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SEPA's main aim is to provide an efficient and integrated environmental protection system for Scotland which will both improve the environment and contribute to the Scottish Ministers' goal of sustainable development.

Radiological Habits Survey,
Torness 2001

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SUMMARY

This report presents the results of a survey, conducted in 2001, into the habits and consumption patterns of people living and working in the vicinity of the British Energy plc Torness power station, which discharges authorised gaseous and aqueous emissions to the atmosphere and the North Sea respectively. Potential exposure pathways to the radioactive discharges from this site include consumption of locally sourced terrestrial and marine foods and occupancy of dwellings, the surrounding area and intertidal areas. The survey investigated all of these pathways and the data obtained on the consumption and occupancy rates of individuals are presented and discussed.

Food eaten included locally grown fruit and vegetables, meat, game, eggs, wild/free foods and seafood. Occupancy habits include those related to residences and workplaces within 1 km of the site, recreational activities over intertidal areas and handling of commercial fishing gear and intertidal sediment. In the marine environment the main activities included angling, walking, dog walking, bait digging, shellfish collecting, beach combing, playing and boat maintenance. Fresh water angling was not noted during the survey as all access to rivers was denied because of the foot and mouth outbreak. Therefore angling enthusiasts were now concentrating on marine angling instead. Terrestrial pathways noted included consumption of vegetables and fruit grown in Innerwick and Barns Ness and more general consumption of farm produce, including eggs. No dairy farms were identified within the survey area. Most of the terrestrial survey was given over to beef and sheep rearing. Some farmers also grew fodder crops for feeding livestock during the winter and vegetables for their own consumption. Small-scale chicken, duck and geese rearing and egg production in the survey area was observed. A crossover between the consumption of locally produced terrestrial food, seafood and game was identified.

1 BACKGROUND

1.1 Regulation of radioactive waste discharges

Sources of radiation exposure to members of the public from nuclear sites are subject to a system of control, which safeguards the potentially most exposed people. There are three main sources of radiation exposure to members of the public from nuclear sites: discharges of radioactive waste to the aquatic environment, discharges to the atmosphere and direct radiation from the site. Regulation of waste discharges is made under the Radioactive Substances Act, 1993, (RSA93) with authorisations that set limits on the quantities and types of radioactivity released. In Scotland, the Scottish Environment Protection Agency (SEPA) is the primary regulatory authority under RSA93. Sources of direct radiation from sites are regulated by the Nuclear Installations Inspectorate (NII) of the Health and Safety Executive (HSE).

1.2 The critical group concept

Radiological protection of the public is based on the concept of a critical group. The critical group is defined as the people who, because of where they live and their habits, receive the highest radiation dose from the site and its discharges. It is the assessed radiation dose to the critical group that is compared to relevant limits and constraints. If the dose to the critical group is acceptable, it follows that the lower doses received by other members of the public will be below any limits and constraints, and overall protection of the public is provided for. This survey provides information to assist SEPA in determining critical group doses.

1.3 Dose limits and constraints

Assessed radiation doses to critical groups are compared to nationally and internationally agreed dose limits, recommendations and constraints. Under current Government policy in Cm 2919 (United Kingdom - Parliament, 1995), these are as follows:

- the principal limit of 1 mSv per year to the public recommended by the International Commission on Radiological Protection (ICRP) (subsidiary limits exist for particular organs of the body)

- the 'source' dose constraint of 0.3 mSv per year which should not be exceeded for a single new source; in addition, the Government accepts that, in general, it should be possible to operate existing facilities within the 0.3 mSv per year constraints

- the 'site' dose constraint of 0.5 mSv per year to be applied to all sources at a single location

2 THE SURVEY

2.1 Survey aims

The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) undertook the survey in 2001 on behalf of SEPA (CEFAS contract C0767 and SEPA contract 230/2350). The aim of the survey was to review habits related to public radiation exposure via aquatic, terrestrial and external exposure pathways resulting from radioactive emissions from the Torness site. Some survey data may be relevant to direct radiation exposure from the site.

The last aquatic habits survey conducted by CEFAS in the Torness area was in 1994. The data from this survey are currently being used for dose assessments in the Torness area. This survey was the first terrestrial habits survey conducted in the Torness area by CEFAS. A direct radiation survey contracted by HMNII was conducted by CEFAS in 1997.

Fieldwork was conducted in order to obtain site specific habits survey data for use in defining critical exposure pathways to the local population and subsequent definition of the critical group(s). General habits survey information for the area was also obtained.

Investigations were carried out to ascertain the following:

- External exposure activities, including angling, commercial fishing (netting and potting), bait digging and mollusc collection along the intertidal shoreline.

- Internal exposure from the consumption of food sources from the aquatic and terrestrial environments.

- The production, use and destination of local produce.

- The types, seasonality of and extent of consumption of wild foods in the area.

- The land use and soil types in the area.

- The extent of occupancy within 1 km of the site.

- The consumption rates of foods from within the survey area.

- The extent of any unusual practices.

The survey team also investigated the possible use of seaweed as a fertiliser or soil conditioner and the transfer of contamination by wildlife. In addition, some information that might be relevant to pathways such as the inhalation of re-suspended radioactivity in road dust and/or sea spray, the inadvertent ingestion of contaminated seawater and/or contact with and/or inadvertent ingestion of contaminated sediments was collected.

2.2 Survey areas

Different survey areas were selected to cover the aquatic, terrestrial and external radiation pathways.

Earlier aquatic surveys of the Torness area used hydrographic survey information to define a survey area from North Berwick to St Abb's head, a distance of 20 km either side of the discharge point. It was taken to extend 3 km offshore. After discussion with the SEPA site inspector and investigation of the area, the survey area was extended to include Eyemouth as it was found to be the major fishing port in the area.

Particular emphasis was placed on identifying angling activity in the area of the discharge pipeline.

The terrestrial survey area was defined as the full circle to a radius of 5 km from site centre, to encompass the main areas of potential deposition.

For external radiation, the survey aimed to cover individuals residing and working within 1 km of the site centre.

2.3 Conduct of the survey

The fieldwork component of the survey was carried out during the period 05th - 18th August, 2001 by three members of staff from the CEFAS laboratory at Lowestoft, according to techniques as described by Leonard *et al.* (1982).

A pre-survey discussion between a CEFAS survey member, British Energy and SEPA was held prior to the start of the fieldwork via E-mail and telephone. These discussions provided an outline of the main aims of the survey and highlighted areas or items which required special attention or effort by the team. On 6th August a meeting was arranged between the survey team, British Energy and SEPA. This served to provide details about site operations, including waste disposal and information about potential pathways and activities in the area. Further information was sought about wildlife studies and pest control measures.

People with a local knowledge of the survey area were contacted for information on any aspects relevant to the exposure pathways. These included the Fishery Officer and Harbour officials, individuals connected with the local inshore fishing industry and commercial licensed fishermen, seafood wholesalers and retailers and marine nature reserve rangers, the local District Council, farmers, smallholders, shop owners (butchers, greengrocers, farm shops etc.,), beekeepers, keen gardeners and members of local gardening/horticultural clubs. Occupants of residences located within 1 km of the site were interviewed about their times at home, both inside their properties and in their gardens.

Individuals who were identified as having the potential to be exposed to radioactivity were contacted and interviewed. For external exposure pathways, where appropriate, gamma dose measurements were taken using a Mini Instrument 6-81 and a compensated Geiger-Muller tube.

Interviews were used to establish individuals' consumption rates and occupancy times relevant to each pathway and to obtain any general information of possible use to the survey. Using this information, a list of occupations and activities was built up to produce a picture of potential exposure pathways. Emphasis was placed on those individuals who were likely to be in the most exposed groups. These included boat owners, anglers, mollusc collectors, bait-diggers, gardeners, beekeepers, farmers and individuals living close to the site.

The survey also identified the land cover within the 5km terrestrial survey area.

2.4 Site activity

Torness power station is powered by twin Advanced Gas-Cooled Reactors (AGR's) which came into operation at the end of 1987. Gaseous emissions are released to the local environment via stacks and the liquid discharges are released into the North Sea. Discharges are made under authorisation from SEPA.

3 METHODS FOR DATA ANALYSIS

3.1 Data conversion

The data collected during the fieldwork was recorded in logbooks or on questionnaire sheets. Information on individuals' consumption and external exposure rates was assessed and entered into the Habits Survey Database. Each individual for whom information was obtained was given a unique identifier (the Observation number) to assist in data sorting. Consumption data were converted to consumption rates in kilograms per year (wet weight) of locally produced food. Where interviewees were unable to provide consumption rates in weight per year, they were asked to estimate the number of units, e.g. the number of eggs consumed per year. In a limited number of cases, annual consumption was supplied in other quantities, for example the number of tomato plants on which the crop was grown or the length and number of rows in which the crop was grown. These data were converted to approximate consumption rates, in kilograms per year, using published produce weights (Hessayon, 1997 and Good Housekeeping, 1994), edible fraction data researched by CEFAS and information supplied by the Beef and Livestock Commission. For the purpose of data analysis, foodstuffs are aggregated into food groups; the typical food groups used in surveys are shown in Table 1.

All consumption and occupancy data in the text are rounded to 2 significant figures to reflect the author's judgement on the accuracy of the methods used. In the tables and annexes, the consumption rate data are usually presented to 1 decimal place to allow for greater transparency in calculations. The exception is for consumption rates less than 0.05 which are presented to 2 decimal places. External exposure data are quoted as integers.

3.2 Determination of critical groups

The critical group is determined by assessing doses that are representative of the most exposed individuals. The group will change according to the assessment being undertaken.

Each assessment will have associated concentrations and/or dose rates distributed in space and time. This survey provides information that can be used to help define the critical group in an assessment but it does not constitute an assessment in itself.

The critical group will be made up of high rate consumers and/or people with high occupancy and/or handling rates. The data from the survey are presented in several ways to provide assessors with options to determine critical groups. The presentations are different for ingestion and external radiation pathways but they have a common feature. The feature is that the habits data are structured into ages and groups of activities with similar attributes. For example, when considering terrestrial food, consumption of all root vegetables is grouped together in a food group called 'root vegetables'; for aquatic food, consumption of all species of crustaceans is grouped. For external exposure over intertidal sediments, exposures over a common substrate are chosen. The choice of a group of activities is made when it is reasonable to assume that consistent concentrations or dose rates would apply within the group. In addition to grouping of activities, ingestion data are structured into age groups; from 0 to 1.0 y of age (3 months); more than 1.0 y to 2.0 y (1 year old); more than 2.0 y to 7.0 y (5 year old); more than 7.0 y to 12.0 y (10 year old); more than 12.0 y to 17.0 y (15 year old); because different dose coefficients can apply to different ages. Children over 17 are treated as adults. These age groupings are consistent with those used by the ICRP 72 (1996).

Ingestion pathways

Consumption rate data are presented for individuals and are further characterised in two ways to represent high rate consumers in each food and age group. Firstly, the 97.5 percentile rate is calculated from the observed data, for each of the food groups where consumption occurred, using the Excel mathematical function for calculating percentiles. This 97.5 percentile rate is calculated for all age groups where consumption was noted. Secondly, the 'cut-off' method described by Hunt *et al* (1982) is used for all age groups observations for each of the food groups where consumption occurred. In this case the rate representing high rate consumers is calculated by taking the arithmetic mean of the maximum value and all

consumption rates observed within a factor of three of the maximum value (termed the lower threshold value). It accords with the principle expressed by ICRP (ICRP, 1984) that the critical group should be small enough to be reasonably homogeneous with respect to age, diet and those aspects of behaviour that affect the doses received.

If, when the top consumption rate value is divided by three, the lower threshold value obtained is above the next highest observation, the next highest suitable observation is used to set the lower threshold but the top value is still included in the mean. CEFAS have called the rate derived by the cut-off method the critical group rate for ease of presentation though the term is not strictly correct. This is because the critical group can only be established when doses are determined taking into account all pathways. Consumption data for aquatic foodstuffs are presented for adults in Tables 2, 3 and 4 and for children in Tables 5, 6 and 7 respectively. For purpose of comparison, values for 97.5 percentile rates based on national data, referred to as 'generic' rates in this report, are shown for aquatic foodstuffs for adults, 15 and 10 year old children in Tables 8, 9 and 10 respectively. Consumption data for terrestrial foodstuffs are presented for adults in Tables 12 to 23, and for children in Tables 24 to 34. Again, for purpose of comparison, values for 97.5 percentile rates based on national data, referred to as 'generic' rates in this report, are shown for terrestrial foodstuffs for adults, 15, 10 and 5 year old children in Tables 8, 9, 10 and 11 respectively.

The critical group rate has been calculated from the survey data for children. However, because few child consumers were identified, the method should be viewed with caution. For assessment purposes, a theoretical approach may be taken where survey rate data for children's age groups are absent or limited. This involves taking the rates for adults, provided in Table 8, and scaling them by ratios (Table 35). The ratios have been calculated using generic 97.5 percentile consumption rates determined by MAFF (Byrom *et al.* 1995, MAFF, 1998) for adults, 15 year olds, 10 year olds and children aged 6 – 12 months.

External exposure in intertidal areas

A similar approach is used for occupancy and handling rates in intertidal areas (Tables 36 and 37 respectively). The 97.5 percentile rates and critical group rates are determined for groups of activities or substrates with common attributes. However, the critical group rate is taken to be the arithmetic mean of all rates observed within a factor of 1.5 of the maximum value. The factor reflects variations in the doses likely to be received due to natural variations in the interactions of radiations with tissues caused by, for example, differences in anatomy.

External exposure in terrestrial areas

Data for the external radiation pathway in terrestrial areas are left in their detailed form, that is occupancy for each individual at each location. Grouping of these data is not helpful at this stage in the assessment process when there is no definitive measurement or prediction of dose rate due to external radiation from the site. These data are presented in Table 38.

A summary of consumption and occupancy rates for adults and children is given in Annex Table 1 and Annex Table 2 respectively.

4 AQUATIC RADIATION PATHWAYS

4.1 Aquatic survey area

The aquatic survey area covered the coastal extent from Eyemouth in the south to North Berwick in the north (Figure 1).

North Berwick to Dunbar

North Berwick

The small harbour at North Berwick catered mainly for pleasure craft. Forty five small yachts/boats were moored here. Four potting boats were found to be operating out of the harbour. The harbour walls were stacked with creels and drilled carbouys, possibly used for whelking. The harbour acted as a base for sightseeing boat trips out to Bass Rock, Craigleith, Fidra and Lamb Island and for charter boats for commercial diving. Pleasure diving was also observed on most occasions when the area was visited.

Three commercial diving charter boats were based at North Berwick.

Visiting diving groups also used the area, some regularly. They dived around Bass Rock and local wrecks.

Another diving group from Kendal came to the area for one weekend a year.

The harbour contained the lifeboat station, the Seabird Centre and the clubhouse of the East Lothian Sailing Club, with an area of tarmac used for a dingy park. The Lifeboat Station had a concrete slipway from the station to the beach where the boat was launched from a trailer. The Seabird Centre had an interactive viewing and information display system with high-powered telescopes looking at the islands bird life. RSPB wardens visited the rocks occasionally to maintain the video cameras and set traps to kill vermin. The East Lothian Sailing Club had between 100 and 150 members, sailing one to three person dingies which were launched from the north beach. Seventy dingies were seen here during the survey and people from six of them were interviewed.

Access to the rocks around the harbour area was made by way of a stepped footpath. This and the harbour walls provided anglers with the opportunity to fish from the rocks. All of the anglers were found to be hobby fishing whilst on holiday.

To the north of the harbour was North Berwick Bay. This was a sandy bay and had areas of flat, brick red rocks and exposed seaweed at low tide. About a dozen small pleasure boats were moored in the bay. The bay was bordered to the south by the harbour entrance and to the north by a large rocky outcrop. The beach was popular with walkers, dog walkers and holiday makers, but was not as popular as the beaches to the south of the harbour. This was reportedly due to the levels of sewage pollution being found in the water and being deposited by the tides on the beach. The beach was used by the East Lothian Sailing Club and various diving clubs from which to launch their dingies and inflatables. The area was visited on a number of occasions during the survey but no bait digging, shellfish or seaweed collection was observed. The bay was backed by a brick sea wall and houses and then, further north, by a green, comprising of a putting area and then a golf course. The golf course was predominantly set above the beach, with grassy banks leading down to a rocky shoreline with paths of shingley sand visible at low tide. The course overlooked the coast between Longskelly Rocks and Hummel Ridges. Other golf clubs in the area have about 1000 members. Wind blown sand from East Bay piled up on the beach and the road and was then collected for use in the bunkers. At one of these golf courses, about 9 holes were located along the beach and may have been subjected to sea spray. Three gamma dose measurements were made on Berwick North beach, over sand and over sand/rocks at low tide, between the Harbour and a golf course.

To the south of the harbour the beaches as far as Milsey Bay comprised of thin stretches of shingley sand with small boulders. The beach nearest the Seabird Centre included a shallow walled area of sea used as a children's paddling pool. This area was most popular with families on holiday, especially at low tide when more sand and areas of seaweed covered rocky outcrops were exposed to provide rockpooling opportunities. No commercial shellfish collection was found and although winkles, limpets, seed mussels and razor shells appeared

to be in abundance; the rockpooling observed appeared to be purely recreational. On one occasion a small rubber boat with an outboard engine was seen with one diver aboard. Gamma dose measurements on the south beaches were taken, at low tide, in three locations over sand, between the Seabird Centre and Milsey Bay.

A golf course started across the road from Milsey Bay. Sand blown from the beach onto the road, together with imported sand, was used in their bunkers. This was done with permission from the East Lothian Council. The course then followed the land as it rose steeply to make it a predominantly cliff top course, backed by a caravan and camping park, overlooking the Leithies and Leckmoram Ness. None of the course was subjected to flooding but some of the cliff top areas may have been exposed to sea spray in bad weather.

Access to a car park and a viewing point overlooking Milsey Bay provided the opportunity to walk along either an impromptu series of grassy cliff top footpaths bordering the golf course or, at low tide, access to the beaches south of this point, down a steep grassy bank, as far as Leckmoram Ness and probably even further. A number of keen walkers were seen and approached but again, they were all on holiday and not regular visitors to the area.

In the town of North Berwick there were a number of shops and restaurants selling local seafood.

From North Berwick driving south, vehicular access to the coast was restricted with no obvious access to Horseshoe Point, Canty Bay beaches, the beach between Gin Head and Tantallon Castle, the beach between the Gegan and Great Car, and Crow Wood. Access to Tantallon Castle was by paid admission and the ruined castle was set on a cliff top position.

Bathan's strand (extending to Peffer Sands) and Tyne sands (all part of the John Muir Country Park)

The first route of coastal access found was down Limetree Walk to Tyninghame Links. Here a car park allowed visitors to park and walk, via two routes through Links Wood, to either Bathan's Strand to the north or Tyne Sands to the south. Each walk took about 20 minutes each way. Other tracks led off into the woods. The car park was roughly situated in the middle of the John Muir Country Park, which extended north as far as Peffer sands and south as far as Dunbar Harbour. Signs near the car park stated that there was a full-time ranger, that it was not recommended to swim, that wildfowling was allowed and that the area was managed by Tyninghame Estate Trustees. The area appeared popular with local dog walkers and walkers and the car park accommodated about 25 cars. Many of the people spoken to in the car park walked themselves or their dogs in the woods only, or just down to the beach and spent between 5 – 10 minutes there before walking back.

The route to Bathan's Strand led to a long sandy bay reaching up as far as Peffer Sands. At low tide a large expanse of coarse golden sand was exposed. Gamma dose rate measurements were made over this sand at low tide. The area was visited on a number of occasions and appeared to be more popular with locals, especially dog walkers, than with tourists, probably due to its secluded nature. However, four families on holiday were found playing on the beach and rockpooling. On one occasion three sets of dog walkers were seen.

At high tide Tyne Sands beach consisted of a very narrow strip of sand, shingle, shells, seaweed and rocks at high tide. The shells were predominantly a mixture of winkles and mussels suggesting that there may be rocks at low tide. Some straight razor shells, cockles and limpet shells were also evident. Through binoculars, an angler was seen to the north of the area, fishing from the large rock outcrop. At low tide, a vast expanse of rock and mussel beds were exposed with occasional patches of sand and seaweed. Many winkles and limpets could be seen and there were signs of cockles and razor shells. On one occasion a family of eight were seen collecting mussels and on another occasion about a dozen people were seen

in the area rockpooling and walking along the beach at the high tide mark. Gamma dose measurements were made here over mussel beds at low tide.

From Tyninghame Links driving south, the coastal access through Kirklandhill was prevented by a chain barrier and the alternative route through Kirklandhill and other routes were all marked as private roads. The next main public access to the John Muir Country Park was at West Barns.

West Barns (John Muir Country Park)

West Barns offered the main public access to the John Muir Country Park. The route was clearly signposted and led to an extensive grassy car park with a children's play area, toilets, information boards, a snack van and a barbecue area. Access to the beach from the parking area was by foot over coastal grasslands and dunes and, in places, salt marsh. Samphire was found growing on the salt marsh. The area was visited on a number of occasions and gamma dose measurements were taken over beach sand at low tide. On one occasion about a dozen people were seen on the beach, walking or sitting in the sand dunes and there was evidence that the salt marsh had been used by horse riders.

Belhaven Bay

At low tide, Belhaven Bay comprised of a very large expanse of fine muddy sand with a few patches of seaweed and even fewer occasional rocks, except to the south of the bay where the cliff leading up to a golf club met the sea via a rocky area. A small freshwater river, the Biel, ran into the bay via the sea. The bay was backed by grasslands. There was a coastal trail between here and Dunbar.

During the survey, about twenty people were seen walking on the beach and a few casual rock poolers on the rocks below the golf course to the south of the bay at low tide. Horse

riders were seen using the beach at low tide. Gamma dose measurements were made over sand/mud at low tide.

North of Dunbar, there was easy access to a small rocky beach and a hill top coastal trail from here to Belhaven Bay (the start of the John Muir Country Park).

At a golf club, sand and sea spray got blown onto parts of the golf course but it was not affected by tidal wash. There was no sand taken from the beach for use in bunkers.

Dunbar Harbours

Dunbar Harbour consists of three main areas, two old harbours (an inner and an outer) and a newer outer harbour. The newer outer harbour had a lifeboat station. A number of small open rowboats (8), yachts (12), motor cruisers (3), small motor boats (3) and commercial fishing vessels (12) were noted. About a dozen children in wet suits were seen on two separate occasions jumping into the side of the new outer harbour waters. Seals were also seen here. On one occasion a small open motor boat with two anglers on board was seen leaving the harbour. A number of anglers were seen at the harbour, either angling from the harbour walls by the entrance to the sea or from behind the harbour to the north. All of those spoken to were only here on holiday either from Edinburgh or Newcastle.

At the Dunbar Old Harbour, pots and nets were evident around the harbour area and ten small boats were moored in the inner harbour - 1 pleasure cruiser, 1 potting boat, 3 open motor boats and 5 closed deck motor boats. The old harbour was surrounded by rocks exposed at low tide and many winkles were in evidence. The entrance to the old outer harbour directly from the sea was now blocked off by boulders and rocks. Entrance to the old Harbour areas was now through the newer outer harbour. Anglers were seen on the walls of the old outer harbour. A number of children were seen swimming here.

Dunbar South Beach

The beach south of Dunbar Harbour consisted of a thin strip of sand backed by a brick sea wall with houses beyond this. At low tide the area was covered by exposed rocks, with rock pools and seaweed. A number of people were seen on the beach walking, dog walking and rockpooling and two anglers could be seen in the distance towards Dunbar harbour a long way out on the rocks. The area was visited on a number of occasions but no commercial coastline activities were seen. Gamma dose measurements were made over beach sand, at low tide.

Dunbar to St Abb's Bay

Whitesands

Access to Whitesands was by road, which led down to a large grassy car park separated from the sandy beach by coastal grassland and grassed dunes. The beach was large and sandy and banked at either side by low rocks. At low tide more sand and rocks were exposed. The beach was visited on a number of occasions.

Barns Ness

Vehicular access to Barns Ness was just possible along a grassy coastal track. This route was paralleled by a pedestrian 'Geology Trail' along the top of the grassy dunes, which took about 20 minutes to walk one way. This area was probably subject to sea spray and may have even flooded at high tide. There was easy intertidal access from the walkway onto mainly rocks and seaweed at low tide (potentially a good rockpooling area).

Access to Barns Ness was by road, which led down to a touring caravans and campsite with public toilet facilities, a large grassy public parking area and a lighthouse. The beach consisted of a small strip of sand at high tide backed by a large area of coastal grassland and

patches of marshland, which separated the public car park and the campsite from the beach. There was also a small area of salt marsh on the seaside in front of the lighthouse. Samphire was observed growing there. At low tide large areas of rock were exposed which would probably provide good angling and winkle picking spots. This area was visited on a number of occasions but no commercial coastal activities were observed. Gamma dose measurements were made over beach sand, at low tide.

Skateraw Harbour

Skateraw Harbour lay to the north of Torness power station. Access was easy by car and there was a car park and toilet facilities on the grassy area behind the bay. The flat grassy area sloped down to the sandy bay, which had a prominent seaweed tide line. The grassy area and the sandy beach were separated from each other by an area comprising of large smooth round stones. At low tide more sand and stony areas were exposed. The bay was banked to the north by grass topped rocks and to the south by the power station. At low tide, areas of rock were exposed to the north and south of the bay.

There was a coastal walkway from Skateraw Harbour to Thorntonloch of about 2.5km in length, which was mainly set in the grassy banks either side of the power station and across the concrete walkway behind it. To the north of Skateraw Harbour the footpath allowed access to the rocks at Chapel Point at low tide. An information board advised walkers to keep to the upper or lower walkways and not to go onto the beach area (until they reach either Skateraw or Thornton beaches at either end). The walkway appeared to be popular with walkers from the Thorntonloch caravan site and joggers from the power station. The information board said that winkles, whelks, limpets and mussels could be found in the area.

Gamma dose measurements were taken over sand and rocks at low tide.

To the north of the Torness nuclear power station, which was only accessible by driving behind it, was an area occupied by the Dunbar Lifeboat Station. The station consisted of a

port-a-cabin and a concrete dock with a crane, which was used to lower the ribbed inflatable lifeboat into the water. In addition, moored permanently in the sea, was the main lifeboat.

Behind the power station, directly to the east, the two cooling water outlets, one for each generator, pumped warm water into the sea near Long Craig. Only one outlet was in operation during the survey due to the outage taking place. The warm water attracted seafish, especially bass, and consequently made the area very popular with anglers. Generally the keen anglers tried to fish as close to the outlets as possible, finding positions on the lower concrete walkway, the breakwater concrete blocks or the rocks exposed at low tide, depending on the state of the tide. However, anglers were also found fishing from positions all along the back of the station and off the breakwater jetty to the north.

Thorntonloch beach

Thorntonloch beach could be accessed either on foot from the north via the coastal walkway from Skateraw Harbour or by a minutes walk from the car park behind the Thorntonloch caravan park. The large sandy beach was backed by the caravan park to the south and a grassy bank to the north. It appeared to be popular with walkers, dog walkers and holidaymakers from the caravan park. At low tide the exposed beach comprised of sand/stones with a little weed. The beach was visited on a number of occasions. On one occasion potting was observed offshore and two anglers were seen fishing off the concrete perimeter wall near the power station.

Gamma dose measurements were taken over sand/stones at mid tide.

Cove

Cove was a very small cliff top village overlooking a rocky bay with steep sides. A sign warning of ‘Danger – rockfall from cliffs’ was erected on the cliff top fencing. An information board stated that, in 2000, there were only two boats operating out of Cove Harbour, setting

creels for lobsters and crabs. Cove Harbour was privately owned and managed by Cove Harbour Conservation Ltd.

Access to Cove Harbour was barred as the steps that led down to it were in need of repair. An inland footpath (The Southern Upland Way) ran from here to Cockburnpath and the A1 at the southern end of Penmanshiel Wood.

Pease Bay

Pease Bay was set in a hollow between sloping hills. The sandy bay was backed, almost entirely, by a caravan park with residential and holiday accommodation. The park also catered for touring caravans. The beach was open to the public but it would be easy to think that entry was prohibited as cars had to be parked in a car park (accommodating about 35 cars) outside of the caravan park, before you walked past the parks barriers and reception and through an area of static caravans to get to the beach.

Pease Bay beach was sandy with a little seaweed at the tide mark. The intertidal area was made up of sand/stones. Gamma dose measurements were taken over sand/stones at low tide. The beach was obviously popular with holiday makers staying at the caravan park who were observed to be paddling, swimming, sunbathing, playing in sand, using inflatables in the water, rock pooling, kite flying, walking and dog walking. On one occasion angling was noted as taking place from the rocks at low tide to the north of the bay. Either side of the bay was banked by steep rock cliffs and there was a freshwater river (possibly Eye Water) running into the bay to the south which came in via a ford over the road behind the bay.

The bay was also a popular location for surfing with surfers and surf kyackers from Edinburgh and Glasgow.

St Abb's

St Abb's was a small village and harbour set in another hollow in the coast. There was no beach but there was vehicular access to two car parking areas by the harbour, one set high up near the village accommodation and the other, right down by the harbour itself. These car parks accommodated about 35 cars between them. The harbour had three distinct areas and was banked on either side by rocky coastline. The large inner harbour had a concrete slipway for boat launching which was banked on either side by rocks and seaweed. On the wall separating the outer and inner harbours there was a lifeboat station with a slipway straight into the outer harbour waters. At the time of the survey, pier access to the right of the harbour was restricted due to maintenance. An information board at the harbour said that a small fishing fleet operates from St Abb's, mainly trawling for prawns (*Nephrops*) at night. A map pinned on a hut by the harbour indicated that further north of St. Abb's there was an intertidal area which comprised of sand flats and mud.

The area was popular with divers due to the presence of kelp beds, deadmens fingers, plumrose and dahlia anenomes, sea squirts, nudibranchs, brittlestars, wolfish, cod, crabs and lobsters. Divers must be certificated, wear full body coverage, must not use spear guns, hooks, gaffs or spears and must not tamper with fishing gear or collect any plants or animals. Permission to dive must be gained and fees paid before the dive commences. Diving, swimming and water skiing were prohibited in and around the harbour as was night diving and diving in rough seas.

There were four full-time fishing boats operating out of St Abb's. Smaller boats were said to set creels (locally called craws) for lobster and crab, returning 1 – 2 days later, dependent on the tides and the weather, to pick up their catch. Seven boats were seen in the large inner harbour and another seven boats in the small inner harbour. About ten small open motor boats were seen in the outer harbour. Plenty of creels and fishing nets were evident around the harbour area. The area was extremely popular with divers, due to the Marine Reserve to

the north. Signs advertising boat diving and sea angling trips were prominent. A boat was observed leaving the harbour on one occasion with about six anglers on board.

Diving was run mainly off St Abb's Head and occasionally off Eyemouth. The sea angling was undertaken off Burnmouth, Eyemouth and Fast Castle.

Other observations included forty divers (2 or possibly 3 organised groups of 10 – 20 divers). Potting was observed taking place just outside the harbour.

St. Abb's and Eyemouth Voluntary Marine Reserve was visited.

It was reported that rock climbers were seen at Souter and Wheat Stack and winkle pickers at Coldingham Bay.

Coldingham Bay

Access to Coldingham Bay beach was easy with 25 spaces for car parking only a couple of minutes walk from the beach, and road access capable of accommodating coaches. Just up the road from the beach was a touring caravan park and Coldingham Youth Hostel. This hostel was situated up the hill to the south of the bay. Signs at the bay indicated that winkles, limpets, and whelks were present and advertised the St. Abb's and Eyemouth Voluntary Marine Reserve (run by the National Trust of Scotland). They organised two hour wildlife walks twice a month, seashore safaris about seven times per month and butterfly hunts about three times per month. Also advertised were 'Discovery Dives', showing dive videos at the Fisherman's Mission, Eyemouth, every Tuesday at 7pm and the Dive Centre at St. Abb's, situated near the post office and village shop.

More signs, erected by the Environmental Health Department of the Scottish Borders Council warned against swimming in the bay due to undercurrents and about diuretic shellfish poisoning in bivalve shellfish. Due to a naturally occurring toxin, members of the public were

advised not to collect or eat mussels, cockles, scallops, queens, oysters or razor shells collected between the areas of St. Abb's and Eyemouth.

The Senior Environmental Health Officer took water quality samples and erected notices warning of diuretic shellfish poisoning along the coastline. He knew of crab potting at St Abb's and of seed mussel beds at Coldingham Bay but didn't know of any commercial shellfish pickers. Water quality samples were taken and analysed regularly by SEPA. The results displayed showed a good standard of cleanliness. Boat launching from the bay was prohibited.

The Bay itself comprised of a gently sloping sandy beach with rocky outcrops to either side. At low tide the exposed beach sloped down to a level about 12 inches below high tide to expose more sand and rocky areas suitable for rockpooling. There was a beach café on the grassy area at the back of the bay. This was advertised as 'open all year, subject to weather conditions'. There was also a beach guard hut, set on a grassy dune overlooking the beach and toilet facilities.

Coldingham Village

No wholesale or retail seafood outlets were found in Coldingham Village but the local Anchor pub did advertise local haddock, lobster and crab on its menu.

From Coldingham Bay to Eyemouth, no vehicular or easy pedestrian access to the coast could be found. The roads through 'Hallydown', 'Fleurs' and 'East Law' were all inaccessible.

Eyemouth

Eyemouth north beach bay was made up of sand and mud with seaweed and rocks exposed at low tide. The north end of the bay had a larger area of rocks exposed at low tide and to the south was the harbour wall. The beach was backed by a brick wall beyond which was a road

and then houses. The beach was visited on a number of occasions. During one visit about thirty people were seen sunbathing, walking, rockpooling and playing on the beach. On another occasion, children were seen jumping from the harbour wall into the bay and swimming and nine sea kyackers were seen offshore. There was also evidence of offshore potting. Gamma dose rate measurements were taken over the muddy sand at low tide.

A golf club, which although it overlooked the harbour, was not effected by either sea spray or flooding and beach sand was not used in the bunkers.

4.2 Commercial fisheries

The main commercial fisheries in the survey area was for *Nephrops*, crabs (edible and velvet) and lobsters (both trawling and creel pots). The boats fishing in the survey area operated from North Berwick, Dunbar, St Abb's and Eyemouth. Approximately 60% of the catch was sold abroad (Spain and France), via the Eyemouth fish market. The remaining 40% was sold to the UK and the local area. Small numbers of fish (haddock, lemon sole and cod etc.,) were caught as a by-catch and either sold or consumed by the fishermen and their families.

The *Nephrops* trawlers caught wet fish as a by-catch but this made up a very small percentage of the wet fish that was landed and sold. Wet fish catches were made by the larger boats, but these vessels didn't fish in the local waters. They went further offshore, a favoured area being the Firth of Forth, and landed their catches in Eyemouth.

Some commercial collection of molluscs, mainly mussels, King scallops and winkles, was noted in the survey area along with some individuals who collected them for personal consumption. Large mussel beds were found at Tyne Sands and commercial winkle collection was observed at Skateraw. One commercial winkle picker, collecting winkles (locally called whelks) from the rocks to the north of Chapel Point near Skateraw, exported them to France and Spain. He reported that there were four to five regular commercial pickers who used this area and other commercial pickers were observed on occasions by the survey team. He also

stated that there was another very popular picking area just south of Torness, near Dunglass (Gutcher's Hole) mainly used by pickers from Berwick-on-Tweed. Evidence of whelk potting was observed at North Berwick and Dunbar but the local fisherman interviewed stated that whelk collecting no longer occurred commercially. Any whelks collected therefore were for personal consumption only.

4.3 Angling and hobby fishing

Angling and hobby fishing were popular in the area with both shore and boat angling taking place. The Torness outfall was a popular location for keen anglers to catch sea bass, mullet, cod, pollack and mackerel. Some anglers reported digging for fresh bait but they were doing this at areas outside the survey area. The bass caught was generally sold to local restaurants and the other fish species were consumed by the fishermen and their families. Pleasure angling was popular all along the coastline of the survey area, particularly off the rocks at North Berwick and the harbour at Dunbar. Angling charter boats operated out of St Abb's Harbour. Angling parties were generally groups of visiting anglers or tourists rather than regular local anglers. A number of local individuals were hobby fishermen who had their own boats from which they rod and lined, or laid a small number of baited longlines for fish and set creels for shellfish. The survey team was informed that these catches were mainly consumed by the fishermen and their families and friends.

4.4 Seafood wholesalers and retailers

Wholesalers and retailers were interviewed to assess the distribution and consumption pathways of local seafood. The majority of the seafood wholesalers were based at Eyemouth. Most of the fish landed was taken to Eyemouth and Dunbar with Eyemouth being the largest port in the area. The catches were landed in Eyemouth, ready for sale at the market on Saturday morning and were distributed as far as Newcastle.

A number of seafood restaurants in Dunbar were visited. Many reported selling fish from Aberdeen. One local seafood specialist reported that the *Nephrops* sold came from France and the mussels from Shetland and that the salmon sold was farmed outside the area. Other wet fish was obtained from Eyemouth and Newhaven fish markets and the crabs and lobsters were local.

About 50% of seafood processing in the area were locally sourced with the rest coming from all over the UK and Ireland. Most of the crustacean catch were sold all over the UK and exported to Europe, although some prawns and lobsters were also retailed through local restaurants, hotels and fishmongers.

4.5 Internal exposure

Consumption of locally caught seafood was identified during this survey. Some individuals provided details of portions eaten expressed as the total weight of seafood prepared. In these cases appropriate values for the edible fraction were used to convert the basic data to edible weights.

Adult consumption rates

Consumption rate data for adults for fish, crustaceans and molluscs are presented in Tables 2, 3 and 4 respectively. The main consumers of fish from the Torness area were anglers, commercial fishermen, recreational fishermen and terrestrial consumers, together with their families.

The main species of fish consumed by adults were haddock, bass, Dover sole, mackerel, herring, whiting and lemon sole. A critical group of 27 individuals was identified with a maximum consumption rate of 83 kg/y and a mean of 41 kg/y. The observed 97.5 percentile rate based on 145 observations was 52 kg/y. This compares with the adult generic mean and 97.5 percentile consumption rates for fish of 15 kg/y and 40 kg/y respectively. Critical group

fish consumption consisted of a mix of 61% mixed fish, 20% haddock, 8% bass, 3% lemon sole, 3% Dover sole, 2% mackerel, 2% herring and 1% whiting.

The main consumers of crustaceans from the Torness area were commercial fishermen, recreational fishermen, shellfish merchants and terrestrial consumers, together with their families.

The main species of crustaceans consumed by adults were crab, *Nephrops* and lobster. A critical group of 17 individuals was identified with a maximum consumption rate of 25 kg/y and a mean of 17 kg/y. The observed 97.5 percentile rate based on 68 observations was 24 kg/y. This compares with the adult generic mean and 97.5 percentile consumption rates for crustaceans of 3.5 kg/y and 10 kg/y respectively. Critical group crustacean consumption consisted of a mix of 40% crab, 37% *Nephrops* and 23% lobster.

The main consumers of molluscs were anglers and fishermen and a small number of individuals who collected them for their own personal consumption.

The main species of molluscs consumed by members of this critical group were mussels. A critical group of 3 individuals was identified with a maximum consumption rate of 6.0 kg/y and a mean of 5.9 kg/y. The observed 97.5 percentile rate based on 21 observations was 6.0 kg/y. This compares with the adult generic mean and 97.5 percentile consumption rates for molluscs of 3.5 kg/y and 10 kg/y respectively. Critical group mollusc consumption consisted of a mix of 96% mussels and 4% King scallop.

Children's consumption rates

Consumption rate data for children for fish, crustaceans and molluscs are shown in Tables 5, 6 and 7 respectively. No children in the three month, one year old and five year old age groups were noted to be consuming locally caught seafood.

15 year old age group

For fish, a critical group of 6 individuals was identified with a maximum consumption rate of 47 kg/y and a mean of 35 kg/y. The observed 97.5 percentile rate based on 8 observations was 47 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for fish of 6.5 kg/y and 20 kg/y respectively.

For crustaceans, a critical group of 4 individuals was identified with a maximum consumption rate of 7.9 kg/y and a mean of 4.5 kg/y. The observed 97.5 percentile rate based on 5 observations was 7.5 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for crustaceans of 2.5 kg/y and 6 kg/y respectively.

For molluscs, a critical group of 2 individuals was identified with a maximum consumption rate of 0.2 kg/y and a mean of 0.2 kg/y. The observed 97.5 percentile rate based on 2 observations was 0.2 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for molluscs of 2.5 kg/y and 6 kg/y respectively.

10 year old age group

For fish, a critical group of 6 individuals was identified with a maximum consumption rate of 28 kg/y and a mean of 23 kg/y. The observed 97.5 percentile rate based on 12 observations was 28 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for fish of 6 kg/y and 20 kg/y respectively.

For crustaceans, a critical group of 3 individuals was identified with a maximum consumption rate of 7.9 kg/y and a mean of 6.7 kg/y. The observed 97.5 percentile rate based on 7 observations was 7.9 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for crustaceans of 2.5 kg/y and 7 kg/y respectively.

For molluscs, a critical group of 1 individual was identified with a maximum consumption rate of 3.0 kg/y. This compares with the generic mean and 97.5 percentile consumption rates for molluscs of 2.5 kg/y and 7 kg/y respectively.

The use of seaweed as a fertiliser

The survey investigated the potential use of seaweed as a fertiliser and a soil conditioner pathway. One individual was found to apply seaweed to their private garden in Innerwick. The individual grew sixteen varieties of vegetables on a nine by fifteen metre plot. The survey team was informed that seaweed was collected occasionally at Barns Ness for use on gardens but not in great quantities. The East Lothian Council collect annually up to 400 tonnes of kelp seaweed from East Dunbar beaches as they have had problems in the past with smell and seaweed flies. They used to dispose it in landfill sites but the cost has now become prohibitive (about £36,000 last year). This year they had negotiated with two local organic farmers to supply them with seaweed for use as a fertiliser and soil conditioner, thus cutting the cost to just that associated with collecting it.

4.6 External exposure

Intertidal occupancy

External exposure from artificial radiation to members of the public who frequent intertidal areas depends on the occupancy time and dose rate after subtraction of an appropriate figure for natural background radiation. Dose rates over mud and saltmarsh have a potential for being higher than over coarser substrates. Consequently occupancy times over these substrates are considered to be radiologically more important than similar times over other substrates. Estimates of natural backgrounds used by CEFAS for assessing doses to individuals (FSA and SEPA, 2000) are 0.05 micro Gy/h for sandy substrates, 0.07 micro Gy/h for mud and saltmarsh and 0.06 micro Gy/h for other substrates.

The predominant substrate materials in the intertidal areas of the survey area were sand and sand and stones.

Intertidal activities observed during the survey included angling, walking, dog walking, bait digging, shellfish collecting, beach combing, playing and boat maintenance. Wildfowling activities did occur in the survey area particularly around the John Muir Country Park but none was observed during the survey. Gamma dose rate measurements were taken at some locations, shown in Table 39, to supplement those which were part of SEPA's scheduled monitoring programme.

Table 36 lists the intertidal occupancy rates observed, grouped by substrate. An angler had the largest occupancy over rock of 1700 h/y and formed the critical group. A mean time of 490 h/y over sand was identified for six individuals, with a maximum rate of 550 h/y for walkers/dog walkers. A winkle picker at Skateraw Harbour, dog walkers, a walker and an angler formed the critical group over sand and stones, with a mean time of 310 h/y for six individuals. A bait digger and angler and a child playing on the beach formed the critical group over muddy sand, with a mean time of 66 h/y for three individuals. Shellfish collectors and a child playing on the beach formed the critical group over mussel beds, with a mean time of 50 h/y for eight individuals.

Handling

Handling sediment while bait digging, mollusc collecting or handling commercial fishing gear can give rise to skin exposure from beta radiation. This needs consideration even though the annual dose limit for skin is a factor of 50 times higher than that for effective dose. There is also a contribution to effective dose due to skin exposure (ICRP, 1991). Table 37 shows the most significant observations made during this survey for times spent handling sediment and commercial fishing gear.

A mean critical group sediment handling time of 360 h/y was identified for one individual winkle collecting at Skateraw Harbour. A mean critical group fishing gear handling time of 1800 h/y was identified for seven individuals using and maintaining nets and pots (creels), with a maximum time of 2200 h/y.

These provide quantitative data that might be of use in the probabilistic assessment of dose and/or risk to individuals via radiological pathways. Pathways to consider include individuals who may inhale re-suspended radioactivity in sea spray, inadvertently ingest contaminated seawater and/or have contact with and/or inadvertently ingest contaminated sediments while undertaking coastal area activities such as angling, walking, sailing, bait digging and water sports.

Watersport activities

Table 40 shows observations made during this survey for times spent involved in various watersport activities.

Beach sand use

At North Berwick, north of the harbour, and Milsey Bay, wind blown sand piled up on the beach and the road and was then collected for use in the bunkers. This was undertaken with permission from the East Lothian Council. There were nine holes located along the beach and these areas may have been subjected to sea spray. Milsey Bay also used imported sand. North of Dunbar, sand and sea spray got blown onto areas of the golf club but this sand was not used in the bunkers. The other golf clubs in the area were contacted and none of them were subjected to flooding or wind blown sand or sea spray.

5 TERRESTRIAL RADIATION PATHWAYS

5.1 Terrestrial survey area and local produce

The survey area is shown in Figure 2 with the farms and residences which were visited, circled. Terrestrial pathways found included consumption of vegetables and fruit grown by gardeners in Innerwick and Barns Ness and more general consumption of farm produce, including eggs. No dairy farms were identified within the survey radius. The majority of the farms within the survey area reared sheep and beef. One livestock farmer was noted to retain and consume his own stock, but most of the animals reared were exported out of the area after sale. The nearest abattoirs identified were at Bathgate and Galashiels. A few farms grew potatoes, turnip, swede and kale which were sold locally to a merchant and then on to local villages and towns. Cereal crops such as barley, winter wheat, spring oats and oil seed rape and grass (hay and silage) were grown for use as animal feed. Spring barley was sold to a local grain merchant for malting purposes in Ormiston. Spring oats was sold at a local auction at Dunbar and used for milling purposes. All the farms, except for one, allowed shooting of game on their farms. All the farmers ate game and gave away the excess to family and friends.

There were no foot and mouth affected farms in the area but several of the farms were understandably being very cautious and therefore as a precaution interviews were mostly conducted either off site or by phone if requested.

No allotment sites were identified within the survey area.

One individual was found to apply seaweed, which was used as a fertiliser and soil conditioner, to their private garden in Innerwick. The individual grew sixteen varieties of vegetables on a nine by fifteen metre plot.

Only one beekeeper was identified within the survey area. It was the individual's first year as a beekeeper so no honey was yet being produced. It was predicted that any honey produced in the coming year would be consumed by his own family with any excess being given away to family and friends. The individual grew vegetables and fruit.

The local shops visited included butchers, fishmongers and greengrocers.

There were two trout farms, one west of Dunbar and the other at Markell, to the north of the site. They were both located outside of the survey area.

5.2 Novel radiation pathways

Consideration was also given to novel pathways during the survey and the following observations were made:

Wildlife observed on site by British Energy plc staff included rats/mice, pigeons, rabbits and peregrines. The banking of the seawall was monitored by the site and checked for burrows which might undermine the soil bank. Vermin was controlled by using poisons and rabbits were shot by a local farmer when a problem was perceived. It was possible that the edible species could leave the site and be shot or caught for consumption. A small family of cats were tolerated on site for use in pest control.

There is a large cement works located approximately 3 km north west of the Torness site. Surrounding that is a quarry and a landfill site. The landfill site had been used for the disposal of non-radioactive, site construction material. This area of land is now farmland.

5.3 Land Cover

Figure 3 shows the land cover in the survey area. The figure was reproduced from a land cover map produced by Macaulay Land Use Research Institute (Macaulay institute for soil research, 1988), with their consent.

A large proportion of the survey area was arable land and grassland to support sheep and cattle for meat production. There were also small pockets of coniferous and non-coniferous plantations bordering the minor waterways in the area and areas of coppiced wood south of the village of Innerwick. There were a few small areas of bog, along with quarries and a landfill site. The main villages were Cockburnspath to the south east and Innerwick to the south west of the survey area.

5.4 Internal Exposure

Farms and homes visited during the survey are shown in Figure 2. The percentage contribution each food type makes to its terrestrial food group for adults is shown in Table 41. No consumption of local cereal crops was identified.

Adult consumption rates

Consumption rate data for adults are shown in the food groups where consumption occurred, in Tables 12 to 23. Consumption of terrestrial foods in the following food groups was identified: green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, sheep meat, poultry, eggs, wild/free foods, rabbits and hares, wild fungi and venison. No consumption was identified for the following food groups: milk, cattle meat, pig meat and honey. For each terrestrial food group the critical group maximum, minimum, mean and 97.5 percentile consumption rates have been calculated using data obtained from all individuals whose consumption was greater than nil. The results are summarised in Table 8. The table

also presents the national generic means and 97.5 percentile consumption rates (Byrom *et al*, 1995, MAFF, 1998) for comparison.

There were no critical group mean consumption rates that exceeded the generic 97.5 percentile rates. Seven critical group mean consumption rates exceeded the generic means. These were for domestic fruit, green vegetables, other vegetables, root vegetables, potatoes, eggs and rabbits and hares. Four critical group mean consumption rate were less than or equal to the generic mean, and this was for sheep meat, poultry, wild and free foods and wild fungi. There is currently no generic consumption data available for venison.

Children's consumption rates

Consumption rate data for children are shown in Tables 24 to 34. No children in the 3 month or one year old age groups were identified as consuming local terrestrial foods. For each terrestrial food group the critical group maximum, minimum, mean and 97.5 percentile consumption rates have been calculated using data obtained from all individuals whose consumption was great than nil for 15, 10 and 5 year olds. The results are summarised in Tables 9, 10 and 11 respectively. These tables also present the national generic means and 97.5 percentile consumption rates (Byrom *et al*, 1995, MAFF, 1998) for comparison.

15 year old age group

Seven children were identified to be eating locally produced terrestrial foods in this age group in 11 of the food groups (Tables 24 to 34). Consumption of terrestrial food in the following food groups was identified: green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, poultry, eggs, wild/free foods, rabbits and hares, wild fungi and venison. No consumption was identified for the following food groups: milk, cattle meat, sheep meat, pig meat and honey. No food groups were consumed at a higher rate than their generic 97.5 percentile rates. Eggs were consumed at a rate higher than their respective generic mean consumption rate. Domestic fruit, green vegetables, other vegetables, root vegetables,

potatoes, poultry, wild and free foods and wild fungi were consumed at rated lower than their respective generic mean consumption rates. No generic consumption rates had been determined by MAFF for this age group for venison and rabbits and hares.

10 year old age group

Thirteen children were identified as eating locally produced food in this age group in 11 of the food groups (Tables 24 to 34). Consumption of terrestrial food in the following food groups was identified: green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, poultry, eggs, wild/free foods, rabbits and hares, wild fungi and venison. No consumption was identified for the following food groups: milk, cattle meat, sheep meat, pig meat and honey. One critical group mean consumption rate exceeded the generic 97.5 percentile rate. This was for root vegetables. Domestic fruit, green vegetables, other vegetables and eggs were consumed at rates higher than their generic mean consumption rates. Potatoes, poultry, wild and free foods and wild fungi were consumed at rates lower than their respective generic mean consumption rates. No generic consumption rates had been determined by MAFF for this age group for venison and rabbits and hares.

5 year old age group

One child was identified as eating locally produced food in this age group in 6 of the food groups (Tables 24 to 28 and 31). Consumption of terrestrial food in the following food groups was identified: green vegetables, other vegetables, root vegetables, potatoes, domestic fruit and wild/free foods. No consumption was identified for the following food groups: milk, cattle meat, sheep meat, pig meat, poultry, eggs, honey, wild fungi, rabbits and hares and venison. No generic consumption rates had been determined by MAFF for this age group.

5.5 External radiation

The external radiation survey sought to obtain information on the amount of time spent (indoors and outdoors) in hours per year of people living and/or working and/or pursuing leisure activities within 1 km of the site centre. Occupancy due to employment associated with operations at Torness was not considered. These data are presented in Table 38.

At the time of the survey, a planned outage of one of the reactors was being undertaken at the station for routine maintenance and had run beyond schedule. It was agreed during a pre-survey meeting at the site that the survey team would continue with the external radiation interviews. Also it was not required to take any gamma dose readings at any of the premises within 1 km of the site. Further discussions during the survey concluded that it was not necessary to take any readings from around the perimeter fence and that the results taken by the station would be sufficient.

Site characteristics

The Torness site is positioned on the coast, approximately 2.5 km south west of the village of Innerwick and 4km south east of the village of Cockburnspath. The area immediately surrounding the site is composed of large sandy beaches to the south and grassy banks to the north, and grazing, mixed and arable farmland. The farmland runs up to the perimeter fence. There is a coastal walkway from Skateraw Harbour to Thorntonloch of about 2.5km in length, which is mainly set in the grassy banks either side of the power station and across the concrete walkway behind it. To the north of Skateraw Harbour the footpath allows access to the rocks at Chapel Point at low tide. To the north of the power station is an area occupied by the Dunbar lifeboat station. Fifteen properties are scattered within the direct radiation survey area. The only commercial activity noted to take place is farming and fishing.

Occupancy times

Local residents and employees and people pursuing leisure activities were interviewed and their occupancy times within the 1 km external radiation survey area were recorded. Data obtained included occupancy rates for the following activities: residential occupancy, farming, fishing and occupancy by members of the lifeboat crew. Quite a number of the residents interviewed spent large amounts of time at home, or in the immediate vicinity. The greatest occupancy time by one individual was 8500 h/y. Eight other individuals, had occupancy times greater than 8000 h/y.

6 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. We have provided data in Annex Tables 1 and 2 so that the full effect of combining pathways can be assessed for individual observations, given the concentrations and dose rates from 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 critical 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.

On the basis of the information in Annex Table 1, the most extensive combinations of pathways for adult dose assessment are shown in Table 42.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Survey findings

Exposure pathways were investigated for approximately 326 individuals. The survey considered pathways relating to three potential sources of exposure.

- discharges of liquid radioactive waste to the North Sea
- discharges of gaseous radioactive waste to the atmosphere and
- external radiation emitted directly from the site

The adult critical group mean consumption rates of seafood were:

- 41 kg/y for fish
- 17 kg/y for crustaceans
- 5.9 kg/y for molluscs.

The main aquatic species consumed were haddock, bass, Dover sole, mackerel, herring, whiting, lemon sole, lobster, crab, *Nephrops* and mussels.

Both fishing gear and sediment handling times were recorded; the critical group means were 1800 h/y and 360 h/y respectively.

The critical group mean occupancy times over intertidal areas were:

- 1700 h/y for rock
- 490 h/y for sand
- 310 h/y for sand and stones
- 66 h/y for muddy sand
- 50 h/y for mussel beds

The adult critical group mean consumption rates of terrestrial foods were:

- 30 kg/y for green vegetables
- 38 kg/y for other vegetables
- 32 kg/y for root vegetables

- 102 kg/y for potatoes
- 22 kg/y for domestic fruit
- 5.7 kg/y for sheep meat
- 5.9 kg/y for poultry
- 13 kg/y for eggs
- 1.8 kg/y for wild/free foods
- 0.3 kg/y for fungi
- 7.1 kg/y for rabbits and hares
- 9.5 kg/y for venison

The main terrestrial foods consumed were potatoes, tomatoes, onions, apples and eggs. The percentage contribution each terrestrial food type makes to its food group is shown in Table 41.

Occupancy times of members of the public within 1 km of the site were recorded. The highest occupancy time (indoor plus outdoor) was 8500 h/y.

7.2 Comparisons with previous surveys

The critical group mean consumption rates from within the survey area show a decrease in the consumption of fish and crustaceans and a slight increase in the consumption rate of molluscs when compared to the data from the 1994 aquatic pathways survey. The earlier data were fish, 58 kg/y, crustaceans, 21 kg/y and molluscs 2.2 kg/y, compared to this survey's consumption rates of fish 41 kg/y, crustaceans 17 kg/y and molluscs 5.9 kg/y.

Landings of fish and shellfish into local ports such as Eyemouth have decreased significantly since 1996 (Table 43) which could explain the drop in the fish and shellfish critical group consumption rates. Sixty percent or more of locally landed shellfish were found to be exported to Europe and the remainder either sold all to the UK or local sources.

The 1994 survey identified a critical group mean intertidal occupancy over rock of 640 h/y (winkle collector), compared to this survey's figure of 1700 h/y (an angler); the critical group is composed of people doing different activities to 1994. The previous survey also identified a critical group mean intertidal occupancy over sand for dog walkers and children playing of 430 h/y, compared to this survey's figure of 490 h/y for angling, walking and dog walking. This survey also identified relatively low occupancies in activities over other substrates (mussel beds, muddy sand and sand and stones) which were not considered separately in the 1994 report for the purpose of identifying critical groups. The 1994 survey critical group mean fishing gear handling time was 2000 h/y, compared to this survey's figure of 1800 h/y. No comparison of the critical group mean sediment handling time could be made as no sediment handling time was noted during the previous survey; this survey's figure was 360 h/y.

The 1994 survey considered aquatic pathways only, therefore no comparisons can be made for terrestrial food pathways.

In common with the 1997 direct radiation survey, this survey identified several individuals living in the Torness area who spent significant times within 1 km of the site.

7.3 Recommendations for environmental monitoring

One important objective of habit surveys is to identify any changes needed to the environmental monitoring programme. The monitoring programme as reported in Radioactivity in Food and the Environment, 2000 (FSA and SEPA, 2001) comprised sampling of sediments, seawater, saltmarsh, seaweed (Porphyra) and various seafoods (including cod, crab, lobster, *Nephrops* and winkles) for aquatic pathways. Grass, soil, various foodstuffs (including milk, fruit, vegetables and potatoes) and wild/free foods (including nettles, ground elder and rosehips) were sampled for terrestrial pathways. Gamma dose rates were taken at Dunbar Inner Harbour, Skateraw, Thorntonloch, Belhaven Bay, Barns Ness, St Abb's and Eyemouth. Beta dose rates were taken at Cove and Dunbar Harbour.

In view of the report's findings it is recommended that:

- The cod sample is replaced by haddock
- The locations where gamma dose rates are measured should be revised.

8 ACKNOWLEDGEMENTS

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9 REFERENCES

Byrom, J., Robinson, C., Simmonds, J. R., Walters, B., and Taylor, R. R. Food consumption rates for use in generalised radiological dose assessments. J. Radiol. Prot. 15 (4) 335-341.

FSA and SEPA, 2001. Radioactivity in Food and the Environment, 2000. FSA and SEPA, London and Stirling. (6), 183 pp.

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

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, pp. 875-889.

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, 201 pp. (ICRP Publ. 60.).

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

Leonard, D. R. P., Hunt, G. J. and Jones, P. G. W., 1982. Investigations of individual radiation exposures from discharges to the aquatic environment: the technique of habit surveys. pp. 512-517 *In:* 'Proceedings of the Third International Symposium on Radiological Protection - Advances in Theory and Practice', Inverness, 6-11 June 1982, Volume 2. The Society of Radiological Protection.

Macaulay Institute for Soil Research, Land cover of Scotland 1988, (LCS88) 1:50,000, Sheet 67, Torness.

MAFF, Joint Food Safety and Standards Group, 1998. Guidance for assessing the potential impact of radionuclide discharges to the environment. Edition 5, MAFF, London.

United Kingdom – Parliament, 1995. Review of radioactive waste management policy, HMSO, London, 55pp. (Cm 2919).

Table 1. Typical food groups used in habits surveys

Green vegetables	Artichoke, Asparagus, Broccoli, Brussel 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	Artichoke, Beetroot, Carrot, Celeriac, Celery, Chicory, Fennel, Garlic, Kohl rabi, Leek, Onion, Parsnip, Radish, Shallot, Spring onion, Swede, Turnip
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	Milk, Butter, Cream, Cheese, Yoghurt, Goats milk
Cattle meat †	
Pig meat †	
Sheep meat †	
Poultry	Chicken, Duck, Goose, Grouse, Guinea fowl, Partridge, Pheasant, Pigeon, Snipe, Turkey, Woodcock
Eggs	Chicken egg, Duck egg, Goose egg
Wild/free foods	Blackberry, Blackcurrant, Chestnut, Crab apple, Damson, Dandelion root, Elderberry, Nettle, Raspberry, Rowanberry, Samphire, Sloe, Strawberry, Watercress, Wild apple
Honey	
Wild Fungi	Mushrooms
Rabbits/Hare	Hare, Rabbit
Venison †	
Fish (sea)	Bass, Brill, Cod, Common ling, Dab, Dover sole, Flounder, Gurnard, Haddock, Hake, Herring, Lemon sole, Mackerel, Monkfish, Mullet, Plaice, Pollack, Saithe, Salmon, Sea Trout, Squid *, Rays, Turbot, Whitebait, Whiting, Witch
Fish (fresh water)	Brown trout, Rainbow trout, Perch, Pike, Salmon (river), Eels
Crustaceans	Crab, Crawfish, Lobster, Nephrops, Squat Lobster, Prawn, Shrimp
Molluscs	Cockles, Cuttlefish, Limpets, Mussels, Oysters, Queen Scallop, Razor shell, Whelks, Winkles

Notes:

* Although squid is a mollusc, radiologically it is more akin to fish.

† Including offal.

Table 2. Adult consumption rates of fish from the Torness area (kg/y)

Observation number	Bass	Cod	Dover sole	Flounder	Grey mullet	Haddock	Herring	Lemon sole	Mackerel	Mixed fish	Plaice	Turbot	Whiting	Total
265	**82.8**													**82.8**
46										**70.8**				**70.8**
47										**70.8**				**70.8**
182						**59.0**								**59.0**
42										**47.2**				**47.2**
43										**47.2**				**47.2**
284										**47.2**				**47.2**
286										**47.2**				**47.2**
24						**18.9**		**18.9**						**37.7**
25						**18.9**		**18.9**						**37.7**
280						**8.8**	**10.3**		**13.5**				**5.0**	**37.7**
281						**8.8**	**10.3**		**13.5**				**5.0**	**37.7**
86										**35.5**				**35.5**
87										**35.5**				**35.5**
20										**35.4**				**35.4**
22										**35.4**				**35.4**
70			**17.7**			**17.7**								**35.4**
71			**17.7**			**17.7**								**35.4**
156										**35.4**				**35.4**
272						**35.4**								**35.4**
273						**35.4**								**35.4**
271										**29.5**				**29.5**
72-76										**28.1**				**28.1**
191-195										27.4				27.4
269	25.6								1.7					27.2
157						14.7		11.8						26.5
34	10.4	6.8			5.5				3.6					26.3
84										23.7				23.7
85										23.7				23.7
88-91										23.7				23.7

Table 2 (cont). Adult consumption rates of fish from the Torness area (kg/y)

Observation number	Bass	Cod	Dover sole	Flounder	Grey mullet	Haddock	Herring	Lemon sole	Mackerel	Mixed fish	Plaice	Turbot	Whiting	Total
36										23.6				23.6
104										23.6				23.6
105										23.6				23.6
111-116										23.6				23.6
131-133										23.6				23.6
146-148										23.6				23.6
60		8.8				8.8			2.9					20.6
61		8.8				8.8			2.9					20.6
41						19.1								19.1
247	16.8													16.8
248	16.8													16.8
278										16.3				16.3
38-40						7.9						7.9		15.7
237	5.3	8.4												13.8
238	5.3	8.4												13.8
227										12.0				12.0
49										11.8				11.8
50										11.8				11.8
124										11.8				11.8
127										11.8				11.8
128										11.8				11.8
135										11.8				11.8
136										11.8				11.8
149										11.8				11.8
150										11.8				11.8
295										11.8				11.8
296										11.8				11.8
92-98										11.4				11.4
58						4.5			4.5					9.0
59						4.5			4.5					9.0

Table 2 (cont). Adult consumption rates of fish from the Torness area (kg/y)

Observation number	Bass	Cod	Dover sole	Flounder	Grey mullet	Haddock	Herring	Lemon sole	Mackerel	Mixed fish	Plaice	Turbot	Whiting	Total
183						8.8								8.8
184						8.8								8.8
123										8.8				8.8
266	7.4													7.4
32										6.8				6.8
249-263	6.0													6.0
56						5.9								5.9
57						5.9								5.9
66						5.9								5.9
67						5.9								5.9
175									2.2	3.1				5.3
176									2.2	3.1				5.3
160										5.2				5.2
161										5.2				5.2
30		1.4				1.4					1.4			4.1
31		1.4				1.4					1.4			4.1
282						3.5								3.5
283						3.5								3.5
239-246	1.3	2.1												3.4
51										2.9				2.9
52										2.9				2.9
117						2.7								2.7
118						2.7								2.7
230										2.5				2.5
231										2.5				2.5
102										2.1				2.1
103										2.1				2.1
232-236										2.0				2.0
276						2.0								2.0
277						2.0								2.0

Table 2 (cont). Adult consumption rates of fish from the Torness area (kg/y)

Observation number	Bass	Cod	Dover sole	Flounder	Grey mullet	Haddock	Herring	Lemon sole	Mackerel	Mixed fish	Plaice	Turbot	Whiting	Total
187				0.2										0.2
188				0.2										0.2

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of fish caught in the survey area based on the 27 highest adult consumers is 41.2 kg/y

The observed 97.5 percentile rate based on 145 observations is 51.9 kg/y

Table 3. Adult consumption rates of crustaceans from the Torness area (kg/y)

Observation number	Crab	Lobster	Nephrops	Total
20	**9.9**	**14.9**		**24.8**
22	**9.9**	**14.9**		**24.8**
38-40	**11.8**		**11.8**	**23.6**
46	**11.8**		**11.8**	**23.6**
47	**11.8**		**11.8**	**23.6**
42	**5.9**	**2.8**	**11.8**	**20.5**
30		**2.2**	**11.8**	**13.9**
31		**2.2**	**11.8**	**13.9**
272	**7.2**	**4.8**		**12.0**
273	**7.2**	**4.8**		**12.0**
227		**9.9**	**2.0**	**11.9**
228		**9.9**	**2.0**	**11.9**
43	**3.0**	**1.4**	**5.9**	**10.3**
156	**10.1**			**10.1**
32	**3.9**	**0.9**	**3.6**	**8.4**
49	0.4	0.6	7.2	8.2
50	0.4	0.6	7.2	8.2
72-76	0.5	7.4		7.9
295	2.7	4.8		7.5
296	2.7	4.8		7.5
157	6.8	0.7		7.5
182	5.0	0.4	1.3	6.7
24	1.3	2.3	2.4	6.0
36	5.9			5.9
276	0.8	1.3	2.2	4.3
280	4.0		0.3	4.2
281	4.0		0.3	4.2
282	1.6	2.6		4.2
283	1.6	2.6		4.2
25	1.3		2.4	3.7
284	0.3	2.9		3.2
286	0.3	2.9		3.2
183	2.3	0.5		2.8
184	2.3	0.5		2.8
175		1.7	0.6	2.3
176		1.7	0.6	2.3
277	0.8	1.3		2.1
92-98	1.6			1.6
135	0.1	1.5		1.6
136	0.1	1.5		1.6
66			1.5	1.5
67			1.5	1.5
178	0.8	0.6		1.5
179	0.8	0.6		1.5
160	1.4			1.4
161	1.4			1.4
278	1.0			1.0
51		0.9		0.9
52		0.9		0.9
56			0.6	0.6
57			0.6	0.6
60	0.4			0.4

Table 3 (cont). Adult consumption rates of crustaceans from the Torness area (kg/y)

Observation number	Crab	Lobster	Nephrops	Total
61	0.4			0.4
124	0.4			0.4
58			0.2	0.2
59			0.2	0.2

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of crustaceans caught in the survey area based on the 17 highest adult consumers is 17.2 kg/y

The observed 97.5 percentile rate based on 68 observations is 24.0 kg/y

Table 4. Adult consumption rates of molluscs from the Torness area (kg/y)

Observation number	King scallop	Mussel	Whelk	Winkle	Total
32	**0.6**	**5.4**			**6.0**
42		**5.9**			**5.9**
43		**5.9**			**5.9**
199				1.8	1.8
200				1.8	1.8
289				1.6	1.6
290				1.6	1.6
295			0.9		0.9
296			0.9		0.9
291-294				0.8	0.8
184				0.4	0.4
183				0.4	0.4
167		0.2			0.2
168-170		0.2			0.2
272				0.1	0.1
273				0.1	0.1

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of molluscs caught in the survey area based on the 3 highest adult consumers is 6.0 kg/y

The observed 97.5 percentile rate based on 21 observations is 6.0 kg/y

Table 5. Children's consumption rates of fish from the Torness area (kg/y)

Fifteen year old age group

Observation number	Bass	Cod	Flounder	Grey Mullet	Haddock	Lemon Sole	Mackerel	Mixed fish	Total
288								**47.2**	**47.2**
287								**47.2**	**47.2**
26					**18.9**	**18.9**			**37.7**
77								**28.1**	**28.1**
106								**23.6**	**23.6**
107								**23.6**	**23.6**
267	7.4								7.4
53								0.7	0.7

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of fish caught in the survey area
based on the 6 highest fifteen year old age group consumers is 34.6 kg/y
The observed 97.5 percentile rate based on 8 observations is 47.2 kg/y

Ten year old age group

Observation number	Bass	Cod	Flounder	Grey Mullet	Haddock	Lemon Sole	Mackerel	Mixed fish	Total
78								**28.1**	**28.1**
79								**28.1**	**28.1**
35	**10.4**	**6.8**		**5.5**			**3.6**		**26.3**
108								**23.6**	**23.6**
27					**9.4**	**9.4**			**18.9**
99								**11.4**	**11.4**
268	7.4								7.4
125								5.7	5.7
126								5.7	5.7
33								3.4	3.4
54								0.7	0.7
55								0.7	0.7

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of fish caught in the survey area
based on the 6 highest ten year old age group consumers is 22.7 kg/y
The observed 97.5 percentile rate based on 12 observations is 28.1 kg/y

Table 6. Children's consumption rates of crustaceans from the Torness area (kg/y)

Fifteen year old age group

Observation number	Crab	Lobster	Nephrops	Total
77	**0.5**	**7.4**		**7.9**
26	**1.3**		**2.4**	**3.7**
288	**0.3**	**2.9**		**3.2**
287	**0.3**	**2.9**		**3.2**
53		0.8		0.8

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of crustaceans caught in the survey area based on the 4 highest fifteen year old age group consumers is 4.5 kg/y

The observed 97.5 percentile rate based on 5 observations is 7.5 kg/y

Ten year old age group

Observation number	Crab	Lobster	Nephrops	Total
78	**0.5**	**7.4**		**7.9**
79	**0.5**	**7.4**		**7.9**
33	**2.0**	**0.4**	**1.8**	**4.2**
99	1.6			1.6
54		0.8		0.8
55		0.8		0.8
27	0.7			0.7

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of crustaceans caught in the survey area based on the 3 highest ten year old age group consumers is 6.7 kg/y

The observed 97.5 percentile rate based on 7 observations is 7.9 kg/y

Table 7. Children's consumption rates of molluscs from the Torness area (kg/y)

Fifteen year old age group

Observation number	King Scallop	Mussel	Total
174		**0.24**	**0.24**
173		**0.24**	**0.24**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of molluscs caught in the survey area based on the 2 highest fifteen year old age group consumers is 0.2 kg/y
The observed 97.5 percentile rate based on 2 observations is 0.2 kg/y

Ten year old age group

Observation number	King Scallop	Mussel	Total
33	0.32	2.69	3.01

Notes

The critical group mean consumption rate of molluscs caught in the survey area based on the 1 highest fifteen year old age group consumer is 0.2 kg/y

Table 8. Summary of adult consumption rates from the Torness area (kg/y)

Food Group	Number of Observations	No. Higher Rate Consumers	Observed Maximum Critical Consumption Rate	Observed Lower Critical Consumption Rate	Observed Critical Group Mean Consumption Rate	Observed 97.5th %ile Consumption Rate	Generic Mean Consumption Rate	Generic 97.5th %ile Consumption Rate
Fish	145	27	82.8	28.1	41.2	51.9	15	40
Crustaceans	68	17	24.8	8.4	17.2	24.0	3.5	10
Molluscs	21	3	6.0	5.9	5.9	6.0	3.5	10
Milk	NC	NC	NC	NC	NC	NC	95	240
Cattle meat	NC	NC	NC	NC	NC	NC	15	45
Domestic fruit	68	21	41.1	13.9	22.0	38.7	20	75
Green vegetables	64	21	50.8	23.2	30.2	43.3	15	45
Honey	NC	NC	NC	NC	NC	NC	2.5	9.5
Wild fungi	4	4	0.5	0.2	0.3	0.5	3	10
Rabbits/Hare	12	7	8.2	4.5	7.1	8.2	6	15
Pig meat	NC	NC	NC	NC	NC	NC	15	40
Sheep meat	4	4	5.7	5.7	5.7	5.7	8	25
Other vegetables	54	13	64.1	22.2	37.7	55.5	20	50
Potato	67	14	165.6	76.1	101.5	128.6	50	120
Root vegetables	64	30	62.5	21.2	32.0	48.0	10	40
Eggs	21	19	17.8	8.7	13.0	17.8	8.5	25
Venison	5	5	9.5	9.5	9.5	9.5	ND	ND
Wild/free foods	21	3	2.3	0.9	1.8	2.3	7	25
Poultry	25	12	23.9	2.7	5.9	15.2	10	30

ND = not determined
NC = not consumed

Table 9. Summary of 15 year old children's consumption rates from the Torness area (kg/y)

Food Group	Number of Observations	No. Higher Rate Consumers	Observed Maximum Critical Consumption Rate	Observed Lower Critical Consumption Rate	Observed Critical Group Mean Consumption Rate	Observed 97.5th %ile Consumption Rate	Generic Mean Consumption Rate	Generic 97.5th %ile Consumption Rate
Fish	10	5	47.2	23.6	33.9	47.2	6.5	20
Crustaceans	5	4	7.9	3.2	4.5	7.5	2.5	6.0
Molluscs	2	2	0.2	0.2	0.2	0.2	2.5	6.0
Milk	NC	NC	NC	NC	NC	NC	110	260
Cattle meat	NC	NC	NC	NC	NC	NC	15	35
Domestic fruit	6	4	17.9	7.9	14.4	17.9	15	50
Green vegetables	4	4	9.5	3.4	6.4	9.5	9	25
Honey	NC	NC	NC	NC	NC	NC	2	5
Wild fungi	1	1	0.2	0.2	0.2	NA	2	5.5
Rabbits/Hare	1	1	8.2	8.2	8.2	NA	ND	ND
Pig meat	NC	NC	NC	NC	NC	NC	10	30
Sheep meat	NC	NC	NC	NC	NC	NC	5.5	15
Other vegetables	4	4	7.7	3.6	5.9	7.7	10	30
Potato	4	3	13.8	7.6	11.7	13.8	60	130
Root vegetables	3	3	8.0	6.4	7.5	8.0	7.5	20
Eggs	2	2	16.9	2.1	9.5	16.5	7	25
Venison	1	1	9.5	9.5	9.5	NA	ND	ND
Wild/free foods	2	2	0.3	0.2	0.3	0.3	3	13
Poultry	4	4	1.8	0.6	1.4	1.8	6.5	20

ND = not determined
NC = not consumed
NA = not applicable. 1 consumer only

Table 10. Summary of 10 year old children's consumption rates from the Torness area (kg/y)

Food Group	Number of Observations	No. Higher Rate Consumers	Observed Maximum Critical Consumption Rate	Observed Lower Critical Consumption Rate	Observed Critical Group Mean Consumption Rate	Observed 97.5th %ile Consumption Rate	Generic Mean Consumption Rate	Generic 97.5th %ile Consumption Rate
Fish	12	6	28.1	11.4	22.7	28.1	6.0	20
Crustaceans	7	3	7.9	4.2	6.7	7.9	2.5	7.0
Molluscs	1	1	3.0	3.0	3.0	NA	2.5	7.0
Milk	NC	NC	NC	NC	NC	NC	110	240
Cattle meat	NC	NC	NC	NC	NC	NC	15	30
Domestic fruit	11	5	20.6	12.9	17.2	20.6	15	50
Green vegetables	8	2	23.2	9.5	16.4	20.8	6	20
Honey	NC	NC	NC	NC	NC	NC	2	7.5
Wild fungi	2	2	0.2	0.2	0.2	0.2	1.5	4.5
Rabbits/Hare	2	2	8.2	8.2	8.2	8.2	ND	ND
Pig meat	NC	NC	NC	NC	NC	NC	8.5	25
Sheep meat	NC	NC	NC	NC	NC	NC	4	10
Other vegetables	7	2	12.8	7.7	10.2	12.0	8	25
Potato	8	2	32.5	13.8	23.2	29.3	45	85
Root vegetables	6	3	34.8	21.2	25.7	33.1	6	20
Eggs	5	3	16.9	8.7	14.1	16.9	6.5	20
Venison	2	2	9.5	9.5	9.5	9.5	ND	ND
Wild/free foods	5	5	0.3	0.2	0.2	0.3	3	11
Poultry	6	2	4.5	1.8	3.2	4.2	5.5	15

ND = not determined
NC = not consumed
NA = not applicable. 1 consumer only

Table 11. Summary of 5 year old children's consumption rates from the Torness area (kg/y)

Food Group	Number of Observations	No. Higher Rate Consumers	Observed Maximum Critical Consumption Rate	Observed Lower Critical Consumption Rate	Observed Critical Group Mean Consumption Rate	Observed 97.5th %ile Consumption Rate	Generic Mean Consumption Rate	Generic 97.5th %ile Consumption Rate
Milk	NC	NC	NC	NC	NC	NC	ND	ND
Cattle meat	NC	NC	NC	NC	NC	NC	ND	ND
Domestic fruit	1	1	2.6	2.6	2.6	NA	ND	ND
Green vegetables	1	1	2.5	2.5	2.5	NA	ND	ND
Honey	NC	NC	NC	NC	NC	NC	ND	ND
Wild fungi	NC	NC	NC	NC	NC	NC	ND	ND
Rabbits/Hare	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
Other vegetables	1	1	0.2	0.2	0.2	NA	ND	ND
Potato	1	1	7.7	7.7	7.7	NA	ND	ND
Root vegetables	1	1	10.0	10.0	10.0	NA	ND	ND
Eggs	NC	NC	NC	NC	NC	NC	ND	ND
Venison	NC	NC	NC	NC	NC	NC	ND	ND
Wild/free foods	1	1	0.3	0.3	0.3	NA	ND	ND
Poultry	NC	NC	NC	NC	NC	NC	ND	ND

ND = not determined
NC = not consumed
NA = not applicable. 1 consumer only

Table 12. Adult consumption rates of green vegetables from the Torness area (kg/y)

Observation number	Asparagus	Broccoli	Brussel sprout	Cabbage	Calabrese	Cauliflower	Courgettes	Cucumber	Kale	Lettuce	Marrow	Spinach	Total
127		**10.2**	**13.7**	**12.8**		**10.2**				**4.0**			**50.8**
128		**10.2**	**13.7**	**12.8**		**10.2**				**4.0**			**50.8**
109		**10.2**		**10.6**		**8.5**		**8.5**					**37.8**
110		**10.2**		**10.6**		**8.5**		**8.5**					**37.8**
60				**30.6**		**4.1**							**34.7**
61				**30.6**		**4.1**							**34.7**
83			**10.9**	**21.3**									**32.2**
102			**9.1**	**12.8**		**6.8**							**28.7**
103			**9.1**	**12.8**		**6.8**							**28.7**
114-116		**2.7**		**3.4**		**5.0**	**0.3**	**11.3**	**0.9**	**0.8**	**0.6**	**3.4**	**28.5**
86				**12.8**		**10.2**				**2.4**			**25.4**
87				**12.8**		**10.2**				**2.4**			**25.4**
92-98			**4.1**	**10.6**		**2.0**	**0.1**	**6.4**					**23.2**
121				8.5		6.8				1.5			16.8
122				8.5		6.8				1.5			16.8
1			0.6	2.3		4.1	0.3	4.3		3.5	0.5	1.1	16.5
2			0.6	2.3		4.1	0.3	4.3		3.5	0.5	1.1	16.5
131-133	2.1	2.7		3.4		2.7				3.0			14.0
56		1.0	2.7	2.6		1.3		3.2				2.3	13.0
57		1.0	2.7	2.6		1.3		3.2				2.3	13.0
282			5.5	5.1						2.4			13.0
283			5.5	5.1						2.4			13.0
149			12.5										12.5
150			12.5										12.5
119				10.2						2.0			12.2
120				10.2						2.0			12.2
84				8.5			0.3			2.4			11.2
85				8.5			0.3			2.4			11.2
3				4.3		3.4	0.0	3.4					11.1
4				4.3		3.4	0.0	3.4					11.1
104		0.8	1.1	2.0		1.6	0.1	2.0		1.2	0.5		9.5
105		0.8	1.1	2.0		1.6	0.1	2.0		1.2	0.5		9.5

Table 12 (cont). Adult consumption rates of green vegetables from the Torness area (kg/y)

Observation number	Asparagus	Broccoli	Brussel sprout	Cabbage	Calabrese	Cauliflower	Courgettes	Cucumber	Kale	Lettuce	Marrow	Spinach	Total
129				5.1		2.0							7.1
130				5.1		2.0							7.1
117				5.1						2.0			7.1
118				5.1						2.0			7.1
48						3.4							3.4
151						3.4							3.4
152						3.4							3.4
12				2.0		0.7				0.6			3.4
13				2.0		0.7				0.6			3.4
123			2.7							0.6			3.3
124			2.7							0.6			3.3
80				2.6						0.6			3.2
82					2.0					0.6			2.6
5-8				2.6									2.6
111-113				1.7						0.8			2.5
18			1.1										1.1
19			1.1										1.1

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of green vegetables from the survey area based on the 21 highest adult consumers is 30.2 kg/y

The observed 97.5 percentile rate based on 64 observations is 43.3 kg/y

Table 13. Adult consumption rates of other vegetables from the Torness area (kg/y)

Observation number	Broad bean	French bean	Pea	Pepper	Runner bean	Tomato	Total
115	**6.8**	**5.8**	**9.0**		**24.5**	**18.0**	**64.1**
127		**5.4**	**13.5**		**20.4**	**16.2**	**55.5**
128		**5.4**	**13.5**		**20.4**	**16.2**	**55.5**
116	**2.3**	**3.2**	**9.0**		**8.2**	**18.0**	**40.7**
114	**2.3**	**2.2**	**9.0**		**8.2**	**18.0**	**39.6**
102			**5.4**			**32.4**	**37.8**
103			**5.4**			**32.4**	**37.8**
60						**32.4**	**32.4**
61						**32.4**	**32.4**
149	**12.5**				**12.5**		**25.0**
150	**12.5**				**12.5**		**25.0**
109	**2.7**	**3.2**	**4.5**		**8.2**	**3.6**	**22.2**
110	**2.7**	**3.2**	**4.5**		**8.2**	**3.6**	**22.2**
83			20.3				20.3
1	1.1	2.0	0.2	0.1	6.1	5.4	14.8
2	1.1	2.0	0.2	0.1	6.1	5.4	14.8
84						14.4	14.4
85						14.4	14.4
56	5.1		0.3			8.1	13.6
57	5.1		0.3			8.1	13.6
92-98	2.3	0.8	3.4			6.3	12.8
131-133		1.8	1.5			5.4	8.7
86			2.3			5.4	7.7
87			2.3			5.4	7.7
104		2.2	2.3			3.2	7.7
105		2.2	2.3			3.2	7.7
48						7.2	7.2
117						5.4	5.4
118						5.4	5.4
3	0.8		0.1			4.3	5.3
4	0.8		0.1			4.3	5.3
62						4.8	4.8
63						4.8	4.8
51						4.3	4.3
52						4.3	4.3
111-113			0.1		2.4		2.5
80						1.8	1.8
82						1.8	1.8
123				0.1		0.9	1.0
124				0.1		0.9	1.0
5-8			0.2				0.2

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of other vegetables from the survey area based on the 13 highest adult consumers is 37.7 kg/y

The observed 97.5 percentile rate based on 54 observations is 55.5 kg/y

Table 14. Adult consumption rates of root vegetables from the Torness area (kg/y)

Observation number	Beetroot	Carrot	Celery	Fennel	Garlic	Leek	Onion	Parsnip	Radish	Shallot	Spring onion	Swede	Turnip	Total
149						**25.0**	**25.0**			**12.5**				**62.5**
150						**25.0**	**25.0**			**12.5**				**62.5**
119	**4.5**					**12.0**	**7.2**					**13.6**		**37.3**
120	**4.5**					**12.0**	**7.2**					**13.6**		**37.3**
102	**2.7**					**12.0**	**19.8**						**2.7**	**37.2**
103	**2.7**					**12.0**	**19.8**						**2.7**	**37.2**
92-98		**12.2**			**0.7**	**3.0**	**4.1**	**1.4**				**13.6**		**34.8**
121	**6.8**						**13.5**					**10.2**		**30.5**
122	**6.8**						**13.5**					**10.2**		**30.5**
127			**4.2**			**13.5**	**2.2**	**5.4**	**0.7**				**4.1**	**30.0**
128			**4.2**			**13.5**	**2.2**	**5.4**	**0.7**				**4.1**	**30.0**
48	**3.0**					**25.0**								**28.0**
109	**4.5**					**3.0**	**11.0**						**9.0**	**27.5**
110	**4.5**					**3.0**	**11.0**						**9.0**	**27.5**
131-133	**4.5**			**0.0**		**7.5**					**2.7**	**9.1**	**1.8**	**25.6**
117	**10.1**	**6.8**					**7.9**							**24.8**
118	**10.1**	**6.8**					**7.9**							**24.8**
56	**1.7**	**10.7**				**2.3**	**8.3**	**0.4**						**23.3**
57	**1.7**	**10.7**				**2.3**	**8.3**	**0.4**						**23.3**
115	**2.7**				**0.2**	**2.7**	**10.8**	**2.2**					**3.2**	**21.8**
123	**2.7**					**1.4**	**2.2**	**2.7**				**12.2**		**21.2**
124	**2.7**					**1.4**	**2.2**	**2.7**				**12.2**		**21.2**
83							19.8							19.8
114	2.7				0.2	2.7	10.8	1.1					1.6	19.1
116	2.7				0.2	2.7	10.8	1.1					1.6	19.1
1	3.4		2.1			0.8	5.5	1.1					4.1	16.9
2	3.4		2.1			0.8	5.5	1.1					4.1	16.9
3	1.4	1.4				6.0	5.5				0.6	1.4	0.3	16.4
4	1.4	1.4				6.0	5.5				0.6	1.4	0.3	16.4
86		5.6				3.6	3.3							12.5
87		5.6				3.6	3.3							12.5
129						5.0	5.5							10.5
130						5.0	5.5							10.5

Table 14 (cont). Adult consumption rates of root vegetables from the Torness area (kg/y)

Observation number	Beetroot	Carrot	Celery	Fennel	Garlic	Leek	Onion	Parsnip	Radish	Shallot	Spring onion	Swede	Turnip	Total
84	6.8						3.3							10.1
85	6.8						3.3							10.1
5-8	1.2	3.0				1.2	3.8						0.7	10.0
104	2.7				0.1	1.6	2.2	0.4					1.1	8.0
105	2.7				0.1	1.6	2.2	0.4					1.1	8.0
60							6.6							6.6
61							6.6							6.6
151						4.7	1.7							6.4
152						4.7	1.7							6.4
18												5.5		5.5
19												5.5		5.5
282						1.8			2.7					4.5
283						1.8			2.7					4.5
88-91						1.3	2.8							4.0
111-113		1.0				1.6	0.9							3.5

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of root vegetables from the survey area based on the 30 highest adult consumers is 32.0 kg/y

The observed 97.5 percentile rate based on 64 observations is 48.0 kg/y

Table 15. Adult consumption rates of potatoes from the Torness area (kg/y)

Observation number	Total
282	**165.6**
283	**165.6**
84	**108.8**
85	**108.8**
80	**108.3**
82	**108.3**
83	**94.5**
48	**91.4**
66	**82.8**
67	**82.8**
56	**76.2**
57	**76.2**
117	**76.1**
118	**76.1**
86	52.9
87	52.9
149	50.0
150	50.0
100	48.6
101	48.6
114-116	39.9
60	38.1
61	38.1
129	37.5
130	37.5
88-91	34.8
127	32.6
128	32.6
92-98	32.6
102	32.4
103	32.4
121	25.8
122	25.8
3	22.4
4	22.4
109	21.6
110	21.6
104	13.8
105	13.8
131-133	12.6
119	8.1
120	8.1
5-8	7.7
151	7.6
152	7.6
123	6.1
124	6.1
1	4.4
2	4.4
12	3.6
13	3.6

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of potatoes from the survey area based on the 14 highest adult consumers is 101.5 kg/y

The observed 97.5 percentile rate based on 67 observations is 128.6 kg/y

Table 16. Adult consumption rates of domestic fruit from the Torness area (kg/y)

Observation number	Apple	Blackberry	Blackcurrant	Boysenberry	Cherry	Gooseberry	Grapes	Loganberry	Peach	Pear	Plum	Raspberry	Redcurrants	Rhubarb	Strawberry	Tayberry	Total
57	**7.8**		**10.6**			**9.2**					**0.4**	**9.0**			**4.1**		**41.1**
56	**7.8**		**10.6**			**9.2**					**0.4**	**9.0**			**4.1**		**41.1**
114-116		**2.7**	**5.7**			**2.7**		**2.7**				**8.1**	**3.0**	**4.6**	**5.4**	**2.7**	**37.6**
83		**8.0**				**12.3**		**8.0**							**5.4**		**33.6**
104	**5.4**				**0.9**	**1.6**	**5.4**		**1.0**	**0.9**		**1.6**		**0.5**	**0.5**		**17.9**
105	**5.4**				**0.9**	**1.6**	**5.4**		**1.0**	**0.9**		**1.6**		**0.5**	**0.5**		**17.9**
117												**10.0**			**6.8**		**16.8**
118												**10.0**			**6.8**		**16.8**
65			**11.4**		**2.0**	**3.1**											**16.5**
84	**5.7**	**4.0**			**2.3**					**2.3**	**2.3**						**16.4**
85	**5.7**	**4.0**			**2.3**					**2.3**	**2.3**						**16.4**
282	**10.5**										**5.1**						**15.6**
283	**10.5**										**5.1**						**15.6**
109	**4.5**		**2.8**										**4.5**		**2.4**		**14.3**
110	**4.5**		**2.8**										**4.5**		**2.4**		**14.3**
151	**5.0**					**3.1**					**2.5**		**3.4**				**14.0**
152	**5.0**					**3.1**					**2.5**		**3.4**				**14.0**
1	**0.5**		**0.5**			**0.5**	**0.5**		**4.5**	**1.1**	**3.2**			**1.2**	**2.0**		**13.9**
2	**0.5**		**0.5**			**0.5**	**0.5**		**4.5**	**1.1**	**3.2**			**1.2**	**2.0**		**13.9**
92-98			4.3			3.1							3.4	0.9	1.3		12.9
102						8.2								4.6			12.8
103						8.2								4.6			12.8
72-76	6.8					0.2				0.9							7.9
140-142	4.5									1.5	0.8						6.8
121			5.7														5.7
122			5.7														5.7
129			5.7														5.7
130			5.7														5.7
70	5.7																5.7
71	5.7																5.7
3															3.4		3.4
4															3.4		3.4
131-133	3.3																3.3
119	2.3				0.5												2.7
120	2.3				0.5												2.7
5-8	1.1														1.5		2.6

Table 16 (cont). Adult consumption rates of domestic fruit from the Torness area (kg/y)

Observation number	Apple	Blackberry	Blackcurrant	Boysenberry	Cherry	Gooseberry	Grapes	Loganberry	Peach	Pear	Plum	Raspberry	Redcurrants	Rhubarb	Strawberry	Tayberry	Total
60	1.6																1.6
61	1.6																1.6
100		0.5												1.2			1.6
101		0.5												1.2			1.6
19	0.2				0.2	0.1				0.1	0.1						0.8
18	0.2				0.2	0.1				0.1	0.1						0.8
86		0.7															0.7
87		0.7															0.7
51															0.5		0.5
52															0.5		0.5
138				0.3													0.3
12		0.2															0.2
13		0.2															0.2

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of domestic fruit from the survey area based on the 21 highest adult consumers is 22.0 kg/y

The observed 97.5 percentile rate based on 68 observations is 38.7 kg/y

Table 17. Adult consumption rates of sheep meat from the Torness area (kg/y)

Observation number	Total
5-8	**5.7**

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of sheep meat from the survey area based on the 4 highest adult consumers is 5.7 kg/y

The observed 97.5 percentile rate based on 4 observations is 5.7 kg/y

Table 18. Adult consumption rates of poultry from the Torness area (kg/y)

Observation number	Chicken	Duck	Goose	Partridge	Pheasant	Total
60	**15.0**	**4.5**	**4.4**			**23.9**
1		**1.4**		**2.1**	**3.0**	**6.5**
2		**1.4**		**2.1**	**3.0**	**6.5**
137					**4.5**	**4.5**
138					**4.5**	**4.5**
131-133					**4.2**	**4.2**
86					**3.6**	**3.6**
87					**3.6**	**3.6**
149					**2.7**	**2.7**
150					**2.7**	**2.7**
84					1.8	1.8
85					1.8	1.8
104					1.8	1.8
105					1.8	1.8
72-76					1.4	1.4
109					0.9	0.9
110					0.9	0.9
12				0.3	0.4	0.6
13				0.3	0.4	0.6

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of poultry from the survey area based on the 12 highest adult consumers is 5.9 kg/y

The observed 97.5 percentile rate based on 25 observations is 15.2 kg/y

Table 19. Adult consumption rates of eggs from the Torness area (kg/y)

Observation number	Chicken egg	Duck egg	Goose egg	Total
1	**17.8**			**17.8**
2	**17.8**			**17.8**
72-76	**12.5**	**4.4**		**16.9**
56	**15.6**			**15.6**
57	**15.6**			**15.6**
60	**6.7**	**1.4**	**5.1**	**13.1**
61	**6.7**	**1.4**	**5.1**	**13.1**
48	**8.9**			**8.9**
92-98	**6.3**	**2.4**		**8.7**
51	2.5			2.5
52	2.5			2.5

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of eggs from the survey area based on the 19 highest adult consumers is 13.0 kg/y

The observed 97.5 percentile rate based on 21 observations is 17.8 kg/y

Table 20. Adult consumption rates of wild/free foods from the Torness area (kg/y)

Observation number	Blackberry	Blackcurrant	Sloe	Total
70	**2.3**			**2.3**
71	**2.3**			**2.3**
48	**0.9**			**0.9**
1			0.5	0.5
2			0.5	0.5
127	0.5			0.5
128	0.5			0.5
5-8		0.3		0.3
62	0.3			0.3
63	0.3			0.3
137	0.3			0.3
72-76	0.2			0.2
123	0.2			0.2
124	0.2			0.2

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of wild/free foods from the survey area based on the 3 highest adult consumers is 1.8 kg/y

The observed 97.5 percentile rate based on 21 observations is 2.3 kg/y

Table 21. Adult consumption rates of rabbits & hares from the Torness area (kg/y)

Observation number	Total
72-76	**8.2**
84	**4.5**
85	**4.5**
1	0.9
2	0.9
131-133	0.3

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of rabbits/hares from the survey area based on the 7 highest adult consumers is 7.1 kg/y

The observed 97.5 percentile rate based on 12 observations is 8.2 kg/y

Table 22. Adult consumption rates of wild fungi from the Torness area (kg/y)

Observation number	Total
1	**0.5**
2	**0.5**
12	**0.2**
13	**0.2**

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of wild fungi from the survey area based on the 4 highest adult consumers is 0.3 kg/y

The observed 97.5 percentile rate based on 4 observations is 0.5 kg/y

Table 23. Adult consumption rates of venison from the Torness area (kg/y)

Observation number	Total
72-76	**9.5**

Notes

Emboldened observations are the critical group consumers

The critical group mean consumption rate of venison from the survey area based on the 5 highest adult consumers is 9.5 kg/y

The observed 97.5 percentile rate based on 5 observations is 9.5 kg/y

Table 24. Children's consumption rates of green vegetables from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Broccoli	Brussel sprout	Cabbage	Cauliflower	Courgettes	Cucumber	Lettuce	Marrow	Total
106	**F**	**14**	**0.8**	**1.1**	**2.0**	**1.6**	**0.1**	**2.0**	**1.2**	**0.5**	**9.5**
107	**F**	**13**	**0.8**	**1.1**	**2.0**	**1.6**	**0.1**	**2.0**	**1.2**	**0.5**	**9.5**
153	**M**	**12**				**3.4**					**3.4**
14	**U**	**13**			**2.0**	**0.7**			**0.6**		**3.4**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of green vegetables from the survey area based on the 4 highest fifteen year old age group consumers is 6.4 kg/y
The observed 97.5 percentile rate based on 4 observations is 9.5 kg/y

Ten year old age group

Observation number	Sex	Age	Broccoli	Brussel sprout	Cabbage	Cauliflower	Courgettes	Cucumber	Lettuce	Marrow	Total
99	**M**	**9**		**4.1**	**10.6**	**2.0**	**0.1**	**6.4**			**23.2**
108	**F**	**9**	**0.8**	**1.1**	**2.0**	**1.6**	**0.1**	**2.0**	**1.2**	**0.5**	**9.5**
154	F	10				3.4					3.4
15	U	11			2.0	0.7			0.6		3.4
16	U	7			2.0	0.7			0.6		3.4
125	M	9		2.7					0.6		3.3
126	F	7		2.7					0.6		3.3
9	U	10			2.6						2.6

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of green vegetables from the survey area based on the 2 highest ten year old age group consumers is 16.4 kg/y
The observed 97.5 percentile rate based on 8 observations is 20.8 kg/y

Table 24 (cont). Children's consumption rates of green vegetables from the Torness area (kg/y)

Five year old age group

Observation number	Sex	Age	Cabbage	Total
10	**U**	**6**	**2.6**	**2.6**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of green vegetables from the survey area
based on the 1 highest five year old age group consumers is 2.6 kg/y
No 97.5% rate was calculated as there was only one observation

Table 25. Children's consumption rates of other vegetables from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	French Bean	Pea	Pepper	Tomato	Total
106	**F**	**14**	**2.2**	**2.3**		**3.2**	**7.7**
107	**F**	**13**	**2.2**	**2.3**		**3.2**	**7.7**
64	**F**	**12**				**4.8**	**4.8**
53	**M**	**16**				**3.6**	**3.6**

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of other vegetables from the survey area based on the 4 highest fifteen year old age group consumers is 5.9 kg/y
The observed 97.5 percentile rate based on 4 observations is 7.7 kg/y

Ten year old age group

Observation number	Sex	Age	Broad bean	French Bean	Pea	Pepper	Tomato	Total
99	**M**	**9**	**2.3**	**0.8**	**3.4**		**6.3**	**12.8**
108	**F**	**9**		**2.2**	**2.3**		**3.2**	**7.7**
54	M	11					3.6	3.6
55	M	10					3.6	3.6
125	M	9				0.1	0.9	1.0
126	F	7				0.1	0.9	1.0
9	U	10			0.2			0.2

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of other vegetables from the survey area based on the 2 highest ten year old age group consumers is 10.2 kg/y
The observed 97.5 percentile rate based on 7 observations is 12.0 kg/y

Five year old age group

Observation number	Sex	Age	Pea	Total
10	**U**	**6**	**0.2**	**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of other vegetables from the survey area based on the 1 highest five year old age group consumers is 0.2 kg/y
No 97.5% rate was calculated as there was only one observation

Table 26. Children's consumption rates of root vegetables from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Beetroot	Garlic	Leek	Onion	Parsnip	Swede	Turnip	Total
106	**F**	**14**	**2.7**	**0.1**	**1.6**	**2.2**	**0.4**		**1.1**	**8.0**
107	**F**	**13**	**2.7**	**0.1**	**1.6**	**2.2**	**0.4**		**1.1**	**8.0**
153	**M**	**12**			**4.7**	**1.7**				**6.4**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of root vegetables from the survey area based on the 3 highest fifteen year old age group consumers is 7.5 kg/y
The observed 97.5 percentile rate based on 3 observations is 8.0 kg/y

Ten year old age group

Observation number	Sex	Age	Beetroot	Carrot	Garlic	Leek	Onion	Parsnip	Swede	Turnip	Total
99	**M**	**9**		**12.2**	**0.7**	**3.0**	**4.1**	**1.4**	**13.6**		**34.8**
125	**M**	**9**	**2.7**			**1.4**	**2.2**	**2.7**	**12.2**		**21.2**
126	**F**	**7**	**2.7**			**1.4**	**2.2**	**2.7**	**12.2**		**21.2**
9	U	10	1.2	3.0		1.2	3.8			0.7	10.0
108	F	9	2.7		0.1	1.6	2.2	0.4		1.1	8.0
154	F	10				4.7	1.7				6.4

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of root vegetables from the survey area based on the 3 highest ten year old age group consumers is 25.7 kg/y
The observed 97.5 percentile rate based on 6 observations is 33.1 kg/y

Five year old age group

Observation number	Sex	Age	Beetroot	Carrot	Garlic	Leek	Onion	Parsnip	Swede	Turnip	Total
10	**U**	**6**	**1.2**	**3.0**		**1.2**	**3.8**			**0.7**	**10.0**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of root vegetables from the survey area based on the 1 highest five year old age group consumers is 10.0 kg/y
No 97.5% rate was calculated as there was only one observation

Table 27. Children's consumption rates of potatoes from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Total
106	**F**	**14**	**13.8**
107	**F**	**13**	**13.8**
153	**M**	**12**	**7.6**
14	U	13	3.6

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of potatoes from the survey area based on the 3 highest fifteen year old age group consumers is 11.7 kg/y
The observed 97.5 percentile rate based on 4 observations is 13.8 kg/y

Ten year old age group

Observation number	Sex	Age	Total
99	**M**	**9**	**32.6**
108	**F**	**9**	**13.8**
9	U	10	7.7
154	F	10	7.6
125	M	9	6.1
126	F	7	6.1
15	U	11	3.6
16	U	7	3.6

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of potatoes from the survey area based on the 2 highest ten year old age group consumers is 23.2 kg/y
The observed 97.5 percentile rate based on 8 observations is 29.3 kg/y

Five year old age group

Observation number	Sex	Age	Total
10	**U**	**6**	**7.7**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of potatoes from the survey area based on the 1 highest five year old age group consumers is 7.7 kg/y
No 97.5% rate was calculated as there was only one observation

Table 28. Children's consumption rates of domestic fruit from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Apple	Blackberry	Cherry	Gooseberry	Grapes	Peach	Pear	Plum	Raspberry	Redcurrants	Rhubarb	Strawberry	Total
106	**F**	**14**	**5.4**		**0.9**	**1.6**	**5.4**	**1.0**	**0.9**		**1.6**		**0.5**	**0.5**	**17.9**
107	**F**	**13**	**5.4**		**0.9**	**1.6**	**5.4**	**1.0**	**0.9**		**1.6**		**0.5**	**0.5**	**17.9**
153	**M**	**12**	**5.0**			**3.1**				**2.5**		**3.4**			**14.0**
77	**F**	**13**	**6.8**			**0.2**			**0.9**						**7.9**
53	M	16												0.5	0.5
14	U	13		0.2											0.2

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of domestic fruit from the survey area based on the 4 highest fifteen year old age group consumers is 14.4 kg/y
The observed 97.5 percentile rate based on 6 observations is 17.9 kg/y

Ten year old age group

Observation number	Sex	Age	Apple	Blackberry	Blackcurrant	Boysenberry	Cherry	Gooseberry	Grapes	Peach	Pear	Plum	Raspberry	Redcurrants	Rhubarb	Strawberry	Total
78	**M**	**10**	**6.8**					**0.2**			**0.9**	**12.7**					**20.6**
79	**M**	**10**	**6.8**					**0.2**			**0.9**	**12.7**					**20.6**
108	**F**	**9**	**5.4**				**0.9**	**1.6**	**5.4**	**1.0**	**0.9**		**1.6**		**0.5**	**0.5**	**17.9**
154	**F**	**10**	**5.0**					**3.1**				**2.5**		**3.4**			**14.0**
99	**M**	**9**			**4.3**			**3.1**						**3.4**	**0.9**	**1.3**	**12.9**
9	U	10	1.1													1.5	2.6
54	M	11														0.5	0.5
55	M	10														0.5	0.5
139	F	11				0.3											0.3
15	U	11		0.2													0.2
16	U	7		0.2													0.2

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of domestic fruit from the survey area based on the 5 highest ten year old age group consumers is 17.2 kg/y
The observed 97.5 percentile rate based on 11 observations is 20.6 kg/y

Table 28 (cont). Children's consumption rates of domestic fruit from the Torness area (kg/y)

Five year old age group

Observation number	Sex	Age	Apple	Strawberry	Total
10	**U**	**6**	**1.1**	**1.5**	**2.6**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of domestic fruit from the survey area
based on the 1 highest five year old age group consumers is 2.6 kg/y
No 97.5% rate was calculated as there was only one observation

Table 29. Children's consumption rates of poultry from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Partridge	Pheasant	Total
106	**F**	**14**		**1.8**	**1.8**
107	**F**	**13**		**1.8**	**1.8**
77	**F**	**13**		**1.4**	**1.4**
14	**U**	**13**	**0.3**	**0.4**	**0.6**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of poultry from the survey area based on the 4 highest fifteen year old age group consumers is 1.4 kg/y
The observed 97.5 percentile rate based on 4 observations is 1.8 kg/y

Ten year old age group

Observation number	Sex	Age	Partridge	Pheasant	Total
139	**F**	**11**		**4.5**	**4.5**
108	**F**	**9**		**1.8**	**1.8**
78	M	10		1.4	1.4
79	M	10		1.4	1.4
15	U	11	0.3	0.4	0.6
16	U	7	0.3	0.4	0.6

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of poultry from the survey area based on the 2 highest ten year old age group consumers is 3.2 kg/y
The observed 97.5 percentile rate based on 6 observations is 4.2 kg/y

Table 30. Children's consumption rates of eggs from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Chicken egg	Duck egg	Total
77	**F**	**13**	**12.5**	**4.4**	**16.9**
53	**M**	**16**	**2.1**		**2.1**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of eggs from the survey area based on the 2 highest fifteen year old age group consumers is 9.5 kg/y.
The observed 97.5 percentile rate based on 2 observations is 16.5 kg/y

Ten year old age group

Observation number	Sex	Age	Chicken egg	Duck egg	Total
78	**M**	**10**	**12.5**	**4.4**	**16.9**
79	**M**	**10**	**12.5**	**4.4**	**16.9**
99	**M**	**9**	**6.3**	**2.4**	**8.7**
54	M	11	2.1		2.1
55	M	10	2.1		2.1

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of eggs from the survey area based on the 3 highest ten year old age group consumers is 14.1 kg/y
The observed 97.5 percentile rate based on 5 observations is 16.9 kg/y

Table 31. Children's consumption rates of Wild/free foods from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Blackberry	Total
64	**F**	**12**	**0.3**	**0.3**
77	**F**	**13**	**0.2**	**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of wild/free foods from the survey area based on the 2 highest fifteen year old age group consumers is 0.3 kg/y
The observed 97.5 percentile rate based on 2 observations is 0.3 kg/y

Ten year old age group

Observation number	Sex	Age	Blackberry	Blackcurrant	Total
9	**U**	**10**		**0.3**	**0.3**
78	**M**	**10**	**0.2**		**0.2**
79	**M**	**10**	**0.2**		**0.2**
125	**M**	**9**	**0.2**		**0.2**
126	**F**	**7**	**0.2**		**0.2**

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of wild/free foods from the survey area based on the 5 highest ten year old age group consumers is 0.2 kg/y
The observed 97.5 percentile rate based on 5 observations is 0.3 kg/y

Five year old age group

Observation number	Sex	Age	Blackcurrant	Total
10	**U**	**6**	**0.3**	**0.3**

Notes
Emboldened observations are the critical group consumers
The critical group mean consumption rate of wild/free foods from the survey area based on the 1 highest five year old age group consumers is 0.3 kg/y
No 97.5% rate was calculated as there was only one observation

Table 32. Children's consumption rates of rabbits/hares from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Total
77	**F**	**13**	**8.2**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of rabbits/hares from the survey area based on the 1 highest fifteen year old age group consumers is 8.2 kg/y
No 97.5% rate was calculated as there was only one observation

Ten year old age group

Observation number	Sex	Age	Total
78	**M**	**10**	**8.2**
79	**M**	**10**	**8.2**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of rabbits/hares from the survey area based on the 2 highest ten year old age group consumers is 8.2 kg/y
The observed 97.5 percentile rate based on 2 observations is 8.2 kg/y

Table 33. Children's consumption rates of wild fungi from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Total
14	**U**	**13**	**0.2**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of wild fungi from the survey area based on the 1 highest fifteen year old age group consumers is 0.2 kg/y.
No 97.5% rate was calculated as there was only one observation

Ten year old age group

Observation Number	Sex	Age	Total
15	**U**	**11**	**0.2**
16	**U**	**7**	**0.2**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of wild fungi from the survey area based on the 2 highest ten year old age group consumers is 0.2 kg/y
The observed 97.5 percentile rate based on 2 observations is 0.2 kg/y

Table 34. Children's consumption rates of venison from the Torness area (kg/y)

Fifteen year old age group

Observation number	Sex	Age	Total
77	**F**	**13**	**9.5**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of venison from the survey area based on the 1 highest fifteen year old age group consumers is 9.5 kg/y.
No 97.5% rate was calculated as there was only one observation

Ten year old age group

Observation number	Sex	Age	Total
78	**M**	**10**	**9.5**
79	**M**	**10**	**9.5**

Notes

Emboldened observations are the critical group consumers
The critical group mean consumption rate of venison from the survey area based on the 2 highest ten year old age group consumers is 9.5 kg/y
The observed 97.5 percentile rate based on 2 observations is 9.5 kg/y

Table 35. Ratios for determining consumption rates for children

Food Group	Ratio child/adult		
	6 - 12 months	10 yr old	15 yr old
Green Vegetables	0.222	0.444	0.556
Other Vegetables	0.2	0.5	0.6
Root Vegetables	0.375	0.5	0.5
Potatoes	0.292	0.708	1.083
Domestic Fruit	0.467	0.667	0.667
Milk	1.333	1	1.083
Cattle Meat	0.222	0.667	0.778
Sheep Meat	0.12	0.4	0.6
Pig Meat	0.138	0.625	0.75
Poultry	0.183	0.5	0.667
Eggs	0.6	0.8	1
Wild/free foods	0.072	0.44	0.52
Rabbits & Hares	ND	ND	ND
Venison	ND	ND	ND
Honey	0.789	0.789	0.526
Wild Fungi	0.15	0.45	0.55
Fish	0.375	0.5	0.5
Crustaceans	0.525*	0.7	0.6
Molluscs	0.525*	0.7	0.6

ND - No data

* No MAFF 1998 data were available for these rates. Ratios were derived by scaling the 10 year olds crustaceans and mollusc consumption data

Table 36. Intertidal occupancy rates in the Torness area (h/y)

Observation number	Location	Activity	Mussel beds	Muddy sand	Rock	Sand	Sand and stones
265	**Torness outfall**	**Angling**			**1729**		
278	**St Abb's/St Abb's**	**Walking and angling**			60	**548**	
227	**Torness and Belhaven Bay**	**Dog walking**				**548**	
271	Torness outfall	Angling			512		
46	**Coldingham beach**	**Walking**				**468**	
47	**Coldingham beach**	**Walking**				**468**	
36	**Coldingham beach**	**Walking**				**455**	
37	**Coldingham beach**	**Walking**				**455**	
229	Torness outfall	Angling			432		
237	**Barns Ness/Torness outfall and jetty**	**Bait digging and angling**		**60**	360		
198	**Skateraw**	**Shellfish collecting**					**364**
58	**Torness beach**	**Dog walking**					**332**
59	**Torness beach**	**Dog walking**					**332**
276	**St Abb's**	**Walking**					**296**
160	Bathan's Strand	Dog walking				287	
161	Bathan's Strand	Dog walking				287	
51	**Torness beach, Torness outfall**	**Dog walking and angling**					**264**
65	**Torness beach**	**Dog walking**					**260**
230	Torness jetty and N. Berwick	Angling			228		
269	Torness outfall	Angling			216		
295	Skateraw	Walking and angling				208	
296	Skateraw	Walking and angling				208	
158	Bathan's Strand	Dog walking				197	
159	Bathan's Strand	Dog walking				197	
52-55	Torness beach	Dog walking					180
279	Coldingham beach	Walking				168	
34	Torness outfall	Angling					163
32	Torness outfall	Angling					156
232-236	Torness outfall	Angling			132		
249	Torness outfall	Angling			126		

Table 36 (cont). Intertidal occupancy rates in the Torness area (h/y)

Observation number	Location	Activity	Mussel beds	Muddy sand	Rock	Sand	Sand and stones
250	Torness outfall	Angling			126		
247	Torness outfall	Angling			120		
270	Torness outfall	Angling			104		
277	Fast Castle	Walking					104
280	St Abb's	Walking					104
281	St Abb's	Walking					104
64	Torness beach	Walking					98
177	Tyne Sands to Dunbar	Beach combing					96
199	Skateraw Harbour	Shellfish collecting and walking					74
200	Skateraw Harbour	Shellfish collecting and walking					74
49	Eyemouth	Walking					72
50	Eyemouth	Walking					72
178	**Belhaven Bay**	**Playing**		**69**			
179	**Belhaven Bay**	**Playing**		**69**			
196	Skateraw	Dog walking				63	
197	Skateraw	Dog walking				63	
62	Torness beach	Walking					52
63	Torness beach	Walking					52
167-171	Tyne Sands to Bellhaven Bay	Shellfish collecting	**50**				
172	Tyne Sands to Bellhaven Bay	Playing	**50**				
173	Tyne Sands to Bellhaven Bay	Shellfish collecting	**50**				
174	Tyne Sands to Bellhaven Bay	Shellfish collecting	**50**				
60	Torness beach	Walking					24
61	Torness beach	Walking					24
162-166	Bathan's Strand	Playing				14	
191	Skateraw	Boat maintenance					12
187	Whitesands	Bait digging				3	
289	Skateraw	Shellfish collecting			3		
290	Skateraw	Shellfish collecting			3		
183	N. Berwick	Shellfish collecting		2			

Table 36 (cont). Intertidal occupancy rates in the Torness area (h/y)

Observation number	Location	Activity	Mussel beds	Muddy sand	Rock	Sand	Sand and stones
184	N. Berwick	Shellfish collecting		2			
182	Belhaven Bay	Bait digging		2			
201	Skateraw	Beach combing					1
202	Skateraw	Beach combing					1

Notes

Emboldened observations are the critical group consumers
The critical group mean intertidal occupancy over mussel beds based on 8 observations is 50 h/y
The critical group mean intertidal occupancy over muddy sand based on 3 observations is 66 h/y
The critical group mean intertidal occupancy over rock based on 1 observations is 1700 h/y
The critical group mean intertidal occupancy over sand based on 6 observations is 490 h/y
The critical group mean intertidal occupancy over sand and stones based on 6 observations is 310 h/y
The observed 97.5 percentile rate based on 8 observations for mussel beds is 50 h/y
The observed 97.5 percentile rate based on 6 observations for muddy sand is 69 h/y
The observed 97.5 percentile rate based on 18 observations for rock is 1200 h/y
The observed 97.5 percentile rate based on 21 observations for sand is 550 h/y
The observed 97.5 percentile rate based on 28 observations for sand and stones is 340 h/y

Table 37. Handling of sediment and commercial fishing gear in the Torness area (h/y)

Observation number	Location	Activity	Gear	Sediment
274	**Unknown**	**Gear handling (sea)**	**2160**	
275	**Unknown**	**Gear handling (sea)**	**2160**	
185	**Within 10 miles of Dunbar**	**Gear handling (sea)**	**2000**	
42	**Firth of Forth area**	**Gear handling (sea)**	**1620**	
44	**Firth of Forth area**	**Gear handling (sea)**	**1620**	
45	**Firth of Forth area**	**Gear handling (sea)**	**1620**	
183	**Within 10 miles of Dunbar/N. Berwick**	**Gear handling (sea)/Shellfish collecting**	**1575**	2
30	Dunbar	Net repairing	1100	
20	Unknown	Gear handling (sea)	1020	
23	Unknown	Gear handling (sea)	1020	
24	Firth of Forth	Gear handling (sea)	1000	
28	Firth of Forth	Gear handling (sea)	1000	
29	Firth of Forth	Gear handling (sea)	1000	
198	**Skateraw**	**Shellfish collecting**		**364**
227	Torness	Gear handling (sea)	336	
72	White Sands Bay	Gear handling (sea)	147	
284	Within 3 miles of Torness	Gear handling (sea)	96	
285	Within 3 miles of Torness	Gear handling (sea)	96	
237	Barns Ness	Bait digging		60
167-171	Tyne Sands to Bellhaven Bay	Shellfish collecting		50
173	Tyne Sands to Bellhaven Bay	Shellfish collecting		50
174	Tyne Sands to Bellhaven Bay	Shellfish collecting		50
199	Skateraw Harbour	Shellfish collecting		11
200	Skateraw Harbour	Shellfish collecting		11
187	White Sands	Bait digging		3
289	Skateraw	Shellfish collecting		3
290	Skateraw	Shellfish collecting		3
184	N. Berwick	Shellfish collecting		2
182	Belhaven Bay	Bait digging		2

Notes

Emboldened observations are the critical group consumers

The critical group mean commercial fishing gear handling times based on 7 observations is 1800 h/y

The critical group mean sediment handling times based on 1 observation is 360 h/y

The observed 97.5 percentile rate based on 17 observations for fishing gear is 2200 h/y

The observed 97.5 percentile rate based on 17 observations for sediment is 240 h/y.

Table 38. Occupancy within 1 km of the Torness site (h/y)

Observation number	Sex	Age (in Years, U if unknown	Indoor occupancy (h/y)	Outdoor occupancy (h/y)	Total Occupancy (h/y)
Adult observations					
48	F	75	8352	196	8548
58	M	55	7842	444	8286
59	F	55	7842	444	8286
62	M	46	4854	3234	8088
63	F	37	6716	1372	8088
61	F	51	7911	173	8084
51	M	43	7792	280	8072
52	F	42	8030	42	8072
66	M	48	5032	3000	8032
57	F	57	6944	126	7070
70	M	73	6844	112	6956
71	F	68	6812	112	6924
60	M	60	5961	173	6134
282	M	55	5240	582	5822
283	F	54	5240	582	5822
65	M	43	5532	260	5792
67	F	50	5586	126	5712
56	M	59	5353	259	5612
69	F	26	4992	0	4992
68	M	28	4368	0	4368
196	M	U	1738	63	1800
197	F	U	1738	63	1800
265	M	U		1729	1729
199	M	U	1103	74	1176
200	F	U	1103	74	1176
271	M	U		512	512
229	M	U		432	432
198	M	U		364	364
237	M	U		360	360
203-227	M	U		237	237
269	M	U		216	216
230	M	U		144	144
232-236	M	U		132	132
249	M	U		126	126
250	M	U		126	126
247	M	U		120	120
270	M	U		104	104
191	M	U		12	12
201	F	U		1	1
202	M	U		1	1

Table 38 (cont). Occupancy within 1 km of the Torness site (h/y)

Observation number	Sex	Age (in Years)	Indoor occupancy (h/y)	Outdoor occupancy (h/y	Total Occupancy (h/y)
Child observations					
53	M	16	6715	252	6967
54	M	11	6715	252	6967
55	M	10	6715	252	6967
64	F	12	5058	1372	6430

Table 39. Gamma dose rates in the Torness area (micro Gy/h)

Location	Substrate	Gamma dose rate at one metre (micro Gy/h)
Peffer sands	sand	0.046
Coldingham bay	sand	0.049
Pease bay	sand	0.052
Pease bay	sand and stones	0.055
Thorntonloch beach	sand and stones	0.046
Thorntonloch beach	sand	0.047
West barns	sand	0.047
Skateraw harbour	rock	0.050
Skateraw harbour	sand	0.045
Skateraw harbour	sand	0.057
Bathan's strand	sand	0.046
North Berwick (n.beach)	sand	0.051
North Berwick (n.beach)	sand and mud	0.050
North Berwick (n.beach)	sand and mud	0.038
North Berwick (n.beach)	sand and mud/rock	0.069
North Berwick (s.beach)	sand and mud/rock	0.057
Milsey bay	sand and mud	0.045
Tyne sands	sand and mud	0.051
Belhaven bay	sand and mud	0.044
Eyemouth (n.beach)	sand and mud	0.054
Dunbar (s.beach)	sand	0.055
Dunbar (n.beach)	rock	0.079
Barns ness	sand	0.050
White sands beach	sand	0.051

Table 40. Times spent involved in various watersport activities in the Torness area (h/y)

Observation number	Location	Activity	Rate (h/y)
314	N. Berwick	Sailing	225
317	N. Berwick	Sailing	216
322	Pease Bay	Surfing	130
318	N. Berwick	Sailing	126
319	N. Berwick	Sailing	126
315	N. Berwick	Sailing	120
316	N. Berwick	Sailing	120
321	Pease Bay	Surfing	120
299	N. Berwick and Dunbar	Diving	78
300	N. Berwick and Dunbar	Diving	78
301	N. Berwick and Dunbar	Diving	78
302	N. Berwick and Dunbar	Diving	78
303	N. Berwick and Dunbar	Diving	78
304	N. Berwick and Dunbar	Diving	78
305	N. Berwick and Dunbar	Diving	78
325	St Abb's	Surf kyacking	78
326	St Abb's	Surf kyacking	78
324	Pease Bay and White Sands	Surf kyacking	65
306	N. Berwick and Dunbar	Diving	52
307	N. Berwick and Dunbar	Diving	52
308	N. Berwick and Dunbar	Diving	52
309	N. Berwick and Dunbar	Diving	52
310	N. Berwick and Dunbar	Diving	52
311	N. Berwick and Dunbar	Diving	52
312	N. Berwick and Dunbar	Diving	52
313	N. Berwick and Dunbar	Diving	52
179	Belhaven Bay	Windsurfing	44
278	St Abb's and Pettico Wick	Diving	42
320	Pease Bay	Surfing	40
323	Pease Bay and White Sands	Surf kyacking	40
49	Eyemouth and St Abb's	Diving	39
156	N. Berwick	Diving	27
297	N. Berwick	Diving	27
298	N. Berwick	Diving	27
191	Skateraw Harbour	Swimming	2

Table 41. Percentage contribution each food type makes to its terrestrial food group for adults

Domestic fruit	
Apple	22.41 %
Blackcurrant	15.18 %
Gooseberry	12.75 %
Strawberry	10.61 %
Raspberry	9.17 %
Redcurrants	6.82 %
Rhubarb	4.83 %
Plum	4.11 %
***Blackberry**	3.70 %
Pear	2.50 %
Loganberry	2.22 %
Grapes	1.65 %
Peach	1.54 %
Cherry	1.36 %
Tayberry	1.11 %
Boysenberry	0.04 %

Green vegetables	
Cabbage	40.98 %
***Cauliflower**	16.95 %
Brussel sprout	13.96 %
Cucumber	12.31 %
Broccoli	6.17 %
Lettuce	6.11 %
Spinach	1.71 %
Asparagus	0.64 %
Marrow	0.38 %
Courgettes	0.32 %
***Kale**	0.28 %
Calabrese	0.21 %

Rabbits & Hares	
Rabbit	100.00 %

Other vegetables	
Tomato	50.70 %
Runner bean	17.73 %
Pea	16.62 %
***Broad bean**	8.94 %
French Bean	5.97 %
Pepper	0.03 %

Root vegetables	
Onion	29.01 %
Leek	21.64 %
Swede	16.29 %
Carrot	11.66 %
Beetroot	9.68 %
Turnip	4.47 %
Parsnip	2.63 %
Shallot	1.96 %
Celery	0.99 %
Spring onion	0.72 %
Radish	0.53 %
Garlic	0.42 %
Fennel	0.01 %

Eggs	
Chicken egg	79.53 %
Duck egg	16.42 %
Goose egg	4.05 %

Wild/free foods	
***Blackberry**	79.59 %
Blackcurrant	12.24 %
Sloe	8.16 %

Poultry	
Pheasant	49.67 %
Chicken	27.98 %
Duck	10.32 %
Goose	7.87 %
Partridge	4.16 %

Notes

Food types asterisked and emboldened were monitored by SEPA (FSA and SEPA, 2001)

Other SEPA samples (FSA and SEPA, 2001): Milk, Potato, Elderberry, Rosehip, Grass

Table 42. Combinations of adult groups for consideration in dose assessments

Combination number	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
1	*	*	*	*	*		*	*	*	*	*													
2	*	*	*	*	*		*	*	*	*	*													
3	*	*	*	*	*	*			*															
4													*	*	*		*				*	*		
5													*	*	*					*				
6													*	*					*		*		*	
7	*	*	*	*				*	*														*	*
8	*	*	*	*	*		*	*					*	*						*			*	*
9		*							*											*				
10					*				*				*										*	*
11					*		*	*	*	*		*	*	*							*			
12	*	*	*	*	*		*			*			*											
13	*	*	*	*					*				*	*										
14															*	*						*		
15													*						*			*		
16																			*				*	*
17															*					*		*	*	*
18													*				*	*				*	*	
19													*	*				*	*					
20															*			*				*		
21													*	*	*				*					

Table 43. Live weight of landings into Eyemouth by UK vessels, by species type, 1996 to 2000 (Tonnes)

		1996	1997	1998	1999	2000	2001
		Tonnes	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Eyemouth	Demersal	4,575	4,360	4,331	3,525	2,218	1,546
	Pelagic	1	1	0	0	1	0
	Shellfish	1,396	1,468	1,562	1,714	1,505	1,032
	Total	5,972	5,829	5,893	5,239	3,724	2,578

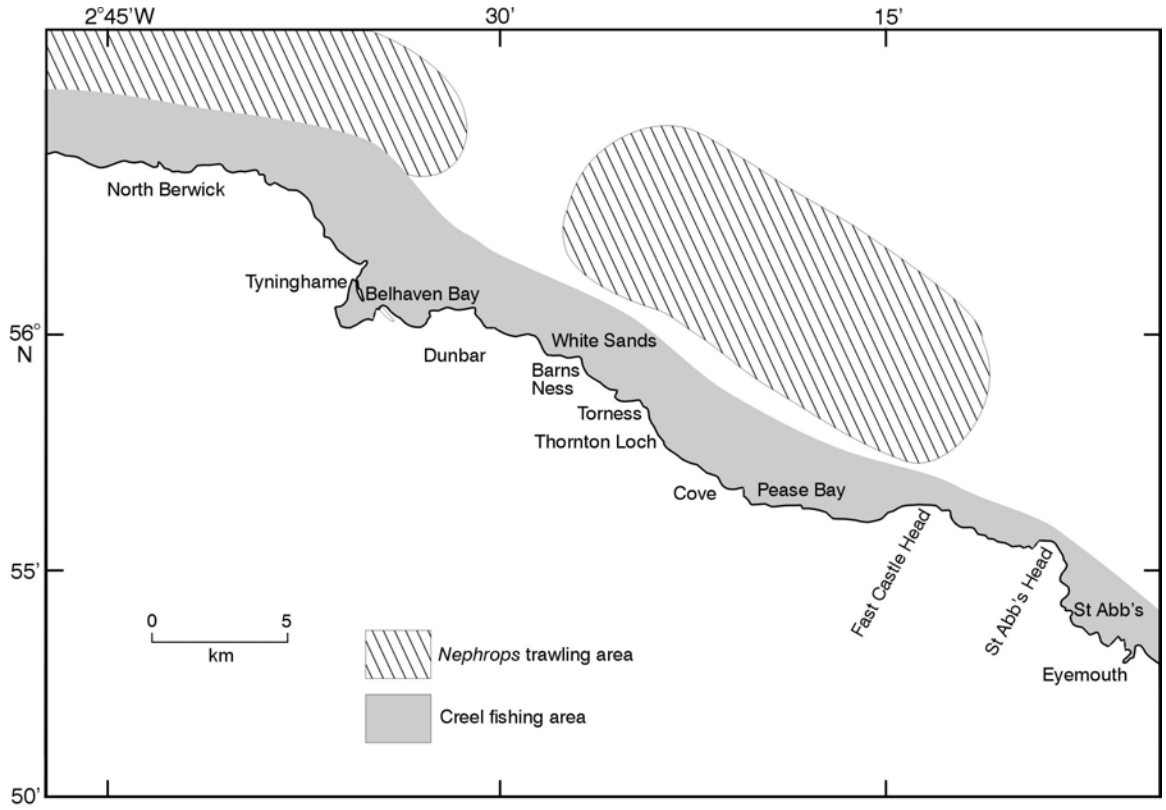

Figure 1. The Torness aquatic survey area.

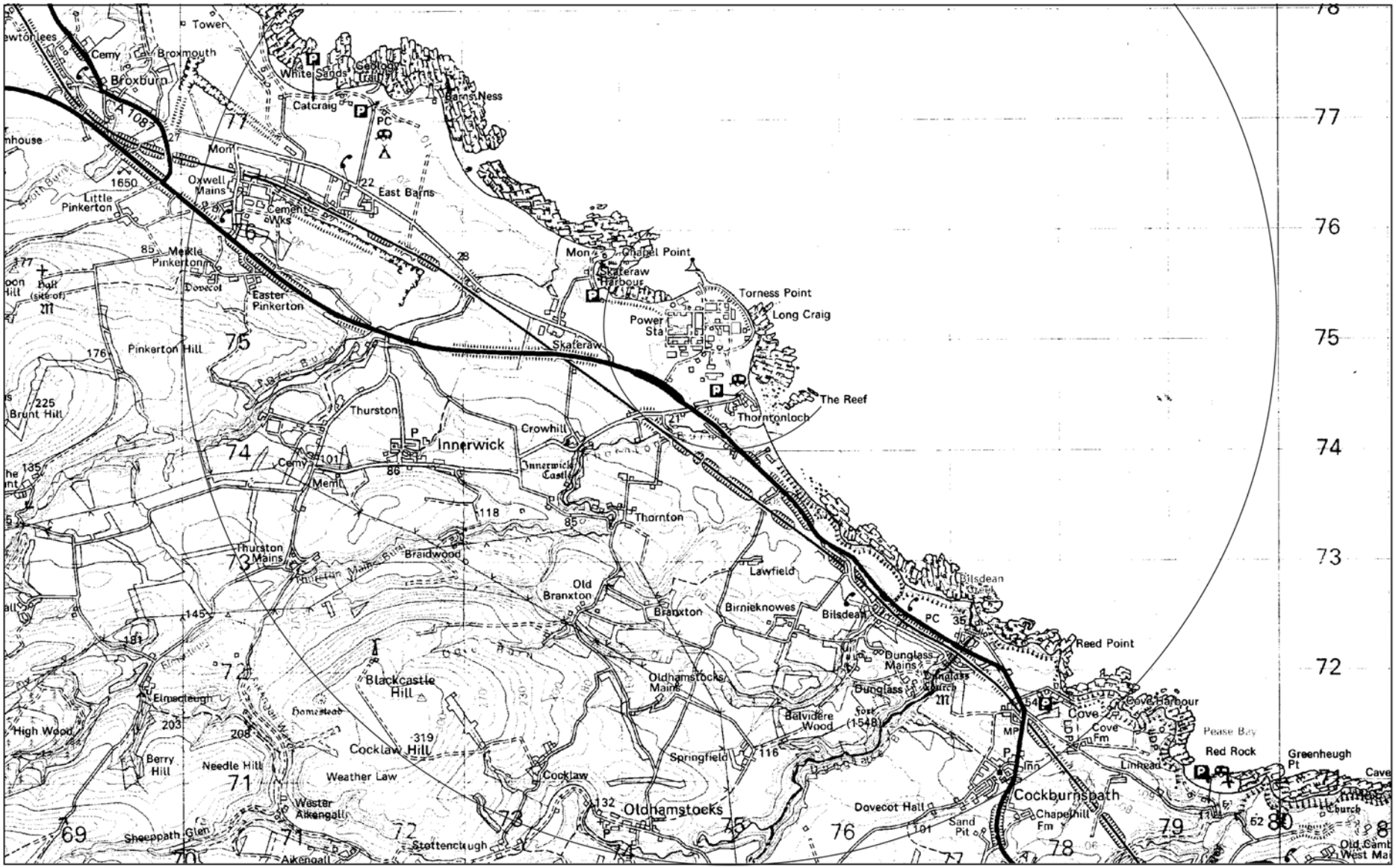

Figure 2. The Torness terrestrial and external radiation survey area

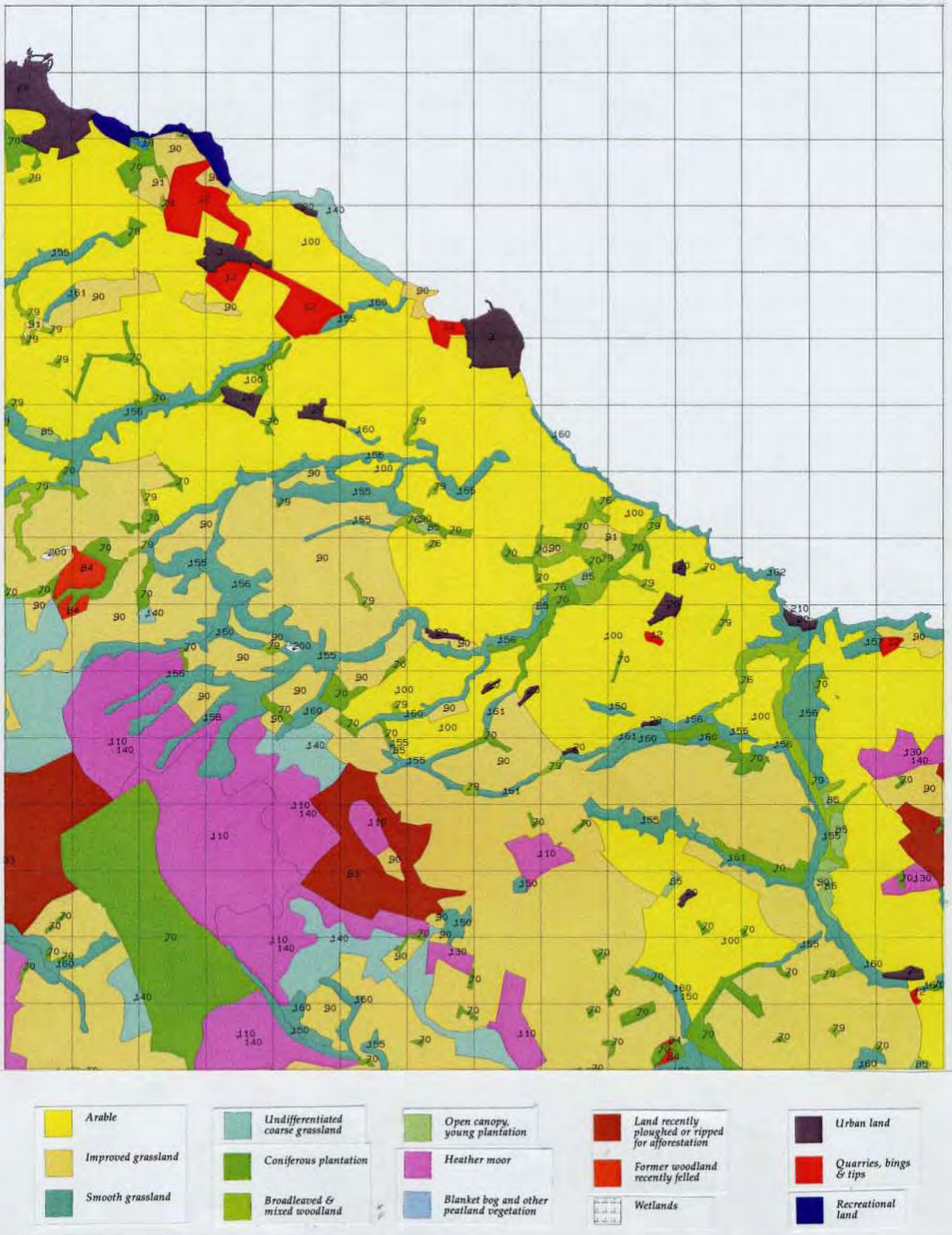

Figure 3. Land cover around Torness .

Number codes on the figure relate to point and line features not shown in the key.
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Base Scale is 1:50000

Annex Table 1. Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
1	M	55	16.5	14.8	16.9	4.4	**13.9**		**6.5**	**17.8**	0.5	0.9	**0.5**													
2	F	55	16.5	14.8	16.9	4.4	**13.9**		**6.5**	**17.8**	0.5	0.9	**0.5**													
3	M	U	11.1	5.3	16.4	22.4	3.4																			
4	F	U	11.1	5.3	16.4	22.4	3.4																			
5	F	U	2.6	0.2	10.0	7.7	2.6	**5.7**			0.3															
6	U	U	2.6	0.2	10.0	7.7	2.6	**5.7**			0.3															
7	U	U	2.6	0.2	10.0	7.7	2.6	**5.7**			0.3															
8	U	U	2.6	0.2	10.0	7.7	2.6	**5.7**			0.3															
12	M	U	3.4			3.6	0.2		0.6				**0.2**													
13	F	U	3.4			3.6	0.2		0.6				**0.2**													
18	M	U	1.1		5.5		0.8																			
19	F	U	1.1		5.5		0.8																			
20	M	35													**35.4**	**24.8**							1020			
22	F	21													**35.4**	**24.8**										
23	M	U																					1020			
24	M	45													**37.7**	6.0							1000			
25	F	42													**37.7**	3.7										
28	M	U																					1000			
29	M	U																					1000			
30	M	66													4.1	**13.9**							1100			
31	F	60													4.1	**13.9**										
32	M	44													6.8	**8.4**	**6.0**					156				

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
34	M	38													26.3							163				
36	M	53													23.6	5.9					**455**					
37	F	52																			**455**					
38	M	53													15.7	**23.6**										
39	F	51													15.7	**23.6**										
40	M	30													15.7	**23.6**										
41	M	27													19.1											
42	M	56													**47.2**	**20.5**	**5.9**						**1620**			
43	F	54													**47.2**	**10.3**	**5.9**									
44	M	U																					**1620**			
45	M	U																					**1620**			
46	M	34													**70.8**	**23.6**					**468**					
47	F	28													**70.8**	**23.6**					**468**					
48	F	75	3.4	7.2	**28.0**	**91.4**				**8.9**	**0.9**														196	8352
49	M	47													11.8	8.2						72				
50	F	50													11.8	8.2						72				
51	M	43		4.3			0.5			2.5					2.9	0.9						**264**			280	7792
52	F	42		4.3			0.5			2.5					2.9	0.9						180			42	8030
56	M	59	13.0	13.6	**23.3**	**76.2**	**41.1**			**15.6**					5.9	0.6									259	5353
57	F	57	13.0	13.6	**23.3**	**76.2**	**41.1**			**15.6**					5.9	0.6									126	6944
58	M	55													9.0	0.2						**332**			444	7842
59	F	55													9.0	0.2						**332**			444	7842

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
60	M	60	**34.7**	**32.4**	6.6	38.1	1.6		**23.9**	**13.1**					20.6	0.4						24			173	5961
61	F	51	**34.7**	**32.4**	6.6	38.1	1.6			**13.1**					20.6	0.4						24			173	7911
62	M	46		4.8							0.3											52				
63	F	37		4.8							0.3											52				
65	M	43					**16.5**															**260**			260	5532
66	M	48				**82.8**									5.9	1.5									3000	5032
67	F	50				**82.8**									5.9	1.5									126	5586
68	M	28																								4368
69	F	26																								4992
70	M	73					5.7				**2.3**				**35.4**										112	6844
71	F	68					5.7				**2.3**				**35.4**										112	6812
72	M	37					7.9		1.4	**16.9**	0.2	**8.2**		**9.5**	**28.1**	7.9							147			
73	F	40					7.9		1.4	**16.9**	0.2	**8.2**		**9.5**	**28.1**	7.9										
74	M	20					7.9		1.4	**16.9**	0.2	**8.2**		**9.5**	**28.1**	7.9										
75	F	20					7.9		1.4	**16.9**	0.2	**8.2**		**9.5**	**28.1**	7.9										
76	M	17					7.9		1.4	**16.9**	0.2	**8.2**		**9.5**	**28.1**	7.9										
80	M	U	3.2	1.8		**108.3**																				
82	F	U	2.6	1.8		**108.3**																				
83	M	U	**32.2**	20.3	19.8	**94.5**	**33.6**																			
84	M	U	11.2	14.4	10.1	**108.8**	**16.4**		1.8			**4.5**			23.7											
85	F	U	11.2	14.4	10.1	**108.8**	**16.4**		1.8			**4.5**			23.7											
86	M	60	**25.4**	7.7	12.5	52.9	0.7		**3.6**						**35.5**											

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
87	F	58	**25.4**	7.7	12.5	52.9	0.7		**3.6**						**35.5**											
88	M	U			4.0	34.8									23.7											
89	M	U			4.0	34.8									23.7											
90	M	U			4.0	34.8									23.7											
91	F	U			4.0	34.8									23.7											
92	M	53	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
93	F	54	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
94	F	U	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
95	F	U	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
96	F	U	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
97	F	U	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
98	M	U	**23.2**	12.8	**34.8**	32.6	12.9			**8.7**					11.4	1.6										
100	M	72				48.6	1.6																			
101	F	59				48.6	1.6																			
102	M	58	**28.7**	**37.8**	**37.2**	32.4	12.8								2.1											
103	M	43	**28.7**	**37.8**	**37.2**	32.4	12.8								2.1											
104	M	53	9.5	7.7	8.0	13.8	**17.9**		1.8						23.6											
105	F	40	9.5	7.7	8.0	13.8	**17.9**		1.8						23.6											
109	M	62	**37.8**	**22.2**	**27.5**	21.6	**14.3**		0.9																	
110	F	59	**37.8**	**22.2**	**27.5**	21.6	**14.3**		0.9																	
111	M	57	2.5	2.5	3.5										23.6											
112	M	25	2.5	2.5	3.5										23.6											

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
113	F	53	2.5	2.5	3.5										23.6											
114	M	59	**28.5**	**39.6**	19.1	39.9	**37.6**								23.6											
115	M	33	**28.5**	**64.1**	**21.8**	39.9	**37.6**								23.6											
116	F	55	**28.5**	**40.7**	19.1	39.9	**37.6**								23.6											
117	F	59	7.1	5.4	**24.8**	**76.1**	**16.8**								2.7											
118	M	64	7.1	5.4	**24.8**	**76.1**	**16.8**								2.7											
119	F	73	12.2		**37.3**	8.1	2.7																			
120	M	79	12.2		**37.3**	8.1	2.7																			
121	M	59	16.8		**30.5**	25.8	5.7																			
122	F	56	16.8		**30.5**	25.8	5.7																			
123	M	U	3.3	1.0	**21.2**	6.1					0.2				8.8											
124	M	U	3.3	1.0	**21.2**	6.1					0.2				11.8	0.4										
127	M	U	**50.8**	**55.5**	**30.0**	32.6					0.5				11.8											
128	F	U	**50.8**	**55.5**	**30.0**	32.6					0.5				11.8											
129	F	U	7.1		10.5	37.5	5.7																			
130	M	U	7.1		10.5	37.5	5.7																			
131	F	U	14.0	8.7	**25.6**	12.6	3.3		**4.2**			0.3			23.6											
132	M	U	14.0	8.7	**25.6**	12.6	3.3		**4.2**			0.3			23.6											
133	M	U	14.0	8.7	**25.6**	12.6	3.3		**4.2**			0.3			23.6											
135	M	U													11.8	1.6										
136	F	U													11.8	1.6										
137	M	U							**4.5**		0.3															

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
138	F	U					0.3		**4.5**																	
140	M	57					6.8																			
141	M	24					6.8																			
142	F	56					6.8																			
146	M	46													23.6											
147	F	44													23.6											
148	F	17													23.6											
149	M	49	12.5	**25.0**	**62.5**	50.0			**2.7**						11.8											
150	F	43	12.5	**25.0**	**62.5**	50.0			**2.7**						11.8											
151	M	40	3.4		6.4	7.6	**14.0**																			
152	F	37	3.4		6.4	7.6	**14.0**																			
156	M	U													**35.4**	**10.1**										
157	M	U													26.5	7.5										
158	F	17																			197					
159	F	17																			197					
160	M	U													5.2	1.4					287					
161	F	U													5.2	1.4					287					
162	F	U																			14					
163	M	U																			14					
167	M	U															0.2	**50**						50		
168	F	U															0.2	**50**						50		
169	M	U															0.2	**50**						50		

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
170	F	U															0.2	**50**						50		
175	F	U													5.3	2.3										
176	F	U													5.3	2.3										
177	M	U																				96				
178	M	U														1.5			**69**							
179	F	U														1.5			**69**							
182	M	U													**59.0**	6.7			2					2		
183	M	U													8.8	2.8	0.4		2				**1575**	2		
184	F	U													8.8	2.8	0.4		2					2		
185	M	U																					**2000**			
187	M	U													0.2						3			3		
188	F	U													0.2											
191	M	U													27.4							12			12	
192	M	U													27.4											
193	M	U													27.4											
194	F	U													27.4											
195	F	U													27.4											
196	M	U																			63				63	1738
197	F	U																			63				63	1738
198	M	U																				**364**		**364**	364	
199	M	U															1.8					74		11	74	1103
200	F	U															1.8					74		11	74	1103

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
201	F	U																				1			1	
202	M	U																				1			1	
203	M	U																							237	
204	M	U																							237	
205	M	U																							237	
206	M	U																							237	
207	M	U																							237	
208	M	U																							237	
209	M	U																							237	
210	M	U																							237	
211	M	U																							237	
212	M	U																							237	
213	M	U																							237	
214	M	U																							237	
215	M	U																							237	
216	M	U																							237	
217	M	U																							237	
218	M	U																							237	
219	M	U																							237	
220	M	U																							237	
221	M	U																							237	
222	M	U																							237	

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
223	M	U																							237	
224	F	U																							237	
225	F	U																							237	
226	F	U																							237	
227	M	U													12.0	**11.9**					**548**		336		237	
228	F	U														**11.9**										
229	M	U																		432					432	
230	M	U													2.5					228					144	
231	F	U													2.5											
232	M	U													2.0					132					132	
233	M	U													2.0					132					132	
234	M	U													2.0					132					132	
235	M	U													2.0					132					132	
236	M	U													2.0					132					132	
237	M	U													13.8				**60**	360				60	360	
238	F	U													13.8											
239	U	U													3.4											
240	U	U													3.4											
241	U	U													3.4											
242	U	U													3.4											
243	U	U													3.4											
244	U	U													3.4											

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
245	U	U													3.4											
246	U	U													3.4											
247	M	U													16.8					120					120	
248	F	U													16.8											
249	M	U													6.0					126					126	
250	M	U													6.0					126					126	
251	U	U													6.0											
252	U	U													6.0											
253	U	U													6.0											
254	U	U													6.0											
255	U	U													6.0											
256	U	U													6.0											
257	U	U													6.0											
258	U	U													6.0											
259	U	U													6.0											
260	U	U													6.0											
261	U	U													6.0											
262	U	U													6.0											
263	U	U													6.0											
265	M	U													**82.8**					**1729**					1729	
266	F	U													7.4											
269	M	U													27.2					216					216	

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
270	M	U																		104					104	
271	M	U													**29.5**					512					512	
272	M	U													**35.4**	**12.0**	0.1									
273	F	U													**35.4**	**12.0**	0.1									
274	M	U																					**2160**			
275	M	U																					**2160**			
276	F	U													2.0	4.3						**296**				
277	M	U													2.0	2.1						104				
278	M	U													16.3	1.0				60	**548**					
279	F	U																			168					
280	M	U													**37.7**	4.2						104				
281	F	U													**37.7**	4.2						104				
282	M	55	13.0		4.5	**165.6**	**15.6**								3.5	4.2									582	5240
283	F	54	13.0		4.5	**165.6**	**15.6**								3.5	4.2									582	5240
284	M	U													**47.2**	3.2							96			
285	M	U																					96			
286	F	U													**47.2**	3.2										
289	M	U															1.6			3				3		
290	M	U															1.6			3				3		
291	F	U															0.8									
292	U	U															0.8									
293	U	U															0.8									

Annex Table 1 (cont). Summary of adult consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (in years. U if unknown)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Sheep meat	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over muddy sand	External occupancy over rock	External occupancy over sand	External occupancy over sand and stones	Handling fishing gear	Handling sediment	External occupancy	Internal occupancy
294	U	U															0.8									
295	M	U													11.8	7.5	0.9				208					
296	F	U													11.8	7.5	0.9				208					

Annex Table 2. Summary of children's consumption rates (kg/y) and occupancy times (h/y)

Observation number	Sex	Age (years)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel bed	External occupancy over sand	Handling sediment	External occupancy	Internal occupancy
Five year old age group																					
172	F	2															**50**				
164	F	5																14			
10	U	6	**2.6**	**0.2**	**10.0**	**7.7**	**2.6**			**0.3**											

Annex Table 2 (cont.). Consumption rates (kg/y), external exposure (h/y) and direct radiation (h/y) for children

Observation number	Sex	Age (years)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over sand	External occupancy over sand and stone	Handling sediment	External occupancy	Internal occupancy
Ten year old age group																					
16	U	7	3.4			3.6	0.2	0.6				**0.2**									
126	F	7	3.3	1.0	**21.2**	6.1				**0.2**				5.7							
165	M	7															14				
33	F	8												3.4	4.2	3.0					
35	F	8												26.3							
27	M	9												18.9	0.7						
99	M	9	**23.2**	**12.8**	**34.8**	**32.6**	**12.9**		**8.7**					11.4	1.6						
108	F	9	**9.5**	**7.7**	8.0	**13.8**	**17.9**	**1.8**						23.6							
125	M	9	3.3	1.0	**21.2**	6.1				**0.2**				5.7							
9	U	10	2.6	0.2	10.0	7.7	2.6			**0.3**											
55	M	10		3.6			0.5		2.1					0.7	0.8			180		252	6715
78	M	10					**20.6**	1.4	**16.9**	**0.2**	**8.2**		**9.5**	28.1	7.9						
79	M	10					**20.6**	1.4	**16.9**	**0.2**	**8.2**		**9.5**	28.1	7.9						
154	F	10	3.4		6.4	7.6	**14.0**														
166	M	10															14				
268	F	10												7.4							
15	U	11	3.4			3.6	0.2	0.6				**0.2**									
54	M	11		3.6			0.5		2.1					0.7	0.8			180		252	6715
139	F	11					0.3	**4.5**													

Annex Table 2 (cont.). Consumption rates (kg/y), external exposure (h/y) and direct radiation (h/y) for children

Observation number	Sex	Age (years)	Green vegetables	Other domestic vegetables	Root vegetables	Potatoes	Domestic Fruit	Poultry	Eggs	Wild/free foods	Rabbits and hares	Wild fungi	Venison	Fish	Crustaceans	Molluscs	External occupancy over mussel beds	External occupancy over sand and stone	Handling sediment	External occupancy	Internal occupancy
Fifteen year old age group																					
64	F	12		**4.8**						**0.3**								98			
153	M	12	**3.4**		**6.4**	**7.6**	**14.0**														
171	F	12															**50**		50		
14	U	13	**3.4**			3.6	0.2	**0.6**				**0.2**									
77	F	13					**7.9**	**1.4**	**16.9**	**0.2**	**8.2**		**9.5**	28.1	7.9						
107	F	13	**9.5**	**7.7**	**8.0**	**13.8**	**17.9**	**1.8**						23.6							
173	M	13														0.2	**50**		50		
267	F	13												7.4							
106	F	14	**9.5**	**7.7**	**8.0**	**13.8**	**17.9**	**1.8**						23.6							
174	M	14														0.2	**50**		50		
287	M	15												47.2	3.2						
26	M	16												37.7	3.7						
53	M	16		**3.6**			0.5		**2.1**					0.7	0.8			180		252	6715
288	M	16												47.2	3.2						

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