

Radon in Dwellings in Scotland: 2008 Review and Atlas

B M R Green, J C H Miles and D M Rees

ABSTRACT

This report details a project, funded by the Scottish Government, to map radon levels in homes throughout Scotland and brings together all the data held in the UK national radon database on radon levels in Scottish dwellings. It updates previous reports and presents the first complete radon probability map for the whole of Scotland including the inhabited off-shore islands.

Data from radon measurements in over 19,000 Scottish dwellings are presented in tabular format by local authority and by various divisions of the postcode system. The radon probability maps are based on the national grid system and show some geographical detail, such as council boundaries, settlements and major roads.

A number of radon Affected Areas are identified on the maps. These are areas where there is a 1% or greater probability of the radon level in a dwelling exceeding the Action Level. It is recommended that a phased programme should be undertaken in the higher probability areas with the twin objectives of identifying homes with high radon levels and encouraging owners and landlords to reduce such levels.

This study was funded by the Scottish Government

© Health Protection Agency
Centre for Radiation, Chemical and Environmental Hazards
Radiation Protection Division
Chilton, Didcot, Oxfordshire OX11 0RQ

Approval: January 2009
Publication: April 2009
£21.00
ISBN 978-0-85951-634-1

This report from HPA Radiation Protection Division reflects understanding and evaluation of the current scientific evidence as presented and referenced in this document.

CONTENTS

| | | |
|--|--|----|
| 1 | Radon | 1 |
| 2 | Health effects of exposure to radon and its short-lived decay products | 1 |
| 3 | Current UK control strategy | 2 |
| 4 | Summary of previous radon studies in Scotland | 3 |
| | 4.1 Initial surveys prior to 1990 | 3 |
| | 4.2 Studies from 1990 to 2000 and the first Affected Areas in 1993 | 3 |
| 5 | The current programme, 2000 to 2008 | 4 |
| 6 | Results | 5 |
| 7 | Mapping | 6 |
| 8 | Discussion | 8 |
| 9 | Conclusions | 9 |
| 10 | Glossary | 9 |
| 11 | References | 10 |
| 12 | Acknowledgments | 11 |
| 13 | Figures and maps | 12 |
| APPENDIX A Details of the radon mapping programme and measurement procedures | | 33 |
| | A1 Background | 33 |
| | A2 Selecting the sample | 33 |
| | A3 Inviting householders to participate | 34 |
| | A4 Measurement procedure | 34 |
| | A5 Iteration and statistics | 34 |
| APPENDIX B Letters and leaflets | | 35 |
| | B1 Text of the letter to Chief Executives and Chief Environmental Health Officers of local authorities | 35 |
| | B2 Text of the letter to the Chief Executives of Health Boards and Directors of Public Health | 36 |
| | B3 Text of the initial letter to householders requesting their co-operation | 37 |
| | B4 Text of the reminder letter to householders requesting their co-operation | 38 |
| | B5 Text of the letter for a result below 100 Bq m ⁻³ | 39 |
| | B6 Text of the letter for a result between 100 and 170 Bq m ⁻³ | 40 |
| | B7 Text of the letter for a result between 170 and 200 Bq m ⁻³ | 41 |
| | B8 Text of the letter for a result over 200 Bq m ⁻³ | 42 |
| | B9 Radon leaflet (printed on A4 and folded to form a 4 page A5 leaflet) | 43 |
| | B10 Instruction leaflet for the radon measurement pack | 44 |
| APPENDIX C Data tables of measurements in dwellings | | 45 |

1 RADON

Radon is a radioactive gas and isotopes, different forms of the same element, occur in the three naturally-occurring decay chains headed by uranium-238, uranium-235 and thorium-232. These radionuclides are found naturally in trace amounts in most rocks and soils; the most abundant isotope of uranium (over 99%) is uranium-238 which includes radon-222 in its decay chain. The higher abundance of radon-222, coupled with a relatively long half-life of 3.8 days, means it is the most important radon isotope as far as risks to human health are concerned. The other two isotopes, radon-219 and radon-220, have half-lives of 3.9 seconds and 54 seconds and are less able to escape from the ground before undergoing further radioactive decay into solid elements. Attention is therefore focussed on radon-222 which will be referred to as radon in this report.

Radon is measured in becquerels per cubic metre of air (Bq m^{-3}). The average concentration in Scottish homes is 16 Bq m^{-3} but much higher levels can occur: the level in one home can be ten times higher or lower than the home next door.

Radon is one of a group of elements, called the noble gases, that also includes helium and neon. These elements do not readily react to form chemical compounds and are simple gases under most conditions. However radon undergoes radioactive decay by alpha-particle emission to form a short-lived isotope of polonium. Several further short-lived decay products are formed in a series of decays by alpha and beta-particle emission before a long-lived isotope, lead-210 – half-life 22 years, is reached. It is the short-lived decay products of radon that are responsible for its serious health effects.

More information about radon can be found on the web sites operated by the Health Protection Agency (HPA), www.hpa.org.uk and www.ukradon.org and in several of the references listed in section 11, in particular ICRP(1993) and NRPB (2000).

2 HEALTH EFFECTS OF EXPOSURE TO RADON AND ITS SHORT-LIVED DECAY PRODUCTS

The UK population is exposed to ionising radiation from natural and man-made sources: the pie chart in figure 1 shows the average exposure from all sources. Radiation of natural origin is responsible for the majority of the exposure and the largest contribution comes from radon. According to the latest review by the Health Protection Agency – Radiation Protection Division (RPD), 84% of the average annual dose to the UK population from all sources comes from the four main components of natural ionising radiation (Watson, 2005). The contributions to the total exposure of the population from the four natural sources of ionising radiation and their contributions are; 9.5% from long-lived natural radionuclides in diet; 12% from cosmic radiation; 13% from terrestrial gamma radiation; 50% from radon and its short-lived decay products.

The detrimental effects of exposure to high radon levels were first observed in sixteenth century silver miners in central Europe as high levels of fatal lung disease and identified as lung cancer in the second half of the nineteenth century. Radon was not identified until the beginning of the twentieth century; the link between radon and lung cancer was made some decades later and the pivotal role of the short-lived decay products in delivering the alpha-radiation dose to the lung not unravelled until the 1950s (ICRP 1993).

In the second half of the twentieth century, many epidemiological studies of groups of miners in different parts of the world demonstrated a statistically significant increase in their risk of lung cancer and, in the larger studies, a positive trend in lung cancer rates was found with increasing radon exposure. The main studies, involving over 60,000 miners and 2,600 cases of lung cancer, were the subject of combined analyses that point to radon as the most probable cause of the extra cases of lung cancer (BEIR VI).

In the final decade of the twentieth century, the first substantial epidemiological case-control studies linking radon levels and lung cancer rates in Swedish and English homes were published. These studies showed that the risks from exposure to elevated levels of radon in the home were consistent with the outcomes of previous studies on miners of both uranium and other minerals, who were occupationally exposed to radon. All these studies have consistently shown an increased risk of lung cancer with radon exposure for both smokers and non-smokers. Further studies and, in particular, two international pooling studies in Europe and North America, have now demonstrated and quantified more precisely than before, the risks from exposure to radon in the home and confirmed that the risk from radon is considerably higher for cigarette smokers than for non-smokers (Darby 2005).

3 CURRENT UK CONTROL STRATEGY

In January 1990, the National Radiological Protection Board (NRPB, now the Radiation Protection Division of the Health Protection Agency, HPA) published the principles providing advice to Government on the limitation of human exposure to radon in homes (NRPB 1990a). A supporting document explored the practical implications and provided numerical limits (NRPB 1990b). These included a recommended Action Level for radon in existing homes in the UK of 200 Bq m⁻³ averaged over a year; that parts of the country with 1% probability or more of present or future homes being above the Action Level, identified from radiological evidence and periodically reviewed, should be regarded as Affected Areas; that appropriate Government authorities should delimit localities where precautions against radon should be installed in future homes.

Guidance on protective measures for new dwellings in the radon Affected Areas in Scotland was published in 1999, (BRE, 1999). Section 3.2 of the Domestic Handbook covers the current requirements for the design and construction of new buildings and conversions to reduce the risk to health from radon (Technical Handbook 2008).

4 SUMMARY OF PREVIOUS RADON STUDIES IN SCOTLAND

4.1 Initial surveys prior to 1990

It was not until the early 1980s that an interest developed in the exposure of the population to radiation of natural origin. By the end of the decade, comprehensive reviews of the exposure of the UK population had been published. These included a National Survey of radon and of gamma ray levels in dwellings (Wrixon et al 1988). Considerable care was taken to select the sample for this survey to ensure it was representative of the population distribution and of the housing stock throughout the UK. This was achieved by selecting every n^{th} address from the Post Office Address file. A total of 2,093 householders throughout the UK completed the measurement programme; of these dwellings, 155 are in Scotland and provide the best estimate of the average radon concentration in Scottish homes. This is 16 Bq m^{-3} , lower than the overall average of 20 Bq m^{-3} for the UK as a whole. This reflects the fact that the large majority of the Scottish population live in the central belt which is a low radon area.

Alongside the National Survey, more intensive surveys were carried out in areas where geological information suggested above average indoor radon levels might occur (Wrixon et al 1988). These included several areas in Scotland such as the southwest around Dalbeattie; parts of Argyll centred around Ballachulish; Aberdeen and the Dee Valley; parts of the northeast around Helmsdale. In total, a further 157 dwellings were surveyed in these areas with a considerably increased average radon concentration of 70 Bq m^{-3} . However a more detailed analysis of the results showed that the highest levels occurred in the Dee Valley and the northeast.

4.2 Studies from 1990 to 2000 and the first Affected Areas in 1993

The findings of the surveys described above and the publication of the advice on a policy to limit exposure to high radon levels (NRPB, 1990a) resulted in a series of initiatives, funded by the Scottish Office, to increase the information on the distribution of radon concentrations in Scottish homes. A series of reports (Green et al 1991, 1993 & 1996) provide the details. An important part was a programme to map the high risk areas in Aberdeenshire and the northeast part of Highland Region. This led to the declaration of two radon Affected Areas in 1993 (NRPB, 1993). These areas, centred on the Dee valley inland of Aberdeen and on Helmsdale in the northeast, were mapped on the basis of a total over 1,800 results from measurements in homes throughout the two regions.

By the new millennium and following a programme of work on behalf of the Scottish Office, the results of measurements in over 9,200 Scottish homes were available; of these 270 were at or above the radon Action Level.

5 THE CURRENT PROGRAMME, 2000 TO 2008

A proposal to complete a radon probability map for dwellings across the whole of Scotland, including both the western and the northern isles was accepted by the then Scottish Executive (now the Scottish Government) which agreed to fund the extra measurements. The objective was to obtain 5 or more measurements in each 5-km square of the national grid. This would allow the completion of a 5-km grid map giving the probability of the radon concentration in an individual dwelling exceeding the Action Level (Miles 1998). In sparsely populated areas of the country, notably the Highlands and the Southern Uplands, it would not always be possible to reach this target.

An analysis of the existing measurement data and information on the location of the housing stock from the Post Office Address File (PAF®) and the Ordnance Survey Address Point File® indicated that a further 10,000 measurements would be required. This figure took account of the facts that over 25% of the 5-km grid squares in Scotland (1,132 out of 3,805) contained no permanent dwellings and a further 300 or so squares contained fewer than 5 dwellings.

The outline methodology to obtain the extra results is given below. Some statistics and more details are contained in appendix A and the letters and leaflet are in appendix B. Please note that direct dial telephone numbers and e-mail addresses have been deleted to avoid confusion as many have changed following the merger of NRPB with the HPA.

- A population-weighted sample of all the dwellings in each 5-km square is selected by reference to the Post-Office Address File (PAF®) and the Ordnance Survey Address Point File®.
- Local Government organisations are informed of the forthcoming programme by the Scottish Government.
- Local authorities and public health boards are sent details of the programme by HPA.
- Letters offering a free radon measurement and asking for the help of householders are posted in batches.
- The numbers of positive replies and returned undelivered letters are assessed and further mailings organised on an iterative basis until either the target of 5 results for each 5-km square is reached or the number of houses is exhausted – the number of requests to any individual address was limited to three.
- Once the householder agreed, a measurement pack is despatched.
- Up to two reminder letters are sent if the householder failed to return the detectors spontaneously at the end of the three month measurement period.
- The householder is informed by letter of the estimated annual average radon level in his home, its significance explained and advice offered whether action is needed to reduce the level. If this was the case, relevant information is supplied.

By the end of the process, over 10,500 measurement packs had been deployed and results for some 9,900 homes had been obtained. The loss rate of less than ten percent is similar to that in comparable surveys elsewhere in the UK and is due to householders moving house, severe illness or death or loss of detectors for a variety of reasons.

6 RESULTS

By early 2008, valid results were available from measurements in a total of 19,100 Scottish homes, of these 370 are at or above the Action Level. More details of the measurement protocol and the method to calculate the annual average radon level in an individual dwelling is given in appendix A (paragraph A4).

These data come from the different radon survey programmes carried out by NRPB and HPA in the last twenty-five years. These surveys were seldom representative of the housing stock of large areas or regions. Indeed, many were intentionally targeted to areas where higher levels were expected. The initial national survey (Wrixon et al 1988) was the only one designed to obtain a population-weighted sample of homes throughout Scotland. The results of this survey continue to provide the best estimates of the average exposure at both national and local authority level. Obviously as the size of the areas to be analysed decreases, the cumulative results become more representative of the total housing stock of these areas. This limitation on how well the cumulative results presented represent the overall position in an area or region needs to be recognised when consulting the data tables, especially for larger regions. It is the radon probability maps described below that provide the best currently available indication of the radon potential for an area.

A series of data tables, summarised below, are contained in appendix C and provide data by local authority and divisions of the postcode (see below). It should be noted that the estimates of the housing stock are derived from the Ordnance Survey Address Point File®. This file is cross-checked on a regular basis with the Post Office Address File (PAF®) maintained by the Royal Mail® for the delivery of mail. However the estimates of the housing stock may differ from those derived from other sources.

The postcode is a system used by the Royal Mail® to route post to the appropriate delivery walk. The structure of the postcode contains three established geographic units for the aggregation of data. The largest is postcode area, Table C3, based on 16 post towns and usually denoted by the first two letters of the postcode. The exception is a single letter G for Glasgow. Postcode areas are divided into postcode districts. Districts are denoted by the letters and numbers in the first half of the postcode, see table C4. Districts are in turn divided into postcode sectors which are denoted by the addition of the first number of the second half of the full postcode and shown in table 5. Note that two postcode areas, DG (Dumfries) and TD (Galashiels), straddle the Scottish/English border. In these two cases, only dwellings and results in Scotland are included in the tables.

To avoid undue precision, numerical values other than averages (see glossary for definitions) have been rounded to two or three significant figures. The administrative

codes used in the tables are those promulgated by the Office for National Statistics. Finally, to avoid giving misleading averages based on small numbers of results and to preserve confidentiality for individual householders, postcode districts or sectors with fewer than 5 results have been excluded from tables C4 and C5.

| | |
|----------|---|
| Table C1 | Overall summary data for Scotland |
| Table C2 | Summary data by local authority. (Not representative, see text) |
| Table C3 | Summary data by postcode area |
| Table C4 | Summary data by postcode district (5 or more results) |
| Table C5 | Summary data by postcode sector (5 or more results) |

A further table, number C6, provides estimates of the number of homes in each division of the radon maps and of the number of homes expected to be at or above the Action Level. These data are included as an aid to planning any future radon programmes and are discussed in more detail in the following sections.

7 MAPPING

Indoor radon concentrations are affected by indoor and outdoor temperatures, by winds, ventilation conditions, and other factors. To average out these temporal variations and to allow sensible comparison between results from measurements at different seasons of the year and in different years, correction factors are applied.

Measurements are made with two passive integrating detectors in each dwelling – one in the main living area and one in a regularly used bedroom. The detectors are placed for three months and the results combined to reflect typical occupancy patterns. Since indoor radon levels are usually higher in cold weather, the results reported to householders are normalised for typical seasonal variations in radon levels to allow the estimated annual radon concentration to be reported (Wrixon et al 1988) and compared to the Action Level. It has been shown (Miles 1998) that the seasonal variations correspond to average outdoor temperature variations. To allow for the fact that weather patterns vary from year to year, the annual average radon concentrations in houses used in the mapping reported here were calculated using temperature corrections based on temperature at the time of measurement, rather than seasonal corrections.

The techniques used to estimate the fraction of the housing stock exceeding the radon Action Level in grid squares in Scotland were similar to those used previously (NRPB, 1993). The distribution of radon concentrations in homes is approximately log-normal whether the sample is taken from the whole housing stock or a single grid square. Lognormal modelling of the results of radon measurements in homes allows the proportion above the Action Level to be estimated. The methodology is described in more detail by Miles (1998).

Some of the grid squares had no radon results. Most of these have virtually no population, so it is not meaningful to refer to the fraction of the existing housing stock above the Action Level. It is useful, however, to estimate the percentage of the housing stock that would be above the Action Level in these squares to allow preventive measures against radon to be taken should new houses be constructed. For this reason, blank squares adjacent to squares with measurements were in-filled using procedures described by Miles (1998).

The results are shown in the following series of figures and maps. Figure 2 gives an overview of the whole of Scotland and shows the estimated proportion of homes per 5-km grid square with radon concentrations exceeding the Action Level of 200 Bq m^{-3} : the proportions range from below 1% to above 30%: the hatched squares are unmapped for the reasons outlined above. Figure 3 is the key to the following map plates and figure 4 shows the number of measurements in each 5-km grid square of the parts of Scotland surveyed: they range from zero to 375.

The 17 map plates, listed below, show the same data as figure 1 at a larger scale together with geographical detail such as settlements, major roads and administrative boundaries. Note that the settlements are selected to give an even spread of locational information and are not necessarily selected solely on population grounds. Each plate covers approximately $16,000 \text{ km}^2$ and the majority are centred on one 100 km grid square of the national grid; the exceptions are to accommodate the variations in the coast line and the off-shore islands.

| | |
|--------|---|
| Map 1 | South-western Scotland |
| Map 2 | South-western Scottish Borders |
| Map 3 | Kintyre and the islands of Islay, Jura and Arran |
| Map 4 | Glasgow and the south-western Lowlands |
| Map 5 | Edinburgh and the south-eastern Scottish Borders |
| Map 6 | North-western Argyll and Bute and the south-western Highlands |
| Map 7 | Central Scotland |
| Map 8 | Tayside, Angus and southern Aberdeenshire |
| Map 9 | Southern Hebrides and western Skye |
| Map 10 | Skye and the western Highlands |
| Map 11 | Central Highlands |
| Map 12 | Moray and northern Aberdeenshire |
| Map 13 | Northern Hebrides |
| Map 14 | North-western Scotland (Sutherland) |
| Map 15 | North-eastern Scotland (Caithness) |

Map 16 Orkney Islands and Fair Isle

Map 17 Shetland Islands

8 DISCUSSION

The data presented both in tabular and map form, give a clearer picture of radon levels in Scottish homes. They confirm that for the majority of the Scottish population, who live in the central belt, radon levels in homes are generally low and are not a cause for concern. In addition to the two areas previously identified, in Aberdeenshire and Highland regions, the maps do identify some further areas where radon concentrations at or above the Action Level are likely to be found in 1% or more of homes. These extra areas include the majority of the Mainland of the Orkney Islands, an area around the centre of the Great Glen in Highland and parts of the Scottish Borders.

The parts of Scotland shown in Figure 2 and the following seventeen map plates, with a probability of 1% or more of homes being above the Action Level, are radon Affected Areas as defined in the NRPB Statement on radon in homes (NRPB, 1990a). The primary purpose of these maps is to draw attention to the areas where radon exposures should be reduced or future exposures minimised: priority of measurement and remediation should be given to those areas with the higher proportions of affected homes.

The final table, number C6, in appendix C is provided as an aid to planning surveys and is based on the outcome of the mapping calculations (see above). Data are provided for each local authority; the third column gives the total housing stock taken from the Post Office Address file. The next six columns divide the total housing stock into the six probability bands shown on the radon maps. The final two columns are the ranges of the number of homes estimated to be at or above the Action Level of 200 Bq m⁻³: the penultimate column relates to radon Affected Areas and the final column to the Local Authority as a whole. The total number of homes at or above the Action Level in Scotland is estimated to be between 1,000 and 4,000.

This tabulation is intended to provide a guide to planning a series of programmes aimed at identifying homes with elevated radon levels. Once identified, the owner-occupiers or landlords as appropriate should be encouraged to carry out remedial works.

Similar programmes are in place in other parts of the UK with differing thresholds. In England, there is an on-going series of initiatives in partnership with local councils at district level and public health authorities to offer all householders in the higher risk areas, defined as 5% probability or greater, a free radon test. When a high level of radon is confirmed the householder is provided with information and advice on remedial methods in a variety of ways including Radon Solution Days held at local venues. Similar programmes operate in Wales (threshold of 10% in the pilot programme) and in Northern Ireland (threshold of 1%).

The data in table C6 shows that there are around 62,000 homes in areas of Scotland with a 1% or greater probability of a radon level being at or above the current Action Level of 200 Bq m⁻³; the number at or above a threshold of 5% is about 6,000. It is estimated that there will be up to 4,000 Scottish homes with radon levels at or above the current Action Level. A phased programme should be undertaken in the highest radon probability areas with the twin objectives of identifying homes with radon concentrations at or above the Action Level and encouraging owner-occupiers or landlords to reduce the radon to an acceptable level.

It should be noted that the Board of the HPA has recommended that UK Building Regulations and Standards should be changed to ensure that all new buildings incorporate basic radon protective measures (HPA 2008).

9 CONCLUSIONS

- i. The parts of Scotland shown in Figure 2, and the following seventeen map plates, with a probability of 1% or more of homes being above the Action Level are radon Affected Areas as defined in the NRPB Statement on radon in homes (NRPB, 1990).
- ii. A phased programme should be undertaken in the highest radon probability areas with the twin objectives of identifying homes with radon concentrations at or above the Action Level and encouraging owner-occupiers and landlords to reduce the radon to an acceptable level.

10 GLOSSARY

Averages. The numerical radon results in this report are presented in two ways: arithmetic average and geometric average. The arithmetic average is the normal value used to describe numerical results: it is the sum of all the results divided by the number of results. The geometric average is the n^{th} root of all n results multiplied together.

Becquerel. Symbol Bq. The unit of the amount or activity of a radionuclide. Describes the rate which transformations occur. 1 Bq = 1 transformation per second.

Becquerel per cubic metre of air. Symbol Bq m⁻³. The amount of a radionuclide in each cubic metre of air. Often referred to as the activity concentration.

Half-life. The time taken for half the amount of a radioactive element to undergo a radioactive transformation and form a different element.

Isotopes. Chemically identical forms of an element with different masses. The mass is indicated by the number after the element.

Radon Action Level. The recommended upper limit for the activity concentration of radon in UK homes. Its value, expressed as the annual average radon gas concentration in the home, is 200 Bq m⁻³.

Radon Affected Areas. Parts of the country with a 1% probability or more of present or future homes being above the Action Level.

Radioactivity. The spontaneous disintegration of unstable elements (*radionuclides*). During the process energy is emitted as either *alpha* or *beta particles* or *gamma rays*

11 REFERENCES

- BEIR VI (1998). Effects of exposure to radon. Washington DC, National Academy Press.
- BRE (1999). Radon: guidance on protective measures for new buildings in Scotland. Building Research Establishment report BR-376 (ISBN 1 86081 334 8).
- Darby SC et al (2005). Radon in homes and risk of lung cancer: collaborative analysis of individual data from 13 European case-control studies. *BMJ*, Jan 29;330(7485):223.
- Green BMR, Lomas PR and O'Riordan MC (1991). Radon in dwellings in Scotland. Chilton, NRPB-M324.
- Green BMR, Lomas PR and O'Riordan MC (1993). Radon in dwellings in Scotland: 1993 review. Chilton, NRPB-M447.
- Green BMR, Lomas PR and Kendall GM (1996). Radon in dwellings in Scotland: 1996 review. Chilton, NRPB-M569.
- HPA (2008). Health Protection Agency Board gives advice on radon measures for new homes. See press release on 21st May 2008, available at www.hpa.org.uk.
- ICRP Publication 65 (1993). Protection against radon-222 at home and at work. *Ann ICRP* **23**, (2).
- Miles JCH (1998). Mapping radon-prone areas by log-normal modelling of house radon data. *Health Phys* **74**, 370-378.
- NRPB (1990a). Statement by the National Radiological Protection Board. Limitation of human exposure to radon in homes. *Doc NRPB* **1**, (1), 15-16.
- NRPB (1990b). Human exposure to radon in homes. Recommendations for the practical application of the Board's Statement. *Doc NRPB*, **1**, (1), 17-32.
- NRPB (1993). Radon affected areas: Scotland. *Doc NRPB*, **4**, (6), 1-8.
- NRPB (2000). Health Risks from Radon. Chilton. ISBN 0 85951 449 8.
- Pinel J, Fearn T, Darby SC and Miles JCH (1995). Seasonal correction factors for indoor radon measurements in the United Kingdom. *Radiat Prot Dosim*, **58**, 127-32.
- Technical Handbook, Scottish Building Standards (2008). Domestic Handbook 2008, section 3. Available to download at: http://www.sbsa.gov.uk/tech_handbooks/tbooks2007.htm
- Watson SJ, Jones AL, Oatway WB and Hughes JS. Ionising radiation exposure of the UK population: 2005 review. Chilton, HPA-RPD-001, ISBN 0 85951 558 3
- Wrixon, A D, Green, B M R, Lomas, P R, Miles, J C H, Cliff, K D, Francis, E A, Driscoll, C M H, James, A C, and O'Riordan, M C., 1988. Natural radiation exposure in UK dwellings. Chilton, NRPB-R190 (London, HMSO).

12 ACKNOWLEDGMENTS

We wish to thank C R Muirhead for his advice on statistical aspects of this work and present and past members of the radon team at HPA and previously NRPB for all their efforts.

The data reported in the tables and used to construct the maps were collected during many surveys carried out by HPA and previously by NRPB on behalf of the Scottish Government and its predecessors, local councils, landlords and individual householders.

13 FIGURES AND MAPS

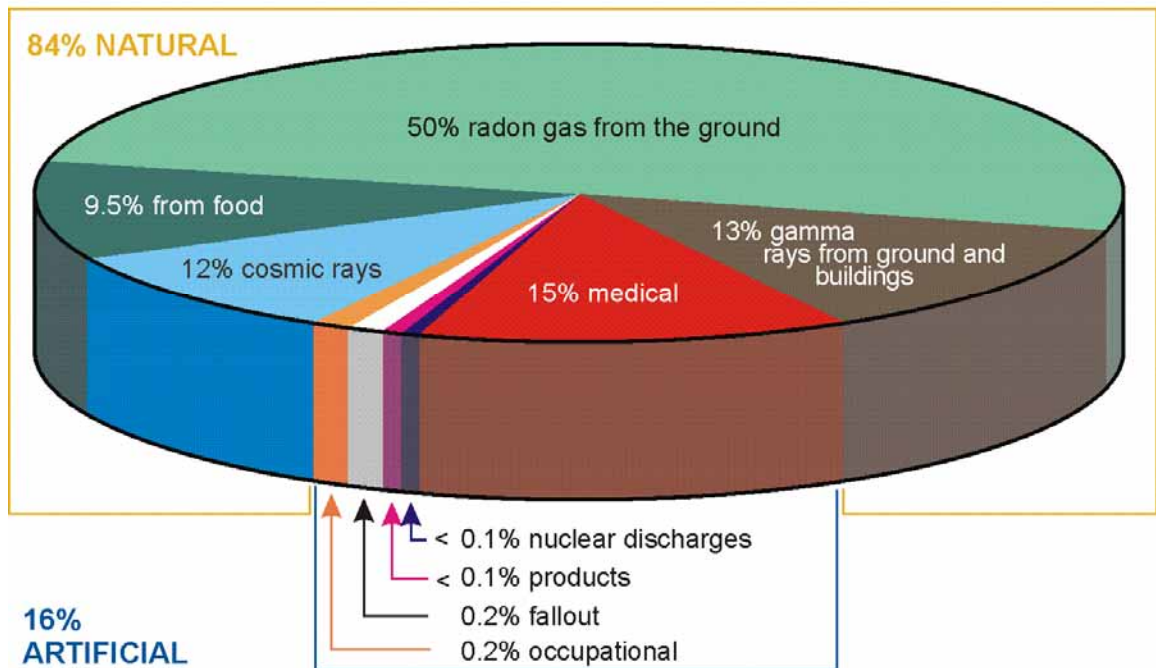


Figure 1 Average radiation exposure to the UK population from all sources

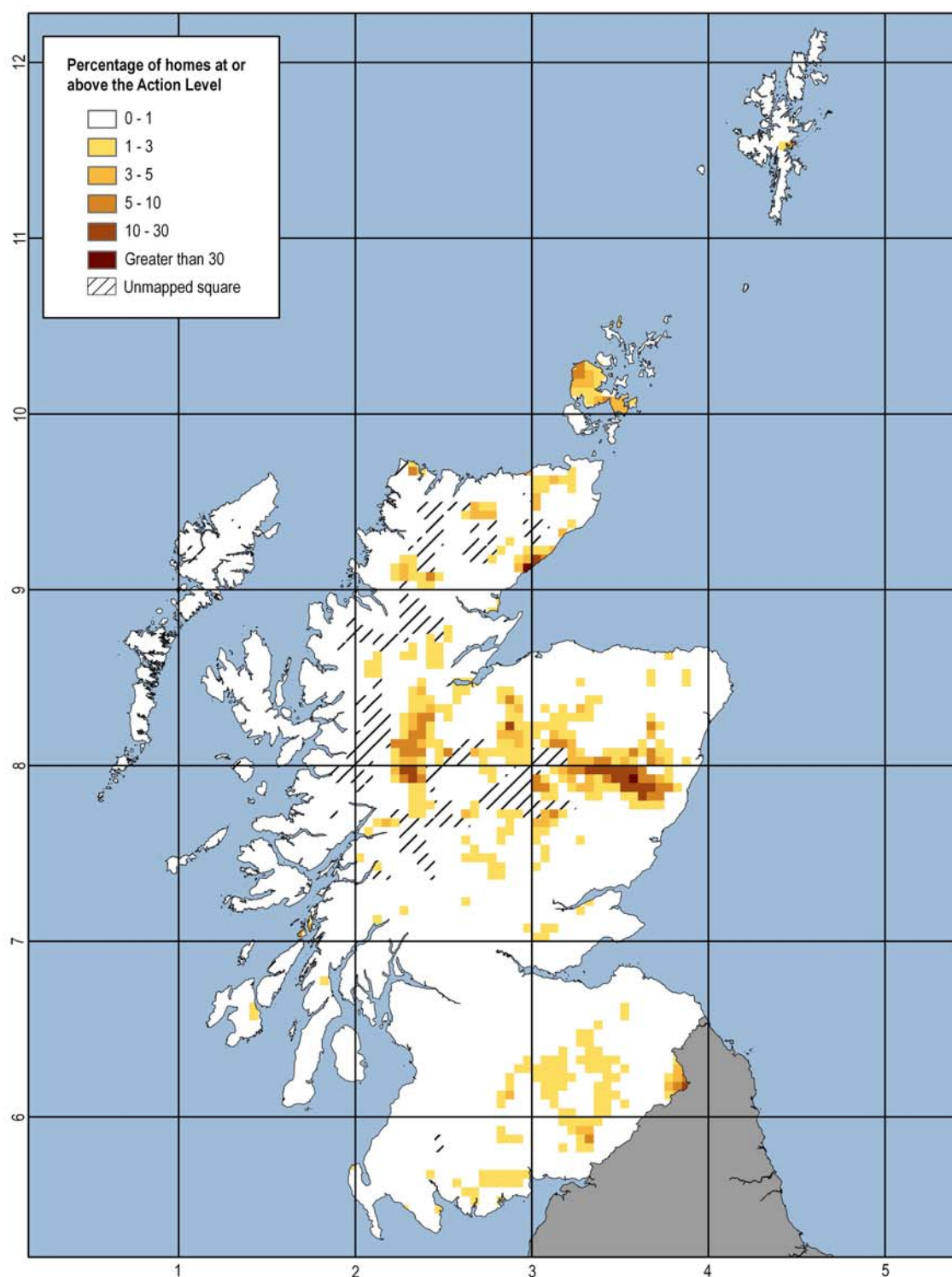


Figure 2 Overall map of radon Affected Areas in Scotland (axis numbers are the 100-km coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
 Radon Affected Area classification © Health Protection Agency copyright [2008]

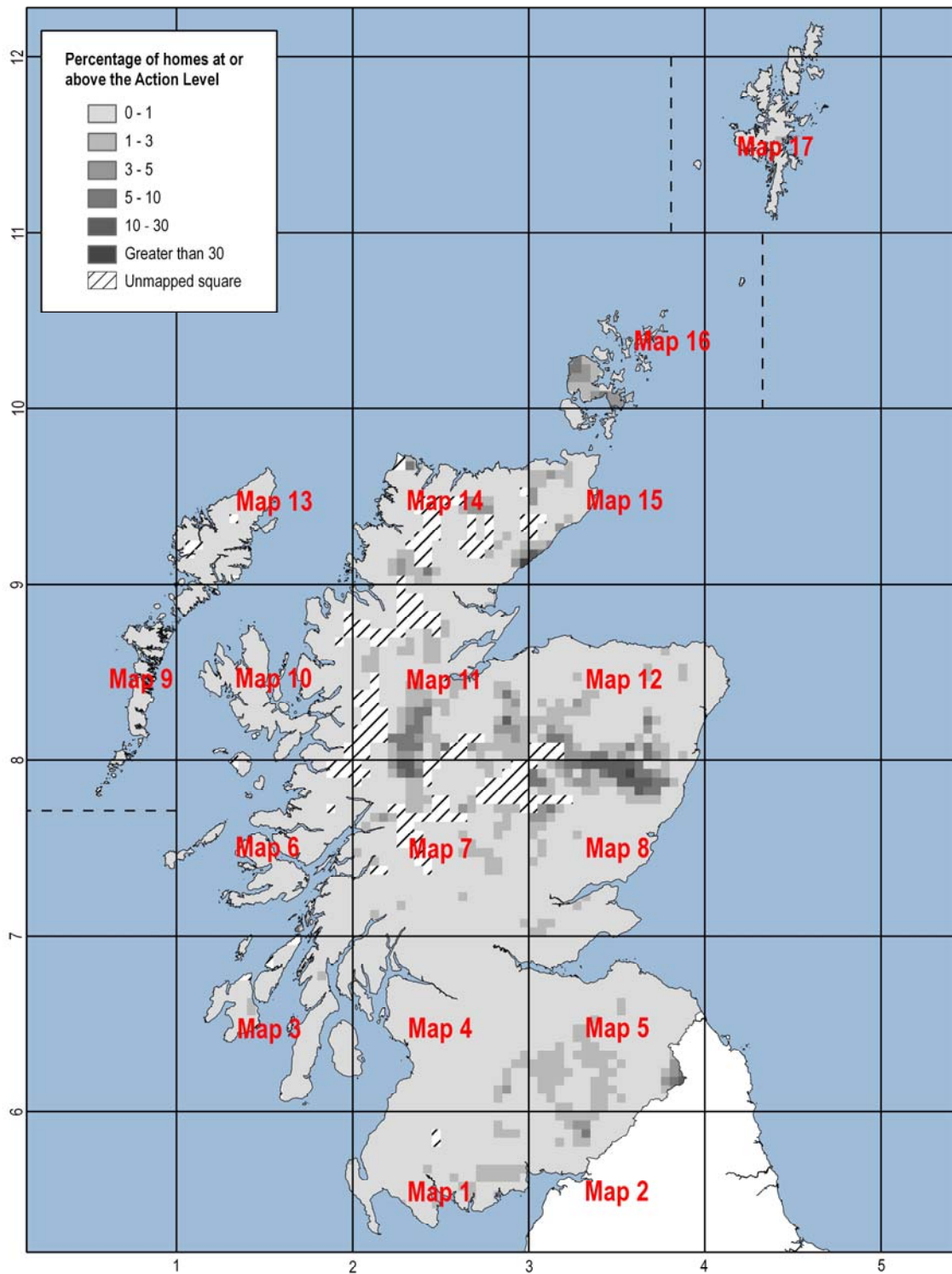


Figure 3 Key to larger scale maps of Affected Areas in Scotland (axis numbers are the 100-km coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]

Radon Affected Area classification © Health Protection Agency copyright [2008]

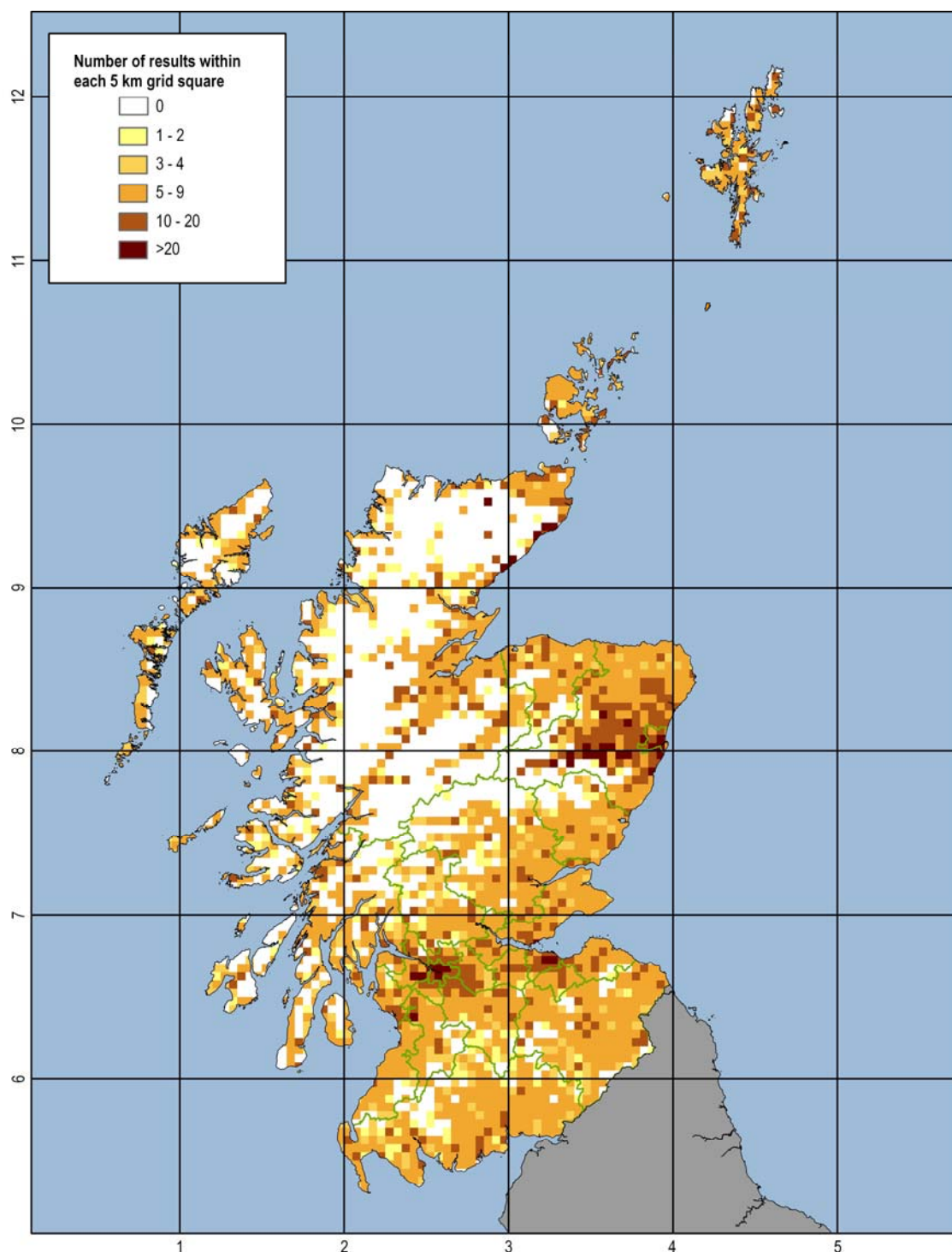
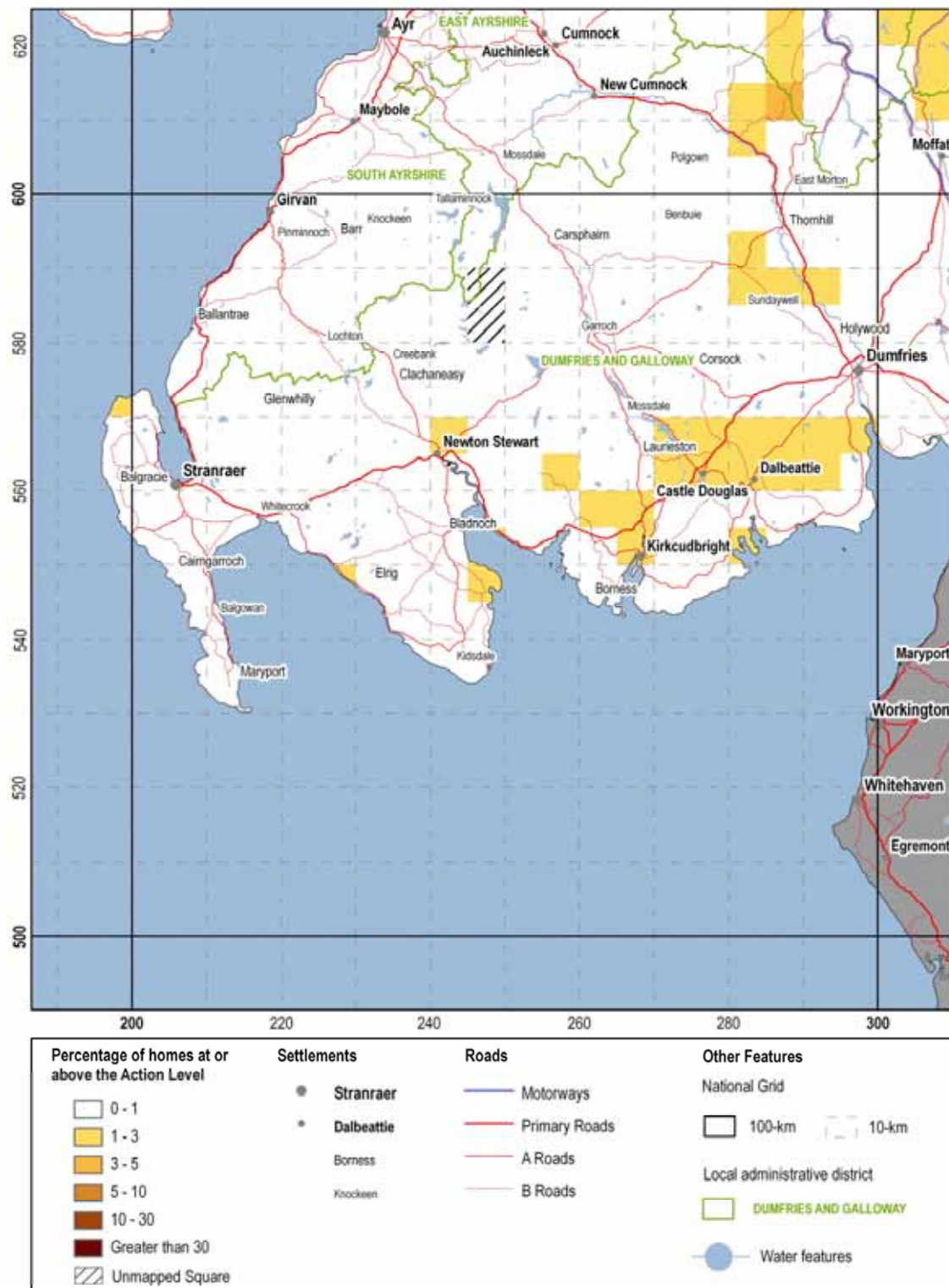


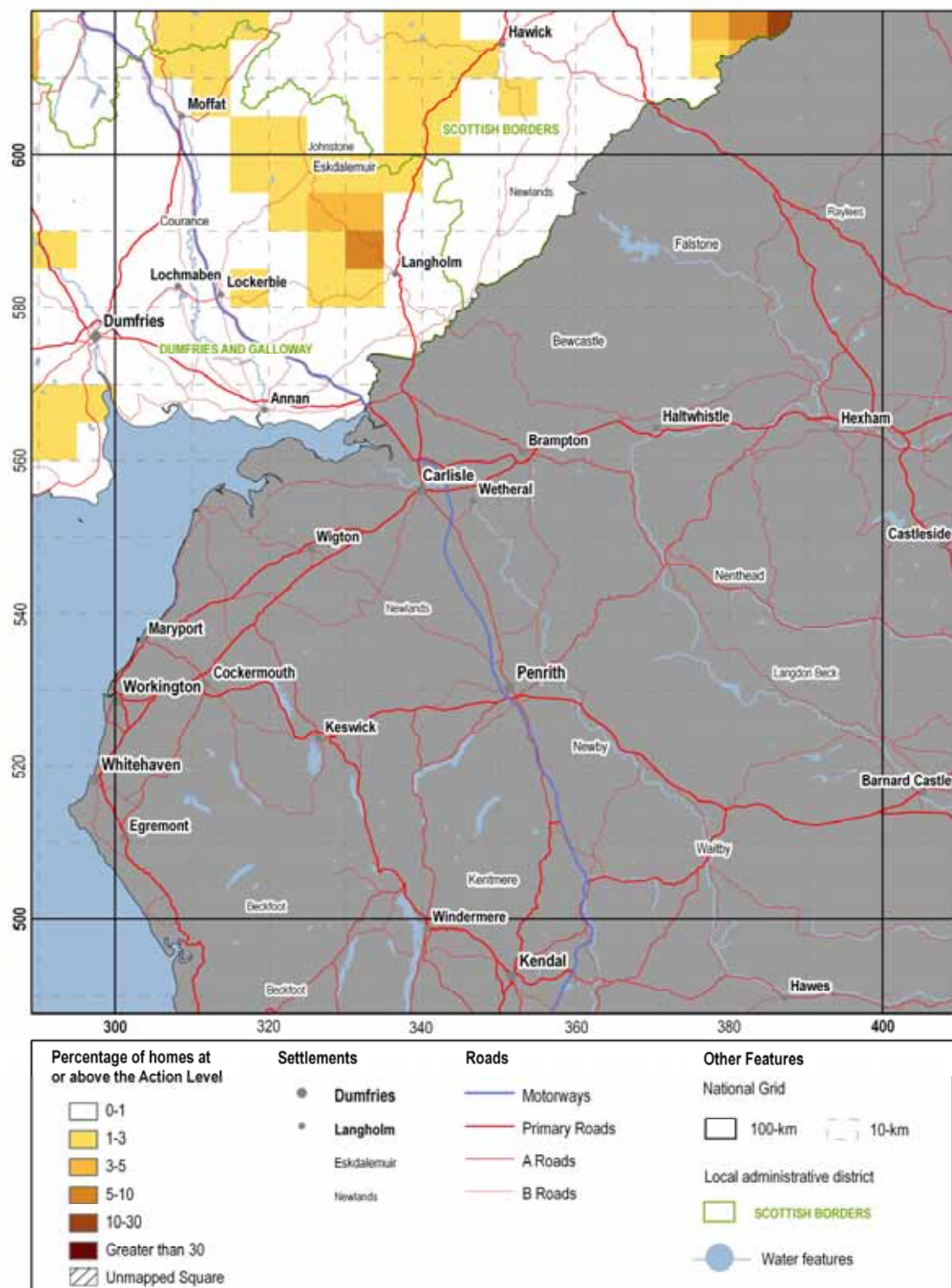
Figure 4 Summary of the number of results by 5 km grid square in Scotland (axis numbers are the 100-km coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
 Radon Affected Area classification © Health Protection Agency copyright [2008]



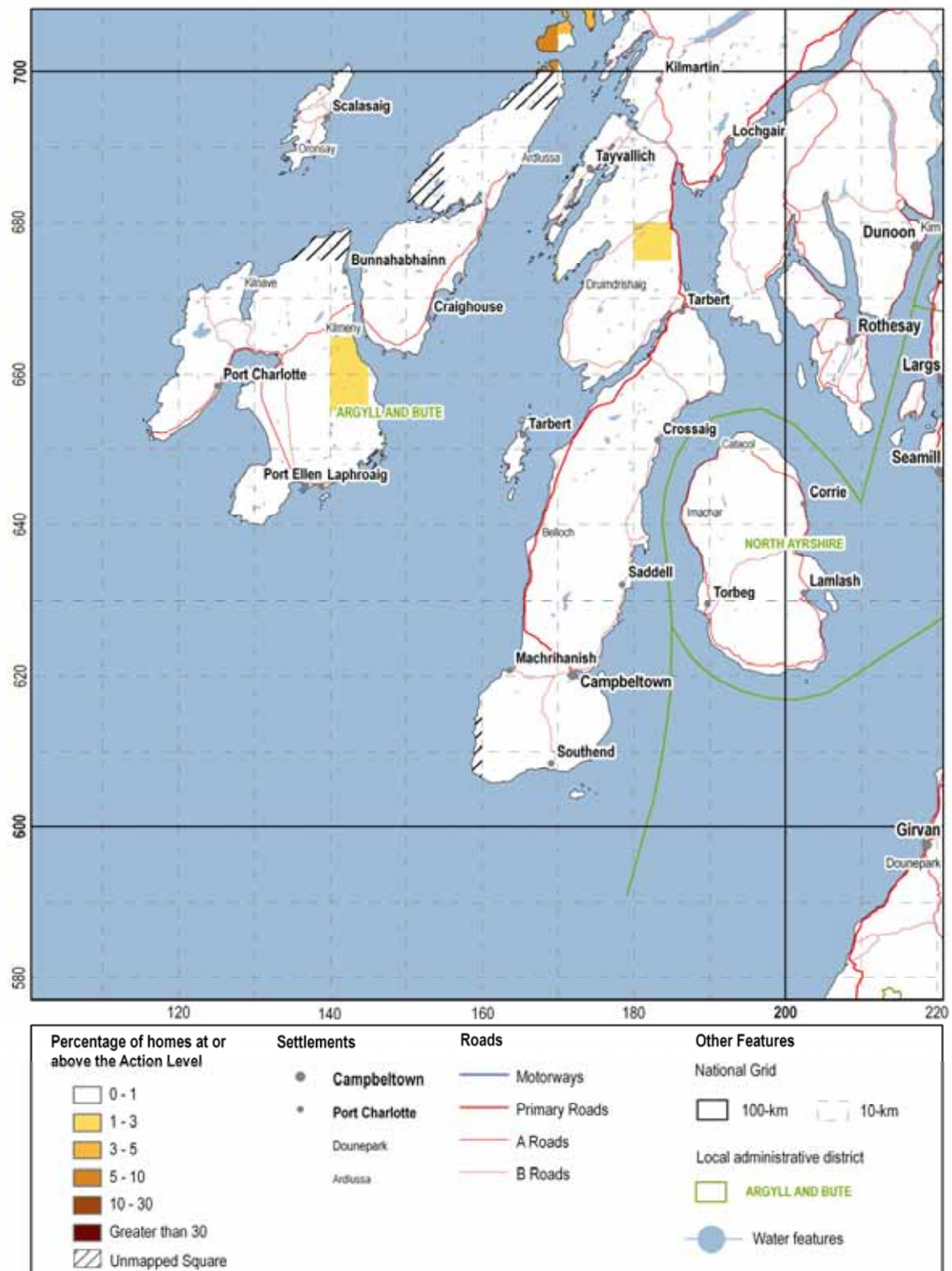
Map 1 South-western Scotland, 100-km grid square NX (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



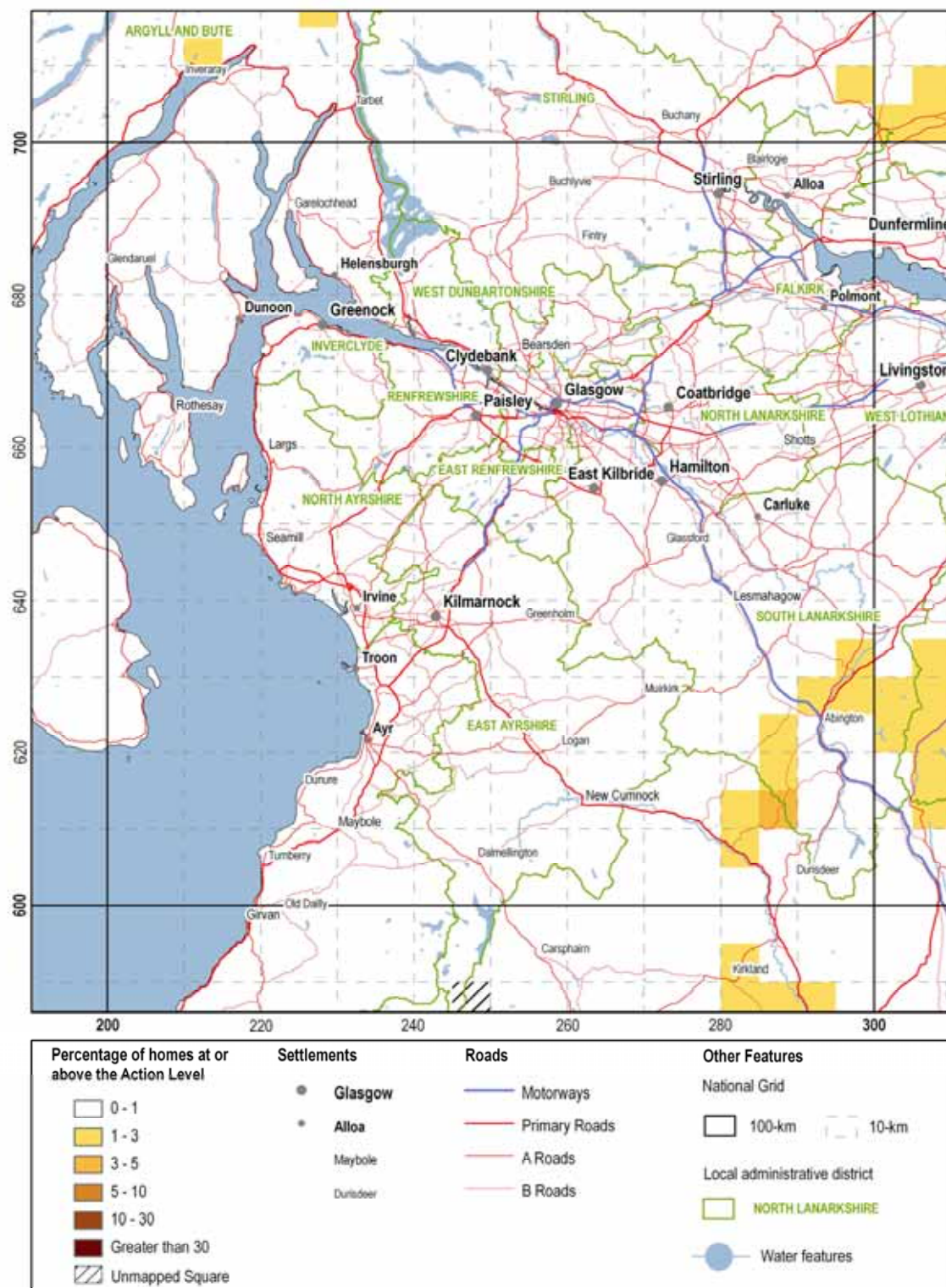
Map 2 South-western Scottish Borders, 100-km grid square NY (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



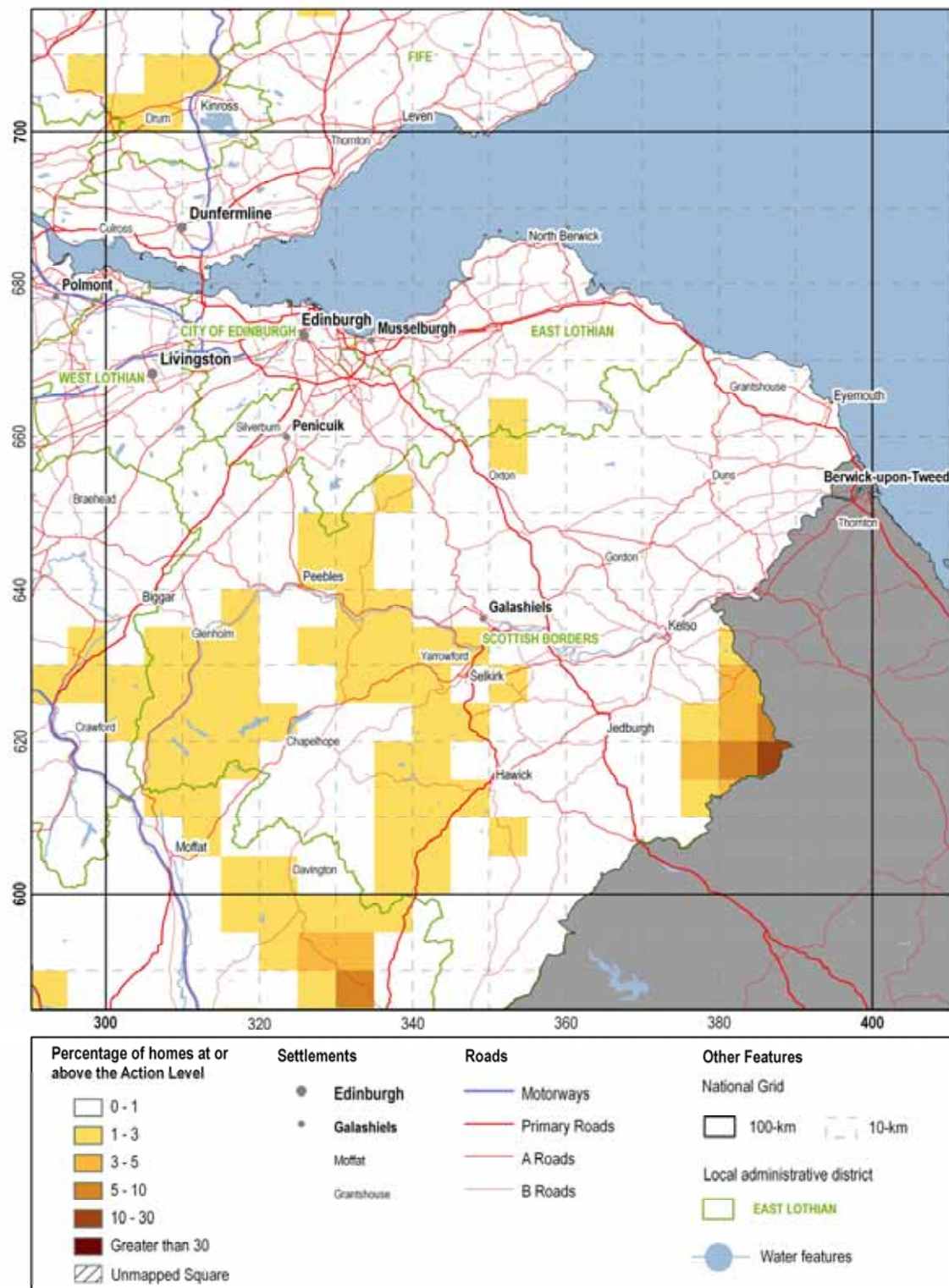
Map 3 Kintyre and the islands of Islay, Jura and Arran, 100-km grid square NR (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



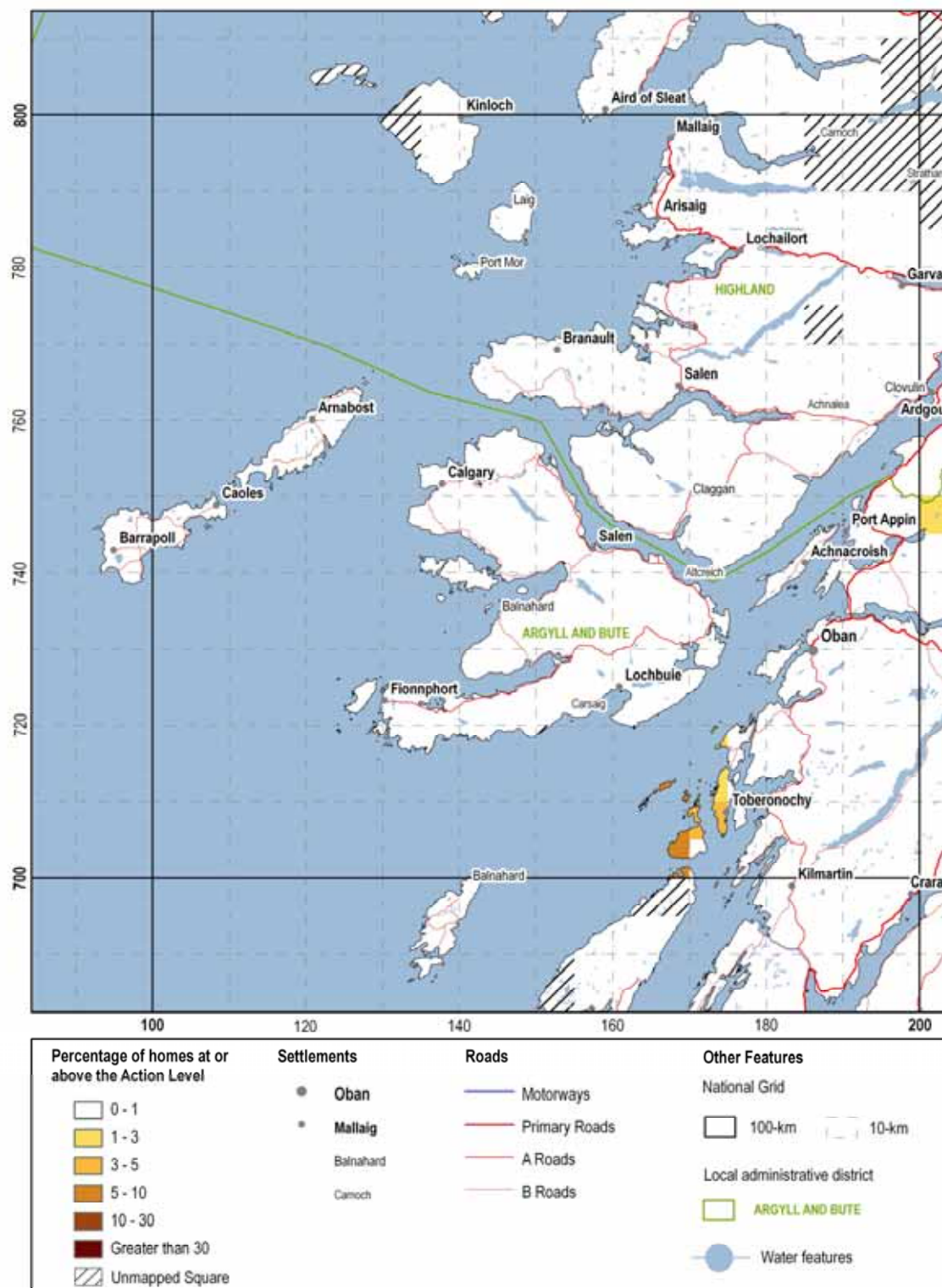
Map 4 Glasgow and the south-western Lowlands, 100-km grid square NS (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



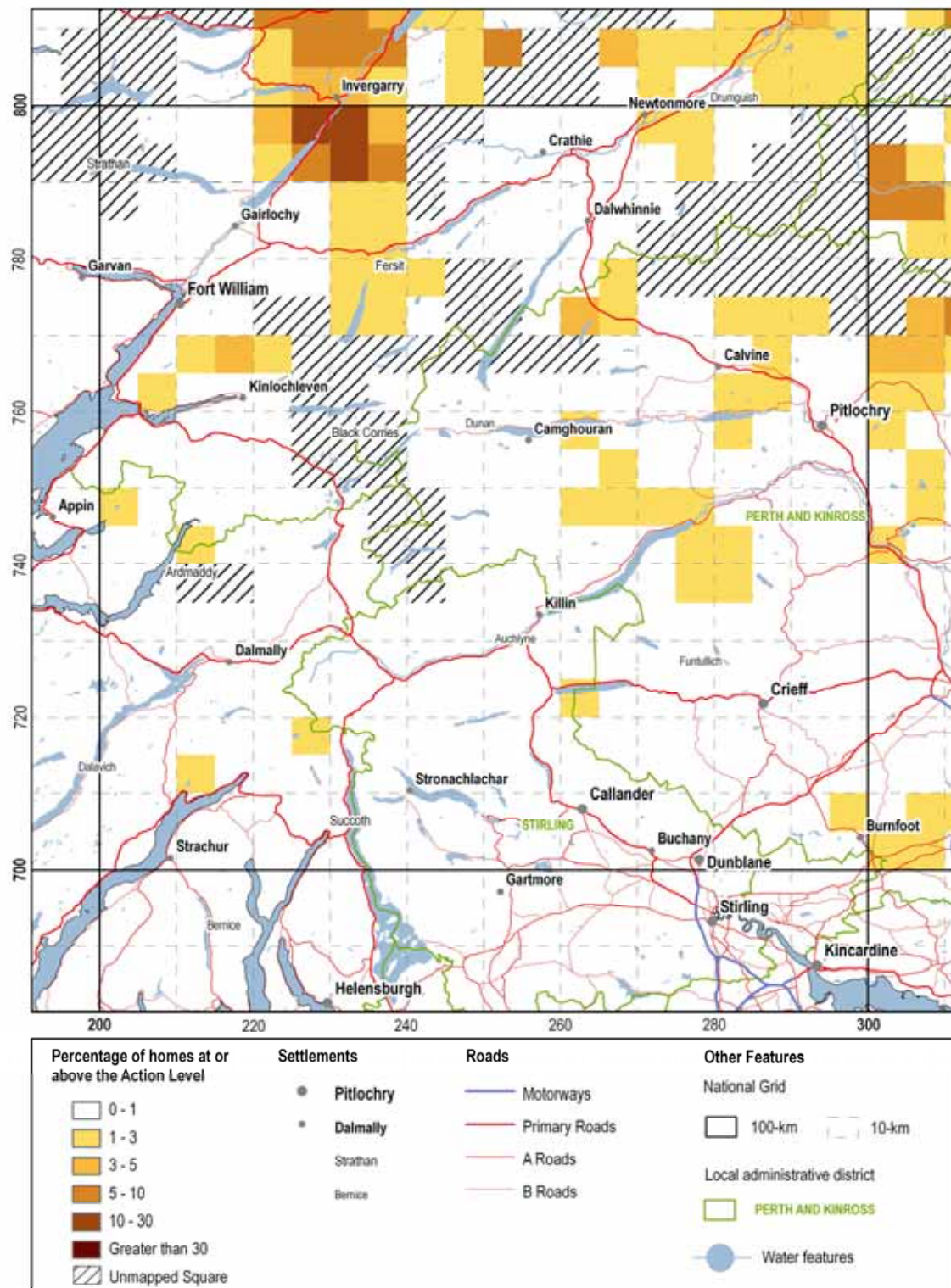
Map 5 Edinburgh and the south-eastern Scottish Borders, 100-km grid square NT (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



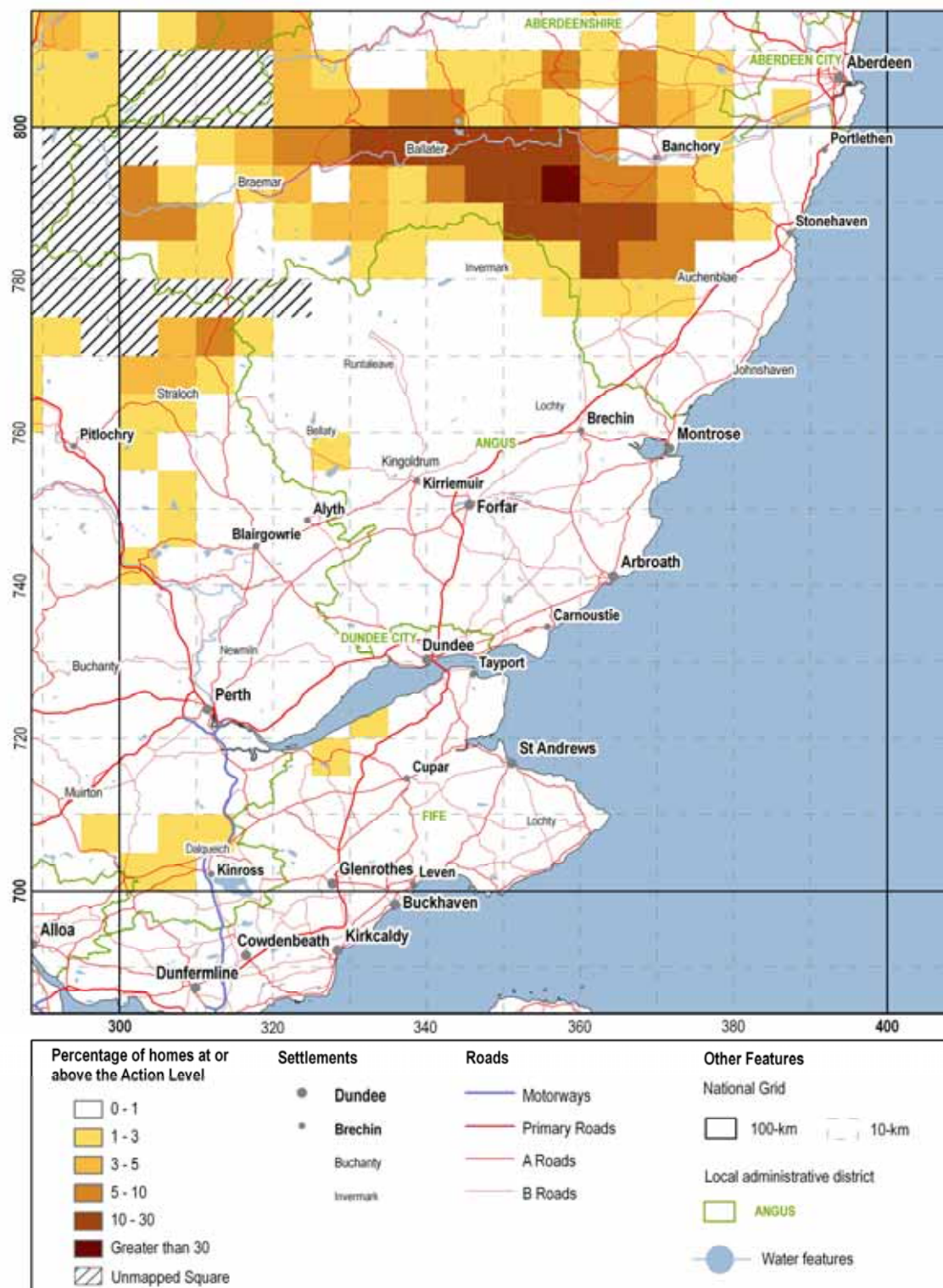
Map 6 North-western Argyll and Bute and the south-western Highlands, 100-km grid square NM (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



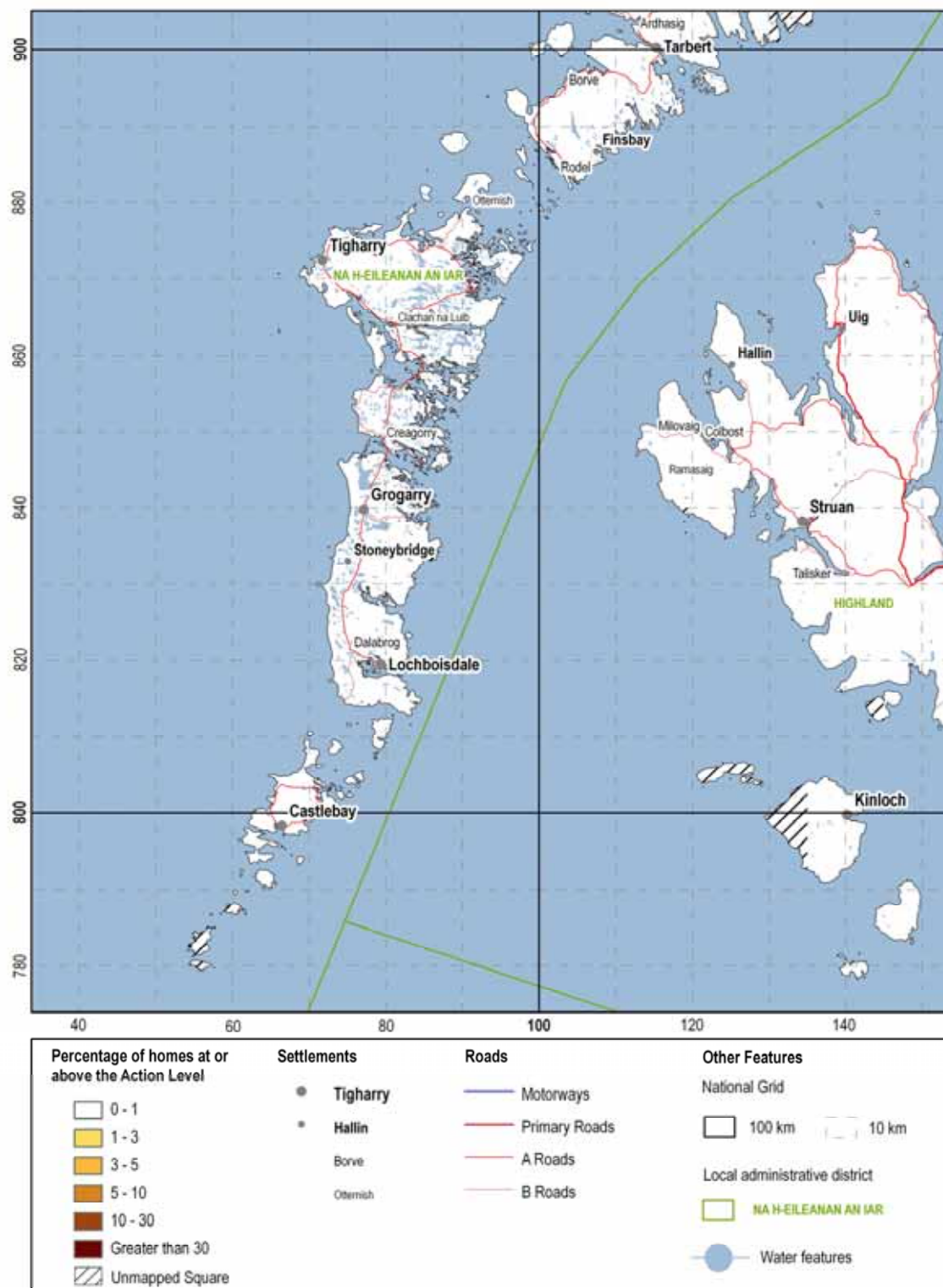
Map 7 Central Scotland, 100-km grid square NN (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
 Radon Affected Area classification © Health Protection Agency copyright [2008]



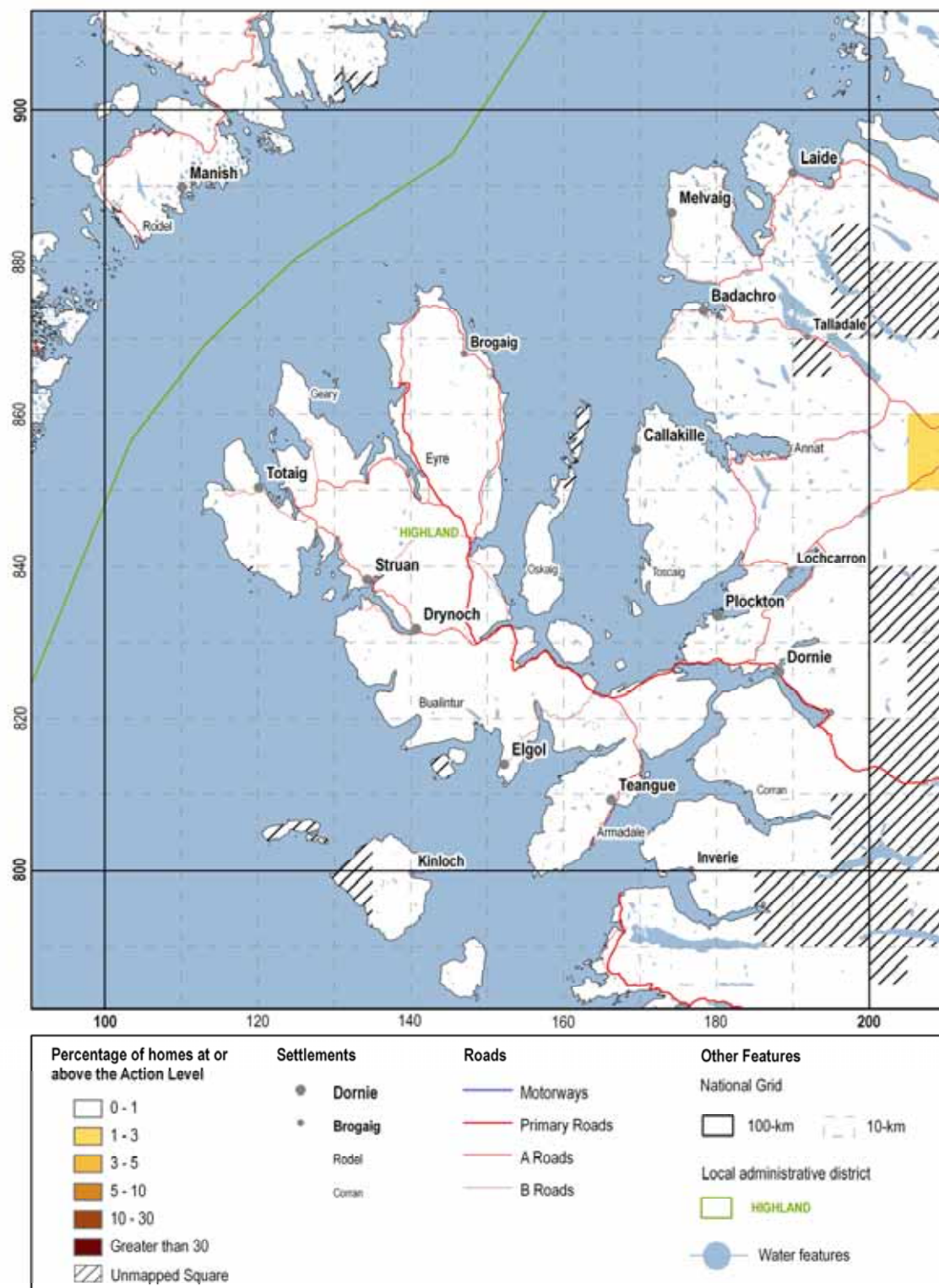
Map 8 Tayside, Angus and southern Aberdeenshire, 100-km grid square NO (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



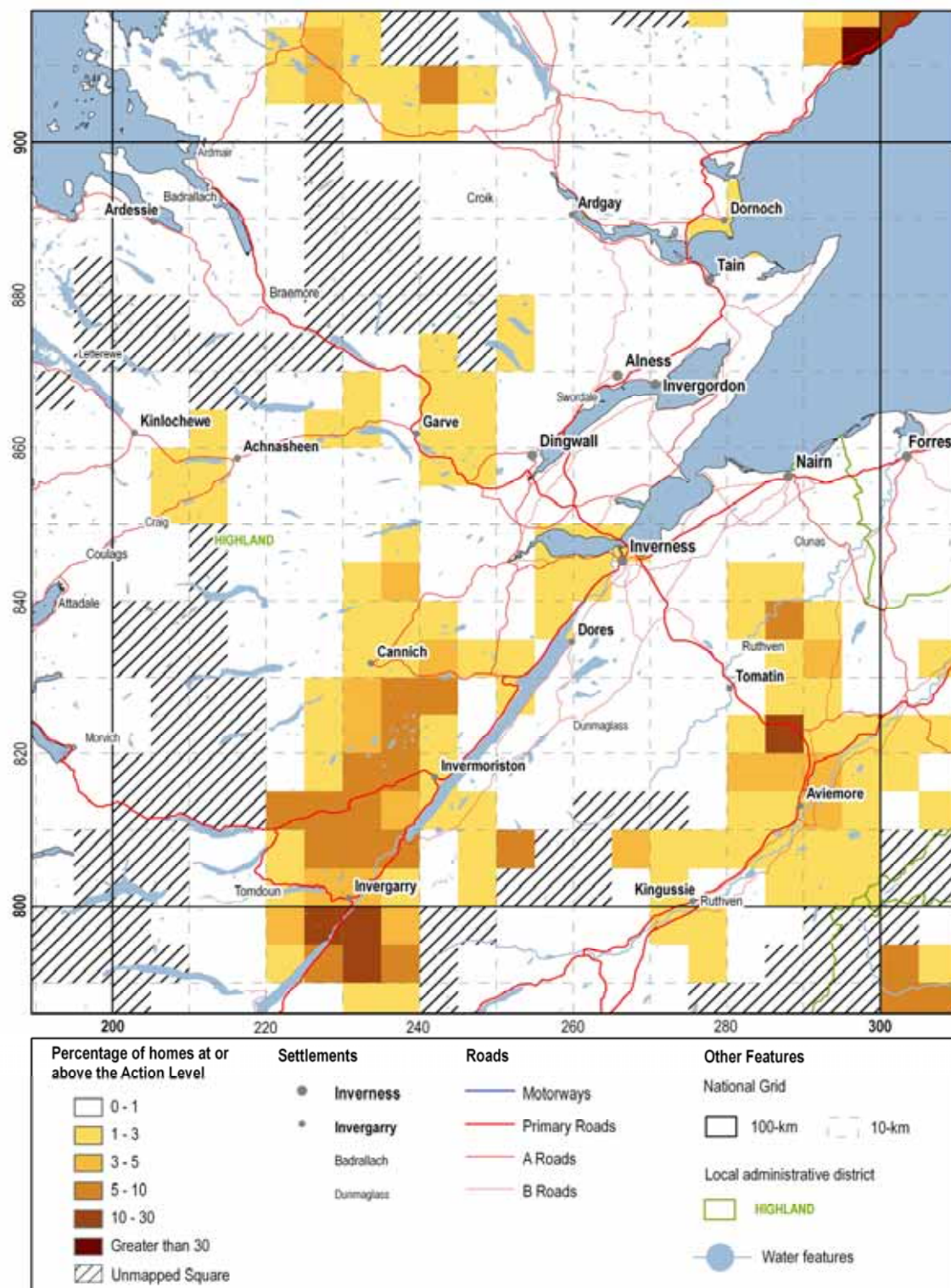
Map 9 Southern Hebrides and western Skye, 100-km grid squares NF and NG (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



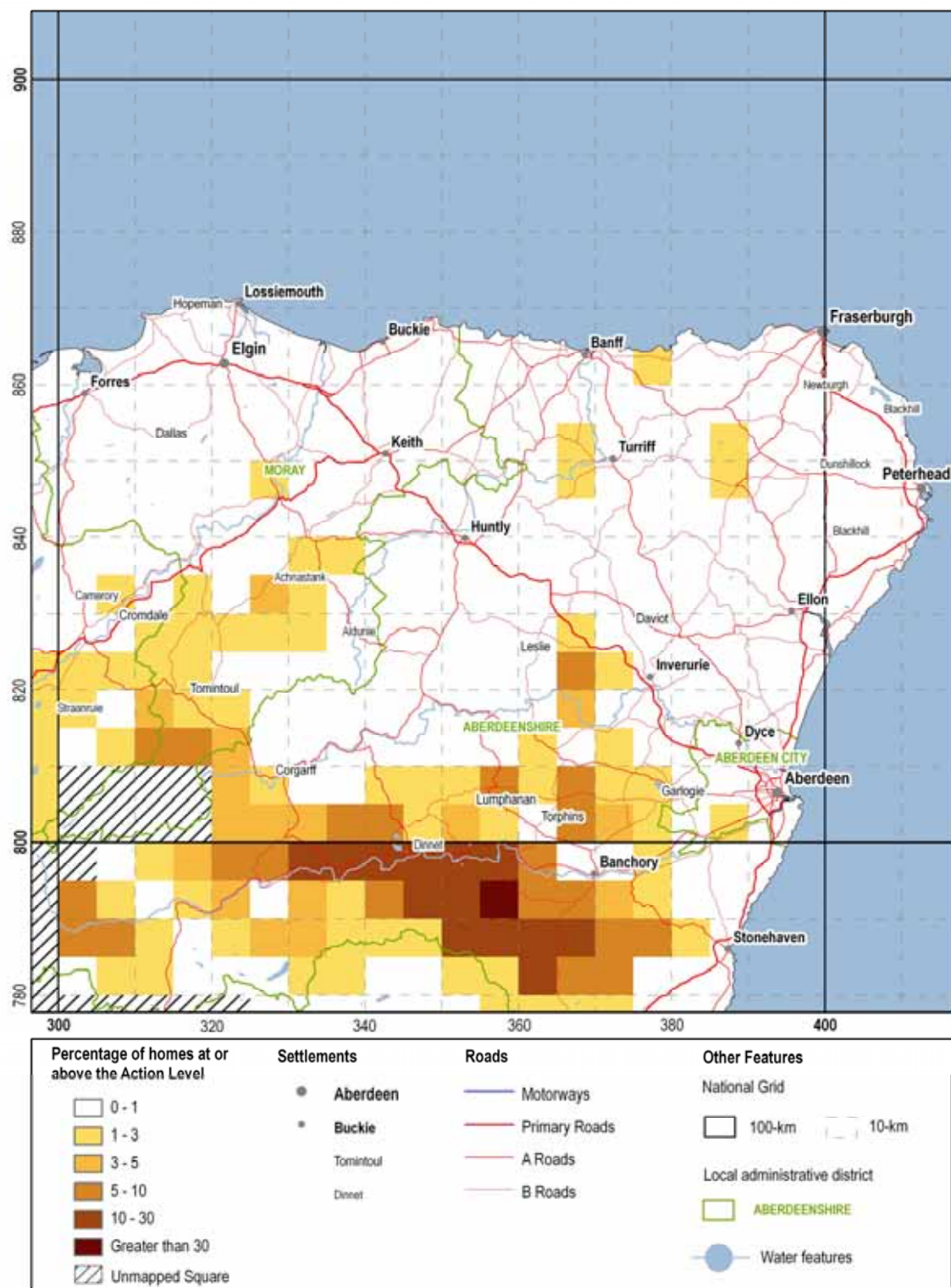
Map 10 Skye and the western Highlands, 100-km grid square NG (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



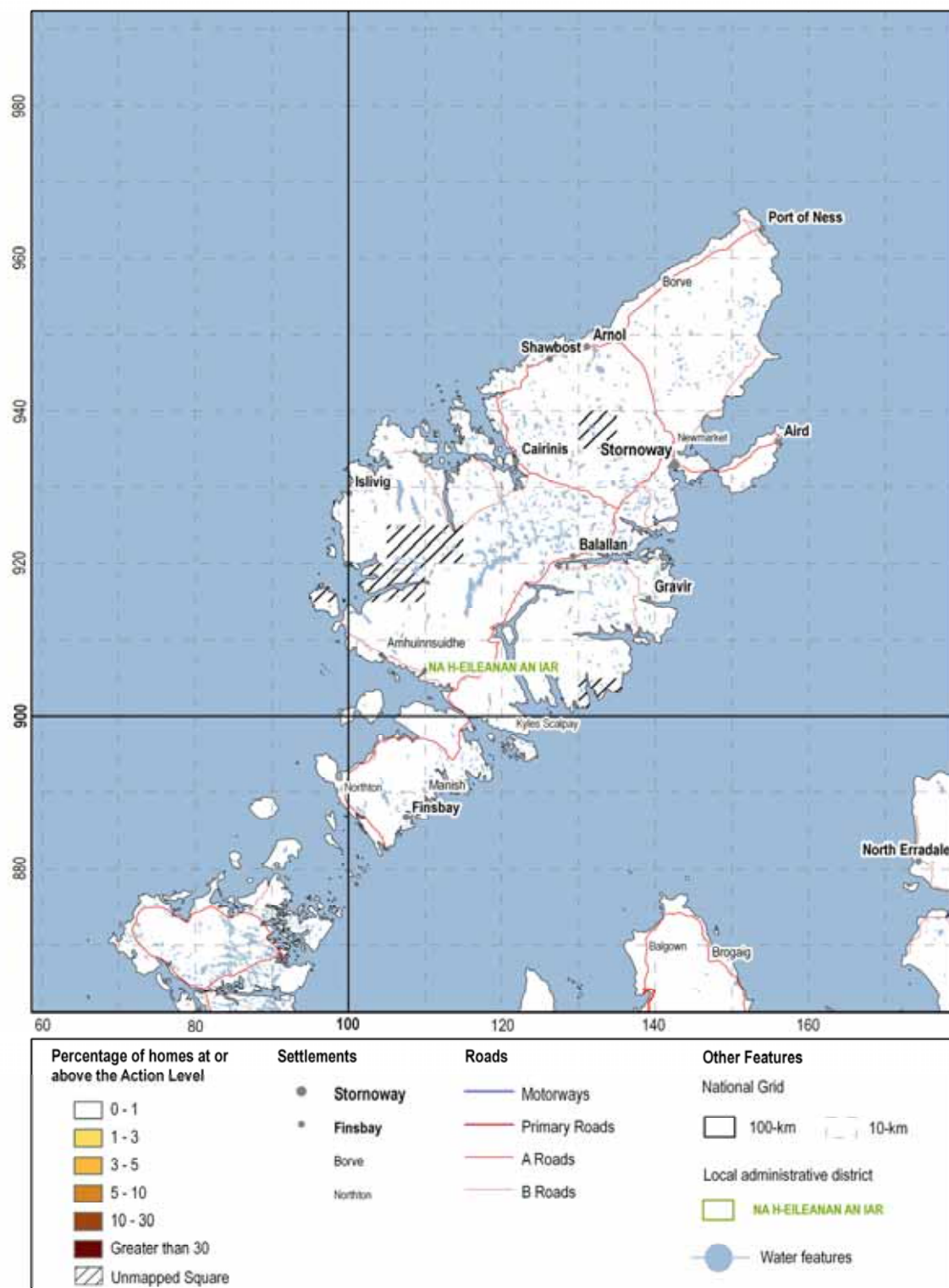
Map 11 Central Highlands, 100-km grid square NH (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



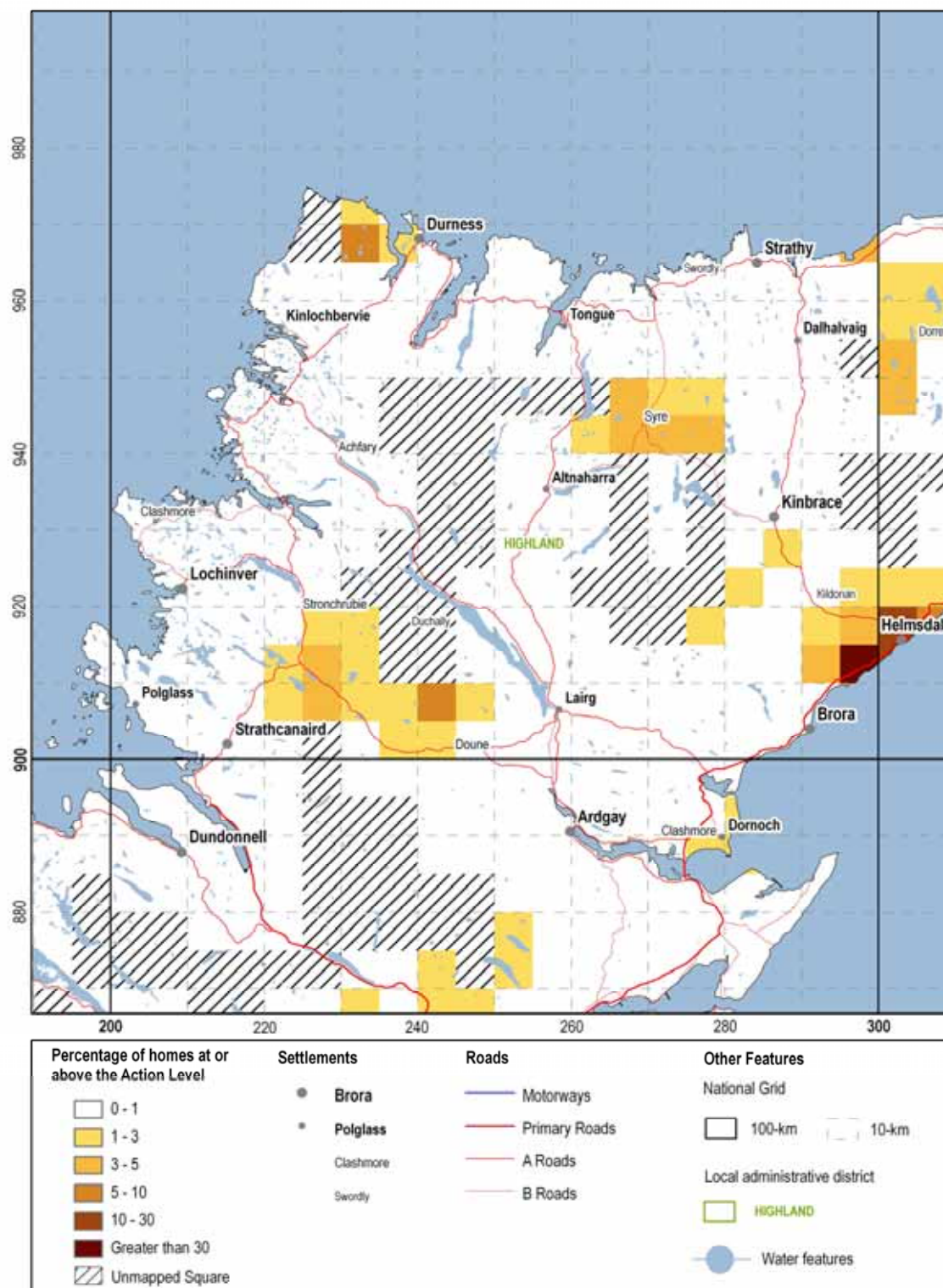
Map 12 Moray and northern Aberdeenshire, 100-km grid square NJ (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency and copyright [2008]



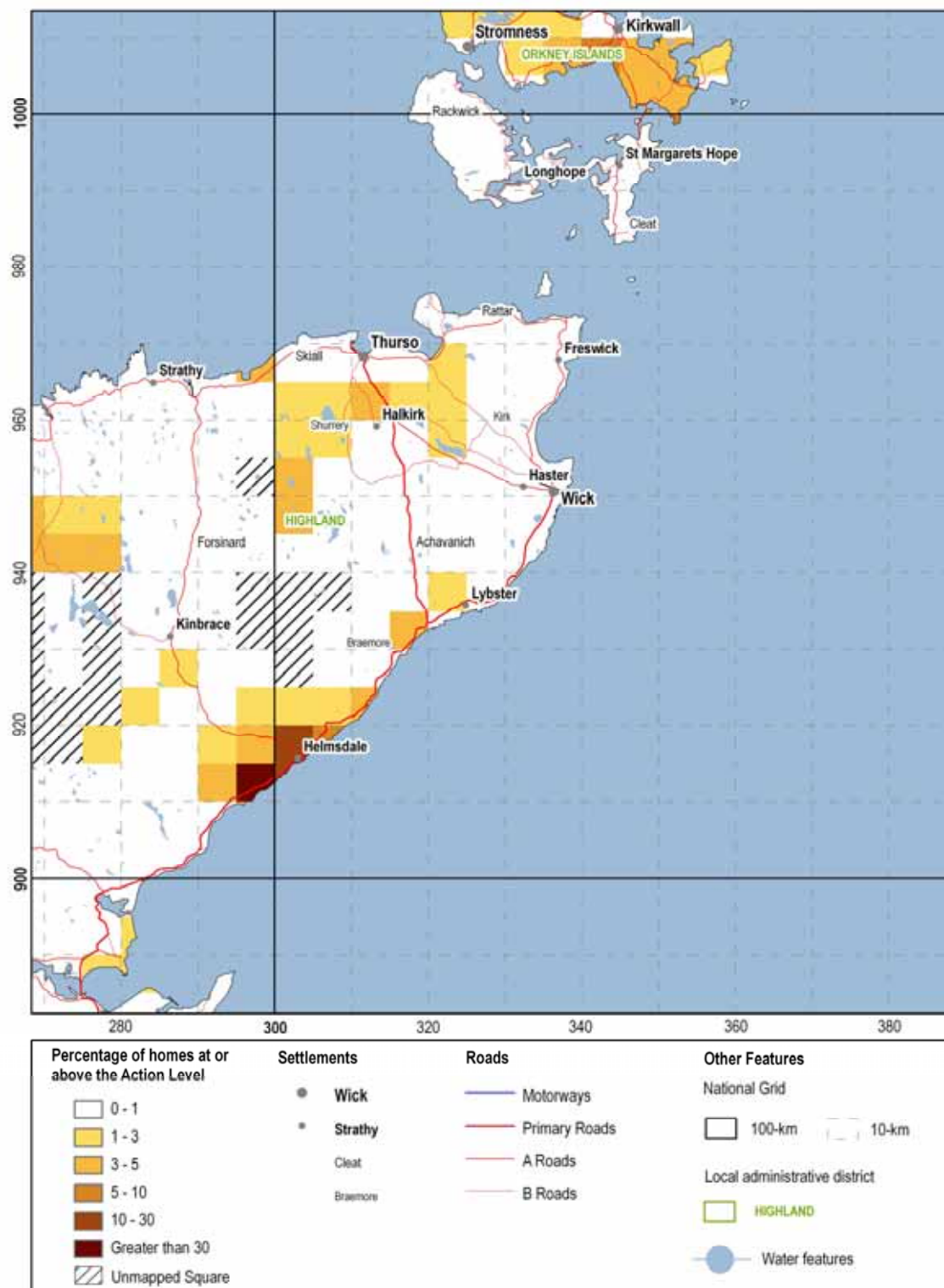
Map 13 Northern Hebrides, 100-km grid squares NB, NF and NG (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



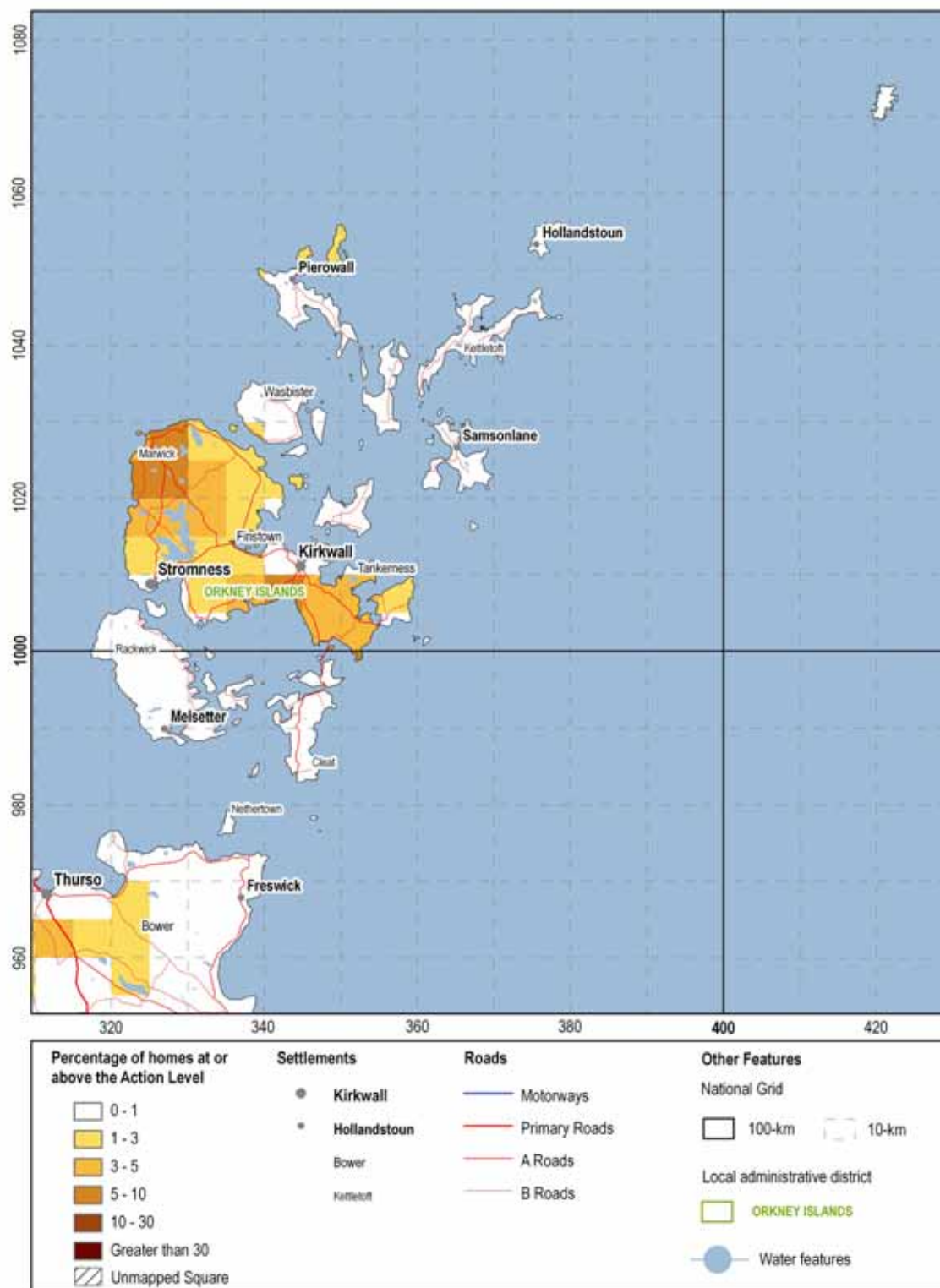
Map 14 North-western Scotland (Sutherland), 100-km grid squares NC and NH (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



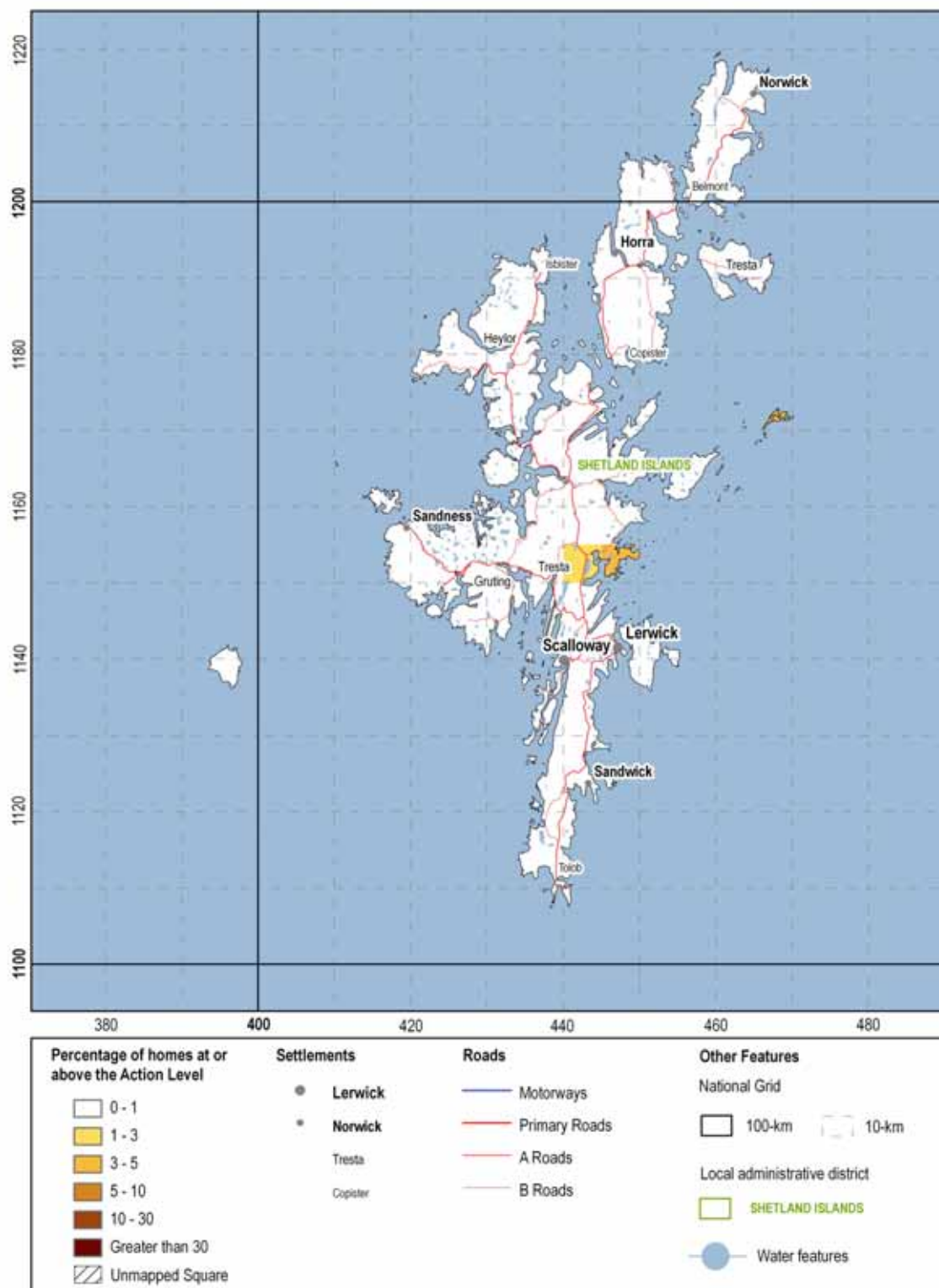
Map 15 North-eastern Scotland (Caithness), 100-km grid squares NC and ND (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



Map 16 Orkney Islands and Fair Isle, 100-km grid squares HY, HZ and ND (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]
Radon Affected Area classification © Health Protection Agency copyright [2008]



Map 17 Shetland Islands, 100-km grid squares HP, HT and HU (axis numbers are the coordinates of the National Grid)

© Crown copyright. All rights reserved [Health Protection Agency][100016969][2008]

Radon Affected Area classification © Health Protection Agency copyright [2008]

APPENDIX A Details of the radon mapping programme and measurement procedures

A1 BACKGROUND

The planning stage of the programme to produce a radon map of Scotland commenced in late 2002. The objective was to obtain 5 or more measurement results in each of the 3,806 or so 5-km squares of the national grid in Scotland. This would allow completion of the radon probability mapping in the same manner as in the two radon Affected Areas already declared in Scotland (inland from Aberdeen and around Helmsdale in the northeast) and elsewhere in the UK.

The UK national radon database contains the results from some 9,200 measurements from previous surveys, however many of these are concentrated in the two radon Affected Areas: only some 386 5-km grid squares contain 5 or more results from these surveys. A further complication is that a significant proportion of the 5-km squares in Scotland, about a third, contain either no dwellings or fewer than 5.

Taking account of these issues, it was calculated that a minimum of a further 8,000 results would be needed to complete the mapping exercise. Experience indicates that there is a need to make allowance for two circumstances:

- (i) Up to 12% of householders starting a three-month radon measurement failed to complete due to illness, death, moving house and other reasons.
- (ii) The positive response rate to offers of a measurement vary between 20% and 40% requiring offers to a multiple of the number of households required. This invariably leads to an excess, more than 5 measurements, in some 5 km squares. The longer the timescale, the smaller the excess as further rounds of letters can be sent once the results of the first round are known.

For planning purposes and assuming a programme over several years, an allowance was made for an extra 2,000 measurements to cover these two circumstances, giving a total of 10,000 measurements.

A2 SELECTING THE SAMPLE

A more detailed analysis using the Post Office Address File (PAF), the Ordnance Survey Address Point file and population data from the 1991 census indicated that at least 765 5-km grid squares contained no dwellings and a further 456 squares contained fewer than 5 dwellings. In addition, some of the more isolated addresses are climbing huts, bothies or hunting lodges with no permanent occupants and sometimes no postal delivery service.

All the domestic addresses in each 5-km grid square with fewer than 5 valid results were identified and any addresses already measured removed, as were any inappropriate ones such as caravans and any obvious non-residential addresses. The number of new

measurements required to give 5 results in each square was calculated and three times this number of addresses selected by a 1 in n procedure for all the addresses in the square. In a significant number of squares, all the addresses were selected due to a low population density.

The 5-km squares bisected by the Scottish/English border were treated differently; only the addresses within Scotland were considered unless these were too few to reach the number required. If this was the case, then all addresses in the square were considered.

A3 INVITING HOUSEHOLDERS TO PARTICIPATE

Letters, addressed to the Householder, were sent to each address asking for their help and offering a radon measurement free of charge: the letter contained a reply slip and a pre-return envelope as well as a leaflet about radon. If no reply was received after six weeks, a reminder letter was sent: a further reminder letter was sent a further six weeks later. The text of the initial letter is reproduced in appendix B3, an example of a reminder letter in B4 and the leaflet in B9. Householders agreeing to participate were sent a measurement kit.

A4 MEASUREMENT PROCEDURE

Measurements in all the surveys, including the earlier surveys, are made with two passive integrating detectors in each dwelling – one in the main living area and one in a regularly used bedroom. The detectors were sent by post to participating householders together with placement instructions (see B10), a short questionnaire to record placement and removal dates and brief details about the dwelling and pre-paid return packaging. The two detectors remain *in situ* for three months and are returned to HPA for analysis. The individual results are combined to reflect typical occupancy patterns. Since indoor radon levels are usually higher in cold weather, the results reported to householders are normalised for typical seasonal variations in radon levels to allow the estimated annual radon concentration to be reported and compared to the radon Action Level (Wrixon et al, 1988; Pinel et al, 1995). Householders are informed by letter of the result and its significance explained: if appropriate, advice on remedial measures is also provided. The text of the letters is given in appendices B5 to B8.

A5 ITERATION AND STATISTICS

At intervals during the survey, the analysis of the available results and the processes described above were repeated with the aim of achieving the target of 5 results in each 5-km square wherever possible. By the end of the process, over 40,000 letters of invitation were despatched, 10,500 measurement packs deployed and valid results obtained for 9,900 homes.

APPENDIX B Letters and leaflets

B1 TEXT OF THE LETTER TO CHIEF EXECUTIVES AND CHIEF ENVIRONMENTAL HEALTH OFFICERS OF LOCAL AUTHORITIES

Dear Mr Smith

Radon survey of Scottish homes

In a letter dated June this year, Dr Ian Hall (SEPA Sponsorship and Waste Division, Scottish Executive Environment Group) described the forthcoming survey of radon levels in Scottish homes and provided examples of the letters and leaflets to be sent to a sample of householders throughout Scotland. I enclose a second copy of the leaflet.

My purpose in writing is to tell you that NRPB is about to start the contact phase of the survey. The initial batch of contact letters will be despatched next week. We will assess the replies, note the location (i.e. 5 km grid square) of the householders willing to participate and despatch further batches to fill in the gaps at intervals over the next few months.

The initial batch will be the largest and includes «Number» addresses in the area covered by «A1».

As mentioned in the letter from Dr Hall, a radon information folder is available from NRPB (please e-mail me at ...). NRPB publishes a quarterly radon newsletter as an insert in the RHIS journal; it is also available as a free download on our website (www.nrpb.org), follow the route publications -> newsletters -> environmental_radon. If you need further information or have any queries please contact myself, my colleague David Rees (...) or any member of the radon team at NRPB (...).

I am sending a copy of this letter addressed to your Chief Environmental Health Officer.

Yours sincerely

Dr Martyn Green
Radon Survey
(...)

B2 TEXT OF THE LETTER TO THE CHIEF EXECUTIVES OF HEALTH BOARDS AND DIRECTORS OF PUBLIC HEALTH

Dear Mr Jones

Radon survey of Scottish homes

In a letter dated June this year, Dr Ian Hall (SEPA Sponsorship and Waste Division, Scottish Executive Environment Group) described the forthcoming survey of radon levels in Scottish homes and provided examples of the letters and leaflets to be sent to a sample of householders throughout Scotland. I enclose a second copy of the leaflet.

My purpose in writing is to tell you that NRPB is about to start the contact phase of the survey. The initial batch of contact letters will be despatched next week. We will assess the replies, note the location (i.e. 5 km grid square) of the householders willing to participate and despatch further batches to fill in the gaps at intervals over the next few months.

The initial batch will be the largest and includes «Number» addresses in the area covered by «A1».

As mentioned in the letter from Dr Hall, a radon information folder is available from NRPB (please e-mail me at ...). NRPB publishes a quarterly radon newsletter as an insert in the RHIS journal; it is also available as a free download on our website (www.hpa.org.uk follow the route publications -> newsletters -> environmental_radon. If you need further information or have any queries please contact myself or my colleague . (...).

I am sending a copy of this letter addressed to your Director of Public Health.

Yours sincerely

Dr Jill Meara FFPH,
Deputy Director/Public Health Physician
(...)

B3 TEXT OF THE INITIAL LETTER TO HOUSEHOLDERS REQUESTING THEIR CO-OPERATION

Dear Householder

NATIONAL SURVEY OF RADON IN HOMES

I'm writing to let you know that your home has been selected as part of the Scottish Executive's official Survey of Radon in Homes. The Environment and Rural Affairs Department (ERAD) has asked the Health Protection Agency (HPA) to measure homes across Scotland to find out about radon levels. Yours is one of a small sample chosen to take part in the survey.

The radon test is simple, completely free and done by post: **so no one will call**. The enclosed leaflet gives details and information about radon. To start the test add your name and telephone number to the form below and return it to HPA - **it really is that easy!** The return envelope is prepaid, so it won't cost you anything to reply.

Although the test is entirely voluntary, by taking part you will be helping us to make more accurate forecasts about radon levels, to assess the health risk from radon and to help to ensure any money spent on radon reduction is used most wisely.

You are one of just a few households selected to help with this study - **so your participation really does count**. We will inform you of the result of the test in your home but otherwise individual data will be treated in confidence by HPA and ERAD.

I look forward to receiving your reply. Please contact me at the address below if you have any queries or comments on this survey.

Yours faithfully

David Rees
Radon Survey

PS This is a free offer, but please note the offer is open only for a limited period.

«A1»

«ID»/STIMSCT5B

«A2»

«A3»

«A4»

Date

«ID»

I wish to accept a free radon measurement as described in the letter from HPA.

Title: (Mr/Mrs/Ms etc)..... Initial(s).....

Surname.....

(BLOCK CAPITALS

PLEASE)

Signed:.....

Telephone

number:.....

B4 TEXT OF THE REMINDER LETTER TO HOUSEHOLDERS REQUESTING THEIR CO-OPERATION

Dear Householder

NATIONAL SURVEY OF RADON IN HOMES

I'm writing to you again as we have no record of a reply to our previous letter. We would like your help as part of the Scottish Executive's official Survey of Radon in Homes. The Environment and Rural Affairs Department (ERAD) has asked the Health Protection Agency (HPA) to measure homes across Scotland to find out about radon levels. Yours is one of a small sample chosen to take part in the survey.

The radon test is simple, completely free and done by post: **so no one will call**. The enclosed leaflet gives details and information about radon. To start the test add your name and telephone number to the form below and return it to HPA - **it really is that easy!** The return envelope is prepaid, so it won't cost you anything to reply.

Although the test is entirely voluntary, by taking part you will be helping us to make more accurate forecasts about radon levels, to assess the health risk from radon and to help to ensure any money spent on radon reduction is used most wisely.

You are one of just a few households selected to help with this study - **so your participation really does count**. We will inform you of the result of the test in your home but otherwise individual data will be treated in confidence by HPA and ERAD.

I look forward to receiving your reply. Please contact me at the address below if you have any queries or comments on this survey.

Yours faithfully

David Rees
Radon Survey

PS This is a free offer, but please note the offer is open only for a limited period.

-----✂-----
«A1» «ID»/STIMSCT5BR
«A2»
«A3»
«A4»

Date
«ID»

I wish to accept a free radon measurement as described in the letter from HPA.

Title: (Mr/Mrs/Ms etc)..... Initial(s).....
Surname.....

(BLOCK CAPITALS

PLEASE)

Signed:..... Telephone
number:.....

B5 TEXT OF THE LETTER FOR A RESULT BELOW 100 BQ M⁻³

Dear Mr and Mrs Smith

Radon in dwellings

I am writing to tell you the result of the radon measurements and whether you should consider further action.

The Action Level in the UK for radon in homes is 200 Bq m⁻³ (becquerel per cubic metre) and it is recommended that concentrations at or above the Action Level should be reduced to be as low as reasonably practicable. The Action Level is the annual average for the whole dwelling. The national average radon level is 20 Bq m⁻³.

The readings from the detectors you returned, assuming that they were placed in accordance with our instruction leaflet, indicate an average radon level for your home over the year of «Reported_conc» Bq m⁻³. When calculating the average, correction factors have been applied that include an adjustment to allow for seasonal variations. As the result is below the Action Level it is not necessary to reduce the level further. Information to supplement the leaflet sent to you with the offer to test is available on the website at www.hpa.org.uk/radiation/radon/index.htm. Radon guides published by DEFRA are also available on request.

If the test was organised by a third party, such as your local council or housing association, the result will normally be given to them. In addition, the result of a test paid for by a tenant will be given to the landlord on request unless the tenant has, in writing, asked us not to. Otherwise, your result will not be disclosed to anyone else without your written permission.

Thank you for undertaking the radon measurement. Please keep this letter in a safe place as a charge may be made for providing further copies.

Yours sincerely

J Smithard(Mrs)
Office Manager - Radon Survey

**B6 TEXT OF THE LETTER FOR A RESULT BETWEEN
100 AND 170 BQ M⁻³**

Our ref: «Meas_id»/JRS170

Date

Dear «sal»

Radon in dwellings

I am writing to tell you the result of the radon measurements and whether you should consider further action.

The Action Level in the UK for radon in homes is 200 Bq m⁻³ (becquerel per cubic metre) and it is recommended that concentrations at or above the Action Level should be reduced to be as low as reasonably practicable. The Action Level is the annual average for the whole dwelling. The national average radon level is 20 Bq m⁻³.

The readings from the detectors you returned, assuming that they were placed in accordance with our instruction leaflet, indicate an average radon level for your home over the year of «Reported_conc» Bq m⁻³. When calculating the average, correction factors have been applied that include an adjustment to allow for seasonal variations. As the result is below the Action Level it is not necessary to reduce the level further, but you are, of course, free to do so if you wish.

The enclosed literature provides general information on radon and how to lower levels. Further advice can be obtained from the contacts listed in the guides. If you decide to take remedial action, once the work is completed, the radon level should be checked again to ensure that it has been effective. We occasionally have research funding available to provide free or reduced cost retests, but only if the work undertaken is likely to be effective and the results of your tests can be made available to your local council. Otherwise the standard fee, currently £38.78 will usually apply.

If the test was organised by a third party, such as your local council or housing association, the result will normally be given to them. In addition, the result of a test paid for by a tenant will be given to the landlord on request unless the tenant has, in writing, asked us not to. Otherwise, your result will not be disclosed to anyone else without your written permission.

Thank you for undertaking the radon measurement. Please keep this letter in a safe place as a charge may be made for providing further copies.

Yours sincerely

Jane Smithard(Mrs)
Office Manager - Radon Survey

**B7 TEXT OF THE LETTER FOR A RESULT BETWEEN
170 AND 200 BQ M⁻³**

Our ref: «Meas_id»/JRS200

Date

Dear «sal»

Radon in dwellings

I am writing to tell you the result of the radon measurements and whether you should consider further action.

The Action Level in the UK for radon in homes is 200 Bq m⁻³ (becquerel per cubic metre) and it is recommended that concentrations at or above the Action Level should be reduced to be as low as reasonably practicable. The Action Level is the annual average for the whole dwelling. The national average radon level is 20 Bq m⁻³.

The readings from the detectors you returned, assuming that they were placed in accordance with our instruction leaflet, indicate an average radon level for your home over the year of «Reported_conc» Bq m⁻³. When calculating the average, correction factors have been applied that include an adjustment to allow for seasonal variations. As the result is approaching the Action Level you might consider taking steps to reduce the level.

The enclosed literature provides general information on radon and how to lower levels. Further advice can be obtained from the contacts listed in the guides. If you decide to take remedial action, once the work is completed, the radon level should be checked again to ensure that it has been effective. We occasionally have research funding available to provide free or reduced cost retests, but only if the work undertaken is likely to be effective and the results of your tests can be made available to your local council. Otherwise the standard fee, currently £38.78 will usually apply.

If the test was organised by a third party, such as your local council or housing association, the result will normally be given to them. In addition, the result of a test paid for by a tenant will be given to the landlord on request unless the tenant has, in writing, asked us not to. Otherwise, your result will not be disclosed to anyone else without your written permission.

Thank you for undertaking the radon measurement. Please keep this letter in a safe place as a charge may be made for providing further copies.

Yours sincerely

Jane Smithard(Mrs)
Office Manager - Radon Survey

B8 TEXT OF THE LETTER FOR A RESULT OVER 200 BQ M⁻³

Our ref: «Meas_id»/JRS750

Date

Dear «sal»

Radon in dwellings

I am writing to tell you the result of the radon measurements and whether you should consider further action.

The Action Level in the UK for radon in homes is 200 Bq m⁻³ (becquerel per cubic metre) and it is recommended that concentrations at or above the Action Level should be reduced to be as low as reasonably practicable. The Action Level is the annual average for the whole dwelling. The national average radon level is 20 Bq m⁻³.

The readings from the detectors you returned, assuming that they were placed in accordance with our instruction leaflet, indicate an average radon level for your home over the year of «Reported_conc» Bq m⁻³. When calculating the average, correction factors have been applied that include an adjustment to allow for seasonal variations. As the result is at or above the Action Level, you are advised to take steps to reduce the level.

The enclosed literature provides general information on radon and how to lower levels. Further advice can be obtained from the contacts listed in the guides. Once the work is completed, the radon level should be checked again to ensure that it has been effective. We occasionally have research funding available to provide free or reduced cost retests, but only if the work undertaken is likely to be effective and the results of your tests can be made available to your local council. Otherwise the standard fee, currently £38.78 will usually apply.

If the test was organised by a third party, such as your local council or housing association, the result will normally be given to them. In addition, the result of a test paid for by a tenant will be given to the landlord on request unless the tenant has, in writing, asked us not to. Otherwise, your result will not be disclosed to anyone else without your written permission.

Thank you for undertaking the radon measurement. Please keep this letter in a safe place as a charge may be made for providing further copies.

Yours sincerely

Jane Smithard(Mrs)
Office Manager-Radon Survey

B9 RADON LEAFLET (PRINTED ON A4 AND FOLDED TO FORM A 4 PAGE A5 LEAFLET)



radon
Don't live with the risk



SCOTTISH EXECUTIVE

Where to go for help

For radon measurements and general information
National Radiological Protection Board (NRPB),
Radon Survey, Chilton, Didcot, Oxon OX11 0RQ
Telephone: 01235 822622 or 0800 614529 (24 hours)
www.nrpb.org

For local information, grants and building regulations
Your local council, see phone book for details

For remediation and building matters
Building Research Establishment (BRE),
Kelvin Road, East Kilbride, Glasgow G75 0RZ
www.bre.co.uk/radon

For more information on companies experienced in
radon remediation work
The Radon Council,
PO Box 39, Shepperton, Middlesex TW17 8AQ
Telephone: 01932 221212



SCOTTISH EXECUTIVE

Telephone: 01312 440330
email: RadioactiveWasteTeam@Scotland.gsi.gov.uk



Radon Survey of Scottish Homes



National Radiological Protection Board
Working in partnership with the Health Protection Agency

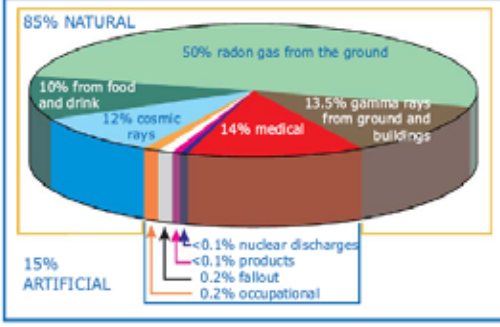
Prepared and produced for the Scottish Executive by the National Radiological Protection Board, Chilton, Didcot, Oxon OX11 0RQ. Telephone: 01235 831600 Fax: 01235 833995

2004

Radon is a natural radioactive gas which enters buildings from the ground and gives radiation doses to the occupants

Sources of Radiation

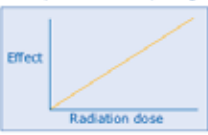
Everybody is exposed to radiation from natural and man-made sources. The pie chart shows the average exposure from all sources. Some 85% of the total comes from natural sources with over half from radon in homes.



Radon is measured in becquerels per cubic metre of air (Bq m^{-3}). The average concentration in UK homes is 20 Bq m^{-3} but levels vary considerably. Indoor radon is the most variable source of radiation exposure and the levels in neighbouring homes can vary by a factor of ten or more. Following advice from the National Radiological Protection Board, the Government recommends that householders with homes above the Action Level of 200 Bq m^{-3} (expressed as the annual average), should take action to reduce the radon concentration.

Risk of Exposure

A study by the Imperial Cancer Research Fund at Oxford University, has confirmed that exposure to radon in homes leads to an increase in the risk of lung cancer. The higher the radon level and the longer you are exposed to radon, the greater the risk.




| Per 1,000 deaths every year in the UK | Cause |
|---------------------------------------|-----------------|
| 30 | Active smoking |
| 10 | Radon |
| 3 | Passive smoking |
| 1 | |
| 0.3 | |

Health studies from around the world link exposure to radon and an increased risk of lung cancer. Smoking 15 cigarettes a day multiplies the risk factor by ten.

Radon Measurements

Radon levels in homes are measured with two small plastic detectors which are sent by post and left in place for three months. The detectors are small, harmless containers with a sensitive plastic element. They do not give off any radiation. Measurements should not be made if the property is unoccupied or undergoing building works.




Remedial Measures

Radon remedial measures are generally simple and effective and only recommended in a small number of homes. In areas where high radon levels are known to be more common, a grant towards remediation work may be available.

B10 INSTRUCTION LEAFLET FOR THE RADON MEASUREMENT PACK

Radon Studies Group
Radiation Protection Division
Health Protection Agency
Chilton
Didcot
Oxfordshire OX11 0RQ
Tel: 01235 822622 (switchboard 831600)
email: radon@hpa.org.uk
www.hpa.org.uk/radiation




04/07

Radon Measurement Instructions

- Place the detectors immediately
- They are measuring all the time, even in the packet
- Keep the padded envelope and record card safe
- They are needed to return the detectors
- Read the full instructions inside
- They will help you complete the test

Any concerns?
Phone the Radon Studies Group on 01235 822622 (office hours)





Placing the detectors – dos and don'ts

- ✓ Remove the two black detectors from the plastic bag. One is labelled 'Living Area' and the other 'Bedroom'.
- ✗ Don't open the detector casing or remove any of the labels, as the results may be affected.
- ✓ Write the date you placed the detectors on the record card.
- ✓ Store the record card and the return envelope in a safe place.
- ✓ Put the 'Living Area' detector in the room most used during the day. It can be placed on a shelf or on (but not in) a piece of furniture. If possible, choose a position near an interior wall.
- ✗ Don't place the detectors on the floor, in direct sunlight, in draughts, near sources of heat or inside any object. Avoid window sills, radiators, fireplaces, televisions and other electrical items that may get warm. Place the detectors where room air can circulate round them.
- ✓ Select a bedroom used regularly and follow the same procedure for the detector labelled 'Bedroom'.
- ✗ If you are planning any major building works, or can't comply with the placement instructions for any reason, **please don't try to store the detectors**. Call the Radon Studies Group immediately for advice, on 01235 822622.
- ✓ The detectors are made of harmless materials, but do place them out of reach of small children and pets.
- ✓ Take care of the detectors. Whether you paid for this measurement yourself, or received the detectors free as part of a government or council funded survey, a charge may be made for replacement detectors.

- ✓ The detectors stay in place for around three calendar months*. Write the date three months from now on the tear-off reminder card below. Also note the locations of the detectors and where you put the record card and return envelope. The tear-off card can go in your diary or on a notice board or calendar as a convenient reminder to return the detectors.
- ✓ After the three month period*, remove the detectors and write the date on the record card. Return the detectors and record card **immediately** using the padded envelope. **No stamp is needed**. The result will normally be available within four weeks of the detectors being returned.

* If you are doing a screening test, please follow the instructions in the covering letter. Please note that the yellow labelled detectors should be returned after two weeks in the envelope provided.

Tear off

| Radon detectors Reminder card | |
|--|---|
| Return date for the detectors |   |
| Living area detector location | |
| Bedroom detector location | |
| Return envelope and record card kept in | |
| Problems? Call the Radon Studies Group on 01235 822622 (office hours). | |

APPENDIX C Data tables of measurements in dwellings

Table C1. Overall summary data for Scotland

| Dwellings | | Results, Bq m ⁻³ | | | |
|-----------|----------|-----------------------------|-------------------|------------------------------|--------------------------|
| Total | Measured | Arithmetic average | Geometric average | Population weighted average* | At or above Action Level |
| 2440000 | 19100 | 37 | 20 | 16 | 370 |

* value from the UK national radon survey (Wrixon et al 1988)

Table C2. Summary data by local authority. (Not representative, see text)

| | | Dwellings | | Results, Bq m ⁻³ | | | |
|------------------|-----------------------|-----------|----------|-----------------------------|-------------------|---------|--------------------------|
| Code | Local authority | Total | Measured | Arithmetic average | Geometric average | Highest | At or above Action Level |
| QA | Aberdeen City | 104000 | 240 | 33 | 25 | 200 | 1 |
| QB | Aberdeenshire | 106000 | 3200 | 63 | 37 | 1600 | 157 |
| QC | Angus | 52800 | 460 | 29 | 22 | 230 | 2 |
| QD | Argyll and Bute | 43300 | 1400 | 22 | 13 | 940 | 12 |
| QE | Scottish Borders | 55100 | 1100 | 36 | 26 | 560 | 12 |
| QF | Clackmannanshire | 23400 | 49 | 23 | 16 | 100 | 0 |
| QG | West Dunbartonshire | 42400 | 71 | 21 | 15 | 100 | 0 |
| QH | Dumfries and Galloway | 71500 | 1500 | 34 | 24 | 610 | 12 |
| QJ | Dundee City | 73000 | 40 | 26 | 20 | 73 | 0 |
| QK | East Ayrshire | 54800 | 290 | 15 | 11 | 110 | 0 |
| QL | East Dunbartonshire | 43900 | 70 | 14 | 11 | 50 | 0 |
| QM | East Lothian | 43500 | 220 | 29 | 21 | 200 | 2 |
| QN | East Renfrewshire | 36400 | 76 | 19 | 16 | 84 | 0 |
| QP | Edinburgh, City of | 232000 | 170 | 18 | 14 | 100 | 0 |
| QQ | Falkirk | 70200 | 110 | 16 | 11 | 86 | 0 |
| QR | Fife | 169000 | 500 | 21 | 16 | 230 | 2 |
| QS | Glasgow City | 297000 | 180 | 11 | 9 | 47 | 0 |
| QT | Highland | 108000 | 4300 | 42 | 22 | 3400 | 111 |
| QU | Inverclyde | 37600 | 63 | 16 | 13 | 82 | 0 |
| QW | Midlothian | 34900 | 110 | 26 | 18 | 210 | 1 |
| QX | Moray | 41400 | 490 | 29 | 19 | 340 | 5 |
| QY | North Ayrshire | 65200 | 290 | 18 | 13 | 91 | 0 |
| QZ | North Lanarkshire | 147000 | 150 | 12 | 9 | 69 | 0 |
| RA | Orkney Islands | 9900 | 520 | 61 | 23 | 4600 | 26 |
| RB | Perth and Kinross | 67100 | 870 | 33 | 25 | 400 | 4 |
| RC | Renfrewshire | 82200 | 110 | 14 | 10 | 65 | 0 |
| RD | Shetland Islands | 10300 | 550 | 33 | 14 | 870 | 18 |
| RE | South Ayrshire | 53600 | 300 | 18 | 13 | 210 | 1 |
| RF | South Lanarkshire | 140000 | 430 | 24 | 16 | 270 | 2 |
| RG | Stirling | 38700 | 410 | 21 | 17 | 130 | 0 |
| RH | West Lothian | 73800 | 150 | 14 | 11 | 94 | 0 |
| RJ | Eilean Siar | 13600 | 670 | 11 | 7 | 710 | 1 |
| Totals (rounded) | | 2440000 | 19100 | 37 | 20 | 4600 | 370 |

Table C3. Summary data by postcode area

| Postcode area | Posttown | Dwellings | | Results, Bq m ⁻³ | | |
|---------------|------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | | Total | Measured | Arithmetic average | Geometric average | At or above Action Level |
| AB | Aberdeen | 221000 | 3700 | 60 | 35 | 163 |
| DD | Dundee | 134000 | 540 | 29 | 22 | 2 |
| DG | Dumfries | 71300 | 1500 | 34 | 24 | 11 |
| EH | Edinburgh | 400000 | 830 | 26 | 18 | 5 |
| FK | Falkirk | 123000 | 520 | 24 | 17 | 1 |
| G | Glasgow | 552000 | 710 | 16 | 12 | 0 |
| HS | Stornoway | 13600 | 670 | 11 | 7 | 1 |
| IV | Inverness | 103000 | 2400 | 27 | 17 | 18 |
| KA | Kilmarnock | 173000 | 870 | 17 | 12 | 1 |
| KW | Kirkwall | 25400 | 1900 | 65 | 31 | 101 |
| KY | Kirkcaldy | 168000 | 530 | 23 | 17 | 3 |
| ML | Motherwell | 171000 | 510 | 26 | 16 | 5 |
| PA | Paisley | 154000 | 1600 | 21 | 12 | 11 |
| PH | Perth | 77400 | 1500 | 35 | 23 | 21 |
| TD | Galashiels | 46300 | 910 | 34 | 25 | 8 |
| ZE | Shetland | 10300 | 550 | 33 | 14 | 18 |

Table C4. Summary data by postcode district (5 or more results)

| Dwellings | | Results, Bq m ⁻³ | | | | Dwellings | | Results, Bq m ⁻³ | | | |
|-------------------|-------|-----------------------------|--------------------|-------------------|--------------------------|-------------------|-------|-----------------------------|--------------------|-------------------|--------------------------|
| Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level | Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level |
| AB10 | 10900 | 24 | 36 | 26 | 1 | AB42 | 14900 | 120 | 25 | 16 | 1 |
| AB11 | 10000 | 16 | 29 | 22 | 0 | AB43 | 10500 | 95 | 24 | 15 | 2 |
| AB12 | 10800 | 88 | 18 | 12 | 0 | AB44 | 1900 | 7 | 32 | 17 | 0 |
| AB13 | 960 | 8 | 45 | 34 | 0 | AB45 | 5400 | 92 | 27 | 17 | 2 |
| AB14 | 2300 | 17 | 31 | 28 | 0 | AB51 | 13700 | 240 | 48 | 30 | 6 |
| AB15 | 15900 | 74 | 41 | 32 | 0 | AB52 | 1900 | 73 | 45 | 28 | 2 |
| AB16 | 13300 | 31 | 20 | 16 | 0 | AB53 | 5400 | 110 | 46 | 29 | 2 |
| AB21 | 9700 | 52 | 26 | 22 | 0 | AB54 | 5200 | 190 | 28 | 20 | 1 |
| AB22 | 7100 | 12 | 41 | 31 | 0 | AB55 | 4300 | 92 | 40 | 25 | 2 |
| AB23 | 4600 | 36 | 30 | 23 | 0 | AB56 | 6800 | 44 | 17 | 12 | 0 |
| AB24 | 17600 | 10 | 27 | 23 | 0 | DD10 | 10200 | 77 | 25 | 20 | 0 |
| AB25 | 8900 | 9 | 21 | 18 | 0 | DD11 | 13300 | 63 | 27 | 21 | 0 |
| AB30 | 2900 | 79 | 45 | 28 | 2 | DD2 | 20900 | 35 | 30 | 23 | 0 |
| AB31 | 6200 | 430 | 78 | 52 | 25 | DD3 | 19500 | 14 | 43 | 32 | 1 |
| AB32 | 4900 | 96 | 39 | 26 | 1 | DD4 | 21500 | 15 | 28 | 21 | 0 |
| AB33 | 2200 | 130 | 34 | 26 | 1 | DD5 | 14100 | 31 | 20 | 16 | 0 |
| AB34 | 2300 | 560 | 94 | 73 | 42 | DD6 | 4300 | 19 | 33 | 27 | 0 |
| AB35 | 1600 | 430 | 123 | 85 | 66 | DD7 | 5200 | 18 | 22 | 19 | 0 |
| AB36 | 320 | 71 | 37 | 28 | 0 | DD8 | 13400 | 170 | 29 | 23 | 0 |
| AB37 | 760 | 70 | 49 | 31 | 3 | DD9 | 5300 | 90 | 35 | 24 | 1 |
| AB38 | 2100 | 52 | 34 | 26 | 0 | DG1 | 12300 | 92 | 25 | 21 | 0 |
| AB39 | 7300 | 130 | 48 | 31 | 3 | DG10 | 2000 | 54 | 44 | 28 | 2 |
| AB41 | 8600 | 160 | 31 | 22 | 1 | DG11 | 5900 | 140 | 37 | 24 | 1 |

| Dwellings Results, Bq m ⁻³ | | | | | | Dwellings Results, Bq m ⁻³ | | | | | |
|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|
| Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level | Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level |
| DG12 | 5900 | 33 | 16 | 14 | 0 | EH49 | 7200 | 23 | 18 | 13 | 0 |
| DG13 | 1500 | 80 | 56 | 41 | 1 | EH5 | 8900 | 11 | 11 | 10 | 0 |
| DG14 | 610 | 41 | 20 | 17 | 0 | EH51 | 7000 | 12 | 20 | 11 | 0 |
| DG16 | 1800 | 9 | 18 | 15 | 0 | EH52 | 8600 | 18 | 17 | 14 | 0 |
| DG2 | 10900 | 140 | 36 | 27 | 0 | EH54 | 22400 | 26 | 11 | 10 | 0 |
| DG3 | 2300 | 97 | 35 | 24 | 1 | EH55 | 3700 | 28 | 10 | 9 | 0 |
| DG4 | 2100 | 35 | 33 | 22 | 0 | EH6 | 21400 | 7 | 16 | 12 | 0 |
| DG5 | 2800 | 46 | 45 | 35 | 1 | EH7 | 19100 | 6 | 16 | 13 | 0 |
| DG6 | 2600 | 62 | 37 | 29 | 1 | FK1 | 14100 | 24 | 11 | 9 | 0 |
| DG7 | 6100 | 250 | 32 | 24 | 1 | FK10 | 16800 | 29 | 18 | 13 | 0 |
| DG8 | 6500 | 300 | 34 | 24 | 3 | FK13 | 3000 | 6 | 17 | 11 | 0 |
| DG9 | 8000 | 140 | 22 | 16 | 0 | FK14 | 1900 | 25 | 54 | 38 | 0 |
| EH10 | 14500 | 14 | 27 | 19 | 0 | FK15 | 4400 | 46 | 30 | 23 | 0 |
| EH11 | 21500 | 6 | 10 | 9 | 0 | FK16 | 850 | 8 | 18 | 17 | 0 |
| EH12 | 17900 | 10 | 17 | 12 | 0 | FK17 | 1700 | 32 | 23 | 17 | 0 |
| EH13 | 6400 | 9 | 22 | 16 | 0 | FK18 | 120 | 9 | 14 | 12 | 0 |
| EH14 | 17300 | 25 | 16 | 14 | 0 | FK19 | 320 | 25 | 29 | 20 | 0 |
| EH16 | 13300 | 14 | 18 | 13 | 0 | FK2 | 20500 | 28 | 20 | 14 | 0 |
| EH17 | 8300 | 5 | 13 | 11 | 0 | FK20 | 180 | 28 | 41 | 23 | 1 |
| EH19 | 5200 | 7 | 15 | 13 | 0 | FK21 | 560 | 48 | 28 | 23 | 0 |
| EH21 | 11200 | 15 | 15 | 12 | 0 | FK3 | 8700 | 6 | 17 | 15 | 0 |
| EH22 | 12500 | 22 | 31 | 20 | 1 | FK4 | 5600 | 14 | 16 | 13 | 0 |
| EH23 | 3200 | 32 | 29 | 20 | 0 | FK5 | 7700 | 8 | 14 | 7 | 0 |
| EH26 | 7300 | 28 | 26 | 19 | 0 | FK6 | 6100 | 17 | 12 | 9 | 0 |
| EH27 | 1100 | 15 | 26 | 16 | 0 | FK7 | 13500 | 25 | 21 | 16 | 0 |
| EH3 | 13700 | 7 | 13 | 11 | 0 | FK8 | 8400 | 110 | 20 | 16 | 0 |
| EH30 | 4100 | 13 | 13 | 11 | 0 | FK9 | 5200 | 18 | 24 | 21 | 0 |
| EH31 | 1300 | 8 | 20 | 17 | 0 | G11 | 12200 | 6 | 7 | 7 | 0 |
| EH32 | 8100 | 24 | 24 | 19 | 0 | G13 | 16300 | 7 | 13 | 11 | 0 |
| EH33 | 5600 | 10 | 23 | 19 | 0 | G14 | 9400 | 5 | 20 | 16 | 0 |
| EH34 | 1000 | 11 | 24 | 21 | 0 | G20 | 16000 | 8 | 11 | 9 | 0 |
| EH35 | 960 | 6 | 23 | 17 | 0 | G21 | 16600 | 14 | 16 | 13 | 0 |
| EH36 | 180 | 7 | 16 | 14 | 0 | G23 | 3200 | 5 | 15 | 12 | 0 |
| EH37 | 720 | 11 | 16 | 14 | 0 | G32 | 18200 | 14 | 10 | 8 | 0 |
| EH38 | 170 | 19 | 46 | 35 | 0 | G33 | 17800 | 14 | 12 | 9 | 0 |
| EH39 | 4300 | 37 | 28 | 22 | 0 | G41 | 14500 | 11 | 7 | 7 | 0 |
| EH4 | 25600 | 20 | 21 | 15 | 0 | G42 | 15400 | 10 | 7 | 7 | 0 |
| EH40 | 980 | 9 | 43 | 35 | 0 | G43 | 8000 | 7 | 16 | 15 | 0 |
| EH41 | 5400 | 46 | 35 | 24 | 1 | G44 | 13000 | 8 | 11 | 10 | 0 |
| EH42 | 4600 | 39 | 32 | 23 | 1 | G46 | 11300 | 7 | 18 | 15 | 0 |
| EH43 | 460 | 9 | 36 | 27 | 0 | G51 | 13600 | 6 | 7 | 7 | 0 |
| EH44 | 1600 | 28 | 45 | 37 | 0 | G52 | 14400 | 14 | 13 | 12 | 0 |
| EH45 | 4900 | 61 | 45 | 31 | 2 | G60 | 2300 | 6 | 22 | 20 | 0 |
| EH46 | 1300 | 52 | 37 | 26 | 0 | G61 | 11000 | 12 | 12 | 11 | 0 |
| EH47 | 12000 | 21 | 10 | 9 | 0 | G62 | 5700 | 17 | 15 | 13 | 0 |
| EH48 | 14900 | 29 | 13 | 10 | 0 | G63 | 4000 | 84 | 16 | 13 | 0 |

RADON IN DWELLINGS IN SCOTLAND: 2008 REVIEW AND ATLAS

| Dwellings Results, Bq m ⁻³ | | | | | | Dwellings Results, Bq m ⁻³ | | | | | |
|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|
| Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level | Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level |
| G64 | 10900 | 18 | 20 | 16 | 0 | IV27 | 2400 | 260 | 20 | 12 | 1 |
| G65 | 6200 | 6 | 13 | 11 | 0 | IV28 | 290 | 31 | 27 | 19 | 0 |
| G66 | 16400 | 30 | 11 | 10 | 0 | IV3 | 9400 | 35 | 149 | 44 | 2 |
| G67 | 16000 | 19 | 13 | 10 | 0 | IV30 | 14600 | 89 | 19 | 14 | 0 |
| G68 | 6600 | 6 | 11 | 9 | 0 | IV31 | 3300 | 15 | 17 | 14 | 0 |
| G69 | 13800 | 16 | 10 | 9 | 0 | IV32 | 2200 | 33 | 25 | 18 | 0 |
| G71 | 11900 | 11 | 16 | 15 | 0 | IV36 | 7100 | 82 | 19 | 15 | 0 |
| G72 | 19700 | 11 | 8 | 7 | 0 | IV4 | 1900 | 100 | 36 | 28 | 0 |
| G73 | 15400 | 15 | 15 | 13 | 0 | IV40 | 1300 | 110 | 20 | 14 | 1 |
| G74 | 17100 | 16 | 13 | 9 | 0 | IV41 | 170 | 8 | 37 | 31 | 0 |
| G75 | 16100 | 15 | 31 | 19 | 0 | IV42 | 240 | 11 | 22 | 15 | 0 |
| G76 | 8900 | 21 | 16 | 13 | 0 | IV43 | 140 | 16 | 14 | 11 | 0 |
| G77 | 9200 | 20 | 24 | 17 | 0 | IV44 | 150 | 14 | 15 | 10 | 0 |
| G78 | 10100 | 30 | 20 | 17 | 0 | IV45 | 120 | 13 | 11 | 8 | 0 |
| G81 | 18600 | 14 | 16 | 12 | 0 | IV46 | 52 | 11 | 21 | 16 | 0 |
| G82 | 11700 | 25 | 17 | 13 | 0 | IV47 | 300 | 33 | 11 | 8 | 0 |
| G83 | 11500 | 83 | 23 | 17 | 0 | IV48 | 44 | 5 | 11 | 6 | 0 |
| G84 | 9100 | 52 | 18 | 14 | 0 | IV49 | 560 | 45 | 27 | 15 | 1 |
| HS1 | 2800 | 7 | 12 | 9 | 0 | IV5 | 500 | 9 | 43 | 33 | 0 |
| HS2 | 6700 | 300 | 14 | 8 | 1 | IV51 | 2400 | 130 | 13 | 9 | 0 |
| HS3 | 730 | 100 | 11 | 8 | 0 | IV52 | 200 | 9 | 20 | 12 | 0 |
| HS4 | 160 | 6 | 6 | 3 | 0 | IV53 | 78 | 10 | 24 | 15 | 0 |
| HS5 | 160 | 13 | 12 | 10 | 0 | IV54 | 710 | 78 | 26 | 16 | 0 |
| HS6 | 960 | 99 | 9 | 6 | 0 | IV55 | 730 | 71 | 10 | 8 | 0 |
| HS7 | 600 | 31 | 11 | 8 | 0 | IV56 | 150 | 23 | 15 | 11 | 0 |
| HS8 | 930 | 78 | 7 | 6 | 0 | IV6 | 1800 | 37 | 28 | 22 | 0 |
| HS9 | 600 | 41 | 7 | 5 | 0 | IV63 | 1100 | 80 | 76 | 50 | 7 |
| IV1 | 1300 | 7 | 69 | 38 | 1 | IV7 | 2400 | 37 | 39 | 20 | 1 |
| IV10 | 1100 | 10 | 32 | 25 | 0 | IV8 | 360 | 6 | 33 | 29 | 0 |
| IV11 | 450 | 16 | 34 | 27 | 0 | IV9 | 570 | 14 | 39 | 33 | 0 |
| IV12 | 5600 | 88 | 30 | 23 | 0 | KA1 | 13600 | 34 | 13 | 11 | 0 |
| IV13 | 270 | 50 | 27 | 22 | 0 | KA10 | 7500 | 11 | 9 | 7 | 0 |
| IV14 | 890 | 27 | 47 | 35 | 0 | KA11 | 9000 | 17 | 21 | 14 | 0 |
| IV15 | 2600 | 20 | 26 | 20 | 0 | KA12 | 9100 | 10 | 9 | 9 | 0 |
| IV16 | 750 | 12 | 19 | 16 | 0 | KA13 | 7500 | 13 | 15 | 11 | 0 |
| IV17 | 2700 | 40 | 29 | 24 | 0 | KA15 | 3100 | 17 | 15 | 12 | 0 |
| IV18 | 2700 | 32 | 23 | 21 | 0 | KA16 | 1600 | 8 | 19 | 16 | 0 |
| IV19 | 2200 | 42 | 34 | 24 | 0 | KA17 | 1800 | 14 | 16 | 13 | 0 |
| IV2 | 20400 | 170 | 27 | 18 | 1 | KA18 | 9900 | 77 | 16 | 12 | 0 |
| IV20 | 1400 | 47 | 19 | 16 | 0 | KA19 | 3600 | 60 | 22 | 17 | 0 |
| IV21 | 600 | 52 | 14 | 10 | 0 | KA2 | 3100 | 12 | 12 | 9 | 0 |
| IV22 | 800 | 110 | 15 | 11 | 0 | KA20 | 4300 | 5 | 13 | 12 | 0 |
| IV23 | 410 | 79 | 27 | 19 | 0 | KA21 | 5800 | 8 | 13 | 12 | 0 |
| IV24 | 760 | 54 | 30 | 23 | 0 | KA22 | 5300 | 5 | 12 | 10 | 0 |
| IV25 | 1200 | 45 | 45 | 27 | 2 | KA23 | 2300 | 17 | 9 | 8 | 0 |
| IV26 | 980 | 50 | 19 | 12 | 0 | KA24 | 3000 | 18 | 20 | 14 | 0 |

| Dwellings Results, Bq m ⁻³ | | | | | | Dwellings Results, Bq m ⁻³ | | | | | |
|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|
| Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level | Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level |
| KA25 | 3400 | 11 | 14 | 10 | 0 | ML10 | 4500 | 44 | 21 | 17 | 0 |
| KA26 | 5500 | 150 | 21 | 14 | 1 | ML11 | 15600 | 130 | 24 | 17 | 0 |
| KA27 | 2700 | 120 | 23 | 16 | 0 | ML12 | 3900 | 170 | 44 | 28 | 5 |
| KA28 | 1300 | 10 | 5 | 5 | 0 | ML2 | 18300 | 17 | 18 | 12 | 0 |
| KA29 | 750 | 11 | 13 | 13 | 0 | ML3 | 24100 | 25 | 11 | 9 | 0 |
| KA3 | 15900 | 64 | 17 | 11 | 0 | ML5 | 20700 | 21 | 9 | 8 | 0 |
| KA30 | 6100 | 20 | 17 | 14 | 0 | ML6 | 23400 | 31 | 8 | 6 | 0 |
| KA4 | 2500 | 15 | 12 | 9 | 0 | ML7 | 6900 | 13 | 15 | 9 | 0 |
| KA5 | 4400 | 32 | 16 | 13 | 0 | ML8 | 8400 | 19 | 11 | 10 | 0 |
| KA6 | 8500 | 62 | 10 | 8 | 0 | ML9 | 10400 | 15 | 12 | 9 | 0 |
| KA7 | 13300 | 27 | 10 | 9 | 0 | PA1 | 13100 | 8 | 14 | 12 | 0 |
| KA8 | 9700 | 12 | 9 | 9 | 0 | PA11 | 2500 | 12 | 22 | 15 | 0 |
| KA9 | 7600 | 13 | 11 | 9 | 0 | PA12 | 1500 | 11 | 17 | 12 | 0 |
| KW1 | 5300 | 150 | 28 | 19 | 1 | PA13 | 2000 | 13 | 23 | 18 | 0 |
| KW10 | 790 | 17 | 28 | 23 | 0 | PA14 | 7600 | 11 | 13 | 12 | 0 |
| KW11 | 71 | 25 | 35 | 25 | 0 | PA15 | 9500 | 8 | 16 | 13 | 0 |
| KW12 | 770 | 46 | 51 | 28 | 2 | PA16 | 12200 | 21 | 15 | 13 | 0 |
| KW13 | 52 | 26 | 17 | 12 | 0 | PA17 | 1100 | 9 | 10 | 8 | 0 |
| KW14 | 6200 | 180 | 37 | 22 | 4 | PA18 | 950 | 7 | 8 | 6 | 0 |
| KW15 | 3900 | 27 | 81 | 31 | 2 | PA2 | 18700 | 12 | 10 | 9 | 0 |
| KW16 | 2000 | 110 | 83 | 22 | 4 | PA20 | 3200 | 49 | 12 | 9 | 0 |
| KW17 | 4100 | 380 | 53 | 23 | 20 | PA21 | 550 | 32 | 14 | 10 | 0 |
| KW2 | 41 | 9 | 38 | 20 | 0 | PA22 | 180 | 36 | 17 | 14 | 0 |
| KW3 | 470 | 170 | 60 | 45 | 3 | PA23 | 6500 | 68 | 18 | 14 | 0 |
| KW5 | 150 | 61 | 74 | 46 | 5 | PA24 | 300 | 26 | 16 | 14 | 0 |
| KW6 | 200 | 67 | 53 | 37 | 2 | PA25 | 45 | 5 | 19 | 17 | 0 |
| KW7 | 64 | 18 | 81 | 53 | 1 | PA26 | 81 | 11 | 16 | 13 | 0 |
| KW8 | 480 | 340 | 150 | 90 | 57 | PA27 | 410 | 27 | 22 | 17 | 0 |
| KW9 | 970 | 280 | 25 | 20 | 0 | PA28 | 3900 | 120 | 24 | 16 | 0 |
| KY1 | 13100 | 21 | 24 | 14 | 1 | PA29 | 1200 | 85 | 21 | 13 | 0 |
| KY10 | 5000 | 37 | 18 | 16 | 0 | PA3 | 12000 | 13 | 12 | 8 | 0 |
| KY11 | 25900 | 55 | 20 | 18 | 0 | PA30 | 710 | 23 | 44 | 29 | 0 |
| KY12 | 18400 | 41 | 16 | 12 | 0 | PA31 | 2600 | 130 | 27 | 17 | 3 |
| KY13 | 4600 | 57 | 41 | 28 | 1 | PA32 | 670 | 38 | 26 | 14 | 0 |
| KY14 | 3100 | 42 | 31 | 23 | 0 | PA33 | 360 | 32 | 15 | 13 | 0 |
| KY15 | 10000 | 70 | 24 | 19 | 0 | PA34 | 5400 | 160 | 30 | 17 | 4 |
| KY16 | 9900 | 53 | 20 | 15 | 0 | PA35 | 640 | 53 | 29 | 18 | 1 |
| KY2 | 13800 | 13 | 20 | 18 | 0 | PA36 | 32 | 10 | 14 | 12 | 0 |
| KY3 | 5200 | 16 | 21 | 16 | 0 | PA37 | 1200 | 41 | 43 | 21 | 1 |
| KY4 | 9700 | 20 | 13 | 10 | 0 | PA38 | 470 | 40 | 24 | 19 | 0 |
| KY5 | 9100 | 16 | 13 | 12 | 0 | PA4 | 10600 | 7 | 12 | 9 | 0 |
| KY6 | 8800 | 21 | 15 | 12 | 0 | PA41 | 94 | 10 | 24 | 19 | 0 |
| KY7 | 12400 | 17 | 18 | 14 | 0 | PA42 | 590 | 28 | 17 | 10 | 0 |
| KY8 | 17200 | 37 | 25 | 16 | 1 | PA43 | 440 | 10 | 9 | 6 | 0 |
| KY9 | 1500 | 12 | 12 | 11 | 0 | PA44 | 160 | 24 | 33 | 13 | 1 |
| ML1 | 24500 | 21 | 13 | 11 | 0 | PA45 | 68 | 7 | 30 | 26 | 0 |

RADON IN DWELLINGS IN SCOTLAND: 2008 REVIEW AND ATLAS

| Dwellings Results, Bq m ⁻³ | | | | | | Dwellings Results, Bq m ⁻³ | | | | | |
|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|---------------------------------------|-------|----------|--------------------|-------------------|--------------------------|
| Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level | Postcode district | Total | Measured | Arithmetic average | Geometric average | At or above Action Level |
| PA46 | 120 | 10 | 22 | 20 | 0 | PH3 | 2700 | 36 | 37 | 23 | 1 |
| PA47 | 120 | 7 | 10 | 9 | 0 | PH31 | 250 | 22 | 41 | 26 | 1 |
| PA48 | 180 | 13 | 8 | 5 | 0 | PH32 | 380 | 19 | 95 | 58 | 3 |
| PA49 | 110 | 6 | 5 | 4 | 0 | PH33 | 5300 | 99 | 33 | 21 | 1 |
| PA5 | 10400 | 15 | 11 | 9 | 0 | PH34 | 490 | 51 | 74 | 31 | 6 |
| PA6 | 2600 | 9 | 20 | 18 | 0 | PH35 | 190 | 29 | 29 | 23 | 0 |
| PA60 | 150 | 29 | 12 | 9 | 0 | PH36 | 790 | 79 | 14 | 9 | 0 |
| PA61 | 140 | 16 | 21 | 14 | 0 | PH37 | 82 | 18 | 17 | 14 | 0 |
| PA62 | 25 | 6 | 13 | 10 | 0 | PH38 | 110 | 30 | 18 | 14 | 0 |
| PA64 | 57 | 9 | 11 | 10 | 0 | PH39 | 190 | 17 | 21 | 15 | 0 |
| PA65 | 100 | 13 | 85 | 16 | 1 | PH4 | 370 | 9 | 40 | 29 | 0 |
| PA66 | 93 | 19 | 7 | 5 | 0 | PH40 | 120 | 10 | 7 | 6 | 0 |
| PA67 | 170 | 15 | 9 | 7 | 0 | PH41 | 450 | 34 | 17 | 13 | 0 |
| PA69 | 21 | 7 | 8 | 5 | 0 | PH42 | 47 | 8 | 17 | 13 | 0 |
| PA7 | 2100 | 6 | 12 | 10 | 0 | PH43 | 14 | 6 | 13 | 7 | 0 |
| PA70 | 57 | 9 | 11 | 7 | 0 | PH49 | 550 | 24 | 19 | 15 | 0 |
| PA71 | 25 | 9 | 43 | 17 | 0 | PH5 | 400 | 9 | 24 | 21 | 0 |
| PA72 | 210 | 23 | 7 | 5 | 0 | PH50 | 530 | 6 | 37 | 31 | 0 |
| PA73 | 42 | 12 | 6 | 4 | 0 | PH6 | 1300 | 36 | 28 | 22 | 0 |
| PA74 | 22 | 9 | 8 | 5 | 0 | PH7 | 4200 | 33 | 23 | 19 | 0 |
| PA75 | 700 | 37 | 10 | 7 | 0 | PH8 | 1100 | 48 | 36 | 29 | 0 |
| PA76 | 90 | 9 | 6 | 3 | 0 | PH9 | 500 | 23 | 35 | 26 | 0 |
| PA77 | 440 | 35 | 10 | 5 | 0 | TD1 | 8500 | 77 | 31 | 22 | 1 |
| PA78 | 120 | 21 | 7 | 4 | 0 | TD10 | 530 | 25 | 22 | 18 | 0 |
| PA8 | 6100 | 9 | 9 | 8 | 0 | TD11 | 3500 | 110 | 32 | 25 | 0 |
| PH1 | 20300 | 100 | 25 | 18 | 0 | TD12 | 1500 | 30 | 43 | 25 | 1 |
| PH10 | 5100 | 80 | 40 | 29 | 1 | TD13 | 440 | 24 | 24 | 18 | 0 |
| PH11 | 1700 | 46 | 25 | 21 | 0 | TD14 | 3300 | 39 | 33 | 20 | 1 |
| PH12 | 920 | 15 | 19 | 16 | 0 | TD15 | 630 | 26 | 43 | 32 | 0 |
| PH13 | 1800 | 27 | 29 | 23 | 0 | TD2 | 1100 | 32 | 39 | 26 | 1 |
| PH14 | 690 | 14 | 28 | 22 | 0 | TD3 | 440 | 25 | 19 | 16 | 0 |
| PH15 | 1800 | 91 | 34 | 27 | 0 | TD4 | 1000 | 10 | 24 | 18 | 0 |
| PH16 | 2100 | 66 | 42 | 32 | 1 | TD5 | 5600 | 110 | 44 | 31 | 2 |
| PH17 | 140 | 26 | 25 | 19 | 0 | TD6 | 3800 | 45 | 32 | 26 | 0 |
| PH18 | 410 | 32 | 46 | 33 | 0 | TD7 | 3600 | 110 | 37 | 29 | 0 |
| PH19 | 56 | 17 | 29 | 23 | 0 | TD8 | 3000 | 68 | 35 | 21 | 1 |
| PH2 | 15500 | 110 | 28 | 22 | 0 | TD9 | 9400 | 180 | 33 | 26 | 1 |
| PH20 | 810 | 38 | 38 | 26 | 0 | ZE1 | 3900 | 23 | 39 | 19 | 1 |
| PH21 | 1100 | 47 | 48 | 36 | 1 | ZE2 | 6200 | 500 | 34 | 14 | 17 |
| PH22 | 1900 | 22 | 71 | 43 | 2 | ZE3 | 220 | 18 | 16 | 9 | 0 |
| PH23 | 360 | 15 | 105 | 61 | 1 | | | | | | |
| PH24 | 440 | 17 | 53 | 43 | 0 | | | | | | |
| PH25 | 520 | 31 | 60 | 45 | 1 | | | | | | |
| PH26 | 1800 | 57 | 36 | 20 | 2 | | | | | | |

Table C5. Summary data by postcode sector (5 or more results)

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| AB10 1 | 1400 | 6 | 69 | 49 | 1 |
| AB10 6 | 5300 | 7 | 24 | 22 | 0 |
| AB10 7 | 4300 | 11 | 25 | 20 | 0 |
| AB11 9 | 1800 | 5 | 17 | 16 | 0 |
| AB12 3 | 3600 | 11 | 19 | 13 | 0 |
| AB12 4 | 3000 | 61 | 13 | 10 | 0 |
| AB12 5 | 4200 | 16 | 41 | 27 | 0 |
| AB13 0 | 960 | 8 | 45 | 34 | 0 |
| AB14 0 | 2300 | 17 | 31 | 28 | 0 |
| AB15 4 | 2100 | 10 | 23 | 23 | 0 |
| AB15 5 | 1800 | 11 | 29 | 25 | 0 |
| AB15 6 | 2800 | 6 | 23 | 21 | 0 |
| AB15 7 | 2400 | 12 | 56 | 49 | 0 |
| AB15 8 | 3900 | 8 | 30 | 24 | 0 |
| AB15 9 | 2800 | 27 | 54 | 39 | 0 |
| AB16 5 | 4900 | 10 | 25 | 23 | 0 |
| AB16 6 | 3700 | 10 | 18 | 13 | 0 |
| AB16 7 | 4700 | 11 | 17 | 15 | 0 |
| AB21 0 | 3200 | 38 | 28 | 23 | 0 |
| AB21 7 | 2700 | 8 | 18 | 16 | 0 |
| AB21 9 | 3800 | 6 | 25 | 21 | 0 |
| AB22 8 | 7100 | 12 | 41 | 31 | 0 |
| AB23 8 | 4600 | 36 | 30 | 23 | 0 |
| AB25 2 | 2900 | 7 | 22 | 18 | 0 |
| AB30 1 | 2900 | 79 | 45 | 28 | 2 |
| AB31 4 | 1900 | 160 | 75 | 46 | 12 |
| AB31 5 | 3600 | 180 | 54 | 44 | 0 |
| AB31 6 | 760 | 98 | 130 | 81 | 13 |
| AB32 6 | 4500 | 76 | 35 | 23 | 1 |
| AB32 7 | 370 | 20 | 54 | 43 | 0 |
| AB33 8 | 2200 | 130 | 34 | 26 | 1 |
| AB34 4 | 530 | 54 | 54 | 43 | 1 |
| AB34 5 | 1800 | 500 | 99 | 78 | 41 |
| AB35 5 | 1600 | 430 | 120 | 85 | 66 |
| AB36 8 | 320 | 71 | 37 | 28 | 0 |
| AB37 9 | 760 | 70 | 49 | 31 | 3 |
| AB38 7 | 1000 | 24 | 36 | 28 | 0 |
| AB38 9 | 1100 | 28 | 32 | 24 | 0 |
| AB39 2 | 4900 | 69 | 40 | 29 | 0 |
| AB39 3 | 2400 | 63 | 56 | 33 | 3 |
| AB41 6 | 1200 | 27 | 29 | 20 | 0 |
| AB41 7 | 2000 | 53 | 36 | 26 | 1 |
| AB41 8 | 1900 | 55 | 31 | 23 | 0 |
| AB41 9 | 3500 | 21 | 17 | 14 | 0 |
| AB42 0 | 1500 | 30 | 20 | 16 | 0 |
| AB42 1 | 4700 | 6 | 15 | 13 | 0 |
| AB42 2 | 3600 | 5 | 12 | 12 | 0 |
| AB42 3 | 1600 | 24 | 20 | 13 | 0 |
| AB42 4 | 1500 | 36 | 36 | 21 | 1 |
| AB42 5 | 2000 | 19 | 25 | 14 | 0 |
| AB43 6 | 1500 | 33 | 34 | 20 | 2 |
| AB43 7 | 1600 | 21 | 22 | 16 | 0 |
| AB43 8 | 1900 | 33 | 15 | 11 | 0 |
| AB43 9 | 5500 | 8 | 19 | 12 | 0 |
| AB44 1 | 1900 | 7 | 32 | 17 | 0 |
| AB45 1 | 2000 | 6 | 12 | 10 | 0 |
| AB45 2 | 2200 | 48 | 16 | 13 | 0 |
| AB45 3 | 1200 | 38 | 44 | 26 | 2 |
| AB51 0 | 4100 | 65 | 31 | 23 | 0 |
| AB51 3 | 2400 | 5 | 45 | 34 | 0 |
| AB51 4 | 2800 | 9 | 11 | 9 | 0 |
| AB51 5 | 2800 | 94 | 41 | 30 | 1 |
| AB51 7 | 860 | 51 | 98 | 56 | 5 |
| AB51 8 | 720 | 20 | 30 | 20 | 0 |
| AB52 6 | 1900 | 73 | 45 | 28 | 2 |
| AB53 4 | 2700 | 30 | 53 | 37 | 1 |
| AB53 5 | 890 | 26 | 36 | 18 | 1 |
| AB53 6 | 590 | 13 | 62 | 52 | 0 |
| AB53 8 | 1200 | 38 | 43 | 27 | 0 |
| AB54 4 | 1400 | 120 | 29 | 21 | 1 |
| AB54 6 | 450 | 38 | 37 | 27 | 0 |
| AB54 7 | 1200 | 31 | 14 | 11 | 0 |
| AB54 8 | 2200 | 9 | 33 | 26 | 0 |
| AB55 4 | 1000 | 25 | 67 | 46 | 2 |
| AB55 5 | 2500 | 31 | 37 | 25 | 0 |
| AB55 6 | 740 | 36 | 24 | 16 | 0 |
| AB56 1 | 3800 | 13 | 12 | 11 | 0 |
| AB56 4 | 2200 | 16 | 12 | 8 | 0 |
| AB56 5 | 850 | 15 | 27 | 20 | 0 |
| DD10 0 | 2500 | 41 | 27 | 22 | 0 |
| DD10 8 | 3900 | 5 | 12 | 9 | 0 |
| DD10 9 | 3800 | 31 | 24 | 20 | 0 |
| DD11 2 | 2400 | 20 | 25 | 20 | 0 |
| DD11 4 | 3400 | 24 | 36 | 29 | 0 |
| DD11 5 | 2600 | 14 | 19 | 16 | 0 |
| DD2 1 | 4100 | 7 | 43 | 33 | 0 |
| DD2 4 | 5300 | 6 | 20 | 16 | 0 |
| DD2 5 | 3200 | 19 | 31 | 24 | 0 |
| DD3 0 | 2800 | 10 | 54 | 43 | 1 |
| DD4 0 | 3300 | 9 | 26 | 20 | 0 |

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| DD5 3 | 4800 | 21 | 21 | 16 | 0 |
| DD5 4 | 3700 | 5 | 22 | 20 | 0 |
| DD6 8 | 2400 | 13 | 35 | 27 | 0 |
| DD6 9 | 1900 | 6 | 29 | 27 | 0 |
| DD7 6 | 2200 | 8 | 17 | 16 | 0 |
| DD7 7 | 3000 | 10 | 27 | 22 | 0 |
| DD8 1 | 3700 | 35 | 25 | 22 | 0 |
| DD8 2 | 3300 | 33 | 26 | 22 | 0 |
| DD8 3 | 2700 | 36 | 27 | 21 | 0 |
| DD8 4 | 2100 | 41 | 29 | 22 | 0 |
| DD8 5 | 1700 | 29 | 39 | 30 | 0 |
| DD9 6 | 2600 | 23 | 25 | 20 | 0 |
| DD9 7 | 2800 | 67 | 38 | 26 | 1 |
| DG1 1 | 2600 | 17 | 30 | 26 | 0 |
| DG1 3 | 3000 | 24 | 27 | 22 | 0 |
| DG1 4 | 4900 | 51 | 22 | 19 | 0 |
| DG10 9 | 2000 | 54 | 44 | 28 | 2 |
| DG11 1 | 2000 | 53 | 36 | 25 | 0 |
| DG11 2 | 2500 | 47 | 49 | 28 | 1 |
| DG11 3 | 1400 | 41 | 27 | 19 | 0 |
| DG12 5 | 2800 | 19 | 15 | 14 | 0 |
| DG12 6 | 3100 | 14 | 17 | 16 | 0 |
| DG13 0 | 1500 | 80 | 56 | 41 | 1 |
| DG14 0 | 610 | 41 | 20 | 17 | 0 |
| DG16 5 | 1800 | 9 | 18 | 15 | 0 |
| DG2 0 | 3400 | 40 | 40 | 30 | 0 |
| DG2 8 | 1700 | 77 | 35 | 27 | 0 |
| DG2 9 | 3400 | 17 | 29 | 23 | 0 |
| DG3 4 | 1000 | 63 | 32 | 22 | 0 |
| DG3 5 | 1200 | 34 | 40 | 26 | 1 |
| DG4 6 | 2100 | 35 | 33 | 22 | 0 |
| DG5 4 | 2800 | 46 | 45 | 35 | 1 |
| DG6 4 | 2600 | 62 | 37 | 29 | 1 |
| DG7 1 | 2700 | 54 | 34 | 27 | 0 |
| DG7 2 | 1300 | 60 | 37 | 29 | 0 |
| DG7 3 | 2100 | 140 | 29 | 21 | 1 |
| DG8 0 | 950 | 81 | 30 | 21 | 1 |
| DG8 6 | 2200 | 67 | 30 | 24 | 0 |
| DG8 7 | 610 | 41 | 39 | 28 | 0 |
| DG8 8 | 1200 | 55 | 30 | 25 | 0 |
| DG8 9 | 1500 | 57 | 46 | 28 | 2 |
| DG9 0 | 1800 | 40 | 27 | 18 | 0 |
| DG9 7 | 3200 | 9 | 16 | 11 | 0 |
| DG9 8 | 1900 | 36 | 21 | 16 | 0 |
| DG9 9 | 1200 | 57 | 20 | 15 | 0 |
| EH10 6 | 3300 | 6 | 27 | 21 | 0 |
| EH10 7 | 1800 | 5 | 37 | 24 | 0 |
| EH12 8 | 5200 | 5 | 10 | 9 | 0 |
| EH13 9 | 3600 | 5 | 13 | 11 | 0 |
| EH14 5 | 3700 | 7 | 16 | 13 | 0 |
| EH14 7 | 2000 | 9 | 19 | 15 | 0 |
| EH16 6 | 5300 | 6 | 15 | 12 | 0 |
| EH21 7 | 3100 | 7 | 12 | 10 | 0 |
| EH22 2 | 2700 | 7 | 44 | 18 | 1 |
| EH22 5 | 2700 | 6 | 19 | 18 | 0 |
| EH23 4 | 3200 | 32 | 29 | 20 | 0 |
| EH26 8 | 2800 | 13 | 30 | 21 | 0 |
| EH26 9 | 1800 | 11 | 28 | 19 | 0 |
| EH27 8 | 1100 | 15 | 26 | 16 | 0 |
| EH30 9 | 4100 | 13 | 13 | 11 | 0 |
| EH31 2 | 1300 | 8 | 20 | 17 | 0 |
| EH32 0 | 4300 | 20 | 25 | 20 | 0 |
| EH33 1 | 2400 | 6 | 19 | 17 | 0 |
| EH34 5 | 1000 | 11 | 24 | 21 | 0 |
| EH35 5 | 960 | 6 | 23 | 17 | 0 |
| EH36 5 | 180 | 7 | 16 | 14 | 0 |
| EH37 5 | 720 | 11 | 16 | 14 | 0 |
| EH38 5 | 170 | 19 | 46 | 35 | 0 |
| EH39 4 | 3000 | 22 | 25 | 20 | 0 |
| EH39 5 | 1300 | 15 | 33 | 26 | 0 |
| EH4 5 | 2000 | 6 | 24 | 17 | 0 |
| EH4 6 | 2600 | 8 | 22 | 15 | 0 |
| EH40 3 | 980 | 9 | 43 | 35 | 0 |
| EH41 3 | 2500 | 7 | 26 | 20 | 0 |
| EH41 4 | 2900 | 39 | 36 | 24 | 1 |
| EH42 1 | 4600 | 39 | 32 | 23 | 1 |
| EH43 6 | 460 | 9 | 36 | 27 | 0 |
| EH44 6 | 1600 | 28 | 45 | 37 | 0 |
| EH45 8 | 2800 | 44 | 52 | 35 | 2 |
| EH45 9 | 2100 | 17 | 26 | 23 | 0 |
| EH46 7 | 1300 | 52 | 37 | 26 | 0 |
| EH47 7 | 3100 | 6 | 10 | 9 | 0 |
| EH47 8 | 3600 | 5 | 15 | 14 | 0 |
| EH47 9 | 2200 | 7 | 8 | 7 | 0 |
| EH48 2 | 5500 | 7 | 9 | 9 | 0 |
| EH48 3 | 3700 | 8 | 20 | 15 | 0 |
| EH48 4 | 2400 | 10 | 11 | 8 | 0 |
| EH49 6 | 3500 | 13 | 17 | 14 | 0 |
| EH49 7 | 3700 | 10 | 19 | 12 | 0 |
| EH51 0 | 3000 | 6 | 13 | 9 | 0 |
| EH51 9 | 4000 | 6 | 26 | 14 | 0 |
| EH52 6 | 4600 | 14 | 16 | 14 | 0 |

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| EH54 6 | 8600 | 12 | 9 | 8 | 0 |
| EH54 8 | 6300 | 5 | 11 | 10 | 0 |
| EH54 9 | 2700 | 7 | 15 | 13 | 0 |
| EH55 8 | 3700 | 28 | 10 | 9 | 0 |
| FK1 2 | 3300 | 7 | 11 | 9 | 0 |
| FK1 3 | 830 | 10 | 9 | 8 | 0 |
| FK10 2 | 6700 | 10 | 15 | 10 | 0 |
| FK10 3 | 3800 | 5 | 15 | 13 | 0 |
| FK10 4 | 3200 | 13 | 23 | 17 | 0 |
| FK13 6 | 3000 | 6 | 17 | 11 | 0 |
| FK14 7 | 1900 | 25 | 54 | 38 | 0 |
| FK15 0 | 1900 | 20 | 25 | 21 | 0 |
| FK15 9 | 2400 | 26 | 33 | 25 | 0 |
| FK16 6 | 850 | 8 | 18 | 17 | 0 |
| FK17 8 | 1700 | 32 | 23 | 17 | 0 |
| FK18 8 | 120 | 9 | 14 | 12 | 0 |
| FK19 8 | 320 | 25 | 29 | 20 | 0 |
| FK2 0 | 6400 | 8 | 27 | 18 | 0 |
| FK2 8 | 3600 | 8 | 19 | 18 | 0 |
| FK2 9 | 4800 | 8 | 16 | 11 | 0 |
| FK20 8 | 180 | 28 | 41 | 23 | 1 |
| FK21 8 | 560 | 48 | 28 | 23 | 0 |
| FK4 1 | 4000 | 6 | 25 | 21 | 0 |
| FK4 2 | 1500 | 8 | 9 | 9 | 0 |
| FK5 4 | 5600 | 5 | 12 | 9 | 0 |
| FK6 5 | 3400 | 13 | 9 | 7 | 0 |
| FK7 7 | 4800 | 6 | 9 | 7 | 0 |
| FK7 8 | 2500 | 6 | 18 | 16 | 0 |
| FK7 9 | 3000 | 10 | 26 | 22 | 0 |
| FK8 3 | 2600 | 110 | 20 | 16 | 0 |
| FK9 4 | 2600 | 13 | 27 | 23 | 0 |
| FK9 5 | 2600 | 5 | 18 | 17 | 0 |
| G21 1 | 4400 | 10 | 19 | 16 | 0 |
| G23 5 | 3200 | 5 | 15 | 12 | 0 |
| G33 6 | 2700 | 5 | 8 | 7 | 0 |
| G41 2 | 3400 | 6 | 7 | 7 | 0 |
| G42 8 | 5400 | 6 | 8 | 7 | 0 |
| G52 1 | 3800 | 6 | 15 | 13 | 0 |
| G52 2 | 4800 | 6 | 13 | 13 | 0 |
| G60 5 | 2300 | 6 | 22 | 20 | 0 |
| G61 4 | 3200 | 6 | 10 | 9 | 0 |
| G62 6 | 1700 | 5 | 17 | 15 | 0 |
| G62 7 | 2800 | 7 | 10 | 10 | 0 |
| G62 8 | 1200 | 5 | 19 | 15 | 0 |
| G63 0 | 2200 | 63 | 16 | 13 | 0 |
| G63 9 | 1800 | 21 | 15 | 13 | 0 |
| G64 2 | 2400 | 7 | 13 | 12 | 0 |
| G65 9 | 3400 | 5 | 10 | 9 | 0 |
| G66 3 | 3100 | 6 | 9 | 8 | 0 |
| G66 5 | 1700 | 5 | 10 | 9 | 0 |
| G66 8 | 1600 | 8 | 16 | 14 | 0 |
| G67 1 | 2600 | 6 | 15 | 14 | 0 |
| G67 2 | 5500 | 6 | 16 | 12 | 0 |
| G67 3 | 3900 | 5 | 8 | 7 | 0 |
| G69 6 | 3900 | 5 | 14 | 13 | 0 |
| G69 7 | 4200 | 5 | 8 | 8 | 0 |
| G72 8 | 5300 | 5 | 8 | 7 | 0 |
| G73 3 | 3700 | 5 | 19 | 15 | 0 |
| G73 4 | 3300 | 6 | 14 | 12 | 0 |
| G74 2 | 3500 | 5 | 11 | 9 | 0 |
| G74 3 | 6500 | 6 | 19 | 10 | 0 |
| G74 4 | 4600 | 5 | 9 | 8 | 0 |
| G75 0 | 4200 | 5 | 23 | 15 | 0 |
| G75 9 | 4100 | 6 | 50 | 34 | 0 |
| G76 0 | 2000 | 10 | 19 | 16 | 0 |
| G76 7 | 3100 | 6 | 14 | 12 | 0 |
| G76 8 | 3300 | 5 | 11 | 10 | 0 |
| G77 5 | 4400 | 8 | 21 | 16 | 0 |
| G77 6 | 4700 | 12 | 25 | 17 | 0 |
| G78 1 | 3900 | 8 | 29 | 23 | 0 |
| G78 3 | 2300 | 12 | 18 | 17 | 0 |
| G78 4 | 270 | 8 | 16 | 14 | 0 |
| G82 4 | 2300 | 6 | 23 | 19 | 0 |
| G82 5 | 2500 | 11 | 15 | 12 | 0 |
| G83 0 | 3600 | 6 | 24 | 18 | 0 |
| G83 7 | 420 | 30 | 20 | 17 | 0 |
| G83 8 | 3500 | 37 | 28 | 19 | 0 |
| G83 9 | 4000 | 10 | 12 | 11 | 0 |
| G84 0 | 2000 | 23 | 21 | 14 | 0 |
| G84 7 | 2600 | 7 | 13 | 13 | 0 |
| G84 8 | 2500 | 14 | 18 | 15 | 0 |
| G84 9 | 1900 | 8 | 14 | 12 | 0 |
| HS1 2 | 2800 | 7 | 12 | 9 | 0 |
| HS2 0 | 4400 | 120 | 11 | 8 | 0 |
| HS2 9 | 2300 | 180 | 15 | 8 | 1 |
| HS3 3 | 730 | 100 | 11 | 8 | 0 |
| HS4 3 | 160 | 6 | 6 | 3 | 0 |
| HS5 3 | 160 | 13 | 12 | 10 | 0 |
| HS6 5 | 960 | 99 | 9 | 6 | 0 |
| HS7 5 | 600 | 31 | 11 | 8 | 0 |
| HS8 5 | 930 | 78 | 7 | 6 | 0 |
| HS9 5 | 600 | 41 | 7 | 5 | 0 |

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| IV1 3 | 670 | 7 | 69 | 38 | 1 |
| IV10 8 | 1100 | 10 | 32 | 25 | 0 |
| IV11 8 | 450 | 16 | 34 | 27 | 0 |
| IV12 4 | 2400 | 9 | 20 | 18 | 0 |
| IV12 5 | 3200 | 79 | 31 | 23 | 0 |
| IV13 7 | 270 | 50 | 27 | 22 | 0 |
| IV14 9 | 890 | 27 | 47 | 35 | 0 |
| IV15 9 | 2600 | 20 | 26 | 20 | 0 |
| IV16 9 | 750 | 12 | 19 | 16 | 0 |
| IV17 0 | 2700 | 40 | 29 | 24 | 0 |
| IV18 0 | 2700 | 32 | 23 | 21 | 0 |
| IV19 1 | 2200 | 42 | 34 | 24 | 0 |
| IV2 4 | 5700 | 7 | 35 | 27 | 0 |
| IV2 5 | 3400 | 27 | 18 | 15 | 0 |
| IV2 6 | 2000 | 110 | 28 | 18 | 1 |
| IV2 7 | 4400 | 30 | 27 | 20 | 0 |
| IV20 1 | 1400 | 47 | 19 | 16 | 0 |
| IV21 2 | 600 | 52 | 14 | 10 | 0 |
| IV22 2 | 800 | 110 | 15 | 11 | 0 |
| IV23 2 | 410 | 79 | 27 | 19 | 0 |
| IV24 3 | 760 | 54 | 30 | 23 | 0 |
| IV25 3 | 1200 | 45 | 45 | 27 | 2 |
| IV26 2 | 980 | 50 | 19 | 12 | 0 |
| IV27 4 | 2400 | 260 | 20 | 12 | 1 |
| IV28 3 | 290 | 31 | 27 | 19 | 0 |
| IV3 8 | 5500 | 32 | 160 | 43 | 2 |
| IV30 1 | 2800 | 5 | 11 | 11 | 0 |
| IV30 5 | 2100 | 25 | 17 | 14 | 0 |
| IV30 6 | 3800 | 5 | 12 | 9 | 0 |
| IV30 8 | 2300 | 51 | 21 | 16 | 0 |
| IV31 6 | 3300 | 15 | 17 | 14 | 0 |
| IV32 7 | 2200 | 33 | 25 | 18 | 0 |
| IV36 1 | 3600 | 14 | 16 | 14 | 0 |
| IV36 2 | 2200 | 59 | 20 | 15 | 0 |
| IV36 3 | 1300 | 9 | 15 | 14 | 0 |
| IV4 7 | 1900 | 100 | 36 | 28 | 0 |
| IV40 8 | 1300 | 110 | 20 | 14 | 1 |
| IV41 8 | 170 | 8 | 37 | 31 | 0 |
| IV42 8 | 240 | 11 | 22 | 15 | 0 |
| IV43 8 | 140 | 16 | 14 | 11 | 0 |
| IV44 8 | 150 | 14 | 15 | 10 | 0 |
| IV45 8 | 120 | 13 | 11 | 8 | 0 |
| IV46 8 | 52 | 11 | 21 | 16 | 0 |
| IV47 8 | 300 | 33 | 11 | 8 | 0 |
| IV48 8 | 44 | 5 | 11 | 6 | 0 |
| IV49 9 | 560 | 45 | 27 | 15 | 1 |
| IV5 7 | 500 | 9 | 43 | 33 | 0 |
| IV51 9 | 2400 | 130 | 13 | 9 | 0 |
| IV52 8 | 200 | 9 | 20 | 12 | 0 |
| IV53 8 | 78 | 10 | 24 | 15 | 0 |
| IV54 8 | 710 | 78 | 26 | 16 | 0 |
| IV55 8 | 730 | 71 | 10 | 8 | 0 |
| IV56 8 | 150 | 23 | 15 | 11 | 0 |
| IV6 7 | 1800 | 37 | 28 | 22 | 0 |
| IV63 6 | 930 | 50 | 76 | 46 | 5 |
| IV63 7 | 170 | 30 | 76 | 58 | 2 |
| IV7 8 | 2400 | 37 | 39 | 20 | 1 |
| IV8 8 | 360 | 6 | 33 | 29 | 0 |
| IV9 8 | 570 | 14 | 39 | 33 | 0 |
| KA1 3 | 3600 | 6 | 17 | 15 | 0 |
| KA1 4 | 3200 | 12 | 8 | 8 | 0 |
| KA1 5 | 2800 | 13 | 15 | 15 | 0 |
| KA10 6 | 5200 | 8 | 10 | 8 | 0 |
| KA11 1 | 4800 | 10 | 29 | 19 | 0 |
| KA11 2 | 1500 | 6 | 10 | 10 | 0 |
| KA12 0 | 4100 | 6 | 9 | 10 | 0 |
| KA13 6 | 4900 | 8 | 17 | 12 | 0 |
| KA13 7 | 2700 | 5 | 11 | 10 | 0 |
| KA15 1 | 1700 | 10 | 15 | 12 | 0 |
| KA15 2 | 1500 | 7 | 15 | 11 | 0 |
| KA16 9 | 1600 | 8 | 19 | 16 | 0 |
| KA17 0 | 1800 | 14 | 16 | 13 | 0 |
| KA18 1 | 3200 | 13 | 14 | 11 | 0 |
| KA18 2 | 2400 | 16 | 11 | 10 | 0 |
| KA18 3 | 2500 | 27 | 17 | 12 | 0 |
| KA18 4 | 1700 | 21 | 19 | 14 | 0 |
| KA19 7 | 2100 | 44 | 23 | 19 | 0 |
| KA19 8 | 1400 | 16 | 21 | 14 | 0 |
| KA2 0 | 1800 | 9 | 13 | 10 | 0 |
| KA21 6 | 2500 | 5 | 13 | 11 | 0 |
| KA23 9 | 2300 | 17 | 9 | 8 | 0 |
| KA24 4 | 1700 | 7 | 14 | 12 | 0 |
| KA24 5 | 1200 | 11 | 24 | 16 | 0 |
| KA25 7 | 1400 | 8 | 15 | 10 | 0 |
| KA26 0 | 2900 | 97 | 21 | 14 | 1 |
| KA26 9 | 2600 | 51 | 20 | 14 | 0 |
| KA27 8 | 2700 | 120 | 23 | 16 | 0 |
| KA28 0 | 1300 | 10 | 5 | 5 | 0 |
| KA29 0 | 750 | 11 | 13 | 13 | 0 |
| KA3 2 | 4000 | 10 | 7 | 7 | 0 |
| KA3 4 | 580 | 13 | 15 | 13 | 0 |
| KA3 5 | 1900 | 10 | 17 | 13 | 0 |

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| KA3 6 | 1600 | 18 | 20 | 12 | 0 |
| KA3 7 | 3500 | 6 | 19 | 17 | 0 |
| KA30 8 | 3100 | 17 | 17 | 14 | 0 |
| KA4 8 | 2500 | 15 | 12 | 9 | 0 |
| KA5 5 | 1900 | 18 | 12 | 10 | 0 |
| KA5 6 | 2500 | 14 | 22 | 17 | 0 |
| KA6 5 | 1800 | 6 | 8 | 5 | 0 |
| KA6 6 | 2500 | 14 | 11 | 9 | 0 |
| KA6 7 | 4300 | 42 | 10 | 8 | 0 |
| KA7 3 | 5100 | 13 | 9 | 7 | 0 |
| KA7 4 | 3800 | 12 | 12 | 11 | 0 |
| KA8 9 | 3900 | 6 | 10 | 10 | 0 |
| KA9 1 | 3600 | 11 | 12 | 10 | 0 |
| KW1 4 | 2600 | 84 | 22 | 16 | 0 |
| KW1 5 | 2700 | 62 | 36 | 24 | 1 |
| KW10 6 | 790 | 17 | 28 | 23 | 0 |
| KW11 6 | 71 | 25 | 35 | 25 | 0 |
| KW12 6 | 770 | 46 | 51 | 28 | 2 |
| KW13 6 | 52 | 26 | 17 | 12 | 0 |
| KW14 7 | 3600 | 130 | 33 | 20 | 2 |
| KW14 8 | 2600 | 51 | 46 | 26 | 2 |
| KW15 1 | 3900 | 27 | 81 | 31 | 2 |
| KW16 3 | 2000 | 110 | 83 | 22 | 4 |
| KW17 2 | 4100 | 380 | 53 | 23 | 20 |
| KW2 6 | 41 | 9 | 38 | 20 | 0 |
| KW3 6 | 470 | 170 | 60 | 45 | 3 |
| KW5 6 | 150 | 61 | 74 | 46 | 5 |
| KW6 6 | 200 | 67 | 53 | 37 | 2 |
| KW7 6 | 64 | 18 | 81 | 53 | 1 |
| KW8 6 | 480 | 340 | 150 | 90 | 57 |
| KW9 6 | 970 | 280 | 25 | 20 | 0 |
| KY1 2 | 4200 | 9 | 19 | 16 | 0 |
| KY1 4 | 2500 | 6 | 7 | 6 | 0 |
| KY10 2 | 1900 | 17 | 15 | 14 | 0 |
| KY10 3 | 3100 | 20 | 20 | 19 | 0 |
| KY11 2 | 5800 | 9 | 15 | 13 | 0 |
| KY11 3 | 1500 | 8 | 28 | 24 | 0 |
| KY11 4 | 6000 | 5 | 17 | 14 | 0 |
| KY11 9 | 4200 | 25 | 21 | 19 | 0 |
| KY12 0 | 5300 | 8 | 18 | 16 | 0 |
| KY12 8 | 5000 | 16 | 17 | 13 | 0 |
| KY12 9 | 5100 | 15 | 14 | 11 | 0 |
| KY13 0 | 890 | 33 | 44 | 27 | 1 |
| KY13 8 | 2200 | 7 | 30 | 29 | 0 |
| KY13 9 | 1500 | 17 | 41 | 30 | 0 |
| KY14 6 | 1300 | 19 | 43 | 35 | 0 |
| KY14 7 | 1800 | 23 | 21 | 17 | 0 |
| KY15 4 | 3000 | 24 | 33 | 26 | 0 |
| KY15 5 | 3900 | 21 | 18 | 15 | 0 |
| KY15 7 | 3100 | 25 | 20 | 18 | 0 |
| KY16 0 | 2300 | 17 | 18 | 16 | 0 |
| KY16 8 | 4800 | 31 | 22 | 16 | 0 |
| KY16 9 | 2800 | 5 | 10 | 6 | 0 |
| KY2 5 | 5500 | 5 | 26 | 24 | 0 |
| KY2 6 | 8300 | 8 | 17 | 15 | 0 |
| KY3 0 | 2200 | 10 | 20 | 17 | 0 |
| KY3 9 | 3000 | 6 | 23 | 14 | 0 |
| KY4 0 | 3200 | 11 | 15 | 11 | 0 |
| KY4 9 | 3700 | 6 | 10 | 9 | 0 |
| KY5 0 | 3300 | 7 | 14 | 13 | 0 |
| KY5 8 | 2600 | 6 | 14 | 14 | 0 |
| KY6 2 | 4100 | 14 | 14 | 11 | 0 |
| KY6 3 | 2600 | 5 | 22 | 17 | 0 |
| KY7 5 | 2100 | 5 | 17 | 15 | 0 |
| KY7 6 | 5900 | 9 | 21 | 17 | 0 |
| KY8 4 | 3400 | 6 | 15 | 13 | 0 |
| KY8 5 | 4400 | 15 | 35 | 20 | 1 |
| KY8 6 | 1400 | 9 | 25 | 22 | 0 |
| KY9 1 | 1500 | 12 | 12 | 11 | 0 |
| ML1 3 | 6400 | 5 | 8 | 6 | 0 |
| ML1 5 | 4500 | 5 | 12 | 11 | 0 |
| ML10 6 | 4500 | 44 | 21 | 17 | 0 |
| ML11 0 | 3900 | 38 | 31 | 19 | 0 |
| ML11 7 | 3400 | 7 | 17 | 13 | 0 |
| ML11 8 | 3700 | 58 | 22 | 16 | 0 |
| ML11 9 | 4600 | 26 | 19 | 17 | 0 |
| ML12 6 | 3900 | 170 | 44 | 28 | 5 |
| ML2 8 | 5700 | 6 | 10 | 7 | 0 |
| ML2 9 | 2700 | 5 | 36 | 30 | 0 |
| ML3 0 | 3500 | 5 | 11 | 10 | 0 |
| ML3 6 | 3400 | 5 | 14 | 14 | 0 |
| ML3 7 | 5500 | 8 | 9 | 7 | 0 |
| ML5 1 | 3300 | 5 | 12 | 11 | 0 |
| ML5 2 | 3900 | 5 | 7 | 5 | 0 |
| ML5 4 | 5400 | 6 | 10 | 10 | 0 |
| ML6 7 | 4200 | 15 | 7 | 5 | 0 |
| ML6 8 | 6000 | 7 | 9 | 7 | 0 |
| ML7 4 | 2900 | 7 | 13 | 8 | 0 |
| ML7 5 | 4000 | 6 | 18 | 10 | 0 |
| ML8 4 | 3400 | 10 | 9 | 8 | 0 |
| ML8 5 | 5000 | 9 | 13 | 12 | 0 |
| ML9 1 | 3300 | 8 | 14 | 9 | 0 |

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| PA11 3 | 2500 | 12 | 22 | 15 | 0 |
| PA12 4 | 1500 | 11 | 17 | 12 | 0 |
| PA13 4 | 2000 | 13 | 23 | 18 | 0 |
| PA14 6 | 3600 | 8 | 13 | 12 | 0 |
| PA16 0 | 4100 | 18 | 13 | 11 | 0 |
| PA17 5 | 1100 | 9 | 10 | 8 | 0 |
| PA18 6 | 950 | 7 | 8 | 6 | 0 |
| PA2 0 | 3200 | 5 | 9 | 8 | 0 |
| PA20 0 | 1800 | 16 | 14 | 11 | 0 |
| PA20 9 | 1400 | 33 | 11 | 8 | 0 |
| PA21 2 | 550 | 32 | 14 | 10 | 0 |
| PA22 3 | 180 | 36 | 17 | 14 | 0 |
| PA23 7 | 2800 | 20 | 21 | 16 | 0 |
| PA23 8 | 3700 | 48 | 17 | 13 | 0 |
| PA24 8 | 300 | 26 | 16 | 14 | 0 |
| PA25 8 | 45 | 5 | 19 | 17 | 0 |
| PA26 8 | 81 | 11 | 16 | 13 | 0 |
| PA27 8 | 410 | 27 | 22 | 17 | 0 |
| PA28 6 | 3900 | 120 | 24 | 16 | 0 |
| PA29 6 | 1200 | 85 | 21 | 13 | 0 |
| PA3 3 | 4400 | 8 | 11 | 11 | 0 |
| PA30 8 | 710 | 23 | 44 | 29 | 0 |
| PA31 8 | 2600 | 130 | 27 | 17 | 3 |
| PA32 8 | 670 | 38 | 26 | 14 | 0 |
| PA33 1 | 360 | 32 | 15 | 13 | 0 |
| PA34 4 | 3500 | 97 | 38 | 21 | 4 |
| PA34 5 | 1900 | 64 | 17 | 12 | 0 |
| PA35 1 | 640 | 53 | 29 | 18 | 1 |
| PA36 4 | 32 | 10 | 14 | 12 | 0 |
| PA37 1 | 1200 | 41 | 43 | 21 | 1 |
| PA38 4 | 470 | 40 | 24 | 19 | 0 |
| PA41 7 | 94 | 10 | 24 | 19 | 0 |
| PA42 7 | 590 | 28 | 17 | 10 | 0 |
| PA43 7 | 440 | 10 | 9 | 6 | 0 |
| PA44 7 | 160 | 24 | 33 | 13 | 1 |
| PA45 7 | 68 | 7 | 30 | 26 | 0 |
| PA46 7 | 120 | 10 | 22 | 20 | 0 |
| PA47 7 | 120 | 7 | 10 | 9 | 0 |
| PA48 7 | 180 | 13 | 8 | 5 | 0 |
| PA49 7 | 110 | 6 | 5 | 4 | 0 |
| PA5 0 | 3100 | 5 | 12 | 9 | 0 |
| PA5 9 | 3300 | 7 | 8 | 7 | 0 |
| PA6 7 | 2600 | 9 | 20 | 18 | 0 |
| PA60 7 | 150 | 29 | 12 | 9 | 0 |
| PA61 7 | 140 | 16 | 21 | 14 | 0 |
| PA62 6 | 25 | 6 | 13 | 10 | 0 |
| PA64 6 | 57 | 9 | 11 | 10 | 0 |
| PA65 6 | 100 | 13 | 85 | 16 | 1 |
| PA66 6 | 93 | 19 | 7 | 5 | 0 |
| PA67 6 | 170 | 15 | 9 | 7 | 0 |
| PA69 6 | 21 | 7 | 9 | 5 | 0 |
| PA7 5 | 2100 | 6 | 12 | 10 | 0 |
| PA70 6 | 57 | 9 | 11 | 7 | 0 |
| PA71 6 | 25 | 9 | 43 | 17 | 0 |
| PA72 6 | 210 | 23 | 7 | 5 | 0 |
| PA73 6 | 42 | 12 | 6 | 4 | 0 |
| PA74 6 | 22 | 9 | 8 | 5 | 0 |
| PA75 6 | 700 | 37 | 10 | 7 | 0 |
| PA76 6 | 90 | 9 | 6 | 3 | 0 |
| PA77 6 | 440 | 35 | 10 | 5 | 0 |
| PA78 6 | 120 | 21 | 7 | 4 | 0 |
| PA8 7 | 3600 | 5 | 11 | 10 | 0 |
| PH1 1 | 3900 | 8 | 26 | 24 | 0 |
| PH1 2 | 5800 | 14 | 24 | 15 | 0 |
| PH1 3 | 4400 | 41 | 23 | 16 | 0 |
| PH1 4 | 2100 | 38 | 28 | 21 | 0 |
| PH10 6 | 3100 | 22 | 35 | 30 | 0 |
| PH10 7 | 2000 | 58 | 42 | 28 | 1 |
| PH11 8 | 1700 | 46 | 25 | 21 | 0 |
| PH12 8 | 920 | 15 | 19 | 16 | 0 |
| PH13 9 | 1800 | 27 | 29 | 23 | 0 |
| PH14 9 | 690 | 14 | 28 | 22 | 0 |
| PH15 2 | 1800 | 91 | 34 | 27 | 0 |
| PH16 5 | 2100 | 66 | 42 | 32 | 1 |
| PH17 2 | 140 | 26 | 25 | 19 | 0 |
| PH18 5 | 410 | 32 | 46 | 33 | 0 |
| PH19 1 | 56 | 17 | 29 | 23 | 0 |
| PH2 0 | 3700 | 19 | 20 | 17 | 0 |
| PH2 6 | 3200 | 23 | 27 | 23 | 0 |
| PH2 7 | 3600 | 28 | 22 | 18 | 0 |
| PH2 9 | 2700 | 37 | 37 | 27 | 0 |
| PH20 1 | 810 | 38 | 38 | 26 | 0 |
| PH21 1 | 1100 | 47 | 48 | 36 | 1 |
| PH22 1 | 1900 | 22 | 71 | 43 | 2 |
| PH23 3 | 360 | 15 | 100 | 61 | 1 |
| PH24 3 | 440 | 17 | 53 | 43 | 0 |
| PH25 3 | 520 | 31 | 60 | 45 | 1 |
| PH26 3 | 1800 | 57 | 36 | 20 | 2 |
| PH3 1 | 2700 | 36 | 37 | 23 | 1 |
| PH31 4 | 250 | 22 | 41 | 26 | 1 |
| PH32 4 | 380 | 19 | 95 | 58 | 3 |
| PH33 6 | 3000 | 39 | 42 | 24 | 1 |

| Postcode sector | Dwellings | | Results, Bq m ⁻³ | | At or above Action Level |
|-----------------|-----------|----------|-----------------------------|-------------------|--------------------------|
| | Total | Measured | Arithmetic average | Geometric average | |
| PH33 7 | 2300 | 60 | 28 | 20 | 0 |
| PH34 4 | 490 | 51 | 74 | 31 | 6 |
| PH35 4 | 190 | 29 | 29 | 23 | 0 |
| PH36 4 | 790 | 79 | 14 | 9 | 0 |
| PH37 4 | 82 | 18 | 17 | 14 | 0 |
| PH38 4 | 110 | 30 | 18 | 14 | 0 |
| PH39 4 | 190 | 17 | 21 | 15 | 0 |
| PH4 1 | 370 | 9 | 40 | 29 | 0 |
| PH40 4 | 120 | 10 | 7 | 6 | 0 |
| PH41 2 | 14 | 6 | 6 | 6 | 0 |
| PH41 4 | 430 | 28 | 19 | 16 | 0 |
| PH42 4 | 47 | 8 | 17 | 13 | 0 |
| PH43 4 | 14 | 6 | 13 | 7 | 0 |
| PH49 4 | 550 | 24 | 19 | 15 | 0 |
| PH5 2 | 400 | 9 | 24 | 21 | 0 |
| PH50 4 | 530 | 6 | 37 | 31 | 0 |
| PH6 2 | 1300 | 36 | 28 | 22 | 0 |
| PH7 3 | 2700 | 17 | 19 | 16 | 0 |
| PH7 4 | 1400 | 16 | 27 | 23 | 0 |
| PH8 0 | 1100 | 48 | 36 | 29 | 0 |
| PH9 0 | 500 | 23 | 35 | 26 | 0 |
| TD1 1 | 2800 | 8 | 15 | 13 | 0 |
| TD1 2 | 3000 | 44 | 22 | 18 | 0 |
| TD1 3 | 2700 | 25 | 50 | 35 | 1 |
| TD10 6 | 530 | 25 | 22 | 18 | 0 |
| TD11 3 | 3500 | 110 | 32 | 25 | 0 |
| TD12 4 | 1500 | 30 | 43 | 25 | 1 |
| TD13 5 | 440 | 24 | 24 | 18 | 0 |
| TD14 5 | 3300 | 39 | 33 | 20 | 1 |
| TD15 1 | 630 | 26 | 43 | 32 | 0 |
| TD2 6 | 1100 | 32 | 39 | 26 | 1 |
| TD3 6 | 440 | 25 | 19 | 16 | 0 |
| TD4 6 | 1000 | 10 | 24 | 18 | 0 |
| TD5 7 | 3500 | 33 | 20 | 16 | 0 |
| TD5 8 | 2100 | 77 | 54 | 40 | 2 |
| TD6 0 | 1700 | 14 | 22 | 20 | 0 |
| TD6 9 | 2100 | 31 | 36 | 29 | 0 |
| TD7 4 | 2200 | 23 | 33 | 27 | 0 |
| TD7 5 | 1400 | 91 | 38 | 30 | 0 |
| TD8 6 | 3000 | 68 | 35 | 21 | 1 |
| TD9 0 | 2400 | 76 | 31 | 25 | 0 |
| TD9 7 | 1900 | 38 | 43 | 34 | 1 |
| TD9 8 | 2600 | 37 | 28 | 23 | 0 |
| TD9 9 | 2500 | 25 | 30 | 24 | 0 |
| ZE1 0 | 3900 | 23 | 39 | 19 | 1 |
| ZE2 9 | 6200 | 500 | 34 | 14 | 17 |
| ZE3 9 | 220 | 18 | 16 | 9 | 0 |

Table C6. Predictive data by local authority

| Code | Local authority | Dwellings in each probability banding* | | | | | | | Expected numbers above Action Level | |
|------------------|-----------------------|--|--------------|---------|---------|---------|-----------|---------------|-------------------------------------|--------------------|
| | | Total | Less than 1% | 1%-2.9% | 3%-4.9% | 5%-9.9% | 10%-29.9% | More than 30% | In Affected Areas | In whole Authority |
| QA | Aberdeen City | 104000 | 100000 | 3700 | 0 | 0 | 0 | 0 | 30-50 | 40-290 |
| QB | Aberdeenshire | 106000 | 96800 | 5200 | 460 | 1000 | 2600 | 46 | 390-620 | 390-790 |
| QC | Angus | 52800 | 52800 | 29 | 0 | 0 | 0 | 0 | <10 | 0-100 |
| QD | Argyll and Bute | 43300 | 42900 | 270 | 51 | 0 | 0 | 0 | <10 | 0-40 |
| QE | Scottish Borders | 55100 | 47900 | 6700 | 460 | 0 | 2 | 0 | 80-140 | 80-310 |
| QF | Clackmannanshire | 23400 | 23300 | 130 | 0 | 0 | 0 | 0 | <10 | 0-20 |
| QG | West Dunbartonshire | 42400 | 42400 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| QH | Dumfries and Galloway | 71500 | 59900 | 11300 | 160 | 40 | 0 | 0 | 100-160 | 120-300 |
| QJ | Dundee City | 73000 | 73000 | 0 | 0 | 0 | 0 | 0 | <10 | 0-110 |
| QK | East Ayrshire | 54800 | 54800 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| QL | East Dunbartonshire | 43900 | 43900 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| QM | East Lothian | 43500 | 43500 | 15 | 0 | 0 | 0 | 0 | <10 | 0-80 |
| QN | East Renfrewshire | 36400 | 36400 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| QP | Edinburgh, City of | 232000 | 232000 | 0 | 0 | 0 | 0 | 0 | <10 | 0-20 |
| QQ | Falkirk | 70200 | 70200 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| QR | Fife | 169000 | 168000 | 230 | 0 | 0 | 0 | 0 | <10 | 0-120 |
| QS | Glasgow City | 297000 | 297000 | 0 | 0 | 0 | 0 | 0 | <10 | 0-40 |
| QT | Highland | 108000 | 86700 | 18300 | 1700 | 470 | 530 | 38 | 320-480 | 320-730 |
| QU | Inverclyde | 37600 | 37600 | 0 | 0 | 0 | 0 | 0 | <10 | 0-20 |
| QW | Midlothian | 34900 | 34900 | 0 | 0 | 0 | 0 | 0 | <10 | 0-20 |
| QX | Moray | 41400 | 39800 | 1500 | 41 | 3 | 0 | 0 | 10-30 | 10-60 |
| QY | North Ayrshire | 65200 | 65200 | 0 | 0 | 0 | 0 | 0 | <10 | 0-20 |
| QZ | North Lanarkshire | 147000 | 147000 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| RA | Orkney Islands | 9900 | 6400 | 1300 | 1500 | 620 | 0 | 0 | 90-120 | 90-150 |
| RB | Perth and Kinross | 67100 | 64700 | 2500 | 5 | 1 | 0 | 0 | 20-40 | 20-250 |
| RC | Renfrewshire | 82200 | 82200 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| RD | Shetland Islands | 10300 | 10100 | 56 | 150 | 0 | 0 | 0 | <10 | 0-20 |
| RE | South Ayrshire | 53600 | 53600 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| RF | South Lanarkshire | 140000 | 139000 | 420 | 120 | 0 | 0 | 0 | 0-20 | 0-50 |
| RG | Stirling | 38700 | 38700 | 33 | 0 | 0 | 0 | 0 | <10 | 0-40 |
| RH | West Lothian | 73800 | 73800 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| RJ | Eilean Siar | 13600 | 13600 | 0 | 0 | 0 | 0 | 0 | <10 | <10 |
| Totals (rounded) | | 2440000 | 2380000 | 51700 | 4600 | 2100 | 3100 | 84 | | |

* A total of 103 postal addresses are in unmapped 5-km squares (see text): these are in Argyll and Bute (1); Highland (94); Perth and Kinross (3); Eilean Siar (5).