Why Study Water?

- Dissolved solids in water are important in the process of water-rock interaction.
- Dissolved solids can control the mobility of dissolved gases.
- Dissolved solids can influence the biochemical and biological processes that occur in water systems.
- Dissolved solids can affect the solubility of minerals and the formation of deposits.

Lance Formation Water Chemistry

- The Lance Formation water chemistry values are dominated by Na and K, with HCO3 as the predominant anion.
- There is considerable scatter in the Na/K ratio, with a number of samples having SO4 as the dominant anion.
- The Ca:Mg ratio is different for the two datasets. These are shown schematically in the ternary diagrams.

TERNARY DIAGRAMS

- A Stiff diagram is also a useful visual tool, a separate Stiff diagram must be constructed for each formation.

Compositional Comparison with Fort Worth Basin

- The data from the Lance Formation water chemistry values are dominated by Na and K, with HCO3 as the predominant anion.
- There is considerable scatter in the Na/K ratio, with a number of samples having SO4 as the dominant anion.
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Water Technology Summary

- Water provides vital geological insights on the composition and quality of the reservoir fluids.
- Understanding the chemistry of reservoir waters is essential for reservoir characterization and fluid characterization.
- Proper wellbore cleanup is critical to minimize the negative impact on gas recovery and reservoir performance.
- Water management is crucial in maintaining the integrity of the reservoir and ensuring the sustainability of the field operations.

TDS vs Depth Plots

- These plots show the trend of TDS with depth for different formations.
- The Almond and the Frontier formations exhibit the largest ranges in TDS, having waters between 1,500 and 3,000 ppm.
- The Lance Formation has water that ranges between 600 and 1,500 ppm.
- The Niobrara Formation has water that ranges between 2,000 and 4,500 ppm.
- The Pennsylvanian-Permian reservoirs have lower TDS values, with waters ranging between 1,000 and 2,500 ppm.

TDS vs Fracturing

- The relationship between TDS and surface fracturing is important for understanding the flow behavior of reservoir fluids.
- The use of ternary diagrams allows the plotting of multiple points on a single diagram.
- One of the best ways of visually examining trends in water chemistry is with ternary diagrams.
- The use of ternary diagrams allows the plotting of multiple points on a single diagram.