

THE SOUTH COPANO BAY FIELD
ARANSAS COUNTY, TEXASLeonard C. Bryant¹ABSTRACT

An extensive province of Upper and Middle Frio production exists along the Gulf Coast of Texas, and in this province the Melbourne sand is one of the prime reservoirs for oil and gas.

Melbourne production in Matagorda and Calhoun Counties is trapped primarily in closures against the upthrown side of down-to-the-coast faults. In contrast, anticlinal closures, located on the downthrown side of down-to-the-coast faults, form the primary traps through Aransas, San Patricio and Nueces Counties.

A case history of the South Copano Bay field, illustrates basic exploration techniques that are useful in exploring for buried depositional type structures.

INTRODUCTION

The South Copano Bay field, located in Aransas and Refugio Counties, Texas, is an anticlinal feature traversed by depositional down-to-the-coast faults. Production has been established in Upper, Middle, and Lower Frio sands from five distinct fault blocks. Regionally the field is in a fairway of Melbourne production which the writer has traced from Wadsworth field in Matagorda County, southwest to the West Corpus Christi Bay field in Nueces County, a distance of approximately one hundred and twenty five miles.

The Melbourne sand, better known as the "K-2" in the Corpus Christi area, is Oligocene (Nonion struma) in age and is considered to be the top of the Middle Frio section. This paper discusses 1) the relationship of South Copano Bay field to the Melbourne trend, 2) the history behind the fields discovery, and 3) early production history of the field.

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The writer wishes to express his thanks to the Cities Service Oil Company for permission to publish this paper. My appreciation is extended to Mr. Joseph J. Marty, Mr. Joseph R. Finerty, Mr. Robert J. Schrock and Mr. Richard L. Beh for their views and critical analysis of this paper. The author also wishes to thank Miss Virginia Pool for preparing the enclosed illustrations.

REGIONAL GEOLOGY

The South Copano Bay field is located in the prolific Frio trend of the Gulf Coast where the Melbourne sand produces in fields such as Wadsworth, Palacios, Kellers Bay, Olivia, Magnolia Beach, West Rockport and West Corpus Christi Bay (see Figure 1). The Melbourne trend, as illustrated on this map, should be divided into two geological provinces separated by a Vicksburg shale uplift in the central portion of Calhoun County. It is the writer's belief that this uplift caused the numerous up-to-the-coast faults in Calhoun County and altered the normal structural pattern necessary for Melbourne accumulation. The cross hatched area of Figure 1 represents an area in Calhoun and Aransas Counties where Melbourne production is practically nonexistent.

Northeast of the Vicksburg uplift, Melbourne accumulation occurs primarily from closures on the upthrown side of down-to-the-coast faults, while southwest of this uplift, accumulation is found in anticlinal features on the downthrown side of down-to-the-coast faults. These faults in Aransas, San Patricio and Nueces Counties, usually die out prior to Marginulina deposition and consequently maps contoured on this datum are of little value. Exploration is further complicated through these counties by a massive Upper Frio section that causes multiples on conventional seismic. The writer has found that in areas where a massive Upper Frio section is present above the buried structures, conventional seismic seldom finds the dip reversal necessary for accumulation. Such was the case in the South Copano Bay field.

HISTORY OF THE FIELD

In late 1957, with the discovery of Commonwealth field in San Patricio County, the oil industry in South Texas turned toward the Lower Frio trend in hopes of finding major reserves. It was at this time that Copano Bay became an area of interest. A large fault was found at 9840 feet in the Hunt #3 Bankers Mortgage well, located south of Tract 116 in Copano Bay (see Figure 2). A long Frio section in the Sun #1-A State Tract 98 compared to the Sun #1-B State Tract 59 indicated that the fault in the #3 Bankers Mortgage passed between the two Sun wells. At that time these were the only deep wells in the immediate area. A seismic review followed and the combined seismic-subsurface map illustrated in Figure 2 was the end result. Although no west dip could actually be found on the records it was so interpreted on this map due to the magnitude of the fault cut in the Hunt #3 Bankers Mortgage. Three distinctive highs appeared on this map and as a result, a 2481 acre block was purchased at the State Lease Sale in March of 1958.

Following the acreage purchase, several wells were drilled in the area and in December of 1961, Whiffen Estate completed the #1 State Tract 112 as a gas well from perforations 8659-66. This well was located near the top of the structure shown on Figure 2, yet only seven net feet of sand was considered productive. Whiffen Estate followed with a second well in Tract 122 to the south and in January of 1962 it was abandoned as a dry hole.

In May of 1962, a detailed study was made of the Copano Bay area. Four sub-surface maps were prepared using the following datums: top of the Marg, top of the K-2, and two deeper horizons. Replicas of the original Marginulina (Figure 3) and K-2 (Figure 4) maps are shown in this paper. The Marginulina map indicated that southeast dip existed across the Bay with no evidence of faulting. At K-2 depth however, an area of interest stood out centering under the northern half of Tract 114 and the southern half of Tract 95. The down-to-the-coast fault striking NE-SW across Tract 95 was traced southwest to Harvey field where 200 feet of displacement was found at K-2 depth. This was sufficient to cause roll over into the downthrown side of the fault and the first pay sand at Harvey field was found immediately below the K-2 sand. Assuming that 200 feet of throw could be expected in Copano Bay on the K-2 sand, the possibilities of a structure under Tract 114 seemed brighter. Sidewall core shows in the Whiffen Estate #1 Tract 112 at 7418, 8035 and 8042 feet substantiated a shallow prospect in an area where excellent Upper and Middle Frio sands were known to exist.

In early June of 1962, this study was completed and a recommendation was submitted to drill a 9000' test 476' out of the northeast corner of Tract 114. While the recommendation was being sent to the Cities Service management for approval, R. Lacy bottomed a well in State Tract 81 and on June 10, 1962 abandoned it as a non-commercial well. Ironically, the well cut the fault that had been projected across the Bay, and 275 feet of displacement was found slightly above the K-2 sand. The magnitude of this fault cut strengthened the Tract 114 prospect since the fault had over 200 feet of throw at K-2 depth. In September of 1962, Alcoa re-entered the Lacy well and established 75 feet of net gas pay from four Lower Frio sands and thus established the first commercial well on the upthrown side of the fault. Cities Service then approved the Tract 114 recommendation with dry hole commitment from Marathon Oil Company. On October 16, 1962, the Cities Service #1 State Tract 114 was logged at a depth of 8948 feet. Ten gas sands and two oil sands (see Figure 5) were found between 7100 and 8900 feet with 150 feet of net pay.

Development of both the upthrown and downthrown segments followed and Figure 6 represents a present day interpretation contoured on top of the K-2 sand. In comparison with the original K-2 map, the basic structural area has not significantly changed although the field is more extensive than originally mapped. The basic difference is found in the upthrown block which is complicated with faults that were not evident from previous work.

PRODUCTION

Twenty six producing wells have been drilled in the field as of March 1, 1965. Cities Service has production from four different fault blocks and completions in sixteen different reservoirs. As of January 1, 1965, after 18 months of oil production and 12 months of gas production, Cities Service had a total investment of \$4,121,000 in the field, 51% of which was paid out. Eighteen months of oil production amounted to 622,000 barrels of oil plus 1 1/2 billion cubic feet of casinghead gas. Twelve months of gas production amounted to

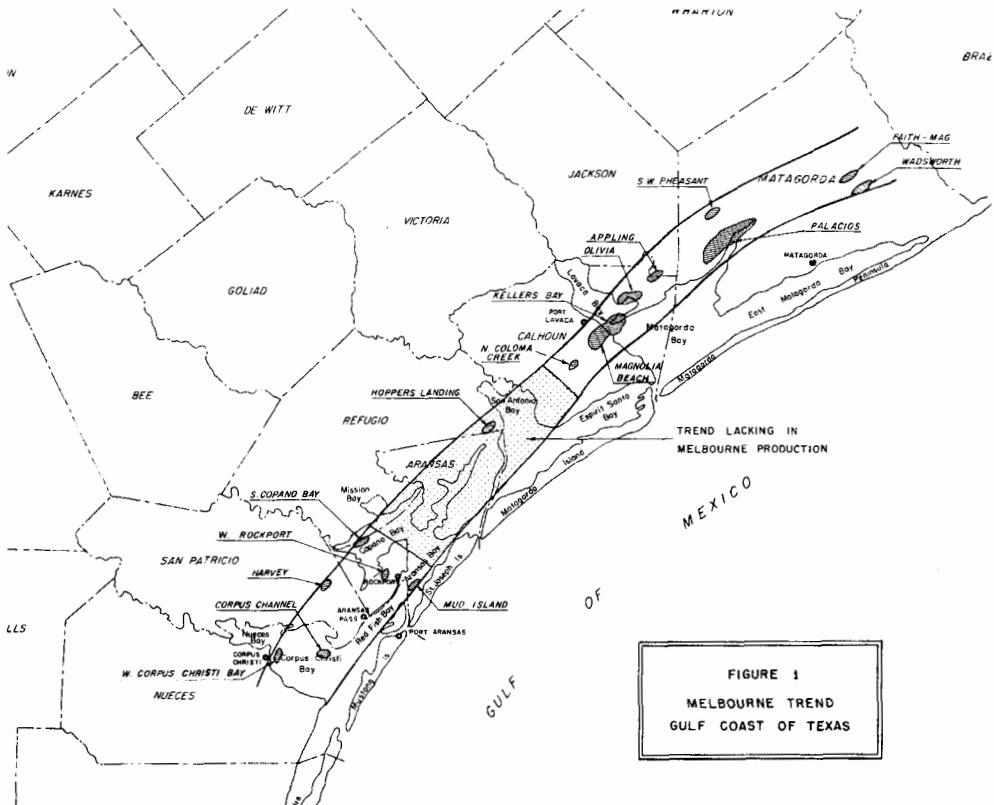
1-3/4 billion cubic feet of gas plus 97,477 barrels of condensate. These figures do not include the Alcoa or British American wells.

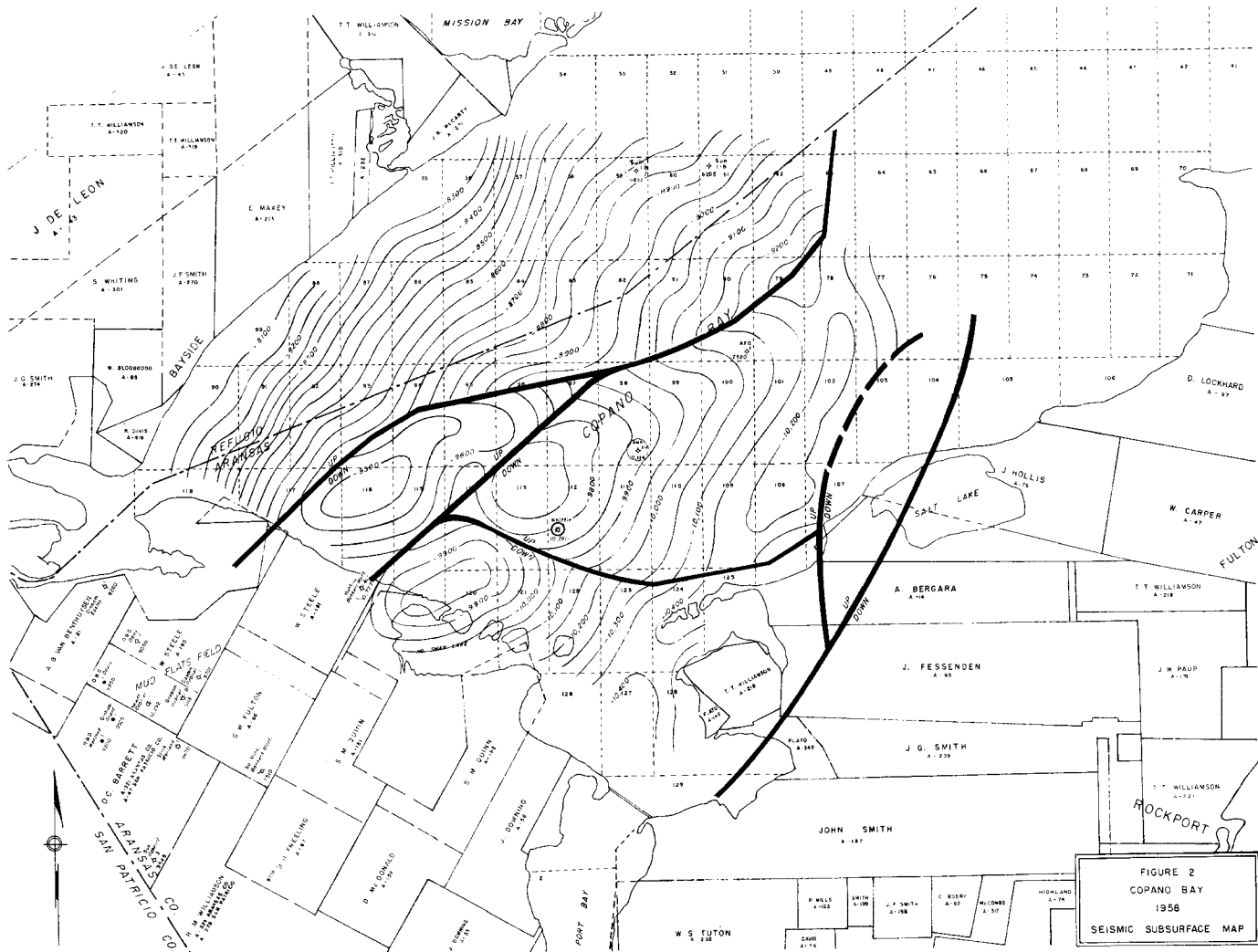
The downthrown anticlinal structure is estimated to contain more than 60% of the reserves in the entire field. The highest well on the downthrown structure has approximately 200 feet of net pay with permeabilities in the Upper Frio sands ranging upward to four thousand millidarcies.

CONCLUSIONS

The K-2 or Melbourne sand produces regionally from Matagorda to Nueces County. It produces from structures that are apparent at the top of the Frio and from buried structures associated with down-to-the-coast depositional faults. Mapping multiple horizons is the best method for locating buried structures. This applies not only to the Melbourne trend but to all areas where shallow structures do not coincide with deeper ones.

The discovery of South Copano Bay field is a prime example where tying seismic information to subsurface information has resulted in the finding of substantial oil and gas reserves. In a highly competitive business such as the oil industry, we must certainly use the most effective exploration methods available if we are to meet the future demands for oil and gas.





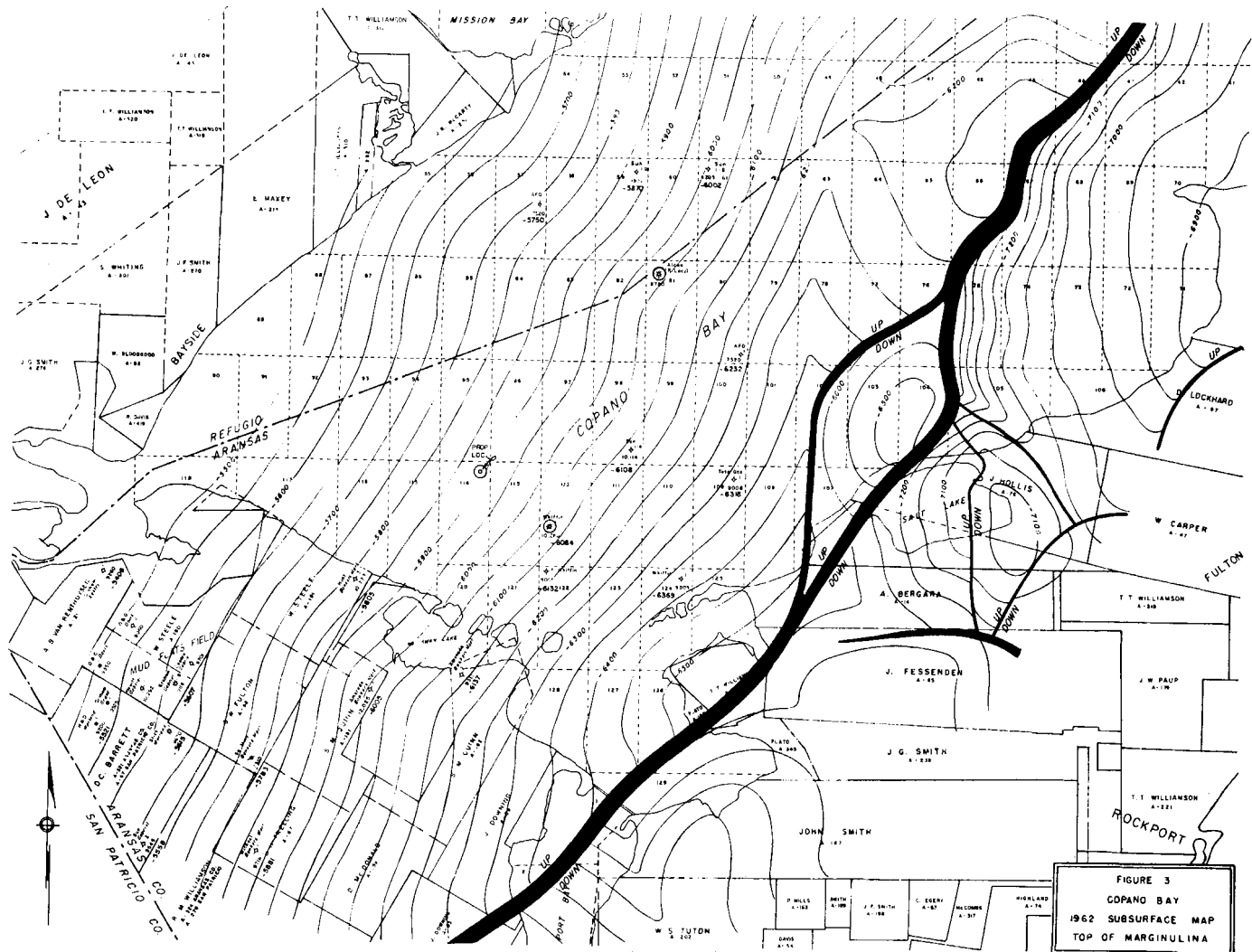


FIGURE 3
 COPANG BAY
 1962 SUBSURFACE MAP
 TOP OF MARGINULINA

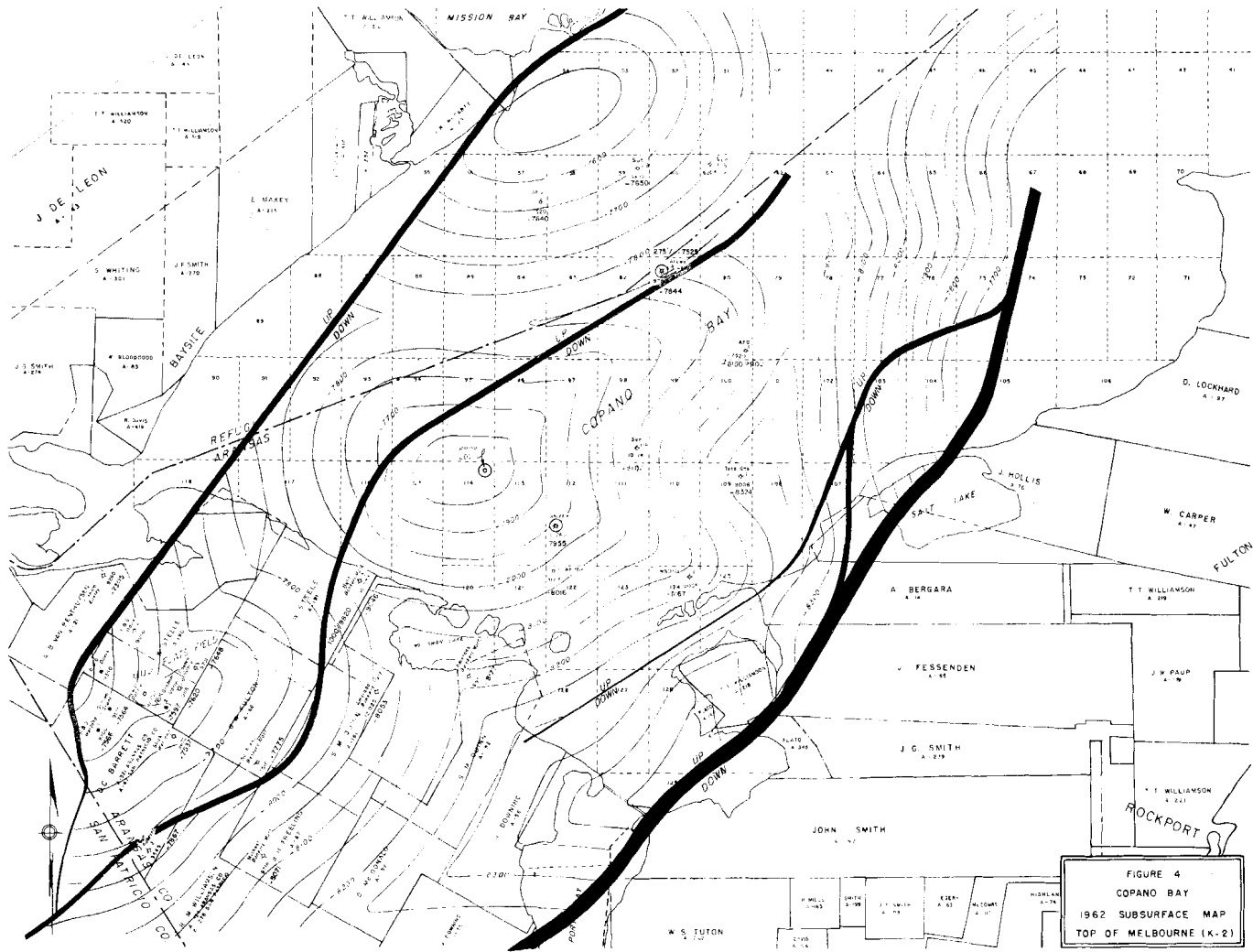


FIGURE 5

CITIES SERVICE PETROLEUM CO.

STATE TRACT 114

WELL #1

WILDCAT

