Title: The Maquoketa Shale

Location: Oakfield Brick Plant, Oakfield, Wis.
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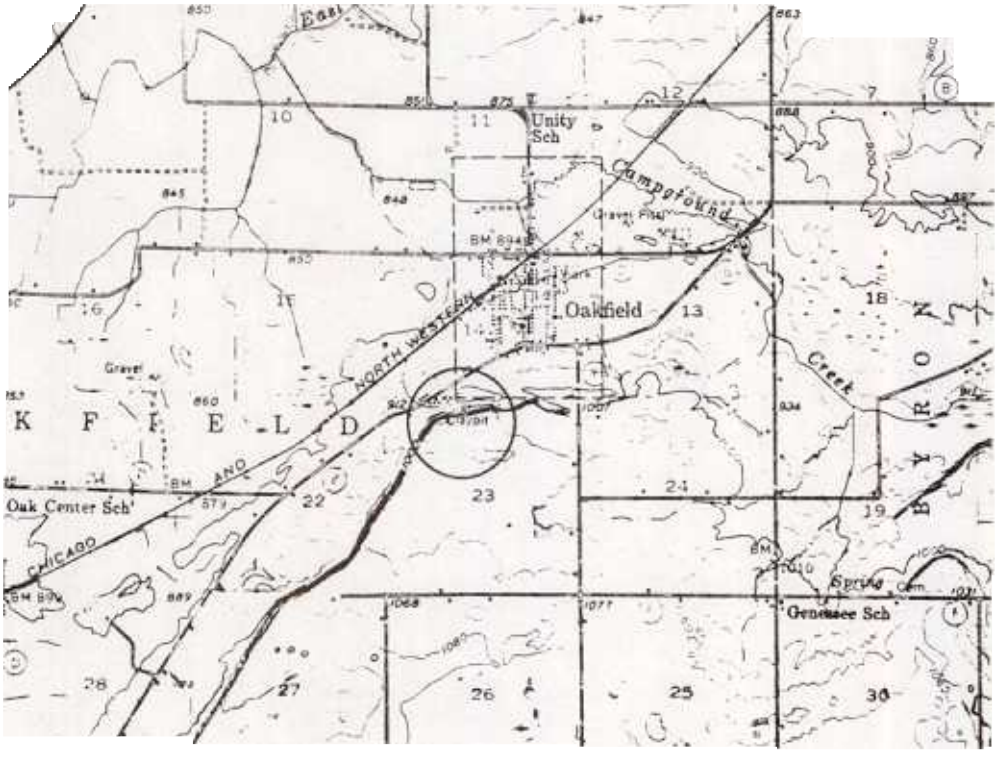

Author: Gene L LaBerge (modified from Gutoski, 1976, and Gavin, 1976)

Description: The Maquoketa Shale was named from exposures along the Little Maquoketa River about 12 miles west of Dubuque, Iowa, by White (1870). In the type area it is a blue or gray dolomitic, silty, fissile shale with some gray-buff, medium grained, argillaceous dolomite layers and lenses. It ranges in thickness from 108 to 240 feet. The Maquoketa was subdivided into three members by Templeton and Willman (1963). They are, in ascending order, the Scales (shale), the Fort Atkinson (dolomitic), and the Brainerd (shale) members. The Scales is approximately 100 feet thick, the Fort Atkinson about 40 feet, and the Brainert about 100 feet thick. The Maquoketa is very fossiliferous locally with Late Ordovician brachiopods, bryozoa, graptolites, trilobites, and conodonts.

This quarry exposes 22 feet of the Fort Atkinson member and 35 feet of the Scales member. The Scales member forms the main exposure and is typical of the formation. It is a soft, fissile, thin bedded, dark gray shale, weathering light gray to tan. The Scales is very pure here, containing dominantly clay minerals, hence the feasibility of a brick plant. Fossils are not generally abundant, but the upper few feet of the

Scales contains well preserved brachiopods and bryozoans. The gradational contact between the Scales and the overlying Fort Atkinson is exposed in the excavated ledge at the northeast end of the pit.

The Fort Atkinson member consists of tan-colored, thinly beeded, medium- to coarse-grained argillaceous dolomite layers interbedded with gray shaley layers. Numerous lenses and pods of clay are contained in the dolomite which appear to be "rip-ups" of shale incorporated in the dolomite, possibly formed when storm waves stirred up the bottom. Fossils are abundant in the dolomite, but are poorly preserved.

The Maquoketa Shale is used for the manufacture of bricks by the Oakfield Brick and Tile Company. The shale is blasted from the walls, crushed to a fine size, and screened. The fine powder is then mixed with water in a "pug mill" and extruded through a rectangular opening the size of bricks. It is cut by a wire into "slabs" the thickness of bricks and placed on pallets. The raw bricks are dried in the drier tunnels for about 72 hours at 400°C to drive all excess water off the bricks. They are then fired in the bee hive kilns at 1800°F (for building brick) or 2200°C (for facing brick). The firing converts the hydrous clay minerals to anhydrous oxides. The relatively high lime content of the Maquoketa ($\pm$15% CaO) results in buff-colored bricks.

The prominent ridge south of the quarry is the late Early Silurian Mayville Dolomite of the Niagara Escarpment. The Maquoketa exposed here was protected from erosion by the capping of resistant dolomite.

Significance: The Maquoketa Shale is the result of two phenomena: 1) major tectonic activity in the northern Appalachian geosyncline, and 2) major transgression of the epeiric seas over the continent. Throughout the Late Cambrian and Ordovician, the seas advanced and withdrew from Wisconsin at least five times (as we will see later). Evidence from sediment distribution patterns suggests that Wisconsin was a land area during much of the time. However, during Late Ordovician time, the seas had transgressed over almost the entire continent. It was during this maximum transgression that the Maquoketa Shale was deposited.

The Late Ordovician was also the time of the first major deformation of the eugeosynclinal portion of the Appalachian geosyncline, called the Taconian Orogeny. The deformation elevated parts of New England above sea level and exposed the sediments to erosion. Streams flowing westward off the Taconic Mountains carried great volumes of sediments into the shallow seas covering the interior of North America. This produced a large delta and alluvial plain of sediments to the west known as the Queenston Delta. Although the sand and silt were deposited mainly in New York and Pennsylvania, the finer muds were carried as far west as Iowa. Thus, the Maquoketa Shale is at the western end of a large delta extending westward from New York.

The Maquoketa Shale has been very important in shaping the topography of eastern Wisconsin. It is easily eroded, but is underlain and overlain by resistant dolomites. The removal of the Maquoketa by pre-glacial streams and Pleistocene glaciers has produced a broad lowland extending

from Green Bay through Lake Winnebago and Horicon Marsh down the Rock River Valley to Illinois. The lowland is nearly 20 miles wide and is underlain by the Galena Dolomite of the Sinnippee Group. On the east the lowland is bounded by the prominent Niagaran Cuesta formed by the Silurian dolomites.

South of the brick plant, a road leads to an abandoned dolomite quarry that affords an excellent view of the lowland. The terminal moraine of the Valders(?) ice lies just north of Oakfield.

References:

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