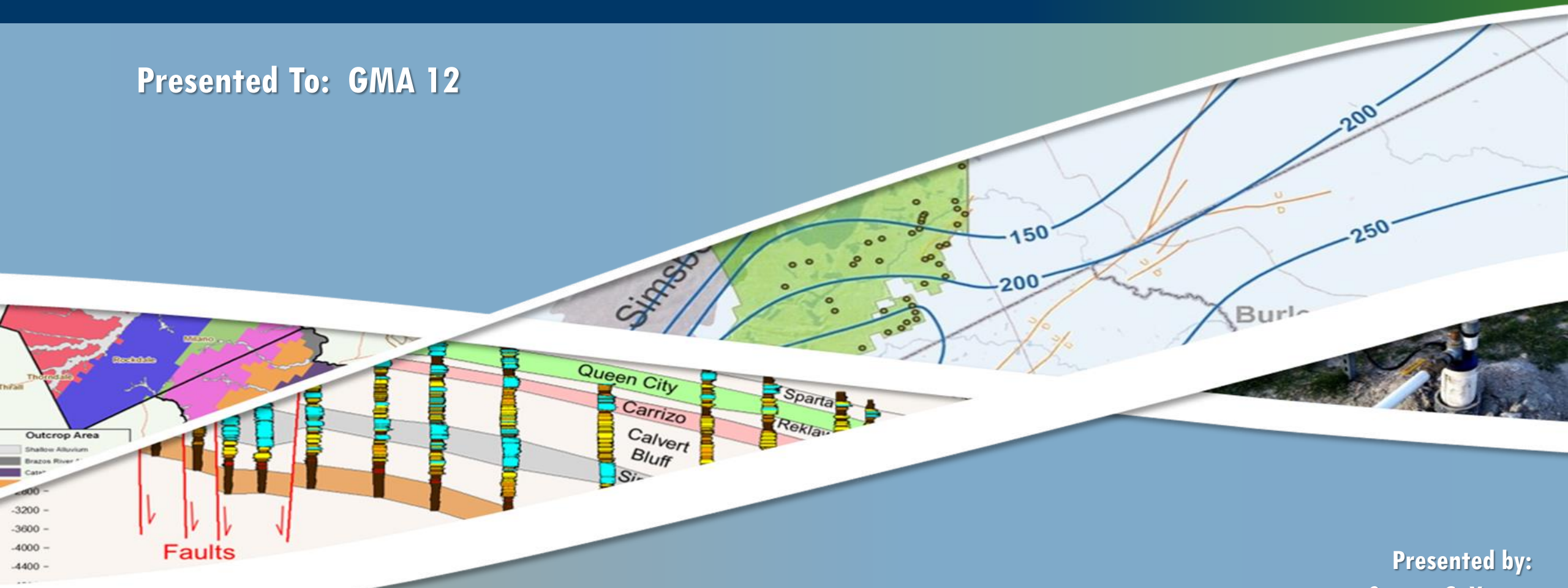
Overview of POSGCD Reclamation Project

Presented To: GMA 12



Presented by:
Steven C. Young
Jonathan Quiroz

May 23, 2024

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

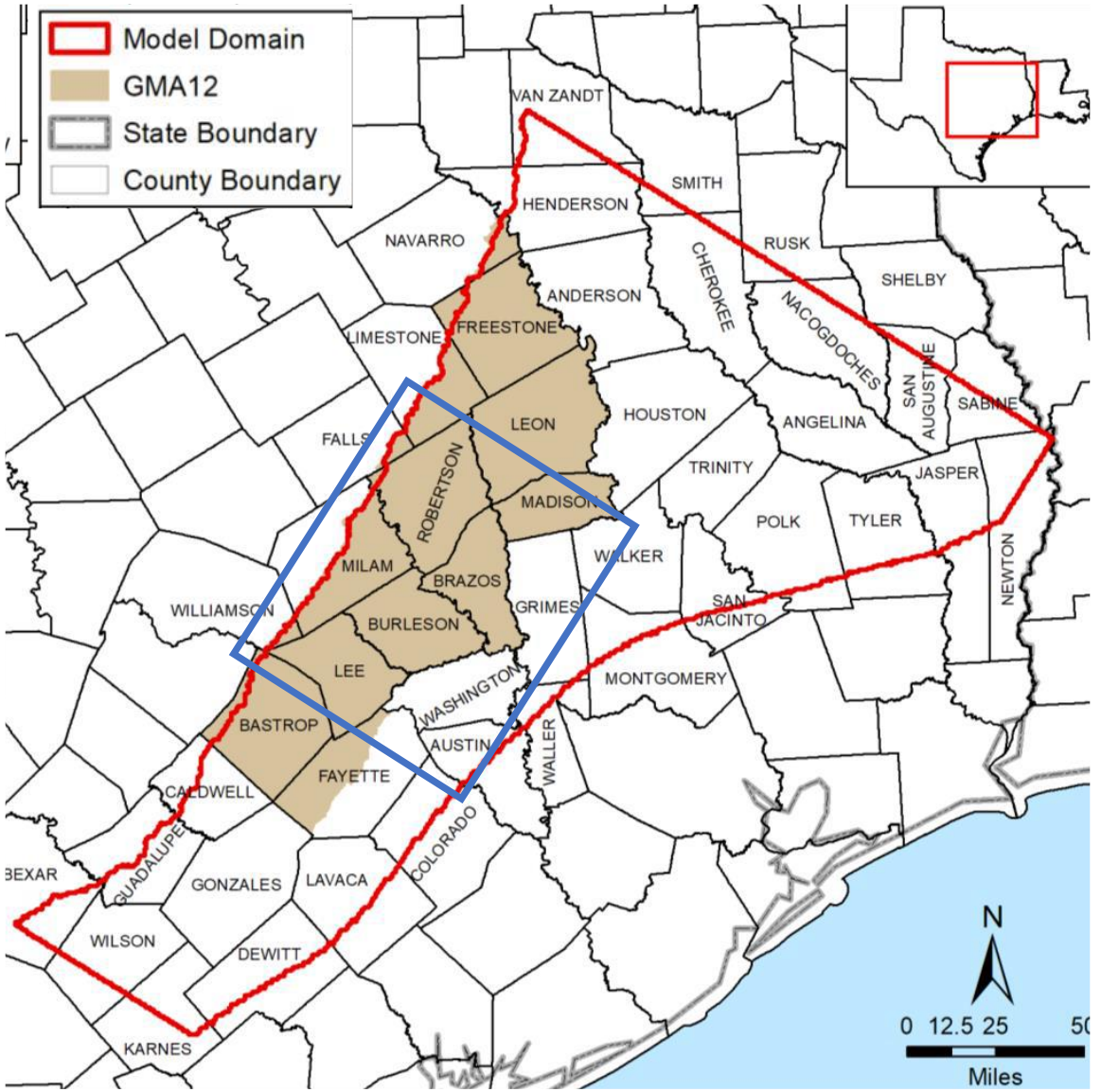
Agenda

- Reclamation Study
- Operational Model
  - Changes in Model Grid Cell and Layers
  - Adjustments to Geology
  - Calibration Targets

Reclamation Study

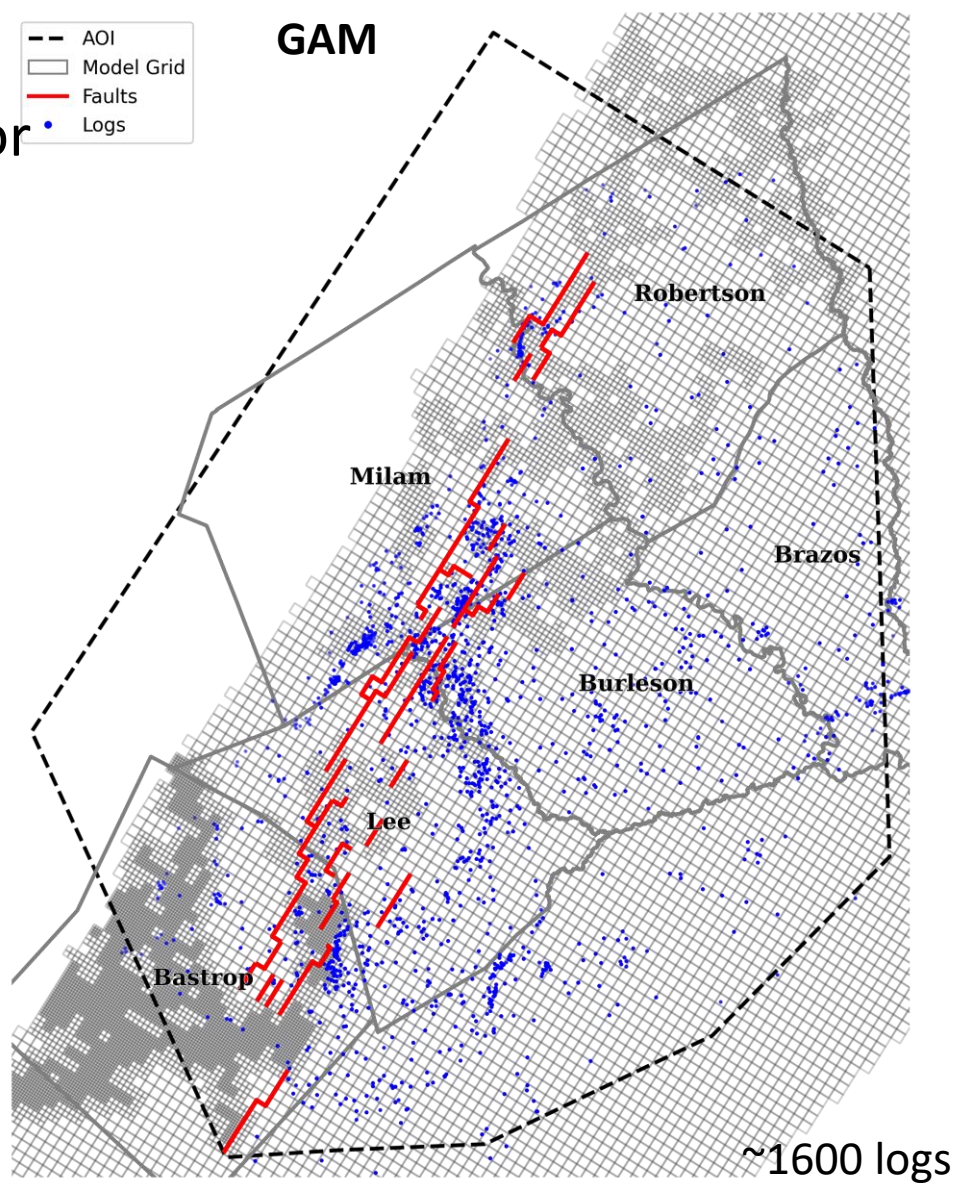
- Objective
  - Enhance GAM to develop an **OP**erations and **MAN**agement Model (**OPMAN**)
  - Apply OPMAN to help guide management decisions
  - Apply OPMAN to investigate long-term sustainability

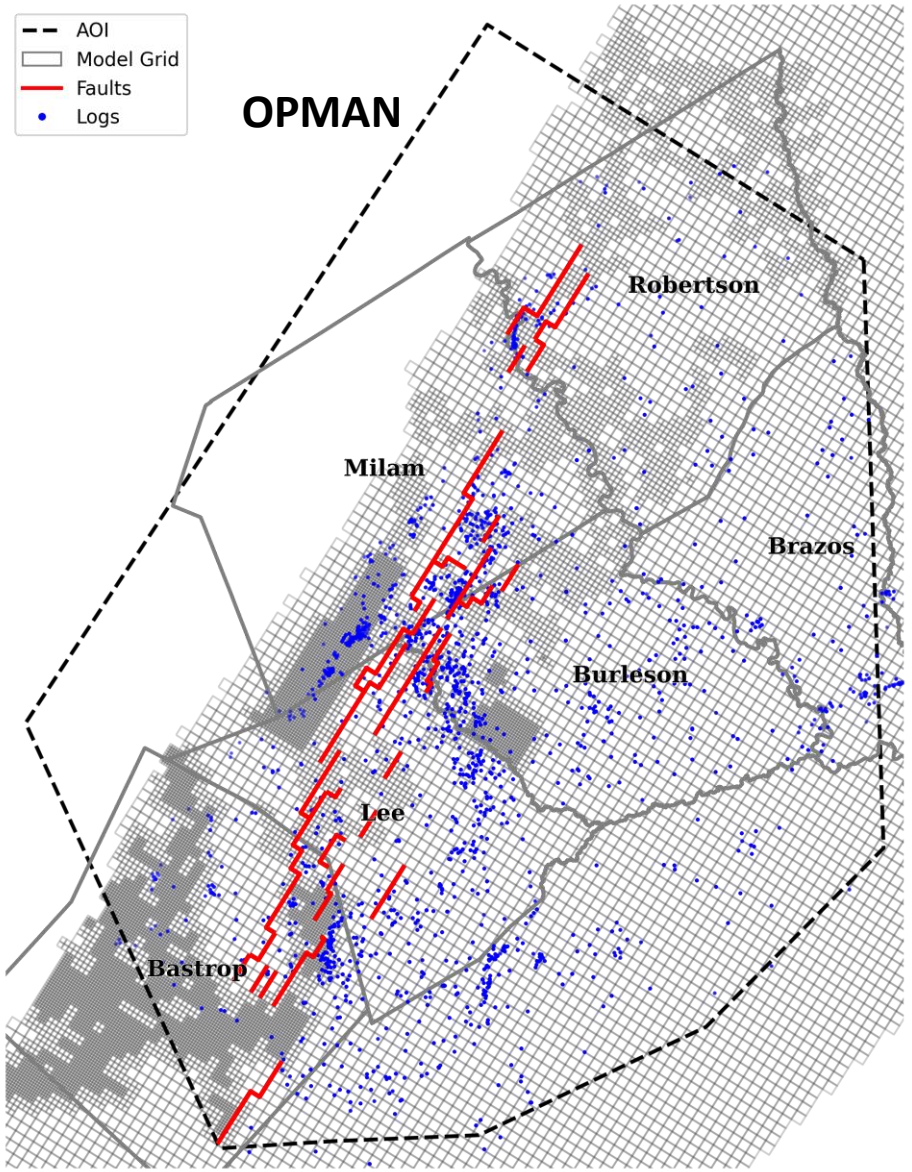
- OPMAN (Blue Box)
  - Extend historical calibration (1930 to 2021)
  - Simulate aquifer pumping tests
  - Incorporate predictive uncertainty



Changes to Model Grids and Layers

- Grid cells
  - Refine near major pumping centers
- Model Layers
  - Changes to outcrops to provide better transitions to confined regions





~1600 logs

Evidence for Making Changes to Model Layers

- Geophysical Logs
  - Coal intervals mark bottom of Calvert Bluff
  - Coal intervals mark top of Hooper
  - Blocky, thick sand beds indicative of Simsboro Layers
  - Continuity between surface geology and geophysical picks

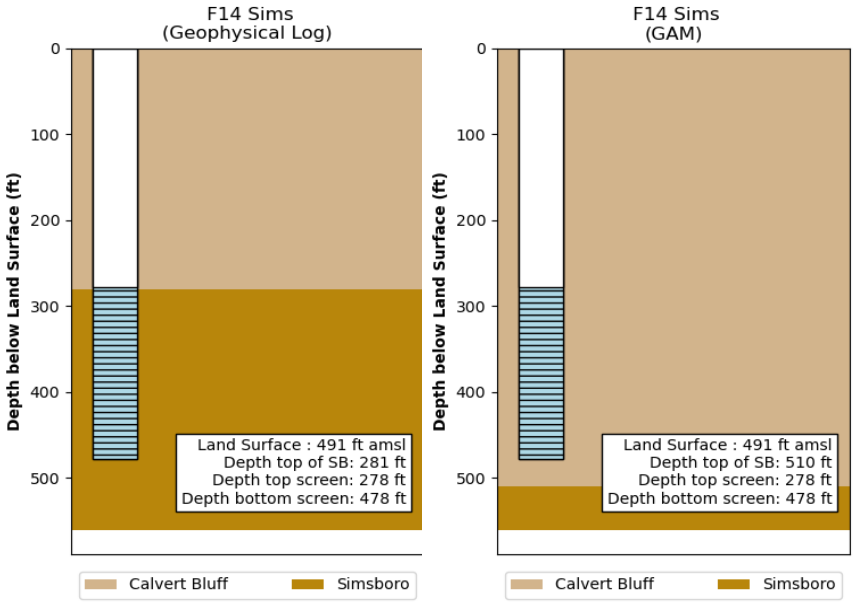
- Measured Water Layers
  - In recent years, water levels lower in Simsboro than Calvert Bluff
  - Simsboro water levels more susceptible for regional declines than Calvert Bluff water levels (examples--- Gause well, Mr. Limoges well)

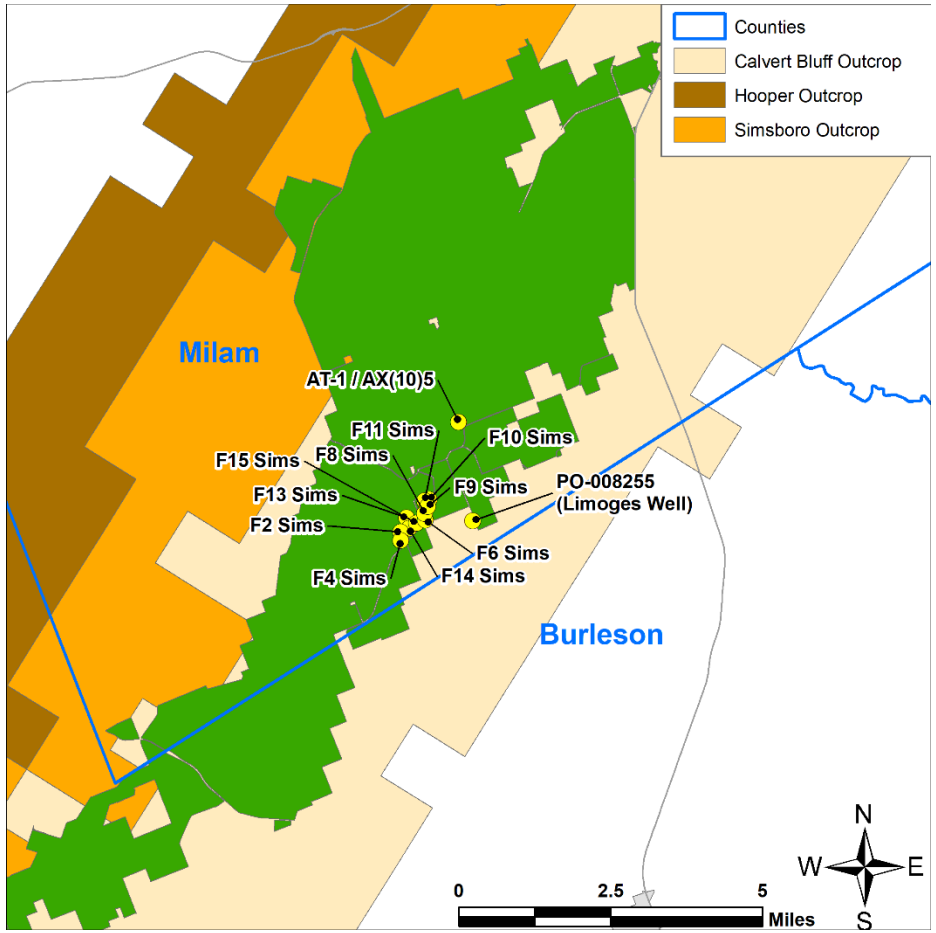
- Water Quality
  - TDS concentrations - lower in Simsboro than Calvert Bluff
  - Calcium/Sodium ratios - higher in Simsboro than Calvert Bluff

- Faults
  - Addition of geophysical logs
  - Inclusion of markers such as coal beds

Summary of INERTA Analysis of 32 Historical Wells As Part of AlCOA's Amendment to 0148 Permit

- INTERA Classified 55 out of the 56 wells as Simsboro wells
  - 11 of the 32 existing wells mapped into the Calvert Bluff based on GAM data were assigned to Simsboro based on analysis of geophysical logs





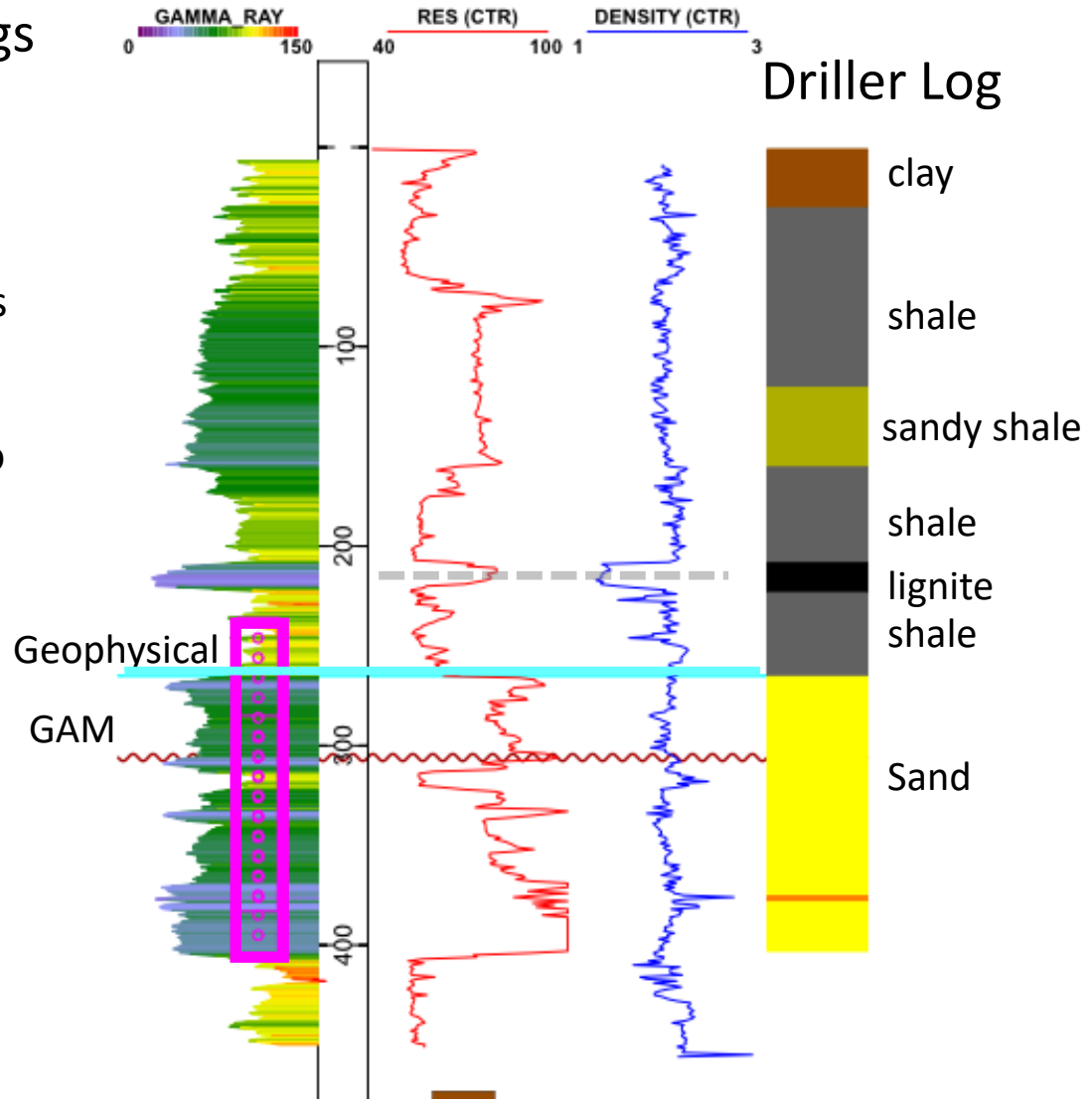
Geophysical Log for Well AX 10-5

Interpretation of Geophysical Logs

- Gamma Log – measures radioactive signatures - higher values and kicks to the right indicate clayey materials
- Resistivity – measures electrical conductance – lower values and kicks to the left indicate shaly material
- Density – measures density of formation – lower values and kicks to the left indicate lignite or carbonate

Observation

- Top of thick sand agrees with kicks in the resistivity and gamma ray and top of Simsboro (geophysical)
- Lignite layer agrees with kicks in gamma ray, resistivity, and density
- Majority of the screen is in the Simsboro formation
- Main coal layer is in the Calvert Bluff



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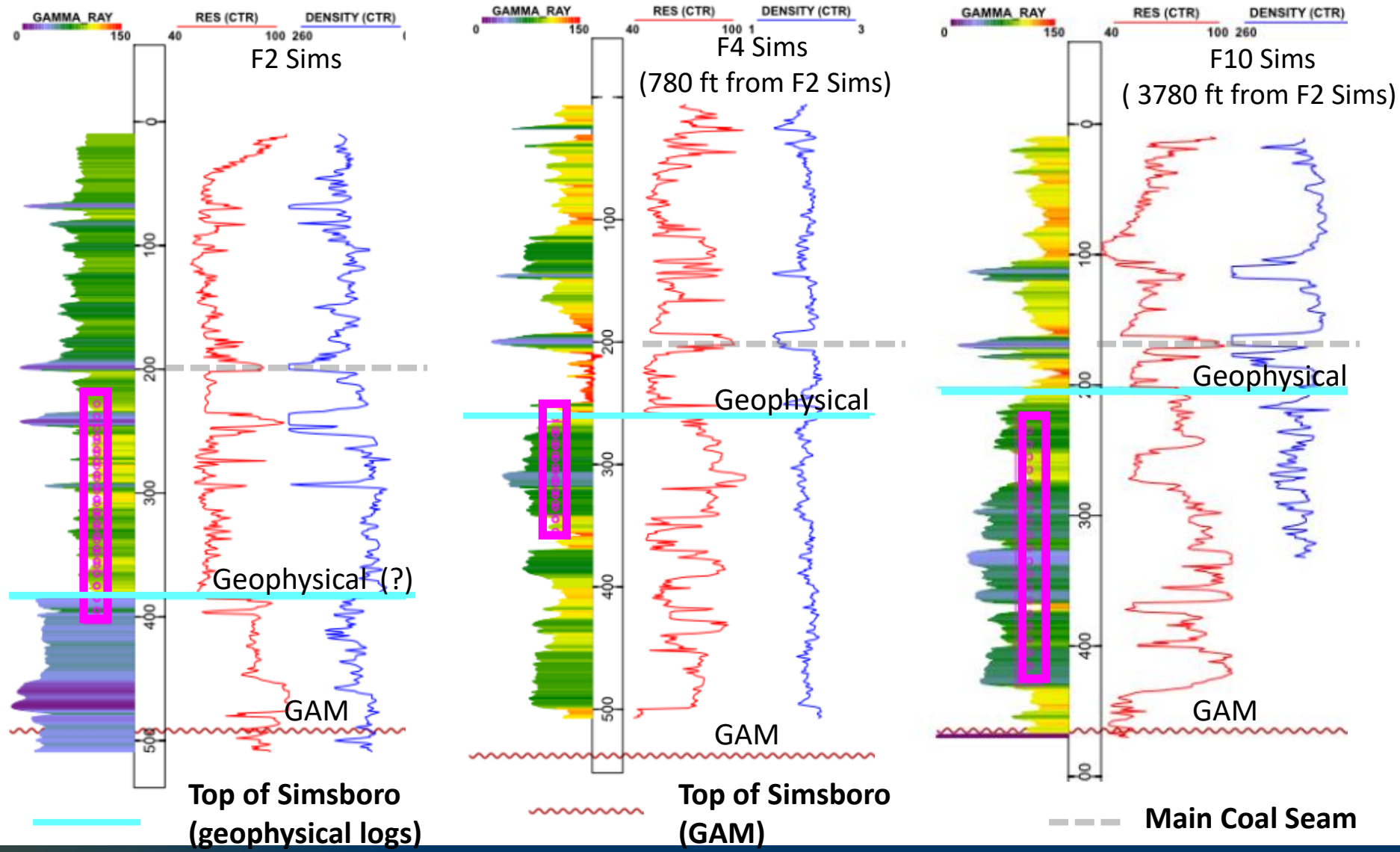
Geophysical Logs for Well F2 Sims and Nearby Wells



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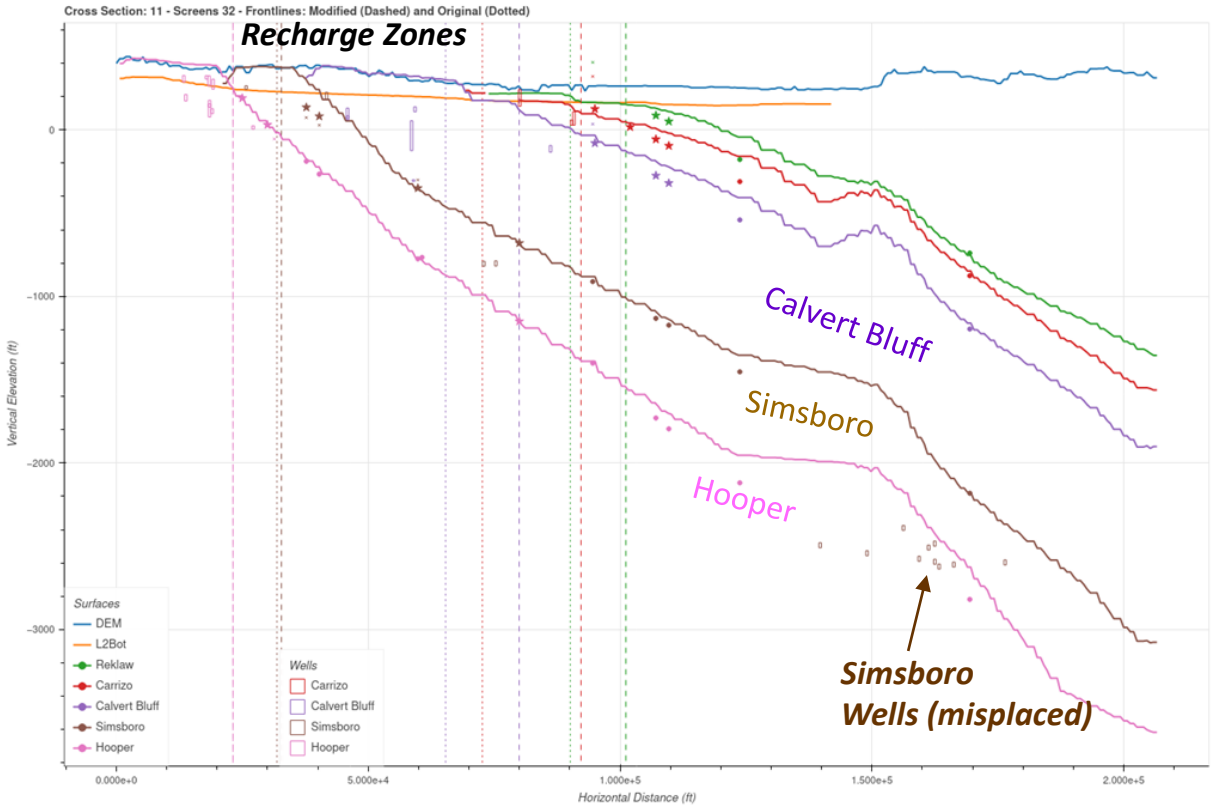
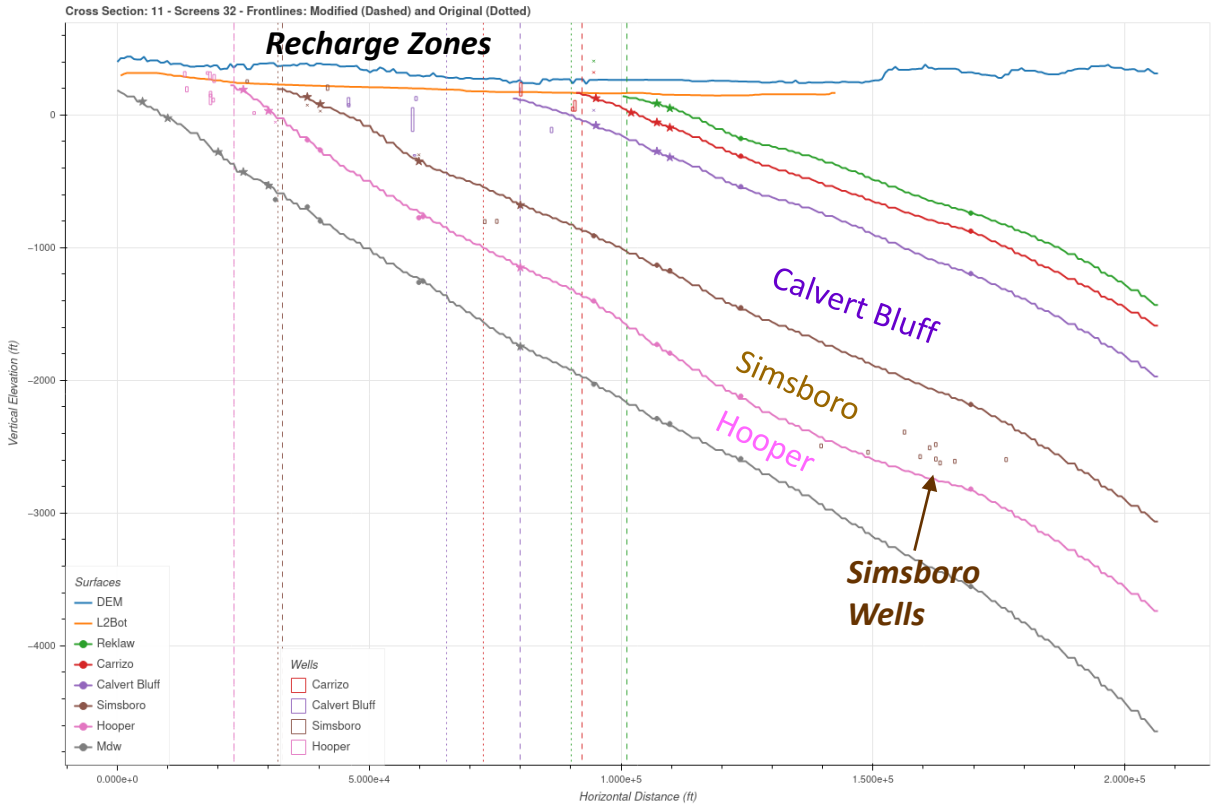
Adjustments to Geology Down Dip

GAM Geology



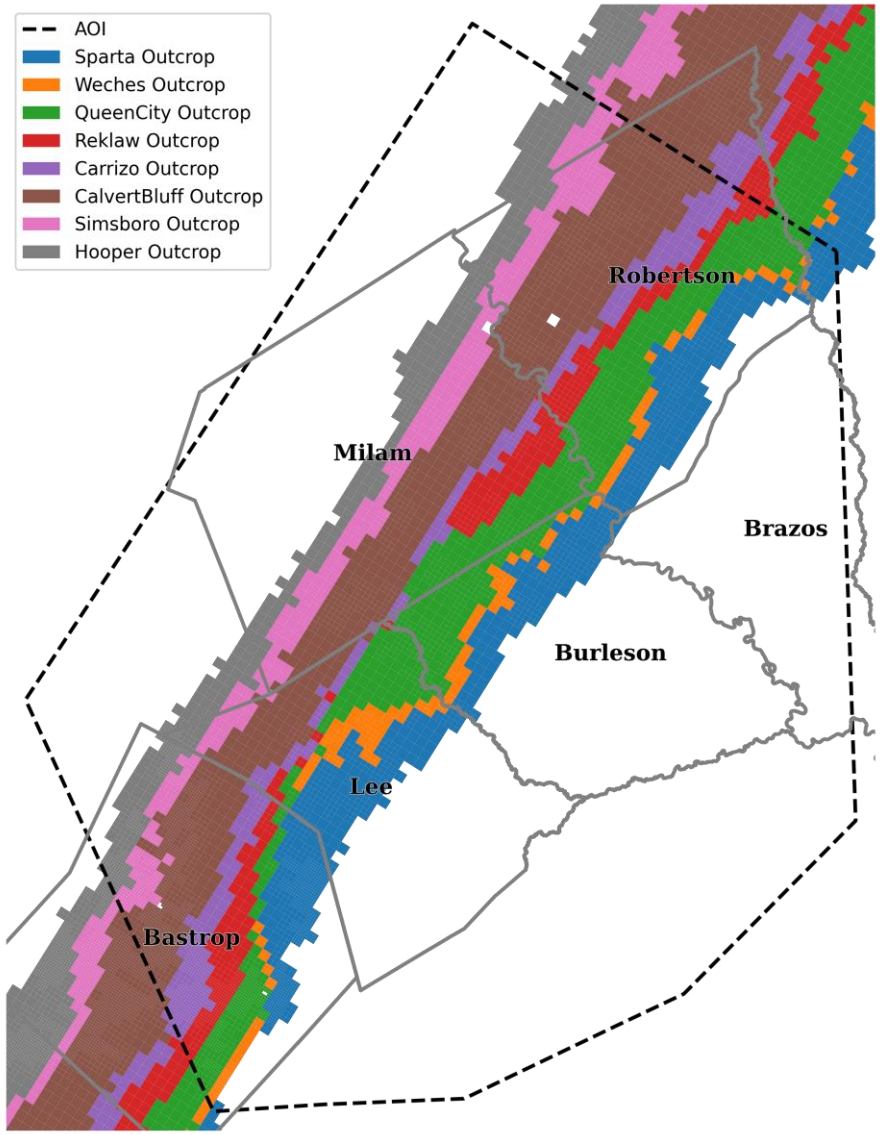
Updated Geology



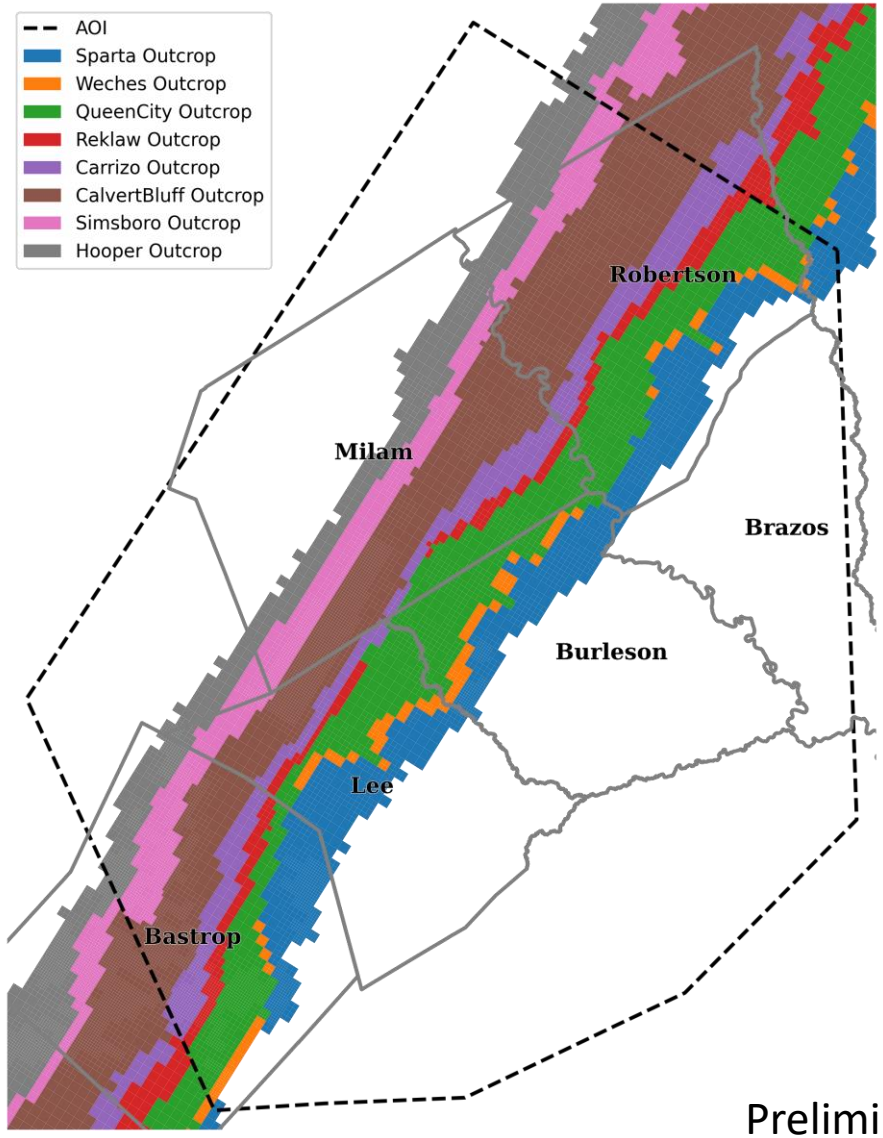
Preliminary Results

Outcrop (Layer 2)

GAM

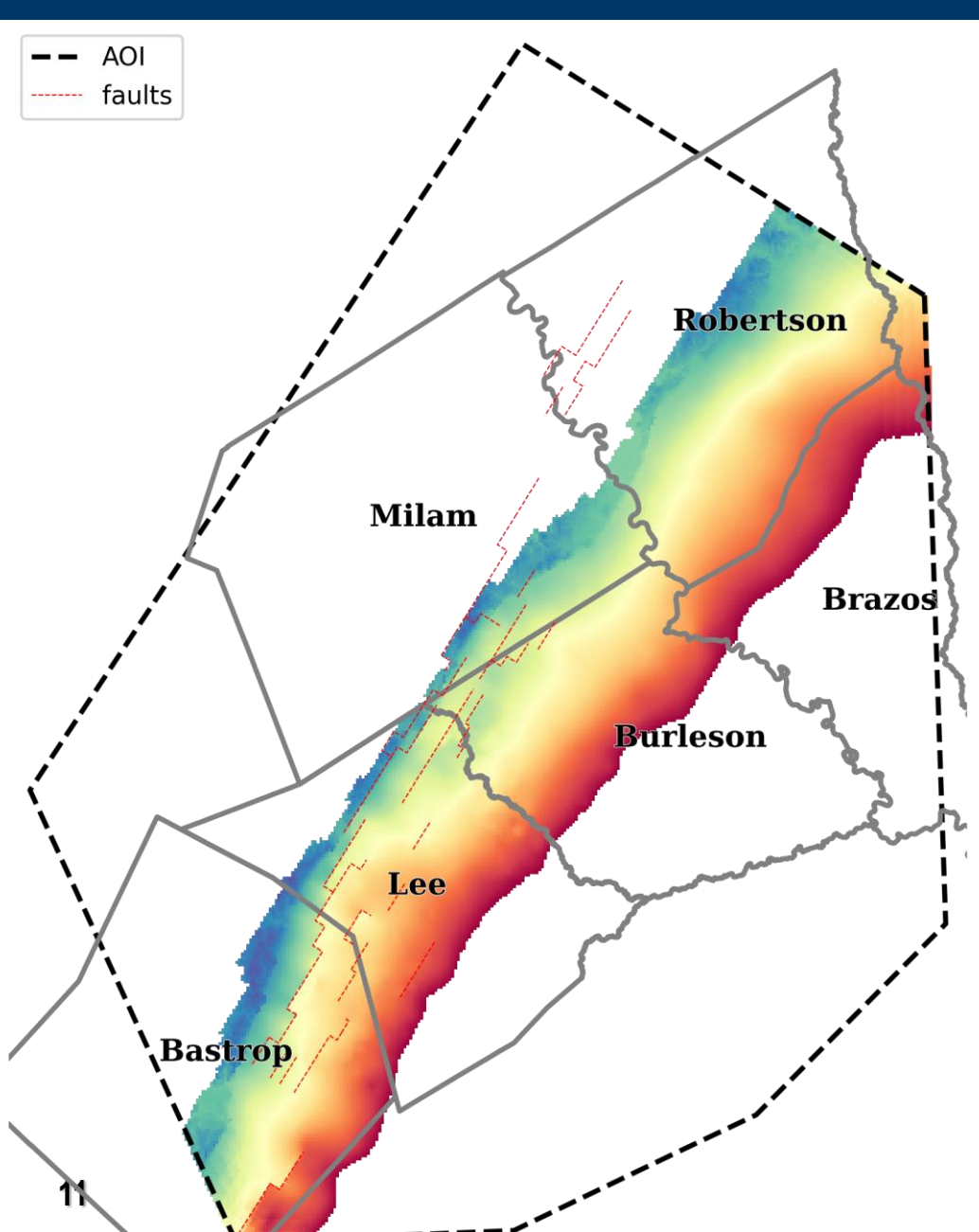


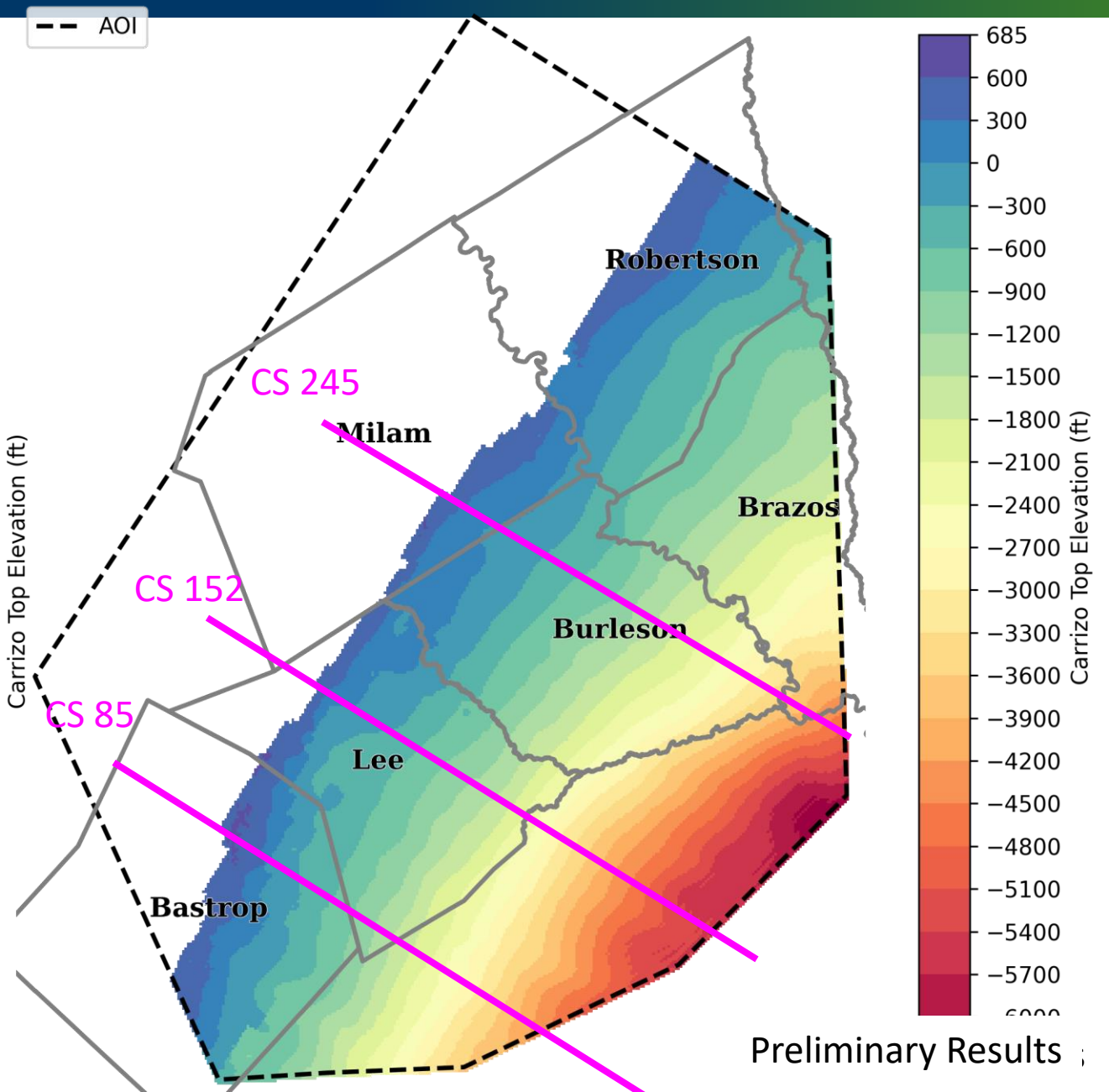
OPMAN



Preliminary Results

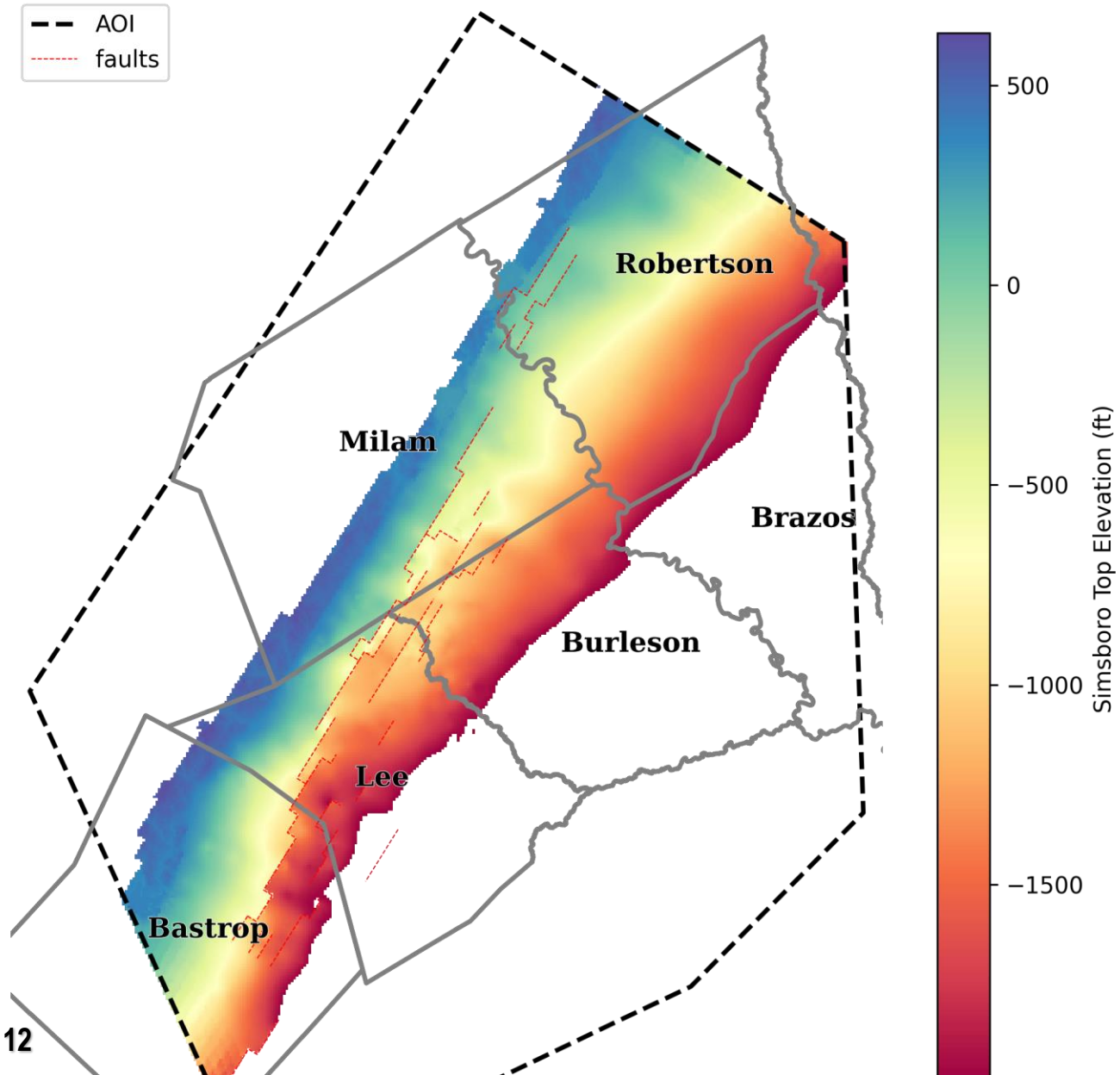
Top of Carrizo

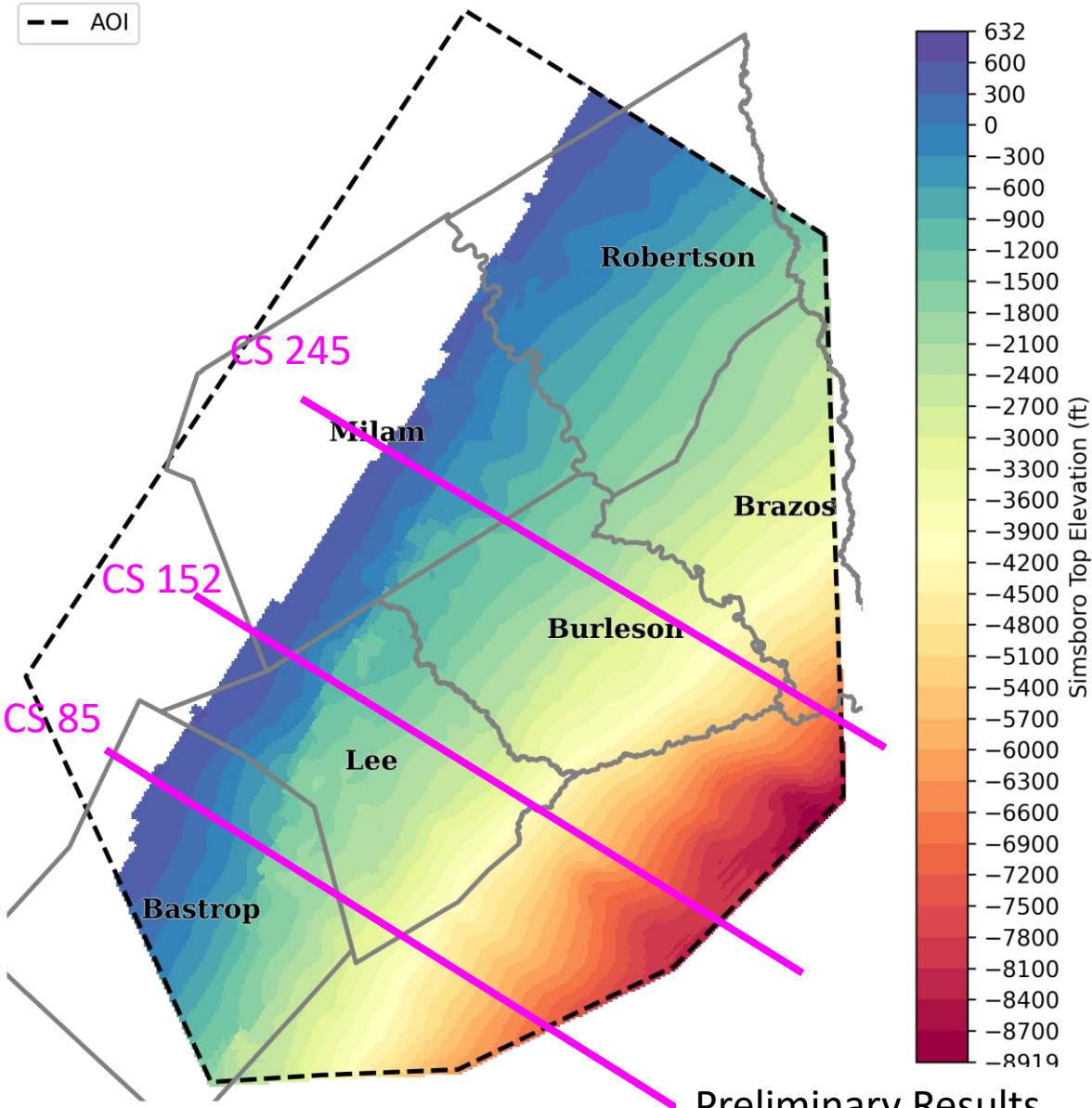




Preliminary Results

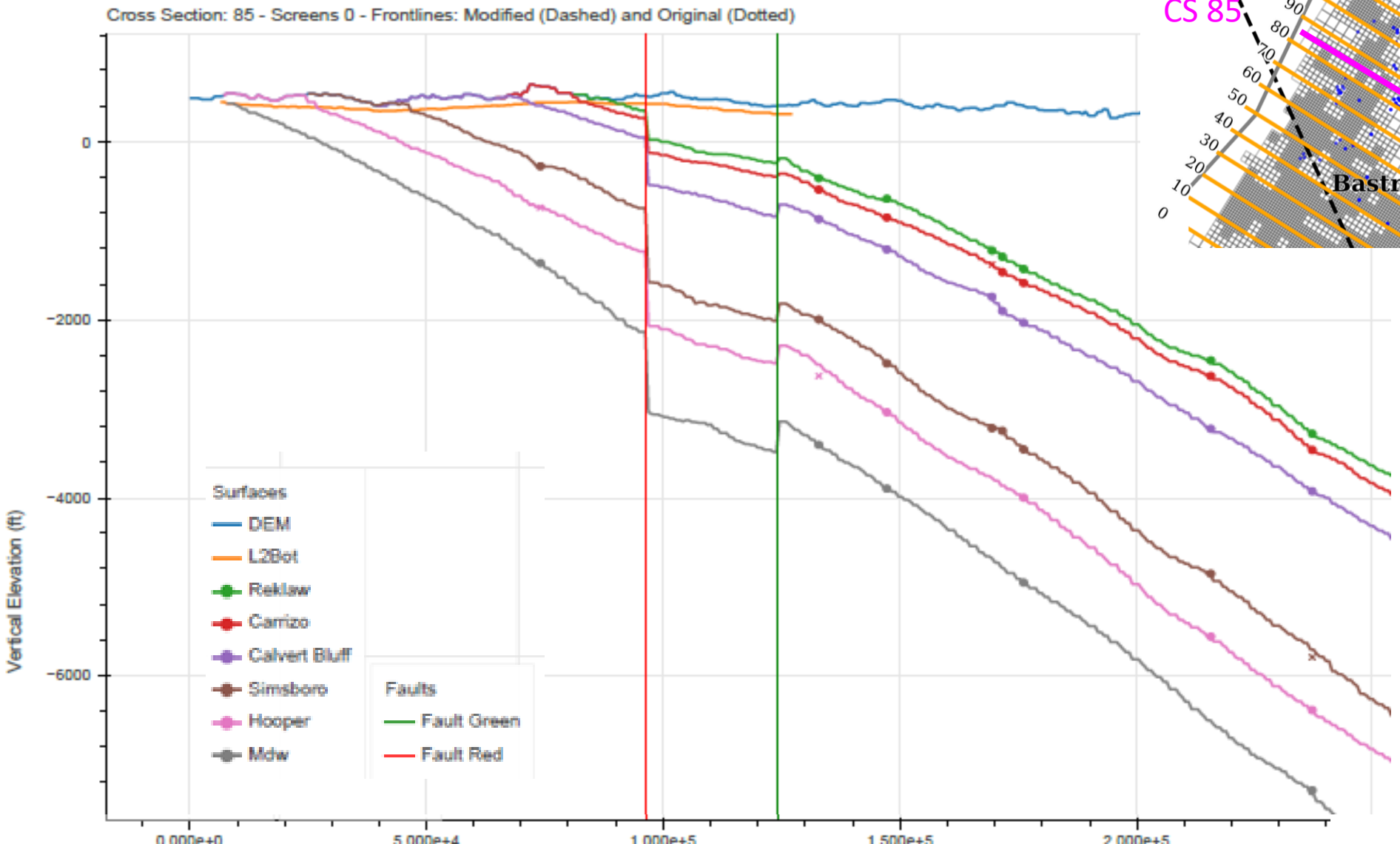
Top of Simsboro

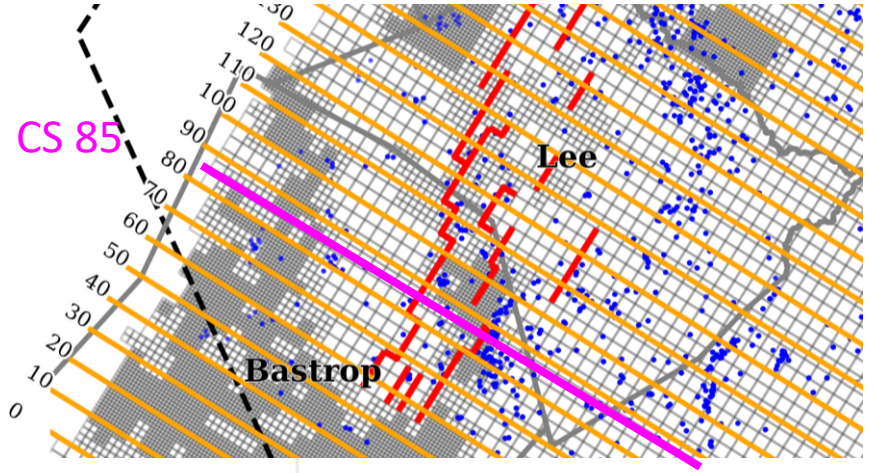




Preliminary Results

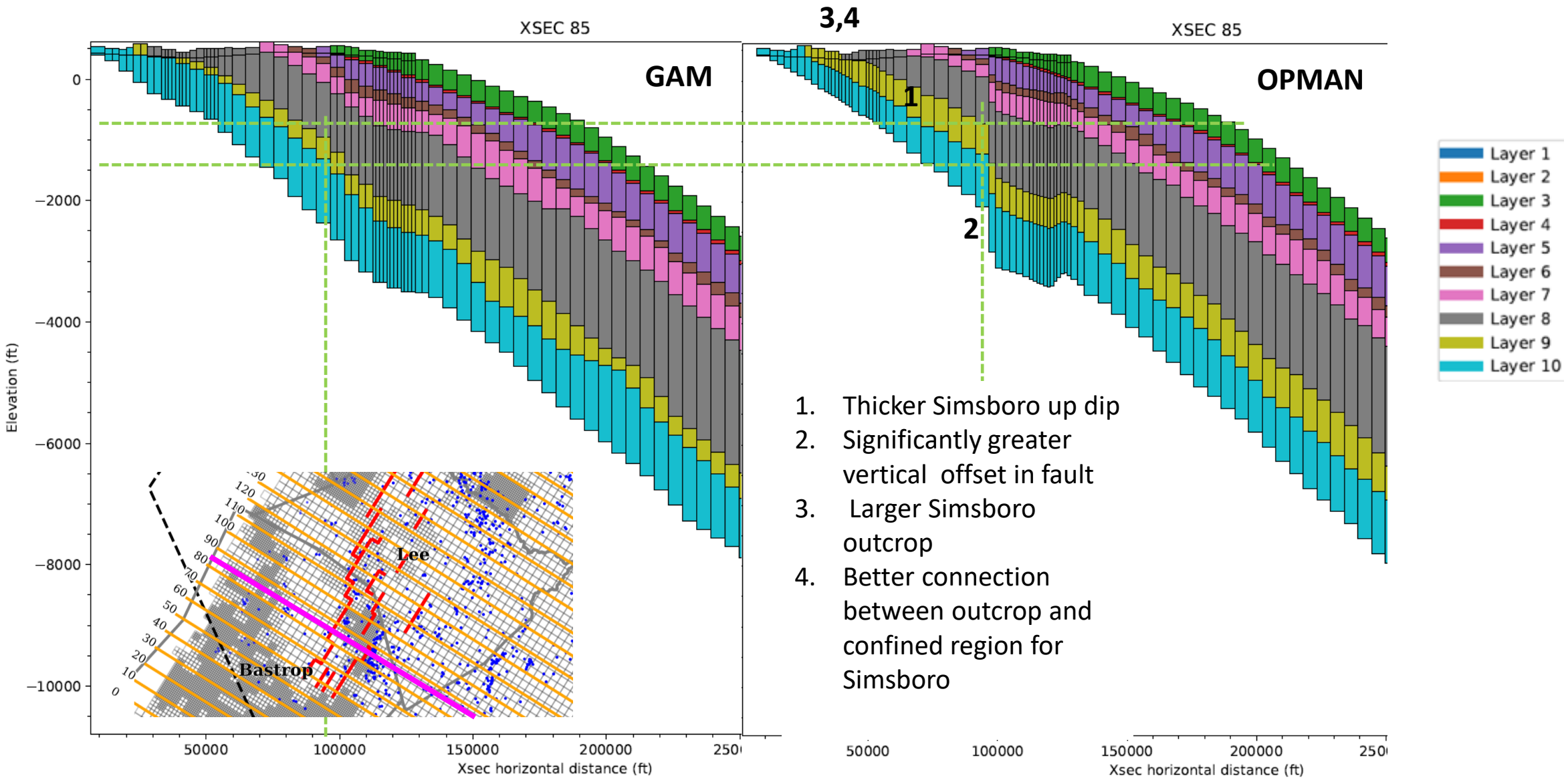
Cross-Section 85





Preliminary Results

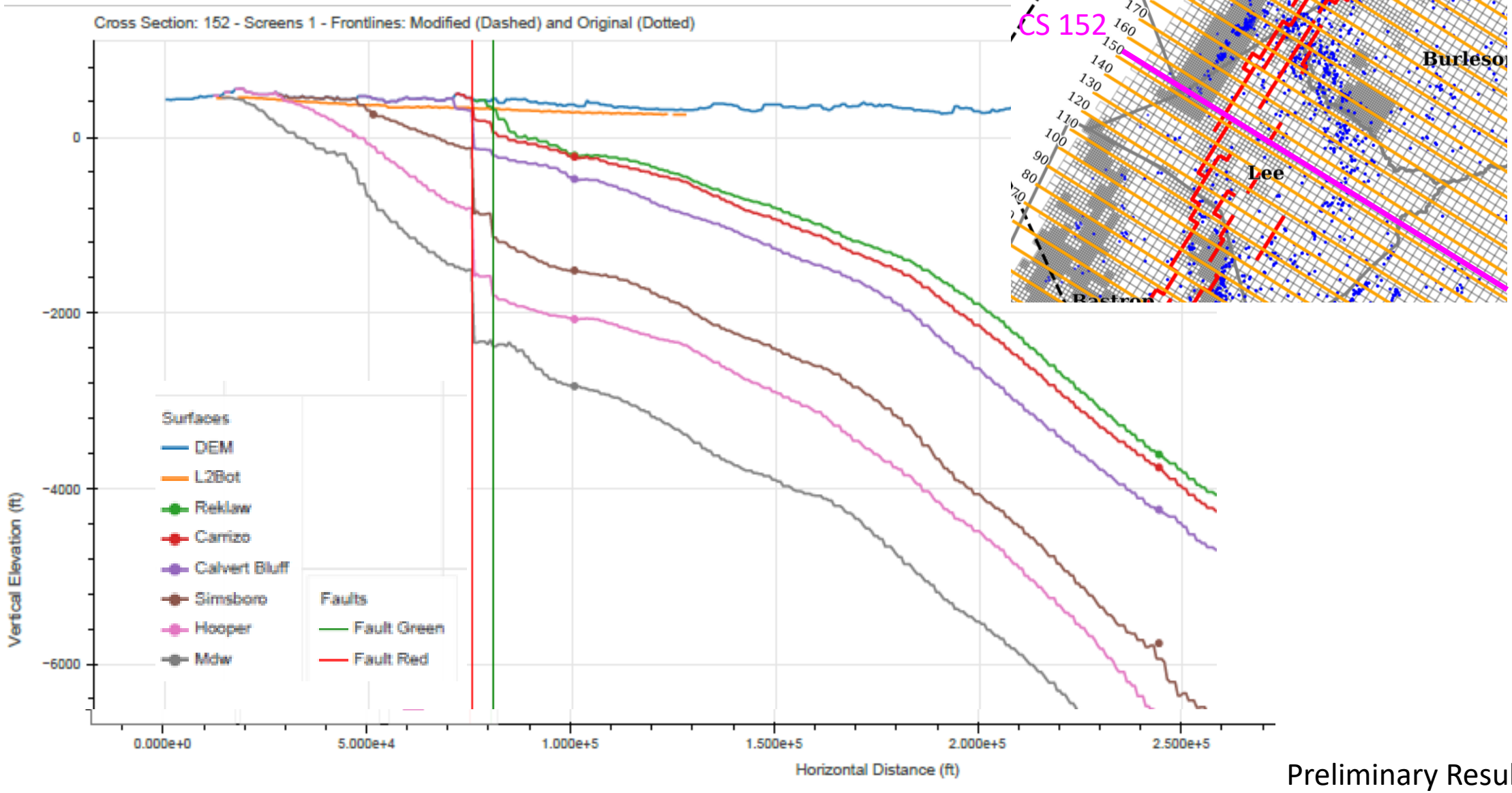
Cross-Section 85



1. Thicker Simsboro up dip
2. Significantly greater vertical offset in fault
3. Larger Simsboro outcrop
4. Better connection between outcrop and confined region for Simsboro

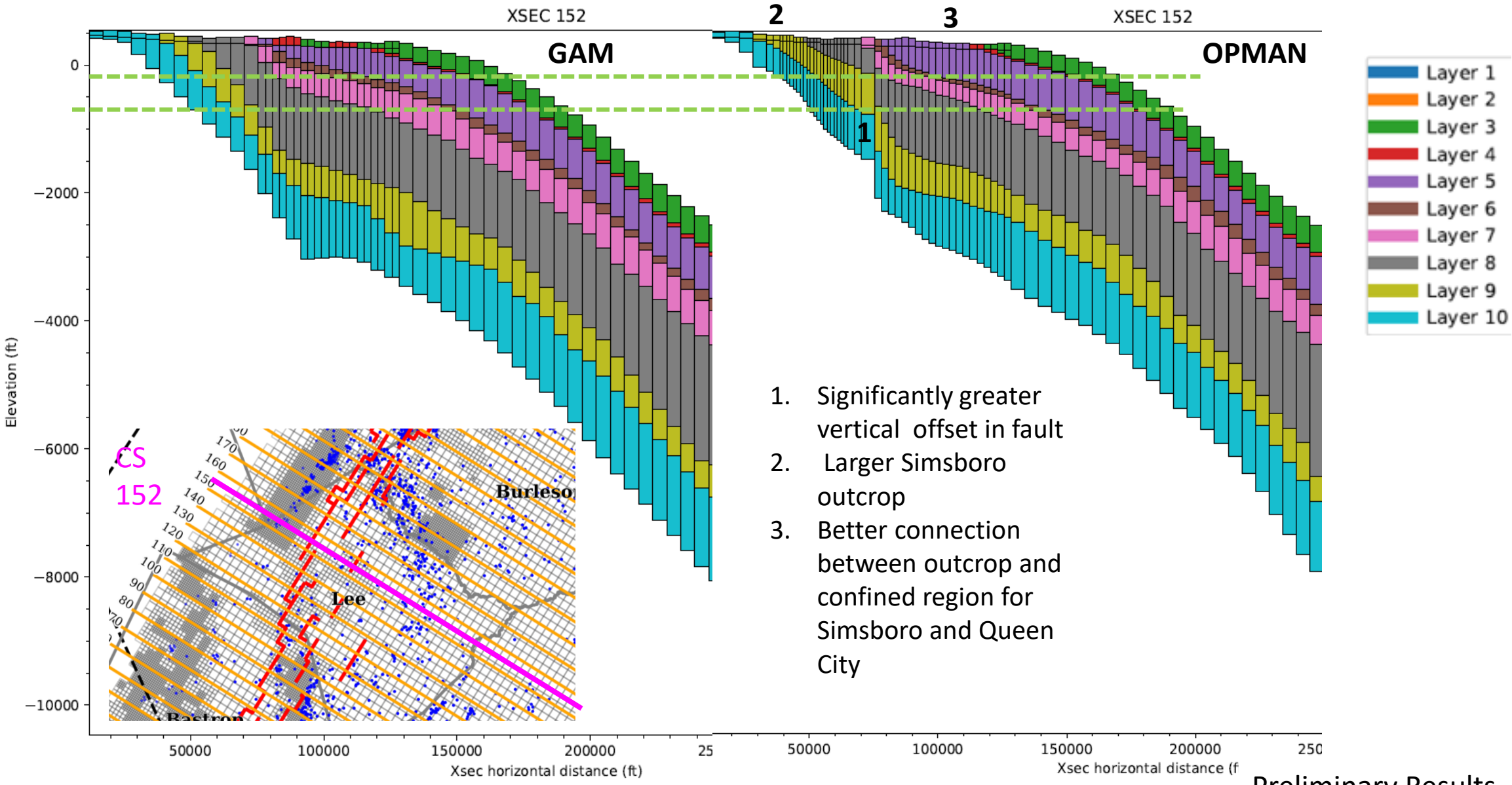
Preliminary Results

Section 152



Preliminary Results

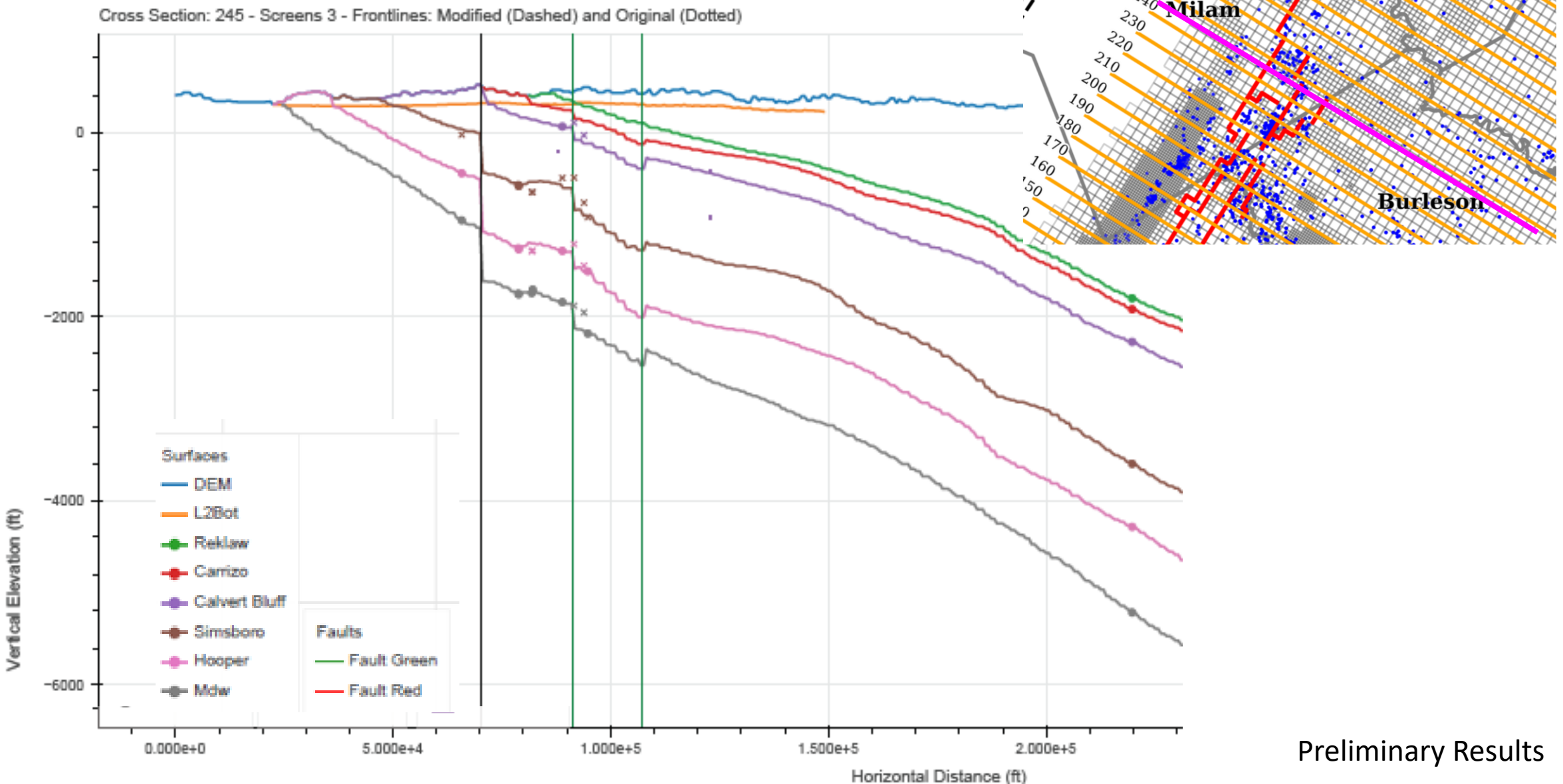
Section 152



1. Significantly greater vertical offset in fault
2. Larger Simsboro outcrop
3. Better connection between outcrop and confined region for Simsboro and Queen City

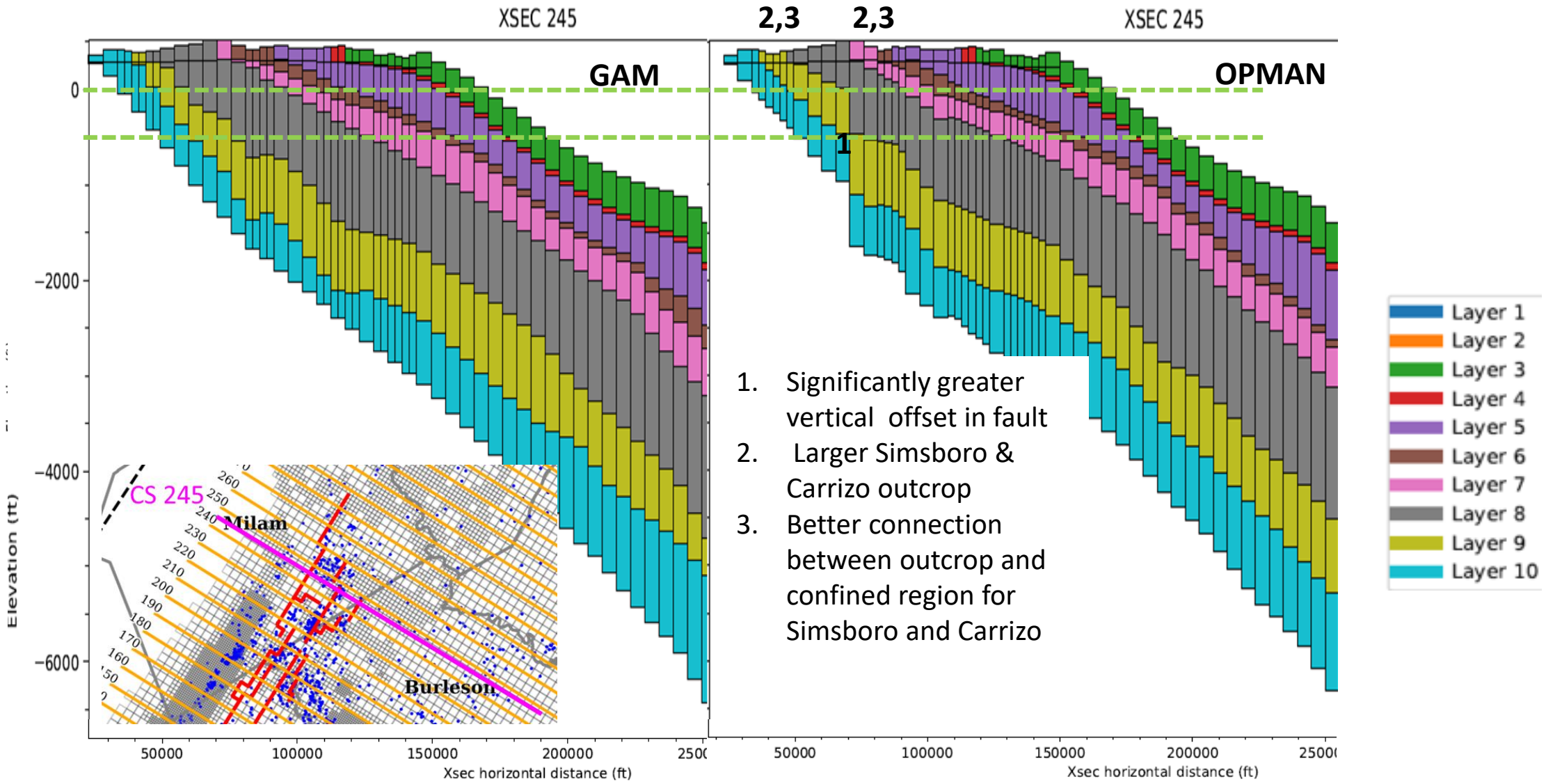
Preliminary Results

Section 245



Preliminary Results

Section 245



1. Significantly greater vertical offset in fault
2. Larger Simsboro & Carrizo outcrop
3. Better connection between outcrop and confined region for Simsboro and Carrizo

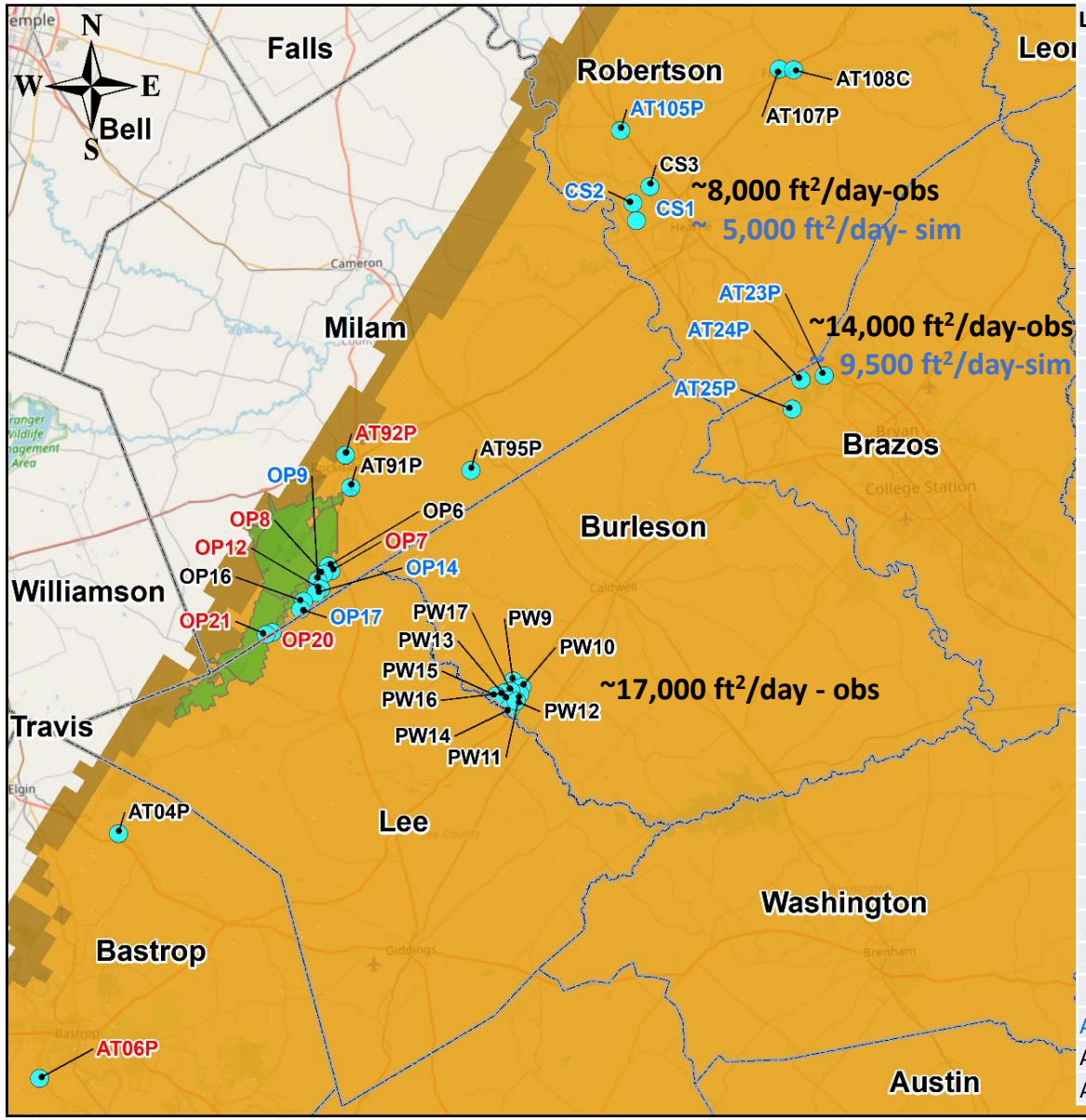
Preliminary Results

Aquifer Properties: Simsboro Transmissivity Values

Red
GAM Transmissivity is Higher than Measured

Blue
GAM Transmissivity is Lower than Measured

Black
GAM Transmissivity is within 25% of Measured



LABEL	Observed	Simulated
PW9	11,471	10,302
PW10	12,083	14,991
PW11	15,550	14,991
PW17	20,880	14,991
PW16	14,304	13,922
PW14	19,504	16,324
PW13	14,602	15,799
PW12	20,686	16,929
PW15	15,614	12,799
CS1	8,758	4,150
CS2	8,493	4,090
CS3	7,528	6,484
OP6	5,421	6,066
OP7	4,892	6,118
OP8	2,190	6,066
OP9	28,115	5,432
OP12	3,165	5,360
OP14	28,116	4,678
OP16	4,210	4,639
OP17	9,379	3,937
OP20	2,301	3,599
OP21	2,950	4,168
AT04P	2,189	2,448
AT06P	3,348	5,139
AT23P	15,187	9,676
AT24P	14,804	10,215
AT25P	13,147	9,070
AT91P	4,445	4,728
AT92P	4,479	6,340
AT95P	7,171	7,094
AT105P	5,654	3,903
AT107P	4,641	5,218
AT108C	7,373	6,579

Legend
- Simsboro Aquifer Test
- SLR Property
- Aquifer Outcrop
- Aquifer Subcrop
- Counties

0 10 20
Miles

Simsbro Aquifer

Pump Test Locations

INTERA

Preliminary Results

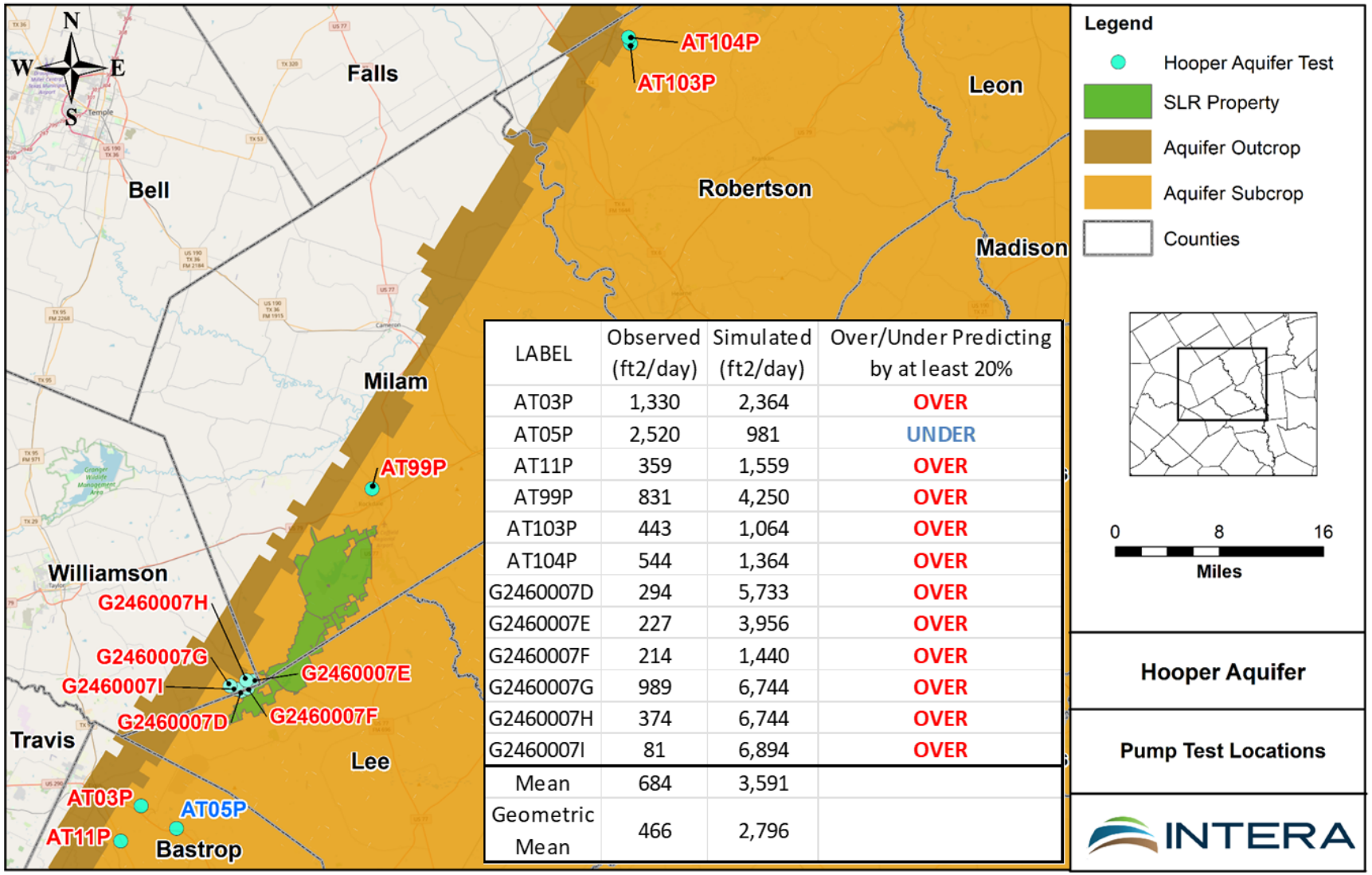
Comparison of Transmissivity Values from Aquifer Pumping Tests : Hooper

Red
GAM Transmissivity is Higher than Measured

Blue
GAM Transmissivity is Lower than Measured

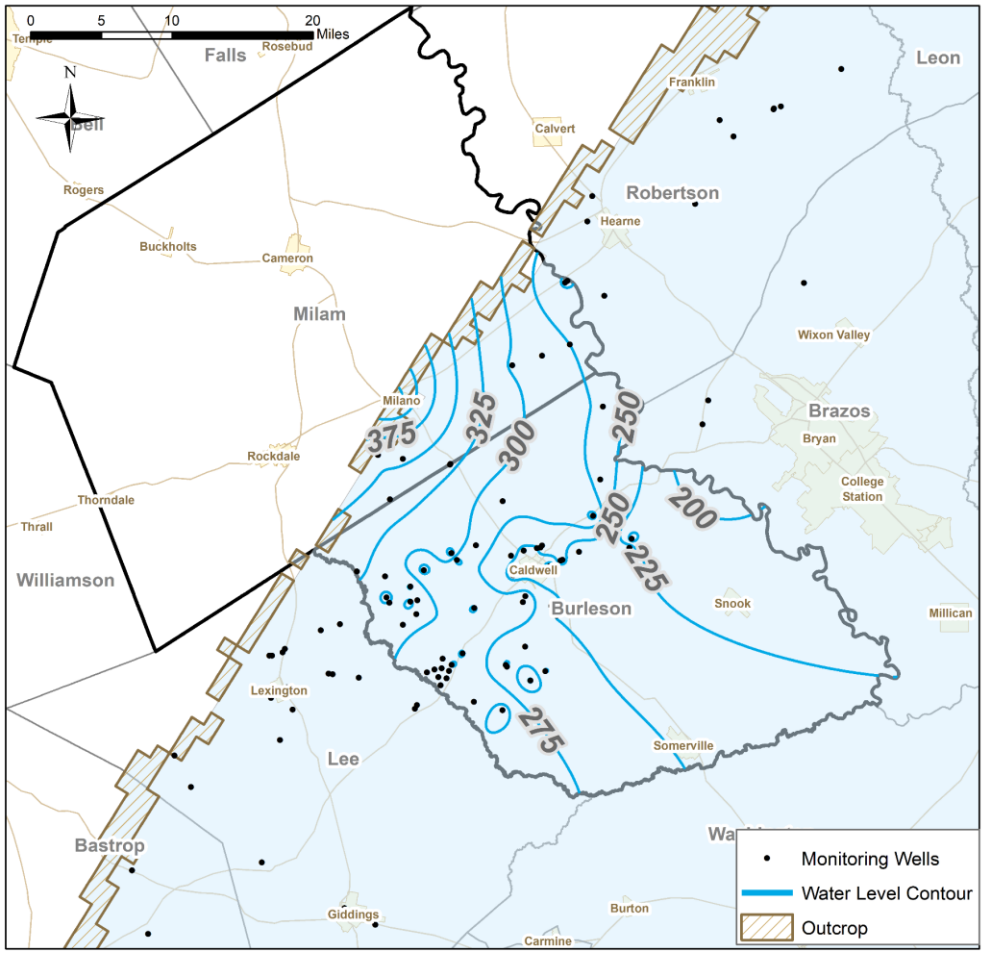
Black
GAM Transmissivity is within 25% of Measured

Preliminary Results



LABEL	Observed (ft2/day)	Simulated (ft2/day)	Over/Under Predicting by at least 20%
AT03P	1,330	2,364	OVER
AT05P	2,520	981	UNDER
AT11P	359	1,559	OVER
AT99P	831	4,250	OVER
AT103P	443	1,064	OVER
AT104P	544	1,364	OVER
G2460007D	294	5,733	OVER
G2460007E	227	3,956	OVER
G2460007F	214	1,440	OVER
G2460007G	989	6,744	OVER
G2460007H	374	6,744	OVER
G2460007I	81	6,894	OVER
Mean	684	3,591	
Geometric Mean	466	2,796	

Simulation of Vista Ridge: Initial Water Levels



Carrizo Water Levels: 2019
T2R Interpolation

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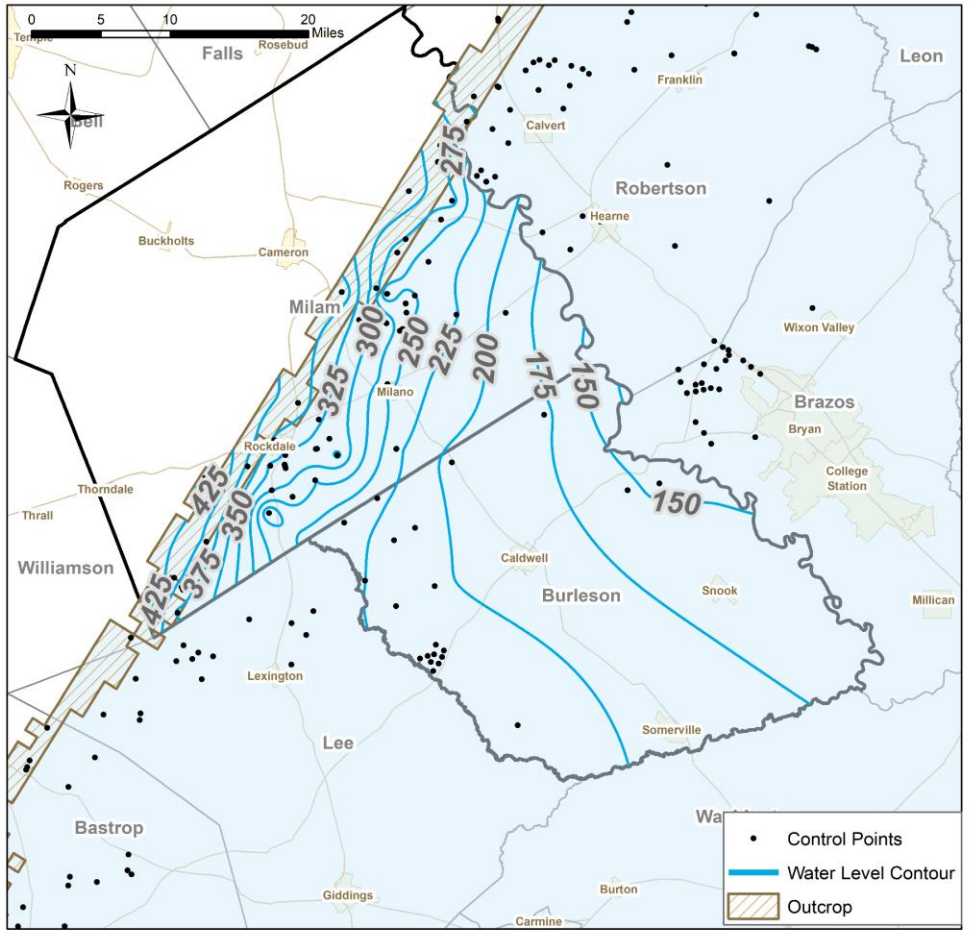

Simsboro Water Levels: 2019
T2R Interpolation

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Preliminary Results

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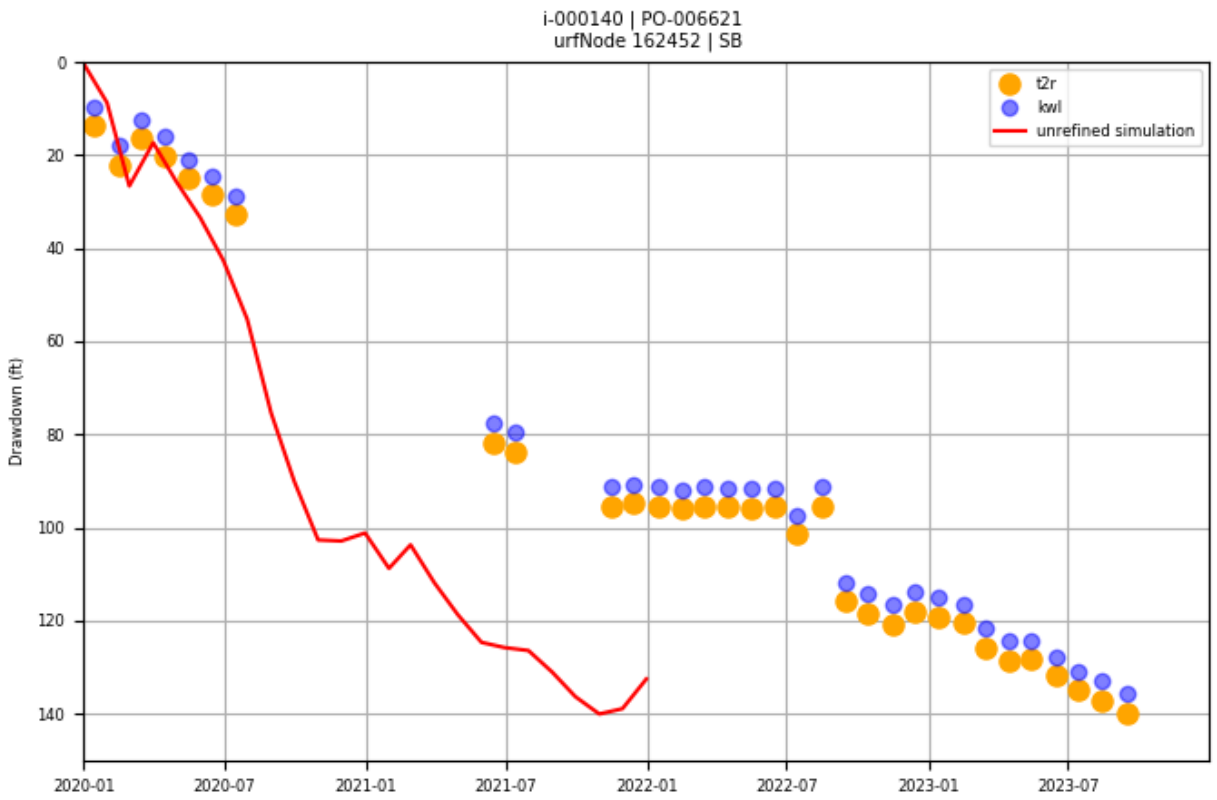
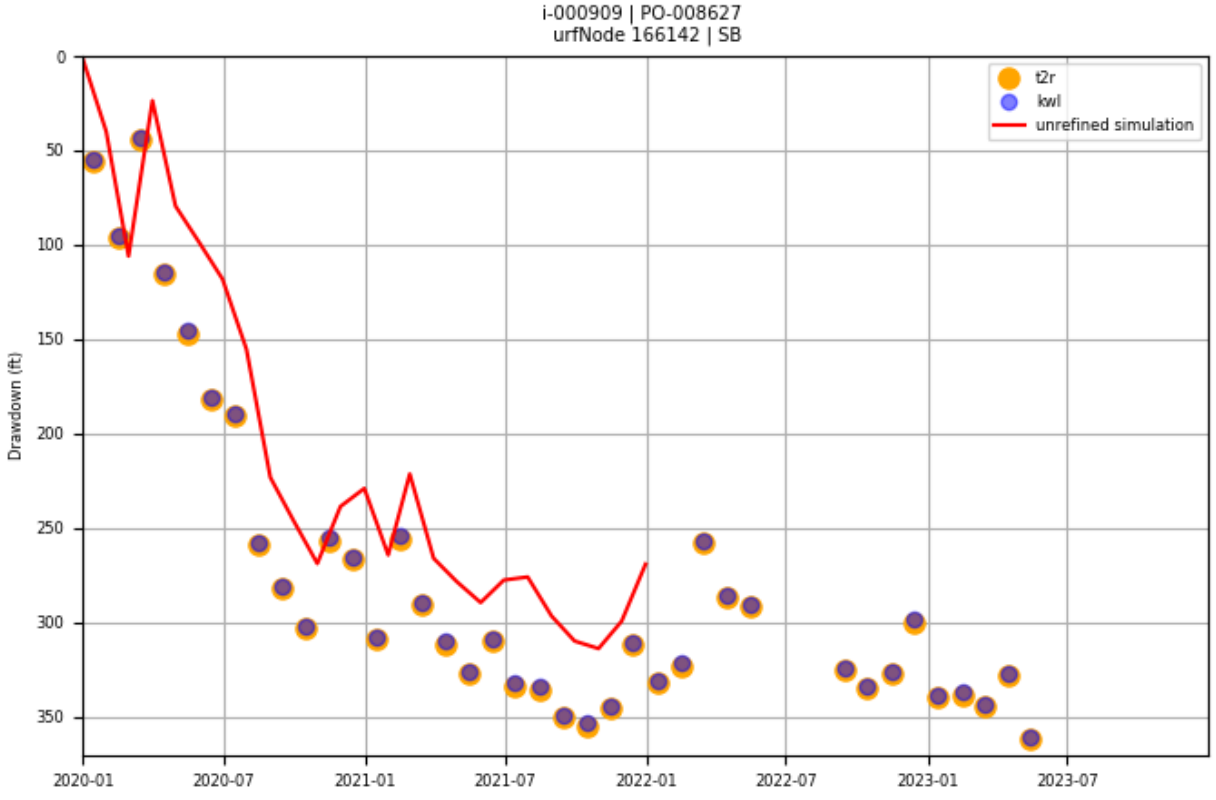
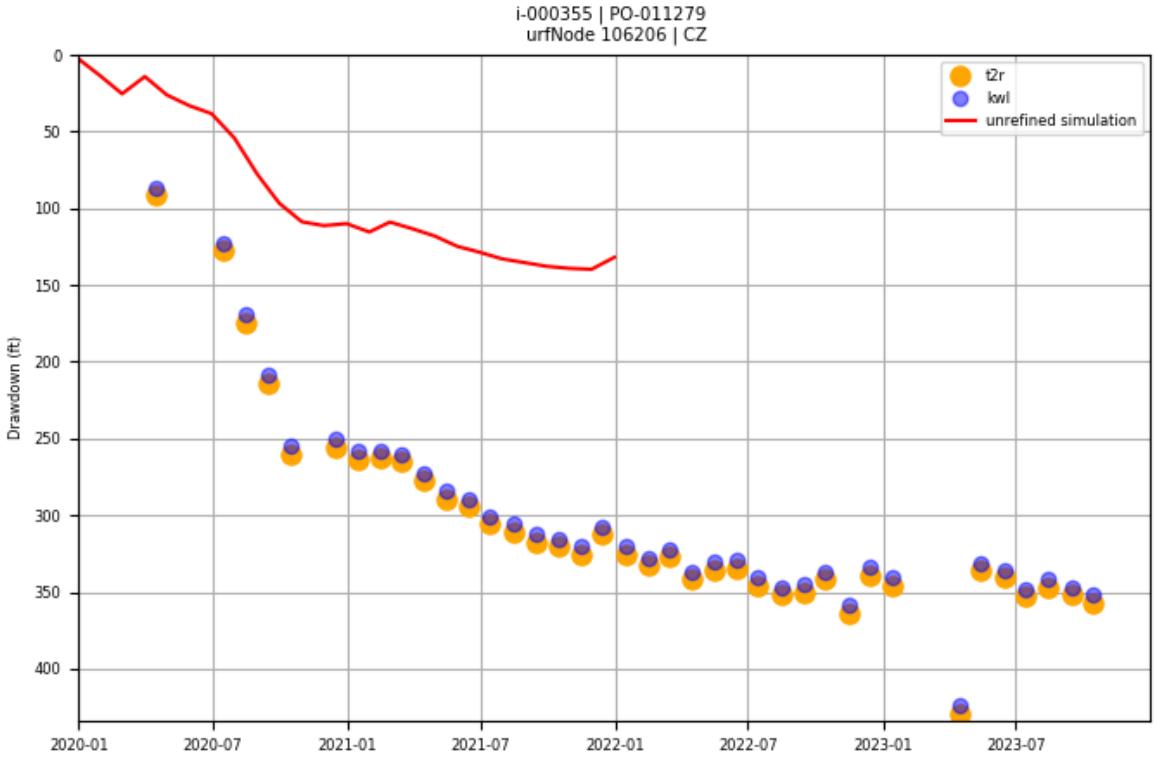
Simulation of Vista Ridge: Simsboro

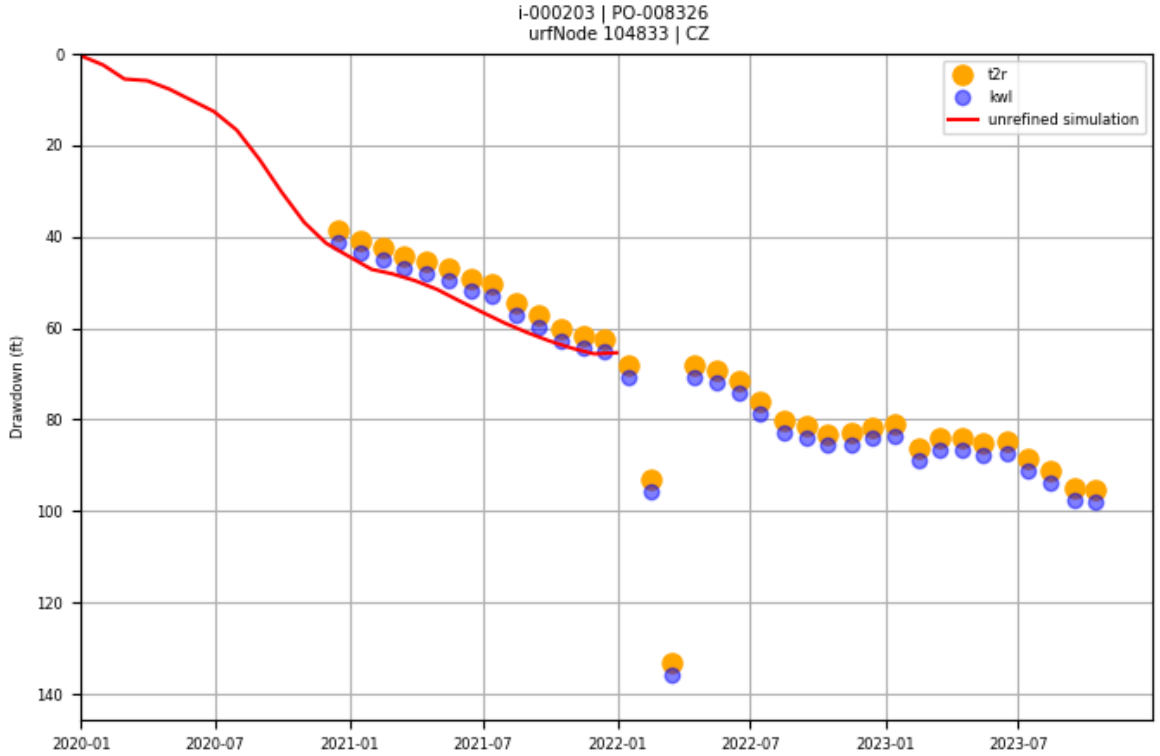




Preliminary Results

Simulation of Vista Ridge: Carrizo





Preliminary Results

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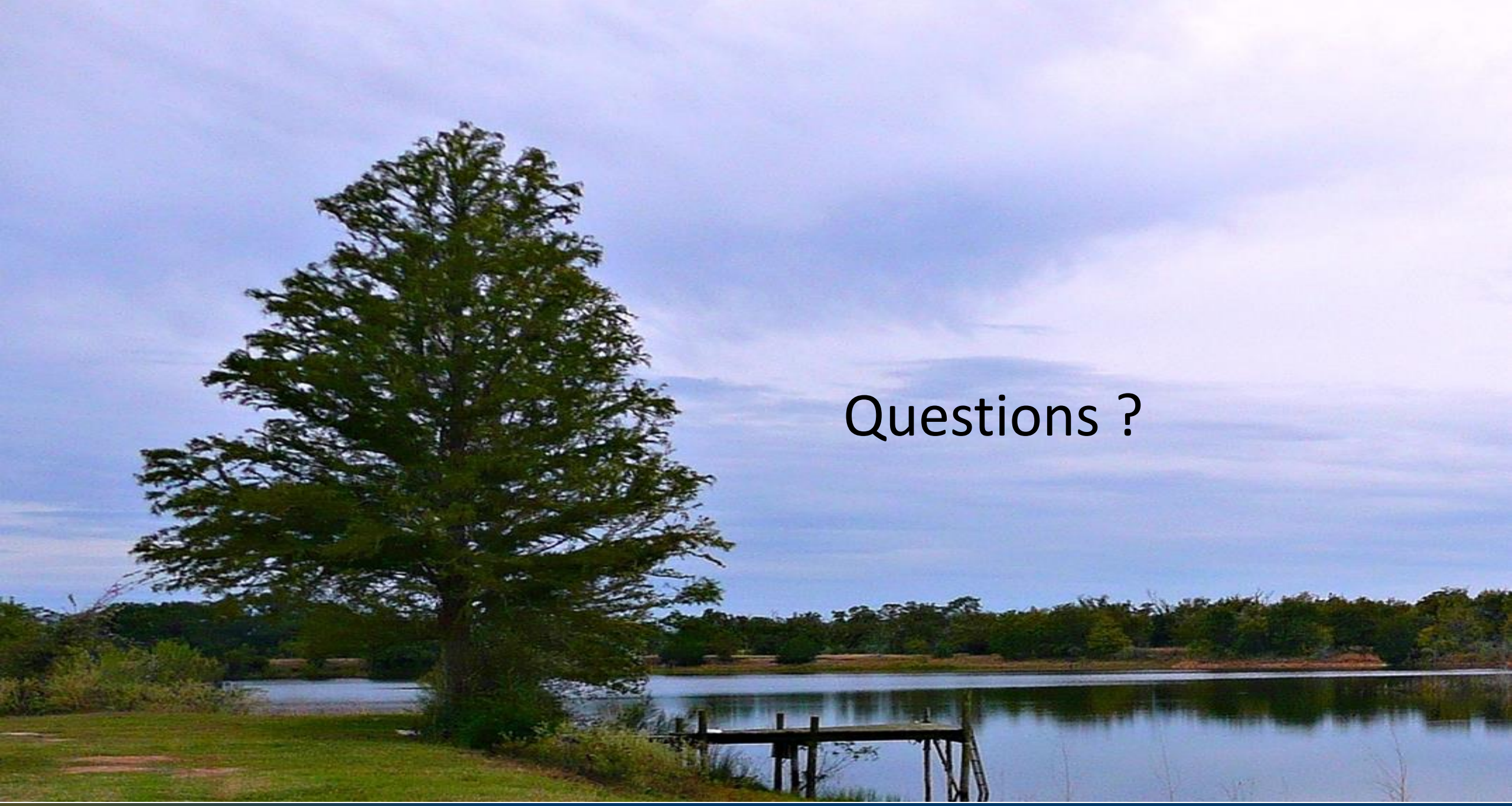
Questions ?