

AREAS RECOMMENDED FOR TIGHT FORMATIONS  
IN WIRT, ROANE AND CALHOUN COUNTIES,  
WEST VIRGINIA

West Virginia  
Tight Formation Committee's Report  
January 1983

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## INTRODUCTION

This report of the West Virginia Tight Formation Committee covers Wirt, Roane and Calhoun Counties, West Virginia. Sandstones recommended by the committee for qualification as tight formations are described in the first section of this report under "Geographical and Geological Descriptions."

The second section, "Geological and Engineering Data," describes the types of data used in making these recommendations. The Committee's recommendations are based on calculations of expected in-situ permeabilities and/or natural production rates of gas and oil, as outlined in the Federal Energy Regulatory Commission's (FERC) Order No. 99 for tight formations. The Committee also addresses the requirement of protecting fresh water aquifers before setting forth its final recommendations in a concluding section.

cannot differentiate between the "Big Injun" and "Squaw"; therefore, production from the "Squaw" sandstone may be recorded as "Big Injun" and is included with it on the Tight Formation Map (Plate 6).

4. The Berea Sandstone is the basal unit of the Lower Mississippian Pocono Group. It usually underlies a dark gray to black shale named the Sunbury or "Coffee Shale" (drillers' terminology) and overlies the thick Devonian shales.

Lithologically the Berea is generally a light gray, very fine-grained sandstone. The grain shape is angular to subangular and sorting is fair. The Berea is slightly argillaceous and slightly calcareous and ranges from loosely to tightly cemented.

Geometrically, it is an elongated sand body that trends northeasterly, and underlies the northern portions of Roane and Calhoun Counties. It probably formed as a shallow marine bar sand or as a channel sand in the delta system.

In a core from Calhoun County (permit number 2846) the Berea contains pebbles and conglomerate. Its porosity ranges from 4.2% to 11.7% and its thickness is 19 feet. A Roane County (permit number 2081) core section shows a porosity range of 4.4% to 13.7% and a thickness of 14 feet.

5. The "Gantz" and Gordon sandstones are of Late Devonian age with the "Gantz" being the uppermost sandstone of Devonian age. The "Gantz" underlies the Berea Sandstone, when the Berea is present; otherwise, it underlies shales of the Pocono Group. In some areas the Gantz is absent and a green-gray shale occupies its position.

Lithologically the "Gantz" is a slightly calcareous, argillaceous, green-gray sandstone with interbedded siltstone. The "Gantz" thins from east to west across the northern part of the study area, and also across the south-central portion. Its thickness ranges up to 60 feet, within an average of 40

of less than 0.1 md. Therefore, an average porosity of 9.6% (Table 11) for the "Big Injun" and "Squaw" interval in the area under consideration is associated with a permeability of less than 0.1 md.

Geophysical logs were unavailable for these wells; therefore, no comparison could be made between measured core porosities and log-calculated porosities. The assumption was made, however, on the basis of previous Tight Formation reports, that calculated log-derived porosities may be used, where cores are unavailable, to determine permeability less than 0.1 md.

Referring to the "Big Injun" and "Squaw" Tight Formation map (Plate 6), fields with an average log-calculated porosity of less than 9.6% will qualify as tight formation fields, providing that natural open flows do not exceed FERC guidelines. Encircled areas on this map were disqualified on the basis of: a) wells with natural initial open flows exceeding those allowed by FERC regulations, and b) wells with oil production exceeding 5 barrels per day as allowed by FERC regulations. Furthermore, areas where porosity is greater than 9.6% do not qualify for tight formation designation. All other areas qualify for Tight Formation designation.

#### Berea Sandstone

Two cores were analyzed, the Pennzoil no. 6 S.P. Hickman (permit Calhoun 2846) located in the Richardson oil field, Lee District, Calhoun County, West Virginia, and the Pennzoil no. 5 H.W. Allen (permit Roane 2081) located in the Liverpool oil field, Roane County (Fig. 2). Plots of permeability versus porosity (Fig. 10 and 11) show that a porosity of 8.8% for Roane 2081 is associated with less than 0.1 md permeability, and a porosity of 9.5% for Calhoun 2846 is associated with less than 0.1 md permeability.



Geophysical logs for these two wells were unavailable for log plots; therefore, no comparison was made between measured core porosities and log-calculated porosities. The assumption was made on the basis of previous Tight Formation reports that calculated log-derived porosities may be used, where cores do not exist, to determine permeability less than 0.1 md.

Please refer to the Berea Sandstone Tight Formation map (Plate 7). Fields with an average log-calculated porosity of less than 9.2% (Table 12) will qualify as tight formation fields, providing that the natural open flow rate does not exceed the allowed flow rate per FERC regulations. Encircled areas on this map were disqualified on the basis of: a) wells with initial open flows exceeding those allowed by FERC regulations, and b) wells with oil production exceeding 5 barrels per day as allowed by FERC regulations. Areas where porosity exceeds 9.2% in the Berea Sandstone do not qualify for tight formation designation. However, no logs were available to calculate and utilize these data. All other areas qualify for Tight Formation designation.

#### "Gantz" and "Gordon" sandstones

No cores were available from wells penetrating the "Gantz" and "Gordon" sandstones; thus, none were analyzed for permeability versus porosity plots.

This pay sand qualifies for tight formation designation because natural initial open flow rates of wells penetrating this interval do not exceed rates versus depth allowed by FERC regulations.

Refer to the "Gantz" and "Gordon" Tight Formation map (Plate 8). Encircled areas on this map are disqualified on the basis of wells with oil production in excess of 5 barrels per day as allowed by FERC regulations. All other areas on this map qualify for tight formation designation.

