Late Paleocene to Early Eocene Karstic Clay Deposit of the Red Bank Group (Northern Belize, Central America)

***Sandor Ricketts**[1], David T. King, Jr.[1], Nicholas R. Myers, Sr.[2], and Daniel Larsen[3]

*sor0003@auburn.edu

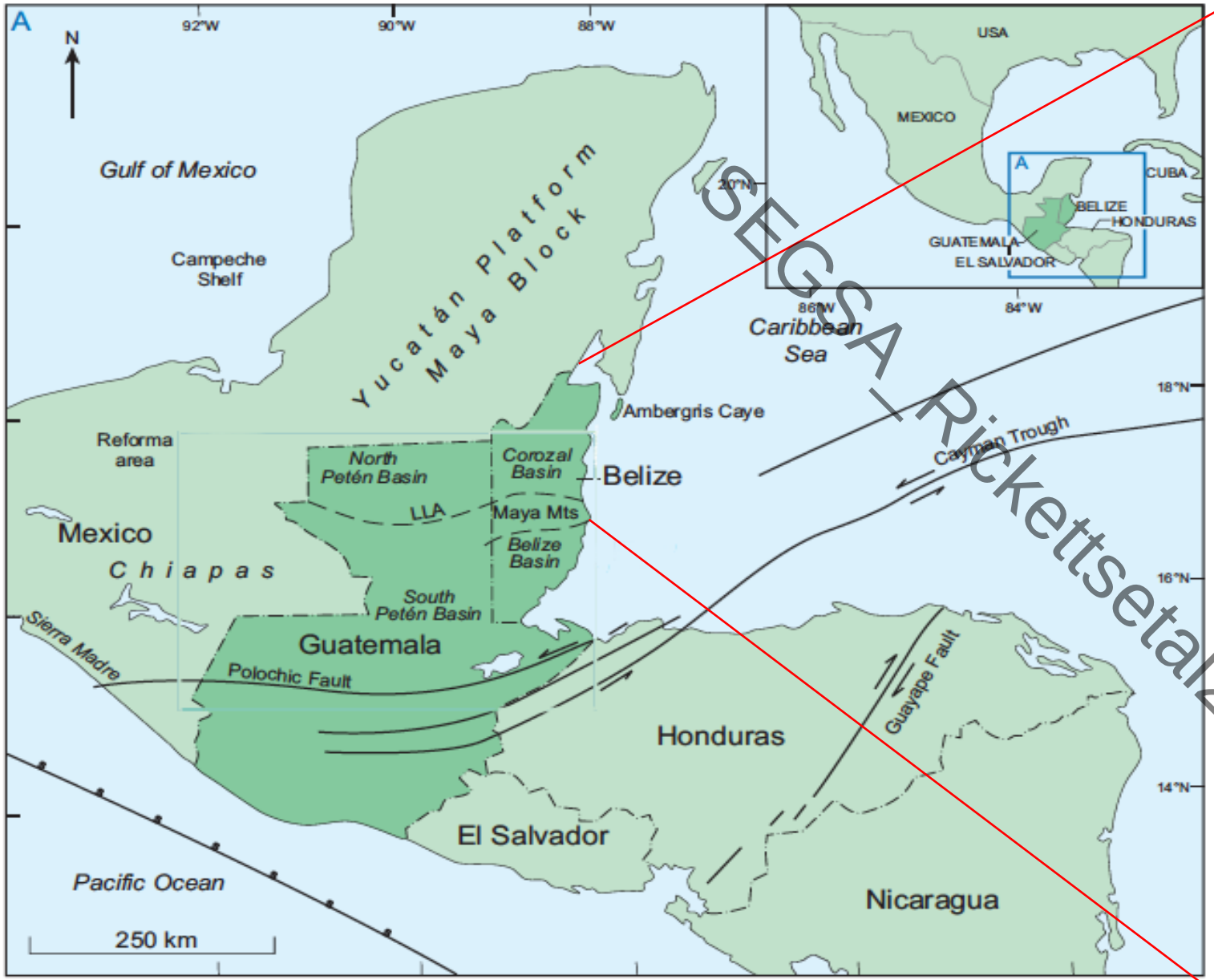
[1]Department of Geosciences, Auburn University, AL

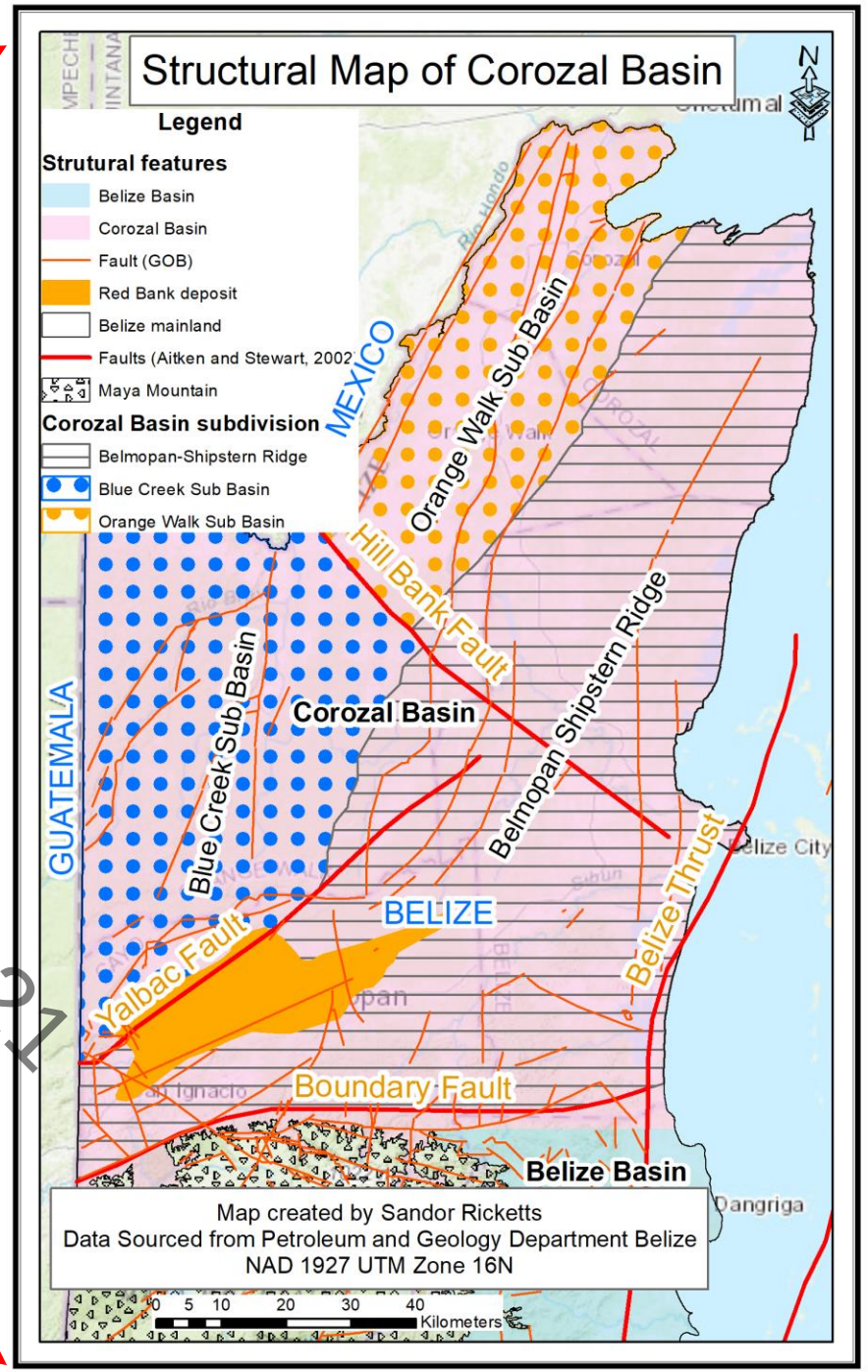
[2]Paleo-Data, Inc., New Orleans, LA

[3]Department of Earth Sciences, University of Memphis, Memphis, TN

April 1, 2021

❑ Introduction



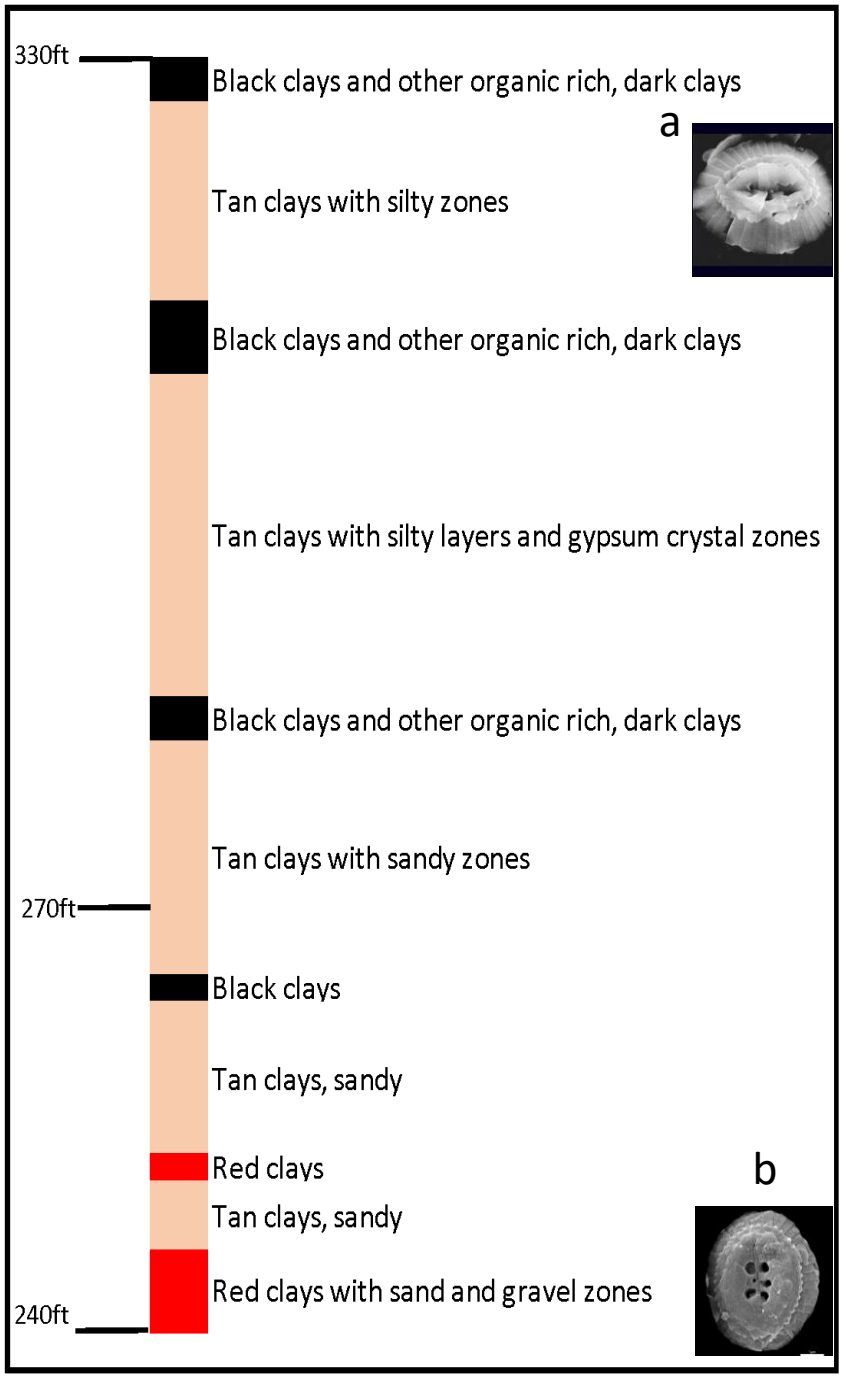


❑ Red Bank Group

Dark grey to black clay *Tan clay* *Red clay*

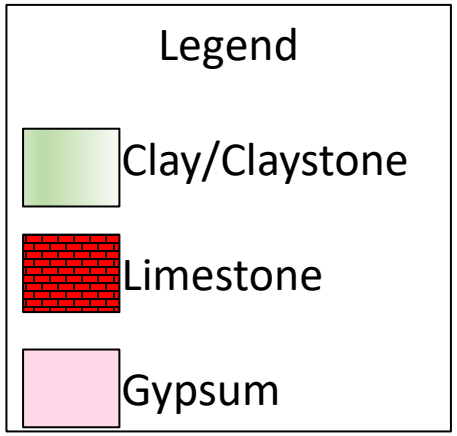
Photos of the Red Bank Group from Spanish Lookout, Belize (personal photos of Dr. King)

- Ages determined using nannofossils
  - *a. Prinsius bisulcus*- ~54.56 m.y.-early Eocene - tan clay
  - *b. Toweius tovae*- ~55.86 m.y.-late Paleocene - red clay

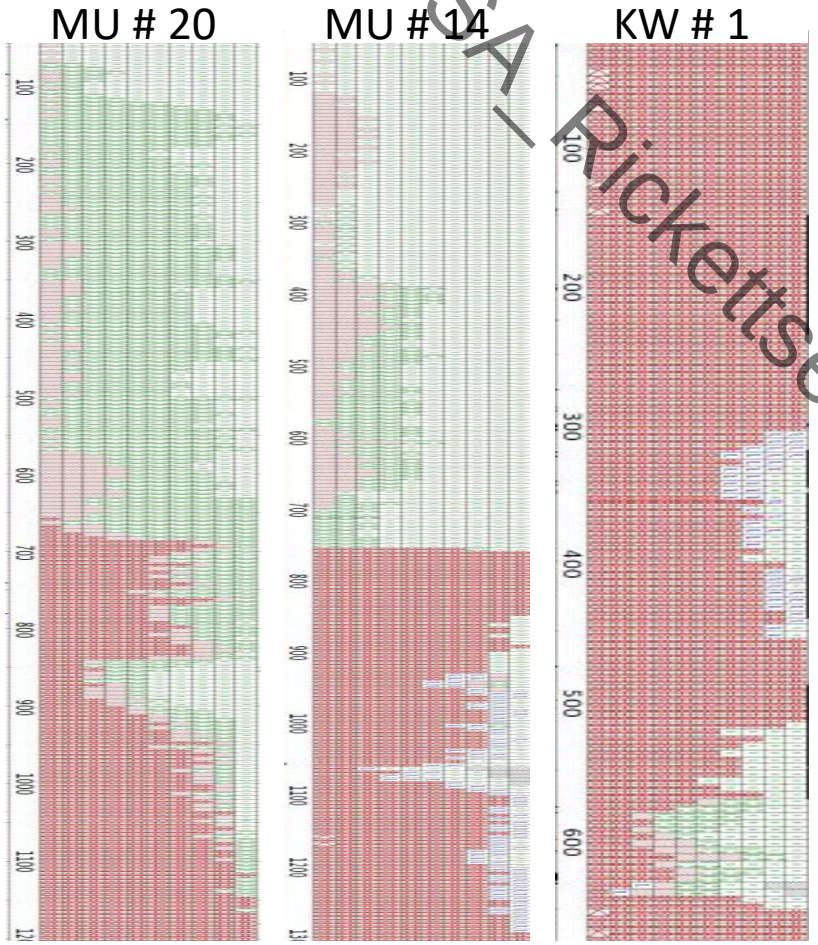


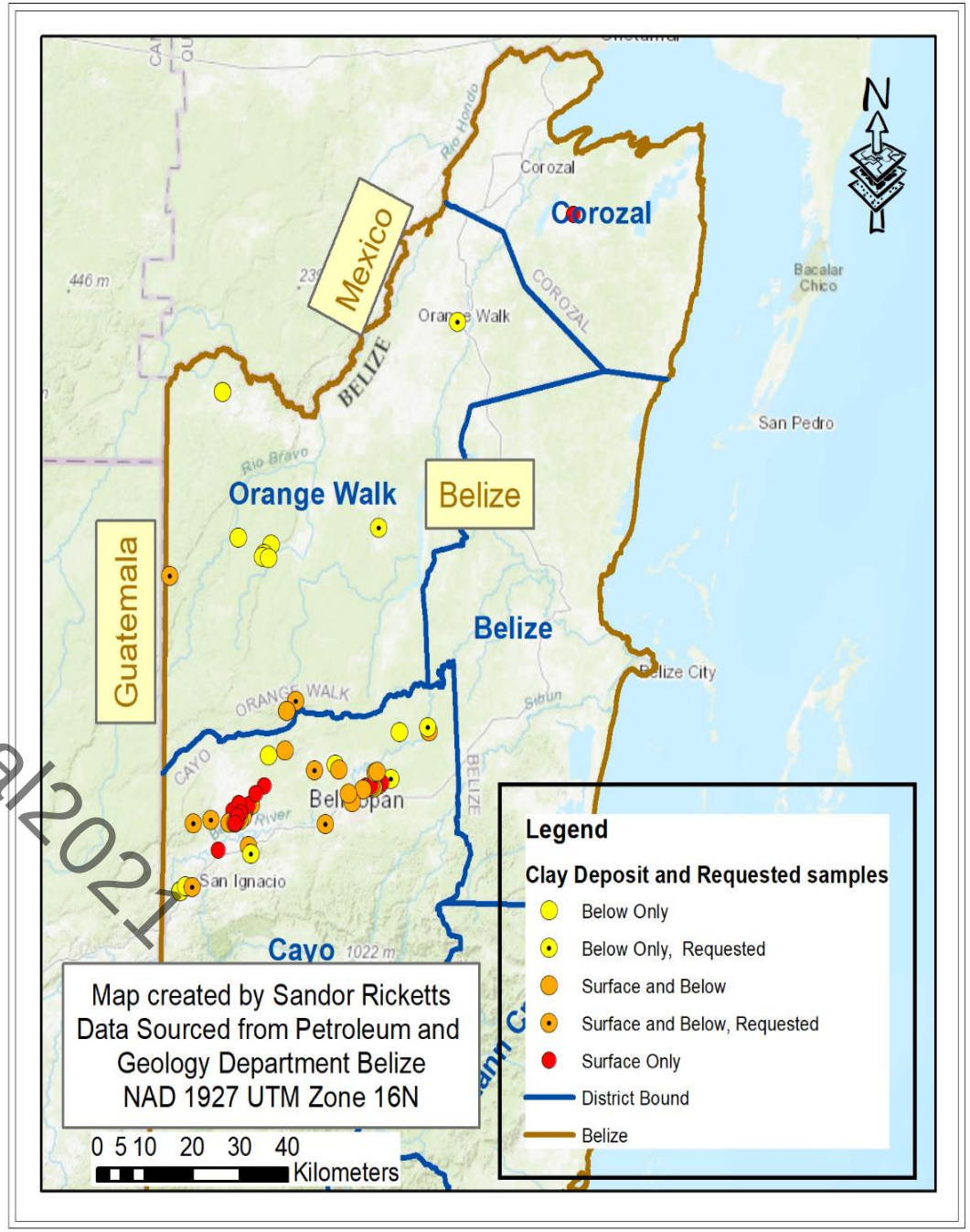
❑ Well & Sample Selection

- Divide wells in category based on clay deposits
  - Clay from surface only
  - Clay from surface and within limestone
  - Clay only in limestone

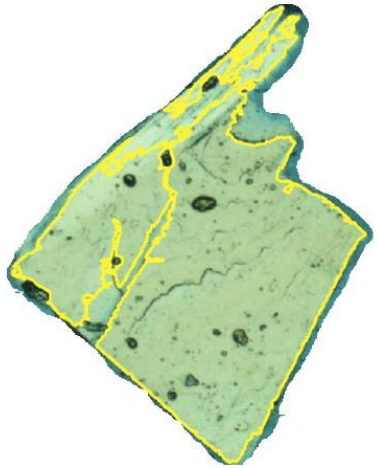


Log segments from Mike Usher (MU) and Kay Works (KW) wells.



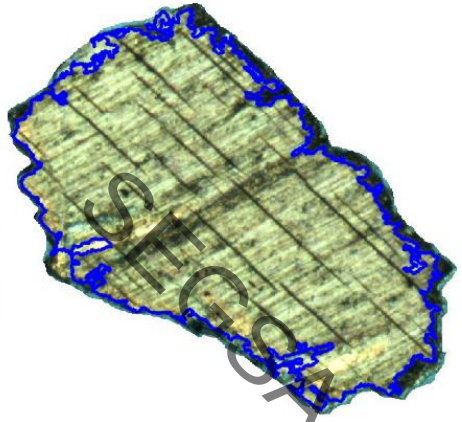


❑ Petrography



CHERT

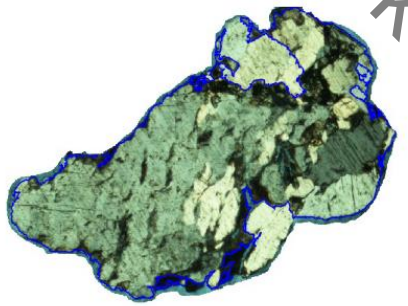
CARBONATE



FRAMEWORK SILICATE

CLAY

FOSSIL

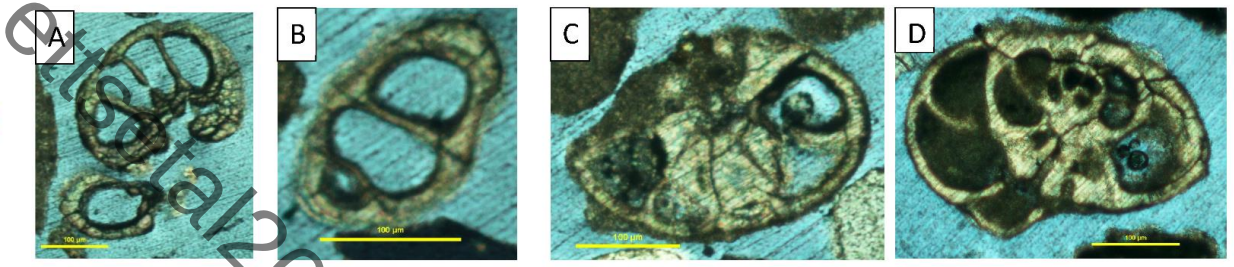


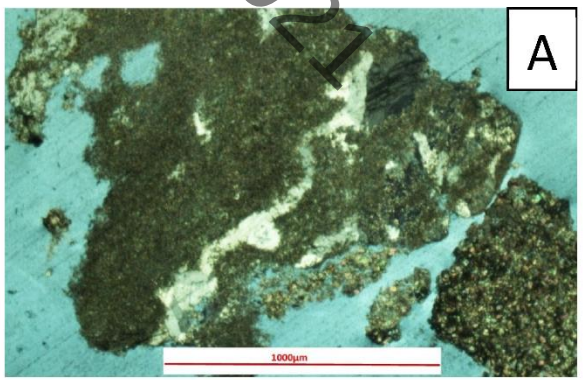
FRAMEWORK SILICATE

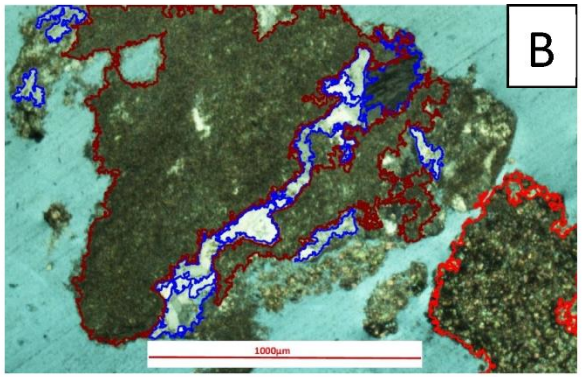
Legend

- Framework silicate
- Clay
- Carbonate
- Chert
- Fossil

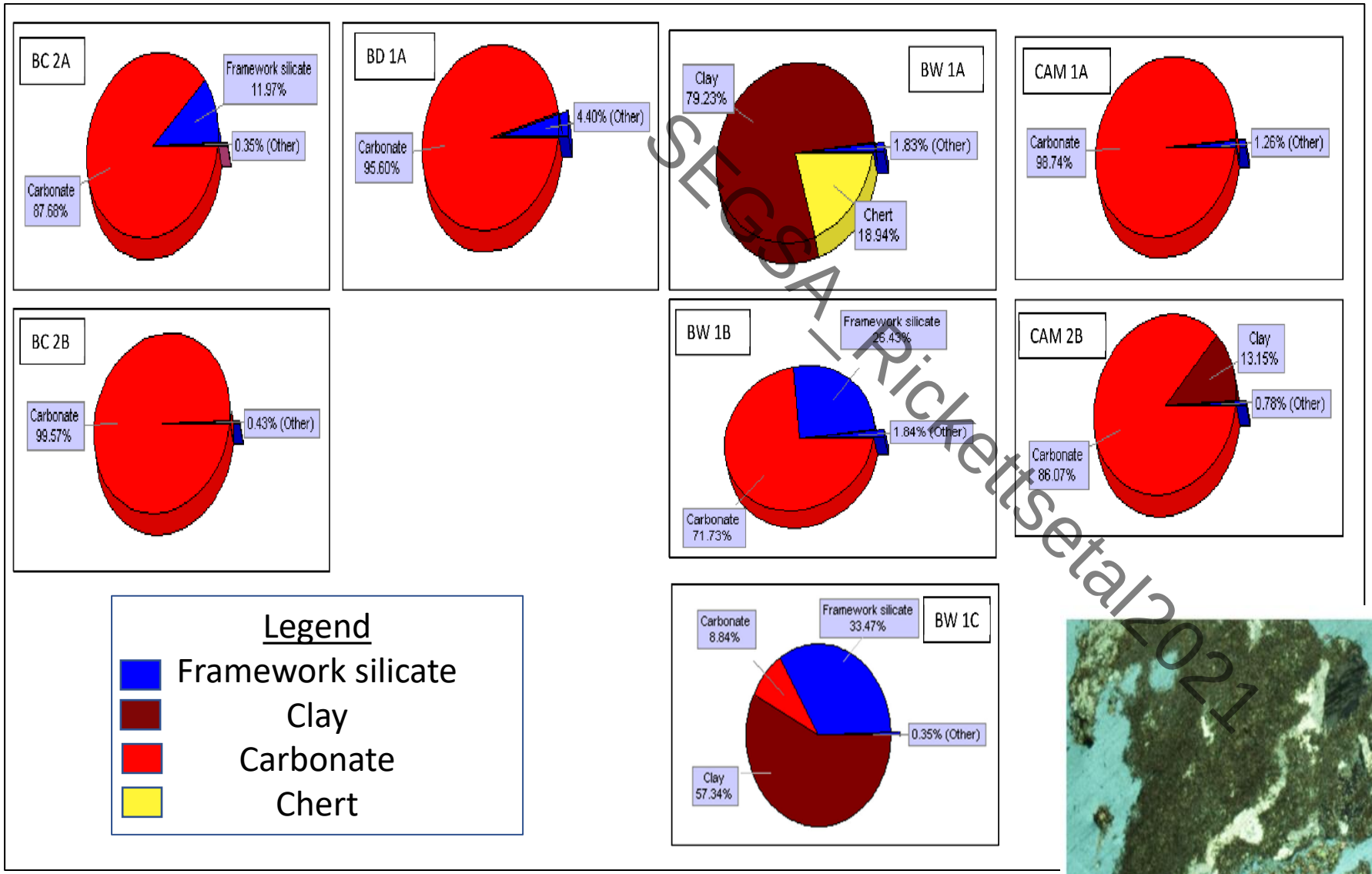
- ❑ Grains
  - Lithological & Mineralogical Mixture
  - Chert, carbonates, framework silicates, clay
- ❑ Fossil
  - Miliolid foraminifera





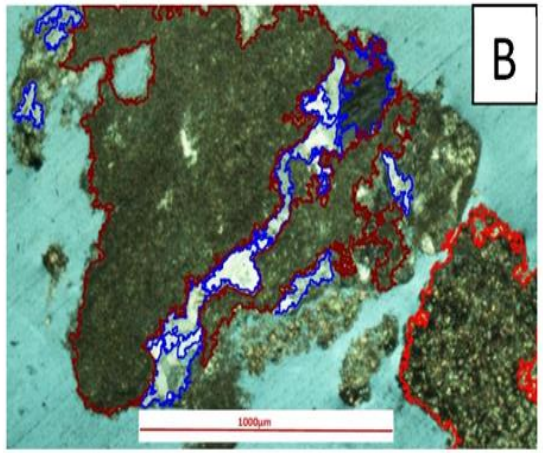


❑ Petrography



- Carbonate domination
- Grains containing clay were second most common

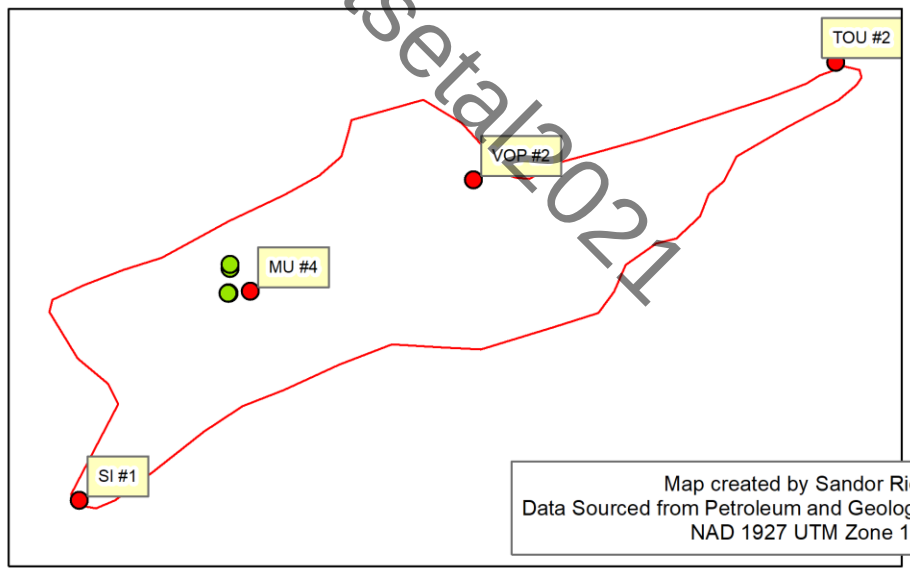
- Clay was underrepresented as many grains were clay encrusted

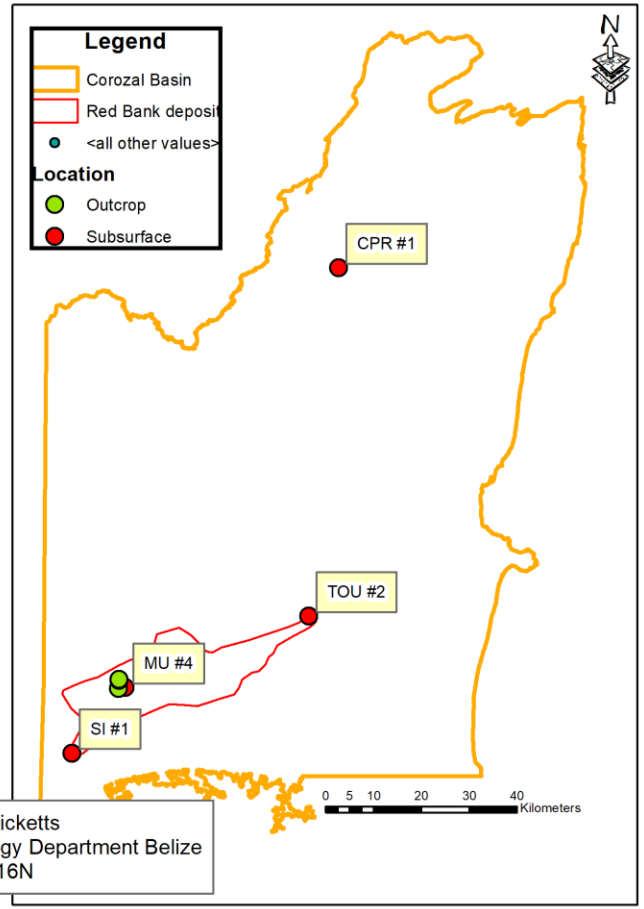


XRD Analysis

Well Number	Well Name	Quantity	Sample number	Sample pictures	Percentage Carbonate	Carbonate Content change
5	Chan Pine Ridge #1	3	CPR #1A		77.50	Decrease with depth
			CPR #1B		46.03	
			CPR #1C		42.65	
9	Mike Usher # 4	2	MU #4A		36.44	Increase with depth
			MU #4B		72.04	
14	San Ignacio #1	3	SI #1A		15.45	Increase with depth
			SI #1B		64.79	
			SI #1C		71.53	
17	Toucan #2	3	Tou #2A		91.53	Decrease then increase
			Tou #2B		59.78	
			Tou #2C		66.26	
18	Valley of Peace #2	2	VOP #2A		34.70	Increase with depth
			VOP #2B		76.42	

- Varying carbonate percentage (blue) with depth for each well
  - CPR #1 **carbonate %** decrease
  - MU #4 **carbonate %** increase
  - SI #1 **carbonate %** increase
  - Tou #2 **carbonate %** decrease then increase
  - Vop #2 **carbonate %** increase

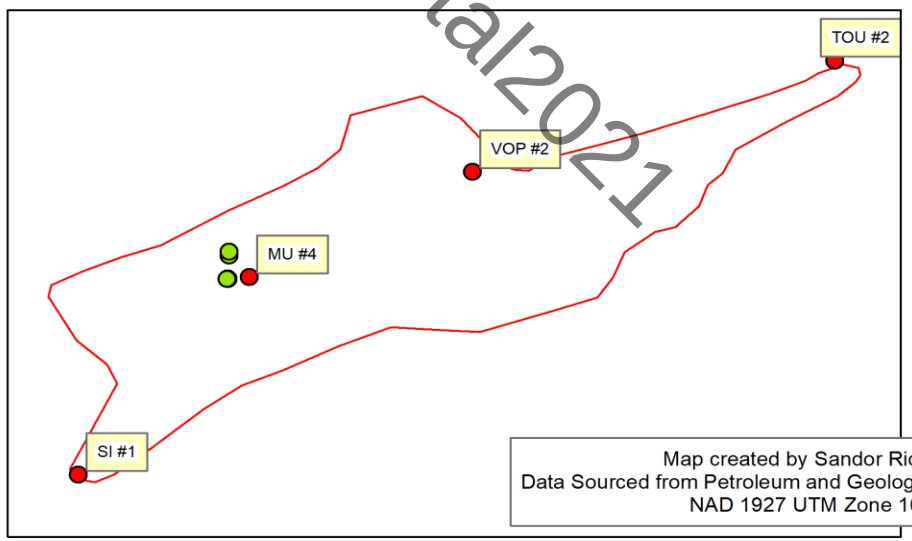


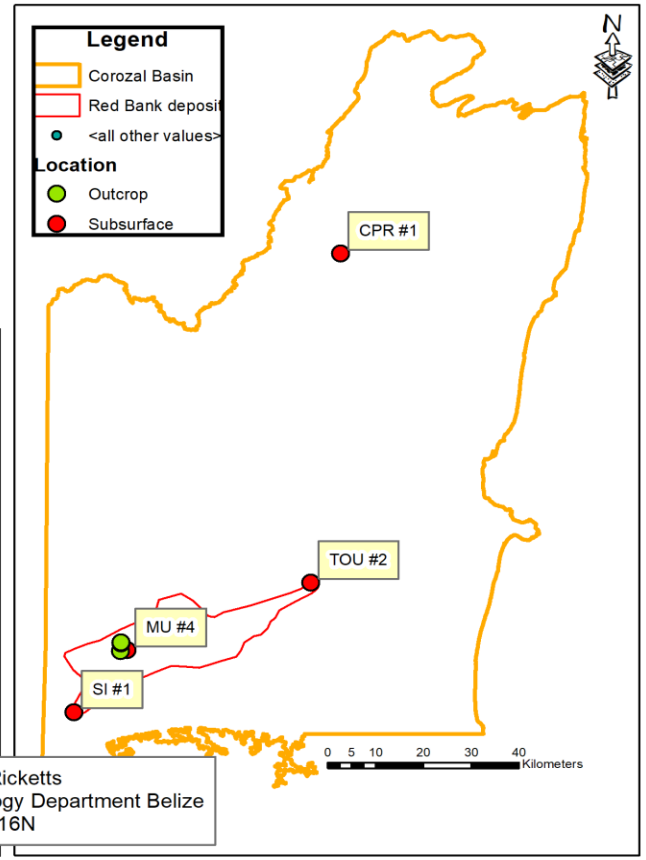


XRD Analysis

Well Number	Well Name	Quantity	Sample number	Residual sediments	Sediment quantity change	Sediment size change
5	Chan Pine Ridge #1	3	CPR #1A		Decrease with depth	Increase then decrease
			CPR #1B			
			CPR #1C			
9	Mike Usher # 4	2	MU #4A		No change	Increase with depth
			MU #4B			
14	San Ignacio #1	3	SI #1A		Decrease then increase	Increase then decrease
			SI #1B			
			SI #1C			
17	Toucan #2	3	Tou #2A		Slight decrease with depth	Increase then decrease
			Tou #2B			
			Tou #2C			
18	Valley of Peace #2	2	VOP #2A		Increase with depth	Decrease with depth
			VOP #2B			

- Varying sediment quantity (brown) and size (orange) with depth with each well
  - CPR #1 **quantity** decrease **size** decrease then increase
  - MU #4 **quantity** no change **size** decrease with depth
  - SI #1 **quantity** decrease then increase **size** increase then decrease
  - Tou #2 **quantity** increase **size** increase then decrease
  - Vop #2 **quantity** increase **size** decrease

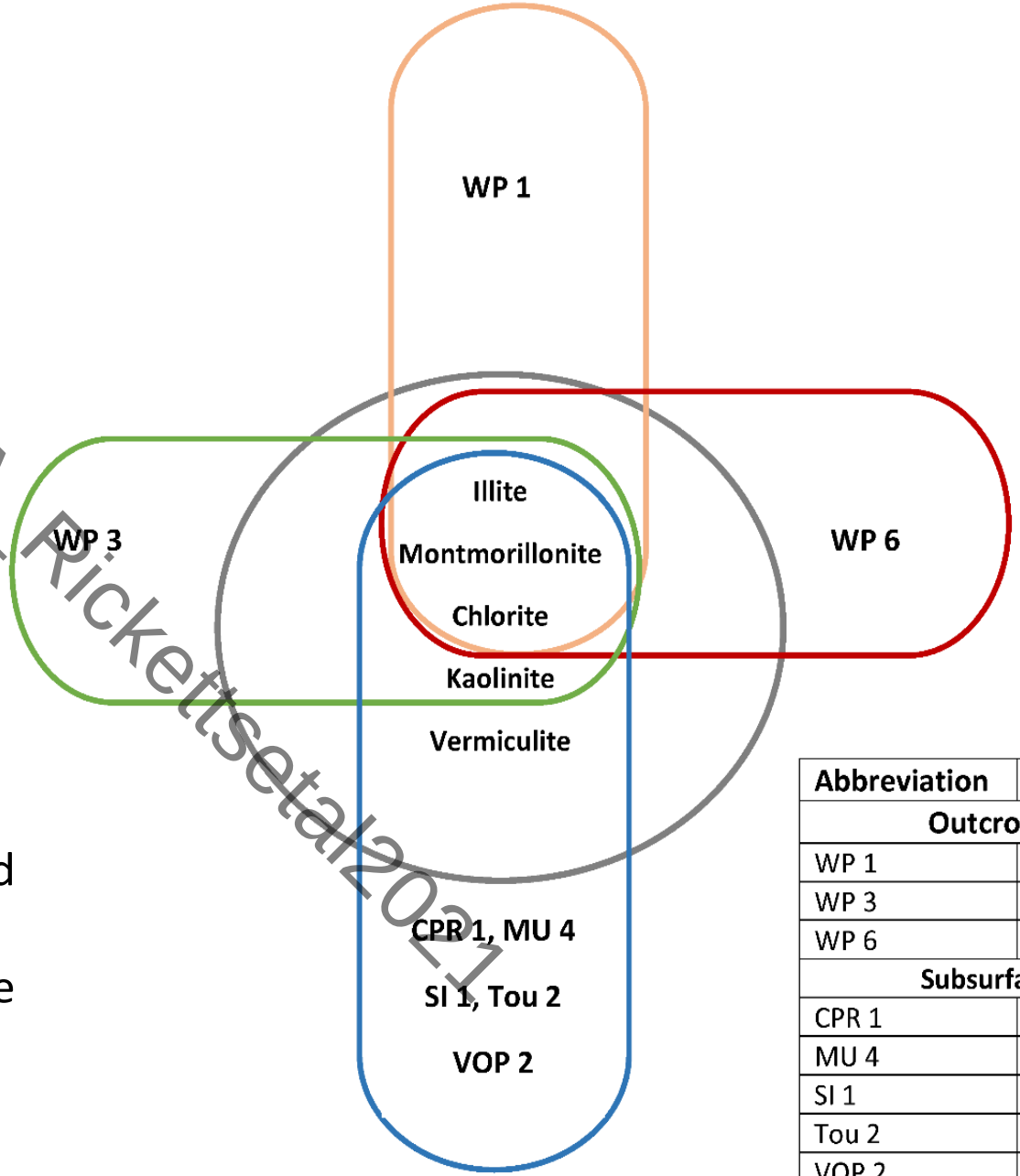




XRD Analysis

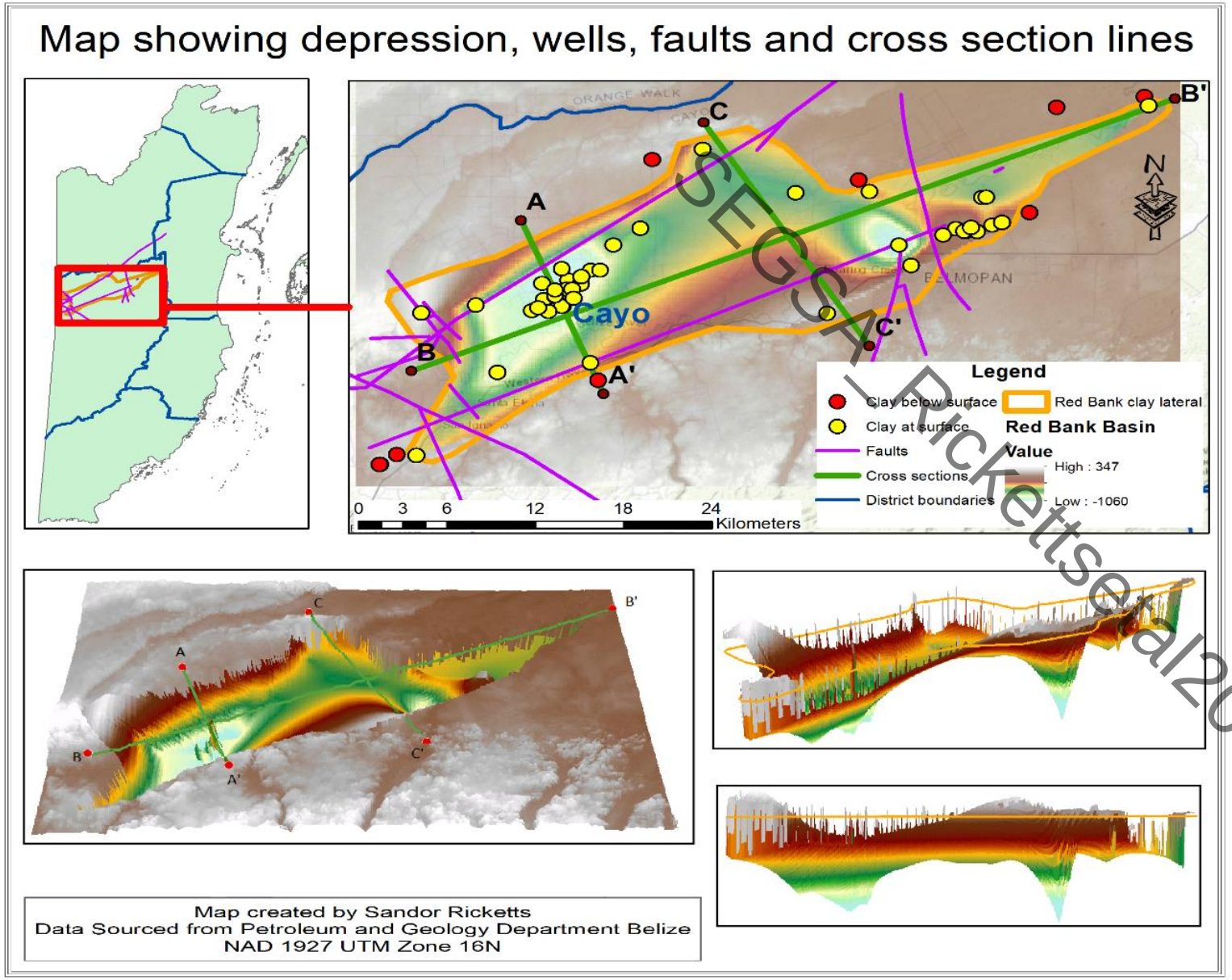
Test	Group	Peaks (A)		
		(001)	(002)	(003)
Air	Chlorite (Fe)	14.2	7.11	4.74
Glycol				
Air	Illite	10.1	5	3.38
Glycol				
Air	Kaolinite	7.15	3.58	
Glycol		7	3.5	
Air	Montmorillonite	15	5	3.75
Glycol		16.9	8.46	5.64
Air	Vermiculite	14.4	7.6	3.58
Glycol				

- All samples (outcrop/subsurface) contained illite, montmorillonite and chlorite
- Kaolinite and vermiculite were present in some samples
- Subsurface samples contained all groups



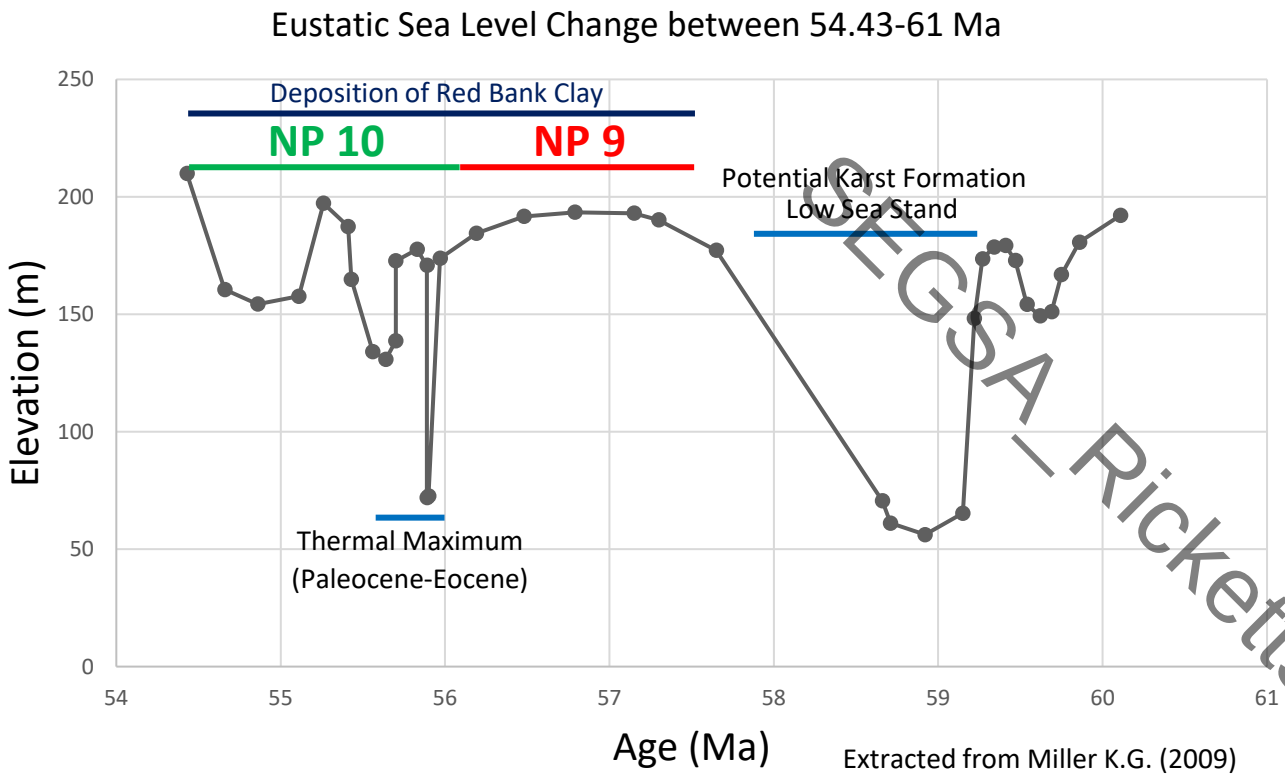
Abbreviation	Sample name
Outcrop samples	
WP 1	Way Point 449_SPB
WP 3	Way Point 448_SP1
WP 6	Way Point 449 SPA
Subsurface samples	
CPR 1	Chan Pine Ridge 1
MU 4	Mike Usher 4
SI 1	San Ignacio 1
Tou 2	Toucan 2
VOP 2	Valley Of Peace 2

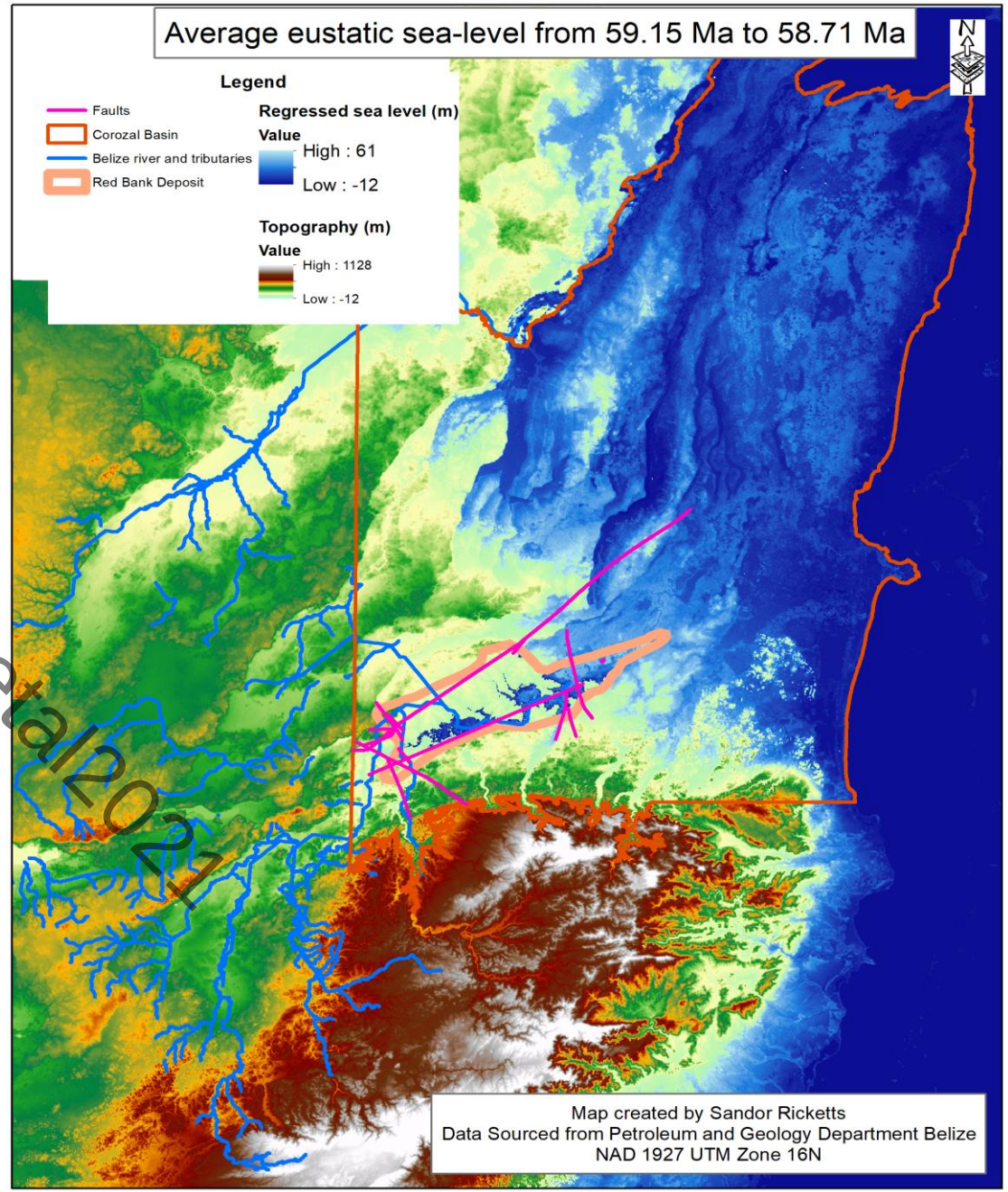
❑ Stratigraphy



- Various peaks and depression
- Clay unconformable contact with underlying limestone
- Variations and faults also interpreted from seismic survey analysis
- Fault bounded with additional cross-cutting faults

❑ Sea Level Change & Depositional Environment Shifts

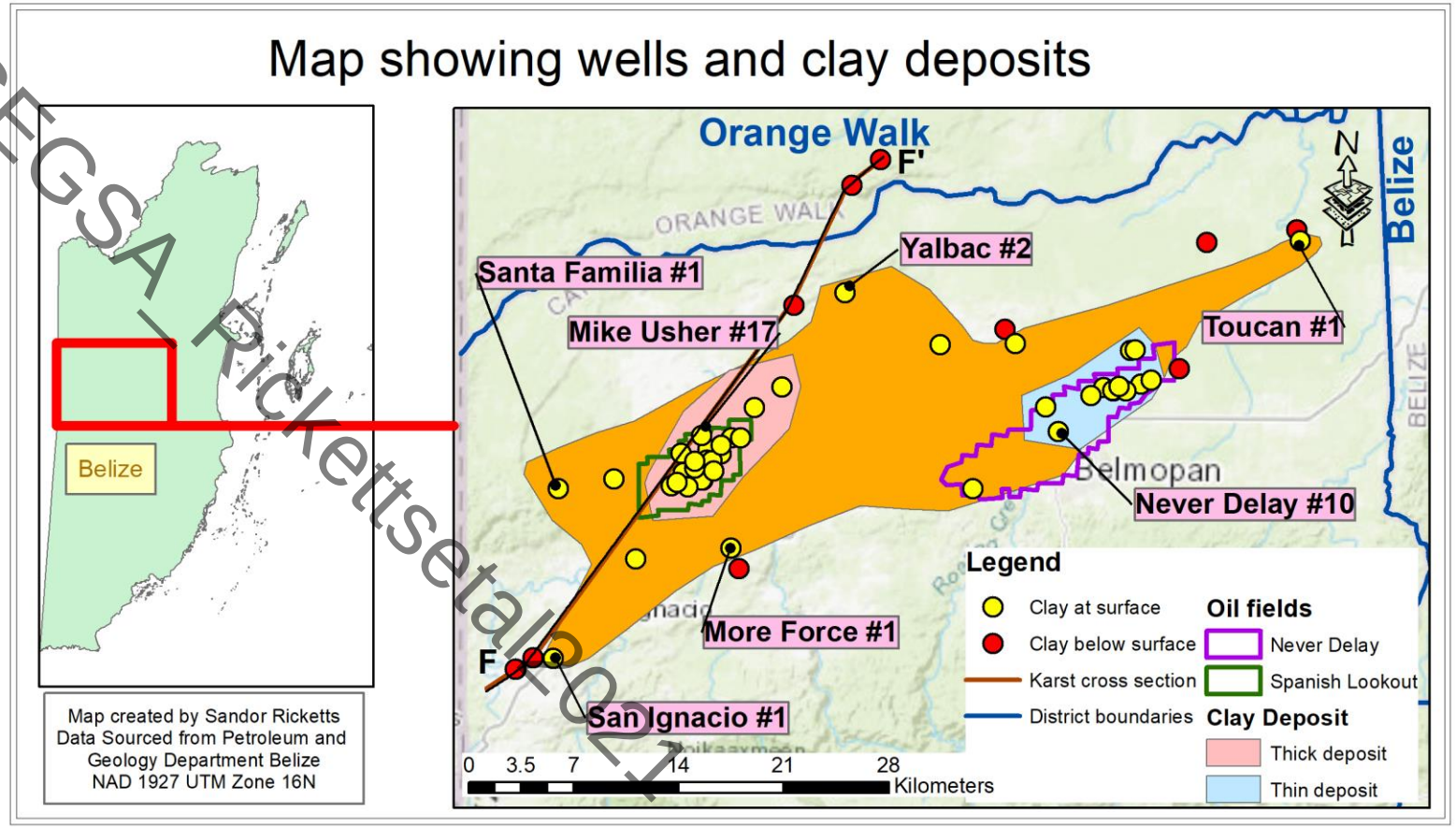




- Thick deposit in karst, some thinner deposits in channels
- Biostratigraphic study indicates thick and thin deposit are marine within the same age range
- P-E Thermal Maximum occurred during deposition of clay may have attributed to gypsum

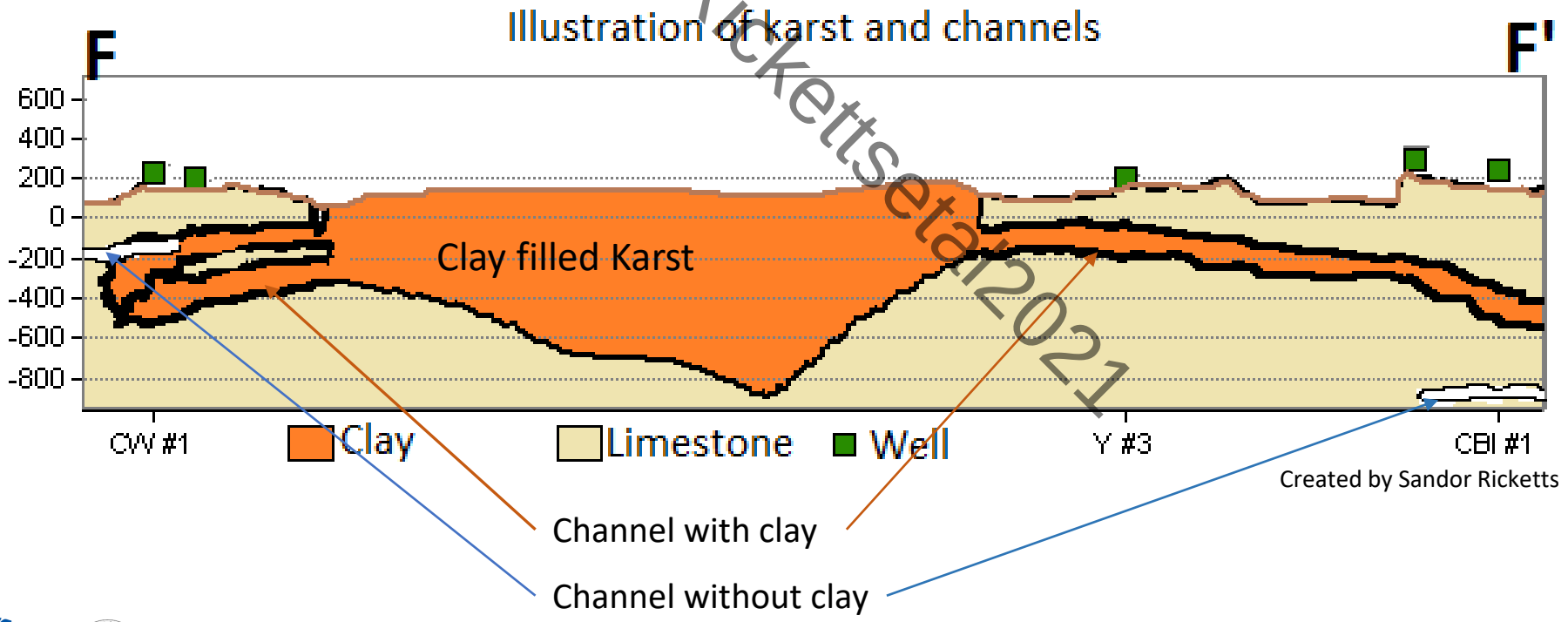
❑ Discussion & Conclusion

- Corozal basin dominated by Cretaceous limestone, later creating the cave system
- Hydrocarbon exploration discovered thick clay deposits
- Clay filled karst are present in the Corozal Basin, karst exhibits no surficial expression
- Red Bank group, was influenced global/regional sea level changes
- Regional tectonic activity influenced the Red Bank Group deposition
- Facies changes in the clay impacted seismic interpretation



❑ Discussion & Conclusion

- Red Bank Clay deposit age range late Paleocene to early Eocene
- Red bank clay is localized in the karstic formation with depositions in channel
- Thicknesses vary depending on karst depth and channel size
- Deposition took place in low energy marine environment
- Deposition Influenced by regression and transgression sequences creating multiple facies
- Deposition in marine and freshwater influence resembling estuary



Thank you for your attention.

Q&A