


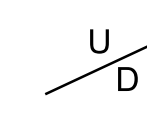
INTRODUCTION

This map shows structural features in the Indiana Heartland (Lafayette, Indianapolis, western half of the Muncie, and western half of the New Castle 1:100,000-scale quadrangles) that can be resolved using computer gridding and contouring software to analyze available data documenting the top of the Trenton Limestone (Ordovician). The top of the Trenton is documented in approximately 5,900 records in the Indiana Geological Survey's Petroleum Database and over three-quarters of these records are concentrated in and near the area covered by this map. Most of the Trenton data comes from petroleum exploration carried out in the early twentieth century when the Trenton Field was developed. These early records lack documentation of stratigraphic boundaries that lie above and below the Trenton but account for the bulk of public domain data available for structural analysis in the map area. As a result, structural analysis and geologic mapping of units that lie above the Trenton in the map area is highly dependent on large- and small-scale structures revealed by the Trenton data. Generalized regional structure on the top of the Trenton is well documented by Dawson (1971), Hasenmueller and Bassett (1980), and Rupp (1991, p. 30-31). Keith (1985, p. 28-31) conducted a detailed study of the top of the Trenton in a small, densely drilled area of Grant and Wells Counties and concluded that the top of the Trenton is an irregular discontinuity surface with as much as 60 ft of relief. This relief on the Trenton top makes it difficult to identify structural details in the map area despite the abundance of Trenton data. This map employs geostatistical techniques (block kriging; 2,400-meter block size) based on a nested nugget (576 ft) and power variogram (scale = 2,000 meters; length = 16,000 meters; and power = 1.5) to filter out relief of the discontinuity surface at the top of the Trenton. The resultant grid was extended to the contoured 60-meter grid with the minimum curvature algorithm. Polygons representing the fault traces shown on the map were used as breaklines in both gridding procedures. All computations were carried out on grids that extend more than 5 miles beyond the map area on all sides. The resultant structure contours represent a trend surface which approximates large- and small-scale structural features documented by the Trenton data. The structure surface depicted by this map may lie above or below Trenton data by as much as several feet as a result of the geostatistical trending process applied to the data (see figures 1 and 2).

The traces of the Fortville Fault, shown in the eastern half of the map, and of the Sharpville Fault are modified from previous studies. The Fortville Fault, first mapped by Dawson (1971) and later modified by Gray, Ault, and Keller (1987), and the Sharpville Fault, mapped and described by Hasenmueller (2000a, 2000b), are mapped as discontinuous fault trends. Gaps in the fault trends represent areas where convincing evidence of faulting is absent. Each fault trace is a cubic-splined polyline that passes smoothly between data on the up- and down-thrown sides of the fault.

This map is the result of a cooperative mapping agreement between the U.S. Geological Survey (USGS) and the Indiana Geological Survey. The mapping was supported with USGS National Cooperative Geologic Mapping Program STATEMAP funds (Cooperative Agreement Number 01HQAG0048) and matching funds from the Indiana Geological Survey.

EXPLANATION

-  Structure contour - Approximately located. Drawn on the approximate top of the Trenton Limestone using computer gridding and contouring software to approximate the structural component of the irregular discontinuity surface at the top of the Trenton Limestone. Contour interval is 50 feet (about 15 meters).
-  Fault - Approximately located. Polygons representing fault traces were treated as breaklines when computing structure on the approximate top of the Trenton Limestone.

EXPLANATION

- Datum Point
- Magnitude of Residuals (ft)
 - > 25
 - 25 - 16
 - 15 - 06
 - 05 - -05
 - 06 - -15
 - 16 - -25
 - < -25

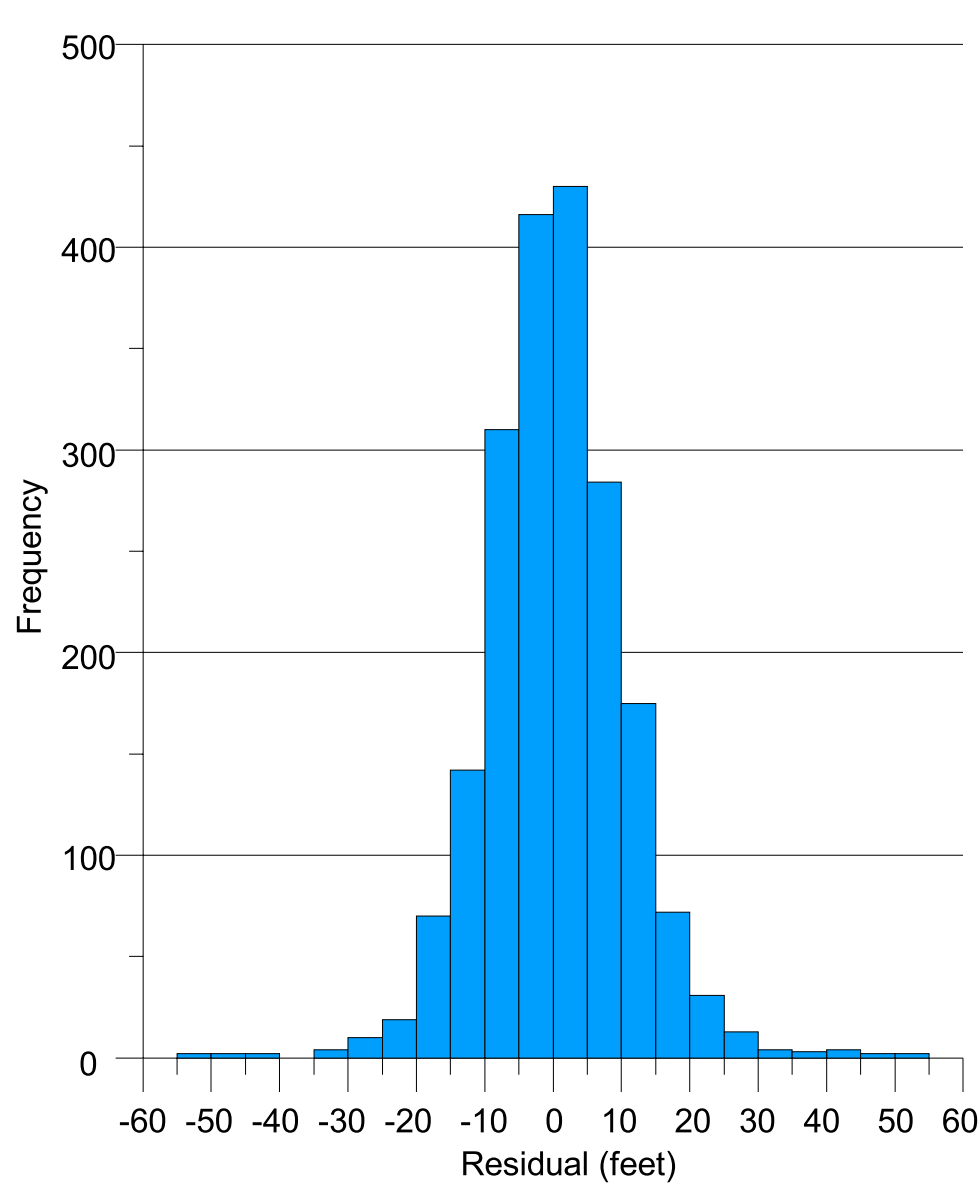


Figure 1. Histogram showing the magnitude and frequency of Trenton top residuals in the map area. Trenton residuals range from -50.6 to 51.7 feet and exhibit a standard deviation of 10.2 feet.

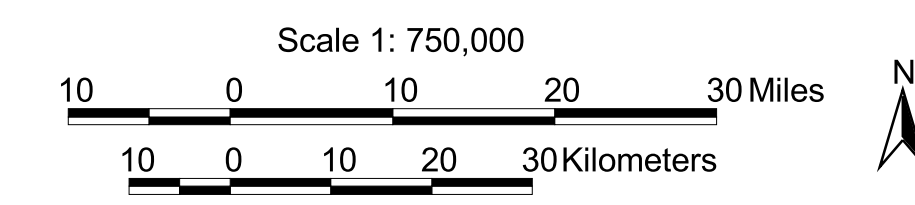
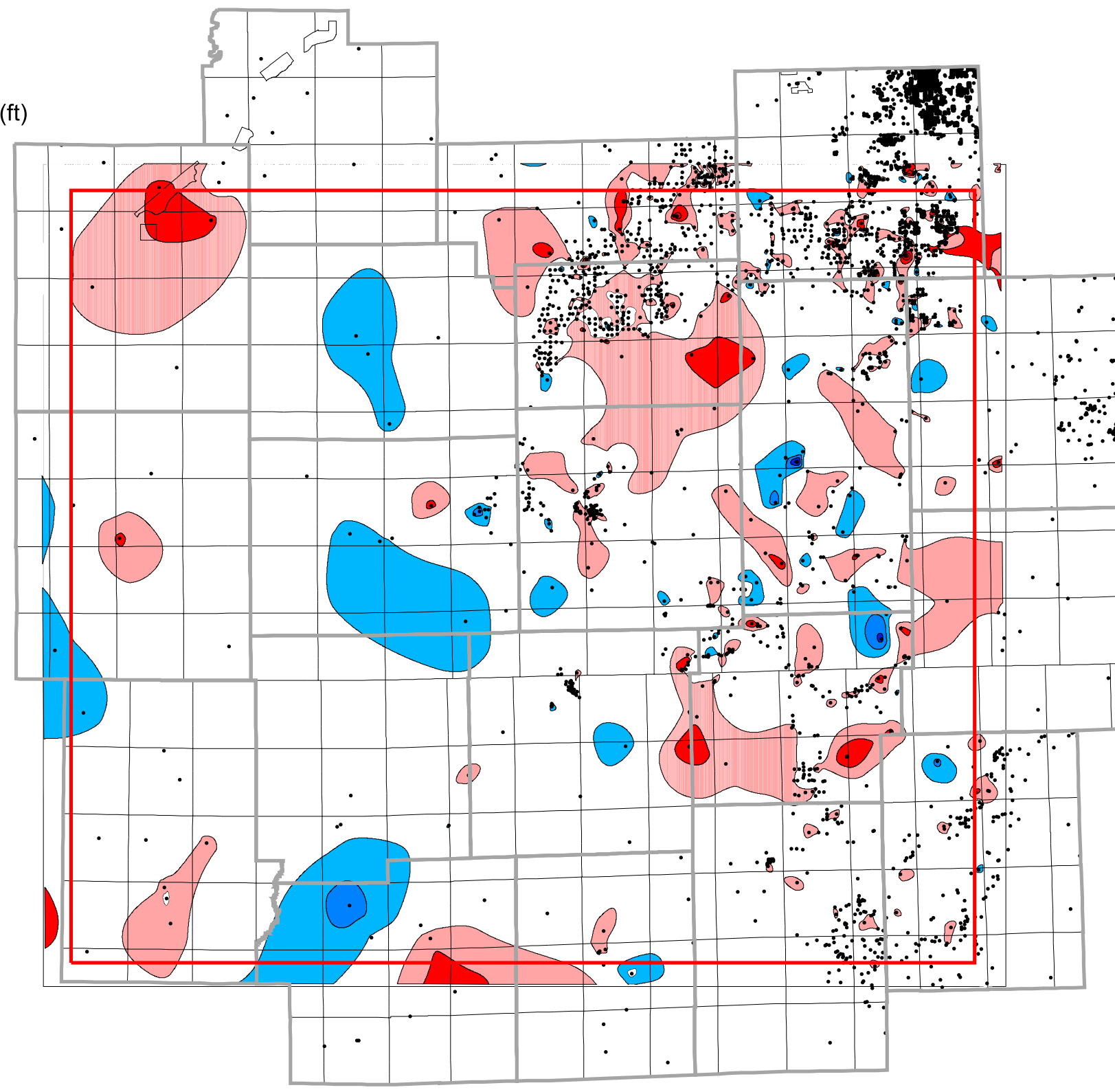
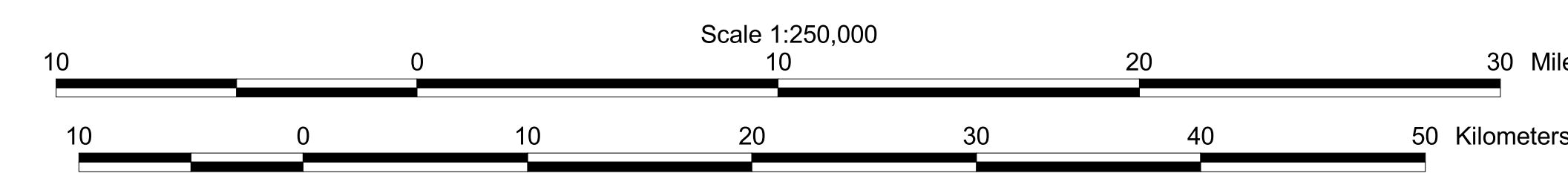
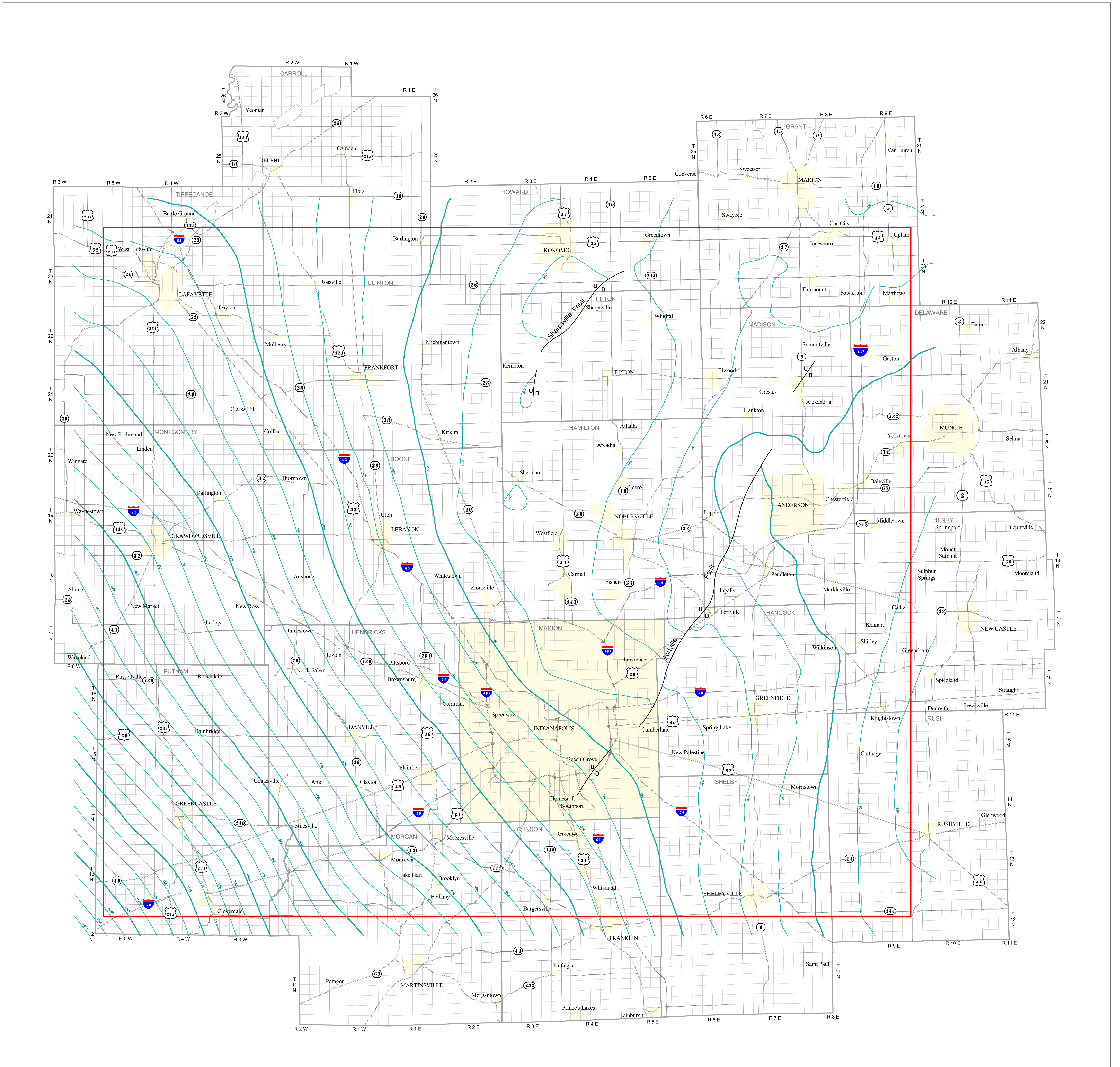
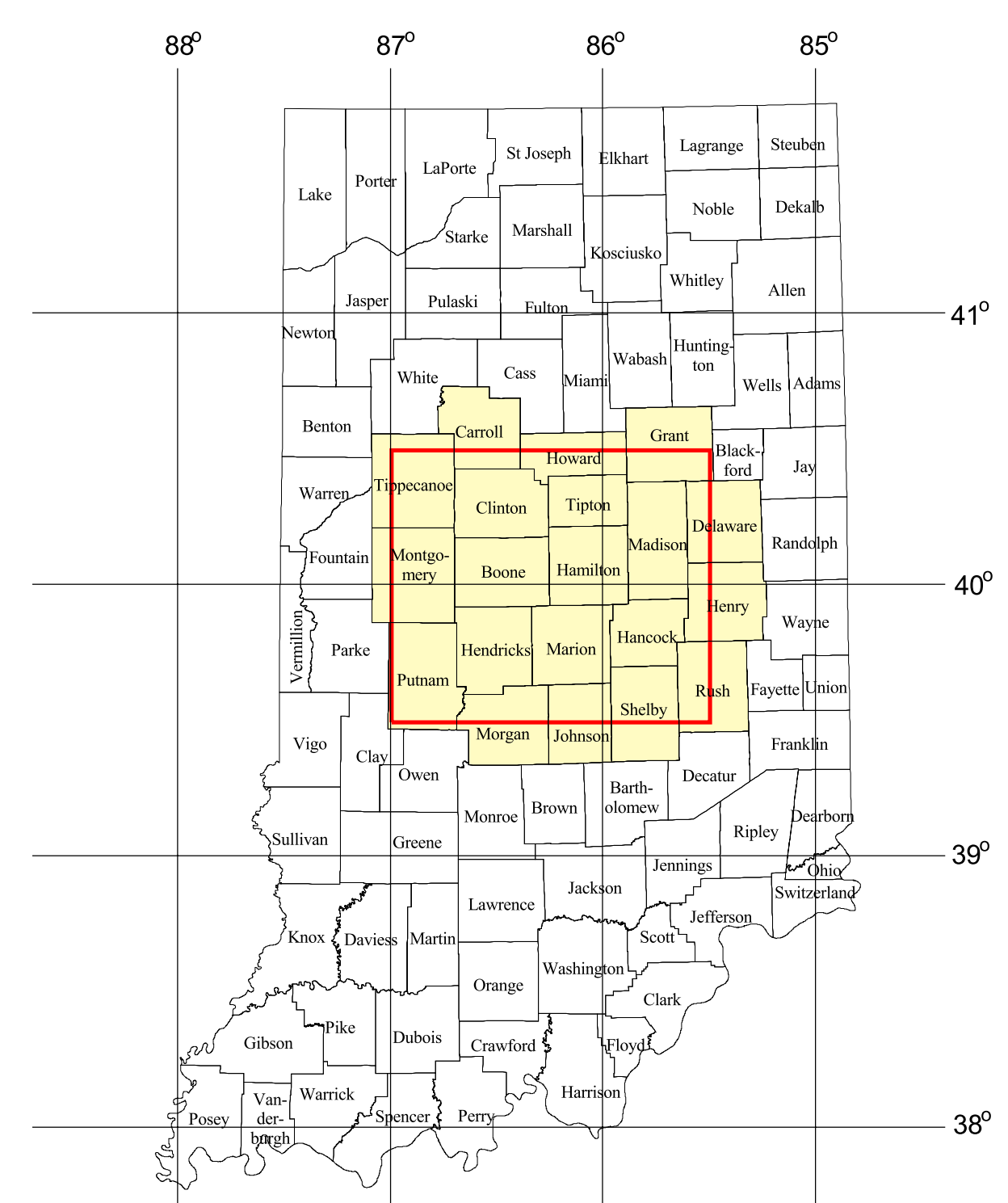


Figure 2. Map showing patterns of Trenton data residuals. Residuals were computed by subtracting the interpolated value of the structure surface representing the approximate top of the Trenton Limestone from Trenton top data points. Color-filled natural neighbor contours were added to emphasize patterns of residual magnitude.




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Index map of Indiana counties showing the location of the Heartland area (red box).

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