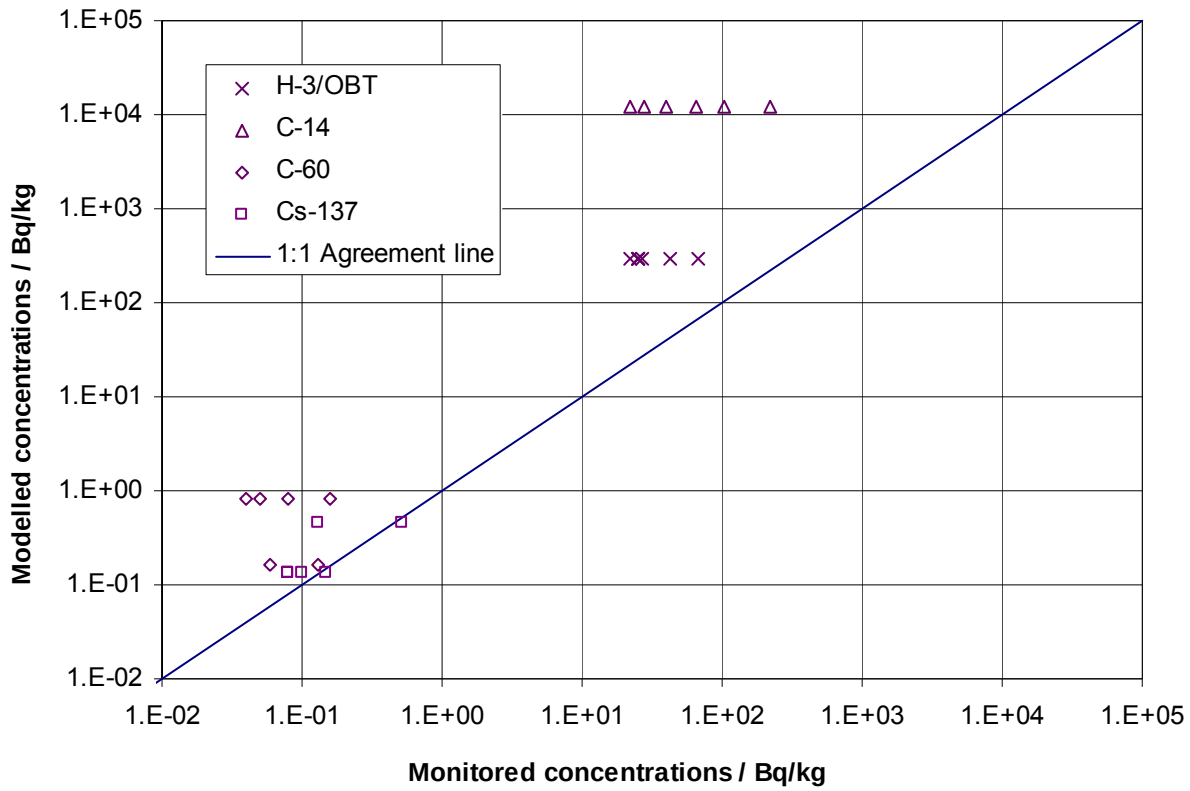


Figure A9.3 Modelled against monitored biota concentrations for Teesmouth and Cleveland Coast SPA (2005)

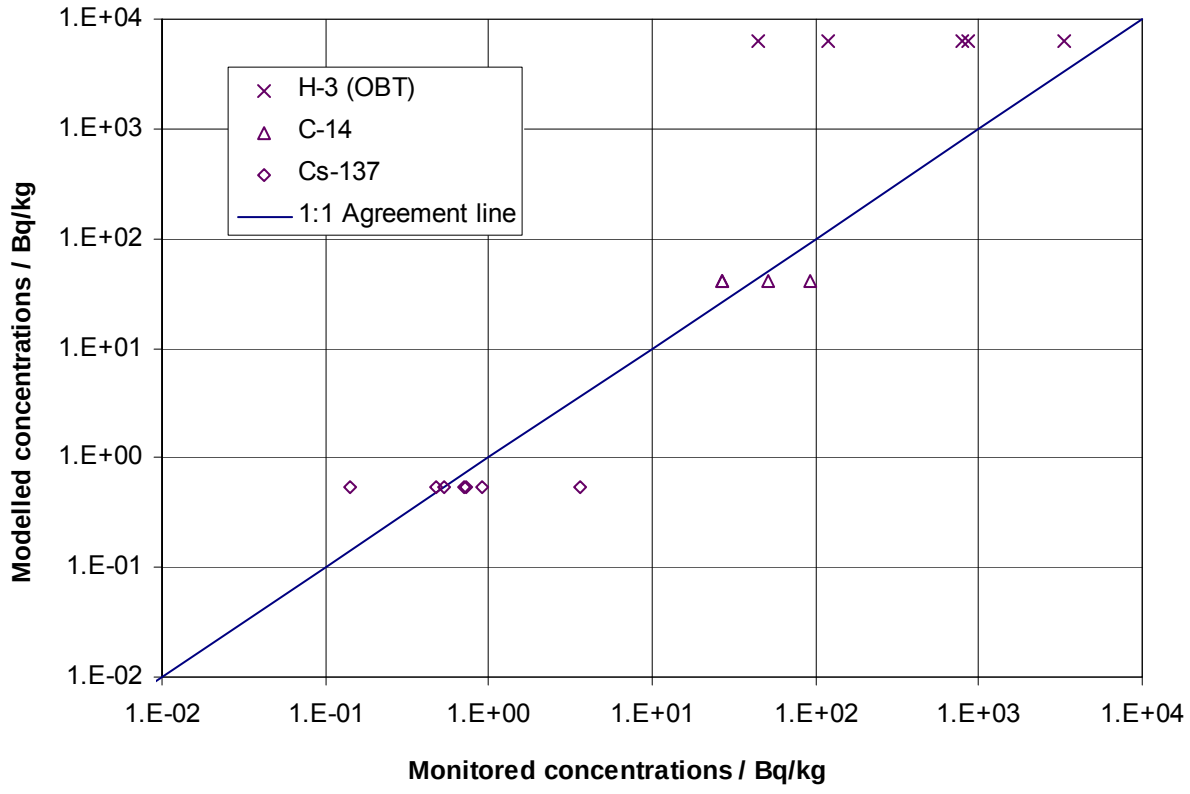


Figure A9.4 Modelled against monitored biota concentrations for Severn Estuary SPA (2006)

Appendix 10 – Historical discharges from Sellafield and natural radioactivity

Introduction

The Stage 3 assessments have been based on modelling of discharges at current authorisation limits, assuming continuous discharge at this rate for 50 years. This is to allow for build-up of radionuclides in the environment. However, the assessment does not take account of concentrations of radionuclides remaining in the environment, if discharges and limits were much higher in the past or if there is significant in-growth of daughter radionuclides.

This is only of concern for radionuclides with long radioactive half-lives and which concentrate in the local environment or for radionuclides which have a daughter with a significantly greater radiological impact (e.g. plutonium-241 which decays to americium-241). The Sellafield site in Cumbria is the main site in England and Wales which had significantly higher historical discharges of longer-lived radionuclides (e.g. plutonium-239) compared to the current authorisation limits. Appendix 9 shows that monitored concentrations of plutonium-239 in biota near Sellafield are higher than concentrations derived from the Stage 3 modelling of current discharges from Sellafield.

The GE Healthcare site in Cardiff also had higher historical discharges of organically bound tritium into the Severn Estuary. These discharges have reduced as a result of changes to operational practices and also the fact that discharges are now via a sewage treatment works. The Stage 3 modelled organically bound tritium concentrations in biota are lower than the monitored concentrations (see Appendix 9); hence in this case the Stage 3 assessment has been sufficiently cautious.

The nearest Natura 2000 site to Sellafield is the Drigg Coast SAC. Dose rates have been calculated for the Drigg Coast SAC for historical discharges from Sellafield and also naturally occurring radionuclides, for comparison purposes.

Calculation of dose rates

The key longer-lived radionuclides for which historical discharges from Sellafield were much higher than the current limits are technetium-99, caesium-137, plutonium isotopes, americium-241 and curium isotopes. Monitoring data in the vicinity of the Drigg Coast SAC for sediment and biota for 2006 are shown in Tables A10.1 and A10.2 respectively.

Naturally occurring radionuclides are also present in sediment and biota in the Drigg Coast SAC and concentrations are shown in Table A10.3 (sediment) and Table A10.4 (biota).

Dose rates to reference organisms for the Drigg Coast SAC due to historical discharges from Sellafield and naturally occurring radionuclides have been calculated using the ERICA tool (available from http://www.project.facilia.se/erica/download.html).

Dose rate results

The dose rates to reference organisms from radionuclides derived from higher historical discharges and naturally occurring radionuclides are shown in Table A10.5. The total doses are shown in Figures A10.1 (full-scale) and A10.2 (limited scale).

It can be seem that for all reference organisms, except phytoplankton, the total dose rates from natural radioactivity and historical discharges were less than 4 microgray/h. These total dose rates are much less than the 60 microgray/h which has been assumed for natural background (see Section 2.1).

In the case of phytoplankton, the total dose rate was 170 microgray/h with contributions of 81 microgray/h from historical discharges and 89 microgray/h from natural radioactivity. In this case the dose rate to phytoplankton from natural radioactivity is higher than the 60 microgray/h assumed for background.

The ERICA assessment tool is probably cautious for phytoplankton (see Appendix 8). Also, the dose rate threshold above which there is likely to be an adverse affect on the integrity of populations of phytoplankton is much higher than the 100 microgray/h threshold discussed in Section 2.1. In the literature, effects that might lead to a reduction in the population have only been observed under laboratory conditions at dose rates in excess of 10000 microgray/h (Woodhead and Zinger 2003).

Conclusions

Dose rates to reference organisms from Sellafield's historical discharges and naturally occurring radionuclides are well within the 60 microgray/h assumed for background, with the exception of phytoplankton. Since Sellafield is the one source of radioactive discharges where discharges were much higher in the past, this indicates that the exclusion of the impact of historical discharges which are higher than current limits is unlikely to affect the overall conclusions of the Stage 3 assessment.

However, some targeted monitoring of phytoplankton would help to reduce the uncertainty in the assessment of dose rates for this reference organism.

Table A10.1 Monitored sediment concentrations (Bq/kg dry weight) for Drigg Coast SAC – Radionuclides with higher historical discharges from Sellafield (2006) (Environment Agency et al. 2007)

Monitoring location	Tc-99	Cs-137	Pu-238	Pu-239	Pu-241	Am-241	Cm-242	Cm-243
Ravenglass – Carleton Marsh		460						
Ravenglass – Carleton Marsh		430						
River Mite Estuary		1300	470	2500	22000	3500		
Ravenglass – Raven Villa		310						
Ravenglass – Raven Villa		320						
Newbiggin (Eskmeals)		940	180	950	7300	1600		
Mean		**627**	**325**	**1725**	**14650**	**2550**		

Table A10.2 Monitored biota concentrations (Bq/kg fresh weight) for Drigg Coast SAC – Radionuclides with higher historical discharges from Sellafield (2006) (Environment Agency et al. 2007**)**

Monitoring location	Tc-99	Cs-137	Pu-238	Pu-239	Pu-241	Am-241	Cm-242	Cm-243
Benthic fish								
Ravenglass – Plaice		5.6	0.004	0.021		0.041	0.000054	0.00004
Mean – 2 sig fig		***5.6***	***0.004***	***0.021***		***0.041***	***5.4E-05***	***0.00004***
Benthic mollusc								
Drigg – Winkles	93	7.5	2.8	14	130	0.13		0.059
Ravenglass – Winkles		8.2				24		
Ravenglass – Cockles	14	4	1.6	8.2	78	24		0.046
Ravenglass – Mussels	860	1.6	1.2	5.7	55	12	0.023	0.024
Mean – 2 sig fig	***320***	***5.3***	***1.9***	***9.3***	***88***	***15***	***0.023***	***0.043***
Crustacean								
Ravenglass – Crabs	18	1.4	0.071	0.36	3.1	1.5		0.003
Ravenglass – Lobsters	480	2.3	0.064	0.32	3.3	7.6		0.013
Mean – 2 sig fig	***250***	***1.9***	***0.068***	***0.34***	***3.2***	***4.6***		***0.008***
Macroalgae								
Ravenglass – Seaweed	2900	12				44		
Mean – 2 sig fig	***2900***	***12***				***44***		
Pelagic fish								
Ravenglass – Cod		8	0.0013	0.0048		0.0079		
Ravenglass – Grey mullet		6.4				<0.12		
Mean – 2 sig fig		***7.2***	***0.0013***	***0.0048***		***0.0079***		
Vascular plant								
Ravenglass – Samphire	1.5	1.5				2.9		
Mean – 2 sig fig	***1.5***	***1.5***				***2.9***		

Table A10.3 Natural background concentration in Irish Sea sediment

Parameter	Po-210	Pb-210	Ra-226	Ra-228	Th-228	Th-230	Th-232	Th-234	U-234	U-235	U-238
Mean concentration	19	**19**	**19**	**20**	**20**	**35**	**20**	**18**	**18**	**0.79**	**19**
Source of data	Same as U-238	Same as U-238	Same as U-238	Same as Th-232	Same as Th-232	DOE (1993)	DOE (1993)	Same as U-234	DOE (1993)	Background calculated from ratio uranium-234 to uranium-235 in natural uranium	DOE (1993)

Table A10.4 Monitored biota concentrations (Bq/kg fresh weight) for Drigg Coast SAC – Naturally occurring radionuclides (2006) (Environment Agency et al. 2007)

Monitoring location	Po-210	Pb-210	Ra-226	Ra-228	Th-228	Th-230	Th-232	Th-234	U-234	U-235	U-238
Benthic fish											
Whitehaven – Plaice	2.6										
Mean – 2 sig fig	***2.6***										
Benthic mollusc											
Saltom Bay – Winkles	19	1.4									
Parton – Winkles	18	2			0.72	0.92	0.42		1.5	0.077	1.3
North Harrington – Winkles	14										
Nethertown – Winkles	17										
Drigg – Winkles					0.76	0.86	0.46				
Tarn Bay – Winkles	15										
Parton – Mussels	42	2									
Nethertown – Mussels	50	2									
St Bees – Limpets	18										
Ravenglass – Cockles	26										
Mean – 2 sig fig	***24***	***1.9***			***0.74***	***0.89***	***0.44***		***1.5***	***0.077***	***1.3***
Crustacean (Bq/kg fresh)											
Parton – Crabs	13	0.063			0.081	0.012	0.005		0.037	0.00081	0.037
Sellafield – Crabs	13	0.0026									
Parton – Lobster	11	0.088			0.034	0.022	0.011				
Sellafield – Lobster	12	0.0026									
Mean – 2 sig fig	***12***	***0.039***			***0.058***	***0.017***	***0.008***		***0.037***	***0.00081***	***0.037***
Pelagic fish (Bq/kg fresh)											
Parton – Cod	0.4	0.022			0.026	0.0087	0.0034		0.009	0.0002	0.0095
Mean – 2 sig fig	***0.4***	***0.022***			***0.026***	***0.0087***	***0.0034***		***0.009***	***0.0002***	***0.0095***

Table A10.5 Dose rates to reference organisms at Drigg Coast SAC for natural radionuclides and Sellafield's historical discharges (microgray/h)

Radionuclide	Benthic fish	Benthic mollusc	Crusta-cean	Macro-algae	Mammal	Pelagic fish	Phytoplankton	Polychaete worm	Reptile	Sea anemones or true corals – colony	Sea anemones or true corals – polyp	Vascular plant	(Wading) bird	Zooplank-ton
Sellafield's historical discharges														
Tc-99	6.5E-05	1.9E-02	1.5E-02	1.7E-01	5.0E-05	6.5E-05	8.1E-06	4.6E-02	6.5E-05	4.5E-02	4.5E-02	8.8E-05	6.5E-05	2.0E-04
Cs-137	9.5E-02	1.0E-01	9.1E-02	1.1E-01	5.1E-03	1.3E-03	6.8E-04	2.1E-01	1.1E-02	9.3E-02	1.1E-01	1.0E-01	6.5E-03	1.0E-03
Pu-238	1.6E-04	6.1E-02	2.2E-03	7.1E-02	4.8E-03	4.2E-05	2.1E+00	2.6E-02	2.6E-03	4.7E-02	4.7E-02	7.1E-02	2.6E-03	1.3E-01
Pu-239	7.2E-04	2.8E-01	1.0E-02	3.3E-01	2.2E-02	1.4E-04	9.5E+00	1.2E-01	1.2E-02	2.1E-01	2.1E-01	3.3E-01	1.2E-02	6.2E-01
Pu-241	1.4E-03	7.2E-04	3.2E-05	1.7E-03	1.1E-04	1.4E-03	4.8E-02	6.2E-04	6.0E-05	1.1E-03	1.1E-03	1.7E-03	6.0E-05	3.1E-03
Am-241	1.7E-02	4.9E-01	1.6E-01	1.4E+00	9.3E-02	2.5E-04	7.0E+01	2.7E+00	5.0E-02	3.9E-02	4.9E-02	1.1E-01	5.0E-02	1.3E+00
Cm-242	2.0E-06	8.1E-04	2.9E-05	2.6E-04	6.2E-06	2.2E-06	5.9E-03	3.4E-05	3.3E-06	6.0E-05	6.0E-05	2.6E-04	3.3E-06	1.7E-04
Cm-243	1.8E-04	1.6E-03	4.3E-04	1.3E-03	2.5E-05	8.7E-06	2.4E-02	5.2E-04	1.3E-05	3.8E-04	4.3E-04	1.2E-03	1.3E-05	6.9E-04
Total	**1.1E-01**	**9.6E-01**	**2.8E-01**	**2.1E+00**	**1.3E-01**	**3.2E-03**	**8.1E+01**	**3.1E+00**	**7.5E-02**	**4.4E-01**	**4.6E-01**	**6.1E-01**	**7.1E-02**	**2.1E+00**
Natural radionuclides														
Pb-210	7.8E-05	6.0E-04	5.2E-05	5.3E-04	2.0E-03	5.5E-06	1.9E-02	1.4E-03	2.0E-03	1.1E-03	1.2E-03	2.2E-04	2.0E-03	2.0E-03
Po-210	8.1E-02	7.4E-01	3.7E-01	8.2E-03	8.2E-02	1.2E-02	2.1E-01	1.6E-01	8.2E-02	4.9E-01	4.9E-01	8.2E-03	8.2E-02	6.3E-01
Ra-226	3.7E-01	9.3E-02	2.1E-01	1.3E-01	8.0E-02	3.6E-01	1.3E+00	2.1E-01	3.7E-01	1.3E+00	1.3E+00	1.2E-01	3.8E-01	1.0E-01
Ra-228	6.2E-03	5.8E-03	5.6E-03	6.2E-03	3.6E-04	1.0E-03	1.3E-03	1.2E-02	1.7E-03	8.6E-03	8.6E-03	5.8E-03	1.1E-03	1.8E-04
Th-228	6.6E-02	1.5E-01	1.9E-02	2.0E-01	1.8E-02	4.8E-03	7.1E+01	6.8E-02	3.2E-03	2.6E-01	2.7E-01	2.0E-01	3.1E-03	7.2E-01
Th-230	9.6E-03	2.4E-02	4.6E-04	3.2E-02	2.9E-03	2.3E-04	1.2E+01	8.2E-03	5.3E-04	4.3E-02	4.3E-02	3.2E-02	5.3E-04	1.2E-01
Th-232	4.0E-03	1.0E-02	1.9E-04	1.3E-02	1.2E-03	7.8E-05	4.9E+00	3.4E-03	2.2E-04	1.8E-02	1.8E-02	1.3E-02	2.2E-04	5.0E-02
Th-234	4.6E-04	6.6E-04	2.8E-04	1.5E-03	5.6E-07	1.8E-06	4.0E-04	1.8E-03	1.0E-07	5.8E-04	1.2E-03	6.1E-04	9.9E-08	1.1E-05
U-234	6.7E-03	4.2E-02	1.0E-03	5.7E-02	1.9E-04	2.5E-04	6.7E-02	1.5E-02	1.9E-03	4.8E-01	4.8E-01	1.1E-01	1.9E-03	1.4E-02
U-235	3.4E-04	2.0E-03	5.4E-05	2.6E-03	8.5E-06	5.2E-06	3.0E-03	7.6E-04	8.4E-05	2.1E-02	2.2E-02	5.0E-03	8.6E-05	6.4E-04
U-238	5.0E-03	3.1E-02	8.9E-04	4.3E-02	1.4E-04	2.3E-04	5.0E-02	1.2E-02	1.4E-03	3.6E-01	3.6E-01	8.3E-02	1.4E-03	1.1E-02
Total	**5.5E-01**	**1.1E+00**	**6.1E-01**	**4.9E-01**	**1.9E-01**	**3.7E-01**	**8.9E+01**	**5.0E-01**	**4.7E-01**	**3.0E+00**	**3.0E+00**	**5.8E-01**	**4.7E-01**	**1.7E+00**
Summary														
Sellafield historical	1.1E-01	9.6E-01	2.8E-01	2.1E+00	1.3E-01	3.2E-03	**8.1E+01**	3.1E+00	7.5E-02	4.4E-01	4.6E-01	6.1E-01	7.1E-02	2.1E+00
Natural	5.5E-01	1.1E+00	6.1E-01	4.9E-01	1.9E-01	3.7E-01	**8.9E+01**	5.0E-01	4.7E-01	3.0E+00	3.0E+00	5.8E-01	4.7E-01	1.7E+00
Grand total	**6.6E-01**	**2.1E+00**	**8.9E-01**	**2.6E+00**	**3.1E-01**	**3.8E-01**	**1.7E+02**	**3.6E+00**	**5.4E-01**	**3.4E+00**	**3.5E+00**	**1.2E+00**	**5.4E-01**	**3.7E+00**

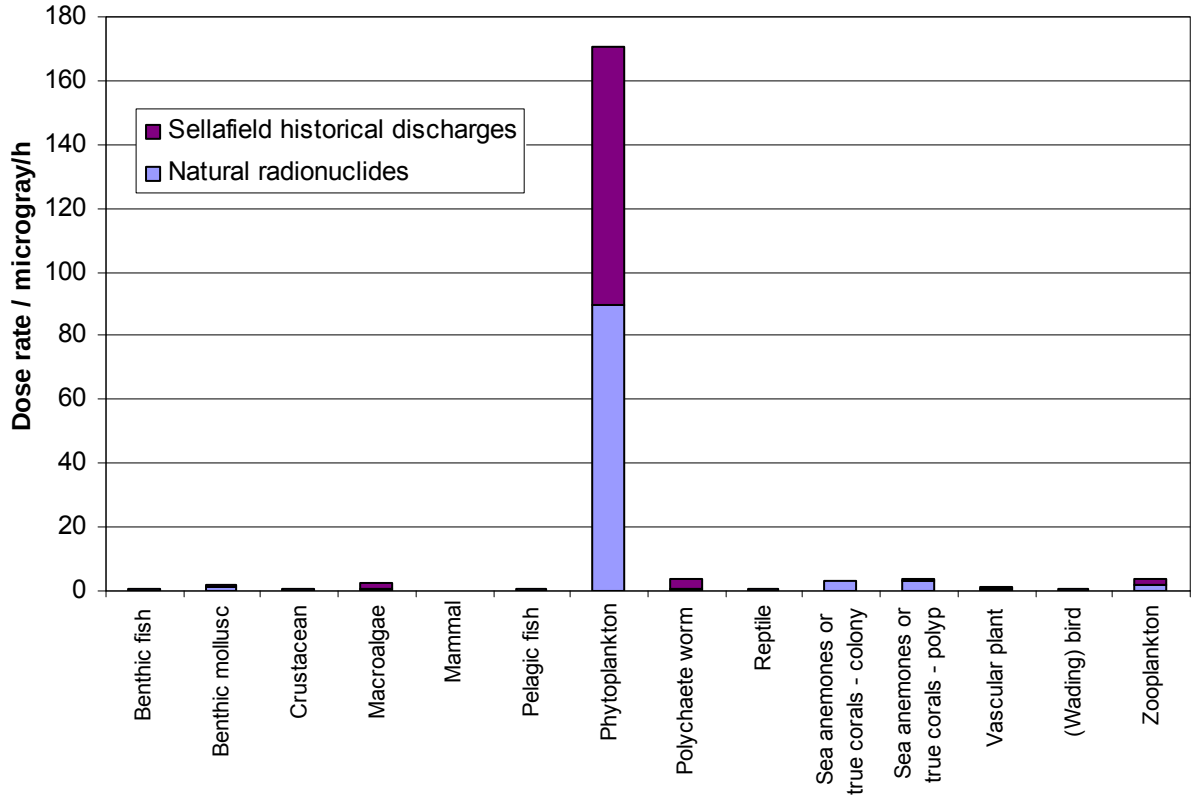


Figure A10.1 Dose rates to marine reference organisms at the Drigg Coastal SAC from Sellafield's historical discharges and natural radioactivity (full scale)

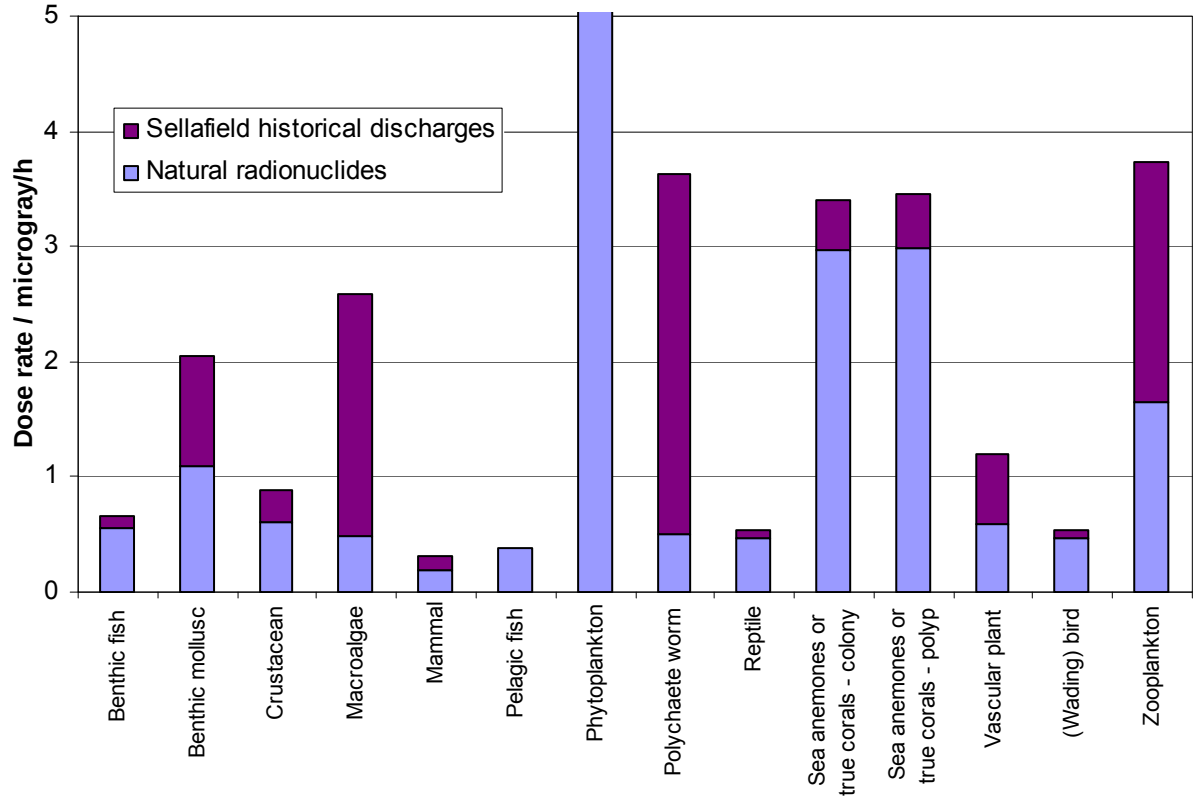


Figure A10.2 Dose rates to marine reference organisms at the Drigg Coast SAC from Sellafield's historical discharges and natural radioactivity (scale to 5 microgray/h**)**

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