



SANTA CLARA UNIT

OCS P-0216

PLATFORM GILDA

**UPDATE TO
PLAN OF DEVELOPMENT**

UNOCAL

**SO. CALIF. DISTRICT
VENTURA, CALIFORNIA**

OCTOBER, 1985



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December 12, 1985

Bill L. McFarland
District Engineer
Southern California District

Mr. Thomas W. Dunaway
Regional Supervisor
Minerals Management Service
Pacific OCS Region
1340 West Sixth Street
Los Angeles, CA 90017

Santa Clara Unit, OCS P-0216

Dear Mr. Dunaway:

Attached are the three confidential copies you requested of an update to the Plan of Development for Santa Clara Unit, OCS P-0216, Platform Gilda, Santa Barbara Channel, California Offshore.

An additional confidential copy has been delivered to Mr. James W. Wright, District Supervisor, Ventura, California.

We consider these to be confidential documents. We expect that particularly the geological and reserve data will be held confidential by the M.M.S. Please let me know if we can be of further assistance.

Very truly yours,

BLM:dlp
Attachments

cc: Mr. James W. Wright

SANTA BARBARA CHANNEL

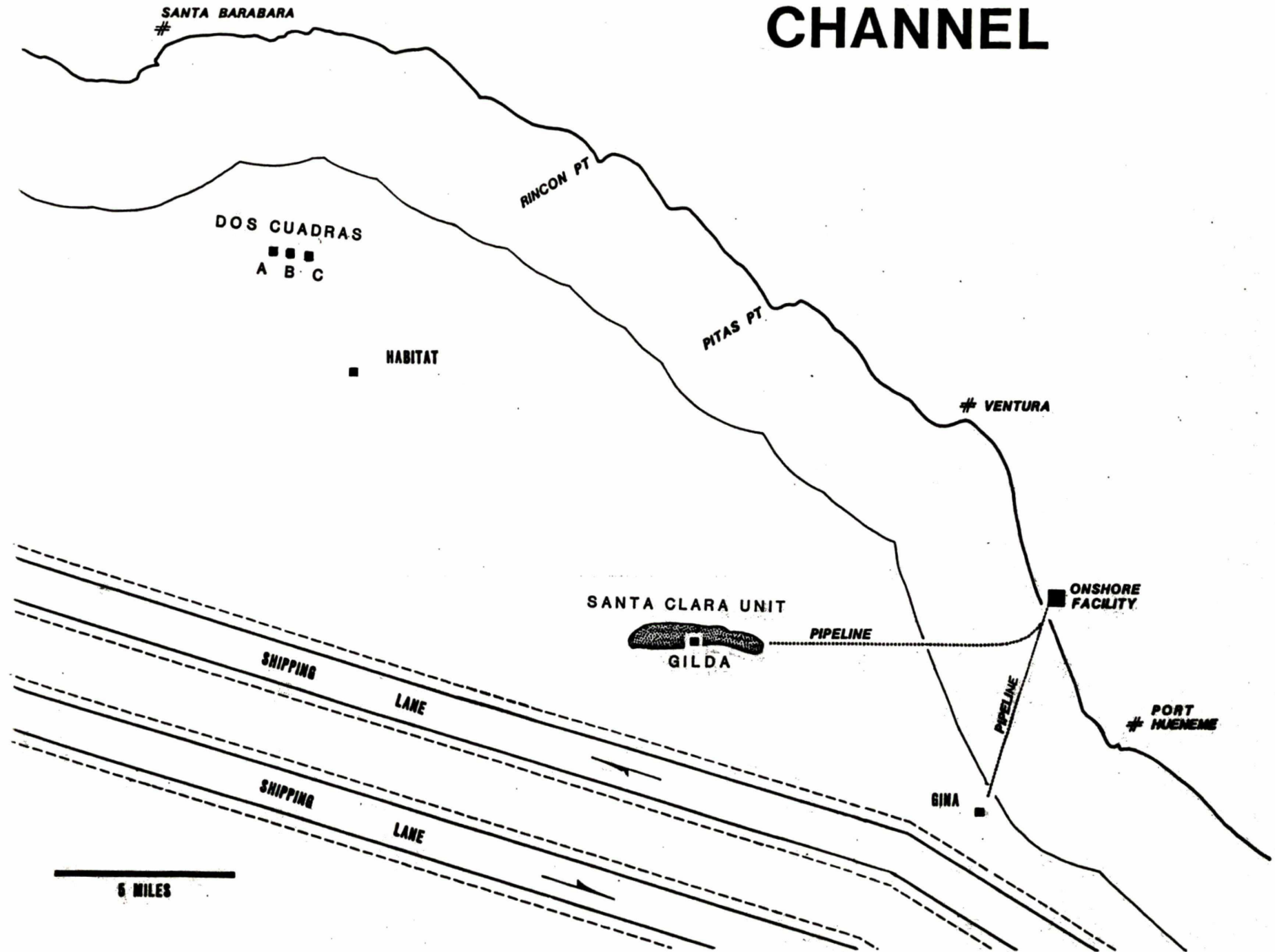


TABLE OF CONTENTS

Brief Summary

Update to Plan of Development

Figures 1 - 6, Location & Geologic Maps

Table 1, Reserve Summary

Figures 7 - 11, Production Curves

Figure 12, 1986 Drilling Schedule

Table 2, Slot Allocation

Figures 15 - 19, Monterey Production Facility

Figures 20 - 24, Geologic Maps

SANTA CLARA UNIT

OCS P-0216

BRIEF SUMMARY

UNION'S WORKING INTEREST: 100%

FEDERAL GOVERNMENT ROYALTY: 16.7%

SURFACE ACREAGE: 5869.6 ac.

WATER DEPTH: 205'

UNIT OPERATOR: Chevron, U.S.A. (Union is designated agent for OCS P-0216)

HISTORY HIGHLIGHTS

- Federal lease acquired in 1968 for bonus of \$12,176,000.
- Four exploratory wells drilled from 1970 to 1979.
- Platform Gilda, with conductor slots for more wells (96) than any other platform in the world, was installed in early 1981.
- Drilling of Upper Repetto Formation wells began with one rig in October, 1981.
- First oil production in December, 1981.
- Mobilized second drilling rig in March, 1983.
- Drilled and completed Middle Pico gas well in July, 1983.
- Recompleted idle well (S-11) as Lower Pico gas well in March, 1984.
- Drilled and completed Lower Repetto test well (S-26) in May, 1984.
- Drilled and completed first Monterey producer (S-49) in November, 1984.
- As of 10-1-85, 50 wells completed - 34 oil wells, 2 gas wells, 12 water injection wells, 2 idle wells.

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Santa Clara Unit
OCS P-0216
Platform Gilda

Update to Plan of Development
Unocal Corporation
October 3, 1985

Lease OCS P-0216 of the Santa Clara Unit is located nine miles west of Ventura, California in Federal Waters. Production is from four distinct reservoirs: the Pico, the Upper Repetto, the Middle and Lower Repetto, and the Monterey. Producing depths range from -2500'± SS to -8000'± SS. The Pico and Repetto reservoirs are composed of alternate sandstone and siltstone sequences and the Monterey formation is composed of fractured diagenetic rocks and shales. The trapping structure of the reservoirs is an east-west trending anticline with a major thrust fault located to the south of the field. Geologic contour and cross-section maps are shown in Figures 1 through 6. Large scale (1"=400', 1"=600') structure and cross-section maps of the reservoirs are attached in Figures 20 through 24. Production from the lease is handled by Platform Gilda which stands in 205' of water.

Cumulative production from Platform Gilda through August of 1985 is 6.21 MMSTB of oil and 13.34 BCF of gas. The current production rate (9/85) is 5200+ BOPD, 2100 BWPD, and 10,500 MCF/D. Ultimate recovery of the currently developed portions of the field is estimated at 39.2 MMSTB and 60.1 BCF. A summary of each reservoir is shown in Table 1.

Initial production from the field began in 1981 from the Upper Repetto reservoir and in 1983 from the Pico reservoir. During 1984 and 1985 development of the Lower Repetto reservoir and Monterey Formation began. A total of 38 producers and 12 injectors are currently active in the field. Individual reservoir and field production curves are shown in Figures 7 through 11.

Future development of oil and gas reservoirs within the Santa Clara Unit will be continued at a reduced pace. Recently drilled wells in the Lower Repetto and Monterey zones have underscored geological uncertainties such as pay thickness, gas-oil and water-oil contacts, and contouring which have complicated development of the resource in each reservoir. By slowing the development pace, more time will be permitted for geological and reservoir evaluation between wells. Upon obtaining better geologic control, an increased development pace may resume.

During 1986, eight Lower Repetto wells and one Monterey well will be completed as shown in the 1986 drilling schedule in Figure 12. A second Monterey well will be in the drilling phase at the end of the year.

Potential undeveloped reserves within the field are estimated at 39.8 MMSTB of oil and 118.9 BCF of gas. It is estimated that an additional 46 wells (40 producers/6 injectors) will be needed to recover these reserves. Upon completion, all 96 conductor slots on the platform will have been used. The current and projected conductor slot allocation is shown in Table 2.

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Monterey Formation

Current Status

The Monterey Formation is the deepest of the four reservoirs in the field. The reservoir ranges in depth from -6000' to -8000' SS. The reservoir covers 1120 acres and has a volume of 669,000 ac-ft of which 253,000 ac-ft is a potential gas cap. OOIP is estimated at 113.9 MMSTB of oil and 110 BCF of gas. Cumulative production through August of 1985 is 99.2 MSTB and 234.1 MMCF. Initial production from the Monterey began in 1984 and currently two wells, S-49 and S-55, are producing. Ultimate recovery from these two wells is estimated at 1.2 MMSTB and 2.1 BCF of gas. The current production rate from the Monterey (8/85) is 600 BOPD, 700 BWPD, and 1900 MCF/D.

Development Program

It is tentatively planned to develop the Monterey Formation with 23 wells on 40 acre spacing as shown on the Monterey's structure contour map in Figure 13. Initially, it is planned to drill eight wells on wider spacing with the remaining fifteen wells to be added as infill locations if further development is warranted.

Currently two producers, S-49 and S-55, are on line producing 100+ BOPD (2000 GOR) and a restricted 500+ BOPD (3500 GOR) respectively. Two additional wells, S-46 and S-59, are presently being drilled into the offsetting eastern and western blocks of the Monterey trend and will be completed by November of 1985. During 1986 two more Monterey wells will be drilled into these same off-setting fault blocks.

The 1986 drilling will commence on one well in June and the other in December. The June spud date coincides with the installation of a new 20 MMCF/D gas sweetening system scheduled for completion in June of 1986. The current 6 MMCF/D gas sweetening system is projected to be at full capacity by the end of 1985 and therefore would not be able to handle any additional gas from the two 1986 development wells.

Recovery

Potential recovery from the Monterey could be as high as 19 MMSTB of oil and 77 BCF of gas. Future delineation drilling will provide a better estimate of the ultimate oil and gas recovery. Forecasting the production response from an undeveloped Monterey field has historically proven to be misleading and its accuracy questionable. Due to the Monterey's complex nature, it is presumptuous to assume that all the Monterey wells will perform similar to current producers S-49 or S-55. Only after a representative number of producers have been on line for a few years can an accurate forecast be made. The key is to drill representative wells which will define (1) the reservoir limits and (2) the productive capabilities of the field. This will hopefully be accomplished with the current eight well development underway.

Monterey Production Facilities

Monterey Oil and Gas Separation System

The permanent oil-gas separation system is shown on the attached Figure 15. The test separator and gross separator, and the associated piping downstream of the separators for liquid flow are all existing equipment. New equipment recently installed includes four headers (2 in each wellroom) that can handle both Repetto and Monterey production. All Monterey production from wellrooms 2 and 4 is routed to wellroom 4 via the four new lines installed across the platform. These are (1) test oil, (2) test gas-casing, (3) gathering gas-casing, and (4) gross oil. New piping was installed downstream of the separators for the gas from the Monterey wells. These lines tie into the casing gas lines and are routed to our temporary sweeteners.

Temporary H₂S Sweetening System

The temporary sweetening system was installed in July of 1985 and is shown on Figure 16. The 7' diameter vessel can handle 6 MMSCFD and the 8' diameter vessel can treat 8 MMSCFD of sour gas with an outlet less than 4 ppm H₂S. The gas is metered and then split so the vessels can be operated in parallel if desired. Each individual gas stream is metered again and then a 200 gpm rate of scrubbing solution is added to each gas stream as it goes through a static mixer. The gas then gets a final scrubbing in the vessels and exits to the compressor suction. If sour gas (4 ppm H₂S) is detected in the sales gas line the Monterey gas goes to flare. If the flare rate approaches 500 MCFD then the well is shut-in. These vessels and skids will be located in front of the control room (see Figure 17). The current plan is to add a third 8' vessel in November.

Permanent H₂S Sweetening System and Process

An amine gas treating unit has been selected to sweeten the Monterey formation sour gas on Platform Gilda. This is a proven process, considered to be the industry standard, and will consistently yield sales gas containing less than 4 ppm hydrogen sulfide. The amine unit is a regenerative process that produces a highly concentrated sour tailgas, which requires additional processing to remove the hydrogen sulfide. A simplified flow schematic of the process is shown on Figure #18.

A Selectox sulfur recovery unit will be installed to remove the sulfur components in the tailgas from the amine regeneration column. This system is a Union Oil patented process that uses a three stage catalytic reactor to convert the hydrogen sulfide directly into a saleable pure grade molten sulfur product. Figure #19 shows a simplified flow schematic of the process. The Selectox unit uses no toxic catalysts, produces no hazardous waste products, and is considered by the Federal E.P.A. to be the B.A.C.T. for sulfur recovery of less than five tons per day.

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Employing a compact modular design, the amine gas treating and Selectox sulfur recovery units will be located on the production deck, as shown on Figure #17. Relocation of the existing glycol regeneration skid and light water tank will provide the deck space necessary for the new units. A cantilevered deck section will be added to the production deck to accommodate the amine unit process columns.

Load Capacity

The original platform production deck was designed for loading of 500 lbs/ft.² Both the large (7' and 8' vessels) temporary process and the permanent process will be skid mounted to distribute the load to a smaller degree than 500 lbs/ft.²

Pico and Repetto Reservoirs

Pico Gas Reservoirs

The Pico gas sands are divided into Upper, Middle, and Lower Pico reservoirs. Upper Pico sands range in depth from -1654' SS to -2400' SS. None of the Upper sands has yet been tapped for production because of gas sales limits placed on Union by the Southern California Gas Company. Eventually, these sands will be developed in a recompleted well to deplete the reserves estimated at 5 BCF.

The Middle Pico sands range in depth from -2860' SS to -3435' SS. Most of these sands are being depleted by well No. S-16, which was completed in July, 1983. Since then, the well has produced 4.2 BCF of gas. Ultimate recovery, when last evaluated, was predicted to be 8.0 BCF. However, recent water production in the well may signify that the ultimate recovery will be less. Well No. S-16 is currently producing 2.3 MMCF/D.

Ranging in depth from -4659' SS to -4980' SS are the Lower Pico gas sands. Until just recently, it was believed that these sands were only gas saturated on the eastern anticline of the field. However, gas saturated sands were encountered on the western anticline in September, 1985 by proposed Monterey well No. S-59. Evaluation of the potential resource on the western anticline has not been completed. Either a new well, perhaps a dual string producer combined with the Upper Pico, or a recompletion may be planned to deplete potential reserves. The Lower Pico sands on the eastern anticline are currently being drained in recompleted well No. S-11. This well appears to have been damaged when recompleted in March, 1984. Since that time, the well has only produced 157 MMCF of the potential 1 BCF.

Upper Repetto Reservoir

Development of the Upper Repetto reservoir from -4800' SS to -6076' SS was begun in October 1981. This reservoir was the main objective for which Platform Gilda was set. First oil production came in December, 1981 with the completion of well No. S-1. Following that, drilling was continued with one, and later two, rigs until 28 producing and 12 injection wells were completed on nominal 20-acre spacings.

As of September 1, 1985, recovery from this reservoir was 5,926,779 barrels of oil and 8.5 BCF of gas. Current production is about 4200 BOPD, 1500 BWPD, and 5600 MCF/D. Between 12,000 and 15,000 BWPD of treated seawater is being injected.

During the development drilling, which was temporarily stopped in June, 1985, several characteristics of the reservoir forced alterations on the original development plan. For example:

- 1) A primary gas cap was discovered on the eastern anticline with well No. S-10 and then confirmed with well No. S-11, leading to the elimination of a few crestal well locations.
- 2) Pressure depletion occurred much more rapidly than predicted by the original reservoir model study, leading to the initiation of a peripheral injection program for pressure maintenance.
- 3) Sands thinned more rapidly to the south than anticipated making several southern well locations non-commercial.

To fully evaluate the potential for this heterogeneous reservoir, a second model study has recently been initiated. This model should be useful for predicting future performance and ultimate recovery under current operating practices. Also, this model will be used to evaluate benefits of gas injection, pattern waterflooding, further drilling, and enhanced oil recovery.

Middle Repetto Reservoir

Two wells (S-36, S-51) have been drilled into the Middle Repetto group of sands between -6173' SS and -6820' SS north of Platform Gilda. Neither well produced at commercial rates because of the low permeability of the sands. Well No. S-51 has recently been recompleted as an Upper Repetto injector. Well No. S-36 is currently producing 34 BOPD. A fracture treatment of S-36 may be attempted to unlock potential reserves in the sands. If the frac job is successful, further development of the sands would continue. However, if the treatment is unsuccessful, development of the reserves will be postponed until Upper and Lower Repetto wells become uneconomic and can be redrilled to drain the Middle Repetto sands.

Cumulative production from the Middle Repetto LP-F through LP-J sands is 24,111 barrels of oil and 31 MMCF of gas as of September 1, 1985. Production from these sands was begun in December, 1984.

Lower Repetto Reservoir

Four wells on OCS P-0216 have been drilled from Platform Gilda into this group of sands from -6480' SS to -8962' SS. Also, at least two wells on each adjacent tract 0215 and 0217 have been tested to suggest that the LP-K through LP-N (and possible LP-O to LP-S further north) could contain a significant amount of reserves in the range of 20 to 30 million barrels. Further delineation of the individual sand thicknesses, gas-oil contacts, and water-oil contacts is necessary to accurately appraise the potential.

The first of the four wells drilled into these sands from Platform Gilda was well No. S-26. It was completed in April, 1984. The second well (S-40) was completed in March, 1985 and recompleted in May, 1985 after producing high rates of gas, oil, and sand. The most recent completions are wells No. S-44 and S-57. These wells were completed in August, 1985.

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As of September 1, 1985, the Lower Repetto group of sands had produced 156,852 barrels of oil and 229 MMCF of gas. Current production from these four wells is about 850 BOPD and 450 MCF/D.

Current development plans are to continue an 80 acre step-out drilling to delineate the reservoir sands as shown in Figure 14. Tentatively, the reservoir will be developed on 40 acre staggered well spacings. Then every other center row well will be converted to water injection to yield a five-spot flood in the LP-L and LP-M sands, and a peripheral flood in the LP-K and LP-N sands. Based on further reservoir delineation, up to 24 wells could be required to fully develop the potential of the Lower Repetto sands.

FIG. 1

SANTA CLARA UNIT

TOP PICO CONTOUR

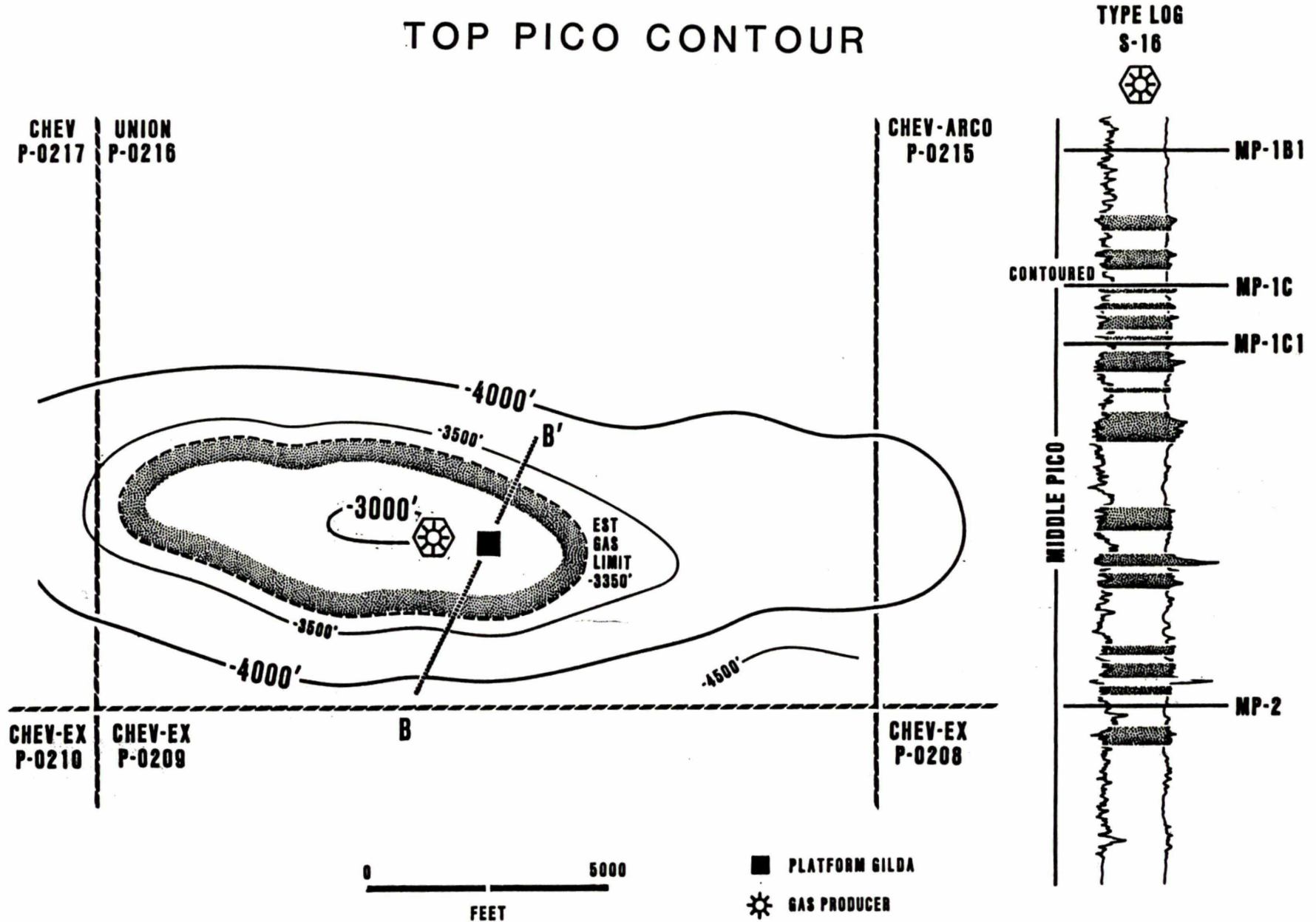


FIG. 1

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FIG. 2

SANTA CLARA UNIT

UPPER REPETTO TOP LP-B SAND

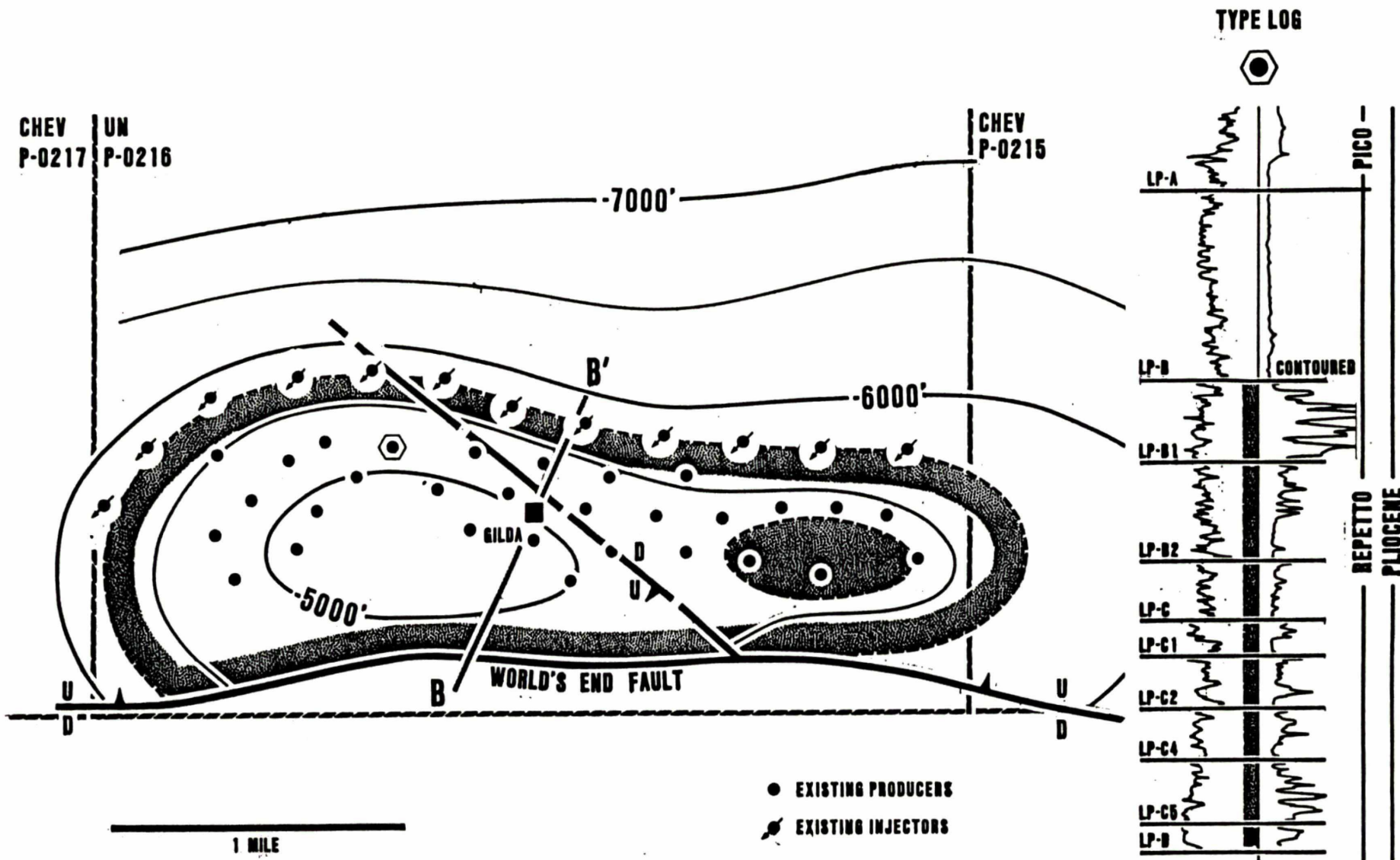


FIG. 2

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FIG. 3
SANTA CLARA UNIT

LOWER REPETTO
 TOP LP-M SAND

TYPE LOG

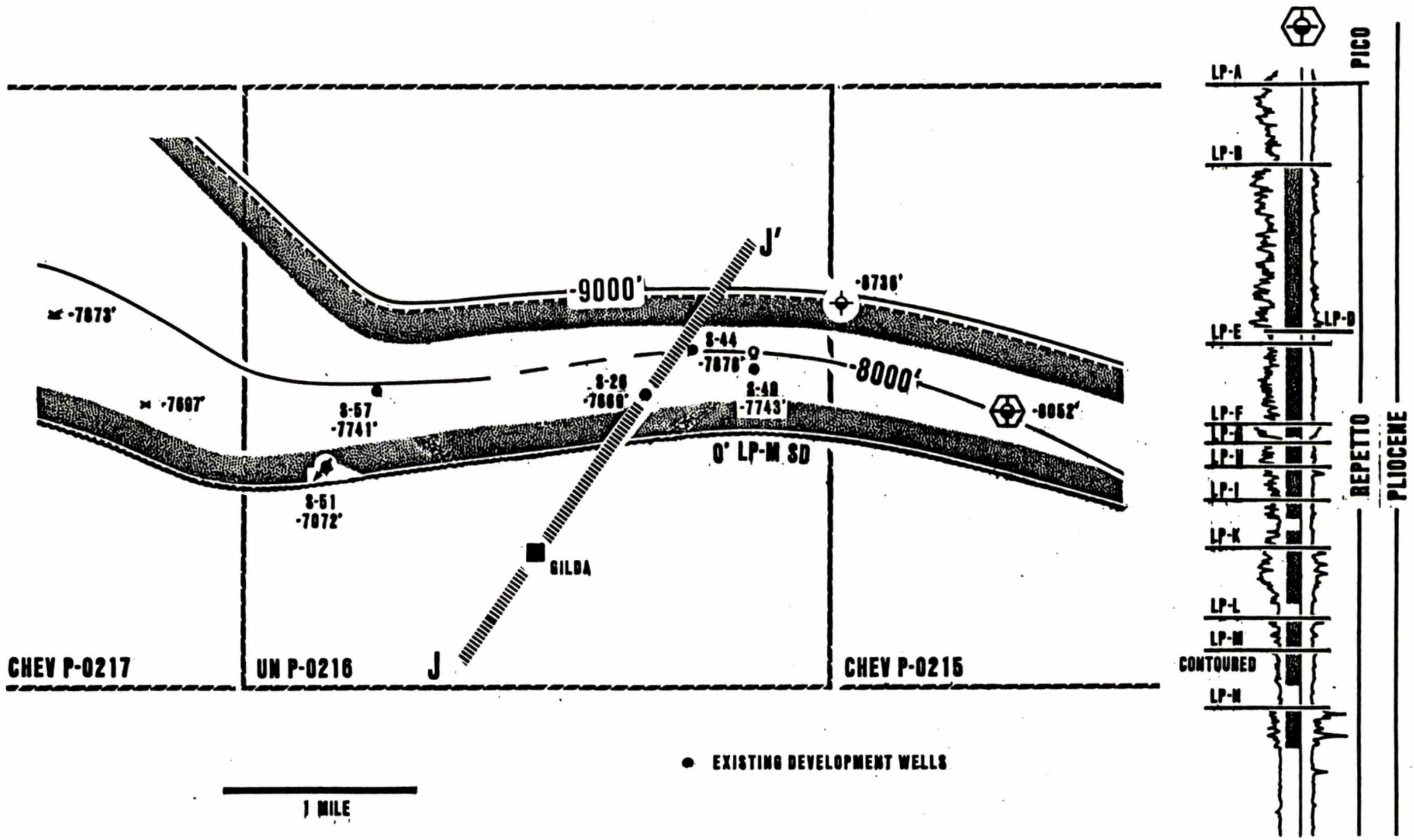


FIG. 3

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FIG. 4

SANTA CLARA UNIT

MONTEREY
TOP M-20 MKR

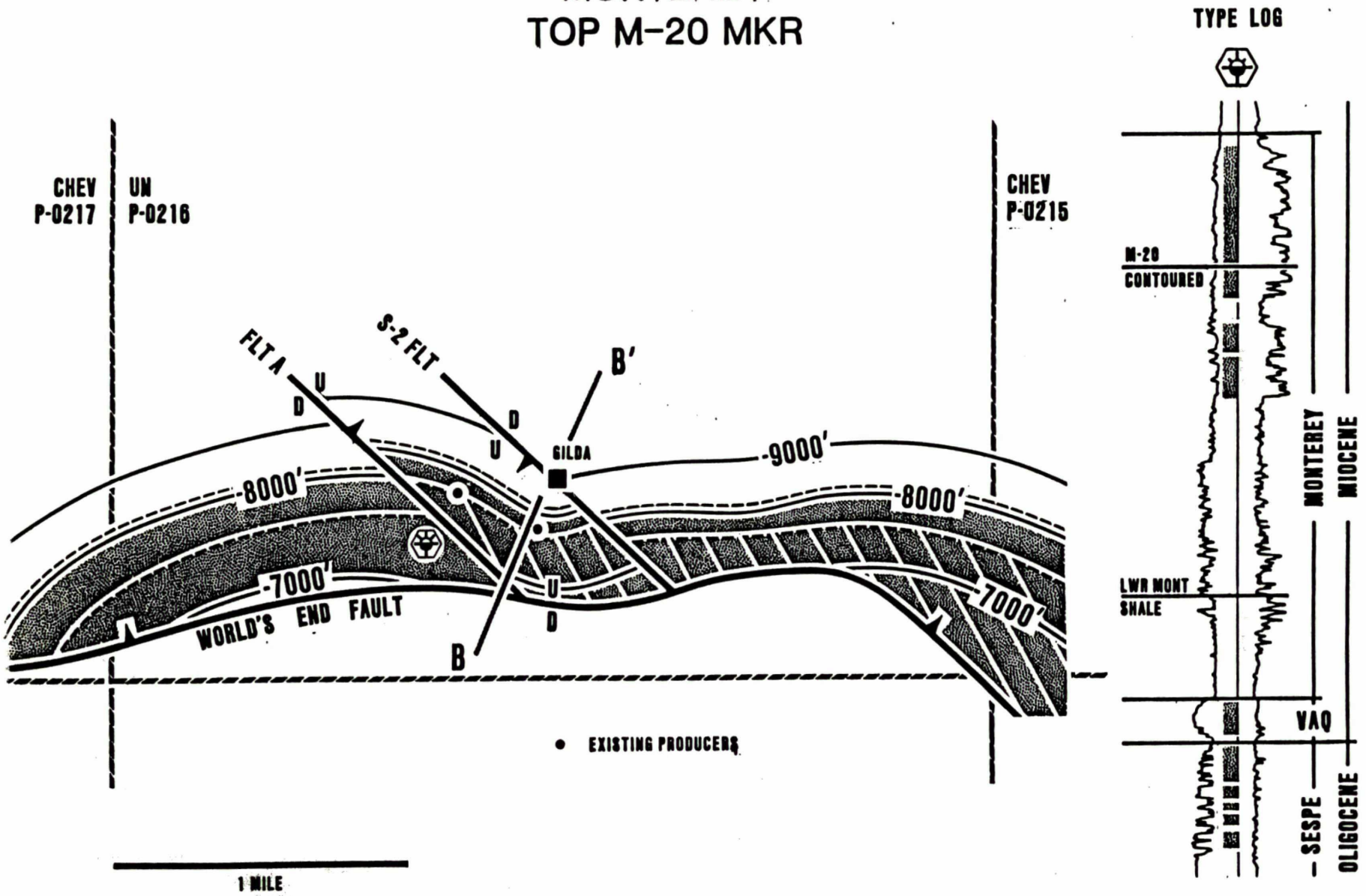


FIG. 4

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FIG. 5

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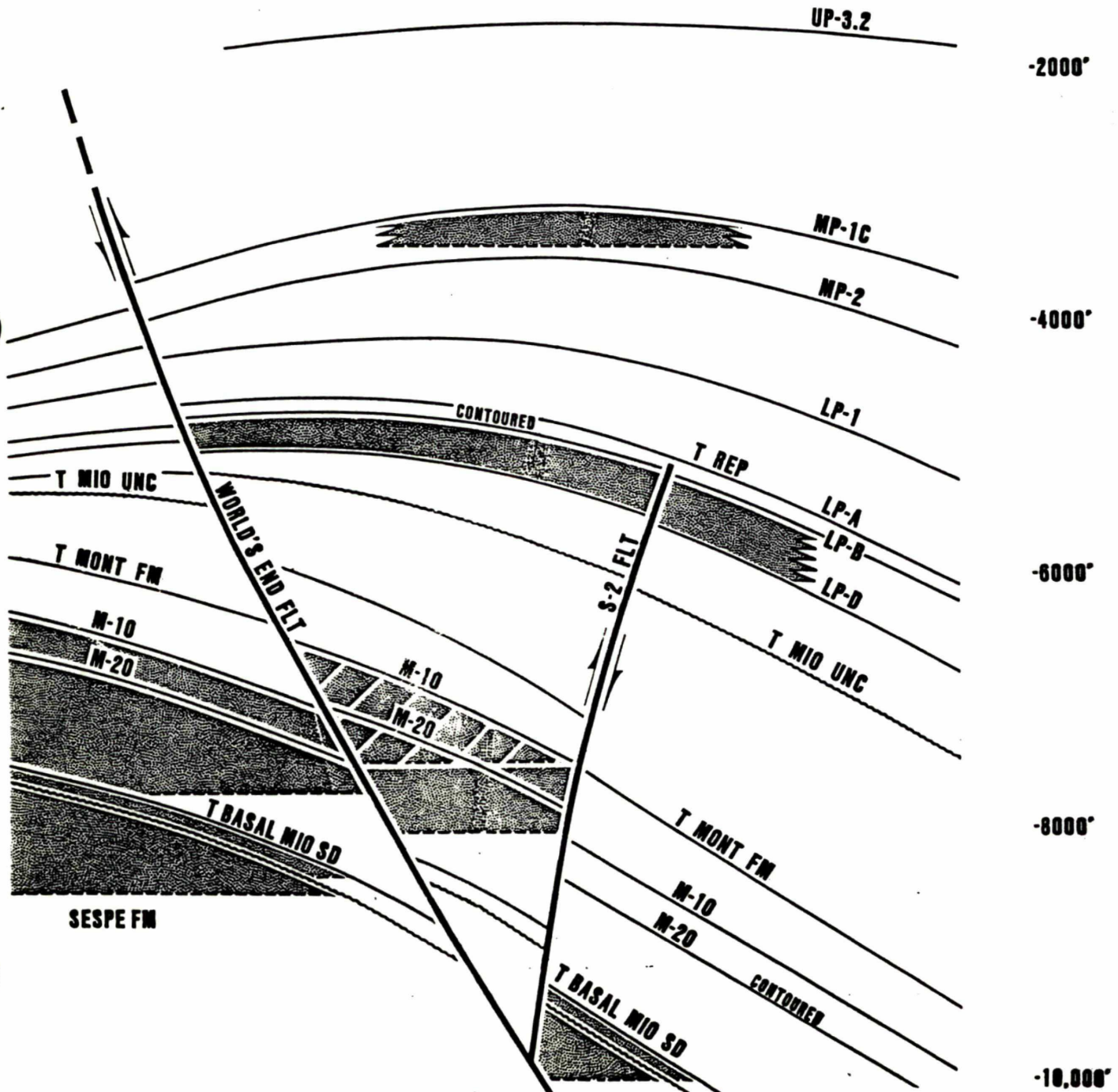
PLATFORM GILDA

B

B'



SEA LEVEL

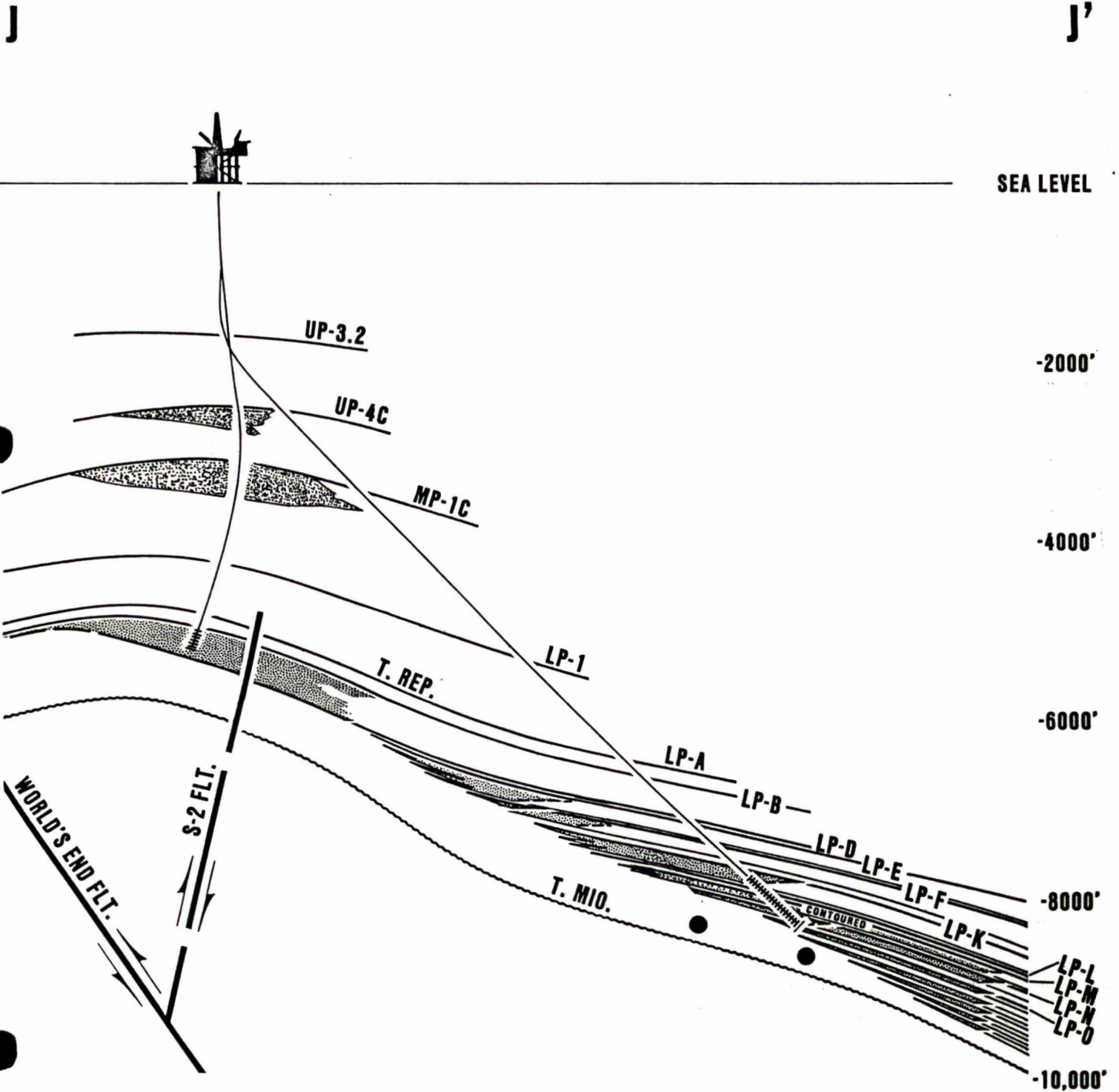


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FIG. 6

SANTA CLARA UNIT

UPPER & LOWER REPETTO FORMATIONS



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TABLE 1

SANTA CLARA UNIT
OCS P-0216
PLATFORM GILDA

RESERVOIR SUMMARY

RESERVOIR	YEAR OF FIRST PROD.	# WELLS PROD./INJ. 9/1/85	# WELLS ADDITIONAL TO DEVELOP FIELD PROD./INJ. 9/1/85	DEVELOPED AND ULTIMATE POTENTIAL			RECOVERY 9/1/85	
				PROD. VOLUME AC-FT	OOIP MMSTB	OGIP BCF	MMSTB	BCF
PICO	1983	2/0	1/0	50,667	0	22.7	0	4.4
UPPER REPETTO	1981	29/12	3/0	173,710	151	72.8	5.93	8.47
MIDDLE/ LWR REPETTO	1984	5/0	14/6	179,465*	130.9*	108*	.18	.24
MONTEREY	1984	2/0	21/0	669,110*	113.9*	110*	.10	.23
UNDESIGNATED			1/0					
		38/12	40/6				6.21	13.34

*RESERVOIR HAS NOT BEEN FULLY DELINEATED.

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FIGURE 7

SANTA CLARA FIELD

PLATFORM GILDA

OCS P-0216

ALL WELLS

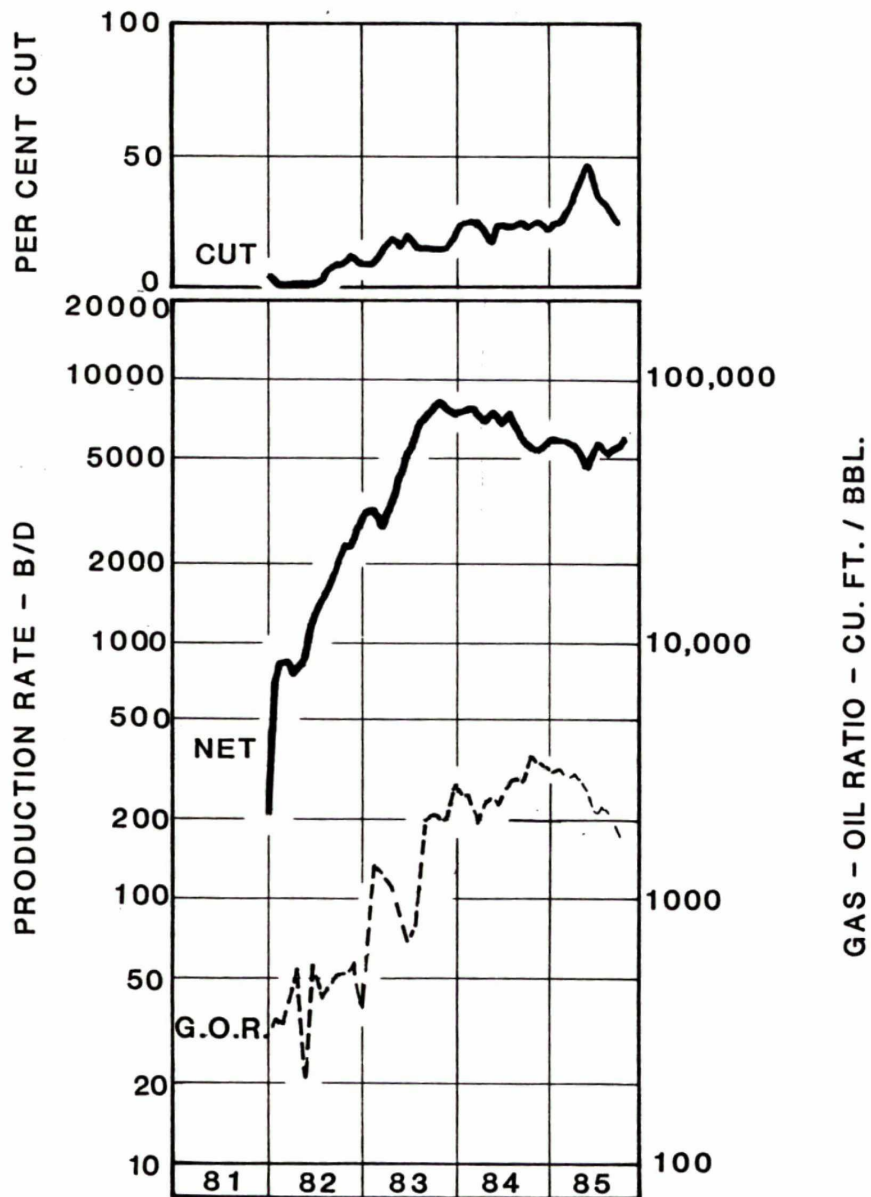


FIGURE 8

SANTA CLARA UNIT PICO PRODUCTION CURVE WELL NO. S-16

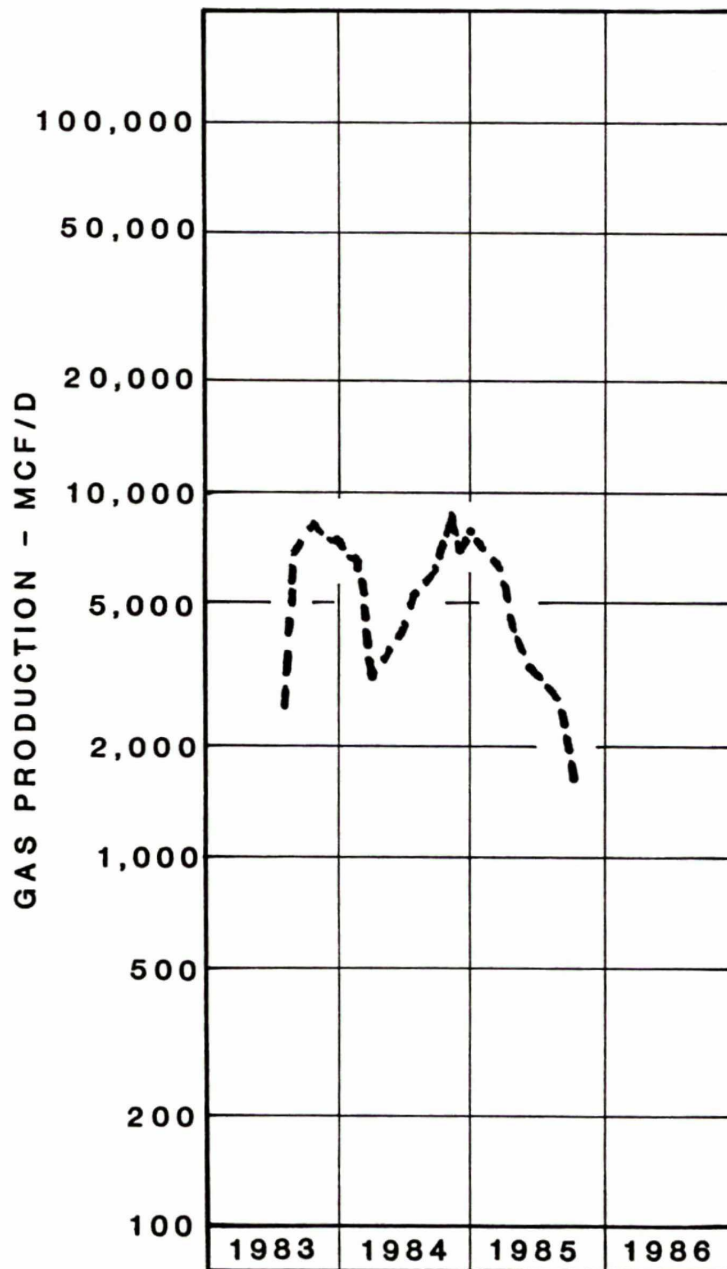


FIGURE 9
SANTA CLARA UNIT
OCS P-0216
PLATFORM GILDA
UPPER REPETTO

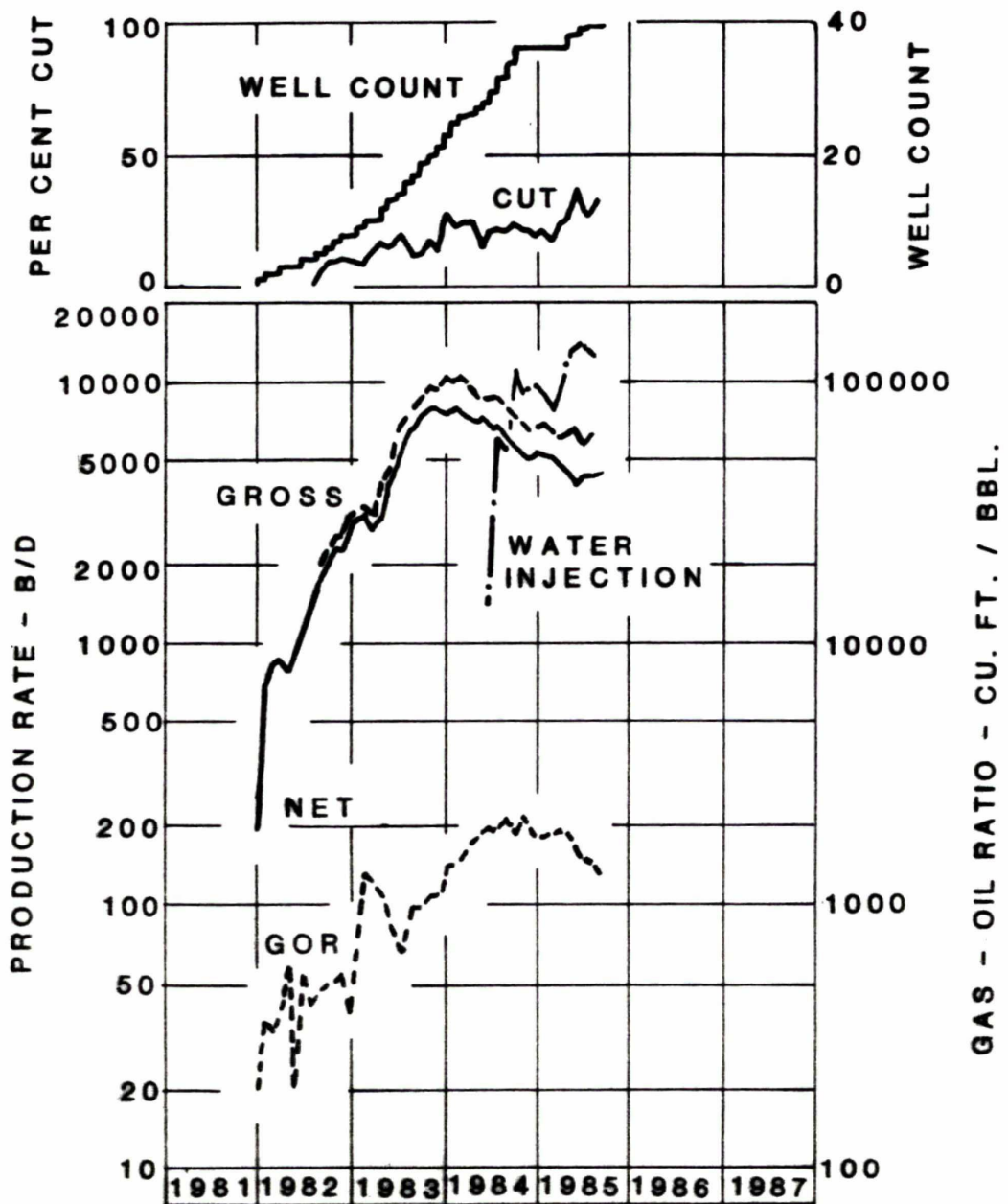


FIGURE 10

SANTA CLARA UNIT

MIDDLE / LOWER REPETTO CURVE

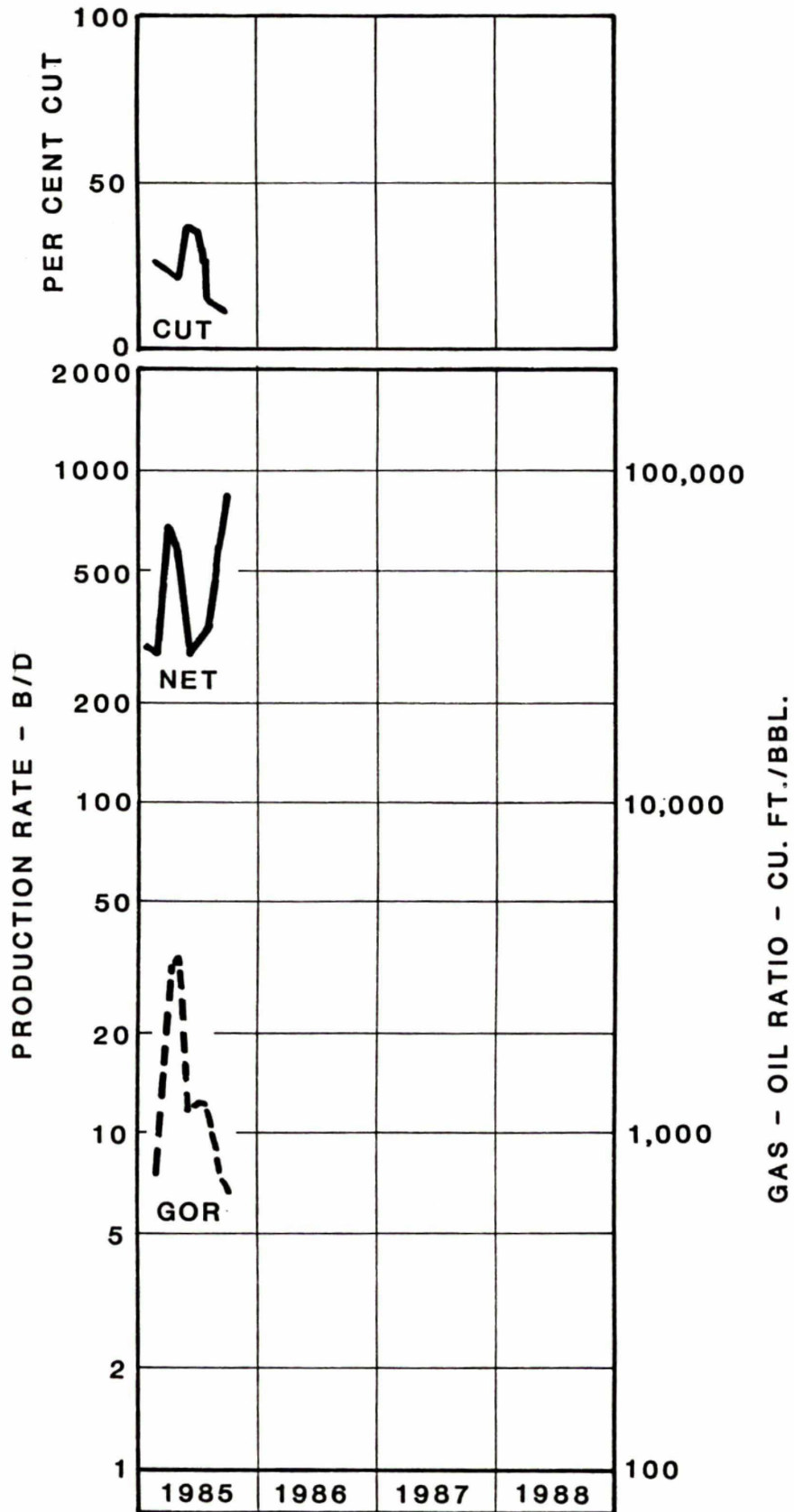


FIGURE 11

SANTA CLARA UNIT MONTEREY PRODUCTION CURVE

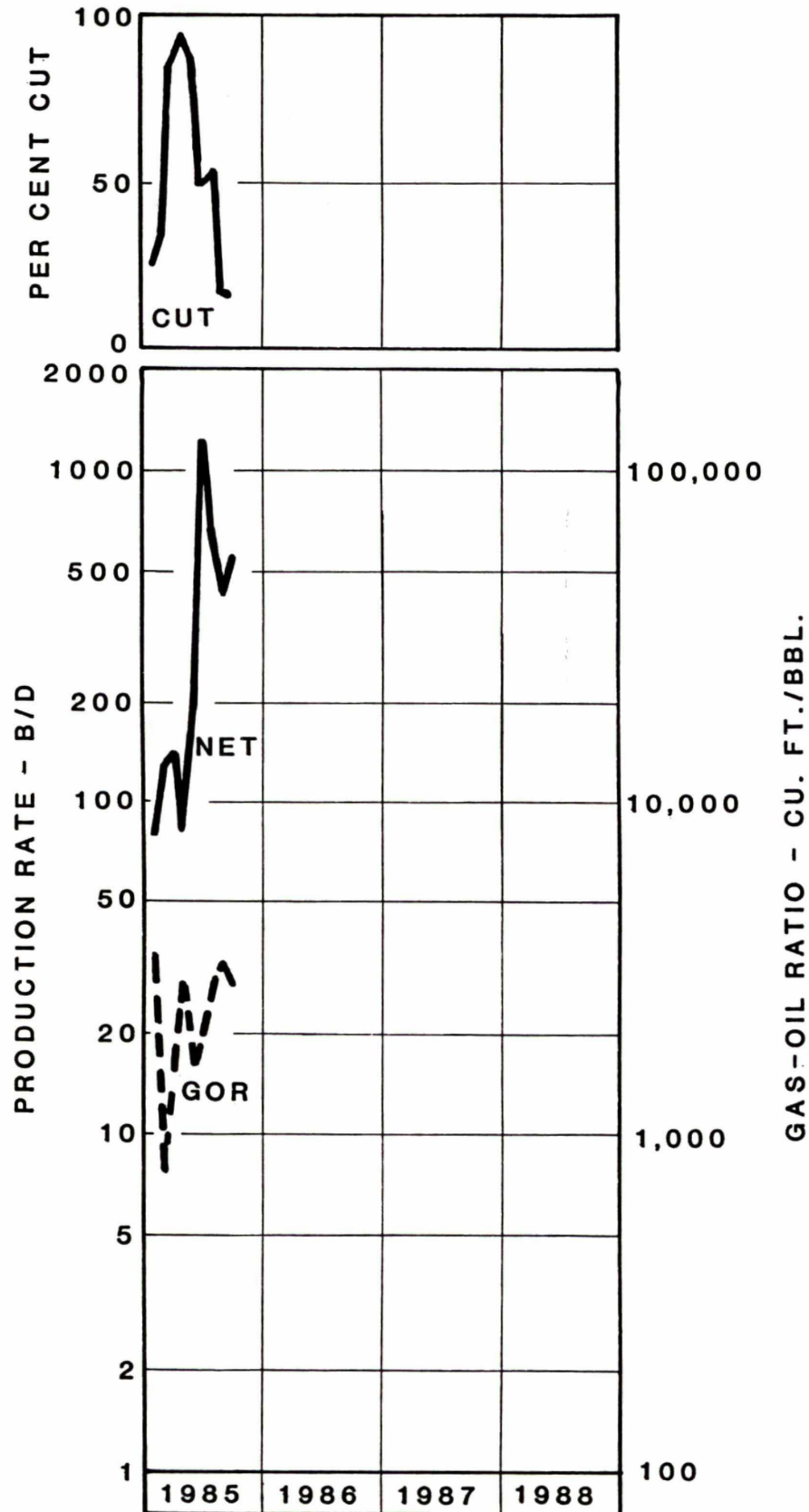


FIG. 12

SANTA CLARA UNIT

1986 DRILLING SCHEDULE

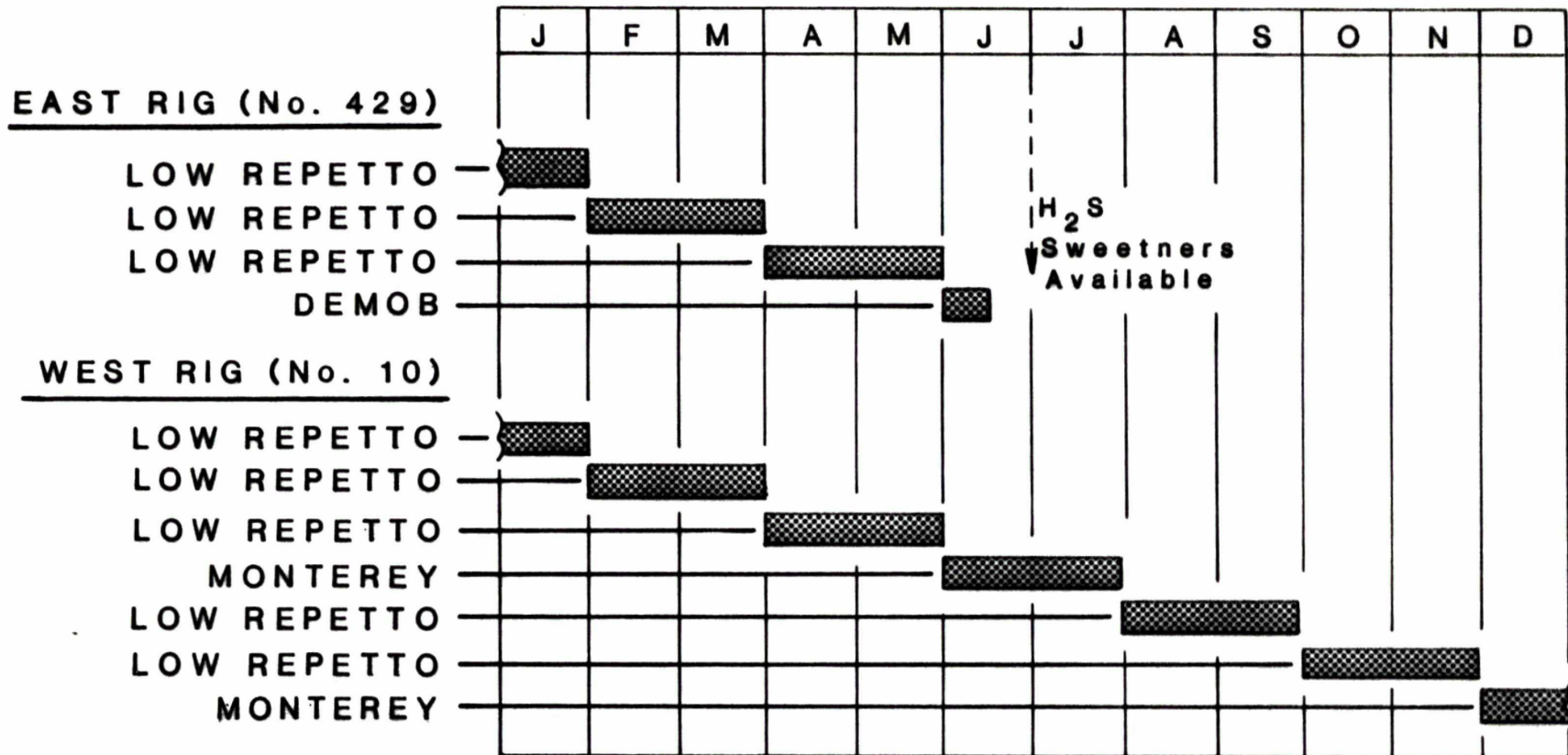


FIG. 12

TABLE 2
SANTA CLARA UNIT
PLATFORM GILDA
CONDUCTOR SLOT ALLOCATION
(AS OF 9-1-1985)

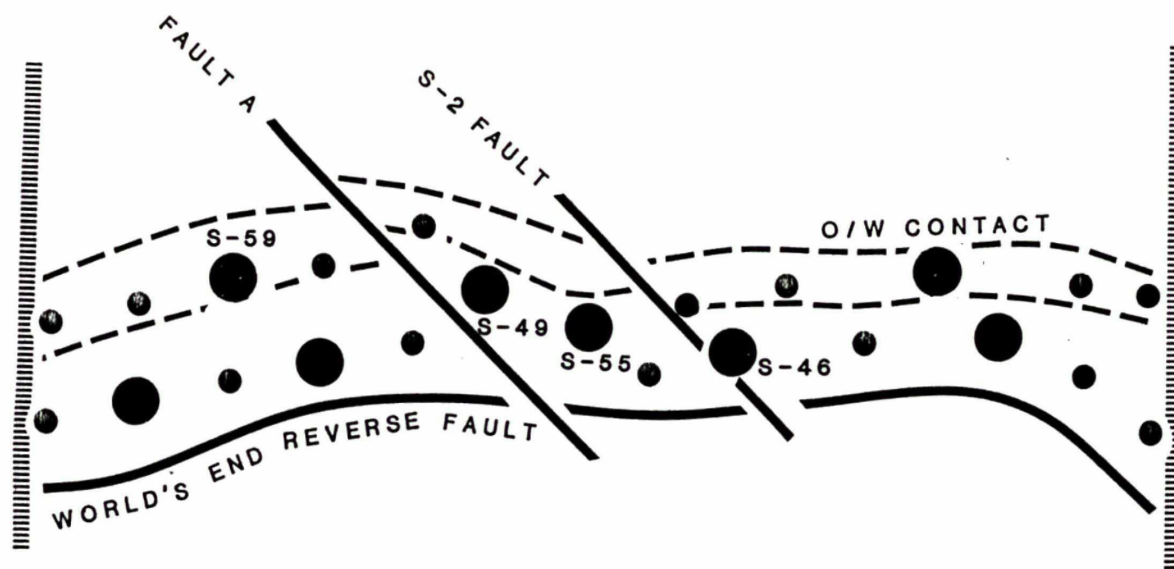
<u>FORMATION</u>	<u>WELLS DRILLED</u>	<u>MAXIMUM ADDITIONAL WELLS</u>	<u>TOTAL WELLS</u>
PICO	2	1	3
UPPER REPETTO	41	3	44
MIDDLE REPETTO	1	0*	1
LOWER REPETTO	4	20	24
MONTEREY	2	21	23
UNDESIGNATED	--	1	1
TOTAL	50	46	96

* FUTURE MIDDLE REPETTO WELLS SHOULD BE REDRILLED LOWER REPETTO WELLS.

FIG. 13

SANTA CLARA UNIT

MONTEREY DEVELOPMENT PLAN



- INITIAL 8 WELL DELINEATION
- POTENTIAL 15 WELL INFILL

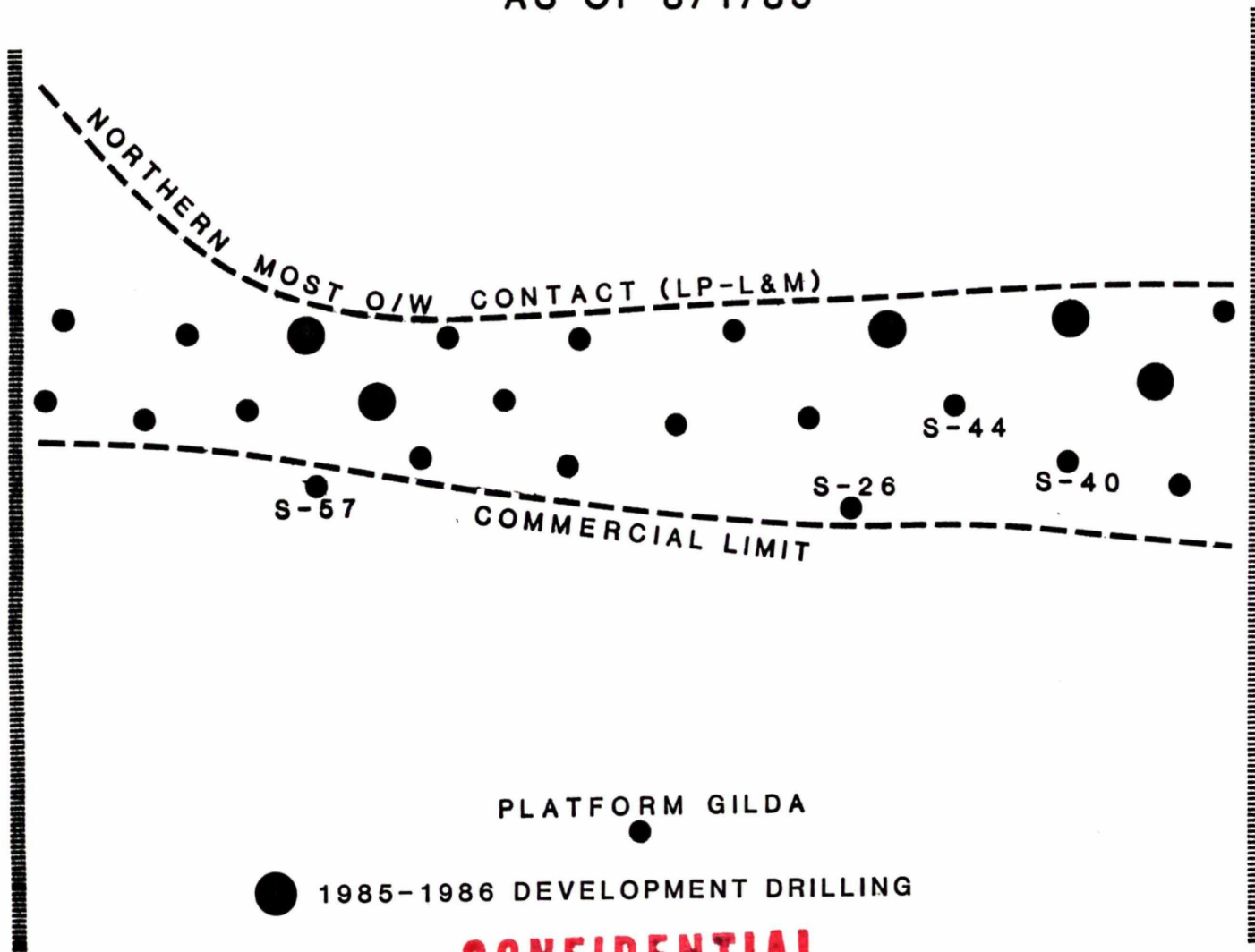
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FIG. 14

SANTA CLARA UNIT

LOWER REPETTO DEVELOPMENT PLAN

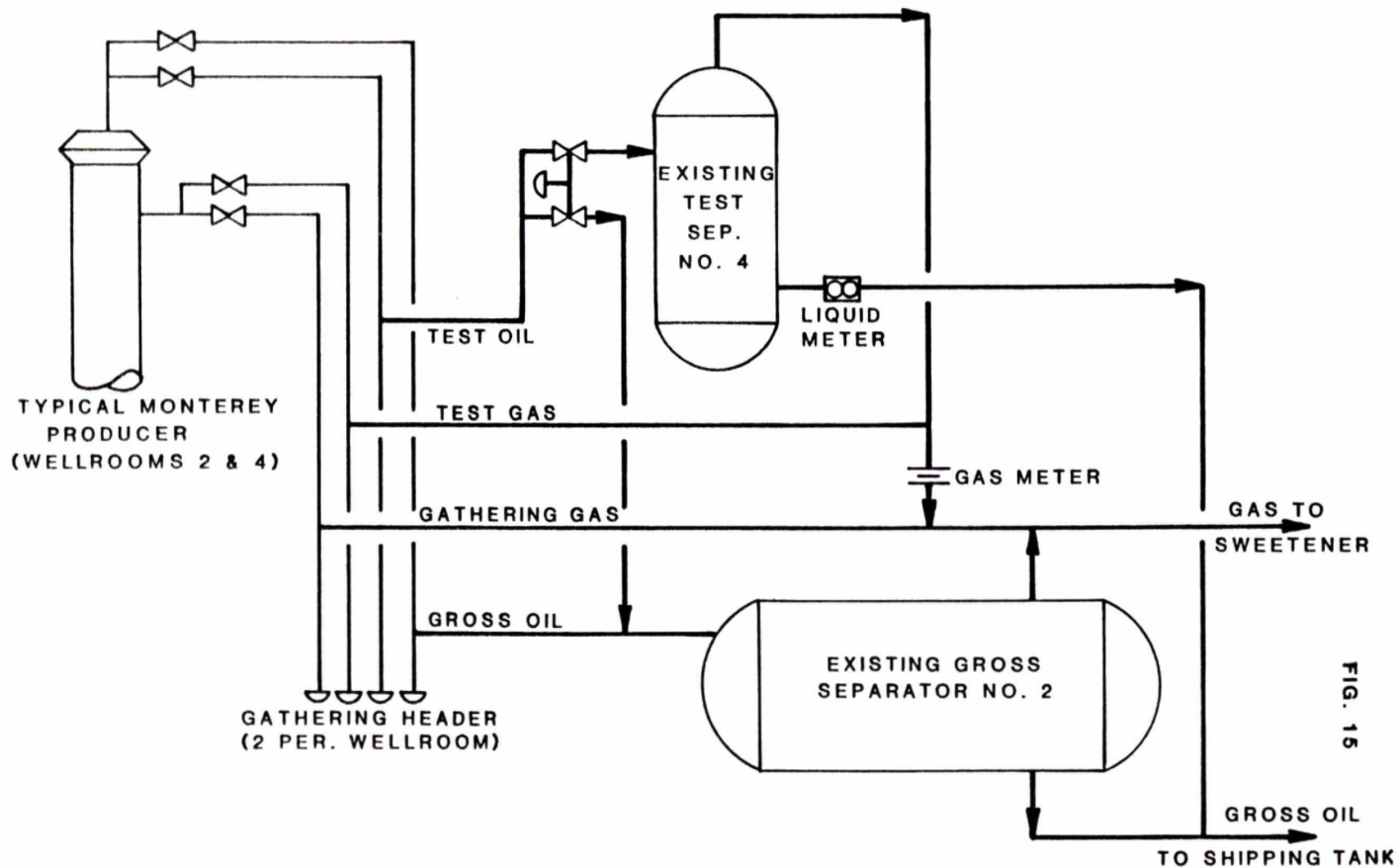
AS OF 8/1/85



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FIG. 14

FIG. 15
PLATFORM GILDA
MONTEREY GATHERING AND SEPARATION
FLOW SCHEMATIC



PLATFORM GILDA

MONTEREY SWEETENING UNIT FLOW SCHEMATIC

FIG. 16

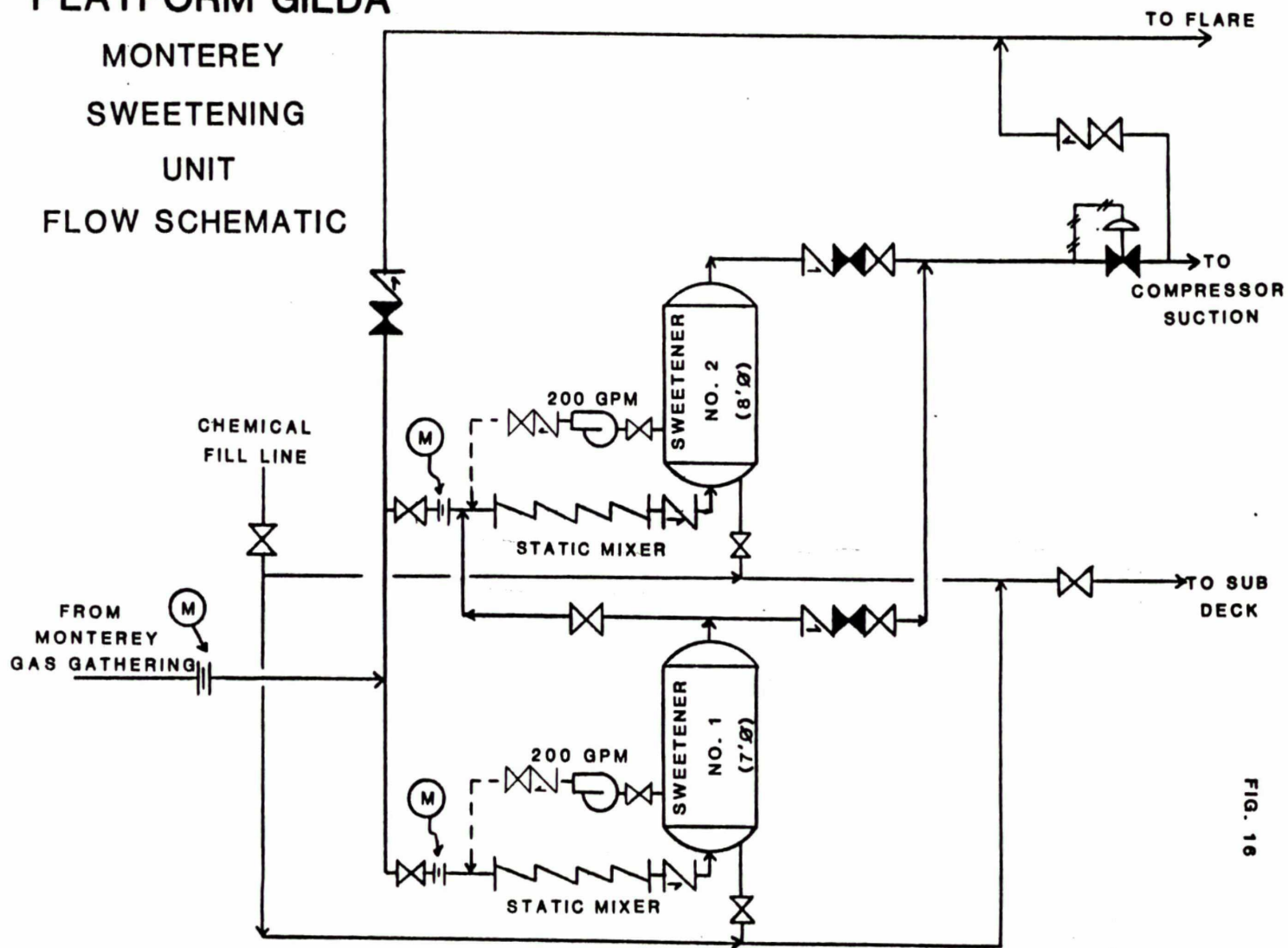


FIG. 16

FIG. 17
PLATFORM GILDA
PRODUCTION DECK
(PLAN VIEW)

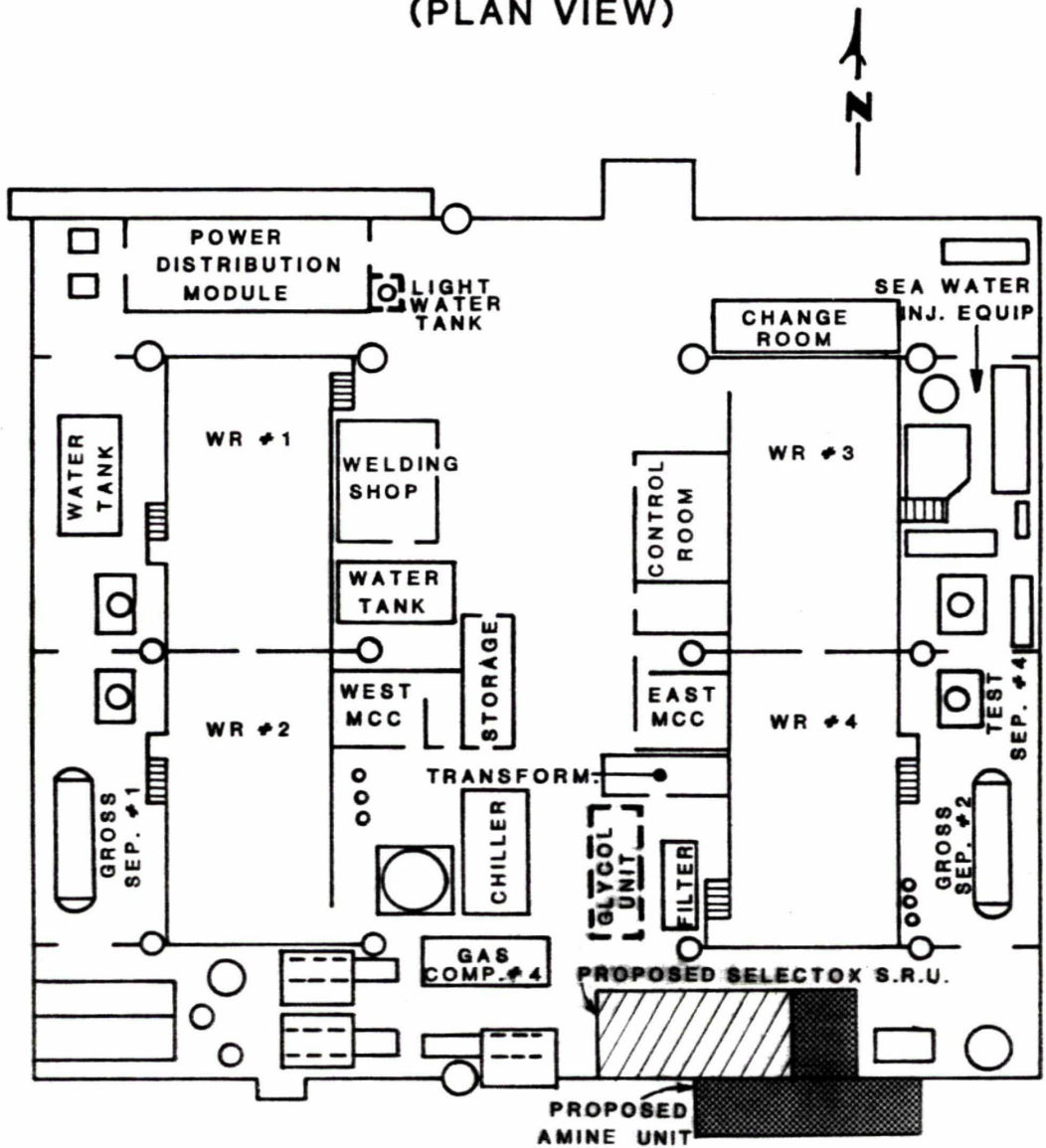


FIG. 17

FIG. 18
AMINE GAS TREATING UNIT
FLOW SCHEMATIC
(20 MMSCFD CAPACITY)

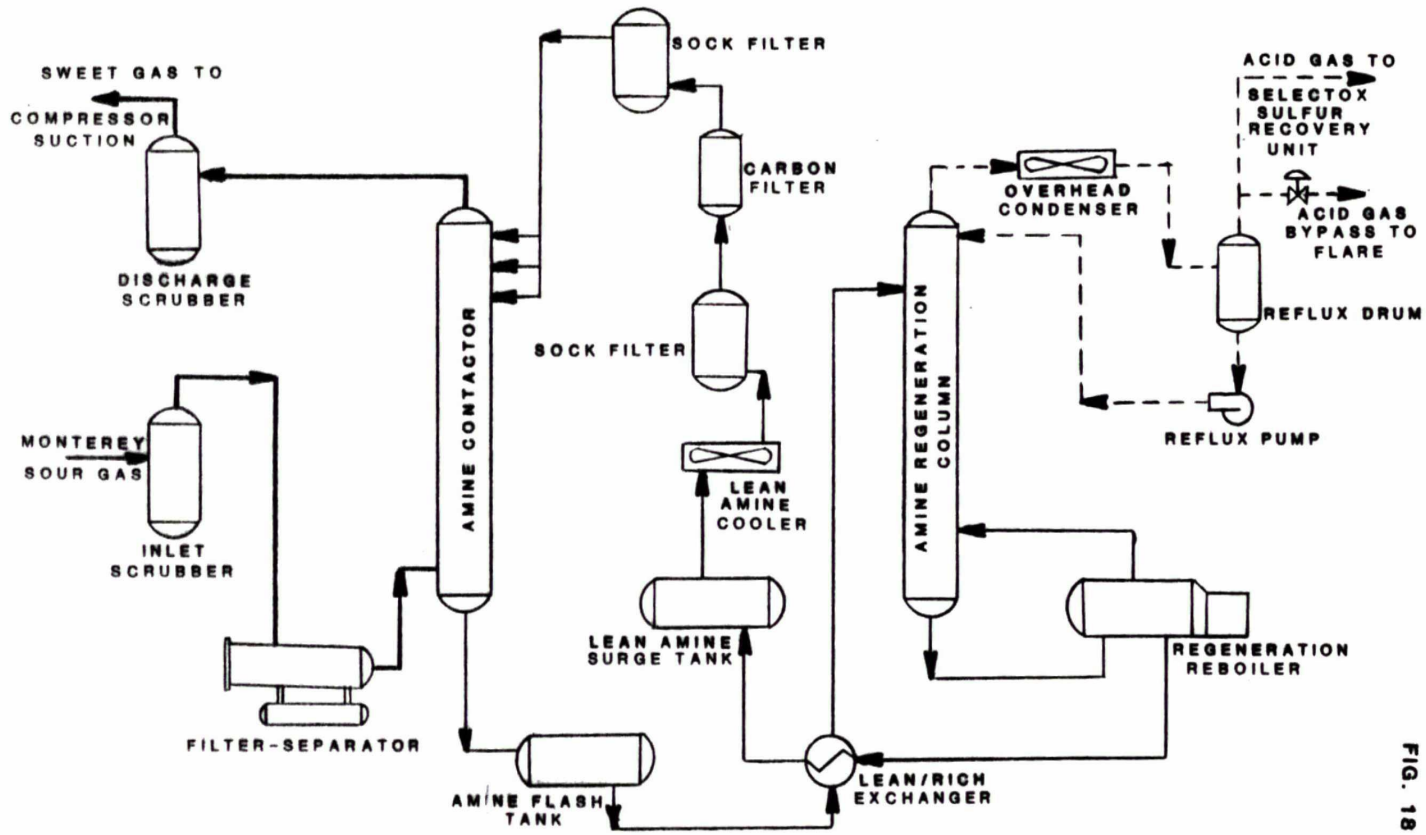


FIG. 18

FIG. 19
SELECTOX SULFUR RECOVERY UNIT
FLOW SCHEMATIC
(2.5 LTPD SULFUR CAPACITY)

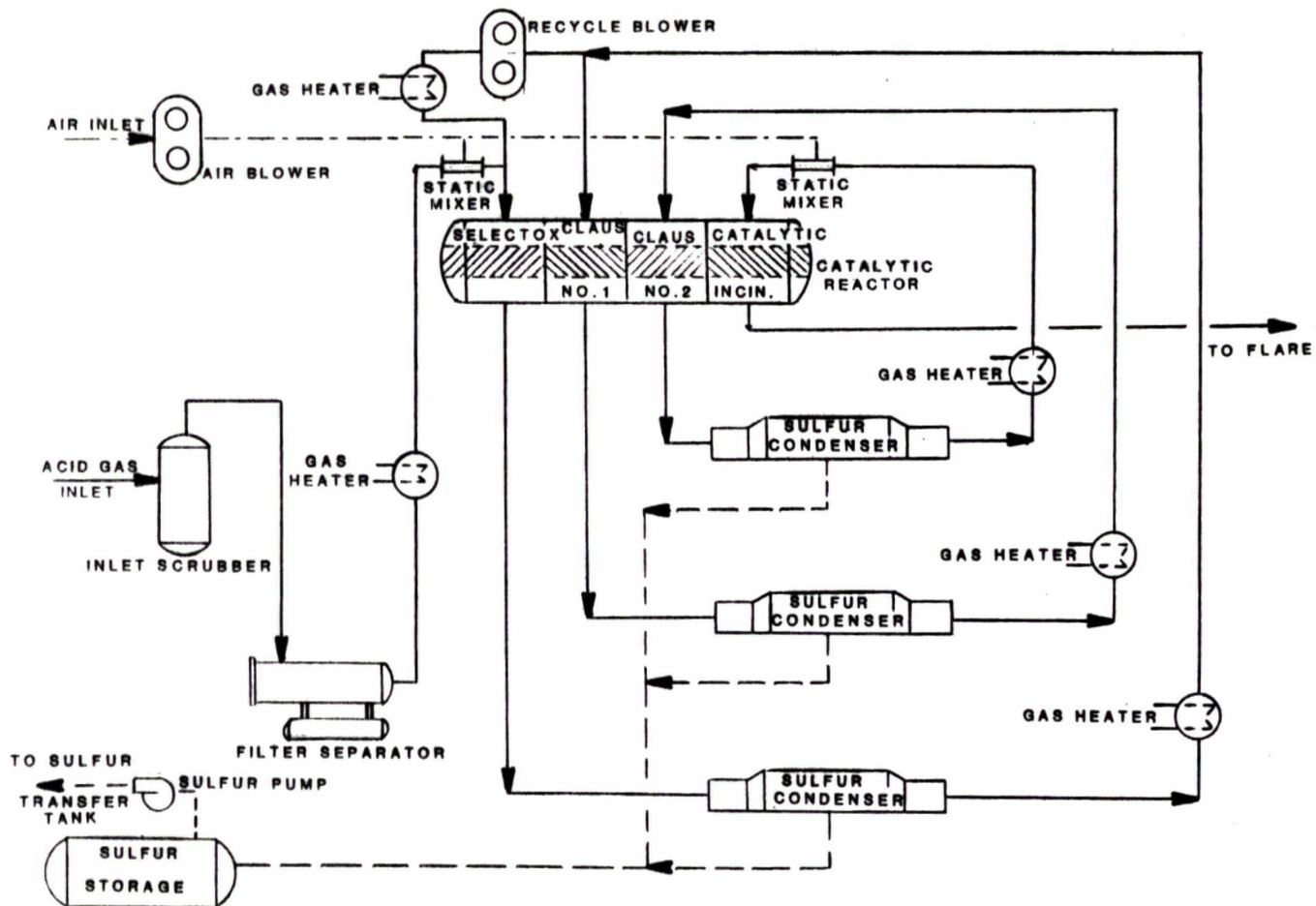


FIG. 19