**THE ROLE OF HVSR IN REMAPPING OHIO’S SUBSURFACE AND REDISCOVERING THE TEAYS RIVER VALLEY**

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**Abstract**

Elevation of the buried bedrock surface (bedrock topography, BT) and thickness of the overlying unconsolidated materials (drift thickness, DT) in once-glaciated areas such as Ohio are fundamental geologic datasets. This information is important for subsurface modeling, resource management, and engineering concerns. Previously produced BT and DT maps and models compiled by the Ohio Geological Survey (OGS) in the early 2000s are great preliminary data sources but are often inadequate for many detailed applications, as they were created with occasionally sparse control points of variable quality. The Horizontal-to-Vertical Spectral Ratio (HVSR) technique has become an important tool to refine mapping in Ohio by facilitating relatively rapid and efficient unconsolidated material thickness estimates for areas of need. Areas that contain extensive buried valleys, rapid development, seismic risk, and/or lack subsurface data are typical project areas of interest. Utilizing geophysical surveys and additional data from well logs led to the development of a long-term mapping program dedicated to updating the BT and DT datasets of Ohio. Since 2017, the HVSR technique supported the near-surface mapping of over 20 published and unpublished OGS products. The HVSR-driven approach to remapping BT and DT has led to the collection, processing, and interpretation of about 6,500 HVSR data records from the 2017–2024 field seasons. Since its inception, work by the OGS HVSR mapping program has also led to unique approaches to survey design, data management, calibration equation development strategies, processing and interpretation, and mapping procedures. The application of HVSR data to BT datasets is showcased in an ongoing case study focused on remapping the Teays River Valley.

The Teays River Valley is a substantial preglacial, bedrock-incised channel that embodies the most dramatic relief in the buried bedrock topographic surface in Ohio. However, its exact location, buried morphology, and valley fill composition have eluded researchers and mappers for over a century because of a lack of data for the buried valley. The HVSR method is effective to search for this long and narrow subsurface feature in Ohio because instruments can be easily deployed across large areas in various survey designs, such as tightly spaced points along transects or as coarser spatial grid points. Although the subsurface rarely satisfies the idealized conceptual model required for the HVSR method to be effective, data collected in recent mapping areas in Ohio have been of sufficient quality to confidently identify deep and shallow bedrock surfaces. Passive seismic surveys, coupled with other geophysical data, test borings, and well logs, have resulted in a partially complete elevation model of the buried bedrock surface of the main Teays Valley channel. As of 2024, approximately 200 km2 of the inferred 300 km2-area that the main Teays Valley spans in Ohio’s glaciated region has been remapped by the OGS. Future BT and DT mapping areas include counties and sites that comprise the remaining ~100 km2 of the buried Teays Valley. Results from these BT and DT mapping projects will assist geologists, geophysicists, and similar workers in applied near-surface projects and researchers studying preglacial and glacial history for the region.