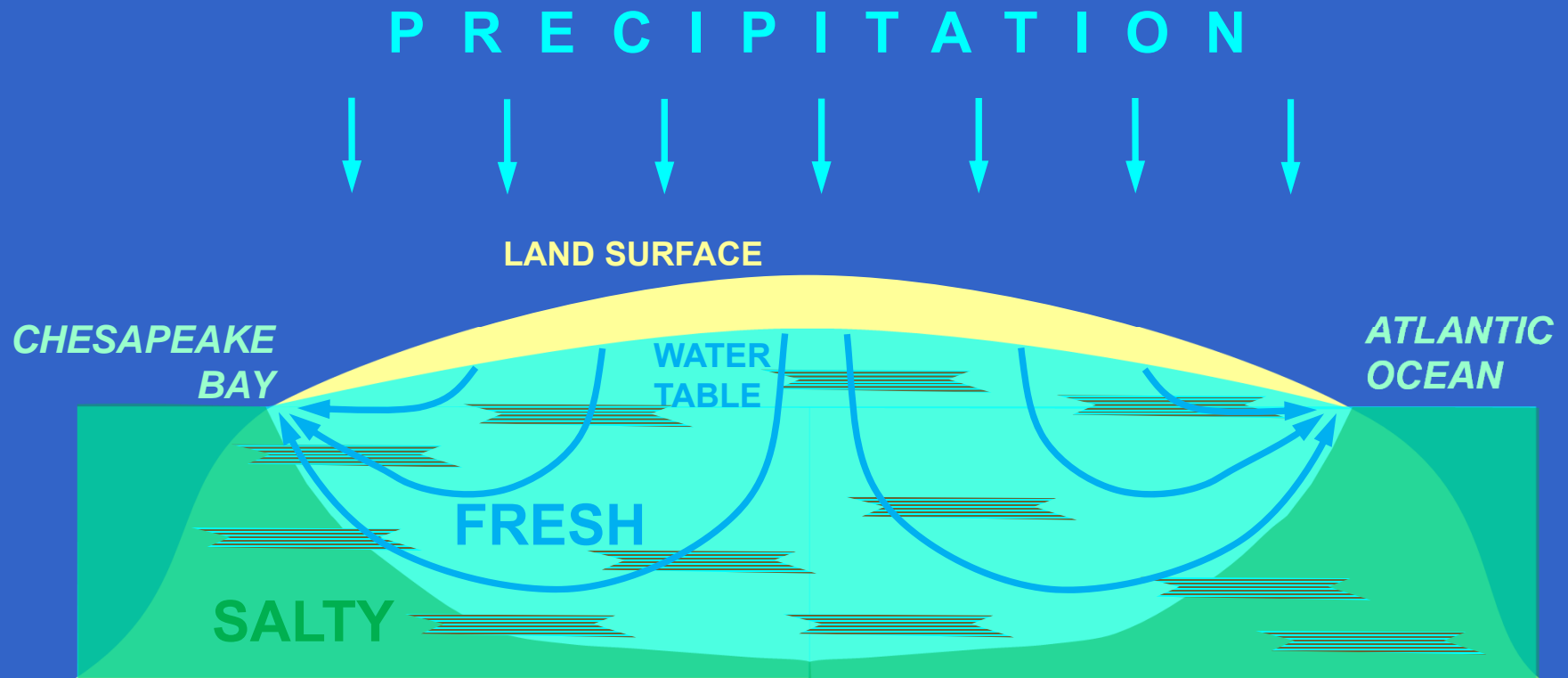


Virginia Eastern Shore



Groundwater Flow

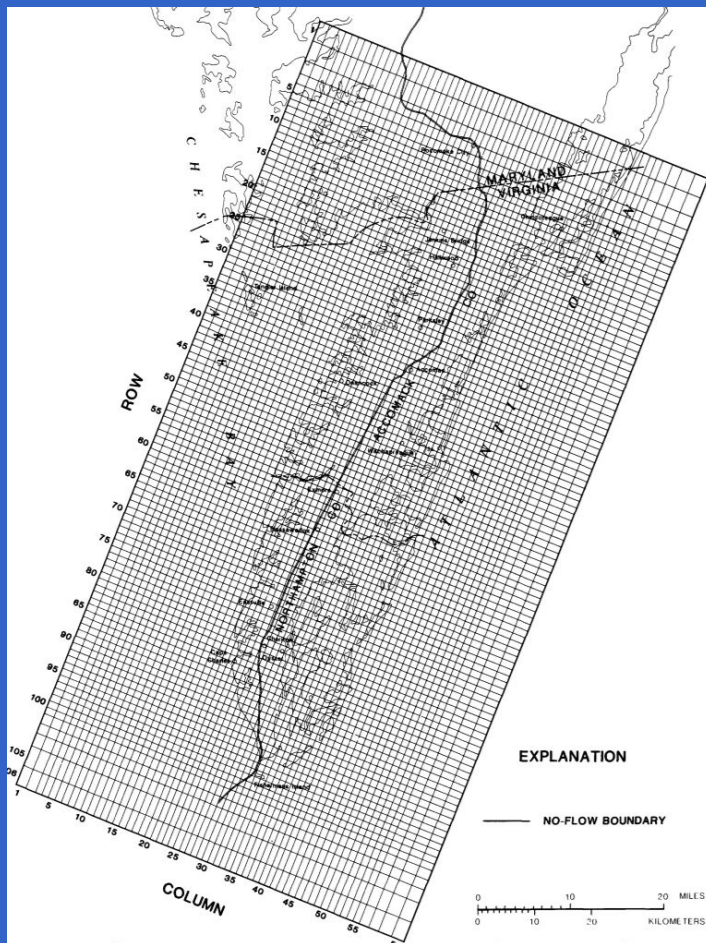


***** VERTICAL SCALE GREATLY EXAGGERATED *****

Previous Studies

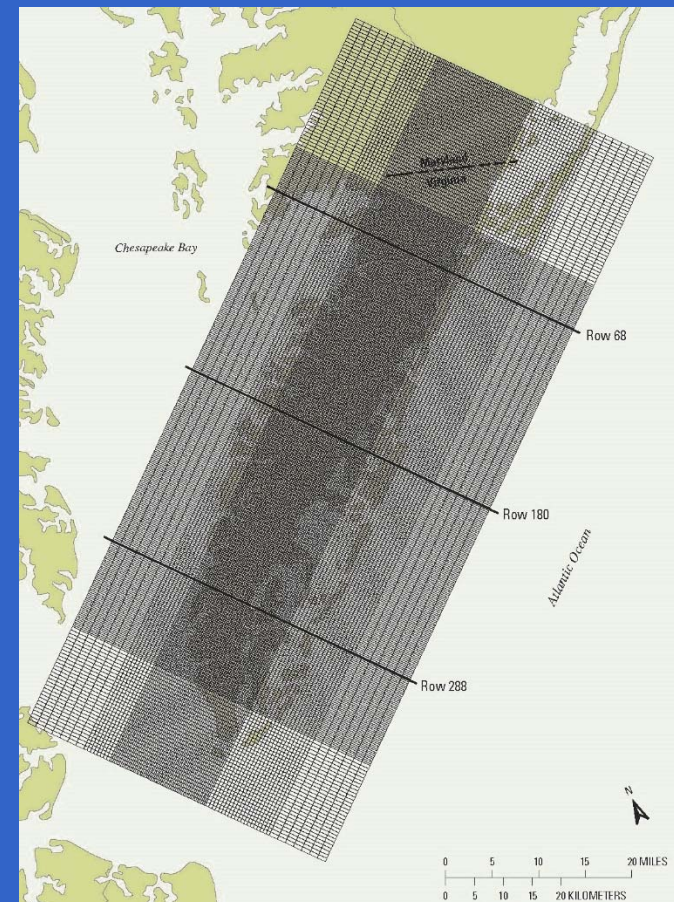
1994 USGS MODEL

- first numerical simulation
- 1982 SWCB framework



2009 USGS MODEL

- increased resolution
- 1982-94 framework



USGS Eastern Shore Study

- *2017 “scoping effort”*

- 1. coop with VA DEQ*
- 2. compile/summarize existing data*
- 3. evaluate technical issues*
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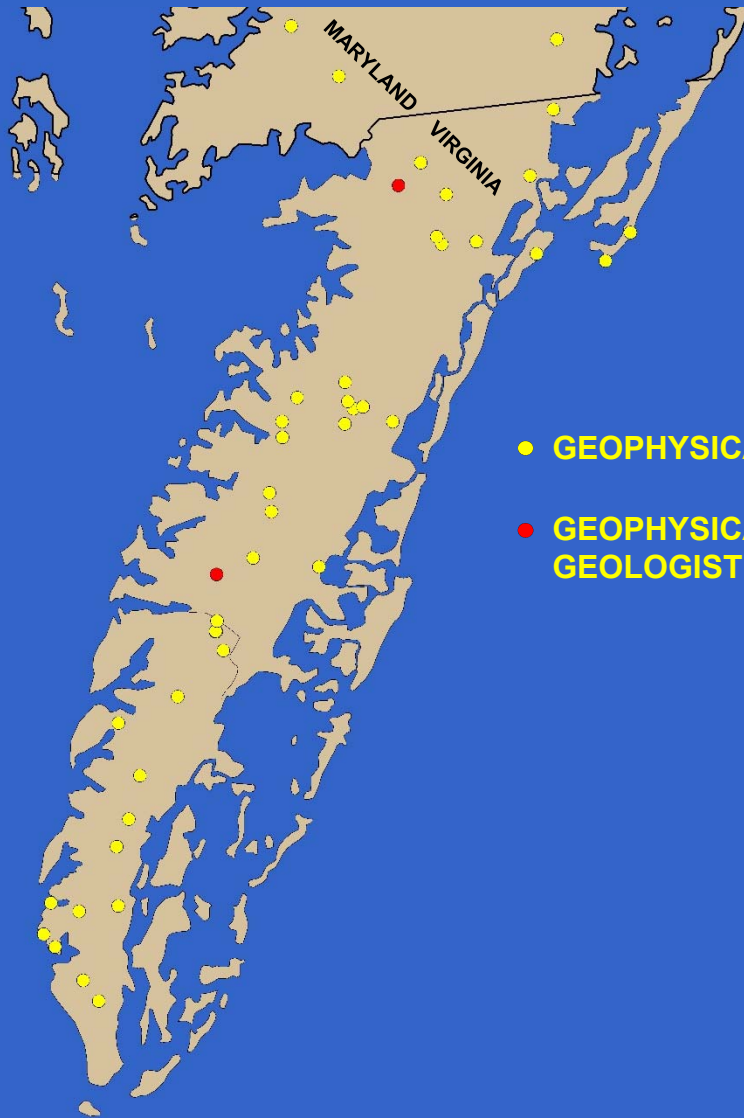
- *2019 - 2020 publication*

USGS Eastern Shore Study

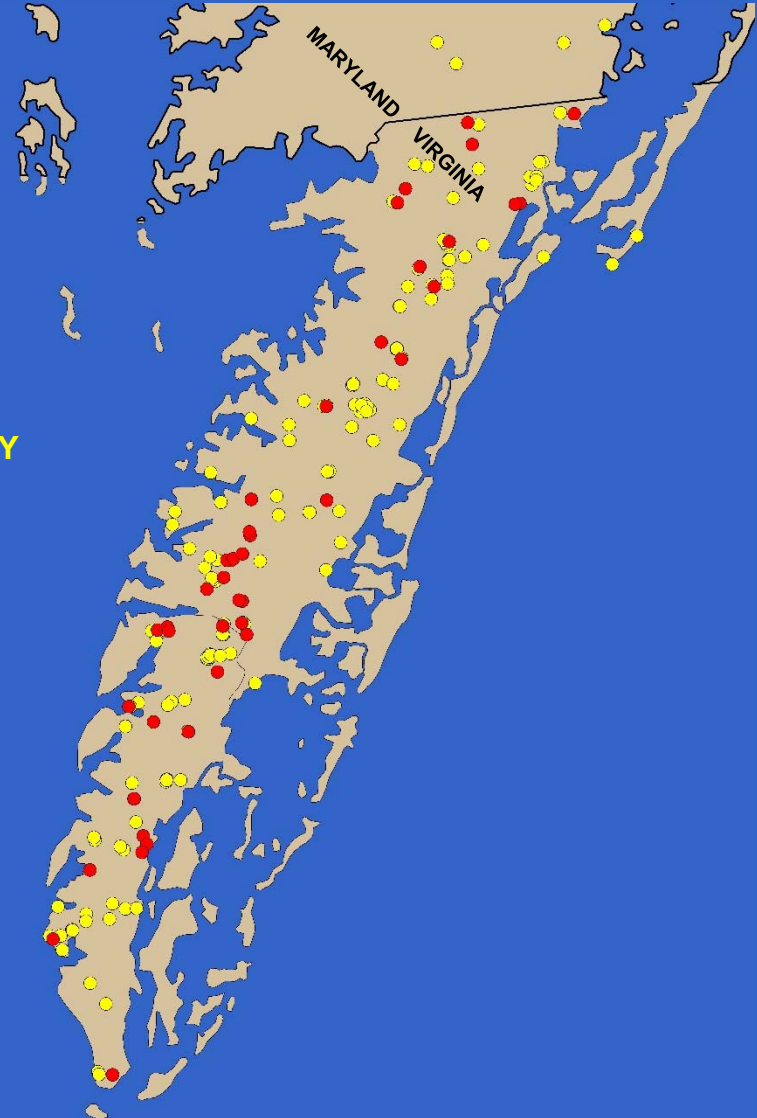
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Borehole Data

1994
47 BOREHOLES



2018
202 BOREHOLES



- GEOPHYSICAL LOG ONLY
- GEOPHYSICAL LOG AND GEOLOGIST LOG

Geology and Geophysics

FLUVIAL SAND AND GRAVEL



2 INCHES

MARINE SILT AND CLAY



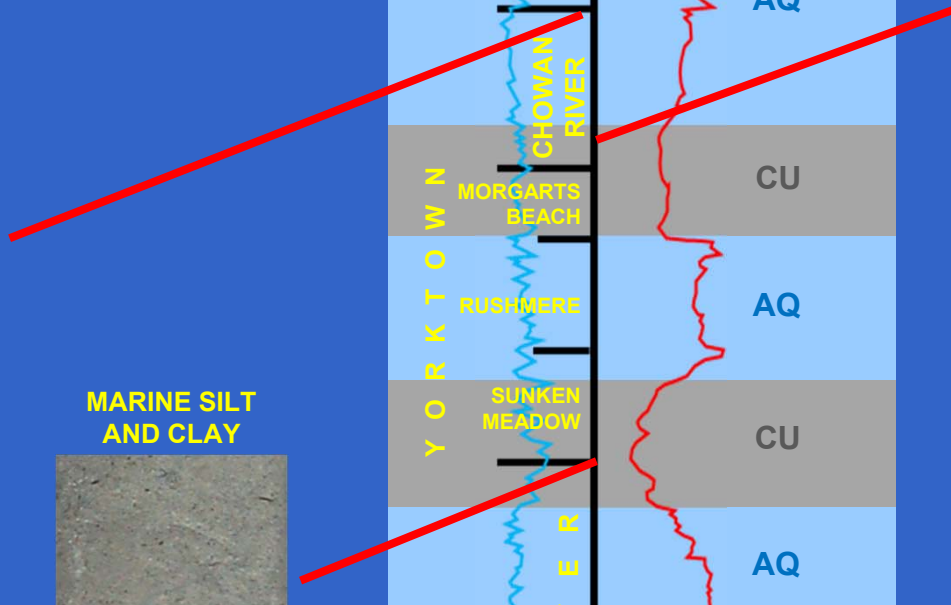
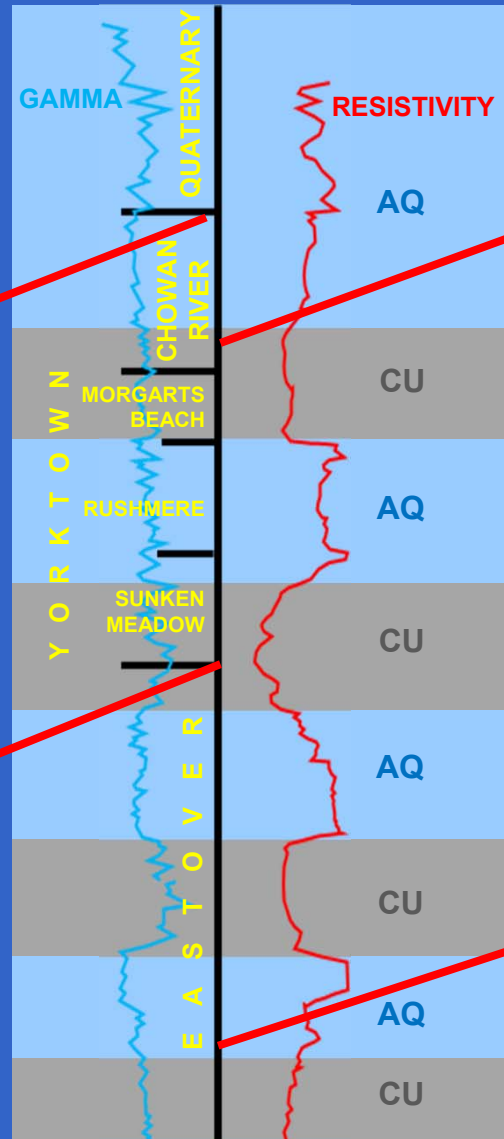
MARINE SILTY FINE SAND



MARINE SHELLS AND SAND



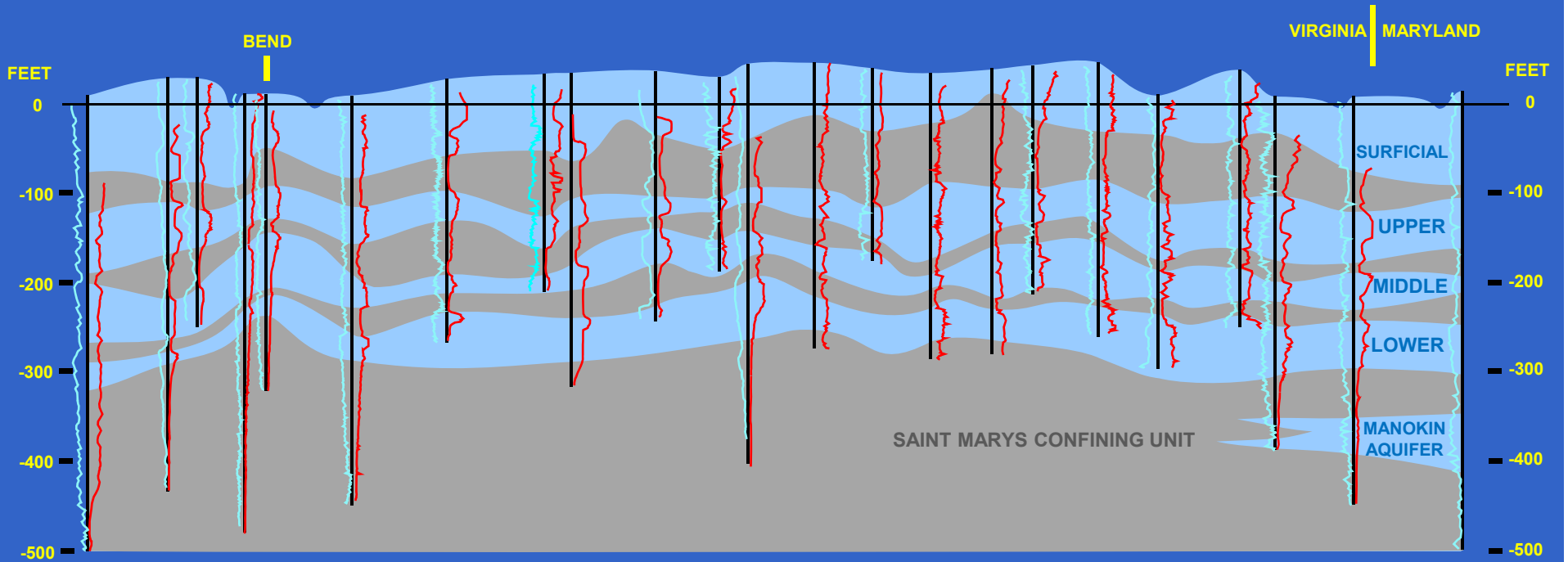
GEOLOGIC FORMATIONS



Log Correlation

SOUTH

NORTH

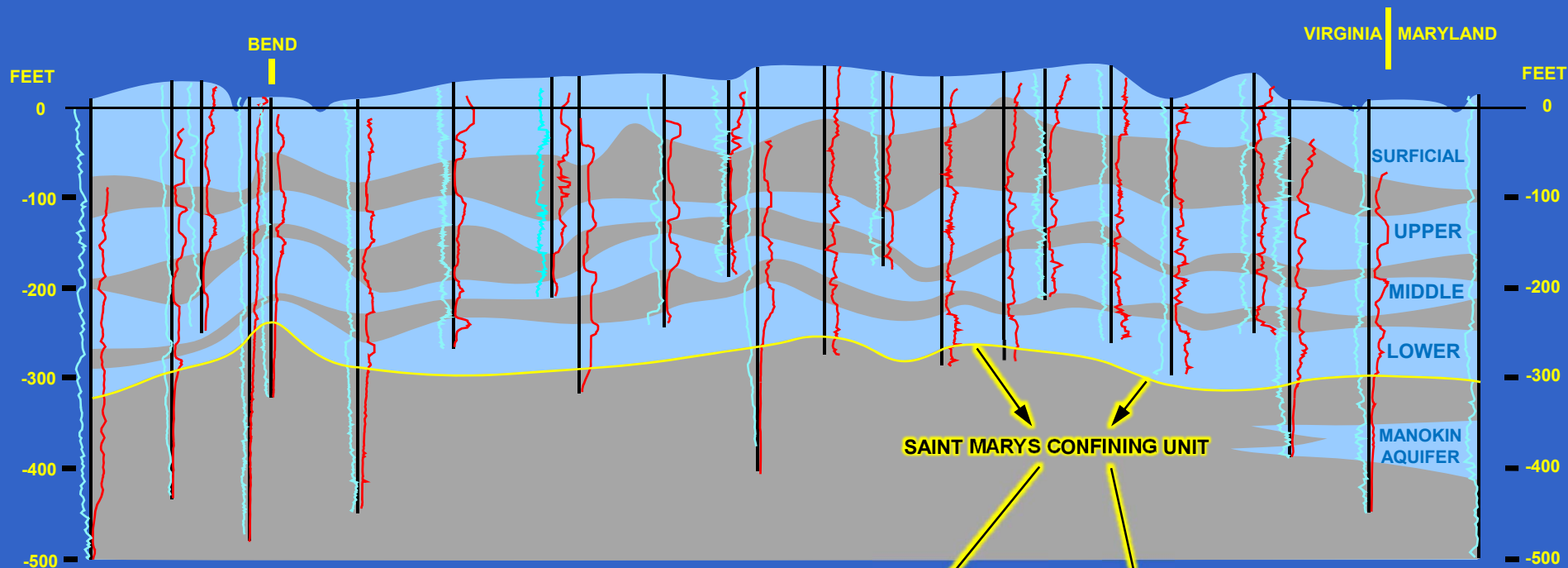


VERTICAL EXAGGERATION 260X

Structural Contouring

SOUTH

NORTH



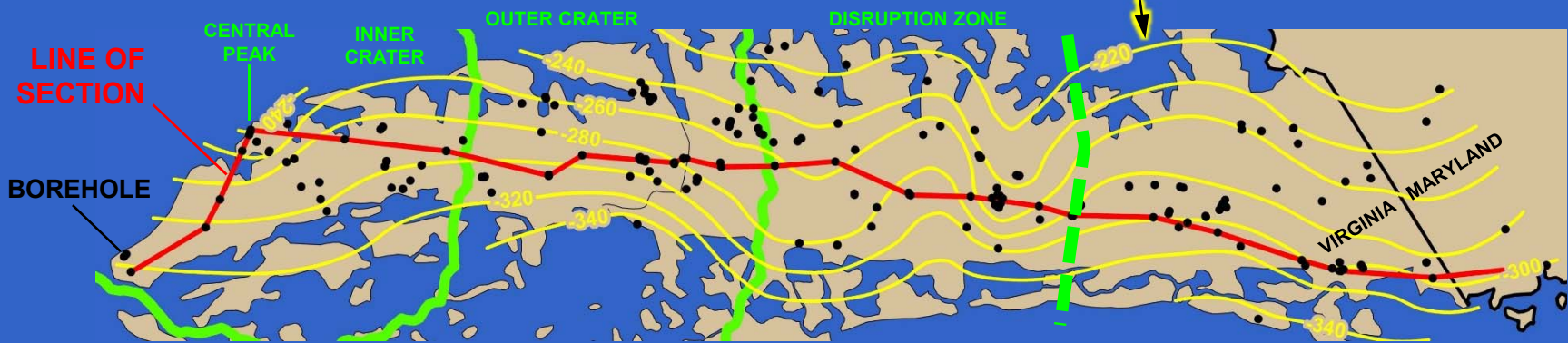
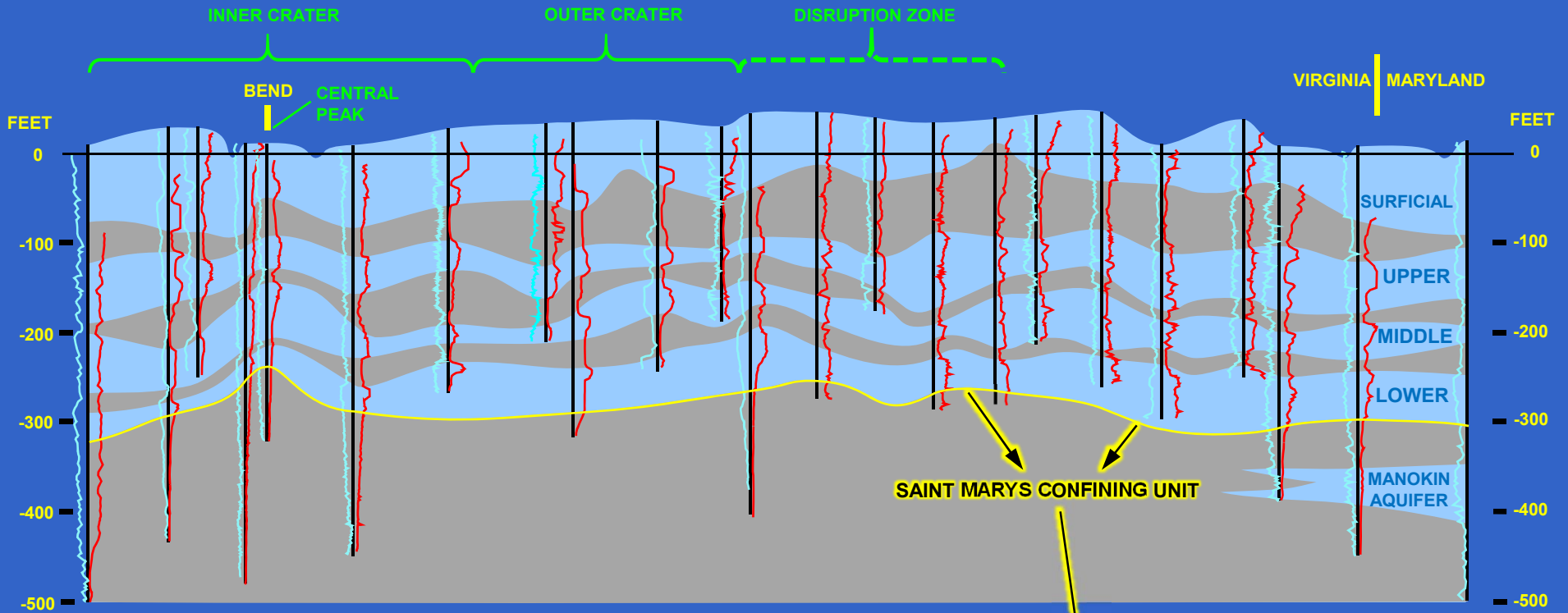
5 MI

VERTICAL EXAGGERATION 260X

Structural Contouring

SOUTH

NORTH



5 MI

VERTICAL EXAGGERATION 260X

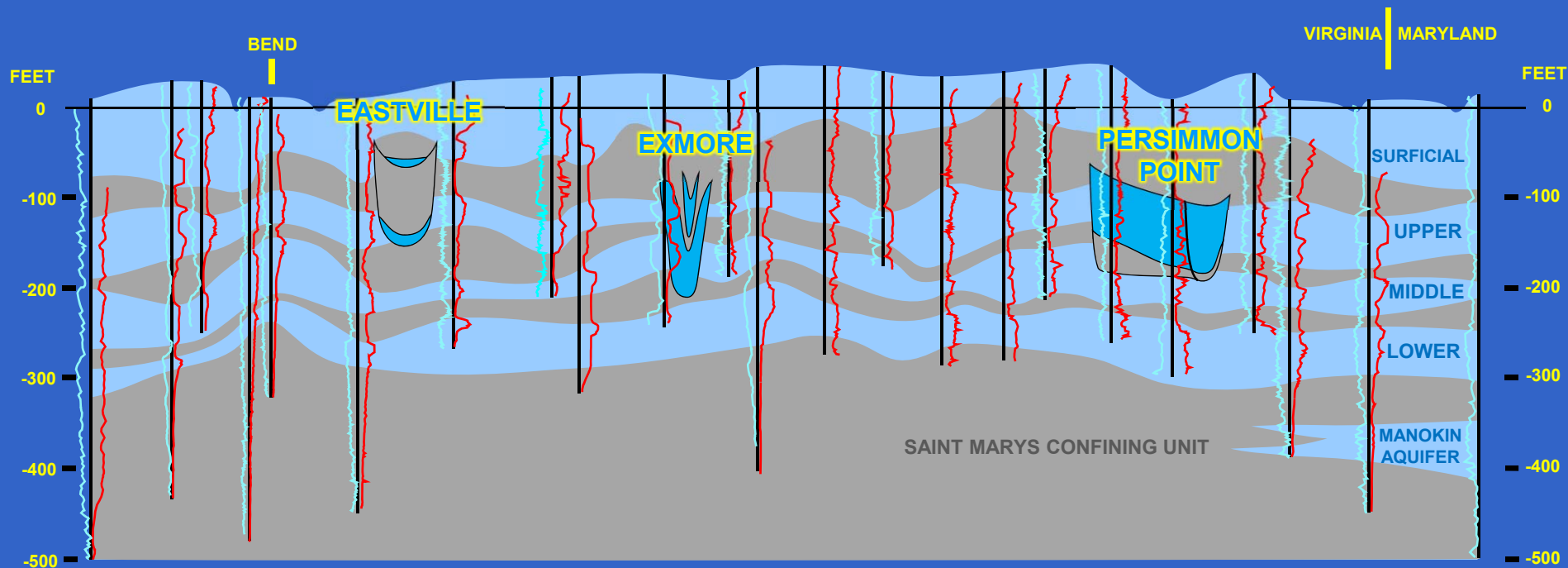
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Paleochannels

SOUTH

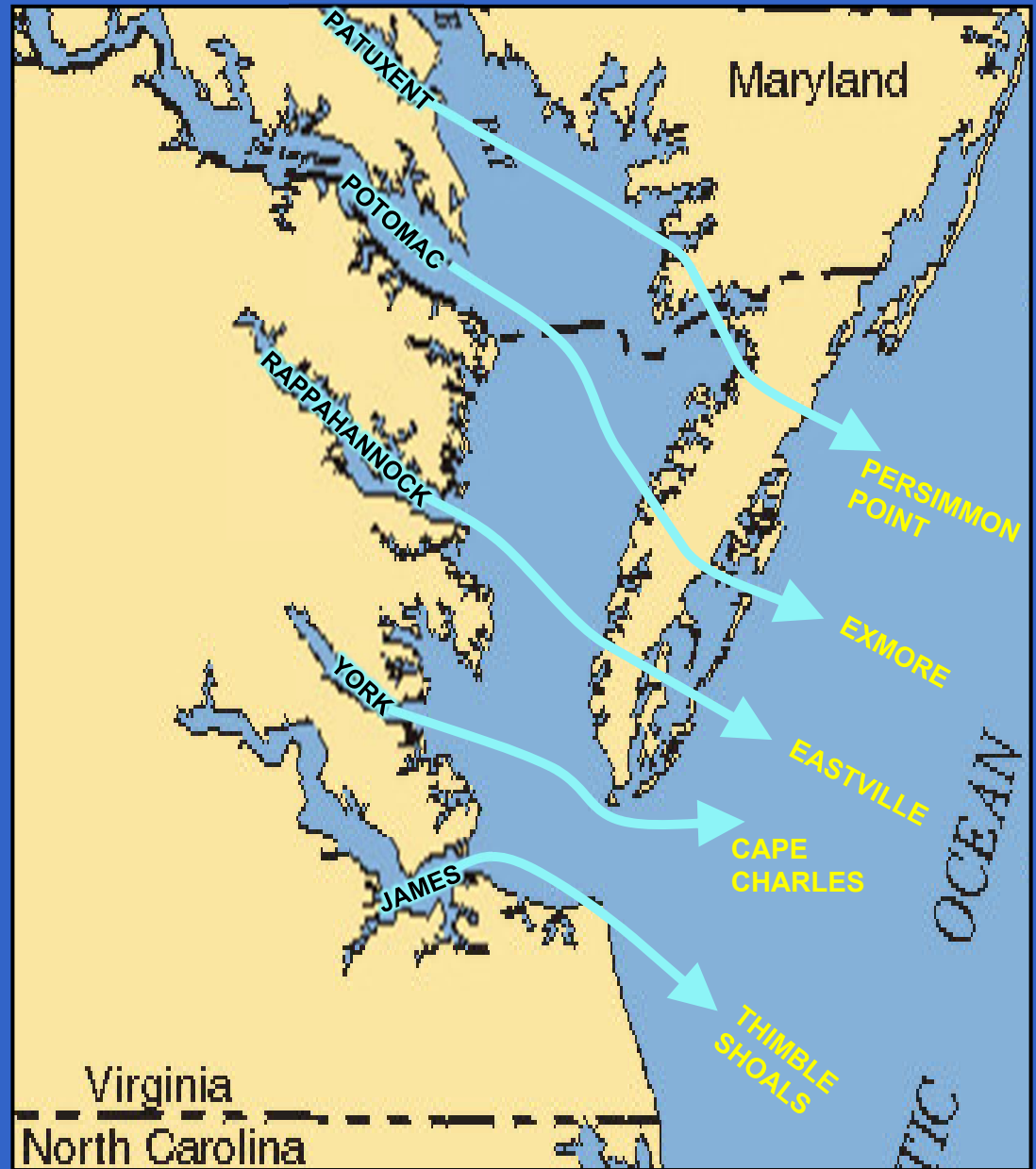
NORTH



VERTICAL EXAGGERATION 260X

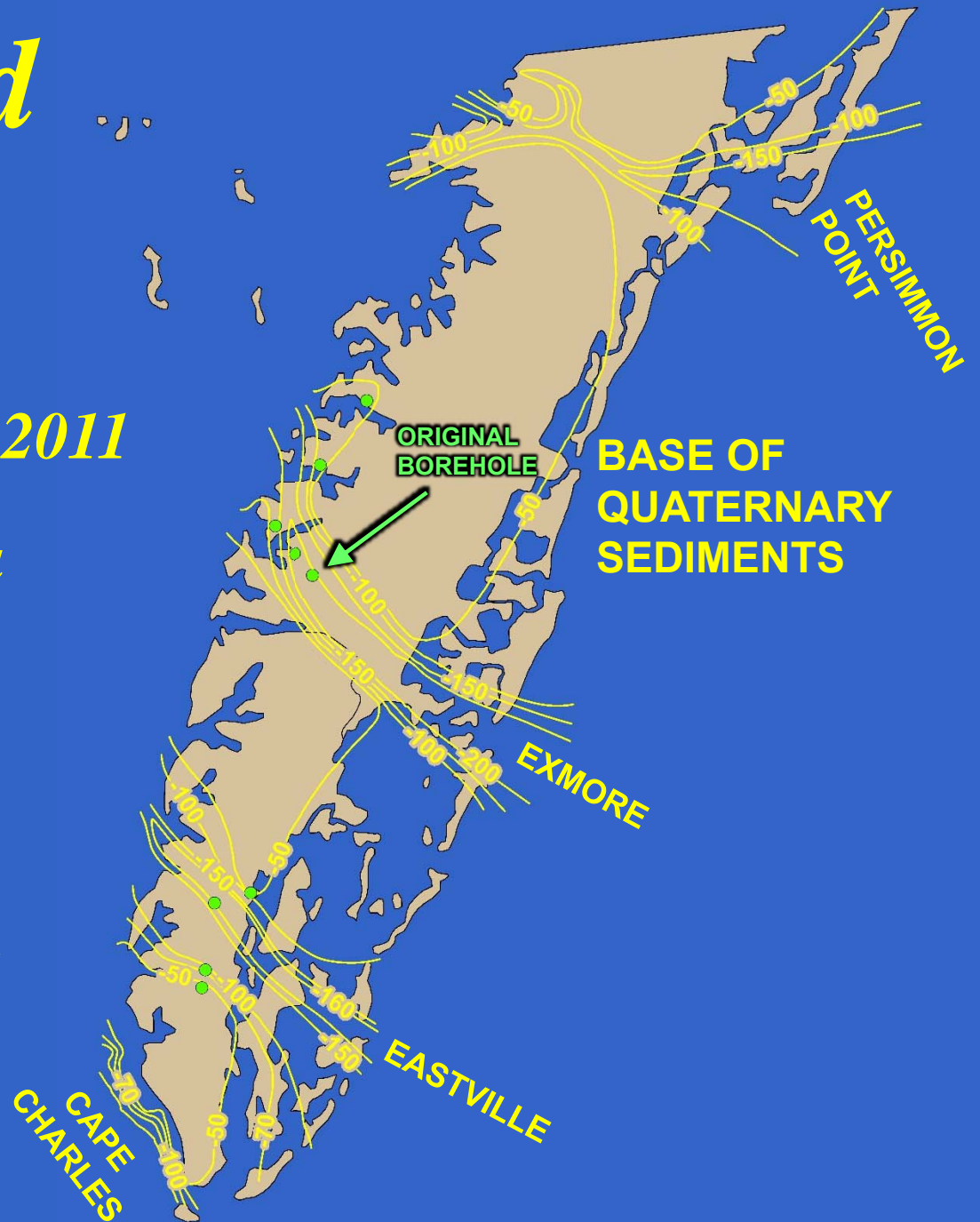
Late Pliocene Lowstand Drainage (Hobbs, 2004)

- *multiple interpretations*
- *interpolated between Bay and ocean*



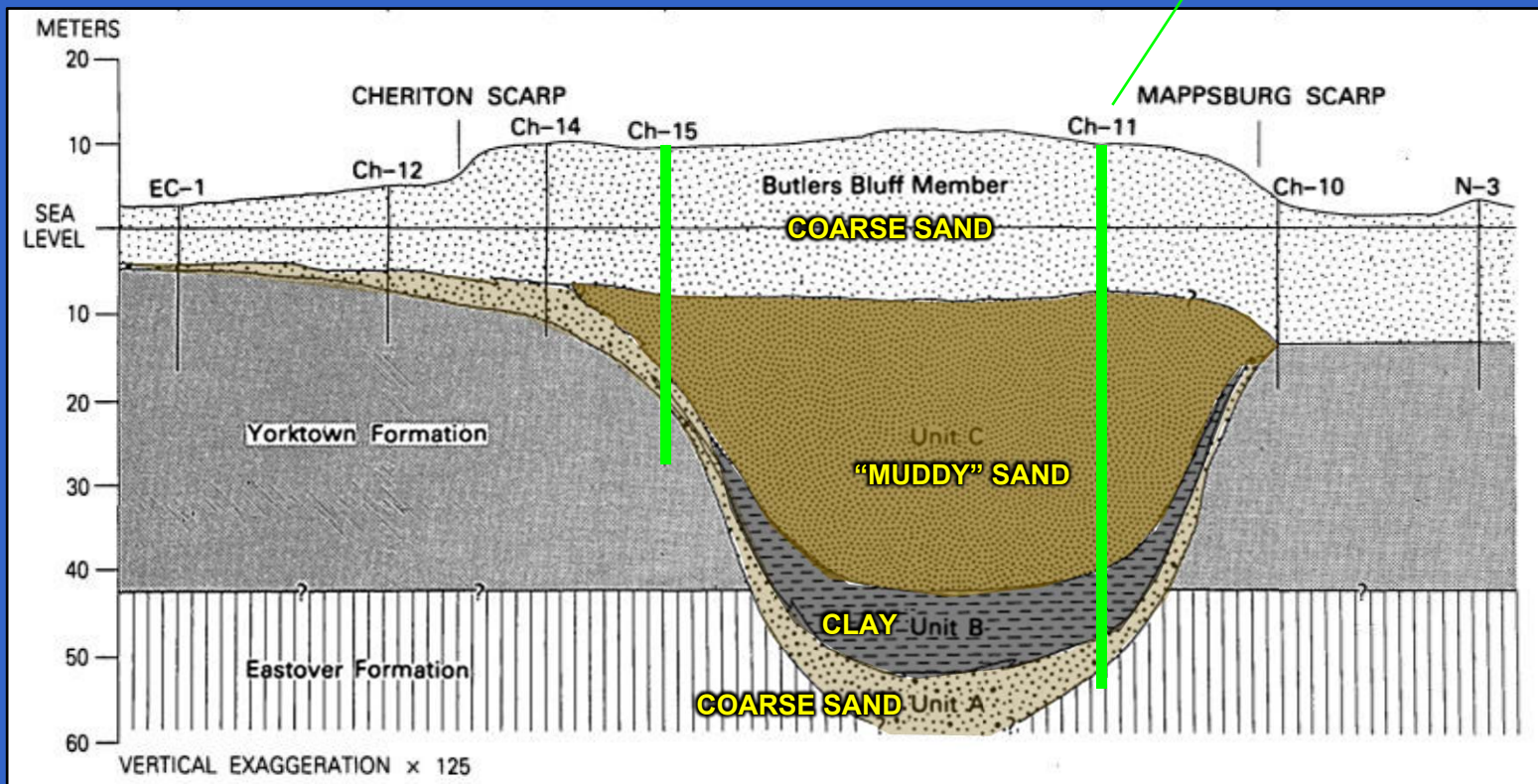
Land-Based Study

- *Mixon, 1985; Powars 2011*
- *original borehole data mostly unavailable*
- *positions of channels approximately known*
- *channel-fill sediments poorly known*

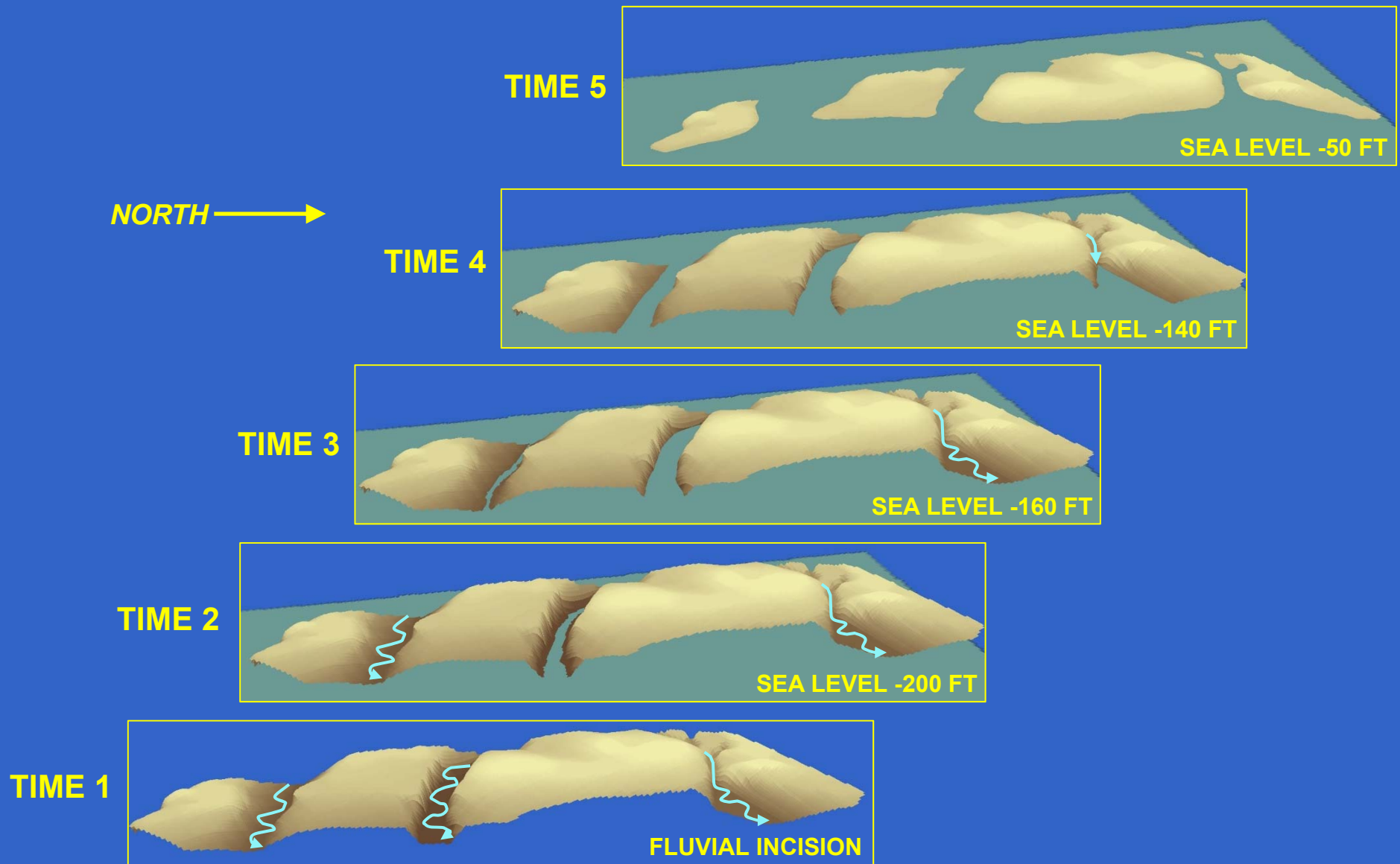


Previously Documented Paleochannel Sediments

(Mixon, 1985)



Paleochannel Inundation



Paleochannel Modeling

**1994
MODEL**

NORTH →

CONSTANT HEAD BOUNDARY

SURFICIAL



UPPER

LEAKANCE



MIDDLE

LEAKANCE



LOWER

NO FLOW BOUNDARY

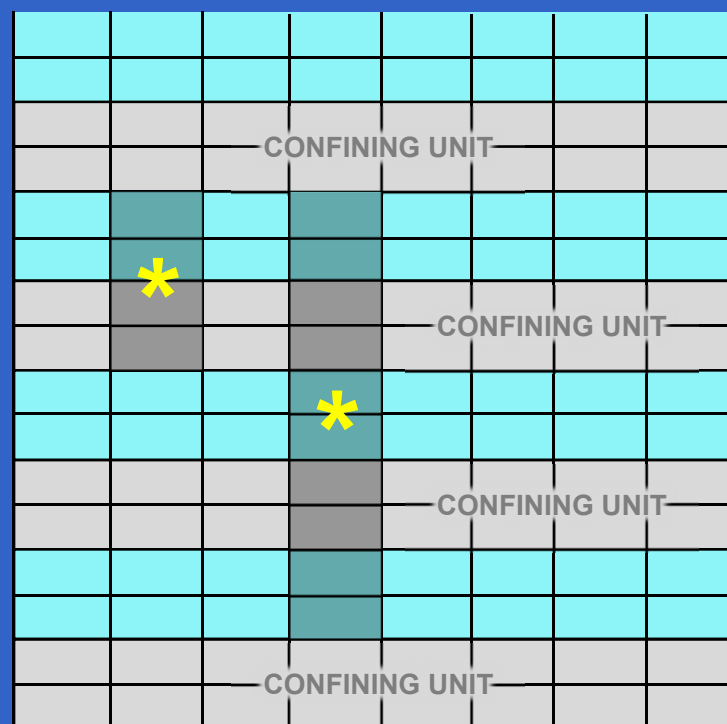
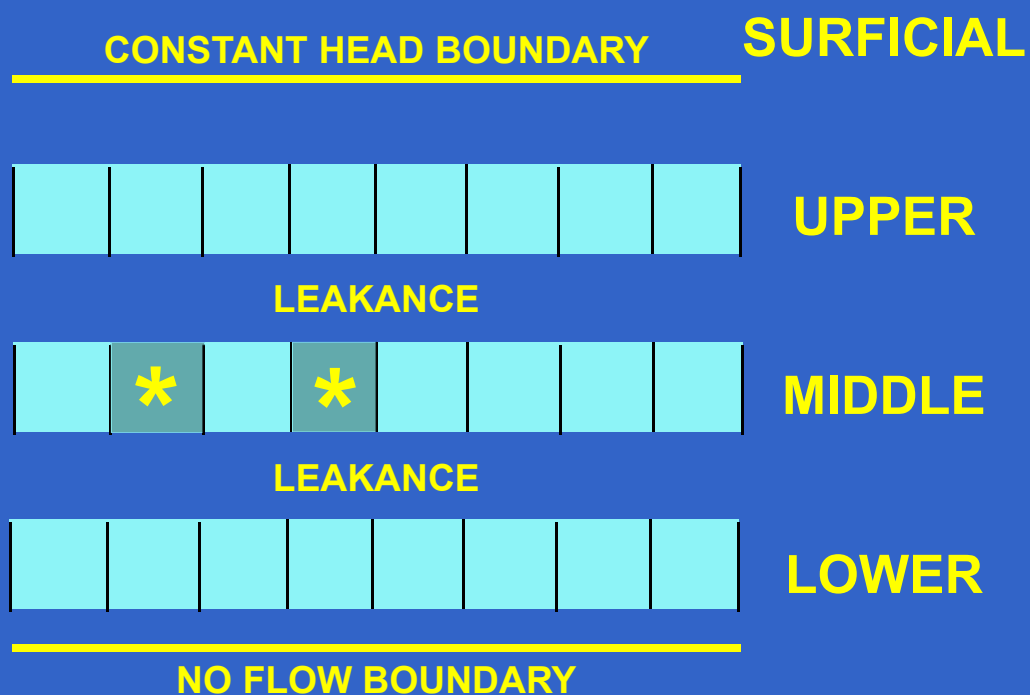
*** PALEOCHANNEL K
= 1/10 CONFINED-AQUIFER K**

Paleochannel Modeling

NORTH →

1994
MODEL

2009
MODEL



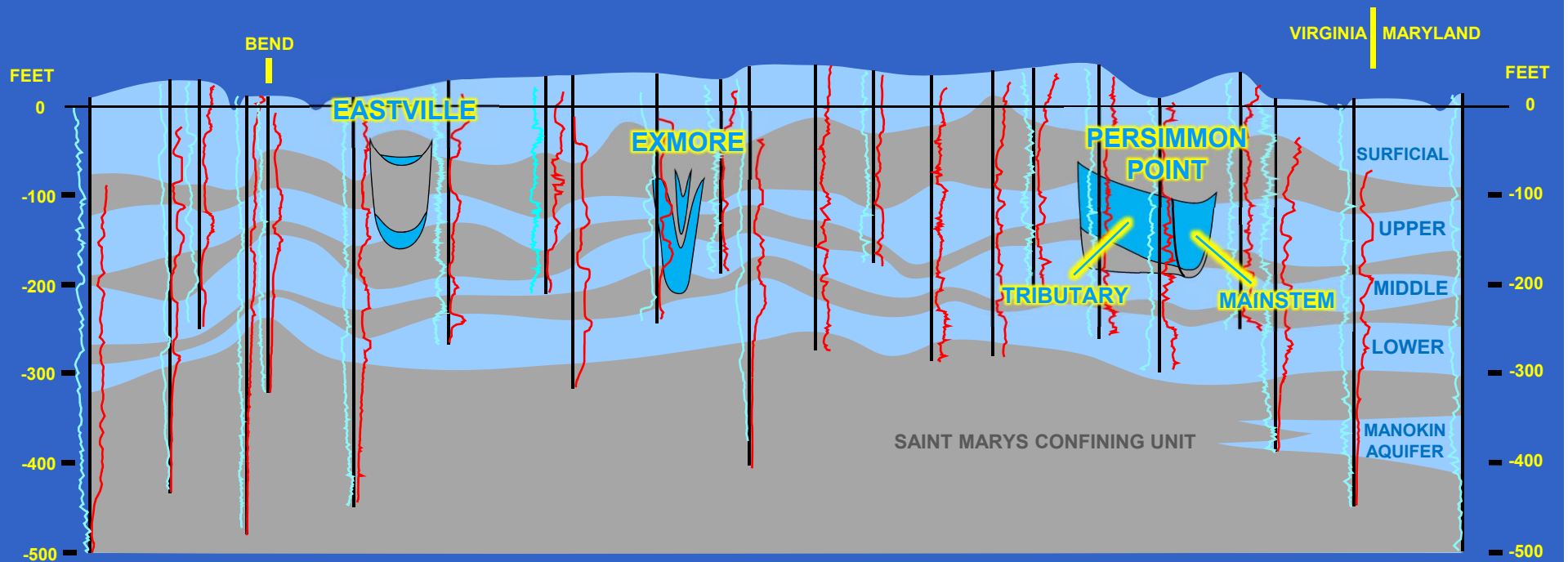
* PALEOCHANNEL K
= 1/10 CONFINED-AQUIFER K

* PALEOCHANNEL K
5 FT/D EASTVILLE
100 FT/D EXMORE

Paleochannels

SOUTH

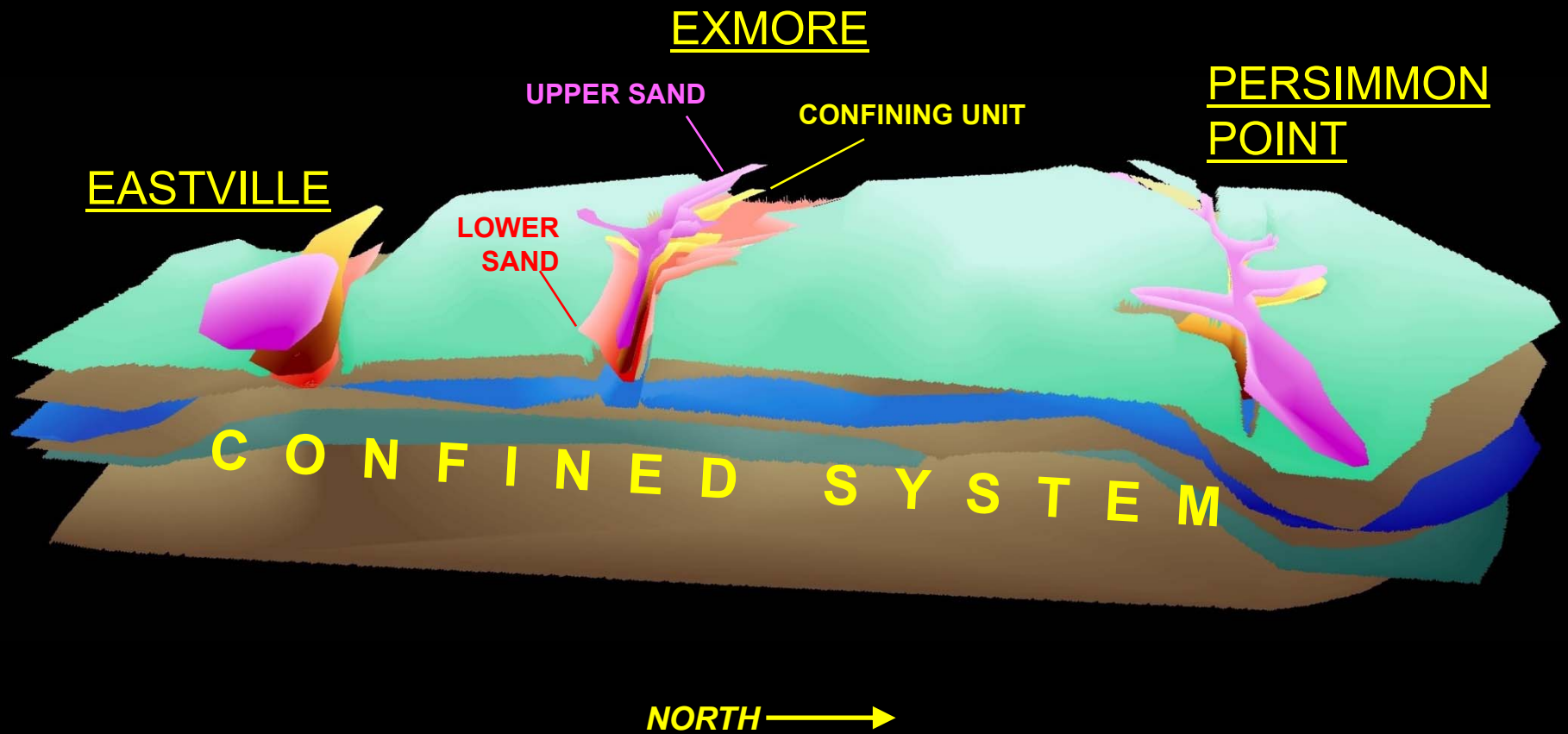
NORTH



QUATERNARY SURFACE



Paleochannel Configurations



Exmore Paleochannel

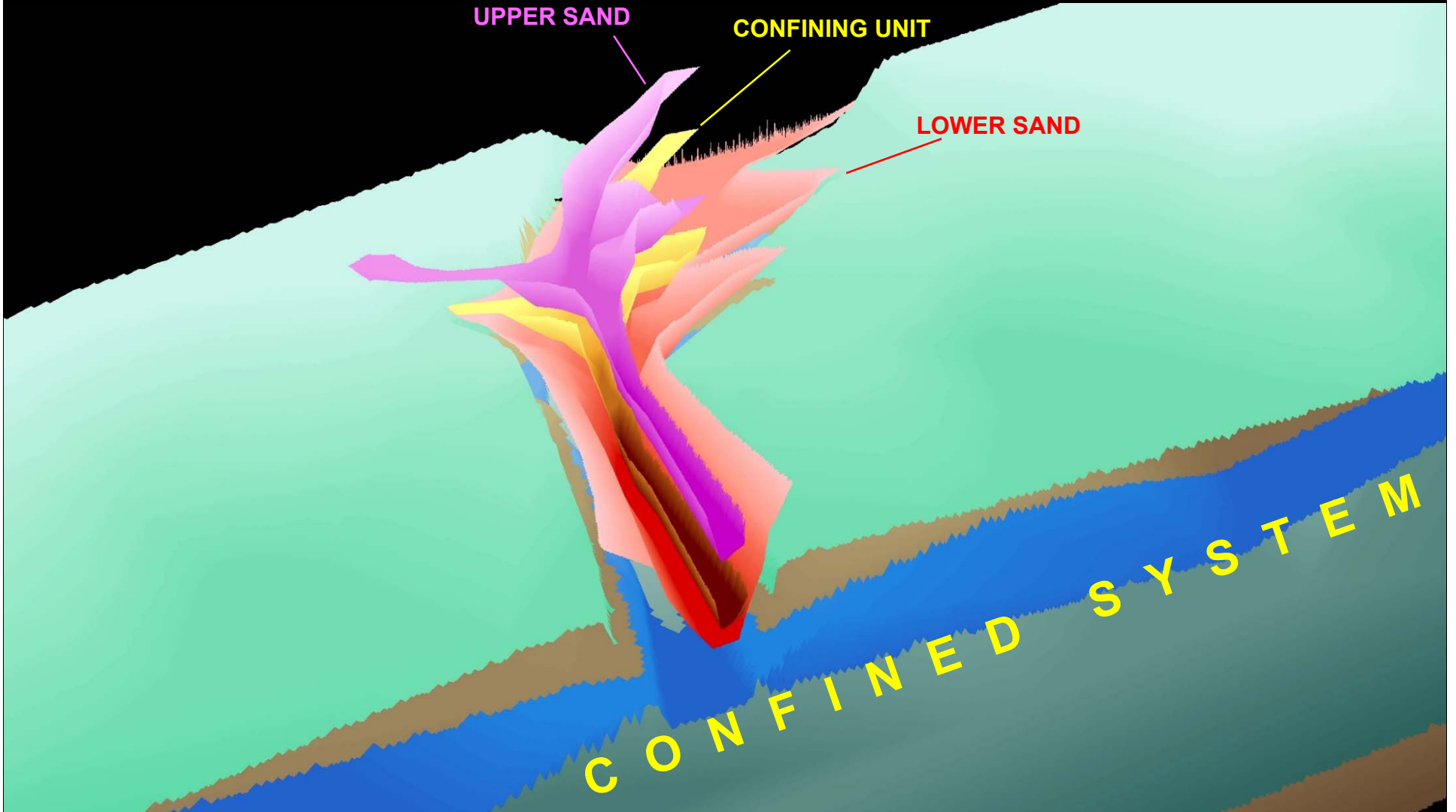
NORTH →

UPPER SAND

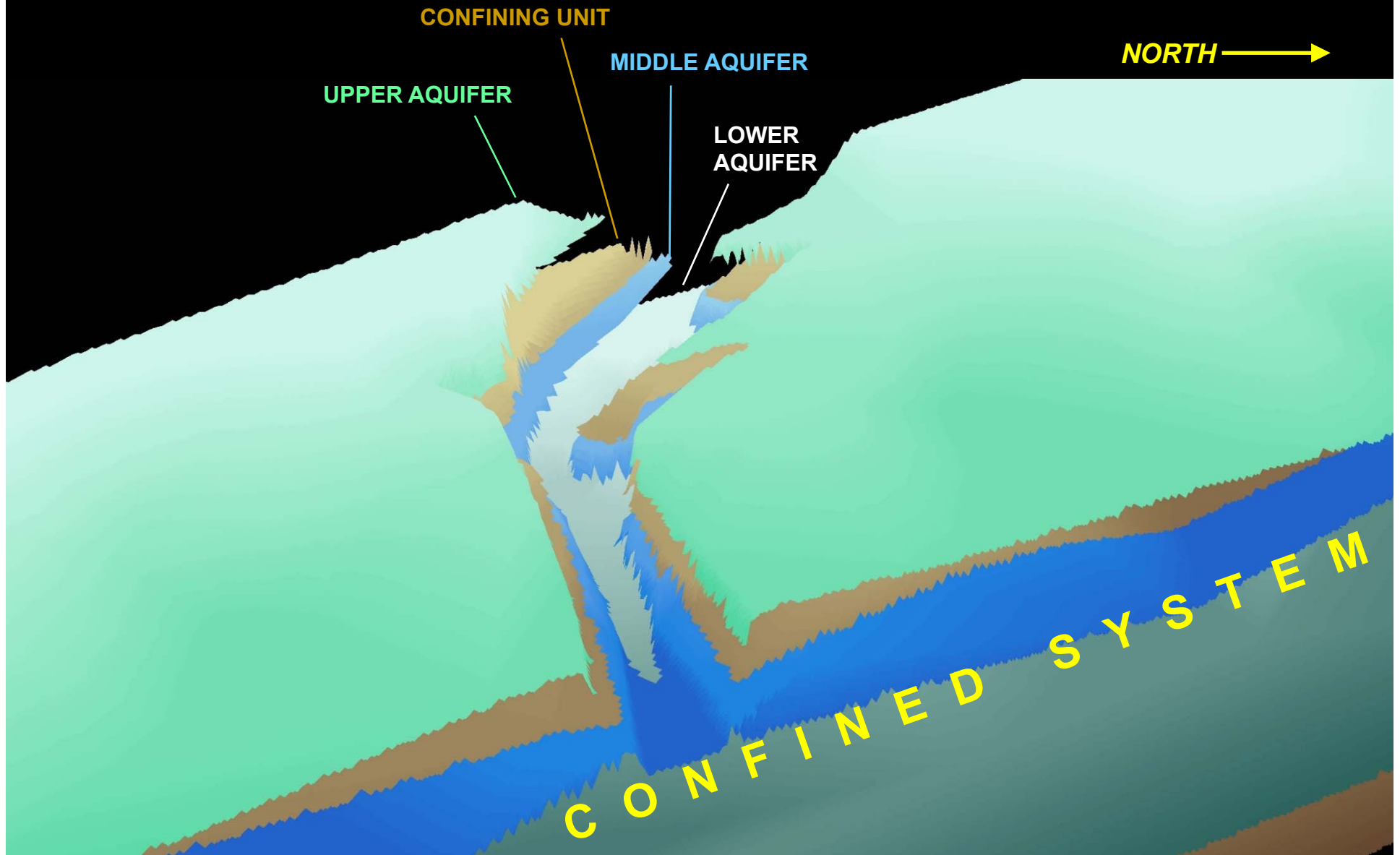
CONFINING UNIT

LOWER SAND

CONFINED SYSTEM



Confined System Incision

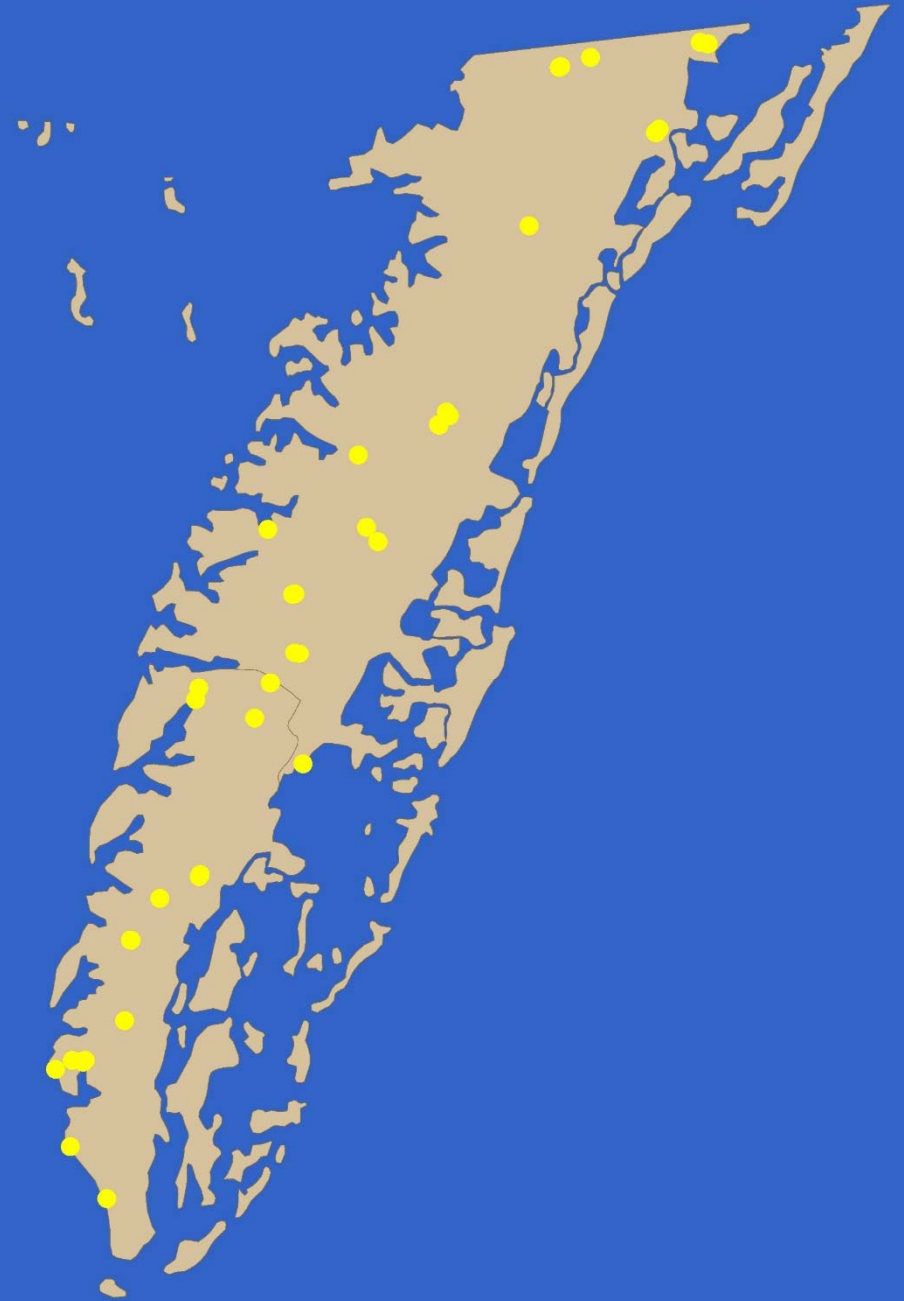


USGS Eastern Shore Study

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- *2019 - 2020 publication*

Aquifer Tests

- VA DEQ permit files
- 36 tests
- 58 wells
- 133 analyses



Transmissivity

MEAN FT²/D

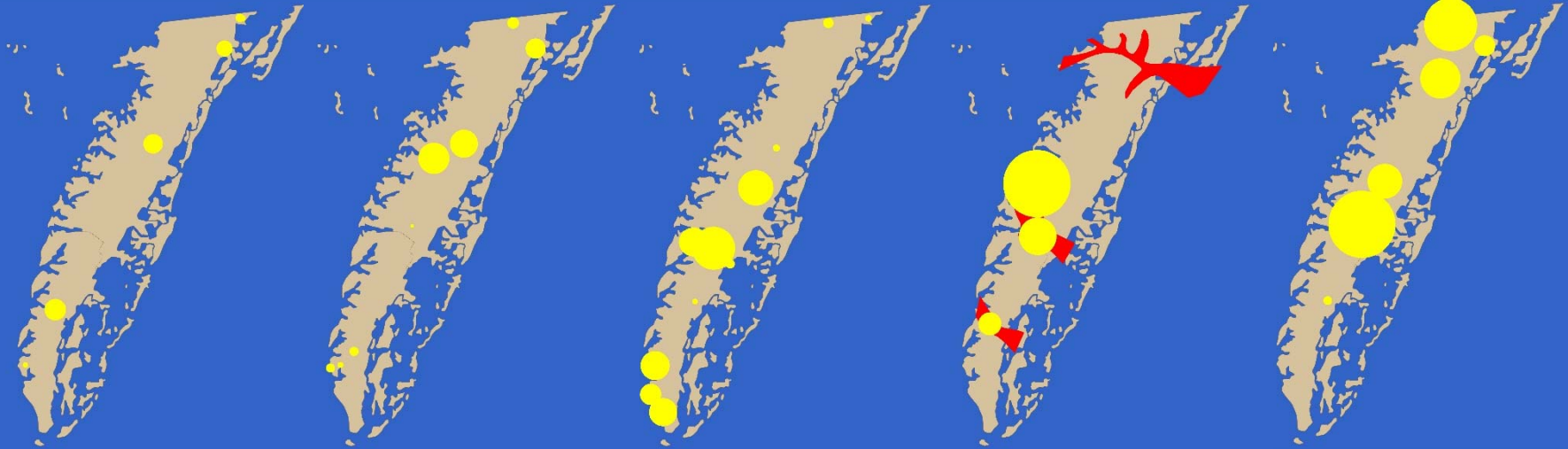
LOWER

MIDDLE

UPPER

PALEO-CHANNELS

SURFICIAL



RANGES

					<u>FT²/D</u>
133	30	143	1820	214	MIN
2080	4360	8270	20340	20290	MAX

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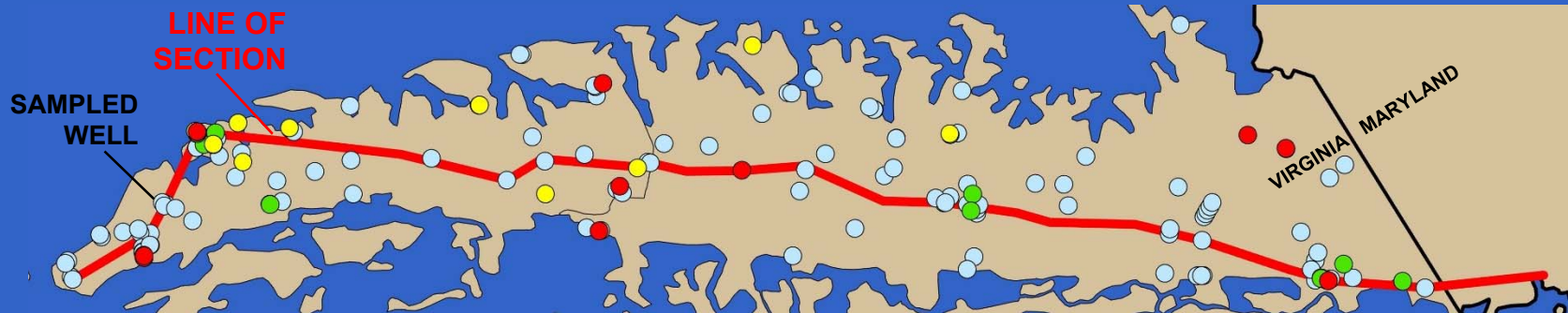
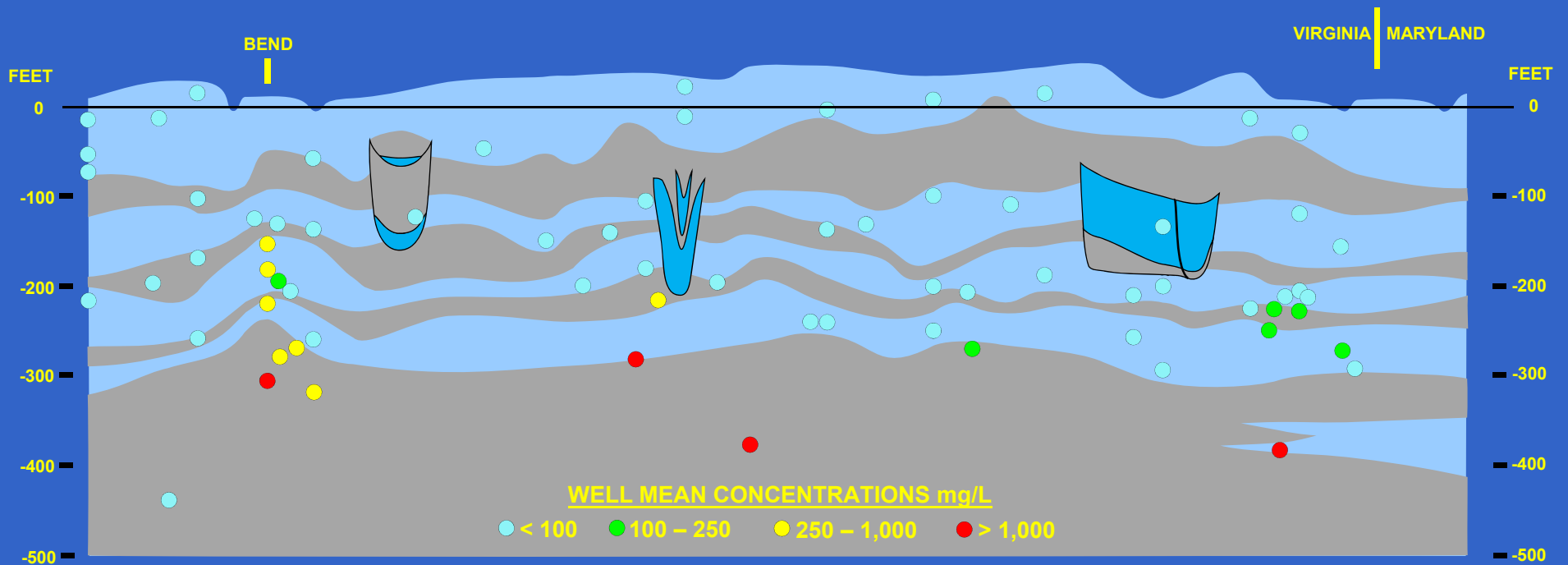
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Groundwater Chloride

SOUTH

NORTH



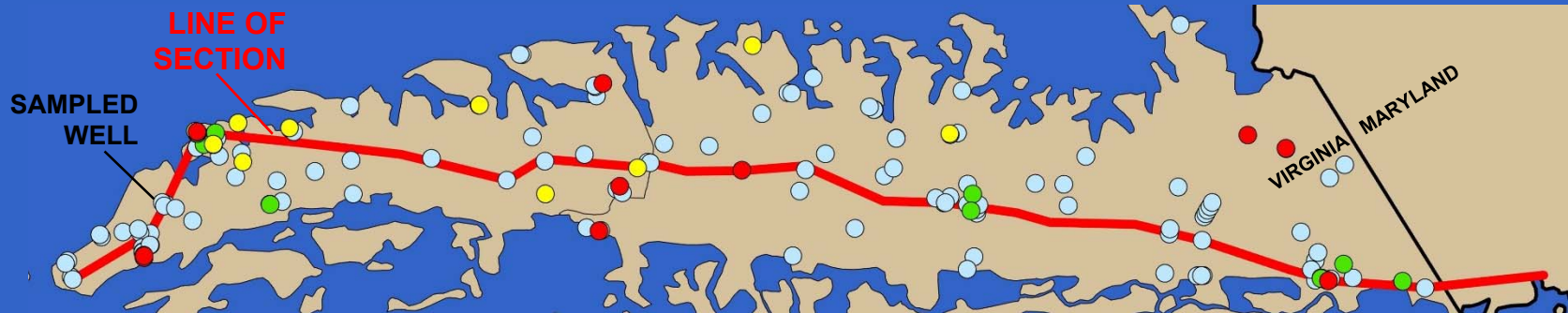
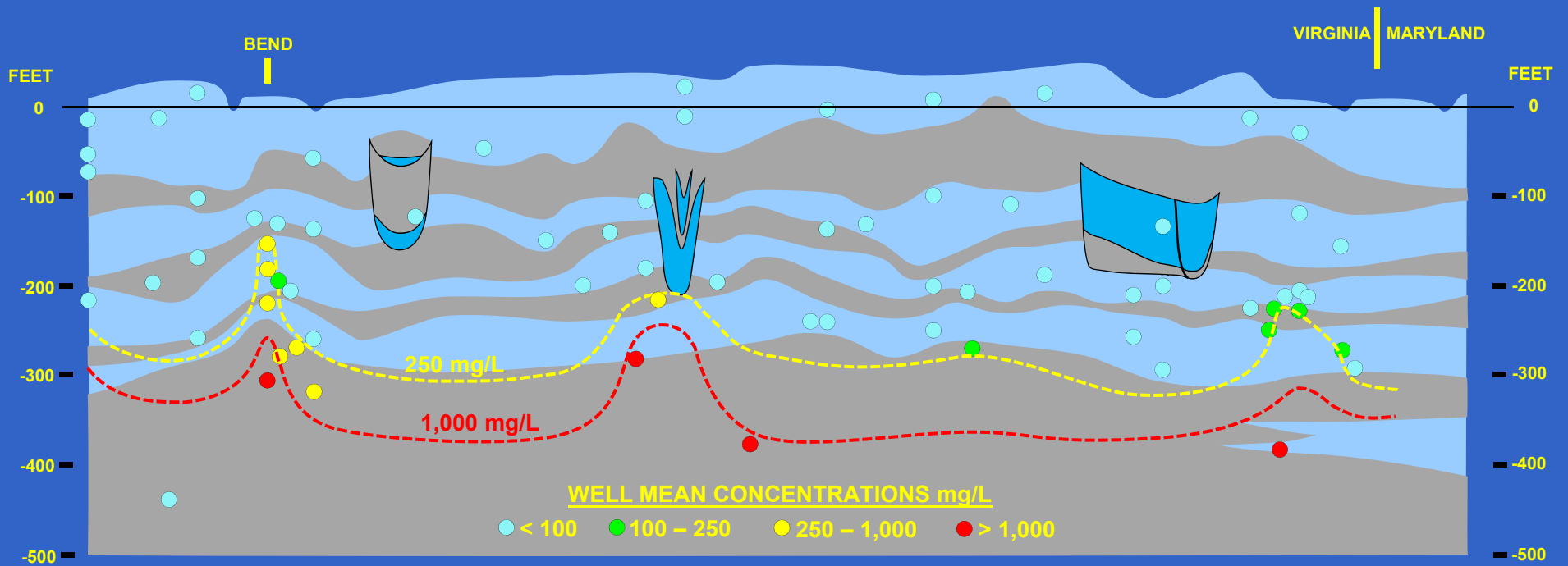
5 MI

VERTICAL EXAGGERATION 260X

Groundwater Chloride

SOUTH

NORTH



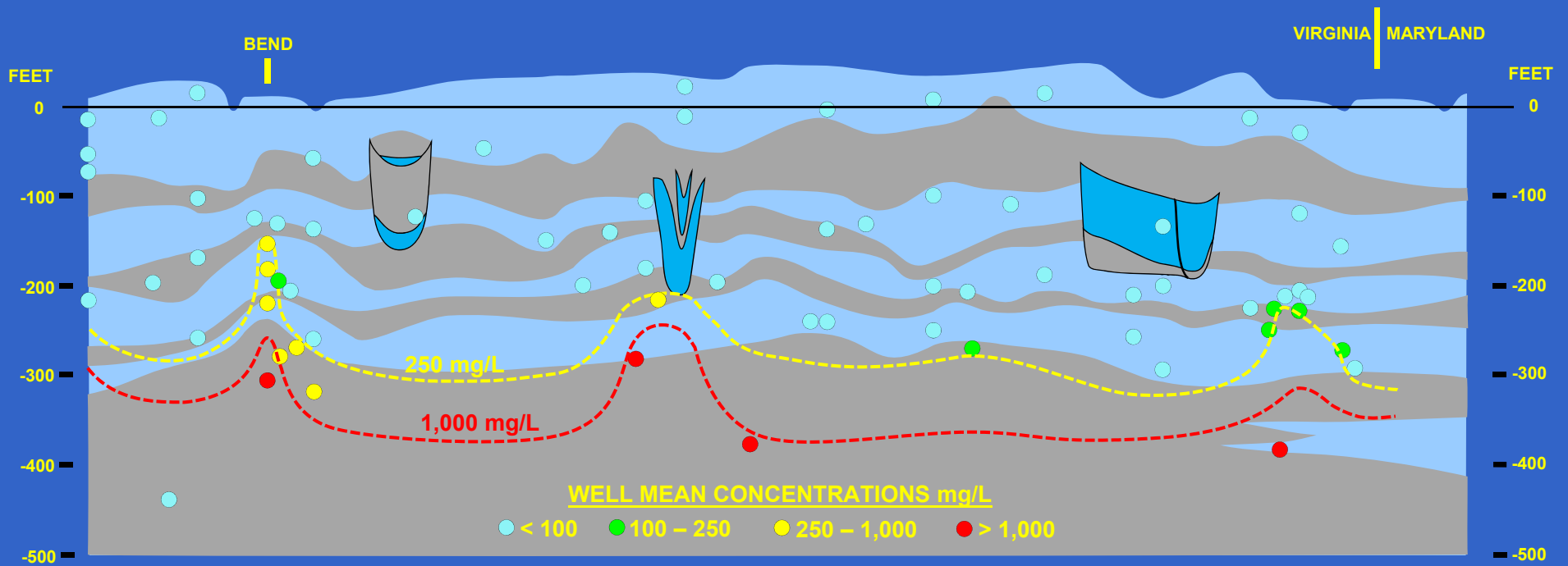
5 MI

VERTICAL EXAGGERATION 260X

Groundwater Chloride

SOUTH

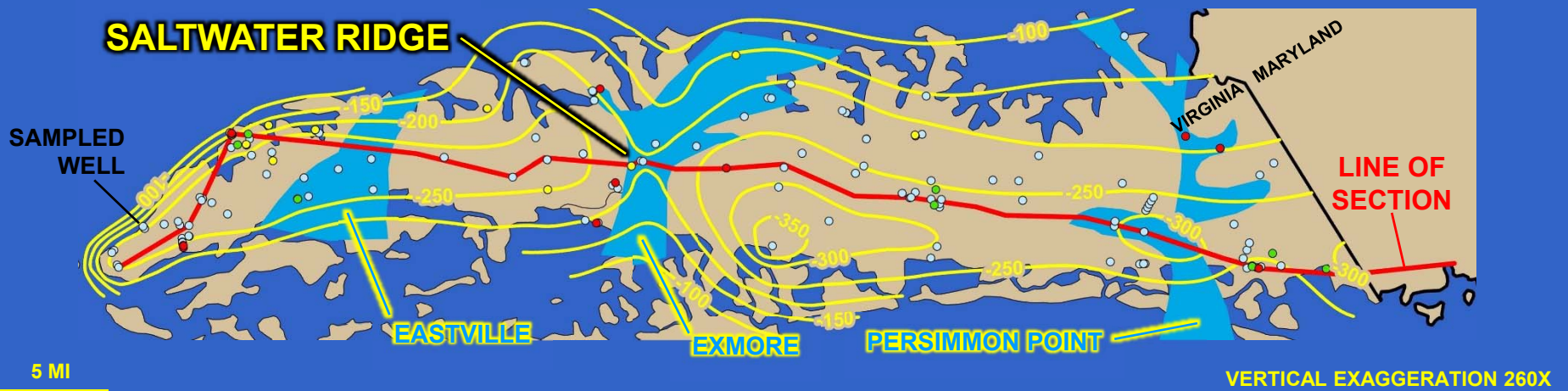
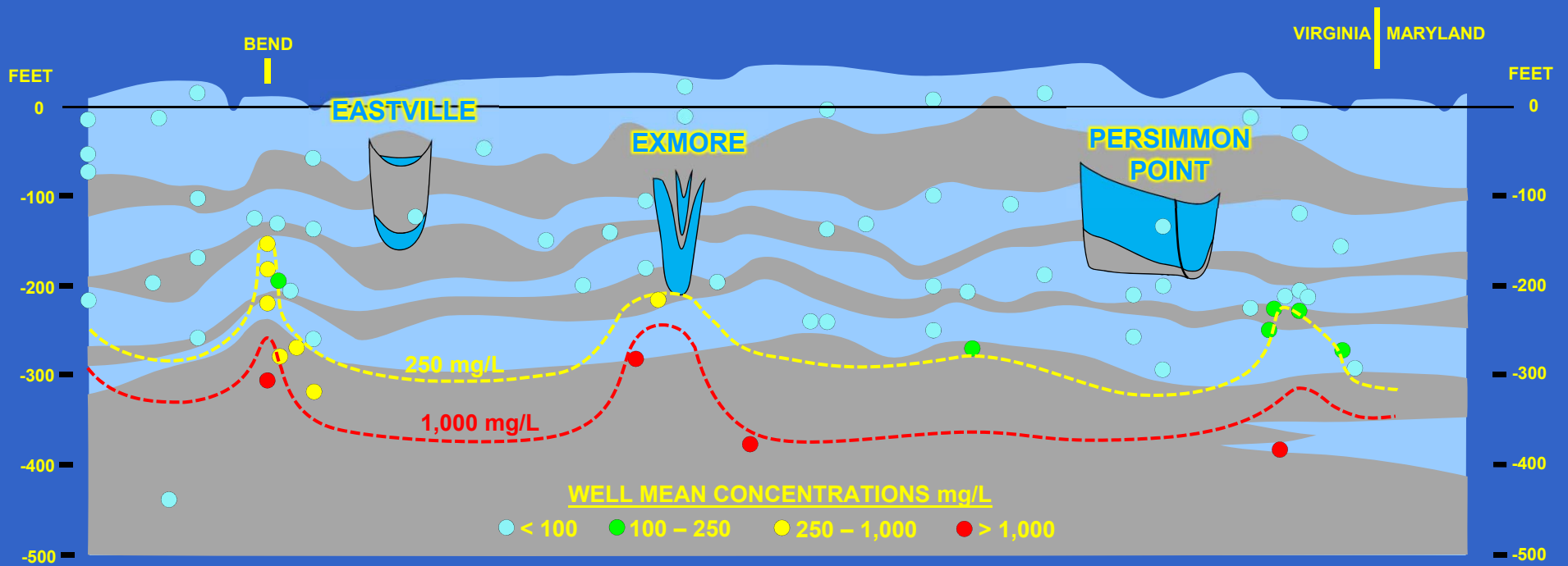
NORTH



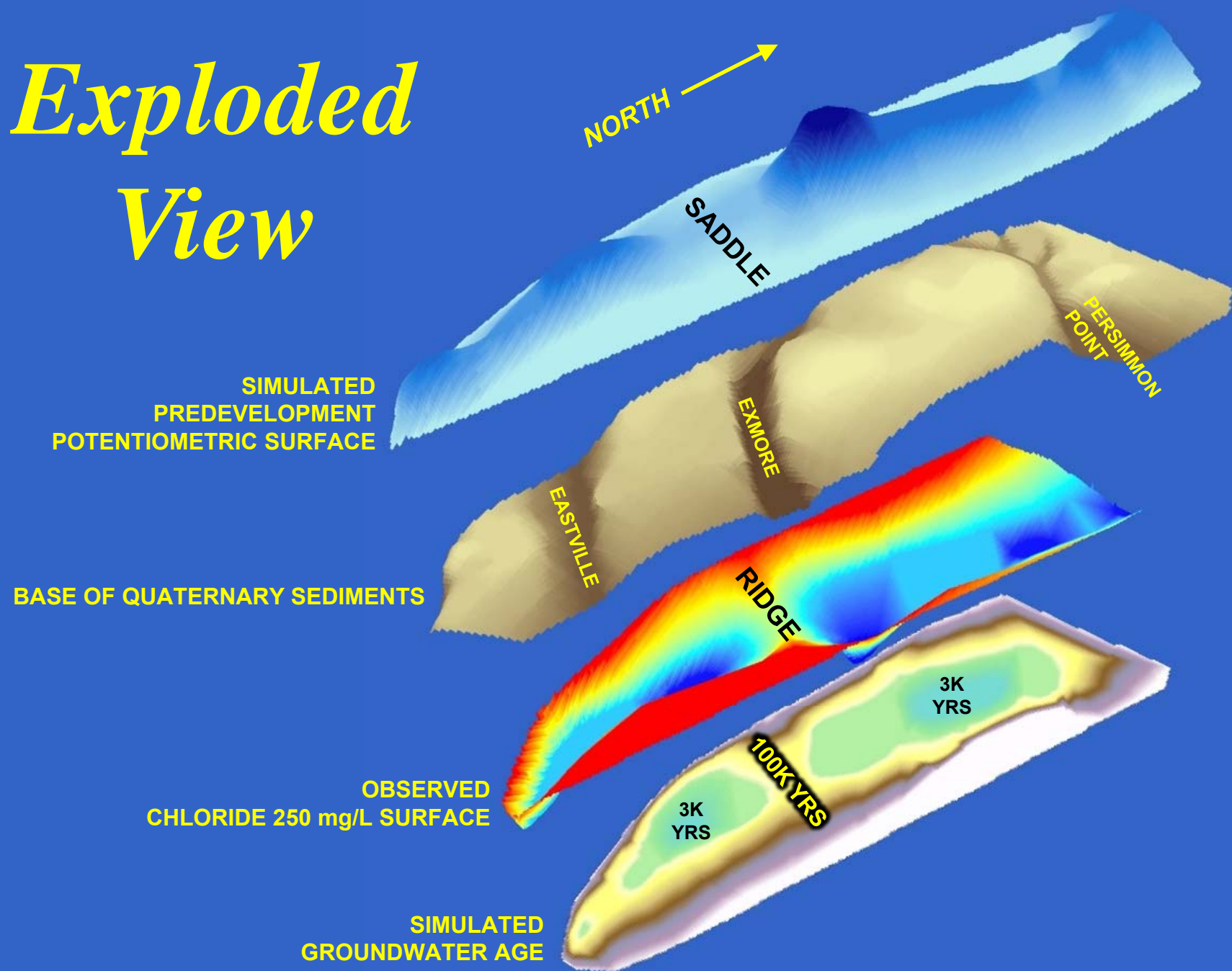
Groundwater Chloride

SOUTH

NORTH



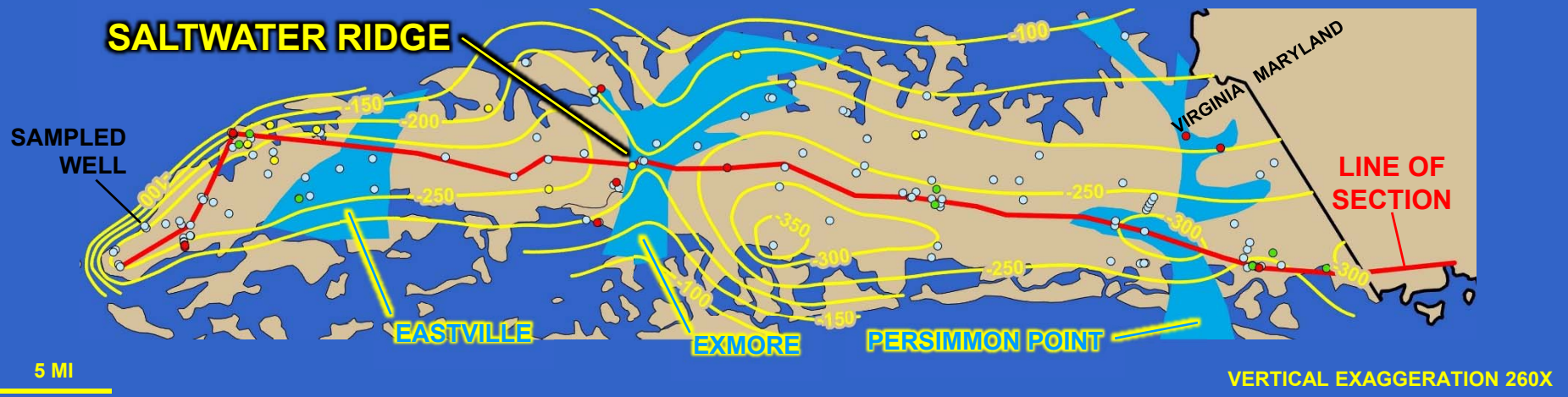
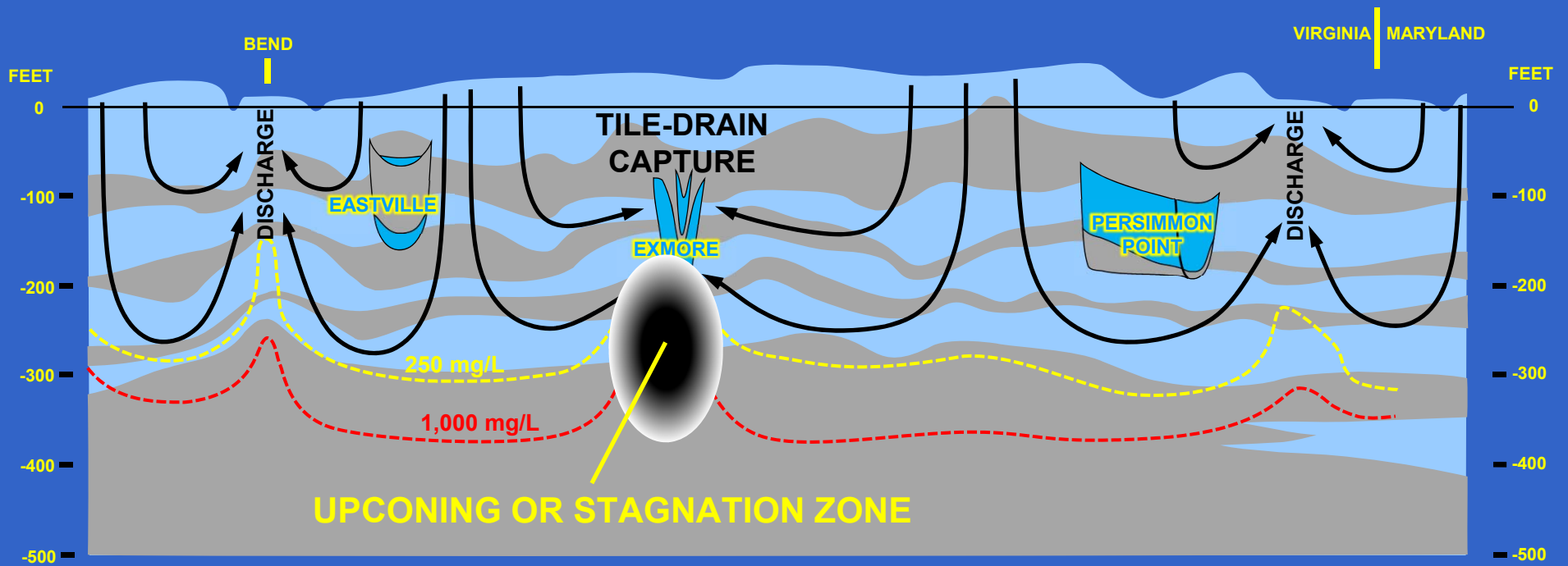
Exploded View



Differential Flushing

SOUTH

NORTH



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Acknowledgements

- *Todd Beach, Scott Bruce – borehole data*
- *Matt Link – aquifer tests*
- *Ryan Green – chloride data*
- *Scott Kudlas – project support*