"Petroleum Exploration in Mongolia – The Final Frontier (Onshore)"
by Debra Gomez, Consulting Geologist

This presentation was given at the monthly DIPS (Denver International Petroleum Society) meeting on May 10 at the Wynkoop Brewing Company. Ms. Gomez is a VP at MHA Petroleum Consultants and received a BS degree in geology from the University of Southern California in 1976 and an MS degree in geology from Northern Arizona University in 1979. Both degrees were in geology. She has assisted in projects in Mongolia for the past 3 years. MHA are acting as consultants to Wolf Petroleum in Mongolia. Tom Fassio, Sandy Perry and Dave Seneshen assisted in the preparation of this talk.

The following material was given as pre-publicity for the talk:

"Mongolia contains several large under-explored sedimentary basins that are geologically similar to highly productive basins in China. Current production is from lower Cretaceous sediments located in lacustrine rift basins in eastern Mongolia. These basins are filled with continental sediments and volcanics that can reach 3-4 km in thickness. Rifting and subsequent basin inversion has resulted in complex basin geometry.

Sub-basins within the larger basin areas are actively being defined by land-based gravity and magnetic surveys, and are confirmed by 2D seismic. Depositional environments for petroleum reservoirs encountered in the lacustrine sub-basins vary from alluvial fans;

fluvial, delta and deep lake fans; and turbidites. Published literature of the reservoir stratigraphy and surface exposures of the Cretaceous are limited. Numerous unconformities within the prospective section that include both structural and stratigraphic traps have been inferred based on seismic interpretation. Sub-basins are self-sourced by lacustrine shales within the sub-basins, and migration of the petroleum appears to have been limited to within the sub-basin. This talk addresses the current status of exploration in Mongolia."

There are only two producing basins in Mongolia. Zuunbayan, in the southeast Gobi Desert, was a producing oil field from 1953 to 1969. It resumed production in 2007 and had exported 2.66 million barrels of oil as of February 2012. The Tamsag Basin began production in 1998 and is currently the most active oil field. Production in the Tamsag basin has increased significantly, with approximately 2.07 million barrels recovered by 2011. In 2011, total crude oil production in Mongolia was over 2.60 million barrels, with a projected annual increase of 10%.

Mongolia is a large (600,000 square miles), sparsely populated (3 million people) country with a young (70% of the population is under 35), well-educated (97.8% literacy) workforce. The first geologic study was done in 1892 by the Russians, and the first oil discovery was made by the Soviets in the 1940s, based on surface anticlines. The Russians remapped the geology in the 1950s. The Petroleum Authority of Mongolia (PAM) was established in 1990 as a state-owned petroleum agency. With the collapse of the Soviet Union, Mongolia became a democracy in 1992. There are 44 different terrains, with megashear zones in major parts of the country. The Jurassic and early Cretaceous rift systems in eastern Mongolia are of most interest for petroleum exploration.

PetroChina is the most successful company in Mongolia, pumping from three fields. PetroChina estimates their reserves at 2.25 billion barrels in place. The Toson Uul field, discovered in 1995 by SOCO (USA), is now being operated by PetroChina.

MHA believes that oil migration is limited, i.e., oil is found chiefly in the basins where it is sourced. Wolf Petroleum performed an initial gravity-magnetic survey over one of its concession blocks (Sukhbaatar) of 23,000 sq. km. and identified six sub-basins. Here, mapping is difficult due to the lack of outcrops. Wolf used satellite imagery to explore for reducing environments, which may contain petroleum seeps. Phase II of the exploration plan involved running 450 km of 2D seismic. The seismic shot holes averaged 15 meters in depth and were each sampled, which helped to verify the geologic maps and remote sensing data. The geochemical data from the samples indicated hydrocarbon anomalies along the fault zones.

Ms. Gomez emphasized that the exploration blocks are very large, with analogs to production across the border in China. She feels that they have identified areas worthy of further petroleum exploration.

An audience member remarked on the problems the mining industry has had with concessions in Mongolia and asked if this could happen to the oil industry. Ms Gomez replied that the Mongolians had introduced a mining law two years ago whereby nobody could hold more than 80% of any claim (i.e. a local partner is required). This was a reaction to the Chinese involvement in resource extraction. However, because of adverse effects on the Mongolian economy, the law has been partly rescinded. Wolf Petroleum is not affected as it has a production sharing agreement.