

# SHORT RESUME OF THE WILCOX EXPLORATION PROGRAM OF NORTHEAST MEXICO

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**GENERAL.** The surface Wilcox outcrop of Northeast Mexico has been known and studied for many years and not until recently have sediments of this age been the objective of subsurface exploration by Petroleos Mexicanos.

Much has been written in regard to the Wilcox or Indio, as it has been locally known, with reference to its surface expression and geologic history but little was known of its subsurface characteristics.

In regard to its surface outcrop, the general description is of sediments of marginal marine, deltaic and lacustrine origin with rapid downdip changes in sand percentages: large sand percentages on the outcrop decrease greatly downdip.

Unfortunately the data obtained from well cuttings has thrown little light on our ability to subdivide the Wilcox into its different subsurface members or stages and detailed paleontological studies are underway which in the near future should establish these divisions. The faunal assemblages are very poor and only the following foraminifera have been identified for the Wilcox: *Siphonina wilcoxensis*; *Robulus wilcoxensis*; *Anomalina umbonata*, *Globorotalia wilcoxensis*, *Nonionella wilcoxensis* and *Globorotalia brodermanni*.

The top of the underlying Midway stage or group, as it is diversely called, is identified by the following foraminifera: *Vaginulina longiforma*, *Clavolinoides midwayensis*, *Cristellaria subaculeata* var. *tuberculeata*, *Marginulina subaculeata*, *Globorotalia membranacea*, *Marginulina tuberculeata*, *Globigerina pseudo-bulloides*, *Bulimina trihedra*, *Eponides elevatus* and *Robulus midwayensis*.

The maximum amount of Wilcox sediments drilled was 1560 meters (5118 feet) in the Azucar No. 1 well. Samples obtained from the Pato, Ceniza, Culebra, Ebanito, Azucar, Troncon and Mier wells indicate a marine environment with a predominantly shale section. These shales are light grey, dark grey, dark brown and only slightly sandy; the sands are grey, well consolidated to compact, calcareous, fine-grained with some pyrite inclusions.

The shales and sands obtained from the wells in the Nuevo Laredo area are typical Wilcox; they are heavily loaded with lignite indicating deltaic or lacustrine environment and the sands make up a major percentage of the sediments.

**AREA OF PRODUCTION AND FUTURE EXPLORATION.** On the accompanying map (Fig. 1), the area of near future Wilcox explorations to the west and northwest of Reynosa has been indicated by the exploratory wells drilled. Another future area is indicated above and below Nuevo Laredo in the same manner.

Within the area to the west and northwest of Reynosa in what is locally known as the Pena Blanca area, Petroleos Mexicanos has drilled and discovered gas on four prospects: Culebra, Pato, Ceniza and Ebanito and is currently drilling the fifth, Florida. To the north, in the Marte R. Gomez (Azucar) Dam area, three prospects have been drilled: two producers, Azucar and Mier; one dry, Troncon; and a fourth, Arcos, is now rigging up. The deepest of these, Mier No. 1, was drilled to a depth of 3100 meters (10,170 feet).

In the Nuevo Laredo area, four wells have been drilled through the Wilcox on the Toro, Vidrios, Tepeyac and Novillo prospects with no commercial results. It must be understood that the last two prospects were primarily Cretaceous tests to the Edwards and will be tested again in the future.

As a result of our seismic, gravity, surface geologic and subsurface geologic interpretations, twenty-one wells have been drilled on twelve prospects, six of which prospects were proven unsuccessfully and it may be assumed that as a result of reinterpretation of data more Wilcox tests will be drilled on these six latter prospects.

Of the twenty-one wells drilled, nine are Wilcox producers and three are Mount Selman producers (Mier and Azucar).

**STRUCTURE.** The wells drilled have been located on seismic and surface geology closures, and as stated, twelve prospects have been drilled and another twenty-five are still to be programmed.

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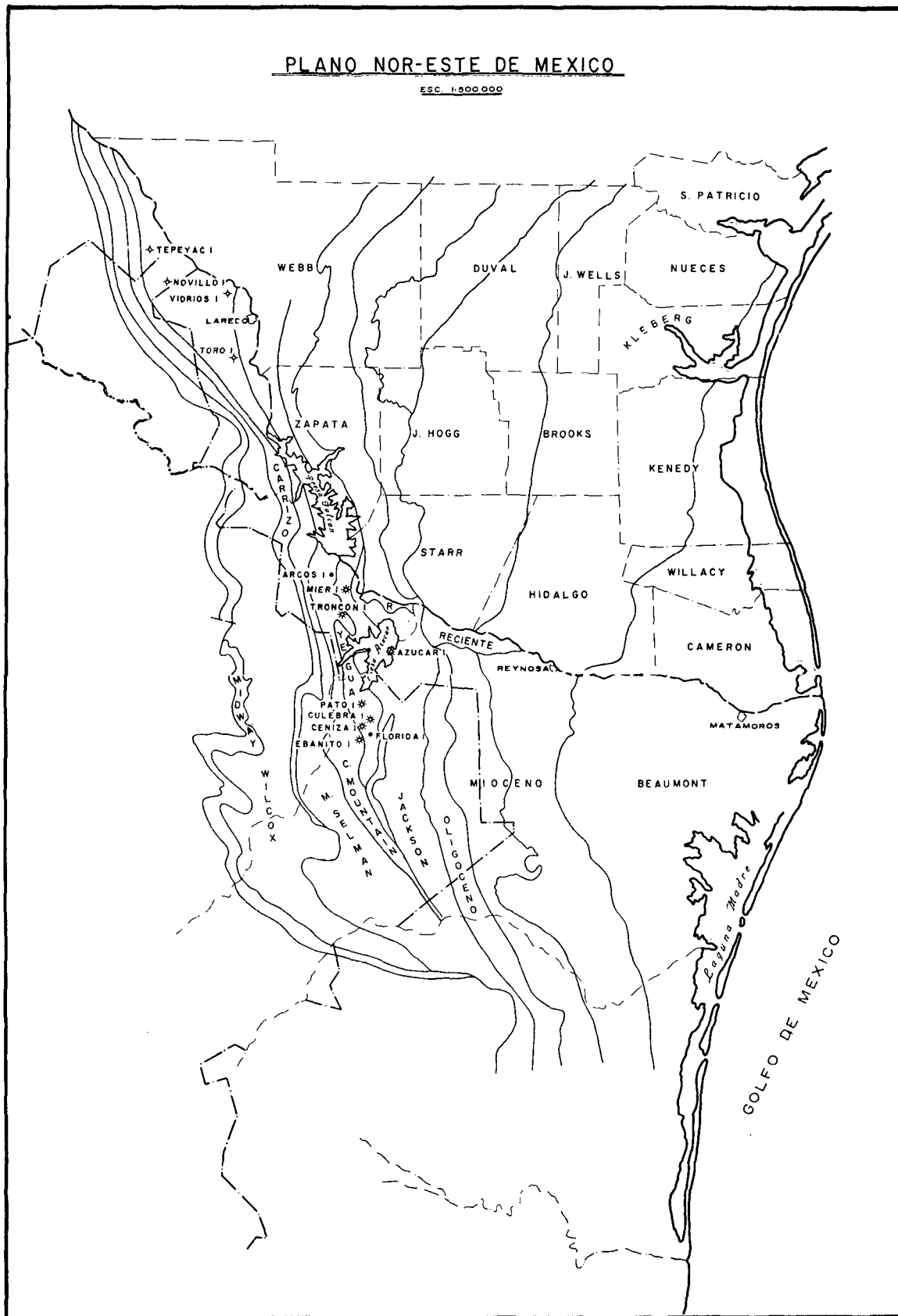


Figure 1. Map of Northeast Mexico.

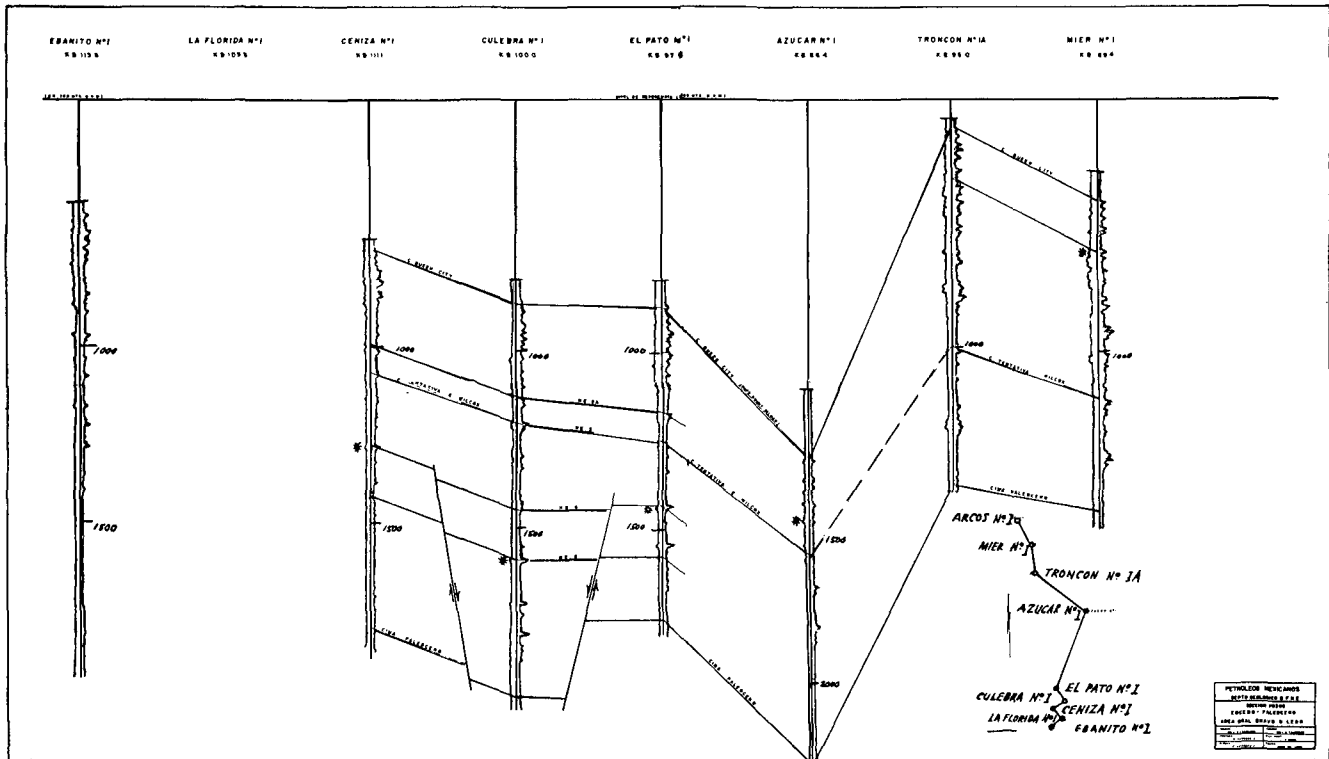


Figure 2. Well Log Cross Section, Eocene-Paleocene, Gral. Bravo Area, Nuevo Leon, Mexico.

The structures are indicated as closures of 100 to 150 feet, both on the seismic and surface features and are complicated by strike and dip faults and some indication of stratigraphic trapping is evident.

A section from the Mier well on the north to the Ebanito well on the south (Fig. 2) indicates the general sand development of the Wilcox as known to date and some of the faulting as ascertained from well data. It is as yet premature to conjure as to the age and origin of these faults, but it may be assumed that they will be normally down-to-the-coast, with longer sections on the downthrown blocks indicating growth of the faulting during sedimentation.

**PRODUCTION.** The nine producing wells in the Wilcox have the following daily gas production: 578,963 cubic meters (20,466,279 cubic feet). The most productive well, Culebra No. 1, produces 107,801 cubic meters (3,807,496 cubic feet) and the least productive, Pato No. 1 produces 17,000 cubic meters (600,355 cubic feet). The recovered rate of distillate averages 1.5 cubic meters (9.43 barrels) per million.

Permeabilities vary from 1.3 to 98 millidarcys and porosities from 6.3 to 29.5%. The sands are usually fractured with 18 to 20 barrels of Mor-Flo with a breakdown pressure of 217 Kg/cm<sup>2</sup> (3,100 lbs.), an initial injection pressure of 308 Kg/cm<sup>2</sup> (4,400 lbs.) and a final injection pressure of 189 Kg/cm<sup>2</sup> (2,700 lbs.).

Development of the existing fields will continue both horizontally and vertically and detailed seismic and geologic work will be carried out in areas of particular interest along the trend.