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# Radiological Habits Survey: Sellafield, 2013

2014

Environment Report RL 02/14

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# Radiological Habits Survey: Sellafield, 2013

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| **Submitted to:** | Food Standards Agency, Environment Agency and Office for Nuclear Regulation. |
| **Date submitted:** | 27th June 2014 |
| **Project Manager:** | Fiona Clyne |
| **Report compiled by:** | Fiona Clyne |
| **Quality control by:** | John Hunt |
| **Approved by & date:** | Bill Camplin, 26th June 2014 |
| **Version:** | Final |

| **Version Control History** | | | |
|---|---|---|---|
| **Author** | **Date** | **Comment** | **Version** |
| Fiona Clyne | 28th February 2014 | Sent to FSA, EA and ONR for comments. | Draft 1 |
| Fiona Clyne | 12th May 2014 | Revised and sent to FSA, EA and ONR for comments. | Draft 2 |
| Fiona Clyne | 27th June 2014 | All amendments completed. | Final |

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Environment Report RL 02/14

# Radiological Habits Survey: Sellafield, 2013

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2014

The work described in this report was carried out under contract to the Environment Agency, the Food Standards Agency and the Health and Safety Executive.
Cefas contract C6028
FSA Project FS131008

This report should be cited as: Clyne, F.J., Garrod, C.J. and Papworth, G.P., 2014. Radiological Habits Survey: Sellafield, 2013. RL 02/14. Cefas, Lowestoft

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## SUMMARY

This report presents the results of a survey conducted in 2013 to determine the habits and consumption patterns of people living, working and pursuing recreational activities in the vicinity of the Sellafield nuclear site in Cumbria. The site discharges gaseous radioactive wastes via stacks to the atmosphere, liquid radioactive wastes via outfalls into the Irish Sea and contains sources of direct radiation. Areas likely to be most affected by the discharges and sources of radiation were defined as the aquatic survey area for liquid discharges, the terrestrial survey area for the deposition from gaseous discharges, and the direct radiation survey area for ionising radiation emanating directly from the site. The occupancy data collected from the direct radiation survey area is also applicable to the direct exposure arising from gaseous releases from the site. The Low Level Waste Repository site is located south-east of the Sellafield site (approximately 5 km between the centre of both sites). Due to the proximity, the aquatic survey area is the same for both sites and the terrestrial survey areas of both sites overlap. A habits survey was conducted in 2012 around the Low Level Waste Repository site and some interview data collected during that survey has been used in the data analysis for this 2013 Sellafield survey.

The following potential exposure pathways related to the Sellafield site were investigated:

- The consumption of food from the aquatic survey area
- Activities and occupancy over intertidal substrates
- The handling of fishing gear and sediment
- Activities and occupancy in and on water
- The use of seaweed as a fertiliser or animal feed
- The consumption of food from the terrestrial survey area
- The use and destination of produce originating from the survey areas
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The transfer of contamination off-site by wildlife
- Activities and occupancy within the direct radiation survey area
- Any new or unusual exposure pathways

Interviews were conducted with members of the public and data collected for 386 individuals are presented and discussed. High rates of consumption, intertidal occupancy and handling are identified using established methods comprising (a) a ‘cut off’ to define the high-rate group and (b) 97.5$^{th}$ percentiles. The rates so identified can be used in dose assessments. Additionally, profiles of integrated habits data are presented specifically for use in total dose assessments.

***The aquatic survey area***

The aquatic survey area (see Figure 1) was defined as the waters and intertidal areas between Parton and Tarn Bay near Bootle, and extended 11 km offshore. The lower reaches of the rivers Ehen, Calder, Irt, Mite and Esk were also included.

Foods from the aquatic survey area were consumed from the following food groups: fish; crustaceans; molluscs; wildfowl; marine plants/algae; salt marsh grazed sheep meat. The mean consumption rate for the adult high-rate group for the separate aquatic consumption pathways for foods potentially affected by liquid discharges were:

- 56 kg $y^{-1}$ for fish
- 25 kg $y^{-1}$ for crustaceans
- 15 kg $y^{-1}$ for molluscs
- 10 kg $y^{-1}$ for wildfowl
- 0.1 kg $y^{-1}$ for marine plants/algae
- 1.9 kg $y^{-1}$ for salt marsh grazed sheep meat

The predominant foods consumed by the high-rate groups were:

- For fish: cod, thornback ray, bass, haddock, plaice
- For crustaceans: *Nephrops,* brown crab and brown shrimp
- For molluscs: winkles and limpets
- For wildfowl: greylag goose, Canada goose and duck (unspecified species)
- For marine plants/algae: samphire
- For salt marsh grazed sheep meat: salt marsh grazed lamb

The activities undertaken by adults in the high-rate groups for intertidal occupancy included wildfowling, angling, bait digging, dog walking, boat maintenance, hooking for crab and lobster, tending livestock, walking, setting nets, collecting winkles, laying pots on the shore and beachcombing. Gamma dose rate measurements were taken at most intertidal locations in the aquatic survey area where activities were occurring. The activities undertaken by adults in the high-rate group for handling fishing gear were handling pots and nets. The activities undertaken by adults in the high-rate group for handling sediment were collecting winkles, bait digging and collecting limpets. The activities undertaken by people in and on the water included windsurfing, surfing, swimming, kayaking, trawling, potting, gill netting, boat maintenance, angling (from a boat and wading in a river), push netting, drift netting, boating and canoeing.

Seaweed was used as a fertiliser on an allotment plot where fruit and vegetables were grown. The use of seaweed as an animal feed was not identified.

***The terrestrial survey area***

The terrestrial survey area (see Figure 2) was defined as the land and freshwater watercourses within 5 km of the centre of the Sellafield site. Interviews were conducted at 25 farms in the terrestrial survey area. Milk (from dairy cattle), beef cattle, lambs, pigs, chickens (sold for egg production), chicken eggs, vegetables and potatoes were produced on the farms. The farmers and their families consumed foods that were produced commercially on their land and also other foods that they produced solely for their own consumption. A variety of fruit and vegetables were grown at one allotment site (with 20 plots) and at several private gardens in the survey area. One beekeeper was identified who kept hives within the survey area but they could not be contacted. Two organised game shoots were taking place on farmland and a small number of farmers were shooting game on their land. A variety of wild foods including mushrooms were collected and consumed. Rainbow trout from a stocked pond were being consumed.

Foods from the terrestrial survey area were consumed from the following food groups: green vegetables; other vegetables; root vegetables; potato; domestic fruit; milk; cattle meat; pig meat; sheep meat; poultry; eggs; wild/free foods; rabbits/hares; honey; wild fungi; venison; freshwater fish. Two mean consumption rates for the adult high-rate groups were found to be greater than the generic 97.5$^{th}$ percentile consumption rates. These were for other vegetables and potato.

The consumption of spring water and well water by humans was identified. Livestock were consuming spring water and well water and also had access to ditches and streams for drinking water.

Control measures taken by the site operator in order to limit the possibility that contamination is transferred off-site by wildlife included actively managing the seagull and pigeon populations on site by culling and removing nests and nesting material.

***The direct radiation survey area***

The direct radiation survey area (see Figure 2) was defined as the land and sea within 1 km of the Sellafield nuclear licensed site boundary. Occupancy rates were obtained for residents, employees, farmers, visitors, and people who were angling, hobby fishing, attending an allotment site, attending a livery and attending a game shoot.

The occupancy rates were analysed in zones according to the distance from the Sellafield nuclear licensed site boundary. With the exception of the outdoor occupancy rate for the >0.5 – 1.0 km zone, which was for a farmer who did not live in the area, the highest indoor, outdoor and total occupancy rates in the 0 – 0.25 km, >0.25 – 0.5 km and >0.5 – 1.0 km zones were for residents.

Gamma dose rate measurements were taken indoors and outdoors at most properties where interviews were conducted in the direct radiation survey area. Background readings were taken at distances beyond 5 km of the Sellafield site centre.

***Comparisons with the previous survey***

Comparisons were made with the results of the last habits survey undertaken in the Sellafield area in 2008. Reasons for significant changes in the consumption rates were identified for certain pathways and these are provided in Section 8.

In the aquatic survey area in 2013, compared with 2008, the mean consumption rates for the adult high-rate groups for fish increased, from 40 kg $y^{-1}$ to 56 kg $y^{-1}$, for crustaceans increased, from 17 kg $y^{-1}$ to 25 kg $y^{-1}$, for molluscs decreased, from 31 kg $y^{-1}$ to 15 kg $y^{-1}$, for wildfowl increased, from 5.0 kg $y^{-1}$ to 10 kg $y^{-1}$, and for marine plants/algae decreased from 0.2 kg $y^{-1}$ to 0.1 kg $y^{-1}$. The consumption of salt marsh grazed lamb was identified in 2012 during the habits survey around the Low Level Waste Repository site and the consumption data for this pathway has been included in this 2013 survey. The pathway was not identified during the 2008 Sellafield survey.

The mean intertidal occupancy rate for the adult high-rate group increased in 2013 compared to 2008 over rock, from 30 h $y^{-1}$ to 74 h $y^{-1}$ and over salt marsh, from 110 h $y^{-1}$ to 210 h $y^{-1}$. The mean intertidal occupancy rate for the adult high-rate group decreased in 2013 compared to 2008 over the following substrates: mud, from 120 h $y^{-1}$ to 81 h $y^{-1}$; mud and sand, from 580 h $y^{-1}$ to 160 h $y^{-1}$; mud, sand and stones, from 510 h $y^{-1}$ to 320 h $y^{-1}$; sand, from 610 h $y^{-1}$ to 550 h $y^{-1}$; sand and stones, from 570 h $y^{-1}$ to 490 h $y^{-1}$. The mean rate for the adult high-rate group for handling fishing gear increased from 980 h $y^{-1}$ in 2008 to 1100 h $y^{-1}$ in 2013 and the mean rate for the adult high-rate group for handling sediment decreased from 960 h $y^{-1}$ in 2008 to 460 h $y^{-1}$ in 2013.

In the terrestrial survey area in 2013, compared with 2008, there were relatively large increases in the mean consumption rates for the adult high-rate groups for poultry, from 9.0 kg $y^{-1}$ to 21 kg $y^{-1}$ and for venison, from 14 kg $y^{-1}$ to 27 kg $y^{-1}$. In 2013, compared with 2008, there were relatively large decreases in the mean consumption rates for the adult high-rate groups for green vegetables, from 41 kg $y^{-1}$ to 22 kg $y^{-1}$ and for honey, from 8.7 kg $y^{-1}$ to 0.2 kg $y^{-1}$. In 2013, compared with 2008, there were relatively smaller increases in the mean consumption rates for the adult high-rate groups for the following food groups: other vegetables, potato, cattle meat, rabbits/hares. In 2013, compared with 2008, there were relatively smaller decreases in the mean consumption rates for the adult high-rate groups for the following food groups: root vegetables, domestic fruit, milk, sheep meat, eggs, wild/free foods, wild fungi and freshwater fish. The consumption of pig meat was identified in 2013 but was not identified in 2008.

In the direct radiation survey area in 2013 compared with 2008, the most significant change was an increase in the highest outdoor occupancy rate in the >0.5 - 1 km zone from 1900 h $y^{-1}$ in 2008 to 3000 h $y^{-1}$ in 2013. Other changes in occupancy were slight.

***Recommendations***

Recommendations for changes to the current environmental monitoring programmes are provided. These are based on the information collected during the survey and also take into account the potential radiological significance of the various pathways that were identified. Recommendations include changing the substrates over which gamma dose rate measurements are taken, from sand and stones at Whitehaven outer harbour to mud and sand, and from pebbles and stones at Braystones to sand.

# 1 INTRODUCTION

The public may be exposed to radiation as a result of the operations of the Sellafield nuclear licensed site either through the permitted discharges of aquatic or gaseous radioactive wastes into the local environment, or from radiation emanating directly from the site. This report provides information on activities carried out by members of the public in the vicinity of the Sellafield site, which may influence their radiation exposure. The study has been funded by the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation in order to support their respective roles in protecting the public from exposure to radiation.

The Low Level Waste Repository site (LLWR) is located close to the Sellafield site (approximately 5 km between the centre of both sites). Due to the proximity, the aquatic survey area is the same for both sites and the terrestrial survey areas of both sites overlap. A habits survey was conducted in 2012 around the LLWR site and some interview data collected during that survey has been used in the data analysis for this 2013 Sellafield survey.

UK policy on the control of radiation exposure has long been based on the recommendations of the International Commission on Radiological Protection (ICRP), which embody the principles of justification of practices, optimisation of protection and dose limitation. Radiological protection of the public is based on the concept of a 'representative person'. This notional individual is defined as being representative of the more highly exposed members of the population. It follows that, if the dose to the representative person is acceptable when compared to dose limits and optimisation, other members of the public will receive acceptable doses, and overall protection to the public is provided from the effects of radiation. The term 'representative person' is equivalent to, and replaces, the term 'average member of the critical group' as recommended by ICRP (ICRP, 2006). The recommendations of the ICRP were updated in 2007 (ICRP, 2007) and, for the public, still include the principle of protecting the individuals most highly exposed to radiation, characterised by the representative person.

## 1.1 Regulatory framework

The Environment Agency regulates the discharges of radioactive waste under the Environmental Permitting Regulations (UK Parliament, 2010). The regulations take account of the European Union (EU) Basic Safety Standards (BSS) Directive 96/29/Euratom (Commission of the European Communities, 1996) which embody the recommendations of the ICRP, particularly ICRP 60 (ICRP, 1991). A new Basic Safety Standards (BSS) Directive (2013/59/Euratom) was adopted by the EU on 5th December 2013 and the UK Government is required to implement the Directive into UK law by 6th February 2018. Installation and operation of certain prescribed activities can only occur on sites if they are licensed under the Nuclear Installations Act 1965 (as amended) (NIA 65) (UK Parliament,

1965). Since 1st April 2011, the Office for Nuclear Regulation (ONR), has implemented this legislation and is also responsible for regulating, under the Ionising Radiations Regulations 1999 (IRR 99) (UK Parliament, 1999), the exposure of the public to direct radiation from the operations occurring on these sites. Prior to 1st April 2011 these functions were carried out by the Nuclear Installations Inspectorate of the Health and Safety Executive.

Appropriate discharge limits are set by the Environment Agency after wide-ranging consultations that include the Food Standards Agency. The Food Standards Agency has responsibilities for ensuring that any radioactivity present in food does not compromise food safety and that permitted discharges of radioactivity do not result in unacceptable doses to consumers via the food chain. The Food Standards Agency also ensures that public radiation exposure via the food chain is within EU acceptable limits.

## 1.2 Radiological protection framework

Dose standards for the public are embodied in the national policy (UK Parliament, 2009a), in guidance from the International Atomic Energy Agency (IAEA), in the Basic Safety Standards for Radiation Protection (IAEA, 1996) and in European Community legislation in the EU BSS Directive 96/29/Euratom (Commission of the European Communities, 1996). The public dose standards were incorporated into UK law in IRR 99. The requirement to observe the conditions laid down in the Basic Safety Standards (BSS) in England and Wales is incorporated in the Environmental Permitting Regulations 2010 (UK Parliament, 2010). These require that the environment agencies ensure, wherever applicable, that:

- All public radiation exposures from radioactive waste disposals are kept As Low As Reasonably Achievable (ALARA), with social and economic factors being taken into account
- The sum of all exposures does not exceed the dose limit of 1 mSv a year
- The dose received from any new source does not exceed 0.3 mSv a year
- The dose received from any single site does not exceed 0.5 mSv a year

The dose limit of 1 mSv per year to the public from all anthropogenic sources other than medical applications is also the recommendation made by the ICRP (ICRP, 2007).

The environment agencies are also required to ensure that the dose estimates are as realistic as possible for the population as a whole and for reference groups of the population. They are required to take all necessary steps to identify the reference groups of the population taking into account the effective pathways of transmission of radioactive substances. Guidance on the principles underlying prospective radiological assessment (i.e. assessments of potential future doses) has been provided by the National Dose Assessment Working Group (NDAWG), which consists of representatives of UK Government Bodies and other organisations with responsibilities for dose assessments (EA, SEPA, DoENI, NRPB and FSA, 2002). NDAWG has also published principles underlying retrospective

radiological assessment (i.e. assessment of doses already received from past discharges) (Allott, 2005) and possible methods of carrying out these assessments using the data from combined habits surveys (Camplin *et al.*, 2005). NDAWG agreed that the optimal method for performing retrospective dose assessments would be to use habits profiles (profiling method). This approach is being adopted in Radioactivity in Food and the Environment (RIFE) publications, (e.g. EA, NIEA, FSA and SEPA, 2011), as combined habits surveys are completed. NDAWG has also published reports on the collection and use of habits survey data in retrospective and prospective dose assessments (NDAWG, 2005; NDAWG 2009); the principles described in these reports are consistent with those used here. More recently, the environment agencies, the Health Protection Agency (now part of Public Health England) and the Food Standards Agency have jointly produced an update of the 2002 interim guidance and principles for assessing doses (EA, SEPA, NIEA, HPA and FSA, 2012).

# 2 THE SURVEY

## 2.1 Site activity

The Sellafield site is located on the Cumbria coast, approximately 12 km south-east of the town of Whitehaven (Figure 1). The main activities on the Sellafield site are: fuel reprocessing at the Magnox Reprocessing Plant and the Thermal Oxide Reprocessing Plant; decommissioning and clean up of redundant nuclear facilities; and waste treatment and storage. The site contains the Calder Hall Magnox nuclear power station, which ceased generating in March 2003 and is undergoing decommissioning.

The Sellafield nuclear site is operated by Sellafield Ltd and is owned by the Nuclear Decommissioning Authority (NDA). Sellafield Limited is permitted to undertake radioactive substances activities at the Sellafield site under the Environmental Permitting Regulations 2010. This includes permission to discharge liquid wastes into the Irish Sea and gaseous wastes via stacks to the local environment. The site is licensed for the purposes of operating certain activities prescribed under the Nuclear Installations Act, 1965. The site contains sources of direct radiation. Details of the amounts of gaseous and liquid radioactive waste discharged are published in the RIFE reports, for example, EA, FSA, NIEA and SEPA, 2013.

Windscale, which includes three reactors being decommissioned, is also located within the Sellafield site. Decommissioning activities at Windscale began in the mid 1980s. In 2008, the Windscale permit and licence was transferred to Sellafield Ltd. Discharges of gaseous and liquid radioactive wastes from Windscale are minor compared to those from the Sellafield site and are included as part of the permitted Sellafield discharges.

Routine activities were being undertaken at the Sellafield site whilst the habits survey fieldwork was being carried out.

Since the habits survey undertaken at Sellafield in 2008, a large area of land to the north and west of the Sellafield site has been bought up by NuGen for the development of a new generation nuclear power station. The area of land is approximately 200 hectares (www.nugeneration.com).

## 2.2 Survey objectives

The Centre for Environment, Fisheries & Aquaculture Science (Cefas) undertook the Sellafield habits survey in 2013 on behalf of the Environment Agency, the Food Standards Agency, and the Office for Nuclear Regulation. The aim of the survey was to obtain comprehensive information on the habits of the public that might lead to their exposure to radiation via liquid discharges, gaseous discharges and direct radiation from the Sellafield nuclear site.

Specifically, investigations were conducted into the following:

- The consumption of food from the aquatic survey area
- Activities and occupancy over intertidal substrates
- The handling of fishing gear and sediment
- Activities and occupancy in and on water
- The use of seaweed as a fertiliser or animal feed
- The consumption of food from the terrestrial survey area
- The use and destination of produce originating from the survey areas
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The transfer of contamination off-site by wildlife
- Activities and occupancy within the direct radiation survey area
- New or unusual exposure pathways

No additional site-specific investigations were requested by the Environment Agency, the Food Standards Agency or the Office for Nuclear Regulation.

## 2.3 Survey areas

The geographic extents of potential effects from liquid discharges, from deposition from gaseous releases, and from direct radiation are different. Therefore, different survey areas were defined to cover each of these three main possible sources of exposure. These were an aquatic survey area relating to liquid discharges, a terrestrial survey area relating to deposition from gaseous discharges, and a direct radiation survey area relating to ionising radiation emanating directly from the site.

The aquatic survey area, shown in Figure 1, covered the waters and intertidal areas between Parton and Tarn Bay near Bootle, and extended 11 km offshore. The lower reaches of the rivers Ehen, Calder, Irt, Mite and Esk were also included. This area was taken to represent the predominant area of mixing of discharged radionuclides in seawater. This aquatic survey area is also used for the LLWR site due to the proximity of the Sellafield and the LLWR sites.

The terrestrial survey area, shown in Figure 2, covered all land within 5 km of the site centre (National Grid Reference: NY 028 038), to encompass the main areas of potential deposition from gaseous discharges. The centre of the Sellafield site is approximately 5 km from the centre of the LLWR site therefore the terrestrial survey areas for both sites overlap.

The direct radiation survey area, which is also shown in Figure 2, was defined as all land and sea within 1 km of the nuclear licensed site boundary. The occupancy data collected from the direct radiation survey area is also applicable to inhalation and external exposure pathways arising from gaseous releases from the site.

The same aquatic, terrestrial and direct radiation survey areas were used in the previous habits survey conducted by Cefas around the Sellafield site, which was in 2008 (Clyne *et al*., 2009).


***Figure 1. The Sellafield aquatic survey area***

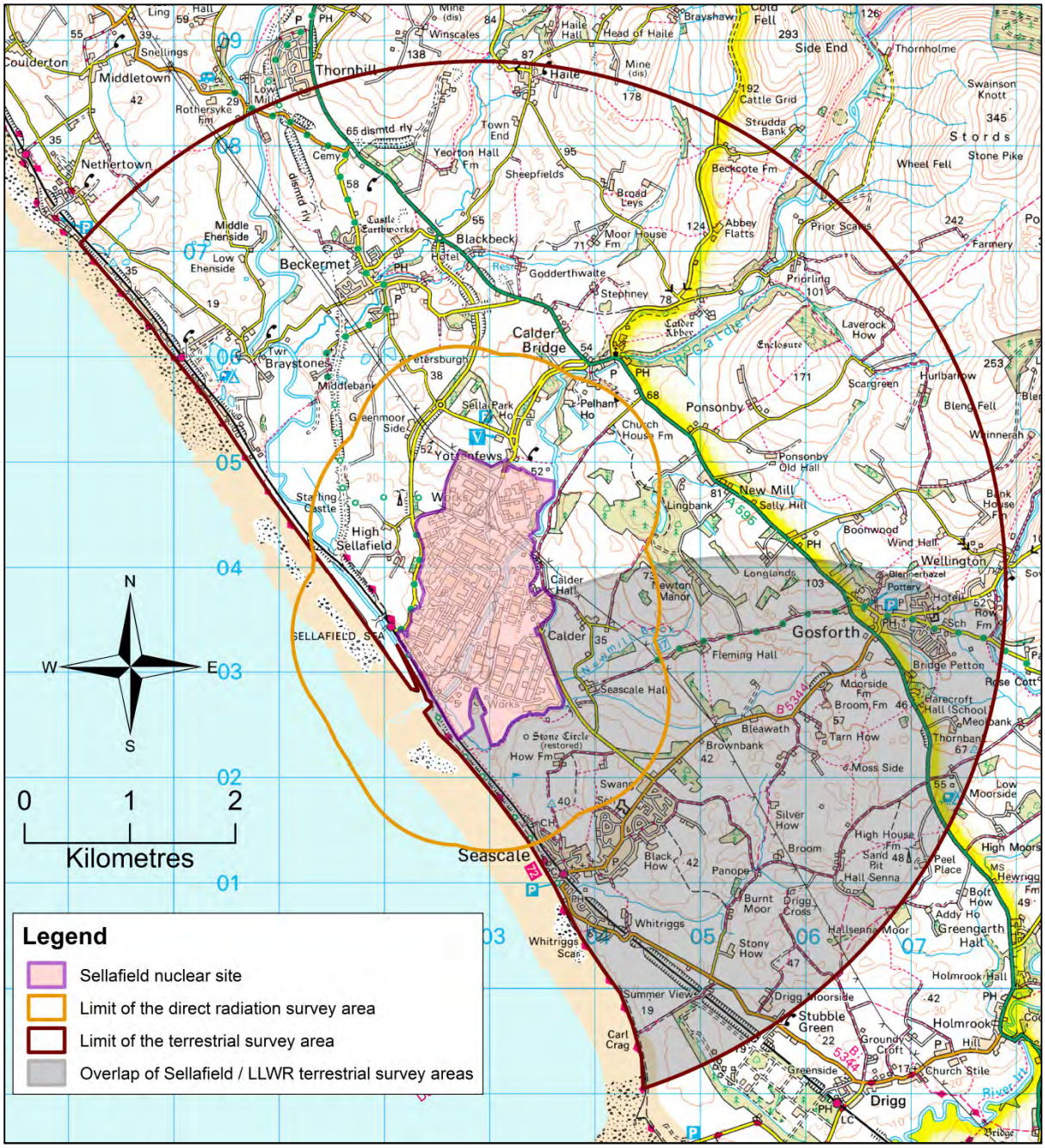


***Figure 2. The Sellafield terrestrial and direct radiation survey areas***

## 2.4 Conduct of the survey

As part of the pre-survey preparation, the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation were contacted to identify any additional site-specific requirements. Information relating to the activities of people in the aquatic and terrestrial survey areas was obtained from Internet searches, Ordnance Survey maps and from previous habits surveys undertaken around the Sellafield site. People with local knowledge of the survey area were contacted for information relevant to the various exposure pathways. These included representatives from the Marine Management Organisation, who provided information on commercial fishing, and representatives from the local fishing industry.

A proposed programme for fieldwork was distributed to the Environment Agency, the Food Standards Agency, and the Office for Nuclear Regulation before the fieldwork commenced, for their comment.

The fieldwork was carried out from the 4$^{th}$ to the 13$^{th}$ September 2013 by a survey team of three people, according to techniques described by Leonard *et al.* (1982). At the start of the fieldwork a meeting was held between the members of the survey team and representatives from the Sellafield site. This discussion provided details about current site activities, local information, and the potential for transfer of contamination off-site by wildlife.

The following information was obtained during the meeting:

- Routine operations were being undertaken on the site at the time of the habits survey.
- The monitoring programme to detect radioactive particles on beaches in the vicinity of Sellafield is continuing at specific locations along the Cumbrian coast between Drigg and Allonby.
- The Sellafield site actively manages the potential transfer of contamination off-site by wildlife. This mainly includes managing the number of seagulls and pigeons that nest on the site by culling and removing nests and nesting material. The rabbit population on the site was reported to be low due to a natural population collapse. Deer have been observed outside of the main security fence but not on site. There is an ongoing monitoring programme for analysing wildlife that is found on the site. Gully pots near the site entrance are routinely monitored due to historic off-site transfer of contamination to sediments by pigeon guano.
- Information about potential exposure pathways and activities in the area included; angling and farming in the direct radiation survey area, a cycle track in the direct radiation survey area, a possible decline in the number of farms producing milk, and a commercial mussel farm at Ravenglass.
- The large area of land to the north and west of the Sellafield site has been bought up by NuGen for the development of a new generation nuclear power station.

**I**nterviews were conducted with individuals who were identified in the pre-survey preparation and others that were identified during the fieldwork. These included, for example, fishermen, anglers, shellfish collectors, people carrying out activities on intertidal areas, farmers, gardeners and people living, working and undertaking recreational activities close to the site. Interviews were used to establish individuals' consumption, occupancy and handling rates relevant to the aquatic, terrestrial and direct radiation survey areas. Any other information of possible use to the survey was also obtained.

In the survey areas that are applicable to the Sellafield site and the LLWR site, interviews were not conducted with certain people who were interviewed in the 2012 LLWR habits survey in order to avoid interviewing the same people repeatedly within a short period of time. These people included wildfowlers and commercial fishermen in the aquatic survey area and farmers in the overlapping terrestrial survey areas. However, the consumption and occupancy rates obtained for these people during the 2012 LLWR habits survey have been used in the data analysis in this report.

Gamma dose rate measurements were taken over intertidal substrates in the aquatic area, and indoors and outdoors at most properties in the direct radiation survey area where interviews were conducted. Background gamma dose rates were taken at a distance beyond 5 km from the site centre. All gamma dose rate measurements were taken using a Mini 600 Series Type 6-81 Environmental Radiation Meter with a compensated Geiger-Müller tube.

For practical and resource reasons, the survey did not involve the whole population in the vicinity of the Sellafield site, but targeted subsets or groups, chosen in order to identify those individuals potentially most exposed to radiation pathways. However, it is possible that even within a subset or group there may have been people not interviewed during the survey. Therefore, to aid interpretation, the number of people for whom data were obtained in each group as a percentage of the estimated complete coverage for that group (where it was possible to make such an estimate) has been calculated. The results are summarised in Table 1. The 'groups' are described and quantified, and the numbers of people for whom data were obtained are given as percentages of the totals. For certain groups, such as anglers, it can be virtually impossible to calculate the total number of people who undertake the activity in the survey area because it is difficult to quantify visitors from outside the area or occasional visitors during the year. Based on UK Office of National Statistics residential data for electoral wards (www.statistics.gov.uk) there were approximately 3,410 people living in the terrestrial survey area, although information was obtained for a significantly smaller number than this. The survey did not include employees or contractors at the Sellafield nuclear site while they were at work. This is because dose criteria applicable to these people whilst at work and the dose assessment methods are different from those for members of the public. However, data were collected for employees and contractors while outside work if these people were encountered during the survey.

People were initially questioned about their habits relating to the survey area that their first identified activity occurred in and, where possible, they were also asked about their habits relating to the other two survey areas. For example, people in the terrestrial survey were initially questioned because it was known that they grew or produced significant quantities of terrestrial foodstuffs. However, they were also asked about habits that might lead to exposure to liquid discharges or direct radiation.

# 3 METHODS FOR DATA ANALYSIS

## 3.1 Data recording and presentation

Data collected during the fieldwork were recorded in logbooks. On return to the laboratory, the data were examined and any notably high rates were double-checked, where possible, by way of a follow-up phone call. In cases where follow-up phone calls were not possible (e.g. interviewees who wished to remain anonymous), the data were accepted at face value. The raw data were entered into a habits survey database where each individual for whom information was obtained was given a unique identifier (the observation number) to assist in maintaining data quality and traceability.

The results of the individuals' consumption, occupancy and handling rates collected during the survey were grouped and presented in tables with the high-rate group members indicated in bold and with the calculated mean rates for the high-rate group and 97.5$^{th}$ percentile rates. The consumption rates, occupancy rates and handling rates for all groups are presented in Annex 1 for adults and Annex 2 for children and infants, with the high-rate group members indicated in bold. The 2012 LLWR habits survey consumption and occupancy data that have been included in the 2013 Sellafield data analysis are presented in italics in Annex 1 and 2.

Where quantifiable data cannot be obtained from interviews but pathways are believed to exist, it is sometimes necessary to provide estimated habits data for use in dose assessments. In this series of habits survey reports, such data is usually presented in Annex 3. It was not necessary to estimate data for the Sellafield survey, but Annex 3 is included in this report to maintain consistency of presentation through the series of reports.

## 3.2 Data conversion

During the interviews, people could not always provide consumption rates in kilograms per year for food or litres per year for milk. In these circumstances, interviewees were asked to provide the information in a different format. For example, some estimated the size and number of items (e.g. eggs) consumed per year, whereas others gave the number of plants in a crop or the length and number of rows in which the crop was grown per year. The database converted these data into consumption rates (kg $y^{-1}$ for food and l $y^{-1}$ for milk) using a variety of conversion factors. These factors included produce weights (Hessayon, 1990 and 1997 and Good Housekeeping, 1994), edible fraction data researched by Cefas, and information supplied by the Meat and Livestock Commission.

### 3.3 Rounding and grouping of data

The consumption and occupancy data in the text of this report are rounded to two significant figures, except for values less than 1.0, which are rounded to one decimal place. This method of presentation reflects the authors' judgement on the accuracy of the methods used. In the tables and annexes, the consumption rate data are presented to one decimal place. Occasionally, this rounding process causes the computed values (row totals, mean rates and 97.5$^{th}$ percentiles), which are based on un-rounded data, to appear slightly erroneous. Consumption rates less than 0.05 kg $y^{-1}$ are presented to two decimal places in order to avoid the value of 0.0 kg $y^{-1}$. External exposure data are quoted as integer numbers of hours per year.

For the purpose of data analysis, foodstuffs were aggregated into food groups as identified in Table 2. Specific food types relevant to this survey are presented in the subsequent tables. The data are structured into groups when it is reasonable to assume that consistent concentrations or dose rates would apply within the group. For example, when considering terrestrial food consumption, all types of root vegetables are grouped together in a food group called 'root vegetables'. Similarly, for aquatic food consumption, all crustacean species are grouped as 'crustaceans'. For external exposure over intertidal sediments, occupancies over the same substrate (e.g. sand) are grouped together.

Data were structured into age groups because different dose coefficients (i.e. the factors which convert intakes of radioactivity into dose) can apply to different ages. The International Commission on Radiological Protection (ICRP) revised its recommendations for the age groupings to be used in radiological assessments and these recommendations were adopted in the 2010 habits survey reports and thereafter. Consequently, the age ranges used in the habits survey reports prior to 2010 differ from those used currently. The age ranges used in this report and the names used for the age groups, based on the recommendations in ICRP 101 (ICRP, 2007), are shown in Table A below, together with those used in reports prior to 2010, for comparison.

***Table A. Names of age groups and range of ages within each age group***

| Age ranges used from 2010 onwards | | | Age ranges used prior to 2010 | |
|---|---|---|---|---|
| **Name of age group[a]** | **Age range in group** | | **Name of age group** | **Age range in group** |
| Infant | 0 to 5-year-old | | 3-month-old | Under 1-year-old |
| | | | 1-year-old | 1-year-old |
| | | | 5-year-old | 2-year-old to 6-year-old |
| Child | 6-year-old to 15-year-old | | 10-year-old | 7-year-old to 11-year-old |
| | | | 15-year-old | 12-year-old to 16-year-old |
| Adult | 16-year-old and over | | Adult | 17-year-old and over |

[a] In the 2010 reports only, the infant age group was called the 1-year-old age group and the child age group was called the 10-year-old age group.

Since there are fewer age groups for children in the current regime, there should, in general, be more observations in each group, resulting in greater robustness in the data. However, data since 2010 will not be directly comparable with data prior to 2010, since the age ranges in the age groups will be different.

For direct radiation pathways, the data were grouped into distance zones from the nuclear site boundary as a coarse indication of the potential dose rate distribution due to this source of exposure. The bands used in this report were: 0 – 0.25 km; >0.25 – 0.5 km; >0.5 – 1.0 km. These distance bands are also useful when assessing exposure to gaseous discharges.

### 3.4 Approaches for the identification of high rates

The habits data have been analysed to identify high rates of consumption, occupancy and handling, which are suitable for use in radiological assessments. Two approaches have been used:

Firstly, the 'cut-off' method described by Hunt *et al.* (1982) was used. With the 'cut-off' method, the appropriate high rate was calculated by taking the arithmetic mean of the values between the maximum observed rate and one third of the maximum observed rate. In this report, the term 'high-rate group' is used to represent the individuals derived by the 'cut-off' method. The mean of the high-rate group was calculated for each food group, intertidal substrate and handling pathway identified in the survey. In certain cases, using the 'cut-off' method resulted in only one person being in the high-rate group. In these cases, expert judgement was used to decide whether the high-rate group should remain as one individual or whether others should be included. If others were included, the second highest rate was divided by three and all observations above this were included in the high-rate group.

Secondly, the 97.5$^{th}$ percentile rate was calculated for each group by using the *Microsoft Excel* mathematical function for calculating percentiles. The use of percentiles accords with precedents used in risk assessments of the safety of food consumption. It should be noted that the interviewees in this study are often selected and, therefore, the calculated percentiles are not based on random data.

Mean and 97.5$^{th}$ percentile consumption rates for adults based on national statistics have been derived by the Ministry of Agriculture, Fisheries and Food (MAFF) (now a part of the Department for Environment, Food and Rural Affairs, Defra) and the Food Standards Agency (Byrom *et al.,* 1995 and FSA, 2002), and these are referred to as generic rates in this report. The generic rates are used as a baseline for comparison with the observed rates.

The mean rates for the high-rate groups for children and infants for consumption, intertidal occupancy and handling pathways, have been calculated. However, in cases where few child or infant

observations were identified, an alternative approach that may be used for assessments is to estimate the mean rates for the high-rate groups for children and infants by applying scaling ratios to the mean rates for the high-rate groups for adults. Ratios for this purpose for the consumption and intertidal occupancy pathways, based on generic 97.5$^{th}$ percentile rates, are provided in Annex 4. The age ranges within the age groups in Annex 4 do not correspond exactly with the age ranges within the age groups used throughout the rest of this report, but these ratios are the best available data for estimating child rates and infant rates from adult rates. Adult to child and adult to infant ratios are not available for handling pathways.

For use in assessments of foetal dose, consumption and occupancy rates are provided in Annex 5 for women of childbearing age. The age range used in this report for women of childbearing age is 15 – 44 years old, which is based on the classification used by the Office of National Statistics (www.statistics.gov.uk).

For the direct radiation pathway, mean occupancy rates and 97.5$^{th}$ percentile rates have not been calculated. Such an analysis is of limited value without a detailed knowledge of the spatial extent of dose rates due to direct radiation.

### 3.5 Profiles of habits survey data for use in total dose assessments

The survey data have been analysed to produce profiles of consumption and occupancy rates according to the method described by Camplin *et al.* 2005. The profiles for adults are used to assess total dose integrated across all pathways of exposure in the RIFE reports (e.g. EA, NIEA, FSA and SEPA, 2013).

Matrices of profiles for adults, children, infants and women of childbearing age are presented in Annexes 6 to 9 respectively. Within each matrix the means for the high-rate groups, as determined by the cut-off method, are presented on the diagonal. Except for the direct radiation pathway the figures across the rows are the means of the consumption and occupancy rates for the other pathways for the individuals within that profile. For the direct radiation pathway the figure denotes the proportion of the individuals within that profile who spend time within the direct radiation survey area.

### 3.6 Data quality

To ensure the quality of the data collected during the survey fieldwork and presented in the report, the following procedures have been employed:

- Experienced scientific staff were used for the fieldwork and data analysis. They had been trained in the techniques of interviewing and obtaining data for all pathways that were relevant to the survey being conducted. Where individuals offered information during interview that was considered unusual, they were questioned further in order to double-check the validity of their claims.
- Where possible, interviewees were contacted again to confirm the results of the initial interview if, when final consumption or occupancy rates were calculated, observations were found to be high in relation to our experience of other surveys. Local factors were taken into account in these cases.
- Data were manipulated in a purpose-built database using a consistent set of conversion factors.
- Data were stored in a database in order to minimise transcription and other errors.
- Draft reports were reviewed by the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation, and by a senior radiological consultant.
- Final reports were only issued when the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation were entirely satisfied with the format and content of the draft report.

# 4 AQUATIC RADIATION PATHWAYS

## 4.1 Aquatic survey area

The aquatic survey area, shown in Figure 1, covered the waters and intertidal areas between Parton and Tarn Bay near Bootle, and extended 11 km offshore. The lower reaches of the rivers Ehen, Calder, Irt, Mite and Esk were also included. This area was taken to represent the predominant area of mixing of discharged radionuclides in seawater. The aquatic survey area used for the Sellafield site is the same as the aquatic survey area used for the LLWR site.

The shore in the northern part of the survey area between Parton and St Bees is predominantly rocky except for the beaches at Parton, Whitehaven and St Bees. Between St Bees and Drigg, the low-lying shore is primarily a mixture of sand, stones and boulder scars with extensive areas of sand or mud and sand exposed at low tide. The Drigg Dunes and Irt Nature Reserve is a large sand dune system at the northern part of the Ravenglass Estuary. The rivers Irt, Mite and Esk flow into the Ravenglass Estuary, which is a vast expanse of mud and sand at low tide with areas of mud and salt marsh. At the southernmost part of the survey area there is a 4 km sand and stones beach in front of the Eskmeals firing range. The Cumbria Coastal Way is a popular coastal walk which follows the shore along much of the survey area and around the Ravenglass Estuary. The aquatic survey area is described below from north to south.

***Parton***

Parton (see Figure 3) marks the northern limit of the survey area. The beach at Parton is coarse sand interspersed with areas of mud, stones and rocks. There is a public slipway for launching small boats and a secure compound where members of an angling club keep their boats and fishing gear. Activities undertaken at Parton included walking, dog walking, angling, beachcombing and collecting peeler crabs. Two hobby fishermen were identified setting pots offshore for crab and lobster.

***Figure 3. Parton***

***Whitehaven***

Whitehaven north beach is sand and stones backed by large sea defence boulders. This beach was reported to be popular with dog walkers and anglers, although none were observed during the survey. Two individuals were operating a push net from the shore to catch brown shrimps.

The harbour at Whitehaven comprises an outer harbour which dries out at low tide (see Figure 4) and an inner harbour in which a permanent area of seawater is maintained behind lock gates. This is the largest base for leisure craft and for commercial and hobby fishing vessels in the survey area. The commercial fishing vessels were predominately *Nephrops* trawlers, most of whom fished in the survey area as well as further afield. A charter boat based in the harbour offered angling and diving trips. A marina was located within the inner harbour, which had more than 285 berths for local and visiting angling and leisure craft. There was also a sailing and boating association with more than 100 members. In the outer harbour, the upper shore was predominantly sand and was regularly used by dog walkers and families playing in the summer months. At low tide, a large area of mud and sand was exposed which was a favoured location for bait diggers. The north and south outer harbour walls extended into the sea and were popular with anglers who preferred to fish into deeper water.

Whitehaven south beach is predominantly sand and stones with patches of rocks. The council had deemed the beach unsafe for the public to access due to coastal erosion and fences had been erected to deter people from going onto the beach. One person was identified walking on the beach.

Further south at Saltom Bay, the cliffs become progressively steeper towards St Bees Head. Access to the shore at Saltom Bay is only possible via tracks and footpaths.

***Figure 4. Whitehaven outer harbour***

***St Bees***

St Bees Head is a rocky headland with steep cliffs, which are a favoured location for rock climbers. The shore around St Bees Head is accessed via several paths down the cliffs, the easiest of which is a footpath leading to Fleswick. Anglers fished from the rocks around St Bees Head as they preferred to fish into deeper water. The waters around St Bees Head were used by experienced and novice divers in the summer months who accessed the area from the shore and by boat.

The beach at St Bees is predominantly sand with a bank of stones on the upper shore (see Figure 5). There were rock pools at the northern end of the beach at the base of St Bees Head. The 2 km beach attracts a large number of locals, tourists and people staying at the cliff top caravan site. There was an access road at the northern end of the beach and another at the southern end of the beach, which was locally known as Seamill. The activities undertaken on the beach during the survey included walking, dog walking and playing. Two individuals were operating a push net from the shore to catch brown shrimps at the Seamill end of the beach. Small leisure craft were launched from the public slipway at St Bees near the lifeboat station. Many interviewees reported that the beach at St Bees was very busy during the summer months particularly on hot days. Many families were reported to be playing on the beach and were undertaking activities including swimming, paddling, water

sports, rock pooling, playing games and building sand castles. Interviewees also reported that people would mainly sit in the area of the beach near the groynes on the sand or on the stone bank (see Figure 5), since this area is close to the amenities.

***Figure 5. St Bees***

***Coulderton, Nethertown and Braystones***

South of Seamill, access to the shore is limited due to a railway track that runs parallel to the coastline. There are access roads to the shore at the villages of Coulderton, Nethertown and Braystones. There is no public parking at Coulderton but there is a large parking area at Nethertown and small parking area at Braystones. The upper shore at Coulderton and at Nethertown (see Figure 6) is a bank of stones and the mid to lower shore is a mixture of boulders, stones and reefs of honeycomb worms (*Sabellaria alveolata*) interspersed with areas of sand. The shore is similar at Braystones but there are larger areas of sand (see Figure 7) or mud and sand exposed at low tide. At all three locations there are beach chalets located at the top of the stone bank, most of which are used as full-time residences or holiday homes. There are two large caravan sites at Braystones. Hobby boats and angling boats were observed pulled up onto the shore at Coulderton.

The beaches were regularly used by residents at the beach chalets and at the caravan sites who were walking, dog walking and angling. Bait digging was also popular at Braystones. Several species of shellfish were collected from the shore; mussels and winkles from Coulderton, and winkles and limpets from Nethertown. Hobby fishermen were identified who were setting pots from the shore

at Coulderton and potting offshore of Coulderton for brown crab and common lobster. Hobby fishermen were also setting nets from the shore at Braystones for mixed fish species.

***Figure 6. Nethertown***

***Sellafield***

The beach at Sellafield is predominantly sand with patches of stones on the upper shore and areas of boulders, stones and reefs of honeycomb worms on the mid to lower shore. The beach is backed by sand dunes behind which the River Ehen flows from the north-west. The River Calder flows from the north-east, through the Sellafield site and converges at the Calder Viaduct with the River Ehen before flowing out to sea. Access to the beach at Sellafield was possible via a coastal cycle path along the southern side of the site. People also walked along the beach to Sellafield from Braystones or Seascale. A small number of individuals were identified who were dog walking, angling and canoeing at Sellafield. Two hobby fishermen were identified who were setting nets from the shore. Angling took place on the lower reaches of the River Ehen.

***Figure 7. Braystones***

***Seascale***

The seaside resort of Seascale is a popular location with locals and tourists, in part due to the easy access, large car park and local amenities. The beach is predominantly sand with a strip of stones on the upper shore (see Figure 8) and a small boulder scar. Activities identified at Seascale included walking, dog walking, shore angling, boat angling, bait digging, kayaking, canoeing, surfing, body boarding, swimming and kite surfing. There is a public slipway for launching small boats and a secure compound where members of an angling club keep their boats. Interviewees reported that during the hot weather in the summer months the beach at Seascale was very busy with families playing on the beach. The beach was particularly busy in the area near the car park and near the amenities.

***Drigg***

To the south of Seascale, the sandy beach at Drigg is backed by sand dunes, with a strip of stones on the upper shore and boulder scars on the lower shore (see Figure 9). There is one access road to the beach and ample parking. The beach was regularly used by local dog walkers, walkers, anglers and bait diggers. Two people were identified collecting shells from the shore and one hobby fisherman was setting pots from the shore. People were also identified undertaking various water sports at Drigg, including kayaking, canoeing, surfing, body boarding and kite surfing. There are two main boulder scars; Drigg Barn Scar and Kokoarrah Scar, the latter of which is beyond the mean low water mark and can only be reached on foot at low water on spring tides. Brown crabs and common lobsters were caught from the boulder scars by using hand held crabbing hooks.

*Figure 8. Seascale*

*Figure 9. Drigg*

**The River Irt and Saltcoats**

The sand dunes at Drigg are part of a nature reserve that extends south to the mouth of the Ravenglass Estuary. The nature reserve comprises a large sandy beach and extensive sand dune system. The River Irt flows from the north-east past Holmrook, through farmland and the nature reserve and into the Ravenglass Estuary near Saltcoats. Access to the river is via farm fields, with the exception of a ford via a track from Shore Road at the southern side of the LLWR site. The only activities identified along the lower reaches of the river were wildfowling, and angling for salmon and sea trout. The shore at Saltcoats is a mixture of mud, sand, stones and salt marsh. There is a popular caravan site with privately owned caravans at Saltcoats. Activities being undertaken at Saltcoats included boat maintenance, dog walking, collecting samphire and collecting mussels (from under the bridge near Saltcoats). Livestock were being grazed on the salt marsh in this area.

**The River Mite and Ravenglass**

The River Mite flows from the north-east through farmland and past the village of Ravenglass where it joins the rivers Irt and Esk in the Ravenglass Estuary. At very low tide people can cross the River Mite at a ford between Saltcoats and Ravenglass. Ravenglass is a busy tourist village with easy access to the firm mud, sand and stones beach. Walkers and dog walkers frequently used the beach and residents whose houses backed onto the beach often used it as an extension to their gardens. There were also many people (tourists and locals) who walk on the beach for a small amount of time. Angling and collecting peeler crabs also took place and boat maintenance was undertaken on the boats that were moored in the channel near the village. In previous years, the collection of shellfish including mussels, cockles and oysters, has been popular in this area but during this survey the only shellfish collection identified was the commercial dredging of mussels offshore.

**The River Esk**

The River Esk flows from the north-east, under the Eskmeals Viaduct and into the Ravenglass Estuary where it joins the rivers Irt and Mite. The shores of the river are predominantly soft mud and salt marsh. There are two fords on the lower reaches of the Esk, one near Waberthwaite Church and one near the Eskmeals Viaduct, where it is possible to cross the river at very low tide. The ford near Waberthwaite Church has steep soft mud banks and deep gullies. A local resident reported that people walking the Cumbria Coastal Way occasionally crossed the river at the ford, although it is regarded as being a dangerous place to cross due to the soft mud and fast moving tides. The River Esk ford near the Eskmeals Viaduct (see Figure 10) is a firm substrate of mud, sand and stones, and the shores of the river at this location are salt marsh and soft mud. It was reported that horse riders and cyclists, and to a lesser extent people on foot, used the ford to cross the river at low tide. Angling was taking place along the River Esk and wildfowling was taking place at Newbiggin Marsh.

*Figure 10. The River Esk ford near the Eskmeals Viaduct*

***Eskmeals***

South of the confluence of the Rivers Irt, Mite and Esk, the Eskmeals Dunes Nature Reserve occupies a spit of land. The sand, shingle and salt marsh shore and extensive sand dune system is accessed by footpath along the River Esk or along the shore from Eskmeals. The Eskmeals firing range covers the southern part of the reserve and extends parallel to the coastline approximately 3 km to the south. The beach alongside the Eskmeals range is predominantly sand with patches of stones and a large expanse of mud, sand and boulder scars at low tide. The beach is accessed through the nature reserve or via a road at the southern end of the beach near Tarn Bay. It was popular with dog walkers, walkers, anglers and bait diggers. The reserve and parts of the beach were closed to the public when firing was taking place on the range. At the southern end of this beach, Tarn Bay marks the southern limit of the survey area.

## 4.2 Commercial fisheries

Approximately 15 small commercial trawlers were based at Whitehaven Harbour, which is the main fishing port in the survey area. The trawlers mainly fished for *Nephrops* with a by-catch of mixed demersal fish species. Some trawlers spent 100% of the time in the survey area and others only fished for part of the year within the survey area. A number of visiting fishing vessels also used Whitehaven Harbour as a temporary base.

Four individuals were identified potting full-time for brown crabs and common lobsters within the survey area. One of the fishermen was also netting for mixed fish species. The fishermen moored their boats in the Ravenglass Estuary and at Whitehaven Harbour. The main potting areas were from Parton to Nethertown and from Sellafield to Tarn Bay.

Several local individuals collected winkles commercially in the survey area, mainly from the boulder scars between Parton and Drigg. There was a commercial mussel dredging operation near Ravenglass. Seed mussel harvested from Morecambe Bay was re-laid at Ravenglass every year to provide an annual harvest of edible sized mussels.

### 4.3 Destination of seafood originating from the aquatic survey area

Two fish and shellfish wholesalers based at Whitehaven Harbour bought the *Nephrops* and fish species landed from the survey area. *Nephrops* were sold to processing factories outside the survey area and the fish were sold at Fleetwood auction. Brown crabs and common lobsters were predominantly exported to buyers in France and Spain with small amounts being sold directly from the fishermen to the public and to local restaurants and hotels. Winkles were sold to a shellfish wholesaler in Scotland and were exported mainly to France and Spain. Mussels were exported to Europe.

### 4.4 Hobby fishing, angling and non-commercial shellfish collecting

In this report, the term ‘hobby fishing’ is used to describe recreational fishing on a small scale with gear such as nets or pots. It is usually carried out by fishermen who do not have commercial fishing licences and therefore it is illegal to offer the catch for sale. Several hobby fishermen operated in the survey area mainly potting offshore of Parton and offshore of Coulderton or setting nets from the shore at Braystones and Sellafield. One fisherman set pots from the shore at Coulderton and Drigg. Hobby fishermen mainly caught bass, cod, grey mullet, haddock, thornback ray, brown crabs and common lobsters. Two individuals were identified push netting for brown shrimps at Whitehaven north beach and Seamill. The catches were consumed by the fishermen’s families and friends.

Individuals caught brown crabs and common lobsters from the boulder scars at Drigg using hand held crabbing hooks.

A charter angling boat operated from Whitehaven Harbour. Many private angling boats were moored at Whitehaven Harbour and in the Ravenglass Estuary as well as being launched from slipways at Parton, St Bees and Seascale, or being launched from the shore at Coulderton, Nethertown and Braystones. Shore angling was popular at many locations including Parton, Whitehaven Harbour walls, St Bees, Coulderton, Nethertown, Braystones, Sellafield, Seascale, Drigg and Eskmeals. The main edible species caught by anglers were bass, plaice, flounder, cod, dab, mackerel and pollack.

Anglers were also identified fishing for salmon and sea trout on the lower reaches of the rivers Ehen, Irt and Esk.

In previous surveys at Sellafield many people were identified collecting molluscs for consumption, mainly winkles, mussels and cockles, and a small amount of razor shells and limpets. However, several people who had previously been interviewed have now stopped collecting and consuming molluscs for various reasons, such as due to old age or ill health. People were identified during this 2013 survey, collecting and consuming small quantities of winkles from Coulderton and Nethertown, collecting limpets from Nethertown, and collecting mussels from Coulderton and Saltcoats. Only one person was identified consuming large quantities of molluscs, which were winkles from Nethertown.

### 4.5 Wildfowling

Two wildfowling clubs were identified whose members were shooting in the survey area. One club had the rights to shoot on the River Irt from the ford near Carleton Marsh to Ravenglass and along the lower reaches of the River Mite. The other club had the rights to shoot on Newbiggin Marsh. The shooting season was from 1$^{st}$ September to the 31$^{st}$ January for the area above the level of mean spring tides and extended to 20$^{th}$ February for the area below the level of the mean spring tide. The main species shot were greylag goose, Canada goose, mallard, teal and wigeon. Wildfowl were consumed by the wildfowlers and their families and friends. Wildfowlers were shooting over salt marsh and mud and came into contact with the sediment when lying or kneeling in gullies, muddy creeks or the edge of river banks. Wildfowlers occasionally wore gloves and some used plastic sheets to protect themselves from the mud.

### 4.6 Other pathways

Beef cattle and sheep were identified grazing on salt marsh near Saltcoats during the 2012 LLWR survey. The consumption of lamb was identified and the consumption data has been included in the data analysis for this 2013 Sellafield survey.

One person was identified who used seaweed as a fertiliser on their allotment plot. The seaweed (mostly bladderwrack and small amounts of kelp) was collected from Nethertown after it had been washed-up onto the shore during rough weather. The seaweed was left to rot down and was then dug into the soil on the allotment plot as well as being made into a liquid feed for use on tomatoes and onions. The use of seaweed as livestock feed was not identified.

## 4.7 Food consumption data

Consumption data for aquatic foods are presented in Tables 3 to 8 for adults and in Tables 9 to 12 for children and infants. The tables include the mean consumption rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates calculated as described in Section 3.4. Adults' consumption rates of vegetables and domestic fruit that were grown on land that had been fertilised with seaweed are presented in Table 13.

***Adults' consumption rates***

The people consuming the greatest quantities of food from the aquatic survey area were commercial and hobby fishermen, shellfish collectors, anglers, wildfowlers, and the families and friends of these groups of people.

Table B presents a summary of the adults' consumption rates for the following food groups: fish; crustaceans; molluscs; wildfowl; marine plants/algae; salt marsh grazed sheep meat. The table includes the mean consumption rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates. For comparison, the table also includes mean consumption rates and 97.5$^{th}$ percentile consumption rates for fish, crustaceans and molluscs based on national data, which are referred to as 'generic' data in this report. No generic rates have been determined for wildfowl, marine plants/algae or salt marsh grazed sheep meat.

***Table B. Summary of adults' consumption rates of foods from the aquatic survey area***

| Food group | Number of observations | Number of high-rate consumers | Observed maximum for the high-rate group (kg y$^{-1}$) | Observed minimum for the high-rate group (kg y$^{-1}$) | Observed mean for the high-rate group (kg y$^{-1}$) | Observed 97.5$^{th}$ percentile (kg y$^{-1}$) | Generic mean (kg y$^{-1}$) | Generic 97.5$^{th}$ percentile (kg y$^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| **Fish** | 105 | 18 | 106.1 | 35.4 | 56.1 | 78.7 | 15.0 | 40.0 |
| **Crustaceans** | 53 | 14 | 47.9 | 16.2 | 25.3 | 47.0 | 3.5 | 10.0 |
| **Molluscs** | 21 | 1 | 15.3 | 15.3 | 15.3 | 9.0 | 3.5 | 10.0 |
| **Wildfowl** | 10 | 4 | 16.8 | 8.0 | 10.2 | 14.8 | Not determined | Not determined |
| **Marine plants/algae** | 2 | 2 | 0.1 | 0.1 | 0.1 | 0.1 | Not determined | Not determined |
| **Salt marsh grazed sheep meat** | 6 | 6 | 1.9 | 1.9 | 1.9 | 1.9 | Not determined | Not determined |

The predominant species of fish consumed by adults were cod, plaice, thornback ray, bass and mackerel, with small quantities of brill, dab, Dover sole, flounder, grey mullet, haddock, pollack, red gurnard, salmon, sea trout, smelts, squid (although squid are molluscs, they are in the fish group as radiologically they are more akin to fish), turbot and whiting. These species were caught throughout the aquatic survey area. Of the fish consumed by the 18 people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 40% cod, 15% thornback ray, 10% bass, 10% haddock, 10% plaice, and 15% of a mix of Dover sole, grey mullet, mackerel, pollack, red gurnard, salmon, squid, turbot and whiting.

The species of crustaceans consumed by adults were brown crab, brown shrimp, common lobster, common prawn and *Nephrops*. The brown crab, common lobster and *Nephrops* were caught throughout the survey area and brown shrimps and common prawns were caught from the shore at Whitehaven north beach and Seamill. Common prawns were also caught incidentally in pots offshore between Sellafield and Tarn Bay. Of the crustaceans consumed by the 14 people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 60% *Nephrops*, 20% brown crab, 10% brown shrimp, 5% common lobster and <5% common prawn (this does not total 100% due to rounding).

The species of molluscs consumed by adults were limpets, mussels, whelks and winkles. The molluscs were collected or caught from the following locations: limpets from Nethertown; mussels from Coulderton, Whitehaven north beach, Seamill, Drigg, Tarn Bay and Saltcoats; whelks from offshore of Coulderton; and winkles from Nethertown, Coulderton and Drigg. Of the molluscs consumed by the only person in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 85% winkles and 15% limpets.

The wildfowl consumed by adults were Canada goose, duck (unspecified species), greylag goose, mallard, teal and wigeon. These were shot on salt marshes in the Ravenglass Estuary including Carleton Marsh and Newbiggin Marsh, and at other unspecified locations in the survey area. Of the wildfowl consumed by the four people in the high-rate group, the percentage breakdown of species, rounded to the nearest 5%, was 70% greylag goose, 15% Canada goose, 10% duck (unspecified species), and 5% of a mix of mallard, teal and wigeon.

The species of marine plants/algae consumed was samphire.

Livestock were grazed on salt marshes near Saltcoats. Adults' consumption of lamb meat from animals grazed on these marshes was identified.

***Children's and infants' consumption rates***

Table C presents a summary of children's and infants' consumption rates of fish, crustaceans, molluscs and wildfowl from the aquatic survey area. The table includes the mean consumption rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates. For the child age group, no consumption of marine plants/algae or salt marsh grazed sheep meat was identified. For the infant age group, no consumption of wildfowl, marine plants/algae or salt marsh grazed sheep meat was identified. No generic rates have been determined for the child or infant age groups.

***Table C. Summary of children's and infants' consumption rates of foods from the aquatic survey area***

| Food group | Number of observations | Number of high-rate consumers | Observed maximum for the high-rate group (kg y$^{-1}$) | Observed minimum for the high-rate group (kg y$^{-1}$) | Observed mean for the high-rate group (kg y$^{-1}$) | Observed 97.5$^{th}$ percentile (kg y$^{-1}$) |
|---|---|---|---|---|---|---|
| **Child age group (6 – 15 years old)** | | | | | | |
| **Fish** | 12 | 3 | 22.3 | 11.1 | 16.0 | 20.2 |
| **Crustaceans** | 2 | 2 | 2.0 | 1.5 | 1.8 | 2.0 |
| **Molluscs** | 2 | 2 | 0.9 | 0.7 | 0.8 | 0.9 |
| **Wildfowl** | 1 | 1 | 8.0 | 8.0 | 8.0 | Not applicable |
| **Infant age group (0 – 5 years old)** | | | | | | |
| **Fish** | 4 | 4 | 7.5 | 5.5 | 7.0 | 7.5 |
| **Crustaceans** | 3 | 3 | 1.0 | 0.8 | 0.9 | 1.0 |
| **Molluscs** | 3 | 3 | 0.5 | 0.3 | 0.4 | 0.5 |

The predominant species of fish consumed by individuals in the child age group was mackerel, salmon, bass and cod, with smaller quantities of dab, Dover sole, flounder, grey mullet, plaice, pollack, red gurnard, sea trout, thornback ray, turbot and whiting. The predominant species of fish consumed by the individuals in the infant age group was cod, bass, mackerel and thornback ray, with smaller quantities of dab, Dover sole, flounder, grey mullet, plaice, pollack, red gurnard and turbot.

The species of crustaceans consumed by the individuals in the child age group and in the infant age group were brown crab and common lobster.

The species of molluscs consumed by the individuals in the child age group and in the infant age group were mussels, winkles and whelks.

The wildfowl consumed by the individual in the child age group was duck (unspecified species) and greylag goose.

### 4.8 Intertidal occupancy

Intertidal occupancy rates for adults are presented in Table 14 and intertidal occupancy rates for children and infants are presented in Table 15. It should be noted that there are often more than one substrate at one named location and that substrates at a given location are liable to change over time. Activities were assigned to the predominant substrate over which they were taking place.

***Adults' intertidal occupancy rates***

Table D presents a summary of the adults' intertidal occupancy rates in the aquatic survey area. The table includes the mean occupancy rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates.

***Table D. Summary of adults' intertidal occupancy rates***

| Intertidal substrate | Number of observations | Number of people in the high-rate group | Maximum of the high-rate group (h y$^{-1}$) | Mean of the high-rate group (h y$^{-1}$) | 97.5$^{th}$ percentile (h y$^{-1}$) |
|---|---|---|---|---|---|
| **Mud** | 3 | 2 | 96 | 81 | 94 |
| **Mud and sand** | 7 | 4 | 234 | 163 | 222 |
| **Mud, sand and stones** | 14 | 5 | 490 | 316 | 438 |
| **Rock** | 4 | 4 | 105 | 74 | 103 |
| **Salt marsh** | 7 | 4 | 312 | 208 | 312 |
| **Sand** | 104 | 31 | 1035 | 546 | 861 |
| **Sand and stones** | 37 | 8 | 828 | 486 | 747 |

The activities undertaken by people in the adult high-rate groups for occupancy over the following intertidal substrates included:

- For mud: wildfowling at Newbiggin Marsh and Carleton Marsh; angling on the banks of the River Esk and River Irt.
- For mud and sand: bait digging at Whitehaven outer harbour.
- For mud, sand and stones: angling in the Ravenglass Estuary; dog walking at Saltcoats; boat maintenance at Saltcoats and Ravenglass.
- For rock: angling at Parton and St Bees Head; hooking for crab and lobster at Drigg.
- For salt marsh: tending livestock at Saltcoats; walking and dog walking at the Eskmeals Nature Reserve.

- For sand: angling at Braystones, Seascale and Drigg; bait digging and walking at Braystones and Eskmeals; setting nets at Braystones and Sellafield; dog walking at Sellafield, Seascale, Drigg, St Bees, Braystones and Nethertown; bait digging at Seascale.
- For sand and stones: dog walking at Parton and Coulderton; angling from Parton to Eskmeals (including Braystones, Coulderton, Nethertown, Sellafield and Drigg); collecting winkles from Parton to Eskmeals (including Nethertown); laying pots on the shore at Coulderton and Drigg; beachcombing at Parton.

***Children's and infants' intertidal occupancy rates***

Table E presents a summary of the children's and infants' intertidal occupancy rates in the aquatic survey area. The table includes the mean occupancy rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates.

***Table E. Summary of children's and infants' intertidal occupancy rates***

| Intertidal substrate | Number of observations | Number of people in the high-rate group | Maximum of the high-rate group (h y$^{-1}$) | Mean of the high-rate group (h y$^{-1}$) | 97.5$^{th}$ percentile (h y$^{-1}$) |
|---|---|---|---|---|---|
| **Child age group (6 – 15 years old)** | | | | | |
| **Mud, sand and stones** | 2 | 2 | 137 | 137 | 137 |
| **Sand** | 4 | 4 | 156 | 128 | 156 |
| **Sand and stones** | 2 | 2 | 20 | 16 | 20 |
| **Infant age group (0 – 5 years old)** | | | | | |
| **Sand** | 7 | 1 | 104 | 104 | 92 |

The activities undertaken by individuals in the child age group high-rate groups for occupancy over the following intertidal substrates included:

- For mud, sand and stones: walking at Ravenglass.
- For sand: dog walking at Seascale; water sports preparation at St Bees, Seascale and Drigg; playing at St Bees; bait digging at Eskmeals.
- For sand and stones: angling at Tarn Bay and Braystones.

The activity undertaken by the individual in the infant age group high-rate group for occupancy over sand was playing at St Bees.

## 4.9 Gamma dose rate measurements

Gamma dose rate measurements were taken over six intertidal substrates. All measurements were taken at a height of 1 metre above the substrate. The results are presented in Table 16 and are summarised below.

- Two measurements taken over mud ranged from 0.079 µGy $h^{-1}$ to 0.93 µGy $h^{-1}$
- One measurement taken over mud and sand was 0.065 µGy $h^{-1}$
- One measurement taken over mud and stones was 0.078 µGy $h^{-1}$
- Two measurements taken over salt marsh ranged from 0.099 µGy $h^{-1}$ to 0.112 µGy $h^{-1}$
- Nine measurements taken over sand ranged from 0.058 µGy $h^{-1}$ to 0.099 µGy $h^{-1}$
- Six measurements taken over sand and stones (including two measurements taken on sand and stones on boulder scars) ranged from 0.080 µGy $h^{-1}$ to 0.094 µGy $h^{-1}$

For comparison, natural background levels have been estimated at 0.05 µGy $h^{-1}$ over sand, 0.07 µGy $h^{-1}$ over mud and over salt marsh, and 0.06 µGy $h^{-1}$ over other substrates (EA, FSA, NIEA and SEPA, 2013).

## 4.10 Handling of fishing gear and sediment

Handling fishing gear that has become entrained with fine sediment particles, or handling sediment while undertaking activities such as bait digging or mollusc collecting, can potentially give rise to skin exposure from beta radiation. Doses to the skin need consideration as part of the dose limitation system (ICRP, 1991).

Fishing gear can also be a source of gamma exposure due to occupancy in the vicinity of the gear. However, this pathway is minor compared with the exposure received during occupancy over intertidal areas and it has therefore been omitted from the report. Handling of angling equipment was not considered to be a significant pathway. Therefore, as in previous surveys, data for this pathway were not collected.

Handling rates of fishing gear and sediment for adults are presented in Table 17 and handling rates of sediment for children are presented in Table 18. No children were identified handling fishing gear and no infants were identified handling fishing gear or sediment.

***Adults' handling rates of fishing gear and sediment***

Table F presents a summary of the handling rates of fishing gear and sediment for adults. The table includes the mean handling rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates.

***Table F. Summary of adults' handling rates of fishing gear and sediment***

| Handling activity | Number of observations | Number of people in the high-rate group | Maximum of the high-rate group (h y$^{-1}$) | Mean of the high-rate group (h y$^{-1}$) | 97.5$^{th}$ percentile (h y$^{-1}$) |
|---|---|---|---|---|---|
| **Handling fishing gear** | 33 | 7 | 1524 | 1120 | 1524 |
| **Handling sediment** | 33 | 3 | 754 | 456 | 428 |

The main activities undertaken by people in the adult high-rate groups for handling included:

- For handling fishing gear: handling pots from Sellafield to Tarn Bay (including Drigg) and Parton to Coulderton; handling nets at Braystones, Sellafield and Parton to Coulderton.
- For handling sediment: collecting winkles from Parton to Eskmeals (including Nethertown); bait digging at Whitehaven outer harbour, Braystones and Eskmeals; collecting limpets at Nethertown.

***Children's handling rates of sediment***

Table G presents a summary of the handling rates of sediment for children. The table includes the mean handling rate for the high-rate group. No children were identified handling fishing gear and no infants were identified handling fishing gear or sediment.

***Table G. Summary of children's handling rates of sediment***

| Handling activity | Number of observations | Number of people in the high-rate group | Maximum of the high-rate group (h y$^{-1}$) | Mean of the high-rate group (h y$^{-1}$) | 97.5$^{th}$ percentile (h y$^{-1}$) |
|---|---|---|---|---|---|
| **Child age group (6 – 15 years old)** | | | | | |
| **Handling sediment** | 1 | 1 | 98 | 98 | Not applicable |

The activity undertaken by the only child in the high-rate group was bait digging, which was undertaken at Eskmeals.

## 4.11 Water based activities

Activities taking place in or on the water can lead to ingestion of water and/or inhalation of spray. These pathways are generally considered to be minor in comparison with other exposure pathways such as the ingestion of foods produced in the vicinity of a nuclear site. However, relevant data have been collected for consideration in dose assessments. Mean occupancy rates for the high-rate groups and 97.5$^{th}$ percentile rates have not been calculated.

Activities where there is a high likelihood of the individual's face submerging under water have been classified as activities 'in water', as they are more likely to lead to ingestion of water. All other activities have been classified as activities 'on water'.

Occupancy rates for activities taking place 'in water' and 'on water' in the survey area are presented in Table 19 for adults and Table 20 for children. No infants were identified spending time 'in water' or 'on water'.

***Activities in the water***

The activities identified taking place in the water, in the aquatic survey area were windsurfing, surfing, swimming and kayaking. Seven observations were recorded for adults and five observations were recorded for children. The highest occupancy rate of 90 h $y^{-1}$ was the same for one adult and two children who were windsurfing and surfing at St Bees, Seascale and Drigg.

Other activities such as diving are known to take place in the survey area but no data were obtained during the survey.

***Activities on the water***

The activities taking place on the water, in the aquatic survey area were trawling, potting, gill netting, boat maintenance, angling (from a boat and wading in a river), push netting, drift netting, boating and canoeing. Forty-seven observations were recorded for adults and two observations were recorded for individuals in the child age group. The highest occupancy rate for adults was 2000 h $y^{-1}$ for two people who were trawling from St Bees to Ravenglass. The only two individuals in the child age group were canoeing for 14 h $y^{-1}$ at St Bees, Seascale and Drigg.

# 5 TERRESTRIAL RADIATION PATHWAYS

## 5.1 Terrestrial survey area

The terrestrial survey area (shown in Figure 2) covered all land and freshwater watercourses within 5 km of the Sellafield site centre (National Grid Reference: NY 028 038). Due to the proximity of the Sellafield site to the LLWR site (approximately 5 km between the centre of both sites) the terrestrial survey areas for both sites overlap. This overlap area is shown in Figure 2.

The land in the terrestrial survey area was predominantly agricultural. Several villages were located within the terrestrial survey area including Beckermet and Haile to the north, Gosforth and Wellington to the east, and the coastal village of Seascale to the south-east. The River Ehen flows from the north-west along the south-western boundary of the site and the River Calder flows from the fells in the north-east and through the middle of the Sellafield site. The rivers converge at the Calder Viaduct and flow into the Irish Sea.

Interviews were conducted at twenty-five working farms in the terrestrial survey area. Of these farms:

- Three produced milk (from dairy cattle)
- One produced milk (from dairy cattle), beef cattle and lambs
- Two produced milk (from dairy cattle) and lambs
- Five produced beef cattle
- Ten produced beef cattle and lambs
- One produced beef cattle, vegetables and potatoes
- One produced beef cattle, lambs and chickens (sold for egg production)
- One produced lambs
- One produced lambs, pigs, beef cattle and chicken eggs

Crops such as barley, oats, wheat, beet and grass for silage were grown on the farms for winter animal feed.

In addition to the farms where interviews were conducted, another six working farms were identified in the survey area where interviews were not conducted because no one was available for an interview at the time of the survey.

Farmers and their families were consuming milk, beef, lamb, pork, chicken eggs, vegetables and potatoes produced commercially on their own farms. Several farmers also kept chickens for eggs and grew vegetables for their own family's consumption.

One allotment site was identified, which was located near Calderbridge. The site started in 2011 and has 20 plots, most of which were in use. A wide variety of produce was being grown and consumed. Many residents in the survey area were identified who grew a wide range of fruit and vegetables in their gardens.

One beekeeper was identified who kept hives within the survey area but they could not be contacted. Two beekeepers who were interviewed in the 2008 survey were no longer keeping hives in the survey area.

Blackberries, damsons, pignuts, plums, sloes and mushrooms were growing wild in the survey area and these were being collected and consumed.

Two organised game shoots were identified on farmland in the survey area. Most of the shooting on farmland was for vermin control but a small number of farmers shot pheasant, pigeon, mallard and goose. The consumption of goose (unspecified species), mallard, pheasant, pigeon, rabbit and venison was identified. The consumption of hares was not identified.

The consumption of groundwater by humans and livestock was identified. Three households used spring water and one household used well water as their domestic supply. Seven farmers supplied their livestock with spring water or well water for drinking. Livestock also had access ditches and streams for drinking water.

### 5.2 Destination of food originating from the terrestrial survey area

Milk was sold locally by one farm but was mainly sold to three national distribution chains. Livestock were sold at auctions in Cockermouth, Carlisle, Ulverston and Wigton. Chickens were sold nationally to other farms for egg production. Chicken eggs and were sold from the door at one farm and vegetables and potatoes were sold from the door at another farm.

### 5.3 The transfer of contamination off-site by wildlife

The transfer of contamination off-site by wildlife was investigated as radionuclides could enter the food chain or contaminate the environment through this pathway. Control measures taken by the site mainly included actively managing the number of seagulls and pigeons that nest on site by culling and removing nests and nesting material. The rabbit population on the site was reported to be low due to a natural population collapse. Deer have been observed outside of the main security fence but not on site. There is an ongoing monitoring programme for analysing wildlife that is found on the site. Gully pots near the site entrance are routinely monitored due to historic off-site transfer of contamination to sediments by pigeon guano.

## 5.4 Food consumption data

Consumption data for locally produced foodstuffs potentially affected by deposition of gaseous discharges are presented in Tables 21 to 37 for adults and Tables 38 to 51 for children and infants.

In order to provide information relevant to monitoring and assessments studies, the consumption rate data collected during the survey were analysed to indicate the percentage that each food type contributed to each food group. The data are summarised in Table 52.

***Adults' consumption rates***

Consumption of locally produced foods was identified in the following 17 food groups: green vegetables; other vegetables; root vegetables; potato; domestic fruit; milk; cattle meat; pig meat; sheep meat; poultry; eggs; wild/free foods; rabbits/hares; honey; wild fungi; venison; freshwater fish.

Table H presents a summary of the adults' consumption rates for the foods consumed from the terrestrial survey area. The table includes the mean consumption rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates calculated as described in Section 3.4. For comparison, the table also includes mean consumption rates and 97.5$^{th}$ percentile consumption rates based on national data, which are referred to as 'generic' data in this report. No generic data have been determined for venison or freshwater fish.

*Table H. Summary of adults' consumption rates of foods from the terrestrial survey area*

| Food group | Number of observations | Number of high-rate consumers | Observed maximum for the high-rate group (kg $y^{-1}$ or l $y^{-1}$) | Observed minimum for the high-rate group (kg $y^{-1}$ or l $y^{-1}$) | Observed mean for the high-rate group (kg $y^{-1}$ or l $y^{-1}$) | Observed 97.5$^{th}$ percentile (kg $y^{-1}$ or l $y^{-1}$) | Generic mean (kg $y^{-1}$ or l $y^{-1}$) | Generic 97.5$^{th}$ percentile (kg $y^{-1}$ or l $y^{-1}$) |
|---|---|---|---|---|---|---|---|---|
| **Green vegetables** | 36 | 15 | 39.6 | 13.8 | 21.6 | 39.6 | 15.0 | 45.0 |
| **Other vegetables** | 31 | 6 | 72.5 | 45.6 | 59.0 | 72.5 | 20.0 | 50.0 |
| **Root vegetables** | 37 | 10 | 47.8 | 18.5 | 33.9 | 47.8 | 10.0 | 40.0 |
| **Potato** | 54 | 16 | 165.1 | 59.0 | 124.3 | 165.1 | 50.0 | 120.0 |
| **Domestic fruit** | 48 | 8 | 49.9 | 17.8 | 32.7 | 48.6 | 20.0 | 75.0 |
| **Milk** | 22 | 15 | 259.3 | 103.7 | 184.9 | 259.3 | 95.0 | 240.0 |
| **Cattle meat** | 26 | 17 | 71.0 | 24.9 | 38.1 | 71.0 | 15.0 | 45.0 |
| **Pig meat** | 14 | 14 | 25.3 | 11.2 | 17.3 | 25.3 | 15.0 | 40.0 |
| **Sheep meat** | 44 | 26 | 17.0 | 5.7 | 9.4 | 17.0 | 8.0 | 25.0 |
| **Poultry** | 31 | 6 | 32.4 | 11.7 | 20.5 | 32.4 | 10.0 | 30.0 |
| **Eggs** | 35 | 25 | 20.8 | 8.2 | 15.3 | 20.8 | 8.5 | 25.0 |
| **Wild/free foods** | 55 | 11 | 6.8 | 3.0 | 5.3 | 6.8 | 7.0 | 25.0 |
| **Rabbits/hares** | 7 | 3 | 2.8 | 2.8 | 2.8 | 2.8 | 6.0 | 15.0 |
| **Honey** | 4 | 4 | 0.2 | 0.2 | 0.2 | 0.2 | 2.5 | 9.5 |
| **Wild fungi** | 8 | 2 | 1.7 | 1.7 | 1.7 | 1.7 | 3.0 | 10.0 |
| **Venison** | 4 | 3 | 26.5 | 26.5 | 26.5 | 26.5 | Not determined | Not determined |
| **Freshwater fish** | 4 | 4 | 1.4 | 1.4 | 1.4 | 1.4 | Not determined | Not determined |

Two mean consumption rates for the high-rate groups were found to be greater than the generic 97.5$^{th}$ percentile consumption rates. These were for other vegetables and potato. Eleven mean consumption rates for the high-rate groups exceeded the generic mean consumption rates. These were for green vegetables, other vegetables, root vegetables, potato, domestic fruit, milk, cattle meat, pig meat, sheep meat, poultry and eggs. Six observed 97.5$^{th}$ percentile consumption rates exceeded the generic 97.5$^{th}$ percentile consumption rates. These were for other vegetables, root vegetables, potato, milk, cattle meat and poultry.

***Children's and infants' consumption rates***

Six individuals in the child age group and seven individuals in the infant age group were identified consuming foods from the terrestrial survey area. Table I presents a summary of children's and infants' consumption rates. The table includes the mean consumption rates for the high-rate groups and the observed 97.5$^{th}$ percentile rates. No generic data have been determined for the child or infant age groups. In the child age group, no consumption of foods from the following food groups was

identified: honey; wild fungi; freshwater fish. In the infant age group, no consumption of foods from the following food groups was identified: green vegetables; other vegetables; root vegetables; domestic fruit; rabbits/hares; honey; wild fungi; venison; freshwater fish.

***Table I. Summary of children's and infants' consumption rates of foods from the terrestrial survey area***

| Food group | Number of observations | Number of high-rate consumers | Observed maximum for the high-rate group (kg $y^{-1}$) | Observed minimum for the high-rate group (kg $y^{-1}$) | Observed mean for the high-rate group (kg $y^{-1}$) | Observed 97.5$^{th}$ percentile (kg $y^{-1}$) |
|---|---|---|---|---|---|---|
| **Child age group (6 - 15 years old)** | | | | | | |
| **Green vegetables** | 3 | 2 | 13.9 | 7.0 | 10.5 | 13.6 |
| **Other vegetables** | 3 | 3 | 8.9 | 3.4 | 5.5 | 8.6 |
| **Root vegetables** | 2 | 1 | 18.5 | 18.5 | 18.5 | 18.1 |
| **Potato** | 2 | 2 | 26.0 | 11.8 | 18.9 | 25.6 |
| **Domestic fruit** | 3 | 3 | 11.8 | 4.8 | 7.4 | 11.5 |
| **Milk** | 1 | 1 | 182.5 | 182.5 | 182.5 | Not applicable |
| **Cattle meat** | 1 | 1 | 11.8 | 11.8 | 11.8 | Not applicable |
| **Pig meat** | 1 | 1 | 8.4 | 8.4 | 8.4 | Not applicable |
| **Sheep meat** | 2 | 2 | 2.8 | 0.9 | 1.9 | 2.8 |
| **Poultry** | 2 | 1 | 15.4 | 15.4 | 15.4 | 15.1 |
| **Eggs** | 3 | 2 | 17.6 | 7.8 | 12.7 | 17.1 |
| **Wild/free foods** | 3 | 1 | 5.1 | 5.1 | 5.1 | 4.9 |
| **Rabbits/hares** | 1 | 1 | 2.8 | 2.8 | 2.8 | Not applicable |
| **Venison** | 1 | 1 | 26.5 | 26.5 | 26.5 | Not applicable |
| **Infant age group (0 - 5 years old)** | | | | | | |
| **Potato** | 4 | 4 | 19.7 | 19.7 | 19.7 | 19.7 |
| **Milk** | 1 | 1 | 182.5 | 182.5 | 182.5 | Not applicable |
| **Cattle meat** | 4 | 4 | 3.7 | 3.7 | 3.7 | 3.7 |
| **Pig meat** | 1 | 1 | 2.8 | 2.8 | 2.8 | Not applicable |
| **Sheep meat** | 6 | 1 | 4.8 | 4.8 | 4.8 | 4.3 |
| **Poultry** | 1 | 1 | 0.5 | 0.5 | 0.5 | Not applicable |
| **Eggs** | 4 | 4 | 5.9 | 5.0 | 5.7 | 5.9 |
| **Wild/free foods** | 5 | 3 | 2.0 | 2.0 | 2.0 | 2.0 |

# 6 DIRECT RADIATION PATHWAYS

## 6.1 Direct radiation survey area

The direct radiation survey area (shown in Figure 2) covered all land and sea within 1 km of the Sellafield nuclear licensed site boundary. The occupancy data collected from the direct radiation area is also applicable to the direct exposure arising from gaseous releases from the site.

The land within the direct radiation survey area is predominantly agricultural. To the north of the site there are many buildings that are used by the Sellafield site as well as a privately owned hotel. To the north-east of the site, a sewage treatment works is located approximately 0.2 km from the site fence and a small residential area is located close to the 1 km limit of the survey area. The River Calder flows from the north-east, through the middle of the site, and joins the River Ehen at the Calder Viaduct. Along the eastern side of the site there is a track that runs alongside the site perimeter. A golf course occupies a large part of the survey area to the south-east of the site, from the site boundary to the outer limit of the survey area.

The River Ehen flows from the north-west, parallel to the coastline along the south-western boundary of the site to the confluence with the River Calder and out into the Irish Sea. The Sellafield Rail Station is located close to the south-western corner of the site. There is a footbridge near the rail station that crosses the River Ehen but this has been closed to the public for many years. A cycle track runs along the south-western side of the site and this was used by members of the public to access the beach at Sellafield. The beach occupies a large part of the survey area to the west and south.

Since the last direct radiation survey undertaken at Sellafield in 2008, a large area of land to the north and west of the Sellafield site has been bought up by NuGen for the development of a new generation nuclear power station. The area of land is approximately 200 hectares (www.nugeneration.com). At the time of the 2013 habits survey, as a result of the land acquisition, three of the four residential properties within the direct radiation survey area were unoccupied and had been boarded up. The land in this area was previously farmed by three farmers but in 2013 it was farmed by one farmer.

## 6.2 Residential activities

Twenty-five residential properties were identified in the direct radiation survey area, one of which was temporarily unoccupied and three were boarded up. The main concentration of houses was in the north-east of the survey area near the 1 km survey area limit. Other residences were scattered throughout the survey area. Interviews were conducted at 13 residences, two of which included

families with children. One property was within the 0 – 0.25 km zone, three properties were within the >0.25 – 0.5 km zone and nine properties were within the >0.5 – 1.0 km zone.

### 6.3 Leisure activities

Two angling clubs were identified that had the fishing rights for the River Calder within the survey area upriver of Duke's Bridge which is located at the Sellafield site boundary. There is a pool in the river at Duke's Bridge that is suitable for angling but angling club officials and the site police ask anglers not to fish in this area. The closest regularly used fishing pool to the site boundary is approximately 70 m upstream of Duke's Bridge. However, the anglers tend to move along the river and fish in different pools rather than remaining in one area. Angling is not permitted along the section of the River Calder that flows through the Sellafield site as this is a conservation area. Angling was also popular on the beach at Sellafield.

Other leisure activities being undertaken on Sellafield beach included walking, dog walking and hobby fishing using nets from the shore. The golf course to the south-east of the site was regularly used by its members. No activities were identified along the track that runs along the eastern side of the Sellafield site. An allotment site with 20 plots was located to the north-east of the site and this was frequently visited by people attending their plots. Other activities within the survey area included attending a livery and attending a private game shoot.

The Sellafield Visitors Centre had closed since the 2008 habits survey. At the time of the 2013 habits survey the building was occasionally being used by workers associated with the Sellafield site.

### 6.4 Commercial activities

Only a few commercial activities took place in the direct radiation survey area. Four farmers had fields within the survey area. Green keepers maintained the golf course greens to the south-east of the site and other staff worked at the golf course club house. The Sellafield Rail Station was unmanned but there was a manned signal box near Sellafield Railway Station, although no one was available for interview during the fieldwork. Full time and part time staff worked at a privately owned hotel that had previously been owned by the Sellafield site. The sewage treatment works was unmanned and was only visited periodically by employees for routine operations.

There were many Sellafield workplaces outside of the licensed site boundary, such as Yottenfews and the Fellside Combined Heat and Power Plant.

## 6.5 Occupancy rates

Table 53 presents indoor, outdoor and total occupancy data for adults, children and infants. An analysis of the data by distance zones and occupancy rates is shown in Table 54. A summary of occupancy rates in the direct radiation survey area is presented in Table J.

***Table J. Summary of direct radiation occupancy rates***

| Zone | Number of observations | Highest indoor occupancy ($h\ y^{-1}$) | Highest outdoor occupancy ($h\ y^{-1}$) | Highest total occupancy ($h\ y^{-1}$) |
|---|---|---|---|---|
| **0 - 0.25 km** | 8 | 7667 | 3060 | 7882 |
| **>0.25 - 0.5 km** | 12 | 7814 | 2864 | 8536 |
| **>0.5 - 1.0 km** | 64 | 7476 | 3000 | 8376 |

***0 - 0.25 km from the nuclear licensed site boundary***

Occupancy data were collected for 8 individuals in the 0 - 0.25 km zone. The observations were for five residents, two farm workers and an angler who was fishing and walking along the River Calder. The highest indoor, outdoor and total occupancy rates were for residents; two of whom had the joint highest indoor and total occupancy rates.

***>0.25 - 0.5 km from the nuclear licensed site boundary***

Occupancy data were collected for 12 individuals in the >0.25 - 0.5 km zone. The observations were for six residents, five employees and one angler. The highest indoor, outdoor and total occupancy rates were for residents, one of whom had the highest indoor and total occupancy rates.

***>0.5 - 1.0 km from the nuclear licensed site boundary***

Occupancy data were collected for 64 people in the >0.5 - 1.0 km zone. The observations were for 19 residents, 27 employees (including farm workers, hotel staff and golf club staff) and 18 people undertaking leisure activities including attending an allotment plot, attending a livery, attending a game shoot, and fishing on the beach. One resident had the highest indoor occupancy rate and the highest total occupancy rate and one farm worker had the highest outdoor occupancy rate.

## 6.6 Gamma dose rate measurements

Gamma dose rate measurements were taken indoors and outdoors at most properties where interviews were conducted in the Sellafield direct radiation survey area. Outdoor measurements were taken approximately 5 to 10 metres from the nearest building where possible. Gamma dose rate measurements over rough grass were taken at locations at distances further than 5 km from the site centre to obtain background dose rates. All measurements were taken at a height of 1 metre above the substrate using a Mini 600 Series Type 6-81 Environmental Radiation Meter with a compensated Geiger-Müller tube. It should be noted that the indoor and outdoor measurements have not been adjusted for background dose rates. The results are presented in Table 55 and are summarised below.

***Indoor measurements***

- Eight measurements taken over concrete ranged from 0.073 µGy $h^{-1}$ to 0.138 µGy $h^{-1}$
- One measurement taken over stone was 0.091 µGy $h^{-1}$
- Three measurements taken over wood ranged from 0.093 µGy$h^{-1}$ to 0.101 µGy $h^{-1}$

***Outdoor measurements***

- Fourteen measurements taken over grass ranged from 0.059 µGy $h^{-1}$ to 0.094 µGy $h^{-1}$

***Background measurements***

- Three measurements taken over grass ranged from 0.054 µGy $h^{-1}$ to 0.073 µGy $h^{-1}$

Estimates of the average annual doses from background radiation to the population across the UK, by county, have been made by Public Health England (previously the Radiation Protection Division of the Health Protection Agency), the most recent of these being a review conducted in 2005 (Watson *et al*, 2005). Further information on background radiation relevant to the geographic region covered in the Sellafield habits survey can be found in the review.

# 7 USES OF HABITS DATA FOR DOSE ASSESSMENTS

## 7.1 Combined pathways

In determining habits data for the purposes of assessing radiological doses to the public, it may be necessary to consider a combination of pathways. Data are provided in Annex 1 and Annex 2 so that the full effect of combining pathways can be assessed for individual observations, given the concentrations and dose rates for a particular assessment. The rates for individuals in the high-rate groups are emboldened. In some circumstances, it will be possible to make simplifying assumptions and define the consumption and external exposure rates appropriate to a series of potential high-rate groups.

The most extensive combinations of pathways for adult dose assessment are shown in Table 56. Each of the 30 combinations shown in Table 56 represents an actual individual (or individuals) from Annex 1 who has positive data (irrespective of the magnitude), for each pathway marked with a cross. It should be noted that combination numbers in Table 56 do not correlate directly with observation numbers in Annex 1. Other individuals from Annex 1 have combinations that are not listed in Table 56 because they have fewer pathways and a dose assessment for them would be adequately covered by one of the 30 listed combinations.

## 7.2 Foetal dose assessment

Dose assessment of the foetus was introduced routinely for the first time in the Radioactivity in Food and the Environment report for 2005 (EA, EHS, FSA and SEPA, 2006), following the publication of recommendations by the Radiation Protection Division of the Health Protection Agency (National Radiological Protection Board, 2005). The adopted approach is to use the consumption and occupancy data for women of childbearing age in order to calculate the potential dose to the foetus. Therefore, consumption and occupancy data collected during the Sellafield habits survey for females of childbearing age are presented in Annex 5. The Office of National Statistics classifies women to be of childbearing age if they are between 15 – 44 years old (www.statistics.gov.uk); this age range has been used in Annex 5. It was not possible to collect ages for all female observations during the habits survey. However, these females with unknown ages have been included in Annex 5 as they might be women of childbearing age.

## 7.3 Total dose assessment

The UK environment agencies and the Food Standards Agency have considered ways of using habits data to calculate total dose retrospectively. The adopted approach is to use the adult consumption and occupancy data collected in each habits survey to create a matrix with a series of habits profiles

for each site. The relevant matrix for the Sellafield adults' profiled habits data is shown in Annex 6. The National Dose Assessment Working Group (NDAWG) has considered this approach to assessing retrospective total doses (Camplin *et al*, 2005) and has agreed that using habits profiles is an appropriate approach. Retrospective total doses around Sellafield are made using these profiles and reported in the Radioactivity in Food and the Environment reports (e.g. EA, FSA, NIEA and SEPA, 2010). Additionally, profiles have been created for the child and infant age groups, and for women of childbearing age. These are shown in Annexes 7, 8, and 9 respectively. They are not currently used in the Radioactivity in Food and the Environment reports.

# 8 COMPARISONS WITH THE PREVIOUS SURVEY

The results from this 2013 survey can be compared with results from the last Sellafield habits survey undertaken in 2008. The comparisons of consumption, intertidal occupancy and handling rates are for adults only. The comparisons of direct radiation occupancy rates include children and infants. The aquatic, terrestrial and direct radiation survey areas in the 2013 survey were the same as those in the 2008 survey.

## 8.1 Aquatic survey area

The main species of fish consumed by the adult high-rate group in 2008 were cod, plaice, mackerel and bass, and in 2013 the main species of fish were cod, thornback ray, bass, haddock and plaice. In 2008, the main species of crustaceans consumed by the adult high-rate group were brown crab, common lobster and *Nephrops*, and in 2013 the main species were *Nephrops*, brown crab, brown shrimp and common lobster. In 2008, the main species of molluscs consumed by the adult high-rate group were winkles, mussels and razor shells, and in 2013 the species were winkles and limpets. The main wildfowl consumed by the adult high-rate group in 2008 were goose (unspecified species), mallard and teal, and in 2013 were greylag goose, Canada goose and duck (unspecified species). In 2008, species of marine plants/algae consumed by the adult high-rate group were *Porphyra* and samphire, and in 2013, the only species was samphire.

A comparison between the 2008 and 2013 data for the consumption of aquatic foods is presented in Table K.

***Table K. Comparison between 2008 and 2013 consumption rates of aquatic food groups for adults***

| | 2008 | | | 2013 | | |
|---|---|---|---|---|---|---|
| **Food group** | **Number in high-rate group** | **Maximum consumption rate (kg $y^{-1}$)** | **Mean consumption rate for the high-rate group (kg $y^{-1}$)** | **Number in high-rate group** | **Maximum consumption rate (kg $y^{-1}$)** | **Mean consumption rate for the high-rate group (kg $y^{-1}$)** |
| **Fish** | 20 | 82.4 | 40.2 | 18 | 106.1 | 56.1 |
| **Crustaceans** | 18 | 30.7 | 16.8 | 14 | 47.9 | 25.3 |
| **Molluscs** | 4 | 49.1 | 31.4 | 1 | 15.3 | 15.3 |
| **Wildfowl** | 12 | 7.6 | 5.0 | 4 | 16.8 | 10.2 |
| **Marine plants/algae** | 3 | 0.2 | 0.2 | 2 | 0.1 | 0.1 |
| **Salt marsh grazed sheep meat** | Not identified | | | 6 | 1.9 | 1.9 |

For fish, in 2013 compared with 2008, there was an increase in the maximum consumption rate and the mean consumption rate for the adult high-rate group. This was due to the identification of two new high-rate consumers, one of whom was a hobby fisherman who caught large quantities of fish which was consumed by both people on a daily basis.

For crustaceans, the increase in the maximum consumption rate and the mean consumption rate for the adult high-rate group was attributed to several high-rate consumers who were identified in the 2012 LLWR habits survey but had not previously been identified. These included *Nephrops* trawler fishermen who consumed their own catch and a hobby fisherman who caught and consumed large quantities of crustaceans. In recent years there has been an increase in the fishing effort directed at *Nephrops* by the Whitehaven fleet which has led to an increase in the time spent fishing in the survey area. In previous years, many boats fished for *Nephrops* for 6 months of the year, whereas many boats now target *Nephrops* for most of the year. The 2012 LLWR data for the *Nephrops* fisherman has been used in the 2013 Sellafield data analysis.

There was a significant decrease in the maximum consumption rate and the mean consumption rate for the adult high-rate group for molluscs in 2013. This is because several people who had previously consumed large quantities of molluscs have stopped collecting and consuming molluscs for various reasons, such as due to old age or ill health. These people were also consuming a wide range of species including large quantities of winkles and mussels and smaller quantities of clams, cockles, razor shells and Pacific oysters. In 2013, only one person was identified consuming large quantities of winkles and other interviewees were consuming small quantities of winkles, mussels and whelks.

The increase in the consumption of wildfowl was due to the identification of new high-rate consumers. The consumption rates of marine plants were small in both years but decreased in 2013. The consumption of salt marsh grazed lamb was identified in 2012 during the habits survey around the LLWR site and the consumption data for this pathway has been included in this 2013 survey. The pathway was not identified during the 2008 Sellafield survey.

For intertidal occupancy, activities were recorded over the following seven substrates in 2008 and in 2013: mud; mud and sand; mud, sand and stones; rock; salt marsh; sand; sand and stones.

The following activities were undertaken by the individuals in the adult high-rate groups for intertidal substrates:

- In 2008: bait digging, wildfowling, collecting mussels, nature reserve warden duties, boat maintenance, walking, dog walking, collecting winkles, angling, setting nets, collecting razor shells, beach combing, collecting crabs and playing.
- In 2013: wildfowling, angling, bait digging, dog walking, boat maintenance, hooking for crabs and lobsters, tending livestock, walking, setting nets, collecting winkles, laying pots on the shore and beachcombing.

The following activities were undertaken by the individuals in the adult high-rate groups for handling fishing gear:

- In 2008: handling pots, nets and trawl gear.
- In 2013: handling pots and nets.

The following activities were undertaken by the individuals in the adult high-rate groups for handling sediment:

- In 2008: bait digging, collecting winkles, cockles and mussels.
- In 2013: collecting winkles.

A comparison between the 2008 and 2013 data for occupancy over intertidal substrates, handling fishing gear and handling sediment is shown in Table L.

***Table L. Comparison between 2008 and 2013 intertidal occupancy rates and handling rates of fishing gear and sediment for adults***

| | 2008 | | | 2013 | | |
|---|---|---|---|---|---|---|
| **Intertidal substrate or handling pathway** | **Number in high-rate group** | **Maximum occupancy or handling rate (h $y^{-1}$)** | **Mean occupancy or handling rate for the high-rate group (h $y^{-1}$)** | **Number in high-rate group** | **Maximum occupancy or handling rate (h $y^{-1}$)** | **Mean occupancy or handling rate for the high-rate group (h $y^{-1}$)** |
| **Mud** | 6 | 156 | 123 | 2 | 96 | 81 |
| **Mud and sand** | 4 | 942 | 581 | 4 | 234 | 163 |
| **Mud, sand and stones** | 5 | 720 | 510 | 5 | 490 | 316 |
| **Rock** | 3 | 50 | 30 | 4 | 105 | 74 |
| **Salt marsh** | 2 | 156 | 111 | 4 | 312 | 208 |
| **Sand** | 20 | 936 | 606 | 31 | 1035 | 546 |
| **Sand and stones** | 10 | 1043 | 565 | 8 | 828 | 486 |
| **Handling fishing gear** | 11 | 1200 | 975 | 7 | 1524 | 1120 |
| **Handling sediment** | 2 | 972 | 957 | 3 | 754 | 456 |

In 2013 compared with 2008, the mean rate for the high-rate group increased significantly for occupancy over rock and for occupancy over salt marsh. In 2013 compared with 2008, the mean rate for the high-rate group decreased for occupancy over the following five substrates: mud; mud and sand; mud, sand and stones; sand; and sand and stones. The most significant decrease was for occupancy over mud and sand.

The decrease in the occupancy rate over mud was mainly attributed to the bait digger with the maximum occupancy rate over mud in 2008 who was no longer spending time over mud in 2013 but was undertaking the same activity over mud and sand. The significant decrease in the occupancy rate over mud and sand was attributed to the two people with the highest occupancy rates over this substrate in 2008, a commercial bait digger and a nature reserve warden, spending more time over different substrates in 2013. In 2013, several anglers were identified fishing from the rocks so the mean occupancy rate for the high-rate group for rock increased significantly compared with 2008. The significant increase in occupancy over salt marsh in 2013 is due to the inclusion of two farmers who tend their livestock on the salt marsh who were not identified in the 2008 survey.

The mean rate for the high-rate group increased for handling fishing gear and decreased significantly for handling sediment. This significant decrease was due to a commercial shellfish collector's considerable reduction in time working on the shore collecting shellfish.

## 8.2 Terrestrial survey area

Activities in the terrestrial survey area in 2013 were broadly similar to those in 2008. The principal types of farm produce continued to be a mix of milk (from dairy cattle), beef cattle and lambs. Additionally in 2013, one farmer produced pigs and a new allotment site was identified.

The mean consumption rates for the adult high-rate group for terrestrial food groups from the 2008 and 2013 surveys are shown in Table M.

***Table M. Comparison between 2008 and 2013 mean consumption rates for the adult high-rate groups for terrestrial food groups (kg $y^{-1}$ or l $y^{-1}$)***

| Food group | 2008 | 2013 |
|---|---|---|
| **Green vegetables** | 40.7 | 21.6 |
| **Other vegetables** | 37.6 | 59.0 |
| **Root vegetables** | 35.2 | 33.9 |
| **Potato** | 89.7 | 124.3 |
| **Domestic fruit** | 45.5 | 32.7 |
| **Milk** | 221.3 | 184.9 |
| **Cattle meat** | 33.9 | 38.1 |
| **Pig meat** | Not identified | 17.3 |
| **Sheep meat** | 14.4 | 9.4 |
| **Poultry** | 9.0 | 20.5 |
| **Eggs** | 22.0 | 15.3 |
| **Wild/free foods** | 6.2 | 5.3 |
| **Rabbits/hares** | 1.9 | 2.8 |
| **Honey** | 8.7 | 0.2 |
| **Wild fungi** | 1.9 | 1.7 |
| **Venison** | 13.6 | 26.5 |
| **Freshwater fish** | 2.3 | 1.4 |

Consumption rates increased in 2013 in the following six food groups: other vegetables; potato; cattle meat; poultry; rabbits/hares; venison. Consumption rates decreased in 2013 in the following 10 food groups: green vegetables; root vegetables; domestic fruit; milk; sheep meat; eggs; wild/free foods; honey; wild fungi; freshwater fish.

There were relatively large increases in the mean consumption rates for the adult high-rate groups for poultry and venison. There were relatively large decreases in the mean consumption rates for the adult high-rate groups for green vegetables and honey. The consumption of pig meat was identified in 2013 but was not identified in 2008.

The increase in the mean consumption rate for the high-rate group for poultry and venison was attributed to newly identified consumers who consumed large quantities of pheasant, pigeon and venison. The significant decrease in the consumption of honey due to a decline in the number of beekeepers keeping hives in the survey area. No specific reasons were identified for the other changes in consumption rates.

People were identified consuming spring water and well water in 2008 and 2013. In 2008, the occupants of one property were drinking fell water but in 2013 no one at this property was available for an interview. Livestock were identified drinking water from wells, springs, streams and ditches in both 2008 and 2013.

### 8.3 Direct radiation survey area

The activities identified in the direct radiation survey area in 2008 and 2013 were similar including residing, working, dog walking, walking, angling and fishing. At the time of the 2013 habits survey, a large area of land to the north and west of the Sellafield site had been bought up by NuGen for the development of a new generation nuclear power station. As a result of this, three residential properties within the direct radiation survey area were unoccupied and had been boarded up but the land in this area was still being farmed. A hotel was located in the survey area which was owned by the Sellafield site in 2008 but was privately owned in 2013. An allotment site with 20 plots had been started in 2011 and the site was frequently used in 2013 by the allotment plot holders.

The Sellafield Visitors Centre had closed since the 2008 habits survey. At the time of the habits survey in 2013 the building was occasionally being used by workers associated with the Sellafield site.

A comparison between the 2008 and 2013 direct radiation occupancy rates, by zone, is presented in Table N.

| *Table N. Comparison between 2008 and 2013 direct radiation occupancy rates (h $y^{-1}$)* | | |
|---|---|---|
| | **2008** | **2013** |
| ***0 - 0.25 km zone*** | | |
| Highest indoor | 8136 | 7667 |
| Highest outdoor | 3298 | 3060 |
| Highest total | 8340 | 7882 |
| ***>0.25 - 0.5 km zone*** | | |
| Highest indoor | 7666 | 7814 |
| Highest outdoor | 3392 | 2864 |
| Highest total | 8396 | 8536 |
| ***>0.5 - 1 km zone*** | | |
| Highest indoor | 7808 | 7476 |
| Highest outdoor | 1890 | 3000 |
| Highest total | 8190 | 8376 |

In 2008 and 2013, with the exception of the highest outdoor occupancy rate for the >0.5 – 1.0 km zone which was for a farm worker who did not live in the area, in all three zones the highest indoor, outdoor and total occupancy rates were for residents. Some of the residents were also farming in the area. In the direct radiation survey area in 2013 compared with 2008, the most significant change was an increase in the highest outdoor occupancy rate in the >0.5 - 1 km zone from 1900 h $y^{-1}$ in 2008 to 3000 h $y^{-1}$ in 2013. Other changes in occupancy were slight.

In the Sellafield direct radiation survey area, nine sets of gamma dose measurements taken in 2013 can be compared with those taken at the same properties in 2008. These data are shown in Table O.

| *Table O. Comparison between 2008 and 2013 gamma dose rates (µGy $h^{-1}$)* | | | | |
|---|---|---|---|---|
| | **Indoor** | | **Outdoor** | |
| **Location** | **2008** | **2013** | **2008** | **2013** |
| Residence 1 | 0.095 | - | 0.081 | 0.079 |
| Residence 2 | 0.096 | 0.091 | 0.085 | 0.085 |
| Residence 3 | - | 0.094 | 0.071 | 0.076 |
| Residence 4 | 0.099 | 0.079 | 0.077 | 0.068 |
| Residence 7 | 0.126 | 0.101 | 0.091 | 0.085 |
| Residence 8 | 0.097 | 0.109 | 0.090 | 0.088 |
| Residence 9 | 0.134 | 0.138 | 0.097 | 0.094 |
| Residence 11 | 0.116 | 0.119 | 0.102 | 0.091 |
| Residence 13 | - | 0.107 | 0.085 | 0.090 |

Notes
These measurements have not been adjusted for background dose rates.
The locations correspond to those in Table 55.

# 9 MAIN FINDINGS

The survey investigated three potential sources of public radiation exposure from the Sellafield site, which were:

- Discharges of liquid radioactive waste to the Irish Sea
- Discharges of gaseous radioactive waste to the atmosphere
- Emissions of direct radiation

Data were collected for 386 individuals including, for example, commercial and hobby fishermen, shellfish collectors, anglers, people spending time on intertidal substrates, farmers, gardeners, and people spending time within the direct radiation survey area. These people were targeted because their habits and where they live may cause them to be exposed to radioactivity from the site. However, it should be noted that the most exposed people can only be defined with the outcome of a dose assessment. All consumption rates recorded are only for foods produced, collected or caught from within the aquatic and terrestrial survey areas as defined in Section 2.3.

## 9.1 Aquatic survey area

The mean consumption rate for the adult high-rate group (as defined in Section 3.4) for the separate aquatic consumption pathways for foods potentially affected by liquid discharges were:

- 56 kg $y^{-1}$ for fish
- 25 kg $y^{-1}$ for crustaceans
- 15 kg $y^{-1}$ for molluscs
- 10 kg $y^{-1}$ for wildfowl
- 0.1 kg $y^{-1}$ for marine plants/algae
- 1.9 kg $y^{-1}$ for salt marsh grazed sheep meat

The predominant foods consumed by the high-rate groups were:

- For fish: cod, thornback ray, bass, haddock, plaice
- For crustaceans: *Nephrops,* brown crab and brown shrimp
- For molluscs: winkles and limpets
- For wildfowl: greylag goose, Canada goose and duck (unspecified species)
- For marine plants/algae: samphire
- For salt marsh grazed sheep meat; salt marsh grazed lamb

Seaweed was used as a fertiliser on an allotment plot where fruit and vegetables were grown. The use of seaweed as an animal feed was not identified.

The mean occupancy rates for adult high-rate groups over the separate intertidal substrates were:

- 81 h $y^{-1}$ for mud
- 160 h $y^{-1}$ for mud and sand
- 320 h $y^{-1}$ for mud, sand and stones
- 74 h $y^{-1}$ for rock
- 210 h $y^{-1}$ for salt marsh
- 550 h $y^{-1}$ for sand
- 490 h $y^{-1}$ for sand and stones

The mean handling rate for the adult high-rate groups for handling were:

- 1100 h $y^{-1}$ for handling fishing gear
- 460 h $y^{-1}$ for handling sediment

The adult maximum occupancy rates for water based activities were:

- 90 h $y^{-1}$ for 'in water'
- 2000 h $y^{-1}$ for 'on water'

## 9.2 Terrestrial survey area

The mean consumption rates for the adult high-rate groups for the separate consumption pathways for foods potentially affected by gaseous discharges were:

- 22 kg $y^{-1}$ for green vegetables
- 59 kg $y^{-1}$ for other vegetables
- 34 kg $y^{-1}$ for root vegetables
- 120 kg $y^{-1}$ for potato
- 33 kg $y^{-1}$ for domestic fruit
- 180 l $y^{-1}$ for milk
- 38 kg $y^{-1}$ for cattle meat
- 17 kg $y^{-1}$ for pig meat
- 9.4 kg $y^{-1}$ for sheep meat
- 21 kg $y^{-1}$ for poultry
- 15 kg $y^{-1}$ for eggs
- 5.3 kg $y^{-1}$ for wild/free foods
- 2.8 kg $y^{-1}$ for rabbits/hares
- 0.2 kg $y^{-1}$ for honey
- 1.7 kg $y^{-1}$ for wild fungi
- 27 kg $y^{-1}$ for venison
- 1.4 kg $y^{-1}$ for freshwater fish

The consumption of foodstuffs by individuals in the child age group (6 – 15 years old) and in the infant age group (0 – 5 years old) was also recorded.

The consumption of groundwater by humans and livestock was identified. Three households used spring water and one household used well water as their domestic supply. Seven farmers supplied their livestock with spring water or well water for drinking. Livestock also had access ditches and streams for drinking.

Control measures taken by the site operator in order to limit the possibility that contamination is transferred off-site by wildlife included actively managing the seagull and pigeon populations on site by culling and the removal of nests and nesting material.

### 9.3 Direct radiation survey area

The highest indoor, outdoor and total occupancy rates in the 0 – 0.25 km, >0.25 – 0.5 km and >0.5 – 1.0 km zones were for residents, with the exception of the highest outdoor occupancy rate which was for a farmer who did not live in the area. The highest indoor, outdoor and total occupancy rates recorded for all zones were:

***0 - 0.25 km zone***

- 7700 h $y^{-1}$ for the indoor occupancy rate
- 3100 h $y^{-1}$ for the outdoor occupancy rate
- 7900 h $y^{-1}$ for the total occupancy rate

***>0.25 - 0.5 km zone***

- 7800 h $y^{-1}$ for the indoor occupancy rate
- 2900 h $y^{-1}$ for the outdoor occupancy rate
- 8500 h $y^{-1}$ for the total occupancy rate

***>0.5 - 1 km zone***

- 7500 h $y^{-1}$ for the indoor occupancy rate
- 3000 h $y^{-1}$ for the outdoor occupancy rate
- 8400 h $y^{-1}$ for the total occupancy rate

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# 10 RECOMMENDATIONS FOR CHANGES TO THE MONITORING PROGRAMME

The information collected during this habits survey can be used to make recommendations for changes to the current monitoring programmes operated by the Environment Agency and the Food Standards Agency, and published in the RIFE report (EA, FSA, NIEA and SEPA, 2013).

## 10.1 Summary of current environmental monitoring programmes

The 2012 monitoring programmes relevant to the areas covered in this report included the samples and measurements listed below. The location names, foods and substrate classifications are taken directly from RIFE.

### *Aquatic monitoring*

**Aquatic samples**

| ***Sample*** | ***Location*** |
|---|---|
| Cod | Parton |
| Cod | Whitehaven |
| Plaice | Whitehaven |
| Skates/rays | Whitehaven |
| Sole | Whitehaven |
| Cod | Sellafield coastal area |
| Plaice | Sellafield coastal area |
| Bass | Sellafield coastal area |
| Grey mullet | Sellafield coastal area |
| Cod | Sellafield offshore area |
| Dab | Sellafield offshore area |
| Plaice | Sellafield offshore area |
| Lesser spotted dogfish | Sellafield offshore area |
| Gurnard | Sellafield offshore area |
| Skates/rays | Sellafield offshore area |
| Spurdog | Sellafield offshore area |
| Brown trout | River Calder |
| Cod | Ravenglass |
| Plaice | Ravenglass |
| Crabs | Parton |
| Lobsters | Parton |
| Winkles | Parton |
| *Nephrops* | Whitehaven |
| Cockles | Whitehaven |
| Mussels | Whitehaven |
| Mussels | Whitehaven outer harbour |
| Winkles | Saltom Bay |

| | |
|---|---|
| Winkles | St Bees |
| Mussels | St Bees |
| Limpets | St Bees |
| Winkles | Nethertown |
| Mussels | Nethertown |
| Crabs | Sellafield coastal area |
| Lobsters | Sellafield coastal area |
| *Nephrops* | Sellafield coastal area |
| Winkles | Sellafield coastal area |
| Mussels | Sellafield coastal area |
| Limpets | Sellafield coastal area |
| Shrimps | Whitriggs |
| Winkles | Drigg |
| Crabs | Ravenglass |
| Lobsters | Ravenglass |
| Winkles | Ravenglass |
| Cockles | Ravenglass |
| Mussels | Ravenglass |
| Winkles | Tarn Bay |

**Gamma dose rate measurements over intertidal sediments**

| ***Substrate*** | ***Location*** |
|---|---|
| Sand | Whitehaven – outer harbour |
| Pebbles and sand | Whitehaven – outer harbour |
| Sand and stones | Whitehaven – outer harbour |
| Sand | St Bees |
| Pebbles and stones | Nethertown beach |
| Stones | Nethertown beach |
| Pebbles and stones | Braystones |
| Grass | Sellafield dunes |
| Sand | North of former pipeline on foreshore |
| Sand | South of former pipeline on foreshore |
| Grass | River Calder downstream of factory sewer |
| Grass | River Calder upstream of factory sewer |
| Sand | Seascale beach |
| Pebbles and sand | Seascale beach |
| Grass | Seascale |
| Grass and mud | Ravenglass – Carleton Marsh |
| Grass | Ravenglass – Carleton Marsh |
| Grass and salt marsh | Ravenglass – River Mite estuary (erosional) |
| Grass | Ravenglass – River Mite estuary (erosional) |
| Salt marsh | Ravenglass – Raven Villa |
| Pebbles and sand | Ravenglass – boat area |
| Sand and stones | Ravenglass – boat area |
| Pebbles | Ravenglass – boat area |
| Pebbles and stones | Ravenglass – boat area |
| Mud | Ravenglass - ford |

| | |
|---|---|
| Mud and sand | Ravenglass - ford |
| Mud and pebbles | Ravenglass - ford |
| Grass | Muncaster Bridge |
| Mud and stones | Ravenglass – salmon garth |
| Pebbles and sand | Ravenglass – salmon garth |
| Sand and stones | Ravenglass – salmon garth |
| Mud | Ravenglass – Eskmeals Nature Reserve |
| Salt marsh | Ravenglass – Eskmeals Nature Reserve |
| Mud | Newbiggin/Eskmeals viaduct |
| Mud and pebbles | Newbiggin/Eskmeals viaduct |
| Salt marsh | Newbiggin/Eskmeals viaduct |
| Salt marsh | Newbiggin/Eskmeals Bridge |
| Grass and salt marsh | Newbiggin/Eskmeals Bridge |
| Salt marsh | Tarn Bay |
| Sand | Tarn Bay |

### *Terrestrial monitoring*

**Terrestrial samples**

Milk

Apples

Barley

Beef kidney

Beef liver

Beef muscle

Blackberries

Blackcurrants

Cabbage

Carrots

Duck

Eggs

Honey

Mushrooms

Oats

Onions

Pheasants

Potatoes

Rabbit

Runner beans

Sheep muscle

Sheep offal

Swede

Turnips
Wood pigeon muscle
Grass
Soil

## 10.2 Recommendations

Recommendations for changes to the current environmental monitoring programmes are made below. They are based on the findings of this survey and also take into account the potential radiological significance of the various pathways that were identified.

It is recommended that the samples and gamma dose rate measurements currently taken, which are not listed below, remain unchanged in the monitoring programmes.

***Environment Agency monitoring***

The current environmental monitoring programme adequately covers the Sellafield area. However, the following suggestions to changes in the substrates over which gamma dose rate measurements are taken:

- The current measurement taken over sand and stones at Whitehaven outer harbour could be changed to mud and sand at Whitehaven outer harbour since this was the substrate that many bait diggers were spending time on.
- The current measurement taken over pebbles and stones at Braystones could be changed to sand as many activities were undertaken over this substrate.

***Food Standards Agency monitoring***

The current food monitoring programme adequately covers the Sellafield area and no changes to this are suggested.

## 11 ACKNOWLEDGEMENTS

Gratitude is expressed to representatives of Sellafield, local authorities, associations and members of the public who offered helpful advice and information during the survey. This survey was undertaken on behalf of the Environment Agency, the Food Standards Agency and the Office for Nuclear Regulation. The project officers for these organisations provided considerable help during the planning of the survey and the drafting of the report.

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www.nugeneration.com

www.statistics.gov.uk

**Table 1. Survey coverage**

| Group | Criteria | Estimate of complete coverage | Number for whom positive data was obtained | Coverage for positive observations | Notes |
|---|---|---|---|---|---|
| **SUMMARY OF ALL PATHWAYS** | | | | | |
| All potential interviewees in the Sellafield aquatic, terrestrial and direct radiation survey areas. | Number of people resident in the terrestrial survey area (excluding those resident in the direct radiation survey area) (See **(B) TERRESTRIAL PATHWAYS**) | 3,410[a] | 86[c] | 2.5% | The survey targeted individuals who were potentially the most exposed, mostly producers of local foods such as farmers and allotment holders. |
| | Number of people resident in the direct radiation survey area (See **(C) DIRECT RADIATION PATHWAYS**) | 50[b] | 30[c] | 60% | Interviews were conducted at 13 residences. |
| | Number of people employed, visiting and undertaking leisure actvities in the direct radiation survey area (See **(C) DIRECT RADIATION PATHWAYS**) | U | 44[c] | U | Excluding people living in the direct radiation survey area and employees and contractors of the Sellafield site. |
| | Number of people effected by liquid discharges (excluding those assigned to other categories above) (See **(A) AQUATIC PATHWAYS**) | U | 226[c] | U | |
| | Total for aquatic, terrestrial and direct radiation survey areas | U | 386[c] | U | |
| **(A) AQUATIC PATHWAYS** | | | | | |
| Commercial fishermen | Number of commercial fishing vessels based in the aquatic survey area | 19 | 10 | 53% | Includes part-time and full-time commercial fishermen. |
| People undertaking activities in or on water (e.g. swimming and angling) | Number of people undertaking activities in or on water in the aquatic survey area | U | 58 | U | Includes commercial fishermen, boat anglers etc. |
| People using the shore including anglers, dog walkers and people playing etc. | Number of people undertaking intertidal activities in the aquatic survey area | U | 147 | U | |
| Fish consumers | Number of people consuming fish from the aquatic survey area | U | 121 | U | |
| Shellfish consumers | Number of people consuming shellfish from the aquatic survey area | U | 58 | U | |
| Wildfowl consumers | Number of people consuming wildfowl from the aquatic survey area | U | 11 | U | |

**Table 1. Survey coverage**

| Group | Criteria | Estimate of complete coverage | Number for whom positive data was obtained | Coverage for positive observations | Notes |
|---|---|---|---|---|---|
| **(B) TERRESTRIAL PATHWAYS** | | | | | |
| Farmers | Number of farmers and their family members consuming food from the terrestrial survey area | 117 | 93 | 79% | Interviews were conducted at 25 working farms out of a total of 31 farms identified within the survey area. |
| Allotment holders | Number of allotment holders and their family members consuming food from the terrestrial survey area | 40 | 6 | 15% | |
| Fruit and vegetable gardeners | Number of gardeners and their family members consuming food from the terrestrial survey area | U | 10 | U | |
| **(C) DIRECT RADIATION PATHWAYS** | | | | | |
| Residents | Number of residents in the survey area | 50 | 30 | 60% | Interviews were conducted at 13 residences. |
| Employees | Number of people employed in the survey area | U | 34 | U | Excluding people living in the direct radiation survey area and employees and contractors of the Sellafield site. |
| Visitors and people undertaking leisure activities | Number of visitors to the survey area | U | 10 | U | |
| **BREAKDOWN OF AGE GROUPS** | | | | | |
| Adult | 16-year-old and over | 2,930 | 349 | 12% | |
| Child | 6-year-old to 15-year-old | 310 | 23 | 7% | |
| Infant | 0 to 5-year-old | 170 | 14 | 8% | |

**Notes**

[a] Estimate of the number of people resident in the 5 km terrestrial survey area based on data from www.statistics.gov.uk.

[b] Estimate of the number of people resident in the 1 km direct radiation survey area based on data from www.statistics.gov.uk.

b The number of people for whom positive data was obtained for pathways (A) and (B) and (C) will usually not equal the relevant totals in the summary of all pathways. This is because in sections (A), (B) and (C) some individuals may be counted two or more times, for example someone who goes shore angling and consumes the catch.

U - Unknown

**Table 2. Typical food groups used in habits surveys**

| Food group | Examples of foods within the group |
|---|---|
| Green vegetables | Asparagus, broccoli, Brussels sprout, cabbage, calabrese, cauliflower, chard, courgette, cucumber, gherkin, globe artichoke, herbs, kale, leaf beet, lettuce, marrow, spinach |
| Other vegetables | Aubergine, broad bean, chilli pepper, French bean, kohl rabi, mangetout, pea, pepper, pumpkin, runner bean, sweetcorn, tomato |
| Root vegetables | Beetroot, carrot, celeriac, celery, chicory, fennel, garlic, Jerusalem artichoke, leek, onion, parsnip, radish, shallot, spring onion, swede, turnip |
| Potato | Potato |
| Domestic fruit | Apple, apricot, blackberry, blackcurrant, boysenberry, cherry, damson, fig, gooseberry, grape, greengage, huckleberry, loganberry, melon, nectarine, peach, pear, plum, raspberry, redcurrant, rhubarb, rowanberry, strawberry, tayberry, whitecurrant |
| Milk | Cows' milk, cream, goats' milk, yoghurt |
| Cattle meat[a] | Beef |
| Pig meat[a] | Pork |
| Sheep meat[a] | Lamb, mutton |
| Poultry[b] | Chicken, duck, goose, grouse, guinea fowl, partridge, pheasant, pigeon, turkey, woodcock |
| Eggs | Chicken egg, duck egg, goose egg |
| Wild/free foods | Blackberry, chestnut, crab apple, damson, dandelion root, elderberry, nettle, rowanberry, sloe |
| Honey | Honey |
| Wild fungi | Mushrooms, other edible fungi |
| Rabbits/Hares | Hare, rabbit |
| Venison[a] | Venison |
| Fish (sea) | Bass, brill, cod, common ling, dab, Dover sole, flounder, gurnard, haddock, hake, herring, lemon sole, mackerel, monkfish, mullet, plaice, pollack, rays, saithe, salmon, sea trout, sprat, turbot, whitebait, whiting, witch, cuttlefish[c], squid[c] |
| Fish (freshwater) | Brown trout, eel (river), perch, pike, rainbow trout, salmon (river) |
| Crustaceans | Brown crab, common lobster, crawfish, *Nephrops* , prawn, shrimp, spider crab, squat lobster, velvet swimming crab |
| Molluscs | Cockles, limpets, mussels, oysters, razor clam, scallops, whelks, winkles |
| Wildfowl[b] | Canada goose, greylag goose, mallard, pink-footed goose, pintail, shoveler, teal, wigeon |

**Notes**

[a] Including offal

[b] Domesticated ducks and geese are classified as poultry. Wild ducks and geese are classified as wildfowl.

[c] Although squid and cuttlefish are molluscs, radiologically they are more akin to fish.

**Table 3. Adults' consumption rates of fish from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Bass | Brill | Cod | Dab | Dover sole | Flounder | Grey mullet | Haddock | Mackerel | Plaice | Pollack | Red gurnard | Salmon | Sea trout | Smelt | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **95** | **5.4** | **-** | **79.4** | **-** | **-** | **-** | **-** | **-** | **-** | **5.4** | **-** | **-** | **-** | **-** | **-** | **-** | **15.9** | **-** | **-** | **106.1** |
| **97** | **5.4** | **-** | **79.4** | **-** | **-** | **-** | **-** | **-** | **-** | **5.4** | **-** | **-** | **-** | **-** | **-** | **-** | **15.9** | **-** | **-** | **106.1** |
| **188** | **7.3** | **-** | **9.1** | **-** | **4.5** | **-** | **9.1** | **10.0** | **7.3** | **-** | **7.3** | **-** | **4.5** | **-** | **-** | **6.8** | **10.0** | **4.1** | **7.3** | **87.1** |
| **189** | **-** | **-** | **27.2** | **-** | **-** | **-** | **11.3** | **34.5** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **73.0** |
| **187** | **-** | **-** | **27.2** | **-** | **-** | **-** | **9.1** | **34.5** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **70.8** |
| **198** | **-** | **-** | **22.5** | **-** | **-** | **-** | **-** | **-** | **-** | **15.0** | **-** | **-** | **-** | **-** | **-** | **-** | **22.5** | **-** | **-** | **59.9** |
| **87** | **-** | **-** | **31.3** | **-** | **-** | **-** | **-** | **-** | **-** | **5.0** | **-** | **-** | **-** | **-** | **-** | **-** | **15.4** | **-** | **-** | **51.7** |
| **161** | **-** | **-** | **15.9** | **-** | **-** | **-** | **-** | **-** | **-** | **15.9** | **-** | **-** | **-** | **-** | **-** | **-** | **15.9** | **-** | **-** | **47.6** |
| **162** | **-** | **-** | **15.9** | **-** | **-** | **-** | **-** | **-** | **-** | **15.9** | **-** | **-** | **-** | **-** | **-** | **-** | **15.9** | **-** | **-** | **47.6** |
| **146** | **9.1** | **-** | **9.1** | **-** | **2.3** | **-** | **2.3** | **-** | **9.1** | **2.3** | **2.3** | **1.1** | **-** | **-** | **-** | **-** | **6.8** | **-** | **-** | **44.2** |
| **147** | **9.1** | **-** | **9.1** | **-** | **2.3** | **-** | **2.3** | **-** | **9.1** | **2.3** | **2.3** | **1.1** | **-** | **-** | **-** | **-** | **6.8** | **-** | **-** | **44.2** |
| **151** | **9.1** | **-** | **9.1** | **-** | **2.3** | **-** | **2.3** | **-** | **9.1** | **2.3** | **2.3** | **1.1** | **-** | **-** | **-** | **-** | **6.8** | **-** | **-** | **44.2** |
| **152** | **9.1** | **-** | **9.1** | **-** | **2.3** | **-** | **2.3** | **-** | **9.1** | **2.3** | **2.3** | **1.1** | **-** | **-** | **-** | **-** | **6.8** | **-** | **-** | **44.2** |
| **45** | **38.8** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **38.8** |
| **85** | **-** | **-** | **22.2** | **-** | **-** | **-** | **-** | **-** | **-** | **3.6** | **-** | **-** | **-** | **-** | **-** | **-** | **10.9** | **-** | **-** | **36.7** |
| **86** | **-** | **-** | **22.2** | **-** | **-** | **-** | **-** | **-** | **-** | **3.6** | **-** | **-** | **-** | **-** | **-** | **-** | **10.9** | **-** | **-** | **36.7** |
| **96** | **1.8** | **-** | **26.3** | **-** | **-** | **-** | **-** | **-** | **-** | **1.8** | **-** | **-** | **-** | **-** | **-** | **-** | **5.4** | **-** | **-** | **35.4** |
| **191** | **-** | **-** | **13.6** | **-** | **-** | **-** | **4.5** | **17.2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **35.4** |
| 102 | 2.3 | - | 9.1 | - | - | - | - | - | 5.1 | 6.8 | 6.8 | 1.6 | - | - | - | - | - | - | - | 31.7 |
| 103 | 2.3 | - | 9.1 | - | - | - | - | - | 5.1 | 6.8 | 6.8 | 1.6 | - | - | - | - | - | - | - | 31.7 |
| 17 | 28.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 28.8 |
| 92 | - | - | 7.3 | - | - | - | - | - | - | 14.1 | - | - | - | - | - | - | 2.3 | - | - | 23.6 |
| 93 | - | - | 7.3 | - | - | - | - | - | - | 14.1 | - | - | - | - | - | - | 2.3 | - | - | 23.6 |
| 94 | - | - | 7.3 | - | - | - | - | - | - | 14.1 | - | - | - | - | - | - | 2.3 | - | - | 23.6 |
| 77 | - | - | 0.5 | - | - | - | - | - | 6.9 | - | 1.7 | - | 12.7 | - | - | - | - | - | 0.5 | 22.3 |
| 75 | - | - | 0.5 | - | - | - | - | - | 6.9 | - | 1.7 | - | 12.7 | - | - | - | - | - | 0.5 | 22.3 |
| 76 | - | - | 0.5 | - | - | - | - | - | 6.9 | - | 1.7 | - | 12.7 | - | - | - | - | - | 0.5 | 22.3 |
| 127 | - | - | 6.8 | - | - | - | - | - | 3.2 | 3.2 | - | - | - | - | - | - | 9.1 | - | - | 22.2 |
| 128 | - | - | 6.8 | - | - | - | - | - | 3.2 | 3.2 | - | - | - | - | - | - | 9.1 | - | - | 22.2 |

**Table 3. Adults' consumption rates of fish from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Bass | Brill | Cod | Dab | Dover sole | Flounder | Grey mullet | Haddock | Mackerel | Plaice | Pollack | Red gurnard | Salmon | Sea trout | Smelt | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 148 | 4.5 | - | 4.5 | - | 1.1 | - | 1.1 | - | 4.5 | 1.1 | 1.1 | 0.6 | - | - | - | - | 3.4 | - | - | 22.1 |
| 256 | - | - | 2.5 | 1.5 | - | 1.5 | - | - | 8.0 | 1.5 | - | - | - | - | - | - | 4.0 | - | - | 19.0 |
| 164 | - | - | - | - | - | - | - | - | - | 8.2 | - | 0.6 | - | - | - | - | 8.2 | - | 1.8 | 18.7 |
| 165 | - | - | - | - | - | - | - | - | - | 8.2 | - | 0.6 | - | - | - | - | 8.2 | - | 1.8 | 18.7 |
| 166 | - | - | - | - | - | - | - | - | - | 8.2 | - | 0.6 | - | - | - | - | 8.2 | - | 1.8 | 18.7 |
| 38 | 5.0 | - | 11.0 | - | - | - | - | - | - | 2.0 | - | - | - | - | - | - | - | - | - | 17.9 |
| 40 | 5.0 | - | 11.0 | - | - | - | - | - | - | 2.0 | - | - | - | - | - | - | - | - | - | 17.9 |
| 41 | 5.0 | - | 11.0 | - | - | - | - | - | - | 2.0 | - | - | - | - | - | - | - | - | - | 17.9 |
| 272 | 3.5 | - | 3.5 | - | - | - | - | - | 3.5 | 3.5 | 3.5 | - | - | - | - | - | - | - | - | 17.7 |
| 123 | 2.3 | - | 6.8 | 1.4 | - | 1.4 | - | - | - | 2.3 | - | - | - | - | - | - | - | 0.7 | - | 14.7 |
| 124 | 2.3 | - | 6.8 | 1.4 | - | 1.4 | - | - | - | 2.3 | - | - | - | - | - | - | - | 0.7 | - | 14.7 |
| 153 | 3.0 | - | 3.0 | - | 0.7 | - | 0.7 | - | 3.0 | 0.7 | 0.7 | 0.4 | - | - | - | - | 2.2 | - | - | 14.6 |
| 155 | 3.0 | - | 3.0 | - | 0.7 | - | 0.7 | - | 3.0 | 0.7 | 0.7 | 0.4 | - | - | - | - | 2.2 | - | - | 14.6 |
| 154 | 3.0 | - | 3.0 | - | 0.7 | - | 0.7 | - | 3.0 | 0.7 | 0.7 | 0.4 | - | - | - | - | 2.2 | - | - | 14.6 |
| 204 | - | - | - | - | - | - | - | - | - | 14.2 | - | - | - | - | - | - | - | - | - | 14.2 |
| 205 | - | - | - | - | - | - | - | - | - | 14.2 | - | - | - | - | - | - | - | - | - | 14.2 |
| 206 | - | - | - | - | - | - | - | - | - | 14.2 | - | - | - | - | - | - | - | - | - | 14.2 |
| 195 | - | 1.4 | 4.1 | - | 2.3 | - | - | - | - | 4.1 | - | - | - | - | - | - | - | - | - | 11.8 |
| 196 | - | 1.4 | 4.1 | - | 2.3 | - | - | - | - | 4.1 | - | - | - | - | - | - | - | - | - | 11.8 |
| 252 | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | 11.8 |
| 253 | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | 11.8 |
| 194 | - | 1.4 | 4.1 | - | 2.3 | - | - | - | - | 4.1 | - | - | - | - | - | - | - | - | - | 11.8 |
| 215 | - | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.3 | 2.6 | - | 10.5 |
| 216 | - | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.3 | 2.6 | - | 10.5 |
| 229 | 2.0 | - | 2.0 | - | - | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | 10.0 |
| 230 | 2.0 | - | 2.0 | - | - | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | 10.0 |
| 44 | 9.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9.7 |
| 144 | - | - | 5.4 | - | - | - | - | - | - | 1.1 | - | - | - | - | - | - | 2.3 | - | - | 8.8 |
| 338 | 2.9 | - | 2.9 | - | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | - | - | 8.7 |

**Table 3. Adults' consumption rates of fish from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Bass | Brill | Cod | Dab | Dover sole | Flounder | Grey mullet | Haddock | Mackerel | Plaice | Pollack | Red gurnard | Salmon | Sea trout | Smelt | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 339 | 2.9 | - | 2.9 | - | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | - | - | 8.7 |
| 308 | - | - | - | - | - | - | - | - | 2.2 | - | - | - | 5.5 | - | - | - | - | - | - | 7.7 |
| 309 | - | - | - | - | - | - | - | - | 2.2 | - | - | - | 5.5 | - | - | - | - | - | - | 7.7 |
| 185 | 1.4 | - | 2.3 | - | - | 1.8 | - | - | - | - | - | - | 1.8 | - | - | - | - | - | - | 7.3 |
| 382 | - | - | 1.3 | - | - | - | - | 0.8 | - | 0.9 | - | - | 2.3 | 1.9 | - | - | - | - | - | 7.2 |
| 381 | - | - | 1.3 | - | - | - | - | 0.8 | - | 0.9 | - | - | 2.3 | 1.9 | - | - | - | - | - | 7.2 |
| 303 | - | - | - | - | - | - | - | - | - | - | - | - | 6.8 | - | - | - | - | - | - | 6.8 |
| 304 | - | - | - | - | - | - | - | - | - | - | - | - | 6.8 | - | - | - | - | - | - | 6.8 |
| 7 | 5.6 | - | - | - | - | 0.4 | - | - | - | 0.4 | - | - | - | - | - | - | - | - | - | 6.4 |
| 340 | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 341 | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 342 | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 343 | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 268 | 1.2 | - | 2.5 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 302 | 1.2 | - | 2.5 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 39 | 1.7 | - | 3.6 | - | - | - | - | - | - | 0.6 | - | - | - | - | - | - | - | - | - | 5.9 |
| 269 | - | - | - | - | - | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 270 | - | - | - | - | - | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 271 | - | - | - | - | - | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | 5.9 |
| 159 | - | - | - | - | - | - | - | - | 4.2 | - | - | - | - | - | - | - | - | - | - | 4.2 |
| 29 | 2.1 | - | - | - | - | - | - | - | - | - | - | - | 1.2 | 0.7 | - | - | - | - | - | 4.0 |
| 30 | 2.1 | - | - | - | - | - | - | - | - | - | - | - | 1.2 | 0.7 | - | - | - | - | - | 4.0 |
| 100 | 2.0 | - | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.0 |
| 101 | 2.0 | - | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.0 |
| 117 | 1.1 | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.4 |
| 118 | 1.1 | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.4 |
| 119 | 1.1 | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.4 |
| 167 | - | - | 1.1 | - | - | - | - | 1.1 | - | 1.1 | - | - | - | - | - | - | - | - | - | 3.4 |
| 168 | - | - | 1.1 | - | - | - | - | 1.1 | - | 1.1 | - | - | - | - | - | - | - | - | - | 3.4 |

**Table 3. Adults' consumption rates of fish from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Bass | Brill | Cod | Dab | Dover sole | Flounder | Grey mullet | Haddock | Mackerel | Plaice | Pollack | Red gurnard | Salmon | Sea trout | Smelt | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 84 | - | - | - | - | - | - | - | - | - | - | - | - | 2.0 | 1.3 | 0.1 | - | - | - | - | 3.3 |
| 240 | - | - | - | - | - | - | - | - | - | - | - | - | 3.3 | - | - | - | - | - | - | 3.3 |
| 241 | - | - | - | - | - | - | - | - | - | - | - | - | 3.3 | - | - | - | - | - | - | 3.3 |
| 242 | - | - | - | - | - | - | - | - | - | - | - | - | 3.3 | - | - | - | - | - | - | 3.3 |
| 243 | - | - | - | - | - | - | - | - | - | - | - | - | 3.3 | - | - | - | - | - | - | 3.3 |
| 98 | - | - | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.0 | - | - | 3.0 |
| 99 | - | - | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.0 | - | - | 3.0 |
| 121 | 0.9 | - | 0.9 | - | - | - | - | - | - | 0.9 | - | - | - | - | - | - | - | - | - | 2.7 |
| 122 | 0.9 | - | 0.9 | - | - | - | - | - | - | 0.9 | - | - | - | - | - | - | - | - | - | 2.7 |
| 160 | - | - | - | - | - | - | - | - | 2.1 | - | - | - | - | - | - | - | - | - | - | 2.1 |
| 104 | - | - | 0.9 | - | - | - | - | - | - | 0.6 | 0.6 | - | - | - | - | - | - | - | - | 2.0 |
| 141 | - | - | - | - | - | - | - | - | 1.4 | 0.3 | - | - | - | - | - | - | - | - | - | 1.7 |
| 142 | - | - | - | - | - | - | - | - | 1.4 | 0.3 | - | - | - | - | - | - | - | - | - | 1.7 |
| 210 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.5 | - | - | 1.5 |
| 211 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.5 | - | - | 1.5 |
| 212 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.5 | - | - | 1.5 |
| 110 | 0.5 | - | 0.5 | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | 1.4 |
| 111 | 0.5 | - | 0.5 | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | 1.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 18 high-rate adult consumers is 56.1 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 105 observations is 78.7 kg $y^{-1}$

**Table 4. Adults' consumption rates of crustaceans from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Brown crab | Brown shrimp | Common lobster | Common prawn | *Nephrops* | Total |
|---|---|---|---|---|---|---|
| **208** | **25.0** | **-** | **-** | **-** | **22.9** | **47.9** |
| **209** | **25.0** | **-** | **-** | **-** | **22.9** | **47.9** |
| **95** | **9.0** | **30.8** | **2.1** | **2.9** | **-** | **44.9** |
| **204** | **-** | **-** | **-** | **-** | **21.3** | **21.3** |
| **205** | **-** | **-** | **-** | **-** | **21.3** | **21.3** |
| **206** | **-** | **-** | **-** | **-** | **21.3** | **21.3** |
| **194** | **-** | **-** | **-** | **-** | **19.5** | **19.5** |
| **195** | **-** | **-** | **-** | **-** | **19.5** | **19.5** |
| **196** | **-** | **-** | **-** | **-** | **19.5** | **19.5** |
| **164** | **-** | **-** | **2.0** | **-** | **17.0** | **19.0** |
| **165** | **-** | **-** | **2.0** | **-** | **17.0** | **19.0** |
| **166** | **-** | **-** | **2.0** | **-** | **17.0** | **19.0** |
| **97** | **13.4** | **-** | **4.3** | **-** | **-** | **17.7** |
| **96** | **2.2** | **8.8** | **2.1** | **2.9** | **-** | **16.2** |
| 199 | - | - | - | - | 15.0 | 15.0 |
| 92 | 4.2 | - | 10.8 | - | - | 14.9 |
| 93 | 4.2 | - | 10.8 | - | - | 14.9 |
| 94 | 4.2 | - | 10.8 | - | - | 14.9 |
| 188 | 5.1 | - | 2.7 | - | 6.1 | 13.9 |
| 163 | 5.9 | - | 5.9 | - | - | 11.8 |
| 340 | 3.6 | - | 5.6 | 0.9 | - | 10.0 |
| 341 | 3.6 | - | 5.6 | 0.9 | - | 10.0 |
| 342 | 3.6 | - | 5.6 | 0.9 | - | 10.0 |
| 343 | 3.6 | - | 5.6 | 0.9 | - | 10.0 |
| 250 | 2.9 | - | 6.1 | - | - | 9.0 |
| 251 | 2.9 | - | 6.1 | - | - | 9.0 |
| 253 | 9.0 | - | - | - | - | 9.0 |
| 161 | 2.2 | 1.0 | 4.7 | - | - | 7.9 |
| 162 | 2.2 | 1.0 | 4.7 | - | - | 7.9 |
| 146 | 4.1 | - | 2.0 | - | - | 6.1 |
| 147 | 4.1 | - | 2.0 | - | - | 6.1 |
| 151 | 4.1 | - | 2.0 | - | - | 6.1 |
| 152 | 4.1 | - | 2.0 | - | - | 6.1 |
| 187 | 1.5 | - | 0.9 | - | 3.6 | 6.1 |
| 189 | 1.5 | - | 0.9 | - | 3.6 | 6.1 |
| 148 | 2.0 | - | 1.0 | - | - | 3.1 |
| 191 | 0.8 | - | 0.4 | - | 1.8 | 3.0 |
| 381 | 0.7 | - | 0.9 | 1.2 | - | 2.8 |
| 382 | 0.7 | - | 0.9 | 1.2 | - | 2.8 |
| 252 | 2.2 | - | - | - | - | 2.2 |
| 144 | 1.0 | - | 1.1 | - | - | 2.1 |
| 153 | 1.3 | - | 0.7 | - | - | 2.0 |
| 154 | 1.3 | - | 0.7 | - | - | 2.0 |
| 155 | 1.3 | - | 0.7 | - | - | 2.0 |
| 85 | - | - | - | - | 1.8 | 1.8 |
| 86 | - | - | - | - | 1.8 | 1.8 |
| 87 | - | - | - | - | 1.8 | 1.8 |
| 201 | - | - | - | - | 1.7 | 1.7 |

**Table 4. Adults' consumption rates of crustaceans from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Brown crab | Brown shrimp | Common lobster | Common prawn | *Nephrops* | Total |
|---|---|---|---|---|---|---|
| 213 | - | - | - | - | 1.5 | 1.5 |
| 198 | - | - | - | - | 1.2 | 1.2 |
| 75 | 0.5 | - | 0.4 | - | - | 1.0 |
| 46 | 0.3 | - | 0.4 | - | - | 0.7 |
| 47 | 0.3 | - | 0.4 | - | - | 0.7 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 14 high-rate adult consumers is 25.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 53 observations is 47.0 kg $y^{-1}$

**Table 5. Adults' consumption rates of molluscs from the Sellafield aquatic survey area (kg $y^{-1}$)**

| Observation number | Limpet | Mussel | Whelk | Winkle | Total |
|---|---|---|---|---|---|
| **345** | **2.0** | **-** | **-** | **13.3** | **15.3** |
| 146 | - | 0.7 | 1.4 | 0.7 | 2.7 |
| 147 | - | 0.7 | 1.4 | 0.7 | 2.7 |
| 151 | - | 0.7 | 1.4 | 0.7 | 2.7 |
| 152 | - | 0.7 | 1.4 | 0.7 | 2.7 |
| 148 | - | 0.3 | 0.7 | 0.3 | 1.4 |
| 95 | - | 0.2 | - | 0.9 | 1.1 |
| 97 | - | - | - | 0.9 | 0.9 |
| 153 | - | 0.2 | 0.4 | 0.2 | 0.9 |
| 154 | - | 0.2 | 0.4 | 0.2 | 0.9 |
| 155 | - | 0.2 | 0.4 | 0.2 | 0.9 |
| 369 | - | 0.2 | - | 0.3 | 0.5 |
| 10 | - | 0.5 | - | - | 0.5 |
| 11 | - | 0.5 | - | - | 0.5 |
| 12 | - | 0.5 | - | - | 0.5 |
| 13 | - | 0.5 | - | - | 0.5 |
| 14 | - | 0.5 | - | - | 0.5 |
| 344 | - | - | - | 0.4 | 0.4 |
| 75 | - | 0.2 | - | - | 0.2 |
| 46 | - | 0.1 | - | - | 0.1 |
| 47 | - | 0.1 | - | - | 0.1 |

**Notes**

The emboldened observation is the high-rate consumer

The mean consumption rate of molluscs based on the only adult consumer is 15.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 21 observations is 9.0 kg $y^{-1}$

## Table 6. Adults' consumption rates of wildfowl from the Sellafield aquatic survey area (kg $y^{-1}$)

| Observation number | Canada goose | Duck (unspecified species) | Greylag goose | Mallard | Teal | Wigeon | Total |
|---|---|---|---|---|---|---|---|
| **373** | **5.6** | **-** | **8.8** | **1.1** | **0.4** | **0.9** | **16.8** |
| **75** | **-** | **1.4** | **6.6** | **-** | **-** | **-** | **8.0** |
| **76** | **-** | **1.4** | **6.6** | **-** | **-** | **-** | **8.0** |
| **77** | **-** | **1.4** | **6.6** | **-** | **-** | **-** | **8.0** |
| 340 | 0.9 | - | 1.4 | 0.6 | - | - | 2.8 |
| 341 | 0.9 | - | 1.4 | 0.6 | - | - | 2.8 |
| 342 | 0.9 | - | 1.4 | 0.6 | - | - | 2.8 |
| 343 | 0.9 | - | 1.4 | 0.6 | - | - | 2.8 |
| 363 | - | - | - | 1.4 | - | - | 1.4 |
| 364 | - | - | - | 1.4 | - | - | 1.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wildfowl based on the 4 high-rate adult consumers is 10.2 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 10 observations is 14.8 kg $y^{-1}$

## Table 7. Adults' consumption rates of marine plants/algae from the Sellafield aquatic survey area (kg $y^{-1}$)

| Observation number | Samphire |
|---|---|
| **46** | **0.1** |
| **47** | **0.1** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of marine plants/algae based on the 2 high-rate adult consumers is 0.1 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 0.1 kg $y^{-1}$

## Table 8. Adults' consumption rates of salt marsh grazed sheep meat from the Sellafield aquatic survey area (kg $y^{-1}$)

| Observation number | Salt marsh grazed lamb |
|---|---|
| **381** | **1.9** |
| **382** | **1.9** |
| **383** | **1.9** |
| **384** | **1.9** |
| **385** | **1.9** |
| **386** | **1.9** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of salt marsh grazed sheep meat based on the 6 high-rate adult consumers is 1.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 6 observations is 1.9 kg $y^{-1}$

## Table 9. Children's and infants' consumption rates of fish from the Sellafield aquatic survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Bass | Cod | Dab | Dover sole | Flounder | Grey mullet | Mackerel | Plaice | Pollack | Red gurnard | Salmon | Sea trout | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **78** | **15** | **-** | **0.5** | **-** | **-** | **-** | **-** | **6.9** | **-** | **1.7** | **-** | **12.7** | **-** | **-** | **-** | **0.5** | **22.3** |
| **156** | **11** | **3.0** | **3.0** | **-** | **0.7** | **-** | **0.7** | **3.0** | **0.7** | **0.7** | **0.4** | **-** | **-** | **2.2** | **-** | **-** | **14.6** |
| **149** | **7** | **2.3** | **2.3** | **-** | **0.6** | **-** | **0.6** | **2.3** | **0.6** | **0.6** | **0.3** | **-** | **-** | **1.7** | **-** | **-** | **11.1** |
| 125 | 8 | 1.1 | 3.4 | 0.7 | - | 0.7 | - | - | 1.1 | - | - | - | - | - | 0.3 | - | 7.4 |
| 31 | 14 | 2.1 | - | - | - | - | - | - | - | - | - | 1.2 | 0.7 | - | - | - | 4.0 |
| 32 | 11 | 2.1 | - | - | - | - | - | - | - | - | - | 1.2 | 0.7 | - | - | - | 4.0 |
| 120 | 15 | 1.1 | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.4 |
| 33 | 7 | 1.6 | - | - | - | - | - | - | - | - | - | 0.9 | 0.5 | - | - | - | 3.0 |
| 255 | 9 | - | - | - | - | - | - | 2.6 | - | - | - | - | - | - | - | - | 2.6 |
| 254 | 8 | - | - | - | - | - | - | 2.6 | - | - | - | - | - | - | - | - | 2.6 |
| 112 | 15 | 0.5 | 0.5 | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | 1.4 |
| 190 | 15 | - | - | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | 0.6 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish for the child age group based upon the 3 high-rate consumers is 16.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 12 observations is 20.2 kg $y^{-1}$

## Table 9. Children's and infants' consumption rates of fish from the Sellafield aquatic survey area (kg $y^{-1}$)

### Infant age group (0 - 5 years old)

| Observation number | Age | Bass | Cod | Dab | Dover sole | Flounder | Grey mullet | Mackerel | Plaice | Pollack | Red gurnard | Salmon | Sea trout | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **157** | **4** | **1.5** | **1.5** | **-** | **0.4** | **-** | **0.4** | **1.5** | **0.4** | **0.4** | **0.2** | **-** | **-** | **1.2** | **-** | **-** | **7.5** |
| **158** | **3** | **1.5** | **1.5** | **-** | **0.4** | **-** | **0.4** | **1.5** | **0.4** | **0.4** | **0.2** | **-** | **-** | **1.2** | **-** | **-** | **7.5** |
| **126** | **5** | **1.1** | **3.4** | **0.7** | **-** | **0.7** | **-** | **-** | **1.1** | **-** | **-** | **-** | **-** | **-** | **0.3** | **-** | **7.4** |
| **150** | **3** | **1.1** | **1.1** | **-** | **0.3** | **-** | **0.3** | **1.1** | **0.3** | **0.3** | **0.1** | **-** | **-** | **0.9** | **-** | **-** | **5.5** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish for the infant age group based upon the 4 high-rate consumers is 7.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 7.5 kg $y^{-1}$

## Table 10. Children's and infants' consumption rates of crustaceans from the Sellafield aquatic survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Brown crab | Common lobster | Total |
|---|---|---|---|---|
| **156** | **11** | **1.3** | **0.7** | **2.0** |
| **149** | **7** | **1.0** | **0.5** | **1.5** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans for the child age group based upon the 2 high-rate consumers is 1.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 2.0 kg $y^{-1}$

### Infant age group (0 - 5 years old)

| Observation number | Age | Brown crab | Common lobster | Total |
|---|---|---|---|---|
| **157** | **4** | **0.7** | **0.3** | **1.0** |
| **158** | **3** | **0.7** | **0.3** | **1.0** |
| **150** | **3** | **0.5** | **0.3** | **0.8** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans for the infant age group based upon the 3 high-rate consumers is 0.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 1.0 kg $y^{-1}$

## Table 11. Children's and infants' consumption rates of molluscs from the Sellafield aquatic survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Mussel | Whelk | Winkle | Total |
|---|---|---|---|---|---|
| **156** | **11** | **0.2** | **0.4** | **0.2** | **0.9** |
| **149** | **7** | **0.2** | **0.3** | **0.2** | **0.7** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of molluscs for the child age group based upon the 2 high-rate consumers is 0.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 0.9 kg $y^{-1}$

### Infant age group (0 - 5 years old)

| Observation number | Age | Mussel | Whelk | Winkle | Total |
|---|---|---|---|---|---|
| **157** | **4** | **0.1** | **0.2** | **0.1** | **0.5** |
| **158** | **3** | **0.1** | **0.2** | **0.1** | **0.5** |
| **150** | **3** | **0.1** | **0.2** | **0.1** | **0.3** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of molluscs for the infant group based upon the 3 high-rate consumers is 0.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 0.5 kg $y^{-1}$

## Table 12. Children's consumption rates of wildfowl from the Sellafield aquatic survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Duck (unspecified species) | Greylag goose | Total |
|---|---|---|---|---|
| 78 | 15 | 1.4 | 6.6 | 8.0 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of wildfowl for the child age group based upon the only high-rate consumer is 8.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

## Table 13. Adults' consumption rates of vegetables and domestic fruit grown on land where seaweed has been used as a fertiliser (kg $y^{-1}$)

### Green vegetables

| Observation number | Brussel sprout | Cabbage | Cauliflower | Total |
|---|---|---|---|---|
| 185 | 8.7 | 17.0 | 8.2 | 33.9 |
| 186 | 8.7 | 17.0 | 8.2 | 33.9 |

### Other vegetables

| Observation number | Broad bean | French bean | Pea | Tomato | Total |
|---|---|---|---|---|---|
| 185 | 16.1 | 3.6 | 14.4 | 11.5 | 45.6 |
| 186 | 16.1 | 3.6 | 14.4 | 11.5 | 45.6 |

### Root vegetables

| Observation number | Carrot | Leek | Onion | Parsnip | Total |
|---|---|---|---|---|---|
| 185 | 7.2 | 7.7 | 28.6 | 4.3 | 47.8 |
| 186 | 7.2 | 7.7 | 28.6 | 4.3 | 47.8 |

### Potato

| Observation number | Potato |
|---|---|
| 185 | 28.0 |
| 186 | 28.0 |

### Domestic fruit

| Observation number | Raspberry |
|---|---|
| 185 | 3.0 |
| 186 | 3.0 |

**Notes**

These foods are included in the aquatic section of this report as the exposure pathway is sea to land transfer and the source of potential exposure is liquid discharge. However these foods were grown in the terrestrial survey area and they are also potentially subject to gaseous discharges. Therefore they are also included in the terrestrial food groups and are included in Annex 1 as terrestrial foods.

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **373** | **Newbiggin Marsh and Carleton Marsh** | **Wildfowling** | **96** | - | - | - | - | - | - |
| | | Dog walking | - | - | - | - | 78 | - | - |
| **29** | **River Esk and River Irt** | **Angling** | **65** | - | - | - | - | - | - |
| | **Ravenglass Estuary** | | - | - | **185** | - | - | - | - |
| | Sellafield | | - | - | - | - | - | 185 | - |
| **46** | **Saltcoats** | Collecting marine plants and mussels | 4 | - | - | - | - | - | - |
| | | **Dog walking** | - | - | **243** | - | - | - | - |
| **344** | **Whitehaven outer harbour** | **Bait digging** | - | **234** | - | - | - | - | - |
| | **Braystones** | **Angling** | - | - | - | - | - | **735** | - |
| | **Braystones and Eskmeals** | **Bait digging and walking** | - | - | - | - | - | | - |
| | Nethertown | Collecting winkles and limpets | - | - | - | - | - | - | 52 |
| **98** | **Whitehaven outer harbour** | **Bait digging** | - | **156** | - | - | - | - | - |
| | **Parton and St Bees Head** | **Angling** | - | - | - | **60** | - | - | - |
| | **Parton** | **Dog walking (including a small amount of time collecting crabs)** | - | - | - | - | - | - | **452** |
| | **Parton to Drigg** | **Angling** | - | - | - | - | - | - | |
| **100** | **Whitehaven outer harbour** | **Bait digging** | - | **156** | - | - | - | - | - |
| | **Parton and St Bees Head** | **Angling** | - | - | - | **60** | - | - | - |
| | Parton to Drigg | Angling (including a small amount of time collecting crabs at Parton) | - | - | - | - | - | - | 212 |
| **127** | **Whitehaven outer harbour** | **Bait digging** | - | **104** | - | - | - | - | - |
| 273 | Whitehaven outer harbour | Bait digging | - | 39 | - | - | - | - | - |
| 268 | Whitehaven outer harbour | Bait digging | - | 36 | - | - | - | - | - |
| | St Bees | Angling | - | - | - | - | - | 96 | - |
| 117 | Whitehaven outer harbour | Bait digging | - | 5 | - | - | - | - | - |
| | Drigg | | - | - | - | - | - | 5 | - |
| | Braystones, Drigg and Eskmeals | Angling | - | - | - | - | - | - | 96 |
| **48** | **Saltcoats** | **Boat maintenance** | - | - | **490** | - | - | - | - |

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **340** | **Ravenglass** | **Boat maintenance** | - | - | **330** | - | - | - | - |
| | Ravenglass Estuary | Wildfowling | - | - | - | - | 42 | - | - |
| **342** | **Ravenglass** | **Boat maintenance** | - | - | **330** | - | - | - | - |
| | Ravenglass Estuary | Wildfowling | - | - | - | - | 42 | - | - |
| 49 | Ravenglass | Walking | - | - | 137 | - | - | - | - |
| 50 | Ravenglass | Walking | - | - | 137 | - | - | - | - |
| 193 | Lower reaches of the River Ehen | Angling | - | - | 135 | - | - | - | - |
| **185** | Ravenglass | Collecting crabs | - | - | 77 | - | - | - | - |
| | **Parton and St Bees Head** | **Angling** | - | - | - | **72** | - | - | **-** |
| | Braystones and Drigg | Bait digging | - | - | - | - | - | 52 | - |
| | **Parton to Eskmeals** | **Angling (including a small amount of time collecting seaweed at Nethertown)** | - | - | - | - | - | - | **506** |
| 308 | Ravenglass | Dog walking | - | - | 39 | - | - | - | - |
| | Sellafield to Seascale | | - | - | - | - | - | 52 | - |
| | Sellafield | Angling | - | - | - | - | - | - | 12 |
| 309 | Ravenglass | Dog walking | - | - | 39 | - | - | - | - |
| | Sellafield to Seascale | | - | - | - | - | - | 52 | - |
| | Sellafield | Angling | - | - | - | - | - | - | 12 |
| 85 | Ravenglass | Walking | - | - | 18 | - | - | - | - |
| | St Bees | | - | - | - | - | - | 156 | - |
| | Parton, Whitehaven south beach and Nethertown | | - | - | - | - | - | - | 273 |
| 110 | Ravenglass | Angling | - | - | 4 | - | - | - | - |
| | Sellafield, Seascale and Drigg | | - | - | - | - | - | - | 16 |
| **187** | Ravenglass | Collecting mussels | - | - | 3 | - | - | - | - |
| | **Braystones and Sellafield** | **Setting nets (including a small amount of time collecting cockles from the shore at Ravenglass)** | - | - | - | - | - | **1035** | - |
| | **Parton to Eskmeals** | **Collecting winkles (including a small amount of time collecting crabs at Drigg)** | - | - | - | - | - | - | **338** |
| | **Braystones and Sellafield** | **Angling** | - | - | - | - | - | - | |

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 97 | Drigg | Hooking for crabs and lobsters | - | - | - | 105 | - | - | - |
| | Parton and Seamill | Angling | - | - | - | - | - | - | 156 |
| 381 | Saltcoats | Tending livestock | - | - | - | - | 312 | - | - |
| 383 | Saltcoats | Tending livestock | - | - | - | - | 312 | - | - |
| 307 | Eskmeals Nature Reserve | Walking | - | - | - | - | 104 | 104 | - |
| 53 | Eskmeals Nature Reserve | Dog walking | - | - | - | - | 104 | - | - |
| 189 | Braystones and Sellafield | Setting nets | - | - | - | - | - | 1032 | - |
| | Parton to Eskmeals | Collecting winkles | - | - | - | - | - | - | 346 |
| 192 | Braystones and Sellafield | Setting nets | - | - | - | - | - | 1032 | - |
| 1 | Drigg | Dog walking | - | - | - | - | - | 730 | - |
| 129 | Sellafield, Seascale and Drigg | Dog walking | - | - | - | - | - | 730 | - |
| 246 | St Bees | Dog walking | - | - | - | - | - | 730 | - |
| 247 | St Bees | Dog walking | - | - | - | - | - | 730 | - |
| 42 | Seascale and Drigg | Angling | - | - | - | - | - | 585 | - |
| | Seascale | Bait digging | - | - | - | - | - | | - |
| 43 | Seascale and Drigg | Angling | - | - | - | - | - | 585 | - |
| | Seascale | Bait digging | - | - | - | - | - | | - |
| 95 | Braystones | Bait digging and setting nets | - | - | - | - | - | 568 | - |
| | Coulderton and Drigg | Laying pots on the shore | - | - | - | - | - | - | 828 |
| | Nethertown | Collecting winkles | - | - | - | - | - | - | |
| | Coulderton, Nethertown and Braystones | Angling | - | - | - | - | - | - | |
| 28 | Drigg | Dog walking | - | - | - | - | - | 548 | - |
| 227 | Braystones | Dog walking | - | - | - | - | - | 548 | - |
| 228 | Braystones | Dog walking | - | - | - | - | - | 548 | - |
| 262 | St Bees | Dog walking | - | - | - | - | - | 548 | - |
| 263 | St Bees | Dog walking | - | - | - | - | - | 548 | - |
| 113 | Seascale | Dog walking | - | - | - | - | - | 525 | - |
| 139 | Seascale | Dog walking | - | - | - | - | - | 415 | - |
| 27 | Seascale and Drigg | Dog walking | - | - | - | - | - | 390 | - |
| 116 | Seascale | Dog walking | - | - | - | - | - | 365 | - |

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **73** | **Drigg** | **Dog walking** | - | - | - | - | - | **365** | - |
| **74** | **Drigg** | **Dog walking** | - | - | - | - | - | **365** | - |
| **143** | **Seascale** | **Dog walking** | - | - | - | - | - | **365** | - |
| **248** | **St Bees** | **Dog walking** | - | - | - | - | - | **365** | - |
| **249** | **St Bees** | **Dog walking** | - | - | - | - | - | **365** | - |
| **261** | **St Bees** | **Dog walking** | - | - | - | - | - | **365** | - |
| **229** | **Nethertown** | **Dog walking** | - | - | - | - | - | **365** | - |
| **230** | **Nethertown** | **Dog walking** | - | - | - | - | - | **365** | - |
| **341** | **Seascale to Drigg** | **Dog walking** | - | - | - | - | - | **365** | - |
| **264** | **St Bees** | **Dog walking** | - | - | - | - | - | **351** | - |
| **265** | **St Bees** | **Dog walking** | - | - | - | - | - | **351** | - |
| 75 | Seascale | Dog walking | - | - | - | - | - | 312 | - |
| 225 | Seascale | Dog walking | - | - | - | - | - | 293 | - |
| 226 | Seascale | Dog walking | - | - | - | - | - | 293 | - |
| 69 | Eskmeals and Tarn Bay | Dog walking | - | - | - | - | - | 274 | - |
| 70 | Eskmeals and Tarn Bay | Dog walking | - | - | - | - | - | 274 | - |
| 137 | Seascale | Dog walking | - | - | - | - | - | 260 | - |
| 138 | Seascale | Dog walking | - | - | - | - | - | 260 | - |
| 109 | Sellafield, Seascale and Drigg | Dog walking | - | - | - | - | - | 260 | - |
| 188 | Braystones and Sellafield | Setting nets | - | - | - | - | - | 240 | - |
| | | Angling | - | - | - | - | - | - | 8 |
| 11 | Eskmeals | Bait digging and dog walking | - | - | - | - | - | 195 | - |
| | Tarn Bay | Collecting mussels | - | - | - | - | - | - | 27 |
| 12 | Eskmeals | Bait digging and dog walking | - | - | - | - | - | 195 | - |
| | Tarn Bay | Collecting mussels | - | - | - | - | - | - | 27 |
| 130 | Seascale | Dog walking | - | - | - | - | - | 188 | - |
| 131 | Seascale to Drigg | Dog walking | - | - | - | - | - | 182 | - |
| 132 | Seascale to Drigg | Dog walking | - | - | - | - | - | 182 | - |
| 338 | Seascale and Drigg | Bait digging | - | - | - | - | - | 156 | - |
| | Drigg | Angling | - | - | - | - | - | | - |
| | Parton | | - | - | - | - | - | - | 78 |
| 140 | Seascale | Dog walking | - | - | - | - | - | 156 | - |

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 106 | St Bees, Seascale and Drigg | Water sports preparation | - | - | - | - | - | 156 | - |
| | Seascale | Dog walking | - | - | - | - | - | | - |
| 114 | Seascale to Drigg | Dog walking | - | - | - | - | - | 156 | - |
| 115 | Seascale to Drigg | Dog walking | - | - | - | - | - | 156 | - |
| 224 | Seascale | Dog walking | - | - | - | - | - | 156 | - |
| 7 | Eskmeals | Bait digging and walking | - | - | - | - | - | 122 | - |
| | Tarn Bay | Angling | - | - | - | - | - | - | 20 |
| **38** | St Bees, Seascale and Drigg | Angling | - | - | - | - | - | 117 | - |
| | **Parton** | **Dog walking** | - | - | - | - | - | - | **286** |
| 2 | Drigg | Dog walking | - | - | - | - | - | 117 | - |
| 54 | Eskmeals | Dog walking | - | - | - | - | - | 117 | - |
| 13 | Eskmeals | Dog walking | - | - | - | - | - | 104 | - |
| 14 | Eskmeals | Dog walking | - | - | - | - | - | 104 | - |
| 34 | Drigg | Dog walking | - | - | - | - | - | 104 | - |
| 35 | Drigg | Dog walking | - | - | - | - | - | 104 | - |
| 244 | St Bees | Playing | - | - | - | - | - | 104 | - |
| 266 | St Bees | Playing | - | - | - | - | - | 104 | - |
| 10 | Eskmeals | Bait digging | - | - | - | - | - | 91 | - |
| | Tarn Bay | Collecting mussels | - | - | - | - | - | - | 27 |
| 25 | Drigg | Dog walking | - | - | - | - | - | 91 | - |
| 17 | Eskmeals | Angling and bait digging | - | - | - | - | - | 87 | - |
| 123 | Drigg | Bait digging | - | - | - | - | - | 78 | - |
| | St Bees to Drigg | Angling | - | - | - | - | - | - | 260 |
| 15 | Eskmeals | Bait digging | - | - | - | - | - | 65 | - |
| 26 | Seascale and Drigg | Dog walking | - | - | - | - | - | 52 | - |
| 6 | St Bees, Seascale and Drigg | Walking | - | - | - | - | - | 30 | - |
| 144 | Drigg | Bait digging | - | - | - | - | - | 26 | - |
| | Braystones to Seascale | Angling | - | - | - | - | - | - | 104 |
| 256 | St Bees | Angling | - | - | - | - | - | 26 | - |
| | Fleswick | | - | - | - | - | - | - | 26 |

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 135 | Seascale to Drigg | Walking | - | - | - | - | - | 26 | - |
| 136 | Seascale to Drigg | Walking | - | - | - | - | - | 26 | - |
| 62 | Seascale | Playing | - | - | - | - | - | 25 | - |
| 9 | Eskmeals | Walking | - | - | - | - | - | 24 | - |
| 83 | Eskmeals | Dog walking | - | - | - | - | - | 24 | - |
| 222 | Seascale | Dog walking | - | - | - | - | - | 21 | - |
| 223 | Seascale | Dog walking | - | - | - | - | - | 21 | - |
| 87 | St Bees | Walking | - | - | - | - | - | 18 | - |
| | Parton, Whitehaven south beach and Nethertown | | - | - | - | - | - | - | 60 |
| 257 | St Bees | Playing | - | - | - | - | - | 18 | - |
| 258 | St Bees | Playing | - | - | - | - | - | 18 | - |
| 276 | Seascale and Drigg | Dog walking | - | - | - | - | - | 18 | - |
| 277 | Seascale and Drigg | Dog walking | - | - | - | - | - | 18 | - |
| 310 | Drigg, and Sellafield to Seascale | Dog walking | - | - | - | - | - | 16 | - |
| 312 | Drigg, and Sellafield to Seascale | Dog walking | - | - | - | - | - | 16 | - |
| 231 | Seascale | Playing | - | - | - | - | - | 15 | - |
| 102 | Drigg | Bait digging | - | - | - | - | - | 13 | - |
| | Sellafield, Seascale and Drigg | Dog walking | - | - | - | - | - | - | 144 |
| | Seascale | Angling | - | - | - | - | - | - | |
| 16 | Eskmeals | Bait digging | - | - | - | - | - | 12 | - |
| 39 | St Bees, Seascale and Drigg | Angling | - | - | - | - | - | 12 | - |
| 170 | Seascale to Drigg | Horse riding | - | - | - | - | - | 12 | - |
| 357 | Seascale to Drigg | Horse riding | - | - | - | - | - | 12 | - |
| 133 | St Bees, Seascale and Drigg | Dog walking | - | - | - | - | - | 10 | - |
| 134 | St Bees, Seascale and Drigg | Dog walking | - | - | - | - | - | 10 | - |
| 274 | Seascale to Drigg | Walking | - | - | - | - | - | 4 | - |
| 275 | Seascale to Drigg | Walking | - | - | - | - | - | 4 | - |
| 36 | Drigg | Collecting shells | - | - | - | - | - | 3 | - |
| 37 | Drigg | Collecting shells | - | - | - | - | - | 3 | - |

**Table 14. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **151** | **Coulderton** | **Dog walking (including a small amount of time collecting winkles and mussels)** | - | - | - | - | - | - | **738** |
| **145** | **Parton** | **Dog walking and beachcombing** | - | - | - | - | - | - | **390** |
| 90 | Parton | Dog walking | - | - | - | - | - | - | 274 |
| 167 | Sellafield, Seascale and Drigg | Dog walking | - | - | - | - | - | - | 225 |
| 168 | Sellafield, Seascale and Drigg | Dog walking | - | - | - | - | - | - | 225 |
| 91 | Parton | Dog walking | - | - | - | - | - | - | 182 |
| 121 | Coulderton, Nethertown and Braystones | Angling | - | - | - | - | - | - | 72 |
| 88 | Parton | Beachcombing | - | - | - | - | - | - | 52 |
| 89 | Parton | Beachcombing | - | - | - | - | - | - | 52 |
| 141 | St Bees and Seascale | Angling | - | - | - | - | - | - | 40 |
| 146 | Coulderton | Collecting mussels and winkles | - | - | - | - | - | - | 8 |
| 369 | Drigg | Collecting mussels and winkles | - | - | - | - | - | - | 3 |

**Notes**

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud based on 2 high-rate observations is 81 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations for mud is 94 h $y^{-1}$

The mean intertidal occupancy rate over mud and sand based on 4 high-rate observations is 163 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 7 observations for mud and sand is 222 h $y^{-1}$

The mean intertidal occupancy rate over mud, sand and stones based on 5 high-rate observations is 316 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 14 observations for mud, sand and stones is 438 h $y^{-1}$

The mean intertidal occupancy rate over rock based on 4 high-rate observations is 74 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations for rock is 103 h $y^{-1}$

The mean intertidal occupancy rate over salt marsh based on 4 high-rate observations is 208 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 7 observations for salt marsh is 312 h $y^{-1}$

The mean intertidal occupancy rate over sand based on 31 high-rate observations is 546 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 104 observations for sand is 861 h $y^{-1}$

The mean intertidal occupancy rate over sand and stones based on 8 high-rate observations is 486 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 37 observations for sand and stones is 747 h $y^{-1}$

**Table 15. Children's and infants' intertidal occupancy rates in the Sellafield aquatic survey area (h $y^{-1}$)**

**Child age group (6 - 15 years old)**

| Observation number | Age | Location | Activity | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|
| **51** | **14** | **Ravenglass** | **Walking** | **137** | - | - |
| **52** | **9** | **Ravenglass** | **Walking** | **137** | - | - |
| **107** | **14** | **Seascale** | **Dog walking** | - | **156** | - |
| | | **St Bees, Seascale and Drigg** | **Water sports preparation** | - | | - |
| **108** | **13** | **Seascale** | **Dog walking** | - | **156** | - |
| | | **St Bees, Seascale and Drigg** | **Water sports preparation** | - | | - |
| **267** | **7** | **St Bees** | **Playing** | - | **104** | - |
| **8** | **15** | **Eskmeals** | **Bait digging** | - | **98** | - |
| | | **Tarn Bay** | **Angling** | - | - | **20** |
| **190** | **15** | **Braystones** | **Angling** | - | - | **12** |

**Notes**

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud, sand and stones based on 2 high-rate observations is 137 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations for mud, sand and stones is 137 h $y^{-1}$

The mean intertidal occupancy rate over sand based on 4 high-rate observations is 128 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations for sand is 156 h $y^{-1}$

The mean intertidal occupancy rate over sand and stones based on 2 high-rate observations is 16 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations for sand and stones is 20 h $y^{-1}$

**Infant age group (0 - 5 years old)**

| Observation number | Age | Location | Activity | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|
| **245** | **3** | **St Bees** | **Playing** | - | **104** | - |
| 63 | 2 | Seascale | Playing | - | 25 | - |
| 259 | 4 | St Bees | Playing | - | 18 | - |
| 260 | 2 | St Bees | Playing | - | 18 | - |
| 233 | 4 | Seascale | Playing | - | 15 | - |
| 234 | 3 | Seascale | Playing | - | 15 | - |
| 235 | 3 | Seascale | Playing | - | 15 | - |

**Notes**

The emboldened observation is the high-rate individual

The mean intertidal occupancy rate over sand based on 1 high-rate observation is 104 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 7 observations for sand is 92 h $y^{-1}$

**Table 16. Gamma dose rate measurements over intertidal substrates in the Sellafield aquatic survey area (µGy $h^{-1}$)**

| Location | National Grid Reference | Substrate | Gamma dose rate at 1 metre[a] |
|---|---|---|---|
| Parton (head of the bay) | NX 979 208 | Sand and stones | 0.080 |
| Parton (centre of the bay) | NX 978 208 | Sand | 0.099 |
| Whitehaven north beach | NX 972 189 | Sand and stones | 0.093 |
| Whitehaven outer harbour | NX 968 185 | Mud and sand | 0.065 |
| St Bees | NX 959 116 | Sand | 0.058 |
| Coulderton | NX 980 084 | Sand | 0.069 |
| Coulderton | NX 980 084 | Sand and stones (boulder scar) | 0.094 |
| Nethertown | NX 989 070 | Sand | 0.066 |
| Nethertown | NX 989 070 | Sand and stones (boulder scar) | 0.087 |
| Braystones | NX 999 059 | Sand | 0.064 |
| Sellafield | NY 023 026 | Sand and stones | 0.090 |
| Seascale | NY 035 009 | Sand | 0.067 |
| Drigg | SD 046 983 | Sand | 0.060 |
| Saltcoats | SD 079 967 | Mud | 0.079 |
| Saltcoats Ford | SD 082 966 | Mud and stones | 0.078 |
| Ravenglass | SD 083 961 | Sand and stones | 0.090 |
| Waberthwaite | SD 099 950 | Salt marsh | 0.099 |
| Eskmeals Viaduct | SD 086 942 | Salt marsh | 0.112 |
| Eskmeals Viaduct | SD 087 942 | Mud | 0.093 |
| Eskmeals | SD 078 906 | Sand | 0.063 |
| Tarn Bay | SD 079 905 | Sand | 0.060 |

**Notes**

[a] These measurements have not been adjusted for natural background dose rates.

**Table 17. Adults' handling rates of fishing gear and sediment in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Fishing gear | Sediment |
|---|---|---|---|---|
| **340** | **Sellafield to Tarn Bay** | **Handling pots** | **1524** | - |
| | Ravenglass Estuary | Wildfowling | - | 42 |
| **342** | **Sellafield to Tarn Bay** | **Handling pots** | **1524** | - |
| | Ravenglass Estuary | Wildfowling | - | 42 |
| **187** | **Braystones and Sellafield** | **Handling nets** | **1100** | - |
| | **Parton to Eskmeals** | **Collecting winkles (including a small amount of time collecting cockles and mussles at Ravenglass and collecting crabs at Drigg)** | - | **296** |
| **189** | **Braystones and Sellafield** | **Handling nets** | **1088** | - |
| | **Parton to Eskmeals** | **Collecting winkles** | - | **346** |
| **192** | **Braystones and Sellafield** | **Handling nets** | **1032** | - |
| **95** | **Braystones** | **Handling nets** | **840** | - |
| | **Coulderton and Drigg** | **Handling pots** | | - |
| | Braystones | Bait digging (including a small amount of time collecting winkles at Nethertown) | - | 56 |
| **92** | **Parton to Coulderton** | **Handling pots and nets** | **735** | - |
| 194 | St Bees to Ravenglass | Handling trawl gear | 300 | - |
| 197 | St Bees to Ravenglass | Handling trawl gear | 300 | - |
| 207 | Parton to Tarn Bay | Handling trawl gear | 263 | - |
| 208 | Parton to Tarn Bay | Handling trawl gear | 263 | - |
| 164 | St Bees to Sellafield | Handling trawl gear | 257 | - |
| 165 | St Bees to Sellafield | Handling trawl gear | 257 | - |
| 166 | St Bees to Sellafield | Handling trawl gear | 257 | - |
| 188 | Braystones and Sellafield | Handling nets | 240 | - |
| 198 | St Bees to Whitehaven | Handling trawl gear | 225 | - |
| 200 | St Bees to Whitehaven | Handling trawl gear | 225 | - |
| 203 | Parton to Tarn Bay | Handling trawl gear | 197 | - |
| 204 | Parton to Tarn Bay | Handling trawl gear | 197 | - |
| 205 | Parton to Tarn Bay | Handling trawl gear | 197 | - |
| 206 | Parton to Tarn Bay | Handling trawl gear | 197 | - |

**Table 17. Adults' handling rates of fishing gear and sediment in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Fishing gear | Sediment |
|---|---|---|---|---|
| 201 | Parton to Tarn Bay | Handling trawl gear | 175 | - |
| 202 | Parton to Tarn Bay | Handling trawl gear | 175 | - |
| 214 | Parton to Tarn Bay | Handling trawl gear | 84 | - |
| 215 | Parton to Tarn Bay | Handling trawl gear | 84 | - |
| 151 | Off Coulderton | Handling pots | 60 | - |
| | Coulderton | Collecting mussels and winkles | - | 8 |
| 146 | Off Coulderton | Handling pots | 60 | - |
| | Coulderton | Collecting mussels and winkles | - | 8 |
| 210 | Parton to Tarn Bay | Handling trawl gear | 53 | - |
| 211 | Parton to Tarn Bay | Handling trawl gear | 53 | - |
| 212 | Parton to Tarn Bay | Handling trawl gear | 53 | - |
| 213 | Parton to Tarn Bay | Handling trawl gear | 53 | - |
| 250 | Off Parton | Handling pots | 4 | - |
| 251 | Off Parton | Handling pots | 4 | - |
| **344** | **Whitehaven outer harbour, Braystones and Eskmeals** | **Bait digging** | - | **754** |
| | **Nethertown** | **Collecting winkles and limpets** | - | |
| 98 | Whitehaven outer harbour | Bait digging | - | 168 |
| | Parton | Collecting crabs | - | |
| 100 | Whitehaven outer harbour | Bait digging | - | 168 |
| | Parton | Collecting crabs | - | |
| 42 | Seascale | Bait digging | - | 156 |
| 43 | Seascale | Bait digging | - | 156 |
| 185 | Braystones and Drigg | Bait digging | - | 135 |
| | Ravenglass | Collecting crabs (including a small amount of time collecting seaweed at Nethertown) | - | |
| 10 | Eskmeals | Bait digging | - | 118 |
| | Tarn Bay | Collecting mussels | - | |
| 11 | Eskmeals | Bait digging | - | 118 |
| | Tarn Bay | Collecting mussels | - | |

**Table 17. Adults' handling rates of fishing gear and sediment in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | Fishing gear | Sediment |
|---|---|---|---|---|
| 12 | Eskmeals | Bait digging | - | 118 |
| | Tarn Bay | Collecting mussels | - | |
| 127 | Whitehaven outer harbour | Bait digging | - | 104 |
| 7 | Eskmeals | Bait digging | - | 98 |
| 373 | Newbiggin Marsh and Carleton Marsh | Wildfowling | - | 96 |
| 123 | Drigg | Bait digging | - | 78 |
| 338 | Seascale and Drigg | Bait digging | - | 78 |
| 15 | Eskmeals | Bait digging | - | 65 |
| 17 | Eskmeals | Bait digging | - | 45 |
| 273 | Whitehaven outer harbour | Bait digging | - | 39 |
| 268 | Whitehaven outer harbour | Bait digging | - | 36 |
| 144 | Drigg | Bait digging | - | 26 |
| 102 | Drigg | Bait digging | - | 13 |
| 16 | Eskmeals | Bait digging | - | 12 |
| 117 | Whitehaven outer harbour and Drigg | Bait digging | - | 10 |
| 369 | Drigg | Collecting mussels and winkles | - | 3 |
| 36 | Drigg | Collecting shells | - | 3 |
| 37 | Drigg | Collecting shells | - | 3 |
| 46 | Saltcoats | Collecting mussels | - | 2 |

**Notes**

Emboldened observations are the high-rate individuals

The mean fishing gear handling rate based on 7 high-rate observations is 1120 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 33 observations for fishing gear is 1524 h $y^{-1}$

The mean sediment handling rate based on 3 high-rate observations is 456 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 33 observations for sediment is 428 h $y^{-1}$

**Table 18. Children's handling rates of sediment in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Age | Location | Activity | Sediment |
|---|---|---|---|---|
| **Child age group (6 - 15 years old)** | | | | |
| **8** | **15** | **Eskmeals** | **Bait digging** | **98** |

**Notes**

The emboldened observation is the high-rate individual

The mean sediment handling rate based upon the only high-rate observation is 98 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 19. Adults' occupancy rates in and on water in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | In water | On water |
|---|---|---|---|---|
| 106 | St Bees, Seascale and Drigg | Windsurfing and surfing | 90 | - |
| | | Canoeing | - | 14 |
| 143 | Seascale | Swimming | 68 | - |
| 6 | St Bees, Seascale and Drigg | Kayaking | 15 | - |
| 75 | Seascale | Swimming | 13 | - |
| 77 | Seascale | Swimming | 13 | - |
| 76 | Seascale | Swimming | 13 | - |
| 46 | Ravenglass Estuary | Swimming | 2 | - |
| 194 | St Bees to Ravenglass | Trawling | - | 2000 |
| 197 | St Bees to Ravenglass | Trawling | - | 2000 |
| 340 | Sellafield to Tarn Bay | Potting | - | 1920 |
| 342 | Sellafield to Tarn Bay | Potting | - | 1920 |
| 164 | St Bees to Sellafield | Trawling | - | 1848 |
| 165 | St Bees to Sellafield | Trawling | - | 1848 |
| 166 | St Bees to Sellafield | Trawling | - | 1848 |
| 198 | St Bees to Whitehaven | Trawling | - | 1800 |
| 200 | St Bees to Whitehaven | Trawling | - | 1800 |
| 207 | Parton to Tarn Bay | Trawling | - | 1750 |
| 208 | Parton to Tarn Bay | Trawling | - | 1750 |
| 203 | Parton to Tarn Bay | Trawling | - | 1519 |
| 204 | Parton to Tarn Bay | Trawling | - | 1519 |
| 205 | Parton to Tarn Bay | Trawling | - | 1519 |
| 206 | Parton to Tarn Bay | Trawling | - | 1519 |
| 201 | Parton to Tarn Bay | Trawling | - | 1200 |
| 202 | Parton to Tarn Bay | Trawling | - | 1200 |
| 92 | Parton to Coulderton | Potting and gill netting | - | 1137 |
| | Whitehaven Harbour | Boat maintenance | - | |
| 214 | Parton to Tarn Bay | Trawling | - | 630 |
| 215 | Parton to Tarn Bay | Trawling | - | 630 |
| 98 | Off Whitehaven | Boat angling | - | 500 |
| 100 | Off Whitehaven | Boat angling | - | 500 |
| 210 | Parton to Tarn Bay | Trawling | - | 450 |
| 211 | Parton to Tarn Bay | Trawling | - | 450 |
| 212 | Parton to Tarn Bay | Trawling | - | 450 |
| 213 | Parton to Tarn Bay | Trawling | - | 450 |
| 127 | Off Whitehaven | Boat angling | - | 400 |
| 146 | Off Coulderton | Potting and boat angling | - | 260 |
| 151 | Off Coulderton | Potting and boat angling | - | 260 |
| 144 | Off Seascale | Boat angling | - | 234 |
| 84 | River Ehen and River Irt | Angling (wading in the river) | - | 205 |
| 102 | Off Seascale | Boat angling | - | 163 |
| 95 | Whitehaven North Beach and Seamill | Push netting | - | 156 |
| 187 | Off Braystones | Drift netting | - | 152 |
| | St Bees to Sellafield | Trawling | - | |
| 229 | Whitehaven to Nethertown | Boat angling | - | 130 |
| 105 | Off Seascale | Boat angling | - | 82 |
| 29 | River Esk and River Irt | Angling (wading in the river) | - | 65 |

**Table 19. Adults' occupancy rates in and on water in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Location | Activity | In water | On water |
|---|---|---|---|---|
| 256 | Whitehaven to Drigg | Boat angling | - | 60 |
| 189 | Off Braystones | Drift netting | - | 56 |
| 49 | Ravenglass Estuary | Boating | - | 30 |
| 50 | Ravenglass Estuary | Boating | - | 30 |
| 48 | Ravenglass Estuary | Boat angling | - | 26 |
| 251 | Off Parton | Potting | - | 17 |
| 250 | Off Parton | Potting | - | 17 |
| 309 | Ravenglass | Canoeing | - | 4 |
| 308 | Ravenglass | Canoeing | - | 4 |

**Table 20. Children's occupancy rates in and on water in the Sellafield aquatic survey area (h $y^{-1}$)**

| Observation number | Age | Location | Activity | In water | On water |
|---|---|---|---|---|---|
| **Child age group (6 - 15 years old)** | | | | | |
| 107 | 14 | St Bees, Seascale and Drigg | Windsurfing and surfing | 90 | - |
| | | | Canoeing | - | 14 |
| 108 | 13 | St Bees, Seascale and Drigg | Windsurfing and surfing | 90 | - |
| | | | Canoeing | - | 14 |
| 51 | 14 | Ravenglass Estuary | Kayaking | 30 | - |
| 52 | 9 | Ravenglass Estuary | Kayaking | 30 | - |
| 78 | 15 | Seascale | Swimming | 13 | - |

**Table 21. Adults' consumption rates of green vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Artichoke | Asparagus | Broccoli | Brussel sprout | Cabbage | Cauliflower | Chard | Courgette | Cucumber | Herbs | Kale | Rocket | Spinach | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **379** | **13.6** | **2.3** | **4.1** | **5.5** | **2.6** | **6.1** | **-** | **5.5** | **-** | **-** | **-** | **-** | **-** | **39.6** |
| **380** | **13.6** | **2.3** | **4.1** | **5.5** | **2.6** | **6.1** | **-** | **5.5** | **-** | **-** | **-** | **-** | **-** | **39.6** |
| **185** | **-** | **-** | **-** | **8.7** | **17.0** | **8.2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **33.9** |
| **186** | **-** | **-** | **-** | **8.7** | **17.0** | **8.2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **33.9** |
| **5** | **-** | **-** | **-** | **-** | **24.4** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **24.4** |
| **314** | **0.7** | **-** | **-** | **3.4** | **4.6** | **-** | **2.4** | **1.1** | **0.3** | **-** | **4.8** | **-** | **2.6** | **19.9** |
| **313** | **0.7** | **-** | **-** | **3.4** | **4.6** | **-** | **2.4** | **1.1** | **0.3** | **-** | **4.8** | **-** | **2.6** | **19.9** |
| **274** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **14.7** | **-** | **-** | **-** | **-** | **-** | **14.7** |
| **275** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **14.7** | **-** | **-** | **-** | **-** | **-** | **14.7** |
| **22** | **-** | **-** | **-** | **-** | **-** | **-** | **3.4** | **5.7** | **2.6** | **0.2** | **-** | **2.1** | **-** | **13.9** |
| **23** | **-** | **-** | **-** | **-** | **-** | **-** | **3.4** | **5.7** | **2.6** | **0.2** | **-** | **2.1** | **-** | **13.9** |
| **357** | **3.6** | **-** | **-** | **-** | **-** | **-** | **-** | **10.1** | **-** | **-** | **-** | **-** | **-** | **13.8** |
| **358** | **3.6** | **-** | **-** | **-** | **-** | **-** | **-** | **10.1** | **-** | **-** | **-** | **-** | **-** | **13.8** |
| **359** | **3.6** | **-** | **-** | **-** | **-** | **-** | **-** | **10.1** | **-** | **-** | **-** | **-** | **-** | **13.8** |
| **360** | **3.6** | **-** | **-** | **-** | **-** | **-** | **-** | **10.1** | **-** | **-** | **-** | **-** | **-** | **13.8** |
| 167 | - | 1.2 | - | - | - | - | - | 11.0 | - | - | - | - | - | 12.2 |
| 168 | - | 1.2 | - | - | - | - | - | 11.0 | - | - | - | - | - | 12.2 |
| 315 | - | - | 6.7 | - | - | - | - | - | - | - | 2.9 | - | - | 9.6 |
| 316 | - | - | 6.7 | - | - | - | - | - | - | - | 2.9 | - | - | 9.6 |
| 363 | - | - | - | - | 5.1 | 4.1 | - | - | - | - | - | - | - | 9.2 |
| 364 | - | - | - | - | 5.1 | 4.1 | - | - | - | - | - | - | - | 9.2 |
| 75 | - | - | - | 0.4 | 6.6 | - | - | - | - | - | - | - | - | 7.0 |
| 76 | - | - | - | 0.4 | 6.6 | - | - | - | - | - | - | - | - | 7.0 |
| 77 | - | - | - | 0.4 | 6.6 | - | - | - | - | - | - | - | - | 7.0 |
| 18 | - | - | - | - | 5.2 | - | - | - | - | - | - | - | - | 5.2 |
| 19 | - | - | - | - | 5.2 | - | - | - | - | - | - | - | - | 5.2 |
| 240 | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 |
| 241 | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 |
| 242 | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 |
| 243 | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 |

## Table 21. Adults' consumption rates of green vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Artichoke | Asparagus | Broccoli | Brussel sprout | Cabbage | Cauliflower | Chard | Courgette | Cucumber | Herbs | Kale | Rocket | Spinach | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 71 | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 |
| 72 | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 |
| 376 | - | - | - | - | - | - | - | 2.7 | - | - | - | - | - | 2.7 |
| 377 | - | - | - | - | - | - | - | 2.7 | - | - | - | - | - | 2.7 |
| 369 | - | - | - | - | - | 2.0 | - | - | - | - | - | - | - | 2.0 |
| 370 | - | - | - | - | - | 2.0 | - | - | - | - | - | - | - | 2.0 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables based on the 15 high-rate adult consumers is 21.6 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 36 observations is 39.6 kg $y^{-1}$

**Table 22. Adults' consumption rates of other vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Broad bean | Chilli pepper | French bean | Mangetout | Pea | Pepper | Runner bean | Squash | Sweetcorn | Tomato | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **313** | **11.3** | **-** | **-** | **-** | **11.3** | **-** | **10.2** | **15.2** | **1.7** | **22.7** | **72.5** |
| **314** | **11.3** | **-** | **-** | **-** | **11.3** | **-** | **10.2** | **15.2** | **1.7** | **22.7** | **72.5** |
| **379** | **3.4** | **2.7** | **11.3** | **-** | **-** | **12.3** | **-** | **2.3** | **-** | **27.0** | **58.9** |
| **380** | **3.4** | **2.7** | **11.3** | **-** | **-** | **12.3** | **-** | **2.3** | **-** | **27.0** | **58.9** |
| **185** | **16.1** | **-** | **3.6** | **-** | **14.4** | **-** | **-** | **-** | **-** | **11.5** | **45.6** |
| **186** | **16.1** | **-** | **3.6** | **-** | **14.4** | **-** | **-** | **-** | **-** | **11.5** | **45.6** |
| 316 | 1.0 | - | - | 2.0 | 2.0 | - | 6.1 | - | - | 4.9 | 16.1 |
| 315 | 1.0 | - | - | 2.0 | 2.0 | - | 6.1 | - | - | 4.9 | 16.1 |
| 274 | - | - | - | - | 1.1 | - | 4.5 | - | 2.9 | 6.8 | 15.3 |
| 275 | - | - | - | - | 1.1 | - | 4.5 | - | 2.9 | 6.8 | 15.3 |
| 167 | - | 1.0 | - | - | 1.8 | - | - | - | - | 10.8 | 13.6 |
| 168 | - | 1.0 | - | - | 1.8 | - | - | - | - | 10.8 | 13.6 |
| 18 | 5.2 | - | - | - | 5.2 | - | - | - | - | - | 10.4 |
| 19 | 5.2 | - | - | - | 5.2 | - | - | - | - | - | 10.4 |
| 75 | 2.2 | - | - | - | 4.4 | - | 2.2 | - | - | - | 8.9 |
| 76 | 2.2 | - | - | - | 4.4 | - | 2.2 | - | - | - | 8.9 |
| 77 | 2.2 | - | - | - | 4.4 | - | 2.2 | - | - | - | 8.9 |
| 67 | - | - | - | - | - | - | - | - | - | 7.2 | 7.2 |
| 68 | - | - | - | - | - | - | - | - | - | 7.2 | 7.2 |
| 357 | - | - | - | - | - | - | 6.8 | - | - | - | 6.8 |
| 358 | - | - | - | - | - | - | 6.8 | - | - | - | 6.8 |
| 359 | - | - | - | - | - | - | 6.8 | - | - | - | 6.8 |
| 360 | - | - | - | - | - | - | 6.8 | - | - | - | 6.8 |
| 169 | - | - | - | - | - | - | - | - | - | 5.0 | 5.0 |
| 170 | - | - | - | - | - | - | - | - | - | 5.0 | 5.0 |
| 308 | - | 0.2 | - | - | 0.05 | 1.0 | - | - | - | 3.6 | 4.9 |
| 309 | - | 0.2 | - | - | 0.05 | 1.0 | - | - | - | 3.6 | 4.9 |
| 376 | - | - | - | - | - | - | - | - | - | 4.6 | 4.6 |
| 377 | - | - | - | - | - | - | - | - | - | 4.6 | 4.6 |

## Table 22. Adults' consumption rates of other vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Broad bean | Chilli pepper | French bean | Mangetout | Pea | Pepper | Runner bean | Squash | Sweetcorn | Tomato | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | - | - | - | - | - | - | - | 1.3 | - | 2.8 | 4.2 |
| 23 | - | - | - | - | - | - | - | 1.3 | - | 2.8 | 4.2 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of other vegetables based on the 6 high-rate adult consumers is 59.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 31 observations is 72.5 kg $y^{-1}$

**Table 23. Adults' consumption rates of root vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Beetroot | Carrot | Celeriac | Fennel | Garlic | Leek | Onion | Parsnip | Shallot | Spring onion | Turnip | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **185** | **-** | **7.2** | **-** | **-** | **-** | **7.7** | **28.6** | **4.3** | **-** | **-** | **-** | **47.8** |
| **186** | **-** | **7.2** | **-** | **-** | **-** | **7.7** | **28.6** | **4.3** | **-** | **-** | **-** | **47.8** |
| **379** | **-** | **2.8** | **-** | **1.0** | **-** | **-** | **41.3** | **1.4** | **-** | **0.2** | **-** | **46.7** |
| **380** | **-** | **2.8** | **-** | **1.0** | **-** | **-** | **41.3** | **1.4** | **-** | **0.2** | **-** | **46.7** |
| **313** | **6.2** | **-** | **2.4** | **-** | **-** | **11.3** | **13.0** | **-** | **-** | **-** | **-** | **32.8** |
| **314** | **6.2** | **-** | **2.4** | **-** | **-** | **11.3** | **13.0** | **-** | **-** | **-** | **-** | **32.8** |
| **274** | **7.0** | **-** | **-** | **-** | **-** | **4.0** | **11.8** | **-** | **1.1** | **-** | **-** | **23.9** |
| **275** | **7.0** | **-** | **-** | **-** | **-** | **4.0** | **11.8** | **-** | **1.1** | **-** | **-** | **23.9** |
| **22** | **2.8** | **-** | **-** | **-** | **-** | **3.5** | **12.2** | **-** | **-** | **-** | **-** | **18.5** |
| **23** | **2.8** | **-** | **-** | **-** | **-** | **3.5** | **12.2** | **-** | **-** | **-** | **-** | **18.5** |
| 363 | - | 5.9 | - | - | - | - | 9.1 | - | - | - | - | 15.0 |
| 364 | - | 5.9 | - | - | - | - | 9.1 | - | - | - | - | 15.0 |
| 18 | - | 5.2 | - | - | - | - | - | - | - | - | 5.2 | 10.4 |
| 19 | - | 5.2 | - | - | - | - | - | - | - | - | 5.2 | 10.4 |
| 354 | - | 9.0 | - | - | - | - | - | - | - | - | - | 9.0 |
| 355 | - | 9.0 | - | - | - | - | - | - | - | - | - | 9.0 |
| 356 | - | 9.0 | - | - | - | - | - | - | - | - | - | 9.0 |
| 240 | - | 5.9 | - | - | - | - | - | - | - | - | 2.9 | 8.8 |
| 241 | - | 5.9 | - | - | - | - | - | - | - | - | 2.9 | 8.8 |
| 242 | - | 5.9 | - | - | - | - | - | - | - | - | 2.9 | 8.8 |
| 243 | - | 5.9 | - | - | - | - | - | - | - | - | 2.9 | 8.8 |
| 71 | 2.9 | 2.9 | - | - | - | - | - | - | - | - | 2.9 | 8.7 |
| 72 | 2.9 | 2.9 | - | - | - | - | - | - | - | - | 2.9 | 8.7 |
| 5 | 8.2 | - | - | - | - | - | - | - | - | - | - | 8.2 |
| 316 | 1.8 | - | - | - | 0.6 | 1.4 | 3.2 | - | - | - | - | 7.0 |
| 315 | 1.8 | - | - | - | 0.6 | 1.4 | 3.2 | - | - | - | - | 7.0 |
| 369 | 1.2 | 3.6 | - | - | - | - | 1.8 | - | - | - | - | 6.6 |
| 370 | 1.2 | 3.6 | - | - | - | - | 1.8 | - | - | - | - | 6.6 |
| 21 | 3.0 | - | - | - | - | - | - | - | - | - | 3.0 | 6.0 |

**Table 23. Adults' consumption rates of root vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Beetroot | Carrot | Celeriac | Fennel | Garlic | Leek | Onion | Parsnip | Shallot | Spring onion | Turnip | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 376 | - | - | - | - | - | 4.1 | - | - | - | - | - | 4.1 |
| 377 | - | - | - | - | - | 4.1 | - | - | - | - | - | 4.1 |
| 357 | - | - | - | - | - | - | 3.6 | - | - | - | - | 3.6 |
| 358 | - | - | - | - | - | - | 3.6 | - | - | - | - | 3.6 |
| 359 | - | - | - | - | - | - | 3.6 | - | - | - | - | 3.6 |
| 360 | - | - | - | - | - | - | 3.6 | - | - | - | - | 3.6 |
| 167 | - | - | - | - | - | - | 1.3 | - | - | - | - | 1.3 |
| 168 | - | - | - | - | - | - | 1.3 | - | - | - | - | 1.3 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of root vegetables based on the 10 high-rate adult consumers is 33.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 37 observations is 47.8 kg $y^{-1}$

**Table 24. Adults' consumption rates of potato from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Potato |
|---|---|
| **240** | **165.1** |
| **241** | **165.1** |
| **242** | **165.1** |
| **243** | **165.1** |
| **231** | **131.6** |
| **232** | **131.6** |
| **236** | **131.6** |
| **237** | **131.6** |
| **346** | **131.6** |
| **348** | **131.6** |
| **349** | **131.6** |
| **18** | **91.3** |
| **19** | **91.3** |
| **379** | **82.8** |
| **380** | **82.8** |
| **21** | **59.0** |
| 278 | 50.0 |
| 279 | 50.0 |
| 20 | 47.2 |
| 274 | 43.7 |
| 275 | 43.7 |
| 369 | 31.8 |
| 370 | 31.8 |
| 185 | 28.0 |
| 186 | 28.0 |
| 22 | 26.0 |
| 23 | 26.0 |
| 331 | 25.0 |
| 332 | 25.0 |
| 333 | 25.0 |
| 5 | 22.8 |
| 71 | 20.6 |
| 72 | 20.6 |
| 354 | 18.2 |
| 355 | 18.2 |
| 356 | 18.2 |
| 315 | 16.4 |
| 316 | 16.4 |
| 313 | 12.5 |
| 314 | 12.5 |
| 75 | 11.8 |
| 76 | 11.8 |
| 77 | 11.8 |
| 167 | 10.9 |
| 168 | 10.9 |
| 169 | 10.0 |
| 170 | 10.0 |
| 363 | 9.1 |

## Table 24. Adults' consumption rates of potato from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Potato |
|---|---|
| 364 | 9.1 |
| 67 | 7.3 |
| 68 | 7.3 |
| 219 | 1.7 |
| 220 | 1.7 |
| 221 | 1.7 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato based on the 16 high-rate adult consumers is 124.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 54 observations is 165.1 kg $y^{-1}$

**Table 25. Adults' consumption rates of domestic fruit from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Apple | Blackcurrant | Blueberry | Damson | Gooseberry | Melon | Pear | Plum | Raspberry | Redcurrant | Rhubarb | Strawberry | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **379** | **12.7** | **5.7** | **0.5** | **0.2** | **8.2** | **5.2** | **0.5** | **-** | **4.5** | **4.5** | **1.1** | **6.8** | **49.9** |
| **380** | **12.7** | **5.7** | **0.5** | **0.2** | **8.2** | **5.2** | **0.5** | **-** | **4.5** | **4.5** | **1.1** | **6.8** | **49.9** |
| **369** | **25.0** | **5.7** | **-** | **-** | **-** | **-** | **-** | **-** | **3.4** | **4.5** | **-** | **4.1** | **42.7** |
| **370** | **25.0** | **5.7** | **-** | **-** | **-** | **-** | **-** | **-** | **3.4** | **4.5** | **-** | **4.1** | **42.7** |
| **315** | **9.1** | **4.5** | **-** | **-** | **-** | **-** | **-** | **2.3** | **-** | **4.5** | **-** | **-** | **20.4** |
| **316** | **9.1** | **4.5** | **-** | **-** | **-** | **-** | **-** | **2.3** | **-** | **4.5** | **-** | **-** | **20.4** |
| **18** | **16.3** | **-** | **-** | **-** | **-** | **-** | **-** | **1.5** | **-** | **-** | **-** | **-** | **17.8** |
| **19** | **16.3** | **-** | **-** | **-** | **-** | **-** | **-** | **1.5** | **-** | **-** | **-** | **-** | **17.8** |
| 75 | 2.2 | - | - | - | - | - | - | 2.2 | 2.9 | - | - | 4.4 | 11.8 |
| 76 | 2.2 | - | - | - | - | - | - | 2.2 | 2.9 | - | - | 4.4 | 11.8 |
| 77 | 2.2 | - | - | - | - | - | - | 2.2 | 2.9 | - | - | 4.4 | 11.8 |
| 357 | 5.0 | - | - | - | - | - | - | - | - | - | 2.3 | - | 7.3 |
| 358 | 5.0 | - | - | - | - | - | - | - | - | - | 2.3 | - | 7.3 |
| 359 | 5.0 | - | - | - | - | - | - | - | - | - | 2.3 | - | 7.3 |
| 360 | 5.0 | - | - | - | - | - | - | - | - | - | 2.3 | - | 7.3 |
| 55 | 6.7 | - | - | - | - | - | - | - | - | - | - | - | 6.7 |
| 56 | 6.7 | - | - | - | - | - | - | - | - | - | - | - | 6.7 |
| 57 | 6.7 | - | - | - | - | - | - | - | - | - | - | - | 6.7 |
| 58 | 6.7 | - | - | - | - | - | - | - | - | - | - | - | 6.7 |
| 59 | 6.7 | - | - | - | - | - | - | - | - | - | - | - | 6.7 |
| 60 | 6.7 | - | - | - | - | - | - | - | - | - | - | - | 6.7 |
| 376 | - | 1.6 | - | - | - | - | - | - | 1.4 | - | - | 3.5 | 6.4 |
| 377 | - | 1.6 | - | - | - | - | - | - | 1.4 | - | - | 3.5 | 6.4 |
| 5 | 5.0 | - | - | - | - | - | - | - | - | - | - | - | 5.0 |
| 22 | 2.0 | - | - | - | - | - | - | - | - | - | 3.6 | - | 5.6 |
| 23 | 2.0 | - | - | - | - | - | - | - | - | - | 3.6 | - | 5.6 |
| 167 | - | - | - | - | - | - | - | - | - | - | 1.5 | 4.1 | 5.6 |
| 168 | - | - | - | - | - | - | - | - | - | - | 1.5 | 4.1 | 5.6 |
| 278 | 3.5 | - | - | - | - | - | - | 1.0 | - | - | - | - | 4.5 |
| 279 | 3.5 | - | - | - | - | - | - | 1.0 | - | - | - | - | 4.5 |
| 274 | - | 1.1 | - | - | - | - | - | - | - | - | 0.9 | 2.3 | 4.3 |
| 275 | - | 1.1 | - | - | - | - | - | - | - | - | 0.9 | 2.3 | 4.3 |

**Table 25. Adults' consumption rates of domestic fruit from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Apple | Blackcurrant | Blueberry | Damson | Gooseberry | Melon | Pear | Plum | Raspberry | Redcurrant | Rhubarb | Strawberry | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 219 | 2.0 | 0.8 | - | - | 0.7 | - | - | - | 0.3 | 0.3 | - | - | 4.2 |
| 220 | 2.0 | 0.8 | - | - | 0.7 | - | - | - | 0.3 | 0.3 | - | - | 4.2 |
| 221 | 2.0 | 0.8 | - | - | 0.7 | - | - | - | 0.3 | 0.3 | - | - | 4.2 |
| 67 | - | - | - | - | - | - | - | 1.4 | - | - | 2.7 | - | 4.1 |
| 68 | - | - | - | - | - | - | - | 1.4 | - | - | 2.7 | - | 4.1 |
| 314 | - | 2.3 | - | - | - | - | - | - | 0.5 | - | - | 0.5 | 3.2 |
| 313 | - | 2.3 | - | - | - | - | - | - | 0.5 | - | - | 0.5 | 3.2 |
| 185 | - | - | - | - | - | - | - | - | 3.0 | - | - | - | 3.0 |
| 186 | - | - | - | - | - | - | - | - | 3.0 | - | - | - | 3.0 |
| 240 | 2.3 | - | - | - | - | - | - | - | - | - | - | - | 2.3 |
| 241 | 2.3 | - | - | - | - | - | - | - | - | - | - | - | 2.3 |
| 242 | 2.3 | - | - | - | - | - | - | - | - | - | - | - | 2.3 |
| 243 | 2.3 | - | - | - | - | - | - | - | - | - | - | - | 2.3 |
| 20 | 2.0 | - | - | - | - | - | - | - | - | - | - | - | 2.0 |
| 231 | - | - | - | - | 1.0 | - | - | - | - | - | - | - | 1.0 |
| 232 | - | - | - | - | 1.0 | - | - | - | - | - | - | - | 1.0 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit based on the 8 high-rate adult consumers is 32.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 48 observations is 48.6 kg $y^{-1}$

## Table 26. Adults' consumption rates of milk from the Sellafield terrestrial survey area (l $y^{-1}$)

| Observation number | Cows' milk |
|---|---|
| **369** | **259.3** |
| **370** | **259.3** |
| **55** | **236.4** |
| **331** | **199.5** |
| **332** | **199.5** |
| **333** | **199.5** |
| **350** | **182.5** |
| **351** | **182.5** |
| **357** | **182.5** |
| **358** | **182.5** |
| **359** | **182.5** |
| **360** | **182.5** |
| **60** | **118.2** |
| **185** | **103.7** |
| **186** | **103.7** |
| 58 | 73.9 |
| 59 | 73.9 |
| 354 | 69.0 |
| 355 | 69.0 |
| 356 | 69.0 |
| 56 | 59.1 |
| 57 | 59.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of milk based on the 15 high-rate adult consumers is 184.9 l $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 22 observations is 259.3 l $y^{-1}$

## Table 27. Adults' consumption rates of cattle meat from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Beef |
|---|---|
| **369** | **71.0** |
| **370** | **71.0** |
| **371** | **71.0** |
| **372** | **71.0** |
| **363** | **31.5** |
| **364** | **31.5** |
| **365** | **31.5** |
| **366** | **31.5** |
| **367** | **31.5** |
| **368** | **31.5** |
| **231** | **24.9** |
| **232** | **24.9** |
| **236** | **24.9** |
| **237** | **24.9** |
| **346** | **24.9** |
| **348** | **24.9** |
| **349** | **24.9** |
| 217 | 15.6 |
| 218 | 15.6 |
| 75 | 11.8 |
| 76 | 11.8 |
| 77 | 11.8 |
| 79 | 11.8 |
| 80 | 11.8 |
| 81 | 11.8 |
| 82 | 11.8 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of cattle meat based on the 17 high-rate adult consumers is 38.1 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 26 observations is 71.0 kg $y^{-1}$

## Table 28. Adults' consumption rates of pig meat from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Pork |
|---|---|
| **363** | **25.3** |
| **364** | **25.3** |
| **365** | **25.3** |
| **366** | **25.3** |
| **367** | **25.3** |
| **368** | **25.3** |
| **282** | **11.2** |
| **283** | **11.2** |
| **286** | **11.2** |
| **287** | **11.2** |
| **288** | **11.2** |
| **289** | **11.2** |
| **290** | **11.2** |
| **291** | **11.2** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of pig meat based on the 14 high-rate adult consumers is 17.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 14 observations is 25.3 kg $y^{-1}$

**Table 29. Adults' consumption rates of sheep meat from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Lamb |
|---|---|
| **3** | **17.0** |
| **4** | **17.0** |
| **217** | **17.0** |
| **218** | **17.0** |
| **61** | **14.5** |
| **62** | **14.5** |
| **67** | **11.3** |
| **68** | **11.3** |
| **361** | **11.3** |
| **362** | **11.3** |
| **374** | **11.3** |
| **375** | **11.3** |
| **278** | **5.7** |
| **279** | **5.7** |
| **280** | **5.7** |
| **281** | **5.7** |
| **363** | **5.7** |
| **364** | **5.7** |
| **365** | **5.7** |
| **366** | **5.7** |
| **367** | **5.7** |
| **368** | **5.7** |
| **369** | **5.7** |
| **370** | **5.7** |
| **371** | **5.7** |
| **372** | **5.7** |
| 231 | 3.0 |
| 232 | 3.0 |
| 236 | 3.0 |
| 237 | 3.0 |
| 346 | 3.0 |
| 348 | 3.0 |
| 349 | 3.0 |
| 75 | 2.8 |
| 76 | 2.8 |
| 77 | 2.8 |
| 282 | 1.3 |
| 283 | 1.3 |
| 286 | 1.3 |
| 287 | 1.3 |
| 288 | 1.3 |
| 289 | 1.3 |
| 290 | 1.3 |
| 291 | 1.3 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of sheep meat based on the 26 high-rate adult consumers is 9.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 44 observations is 17.0 kg $y^{-1}$

**Table 30. Adults' consumption rates of poultry from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Goose (unspecified species) | Mallard | Pheasant | Pigeon | Turkey | Total |
|---|---|---|---|---|---|---|
| **18** | **-** | **-** | **32.4** | **-** | **-** | **32.4** |
| **19** | **-** | **-** | **32.4** | **-** | **-** | **32.4** |
| **75** | **-** | **-** | **3.9** | **11.5** | **-** | **15.4** |
| **76** | **-** | **-** | **3.9** | **11.5** | **-** | **15.4** |
| **77** | **-** | **-** | **3.9** | **11.5** | **-** | **15.4** |
| **5** | **-** | **-** | **11.7** | **-** | **-** | **11.7** |
| 308 | - | - | 8.1 | - | - | 8.1 |
| 309 | - | - | 8.1 | - | - | 8.1 |
| 369 | 1.1 | - | 1.4 | - | 0.9 | 3.3 |
| 370 | 1.1 | - | 1.4 | - | 0.9 | 3.3 |
| 373 | - | - | 2.7 | - | - | 2.7 |
| 371 | 1.1 | - | - | - | 0.9 | 2.0 |
| 372 | 1.1 | - | - | - | 0.9 | 2.0 |
| 282 | - | 0.9 | 0.9 | - | - | 1.8 |
| 283 | - | 0.9 | 0.9 | - | - | 1.8 |
| 363 | - | - | 1.4 | 0.3 | - | 1.7 |
| 364 | - | - | 1.4 | 0.3 | - | 1.7 |
| 240 | - | - | 0.7 | - | - | 0.7 |
| 241 | - | - | 0.7 | - | - | 0.7 |
| 242 | - | - | 0.7 | - | - | 0.7 |
| 243 | - | - | 0.7 | - | - | 0.7 |
| 357 | - | - | 0.7 | - | - | 0.7 |
| 358 | - | - | 0.7 | - | - | 0.7 |
| 359 | - | - | 0.7 | - | - | 0.7 |
| 360 | - | - | 0.7 | - | - | 0.7 |
| 55 | - | - | 0.5 | - | - | 0.5 |
| 56 | - | - | 0.5 | - | - | 0.5 |
| 57 | - | - | 0.5 | - | - | 0.5 |
| 58 | - | - | 0.5 | - | - | 0.5 |
| 59 | - | - | 0.5 | - | - | 0.5 |
| 60 | - | - | 0.5 | - | - | 0.5 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of poultry based on the 6 high-rate adult consumers is 20.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 31 observations is 32.4 kg $y^{-1}$

**Table 31. Adults' consumption rates of eggs from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Chickens' egg | Ducks' egg | Total |
|---|---|---|---|
| **231** | **20.8** | **-** | **20.8** |
| **232** | **20.8** | **-** | **20.8** |
| **236** | **20.8** | **-** | **20.8** |
| **238** | **20.8** | **-** | **20.8** |
| **239** | **20.8** | **-** | **20.8** |
| **240** | **17.8** | **-** | **17.8** |
| **241** | **17.8** | **-** | **17.8** |
| **242** | **17.8** | **-** | **17.8** |
| **243** | **17.8** | **-** | **17.8** |
| **75** | **-** | **17.6** | **17.6** |
| **76** | **-** | **17.6** | **17.6** |
| **77** | **-** | **17.6** | **17.6** |
| **217** | **16.4** | **-** | **16.4** |
| **218** | **16.4** | **-** | **16.4** |
| **376** | **15.7** | **-** | **15.7** |
| **377** | **15.7** | **-** | **15.7** |
| **61** | **15.3** | **-** | **15.3** |
| **62** | **15.3** | **-** | **15.3** |
| **308** | **8.9** | **-** | **8.9** |
| **309** | **8.9** | **-** | **8.9** |
| **379** | **8.9** | **-** | **8.9** |
| **380** | **8.9** | **-** | **8.9** |
| **219** | **8.2** | **-** | **8.2** |
| **220** | **8.2** | **-** | **8.2** |
| **221** | **8.2** | **-** | **8.2** |
| 369 | 6.8 | - | 6.8 |
| 370 | 6.8 | - | 6.8 |
| 64 | 4.9 | - | 4.9 |
| 65 | 4.9 | - | 4.9 |
| 305 | 4.1 | - | 4.1 |
| 306 | 4.1 | - | 4.1 |
| 357 | 3.4 | - | 3.4 |
| 358 | 3.4 | - | 3.4 |
| 359 | 3.4 | - | 3.4 |
| 360 | 3.4 | - | 3.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs based on the 25 high-rate adult consumers is 15.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 35 observations is 20.8 kg $y^{-1}$

**Table 32. Adults' consumption rates of wild/free foods from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Blackberry | Damson | Pignut | Plum | Sloe | Total |
|---|---|---|---|---|---|---|
| **240** | **4.5** | **-** | **-** | **2.3** | **-** | **6.8** |
| **241** | **4.5** | **-** | **-** | **2.3** | **-** | **6.8** |
| **242** | **4.5** | **-** | **-** | **2.3** | **-** | **6.8** |
| **243** | **4.5** | **-** | **-** | **2.3** | **-** | **6.8** |
| **75** | **3.7** | **1.4** | **0.2** | **-** | **-** | **5.3** |
| **76** | **3.7** | **1.4** | **-** | **-** | **-** | **5.1** |
| **77** | **3.7** | **1.4** | **-** | **-** | **-** | **5.1** |
| **336** | **5.0** | **-** | **-** | **-** | **-** | **5.0** |
| **217** | **0.5** | **-** | **-** | **-** | **3.4** | **3.9** |
| **218** | **0.5** | **-** | **-** | **-** | **3.4** | **3.9** |
| **337** | **3.0** | **-** | **-** | **-** | **-** | **3.0** |
| 231 | 2.0 | - | - | - | - | 2.0 |
| 232 | 2.0 | - | - | - | - | 2.0 |
| 369 | 1.5 | - | - | - | 0.5 | 2.0 |
| 370 | 1.5 | - | - | - | 0.5 | 2.0 |
| 18 | 1.5 | - | - | - | - | 1.5 |
| 19 | 1.5 | - | - | - | - | 1.5 |
| 278 | 1.5 | - | - | - | - | 1.5 |
| 279 | 1.5 | - | - | - | - | 1.5 |
| 305 | 1.5 | - | - | - | - | 1.5 |
| 306 | 1.5 | - | - | - | - | 1.5 |
| 61 | 1.2 | - | - | - | - | 1.2 |
| 62 | 1.2 | - | - | - | - | 1.2 |
| 308 | 0.6 | 0.5 | - | - | - | 1.0 |
| 309 | 0.6 | 0.5 | - | - | - | 1.0 |
| 331 | 1.0 | - | - | - | - | 1.0 |
| 332 | 1.0 | - | - | - | - | 1.0 |
| 333 | 1.0 | - | - | - | - | 1.0 |
| 55 | 0.9 | - | - | - | - | 0.9 |
| 56 | 0.9 | - | - | - | - | 0.9 |
| 57 | 0.9 | - | - | - | - | 0.9 |
| 58 | 0.9 | - | - | - | - | 0.9 |
| 59 | 0.9 | - | - | - | - | 0.9 |
| 60 | 0.9 | - | - | - | - | 0.9 |
| 67 | 0.5 | 0.5 | - | - | - | 0.9 |
| 68 | 0.5 | 0.5 | - | - | - | 0.9 |
| 357 | - | - | - | - | 0.8 | 0.8 |
| 358 | - | - | - | - | 0.8 | 0.8 |
| 359 | - | - | - | - | 0.8 | 0.8 |
| 360 | - | - | - | - | 0.8 | 0.8 |
| 361 | 0.7 | - | - | - | - | 0.7 |
| 362 | 0.7 | - | - | - | - | 0.7 |
| 169 | 0.5 | - | - | - | - | 0.5 |
| 170 | 0.5 | - | - | - | - | 0.5 |
| 185 | 0.5 | - | - | - | - | 0.5 |
| 186 | 0.5 | - | - | - | - | 0.5 |
| 22 | 0.5 | - | - | - | - | 0.5 |
| 23 | 0.5 | - | - | - | - | 0.5 |
| 282 | 0.5 | - | - | - | - | 0.5 |
| 283 | 0.5 | - | - | - | - | 0.5 |
| 379 | 0.5 | - | - | - | - | 0.5 |
| 380 | 0.5 | - | - | - | - | 0.5 |

**Table 32. Adults' consumption rates of wild/free foods from the Sellafield terrestrial survey area (kg $y^{-1}$)**

| Observation number | Blackberry | Damson | Pignut | Plum | Sloe | Total |
|---|---|---|---|---|---|---|
| 219 | 0.4 | - | - | - | - | 0.4 |
| 220 | 0.4 | - | - | - | - | 0.4 |
| 221 | 0.4 | - | - | - | - | 0.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild/free foods based on the 11 high-rate adult consumers is 5.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 55 observations is 6.8 kg $y^{-1}$

## Table 33. Adults' consumption rates of rabbits/hares from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Rabbit |
|---|---|
| **75** | **2.8** |
| **76** | **2.8** |
| **77** | **2.8** |
| 240 | 0.2 |
| 241 | 0.2 |
| 242 | 0.2 |
| 243 | 0.2 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of rabbits/hares based on the 3 high-rate adult consumers is 2.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 7 observations is 2.8 kg $y^{-1}$

## Table 34. Adults' consumption rates of honey from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Honey |
|---|---|
| **357** | **0.2** |
| **358** | **0.2** |
| **359** | **0.2** |
| **360** | **0.2** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of honey based on the 4 high-rate adult consumers is 0.2 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 0.2 kg $y^{-1}$

## Table 35. Adults' consumption rates of wild fungi from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Mushrooms |
|---|---|
| **379** | **1.7** |
| **380** | **1.7** |
| 278 | 0.5 |
| 279 | 0.5 |
| 240 | 0.2 |
| 241 | 0.2 |
| 242 | 0.2 |
| 243 | 0.2 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild fungi based on the 2 high-rate adult consumers is 1.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 8 observations is 1.7 kg $y^{-1}$

## Table 36. Adults' consumption rates of venison from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Venison |
|---|---|
| **75** | **26.5** |
| **76** | **26.5** |
| **77** | **26.5** |
| 373 | 1.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of venison based on the 3 high-rate adult consumers is 26.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 26.5 kg $y^{-1}$

## Table 37. Adults' consumption rates of freshwater fish from the Sellafield terrestrial survey area (kg $y^{-1}$)

| Observation number | Rainbow trout |
|---|---|
| **240** | **1.4** |
| **241** | **1.4** |
| **242** | **1.4** |
| **243** | **1.4** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of freshwater fish based on the 4 high-rate adult consumers is 1.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 1.4 kg $y^{-1}$

## Table 38. Children's consumption rates of green vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Brussel sprout | Cabbage | Chard | Courgette | Cucumber | Herbs | Rocket | Total |
|---|---|---|---|---|---|---|---|---|---|
| **24** | **14** | **-** | **-** | **3.4** | **5.7** | **2.6** | **0.2** | **2.1** | **13.9** |
| **78** | **15** | **0.4** | **6.6** | **-** | **-** | **-** | **-** | **-** | **7.0** |
| 378 | 7 | - | - | - | 2.0 | - | - | - | 2.0 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables for the child age group based upon the 2 high-rate consumers is 10.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 13.6 kg $y^{-1}$

## Table 39. Children's consumption rates of other vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Broad bean | Pea | Runner bean | Squash | Tomato | Total |
|---|---|---|---|---|---|---|---|
| **78** | **15** | **2.2** | **4.4** | **2.2** | **-** | **-** | **8.9** |
| **24** | **14** | **-** | **-** | **-** | **1.3** | **2.8** | **4.2** |
| **378** | **7** | **-** | **-** | **-** | **-** | **3.4** | **3.4** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of other vegetables for the child age group based upon the 3 high-rate consumers is 5.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 8.6 kg $y^{-1}$

## Table 40. Children's consumption rates of root vegetables from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Beetroot | Leek | Onion | Total |
|---|---|---|---|---|---|
| **24** | **14** | **2.8** | **3.5** | **12.2** | **18.5** |
| 378 | 7 | - | 3.1 | - | 3.1 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of root vegetables for the child age group based upon the only high-rate consumer is 18.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 18.1 kg $y^{-1}$

## Table 41. Children's and infants' consumption rates of potato from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Potato |
|---|---|---|
| **24** | **14** | **26.0** |
| **78** | **15** | **11.8** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato for the child age group based upon the 2 high-rate consumers is 18.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 25.6 kg $y^{-1}$

**Infant age group (0 - 5 years old)**

| Observation number | Age | Potato |
|---|---|---|
| **233** | **4** | **19.7** |
| **347** | **4** | **19.7** |
| **234** | **3** | **19.7** |
| **235** | **3** | **19.7** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato for the infant age group based upon the 4 high-rate consumers is 19.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 19.7 kg $y^{-1}$

## Table 42. Children's consumption rates of domestic fruit from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Apple | Blackcurrant | Plum | Raspberry | Rhubarb | Strawberry | Total |
|---|---|---|---|---|---|---|---|---|
| 78 | 15 | 2.2 | - | 2.2 | 2.9 | - | 4.4 | 11.8 |
| 24 | 14 | 2.0 | - | - | - | 3.6 | - | 5.6 |
| 378 | 7 | - | 1.2 | - | 1.0 | - | 2.6 | 4.8 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit for the child age group based upon the 3 high-rate consumers is 7.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 11.5 kg $y^{-1}$

## Table 43. Children's and infants' consumption rates of milk from the Sellafield terrestrial survey area (l $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Cows' milk |
|---|---|---|
| 353 | 6 | 182.5 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of milk for the child age group based upon the only high-rate consumer is 182.5 l $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Infant age group (0 - 5 years old)**

| Observation number | Age | Cows' milk |
|---|---|---|
| 352 | 4 | 182.5 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of milk for the infant age group based upon the only high-rate consumer is 182.5 l $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

## Table 44. Children's and infants' consumption rates of cattle meat from the Sellafield terrestrial survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Beef |
|---|---|---|
| 78 | 15 | 11.8 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of cattle meat for the child age group based upon the only high-rate consumer is 11.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

### Infant age group (0 - 5 years old)

| Observation number | Age | Beef |
|---|---|---|
| 233 | 4 | 3.7 |
| 347 | 4 | 3.7 |
| 234 | 3 | 3.7 |
| 235 | 3 | 3.7 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of cattle meat for the infant age group based upon the 4 high-rate consumers is 3.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 3.7 kg $y^{-1}$

## Table 45. Children's and infants' consumption rates of pig meat from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Pork |
|---|---|---|
| **284** | **7** | **8.4** |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of pig meat for the child age group based upon the only high-rate consumer is 8.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Infant age group (0 - 5 years old)**

| Observation number | Age | Pork |
|---|---|---|
| **285** | **3** | **2.8** |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of pig meat for the infant age group based upon the only high-rate consumer is 2.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

## Table 46. Children's and infants' consumption rates of sheep meat from the Sellafield terrestrial survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Lamb |
|---|---|---|
| **78** | **15** | **2.8** |
| **284** | **7** | **0.9** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of sheep meat for the child age group based upon the 2 high-rate consumers is 1.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 2.8 kg $y^{-1}$

### Infant age group (0 - 5 years old)

| Observation number | Age | Lamb |
|---|---|---|
| **63** | **2** | **4.8** |
| 233 | 4 | 0.4 |
| 347 | 4 | 0.4 |
| 234 | 3 | 0.4 |
| 235 | 3 | 0.4 |
| 285 | 3 | 0.3 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of sheep meat for the infant age group based upon the only high-rate consumer is 4.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 6 observations is 4.3 kg $y^{-1}$

## Table 47. Children's and infants' consumption rates of poultry from the Sellafield terrestrial survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Mallard | Pheasant | Pigeon | Total |
|---|---|---|---|---|---|
| **78** | **15** | **-** | **3.9** | **11.5** | **15.4** |
| 284 | 7 | 0.7 | 0.7 | - | 1.4 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of poultry for the child age group based upon the only high-rate consumer is 15.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 15.1 kg $y^{-1}$

### Infant age group (0 - 5 years old)

| Observation number | Age | Mallard | Pheasant | Pigeon | Total |
|---|---|---|---|---|---|
| **285** | **3** | **0.2** | **0.2** | **-** | **0.5** |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of poultry for the infant age group based upon the only high-rate consumer is 0.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

## Table 48. Children's and infants' consumption rates of eggs from the Sellafield terrestrial survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Chicken egg | Duck egg | Total |
|---|---|---|---|---|
| **78** | **15** | **-** | **17.6** | **17.6** |
| **378** | **7** | **7.8** | **-** | **7.8** |
| 66 | 15 | 4.9 | - | 4.9 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs for the child age group based upon the 2 high-rate consumers is 12.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 17.1 kg $y^{-1}$

### Infant age group (0 - 5 years old)

| Observation number | Age | Chicken egg | Duck egg | Total |
|---|---|---|---|---|
| **233** | **4** | **5.9** | **-** | **5.9** |
| **234** | **3** | **5.9** | **-** | **5.9** |
| **235** | **3** | **5.9** | **-** | **5.9** |
| **63** | **2** | **5.0** | **-** | **5.0** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs for the infant age group based upon the 4 high-rate consumers is 5.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 5.9 kg $y^{-1}$

## Table 49. Children's and infants' consumption rates of wild/free foods from the Sellafield terrestrial survey area (kg $y^{-1}$)

### Child age group (6 - 15 years old)

| Observation number | Age | Blackberry | Damson | Total |
|---|---|---|---|---|
| **78** | **15** | **3.7** | **1.4** | **5.1** |
| 24 | 14 | 0.5 | - | 0.5 |
| 284 | 7 | 0.3 | - | 0.3 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of wild/free foods for the child age group based upon the only high-rate consumer is 5.1 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 4.9 kg $y^{-1}$

### Infant age group (0 - 5 years old)

| Observation number | Age | Blackberry | Damson | Total |
|---|---|---|---|---|
| **233** | **4** | **2.0** | **-** | **2.0** |
| **234** | **3** | **2.0** | **-** | **2.0** |
| **235** | **3** | **2.0** | **-** | **2.0** |
| 63 | 2 | 0.4 | - | 0.4 |
| 285 | 3 | 0.1 | - | 0.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild/free foods for the infant age group based upon the 3 high-rate consumers is 2.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 5 observations is 2.0 kg $y^{-1}$

## Table 50. Children's consumption rates of rabbits/hares from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Rabbit |
|---|---|---|
| 78 | 15 | 2.8 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of rabbits/hares for the child age group based upon the only high-rate consumer is 2.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

## Table 51. Children's consumption rates of venison from the Sellafield terrestrial survey area (kg $y^{-1}$)

**Child age group (6 - 15 years old)**

| Observation number | Age | Venison |
|---|---|---|
| 78 | 15 | 26.5 |

**Notes**

The emboldened observation is the high-rate individual

The mean consumption rate of venison for the child age group based upon the only high-rate consumer is 26.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 52. Percentage contribution each food type makes to its terrestrial food group for adults**

| | |
|---|---|
| **Green vegetables** | |
| ***Cabbage*** | 29.44 % |
| Courgette | 27.47 % |
| Artichoke | 9.70 % |
| Cauliflower | 9.19 % |
| Brussel sprout | 8.20 % |
| Broccoli | 4.87 % |
| Kale | 3.46 % |
| Chard | 2.61 % |
| Asparagus | 1.56 % |
| Cucumber | 1.31 % |
| Spinach | 1.15 % |
| Rocket | 0.95 % |
| Herbs | 0.08 % |
| **Other vegetables** | |
| Tomato | 36.80 % |
| Broad bean | 15.77 % |
| Pea | 14.66 % |
| ***Runner bean*** | 13.01 % |
| Squash | 6.47 % |
| French bean | 5.10 % |
| Pepper | 4.56 % |
| Sweetcorn | 1.58 % |
| Chilli pepper | 1.36 % |
| Mangetout | 0.70 % |
| **Root vegetables** | |
| ***Onion*** | 48.26 % |
| ***Carrot*** | 19.73 % |
| Leek | 11.87 % |
| Beetroot | 10.25 % |
| ***Turnip*** | 5.78 % |
| Parsnip | 2.12 % |
| Celeriac | 0.89 % |
| Shallot | 0.42 % |
| Fennel | 0.38 % |
| Garlic | 0.22 % |
| Spring onion | 0.08 % |
| **Potato** | |
| ***Potato*** | 100.00 % |
| **Domestic fruit** | |
| ***Apple*** | 50.71 % |
| Strawberry | 11.21 % |
| ***Blackcurrant*** | 8.92 % |
| Raspberry | 7.11 % |
| Rhubarb | 5.85 % |
| Redcurrant | 5.70 % |
| Gooseberry | 4.11 % |
| Plum | 3.84 % |
| Melon | 2.10 % |
| Pear | 0.18 % |
| Blueberry | 0.18 % |
| Damson | 0.09 % |
| **Milk** | |
| ***Cows' milk*** | 100.00 % |
| **Cattle meat** | |
| ***Beef*** [a] | 100.00 % |
| **Pig meat** | |
| Pork | 100.00 % |
| **Sheep meat** | |
| ***Lamb*** [b] | 100.00 % |
| **Poultry** | |
| ***Pheasant*** | 73.18 % |
| ***Pigeon*** [c] | 21.02 % |
| Goose | 2.63 % |
| Turkey | 2.09 % |
| Mallard | 1.08 % |
| **Eggs** | |
| ***Chicken egg*** | 87.66 % |
| Duck egg | 12.34 % |
| **Wild/free foods** | |
| ***Blackberry*** | 73.95 % |
| Sloe | 10.93 % |
| Plum | 9.03 % |
| Damson | 5.87 % |
| Pignut | 0.23 % |
| **Rabbits/hares** | |
| ***Rabbit*** | 100.00 % |
| **Honey** | |
| ***Honey*** | 100.00 % |
| **Wild fungi** | |
| ***Mushrooms*** | 100.00 % |
| **Venison** | |
| Venison | 100.00 % |
| **Freshwater fish** | |
| Rainbow trout | 100.00 % |

**Notes**

Food types in emboldened italics were monitored by FSA in 2012 (EA, FSA, NIEA and SEPA, 2013). Barley, duck, oats, swede were also monitored.

Percentages are based on the consumption of all adults in the survey consuming that particular food group.

[a]Beef kidney, liver and muscle.

[b]Sheep muscle and sheep offal

[c]Wood pigeon muscle.

**Table 53. Direct radiation occupancy rates for adults, children and infants in the Sellafield area (h $y^{-1}$)**

| Observation number | Sex | Age (years) | Main activity | Indoor occupancy | Outdoor occupancy | Total occupancy |
|---|---|---|---|---|---|---|
| **0 to 0.25 km zone** | | | | | | |
| 234 | M | 3 | Residing | 7667 | 215 | 7882 |
| 235 | M | 3 | Residing | 7667 | 215 | 7882 |
| 231 | F | 31 | Residing | 5649 | 1611 | 7260 |
| 233 | M | 4 | Residing | 6256 | 956 | 7212 |
| 232 | M | 38 | Residing | 3813 | 3060 | 6873 |
| 237 | M | U | Working | 300 | 2100 | 2400 |
| 236 | M | U | Working | 365 | 1460 | 1825 |
| 185 | M | 61 | Fishing and walking along the River Calder | - | 605 | 605 |
| **>0.25 to 0.5 km zone** | | | | | | |
| 220 | F | U | Residing | 7814 | 722 | 8536 |
| 219 | M | U | Residing | 6120 | 2301 | 8421 |
| 218 | M | 56 | Residing | 5473 | 2864 | 8337 |
| 217 | F | 51 | Residing | 6086 | 1790 | 7876 |
| 167 | M | 60 | Residing | 7274 | 350 | 7624 |
| 168 | F | 57 | Residing | 5174 | 650 | 5824 |
| 181 | M | U | Working | 264 | 2200 | 2464 |
| 182 | M | U | Working | 264 | 2200 | 2464 |
| 183 | M | U | Working | 264 | 2200 | 2464 |
| 221 | M | U | Working | 625 | 1625 | 2250 |
| 184 | M | U | Working | 880 | 1174 | 2054 |
| 29 | M | 38 | Angling on Sellafield beach | - | 185 | 185 |
| **>0.5 to 1 km zone** | | | | | | |
| 169 | M | 65 | Residing | 7476 | 900 | 8376 |
| 336 | M | 51 | Residing | 5705 | 2300 | 8005 |
| 310 | F | 51 | Residing | 6876 | 770 | 7646 |
| 276 | M | 76 | Residing | 6944 | 660 | 7604 |
| 277 | F | 63 | Residing | 6944 | 660 | 7604 |
| 274 | F | 65 | Residing | 6203 | 1169 | 7372 |
| 275 | M | 65 | Residing | 6203 | 1169 | 7372 |
| 311 | F | 23 | Residing | 7003 | 50 | 7053 |
| 308 | F | 45 | Residing | 5382 | 1456 | 6838 |
| 282 | M | 37 | Residing | 5019 | 1755 | 6774 |
| 285 | F | 3 | Residing | 5956 | 702 | 6658 |
| 306 | M | 69 | Residing | 6069 | 510 | 6579 |
| 170 | F | 55 | Residing | 6036 | 500 | 6536 |
| 309 | M | 47 | Residing | 5076 | 1456 | 6532 |
| 305 | F | 66 | Residing | 6277 | 72 | 6349 |
| 284 | M | 7 | Residing | 5171 | 1053 | 6224 |
| 312 | M | 52 | Residing | 6027 | 128 | 6155 |
| 283 | F | 36 | Residing | 5099 | 1053 | 6152 |
| 337 | M | 60 | Residing | 4914 | 956 | 5870 |
| 331 | F | 53 | Working | 500 | 3000 | 3500 |
| 171 | F | U | Working | 2025 | 150 | 2175 |
| 176 | F | U | Working | 2025 | 150 | 2175 |
| 317 | M | U | Working | 1926 | 50 | 1976 |
| 318 | M | U | Working | 1926 | 50 | 1976 |
| 319 | M | U | Working | 1926 | 50 | 1976 |
| 320 | M | U | Working | 1926 | 50 | 1976 |
| 321 | M | U | Working | 1926 | 50 | 1976 |
| 322 | F | U | Working | 1926 | 50 | 1976 |

**Table 53. Direct radiation occupancy rates for adults, children and infants in the Sellafield area (h $y^{-1}$)**

| Observation number | Sex | Age (years) | Main activity | Indoor occupancy | Outdoor occupancy | Total occupancy |
|---|---|---|---|---|---|---|
| 323 | F | U | Working | 1926 | 50 | 1976 |
| 324 | F | U | Working | 1926 | 50 | 1976 |
| 325 | F | U | Working | 1926 | 50 | 1976 |
| 334 | M | U | Working | - | 1794 | 1794 |
| 172 | F | U | Working | 1040 | 74 | 1114 |
| 174 | M | U | Working | 1040 | 74 | 1114 |
| 175 | M | U | Working | 1040 | 74 | 1114 |
| 326 | F | U | Working | 880 | 50 | 930 |
| 327 | F | U | Working | 880 | 50 | 930 |
| 328 | F | U | Working | 880 | 50 | 930 |
| 329 | M | U | Working | 880 | 50 | 930 |
| 330 | M | U | Working | 880 | 50 | 930 |
| 335 | F | U | Working | - | 920 | 920 |
| 292 | F | U | Visiting | - | 730 | 730 |
| 293 | F | U | Visiting | - | 730 | 730 |
| 294 | F | U | Visiting | - | 730 | 730 |
| 295 | F | U | Visiting | - | 730 | 730 |
| 296 | F | U | Visiting | - | 730 | 730 |
| 177 | F | U | Working | 624 | 70 | 694 |
| 180 | F | U | Working | 624 | 70 | 694 |
| 313 | F | 73 | Attending an allotment plot | - | 468 | 468 |
| 314 | M | 73 | Attending an allotment plot | - | 468 | 468 |
| 315 | F | 66 | Attending an allotment plot | - | 410 | 410 |
| 316 | M | 68 | Attending an allotment plot | - | 410 | 410 |
| 173 | F | U | Working | 312 | 34 | 346 |
| 178 | F | U | Working | 312 | 34 | 346 |
| 179 | F | U | Working | 312 | 34 | 346 |
| 187 | M | 66 | Hobby fishing on the beach at Sellafield | - | 270 | 270 |
| 189 | M | 31 | Hobby fishing on the beach at Sellafield | - | 258 | 258 |
| 192 | M | 33 | Hobby fishing on the beach at Sellafield | - | 258 | 258 |
| 297 | M | U | Visiting | - | 77 | 77 |
| 298 | M | U | Visiting | - | 77 | 77 |
| 299 | M | U | Visiting | - | 77 | 77 |
| 300 | M | U | Visiting | - | 77 | 77 |
| 301 | M | U | Visiting | - | 77 | 77 |
| 188 | F | 62 | Hobby fishing on the beach at Sellafield | - | 62 | 62 |

**Notes**

U = Unknown

**Table 54. Analysis of direct radiation occupancy rates for adults, children and infants in the Sellafield area**

| Number of hours | Number of observations |
|---|---|
| **0 to 0.25 km zone** | |
| >8000 to 8760 | 0 |
| >7000 to 8000 | 4 |
| >6000 to 7000 | 1 |
| >5000 to 6000 | 0 |
| >4000 to 5000 | 0 |
| >3000 to 4000 | 0 |
| >2000 to 3000 | 1 |
| >1000 to 2000 | 1 |
| 0 to 1000 | 1 |
| **0 to 8760** | **8** |
| **>0.25 to 0.5 km zone** | |
| >8000 to 8760 | 3 |
| >7000 to 8000 | 2 |
| >6000 to 7000 | 0 |
| >5000 to 6000 | 1 |
| >4000 to 5000 | 0 |
| >3000 to 4000 | 0 |
| >2000 to 3000 | 5 |
| >1000 to 2000 | 0 |
| 0 to 1000 | 1 |
| **0 to 8760** | **12** |
| **>0.5 to 1 km zone** | |
| >8000 to 8760 | 2 |
| >7000 to 8000 | 6 |
| >6000 to 7000 | 10 |
| >5000 to 6000 | 1 |
| >4000 to 5000 | 0 |
| >3000 to 4000 | 1 |
| >2000 to 3000 | 2 |
| >1000 to 2000 | 13 |
| 0 to 1000 | 29 |
| **0 to 8760** | **64** |

## Table 55. Gamma dose rate measurements for the Sellafield direct radiation survey (μGy $h^{-1}$)

| Residences and businesses | | | | |
|---|---|---|---|---|
| **Residence** | **Indoor substrate** | **Indoor gamma dose rate at 1 metre[a]** | **Outdoor substrate** | **Outdoor gamma dose rate at 1 metre[a]** |
| Residence 1 | - | - | Grass | 0.079 |
| Residence 2 | Stone | 0.091 | Grass | 0.085 |
| Residence 3 | Wood | 0.094 | Grass | 0.076 |
| Residence 4 | Concrete | 0.079 | Grass | 0.068 |
| Residence 5 | Concrete | 0.073 | Grass | 0.077 |
| Residence 6 | - | - | Grass | 0.077 |
| Residence 7 | Wood | 0.101 | Grass | 0.085 |
| Residence 8 | Concrete | 0.109 | Grass | 0.088 |
| Residence 9 | Concrete | 0.138 | Grass | 0.094 |
| Residence 10 | Concrete | 0.097 | Grass | 0.091 |
| Residence 11 | Concrete | 0.119 | Grass | 0.091 |
| Residence 12 | Concrete | 0.127 | Grass | 0.085 |
| Residence 13 | Concrete | 0.107 | Grass | 0.090 |
| Business 1 | Wood | 0.093 | Grass | 0.059 |

| Backgrounds | | | | |
|---|---|---|---|---|
| | **Location** | **National Grid Reference** | **Substrate** | **Background gamma dose rate at 1 metre** |
| Background 1 | St Bees | NX 973 126 | Grass | 0.054 |
| Background 2 | Saltcoats | SD 076 979 | Grass | 0.073 |
| Background 3 | Near Gosforth | NY 090 034 | Grass | 0.067 |

**Notes**

[a] These measurements have not been adjusted for background dose rates.

**Table 56. Combinations of adult pathways for consideration in dose assessments in the Sellafield area**

| Combination number | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | X | X | X | X | | | X | X | | X | X | | X | | X | X | X | X | X | | | X | | | | | | | X | | | | X | | | |
| 2 | | | | | | | X | X | X | X | X | | | | | X | | X | | | | | | | | | | | | | | | | | | |
| 3 | X | X | X | | | | | | | | | | | | | | | | | | | | | X | X | X | X | | | X | | | | | |
| 4 | X | | | | | | | | | | | | | | | | | | | | | | | X | | X | | | X | | | | | X | | X |
| 5 | | X | X | | X | | | | | | | | | | | | | | | | | | | X | | X | | | | | | X | X | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | | | | | | | |
| 7 | | | | | | | X | X | X | | X | X | | | | X | X | X | | X | | | | | | | | | X | | | | | | | |
| 8 | X | X | | | | | | | | | | | | | | | | | | | | | | | | X | | | X | | X | X | | X | | X |
| 9 | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | X | | | X | | | | | | |
| 10 | X | | | | | | | | | | | | | | | | | | | | | | | | X | | X | | | X | | X | | X | | |
| 11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | | | X | X | | |
| 12 | X | | | | | | | | | | | | | | | | | | | | | | | | X | | | | X | X | | X | | | | |
| 13 | X | | | | | | X | X | X | X | X | | | | | | | | | | | | | | | | | | X | X | | | | | X | | X |
| 14 | | | | | | | | X | | X | | | | | | | | X | | | | | | | | | | | X | | | | | X | | X |
| 15 | X | | | | | | X | X | X | X | X | X | | | | | | X | | | | | | | | X | X | | X | X | | X | | | | X |
| 16 | | | | | | | | | | X | X | | X | | X | | X | X | | | | | | | | | | | X | | | | | X | | X |
| 17 | X | | | | | | X | | X | X | X | | | | | X | X | X | X | | X | | X | | | | | | | | | | | | | |
| 18 | | | | | | | X | X | X | X | X | | | | | | | | | | | | | | | | | | X | | | | | X | | X |
| 19 | | | | | | | | | | X | X | | | | X | | | X | | | X | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | X | X | X | | X | | | | | | | | | | | | | | | | X | | X |
| 21 | X | | | | | | | X | | | | | | | | X | X | X | | | | | | | X | | | | X | X | | | X | X | | X |
| 22 | | | | | | | | | | X | | X | | | | | | X | | | | | | | | | | | | | | | | X | | X |
| 23 | X | X | | X | | | | | | | | | | | | | | | | | | | | | X | | | X | | | X | X | | X | | |
| 24 | | | X | | | | | | | | | | | | | X | | | | | | | | | X | | | | X | X | | X | | | | |
| 25 | | | | X | | | X | | X | X | | | X | X | X | X | | | | | | | | | | | | | | | | | | | | |
| 26 | | | X | | | | X | | X | X | X | X | X | | X | X | X | X | | | | | | | | | | | | X | | X | | | | |
| 27 | | | | | | | X | | X | X | X | X | X | | X | X | X | X | | | | | | | | | | | | | | | | | | X |
| 28 | | | | X | | | | | | | | | | | | X | | | | | | X | | X | | | | X | | | | X | | | | |
| 29 | | | | | | | X | X | X | X | X | | | | | | X | X | | | X | | | | | | | | | | | | | | | |
| 30 | X | X | | | | X | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | |

**Notes**

The food groups and external exposure pathways marked with a cross are combined for the corresponding combination number. For example, combination number 1 represents an individual (or individuals) from Annex 1 who had positive data for the following pathways: fish, crustaceans, molluscs, wildfowl, green vegetables, other vegetables, potato, domestic fruit, cattle meat, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, venison, intertidal occupancy over sand and occupancy in water.

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F | 56 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - | - |
| 2 | F | 56 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 117 | - | - | - | - | - | - | - |
| 3 | M | 79 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **17.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | F | 78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **17.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | M | 78 | - | - | - | - | - | - | **24.4** | - | 8.2 | 22.8 | 5.0 | - | - | - | - | **11.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | M | 46 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30 | - | - | - | 15 | - | - | - |
| 7 | M | 45 | 6.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 122 | 20 | - | 98 | - | - | - | - |
| 9 | F | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - | - | - |
| 10 | M | 70 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 91 | 27 | - | 118 | - | - | - | - |
| 11 | M | 48 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 195 | 27 | - | 118 | - | - | - | - |
| 12 | M | 22 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 195 | 27 | - | 118 | - | - | - | - |
| 13 | F | 46 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |
| 14 | F | 21 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |
| 15 | M | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 65 | - | - | 65 | - | - | - | - |
| 16 | M | 53 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | - | - | 12 | - | - | - | - |
| 17 | M | 33 | 28.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 87 | - | - | 45 | - | - | - | - |
| 18 | M | 49 | - | - | - | - | - | - | 5.2 | 10.4 | 10.4 | **91.3** | **17.8** | - | - | - | - | **32.4** | - | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 19 | F | 83 | - | - | - | - | - | - | 5.2 | 10.4 | 10.4 | **91.3** | **17.8** | - | - | - | - | **32.4** | - | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20 | M | 65 | - | - | - | - | - | - | - | - | - | 47.2 | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 21 | M | 65 | - | - | - | - | - | - | - | - | 6.0 | **59.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 22 | M | 53 | - | - | - | - | - | - | **13.9** | 4.2 | **18.5** | 26.0 | 5.6 | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 23 | F | 54 | - | - | - | - | - | - | **13.9** | 4.2 | **18.5** | 26.0 | 5.6 | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25 | F | 32 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 91 | - | - | - | - | - | - | - |
| 26 | M | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | - | - | - | - |
| 27 | M | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **390** | - | - | - | - | - | - | - |
| 28 | M | 86 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **548** | - | - | - | - | - | - | - |
| 29 | M | 38 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **65** | - | **185** | - | - | 185 | - | - | - | - | 65 | - | 185 |
| 30 | F | 35 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 34 | M | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |
| 35 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |
| 36 | F | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | 3 | - | - | - | - |
| 37 | M | 56 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | 3 | - | - | - | - |
| 38 | M | 62 | 17.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 117 | **286** | - | - | - | - | - | - |
| 39 | M | 39 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | - | - | - | - | - | - | - |
| 40 | M | 62 | 17.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 41 | F | 60 | 17.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 42 | M | 53 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **585** | - | - | 156 | - | - | - | - |
| 43 | M | 43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **585** | - | - | 156 | - | - | - | - |
| 44 | F | 59 | 9.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45 | F | 81 | **38.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 46 | M | 69 | - | 0.7 | 0.1 | - | **0.1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | **243** | - | - | - | - | - | 2 | 2 | - | - | - |
| 47 | F | 68 | - | 0.7 | 0.1 | - | **0.1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48 | M | 62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **490** | - | - | - | - | - | - | - | 26 | - | - |
| 49 | M | 51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 137 | - | - | - | - | - | - | - | 30 | - | - |
| 50 | F | 46 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 137 | - | - | - | - | - | - | - | 30 | - | - |
| 53 | M | 46 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **104** | - | - | - | - | - | - | - | - |
| 54 | M | 58 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 117 | - | - | - | - | - | - | - |
| 55 | M | 56 | - | - | - | - | - | - | - | - | - | - | 6.7 | **236.4** | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 56 | F | 56 | - | - | - | - | - | - | - | - | - | - | 6.7 | 59.1 | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 57 | F | 23 | - | - | - | - | - | - | - | - | - | - | 6.7 | 59.1 | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 58 | M | 51 | - | - | - | - | - | - | - | - | - | - | 6.7 | 73.9 | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 59 | F | 52 | - | - | - | - | - | - | - | - | - | - | 6.7 | 73.9 | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 60 | F | 81 | - | - | - | - | - | - | - | - | - | - | 6.7 | **118.2** | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 61 | M | 37 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **14.5** | - | **15.3** | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 62 | F | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **14.5** | - | **15.3** | 1.2 | - | - | - | - | - | - | - | - | - | - | 25 | - | - | - | - | - | - | - |
| 64 | M | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 65 | F | 48 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 67 | M | 58 | - | - | - | - | - | - | - | 7.2 | - | 7.3 | 4.1 | - | - | - | **11.3** | - | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 68 | M | 24 | - | - | - | - | - | - | - | 7.2 | - | 7.3 | 4.1 | - | - | - | **11.3** | - | - | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 69 | M | 58 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - | - |
| 70 | F | 48 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - | - |
| 71 | F | 75 | - | - | - | - | - | - | 2.9 | - | 8.7 | 20.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 72 | F | 36 | - | - | - | - | - | - | 2.9 | - | 8.7 | 20.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 73 | M | 62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - | - |
| 74 | F | 61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - | - |
| 75 | M | 52 | 22.3 | 1.0 | 0.2 | **8.0** | - | - | 7.0 | 8.9 | - | 11.8 | 11.8 | - | 11.8 | - | 2.8 | **15.4** | **17.6** | **5.3** | **2.8** | - | - | **26.5** | - | - | - | - | - | - | 312 | - | - | - | 13 | - | - | - |
| 76 | M | 27 | 22.3 | - | - | **8.0** | - | - | 7.0 | 8.9 | - | 11.8 | 11.8 | - | 11.8 | - | 2.8 | **15.4** | **17.6** | **5.1** | **2.8** | - | - | **26.5** | - | - | - | - | - | - | - | - | - | - | 13 | - | - | - |
| 77 | M | 28 | 22.3 | - | - | **8.0** | - | - | 7.0 | 8.9 | - | 11.8 | 11.8 | - | 11.8 | - | 2.8 | **15.4** | **17.6** | **5.1** | **2.8** | - | - | **26.5** | - | - | - | - | - | - | - | - | - | - | 13 | - | - | - |
| 79 | M | 51 | - | - | - | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 80 | M | 24 | - | - | - | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 81 | M | 20 | - | - | - | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 82 | F | 17 | - | - | - | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 83 | F | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - | - | - |
| 84 | M | 56 | 3.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 205 | - | - | - |
| 85 | M | 71 | **36.7** | 1.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | 156 | 273 | - | - | - | - | - | - |
| 86 | F | 69 | **36.7** | 1.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 87 | F | 41 | **51.7** | 1.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | 60 | - | - | - | - | - | - |
| 88 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | - | - | - |
| 89 | F | 34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | - | - | - |
| 90 | F | 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - |
| 91 | M | 68 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - |
| 92 | M | 49 | 23.6 | 14.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **735** | - | - | 1137 | - | - |
| 93 | F | 49 | 23.6 | 14.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 94 | F | 19 | 23.6 | 14.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | M | 65 | **106.1** | **44.9** | **1.1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **568** | **828** | **840** | 56 | - | 156 | - | - |
| 96 | F | 64 | **35.4** | **16.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 97 | M | 41 | **106.1** | **17.7** | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **105** | - | - | 156 | - | - | - | - | - | - |
| 98 | M | 77 | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **156** | - | **60** | - | - | **452** | - | 168 | - | 500 | - | - |
| 99 | F | 76 | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 100 | M | 55 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **156** | - | **60** | - | - | 212 | - | 168 | - | 500 | - | - |
| 101 | F | 54 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 102 | M | 67 | 31.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 | 144 | - | 13 | - | 163 | - | - |
| 103 | F | 60 | 31.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 104 | F | 34 | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 105 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 82 | - | - |
| 106 | M | 47 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | 14 | - | - |
| 109 | F | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 260 | - | - | - | - | - | - |
| 110 | M | 42 | 1.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | - | 16 | - | - | - | - | - | - |
| 111 | M | 17 | 1.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 113 | F | 30 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **525** | - | - | - | - | - | - |
| 114 | M | 46 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | - |
| 115 | F | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | - |
| 116 | M | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - |
| 117 | M | 49 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | 5 | 96 | - | 10 | - | - | - | - |
| 118 | F | 46 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 119 | F | 17 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 121 | M | 40 | 2.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 72 | - | - | - | - | - | - |
| 122 | F | 38 | 2.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 123 | M | 38 | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 78 | 260 | - | 78 | - | - | - | - |
| 124 | F | 37 | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 127 | M | 73 | 22.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **104** | - | - | - | - | - | - | 104 | - | 400 | - | - |
| 128 | F | 73 | 22.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 129 | M | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - |
| 130 | M | 80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 188 | - | - | - | - | - | - |
| 131 | F | 39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - |
| 132 | M | 41 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - |
| 133 | M | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | - | - | - |
| 134 | F | 41 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | - | - | - |
| 135 | M | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 26 | - | - | - | - | - | - |
| 136 | F | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 26 | - | - | - | - | - | - |
| 137 | F | 47 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 260 | - | - | - | - | - | - |
| 138 | M | 48 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 260 | - | - | - | - | - | - |
| 139 | F | 54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **415** | - | - | - | - | - | - |
| 140 | M | 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | - |
| 141 | M | 48 | 1.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 40 | - | - | - | - | - | - |
| 142 | F | 48 | 1.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 143 | F | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | 68 | - | - | - |
| 144 | M | 48 | 8.8 | 2.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 26 | 104 | - | 26 | - | 234 | - | - |
| 145 | M | 61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **390** | - | - | - | - | - | - |
| 146 | M | 52 | **44.2** | 6.1 | **2.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | 60 | 8 | - | 260 | - | - |
| 147 | F | 50 | **44.2** | 6.1 | **2.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 148 | M | 23 | 22.1 | 3.1 | **1.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 151 | M | 65 | **44.2** | 6.1 | **2.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **738** | 60 | 8 | - | 260 | - | - |
| 152 | F | 53 | **44.2** | 6.1 | **2.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 153 | F | 37 | 14.6 | 2.0 | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 154 | M | 38 | 14.6 | 2.0 | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 155 | M | 40 | 14.6 | 2.0 | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 159 | M | 63 | 4.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 160 | F | 38 | 2.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 161 | M | 74 | **47.6** | 7.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 162 | F | 75 | **47.6** | 7.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 163 | F | 44 | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 164 | M | 34 | 18.7 | **19.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 257 | - | - | 1848 | - | - |
| 165 | M | 40 | 18.7 | **19.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 257 | - | - | 1848 | - | - |
| 166 | M | 62 | 18.7 | **19.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 257 | - | - | 1848 | - | - |
| 167 | M | 60 | 3.4 | - | - | - | - | - | 12.2 | 13.6 | 1.3 | 10.9 | 5.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 225 | - | - | - | - | 7274 | 350 |
| 168 | F | 57 | 3.4 | - | - | - | - | - | 12.2 | 13.6 | 1.3 | 10.9 | 5.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 225 | - | - | - | - | 5174 | 650 |
| 169 | M | 65 | - | - | - | - | - | - | - | 5.0 | - | 10.0 | - | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7476 | 900 |
| 170 | F | 55 | - | - | - | - | - | - | - | 5.0 | - | 10.0 | - | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | 12 | - | - | - | - | - | 6036 | 500 |
| 171 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2025 | 150 |
| 172 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1040 | 74 |
| 173 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 312 | 34 |
| 174 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1040 | 74 |
| 175 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1040 | 74 |
| 176 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2025 | 150 |
| 177 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 624 | 70 |
| 178 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 312 | 34 |
| 179 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 312 | 34 |
| 180 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 624 | 70 |
| 181 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 264 | 2200 |
| 182 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 264 | 2200 |
| 183 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 264 | 2200 |
| 184 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 1174 |
| 185 | M | 61 | 7.3 | - | - | - | - | - | **33.9** | **45.6** | **47.8** | 28.0 | 3.0 | **103.7** | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | 77 | **72** | - | 52 | **506** | - | 135 | - | - | - | 605 |
| 186 | F | 58 | - | - | - | - | - | - | **33.9** | **45.6** | **47.8** | 28.0 | 3.0 | **103.7** | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 187 | M | 66 | **70.8** | 6.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | **1035** | **338** | **1100** | **296** | - | 152 | - | 270 |
| 188 | F | 62 | **87.1** | 13.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 240 | 8 | 240 | - | - | - | - | 62 |
| 189 | M | 31 | **73.0** | 6.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1032** | **346** | **1088** | **346** | - | 56 | - | 258 |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 191 | M | 77 | **35.4** | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 192 | M | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1032** | - | **1032** | - | - | - | - | 258 |
| 193 | M | 68 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 135 | - | - | - | - | - | - | - | - | - | - |
| *194* | *M* | *U* | *11.8* | ***19.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *300* | - | - | *2000* | - | - |
| *195* | *F* | *U* | *11.8* | ***19.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *196* | *M* | *U* | *11.8* | ***19.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *197* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *300* | - | - | *2000* | - | - |
| *198* | *M* | *U* | ***59.9*** | *1.2* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *225* | - | - | *1800* | - | - |
| *199* | *F* | *U* | - | *15.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *200* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *225* | - | - | *1800* | - | - |
| *201* | *M* | *U* | - | *1.7* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *175* | - | - | *1200* | - | - |
| *202* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *175* | - | - | *1200* | - | - |
| *203* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *197* | - | - | *1519* | - | - |
| *204* | *M* | *U* | *14.2* | ***21.3*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *197* | - | - | *1519* | - | - |
| *205* | *M* | *U* | *14.2* | ***21.3*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *197* | - | - | *1519* | - | - |
| *206* | *M* | *U* | *14.2* | ***21.3*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *197* | - | - | *1519* | - | - |
| *207* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *263* | - | - | *1750* | - | - |
| *208* | *M* | *U* | - | ***47.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *263* | - | - | *1750* | - | - |
| *209* | *F* | *U* | - | ***47.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *210* | *M* | *U* | *1.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *53* | - | - | *450* | - | - |
| *211* | *M* | *U* | *1.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *53* | - | - | *450* | - | - |
| *212* | *M* | *U* | *1.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *53* | - | - | *450* | - | - |
| *213* | *M* | *U* | - | *1.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *53* | - | - | *450* | - | - |
| *214* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *84* | - | - | *630* | - | - |
| *215* | *M* | *U* | *10.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *84* | - | - | *630* | - | - |
| *216* | *F* | *U* | *10.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *217* | *F* | 51 | - | - | - | - | - | - | - | - | - | - | - | - | *15.6* | - | ***17.0*** | - | ***16.4*** | ***3.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6086 | 1790 |
| *218* | *M* | 56 | - | - | - | - | - | - | - | - | - | - | - | - | *15.6* | - | ***17.0*** | - | ***16.4*** | ***3.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5473 | 2864 |
| *219* | *M* | U | - | - | - | - | - | - | - | - | - | 1.7 | 4.2 | - | - | - | - | - | ***8.2*** | *0.4* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6120 | 2301 |
| *220* | *F* | U | - | - | - | - | - | - | - | - | - | 1.7 | 4.2 | - | - | - | - | - | ***8.2*** | *0.4* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7814 | 722 |
| 221 | M | U | - | - | - | - | - | - | - | - | - | 1.7 | 4.2 | - | - | - | - | - | ***8.2*** | *0.4* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 625 | 1625 |
| 222 | M | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - | - | - |
| 223 | F | 49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - | - | - |
| 224 | F | 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | - | - |
| 225 | M | 68 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 293 | - | - | - | - | - | - | - |
| 226 | F | 68 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 293 | - | - | - | - | - | - | - |
| 227 | M | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **548** | - | - | - | - | - | - | - |
| 228 | F | 43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **548** | - | - | - | - | - | - | - |
| 229 | M | 56 | 10.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | 130 | - | - | - |
| 230 | F | 56 | 10.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - | - |
| *231* | *F* | 31 | - | - | - | - | - | - | - | - | - | ***131.6*** | *1.0* | - | ***24.9*** | - | *3.0* | - | ***20.8*** | *2.0* | - | - | - | - | - | - | - | - | - | - | - | - | *15* | - | - | - | - | 5649 | 1611 |
| *232* | *M* | 38 | - | - | - | - | - | - | - | - | - | ***131.6*** | *1.0* | - | ***24.9*** | - | *3.0* | - | ***20.8*** | *2.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3813 | 3060 |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *236* | *M* | U | - | - | - | - | - | - | - | - | - | ***131.6*** | - | - | ***24.9*** | - | *3.0* | - | ***20.8*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 365 | 1460 |
| *237* | *M* | U | - | - | - | - | - | - | - | - | - | ***131.6*** | - | - | ***24.9*** | - | *3.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 300 | 2100 |
| 238 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **20.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 239 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **20.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 240 | M | 54 | 3.3 | - | - | - | - | - | 2.9 | - | 8.8 | **165.1** | 2.3 | - | - | - | - | 0.7 | **17.8** | **6.8** | 0.2 | - | 0.2 | - | **1.4** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 241 | F | 58 | 3.3 | - | - | - | - | - | 2.9 | - | 8.8 | **165.1** | 2.3 | - | - | - | - | 0.7 | **17.8** | **6.8** | 0.2 | - | 0.2 | - | **1.4** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 242 | F | 22 | 3.3 | - | - | - | - | - | 2.9 | - | 8.8 | **165.1** | 2.3 | - | - | - | - | 0.7 | **17.8** | **6.8** | 0.2 | - | 0.2 | - | **1.4** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 243 | M | 22 | 3.3 | - | - | - | - | - | 2.9 | - | 8.8 | **165.1** | 2.3 | - | - | - | - | 0.7 | **17.8** | **6.8** | 0.2 | - | 0.2 | - | **1.4** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 244 | M | 42 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - |
| 246 | F | 62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - |
| 247 | M | 62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - |
| 248 | M | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - |
| 249 | F | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - |
| 250 | M | 24 | - | 9.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | 17 | - | - |
| 251 | M | 27 | - | 9.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | 17 | - | - |
| 252 | M | 55 | 11.8 | 2.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 253 | M | 80 | 11.8 | 9.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 256 | M | U | 19.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 26 | 26 | - | - | - | 60 | - | - |
| 257 | M | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - | - | - | - |
| 258 | F | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - | - | - | - |
| 261 | M | 59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - | - |
| 262 | M | 70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **548** | - | - | - | - | - | - | - |
| 263 | F | 72 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **548** | - | - | - | - | - | - | - |
| 264 | M | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **351** | - | - | - | - | - | - | - |
| 265 | F | 51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **351** | - | - | - | - | - | - | - |
| 266 | F | 29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |
| 268 | M | 45 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | - | - | - | 96 | - | - | 36 | - | - | - | - |
| 269 | M | 16 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 270 | M | 41 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 271 | F | 39 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 272 | M | 61 | 17.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 273 | M | 30 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 39 | - | - | - | - | - | - | 39 | - | - | - | - |
| 274 | F | 65 | - | - | - | - | - | - | **14.7** | 15.3 | **23.9** | 43.7 | 4.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - | - | 6203 | 1169 |
| 275 | M | 65 | - | - | - | - | - | - | **14.7** | 15.3 | **23.9** | 43.7 | 4.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | - | - | - | - | - | 6203 | 1169 |
| 276 | M | 76 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - | - | 6944 | 660 |
| 277 | F | 63 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - | - | 6944 | 660 |
| 278 | M | U | - | - | - | - | - | - | - | - | - | 50.0 | 4.5 | - | - | - | **5.7** | - | - | 1.5 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 279 | F | U | - | - | - | - | - | - | - | - | - | 50.0 | 4.5 | - | - | - | **5.7** | - | - | 1.5 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 280 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **5.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 281 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **5.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 282 | M | 37 | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | 1.8 | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5019 | 1755 |
| 283 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | 1.8 | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5099 | 1053 |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 286 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 287 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 288 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 289 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 290 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 291 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | **11.2** | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 292 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 293 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 294 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 295 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 296 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 297 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 77 |
| 298 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 77 |
| 299 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 77 |
| 300 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 77 |
| 301 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 77 |
| 302 | F | 41 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 303 | M | 71 | 6.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 304 | F | 70 | 6.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 305 | F | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.1 | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6277 | 72 |
| 306 | M | 69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.1 | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6069 | 510 |
| 307 | M | 78 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **104** | 104 | - | - | - | - | - | - | - |
| 308 | F | 45 | 7.7 | - | - | - | - | - | - | 4.9 | - | - | - | - | - | - | - | 8.1 | **8.9** | 1.0 | - | - | - | - | - | - | - | 39 | - | - | 52 | 12 | - | - | - | 4 | 5382 | 1456 |
| 309 | M | 47 | 7.7 | - | - | - | - | - | - | 4.9 | - | - | - | - | - | - | - | 8.1 | **8.9** | 1.0 | - | - | - | - | - | - | - | 39 | - | - | 52 | 12 | - | - | - | 4 | 5076 | 1456 |
| 310 | F | 51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 16 | - | - | - | - | - | 6876 | 770 |
| 311 | F | 23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7003 | 50 |
| 312 | M | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 16 | - | - | - | - | - | 6027 | 128 |
| 313 | F | 73 | - | - | - | - | - | - | **19.9** | **72.5** | **32.8** | 12.5 | 3.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 468 |
| 314 | M | 73 | - | - | - | - | - | - | **19.9** | **72.5** | **32.8** | 12.5 | 3.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 468 |
| 315 | F | 66 | - | - | - | - | - | - | 9.6 | 16.1 | 7.0 | 16.4 | **20.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 820 |
| 316 | M | 68 | - | - | - | - | - | - | 9.6 | 16.1 | 7.0 | 16.4 | **20.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 820 |
| 317 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 318 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 319 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 320 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 321 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 322 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 323 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 324 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 325 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 326 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 327 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 328 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 329 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 330 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 331 | F | 53 | - | - | - | - | - | - | - | - | - | 25.0 | - | **199.5** | - | - | - | - | - | 1.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 500 | 3000 |
| 332 | M | 56 | - | - | - | - | - | - | - | - | - | 25.0 | - | **199.5** | - | - | - | - | - | 1.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 333 | F | 21 | - | - | - | - | - | - | - | - | - | 25.0 | - | **199.5** | - | - | - | - | - | 1.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 334 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1794 |
| 335 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 920 |
| 336 | M | 51 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **5.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5705 | 2300 |
| 337 | M | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **3.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4914 | 956 |
| 338 | M | 52 | 8.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | 78 | - | 78 | - | - | - | - |
| 339 | F | 50 | 8.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *340* | *M* | *54* | *5.9* | *10.0* | - | *2.8* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *330* | - | *42* | - | - | ***1524*** | *42* | - | *1920* | - | - | - |
| *341* | *F* | *51* | *5.9* | *10.0* | - | *2.8* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***365*** | - | - | - | - | - | - | - | - |
| *342* | *M* | *18* | *5.9* | *10.0* | - | *2.8* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | *330* | - | *42* | - | - | ***1524*** | *42* | - | *1920* | - | - | - |
| *343* | *M* | *16* | *5.9* | *10.0* | - | *2.8* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 344 | M | U | - | - | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **234** | - | - | - | ***735*** | *52* | - | ***754*** | - | - | - |
| 345 | F | U | - | - | **15.3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *346* | *F* | *U* | - | - | - | - | - | - | - | - | - | ***131.6*** | - | - | ***24.9*** | - | *3.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *348* | *M* | *U* | - | - | - | - | - | - | - | - | - | ***131.6*** | - | - | ***24.9*** | - | *3.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *349* | *F* | *U* | - | - | - | - | - | - | - | - | - | ***131.6*** | - | - | ***24.9*** | - | *3.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *350* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | ***182.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *351* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | - | ***182.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *354* | *M* | *U* | - | - | - | - | - | - | - | - | *9.0* | *18.2* | - | *69.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *355* | *F* | *U* | - | - | - | - | - | - | - | - | *9.0* | *18.2* | - | *69.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *356* | *M* | *U* | - | - | - | - | - | - | - | - | *9.0* | *18.2* | - | *69.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *357* | *F* | *U* | - | - | - | - | - | - | ***13.8*** | *6.8* | *3.6* | - | *7.3* | ***182.5*** | - | - | - | *0.7* | *3.4* | *0.8* | - | ***0.2*** | - | - | - | - | - | - | - | - | *12* | - | - | - | - | - | - | - | - |
| *358* | *M* | *U* | - | - | - | - | - | - | ***13.8*** | *6.8* | *3.6* | - | *7.3* | ***182.5*** | - | - | - | *0.7* | *3.4* | *0.8* | - | ***0.2*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *359* | *M* | *U* | - | - | - | - | - | - | ***13.8*** | *6.8* | *3.6* | - | *7.3* | ***182.5*** | - | - | - | *0.7* | *3.4* | *0.8* | - | ***0.2*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *360* | *M* | *U* | - | - | - | - | - | - | ***13.8*** | *6.8* | *3.6* | - | *7.3* | ***182.5*** | - | - | - | *0.7* | *3.4* | *0.8* | - | ***0.2*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *361* | *M* | *58* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***11.3*** | - | - | *0.7* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *362* | *F* | *57* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***11.3*** | - | - | *0.7* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *363* | *M* | *U* | - | - | - | *1.4* | - | - | *9.2* | - | *15.0* | *9.1* | - | - | ***31.5*** | ***25.3*** | ***5.7*** | 1.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *364* | *M* | *U* | - | - | - | *1.4* | - | - | *9.2* | - | *15.0* | *9.1* | - | - | ***31.5*** | ***25.3*** | ***5.7*** | 1.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *365* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | ***31.5*** | ***25.3*** | ***5.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *366* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | ***31.5*** | ***25.3*** | ***5.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *367* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | ***31.5*** | ***25.3*** | ***5.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *368* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | ***31.5*** | ***25.3*** | ***5.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *369* | *F* | *U* | - | - | *0.5* | - | - | - | *2.0* | - | *6.6* | *31.8* | ***42.7*** | ***259.3*** | ***71.0*** | - | ***5.7*** | *3.3* | 6.8 | 2.0 | - | - | - | - | - | - | - | - | - | - | - | *3* | - | *3* | - | - | - | - |
| *370* | *M* | *U* | - | - | - | - | - | - | *2.0* | - | *6.6* | *31.8* | ***42.7*** | ***259.3*** | ***71.0*** | - | ***5.7*** | *3.3* | 6.8 | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *371* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | ***71.0*** | - | ***5.7*** | *2.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *372* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | ***71.0*** | - | ***5.7*** | *2.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Annex 1. Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Marine plants/algae | Salt marsh grazed sheep meat | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud | Intertidal occupancy over mud and sand | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over rock | Intertidal occupancy over salt marsh | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling fishing gear | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *373* | *M* | *70* | - | - | - | ***16.8*** | - | - | - | - | - | - | - | - | - | - | - | 2.7 | - | - | - | - | - | *1.1* | - | ***96*** | - | - | - | *78* | - | - | - | *96* | - | - | - | - |
| *374* | *M* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***11.3*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *375* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***11.3*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *376* | *F* | *30* | - | - | - | - | - | - | *2.7* | *4.6* | *4.1* | - | *6.4* | - | - | - | - | - | ***15.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *377* | *M* | *36* | - | - | - | - | - | - | *2.7* | *4.6* | *4.1* | - | *6.4* | - | - | - | - | - | ***15.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *379* | *M* | *67* | - | - | - | - | - | - | ***39.6*** | ***58.9*** | ***46.7*** | ***82.8*** | ***49.9*** | - | - | - | - | - | ***8.9*** | *0.5* | - | - | ***1.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *380* | *F* | *65* | - | - | - | - | - | - | ***39.6*** | ***58.9*** | ***46.7*** | ***82.8*** | ***49.9*** | - | - | - | - | - | ***8.9*** | *0.5* | - | - | ***1.7*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *381* | *M* | *55* | *7.2* | *2.8* | - | - | - | ***1.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***312*** | - | - | - | - | - | - | - |
| *382* | *F* | *52* | *7.2* | *2.8* | - | - | - | ***1.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *383* | *M* | *32* | - | - | - | - | - | ***1.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ***312*** | - | - | - | - | - | - | - |
| *384* | *F* | *U* | - | - | - | - | - | ***1.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *385* | *F* | *24* | - | - | - | - | - | ***1.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *386* | *F* | *22* | - | - | - | - | - | ***1.9*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes**

U = Unknown

Emboldened observations are the high-rate individuals

The data in italics are from the 2012 Low Level Waste Repository habits survey

## Annex 2. Children's and infants' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Venison | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Child age group (6 - 15 years old)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | M | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **98** | **20** | **98** | - | - | - | - |
| 24 | F | 14 | - | - | - | - | **13.9** | **4.2** | **18.5** | **26.0** | **5.6** | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - |
| 31 | M | 14 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 32 | F | 11 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 33 | F | 7 | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51 | M | 14 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **137** | - | - | - | 30 | - | - | - |
| 52 | M | 9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **137** | - | - | - | 30 | - | - | - |
| 66 | M | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.9 | - | - | - | - | - | - | - | - | - | - | - |
| 78 | M | 15 | **22.3** | - | - | **8.0** | **7.0** | **8.9** | - | **11.8** | **11.8** | - | **11.8** | - | **2.8** | **15.4** | **17.6** | **5.1** | **2.8** | **26.5** | - | - | - | - | 13 | - | - | - |
| 107 | M | 14 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **156** | - | - | 90 | 14 | - | - |
| 108 | M | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **156** | - | - | 90 | 14 | - | - |
| 112 | M | 15 | 1.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 120 | M | 15 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 125 | F | 8 | 7.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 149 | F | 7 | **11.1** | **1.5** | **0.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 156 | F | 11 | **14.6** | **2.0** | **0.9** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 190 | F | 15 | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **12** | - | - | - | - | - |
| 254 | F | 8 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 255 | F | 9 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 267 | F | 7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **104** | - | - | - | - | - | - |
| 284 | M | 7 | - | - | - | - | - | - | - | - | - | - | - | **8.4** | **0.9** | 1.4 | - | 0.3 | - | - | - | - | - | - | - | - | 5171 | 1053 |
| *353* | *F* | 6 | - | - | - | - | - | - | - | - | - | ***182.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *378* | *F* | 7 | - | - | - | - | *2.0* | ***3.4*** | *3.1* | - | ***4.8*** | - | - | - | - | - | ***7.8*** | - | - | - | - | - | - | - | - | - | - | - |

## Annex 2. Children's and infants' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Venison | Intertidal occupancy over mud, sand and stones | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling sediment | Occupancy in water | Occupancy on water | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Infant age group (0 - 5 years old)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 63 | M | 2 | - | - | - | - | - | - | - | - | - | - | - | - | **4.8** | - | **5.0** | 0.4 | - | - | - | 25 | - | - | - | - | - | - |
| 126 | F | 5 | **7.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 150 | F | 3 | **5.5** | **0.8** | **0.3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 157 | F | 4 | **7.5** | **1.0** | **0.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 158 | M | 3 | **7.5** | **1.0** | **0.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *233* | *M* | 4 | - | - | - | - | - | - | - | ***19.7*** | - | - | ***3.7*** | - | *0.4* | - | ***5.9*** | ***2.0*** | - | - | - | *15* | - | - | - | - | 6256 | 956 |
| *234* | *M* | 3 | - | - | - | - | - | - | - | ***19.7*** | - | - | ***3.7*** | - | *0.4* | - | ***5.9*** | ***2.0*** | - | - | - | *15* | - | - | - | - | 7667 | 215 |
| *235* | *M* | 3 | - | - | - | - | - | - | - | ***19.7*** | - | - | ***3.7*** | - | *0.4* | - | ***5.9*** | ***2.0*** | - | - | - | *15* | - | - | - | - | 7667 | 215 |
| 245 | M | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **104** | - | - | - | - | - | - |
| 259 | M | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - | - | - |
| 260 | M | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - | - | - |
| 285 | F | 3 | - | - | - | - | - | - | - | - | - | - | - | **2.8** | 0.3 | **0.5** | - | 0.1 | - | - | - | - | - | - | - | - | 5956 | 702 |
| *347* | *F* | 4 | - | - | - | - | - | - | - | ***19.7*** | - | - | ***3.7*** | - | *0.4* | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *352* | *F* | 4 | - | - | - | - | - | - | - | - | - | ***182.5*** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes**

U = Unknown

Emboldened observations are the high-rate individuals

The data in italics are from the 2012 Low Level Waste Repository habits survey

## Annex 3. Qualitative and estimated data for use in dose assessments

| Details of activity | Exposure pathways involved | Estimated rate |
|---|---|---|
| None identified | None identified | Not applicable |

## Annex 4. Ratios for determining consumption and occupancy rates for children and infants

| Group | Ratio[a] | |
|---|---|---|
| | Child[e]/adult | Infant[e]/adult |
| Fish[b] | 0.200 | 0.050 |
| Crustaceans[b] | 0.250 | 0.050 |
| Molluscs[b] | 0.250 | 0.050 |
| Green vegetables | 0.444 | 0.222 |
| Other vegetables | 0.500 | 0.200 |
| Root vegetables | 0.500 | 0.375 |
| Potatoes | 0.708 | 0.292 |
| Domestic fruit | 0.667 | 0.467 |
| Milk | 1.000 | 1.333 |
| Cattle meat | 0.667 | 0.222 |
| Pig meat | 0.625 | 0.138 |
| Sheep meat | 0.400 | 0.120 |
| Poultry | 0.500 | 0.183 |
| Eggs | 0.800 | 0.600 |
| Wild/free foods[c] | 0.490 | 0.110 |
| Game[d] | 0.500 | 0.140 |
| Honey | 0.789 | 0.789 |
| Wild fungi | 0.450 | 0.150 |
| Freshwater fish[b] | 0.250 | 0.050 |
| External exposure over intertidal substrates | 0.500 | 0.030 |

**Notes**

[a]Excepting notes b and c, consumption ratios were derived from Byrom et al., (1995) which presented data for infants aged 6 to 12 months and children aged 10 to 11 years.

[b]Ratios were derived from Smith and Jones, (2003) which presented data for infants and children of unspecified ages.

[c]Ratios were derived from FSA data for wild fruit and nuts for infants and 10-year-old children.

[d]Game includes rabbits/hares and venison.

[e]Note that the age ranges within the age groups in this table do not correspond exactly with the age ranges within the age groups used throughout the rest of this report.

**Annex 5. Consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) for women of childbearing age[a] in the Sellafield area, for use in foetal for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Salt marsh grazed sheep | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Freshwater fish | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling sediment | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | F | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - |
| 14 | F | 21 | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - |
| 25 | F | 32 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 91 | - | - | - | - |
| 30 | F | 35 | 4.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - |
| 57 | F | 23 | - | - | - | - | - | - | - | - | 6.7 | 59.1 | - | - | - | 0.5 | - | 0.9 | - | - | - | - | - | - | - | - | - |
| 62 | F | 35 | - | - | - | - | - | - | - | - | - | - | - | - | 14.5 | - | 15.3 | 1.2 | - | - | - | - | 25 | - | - | - | - |
| 72 | F | 36 | - | - | - | - | 2.9 | - | 8.7 | 20.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 82 | F | 17 | - | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 87 | F | 41 | 51.7 | 1.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | 60 | - | - | - |
| 88 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - |
| 89 | F | 34 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - |
| 90 | F | 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - |
| 94 | F | 19 | 23.6 | 14.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 104 | F | 34 | 2.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 109 | F | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 260 | - | - | - | - |
| 113 | F | 30 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 525 | - | - | - | - |
| 115 | F | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - |
| 119 | F | 17 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 122 | F | 38 | 2.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 124 | F | 37 | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 131 | F | 39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - |
| 134 | F | 41 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | - |

**Annex 5. Consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) for women of childbearing age[a] in the Sellafield area, for use in foetal for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Salt marsh grazed sheep | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Freshwater fish | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling sediment | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 153 | F | 37 | 14.6 | 2.0 | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 160 | F | 38 | 2.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 163 | F | 44 | - | 11.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 171 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2025 | 150 |
| 172 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1040 | 74 |
| 173 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 312 | 34 |
| 176 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2025 | 150 |
| 177 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 624 | 70 |
| 178 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 312 | 34 |
| 179 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 312 | 34 |
| 180 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 624 | 70 |
| 190 | F | 15 | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | - | - | - |
| *195* | *F* | *U* | *11.8* | *19.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *199* | *F* | *U* | - | *15.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *209* | *F* | *U* | - | *47.9* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *216* | *F* | *U* | *10.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *220* | *F* | U | - | - | - | - | - | - | - | 1.7 | 4.2 | - | - | - | - | - | *8.2* | *0.4* | - | - | - | - | - | - | - | 7814 | 722 |
| 224 | F | 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - |
| 228 | F | 43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 548 | - | - | - | - |
| *231* | *F* | 31 | - | - | - | - | - | - | - | *131.6* | *1.0* | - | *24.9* | - | *3.0* | - | *20.8* | *2.0* | - | - | - | - | *15* | - | - | 5649 | 1611 |
| 242 | F | 22 | 3.3 | - | - | - | 2.9 | - | 8.8 | 165.1 | 2.3 | - | - | - | - | 0.7 | 17.8 | 6.8 | 0.2 | - | 0.2 | 1.4 | - | - | - | - | - |
| 258 | F | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 18 | - | - | - | - |
| 266 | F | 29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - |

**Annex 5. Consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) for women of childbearing age[a] in the Sellafield area, for use in foetal for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Salt marsh grazed sheep | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Freshwater fish | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling sediment | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 271 | F | 39 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 279 | F | U | - | - | - | - | - | - | - | 50.0 | 4.5 | - | - | - | 5.7 | - | - | 1.5 | - | - | 0.5 | - | - | - | - | - | - |
| 281 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - |
| 283 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | 11.2 | 1.3 | 1.8 | - | 0.5 | - | - | - | - | - | - | - | 5099 | 1053 |
| 287 | F | U | - | - | - | - | - | - | - | - | - | - | - | 11.2 | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - |
| 289 | F | U | - | - | - | - | - | - | - | - | - | - | - | 11.2 | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - |
| 291 | F | U | - | - | - | - | - | - | - | - | - | - | - | 11.2 | 1.3 | - | - | - | - | - | - | - | - | - | - | - | - |
| 292 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 293 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 294 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 295 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 296 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 |
| 302 | F | 41 | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 311 | F | 23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7003 | 50 |
| 322 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 323 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 324 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 325 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1926 | 50 |
| 326 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 327 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 328 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 880 | 50 |
| 333 | F | 21 | - | - | - | - | - | - | - | 25.0 | - | 199.5 | - | - | - | - | - | 1.0 | - | - | - | - | - | - | - | - | - |
| 335 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 920 |

**Annex 5. Consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) for women of childbearing age[a] in the Sellafield area, for use in foetal for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Salt marsh grazed sheep | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Pig meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Honey | Wild fungi | Freshwater fish | Intertidal occupancy over sand | Intertidal occupancy over sand and stones | Handling sediment | Indoor occupancy within 1 km of the licensed site boundary | Outdoor occupancy within 1 km of the licensed site boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 345 | F | U | - | - | 15.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *346* | *F* | *U* | - | - | - | - | - | - | - | *131.6* | - | - | *24.9* | - | *3.0* | - | - | - | - | - | - | - | - | - | - | - | - |
| *349* | *F* | *U* | - | - | - | - | - | - | - | *131.6* | - | - | *24.9* | - | *3.0* | - | - | - | - | - | - | - | - | - | - | - | - |
| *351* | *F* | *U* | - | - | - | - | - | - | - | - | - | *182.5* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *355* | *F* | *U* | - | - | - | - | - | - | *9.0* | *18.2* | - | *69.0* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *357* | *F* | *U* | - | - | - | - | *13.8* | *6.8* | *3.6* | - | *7.3* | *182.5* | - | - | - | *0.7* | *3.4* | *0.8* | - | *0.2* | - | - | *12* | - | - | - | - |
| *365* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | *31.5* | *25.3* | *5.7* | - | - | - | - | - | - | - | - | - | - | - | - |
| *369* | *F* | *U* | - | - | *0.5* | - | *2.0* | - | *6.6* | *31.8* | *42.7* | *259.3* | *71.0* | - | *5.7* | *3.3* | 6.8 | 2.0 | - | - | - | - | - | *3* | *3* | - | - |
| *372* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | 71.0 | - | *5.7* | *2.0* | - | - | - | - | - | - | - | - | - | - | - |
| *375* | *F* | *U* | - | - | - | - | - | - | - | - | - | - | - | - | *11.3* | - | - | - | - | - | - | - | - | - | - | - | - |
| *376* | *F* | *30* | - | - | - | - | *2.7* | *4.6* | *4.1* | - | *6.4* | - | - | - | - | - | *15.7* | - | - | - | - | - | - | - | - | - | - |
| *384* | *F* | *U* | - | - | - | *1.9* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *385* | *F* | *24* | - | - | - | *1.9* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| *386* | *F* | *22* | - | - | - | *1.9* | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**Notes**

U = Unknown

[a] Based on National Statistics guidelines women were deemed to be of childbearing age if they were between 15 and 44 years old. Women of unknown age were included as they were potentially women of childbearing age

The data in italics are from the 2012 Low Level Waste Repository habits survey

## Annex 6. Summary of profiles for adults in the Sellafield area

| Profile Name | Number of individuals | Pathway Name: Crustacea | Direct[a] | Eggs | Fish - Freshwater | Fish - Sea | Fruit - Domestic | Fruit and nuts - Wild | Gamma ext - Salt marsh[b] | Gamma ext - Sediment[c] | Honey | Marine plants and algae | Meat - Cow | Meat - Game[d] | Meat - Pig | Meat - Poultry | Meat - Salt marsh grazed sheep | Meat - Sheep | Meat - Wildfowl | Milk | Molluscs | Mushrooms | Occupancy IN water | Occupancy ON water | Plume (IN; 0 - 0.25 km)[e] | Plume (MID; >0.25 - 0.5 km)[e] | Plume (OUT; >0.5 - 1 km)[e] | Vegetables - Green | Vegetables - Other Domestic | Vegetables - Potatoes | Vegetables - Root |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | kg | - | kg | kg | kg | kg | kg | h | h | kg | kg | kg | kg | kg | kg | kg | kg | kg | l | kg | kg | h | h | h | h | h | kg | kg | kg | kg |
| Crustacean consumers | 14 | 25.3 | - | - | - | 27.3 | - | - | - | 110 | - | - | - | - | - | - | - | - | - | - | 0.15 | - | - | 1000 | - | - | - | - | - | - | - |
| Occupants for direct radiation | 79 | 0.33 | 1.00 | 1.8 | - | 3.3 | 1.1 | 0.37 | - | 74 | - | - | 1.7 | - | 0.28 | 0.25 | - | 0.61 | - | 3.8 | - | - | - | 4 | 240 | 740 | 2090 | 1.9 | 3.8 | 9.8 | 2.3 |
| Egg consumers | 25 | 0.04 | 0.40 | 15.3 | 0.23 | 3.8 | 6.9 | 2.4 | - | 22 | - | - | 5.7 | 3.6 | - | 2.6 | - | 3.2 | 0.95 | - | <0.01 | 0.17 | 2 | <1 | 640 | 1420 | 530 | 4.7 | 6.5 | 50.4 | 5.5 |
| Freshwater fish consumers | 4 | - | - | 17.8 | 1.4 | 3.3 | 2.3 | 6.8 | - | - | - | - | - | 0.23 | - | 0.68 | - | - | - | - | - | 0.23 | - | - | - | - | - | 2.9 | - | 165.1 | 8.8 |
| Sea fish consumers | 18 | 8.6 | 0.17 | - | - | 56.1 | - | - | - | 320 | - | - | - | - | - | - | - | - | - | - | 0.72 | - | - | 150 | - | - | 33 | - | - | - | - |
| Domestic fruit consumers | 8 | - | 0.25 | 3.9 | - | - | 32.7 | 0.99 | - | <1 | - | - | 17.7 | - | - | 8.9 | - | 1.4 | - | 64.8 | 0.07 | 0.43 | - | - | - | - | 210 | 14.1 | 21.3 | 55.5 | 17.7 |
| Wild fruit and nut consumers | 11 | 0.09 | 0.36 | 14.3 | 0.51 | 7.3 | 4.0 | 5.3 | - | 28 | - | - | 6.1 | 8.1 | - | 4.5 | - | 3.9 | 2.2 | - | 0.02 | 0.08 | 4 | - | - | 1470 | 1260 | 3.0 | 2.4 | 63.3 | 3.2 |
| Occupants for exposure - Salt marsh | 4 | 0.70 | - | - | - | 1.8 | - | - | 210 | 26 | - | - | - | - | - | - | 0.94 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Occupants for exposure - Sediment | 21 | 3.0 | 0.19 | - | - | 14.5 | 0.14 | 0.02 | - | 760 | - | - | - | - | - | - | - | - | - | 4.9 | 0.20 | - | - | 55 | 29 | - | 37 | 1.6 | 2.2 | 1.3 | 2.3 |
| Honey consumers | 4 | - | - | 3.4 | - | - | 7.3 | 0.79 | - | 3 | 0.23 | - | - | - | - | 0.68 | - | - | - | 182.5 | - | - | - | - | - | - | - | 13.8 | 6.8 | - | 3.6 |
| Marine plants and algae consumers | 2 | 0.70 | - | - | - | - | - | - | - | 120 | - | 0.11 | - | - | - | - | - | - | - | - | 0.12 | - | <1 | - | - | - | - | - | - | - | - |
| Cattle meat consumers | 17 | - | 0.24 | 4.5 | - | - | 5.1 | 0.47 | - | 1 | - | - | 38.1 | - | 8.9 | 0.82 | - | 4.5 | 0.16 | 30.5 | 0.03 | - | - | - | 1080 | - | - | 1.3 | - | 59.0 | 2.5 |
| Game meat consumers | 3 | 0.32 | - | 17.6 | - | 22.3 | 11.8 | 5.2 | - | 100 | - | - | 11.8 | 29.3 | - | 15.4 | - | 2.8 | 8.0 | - | 0.08 | - | 13 | - | - | - | - | 7.0 | 8.9 | 11.8 | - |
| Pork meat consumers | 14 | - | 0.14 | - | - | - | - | 0.06 | - | - | - | - | 13.5 | - | 17.3 | 0.50 | - | 3.1 | 0.19 | - | - | - | - | - | - | - | - | 920 | 1.3 | - | 1.3 | 2.1 |
| Poultry meat consumers | 6 | 0.16 | - | 8.8 | - | 11.2 | 12.6 | 3.1 | - | 52 | - | - | 5.9 | 14.7 | - | 20.5 | - | 1.4 | 4.0 | - | 0.04 | - | 7 | - | - | - | - | 9.3 | 7.9 | 40.1 | 4.8 |
| Salt marsh grazed sheep consumers | 6 | 0.93 | - | - | - | 2.4 | - | - | 100 | - | - | - | - | - | - | - | 1.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Sheep meat consumers | 26 | - | 0.08 | 3.0 | - | - | 3.9 | 0.78 | - | 1 | - | - | 19.4 | - | 5.8 | 0.54 | - | 9.4 | 0.10 | 19.9 | 0.02 | 0.04 | - | - | - | 620 | - | 0.86 | 0.55 | 7.5 | 1.7 |
| Wildfowl consumers | 4 | 0.24 | - | 13.2 | - | 16.7 | 8.8 | 3.9 | 20 | 100 | - | - | 8.9 | 22.3 | - | 12.3 | - | 2.1 | 10.2 | - | 0.06 | - | 10 | - | - | - | - | 5.3 | 6.7 | 8.8 | - |
| Milk consumers | 15 | - | 0.13 | 1.8 | - | 0.48 | 8.9 | 0.87 | - | 43 | 0.06 | - | 9.5 | - | - | 0.68 | - | 0.75 | - | 184.9 | 0.03 | - | - | - | 40 | - | 230 | 8.5 | 7.9 | 13.0 | 8.2 |
| Mollusc consumers | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 15.3 | - | - | - | - | - | - | - | - | - | - |
| Mushroom consumers | 2 | - | - | 8.9 | - | - | 49.9 | 0.45 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.7 | - | - | - | - | - | 39.6 | 58.9 | 82.8 | 46.7 |
| Occupancy IN water | 2 | - | - | - | - | - | - | - | - | 260 | - | - | - | - | - | - | - | - | - | - | - | - | 79 | 7 | - | - | - | - | - | - | - |
| Occupancy ON water | 18 | 12.6 | - | - | - | 11.4 | - | - | 5 | 37 | - | - | - | - | - | - | - | - | 0.31 | - | - | - | - | 1670 | - | - | - | - | - | - | - |
| Occupants for plume pathways (0 - 0.25 km) | 2 | - | 1.00 | 20.8 | - | - | 1.0 | 2.0 | - | 8 | - | - | 24.9 | - | - | - | - | 3.0 | - | - | - | - | - | - | 7070 | - | - | - | - | 131.6 | - |
| Occupants for plume pathways (>0.25 - 0.5 km) | 6 | - | 1.00 | 8.2 | - | 1.1 | 3.2 | 1.4 | - | 75 | - | - | 5.2 | - | - | - | - | 5.7 | - | - | - | - | - | - | - | 7770 | - | 4.1 | 4.5 | 4.2 | 0.44 |
| Occupants for plume pathways (>0.5 - 1 km) | 18 | - | 1.00 | 1.4 | - | 0.86 | 0.48 | 0.89 | - | 16 | - | - | - | - | 1.2 | 1.1 | - | 0.14 | - | 11.1 | - | - | - | <1 | - | - | 6800 | 1.6 | 2.8 | 7.4 | 2.7 |
| Green vegetable consumers | 15 | - | 0.33 | 2.1 | - | 0.48 | 11.1 | 0.40 | - | 44 | 0.06 | - | - | - | - | 0.96 | - | - | - | 62.5 | - | 0.23 | - | - | 40 | - | 1050 | 21.6 | 28.0 | 27.2 | 24.1 |
| Other domestic vegetable consumers | 6 | - | 0.50 | 3.0 | - | 1.2 | 18.7 | 0.32 | - | 110 | - | - | - | - | - | - | - | - | - | 34.6 | - | 0.57 | - | - | 100 | - | 160 | 31.1 | 59.0 | 41.1 | 42.4 |
| Potato consumers | 16 | - | 0.25 | 9.5 | 0.35 | 0.82 | 9.1 | 2.2 | - | <1 | - | - | 10.9 | 0.06 | - | 4.2 | - | 1.3 | - | - | - | 0.27 | - | - | 1150 | - | - | 6.3 | 8.7 | 124.3 | 9.7 |
| Root vegetable consumers | 10 | - | 0.50 | 1.8 | - | 0.73 | 13.2 | 0.28 | - | 64 | - | - | - | - | - | - | - | - | - | 20.7 | - | 0.34 | - | - | 61 | - | 1570 | 24.4 | 39.3 | 38.6 | 33.9 |

**Notes**

[a]Expressed as the proportion of the profile members who are exposed to direct radiation.

[b]Gamma ext - saltmarsh only includes occupancy over saltmarsh.

[c]Gamma ext - sediments represents occupancy over mud; mud and sand; mud, sand and stones; sand; sand and stones.

[d]Game meat includes venison and rabbits/hares.

[e]Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

## Annex 7. Summary of profiles for the child age group (6 - 15 years old) in the Sellafield area

| Profile Name | Number of individuals | Pathway Name | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Crustacea | Direct[a] | Eggs | Fish - Sea | Fruit - Domestic | Fruit and nuts - Wild | Gamma ext - Sediment[b] | Meat - Cow | Meat - Game[c] | Meat - Pig | Meat - Poultry | Meat - Sheep | Meat - Wildfowl | Milk | Mollusca | Occupancy IN water | Occupancy ON water | Plume (OUT; >0.5 - 1 km)[d] | Vegetables - Green | Vegetables - Other Domestic | Vegetables - Potatoes | Vegetables - Root |
| | | kg | - | kg | kg | kg | kg | h | kg | kg | kg | kg | kg | kg | l | kg | h | h | h | kg | kg | kg | kg |
| Crustacean consumers | **2** | 1.8 | **-** | **-** | 12.8 | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | - | - | **0.79** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| Occupants for direct radiation | **1** | - | 1.00 | - | - | - | 0.34 | - | - | - | 8.4 | 1.4 | 0.94 | - | - | - | - | - | 6220 | - | - | - | - | - |
| Egg consumers | **2** | - | - | 12.7 | 11.2 | 8.3 | 2.6 | - | 5.9 | 14.7 | - | 7.7 | 1.4 | 4.0 | - | - | 7 | - | - | 4.5 | 6.2 | 5.9 | 1.5 | |
| Sea fish consumers | **3** | 1.2 | - | 5.9 | 16.0 | 3.9 | 1.7 | - | 3.9 | 9.8 | - | 5.1 | 0.94 | 2.7 | - | 0.53 | 4 | - | - | 2.3 | 3.0 | 3.9 | - | |
| Domestic fruit consumers | **3** | - | - | 8.5 | 7.4 | 7.4 | 1.9 | - | 3.9 | 9.8 | - | 5.1 | 0.94 | 2.7 | - | - | 4 | - | - | 7.6 | 5.5 | 12.6 | 7.2 | |
| Wild fruit and nut consumers | **1** | - | - | 17.6 | 22.3 | 11.8 | 5.1 | - | 11.8 | 29.3 | - | 15.4 | 2.8 | 8.0 | - | - | 13 | - | - | 7.0 | 8.9 | 11.8 | - | |
| Occupants for exposure - sediment | **6** | - | - | - | - | - | - | 130 | - | - | - | - | - | - | - | - | 40 | 5 | - | - | - | - | - | |
| Cattle meat consumers | **1** | - | - | 17.6 | 22.3 | 11.8 | 5.1 | - | 11.8 | 29.3 | - | 15.4 | 2.8 | 8.0 | - | - | 13 | - | - | 7.0 | 8.9 | 11.8 | - | |
| Game meat consumers | **1** | - | - | 17.6 | 22.3 | 11.8 | 5.1 | - | 11.8 | 29.3 | - | 15.4 | 2.8 | 8.0 | - | - | 13 | - | - | 7.0 | 8.9 | 11.8 | - | |
| Pork meat consumers | **1** | - | 1.00 | - | - | - | 0.34 | - | - | - | 8.4 | 1.4 | 0.94 | - | - | - | - | - | 6220 | - | - | - | - | |
| Poultry meat consumers | **1** | **-** | - | 17.6 | 22.3 | 11.8 | 5.1 | - | 11.8 | 29.3 | - | 15.4 | 2.8 | 8.0 | - | - | 13 | - | - | 7.0 | 8.9 | 11.8 | - | |
| Sheep meat consumers | **2** | **-** | 0.50 | 8.8 | 11.2 | 5.9 | 2.7 | - | 5.9 | 14.7 | 4.2 | 8.4 | 1.9 | 4.0 | - | - | 7 | - | 3110 | 3.5 | 4.4 | 5.9 | - | |
| Wildfowl consumers | **1** | **-** | - | 17.6 | 22.3 | 11.8 | 5.1 | - | 11.8 | 29.3 | - | 15.4 | 2.8 | 8.0 | - | - | 13 | - | - | 7.0 | 8.9 | 11.8 | - | |
| Milk consumers | **1** | **-** | - | - | - | - | - | - | - | - | - | - | - | - | 182.5 | - | - | - | - | - | - | - | - | |
| Mollusc consumers | **2** | **1.8** | - | - | 12.8 | - | - | - | - | - | - | - | - | - | - | 0.79 | - | - | - | - | - | - | - | |
| Occupancy IN water | **4** | **-** | - | - | - | - | - | 150 | - | - | - | - | - | - | - | - | 60 | 7 | - | - | - | - | - | |
| Occupancy ON water | **2** | **-** | - | - | - | - | - | 160 | - | - | - | - | - | - | - | - | 90 | 14 | - | - | - | - | - | |
| Occupants for plume pathways (>0.5 - 1 km) | **1** | **-** | 1.00 | - | - | - | 0.34 | - | - | - | 8.4 | 1.4 | 0.94 | - | - | - | - | - | 6220 | - | - | - | - | |
| Green vegetable consumers | **2** | **-** | - | 8.8 | 11.2 | 8.7 | 2.8 | - | 5.9 | 14.7 | - | 7.7 | 1.4 | 4.0 | - | - | 7 | - | - | 10.5 | 6.5 | 18.9 | 9.2 | |
| Other domestic vegetable consumers | **3** | **-** | - | 8.5 | 7.4 | 7.4 | 1.9 | - | 3.9 | 9.8 | - | 5.1 | 0.94 | 2.7 | - | - | 4 | - | - | 7.6 | 5.5 | 12.6 | 7.2 | |
| Potato consumers | **2** | **-** | - | 8.8 | 11.2 | 8.7 | 2.8 | - | 5.9 | 14.7 | - | 7.7 | 1.4 | 4.0 | - | - | 7 | - | - | 10.5 | 6.5 | 18.9 | 9.2 | |
| Root vegetable consumers | 1 | - | - | - | - | 5.6 | 0.45 | - | - | - | - | - | - | - | - | - | - | - | - | 13.9 | 4.2 | 26.0 | 18.5 | |

**Notes**

[a]Expressed as the proportion of the profile members who are exposed to direct radiation.

[b]Gamma ext - sediment includes occupancy over mud, sand and stones; sand; sand and stones.

[c]Game meat includes venison, rabbits/hares.

[d]Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

## Annex 8. Summary of profiles for the infant age group (0 - 5 years old) in the Sellafield area

| | | Pathway Name | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile Name | Number of individuals | Crustacea | Direct[a] | Eggs | Fish - Sea | Fruit and nuts - Wild | Gamma ext - Sediments[b] | Meat - Cow | Meat - Pig | Meat - Poultry | Meat - Sheep | Milk | Mollusca | Plume (IN; 0 - 0.25 km)[e] | Plume (OUT; >0.5 - 1 km)[e] | Vegetables - Potatoes |
| | | kg | - | kg | kg | kg | h | kg | kg | kg | kg | l | h | h | h | kg |
| Crustacean consumers | **3** | 0.95 | - | - | 6.9 | - | - | - | - | - | - | - | 0.42 | - | - | - |
| Occupants for direct radiation | **4** | - | 1.00 | 4.4 | - | 1.5 | 11 | 2.8 | 0.70 | 0.11 | 0.41 | - | - | 5740 | 1660 | 14.8 |
| Egg consumers | **4** | - | 0.75 | 5.7 | - | 1.6 | 17 | 2.8 | - | - | 1.5 | - | - | 5740 | - | 14.8 |
| Sea fish consumers | **4** | 0.71 | - | - | 7.0 | - | - | - | - | - | - | - | 0.32 | - | - | - |
| Wild fruit and nut consumers | **3** | - | 1.00 | 5.9 | - | 2.0 | 15 | 3.7 | - | - | 0.45 | - | - | 7660 | - | 19.7 |
| Occupants over sediment | **1** | - | - | - | - | - | 100 | - | - | - | - | - | - | - | - | - |
| Cattle meat consumers | **4** | - | 0.75 | 4.4 | - | 1.5 | 11 | 3.7 | - | - | 0.45 | - | - | 5740 | - | 19.7 |
| Pork meat consumers | **1** | - | 1.00 | - | - | 0.11 | - | - | 2.8 | 0.45 | 0.31 | - | - | - | 6660 | - |
| Poultry meat consumers | **1** | - | 1.00 | - | - | 0.11 | - | - | 2.8 | 0.45 | 0.31 | - | - | - | 6660 | - |
| Sheep meat consumers | **1** | - | - | 5.0 | - | 0.39 | 25 | - | - | - | 4.8 | - | - | - | - | - |
| Milk consumers | **1** | - | - | - | - | - | - | - | - | - | - | 182.5 | - | - | - | - |
| Mollusc consumers | **3** | 0.95 | - | - | 6.9 | - | - | - | - | - | - | - | 0.42 | - | - | - |
| Occupants for plume pathways (0 - 0.25 km) | 3 | - | 1.00 | 5.9 | - | 2.0 | 15 | 3.7 | - | - | 0.45 | - | - | 7660 | - | 19.7 |
| Occupants for plume pathways (>0.5 - 1 km) | 1 | - | 1.00 | - | - | 0.11 | - | - | 2.8 | 0.45 | 0.31 | - | - | - | 6660 | - |
| Potato consumers | 4 | - | 0.75 | 4.4 | - | 1.5 | 11 | 3.7 | - | - | 0.45 | - | - | 5740 | - | 19.7 |

**Notes**

[a]Expressed as the proportion of the profile members who are exposed to direct radiation.

[b]Gamma ext - sediment includes occupancy over sand.

[c]Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

## Annex 9. Summary of profiles for women of childbearing age in the Sellafield area, for use in foetal dose assessments

| | | Pathway Name | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Profile Name** | **Number of individuals** | **Crustacea** | **Direct[a]** | **Eggs** | **Fish - Freshwater** | **Fish - Sea** | **Fruit - Domestic** | **Fruit and nuts - Wild** | **Gamma ext - Sediment[b]** | **Honey** | **Meat - Cow** | **Meat - Game[c]** | **Meat - Pig** | **Meat - Poultry** | **Meat - Salt marsh grazed sheep** | **Meat - Sheep** | **Milk** | **Molluscs** | **Mushrooms** | **Plume (IN; 0 - 0.25 km)[d]** | **Plume (MID; >0.25 - 0.5 km)[d]** | **Plume (OUT; >0.5 - 1 km)[d]** | **Vegetables - Green** | **Vegetables - Other Domestic** | **Vegetables - Potatoes** | **Vegetables - Root** |
| | | **kg** | **-** | **kg** | **kg** | **kg** | **kg** | **kg** | **h** | **kg** | **kg** | **kg** | **kg** | **kg** | **kg** | **kg** | **l** | **kg** | **kg** | **h** | **h** | **h** | **kg** | **kg** | **kg** | **kg** |
| Crustacean consumers | **2** | 33.7 | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Occupants for direct radiation | **25** | - | 1.00 | 1.2 | - | - | 0.21 | 0.11 | <1 | - | 1.0 | - | 0.45 | 0.07 | - | 0.17 | - | - | - | 290 | 340 | 1450 | - | - | 5.3 | - |
| Egg consumers | **5** | - | 0.40 | 15.5 | 0.28 | 0.65 | 2.8 | 2.1 | 8 | - | 5.0 | 0.05 | - | 0.14 | - | 3.5 | - | - | 0.05 | 1450 | 1710 | - | 1.1 | 0.92 | 59.7 | 2.6 |
| Freshwater fish consumers | **1** | - | - | 17.8 | 1.4 | 3.3 | 2.3 | 6.8 | - | - | - | 0.23 | - | 0.68 | - | - | - | - | 0.23 | - | - | - | 2.9 | - | 165.1 | 8.8 |
| Sea fish consumers | **2** | 8.4 | - | - | - | 37.6 | - | - | 39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Domestic fruit consumers | **1** | - | - | 6.8 | - | - | 42.7 | 2.0 | 3 | - | 71.0 | - | - | 3.3 | - | 5.7 | 259.3 | 0.52 | - | - | - | - | 2.0 | - | 31.8 | 6.6 |
| Wild fruit and nut consumers | **1** | - | - | 17.8 | 1.4 | 3.3 | 2.3 | 6.8 | - | - | - | 0.23 | - | 0.68 | - | - | - | - | 0.23 | - | - | - | 2.9 | - | 165.1 | 8.8 |
| Occupants for exposure - sediment | **4** | - | - | - | - | - | - | - | 400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Honey consumers | **1** | - | - | 3.4 | - | - | 7.3 | 0.79 | 12 | 0.23 | - | - | - | 0.68 | - | - | 182.5 | - | - | - | - | - | 13.8 | 6.8 | - | 3.6 |
| Cattle meat consumers | **6** | - | 0.17 | 4.6 | - | - | 7.3 | 0.67 | 3 | - | 41.4 | - | 4.2 | 0.88 | - | 4.3 | 43.2 | 0.09 | - | 1210 | - | - | 0.34 | - | 71.1 | 1.1 |
| Game meat consumers | **1** | - | - | 17.8 | 1.4 | 3.3 | 2.3 | 6.8 | - | - | - | 0.23 | - | 0.68 | - | - | - | - | 0.23 | - | - | - | 2.9 | - | 165.1 | 8.8 |
| Pork meat consumers | **5** | - | 0.20 | - | - | - | - | 0.09 | - | - | 6.3 | - | 14.1 | 0.36 | - | 2.1 | - | - | - | - | - | 1230 | - | - | - | - |
| Poultry meat consumers | **3** | - | 0.33 | 2.3 | - | - | 14.2 | 0.82 | 1 | - | 47.3 | - | 3.7 | 2.4 | - | 4.2 | 86.4 | 0.17 | - | - | - | 2050 | 0.68 | - | 10.6 | 2.2 |
| Salt marsh grazed sheep consumers | **3** | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.9 | - | - | - | - | - | - | - | - | - | - | - |
| Sheep meat consumers | **7** | - | - | 3.2 | - | - | 6.7 | 0.67 | 4 | - | 24.8 | - | 3.6 | 0.76 | - | 7.7 | 37.0 | 0.07 | 0.07 | - | - | - | 0.29 | - | 11.7 | 0.95 |
| Milk consumers | **4** | - | - | 2.6 | - | - | 12.5 | 0.95 | 4 | 0.06 | 17.7 | - | - | 1.0 | - | 1.4 | 205.9 | 0.13 | - | - | - | - | 4.0 | 1.7 | 14.2 | 2.6 |
| Mollusc consumers | **1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 15.3 | - | - | - | - | - | - | - | - |
| Mushroom consumers | **2** | - | - | 8.9 | 0.71 | 1.6 | 3.4 | 4.2 | - | - | - | 0.11 | - | 0.34 | - | 2.8 | - | - | 0.36 | - | - | - | 1.5 | - | 107.6 | 4.4 |
| Occupants for plume pathways (0 - 0.25 km) | **1** | - | 1.00 | 20.8 | - | - | 1.0 | 2.0 | 15 | - | 24.9 | - | - | - | - | 3.0 | - | - | - | 7260 | - | - | - | - | 131.6 | - |
| Occupants for plume pathways (>0.25 - 0.5 km) | **1** | - | 1.00 | 8.2 | - | - | 4.2 | 0.38 | - | - | - | - | - | - | - | - | - | - | - | - | 8540 | - | - | - | 1.7 | - |
| Occupants for plume pathways (>0.5 - 1 km) | **2** | - | 1.00 | - | - | - | - | 0.23 | - | - | - | - | 5.6 | 0.90 | - | 0.63 | - | - | - | - | - | 6600 | - | - | - | - |
| Green vegetable consumers | **1** | - | - | 3.4 | - | - | 7.3 | 0.79 | 12 | 0.23 | - | - | - | 0.68 | - | - | 182.5 | - | - | - | - | - | 13.8 | 6.8 | - | 3.6 |
| Other domestic vegetable consumers | **2** | - | - | 9.5 | - | - | 6.8 | 0.40 | 6 | 0.11 | - | - | - | 0.34 | - | - | 91.3 | - | - | - | - | - | 8.2 | 5.7 | - | 3.8 |
| Potato consumers | **4** | - | 0.25 | 9.6 | 0.35 | 0.82 | 0.82 | 2.2 | 4 | - | 18.7 | 0.06 | - | 0.17 | - | 2.2 | - | - | 0.06 | 1820 | - | - | 0.74 | - | 140.0 | 2.2 |
| Root vegetable consumers | **6** | - | - | 7.3 | 0.24 | 0.54 | 9.8 | 1.6 | 3 | 0.04 | 11.8 | 0.04 | - | 0.78 | - | 0.94 | 85.1 | 0.09 | 0.04 | - | - | - | 4.1 | 1.9 | 39.3 | 6.8 |

**Notes**

[a]Expressed as the proportion of the profile members who are exposed to direct radiation.

[b]Gamma ext - sediment includes occupancy over sand; sand and stones.

[c]Game meat includes rabbits/hares.

[d]Plume times are the sums of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

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