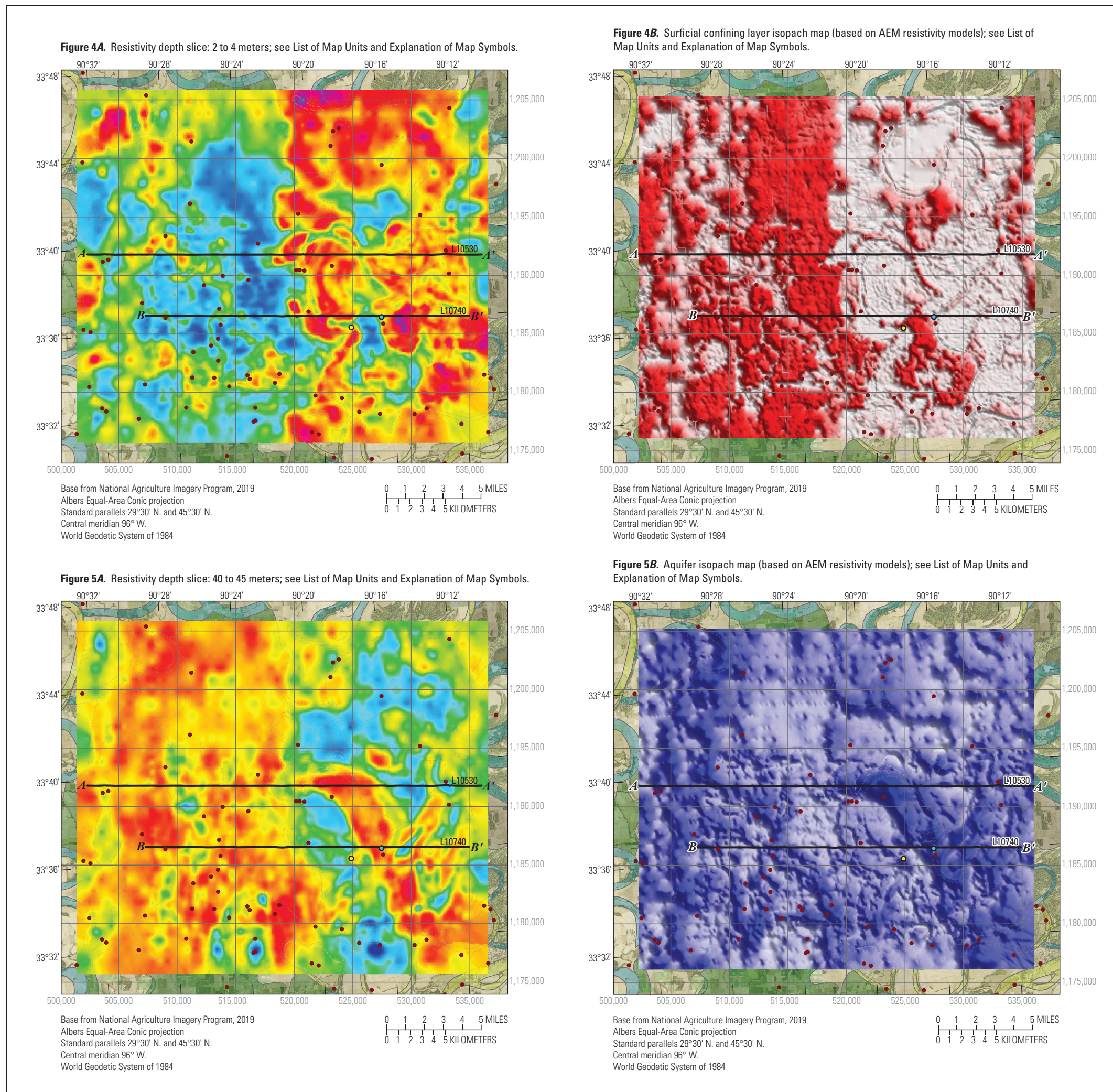




LIST OF MAP UNITS

SURFICIAL GEOLOGY

[Figures 4 and 5; surficial geology from Wacaster and others (2018); colors on the maps may locally appear lighter due to transparency effects over the aerial photography]

Qb	Backswamp deposits (Holocene)—Floodbasin
Qchm	Mississippi River abandoned channels (Holocene)—Neck and chute cutoffs
Qcom	Mississippi River abandoned courses (Holocene)
Qp	Point bar deposits (Holocene)—Meander scroll
Qvl	Late Wisconsin stage valley train (Pleistocene)

EXPLANATION OF MAP SYMBOLS

Airborne survey flight line cross section and identifier—Figures 4, 5, and hydrostratigraphy sections

- **Borehole**—Figures 4 and 5
- **Proposed Tallahatchie River extraction site**—Figures 4 and 5
- **Proposed MRVA aquifer injection site**—Figures 4 and 5

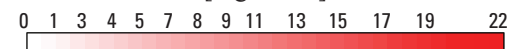
RESISTIVITY IN OHM-METERS

[Figures 4A, 5A, and 6, and cross sections]



THICKNESS IN METERS

[Figure 4B]



THICKNESS IN METERS

[Figure 5B]

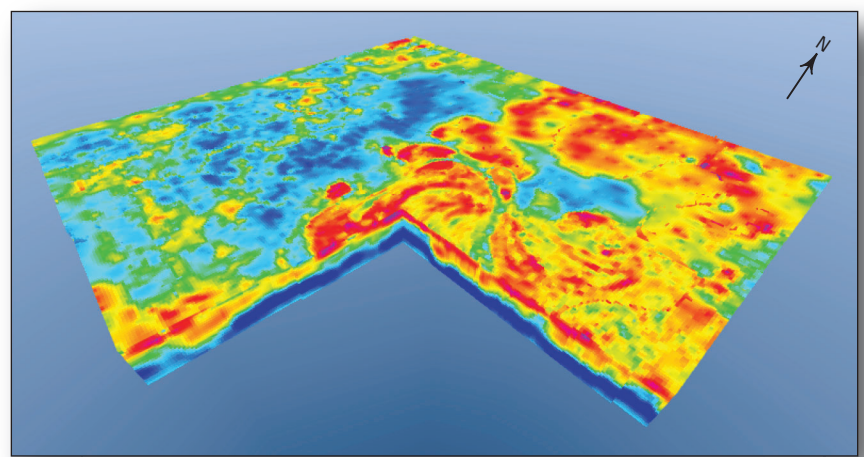
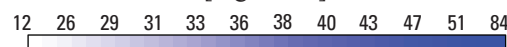


Figure 6. Oblique view of the three-dimensional airborne electromagnetic resistivity model block; extreme vertical exaggeration.

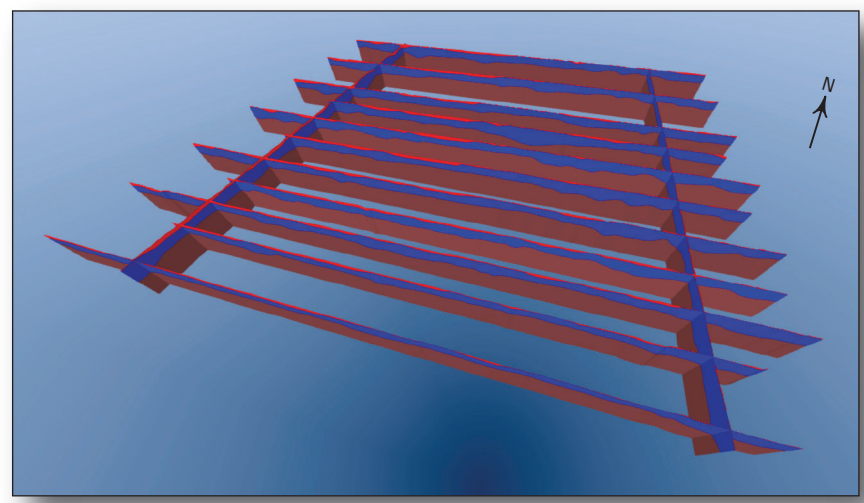
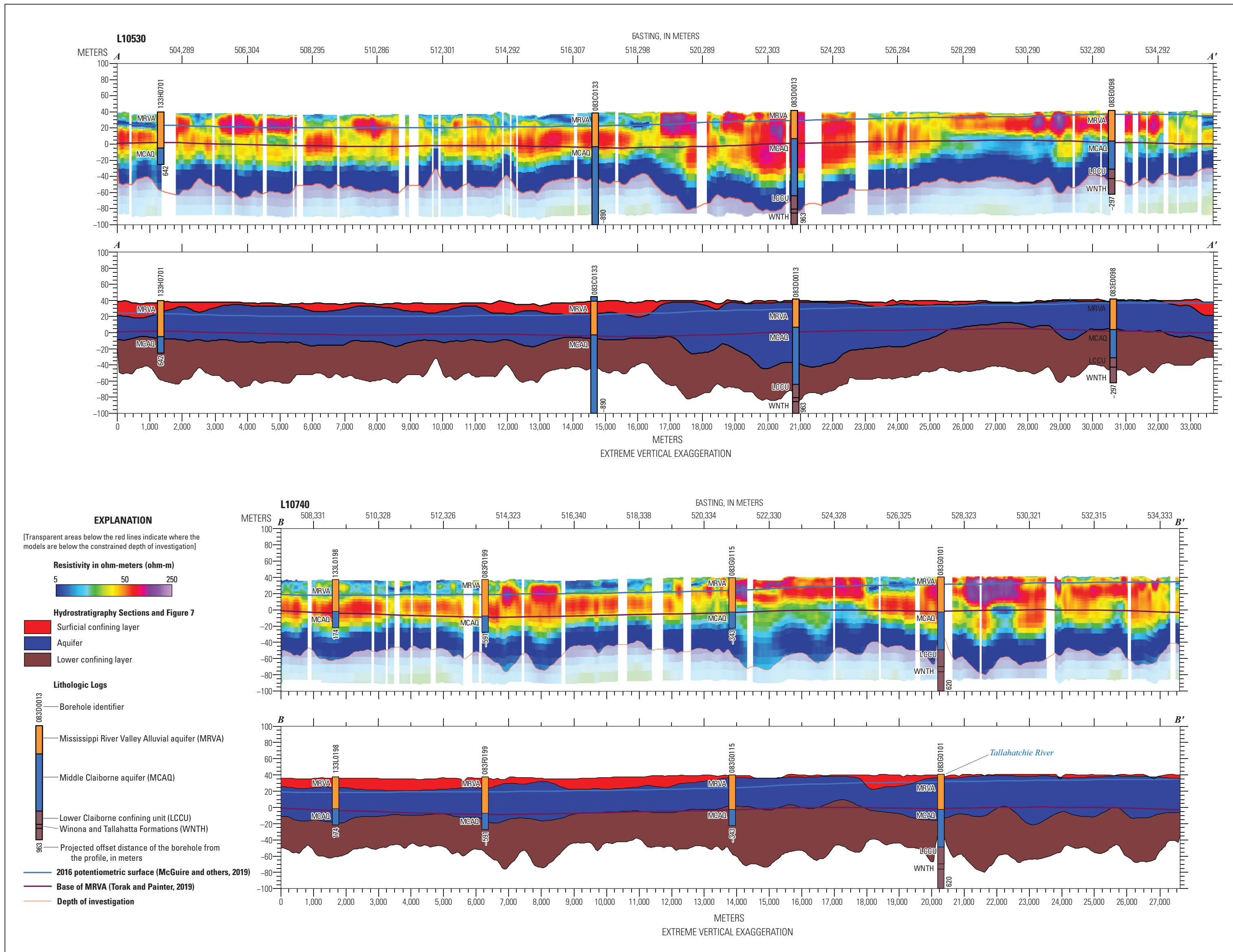


Figure 7. Oblique view of the fence diagram of interpreted hydrostratigraphic units (colors correspond to the explanation for the sections); extreme vertical exaggeration.

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ELECTROMAGNETICS

Depth slices are a useful representation of the resistivity data by demonstrating the lateral variation in resistivity across the entire survey area at particular depths. The shallow depth slice (2–4 m, fig. 4A) demonstrates the correlation between the low resistivity areas and the thicker interpreted surficial confining layer (fig. 4B) as well as the mapped surficial geology (Saucier, 1994; Wacaster and others, 2018). The high resistivity areas in the deeper slice (40–45 m, fig. 5A) correlate with the thicker areas of the interpreted aquifer unit (fig. 5B). Two sample resistivity section profiles (L10530 and L10740) are shown to illustrate typical vertical resistivity structure and the correlation with hydrogeologic units from available logs (Hoffmann, 2017) within 1 km of the AEM profiles. Profile L10530 exhibits a thicker resistive aquifer layer centered around 522,300 m Easting whose lateral extent at depth can be identified in the 40–45 m resistivity depth slice map. The proposed U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) surface water extraction area is along the Tallahatchie River near profile L10740.

The existing understanding of the base of the Mississippi River Valley Alluvial aquifer (MRVA) (Hart and others, 2008; Torak and Painter, 2019) is based on lithologic and borehole geophysical logs in the survey area and are shown on the section profiles (dark red lines). The regional 2016 potentiometric surface (McGuire and others, 2019) is also shown on the profiles (blue lines). Inverted resistivity models derived from the AEM data indicate that resistive (approximately >50 ohm-m) areas are well correlated to log picks associated with the top/bottom of the MRVA. A 12–84 m thick aquifer layer has been interpreted from the AEM data based on resistivity thresholds, which will help further refine the hydrostratigraphy throughout the survey area.

The AEM data also indicate a discontinuous, electrically conductive surficial confining layer that is up to 22 m thick, more persistent in the western half of the survey, where backswamp (floodbasin; Qb) deposits are indicated in the surficial geology map. This conductive layer is not indicated in lithologic logs but may be an important barrier to recharge and will be included as input into future groundwater models. The eastern limit of the conductor generally corresponds with the transition to point bar (meander scroll; Qp) deposits.

Underlying the interpreted aquifer unit, the conductor at depth is referred to as the lower confining unit and is composed of the Middle Claiborne aquifer (MCAQ) and Lower Claiborne confining unit (LCCU), which also includes the Winona and Tallahatche Formations (WNTH). The depth of investigation (red lines) in the section profiles indicates the maximum depth to which the AEM inverted models are sensitive to the input data and to which subsurface geology can be interpreted. The ability to visualize and analyze the inverted resistivity model data (fig. 6) and interpreted hydrostratigraphy (fig. 7) in three-dimensional space allows for a greater understanding of the study area.

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High-Resolution Airborne Geophysical Survey of the Shellmound, Mississippi Area

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