PROPOSED BURTON FLAT DEEP UNIT

EDDY COUNTY, NEW MEXICO

GEOLOGY

INTRODUCTION

The proposed Burton Flat Unit, comprising approximately 5,808 acres in State and Federal leases, is located 8 miles northeast of the city of Carlsbad, New Mexico and 2½ miles northeast of Carlsbad National Wildlife Refuge which is centered around Lake Avalon reservoir located on the Pecos River.

The topography of the proposed unit is essentially expressionless with elevation variance from 3,180 feet to 3,280 feet above sea level. The proposed unit covers a portion of an area designated by United States Geological Survey as "Burton Flat", hence the name of the proposed unit. The Burton Flat area is separated topographically from the Pecos River and Lake Avalon reservoir by the low relief Alacran Hills and their northwest extension to Fade Away Ridge. Drainage is essentially internal with a small alkali lake or playa located in Section 4, T-21-S, R-27-E, bordering the proposed unit on the southwest. In periods of excessive rainfall, some runoff undoubtedly is captured by Lone Tree Draw immediately southeast of the proposed unit. Runoff down Lone Tree Draw is usually absorbed by the substrata before reaching the Pecos River below the city of Carlsbad.

Surface and near-surface rock under the proposed unit is composed of Rustler (Permian) dolomite. Pliestocene and Recent soil supports semi-dessert flora typical of the region. The surface is used for the grazing of livestock.

STRATIGRAPHY

The proposed Burton Flat Unit is located on the margin of the Delaware Basin as defined by Guadalupian-aged rocks. The proposed Unit is positioned over the shelfward flank of the Capitan reef. Yates sandstone of the back reef environment are present and produce oil on the west side of the proposed Unit area at the Saladar field from an average depth of 650 feet. The Yates sandstone is probably present under the entire proposed unit but eventually wedges out into the Capitan reef south-southeast of the proposed unit. Structural closure at the Yates horizon at the Saladar field is responsible for trapping and accumulation of oil in this field. The structural closure is believed due to differential compaction over an earlier Guadalupain biohermal reef. This compaction phenomenon is observable at surface exposures in the low relief hills southwest of the city of Carlsbad.

At the location of the proposed Unit, the Yates is underlain by the Capitan reef complex. The reef is usually porous and is a freshwater reservoir in this area. This reef is a water supply source for the city of Carlsbad, New Mexico. It is mandatory that these water reserves be protected and any drilling program on the proposed Unit shall provide this protection. The Capitan reef complex extends from approximately 800 feet to approximately 3000 feet below the surface under the proposed Unit.

Approximately 2300 feet of Lower Guadalupian Delaware sandstone underlies the Capitan reef in the locality of the proposed Burton Flat Unit. These sandstones offer some potential as oil reservoirs, therefore unitization of the formations under the proposed Unit should commence at the top of these sandstones as defined at 2970 feet by the Acoustic Velocity Survey conducted in the Humble No. 1 Cedar Hills Unit well located 1980' FSL, 660' FEL, Section 15, T-21-S, R-27-E.

Approximately 3600 feet of Bone Spring limestone and sandstone underly the Delaware Sandstone at the location of the proposed Unit. These Leonardian rocks were deposited in a basinal environment, are very fine textured and usually lack effective reservoir parameters.

It is anticipated that approximately 1350 feet - 1400 feet of Wolfcamp shales will be present below the Bone Spring formation. These basal Permian rocks are composed principally of interbedded limestones and shales which were deposited in basinal environment. The detrital limestones offer some potential as hydrocarbon reservoirs, however, where tested in the immediate area, they have been found to be of low capacity and uneconomical. Should an indicated Wolfcamp oil or gas reservoir be encountered under the proposed Unit it should be evaluated by an extended multiflow drillstem test in order to determine its capacity as an economical horizon.

The Upper Pennsylvanian is essentially absent by non-deposition under the proposed Unit. It is possible that Upper Pennsylvanian may be represented in the lower portion of clastic rock assigned to the Wolfcamp in this report, however, paleontological evidence is lacking to support this possibility. The first definitive Pennsylvanian rock unit under the captioned area is a Lower Strawn limestone, which is one of the principal objectives under the proposed Unit.

The Lower Strawn carbonate bank projected under the proposed Unit is regionally composed of three principal biogenetic units; a lower biostrome, a middle unit which contains random bioherms and an upper biostromal unit. The lower biostrome is the principal productive horizon at the Lusk field located approximately 20 miles east-northeast of the proposed Unit. This stratigraphic unit is also productive in the South Carlsbad field located approximately 12 miles south-southwest of the proposed unit. This lower unit of the Strawn is a specific objective under the proposed unit. The accompanying lower biostrome isopachous maps show the relationship of this Strawn member to the proposed Unit.

As mentioned above, the lower biostromal unit has a biogenetic origin. The principal fossil constituent is the algae Ivanovia. These algae had leaf-shaped blades and grew in colonies which resembled a cabbage patch. These blades acted as sediment baffles and not only stabalized algae debris, but also captured lime mud sediment washed in during storms, thus a bank deposit developed. As the algae blades fell upon their death, many of the blades were deposited convex upward, leaving sheltered voids beneath the blades. Since the blades were composed of rather strong aragonite (later changed to calcite), the protective voids (primary porosity) were preserved beneath these blades. Subsequent leaching of these accumulations increased the effectiveness of the primary porosity, thus providing an excellent reservoir for the accumulation of hydrocarbons.

Approximately 900 feet - 1000 feet of Lower Pennsylvanian (Atoka and Morrow) rocks are present below the Strawn. The Lower Morrow, consisting of approximately 500' of interbedded sandstones and shales are present under the proposed Burton Flat Unit. The Lower Morrow sandstones are porous and are principle objectives under the proposed Unit. Commercial quantities of Morrow gas has been established in several directions from the proposed Unit. The most significant nearby Morrow gas reserves are those being developed at the South Carlsbad field, 12 miles to the south and at the Catclaw Unit area, 10 miles to the west.

While the Lower Morrow can be subdivided into several correlative units, it is difficult to map the individual sandstones. The lower most of these units, designated "F" zone on the accompanying maps and cross-sections is an exception. This unit can be mapped with a fair degree of confidence. The sandstone in the "F" zone is the principle producing horizon at the Rock Tank Unit, 22 miles to the southwest, and is productive under the Catclaw unit mentioned above. This sandstone is projected under the proposed Burton Flat prospect as shown on the accompanying maps.

Approximately 800 feet of Mississippian shale and limestone underlies the Morrow at the proposed Unit. There are no rocks below the Morrow which are considered commercial objectives under the proposed Burton Flat unit. The test well on the proposed unit will be bottomed in the top of the Mississippian (Barnett) shale.

STRUCTURE

A southeast plunging structural anticline is present under the proposed Burton Flat Unit. The porosity trend of the Strawn biostrome and Lower Morrow "F" zone cross this structural feature as shown on the accompanying maps. The coincidence of a positive structure and porosity creates a trap for hydrocarbons in these two formations. It should be noted that because of the position of the two porosity trends, the area prospective for each reservoir is not exactly the same. The proposed Unit outline was determined by combining the prospective area for each zone.

It is apparent that a portion of Sections 10 and 11 of T-21-S, R-27-E might also be prospective. The owners of these leases were invited to participate in the proposed Unit but declined to do so; therefore, that acreage is omitted from the Unit.

An 11,500' test well, located in the NW/4 of Section 3, T-21-S, R-27-E is planned for the evaluation of the proposed Burton Flat Unit.

Richard D. Jons

Richard D. Jons
Regional Geologist
Monsanto Company
Midland, Texas
June 23, 1972

Enclosures:

(1) Surface Topography
(2) Isopach Strawn Lower Biostrome
(3) Isopach Net Porosity Strawn Lower Biostrome
(4) Structure Base of Strawn
(5) Isopach Morrow "F" Zone Clean Sandstone
(6) Isopach Morrow "F" Zone Net Porosity
(7) Structure Base of Morrow - Top Barnett Shale
(8) Structural Cross Section - A-A'
(9) Structural Cross Section - B-B'

Unit Name BURTON FLAT DEEP UNIT (EXPLORATORY)

Operator Monsanto Company

County Eddy

OCC

4791

DATE APPROVED	OCC CASE NO. 4791 OCC ORDER NO. R-4371	EFFECTIVE DATE	TOTAL ACREAGE	STATE	FEDERAL	INDIAN-FEE	SEGREGATION CLAUSE	TERM
Commissioner 8-24-72	8-21-72	8-29-72	5,807.72	1,234.62	4,253.10	320.00	Yes	5 yrs.

UNIT AREA

TOWNSHIP 20 SOUTH, RANGE 28 EAST, NMPM

Sections 26 and 27: All
Section 28 S/2
Sections 33, 34, & 35 All

TOWNSHIP 21 SOUTH, RANGE 27 EAST, NMPM

Section 1: Lots 3, 4, 5, 6, 11, 12, 13, 14 and SW/4
Section 2 and 3: All

Unit Name BURTON FLAT DEEP UNIT (EXPLORATORY)
Operator Monsanto Company
County Eddy

STATE TRACT NO.	LEASE NO.	INSTI-TUTION	SEC.	TWP.	RGE.	SUBSECTION	RATIFIED DATE	RATIFIED ACRES	ACREAGE NOT RATIFIED	LESSEE
23	L-2766	C.S.	2	21S	27E	Lots 1, 2, 3, 4, 7, 8, 9, 13, 14	8/21/72	314.62		Monsanto Company
24	L-3568	C.S.	2	21S	27E	S/2	8/21/72	320.00		Gulf Oil Corporation
25	L-6322	C.S.	28	20S	28E	S/2	8/18/72	320.00		Cities Service Oil Co.
26	L-6523	C.S.	2	21S	27E	Lots 5, 6, 10, 11, 12, 15 & 16	8/21/72	280.00		Monsanto Company