Geophysical Investigation of the Shallow Subsurface in St. Charles and St. Louis Counties, Missouri

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A seismic refraction survey using a 24 channel Geometrics Geode Ultra- Light Exploration Seismograph was conducted to determine the velocities of the subsurface layers, nature of the lithology and depth to bedrock in Greater St. Louis, Missouri, area. A 10 lb sledge hammer source, 5 m geophone interval, 120 m spread length and a 10 m offset were generally adopted throughout the survey. Forward and reverse surveys were taken in perpendicular directions to determine the depth and orientation of the bedrock. Over 10 lines were surveyed to date with additional surveys planned for next year. This study is in support of the St. Louis Area Earthquake Hazards Mapping Project (SLAEHMP) led by United States Geological Survey (USGS) and the Missouri Department of Natural Resources, Division of Geology and Land Survey (DNR, DGLS). Travel-time graphs were plotted from the picks of the first arrivals of the primary P-wave and were used to determine the apparent and true velocities of the layers. Three layers were identified with an average velocity of 400 m/s, 1654 m/s, and 3609 m/s, respectively. They correspond to a weathered top soil layer, an alluvial/glacial till layer, and the limestone bedrock, respectively. The average thicknesses of the overlying sediments are between 4 m and 53 m. The bedrock has an average dip of less than 8^{o}. Results generated from the refraction survey correlate well with independently determined depths and velocities using Cone Penetration Test conducted by the Missouri Department of Transportation and other agencies for the same study area.