Virginia Commission on Energy and Environment
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Practical Concerns with Planning for the Potential Development of Oil and Gas Offshore of Virginia

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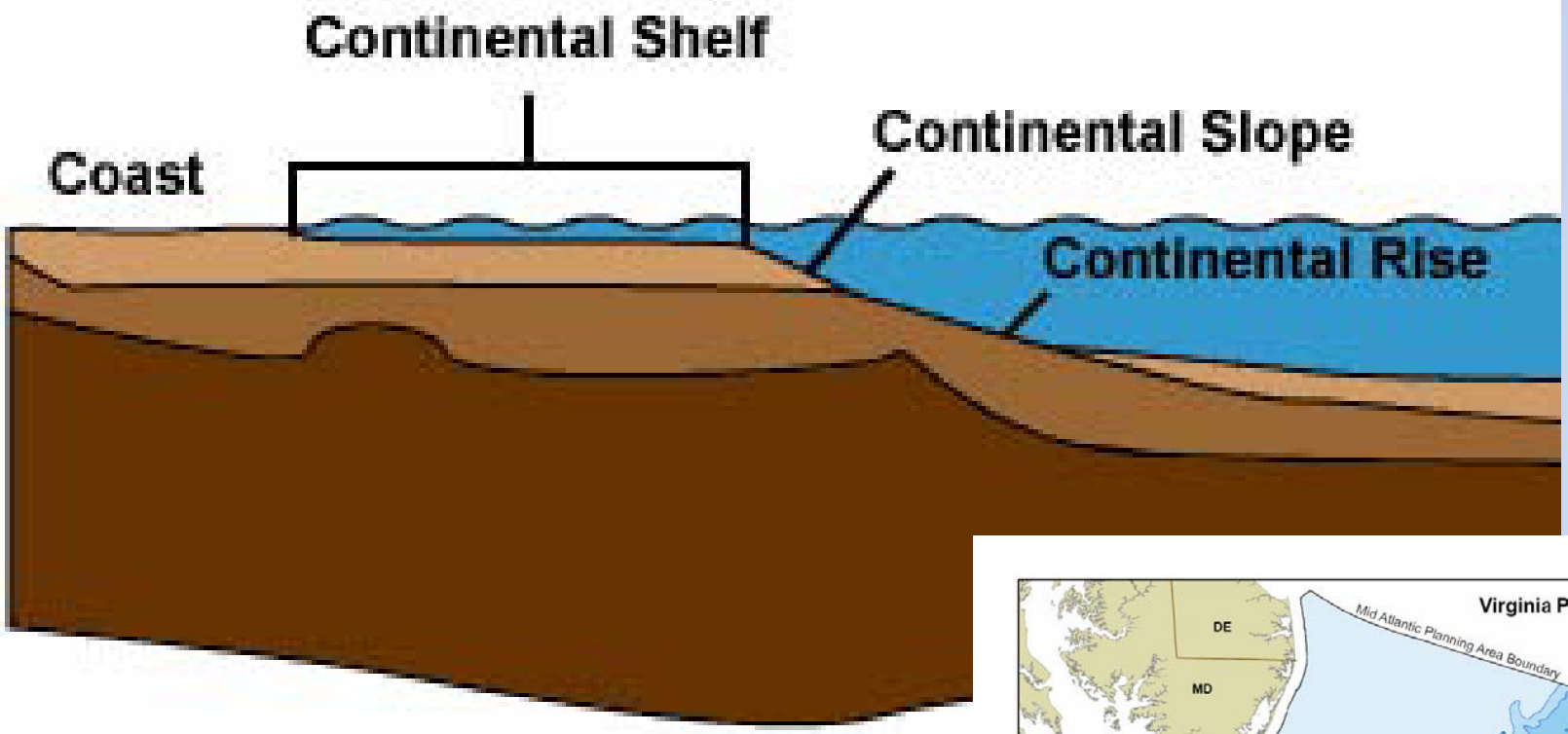


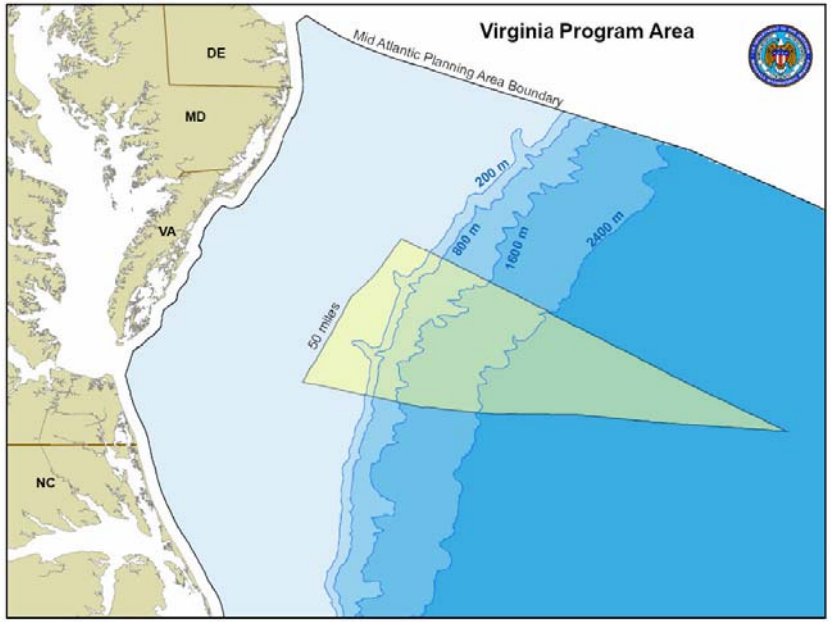


Figure 1 from Virginia House Document No. 22, 2006
(Citing http://www.onr.navy.mil/focus/ocean/regions/oceanfloor2.htm)
http://leg2.state.va.us/dls/h&sdocs.nsf/By+Year/HD222006/$file?HD22.pdf

DEFINITIONS

Outer Continental Shelf – 3 nautical miles (~5 km) to 200 nautical miles (370 km) offshore. Generally synonymous with the Exclusive Economic Zone (EEZ). Managed by the U. S. Government

Inner Continental Shelf –inshore of 3 n mi. Managed by the state.

The basics of petroleum geology

Live, organic material in the ocean dies and settles to the sea floor where it is buried.

With continued burial and time, pressure and temperature rise.

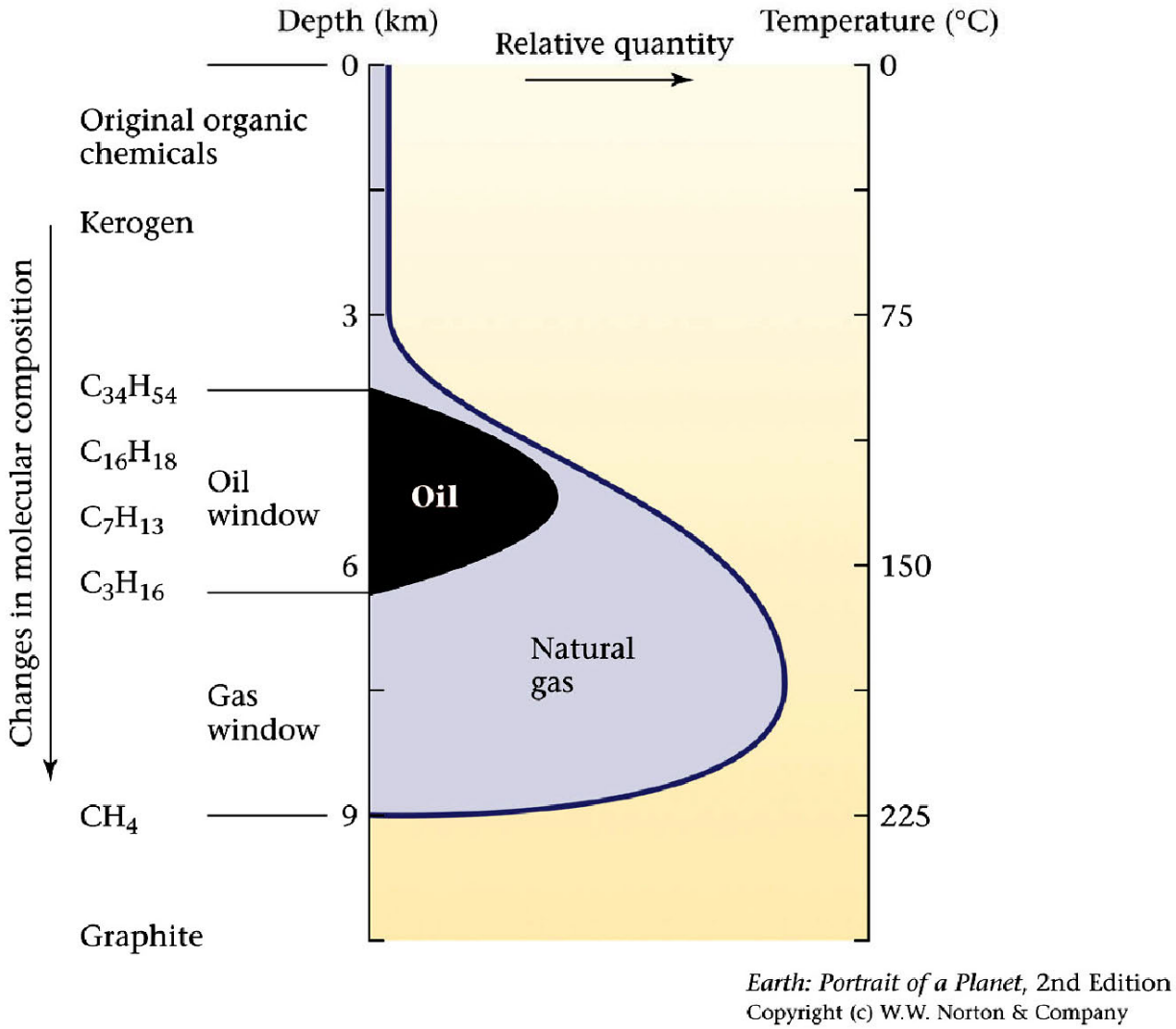
The organic matter changes to kerogen, a precursor of petroleum.

Because oil is lighter than water, it tries to rise within the sediments in which it has formed.

This requires that the sedimentary strata be porous (have “holes”) and be permeable (connections among the holes).

For the petroleum to accumulate, there most be something to stop (cap) the upward flow and a place where the accumulation can occur (trap).

The petroleum still must be found, recovered, transported, and refined.



Temperature
Pressure
Time
Catalysts

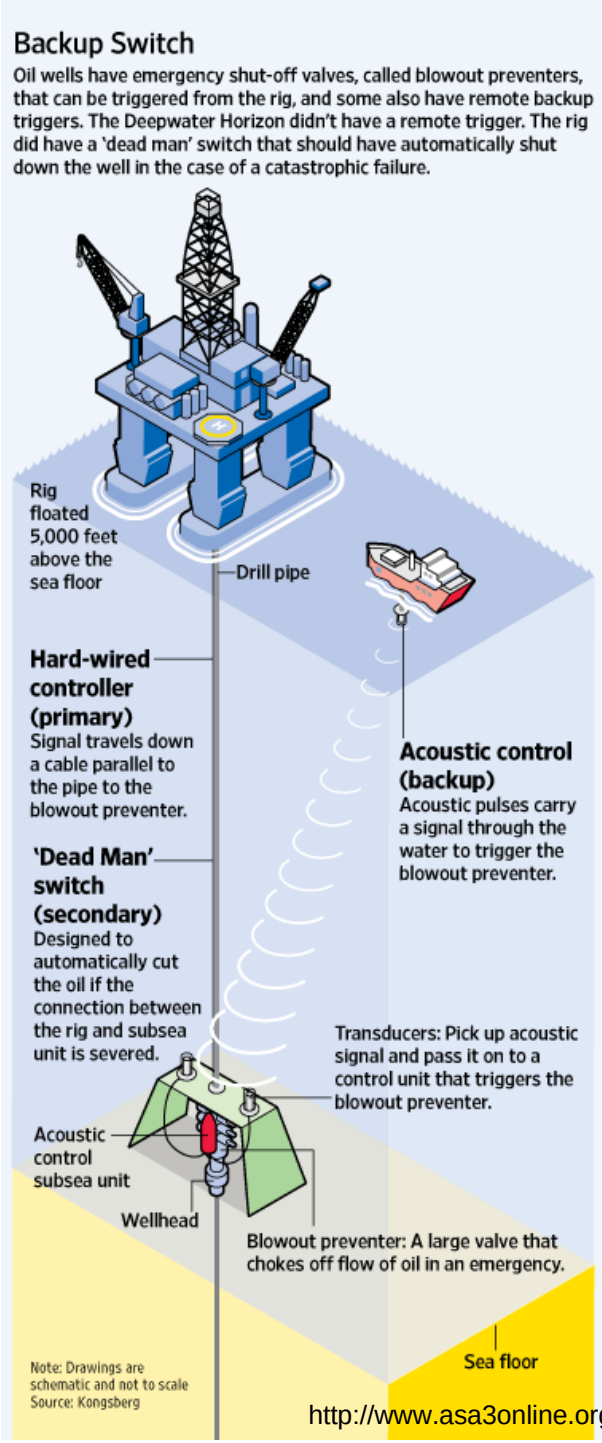
Burial and heating for tens of millions of years

Higher heat or pressure can shorten time to maturity

Think of the different types of coal – peat, bituminous (soft) coal, and anthricite.

Must be heated to 100° to 160° C (210° to 320° F) for oil to form.
This usually requires burial of 4 to 6 km (13,000 to 20,000 ft)

Deepwater Drilling

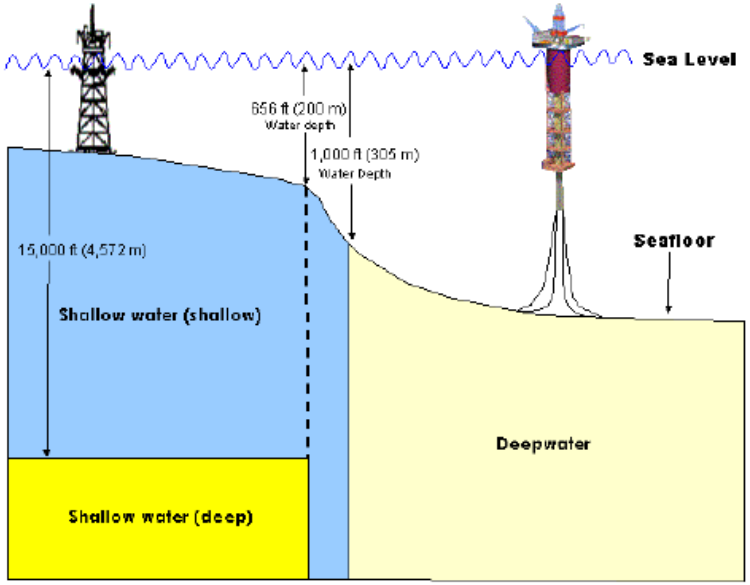


http://www.oilrig-photos.com/picture/number1932.asp

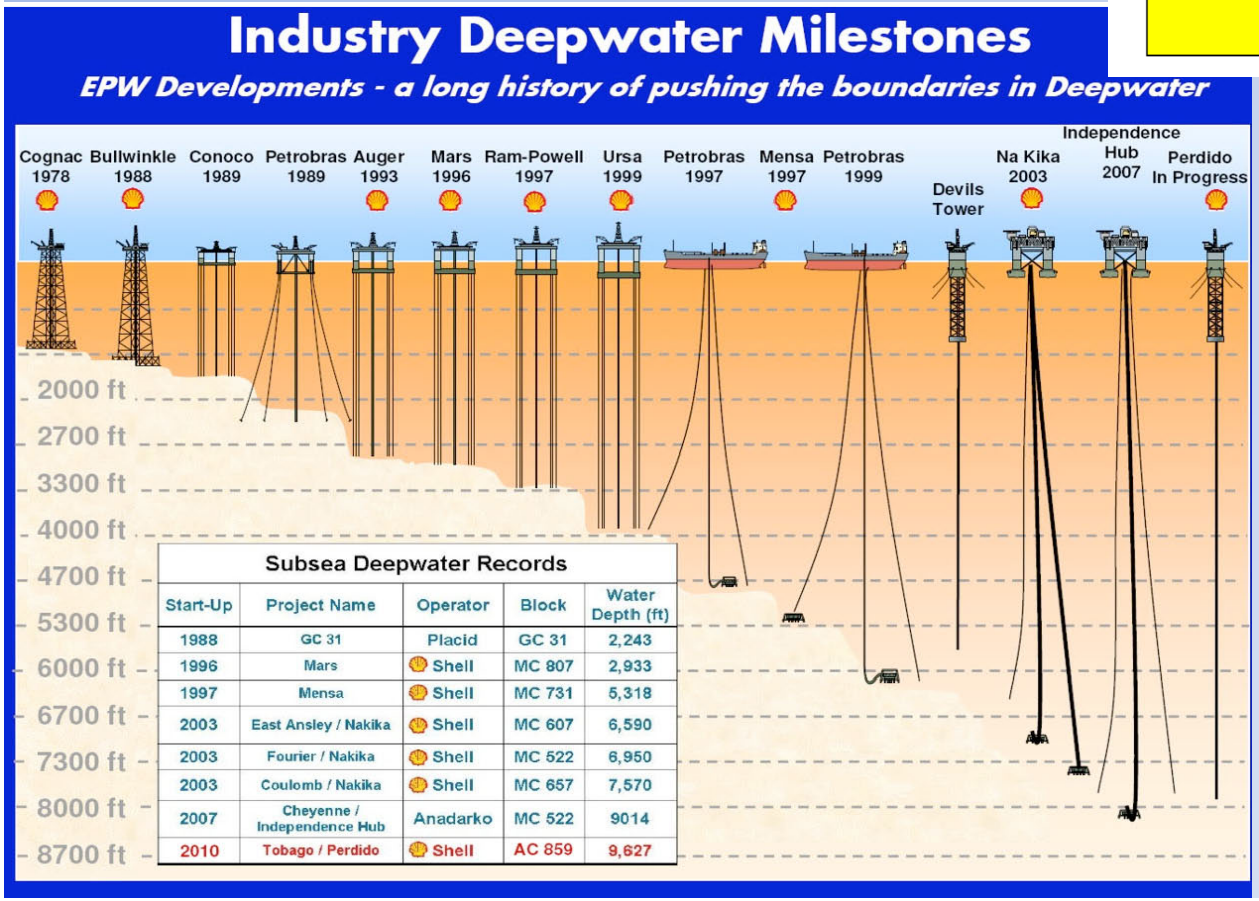
http://www.asa3online.org/Voices/2010/05/04/the-deepwater-horizon-disaster/comment-page-2/

Offshore Drilling and Production

Started on shore, moved across marshes into shallow offshore, then further offshore but still built on the sea floor, then floating but tethered, then fully floating with dynamic positioning



http://www.wikinvest.com/image/GOM_Deepwater_Diagram.png



Subsea Deepwater Records

Start-Up	Project Name	Operator	Block	Water Depth (ft)
1988	GC 31	Placid	GC 31	2,243
1996	Mars	Shell	MC 807	2,933
1997	Mensa	Shell	MC 731	5,318
2003	East Ansley / Nakika	Shell	MC 607	6,590
2003	Fourier / Nakika	Shell	MC 522	6,950
2003	Coulomb / Nakika	Shell	MC 657	7,570
2007	Cheyenne / Independence Hub	Anadarko	MC 522	9014
2010	Tobago / Perdido	Shell	AC 859	9,627

Deep Water Oil & Gas Wells

MMS classifies wells in 1000 ft (305 m) as deep water. Some agencies use other depths. Ultra deep is greater than 5000 ft of water. Does not consider length below the sea floor.

Independence Hub

Departing shipyard in Singapore, May 2006

Lease costs can be $1,000,000 per day

Drill rigs and production platforms/hubs used offshore of Virginia likely would be towed from the Gulf Coast, offshore of Nigeria, or from shipyards in the Baltic (Poland, Latvia).

It is likely that crews would be flown in from the Gulf of Mexico for ~2 week tours.

If there is enough product to continue development, it must be brought ashore

Submarine pipelines cost about $8 million per mile

Or it could be shipped/lightered to shore.

Outer Continental Shelf Regulatory & Environmental Review

1: Develop 5-year program
30 – 36 months

2: Plan for Specific Sale
12 – 14 months (42 to 50 months) – Leases Issues

3: Exploration Plan Approval
3 – 6 months (45 to 56 months) – Exploration Drilling Starts

4a: Development and Coordination Document Approval
4 – 8 months (49 to 64 (67) months) -- Development Drilling Starts
(affected states can request an additional 3 months)

4b: Development and Production Plan Approval
12 – 18 months (61 to 82 (85) months) –
Production Well Application

5: Drilling Begins - 5 to 7 years after start.

Past Lease Activity in the Mid-Atlantic Region

10 Oil and Gas Lease Sales 1978 – 1983

410 Leases

The Last 8 Leases Relinquished in 2000

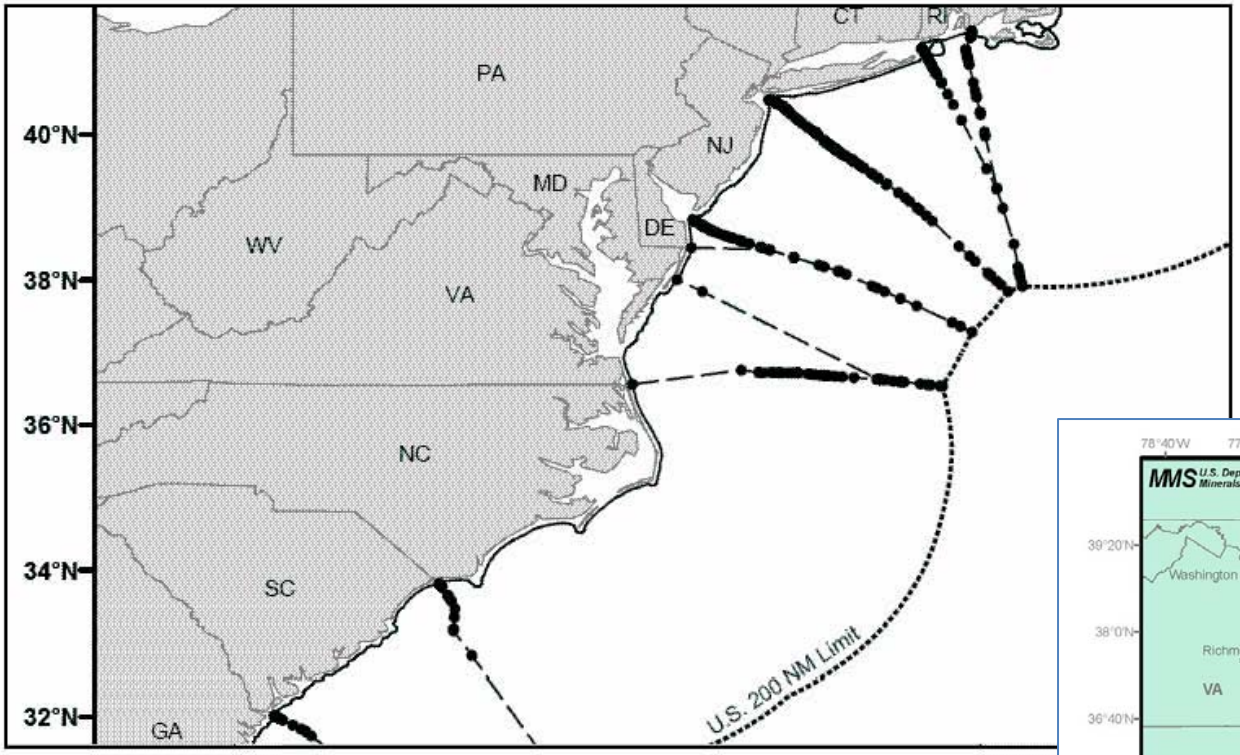
Only 1 Virginia Lease, It Was Not Drilled

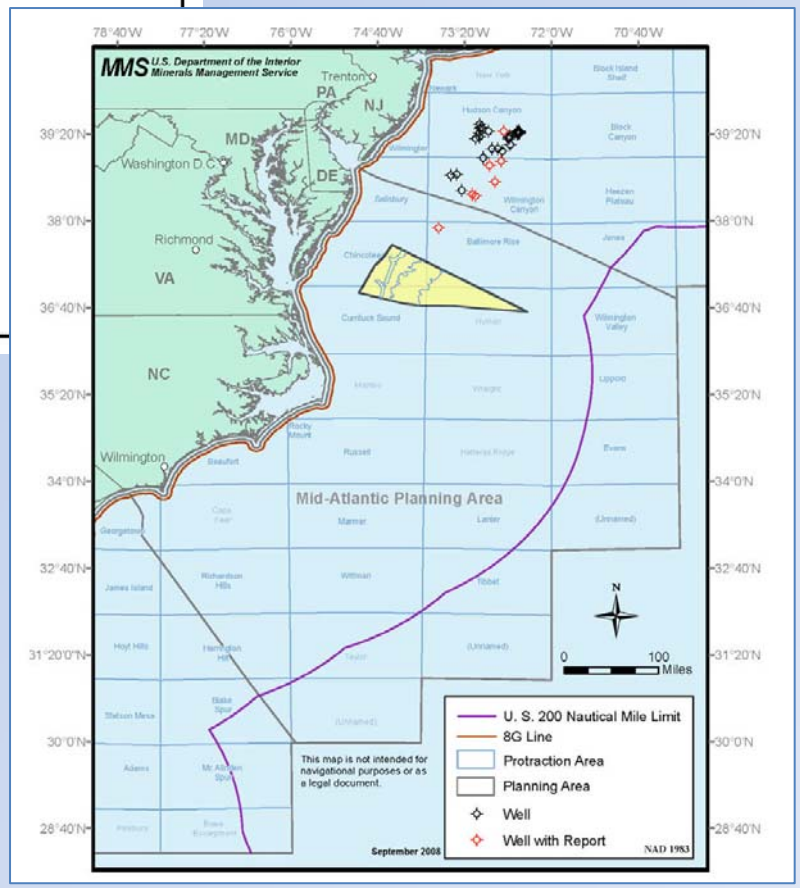
Summary of Activities for Offshore Petroleum

Seismic acquisition
Lease sale
Exploratory drilling and seismic surveys
Shallow hazard survey
Environmental and development drilling
Platform/Pipeline construction and installation
On shore facilities construction
Production
Decommissioning

http://www.jamaicaobserver.com/news/html/20060225T190000-0500_99510_OBS_ONBOARD_THE_OIL_EXPLORATION_SHIP_.asp

http://www.glossary.oilfield.slb.com/DisplayImage.cfm?ID=215



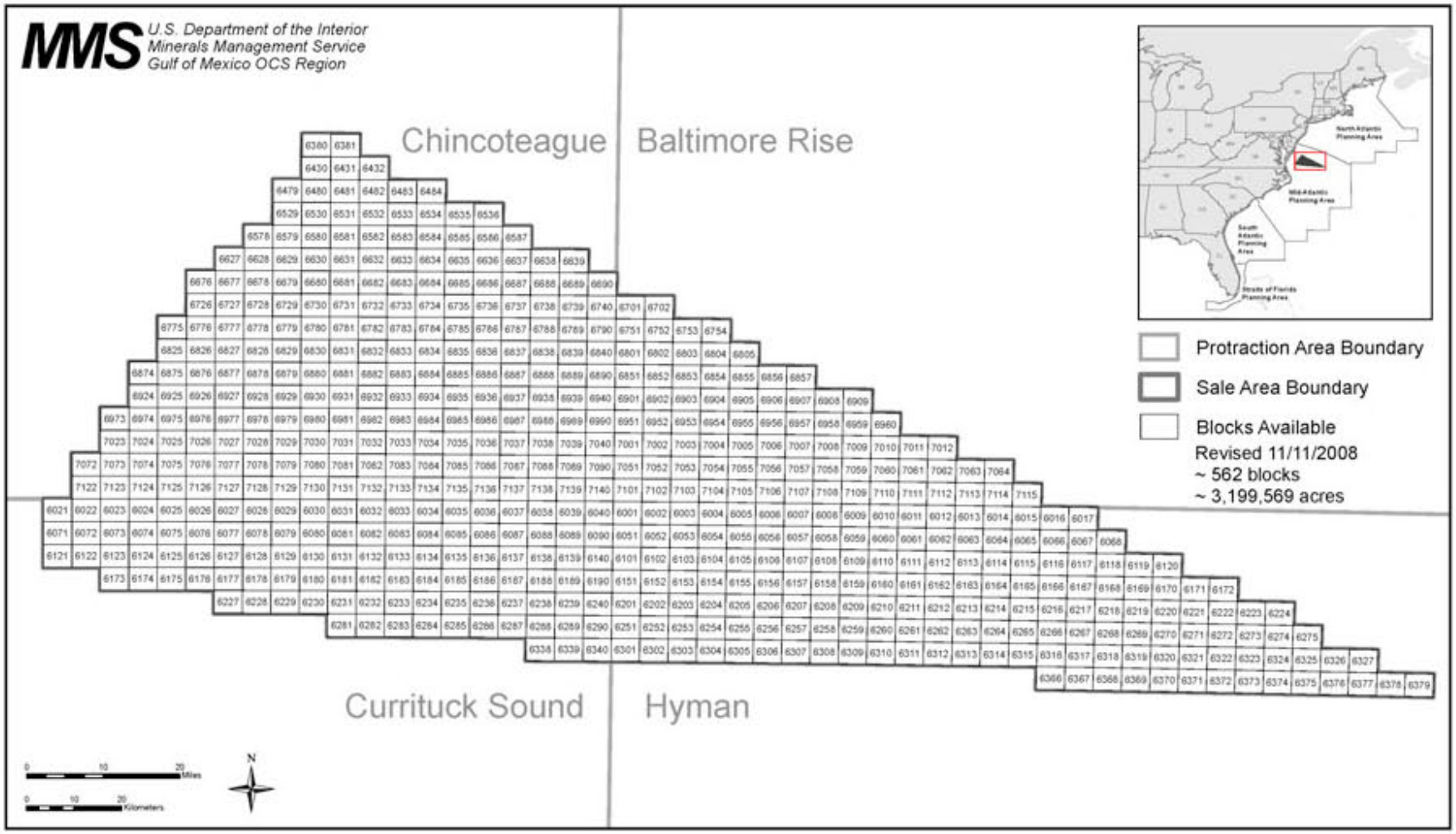


Federal Register, v. 71, n. 11, pp 127-131, Jan 3, 2006

Royalties for production from beneath federal waters (more than 3 n mi offshore) go to the federal government not to the states, unless authorized by an act of Congress.

Many people now expect stricter regulations that would be more strictly enforced should there be activity in new areas.

Lease Blocks in the Virginia area



Recent estimates indicate off-shore oil reserves may produce from 130 million to 2 billion barrels of oil (1 to 14 years of Virginia's needs) and 1.14 to 36 trillion cubic feet of natural gas (3.6 to 100 years of Virginia's needs)

Schnare, D., 2009. Virginia Off-Shore Oil and Gas ~ Fact and Fiction. Thomas Jefferson Institute for Public Policy.

Petroleum use in the United States for 2008

7,136,255,000 bbls per year of petroleum
19,498,000 bbls per day of petroleum

23,200 billion ft^3 per year of natural gas
64 billion ft^3 per day of natural gas

Estimates for offshore Virginia

130 million to 2 billion bbls of petroleum
1.14 to 36 trillion ft^3 of natural gas

So .. The offshore Virginia resource may provide the U.S with
6.7 to 103 days of petroleum
17.8 to 562 days of natural gas
(if I haven't lost any zeros)

Remember: Whatever might be produced offshore of Virginia goes into "world market" and is not reserved for local or domestic use.

Oil and Gas Potential from Seismically Delineated Structures and Stratigraphic Traps, Offshore Virginia

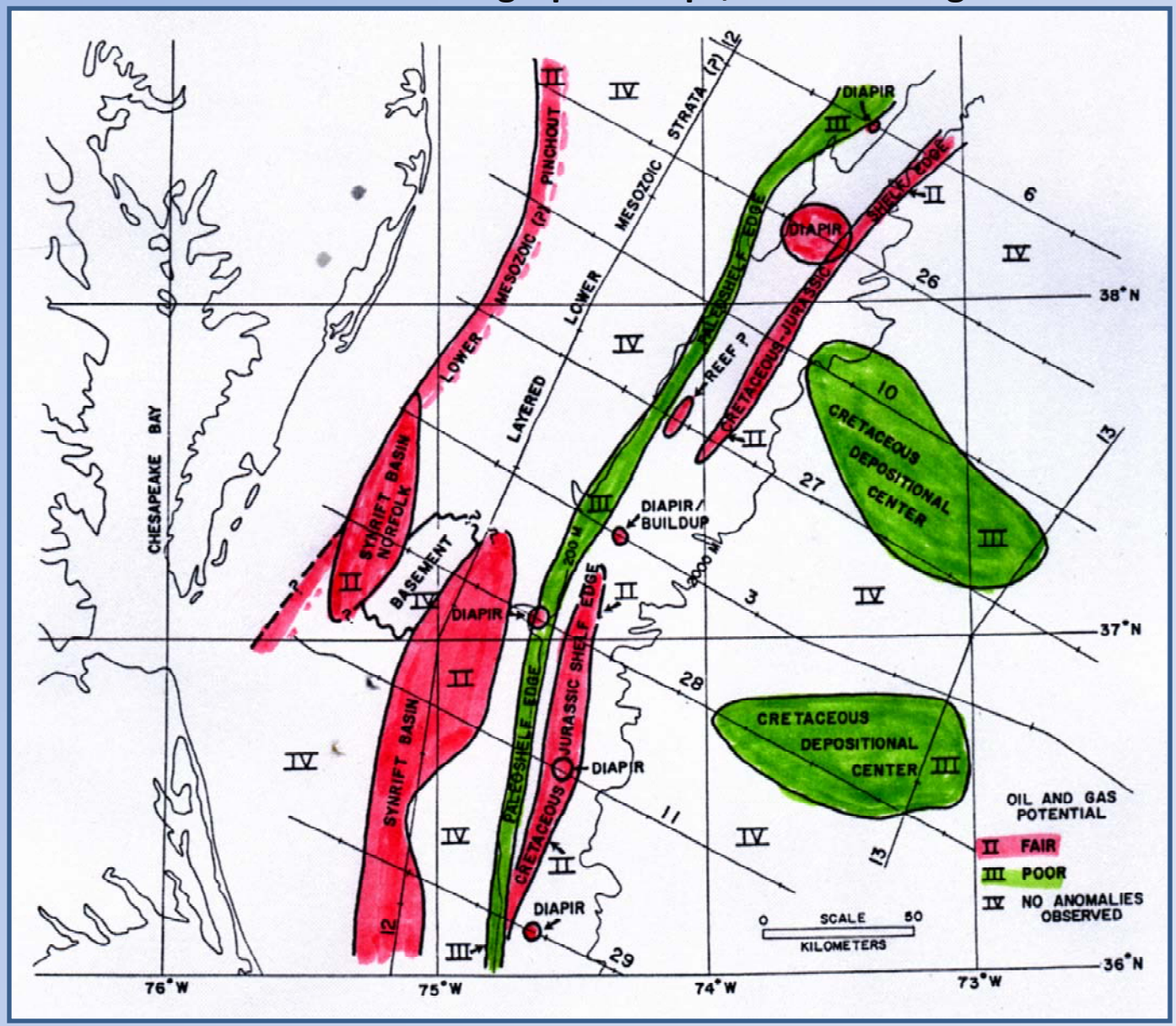
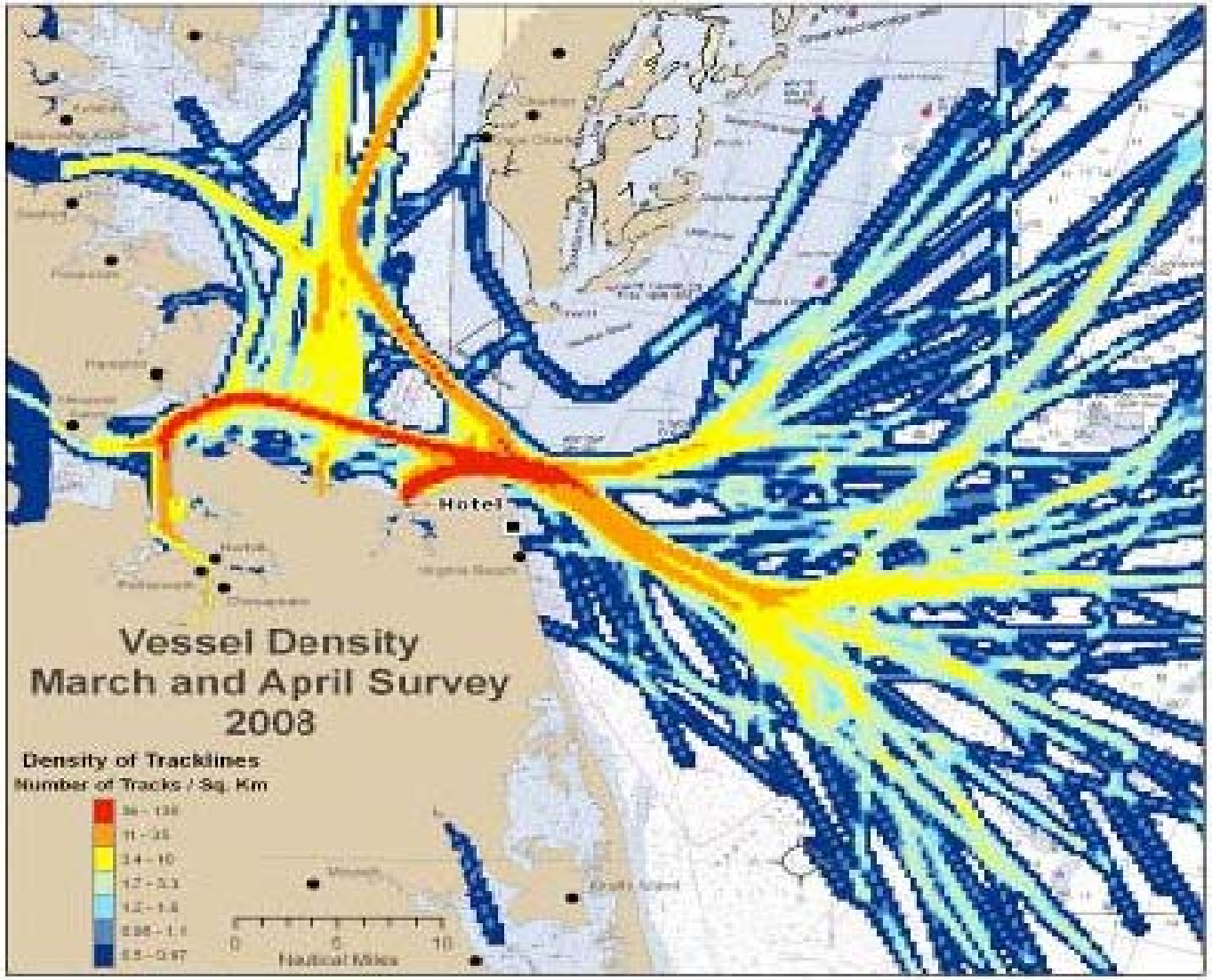


Figure 5 from Bayer, K.C. and R.C. Milici, 1987. Geology and Petroleum Potential of Mesozoic and Cenozoic Rocks, Offshore Virginia. Virginia Division of Mineral Resources Publication 73, Part D, 111p.



From Diaz, R.J. et al., 2009. Workshop on Environmental Research Needs in Support of Potential Virginia Offshore Oil and Gas Activities. OCS Sudy, MMS 2009-011.

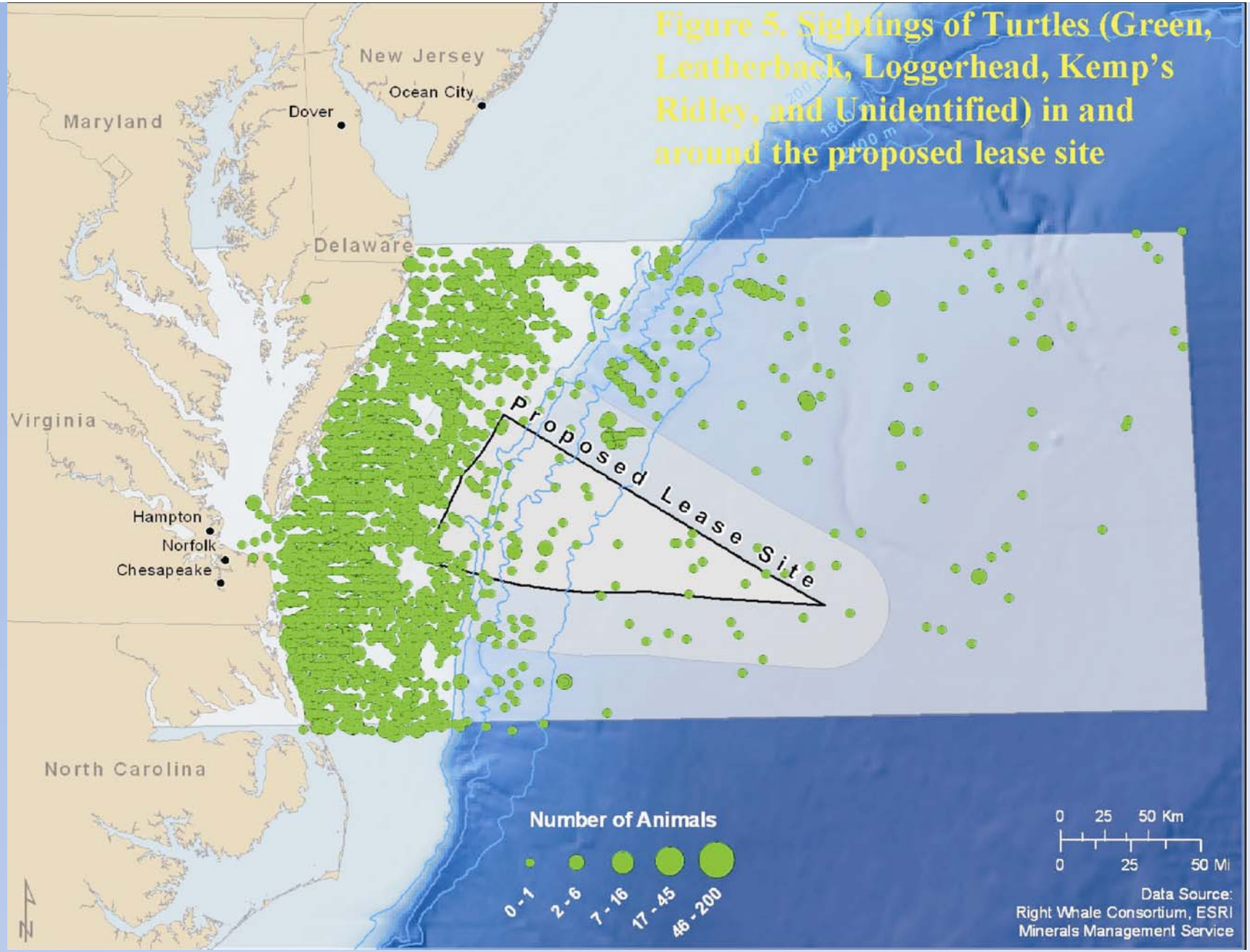


Figure 5. Sightings of Turtles (Green, Leatherback, Loggerhead, Kemp's Ridley, and Unidentified) in and around the proposed lease site

From : Kraus, S. D., 2009. Protected and endangered species. In – Diaz, R.J., et. al., Workshop on Environmental Research Needs in Support of Potential Virginia Oil and Gas Activities, OCS Study MMS 2009-011, Minerals Management Service

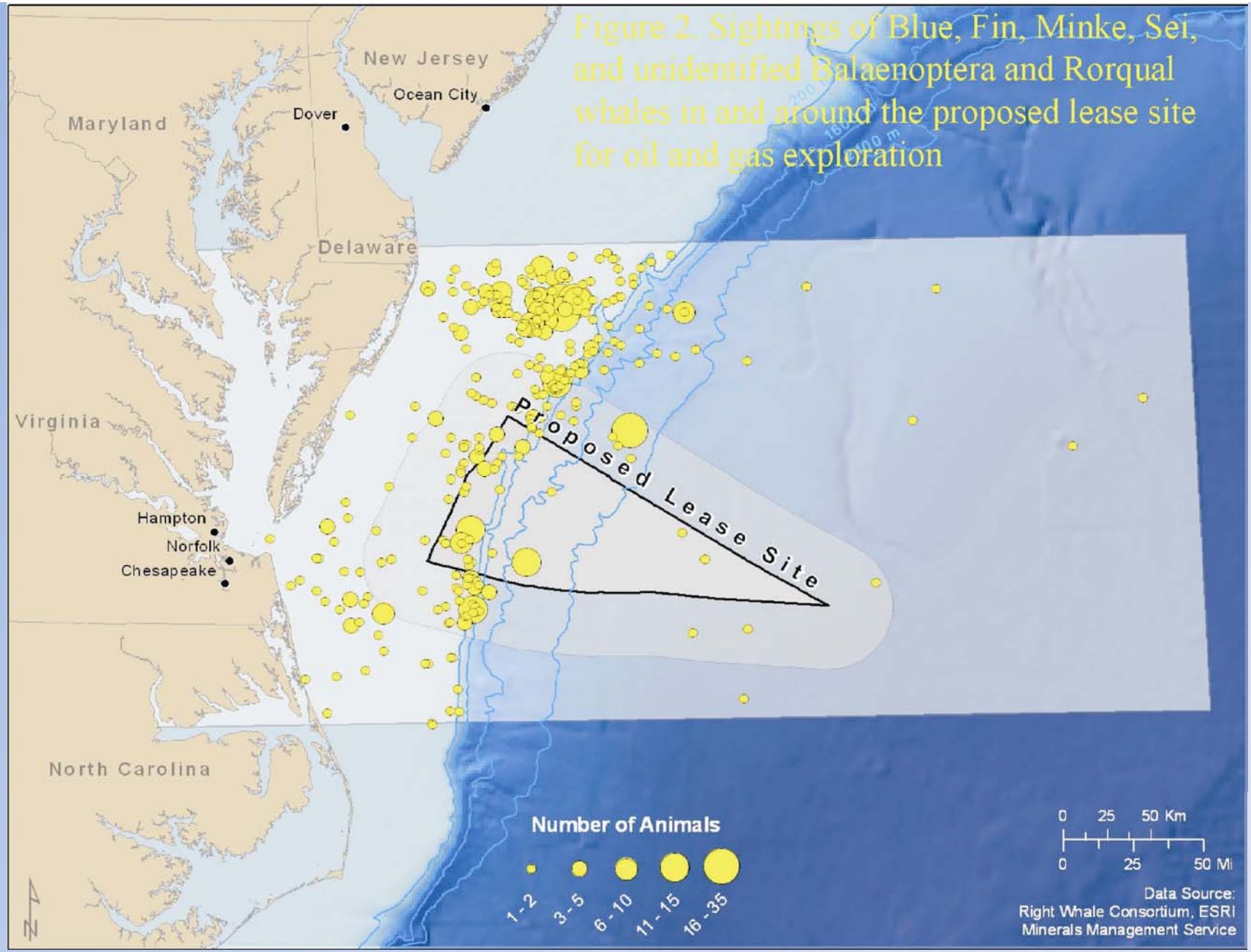


Figure 2. Sightings of Blue, Fin, Minke, Sei, and unidentified Balaenoptera and Rorqual whales in and around the proposed lease site for oil and gas exploration

From : Kraus, S. D., 2009. Protected and endangered species. In – Diaz, R.J., et. al., Workshop on Environmental Research Needs in Support of Potential Virginia Oil and Gas Activities, OCS Study MMS 2009-011, Minerals Management Service

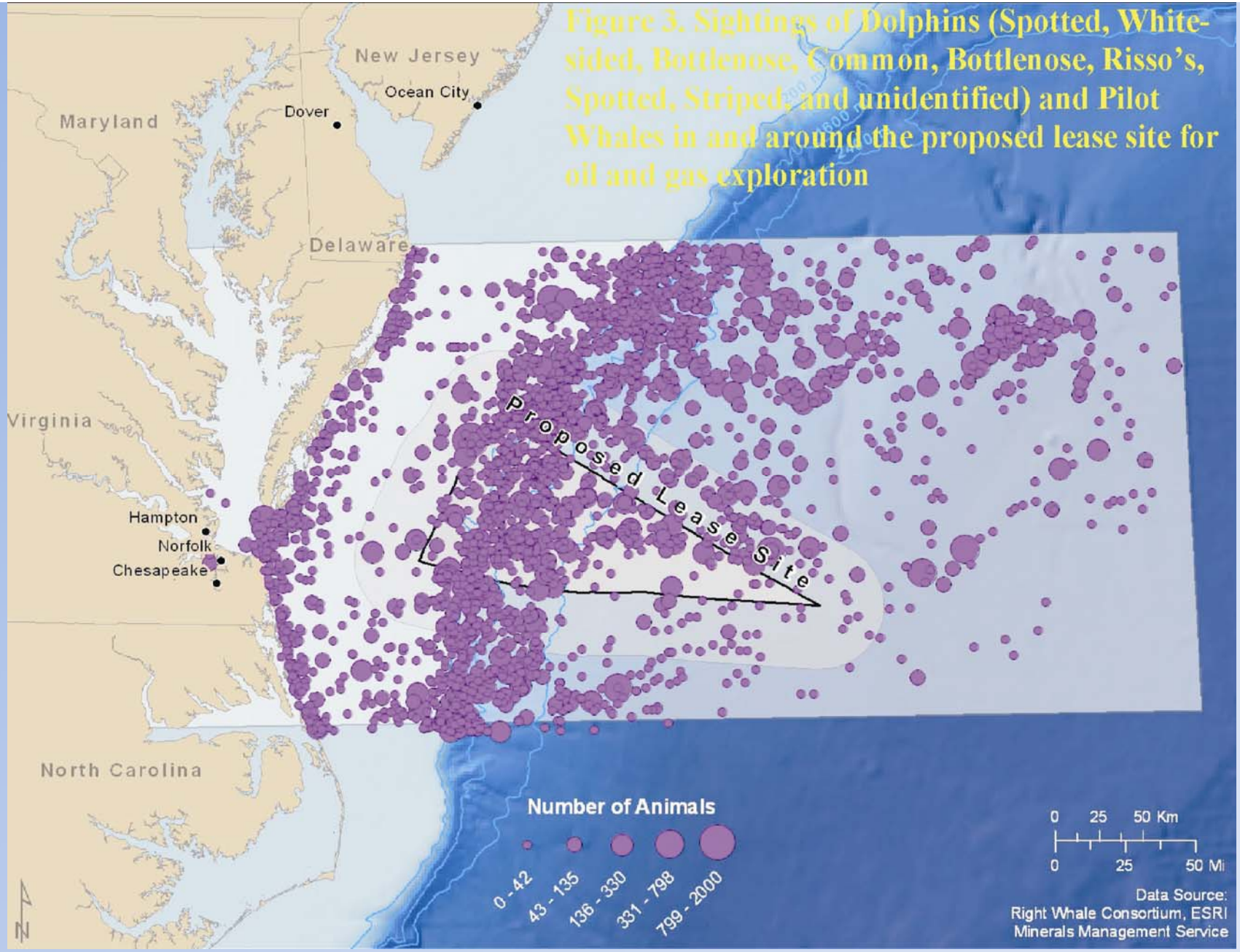
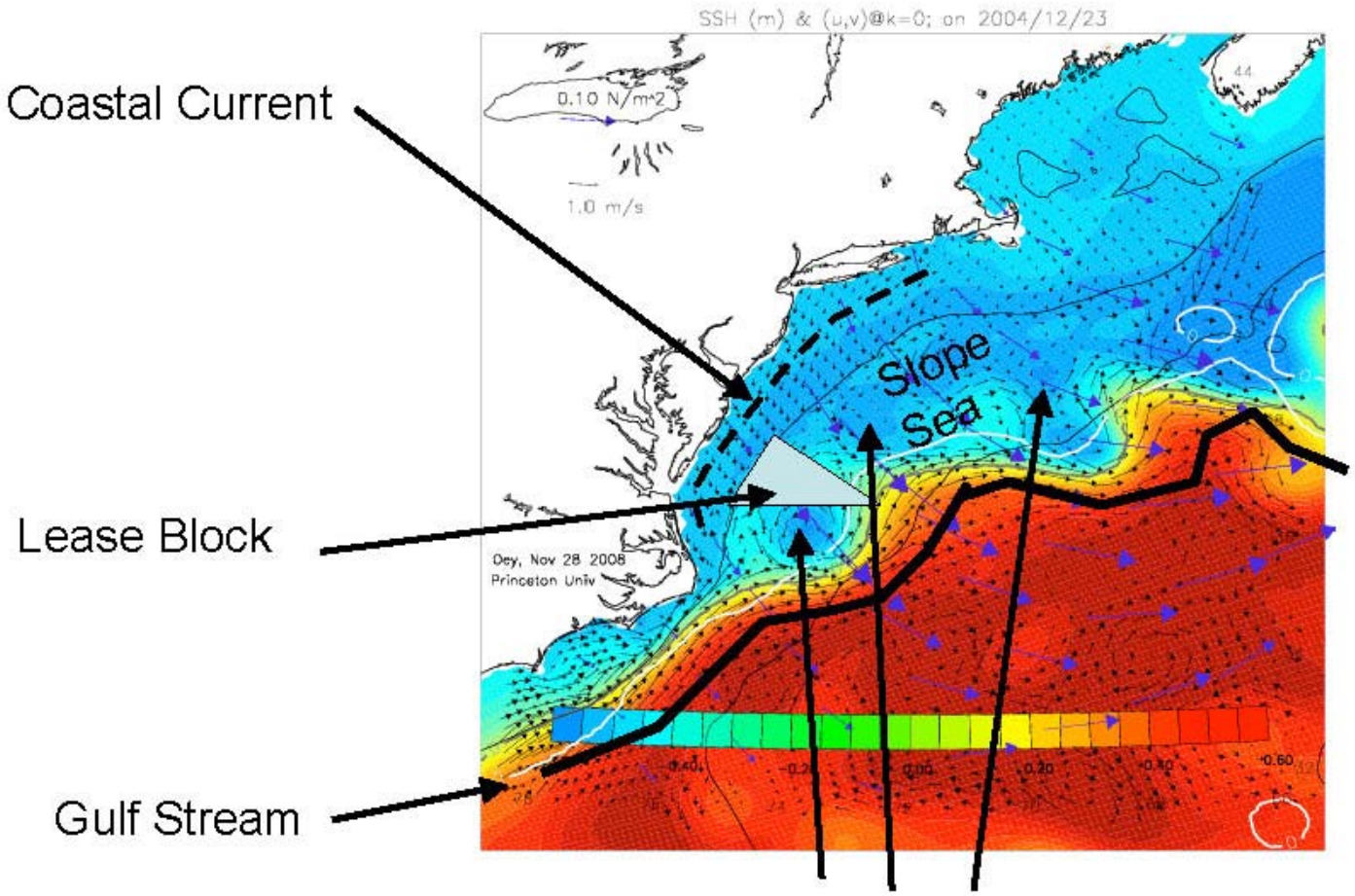


Figure 3. Sightings of Dolphins (Spotted, White-sided, Bottlenose, Common, Bottlenose, Risso's, Spotted, Striped, and unidentified) and Pilot Whales in and around the proposed lease site for oil and gas exploration

From : Kraus, S. D., 2009. Protected and endangered species. In – Diaz, R.J., et. al., Workshop on Environmental Research Needs in Support of Potential Virginia Oil and Gas Activities, OCS Study MMS 2009-011, Minerals Management Service

The Gulf Stream



Offshore Energy Resources

We have been here before

"This report is a planning effort aimed at anticipating and planning for the implications of oil and gas drilling on the Atlantic Continental Shelf. Specifically, it is designed to provide technical information on pipeline siting and construction requirements as well as on the potential environmental impacts associated with pipelines. It is intended to assist state and local officials in making decisions about pipelines coming ashore in Virginia – whether to allow or no not allow pipelines and, if they are allowed, to determine the coastal areas which would be most suitable as landfall sites. The report does not intend to promote or discourage pipelines but rather to identify and discuss the range of potential problems and opportunities associated with pipeline activities. In addition, this is a technical planning document only and does not attempt to establish policy for the Commonwealth of Virginia with respect to pipelines or any other OCS activity."

OFFSHORE PIPELINE CORRIDORS
AND LANDFALLS
IN COASTAL VIRGINIA

by

Ann Hayward Rooney-Char
and
Ronald Page Ayres

Prepared for the Virginia Coastal Resources Management Program

Office of the Secretary of Commerce and Resources

Special Report in Applied Marine Science and Ocean Engineering
No. 190

Virginia Institute Of Marine Science
Gloucester Point, Virginia 23062

WILLIAM J. HARGIS, JR., DIRECTOR

1978

VOLUME ONE

Topics that must be considered

Drilling & Production platforms

- Platforms will be sited where the resources are located.

- Will they be a hazard to navigation?
- Will they survive storms etc?
- What is the stability of substrate for supporting equipment?
- What are the environmental concerns associated with constructing the platforms?
- What are the environmental concerns associated with the structures after they are built

Moving the product from platform to shore

This could be by pipeline.

- **Should pipelines be on the surface of the sea floor or should they be buried?**
- **How deeply should pipelines be buried?**
- **What would be the environmental consequences of burying the pipelines?**
- **How severe will the disturbances caused by the pipeline be?**
- **How quickly will the environmental system recover?**

Additional considerations for submarine pipelines

- Potential conflicts with existing and planned submarine communications cables (both civilian/commercial and military)
- Shipwrecks and other archaeological sites
- Commercial fishing areas (dragging gear across the sea floor etc.)
- Unexploded ordinance
- Actual and potential areas of spoil disposal or sand mining
- Other special use areas

http://domesticfuel.com/wp-content/uploads/2008/11/offshore_wind_turbine.jpg

Bringing the pipeline ashore

- Where should pipelines come ashore?
- How deeply should pipelines be buried as they cross the nearshore zone
- How far inland should it remain buried?
- What is the rate of shoreline retreat? Is it likely to change?
- What will the onshore environmental consequences be?
- Different onshore environments (beach, dunes, marsh, bluff, upland) require different considerations.
- Even if the refining/processing complexes are farther inland, what onshore structures are required?
- What would be needed to assure the security of the pipelines and associated infrastructure?

http://news.nationalgeographic.com/news/bigphotos/2382031.html

Regulatory considerations

- This will require the NEPA/Environmental Impact Statement process.
- The earlier the work on the EIS is begun and the more thorough the EIS , the smoother the process will be.
- Federal, state, and local concerns and participation.

http://www.csmonitor.com/2005/0726/p03s01-usgn.html

The role of VIMS

- VIMS is the Virginia agency charged to provide advice on coastal, estuarine, and marine matters.
- VIMS is neither for nor against offshore drilling.
- VIMS provides environmental data and unbiased interpretations.
- VIMS has a long history in this sort of scientific and environmental investigation and in project coordination.
- Fishes and fisheries, sea turtles, marine mammals.
- Bottom-dwelling organisms.
- Wave climate and currents.
- Sea floor disturbance and sediment movement.
- Tools such as side-scan sonar to view the sea floor.
- VIMS will be involved in reviewing the research of others pertaining to the EIS etc.

http://www.scandoil.com/moxie-bm2/news/spot_news/lundin-finds-oil-in-pl340-offshore-norway.shtml

There is a long way to go before there can be any drilling for oil or gas offshore of Virginia

There are many questions to be answered before any decisions to permit drilling can be made.

Thank you

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