Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

For the future of our environment

Radiological Habits Survey: Torness 2023

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Radiological Habits Survey: Torness 2023

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List of abbreviations and definitions

AGR	Advanced Gas-Cooled Reactor
ALB	All Weather Lifeboat
BSSD	Basic Safety Standards Directive
DC	Direct Current
DORIS	Dispersion of Radionuclides into the Sea
ELYC	East Lothian Yacht Club
ERL	Environmental Radioactivity Laboratory, University of Stirling
GPS	Global Positioning System
GRANIS	Gamma Radiation above Nuclides in Soil
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ILB	In-shore Lifeboat
LLC	Local Liaison Committee
MET	Meteorological
MoGSS	Mobile Gamma Spectrometry System
NBRC	North Berwick Rowing Club
NDAWG	National Dose Assessment Working Group
ONR	Office of Nuclear Regulation
PC-CREAM	Consequences of Releases to the Environment: Assessment Methodology
RESUS	Resuspension of activity concentrations into air model used within PC-CREAM
RIFE	Radioactivity in Food and the Environment
RNLI	Royal National Lifeboat Institute

SEPA	Scottish Environment Protection Agency
UK	United Kingdom
UKAS	United Kingdom Accreditation Service

Units

Bq	Becquerel	m	milli (one thousandth, E^{-3})
TBq	Terabecquerel	µ	micro (one millionth, E^{-6})
Gy	Gray	%	percentage
[H*(0.07)]	Directional dose equivalent at 0.07 mm skin depth	ha	hectare
Sv	Sievert	km	kilometre
mSv	milliSieverts	m	metres
µSv	microSieverts	cm	centimetre
nGy	nano Gray	y^{-1}	per year
eV	Electron volt	w^{-1}	per week
keV	kiloelectron volt	d^{-1}	per day
l	litres	h^{-1}	per hour
M	Mega (one million, E^{6})	Hz	hertz

Summary

This report presents the findings of the 2023 Torness Habits Survey to determine the habits and consumption patterns of people living and undertaking recreational activities in the vicinity of the Torness nuclear site. The site is authorised to discharge both gaseous radioactive waste from several outlets as well as liquid radioactive waste through a pipeline outfall into the North Sea. Sources of direct radiation are also present.

The survey targeted the three areas that were likely to be affected by discharges from the site, defined as:

- An aquatic survey area; covering the aquatic and intertidal areas from North Berwick in the north to Eyemouth in the south.
- A terrestrial survey area; extending 5km radial from the site.
- The direct radiation survey area: centred on Torness which relates to ionising radiation emanating from the site.

During the survey, several potential exposure pathways were investigated through methods including postal and face-to-face surveys and general observations. The survey was conducted in two parts: (i) Phase 1 - the face-to-face survey during the summer of 2023, which was undertaken within and outwith the local school holiday period; and (ii) Phase 2 - a follow up survey during winter 2023.

Data obtained during the survey included the consumption of foods produced within the terrestrial survey area; occupancy of both terrestrial areas and within the direct radiation survey area; consumption of aquatic food from within the aquatic survey area; occupancy of aquatic and intertidal areas; and the handling of equipment used within the aquatic survey area.

Interviews with members of the public were carried out over a period of 14 days and data for 464 individuals are presented and discussed for the face-to-face Phase 1 survey and a further nine individuals were re-surveyed within Phase 2. Those high-rate individuals are identified using established methods comprising a ‘cut-off’ to define the high-rate group and 97.5th percentiles for dose assessment analysis.

The aquatic survey area

Fish, crustaceans, molluscs and seaweed are all consumed by adults. The mean consumption rates for adult high-rate groups for each of these food groups were:

- 35.1kg y^{-1} for fish (bass, cod, mackerel, pollock, and haddock).
- 33kg y^{-1} for crustaceans (common lobster and prawn).
- 6kg y^{-1} for molluscs (winkles).
- 0.5kg y^{-1} seaweed.

One child was found to consume 2.1kg y^{-1} of fish (bass). One infant was found to consume 2.6kg y^{-1} of fish (cod and mackerel) and 0.15kg y^{-1} of crustaceans (common lobster). No other aquatic foods were determined to be consumed by children or infants.

Aquatic activities included body boarding, coasteering, diving, lifeguard duties, outdoor swimming, snorkelling, stand up paddle boarding, surfing, and windsurfing.

Intertidal activities included bait digging, sitting/picnicking/BBQ, beachcombing, bird/nature watching, collecting sea glass, collecting seaweed, collecting winkles, crabbing, dog walking, fishing, horse riding, jogging, lifeguard duties, litter picking, outdoor exercise class, paddling, photography, playing, research/educational purposes, rock pooling, sunbathing, walking, and working.

The mean rates for the adult high-rate group for occupancy within the aquatic survey area were:

- 444h y^{-1} for activities in the water.
- 2275h y^{-1} activities on the water.
- 2828h y^{-1} handling equipment.
- 469h y^{-1} handling sediment.

A total of 18 in-situ gamma dose rate measurements were made over intertidal surfaces during the survey period.

The terrestrial survey area

The mean consumption rates for the high-rate groups for adult terrestrial foods were:

- 28.8kg y^{-1} green vegetables.
- 10.2kg y^{-1} other vegetables.
- 40.2kg y^{-1} root vegetables.
- 130kg y^{-1} potatoes.
- 143kg y^{-1} domestic fruit.
- 5.4kg y^{-1} wild fruit.
- 6kg y^{-1} wild mushrooms.
- 2.5kg y^{-1} game (rabbit and hare).
- 2.7kg y^{-1} game (birds).
- 5.5kg y^{-1} game (venison).
- 10kg y^{-1} sheep.
- 32.1kg y^{-1} eggs.
- 0.5kg y^{-1} honey.

The high-rate group mean consumption rates reported in the 2023 were lower than those reported for 2016 for three food groups: wild fruit, game and honey.

The direct radiation survey area

The highest occupancy rates in 2023, within the direct radiation area were as follows:

- 8033h y^{-1} for the total occupancy rate (for a resident).
- 7854h y^{-1} for the indoor occupancy rate (for a resident).
- 2190h y^{-1} for the outdoor occupancy rate (for a resident).

Comparisons with previous surveys

The results of the Torness 2023 Habits Survey were compared with the last habits survey carried out at Torness in 2016.

In the aquatic survey area, the overall mean consumption rate for the adult high-rate group for fish and molluscs decreased in the 2023 survey compared to 2016. Crustacean overall mean consumption rate for the adult high-rate group was comparable in 2023 to 2016. The main species of fish consumed by adult were cod, mackerel and bass in 2016 compared with cod, mackerel, bass, pollock, and haddock in 2023. The main crustaceans consumed by adults in 2016 and 2023 were common lobster and brown crab. Mollusc consumption in 2016 consisted of mussels, winkles and razor clams by adults compared to only winkles being consumed in 2023. No wildfowl was consumed in 2023. Consumption of mallard, pink-footed geese, teal, wigeon and grey lag geese were consumed within the 2016 survey. The consumption of marine/intertidal plant/algae (seaweed) by adults was identified in 2016 and 2023.

Children consumed only bass in 2023 compared with cod in 2016. Infants consumed cod and mackerel in 2023 compared with cod, mackerel, pollock, and salmon in the 2016 survey.

The adult mean occupancy for the high-rate group for in water, on water, handling equipment and handling sediment decreased in 2023 compared with the 2016 survey.

Adult consumption rates of locally produced food items increased in the 2023 survey in the green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, wild fungi, sheep meat and eggs food groups in comparison to the 2016 survey. Adult consumption rates decreased in the 2023 survey in wild fruit, game, and honey food groups in comparison to the 2016 survey.

In 2023 the total occupancy, highest indoor occupancy and highest outdoor occupancy decreased when compared with the 2016 survey.

Suggestions for changes to the monitoring programme

It is recommended that Scottish Environment Protection Agency's (SEPA) routine monitoring continue as is (i.e., as prior to the Covid-19 pandemic) as no new potential exposure pathways were identified during this survey.

1 Introduction

1.1 Regulatory context

Torness nuclear power station is powered by two Advanced Gas-Cooled Reactors (AGRs) and is owned and operated by EDF Energy Generation. The site holds an Authorisation under Environmental Authorisations (Scotland) Regulations 2018 (Scottish Government, 2018), which allows the disposal of solid, liquid, and gaseous radioactive wastes. The power station has extended operational power generation to 2030, as of December 2024.

The current United Kingdom (UK) legislation, relating to radioactivity, provides uniform safety standards to protect the health of workers and members of the public. The UK's statutory obligation is now under the International Atomic Energy Agency (IAEA) Basic Safety Standard, (General Safety Requirements) Part 3, Schedule III.3 for the 1mSv committed effective dose and 50mSv skin annual dose limit since leaving the EU (IAEA, 2014). This lays down basic safety standards for protecting people against the impact of exposure to ionising radiation. Following the UK's departure from the European Union, the UK agreed a nuclear cooperation agreement with the European Commission (2021), ensuring both parties continue working together on civil nuclear matters including safeguards, safety, and security.

The site discharges radioactive effluent and gases into the environment that may result in the exposure of the public by two primary pathways:

(i) Discharges to the aquatic environment.
(ii) Discharges to the atmosphere.

From these pathways, members of the public may be exposed through inhalation, ingestion of locally sourced food and/or indirectly due to external exposure to contaminated materials (Smith and Jones, 2003). In addition, there may be a direct exposure pathway (commonly referred to as direct shine) from the site which members of the public could be exposed to as they undertake their day-to-day activities.

It is also recognised that enhanced doses from external exposure due to authorised discharges and the consumption of locally sourced foods may occur because of contemporary and historical discharges accumulating in the environment (Dale et al., 2008; Tyler et al., 2013). It is the responsibility of SEPA to regulate the discharges from the site to ensure that the public are not exposed to doses more than the legal limits. Exposure to direct shine from nuclear radiation or waste facilities is the responsibility of the Office of Nuclear Regulation (ONR) within a nuclear licensed site, and the Health and Safety Executive (HSE) outside a nuclear licensed site, where any direct exposure impacts on facility workers.

1.2 Definition of the representative person

The optimal approach for assessing doses to the public is through a combination of site-specific habit data and an environmental monitoring programme to determine ambient dose rates and concentrations in foodstuffs. In addition to the various interactions an individual may have with exposure routes, the actual doses received are also dependent upon age, size, and metabolism. Thus, the standard approach is to identify and consider these sources of variability in appropriate groups. The concept of the representative person was introduced by the International Commission on Radiological Protection (ICRP) (2006) and recommended to replace the previously used concept of the critical group in 2007 (ICRP, 2007). The representative person is the individual that represents the more highly exposed members of the public and is typically defined by a cut-off, for example the top 97.5% of the dose distribution within one or more routes of exposure. Within this concept, if the dose received by the representative person(s) can be demonstrated to be within the accepted dose limits and constraints, then the public are considered to be protected.

Within the scope of this report the information provided will assist SEPA in determining the representative person within the Torness area. The representative person is established using environmental monitoring data in conjunction with habits survey data.

1.3 Dose limits and constraints

The system of dose limitation recommended by ICRP (2007), and subsequently in UK legislation, requires that: the retrospective maximum permissible dose limits do not exceed 1mSv y^{-1} from all anthropogenic sources. For prospective assessments, the maximum permissible doses or constraints used by SEPA are:

(i) 0.3mSv y^{-1} for any single source of radioactivity.
(ii) 0.5mSv y^{-1} for a single site from which radioactive discharges are made.

It is also accepted by the UK Government that it should be possible to operate existing nuclear facilities without exceeding the 0.3mSv y^{-1} constraint (Hunt et al., 1982; Leonard et al., 1982). It is therefore incumbent upon SEPA to ensure that these dose limits/constraints are not exceeded for all authorised discharges of ionising radiation to the environment.

1.4 Habits survey aim

The aim of the habits survey is to collect site-specific data to allow a bespoke assessment to be made that identifies the representative individual(s). The identification of the representative person is a result of combining known information on the consumption of local foods and occupancy times with data from SEPA's routine environmental monitoring programme. The survey aims to collect data on the consumption rates of locally grown foods and occupancy times to identify the doses to the most representative person(s). The survey also aims to identify any habits which the routine programme does not currently adequately cover and may recommend the adoption of new monitoring due to new or changing habits or the removal of monitoring that is no longer required. The survey does this by:

(i) Collecting data on a range of habits/activities by the public in the environment immediately surrounding the nuclear site and surrounding areas that might lead to exposure to radioactivity or radiation from any combination of licensed liquid or gaseous discharges, or direct radiation from on-site activities at Torness.

(ii) Collecting information on consumption of food grown or produced (including wild & free foods) in the survey area and determining an annual rate of consumption for each individual surveyed and household members of all ages.

This report presents the findings for the 2023 habits survey of the Torness nuclear licensed site. All raw data can be found in Appendix A1. The previous survey was undertaken (fieldwork components) during the periods 6 – 22 May and 11 – 15 August 2016 (Dale et al., 2017).

2 The survey

2.1 Introduction

This chapter describes the site characteristics including recent and prospective site activities, and the surrounding land cover characteristics. In preparation for the survey, a meeting was held with site operators and the SEPA site inspector in April 2023.

To raise the profile of the survey, SEPA brought the Torness Habits Survey to the attention of the local liaison committee (LLC) during the April 2023 LLC meeting.

2.2 Torness site activity

2.2.1 Current on-site activity

The Torness Nuclear Power Station was commissioned in 1988 by the South of Scotland Electricity Board and is now operated by EDF Energy. The power station is situated some 50km east of Edinburgh on the Berwickshire coastline. Torness is powered by two AGRs that generate approximately 1200 MW of electricity at full capacity. As was reported in the site meeting in April, the operational lifetime of the site has been amended to extending of power generation to 2028 (during the previous habit survey in 2016 the operational lifetime was extended to 2030). Site worker numbers remain around 700 but this number almost doubles to 1200 people during periods of reactor outage (a planned reactor shut down), which typically occurs every three years.

The site discharges both liquid effluent directly into the North Sea via the outfall pipeline, and gaseous waste to the atmosphere from a series of fifteen stacks under authorisation from SEPA. The site also contains sources of direct radiation. The cooling water intake is filtered and the resultant marine material, including seaweed and jellyfish, is sent to local contractors. This material is composted outwith the survey area.

During the Covid-19 pandemic the Torness visitor centre was closed. It re-opened in 2022 and now continues to attract visitors with additional staff employed.

2.2.2 Offsite changes

EDF are extending cables (direct current (DC) connectors) which are being brought onshore at Thorntonloch, Innerwick and a further one planned for Skateraw for windfarm expansion.

The construction of the new Viridor Energy Recovery Facility plant became operational in 2019.

2.3 Estimated activity concentrations from licensed discharges from Torness

Permitted limits of aqueous discharges of tritium (7.0E+14 Bq y^{-1}), sulphur-35 (3.0E+12 Bq y^{-1}), cobalt-60 (1.0E+10 Bq y^{-1}), alpha (5.0E+8 Bq y^{-1}, assessed as plutonium-239), and all other non-alpha (1.5E+11 Bq y^{-1}, assessed as caesium-137 from Torness in the Radioactivity in Food and the Environment 2021 (RIFE 27) were used to calculate activity concentrations in water using the DORIS model within PC-CREAM 1.5.1.92 (database version 2.0.0) (Smith and Simmonds, 2009). A continuous release was assumed when modelling unfiltered seawater, fish, seaweed, crustacean, and mollusc activity concentrations over a 50-year period. The default values for the Torness area in PC-CREAM were used for all element dependent parameters (e.g., sediment distribution coefficients, K_d and concentration factors), local compartment details (e.g., depth, coastline length, volumetric exchange rate, suspended sediment load, sedimentation rate, sediment density and diffusion rate) and regional model information (e.g., volume, depth, suspended sediment load, sedimentation rate, sediment density, diffusion rate).

Activity concentration values reported at 50 years for unfiltered seawater in the immediate vicinity of Torness were estimated to be:

8.82E0 Bq l^{-1} for tritium, 3.51E-2 Bq l^{-1} for sulphur-35, 1.03E-4 Bq l^{-1} for cobalt-60, 6.10E-6 Bq l^{-1} for alpha, and 1.88E-3 Bq l^{-1} for all other non-alpha. Activity concentrations in different foodstuffs were estimated and are presented in Table 2.1. The external gamma dose rate for beaches areas was estimated to be 1.28E+00 $\mu Sv\ y^{-1}$.

Activity concentrations in different foodstuffs were estimated to be as seen in Table 2.1.

Table 2.1 Estimated activity concentrations in foodstuffs

Foodstuff	Tritium Bq kg^{-1}	Sulphur-35 Bq kg^{-1}	Cobalt-60 Bq kg^{-1}	alpha Bq kg^{-1}	all other non-alpha Bq kg^{-1}
Fish	8.82E0	6.99E-2	3.35E-2	3.04E-4	1.82E-1
Crustaceans	8.82E0	3.51E-2	3.44E-1	6.10E-4	5.46E-2
Molluscs	8.82E0	1.40E-1	1.72E-1	9.10E-3	5.46E-2

Atmospheric activity concentrations were modelled using the PLUME model in PC-CREAM (Smith and Simmonds, 2009). The permitted gaseous discharges from Torness were modelled and included tritium (1.1E+13 Bq y^{-1}), carbon-14 (4.5E+12 Bq y^{-1}), sulphur-35 (3.0E+11 Bq y^{-1}), argon-41 (7.5E+13 Bq y^{-1}), iodine-131 (2.0E+9 Bq y^{-1}), and particulate beta (4.0E+8 Bq y^{-1}, assessed as caesium-137). PLUME was set to calculate activity concentrations in air from a 77m stack height and are reported here over a range of distances from 500 to 25,000 metres. The meteorological (MET) stability scheme was applied using the default settings with data extracted based on the MET Pasquill D, with rain category, selected by reviewing the local meteorological data. The estimated activity concentrations in air are presented in Table 2.2.

Table 2.2 Calculated activity concentrations in air (Bq m^{-3}) discharged from a stack height of 77m

Distance (m)	Argon-41	Carbon-14	Tritium	Iodine-131	Sulphur-35	Caesium-137
500	4.26E-02	2.57E-03	6.29E-03	1.14E-06	1.71E-04	2.28E-07
1 000	1.89E-01	1.15E-02	2.81E-02	5.03E-06	7.56E-04	1.01E-06
5 000	4.08E-02	2.60E-03	6.37E-03	1.06E-06	1.63E-04	2.18E-07
10 000	1.37E-02	9.30E-04	2.27E-03	3.48E-07	5.48E-05	7.30E-08
15 000	7.02E-03	5.09E-04	1.24E-03	1.76E-07	2.81E-05	3.75E-08
20 000	4.32E-03	3.33E-04	8.14E-04	1.07E-07	1.73E-05	2.31E-08
25 000	2.93E-03	2.41E-04	5.89E-04	7.17E-08	1.18E-05	1.57E-08

The GRANIS (external exposure model) and RESUS (resuspension model) modules in PC-CREAM were used to estimate the external dose rates at the same specified distances from the Torness site, using the data presented in Table 2.2. Table 2.3 reports the estimated external doses modelled from PC-CREAM for adults, children, and infants.

Table 2.3 Modelled total external doses (μSv) in the 50th year to Adults, Children, or Infants at specified distances from a 77m stack at Torness after 50 years of release

Distance (m)	Adult	Child	Infant
500	3.32E-01	3.29E-01	3.06E-01
1 000	3.42E-01	3.35E-01	2.91E-01
5 000	6.45E-02	6.30E-02	5.38E-02
10 000	2.44E-02	2.38E-02	2.03E-02
15 000	1.37E-02	1.34E-02	1.14E-02
20 000	9.15E-03	8.92E-03	7.56E-03
25 000	6.67E-03	6.50E-03	5.49E-03

2.4 Survey areas

Low activity concentrations within the environment of Torness was demonstrated following the assessment of the radionuclide concentrations modelled by PC-CREAM. The 2023 Habits Survey was designed to encompass the marine and terrestrial environments likely to be affected by discharges, including the area of potential direct radiation shine from ionising radiation emanating directly from the Torness nuclear licensed site. These areas are consistent with the previous habits survey (2016) and are shown in Figure 2.1.

A Mobile Gamma Spectrometry System (MoGSS), (carborne and handheld), survey of the full survey area (roads and coastline) was also undertaken.

The 2023 survey areas focused on:

(i) A 1km zone from the centre of the nuclear licensed site (covering housing and land-use close to the site) which relates to the ionising radiation directly from the site.

(ii) The terrestrial survey areas included a 5km radial zone from the Torness nuclear licensed site boundary.

(iii) The aquatic survey areas include the intertidal areas and waters stretching from North Berwick in the north to Eyemouth in the south, extending 3km offshore.

2.5 Land cover data

The land cover is presented in Figure 2.2. Torness is immediately surrounded by arable and horticultural land. Limestone rock exposures between Torness and Dunbar are being quarried. The river and stream corridors are characterised by narrow strips of broad leaved, mixed and yew woodland with increasing pockets of coniferous woodland occurring inland towards the southwest. Further inland, and with increasing elevation, dwarf shrubland becomes increasingly dominant.

2.6 Soil data

Soil data is presented in Figure 2.3. The coastal sections are characterised by non-calcareous gleys which then transform to brown earths with increasing distance inland and dominate up to 8km from the site. At this point the soil becomes increasingly organic changing from small areas of humus podzols to undifferentiated peat and peaty podzols with increasing elevation.

2.7 Topographic wetness index

Catchment hydrology can be important in the redistribution of radionuclides. For example, organic soils can allow radionuclides (e.g., Caesium-137 from fallout) to be transported in solution as well as in particulate form. When these hydrological flow paths cross from organic to mineral rich soils, the radionuclides can become bound to clays and oxides within the soil matrices. In extreme conditions, these areas have

been shown to result in elevated concentrations of radioactivity (Tyler and Heal, 2000). Building on the soil and 50m resolution digital elevation model for Scotland using the Ordnance Survey Terrain 50 product, found at the Ordnance Survey Terrain 50 website, Figure 2.4 shows details of the hydrological flow paths within the survey area. The lighter area indicates low flow, water flowing away, whilst areas of increasing blueness represent wetter areas. This provides more detail of hydrological flow pathways and highlights areas where radionuclides from atmospheric fallout might accumulate.

Figure 2.1 The terrestrial survey area for the 2023 Torness Habits Survey

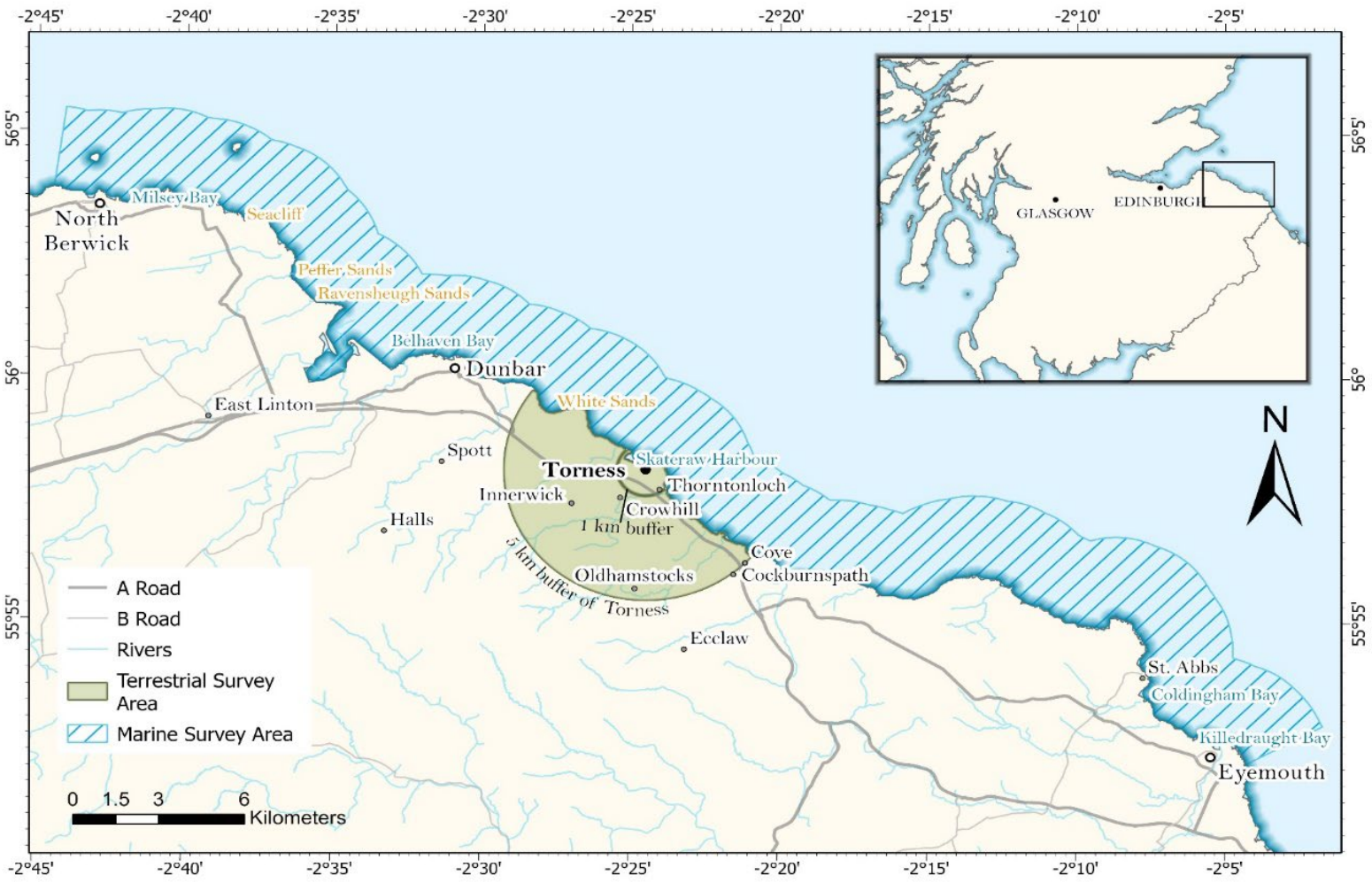


Figure 2.2 The land cover characterising the Torness survey area and surrounds (Land Cover Map, 2015; Ordnance Survey Great Britain, 2018

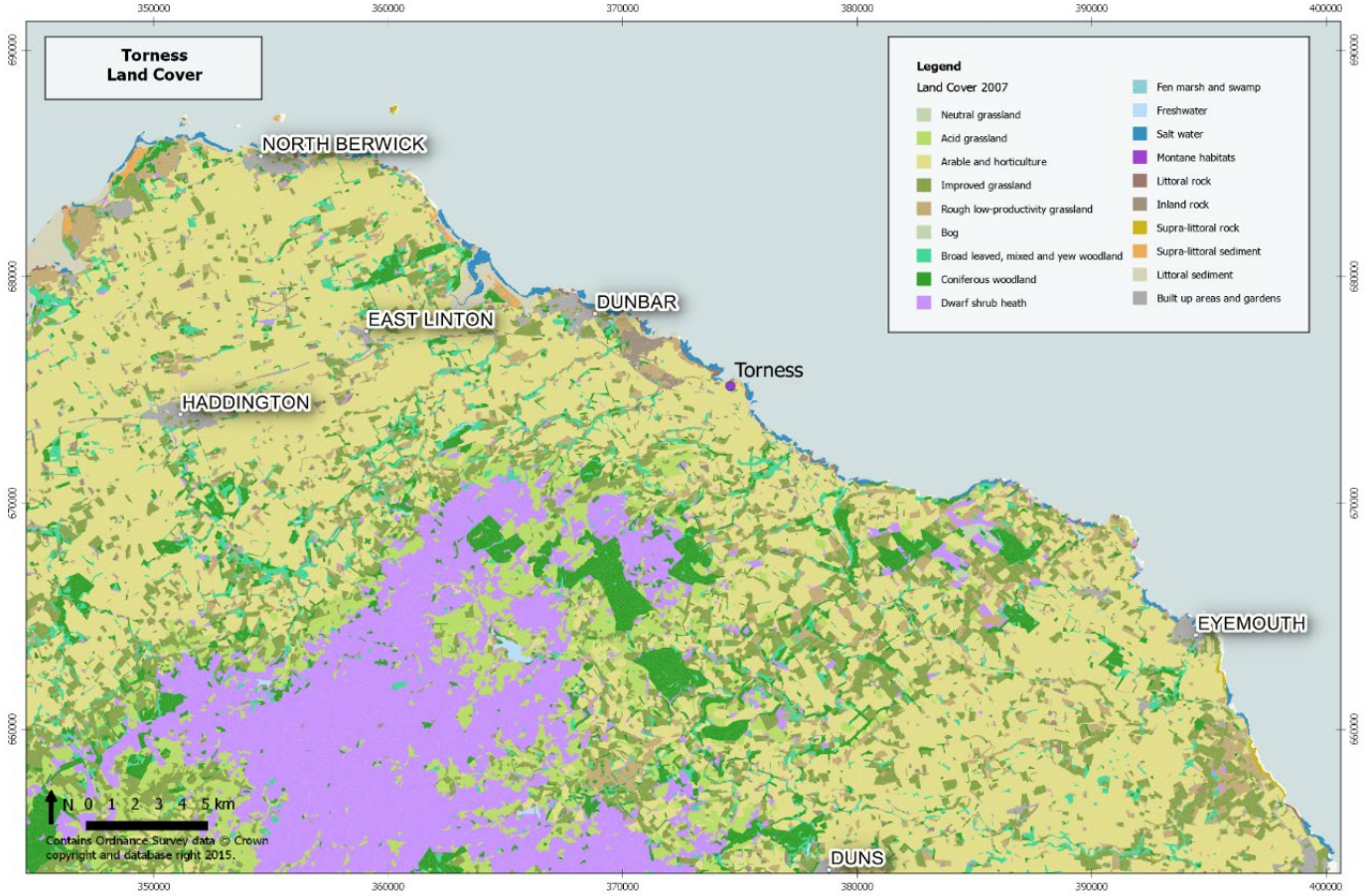


Figure 2.3 Soil types dominating the Torness survey area (The James Hutton Institute, 2015)

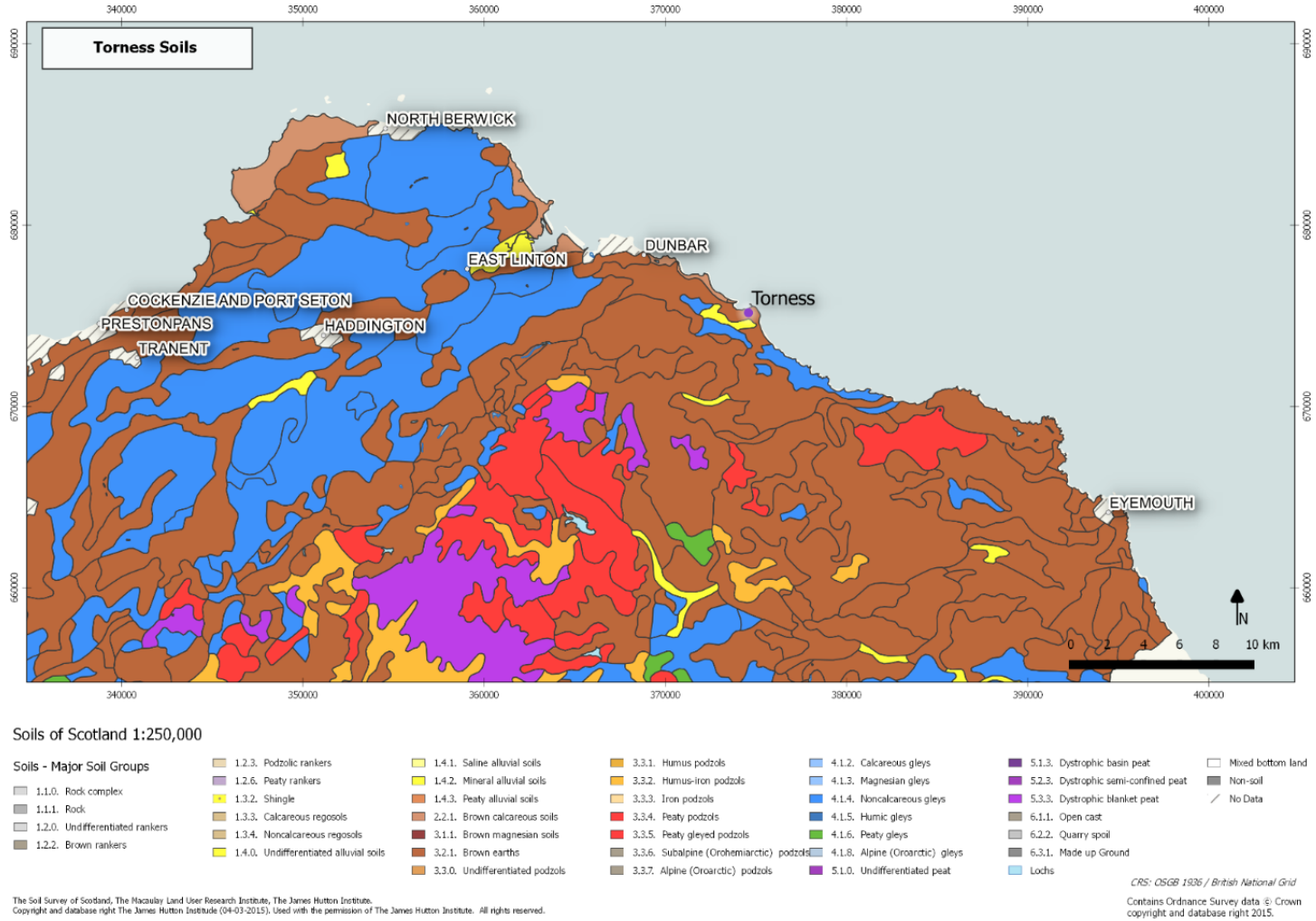
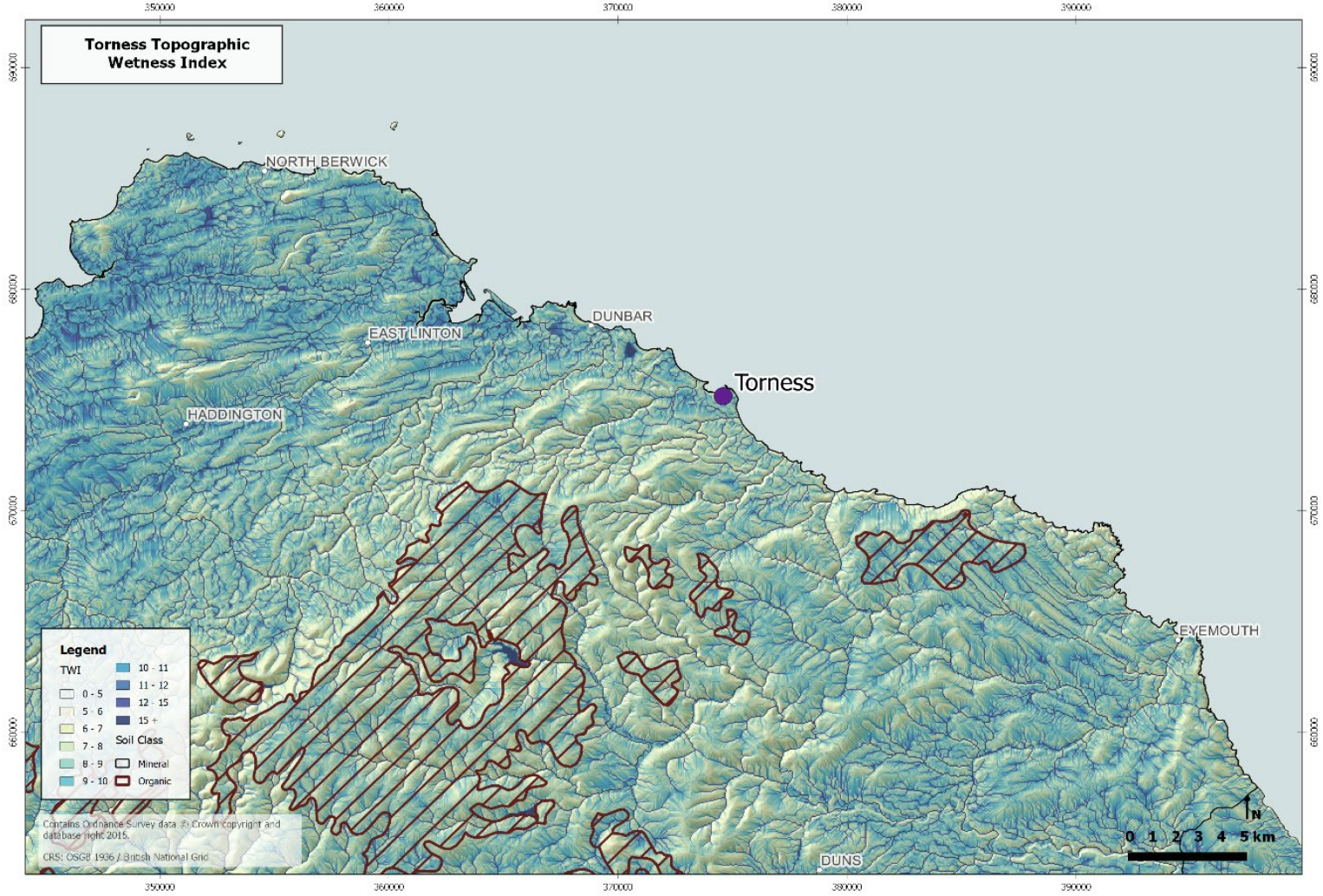


Figure 2.4 The topographic wetness index in the Torness survey area (Ordnance Survey Great Britain, 2018)



3 Methods

3.1 Introduction

To provide consistency and traceability to previous habit surveys, the methods employed and described in this chapter are largely based on the approach outlined in Leonard et al., (1982), Green et al., (2001) and National Dose Assessment Working Group (NDAWG) (2013). The previous habit surveys of the Torness nuclear licensed site provided a useful frame of reference for undertaking this survey. Following the desktop study described in Chapter 2, the habit survey was defined and includes:

(i) An initial postal survey.

(ii) A mobile radiometric survey to characterise the heterogeneity of radiation in the environment surrounding the Torness site.

(iii) Face-to-face surveys and follow-up phone calls.

(iv) A series of informal meetings during and after the face-to-face surveys to validate the data and findings.

3.2 Postal survey

To obtain a provisional assessment of the activity and food consumption habits of the local community living within the survey area, a postal questionnaire was distributed to 2000 households. The households were selected using a random sampling method and numbers varied according to the number of households found within each area. While the survey was sent to a particular individual in the household, the survey questions were designed to collect information on the habits of the people living in that household. Only one individual per household was therefore selected to receive the postal survey. The selected households included individuals living in the following geographical areas (Figure 3.1):

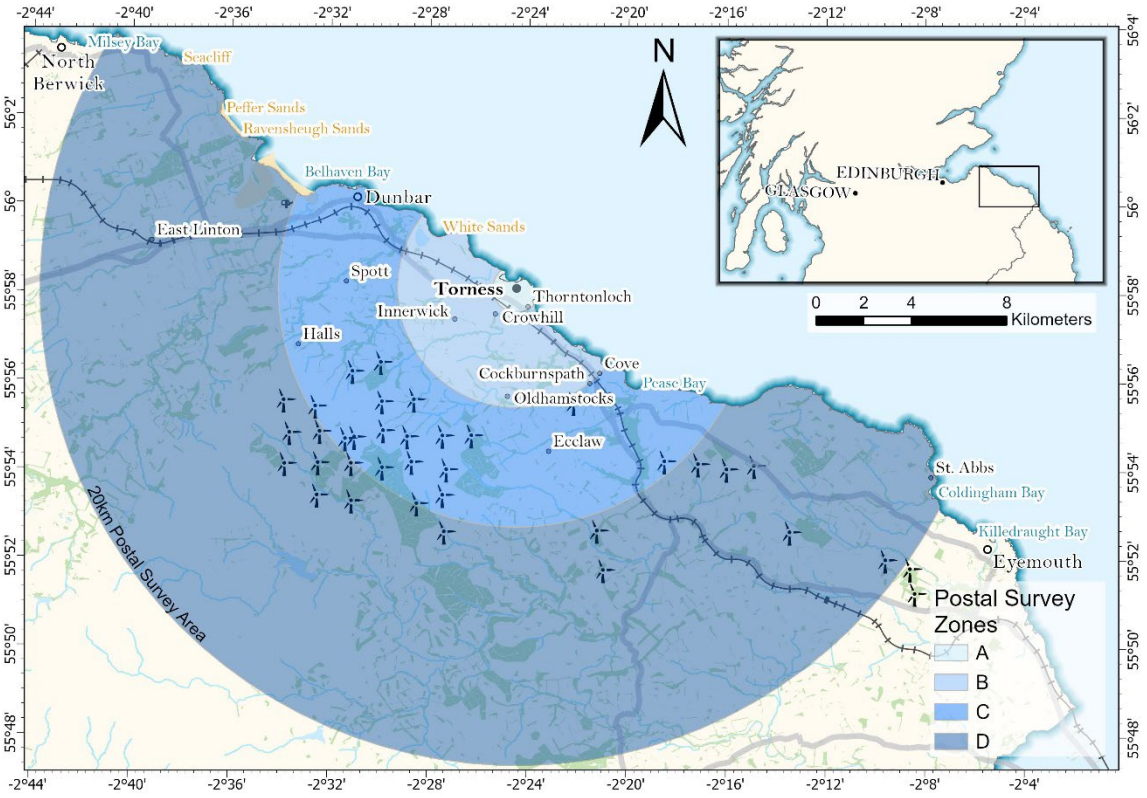
(i) Within the 1km radius surrounding the Torness site and the geographical area (Zone A).

(ii) Between 1km and 5km from the Torness site (Zone B).

(iii) Between 5km and 10km from the Torness site (Zone C).

(iv) Between 10km and 20km from the Torness site plume (Zone D).

Figure 3.1 Map showing the postal survey zones for the Torness survey



The open electoral register was used to obtain contact details for households within the postal survey area. Considering the location of the modelled plume (eastwards towards the North Sea), surveys were randomly distributed to houses within the full 20km postal survey area. The postal survey produced an independent data set from a broader cross section of the population living in the area, potentially providing the means to identify new or missed habits that might provide a useful focus to target during the face-to-face surveys or focus group discussions.

The postal survey included questions on food consumption, activities, and a map for identifying whereabouts the different activities were undertaken by household members. Further information can be found in Appendix A2.

3.3 Radiometric surveys

The radiometric surveys comprised a carborne and handheld MoGSS, in-situ gamma dose rate and beta skin dose rate measurements. Further details are provided in Appendix A3.

3.3.1 In-situ dosimetry

The Environmental Radioactivity Laboratory (ERL) has ISO 17025:2017 accredited procedures for the deployment and recording of gamma dose rate in air using two Thermo Radeye instruments. Measurements were undertaken at all locations where occupancy or location may lead to potentially higher exposure to radioactivity because of Torness site activities. These included areas that may have elevated radionuclide concentrations where fine sediment is known to accumulate (e.g., salt marshes and mudflats). The effective dose from terrestrial gamma radiation was calculated and reported in μSv h^{-1}. Further details of the in-situ methodology can be found in Appendix A3.

3.3.2 Beta dosimetry

A ruggedized Thermo BP19RD/Electra instrument was deployed to assess the beta dosimetry of skin dose [H*(0.07)]. The BP19RD provided a wide area monitor instrument (100cm^2) and was used to monitor item(s) that were potentially exposed to the higher radioactivity concentrations within the survey area. Further details of the beta skin dosimetry can be found in Appendix A4.

3.4 Conduct of the survey

The pre-survey preparations involved:

(i) Discussions with SEPA over the requirements for the Torness survey.

(ii) Reviewing past survey reports and maps to identify key information.

(iii) Compiling a directory of key groups involved in activities in the area from web searches and from people living in the survey area with relevant knowledge.

(iv) Agreeing the field survey programme with SEPA.

(v) University of Stirling staff conducting a carborne and handheld MoGSS survey.

3.5 Meetings and informal contacts

In the 2023 survey, habits data and information were collected through a variety of approaches. This included contacting relevant parties and individuals for potential focus groups as well as ‘standard’ face-to-face interviews. The multi-methods approach facilitated a means to ‘triangulate’ (verify) the data gathered through the different approaches: e.g., to check occupancy and activity data against the ‘snapshot’ observations recorded over a limited number of days in one season acquired from the individual face-to-face interviews. It also provided some additional information about local produce grown and consumed by householders, garden clubs, horticulturalists and farmers and consumption of types of local food such as honey and game. Such information also aided in the development of survey data collection with individual contacts within relevant groups providing additional contacts to follow-up. These groups were approached prior to, during and after the face-to-face interviews by telephone and email.

A directory of local groups, bodies and organisations that potentially undertake relevant activities within the survey area was compiled prior to the field surveys. The directory proved an invaluable resource through the survey period both for contacting groups and for use as a checklist against which responses and non-responses from potentially important groups about activity, occupancy, exposure and local food consumption could be recorded. For future surveys, the directory will provide a useful starting point and a means of monitoring any changes in group/business or other activity in the area.

3.6 Data conversion & analyses

During the face-to-face interviews, data on food consumption was recorded in units provided by respondents (e.g., pounds, grams, and ounces) and later converted into kilograms per year. The weights provided are for the fresh weight prepared and consumed. In some cases, respondents were unable to estimate food consumption in kilograms per year and instead gave the number of plants grown or the length and number of rows. These data were converted into consumption rates using conversion weights where possible e.g., one broccoli plant yields 700g (Garden Forum Horticulture, 2009; Hessayon, 2014) so that all consumption figures were reported in kilograms per year. Data for each survey were transferred to a bespoke Microsoft Access database for analysis. The figures reported from individuals are utilised within this report after the percentage of any gifting or waste deducted from the final annual figure(s).

3.7 Data rounding and grouping

All data collected from the face-to-face and postal surveys are reported to two significant figures. For the food consumption data, the total annual consumption (kg y^{-1}) of different food types were calculated by multiplying the quantity (kg) and frequency (times per year). The food items were placed into groups with similar attributes (Table 3.1). These groups are like those used in previous survey reports but with a focus on the most commonly encountered food types. Individuals were given the option to add any additional food items using an 'Other' food category.

The time (h y^{-1}) individuals spent carrying out activities was calculated by multiplying frequency (occasions per year) and duration (hours), whilst considering seasonality where appropriate. Data reported are after any holidays and working hours within their survey replies were accounted for. A 'liquid' category was also added to the survey for individuals who carry out aquatic activities that could result in their inadvertent ingestion of water, e.g., outdoor swimming/sailing.

The age groupings used in this report are based on ICRP recommendations and are listed below in Table 3.2.

Table 3.1 Food groups used in the Torness Habits Survey

Food group	Example of foods within this group
Green leafy vegetables	Asparagus, broccoli, Brussel sprouts, cabbage, calabrese, cauliflower, celery, chard, herbs, kale, kohl rabi, lettuce, Pak choi, rhubarb, marrow, spinach
Other domestic vegetables (legumes)	Broad beans, French bean, pea, runner beans
Root vegetables	Beetroot, carrot, celeriac, fennel, garlic, Jerusalem artichoke, leek, onion, parsnip, radish, shallot, spring onion, swede, turnip
Potato	Potato
Domestic fruit	Apple, blackberry, blackcurrant, blueberries, corn, courgette, cucumber, gooseberry, grape, pear, pepper, plum, raspberry, redcurrant, strawberry, tayberry, tomato
Milk	Milk, yoghurt, cheese
Cattle meat	Beef, buffalo
Pig meat	Pork
Sheep meat	Lamb, mutton
Poultry	Chicken, duck, goose, turkey
Eggs	Eggs
Wild/free foods	Blackberry, chestnuts, crab apples, damson, dandelion root, garlic, elderberry, elderflower, nettle, raspberry, rowanberry, sloe, strawberry
Honey	Honey
Venison	Venison
Fish	Bass, cod, Dover sole, kipper (herring), mackerel, pollock, salmon, sea trout, trout (freshwater)
Crustaceans	Brown crab, common lobster, shrimps
Molluscs	Mussels, razor clams, scallops, winkles
Wildfowl	Mallard, pink-footed goose, teal, widgeon

Food group	Example of foods within this group
Game - bird	Partridge, pheasant, quail

Table 3.2 ICRP age groups used in the dose assessment

Name of age group	Age range
Group 1 - Infant	0 to 5 year old
Group 2 - Child	6 to 15 year old
Group 3 - Adult	16 year old and over

3.8 Qualitative and quantitative observations

Whilst undertaking the face-to-face surveys, observational data were acquired on any obvious changes to each location such as new build housing, along with information on site usage and numbers of individuals undertaking specific habits. Observations were acquired over a specified time, e.g., 20 minutes, with both onshore and offshore (including intertidal) activities noted. The number of individuals, their gender and their approximate age were noted for each activity witnessed. Where large groups of people were observed, the number of individuals was estimated. After the observation period, individuals were approached where possible and subsequent face-to-face surveys conducted. Contact with individuals during face-to-face interviews frequently allowed the accuracy of observations to be checked and sometimes to be expanded, e.g., dog walkers might also engage in beachcombing and sailing at other times. Along with noting the weather conditions at the time of survey, this approach provided a basis for making a comparison with habits at different times of both day and seasons (e.g., within and outwith the period of the local school holidays).

One of the problems with this type of survey is being confident in a person's recollection of portion size/mass or occupancy/activity times. To address this, the survey team had information on what might be considered a reasonable range for consumption of different foods. Where a survey individual's response was outwith

these ranges, the survey team challenged and verified the response. To achieve this, visual aids of, e.g., portions of vegetables or fruit, were shown to allow the individual to re-evaluate and confirm their data. With regards to occupancy, a similar approach was taken where all ‘extreme’ figures were also challenged. It is not possible to visualise ‘time’ so the survey individual’s initial times would be calculated to a per year basis to show how this might be compared with their other daily habits and work life. If the surveyed individual confirmed the ‘extreme’ value, then these were recorded as this is the information the survey team were given. While the survey team’s approach should minimise incorrect information from being collected, it remains possible that extreme results could still be reported and thus may be a potential source of error within the survey.

4 Postal survey

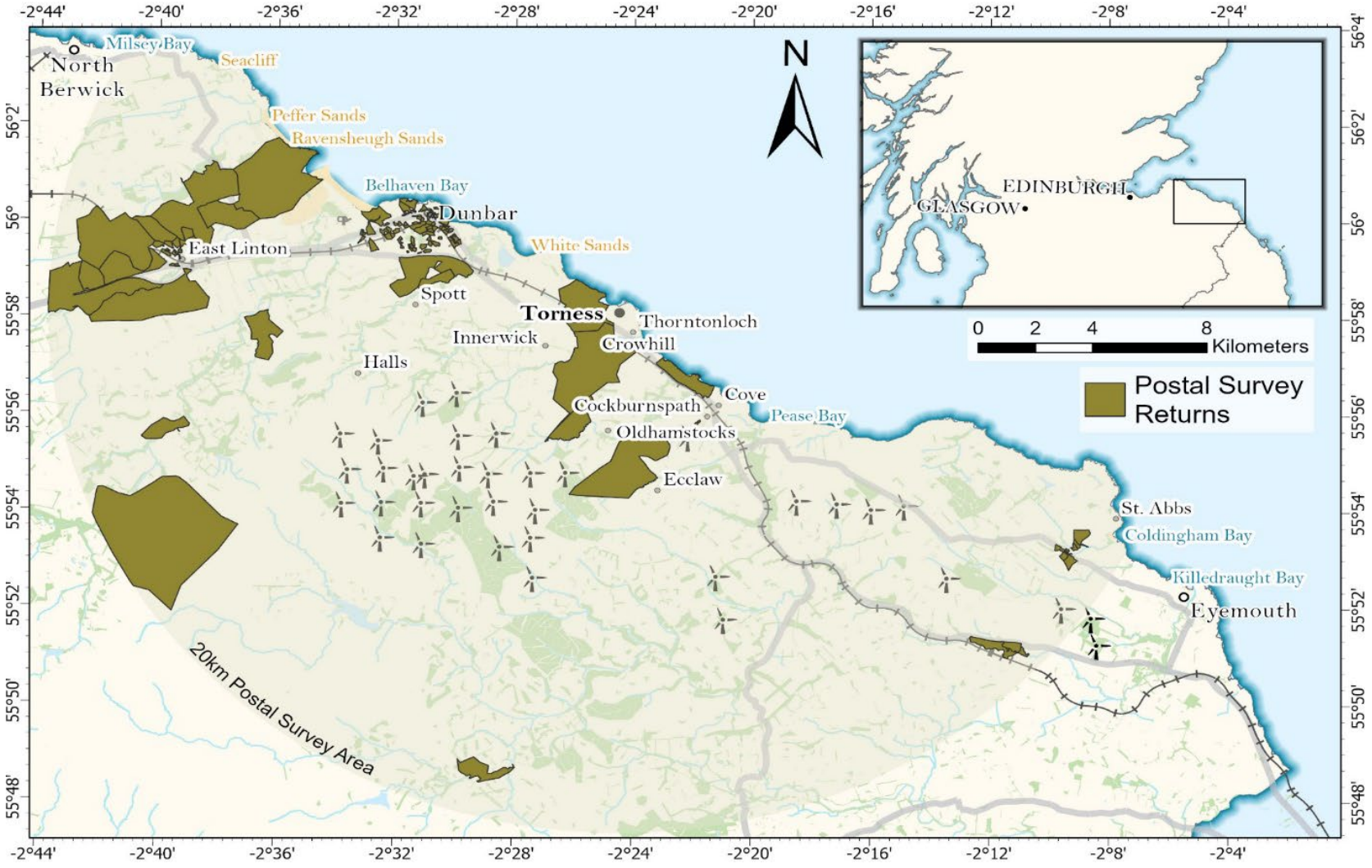
4.1 Introduction

The results from the postal survey provide an overview of the habits within an area of 20km radius centred on the Torness nuclear licensed site.

2000 postal surveys were sent out to households in the survey area and 171 postal returns were used in the analysis (Figure 4.1). This is comparable with previous habit postal surveys around the different nuclear sites across Scotland.

The postal survey proved useful for identifying where households undertook popular activities and the proximity of these activities to the Torness site. The survey was not designed to capture the length of time individuals spent doing these activities. The postal survey results are presented in detail in Appendix A2.

Figure 4.1. Postal survey returns density map (Zone A – 0-1km, Zone B – 1-5km, Zone C – 5-10km and Zone D – 10-20km)



5 Aquatic radiation pathways

5.1 Introduction

Survey locations were established following the desktop review (Chapter 2) and to allow effective comparison with the previous Torness Habits Survey in 2016 (Dale et al., 2017). The survey locations were visited throughout the survey period and observations of offshore and onshore activities were undertaken. The survey schedule ensured that each location was visited at different times of the day, reflecting the different activities occurring at each location.

5.1.1 Aquatic survey area descriptions

The survey locations were established from the analysis presented in Chapter 2 and to provide consistency with the previous Torness Habits Survey undertaken in 2016. The aquatic survey area stretches from North Berwick in the north to Eyemouth in the south.

The survey locations were visited throughout two survey periods, the first outwith the school holiday period (24 May to 30 May) and the second within the school holiday period (5 July to 11 July) of 2018. Offshore and onshore observations were undertaken at each site.

The survey locations are reported from North Berwick in the north to Eyemouth in the south. See Appendix A5 for site descriptions and observations.

5.2 Commercial seafood operations

Commercial seafood operations operate within the survey area. Fish are landed at North Berwick, Dunbar, Cove, St Abbs, and Eyemouth. Fish landed are lobster, crab (brown and velvet) and prawn.

Fish wholesales within the survey area sell most of their produce overseas (mainland Europe and China) with a small percentage staying locally for sale.

One local fishmonger sourced their produce seasonally from a local fish merchant.

No commercial collecting of molluscs was determined within the survey area.

5.3 Non-commercial fishing and angling

Angling was a popular activity and the below text shows areas where non-commercial fishing, bait digging, and molluscs and crustaceans collection took place within the aquatic survey area.

Bait digging: North Berwick, Coldingham Bay, Skateraw

Fishing from shore/rocks/pier/boat: Coldingham Bay – from rocks and shore, Killiedraught Bay – from rocks, Dunbar Harbour, Eyemouth Harbour and beach, St Abbs Harbour, Cove Harbour, North Berwick Harbour, Milsey Bay – from rocks, Thorntonloch – Torness outflow pipe, Thorntonloch – from rocks and shore, Seacliff – from shore, Skateraw – from shore, Tyninghame – from shore

Mollusc/crustaceans picking (non-commercial): Collecting winkles – Skateraw, Collecting winkles – North Berwick, Collecting winkles – Thorntonloch, Crabbing – Dunbar Harbour, Crabbing – Coldingham Bay

It has been reported that some individuals have been fishing near the Torness outflow pipeline and illegally fishing for sea bass. There is a restriction allowing two sea bass per individual that can be retained, however, it is reported that some individuals are exceeding this restricted quota. It is reported from Torness nuclear site that this is currently being dealt with themselves and another party.

5.4 Wildfowling

During the survey period no individual reported to shoot or consume wildfowl from within the survey area.

5.5 Royal National Lifeboat Institute (RNLI)

The Royal National Lifeboat Institute (RNLI) has lifeboats moored at Dunbar and Torness Power Station. The Dunbar lifeboat is a small in-shore lifeboat (ILB) for approximately three to four people. The ILB covers the area from St Abbs Head to Bass Rock and up to three miles offshore. The Torness lifeboat is an all-weather lifeboat (ALB) for approximately five to seven people. The ALB covers the area between St Abbs Head to Fyffe Ness going up to 100 miles offshore. The lifeboat

crews train twice weekly for two to three hours each session. In 2023, there were approximately a total of 20 call outs for rescue.

St Abbs has an independently owned lifeboat, and a RNLI lifeboat is held at Eyemouth.

5.6 Sailing and rowing

There are several sailing and rowing clubs within the survey area with events and activities both competitive and for leisure. The clubs provide regular training sessions with boats hosed down with fresh water following events. Wetsuits and clothing are washed at home.

5.7 Professional dog walkers

Professional dog walkers operate within the survey area. These groups will be active along the coastal strip for much longer periods. As dogs can enter the sea and the route of walks often encompasses muddy and sandy areas, the group may potentially have greater exposure to intertidal substrates. The survey team were unable to obtain any information from this group.

5.8 Animals grazing

Cows (no dairy herds identified) and sheep were observed grazing in several fields within and around the survey area. No cattle or sheep were observed grazing on seaweed or within intertidal areas anywhere within the survey area.

5.9 Seaweed foraging

One individual interviewed reported to collect and consume seaweed - laver seaweed (*Porphyra umbilicalis*) 0.25kg annually and spaghetti seaweed (*Himanthalia elongata*) 0.25kg annually. Seaweed was foraged from within the survey area at Tyninghame beach. A second individual reported to collecting seaweed, drying it, and using it as a seasoning on food however, no further information on this was provided.

5.10 Other pathways

Seaweed and jellyfish are regularly removed from the Torness Power Station seawater filters although the quantity varies depending on the weather. Preparation for potential large influxes is aided by weather forecasting. The seaweed is washed off the filters into a collection skip where it is then transferred off site to Waste and Recycling for composting.

5.11 Internal exposure – phase 1

5.11.1 Adult consumption rates

Table 5.1 presents a summary of the consumption rates for aquatic food types including fish, crustaceans, molluscs and seaweed. Mean adult consumption rates for the high-rate groups and the observed 97.5th percentile rates are included in Table 5.1. The high-rate group was determined using a 'cut-off' method described by Hunt et al., (1982). This 'cut-off' method calculates the high-rate value by taking the mean of the values between the maximum observed rate and one third of the maximum observed rate. Therefore, the 'cut-off' method within this report is represented as the individuals derived to obtain the 'high-rate group'. The table also includes mean consumption rates and 97.5th percentile rates based on the full dataset.

Table 5.1 Summary of adults' consumption rates of foods from the aquatic survey area

Food Group	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (kg y^{-1})	Observed minimum for the high-rate group (kg y^{-1})	Observed mean for the high-rate group (kg y^{-1})	Observed 97.5th percentile for the high-rate group (kg y^{-1})	Full dataset – Observed mean (kg y^{-1})	Full dataset – 97.5th percentile (kg y^{-1})	National Data mean (kg y^{-1})	National data 97.5th percentile (kg y^{-1})
Fish	33	9	52	20	35.1	52	13.7	52	15	40
Crustaceans	16	2	48	18	33	47.3	8.8	36.8	4	10
Molluscs	3	3	6	6	6	6	6	6	4	10
Seaweed	1	1	0.5	0.5	0.5	NA	0.5	NA	ND	ND

NA - Not applicable

ND - Not determined

The generic mean and generic 97.5th percentile rates based on National Habit Data are also included (Smith and Jones, 2003). The national data are used to compare the high-rate mean and high-rate maximum consumers within the habits survey. During the Torness habits survey it became apparent that the national data do not consider any extreme habits of consumption. For example, there may be regional or local differences in habits which may result in very different rates of consumption, for fish, crustaceans, and molluscs (Table 5.1), which is vastly greater than the national mean and may represent an important local pathway. It may be necessary to consider that the national data cannot capture local or regional variations in habits, which may have local significance within habits-based assessments.

Adults consumed bass (4 individuals), cod (11 individuals), mackerel (26 individuals), pollock (2 individuals) and haddock (7 individuals) all sourced from within the aquatic survey area. It should be noted that some adults consumed more than one fish type (flat and/or round). The observed maximum consumption (quantity times frequency) of fish was 52kg y^{-1} and this individual consumed mackerel that was sourced and self-caught from within the survey area. The mean fish consumption for the adult high-rate group was 35.1kg y^{-1}.

Crustacean consumption consisted of brown crab (7 individuals) and common lobster (12 individuals), and prawns (three individuals). The highest consumption was by an individual consuming 48kg y^{-1}, the individual consumed common lobster which was locally sourced and self-caught from within the survey area. The mean crustacean consumption for the adult high-rate group was 33kg y^{-1}. It should be noted that some adults consumed more than one crustacean type.

Mollusc consumption consisted of winkles (three individuals). The observed maximum consumption was by all three individuals each consuming 6kg y^{-1} self-caught and sourced from within the survey area. The mean mollusc consumption for the adult high-rate group was 6kg y^{-1}.

Seaweed was consumed by one individual (0.5kg y^{-1}). The seaweed (laver and spaghetti seaweed) was sourced by the individual from within the survey area.

No wildfowl consumption was identified within the survey area.

5.11.2 Children and infant consumption rates

Table 5.3 presents a summary of children's consumption rates of fish and molluscs from the aquatic survey area. Mean consumption rates for the high-rate groups and the observed 97.5th percentile rates are included in Table 5.2.

Table 5.2 Summary of children's consumption rates of foods from the aquatic survey area

Age Group	Food Group	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (kg y^{-1})	Observed minimum for the high-rate group (kg y^{-1})	Observed mean for the high-rate group (kg y^{-1})	Observed 97.5th percentile for the high-rate group (kg y^{-1})	Full dataset – Observed mean (kg y^{-1})	Full dataset – 97.5th percentile (kg y^{-1})
Child (6 to 15 years)	Fish	1	1	2.1	2.1	2.1	NA	2.1	NA
Infant (0 to 6 years)	Fish	1	1	2.6	2.6	2.6	NA	2.6	NA
Infant (0 to 6 years)	Crustaceans	1	1	0.15	0.15	0.15	NA	0.15	NA

NA = Not applicable

The table also includes mean consumption rates and 97.5th percentile rates based on the full dataset.

For the child age group, bass (one individual) was consumed. The observed maximum consumption was 2.1kg y^{-1}, and the bass was sourced and self-caught by a family member from within the survey area. No consumption of mollusc, crustacean or wildfowl was found for the children age group.

For the infant age group, the observed maximum consumption was 2.6kg y^{-1} by one individual (cod 2kg y^{-1} and mackerel 0.6kg y^{-1}). The fish was sourced and self-caught by a family friend from within the survey area. One infant was found to consume crustaceans and consisted of common lobster (0.15kg y^{-1}) which was sourced and self-caught by a family member from within the survey area. No consumption of mollusc or wildfowl was found for the infant age group.

5.12 External exposure – phase 1

Occupancy rates for adult intertidal activities are presented in Table 5.3. Occupancy rates for adult aquatic (in water), aquatic (on water), handling rates of equipment and handling rates of sediment are presented in Table 5.4.

Intertidal activities for adults included bait digging, sitting/picnicking/BBQ, beachcombing, bird/nature watching, collecting sea glass, collecting seaweed, collecting winkles, crabbing, dog walking, fishing, horse riding, jogging, lifeguard duties, litter picking, outdoor exercise class, paddling, photography, playing, research/education, rock pooling, sunbathing, walking and working.

The activities undertaken by adults in the high-rate group over the following intertidal substrates included:

Rock: sitting/picnicking/BBQ at Whitesands; beachcombing at North Berwick; collecting sea glass at Seacliff; collecting seaweed at Tyninghame; collecting winkles at North Berwick and Skateraw; crabbing at Dunbar Harbour; fishing at Dunbar Harbour, Torness (outflow pipe), Eyemouth, Thorntonloch, St Abbs Harbour, Coldingham Bay, Killiedraught Bay, Milsey Bay; and Skateraw,

Mud: sunbathing at Skateraw; and, playing and sitting/picnicking/BBQ at Belhaven Bay.

Sand: sitting/picnicking/BBQ at Belhaven Bay, Coldingham Bay, Pease Bay, Seacliff and Whitesands; beachcombing at Barns Ness, Dunbar East beach, Thorntonloch and Whitesands; collecting sea glass at Belhaven Bay and Coldingham Bay; dog walking at Dunbar East beach, Skateraw, Thorntonloch, Tyninghame and Whitesands; fishing at Tyninghame; horse riding at Belhaven Bay; jogging at North Berwick; paddling at Barns Ness, Belhaven Bay, Coldingham Bay, Cove, Dunbar East beach, Eyemouth, North Berwick, Pease Bay, Seacliff, Thorntonloch and Whitesands; playing at Belhaven Bay, Coldingham Bay, Cove, Dunbar East beach, Eyemouth, Milsey Bay, North Berwick, Pease Bay, Skateraw, Thorntonloch, Tyninghame and Whitesands; rock pooling at Belhaven Bay, Coldingham Bay, Dunbar East beach, Eyemouth, Thorntonloch and Whitesands; and, walking at Barns Ness, Belhaven Bay, Coldingham Bay, Dunbar East beach, North Berwick, Seacliff, Thorntonloch and Whitesands.

Sand and stones: sitting/picnicking/BBQ at Dunbar East beach, Cove, Seacliff and St Abbs; beachcombing at Cove, North Berwick and St Abbs; bird/nature watching at Barns Ness, Cove, St Abbs and Whitesands; collecting sea glass at Dunbar East beach and Seacliff; collecting winkles at Thorntonloch, dog walking at Cove, Skateraw and Thorntonloch; fishing at Eyemouth, Skateraw, Thorntonloch and Torness (outflow pipe); paddling at Cove; photography at Cove; playing at Cove and Whitesands; rock pooling at North Berwick; and, walking at Cove, North Berwick, St Abbs, Thorntonloch and Whitesands.

Stones: beachcombing at North Berwick; and, walking at North Berwick

The highest intertidal occupancy rate was 1095h y^{-1} for an individual who spent time dog walking on a sand and stone substrate within the survey area. On a mud substrate the highest occupancy was 8h y^{-1} and this was for an individual who spent time paddling within the survey area. On rock substrate the highest occupancy was 906h y^{-1} and this was for an individual who spent time fishing within the survey area. On a sand substrate the highest occupancy was 988h y^{-1} for an individual who spent

time dog walking within the survey area. On stone substrate the highest occupancy was 288h y^{-1} for an individual who spent time fishing within the survey area.

Table 5.3 Summary of adults' external exposure for intertidal activities over intertidal substrates

Intertidal Substrate	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group ($h\ y^{-1}$)	Observed minimum for the high-rate group ($h\ y^{-1}$)	Observed mean for the high-rate group ($h\ y^{-1}$)	Observed 97.5th percentile	Observed mean for the full dataset ($h\ y^{-1}$)	Observed 97.5th percentile for the full dataset ($h\ y^{-1}$)
Mud	2	2	8	3	5.5	8	5.5	8
Rock	39	2	906	384	645	893	79	410
Sand	200	23	988	350	598	917	121	734
Sand and stones	31	1	1095	1095	1095	NA	50.5	313
Stones	10	1	288	288	288	NA	42	232

Activities in the water included bodyboarding, coasteering, diving, lifeguard duties, outdoor swimming, snorkelling, stand-up paddle boarding, surfing and windsurfing. The highest occupancy rate for adults in the water was 720h y^{-1} for an individual who spends time outdoor swimming and surfing within the survey area. Activities on the water included being on a dive boat, boat maintenance, canoeing, commercial creeling/fishing, dinghy sailing, kayaking, powerboating, rowing, sailing, sea angling, wildlife tours. The highest occupancy rate for adults on water was 3000h y^{-1}. This individual spends time commercial fishing/creeling within the survey area. Adults were also found to handle equipment within the survey area. The activities for adults involved handling boats and boating equipment, handling clothes and overalls and handling fishing gear. The highest level of handling equipment was 3480h y^{-1}, this individual spent time commercial fishing/creeling, and handling boats, boating equipment, and fishing gear. The highest level of handling sediment was 728h y^{-1}, and this is for an individual who spends time playing within the survey area. The occupancy data for intertidal activities were used for estimating the external gamma dose rate. Selected relevant intertidal activity occupancy data were also used to derive the handling sediment category which was then used for estimating the beta skin dose rate. Intertidal activities comprised: bait digging, sitting/picnicking/BBQ, beachcombing, collecting sea glass, collecting seaweed, collecting winkles, crabbing, beach clean/litter picking, paddling, playing, research/education and rock pooling.

Table 5.4 Summary of adults' external exposure for aquatic activities (in water and on water), handling of equipment and handling of sediment

Activity	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group ($h\ y^{-1}$)	Observed minimum for the high-rate group ($h\ y^{-1}$)	Observed mean for the high-rate group ($h\ y^{-1}$)	Observed 97.5th percentile for the high-rate group ($h\ y^{-1}$)	Observed mean for the full dataset ($h\ y^{-1}$)	Observed 97.5th percentile for the full dataset ($h\ y^{-1}$)
Aquatic (in water)	97	10	720	242	444	720	65.3	550
Aquatic (on water)	36	4	3000	1095	2275	2966	317	2605
Handling equipment	69	3	3480	2457	2828	3433	218	2484
Handling sediment	139	6	728	274	469	728	57	288

Occupancy rates for children and infant intertidal activities are presented in Table 5.5. Occupancy rates for children and infant aquatic (in water), aquatic (on water), handling rates of equipment and handling rates of sediment are presented in Table 5.6.

Intertidal activities for children included beachcombing, crabbing, dog walking, horse riding, paddling, playing, rock pooling, walking, jogging, litter picking, sitting/picnicking/BBQ, fishing, and collecting sea glass.

The activities undertaken by children in the high-rate group over the following intertidal substrates included:

Rock: crabbing at Dunbar Harbour; and fishing at Dunbar Harbour; rock pooling at Belhaven Bay, Coldingham Bay, Dunbar East beach, Eyemouth beach, Seacliff, Thorntonloch and Whitesands.

Sand: sitting/picnicking/BBQ at Belhaven Bay, Coldingham Bay and Seacliff; dog walking at Dunbar Harbour, Dunbar East beach, Skateraw, Thorntonloch and Whitesands; paddling at Belhaven Bay, Eyemouth and Seacliff; playing at Belhaven Bay, Coldingham and Eyemouth; rock pooling at Dunbar East beach, and Eyemouth; and walking at Belhaven Bay and Seacliff.

Sand and stone: sitting/picnicking/BBQ at Cove; beachcombing at Cove; dog walking at Cove; fishing at Skateraw; paddling at Cove and Whitesands; and, playing at Whitesands, Cove, North Berwick and Skateraw.

Stones: rock pooling at Coldingham Bay and Eyemouth.

The highest intertidal occupancy rate for a child was 832h y^{-1} for an individual who spent time dog walking (104h y^{-1}), playing (364h y^{-1}) and sitting/picnicking/BBQ (364h y^{-1}) on a sand substrate within the survey area. On rock substrate, the highest occupancy was 208h y^{-1}, and this was for a child who spent time rock pooling within the survey area. On sand and stone substrate, the highest occupancy was 30h y^{-1} and this was for a child who spent time beachcombing, dog walking, paddling, playing and sitting/picnicking/BBQ within the survey area. On stone substrate, the

highest occupancy was 1h y^{-1} and this was for five children who spent time rock pooling within the survey area.

Intertidal activities for infants included rock pooling, playing, sitting/picnicking/BBQ, dog walking, horse riding, paddling and playing.

The activities undertaken by infants in the high-rate group over the following intertidal substrates included:

Rocks: rock pooling at Coldingham Bay.

Sand and stone: playing at Cove Bay.

Sand: sitting/picnicking/BBQ at North Berwick, Coldingham Bay, Whitesands, Belhaven Bay and Milsey Bay; beachcombing at Whitesands, Barns Ness, Dunbar East beach, Thorntonloch and Tyninghame; dog walking at Barns Ness, Dunbar East beach, Thorntonloch, Belhaven Bay and Tyninghame; horse riding at Belhaven Bay; paddling at Barns Ness, Whitesands, Thorntonloch, Dunbar East beach, Coldingham Bay, North Berwick, Eyemouth beach, Cove, Seacliff and Milsey Bay; and, playing at Whitesands, Barns Ness, Dunbar East beach, Thorntonloch, Pease Bay, Cove, Eyemouth, Coldingham Bay, Belhaven Bay, Seacliff, Milsey Bay and Tyninghame.

The highest intertidal occupancy rate for an infant was 576h y^{-1} for an individual who spent time dog walking (288h y^{-1}) and playing (288h y^{-1}) on sand substrate within the survey area. On rock substrate, the highest occupancy was 10h y^{-1} and this was for an individual who spent time rock pooling within the survey area. On sand and stone substrate, the highest occupancy was 1h y^{-1} and this was for two individuals who spent time playing within the survey area.

Table 5.5 Summary of children and infant external exposure for intertidal activities over intertidal substrates

Age Group	Intertidal substrate	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (h y^{-1})	Observed minimum for the high-rate group (h y^{-1})	Observed mean for the high-rate group (h y^{-1})	Observed 97.5th percentile for the high-rate group (h y^{-1})	Observed mean for the full dataset (h y^{-1})	97.5th percentile for the full dataset (h y^{-1})
Child (6 to 15 years)	Rock	9	2	208	208	208	208	54.9	208
Child (6 to 15 years)	Sand	56	2	832	592	712	826	70.5	473
Child (6 to 15 years)	Sand and stones	10	5	30	28	28.8	30	15.5	30
Child (6 to 15 years)	Stones	5	5	1	1	1	NA	1	NA
Infant (0 to 5 years)	Rock	1	1	10	10	10	NA	10	NA

Age Group	Intertidal substrate	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group ($h\ y^{-1}$)	Observed minimum for the high-rate group ($h\ y^{-1}$)	Observed mean for the high-rate group ($h\ y^{-1}$)	Observed 97.5th percentile for the high-rate group ($h\ y^{-1}$)	Observed mean for the full dataset ($h\ y^{-1}$)	97.5th percentile for the full dataset ($h\ y^{-1}$)
Infant (0 to 5 years)	Sand	28	2	576	234	405	567	51	345
Infant (0 to 5 years)	Sand and stones	2	2	1	1	1	1	1	1

Children's activities in the water included body boarding, outdoor swimming, standup paddle boarding and surfing. The highest occupancy rate for children in water was 40h y^{-1} for two individuals who spend time body boarding within the survey area. Activities on the water included kayaking and dinghy sailing. The highest occupancy rate for children on water was 10h y^{-1}, this was for two individuals who spend time kayaking within the survey area. Children were also found to handle equipment within the survey area, the activities for children involved handling boats and boating equipment and handling fishing gear. The highest level of handling equipment was 40h y^{-1} for two individuals spending time handling equipment. The highest level of handling sediment was 728h y^{-1}, and this is for an individual who spends time BBQ/picnicking/sitting and playing within the survey area. The occupancy data for intertidal activities were used for estimating the external gamma dose rate. Selected relevant intertidal activity occupancy data were also used to derive the handling sediment category which was then used for estimating the beta skin dose rate. Intertidal activities comprised: sitting/picnicking/BBQ, beachcombing, collecting sea glass, crabbing, beach clean/litter picking, paddling, playing and rock pooling.

Infant activities in the water included bodyboarding and outdoor swimming. The highest occupancy rate for an infant in water was 20h y^{-1} for an individual outdoor swimming within the survey area. No infant was found to undertake on water activities within the survey area. Infants were found to handle equipment and the highest level of handling equipment for an infant was 6.5h y^{-1} for an individual handling boats/boating equipment. The highest level for an infant handling sediment was 288h y^{-1} and this was for an individual who spent time playing within the survey area. The occupancy data for intertidal activities were used for estimating the external gamma dose rate. Selected relevant intertidal activity occupancy data were also used to derive the handling sediment category which was then used for estimating the beta skin dose rate. Intertidal activities comprised: sitting/picnicking/BBQ, beachcombing, paddling, playing and rock pooling.

Gamma dose rate measurements over different substrates within the survey area can be found in Chapter 7.

Table 5.6 Summary of children and infant external exposure aquatic activities (in water and on water), handling of equipment and handling sediment

Age Group	Activity	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group ($h\ y^{-1}$)	Observed minimum for the high-rate group ($h\ y^{-1}$)	Observed mean for the high-rate group ($h\ y^{-1}$)	Observed 97.5th percentile for the high-rate group ($h\ y^{-1}$)	Observed mean for the full dataset ($h\ y^{-1}$)	Observed 97.5th percentile for the full dataset ($h\ y^{-1}$)
Child (6 to 15 years)	Aquatic (in water)	37	16	40	15	23	40	13	40
Child (6 to 15 years)	Aquatic (on water)	5	5	10	7	8.2	10	8.2	10
Child (6 to 15 years)	Handling equipment	15	6	40	16	26.5	40	13	40
Child (6 to 15 years)	Handling sediment	57	4	728	273	391	695	61	282
Infant (0 to 5 years)	Aquatic (in water)	6	3	20	9	14	19.6	9.2	19
Infant (0 to 5 years)	Handling equipment	2	1	6.5	6.5	6.5	NA	4.25	6.4

Age Group	Activity	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (h y^{-1})	Observed minimum for the high-rate group (h y^{-1})	Observed mean for the high-rate group (h y^{-1})	Observed 97.5th percentile for the high-rate group (h y^{-1})	Observed mean for the full dataset (h y^{-1})	Observed 97.5th percentile for the full dataset (h y^{-1})
Infant (0 to 5 years)	Handling sediment	27	4	288	104	200	284	40	253

6 Terrestrial radiation pathways

6.1 Introduction

Chapter 6 reports on inland routes of exposure immediately adjacent to the Torness site, coastal and intertidal areas (Figure 2.1). This chapter also details the production and consumption of private food, including the results from face-to-face discussions.

6.1.1 Terrestrial survey area

The terrestrial survey area stretches a 5km radial from the southern outskirts of Dunbar to Cove and inland taking in all conurbations with communities ranging from as small as one house to villages. Much of the land within the survey area is agricultural, predominantly arable and livestock (mostly cattle and sheep).

6.2 Private food production

No allotments were found within the 5km radius from the Torness site.

Over the survey period, 19 people were interviewed who grew their own fruit and vegetables within their own home gardens and the food grown was consumed by their families and friends. These interviews yielded data of sufficient quality, as many retained detailed records of the crop grown and the respective yield.

A total of three individuals surveyed reported to keeping chickens with two of these individuals' keeping ducks.

Shooting of venison, rabbit, pheasant, and pigeon for human consumption was reported from within the 5km survey area.

6.3 Commercial food production

Local butchers were contacted to determine where their produce was sourced. Of butchers contacted, no meat produce was sourced from within the terrestrial survey area.

6.4 Wild foods

Within the terrestrial survey area wild food consumption was reported by 16 individuals. A breakdown of the foods, number of individuals, consumption and locations are detailed in Table 6.1.

6.5 Production of honey

Beekeepers are not required to be a member of a bee keeping association or to be registered therefore the precise numbers in the survey area are unknown, however, if honey is to be sold commercially then a licence is required.

Two beekeepers that keep apiaries within the 5km survey area were identified and interviewed. Beekeepers were found to consume, sell, and gift honey produced. Apiaries consisted of one hive and two hives with a yield of 5kg and 27kg respectively.

6.6 Farms

Within the Torness terrestrial survey area 11 working farms were identified, however, only six farms agreed or were available to provide information. Farming included cattle, sheep, crops, and mixed farming (crops and animals). Water was supplied from the mains water supply and a private water supply for human consumption. Cattle and sheep water consumption was from mains water or private water supply; however, ditch/burn water was accessible to cattle and sheep on four of the farms. Consumption of game and farm animal produce was determined. Crops produced within the 5km survey area were winter wheat, spring barley, leek, spring oats, turnip, potato, carrot, onion, apples, grass, hay, and silage. Some produce grown was consumed and some farms producing some of their own animal feed. Poultry (chicken, duck, geese) was kept with some eggs (chicken and duck) being consumed and chicken, duck and goose eggs sold locally.

Table 6.1 Wild food summary of total number of individuals, highest annual consumption, and locations

Food type	Total number of individuals	Maximum individual consumption (kg y^{-1})	Location of maximum consumption foraged	Other locations of foraging
Blackberry	7	5	Thorntonloch and Innerwick	-
Cherries	2	0.25	Thorntonloch	-
Elderflower	7	0.6	Innerwick	Innerwick
Garlic leaves	5	1	Thorntonloch	Innerwick, Thornton Glen
Mushrooms	12	13	Innerwick	Skateraw, Torness, Thorntonloch
Rosehips	2	0.23	Thorntonloch	-
Sea Buck thorn	2	0.13	Thorntonloch	-
Sloe berries	8	1.5	Thorntonloch and Innerwick	-

6.7 Internal exposure – phase 1

6.7.1 Internal exposure adult consumption rate

Consumption data for locally produced foodstuffs potentially affected by atmospheric releases from Torness are presented in Table 6.2 for adults.

The table presents the adult consumption rates summarising the number of observations made, the number of people in the high-rate consumer group, the minimum and maximum observed consumption rates for the high-rate consumer group and the observed 97.5th percentile consumption rate. The table contains the mean consumption rate for both the high-rate consumer group and the whole dataset

collected from around Torness. The table also provides the mean and 97.5th percentile consumption rates from national data (Smith and Jones, 2003) for comparison. The national data are used to compare the high-rate mean and high-rate maximum consumers within the habits survey. During the Torness habits survey it became apparent that the national consumption data does not consider any extreme habits, and this may be an area for further research. For example, there may be regional or local differences in habits which may result in different rates of consumption, (Table 6.2), with many of the food groups showing greater consumption than the national mean and may represent an important local pathway. It may be necessary to consider that the national data (which is aggregated and is useful as a broad comparison) cannot capture local or regional variations in habits, which may have significance.

Consumption of locally produced foods was identified and are presented in Table 6.2.

Table 6.2 Summary of adult consumption rate of foods from the terrestrial survey area

Food type	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (kg y^{-1} or l y^{-1})	Observed minimum for the high-rate group (kg y^{-1} or l y^{-1})	Observed mean for the high-rate group (kg y^{-1} or l y^{-1})	Observed 97.5th percentile for high-rate group (kg y^{-1} or l y^{-1})	Full dataset – Observed mean (kg y^{-1} or l y^{-1})	Full dataset – 97.5th percentile (kg y^{-1} or l y^{-1})	National mean (kg y^{-1} or l y^{-1})	National 97.5th percentile (kg y^{-1} or l y^{-1})
Green vegetables	18	1	28.8	28.8	28.8	NA	4.7	19.6	15	45
Other vegetables	7	3	17.3	6.7	10.2	16.8	6.2	15.7	20	50
Root vegetables	16	4	43.8	36.7	40.2	43.8	12.9	43.8	10	40
Potatoes	19	2	130	130	130	130	21.7	130	50	120
Fruit domestic	27	2	173	113	143	172	29	134	20	75
Fruit wild	12	4	7.3	3.6	5.4	7.3	2.6	7.3	7	25
Wild fungi	10	3	6.5	5	6	6.5	2.3	6.5	3	10

Food type	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (kg y^{-1} or l y^{-1})	Observed minimum for the high-rate group (kg y^{-1} or l y^{-1})	Observed mean for the high-rate group (kg y^{-1} or l y^{-1})	Observed 97.5th percentile for high-rate group (kg y^{-1} or l y^{-1})	Full dataset – Observed mean (kg y^{-1} or l y^{-1})	Full dataset – 97.5th percentile (kg y^{-1} or l y^{-1})	National mean (kg y^{-1} or l y^{-1})	National 97.5th percentile (kg y^{-1} or l y^{-1})
Meat game (rabbit/hare)	2	2	2.5	2.5	2.5	2.5	2.5	2.5	6	15
Meat game (birds)	2	4	4	1.4	2.7	4	2.2	4	ND	ND
Meat game (venison)	2	2	5.5	5.5	5.5	5.5	5.5	5.5	ND	ND
Meat sheep	4	4	10	10	10	10	10	10	10	30
Eggs	6	4	43.5	19.8	32.1	43.5	22.8	43.5	8.5	25
Honey	6	6	0.8	0.3	0.5	0.8	0.5	0.8	2.5	9.5

ND – not determined

Three observed mean consumption rates for the high-rate consumer group were found to be greater than the national 97.5th percentile value. This was for potatoes, domestic fruit, and eggs. All high figures were checked with individuals for verification. Five of the observed mean consumption rates for the high-rate consumer group were found to exceed the national mean consumption rates. These were for green vegetables, root vegetables, potatoes, domestic fruit, and eggs.

6.7.2 Child consumption rates

Table 6.3 presents a summary of the child consumption rates. The table summarises the number of observations made, the number of people in the high-rate consumer group, the minimum and maximum observed consumption rates for the high-rate consumer group and the observed 97.5th percentile consumption rate. The table also contains the mean consumption rate for both the high-rate consumer group and the whole dataset collected from around Torness.

Child consumption of locally produced foods was identified for green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, wild fruit, wild fungi, sheep meat and honey.

No infant consumption of locally produced foods from within the survey area was determined.

Table 6.3 Summary of child and infant consumption rates

Age Group	Food type	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (kg y^{-1} or l y^{-1})	Observed minimum for the high-rate group (kg y^{-1} or l y^{-1})	Observed mean for the high-rate group (kg y^{-1} or l y^{-1})	Observed 97.5th percentile for high-rate group (kg y^{-1} or l y^{-1})	Full dataset – Observed mean (kg y^{-1} or l y^{-1})	Full dataset – 97.5th percentile (kg y^{-1} or l y^{-1})
Child (6 to 15 years)	Green vegetables	1	1	7.2	7.2	7.2	NA	7.2	NA
Child (6 to 15 years)	Other vegetable	1	1	4.2	4.2	4.2	NA	4.2	NA
Child (6 to 15 years)	Root vegetables	1	1	1.65	1.65	1.65	NA	1.65	NA
Child (6 to 15 years)	Potatoes	1	1	3.1	3.1	3.1	NA	3.1	NA
Child (6 to 15 years)	Domestic fruit	1	1	44.2	44.2	44.2	NA	44.2	NA
Child (6 to 15 years)	Fruit wild	1	1	0.2	0.2	0.2	NA	0.2	NA

Age Group	Food type	Number of observations	Number of people in the high-rate group	Observed maximum for the high-rate group (kg y^{-1} or l y^{-1})	Observed minimum for the high-rate group (kg y^{-1} or l y^{-1})	Observed mean for the high-rate group (kg y^{-1} or l y^{-1})	Observed 97.5th percentile for high-rate group (kg y^{-1} or l y^{-1})	Full dataset – Observed mean (kg y^{-1} or l y^{-1})	Full dataset – 97.5th percentile (kg y^{-1} or l y^{-1})
Child (6 to 15 years)	Wild fungi	1	1	0.03	0.03	0.03	NA	0.03	NA
Child (6 to 15 years)	Meat sheep	3	3	5	5	5	5	5	5
Child (6 to 15 years)	Honey	1	1	0.33	0.33	0.33	NA	0.33	NA

7 External exposure

7.1 Introduction

Gamma dose rate can vary markedly over short distances due to external factors e.g. geology, nearby buildings, trees etc., anthropogenic releases and direct shine from nuclear power plant activities. An understanding of the spatial variation in dose rate is important for determining the implications of the habits of the local population. A mobile (both handheld and carborne, see section 7.2) and in-situ gamma dose rate survey (section 7.3) was therefore undertaken. To achieve large-scale coverage, MoGSS was used to measure the dose rates for the natural occurring gamma emitting radionuclides (potassium-40 and the uranium-238 and thorium-232 decay series) alongside estimates for anthropogenic caesium-137. To note, this approach does not assess the occurrence of Tritium (the most abundant radionuclide released from Torness) as it is not a gamma emitting radionuclide.

Beta dosimetry (section 7.4) was undertaken on a boat and sailing equipment in the Torness area to estimate the skin dose associated with radioactivity in the environment.

7.2 Mobile Gamma Spectrometry Survey (MoGSS)

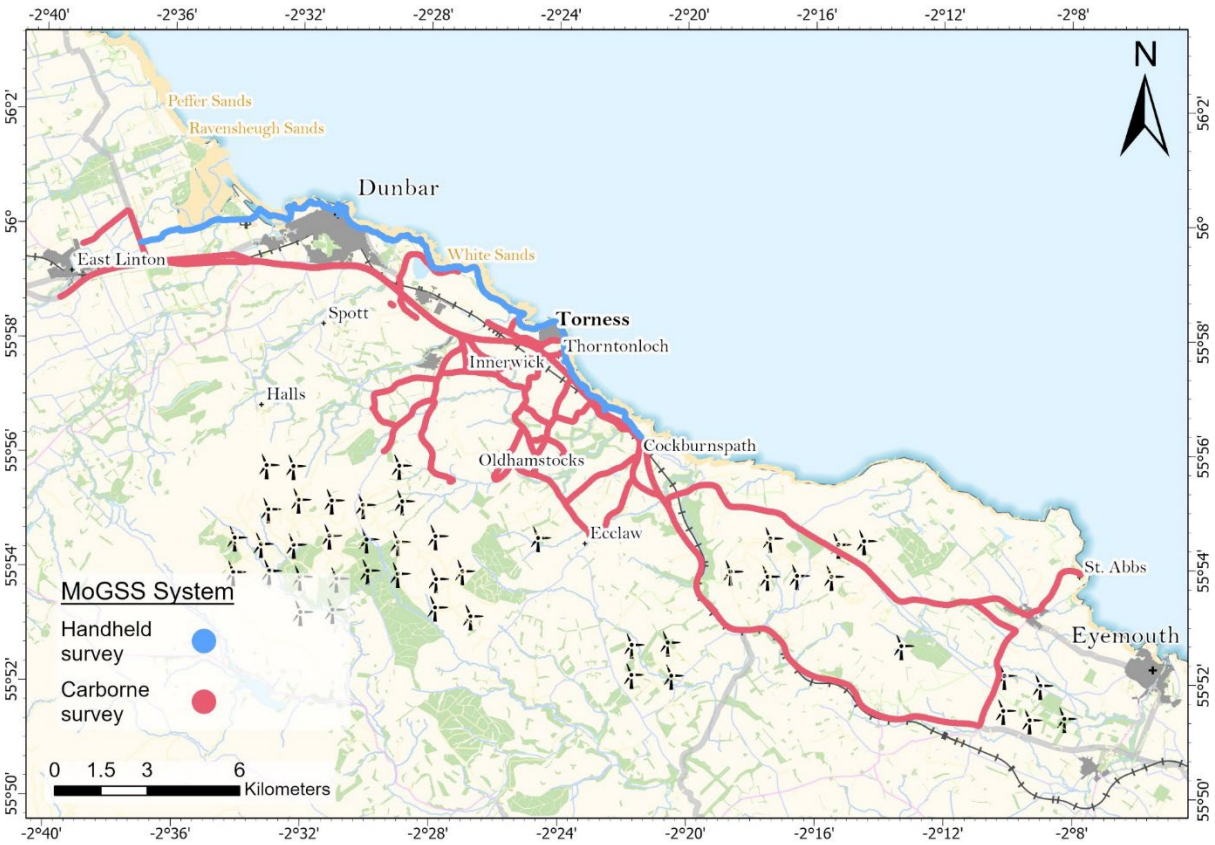
MoGSS was utilised to measure the differential dose estimations for the natural radioelements (potassium-40 and the uranium-238 and thorium-232 decay series) alongside estimates for anthropogenic caesium-137. The ability to separate dose contributors is especially important given that any potential contributions from caesium-137 could be identified from the spatially variable background element concentrations, particularly on beaches close to the site.

7.2.1 Survey area

A carborne gamma spectrometry survey of the study area was undertaken supplemented by a handheld gamma spectrometry system along some of the coastal sections from Tyninghame to Cove Bay. Areas of particular focus were within 5km radius of the Torness site and around intertidal areas that could be accessed by the public. The roads surveyed covered more than 50km.

To obtain as broad a spatial sample as possible and to investigate as many environments as possible, two systems operating MoGSS were deployed. Firstly, one large volume sodium iodide detector was mounted in a box on top of a car, which was driven along the roads within the area of interest (Varley et al., 2020). The system, with a detector volume of four litres, has high counting efficiency but was restricted to areas of vehicular access and thus could only be used on roads and carparks. To focus in on smaller areas not accessible by vehicle and to cover accessible coastline areas, a handheld system comprising a 71 × 71mm sodium iodide detector was used. The MoGSS units produced a differential energy spectra recorded at one second integration times alongside high accuracy (<0.6m) differential global positioning system (GPS) readings. Coverage of the handheld and carborne MoGSS are shown in Figure 7.1.

Figure 7.1 Coverage for handheld and carborne MoGSS



7.2.2 Carborne and handheld results

Overall, 33000 spectral measurements were made (~11788 – carborne; ~21222 – handheld).

Dose rates typically ranged from 0.003µGy h^{-1} (3nGy h^{-1}) to more than 0.08µGy h^{-1} (80nGy h^{-1}). Higher values between 0.08 and 0.65µGy h^{-1} may be attributable to elevated natural radiation, for example high concentrations of potassium-40 from road and building construction materials.

7.3 In-situ gamma dosimetry

The ERL has ISO 17025:2017 accredited procedures for the deployment and recording of gamma dose rate in air, using ISO 17025:2017 accredited (UKAS) calibrations for two Thermo Radeye instruments. Measurements were taken at all locations where occupancy or location may lead to higher exposure to radioactivity or radiation because of site activities.

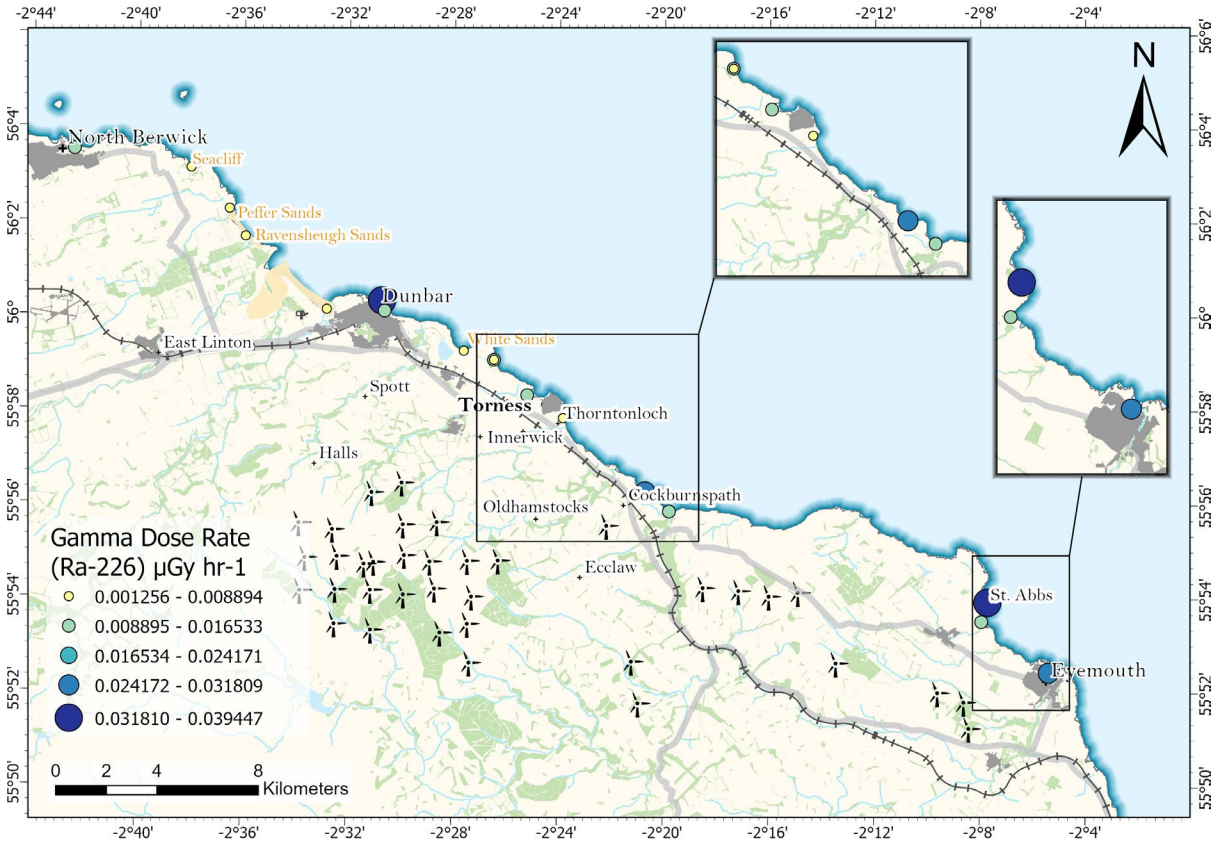
Eighteen in-situ gamma dose rate measurements were collected at intertidal sites during the survey. A UKAS accredited procedure was followed to estimate the terrestrial gamma dose rate. Since most of the dose contribution was thought to be from naturally occurring radionuclides, a radium-226 calibration was used to estimate dose rate for all gamma dose rate measurements. Radium-226 occurs naturally in the environment and emits several gamma-rays spanning the environmentally relevant energy spectrum (0-2204keV).

A summary of the dose rate measurements made across the survey area for terrestrial and intertidal areas can be found in Table 7.1. Notice that most of the higher readings are made over mud and stone. Lower readings tended to be recorded on sandier areas. Spatially (Figure 7.2), there was little evidence to link patterns in dose rates to the Torness site.

Table 7.1 Summary of gamma dose rate measurements collected across the Torness survey area

Site	Surface	Eastings	Northings	Dose (μGy h^{-1})	2σ Uncertainty (μGy h^{-1})
Milsey Bay	Sand	3559	6852	0.009	0.0033
Seacliff	Sand	3605	6845	0.006	0.0033
Peffer Sands	Sand	3620	6829	0.002	0.0032
Ravensheugh	Sand	3626	6818	0.001	0.0032
Bathan Sands	Sand	3631	6813	0.008	0.0033
Belhaven Bay	Sand	3658	6789	0.007	0.0033
Dunbar	Sand/Seaweed	3681	6788	0.011	0.0034
Eyemouth	Sand/Rock/ Seaweed	3943	6645	0.032	0.0039
Coldingham Bay	Sand	3917	6665	0.011	0.0034
St. Abbs	Stone/Seaweed	3919	6673	0.032	0.0039
Pease Bay	Sand	3793	6709	0.016	0.0035
Cove	Stone/Sand	3784	6717	0.030	0.0039
Thorntonloch	Sand	3752	6746	0.005	0.0033
Skateraw	Sand/Pebbles	3737	6755	0.011	0.0034
N, Barns Ness	Sand/Pebbles/ Seaweed	3724	6769	0.012	0.0034
S, Barns Ness	Sand/Pebbles/ Seaweed	3724	6769	0.003	0.0032
Whitesands	Sand	3712	6772	0.007	0.0033
Dunbar	Sand/Pebbles/Seaweed	3680	6792	0.039	0.0042

Figure 7.2 Summary of the gamma dose rate measurements across the Torness survey area



7.4 In-situ beta dosimetry

Beta dosimetry of skin dose [H*(0.07)] was measured on a sailing boat and fishing equipment that were situated close to the coast. Three in-situ beta dose measurements were collected: one sailing boat; one lobster pot; and one fishing rope during the survey. Each result was below the detection limit of 0.2µSv h^{-1} per cm^{-2}.

7.5 Occupancy rates

7.5.1 Occupancy data for the survey area

The Phase 1 interviews revealed that individuals take part in a range of terrestrial, aquatic, and intertidal activities within the survey area (Table 7.3). For terrestrial activities, the most popular activity was dog walking (38 individuals) with the highest occupancy being 2190h y^{-1} at Thorntonloch. The activity with the overall maximum

occupancy was farming spending 4160h y^{-1} within the terrestrial survey area. For the aquatic activities, outdoor swimming was the most popular (115 individuals) and the individual with the highest occupancy spent 137h y^{-1} at Belhaven Bay and Skateraw. The aquatic activity with the overall maximum occupancy was for an individual commercial fishing/creeling spending 3000h y^{-1} at offshore Dunbar Harbour. For the intertidal activities, playing was the most popular (115 individuals) with the highest individual occupancy being 364h y^{-1} at Coldingham Bay.

Table 7.2 Summary of the activities and total number of individuals that take part in the activities. The location of the maximum occupancy is also given

Activity type	Activity	Number of Individuals	Maximum Occupancy (h y^{-1})	Location of Maximum Occupancy (if provided)
Terrestrial	At work	3	2920	Within survey area
Terrestrial	Beekeeping	2	104	Within survey area
Terrestrial	Bird/nature watching	7	1095	Dunbar
Terrestrial	Camping	6	36	Whitesands
Terrestrial	Collecting wild produce	9	52	Thorntonloch
Terrestrial	Crofting	3	312	Within survey area
Terrestrial	Cycling	14	547.5	Thorntonloch
Terrestrial	Dog walking	38	2190	Thorntonloch
Terrestrial	Farming	4	4160	Within survey area
Terrestrial	Gardening	24	1095	Skateraw
Terrestrial	Horse riding	1	3	Within survey area

Activity type	Activity	Number of Individuals	Maximum Occupancy (h y^{-1})	Location of Maximum Occupancy (if provided)
Terrestrial	Litter picking	1	24	Within survey area
Terrestrial	Looking after hens	1	730	Within survey area
Terrestrial	Outdoor work	2	1954	Within survey area
Terrestrial	Painting	1	136	Within survey area
Terrestrial	Playing	2	208	Within survey area
Terrestrial	Rambling/walking	36	730	Skateraw
Terrestrial	Running	2	365	Within survey area
Terrestrial	Shooting	2	32	Within survey area
Terrestrial	Sitting/picnicking/BBQ	20	468	Skateraw
Intertidal	Bait digging	3	52	North Berwick
Intertidal	Sitting/picnicking/BBQ	98	364	Coldingham Bay
Intertidal	Beachcombing	38	241	Coldingham Bay
Intertidal	Bird/nature watching	6	72	Barns Ness and Thorntonloch
Intertidal	Collecting sea glass	9	3	Belhaven Bay
Intertidal	Collecting seaweed	3	5	Thorntonloch
Intertidal	Collecting winkles	2	144	North Berwick and Skateraw
Intertidal	Crabbing	9	12	Coldingham Bay

Activity type	Activity	Number of Individuals	Maximum Occupancy ($h\ y^{-1}$)	Location of Maximum Occupancy (if provided)
Intertidal	Dog walking	81	1095	Thorntonloch and Skateraw
Intertidal	Fishing	34	906	Torness, St Abbs Harbour, Dunbar Harbour
Intertidal	Horse riding	6	12	Coldingham Bay
Intertidal	Jogging	4	104	Dunbar east beach
Intertidal	Lifeguard	1	576	Coldingham Bay
Intertidal	Litter picking	4	1	Coldingham Bay
Intertidal	Outdoor exercise	1	9	Belhaven Bay
Intertidal	Paddling	74	31	North Berwick
Intertidal	Photography	1	2	Cove
Intertidal	Playing	115	364	Coldingham Bay
Intertidal	Research/education	2	48	Killiedraught Bay, Coldingham Bay and St Abbs Harbour
Intertidal	Rock pooling	50	241	Coldingham Bay
Intertidal	Sea angling	1	6	Dunbar Harbour and Skateraw
Intertidal	Sunbathing	15	65	Belhaven Bay
Intertidal	Walking	85	548	Coldingham Bay and North Berwick
Intertidal	Working	1	156	Skateraw and Thorntonloch

Activity type	Activity	Number of Individuals	Maximum Occupancy (h y^{-1})	Location of Maximum Occupancy (if provided)
Aquatic	Being on a dive boat	2	312	St Abbs Harbour
Aquatic	Boat maintenance	3	78	St Abbs Harbour
Aquatic	Body boarding	23	273	Coldingham Bay
Aquatic	Canoeing	2	18	Belhaven Bay
Aquatic	Coasteering	2	39	Belhaven Bay
Aquatic	Commercial fishing/creeling	4	3000	Dunbar Harbour
Aquatic	Dinghy sailing	5	7	Cove
Aquatic	Diving	5	52	St Abbs Harbour
Aquatic	Kayaking	12	30	Thorntonloch
Aquatic	Lifeguard	1	64	Coldingham Bay
Aquatic	Outdoor swimming	115	137	Belhaven Bay and Skateraw
Aquatic	Powerboating	3	18	Eyemouth Harbour
Aquatic	Rowing	1	24	Coldingham Bay
Aquatic	Sailing	2	104	Dunbar Harbour
Aquatic	Sea angling	12	234	North Berwick, Barns Ness and Dunbar
Aquatic	Snorkelling	2	12	Thorntonloch, Skateraw, Coldingham Bay and St Abbs Harbour
Aquatic	Stand-up paddleboarding	29	28	Eyemouth

Activity type	Activity	Number of Individuals	Maximum Occupancy (h y^{-1})	Location of Maximum Occupancy (if provided)
Aquatic	Surfing	23	672	Thorntonloch, Pease Bay, Coldingham Bay and Whitesands
Aquatic	Training	1	312	Dunbar
Aquatic	Wildlife tours	1	1095	To Bass Rock
Aquatic	Windsurfing	2	104	Thorntonloch, Coldingham Bay, St Abbs Harbour and Skateraw

7.5.2 Occupancy rates within one kilometre of Torness (inside/outside work or home)

Individuals living or working within the immediate area of Torness were asked to estimate how much time they spend inside and outside their home or workplace. The results presented in Table 7.3 show the time spent indoors and outdoors on an annual basis. A total of five individuals interviewed worked within 1km of the Torness nuclear licensed site. The highest amount of time spent indoors at work for one individual each was 2080h y^{-1} and the highest amount of time spent outdoors at work for one individual was 2190h y^{-1}. Twenty-seven individuals who lived within 1km of the Torness nuclear licensed site were interviewed. The highest amount of time spent indoors for one individual was 7854h y^{-1} indoors, and the highest amount of time spent in the immediate area outside their house was 2190h y^{-1} for one individual. All figures consider any holiday period away from home with all figures checked and confirmed by the individuals. The highest total occupancy living within 1km of the Torness nuclear licensed site was 8033h y^{-1} for two individuals.

Table 7.3 Occupancy rates of those individuals working or living within 1km of Torness

Survey ID	Indoors at home ($h\ y^{-1}$)	Outdoors at home ($h\ y^{-1}$)	Indoors at work ($h\ y^{-1}$)	Outdoors at work ($h\ y^{-1}$)
167	3213	1428	0	0
84	7854	179	0	0
98	2520	1680	0	0
176	4368	1092	0	0
177	1040	676	0	0
171	5250	700	0	0
262	1152	576	0	0
102	1152	576	0	0
28	5824	1460	2080	0
29	5475	1014	0	0
46	3650	1460	1040	1040
217	3650	2190	0	1300
442	4095	1365	0	0
218	4095	1365	0	0
54	3285	2190	0	8
80	3150	0	0	0
32	1820	1071	0	0
335	3285	0	0	2190
348	1404	0	0	624
51	2555	1825	0	0

Survey ID	Indoors at home ($h\ y^{-1}$)	Outdoors at home ($h\ y^{-1}$)	Indoors at work ($h\ y^{-1}$)	Outdoors at work ($h\ y^{-1}$)
341	5307	1657	156	0
345	5307	1657	0	0
44	3276	0	36	1954
351	3696	1464	0	0
352	3696	1344	0	0
417	3276	780	0	0
81	4914	0	0	0

8 Phase 2 survey results

8.1 Introduction

There were three aims of the Phase 2 surveys conducted. These were to i) validate the Phase 1 face-to-face surveys, ii) identify any major changes to internal/external exposure paths and iii) identify any new pathways within a select group of individuals. To determine the individuals selected, the total dose from all exposure pathways for each individual was estimated. This was used to identify three individuals from different parts of the dose distribution (e.g., the top third, middle third and bottom third of the distribution). It was agreed with SEPA that the Phase 2 survey should target nine individuals. Additional considerations affecting selection were that some individuals (when asked during Phase 1) said they did not want to be contacted again, for some individuals we had incorrect contact details, or individuals did not respond to approaches made by the survey team during the Phase 2 surveys. For Torness, follow up surveys were made in January 2023. Of the individuals contacted within each part of the distribution, follow up surveys were completed for three individuals from the high (A, B and C), medium (D, E and F) and low (G, H and I) group (a total of nine individuals).

8.2 Phase 2 internal exposure

8.2.1 Internal terrestrial

There was no terrestrial food group consumption (all locally sourced within 5km) reported by any individual selected within the high, medium, and low group within Phase 1 of the survey. No individual reported the consumption of terrestrial produce within the Phase 2 survey.

8.2.2 Internal aquatic

Table 8.1 summarises reported changes in aquatic food consumption. Individuals B and C reported consuming fish within the Phase 1 survey. Individual B's consumption was comparable with the Phase 2 survey (though slightly less consumption reported). Individual C reported 50% less fish consumption and approximately 50% more crustacean consumption in the Phase 2 survey.

Table 8.1 Survey comparison of aquatic consumption (kg y^{-1}) for individuals B and C

Food type	B Phase 1 (kg y^{-1})	B Phase 2 (kg y^{-1})	C Phase 1 (kg y^{-1})	C Phase 2 (kg y^{-1})
Fish	15.5	13.7	48	24
Crustacean	5.2	3.2	48	91

8.3 Phase 2 external exposure

8.3.1 External terrestrial

Individual B (high group) was the only individual to report any terrestrial activities within the Phase 1 and Phase 2 survey (Tables 8.2). Cycling was reported in the Phase 2 survey, and this was not an activity that the individual was undertaking when surveyed within the Phase 1 survey.

Table 8.2 Survey comparison of terrestrial activity times for individual B in the high occupancy group

Terrestrial activities	Phase 1 (h y^{-1})	Phase 2 (h y^{-1})
Cycling	-	8

8.3.2 External aquatic

Within the high occupancy group (Table 8.3), Individual A reported no change with activities and occupancy (commercial fishing) between the Phase 1 and Phase 2 surveys.

Individual B reported increased occupancy within the Phase 2 survey with taking up kayaking since the Phase 1 survey and spending more time on intertidal substrate. The individual reported metal detecting in the Phase 2 survey which was not reported in the Phase 1 survey, because of this, handling sediment was evident in the Phase 2 survey. Increased occupancy through dog walking on intertidal substrate was also reported in the Phase 2 survey. Individual C reported comparable occupancy within both the Phase 1 and Phase 2 surveys.

Within the medium occupancy group (Table 8.4), Individual D reported increasing the time spent outdoor swimming between the Phase 1 and 2 surveys. Individual E reported spending slightly less time on intertidal substrate handling sediment in the Phase 2 survey than was reported in the Phase 1 survey. Individual F reported no change between the Phase 1 and Phase 2 surveys.

Within the low occupancy group (Table 8.5), no changes were reported between the Phase 1 and Phase 2 surveys.

Table 8.3 Survey comparison of intertidal and aquatic activity times for the individuals A, B and C in the high group

Intertidal and aquatic activities	A Phase 1 (h y^{-1})	A Phase 2 (h y^{-1})	B Phase 1 (h y^{-1})	B Phase 2 (h y^{-1})	C Phase 1 (h y^{-1})	C Phase 2 (h y^{-1})
Occupancy on sand	-	-	821	1572	-	-
Occupancy on water	3000	3000	546	1057	798	876
Handling of equipment/fishing gear	3480	3480	293	764	824	919
Handling of sediment	-	-	-	112	-	-

Table 8.4 Survey comparison of intertidal and aquatic activity times for the individuals D, E and F in the medium group

Intertidal and aquatic activities	D Phase 1 (h y^{-1})	D Phase 2 (h y^{-1})	E Phase 1 (h y^{-1})	E Phase 2 (h y^{-1})	F Phase 1 (h y^{-1})	F Phase 2 (h y^{-1})
Occupancy on sand	507	422	40	40	173	173
Occupancy on rock	241	242	-	-	-	-
Occupancy in water	60	152	-	-	-	-
Handling of sediment	507	507	40	30	173	173

Table 8.5 Survey comparison of intertidal and aquatic activity times for the individuals G, H and I in the high group

Intertidal and aquatic activities	G Phase 1 (h y^{-1})	G Phase 2 (h y^{-1})	H Phase 1 (h y^{-1})	H Phase 2 (h y^{-1})	I Phase 1 (h y^{-1})	I Phase 2 (h y^{-1})
Occupancy on sand	36	36	26	26	2	2
Handling of sediment	-	-	-	-	2	2

8.4 Living and working within 1km

None of the followed up nine individuals lived or worked within the 1km terrestrial zone.

9 Post Covid-19 habit analysis

It was discussed with SEPA that due to the pandemic individuals' habits may have somewhat changed for different reasons. Individuals were asked if any of their habits (terrestrial, intertidal, and aquatic) had changed since the Covid-19 pandemic. Within the survey a total of 205 individuals provided a definitive answer to whether there had been any changes to habits. Figures 9.1 to 9.4 show individuals' habits post Covid-19.

Figure 9.1 shows that a total of 160 individuals reported that there had been no changes to their habits, 81 individuals reported that they now spent more time outdoors (some individuals indicated that as a family they all spent more time outdoors), 11 individuals reported that they now spent less time outdoors and seven individuals reported that their habits had changed due to 'other' reasons. Figures 9.2, 9.3 and 9.4 provide a breakdown of each category within Table 9.1. Although more individuals reported no change to their habits, a significant number of individuals did report to spending more time outdoors.

Figure 9.1 Post Covid-19 changes in times spent indoors, outdoors and other identified from individuals surveyed

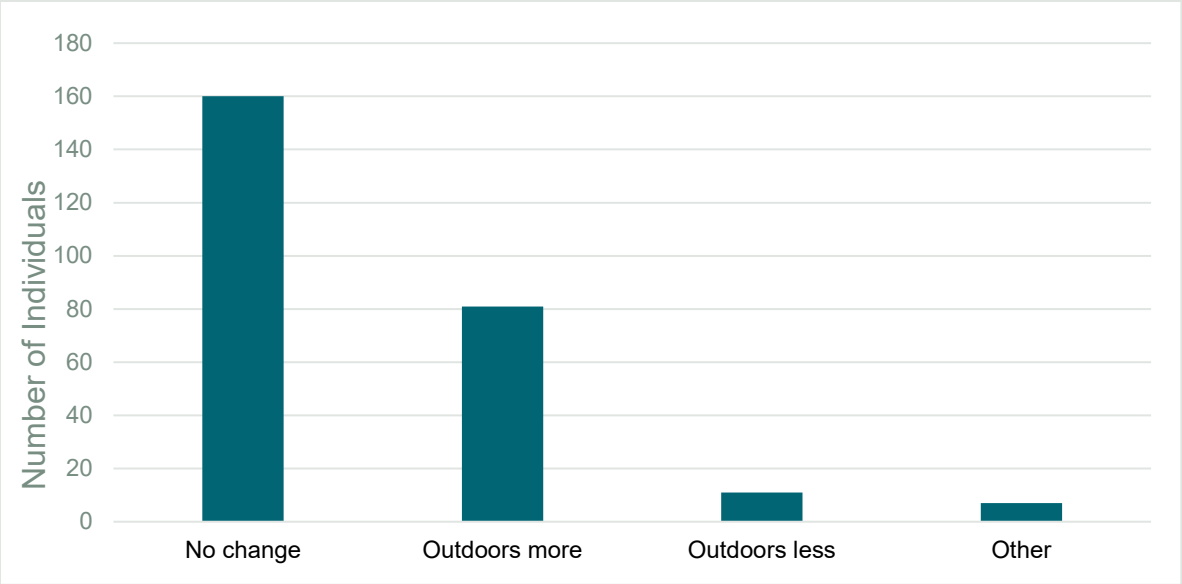


Figure 9.2 Breakdown of habits individuals reported post Covid-19 for those individuals reporting more time spent outdoors

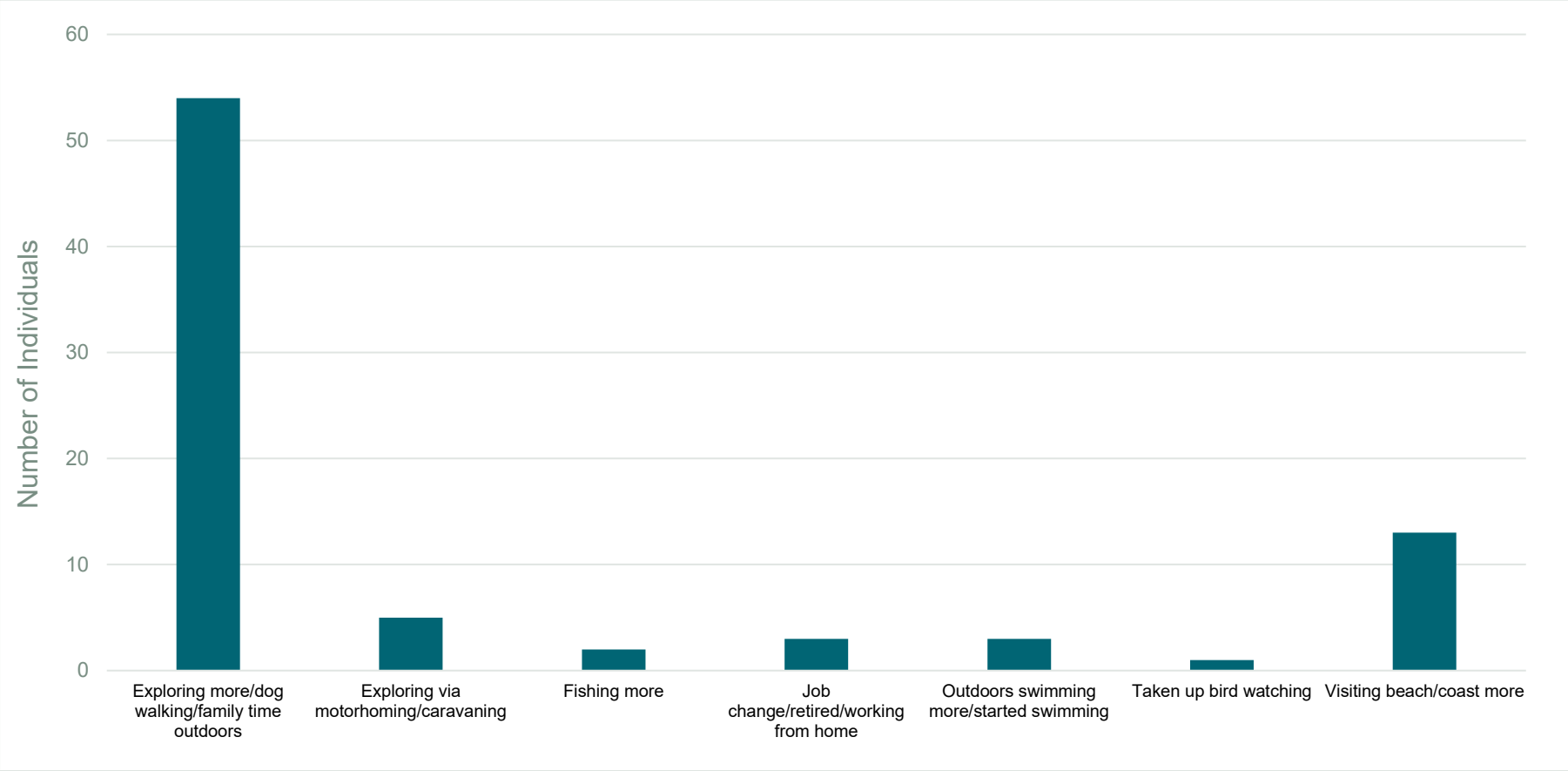


Figure 9.3 Breakdown of habits individuals reported post Covid-19 for those individuals reporting less time spent outdoors

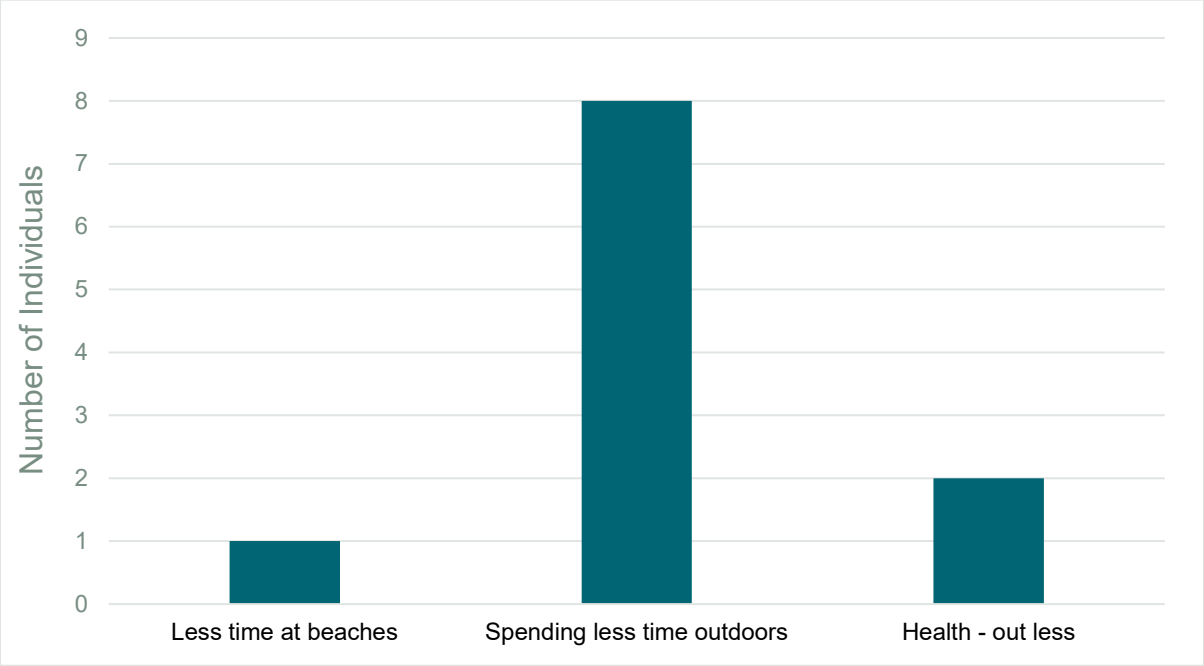
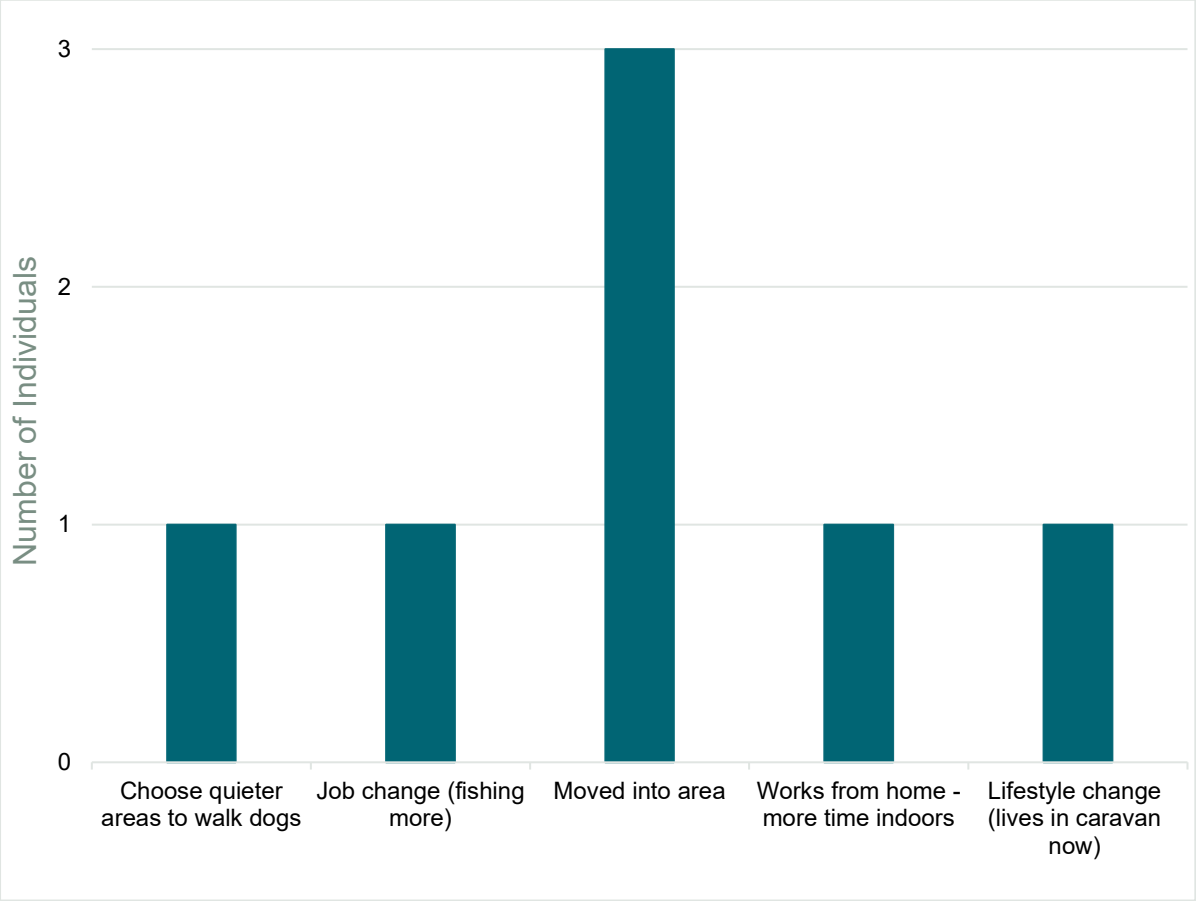


Figure 9.4 Breakdown of 'Other' contributors to post Covid-19 habit change



10 Comparisons with the previous survey

10.1 Introduction

The results from the 2023 Torness Habits Survey have been reported in chapters 4-7 for both the postal survey and the face-to-face Phase 1 survey. These results can be compared with results from the previous habits survey, undertaken in Torness in 2016 by the University of Stirling.

The aquatic and terrestrial face-to-face survey area in the 2023 survey is consistent with the previous 2016 survey.

10.2 Aquatic survey

10.2.1 Phase 1 – adult consumption rates – internal exposure

In 2023, the mean crustacean consumption rate for the high-rate group increased from 29kg y^{-1} to 33kg y^{-1} compared with the 2016 survey. The mean fish and mollusc consumption for the high-rate group decreased in 2023 when compared with the 2016 survey from 101kg y^{-1} to 35kg y^{-1} and 35kg y^{-1} to 6kg y^{-1} respectively. The 2016 mean fish consumption for the high-rate group was much higher due to an 'extreme' consumption determined (maximum consumption of 208kg y^{-1}). This was however the data provided (and was confirmed with the individual) therefore could not be discounted. In the 2023 survey a substantially lower consumption is reflected therefore acknowledgment of this should be considered when comparing the 2023 data with 2016. It should also be noted that all of the consumption habit data provided is dependent on the individuals interviewed during the fieldwork whether this is focussed with specific activity groups e.g. commercial fishing or, with individuals randomly interviewed e.g. whilst fishing from the intertidal substrate. The data provided is therefore dependent upon individuals agreeing to undertake the survey at the time. The main species of fish consumed by the adult high-rate group were cod, mackerel and bass in 2016 compared with cod, mackerel, bass, pollock, and haddock in 2023. The main crustaceans consumed by the adult high-rate group in 2016 and 2023 were common lobster and brown crab. Mollusc consumption in 2016 consisted of mussels, winkles and razor clams by the adult high-rate group

compared to only winkles being consumed in 2023. No wildfowl was consumed in 2023 however consumption of mallard, pink-footed geese, teal, wigeon and grey lag geese were consumed within the 2016 survey. The consumption of marine/intertidal plant/algae (seaweed) by adults was identified in 2016 and 2023.

A comparison between 2016 and 2023 adult consumption rates of aquatic foods in the face-to-face interviews is presented in Table 10.1. The table also provides the mean consumption rates from national data (Smith and Jones, 2003) for comparison.

Table 10.1 Comparison between 2016 and 2023 adult consumption rates of aquatic foods

Food Group	2016 Number of people in the high-rate group	2016 Maximum consumption rate (kg y^{-1})	2016 Mean consumption rate (kg y^{-1})	2023 Number of people in the high-rate group	2023 Maximum consumption rate (kg y^{-1})	2023 Mean consumption rate (kg y^{-1})	National Mean (kg y^{-1})
Fish	11	208	101	9	52	35	15.00
Crustaceans	12	47.5	29	2	48	33	4.00
Molluscs	2	45.4	35	3	6	6	4.00
Wildfowl	1	116	116	ND	ND	ND	ND

ND – not determined

10.2.2 Phase 1 – children and infant consumption rates – internal exposure

The consumption of fish within the children's high-rate group decreased in 2023 compared to 2016. The children's high-rate group consumed only bass in 2023 compared with cod in 2016. No children were found to consume crustaceans or wildfowl in the 2023 survey compared with consumption of both food groups in 2016. No mollusc consumption was determined in either the 2016 or the 2023 survey.

Infants only consumed fish and crustacean in both the 2016 and 2023 survey. Fish consumed within the high-rate group in 2023 was cod and mackerel compared with cod, mackerel, pollock, and salmon in the 2016 survey. Crustacean consumed within the high-rate group in 2016 and 2023 was common lobster. Both fish and crustacean consumption decreased in 2023 from 31kg y^{-1} to 2.6kg y^{-1} and 2kg y^{-1} to 0.15kg y^{-1} respectively, when compared to the 2016 survey.

A comparison between 2016 and 2023 of children and infant consumption rates of aquatic foods in the face-to-face interviews is presented in Table 10.2.

Table 10.2 Comparison between 2016 and 2023 children and infant consumption rates of aquatic foods

Age Group	Food Group	2016 Number of people in the high-rate group	2016 Maximum consumption for the high-rate group (kg y^{-1})	2016 Mean consumption for the high-rate group (kg y^{-1})	2023 Number of people in the high-rate group	2023 Maximum consumption for the high-rate group (kg y^{-1})	2023 Mean consumption rate for the high-rate group (kg y^{-1})
Child (6 to 15 years)	Fish	5	20	12.5	1	2.1	2.1
Child (6 to 15 years)	Crustacean	1	1.5	1.5	ND	ND	ND
Child (6 to 15 years)	Wildfowl	1	116	116	ND	ND	ND
Infant (0 to 5 years)	Fish	1	31.2	31.2	1	2.6	2.6
Infant (0 to 5 years)	Crustacean	1	2	2	1	0.15	0.15

10.2.3 Phase 1 – adult intertidal/aquatic occupancy – external exposure

External exposure was divided into five groups: intertidal activities, aquatic in water activities, aquatic on water activities, handling of equipment, and handling of sediment.

The highest total intertidal occupancy in 2023 was 1095h y^{-1} for an adult on sand and stone substrate spending time dog walking. This is decreased from 2016 with the highest total intertidal occupancy of 1829h y^{-1}.

In 2023 there was a decrease in occupancy for in water, on water, handling equipment and handling sediment compared with the 2016 survey. A comparison is shown in Table 10.3

Table 10.3 Comparison of the 2016 and 2023 aquatic external exposure pathways for adults

Activity	2016 Number of people in the high-rate group	2016 Maximum occupancy for the high-rate group (h y^{-1})	2016 Mean occupancy for the high-rate group (h y^{-1})	2023 Number of people in the high-rate group	2023 Maximum occupancy for the high-rate group (h y^{-1})	2023 Mean occupancy for the high-rate group (h y^{-1})
Aquatic (in water)	1	1372	1372	10	720	444
Aquatic (on water)	2	5864	4547	4	3000	2275
Handling equipment	3	5961	3945	3	3480	2828
Handling sediment	14	1829	1061	4	728	582

10.2.4 Phase 1 – children and infant intertidal/aquatic occupancy – external exposure

Children intertidal/aquatic occupancy external exposure was divided into five groups: intertidal activities, aquatic in water activities, aquatic on water activities, handling of equipment, and handling of sediment.

The highest total intertidal occupancy in 2023 was 832h y^{-1} for a child on sand substrate dog walking, playing, and sitting/picnicking/BBQ, an increase from 2016 with an intertidal occupancy of 811h y^{-1} for a child. The highest total intertidal occupancy increased in 2023 for an infant (spending time dog walking on a sand substrate) compared with infant intertidal occupancy in 2016 (576h y^{-1} and 314h y^{-1} respectively).

The highest occupancy for a child in water, on water and handling equipment decreased in 2023 compared with 2016. However, the highest occupancy for a child handling sediment increased in 2023 when compared to the 2016 survey.

The highest occupancy for an infant in water and handling sediment decreased in 2023 compared with 2016. On water occupancy for an infant was determined in 2016 but not in 2023, and handling equipment was determined in 2023 but not in 2016.

A comparison is shown in Table 10.4.

Table 10.4 Comparison of the 2016 and 2023 aquatic external exposure pathways for children and infants

Age Group	Activity	2016 Number of people in the high-rate group	2016 Maximum occupancy for the high-rate group (h y^{-1})	2016 Mean occupancy for the high-rate group (h y^{-1})	2023 Number of people in the high-rate group	2023 Maximum occupancy for the high-rate group (h y^{-1})	2023 Mean occupancy rate for the high-rate group (h y^{-1})
Child (6 to 15 years)	Aquatic (in water)	4	228	162	2	91	91
Child (6 to 15 years)	Aquatic (on water)	1	548	548	5	10	8.2
Child (6 to 15 years)	Handling equipment	2	148	148	2	91	91
Child (6 to 15 years)	Handling sediment	3	663	663	4	728	391
Infant (0 to 5 years)	Aquatic (in water)	5	228	228	3	20	14
Infant (0 to 5 years)	Aquatic (on water)	2	65	65	ND	ND	ND
Infant (0 to 5 years)	Handling equipment	ND	ND	ND	1	6.5	6.5

Age Group	Activity	2016 Number of people in the high-rate group	2016 Maximum occupancy for the high-rate group (h y^{-1})	2016 Mean occupancy for the high-rate group (h y^{-1})	2023 Number of people in the high-rate group	2023 Maximum occupancy for the high-rate group (h y^{-1})	2023 Mean occupancy rate for the high-rate group (h y^{-1})
Infant (0 to 5 years)	Handling sediment	19	314	314	4	288	200

ND – not determine

10.3 Terrestrial survey

10.3.1 Phase 1 – adult consumption rates – internal exposure

Consumption rates of locally produced food items have increased in the 2023 survey in the green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, wild fungi, sheep meat and eggs food groups in comparison to the 2016 survey.

Consumption rates decreased in the 2023 survey in wild fruit, game and honey food groups in comparison to the 2016 survey.

No consumption for beef or poultry was determined in 2023 compared to consumption determined in the 2016 survey.

No consumption of pig meat, milk or spring water was determined in either the 2016 or 2023 survey.

A comparison between the 2016 and 2023 mean consumption rates for adult consumption of the terrestrial food groups is presented in Table 10.5. The table also provides the mean consumption rates from national data (Smith and Jones, 2003) for comparison.

Table 10.5 Comparison between 2016 and 2023 mean consumption rates of local terrestrial food groups for adults (kg y^{-1} or l y^{-1})

Food group	2016 Mean consumption rate for the high-rate group (kg y^{-1} or l y^{-1})	2023 Mean consumption rate for the high-rate group (kg y^{-1} or l y^{-1})	National mean
Green vegetables	24.1	28.8	15.0
Other vegetables	5	10.2	20.0
Root vegetables	23.5	40.2	10.0
Potatoes	84	130	50.0
Domestic fruit	73	143	20.0
Wild fruit	93	5.4	7
Wild mushrooms	4	6	3
Meat beef	47	ND	15.0
Meat game (birds)	-	2.7	-
Meat game (venison)	-	5.5	ND
Meat game (rabbit/hare)	-	2.5	ND
Meat game (all)	45	-	ND
Meat poultry	4.5	ND	10.0
Meat sheep	9	10	8
Honey	4.5	0.5	2.50
Eggs	14.8	32.1	8.5

ND – not determined

10.3.2 Phase 1 – child consumption rates – internal exposure

In 2023, consumption rates of locally produced food were reported for green vegetables, other vegetables, root vegetables, potatoes, domestic fruit, wild fruit, wild fungi, sheep meat and honey. Compared with 2016, consumption increased for domestic fruit and decreased for wild fruit in 2023. Consumption was found in eggs in 2016 but not in the 2023 survey. Consumption of only domestic fruit, wild fruit and eggs were reported in 2016 survey. The mean consumption rates for children are presented in Table 10.6.

Table 10.6 Comparison between 2016 and 2023 mean consumption rates of local terrestrial food groups for children (kg y^{-1} or l y^{-1})

Food Group	2016 Mean consumption rate for the high-rate group (kg y^{-1} or l y^{-1})	2023 Mean consumption rate for the high-rate group (kg y^{-1} or l y^{-1})
Green vegetables	ND	7.2
Other vegetables	ND	4
Root vegetables	ND	1.7
Potatoes	ND	3.1
Domestic fruit	42.3	44.2
Wild fruit	0.9	0.2
Wild fungi	ND	0.03
Meat sheep	ND	5
Honey	ND	0.33
Eggs	10.7	ND

ND – not determined

10.4 Occupancy living/working within 1km of Torness

Table 10.7 presents the comparisons between the 2016 and 2023 survey occupancy rates within the direct radiation survey area (h y^{-1}). The table displays the time spent indoors and outdoors of their home (living) and for those who work and spend time indoors and outdoors within 1km of the Torness nuclear licensed site (Torness site workers were not included in either survey). In 2023, the total occupancy and outdoor occupancy decreased compared with 2016. However, indoor occupancy increased in 2023 compared with the 2016 survey. Both outdoor and indoor occupancy for individuals working within 1km of the Torness site decreased in 2023 compared with the 2016 survey.

Table 10.7 Comparison between 2016 and 2023 occupancy rates for people living and working within the direct radiation area (h y^{-1})

Occupancy	2016	2023
Highest total	8395	8033
Highest indoor at home	6935	7854
Highest outdoor at home	3370	2190
Highest indoor at work	2295	2080
Highest outdoor at work	2240	2190

11 Recommendations and suggestions for monitoring programme changes.

11.1 Introduction

The Habits Survey presents results for occupancy, activity, and food consumption from three main sources of community engagement: (i) Postal questionnaire (n = 171); (ii) face-to-face surveys (n = 465); and (iii) several meetings and informal contacts. These data have been supplemented with radiometric surveys including: (i) a car-borne and hand-held gamma spectrometry survey (n = 11788 (carborne); n = 21222 (handheld)); (ii) in situ gamma dose rate (n = 18 intertidal); and (iv) Beta skin dose assessments (n = 3).

11.2 Ongoing monitoring

The RIFE report demonstrates a comprehensive set of monitoring undertaken annually around the Torness site encompassing a range of food types and environmental substrates. The gamma dose rates reported by RIFE are generally higher than those reported here because the RIFE data include the cosmic contribution to dose. This assessment reports the terrestrial gamma dose rate only. When taking this into account, the results are similar. Samples taken and reported by SEPA are provided within the RIFE Reports (e.g., RIFE, 2022) and covered cod, mackerel, crab, lobster, Nephrops, winkles, seaweed (*Fuscus vesiculosus*), sediment, seawater, milk, apples, beetroot, Brussel sprouts, cabbage, carrots, chicken, eggs, goose, partridge, pheasant, rosehips, turnips, venison, wild mushrooms, grass, soil, and freshwater.

11.3 Conclusions and recommendations

Information collected between Phase 1 and 2 surveys demonstrates that there can be differences in data due to a change in habits over the course of a year and/or there is an over or underestimating when reporting of information on consumption and occupancy. This is despite extensive steps taken to check the validity of the results collected during the face-to-face questions.

In some cases, there are differences in the surveyed individual responses between Phases 1 and 2. These differences may be genuine, e.g., a real change in consumption or occupancy between the different parts of the year when the Phase 1 and 2 surveys were conducted, or they may be due to different estimates of their consumption/activities, e.g., Phase 2 surveys are conducted via pre-arranged telephone interviews and the survey individuals may be able to better prepare for the questions than when they are approached in the survey area at random.

Overall, for Torness the results of the Phase 2 surveys largely demonstrate that they provide confidence in the representativeness of the data collected throughout the Phase 1 surveys. It is anticipated that some work can still be done to explain the differences between Phase 1 and 2 surveys e.g., by establishing whether they are due to seasonal/weather conditions, or an over/under-estimating on the part of the survey individual. The survey team will consider additional ways to evaluate this in further surveys.

It is recommended that SEPA's routine monitoring continues as is (i.e., as prior to the Covid-19 pandemic) as no new potential exposure pathways were identified during this survey.

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Appendices

Appendix A

Appendix A1: Raw data

Table A1.1 Phase 1 adult fish consumption

Observation number	Food type	Sum of consumption (kg y^{-1})
121	Bass	4.5
121	Mackerel	41
171	Mackerel	5.4
293	Cod	16
304	Cod	16
325	Cod	16
379	Mackerel	52
431	Cod	2. 8
431	Mackerel	3
431	Haddock	3.8
38	Mackerel	0. 7
49	Bass	13.6
49	Cod	7.3
49	Pollock	5.7
50	Cod	2.5
50	Mackerel	0.6
50	Mackerel	6.8
93	Cod	2.5
93	Mackerel	1. 4

Observation number	Food type	Sum of consumption (kg y^{-1})
111	Mackerel	0. 7
120	Bass	2.1
163	Mackerel	0.7
182	Mackerel	52
207	Mackerel	3
207	Haddock	2. 8
208	Mackerel	3
208	Haddock	2. 8
209	Mackerel	3
209	Haddock	2. 8
210	Mackerel	3
210	Haddock	2. 8
211	Mackerel	3
211	Haddock	2. 8
213	Bass	13.6
213	Cod	7.3
213	Pollock	5.7
312	Cod	11
312	Mackerel	4.5
328	Mackerel	0.8
329	Cod	10
329	Mackerel	10
332	Haddock	48

Observation number	Food type	Sum of consumption (kg y^{-1})
336	Mackerel	1.6
341	Mackerel	22.7
353	Mackerel	1.1
78	Cod	2.5
78	Mackerel	0.6
342	Mackerel	1.6
345	Mackerel	22.7
347	Mackerel	1.1

Table A1.2 Phase 1 children fish consumption

Observation number	Food type	Sum of consumption (kg y^{-1})
116	Bass	2.1

Table A1.3 Phase 1 infant fish consumption

Observation number	Food type	Sum of consumption (kg y^{-1})
77	Cod	2
77	Mackerel	0.6

Table A1.4 Phase 1 adult crustacean consumption

Observation number	Food type	Sum of consumption (kg y^{-1})
267	Prawns (langoustines)	1.7
293	Brown crab	7.9

Observation number	Food type	Sum of consumption (kg y^{-1})
293	Common lobster	7.9
304	Brown crab	7.9
304	Common lobster	7.9
325	Brown crab	7.9
325	Common lobster	7.9
351	Common lobster	0.5
352	Common lobster	0.5
390	Common lobster	0.2
420	Crab	18
133	Prawns (langoustines)	1.7
136	Prawns (langoustines)	1.7
191	Common lobster	0.2
312	Brown crab	0.7
312	Common lobster	4.5
332	Common lobster	48
336	Brown crab	1.4
336	Common lobster	5.5
360	Common lobster	2
342	Brown crab	1.4
342	Common lobster	5.5

Table A1.5 Phase 1 infant crustacean consumption

Observation number	Food type	Sum of consumption (kg y^{-1})
192	Common lobster	0.2

Table A1.6 Phase 1 adult mollusc consumption

Observation number	Food type	Sum of consumption (kg y^{-1})
118	Winkles	6
117	Winkles	6
39	Winkles	6

Table A1.7: Phase 1 adult in water activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. outdoors swimming at multiple beaches in the area

Observation number	Aquatic activity	Occupancy (h y^{-1})
354	Outdoor swimming	0.96
354	Outdoor swimming	0.96
354	Outdoor swimming	0.96
380	Outdoor swimming	3.4
380	Outdoor swimming	3.4
397	Outdoor swimming	1
397	Stand-up paddle boarding	2
397	Stand-up paddle boarding	2
397	Stand-up paddle boarding	2
15	Body boarding	39

Observation number	Aquatic activity	Occupancy (h y^{-1})
15	Coasteering	39
15	Outdoor swimming	19.5
15	Surfing	39
26	Outdoor swimming	29.25
37	Outdoor swimming	0.1
58	Outdoor swimming	1
59	Outdoor swimming	26
61	Outdoor swimming	4.95
87	Outdoor swimming	4.16
87	Outdoor swimming	4.16
87	Outdoor swimming	4.16
166	Surfing	156
166	Surfing	156
166	Surfing	156
174	Outdoor swimming	20
174	Outdoor swimming	9
174	Outdoor swimming	1
175	Outdoor swimming	0.6
175	Outdoor swimming	0.3
175	Stand-up paddle boarding	0.33
201	Body boarding	10
201	Outdoor swimming	10
201	Surfing	10

Observation number	Aquatic activity	Occupancy (h y^{-1})
212	Outdoor swimming	6
212	Stand-up paddle boarding	6
223	Outdoor swimming	3
265	Outdoor swimming	64
266	Outdoor swimming	1.7
287	Outdoor swimming	5
293	Outdoor swimming	48
293	Surfing	168
293	Surfing	168
293	Surfing	168
293	Surfing	168
304	Outdoor swimming	48
325	Outdoor swimming	48
325	Surfing	168
325	Surfing	168
325	Surfing	168
325	Surfing	168
367	Surfing	78
367	Surfing	78
379	Outdoor swimming	2
382	Outdoor swimming	17.16
382	Stand-up paddle boarding	1.5
389	Outdoor swimming	9

Observation number	Aquatic activity	Occupancy (h y^{-1})
389	Outdoor swimming	0.4
464	Body boarding	8
464	Coasteering	0.75
464	Diving	48
464	Lifeguard	64
464	Outdoor swimming	112
464	Stand-up paddle boarding	8
464	Surfing	32
6	Outdoor swimming	30
21	Outdoor swimming	0.2
22	Stand-up paddle boarding	3
24	Diving	10
24	Snorkelling	6
28	Outdoor swimming	3
30	Body boarding	6
30	Surfing	260
30	Surfing	260
30	Windsurfing	78
34	Outdoor swimming	60
36	Diving	52
36	Outdoor swimming	26
36	Outdoor swimming	26
36	Outdoor swimming	26

Observation number	Aquatic activity	Occupancy (h y^{-1})
36	Outdoor swimming	26
36	Snorkelling	3
36	Snorkelling	3
36	Snorkelling	3
36	Snorkelling	3
36	Stand-up paddle boarding	3
36	Stand-up paddle boarding	3
36	Stand-up paddle boarding	3
36	Stand-up paddle boarding	3
36	Windsurfing	26
36	Windsurfing	26
36	Windsurfing	26
36	Windsurfing	26
46	Outdoor swimming	1.8
46	Outdoor swimming	1.8
50	Outdoor swimming	13
50	Surfing	6
51	Outdoor swimming	0.02
52	Outdoor swimming	0.02
68	Outdoor swimming	1
83	Outdoor swimming	1.5
85	Surfing	156
85	Surfing	156

Observation number	Aquatic activity	Occupancy (h y^{-1})
85	Surfing	156
90	Outdoor swimming	4
105	Stand-up paddle boarding	15
106	Stand-up paddle boarding	1.5
138	Outdoor swimming	5
155	Outdoor swimming	5
156	Outdoor swimming	5
190	Outdoor swimming	3.25
197	Outdoor swimming	9
197	Outdoor swimming	0.4
198	Outdoor swimming	17.16
199	Outdoor swimming	17.16
200	Outdoor swimming	17.16
202	Outdoor swimming	17.16
204	Outdoor swimming	117
206	Outdoor swimming	3
239	Body boarding	10
239	Outdoor swimming	5
239	Stand-up paddle boarding	6
240	Body boarding	10
240	Outdoor swimming	5
240	Stand-up paddle boarding	5
277	Outdoor swimming	1.5

Observation number	Aquatic activity	Occupancy (h y^{-1})
282	Body boarding	10
282	Outdoor swimming	5
282	Stand-up paddle boarding	6
290	Diving	2
294	Outdoor swimming	1.5
295	Outdoor swimming	39
296	Outdoor swimming	39
296	Stand-up paddle boarding	3
296	Surfing	48
303	Outdoor swimming	4
303	Surfing	20
308	Body boarding	273
319	Outdoor swimming	58.5
319	Outdoor swimming	58.5
319	Outdoor swimming	9.75
319	Outdoor swimming	9.75
322	Body boarding	12
322	Outdoor swimming	9
322	Stand-up paddle boarding	13
322	Surfing	208
323	Outdoor swimming	78
323	Surfing	312
324	Outdoor swimming	26

Observation number	Aquatic activity	Occupancy (h y^{-1})
326	Outdoor swimming	1
326	Outdoor swimming	1
329	Outdoor swimming	20
330	Outdoor swimming	1
338	Body boarding	104
353	Outdoor swimming	0.5
404	Surfing	39
410	Outdoor swimming	0.1
418	Outdoor swimming	2
419	Outdoor swimming	2
421	Diving	2
423	Stand-up paddle boarding	3
423	Surfing	48
424	Stand-up paddle boarding	3
424	Surfing	48
425	Stand-up paddle boarding	3
427	Outdoor swimming	39
441	Outdoor swimming	1
441	Outdoor swimming	1
448	Stand-up paddle boarding	28
18	Outdoor swimming	0.2
154	Outdoor swimming	36
229	Body boarding	10

Observation number	Aquatic activity	Occupancy (h y^{-1})
229	Outdoor swimming	10
229	Surfing	10
230	Outdoor swimming	6
230	Stand-up paddle boarding	6
231	Outdoor swimming	3
339	Outdoor swimming	26
347	Outdoor swimming	0.5
370	Outdoor swimming	0.5
371	Outdoor swimming	15
371	Stand-up paddle boarding	15
373	Body boarding	14
373	Outdoor swimming	7
375	Body boarding	14
375	Outdoor swimming	7

Table A1.8 Phase 1 children in water activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. outdoors swimming at multiple beaches in the area

Observation number	Aquatic activity	Occupancy (h y^{-1})
7	Outdoor swimming	20
62	Outdoor swimming	3
62	Surfing	12
63	Outdoor swimming	3

Observation number	Aquatic activity	Occupancy (h y^{-1})
63	Surfing	12
65	Outdoor swimming	3
65	Surfing	12
66	Outdoor swimming	3
104	Outdoor swimming	0.3
107	Outdoor swimming	1
130	Outdoor swimming	2
131	Outdoor swimming	2
142	Outdoor swimming	12.5
153	Outdoor swimming	12.5
160	Body boarding	6
161	Body boarding	6
185	Surfing	26
220	Outdoor swimming	1.5
220	Stand-up paddle boarding	1
221	Outdoor swimming	1.5
221	Stand-up paddle boarding	1
236	Outdoor swimming	2
236	Surfing	7
242	Body boarding	10
242	Outdoor swimming	5
242	Stand-up paddle boarding	5
259	Outdoor swimming	8

Observation number	Aquatic activity	Occupancy (h y^{-1})
259	Stand-up paddle boarding	8
260	Outdoor swimming	8
260	Stand-up paddle boarding	8
331	Outdoor swimming	1
422	Stand-up paddle boarding	3
443	Outdoor swimming	3
443	Outdoor swimming	3
444	Outdoor swimming	3
444	Outdoor swimming	3
445	Outdoor swimming	3
445	Outdoor swimming	3
449	Stand-up paddle boarding	28
450	Stand-up paddle boarding	28
145	Body boarding	40
146	Body boarding	40
232	Outdoor swimming	1.7
232	Stand-up paddle boarding	10
233	Outdoor swimming	3
344	Outdoor swimming	26
234	Outdoor swimming	1.7
234	Stand-up paddle boarding	10
235	Outdoor swimming	3
376	Body boarding	14

Observation number	Aquatic activity	Occupancy (h y^{-1})
376	Outdoor swimming	7
377	Body boarding	14
377	Outdoor swimming	7
378	Body boarding	14
378	Outdoor swimming	7

Table A1.9 Phase 1 infant in water activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. outdoors swimming at multiple beaches in the area

Observation number	Aquatic activity	Occupancy (h y^{-1})
100	Body boarding	6.5
237	Body boarding	2
8	Outdoor swimming	20
159	Outdoor swimming	12.5
237	Outdoor swimming	7
446	Outdoor swimming	3
446	Outdoor swimming	3
108	Outdoor swimming	1

Table A1.10 Phase 1 adult on water activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. kayaking at multiple beaches in the area

Observation number	Aquatic activity	Occupancy (h y^{-1})
265	Wildlife tours	1095

Observation number	Aquatic activity	Occupancy (h y^{-1})
15	Canoeing	18
55	Canoeing	3
61	Kayaking	6
87	Kayaking	2
170	Boat maintenance	2
170	Sea angling	56
171	Sea angling	24
201	Kayaking	10
262	Sailing	12
267	Commercial fishing/creeling	3000
293	Sailing	104
325	Boat maintenance	52
325	Commercial fishing/creeling	2496
379	Sea angling	24
382	Kayaking	3
392	Kayaking	30
420	Commercial fishing/creeling	2106
420	Commercial fishing/creeling	351
431	Power boating	9
431	Power boating	9
431	Sea angling	12
24	Being on a dive boat	30
33	Sea angling	15

Observation number	Aquatic activity	Occupancy (h y^{-1})
36	Being on a dive boat	312
43	Kayaking	2
50	Kayaking	6
50	Rowing	24
89	Sea angling	56
182	Sea angling	24
203	Kayaking	6
312	Sea angling	78
312	Sea angling	78
312	Sea angling	78
312	Training	312
322	Kayaking	13
332	Boat maintenance	78
332	Commercial fishing/creeling	780
336	Power boating	8
336	Sea angling	20
341	Sea angling	24
353	Sea angling	4
356	Sea angling	3
229	kayaking	10
342	Power boating	8
342	Sea angling	20
373	Dinghy sailing	7

Observation number	Aquatic activity	Occupancy (h y^{-1})
375	Dinghy sailing	7

Table A1.11 Phase 1 children on water activities

Observation number	Aquatic activity	Occupancy (h y^{-1})
234	Kayaking	10
232	Kayaking	10
378	Dinghy sailing	7
377	Dinghy sailing	7
376	Dinghy sailing	7

Table A1.12 Phase 1 adult intertidal activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. dog walking at multiple beaches in the area

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
3	Dog walking	0	104	0	0	0
3	Outdoor exercise class	0	9	0	0	0
3	Sitting/picnicking/ BBQ	0	52	0	0	0
3	Dog walking	0	104	0	0	0
3	Dog walking	0	104	0	0	0
3	Dog walking	0	104	0	0	0
4	Sitting/picnicking/ BBQ	4	0	0	0	0
4	Playing	4	0	0	0	0
6	Dog walking	0	72	0	0	0
6	Playing	0	72	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
6	Dog walking	0	72	0	0	0
6	Playing	0	72	0	0	0
6	Playing	0	72	0	0	0
6	Dog walking	0	72	0	0	0
6	Playing	0	72	0	0	0
6	Dog walking	0	72	0	0	0
10	Playing	0	58.4	0	0	0
10	Playing	0	58.4	0	0	0
10	Beachcombing	0	58.4	0	0	0
10	Beachcombing	0	58.4	0	0	0
11	Playing	0	8	0	0	0
12	Dog walking	0	0.75	0	0	0
13	Dog walking	0	36	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
14	Dog walking	0	0.75	0	0	0
15	Playing	0	1.5	0	0	0
15	Sitting/picnicking/ BBQ	0	1.5	0	0	0
15	Dog walking	0	104	0	0	0
15	Walking	0	78	0	0	0
15	Sunbathing	0	1.5	0	0	0
26	Paddling	0	0.66	0	0	0
26	Playing	0	0.66	0	0	0
26	Sitting/picnicking/ BBQ	0	0.66	0	0	0
26	Walking	0	2	0	0	0
58	Research/education	0	0.5	0	0	0.5
59	Dog walking	0	208	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
59	Dog walking	0	780	0	0	0
26	Sitting/picnicking/ BBQ	0	5	0	0	0
26	Sunbathing	0	52	0	0	0
26	Dog walking	0	104	0	0	0
27	Sitting/picnicking /BBQ	0	0	0	39	0
28	Dog walking	0	91.25	0	0	0
28	Sitting/picnicking/ BBQ	0	26	0	0	0
29	Dog walking	0	91.25	0	0	0
31	Sitting/picnicking/ BBQ	0	0	6	0	0
31	Walking	0	0	6	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
31	Sitting/picnicking/ BBQ	0	0	6	0	0
31	Bird/Nature watching	0	0	6	0	0
31	Beachcombing	0	0	6	0	0
31	Beachcombing	0	0	6	0	0
31	Walking	0	0	6	0	0
31	Bird/Nature watching	0	0	6	0	0
34	Rock pooling	0	0	0	0	240.9
34	Beachcombing	0	240.9	0	0	0
34	Sitting/picnicking/ BBQ	0	25	0	0	0
34	Walking	0	240.9	0	0	0
35	Beachcombing	0	182.5	0	0	0
35	Paddling	0	1	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
35	Dog walking	0	365	0	0	0
37	Sitting/picnicking/ BBQ	0	0.5	0	0	0
37	Playing	0	0.5	0	0	0
37	Walking	0	0.5	0	0	0
37	Sunbathing	0	0.5	0	0	0
37	Walking	0	0.5	0	0	0
38	Fishing	0	0	1	0	0
39	Collecting winkles	0	0	24	0	0
39	Walking	0	0	8	0	0
40	Fishing	0	0	0	0	120
42	Walking	0	0.5	0	0	0
42	Beachcombing	0	0.5	0	0	0
43	Fishing	0	0	0	0	14

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
44	Dog walking	0	548	0	0	0
45	Dog walking	0	72	0	24	0
46	Dog walking	0	0	547.5	0	0
46	Dog walking	0	0	547.5	0	0
47	Crabbing	0	0	0	0	2
48	Working	0	26	0	0	0
48	Working	0	130	0	0	0
49	Fishing	0	0	40	0	0
50	Crabbing	0	0	0	12	0
50	Playing	0	52	0	0	0
50	Sunbathing	0	52	0	0	0
51	Walking	0	9	0	0	0
51	Collecting seaweed	0	5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
52	Walking	0	9	0	0	0
53	Paddling	0	31.2	0	0	0
53	Playing	0	156	0	0	0
54	Sunbathing	3	0	0	0	0
55	Dog walking	0	365	0	0	0
55	Sitting/picnicking/ BBQ	0	3	0	0	0
57	Sitting/picnicking/ BBQ	0	7.92	0	0	0
57	Walking	0	7.92	0	0	0
57	Beachcombing	0	7.92	0	0	0
58	Walking	0	13	13	13	13
58	Rock pooling	0	0	2	0	0
58	Beachcombing	0	13	13	13	13

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
59	Dog walking	0	156	0	0	0
59	Sitting/picnicking/ BBQ	0	6.5	0	0	0
59	Paddling	0	6.5	0	0	0
60	Sitting/picnicking/ BBQ	0	52	0	0	0
60	Jogging	0	6	0	0	0
61	Walking	0	8	0	0	0
61	Playing	0	6	0	0	0
70	Sitting/picnicking/ BBQ	0	2	0	0	0
70	Paddling	0	2	0	0	0
70	Playing	0	2	0	0	0
71	Dog walking	0	2	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
74	Dog walking	0	6	0	0	0
74	Dog walking	0	6	0	0	0
74	Dog walking	0	6	0	0	0
74	Dog walking	0	6	0	0	0
75	Playing	0	7.2	0	0	0
75	Playing	0	7.2	0	0	0
75	Paddling	0	0.96	0	0	0
75	Paddling	0	0.96	0	0	0
75	Paddling	0	0.96	0	0	0
75	Playing	0	7.2	0	0	0
87	Walking	0	65	0	0	0
87	Walking	0	65	0	0	0
87	Walking	0	65	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
88	Walking	0	0.5	0	0	0
90	Walking	0	6	0	0	0
91	Horse riding	0	12	0	0	0
91	Dog walking	0	182.5	0	0	0
92	Fishing	0	46	0	0	0
92	Walking	0	0.5	0	0	0
92	Fishing	0	0	0	0	12
93	Fishing	0	0	0	0	72
94	Fishing	0	0	0	0	260
94	Fishing	0	0	0	0	15
95	Fishing	0	0	0	0	6
95	Fishing	0	0	0	0	450
95	Fishing	0	0	0	0	450

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
96	Dog walking	0	182.5	0	0	0
97	Paddling	0	3	0	0	0
97	Rock pooling	0	3	0	0	0
97	Paddling	0	3	0	0	0
97	Rock pooling	0	3	0	0	0
97	Sitting/picnicking/ BBQ	0	3	0	0	0
97	Playing	0	3	0	0	0
97	Playing	0	3	0	0	0
97	Sitting/picnicking/ BBQ	0	3	0	0	0
98	Dog walking	0	105	0	0	0
103	Dog walking	0	4	0	0	0
109	Dog walking	0	2	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
110	Walking	0	52	0	0	0
111	Fishing	0	0	1	0	0
112	Fishing	0	0	1	0	0
113	Fishing	0	0	1	0	0
121	Fishing	0	0	0	0	165
121	Fishing	0	357.5	0	0	0
121	Fishing	0	33	0	0	0
121	Fishing	0	82.5	0	0	0
123	Rock pooling	0	0.5	0	0.5	0
123	Rock pooling	0	0.5	0	0.5	0
129	Walking	0	3	0	0	0
129	Playing	0	3	0	0	0
132	Walking	0	0.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
138	Playing	0	10	0	0	0
138	Sitting/picnicking/ BBQ	0	10	0	0	0
138	Rock pooling	0	0	0	0	10
140	Walking	0	36	0	0	0
1152	Paddling	0	274	0	0	0
155	Playing	0	10	0	0	0
155	Sitting/picnicking/ BBQ	0	10	0	0	0
155	Rock pooling	0	0	0	0	10
156	Rock pooling	0	0	0	0	10
156	Sitting/picnicking/ BBQ	0	10	0	0	0
156	Playing	0	10	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
162	Paddling	0	0.96	0	0	0
162	Paddling	0	0.96	0	0	0
162	Paddling	0	0.96	0	0	0
162	Playing	0	7.2	0	0	0
162	Playing	0	7.2	0	0	0
162	Playing	0	7.2	0	0	0
163	Fishing	0	0	0	0	18
167	Dog walking	0	26	0	0	0
169	Walking	0	234	0	0	0
170	Walking	0	6	0	0	0
171	Collecting seaweed	0	1	0	0	0
172	Sea Angling	0	3	0	0	0
172	Sea Angling	0	0	0	0	3

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
172	Walking	0	3	0	0	0
173	Dog walking	0	182.5	0	0	0
174	Sitting/picnicking/ BBQ	0	3	0	0	0
174	Dog walking	0	39	0	0	0
174	Paddling	0	3	0	0	0
174	Dog walking	0	39	0	0	0
174	Playing	0	3	0	0	0
174	Rock pooling	0	3	0	0	0
174	Sitting/picnicking/ BBQ	0	3	0	0	0
174	Paddling	0	3	0	0	0
174	Rock pooling	0	3	0	0	0
174	Playing	0	3	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
175	Walking	0	0.5	0	0	0
175	Collecting seaweed	0	0	0	0	3
178	Dog walking	0	273.75	0	0	0
179	Horse riding	0	12	0	0	0
179	Dog walking	0	182.5	0	0	0
180	Playing	0	24	0	0	0
186	Sitting/picnicking/ BBQ	0	6	0	0	0
190	Sitting/picnicking/ BBQ	0	6	0	0	0
191	Sitting/picnicking/ BBQ	0	10	0	0	0
191	Paddling	0	0.25	0	0	0
193	Sitting/picnicking/ BBQ	0	2	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
194	Sitting/picnicking/ BBQ	0	4	0	0	0
197	Sitting/picnicking/ BBQ	0	2	0	0	0
198	Sitting/picnicking/ BBQ	0	104	0	0	0
199	Sitting/picnicking/ BBQ	0	104	0	0	0
200	Sitting/picnicking/ BBQ	0	104	0	0	0
201	Sitting/picnicking/ BBQ	0	12.5	0	0	0
201	Paddling	0	12.5	0	0	0
201	Rock pooling	0	0	0	0	12.5
201	Walking	0	12.5	0	0	0
201	Walking	0	12.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
201	Paddling	0	12.5	0	0	0
201	Rock pooling	0	0	0	0	12.5
201	Sitting/picnicking/ BBQ	0	12.5	0	0	0
202	Sitting/picnicking/ BBQ	0	104	0	0	0
203	Dog walking	0	52	0	0	0
203	Dog walking	0	9	0	0	0
203	Dog walking	0	9	0	0	0
203	Sitting/picnicking/ BBQ	0	6	0	0	0
203	Dog walking	0	9	0	0	0
421	Beachcombing	0	0	0	3	0
212	Sunbathing	0	1	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
212	Playing	0	2	0	0	0
212	Dog walking	0	192	0	0	0
212	Paddling	0	24	0	0	0
212	Beachcombing	0	96	0	0	0
212	Rock pooling	0	0	0	0	96
214	Bird/Nature watching	0	0	1	0	0
214	Bird/Nature watching	0	0	1	0	0
215	Sitting/picnicking/ BBQ	0	5	0	0	0
215	Paddling	0	0.12	0	0	0
218	Paddling	0	4	0	0	0
218	Walking	0	117	0	0	0
219	Walking	0	7	0	0	0
222	Collecting sea glass	0	0	0.5	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
222	Sitting/picnicking/ BBQ	0	0	0.5	0	0
222	Collecting sea glass	0	0	1	0	0
222	Sitting/picnicking/ BBQ	0	0	1	0	0
223	Sitting/picnicking/ BBQ	0	0	6	0	0
223	Paddling	0	0	6	0	0
223	Beachcombing	0	0	6	0	0
223	Playing	0	0	6	0	0
223	Dog walking	0	0	6	0	0
224	Sitting/picnicking/ BBQ	0	1	0	0	0
224	Collecting sea glass	0	1	0	0	0
224	Collecting sea glass	0	0	0.2	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
224	Sitting/picnicking/ BBQ	0	0	0.5	0	0
225	Dog walking	0	5	0	0	0
225	Dog walking	0	3	0	0	0
226	Dog walking	0	5	0	0	0
226	Dog walking	0	3	0	0	0
229	Walking	0	12.5	0	0	0
229	Rock pooling	0	0	0	0	12.5
229	Sitting/picnicking/ BBQ	0	12.5	0	0	0
229	Rock pooling	0	0	0	0	12.5
229	Paddling	0	12.5	0	0	0
229	Walking	0	12.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
229	Sitting/picnicking/ BBQ	0	12.5	0	0	0
229	Paddling	0	12.5	0	0	0
230	Playing	0	2	0	0	0
230	Beachcombing	0	96	0	0	0
230	Dog walking	0	192	0	0	0
230	Rock pooling	0	0	0	0	96
230	Paddling	0	24	0	0	0
230	Sunbathing	0	1	0	0	0
231	Sitting/picnicking/ BBQ	0	0	6	0	0
231	Beachcombing	0	0	6	0	0
231	Dog walking	0	0	6	0	0
231	Playing	0	0	6	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
231	Paddling	0	0	6	0	0
239	Litter picking	0	1	0	0	0
239	Paddling	0	5	0	0	0
239	Sitting/picnicking/ BBQ	0	20	0	0	0
239	Collecting sea glass	0	2	0	0	0
240	Collecting sea glass	0	2	0	0	0
240	Paddling	0	5	0	0	0
240	Litter picking	0	1	0	0	0
240	Sitting/picnicking/ BBQ	0	20	0	0	0
241	Walking	0	96	0	0	0
241	fishing from shore	0	520	0	0	0
243	Walking	0	0.33	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
243	Paddling	0	0.5	0	0	0
243	Sitting/picnicking/ BBQ	0	24	0	0	0
244	Walking	0	0.33	0	0	0
244	Sitting/picnicking/ BBQ	0	24	0	0	0
244	Paddling	0	0.5	0	0	0
246	Walking	0	0.5	0	0	0
248	Sitting/picnicking/ BBQ	0	0	0	0	1
248	Playing	0	0	2	0	0
249	Playing	0	0	2	0	0
250	Playing	0	0	2	0	0
254	Walking	0	4	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
258	Sitting/picnicking/ BBQ	0	3	0	0	0
258	Playing	0	12	0	0	0
263	Dog walking	0	4	0	0	0
265	Jogging	0	104	0	0	0
265	Dog walking	0	730	0	0	0
265	Dog walking	0	24	0	0	0
266	Sitting/picnicking/ BBQ	0	8	0	0	0
269	Walking	0	52	0	0	0
270	Fishing	0	0	0	0	7
270	Crabbing	0	0	0	0	7
271	Rock pooling	0	0.5	0	0.5	0
271	Rock pooling	0	0.5	0	0.5	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
272	Playing	0	3	0	0	0
272	Walking	0	3	0	0	0
273	Research/education	0	8	0	0	8
273	Research/education	0	8	0	0	8
273	Research/education	0	16	0	0	0
274	Playing	0	0	1	0	0
275	Paddling	0	2	0	0	0
275	Playing	0	2	0	0	0
275	Sitting/picnicking/ BBQ	0	2	0	0	0
276	Sitting/picnicking/ BBQ	0	9	0	0	0
277	Walking	0	7	0	0	0
278	Paddling	0	0.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
278	Paddling	0	0.5	0	0	0
278	Dog walking	0	1.5	0	0	0
278	Dog walking	0	2.5	0	0	0
279	Collecting sea glass	0	0	0.5	0	0
279	Collecting sea glass	0	0	1	0	0.5
279	Sitting/picnicking/ BBQ	0	0	1	0	0
279	Sitting/picnicking/ BBQ	0	0	0.5	0	0
280	Dog walking	0	5	0	0	0
280	Dog walking	0	3	0	0	0
281	Sitting/picnicking/ BBQ	0	14	0	0	0
282	Paddling	0	5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
282	Litter picking	0	1	0	0	0
282	Sitting/picnicking/ BBQ	0	20	0	0	0
282	Collecting sea glass	0	2	0	0	0
283	Walking	0	24	0	0	0
284	Bait digging	0	3	0	0	0
285	Fishing	0	0	0	9	0
286	Fishing	0	0	18	0	0
286	Dog walking	0	182.5	0	0	0
286	Dog walking	0	182.5	0	0	0
287	Rock pooling	0	0	0	0	10
287	Sitting/picnicking/ BBQ	0	10	0	0	0
287	Playing	0	10	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
289	Fishing	0	0	0	0	274
291	Walking	0	7	0	0	0
291	Fishing	0	0	0	0	8
292	Sitting/picnicking/ BBQ	0	24	0	0	0
292	Paddling	0	0.5	0	0	0
292	Walking	0	0.33	0	0	0
293	Dog walking	0	36	0	0	0
293	Dog walking	0	36	0	0	0
293	Dog walking	0	36	0	0	0
294	Jogging	0	52	0	0	0
294	Walking	0	273.75	0	0	0
295	Dog walking	0	730	0	0	0
295	Paddling	0	1.33	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
296	Dog walking	0	104	0	0	0
296	Sitting/picnicking/ BBQ	0	364	0	0	0
296	Playing	0	364	0	0	0
297	Bird/Nature watching	0	10	0	0	0
297	Bird/Nature watching	0	10	0	0	0
297	Fishing	0	0	0	0	18
298	Dog walking	0	70	0	0	0
298	Dog walking	0	70	0	0	0
298	Dog walking	0	70	0	0	0
298	Dog walking	0	70	0	0	0
298	Dog walking	0	70	0	0	0
299	Walking	0	3.5	0	0	0
299	Rock pooling	0	3.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
299	Beachcombing	0	3.5	0	0	0
299	Rock pooling	0	3.5	0	0	0
299	Beachcombing	0	3.5	0	0	0
299	Walking	0	3.5	0	0	0
300	Walking	0	0.5	0	0	0
301	Fishing	0	3	0	0	0
302	Walking	0	36	0	0	0
303	Dog walking	0	12	0	0	0
304	Dog walking	0	36	0	0	0
304	Dog walking	0	36	0	0	0
304	Dog walking	0	36	0	0	0
305	Walking	0	26	0	0	0
305	Walking	0	17.16	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
306	Walking	0	273.75	0	0	0
306	Walking	0	273.75	0	0	0
307	Paddling	0	40	0	0	0
310	Collecting winkles	0	0	0	0	108
310	Collecting winkles	0	0	0	0	36
311	Bird/Nature watching	0	36	0	0	0
311	Bird/Nature watching	0	0	36	0	0
312	Dog walking	0	273.75	0	0	0
312	Dog walking	0	273.75	0	0	0
312	Dog walking	0	273.75	0	0	0
313	Walking	0	0	2	0	0
314	Horse riding	0	2.75	0	0	0
316	Rock pooling	0	12	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
316	Sitting/picnicking/ BBQ	0	156	0	0	0
316	Paddling	0	4.5	0	0	0
317	photography	0	0	2	0	0
318	Fishing	0	0	0	0	6
320	Paddling	0	14	0	0	0
320	Crabbing	0	0	0	0	1
320	Rock pooling	0	21	0	0	0
321	Walking	0	6	0	0	0
321	Playing	0	6	0	0	0
321	Rock pooling	0	6	0	0	0
321	Paddling	0	6	0	0	0
321	Walking	0	6	0	0	0
321	Beachcombing	0	6	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
321	Paddling	0	6	0	0	0
321	Playing	0	6	0	0	0
321	Beachcombing	0	6	0	0	0
321	Rock pooling	0	6	0	0	0
323	Dog walking	0	104	0	0	0
323	Bait digging	0	3	0	0	0
323	Fishing	0	0	0	0	36
324	Dog walking	0	52	0	0	0
325	Dog walking	0	36	0	0	0
325	Dog walking	0	36	0	0	0
325	Dog walking	0	36	0	0	0
326	Playing	0	7.5	0	0	0
326	Walking	0	7.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
327	Walking	0	13	0	0	0
327	Playing	0	13	0	0	0
327	Walking	0	13	0	0	0
327	Beachcombing	0	13	0	0	0
327	Paddling	0	13	0	0	0
327	Rock pooling	0	13	0	0	0
327	Playing	0	13	0	0	0
327	Beachcombing	0	13	0	0	0
327	Paddling	0	13	0	0	0
328	Fishing	0	0	0	5.5	0
328	Fishing	0	0	0	5.5	0
328	Fishing	0	0	0	5	0
329	Playing	0	72	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
329	Dog walking	0	72	0	0	0
329	Playing	0	72	0	0	0
329	Playing	0	72	0	0	0
329	Dog walking	0	72	0	0	0
329	Dog walking	0	72	0	0	0
329	Dog walking	0	72	0	0	0
329	Playing	0	72	0	0	0
329	fishing from shore	0	96	0	0	0
330	Paddling	0	0.66	0	0	0
330	Playing	0	0.66	0	0	0
330	Sitting/picnicking/ BBQ	0	0.66	0	0	0
333	Sitting/picnicking/ BBQ	0	3	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
333	Playing	0	12	0	0	0
334	Sitting/picnicking/ BBQ	0	156	0	0	0
334	Rock pooling	0	12	0	0	0
334	Paddling	0	4.5	0	0	0
336	Walking	0	0	4	0	0
337	Walking	0	4	0	0	0
340	Dog walking	0	52	0	0	0
341	Dog walking	0	468	0	0	0
6660	Walking	0	0	4	0	0
347	Dog walking	0	0	52	0	0
349	Dog walking	0	104	0	0	0
350	Paddling	0	0.17	0	0	0
350	Dog walking	0	34.32	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
351	Walking	0	2	0	0	0
351	Walking	0	12	0	0	0
351	Walking	0	12	0	0	0
351	Walking	0	1	0	0	0
353	Dog walking	0	0	52	0	0
354	Dog walking	0	6	0	0	0
354	Dog walking	0	6	0	0	0
354	Dog walking	0	6	0	0	0
354	Dog walking	0	6	0	0	0
357	Walking	0	0.5	0	0	0
357	Beachcombing	0	0.5	0	0	0
360	Fishing	0	0	0	0	14
365	Dog walking	0	26	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
366	Walking	0	18	0	0	0
367	Walking	0	520	0	0	0
367	Sitting/picnicking/ BBQ	0	6	0	0	0
369	Sitting/picnicking/ BBQ	0	5	0	0	0
369	Walking	0	5	0	0	0
369	Bird/Nature watching	0	5	0	0	0
370	Walking	0	1	0	0	0
371	Playing	0	10	0	0	0
372	Walking	0	12	0	0	0
373	Dog walking	0	0	28	0	0
374	Walking	0	12	0	0	0
375	Dog walking	0	0	28	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
381	Sitting/picnicking/ BBQ	0	4	0	0	0
382	Sitting/picnicking/ BBQ	0	104	0	0	0
389	Sitting/picnicking/ BBQ	0	2	0	0	0
390	Paddling	0	0.25	0	0	0
390	Sitting/picnicking/ BBQ	0	10	0	0	0
391	Sitting/picnicking/ BBQ	0	2	0	0	0
392	Fishing	0	0	0	0	6
393	Fishing	0	0	0	156	0
393	Fishing	0	0	16	0	0
393	Fishing	0	0	0	80	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
393	Bait digging	0	52	0	0	0
393	Fishing	0	0	0	52	0
394	Dog walking	0	9	0	0	0
394	Dog walking	0	9	0	0	0
394	Dog walking	0	52	0	0	0
394	Sitting/picnicking/ BBQ	0	6	0	0	0
394	Dog walking	0	9	0	0	0
396	Beachcombing	0	8	0	0	0
396	Walking	0	6	0	0	0
398	Dog walking	0	26	0	0	0
398	Sitting/picnicking/ BBQ	0	156	0	0	0
399	Bird/Nature watching	0	0	1	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
399	Bird/Nature watching	0	0	1	0	0
410	Sunbathing	0	65	0	0	0
410	Sitting/picnicking/ BBQ	0	65	0	0	0
402	Sunbathing	0	65	0	0	0
402	Sitting/picnicking/ BBQ	0	65	0	0	0
403	Sunbathing	0	65	0	0	0
403	Sitting/picnicking/ BBQ	0	65	0	0	0
404	Sitting/picnicking/ BBQ	0	65	0	0	0
404	Sunbathing	0	65	0	0	0
405	Sitting/picnicking/ BBQ	0	65	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
405	Sunbathing	0	65	0	0	0
406	Sitting/picnicking/ BBQ	0	65	0	0	0
406	Sunbathing	0	65	0	0	0
407	Sunbathing	0	65	0	0	0
407	Sitting/picnicking/ BBQ	0	65	0	0	0
408	Sitting/picnicking/ BBQ	0	65	0	0	0
408	Sunbathing	0	65	0	0	0
409	Sitting/picnicking/ BBQ	0	5	0	0	0
409	Paddling	0	0.12	0	0	0
416	Dog walking	0	104	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
423	Sitting/picnicking/ BBQ	0	364	0	0	0
423	Dog walking	0	104	0	0	0
423	Playing	0	364	0	0	0
427	Paddling	0	1.33	0	0	0
427	Dog walking	0	730	0	0	0
428	Dog walking	0	70	0	0	0
428	Dog walking	0	70	0	0	0
428	Dog walking	0	70	0	0	0
428	Dog walking	0	70	0	0	0
428	Dog walking	0	70	0	0	0
429	Rock pooling	0	6	0	0	0
429	Walking	0	6	0	0	0
429	Playing	0	6	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
429	Beachcombing	0	6	0	0	0
429	Walking	0	6	0	0	0
429	Paddling	0	6	0	0	0
429	Beachcombing	0	6	0	0	0
429	Rock pooling	0	6	0	0	0
429	Playing	0	6	0	0	0
429	Paddling	0	6	0	0	0
433	Rock pooling	0	13	0	0	0
433	Beachcombing	0	13	0	0	0
433	Walking	0	13	0	0	0
433	Paddling	0	13	0	0	0
433	Playing	0	13	0	0	0
433	Rock pooling	0	13	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
433	Beachcombing	0	13	0	0	0
433	Walking	0	13	0	0	0
433	Paddling	0	13	0	0	0
433	Playing	0	13	0	0	0
433	Rock pooling	0	13	0	0	0
434	Walking	0	13	0	0	0
434	Playing	0	13	0	0	0
434	Rock pooling	0	13	0	0	0
434	Paddling	0	13	0	0	0
434	Walking	0	13	0	0	0
434	Beachcombing	0	13	0	0	0
434	Rock pooling	0	13	0	0	0
434	Paddling	0	13	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
434	Beachcombing	0	13	0	0	0
434	Playing	0	13	0	0	0
437	Rock pooling	0	3.5	0	0	0
437	Walking	0	3.5	0	0	0
437	Beachcombing	0	3.5	0	0	0
437	Walking	0	3.5	0	0	0
437	Rock pooling	0	3.5	0	0	0
437	Beachcombing	0	3.5	0	0	0
438	Walking	0	3.5	0	0	0
438	Beachcombing	0	3.5	0	0	0
438	Rock pooling	0	3.5	0	0	0
438	Walking	0	3.5	0	0	0
438	Rock pooling	0	3.5	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
438	Beachcombing	0	3.5	0	0	0
441	Playing	0	7.5	0	0	0
441	Walking	0	7.5	0	0	0
442	Walking	0	117	0	0	0
447	Paddling	0	14	0	0	0
447	Rock pooling	0	21	0	0	0
447	Crabbing	0	0	0	0	1
448	Crabbing	0	0	0	0	1
448	Rock pooling	0	21	0	0	0
448	Paddling	0	14	0	0	0
452	Playing	0	58.4	0	0	0
452	Beachcombing	0	58.4	0	0	0
452	Beachcombing	0	58.4	0	0	0

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
452	Playing	0	58.4	0	0	0
453	Sitting/picnicking/ BBQ	0	0.66	0	0	0
453	Paddling	0	0.66	0	0	0
453	Playing	0	0.66	0	0	0
454	Playing	0	58.4	0	0	0
454	Beachcombing	0	58.4	0	0	0
454	Playing	0	58.4	0	0	0
454	Beachcombing	0	58.4	0	0	0
459	Playing	0	8	0	0	0
460	Playing	0	8	0	0	0
464	Lifeguard	0	576	0	0	0
1	Fishing	0	0	0	0	18
2	Fishing	0	0	0	0	96

Observation number	Intertidal activity	Occupancy on mud (h y^{-1})	Occupancy on Sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
2	Fishing	0	0	0	0	192
2	Fishing	0	0	0	0	96

Table A1.13 Phase 1 children intertidal activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. dog walking at locations in the area

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
5	Crabbing	0	0	0	3
5	Fishing	0	0	0	3
7	Dog walking	72	0	0	0
7	Dog walking	72	0	0	0
7	Dog walking	72	0	0	0
7	Dog walking	72	0	0	0
7	Playing	72	0	0	0
7	Playing	72	0	0	0
7	Playing	72	0	0	0
7	Playing	72	0	0	0
7	fishing from shore	16	0	0	0
62	Dog walking	52	0	0	0
62	Dog walking	52	0	0	0
62	Dog walking	52	0	0	0
62	Dog walking	52	0	0	0
62	Playing	26	0	0	0
62	Playing	26	0	0	0
62	Rock pooling	0	0	0	52
62	Rock pooling	0	0	0	52

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
62	Rock pooling	0	0	0	52
62	Rock pooling	0	0	0	52
62	Sitting/picnicking/BBQ	13	0	0	0
63	Dog walking	52	0	0	0
63	Dog walking	52	0	0	0
63	Dog walking	52	0	0	0
63	Dog walking	52	0	0	0
63	Rock pooling	0	0	0	52
63	Rock pooling	0	0	0	52
63	Rock pooling	0	0	0	52
63	Rock pooling	0	0	0	52
63	Sitting/picnicking/BBQ	13	0	0	0
65	Playing	26	0	0	0
65	Sitting/picnicking/BBQ	13	0	0	0
66	Playing	26	0	0	0
66	Sitting/picnicking/BBQ	13	0	0	0
99	Paddling	3	0	0	0
99	Paddling	3	0	0	0
99	Playing	3	0	0	0
99	Playing	3	0	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
99	Rock pooling	3	0	0	0
99	Rock pooling	3	0	0	0
99	Sitting/picnicking/BBQ	3	0	0	0
99	Sitting/picnicking/BBQ	3	0	0	0
104	Dog walking	4	0	0	0
107	Playing	24	0	0	0
115	Playing	0	2	0	0
115	Fishing	0	1	0	0
116	Playing	0	2	0	0
116	Fishing	0	1	0	0
124	Rock pooling	0.5	0	0.5	0
124	Rock pooling	0.5	0	0.5	0
125	Rock pooling	0.5	0	0.5	0
125	Rock pooling	0.5	0	0.5	0
126	Rock pooling	0.5	0	0.5	0
126	Rock pooling	0.5	0	0.5	0
127	Rock pooling	0.5	0	0.5	0
127	Rock pooling	0.5	0	0.5	0
128	Rock pooling	0.5	0	0.5	0
128	Rock pooling	0.5	0	0.5	0
130	Playing	3	0	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
130	Walking	3	0	0	0
131	Playing	3	0	0	0
131	Walking	3	0	0	0
142	Playing	10	0	0	0
142	Rock pooling	0	0	0	10
142	Sitting/picnicking/BBQ	10	0	0	0
153	Playing	10	0	0	0
153	Rock pooling	0	0	0	10
153	Sitting/picnicking/BBQ	10	0	0	0
160	Sitting/picnicking/BBQ	9	0	0	0
161	Sitting/picnicking/BBQ	9	0	0	0
183	Playing	26	0	0	0
184	Playing	26	0	0	0
188	Playing	6	0	0	0
195	Paddling	1	0	0	0
195	Playing	3	0	0	0
196	Paddling	1	0	0	0
196	Playing	3	0	0	0
220	Playing	2	1.5	0	0
220	Walking	3.5	0	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
221	Playing	2	1.5	0	0
221	Walking	3.5	0	0	0
221	Jogging	2	0	0	0
228	Paddling	1	0	0	0
228	Paddling	1	0	0	0
228	Playing	2	0	0	0
228	Playing	4	0	0	0
236	Paddling	2	0	0	0
236	Playing	12	0	0	0
238	Paddling	2	0	0	0
238	Playing	12	0	0	0
242	Paddling	5	0	0	0
242	Playing	10	0	0	0
242	Litter picking	1	0	0	0
242	Sitting/picnicking/BBQ	10	0	0	0
242	Collecting sea glass	2	0	0	0
245	Playing	85.8	0	0	0
245	Playing	26	0	0	0
247	Playing	7	0	0	0
253	Paddling	0.24	0	0	0
253	Playing	0	2	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
256	Horse riding	2.75	0	0	0
257	Horse riding	2.75	0	0	0
259	Playing	16	0	0	0
259	Collecting sea glass	3	0	0	0
260	Playing	16	0	0	0
260	Collecting sea glass	3	0	0	0
331	Paddling	0.66	0	0	0
331	Playing	0.66	0	0	0
331	Sitting/picnicking/BBQ	0.66	0	0	0
422	Dog walking	104	0	0	0
422	Playing	364	0	0	0
422	Sitting/picnicking/BBQ	364	0	0	0
432	Beachcombing	6	0	0	0
432	Beachcombing	6	0	0	0
432	Paddling	6	0	0	0
432	Paddling	6	0	0	0
432	Playing	6	0	0	0
432	Playing	6	0	0	0
432	Rock pooling	6	0	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
432	Rock pooling	6	0	0	0
432	Walking	6	0	0	0
432	Walking	6	0	0	0
435	Beachcombing	13	0	0	0
435	Beachcombing	13	0	0	0
435	Paddling	13	0	0	0
435	Paddling	13	0	0	0
435	Playing	13	0	0	0
435	Playing	13	0	0	0
435	Rock pooling	13	0	0	0
435	Rock pooling	13	0	0	0
435	Walking	13	0	0	0
435	Walking	13	0	0	0
440	Beachcombing	3.5	0	0	0
440	Beachcombing	3.5	0	0	0
440	Rock pooling	3.5	0	0	0
440	Rock pooling	3.5	0	0	0
440	Walking	3.5	0	0	0
440	Walking	3.5	0	0	0
443	Playing	7.5	0	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
443	Walking	7.5	0	0	0
444	Playing	7.5	0	0	0
444	Walking	7.5	0	0	0
445	Playing	7.5	0	0	0
445	Walking	7.5	0	0	0
449	Crabbing	0	0	0	1
449	Paddling	14	0	0	0
449	Rock pooling	21	0	0	0
450	Crabbing	0	0	0	1
450	Paddling	14	0	0	0
450	Playing	10.5	0	0	0
450	Rock pooling	10.5	0	0	0
455	Beachcombing	58.4	0	0	0
455	Beachcombing	58.4	0	0	0
455	Playing	58.4	0	0	0
455	Playing	58.4	0	0	0
456	Beachcombing	58.4	0	0	0
456	Beachcombing	58.4	0	0	0
456	Playing	58.4	0	0	0
456	Playing	58.4	0	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
457	Beachcombing	58.4	0	0	0
457	Beachcombing	58.4	0	0	0
457	Playing	58.4	0	0	0
457	Playing	58.4	0	0	0
461	Playing	8	0	0	0
463	Playing	8	0	0	0
151	Paddling	274	0	0	0
232	Paddling	12.5	0	0	0
232	Paddling	12.5	0	0	0
232	Rock pooling	0	0	0	12.5
232	Rock pooling	0	0	0	12.5
232	Walking	12.5	0	0	0
232	Walking	12.5	0	0	0
232	Sitting/picnicking/BBQ	12.5	0	0	0
232	Sitting/picnicking/BBQ	12.5	0	0	0
233	Beachcombing	0	6	0	0
233	Dog walking	0	6	0	0
233	Paddling	0	6	0	0
233	Playing	0	6	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on stone (h y^{-1})	Occupancy on rock (h y^{-1})
233	Sitting/picnicking/BBQ	0	6	0	0
344	Dog walking	52	0	0	0
234	Paddling	12.5	0	0	0
234	Paddling	12.5	0	0	0
234	Rock pooling	0	0	0	12.5
234	Rock pooling	0	0	0	12.5
234	Walking	12.5	0	0	0
234	Walking	12.5	0	0	0
234	Sitting/picnicking/BBQ	12.5	0	0	0
234	Sitting/picnicking/BBQ	12.5	0	0	0
235	Beachcombing	0	6	0	0
235	Dog walking	0	6	0	0
235	Paddling	0	6	0	0
235	Playing	0	6	0	0
235	Sitting/picnicking/BBQ	0	6	0	0
376	Dog walking	0	28	0	0
377	Dog walking	0	28	0	0
378	Dog walking	0	28	0	0

Table A1.14 Phase 1 infant intertidal activities. Where observation numbers are listed more than once for same activity, this indicates that the activity is undertaken at more than one location, e.g. dog walking at locations in the area

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on rock (h y^{-1})
8	Playing	72	0	0
8	Dog walking	72	0	0
8	Dog walking	72	0	0
8	Playing	72	0	0
8	Playing	72	0	0
8	Dog walking	72	0	0
8	Playing	72	0	0
8	Dog walking	72	0	0
16	Dog walking	0.75	0	0
17	Dog walking	0.75	0	0
69	Playing	24	0	0
72	Sitting/picnicking/BBQ	2	0	0
72	Paddling	2	0	0
72	Playing	2	0	0
73	Paddling	2	0	0
73	Sitting/picnicking/BBQ	2	0	0
73	Playing	2	0	0
76	Paddling	0.96	0	0
76	Playing	7.2	0	0
76	Playing	7.2	0	0
76	Playing	7.2	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on rock (h y^{-1})
76	Paddling	0.96	0	0
76	Paddling	0.96	0	0
82	Playing	7.2	0	0
82	Playing	7.2	0	0
82	Paddling	0.96	0	0
82	Paddling	0.96	0	0
82	Playing	7.2	0	0
82	Paddling	0.96	0	0
100	Rock pooling	3	0	0
100	Playing	3	0	0
100	Sitting/picnicking/BBQ	3	0	0
100	Playing	3	0	0
100	Sitting/picnicking/BBQ	3	0	0
100	Rock pooling	3	0	0
100	Paddling	3	0	0
100	Paddling	3	0	0
198	Playing	24	0	0
159	Sitting/picnicking/BBQ	10	0	0
159	Rock pooling	0	0	10
159	Playing	10	0	0
164	Playing	0	1	0
165	Playing	0	1	0
189	Playing	6	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on rock (h y^{-1})
192	Playing	10	0	0
192	Paddling	0.25	0	0
216	Paddling	0.12	0	0
216	Playing	5	0	0
227	Playing	4	0	0
227	Paddling	1	0	0
227	Playing	2	0	0
227	Paddling	1	0	0
237	Playing	10	0	0
255	Horse riding	2.75	0	0
346	Sitting/picnicking/BBQ	156	0	0
346	Rock pooling	12	0	0
346	Paddling	4.5	0	0
358	Walking	0.5	0	0
358	Beachcombing	0.5	0	0
359	Beachcombing	0.5	0	0
359	Walking	0.5	0	0
426	Paddling	1.33	0	0
430	Playing	6	0	0
430	Beachcombing	6	0	0
430	Paddling	6	0	0
430	Walking	6	0	0
430	Paddling	6	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on rock (h y^{-1})
430	Walking	6	0	0
430	Beachcombing	6	0	0
430	Rock pooling	6	0	0
430	Playing	6	0	0
430	Rock pooling	6	0	0
436	Walking	13	0	0
436	Playing	13	0	0
436	Rock pooling	13	0	0
436	Rock pooling	13	0	0
436	Playing	13	0	0
436	Paddling	13	0	0
436	Beachcombing	13	0	0
436	Paddling	13	0	0
436	Beachcombing	13	0	0
436	Walking	13	0	0
439	Rock pooling	3.5	0	0
439	Walking	3.5	0	0
439	Beachcombing	3.5	0	0
439	Rock pooling	3.5	0	0
439	Walking	3.5	0	0
439	Beachcombing	3.5	0	0
446	Walking	7.5	0	0
446	Playing	7.5	0	0

Observation number	Intertidal activity	Occupancy on sand (h y^{-1})	Occupancy on sand and stone (h y^{-1})	Occupancy on rock (h y^{-1})
458	Playing	58.4	0	0
458	Playing	58.4	0	0
458	Beachcombing	58.4	0	0
458	Beachcombing	58.4	0	0
462	Playing	8	0	0
465	Playing	8	0	0

Table A1.15 Phase 1 adult handling sediment activities

Observation number	Sum of handling sediment (h y^{-1})
3	52
60	52
180	24
275	6
4	8
15	3
26	5
37	1
47	2
55	3
57	16
58	2
59	13

Observation number	Sum of handling sediment (h y^{-1})
61	6
162	24.5
171	1
174	24
175	3
201	75
212	218
223	24
266	8
270	7
271	2
272	3
273	48
274	1
276	9
287	30
367	6
369	5
381	4
382	104
389	2
390	10.3
391	2

Observation number	Sum of handling sediment (h y^{-1})
393	52
394	6
396	8
398	156
409	5
453	2
6	288
10	234
11	8
19	2
24	1
27	39
28	26
31	24
34	507
35	184
39	24
42	0.5
50	64
51	5
53	187
70	6
75	24.5

Observation number	Sum of handling sediment (h y^{-1})
97	24
123	2
129	3
138	30
155	30
156	30
186	6
190	6
191	10.3
193	2
194	4
197	2
198	104
199	104
200	104
202	104
203	6
205	3
215	5
218	4
222	3
224	2.7
239	28

Observation number	Sum of handling sediment (h y^{-1})
240	28
243	24.5
244	24.5
248	3
249	2
250	2
258	15
278	1
279	3.5
281	14
282	28
285	3
292	24.5
295	1.3
296	728
299	14
307	40
310	144
316	173
320	36
321	48
323	3
326	7.5

Observation number	Sum of handling sediment (h y^{-1})
327	91
329	288
330	2
333	15
334	173
350	0.2
357	0.5
401	65
402	65
403	65
404	65
405	65
406	65
407	65
408	65
423	728
427	1.3
429	48
433	117
434	104
437	14
438	14
441	7.5

Observation number	Sum of handling sediment (h y^{-1})
447	36
448	36
452	234
454	234
459	8
460	8
152	274
229	75
230	218
231	24
371	10

Table A1.16 Phase 1 children handling sediment activities

Observation number	Sum of handling sediment (h y^{-1})
5	3
7	288
62	273
63	221
65	39
66	39
99	24
107	24
115	2

Observation number	Sum of handling sediment (h y^{-1})
116	2
124	2
125	2
126	2
127	2
128	2
130	3
131	3
142	30
151	274
153	30
160	9
161	9
183	26
184	26
188	6
195	4
196	4
220	3.5
221	3.5
228	8
232	75
233	24

Observation number	Sum of handling sediment (h y^{-1})
234	75
235	24
236	14
238	14
242	28
245	112
247	7
253	2.2
259	19
260	19
331	2
422	728
432	48
435	104
440	14
443	7.5
444	7.5
445	7.5
449	36
450	36
455	234
456	234
457	234

Observation number	Sum of handling sediment (h y^{-1})
461	8
463	8

Table A1.17 Phase 1 infant handling sediment activities

Observation number	Sum of handling sediment (h y^{-1})
8	288
69	24
72	6
73	6
76	24.5
82	24.5
100	24
108	24
159	30
164	1
165	1
189	6
192	10.3
216	5
227	8
237	10
346	173
358	0.5

Observation number	Sum of handling sediment (h y^{-1})
359	0.5
426	1.3
430	48
436	104
439	14
446	7.5
458	234
462	8
465	8

Table A1.18 Phase 1 adult handling equipment activities

Observation number	Sum of handling equipment (h y^{-1})
15	96
24	36
30	6
33	15
36	324
38	1
40	123
43	14
49	43.5
50	24
55	3

Observation number	Sum of handling equipment (h y^{-1})
89	56
92	61
93	73
94	277
95	956
105	1.7
111	1
113	1
114	1
121	638
163	18
170	58
171	26
172	6.5
182	24
201	10
229	10
239	11
240	11
241	520
264	70
267	3480
270	7

Observation number	Sum of handling equipment (h y^{-1})
282	11
285	9.5
286	18.5
289	274
291	8
297	18
301	3
308	273
310	6
312	293
318	7
322	12
323	36
325	2548
328	16
329	96
332	884
336	28
338	104
341	27
342	28
353	4
356	3

Observation number	Sum of handling equipment (h y^{-1})
360	14
373	21
375	21
379	24
382	1.5
392	6.8
393	335
420	2457
431	30
464	8.8
1	19.5
2	400

Table A1.19 Phase 1 children handling equipment activities

Observation number	Sum of handling equipment (h y^{-1})
5	3
7	16
115	1
116	1
145	40
146	40
160	6
161	6

Observation number	Sum of handling equipment (h y^{-1})
185	2
220	0.3
221	0.3
242	10
376	21
377	21
378	21

Table A1.20 Phase 1 infant handling equipment activities

Observation number	Sum of handling equipment (h y^{-1})
100	6.5
237	2

Table A1.21 Phase 1 adult terrestrial activities

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
26	Rambling/walking	180
55	Dog walking	1460
58	Bird/nature watching	6
58	Rambling/walking	6
58	Sitting/picnicking/BBQ	3
98	Cycling	120
98	Dog walking	105
98	Gardening	427

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
98	Collecting wild produce	4
98	Painting	136
132	Bird/nature watching	2
167	Gardening	260
167	Rambling/walking	548
171	Gardening	1095
173	Dog walking	365
173	Gardening	730
174	Dog walking	47.5
175	Rambling/walking	0.5
176	Looking after hens	730
177	Dog walking	137
177	Gardening	100
181	Bird/nature watching	1
252	At work	752
261	Cycling	274
261	Gardening	52
261	Collecting wild produce	6
262	Dog walking	144
262	Sitting/picnicking/BBQ	288
268	Rambling/walking	3
269	Dog walking	52
269	Gardening	104

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
269	Rambling/walking	365
293	Dog walking	365
293	Gardening	24
304	Dog walking	365
315	Sitting/picnicking/BBQ	9
325	Dog walking	365
325	Gardening	24
335	Bee keeping	104
335	Dog walking	365
335	Collecting wild produce	52
335	Farming	2352
348	Farming	624
351	Gardening	117
351	Rambling/walking	24
351	Collecting wild produce	2
352	Gardening	117
355	Farming	4160
361	Cycling	548
361	Gardening	548
365	Horse riding	3
396	Bird/nature watching	1095
398	Dog walking	548
398	Gardening	104

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
442	Cycling	78
442	Rambling/walking	117
442	Camping	22
9	Rambling/walking	9
9	Sitting/picnicking/BBQ	0.2
10	Rambling/walking	114
10	Sitting/picnicking/BBQ	104
12	Dog walking	1
13	Dog walking	365
14	Dog walking	1
19	Camping	22
21	Camping	36
28	Cycling	104
28	Dog walking	365
28	Gardening	19.5
29	Dog walking	365
29	Gardening	548
29	Sitting/picnicking/BBQ	468
30	Sitting/picnicking/BBQ	9
32	Rambling/walking	730
32	Collecting wild produce	3
32	Farming	2366
44	Outdoor work	1954

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
44	Cleaning	274
45	Dog walking	18
46	Bird/nature watching	26
46	Cycling	104
46	Dog walking	365
46	Gardening	548
46	Rambling/walking	468
46	Collecting wild produce	20
51	Rambling/walking	520
51	Sitting/picnicking/BBQ	117
52	Sitting/picnicking/BBQ	117
52	Outdoor work	840
54	At work	2920
84	Gardening	183
85	Dog walking	137
85	Gardening	300
85	Shooting	30
88	Bird/nature watching	2
92	Rambling/walking	0.5
96	Dog walking	365
96	Gardening	730
101	Gardening	260
101	Rambling/walking	208

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
101	Collecting wild produce	6
101	Litter picking	24
102	Dog walking	48
102	Sitting/picnicking	288
110	Dog walking	52
110	Gardening	730
110	Rambling/walking	52
119	Rambling/walking	3
217	Bird/nature watching	26
217	Dog walking	365
217	Gardening	195
217	Shooting	32
218	Cycling	78
218	Rambling/walking	117
254	Rambling/walking	1
285	Bait digging	18
288	Dog walking	1095
324	Bee keeping	104
324	Dog walking	624
324	Sitting/picnicking/BBQ	13
324	Collecting wild produce	26
324	Crofting	312
327	Cycling	4

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
330	Camping	21
337	Rambling/walking	1
339	Dog walking	730
341	Dog walking	913
341	Gardening	730
349	Cycling	18
349	Dog walking	365
349	Running	365
350	Dog walking	183
350	Gardening	365
353	Rambling/walking	4
416	Cycling	18
416	Dog walking	365
416	Running	365
433	Cycling	4
434	Cycling	4
451	Rambling/walking	9
451	Sitting/picnicking/BBQ	0.2
452	Rambling/walking	104
452	Sitting/picnicking/BBQ	104
454	Rambling/walking	104
454	Sitting/picnicking/BBQ	104
459	Rambling/walking	10

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
460	Rambling/walking	10
18	Camping	36
340	Dog walking	624
340	Sitting/picnicking/BBQ	13
340	Collecting wild produce	26
340	Crofting	312
347	Rambling/walking	4

Table A1.22 Phase 1 children terrestrial activities

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
331	Camping	21
344	Dog walking	624
344	Playing	208
344	Sitting/picnicking/BBQ	13
344	Crofting	312
435	Cycling	4
455	Rambling/walking	104
455	Sitting/picnicking/BBQ	104
456	Rambling/walking	104
456	Sitting/picnicking/BBQ	104
457	Rambling/walking	104
457	Sitting/picnicking/BBQ	104
461	Rambling/walking	10

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
463	Rambling/walking	10

Table A1.23 Phase 1 infant terrestrial activities

Observation number	Terrestrial activity	Sum of occupancy (h y^{-1})
436	Cycling	4
17	Dog walking	1
16	Dog walking	1
465	Rambling/walking	10
462	Rambling/walking	10
458	Rambling/walking	104
458	Sitting/picnicking/BBQ	104

Table A1.24 Phase 1 adult green vegetable consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
28	Asparagus	0.1
29	Asparagus	0.2
32	Lettuce	1.1
32	Cauliflower	0.4
32	Cabbage	1.3
32	Brussel sprouts	0.3
46	Rhubarb	1
46	Spinach	0.7
51	Rhubarb	4
52	Rhubarb	4

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
96	Rhubarb	1
96	Herbs	0.05
98	Pak choi	1
98	Rhubarb	0.5
98	Cauliflower	2
171	Lettuce	23.4
171	Asparagus	5.4
172	Rhubarb	1
172	Herbs	0.05
217	Spinach	0.7
217	Rhubarb	1
315	Rhubarb	4
324	Cabbage	0. 5
324	Spinach	0.2
324	Lettuce	0.4
324	Chard	0.2
324	Broccoli	0.7
324	Rhubarb	4.6
324	Kale	0.6
340	Spinach	0.2
340	Broccoli	0.7
340	Cabbage	0.5
340	Chard	0.2

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
340	Kale	0.6
340	Lettuce	0.4
340	Rhubarb	4.6
355	Cauliflower	2.5
355	Cabbage	2.5
361	Cabbage	2.5
361	Cauliflower	2.5
362	Rhubarb	4
363	Rhubarb	4

Table A1.25 Phase 1 children green vegetable consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
344	Rhubarb	4.6
344	Spinach	0.2
344	Lettuce	0.4
344	Kale	0.6
344	Chard	0.2
344	Cabbage	0.5
344	Broccoli	0.7

Table A1.26 Phase 1 adult other vegetable consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
32	Pea	17

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
46	Pea	6.7
217	Pea	6.7
324	Pea	1.3
324	French bean	0.5
324	Broad bean	0.9
324	Runner Bean	1.4
340	Pea	1.3
340	French bean	0.5
340	Broad bean	0.9
340	Runner Bean	1.4
351	Runner Bean	2.3
352	Runner Bean	2.3

Table A1.27 Phase 1 children other vegetable consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
344	Runner Bean	1.4
344	Pea	1.3
344	French bean	0.5
344	Broad bean	1

Table A1.28 Phase 1 adult root vegetable consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
32	Swede	0.4
32	Carrot	1

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
32	Garlic	0.08
32	Leek	1.2
32	Spring Onion	0.04
32	Onion	1
46	Beetroot	18.2
46	Spring Onion	0.3
46	Onion	7.8
46	Beetroot	10.4
98	Garlic	0.5
98	Radish	0.5
101	Jerusalem Artichoke	1.5
171	Beetroot	3.1
171	Garlic	0.9
171	Onion	3.3
171	Spring Onion	0.4
171	Swede	4.8
217	Beetroot	18.2
217	Spring Onion	0.3
217	Beetroot	10.4
217	Onion	7.8
261	Jerusalem Artichoke	1.5
324	Turnip	0.3
324	Radish	0.1

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
324	Leek	0.5
324	Fennel	0.2
324	Beetroot	0.5
335	Leek	13
335	Turnip	10
335	Onion	7.8
335	Carrot	13
340	Radish	0.1
340	Fennel	0.2
340	Beetroot	0.5
340	Turnip	0.3
340	Leek	0.5
348	Leek	13
348	Onion	7.8
348	Carrot	13
348	Turnip	10
351	Leek	0.6
352	Leek	0.6
355	Carrot	5
355	Onion	5
361	Onion	5
361	Carrot	5
398	Onion	0.6

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
398	Carrot	0.6

Table A1.29 Phase 1 children root vegetable consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
344	Turnip	0.3
344	Radish	0.1
344	Leek	0.5
344	Fennel	0.2
344	Beetroot	0.5

Table A1.30 Phase 1 adult potato consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
28	Potatoes	0.5
29	Potatoes	0.2
32	Potatoes	9.2
46	Potatoes	34.7
96	Potatoes	1.5
98	Potatoes	5
171	Potatoes	2.3
173	Potatoes	1.5
217	Potatoes	34.7
324	Potatoes	3.1
335	Potatoes	130
340	Potatoes	3.1

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
341	Potatoes	3.1
348	Potatoes	130
351	Potatoes	1.2
352	Potatoes	1.2
355	Potatoes	25
361	Potatoes	25
398	Potatoes	1

Table A1.31 Phase 1 children potato consumption

Observation number	Vegetable type	Sum of consumption (kg y^{-1})
344	Potatoes	3.1

Table A1.32 Phase 1 adult fruit consumption

Observation number	Fruit type	Sum of consumption (kg y^{-1})
29	Pear	1
29	Apple	1
32	Cucumber	6.3
32	Apple	1.2
32	Plum	0.4
32	Blackberry	1.1
32	Tomato	1.4
32	Strawberry	1.1
46	Cucumber	8.8

Observation number	Fruit type	Sum of consumption (kg y^{-1})
46	Plum	12
46	Raspberry	8
46	Blackcurrant	22.5
46	Redcurrant	10
51	Blackcurrant	1.5
51	Raspberry	1
51	Redcurrant	0.5
51	Tomato	1
51	Gooseberry	0.1
51	Raspberry	1
51	Pear	5
51	Apple	10
51	Plum	5
51	Pepper	0.4
51	Cucumber	1.6
52	Cucumber	1.6
52	Gooseberry	0.1
52	Plum	5
52	Apple	10
52	Pepper	0.4
52	Blackcurrant	1.5
52	Raspberry	1

Observation number	Fruit type	Sum of consumption (kg y^{-1})
52	Raspberry	1
52	Tomato	1
52	Redcurrant	0.5
52	Pear	5
98	Pear	2
98	Apple	3
98	Cucumber	2
98	Pepper	2
98	Tomato	3
101	Strawberry	2.7
101	Grape	2.5
101	Figs	0.8
171	Grape	3
171	Pear	19
171	Cucumber	1.3
171	Cherries	2.8
171	Apple	66
171	Courgettes	2.9
171	Plum	2
171	Tomato	16
217	Apple	112
217	Raspberry	8
217	Plum	12

Observation number	Fruit type	Sum of consumption (kg y^{-1})
217	Redcurrant	10
217	Cucumber	8.8
217	Blackcurrant	22.5
261	Grape	2.5
261	Strawberry	2.7
293	Apple	0.2
293	Pear	0.2
293	Plum	5
304	Apple	0.2
304	Pear	0.2
304	Plum	5
315	Cucumber	1.6
315	Tomato	1
315	Pepper	0.4
324	Redcurrant	1.3
324	Cucumber	3.3
324	Strawberry	3.2
324	Gooseberry	1.3
324	Blackcurrant	1.5
324	Sweetcorn	0.4
324	Blackberry	9
324	Apple	13.5
324	Tomato	8

Observation number	Fruit type	Sum of consumption (kg y^{-1})
324	Blueberries	1.8
324	Raspberry	1
325	Apple	0.2
325	Plum	5
325	Pear	0.2
335	Pear	13
335	Apple	13
335	Cherries	1
335	Plum	13
340	Sweetcorn	0.4
340	Strawberry	3.2
340	Blueberries	1.8
340	Blackberry	9
340	Tomato	8
340	Blackcurrant	1.5
340	Redcurrant	1.3
340	Raspberry	1
340	Gooseberry	1.3
340	Cucumber	3.3
340	Apple	13.5
341	Plum	3
341	Pear	2.3
341	Apple	13.5

Observation number	Fruit type	Sum of consumption (kg y^{-1})
345	Apple	27
345	Plum	6
345	Pear	4.5
348	Cherries	1
348	Apple	13
348	Plum	13
348	Pear	13
351	Tomato	6
351	Strawberry	0.5
351	Blueberries	2.7
352	Tomato	6
352	Strawberry	0.5
352	Blueberries	2.7
355	Apple	12.5
355	Cucumber	5
355	Raspberry	0.3
355	Tomato	20
355	Strawberry	0.3
361	Cucumber	5
361	Tomato	20
361	Raspberry	0.3
361	Apple	12.5
361	Courgettes	5.8

Observation number	Fruit type	Sum of consumption (kg y^{-1})
361	Strawberry	0.3
362	Tomato	1
362	Cucumber	1.6
362	Pepper	0.4
363	Cucumber	0.4
363	Pepper	0.4
363	Tomato	1
398	Apple	0.6

Table A1.33 Phase 1 children fruit consumption

Observation number	Fruit type	Sum of consumption (kg y^{-1})
344	Cucumber	3.25
344	Sweetcorn	0.38324
344	Tomato	8
344	Strawberry	3.15
344	Redcurrant	1.32
344	Raspberry	1
344	Gooseberry	1.32
344	Blueberries	1.7952
344	Blackcurrant	1.485
344	Blackberry	9
344	Apple	13.5

Table A1.34 Phase 1 adult wild foods consumption

Observation number	Wild food type	Sum of consumption (kg y^{-1})
98	Elderflower	0.3
98	Mushrooms	2
98	Garlic Leaves	1
177	Mushrooms	5
261	Mushrooms	0.3
261	Mushrooms	0.1
335	Blackberry	5
335	Sloe	1.5
335	Mushrooms	1
335	Cherries	0.3
335	Garlic Leaves	0.5
348	Blackberry	5
348	Sloe	1.5
348	Mushrooms	1
348	Cherries	0.3
348	Garlic Leaves	0.5
351	Garlic Leaves	0.5
352	Garlic Leaves	0.5
46	Blackberry	2.5
46	Elderflower	0.3
46	Sloe	0.8
46	Mushrooms	6.5

Observation number	Wild food type	Sum of consumption (kg y^{-1})
51	Elderflower	0.4
51	Rosehips	0.2
51	Sloe	0.2
51	Sea buck thorn	0.1
52	Elderflower	0.4
52	Rosehips	0.2
52	Sloe	0.2
52	Sea buck thorn	0.1
101	Mushrooms	0.1
101	Mushrooms	0.3
217	Blackberry	2.5
217	Elderflower	0.3
217	Sloe	0.8
217	Mushrooms	6.5
324	Blackberry	0.2
324	Elderflower	0.2
324	Sloe	1
324	Mushrooms	0.03
340	Blackberry	0.2
340	Elderflower	0.2
340	Sloe	1
340	Mushrooms	0.03

Table A1.35 Phase 1 children wild foods consumption

Observation number	Wild food type	Sum of consumption (kg y^{-1})
344	Blackberry	0.2
344	Mushrooms	0.03

Table A1.36 Phase 1 adult lamb consumption

Observation number	Meat	Sum of consumption (kg y^{-1})
335	Lamb	10
348	Lamb	10
364	Lamb	10
412	Lamb	10

Table A1.37 Phase 1 children lamb consumption

Observation number	Meat	Sum of consumption (kg y^{-1})
413	Lamb	5
414	Lamb	5
415	Lamb	5

Table A1.38 Phase 1 adult game consumption

Observation number	Meat	Sum of consumption (kg y^{-1})
46	Wild venison	5.5
217	Wild venison	5.5
335	Rabbit	2.5

Observation number	Meat	Sum of consumption (kg y^{-1})
348	Rabbit	2.5

Table A1.39 Phase 1 adult honey consumption

Observation number	Honey	Sum of consumption (kg y^{-1})
46	Honey	0.8
217	Honey	0.8
324	Honey	0.3
335	Honey	0.5
340	Honey	0.3
348	Honey	0.5

Table A1.40 Phase 1 children honey consumption

Observation number	Honey	Sum of consumption (kg y^{-1})
344	Honey	0.3

Table A1.41 Phase 1 adult wild fungi consumption. Note this table reflects the mushroom data already presented as part of Table 34 and is included here for summary purposes only

Observation number	Wild fungi	Sum of consumption (kg y^{-1})
46	Mushrooms	6.5
98	Mushrooms	2
101	Mushrooms	0.25
101	Mushrooms	0.1
177	Mushrooms	5

Observation number	Wild fungi	Sum of consumption (kg y^{-1})
217	Mushrooms	6.5
261	Mushrooms	0.25
261	Mushrooms	0.1
324	Mushrooms	0.025
335	Mushrooms	1
340	Mushrooms	0.025
348	Mushrooms	1

Table A1.42 Phase 1 children wild fungi consumption. Note this table reflects the mushroom data already presented as part of Table 35 and is included here for summary purposes only

Observation number	Wild fungi	Sum of consumption (kg y^{-1})
344	Mushrooms	0.03

Table A1.43 Phase 1 adult egg consumption

Observation number	Eggs	Sum of consumption (kg y^{-1})
32	Duck eggs	1.7
32	Chicken eggs	18
101	Duck eggs	4.2
176	Duck eggs	21.8
261	Duck eggs	4.2
335	Duck eggs	7.3
335	Chicken eggs	36.2
348	Duck eggs	7.3
348	Chicken eggs	36.2

Appendix A2: Postal survey

The postal survey produced an independent data set from a broad cross section of the population living in the area potentially providing the means to identify new or missed habits to target during the face-to-face surveys or focus group discussions.

The postal survey helped refine and revise the face-to-face survey plans and identify optimal geographic areas to target during the face-to-face surveys. It provided additional information on potential sites for the collection of observational data and indicated the optimum timings to visit each survey location. Furthermore, the postal survey provided contacts for individuals and groups to follow up with and a wider list of activities that merited further investigation in the later face to face survey work. Follow up with contacts was only undertaken if specific permission was granted by the survey respondent(s).

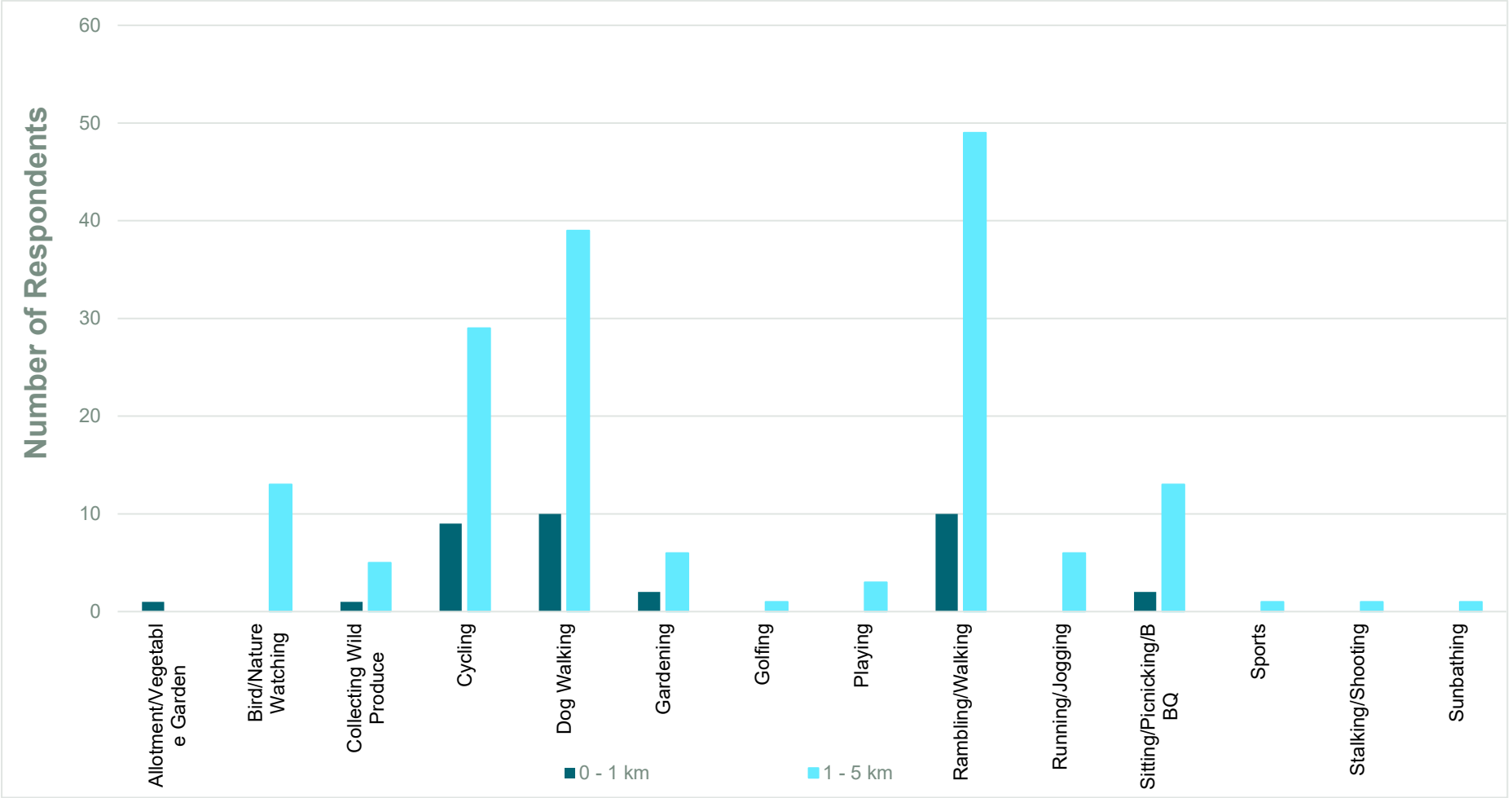
A2.1 Postal survey results

A2.1.1 Terrestrial external exposure

Several respondents reported undertaking a range of terrestrial activities within 5km of the Torness site (Figure A2i).

Within 1km of the site dog walking and rambling/walking (each with 10 respondents) and cycling (nine respondents) were the most popular activities. One respondent reported to collecting wild produce and allotment/vegetable garden within 1km of the site and whilst gardening and sitting/picnicking/BBQ was reported by two respondents within 1km of the site.

Figure A2i Overview of the number of respondents participating in terrestrial activities within 5km of the site



Within 1 – 5km of the site the most popular activity was rambling/walking with 49 respondents followed by dog walking (39 respondents) and cycling (29 respondents). Bird/nature watching and sitting/picnicking/BBQ appeared relatively popular.

Whitesands (and west of Whitesands) reported the widest range of activities which comprised: bird/nature watching, cycling, dog walking, golfing, playing, rambling/walking, and running/jogging. Rambling/walking, cycling and dog walking were three activities undertaken at more sites than any other activity (20, 18 and 13 locations respectively).

The location where the range of terrestrial activities within 5km were as follows:

Allotments: Thorntonloch.

Bird/Nature-Watching: Dunglass House, Innerwick (and west), Near Oldhamstocks, Oldhamstocks to Innerwick, Whitesands (and west), Whitesands Nature Reserve.

Cycling: All over 5km, Cove, Cove to Whitesands, Crowhill - west along railway, Dunbar, Dunglass House, Innerwick (and west), Near Doon Hill, North of Innerwick to railway line, Oldhamstocks, Oldhamstocks to Innerwick, Railway west of Torness, Skateraw, South of Innerwick Castle, Thorntonloch, Whitesands (and west), Whitesands Nature Reserve, Within 5km.

Collecting Wild Produce: All over 5km, Crowhill, Innerwick (and west), Near Oldhamstocks, South of Innerwick Castle.

Dog-Walking: Barns Ness, Cove, Crowhill, Dunbar, Dunglass House, Halls, Near Thurston, Outskirts of Dunbar, Skateraw, Skateraw to Whitesands, Sicar, Thorntonloch, Whitesands (and west), Whitesands Nature Reserve.

Gardening: Cockburnspath, Crowhill, Dunglass House, Near Oldhamstocks, Oldhamstocks, Outskirts of Dunbar, Skateraw.

Golfing: Whitesands (and west).

Rambling/Walking: Barns Ness, Barns Ness to Dunbar, Cove, Cove to Whitesands, Dunbar, Dunglass House, Innerwick Castle, Innerwick (and west), Near Thurston, Oldhamstocks, Oldhamstocks to Innerwick, Outskirts of Dunbar, Skateraw, Sicar, South of Thorntonloch, Thorntonloch, Whitesands (and west), Whitesands Nature Reserve, Within 5km.

Running/Jogging: Dunbar, Outskirts of Dunbar, Whitesands (and west), Whitesands Nature Reserve, Within 5km.

Sitting/Picnicking/BBQ: Barns Ness, Crowhill, Dunbar, Near Oldhamstocks, Oldhamstocks, Skateraw, South of Thorntonloch, Thorntonloch, Whitesands Nature Reserve.

Stalking/Shooting: Barns Ness.

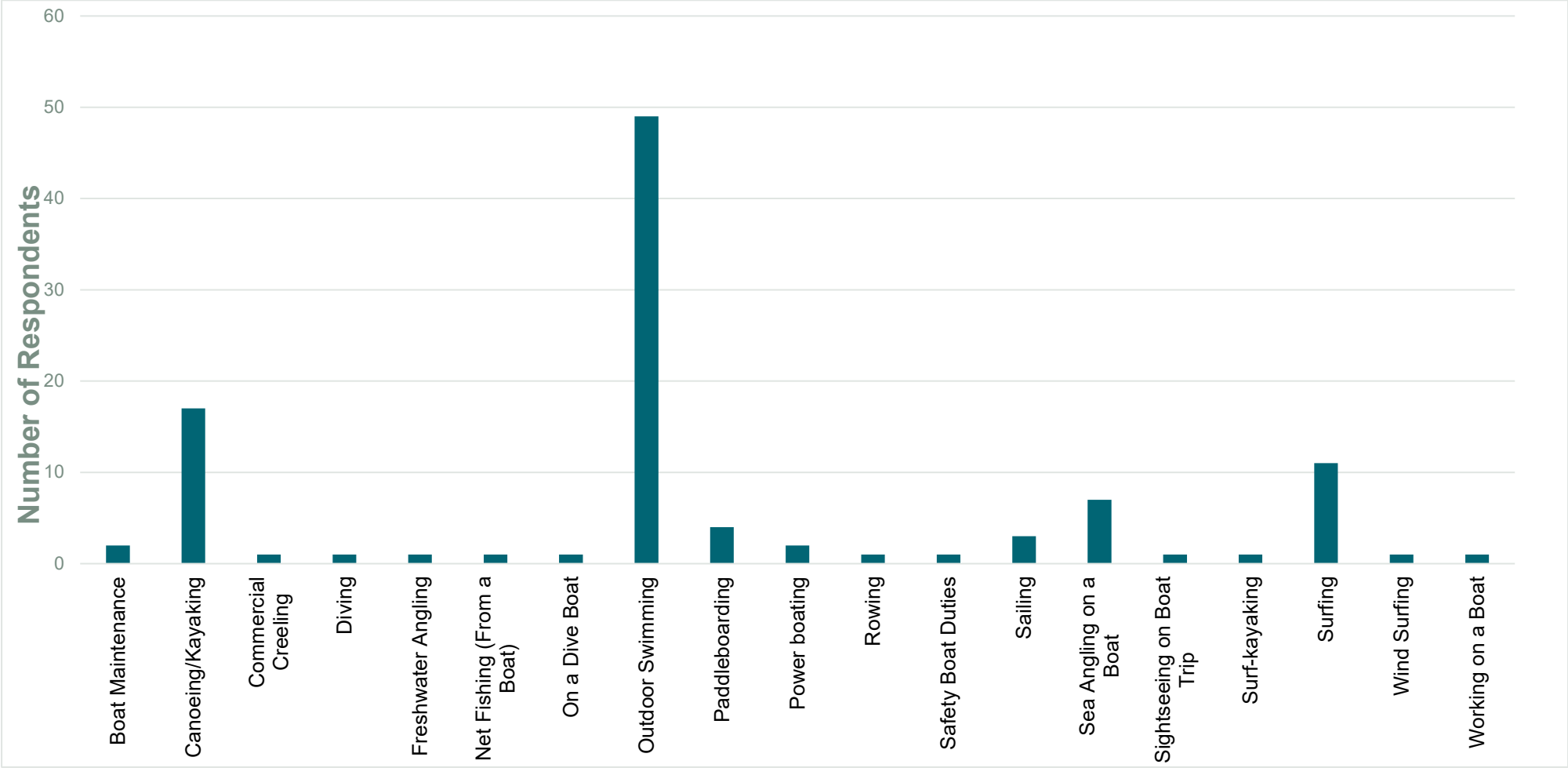
Sunbathing: Crowhill.

Playing: Near Oldhamstocks, Whitesands (and west).

A2.2 Aquatic external exposure

Several respondents reported they engaged in aquatic activities within the survey area. The total number of respondents undertaking each aquatic activity, either in or on the water and the distance from the Torness site are presented in Figure A2ii.

Figure A2ii Summary of the number of respondents undertaking aquatic activities less than 20km from Torness



Across the whole aquatic survey area outdoor swimming was the most popular aquatic activity (49 respondents) followed by canoeing/kayaking and surfing (17 and 11 respectively).

In terms of activity locations North Berwick beach had seven activities reported to be undertaken with Dunbar beach and Belhaven Bay reporting six activities each. Most sites reported outdoor swimming.

The aquatic activities at each location are as follows:

Boat maintenance: Dunbar Beach, North Berwick Beach.

Canoeing/kayaking: Belhaven Bay, Eyemouth to Cove, Dunbar Beach, Milsey Bay, North Berwick Beach, Pease Bay, Seacliff, Skateraw, Starney Bay, Whitesands.

Commercial creeling: Thorntonloch to St Abbs.

Diving: Coldingham Bay.

Freshwater angling: St Abbs.

Net fishing (from a boat): St Abbs.

On a dive boat: St Abbs.

Outdoor swimming: Bathans Strand, Belhaven Bay, Coldingham Bay, Cove, Dunbar Beach, Milsey Bay, North Berwick Beach, Pease Bay, Peffer Sands, Ravensheugh Sands, Seacliff, Skateraw, Thorntonloch, St Abbs, Whitesands.

Rowing: Dunbar Beach.

Safety boat duties: North Berwick Beach.

Sailing: Belhaven Bay, Dunbar Beach, North Berwick Beach.

Sea-angling on a boat: Cove, Killiedraught Bay, Skateraw, Torness Beach, St Abbs.

Sightseeing on boat trip: North Berwick Beach.

Surfing: Belhaven Bay, Coldingham Bay, Pease Bay, Seacliff, Thorntonloch.

Surf kayaking: Whitesands.

Paddleboarding: Belhaven Bay, Dunbar Beach, Seacliff.

Power boating: Milsey Bay, St Abbs.

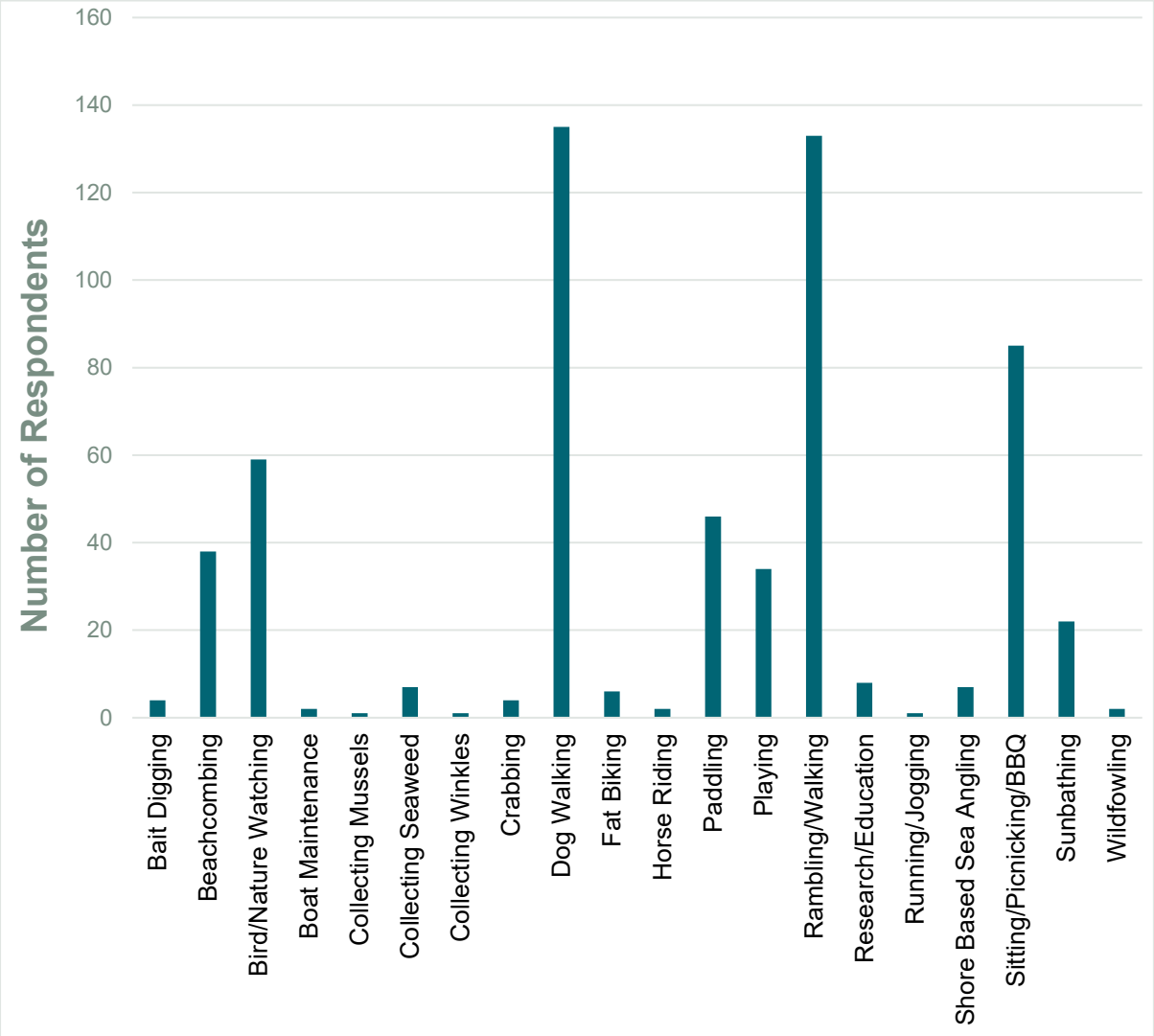
Windsurfing: Belhaven Bay.

Working on a boat: North Berwick Beach.

A2.3 External intertidal exposure

Several respondents undertake activities in the intertidal zone within the survey area. The total number of respondents undertaking each intertidal activity are presented in Figure A2iii with the highest number of respondents dog walking (135 respondents) rambling/walking (133 respondents) with sitting/picnicking/nature watching, bird/nature watching and paddling with 85, 59 and 46 respondents respectively.

Figure A2iii Summary of number of households undertaking intertidal activities less than 20km from Torness



In terms of activity locations Belhaven Bay and Whitesands had 15 activities each reported to be undertaken with North Berwick and St Abbs reporting 12 activities each. Most sites reported outdoor swimming. The intertidal activities undertaken by respondents at each location are as follows:

Beachcombing: Barns Ness, Belhaven Bay, Coldingham Bay, Cove, Dunbar Beach, Killiedraught Bay, North Berwick Beach, Pearse Bay, Peffer Sands, Ravensheugh Sands, Skateraw, St Abbs, Thorntonloch, Whitesands.

Bait Digging: Belhaven Bay, Killiedraught Bay, Skateraw, Whitesands.

Bird/Nature-Watching: Barns Ness, Belhaven Bay, Coldingham Bay, Cove, Dunbar Beach, Dunglass Beach, Eyemouth Beach, North Berwick Beach, Peffer Sands, Ravensheugh Sands, Skateraw, St Abbs, Thorntonloch, Torness Beach, Whitesands.

Boat Maintenance: North Berwick Beach, St Abbs.

Collecting mussels: Belhaven Bay.

Collecting Seaweed: Coldingham Bay, Cove, Dunbar Beach, Killiedraught Bay, Pearse Bay, St Abbs.

Collecting Winkles: Skateraw.

Crabbing: Belhaven Bay, Dunbar Beach, St Abbs, Whitesands.

Dog-Walking: Barns Ness, Bathans Strand, Belhaven Bay, Coldingham Bay, Dunbar Beach, Eyemouth Beach, Killiedraught Bay, Milsey Bay, North Berwick Beach, Pearse Bay, Peffer Sands, Ravensheugh Sands, Seacliff, Skateraw, St Abbs, Thorntonloch, Tyninghame, Whitesands.

Fat biking: Belhaven Bay, Cove, North Berwick Beach, Pearse Bay, Peffer Sands, Whitesands.

Horse riding: Ravensheugh Sands, Seacliff.

Paddling: Belhaven Bay, Coldingham Bay, Cove, Dunbar Beach, Eyemouth Beach, North Berwick Beach, Pearse Bay, Peffer Sands, Seacliff, St Abbs, Thorntonloch, Whitesands.

Playing: Belhaven Bay, Coldingham Bay, Cove, Dunbar Beach, Eyemouth Beach, North Berwick Beach, Pearse Bay, Ravensheugh Sands, Seacliff, Skateraw, St Abbs, Thorntonloch, Whitesands.

Rambling/walking: Barns Ness, Bathans Strand, Belhaven Bay, Beaches between Eyemouth and Cockburnspath, Cove, Dunbar Beach, Dunglass Beach, Eyemouth Beach, Killiedraught Bay, Milsey Bay, North Berwick Beach, Pearse Bay, Peffer

Sands, Ravensheugh Sands, Seacliff, Skateraw, St Abbs, Thorntonloch, Torness Beach, Tyninghame, Whitesands, Whitesands Nature Reserve.

Research/Education: Belhaven Bay, Cove, Killiedraught Bay, North Berwick Beach, Pearse Bay, Peffer Sands, Seacliff, Whitesands.

Running/jogging: Whitesands.

Shore-Based Sea-Angling: Barns Ness, Belhaven Bay, Cove, St Abbs, Thorntonloch, Whitesands.

Sitting/Picnicking/BBQ: Barns Ness, Belhaven Bay, Cove, Dunbar Beach, Eyemouth Beach, Killiedraught Bay, North Berwick Beach, Pearse Bay, Peffer Sands, Ravensheugh Sands, Seacliff, Skateraw, St Abbs, Thorntonloch, Whitesands.

Sun-Bathing: Barns Ness, Belhaven Bay, Dunbar Beach, North Berwick Beach, Peffer Sands, Ravensheugh Sands, Seacliff, Skateraw, St Abbs, Thorntonloch, Whitesands.

Wildfowling: Belhaven Bay.

A2.4 Internal exposure

Respondents were asked to provide information on where they sourced their food. A summary of the results (Figure A2iv) shows the origins of where respondents sourced their food as a percentage. Results show that the respondents bought most of their food sourced from local shops or supermarkets within and outwith the terrestrial (5km) and marine (20km) survey area. This was consistent across all food groups reflecting the low numbers of respondents that sourced local produce. Fish was the highest of local sourced produce (56 respondents) compared with 114 respondents sourcing ‘most foods’ from a supermarket and/or local shop.

Figure A2iv Source of food consumed by postal survey respondents

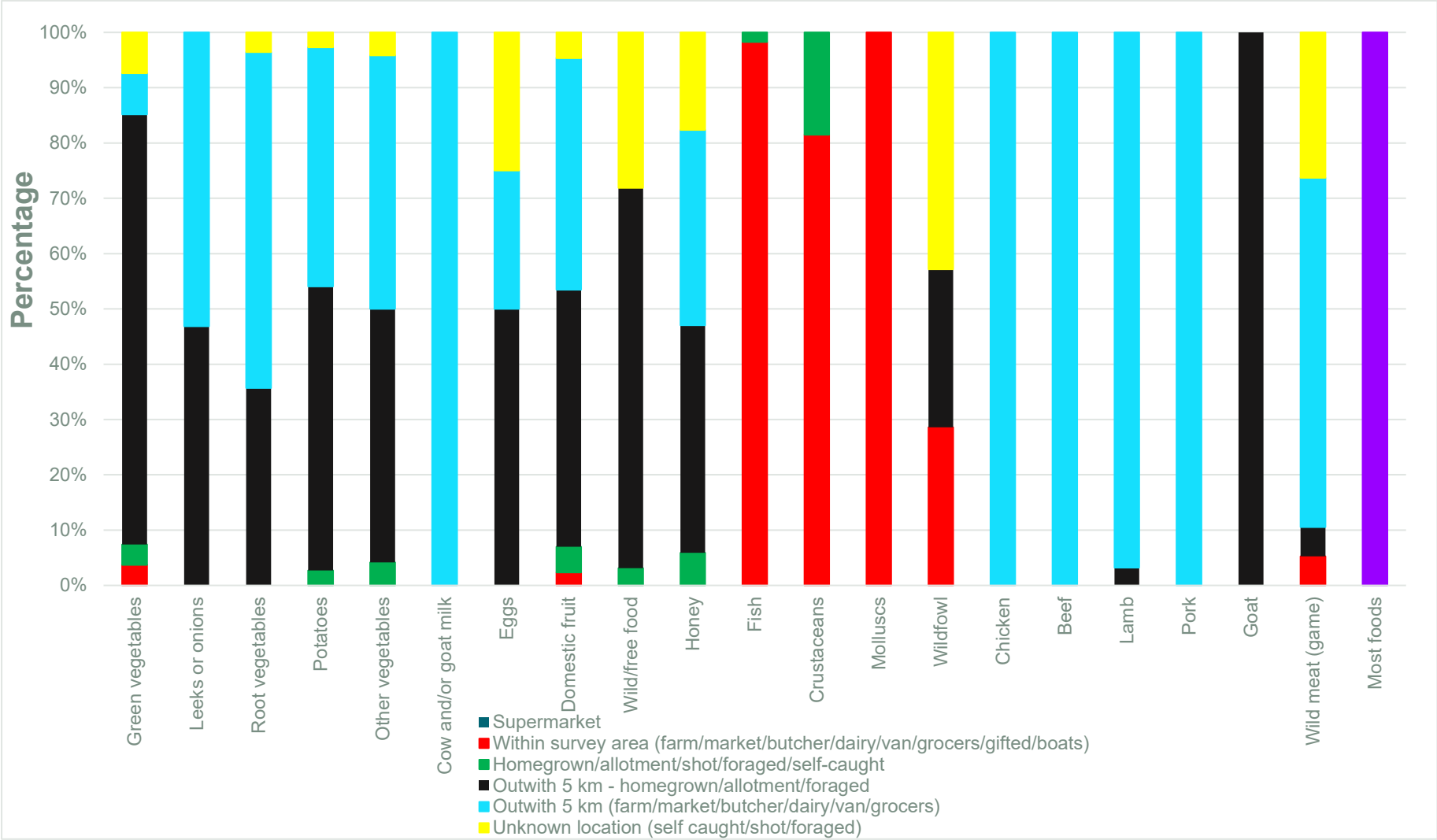


Figure A2v Number of respondents sourcing food from food groups

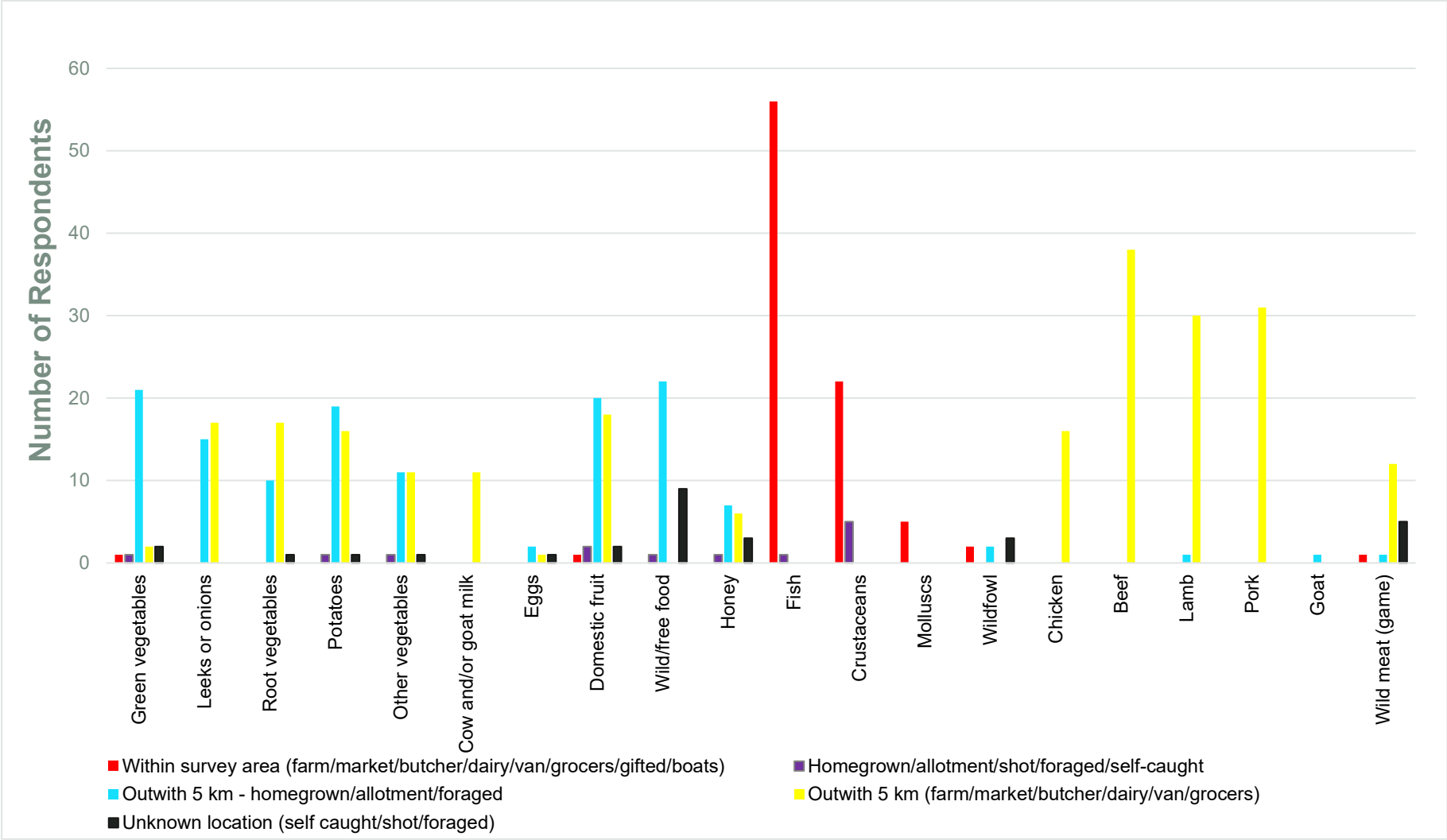


Figure A2v shows the number of respondents sourcing food from each food group locally sourced, homegrown/allotment/shot/foraged/self-caught and outwith the survey area. Food sourced from within the survey area showed the largest number of respondents sourcing fish (56 respondents) and 22 respondents sourcing crustaceans from a market/fish van/gifted or off boats (of those 22 respondents, six sourced crustaceans off boats at harbours within the survey area). Molluscs and wildfowl were sourced from within the survey area (five and four respondents respectively) and two respondents sourced milk within the survey area and one respondent sourced wild meat (game) from within the survey area. Beef was sourced by 38 respondents from outwith 5km from a farm/market/butcher and 18 respondents reported to sourcing domestic fruit from outwith 5km either sourced as homegrown, allotment or foraged.

Table A2iv provides an overview of where local produce within the survey area was sourced.

Table A2i Summary of locally produced food

Food Group	Number of individuals	Locally home grown/foraged/caught/shot
Green vegetables	1	Skateraw
Potatoes	1	Skateraw
Other vegetables	1	Skateraw
Domestic fruit	2	Skateraw and Cockburnspath
Wild/free food	1	Crowhill
Honey	1	Cockburnspath
Fish	1	Dunbar harbour
Crustaceans	11	North Berwick, Dunbar and St Abbs
Wild meat (game)	1	Crowhill

Appendix A3: In-situ gamma dose rate measurements

The protocol requires the detector's probe to be positioned 1m above the surface and counts acquired over a 600 second integration time. The cosmic and intrinsic components to the measurement are then subtracted. The protocol also requires no persons operating the detector to be within 5m of the probe during the count. Both instruments are calibrated using radon-226 and caesium-137 sources (the calibration being chosen to reflect naturally occurring or anthropogenic radionuclide sources respectively). Here, gamma dose rates were dominated by the natural background, so all results are reported with the radon-226 calibration and reported as μGy h^{-1}.

For the dose assessment tool, gamma dose rates were converted to Effective Dose (μSv h^{-1}) using a conversion factor of 0.85, which assumes an individual is standing and exposed to terrestrial derived gamma radiation. This conversion factor is used for most statutory monitoring programmes (Punt et al., 2011). All survey measurements are reported as terrestrial gamma dose measurements as they have had the cosmic and intrinsic component subtracted.

Appendix A4: Beta skin dosimetry measurements

The instrument was calibrated under UKAS accreditation against strontium-90 and yttrium-90; chlorine-36 and carbon-14 (and put inside a file poly-pocket to protect the system from the weather). A 12mm Perspex shield was used to shield out any beta emissions and so enable the gamma contribution to the instrument to be established. All measurements were made with a 20 second integration time and in duplicate, with and without the 12mm Perspex shield, enabling the net beta contribution to skin dose rate to be estimated (effective dose, or ambient dose equivalent) and reported in $\mu Sv\ h^{-1}$. The system is estimated to have a detection limit of around $0.2\mu Sv\ h^{-1}$.

Appendix A5: Site descriptions and observations

A5.1 North Berwick, Milsey Bay, and Seacliff

North Berwick is the most northerly site within the survey area and is a busy tourist town with a working harbour. The harbour has four creelers (only one of which is full time) that fish for lobster, mackerel and occasionally velvet crabs. It is also home to the East Lothian Yacht Club (ELYC) and the North Berwick Rowing Club (NBRC). There are catamaran trips and Rigid Inflatable Boats (RIBs) that provide bird watching, sightseeing and visits to the Isle of May and Bass Rock. ELYC, based at the harbour, provides sailing for adults and children including a cadet's membership. NBRC is also based at the harbour and during the summer period there is a Fringe Festival which attracts many visitors and locals. A lobster hatchery is situated at the harbour which provides a tourist attraction, with its aim to improve the sustainability of lobster populations, rearing lobster eggs until they are 12 weeks old then releasing them back into the sea.

Both within and outwith the school holiday period North Berwick harbour was popular with visitors and locals. To the east of the harbour is Milsey Bay, a sandy beach with many rocky outcrops throughout its length and a tidal swimming pool. Milsey Bay was well populated within the school holiday period with many individuals and families dog walking, swimming, paddling, sitting/picnicking, two photographers, two individuals fishing from the shore, one individual jogging and one motorboat offshore sailing.

Outwith the school holiday period, Milsey Bay was popular with individuals swimming (more than 20), many individuals paddling and dog walking, and families walking, playing, sitting/picnicking and rock pooling. One individual was bait digging. There is a rocky promontory at the east end of Milsey Bay and the rocky coastline continues towards Seacliff but this part of the coastline west of Seacliff is inaccessible due to the steep cliffs.

Seacliff (Figure A5i) is a sandy beach with the steep rocky cliff-side continuing the western end of the beach, and only accessible via a private road via a coin-operated barrier. A small harbour is situated west of the beach.

Seacliff was quieter within the school holiday period with ten dog walkers, four walkers, five photographers, two children paddling, one individual horse riding, one individual sitting/picnicking, one individual fishing from the shore, and one pleasure boat sailing offshore.

Outwith the school holiday period, many individuals and families/groups were dog walking, walking, playing, sitting picnicking, rock pooling and paddling. More than 20 individuals were swimming, five individuals were kayaking, two individuals paddleboarding, six individuals body boarding and two individuals fishing.

Figure A5i Seacliff beach (June 2023)

Spume was noted at the Seacliff site within the school holiday period.

A5.2 Peffer Sands, Ravensheugh Sands and Bathan's Strand

South from Seacliff is a wide and long sandy expanse comprising Peffer Sands, Ravensheugh Sands and Bathan's Strand. Access to Peffer Sands is possible from a public car park and walking through a wooded area to the coast with access also possible north of the beach though for both access routes access time is limited as it can become cut off at high tide. No observations of intertidal or aquatic activities were observed either outwith or within the school holiday period at Peffer Sands. However, one tractor and five RIBs were observed sitting on the intertidal substrate at this beach. Continuing south, observations outwith the school holiday period at Ravensheugh Sands included five dog walkers, two infants playing, approximately 20 individuals walking, approximately 11 individuals sitting/picnicking, twelve individuals swimming, three individuals paddling, eight paddleboarders and a family flying a kite. Within the school holiday period only four adults and one child were observed walking. No offshore activities were observed.

Continuing south to Bathan's Strand there is a rocky headland which separates this sandy expanse from Belhaven Bay. Outwith the school holiday period intertidal activities included one family rock pooling. Within the school holiday period observations included one individual dog walking and one tee pee tent at the foot of a dune – no campers however were noted at the time of the beach visit. No offshore activities were observed either outwith or within the school holiday period.

No spume was observed at these sites either outwith or within the school holiday period.

A5.3 Belhaven Bay

Belhaven Bay is a large sandy beach and is accessible west of Dunbar (by the Biel Water) and via the John Muir Country Park. During the survey period outwith the school holiday period, activities included 50+ surfers, approximately 16 dog walkers, many families playing and walking, families sitting/picnicking, one family rock pooling, approximately five adults and 15+ children swimming and paddling, four kayakers, three individuals flying a kite and one fishing boat offshore. Wildfowling is permitted by license in areas of the John Muir Country Park. The number of permits for John Muir Country Park the for the 22/23 season was 125 and for 2023/24 there was 85. The season runs 1 September and ends on 20 February.

Within the school holiday period activities included 60+ individuals playing (mainly families), 20 individuals dog walking, 24 walkers, two individuals sitting/picnicking, seven photographers, six individuals flying kites, two kayakers, two individuals paddling, one jogger, 80+ surfers, 11 paddleboarders and five individuals horse riding. The northern section of Belhaven Bay is accessible via Tyne Sands where the River Tyne flows through the saltmarsh area in the northern end of the John Muir Country Park and then out through the sand to the sea. At the southern end of the beach the Biel Water flows beside rocky outcrops and into the sea.

Between Belhaven Bay and Dunbar, the coastline is backed by steep rocky cliffs and the shore is largely inaccessible.

No spume was observed outwith or within the school holiday period at Belhaven Bay.

A5.4 Dunbar

Dunbar is home to a busy harbour which consists of an outer harbour where approximately 18 sailboats/leisure craft, seven motorboats, six RIBs and five fishing boats were moored and with

an interconnecting harbour where boats rested on the mud at low tide. The substrate is predominately mud with stone and seaweed present. A slipway allows access for boats and individuals. Access at low tide is also possible via rocks.

Outwith the school holiday period eleven individuals were observed fishing off the harbour and several more off the rocks behind the harbour, two kayakers and two paddleboarders, and a few individuals walking and dog walking around the harbour.

Within the school holiday period the harbour (Figure A5ii) was popular with dog walkers, walkers, individuals sitting on rocks, two individuals fishing from rocks behind the harbour and two families crabbing from the harbour wall.

There are reported to be 30 registered fishing boats (25 full-time and five part-time) based at Dunbar with lobster, crab and prawn landed.

The RNLI has an office at Dunbar Harbour with a small inshore lifeboat moored at the harbour.

To the east of the harbour is Dunbar's East beach which is a long sandy stretch. Activities on this beach outwith the school holiday period included, groups of children playing, one child body boarding and individuals walking. Within the school holiday period Dunbar east beach activities included eight individuals dog walking, several families sitting/picnicking, paddling, and playing, five individuals beachcombing, approximately 17 individuals walking, ten individuals rock pooling and one individual swimming.

No spume was observed outwith or within the school holiday period at either Dunbar harbour or Dunbar East beach.

Figure A5ii Dunbar Harbour (June 2023)

A5.5 Whitesands, Barns Ness and Skateraw Harbour

South of Dunbar the shore is a mixture of pebbles and sand with rocks. Whitesands is a sandy beach with some rock; this stretch of coast to Torness Power Station is accessible by foot along a coastal path and by road. 12 dog walkers, 11 individuals walking, 24 individuals sitting/picnicking (mainly families), one individual rock pooling, six individuals paddling, one paddleboarder, approximately five groups camping, and two cyclists were observed at Whitesands outwith the school holiday period. The substrate at Barns Ness beach consists of sand and pebbles and a rock platform. 22 dog walkers, four walkers and four birdwatchers were observed on the intertidal substrate and coastal paths with one fishing boat and yacht sailing offshore. Skateraw Harbour (Figure A5iii) has a sandy foreshore with seaweed and pebbles and outwith the school holiday period 14 individuals dog walking, five individuals walking, families playing, 11 individuals sitting/picnicking, two individuals swimming, one bait digger were observed with fishing boat offshore. The area around Skateraw Harbour forms part of the Scottish Site of Special Scientific Interest, which attracts bird watchers to the area to observe the intertidal birdlife. Access around the Torness nuclear power station is provided via a coastal path.

Within the school holiday survey period intertidal activities observed included approximately 30 individuals dog walking, 22 individuals walking, six individuals playing, three families sitting/picnicking, 20 individuals swimming, four individuals paddling and two surfers at Whitesands. At Barns Ness, intertidal activities observed were 26 dog walkers, ten individuals

playing, seven walkers, one photographer and seven individuals rock pooling. Barns Ness Light House is a popular attraction with individuals observed walking and dog walking. At Skateraw Harbour, intertidal activities included of eight dog walkers, one bait digger, six individuals camping and three walkers. Offshore one pleasure boat and four RIBs were observed.

It was reported to the survey team that this area (Whitesands, Barns Ness and Skateraw) had seen a substantial increase in the number of individuals camping since the Covid-19 pandemic.

No spume was observed at these sites outwith or within the school holiday period.

Figure A5iii Skateraw looking towards the Torness site (June 2023)

A5.6 Torness Power Station

The spillway from Torness Power Station is bounded by rocky boulders forming a man-made embankment leading down to a sandy beach with flat rocky outcrops both to the east (to Thorntonloch) and west (to Skateraw). The spillway area was found to be popular with fishermen fishing from the rocky boulders and from the beach from shelving rock. It was reported that individuals are illegally fishing for bass however it was reported that this is being dealt with by the site alongside another organisation. The bass being illegally caught are fished in larger quantities than legally permitted and they are of below the recommended size legally required.

Outwith the school holiday period 15 individuals fishing were observed by the Torness spillway and its immediate intertidal substrate.

Within the school holiday period eight dog walkers, one individual birdwatching and ten individuals fishing were observed by the Torness spillway and its immediate intertidal substrate.

The RNLI all-weather lifeboat is moored at Torness.

Seaweed and jellyfish are regularly removed from the Torness Power Station seawater filters although the quantity varies depending on the weather. Preparation for potential large influxes is aided by weather forecasting. The seaweed is washed off the filters into a collection skip where it is then transferred off site to Waste and Recycling for composting.

Spume was observed at the spillway within the school holiday survey period.

A5.7 Thorntonloch, Cove and Pease Bay

South of Torness Power Station is Thorntonloch with a large sandy beach (Figure A5iv). A caravan park is situated by the beach with access to the intertidal area. Offshore windfarm works were in progress with EDF Renewables linking offshore cables onshore at Thorntonloch. Transmit cables will transmit energy along the 37km cable from offshore windfarms making landfall at Thorntonloch beach. The onshore cable will then run underground for approximately 12km where it will connect with the onshore windfarm in the Lammermuir Hills. This work was still in progress at the time of the survey.

Outwith the school holiday period there were many dog walkers (20+), and many families playing, walking, and sitting/picnicking and two fishing boats were observed offshore.

Within the school holiday survey period intertidal activities included dog walking (20+), families playing, approximately seven individuals walking, eight individual fishing, two children paddling, four surfers, and five individuals camping on the beach. One individual was observed winkle picking however, the individual declined to be interviewed.

Figure A5iv Looking to Thorntonloch (June 2023)

From Thorntonloch the coastline is rocky with access possible to a rocky beach with a sandy foreshore (Figure A5v), west of Cove Bay and its harbour, via an access road that runs down a steep embankment and rocks. Seaweed was visible at low tide. To the east, there is a small sand and pebble beach, Cove Bay, and a small walled harbour, Cove Harbour. Access is via a steep grassy embankment that is thick with gorse, however this beach could also be accessed through a tunnel in the landscape leading from the access road. Outwith the school holiday period intertidal activities included two dog walkers, six individuals walking, two photographers, one jogger and three individuals swimming. Within the school holiday period intertidal activities included two dog walkers, two families playing, 13 individuals walking, two families sitting/picnicking, one photographer and a fashion shoot of seven individuals (photography on the harbour wall), four individuals paddling and one individual fishing from the shore. Two creel boats and four motorboats were moored in the harbour.

Figure A5v View looking to Cove beach (June 2023)

Continuing south from Cove is Pease Bay, which is a sand and pebble beach, accessed via a caravan park located nearby. A stream flows into the bay with wild garlic growing along the bank. Outwith the school holiday period four individuals dog walking, one individual walking and four individuals surfing were observed. One fishing boat offshore was observed.

Within the school holiday period intertidal activities observed were seven dog walkers, 15 walkers, one adult and six children playing, seven individuals sitting/picnicking and three individuals swimming. Offshore, two sailing pleasure boats and four motor/speed boats were observed.

No spume was observed at any of these sites outwith or within the school holiday period.

A5.8 St Abbs Head, St Abbs, Coldingham Bay and Killiedraught Bay

Continuing southeast the coastline is steep cliff towards the rocky coastline of St Abbs. St Abbs has a small harbour with five fishing boats moored and resting on the sand substrate. Also moored in the harbour were ten sailing pleasure yachts and five RIBs.

Outwith the school holiday period four individuals were fishing from the rocks, three individuals were kayaking. Many tourists and campervans were noted at the harbour.

The coastal area between St Abbs and Eyemouth is a Voluntary Marine Reserve which covers 1 030 hectares along an 8km stretch of coast with the aim to conserve marine life and promote

sustainable fishing. A Marine Research Station is established here, and a private lifeboat is based at St Abbs Harbour.

Within the school holiday period at St Abbs Harbour two divers were preparing to go out diving, and some visitors walking around the harbour were noted.

The coastal area surrounding St Abbs is predominantly rocky and continuing south is Coldingham Bay, a sandy beach which has been awarded blue flag status, with 30 beach huts and a café. Lifeguards are present during the summer season from May to September.

Outwith the school holiday period Coldingham Bay (Figure A5vi) was popular with 11 dog walkers, 10 walkers, one family playing, one family sitting/picnicking, one family rock pooling, three individuals swimming, one individual paddleboarding and one RIB sailing offshore. Within the school holiday period intertidal activities included,13 dog walkers, 50+ individuals playing (families with children and infants), 30+ individuals walking, 20+ individuals sitting/picnicking, approximately 17 individuals swimming (adults, children and infants), one adult, 11 children and three infants paddling, two adults and five children rock pooling, two individuals surfing, three individuals paddleboarding and six individuals' bodyboarding (three adults and three children). Offshore two RIBs and three fishing boats were observed sailing.

Figure A5vi Coldingham Bay (August 2023)

Access to the rocky cliff side and shore between Coldingham Bay and Killiedraught Bay below is relatively limited due to steep cliffs. Killiedraught Bay is accessible via a cliff path from the

nearby caravan park or from a playing field next to the caravan park which leads to the sand and stony beach which has seaweed on the rocky foreshore. Outwith the school holiday period, two individuals birdwatching, one individual rock pooling (rock pooling and collecting seaweed) and one fishing boat offshore were observed. The individual rock pooling was collecting seaweed as part of an ongoing scientific project to determine the seaweed and marine environment health. Within the school holiday period one individual was swimming, and two individuals were fishing of the rocks to the south of the beach. Offshore one fishing boat was observed.

No spume was observed at any of these sites outwith or within the school holiday survey period.

A5.9 Eyemouth

Continuing south from Killiedraught Bay, Eyemouth was the furthest most point of the aquatic survey. Eyemouth harbour was noted to have 11 creel fishing boats were moored at the harbour, 11 pleasure boats, one RNLI boat and four boats resting on the intertidal substrate at the time of survey. Both langoustine fishing boats and creel fishing boats that operate out of Eyemouth Harbour. Both outwith and within the school holiday period the harbour was relatively busy with walkers and individuals sightseeing and two individuals were observed fishing off the harbour wall outwith the school holiday period. The Eye Water flows into the eastern side of the harbour. This area of Eyemouth contains some residential housing, commercial businesses, Eyemouth Harbour and fish merchants and a dive centre.

Eyemouth beach is predominantly composed of a sandy substrate with some pebbles with access to the beach from the eastern end from the harbour and access from the western end is via a caravan park. A high stone beach wall runs the extent of the beach with road access above.

To the western side of the beach are rocky outcrops with rock pools and further west a rocky promontory. Outwith the school holiday period nine individuals were observed dog walking, six individuals playing, five individuals walking on the beach and four individuals kayaking. Within the school holiday period intertidal activities included 11 dog walkers, four individuals walking and three individuals shore fishing.

No spume was observed at these sites outwith or within the school holiday period.

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