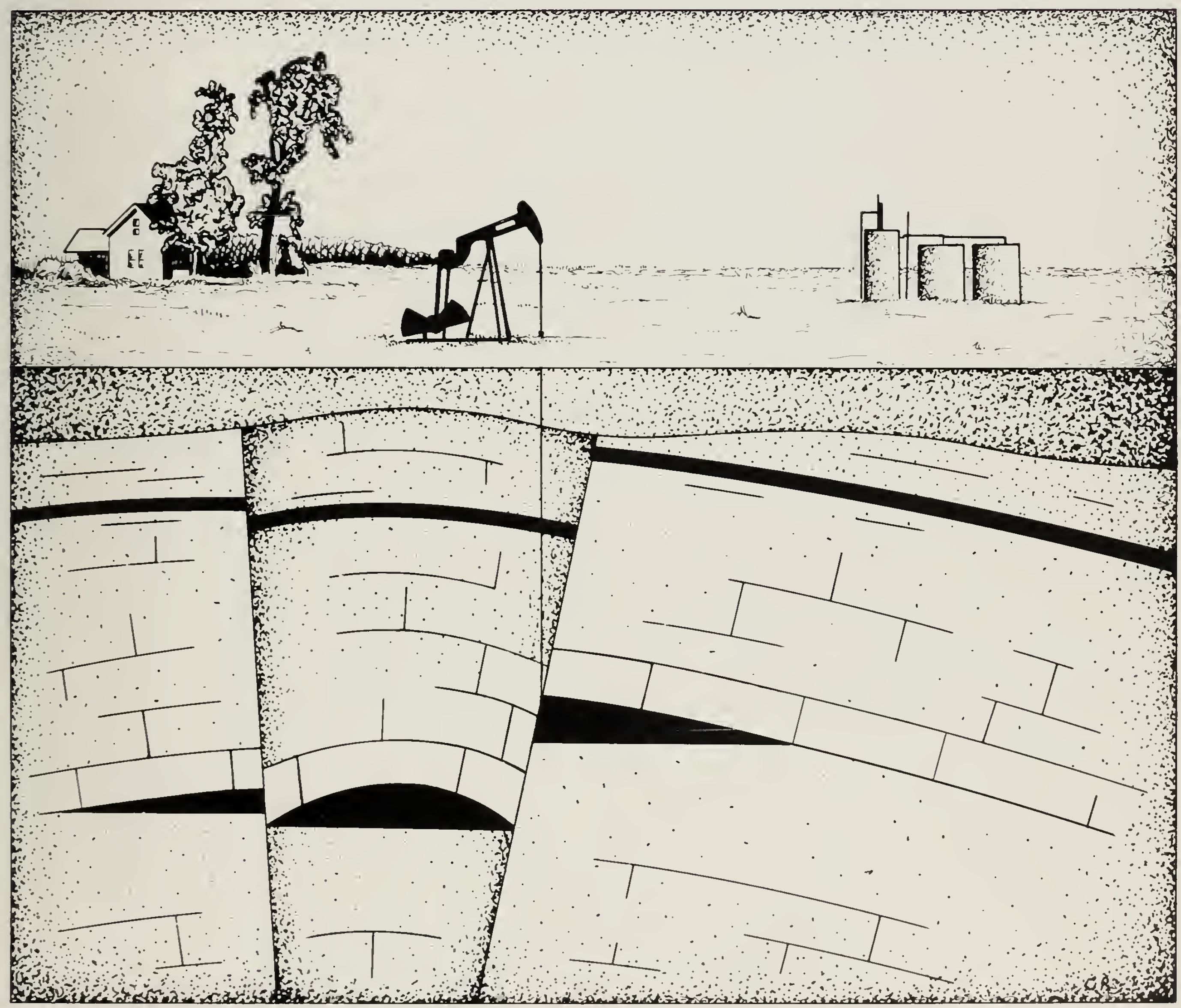
THE WABASH VALLEY FAULT SYSTEM IN SOUTHEASTERN ILLINOIS

Hubert M. Bristol and Janis D. Treworgy



Illinois Institute of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY DIVISION, URBANA, ILLINOIS
Jack A. Simon, Chief

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COVER ILLUSTRATION: Diagrammatic cross section illustrating faulting and folding of the Wabash Valley Fault System and their relation to mineral distribution. Such an anticline within a graben occurs between the Herald-Phillipstown Fault and the Maunie Fault.

Bristol, Hubert M

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THE WABASH VALLEY FAULT SYSTEM IN SOUTHEASTERN ILLINOIS

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ABSTRACT

The Illinois portion of the Wabash Valley Fault System extends north-northeastward for about 60 miles (97 km) from just north of the Shawneetown Fault Zone, through Gallatin and White Counties, and terminates in Edwards and Wabash Counties. Spanning an area in Illinois about 15 miles (24 km) wide, the fault system is characterized by generally parallel, high-angle, normal faults that bound horsts and grabens. Maximum displacements along the individual faults range up to 480 feet (146 m). Geophysical logs from the numerous oil test borings in the area provide data for detailed delineation of the fault system. No surface expression of faulting has been observed in Illinois. Faulting is post-Pennsylvanian and pre-Pleistocene in age.

INTRODUCTION

Location and purpose of study

The Wabash Valley Fault System in southeastern Illinois and southwestern Indiana has been an area of extensive petroleum exploration during the past 40 years. Because of the close association of some oil pools to faults, a detailed understanding of the fault system is important. The location, age, and nature of faulting are also considered in planning coal mine sites and in locating and designing major man-made structures.

The purpose of this project was to determine the nature, age, and extent of faulting in the Illinois portion of the Wabash Valley Fault System. Data from several thousand oil test holes in the area permit detailed examination of many of the faults. Geophysical logs of these borings were used in correlating stratigraphic horizons for structural mapping. On several logs, shortened and disturbed sections indicate the exact location of faults. Where a fault is cut by two or more closely spaced wells, the fault plane dip has been measured. Geophysical logs from oil test holes in Indiana were used where faults extend across the state line. Faults have been observed in two underground mines in the study area, but no surface expression of faulting has been noted.

The Wabash Valley Fault System extends across parts of Gallatin, White, Edwards, and Wabash Counties, Illinois, (fig. 1) and adjacent counties in southwestern Indiana. The fault system is characterized by mostly parallel, high-angle normal faults that extend generally north-northeastward for about 60 miles (97 km) and span an area about 30 miles (48 km) wide; the Illinois portion of the fault system is 15 miles (24 km) wide.

Previous studies

The numerous oil tests from extensive exploration for petroleum in the Wabash Valley area since the mid-1930s have contributed greatly, almost exclusively, to knowledge of the subsurface geology in this area. During the 1950s a series of coal resource reports on the Wabash Valley area was published using data from the many oil tests to depict structure on various Pennsylvanian horizons (Pullen, 1951; Smith and Cady, 1951; Harrison, 1951; Cady et al., 1955). All of the major faults that are presently recognized in the Wabash Valley Fault System (fig. 2) were shown on these structure maps of the 1950s.

Subsequent petroleum exploration has permitted more detailed mapping of the fault system and has resulted in significant changes in the interpretation of the structural picture (Bristol, 1968; Bristol and Howard, 1976). A recent report on the Wabash Valley Fault System in Gallatin County and southernmost White County (Bristol, 1975) presents revised structure maps on several Pennsylvanian and Mississippian horizons for that area and discusses the various faults, horsts, and grabens in detail. Structural interpretations are further revised herein; several faults are excluded at the southern end of the fault system where the relative paucity of data provides no evidence for faulting.

GEOLOGICAL SETTING

Stratigraphic relations

Pennsylvanian strata lie at the bedrock surface throughout the Illinois portion of the Wabash Valley Fault System and are everywhere covered by up to 100 feet (31 m) of glacial

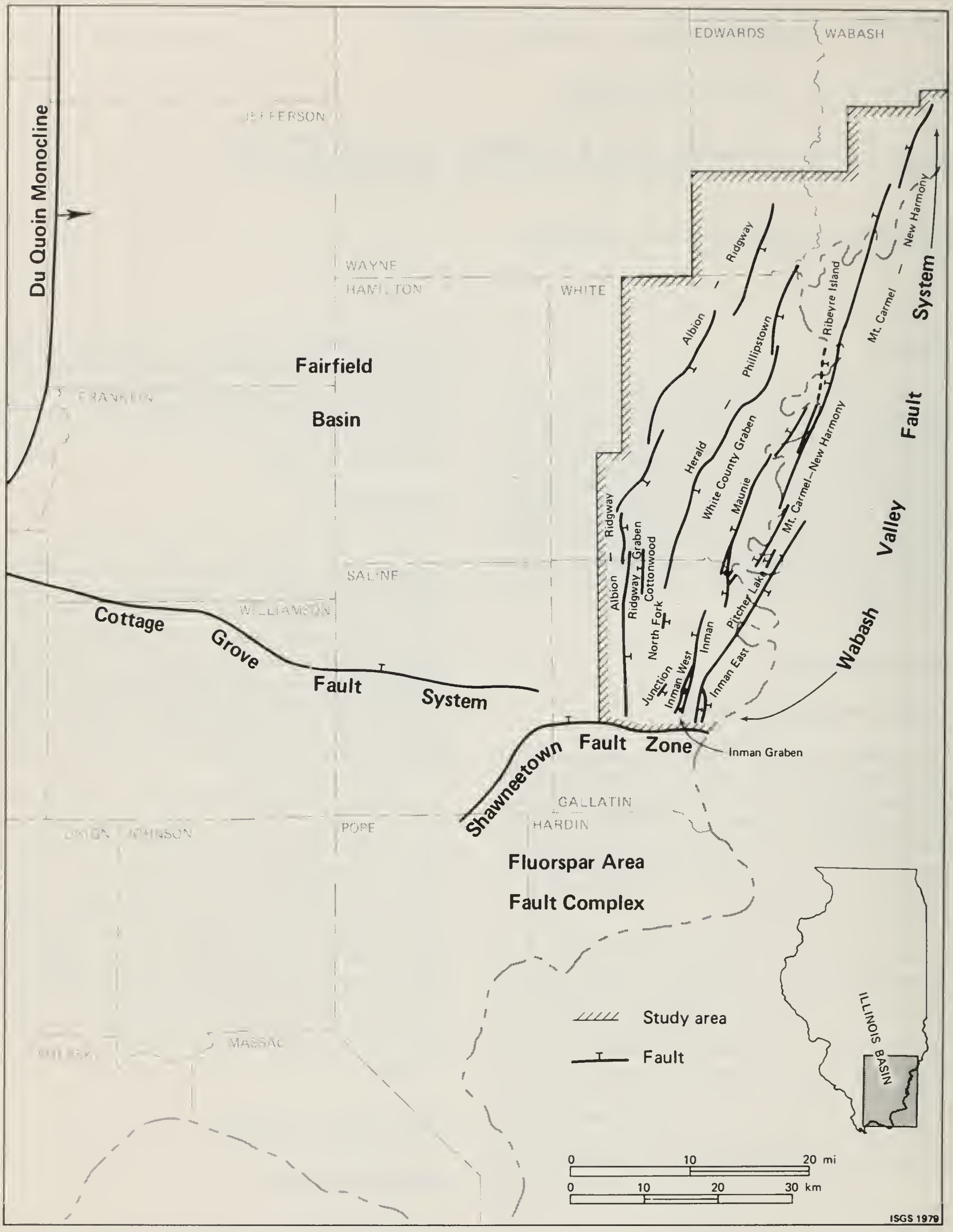

Figure 1. Prominent structural features in Illinois and area of study.

Figure 2. Location and name of major structures in the Wabash Valley Fault System. Shaded areas refer to detailed structure maps (see figs. 7, 8, and 9). Lines of cross-sections A-A' and B-B' are shown (see figs. 10 and 11).

drift, loess, and alluvium. Structural mapping in the study area is restricted to the Mississippian and Pennsylvanian strata because of the paucity of borings that penetrate rocks deeper than the upper part of the Valmeyeran Series (middle Mississippian). The generalized columnar section (fig. 3) shows the stratigraphic relations of these rocks.

Mississippian and Pennsylvanian strata generally thicken westward and northwestward toward the Fairfield Basin. Thicknesses of the strata are not affected by faulting. Five borings that penetrate Ordovician rocks (fig. 4) indicate uniform thicknesses of stratigraphic units as deep as the top of the "Trenton."

Several Mississippian and Pennsylvanian horizons are continuous and are relatively easy to pick on geophysical logs (shown later in fig. 11) from the Wabash Valley area. Three horizons were selected for structural mapping in this study: (1) the base of the Beech Creek Limestone (commonly called the "Barlow lime"); (2) the top of the Herrin (No. 6) Coal Member; and (3) the top of the West Franklin Limestone Member.

The Beech Creek Limestone of the Mississippian Chesterian Series is a persistent limestone formation that is generally less than 10 feet (3 m) thick in southeastern Illinois (fig. 4). It is widely used as a horizon for structural mapping in the Illinois Basin (Bristol, 1968).

The Herrin (No. 6) Coal Member of the Pennsylvanian Carbondale Formation is approximately 2,000 feet (610 m) above the Beech Creek Limestone. Its thickness ranges from less than 3 to as much as 8 feet (1 to 2 m) in the Illinois portion of the Wabash Valley Fault System. The top of the Herrin Coal is difficult to pick on geophysical logs when the Brereton Limestone Member directly overlies the coal. In these places the kicks on the resistivity curve of these two units combine to form a single peak (Pullen, 1951, p. 74-75). Nevertheless, the top of the coal can be picked within 5-foot (2-m) accuracy. The channel phase of the Anvil Rock Sandstone Member has replaced the Herrin Coal in a strip that measures 0.5 to 1.5 miles (1 to 2 km) wide and trends generally southward through the study area (fig. 5). The subcrop of the Herrin Coal is at the very southern end of the fault system in the southern half of T. 9 S.

The West Franklin Limestone Member of the Pennsylvanian Modesto Formation lies about 250 to 300 feet (76 to 91 m) above the Herrin Coal. The West Franklin top has been selected for structural mapping (fig. 6) mainly because it serves as the best Pennsylvanian horizon for correlating with the Indiana portion of the Wabash Valley Fault System. The West Franklin consists of from one to three limestone benches separated by thin shale units (Smith and Cady, 1951, p. 55, 57; Pullen, 1951, p. 71, 74). These benches produce characteristic kicks on geophysical logs that are easily recognizable except when the limestone is directly overlain or replaced by a sandstone channel fill. When one or two benches are absent, generally it is not possible to determine which of the three benches are represented; thus some inferred minor discontinuities of less than 30 feet (9 m) in the structural configuration may result. The West Franklin becomes difficult to pick on geophysical logs towards its erosional edge (Andresen, 1956) in the southern part of the study area. In much of Gallatin County, the West Franklin has been preserved only on the downthrown side of the faults; it has been eroded along the upthrown side. Elsewhere in the study area, the absence of the West Franklin is due to localized facies changes.

Structural setting

The Wabash Valley Fault System is located just north of several major structural features in the Eastern Interior Region. South of the Wabash Valley Fault System is the westward-trending part of the Shawneetown Fault Zone (fig. 1); at its western extent it curves abruptly to the southwest and generally parallels the Fluorspar Area Fault Complex to the south and east. The westward-trending segment of the Shawneetown Fault Zone is part of the major Rough Creek Lineament, which also includes the Cottage Grove Fault System located farther west in Illinois. North of this lineament in southeastern Illinois and west of the Wabash Valley faults is the Fairfield Basin, the deep part of the Illinois Basin. The Wabash Valley Fault System penetrates strata of the eastern flank of the Fairfield Basin; strata dip into the basin at a cumulative rate of about 25 feet per mile (4.7 m per km).

WABASH VALLEY FAULT SYSTEM

The Wabash Valley Fault System in Illinois consists of a series of parallel, high-angle normal faults that bound horsts and grabens (figs. 2, 4, 5, and 6). The easternmost faults extend into Indiana. Displacements along individual faults range up to 480 feet (146 m) and decrease at their northern and southern extremities. The faults are characterized by slightly arcuate segments that overlap one another, rather than one long fault trace. The term "fault" is used here in the singular to denote each set of overlapping parallel faults or fault segments that form one general lineation. Examples of this include the Albion-Ridgway, Herald-Phillipstown, Maunie, and Mt. Carmel-New Harmony Faults (fig. 2).

In one area where fault segments overlap, namely that of the Mt. Carmel-New Harmony Fault (fig. 7), a set of three cross faults, each with a displacement of about 7 feet (2 m), has been observed in an underground coal mine (W. John Nelson, personal communication, 1979). Apparently a jog in the zone of weakness, along which the major northeastward faulting occurred, caused a build-up of rotational stress in this area, and a consequent wrenching action resulted in cross-faulting. The amount of displacement across these three faults, 21 feet (6 m) down to the

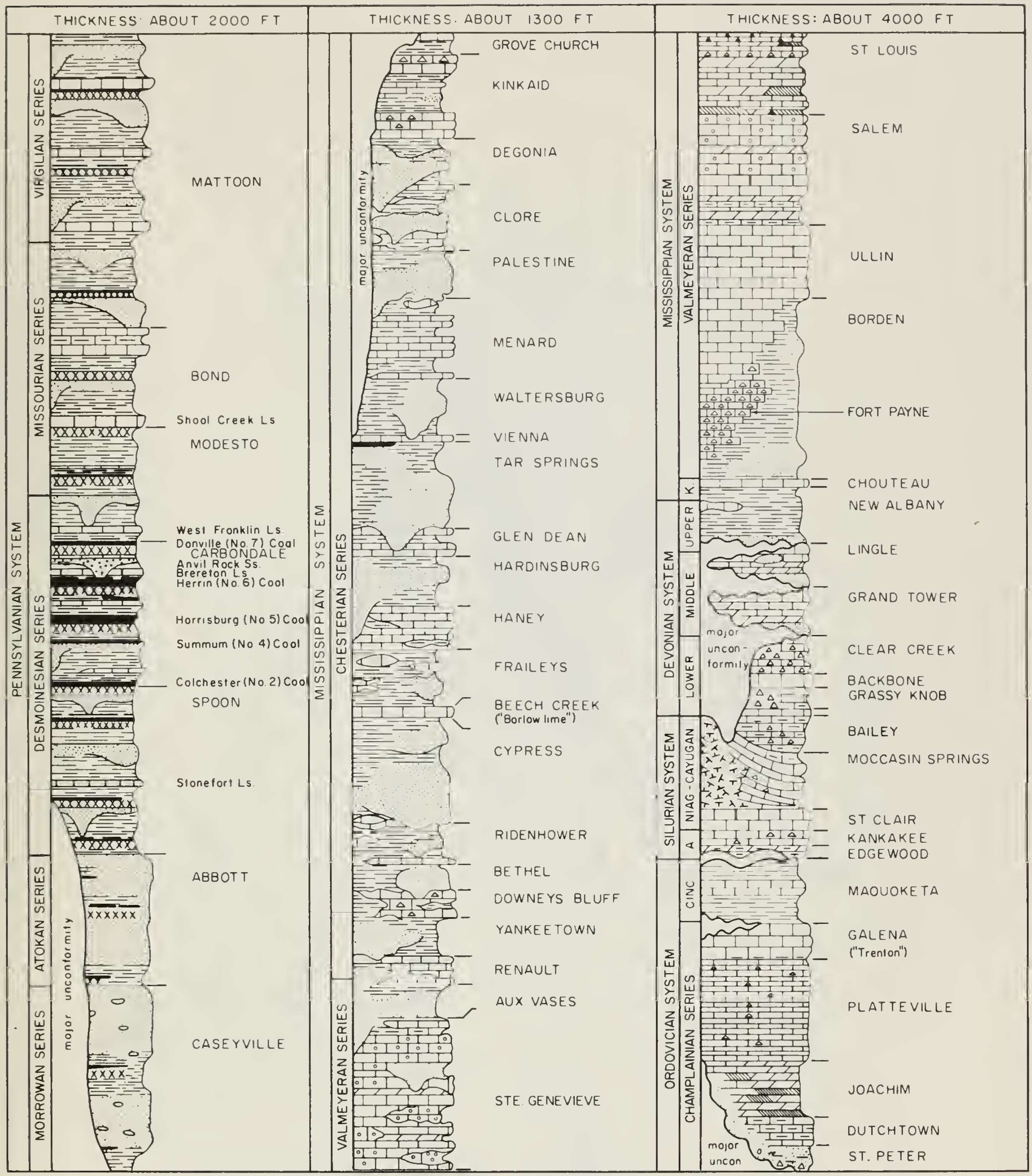

Figure 3. Generalized stratigraphic column of southern Illinois. Formation names are in capitals; member names are in lower case. About 4,000 feet of Canadian (lower Ordovician) and Croixan (upper Cambrian) rocks under the St. Peter are not shown. Kinderhookian (K.), Niagaran (NIAG.), Alexandrian (A.), and Cincinnatian (CINC.) Series are abbreviated. (Modified from Swann and Willman, 1961.)

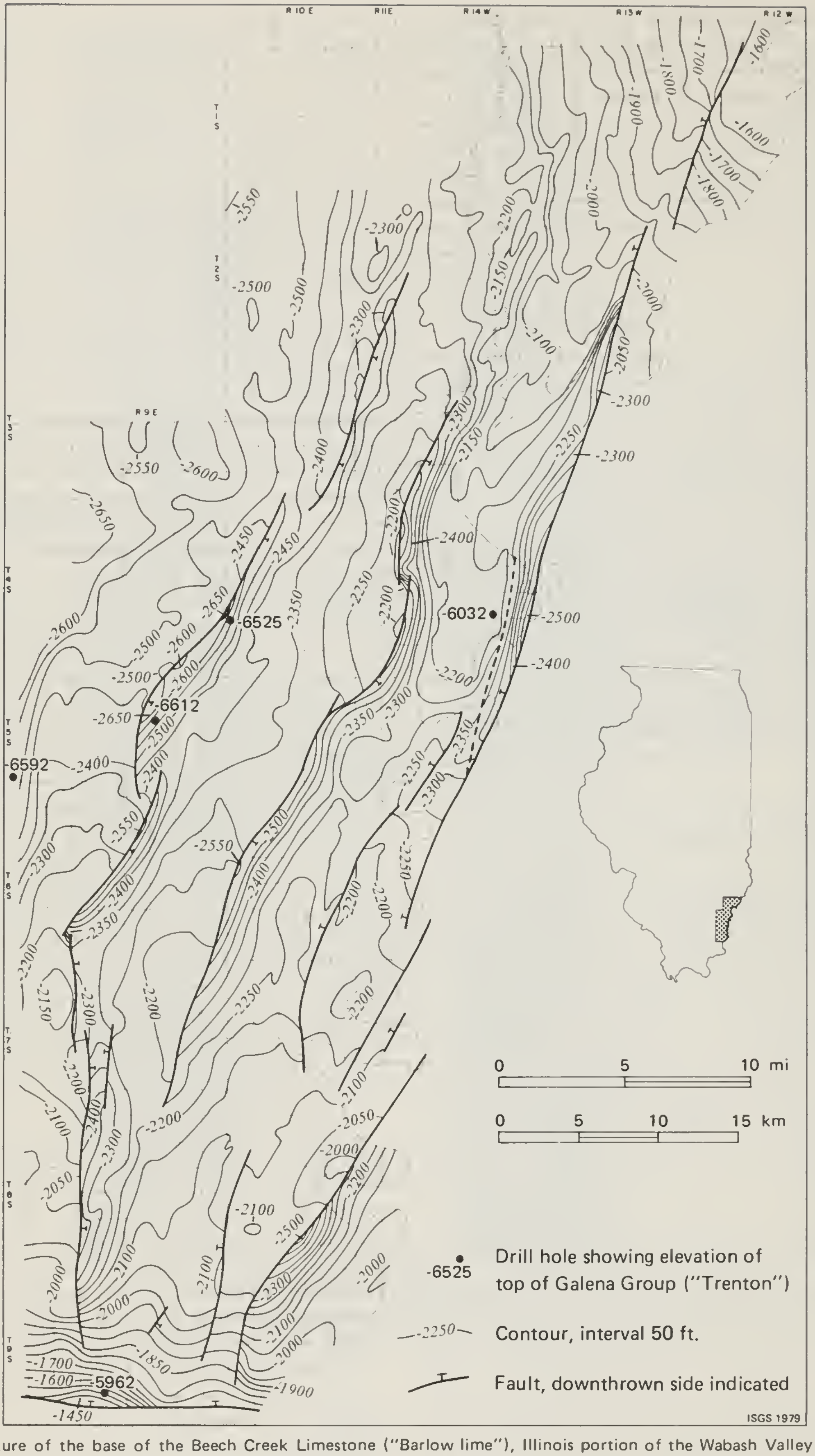

Figure 4. Structure of the base of the Beech Creek Limestone ("Barlow lime"), Illinois portion of the Wabash Valley Fault System and small portions of Indiana. Drill holes reaching the Galena ("Trenton") are shown with elevation of top of Galena Group. Datum mean sea level.

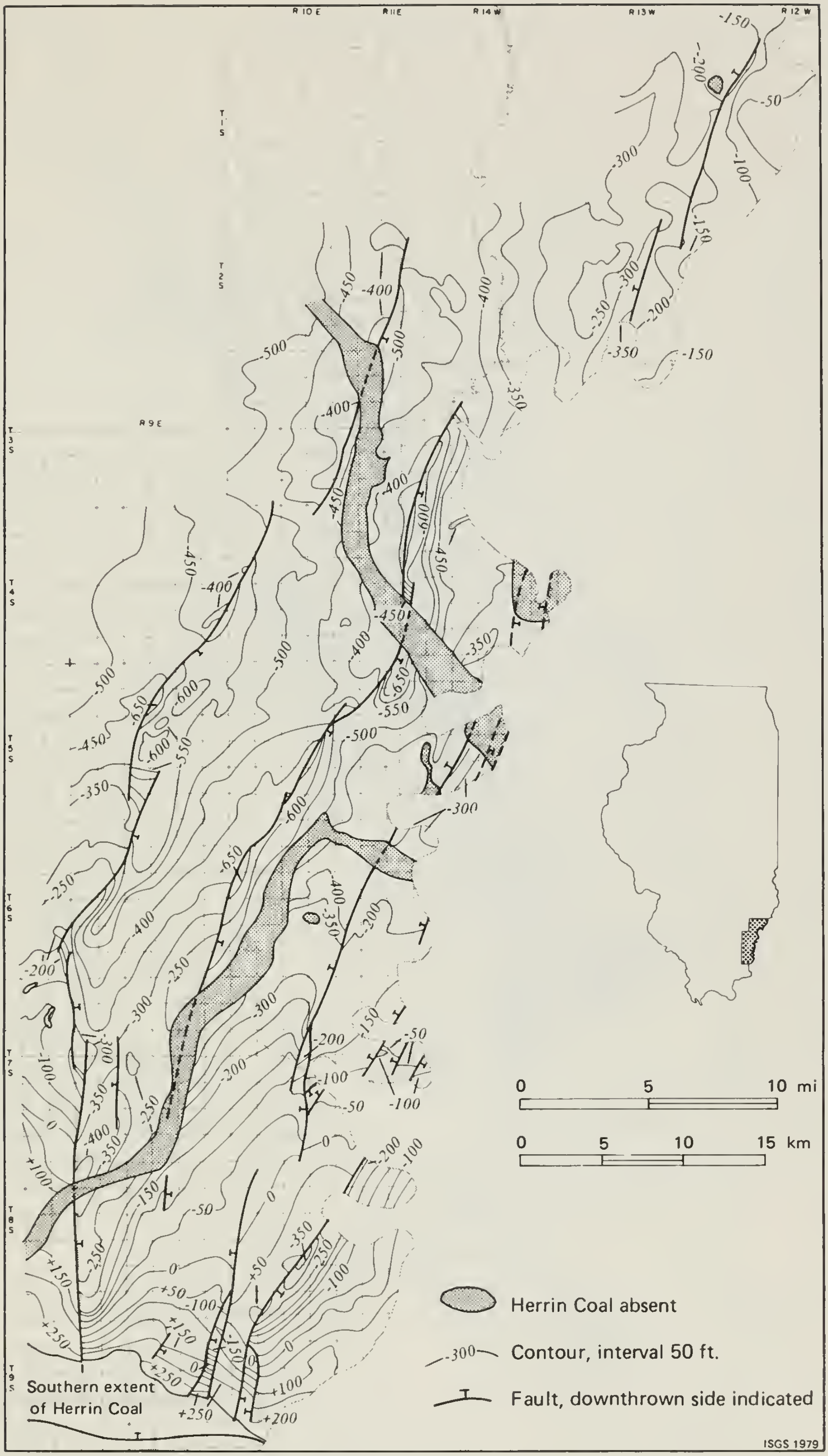

Figure 5. Structure of the top of the Herrin (No. 6) Coal, Illinois portion of the Wabash Valley Fault System. Datum mean sea level.

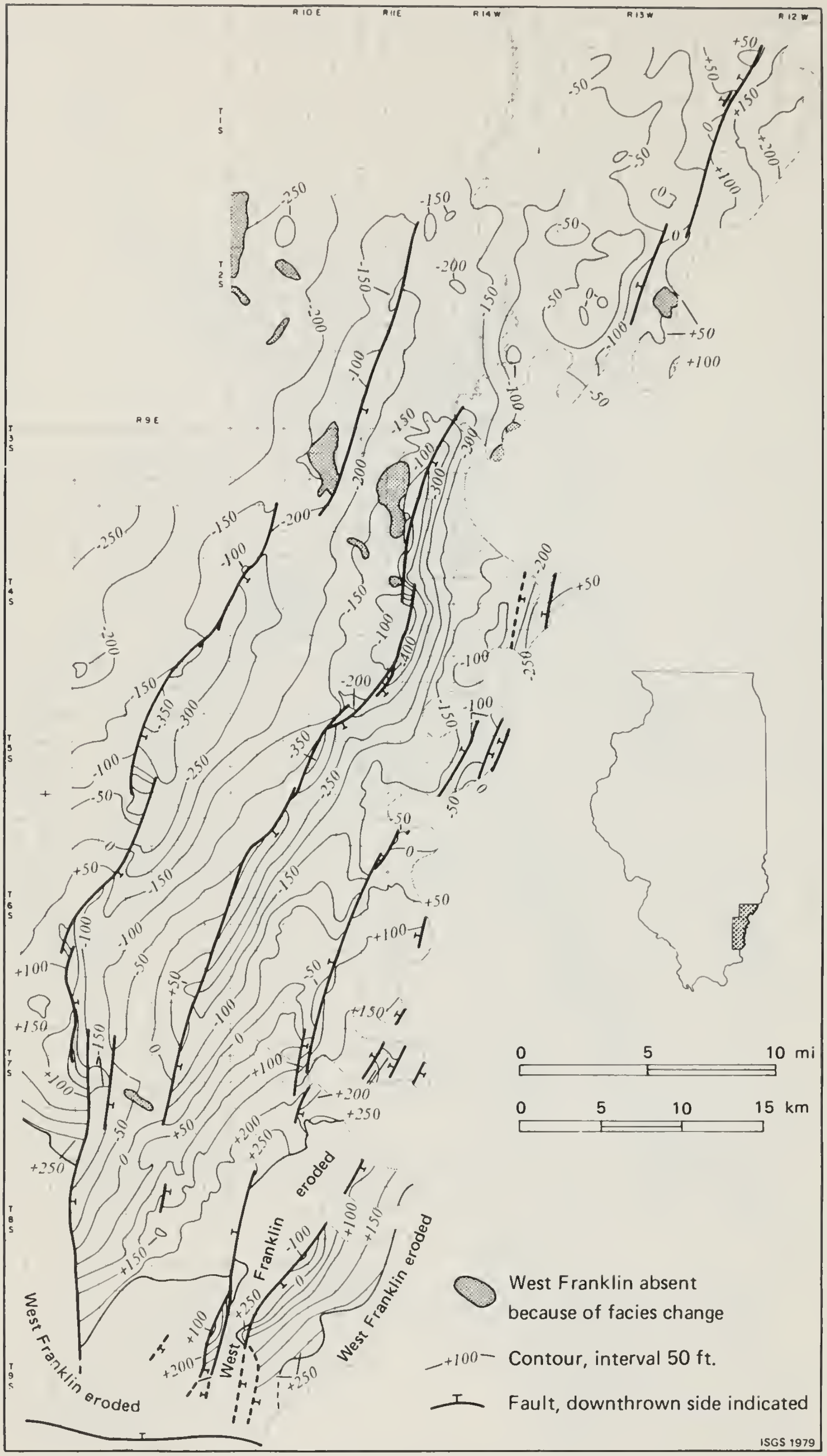

Figure 6. Structure of the top of the West Franklin Limestone, Illinois portion of the Wabash Valley Fault System. Datum mean sea level.

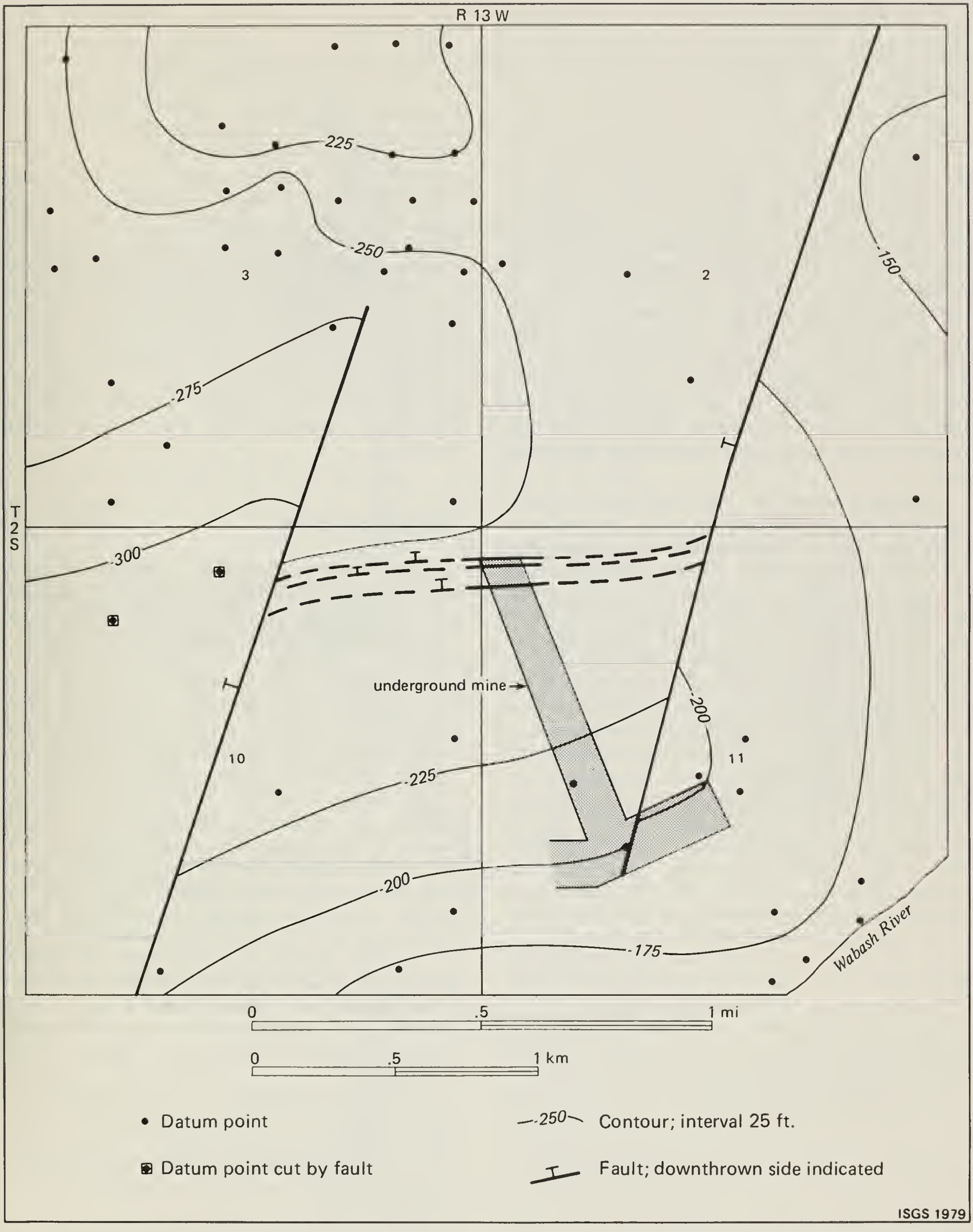

Figure 7. Detailed structure of the top of the Herrin (No. 6) Coal in Wabash County (see fig. 2) illustrating the presence of cross faults, as observed in an underground mine, in the overlapping area of the two major fault segments of the Mt. Carmel-New Harmony Fault. Datum mean sea level.

north, coincides with the amount of displacement observed in two borings that straddle these faults. It is expected that these generally eastward-trending cross faults curve slightly southwestward and northeastward and join or intersect, but do not cross, the main faults (indicated by the dashed lines in fig. 7).

Details of two other areas where fault segments overlap are presented in figures 8 and 9. In the northern overlap area of the Herald-Phillipstown Fault (fig. 8), sufficient data indicate that there is a progressive, though fairly rapid, dip down to the north between the ends of the two major fault segments. Possibly this dip is accompanied by a series of eastward-trending cross faults that resulted from wrenching action caused by jogging of the major fault segments as described above. Cross faults, if present, would curve, generally parallel to the structural contours, to intersect or join the northeast-trending faults, but would not cross them. Cross faults, however, were not observed in the borings in this area, but it would be difficult to detect their presence because of the small displacements they would have.

Faulting in the Wabash Valley Fault System probably extends down into the basement rocks, the surface of which lies 12,000 to 14,000 feet (3,600 to 4,300 m) below sea level. Evidence for this is the fact that the amount of displacement at a given point along the major faults is generally constant with depth through the Pennsylvanian and the upper part of the Valmeyeran (middle Mississippian) rocks (figs. 10 and 11). Some of the minor faults or bifurcations at the southern extent of major faults do die out with depth as can be observed by comparing the structural configuration of the West Franklin Limestone (fig. 6) and Herrin Coal (fig. 5) with the structural configuration of the Beech Creek Limestone (fig. 4). Structure on the Pennsylvanian horizons (figs. 5 and 6) is somewhat more complex than on the Mississippian horizon (fig. 4). Examples of this relative complexity include (1) the Inman West Fault, a branch of the Inman Fault, which cuts through Pennsylvanian rocks but not Mississippian rocks; (2) the southern ends of the Maunie and Inman East Faults, which have several branch faults in the Pennsylvanian strata, but appear as one fault trace on the Mississippian Beech Creek horizon, and (3) the North Fork Fault, which is recognized only on the Pennsylvanian horizons.

Some of this complexity is attributable to the relative abundance of data in the Pennsylvanian rocks. Nevertheless, several geophysical logs from borings in the area that penetrate Mississippian strata show more than one fault, and all but one of these faults are usually confined to Pennsylvanian strata. This is illustrated in a cross section of the Herald-Phillipstown Fault in northeastern White County (fig. 11). Here as many as three faults have been observed in the Pennsylvanian strata in boring 1287, two faults are encountered deeper in the Pennsylvanian strata in boring 959, and just one fault is recognized in the lower part of the Mississippian Chesterian strata in boring 1290. The fault appears to bifurcate upward forming several faults. Further evidence of the complexity of faulting in the Pennsylvanian rocks has been observed in underground coal mining operations in the Wabash Valley area. Here the faulting is characterized by multiple, high-angle, normal faults trending north-northeastward (Illinois State Geological Survey Coal Section field notes).

Fault planes in the Wabash Valley area dip at angles ranging from 50 to 85 degrees. Projections of the faults down to the basement indicate that fault traces at the basement could occur up to 2 miles (3 km) away from the surface projections of the faults in a direction perpendicular to the strike. A detailed structure map on the base of the Beech Creek Limestone in northern White County (fig. 9) illustrates the position of the trace of the Albion-Ridgway Fault on the Beech Creek Limestone relative to its trace on the West Franklin Limestone. Here the trace on the stratigraphically deeper Beech Creek is 0.1 to 0.33 mile (200 to 500 m) to the downthrown side of the trace on the West Franklin.

Individual structures

The Wabash Valley Fault System comprises 12 named faults, 2 named grabens (fig. 2, tables 1 and 2), and numerous minor structures as previously mentioned. The named structures are discussed here, generally from west to east.

Albion-Ridgway Fault. The westernmost set of north-northeast trending arcuate faults in the Wabash Valley Fault System is herein named the Albion-Ridgway Fault. This set includes five overlapping, generally parallel fault segments, which extend from about 2 miles (3 km) north of the Shawneetown Fault Zone in Gallatin County through White County and terminate several miles into Edwards County, a total distance of about 50 miles (81 km). The four southern segments were formerly called the Ridgway Fault, named for the town of Ridgway in Gallatin County, and the northernmost segment was called the Albion Fault, named after the town of Albion in Edwards County. This northern segment is on trend with the southern segments and appears to be part of the same set of faults; hence the new name Albion-Ridgway is applied to the entire sequence. A detailed structure map of this northernmost overlapping area of the major fault segments is given in figure 9.

Strata are downthrown to the east along this set of faults and have a maximum displacement of about 430 feet (131 m) in Sec. 7, T. 8 S., R. 9 E., Gallatin County. The amount of displacement decreases rapidly southward from this point and varies northward, eventually dying out in Edwards County.

Cottonwood Fault. The Cottonwood Fault, named for the town of Cottonwood, Gallatin County, is a generally north-

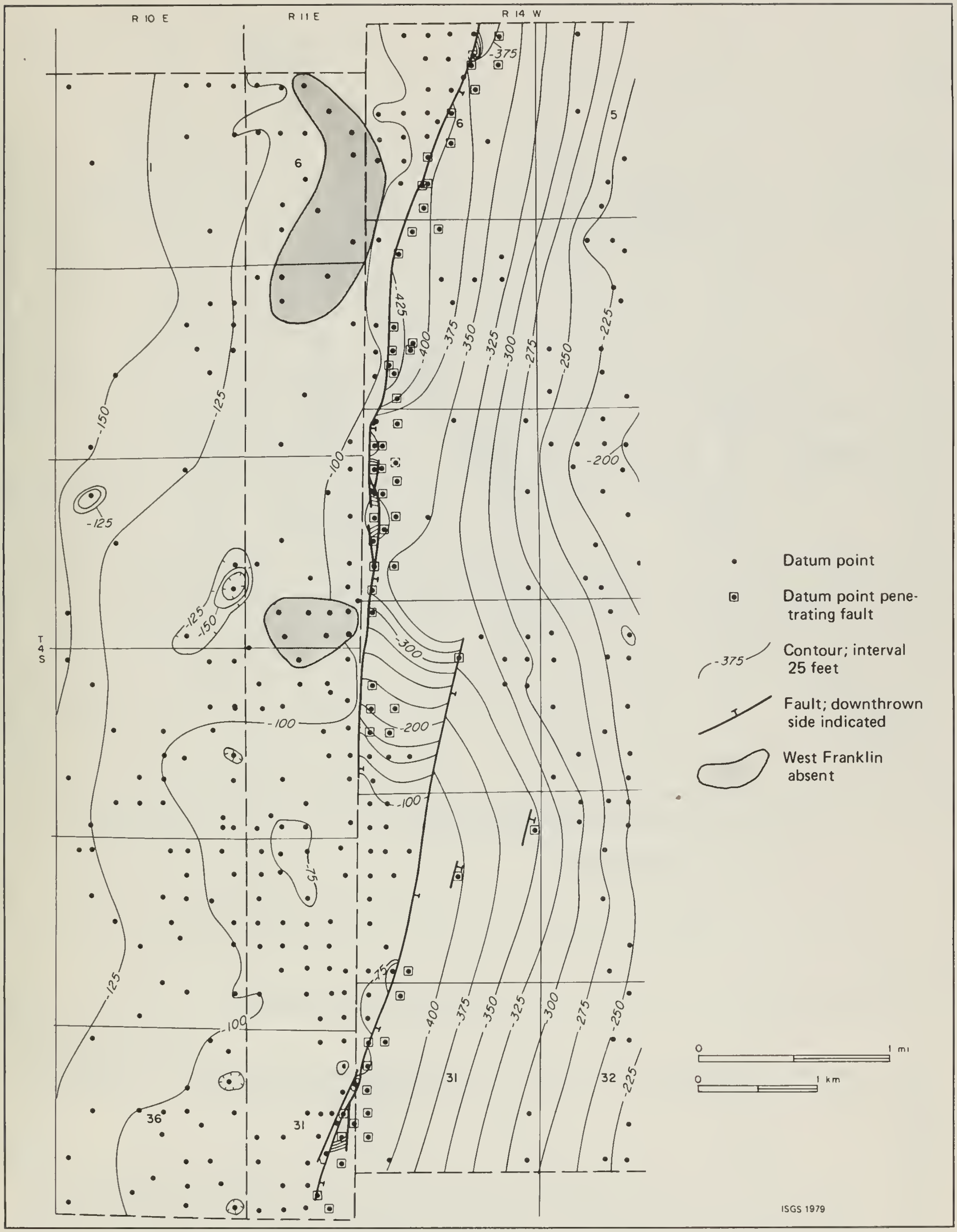

Figure 8. Detailed structure of the top of the West Franklin Limestone illustrating the overlapping area of the two segments of the Herald-Phillipstown Fault in White County (see fig. 2). Datum mean sea level.

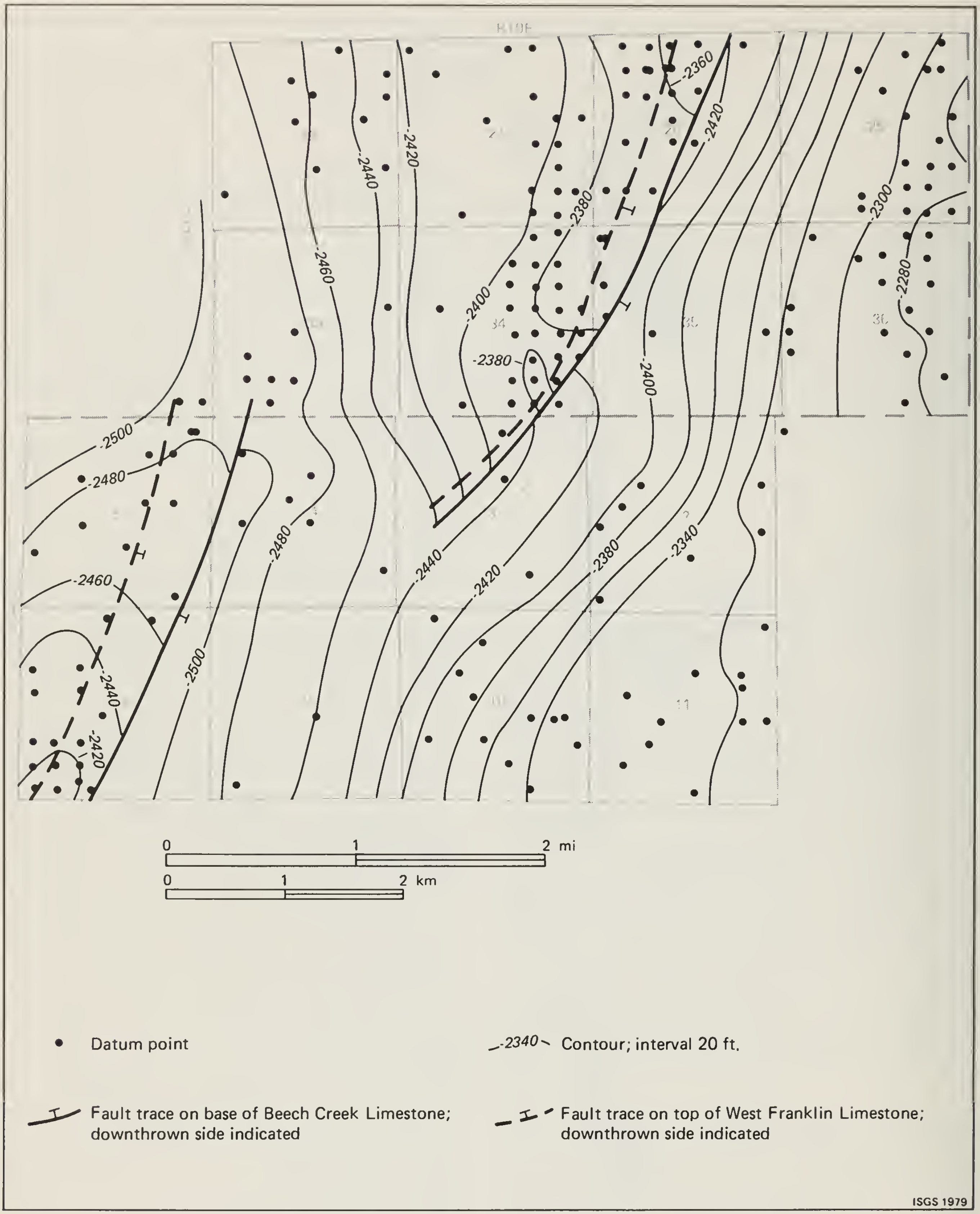

Figure 9. Detailed structure of the base of the Beech Creek Limestone ("Barlow lime") along a portion of the Albion-Ridgway Fault in White County (see fig. 2) illustrating (1) the parallel overlapping nature of major fault segments typical of the faulting in the Wabash Valley Fault System and (2) the trace of the fault on the top of the West Franklin Limestone (dashed line) relative to the fault trace on the base of the Beech Creek Limestone (solid line). Datum mean sea level.

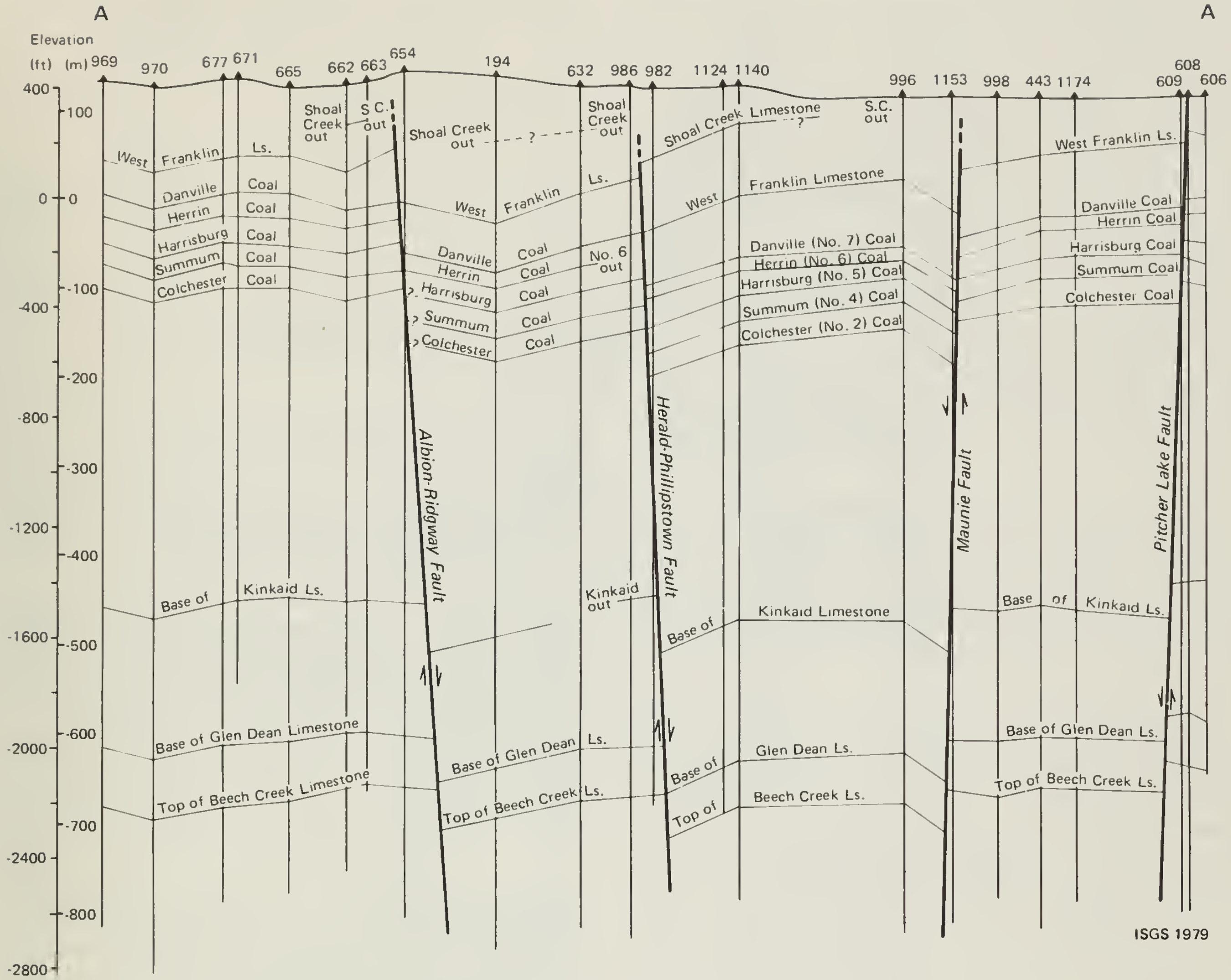

Figure 10. East-west cross section (A-A') along the Gallatin-White County line (see fig. 2) showing stratigraphic relations across the Wabash Valley Fault System. ISGS county number for each well shown across top. (From Harrison, 1951, with nomenclature modifications.)

TABLE 1. Name, location, direction of dip, and maximum displacement of faults in the Wabash Valley Fault System.

Fault	Location by county	Direction of dip	Maximum displacement (ft/m)
Albion-Ridgway (formerly the Albion and Ridgway Faults)	Gallatin, White, Edwards	East	430/131
Cottonwood	Gallatin, White	West	100/31
Herald-Phillipstown	Gallatin, White, Wabash	East	350/107
Inman	Gallatin	West	300/91
Inman East	Gallatin, Posey (Indiana)	East	480/146
Inman West	Gallatin	East	260/79
Junction	Gallatin	East	90/27
Maunie	Gallatin, White	West	175/53
Mt. Carmel-New Harmony (formerly Mt. Carmel and New Harmony Faults)	White, Posey (Indiana), Gibson (Indiana), Wabash	West	300/91
North Fork	Gallatin	East	25/8
Pitcher Lake	Gallatin, Posey (Indiana)	West	50/15
Ribeyre Island	White, Posey (Indiana)	East	170/52

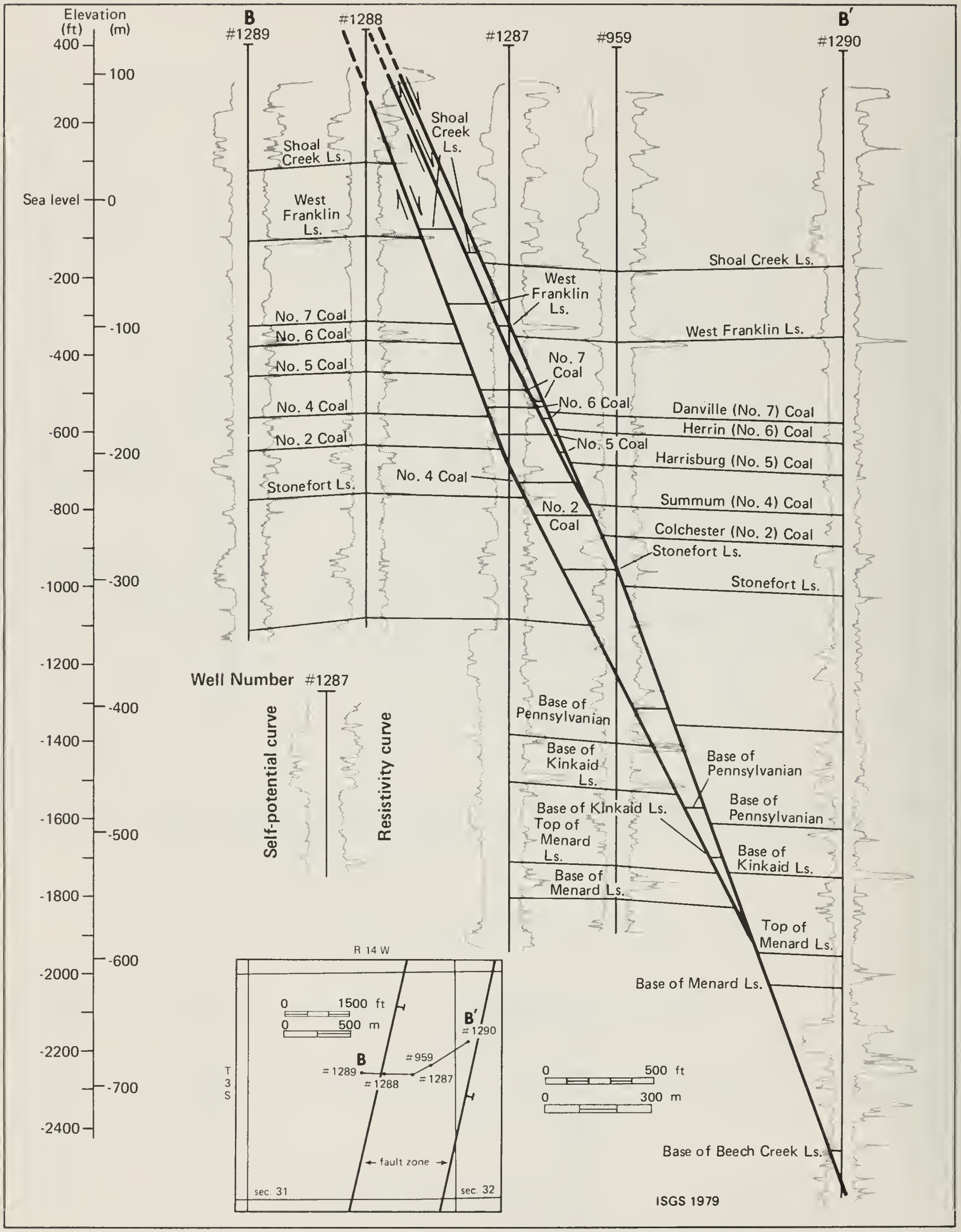

Figure 11. East-west cross-section (B-B′) using electric logs to show stratigraphic relations across the Herald-Phillipstown Fault in White County (see fig. 2). (Modified from Harrison, 1951.)

TABLE 2. Name and location of grabens and faults bounding them in the Wabash Valley Fault System.

Graben	Location by county	Faults bounding grabens: On the west	On the east
Inman	Gallatin	Inman West	Inman
Ridgway	Gallatin	Southernmost segment of Albion-Ridgway	Cottonwood

ward-trending fault that extends for about 3 miles (5 km) within the southwestern part of T. 7 S., R. 9 E. Strata are downthrown to the west and have a maximum displacement of about 100 feet (31 m) in Sec. 20, T. 7 S., R. 9 E.

Ridgway Graben. The Ridgway Graben is bounded on the east by the Cottonwood Fault and on the west by the northern quarter of the southernmost segment of the Albion-Ridgway Fault. Located in the southwestern part of T. 7 S., R. 9 E., Gallatin County, the Ridgway Graben is generally 0.75 to 1 mile wide (1 to 2 km) and extends northward for about 3 miles (5 km). Maximum displacement on the western side of the graben is about 200 feet (61 m) and is slightly more than 100 feet (31 m) on the eastern side.

Herald-Phillipstown Fault. East of the Albion-Ridgway Fault and essentially parallel to it is a set of two overlapping, generally parallel, arcuate faults known as the Herald-Phillipstown Fault, named for the towns of Herald and Phillipstown in White County. A detailed structure map of the overlapping area of the two fault segments is given in figure 8. These fault segments, dipping to the east, strike generally north-northeastward from Sec. 34, T. 7 S., R. 9 E. in northern Gallatin County through White County and terminate just within Wabash County, Sec. 16, T. 3 S., R. 14 W., a distance of about 31 miles (50 km). Displacements along the fault segments reach a maximum of about 350 feet (107 m) in Sec. 18, T. 6 S., R. 10 E. and diminish fairly rapidly southward and more gradually northward. A cross section of the northern fault segment is shown in figure 11.

North Fork Fault. Just south of the Herald-Phillipstown Fault is a small fault, the North Fork Fault, that has been recognized only in the Pennsylvanian rocks. It trends northward for about 1.5 miles (2 km) in north-central Gallatin County, Secs. 10 and 15, T. 8 S., R. 9 E. Strata are downthrown to the east with a maximum displacement of about 25 feet (8 m).

Maunie Fault. The Maunie Fault, named for the town of Maunie, White County, comprises two overlapping, parallel fault segments that occur about 4 miles (6 km) east of the Herald-Phillipstown Fault. The fault segments extend generally north-northeastward for about 18 miles (29 km) from northeastern Gallatin County to east-central White County. Strata are downthrown to the west along the fault. The southern end of the southern fault segment appears to bifurcate in the Pennsylvanian and extends about 2 miles (3 km) farther south than the single trace in the Mississippian Beech Creek Limestone (figs. 4, 5, and 6; Bristol, 1975, figs. 11, 12, and 13). The fault appears to terminate northward at the state line in Sec. 16, T. 5 S., R. 14 W. Displacements along the fault segments range up to 175 feet (53 m) in Sec. 10, T. 7 S., R. 10 E. and decrease to the north and south.

Junction Fault. Southwest of the Maunie Fault is the Junction Fault, named for the town of Junction, Gallatin County. It extends northeastward for about 1.25 miles (2 km) through parts of Secs. 10, 15, and 16, T. 9 S., R. 9 E. Strata are downthrown to the east along the fault and have a maximum displacement of about 90 feet (27 m).

Inman Fault. The Inman Fault, about 2 miles (3 km) east of the Junction Fault, trends north-northeastward and bifurcates southward within the Pennsylvanian strata to form the Inman West Fault and the Inman Graben. Named for the town of Inman, Gallatin County, the Inman Fault extends for about 9 miles (15 km) from Sec. 24, T. 9 S., R. 9 E., to Sec. 7, T. 8 S., R. 10 E. The fault dips to the west with a maximum displacement of about 300 feet (91 m) in the Pennsylvanian strata in Sec. 13, T. 9 S., R. 9 E. North of the bifurcation, within the Pennsylvanian strata (fig. 5) and along the entire fault in the Mississippian strata where a graben is not recognized (fig. 4), the amount of displacement is generally less than 50 feet (15 m).

Inman West Fault. The Inman West Fault, previously named the Hill Fault (Bristol, 1975), is a subparallel, westward bifurcation of the Inman Fault, from which it gets its name. It has been observed only in the Pennsylvanian strata. Striking north-northeastward, the Inman West Fault extends for about 4.5 miles (7 km) through the eastern part of T. 9 S., R. 9 E. Strata are downthrown to the east along the fault and have a maximum displacement of about 260 feet (79 m) in Sec. 12.

Inman Graben. The Inman Graben, previously named the Hill Graben (Bristol, 1975), is a narrow, generally less than 0.5 mile (800 m) wide, graben that extends north-northeastward for about 4.5 miles (7 km) and has been observed only in the Pennsylvanian strata. It is bounded on the west by the Inman West Fault and on the east by the Inman Fault. Displacements along the graben reach a maximum of about 260 feet (79 m) on the western side and about 300 feet (91 m) on the eastern side.

Inman East Fault. About 1.5 to 2 miles (2 to 3 km) east of the Inman Fault is a subparallel, north- to northeast-trending fault called the Inman East Fault. It extends for approximately 13 miles (21 km) in Illinois from about a mile (2 km) north of the Shawneetown Fault Zone in Gallatin County (Sec. 30, T. 9 S., R. 10 E.), through parts of Posey County, Indiana, to the southeastern corner of White County, Illinois (Sec. 20, T. 7 S., R. 14 W.), and then continues into Indiana where it dies out. The fault dips to the east and has a maximum throw of about 480 feet (146 m) in Sec. 28, T. 8 S., R. 10 E. From that point the amount of displacement diminishes rapidly southward and more gradually northward. Within the Pennsylvanian strata the fault bifurcates at its southern end.

Pitcher Lake Fault. Less than a mile (< 2 km) west of the northern part of the Inman East Fault in the southeastern corner of White County, the Pitcher Lake Fault strikes north-northeastward for 1.5 miles (2 km) in Illinois and extends into Indiana. Named for Pitcher Lake in Posey County, Indiana, this fault displaces the strata as much as 50 feet (15 m) downward to the west.

Mt. Carmel-New Harmony Fault. The northeasternmost set of three overlapping, parallel fault segments is herein named the Mt. Carmel-New Harmony Fault. The northernmost segment was formerly named the Mt. Carmel Fault after the town of Mt. Carmel, Wabash County, and the two southern segments, the New Harmony Fault after the town of New Harmony, Posey County, Indiana. The three major fault segments extend from the southeastern corner of White County north-northeastward along the Illinois-Indiana boundary over a distance of about 43 miles (69 km) and terminate in Wabash County. Strata are downthrown to the west along the fault segments, and maximum displacement is about 300 feet (91 m) in Secs. 24 and 25, T. 4 S., R. 14 W., White County.

A set of three eastward-trending cross faults, each with a displacement of about 7 feet (2 m), has been observed in an underground coal mine between the ends of the two northern major fault segments (fig. 7). We believe that these cross faults intersect, or join, and essentially connect the major fault segments, thus demonstrating that the major fault segments are one linear zone of weakness; hence the new name Mt. Carmel-New Harmony Fault.

Ribeyre Island Fault. The Ribeyre Island Fault, named herein, branches off the central fault segment of the Mt. Carmel-New Harmony Fault and is subparallel to it. The Ribeyre Island Fault strikes north-northeastward for about 10 miles (16 km) from Sec. 4, T. 6 S., R. 14 W. to Sec. 14, T. 4 S., R. 14 W. through parts of White County, Illinois, and Posey County, Indiana. This fault, named for Ribeyre Island, Posey County, is best recognized on the West Franklin Limestone horizon. Here data indicate the existence of the fault along its southern trace, but data are too sparse to do more than to suggest that the fault exists along its northern trace as mapped. The Herrin (No. 6) Coal has been cut out by the channel phase of the Anvil Rock Sandstone along much of the extent of the fault and hence does not provide any supporting evidence. On the Beech Creek Limestone the fault, if present, strikes parallel to the structural contour lines, and therefore it may be interpreted as a hinge line of an eastward-dipping monocline rather than a fault. Maximum displacement along the fault is about 170 feet (52 m) in the West Franklin Limestone in Sec. 22, T. 5 S., R. 14 W. Displacement along the fault in the Beech Creek Limestone would be less than 50 feet (< 15 m).

Previously mapped structures. Three structures previously mapped in Gallatin County—the Equality and Junction West Faults and the Junction Horst (Bristol, 1975)—have been reinterpreted in this study and are no longer recognized in the area. The southern extent of another structure, the Greathouse Island Fault, has been reinterpreted to be the southernmost segment of the Mt. Carmel-New Harmony Fault; thus the Greathouse Island Fault is no longer recognized in Illinois.

Oil production

It is apparent from examining the location of oil fields in the area of the Wabash Valley Fault System that many of the fields are found in the upthrown blocks of the faults (fig. 12). The fault planes act as seals, preventing the escape of hydrocarbons from the reservoirs.

A compilation of the production data (table 3) for fields related to or adjacent to faults in the Illinois portion of the Wabash Valley Fault System is presented. Since 1938, when oil was first found in the Wabash Valley area, these fields have produced nearly 400 million barrels of oil (table 3). Prospects for finding additional oil are favorable throughout the area. Stratigraphic traps in Chesterian sediments have potential, and exploration in zones below the Mississippian Ste. Genevieve Limestone currently is productive. Thus, although the area has been rather extensively drilled, under favorable economic conditions, new oil will continue to be sought and found in the area of the Wabash Valley Fault System.

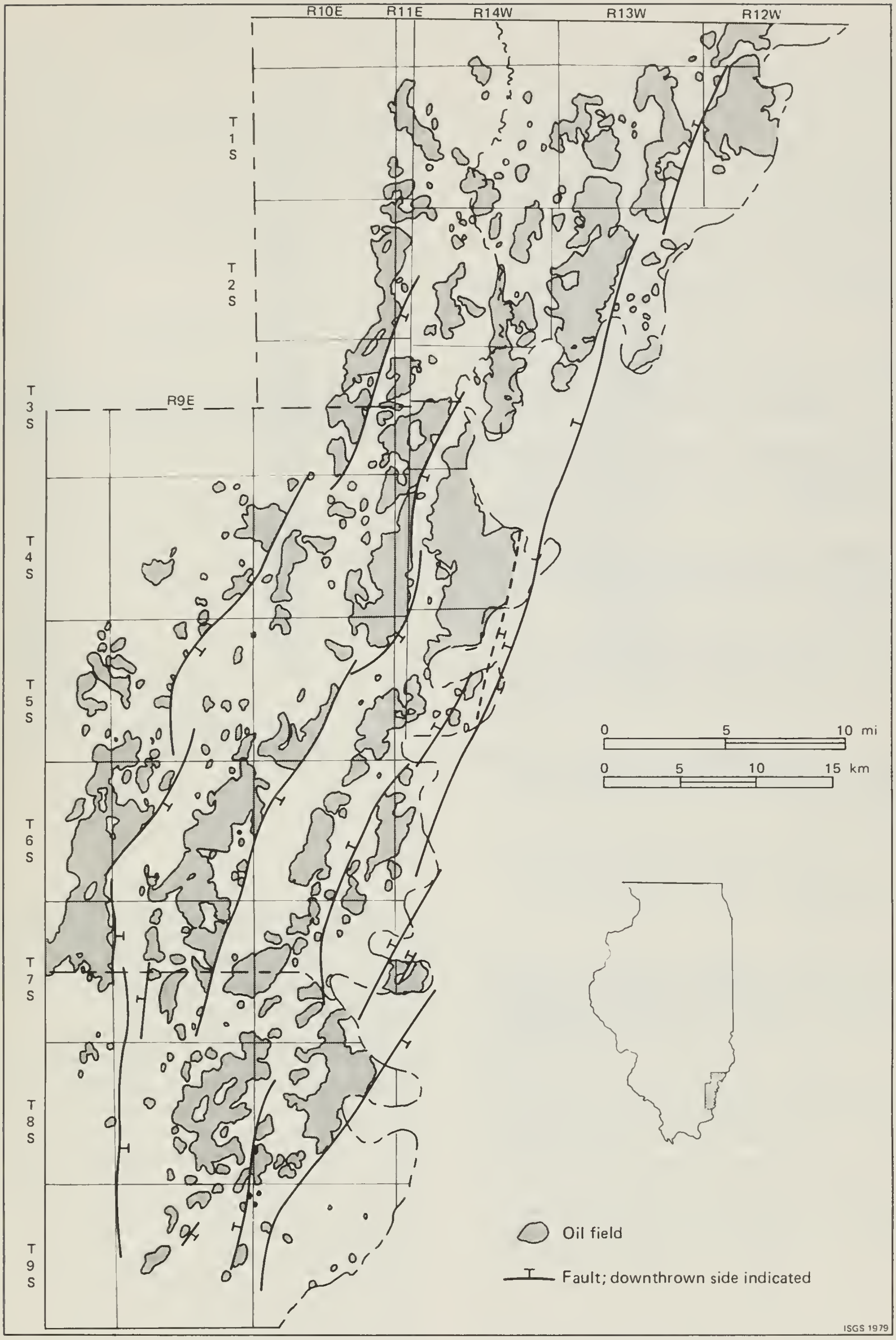

Figure 12. Oil fields at various stratigraphic horizons in relation to faults in the Wabash Valley Fault System. (Modified from Van Den Berg and Lawry, 1979.)

TABLE 3. Oil production from fields in the Illinois portion of the Wabash Valley Fault System.

Field	Location of county	Year of discovery		Cumulative production through 1977 (thousands of bbl)
Ab Lake	Gallatin	1947		120.4
Albion Consolidated	White, Edwards	1940		29,888.7
Centerville East	White	1941		8,456.3
Concord Consolidated	White	1942		8,220.9
Concord East Consolidated	White	1942		889.6
Fehrer Lake[a]	Gallatin	1963		4.7
Herald Consolidated	Gallatin, White	1940		16,891.4
Inman East Consolidated	Gallatin	1940		22,023.5
Junction	Gallatin	1939		693.3
Junction East	Gallatin	1953		122.4
Junction North	Gallatin	1946		250.7
Maunie North Consolidated	White	1941		4,981.5
Maunie South Consolidated	White	1941		7,329.5
Mt. Carmel	Wabash	1939		18,316.1[b]
New Harmony Consolidated	White, Edwards, Wabash	1939		159,157.1[b]
New Harmony South	White	1941		113.3[b]
New Haven Consolidated	White	1941		2,565.7
Phillipstown Consolidated	White, Edwards	1939		29,851.0
Ridgway[a]	Gallatin	1946		0.1
Roland Consolidated	Gallatin, White	1939		57,671.9
Shawneetown[a]	Gallatin	1945		16.9
Shawneetown East	Gallatin	1952		18.3
Storms Consolidated	White	1939		20,683.7
Sumpter	White	1945		398.9
Sumpter South	White	1948		886.6
Trumbull Consolidated	White	1944		3,673.3
			TOTAL	393,225.8
			1977 production	3,790.8

Note: Statistics from Van Den Berg and Lawry, 1979.
[a]Abandoned
[b]Illinois portion only

History of faulting

The faults of the Wabash Valley Fault System are uniform in nature and appear to be the result of the same tectonic episode. Movement along the faults is late- to post-Pennsylvanian and pre-Pleistocene in age, as evidenced by (1) the youngest existing strata displaced by the faults are of the Mattoon Formation (late-Pennsylvanian); (2) the thicknesses of complete stratigraphic units, Pennsylvanian and older in age, do not change significantly across the faults; (3) the amount of displacement along the major faults does not vary generally with depth, and (4) faults have not been observed at the surface in the Pleistocene deposits. The occurrence of the West Franklin Limestone along the downthrown side of the faults in Gallatin County and its absence along the upthrown side indicates that faulting preceded erosion of the Pennsylvanian strata in the area. The absence of strata younger than Pennsylvanian and older than Pleistocene in the Wabash Valley area makes it difficult to date the fault system more accurately. Much of the tectonic activity in the Eastern Interior Region, which includes the Wabash Valley Fault System, is presumed to have been related to the Appalachian Revolution, which occurred near the close of the Paleozoic in the eastern United States (Atherton, 1971, p. 41).

The nature of the faults in the Wabash Valley Fault System differs from that of the faults to the south. The Wabash Valley Fault System is characterized by high-angle normal faults that are generally parallel and north-northeast trending. The Shawneetown Fault Zone immediately to the south, however, is characterized by reverse faults that trend westward and curve sharply southwestward at the western end of the fault zone. In contrast to the nature of faulting in the Wabash Valley Fault System, the faults in the Fluorspar Area Fault Complex south of the Shawneetown Fault Zone trend mostly northeastward to eastward and occasionally northwestward. Although these are dominantly normal faults, high-angle reverse faults and strike-slip faults have been reported (Baxter, Desborough, and Shaw, 1967, p. 32).

We believe that the Wabash Valley Fault System, though adjacent to several other major fault systems to the south, is the result of different faulting mechanisms and is not continuous with those fault systems to the south. Although data become scarce toward the southern extremity of the Wabash Valley Fault System, evidence is sufficient to indicate that the amount of displacement along the faults diminishes southward. There is no evidence at this time to assume that the Wabash Valley faults intersect and cross the Shawneetown Fault Zone.

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