INTEGRATION

Significant volumes (>1 million barrels) of produced water are generated daily during production operations for oil and gas in North Dakota. Most produced water is brine (sodium), with very high concentrations of total dissolved solids. Produced water has been historically managed as waste in the oil and gas industry. Subsurface injection is the industry-preferred alternative for produced water disposal. Because produced water is brine, produced water disposal values are related to salt water disposal values (SWD).

THE DAKOTA GROUP

Geology of the area is the major factor in determining if injection is a viable option for produced water disposal. The Williston Basin of North Dakota has a broad sequence of geologic units (Dakota Group) present at an optimal depth for produced water disposal. The lower Cretaceous Dakota Group consists of four formations to decreasing sizes (top to bottom): A, B', B, and C. The A Formation is a combination of marine and non-marine sandstones and siltstones and is the primary target for injection. The B' Formation is a combination of marine and non-marine sandstones and siltstones deposited in the A Formation and is the secondary target for injection. The B Formation is a combination of marine and non-marine sandstones and siltstones deposited in the B' Formation and is the tertiary target for injection. The C Formation is a combination of marine and non-marine sandstones and siltstones deposited in the C Formation and is the quaternary target for injection.

Overlying the Dakota Group are several important series of Cretaceous formations, including the Pierre Formation, a very thick, impervious sandstone. The Pierre Formation is not the primary target for injection. The upper Cretaceous is characterized by a broad sequence of geologic units (Dakota Group) present at an optimal depth for produced water disposal. 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