



Scott Kennedy, M.S. Candidate, May 2022

**STRATIGRAPHIC STUDY OF THE TURONIAN SEMILLA SANDSTONE
MEMBER OF THE MANCOS SHALE, SAN JUAN BASIN, NEW MEXICO**

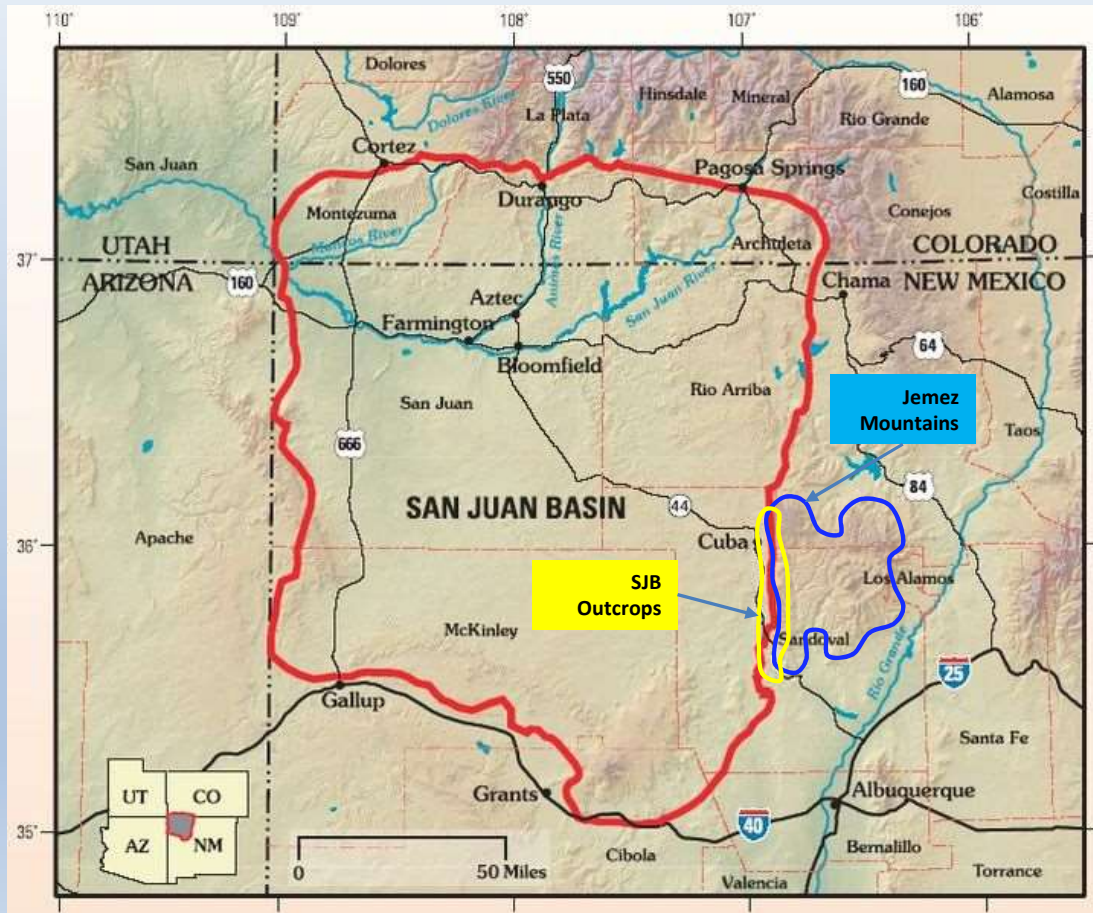
Project Summary

- Complete a stratigraphic study of the Semilla Sandstone member of the Mancos Shale of the San Juan Basin, New Mexico using both outcrop observation and petrographic thin section analysis.
- Compare those findings to the time equivalent Codell Sandstone in the southern Denver Basin and the Northern Raton Basin
- Use those comparisons to gain a greater understanding of the regional deposition of these two sandstones and of the depositional mechanisms of these shallow marine sandstones.

Outline

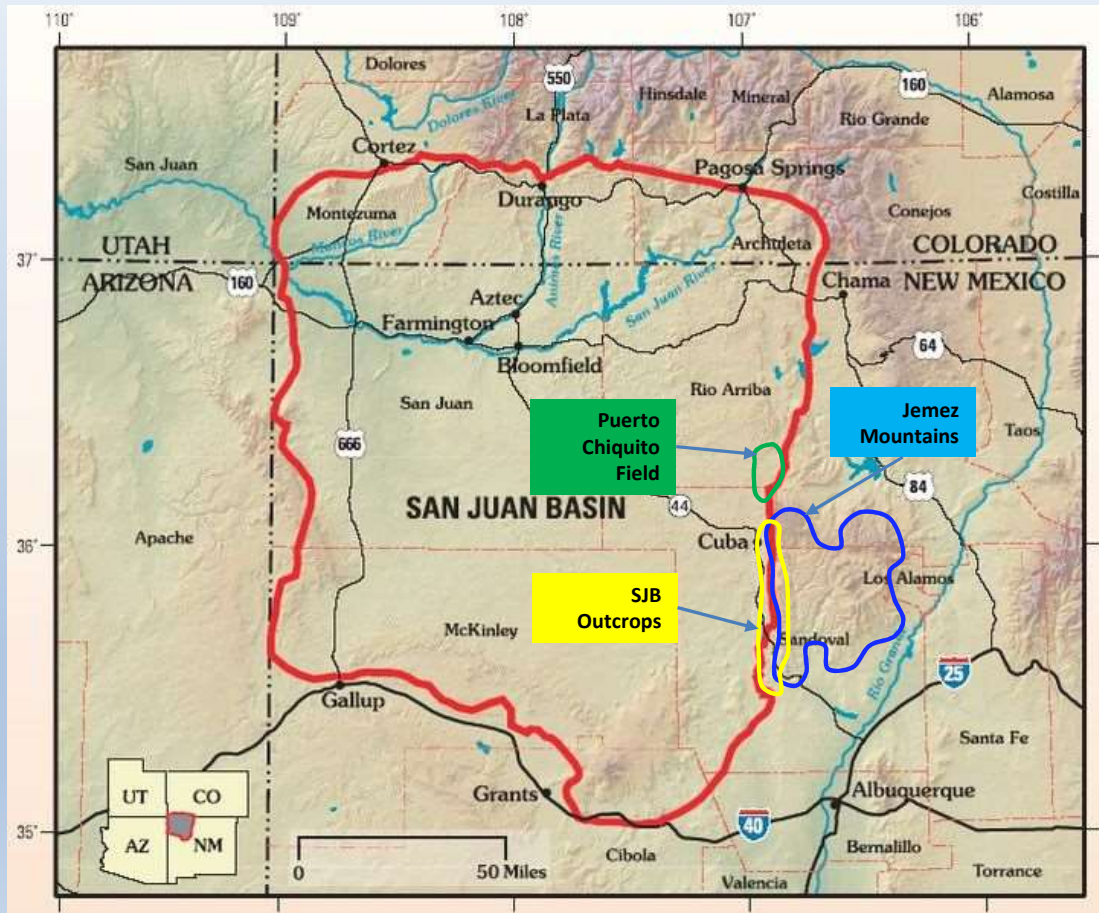
- Study Area
- Geologic Background
- Stratigraphy
- Facies Comparisons
- Interpretations of Depositional Environment
- Subsurface Data
- Conclusions
- Further Research

Study Area – San Juan Basin



- The Semilla is present in the subsurface on the eastern portion of the basin
- The Semilla Sandstone Crops out on the western flank of the Jemez Mountains

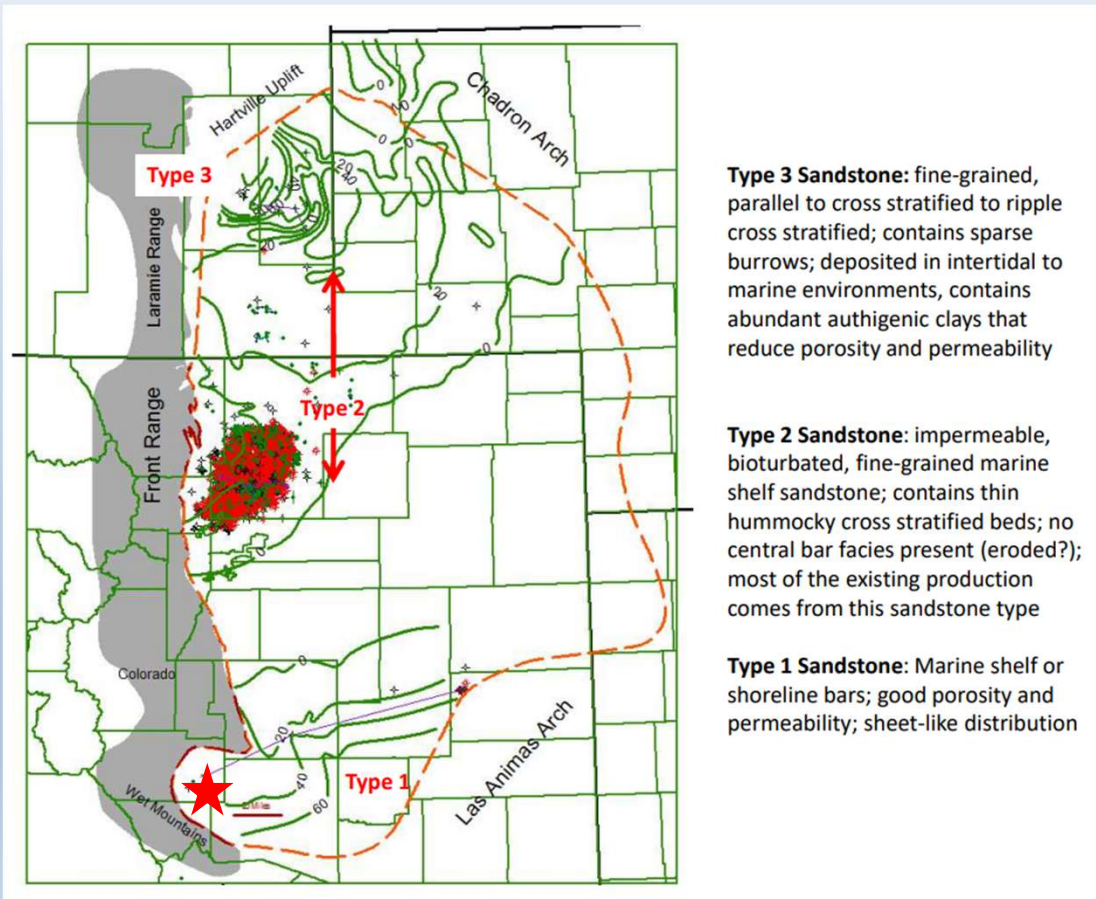
Study Area – San Juan Basin



USGS, 2002

- Puerto Chiquito Field has been added to the study area
- Filled with subsurface data and nearby outcrops

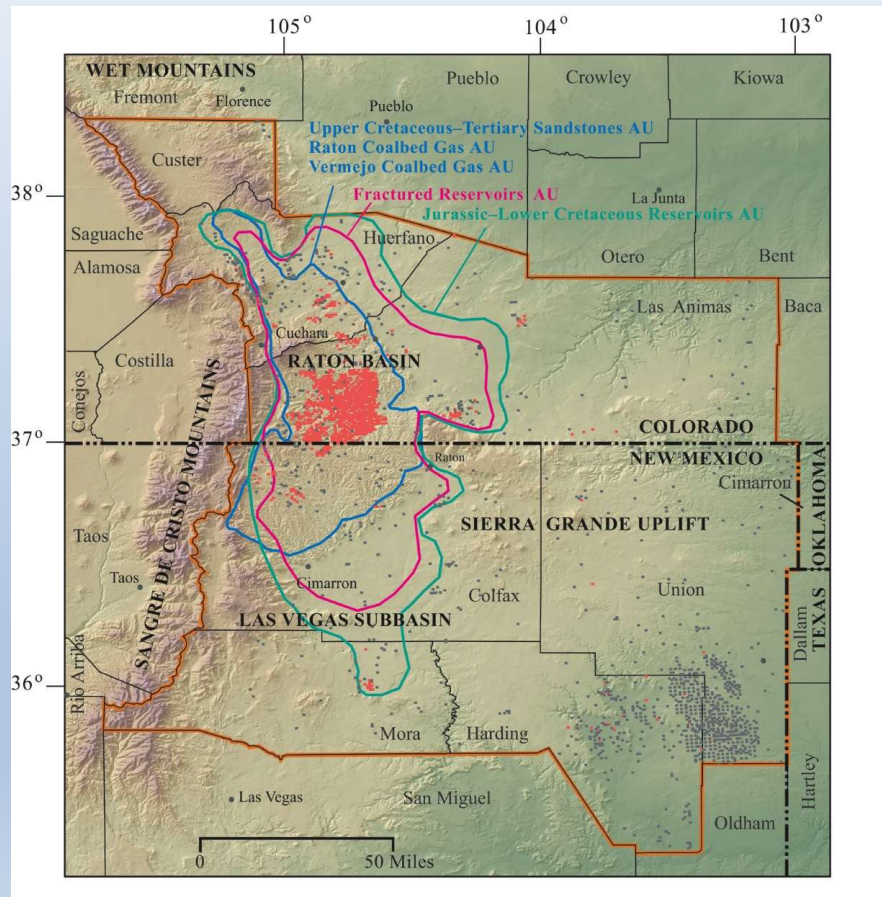
Study Area – Denver Basin



Sonnenberg, 2020

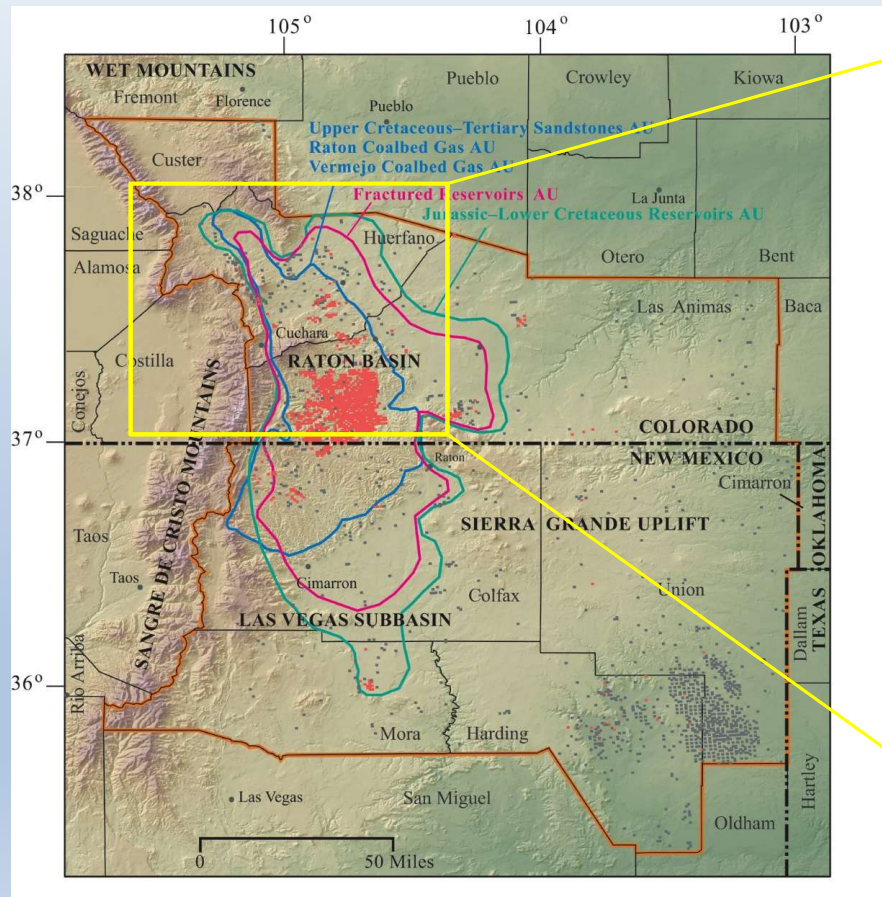
- The Denver Basin portion of the project takes a look at the Forest Mackenzie #1-3 Well
- This well cored the type 1 Codell Sandstone

Study Area – Raton Basin

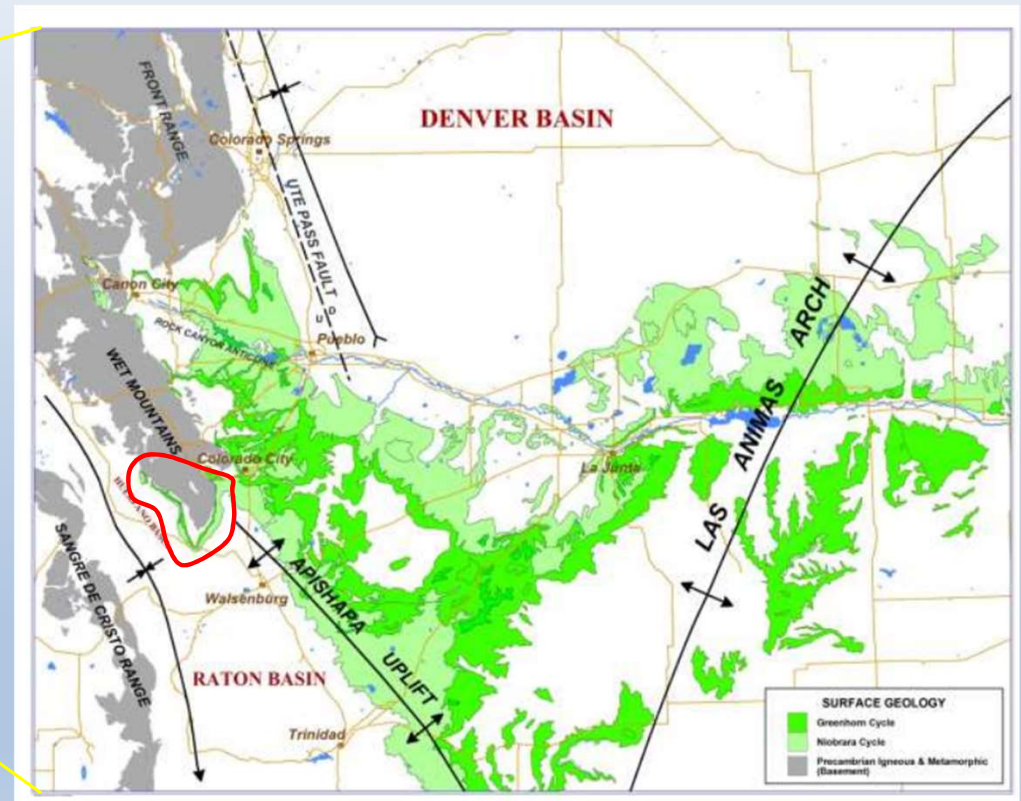


- The Codell Sandstone is present throughout the northern end of the Raton Basin
- The outcrops of focus in this study are along the southern tip of the Wet Mountains

Study Area – Raton Basin

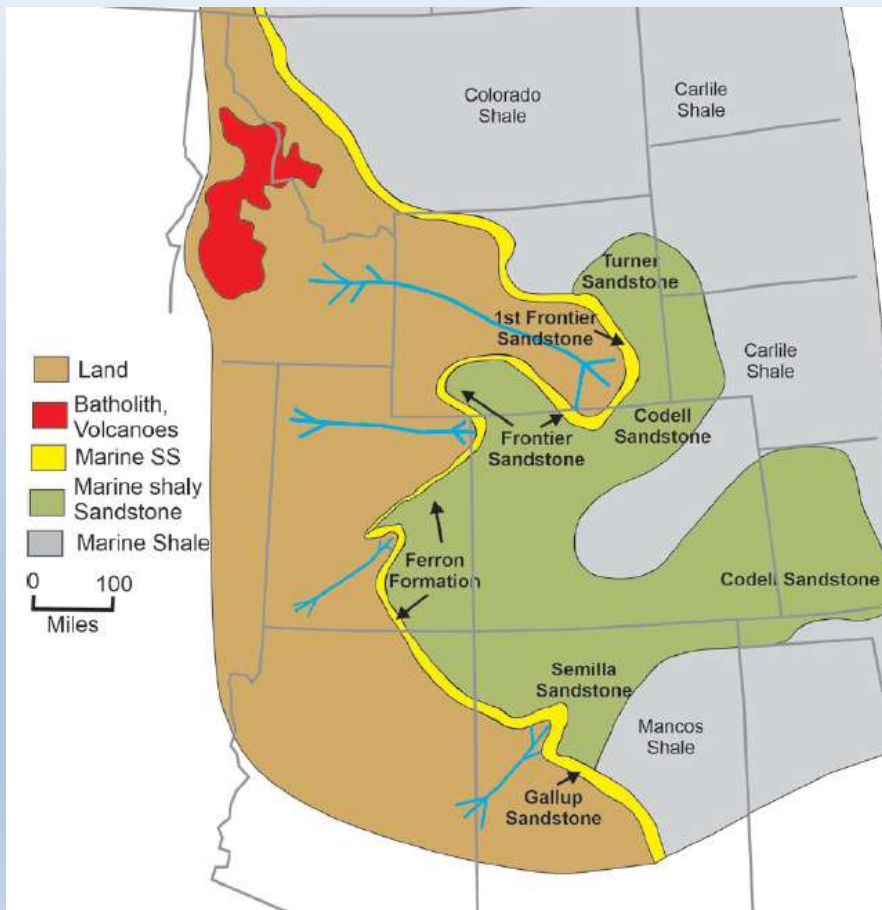


USGS, 2004



Lewis, 2013

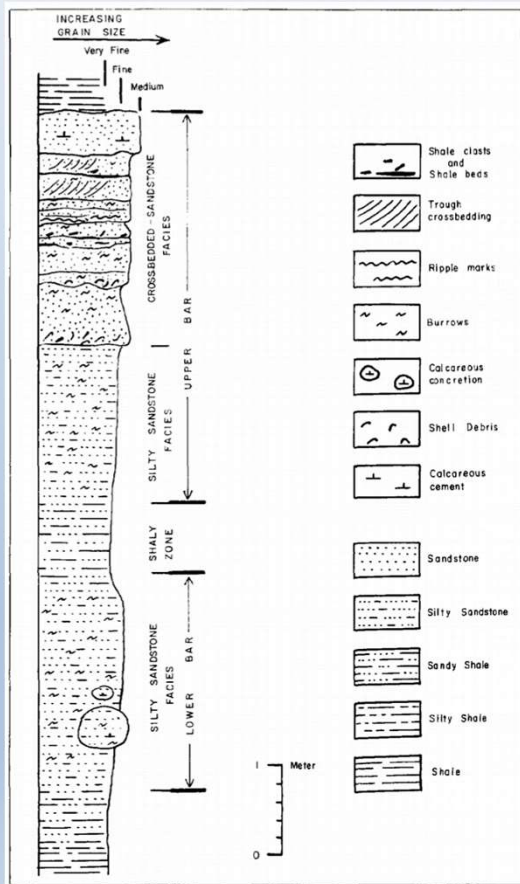
Geologic Background



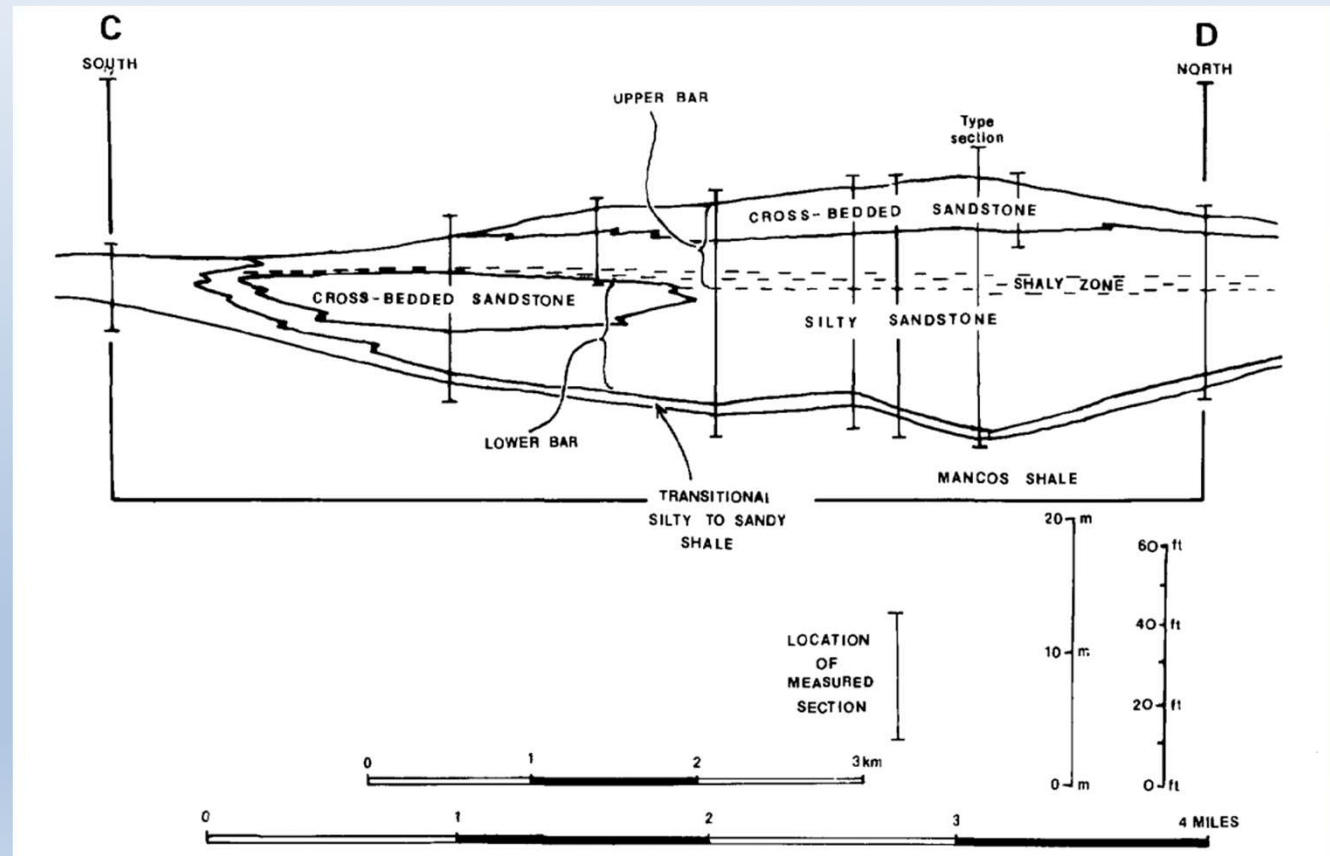
Sonnenberg, 2021

- The Western Cretaceous Interior Seaway saw the deposition of many time equivalent shallow marine sandstones
 - The Turner Sandstone of the Powder River Basin
 - The Codell Sandstone of the Denver and Raton Basins
 - The Semilla Sandstone of the San Juan Basin

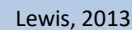
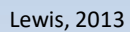
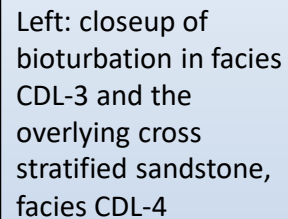
Semilla Stratigraphy



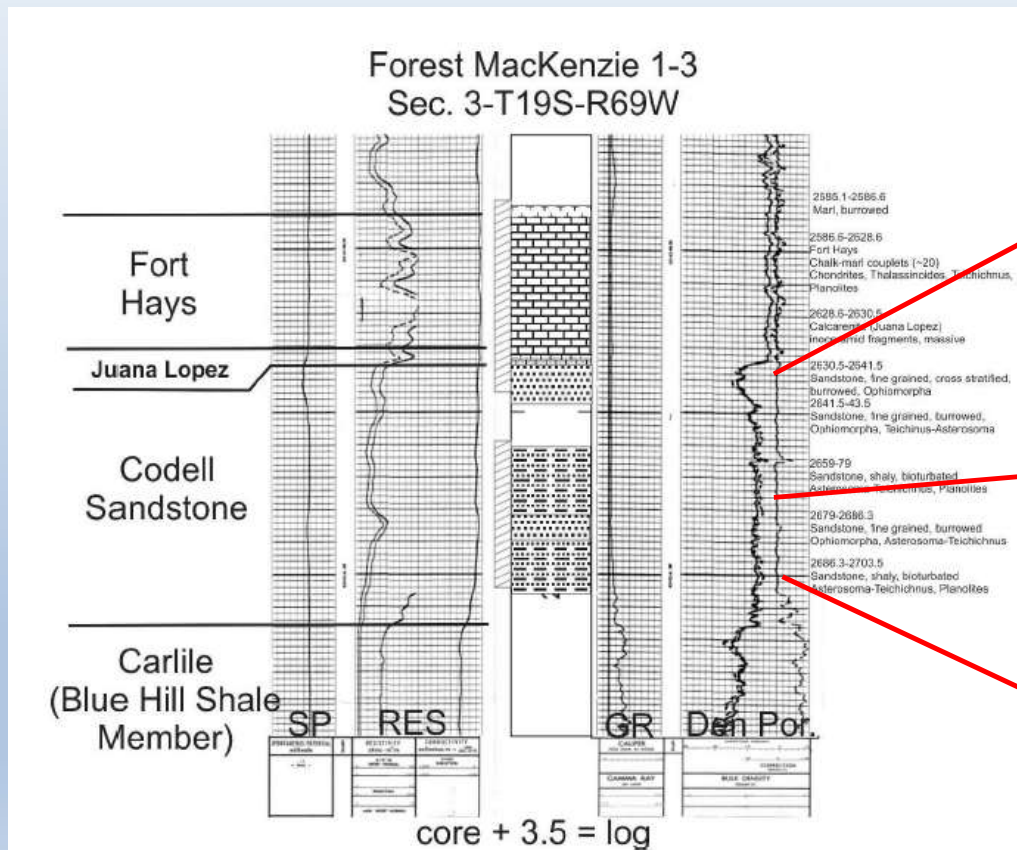
La Fon, 1981



La Fon, 1981



Codell Stratigraphy



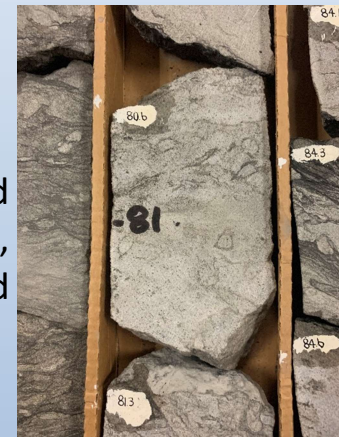
Sonnenberg, 2020



Well sorted, cross
stratified upper
sandstone

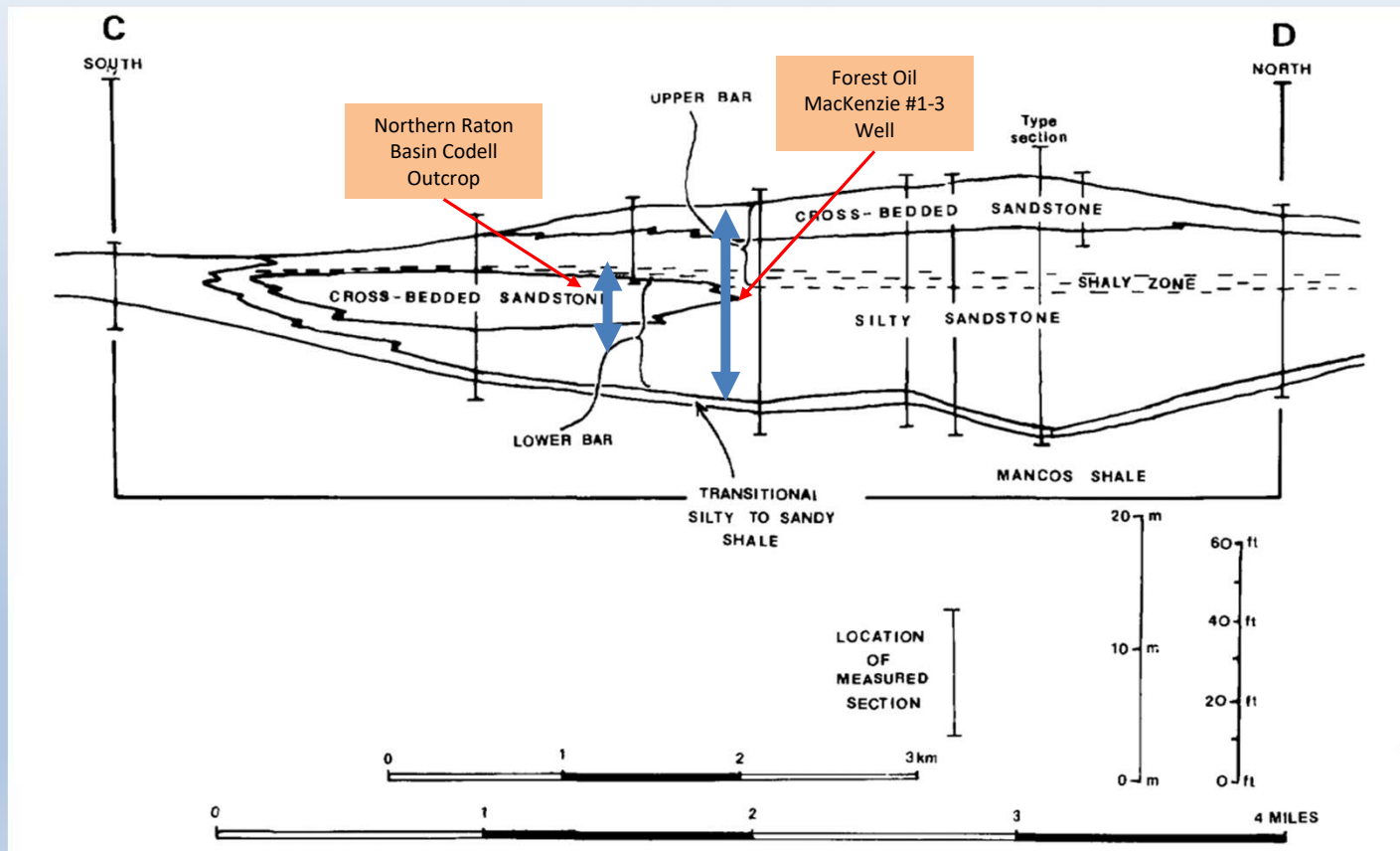


Fine grained
sandstone,
bioturbated



More poorly
sorted, heavily
bioturbated
lower sandstone

Facies Comparison

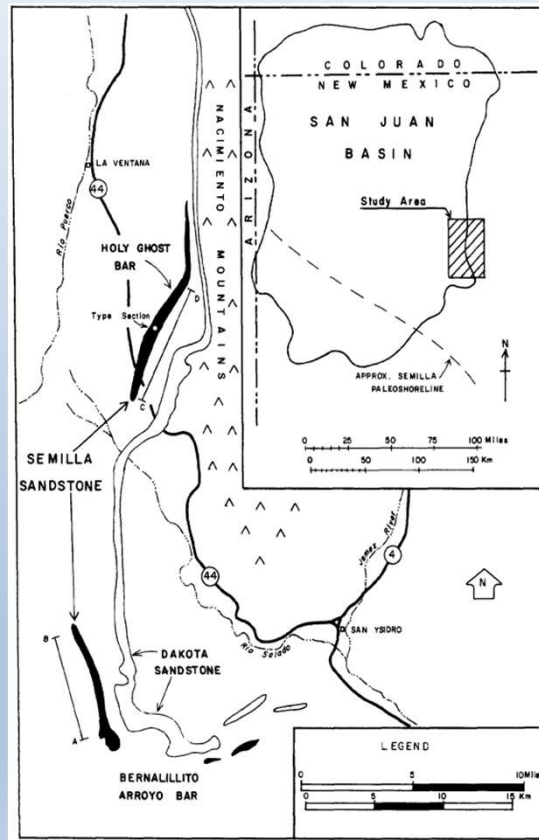


La Fon, 1981

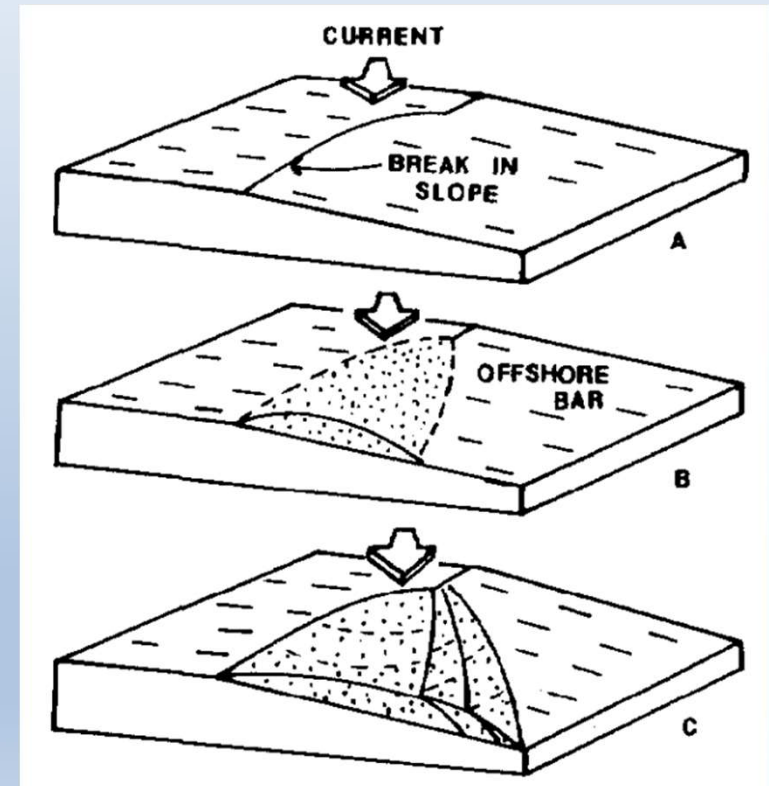
Depositional Environment

Marine Shelf Bar

- Tidal Bars, Tidal Ridges, Linear Shelf Sandstones
- Sand originally deposited on the shelf during a time of lowstands
- Reworked by tidal and wave currents



La Fon, 1981

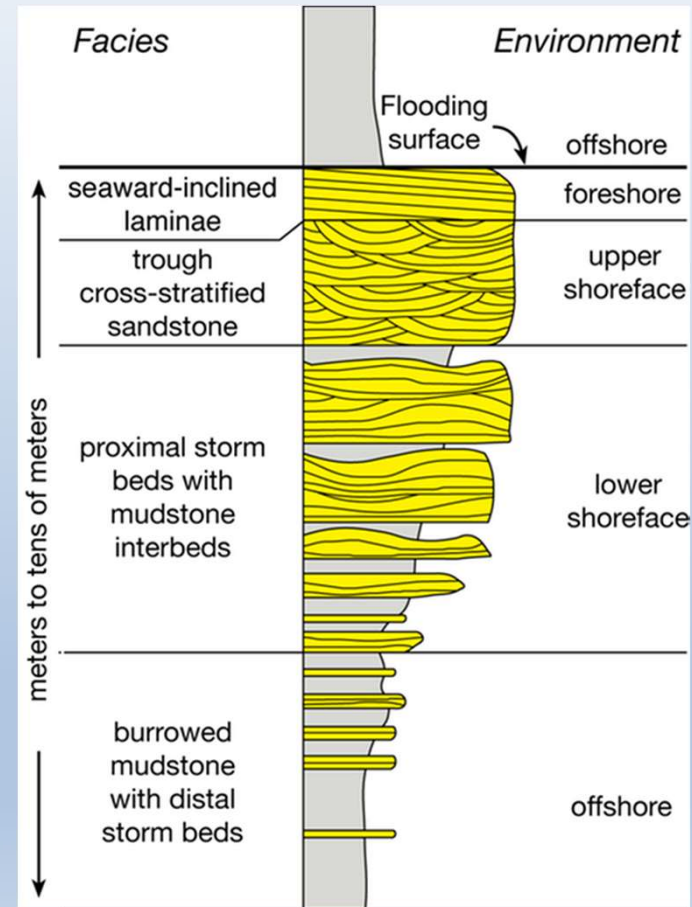


La Fon, 1981

Depositional Environment

Detached Lowstands Shoreface

- Shoreface sandstone that was stranded upon rapid relative sea level rise
- Incomplete shoreface sequences possible due to erosion

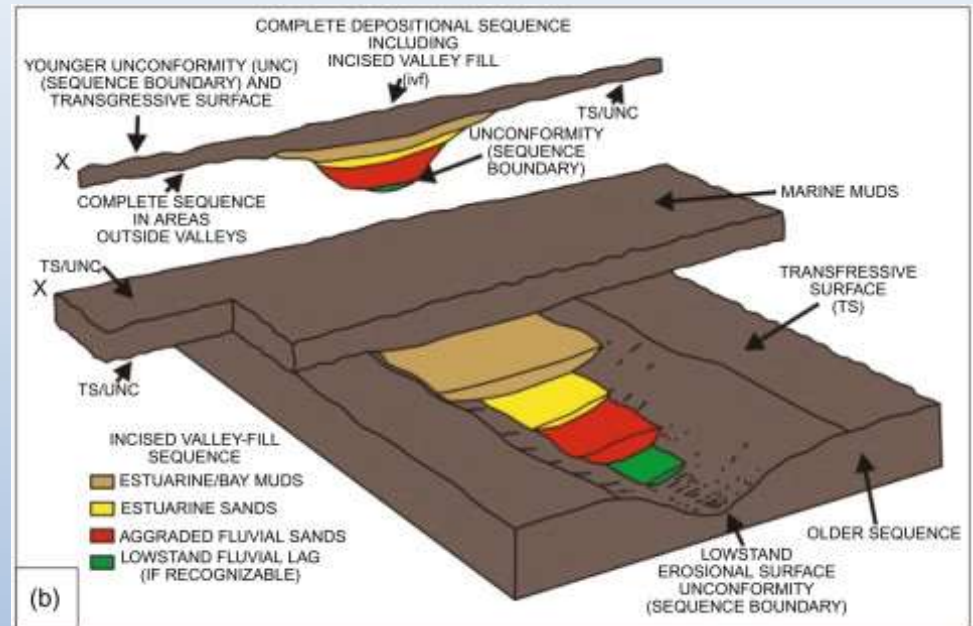


Van Wagoner et al., 1990

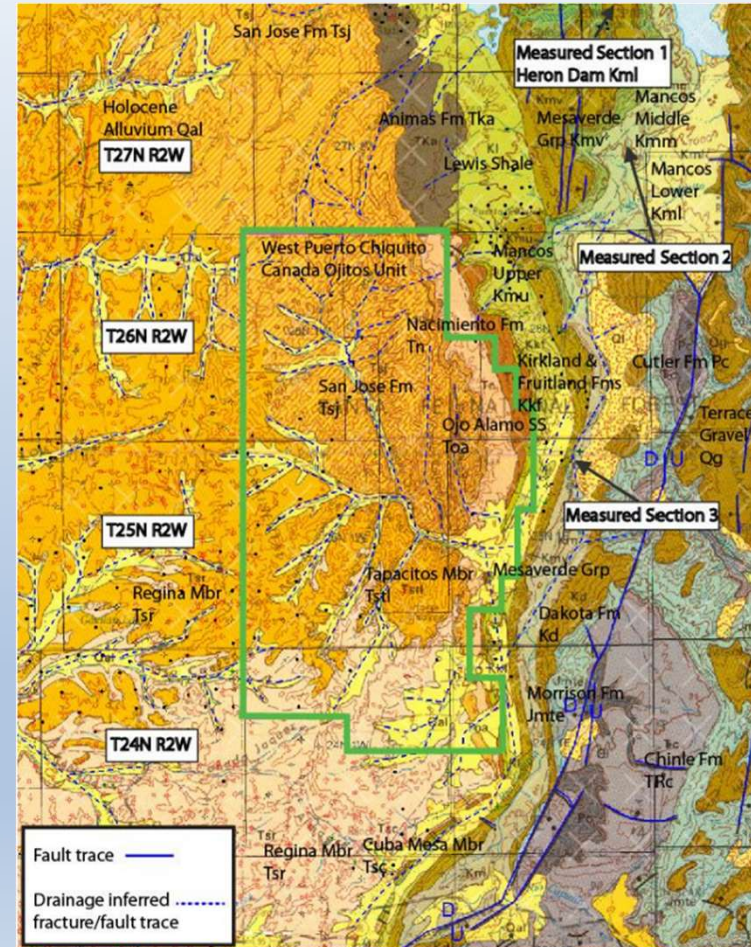
Depositional Environment

Incised Valley

- Valley filled with a mixture of terrestrial, fluvial and marine strata
- Problems
 - Lack of fluvial facies
 - No evidence of subaerial exposure

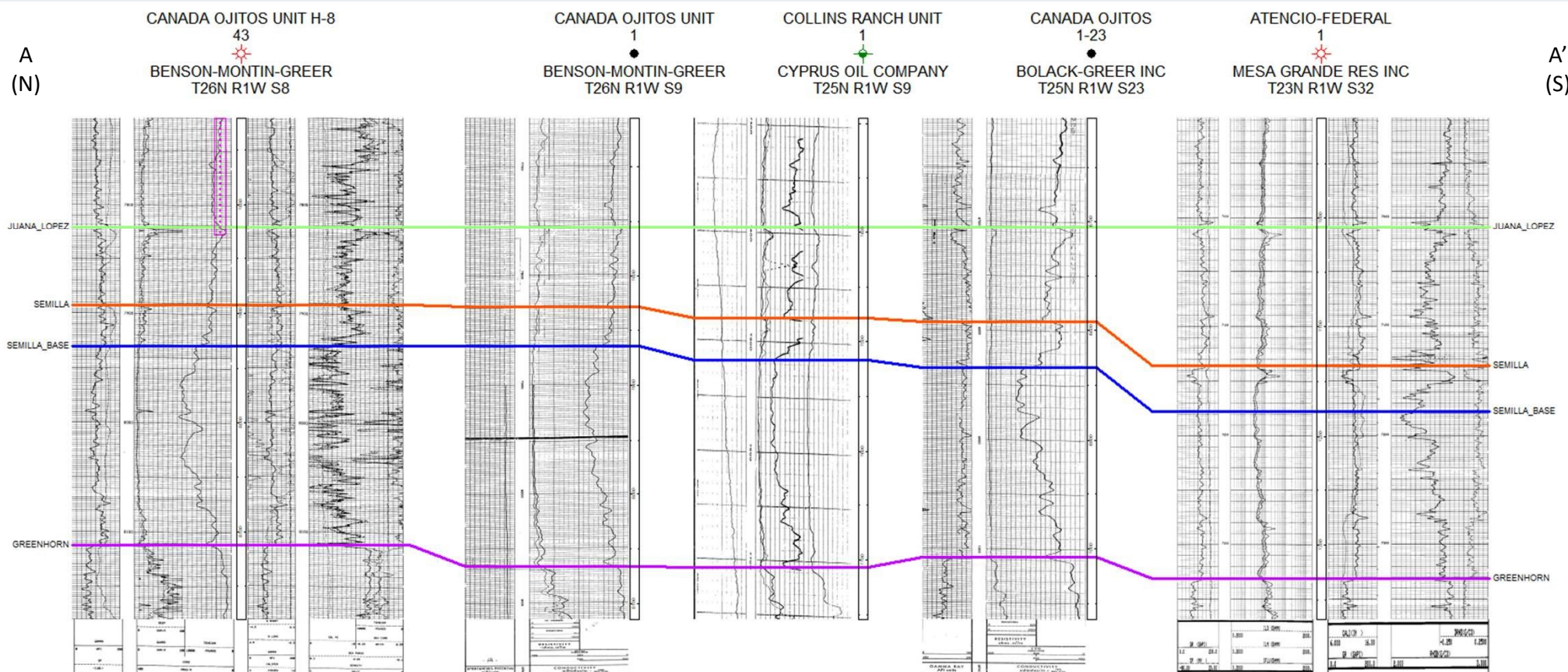


Weimer, 1992



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Subsurface Data – Puerto Chiquito Field



Conclusions

- The Semilla and type 1 Codell sandstones share similar stratigraphy
- Based on Semilla outcrops, it appears to be more discontinuous than the Codell
- The depositional environment of both sandstones is not agreed upon
- The Semilla could be a great reservoir

Further Research

- Locate, describe and sample Semilla outcrops east of Puerto Chiquito Field
- Continue working with subsurface data in Puerto Chiquito Field
- Compare lithology of the Semilla and Codell using petrographic analysis
- Gather more evidence as to the depositional environment of the Semilla and whether it matches that of the Codell

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