UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Technical Letter
Dribble-10
January 8, 1962

Federal Center, Denver, 25, Colorado

Mr. J. E. Reeves
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Dear Mr. Reeves:

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TECHNICAL LETTER: DRIBBLE-10

SUBSURFACE CONTOUR MAPS OF MAJOR REFLECTING
HORIZONS IN THE VICINITY OF TATUM DOME,
LAMAR COUNTY, MISSISSIPPI

By

R. A. Black and W. S. Twenhofel

January 8, 1962

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Sincerely yours,

W. S. Twenhofel

W. S. Twenhofel
Program Supervisor, Dribble
Special Projects Branch

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By

R. A. Black and W. S. Twenhofel

Tatum salt dome, Lamar County, Mississippi is the proposed site for a series of underground nuclear tests, code name Dribble, in the Vela Uniform program for the improvement of means of detecting underground explosions. The dome was the site of a seismic reflection survey made in 1960 by the Humble Oil and Refining Company as a part of their oil exploration program. The magnetic tapes from the seismic survey were made available to the U. S. Geological Survey on a "Company Confidential" basis to assist in the evaluation of Tatum Dome as a site for the Dribble experiments. The location of the seismic traverses and shot points are shown in figure 1.

The magnetic tapes were replayed, weathering and elevation corrections were made from up-hole times and survey data, and normal move out corrections were made, using the linear velocity function $V_Z = 6100 + 0.7Z$. This velocity function was derived from velocity surveys of five wells in the vicinity of Tatum Dome and has since been verified by a study of ten additional velocity surveys made in wells within a 25-mile radius of Tatum Dome (Black, R. A., and Balsinger, D. F., Technical Letter: Dribble 11, Nov. 1961). Paper

records were made from the corrected magnetic tapes, using a low cut filter of 36 cycles per second and a high cut filter of 50 cycles per second, fast acting automatic gain control, and a bi-lateral mix of 20-60-20 percent. The records were picked and cross-sections were prepared for each of the seismic traverses shown in figure 1. The reflection events with steep dips were migrated, using curved ray paths, to their correct position along the traverse line. From these data an interpretation was made of the size and shape of the salt core to a depth of 5,000 feet, (Black, R. A., and Twenhofel, W. S., Technical Letter: Dribble-1, June 1961).

Definition of the structure of the sedimentary rocks surrounding Tatum Dome is of particular importance to the hydrologic studies being made to ascertain possible contamination problems. There are at least four reflecting horizons that can be identified and traced on the seismic records for the traverses shown in figure 1. These reflections were used to prepare the sub-surface structure contour maps shown in figures 2-5.

The structure contours shown in figure 2 are on a reflecting horizon in the Vicksburg group. Figure 3 shows structure contours from a reflection horizon in the Cook Mountain formation, also known as the "Camerina" limestone. The reflection horizon shown in figure 4 is in the Winona-Tallahatta sequence, undifferentiated, and figure 5 shows a reflection horizon in the middle Wilcox group. The reflections were identified by comparison of the reflection contour maps with lithologic and geophysical logs of the Humble Hibernia Bank and the Shell Hibernia Bank wells and Hydrologic Test Wells 1 and 2 shown on figures 2-5.

Continuous velocity logs for the Humble Hibernia Bank well and Hydrologic Test wells 1 and 2, show velocity discontinuities that correlate with the reflection horizons shown in figures 2-5.

Figure 2. Structure contour map of reflecting horizon in Vicksburg group, Tatum Salt Dome, Lamar County, Mississippi

Figure 3. Structure contour map of reflecting horizon in the Cook Mountain formation, Tatum Salt Dome, Lamar County, Mississippi

Figure 4. Structure contour map of reflecting horizon in Wilcox-Tallahatchee undifferentiated, Tatum Salt Dome, Lamar County, Mississippi

Figure 5 Structure contour map of reflecting horizon in Middle Wilcox group, Tatum Salt Dome, Lamar County, Mississippi