

## Using Geophysical Logs to Estimate Relative Uplift in Upper Cook Inlet Basin, Alaska

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Publically available estimates of relative intrabasinal Tertiary uplift within Cook Inlet Basin, Alaska have been difficult to obtain in the past. Although such studies have been conducted, they have remained either proprietary or available only by sale. This study is the first attempt we know of to make such data and preliminary conclusions available publically.

Semilogarithmic profiles of sonic travel time (DT) versus true vertical depth (TVD) for 64 wells in Upper Cook Inlet Basin, Alaska were considered in estimating relative magnitudes of intrabasinal Tertiary uplift. Bishop Creek Unit #11-11 (BCU 11-11) yielded the slowest extrapolated surface sonic transit time (DT<sub>0</sub>) of 210.8  $\mu$ s/ft, which was within 5.5% of the widely accepted value of 200  $\mu$ s/ft in basins considered to have undergone minimal erosion. All other wells in this study, when compared to BCU 11-11, registered minimum relative uplift estimates of up to 12,000 ft. Prior to creating DT versus TVD profiles, spontaneous potential (SP) curves for each well were baseline shifted to 100 millivolts (mv) to minimize inherent drift. Sonic travel time logs were edited to remove cycle skip, coal, conglomerate, and hard streak effects. Only sonic transit time (DT) and TVD values corresponding to SP baseline shifted values between 85-100 mv were included in an effort to limit analysis to mud-rich (shale) lithologies. Further editing removed DT and TVD values from over-pressured zones and unreliable data intervals.

An intrabasinal relative uplift contour map constructed from the data indicates the area immediately south and west of the North Fork Unit 41-35 (NFU 41-35) well has experienced the greatest amount of relative uplift when compared with BCU 11-11. Other areas of marked relative uplift include NE-SW trending swaths east and west of BCU 11-11 (basin center) and the area south of NFU 41-35 extending to the Seldovia Arch. These trends are in good agreement with structure and base Tertiary contour maps previously published. Strong regional trends indicating shallower DT-TVD regression slopes on the edges of the basin and steeper slopes in the center of the basin may indicate differences in sediment source, lithology, or depositional histories.

Although site specific uplift histories can be variable and strongly influenced by local faulting, folding, and sediment deposition rates this study identifies BCU 11-11 as the most appropriate well against which relative uplift in other Upper Cook Inlet wells may be compared. Ongoing research will incorporate these uplift estimates into geohistory models for specific Upper Cook Inlet Basin wells in order to estimate petroleum migration pathways and reservoir potential.