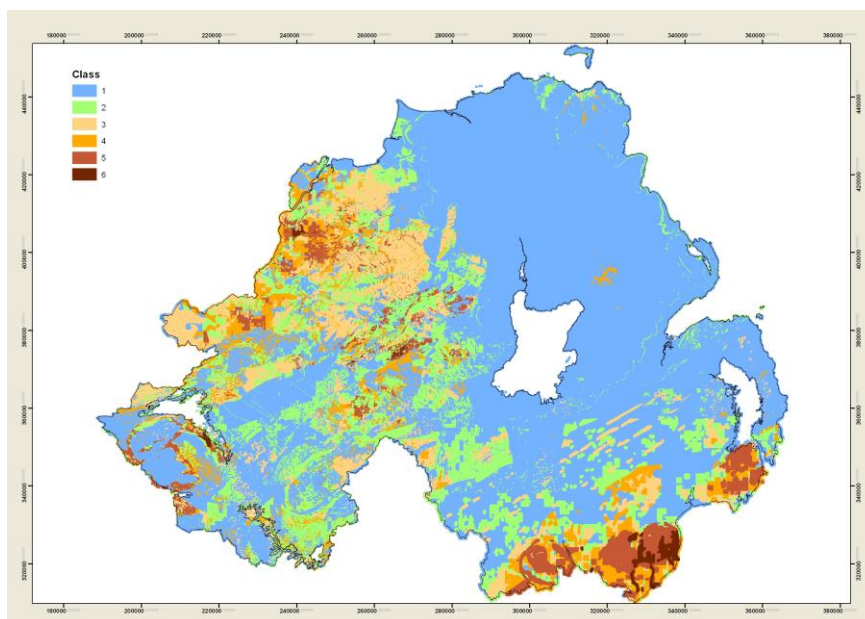


User Guide for the PHE-GSNI- BGS Joint Radon Potential Dataset for Northern Ireland

Open Report OR/13/048



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Foreword

This report presents a description of the digital radon potential dataset for Northern Ireland developed by the British Geological Survey (BGS) and Public Health England (PHE) and provides guidance on the application of the dataset. The method has been critically assessed and its fitness for purpose determined by J D Appleton and K A M Adlam (BGS) and D Rees, Z Daraktchieva, J Smithard, J Bradley and N McColl (PHE).

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Summary

The British Geological Survey (BGS), the Geological Survey of Northern Ireland (GSNI) and Public Health England (PHE) have collaborated in producing a new map of the potential for radon exposure in buildings in Northern Ireland. This new map, and the underlying digital dataset, is based on statistical analysis of radon levels in dwellings, many funded by the Northern Ireland Environment Agency (NIEA), within the framework of 1: 10 000 and 1: 250 000 scale GSNI digital geology. This report describes the methodology developed by the British Geological Survey (BGS) and Public Health England (PHE) to produce this new assessment of radon potential in Northern Ireland. The purpose of the user guide is to enable those licensing this dataset to have a better appreciation of how the dataset has been created and therefore better understand the potential applications and limitations that the dataset may have.

Acknowledgements

Alex Donald and Mark Cooper (GSNI) provided the 1:10 000 and 1:250 000 scale geological data and provided advice on issues related to combining and simplifying the geological data. Keith Adlam and Tony Myers (BGS) removed dykes from the 1:250 000 scale data, combined the geological data to cover the whole of Northern Ireland at the best scale available, and clipped the geological data using an OSNI coastline and major water bodies. Zornitza Daraktchieva (PHE) processed the indoor radon data for those bedrock-superficial geology combinations with sufficient indoor radon measurements. Don Appleton processed the remainder of the indoor radon data and compiled the final baseline digital radon potential dataset. Keith Adlam (BGS) buffered the baseline radon potential dataset and produced the 1-km indicative atlas dataset. David Rees (PHE) checked the final digital datasets and, with other PHE colleagues, prepared the 1-km Indicative Atlas. Chris Scivyer (Building Research Establishment) kindly provided advice on radon protective measures required in Northern Ireland. Funding for the majority of the radon measurements in dwellings was provided by the Northern Ireland Environment Agency (NIEA) or its predecessor organisations. Joanna Wragg, Antonio Ferreira, Paul Turner, Kathryn Lee and Gerry Wildman, (BGS), David Rees, Neil McColl, Zornitza Daraktchieva and Daryl Dixon (PHE) and Mike Young (GSNI) are thanked for reviewing and suggesting improvements to this report.

1 Introduction

The joint Public Health England (PHE) – Geological Survey of Northern Ireland (GSNI) – British Geological Survey (BGS) digital RADON POTENTIAL DATASET FOR NORTHERN IRELAND described in this report provides the current definitive map of radon Affected Areas in Northern Ireland. It allows an estimate to be made of the probability that an individual property or site is at or above the Action Level for radon (200 Bq m⁻³). The RADON POTENTIAL DATASET FOR NORTHERN IRELAND provides information on the level of protection required for new buildings as described in the latest Building Research Establishment guidance on radon protective measures for new buildings (*BR-413 Radon: Guidance on protective measures for new dwellings in Northern Ireland (2004)*).

The Industrial Pollution and Radiochemical Inspectorate of the Northern Ireland Environment Agency (NIEA) and the Health Protection Agency (HPA – now part of Public Health England) published a report on Radon in Dwellings in Northern Ireland (Green et al., 2009) containing maps based on radon results from over 23,000 homes. The maps of radon potential in that report were derived from radon measurements and presented as average radon potential in each 1-km square on the Irish grid within Northern Ireland.

Miles and Appleton (2005) demonstrated that combining geological and grid square radon mapping, as described in this report, provides more accurate mapping than either method used separately. The combined mapping method has been used to produce the current radon datasets and indicative atlases for England and Wales (Appleton and Miles, 2005; Miles et al., 2007; Appleton et al., 2011; Scheib et al., 2013) and Scotland (Scheib et al., 2009; Miles et al., 2011).

The radon potential dataset described in the current report replaces the HPA-NIEA 1-km grid radon map published in 2009 (Green et al., 2009). This radon potential dataset for Northern Ireland is based on indoor radon measurements made by PHE and 1:10 000 scale digital geology information provided by the Geological Survey of Northern Ireland (GSNI), or 1: 250 000 scale digital geology in those areas where the 1 : 10 000 data is not yet available (Figure 1). The measured indoor radon data is used with the agreement of PHE. Confidentiality of measurement locations is maintained through data management practices. Access to the data is restricted.

The general methodology by which the PHE-GSNI-BGS joint radon dataset for Northern Ireland was produced is described in Miles and Appleton (2005) and Appleton et al. (2011). This report provides greater detail on the methodology and guidance on how the dataset can be used. Searches of the full dataset are available by individual address or site area from the PHE and BGS enquiries services.

An indicative version of the full data set for Northern Ireland (showing only the maximum radon potential in each 1-km grid square) was published in 2014 (Rees et al., 2014).

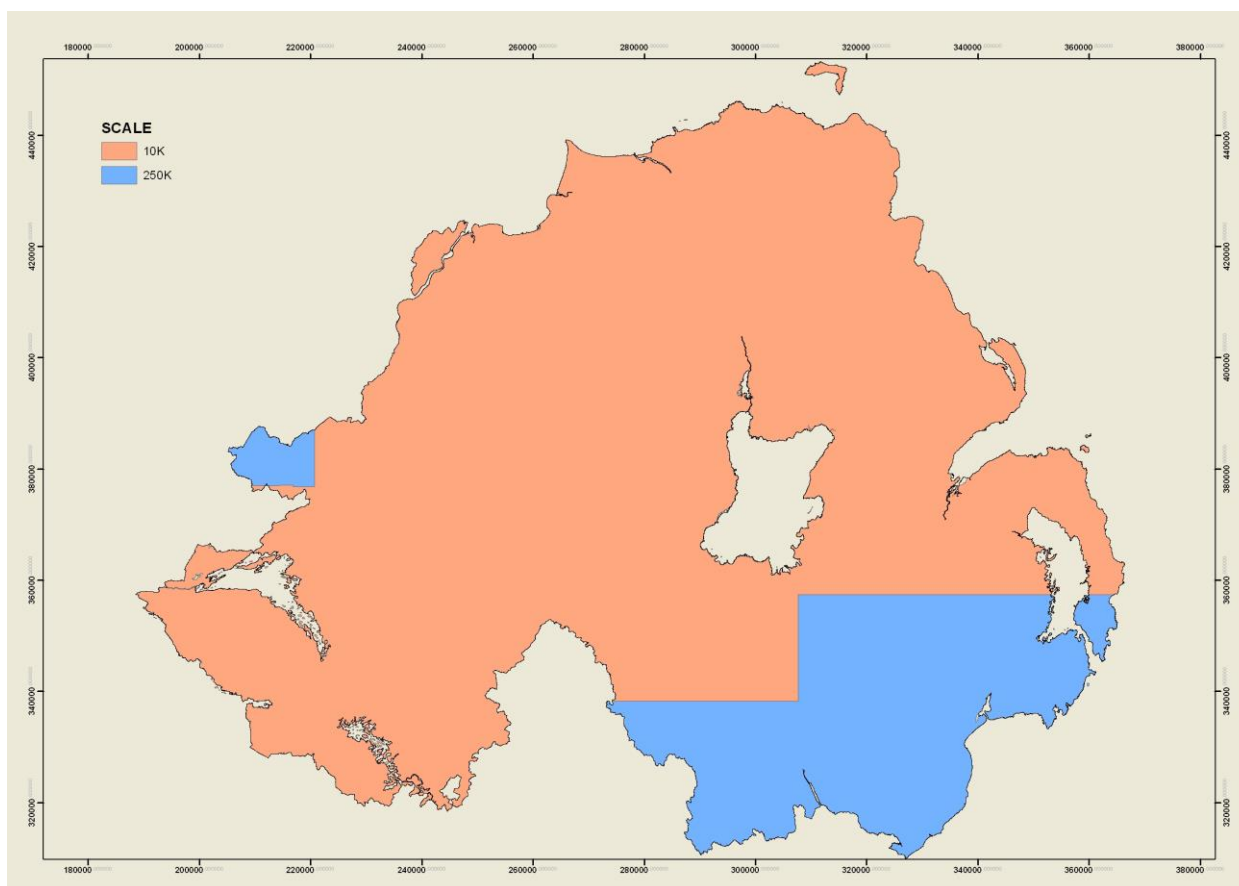


Figure 1 Scale of geological data used to produce radon map

Founded in 1835, the British Geological Survey (BGS) is the world's oldest national geological survey and the United Kingdom's premier centre for earth science information and expertise. The BGS provides expert services and impartial advice in all areas of geoscience, to both the public and private sectors, in the UK and internationally.

BGS's innovative digital data products aim to help describe the ground surface and what lies beneath. These digital products are based on the outputs of the BGS survey and research programmes and our substantial national data holdings. These data coupled with our in-house geoscientific knowledge are combined to provide products relevant to a wide range of users in central and local government, insurance and housing industry, engineering and environmental business, and the public.

Further information on all the digital data provided by the BGS can be found on our website at <http://www.bgs.ac.uk/products/home.html> or by contacting: Central Enquiries, British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, NG12 5GG; Direct tel. +44(0)115 936 3143; Fax. +44(0)115 9363150 ; email enquiries@bgs.ac.uk

The Geological Survey of Northern Ireland (GSNI) is part of the Department of Enterprise, Trade and Investment (DETI). It is staffed by scientists of BGS under contract to DETI, which allows GSNI to call upon expertise from within other parts of the BGS. GSNI also advises other Northern Ireland government departments. GSNI provides geoscience information and services to inform decision making and holds an extensive archive of maps, boreholes and site investigation reports; detailed urban and regional geochemical and geophysical data, and publishes books, memoirs and reports. The GSNI maps, models and monitors the ground and this research underpins decision

making, promotes economic development and generates baseline data for environmental management.

Further information can be found on the GSNI web site at <http://www.bgs.ac.uk/gsni/> or by contacting the Geological Survey of Northern Ireland, Colby House, Stranmillis Court, Belfast BT9 5BF. Tel: +44 (0)28 9038 8462; Fax: +44 (0)28 9038 8461; email: gsni@detini.gov.uk.

Public Health England was formed on 1 April 2013 and incorporated the Centre for Radiation, Chemical and Environmental Hazards (CRCE) of the Health Protection Agency (HPA). CRCE carries out PHE's work on ionising and non-ionising radiations. It undertakes research to advance knowledge about protection of people from the risks of these radiations; provides laboratory and technical services; runs training courses; provides expert information and has a significant advisory role in the UK. Radon mapping is carried out and related research and services are provided by the Radon Group within CRCE.

For further general information on radon contact: Radon Group, Public Health England, Centre for Radiation, Chemical and Environmental Hazards, Chilton, Didcot, Oxon OX11 0RQ
Direct tel. +44(0) 1235 822622; Fax. +44(0)1235 833891; Email: radon@phe.gov.uk; Web: www.phe.gov.uk or www.ukradon.org

2 The Northern Ireland Radon Potential Dataset

2.1 BACKGROUND

Public understanding of the effect of land contamination and ground conditions on the health of the occupants, the safety of property, and the implication for the value of property is growing. Local councils are under increasing pressure from central government to provide environmental information. Information about geological and geochemical hazards is needed, in particular, the identification of areas with a potential for land contamination or ground movement.

In response to this, BGS initiated a development programme to produce data sets that identified and assessed potential geohazards threatening the human environment, including:

- Six ground stability hazard datasets
- Superficial deposit thickness models
- Scans of onshore borehole logs
- Scans of geology and historic topography maps
- Ground permeability data
- Susceptibility to groundwater flooding data
- Geological indicators of past flooding data
- GIS data identifying potential radon hazard (produced in collaboration with PHE)
- Non-coal mining hazards data

Similar products have been generated or are being generated in Northern Ireland by GSNI in conjunction with BGS.

Radon is a natural radioactive gas, which enters buildings from the ground. Exposure can increase the risk of lung cancer. Radon is the biggest source of human exposure to ionising radiation in the UK and is responsible for an estimated 1,100 lung cancer deaths a year (McColl et al., 2010). PHE recommends that radon levels should be reduced in homes where the annual average is at or above 200 becquerels per cubic metre (200 Bq m⁻³). This is termed the Action Level. PHE defines radon Affected Areas as those with 1% chance or more of a house having a radon concentration at or above the Action Level of 200 Bq m⁻³.

The joint PHE-GSNI-BGS digital RADON POTENTIAL DATASET FOR NORTHERN IRELAND provides the current definitive map of radon Affected Areas in Northern Ireland.

Brief summaries of the main relationships between radon and geology in Northern Ireland are available in Appleton et al. (2008; 2011) and a more detailed review in Appleton et al. (2015). Comparison of the simplified geological map (Figure 2) with the radon potential map (Figure 3) shows that moderate and high radon potential in Northern Ireland is associated mainly with (i) the Neoproterozoic psammities, semipelites, meta-limestones, volcanics and mafic intrusives of Counties Londonderry and Tyrone; (ii) Silurian Hawick Group greywackes and, to a much more limited extent Gala Group greywackes, in the southern sector of Counties Armagh and Down; (iii) Ordovician and Silurian acid intrusives and volcanics in eastern Counties Londonderry and Tyrone; (iv) Middle-Late Devonian conglomerates in County Tyrone; (v) Lower Carboniferous (Dinantian) limestone in the western sector of Northern Ireland, especially in County Fermanagh; (vi) Palaeogene (Tertiary) and Late Caledonian acid intrusive rocks of the Mourne Mountains Complex, Slieve Gullion Complex and Newry Granodiorite Complex in the SE sector in County Down and County Armagh. Moderate to high radon potential is sometimes associated with glacio-fluvial sand and gravel deposits where these overlie a range of bedrocks, some of which have relatively low radon potential. In this latter case the enhanced radon potential is probably caused by the high permeability of superficial deposits. Radon potential tends to be lower when bedrocks characterised by moderate or high radon potential are overlain by relatively impermeable silt-clay alluvium, glaciolacustrine, and lacustrine deposits; peat; and glacial till and moraine. Redistribution of rock debris derived from uranium-rich bedrocks, such as the Mourne Mountains granites, through glacial, alluvial and other processes can also result in higher radon potential being associated with superficial deposits relative to underlying bedrocks.

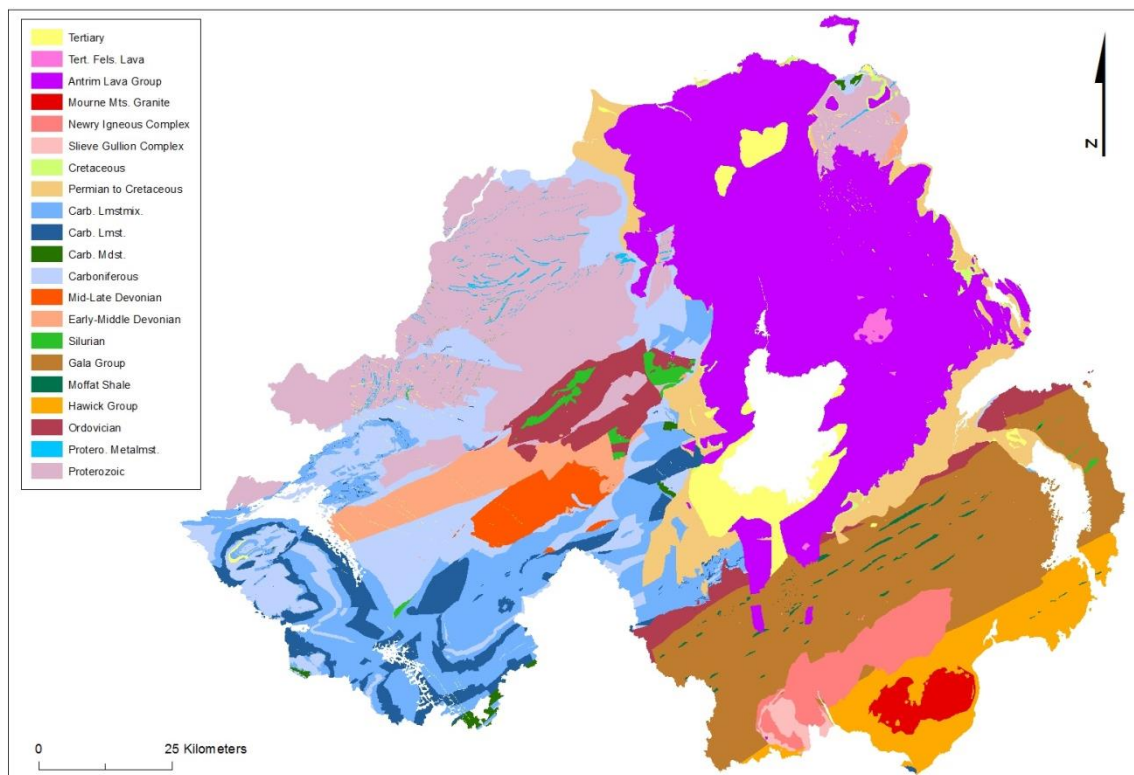


Figure 2 Simplified bedrock geology of Northern Ireland (Carb. = Carboniferous; Lmst. = Limestone; Lmstmix.= limestone with sandstone, siltstone, and/or mudstone; Mdst.= Mudstone; Tert.= Tertiary)

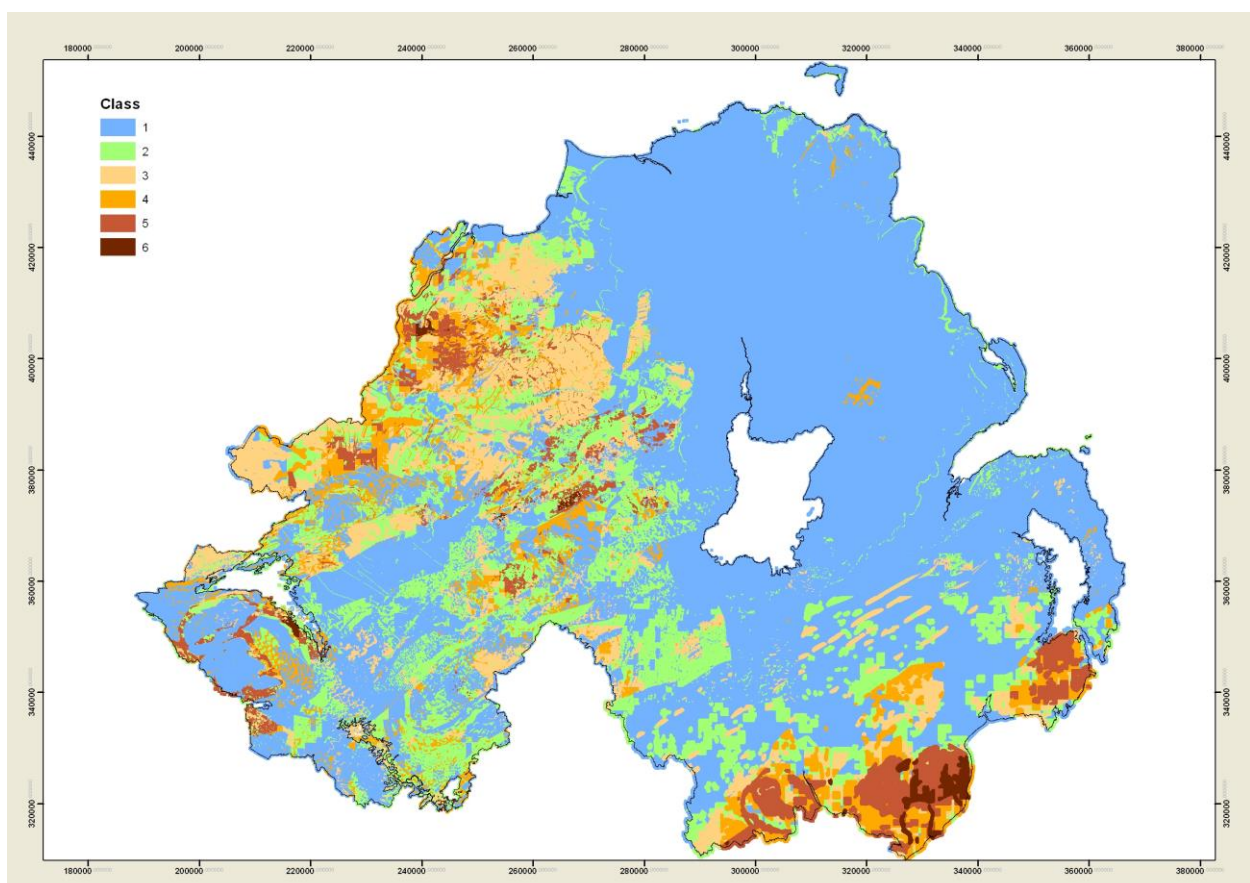


Figure 3 Radon map of Northern Ireland based on geology and indoor radon data (buffered version; see section 3.4 for explanation of buffering)

2.2 WHO MIGHT REQUIRE THIS DATA?

- Local Authority Environmental Health and Building Control Departments
- Organisations providing environmental reports for property owners, including householders, landlords and employers, and property developers
- Solicitors, surveyors, architects, environmental and radiological consultants

2.3 WHAT THE DATASET SHOWS

The RADON POTENTIAL DATASET FOR NORTHERN IRELAND will allow an estimate to be made of the probability that an individual property in Northern Ireland is at or above the Action Level for radon. The data can also be used to provide a radon potential estimate for a development site. The probability banding is represented here by the classification number for ease of use. The probability banding should be used when quoting the estimated radon potential range – see Table 3 below.

The data provide information on the level of protection required for new buildings and extensions greater than 30 m² under *C2 Preparation of site and resistance to dangerous and harmful substance*. Technical guidance is available in *BR-413 Radon: Guidance on protective measures for new dwellings in Northern Ireland* (Building Research Establishment, 2004; ISBN 1 86081 4697).

For enquiries relating to single properties, the full address and postcode or the National Grid coordinates of a property will be required to interrogate the RADON POTENTIAL DATASET FOR NORTHERN IRELAND which will provide an estimate of the probability that a particular property is at or above the Action Level for radon. For BR413 enquiries, the dataset can also be searched using site outlines when no property addresses are available. More information on how address data can be used to interrogate the Radon Potential dataset is described in sections 3.5 and 3.6.

3 Technical Information

The Joint Radon Potential Dataset for Northern Ireland is split into two layers:

1. RADON POTENTIAL DATASET FOR NORTHERN IRELAND
2. INDICATIVE ATLAS OF RADON IN NORTHERN IRELAND

3.1 DEFINITIONS

- RADON POTENTIAL DATASET FOR NORTHERN IRELAND (Radon_NI_V1) provides the current definitive map of radon Affected Areas in Northern Ireland.

- INDICATIVE ATLAS OF RADON IN NORTHERN IRELAND DATASET (Radon_Atlas_NI_V1) presents a simplified version of the RADON POTENTIAL DATASET FOR NORTHERN IRELAND with each 1-km grid square being classed according to the highest radon potential found within it, so it is indicative rather than definitive. The INDICATIVE ATLAS OF RADON IN NORTHERN IRELAND is published in Rees et al., 2014. The Indicative Atlas should not be used to provide reports for sites unless all the site lies within a grid square with <1% of dwellings exceeding the Radon Action Level (Class 1).

3.2 SCALE

The RADON POTENTIAL DATASET FOR NORTHERN IRELAND is produced for use at 1:10 000 scale or 1:250 000 scale (see Figure 1).

3.3 FIELD DESCRIPTIONS

Table 1 Attribute table field descriptions for RADON POTENTIAL DATASET FOR NORTHERN IRELAND (Radon_NI_V1)

FIELD NAME	FIELD TYPE	DESCRIPTION	FIELD CONTENT
Class	Numeric-integer	Radon potential class	Range: 1 to 6*
Version	String	Dataset title and version number	Radon_NI_V1

Table 2 Attribute table field descriptions for INDICATIVE ATLAS OF RADON IN NORTHERN IRELAND DATASET (Radon_Atlas_NI_V1)

FIELD NAME	FIELD TYPE	DESCRIPTION	FIELD CONTENT
Tile	String	Land and Property Services (LPS) of Northern Ireland 1-km grid square identifier	e.g. H2722
Class_max	Numeric-integer	Radon potential	Range: 1 to 6*
Version	String	Dataset title and version number	Radon_Atlas_NI_V1

* See Table 3 for explanation of the percentage bands

Table 3 Radon Potential Classes and percentage bands

Radon Potential Class	Estimated percentage of dwellings exceeding the Radon Action Level (Nominal percentage band)	Estimated percentage of dwellings exceeding the Radon Action Level (Actual percentage band)
1	0-1	0 to 0.99999
2	1-3	1 to 2.99999
3	3-5	3 to 4.99999
4	5-10	5 to 9.99999
5	10-30	10 to 29.99999
6	30-100	30 to 100

3.4 CREATION OF THE DATASET

The land area is first divided up using a combination of bedrock and superficial geological characteristics derived from GSNI 1:10 000 DiGMap and 1:250 000 scale digital geological map data (Figure 1; GSNI 1991, 1997; <http://www.bgs.ac.uk/gsni/geology/status/index.html>). Each different combination of geological characteristics may appear at the land surface in many discontinuous locations across the country.

In order to facilitate the seamless 1-km interpolation of radon potential within major geological units, simplified bedrock and superficial geology classification systems were developed. These ensure continuity and also group some geological units with similar characteristics. Grouping similar geological units ensured that there were a sufficient number of indoor radon measurements for intra-geological unit grid square mapping to be carried out over a greater proportion of Northern Ireland. There are 360 named 1:10 000 scale bedrock geological units in Northern Ireland and 44 bedrock units in the area with only 1: 250 000 scale bedrock geology (Figure 1). These were grouped using a simplified bedrock classification comprising 69 units. There are 12 individually named 1:250,000 scale superficial geological units and 27 1: 10 0000 scale superficial geology units. A simplified superficial geology classification comprising 14 units was used in the radon mapping procedure. Once the superficial geology has been unioned with bedrock geology there are a total of 466 bedrock/superficial geology combinations.

Accurate coordinates for house measurement results are required for the radon mapping method. Of the approximately 24,000 radon measurements¹ for domestic dwellings available in Northern Ireland, 23,000 have precise coordinates obtained from the *Land and Property Services (LPS) Pointer®* (from now on referred as *Pointer®*) location data². These results were used for preparing the radon maps.

Each of these measurements is allocated to the bedrock–superficial geological combination underlying it. Taking each geological combination in turn, the spatial variation of radon potential is mapped, treating the combination as if it were continuous over the land area. All of the maps of

¹ See Green et al. (2009) which gives details of the radon measurement programmes and procedures

² See <http://www.nidirect.gov.uk/pointer>. Land and Property Services (LPS) now incorporates the former Ordnance Survey of Northern Ireland (OSNI)

radon potential within different geological combinations are then combined to produce a map of variation in radon potential over the whole land surface. This unbuffered dataset formed the raw data on which processing was carried out to ensure all end-users would achieve consistent results.

The unbuffered radon potential dataset was pre-processed using ArcGIS 10.1 :

- To include a 'geological data accuracy' buffer of 10 m or 250 m to allow for the precision (uncertainty) of the geological lines as defined as part of the 1: 10,000 or 1:250,000 scale geological data used to create the raw radon dataset.
- To include a 'residential property' buffer of 25 m, to allow for the average extent of homes located using *Pointer*® coordinates.

The 'geological data accuracy' and 'residential property' buffers were added together and the resultant 35 m or 275 m buffer was applied sequentially to radon potential Class 6, 5, 4, 3 and 2 (Table 3) base radon potential data polygons derived from unbuffered radon potential data. These buffered polygons, together with the Class 1 polygons, were converted to separate 25 m raster grids, which were then superimposed³ on each other to produce a final 25 m raster grid that gives the highest radon probability for each individual 25 m cell.

The radon potential dataset does not quite extend to the coastline in some areas; either because reclamation of land has moved the coastline or because the coastline used on the paper map from which the digital geology was captured does not quite reach the actual coastline due to the scale of the mapping. In order to obtain radon potential values in these areas, values were extrapolated by expanding the raster grid by 200 m based on the adjacent cells.

The raster grid was then converted back to a vector dataset as an ArcGIS shape file without simplification of the cell boundaries.

The final RADON POTENTIAL ArcGIS shape file was intersected with the Irish Grid 1-km tile boundaries to split large polygons, and multipart polygons were converted to single part, to improve the performance of the final dataset.

The INDICATIVE ATLAS OF RADON IN NORTHERN IRELAND dataset (Figure 4: Right) was created from the buffered RADON POTENTIAL DATASET FOR NORTHERN IRELAND (Figure 4: Left) after intersecting it with a 1-km grid, by selecting the highest radon class (1-6) that occurred within each 1-km square.

³ Higher classes had priority over lower classes

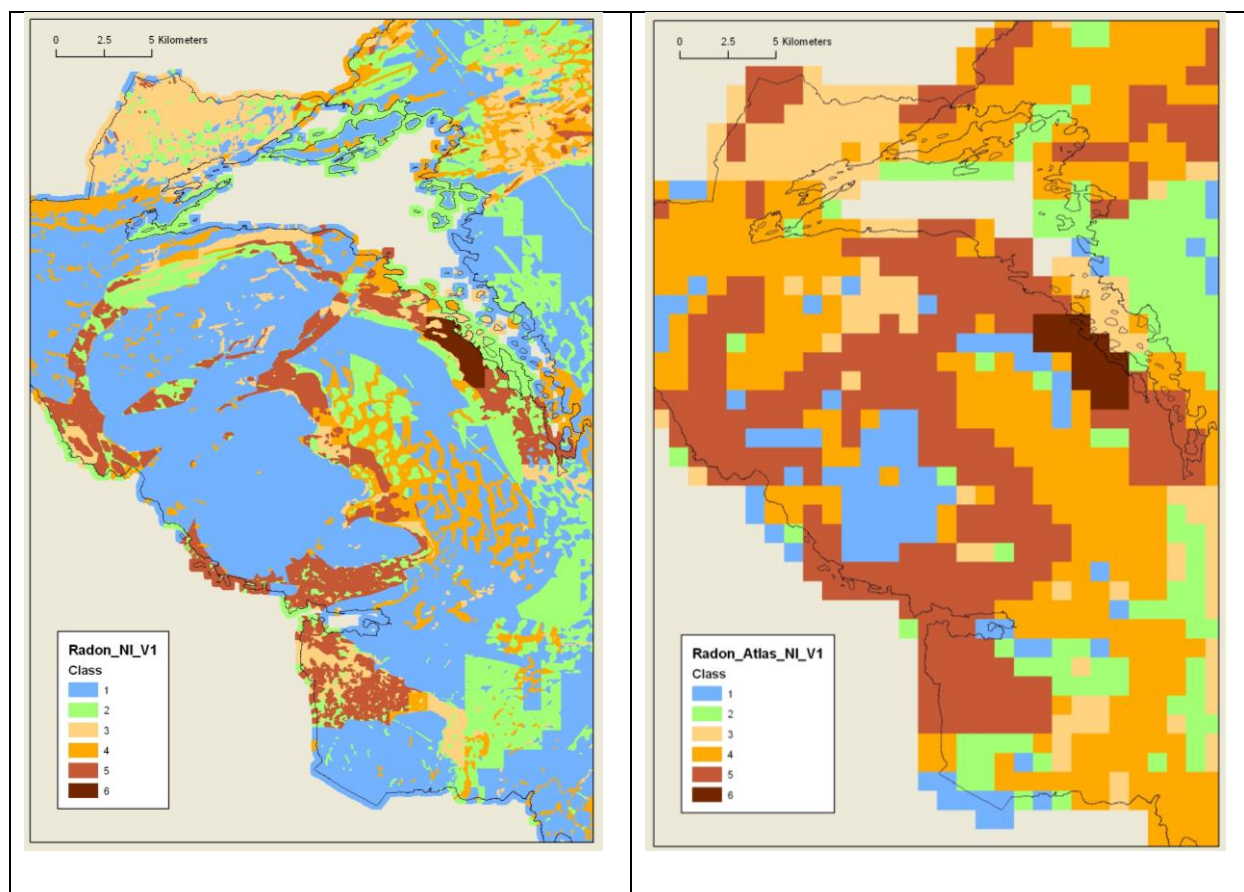


Figure 4 Extract from buffered RADON POTENTIAL DATASET FOR NORTHERN IRELAND (Left) and corresponding INDICATIVE ATLAS OF RADON IN NORTHERN IRELAND DATASET (Right)

3.5 USE OF *Pointer*® TO SEARCH THE RADON POTENTIAL DATASET FOR SMALL BUILDINGS IN NORTHERN IRELAND

The *Pointer*® is the address database for Northern Ireland maintained by Land & Property Services (LPS), with input from Local Councils and Royal Mail. *Pointer*® is a dataset for addressable buildings in Northern Ireland and can be used to query the Radon Potential Dataset to establish whether a building is in a radon Affected Area and to determine what level of radon protective measures are required for larger (>30 m²) extensions to small existing buildings (see section 2.3 for more information).

***Pointer*® address coordinates should not be used when the footprint of the building (home or workplace) including any planned extension, exceeds 25 metres in any direction. For larger buildings groups of buildings and sites, the instructions in Section 3.6 should be followed.**

During testing it was found that some *Pointer*® address coordinates joined to the buffered radon class dataset returned a value of 0 instead of a radon potential class value. This was because, when a point lies exactly on the boundary between polygons no value is returned in the GIS. It was discovered that some GIS systems **do** return a value in this situation and some **do not**. Also if a value is returned, it is not known which of the two possible values (from the two polygons either side of the polygon boundary) will be returned. To ensure consistency between different systems the dataset was moved by -0.01 of a metre (1 cm) in both the x and y directions. This then ensures

that no *Pointer*® address coordinates can ever lie directly on top of a boundary between polygons. As the *Pointer*® address coordinates are held to 1 metre accuracy ('Pointer technical specification' link in <http://www.nidirect.gov.uk/pointer>), the final shifted dataset will have no boundaries that have coordinates exactly on metre boundaries. This is the final RADON POTENTIAL DATASET FOR NORTHERN IRELAND.

This pre-processing of the data should ensure that all RADON POTENTIAL DATASET FOR NORTHERN IRELAND users will obtain the same result when using *Pointer*® address coordinates. Data users should not apply any further buffer to the *Pointer*® address coordinates, for example to define property extent, because a 25 m buffer for this purpose is already included in the RADON POTENTIAL DATASET FOR NORTHERN IRELAND. Additionally, any other forms of spatial search against the data, e.g., measured grid references or site polygons, do not need to be buffered.

This pre-processed RADON POTENTIAL DATASET FOR NORTHERN IRELAND has been subject to rigorous quality checks involving BGS and PHE personnel.

3.6 SEARCHING THE RADON POTENTIAL DATASET FOR LARGE BUILDINGS OR SITES IN NORTHERN IRELAND

When making spatial searches against the Radon Potential Dataset for larger buildings with a footprint greater than 25 metres, a polygon defining the spatial extent of the building (and extensions) should be used as the search area instead of the *Pointer*® address coordinates. The highest value radon potential band encountered in the search area should be used for the overall result. **As the data is pre-buffered it is not necessary to buffer any search area other than to allow for any inaccuracies in defining the site outline.** The same procedure should be followed when using any other site outlines, such as for a building development site or for areas that include a number of buildings.

The Radon Potential Dataset can be used to establish whether a large building, groups of buildings or site is in a radon Affected Area and to determine what level of radon protective measures are required for new buildings or larger (>30 m²) extensions to existing large buildings (see section 2.3 for more information).

3.7 DATASET HISTORY

This radon potential hazard information for Northern Ireland is based on radon measurements, made in homes and held by Public Health England (PHE) and GSNI digital geology information. This product was derived from the GSNI 1:10 000 and 1:250 000 scale digital bedrock and superficial geology geological map data of Northern Ireland (<http://www.bgs.ac.uk/gsni/geology/status/index.html> and Figure 1). Each data layer is rectified to align with Irish National Grid origin. The measured indoor radon data is used by the BGS with the agreement of PHE. Confidentiality of measurement locations is maintained through data management practices.

Derivation of radon potential data started as part of the DETI Tellus project (Young and Earls, 2007), and was completed by the Derived Products Team of the Information Products science area of BGS.

The current RADON POTENTIAL DATASET FOR NORTHERN IRELAND (**Version 1.0**) was released in 2015.

The PHE, GSNI, and BGS are committed to improving the RADON POTENTIAL DATASET as more information becomes available.

3.8 COVERAGE

Data are provided to identify estimated radon potential in Northern Ireland. The radon potential dataset is based on 1:10 000 scale digital geology information or 1: 250 000 scale digital geology in those areas where the 1:10 000 data is not yet available (Figure 1).

3.9 DATA FORMAT

The RADON POTENTIAL DATASET consists of vector polygons and is available in a range of GIS formats, including ArcGIS (.shp), and MapInfo (.tab). More specialised formats may be available but may incur additional processing costs. Due to the differences in precision of different formats and to small changes in precision during translation between formats, the absolute position of features in different GIS systems may vary by a few millimetres on the ground.

Important note regarding GIS format conversion: It is strongly recommended that the data are used in the format supplied and not converted to other GIS formats as errors can be cumulative. These issues of precision may appear to be minor but can lead to different answers being reported by different GIS software solutions.

3.10 LIMITATIONS

- The RADON POTENTIAL DATASET FOR NORTHERN IRELAND has been developed at a combination of 1:10 000 and 1: 250 000 scales and must not be used at larger scales.
- A 35 m buffer has been applied to the 1: 10 000 scale base radon potential data and a 275 m buffer to the 1: 250 000 scale data. All spatial searches of the RADON POTENTIAL DATASET FOR NORTHERN IRELAND should be done without applying any additional buffer.
- The RADON POTENTIAL DATASET FOR NORTHERN IRELAND is concerned with radon potential related to NATURAL geological sources only. The data do NOT cover the impacts of man-made features.
- The RADON POTENTIAL DATASET FOR NORTHERN IRELAND is based on, and limited to, an interpretation of the records in the possession of PHE, GSNI and BGS at the time the base radon potential data set was created (November 2013).
- An indication of high radon potential does not necessarily mean that an individual property will have a high radon concentration and an indication of low radon potential does not mean that an individual property will have a low radon concentration. To find

out whether a property is above, at or below the Action Level individual radon measurements are required. Guidance on measuring radon can be obtained from PHE (www.ukradon.org).

- All address searches against the data should be made using *Pointer*® address coordinates (under the Terms & Conditions described by LPS).

4 Model Questions and Answers

There are two searches which can be made against the RADON POTENTIAL DATASET FOR NORTHERN IRELAND.

4.1 RADON AFFECTED AREA

QUESTION:

Is the property in a radon Affected Area as defined by Public Health England (PHE) and if so what percentage of homes are estimated to be above the Action Level?

ANSWER:

Radon Potential Class*	Is the property in a Radon Affected Area?	Additional information
1	No	The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). The property is not in a radon affected area.
2	Yes	The property is in an Intermediate probability radon area (1 to 3% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
3	Yes	The property is in an Intermediate probability radon area (3 to 5% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
4	Yes	The property is in an Intermediate probability radon area (5 to 10% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
5	Yes	The property is in a Higher probability radon area (10 to 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.
6	Yes	The property is in a Higher probability radon area (more than 30% of homes are estimated to be at or above the Action Level). The property is in a radon affected area.

*The Radon Potential Class number should not be included in answers.

GUIDANCE:

The UK radon 'Action Level' is 200 becquerels per cubic metre for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to exceed the Action Level (i.e. are in an Intermediate or Higher probability radon area) the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level. This does not necessarily mean there is a radon problem in the property; the only way to find out whether it is above or below the Action Level is to carry out a radon measurement in an existing property.

PHE and NIEA (<http://www.doeni.gov.uk/niea/pollution-home/radiation/radon-gas-in-your-home.htm>) advise that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels above the Action Level (200 Bq m⁻³) should be remediated to as low as reasonably practicable, if possible to below the Target Level of 100 Bq m⁻³. Householders with levels between the Target Level and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex-smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. PHE provides a radon testing service which can be accessed at www.ukradon.org.

If you are buying a currently occupied property in a Radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were above the Radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from PHE or www.ukradon.org

4.2 RADON PROTECTIVE MEASURES**QUESTION:**

Is the property in an area where radon protective measures are required for new buildings or larger (>30 m²) extensions to existing ones as described in the Building Research Establishment publication BR-413 (2004; see below).

ANSWERS:

Radon Potential Class*	What level of radon protective measures are required for new buildings in Northern Ireland?
1	None
2	Zone 1 Protective Measures
3	Zone 1 Protective Measures
4	Zone 1 Protective Measures
5	Zone 2 Protective Measures
6	Zone 2 Protective Measures

*The Radon Potential Class number should not be included in answers.

GUIDANCE:

When extensions larger than 30 m² are made to existing buildings in Zone 1 or Zone 2 radon areas, or new buildings are constructed in these areas, the Building Regulations require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations for Northern Ireland may require either:

1. No protective measures
2. Zone 1 protective measures
3. Zone 2 protective measures

More details of the protective measures required in Northern Ireland are available in *BR413 Radon: Guidance on protective measures for new dwellings in Northern Ireland (2004)*. Additional information and guidance is available from the Building Research Establishment website (<http://www.bre.co.uk/radon/>)

Whether or not an existing building is in fact above or below the radon Action Level can only be established by having the building tested. PHE provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622). Other validated radon testing services are available.

5 Further Information

5.1 RADON IN THE WORKPLACE

The control of exposure to radon in commercial and public buildings, including schools, is the responsibility of the Health and Safety Executive for Northern Ireland or the appropriate district council.

Information on radon measurement in the workplace and in the home is available at:
www.UKradon.org

Additional advice on radon in the workplace can be found at:

[http://www.hseni.gov.uk/guidance/topics/radiation - 3 column/radon-2.htm](http://www.hseni.gov.uk/guidance/topics/radiation_-_3_column/radon-2.htm)

Further related information can be found at www.bre.co.uk/radon.

6 Contacts

For more information on radon in homes, contact NIEA on:

Industrial Pollution and Radiochemical Inspectorate (IPRI)
Klondyke Building
Cromac Avenue
Gasworks Business Park
Belfast
BT7 2JA
Tel: 028 9056 9299
Email: IPRI@doeni.gov.uk

Radon Group

PHE Centre for Radiation, Chemical and Environmental Hazards
Chilton
Didcot
Oxon
OX11 0RQ
Tel: 01235 822622
Fax: 01235 833891
Email: radon@phe.gov.uk
Web: www.UKradon.org

Geological Survey of Northern Ireland
Colby House
Stranmillis Court
Belfast
BT9 5BF
Tel: +44 (0)28 9038 8462
Fax: +44 (0)28 9038 8461
email: gsni@detini.gov.uk
web site <http://www.bgs.ac.uk/gsni/>

Enquiries
British Geological Survey
Environmental Science Centre
Keyworth
Nottingham
NG12 5GG
Tel: 0115-936-3143
Fax: 0115-936-3276
Email: enquiries@bgs.ac.uk
Web: <http://www.bgs.ac.uk>

Building Research Establishment, advice on radon: www.bre.co.uk/radon/

7 Licensing Information

The British Geological Survey, acting as agent for the GSNI and PHE, does not sell digital mapping data to external parties. Instead, BGS grants external parties a licence to use this data, subject to certain standard terms and conditions. In general, a licence fee will be payable based on the type of data, the number of users, and the duration (years) of a licence.

All recipients of a licence (potential licensees) are required to return a signed digital data licence document to us before authorisation for release of BGS digital data is given.

In general terms, a BGS digital data licensee **will** be permitted to:

- make internal use of the dataset(s)
- allow a specified number of internal users to access/use the data (the number of users will be agreed with the licensee and specified in the licence document) for the purposes of their day-to-day internal activities
- reproduce extracts from the data up to A3 for use in external analogue (paper/hard copy) or non-query able electronic (e.g. secured .pdf) format: to meet a public task duty; fulfil a statutory requirement; and/or as part of academic or other non-commercial research

But **will not** be permitted to:

- provide a bureau service for others or incorporate the data in the generation of products or services for commercial purposes
- sell, assign, sublicense, rent, lend or otherwise transfer (any part of) the dataset(s) or the licence
- place (any part of) the dataset(s) on the Internet

The BGS is committed to ensuring that all the digital data it holds which is released to external parties under licence has been through a robust internal approval process, to ensure that geoscientific standards and corporate quality assurance standards are maintained. This approval process is intended to ensure that all data released: (i) is quality assured; (ii) meets agreed BGS data management standards; (iii) is not in breach of any 3rd party intellectual property rights, or other contractual issues (such as confidentiality issues), that would mean that release of the data is not appropriate.

When the BGS digital datasets are revised any upgrades will be automatically supplied to the licensee, at no additional cost. The joint RADON POTENTIAL DATASET FOR NORTHERN IRELAND is revised on a periodic rather than on an annual basis, licensees will therefore not automatically receive a new dataset each year unless changes have been made to the data.

These are general comments for guidance only. A licensee of BGS's digital data is provided with full details of the basis on which individual BGS datasets licensed to them are supplied.

If you have any doubts about whether your proposed use of the BGS data will be covered by a BGS digital licence, the BGS Intellectual Property Rights (IPR) section will be happy to discuss this with you and can be contacted through the following email address: iprdigital@bgs.ac.uk. BGS IPR will usually be able to provide reassurance that the licence will cover individual user requirements and/or to include additional 'special conditions' in the licence documentation, addressing specific requirements within BGS's permitted usage.

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