

Case Study:

Critical Casing Points, Identification of Najmah Top and Sublayers with Wellsite Inorganic Geochemistry

GEOLOG

Kuwait Oil Company (KOC) · Well BT-A · Kuwait Wellsite Inorganic Geochemistry (XRF + XRD) with GEOLOG Surface Logging

12¼"

CASING POINT SUPPORTED IN REAL TIME

19–21 ppg

GOTNIA HPHT MUD WEIGHT REGIME

GEOROX

Challenge

The Gotnia HPHT formation, with interbeds of limestone, overlies the Najmah reservoir and is drilled with high mud weight (19–21 ppg) to control high-pressured limestone sections. Setting the 12¼" casing point correctly, immediately after the Gotnia HPHT, at the top of the Najmah limestone is critical: it allows the mud weight to be reduced for the next phase and the well to be completed successfully. Miss the point, and numerous drilling and completion problems can follow, in some cases the well is abandoned.

The problem: the limestone patches at the base of the Gotnia are visually almost identical to the limestone at the Najmah top. Standard microscopy and calcimetry can fail to identify the Najmah top.

Solution

GEOLOG deployed wellsite inorganic geochemistry, real-time XRF elemental and XRD mineralogical analysis of drill cuttings at surface. Working with the KOC geochemistry and geology teams, GEOLOG identified dedicated elemental and mineral markers, and three diagnostic ratios that indicate the top of the Najmah limestone.

NAJMAH TRANSITION

Appearance of Molybdenum (Mo); increase in Silicon (Si) and calcite; start of reduction in Sulfur (S) and Phosphorus (P); no halite and no Chlorine (Cl).

NAJMAH TOP

Muscovite as the main indicator, confirmed by clay elements Aluminium, Potassium and Iron (Al, K, Fe); disappearance of Phosphorus (P); increase of Molybdenum (Mo), Nickel (Ni), Titanium (Ti), Vanadium (V) and Manganese (Mn).

Results

On Well BT-A, the Najmah Transition and Najmah Top were identified in real time from cuttings, where the two limestones could not be separated visually, supporting the 12¼" casing-point decision after the Gotnia HPHT section and the planned mudweight reduction for the next phase. The methodology was applied in several wells across different Kuwait fields, with the wells completed successfully, and was published as [IADC/SPE-191024-MS](#).

Key Outcomes

- Najmah top identified in real time from cuttings, where microscopy and calcimetry can fail
- 12¼" casing point after the Gotnia HPHT section supported in real time
- Provided the basis for the planned mud-weight reduction from the 19–21 ppg Gotnia regime in the next hole section
- Applied in several wells across Kuwait fields; published as IADC/SPE-191024-MS

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WELL BT-A: REAL-TIME ELEMENTAL & MINERALOGICAL LOG

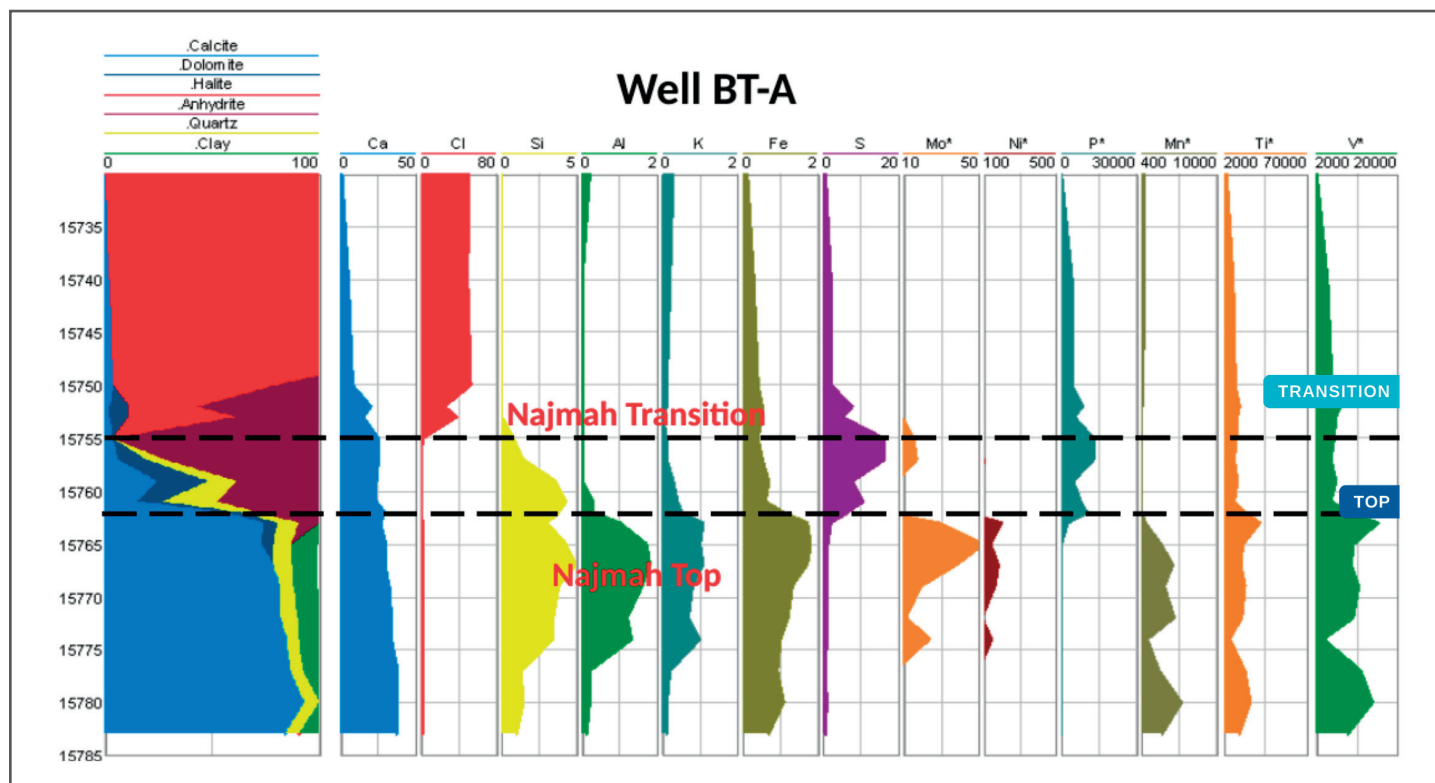


Figure 1. Well BT-A XRF elemental and XRD mineralogical log, 15,735–15,785 ft. Dashed lines: Najmah Transition and Najmah Top picks from cuttings, identified in real time at the wellsite

Indicator group	NAJMAH TRANSITION	NAJMAH TOP
Key mineral	Calcite increase	Muscovite (main indicator)
Elements appearing / rising	Mo appears; Si increases	Mo, Ni, Ti, V, Mn increases; clay elements Al, K, Fe confirmed
Elements falling / absent	S and P begin to reduce; no halite, no Cl	P disappears

Services used

GEOROX

Elemental (XRF) and Mineralogical (XRD) Analysis.

Technical Paper Reference



IADC/SPE-191024-MS

"Critical Casing Points, Identification of Najmah Top and Sublayers with Wellsite Inorganic Geochemistry in Kuwait Carbonate Reservoir."