Southeast Offshore Storage Resource Assessment (SOSRA)

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James Knapp, Ph.D. | University of South Carolina
Jack Pashin, Ph.D. | Oklahoma State University

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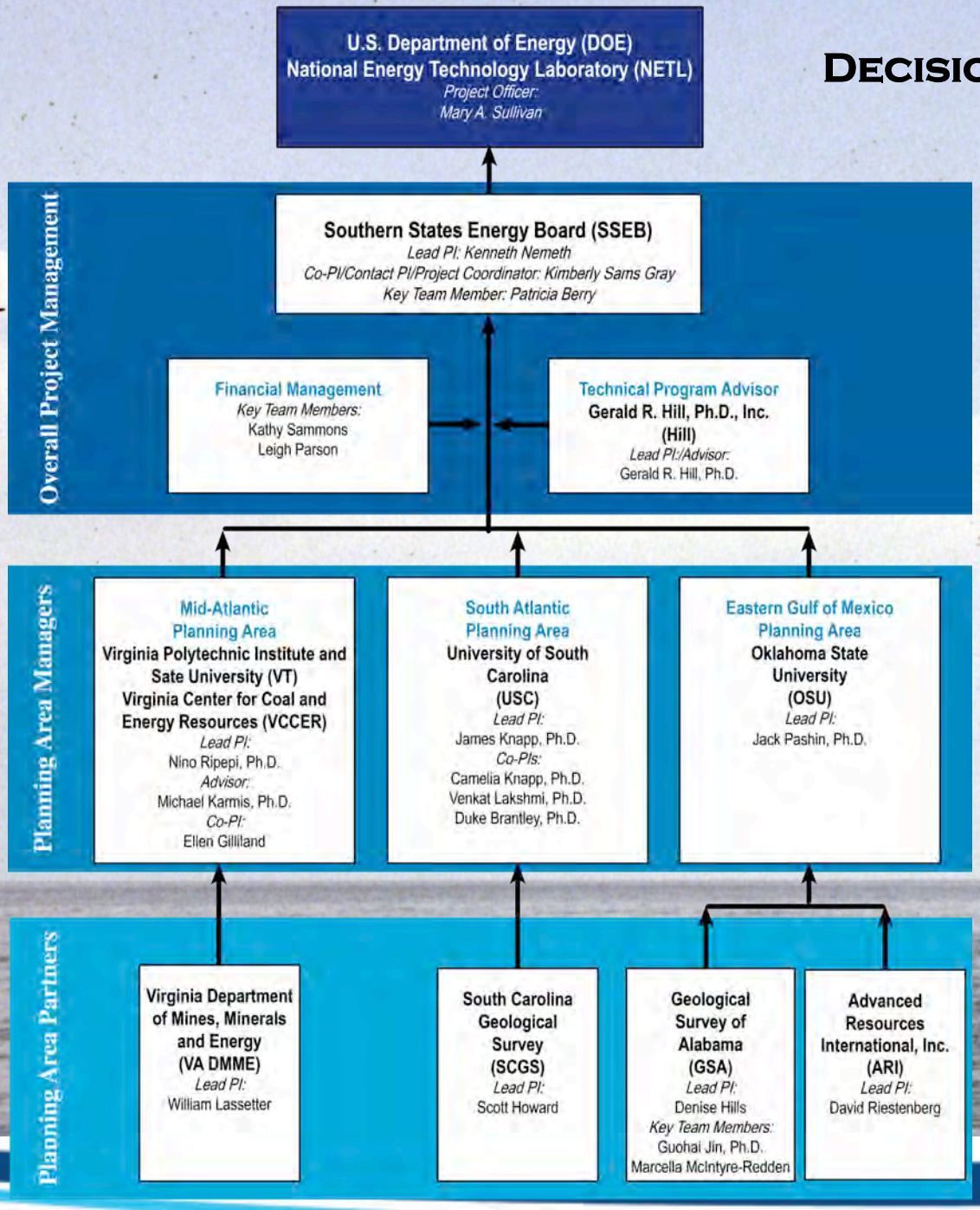
Decision Making & Communications



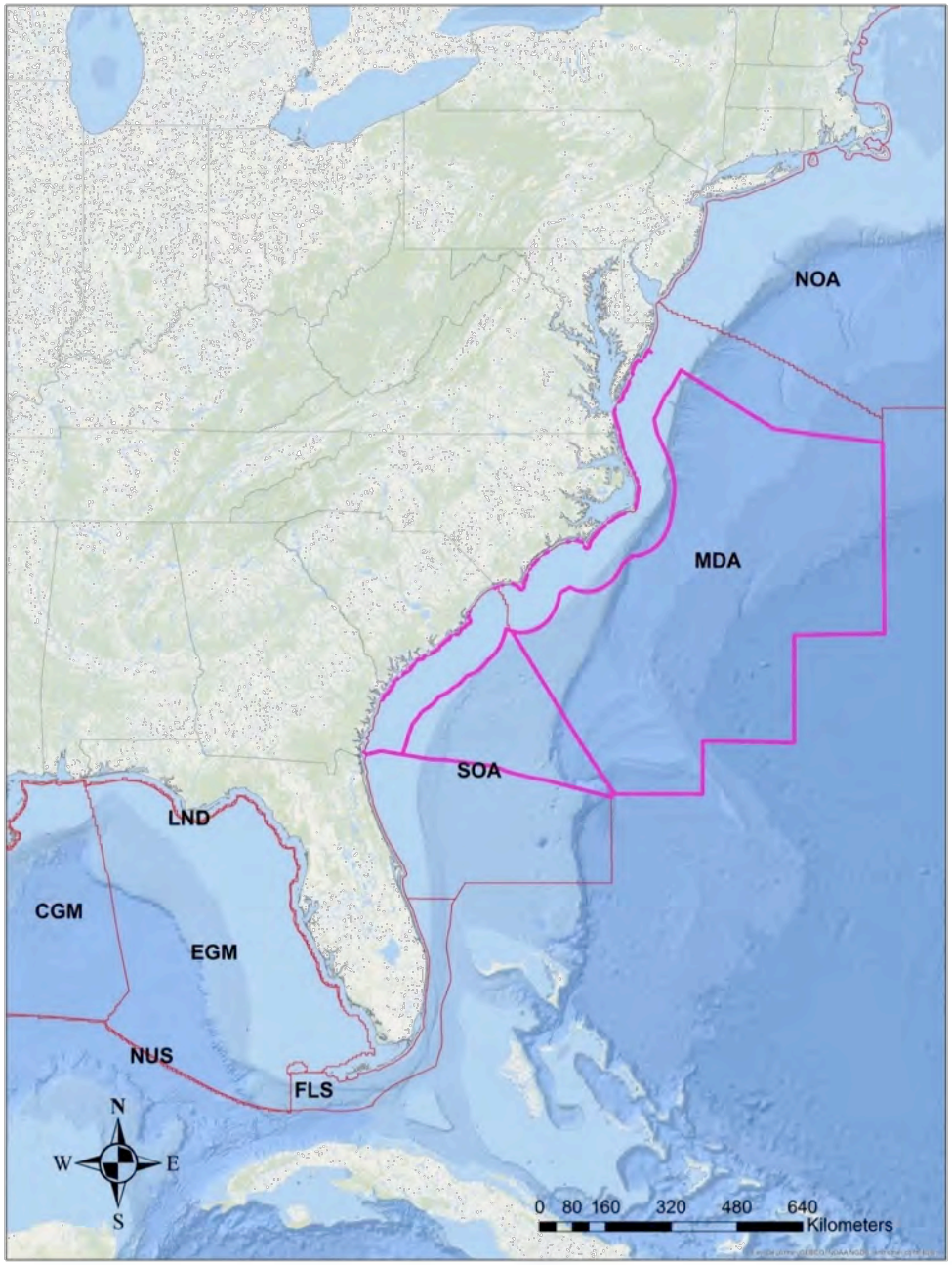
Advisory Committee:
state geological surveys, universities, state oil and gas boards, oil and gas companies, and utilities
(no contract, no decision making authority)

SOSRA Study Area

RED boundary represents the planning areas.

PINK areas are currently under consideration for leasing in the 2017-2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program (DPP).

All of the new area in the January 2015 DPP falls within the SOSRA study area.



http://www.boem.gov/2017-2022-DPP/

Mid-Atlantic

Nino Ripepi, Ph.D.
Virginia Polytechnic Institute and State University

Mid-Atlantic: Team

- ***Virginia Tech***

  Public land-grant university founded in 1872.

- ***VCCER***

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

- ***VA DMME***

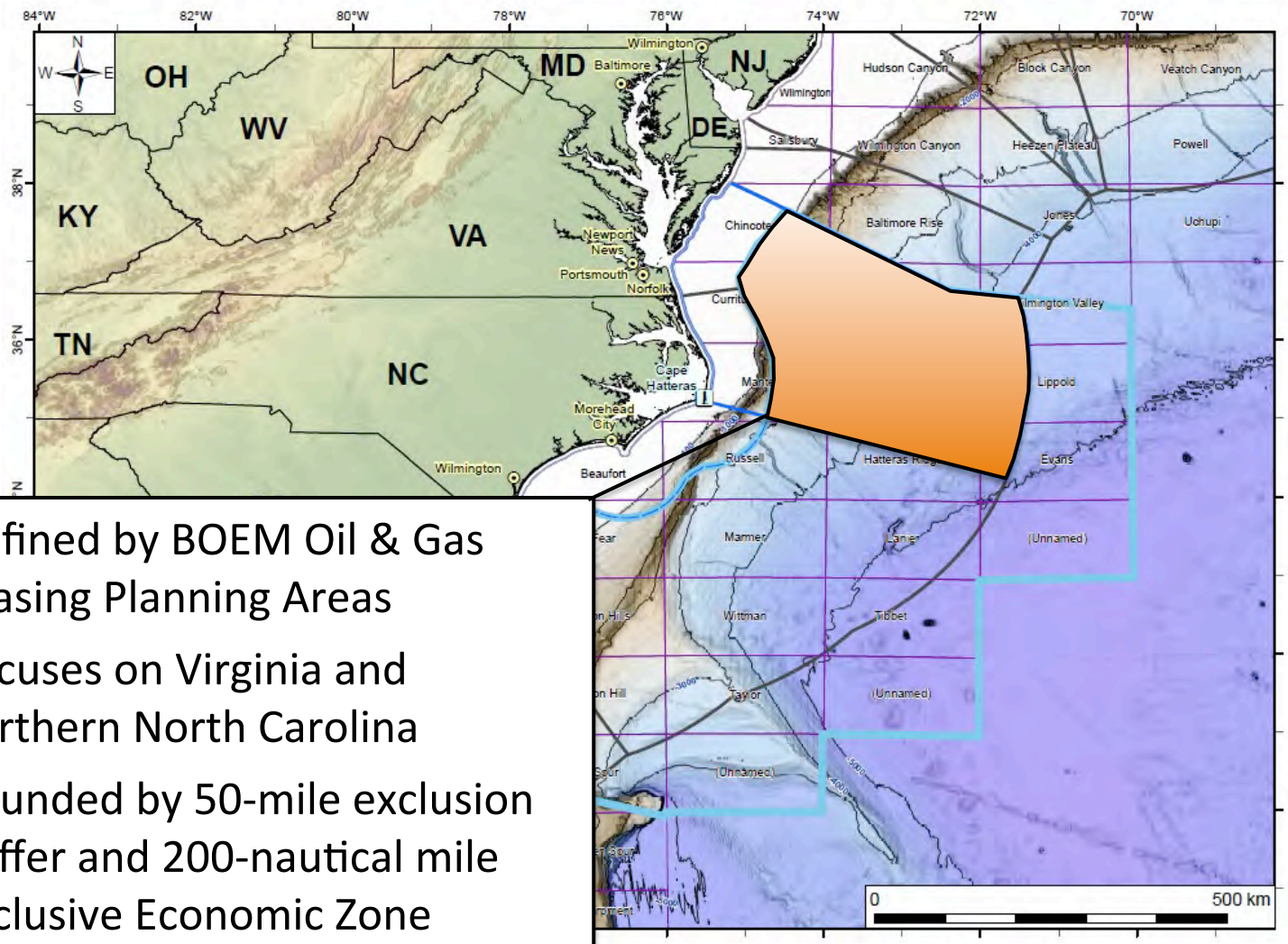
  Virginia agency which houses the state's geological survey and mining, oil, and gas regulatory bodies.

- ***ADVISOR***

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

Virginia Center for Coal and Energy Research

Mid-Atlantic: Study Area



- Defined by BOEM Oil & Gas Leasing Planning Areas
- Focuses on Virginia and northern North Carolina
- Bounded by 50-mile exclusion buffer and 200-nautical mile Exclusive Economic Zone

Current Tasks

- Task 2.0 Geologic Overview
  - Task 3.0 Data Collection

					PHASE I (10/01/2015 to 3/31/2017)					
					BUDGET PERIOD 1 (18 MONTHS)					
					FY2016				FY2	
					Q1	Q2	Q3	Q4	Q1	Q2
					Oct-Dec 2015	Jan-Mar 2016	Apr-Jun 2016	Jul-Sep 2016	Oct-Dec 2016	Jan-Mar 2017
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						

Upcoming Tasks

- Task 3.0 Data Collection
- Task 4.0 Data Analysis

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Upcoming Tasks

- Task 4.0 Data Analysis

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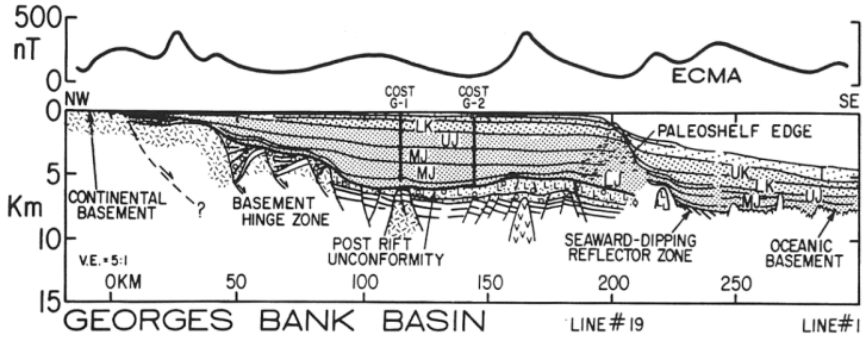
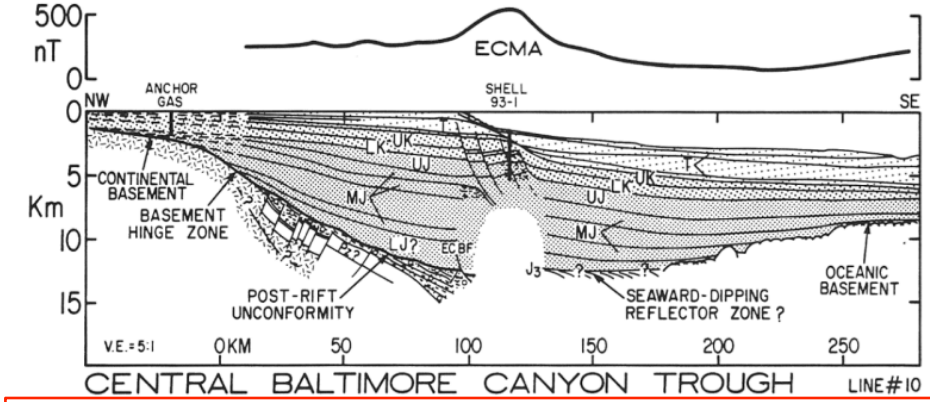
4.3		Well-Seismic Ties	04/01/16	03/31/17						

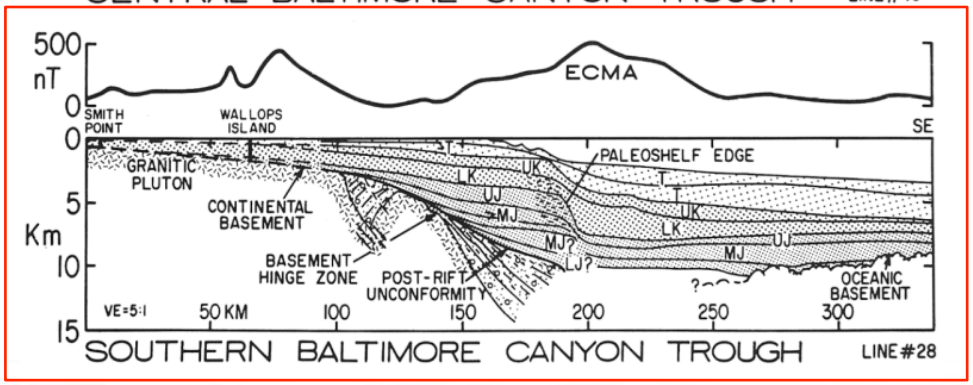
Tasks 2.0-4.0 support key deliverables:

- Initial Geologic Characterization Report
- Comprehensive Project Database
- SOSRA Data Quality and Coverage Evaluation → basis for Go/No-Go Decision Point

Task 2.0: Geologic Overview and Characterization







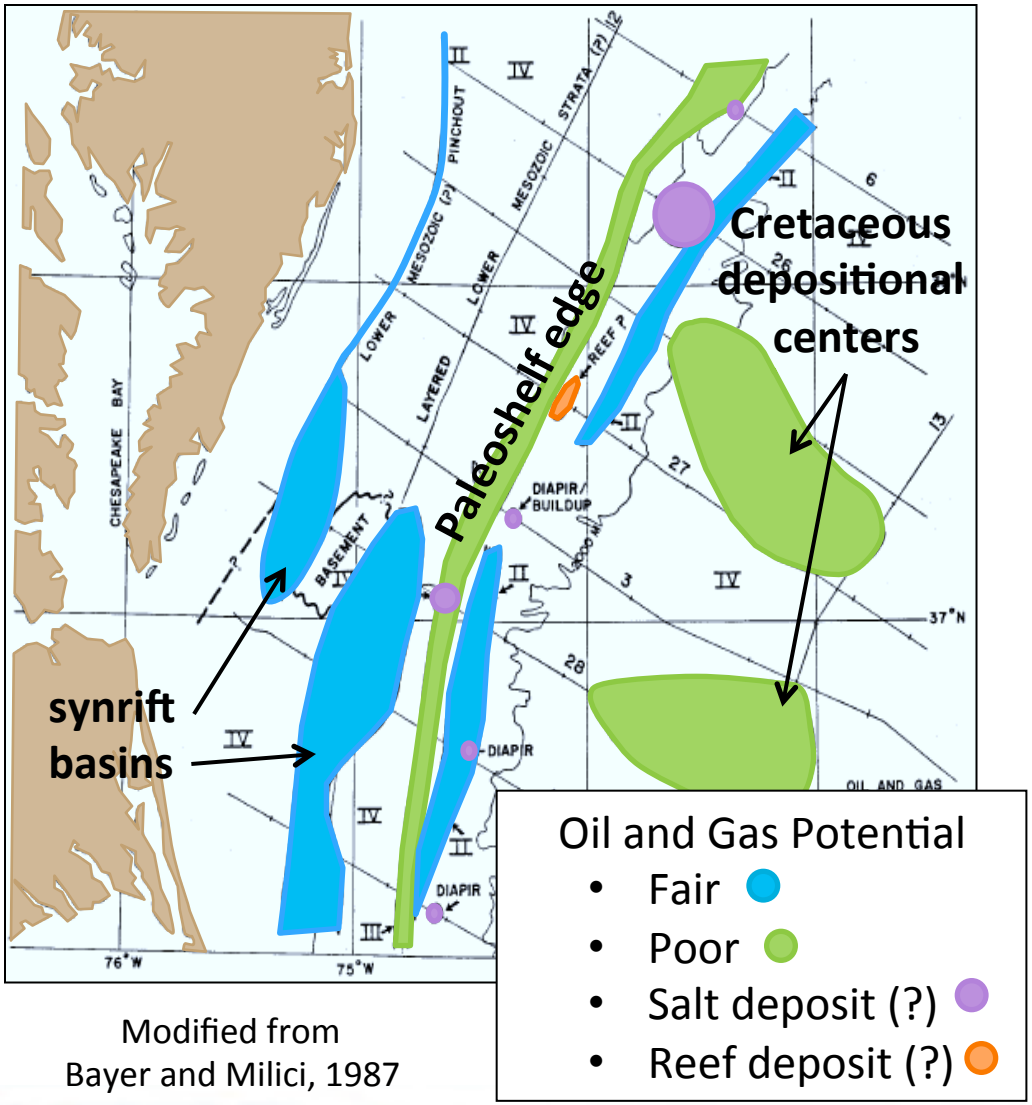
Previous characterization by:

- **K.C. Bayer + R.C. Milici (former Commissioner of Mineral Resources and State Geologist for Virginia)**
- **Fugro Consultants, Inc.**
- **Gulf Coast Carbon Center**

Subcontractors for Task 2.0:

- **DMME + R.C. Milici**
- **Fugro Consultants, Inc.**

Task 2.0: Geologic Overview and Characterization



Modified from
Bayer and Milici, 1987

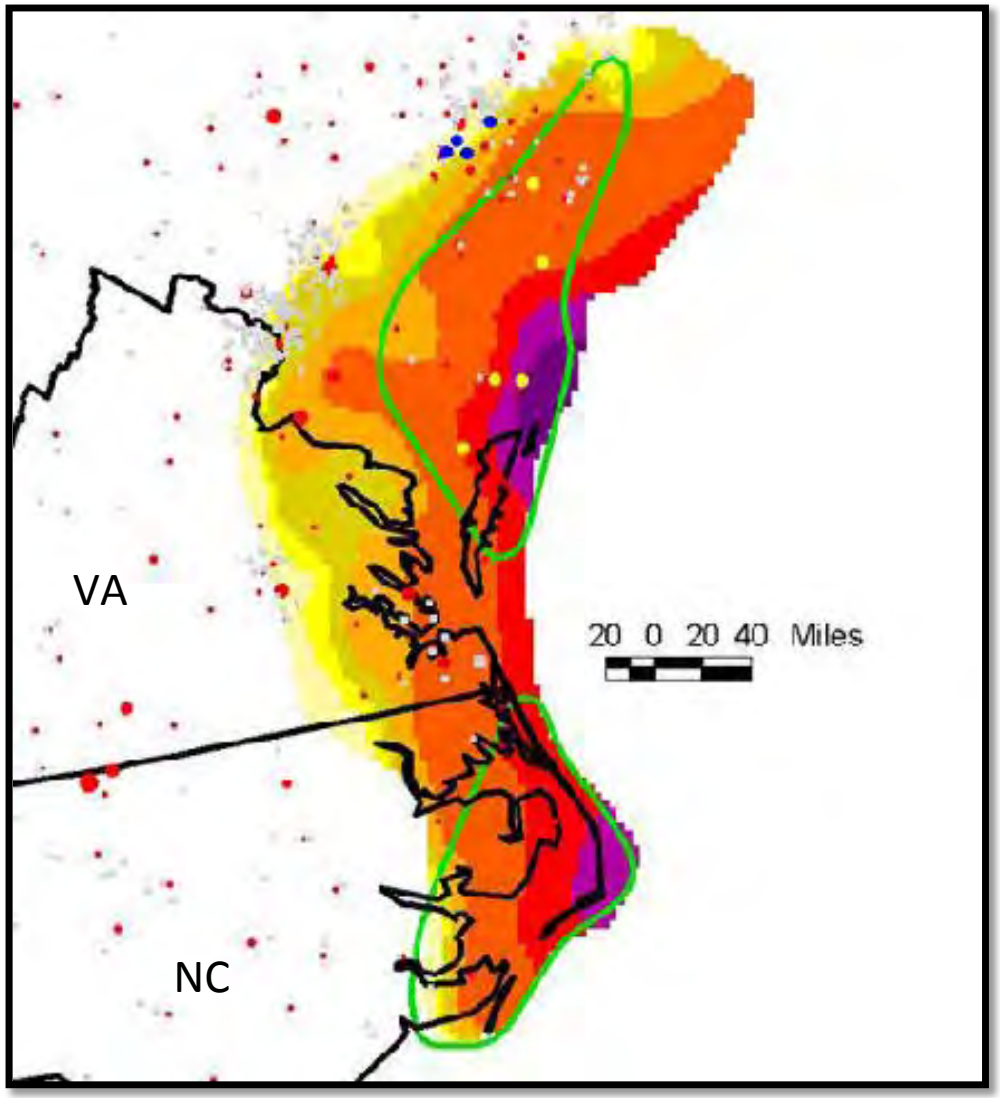
Map of oil and gas potential

- Based on parameters such as: source bed, reservoir rocks, seals and thermal maturation
- 5 of the exploration wells found significant amount of gas:
  - In 3 of the 5 wells, oil condensate was associated with the gas
  - Not enough for commercial production
- Significant uncertainty in structural interpretation

SOSRA-Mid-Atlantic Tasks will:

- refine previous characterization efforts with additional data
- Assess CO_2 storage potential

Task 2.0: Geologic Overview and Characterization



Brine Storage Capacity

- Potomac Aquifer

largest, deepest, and stratigraphically lowest aquifer in VA

- Confining zone is regionally extensive:

not practical to consider the entire aquifer as an injection reservoir

- Dense clay interbeds:

suitable primary seal for a smaller-scale, localized injection zone

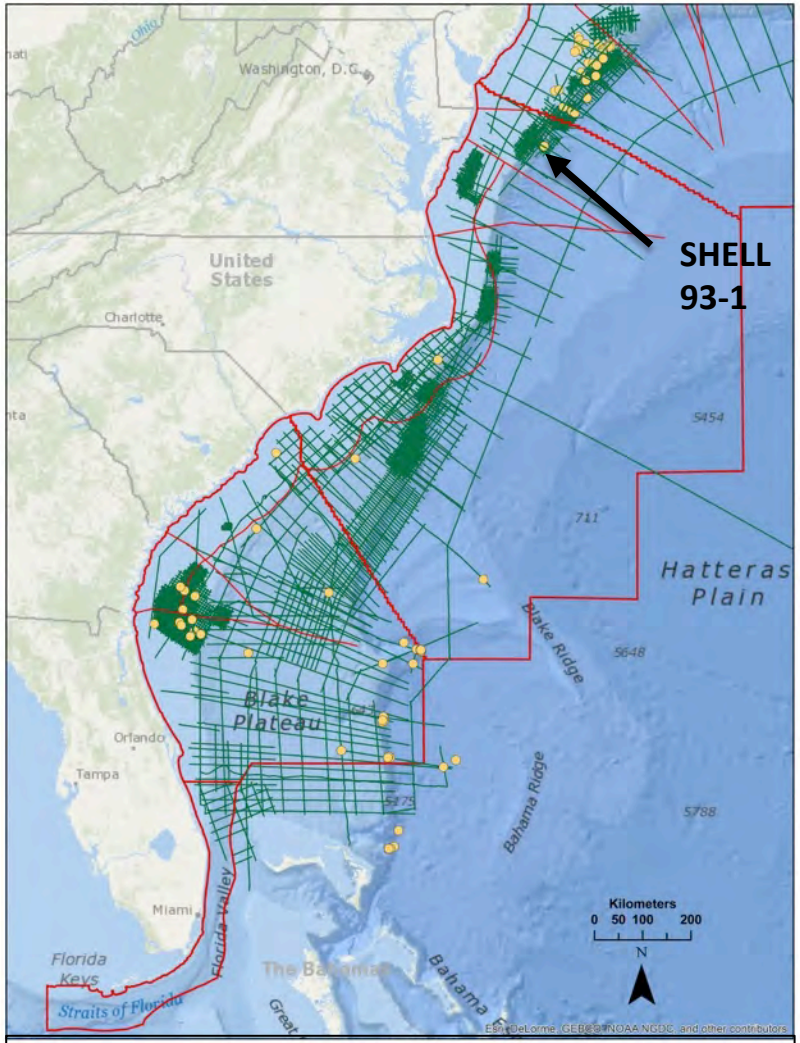
Formation thickness(m)
- 1000-750
- 750-500
- 500-200
- 200-100
- 100-50
- 50-10
- <10
- Adequate Depth

Gulf Coast Carbon Center

http://www.beg.utexas.edu/gccc/forum/codexdownloadpdf.php?ID=54

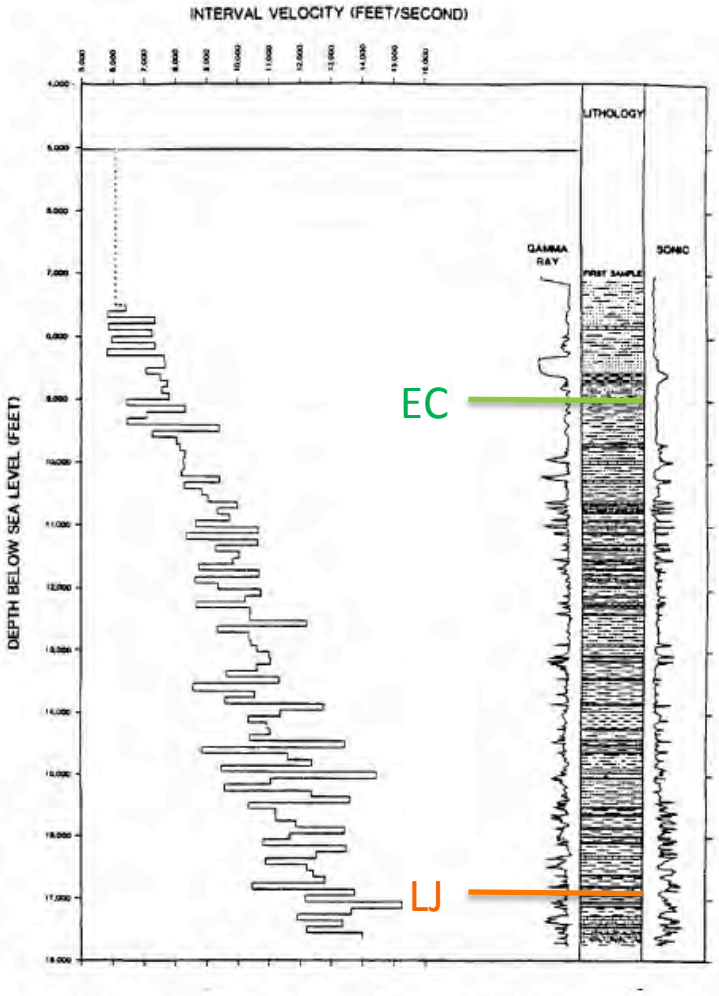
Data Overview

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



Virginia Offshore Oil and Gas Readiness Study, prepared by Fugro Consultants, Inc. for DMME (2015)

Task 3.0: Data Collection



Note: The sonic curve shown above is an edited version of the digital sonic curve available from BOEM/BSEE's Data Center.

INTERVAL VELOCITY, WELL CURVES AND LITHOLOGIC PROFILE, SHELL 93-1 WELL (OFFSHORE MARYLAND)
Oil and Gas Readiness Study
Offshore Virginia

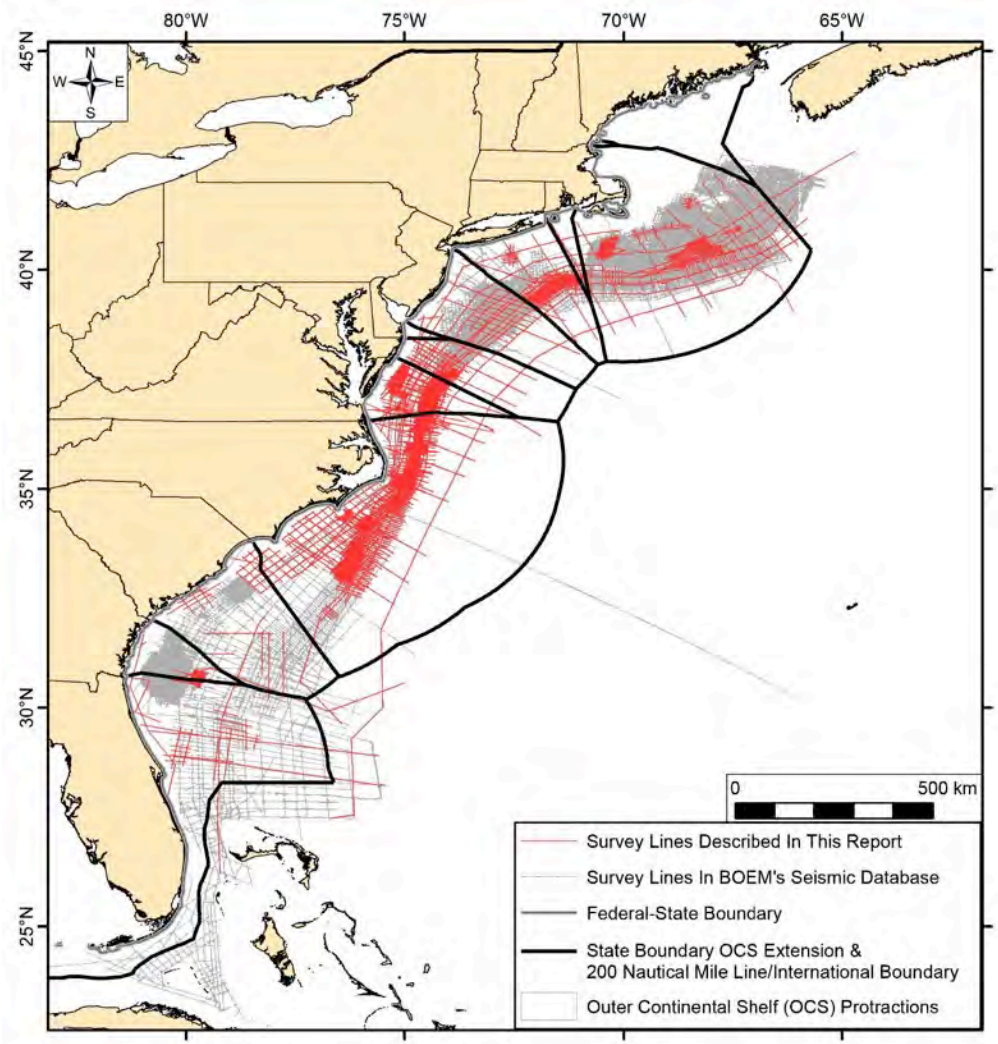
Seismic interval velocity log from Shell 93-1 Well

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
- Target Identified
  - Early Cretaceous
  - Late Jurassic

Potential hydrocarbon intervals thin

Task 3.0: Data Collection



Seismic Data

Previous research of 2D Multichannel seismic data

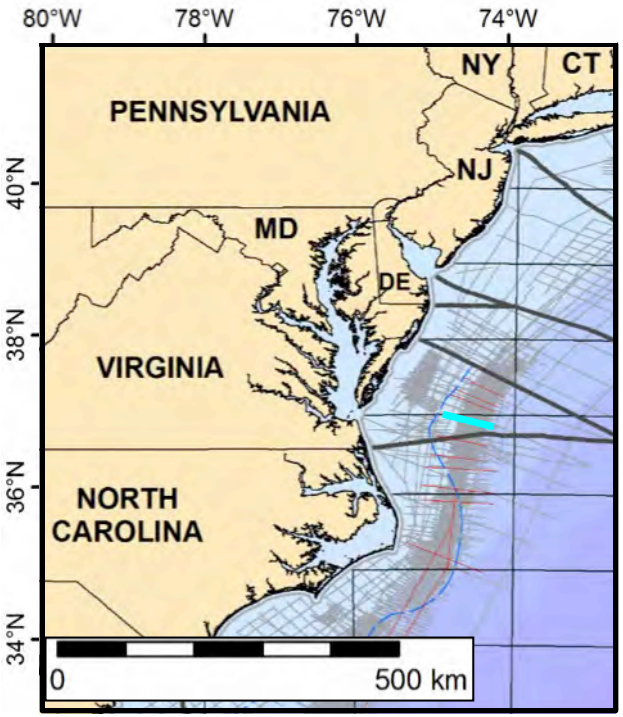
- 19 different seismic surveys
- Summary sheets available for all (seismic trackline maps, list of field parameters)

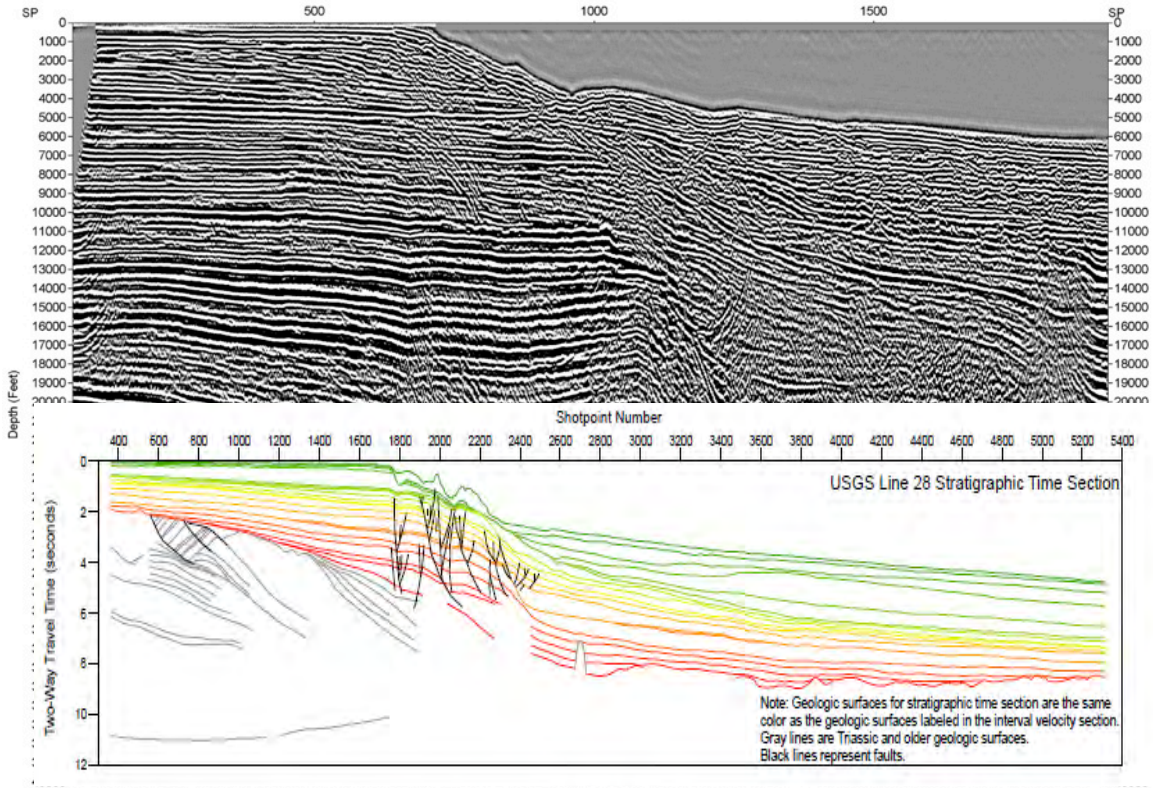
Density of seismic coverage depends on the area's geological structure

- Complex (near modern shelf break): Dense grid of seismic grid required
- Less complex (distal continental slope): less data is needed

Task 3.0: Data Collection

Line 18074 (Shell): Cross section of shelf structure





Seismic depth section

- 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

Planned Activities for early next Quarter:

- **Meetings with Mid-Atlantic subcontractors, DMME and Fugro to select seismic lines for interpretation based on Quality and Coverage Assessment**

- **Strategic planning meeting of Mid-Atlantic and South-Atlantic teams to address overlap and processing**