

Geologic Hazards

Earthquake

General

Earthquakes are very rare in Pennsylvania and have caused little damage, with no reported injuries or casualties. Earthquakes that do occur in Pennsylvania happen deep within the earth’s crust. This is because the Commonwealth does not lie on an active fault. In most cases, these earthquakes are non-measurable events. Nonetheless, earthquake standards are a valuable consideration when determining building codes. The Richter Scale below describes the magnitude of earthquakes.

The Richter Scale			
Descriptor	Richter Magnitude	Earthquake Effects	Worldwide Annual Average
Micro	Less than 2.0	Microearthquakes, not felt.	About 8,000/day
Very Minor	2.0-2.9	Generally not felt, but recorded.	About 1,000/day
Minor	3.0-3.9	Often felt, but rarely cause damage	49,000 (estimated)
Light	4.0-4.9	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 (estimated)
Moderate	5.0-5.9	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800
Strong	6.0-6.9	Can be destructive in areas up to about 100 miles across in populated areas.	120
Major	7.0-7.9	Can cause serious damage over larger areas.	18
Great	8.0 or greater	Can cause serious damage in areas several hundred miles across	1

Source: U.S. Geological Survey (USGS)

History

No significant earthquakes have been recorded in Juniata County. Parts of southeastern Pennsylvania, such as Lebanon and Berks Counties, have experienced minor earthquakes with minimal damage.

Vulnerability

Juniata County has a low vulnerability to earthquakes. No significant earthquakes have been documented in County history.

Probability

The probability of an earthquake affecting Juniata County is extremely low, with a probability of occurrence less than once every 30 years. While Juniata County does not lie on a major fault line, it is still possible that the County could experience minor, unrecorded quakes with minimal to no damage.

Maximum Threat

Because Juniata County does not rest on a major fault, no single area is at greater risk of an earthquake than another.

Secondary Effects

The secondary effects of an earthquake can range from nominal to severe, based on its location and magnitude. Even minor quakes have the potential to cause power outages, hazardous material spills, dam failures, traffic accidents, and landslides. The economic impact from widespread structural damage to property, facilities, and infrastructure can also be adversely affected. A limited disruption of critical government services may occur.

Landslides

General

Landslides are a natural movement of the earth down a slope. While there have been no recorded deaths or injuries from landslides in Pennsylvania, this does not mean they cannot occur. The worst damage caused by landslides usually affects utilities, pipelines, roadways, and buildings.

History

Landslide history is not as well documented as other hazards, primarily because landslides are not always seen. Landslides have occurred all over Pennsylvania and have caused minor to major damage. While no significant landslides have been documented in Juniata County, landslides are a considerable geologic hazard that can occur in any area under specific local conditions. The Pennsylvania Department of Transportation estimates it spends \$10 million annually on repair contracts for roadways damaged by landslides throughout the Commonwealth.

Vulnerability

The total number of landslides and their damage in Pennsylvania is unknown. Reporting of landslides varies widely from county to county. Landslides are most often seen in Allegheny, Armstrong, Beaver, Tioga, and Washington Counties. Most landslides occur as a result of heavy precipitation. Also contributing to this is the removal of vegetation, changing the slope of a hillside, and earthquakes.

Probability

There is a relatively low probability that a landslide will significantly affect Juniata County. History shows a frequency of occurrence every 30 years or less. While susceptibility and probability are low in Juniata County, minor landslides resulting in minimal to no damage may occur more frequently.

Maximum Threat

The threat of a landslide is greatest along high-volume traffic areas, especially where the road travels through a cut in the topography. Therefore, U.S. Route 22/322 and U.S. Route 11/15 face the greatest risk associated with landslides.

Secondary Effects

Similar to earthquakes, the secondary effects from a landslide can cause traffic disruption and accidents. These events can also lead to power outages and hazardous material spills.

Radon

General

Radon is a naturally occurring, colorless, odorless, inert, radioactive gas. It forms as a product of the natural decay of uranium. Radon and its radioactive products are dangerous to health. Alpha particles are a probable cause of lung cancer. Radon is a very significant hazard in Pennsylvania. Studies done in Pennsylvania since 1984 show that indoor radon levels are dependent on the radon-emanation properties of soil and rock which a home is built. The following table, completed by the Pennsylvania Department of Environmental Protection (DEP), Bureau of Radon Protections, suggests guidelines to reduce radon exposure levels to 0.02 Working Levels (WL) or less. Conversions from WL to pCi/L are usually approximate. A level of 0.02 WL is usually equal to about 4 pCi/L in a typical home.

If your home measures*	Suggested Action**	Time Frame for Plan
more than 5.0 WL	Residents should either promptly relocate or undertake temporary remedial action to lower levels as far below 5.0 WL as possible. Smoking in high areas discouraged.	Within 2-3 days
1.0 to 5.0 WL	Residents should undertake temporary remedial action to lower levels as far below 1.0 WL as possible. Smoking in high areas discouraged.	Within 1 week
0.5 to 1.0 WL	Residents should undertake temporary remedial action to lower levels as far below 0.5 WL as possible.	Within 2 weeks
0.1 to 0.5 WL	Residents should undertake temporary remedial action to lower levels as far below 0.1 WL as possible. Higher exposure levels require action to be taken in a shorter period of time.	3 weeks to 3 months
0.02 to 0.1 WL	Residents should undertake temporary and/or permanent remedial action to lower levels below 0.02 WL. Higher exposure levels require action to be taken in a shorter period of time.	4 to 15 months
<p>* Assumes continuous 24-hour exposure in living area. ** Home testing should be conducted at the end of the indicated time frame to determine if remedial action has reduced the radon daughter exposure levels below the indicated value. If remedial action has not been successful, residents should be aware of the risks associated with continuous exposure at the indicated levels.</p>		

Source: Pennsylvania Department of Environmental Protection

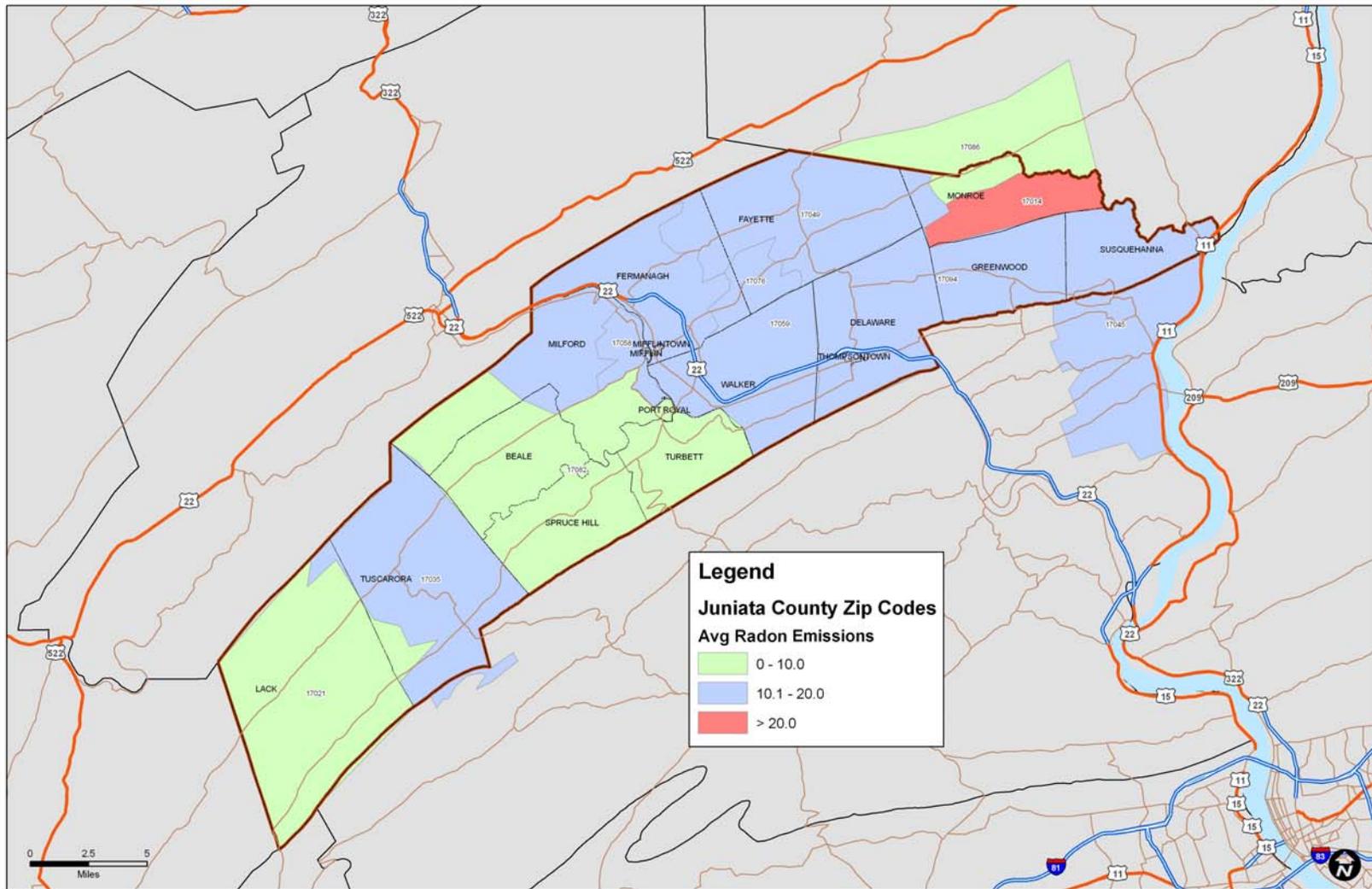
History

In 1984, the Pennsylvania Radon Bureau responded to the highest level of radon daughter levels (concentration of decay products of radon in the uranium chain) ever reported in the Commonwealth with a massive radon monitoring, educational, and remediation effort. As of November 1986, over 18,000 homes had been screened for radon, and approximately 59 percent were found to have radon daughter levels in excess of 0.02 Working Levels. Radon daughter levels ranged up to 13 Working Levels (WL) or 2600 pCi/L (pico Curies per liter) of radon gas. The EPA recommends that homeowners take action to reduce their home indoor radon levels if their home's test is 4pCi/L (pico Curies per liter) or higher. While individual instances of radon are not well documented, no individual location can be assumed safe unless proven so by testing.

Vulnerability

The map below illustrates the average radon levels for the zip codes of Juniata County, measured by the Pennsylvania Department of Environmental Protection.

Juniata County Radon Zones



Source: PA Department of Environmental Protection

Probability

There is a high probability for radon emission in Juniata County. No area should be assumed safe until tests have proven so.

Maximum Threat

All Juniata County municipalities, except for the Richfield zip code area of 17086, face a high potential for radon gas emission, with average results greater than 4.0 pCi/L. Only areas that have been tested and found safe can be considered not susceptible to the effects of radon gas emissions.

Secondary Effects

Often, radon goes undetected and unnoticed. Because of this, the secondary effects are more difficult to identify and track. However, radon is known to have adverse short- and long-term effects on the health and safety of persons affected, and is widely believed to be a probable cause of lung cancer.

Subsidence and Sinkholes

Subsidence is caused by the removal of ground water or other resources from the ground. Sinkholes are a natural hazard caused by erosion underground. The difference between subsidence and sinkholes is that subsidence is a manmade hazard, while sinkholes are naturally occurring. The United State Geological Survey states that sinkholes are a characteristic of karst topography that results from dissolution and collapse of carbonate rock, such as limestone and dolomite. It is characterized by closed depressions or sinkholes, caves, and underground drainage.

History

The United States Geological Survey states that sinkholes have been most dangerous and frequent in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. While the U.S. Geological Survey has no recorded sinkholes in Juniata County, this does not mean one does not exist. Juniata County's volume of limestone rock make it susceptible to sinkholes.

Vulnerability

Subsidence and sinkholes strongly correlate to the distribution of carbonate rock. However, not all areas underlain by carbonate bedrock, such as limestone, are at risk. According to the PA Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, no sinkholes exist in Juniata County. Yet, because of the limestone rock formations located in Juniata County, there is still the possibility that subsidence or a sinkhole could occur.

Probability

The probability for subsidence or sinkholes to occur in Juniata County is relatively low. It is estimated that these events occur every 30 years or less with low impact. There is even less probability for a severe event.

Maximum Threat

Juniata County's geologic makeup makes it susceptible to subsidence and sinkholes. The maximum threat would occur in areas that are underlain with carbonate rock, such as limestone.

Secondary Effects

Sinkholes occur without warning and can damage critical infrastructure, such as road networks, and can cause traffic disruption, accidents, and pipeline breaks. Accidents and pipeline breaks can introduce hazardous materials into the affected areas.