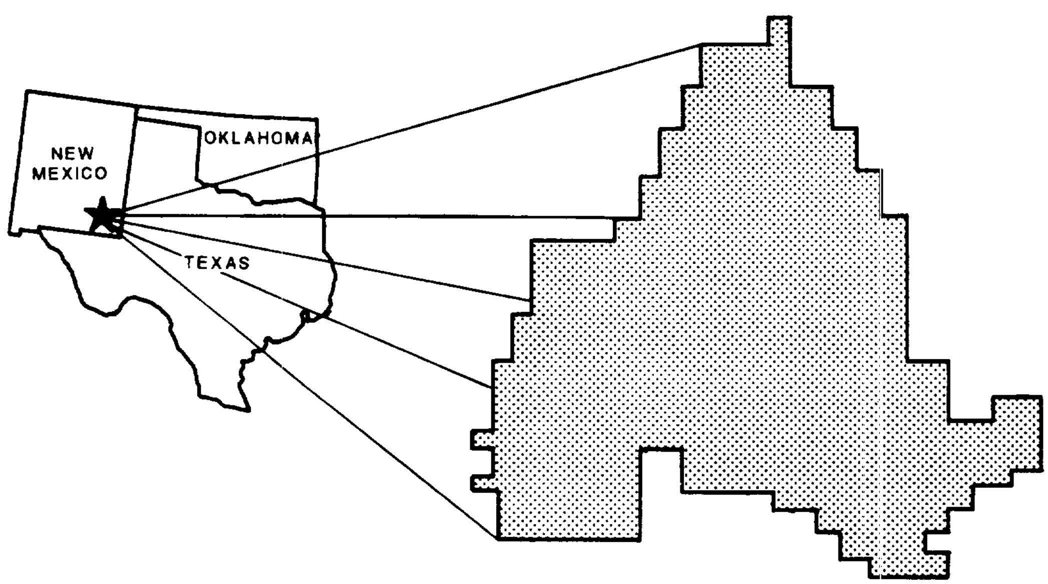
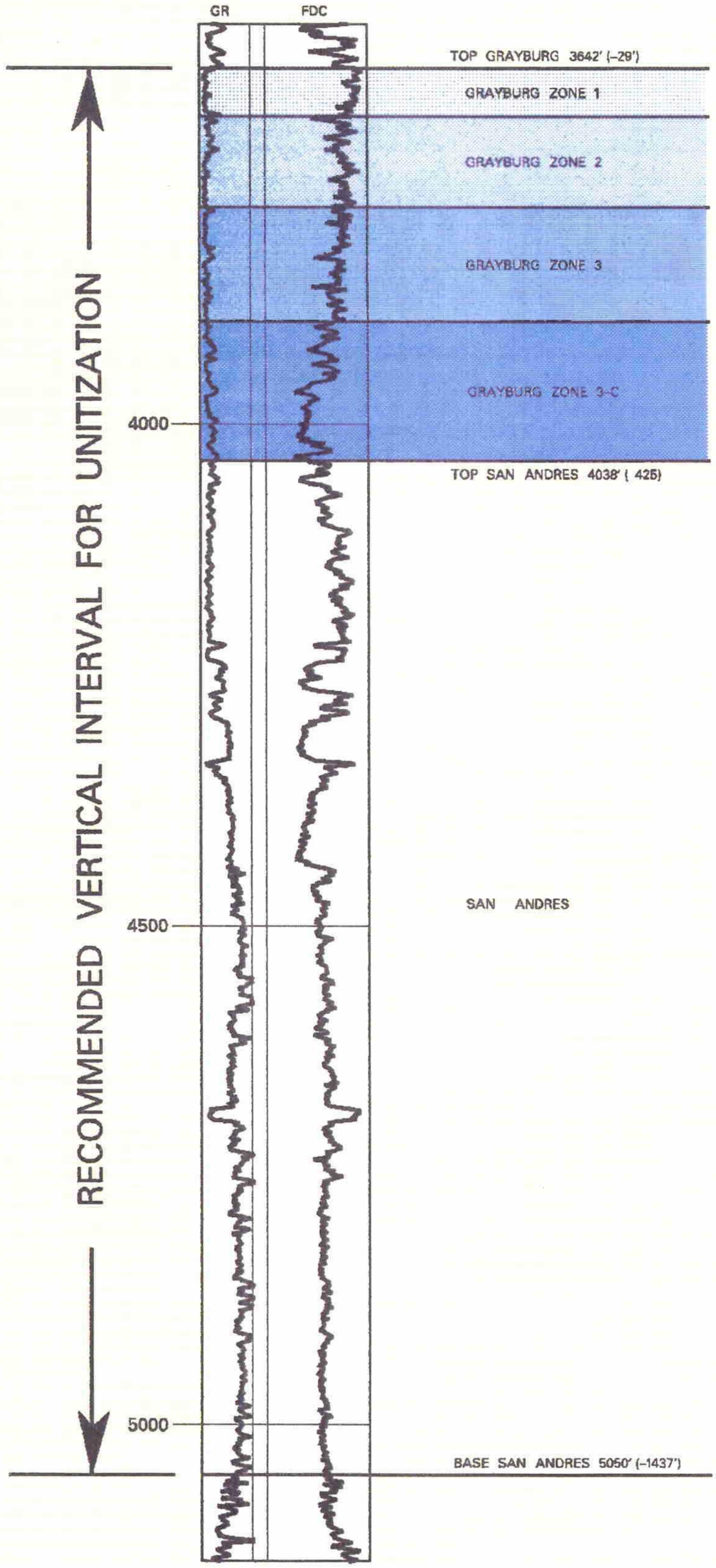
GEOLOGIC EVALUATION FOR
EVALUATION OF PRIMARY RESERVES,
ASSESSMENT OF WATERFLOOD POTENTIAL, AND
PROPOSAL FOR A WATERFLOOD DEVELOPMENT PLAN

NORTH MONUMENT GRAYBURG / SAN ANDRES UNIT
LEA COUNTY, NEW MEXICO

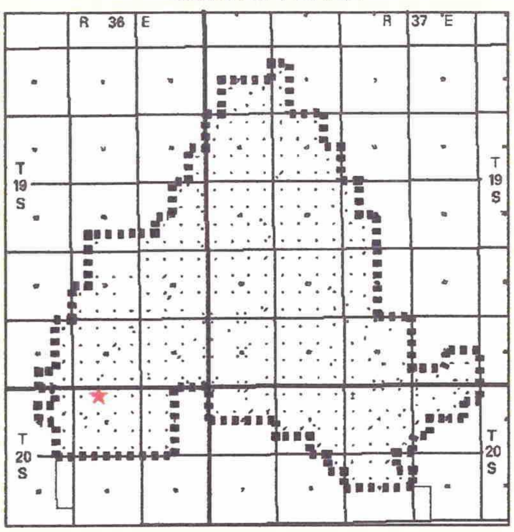


NOVEMBER 7, 1990

TYPE WELL
AHC MONUMENT ABO UNIT No. 1
SEC. 2 T-20-S R-36-E
ELEV. 3613'



NORTH MONUMENT UNIT AREA
LOCATION OF TYPE WELL

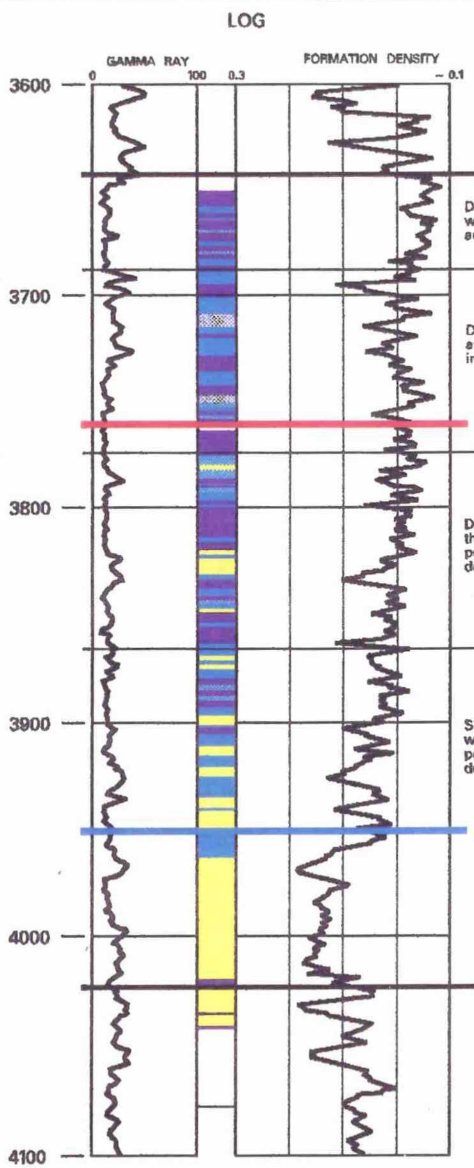


HESS AMERADA HESS CORPORATION

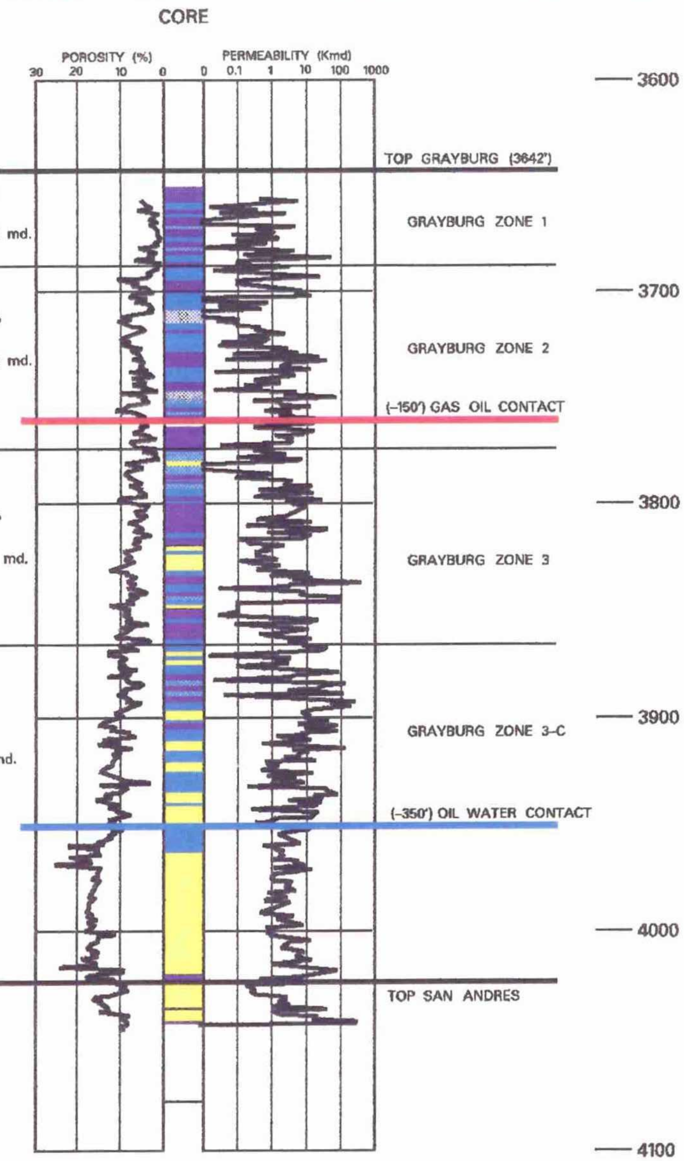
PROPOSED NORTH MONUMENT
GRAYBURG /SAN ANDRES UNIT
TYPE WELL
MONUMENT ABO UNIT No.1

FIGURE No. 1

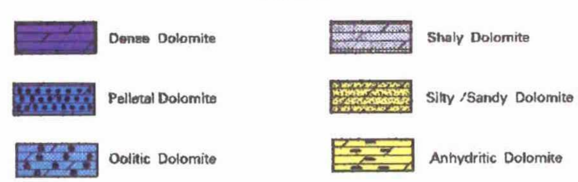
GRAYBURG SECTION
MONUMENT ABO UNIT No. 1
SEC. 2 T–20–S R–36–E
ELEV. 3613'



Lithology	Reservoir quality	Porosity / Permeability
Dense, slightly anhydritic dolomite with some interbedded oolitic, pelletal, and shaly dolomite.	Reservior quality is very low.	Porosity Range: 0.2 – 6.5% Avg.: 2.1% * Permeability Range: <0.1 – 59.8 md. Avg.: 0.2 md. *
Dense slightly oolitic, pelletal and anhydritic dolomite with thin interbedded silty and shaly dolomite.	Reservior quality is low with a few streaks of fair porosity and permeability.	Porosity Range: 0.7 – 10.7% Avg.: 5.1% * Permeability Range: <0.1 – 89.3 md. Avg.: 0.8 md. *
Dense dolomite interbedded with thin porous intervals of oolitic and pelletal dolomite and silty to sandy dolomite.	Reservior quality is fair, but varies with the amount and occurrence of intercrystalline, intergranular, pinpoint, vuggy, and moldic porosity.	Porosity Range: 3.0 – 12.2% Avg.: 7.2% * Permeability Range: <0.1 – 437 md. Avg.: 1.9 md. *
Silty to sandy dolomite with interbedded oolitic, pelletal dolomite, and anhydritic dolomite with sulfur.	Reservior quality is good, but varies vertically and laterally.	Porosity Range: 2 – 25% Avg.: 13.3% * Permeability Range: 0.2 – 198 md. Avg.: 4.0 md. *



LEGEND

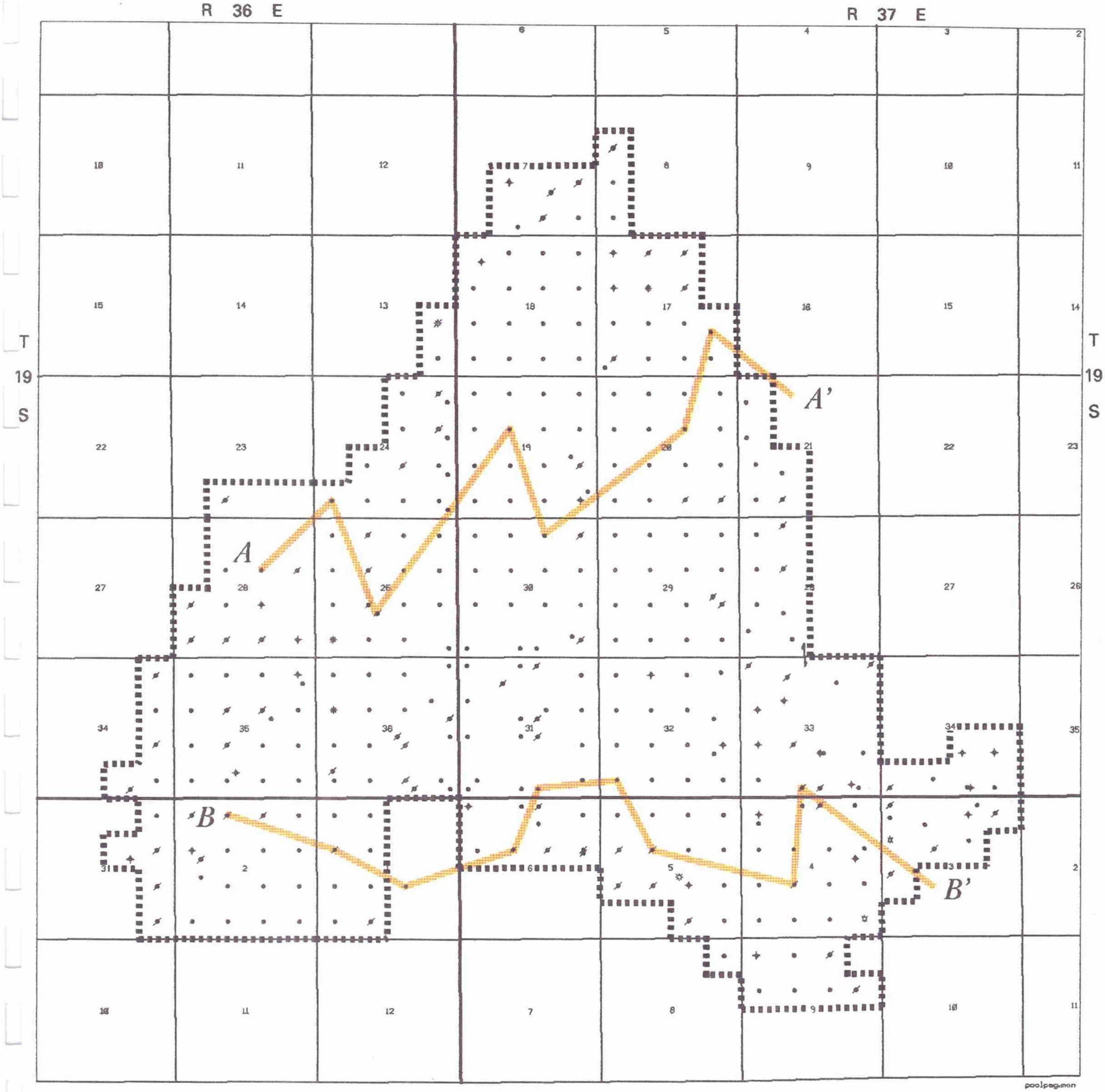


*Note: All porosity averages are arithmetic averages and permeability values are geometric averages.

12

HESS AMERADA HESS CORPORATION

NORTH MONUMENT GRAYBURG / SAN ANDRES UNIT
TYPE WELL:
RESERVIOR DESCRIPTION
MONUMENT ABO UNIT No.1
FIGURE No. 2



LEGEND

- ● OIL WELL
- ☼ GAS WELL
- TEMPORARILY ABANDONED
- ✦ PLUGGED & ABANDONED
- ▪▪▪▪▪ PROPOSED NORTH MONUMENT GRAYBURG / SAN ANDRES UNIT
- ▬▬ CROSS-SECTION

INDEX MAP OF CROSS-SECTION

NORTH MONUMENT GRAYBURG / SAN ANDRES UNIT AREA

Lea County, New Mexico

AMERADA HESS CORPORATION

0 1 2
MILES

FIGURE 3

TABLE OF CONTENTS

PAGE

List of Figures....................ii

Conclusions.................... 1

Introduction.................... 2

Purpose.................... 2

Geologic Setting.................... 2

Geologic Summary.................... 3

Sources of Geologic Information.................... 4

Stratigraphy.................... 4

Type Log.................... 4

Lithofacies and Reservoir Description.................... 5

Zonation.................... 8

Fluid Contacts.................... 9

Structure.................... 9

Oil Column.................... 9

LIST OF FIGURES

1. Type Log of Unit Area
2. Type Log: Grayburg Reservoir Description
3. Index Map of Cross-Sections
4. Stratigraphic Cross-Section A-A
5. Stratigraphic Cross-Section B-B'
6. Structure Map: Top Grayburg Zone 1
7. Structure Map: Top Grayburg Zone 3-C
8. Structural Cross-Section A-A'
9. Structural Cross-Section B-B'
10. Gross Thickness of Oil Column: Zone 3-C
11. Gross Thickness of Oil Column: Zone 3
12. Gross Thickness of Oil Column: Zone 2
13. Gross Thickness of Oil Column: Zone 1

CONCLUSIONS

The geologic evaluation of available information supports the following:

1. The recommended unitized interval from the top of the Grayburg to the base of the San Andres consists of five major subdivisions (one in the San Andres and four in the Grayburg) which are identifiable and correlatable across the unit area.

2. The four subdivisions (Zones 1, 2, 3, and 3-C) in the Grayburg Formation each with distinct lithologic and textural differences affect the distribution and nature of porosity and permeability development.

3. The best reservoir quality (highest overall porosity and permeability) is present in the lower half of the Grayburg Formation in Zones 3 and 3-C.

4. Zone 1 in the uppermost Grayburg has the poorest reservoir quality.

5. Lateral and vertical continuity of flow units is likely to be best in Zone 3-C. The degree of continuity in upper zones will vary and decrease upwards within the Grayburg section.

6. There appears to be sufficient stratigraphic continuity, particularly in Zones 3 and 3-C, to flood these zones in the proposed unit area.

7. No known significant structural deviation (i.e. fault) exists within the unit area; and, the Grayburg appears to have relatively constant thickness throughout the unit area.

INTRODUCTION

Purpose

This report reviews and evaluates the geology of the proposed North Monument Grayburg/San Andres Unit in support of the Technical Committee Report, "Evaluation of Primary Reserves, Assessment of Waterflood Potential, and Proposal for a Waterflood Development Plan", of November 7, 1990. Topics addressed in this geologic report include:

- Reservoir Description of the San Andres Formations
- Geologic Zonation of Grayburg/San Andres
- Stratigraphic and Structural Aspects of the Unit Area

Geologic Setting

The Monument Grayburg/San Andres pool is a north-south trending anticlinal structure approximately nine miles long by six miles wide situated on the northwest corner of the Central Basin Platform bordering the Delaware Basin. Production is from porous and permeable intervals within the Grayburg and San Andres formations of Permian age.

The San Andres is thick massive carbonate which was deposited in a shallow water marine shelf environment on the Central Basin Platform and along the margins of the Midland and Delaware Basins. Much of the hydrocarbon production is from a porous lagoonal dolomite facies, which is found over a large portion of the Permian Basin except in the Delaware basin and a part of the Midland Basin in traps formed by drape folds overlying deep structures and reefs. Updip production is controlled by the loss of reservoir quality caused by a facies change into an evaporitic facies. Although the formation is several hundred feet thick, only the uppermost San Andres occurs above the estimated original oil-water contact at North Monument.

Overlying the San Andres are the interbedded dolomite, mudstone, wackestone, grainstones, and silty and sandy dolomites of the Grayburg. A significant portion of the Guadalupian hydrocarbon production comes from a porous back reef lagoonal dolomite facies of the Grayburg formation. A basinward prograding continental facies of sabka and fluvial sands reduced the areal extent of shallow water lagoonal facies. Updip production is also controlled by a change into an evaporitic facies, which reduced porosity and permeability.

GEOLOGIC SUMMARY

Both the San Andres and Grayburg Formations at North Monument were deposited in a shallow water marine shelf environment along the northwestern edge of the Central Basin Platform during the Permian. There are some distinct lithologic and textural characters which affect the distribution and nature of the porosity and permeability development in these formations.

The upper San Andres is described as having fewer oolitic and silty or sandy intervals, and is generally more calcareous and fossiliferous than the overlying Grayburg. The porosity and permeability development in the San Andres, which is honeycomb or cavernous in places, was largely controlled by diagenetic and post-depositional processes including fracturing, brecciation and solution along pre-existing pore channels. Although core data and logs indicate that the average porosity of the San Andres is generally slightly less than that in zone 3-C, the permeability is commonly greater than in the lowermost Grayburg.

Most of Zone 3-C was found to have a distinct granular texture due to the presence of:

1. oolitic and pelletal dolomite,
2. silty dolomite and/or very-fine grained sandy dolomite, and
3. combinations of both of the above.

This granular texture was the result of a relatively high energy environment of deposition when compared to most of the immediately underlying San Andres or overlying subdivisions of the Grayburg. The resulting porosity and permeability development in Zone 3-C is largely reported to be intergranular or intercrystalline although some secondary vugs are common in the predominantly dolomitic intervals. The best porosity in the zone is usually found in the silty and sandy intervals, while the best combination of porosity and permeability occurred in the well developed oolitic dolomites.

The upper subdivisions of the Grayburg (Zones 1, 2 and 3) contained significantly fewer oolitic and silty or sandy intervals than Zone 3-C. The average porosities and permeabilities of these subdivisions are lower than those found in Zone 3-C or the San Andres. Zones 2 and 3 represented lower energy environments with occasional short-lived periods of higher depositional energy sometimes accompanied by the influx of clastic silt or sand. The dense dolomite of Zone 1 is probably indicative of continuous deposition in a shallow and very low energy environment.

The subdivisions of the Grayburg/San Andres at North Monument have considerable lateral variation in lithology and porosity/permeability development. Combined with the poor quality of much of the log data, fieldwide detailed correlations are often made with great difficulty and some uncertainty. This is especially true in the central and eastern portions of the unit area which has less core data and considerably fewer modern logs available. In most instances the upper subdivisions of the Grayburg are more easily identified than Zone 3-C and the San Andres.

Sources of Geologic Information

Sources of geological data used included:

1. Nuclear and electric logs and computer processed logs from about 335 wells;

2. core analyses from 5 wells for a total of 786 feet (601 feet in the Garyburg and 185 feet in the San Andres).

3. lithologic descriptions from well cuttings in about 26 wells.

Despite the relatively large amount of log information available, detailed geologic study and correlation is difficult due to the poor quality of much of this data.

Most of the logs reviewed were old gamma-ray neutron logs from the early 1960's which were run when wells were worked over, often 15 to 20 years after they were originally completed. In many instances these logs were adversely affected by one or more of the following: hole size variation below casing points; a change or shift in the response of the log when passing upward from open hole into the cased portion of the well; or, substantial changes in log response due to the build-up of a somewhat radioactive scale opposite the producing zone. Relatively few modern logs (compensated neutron, formation density, sidewall neutron porosity, sonic, etc.) are available, most of which came from either replacement wells or deeper wells.

A very limited amount of core was available. There were only two wells which were cored from near the top of the Grayburg into the upper San Andres. Core data from the remaining ten wells represented a partial coverage of the formation interval. Detailed lithologic and textural descriptions of the cuttings were limited in several instances due to their small size and poor quality.

STRATIGRAPHY

Type Log

The Amerada Hess Corporation Abo Unit No. 1 (located in NE 1/4 of NW 1/4, Sec. 2, T-20-S, R-36-E), as illustrated in Figure 1, has been designated as the type log for this unit. The recommended vertical interval for unitization as indicated in Figure 1 is from the base of the San Andres formation to the top of the Grayburg Formation. Four major subdivisions of the Grayburg are shown (Zones 1, 2, 3 and 3-C). The position of the type well within the unit is displayed. These major subdivisions of the Grayburg are shown in Figure 2, with a display of the major lithofacies, a brief lithologic description, a description of reservoir quality, and an arithmetic average porosity and geometric average permeability from core analysis for each zone. These descriptions as well as the porosity and permeability values shown are not intended to represent average fieldwide values, but are included to illustrate typical differences in reservoir quality of the four subdivisions.

Lithofacies and Reservoir Description

Almost the entire Grayburg Formation is cored in the type referenced well, the Abo Unit No. 1. This cored interval as illustrated in Figure 2 is one of the best sources of information on lithofacies and reservoir charactertistics within the unit area. About 64 percent (382 feet out of 601 feet) of the core data in this unit area comes from this well. The data from this well combined with a few other wells with limited core data or well cuttings form the basis for the lithofacies and reservoir description of the five major subdivisions of the unitized interval.

San Andres

In the Monument area, the San Andres is commonly found to be a massive, dense, relatively clean, limy to calcareous dolomite. A granular texture, typically pelletal or oolitic, was occasionally reported. Some thin clastic intervals of silt or very-fine grained sand are sometimes noted, but they usually don't occur within the top 20 to 40 feet of the formation.

Lithologic descriptions from core and well cuttings commonly report the presence of fossils, especially fusulinids and occasionally some crinoids or gastropods, within the San Andres. Brecciation and/or fractures, with the openings often lined with either coarse crystalline calcite or an asphaltic appearing residue, are noted.

Although porosity in the San Andres is occasionally reported as intergranular or intercrystalline, it was more often described as pinpoint to vuggy, fossil-moldic or oolmoldic, or due to fractures or brecciation. The existence of honeycomb and cavernous porosity has long been postulated due to the lost circulation zones and rapid penetration times (or actual dropping of the bit) during drilling of the San Andres. It appears that much of the porosity in the San Andres was created or substantially enhanced by the, leaching of fossils and oolites, or solution along pre-existing pore channels. The contact between the San Andres and the Grayburg is thought to be unconformable; therefore, much of the secondary porosity may have been developed during extended exposure of the formation to percolating surface waters. The contact of the San Andres with the overlying Grayburg is more readily distinguished in core samples than on logs. In portions of the unit area this contact was much more difficult to identify. Lateral changes in lithology and porosity resulted in very similar log responses for the upper San Andres and lower Grayburg. The uppermost San Andres is generally reported to be more limy or calcareous; more fossiliferous; less oolitic and pelletal; and, significantly less silty, sandy and argillaceous than the lowermost Grayburg. In the western portion of the unit area, as illustrated on the type log (Figure 1), the neutron, density or sonic log responses often show less porosity in the upper San Andres compared to the overlying Grayburg.

A very limited amount of San Andres core is available from within the unit area. There were only three wells within the general area of the unit which have cores. In all three cases the cored interval was below the estimated OWC of minus 350 feet and only in the upper San Andres. Individual porosity values are as low as 2.6% and as high as 24.3%, while the per well average porosity ranged from 8.0% to 10.9% over the entire cored interval. Permeability values varied from less than 0.1 md to a high of 434 md.

Arithmetic average permeabilities over the entire interval cored in each well ranged from 3.4 to 69.1 md, while the geometric average varied from 0.47 to 12.86 md.

Grayburg Zone 3-C

Sample and core descriptions indicated that Zone 3-C is largely composed of granular textured (oolitic, pisolitic, pelletal or pelloidal) dolomite interbedded with intervals of denser (micritic, earthy) dolomite and a variable but often substantial amount of quartz silt and very-fine grained sand. In many instances the lithology is described as a complex mixture of dolomite and silt or sand.

The porosity in Zone 3-C is generally described as intergranular and intercrystalline in both the predominantly silty and sandy intervals as well as in the granular textured dolomite. Pinpoint to vuggy porosity is quite common in the dolomite, and occasionally some fossilmoldic and oolmoldic porosity is observed.

From the limited amount of core data available, the porosity of Zone 3-C was found to range from 2% to as high as 25% in a single well. Some of the best porosity development occurs in the very silty and sand horizons; however, the corresponding permeabilities are generally fair to poor due to the small grain size and the presence of dolomitic cement. The core analysis seldom indicated permeabilities above a few millidarcies in the silty and sandy intervals.

The best combination of porosity and permeability occurs in the well developed oolitic dolomites. Porosities in these intervals are generally between 10 to 15% with permeabilities ranging from approximately 10 to over 200 md. Permeabilities in excess of about 40 md were rare, however, and the geometric average permeability for the entire zone is on the order of a few millidarcies.

Grayburg Zone 3

Zone 3 generally appears to consist of relatively dense dolomite interbedded with numerous thin porous intervals of pelletal or oolitic dolomite and silty or very fine-grained sandy dolomite. The denser portions of the zone are commonly described as having a cryptocrystalline, micritic, earthy or very-fine grained texture. The thin porous intervals are similar to, but not as thick and usually not as well developed or continuous as those in Zone 3-C, Fossils, especially fusulinids and some gastropods, and evidence of burrowing are occasionally noted as were argillaceous lamination, stylolites, disseminated pyrite and small amounts of anhydrite.

Porosity in Zone 3 is intergranular or intercrystalline, pinpoint to vuggy and occasionally moldic. Although the average porosity and geometric average permeability values from the core analysis significantly less than those of Zone 3-C, the range in values is similar due to the thin porous intervals of oolitic dolomite and siltstone or sandstone which are fairly well developed. Fractures may also contribute to some high permeability values.

The thin porous and permeable intervals, which evidently represent short-lived increases in an otherwise lower energy depositional environment, are generally more common in the lower portion of Zone 3. This sometimes led to difficulty in identifying the base of the subdivision, especially where the porosity development in upper Zone 3-C is poorer than normal.

Although nearly all of Zone 3 in the unit area occurs above the estimated original WOC of minus 350 feet, production has generally been fair to poor due to the lack of thick, well developed porous and permeable intervals characteristic of Zone 3-C and the San Andres.

Grayburg Zone 2

The lower 40 to 70 feet of Zone 2 is usually described in core and sample studies as a cryptocrystalline, micritic or earthy dolomite which is only slightly pelletal or oolitic in appearance. The oolites are often reported as "altered" or the texture described as "pseudo-oolitic". The dolomite is slightly anhydritic or slightly silty; and, fossils (fusulinids) are only occasionally noted. The dense nature of this interval, compared to the somewhat more porous Zone 3, is usually easy to identify on logs.

The upper 30 to 50 feet of Zone 2 consists largely of dolomite interbedded with some thin siltstones or very fine-grained sandstones. Some argillaceous partings and shaley laminations are often reported, along with minor amounts anhydrite and disseminated pyrite. The dolomite is similar to, but often more silty and granular textured, than that found in the lower portion of the zone. A micritic, earthy, pelletal or fine-grained texture is present, while oolites, pelloids and fossils are less numerous.

Very little core data is available for the upper Grayburg at Monument. Of the 12 cores in the field, only four included information on Zone 2. The average porosities and geometric permeabilities reported for the zone are quite low, although a few thin intervals of fair to good intergranular or vuggy porosity are occasionally noted, especially in the upper portion of the zone. In general, Zone 2 is denser, less porous and less permeable than the underlying Grayburg zones.

Grayburg Zone 1

The uppermost subdivision of the Grayburg is commonly a dense cryptocrystalline or micritic dolomite. The presence of a few fusulinids, some thin and very poorly developed oolitic or pelletal intervals, and some thin shaley laminations is occasionally noted. The dolomite is slightly silty or slightly anhydritic in places.

The limited amount of core data indicates that Zone 1 has the lowest reservoir quality and the poorest porosity and permeability developed of any of the Grayburg subdivisions. Average porosities of less than 3% and geometric average permeabilities of less than 0.2 md are at least half the values of any other zone in the same well.

Zonation

The lowermost subdivision of the Grayburg as used in this report is Zone 3-C. The lower boundary of this zone, a possible unconformable contact with the San Andres, was previously described. The upper boundary has been defined as the top of the most continuous porosity development in the basal Grayburg. This upper boundary occurred at approximately the same stratigraphic point throughout the unit, and is more clearly defined on modern logs, from core analysis, and on computer processed logs. The contact is not as easily determined from the older electric and gamma-ray neutron logs. Lithofacies changes and resulting porosity of Zone 3-C was found to be quite variable both vertically and laterally. This sometimes makes it difficult to identify the upper and lower boundaries of the zone, particularly on the poor quality logs. The gross thickness of the zone ranged from about 120 feet to approximately 160 feet.

A thin but reasonably consistent porous horizon is used as a marker to identify the top of Zone 3 throughout the unit area. The gross thickness of Zone 3 varies from approximately 80 to over 125 feet.

Zone 2 is identified on logs throughout the unit area. The boundaries are delineated by the contrasts in rock and log characteristics that exist between the upper and lower parts of Zone 2 and their adjacent zones. The lower boundary is identified by the contrast between the somewhat more porous rocks of Zone 3 as compared to the more dense dolomites in the lower portion of Zone 2. The upper boundary of Zone 2 is identified by the contrast between the cleaner and denser rocks of Zone 1 as compared to the more silty, shaley and more granular dolomites in the upper part of Zone 2. As illustrated on the type log in Figures 4 and 2, the gamma-ray response indicates more radioactivity and the density curve more porosity than in the cleaner, denser dolomite of Zone 1 and of the lower part of Zone 2. The gross thickness of Zone 2 ranges from about 60 feet to nearly 120 feet.

The dense and tight nature of Zone 1 is quite evident on the neutron, density and sonic logs throughout the unit which make both the upper and lower boundaries of the subdivision rather easy to identify. The top of Zone 1, which is also the top of the Grayburg, is placed at the base of the lowermost silty or sandy interval in the overlying Penrose, member of the Queen Formation. The gross thickness of the zone varies from approximately 20 to 60 feet, but is commonly 35 to 45 feet throughout most of the unit area.

The four major zones of the Grayburg Formation are identifiable and present over the entire unit area. Two east-west stratigraphic cross-sections were constructed. The location of both lines of cross-section has been illustrated in Figure 3. Cross-Sections A-A' (Figure 4) and B-B' (Figure 5) show the correlation, continuity and variations of the major subdivisions of the Grayburg/San Andres at North Monument. The type log is included as a westermost well cross-section B-B'. All four subdivisions of the Grayburg Formation are present throughout the unit area. Other than minor isopacheous variations no known major stratigraphic discontinuity exists. Within each zone smaller scale lateral and vertical stratigraphic variations exist which affect the distribution and movement of fluids. Future detailed stratigraphic studies will more accurately define the continuity and limits of flow units and potential barriers.

FLUID CONTACTS

A review of the available information have indicated that there were nearly uniform and horizontal gas-oil and oil-water contacts in both the Grayburg and San Andres in the North Monument area. There was not always agreement, however, on the precise subsea depths of these contacts. The reported original GOC commonly varied from minus 150 to minus 200 feet, while the WOC generally ranged from minus 350 to minus 400 feet. Since there was insufficient data available to determine the precise position of these original contacts, the Technical Committee ultimately decided on generally accepted values of minus 150 feet for the GOC, and minus 350 feet for the WOC. The reasonably consistent contacts which cross formational boundaries indicate that there must have been some degree of vertical permeability in these units allowing for the relatively uniform segregation of fluids over geologic time.

STRUCTURE

The Monument Grayburg/San Andres pool is a north-south trending anticlinal structure about nine miles long by six miles wide. The North Monument Unit is situated at the northern end of the structure. Structure maps (Figures 5 and 6) show the structural configuration at the tops of the Grayburg and at Grayburg Zone 3-C. Note that the configuration of both maps are similar. The structure of other Grayburg zones and the top of the San Andres have the same characteristic north-south anticlinal axis and northwest-southeast trend of other nearby fields to the south and east. It should be noted that little control is available for establishing contours much below minus 350 feet since very few wells penetrated much deeper than the oil-water contract.

Fluid contacts are noted on the structure maps as are both lines of the structural cross-sections A-A' and B-B'. Cores from the Abo Unit No. 1 have natural fractures within the Grayburg. However, no information is available to indicate how extensive fracturing is within the unit area; nor, is the specific cause of fracturing known. While faults with minor offset may exist, no faults were identified.

The two east-west structural cross-sections A-A' (Figure 8) and B-B' (Figure 9) show the approximate structural profile of each of the major subdivisions of the unitized interval over the unit area. The original fluid contacts are noted with the original water-oil contact (WOC) at minus 350 feet and the original gas-oil contact at minus 150 feet. As illustrated in both of these cross-sections a significant portion of the original oil column throughout the unit area is found in Zones 3 and 3-C, which are the primary targets of the proposed waterflood.

OIL COLUMN THICKNESS

As illustrated in Figure 10, Zone 3-C comprised a significant portion of the oil column throughout much of the unit area. In the north-central portion of the field, up to 150 feet of the original oil column consisted of Zone 3-C while to the south the thickness may exceed 100 feet. In the structurally highest part of the field, much of Zone 3-C occurs above the original GOC of minus 150 feet. Outside the zero (0) contour along the edges of the field, all of Zone 3-C was found to be below the estimated original WOC of minus 350 feet.

As illustrated in Figure 11, a significant portion of the original oil column was composed of Zone 3 along the western edge and in the northeastern part of the unit area. Inside the zero (0) contour all of Zone 3 occurred above the estimated original GOC of minus 150 feet.

As illustrated in Figure 12, the only significant contribution of Zone 2 to the oil column occurs along the eastern and western edges of the unit area. Throughout most of the unit, the zone occurs above the estimated original GOC of minus 150 feet.

As illustrated in Figure 13, Zone 1 contributed a small amount to the oil column along the far eastern and western edges of the unit area. Throughout the remainder of the unit, all of the zone occurs above the estimated original GOC of minus 150 feet.