Cefas

Cefas contract report C2848

# Radiological Habits Survey: Sellafield, 2008

2009

Environment Report RL 02/09

Environment Agency

FOOD STANDARDS AGENCY

HSE Health & Safety Executive

# Radiological Habits Survey: Sellafield, 2008

**Environment Report RL02/09**

**The Centre for Environment, Fisheries & Aquaculture Science**
**Lowestoft Laboratory**
**Pakefield Road**
**Lowestoft**
**Suffolk**
**NR33 0HT**

**F.J. Clyne, J.R. Tipple, C.J. Garrod and T.M. Jeffs**

**2009**

**Peer reviewed by S.B. Jenkinson**

**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 C2848**
**FSA Project PAU 198 / Lot 7 / ERI0006**

**SUMMARY** **7**

**1. INTRODUCTION** **13**
1.1 Regulatory framework 13
1.2 Radiological protection framework 14

**2. THE SURVEY** **16**
2.1 Site activity 16
2.2 Survey objectives 17
2.3 Survey areas 18
2.4 Conduct of the survey 19

**3. METHODS FOR DATA ANALYSIS** **23**
3.1 Data recording and presentation 23
3.2 Data analysis 25

**4. AQUATIC RADIATION PATHWAYS** **28**
4.1 Aquatic survey area 28
4.2 Commercial fisheries 34
4.3 Seafood wholesalers and retailers 35
4.4 Angling, hobby fishing and shellfish collecting 36
4.5 Wildfowling 37
4.6 Other pathways 38
4.7 Food consumption data 38
4.8 Intertidal occupancy 43
4.9 Handling of fishing gear and sediment 48
4.10 Inadvertent ingestion or inhalation of sediment 50
4.11 Water based activities 51

**5. TERRESTRIAL RADIATION PATHWAYS** **52**
5.1 Terrestrial survey area 52
5.2 Terrestrial food wholesalers and retailers 54
5.3 The transfer of contamination off-site by wildlife 55
5.4 Food consumption data 56

**6. DIRECT RADIATION PATHWAYS** **60**
6.1 Direct radiation survey area 60
6.2 Residential activities 60
6.3 Leisure activities 61
6.4 Commercial activities 61
6.5 Occupancy rates 62
6.6 Gamma dose rate measurements 63

**7. COMBINED PATHWAYS** **65**
7.1 Use of the data for total dose assessment 66
7.2 Use of the data for foetal dose assessments 66

**8. CONCLUSIONS AND SUGGESTIONS** **67**
8.1 Survey findings 67
8.2 Comparisons with previous surveys 71
*Table A Comparison between 2003 and 2008 aquatic internal exposure pathways at Sellafield* *73*
*Table B Comparison between 2003 and 2008 aquatic external exposure pathways at Sellafield* *74*
*Table C Comparison between 2003 and 2008 mean consumption rates for the adult high-rate groups for terrestrial food groups at Sellafield (kg $y^{-1}$ or l $y^{-1}$)* *75*
*Table D Comparison between 2003 and 2008 direct radiation occupancy rates in the 0 – 0.25 km zone at Sellafield (h $y^{-1}$)* *77*

*Table E Comparison between 2003 and 2008 direct radiation occupancy rates in the >0.25 – 0. 5 km zone at Sellafield (h $y^{-1}$)* *77*
*Table F Comparison between 2003 and 2008 direct radiation occupancy rates in the >0.5 – 1.0 km zone at Sellafield (h $y^{-1}$)* *77*
*Table G Comparison between 2003 and 2008 gamma dose rates at Sellafield (µGy $h^{-1}$)* *78*
8.3 Summary of current environmental monitoring programmes 79
8.4 Suggestions for changes to the monitoring programmes 81

**9. ACKNOWLEDGEMENTS 82**

**10. REFERENCES 83**

**FIGURES**

Figure 1 The Sellafield aquatic survey area
Figure 2 The Sellafield terrestrial (outer ring) and direct radiation (inner ring) survey areas

**TABLES**

Table 1 Survey coverage
Table 2 Typical food groups used in habits surveys
Table 3 Adults' consumption rates of fish in the Sellafield area (kg $y^{-1}$)
Table 4 Adults' consumption rates of crustaceans in the Sellafield area (kg $y^{-1}$)
Table 5 Adults' consumption rates of molluscs in the Sellafield area (kg $y^{-1}$)
Table 6 Adults' consumption rates of wildfowl in the Sellafield area (kg $y^{-1}$)
Table 7 Adults' consumption rates of marine plants/algae in the Sellafield area (kg $y^{-1}$)
Table 8 Adult consumption rates of vegetables and fruit grown on land where seaweed has been used as a fertiliser (kg $y^{-1}$)
Table 9 Children's consumption rates of fish in the Sellafield area (kg $y^{-1}$)
Table 10 Children's consumption rates of crustaceans in the Sellafield area (kg $y^{-1}$)
Table 11 Children's consumption rates of molluscs in the Sellafield area (kg $y^{-1}$)
Table 12 Children's consumption rates of wildfowl in the Sellafield area (kg $y^{-1}$)
Table 13 Summary of adults' consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)
Table 14 Summary of 15-year-old children's consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)
Table 15 Summary of 10-year-old children's consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)
Table 16 Summary of 5-year-old children's consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)
Table 17 Summary of 1-year-old children's consumption rates in the Sellafield area (l $y^{-1}$)
Table 18 Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)
Table 19 Children's intertidal occupancy rates in the Sellafield area (h $y^{-1}$)
Table 20 Gamma dose rate measurements over intertidal substrates in the Sellafield area (µGy $h^{-1}$)
Table 21 Adults' handling rates of fishing gear and sediment in the Sellafield area (h $y^{-1}$)
Table 22 Children's handling rates of sediment in the Sellafield area (h $y^{-1}$)
Table 23 Adults' intertidal occupancy rates in the Ravenglass Estuary for consideration in the assessment of inadvertent inhalation and ingestion of sediment (h $y^{-1}$)
Table 24 Children's intertidal occupancy rates in the Ravenglass Estuary for consideration in the assessment of inadvertent inhalation and ingestion of sediment (h $y^{-1}$)
Table 25 Adults' occupancy rates in and on water in the Sellafield area (h $y^{-1}$)
Table 26 Children's occupancy rates in and on water in the Sellafield area (h $y^{-1}$)
Table 27 Adults' consumption rates of green vegetables in the Sellafield area (kg $y^{-1}$)
Table 28 Adults' consumption rates of other vegetables in the Sellafield area (kg $y^{-1}$)
Table 29 Adults' consumption rates of root vegetables in the Sellafield area (kg $y^{-1}$)

Table 30 Adults' consumption rates of potato in the Sellafield area (kg $y^{-1}$)
Table 31 Adults' consumption rates of domestic fruit in the Sellafield area (kg $y^{-1}$)
Table 32 Adults' consumption rates of milk in the Sellafield area (l $y^{-1}$)
Table 33 Adults' consumption rates of cattle meat in the Sellafield area (kg $y^{-1}$)
Table 34 Adults' consumption rates of sheep meat in the Sellafield area (kg $y^{-1}$)
Table 35 Adults' consumption rates of poultry in the Sellafield area (kg $y^{-1}$)
Table 36 Adults' consumption rates of eggs in the Sellafield area (kg $y^{-1}$)
Table 37 Adults' consumption rates of wild/free foods in the Sellafield area (kg $y^{-1}$)
Table 38 Adults' consumption rates of rabbits/hares in the Sellafield area (kg $y^{-1}$)
Table 39 Adults' consumption rates of honey in the Sellafield area (kg $y^{-1}$)
Table 40 Adults' consumption rates of wild fungi in the Sellafield area (kg $y^{-1}$)
Table 41 Adults' consumption rates of venison in the Sellafield area (kg $y^{-1}$)
Table 42 Adults' consumption rates of freshwater fish in the Sellafield area (kg $y^{-1}$)
Table 43 Children's consumption rates of green vegetables in the Sellafield area (kg $y^{-1}$)
Table 44 Children's consumption rates of other vegetables in the Sellafield area (kg $y^{-1}$)
Table 45 Children's consumption rates of root vegetables in the Sellafield area (kg $y^{-1}$)
Table 46 Children's consumption rates of potato in the Sellafield area (kg $y^{-1}$)
Table 47 Children's consumption rates of domestic fruit in the Sellafield area (kg $y^{-1}$)
Table 48 Children's consumption rates of milk in the Sellafield area (l $y^{-1}$)
Table 49 Children's consumption rates of cattle meat in the Sellafield area (kg $y^{-1}$)
Table 50 Children's consumption rates of sheep meat in the Sellafield area (kg $y^{-1}$)
Table 51 Children's consumption rates of poultry in the Sellafield area (kg $y^{-1}$)
Table 52 Children's consumption rates of eggs in the Sellafield area (kg $y^{-1}$)
Table 53 Children's consumption rates of wild/free foods in the Sellafield area (kg $y^{-1}$)
Table 54 Children's consumption rates of rabbits/hares in the Sellafield area (kg $y^{-1}$)
Table 55 Children's consumption rates of wild fungi in the Sellafield area (kg $y^{-1}$)
Table 56 Children's consumption rates of venison in the Sellafield area (kg $y^{-1}$)
Table 57 Children's consumption rates of freshwater fish in the Sellafield area (kg $y^{-1}$)
Table 58 Percentage contribution each food type makes to its terrestrial food group for adults
Table 59 Occupancy rates for adults and children in the Sellafield direct radiation survey area (h $y^{-1}$)
Table 60 Analysis of occupancy rates for adults and children in the Sellafield direct radiation survey area
Table 61 Gamma dose rate measurements for the Sellafield direct radiation survey (µGy $h^{-1}$)
Table 62 Combinations of adult pathways for consideration in dose assessments in the Sellafield area

**ANNEXES**

Annex 1 Adults' consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area
Annex 2 Children's consumption rates (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area
Annex 3 Qualitative and estimated data for use in dose assessments
Annex 4 Ratios for determining consumption and occupancy rates for children
Annex 5 Summary of adults' profiled consumption data (kg $y^{-1}$ or l $y^{-1}$) and occupancy data (h $y^{-1}$) in the Sellafield area
Annex 6 Female consumption (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area, for use in foetal dose assessments

**SUMMARY**

This report presents the results of a survey conducted in 2008 to determine the habits and consumption patterns of people living, working and pursuing recreational activities in the vicinity of the Sellafield Ltd nuclear site in Cumbria. The Sellafield site comprised a Magnox Reprocessing Plant, a Thermal Oxide Reprocessing Plant, waste storage and treatment facilities, the Calder Hall Magnox nuclear power station and the Windscale research establishment. The current main operations include fuel reprocessing, waste storage and treatment, and decommissioning. The Calder Hall Magnox nuclear power station, which ceased generating electricity in 2003, and the Windscale research establishment are being decommissioned. The Sellafield site discharges gaseous radioactive waste via stacks to the atmosphere and liquid radioactive waste via pipelines to the Irish Sea. The site contains sources of direct radiation.

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

- 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 consumption of seaweed and the use of seaweed as a fertiliser or animal feed
- The consumption of food from the terrestrial survey area
- The production, use and destination of local produce
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The transfer of contamination off-site by wildlife
- Occupancy within 1 km of the licensed site boundary
- Any new or unusual exposure pathways

Additionally, the following issues were investigated, as the result of site-specific requests by the Environment Agency:

- Activities and occupancy over intertidal substrates in the Ravenglass Estuary that disturb the sediment, either on the surface or at depth, and may result in the inadvertent inhalation or ingestion of sediment.
- Rock climbing at St Bees Head, relating to historic off-site contamination of the environment by seagull guano.
- Handling of sediment from road drains at Seascale by workers cleaning the drains, relating to off-site contamination of the environment by pigeon guano.

Interviews were conducted with members of the public and data collected for 426 individuals are presented and discussed. High rates of consumption, occupancy and handling are identified by using the 'cut off' method and 97.5$^{th}$ percentiles. These rates 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 covered all intertidal areas between Parton and Tarn Bay, including the lower reaches of the rivers Ehen, Calder, Irt, Mite and Esk. Internal and external exposure pathways were investigated because of the potential effects from liquid discharges. Foods from the aquatic survey area were consumed from the following food groups: fish, crustaceans, molluscs, wildfowl, and marine plants/algae. The predominant foods consumed by the respective high-rate groups for these food groups were cod, plaice, mackerel and bass; brown crab, common lobster and *Nephrops*; winkles, mussels and razor shells; goose, mallard and teal; *Porphyra* and samphire. The mean consumption rate for the adult high-rate group for fish was 40 kg $y^{-1}$, which was equal to the respective generic 97.5$^{th}$ percentile rate. The mean consumption rates for the adult high-rate group for crustaceans and molluscs were 17 kg $y^{-1}$ and 31 kg $y^{-1}$ respectively, which exceeded both their generic 97.5$^{th}$ percentile rates. Generic 97.5$^{th}$ percentile rates have not been determined for wildfowl or marine plants/algae. The adult high-rate groups for intertidal occupancy included people undertaking bait digging, wildfowling, shellfish collecting, nature reserve warden duties, boat maintenance, walking,

dog walking, angling and beachcombing. Gamma dose rate measurements were taken at most locations in the aquatic survey area where activities were occurring. Activities in the adult high-rate group for handling fishing gear were trawling, potting and setting nets, and for handling sediment were collecting molluscs and bait digging. Activities were identified in the Ravenglass Estuary where the sediment was disturbed at various depths. These included bait digging, shellfish collecting, wildfowling, horse riding, walking and dog walking. People were undertaking water-based activities such as commercial fishing, sailing, canoeing, swimming and diving. One individual was identified that used seaweed as a fertiliser for vegetables and fruit. The use of seaweed as animal feed was not identified.

The terrestrial survey covered an area up to 5 km from the Sellafield site centre. In this area, internal exposure pathways were investigated because of the potential effects from gaseous discharges. Thirty-four farms were identified which produced beef cattle, lambs, dairy cattle, poultry, eggs, potatoes and arable crops. Farmers consumed produce from their farms and residents consumed fruit and vegetables grown in their gardens. Two beekeepers were identified who produced honey within the survey area. Freshwater angling was identified on the rivers Ehen and Calder. Foods from the terrestrial area were consumed from the following food groups: green vegetables, other vegetables, root vegetables, potato, domestic fruit, milk, cattle meat, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, honey, wild fungi, venison and freshwater fish. No mean consumption rates for the adult high-rate groups exceeded their respective generic 97.5$^{th}$ percentile rates. The consumption of pig meat and cereals was not identified.

The human consumption of spring, well and fell water was identified at farms in the north-east section of the terrestrial survey area. The occupants of a beach residence near Braystones Rail Station were using well water as their domestic water supply. There was a pipe coming out of the dunes at Braystones that was fed by spring water and one individual reported that he occasionally drank from the pipe. Livestock were identified drinking river, stream, fell, spring, well and borehole water.

The transfer of contamination off-site by wildlife was investigated, as radionuclides could enter the food chain or contaminate the environment through this pathway. A Sellafield Ltd representative reported that wildlife such as pigeons, seagulls and rabbits were observed on the Sellafield site, although the numbers were considered to be low. The site policy was to actively remove habitat and try to prevent wildlife access, although there was still the possibility of wildlife becoming contaminated. Pigeons and seagulls found on the site were monitored annually and periodically culled. Some individuals living in the terrestrial survey area were consuming rabbits and pigeons that were caught or shot within 5 km of the site but it was not known if these animals and birds had spent time on the site. Contact with sediments in Seascale road drains by workers cleaning the drains was investigated relating to historic contamination of the sediments by pigeon guano. It was reported to be unlikely that workers cleaning the drains would come into contact with the sediment. Rock climbing at St Bees Head was investigated relating to historic off-site contamination of the rocks by seagull guano. St Bees Head was popular with rock climbers and it was reported that they tried to avoid areas with seagull guano. There were four climbing areas, the most popular of which had very little bird activity.

The direct radiation survey covered an area out to 1 km from the licensed site boundary. In this area, external pathways were investigated because of potential effects from ionising radiation emanating directly from the site and from exposure to gases discharged to the atmosphere from the site. Occupancy rates were obtained for residents, employees and for people undertaking leisure activities such as angling and dog walking. The highest outdoor occupancy rate was for a farmer who lived and worked in the >0.25 – 0.5 km zone, the highest indoor occupancy rate was for a resident in the 0 – 0.25 km zone, and the highest total occupancy rate was for a resident in the >0.25 – 0.5 km zone. 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 licensed site centre.

Comparisons were made with the results from the previous combined habits survey undertaken around Sellafield in 2003. Comparisons have not been made with the results from the Sellafield annual reviews of shellfish consumption and intertidal occupancy, conducted between 2004 and 2007, or with the results from a beach occupancy habits survey relating to radioactive particles detected on beaches in the Sellafield area conducted in 2007, due to differences in the survey areas and individuals that were targeted.

In the aquatic survey in 2008, compared with 2003, there were decreases in the mean consumption rates for the adult high-rate groups for fish, crustaceans and molluscs, and increases in the mean rates for wildfowl and marine plants/algae. The mean consumption rates for the adult high-rate group for fish decreased slightly from 41 kg $y^{-1}$ to 40 kg $y^{-1}$, for crustaceans decreased significantly from 27 kg $y^{-1}$ to 17 kg $y^{-1}$, and for molluscs decreased slightly from 34 kg $y^{-1}$ to 31 kg $y^{-1}$. The mean consumption rate for the adult high-rate group for wildfowl increased from 1.9 kg $y^{-1}$ to 5.0 kg $y^{-1}$ and the rate for marine plants increased from 0.1 kg $y^{-1}$ to 0.2 kg $y^{-1}$.

Where similar substrates were identified in 2003 and 2008, a comparison of mean intertidal occupancy rates for the adult high-rate groups has been made. The mean intertidal occupancy rates for the adult high-rate groups over the following substrates decreased in 2008: mud and sand (classified as sand and mud in 2003) from 870 h $y^{-1}$ to 580 h $y^{-1}$; salt marsh from 400 h $y^{-1}$ to 110 h $y^{-1}$; and sand and stones from 860 h $y^{-1}$ to 570 h $y^{-1}$. The mean intertidal occupancy rate over rock remained the same at 30 h $y^{-1}$ and the mean intertidal occupancy rate over sand increased from 500 h $y^{-1}$ to 610 h $y^{-1}$. The mean handling rates for the adult high-rate groups for fishing gear increased from 730 h $y^{-1}$ to 980 h $y^{-1}$ and for sediment decreased slightly from 1000 h $y^{-1}$ to 960 h $y^{-1}$.

In the terrestrial survey area, there were no significant changes in the mean consumption rates for the adult high-rate groups between 2003 and 2008. There were small increases in the mean consumption rates of the following food groups: green vegetables, root vegetables, domestic fruit, poultry, eggs, wild/free foods, honey, and freshwater fish. There were small decreases in

the mean consumption rates of the following food groups: other vegetables, potato, milk, cattle meat, sheep meat, rabbits/hares, wild fungi and venison. The consumption of pig meat and cereals was not identified in either survey.

In the direct radiation area, there were no significant changes to the occupancy rates in the three zones between 2003 and 2008. In the 0 - 0.25 km zone, there was a small decrease in the total occupancy rate from 8400 h $y^{-1}$ in 2003 to 8300 h $y^{-1}$ in 2008. In the >0.25 - 0.5 km zone and in the >0.5 - 1.0 km zone, the total occupancy rates remained the same in 2008 at 8400 h $y^{-1}$ and 8200 h $y^{-1}$, respectively. Gamma dose rate measurements taken at six residences were compared and the results were broadly similar in 2003 and 2008.

Suggestions are provided for changes to the current environmental monitoring programmes on the basis of the information collected during the survey. These include replacing a dab sample with mackerel, replacing limpets with razor shells, replacing French beans with tomatoes, adding a one-off sample of venison, and introducing a gamma dose rate measurement over sand at Drigg.

# 1 INTRODUCTION

The public may be exposed to radiation as a result of operations on the Sellafield site, either from discharges of liquid or gaseous radioactive wastes into the local environment, or from radiation emanating directly from the site. This report provides information about activities carried out by members of the public under everyday circumstances, which may influence their radiation exposure. The study has been funded by the Environment Agency, the Food Standards Agency and the Health and Safety Executive in order to support their respective roles in protecting the public from the effects of radiation.

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 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 relevant dose limits and constraints, other members of the public will receive lower 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).

## 1.1 Regulatory framework

The Environment Agency regulates discharges of waste under the Radioactive Substances Act 1993 (RSA 93) (UK Parliament, 1993) as amended by: the Environment Act 1995 (EA 95) (UK Parliament, 1995a); by legislation implementing the European Union (EU) Basic Safety Standards (BSS) Directive 96/29/Euratom (CEC, 1996); and by the Energy Act 2004 (EA 04) (UK Parliament, 2004). The Directive takes into account the recommendations of the ICRP, particularly ICRP 60 (ICRP, 1991). Authorisations under RSA 93 are issued by the Environment Agency after wide-ranging consultations that include the Food Standards

Agency. As well as being a Statutory Consultee, the Food Standards Agency has responsibilities for ensuring that any radioactivity present in food does not compromise food safety and that authorised 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 accepted limits. Consultation papers on Statutory Guidance to the Environment Agency on the regulation of radioactive waste discharges were issued by the Department of the Environment, Transport and the Regions (DETR) (now part of the Department for Environment, Food and Rural Affairs (Defra)) in 2000 (DETR, 2000a) and the Welsh Assembly in 2002 (The Welsh Assembly Government, 2002). These documents state that the protection of the most highly exposed individuals in the population is the appropriate radiological protection methodology to use.

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). The Nuclear Installations Inspectorate of the Health and Safety Executive implements this legislation and is also responsible for regulating, under the Ionising Radiations Regulations (IRR 99) (UK Parliament, 1999), the restriction of exposure of the public to direct radiation from operations occurring on these sites.

## 1.2 Radiological protection framework

Dose standards for the public are embodied in national policy (UK Parliament, 1995b), 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. The public dose standards were incorporated into UK law in IRR 99. In order to implement the Directive in England and Wales, the Environment Agency was issued with a direction by the DETR in 2000 (DETR, 2000b). This included the requirements that the Environment Agency ensure, wherever applicable:

- All public radiation exposures from radioactive waste disposal are kept As Low As Reasonably Achievable (ALARA)

- The sum of such exposures does not exceed the dose limit of 1 mSv a year

The principal limit of 1 mSv per year to the public is also the recommendation made by the ICRP.

The Environment Agency shall have regard for maximum doses to individuals for use at the planning stage:

- 0.3 mSv a year from any source
- 0.5 mSv a year from the discharges from any single site

The Environment Agency is 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. It is 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 a group of UK Government Bodies (EA, SEPA, DoENI, NRPB and FSA, 2002). The National Dose Assessment Working Group (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 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, EHS, FSA and SEPA, 2008), as combined habits surveys are completed.

# 2 THE SURVEY

## 2.1 Site activity

The Sellafield site is located in Cumbria, approximately 12 km south-east of the town of Whitehaven (Figure 1).

The Sellafield site comprised a Magnox Reprocessing Plant, a Thermal Oxide Reprocessing Plant, waste storage and treatment facilities, the Calder Hall Magnox nuclear power station and the Windscale research establishment. The current main operations include fuel reprocessing, waste storage and treatment, and decommissioning. The Calder Hall Magnox nuclear power station, which ceased generating in 2003, (EA, FSA, NIEA and SEPA, 2008) and the Windscale research establishment are being decommissioned.

Whilst the habits survey fieldwork was being carried out, routine decommissioning activities were being undertaken at the Sellafield site.

The Sellafield site, including Windscale, discharges gaseous radioactive waste via stacks to the atmosphere, liquid radioactive waste via outfalls into the Irish Sea and contains sources of direct radiation. Details of the amounts of gaseous and liquid radioactive waste discharged in 2007 have been published (EA, FSA, NIEA and SEPA, 2008).

The Sellafield site, including Windscale, is owned by the Nuclear Decommissioning Authority (NDA) and is managed and operated by Sellafield Ltd on behalf of the NDA. In 2008 the Windscale site, which was previously operated by the United Kingdom Atomic Energy Authority (UKAEA), was integrated with the Sellafield site. Under the Nuclear Installations Act 65 (NIA 65), Sellafield Ltd is the site licence holder for both Sellafield and Windscale, although these are two separate licences. The licence allows the installation and operation of certain activities. Sellafield Ltd has a single multimedia authorisation and under the Radioactive Substances Act 93 (RSA 93), Sellafield Ltd are authorised to discharge gaseous

radioactive waste via stacks to the atmosphere and liquid radioactive waste via pipelines into the Irish Sea.

## 2.2 Survey objectives

The Centre for Environment, Fisheries & Aquaculture Science (Cefas) undertook the Sellafield habits survey in 2008 on behalf of the Environment Agency, the Food Standards Agency, and the Health and Safety Executive. The aim of the survey was to obtain comprehensive information on the habits of the public that might lead to their exposure to gaseous discharges, liquid 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 consumption of seaweed and the use of seaweed as a fertiliser or animal feed
- The consumption of food from the terrestrial survey area
- The production, use and destination of local produce
- The consumption and use of groundwater and surface water in the terrestrial survey area
- The transfer of contamination off-site by wildlife
- Occupancy within 1 km of the licensed site boundary
- New or unusual exposure pathways

Additionally, the following issues were investigated, as the result of site-specific requests by the Environment Agency:

- Activities and occupancy over intertidal substrates in the Ravenglass Estuary that disturb the sediment, either on the surface or at depth, and may result in the inadvertent inhalation or ingestion of sediment.
- Rock climbing at St Bees Head was investigated relating to historic off-site contamination of the environment by seagull guano.
- Handling of sediment from road drains at Seascale by workers cleaning the drains relating to off-site contamination of the environment by pigeon guano.

### 2.3 Survey areas

Three survey areas were defined to encompass the main areas potentially affected by the discharges from the site and sources of radioactivity. These were an aquatic area relating to liquid discharges, a terrestrial area relating to the deposition of gaseous discharges, and a direct radiation area relating to ionising radiation emanating directly from the site.

The aquatic survey area, shown in Figure 1, covered the coast from Parton in the north, to Tarn Bay in the south, and extended 11 km offshore. The lower reaches of the rivers Ehen and Calder, and the Ravenglass Estuary including the lower reaches of rivers Irt, Mite and Esk were also investigated.

The terrestrial survey area covered all land within 5 km of the site centre (NGR NY 029 038), shown in Figure 2, to encompass the main areas of potential deposition from gaseous discharges. Watercourses and ponds potentially containing contamination from washout of gaseous discharges are discussed in the terrestrial section of this report.

The direct radiation survey area, which is also shown in Figure 2, was defined as the area within 1 km of the licensed site boundary.

The same aquatic, terrestrial and direct radiation areas were used in the previous combined habits survey conducted by Cefas in the Sellafield area, which was in 2003 (Clyne *et al*., 2004).

Other habits surveys have been conducted in the Sellafield area since 2003. Annual reviews of shellfish consumption and intertidal occupancy were conducted in 2004, 2005, 2006 and 2007 (Tipple, 2005, 2006 and 2007; and Clyne, 2008, respectively), and a beach occupancy habits survey was conducted in 2007, relating to potential exposure from radioactive particles detected on beaches (Clyne *et al*., 2008).

### 2.4 Conduct of the survey

As part of the pre-survey preparation, the Environment Agency, the Food Standards Agency and the Health and Safety Executive 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 at Sellafield. People with a local knowledge of the survey area were contacted for local information relevant to the various exposure pathways. These included representatives from a beekeeping association, the Cumbria Sea Fisheries Committee, the Marine Fisheries Agency, and the British Association for Shooting and Conservation. These people provided information on beekeeping, commercial and hobby fishing, shellfish collection, angling and wildfowling.

A proposed programme for fieldwork was distributed to the Environment Agency, the Food Standards Agency, and the Health and Safety Executive before the fieldwork commenced, for their comment.

The fieldwork was carried out from 17$^{th}$ – 27$^{th}$ June 2008 by a survey team of four people, according to techniques described by Leonard *et al.* (1982). At the start of the fieldwork a meeting was held between the survey team and a Sellafield Ltd representative. This

discussion provided details about current site activities, local information, potential pathways and activities in the area, and the transfer of contamination off-site by wildlife.

The following information was obtained during the meeting:

- The current site activities included intermittent reprocessing and decommissioning activities; dismantling of the Windscale pile chimneys and the Advanced Gas Cooled reactor; and retrieving sludge from ponds.
- The Sealine Recovery Project to recover redundant pipelines had been completed, although the public footpath from the Sellafield Rail Station to Sellafield beach remained closed due to further work on the existing pipelines.
- There was increased monitoring of the beaches between St Bees and Ravenglass due to the detection of radioactive particles on the beaches. Most of the particles had been detected on the beaches between Sellafield and Braystones. The advice from the Health Protection Agency (HPA) at the time was that no precautionary actions were necessary to prevent public access to beaches in the area.
- Wildlife were identified on site, although the numbers were considered to be low. The site policy was to actively remove habitat and try to prevent wildlife access, although there is still the possibility of wildlife becoming contaminated. Pigeons and seagulls on site were monitored annually and were periodically culled. Rabbits were not culled and were not routinely monitored. Pheasants and migratory birds were occasionally seen on site but were not monitored as the numbers were so low.

Interviews were conducted with individuals who were identified in the pre-survey preparation and others that were identified during the fieldwork. These included, for example, commercial fishermen, hobby fishermen, anglers, farmers, gardeners, beekeepers and people living and working close to the site. Interviews were used to establish individuals' consumption, occupancy and handling rates relevant to the aquatic, terrestrial and direct radiation areas. Any other information of possible use to the survey was also obtained. Gamma dose rate measurements were taken over intertidal substrates in the aquatic area, and indoors and

outdoors of most properties in the direct radiation area where interviews were conducted. Background gamma dose rates were taken at a distance beyond 5 km from the site centre.

Four Cefas personnel spent nine days each investigating the survey areas and interviewing individuals who were relevant to the survey. Observations for 426 individuals were recorded.

For practical and resource reasons, the survey did not involve the whole population in the vicinity of Sellafield, 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 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. Overall, the number of potential interviewees in the terrestrial survey area was estimated to be 8,000, although information was obtained for a significantly smaller number than this. It should be noted that the survey did not include site employees or contractors while they were at work. This is because dose criteria applicable to these people whilst at work and the dose assessment methods are different to those for members of the public. However, any consumption data, and activities and occupancy rates for these employees while outside work, are included in the results if employees 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. During interviews with representatives from certain groups or organisations it was not possible to collect data for all pathways for each person. For example, a representative of a diving club was interviewed and provided generic data for occupancy rates in and on water for the club members. However, it was not possible to gain consumption data for each member. In Annexes 1 and 2, these individuals only have data for the pathways of primary interest.

# 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 rare 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.

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.

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 usually 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 integers.

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 Health and Safety Executive, and by a senior Cefas radiological scientist.
- Final reports were only issued when the Environment Agency, the Food Standards Agency and the Health and Safety Executive were entirely satisfied with the format and content of the draft report.

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. salt marsh) are grouped together.

In addition, data are 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 age groups and their relevant age ranges are based on the recommendations in ICRP 72 (ICRP, 1996), and are listed below:

| Age group | Age range in group |
|---|---|
| 3-month-old | Under 1-year-old |
| 1-year-old | 1-year-old |
| 5-year-old | 2-year-old to 6-year-old |
| 10-year-old | 7-year-old to 11-year-old |
| 15-year-old | 12-year-old to 16-year-old |
| Adult | 17-year-old and over |

For direct radiation pathways, the data are grouped into distance zones from the site perimeter as a coarse indication of the potential dose rate distribution due to this source of exposure. The bands used are: 0 – 0.25 km, >0.25 – 0.5 km and >0.5 – 1 km. These distance bands are also useful when assessing exposure to gaseous discharges.

### 3.2 Data analysis

The results of the survey are the individuals' consumption, occupancy and handling rates given in Annexes 1 and 2. These can be used in radiological assessments of the effects of the operations at the Sellafield site.

Where quantifiable data cannot be obtained from interviews but pathways are believed to exist, it is sometimes necessary to provide quantitative or 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.

The habits data have been analysed to indicate high rates of consumption, occupancy and handling, prior to a formal assessment being undertaken. Three 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 pathways 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 to give a new cut-off value and all observations above this were included in the high-rate group.

Secondly, 97.5$^{th}$ percentile rates were calculated using the Excel mathematical function for calculating percentiles. This method accords with precedents used in risk assessment of the safety of food consumption.

Thirdly, profiles have been produced that give a complete view of the habits of the individual that might lead to exposure to all the discharges and radiation from the site. The profiles are based on values calculated by the 'cut off' method. The profiled data can be used to assess total dose integrated across all pathways of exposure.

Mean and 97.5$^{th}$ percentile rates based on national statistics have been derived by the Ministry of Agriculture, Fisheries and Food (MAFF) (now part of 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.

For ingestion, intertidal occupancy and handling pathways, mean rates for the high-rate groups for children have been calculated from the survey data. However, because few child observations were identified, the rates should be viewed with caution. For assessments purposes, an alternative approach may be taken which involves scaling the mean rates for the adult high-rate groups by ratios. These ratios are given in Annex 4 and have been calculated using generic 97.5$^{th}$ percentile consumption rates.

For use in assessments of foetal dose, consumption and occupancy rates are provided in Annex 6 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.

# 4 AQUATIC RADIATION PATHWAYS

## 4.1 Aquatic survey area

The aquatic survey area covered all intertidal areas between Parton in the north and Tarn Bay in the south (Figure 1). The lower reaches of the rivers Ehen and Calder, and the Ravenglass Estuary including the lower reaches of the rivers Irt, Mite and Esk were also investigated.

### Overview of survey area

The north of the survey area between Parton and St Bees was largely inaccessible due to the rocky shoreline, except for the sandy beaches at Parton, Whitehaven and St Bees. Between St Bees and Drigg the low-lying shore was sand and stones with rocky scars. The upper foreshore in this area was predominantly stones to the north and was predominantly sand to the south. At low tide there were extensive areas of mud and sand. The Drigg Dunes and Irt Nature Reserve was a large area of sand and sand dunes which was situated at the northern mouth of the Ravenglass Estuary. The rivers Irt, Mite and Esk flow into the Ravenglass Estuary, which was a vast expanse of mud and sand at low tide with areas of salt marsh. At the southernmost part of the survey area was the long sand and stone beach at Eskmeals. The Cumbria Coastal Way was a popular coastal walk which followed the shore along the whole of the survey area and around the Ravenglass Estuary.

### Parton

Parton is a small coastal village located approximately 2 km north of Whitehaven. There was a small sandy bay with patches of mud, sand and boulders, which was backed by rocks. Activities undertaken at Parton included walking, dog walking, shore angling and winkle collection. Members of local angling clubs regularly fished from the beach during the summer months for bass and plaice. There was a slipway and a compound where members of a local angling club and a diving club kept their boats. Two individuals were identified hobby fishing

offshore of Parton for brown crabs (*Cancer pagurus*) and common lobsters (*Homarus gammarus*).

**Whitehaven**

The beach to the north of Whitehaven Harbour was sandy and backed by cliffs. It was popular with dog walkers and with anglers in the summer months. Some individuals collected mussels (*Mytilus edulis*) for their own consumption from the rocks at Redness Point, which was located to the north of the beach.

The harbour at Whitehaven was a base for many of the commercial fishing vessels and hobby fishing boats working in the survey area, as well as for many more commercial vessels that fished further afield in the Irish Sea. It consisted of an outer harbour that dried out at low tide and an inner harbour that maintained a permanent seawater area behind lock gates. Within the inner harbour there was a marina with more than 200 berths for local and visiting angling and leisure craft. A sailing and boating association was based at the harbour which had over 100 members, some of which sailed all year round and some were also keen boat anglers. Angling and diving parties regularly went out on the two charter boats which were based in the marina. The north and west piers of Whitehaven Harbour were popular with local anglers, and at low tide bait diggers and dog walkers were observed on the outer harbour beach.

Individuals collected winkles from the rocks at the beach to the south of Whitehaven Harbour and at Barrow Mouth in Saltom Bay approximately 2 km south of Whitehaven.

**St Bees Head and St Bees**

St Bees Head is a rocky headland, the shore of which was largely inaccessible except for three designated rock climbing areas and Fleswick Bay where people were reported to go walking. Rock climbing occurred all year round, except during the seabird nesting season when climbing was prohibited, and was particularly popular in the summer months. One individual was identified who collected mussels for his own consumption from the rocks at the base of St Bees Head. The shore around St Bees Head was a popular location for divers in the summer.

The beach at St Bees was predominantly sand with a strip of stones on the upper foreshore. There was a large caravan park at St Bees and a public slipway. The area was popular with locals and tourists undertaking activities such as walking, dog walking, angling and families playing on the beach. One individual was identified who collected razor fish (*Ensis siliqua*) for their own consumption from the extreme lower shore on very low tides. In previous Sellafield habits surveys, St Bees was found to be the busiest beach in the survey area. However, due to adverse weather conditions during the 2008 fieldwork, there were fewer people on the beach than in previous surveys. Activities such as windsurfing, kite-surfing, jet skiing, and kayaking were not observed, although it was reported that in fine weather they were still popular.

**Coulderton, Nethertown and Braystones**

South of St Bees, access to the coastline was limited due to the coastal railway track situated parallel to the shore. There were access roads to the shore at the villages of Coulderton, Nethertown and Braystones. The intertidal substrate at these locations was predominantly stones, rocks, reefs of honeycomb worms (*Sabellaria alveolata*), and patches of sand. At Braystones, there were larger areas of sand than at Coulderton and Nethertown. At low tide the exposed lower foreshore was an extensive area of mud and sand.

At Coulderton there were approximately 40 beach chalets, which were used as full time residences or holiday homes. Individuals were identified angling and collecting crabs, and fishing boats were kept on the beach at this location. At Nethertown there were five chalets, and although this was a well-used access route to the beach, the only activity identified during the fieldwork was collecting peeler crabs for bait. At Braystones there were two caravan parks and approximately 40 beach chalets used as full time residences or holiday homes. Hobby fishing boats were pulled up on the beach and one individual was identified setting nets from the shore. Braystones beach was popular with shore anglers, winkle collectors and bait diggers.

**Sellafield**

The beach at Sellafield was predominantly sand with patches of stones and honeycomb reefs and was backed by sand dunes. The River Ehen flows from the north-west between the dunes and the south-western boundary of the Sellafield site and the River Calder flows from the north-east and through the Sellafield site. These rivers converge at the Calder Viaduct and flow out to sea. The site outfalls were located offshore of the confluence of the two rivers. Access to the beach was difficult due to the closure of the only public footpath to the beach via the bridge at the Sellafield Rail Station. The footpath has been closed since 2003 due to work undertaken by the Sellafield site to remove redundant pipelines from the shore and continued work on the remaining pipelines. At the time of the fieldwork, the only public access to the beach at Sellafield was by foot from Braystones or Seascale. A small number of individuals were identified who were walking, angling and collecting crabs for bait on the beach at Sellafield. Angling was identified on the River Ehen and River Calder.

**Seascale**

The seaside resort of Seascale was a popular location with tourists and locals. The beach was predominantly sand with a strip of stones on the upper foreshore and a small rocky scar. Activities identified at Seascale included walking, dog walking, playing, shore angling, boat

angling, bait digging and beachcombing. Due to adverse weather conditions during the fieldwork, there were fewer people observed on the beach than in previous habits surveys. Boat angling was popular offshore of Seascale and there was a secure small boat compound with approximately 15 boats and a slipway to launch the boats.

**Drigg**

South of Seascale was Drigg beach, which was predominantly sand with patches of stones and was backed by sand dunes. A large expanse of mud and sand was exposed at low tide. Drigg was popular with dog walkers, shore anglers and bait diggers. A group of volunteers was identified that regularly collected litter from the beach. There were two rocky outcrops, Drigg Barn Scar and Kokoarrah Scar, the latter of which was beyond the mean low water mark but could be reached at low water on spring tides. Winkles and mussels were collected from Drigg Barn Scar and it was reported that common lobsters and brown crabs could be caught by hand held crabbing hooks from both rocky outcrops.

**The Ravenglass Estuary**

The Ravenglass Estuary is a large expanse of mud and sand at low tide into which the rivers Irt, Mite and Esk flow. The confluence of the three rivers is near the village of Ravenglass.

*The River Irt and Saltcoats*

The Drigg Dunes and Irt Estuary Nature Reserve is a spit of land situated at the north of the Ravenglass Estuary mouth. The reserve comprised a large sand beach and sand dune system and activities identified were walking and dog walking. The River Irt flows from the north-east past Holmrook, through farmland and the nature reserve and into the Ravenglass Estuary near Saltcoats. At low tide the shores of the river were salt marsh, mud and sand. Activities along the river were limited due to the difficult access, although wildfowling, angling and cockle collecting were identified. Wildfowling was popular on Carleton Marsh and Saltcoats Marsh, angling was identified on the banks of the River Irt and cockles were

collected from the shores of the river. At Saltcoats, the shore was mud, sand and salt marsh. There was a popular caravan site with privately owned caravans, although intertidal activities were infrequently undertaken due to the nature of the substrate. Activities included horse riding, boat maintenance, samphire (*Salicornia spp*.) collection and boat angling. Angling boats were moored on the mud and sand near Saltcoats.

*The River Mite and Ravenglass*

The River Mite flows from the north-east past the village of Ravenglass where it joins the rivers Irt and Esk in the Ravenglass Estuary. The River Mite flows through farmland therefore access to the shores was difficult and the only activity identified was wildfowling. Ravenglass was a busy tourist village with easy access to the firm mud, sand and stones beach. Walkers and dog walkers frequently used the beach and people in Ravenglass village, whose houses backed onto the beach, used it as an extension to their gardens. Shellfish collection was popular at this location and individuals frequently collected mussels (*Mytilus edulis*), cockles (*Cerastoderma edule*), Pacific oysters (*Crassostrea gigas*) and clams (unknown species). Commercial dredging for mussels was identified near Ravenglass and commercial potting boats, angling boats and sailing boats were moored in the estuary in the vicinity of the village.

*The River Esk*

The River Esk flows from the north-east, under the Eskmeals Viaduct and into the Ravenglass Estuary. The shores of the river were predominantly soft mud and salt marsh, with areas of firm mud and sand near the Eskmeals Viaduct. There were two fords on the lower reaches of the Esk, near Waberthwaite Church and near the Eskmeals Viaduct, where it was possible to cross the river at very low tide. The ford near Waberthwaite Church had steep soft mud banks and deep gullies. There were areas of salt marsh on the banks of the river and although it was not used for grazing livestock, cattle occasionally wandered on to the marsh. A local resident reported that people walking the Cumbria Coastal Way crossed the river at the ford, although it was regarded as being a dangerous place to cross due to the soft mud and fast moving tides. Members of a local organisation were undertaking environmental monitoring on the shores of the River Esk and brought visitors to the area. The

ford at the Eskmeals Viaduct was a firm substrate of mud, sand and stones, and the shores of the river at this location were 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. Other activities identified along the River Esk were wildfowling at Newbiggin Marsh and angling.

**Eskmeals**

Eskmeals Nature Reserve occupied the northern part of the Eskmeals firing range that extended approximately 3 km south of the River Esk. The reserve was predominantly sand dunes with sand, stones and salt marsh on the shore. Access to the nature reserve was by footpath near the Eskmeals Viaduct. Eskmeals beach, also known locally as Bootle beach, was a long sandy beach with patches of stones and a large expanse of mud, sand and rocky scars at low tide. The beach was accessed through the reserve or from a road near Tarn Bay and was popular with dog walkers, walkers and bait diggers. The reserve and parts of the beach were closed to the public when firing was taking place on the range.

## 4.2 Commercial fisheries

At the time of the fieldwork, it was reported that 16 full-time commercial trawl vessels were operating out of Whitehaven Harbour. At the time of the 2003 survey, the Whitehaven trawlers fished almost exclusively outside the survey area, but in 2008, most of the trawlers fished within the survey area for at least some of the time and some fished within the survey area all the time. It was reported that this change in fishing pattern was due to increasing fuel prices that encouraged fishing within the survey area since these grounds were closer to Whitehaven. Approximately 75% of the vessels trawled for *Nephrops* (*Nephrops norvegicus*) from May to August and then trawled for fish for the rest of the year. The other vessels were trawling for *Nephrops* or fish species for six months of the year and were fishing for molluscs for the rest of the year around the Isle of Man, well away from the survey area.

Four individuals were identified potting for brown crabs and common lobsters within the survey area. Three fishermen moored their boats in the Ravenglass Estuary. The other fisherman moored his boat in Workington Harbour, and although this port was outside the survey area, he fished within the survey area. The main fishing areas were in the vicinity of Ravenglass, Seascale, Braystones, St Bees Head and Parton. Potting was seasonal, generally commencing in April and finishing with the onset of rough weather in October.

Winkles were collected commercially in the survey area, mainly from the rocky sections of coastline between Parton and Drigg. Two local collectors were identified and it was reported that groups from further afield had been observed collecting winkles in the area. A new commercial mussel dredging operation near Ravenglass commenced in 2007. As this was a new operation, the ground was going to be left to re-seed naturally and it was reported that if this was unsuccessful, seed mussel would be harvested from Morecambe Bay and re-laid at Ravenglass.

### 4.3 Seafood wholesalers and retailers

Four local fish and shellfish wholesalers bought the white fish and *Nephrops* landed from the survey area. The fish were sold at Fleetwood auction and the *Nephrops* were sold to processing factories outside the survey area. Brown crabs and common lobsters were predominantly sold to a wholesaler and exported to buyers in France and Spain. Small amounts of brown crabs and common lobsters were 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 Holland. No retailers were identified that sold any fish or shellfish caught in the survey area.

### 4.4 Angling, hobby fishing and shellfish collecting

Shore angling was very popular and occurred on most of the beaches and piers in the survey area. Two sea angling clubs were identified with keen members who fished throughout the year and participated in regular angling competitions. Boat angling was also popular in the survey area and one boat angling club was identified with approximately 30 members. Angling boats were moored in Whitehaven Harbour and the Ravenglass Estuary, were kept in enclosed compounds at Parton and Seascale, and were kept on the beach at Coulderton and Braystones.

The predominant fish species caught and consumed in the area during the summer months were bass (*Dicentrarchus labrax*), mackerel (*Scomber scombrus*), plaice (*Pleuronectes platessa*), thornback ray (*Raja clavata*) and pollack (*Pollachius pollachius*). Species caught and consumed less frequently included flounder (*Platichthys flesus*), turbot (*Scophthalmus maximus*), squid (*Loligo forbesi*), grey mullet (*Chelon labrosus*), eel (*Anguilla anguilla*), Dover sole (*Solea solea*), dab (*Limanda limanda*), sea trout (*Salmo trutta*) and salmon (*Salmo salar*). The latter two species were caught from the River Ehen, River Calder and River Esk. During the winter the predominant species caught and consumed were cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and whiting (*Merlangius merlangus*).

In this report, the term ‘hobby fishing’ means recreational fishing on a small scale with gear such as nets or pots. It is usually carried out from boats that do not have commercial fishing licences and therefore it is illegal to offer the catch for sale. Several individuals were identified hobby fishing on a small-scale at Parton, Coulderton, Braystones and Seascale, with a few pots or nets. The catches of brown crabs, common lobsters and various fish species were consumed by the fishermen, their families and friends. The maximum number of pots permitted for an unlicensed fisherman was five.

Crustaceans were occasionally collected non-commercially from the shore. It was reported that individuals collected brown crabs and common lobsters using hand held ‘crabbing hooks’

at low tide amongst the rocks at Drigg Barn Scar and Kokoarrah Scar, although this was not identified during the fieldwork.

Molluscs collected and caught non-commercially in the survey area included winkles, cockles, mussels, clams, Pacific oysters, razor fish and whelks (*Buccinum undatum*). Individuals collected winkles for their own consumption from the intertidal rocky areas at Parton, Barrow Mouth, St Bees Head, Coulderton, Braystones, Nethertown and Drigg Barn Scar. Mussels, cockles, Pacific oysters and clams were collected regularly in the Ravenglass Estuary. Mussels were also collected from the rocks at Redness Point near Whitehaven. Razor fish were collected from St Bees and Braystones beaches. Whelks were caught in season as a by-catch offshore in lobster pots. The collection of limpets (*Patella vulgata*) was not identified.

### 4.5 Wildfowling

Two wildfowling clubs were identified in the survey area. One club had 12 active members and 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 four active members and had the rights to shoot on Newbiggin Marsh. One wildfowler was also identified shooting on Saltcoats Marsh. The shooting season was from 1st September to the 31st January for the area above the level of mean spring tides and extended to 20th February for the area below the level of the mean spring tide. The main species shot were greylag goose (*Anser anser*), pink-footed goose (*Anser brachyrhynchus*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), teal (*Anas crecca*) and wigeon (*Anas penelope*). The occasional common snipe (*Gallinago gallinago*) was also shot. Wildfowlers were shooting over salt marsh and mud and came into contact with the sediment when laying or kneeling in gullies, muddy creeks or the edge of river banks. Some wildfowlers wore gloves and some used plastic sheets to protect themselves from the mud.

## 4.6 Other pathways

One person was identified who regularly used seaweed as a fertiliser on vegetables and fruit, which were consumed by two people. Three people identified during the 2003 survey using seaweed as a fertiliser were no longer doing so. The use of seaweed as animal feed was not identified.

During the 2003 survey, a farmer was identified who regularly removed a trailer load of sand and stones from Drigg beach to repair farm lanes and tracks. In 2008, the survey team could not confirm if this activity was still undertaken.

## 4.7 Food consumption data

Consumption data for aquatic foodstuffs are presented in Tables 3 to 8 for adults and in Tables 9 to 12 for children. 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 3.2. For purposes of comparison, the data are summarised in Table 13 for adults and Tables 14 to 16 for children (15-year-olds, 10-year-olds and 5-year-olds, respectively). The summary tables also include 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 are available for the 5-year-old group.

### Adults' consumption rates

Adults were consuming foods from the following five food groups: fish, crustaceans, molluscs, wildfowl and marine plants/algae. The people consuming the greatest quantities of food from the aquatic survey area were commercial fishermen, hobby fishermen, anglers, shellfish collectors, wildfowlers and the families of these groups of people.

The predominant species of fish consumed by all adults were cod, plaice, bass, and mackerel, with smaller quantities of thornback ray, haddock, salmon, pollack, whiting, grey mullet, eel, flounder, sea trout, turbot, dab, squid and Dover sole. A high-rate group of 20 individuals was identified with a maximum consumption rate of 82 kg $y^{-1}$ and a mean of 40 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on 96 observations was 51 kg $y^{-1}$. This compares with the adult generic mean and 97.5$^{th}$ percentile rates for fish of 15 kg $y^{-1}$ and 40 kg $y^{-1}$ respectively. The percentage breakdown of species consumed by the high-rate group, rounded to the nearest 5% and excluding mixed fish, was 25% cod, 15% plaice, 15% mackerel, 10% bass, 10% thornback ray, 5% pollack, 5% haddock, and approximately 15% of all other species named in Table 3.

The species of crustaceans consumed by adults were brown crab, common lobster, *Nephrops* and brown shrimp. Eighteen individuals were identified in the high-rate group with a maximum consumption rate of 31 kg $y^{-1}$ and a mean of 17 kg $y^{-1}$. The observed 97.5$^{th}$ percentile consumption rate based on 50 observations was 29 kg $y^{-1}$. This compares with the adult generic mean and 97.5$^{th}$ percentile rates for crustaceans of 3.5 kg $y^{-1}$ and 10 kg $y^{-1}$ respectively. The percentage breakdown of species consumed by the high-rate group, rounded to the nearest 5%, was 70% brown crab, 20% common lobster and 10% *Nephrops*.

The species of molluscs consumed by adults were winkle, mussel, razor shell, cockle, clam, Pacific oyster and whelk. A high-rate group of four individuals was identified with a maximum consumption rate of 49 kg $y^{-1}$ and a mean of 31 kg $y^{-1}$. The observed 97.5$^{th}$ percentile consumption rate based on 28 observations was 36 kg $y^{-1}$. This compares with the adult generic mean and 97.5$^{th}$ percentile rates for molluscs of 3.5 kg $y^{-1}$ and 10 kg $y^{-1}$ respectively. The percentage breakdown of species consumed by the high-rate group, rounded to the nearest 5%, was 45% winkle, 40% mussel, 5% razor shell, 5% cockle, 5% clam and 5% Pacific oyster.

The wildfowl consumed by adults were greylag goose, unidentified goose species, mallard, teal, wigeon and snipe. A high-rate group of 12 individuals was identified with a maximum

consumption rate of 7.6 kg $y^{-1}$ and a mean of 5.0 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on 17 observations was 7.6 kg $y^{-1}$. No generic data are available for this food group. The percentage breakdown of species consumed by the high-rate group, rounded to the nearest 5%, was 50% greylag goose, 30% mallard, 10% teal and 5% wigeon.

The species of marine plants/algae consumed by adults were *Porphyra* collected from the Braystones area and samphire collected from Ravenglass and Saltcoats. A high-rate group of three individuals was identified with a maximum consumption rate of 0.2 kg $y^{-1}$ and a mean consumption rate of 0.2 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on three observations was also 0.2 kg $y^{-1}$. No generic data are available for this food group. The percentage breakdown of species consumed by the high-rate group, rounded to the nearest 5%, was 65% *Porphyra* and 35% samphire.

Two adults were identified consuming vegetables and fruit grown in fertiliser made from seaweed collected on beaches in the aquatic survey area. Table 8 presents the consumption rates of all foods consumed, which were beetroot, broad beans, Brussels sprouts, cabbage, cucumber, onion, potato, rhubarb, runner beans and tomatoes. These foods are included in the aquatic section of this report as the exposure pathway is sea to land transfer and the source of exposure is liquid discharge. The consumption rates are not included in the terrestrial food groups or Annex 1.

**Children's consumption rates**

**15-year-old age group**

Children in the 15-year-old age group were consuming food from the following food groups: fish, crustaceans, molluscs and wildfowl. No consumption of marine plants/algae was identified.

For fish, a high-rate group of five individuals was identified with a maximum consumption rate of 12 kg $y^{-1}$ and a mean of 7.2 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on six observations was 11 kg $y^{-1}$. This compares with the 15-year-old age group generic mean and 97.5$^{th}$ percentile rates for fish of 6.5 kg $y^{-1}$ and 20 kg $y^{-1}$ respectively.

For crustaceans, a high-rate group of two individuals was identified with a maximum consumption rate of 7.1 kg $y^{-1}$ and a mean of 4.9 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on three observations was 6.9 kg $y^{-1}$. This compares with the 15-year-old age group generic mean and 97.5$^{th}$ percentile rates for crustaceans of 2.5 kg $y^{-1}$ and 6.0 kg $y^{-1}$ respectively.

For molluscs, a high-rate group of one individual was identified with a consumption rate of 1.2 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on two observations was 1.2 kg $y^{-1}$. This compares with the 15-year-old age group generic mean and 97.5$^{th}$ percentile rates for molluscs of 2.5 kg $y^{-1}$ and 6.0 kg $y^{-1}$ respectively.

For wildfowl, a high-rate group of four individuals was identified with a maximum consumption rate for two individuals of 4.2 kg $y^{-1}$ and a mean of 3.4 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate based on four observations was 4.2 kg $y^{-1}$. No generic data are available for this food group.

**10-year-old age group**

Children in the 10-year-old age group were consuming foods from the following food groups: fish, crustaceans and molluscs. No consumption of wildfowl or marine plants/algae was identified.

For fish, a high-rate group of two individuals was identified with identical consumption rates of 7.1 kg $y^{-1}$, and a maximum, mean and observed 97.5$^{th}$ percentile rate of 7.1 kg $y^{-1}$. This compares with the generic mean and 97.5$^{th}$ percentile consumption rates for fish of 6.0 kg $y^{-1}$ and 20 kg $y^{-1}$ respectively.

For crustaceans, a high-rate group of two individuals was identified with identical consumption rates of 2.7 kg $y^{-1}$, and a maximum, mean and observed 97.5$^{th}$ percentile rate of 2.7 kg $y^{-1}$. This compares with the generic mean and 97.5$^{th}$ percentile consumption rates for crustaceans of 2.5 kg $y^{-1}$ and 7.0 kg $y^{-1}$ respectively.

For molluscs, a high-rate group of two individuals was identified with identical consumption rates of 1.2 kg $y^{-1}$, and a maximum, mean and observed 97.5$^{th}$ percentile rate of 1.2 kg $y^{-1}$. This compares with the generic mean and 97.5$^{th}$ percentile consumption rates for molluscs of 2.5 kg $y^{-1}$ and 7.0 kg $y^{-1}$ respectively.

**5-year-old age group**

One child in the 5-year-old age group was consuming foods from the following food groups: fish, crustaceans and molluscs. No consumption of wildfowl or marine plants/algae was identified.

For fish, one individual was identified in the high-rate group with a consumption rate of 3.5 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate is not applicable for one observation.

For crustaceans, one individual in the high-rate group was identified with a consumption rate of 1.0 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate is not applicable for one observation.

For molluscs, one individual was identified in the high-rate group with a consumption rate of 0.6 kg $y^{-1}$. The observed 97.5$^{th}$ percentile rate is not applicable for one observation.

**1-year-old age group**

No children in the 1-year-old age group were identified consuming any aquatic foods from the survey area.

**3-month-old age group**

No children in the 3-month-old age group were identified consuming any aquatic foods from the survey area.

## 4.8 Intertidal occupancy

Intertidal occupancy rates for adults and children are presented in Table 18 and Table 19, respectively. Activities were identified over the following seven types of substrate: mud; mud and sand; mud, sand and stones; rock; salt marsh; sand; and sand and stones.

**Adults' intertidal occupancy rates**

The maximum occupancy rate recorded over mud was 160 h $y^{-1}$ for a bait digger. Five wildfowlers had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 120 h $y^{-1}$.

The maximum occupancy rate recorded over mud and sand was 940 h $y^{-1}$ for a bait digger/mussel collector. Three other individuals, a nature reserve warden, an individual

undertaking boat maintenance and a walker, had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 580 h $y^{-1}$.

The maximum occupancy rate recorded over mud, sand and stones was 720 h $y^{-1}$ for two individuals who were undertaking boat maintenance. Two other individuals also undertaking boat maintenance and a dog walker had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 510 h $y^{-1}$.

The maximum occupancy rate recorded over rock was 50 h $y^{-1}$ for an angler. Two other individuals, both winkle collectors, had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 30 h $y^{-1}$.

The maximum occupancy rate recorded over salt marsh was 160 h $y^{-1}$ for a nature reserve warden. One other individual, a wildfowler, had an occupancy rate within a factor of three of this. This provides a mean occupancy rate for this group of 110 h $y^{-1}$.

The maximum occupancy rate recorded over sand was 940 h $y^{-1}$ for an angler. Nineteen other individuals, who were angling, bait digging, setting nets, dog walking, collecting razor shells and beachcombing, had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 610 h $y^{-1}$.

The maximum occupancy rate recorded over sand and stones was 1000 h $y^{-1}$ for an angler/shellfish collector. Nine other individuals, who were angling, collecting crabs, playing, walking and dog walking, had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 570 h $y^{-1}$.

**Children's intertidal occupancy rates**

**15-year-old age group**

Activities for the 15-year-old age group were identified over the following three types of substrate: mud and sand; sand; and sand and stones.

The only occupancy rate recorded over mud and sand was 140 h $y^{-1}$ for an individual who was horse riding and collecting cockles. No other individuals were identified over mud and sand, so the occupancy rate for this group is 140 h $y^{-1}$.

The maximum occupancy rate recorded over sand was 220 h $y^{-1}$ for a dog walker. Two walkers had occupancy rates within a factor of three of this. This provides a mean occupancy rate for this group of 180 h $y^{-1}$.

The only occupancy rate recorded over sand and stones was 260 h $y^{-1}$ for an individual who was playing. No other individuals were identified over sand and stones, so the occupancy rate for this group is 260 h $y^{-1}$.

**10-year-old age group**

Activities for the 10-year-old age group were identified over the following two types of substrate: sand; and sand and stones.

The maximum occupancy rate recorded over sand was 220 h $y^{-1}$ for a dog walker. No other individuals had occupancy rates within a factor of three of this, so the occupancy rate for this group is 220 h $y^{-1}$.

The maximum occupancy rate recorded over sand and stones was 480 h $y^{-1}$ for an individual who was playing, collecting winkles and angling. One individual who was playing had an

occupancy rate within a factor of three of this. This provides a mean occupancy rate for this group of 370 h $y^{-1}$.

**5-year-old age group**

Activities for the 5-year-old age group were identified over the following three types of substrate: mud and sand; sand; and sand and stones.

The maximum occupancy rate recorded over mud, sand and stones was 10 h $y^{-1}$ for two walkers. One other walker had an occupancy rate within a factor of three of this. This provides a mean occupancy rate for this group of 9 h $y^{-1}$.

The maximum occupancy rate recorded over sand was 220 h $y^{-1}$ for a dog walker. No other individuals had occupancy rates within a factor of three of this, so the occupancy rate for this group is 220 h $y^{-1}$.

The maximum occupancy rate recorded over sand and stones was 390 h $y^{-1}$ for an individual who was playing and angling. No other individuals had occupancy rates within a factor of three of this, so the occupancy rate for this group is 390 h $y^{-1}$.

**1-year-old age group**

Activities for the 1-year-old age group were identified over the following two types of substrate: sand; and sand and stones.

The maximum occupancy rate recorded over sand was 39 h $y^{-1}$ for an individual who was dog walking. No other individuals had occupancy rates within a factor of three of this, so the occupancy rate for this group is 39 h $y^{-1}$.

The only occupancy rate recorded over sand and stones was 130 h $y^{-1}$ for an individual who was playing. No other individuals were identified over sand and stones, so the occupancy rate for this group is 130 h $y^{-1}$.

**3-month-old age group**

Activities for the 3-month-old age group were only identified over sand.

The only occupancy rate recorded over sand was 2 h $y^{-1}$ for an individual who was playing. No other individuals were identified over sand, so the occupancy rate for this group is 2 h $y^{-1}$.

**Gamma dose rate measurements**

Representative gamma dose rate measurements at 1 m above the substrate were taken over mud; mud and sand; salt marsh; sand; and sand and stones. These measurements (shown in Table 20) ranged from 0.096 µGy $h^{-1}$ to 0.160 µGy $h^{-1}$ over mud; from 0.076 µGy $h^{-1}$ to 0.106 µGy $h^{-1}$ over mud and sand; from 0.128 µGy $h^{-1}$ to 0.132 µGy $h^{-1}$ over mud and sand with boulders nearby; from 0.123 µGy $h^{-1}$ to 0.127 µGy $h^{-1}$ over salt marsh; from 0.061 µGy $h^{-1}$ to 0.087 µGy $h^{-1}$ over sand; and from 0.089 µGy $h^{-1}$ to 0.091 µGy $h^{-1}$ over sand and stones with boulders nearby The measurement over sand and stones was 0.105 µGy $h^{-1}$. Natural levels of around 0.05 µGy $h^{-1}$ over sand and around 0.07 µGy $h^{-1}$ over mud and salt marsh are expected. A value of 0.06 µGy $h^{-1}$ is expected for all other substrate types.

## 4.9 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 there is a separate dose limit for skin for members of the public. There is also a contribution to effective dose due to skin exposure (ICRP, 1991).

Fishing gear can also be a source of whole body 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.

Table 21 presents the adult handling rates of fishing gear and sediment recorded during the survey. Table 22 presents the children's handling rates of sediment.

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

The maximum fishing gear handling rate recorded was 1200 h $y^{-1}$ for four fishermen. Seven other fishermen had fishing gear handling rates that came within a factor of three of this. This provides a mean handling rate for this group of 980 h $y^{-1}$.

The maximum sediment handling rate recorded was 970 h $y^{-1}$ for a bait digger/mollusc collector. A bait digger/mussel collector had a sediment handling rate that came within a factor of three of this. This provides a mean handling rate for this group of 960 h $y^{-1}$.

**Children's handling rates of sediment**

Handling sediment was identified for the 15-year-old and 10-year-old age groups. No children in the 5-year-old, 1-year-old and 3-month-old age groups were identified handling sediment.

**15-year-old age group**

The only sediment handling rate recorded was 8 h $y^{-1}$ for an individual who was collecting cockles. No other individuals in this age group were identified handling sediment, so the handling rate for this group is 8 h $y^{-1}$.

**10-year-old age group**

The only sediment handling rate recorded was 110 h $y^{-1}$ for an individual who was collecting winkles. No other individuals were identified handling sediment, so the handling rate for this group is 110 h $y^{-1}$.

### 4.10 Inadvertent ingestion or inhalation of sediment

Activities taking place over intertidal substrates can lead to the inadvertent ingestion or inhalation of sediment. This exposure pathway was specifically investigated in the Ravenglass Estuary to identify activities where individuals could disturb the sediment, on the surface or at varying depths, which may result in the inadvertent ingestion or inhalation of the sediment.

Tables 23 and 24 present the intertidal occupancy rates for activities in the Ravenglass Estuary for adults and children respectively. These data were extracted from the intertidal occupancy tables for the Sellafield aquatic survey area (Tables 18 and 19) and are provided in a separate table for consideration in dose assessments of inadvertent ingestion and inhalation of sediments. Mean occupancy rates for the high-rate groups and 97.5$^{th}$ percentile rates have not been calculated.

There were many areas of very soft mud and salt marsh in the Ravenglass Estuary where people undertaking various activities could disturb the sediment. The following activities were identified in the estuary: bait digging, wildfowling, cockle and mussel collecting, environmental monitoring, horse riding, walking, dog walking, boat maintenance and angling. The depth at which the sediment was disturbed varied for these activities. The activity where the deepest sediments were disturbed was bait digging, where an approximate depth of 30 cm could be reached, usually digging in mud and sand or mud. Activities where the sediment was disturbed to a depth of approximately 10 cm, depending on the firmness of the sediment, were cockle collection, wildfowling, horse riding, walking and dog walking. Wildfowlers reported that they laid or kneeled on mud and salt marsh in muddy gullies or the edge of river banks, some wildfowlers wore gloves and some used plastic sheets to protect themselves from the mud. Sediment could also be transported on clothing, footwear, horse shoes or dogs and could become re-suspended in vehicles or in houses.

### 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 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 for adults and children are presented in Table 25 and Table 26, respectively. Generic data for divers, members of a sailing club, and members of the sea scouts were gained through interviews with representatives of the groups.

**Activities in the water**

Activities taking place in the water around Sellafield were swimming and diving. Twenty-eight observations were recorded for adults and 18 observations were recorded for children. The highest occupancy rate was 56 h $y^{-1}$ for one adult and two children who were swimming.

**Activities on the water**

Activities taking place on the water around Sellafield included trawling, netting, potting, angling, mussel dredging, sailing, rowing and canoeing. Seventy-two observations were recorded for adults and 12 observations were recorded for children. The highest occupancy rate for adults was 1700 h $y^{-1}$ for a commercial fisherman and the highest occupancy rate for children was 40 h $y^{-1}$ for 12 children who were rowing and sailing.

# 5 TERRESTRIAL RADIATION PATHWAYS

## 5.1 Terrestrial survey area

The terrestrial survey area covered all land, freshwater watercourses and ponds within 5 km of the Sellafield site centre (NGR NY 029 038), as shown in Figure 2.

The land within 5 km of the Sellafield site 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. The Low Level Waste Repository near Drigg spanned the limit of the survey area to the south-east.

Thirty-four working farms were identified in the Sellafield terrestrial survey area. Of these:

- Six produced beef cattle
- Nine produced beef cattle and lambs
- Seven produced beef cattle and dairy cattle
- One produced beef cattle, lambs, eggs and grain
- One produced beef cattle, lambs and hens for laying eggs
- Two produced dairy cattle and lambs
- Two produced dairy cattle
- Two produced lambs
- One produced dairy cattle, beef cattle and lambs
- One produced dairy cattle and potatoes
- One produced beef cattle, dairy cattle and eggs
- One produced beef cattle, dairy cattle, lambs, turkeys and eggs

Beef cattle and lambs were mainly sold through Broughton, Cockermouth and Carlisle auctions. Beef cattle were also sold to an abattoir in Preston and lambs were also sold to Welsh Country Foods. Milk was sold to Dairy Farmers of Britain and First Milk. A new dairy was identified in the area, which processed milk and produced butter, cream, yoghurt and ice cream. The milk and milk produce was sold within the survey area and to multiple outlets throughout west Cumbria. Three farms were identified that had ceased milk production since the 2003 survey. Eggs and potatoes were sold directly to the public from the farms.

Farmers and their families were consuming beef, lamb, milk, eggs and potatoes produced on their own farms.

No allotment sites were identified in the terrestrial survey area, although residents were interviewed that grew a variety of fruit and vegetables in their gardens.

Two beekeepers were identified in the survey area. One beekeeper had four hives at Yeorton and one beekeeper had one hive at Wellington. The beekeepers consumed their own honey and gave the surplus to family and friends. Honey was also sold through a shop in Egremont. The average production of honey per hive was 17 kg $y^{-1}$. Since 2003, two beekeepers in the Sellafield area have ceased producing honey.

Various foods were growing wild in the survey area and were collected and consumed. These foods included blackberries, crab apples, damsons, hazel nuts, sloes and mushrooms. Game and rough shooting took place within the survey area. The species shot and consumed were pheasant, woodcock, partridge, pigeon, rabbit, hare and roe deer.

Angling was identified on the rivers Calder and Ehen within the terrestrial survey area. Two angling clubs were identified whose members fished on the River Calder. One club with approximately 50 members had the lease to fish along the River Calder between the Sellafield site boundary and Calder Bridge, the other club had 25 members and had the lease to fish up to 0.5 km north of the site boundary. Angling was prohibited on the stretch of the

River Calder that passed though the Sellafield site because it was a conservation area. Angling was identified on the River Ehen between Braystones and the sea. Three families were consuming brown trout (*Salmo trutta*) caught from the River Calder within the terrestrial survey area. In previous surveys, the consumption of trout was identified from a stocked pond in the survey area and although the pond was still stocked with trout in 2008, none were being consumed.

In the north-east section of the terrestrial area, the occupants of four farms were identified using spring, well or fell water as their domestic water supply. To the north-west of the site, near Braystones Rail Station, occupants of a beach residence used well water as their domestic water supply. It was reported that there might be several other residents of beach chalets near Braystones Rail Station using well water as their domestic supply, although this was not confirmed. Residents at two other beach chalets reported that groundwater welled up into tanks in their gardens, which was used to water fruit and vegetables in their garden and for hand washing in an outside basin. During the 2003 Sellafield habits survey, a pipe was identified coming out of the dunes at Braystones that was fed by spring water and was used for drinking water. Since then, the pipe had been lowered towards the ground which had made it difficult to collect water, although one individual reported that he occasionally drank water from the pipe. Livestock were identified drinking river, stream, fell, spring, well or borehole water at 11 farms throughout the survey area.

### 5.2 Terrestrial food wholesalers and retailers

Wholesalers and retailers were interviewed to establish whether they were selling produce from within the survey area. They included a dairy, greengrocers, butchers and convenience stores in Whitehaven, Cleator Moor, Egremont, Gosforth and Seascale. The dairy processed milk from its own farm and produced butter, cream, yoghurt and ice cream. These products were sold from the dairy, from a shop within the survey area and from multiple outlets throughout west Cumbria.

### 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. A representative from Sellafield Ltd reported that their policy is to actively remove habitat and try to prevent wildlife access, although there is still the possibility of wildlife becoming contaminated. Wildlife such as pigeons, seagulls and rabbits were identified on site, although the numbers were considered to be low. Pigeons and seagulls found on site were monitored annually and were periodically culled. Rabbits were not culled and were not routinely monitored. Pheasants and migratory birds were occasionally seen on site but were not monitored, as the numbers were so low. Some individuals living in the terrestrial survey area were consuming rabbits and pigeons that were caught or shot within 5 km of the site but it was not known if these animals and birds had spent time on the site.

The Environment Agency has monitored sediments that accumulate in road drains in Seascale since 1999 following an incident where high concentrations of caesium-137 were found in feral pigeons. Large numbers of pigeons were found at a bird sanctuary in Seascale, which resulted in the contamination of the environment and of the sediment in the road drains (EA, EHS, FSA and SEPA, 2008). During the habits survey, investigations were made to identify whether workers who cleaned the road drains in the Seascale area had any contact with the sediment in the drains. It was reported that the drains were cleaned bi-annually using a suction hose and that the contract workers wore full personal protective equipment, so it was highly unlikely that there would be any contact with the sediment. The waste was transported directly to a waste disposal site near Workington.

Historically, contaminated seagull guano has been identified on the rocks at St Bees Head and investigations were made to identify whether rock climbers could come into contact with seagull guano. Four climbing areas were identified at St Bees Head. The Apiary Wall was the most popular climbing area and the keenest rock climbers were reported to climb for approximately 120 h $y^{-1}$, although this area had very little bird activity. St Bees North Crag

was not a popular climbing area as it was a nesting area and the keenest people were climbing here for approximately 40 h $y^{-1}$. St Bees South Crag was unpopular with climbers as it was a nesting area and the keenest people were climbing for approximately 10 h $y^{-1}$. There were boulders at Fleswick Bay, and this area was only visited very occasionally. The climbers tried to avoid areas with seagull guano.

## 5.4 Food consumption data

Consumption data for locally produced foodstuffs potentially affected by gaseous discharges are presented in Tables 27 to 42 for adults and Tables 43 to 57 for children. These tables include the mean consumption rates for the high-rate groups together with the observed 97.5$^{th}$ percentile consumption rates, as described in Section 3.2. For comparison purposes, the data are summarised in Table 13 for adults and in Tables 14 to 17 for children (15-year-olds, 10-year-olds, 5-year-olds and 1-year-olds, respectively). No children in the 3-month-old age group were consuming foods from the terrestrial survey area.

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 58 and the foods sampled as part of the 2007 Food Standards Agency monitoring programme (EA, EHS, FSA and SEPA, 2008) are identified by emboldened italics in the table.

### Adults' consumption rates

Consumption of locally produced foods was identified in the following 16 food groups: green vegetables, other vegetables, root vegetables, potato, domestic fruit, milk, cattle meat, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, honey, wild fungi, venison and freshwater fish. No consumption of pig meat or cereals was identified.

No mean consumption rates for the high-rate groups were found to be greater than the generic 97.5$^{th}$ percentile consumption rates. Ten 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, sheep meat, eggs and honey. Eight observed 97.5$^{th}$ percentile consumption rates exceeded the generic 97.5$^{th}$ percentile consumption rates. These were for green vegetables, other vegetables, root vegetables, potato, milk, cattle meat, sheep meat and eggs.

**Children's consumption rates**

**15-year-old age group**

Ten children in this age group were identified consuming locally produced foods. Consumption was identified in the following 15 food groups: green vegetables, other vegetables, root vegetables, potato, domestic fruit, milk, cattle meat, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, wild fungi, venison and freshwater fish. No consumption of pig meat, honey or cereals was identified.

One mean consumption rate for the high-rate group was found to be greater than the generic 97.5$^{th}$ percentile consumption rate, which was for root vegetables. Seven further mean consumption rates for the high-rate groups exceeded the generic mean consumption rates. These were for green vegetables, potato, milk, cattle meat, eggs, wild/free foods and wild fungi. One observed 97.5$^{th}$ percentile consumption rate was greater than the generic 97.5$^{th}$ percentile consumption rate, which was for root vegetables.

**10-year-old age group**

Nine children in this age group were identified consuming locally produced food. Consumption was identified in the following 10 food groups: green vegetables, other vegetables, root vegetables, potato, domestic fruit, milk, cattle meat, eggs, wild/free foods and

wild fungi. No consumption was identified for pig meat, sheep meat, poultry, rabbits/hares, honey, venison, freshwater fish and cereals. No mean consumption rates for the high-rate groups were found to be greater than the generic 97.5$^{th}$ percentile consumption rates. In four food groups, the mean consumption rates for the high-rate groups were higher than the generic mean consumption rates. These were for root vegetables, potato, milk and wild/free foods. No observed 97.5$^{th}$ percentile consumption rates were greater than the generic 97.5$^{th}$ percentile consumption rates.

**5-year-old age group**

Nine children in this age group were identified consuming locally produced food. Consumption was identified in the following nine food groups: green vegetables, other vegetables, potato, domestic fruit, milk, cattle meat, eggs, wild/free foods and wild fungi. No consumption was identified for root vegetables, pig meat, sheep meat, poultry, rabbits/hares, honey, venison, freshwater fish and cereals. No generic 97.5$^{th}$ percentile or generic mean consumption rates have been determined for this age group so no comparisons with the observed rates are possible.

**1-year-old age group**

Two children in this age group were identified consuming milk. No consumption was identified for green vegetables, other vegetables, root vegetables, potato, domestic fruit, cattle meat, pig meat, sheep meat, poultry, eggs, wild/free foods, rabbits/hares, honey, wild fungi, venison, freshwater fish and cereals. No generic 97.5$^{th}$ percentile or generic mean consumption rates have been determined for this age group so no comparison with the observed rate is possible.

**3-month-old age group**

No children in the 3-month-old age group were identified consuming foods from the terrestrial survey area.

# 6 DIRECT RADIATION PATHWAYS

## 6.1 Direct radiation survey area

The direct radiation survey area covered all land within 1 km of the Sellafield licensed site boundary, as shown in Figure 2. 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 was predominantly agricultural. To the north of the site was the Sellafield Visitors Centre and other buildings owned by Sellafield Ltd. A small residential area was located to the north-east of the site close to the 1 km limit of the area. The River Calder flowed from the north-east, through the middle of the site, and joined the River Ehen at the Calder Viaduct. To the east of the site there was a track that continued half way along the eastern perimeter of the site, near the Calder Hall fence. A golf course was located to the south-east of the site and was adjacent to the site boundary.

The River Ehen flowed 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 to the Irish Sea. There was a public footbridge near the Sellafield Rail Station that crossed the River Ehen. However, at the time of the fieldwork this was closed due to site operations on existing pipelines and public access to Sellafield beach was only possible on foot from Braystones or Seascale.

## 6.2 Residential activities

Twenty-five residences were identified in the direct radiation survey area, two of which were not occupied. 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 with 16 of the households, and included three families with

children. Of these, four residences were within the 0 – 2.5 km zone, three were in the >0.25 – 5 km zone and nine were in the >0.5 – 1 km zone. Six of the residences were farms.

### 6.3 Leisure activities

Angling was popular in the direct radiation survey area on the rivers Ehen and Calder and from Sellafield beach. Two angling clubs were identified that fished the River Calder upstream of the licensed site boundary. One club had approximately 50 members and had the rights to fish up to 0.5 km north of the boundary and the other club had approximately 25 members and had the rights to fish the river from the boundary north to Calder Bridge. Public access was not permitted on the River Calder through the middle of the site due to conservation reasons. Activities on Sellafield beach also included walking, dog walking and bait digging, although the beach was infrequently used due to difficulties in accessing it. There was a golf course adjacent to the south-east of the site. No activities were identified on the track near the Calder Hall fence.

The Sellafield Visitors Centre was open to the public and annually received a large number of visitors. Parties of school children frequently visited the centre and also the gardens at Yottenfews Farm for nature studies.

### 6.4 Commercial activities

Commercial activities within the direct radiation survey area included farming, green keeping at the golf club, railway operations, and environmental monitoring. Six farms were located within 1 km of the site, two of which employed a total of five farm workers. Four green keepers were identified who maintained the golf course greens to the south-east of the site. Near Sellafield Rail Station there was a manned signal box, although no one was available for interview during the fieldwork. Two Environment Agency contractors undertook environmental monitoring of the River Calder, both upstream and downstream, and on Sellafield beach.

The activities of Sellafield Ltd employees and contractors while at work were not considered in the direct radiation survey. This included employees working outside the licensed site boundary at the Sellafield Visitors Centre, Yottenfews Farm, Sella Park House and Fellside Combined Heat and Power Plant, which were located within the direct radiation survey area.

## 6.5 Occupancy rates

Table 59 presents indoor, outdoor and total occupancy data for adults and children. An analysis of the data by distance zones and occupancy rates is shown in Table 60.

### 0 - 0.25 km from the licensed site boundary

Occupancy data were collected for 20 individuals in the 0 - 0.25 km zone. The observations were for nine residents, one visitor, five people working in the area and five anglers fishing on the River Calder and River Ehen. A resident who was a farmer had the highest total occupancy rate of 8300 h $y^{-1}$, another resident had the highest indoor occupancy rate of 8100 h $y^{-1}$, and another farmer had the highest outdoor occupancy rate of 3000 h $y^{-1}$.

### >0.25 – 0.5 km from the licensed site boundary

Occupancy data were collected for 17 individuals in the >0.25 to 5.0 km zone. The observations were for 10 residents, two visitors, four employees, and one angler fishing on Sellafield beach. A resident had the highest total occupancy rate of 8400 h $y^{-1}$ and also had the highest indoor rate of 7700 h $y^{-1}$. A farmer had the highest outdoor occupancy rate of 3400 h $y^{-1}$.

**>0.5 – 1.0 km from the licensed site boundary**

Occupancy data were collected for 24 people in the >0.5 - 1.0 km zone. The observations were for 23 residents and one person working on their farm who lived outside the area. Two residents had the identical highest total occupancy rates of 8200 h $y^{-1}$, one child resident had the highest indoor rate of 7800 h $y^{-1}$ and another resident had the highest outdoor rate of 1900 h $y^{-1}$.

## 6.6 Gamma dose rate measurements

Table 61 presents gamma dose rate measurements for the Sellafield direct radiation survey area. Gamma dose rate measurements were taken both indoors and outdoors of most residences where interviews were conducted. Outdoor measurements were taken approximately 5 to 10 metres from the nearest building. 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. It should be noted that the indoor and outdoor measurements have not been adjusted for natural background dose rates.

Twelve outdoor measurements taken over grass ranged from 0.077 µGy $h^{-1}$ to 0.102 µGy $h^{-1}$ and two taken over concrete were 0.071 µGy $h^{-1}$ and 0.090 µGy $h^{-1}$. Eleven indoor measurements, taken over wood, concrete and tiles, ranged from 0.088 µGy $h^{-1}$ to 0.134 µGy $h^{-1}$. Four background readings over rough grass ranged from 0.068 µGy $h^{-1}$ to 0.086 µGy $h^{-1}$. Eight of the outdoor measurements taken during the survey were greater than the highest background measurement.

Comprehensive studies of background radiation have been carried out on a national scale by the Radiation Protection Division of the Health Protection Agency (previously the National Radiological Protection Board), the most recent of these being a review conducted in 2005

(Watson *et al*, 2005). The results from this review could be used for comparison with the data collected during the survey.

# 7 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 Annexes 1 and 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. 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. Such assumptions will depend on the assessment in question but some initial observations are provided here as a starting point for those undertaking assessments.

The most extensive combinations of pathways for adult dose assessments are shown in Table 62. Each of the 41 combinations shown in Table 62 represents an actual individual (or individuals) from Annex 1 who has positive data (irrespective of the magnitude), for each pathway marked with an asterisk. It should be noted that combination numbers in Table 62 do not correlate directly with observation numbers in Annex 1. Other individuals from Annex 1 have combinations that are not listed in Table 62 because they have fewer pathways and a dose assessment for them would be adequately covered by one of the 41 listed combinations.

Combinations of pathways using mean rates for the high-rate groups may be achieved by considering the data in Annexes 1 and 2. Although these mean rates are not given in the annexes, the rates for individuals in the high-rate groups are emboldened and are therefore apparent.

## 7.1 Use of the data for total dose assessment

The 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 5. 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 a suitable 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, EHS, FSA and SEPA, 2008).

## 7.2 Use of the data for foetal dose assessments

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 ratios of the consumption and occupancy data for women of childbearing age in order to calculate the dose to the foetus. Therefore consumption and occupancy data collected during the Sellafield habits survey for females of childbearing age are presented in Annex 6. 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 6. 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 6 as they are potentially women of childbearing age.

# 8 CONCLUSIONS AND SUGGESTIONS

## 8.1 Survey 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 426 individuals including commercial fishermen, hobby fishermen, shellfish collectors, anglers, farmers, gardeners, beekeepers and people spending time within 1 km of the Sellafield licensed site boundary. 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 could 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.

The mean consumption rate for the adult high-rate group (as defined in Section 3.2) for the separate aquatic consumption pathways for foods potentially affected by liquid discharges were:

- 40 kg $y^{-1}$ for fish
- 17 kg $y^{-1}$ for crustaceans
- 31 kg $y^{-1}$ for molluscs
- 5.0 kg $y^{-1}$ for wildfowl
- 0.2 kg $y^{-1}$ for marine plants/algae

The predominant foods consumed by the respective high-rate groups for these food groups were: cod, plaice, mackerel and bass; brown crab, common lobster and *Nephrops*; winkles, mussel and razor shells; greylag goose and mallard; *Porphyra* and samphire.

The use of seaweed as a fertiliser on vegetables and fruit was identified. The use of seaweed for animal feed was not identified.

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

- 120 h $y^{-1}$ for mud
- 580 h $y^{-1}$ for mud and sand
- 510 h $y^{-1}$ for mud, sand and stones
- 30 h $y^{-1}$ for rock
- 110 h $y^{-1}$ for salt marsh
- 610 h $y^{-1}$ for sand
- 570 h $y^{-1}$ for sand and stones

The mean handling rate for the adult high-rate group for fishing gear was 980 h $y^{-1}$ and for sediment was 960 h $y^{-1}$.

The adult maximum occupancy rate in water was 56 h $y^{-1}$ and on water was 1700 h $y^{-1}$.

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

- 41 kg $y^{-1}$ for green vegetables
- 38 kg $y^{-1}$ for other vegetables
- 35 kg $y^{-1}$ for root vegetables
- 90 kg $y^{-1}$ for potato
- 45 kg $y^{-1}$ for domestic fruit
- 220 l $y^{-1}$ for milk
- 34 kg $y^{-1}$ for cattle meat
- 14 kg $y^{-1}$ for sheep meat
- 9.0 kg $y^{-1}$ for poultry
- 22 kg $y^{-1}$ for eggs
- 6.2 kg $y^{-1}$ for wild/free foods
- 1.9 kg $y^{-1}$ for rabbits/hares
- 8.7 kg $y^{-1}$ for honey
- 1.9 kg $y^{-1}$ for wild fungi
- 14 kg $y^{-1}$ for venison
- 2.3 kg $y^{-1}$ for freshwater fish

No consumption of pig meat or cereals was identified from the survey area. The consumption of foodstuffs by children (15-year-old, 10-year-old, 5-year-old and 1-year-old age groups) was also recorded. Combinations of food groups (both aquatic and terrestrial) consumed at mean high-rates together with external pathway exposures can be derived from the data for individuals in Annexes 1 and 2. Rates for individuals making up the high-rate groups are presented in bold type.

Occupants of four farms to the north-east of the survey area were identified using spring, well and fell water as their domestic supply. The occupants of a beach residence near Braystones Rail Station used well water as their only domestic water supply. There was a pipe coming out of the dunes at Braystones that was fed by spring water and one individual reported that

he occasionally drank from the pipe. Well water was also used at other beach chalets at Braystones to water fruit and vegetables in the garden and for an outside hand basin. Livestock were identified drinking river, stream, fell, spring, well or borehole water at 11 farms throughout the area.

The transfer of contamination off-site by wildlife was investigated as radionuclides could enter the food chain or contaminate the environment through this pathway. A representative from Sellafield Ltd reported that wildlife such as pigeons, seagulls and rabbits were observed on the Sellafield site, although the numbers were considered to be low. The site policy is to actively remove habitat and try to prevent wildlife access, although there is still the possibility of animals becoming contaminated. Pigeons and seagulls on site were monitored annually and were periodically culled. Some individuals living in the terrestrial survey area were consuming rabbits and pigeons that were caught or shot within 5 km of the site but it was not known if these animals and birds had spent time on the site. Contact with sediments in Seascale road drains by workers cleaning the drains was investigated relating to historic off-site transfer of contamination to sediments by pigeon guano. It was reported to be unlikely that workers cleaning the drains would come into contact with the sediment. Rock climbing at St Bees Head was investigated relating to historic off-site contamination of the rocks by seagull guano. St Bees Head was popular with rock climbers and it was reported that they tried to avoid areas with seagull guano. There were four climbing areas, the most popular of which had very little bird activity.

For occupancy by members of the public within 1 km of the Sellafield licensed site boundary, the highest total, indoor and outdoor occupancy rates were:

- For the 0 - 0.25 km zone; 8300 h $y^{-1}$ total occupancy, 8100 h $y^{-1}$ indoors and 3300 h $y^{-1}$ outdoors
- For the >0.25 - 0.5 km zone; 8400 h $y^{-1}$ total occupancy, 7700 h $y^{-1}$ indoors and 3400 h $y^{-1}$ outdoors
- For the >0.5 - 1.0 km zone; 8200 h $y^{-1}$ total occupancy, 7800 h $y^{-1}$ indoors and 1900 h $y^{-1}$ outdoors

In the 0 - 0.25 km zone, the highest total occupancy rate was for a farmer who lived in the area. A resident had the highest indoor rate and another farmer had the highest outdoor rate.

In the >0.25 - 0.5 km zone, the highest total and indoor occupancy rates were for a resident and the highest outdoor occupancy rate was for a farmer.

In the >0.5 - 1.0 km zone, the highest total occupancy rate was for two adult residents. The highest indoor rate was for a child resident and an adult resident had the highest outdoor occupancy rate.

## 8.2 Comparisons with previous surveys

The results from this 2008 survey can be compared with results from the last combined habits survey undertaken in 2003. All comparisons for consumption, intertidal occupancy and handling include data for adults only. Other habits surveys have been undertaken since 2003. Annual reviews of shellfish consumption and intertidal occupancy were conducted in the Sellafield area in 2004, 2005, 2006 and 2007 (Tipple, 2005, 2006 and 2007; and Clyne, 2008 respectively), and a beach occupancy habits survey relating to potential exposure to radioactive particles was conducted in 2007 (Clyne *et al*., 2008). The results from these habits surveys are not directly comparable with the 2008 survey due to differences in the size of the survey areas and the groups of individuals that were targeted.

### Aquatic survey

The types of activities identified in 2008 were for the most part similar to those identified in 2003. The main changes in commercial fishing between 2003 and 2008 were the increase in trawling and a new mussel fishery. The number of vessels trawling for *Nephrops* and fish closer to the homeport of Whitehaven had increased in 2008 as a result of an increase in fuel prices. A new mussel fishery near Ravenglass was identified that commenced in 2007 and the mussels were exported to Holland for consumption. In the 2008 fieldwork, increased

effort was placed on identifying activities in the Ravenglass Estuary where people could disturb the sediment at various depths, which may result in the inadvertent ingestion or inhalation of sediment. Activities identified were bait digging, wildfowling, cockle and mussel collecting, environmental monitoring, horse riding, walking, dog walking, boat maintenance and angling. Two wildfowling clubs were identified in 2008 whose members shoot on the banks of the rivers Irt, Mite and Esk in the Ravenglass Estuary. During the 2008 fieldwork there were periods of gales and adverse weather which resulted in fewer people observed on intertidal areas. In the 2008 survey there was a large decrease in the number of people using seaweed as a fertiliser on their vegetables. Four people had ceased using seaweed and one new individual was identified who used seaweed as a fertiliser on vegetables and fruit.

***Internal exposure***

The main species of fish consumed by the adult high-rate group in 2003 were cod, plaice, mackerel and thornback ray. This is similar to the species predominantly consumed by the 2008 adult high-rate group which were cod, plaice, mackerel and bass. The main crustacean species consumed by the adult high-rate group in 2003 were brown crabs, common lobsters and *Nephrops*, which remained unchanged in 2008. In 2003 the main species of molluscs consumed by the adult high-rate group were mussels, winkles and cockles, and in 2008 the predominant species were identified as winkles, mussels and razor shells. Wildfowl consumed by the high-rate group in 2003 were goose and duck (unspecified species), and in 2008 were greylag goose and mallard. The only species of marine plants/algae consumed in 2003 was *Porphyra*, and in 2008 the species consumed were *Porphyra* and samphire. A comparison between the 2003 and 2008 data for the consumption of aquatic foods is presented in Table A.

*Table A. Comparison between 2003 and 2008 aquatic internal exposure pathways at Sellafield*

| | 2003 | | | 2008 | | |
|---|---|---|---|---|---|---|
| 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 | 31 | 74.3 | 41.3 | 20 | 82.4 | 40.2 |
| Crustaceans | 10 | 47.7 | 27.0 | 18 | 30.7 | 16.8 |
| Molluscs | 9 | 53.1 | 33.7 | 4 | 49.1 | 31.4 |
| Wildfowl | 6 | 2.6 | 1.9 | 12 | 7.6 | 5.0 |
| Marine plants/algae | 2 | 0.1 | 0.1 | 3 | 0.2 | 0.2 |

***External exposure***

For intertidal occupancy in 2003, activities were recorded over the following six substrates: coal and sand; rock; salt marsh; sand; sand and mud; and sand and stones. In 2008, activities were recorded over the following seven substrates: mud; mud and sand; mud, sand and stones; rock; salt marsh; sand; and sand and stones. The following five substrates can therefore be compared: mud and sand; rock; salt marsh; sand; and sand and stones. A comparison of sediment and gear handling has also been made.

A comparison between the 2003 and 2008 data for occupancy over intertidal substrates, handling fishing gear and handling sediment is shown in Table B.

The intertidal occupancy activities undertaken by the individuals in the high-rate groups in 2003 included dog walking, bait digging, angling, playing, shellfish collecting, wildfowling and nature reserve warden duties. In 2008 the activities were similar, with the addition of boat maintenance and setting nets. The activities for individuals in the high-rate group for handling fishing gear in 2003 included potting and setting nets, and in 2008 were similar with the addition of trawling. The activities for individuals in the high-rate group for handling sediment in 2003 and 2008 were shellfish collecting and bait digging.

*Table B. Comparison between 2003 and 2008 aquatic external exposure pathways at Sellafield*

| | 2003 | | | 2008 | | |
|---|---|---|---|---|---|---|
| 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 and sand | 14 | 1587 | 868 | 4 | 942 | 581 |
| Rock | 2 | 30 | 30 | 3 | 50 | 30 |
| Salt marsh | 1 | 400 | 400 | 2 | 156 | 111 |
| Sand | 20 | 891 | 502 | 20 | 936 | 606 |
| Sand and stones | 2 | 1095 | 856 | 10 | 1043 | 565 |
| Handling fishing gear | 8 | 1000 | 732 | 11 | 1200 | 975 |
| Handling sediment | 5 | 1500 | 1004 | 2 | 972 | 957 |

The mean intertidal occupancy rates for the high-rate groups for rock and for sand in 2008 were broadly similar to those in 2003. The most significant changes were decreases in occupancy over mud and sand, over salt marsh and over sand and stones. The decrease in the occupancy over mud and sand can be attributed to two individuals who were collecting shellfish commercially and spending approximately 1500 h $y^{-1}$ over mud and sand in 2003 but had ceased collecting shellfish in 2008. The occupancy over salt marsh decreased because the individual spending 400 h $y^{-1}$ over salt marsh in 2003 now spends time over different substrates. The occupancy over sand and stones decreased because the dog walker identified in 2003 was no longer spending as much time on the beach. In 2008 the handling rates of commercial fishing gear increased due to a greater number of trawling vessels operating in the area. The rates of handling sediment decreased slightly.

**Terrestrial survey**

The main change in the terrestrial survey area between 2003 and 2008 was the reduction in the number of dairy farms. Three dairy farms had ceased keeping dairy cattle and were producing beef cattle and lambs instead. One new dairy was identified in 2008, which processed milk from its farm and produced butter, cream, yoghurt and ice cream. There was also a reduction in the number of beekeepers identified producing honey in the area from four in 2003 to two in 2008.

The mean consumption rates for the adult high-rate group for terrestrial food groups from the 2003 and 2008 surveys are shown in Table C below.

*Table C. Comparison between 2003 and 2008 mean consumption rates for the adult high-rate groups for terrestrial food groups at Sellafield (kg $y^{-1}$ or l $y^{-1}$)*

| Food group | 2003 | 2008 |
|---|---|---|
| Green vegetables | 35.8 | 40.7 |
| Other vegetables | 38.4 | 37.6 |
| Root vegetables | 30.9 | 35.2 |
| Potato | 109.4 | 89.7 |
| Domestic fruit | 32.1 | 45.5 |
| Milk | 260.0 | 221.3 |
| Cattle meat | 46.3 | 33.9 |
| Sheep meat | 23.6 | 14.4 |
| Poultry | 6.6 | 9.0 |
| Eggs | 13.1 | 22.0 |
| Wild/free foods | 3.4 | 6.2 |
| Rabbits/hares | 2.4 | 1.9 |
| Honey | 5.0 | 8.7 |
| Wild fungi | 2.1 | 1.9 |
| Venison | 22.7 | 13.6 |
| Freshwater fish | 0.2 | 2.3 |

Consumption rates increased in 2008 in the following eight food groups: green vegetables, root vegetables, domestic fruit, poultry, eggs, wild/free foods, honey and freshwater fish. Consumption rates decreased in 2008 for other vegetables, potato, milk, cattle meat, sheep meat, rabbits/hares, wild fungi and venison. The consumption of pig meat and cereals was not identified in 2003 and 2008.

In 2008, groundwater was still used at the same farms located on the fells to the north-east of the site that were identified in 2003. In 2008, the occupants of a beach residence near Braystones Rail Station were identified using well water as their domestic water supply; this was not identified in 2003. It was reported that there might be several other residents of beach chalets using well water, although this was not confirmed. In 2003, a pipe was identified coming out of the dunes at Braystones that was fed by spring water and was used by people in holiday homes for drinking water. Since 2003, the pipe has been lowered towards the ground, making it difficult to place a receptacle under the pipe to collect water. In 2008 one individual reported that he occasionally drank from the pipe.

***The transfer of contamination off-site by wildlife***

The off-site transfer of contamination from the Sellafield site by wildlife was investigated in both 2003 and 2008. In both surveys, pigeons, seagulls and rabbits were identified in low numbers on site and the site policy was to actively remove habitat and try to prevent wildlife access. The consumption of pigeons and rabbits that were shot within 5 km of the site was identified in both surveys.

In 2003 and 2008, contact with sediments in Seascale road drains by workers cleaning the drains was investigated relating to historic off-site transfer of contamination of sediments by pigeon guano, and rock climbing at St Bees Head was investigated relating to historic off-site contamination of the rocks by seagull guano. There was no change in these activities between 2003 and 2008. It was still considered to be unlikely that workers cleaning the drains would come into contact with the sediment, and rock climbing was still popular at St Bees Head, although climbers avoided the guano where possible.

**Direct radiation survey**

The residences, commercial activities and leisure activities were broadly similar in 2003 and 2008. Three residences were unoccupied in 2003 and two were unoccupied in 2008. In both 2003 and 2008 the public footbridge to the Sellafield beach via Sellafield Rail Station was closed due to site operations on pipelines.

A comparison between the 2003 and 2008 direct radiation occupancy rates is presented in Tables D, E and F below.

*Table D. Comparison between 2003 and 2008 direct radiation occupancy rates in the 0 – 0.25 km zone at Sellafield (h $y^{-1}$)*

| | **2003** | **2008** |
|---|---|---|
| Highest total | 8424 | 8340 |
| Highest indoor | 6762 | 8136 |
| Highest outdoor | 3120 | 3298 |

The highest total occupancy rates in 2003 and in 2008 were for the same farmer in both surveys. The highest indoor occupancy rates in 2003 and in 2008 were for residents. The highest outdoor occupancy rates in 2003 and in 2008 were for the same farmer in both surveys.

*Table E. Comparison between 2003 and 2008 direct radiation occupancy rates in the >0.25 – 0.5 km zone at Sellafield (h $y^{-1}$)*

| | **2003** | **2008** |
|---|---|---|
| Highest total | 8376 | 8396 |
| Highest indoor | 7940 | 7666 |
| Highest outdoor | 2920 | 3392 |

The highest total occupancy rate in 2003 was for a resident/farm worker and in 2008 was for a resident. The highest indoor occupancy rates in 2003 and in 2008 were both for residents. The highest outdoor occupancy rates in 2003 and 2008 were for the same farmer in both surveys.

*Table F. Comparison between 2003 and 2008 direct radiation occupancy rates in the >0.5 – 1.0 km zone at Sellafield (h $y^{-1}$)*

| | **2003** | **2008** |
|---|---|---|
| Highest total | 8216 | 8190 |
| Highest indoor | 7049 | 7808 |
| Highest outdoor | 3500 | 1890 |

The highest total occupancy rate in 2003 was for a farmer and in 2008 was for two adult residents with identical occupancy rates. The highest indoor occupancy rate in both 2003 and 2008 was for a resident. The highest outdoor occupancy rate in 2003 was for a farmer, who also had the highest total rate, and in 2008 was for a resident.

Commercial activities observed during both surveys were the same, which were farming, railway operations, golf course activities and environmental monitoring.

In the Sellafield direct radiation area, gamma dose rate measurements for some residences and farms in 2008 can be compared with gamma dose rate measurements taken at the same properties in 2003. These are presented in Table G.

*Table G. Comparison between 2003 and 2008 gamma dose rates at Sellafield (µGy $h^{-1}$)*

| | **Outdoor[a]** | | **Indoor[a]** | |
|---|---|---|---|---|
| **Residence number[b]** | **2003** | **2008** | **2003** | **2008** |
| Residence 1 | 0.092 | 0.085 | 0.094 | 0.092 |
| Residence 3 | 0.087 | 0.085 | 0.087 | 0.096 |
| Residence 4 | 0.078 | 0.071 | 0.097 | NM |
| Residence 6 | 0.091 | 0.091 | 0.123 | 0.126 |
| Residence 7 | 0.086 | 0.090 | 0.113 | 0.097 |
| Residence 8 | 0.100 | 0.097 | 0.127 | 0.134 |

[a] *These measurements have not been adjusted for natural background dose rates*
[b] *These residence numbers correspond to those in Table 61*
NM = Not measured

## 8.3 Summary of current environmental monitoring programmes

The 2007 Sellafield monitoring programmes operated by the Environment Agency and the Food Standards Agency are presented in the Radioactivity in Food and the Environment (RIFE) report (EA, FSA, NIEA and SEPA, 2008) and included the following samples and measurements. The aquatic monitoring programme for Sellafield was extensive and included locations as far afield as Scotland. Therefore, where possible, the aquatic samples and measurements listed below are for locations that are included within the aquatic survey area in this report. The location names, foods and substrate classifications are taken directly from RIFE.

**Aquatic monitoring**

• Fish: bass, cod, dab, flounder, grey mullet, lesser spotted dogfish, plaice, salmon, sea trout, skate/ray and sole.

• Crustaceans: brown crabs, common lobsters, *Nephrops,* Pacific oyster and shrimps.

• Molluscs: cockles, limpets, mussels and winkles.

• Marine plants: *Porphyra, Rhodymenia spp.*, samphire and seaweed.

• Sediment: Whitehaven outer harbour, St Bees beach, Sellafield beach (south of former pipeline), River Calder (downstream), River Calder (upstream), Seascale beach, Ravenglass (Carleton Marsh and Raven Villa), River Mite Estuary and Newbiggin (Eskmeals).

• Gamma dose rate measurements over intertidal areas: Whitehaven outer harbour, St Bees, Nethertown beach, Braystones, Sellafield dunes, north of former pipeline on foreshore, south of former pipeline on foreshore, River Calder downstream of factory sewer, River Calder upstream of factory sewer, Seascale beach, Seascale, Ravenglass (Carleton Marsh, River Mite Estuary, Raven Villa, boat area, ford, salmon garth and Eskmeals Nature Reserve), Muncaster Bridge, Newbiggin/Eskmeals viaduct, Newbiggin/Eskmeals bridge and Tarn Bay.

• Beta dose rate measurements over intertidal areas: Whitehaven outer harbour, St Bees, Sellafield pipeline, Ravenglass (Raven Villa) and Tarn Bay and beta dose rate measurements over nets, rope and pots.

• Transfer of radionuclides from sea to land: beetroot, cabbage, onions, parsnips, potatoes, runner beans, shallots and soil.

**Terrestrial monitoring**

• Terrestrial foods: apples, barley, beef, beetroot, blackberries, blackcurrants, broccoli, cabbage, carrots, cauliflower, duck, eggs, elderberries, French beans, honey, milk, onions, pheasants, potatoes, rabbit, rhubarb, sheep, sloe berries, swede, wheat and wood pigeon.

• Grass

• Soil

• Surface water: Ehen Spit beach, River Ehen (100m downstream of sewer outfall), River Calder (downstream) and River Calder (upstream).

**Off-site transfer of contamination**

• Road drain sediments: Seascale and Whitehaven.

## 8.4 Suggestions for changes to the monitoring programmes

The following lists are suggestions for changes to the current environmental monitoring programmes. It should be noted that the suggestions are based on the findings of this survey. They are not the outcome of any form of radiological assessment. It is suggested that samples currently monitored, which are not listed below, remain unchanged in the monitoring programme.

Environment Agency monitoring

- Gamma dose rate measurements could be introduced over sand at Drigg as this is the only beach in the aquatic survey area that is not monitored and where there were high occupancy rates.

Food Standards Agency monitoring

- The dab sample could be replaced with mackerel since it was consumed in higher quantities. Two other flat fish are currently monitored and were consumed in greater quantities than dab.
- Limpets could be replaced with razor shells as the consumption of limpets was not identified and razor shells were consumed in large quantities.
- French beans could be replaced with tomatoes as they made the highest percentage contribution to the ‘other vegetables’ food group.
- The consumption of venison was identified therefore a one-off sample of venison could be added for reassurance purposes.

**ACKNOWLEDGEMENTS**

Gratitude is expressed to representatives of local authorities and 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 Health and Safety Executive. The project officers for these organisations provided considerable help during the planning of the survey and the drafting of the report.

## 10 REFERENCES


Allott, R., 2005. Assessment of compliance with the public dose limit. Principles for the assessment of total retrospective public doses. NDAWG/2/2005. National Dose Assessment Working Group.

Byrom, J., Robinson, C., Simmonds, J.R., Walters, B., and Taylor, R.R., 1995. Food consumption rates for use in generalised radiological dose assessments. J. Radiol. Prot. 1995 Vol. 15 No 4 335-341.

Camplin, W.C., Grzechnik, M.P. and Smedley, C.A., 2005. Methods for assessment of total dose in the Radioactivity in Food and the Environment report. Presented to the *National Dose Assessments Working Group (NDAWG)*. Paper NDAWG/3/2005, 27th April 2005.

CEC, 1996. Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. Off. J. Eur. Commun., 39(L159): 1-114.

Clyne, F.J., McTaggart, K.A. and Tipple, J.R., 2004. Radiological Habits Survey: Sellafield, 2003. EA, FSA and HSE, Warrington, London and Bootle.

Clyne, F.J., Gough, C. and Edgar, A, 2008 Radiological Habits Survey: Sellafield Beach Occupancy, 2007. EA, Warrington.

Clyne, F.J., 2008. Radiological Habits Survey: Sellafield Review, 2007. Shellfish consumption and intertidal occupancy review. EA, FSA and HSE, Warrington, London and Bootle.

DETR, 2000a. Statutory Guidance on the Regulation of Radioactive Discharges into the Environment from Nuclear Licensed Sites. A consultation paper. DETR, London.

DETR, 2000b. Radioactive Substances (Basic Safety Standards) (England and Wales) Direction 2000. DETR, London.

EA, EHS, FSA and SEPA, 2006. Radioactivity in Food and the Environment, 2005. EA, EHS, FSA and SEPA, Warrington, Belfast, London and Stirling. RIFE (11).

EA, FSA, NIEA and SEPA, 2008. Radioactivity in Food and the Environment, 2007. EA, FSA, NIEA and SEPA, Warrington, London, Belfast and Stirling. RIFE (13).

EA, SEPA, DoENI, NRPB and FSA, 2002. Authorisation of discharges of radioactive waste to the environment. Principles for the assessment of prospective public doses. Interim Guidance. EA, SEPA, DoENI, NRPB and FSA, Lancaster.

FSA, 2002. Assessment Methodology for the Potential Impact on Food of Radioactive Discharges to the Environment. FSA, London.

Good Housekeeping, 1994. Good Housekeeping Cook Book. Ebury Press, London.

Hessayon, D. G., 1990. The Fruit Expert, pbi Publications, Waltham Cross.

Hessayon, D. G., 1997. The New Vegetable & Herb Expert, Expert Books, London.

Hunt, G.J., Hewett, C.J. and Shepherd, J.G., 1982. The identification of critical groups and its application to fish and shellfish consumers in the coastal area of the north-east Irish Sea. Health Physics, Vol. 43, No 6, 875-889.

IAEA, 1996. International basic safety standards for protection against ionizing radiation and for the safety of radiation sources. Saf. Ser. No. 115. IAEA, Vienna.

ICRP, 1984. A Compilation of the Major Concepts and Quantities in use by ICRP. Pergamon Press, Oxford, (ICRP Publ. 42.).

ICRP, 1991. 1990 Recommendations of the International Commission on Radiological Protection. Annal. ICRP 21 (1-3). Pergamon Press, Oxford, (ICRP Publ. 60.).

ICRP, 1996. Age-dependent doses to members of the public from intake of radionuclides. Annal. ICRP 26 (1). Elsevier Science, Oxford, (ICRP Publ. 72).

ICRP, 2006. Assessing dose of the representative person for the purpose of radiation protection of the public.. Annal. ICRP 36 (3). Elsevier Science, Oxford, (ICRP Publ. 101.).

Leonard, D.R.P., Hunt, G.J. and Jones, P.G.W., 1982. Investigation of individual radiation exposures from discharges to the aquatic environment: techniques used in habits surveys. Proc. 3rd Int. Symp. Soc. Radiol. Prot., Inverness, 6 to 11 June 1982. Vol 2, 512-517. Society for Radiological Protection.

National Radiological Protection Board, 2005. Guidance on the application of dose coefficients for the embryo and fetus from intakes of radionuclides by the mother. Docs NRPB 16(2). NRPB, Chilton, 41pp.

Smith, K.R. and Jones, A.L., 2003. Generalised habit data for radiological assessments. NRPB-W41. NRPB, Chilton.

The Welsh Assembly Government, 2002. Statutory Guidance on the Regulation of Radioactive Discharges into the Environment from Nuclear Licensed Sites in Wales. A consultation paper. The Welsh Assembly Government, Cardiff.

Tipple, J.R., 2005. Shellfish consumption and intertidal occupancy review, Sellafield 2004. EA, FSA and HSE, Warrington, London and Bootle.

Tipple, J.R., 2006. Radiological Habits Survey: Sellafield Review, 2005. Shellfish consumption and intertidal occupancy review. EA, FSA and HSE, Warrington, London and Bootle.

Tipple, J.R., 2007. Radiological Habits Survey: Sellafield Review, 2006. Shellfish consumption and intertidal occupancy review. EA, FSA and HSE, Warrington, London and Bootle.

UK Parliament, 1965. Nuclear Installations Act, 1965 (as amended). HMSO, London.

UK Parliament, 1993. Radioactive Substances Act, 1993. HMSO, London.

UK Parliament, 1995a. Environment Act, 1995. HMSO, London.

UK Parliament, 1995b. Review of Radioactive Waste Management Policy. HMSO, London, 55pp. (Cm 2919).

UK Parliament, 1999. The Ionising Radiation Regulations 1999. Stat. Inst. 1999/3232. HMSO, London, 67pp.

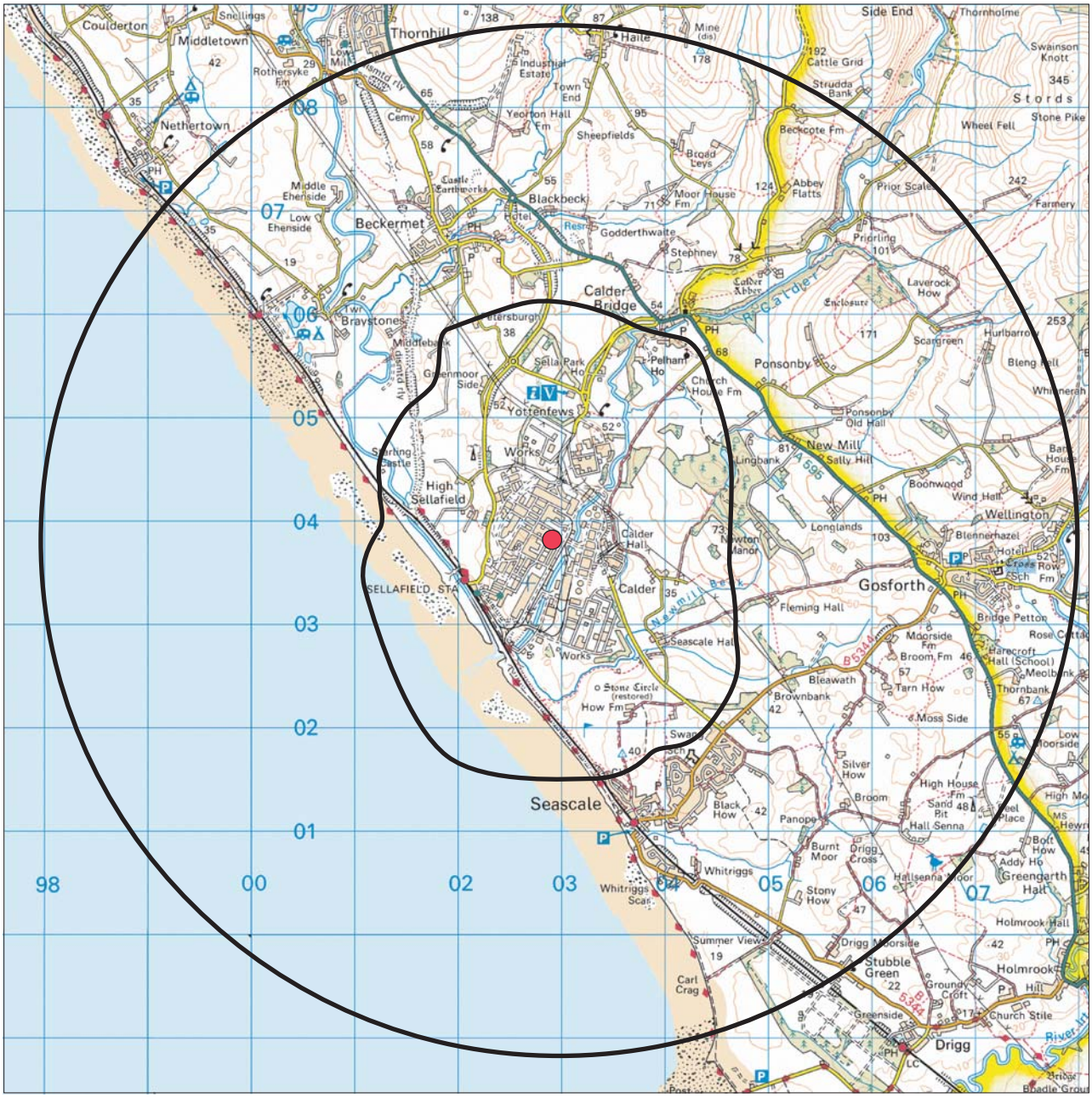
UK Parliament, 2004. Energy Act, 2004. HMSO, London.

Watson, S.J., Jones, A.L., Oatway, W.B. and Hughes, J.S., 2005. Ionising Radiation Exposure of the UK Population: 2005 review. HPA-RPD-001, Chilton.

www.statistics.gov.uk

Figure 1. The Sellafield aquatic survey area

1 Drigg Dunes and Irt Estuary Nature Reserve
2 Carleton Marsh and ford
3 Saltcoats and Saltcoats Marsh
4 Holmrook
5 Ford at Saltcoats/Ravenglass
6 Eskmeals Viaduct and ford
7 Ford near Waberthwaite Church
8 Eskmeals Nature Reserve
9 Newbiggin Marsh




© Crown copyright

Figure 2. The Sellafield terrestrial (outer ring) and direct radiation (inner ring) survey areas

Key

● Sellafield site centre

**Table 1. Survey coverage**

| Group | Criteria | Estimate of complete coverage | Number for whom positive data were obtained | Coverage for positive observations | Notes |
|---|---|---|---|---|---|
| **SUMMARY OF ALL PATHWAYS** | | | | | |
| All potential people in Sellafield aquatic, terrestrial and direct radiation survey areas | Number of people resident in terrestrial survey area (excluding those resident in the direct radiation survey area) (See (B) terrestrial pathways) | 8000[a] | 113[b] | 1% | The survey targeted individuals who were potentially the most exposed (see Section 2.4), mostly producers of local food (farmers and gardeners). |
| | Number of people resident in the direct radiation survey area (See (C) direct radiation pathways) | 55 | 42 | 76% | |
| | Number of people employed but not resident in the direct radiation survey area (See (C) direct radiation pathways) | 15 | 10 | 66% | Excluding employees and contractors of Sellafield Ltd., and people living in the direct radiation survey area |
| | Number of people visiting the direct radiation area (See (C) direct radiation pathways) | U | 3 | U | |
| | Number of people affected by liquid discharges (excluding people resident in the terrestrial survey area) (See (A) aquatic pathways) | U | 258[b] | U | |
| | Total for aquatic, terrestrial and direct radiation survey areas | U | 426[b] | U | In the Summary of All Pathways section each interviewee has only been counted once. This is in the section where their predominant activities took place |
| **(A) AQUATIC PATHWAYS** | | | | | |
| Commercial fishermen | Number of commercial fishermen actively fishing in survey area | 30 | 14 | 46% | |
| Hobby fishermen | Number of hobby fishermen fishing in survey area | U | 9 | U | |
| Shellfish collectors | Number of shellfish collectors in survey area | U | 28 | U | |
| Bait diggers | Number of baitdiggers in survey area | U | 18 | U | |
| Shore anglers and other beach users | Number seen in action or spoken to during survey | U | 180 | U | |
| Wildfowlers | Number seen or heard of during survey | 20 | 7 | 35% | Two wildfowling clubs were identified |

**Table 1. Survey coverage**

| Group | Criteria | Estimate of complete coverage | Number for whom positive data were obtained | Coverage for positive observations | Notes |
|---|---|---|---|---|---|
| **(B) TERRESTRIAL PATHWAYS** | | | | | |
| Farms | Number of farmers and their family members consuming food from the survey area | U | 105 | U | 34 farmers in the survey area were interviewed |
| Gardeners | Number of gardeners and their family members consuming food from the survey area | U | 9 | U | |
| Bee keepers | Number of people consuming honey in survey area | U | 5 | U | Two beekeepers in the area were interviewed |
| **(C) DIRECT RADIATION PATHWAYS** | | | | | |
| Occupancy of area | Total number of occupancies excluding site employees and contractors | U | 61 | U | |
| Residences | Number of residents in the survey area | 55 | 42 | 76% | Estimate of 23 occupied houses in the area, 16 households were interviewed |
| Employees | Number of people employed in the survey area | 15 | 10 | 67% | Excluding employees and contractors of Sellafield Ltd., and people living in the direct radiation survey area |
| Visitors | Number of visitors in the survey area | U | 3 | U | |
| Leisure activities | Number of people undertaking leisure activites | U | 6 | U | |
| **BREAKDOWN OF AGE GROUPS** | | | | | |
| Adults | 17-year-old and over | U | 359 | U | |
| 15-year-old | 12-year-old to 16-year-old | U | 23 | U | |
| 10-year-old | 7-year-old to 11-year-old | U | 17 | U | |
| 5-year-old | 2-year-old to 6-year-old | U | 22 | U | |
| 1-year-old | 1-year-old | U | 4 | U | |
| 3-month-old | Under 1-year-old | U | 1 | U | |

**Notes**

[a] Data from www.statistics.gov.uk were used to estimate this figure for people resident in the 5 km survey area.

[b] The number of people for whom positive data was obtained, for pathways (A) and (B), will not equal the relevant totals in the summary of all pathways. This is because some individuals, for example someone who fishes from a boat and the shore and digs their own bait, will be counted three times within the pathway, whereas others, such as the families of fishermen, will not be counted at all.

U - Unknown

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

| Food group | Foods within the food groups |
|---|---|
| Green vegetables | Globe artichoke, asparagus, broccoli, Brussels sprout, cabbage, calabrese, cauliflower, chard, courgettes, cucumber, gherkin, herbs, kale, leaf beet, lettuce, marrow, spinach |
| Other vegetables | Aubergine, broad bean, chilli pepper, french bean, mangetout, pea, pepper, runner bean, sweetcorn, tomato |
| Root vegetables | Jerusalem artichoke, beetroot, carrot, celeriac, celery, chicory, fennel, garlic, kohl rabi, leek, onion, parsnip, radish, shallot, spring onion, swede, turnip |
| Potato | Potato |
| Domestic fruit | Apple, apricot, blackberry, blackcurrant, boysenberry, cherry, damson, fig, gooseberry, grapes, greengages, huckleberry, loganberry, melon, nectarines, peach, pear, plum, pumpkin, raspberry, redcurrants, rhubarb, rowanberry, strawberry, tayberry, whitecurrant |
| Milk | Cow's milk, cream, yoghurt, goat's milk |
| Solid milk products | Butter, cheese |
| Cattle meat[b] | Beef |
| Pig meat[b] | Pork |
| Sheep meat[b] | Lamb, mutton |
| Poultry | Chicken, duck, goose, grouse, guinea fowl, partridge, pheasant, pigeon, snipe, turkey, woodcock |
| Eggs | Chicken egg, duck egg, goose egg |
| Wild/free foods | Blackberry, chestnut, crab apple, damson, dandelion root, elderberry, nettle, raspberry, rowanberry, sloe, strawberry, |
| Honey | Honey |
| Wild Fungi | Mushrooms, other edible fungi |
| Rabbits/Hares | Rabbit, hare |
| Venison[b] | Venison |
| Fish (sea) | Bass, brill, cod, common ling, dab, Dover sole, flounder, gurnard, haddock, hake, herring, lemon sole, mackerel, monkfish, mullet, plaice, pollack, witch saithe, salmon, sea trout, squid[a], cuttlefish[a], rays, turbot, whitebait, whiting |
| Fish (freshwater) | Brown trout, rainbow trout, perch, pike, salmon (river), eels |
| Crustaceans | Brown crab, spider crab, crawfish, lobster, *Nephrops* , squat lobster, prawn, shrimp |
| Molluscs | Cockles, limpets, mussels, oysters, queens, scallops, razor shell, whelks, winkles |

**Notes**

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

[b] Including offal

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

| Observation number | Bass | Cod | Dab | Dover sole | Eel | Flounder | Grey mullet | Haddock | Mackerel | Mixed fish | Plaice | Pollack | Salmon | Sea trout | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **169** | **-** | **12.2** | **-** | **2.8** | **-** | **-** | **-** | **-** | **15.9** | **-** | **5.0** | **12.2** | **-** | **-** | **9.8** | **12.2** | **-** | **12.2** | **82.4** |
| **46** | **14.9** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **23.6** | **-** | **-** | **-** | **-** | **-** | **-** | **23.6** | **-** | **-** | **62.1** |
| **115** | **9.1** | **9.1** | **-** | **-** | **-** | **-** | **9.1** | **-** | **5.9** | **-** | **4.5** | **9.1** | **-** | **-** | **-** | **4.5** | **-** | **-** | **51.3** |
| **116** | **9.1** | **9.1** | **-** | **-** | **-** | **-** | **9.1** | **-** | **5.9** | **-** | **4.5** | **9.1** | **-** | **-** | **-** | **4.5** | **-** | **-** | **51.3** |
| **75** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **47.2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **47.2** |
| **76** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **47.2** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **47.2** |
| **74** | **5.7** | **5.7** | **-** | **-** | **-** | **5.7** | **-** | **-** | **14.4** | **-** | **5.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **37.1** |
| **47** | **-** | **17.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **17.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **35.4** |
| **48** | **-** | **17.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **17.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **35.4** |
| **49** | **-** | **17.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **17.7** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **35.4** |
| **64** | **8.8** | **8.8** | **-** | **-** | **8.8** | **-** | **-** | **-** | **-** | **-** | **8.8** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **35.4** |
| **65** | **8.8** | **8.8** | **-** | **-** | **8.8** | **-** | **-** | **-** | **-** | **-** | **8.8** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **35.4** |
| **160** | **6.8** | **17.2** | **2.3** | **-** | **-** | **2.3** | **-** | **-** | **-** | **-** | **2.3** | **-** | **-** | **-** | **-** | **-** | **-** | **4.5** | **35.4** |
| **161** | **6.8** | **17.2** | **2.3** | **-** | **-** | **2.3** | **-** | **-** | **-** | **-** | **2.3** | **-** | **-** | **-** | **-** | **-** | **-** | **4.5** | **35.4** |
| **117** | **5.0** | **12.0** | **-** | **-** | **-** | **-** | **5.0** | **-** | **2.0** | **-** | **-** | **-** | **-** | **-** | **-** | **5.0** | **5.0** | **-** | **34.0** |
| **168** | **-** | **14.6** | **-** | **-** | **-** | **-** | **-** | **14.6** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **29.3** |
| **54** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **23.6** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **5.4** | **-** | **-** | **29.0** |
| **112** | **3.0** | **9.1** | **-** | **-** | **-** | **-** | **-** | **-** | **9.1** | **-** | **1.5** | **6.0** | **-** | **-** | **-** | **-** | **-** | **-** | **28.7** |
| **113** | **3.0** | **9.1** | **-** | **-** | **-** | **-** | **-** | **-** | **9.1** | **-** | **1.5** | **6.0** | **-** | **-** | **-** | **-** | **-** | **-** | **28.7** |
| **114** | **3.0** | **9.1** | **-** | **-** | **-** | **-** | **-** | **-** | **9.1** | **-** | **1.5** | **6.0** | **-** | **-** | **-** | **-** | **-** | **-** | **28.7** |
| 283 | - | 9.0 | - | - | - | - | - | - | 5.5 | - | 9.0 | - | - | - | - | - | - | - | 23.5 |
| 284 | - | 9.0 | - | - | - | - | - | - | 5.5 | - | 9.0 | - | - | - | - | - | - | - | 23.5 |
| 55 | - | - | - | - | - | - | - | 17.7 | - | - | - | - | - | - | - | 5.4 | - | - | 23.1 |
| 56 | - | - | - | - | - | - | - | 17.7 | - | - | - | - | - | - | - | 5.4 | - | - | 23.1 |
| 62 | 4.5 | 10.5 | - | - | - | - | - | - | - | - | - | - | 4.6 | 1.3 | - | - | - | - | 20.8 |
| 63 | 4.5 | 10.5 | - | - | - | - | - | - | - | - | - | - | 4.6 | 1.3 | - | - | - | - | 20.8 |
| 144 | - | 9.1 | - | - | - | - | - | - | - | - | 9.1 | - | - | - | - | 1.8 | - | - | 20.0 |
| 145 | - | 9.1 | - | - | - | - | - | - | - | - | 9.1 | - | - | - | - | 1.8 | - | - | 20.0 |
| 162 | 3.4 | 8.6 | 1.1 | - | - | 1.1 | - | - | - | - | 1.1 | - | - | - | - | - | - | 2.3 | 17.7 |
| 163 | 3.4 | 8.6 | 1.1 | - | - | 1.1 | - | - | - | - | 1.1 | - | - | - | - | - | - | 2.3 | 17.7 |
| 50 | - | - | - | - | - | - | - | - | 5.8 | - | 5.8 | - | - | - | - | - | - | 5.8 | 17.5 |
| 118 | 2.5 | 6.0 | - | - | - | - | 2.5 | - | 1.0 | - | - | - | - | - | - | 2.5 | 2.5 | - | 17.0 |
| 154 | 6.4 | 6.4 | - | - | - | 0.9 | - | - | - | - | 0.9 | - | - | 2.3 | - | - | - | - | 16.8 |
| 108 | - | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 14.7 |
| 109 | - | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 14.7 |

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

| Observation number | Bass | Cod | Dab | Dover sole | Eel | Flounder | Grey mullet | Haddock | Mackerel | Mixed fish | Plaice | Pollack | Salmon | Sea trout | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | - | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 14.7 |
| 111 | - | 14.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 14.7 |
| 92 | 3.9 | 5.4 | - | - | - | - | - | - | - | - | 3.6 | - | - | - | - | - | - | - | 12.9 |
| 70 | 2.7 | 3.7 | - | - | - | - | - | - | - | - | 2.5 | - | - | - | - | - | - | 3.2 | 12.1 |
| 71 | 2.7 | 3.7 | - | - | - | - | - | - | - | - | 2.5 | - | - | - | - | - | - | 3.2 | 12.1 |
| 2 | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 | - | - | - | - | 2.9 | 2.9 | - | 11.8 |
| 3 | - | 2.9 | - | - | - | - | - | - | - | - | 2.9 | - | - | - | - | 2.9 | 2.9 | - | 11.8 |
| 77 | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | 11.8 |
| 79 | - | - | - | - | - | - | - | - | - | 11.8 | - | - | - | - | - | - | - | - | 11.8 |
| 286 | - | 4.5 | - | - | - | - | - | - | 2.7 | - | 4.5 | - | - | - | - | - | - | - | 11.7 |
| 123 | - | 0.9 | - | - | - | - | - | - | - | - | 2.7 | 0.6 | - | - | - | 5.4 | - | - | 9.7 |
| 309 | 3.4 | - | - | - | - | - | - | - | - | - | 6.0 | - | - | - | - | - | - | - | 9.4 |
| 80 | - | - | - | - | - | - | - | - | - | 8.8 | - | - | - | - | - | - | - | - | 8.8 |
| 81 | - | - | - | - | - | - | - | - | - | 8.8 | - | - | - | - | - | - | - | - | 8.8 |
| 66 | 1.8 | 2.5 | - | - | - | - | - | - | - | - | 1.7 | - | - | - | - | - | - | 2.2 | 8.1 |
| 67 | 1.8 | 2.5 | - | - | - | - | - | - | - | - | 1.7 | - | - | - | - | - | - | 2.2 | 8.1 |
| 68 | 1.8 | 2.5 | - | - | - | - | - | - | - | - | 1.7 | - | - | - | - | - | - | 2.2 | 8.1 |
| 183 | - | - | - | - | - | - | - | - | 1.0 | - | - | - | 6.8 | - | - | - | - | - | 7.8 |
| 184 | - | - | - | - | - | - | - | - | 1.0 | - | - | - | 6.8 | - | - | - | - | - | 7.8 |
| 139 | 0.9 | 0.9 | - | - | - | - | - | - | 4.2 | - | 0.9 | - | - | - | - | 0.9 | - | - | 7.8 |
| 15 | - | - | - | - | - | - | - | - | - | - | - | - | 6.5 | - | - | - | - | - | 6.5 |
| 35 | - | - | - | - | - | - | - | - | - | - | - | - | 6.5 | - | - | - | - | - | 6.5 |
| 36 | - | - | - | - | - | - | - | - | - | - | - | - | 6.5 | - | - | - | - | - | 6.5 |
| 37 | - | - | - | - | - | - | - | - | - | - | - | - | 6.5 | - | - | - | - | - | 6.5 |
| 137 | 2.3 | 2.3 | - | - | - | - | - | - | - | - | 1.1 | - | - | - | - | - | - | - | 5.7 |
| 138 | 2.3 | 2.3 | - | - | - | - | - | - | - | - | 1.1 | - | - | - | - | - | - | - | 5.7 |
| 314 | - | 1.3 | - | - | - | - | - | 0.8 | 1.2 | - | 0.9 | - | - | - | - | 1.3 | - | - | 5.5 |
| 315 | - | 1.3 | - | - | - | - | - | 0.8 | 1.2 | - | 0.9 | - | - | - | - | 1.3 | - | - | 5.5 |
| 306 | 0.6 | 4.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.2 |
| 307 | 0.6 | 4.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.2 |
| 308 | 0.6 | 4.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.2 |
| 155 | 1.6 | 1.6 | - | - | - | 0.2 | - | - | - | - | 0.2 | - | 0.2 | 0.6 | - | - | - | - | 4.4 |
| 124 | - | 0.9 | - | - | - | - | - | - | - | - | 2.7 | 0.6 | - | - | - | - | - | - | 4.2 |
| 243 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | 2.6 | 1.3 | - | - | - | - | 4.1 |
| 244 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | 2.6 | 1.3 | - | - | - | - | 4.1 |

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

| Observation number | Bass | Cod | Dab | Dover sole | Eel | Flounder | Grey mullet | Haddock | Mackerel | Mixed fish | Plaice | Pollack | Salmon | Sea trout | Squid | Thornback ray | Turbot | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140 | 0.9 | 0.9 | - | - | - | - | - | - | - | - | 0.9 | - | - | - | - | 0.9 | - | - | 3.6 |
| 73 | 0.8 | 1.1 | - | - | - | 0.8 | - | - | - | - | 0.7 | - | - | - | - | - | - | - | 3.4 |
| 72 | 0.8 | 1.1 | - | - | - | 0.8 | - | - | - | - | 0.7 | - | - | - | - | - | - | - | 3.4 |
| 40 | - | - | - | - | - | - | - | - | 1.8 | - | 0.3 | - | 0.9 | - | - | - | - | - | 3.0 |
| 41 | - | - | - | - | - | - | - | - | 1.8 | - | 0.3 | - | 0.9 | - | - | - | - | - | 3.0 |
| 42 | - | - | - | - | - | - | - | - | 1.8 | - | 0.3 | - | 0.9 | - | - | - | - | - | 3.0 |
| 25 | - | - | - | - | - | - | - | - | - | - | - | - | 2.9 | - | - | - | - | - | 2.9 |
| 26 | - | - | - | - | - | - | - | - | - | - | - | - | 2.9 | - | - | - | - | - | 2.9 |
| 211 | - | - | - | - | - | - | - | - | 0.4 | - | - | 2.5 | - | - | - | - | - | - | 2.8 |
| 212 | - | - | - | - | - | - | - | - | 0.4 | - | - | 2.5 | - | - | - | - | - | - | 2.8 |
| 213 | - | - | - | - | - | - | - | - | 0.4 | - | - | 2.5 | - | - | - | - | - | - | 2.8 |
| 156 | - | - | - | - | - | - | - | - | - | - | - | - | 0.7 | 2.0 | - | - | - | - | 2.7 |
| 157 | - | - | - | - | - | - | - | - | - | - | - | - | 0.7 | 2.0 | - | - | - | - | 2.7 |
| 158 | - | - | - | - | - | - | - | - | - | - | - | - | 0.7 | 2.0 | - | - | - | - | 2.7 |
| 159 | - | - | - | - | - | - | - | - | - | - | - | - | 0.7 | 2.0 | - | - | - | - | 2.7 |
| 174 | - | - | - | - | - | - | - | - | - | - | - | - | 2.6 | - | - | - | - | - | 2.6 |
| 175 | - | - | - | - | - | - | - | - | - | - | - | - | 2.6 | - | - | - | - | - | 2.6 |
| 177 | - | - | - | - | - | - | - | - | - | - | - | - | 2.6 | - | - | - | - | - | 2.6 |
| 141 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.6 |
| 142 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.6 |
| 195 | - | 1.7 | - | - | - | - | - | - | 0.7 | - | - | - | - | - | - | - | - | - | 2.4 |
| 196 | - | 1.7 | - | - | - | - | - | - | 0.7 | - | - | - | - | - | - | - | - | - | 2.4 |
| 223 | - | - | - | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | 0.6 |
| 353 | - | - | - | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | 0.2 |
| 354 | - | - | - | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | 0.2 |
| 355 | - | - | - | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | 0.2 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 20 high-rate adult consumers is 40.2 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 96 observations is 51.3 kg $y^{-1}$

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

| Observation number | Brown shrimp | Brown crab | Common lobster | *Nephrops* | Total |
|---|---|---|---|---|---|
| **108** | **-** | **30.7** | **-** | **-** | **30.7** |
| **110** | **-** | **30.7** | **-** | **-** | **30.7** |
| **160** | **-** | **20.4** | **3.4** | **-** | **23.8** |
| **161** | **-** | **20.4** | **3.4** | **-** | **23.8** |
| **116** | **0.5** | **8.4** | **14.8** | **-** | **23.8** |
| **169** | **-** | **3.7** | **3.0** | **9.8** | **16.5** |
| **283** | **-** | **8.8** | **5.4** | **-** | **14.3** |
| **284** | **-** | **8.8** | **5.4** | **-** | **14.3** |
| **115** | **0.5** | **8.4** | **4.9** | **-** | **13.9** |
| **109** | **-** | **13.2** | **-** | **-** | **13.2** |
| **111** | **-** | **13.2** | **-** | **-** | **13.2** |
| **112** | **-** | **5.6** | **6.6** | **-** | **12.2** |
| **113** | **-** | **5.6** | **6.6** | **-** | **12.2** |
| **114** | **-** | **5.6** | **6.6** | **-** | **12.2** |
| **162** | **-** | **10.2** | **1.7** | **-** | **11.9** |
| **163** | **-** | **10.2** | **1.7** | **-** | **11.9** |
| **75** | **-** | **-** | **-** | **11.8** | **11.8** |
| **76** | **-** | **-** | **-** | **11.8** | **11.8** |
| 123 | - | 8.3 | 1.8 | - | 10.2 |
| 124 | - | 8.3 | 1.8 | - | 10.2 |
| 168 | - | - | - | 7.3 | 7.3 |
| 54 | - | 1.0 | - | 6.1 | 7.2 |
| 55 | - | 1.0 | - | 6.1 | 7.2 |
| 56 | - | 1.0 | - | 6.1 | 7.2 |
| 286 | - | 4.4 | 2.7 | - | 7.1 |
| 47 | - | 3.6 | 1.9 | - | 5.5 |
| 49 | - | 3.6 | 1.9 | - | 5.5 |
| 79 | - | 0.5 | 1.1 | 3.4 | 5.0 |
| 77 | - | 0.5 | 1.1 | 3.4 | 5.0 |
| 46 | - | 4.7 | - | - | 4.7 |
| 50 | - | 4.3 | - | - | 4.3 |
| 48 | - | 1.8 | 1.9 | - | 3.7 |
| 62 | - | 1.0 | 2.1 | - | 3.2 |
| 66 | - | 1.7 | 0.9 | - | 2.6 |
| 67 | - | 1.7 | 0.9 | - | 2.6 |
| 68 | - | 1.7 | 0.9 | - | 2.6 |
| 70 | - | 1.7 | 0.9 | - | 2.6 |
| 71 | - | 1.7 | 0.9 | - | 2.6 |
| 314 | - | - | 1.1 | 1.1 | 2.2 |
| 315 | - | - | 1.1 | 1.1 | 2.2 |
| 69 | - | 1.7 | - | - | 1.7 |
| 144 | - | 1.0 | 0.2 | - | 1.2 |
| 145 | - | 1.0 | 0.2 | - | 1.2 |
| 117 | - | 1.0 | - | - | 1.0 |
| 118 | - | 1.0 | - | - | 1.0 |
| 26 | - | 0.5 | 0.4 | - | 0.9 |
| 309 | - | 0.3 | 0.5 | - | 0.8 |
| 213 | - | - | 0.5 | - | 0.5 |
| 211 | - | 0.4 | - | - | 0.4 |
| 212 | - | 0.4 | - | - | 0.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 18 high-rate adult consumers is 16.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 50 observations is 29.2 kg $y^{-1}$

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

| Observation number | Clam | Cockle | Mussel | Pacific oyster | Razor shell | Whelk | Winkle | Total |
|---|---|---|---|---|---|---|---|---|
| **62** | **4.1** | **3.7** | **23.2** | **4.1** | **6.0** | **-** | **8.0** | **49.1** |
| **93** | **-** | **-** | **8.7** | **-** | **-** | **-** | **21.3** | **30.0** |
| **94** | **-** | **-** | **8.7** | **-** | **-** | **-** | **21.3** | **30.0** |
| **46** | **-** | **1.1** | **11.8** | **-** | **-** | **-** | **3.7** | **16.6** |
| 50 | - | - | 10.0 | - | - | - | 3.6 | 13.6 |
| 58 | - | - | 3.5 | - | - | - | 5.8 | 9.3 |
| 169 | - | 6.6 | 0.2 | - | 1.0 | - | - | 7.8 |
| 160 | - | 2.9 | - | - | - | - | 2.9 | 5.9 |
| 161 | - | 2.9 | - | - | - | - | 2.9 | 5.9 |
| 57 | - | - | 3.5 | - | - | - | - | 3.5 |
| 162 | - | 1.5 | - | - | - | - | 1.5 | 2.9 |
| 163 | - | 1.5 | - | - | - | - | 1.5 | 2.9 |
| 66 | - | - | 0.4 | - | - | - | 0.8 | 1.2 |
| 47 | - | 0.9 | - | - | - | - | - | 0.9 |
| 117 | - | - | 0.4 | - | 0.4 | - | - | 0.8 |
| 279 | - | - | 0.1 | - | - | - | 0.3 | 0.5 |
| 168 | - | 0.2 | 0.2 | - | - | - | - | 0.5 |
| 314 | - | - | 0.4 | - | - | - | - | 0.4 |
| 315 | - | - | 0.4 | - | - | - | - | 0.4 |
| 211 | - | 0.2 | 0.1 | - | - | - | - | 0.3 |
| 212 | - | 0.2 | 0.1 | - | - | - | - | 0.3 |
| 213 | - | 0.2 | 0.1 | - | - | - | - | 0.3 |
| 283 | - | - | - | - | - | 0.2 | - | 0.2 |
| 123 | - | - | 0.1 | - | - | - | - | 0.1 |
| 124 | - | - | 0.1 | - | - | - | - | 0.1 |
| 112 | - | - | - | - | - | - | 0.03 | 0.03 |
| 113 | - | - | - | - | - | - | 0.03 | 0.03 |
| 114 | - | - | - | - | - | - | 0.03 | 0.03 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of molluscs based on the 4 high-rate adult consumers is 31.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 28 observations is 36.2 kg $y^{-1}$

**Table 6. Adults' consumption rates of wildfowl in the Sellafield area (kg $y^{-1}$)**

| Observation number | Goose | Mallard | Snipe | Teal | Wigeon | Total |
|---|---|---|---|---|---|---|
| **283** | **1.5** | **4.5** | **-** | **1.6** | **-** | **7.6** |
| **284** | **1.5** | **4.5** | **-** | **1.6** | **-** | **7.6** |
| **152** | **3.3** | **0.9** | **-** | **0.2** | **0.5** | **5.0** |
| **153** | **3.3** | **0.9** | **-** | **0.2** | **0.5** | **5.0** |
| **156** | **3.3** | **0.7** | **-** | **0.2** | **0.5** | **4.7** |
| **157** | **3.3** | **0.7** | **-** | **0.2** | **0.5** | **4.7** |
| **158** | **3.3** | **0.7** | **-** | **0.2** | **0.5** | **4.7** |
| **159** | **3.3** | **0.7** | **-** | **0.2** | **0.5** | **4.7** |
| **35** | **2.6** | **0.7** | **0.3** | **0.2** | **0.4** | **4.2** |
| **36** | **2.6** | **0.7** | **0.3** | **0.2** | **0.4** | **4.2** |
| **37** | **2.6** | **0.7** | **0.3** | **0.2** | **0.4** | **4.2** |
| **286** | **0.7** | **2.3** | **-** | **0.8** | **-** | **3.8** |
| 206 | 1.1 | 0.8 | - | - | 0.4 | 2.3 |
| 207 | 1.1 | 0.8 | - | - | 0.4 | 2.3 |
| 280 | 1.5 | - | - | - | - | 1.5 |
| 10 | - | 1.4 | - | - | - | 1.4 |
| 11 | - | 1.4 | - | - | - | 1.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wildfowl based on the 12 high-rate adult consumers is 5.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 17 observations is 7.6 kg $y^{-1}$

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

| Observation number | *Porphyra* | Samphire | Total |
|---|---|---|---|
| **168** | **0.2** | **-** | **0.2** |
| **169** | **0.2** | **-** | **0.2** |
| **212** | **-** | **0.2** | **0.2** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of marine plants/algae based on the 3 high-rate adult consumers is 0.2 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 0.2 kg $y^{-1}$

**Table 8. Adults' consumption rates of vegetables and fruit grown on land where seaweed has been used as a fertiliser in the Sellafield area (kg $y^{-1}$)**

| Observation number | Beetroot | Broad bean | Brussel sprout | Cabbage | Cucumber | Onion | Potato | Rhubarb | Runner bean | Tomato |
|---|---|---|---|---|---|---|---|---|---|---|
| 154 | 6.6 | 7.3 | 4.4 | 6.8 | 4.1 | 17.3 | 14.6 | 9.2 | 14.5 | 28.8 |
| 155 | 6.6 | 7.3 | 4.4 | 6.8 | 4.1 | 17.3 | 14.6 | 9.2 | 14.5 | 28.8 |

**Notes**

These data are not included in the vegetable and food groups in Tables 27, 28, 29, 30 and 31 and Annex 1 because the source of exposure is liquid discharge and not gaseous discharge

**Table 9. Children's consumption rates of fish in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Bass | Cod | Dab | Flounder | Mackerel | Plaice | Pollack | Salmon | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **285** | **13** | **-** | **4.5** | **-** | **-** | **2.7** | **4.5** | **-** | **-** | **-** | **11.7** |
| **164** | **13** | **1.4** | **3.4** | **0.5** | **0.5** | **-** | **0.5** | **-** | **-** | **0.9** | **7.1** |
| **39** | **13** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **6.5** | **-** | **6.5** |
| **38** | **12** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **6.5** | **-** | **6.5** |
| **125** | **13** | **-** | **0.9** | **-** | **-** | **-** | **2.7** | **0.6** | **-** | **-** | **4.2** |
| 214 | 16 | - | - | - | - | 0.4 | - | 2.5 | - | - | 2.8 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of fish based on the 5 high-rate 15-year-old age group consumers is 7.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 6 observations is 11.1 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Bass | Cod | Dab | Flounder | Mackerel | Plaice | Pollack | Salmon | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **165** | **11** | **1.4** | **3.4** | **0.5** | **0.5** | **-** | **0.5** | **-** | **-** | **0.9** | **7.1** |
| **166** | **8** | **1.4** | **3.4** | **0.5** | **0.5** | **-** | **0.5** | **-** | **-** | **0.9** | **7.1** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of fish based on the 2 high-rate 10-year-old age group consumers is 7.1 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 7.1 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Bass | Cod | Dab | Flounder | Mackerel | Plaice | Pollack | Salmon | Whiting | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **167** | **6** | **0.7** | **1.7** | **0.2** | **0.2** | **-** | **0.2** | **-** | **-** | **0.5** | **3.5** |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of fish based on the only 5-year-old age group consumer is 3.5 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 10. Children's consumption rates of crustaceans in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Brown crab | Common lobster | Total |
|---|---|---|---|---|
| **285** | **13** | **4.4** | **2.7** | **7.1** |
| **164** | **13** | **2.0** | **0.7** | **2.7** |
| 125 | 13 | - | 1.8 | 1.8 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of crustaceans based on the 2 high-rate 15-year-old age group consumers is 4.9 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 3 observations is 6.9 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Brown crab | Common lobster | Total |
|---|---|---|---|---|
| **165** | **11** | **2.0** | **0.7** | **2.7** |
| **166** | **8** | **2.0** | **0.7** | **2.7** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of crustaceans based on the 2 high-rate 10-year-old age group consumers is 2.7 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 2.7 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Brown crab | Common lobster | Total |
|---|---|---|---|---|
| **167** | **6** | **1.0** | **-** | **1.0** |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of crustaceans based on the only 5-year-old age group consumer is 1.0 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 11. Children's consumption rates of molluscs in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Cockle | Mussel | Winkle | Total |
|---|---|---|---|---|---|
| **164** | **13** | **0.6** | **-** | **0.6** | **1.2** |
| 214 | 16 | 0.2 | 0.1 | - | 0.3 |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of molluscs based on the only high-rate 15-year-old age group consumer is 1.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 1.2 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Cockle | Mussel | Winkle | Total |
|---|---|---|---|---|---|
| **165** | **11** | **0.6** | **-** | **0.6** | **1.2** |
| **166** | **8** | **0.6** | **-** | **0.6** | **1.2** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of molluscs based on the 2 high-rate 10-year-old age group consumers is 1.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 1.2 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Cockle | Mussel | Winkle | Total |
|---|---|---|---|---|---|
| **167** | **6** | **0.3** | **-** | **0.3** | **0.6** |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of molluscs based on the only 5-year-old age group consumer is 0.6 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 12. Children's consumption rates of wildfowl in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Goose | Mallard | Snipe | Teal | Wigeon | Total |
|---|---|---|---|---|---|---|---|
| **39** | **13** | **2.6** | **0.7** | **0.3** | **0.2** | **0.4** | **4.2** |
| **38** | **12** | **2.6** | **0.7** | **0.3** | **0.2** | **0.4** | **4.2** |
| **285** | **13** | **0.7** | **2.3** | **-** | **0.8** | **-** | **3.8** |
| **281** | **15** | **1.5** | **-** | **-** | **-** | **-** | **1.5** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wildfowl based on the 4 high-rate 15-year-old age group consumers is 3.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 4.2 kg $y^{-1}$

**Table 13. Summary of adults' consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)**

| Food group | Number of observations | Number of high-rate consumers | Observed maximum consumption rate for the high-rate group | Observed minimum consumption rate for the high-rate group | Observed mean consumption rate for the high-rate group | Observed 97.5th percentile consumption rate | Generic mean consumption rate | Generic 97.5th percentile consumption rate |
|---|---|---|---|---|---|---|---|---|
| Fish | 96 | 20 | 82.4 | 28.7 | 40.2 | 51.3 | 15.0 | 40.0 |
| Crustaceans | 50 | 18 | 30.7 | 11.8 | 16.8 | 29.2 | 3.5 | 10.0 |
| Molluscs | 28 | 4 | 49.1 | 16.6 | 31.4 | 36.2 | 3.5 | 10.0 |
| Wildfowl | 17 | 12 | 7.6 | 3.8 | 5.0 | 7.6 | ND | ND |
| Marine plants/algae | 3 | 3 | 0.2 | 0.2 | 0.2 | 0.2 | ND | ND |
| Green vegetables | 23 | 5 | 52.0 | 20.3 | 40.7 | 52.0 | 15.0 | 45.0 |
| Other vegetables | 22 | 6 | 58.9 | 26.2 | 37.6 | 58.9 | 20.0 | 50.0 |
| Root vegetables | 24 | 6 | 46.7 | 26.2 | 35.2 | 46.7 | 10.0 | 40.0 |
| Potato | 48 | 23 | 150.0 | 76.2 | 89.7 | 141.3 | 50.0 | 120.0 |
| Domestic fruit | 37 | 4 | 62.6 | 28.4 | 45.5 | 62.6 | 20.0 | 75.0 |
| Milk | 54 | 37 | 365.0 | 146.0 | 221.3 | 365.0 | 95.0 | 240.0 |
| Cattle meat | 19 | 14 | 52.0 | 17.7 | 33.9 | 52.0 | 15.0 | 45.0 |
| Pig meat | NC | NC | NC | NC | NC | NC | 15.0 | 40.0 |
| Sheep meat | 16 | 10 | 26.0 | 11.3 | 14.4 | 26.0 | 8.0 | 25.0 |
| Poultry | 33 | 5 | 18.9 | 6.3 | 9.0 | 9.0 | 10.0 | 30.0 |
| Eggs | 51 | 16 | 39.7 | 14.8 | 22.0 | 36.8 | 8.5 | 25.0 |
| Wild/free foods | 43 | 5 | 7.5 | 5.2 | 6.2 | 7.4 | 7.0 | 25.0 |
| Rabbits/hares | 7 | 4 | 3.4 | 1.1 | 1.9 | 3.1 | 6.0 | 15.0 |
| Honey | 5 | 3 | 9.1 | 8.5 | 8.7 | 9.0 | 2.5 | 9.5 |
| Wild fungi | 42 | 16 | 2.7 | 0.9 | 1.9 | 2.7 | 3.0 | 10.0 |
| Venison | 5 | 3 | 13.6 | 13.6 | 13.6 | 13.6 | ND | ND |
| Cereals | NC | NC | NC | NC | NC | NC | 50.0 | 100.0 |
| Freshwater fish | 8 | 1 | 2.3 | 2.3 | 2.3 | 2.0 | 15.0 | 40.0 |

ND = not determined
NC = not consumed

**Table 14. Summary of 15-year-old children's consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)**

| Food group | Number of observations | Number of high-rate consumers | Observed maximum consumption rate for the high-rate group | Observed minimum consumption rate for the high-rate group | Observed mean consumption rate for the high-rate group | Observed 97.5th percentile consumption rate | Generic mean consumption rate | Generic 97.5th percentile consumption rate |
|---|---|---|---|---|---|---|---|---|
| Fish | 6 | 5 | 11.7 | 4.2 | 7.2 | 11.1 | 6.5 | 20.0 |
| Crustaceans | 3 | 2 | 7.1 | 2.7 | 4.9 | 6.9 | 2.5 | 6.0 |
| Molluscs | 2 | 1 | 1.2 | 1.2 | 1.2 | 1.2 | 2.5 | 6.0 |
| Wildfowl | 4 | 4 | 4.2 | 1.5 | 3.4 | 4.2 | ND | ND |
| Marine plants/algae | NC | NC | NC | NC | NC | NC | ND | ND |
| Green vegetables | 3 | 2 | 14.7 | 8.7 | 11.7 | 14.4 | 9.0 | 25.0 |
| Other vegetables | 1 | 1 | 5.8 | 5.8 | 5.8 | NA | 10.0 | 30.0 |
| Root vegetables | 2 | 2 | 32.8 | 14.7 | 23.8 | 32.4 | 7.5 | 20.0 |
| Potato | 5 | 4 | 76.2 | 41.7 | 67.6 | 76.2 | 60.0 | 130.0 |
| Domestic fruit | 4 | 2 | 4.6 | 2.4 | 3.5 | 4.5 | 15.0 | 50.0 |
| Milk | 5 | 4 | 182.5 | 182.5 | 182.5 | 182.5 | 110.0 | 260.0 |
| Cattle meat | 2 | 2 | 26.0 | 26.0 | 26.0 | 26.0 | 15.0 | 35.0 |
| Pig meat | NC | NC | NC | NC | NC | NC | 10.0 | 30.0 |
| Sheep meat | 1 | 1 | 3.8 | 3.8 | 3.8 | NA | 5.5 | 15.0 |
| Poultry | 4 | 2 | 3.9 | 3.9 | 3.9 | 3.9 | 6.5 | 20.0 |
| Eggs | 5 | 4 | 17.8 | 8.9 | 13.3 | 17.8 | 7.0 | 25.0 |
| Wild/free foods | 6 | 1 | 5.4 | 5.4 | 5.4 | 4.9 | 3.0 | 13.0 |
| Rabbits/hares | 2 | 2 | 1.1 | 1.1 | 1.1 | 1.1 | ND | ND |
| Honey | NC | NC | NC | NC | NC | NC | 2.0 | 5.0 |
| Wild fungi | 7 | 2 | 2.7 | 2.7 | 2.7 | 2.7 | 2.0 | 5.5 |
| Venison | 2 | 2 | 13.6 | 13.6 | 13.6 | 13.6 | ND | ND |
| Cereals | NC | NC | NC | NC | NC | NC | 50.0 | 95.0 |
| Freshwater fish | 2 | 2 | 0.2 | 0.2 | 0.2 | 0.2 | 6.5 | 20.0 |

ND = not determined
NC = not consumed
NA = not applicable

**Table 15. Summary of 10-year-old children's consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)**

| Food group | Number of observations | Number of high-rate consumers | Observed maximum consumption rate for the high-rate group | Observed minimum consumption rate for the high-rate group | Observed mean consumption rate for the high-rate group | Observed 97.5th percentile consumption rate | Generic mean consumption rate | Generic 97.5th percentile consumption rate |
|---|---|---|---|---|---|---|---|---|
| Fish | 2 | 2 | 7.1 | 7.1 | 7.1 | 7.1 | 6.0 | 20.0 |
| Crustaceans | 2 | 2 | 2.7 | 2.7 | 2.7 | 2.7 | 2.5 | 7.0 |
| Molluscs | 2 | 2 | 1.2 | 1.2 | 1.2 | 1.2 | 2.5 | 7.0 |
| Wildfowl | NC | NC | NC | NC | NC | NC | ND | ND |
| Marine plants/algae | NC | NC | NC | NC | NC | NC | ND | ND |
| Green vegetables | 2 | 2 | 3.7 | 1.8 | 2.7 | 3.6 | 6.0 | 20.0 |
| Other vegetables | 3 | 3 | 5.8 | 3.1 | 4.3 | 5.7 | 8.0 | 25.0 |
| Root vegetables | 1 | 1 | 6.5 | 6.5 | 6.5 | NA | 6.0 | 20.0 |
| Potato | 5 | 1 | 82.8 | 82.8 | 82.8 | 75.4 | 45.0 | 85.0 |
| Domestic fruit | 5 | 2 | 5.4 | 4.6 | 5.0 | 5.3 | 15.0 | 50.0 |
| Milk | 3 | 3 | 146.0 | 59.1 | 117.0 | 146.0 | 110.0 | 240.0 |
| Cattle meat | 2 | 2 | 14.0 | 11.2 | 12.6 | 13.9 | 15.0 | 30.0 |
| Pig meat | NC | NC | NC | NC | NC | NC | 8.5 | 25.0 |
| Sheep meat | NC | NC | NC | NC | NC | NC | 4.0 | 10.0 |
| Poultry | NC | NC | NC | NC | NC | NC | 5.5 | 15.0 |
| Eggs | 6 | 4 | 3.8 | 2.0 | 2.6 | 3.6 | 6.5 | 20.0 |
| Wild/free foods | 4 | 1 | 5.4 | 5.4 | 5.4 | 5.1 | 3.0 | 11.0 |
| Rabbits/hares | NC | NC | NC | NC | NC | NC | ND | ND |
| Honey | NC | NC | NC | NC | NC | NC | 2.0 | 7.5 |
| Wild fungi | 4 | 4 | 0.3 | 0.1 | 0.2 | 0.3 | 1.5 | 4.5 |
| Venison | NC | NC | NC | NC | NC | NC | ND | ND |
| Cereals | NC | NC | NC | NC | NC | NC | 45.0 | 75.0 |
| Freshwater fish | NC | NC | NC | NC | NC | NC | 6.0 | 20.0 |

ND = not determined
NC = not consumed
NA = not applicable

**Table 16. Summary of 5-year-old children's consumption rates in the Sellafield area (kg $y^{-1}$ or l $y^{-1}$)**

| Food group | Number of observations | Number of high-rate consumers | Observed maximum consumption rate for the high-rate group | Observed minimum consumption rate for the high-rate group | Observed mean consumption rate for the high-rate group | Observed 97.5th percentile consumption rate | Generic mean consumption rate | Generic 97.5th percentile consumption rate |
|---|---|---|---|---|---|---|---|---|
| Fish | 1 | 1 | 3.5 | 3.5 | 3.5 | NA | ND | ND |
| Crustaceans | 1 | 1 | 1.0 | 1.0 | 1.0 | NA | ND | ND |
| Molluscs | 1 | 1 | 0.6 | 0.6 | 0.6 | NA | ND | ND |
| Wildfowl | NC | NC | NC | NC | NC | NC | ND | ND |
| Marine plants/algae | NC | NC | NC | NC | NC | NC | ND | ND |
| Green vegetables | 1 | 1 | 0.7 | 0.7 | 0.7 | NA | ND | ND |
| Other vegetables | 3 | 3 | 3.9 | 1.7 | 3.2 | 3.9 | ND | ND |
| Root vegetables | NC | NC | NC | NC | NC | NC | ND | ND |
| Potato | 3 | 2 | 5.1 | 2.4 | 3.7 | 4.9 | ND | ND |
| Domestic fruit | 4 | 1 | 1.3 | 1.3 | 1.3 | 1.2 | ND | ND |
| Milk | 4 | 3 | 182.5 | 146.0 | 170.3 | 182.5 | ND | ND |
| Cattle meat | 1 | 1 | 8.4 | 8.4 | 8.4 | NA | ND | ND |
| Pig meat | NC | NC | NC | NC | NC | NC | ND | ND |
| Sheep meat | NC | NC | NC | NC | NC | NC | ND | ND |
| Poultry | NC | NC | NC | NC | NC | NC | ND | ND |
| Eggs | 4 | 2 | 2.4 | 1.1 | 1.7 | 2.3 | ND | ND |
| Wild/free foods | 2 | 2 | 0.2 | 0.1 | 0.1 | 0.2 | ND | ND |
| Rabbits/hares | NC | NC | NC | NC | NC | NC | ND | ND |
| Honey | NC | NC | NC | NC | NC | NC | ND | ND |
| Wild fungi | 1 | 1 | 0.2 | 0.2 | 0.2 | NA | ND | ND |
| Venison | NC | NC | NC | NC | NC | NC | ND | ND |
| Cereals | NC | NC | NC | NC | NC | NC | ND | ND |
| Freshwater fish | NC | NC | NC | NC | NC | NC | ND | ND |

ND = not determined
NC = not consumed
NA = not applicable

**Table 17. Summary of 1-year-old children's consumption rates in the Sellafield area (l $y^{-1}$)**

| Food group | Number of observations | Number of high-rate consumers | Observed maximum consumption rate for the high-rate group | Observed minimum consumption rate for the high-rate group | Observed mean consumption rate for the high-rate group | Observed 97.5th percentile consumption rate | Generic mean consumption rate | Generic 97.5th percentile consumption rate |
|---|---|---|---|---|---|---|---|---|
| Fish | NC | NC | NC | NC | NC | NC | ND | ND |
| Crustaceans | NC | NC | NC | NC | NC | NC | ND | ND |
| Molluscs | NC | NC | NC | NC | NC | NC | ND | ND |
| Wildfowl | NC | NC | NC | NC | NC | NC | ND | ND |
| Marine plants/algae | NC | NC | NC | NC | NC | NC | ND | ND |
| Green vegetables | NC | NC | NC | NC | NC | NC | ND | ND |
| Other vegetables | NC | NC | NC | NC | NC | NC | ND | ND |
| Root vegetables | NC | NC | NC | NC | NC | NC | ND | ND |
| Potato | NC | NC | NC | NC | NC | NC | ND | ND |
| Domestic fruit | NC | NC | NC | NC | NC | NC | ND | ND |
| Milk | 2 | 2 | 182.5 | 182.5 | 182.5 | 182.5 | ND | ND |
| Cattle meat | NC | NC | NC | NC | NC | NC | ND | ND |
| Pig meat | NC | NC | NC | NC | NC | NC | ND | ND |
| Sheep meat | NC | NC | NC | NC | NC | NC | ND | ND |
| Poultry | NC | NC | NC | NC | NC | NC | ND | ND |
| Eggs | NC | NC | NC | NC | NC | NC | ND | ND |
| Wild/free foods | NC | NC | NC | NC | NC | NC | ND | ND |
| Rabbits/hares | NC | NC | NC | NC | NC | NC | ND | ND |
| Honey | NC | NC | NC | NC | NC | NC | ND | ND |
| Wild fungi | NC | NC | NC | NC | NC | NC | ND | ND |
| Venison | NC | NC | NC | NC | NC | NC | ND | ND |
| Cereals | NC | NC | NC | NC | NC | NC | ND | ND |
| Freshwater fish | NC | NC | NC | NC | NC | NC | ND | ND |

ND = not determined
NC = not consumed

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **74** | **Whitehaven Harbour** | **Bait digging** | **156** | - | - | - | - | - | - |
| | **Parton and Whitehaven** | **Angling** | - | - | - | - | - | **416** | - |
| **152** | **Newbiggin Marsh and Carleton Marsh** | **Wildfowling** | **120** | - | - | - | - | - | - |
| **206** | **River Irt** | **Wildfowling** | **115** | - | - | - | - | - | - |
| **208** | **River Irt** | **Wildfowling** | **115** | - | - | - | - | - | - |
| **209** | **River Irt** | **Wildfowling** | **115** | - | - | - | - | - | - |
| **210** | **River Irt** | **Wildfowling** | **115** | - | - | - | - | - | - |
| 156 | Newbiggin Marsh and Carleton Marsh | Wildfowling | 42 | - | - | - | - | - | - |
| 199 | Eskmeals Ford | Walking | 10 | - | - | - | - | - | - |
| | Eskmeals | Walking | - | - | - | - | 46 | - | - |
| | | Angling and walking | - | - | - | - | - | 179 | - |
| 197 | Eskmeals Viaduct | Environmental monitoring | 6 | - | - | - | - | - | - |
| | River Esk at the ford near Waberthwaite Church | | - | - | - | - | 6 | - | - |
| 198 | Eskmeals Viaduct | Environmental monitoring | 6 | - | - | - | - | - | - |
| | River Esk at the ford near Waberthwaite Church | | - | - | - | - | 6 | - | - |
| **57** | **Drigg and Ravenglass** | **Bait digging and collecting mussels** | - | **942** | - | - | - | - | - |
| | **Braystones** | **Angling** | - | | - | - | - | **936** | - |
| **242** | **Eskmeals Nature Reserve** | **Nature reserve warden duties** | - | **520** | - | - | - | - | - |
| | | | - | - | - | - | **156** | - | - |
| **283** | **Ravenglass** | **Boat maintenance** | - | **472** | - | - | - | - | - |
| | **Saltcoats Marsh** | **Wildfowling** | - | - | - | - | **65** | - | - |
| **47** | **Parton** | **Walking** | - | **390** | - | - | - | - | - |
| 60 | Parton | Dog walking | - | 274 | - | - | - | - | - |
| 61 | Parton | Dog walking | - | 274 | - | - | - | - | - |
| 50 | Whitehaven Harbour | Bait digging | - | 240 | - | - | - | - | - |
| **64** | Whitehaven Harbour | Bait digging | - | 208 | - | - | - | - | - |
| | **Parton to St Bees and Sellafield** | **Angling** | - | - | - | - | - | **572** | - |
| **92** | Whitehaven Harbour | Bait digging | - | 182 | - | - | - | **455** | - |
| | **Parton, St Bees and Drigg** | **Angling** | - | - | - | - | - | - | - |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 59 | Parton | Dog walking | - | 182 | - | - | - | - | - |
| **72** | Whitehaven Harbour | Bait digging | - | 156 | - | - | - | - | - |
| | **Parton and Whitehaven** | **Angling** | - | - | - | - | - | **416** | - |
| 54 | Various locations | Walking | - | 150 | - | - | - | - | - |
| 211 | Saltcoats and the River Irt | Horse riding and collecting cockles | - | 138 | - | - | - | - | - |
| 223 | Eskmeals and Ravenglass Estuary | Bait digging and angling | - | 88 | - | - | - | - | - |
| **154** | Ravenglass | Bait digging | - | 80 | - | - | - | - | - |
| | Ravenglass | Collecting mussels | - | - | 20 | - | - | - | - |
| | Drigg | Bait digging | - | - | - | - | - | 100 | - |
| | **Braystones, Sellafield and Nethertown** | **Angling and collecting crabs** | - | - | - | - | - | - | **476** |
| 224 | Drigg | Bait digging | - | 52 | - | - | - | - | - |
| | Drigg | Angling | - | - | - | - | - | 156 | - |
| | Braystones | Angling | - | - | - | - | - | - | 156 |
| 195 | Saltcoats | Boat maintenance | - | 36 | - | - | - | - | - |
| 309 | Ravenglass and Drigg | Collecting mussels and bait digging | - | 25 | - | - | - | - | - |
| | Braystones to Drigg | Angling | - | - | - | - | - | 144 | - |
| | Seascale | Dog walking | - | - | - | - | - | - | 78 |
| **160** | Ravenglass | Collecting cockles | - | 24 | - | - | - | - | - |
| | **Ravenglass** | **Boat maintenance** | - | - | **380** | - | - | - | - |
| | **South of Whitehaven** | **Collecting winkles** | - | - | - | **20** | - | - | - |
| | Various locations | Angling | - | - | - | - | - | - | 120 |
| **161** | Ravenglass | Collecting cockles | - | 24 | - | - | - | - | - |
| | **Ravenglass** | **Boat maintenance** | - | - | **380** | - | - | - | - |
| | **South of Whitehaven** | **Collecting winkles** | - | - | - | **20** | - | - | - |
| | Various locations | Angling | - | - | - | - | - | - | 120 |
| 314 | Ravenglass | Collecting mussels | - | 24 | - | - | - | - | - |
| | Ravenglass | Dog walking | - | - | 130 | - | - | - | - |
| | St Bees and Drigg | Dog walking | - | - | - | - | - | 104 | - |
| | Seascale | Dog walking | - | - | - | - | - | - | 104 |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 315 | Ravenglass | Collecting mussels | - | 24 | - | - | - | - | - |
| | Ravenglass | Dog walking | - | - | 130 | - | - | - | - |
| | St Bees and Drigg | Dog walking | - | - | - | - | - | 104 | - |
| | Seascale | Dog walking | - | - | - | - | - | - | 104 |
| **168** | Ravenglass | Collecting cockles | - | 15 | - | - | - | - | - |
| | **Braystones** | **Setting nets and bait digging** | - | - | - | - | - | **606** | - |
| | **Ravenglass and Drigg** | **Collecting mussels** | - | - | - | - | - | - | **1043** |
| | **Parton to Drigg** | **Collecting winkles** | - | - | - | - | - | - | |
| | **St Bees to Drigg** | **Angling** | - | - | - | - | - | - | |
| 212 | River Irt | Collecting cockles | - | 8 | - | - | - | - | - |
| 213 | River Irt | Collecting cockles | - | 8 | - | - | - | - | - |
| **108** | **Ravenglass** | **Boat maintenance** | - | - | **720** | - | - | - | - |
| **110** | **Ravenglass** | **Boat maintenance** | - | - | **720** | - | - | - | - |
| **97** | **Ravenglass** | **Dog walking** | - | - | **350** | - | - | - | - |
| 221 | Ravenglass | Walking | - | - | 32 | - | - | - | - |
| | Drigg | Walking | - | - | - | - | - | 24 | |
| | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 217 | Ravenglass | Walking | - | - | 10 | - | - | - | - |
| 218 | Ravenglass | Walking | - | - | 10 | - | - | - | - |
| 98 | Ravenglass | Walking | - | - | 6 | - | - | - | - |
| 99 | Ravenglass | Walking | - | - | 6 | - | - | - | - |
| 101 | Ravenglass | Dog walking | - | - | 2 | - | - | - | - |
| 102 | Ravenglass | Dog walking | - | - | 2 | - | - | - | - |
| **307** | **Parton** | **Angling** | - | - | - | **50** | - | - | - |
| | **St Bees and Drigg** | **Dog walking and angling** | - | - | - | - | - | **518** | - |
| 231 | Eskmeals Nature Reserve | Nature reserve warden duties | - | - | - | - | 6 | - | - |
| | | | - | - | - | - | - | 36 | - |
| 394 | Seascale | Walking | - | - | - | - | 2 | - | - |
| | | | - | - | - | - | - | 2 | - |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **412** | **Seascale** | **Dog walking** | - | - | - | - | - | **912** | - |
| **413** | **Seascale** | **Dog walking** | - | - | - | - | - | **912** | - |
| **414** | **Seascale** | **Dog walking** | - | - | - | - | - | **912** | - |
| **117** | **Braystones** | **Setting nets, bait digging and collecting razor shells** | - | - | - | - | - | **856** | - |
| | **Braystones and Sellafield** | **Angling, collecting crabs, playing and walking** | - | - | - | - | - | - | **450** |
| **410** | **Seascale** | **Dog walking** | - | - | - | - | - | **730** | - |
| **411** | **Seascale** | **Dog walking** | - | - | - | - | - | **730** | - |
| **66** | **Parton, St Bees, Drigg and Sellafield** | **Angling** | - | - | - | - | - | **650** | - |
| **70** | **Parton, St Bees, Drigg and Sellafield** | **Angling** | - | - | - | - | - | **650** | - |
| **62** | **Various locations** | **Beach combing** | - | - | - | - | - | **444** | - |
| **53** | **St Bees** | **Dog walking** | - | - | - | - | - | **365** | - |
| **184** | **Seascale** | **Dog walking** | - | - | - | - | - | **365** | - |
| **225** | **Drigg** | **Dog walking** | - | - | - | - | - | **340** | - |
| **226** | **Drigg** | **Dog walking** | - | - | - | - | - | **340** | - |
| 327 | Seascale to Sellafield | Walking | - | - | - | - | - | 260 | - |
| 194 | Seascale to Ravenglass | Dog walking | - | - | - | - | - | 256 | - |
| 385 | St Bees and Seascale | Walking | - | - | - | - | - | 232 | - |
| 329 | St Bees, Seascale and Drigg | Dog walking | - | - | - | - | - | 221 | - |
| 205 | Drigg | Dog walking | - | - | - | - | - | 208 | - |
| 51 | St Bees | Dog walking | - | - | - | - | - | 182 | - |
| 52 | St Bees | Dog walking | - | - | - | - | - | 182 | - |
| 118 | Braystones | Setting nets and bait digging | - | - | - | - | - | 158 | - |
| | Braystones | Collecting crabs, playing and angling | - | - | - | - | - | - | 127 |
| 169 | Braystones | Setting nets | - | - | - | - | - | 156 | - |
| | St Bees to Drigg, and Braystones | Angling and playing | - | - | - | - | - | - | 344 |
| 180 | Seascale | Dog walking | - | - | - | - | - | 156 | - |
| 181 | Seascale | Dog walking | - | - | - | - | - | 156 | - |
| 95 | Lower reaches of River Ehen | Angling | - | - | - | - | - | 112 | - |
| | Braystones | Walking | - | - | - | - | - | - | 28 |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 306 | Drigg | Dog walking | - | - | - | - | - | 104 | - |
| 378 | Drigg | Dog walking | - | - | - | - | - | 104 | - |
| 384 | Seascale | Dog walking | - | - | - | - | - | 78 | - |
| **144** | Seascale and Drigg | Bait digging | - | - | - | - | - | 73 | - |
| | **Drigg to Coulderton** | **Angling** | - | - | - | - | - | - | **546** |
| 361 | Seascale | Walking | - | - | - | - | - | 68 | - |
| 141 | Eskmeals | Bait digging | - | - | - | - | - | 52 | - |
| | Sellafield | Collecting crabs | - | - | - | - | - | - | 194 |
| | Seascale and Drigg | Angling | - | - | - | - | - | - | |
| 143 | Eskmeals | Bait digging | - | - | - | - | - | 52 | - |
| | Sellafield | Collecting crabs | - | - | - | - | - | - | 194 |
| | Seascale and Drigg | Angling | - | - | - | - | - | - | |
| 40 | Drigg | Angling | - | - | - | - | - | 42 | - |
| 334 | St Bees and Seascale | Dog walking | - | - | - | - | - | 39 | - |
| 335 | St Bees and Seascale | Dog walking | - | - | - | - | - | 39 | - |
| 356 | Seascale | Walking | - | - | - | - | - | 36 | - |
| 148 | St Bees | Playing | - | - | - | - | - | 25 | - |
| | Coulderton, and various locations | Beach combing and walking | - | - | - | - | - | - | 24 |
| 149 | St Bees | Playing | - | - | - | - | - | 25 | - |
| | Coulderton, and various locations | Beach combing and walking | - | - | - | - | - | - | 24 |
| 185 | Drigg | Dog walking | - | - | - | - | - | 24 | - |
| 186 | Drigg | Dog walking | - | - | - | - | - | 24 | - |
| 375 | Seascale and Drigg | Walking | - | - | - | - | - | 24 | - |
| 376 | Seascale and Drigg | Walking | - | - | - | - | - | 24 | - |
| 404 | St Bees | Walking | - | - | - | - | - | 24 | - |
| 405 | St Bees | Walking | - | - | - | - | - | 24 | - |
| 391 | Drigg | Dog walking | - | - | - | - | - | 22 | - |
| 215 | Various locations | Walking | - | - | - | - | - | 21 | - |
| 216 | Various locations | Walking | - | - | - | - | - | 21 | - |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 338 | Seascale to Drigg | Dog walking | - | - | - | - | - | 18 | - |
| 137 | Braystones | Bait digging | - | - | - | - | - | 12 | - |
| | Coulderton | Collecting crabs | - | - | - | - | - | - | 132 |
| | Various locations | Angling | - | - | - | - | - | - | |
| 387 | Seascale | Walking | - | - | - | - | - | 12 | - |
| 318 | Seascale | Walking | - | - | - | - | - | 11 | - |
| 319 | Seascale | Walking | - | - | - | - | - | 11 | - |
| 326 | Seascale | Walking | - | - | - | - | - | 11 | - |
| 192 | Seascale | Walking | - | - | - | - | - | 7 | - |
| 193 | Seascale | Walking | - | - | - | - | - | 7 | - |
| 316 | Seascale | Dog walking | - | - | - | - | - | 7 | - |
| 317 | Seascale | Dog walking | - | - | - | - | - | 7 | - |
| 368 | Seascale | Walking | - | - | - | - | - | 6 | - |
| 310 | Drigg | Nature watching | - | - | - | - | - | 5 | - |
| 311 | Drigg | Nature watching | - | - | - | - | - | 5 | - |
| 312 | Drigg | Nature watching | - | - | - | - | - | 5 | - |
| 313 | Drigg | Nature watching | - | - | - | - | - | 5 | - |
| 393 | Seascale | Walking | - | - | - | - | - | 5 | - |
| 383 | Seascale | Dog walking | - | - | - | - | - | 4 | - |
| 320 | Seascale | Walking | - | - | - | - | - | 3 | - |
| 321 | Seascale | Walking | - | - | - | - | - | 3 | - |
| 322 | Seascale | Walking | - | - | - | - | - | 3 | - |
| 344 | Seascale | Walking | - | - | - | - | - | 3 | - |
| 323 | Seascale | Walking | - | - | - | - | - | 2 | - |
| | St Bees, Seascale and Eskmeals | Kite flying | - | - | - | - | - | - | 128 |
| 324 | Seascale | Walking | - | - | - | - | - | 2 | - |
| | St Bees, Seascale and Eskmeals | Kite flying | - | - | - | - | - | - | 128 |
| 392 | Seamill | Walking | - | - | - | - | - | 2 | - |
| 395 | Seascale | Walking | - | - | - | - | - | 2 | - |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| **200** | **Eskmeals** | **Dog walking** | - | - | - | - | - | - | **730** |
| **128** | **Seascale** | **Dog walking** | - | - | - | - | - | - | **548** |
| **115** | **Coulderton** | **Angling** | - | - | - | - | - | - | **520** |
| **107** | **Seascale** | **Dog walking** | - | - | - | - | - | - | **503** |
| **127** | **Seascale** | **Dog walking** | - | - | - | - | - | - | **469** |
| **126** | **Seascale** | **Dog walking** | - | - | - | - | - | - | **365** |
| 146 | Seascale | Dog walking | - | - | - | - | - | - | 330 |
| 147 | Seascale | Dog walking | - | - | - | - | - | - | 264 |
| 201 | Eskmeals | Walking | - | - | - | - | - | - | 156 |
| 202 | Eskmeals | Walking | - | - | - | - | - | - | 156 |
| 103 | Seascale | Beach combing | - | - | - | - | - | - | 150 |
| 104 | Seascale | Beach combing | - | - | - | - | - | - | 150 |
| 105 | Seascale | Dog walking | - | - | - | - | - | - | 143 |
| 203 | Eskmeals | Walking | - | - | - | - | - | - | 137 |
| 132 | Braystones | Dog walking | - | - | - | - | - | - | 130 |
| 133 | Seascale | Playing | - | - | - | - | - | - | 130 |
| 131 | Braystones | Dog walking | - | - | - | - | - | - | 104 |
| 135 | Seascale | Playing | - | - | - | - | - | - | 52 |
| 415 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 416 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 417 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 418 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 419 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 420 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 421 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 422 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 423 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 424 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 425 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |

**Table 18. Adults' intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Rock | Salt marsh | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|---|---|
| 426 | Drigg and Eskmeals | Litter collecting | - | - | - | - | - | - | 33 |
| 129 | Seascale | Dog walking | - | - | - | - | - | - | 26 |
| 96 | Braystones | Walking | - | - | - | - | - | - | 21 |
| 106 | Seascale | Walking | - | - | - | - | - | - | 12 |
| 222 | Eskmeals | Walking | - | - | - | - | - | - | 11 |
| 46 | St Bees | Collecting mussels | - | - | - | - | - | - | 10 |
| 130 | Braystones | Dog walking | - | - | - | - | - | - | 9 |
| 204 | Eskmeals | Walking | - | - | - | - | - | - | 5 |
| 279 | Drigg | Collecting winkles | - | - | - | - | - | - | 3 |
| 112 | Coulderton | Collecting winkles | - | - | - | - | - | - | 1 |
| 123 | Drigg | Collecting mussels | - | - | - | - | - | - | 1 |

**Notes**

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud based on 6 high-rate observations is 123 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 10 observations for mud is 148 h $y^{-1}$

The mean intertidal occupancy rate over mud and sand based on 4 high-rate observations is 581 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 25 observations for mud and sand is 689 h $y^{-1}$

The mean intertidal occupancy rate over mud, sand and stones based on 5 high-rate observations is 510 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 15 observations for mud, sand and stones is 720 h $y^{-1}$

The mean intertidal occupancy rate over rock based on 3 high-rate observations is 30 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations for rock is 49 h $y^{-1}$

The mean intertidal occupancy rate over salt marsh based on 2 high-rate observations is 111 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 7 observations for salt marsh is 142 h $y^{-1}$

The mean intertidal occupancy rate over sand based on 20 high-rate observations is 606 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 88 observations for sand is 912 h $y^{-1}$

The mean intertidal occupancy rate over sand and stones based on 10 high-rate observations is 565 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 61 observations for sand and stones is 639 h $y^{-1}$

**Table 19. Children's intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Location | Activity | Mud and sand | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|
| **214** | **16** | **Saltcoats and the River Irt** | **Horse riding and collecting cockles** | **138** | **-** | **-** | **-** |
| **331** | **13** | **St Bees, Seascale and Drigg** | **Dog walking** | **-** | **-** | **221** | **-** |
| **389** | **13** | **Seascale** | **Walking** | **-** | **-** | **156** | **-** |
| **388** | **15** | **Seascale** | **Walking** | **-** | **-** | **156** | **-** |
| 406 | 13 | St Bees | Walking | - | - | 24 | - |
| **170** | **12** | **Braystones** | **Playing** | **-** | **-** | **-** | **258** |

**Notes**

Emboldened observations are the high-rate individuals

The intertidal occupancy rate over mud and sand based on the only observation is 138 h $y^{-1}$

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

The mean intertidal occupancy rate over sand based on 3 high-rate observations is 178 h $y^{-1}$

The observed 97.5th percentile rate based on 4 observations for sand is 216 h $y^{-1}$

The intertidal occupancy rate over sand and stones based on the only observation is 258 h $y^{-1}$

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

**10-year-old age group**

| Observation number | Age | Location | Activity | Mud and sand | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|
| **332** | **11** | **St Bees, Seascale and Drigg** | **Dog walking** | **-** | **-** | **221** | **-** |
| 362 | 10 | Seascale | Walking | - | - | 68 | - |
| 363 | 8 | Seascale | Walking | - | - | 68 | - |
| 379 | 8 | Drigg | Dog walking | - | - | 24 | - |
| 407 | 8 | St Bees | Walking | - | - | 24 | - |
| **172** | **8** | **Braystones** | **Playing** | **-** | **-** | **-** | **478** |
| | | **Parton to Drigg** | **Collecting winkles** | **-** | **-** | **-** | |
| | | **St Bees to Drigg** | **Angling** | **-** | **-** | **-** | |
| **171** | **10** | **Braystones** | **Playing** | **-** | **-** | **-** | **258** |

**Notes**

Emboldened observations are the high-rate individuals

The intertidal occupancy rate over sand based on the only high-rate observation is 221 h $y^{-1}$

The observed 97.5th percentile rate based on 5 observations for sand is 206 h $y^{-1}$

The mean intertidal occupancy rate over sand and stones based on 2 high-rate observations is 368 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations for sand and stones is 473 h $y^{-1}$

**Table 19. Children's intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

**5-year-old age group**

| Observation number | Age | Location | Activity | Mud and sand | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|
| **220** | **5** | **Ravenglass** | **Walking** | **-** | **10** | **-** | **-** |
| **219** | **3** | **Ravenglass** | **Walking** | **-** | **10** | **-** | **-** |
| **100** | **5** | **Ravenglass** | **Walking** | **-** | **6** | **-** | **-** |
| **333** | **3** | **St Bees, Seascale and Drigg** | **Dog walking** | **-** | **-** | **221** | **-** |
| 364 | 6 | Seascale | Walking | - | - | 68 | - |
| 336 | 4 | St Bees and Seascale | Dog walking | - | - | 39 | - |
| 150 | 5 | St Bees | Playing | - | - | 25 | - |
| | | Coulderton | Beach combing | - | - | - | 24 |
| | | Various locations | Walking | - | - | - | |
| 151 | 3 | St Bees | Playing | - | - | 25 | - |
| | | Coulderton | Beach combing | - | - | - | 24 |
| | | Various locations | Walking | | | | |
| 371 | 6 | Seascale | Walking | - | - | 6 | - |
| 372 | 2 | Seascale | Walking | - | - | 6 | - |
| **173** | **5** | **Braystones** | **Playing** | **-** | **-** | **-** | **387** |
| | | **St Bees to Drigg** | **Angling** | **-** | **-** | **-** | |
| 136 | 2 | Seascale | Playing | - | - | - | 52 |
| 119 | 6 | Braystones | Playing | - | - | - | 24 |
| 120 | 5 | Braystones | Playing | - | - | - | 24 |
| 121 | 4 | Braystones | Playing | - | - | - | 24 |
| 122 | 4 | Braystones | Playing | - | - | - | 24 |

**Notes**

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud, sand and stones based on 3 high-rate observations is 9 h $y^{-1}$

The observed 97.5th percentile rate based on 3 observations for mud, sand and stones is 10 h $y^{-1}$

The intertidal occupancy rate over sand based on the only high-rate observation is 221 h $y^{-1}$

The observed 97.5th percentile rate based on 7 observations for sand is 198 h $y^{-1}$

The intertidal occupancy rate over sand and stones based on the only high-rate observation is 387 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 8 observations for sand and stones is 328 h $y^{-1}$

**1-year-old age group**

| Observation number | Age | Location | Activity | Mud and sand | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|
| **337** | **1** | **St Bees and Seascale** | **Dog walking** | **-** | **-** | **39** | **-** |
| 373 | 1 | Seascale | Walking | - | - | 6 | - |
| **134** | **1** | **Seascale** | **Playing** | **-** | **-** | **-** | **130** |

**Notes**

Emboldened observations are the high-rate individuals

The intertidal occupancy rate over sand based on the only high-rate observation is 39 h $y^{-1}$

The observed 97.5th percentile rate based on 2 observations for sand is 38 h $y^{-1}$

The intertidal occupancy rate over sand and stones based on the only observation is 130 h $y^{-1}$

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

**Table 19. Children's intertidal occupancy rates in the Sellafield area (h $y^{-1}$)**

**3-month-old age group**

| Observation number | Age | Location | Activity | Mud and sand | Mud, sand and stones | Sand | Sand and stones |
|---|---|---|---|---|---|---|---|
| **325** | **0.1** | **Seascale** | **Playing** | **-** | **-** | **2** | **-** |

**Notes**

The emboldened observation is the high-rate individual

The intertidal occupancy rate over sand based on the only observation is 2 h $y^{-1}$

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

**Table 20. Gamma dose rate measurements over intertidal substrates in the Sellafield area (µGy $h^{-1}$)**

| Location | NGR | Substrate | Gamma dose rate at 1 metre[a] |
|---|---|---|---|
| Parton | NX 977 208 | Mud and sand, with boulders nearby | 0.132 |
| Parton | NX 977 207 | Mud and sand, with boulders nearby | 0.128 |
| Whitehaven outer harbour | NX 968 185 | Mud and sand | 0.103 |
| Coulderton | NX 981 085 | Sand | 0.067 |
| Coulderton | NX 980 085 | Sand and stones, with boulders nearby | 0.091 |
| Nethertown | NX 988 072 | Sand and stones, with boulders nearby | 0.089 |
| Braystones | NX 999 059 | Sand | 0.061 |
| Seascale | NY 036 009 | Sand | 0.069 |
| Drigg | SD 047 984 | Sand | 0.087 |
| Saltcoats | SD 079 967 | Mud and sand | 0.106 |
| Near the ford at Saltcoats | SD 082 966 | Mud | 0.096 |
| Ravenglass, near fishing boats | SD 083 962 | Mud and sand | 0.076 |
| River Esk at the ford near Waberthwaite Church | SD 099 950 | Salt marsh | 0.127 |
| Eskmeals Viaduct | SD 087 942 | Mud | 0.160 |
| Eskmeals Viaduct | SD 087 942 | Mud | 0.111 |
| Eskmeals Viaduct | SD 087 943 | Salt marsh | 0.123 |
| Eskmeals | SD 076 902 | Sand | 0.078 |
| Eskmeals | SD 075 901 | Sand and stones | 0.105 |

**Notes**

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

**Table 21. Adults' handling rates of fishing gear and sediment in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Fishing gear | Sediment |
|---|---|---|---|---|
| **160** | **Off Ravenglass** | **Handling pots and set nets** | **1200** | - |
| | Ravenglass | Collecting cockles | - | 44 |
| | South of Whitehaven | Collecting winkles | - | |
| **161** | **Off Ravenglass** | **Handling pots and set nets** | **1200** | - |
| | Ravenglass | Collecting cockles | **-** | 44 |
| | South of Whitehaven | Collecting winkles | **-** | |
| **77** | **Various locations** | **Handling trawl gear** | **1200** | - |
| **78** | **Various locations** | **Handling trawl gear** | **1200** | - |
| **75** | **Various locations** | **Handling trawl gear** | **1104** | - |
| **76** | **Various locations** | **Handling trawl gear** | **1104** | - |
| **108** | **Off Ravenglass** | **Handling pots** | **1089** | - |
| **110** | **Off Ravenglass** | **Handling pots** | **1089** | - |
| **117** | **Braystones** | **Handling set nets** | **620** | - |
| | Braystones | Bait digging, collecting crabs and razor shells | **-** | 308 |
| **168** | **Braystones** | **Handling set nets** | **520** | - |
| | **Braystones** | **Bait digging** | **-** | **972** |
| | **Parton to Drigg** | **Collecting winkles** | **-** | |
| | **Ravenglass** | **Collecting cockles and mussels** | **-** | |
| **123** | **Various locations** | **Handling pots and set nets** | **400** | - |
| | Drigg | Collecting mussels | **-** | 1 |
| 118 | Braystones | Handling set nets | 155 | - |
| | Braystones | Bait digging and collecting crabs | - | 5 |
| 144 | Off Seascale | Handling pots | 65 | - |
| | Seascale and Drigg | Bait digging | - | 73 |
| 66 | Off Parton | Handling pots | 60 | - |
| 115 | Off Coulderton | Handling pots | 42 | - |
| 112 | Off Coulderton | Handling pots | 42 | - |
| | Coulderton | Collecting winkles | - | 1 |
| 47 | Off Parton | Handling pots | 30 | - |
| 227 | Ravenglass | Handling dredge gear | 30 | - |
| 228 | Ravenglass | Handling dredge gear | 30 | - |
| 229 | Ravenglass | Handling dredge gear | 30 | - |

**Table 21. Adults' handling rates of fishing gear and sediment in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Fishing gear | Sediment |
|---|---|---|---|---|
| 230 | Ravenglass | Handling dredge gear | 30 | - |
| **57** | **Drigg** | **Bait digging** | - | **942** |
| | **Ravenglass** | **Collecting mussels** | - | |
| 154 | Drigg | Bait digging | - | 260 |
| | Nethertown | Collecting crabs | - | |
| | Ravenglass | Collecting mussels | - | |
| 50 | Whitehaven harbour | Bait digging | - | 240 |
| 64 | Whitehaven harbour | Bait digging | - | 208 |
| 92 | Whitehaven harbour | Bait digging | - | 182 |
| 72 | Whitehaven harbour | Bait digging | - | 156 |
| 74 | Whitehaven harbour | Bait digging | - | 156 |
| 152 | Newbiggin Marsh and Carleton Marsh | Wildfowling | - | 120 |
| 206 | River Irt | Wildfowling | - | 115 |
| 208 | River Irt | Wildfowling | - | 115 |
| 209 | River Irt | Wildfowling | - | 115 |
| 210 | River Irt | Wildfowling | - | 115 |
| 223 | Eskmeals | Bait digging | - | 72 |
| 283 | Saltcoats Marsh | Wildfowling | - | 65 |
| 141 | Eskmeals | Bait digging | - | 64 |
| | Sellafield | Collecting crabs | - | |
| 143 | Eskmeals | Bait digging | - | 64 |
| | Sellafield | Collecting crabs | - | |
| 224 | Drigg | Bait digging | - | 52 |
| 156 | Newbiggin Marsh and Carleton Marsh | Wildfowling | - | 42 |
| 309 | Drigg | Bait digging | - | 25 |
| | Ravenglass | Collecting mussels | - | |
| 137 | Braystones | Bait digging | - | 24 |
| | Coulderton | Collecting crabs | - | |
| 314 | Ravenglass | Collecting mussels | - | 24 |
| 315 | Ravenglass | Collecting mussels | - | 24 |
| 46 | St Bees | Collecting mussels | - | 10 |
| 211 | River Irt | Collecting cockles | - | 8 |

**Table 21. Adults' handling rates of fishing gear and sediment in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | Fishing gear | Sediment |
|---|---|---|---|---|
| 212 | River Irt | Collecting cockles | - | 8 |
| 213 | River Irt | Collecting cockles | - | 8 |
| 279 | Drigg | Collecting winkles | - | 3 |

**Notes**

Emboldened observations are the high-rate individuals

The mean fishing gear handling rate based on 11 high-rate observations is 975 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate for fishing gear based on 20 observations is 1200 h $y^{-1}$

The mean sediment handling rate based on 2 high-rate observations is 957 h $y^{-1}$

The observed 97.5$^{th}$ percentile rate for sediment based on 35 observations is 947 h $y^{-1}$

**Table 22. Children's handling rates of sediment in the Sellafield area (h $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Location | Activity | Sediment |
|---|---|---|---|---|
| **214** | **16** | **River Irt** | **Collecting cockles** | **8** |

**Notes**
The emboldened observation is the high-rate individual
The sediment handling rate based on the only observation is 8 h $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**10-year-old age group**

| Observation number | Age | Location | Activity | Sediment |
|---|---|---|---|---|
| **172** | **8** | **Parton to Drigg** | **Collecting winkles** | **110** |

**Notes**
The emboldened observation is the high-rate individual
The sediment handling rate based on the only observation is 110 h $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 23. Adults' intertidal occupancy rates in the Ravenglass Estuary, for consideration in the assessment of inadvertent inhalation and ingestion of sediment (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Salt marsh |
|---|---|---|---|---|---|---|
| 152 | Newbiggin Marsh and Carleton Marsh | Wildfowling | 120 | - | - | - |
| 206 | River Irt | Wildfowling | 115 | - | - | - |
| 208 | River Irt | Wildfowling | 115 | - | - | - |
| 209 | River Irt | Wildfowling | 115 | - | - | - |
| 210 | River Irt | Wildfowling | 115 | - | - | - |
| 156 | Newbiggin Marsh and Carleton Marsh | Wildfowling | 42 | - | - | - |
| 197 | Eskmeals Viaduct and River Esk at the ford near Waberthwaite Church | Environmental monitoring | 6 | - | - | - |
| 198 | Eskmeals Viaduct and River Esk at the ford near Waberthwaite Church | Environmental monitoring | 6 | - | - | - |
| 199 | Eskmeals Ford | Walking | 10 | - | - | 46 |
| 242 | Eskmeals Nature Reserve | Nature reserve warden duties | - | 520 | - | 156 |
| 283 | Ravenglass | Boat maintenance | - | 472 | - | - |
| | Saltcoats Marsh | Wildfowling | - | - | - | 65 |
| 211 | Saltcoats and the River Irt | Horse riding and collecting cockles | - | 138 | - | - |
| 154 | Ravenglass | Bait digging | - | 80 | - | - |
| | | Collecting mussels | - | - | 20 | - |
| 315 | Ravenglass | Collecting mussels | - | 25 | - | - |
| | | Dog walking | - | - | 130 | - |
| 160 | Ravenglass | Collecting cockles | - | 24 | - | - |
| | | Boat maintenance | - | - | 380 | - |
| 161 | Ravenglass | Collecting cockles | - | 24 | - | - |
| 161 | Ravenglass | Boat maintenance | - | - | 380 | - |
| 314 | Ravenglass | Collecting mussels | - | 24 | - | - |
| | | Dog walking | - | - | 130 | - |
| 223 | Ravenglass Estuary | Angling | - | 16 | - | - |
| 168 | Ravenglass | Collecting cockles | - | 15 | - | - |
| 212 | River Irt | Collecting cockles | - | 8 | - | - |
| 213 | River Irt | Collecting cockles | - | 8 | - | - |
| 309 | Ravenglass | Collecting mussels | - | 1 | - | - |
| 108 | Ravenglass | Boat maintenance | - | - | 720 | - |

**Table 23. Adults' intertidal occupancy rates in the Ravenglass Estuary, for consideration in the assessment of inadvertent inhalation and ingestion of sediment (h $y^{-1}$)**

| Observation number | Location | Activity | Mud | Mud and sand | Mud, sand and stones | Salt marsh |
|---|---|---|---|---|---|---|
| 110 | Ravenglass | Boat maintenance | - | - | 720 | - |
| 97 | Ravenglass | Dog walking | - | - | 350 | - |
| 221 | Ravenglass | Walking | - | - | 32 | - |
| 217 | Ravenglass | Walking | - | - | 10 | - |
| 218 | Ravenglass | Walking | - | - | 10 | - |
| 98 | Ravenglass | Walking | - | - | 6 | - |
| 99 | Ravenglass | Walking | - | - | 6 | - |
| 101 | Ravenglass | Dog walking | - | - | 2 | - |
| 102 | Ravenglass | Dog walking | - | - | 2 | - |
| 231 | Eskmeals Nature Reserve | Nature reserve warden duties | - | - | - | 6 |

**Notes**

These intertidal occupancy rates have been extracted from Table 18, and are presented separately for consideration in dose assessments

**Table 24. Children's intertidal occupancy rates in the Ravenglass Estuary for consideration in the assessment of inadvertent inhalation and ingestion of sediment (h $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Location | Activity | Mud and sand |
|---|---|---|---|---|
| 214 | 16 | Saltcoats | Horse riding | 130 |
| | | River Irt | Collecting cockles | 8 |

**5-year-old age group**

| Observation number | Age | Location | Activity | Mud, sand and stones |
|---|---|---|---|---|
| 220 | 5 | Ravenglass | Walking | 10 |
| 219 | 3 | Ravenglass | Walking | 10 |
| 100 | 5 | Ravenglass | Walking | 6 |

**Notes**

These intertidal occupancy rates have been extracted from Table 19, and are presented separately for consideration in dose assessments

**Table 25. Adults' occupancy rates in and on water in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | In water | On water |
|---|---|---|---|---|
| 361 | Seascale | Swimming | 56 | - |
| 299 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 300 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 301 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 302 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 303 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 304 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 305 | Whitehaven | Swimming | 36 | - |
| | | Rowing and sailing | - | 40 |
| 259 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 260 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 261 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 262 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 263 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 264 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 265 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 266 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 267 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 268 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 269 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 270 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 271 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 272 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 273 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 274 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 275 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 276 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |

**Table 25. Adults' occupancy rates in and on water in the Sellafield area (h $y^{-1}$)**

| Observation number | Location | Activity | In water | On water |
|---|---|---|---|---|
| 277 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 278 | St Bees Head | Diving | 33 | - |
| | Parton, St Bees and Seascale | On a dive boat | - | 25 |
| 75 | Various locations | Trawling | - | 1656 |
| 76 | Various locations | Trawling | - | 1656 |
| 77 | Various locations | Trawling | - | 1350 |
| 78 | Various locations | Trawling | - | 1350 |
| 115 | Coulderton | Push netting, angling and potting | - | 1328 |
| | Various locations | Charter boat skipper | | |
| 160 | Off Ravenglass | Potting and setting nets | - | 1000 |
| 161 | Off Ravenglass | Potting and setting nets | - | 1000 |
| 112 | Off Coulderton | Potting and angling | - | 646 |
| 123 | Various | Potting and setting nets | - | 600 |
| 144 | Off Seascale | Potting and angling | - | 582 |
| 108 | Off Ravenglass | Potting | - | 553 |
| 110 | Off Ravenglass | Potting | - | 553 |
| 227 | Ravenglass | Mussel dredging | - | 288 |
| 228 | Ravenglass | Mussel dredging | - | 288 |
| 229 | Ravenglass | Mussel dredging | - | 288 |
| 230 | Ravenglass | Mussel dredging | - | 288 |
| 80 | Various locations | Sailing | - | 286 |
| 82 | Various locations | Sailing | - | 286 |
| 83 | Various locations | Sailing | - | 286 |
| 84 | Various locations | Sailing | - | 286 |
| 85 | Various locations | Sailing | - | 286 |
| 86 | Various locations | Sailing | - | 286 |
| 87 | Various locations | Sailing | - | 286 |
| 88 | Various locations | Sailing | - | 286 |
| 89 | Various locations | Sailing | - | 286 |
| 90 | Various locations | Sailing | - | 286 |
| 91 | Various locations | Sailing | - | 286 |
| 195 | Off Saltcoats | Angling | - | 240 |
| 47 | Off Parton | Potting | - | 60 |
| 66 | Off Parton | Potting | - | 60 |
| 232 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 233 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 234 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 235 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 236 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 237 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 238 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 239 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 240 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 241 | Bees to Whitehaven and Ravenglass Estu | Canoeing | - | 38 |
| 247 | Rivers Esk, Irt and Mite | Canoeing | - | 32 |
| 183 | Seascale | Angling | - | 12 |
| 184 | Seascale | Angling | - | 12 |
| 248 | Rivers Esk, Irt and Mite | Canoeing | - | 12 |
| 249 | Rivers Esk, Irt and Mite | Canoeing | - | 12 |

**Table 26. Children's occupancy rates in and on water in the Sellafield area (h $y^{-1}$)**

| Observation number | Age | Location | Activity | In water | On water |
|---|---|---|---|---|---|
| **15-year-old age group** | | | | | |
| 291 | 12 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 292 | 12 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 293 | 13 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 294 | 13 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 295 | 15 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 296 | 15 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 297 | 15 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 298 | 15 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 331 | 13 | St Bees | Swimming | 24 | - |
| **10-year-old age group** | | | | | |
| 362 | 10 | Seascale | Swimming | 56 | - |
| 363 | 8 | Seascale | Swimming | 56 | - |
| 287 | 10 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 288 | 10 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 289 | 11 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 290 | 11 | Whitehaven | Swimming | 36 | - |
| | | | Rowing and sailing | - | 40 |
| 332 | 11 | St Bees | Swimming | 24 | - |
| **5-year-old age group** | | | | | |
| 364 | 6 | Seascale | Swimming | 56 | - |
| 333 | 3 | St Bees | Swimming | 24 | - |

**Table 27. Adults' consumption rates of green vegetables in the Sellafield area (kg $y^{-1}$)**

| Observation number | Artichoke | Asparagus | Broccoli | Brussels sprout | Cabbage | Cauliflower | Chard | Courgette | Cucumber | Herbs | Kale | Lettuce | Rocket | Spinach | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **351** | **-** | **-** | **15.3** | **2.5** | **15.3** | **9.2** | **1.4** | **5.0** | **-** | **0.1** | **2.5** | **-** | **-** | **0.8** | **52.0** |
| **352** | **-** | **-** | **15.3** | **2.5** | **15.3** | **9.2** | **1.4** | **5.0** | **-** | **0.1** | **2.5** | **-** | **-** | **0.8** | **52.0** |
| **12** | **13.6** | **2.3** | **4.1** | **5.5** | **2.6** | **6.1** | **-** | **5.5** | **-** | **-** | **-** | **-** | **-** | **-** | **39.6** |
| **13** | **13.6** | **2.3** | **4.1** | **5.5** | **2.6** | **6.1** | **-** | **5.5** | **-** | **-** | **-** | **-** | **-** | **-** | **39.6** |
| **187** | **-** | **-** | **-** | **8.2** | **-** | **-** | **-** | **5.5** | **5.1** | **-** | **-** | **1.5** | **-** | **-** | **20.3** |
| 14 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 15 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 16 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 17 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 18 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 19 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 20 | - | - | - | - | 14.7 | - | - | - | - | - | - | - | - | - | 14.7 |
| 279 | - | - | - | - | 7.9 | 0.8 | - | - | - | - | - | - | - | - | 8.7 |
| 280 | - | - | - | - | 7.9 | 0.8 | - | - | - | - | - | - | - | - | 8.7 |
| 117 | - | - | 1.5 | - | - | - | - | 1.5 | - | - | - | 1.3 | 1.3 | 1.5 | 7.0 |
| 118 | - | - | 1.5 | - | - | - | - | 1.5 | - | - | - | 1.3 | 1.3 | 1.5 | 7.0 |
| 409 | - | - | - | - | 5.0 | - | - | - | - | - | - | 2.0 | - | - | 7.0 |
| 377 | - | - | - | - | - | - | - | - | 4.5 | 0.2 | - | 0.8 | 0.4 | - | 5.9 |
| 378 | - | - | - | - | - | - | - | - | 4.5 | 0.2 | - | 0.8 | 0.4 | - | 5.9 |
| 329 | - | - | - | - | - | - | - | - | 3.4 | 0.2 | - | 1.7 | - | - | 5.2 |
| 183 | - | - | 4.5 | - | - | - | - | - | - | - | - | - | - | - | 4.5 |
| 404 | - | - | - | - | - | - | - | - | - | - | - | 4.0 | - | - | 4.0 |
| 184 | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | 2.3 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables based on the 5 high-rate adult consumers is 40.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 23 observations is 52.0 kg $y^{-1}$

**Table 28. Adults' consumption rates of other vegetables in the Sellafield area (kg $y^{-1}$)**

| Observation number | Aubergine | Broad bean | Chilli pepper | French bean | Pea | Pepper | Pumpkin | Runner bean | Squash | Sweetcorn | Tomato | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **-** | **3.4** | **2.7** | **11.3** | **-** | **12.3** | **-** | **-** | **2.3** | **-** | **27.0** | **58.9** |
| **13** | **-** | **3.4** | **2.7** | **11.3** | **-** | **12.3** | **-** | **-** | **2.3** | **-** | **27.0** | **58.9** |
| **187** | **-** | **1.8** | **-** | **-** | **8.1** | **-** | **-** | **-** | **-** | **-** | **18.0** | **27.9** |
| **27** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **27.0** | **27.0** |
| **28** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **27.0** | **27.0** |
| **192** | **-** | **-** | **-** | **-** | **-** | **1.0** | **-** | **-** | **-** | **-** | **25.2** | **26.2** |
| 377 | 0.7 | - | - | - | - | 4.1 | - | 1.5 | - | - | 9.0 | 15.3 |
| 378 | 0.7 | - | - | - | - | 4.1 | - | 1.5 | - | - | 9.0 | 15.3 |
| 375 | - | 2.5 | - | - | - | - | - | 9.2 | - | - | - | 11.7 |
| 376 | - | 2.5 | - | - | - | - | - | 9.2 | - | - | - | 11.7 |
| 351 | - | 1.9 | - | 0.4 | 1.6 | - | 0.4 | 5.5 | - | 0.6 | - | 10.5 |
| 352 | - | 1.9 | - | 0.4 | 1.6 | - | 0.4 | 5.5 | - | 0.6 | - | 10.5 |
| 329 | - | - | - | - | - | 0.7 | - | 4.1 | - | - | 3.6 | 8.3 |
| 193 | - | - | - | - | - | 1.0 | - | - | - | - | 7.2 | 8.2 |
| 404 | - | - | - | - | - | - | - | - | - | - | 8.1 | 8.1 |
| 117 | - | 1.5 | - | 1.5 | - | - | - | - | - | - | 2.5 | 5.5 |
| 118 | - | 1.5 | - | 1.5 | - | - | - | - | - | - | 2.5 | 5.5 |
| 183 | - | - | - | 1.8 | - | - | - | - | - | - | 2.7 | 4.5 |
| 184 | - | - | - | 1.8 | - | - | - | - | - | - | 2.7 | 4.5 |
| 338 | - | - | - | - | - | - | - | - | - | - | 3.6 | 3.6 |
| 339 | - | - | - | - | - | - | - | - | - | - | 3.6 | 3.6 |
| 409 | - | - | - | - | - | - | - | - | - | - | 3.0 | 3.0 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of other vegetables based on the 6 high-rate adult consumers is 37.6 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 22 observations is 58.9 kg $y^{-1}$

**Table 29. Adults' consumption rates of root vegetables in the Sellafield area (kg $y^{-1}$)**

| Observation number | Beetroot | Carrot | Fennel | Garlic | Leek | Onion | Parsnip | Shallot | Spring onion | Swede | Turnip | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **-** | **2.8** | **1.0** | **-** | **-** | **41.3** | **1.4** | **-** | **0.2** | **-** | **-** | **46.7** |
| **13** | **-** | **2.8** | **1.0** | **-** | **-** | **41.3** | **1.4** | **-** | **0.2** | **-** | **-** | **46.7** |
| **279** | **-** | **12.1** | **-** | **-** | **-** | **15.7** | **-** | **-** | **-** | **-** | **5.0** | **32.8** |
| **280** | **-** | **12.1** | **-** | **-** | **-** | **15.7** | **-** | **-** | **-** | **-** | **5.0** | **32.8** |
| **351** | **2.7** | **5.6** | **-** | **-** | **-** | **5.0** | **1.4** | **3.4** | **-** | **8.2** | **-** | **26.2** |
| **352** | **2.7** | **5.6** | **-** | **-** | **-** | **5.0** | **1.4** | **3.4** | **-** | **8.2** | **-** | **26.2** |
| 14 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 15 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 16 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 17 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 18 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 19 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 20 | - | - | - | - | - | - | - | - | - | - | 14.7 | 14.7 |
| 377 | 2.7 | - | - | - | - | 9.5 | - | - | 0.7 | - | - | 12.9 |
| 378 | 2.7 | - | - | - | - | 9.5 | - | - | 0.7 | - | - | 12.9 |
| 117 | 2.5 | 2.5 | - | - | 2.5 | 5.0 | - | - | - | - | - | 12.5 |
| 118 | 2.5 | 2.5 | - | - | 2.5 | 5.0 | - | - | - | - | - | 12.5 |
| 187 | - | 5.4 | - | - | - | 6.6 | - | - | - | - | - | 12.0 |
| 27 | - | 3.4 | - | - | 1.1 | - | - | - | - | - | 5.7 | 10.2 |
| 28 | - | 3.4 | - | - | 1.1 | - | - | - | - | - | 5.7 | 10.2 |
| 188 | - | - | - | - | - | 6.6 | - | - | - | - | - | 6.6 |
| 183 | - | - | - | 0.2 | 4.0 | - | - | 1.1 | - | - | - | 5.3 |
| 184 | - | - | - | 0.2 | 4.0 | - | - | 1.1 | - | - | - | 5.3 |
| 409 | - | 5.0 | - | - | - | - | - | - | - | - | - | 5.0 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of root vegetables based on the 6 high-rate adult consumers is 35.2 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 24 observations is 46.7 kg $y^{-1}$

**Table 30. Adults' consumption rates of potato in the Sellafield area (kg $y^{-1}$)**

| Observation number | Potato |
|---|---|
| **33** | **150.0** |
| **34** | **150.0** |
| **29** | **100.0** |
| **30** | **100.0** |
| **31** | **100.0** |
| **10** | **95.3** |
| **11** | **95.3** |
| **27** | **88.5** |
| **28** | **88.5** |
| **12** | **82.8** |
| **13** | **82.8** |
| **22** | **82.8** |
| **23** | **82.8** |
| **409** | **78.0** |
| **4** | **76.2** |
| **5** | **76.2** |
| **14** | **76.2** |
| **15** | **76.2** |
| **16** | **76.2** |
| **17** | **76.2** |
| **18** | **76.2** |
| **19** | **76.2** |
| **20** | **76.2** |
| 338 | 47.2 |
| 339 | 47.2 |
| 279 | 41.7 |
| 280 | 41.7 |
| 375 | 26.0 |
| 376 | 26.0 |
| 2 | 25.4 |
| 3 | 25.4 |
| 396 | 16.9 |
| 397 | 16.9 |
| 398 | 16.9 |
| 399 | 16.9 |
| 183 | 16.4 |
| 184 | 16.4 |
| 351 | 13.6 |
| 352 | 13.6 |
| 340 | 11.8 |
| 117 | 10.0 |
| 118 | 10.0 |
| 377 | 9.1 |
| 378 | 9.1 |
| 62 | 3.4 |
| 63 | 3.4 |
| 327 | 1.4 |
| 329 | 1.3 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of potato based on the 23 high-rate adult consumers is 89.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 48 observations is 141.3 kg $y^{-1}$

**Table 31. Adults' consumption rates of domestic fruit in the Sellafield area (kg $y^{-1}$)**

| Observation number | Apple | Blackberry | Blackcurrant | Blueberry | Damson | Gooseberry | Melon | Pear | Plum | Raspberry | Redcurrant | Rhubarb | Strawberry | Whitecurrant | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **12** | **25.4** | **-** | **5.7** | **0.5** | **0.2** | **8.2** | **5.2** | **0.5** | **-** | **4.5** | **4.5** | **1.1** | **6.8** | **-** | **62.6** |
| **13** | **25.4** | **-** | **5.7** | **0.5** | **0.2** | **8.2** | **5.2** | **0.5** | **-** | **4.5** | **4.5** | **1.1** | **6.8** | **-** | **62.6** |
| **375** | **11.3** | **-** | **-** | **-** | **-** | **-** | **-** | **6.8** | **7.9** | **2.3** | **-** | **-** | **-** | **-** | **28.4** |
| **376** | **11.3** | **-** | **-** | **-** | **-** | **-** | **-** | **6.8** | **7.9** | **2.3** | **-** | **-** | **-** | **-** | **28.4** |
| 338 | 18.1 | - | - | - | - | - | - | 1.8 | - | - | - | - | - | - | 20.0 |
| 339 | 18.1 | - | - | - | - | - | - | 1.8 | - | - | - | - | - | - | 20.0 |
| 187 | 6.8 | - | 1.1 | - | - | 1.2 | - | - | - | 1.6 | 0.9 | - | - | - | 11.6 |
| 385 | 6.8 | - | - | - | - | - | - | 4.5 | - | - | - | - | - | - | 11.3 |
| 2 | 3.7 | - | - | - | - | - | - | 3.7 | 3.7 | - | - | - | - | - | 11.2 |
| 3 | 3.7 | - | - | - | - | - | - | 3.7 | 3.7 | - | - | - | - | - | 11.2 |
| 378 | - | 1.1 | 4.7 | - | - | - | - | - | - | - | 3.0 | - | 1.8 | - | 10.7 |
| 377 | - | - | 4.7 | - | - | - | - | - | - | - | 3.0 | - | 1.8 | - | 9.6 |
| 174 | 7.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.5 |
| 175 | 7.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.5 |
| 176 | 7.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.5 |
| 177 | 7.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.5 |
| 348 | - | - | - | - | - | - | - | - | - | - | - | - | 6.8 | - | 6.8 |
| 329 | 6.0 | - | - | - | - | - | 0.6 | - | - | - | - | - | - | - | 6.6 |
| 27 | - | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | 5.7 |
| 28 | - | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | 5.7 |
| 351 | - | - | 1.1 | - | - | 1.1 | - | - | - | - | 1.1 | 1.1 | - | 1.1 | 5.7 |
| 352 | - | - | 1.1 | - | - | 1.1 | - | - | - | - | 1.1 | 1.1 | - | 1.1 | 5.7 |
| 409 | - | - | - | - | - | - | - | - | - | - | - | 3.0 | - | - | 3.0 |
| 279 | 2.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.4 |
| 280 | 2.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.4 |
| 180 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | 2.3 |
| 181 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | 2.3 |
| 340 | 1.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.8 |
| 117 | - | - | - | - | - | - | - | - | - | - | - | - | 1.0 | - | 1.0 |
| 118 | - | - | - | - | - | - | - | - | - | - | - | - | 1.0 | - | 1.0 |
| 343 | - | - | - | - | - | - | - | - | - | - | - | - | 0.9 | - | 0.9 |
| 344 | - | - | - | - | - | - | - | - | - | - | - | - | 0.9 | - | 0.9 |

**Table 31. Adults' consumption rates of domestic fruit in the Sellafield area (kg $y^{-1}$)**

| Observation number | Apple | Blackberry | Blackcurrant | Blueberry | Damson | Gooseberry | Melon | Pear | Plum | Raspberry | Redcurrant | Rhubarb | Strawberry | Whitecurrant | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | - | - | - | - | - | - | - | - | 0.8 | - | - | - | - | - | 0.8 |
| 36 | - | - | - | - | - | - | - | - | 0.8 | - | - | - | - | - | 0.8 |
| 37 | - | - | - | - | - | - | - | - | 0.8 | - | - | - | - | - | 0.8 |
| 360 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.2 |
| 361 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.2 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit based on the 4 high-rate adult consumers is 45.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 37 observations is 62.6 kg $y^{-1}$

**Table 32. Adults' consumption rates of milk in the Sellafield area (l $y^{-1}$)**

| Observation number | Milk |
|---|---|
| **33** | **365.0** |
| **34** | **365.0** |
| **365** | **365.0** |
| **366** | **365.0** |
| **367** | **365.0** |
| **368** | **365.0** |
| **369** | **365.0** |
| **370** | **365.0** |
| **29** | **228.1** |
| **30** | **228.1** |
| **31** | **228.1** |
| **32** | **228.1** |
| **339** | **202.9** |
| **4** | **182.5** |
| **5** | **182.5** |
| **8** | **182.5** |
| **9** | **182.5** |
| **10** | **182.5** |
| **11** | **182.5** |
| **14** | **182.5** |
| **15** | **182.5** |
| **16** | **182.5** |
| **17** | **182.5** |
| **18** | **182.5** |
| **19** | **182.5** |
| **20** | **182.5** |
| **279** | **182.5** |
| **280** | **182.5** |
| **340** | **177.3** |
| **390** | **177.3** |
| **391** | **177.3** |
| **392** | **147.8** |
| **393** | **147.8** |
| **394** | **147.8** |
| **395** | **147.8** |
| **360** | **146.0** |
| **361** | **146.0** |
| 357 | 118.2 |
| 349 | 104.0 |
| 350 | 104.0 |
| 409 | 104.0 |
| 380 | 103.7 |
| 381 | 103.7 |
| 382 | 103.7 |
| 404 | 59.1 |
| 405 | 59.1 |
| 174 | 44.3 |
| 175 | 44.3 |
| 176 | 44.3 |
| 177 | 44.3 |
| 341 | 29.6 |
| 342 | 29.6 |
| 323 | 2.3 |
| 324 | 2.3 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of milk based on the 37 high-rate adult consumers is 221.3 l $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 54 observations is 365.0 l $y^{-1}$

**Table 33. Adults' consumption rates of cattle meat in the Sellafield area (kg $y^{-1}$)**

| Observation number | Beef |
|---|---|
| **174** | **52.0** |
| **175** | **52.0** |
| **177** | **52.0** |
| **339** | **46.3** |
| **353** | **31.5** |
| **354** | **31.5** |
| **355** | **31.5** |
| **360** | **28.0** |
| **361** | **28.0** |
| **4** | **26.0** |
| **5** | **26.0** |
| **390** | **26.0** |
| **391** | **26.0** |
| **340** | **17.7** |
| 25 | 12.5 |
| 26 | 12.5 |
| 343 | 11.8 |
| 344 | 11.8 |
| 348 | 11.8 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of cattle meat based on the 14 high-rate adult consumers is 33.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 19 observations is 52.0 kg $y^{-1}$

**Table 34. Adults' consumption rates of sheep meat in the Sellafield area (kg $y^{-1}$)**

| Observation number | Lamb |
|---|---|
| **390** | **26.0** |
| **391** | **26.0** |
| **343** | **11.8** |
| **344** | **11.8** |
| **348** | **11.8** |
| **25** | **11.3** |
| **26** | **11.3** |
| **353** | **11.3** |
| **354** | **11.3** |
| **355** | **11.3** |
| 180 | 5.7 |
| 181 | 5.7 |
| 253 | 5.7 |
| 254 | 5.7 |
| 279 | 3.8 |
| 280 | 3.8 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of sheep meat based on the 10 high-rate adult consumers is 14.4 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 16 observations is 26.0 kg $y^{-1}$

**Table 35. Adults' consumption rates of poultry in the Sellafield area (kg $y^{-1}$)**

| Observation number | Duck | Goose | Partridge | Pheasant | Pigeon | Turkey | Woodcock | Total |
|---|---|---|---|---|---|---|---|---|
| **43** | **3.4** | **-** | **-** | **13.5** | **2.1** | **-** | **-** | **18.9** |
| **41** | **-** | **-** | **-** | **4.5** | **0.5** | **-** | **1.5** | **6.5** |
| **40** | **-** | **-** | **-** | **4.5** | **0.5** | **-** | **1.5** | **6.5** |
| **42** | **-** | **-** | **-** | **4.5** | **0.5** | **-** | **1.5** | **6.5** |
| **44** | **1.1** | **-** | **-** | **4.5** | **0.7** | **-** | **-** | **6.3** |
| 35 | - | - | - | 1.1 | 2.3 | - | 0.5 | 3.9 |
| 36 | - | - | - | 1.1 | 2.3 | - | 0.5 | 3.9 |
| 37 | - | - | - | 1.1 | 2.3 | - | 0.5 | 3.9 |
| 253 | - | - | - | 2.7 | 0.3 | - | 0.2 | 3.2 |
| 254 | - | - | - | 2.7 | 0.3 | - | 0.2 | 3.2 |
| 152 | - | - | - | 2.7 | - | - | - | 2.7 |
| 153 | - | - | - | 2.7 | - | - | - | 2.7 |
| 279 | - | 1.5 | - | - | - | 1.2 | - | 2.6 |
| 390 | - | - | - | 1.4 | - | - | - | 1.4 |
| 391 | - | - | - | 1.4 | - | - | - | 1.4 |
| 280 | - | - | - | - | - | 1.2 | - | 1.2 |
| 185 | - | - | - | 0.8 | - | - | - | 0.8 |
| 186 | - | - | - | 0.8 | - | - | - | 0.8 |
| 14 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 15 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 16 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 17 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 18 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 19 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 20 | - | - | 0.2 | 0.3 | - | - | - | 0.6 |
| 181 | - | - | - | 0.5 | - | - | - | 0.5 |
| 206 | - | - | - | 0.5 | - | - | - | 0.5 |
| 207 | - | - | - | 0.5 | - | - | - | 0.5 |
| 338 | - | - | - | 0.5 | - | - | - | 0.5 |
| 357 | - | - | - | 0.5 | - | - | - | 0.5 |
| 380 | - | - | - | 0.3 | - | - | - | 0.3 |
| 381 | - | - | - | 0.3 | - | - | - | 0.3 |
| 382 | - | - | - | 0.3 | - | - | - | 0.3 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of poultry based on the 5 high-rate adult consumers is 9.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 33 observations is 9.0 kg $y^{-1}$

**Table 36. Adults' consumption rates of eggs in the Sellafield area (kg $y^{-1}$)**

| Observation number | Chicken egg | Duck egg | Total |
|---|---|---|---|
| **2** | **19.4** | **20.3** | **39.7** |
| **3** | **19.4** | **20.3** | **39.7** |
| **1** | **7.5** | **20.3** | **27.9** |
| **250** | **23.7** | **-** | **23.7** |
| **251** | **23.7** | **-** | **23.7** |
| **252** | **23.7** | **-** | **23.7** |
| **4** | **17.8** | **-** | **17.8** |
| **5** | **17.8** | **-** | **17.8** |
| **192** | **17.8** | **-** | **17.8** |
| **193** | **17.8** | **-** | **17.8** |
| **341** | **17.8** | **-** | **17.8** |
| **342** | **17.8** | **-** | **17.8** |
| **357** | **17.8** | **-** | **17.8** |
| **338** | **17.4** | **-** | **17.4** |
| **339** | **17.4** | **-** | **17.4** |
| **183** | **14.8** | **-** | **14.8** |
| 340 | 11.9 | - | 11.9 |
| 353 | 11.9 | - | 11.9 |
| 354 | 11.9 | - | 11.9 |
| 355 | 11.9 | - | 11.9 |
| 12 | 8.9 | - | 8.9 |
| 13 | 8.9 | - | 8.9 |
| 44 | 8.9 | - | 8.9 |
| 45 | 8.9 | - | 8.9 |
| 184 | 8.9 | - | 8.9 |
| 349 | 8.9 | - | 8.9 |
| 350 | 8.9 | - | 8.9 |
| 386 | 8.9 | - | 8.9 |
| 387 | 8.9 | - | 8.9 |
| 392 | 8.9 | - | 8.9 |
| 393 | 8.9 | - | 8.9 |
| 394 | 8.9 | - | 8.9 |
| 395 | 8.9 | - | 8.9 |
| 253 | 8.2 | - | 8.2 |
| 254 | 8.2 | - | 8.2 |
| 187 | 6.2 | - | 6.2 |
| 188 | 6.2 | - | 6.2 |
| 29 | - | 5.9 | 5.9 |
| 30 | - | 5.9 | 5.9 |
| 31 | - | 5.9 | 5.9 |
| 329 | 5.5 | - | 5.5 |
| 377 | 4.0 | - | 4.0 |
| 378 | 4.0 | - | 4.0 |
| 360 | 2.4 | - | 2.4 |
| 361 | 2.4 | - | 2.4 |
| 396 | 2.3 | - | 2.3 |
| 397 | 2.3 | - | 2.3 |
| 398 | 2.3 | - | 2.3 |
| 399 | 2.3 | - | 2.3 |
| 343 | 1.5 | - | 1.5 |
| 344 | 1.5 | - | 1.5 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of eggs based on the 16 high-rate adult consumers is 22.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 51 observations is 36.8 kg $y^{-1}$

**Table 37. Adults' consumption rates of wild/free foods in the Sellafield area (kg $y^{-1}$)**

| Observation number | Blackberry | Crab apple | Damson | Hazel nut | Sloe | Total |
|---|---|---|---|---|---|---|
| **117** | **7.5** | **-** | **-** | **-** | **-** | **7.5** |
| **118** | **7.5** | **-** | **-** | **-** | **-** | **7.5** |
| **404** | **5.4** | **-** | **-** | **-** | **-** | **5.4** |
| **405** | **5.4** | **-** | **-** | **-** | **-** | **5.4** |
| **338** | **1.8** | **-** | **-** | **-** | **3.4** | **5.2** |
| 390 | 2.3 | - | - | - | - | 2.3 |
| 391 | 2.3 | - | - | - | - | 2.3 |
| 392 | 2.3 | - | - | - | - | 2.3 |
| 393 | 2.3 | - | - | - | - | 2.3 |
| 394 | 2.3 | - | - | - | - | 2.3 |
| 395 | 2.3 | - | - | - | - | 2.3 |
| 35 | - | 0.9 | 0.5 | - | 0.8 | 2.1 |
| 36 | - | 0.9 | 0.5 | - | 0.8 | 2.1 |
| 37 | - | 0.9 | 0.5 | - | 0.8 | 2.1 |
| 279 | 2.0 | - | - | - | - | 2.0 |
| 2 | 0.9 | - | - | 1.0 | - | 1.9 |
| 3 | 0.9 | - | - | 1.0 | - | 1.9 |
| 185 | 0.7 | 1.1 | - | - | - | 1.8 |
| 186 | 0.7 | 1.1 | - | - | - | 1.8 |
| 339 | 1.8 | - | - | - | - | 1.8 |
| 43 | 1.5 | - | - | - | - | 1.5 |
| 44 | 1.5 | - | - | - | - | 1.5 |
| 45 | 1.5 | - | - | - | - | 1.5 |
| 386 | 1.4 | - | - | - | - | 1.4 |
| 387 | 1.4 | - | - | - | - | 1.4 |
| 383 | 1.2 | - | - | - | - | 1.2 |
| 384 | 1.2 | - | - | - | - | 1.2 |
| 377 | 1.1 | - | - | - | - | 1.1 |
| 327 | 0.9 | - | - | - | - | 0.9 |
| 329 | 0.8 | - | - | - | - | 0.8 |
| 340 | - | - | - | - | 0.7 | 0.7 |
| 12 | 0.5 | - | - | - | - | 0.5 |
| 13 | 0.5 | - | - | - | - | 0.5 |
| 349 | 0.5 | - | - | - | - | 0.5 |
| 350 | 0.5 | - | - | - | - | 0.5 |
| 380 | 0.5 | - | - | - | - | 0.5 |
| 381 | 0.5 | - | - | - | - | 0.5 |
| 382 | 0.5 | - | - | - | - | 0.5 |
| 343 | 0.4 | - | - | - | - | 0.4 |
| 344 | 0.4 | - | - | - | - | 0.4 |
| 348 | 0.4 | - | - | - | - | 0.4 |
| 360 | 0.1 | - | - | - | - | 0.1 |
| 361 | 0.1 | - | - | - | - | 0.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild/free foods based on the 5 high-rate adult consumers is 6.2 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 43 observations is 7.4 kg $y^{-1}$

**Table 38. Adults' consumption rates of rabbits/hares in the Sellafield area (kg $y^{-1}$)**

| Observation number | Hare | Rabbit | Total |
|---|---|---|---|
| **43** | **-** | **3.4** | **3.4** |
| **253** | **1.6** | **-** | **1.6** |
| **254** | **1.6** | **-** | **1.6** |
| **44** | **-** | **1.1** | **1.1** |
| 35 | - | 1.1 | 1.1 |
| 36 | - | 1.1 | 1.1 |
| 37 | - | 1.1 | 1.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of rabbits/hares based on the 4 high-rate adult consumers is 1.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 7 observations is 3.1 kg $y^{-1}$

The un-rounded value for observation number 44 is 1.125 kg $y^{-1}$ and the un-rounded values for observation numbers 35, 36 and 37 are 1.08 kg $y^{-1}$. The 'cut off' value is 1.125, therefore, observation 44 has been included in the high-rate group.

**Table 39. Adults' consumption rates of honey in the Sellafield area (kg $y^{-1}$)**

| Observation number | Honey |
|---|---|
| **328** | **9.1** |
| **375** | **8.5** |
| **376** | **8.5** |
| 338 | 1.4 |
| 339 | 1.4 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of honey based on the 3 high-rate adult consumers is 8.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 5 observations is 9.0 kg $y^{-1}$

**Table 40. Adults' consumption rates of wild fungi in the Sellafield area (kg $y^{-1}$)**

| Observation number | Mushrooms |
|---|---|
| **386** | **2.7** |
| **387** | **2.7** |
| **353** | **2.6** |
| **354** | **2.6** |
| **355** | **2.6** |
| **390** | **2.3** |
| **391** | **2.3** |
| **12** | **1.7** |
| **13** | **1.7** |
| **380** | **1.5** |
| **381** | **1.5** |
| **382** | **1.5** |
| **117** | **1.5** |
| **118** | **1.5** |
| **2** | **0.9** |
| **3** | **0.9** |
| 185 | 0.7 |
| 186 | 0.7 |
| 377 | 0.7 |
| 378 | 0.7 |
| 27 | 0.5 |
| 28 | 0.5 |
| 338 | 0.5 |
| 339 | 0.5 |
| 383 | 0.5 |
| 384 | 0.5 |
| 392 | 0.3 |
| 393 | 0.3 |
| 394 | 0.3 |
| 395 | 0.3 |
| 43 | 0.3 |
| 44 | 0.3 |
| 45 | 0.3 |
| 4 | 0.2 |
| 5 | 0.2 |
| 35 | 0.2 |
| 36 | 0.2 |
| 37 | 0.2 |
| 360 | 0.2 |
| 361 | 0.2 |
| 404 | 0.1 |
| 405 | 0.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of wild fungi based on the 16 high-rate adult consumers is 1.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 42 observations is 2.7 kg $y^{-1}$

**Table 41. Adults' consumption rates of venison in the Sellafield area (kg $y^{-1}$)**

| Observation number | Venison |
|---|---|
| **35** | **13.6** |
| **36** | **13.6** |
| **37** | **13.6** |
| 152 | 1.1 |
| 153 | 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 13.6 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 5 observations is 13.6 kg $y^{-1}$

**Table 42. Adults' consumption rates of freshwater fish in the Sellafield area (kg $y^{-1}$)**

| Observation number | Brown trout |
|---|---|
| **154** | **2.3** |
| 40 | 0.7 |
| 41 | 0.7 |
| 42 | 0.7 |
| 155 | 0.6 |
| 35 | 0.2 |
| 36 | 0.2 |
| 37 | 0.2 |

**Notes**

The emboldened observation is the high-rate consumer

The mean consumption rate of freshwater fish based on the only high-rate adult consumer is 2.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 8 observations is 2.0 kg $y^{-1}$

**Table 43. Children's consumption rates of green vegetables in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Cabbage | Cauliflower | Cucumber | Herbs | Lettuce | Rocket | Total |
|---|---|---|---|---|---|---|---|---|
| **21** | **15** | **14.7** | **-** | **-** | **-** | **-** | **-** | **14.7** |
| **281** | **15** | **7.9** | **0.8** | **-** | **-** | **-** | **-** | **8.7** |
| 331 | 13 | - | - | 2.4 | 0.1 | 1.2 | - | 3.7 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables based on the 2 high-rate 15-year-old age group consumers is 11.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 3 observations is 14.4 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Cabbage | Cauliflower | Cucumber | Herbs | Lettuce | Rocket | Total |
|---|---|---|---|---|---|---|---|---|
| **332** | **11** | **-** | **-** | **2.4** | **0.1** | **1.2** | **-** | **3.7** |
| **379** | **8** | **-** | **-** | **1.1** | **0.1** | **0.4** | **0.2** | **1.8** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of green vegetables based on the 2 high-rate 10-year-old age group consumers is 2.7 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 3.6 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Cabbage | Cauliflower | Cucumber | Herbs | Lettuce | Rocket | Total |
|---|---|---|---|---|---|---|---|---|
| **333** | **3** | **-** | **-** | **0.7** | **0.03** | **-** | **-** | **0.7** |

**Notes**

The emboldened observation is the high-rate consumer

The consumption rate of green vegetables based on the only 5-year-old age group consumer is 0.7 kg $y^{-1}$

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

**Table 44. Children's consumption rates of other vegetables in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Aubergine | Pea | Pepper | Runner bean | Tomato | Total |
|---|---|---|---|---|---|---|---|
| **331** | **13** | **-** | **-** | **0.5** | **2.9** | **2.5** | **5.8** |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of other vegetables based on the only 15-year-old age group consumer is 5.8 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**10-year-old age group**

| Observation number | Age | Aubergine | Pea | Pepper | Runner bean | Tomato | Total |
|---|---|---|---|---|---|---|---|
| **332** | **11** | **-** | **-** | **0.5** | **2.9** | **2.5** | **5.8** |
| **189** | **7** | **-** | **0.9** | **-** | **-** | **3.0** | **3.9** |
| **379** | **8** | **0.3** | **-** | **2.0** | **0.8** | **-** | **3.1** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of other vegetables based on the 3 high-rate 10-year-old age group consumers is 4.3 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 3 observations is 5.7 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Aubergine | Pea | Pepper | Runner bean | Tomato | Total |
|---|---|---|---|---|---|---|---|
| **190** | **5** | **-** | **0.9** | **-** | **-** | **3.0** | **3.9** |
| **191** | **3** | **-** | **0.9** | **-** | **-** | **3.0** | **3.9** |
| **333** | **3** | **-** | **-** | **0.1** | **0.8** | **0.7** | **1.7** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of other vegetables based on the 3 high-rate 5-year-old age group consumers is 3.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 3 observations is 3.9 kg $y^{-1}$

**Table 45. Children's consumption rates of root vegetables in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Beetroot | Carrot | Onion | Spring onion | Turnip | Total |
|---|---|---|---|---|---|---|---|
| **281** | **15** | **-** | **12.1** | **15.7** | **-** | **5.0** | **32.8** |
| **21** | **15** | **-** | **-** | **-** | **-** | **14.7** | **14.7** |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of root vegetables based on the 2 high-rate 15-year-old age group consumers is 23.8 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 2 observations is 32.4 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Beetroot | Carrot | Onion | Spring onion | Turnip | Total |
|---|---|---|---|---|---|---|---|
| **379** | **8** | **1.4** | **-** | **4.8** | **0.3** | **-** | **6.5** |

**Notes**

The emboldened observation is the high-rate consumer

The consumption rate of root vegetables based on the only 10-year-old age group consumer is 6.5 kg $y^{-1}$

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

**Table 46. Children's consumption rates of potato in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Potato |
|---|---|---|
| **21** | **15** | **76.2** |
| **6** | **14** | **76.2** |
| **7** | **12** | **76.2** |
| **281** | **15** | **41.7** |
| 331 | 13 | 0.9 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of potato based on the 4 high-rate 15-year-old age group consumers is 67.6 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 5 observations is 76.2 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Potato |
|---|---|---|
| **24** | **9** | **82.8** |
| 400 | 9 | 8.5 |
| 401 | 8 | 8.5 |
| 379 | 8 | 4.6 |
| 332 | 11 | 0.9 |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of potato based on the only high-rate 10-year-old age group consumer is 82.8 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 5 observations is 75.4 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Potato |
|---|---|---|
| **402** | **5** | **5.1** |
| **403** | **2** | **2.4** |
| 333 | 3 | 0.3 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of potato based on the 2 high-rate 5-year-old age group consumers is 3.7 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 3 observations is 4.9 kg $y^{-1}$

**Table 47. Children's consumption rates of domestic fruit in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Apple | Blackberry | Blackcurrant | Gooseberry | Melon | Plum | Redcurrant | Strawberry | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **331** | **13** | **4.2** | **-** | **-** | **-** | **0.4** | **-** | **-** | **-** | **4.6** |
| **281** | **15** | **2.4** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **2.4** |
| 39 | 13 | - | - | - | - | - | 0.8 | - | - | 0.8 |
| 38 | 12 | - | - | - | - | - | 0.8 | - | - | 0.8 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit based on the 2 high-rate 15-year-old age group consumers is 3.5 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 4.5 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Apple | Blackberry | Blackcurrant | Gooseberry | Melon | Plum | Redcurrant | Strawberry | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **379** | **8** | **-** | **0.6** | **2.4** | **-** | **-** | **-** | **1.5** | **0.9** | **5.4** |
| **332** | **11** | **4.2** | **-** | **-** | **-** | **0.4** | **-** | **-** | **-** | **4.6** |
| 362 | 10 | 0.2 | - | - | - | - | - | - | - | 0.2 |
| 363 | 8 | 0.2 | - | - | - | - | - | - | - | 0.2 |
| 189 | 7 | - | - | - | 0.1 | - | - | - | - | 0.1 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of domestic fruit based on the 2 high-rate 10-year-old age group consumers is 5.0 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 5 observations is 5.3 kg $y^{-1}$

**Table 47. Children's consumption rates of domestic fruit in the Sellafield area (kg $y^{-1}$)**

**5-year-old age group**

| Observation number | Age | Apple | Blackberry | Blackcurrant | Gooseberry | Melon | Plum | Redcurrant | Strawberry | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| **333** | **3** | **1.2** | **-** | **-** | **-** | **0.1** | **-** | **-** | **-** | **1.3** |
| 364 | 6 | 0.2 | - | - | - | - | - | - | - | 0.2 |
| 190 | 5 | - | - | - | 0.1 | - | - | - | - | 0.1 |
| 191 | 3 | - | - | - | 0.1 | - | - | - | - | 0.1 |

**Notes**

The emboldened observation is the high-rate consumer

The consumption rate of domestic fruit based on the only high-rate 5-year-old age group consumer is 1.3 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 1.2 kg $y^{-1}$

**Table 48. Children's consumption rates of milk in the Sellafield area (l $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Milk |
|---|---|---|
| **21** | **15** | **182.5** |
| **281** | **15** | **182.5** |
| **6** | **14** | **182.5** |
| **7** | **12** | **182.5** |
| 406 | 13 | 59.1 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of milk based on the 4 high-rate 15-year-old age group consumers is 182.5 l $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 5 observations is 182.5 l $y^{-1}$

**10-year-old age group**

| Observation number | Age | Milk |
|---|---|---|
| **362** | **10** | **146.0** |
| **363** | **8** | **146.0** |
| **407** | **8** | **59.1** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of milk based on the 3 high-rate 10-year-old age group consumers is 117.0 l $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 3 observations is 146.0 l $y^{-1}$

**5-year-old age group**

| Observation number | Age | Milk |
|---|---|---|
| **371** | **6** | **182.5** |
| **372** | **2** | **182.5** |
| **364** | **6** | **146.0** |
| 282 | 2 | 14.8 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of milk based on the 3 high-rate 5-year-old age group consumers is 170.3 l $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 4 observations is 182.5 l $y^{-1}$

**1-year-old age group**

| Observation number | Age | Milk |
|---|---|---|
| **373** | **1** | **182.5** |
| **374** | **1** | **182.5** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of milk based on the 2 high-rate 1-year-old age group consumers is 182.5 l $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 182.5 l $y^{-1}$

**Table 49. Children's consumption rates of cattle meat in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Beef |
|---|---|---|
| **6** | **14** | **26.0** |
| **7** | **12** | **26.0** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of cattle meat based on the 2 high-rate 15-year-old age group consumers is 26.0 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 26.0 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Beef |
|---|---|---|
| **362** | **10** | **14.0** |
| **363** | **8** | **11.2** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of cattle meat based on the 2 high-rate 10-year-old age group consumers is 12.6 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 13.9 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Beef |
|---|---|---|
| **364** | **6** | **8.4** |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of cattle meat based on the only 5-year-old age group consumer is 8.4 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 50. Children's consumption rates of sheep meat in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Lamb |
|---|---|---|
| **281** | **15** | **3.8** |

**Notes**

The emboldened observation is the high-rate consumer

The consumption rate of sheep meat based on the only 15-year-old age group consumer is 3.8 kg $y^{-1}$

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

**Table 51. Children's consumption rates of poultry in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Partridge | Pheasant | Pigeon | Turkey | Woodcock | Total |
|---|---|---|---|---|---|---|---|
| **39** | **13** | **-** | **1.1** | **2.3** | **-** | **0.5** | **3.9** |
| **38** | **12** | **-** | **1.1** | **2.3** | **-** | **0.5** | **3.9** |
| 281 | 15 | - | - | - | 1.2 | - | 1.2 |
| 21 | 15 | 0.2 | 0.3 | - | - | - | 0.6 |

**Notes**

Emboldened observations are the high-rate consumers

The mean consumption rate of poultry based on the 2 high-rate 15-year-old age group consumers is 3.9 kg $y^{-1}$

The observed 97.5$^{th}$ percentile rate based on 4 observations is 3.9 kg $y^{-1}$

**Table 52. Children's consumption rates of eggs in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Chicken egg |
|---|---|---|
| **6** | **14** | **17.8** |
| **7** | **12** | **17.8** |
| **388** | **15** | **8.9** |
| **389** | **13** | **8.9** |
| 331 | 13 | 3.8 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of eggs based on the 4 high-rate 15-year-old age group consumers is 13.3 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 5 observations is 17.8 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Chicken egg |
|---|---|---|
| **332** | **11** | **3.8** |
| **362** | **10** | **2.4** |
| **363** | **8** | **2.4** |
| **379** | **8** | **2.0** |
| 400 | 9 | 1.1 |
| 401 | 8 | 1.1 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of eggs based on the 4 high-rate 10-year-old age group consumers is 2.6 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 6 observations is 3.6 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Chicken egg |
|---|---|---|
| **364** | **6** | **2.4** |
| **333** | **3** | **1.1** |
| 402 | 5 | 0.7 |
| 403 | 2 | 0.3 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of eggs based on the 2 high-rate 5-year-old age group consumers is 1.7 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 4 observations is 2.3 kg $y^{-1}$

**Table 53. Children's consumption rates of wild/free foods in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Blackberry | Crab apple | Damson | Total |
|---|---|---|---|---|---|
| **406** | **13** | **5.4** | **-** | **-** | **5.4** |
| 388 | 15 | 1.4 | - | - | 1.4 |
| 39 | 13 | - | 0.9 | 0.5 | 1.4 |
| 389 | 13 | 1.4 | - | - | 1.4 |
| 38 | 12 | - | 0.9 | 0.5 | 1.4 |
| 331 | 13 | 0.5 | - | - | 0.5 |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of wild/free foods based on the only high-rate 15-year-old age group consumer is 5.4 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 6 observations is 4.9 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Blackberry | Crab apple | Damson | Total |
|---|---|---|---|---|---|
| **407** | **8** | **5.4** | **-** | **-** | **5.4** |
| 332 | 11 | 0.5 | - | - | 0.5 |
| 362 | 10 | 0.1 | - | - | 0.1 |
| 363 | 8 | 0.1 | - | - | 0.1 |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of wild/free foods based on the only high-rate 10-year-old age group consumer is 5.4 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 4 observations is 5.1 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Blackberry | Crab apple | Damson | Total |
|---|---|---|---|---|---|
| **333** | **3** | **0.2** | **-** | **-** | **0.2** |
| **364** | **6** | **0.1** | **-** | **-** | **0.1** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of wild/free foods based on the 2 high-rate 5-year-old age group consumers is 0.1 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 0.2 kg $y^{-1}$

**Table 54. Children's consumption rates of rabbits/hares in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Rabbit |
|---|---|---|
| **39** | **13** | **1.1** |
| **38** | **12** | **1.1** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of rabbits/hares based on the 2 high-rate 15-year-old age group consumers is 1.1 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 1.1 kg $y^{-1}$

**Table 55. Children's consumption rates of wild fungi in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Mushrooms |
|---|---|---|
| **388** | **15** | **2.7** |
| **389** | **13** | **2.7** |
| 6 | 14 | 0.2 |
| 7 | 12 | 0.2 |
| 39 | 13 | 0.2 |
| 38 | 12 | 0.2 |
| 406 | 13 | 0.1 |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of wild fungi based on the 2 high-rate 15-year-old age group consumers is 2.7 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 7 observations is 2.7 kg $y^{-1}$

**10-year-old age group**

| Observation number | Age | Mushrooms |
|---|---|---|
| **379** | **8** | **0.3** |
| **362** | **10** | **0.2** |
| **363** | **8** | **0.2** |
| **407** | **8** | **0.1** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of wild fungi based on the 4 high-rate 10-year-old age group consumers is 0.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 4 observations is 0.3 kg $y^{-1}$

**5-year-old age group**

| Observation number | Age | Mushrooms |
|---|---|---|
| **364** | **6** | **0.2** |

**Notes**
The emboldened observation is the high-rate consumer
The consumption rate of wild fungi based on the only 5-year-old age group consumer is 0.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate is not applicable for 1 observation

**Table 56. Children's consumption rates of venison in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Venison |
|---|---|---|
| **39** | **13** | **13.6** |
| **38** | **12** | **13.6** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of venison based on the 2 high-rate 15-year-old age group consumers is 13.6 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 13.6 kg $y^{-1}$

**Table 57. Children's consumption rates of freshwater fish in the Sellafield area (kg $y^{-1}$)**

**15-year-old age group**

| Observation number | Age | Brown trout |
|---|---|---|
| **39** | **13** | **0.2** |
| **38** | **12** | **0.2** |

**Notes**
Emboldened observations are the high-rate consumers
The mean consumption rate of freshwater fish based on the 2 high-rate 15-year-old age group consumers is 0.2 kg $y^{-1}$
The observed 97.5$^{th}$ percentile rate based on 2 observations is 0.2 kg $y^{-1}$

**Table 58. Percentage contribution each food type makes to its terrestrial food group for adults**

| Green vegetables | |
|---|---|
| ***Cabbage*** | 43.0 % |
| ***Broccoli*** | 12.0 % |
| Brussels sprout | 8.1 % |
| ***Cauliflower*** | 8.0 % |
| Courgettes | 7.3 % |
| Artichoke | 6.7 % |
| Cucumber | 6.4 % |
| Lettuce | 3.3 % |
| Kale | 1.2 % |
| Asparagus | 1.1 % |
| Spinach | 1.1 % |
| Rocket | 0.8 % |
| Chard | 0.7 % |
| Herbs | 0.2 % |

| Other vegetables | |
|---|---|
| Tomato | 60.5 % |
| Runner bean | 13.6 % |
| Pepper | 7.3 % |
| Broad bean | 7.2 % |
| ***French bean*** | 6.2 % |
| Pea | 2.3 % |
| Chilli pepper | 1.1 % |
| Squash | 0.9 % |
| Aubergine | 0.3 % |
| Sweetcorn | 0.3 % |
| Pumpkin | 0.2 % |

| Root vegetables | |
|---|---|
| ***Onion*** | 42.9 % |
| Turnip | 26.6 % |
| ***Carrot*** | 13.5 % |
| ***Beetroot*** | 6.2 % |
| ***Swede*** | 3.5 % |
| Leek | 3.3 % |
| Shallot | 1.9 % |
| Parsnip | 1.2 % |
| Fennel | 0.4 % |
| Spring onion | 0.4 % |
| Garlic | 0.1 % |

| Potato | |
|---|---|
| ***Potato*** | 100.0 % |

| Domestic fruit | |
|---|---|
| ***Apple*** | 44.3 % |
| Pear | 7.7 % |
| Strawberry | 7.1 % |
| ***Rhubarb*** | 6.6 % |
| Plum | 6.5 % |
| Gooseberry | 6.2 % |
| ***Blackcurrant*** | 6.2 % |
| Redcurrant | 4.7 % |
| Raspberry | 3.9 % |
| Blackberry | 3.2 % |
| Melon | 2.8 % |
| Whitecurrant | 0.6 % |
| Blueberry | 0.2 % |
| Damson | 0.1 % |

| Milk | |
|---|---|
| ***Cow's milk*** | 100.0 % |

| Cattle meat | |
|---|---|
| ***Beef*** | 100.0 % |

| Sheep meat | |
|---|---|
| ***Lamb*** | 100.0 % |

| Poultry | |
|---|---|
| ***Pheasant*** | 70.0 % |
| ***Pigeon*** | 15.0 % |
| Woodcock | 8.2 % |
| Turkey | 3.0 % |
| Partridge | 2.0 % |
| Goose | 1.9 % |

| Eggs | |
|---|---|
| ***Chicken egg*** | 80.3 % |
| Duck egg | 19.7 % |

| Wild/free foods | |
|---|---|
| ***Blackberry*** | 81.6 % |
| ***Sloe*** | 7.9 % |
| Crab apple | 6.2 % |
| Hazel nuts | 2.5 % |
| Damson | 1.7 % |

| Rabbits/hares | |
|---|---|
| ***Rabbit*** | 70.7 % |
| Hare | 29.3 % |

| Honey | |
|---|---|
| ***Honey*** | 100.0 % |

| Wild fungi | |
|---|---|
| Mushrooms | 100.0 % |

| Venison | |
|---|---|
| Venison | 100.0 % |

| Freshwater fish | |
|---|---|
| Brown trout | 100.0 % |

**Notes**

Food types in emboldened italics were monitored by FSA in 2007 (EA, EHS, FSA and SEPA, 2008).
Beef kidney, beef liver, duck, elderberry, sheep offal, wheat and barley were also monitored.
Percentages are based on the consumption of all adults in the survey consuming that particular food group.

**Table 59. Occupancy rates for adults and children in the Sellafield direct radiation survey area (h $y^{-1}$)**

| Observation number | Age (years) | Indoor occupancy | Outdoor occupancy | Total occupancy |
|---|---|---|---|---|
| **0 to 0.25 km zone** | | | | |
| 175 | 48 | 5316 | 3024 | 8340 |
| 252 | 85 | 8136 | - | 8136 |
| 250 | 56 | 6210 | 1820 | 8030 |
| 174 | 48 | 5635 | 1825 | 7460 |
| 343 | 33 | 3646 | 3298 | 6944 |
| 251 | 49 | 6046 | 104 | 6150 |
| 344 | 26 | 5815 | 238 | 6053 |
| 176 | 20 | 4868 | 624 | 5492 |
| 177 | 18 | 3508 | 884 | 4392 |
| 345 | U | - | 2400 | 2400 |
| 348 | 62 | - | 720 | 720 |
| 154 | U | - | 288 | 288 |
| 346 | U | - | 200 | 200 |
| 347 | U | - | 200 | 200 |
| 95 | 62 | - | 112 | 112 |
| 156 | U | - | 30 | 30 |
| 141 | 30 | - | 12 | 12 |
| 143 | 35 | - | 12 | 12 |
| 245 | U | - | 13 | 13 |
| 246 | U | - | 13 | 13 |
| **>0.25 to 0.5 km zone** | | | | |
| 179 | U | 7666 | 730 | 8396 |
| 339 | 50 | 4932 | 3392 | 8324 |
| 338 | 45 | 6136 | 1988 | 8124 |
| 178 | U | 5834 | 2050 | 7884 |
| 404 | 44 | 6006 | 1754 | 7760 |
| 406 | 13 | 5755 | 1056 | 6811 |
| 407 | 8 | 6105 | 682 | 6787 |
| 405 | 46 | 6386 | 230 | 6616 |
| 180 | 55 | 6307 | 88 | 6395 |
| 181 | 53 | 6307 | 88 | 6395 |
| 340 | 23 | 2244 | 276 | 2520 |
| 255 | U | - | 1410 | 1410 |
| 256 | U | - | 1410 | 1410 |
| 257 | U | - | 1410 | 1410 |
| 258 | U | - | 1410 | 1410 |
| 341 | 24 | 508 | 52 | 560 |
| 117 | 54 | - | 52 | 52 |
| **>0.5 to 1 km zone** | | | | |
| 192 | 59 | 6622 | 1568 | 8190 |
| 193 | 59 | 6958 | 1232 | 8190 |
| 337 | 1 | 7808 | 365 | 8173 |
| 333 | 3 | 6613 | 868 | 7481 |
| 187 | 62 | 6540 | 924 | 7464 |
| 185 | 71 | 5484 | 1890 | 7374 |
| 186 | 57 | 6114 | 1260 | 7374 |
| 329 | 37 | 6492 | 868 | 7360 |
| 253 | 59 | 6404 | 750 | 7154 |
| 254 | 60 | 6300 | 750 | 7050 |
| 184 | 40 | 6637 | 347 | 6984 |
| 336 | 4 | 6459 | 365 | 6824 |

**Table 59. Occupancy rates for adults and children in the Sellafield direct radiation survey area (h $y^{-1}$)**

| Observation number | Age (years) | Indoor occupancy | Outdoor occupancy | Total occupancy |
|---|---|---|---|---|
| 334 | 40 | 6065 | 546 | 6611 |
| 183 | 42 | 6097 | 347 | 6444 |
| 331 | 13 | 6144 | 70 | 6214 |
| 332 | 11 | 6144 | 70 | 6214 |
| 188 | 34 | 5678 | 104 | 5782 |
| 182 | 54 | 4994 | 92 | 5086 |
| 385 | 52 | 4396 | 406 | 4802 |
| 335 | 44 | 3302 | 365 | 3667 |
| 408 | 47 | 624 | 1872 | 2496 |
| 330 | 37 | 1704 | - | 1704 |
| 358 | 59 | 1082 | 266 | 1348 |
| 359 | 52 | 1082 | 266 | 1348 |

**Notes**
U = Unknown

**Table 60. Analysis of occupancy rates for adults and children in the Sellafield direct radiation survey area**

| **0 to 0.25 km zone** | |
|---|---|
| Number of hours | Number of observations |
| 8000 to 8760 | 3 |
| 7000 to 8000 | 1 |
| 6000 to 7000 | 3 |
| 5000 to 6000 | 1 |
| 4000 to 5000 | 1 |
| 3000 to 4000 | 0 |
| 2000 to 3000 | 1 |
| 1000 to 2000 | 0 |
| 0 to 1000 | 10 |
| **0 to 8760** | **20** |

| **>0.25 to 0.5 km zone** | |
|---|---|
| Number of hours | Number of observations |
| 8000 to 8760 | 3 |
| 7000 to 8000 | 2 |
| 6000 to 7000 | 5 |
| 5000 to 6000 | 0 |
| 4000 to 5000 | 0 |
| 3000 to 4000 | 0 |
| 2000 to 3000 | 1 |
| 1000 to 2000 | 4 |
| 0 to 1000 | 2 |
| **0 to 8760** | **17** |

| **>0.5 to 1 km zone** | |
|---|---|
| Number of hours | Number of observations |
| 8000 to 8760 | 3 |
| 7000 to 8000 | 7 |
| 6000 to 7000 | 6 |
| 5000 to 6000 | 2 |
| 4000 to 5000 | 1 |
| 3000 to 4000 | 1 |
| 2000 to 3000 | 1 |
| 1000 to 2000 | 3 |
| 0 to 1000 | 0 |
| **0 to 8760** | **24** |

**Table 61. Gamma dose rate measurements for the Sellafield direct radiation survey (µGy $h^{-1}$)**

| **Residences** | | | | |
|---|---|---|---|---|
| Location | Outdoor substrate | Outdoor gamma dose rate at 1 metre[a] | Indoor substrate | Indoor gamma dose rate at 1 metre[a] |
| House 1 | Grass | 0.085 | Concrete | 0.092 |
| House 2 | Grass | 0.081 | Concrete | 0.095 |
| House 3 | Grass | 0.085 | Tiles | 0.096 |
| House 4 | Concrete | 0.071 | - | NM |
| House 5 | Grass | 0.077 | Concrete | 0.099 |
| House 6 | Grass | 0.091 | wood | 0.126 |
| House 7 | Concrete | 0.090 | Tiles | 0.097 |
| House 8 | Grass | 0.097 | Concrete | 0.134 |
| House 9 | Grass | 0.093 | - | NM |
| House 10 | Grass | 0.088 | Tiles | 0.119 |
| House 11 | Grass | 0.085 | - | NM |
| House 12 | Grass | 0.089 | Concrete | 0.119 |
| House 13 | Grass | 0.089 | Tiles | 0.088 |
| House 14 | Grass | 0.102 | Concrete | 0.116 |

| **Backgrounds** | | | |
|---|---|---|---|
| | Location | Substrate | Background gamma dose rate at 1 metre |
| Background 1 | St Bees | Rough grass | 0.070 |
| Background 2 | Lowther Park | Rough grass | 0.068 |
| Background 3 | Santon | Rough grass | 0.083 |
| Background 4 | Saltcoats | Rough grass | 0.086 |

**Notes**

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

NM = Not measured

**Table 62. Combinations of adult pathways for consideration in dose assessments in the Sellafield area**

| Combination number | Fish | Crustaceans | Molluscs | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 | * | | | | | | | | * | * | | | | | * | * | | | * | | | | | | | | | | | | | | | |
| 2 | | | | | | | * | | * | * | * | * | | | * | * | | * | * | | | | | | | | | | | | | | * | * |
| 3 | | | | | * | * | | * | * | * | * | | * | * | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | * | * | * | * | * | | | | | * | * | | | * | | | | | | | | | | | | | | | |
| 5 | * | | | | | * | | * | * | | * | | | * | | | | | | | | | | | | | | | | | | | | |
| 6 | * | * | | | | | | | | | | * | * | | | | | | | | | | | | | | | | | | | | | |
| 7 | * | | | | * | | | | | * | | | | * | | * | * | | * | * | * | | | | | | | | | | | | | |
| 8 | * | | | | | | | | | | | | | * | | | | | | | * | | | | | | * | | | | | | | |
| 9 | | | | | | | | | | | | | | * | * | * | * | | * | | | | | | | | | | | | | | | |
| 10 | * | * | * | | | | | | | | | | | | | | | | | | | | * | * | * | | | * | * | * | | * | | |
| 11 | * | * | * | * | | | | | | | | | | | | | | | | | | | * | | | | * | * | | * | | | | |
| 12 | * | * | * | | | * | * | * | * | * | | | | | | * | | | * | | | | | | | | * | * | * | * | | | | * |
| 13 | * | | | | | | | | | | | | | | | | | | | | * | | * | * | | | * | * | | * | | | | * |
| 14 | * | * | * | | | | | | | | | | | | | | | | | | | | | | | | * | | * | | | * | | |
| 15 | * | | | | | | | | | | | | | | | | | | | | | * | | | | | * | | | * | | | | |
| 16 | * | * | | | | | | | | | | | | | | | | | | | | | | | | | * | * | * | * | | * | | |
| 17 | | | | | * | | | | | | | | | * | | | | | | * | | * | | | | | | | | * | | | | |
| 18 | * | | | | * | | | | | | | | | | | | | | | | | * | | | | | | | | * | | | | * |
| 19 | * | | | | | | | | | * | * | * | | | | | | | | | | | | | | | | | | | | | * | * |
| 20 | | | | | | | | | | * | | | * | * | | | | | | | | | | | | | * | | | | | | * | * |

**Table 62. Combinations of adult pathways for consideration in dose assessments in the Sellafield area**

| Combination number | Fish | Crustaceans | Molluscs | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | * | | | | | * | * | * | * | | | | | | * | | | | | | | | | | | | * | | | | | * | * | * |
| 22 | | | | | | | * | | * | * | | | | * | * | * | | * | * | | | | | | | | * | | | | | | * | * |
| 23 | | | | | | * | * | * | | * | | | | | * | | | | | | | | | | | | | | | | | | * | * |
| 24 | | | | | | | | | | | | | | | | | | | | | | * | | | | * | * | | | | | | | |
| 25 | * | * | * | | * | | | | | | | | | | | | | | | | | | * | | | * | | | | * | | | | |
| 26 | | | | | | | | | | | | | * | * | * | | * | | | | | | | | | | | | | | | | * | * |
| 27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | * | * | | |
| 28 | | | * | | | * | | * | * | * | * | | * | * | | * | | | | | | | | | | | | * | | * | | | | |
| 29 | * | | | | | | | | | | | | | | | | | | | | | | | | * | | * | | | | | | | |
| 30 | * | * | * | | | | | | | | | | | | | | | | | | | | * | * | | | * | * | | * | | | | |
| 31 | | | | | | | | | | | * | | | | | | | | | | | | | | | | * | * | | | | | | |
| 32 | | | | | | * | * | | * | * | | | | | * | * | | | | | | | | | | | * | | | | | | * | * |
| 33 | | | | | | | | | | * | | * | * | | * | * | | | | | | | | | | | * | | | | | | * | * |
| 34 | * | | | | | | | | | | | * | * | | * | | | | * | | | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | * | | | * | * | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | * | * | * | | | * | * | | | * | | | | | | | | * | | | | * | | | |
| 37 | | | | | | * | * | * | * | * | | | | | * | | | | * | | | | | | | | * | | | | | | | |
| 38 | | | | | | | | | | | * | * | * | * | | * | | | * | | | | | | | | * | | | | | | | |
| 39 | | | | | | | | | | | * | | | | * | * | | | * | | | | | | | * | * | | | | | | | |
| 40 | | | | | | * | * | | | | * | | | | | * | | | * | | | | | | | | * | | | | | | * | * |
| 41 | | | | | | * | * | * | * | * | * | | | | | | | | | | | | | | | | | | | | | | | |

**Notes**

The food groups and external exposure pathways marked with an asterisk are combined for the corresponding combination number.
For example, combination number 1 represents an individual (or individuals) from Annex 1 who had positive data in the following pathways; fish, potato, domestic fruit, eggs, wild/free foods and wild fungi

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **27.9** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | F | 53 | 11.8 | - | - | - | - | - | - | - | 25.4 | 11.2 | - | - | - | - | **39.7** | 1.9 | - | - | **0.9** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | M | 32 | 11.8 | - | - | - | - | - | - | - | 25.4 | 11.2 | - | - | - | - | **39.7** | 1.9 | - | - | **0.9** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | M | 48 | - | - | - | - | - | - | - | - | **76.2** | - | **182.5** | **26.0** | - | - | **17.8** | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | F | 47 | - | - | - | - | - | - | - | - | **76.2** | - | **182.5** | **26.0** | - | - | **17.8** | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | M | 53 | - | - | - | - | - | - | - | - | - | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 9 | F | 47 | - | - | - | - | - | - | - | - | - | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10 | M | 48 | - | - | - | - | 1.4 | - | - | - | **95.3** | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 11 | F | 75 | - | - | - | - | 1.4 | - | - | - | **95.3** | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 12 | M | 62 | - | - | - | - | - | **39.6** | **58.9** | **46.7** | **82.8** | **62.6** | - | - | - | - | 8.9 | 0.5 | - | - | **1.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 13 | F | 60 | - | - | - | - | - | **39.6** | **58.9** | **46.7** | **82.8** | **62.6** | - | - | - | - | 8.9 | 0.5 | - | - | **1.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 14 | M | 46 | - | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 15 | F | 47 | 6.5 | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 16 | M | 51 | - | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 17 | F | 50 | - | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 18 | F | 18 | - | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 19 | M | 23 | - | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20 | F | 17 | - | - | - | - | - | 14.7 | - | 14.7 | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 22 | M | 43 | - | - | - | - | - | - | - | - | **82.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 23 | F | 47 | - | - | - | - | - | - | - | - | **82.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 25 | M | 32 | 2.9 | - | - | - | - | - | - | - | - | - | - | 12.5 | **11.3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26 | F | 30 | 2.9 | 0.9 | - | - | - | - | - | - | - | - | - | 12.5 | **11.3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 27 | M | 63 | - | - | - | - | - | - | **27.0** | 10.2 | **88.5** | 5.7 | - | - | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 28 | F | 56 | - | - | - | - | - | - | **27.0** | 10.2 | **88.5** | 5.7 | - | - | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 29 | M | 78 | - | - | - | - | - | - | - | - | **100.0** | - | **228.1** | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 30 | F | 71 | - | - | - | - | - | - | - | - | **100.0** | - | **228.1** | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 31 | F | 31 | - | - | - | - | - | - | - | - | **100.0** | - | **228.1** | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 32 | M | U | - | - | - | - | - | - | - | - | - | - | **228.1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 33 | M | 66 | - | - | - | - | - | - | - | - | **150.0** | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | F | 65 | - | - | - | - | - | - | - | - | **150.0** | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35 | M | 47 | 6.5 | - | - | - | **4.2** | - | - | - | - | 0.8 | - | - | - | 3.9 | - | 2.1 | 1.1 | - | 0.2 | **13.6** | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 36 | F | 43 | 6.5 | - | - | - | **4.2** | - | - | - | - | 0.8 | - | - | - | 3.9 | - | 2.1 | 1.1 | - | 0.2 | **13.6** | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 37 | M | 23 | 6.5 | - | - | - | **4.2** | - | - | - | - | 0.8 | - | - | - | 3.9 | - | 2.1 | 1.1 | - | 0.2 | **13.6** | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 40 | M | 40 | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | **6.5** | - | - | - | - | - | - | **0.7** | - | - | - | - | - | 42 | - | - | - | - | - | - | - |
| 41 | M | 65 | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | **6.5** | - | - | - | - | - | - | **0.7** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 42 | F | 65 | 3.0 | - | - | - | - | - | - | - | - | - | - | - | - | **6.5** | - | - | - | - | - | - | **0.7** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 43 | M | 73 | - | - | - | - | - | - | - | - | - | - | - | - | - | **18.9** | - | 1.5 | **3.4** | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 44 | M | 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | **6.3** | 8.9 | 1.5 | **1.1** | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 45 | F | 93 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.9 | 1.5 | - | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 46 | M | U | **62.1** | 4.7 | **16.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | 10 | - | - | - | - |
| 47 | M | 68 | **35.4** | 5.5 | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **390** | - | - | - | - | - | 30 | - | - | 60 | - | - |
| 48 | F | 69 | **35.4** | 3.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 49 | F | 36 | **35.4** | 5.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 50 | M | U | 17.5 | 4.3 | 13.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 240 | - | - | - | - | - | - | 240 | - | - | - | - |
| 51 | M | 61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - | - |
| 52 | F | 61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - | - |
| 53 | M | 50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - | - |
| 54 | M | 66 | **29.0** | 7.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 150 | - | - | - | - | - | - | - | - | - | - | - |
| 55 | F | 64 | 23.1 | 7.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 56 | F | 36 | 23.1 | 7.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 57 | M | 67 | - | - | 3.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **942** | - | - | - | **936** | - | - | **942** | - | - | - | - |
| 58 | F | 67 | - | - | 9.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 59 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - | - | - | - | - | - |
| 60 | F | 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - | - | - | - | - | - |
| 61 | F | 29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - | - | - | - | - | - |
| 62 | M | U | 20.8 | 3.2 | **49.1** | - | - | - | - | - | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **444** | - | - | - | - | - | - | - |
| 63 | F | U | 20.8 | - | - | - | - | - | - | - | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 64 | M | 68 | **35.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 208 | - | - | - | **572** | - | - | 208 | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65 | F | 68 | **35.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 66 | M | 49 | 8.1 | 2.6 | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **650** | - | 60 | - | - | 60 | - | - |
| 67 | F | 48 | 8.1 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 68 | M | 20 | 8.1 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 69 | F | 23 | - | 1.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 70 | M | 71 | 12.1 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **650** | - | - | - | - | - | - | - |
| 71 | F | 70 | 12.1 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 72 | M | 45 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | **416** | - | - | 156 | - | - | - | - |
| 73 | F | 45 | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 74 | M | 49 | **37.1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **156** | - | - | - | - | **416** | - | - | 156 | - | - | - | - |
| 75 | M | 63 | **47.2** | **11.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1104** | - | - | 1656 | - | - |
| 76 | M | 35 | **47.2** | **11.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1104** | - | - | 1656 | - | - |
| 77 | M | 50 | 11.8 | 5.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1200** | - | - | 1350 | - | - |
| 78 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **1200** | - | - | 1350 | - | - |
| 79 | F | 50 | 11.8 | 5.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 80 | M | 60 | 8.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 81 | F | 60 | 8.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 82 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 83 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 84 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 85 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 86 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 87 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 88 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 89 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 90 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 91 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 92 | M | 45 | 12.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | **455** | - | - | 182 | - | - | - | - |
| 93 | M | 51 | - | - | **30.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 94 | M | 20 | - | - | **30.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 95 | M | 62 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 112 | 28 | - | - | - | - | - | 112 |
| 96 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - | - |
| 97 | M | 54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **350** | - | - | - | - | - | - | - | - | - | - |
| 98 | M | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - | - | - | - | - |
| 99 | F | 39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - | - | - | - | - |
| 101 | M | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - | - |
| 102 | F | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - | - | - |
| 103 | M | 67 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 150 | - | - | - | - | - | - |
| 104 | F | 70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 150 | - | - | - | - | - | - |
| 105 | F | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 143 | - | - | - | - | - | - |
| 106 | F | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | - | - | - | - | - | - |
| 107 | M | 67 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **503** | - | - | - | - | - | - |
| 108 | M | 77 | 14.7 | **30.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **720** | - | - | - | - | **1089** | - | - | 553 | - | - |
| 109 | F | U | 14.7 | **13.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 110 | M | U | 14.7 | **30.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **720** | - | - | - | - | **1089** | - | - | 553 | - | - |
| 111 | F | U | 14.7 | **13.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 112 | M | 47 | **28.7** | **12.2** | 0.03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 42 | 1 | - | 646 | - | - |
| 113 | F | 80 | **28.7** | **12.2** | 0.03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 114 | M | 19 | **28.7** | **12.2** | 0.03 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 115 | M | 47 | **51.3** | **13.9** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **520** | 42 | - | - | 1328 | - | - |
| 116 | F | 42 | **51.3** | **23.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 117 | M | 54 | **34.0** | 1.0 | 0.8 | - | - | 7.0 | 5.5 | 12.5 | 10.0 | 1.0 | - | - | - | - | - | **7.5** | - | - | **1.5** | - | - | - | - | - | - | - | **856** | **450** | **620** | 308 | - | - | - | 52 |
| 118 | F | 53 | 17.0 | 1.0 | - | - | - | 7.0 | 5.5 | 12.5 | 10.0 | 1.0 | - | - | - | - | - | **7.5** | - | - | **1.5** | - | - | - | - | - | - | - | 158 | 127 | 155 | 5 | - | - | - | - |
| 123 | M | 44 | 9.7 | 10.2 | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | **400** | 1 | - | 600 | - | - |
| 124 | F | 44 | 4.2 | 10.2 | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 126 | M | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | - | - |
| 127 | M | 49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **469** | - | - | - | - | - | - |
| 128 | M | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **548** | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 129 | F | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 26 | - | - | - | - | - | - |
| 130 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9 | - | - | - | - | - | - |
| 131 | M | 37 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - |
| 132 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 130 | - | - | - | - | - | - |
| 133 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 130 | - | - | - | - | - | - |
| 135 | F | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | - | - | - |
| 137 | M | U | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | 132 | - | 24 | - | - | - | - |
| 138 | F | U | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 139 | M | 77 | 7.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 140 | F | U | 3.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 141 | M | 30 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | 194 | - | 64 | - | - | - | 12 |
| 142 | F | 27 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 143 | M | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | 194 | - | 64 | - | - | - | 12 |
| 144 | M | U | 20.0 | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 73 | **546** | 65 | 73 | - | 582 | - | - |
| 145 | F | U | 20.0 | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 146 | M | 25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 330 | - | - | - | - | - | - |
| 147 | F | 23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 264 | - | - | - | - | - | - |
| 148 | M | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25 | 24 | - | - | - | - | - | - |
| 149 | F | 31 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25 | 24 | - | - | - | - | - | - |
| 152 | M | 65 | - | - | - | - | **5.0** | - | - | - | - | - | - | - | - | 2.7 | - | - | - | - | - | 1.1 | - | **120** | - | - | - | - | - | - | - | 120 | - | - | - | - |
| 153 | F | 67 | - | - | - | - | **5.0** | - | - | - | - | - | - | - | - | 2.7 | - | - | - | - | - | 1.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 154 | M | U | 16.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2.3** | - | 80 | 20 | - | - | 100 | **476** | - | 260 | - | - | - | 288 |
| 155 | F | U | 4.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **0.6** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 156 | M | U | 2.7 | - | - | - | **4.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 42 | - | - | - | - | - | - | - | 42 | - | - | - | 30 |
| 157 | F | U | 2.7 | - | - | - | **4.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 158 | U | U | 2.7 | - | - | - | **4.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 159 | U | U | 2.7 | - | - | - | **4.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 160 | M | U | **35.4** | **23.8** | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | **380** | **20** | - | - | 120 | **1200** | 44 | - | 1000 | - | - |
| 161 | M | U | **35.4** | **23.8** | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | **380** | **20** | - | - | 120 | **1200** | 44 | - | 1000 | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 162 | F | U | 17.7 | **11.9** | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 163 | F | U | 17.7 | **11.9** | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 168 | M | U | **29.3** | 7.3 | 0.5 | **0.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 15 | - | - | - | **606** | **1043** | **520** | **972** | - | - | - | - |
| 169 | F | U | **82.4** | **16.5** | 7.8 | **0.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | 344 | - | - | - | - | - | - |
| 174 | F | 48 | 2.6 | - | - | - | - | - | - | - | - | 7.5 | 44.3 | **52.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5635 | 1825 |
| 175 | M | 48 | 2.6 | - | - | - | - | - | - | - | - | 7.5 | 44.3 | **52.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5316 | 3024 |
| 176 | M | 20 | - | - | - | - | - | - | - | - | - | 7.5 | 44.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4868 | 624 |
| 177 | F | 18 | 2.6 | - | - | - | - | - | - | - | - | 7.5 | 44.3 | **52.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3508 | 884 |
| 178 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5834 | 2050 |
| 179 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7666 | 730 |
| 180 | M | 55 | - | - | - | - | - | - | - | - | - | 2.3 | - | - | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | 6307 | 88 |
| 181 | F | 53 | - | - | - | - | - | - | - | - | - | 2.3 | - | - | 5.7 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | 6307 | 88 |
| 182 | M | 54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4994 | 92 |
| 183 | M | 42 | 7.8 | - | - | - | - | 4.5 | 4.5 | 5.3 | 16.4 | - | - | - | - | - | **14.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | 6097 | 347 |
| 184 | F | 40 | 7.8 | - | - | - | - | 2.3 | 4.5 | 5.3 | 16.4 | - | - | - | - | - | 8.9 | - | - | - | - | - | - | - | - | - | - | - | **365** | - | - | - | - | 12 | 6637 | 347 |
| 185 | M | 71 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.8 | - | 1.8 | - | - | 0.7 | - | - | - | - | - | - | - | 24 | - | - | - | - | - | 5484 | 1890 |
| 186 | F | 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.8 | - | 1.8 | - | - | 0.7 | - | - | - | - | - | - | - | 24 | - | - | - | - | - | 6114 | 1260 |
| 187 | F | 62 | - | - | - | - | - | **20.3** | **27.9** | 12.0 | - | 11.6 | - | - | - | - | 6.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6540 | 924 |
| 188 | M | 34 | - | - | - | - | - | - | - | 6.6 | - | - | - | - | - | - | 6.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5678 | 104 |
| 192 | M | 59 | - | - | - | - | - | - | **26.2** | - | - | - | - | - | - | - | **17.8** | - | - | - | - | - | - | - | - | - | - | - | 7 | - | - | - | - | - | 6622 | 1568 |
| 193 | F | 59 | - | - | - | - | - | - | 8.2 | - | - | - | - | - | - | - | **17.8** | - | - | - | - | - | - | - | - | - | - | - | 7 | - | - | - | - | - | 6958 | 1232 |
| 194 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 256 | - | - | - | - | - | - | - |
| 195 | M | 58 | 2.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | - | - | - | - | - | - | - | - | 240 | - | - |
| 196 | F | U | 2.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 197 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | 6 | - | - | - | - | - | - | - | - |
| 198 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | 6 | - | - | - | - | - | - | - | - |
| 199 | M | 64 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | 46 | 179 | - | - | - | - | - | - | - |
| 200 | M | 61 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - |
| 201 | M | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 202 | M | 75 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | - | - | - | - | - | - |
| 203 | F | 72 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 137 | - | - | - | - | - | - |
| 204 | M | 41 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - |
| 205 | M | 45 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 208 | - | - | - | - | - | - | - |
| 206 | M | 52 | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | **115** | - | - | - | - | - | - | - | 115 | - | - | - | - |
| 207 | F | 53 | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 208 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **115** | - | - | - | - | - | - | - | 115 | - | - | - | - |
| 209 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **115** | - | - | - | - | - | - | - | 115 | - | - | - | - |
| 210 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **115** | - | - | - | - | - | - | - | 115 | - | - | - | - |
| 211 | F | 46 | 2.8 | 0.4 | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 138 | - | - | - | - | - | - | 8 | - | - | - | - |
| 212 | M | 50 | 2.8 | 0.4 | 0.3 | **0.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | - | - | - | - | - | - | 8 | - | - | - | - |
| 213 | F | 18 | 2.8 | 0.5 | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | - | - | - | - | - | - | 8 | - | - | - | - |
| 215 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - | - | - |
| 216 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - | - | - |
| 217 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | - | - | - | - | - | - | - |
| 218 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | - | - | - | - | - | - | - |
| 221 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 32 | - | - | 24 | 33 | - | - | - | - | - | - |
| 222 | M | 66 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - | - | - | - | - | - |
| 223 | M | 60 | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 88 | - | - | - | - | - | - | 72 | - | - | - | - |
| 224 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | 156 | 156 | - | 52 | - | - | - | - |
| 225 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **340** | - | - | - | - | - | - | - |
| 226 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **340** | - | - | - | - | - | - | - |
| 227 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30 | - | - | 288 | - | - |
| 228 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30 | - | - | 288 | - | - |
| 229 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30 | - | - | 288 | - | - |
| 230 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 30 | - | - | 288 | - | - |
| 231 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | 36 | - | - | - | - | - | - | - |
| 232 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 233 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 234 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 235 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 236 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 237 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 238 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 239 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 240 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 241 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 38 | - | - |
| 242 | M | 73 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **520** | - | - | **156** | - | - | - | - | - | - | - | - |
| 243 | M | U | 4.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 244 | F | U | 4.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 245 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 |
| 246 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 |
| 247 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 32 | - | - |
| 248 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | - | - |
| 249 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | - | - |
| 250 | M | 56 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **23.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6210 | 1820 |
| 251 | F | 49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **23.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6046 | 104 |
| 252 | F | 85 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **23.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8136 | - |
| 253 | M | 59 | - | - | - | - | - | - | - | - | - | - | - | - | 5.7 | 3.2 | 8.2 | - | **1.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6404 | 750 |
| 254 | F | 60 | - | - | - | - | - | - | - | - | - | - | - | - | 5.7 | 3.2 | 8.2 | - | **1.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6300 | 750 |
| 255 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1410 |
| 256 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1410 |
| 257 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1410 |
| 258 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1410 |
| 259 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 260 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 261 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 262 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 263 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 264 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 265 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 266 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 267 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 268 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 269 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 270 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 271 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 272 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 273 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 274 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 275 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 276 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 277 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 278 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | 25 | - | - |
| 279 | F | 53 | - | - | 0.5 | - | - | 8.7 | - | **32.8** | 41.7 | 2.4 | **182.5** | - | 3.8 | 2.6 | - | 2.0 | - | - | - | - | - | - | - | - | - | - | - | 3 | - | 3 | - | - | - | - |
| 280 | M | 48 | - | - | - | - | 1.5 | 8.7 | - | **32.8** | 41.7 | 2.4 | **182.5** | - | 3.8 | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 283 | M | U | 23.5 | **14.3** | 0.2 | - | **7.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **472** | - | - | **65** | - | - | - | 65 | - | - | - | - |
| 284 | F | U | 23.5 | **14.3** | - | - | **7.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 286 | M | U | 11.7 | 7.1 | - | - | **3.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 299 | M | 17 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 300 | F | 17 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 301 | F | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 302 | M | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 303 | F | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 304 | M | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 305 | F | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 306 | F | 60 | 5.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 307 | M | 60 | 5.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **50** | - | **518** | - | - | - | - | - | - | - |
| 308 | F | U | 5.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 309 | M | 35 | 9.4 | 0.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25 | - | - | - | 144 | 78 | - | 25 | - | - | - | - |
| 310 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - | - |
| 311 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - | - |
| 312 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - | - |
| 313 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - | - |
| 314 | M | 34 | 5.5 | 2.2 | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | 130 | - | - | 104 | 104 | - | 24 | - | - | - | - |
| 315 | F | 33 | 5.5 | 2.2 | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | 130 | - | - | 104 | 104 | - | 24 | - | - | - | - |
| 316 | F | 47 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | - | - | - | - | - | - | - |
| 317 | M | 55 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7 | - | - | - | - | - | - | - |
| 318 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - | - | - | - | - | - | - |
| 319 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - | - | - | - | - | - | - |
| 320 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| 321 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| 322 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - | - | - |
| 323 | F | 33 | - | - | - | - | - | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 128 | - | - | - | - | - | - |
| 324 | M | 35 | - | - | - | - | - | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 128 | - | - | - | - | - | - |
| 326 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - | - | - | - | - | - | - |
| 327 | F | U | - | - | - | - | - | - | - | - | 1.4 | - | - | - | - | - | - | 0.9 | - | - | - | - | - | - | - | - | - | - | 260 | - | - | - | - | - | - | - |
| 328 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **9.1** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 329 | F | 37 | - | - | - | - | - | 5.2 | 8.3 | - | 1.3 | 6.6 | - | - | - | - | 5.5 | 0.8 | - | - | - | - | - | - | - | - | - | - | 221 | - | - | - | - | - | 6492 | 868 |
| 330 | M | 37 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1704 | - |
| 334 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 39 | - | - | - | - | - | 6065 | 546 |
| 335 | M | 44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 39 | - | - | - | - | - | 3302 | 365 |
| 338 | F | 45 | - | - | - | - | - | - | 3.6 | - | 47.2 | 20.0 | - | - | - | 0.5 | **17.4** | **5.2** | - | 1.4 | 0.5 | - | - | - | - | - | - | - | 18 | - | - | - | - | - | 6136 | 1988 |
| 339 | M | 50 | - | - | - | - | - | - | 3.6 | - | 47.2 | 20.0 | **202.9** | **46.3** | - | - | **17.4** | 1.8 | - | 1.4 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | 4932 | 3392 |
| 340 | M | 23 | - | - | - | - | - | - | - | - | 11.8 | 1.8 | **177.3** | **17.7** | - | - | 11.9 | 0.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2244 | 276 |
| 341 | M | 24 | - | - | - | - | - | - | - | - | - | - | 29.6 | - | - | - | **17.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 508 | 52 |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 342 | F | 23 | - | - | - | - | - | - | - | - | - | - | 29.6 | - | - | - | **17.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 343 | M | 33 | - | - | - | - | - | - | - | - | - | 0.9 | - | 11.8 | **11.8** | - | 1.5 | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3646 | 3298 |
| 344 | F | 26 | - | - | - | - | - | - | - | - | - | 0.9 | - | 11.8 | **11.8** | - | 1.5 | 0.4 | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - | 5815 | 238 |
| 345 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2400 |
| 346 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 200 |
| 347 | M | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 200 |
| 348 | M | 62 | - | - | - | - | - | - | - | - | - | 6.8 | - | 11.8 | **11.8** | - | - | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 720 |
| 349 | M | 69 | - | - | - | - | - | - | - | - | - | - | 104.0 | - | - | - | 8.9 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 350 | F | 58 | - | - | - | - | - | - | - | - | - | - | 104.0 | - | - | - | 8.9 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 351 | M | 60 | - | - | - | - | - | **52.0** | 10.5 | **26.2** | 13.6 | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 352 | F | 54 | - | - | - | - | - | **52.0** | 10.5 | **26.2** | 13.6 | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 353 | F | 51 | 0.2 | - | - | - | - | - | - | - | - | - | - | **31.5** | **11.3** | - | 11.9 | - | - | - | **2.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 354 | M | 51 | 0.2 | - | - | - | - | - | - | - | - | - | - | **31.5** | **11.3** | - | 11.9 | - | - | - | **2.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 355 | F | 89 | 0.2 | - | - | - | - | - | - | - | - | - | - | **31.5** | **11.3** | - | 11.9 | - | - | - | **2.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 356 | F | 67 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | - | - | - | - | - | - | - |
| 357 | M | 66 | - | - | - | - | - | - | - | - | - | - | 118.2 | - | - | 0.5 | **17.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 358 | F | 59 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1082 | 266 |
| 359 | M | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1082 | 266 |
| 360 | M | 40 | - | - | - | - | - | - | - | - | - | 0.2 | **146.0** | **28.0** | - | - | 2.4 | 0.1 | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 361 | F | 41 | - | - | - | - | - | - | - | - | - | 0.2 | **146.0** | **28.0** | - | - | 2.4 | 0.1 | - | - | 0.2 | - | - | - | - | - | - | - | 68 | - | - | - | 56 | - | - | - |
| 365 | F | 62 | - | - | - | - | - | - | - | - | - | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 366 | M | 67 | - | - | - | - | - | - | - | - | - | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 367 | M | 30 | - | - | - | - | - | - | - | - | - | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 368 | F | 27 | - | - | - | - | - | - | - | - | - | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - | - |
| 369 | M | 34 | - | - | - | - | - | - | - | - | - | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 370 | F | 25 | - | - | - | - | - | - | - | - | - | - | **365.0** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 375 | M | 72 | - | - | - | - | - | - | 11.7 | - | 26.0 | **28.4** | - | - | - | - | - | - | - | **8.5** | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - | - | - |
| 376 | F | 65 | - | - | - | - | - | - | 11.7 | - | 26.0 | **28.4** | - | - | - | - | - | - | - | **8.5** | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - | - | - |
| 377 | M | 48 | - | - | - | - | - | 5.9 | 15.3 | 12.9 | 9.1 | 9.6 | - | - | - | - | 4.0 | 1.1 | - | - | 0.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 378 | F | 49 | - | - | - | - | - | 5.9 | 15.3 | 12.9 | 9.1 | 10.7 | - | - | - | - | 4.0 | - | - | - | 0.7 | - | - | - | - | - | - | - | 104 | - | - | - | - | - | - | - |
| 380 | M | U | - | - | - | - | - | - | - | - | - | - | 103.7 | - | - | 0.3 | - | 0.5 | - | - | **1.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 381 | F | U | - | - | - | - | - | - | - | - | - | - | 103.7 | - | - | 0.3 | - | 0.5 | - | - | **1.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 382 | F | 21 | - | - | - | - | - | - | - | - | - | - | 103.7 | - | - | 0.3 | - | 0.5 | - | - | **1.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 383 | M | 57 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.2 | - | - | 0.5 | - | - | - | - | - | - | - | 4 | - | - | - | - | - | - | - |
| 384 | F | 50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.2 | - | - | 0.5 | - | - | - | - | - | - | - | 78 | - | - | - | - | - | - | - |
| 385 | M | 52 | - | - | - | - | - | - | - | - | - | 11.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 232 | - | - | - | - | - | 4396 | 406 |
| 386 | M | 41 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.9 | 1.4 | - | - | **2.7** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 387 | F | 42 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.9 | 1.4 | - | - | **2.7** | - | - | - | - | - | - | - | 12 | - | - | - | - | - | - | - |
| 390 | M | 58 | - | - | - | - | - | - | - | - | - | - | **177.3** | **26.0** | **26.0** | 1.4 | - | 2.3 | - | - | **2.3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 391 | F | 56 | - | - | - | - | - | - | - | - | - | - | **177.3** | **26.0** | **26.0** | 1.4 | - | 2.3 | - | - | **2.3** | - | - | - | - | - | - | - | 22 | - | - | - | - | - | - | - |
| 392 | M | 54 | - | - | - | - | - | - | - | - | - | - | **147.8** | - | - | - | 8.9 | 2.3 | - | - | 0.3 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - |
| 393 | F | 46 | - | - | - | - | - | - | - | - | - | - | **147.8** | - | - | - | 8.9 | 2.3 | - | - | 0.3 | - | - | - | - | - | - | - | 5 | - | - | - | - | - | - | - |
| 394 | M | 27 | - | - | - | - | - | - | - | - | - | - | **147.8** | - | - | - | 8.9 | 2.3 | - | - | 0.3 | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - | - | - |
| 395 | M | 21 | - | - | - | - | - | - | - | - | - | - | **147.8** | - | - | - | 8.9 | 2.3 | - | - | 0.3 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - |
| 396 | M | 64 | - | - | - | - | - | - | - | - | 16.9 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 397 | F | 64 | - | - | - | - | - | - | - | - | 16.9 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 398 | M | 40 | - | - | - | - | - | - | - | - | 16.9 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 399 | F | 38 | - | - | - | - | - | - | - | - | 16.9 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 404 | M | 44 | - | - | - | - | - | 4.0 | 8.1 | - | - | - | 59.1 | - | - | - | - | **5.4** | - | - | 0.1 | - | - | - | - | - | - | - | 24 | - | - | - | - | - | 6006 | 1754 |
| 405 | F | 46 | - | - | - | - | - | - | - | - | - | - | 59.1 | - | - | - | - | **5.4** | - | - | 0.1 | - | - | - | - | - | - | - | 24 | - | - | - | - | - | 6386 | 230 |
| 408 | F | 47 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 624 | 1872 |
| 409 | M | 53 | - | - | - | - | - | 7.0 | 3.0 | 5.0 | **78.0** | 3.0 | 104.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 410 | M | 45 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - | - |
| 411 | F | 43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **730** | - | - | - | - | - | - | - |
| 412 | M | 65 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **912** | - | - | - | - | - | - | - |
| 413 | F | 67 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **912** | - | - | - | - | - | - | - |
| 414 | F | 69 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **912** | - | - | - | - | - | - | - |
| 415 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |

**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 | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 416 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 417 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 418 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 419 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 420 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 421 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 422 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 423 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 424 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 425 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |
| 426 | U | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 33 | - | - | - | - | - | - |

**Notes**

Emboldened observations are the high-rate individuals

U = Unknown

**Annex 2. Children's 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 | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud and sand | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15-year-old age group** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | M | 14 | - | - | - | - | - | - | - | **76.2** | - | **182.5** | **26.0** | - | - | **17.8** | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - |
| 7 | M | 12 | - | - | - | - | - | - | - | **76.2** | - | **182.5** | **26.0** | - | - | **17.8** | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - |
| 21 | M | 15 | - | - | - | - | **14.7** | - | **14.7** | **76.2** | - | **182.5** | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 38 | M | 12 | **6.5** | - | - | **4.2** | - | - | - | - | 0.8 | - | - | - | **3.9** | - | 1.4 | **1.1** | 0.2 | **13.6** | **0.2** | - | - | - | - | - | - | - | - | - |
| 39 | F | 13 | **6.5** | - | - | **4.2** | - | - | - | - | 0.8 | - | - | - | **3.9** | - | 1.4 | **1.1** | 0.2 | **13.6** | **0.2** | - | - | - | - | - | - | - | - | - |
| 125 | F | 13 | **4.2** | 1.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 164 | F | 13 | **7.1** | **2.7** | **1.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 170 | M | 12 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **258** | - | - | - | - | - |
| 214 | F | 16 | 2.8 | - | **0.3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **138** | - | - | - | 8 | - | - | - | - |
| 281 | M | 15 | - | - | - | **1.5** | **8.7** | - | **32.8** | **41.7** | **2.4** | **182.5** | - | **3.8** | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 285 | M | 13 | **11.7** | **7.1** | - | **3.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 291 | M | 12 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 292 | F | 12 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 293 | M | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 294 | F | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 295 | M | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 296 | F | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 297 | M | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |

**Annex 2. Children's 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 | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud and sand | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 298 | F | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 331 | F | 13 | - | - | - | - | 3.7 | **5.8** | - | 0.9 | **4.6** | - | - | - | - | 3.8 | 0.5 | - | - | - | - | - | - | **221** | - | - | 24 | - | 6144 | 70 |
| 388 | F | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | **8.9** | 1.4 | - | **2.7** | - | - | - | - | **156** | - | - | - | - | - | - |
| 389 | F | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - | **8.9** | 1.4 | - | **2.7** | - | - | - | - | **156** | - | - | - | - | - | - |
| 406 | M | 13 | - | - | - | - | - | - | - | - | - | 59.1 | - | - | - | - | **5.4** | - | 0.1 | - | - | - | - | 24 | - | - | - | - | 5755 | 1056 |
| **10-year-old age group** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | M | 9 | - | - | - | - | - | - | - | **82.8** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 165 | F | 11 | **7.1** | **2.7** | **1.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 166 | M | 8 | **7.1** | **2.7** | **1.2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 171 | M | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **258** | - | - | - | - | - |
| 172 | M | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **478** | 110 | - | - | - | - |
| 189 | F | 7 | - | - | - | - | - | **3.9** | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 287 | M | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 288 | F | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 289 | M | 11 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 290 | F | 11 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 332 | F | 11 | - | - | - | - | **3.7** | **5.8** | - | 0.9 | **4.6** | - | - | - | - | **3.8** | 0.5 | - | - | - | - | - | - | **221** | - | - | 24 | - | 6144 | 70 |
| 362 | F | 10 | - | - | - | - | - | - | - | - | 0.2 | **146.0** | **14.0** | - | - | **2.4** | 0.1 | - | **0.2** | - | - | - | - | 68 | - | - | 56 | - | - | - |
| 363 | F | 8 | - | - | - | - | - | - | - | - | 0.2 | **146.0** | **11.2** | - | - | **2.4** | 0.1 | - | **0.2** | - | - | - | - | 68 | - | - | 56 | - | - | - |

**Annex 2. Children's 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 | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud and sand | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 379 | F | 8 | - | - | - | - | **1.8** | **3.1** | **6.5** | **4.6** | **5.4** | - | - | - | - | **2.0** | - | - | **0.3** | - | - | - | - | 24 | - | - | - | - | - | - |
| 400 | M | 9 | - | - | - | - | - | - | - | **8.5** | - | - | - | - | - | 1.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 401 | F | 8 | - | - | - | - | - | - | - | **8.5** | - | - | - | - | - | 1.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 407 | F | 8 | - | - | - | - | - | - | - | - | - | **59.1** | - | - | - | - | **5.4** | - | **0.1** | - | - | - | - | 24 | - | - | - | - | 6105 | 682 |
| **5-year-old age group** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 | F | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **6** | - | - | - | - | - | - | - |
| 119 | F | 6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - |
| 120 | F | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - |
| 121 | F | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - |
| 122 | M | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | - | - | - | - | - |
| 136 | F | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | - | - |
| 150 | F | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25 | 24 | - | - | - | - | - |
| 151 | F | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25 | 24 | - | - | - | - | - |
| 167 | M | 6 | **3.5** | **1.0** | **0.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 173 | F | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **387** | - | - | - | - | - |
| 190 | F | 5 | - | - | - | - | - | **3.9** | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 191 | M | 3 | - | - | - | - | - | **3.9** | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 219 | M | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **10** | - | - | - | - | - | - | - |
| 220 | M | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **10** | - | - | - | - | - | - | - |

**Annex 2. Children's 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 | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | Wild fungi | Venison | Freshwater fish | Intertidal occupancy over mud and sand | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 282 | M | 2 | - | - | - | - | - | - | - | - | - | 14.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 333 | M | 3 | - | - | - | - | **0.7** | **1.7** | - | 0.3 | **1.3** | - | - | - | - | **1.1** | **0.2** | - | - | - | - | - | - | **221** | - | - | 24 | - | 6613 | 868 |
| 336 | M | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 39 | - | - | - | - | 6459 | 365 |
| 364 | F | 6 | - | - | - | - | - | - | - | - | 0.2 | **146.0** | **8.4** | - | - | **2.4** | **0.1** | - | **0.2** | - | - | - | - | 68 | - | - | 56 | - | - | - |
| 371 | F | 6 | - | - | - | - | - | - | - | - | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - |
| 372 | F | 2 | - | - | - | - | - | - | - | - | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - |
| 402 | M | 5 | - | - | - | - | - | - | - | **5.1** | - | - | - | - | - | 0.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 403 | F | 2 | - | - | - | - | - | - | - | **2.4** | - | - | - | - | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **1-year-old age group** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 134 | F | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **130** | - | - | - | - | - |
| 337 | F | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **39** | - | - | - | - | 7808 | 365 |
| 373 | F | 1 | - | - | - | - | - | - | - | - | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - |
| 374 | F | 1 | - | - | - | - | - | - | - | - | - | **182.5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **3-month-old age group** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 325 | F | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | **2** | - | - | - | - | - | - |

**Notes**

U=Unknown

Emboldened observations are the high-rate individuals

**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**

| Group | Ratio child/adult[a] | |
|---|---|---|
| | 1-year-old | 10-year-old |
| Fish[b] | 0.050 | 0.200 |
| Crustaceans[b] | 0.050 | 0.250 |
| Molluscs[b] | 0.050 | 0.250 |
| Green vegetables | 0.222 | 0.444 |
| Other vegetables | 0.200 | 0.500 |
| Root vegetables | 0.375 | 0.500 |
| Potatoes | 0.292 | 0.708 |
| Domestic fruit | 0.467 | 0.667 |
| Milk | 1.333 | 1.000 |
| Cattle meat | 0.222 | 0.667 |
| Pig meat | 0.138 | 0.625 |
| Sheep meat | 0.120 | 0.400 |
| Poultry | 0.183 | 0.500 |
| Eggs | 0.600 | 0.800 |
| Wild/free foods[c] | 0.110 | 0.490 |
| Game[d] | 0.140 | 0.500 |
| Honey | 0.789 | 0.789 |
| Wild fungi | 0.150 | 0.450 |
| Freshwater fish[b] | 0.050 | 0.250 |
| Direct radiation | 1.000 | 1.000 |
| External exposure | 0.030 | 0.500 |
| Plume | 1.000 | 1.000 |

**Notes**

[a]The age groups suggested for assessment in this table are those relating to dose coefficients representing 1 to 2 year olds (labelled 1-year-old) and 7 to 12 year olds (labelled 10-year-old). Excepting notes b and c, consumption ratios were derived from Byrom et al., (1995) for 1-year-old (6 to 12 months) and 10-year-old children (10 to 11 years)

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

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

[d]Game includes rabbits/hares and venison.

**Annex 5. Summary of adults' profiled consumption data (kg $y^{-1}$ or l $y^{-1}$) and occupancy data (h $y^{-1}$) 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 - Sediment[b] | Gamma ext - salt marsh | Honey | Marine plants/algae | Meat - Cow | Meat - Game[c] | Meat - Poultry | Meat - Sheep | Milk | Mollusca | Mushrooms | Occupancy IN water | Occupancy ON water | Plume (IN; 0-0.25km)[d] | Plume (MID; >0.25-0.5km)[d] | Plume (OUT; >0.5-1km)[d] | Vegetables - Green | Vegetables - Other Domestic | Vegetables - Potatoes | Vegetables - Root |
| | | kg | - | kg | kg | kg | kg | kg | h | h | kg | kg | kg | kg | kg | kg | l | kg | kg | h | h | h | h | h | kg | kg | kg | kg |
| Crustacean consumers | 18 | 16.8 | - | - | - | 32.1 | - | - | 220 | - | - | - | - | 0.8 | - | - | - | 1.4 | - | - | 470 | - | - | - | - | - | - | - |
| Occupants for direct radiation | 52 | - | 1 | 5 | - | 1.5 | 1.8 | 0.5 | 80 | - | 0.2 | - | 4.3 | 0.2 | 0.2 | 0.9 | 11.9 | - | 0.1 | - | - | 1250 | 1320 | 2050 | 0.8 | 1.9 | 3.3 | 0.8 |
| Egg consumers | 16 | - | 0.7 | 22 | - | 2 | 3.9 | 0.7 | - | - | 0.2 | - | 6.1 | - | 0.1 | - | 46.6 | - | 0.2 | - | - | 1320 | 190 | 2400 | 0.3 | 2.9 | 19.6 | 0.3 |
| Freshwater fish consumers | 1 | - | 0.2 | - | 1 | 6 | - | - | 140 | - | - | - | - | - | 3.9 | - | - | - | - | - | - | 60 | - | - | - | - | - | - |
| Sea fish consumers | 20 | 9.8 | 0.1 | - | - | 40.2 | 0.1 | 0.4 | 350 | - | - | - | - | - | - | - | - | 1.9 | 0.1 | - | 370 | - | - | - | 0.4 | 0.3 | 0.5 | 0.6 |
| Domestic fruit consumers | 4 | - | - | 4.4 | - | - | 45.5 | 0.2 | 10 | - | 4.3 | - | - | - | - | - | - | - | 0.9 | - | - | - | - | - | 19.8 | 35.3 | 54.4 | 23.3 |
| Wild fruit and nut consumers | 5 | 0.4 | 0.6 | 3.5 | - | 10.2 | 4.4 | 6.2 | 330 | - | 0.3 | - | - | - | 0.1 | - | 23.6 | 0.2 | 0.7 | - | - | - | 510 | 500 | 3.6 | 4.5 | 13.4 | 5 |
| Occupants for exposure - sediment | 16 | 4.7 | 0.1 | - | 0.1 | 11.1 | 0.1 | 0.5 | 910 | - | - | - | - | - | - | - | - | 0.4 | 0.1 | - | 70 | 20 | - | - | 0.4 | 0.3 | 0.6 | 0.8 |
| Occupants for exposure - salt marsh | 2 | 7.1 | - | - | - | 11.7 | - | - | 500 | 110 | - | - | - | 3.8 | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - |
| Honey consumers | 3 | - | 0.3 | - | - | - | 18.9 | - | 20 | - | 8.7 | - | - | - | - | - | - | - | - | - | - | - | - | 570 | - | 7.8 | 17.3 | - |
| Marine plants/algae consumers | 3 | 8.1 | - | - | - | 38.2 | - | - | 720 | - | - | 0.2 | - | - | - | - | - | 2.9 | - | - | - | - | - | - | - | - | - | - |
| Cattle meat consumers | 14 | - | 0.3 | 7.5 | - | 0.6 | 3.2 | 0.5 | 10 | - | 0.1 | - | 33.9 | - | 0.2 | 6.1 | 108.9 | - | 1 | - | - | 1440 | 40 | - | - | 0.3 | 15.1 | - |
| Game meat consumers | 5 | 5.7 | - | - | 0.1 | 13.3 | 0.5 | 1.3 | 90 | 10 | - | - | - | 14.4 | 2.4 | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| Poultry meat consumers | 5 | - | - | 1.8 | 0.4 | 1.8 | - | 0.6 | 10 | - | - | - | - | 0.9 | 9 | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| Sheep meat consumers | 10 | 0.1 | 0.2 | 3.9 | - | 0.7 | 0.9 | 0.6 | - | - | - | - | 20.7 | - | 0.3 | 14.4 | 35.5 | - | 1.2 | - | - | 260 | - | - | - | - | - | - |
| Milk consumers | 37 | - | - | 3.3 | - | 0.2 | 0.7 | 0.5 | - | - | - | - | 6.1 | 0.1 | 0.3 | 1.6 | 221.3 | - | 0.2 | - | - | - | 20 | - | 3.3 | 0.1 | 43.7 | 4.6 |
| Mollusca consumers | 4 | 2 | - | - | - | 20.7 | - | - | 110 | - | - | - | - | - | - | - | - | 31.4 | - | - | - | - | - | - | - | - | 0.9 | - |
| Mushroom consumers | 16 | 0.1 | 0.1 | 9.4 | - | 4.7 | 9.4 | 1.8 | 100 | - | - | - | 9.2 | - | 0.2 | 5.4 | 41.6 | 0.1 | 1.9 | - | - | - | - | - | 5.8 | 8 | 14.8 | 7.4 |
| Occupants in water | 28 | - | - | 0.1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 5.2 | - | - | 30 | 30 | - | - | - | - | - | - | - |
| Occupants on water | 12 | 14.6 | - | - | - | 26.3 | - | - | 300 | - | - | - | - | - | - | - | - | 1 | - | - | 1020 | - | - | - | - | - | - | - |
| Occupants for plume pathways (inner area) | 9 | - | 1 | 6.6 | - | 0.9 | 3.3 | - | - | - | - | - | 17.3 | - | - | - | 26.3 | - | - | - | - | 6780 | - | - | - | - | - | - |
| Occupants for plume pathways (middle area) | 8 | - | 1 | 0.6 | - | - | 0.6 | - | 50 | - | - | - | - | - | 0.1 | 1.4 | - | - | - | - | - | - | 7490 | - | - | - | 4.2 | - |
| Occupants for plume pathways (outer area) | 15 | - | 1 | 8.3 | - | 1 | 1.2 | 0.4 | 60 | - | - | - | - | - | 0.1 | - | - | - | 0.1 | - | - | - | - | 6640 | 2.2 | 5.3 | 2.4 | 1.9 |
| Green vegetable consumers | 5 | - | 0.2 | 4.8 | - | - | 29.6 | 0.2 | - | - | - | - | - | - | - | - | - | - | 0.7 | - | - | - | - | 1490 | 40.7 | 33.3 | 38.6 | 31.6 |
| Other domestic vegetable consumers | 6 | - | 0.3 | 7 | - | - | 24.7 | 0.2 | - | - | - | - | - | - | - | - | - | - | 0.7 | - | - | - | - | 2610 | 16.6 | 37.6 | 57.1 | 21 |
| Potato consumers | 23 | - | - | 3.1 | - | 0.3 | 6.1 | - | - | - | - | - | 2.3 | 0.1 | 0.2 | - | 153.3 | - | 0.2 | - | - | - | - | - | 8.2 | 7.6 | 89.7 | 9.7 |
| Root vegetable consumers | 6 | - | - | 3 | - | - | 23.6 | 0.5 | - | - | - | - | - | 0.2 | 0.6 | 1.3 | 60.8 | 0.1 | 0.6 | - | - | - | - | - | 33.4 | 23.1 | 46 | 35.2 |

**Notes**

[a] Direct radiation is expressed as a proportion of the group who are present within 1 km of the site

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

[c] Game meat includes rabbits/hares, venison and wildfowl

[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 6. Female consumption (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area, for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | 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 salt marsh | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | F | 18 | - | - | - | - | - | 14.7 | - | 14.7 | 76.2 | - | 182.5 | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20 | F | 17 | - | - | - | - | - | 14.7 | - | 14.7 | 76.2 | - | 182.5 | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26 | F | 30 | 2.9 | 0.9 | - | - | - | - | - | - | - | - | - | 12.5 | 11.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 31 | F | 31 | - | - | - | - | - | - | - | - | 100.0 | - | 228.1 | - | - | - | 5.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 36 | F | 43 | 6.5 | - | - | - | 4.2 | - | - | - | - | 0.8 | - | - | - | 3.9 | - | 2.1 | 1.1 | 0.2 | 13.6 | 0.2 | - | - | - | - | - | - | - | - | - | - | - |
| 49 | F | 36 | 35.4 | 5.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 56 | F | 36 | 23.1 | 7.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 59 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 182 | - | - | - | - | - | - | - | - | - |
| 60 | F | 28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - | - | - | - |
| 61 | F | 29 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 274 | - | - | - | - | - | - | - | - | - |
| 63 | F | U | 20.8 | - | - | - | - | - | - | - | 3.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 69 | F | 23 | - | 1.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 86 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 87 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 88 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 89 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 90 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 286 | - | - |
| 96 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - |
| 99 | F | 39 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - | - | - |
| 102 | F | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - | - | - |
| 105 | F | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 143 | - | - | - | - | - |

**Annex 6. Female consumption (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area, for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | 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 salt marsh | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 109 | F | U | 14.7 | 13.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 111 | F | U | 14.7 | 13.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 116 | F | 42 | 51.3 | 23.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 124 | F | 44 | 4.2 | 10.2 | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 130 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9 | - | - | - | - | - |
| 132 | F | 36 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 130 | - | - | - | - | - |
| 133 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 130 | - | - | - | - | - |
| 135 | F | 35 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52 | - | - | - | - | - |
| 138 | F | U | 5.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 140 | F | U | 3.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 142 | F | 27 | 2.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 145 | F | U | 20.0 | 1.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 147 | F | 23 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 264 | - | - | - | - | - |
| 149 | F | 31 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 25 | 24 | - | - | - | - | - |
| 155 | F | U | 4.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.6 | - | - | - | - | - | - | - | - | - | - | - |
| 157 | F | U | 2.7 | - | - | - | 4.7 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 162 | F | U | 17.7 | 11.9 | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 163 | F | U | 17.7 | 11.9 | 2.9 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 169 | F | U | 82.4 | 16.5 | 7.8 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 156 | 344 | - | - | - | - | - |
| 177 | F | 18 | 2.6 | - | - | - | - | - | - | - | - | 7.5 | 44.3 | 52.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3508 | 884 |
| 179 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7666 | 730 |

**Annex 6. Female consumption (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area, for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | 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 salt marsh | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 184 | F | 40 | 7.8 | - | - | - | - | 2.3 | 4.5 | 5.3 | 16.4 | - | - | - | - | - | 8.9 | - | - | - | - | - | - | - | - | - | 365 | - | - | - | 12 | 6637 | 347 |
| 196 | F | U | 2.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 198 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | 6 | - | - | - | - | - | - | - |
| 213 | F | 18 | 2.8 | 0.5 | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8 | - | - | - | - | 8 | - | - | - | - |
| 214 | F | 16 | 2.8 | - | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 138 | - | - | - | - | 8 | - | - | - | - |
| 216 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 21 | - | - | - | - | - | - |
| 218 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - | - | - | - | - | - | - | - |
| 226 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 340 | - | - | - | - | - | - |
| 244 | F | U | 4.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 284 | F | U | 23.5 | 14.3 | - | - | 7.6 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 296 | F | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 298 | F | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 300 | F | 17 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 301 | F | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 303 | F | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 305 | F | 18 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 36 | 40 | - | - |
| 308 | F | U | 5.2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 315 | F | 33 | 5.5 | 2.2 | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 24 | 130 | - | 104 | 104 | 24 | - | - | - | - |
| 319 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - | - | - | - | - | - |
| 322 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | - | - | - | - | - | - |
| 323 | F | 33 | - | - | - | - | - | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | 128 | - | - | - | - | - |

**Annex 6. Female consumption (kg $y^{-1}$ or l $y^{-1}$) and occupancy rates (h $y^{-1}$) in the Sellafield area, for use in foetal dose assessments**

| Observation number | Sex | Age (years) | Fish | Crustaceans | Molluscs | Marine plants/algae | Wildfowl | Green vegetables | Other vegetables | Root vegetables | Potato | Domestic fruit | Milk | Cattle meat | Sheep meat | Poultry | Eggs | Wild/free foods | Rabbits/hares | 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 salt marsh | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 326 | F | U | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - | - | - | - | - | - |
| 327 | F | U | - | - | - | - | - | - | - | - | 1.4 | - | - | - | - | - | - | 0.9 | - | - | - | - | - | - | - | - | 260 | - | - | - | - | - | - |
| 329 | F | 37 | - | - | - | - | - | 5.2 | 8.3 | - | 1.3 | 6.6 | - | - | - | - | 5.5 | 0.8 | - | - | - | - | - | - | - | - | 221 | - | - | - | - | 6492 | 868 |
| 334 | F | 40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 39 | - | - | - | - | 6065 | 546 |
| 342 | F | 23 | - | - | - | - | - | - | - | - | - | - | 29.6 | - | - | - | 17.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 344 | F | 26 | - | - | - | - | - | - | - | - | - | 0.9 | - | 11.8 | 11.8 | - | 1.5 | 0.4 | - | - | - | - | - | - | - | - | 3 | - | - | - | - | 5815 | 238 |
| 361 | F | 41 | - | - | - | - | - | - | - | - | - | 0.2 | 146.0 | 28.0 | - | - | 2.4 | 0.1 | - | 0.2 | - | - | - | - | - | - | 68 | - | - | 56 | - | - | - |
| 368 | F | 27 | - | - | - | - | - | - | - | - | - | - | 365.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | 6 | - | - | - | - | - | - |
| 370 | F | 25 | - | - | - | - | - | - | - | - | - | - | 365.0 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 381 | F | U | - | - | - | - | - | - | - | - | - | - | 103.7 | - | - | 0.3 | - | 0.5 | - | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 382 | F | 21 | - | - | - | - | - | - | - | - | - | - | 103.7 | - | - | 0.3 | - | 0.5 | - | 1.5 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 387 | F | 42 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.9 | 1.4 | - | 2.7 | - | - | - | - | - | - | 12 | - | - | - | - | - | - |
| 388 | F | 15 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.9 | 1.4 | - | 2.7 | - | - | - | - | - | - | 156 | - | - | - | - | - | - |
| 399 | F | 38 | - | - | - | - | - | - | - | - | 16.9 | - | - | - | - | - | 2.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 411 | F | 43 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 730 | - | - | - | - | - | - |

**Notes**

U = Unknown

## About us

Cefas is a multi-disciplinary scientific research and consultancy centre providing a comprehensive range of services in fisheries management, environmental monitoring and assessment, and aquaculture to a large number of clients worldwide.

We have more than 500 staff based in 2 laboratories, our own ocean-going research vessel, and over 100 years of fisheries experience.

We have a long and successful track record in delivering high-quality services to clients in a confidential and impartial manner.
(www.cefas.co.uk)

Cefas Technology Limited (CTL) is a wholly owned subsidiary of Cefas specialising in the application of Cefas technology to specific customer needs in a cost-effective and focussed manner.

CTL systems and services are developed by teams that are experienced in fisheries, environmental management and aquaculture, and in working closely with clients to ensure that their needs are fully met.
(www.cefastechnology.co.uk)

## Customer focus

With our unique facilities and our breadth of expertise in environmental and fisheries management, we can rapidly put together a multi-disciplinary team of experienced specialists, fully supported by our comprehensive in-house resources.

Our existing customers are drawn from a broad spectrum with wide ranging interests. Clients include:

- international and UK government departments
- the European Commission
- the World Bank
- Food and Agriculture Organisation of the United Nations (FAO)
- oil, water, chemical, pharmaceutical, agro-chemical, aggregate and marine industries
- non-governmental and environmental organisations
- regulators and enforcement agencies
- local authorities and other public bodies

We also work successfully in partnership with other organisations, operate in international consortia and have several joint ventures commercialising our intellectual property.

**Head office**
**Centre for Environment,**
**Fisheries & Aquaculture Science**
**Pakefield Road, Lowestoft,**
**Suffolk NR33 0HT UK**

**Tel** +44 (0) 1502 56 2244
**Fax** +44 (0) 1502 51 3865
**Web** www.cefas.co.uk

printed on paper made from a minimum 75% de-inked post-consumer waste

© Crown copyright 2009