

## Feature Article

### *Keechi and Palestine Salt Domes, Anderson County, Texas<sup>1</sup>*

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(Editor's note: The Keechi and Palestine salt domes were the subject of an HGS field trip in March, 1997.)

The Keechi and Palestine salt domes are two of a group of 17 shallow piercement domes known as the Interior Salt Domes of East Texas, which lie along the axial region of the East Texas embayment. Their source layer, the Louann Salt of Jurassic age, is probably deeper than 20,000 feet subsea elevation in the vicinity of the Keechi and Palestine domes. These two domes are located near the town of Palestine, in Anderson County, approximately 160 miles north of Houston.

Several items cause these domes to be of interest to both casual and serious observers. They are two of only four salt domes in this region which have Cretaceous outcrops on top (Figure 1), this in an area typified by early to middle Eocene outcrops. Surface expression of typical salt dome geology is present, including annular outcrops, steep dips, radial faults, and geomorphic expression of the underlying geology. The amount of vertical uplift on the oldest exposed strata is very large, approximately 4,000 feet at Keechi dome and 6,000 feet at Palestine dome. The shallowest known salt, or apex of the salt core, is at a depth of 370 feet on Keechi dome and only 120 feet on Palestine dome. Both may be studied easily because both are readily accessible by hard-surfaced roads which pass directly over the crests of both domes.

Both Keechi and Palestine domes have had a long history of geologic study. Both were recognized as geologic anomalies in the late 1800s, but their origin as salt uplifts was not recognized until later. The level of geologic and industrial interest in these domes has been sporadic. Salt was solution-mined at Palestine dome from 1904 to 1937. Both domes also have been studied recently as possible sites for disposal of nuclear and chemical wastes in man-made salt caverns, but so far no such disposal is being done at either Keechi or Palestine.

Both domes have been the object of oil and gas drilling since before 1920, but neither oil nor gas ever has been produced from either dome. Two of the most interesting

wells drilled in this vicinity are the Pure Oil 1 City of Palestine, drilled in 1956, and the Oxy Petroleum 1 Lem Mallard, drilled in 1981; both are dry holes. The Pure Oil well was drilled on a Cretaceous interdomal high between the two salt piercements and reached a total depth of 11,888 feet in the uppermost part of the Travis Peak Formation. This well is considered to be rather typical of the undisturbed geologic section in the immediate vicinity of the two salt domes. The Oxy well was drilled approximately 4½ miles southeast of the Keechi dome. This well reached a total depth of 19,250 feet in the Haynesville Limestone and is the deepest well in this area.

At least four wells have drilled through salt overhangs on these two domes, two on Keechi and two on Palestine. On Keechi dome, the Producers Oil Company 1 Barrett & Greenwood, drilled in 1915 on the south flank of the dome, penetrated 660 feet of salt, then almost 300 feet of possible Woodbine Sand, and reached total depth in salt at 3,170 feet. The EP Operating 1 Chevron Fee, drilled in 1992 on the east flank, penetrated approximately 4,600 feet of salt overhang, approximately 150 feet of which was probable caprock, exited the salt at 8,476 feet in the Goodland Limestone, and reached total depth of 11,040 feet in the Rodessa Formation. On the Palestine dome, the Texaco 1 Davey in 1962 drilled out of the base of salt at 9,280 feet into the Paluxy Sand and reached total depth of 12,141 feet in the Travis Peak Formation; top of the salt overhang in this

well is not known. The Hunt 1 Biggan, drilled in 1983, penetrated a salt overhang approximately 7,000 feet thick, exited salt at 10,100 feet in the Upper Glen Rose Formation, and reached total depth of 12,523 feet in the Pettet Formation. Both of these wells are on the northeast flank of the Palestine dome.

Working the surface geology in this area of soft, Tertiary outcrops can be challenging. Units normally are identified by soils and vegetation with help from limited exposures in creek banks and road cuts. The only persistent and easily identifiable unit in this area is the basal member (Newby) of the Reklaw Formation, and it is very reliable for structural mapping. Most faults can be recognized initially by noting offsets in the outcrop of this unit as one walks

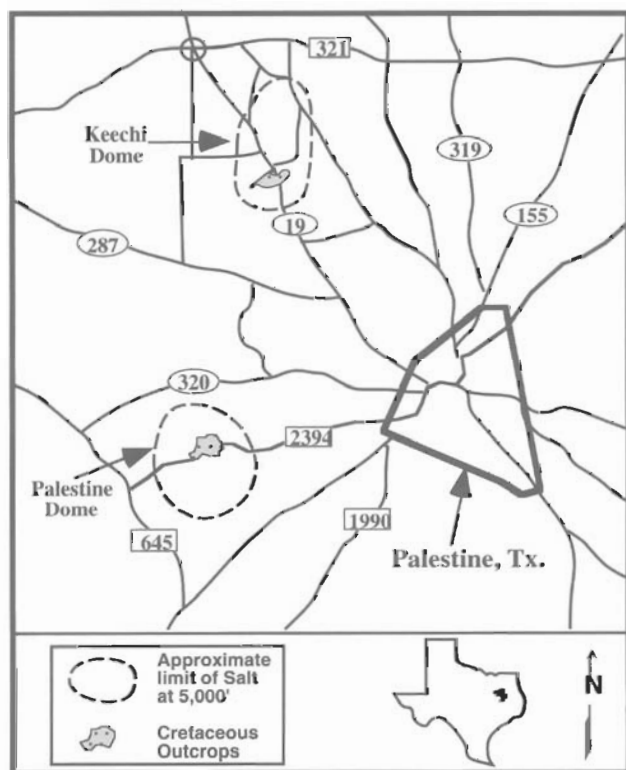


Fig. 1  
General location map of  
Keechi and Palestine Salt Domes

**Stratigraphic Section**

System	Series	Group	Formation	Thickness		
				Pure Oil Co. #1 Palestine	Outcrop	
					Keechi	Palestine
Quaternary	Recent Pleistocene		Alluvium	---	0'-20'	0'-20'
			Terrace	---	?	0'-35'
Tertiary	Eocene	Claiborne	Sparta	---	<10'	---
			Weches	---	40'-50'	---
			Queen City	About 2,300' (Spud in Queen City)	300'	125'
			Reklaw		70'-100'	65'-125'
			Carrizo		60'-100'	20'-110'
		Wilcox		1,100'-1,400'	12,00'-1,500'	
	Paleocene		Midway	770'	100'-200'	650'
			Navarro	504'	200'-250'	250'
Cretaceous	Gulf		Taylor	1,209'	600'-800'	600'-900'
			Austin	273'	---	30'-250'
			Eagle Ford	245'	---	125'
			Woodbine	877'	---	35'
			Comanche	Maness	110'	---
			Buda	150'	---	25'

Figure 2

Stratigraphic Section of the Keechi and Palestine salt dome area.

the periphery of the domes. These fault observations then can be supplemented by further, but more tenuous, observations toward the center of the domal uplifts.

The Palestine dome more closely resembles a "typical" salt dome with its circular outline, concentric outcrop pattern, steep dips, radial faults, and well-developed topo-

graphical features such as a central depression and associated centripetal drainage. The oldest stratigraphic unit exposed on this dome is the Buda Limestone of early Cretaceous age, and it is uplifted approximately 6,000 feet above its normal position in this area. Other Cretaceous units exposed include the Woodbine Sand, Eagle Ford Shale, Austin Chalk, and Taylor and

Navarro Groups.

Most of these same features can be observed on the Keechi dome but in a more subdued or less typical fashion. The salt core is elliptical in plan view. The elliptical outcrop pattern, however, does not have quite the same orientation as does the salt core. Although radial faulting is present, the dominant feature is a northeast-southwest trending, down-to-the-northwest half graben. Topographic expression is not as well developed as at the Palestine dome. The Pecan Gap Chalk, which is part of the Taylor Group of Upper Cretaceous rocks, is the oldest unit exposed on this dome; and it has been uplifted approximately 4,000 feet.

Both the Keechi and Palestine salt domes are spectacular geologic features clothed in a very subdued surface manifestation. All the subtleties of soft rock Tertiary surface geology, combined with the normal geological complexities of salt domes, have caused these two domes as subjects of continuing geological interest and challenge.

<sup>1</sup> Modified from an article previously published in the Dallas Geological Society Newsletter, January 1992