Southeast Offshore Storage Resource Assessment (SOSRA)
Project Number: DE-FE0026086

Patricia Berry| Southern States Energy Board
Ellen Gilliland | Virginia Polytechnic Institute and State University
James Knapp, Ph.D. | University of South Carolina
Jack Pashin, Ph.D. | Oklahoma State University

This material is based upon work supported by the U.S. Department of Energy National Energy Technology Laboratory. Cost share and research support are provided by the Project Partners and an Advisory Committee.

U.S. Department of Energy | National Energy Technology Laboratory
DE-FOA0001246 Annual Review
August 17, 2016

Decision Making & Communications

U.S. Department of Energy (DOE)
National Energy Technology Laboratory (NETL)
Project Officer:
Mary A. Sullivan

Overall Project Management

Southern States Energy Board (SSEB)
Lead PI: Kenneth Nemeth
Co-PI/Contact PI/Project Coordinator: Kimberly Sams Gray
Key Team Member: Patricia Berry

Financial Management
Key Team Members:
Kathy Sammons
Leigh Parson

Technical Program Advisor
Gerald R. Hill, Ph.D., Inc. (Hill)
Lead PI:/Advisor:
Gerald R. Hill, Ph.D.

Planning Area Managers

Mid-Atlantic Planning Area
Virginia Polytechnic Institute and Sate University (VT)
Virginia Center for Coal and Energy Resources (VCCER)
Lead PI:
Nino Ripepi, Ph.D.
Advisor:
Michael Karmis, Ph.D.
Co-PI:
Ellen Gilliland

South Atlantic Planning Area
University of South Carolina (USC)
Lead PI:
James Knapp, Ph.D.
Co-PIs:
Camelia Knapp, Ph.D.
Venkat Lakshmi, Ph.D.
Duke Brantley, Ph.D.

Eastern Gulf of Mexico Planning Area
Oklahoma State University (OSU)
Lead PI:
Jack Pashin, Ph.D.

Planning Area Partners

Virginia Department of Mines, Minerals and Energy (VA DMME)
Lead PI:
William Lassetter

South Carolina Geological Survey (SCGS)
Lead PI:
Scott Howard

Geological Survey of Alabama (GSA)
Lead PI:
Denise Hills
Key Team Members:
Guohai Jin, Ph.D.
Marcella McIntyre-Redden

Advanced Resources International, Inc. (ARI)
Lead PI:
David Riestenberg

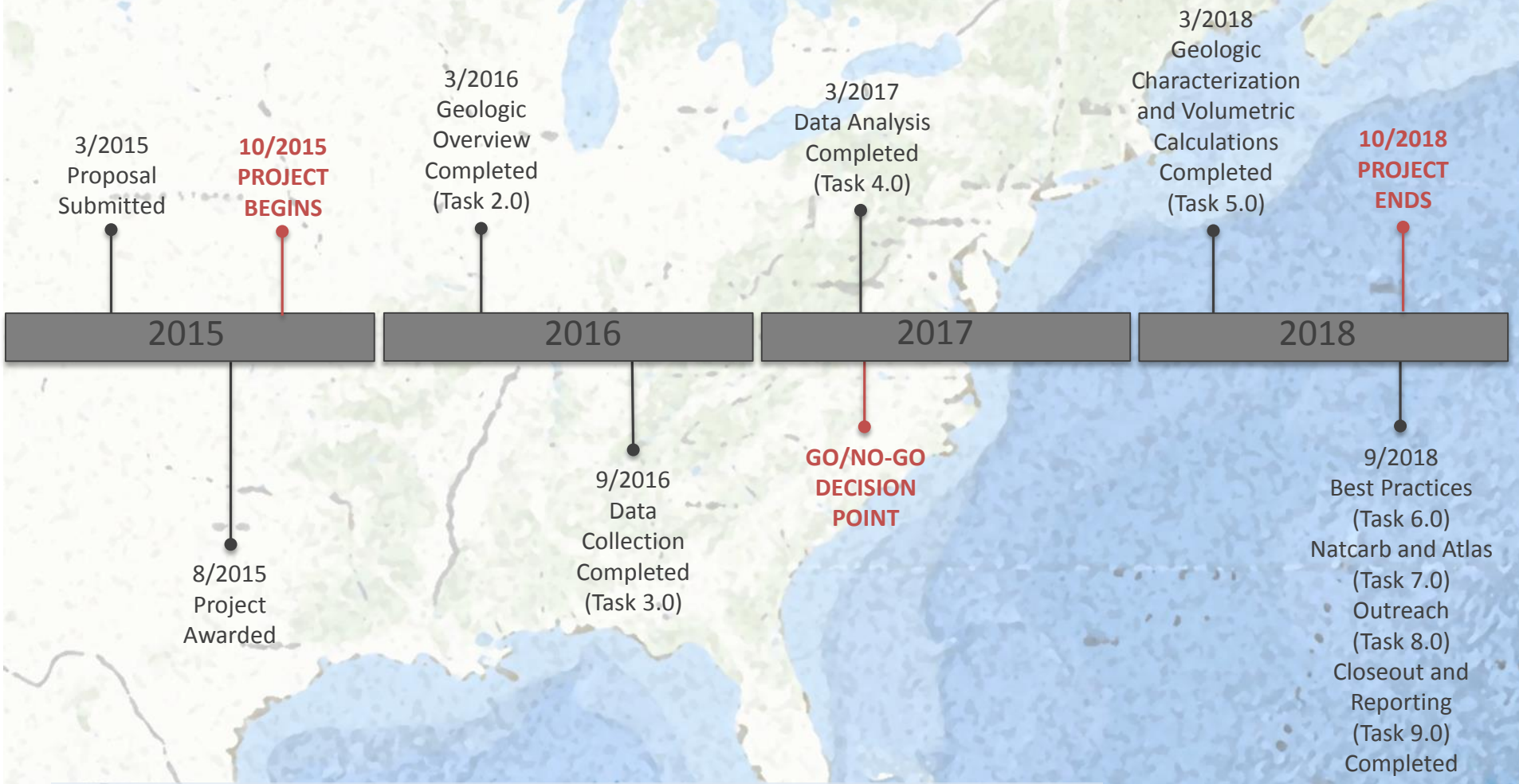
Advisory Committee: state geological surveys, universities, state oil and gas boards, oil and gas companies, and utilities (no contract, no decision making authority)

SCHEDULE

PHASE I/BUDGET PERIOD 1 | 10/01/2015 to 3/31/2017

GO/NO-GO DECISION POINT: *The data collected and analyzed in Phase I is sufficient to perform a quality prospective storage resource assessment and the project should proceed to Phase II.*

PHASE II/BUDGET PERIOD 2 | 4/01/2017 to 9/30/2018



Note: Task 1.0, Project Management and Planning, extends throughout the entire program period.

Presentation Outline

Patti Berry | Southern States Energy Board

- Introduction

Ellen Gilliland | Virginia Polytechnic Institute and State University

- Mid-Atlantic Planning Area

James Knapp, Ph.D. | University of South Carolina

- South-Atlantic Planning Area

Jack Pashin, Ph.D. | Oklahoma State University

- Eastern Gulf of Mexico
- Conclusion

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This material is based upon work supported by the U.S. Department of Energy National Energy Technology Laboratory. Cost share and research support are provided by the Project Partners and an Advisory Committee.

Mid-Atlantic Research Team

- ***Virginia Tech***
  Public land-grant university founded in 1872.

- ***VCCER***
  Interdisciplinary study, research, information, and resource facility for the Commonwealth of Virginia.

Virginia Tech

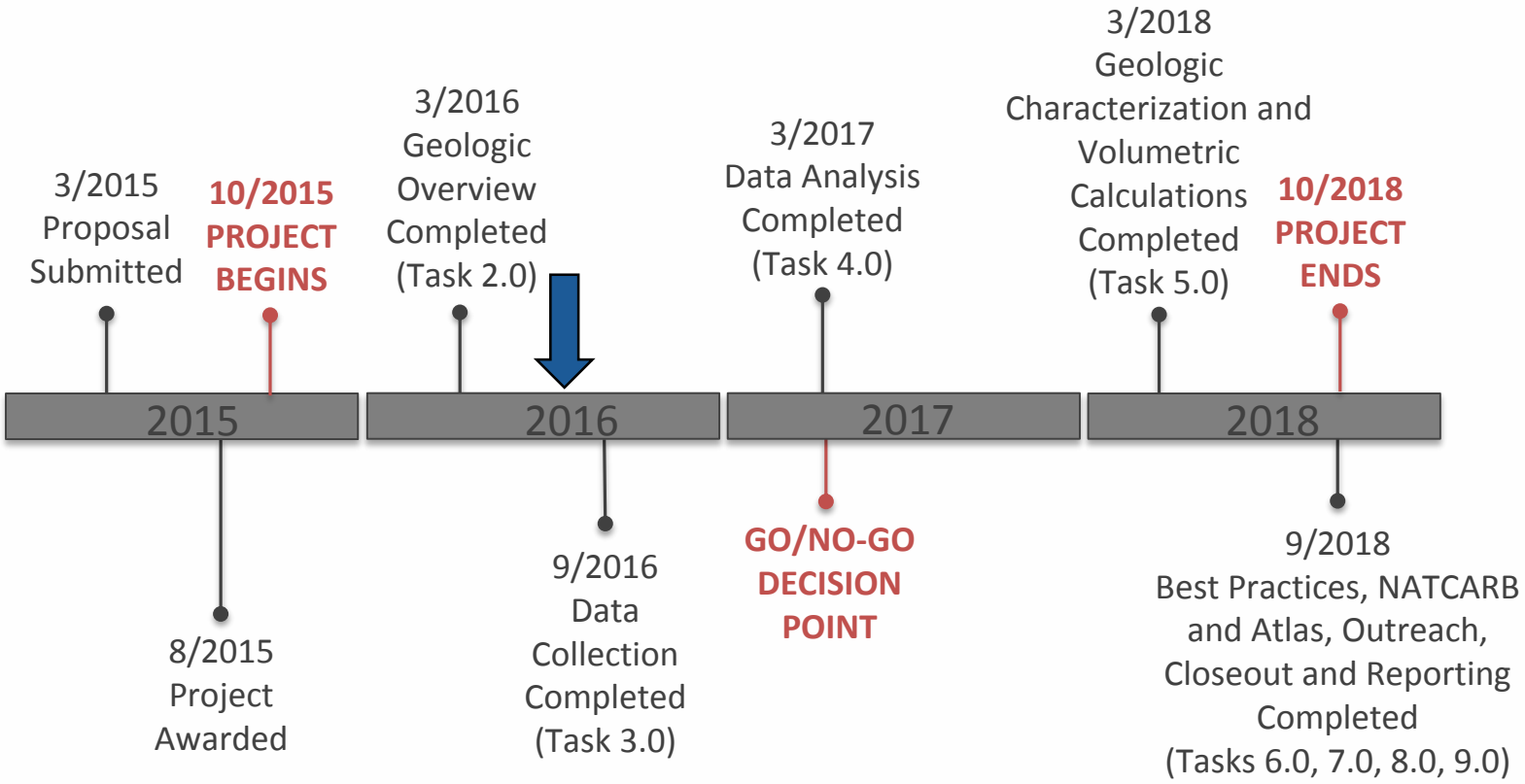
Virginia Center for Coal and Energy Research

- ***VA DMME***
  Virginia agency which houses the state's geological survey and mining, oil, and gas regulatory bodies.

- ***ADVISOR***
  Robert Milici, Scientist Emeritus, USGS; former state Geologist of Virginia

DMME
Virginia Department of Mines Minerals and Energy

SOSRA Project Timeline

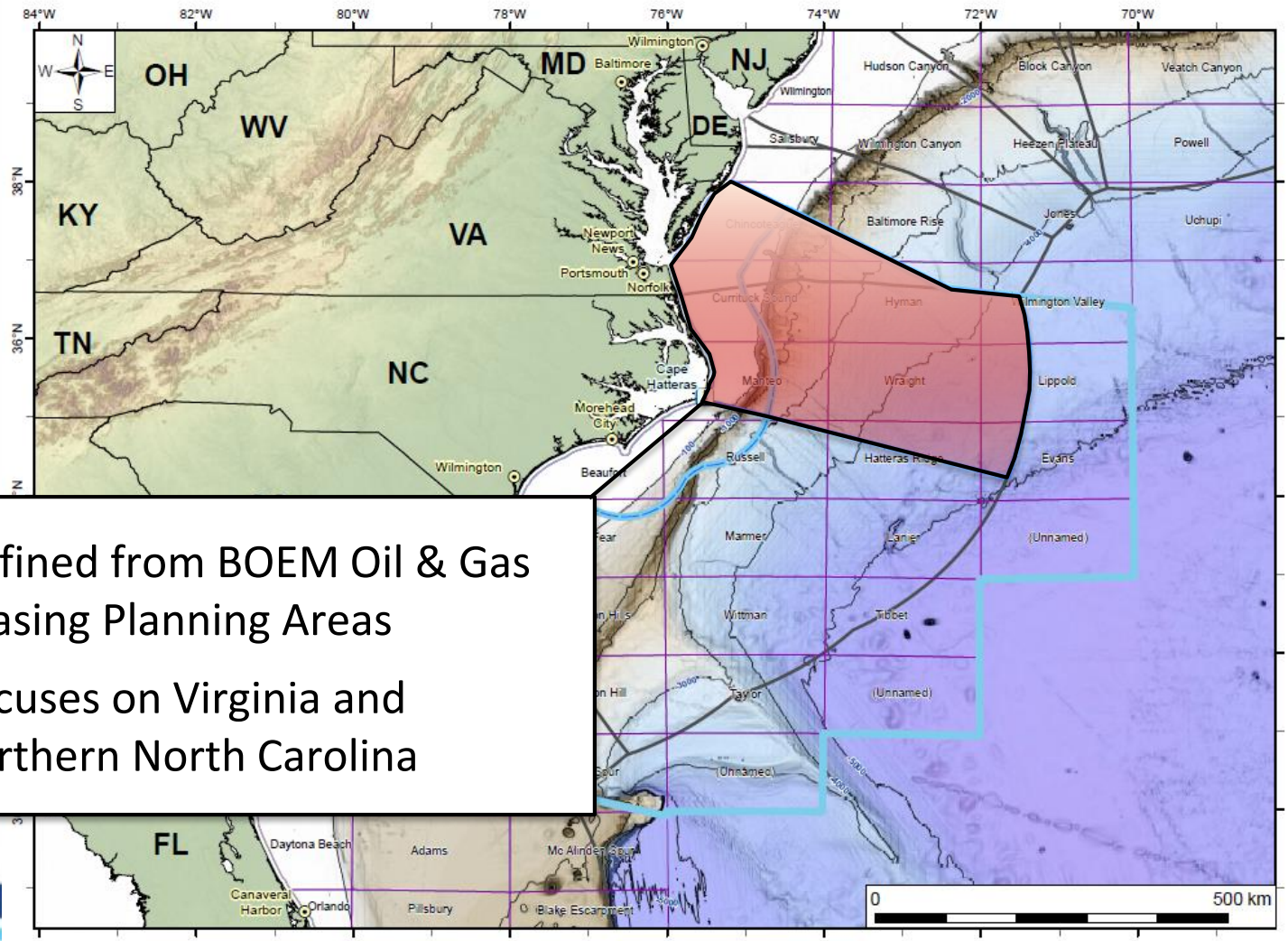


GO/NO-GO DECISION POINT: *The data collected and analyzed in Phase I is sufficient to perform a quality prospective storage resource assessment and the project should proceed to Phase II.*

Note: Task 1.0, Project Management and Planning, extends throughout the entire program period.

8

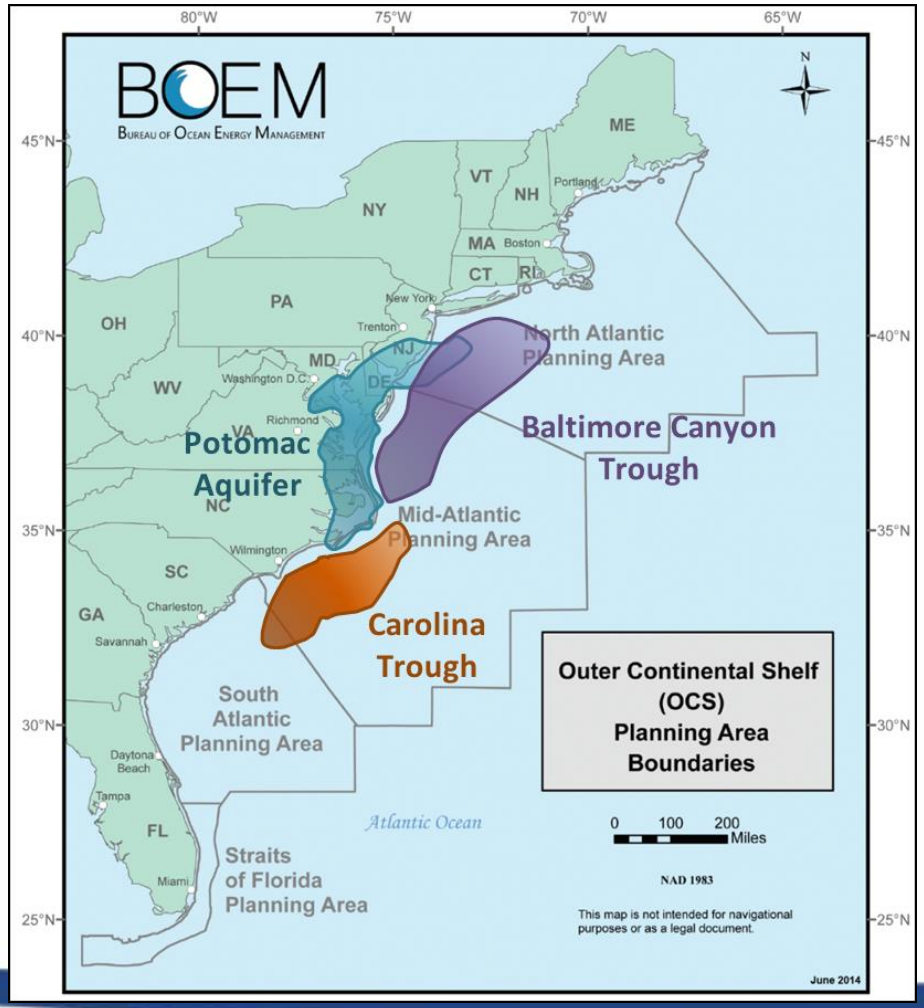
SOSRA Mid-Atlantic Study Area



- Defined from BOEM Oil & Gas Leasing Planning Areas
- Focuses on Virginia and northern North Carolina

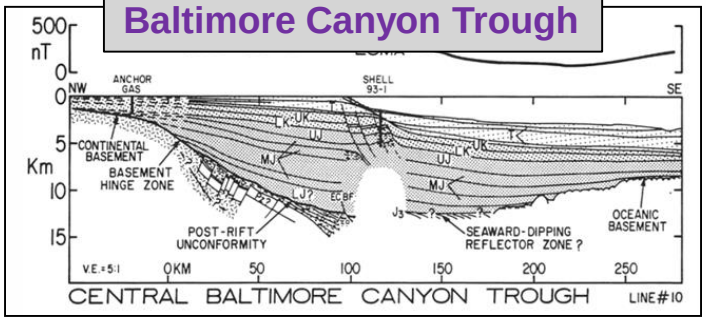
Initial Geologic Characterization

Geologic Provinces



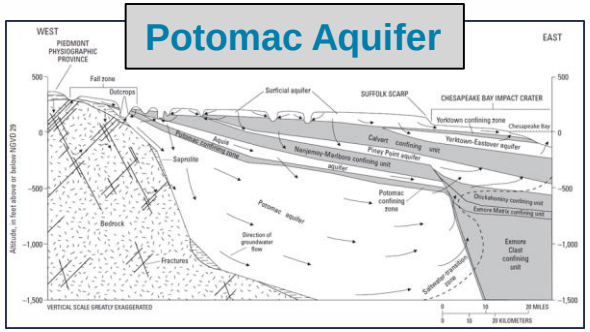
Modified from BOEM, USGS, GCCC, and Bayer and Milici,1987.

Baltimore Canyon Trough



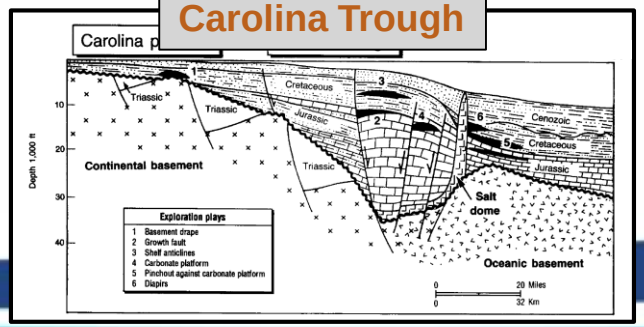
From Klitgord, 1988.

Potomac Aquifer



From USGS, 2013.

Carolina Trough

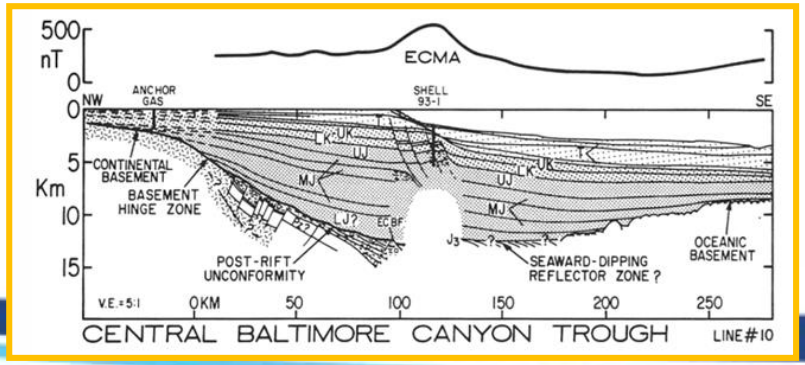


From Carpenter and Amato, 1992.

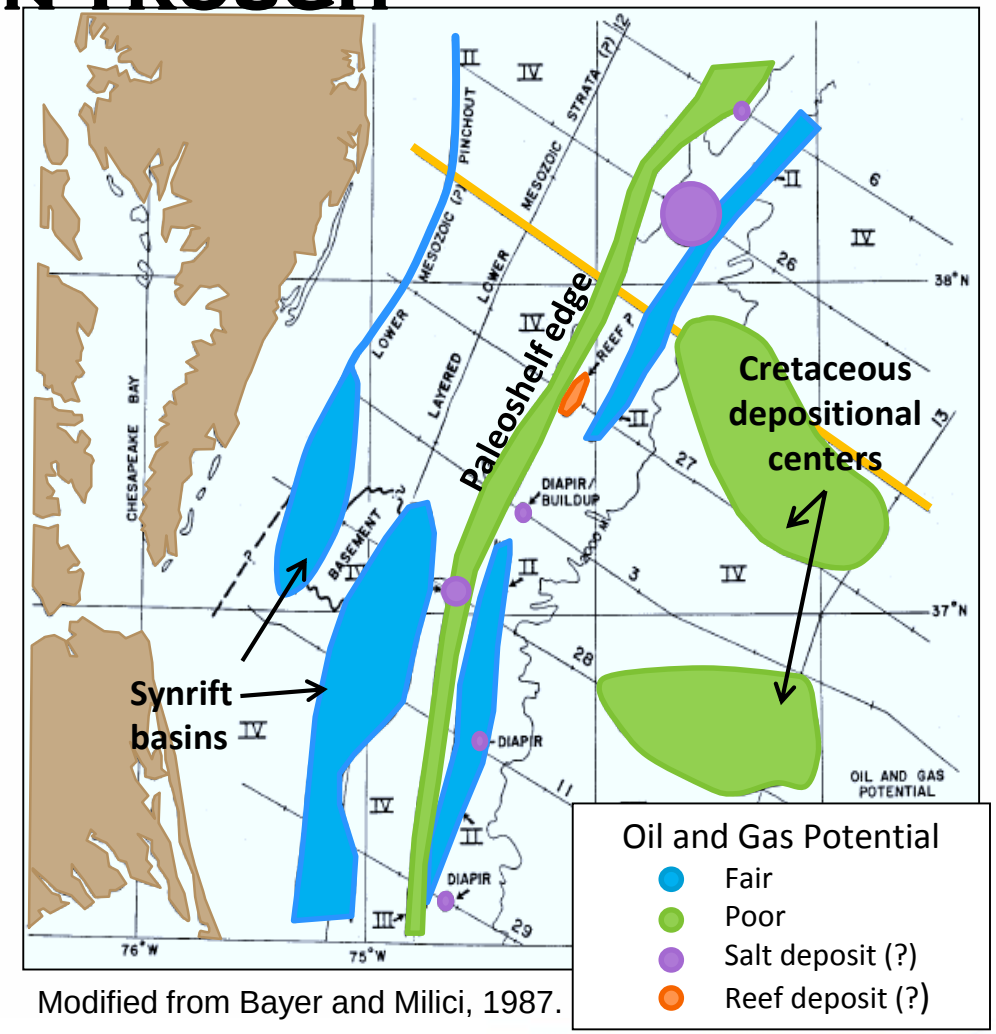
Initial Geologic Characterization

Baltimore Canyon Trough

- Oil and gas exploration in 1970s-1980s
- Prospects identified, but
  - poorly defined
  - poor-fair O/G potential
- SOSRA will revisit geo-provinces, focus on:
  - reservoir, seal quality
  - technological advancements

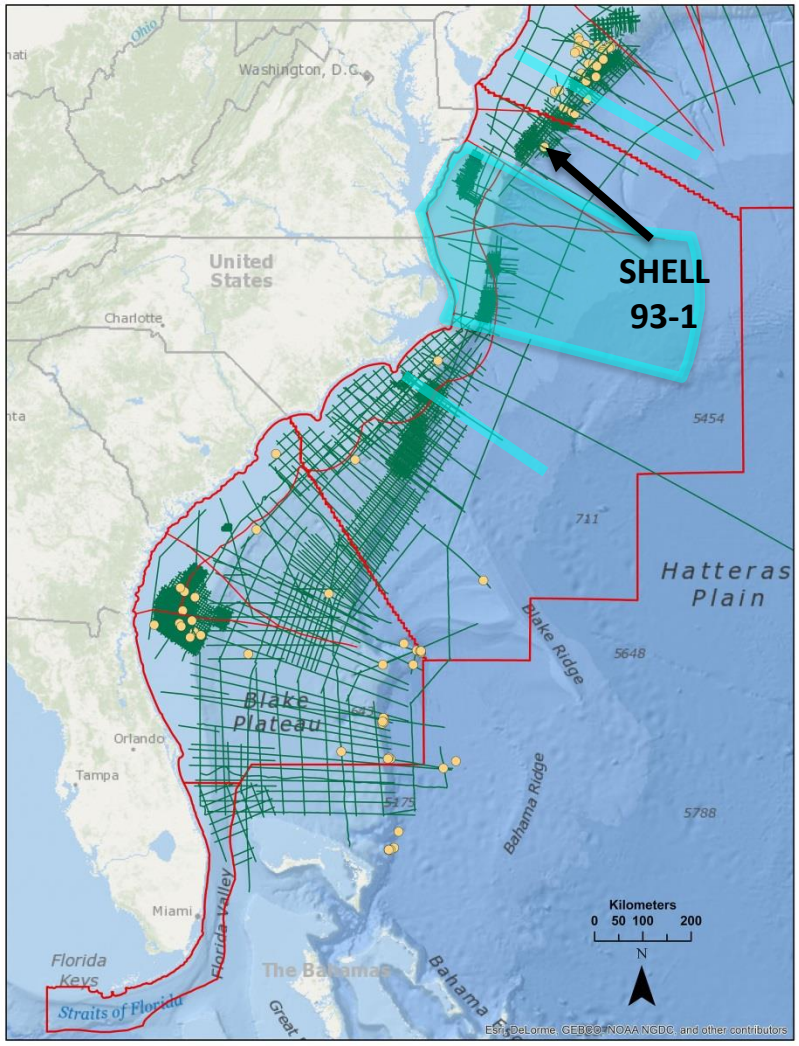


From Klitgord, 1988.



Modified from Bayer and Milici, 1987.

Data Overview



Comprehensive Database:

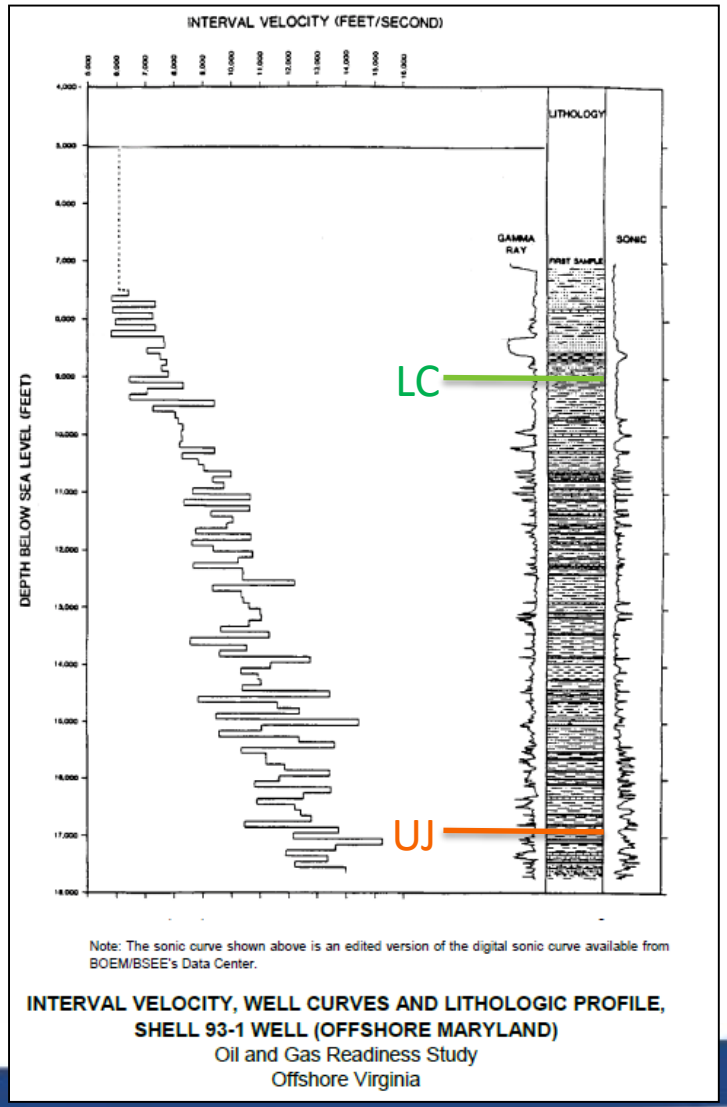
- ***Wells***
  - Atlantic Slope Project (1967): 13
  - Atlantic Margin Coring (1976): 3
  - Ocean Drilling Program (1987): 2
  - Shell Oil and Gas Exploration (1984): 1
  - Shell 93-1 has the only velocity measuremen
- ***2D multi-channel seismic***
- ***Proprietary data sets***
- ***Ties from outside study area***

Data Analysis
Well Data

Seismic interval velocity log from Shell 93-1 Well

Schlumberger Well Seismic Tool (WST)

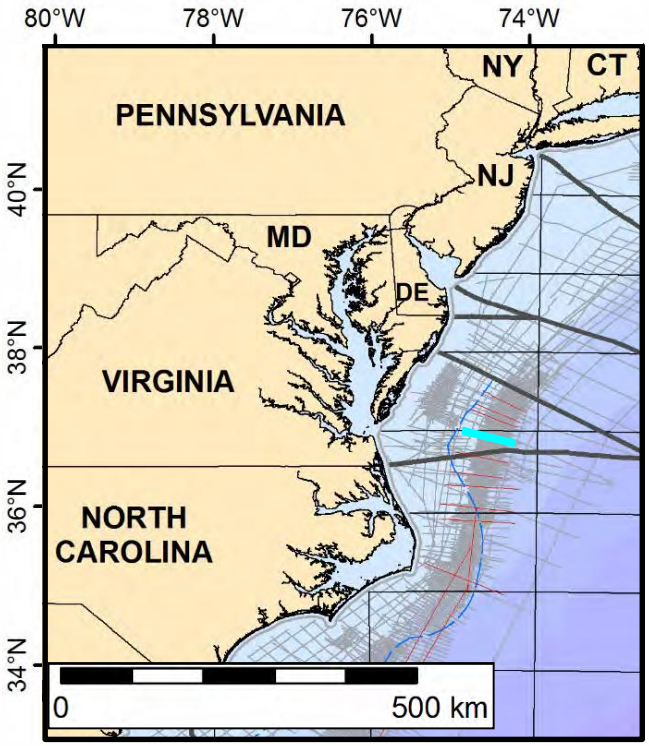
- Water Depth 5,000 ft
  True Vertical Depth 17,740 ft
- Combined with gamma ray and sonic logs to infer geologic lithology
- Can correlate logs and lithology with seismic horizons to extrapolate geological interpretations across study area
- Targets Identified
  - Lower Cretaceous
  - Upper Jurassic



Modified from BOEM/BSEE.

Data Analysis

2D Seismic Data



Seismic Tracklines: Permit E04-82

Line 18074 of Permit E04-82 Representative Line Used to Describe Field and Processing Parameters

Seismic Tracklines of All Surveys Described in Report

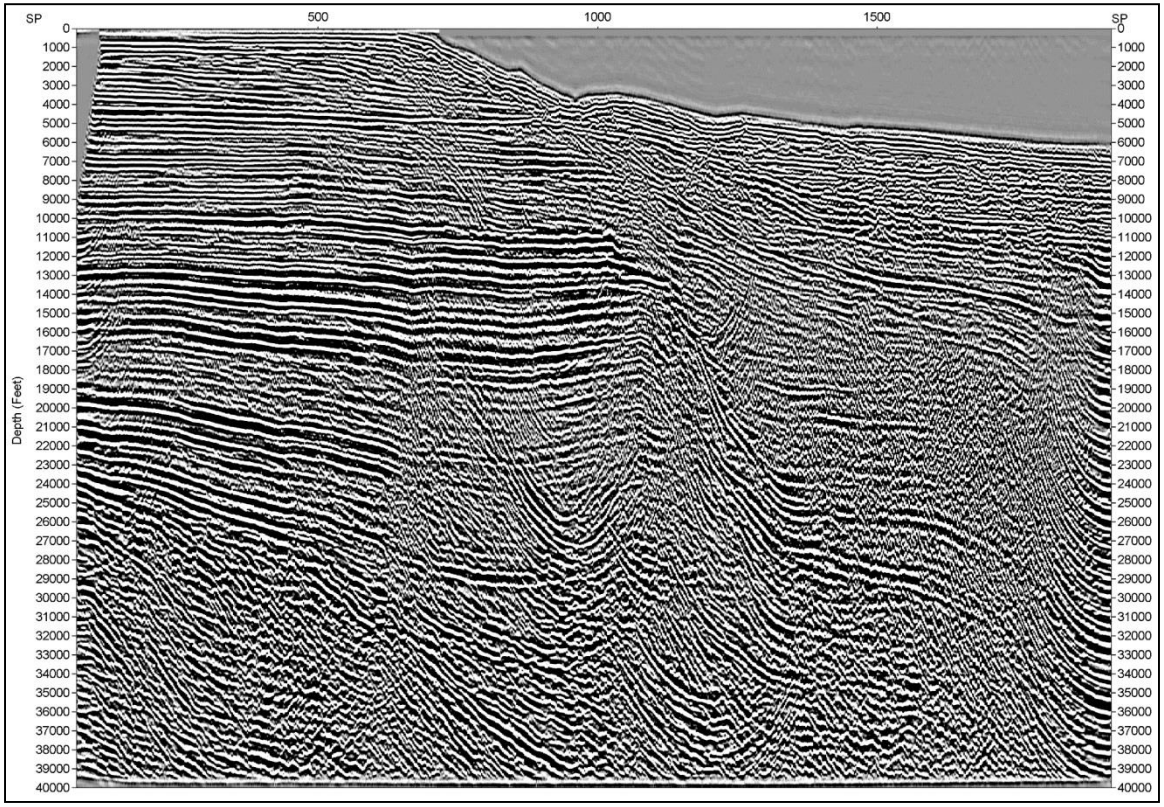
Outer Continental Shelf (OCS) Protractions

50-Mile Exclusion Buffer: 2017–2022 OCS Oil and Gas Leasing Draft Proposed Program

Federal-State Boundary (3 Nautical Mile Limit)

State Boundary OCS Extension and 200 Nautical Mile Line/International Boundary

Line 18074 (Shell): Seismic depth section

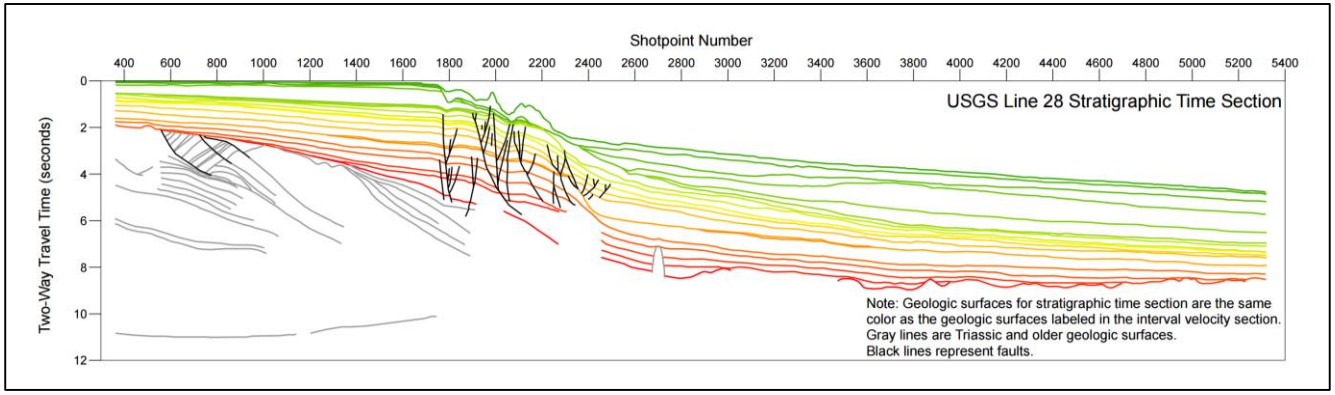


From BOEM/BSEE.

Cross section of shelf structure

Prospective Storage Resource Assessment

- Seismic Interpretation and Basin Analysis



From Fugro, modified after Klitgord et al., 1994.

- Volumetric Calculations, US-DOE Methodology

US-DOE CO2 Storage Resource Mass Estimates (from Goodman et al., 2011)

For oil/gas reservoirs:

$$G_{CO_2} = Ah_n\phi_e(1 - S_{wi})B\rho_{CO_2 std}E_{oil/gas}$$

A= area h_n= net thickness Φ_e= avg. effective porosity
S_{wi}= initial water saturation B= initial oil/gas formation volume factor
$\rho_{CO_2 std}$= standard CO_2 density E= storage efficiency factor

For saline aquifers:

$$G_{CO_2} = A_t h_g \phi_{tot} \rho E_{saline}$$

A_t= total area h_g= gross formation thickness
Φ_{tot}= total porosity ρ = CO_2 density
E_{saline}= storage efficiency factor

- Definition of Target Development Areas

Upcoming Project Activities

- Completion of the Comprehensive Project Database
- Combined meeting of Mid-Atlantic subcontractors and consultants
- Strategic planning meeting of Mid-Atlantic and South-Atlantic teams
- **Data Analysis** + Data Quality and Coverage Evaluation + Go/No-Go Decision Point

SOSRA:
Southeast Offshore Storage Resource Assessment –
North Carolina to Florida

16 August 2016

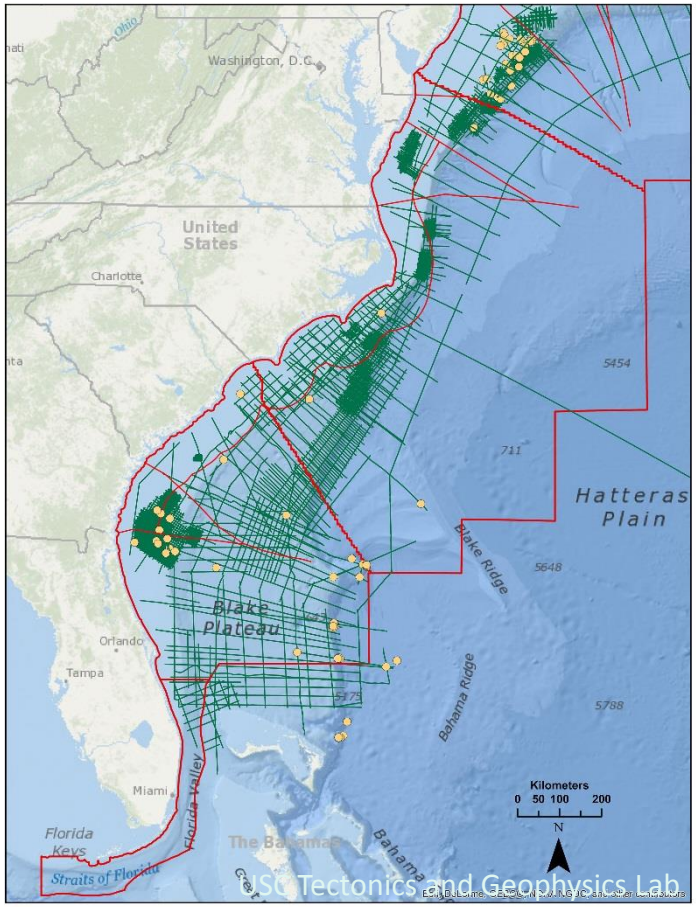
U.S. Department of Energy
Office of Fossil Energy / NETL Workshop
Pittsburgh, PA

James H. Knapp
School of the Earth, Ocean & Environment
University of South Carolina

South Atlantic Team Members

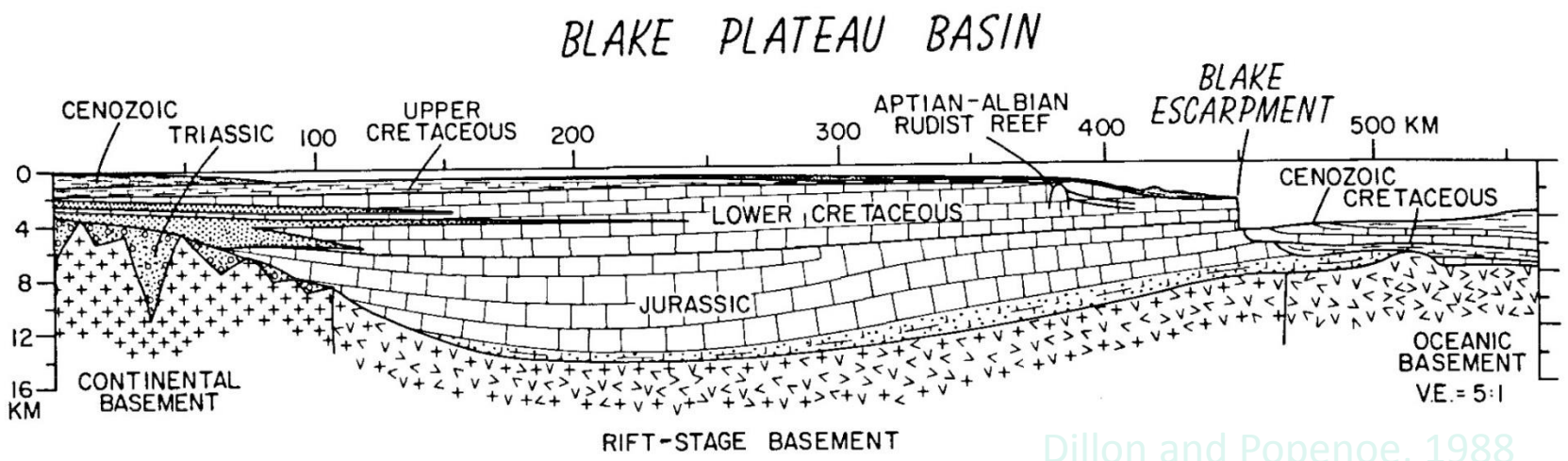
- School of the Earth, Ocean, and Environment
  - Prof. James H. Knapp
  - Prof. Venkat Lakshmi
- Earth Sciences and Resources Institute - SC
  - Prof. Camelia C. Knapp
  - Dr. Duke Brantley
- South Carolina Geological Survey
  - Dr. Scott Howard

The Challenge - South Atlantic Assessment



- Characterize porosity and permeability over >2 M km^3
- > 200,000 line km 2-D seismic reflection data
- 6 exploration wells plus COST-GE well
- ODP / DSDP / IODP scientific drilling
- Legacy seismic refraction data

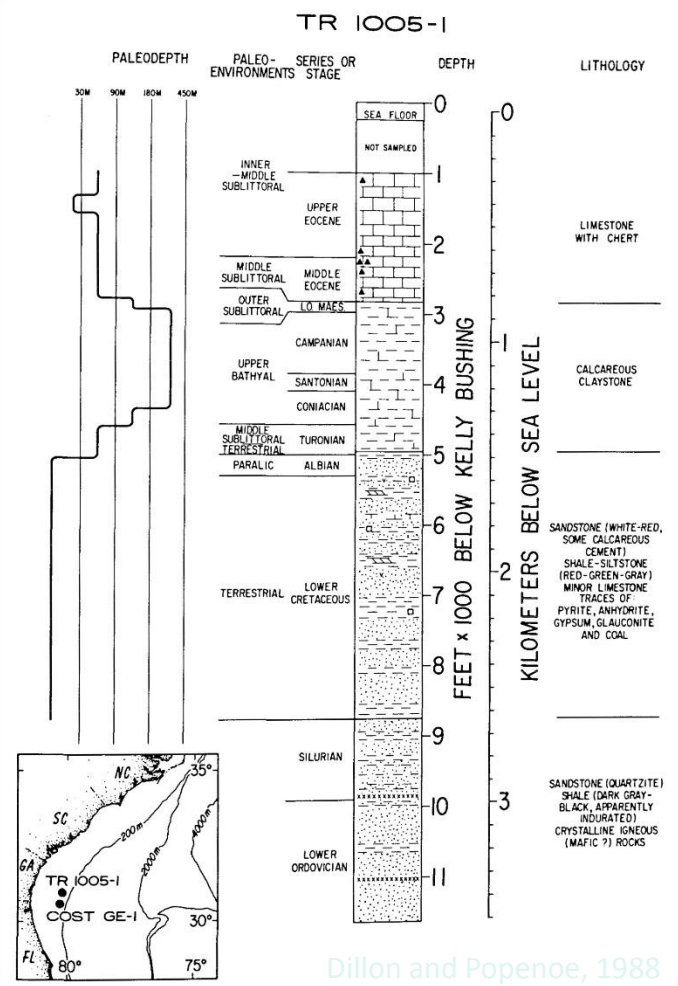
Blake Plateau Basin



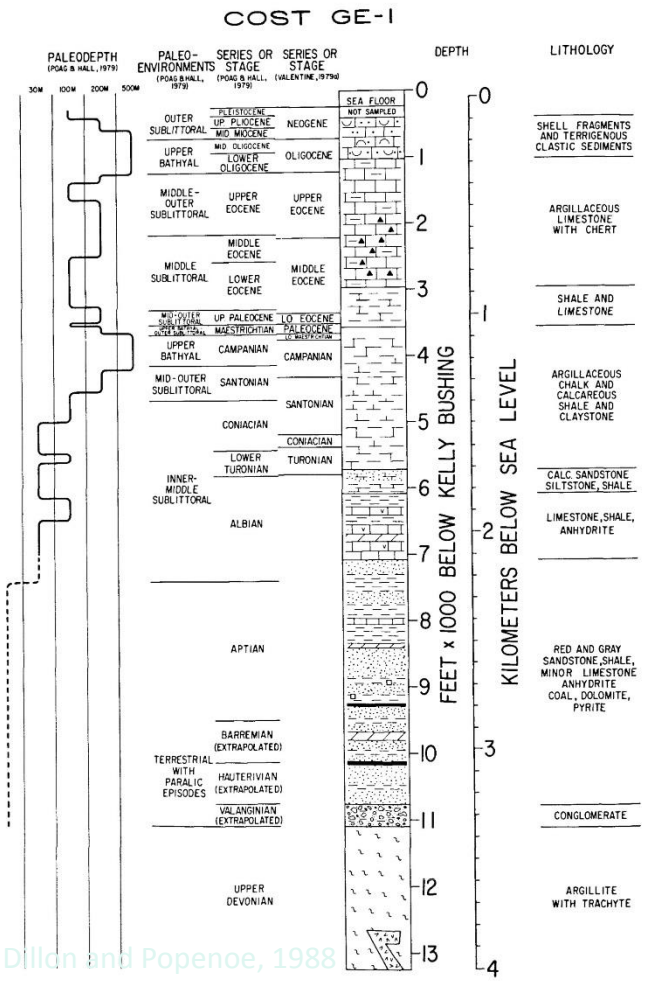
Dillon and Popenoe, 1988

- Broad shelf basin up to 14 km thick
- Dominated by Mesozoic carbonate sequence
- Outer basement high

COST-GE and Transco 1005-1

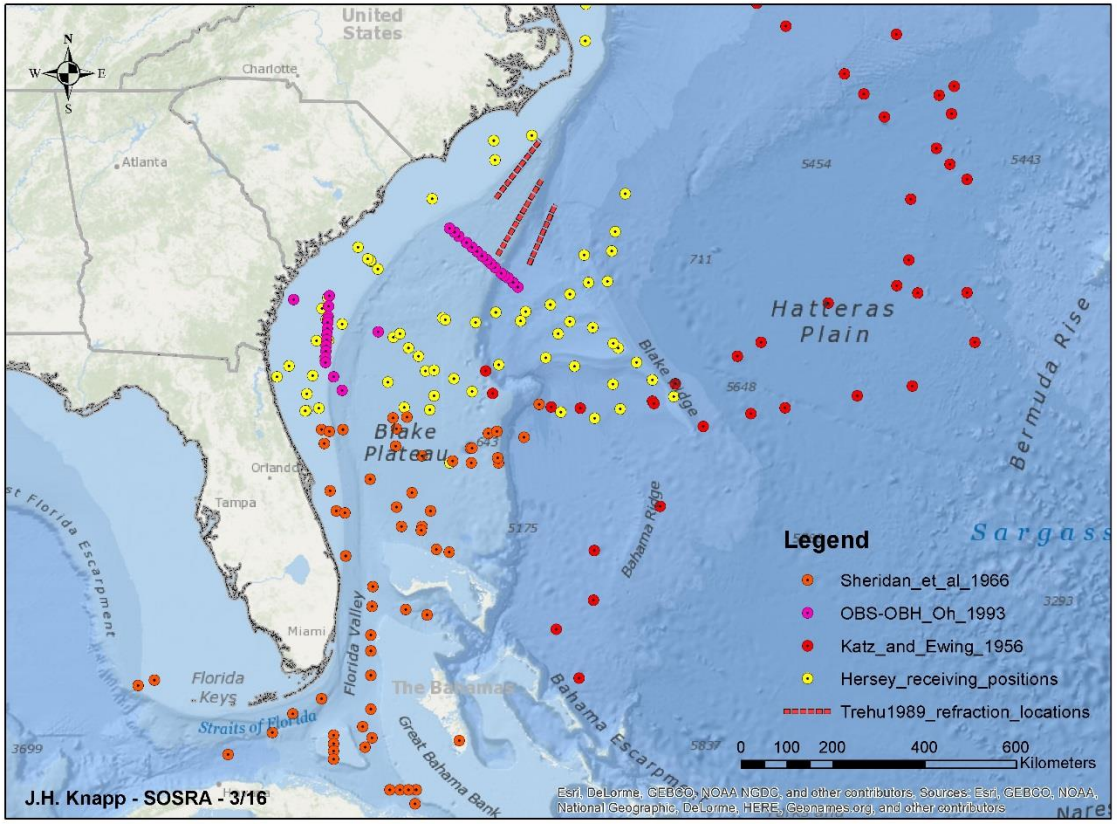


Dillon and Popenoe, 1988



Dillon and Popenoe, 1988

Seismic Refraction Measurements



Conclusions

- South Atlantic is a major frontier area despite decades of data acquisition and an earlier phase of hydrocarbon exploration
- Extensive 2-D seismic dataset, but limited well control
- Potential to link offshore CO2 sequestration to petroleum development if exploration goes forward
- How to constrain uncertainties of assessment given limited well control?

Southeast Offshore Storage Resource Assessment (SOSRA)
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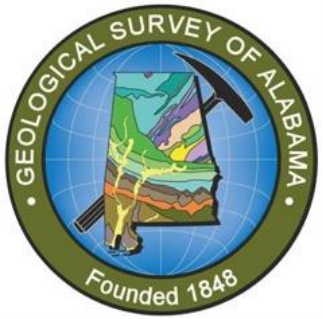
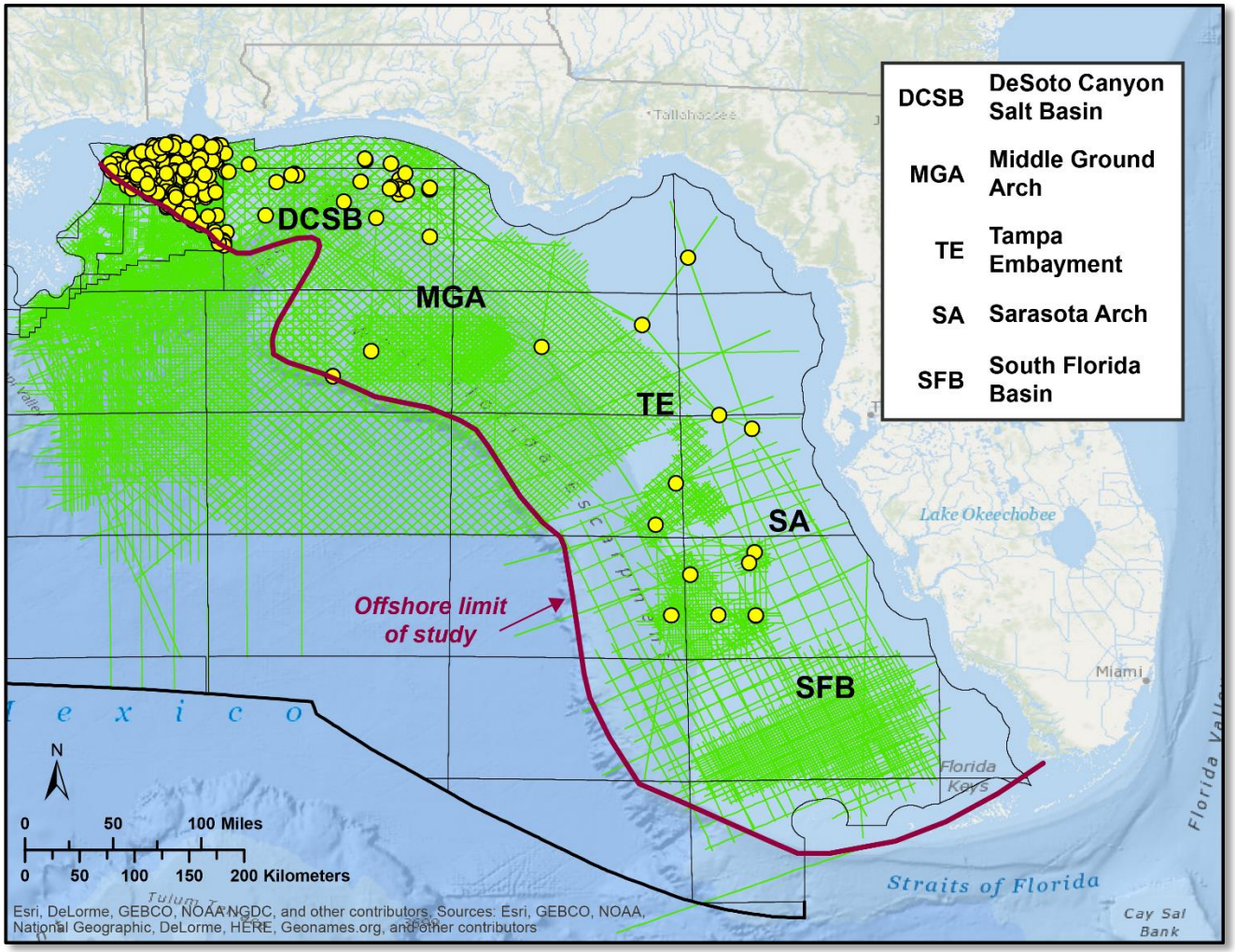
Eastern Gulf of Mexico

Jack C. Pashin and Jenny Meng, Oklahoma State University
Denise J. Hills, Guohai Jin, and Marcella R. Redden, Geological Survey of Alabama



Study Area and Subregions



DCSB DeSoto Canyon Salt Basin

MGA Middle Ground Arch

TE Tampa Embayment

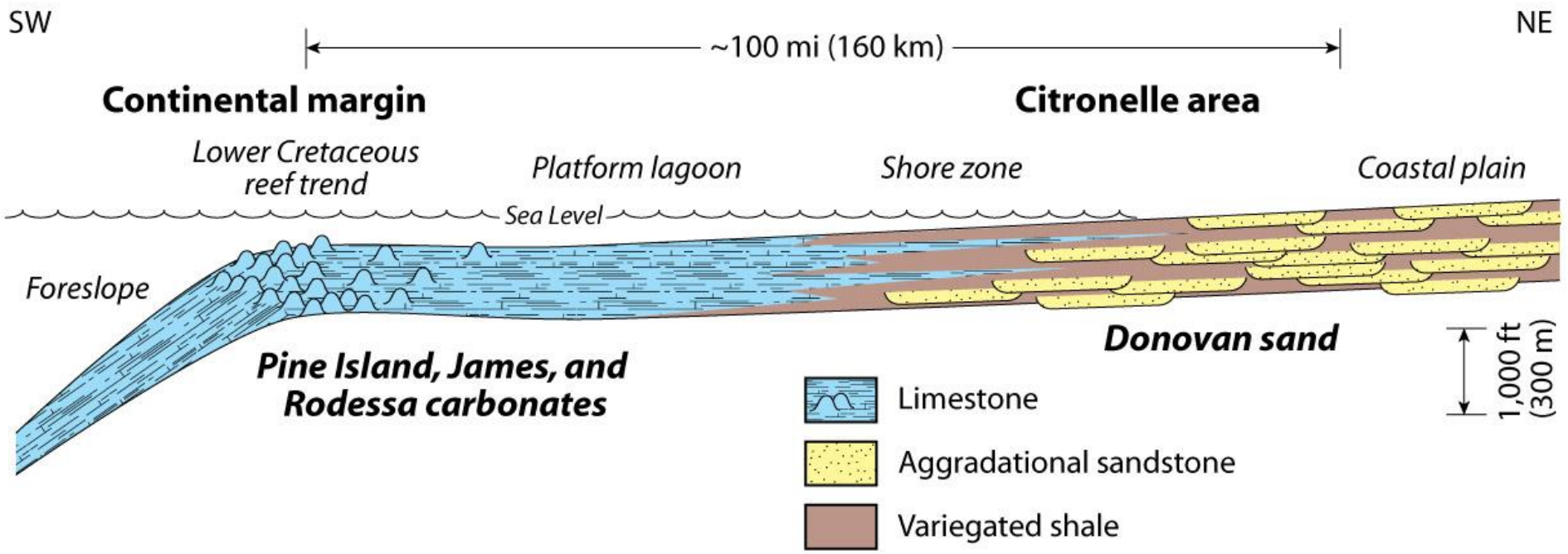
SA Sarasota Arch

SFB South Florida Basin

Cretaceous Facies

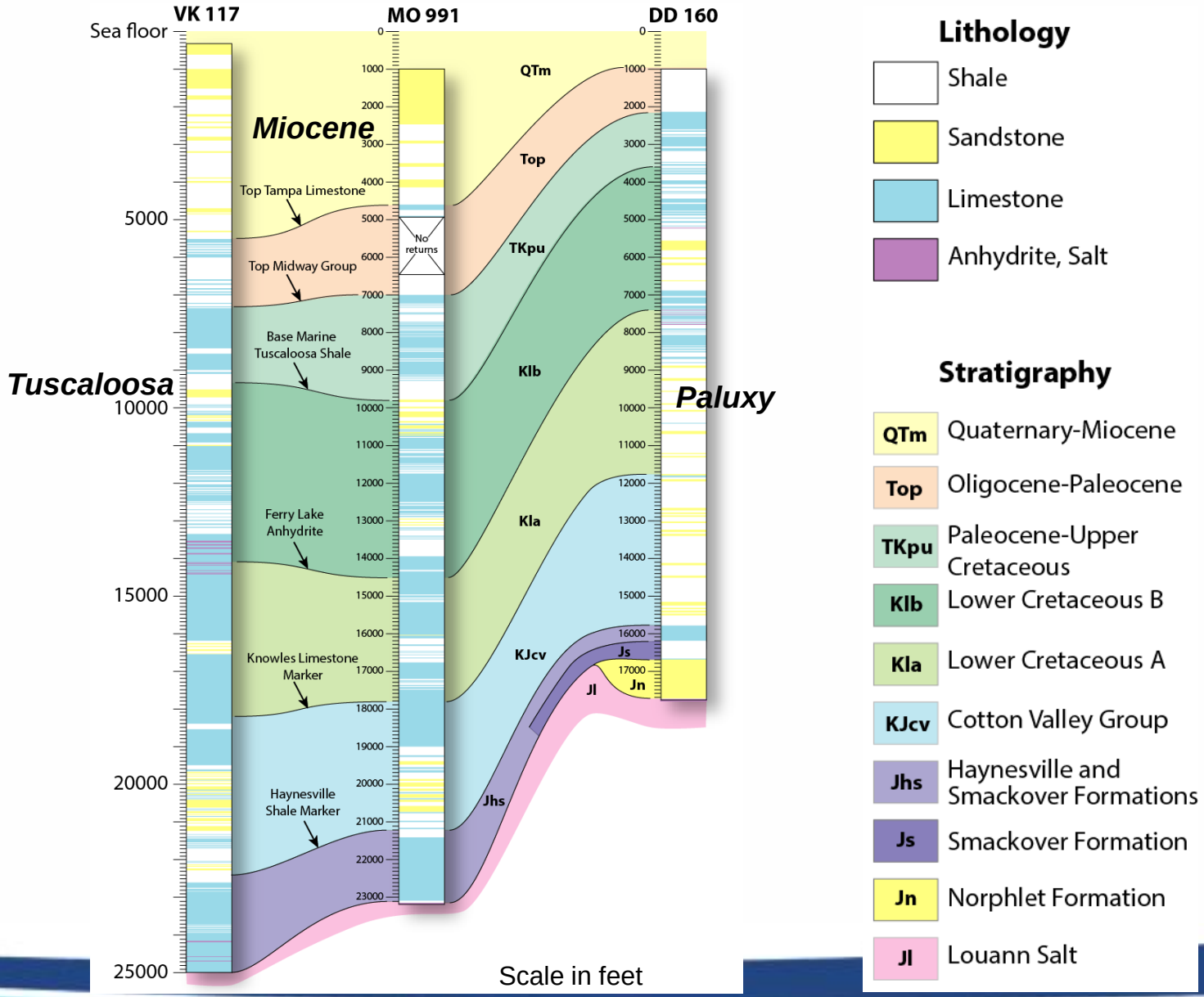
SOSRA REGION

NETL EOR TEST
SECARB ANTHROPOGENIC TEST

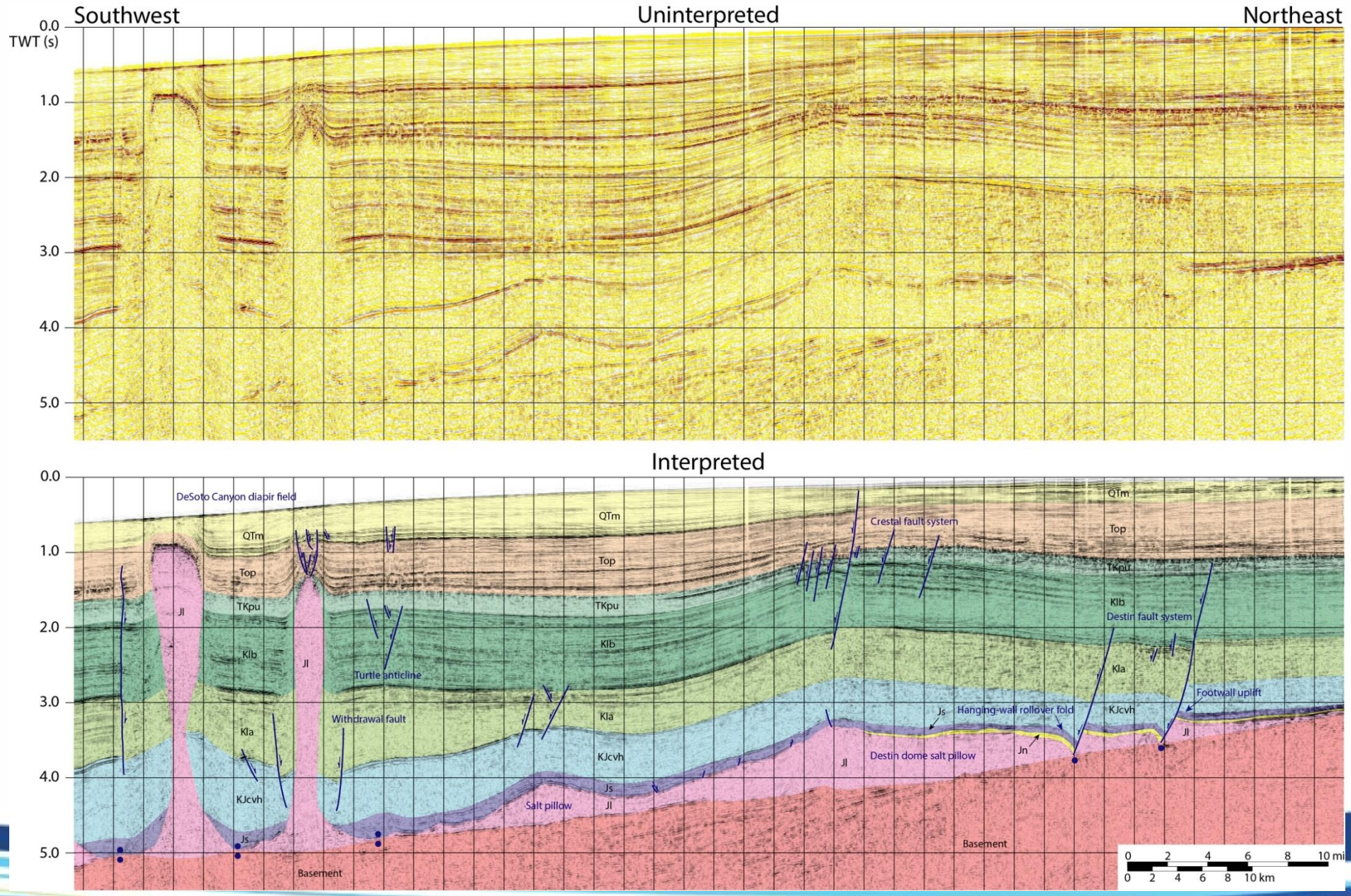


Pashin et al. (2014)

DeSoto Canyon Salt Basin - Lithologic Columns

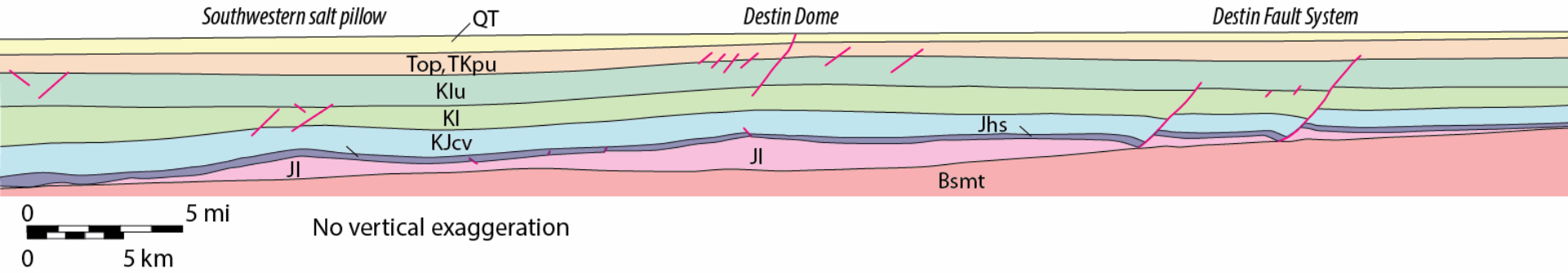


DCSB Destin Dome

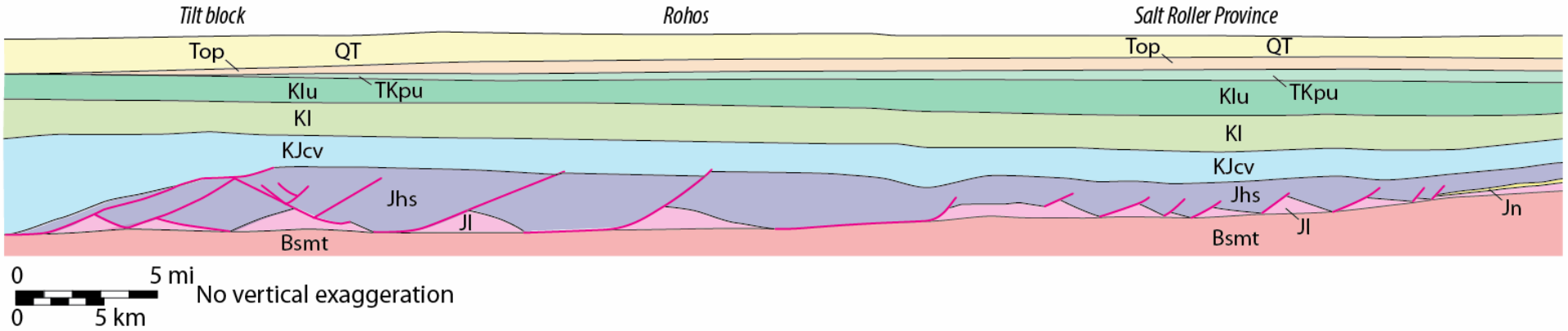


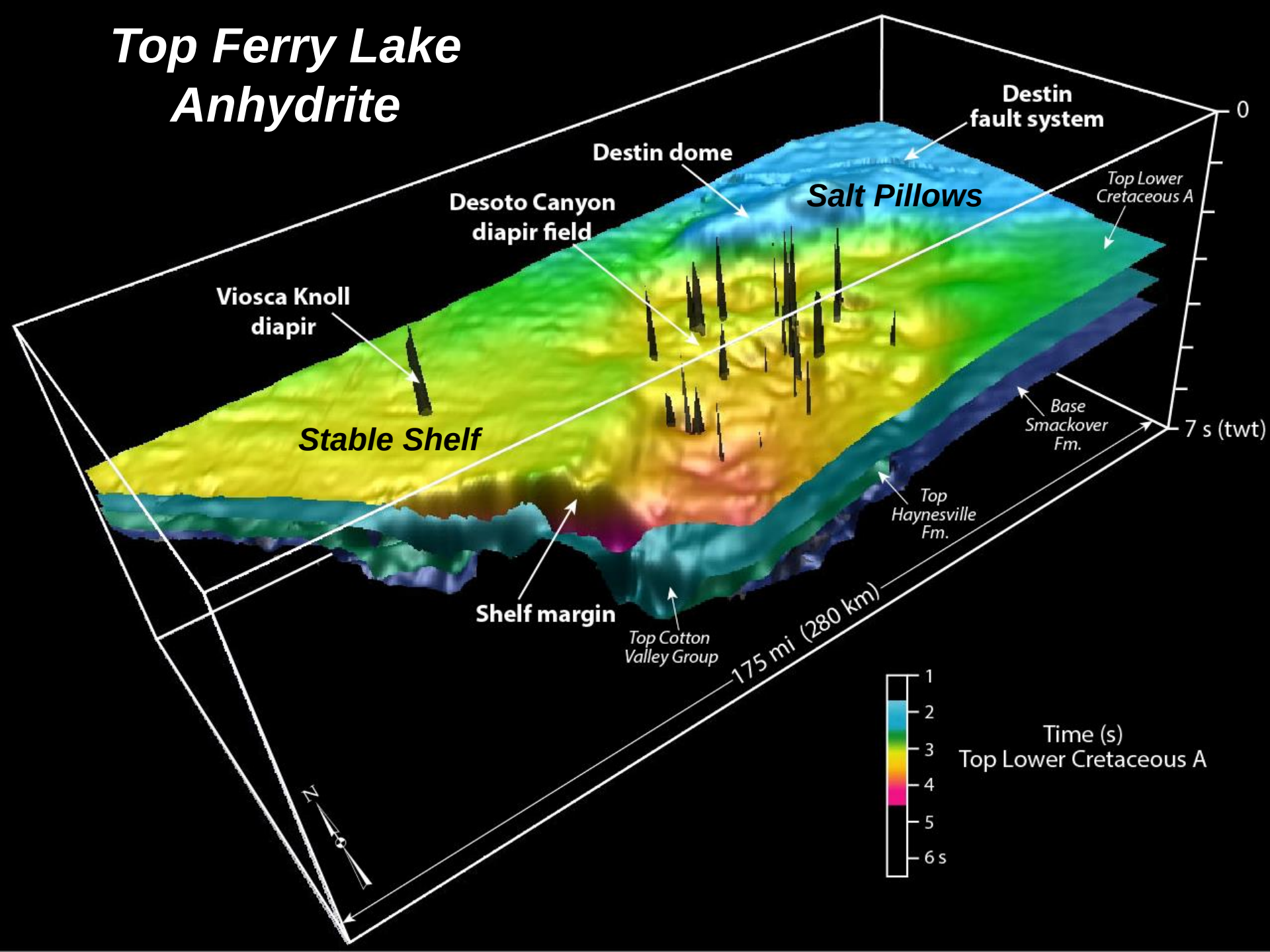
Regional Cross Sections

Salt Pillows and Peripheral Faults

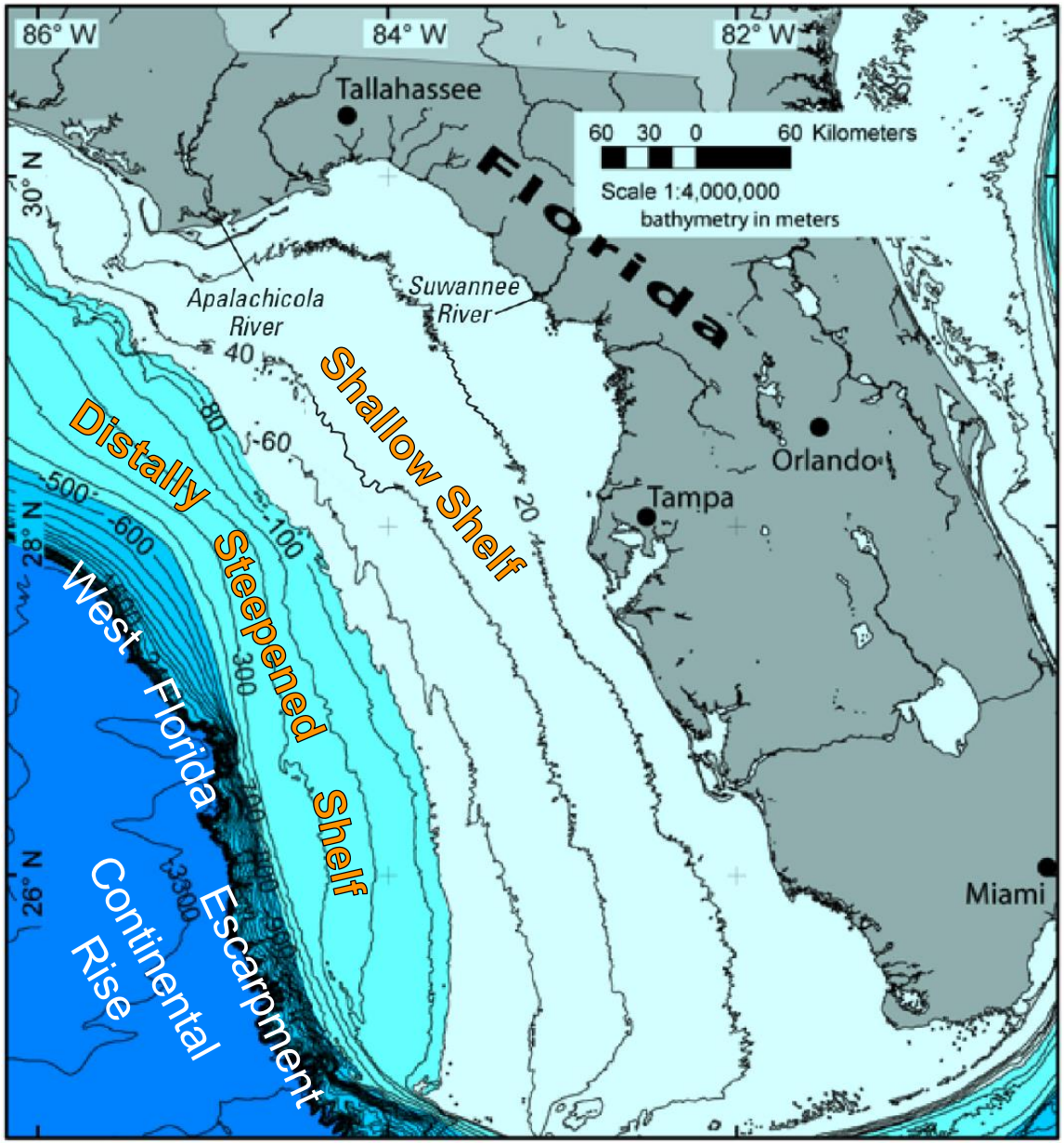


Salt Rollers and Stable Shelf



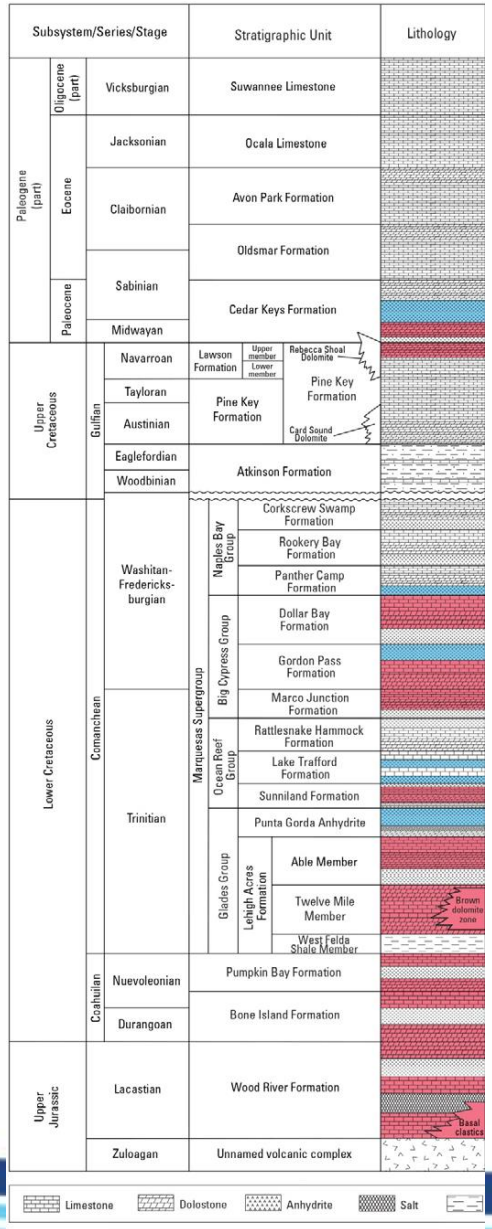

Top Ferry Lake Anhydrite
Destin fault system
Destin dome
Desoto Canyon diapir field
Salt Pillows
Top Lower Cretaceous A
Viosca Knoll diapir
Stable Shelf
Base Smackover Fm.
Top Haynesville Fm.
Shelf margin
Top Cotton Valley Group
0
7 s (twt)
175 mi (280 km)
N
1
2
3
4
5
6 s
Time (s)
Top Lower Cretaceous A

West Florida Shelf Bathymetry



- Broad, shallow, region near shore (NE of 80 m contour).
- Distally steepened outer shelf leading to West Florida Escarpment.

Florida - Lithologic Columns



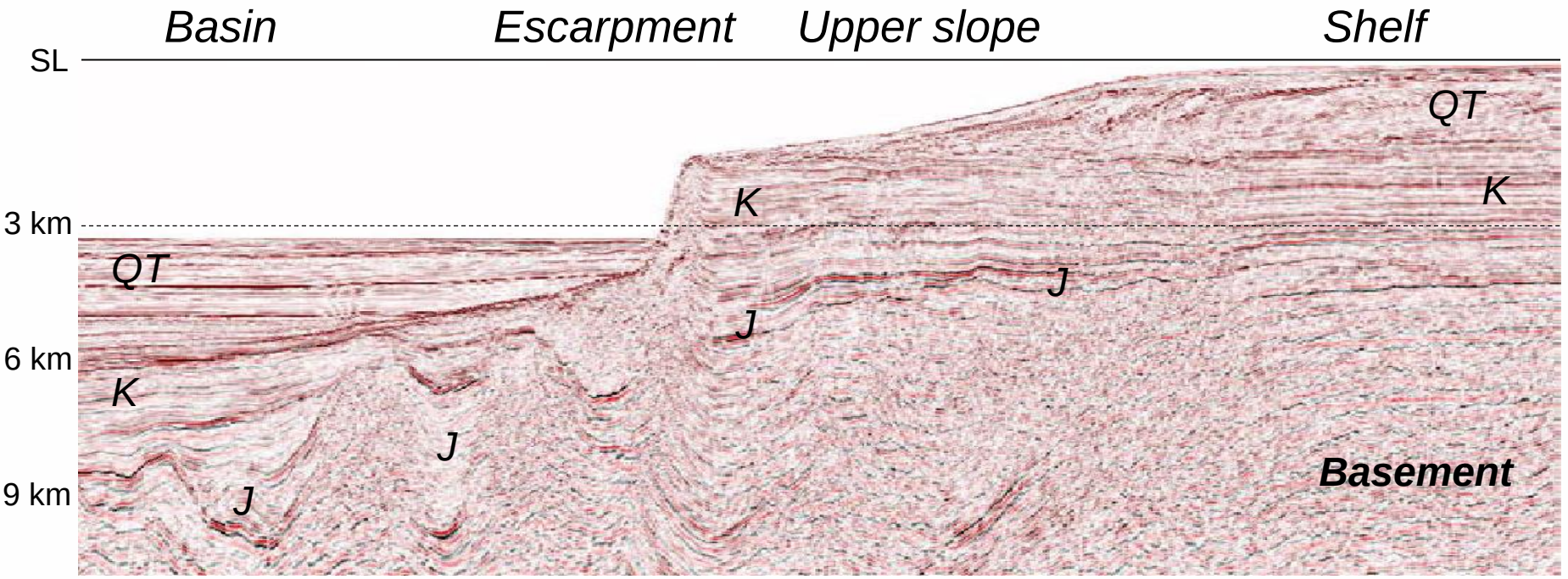
Blue - Seal
Red - Sink

		PANHANDLE FLORIDA		NORTHERN FLORIDA		SOUTHERN FLORIDA	
SYSTEM	SERIES	FORMATION	HYDROSTRATIGRAPHIC UNIT	FORMATION	HYDROSTRATIGRAPHIC UNIT	FORMATION	HYDROSTRATIGRAPHIC UNIT
QUATERNARY	HOLOCENE	Undifferentiated sediments	sand and gravel aquifer / surficial aquifer system	Undifferentiated sediments Anastasia Formation	surficial aquifer system	Undifferentiated sediments Miami Limestone Key Largo Limestone Anastasia Formation	surficial aquifer system Biscayne aquifer
	PLEISTOCENE			Undifferentiated sediments Miccosukee Formation Cypresshead Formation		Undifferentiated sediments Tamiami Formation Long Key Formation Hawthorn Group	
TERTIARY	PLIOCENE	Citronelle Formation Miccosukee Formation Jackson Bluff Formation Intracoastal Formation Alum Bluff Group Coarse Clastics					
	MIOCENE	Coarse Clastics Alum Bluff Group Pensacola Clay Intracoastal Formation Hawthorn Group Chipola Formation	intermediate aquifer system or intermediate confining unit	Hawthorn Group	intermediate aquifer system or intermediate confining unit	Hawthorn Group	intermediate aquifer system or intermediate confining unit
		Bruce Creek Limestone St. Marks Formation Chattahoochee Formation		St. Marks Formation			
	OLIGOCENE	Bucatunna Clay Chickasawhay Limestone Marianna Limestone Suwannee Limestone	Floridan aquifer system	Suwannee Limestone	Floridan aquifer system	Suwannee Limestone	Floridan aquifer system
	EOCENE	Ocala Limestone Avon Park Formation Lisbon Formation Tallahatta Formation Claiborne Group Undiff.		Ocala Limestone Avon Park Formation Oldsmar Formation		Ocala Limestone Avon Park Formation Oldsmar Formation	
	PALEOCENE	Wilcox Group Midway Group	undifferentiated aquifer systems and confining units	Cedar Keys Formation	undifferentiated aquifer systems and confining units	Cedar Keys Formation	undifferentiated aquifer systems and confining units
CRETACEOUS AND OLDER		Undifferentiated		Undifferentiated		Undifferentiated	

SEGS (1986)

Roberts-Ashby et al. (2015)

West Florida Shelf-Escarpment



Roberts and Erickson (2009)

Eastern Gulf Progress to Date

- Large portfolio of potential sinks and seals in eastern Gulf of Mexico region identified.
- Public seismic data acquired, loaded, and being interpreted.
- GIS built, well database, directional surveys, paleo reports, velocity surveys loaded.
- Geophysical logs being acquired.
- Complex structural chronology, stratigraphic architecture in DeSoto Canyon Salt Basin.
- Relatively simple Cretaceous carbonate platform and distally steepened Cenozoic shelf in West Florida.
- Geopressure >12,000 ft; main storage prospects in Cretaceous-Miocene section.
- Is sufficient porosity, permeability available in carbonate units to support commercial offshore storage?
- Are robust reservoir seals developed above Miocene sand units?

Synergy Opportunities

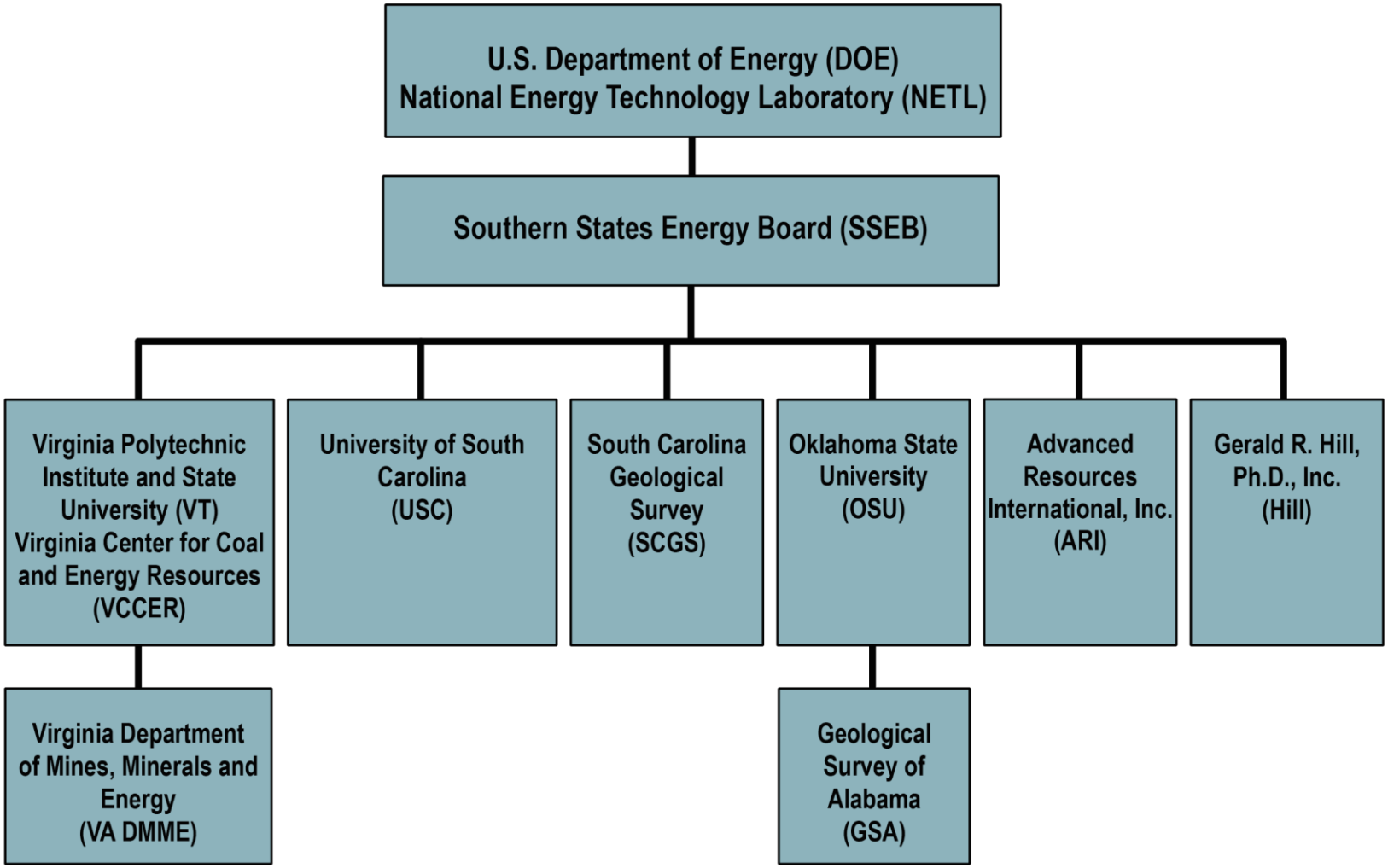
- Strong synergy among project team facilitates regional characterization.
- Communication among industrial and governmental stakeholders facilitates knowledge sharing, identification of high potential focus areas.
- Engagement of utilities and offshore energy producers helps identify early opportunities for deployment.

Bibliography

- Pashin, J. C., Guohai Jin, and Hills, D. J., in review, Mesozoic petroleum systems and structure in the Mobile, Pensacola, Destin Dome, and Viosca Knoll Areas of the MAFLA Shelf, in Lowery, C., Snedden, J. W., and Blum, M. D., eds., Mesozoic of the Gulf Rim and Beyond: New Progress in Science and Exploration of the Gulf of Mexico Basin: GCS-SEPM Rosen-Perkins Conference Proceedings.
- Hills, D. J., Pashin, J. C., and Redden, M. R., 2016, Investigating the eastern Gulf of Mexico for potential geologic storage of CO_2: Geological Society of America Abstracts with Programs, in press.
- Pashin, J. C., Guohai Jin, Hills, D. J., and Meng Jingyao, 2016, Evolution of giant salt pillows in the Destin Dome Area, eastern Gulf of Mexico: Implications for petroleum exploration and geologic CO_2 storage: Geological Society of America Abstracts with Programs, in press.
- Hills, D. J., Pashin, J. C., and Redden, M. R., 2016, Southeast Offshore Storage Resource Assessment: Opportunities in the eastern Gulf of Mexico for CO_2 storage: American Association of Petroleum Geologists Annual Convention and Exhibition Program, unpaginated CD-ROM.

Supplemental Slides

Organizational Chart: Contractual



Benefit to the Program: Supporting Carbon Storage Program Goals

- **Goal 3**: "Support industry's ability to predict CO_2 storage capacity in geologic formations to within ±30 percent."
  - Conduct a prospective storage resource assessment for offshore regions of the Eastern Gulf of Mexico, Straits of Florida, Mid-Atlantic, and South Atlantic.
- **Goal 4**: "Develop Best Practice Manuals for monitoring, verification, accounting (MVA), and assessment; site screening, selection, and initial characterization; public outreach; well management activities; and risk analysis and simulation."
  - Produce information and develop recommendations that will be useful for inclusion in the DOE Best Practices Manuals (BPMs).
- **Overall Objective**: "Develop and advance technologies that will significantly improve the effectiveness and reduce the cost of implementing carbon storage, both onshore and offshore, and be ready for widespread commercial deployment in the 2025–2035 timeframe."
  - Identify target development areas based on physical and regulatory considerations and computational simulations for CO_2 injection and enhanced recovery.
  - Develop outreach program and reporting related to shared data (NatCarb database and Atlas) and commercial deployment of offshore carbon storage operations.

Project Overview: Goal and Objectives

Goal

Provide a high quality prospective carbon dioxide (CO_2) storage resource assessment of the eastern Gulf of Mexico and the Mid- and South Atlantic seaboard.

Objectives

Phase I /Budget Period 1 (BP1)

- **Objective 1:** Provide an overview of the basic geologic framework of the SOSRA region, identify potential storage units, and define the key planning areas. [Goal 3]

Phase II /Budget Period 2 (BP2)

- **Objective 2:** Provide a robust characterization of offshore CO_2 storage opportunities, as well as conduct a volumetric analysis that is consistent with established procedures employed by the National Energy Technology Laboratory (NETL) for CO_2 assessment. [Goal 3]
- **Objective 3:** Provide limited modeling of offshore CO_2 storage to identify well and reservoir configurations that are capable of meeting the goal of 30 megatonnes or greater storage in key focus areas. [Goal 3]
- **Objective 4:** Development of Best Practices Manuals (BPMs) based upon this research to advance the state of knowledge by identifying paths to deployment and applicable technologies that improve the effectiveness while reducing the cost of storage operations. [Goal 4]

Task/Subtask Breakdown

1

Project Management and Planning (Phases I-II/BPs 1-2)

1.1 – Overall Project Management, Planning, and Communication

1.2 – Project Management Plan

1.3 – Planning Area Managers' Technical and Financial Project Coordination

Geologic Overview (Phase I/BP 1)

Main Geologic Provinces – 2.1

Potential Storage Units – 2.2

Planning Areas – 2.3

2

3

Data Collection (Phase I/BP 1)

3.1 – Seismic Databases

3.2 – Well Logs

3.3 – Additional Data

Task/Subtask Breakdown

4

Data Analysis (Phase I/BP 1)

4.1 – Quality Assessment

4.2 – Coverage Assessment

4.3 – Well-Seismic Ties

4.4 – Seismic Interpretation

Geologic Characterization and Volumetric Calculations (Phase II/BP 2)

5

Reservoir Characterization – 5.1

Mapping – 5.2

CO_2 Storage Resource – 5.3

Identification of Target Development Areas – 5.4

CO_2 Storage Capacity – 5.5

Task/Subtask Breakdown

6

Best Practices (Phases I-II/BPs 1-2)

6.1 – BPM Scoping and Protocol Development

6.2 – BPM Development and Drafting

NatCarb and Atlas (Phase II/BP 2)

National Carbon Sequestration Database and Geographic Information System (NatCarb) – 7.1

United States Carbon Utilization and Storage Atlas – 7.2

7

8

Public Outreach (Phases I-II/BPs 1-2)

8.1 – Knowledge Sharing

8.2 – Technology Transfer

Closeout and Reporting (Phase II/BP 2)

Modeling-based MVA Recommendations – 9.1

Infrastructure Development Recommendations – 9.2

Target Development Recommendations – 9.3

9

Decision Points and Success Criteria

Decision Point	Success Criteria	Description	Criteria to Define Success & Importance	Completed
✓	✓	Negotiation/Implementation of PMP Go/No-Go Decision Point 1 (Reference Deliverable 1.2.a)	SSEB will revise the Project Management Plan that is submitted with the application by including details from the negotiation process. DOE/NETL's approval of this plan and its implementation is necessary to carry out the stated goals of the project and budget objectives.*	✓
✓	✓	The data collected and analyzed in Phase I is sufficient to perform a quality prospective storage resource assessment and the project should proceed to Phase II. Go/No-Go Decision Point 2 (Reference Deliverable 4.2.a)	During Phase I, the project team will conduct initial geologic characterization of the planning areas and collect and analyze seismic, well, and other sources of data. At the end of Phase I, the project team will evaluate the data quality and coverage to determine whether it is sufficient to determine whether data collected and analyzed to date is sufficient to define the areal extent and physical properties of prospective CO_2 sinks, reservoir seals, and traps. If the data is sufficient, then the project team will perform a quality prospective storage resource assessment, and then proceed to Phase II, pending the results of Go/No-Go Decision Point 3.	
✓	✓	Negotiation/Implementation of Phase II Go/No-Go Decision Point 3 (Reference Deliverable 1.2.b)	A continuation application will be prepared and submitted to DOE/NETL. Success will be measured by DOE/NETL's approval of the continuation application and concurrence that the project is meeting its objectives on schedule and within budget. Decision Point 3 provides the basis for Phase II authorization, pending the outcome of the Go/No-Go Decision Point 2. A favorable decision to proceed is critical in achieving the stated goals of the project and budget objectives.*	

**Criteria description incomplete. Refer to the current PMP for the full description.*

Milestones

Task / Subtask	Milestone Title	Planned Completion Date	Verification Method
1.2	Implement Project Management Plan	10/30/15 *Completed 10/14/15*	Project Management Plan File (Deliverable 1.2.a)
1.1	Provide SOSRA Presentation during Kickoff Meeting	12/31/15 *Completed 11/10/15*	Kickoff Meeting Presentation File (Deliverable 1.1.b)
3.0	Complete Data Collection	09/30/16	Comprehensive Project Database Report File (Deliverable 3.0)
4.2	Complete Data Quality and Coverage Evaluation	12/31/16	SOSRA Data Quality and Coverage Evaluation Report File (Deliverable 4.2.a)
1.2	Implement Project Management Plan for Phase II	03/31/17	Project Management Plan - Phase II Update File (Deliverable 1.2.b)
4.4	Complete Data Analysis	03/31/17	Summary of Data Analysis File (Deliverable 4.4.a)
5.0	Complete SOSRA Prospective Storage Resource Assessment	03/31/18	SOSRA Prospective Storage Resource Assessment Results File (Deliverable 5.0)
7.0	Submit NatCarb Data and Atlas Contribution to DOE/NETL	09/30/18	Summary of NatCarb Data and Atlas Contribution (Deliverable 7.0)

Risk Matrix

Uncertain Future Event	Risk to Project	Risk Management Method	Risk Level
Reporting and milestones	Delayed or late reports	Reporting requirements and milestones are manageable and not constrained by any single participant or event. SSEB will manage the project and assist in report preparation to regain any schedule slippage.	Low probability Low consequence
Cost share	Cost share must be harmonized temporally with federal spend	Cost share is committed by all participants.	Low probability Low consequence
Environmental Impacts	Environmental impacts to air, land, and water resources and potential impacts of waste production	The project approach and the existing facilities that will be used to support the project will not impact air, land, or water resources or impact waste production. No new construction or field disturbance is necessary to accomplish the project objectives.	Low probability Low consequence
Staff availability	If staff are overcommitted to several projects, delays in completion may result	Participants are experienced in handling multiple projects. The participating partners and entities have considerable depth in professional staff with related experience.	Low probability Low consequence

Gantt chart (p1)

Southeast Offshore Storage Resource Assessment

Task Schedule | Subtask Schedule | Deliverable | ✓ Milestone and Deliverable | Decision Point

Task / Subtask	Deliverable Number	Description	Milestone	Decision Point	Resource	Start Date	End Date
	Decision Point 1	**GO/NO-GO DECISION POINT: NEGOTIATION/IMPLEMENTATION OF PROJECT AWARD AND PMP**	✓	✓		**10/01/15**	**10/01/15**
1.0		**PROJECT MANAGEMENT AND PLANNING**				**10/01/15**	**09/30/18**
1.1		Overall Project Management, Planning, and Communication				10/01/15	09/30/18
	1.1.a	*Communications Plan*				*10/01/15*	*11/30/15*
	1.1.b	*Kickoff Meeting Presentation File*	✓			*10/01/15*	*12/31/15*
	1.1.c	*Annual Review Meeting Presentation File*				*07/01/16*	*09/30/16*
	1.1.d	*Annual Review Meeting Presentation File*				*07/01/17*	*09/30/17*
	1.1.e	*Annual Review Meeting Presentation and Final Briefing File*				*07/01/18*	*09/30/18*
	1.1.f	*Data Submitted to NETL-EDX*				*07/01/18*	*09/30/18*
1.2		Project Management Plan				10/01/15	09/30/18
	1.2.a	*Project Management Plan*	✓			*10/01/15*	*10/30/15*
	1.2.b	*Project Management Plan - Phase II Update*	✓			*01/01/17*	*03/31/17*
	Decision Point 2	**GO/NO-GO DECISION POINT: NEGOTIATION/IMPLEMENTATION OF PHASE II MODIFICATION AND PMP APPROVAL**	✓	✓		**03/31/17**	**03/31/17**
1.3		Planning Area Managers' Technical and Financial Project Management				10/01/15	09/30/18
2.0		**GEOLOGIC OVERVIEW**				**10/01/15**	**03/31/16**
	2.0	*Initial Geologic Characterization Report*				*10/01/15*	*03/31/16*
2.1		Main Geologic Provinces				10/01/15	12/31/15
2.2		Potential Storage Units				10/01/15	03/31/16
2.3		Planning Areas				10/01/15	12/31/15
3.0		**DATA COLLECTION**				**10/01/15**	**09/30/16**
	3.0	*Comprehensive Project Database*	✓			*10/01/15*	*09/30/16*
3.1		Seismic Databases				10/01/15	09/30/16
3.2		Well Logs				10/01/15	09/30/16
3.3		Additional Data				10/01/15	09/30/16
4.0		**DATA ANALYSIS**				**04/01/16**	**03/31/17**
4.1		Quality Assessment				04/01/16	12/31/16
4.2		Coverage Assessment				04/01/16	12/31/16
	4.2.a	*SOSRA Data Quality and Coverage Evaluation*	✓			*04/01/16*	*12/31/16*
4.3		Well-Seismic Ties				04/01/16	03/31/17
4.4		Seismic Interpretation				04/01/16	03/31/17
	4.4.a	*Summary of Data Analysis*	✓			*04/01/16*	*03/31/17*
	Decision Point 3	**GO/NO-GO DECISION POINT: IS DATA SUFFICIENT TO PROCEED TO PHASE II?**	✓	✓		**03/31/17**	**03/31/17**

PHASE I (10/01/2015 to 3/31/2017)						PHASE II (4/01/2017 to 09/30/2018)					
BUDGET PERIOD 1 (18 MONTHS)						BUDGET PERIOD 2 (18 MONTHS)					
FY2016				FY2017		FY2017		FY2018			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Oct-Dec 2015	Jan-Mar 2016	Apr-Jun 2016	Jul-Sep 2016	Oct-Dec 2016	Jan-Mar 2017	Apr-Jun 2017	Jul-Sep 2017	Oct-Dec 2017	Jan-Mar 2018	Apr-Jun 2018	Jul-Sep 2018

Gantt chart (p2)

5.0		**GEOLOGIC CHARACTERIZATION AND VOLUMETRIC CALCULATIONS**			**04/01/17**	**03/31/18**													
	5.0	*SOSRA Prospective Storage Resource Assessment Results*	✓		*04/01/17*	*03/31/18*											✓		
5.1		Reservoir Characterization			04/01/17	03/31/18													
5.2		Mapping			04/01/17	03/31/18													
5.3		CO2 Storage Resource			07/01/17	03/31/18													
5.4		Identification of Target Development Areas			07/01/17	03/31/18													
5.5		CO2 Storage Capacity			07/01/17	03/31/18													
6.0		**BEST PRACTICES**			**10/01/15**	**09/30/18**													
6.1		Best Practices Manuals Scoping and Protocol Development			10/01/15	03/31/17													
	6.1.a	*BPM Working Group Preliminary Report: Scoping and Protocol Development*			*01/01/17*	*03/31/17*													
6.2		Best Practices Manuals Development and Drafting			04/01/17	09/30/18													
	6.2.a	*SOSRA Documentation of Input to Offshore BPM Development and Drafting*			*07/01/18*	*09/30/18*													
7.0		**NATCARB AND ATLAS**			**10/01/17**	**09/30/18**													
	7.0	*Summary of NatCarb Data and Atlas Contribution*	✓		*07/01/18*	*09/30/18*													✓
7.1		National Carbon Sequestration Database and Geographic Information System (NatCarb)			10/01/17	09/30/18													
7.2		United States Carbon Utilization and Storage Atlas			10/01/17	09/30/18													
8.0		**OUTREACH**			**10/01/15**	**09/30/18**													
8.1		Public Outreach			10/01/15	09/30/18													
	8.1.a	*Initial Project Fact Sheet*			*10/01/15*	*12/31/15*													
8.2		Knowledge Sharing and Technology Transfer			10/01/15	09/30/18													
	8.2.a	*Comprehensive Technology Transfer Plan*			*01/01/16*	*09/30/16*													
	8.2.b	*Summary Report of Knowledge Sharing and Technology Transfer Activities*	✓		*10/01/17*	*09/30/18*													✓
9.0		**CLOSEOUT AND REPORTING**			**10/01/17**	**09/30/18**													
9.1		Modeling-based MVA Recommendations			10/01/17	09/30/18													
	9.1.a	*Modeling-based MVA Recommendations*			*10/01/17*	*09/30/18*													
9.2		Infrastructure Development Recommendations			10/01/17	09/30/18													
	9.2.a	*Infrastructure Development Recommendations*			*10/01/17*	*09/30/18*													
9.3		Target Development Recommendations			10/01/17	09/30/18													
	9.3.a	*Target Development Recommendations*			*10/01/17*	*09/30/18*													

Resources & Facilities

- ***Facilities***
  Ample office space, conference rooms, and telepresence capabilities for hosting meetings.
- ***Information Technology***
  Cloud-based file sharing, remote access and control, and online meeting capability for remote collaboration.
- ***Software***
  Schlumberger's Petrel E&P software platform: geomodeling, interpretation, and reservoir simulation suites.