3.8 EARTHQUAKE

Characteristics and Classification

Earthquakes typically occur near tectonic plate boundaries but can occur in the middle of plates. South Carolina is located in the interior of the North American plate and does not have an active plate boundary nearby. However, the energy released from the sudden displacement of rock in the Earth's crust can occur in weak spots along known faults and fault systems or inferred faults.

Earthquakes vary in magnitude and intensity. Two different scales are used to describe the physical force of the earthquake, or the amount of energy released by measuring the amplitude of the shock waves.

- The Moment Magnitude scale is an instrument-based measurement of the physical force of the earthquake measured by the amplitude of the shock waves.
- The Modified Mercalli Intensity scale measures the impacts that do not have a mathematical basis; instead, it is a ranking based on observed effects. According to U.S. Geological Survey (USGS) (2020a), the lower numbers of the intensity scale generally deal with the way the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage as shown in Table 23.

There are multiple effects associated with the release of energy waves from earthquakes, first *shaking the ground side to side and then up and down.* These waves can cause destruction on the surface from the shaking. After these primary effects, secondary effects are possible, and can be just as destructive in certain cases. These secondary effects include:

- *Aftershocks:* Aftershocks are tremors that follow the original event and are often smaller. They can happen for weeks to years after the event. The larger the original event, the stronger the aftershocks can be and the longer they can persist.
- *Soil Liquefaction:* Liquefaction occurs when the movement of earth forces water into the soil around structures, making the very ground behave more like a liquid than a solid. This can cause the foundation of structures to sink or shift. The occurrence of liquefaction depends on several factors like soil type, soil saturation, and shaking characteristics.
- *Fires:* The movement of earth can cause gas line ruptures and can snap powerlines creating fire-prone environments. At the same time, waterlines might break making it more difficult to put out any fires occur (SCEMD, 2020b).
- *Landslides:* One of the triggers for landslide occurrence is earthquake. Landslides are mass movement of soil and might include rock falls that can cause significant damage.

Table 23: Earthquake Intensity Description

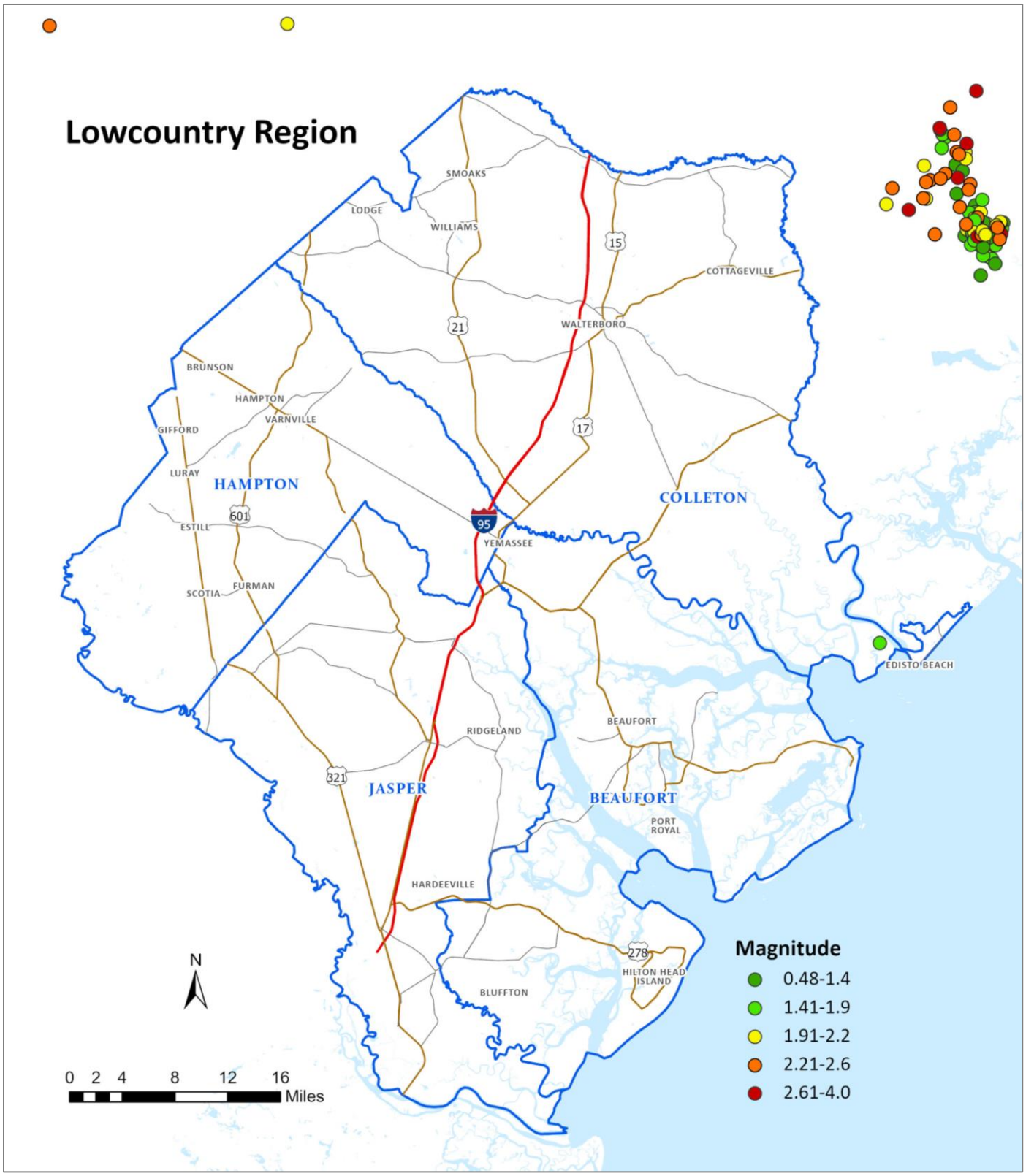
Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Note: Abbreviated description of the levels of modified Mercalli intensity.
Source: US Geological Survey (USGS)

Location and Extent

Earthquakes are low probability events in South Carolina and rarely felt. However, the August 31, 1886, Charleston Earthquake is notable because of its intensity (intensity X on the Modified Mercalli Scale). According to the State Hazard Mitigation Plan, earthquakes such as the 1886 Charleston event have a frequency of occurrence on the order of 400-500 years. Other evidence suggests that places near Bluffton may have occurrences in the range of every 2000 years (SCEMD 2018). Given evidence of prior large events in the Lowcountry, it appears that any given year has about a 1/400 chance of a large earthquake event. Figure 23 illustrates the earthquake events in the Lowcountry region and nearby area.

Figure 23: Recent Earthquakes near the Lowcountry Region 2000-2019



Source: Hazards and Vulnerability Research Institute (HVRI)

Beaufort County

There was no record of earthquake events in the recent period (2000-2019).

City of Beaufort and Towns of Bluffton, Hilton head Island, and Port Royal

- There was no record of earthquake events in the recent period (2000-2019).

Colleton County

There was no record of earthquake events in the recent period (2000-2019).

Town of Edisto Beach

- Between 2000-2019, an earthquake event occurred in the Town of Edisto Beach with 1.88 magnitude. No damage was reported.

City of Walterboro and Towns of Cottageville, Lodge, Smoaks, and Williams

- There was no record of earthquake events in the recent period (2000-2019).

Hampton County

There was no record of earthquake events in the recent period (2000-2019).

Towns of Brunson, Estill, Furman, Gifford, Hampton, Luray, Scotia, Varnville, and Yemassee

- There was no record of earthquake events in the recent period (2000-2019).

Jasper County

There was no record of earthquake events in the recent period (2000-2019).

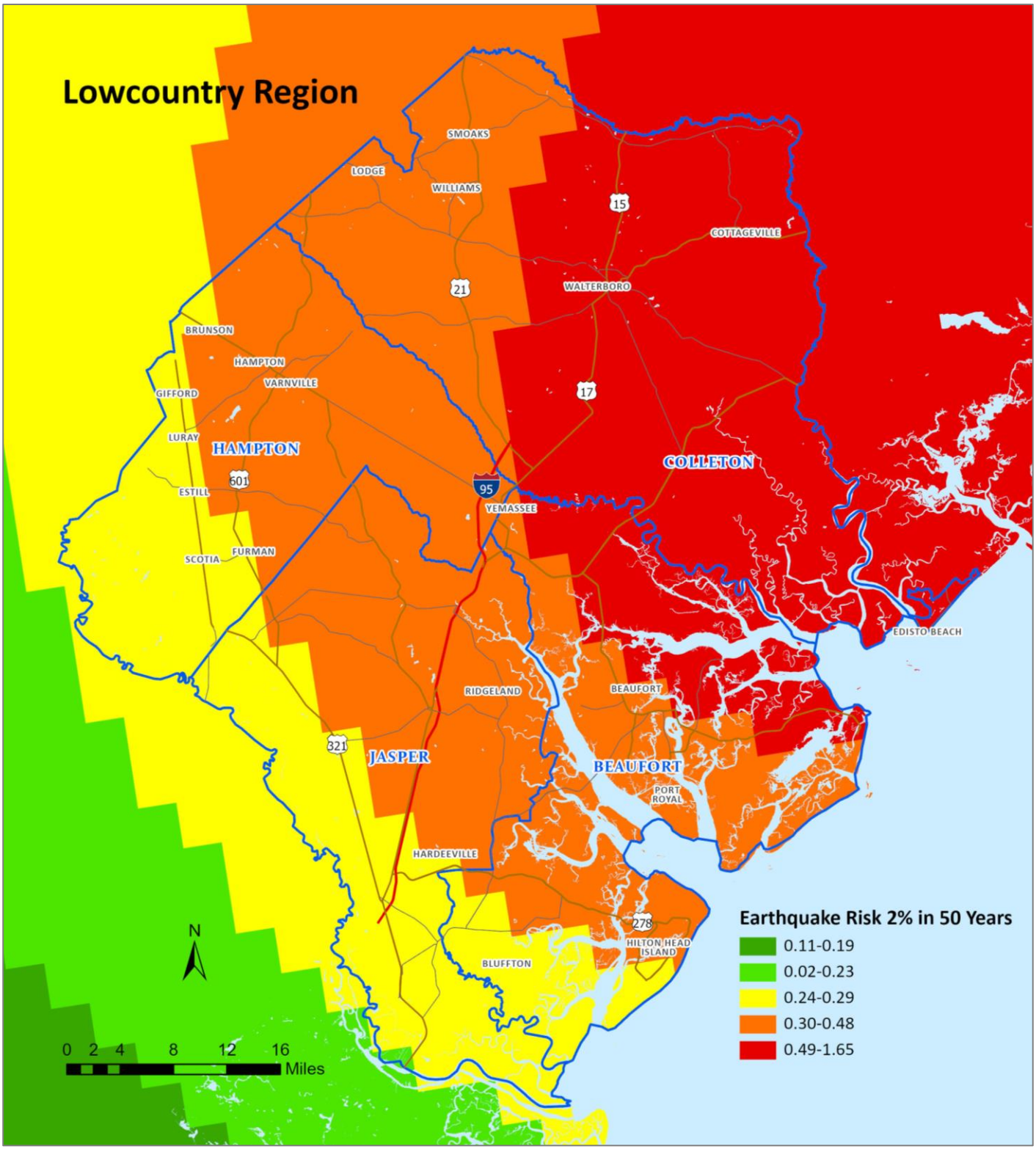
City of Hardeeville and Town of Ridgeland

- There was no record of earthquake events in the recent period (2000-2019).

Future Probability

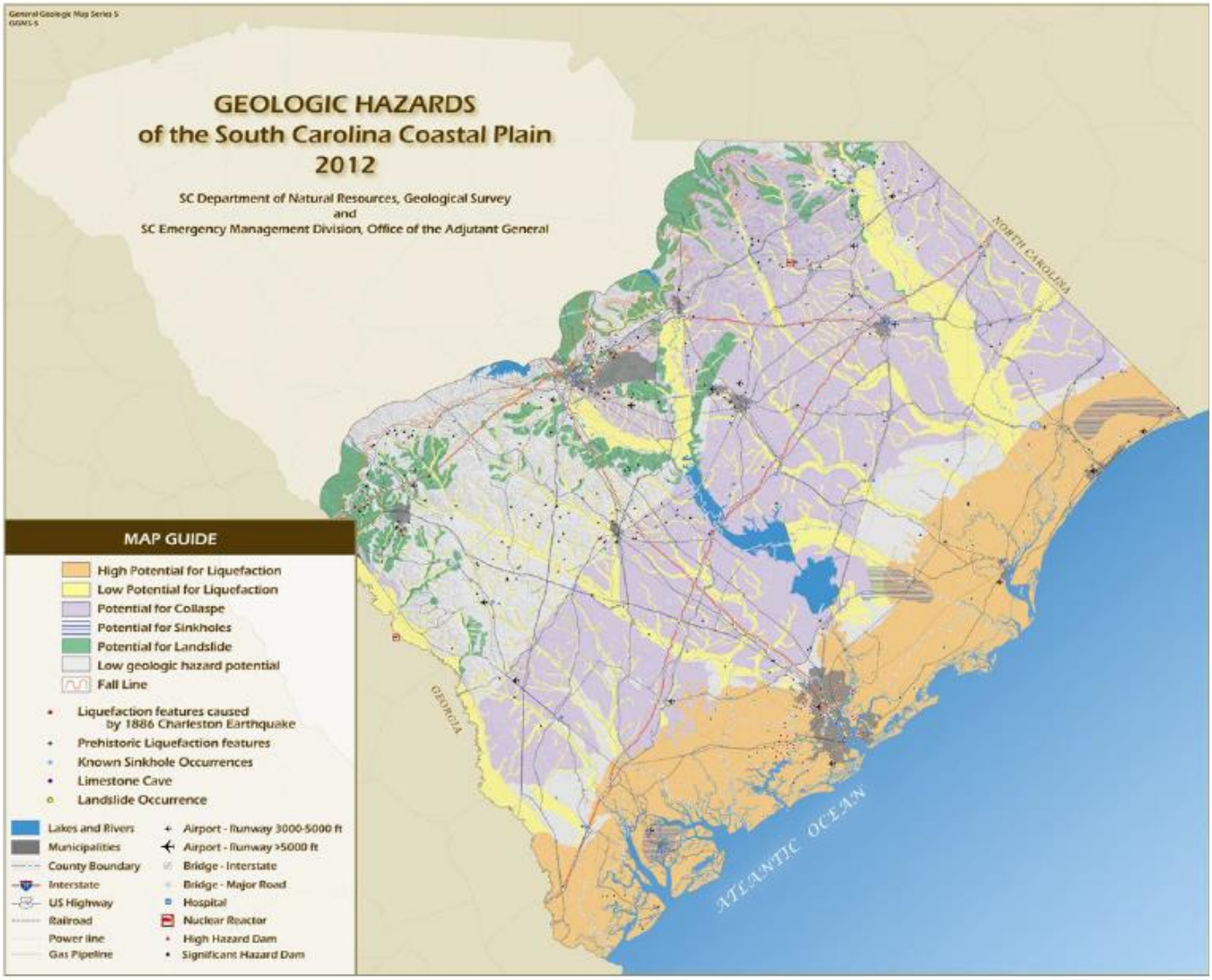
For the Lowcountry region, there is a potential for liquefaction and tsunami activity from localized earthquakes. The U.S. Geological Survey provides probability maps of potential earthquake risk. Potential earthquake risk using peak ground acceleration (PGA) shows the amount of ground motion expected with a 2% probability of being exceeded in 50 years. The highest hazard areas are color coded red, with the lowest hazard areas in blue. The Lowcountry counties range from red to yellow showing a moderate to high hazard potential (Figure 24). In addition, according to SCEMD (n.d.), most of the Lowcountry area east of Interstate 95 has a high potential for liquefaction (Figure 25).

Figure 24: Earthquake Risk – Peak Ground Acceleration of 2% in 50 Years



Source: Hazards and Vulnerability Research Institute (HVRI)

Figure 25: Geologic Hazards of South Carolina – Liquefaction Potential



Source: SC Emergency Management Division (SCEMD)