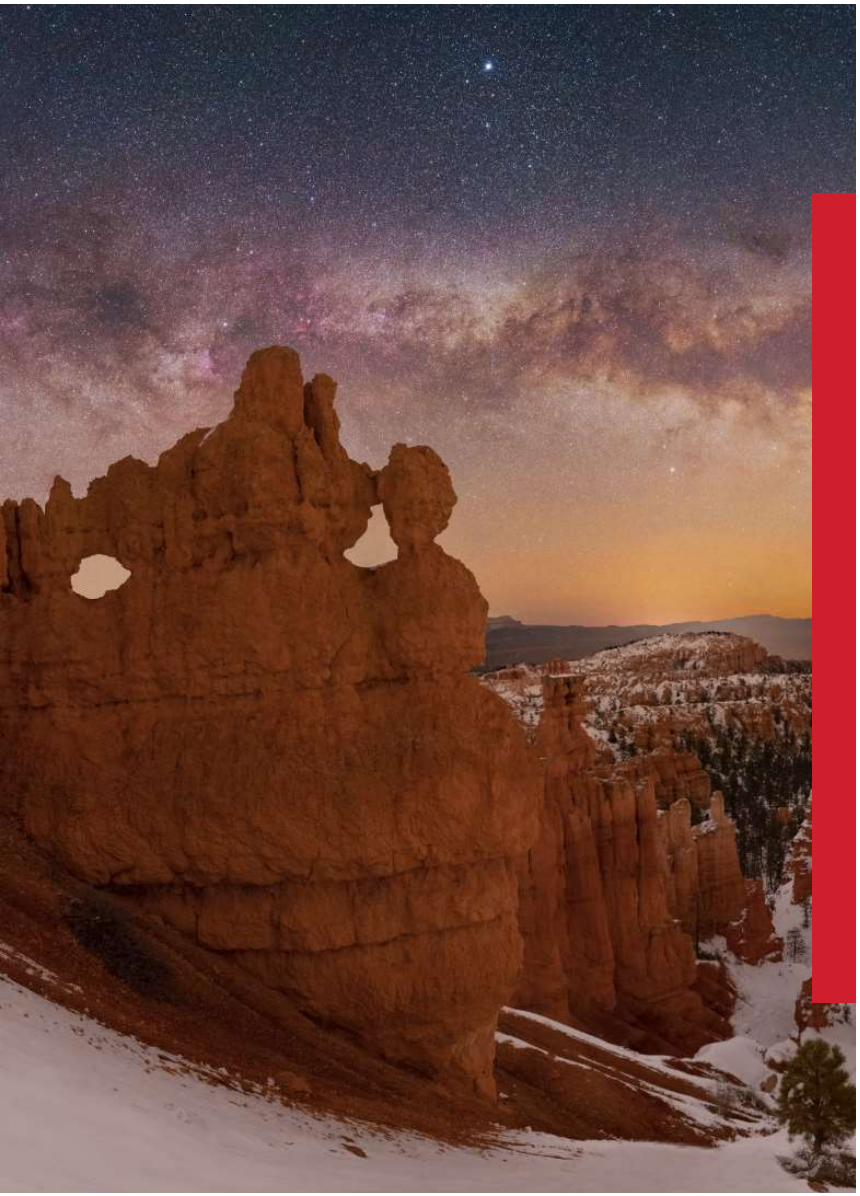

Uinta Basin CarbonSAFE II: An Overview

Ting Xiao
Research Assistant Professor
Energy & Geoscience Institute, University of Utah
August 30th, 2023
ting.xiao@utah.edu

Acknowledgement

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Our Project Team

PI & Co-PIs


Dr. Ting Xiao

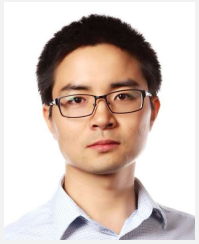

Dr. Brian McPherson


Mr. Michael Vanden Berg


Dr. Richard Middleton


Dr. Maohong Fan

Management Committee


Dr. Bailian Chen


Dr. Lianjie Huang


Dr. William Ampomah


Dr. Sai Wang


Ms. Candace Cady

Key Personnel


Dr. Rouzbeh Moghanloo


Dr. Nathan Moodie


Dr. Erin Middleton


Dr. Carlos Vega


Ms. Felixcia Blanchard

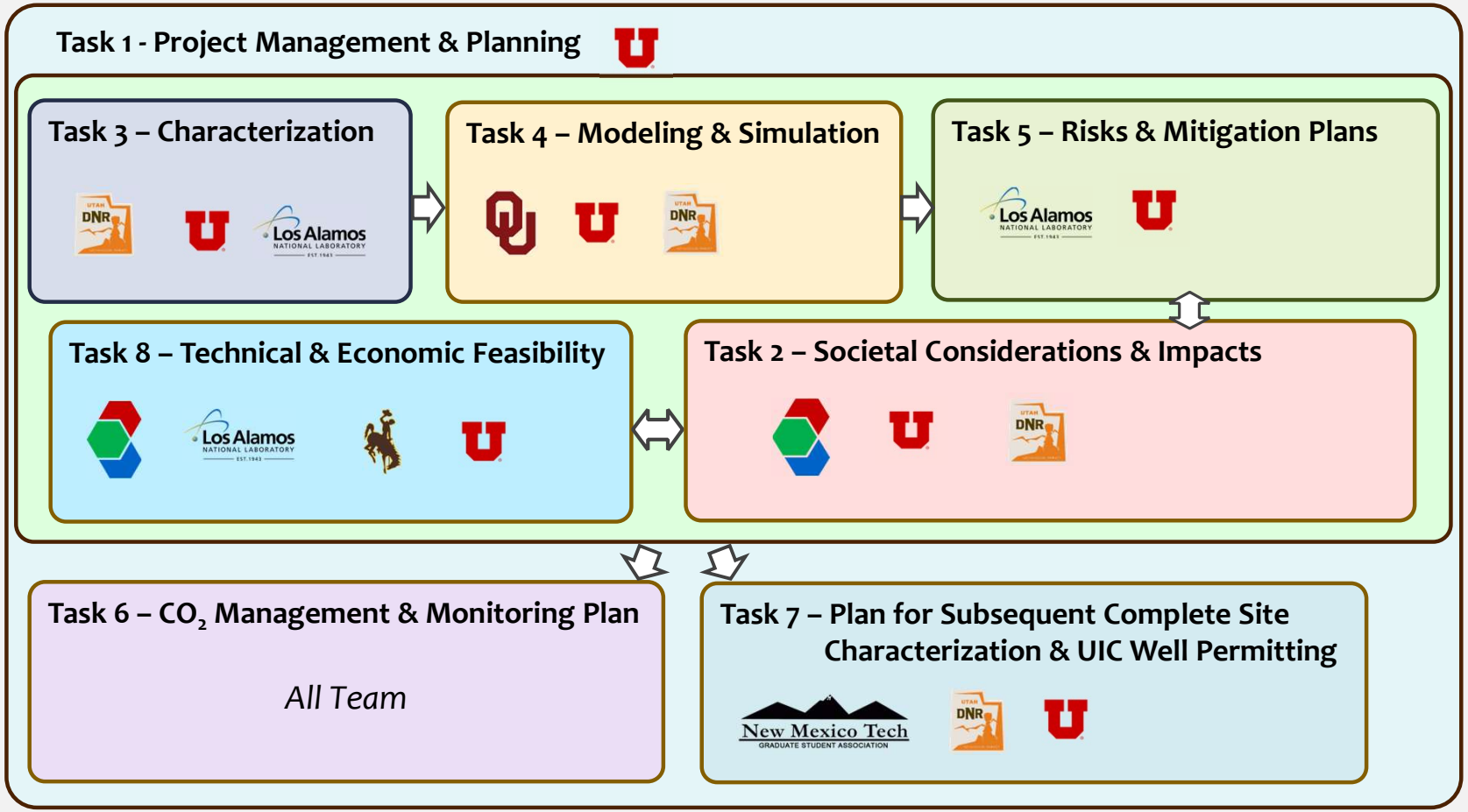

HOHN ENGINEERING, PLLC

Project Goals

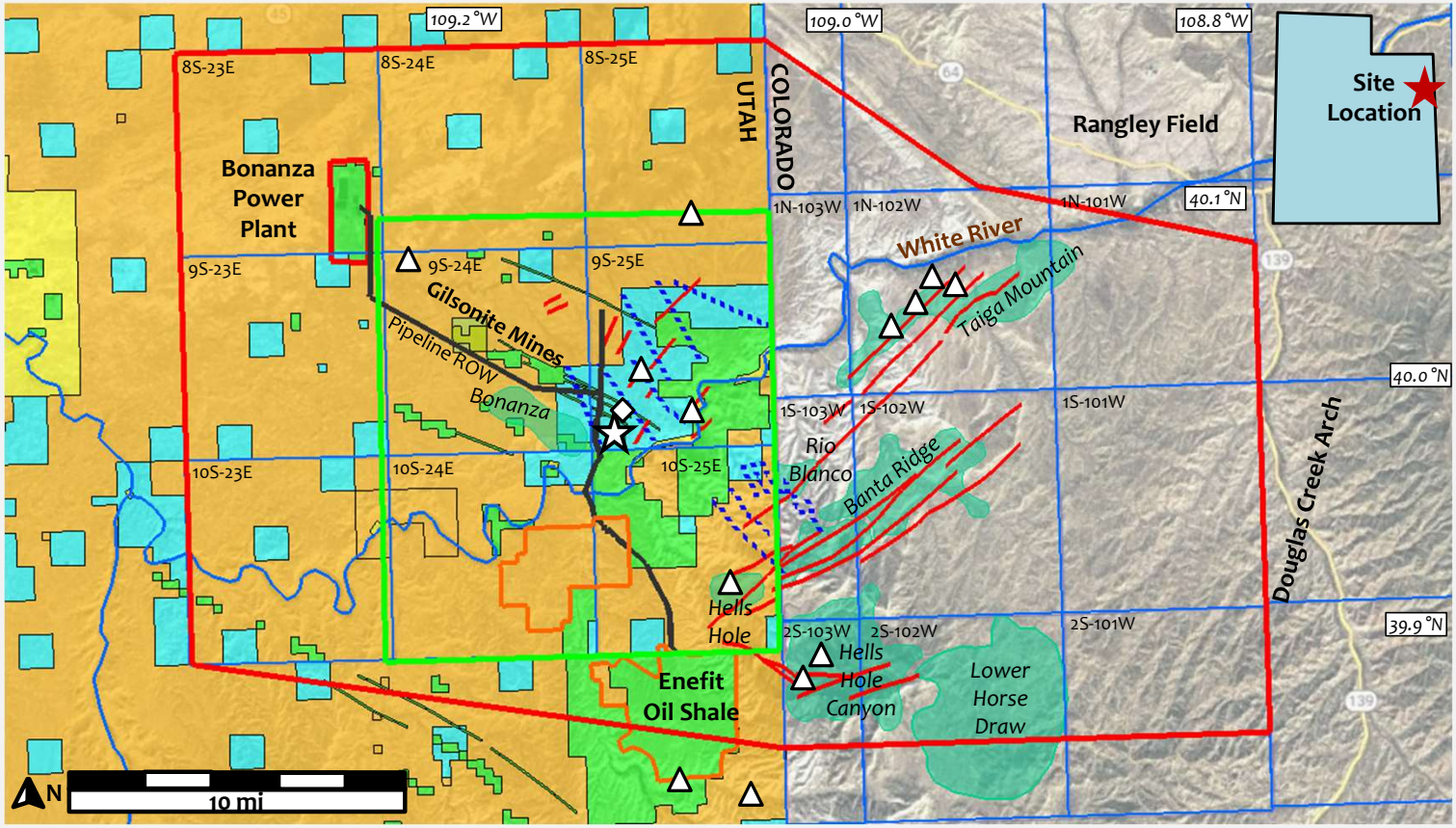
Uinta Basin CarbonSAFE II: Storage Complex Feasibility

To establish the technical and economic feasibility of a commercial-scale CO_2 geological storage complex in the northeast Uinta Basin, Utah, to securely and economically sequester 50 million metric tons of captured CO_2 in 30 years.

Tasks and Leadership



Research Site Overview



LEGEND

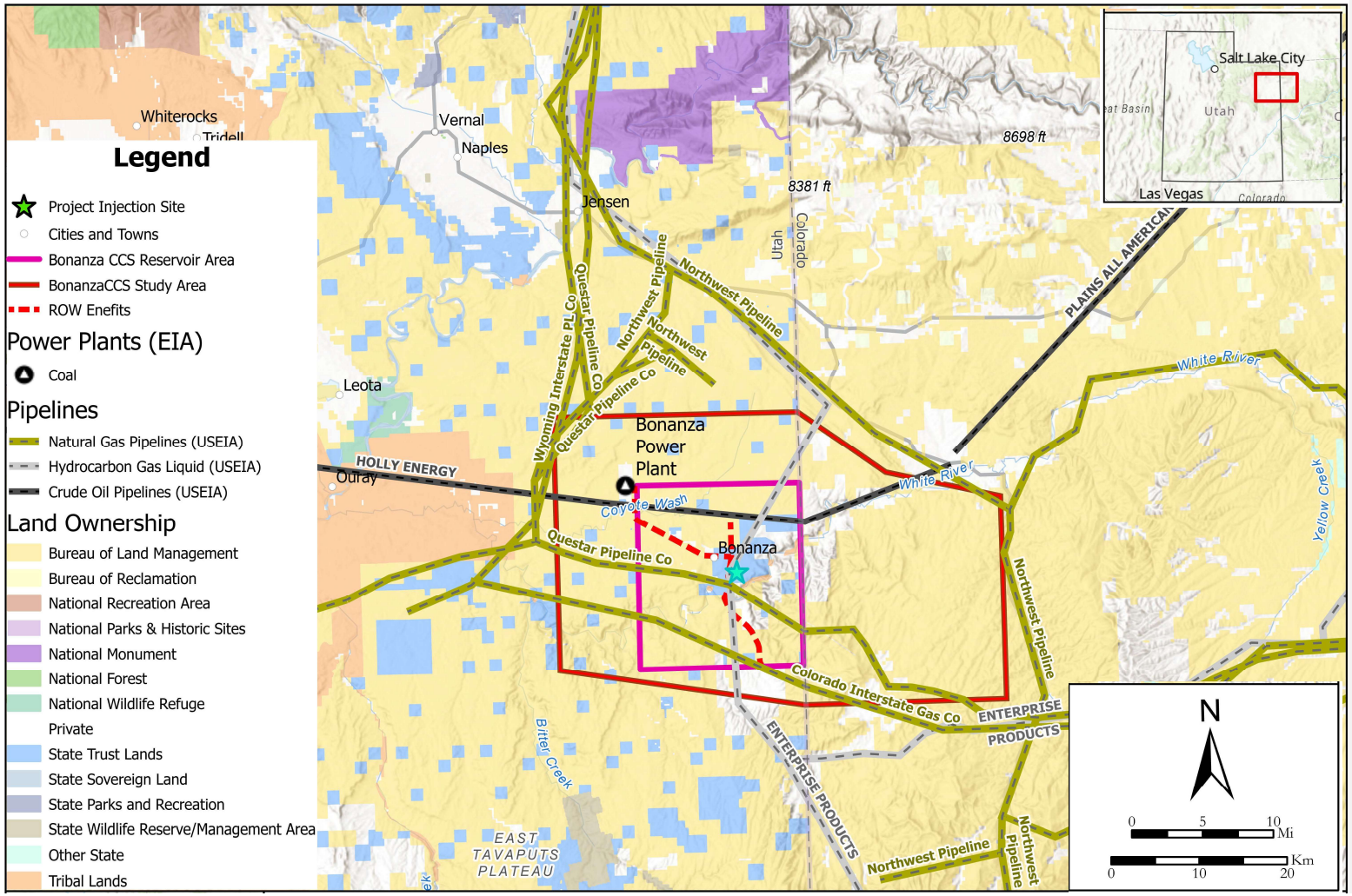
CarbonSAFE PHASE II Study
- Area of Study
- Proposed Injection Site
- CCS Storage Area
- Proposed Stratigraphic Well

Geological Features and Data
- Wells with Cores / Cuttings / Logs
- Faults
- Legacy 2D Seismic Lines

Oil and Gas Operations
- Oil and Gas Fields
- Enefit Oil Shale Mines
- Enefit Pipeline Right-Of-Way

Utah Land Ownership
- Tribal
- Private
- State (SITLA)
- Federal

Regional Overview



Utah Policy Support

- **Utah State House Bill 244 Geological Carbon Sequestration**
  - Pore Space Ownership
  - Permit Pathway for Commercial CCS Projects
  - Long-term Liability

- **Governor's Office of Energy Development**
  - Utah High-cost Infrastructure Tax Credit (HCITC) – promote investment in rural energy-related infrastructure projects

Public Engagement

Project Advisory Board

Mr. Craig Brown
General Manager,
American Gilsonite

Mr. Wesley Adams
Business Development Manager,
SITLA

Mr. John Baza
Director,
Utah Division of OGM

Mr. Travis Campbell
Director,
Uintah County Economic Development

Stakeholders and Organizations Engagement

Ute Tribe Business Council
2022, MOU

Utah Office of Energy Development
2022, Letter of Support

Enefit American Oil
2022, Letter of Support

Green Leaf Resources
2022, Letter of Support

KGH Operator
2022, Letter of Support

Hohn Engineering
2022, Letter of Support

Bayless Producer LLC
2022, Letter of Support

Deseret Power
2022, Letter of Support

Milestone Carbon
2022, Letter of Support

Ute Energy

Uintah County

Vernal City

Naples City

Utah State University Eastern

Uintah Basin Applied Technology College

UU Kem C. Gardner Policy Institute

UU Equity, Diversity & Inclusion Office

Utah Association of Energy Users

Utah Clean Energy

Utah Department of Environmental Quality

Utah Department of Public Utilities

Utah Division of Multicultural Affairs

Utah Office of Consumer Protection

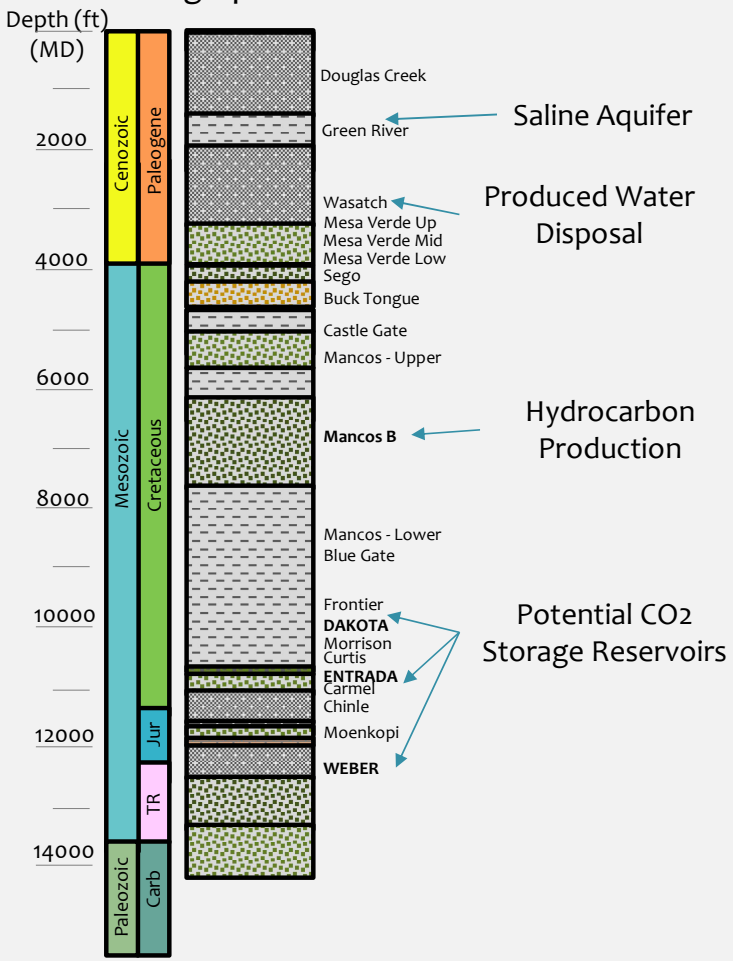
Utah Health Department

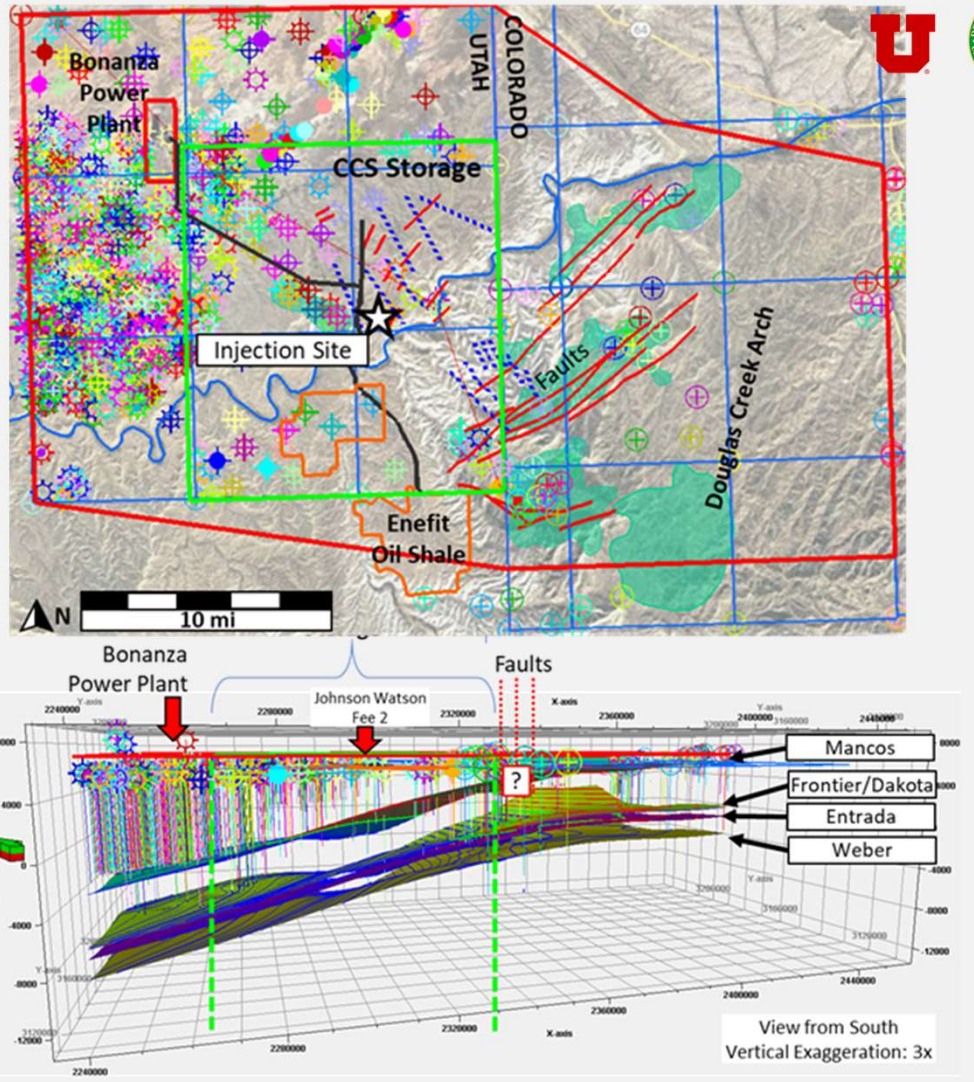
Utah Mining Association

Seven County Infrastructure Coalition

Regional Geology

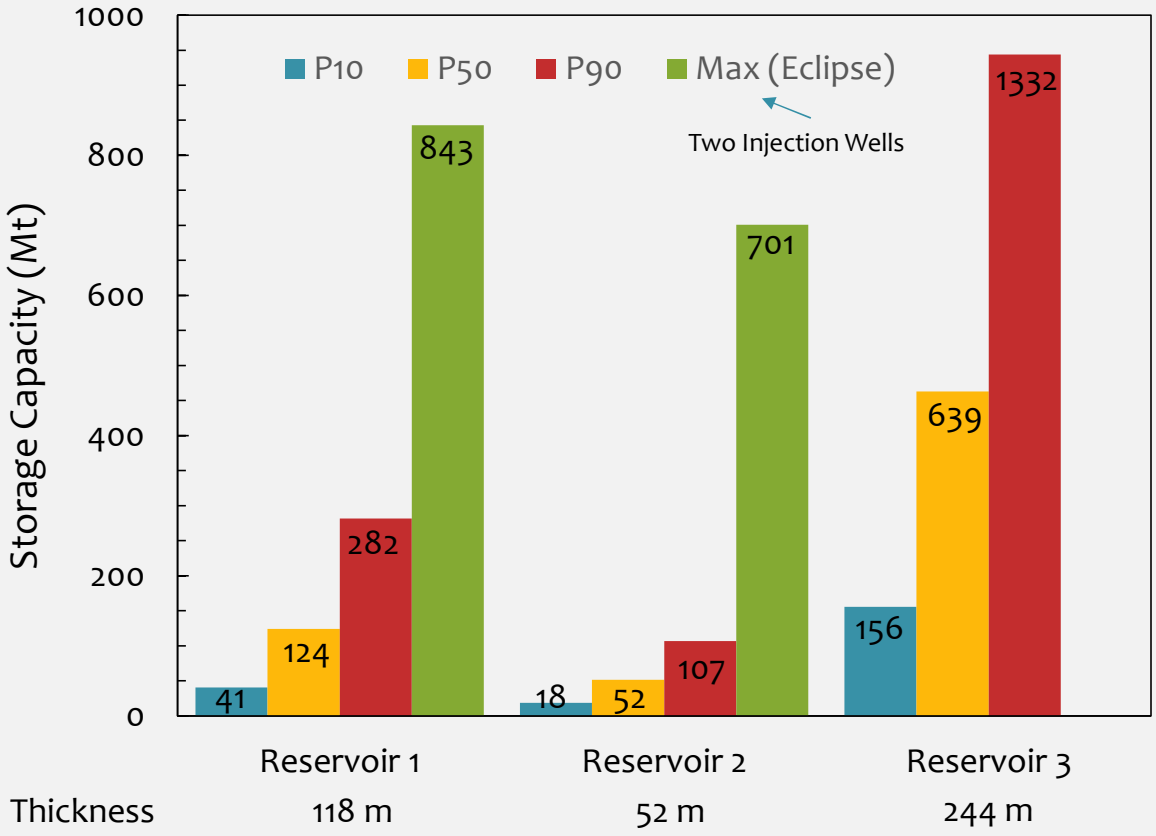
Stratigraphic Column

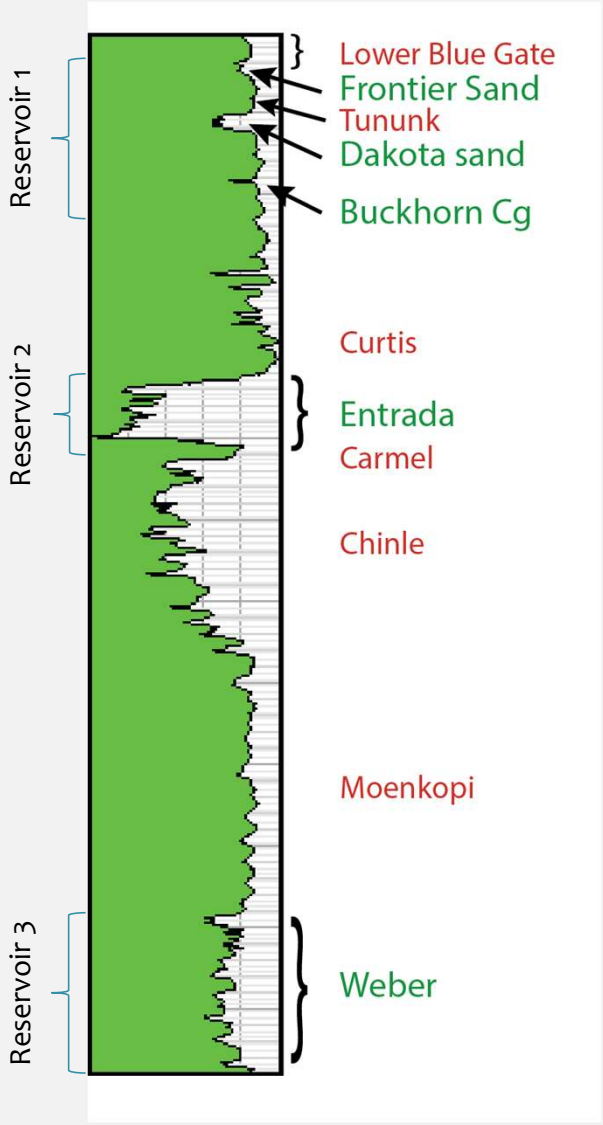




Prospective Storage Capacity

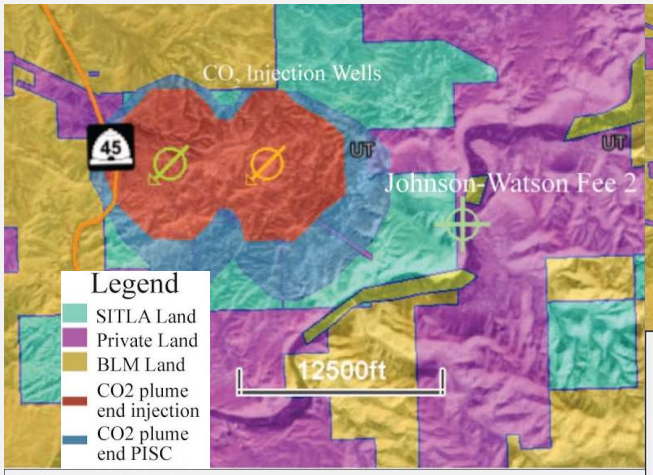
CO2-SCREEN Volumetric Calculation in 400 km²

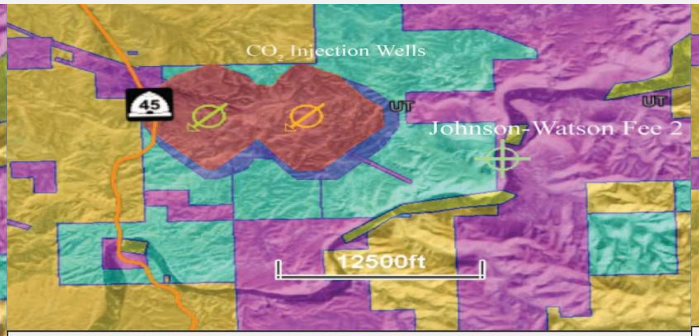


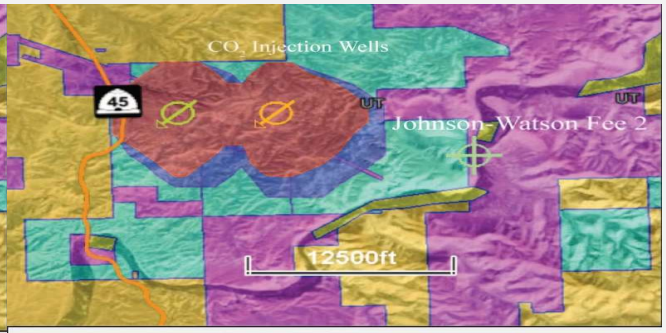


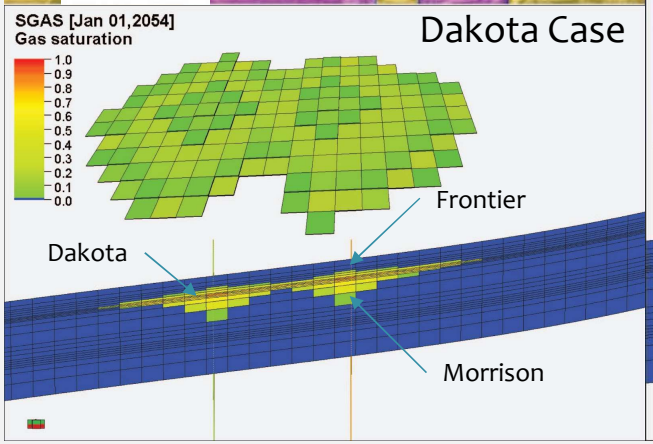
Numerical Simulations

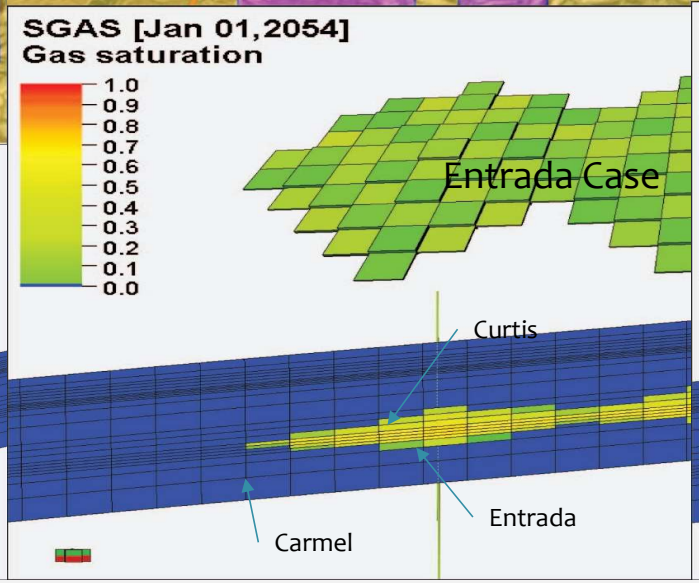
Total Simulation Time: 80 years (30 years injection of 50 Mt CO_2 + 50 years PISC)

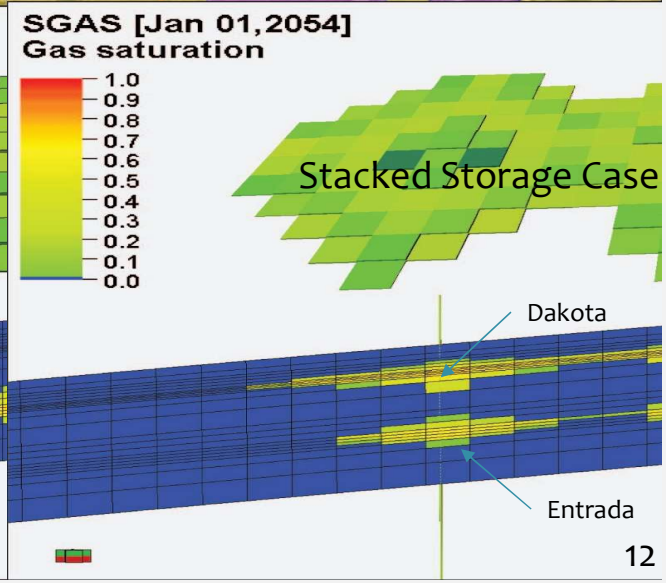








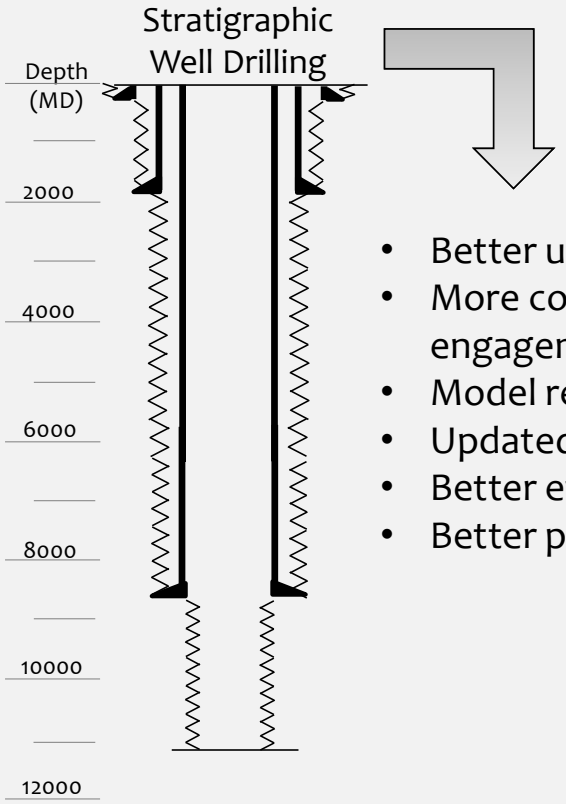




Summary

- ✓ CO_2 Source(s)
- ✓ Geology
- ✓ Environment
- ✓ Policy and Legislation
- ✓ Stakeholder and Public Support

What Is Next:



- Better understanding of geology
- More collaborations and engagements with stakeholders
- Model refinement
- Updated simulation results
- Better evaluation of feasibility
- Better planning

t.xiao@egi.Utah.edu | egi.utah.edu

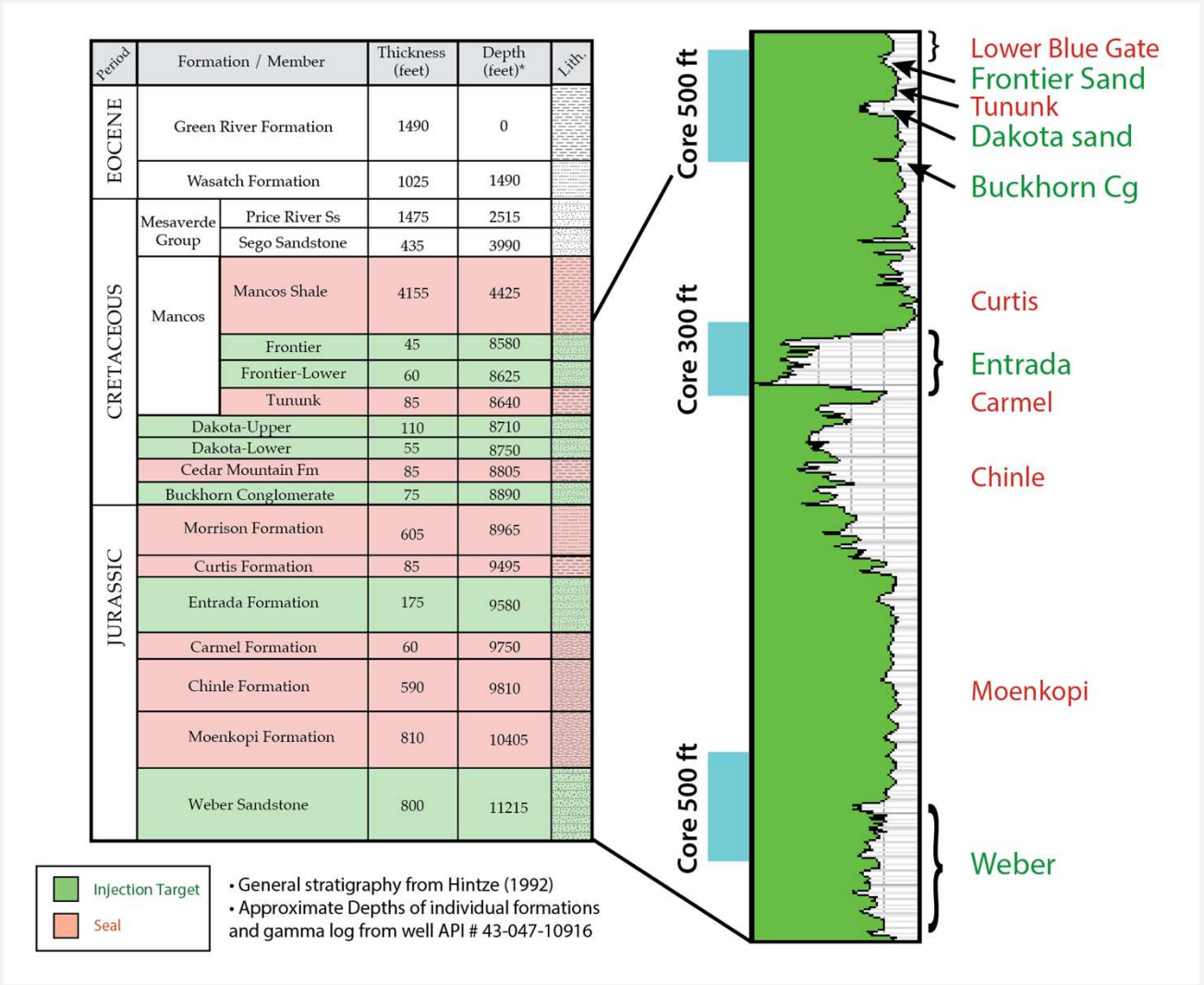
Prospective Storage Capacity

CO2-SCREEN Volumetric Calculation in 400 km²

Formation Type	Formation Name	Thickness	Poro	Storage Resource		
		[m]	[%]	P_{10} [Mt]	P_{50} [Mt]	P_{90} [Mt]
Seal	MANCOS	1267	3.0			
Reservoir A	FRONTIER	16	14.0	8.3	25.2	57.7
	Tununk / Juana Lopez MS	24	8.0	0.6	2.1	5.8
	DAKOTA-Upper	12	22.5	0.8	2.9	8.3
	DAKOTA-Lower	16	19.0	12.4	38.5	88.9
	CEDAR MOUNTAIN	26	7.0	0.6	1.9	5.3
	Buckhorn Cg	24	17.0	18.0	53.8	115.7
	SUBTOTAL			**40.7**	**124.2**	**281.7**
Seal	MORRISON	161	10.0			
	CURTIS	26	9.0			
Reservoir B	ENTRADA	52	18.0	**18.4**	**51.6**	**106.9**
Seal	CARMEL	19	6.0			
	CHINLE	181	4.0			
	MOENKOPI / PARK CITY	246	6.0			
Reservoir C	WEBER	244	16.5	**155.6**	**463.0**	**943.7**
Basement	MORGAN	378	4.0			
	MISSISSIPPIAN	600	2.0			
TOTAL				**214.6**	**638.8**	**1332.3**

Max **843 Mt** (Eclipse)

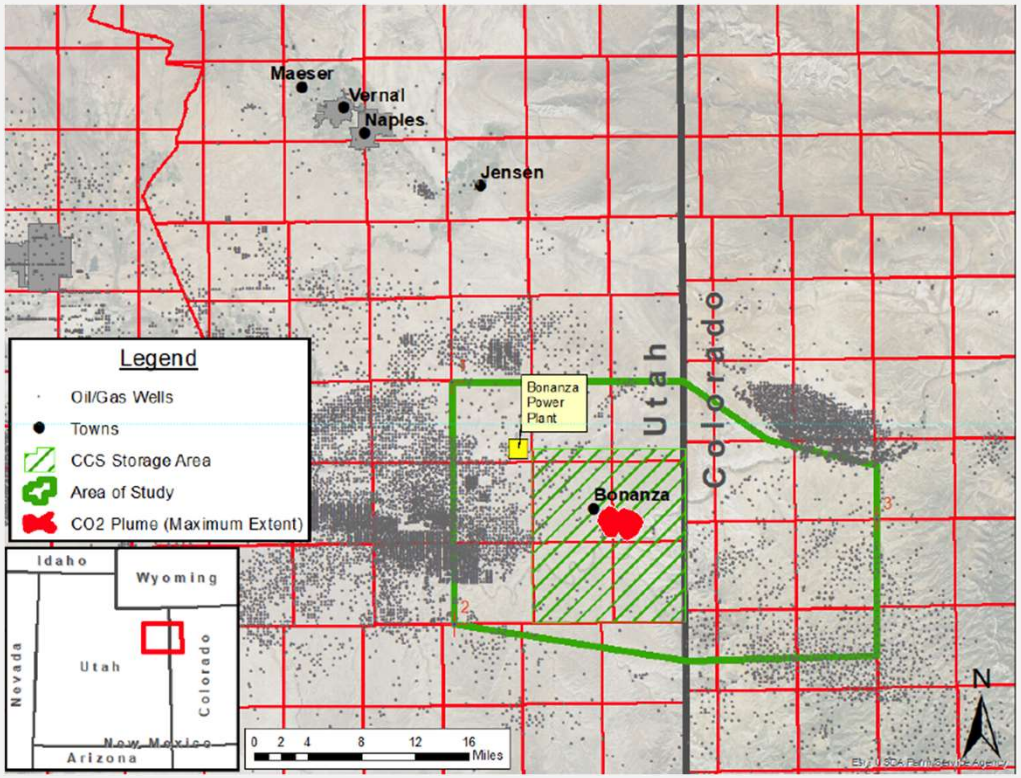
Max **701 Mt** (Eclipse)

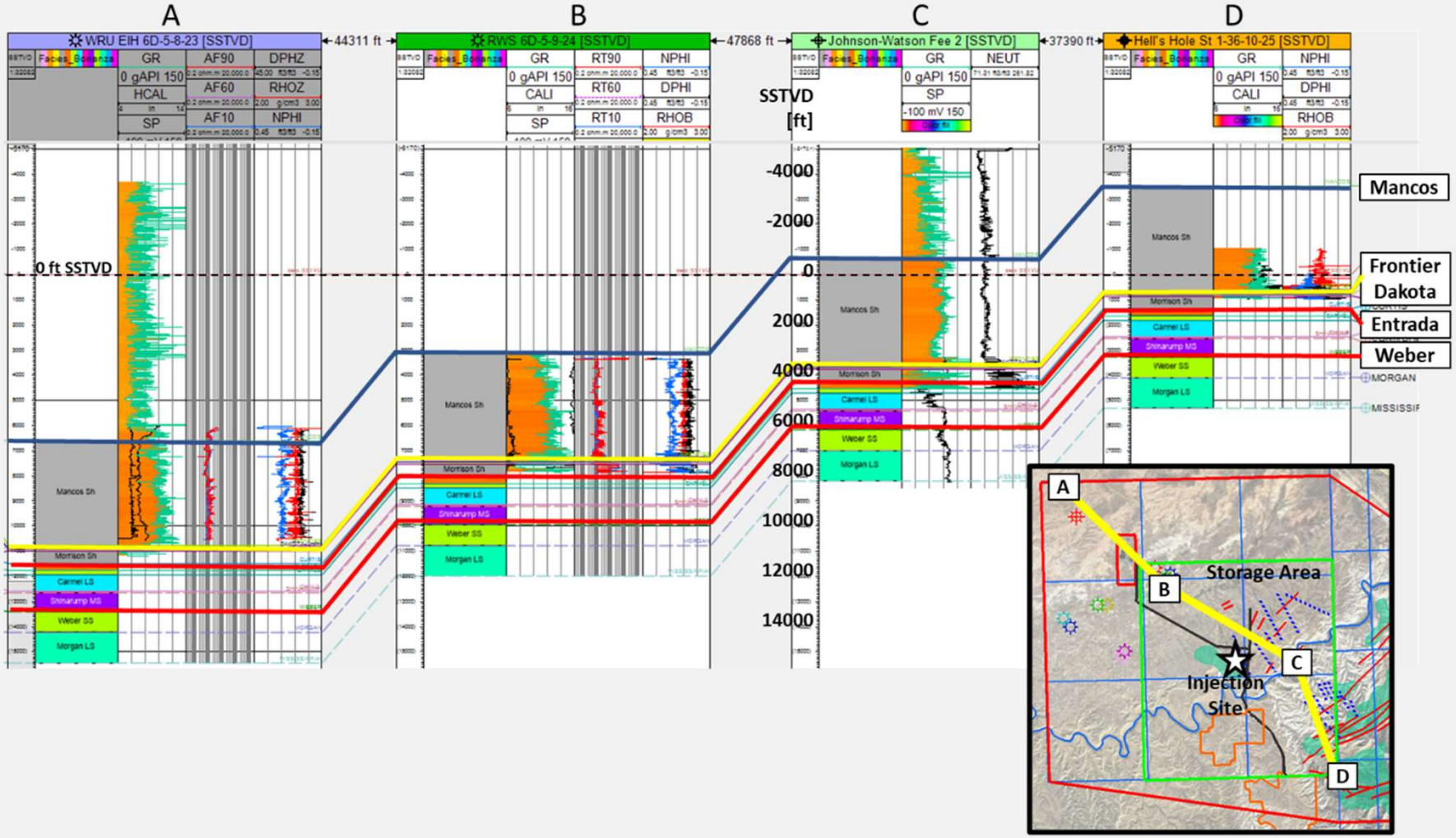

Period
Formation / Member
Thickness (feet)
Depth (feet)*
Lith.
EOCENE
Green River Formation 1490 0
Wasatch Formation 1025 1490
CRETACEOUS
Mesaverde Group
Price River Ss 1475 2515
Sego Sandstone 435 3990
Mancos
Mancos Shale 4155 4425
Frontier 45 8580
Frontier-Lower 60 8625
Tununk 85 8640
Dakota-Upper 110 8710
Dakota-Lower 55 8750
Cedar Mountain Fm 85 8805
Buckhorn Conglomerate 75 8890
JURASSIC
Morrison Formation 605 8965
Curtis Formation 85 9495
Entrada Formation 175 9580
Carmel Formation 60 9750
Chinle Formation 590 9810
Moenkopi Formation 810 10405
Weber Sandstone 800 11215
Core 500 ft
Core 300 ft
Core 500 ft
Lower Blue Gate
Frontier Sand
Tununk
Dakota sand
Buckhorn Cg
Curtis
Entrada
Carmel
Chinle
Moenkopi
Weber
Injection Target
Seal
• General stratigraphy from Hintze (1992)
• Approximate Depths of individual formations and gamma log from well API # 43-047-10916

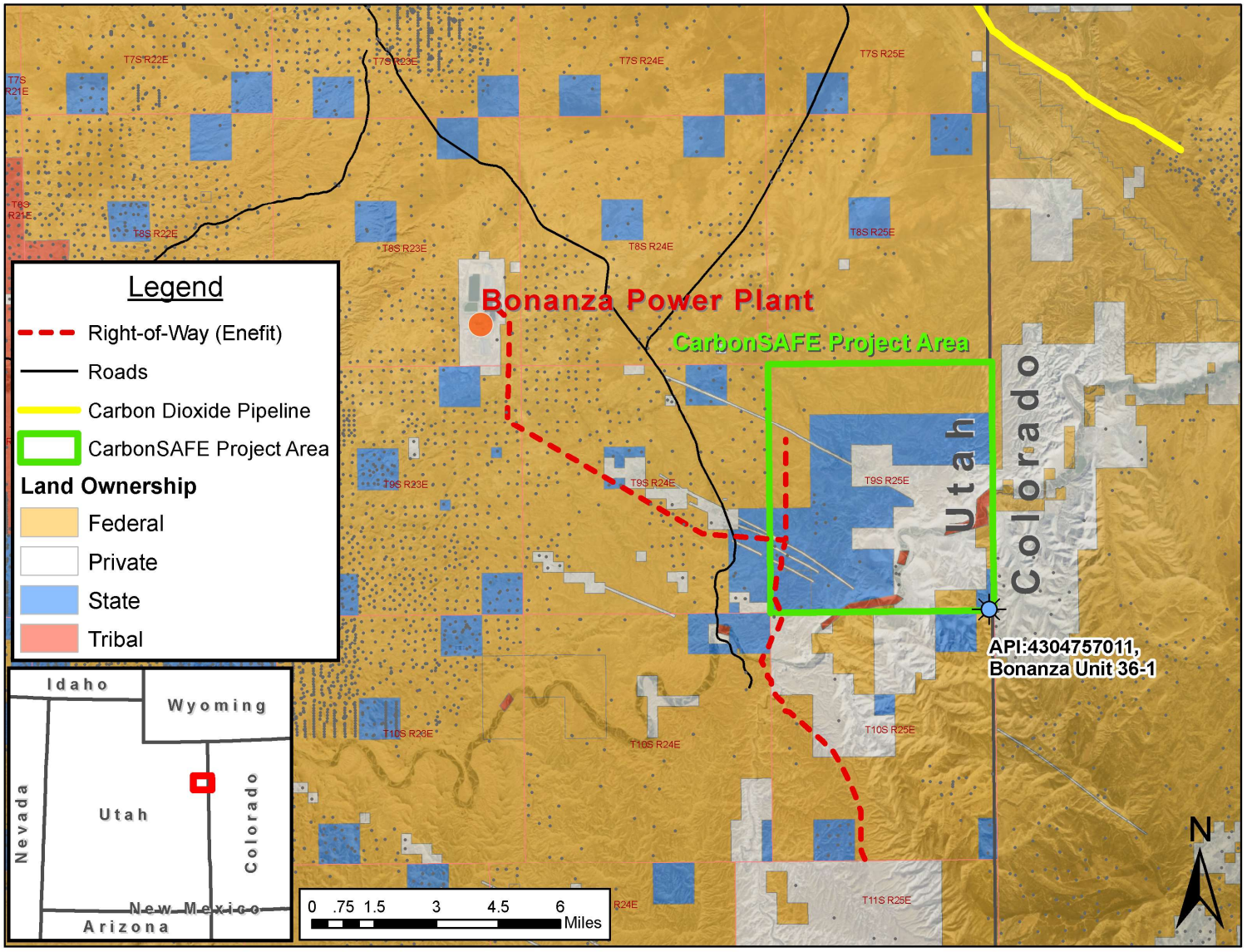
Stratigraphic sequence with depth and thickness at the Johnson Watson-2

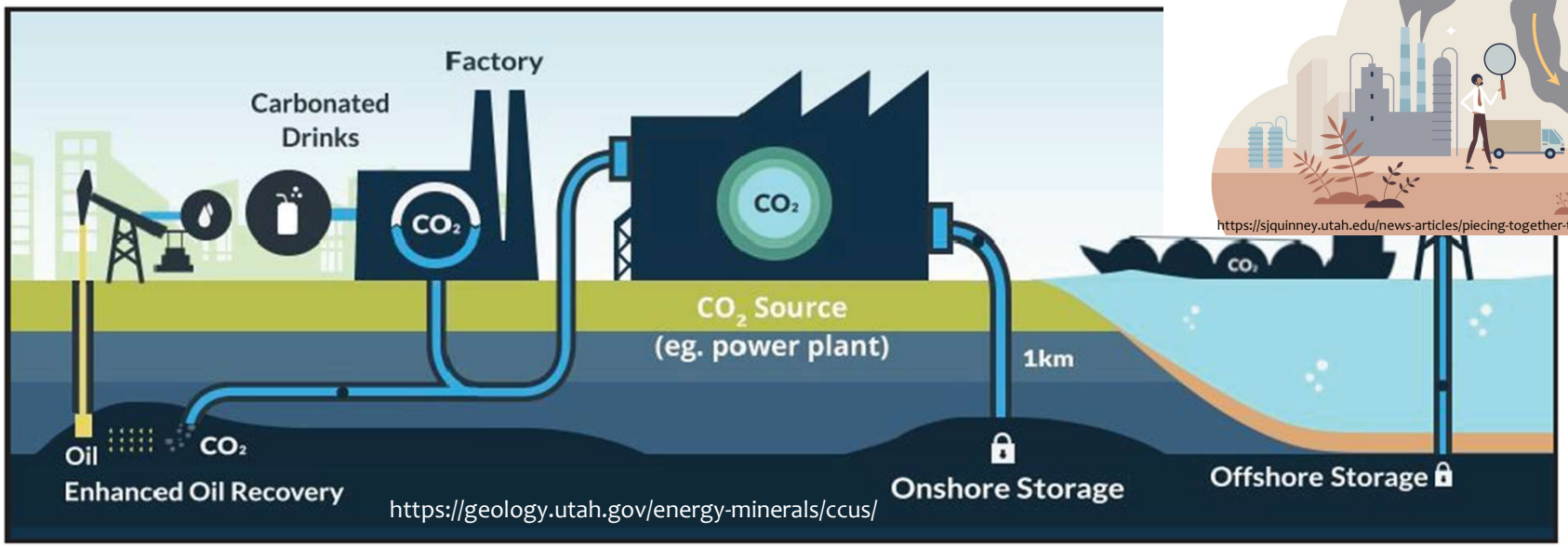
Reservoir	Formation Tops	Depth [ft]	Thickness [ft]
Oil and Gas	GREEN RIVER	0	1130
Oil and Gas	WASATCH	1130	1100
Oil and Gas	MESA VERDE	2230	2193
Seal	MANCOS	4423	4156
Primary CCS Reservoir	FRONTIER	8579	49
	FRONTIER - LOWER	8628	13
	Tununk (Juana Lopez) MS	8641	71
	DAKOTA-Upper	8712	40
	DAKOTA-Lower	8752	52
	CEDAR MOUNTAIN	8804	84
	Buckhorn Cg	8888	79
Seal	MORRISON	8967	527
	CURTIS	9494	84
CCS Reservoir	ENTRADA	9578	172
Seal	CARMEL	9750	62
	CHINLE	9812	593
	MOENKOPI/ PARK CITY	10405	808
CCS Reservoir	WEBER	11213	800
Seal	MORGAN	12013	1240
	MISSISSIPPIAN	13253	

Preliminary Regional Analysis




A
B
C
D
WRU EIH 6D-5-8-23 [SSTVD]
RWS 6D-5-9-24 [SSTVD]
Johnson-Watson Fee 2 [SSTVD]
Hell's Hole St 1-36-10-25 [SSTVD]
44311 ft
47868 ft
37390 ft
SSTVD [ft]
0 ft SSTVD
-4000
-2000
0
2000
4000
6000
8000
10000
12000
14000
Mancos
Frontier
Dakota
Entrada
Weber
MORGAN
MISSISSIF
Mancos Sh
Morrison Sh
Carmel LS
Shinarump MS
Weber SS
Morgan LS
Storage Area
Injection Site


Legend
Right-of-Way (Enefit)
Roads
Carbon Dioxide Pipeline
CarbonSAFE Project Area
Land Ownership
Federal
Private
State
Tribal
Bonanza Power Plant
CarbonSAFE Project Area
Utah
Colorado
API:4304757011,
Bonanza Unit 36-1
T7S R22E
T7S R23E
T7S R24E
T7S R25E
T8S R22E
T8S R23E
T8S R24E
T8S R25E
T9S R23E
T9S R24E
T9S R25E
T10S R23E
T10S R24E
T10S R25E
T11S R25E
Idaho
Wyoming
Nevada
Utah
Colorado
New Mexico
Arizona
0 .75 1.5 3 4.5 6
Miles
N



https://geology.utah.gov/energy-minerals/ccus/

https://sjquinney.utah.edu/news-articles/piecing-together-the-fragmented-legal-doctrines-governing-pore-space/