Illinois Preliminary Geologic Map
IPGM Kellerville-BG

Bedrock Geology of Kellerville Quadrangle

Adams and Brown Counties, Illinois

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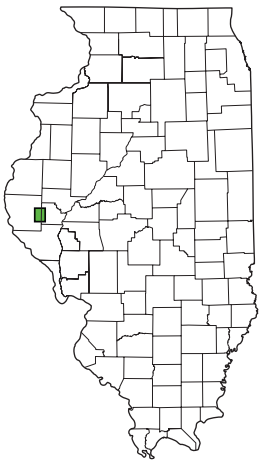

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Structural Geology

The Kellerville Quadrangle is located in eastern Adams, western Brown, and northern Pike Counties, Illinois. It occurs a few miles east of the crest of the north-south trending Mississippi River Arch. Regional dips average 8 feet per mile to the east (Howard 1961), but local flexures have produced structures which often obscure this regional dip.

The most prominent structural feature in the region is the Fishhook Anticline (Meents 1958, Howard 1961), which is about 8 miles long and trends east-southeast. It is located south of the Kellerville Quadrangle on the adjacent Fishhook Quadrangle. An irregular structural terrace occurs on the northeast flank of the Fishhook Anticline in the Kellerville Quadrangle. This terrace is about 250 feet lower than the crest of the anticline and trends in the same east-southeast direction through the central and southeastern portion of the Quadrangle. There is some closure on this terrace (see economic geology below) with oil accumulation in what is known as the Kellerville and Siloam pools (Meents 1958, Howard 1961). The remainder of the quadrangle (roughly the north half) is structurally lower and generally flat compared to the structural terrace at the Kellerville and Siloam pools.

Economic Geology

Oil and Gas Resources

Oil and gas production in the Kellerville Quadrangle occurs on the structural terrace on the northeast flank of the Fishhook Anticline. The initial discovery well for the Kellerville Pool (Adams and Brown Counties T1S & T2S, R5W) in 1959 was drilled by Ray Starr on the Wendell Doole farm in the NE NE NE Sec. 11, T2S, R5W, Adams County. The well was completed in porous Silurian dolomite at a depth of 639 feet with production of 3 barrels of oil per day. The Kellerville pool was extended 1.25 miles to the northeast in August (1959) by C. Arthur Beckman (no. 1 Pierce) in the SE SE SW Sec. 36, T1S, R5W. This well produced from the same Silurian dolomite at 651 feet with a production of 10 barrels of oil and 80 barrels of water per day. Further extensions of the Kellerville pool occurred at later dates. The Vernon Allen Community no. 1 well was drilled by Mike Callihan midway between the discovery well and the no. 1 Pierce well in the SW SW NW Sec. 1, T2S, R5W. Upon completion, this well produced 10 barrels of oil and 60 barrels of water per day from a depth of 634 to 635 feet in the Silurian. Ray Starr drilled the no.1 C.A. Hendricks well in February of 1960 in the NE NE NW Sec. 2, T2S, R5W, which upon completion produced 200 barrels of oil per day from a depth of 639 feet in the Silurian.

By the end of 1960, the Kellerville pool had produced over 53,000 barrels of oil from twenty-two wells: all but about 2,000 barrels of this amount came from four wells. Annual production from this pool was about 24,000 barrels per year in the early 1960's (Howard 1961). By 1988, 81 wells were producing from the Kellerville pool (Huff 1988). As of 1988, production was averaging 4,100 barrels per year (Huff 1988).

The Siloam Pool (T2S, R4W, Brown County) in this quarangle was discovered in October 1959 by Charles Eager (W. L. Davis farm) in the SE SW SE Sec. 8, T2S, R4W, Brown County. Initial production was about 120 barrels of oil from porous Silurian dolomite at a depth of 634 feet and, upon completion, this rose to 530 barrels per day. Offset wells in the Siloam Pool produced 70 to 300 barrels of oil per day (Howard 1961). The Siloam Pool was extended to the east of the Kellerville Quadrangle in May 1960 with the Henry Bush no. 2 well in the NW NW NE Sec. 16, T2S, R4W. It produced 24 barrels of oil per day from a Silurian dolomite pay zone at 664–668 feet. Another extension of this pool to the east of the quadrangle occurred in May 1960 in the NE NW SW Sec. 9, T2S, R4W, when the no. 2-P well was drilled by T. W. Pannel on the Kenneth Lee property. Initially, this well produced 500,000 cubic feet of gas and 100 barrels of oil per day. After completion, it produced 70 barrels of oil and 20 barrels of water per day from the Silurian at the 671 to 676 foot interval.

Eight wells in the Siloam field accounted for most of the 96,000 barrels of oil produced by the end of 1960 with an annual production of 27,600 barrels (Howard 1961). As of 1988, oil production was significantly reduced to 6,100 barrels per year (Huff 1988). There were 35 producing wells in the Siloam pool by 1988 (Huff 1988). To date, cumulative production has totalled some 312,500 barrels for the Kellerville Pool and 301,500 barrels for the Siloam Pool.

The pay zone for oil production in both the Kellerville and Siloam pools is in the Silurian Kankakee Formation. The combined thickness of the Silurian Kankakee and Edgewood Formations averages some 11 to 15 feet in the area, but in the Siloam pool they thicken to 25 to 28 feet. A maximum thickness of 53 feet was reported in the SE NE SE Sec. 8, T2S, R4W. The Devonian carbonates are absent over most of the oil pools and the Devonian-Mississippian Kinderhook-New Albany rests directly on the Silurian Kankakee Formation (Howard 1961). A few miles to the west, the Silurian carbonates have been removed by erosion, and the New Albany rests directly on the Maquoketa Shale.

The Kankakee pay zone is a vuggy and, in places, cavernous, slightly fossiliferous dolomite that occurs in the lower half of the formation. This zone is typically about a foot or two above the underlying Maquoketa Shale. Thicknesses of the pay zone are erratic but the maximum thickness is about 7.5 feet (Howard 1961). Although located on a structural shelf or terrace, secondary porosity seems to be the dominant factor in controlling oil and gas productivity (Howard 1961). Some of the structurally highest areas on in the Kellerville and Siloam pools had dry holes, indicating a lack of porosity. Oil and gas occur in the higher parts of the porous lenses at the base of the Kankakee Formation (Howard 1961).

Limestone Resources

Middle Mississippian rocks and high-calcium limestone in western Illinois that are potential sources of construction aggregate include the Burlington, Keokuk, Warsaw, Salem, and St. Louis Formations (Harvey 1964, Goodwin and Harvey 1980, Cloos and Baxter 1981). Several quarries and underground mines operate in the Burlington-Keokuk elsewhere in Adams County and in several neighboring counties.

The Burlington and Keokuk Limestones are light gray, cherty crinodal limestones with some high-calcium limestone intervals. In most areas in the quadrangle, the Burlington-Keokuk occurs 150 to 250 feet below the Quaternary sediments, and thus it is buried too deeply to be accessible for surface mining at the present time. The Burlington-Keokuk forms the bedrock floor beneath alluvium along McKee Creek in the southeastern part of the quadrangle. Here, and in other areas where the overburden is thin, the combined Burlington-Keokuk, upper Warsaw-Salem, and St. Louis Limestones provide roughly 300 feet of continuous limestone resource potential for major quarrying operation.

The Warsaw Formation, which is widely present in the quadrangle, overlies the Keokuk Limestone. The Warsaw is divisible into two units (Lasemi et al. 1999): a lower, shale-dominated interval (the lower Warsaw) and an upper, carbonate-dominated interval (the upper Warsaw). In west-central and northwestern Illinois and southeastern Iowa, the upper Warsaw may contain dense bioclastic dolomite that is a source of good quality construction aggregate (Lasemi et al. 1999).

The lower half of the Warsaw in the Kellerville Quadrangle is characterized mostly by geode-bearing, greenish-gray siltsone, silty mudstone and silty shales interbeded with thin argillaceous limestone (grainstone to packstone). During mapping of this quadrangle and the adjacent Fishhook Quadrangle, economically significant carbonate strata in the upper part of the Warsaw Formation were found. These carbonates are best exposed in roughly the southern one-third of the quadrangle along McKee Creek, Missouri Creek, and adjacent tributaries due to the general rise of strata (to the southwest) and deep stream dissection. Along these streams, the upper Warsaw contains 10 to 30 feet or more of dolomitic, slightly sandy, fossiliferious limestone that is greenish gray, but typically weathers grayish orange to grayish yellow orange in color. In some areas along McKee Creek, the upper Warsaw carbonate strata form large cliffs or bluffs over 30 feet high, consisting of one or two massive carbonate ledges interbedded with greenish gray shale. In other areas, these ledges grade into a thinner, argillaceous, fossiliferous limestone beds (grainstones to packstones) similar to those seen in the lower part of the formation. Locally, the upper Warsaw carbonate may be eroded, allowing the overlying St. Louis to rest directly on the lower shaley part of the Warsaw.

The Warsaw carbonate beds (limestone and dolomitic limestone), in places, are of sufficient quality for most construction purposes. However, because of their limited thickness and distribution, these strata will not be a major source of construction aggregate, except for local use in moderate or small size quarrying operations. Also, the upper Warsaw carbonate beds, when present at or near the surface, are weathered and relatively soft for most construction purposes. However, in areas of relatively thick Salem-St. Louis, the upper Warsaw carbonates are less weathered and the quality improves significantly. In many areas, the upper Warsaw may contain dense dolomite beds that are suitable for high-quality construction aggregate.

Other potential aggregate resources in the region include the limestone and dolomite of the Salem and St. Louis Limestones. However, the Salem is generally thin or absent in the quadrangle, and the St. Louis occurs only sporadically due to pre-Pennsylvanian erosion.

The St. Louis Limestone is characterized by light- gray to gray-brown microcrystalline limestone and dolomite that weathers yellow-gray to tan, with scattered interbeds of green shale. It also contains some beds of evaporites such as gypsum and anhydrite in the subsurface; in outcrops these layers have been dissolved and overlying limestones are typically collapsed into brecciated zones (Collinson et al. 1954, Lasemi et al. 1999). The St. Louis may represent only a marginal source of aggregate for local use in the areas of the Kellerville Quadrangle where it is best developed. The St. Louis is best exposed along the southern reaches of Little Missouri Creek (east half of Sec. 17, T2S, R4W, Brown County), where it is up to 20 feet thick, and Walnut Fork Creek (eastern half of Sec. 5, T2S, R5W, Adams County) where it is 20 to 30 feet thick. Elsewhere, the St. Louis is thinner and very discontinuous due to erosion at the Mississippian-Pennsylvanian unconformity. Subsurface mapping shows that the formation is thickest in parts of Sections 9-11, and 14-16, T2S, R5W.

The Burlington-Keokuk, Warsaw, Salem and/or St. Louis combined could provide significant amounts of construction aggregates for maintaining local and state transportation infrastructure. The aggregate resources are being lost to urbanization in rapidly developing regions such as the St. Louis Metro East or Quincy areas. The currently underpopulated areas such as west-central Illinois (e.g., Kellerville Quadrangle) could become exploration targets for these valuable resources that are needed to maintain infrastructure in the rapidly developing regions.

Clay Resources

Beds of gray, fine-grained, non-laminated claystone, which range in thickness from a few feet to over 15 feet, occur directly beneath the Colchester Coal in the top of the Tradewater Formation, which rests unconformably on the Mississippian strata. The basal part of the claystone is often sandy and grades laterally into a sandy claystone to a sandstone that

thickens into 10 to 30 foot channels that were cut into the underlying Mississippian strata along the irregular unconformity surface.

On the Mississippi River Arch, where the Tradewater is very thin due to long periods of erosion or non-deposition, the claystone below the Colchester Coal represents a multiple stacked paleosol. The characteristics of this claystone (named Cheltenham Clay by Willman et al. 1975) are of potential interest in the production of a number of ceramic products.

These clays were referred to as "stoneware clays" by White (1963). According to White, these clays and some associated shales in this area are buff-burning. He noted that the clays in this interval have a set of consistent physical properties that enhances their utilization in ceramic work. He sampled this claystone interval just a mile to the west of the Kellerville Quadrangle (on the Liberty Quadrangle, NE SW NE Sec. 18, T2S, R5W, Adams County) and found them to be largely of this character. The clays are noted to be suitable for the manufacturing of drain tile, fillers, flower pots, flue liners, pottery, low heat-duty refractories, sewer pipe, stoneware, structural clay products, and terra cotta. Mapping of the Tradewater interval below the Colchester Coal has revealed many occurrences of this claystone on the Kellerville Quadrangle. It is possible that some of these Tradewater claystones might yield commercial deposits. However, no such development has yet occured.

White (1963) noted that shales and clays of the Carbondale Formation in western Illinois (above the Colchester Coal) are all red-burning in character. These shales and clays could be used in the manufacture of a number of ceramic products, including drain tiles, flower pots, pottery, sewer pipes and structural clay products.

Coal Resources

The Colchester Coal was the most prominent coal found and the only one actually mapped on the quadrangle. The younger Houchin Creek Coal was recognized in a few locations below the Hanover limestone, but not enough was present to be mappable. The Colchester was mapped in the southwest half of the quadrangle where deep stream dissection and the gentle dip of the bedrock to the northeast have resulted in numerous exposures. The coal is quite thin, averaging only about 18 inches in thickness. Although many small mines were operated for local consumption by farmers and landowners, there has been no large-scale coal mining operations in the quadrangle. The coal is overlain by a marine black shale (the Mecca Quarry Shale Member) and associated limestone beds (probably the Oak Grove Limestone Member?). The sulfur content of the coal is high (> 3%), primarily due to sulfur contributions from the seawater that deposited the overlying marine rocks. Reinertsen (1964) reported a sulfur value of 3.9% for the Colchester Coal from a sample of the coal taken from a mine in Adams County. The coal also has a low heating value (marginal subbituminous to bituminous). These factors together with an average thickness of 18 inches, make it unlikely that the Colchester Coal will have much economic potential in the near future.

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