LIDAR-XRF CONSTRAINED SEISMIC MODEL OF MCKITTRICK CANYON SHELF EDGE OUTCROP: INSIGHT INTO SUBSURFACE CAPITANIAN SHELF EDGE SEQUENCE STRATIGRAPHY AND PALEO OCEANIC ENVIRONMENTS

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Outcrop scale analytical models, while exceeding conventional reflection seismic resolution, provide the detail necessary for crafting appropriate proxies for pragmatic subsurface well to seismic sequence stratigraphic correlation. Such analyses are particularly insightful within massive carbonate-shale accumulations in the Permian Basin.

An integration of outcrop measurements of LiDAR, Spectral Gamma Ray, XRF, Schmidt Hammer, and bulk density was conducted on transects on and perpendicular to the McKittrick Canyon East Wall Geology Trail. Preliminary results indicate:

1. Following processing and the application of a series of filters to remove vegetation cover, LiDAR reflectivity values correspond to lithology mixes, where increasing reflectivities indicate decreasing terrigenous shale content and increasing limestone-dolomite content.
2. Spectral Gamma ray analyses conducted at 1 m intervals reveal high resolution parasequence discriminations which can be articulated into four main parasequence sets: High Stand Systems Tracts, Regressive Systems Tracts, Lowstand Systems Tracts, and Transgressive Systems Tracts.
3. X-ray Fluorescence spectrometry output of trace elements reveal provenance proxies which confirm reciprocal sedimentation while the oxidation proxies can vary independently from Delaware sea level changes.
4. Schmidt hammer results coupled with the bulk density measurements allow both an assessment of brittleness and an indirect measure of V_p for forward seismic model construction.

5. The forward seismic model played out in a variety of frequency band widths and seismic attributes provides, when constrained with borehole sequence stratigraphy, a proxy model for im proved seismic stratigraphic interpretat ion of Capitanian shelf development on the Northwest Shelf,

These preliminary observations reveal the value of the novel integration of these tools for increased information and resolution of complex cycles of carbonate sequence stratigraphy in the Permian subsurface.