Estimating Beach Volume Change as a function of Beach Profile Spacing

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Chris Creed, P.E.
Al Browder, Ph.D., P.E.

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Jacksonville, Florida

How does the “accuracy” of beach volume change estimates vary with fewer beach profile survey lines?

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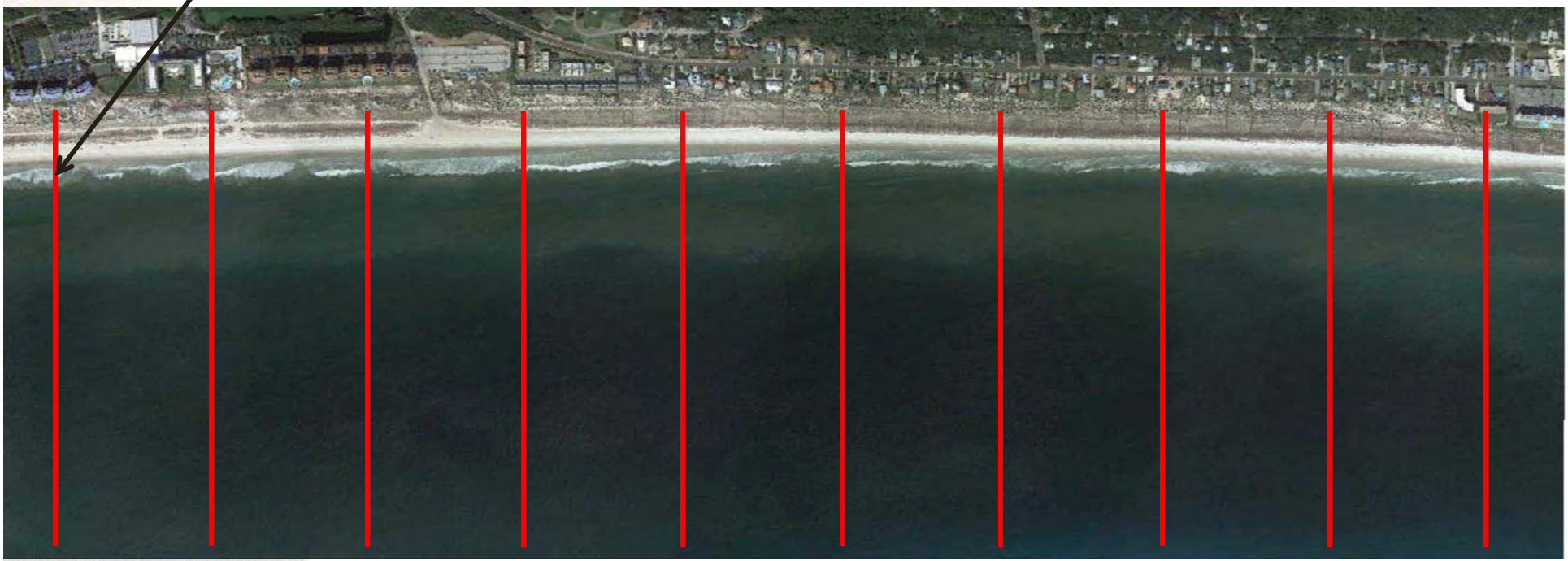
BEACH PROFILE SURVEY LINE



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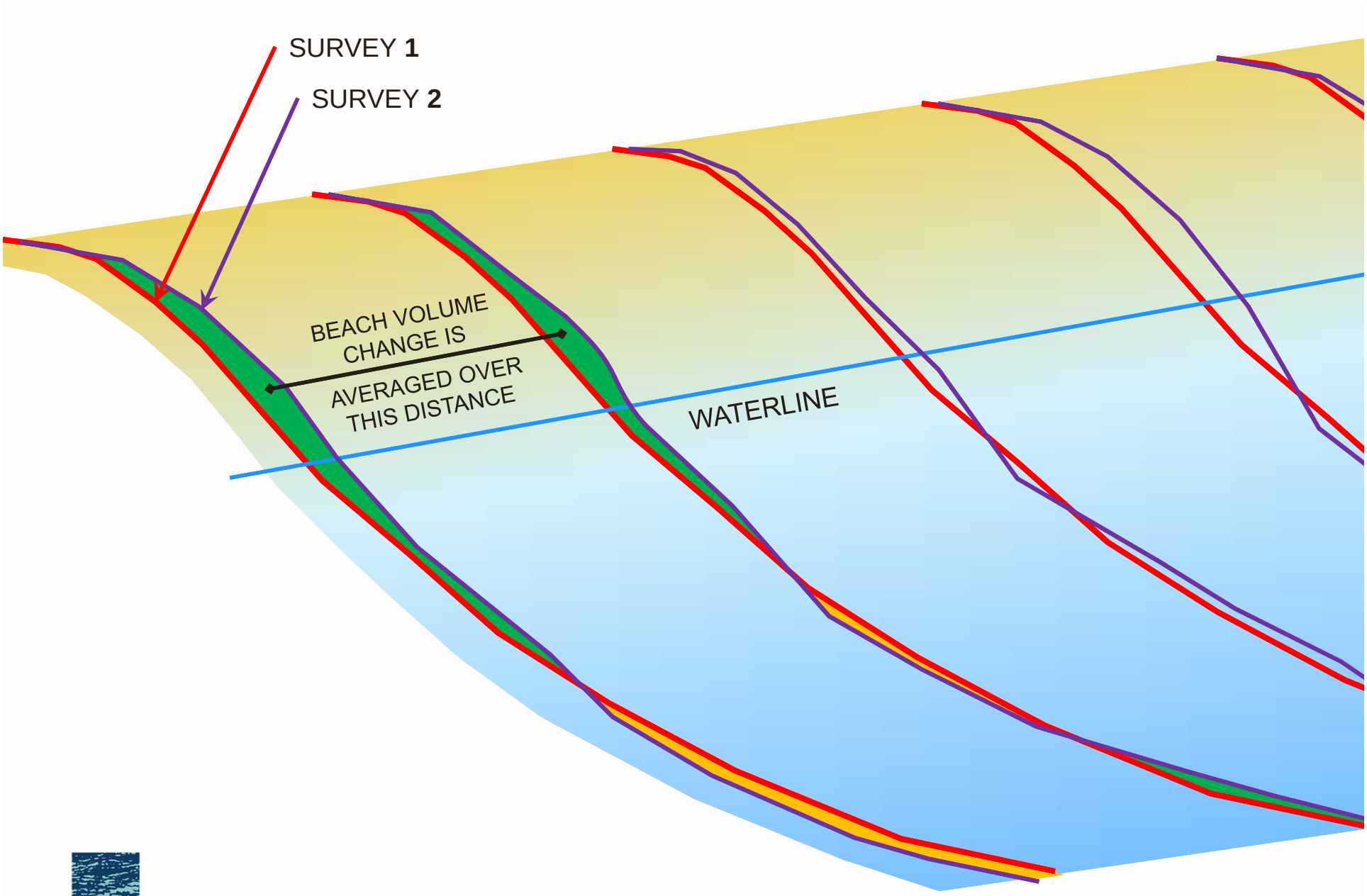

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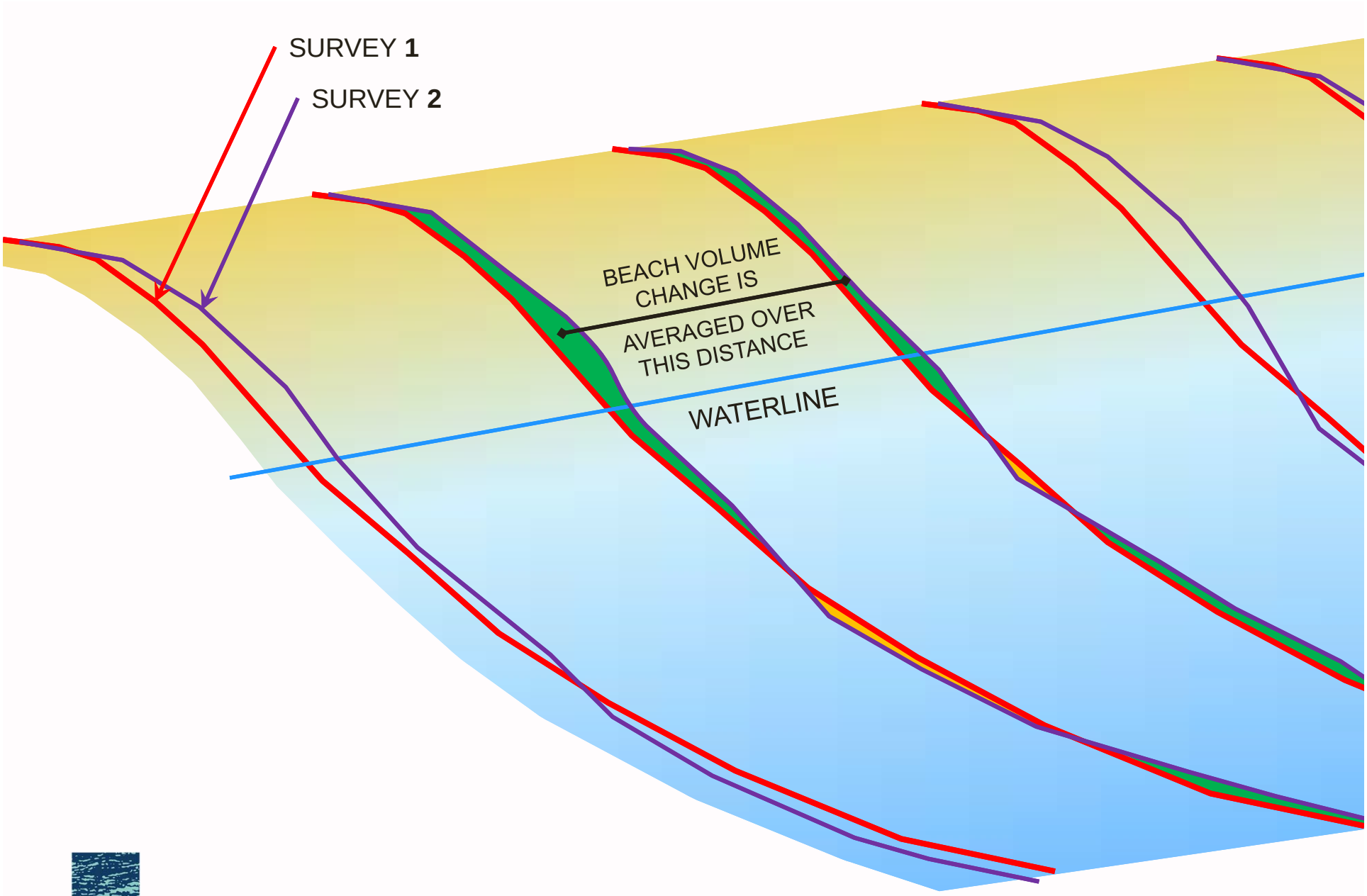

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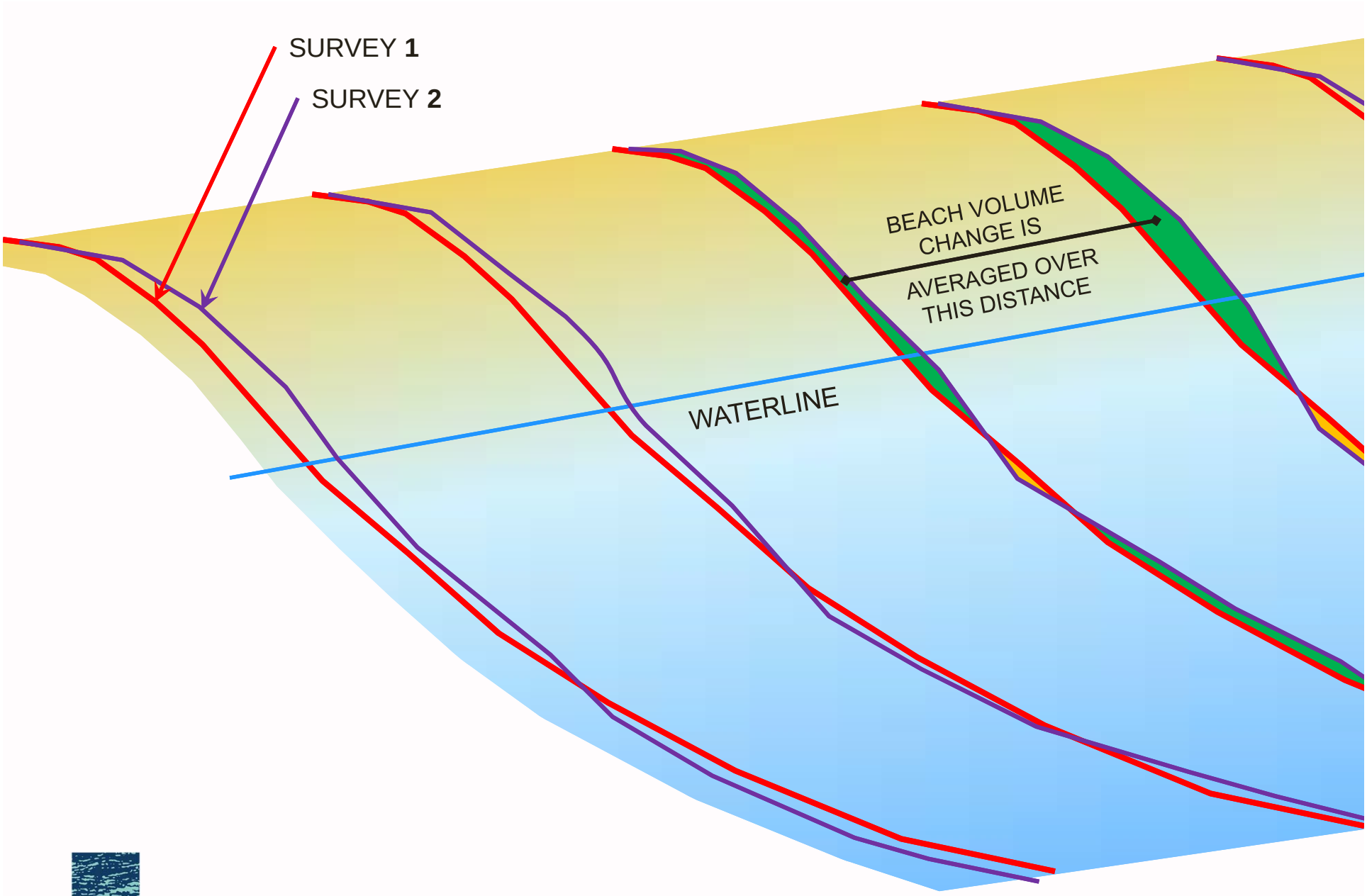

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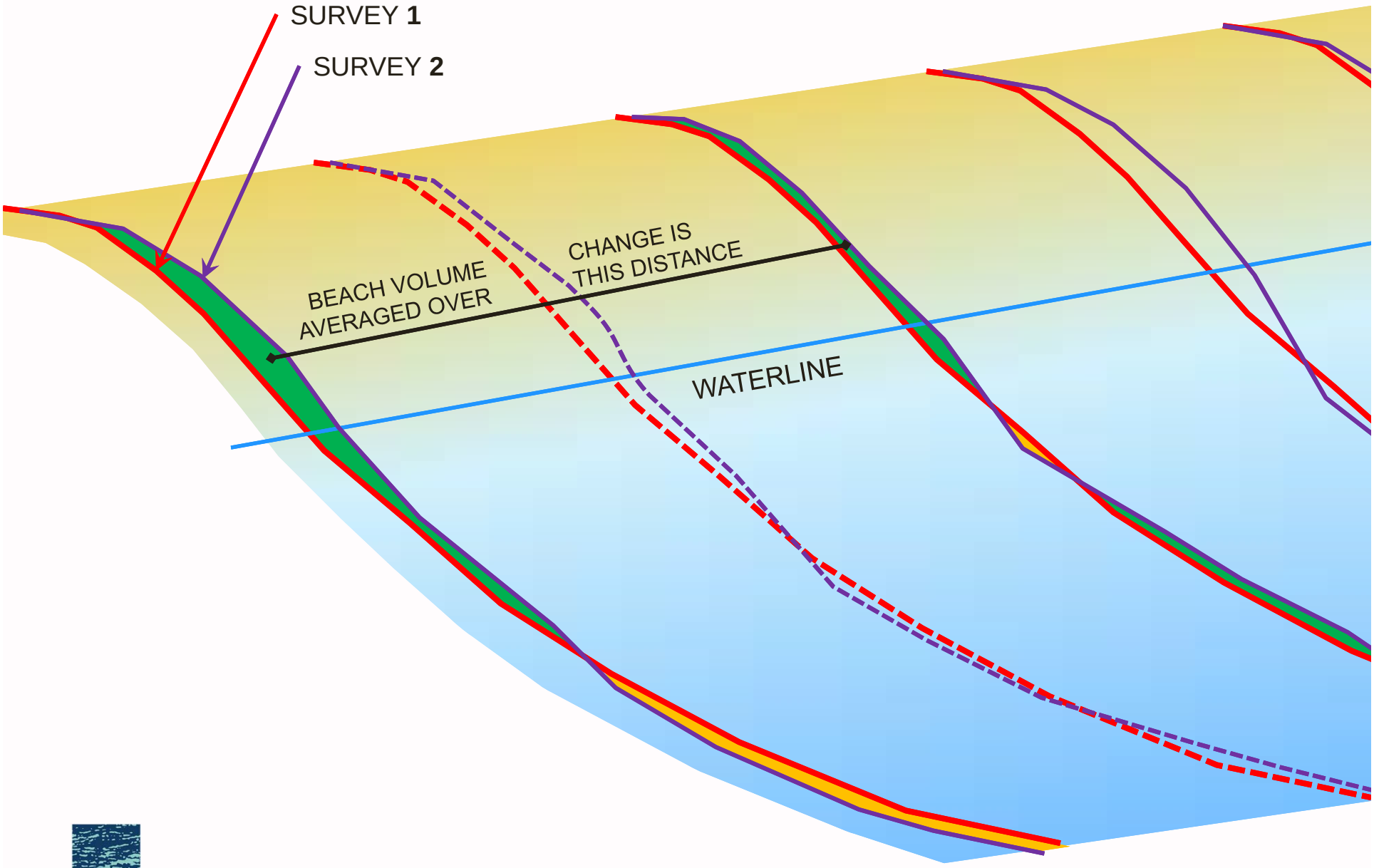

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COMPLETE BEACH PROFILE SURVEY SET

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TYPICAL BEACH PROFILE SURVEYS (1000-FT)

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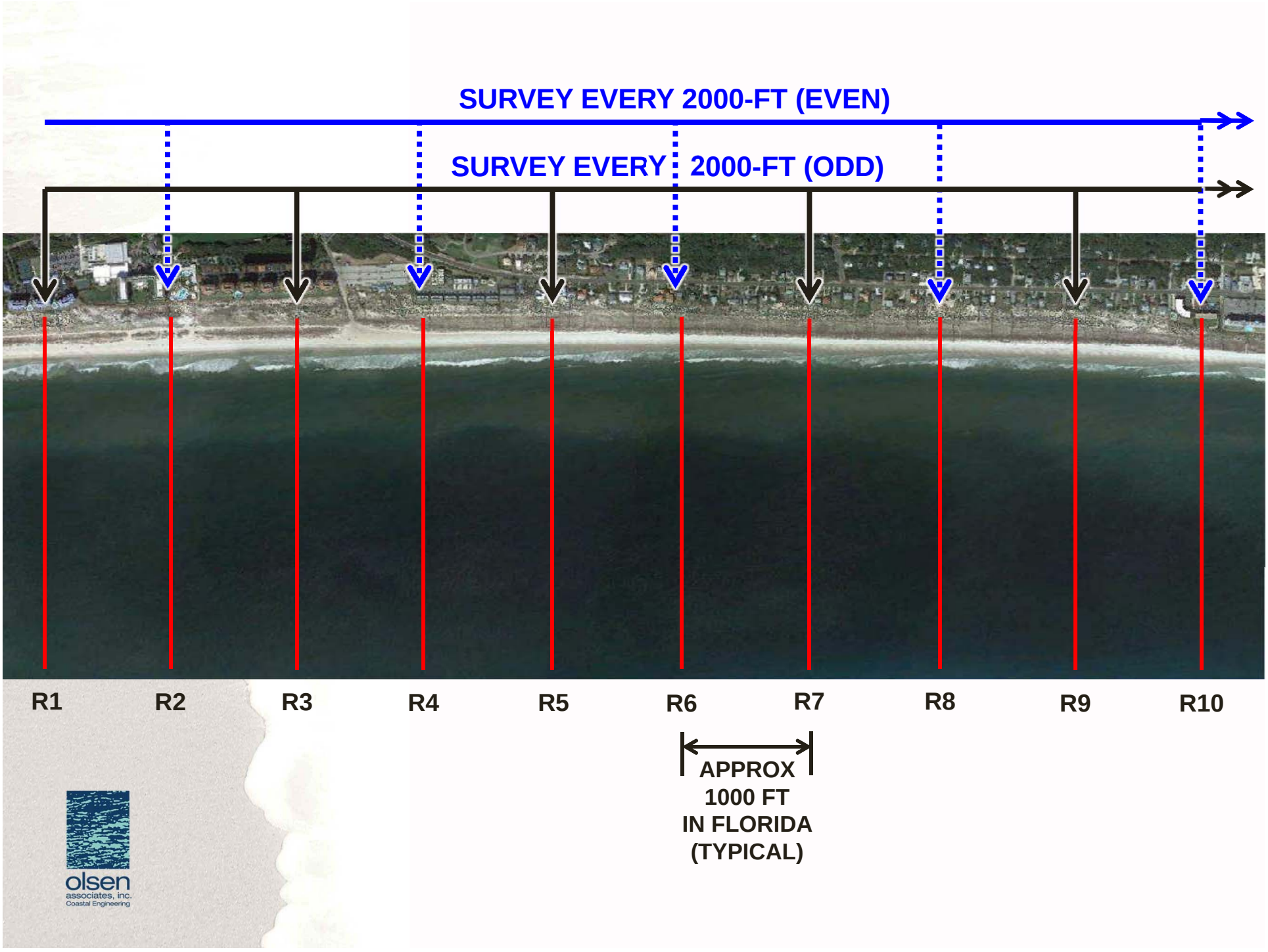

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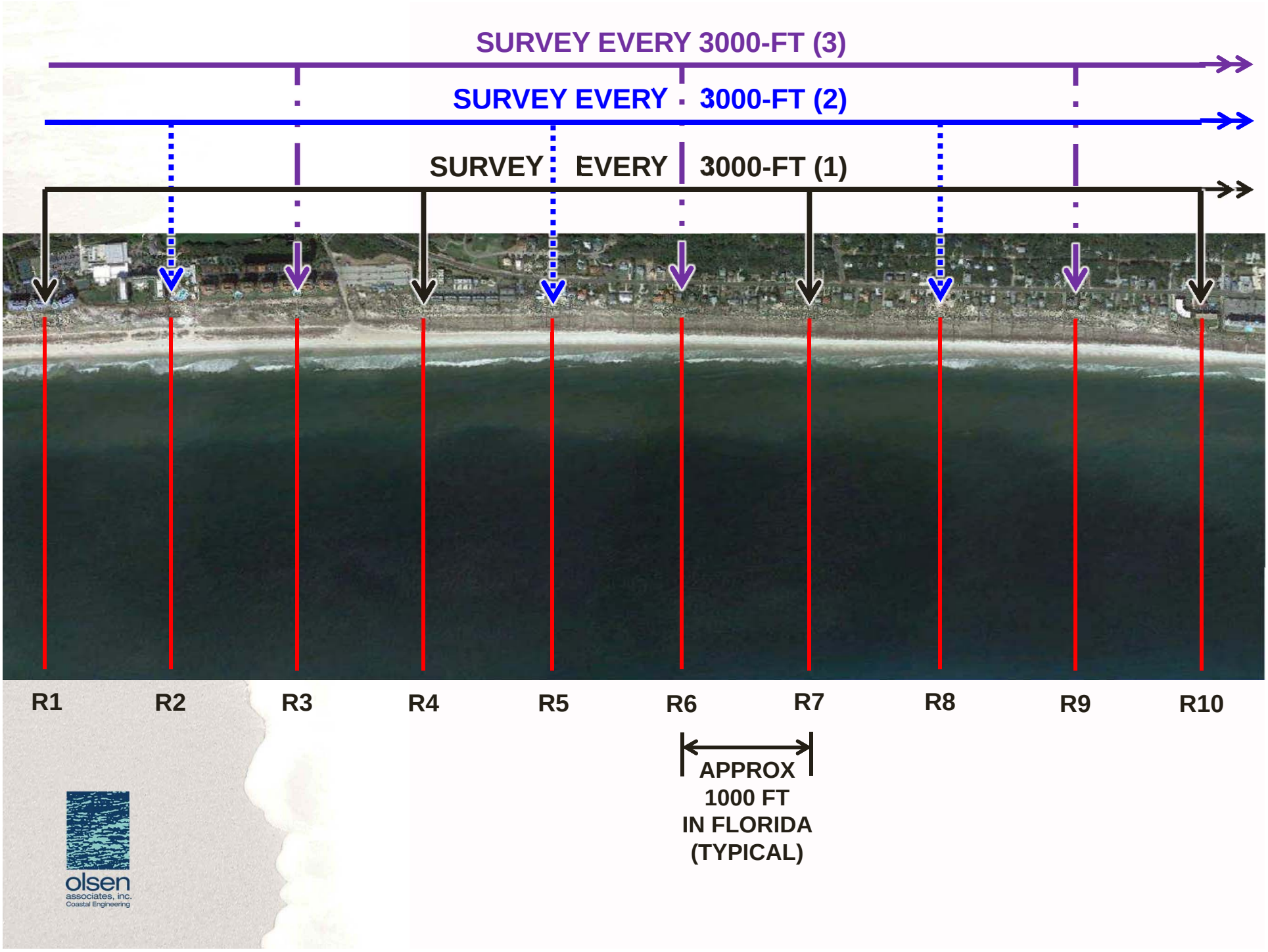
SURVEY EVERY 3000-FT (3)
SURVEY EVERY 3000-FT (2)
SURVEY EVERY 3000-FT (1)
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
APPROX
1000 FT
IN FLORIDA
(TYPICAL)
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Why survey less profile lines?

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Why survey less profile lines?

For long shorelines (3+ miles)….

- **Survey costs decrease mostly linearly with number of profiles**
- **Analysis costs decrease somewhat with number of profiles**

Example…..

- **4-mile shoreline: Savings of *$ 6K - $10K* to survey every 2nd or 3rd line**
- **8-mile shoreline: Savings of *$13K - $20K* to survey every 2nd or 3rd line**

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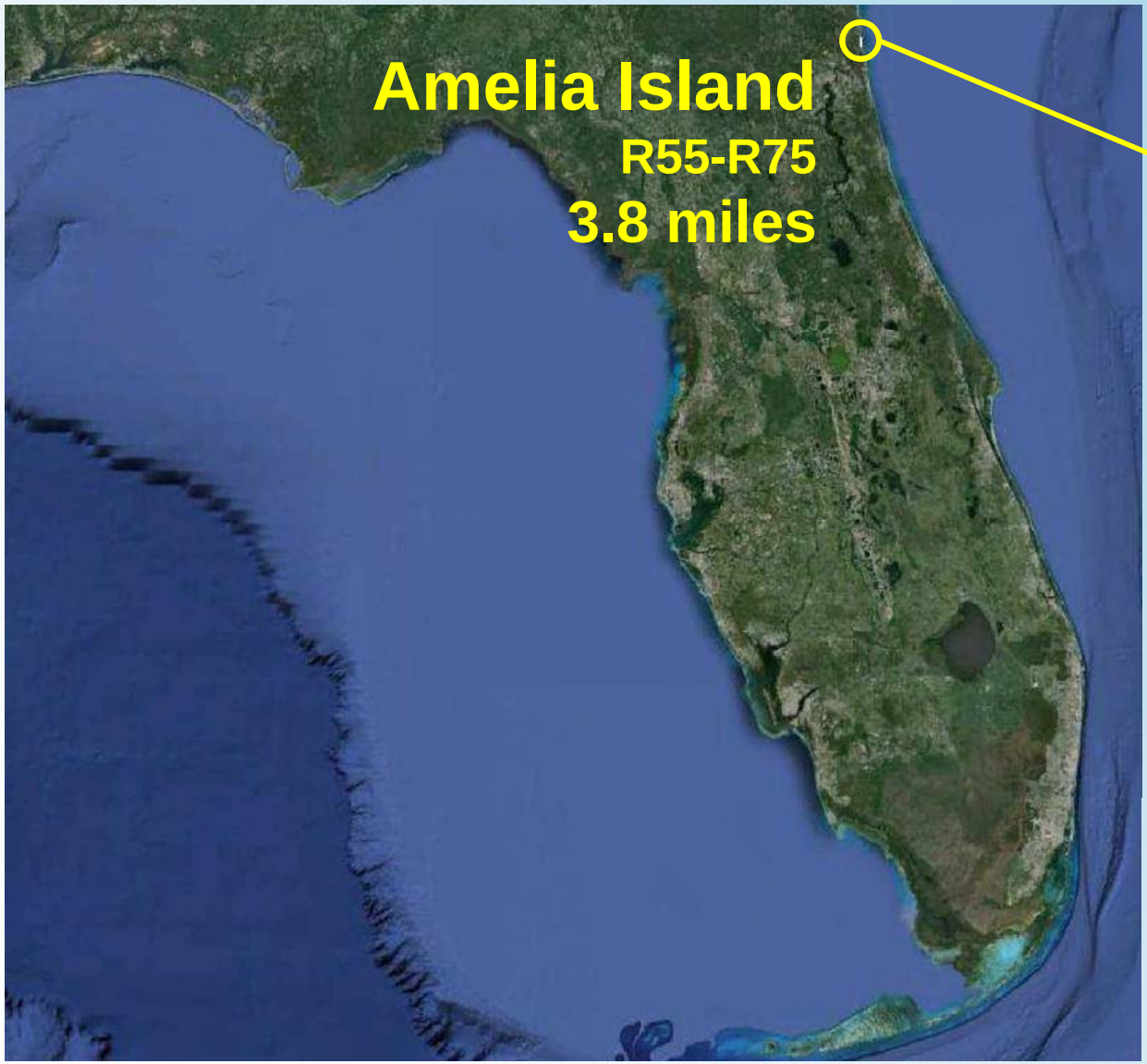

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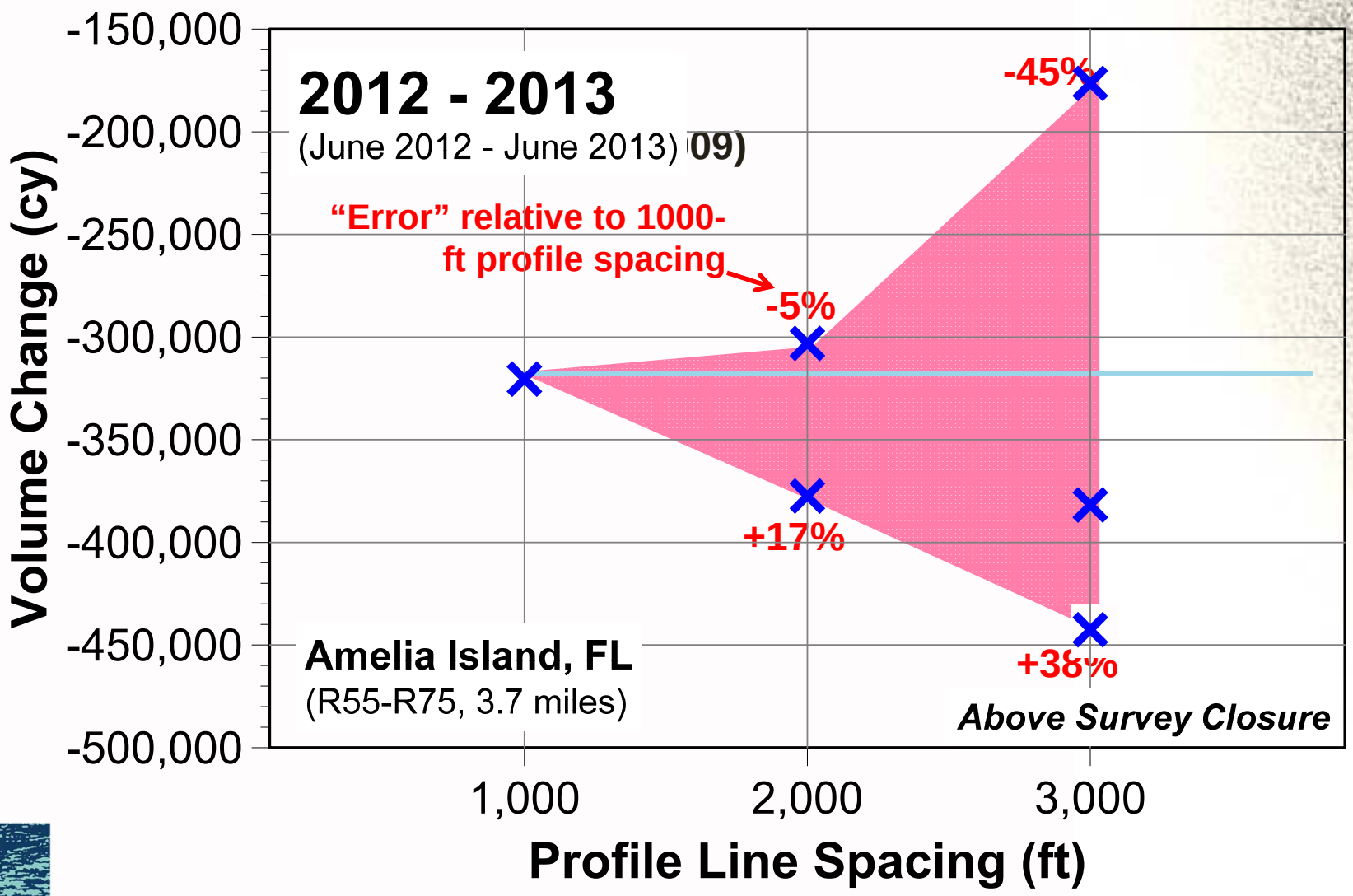
AMELIA ISLAND



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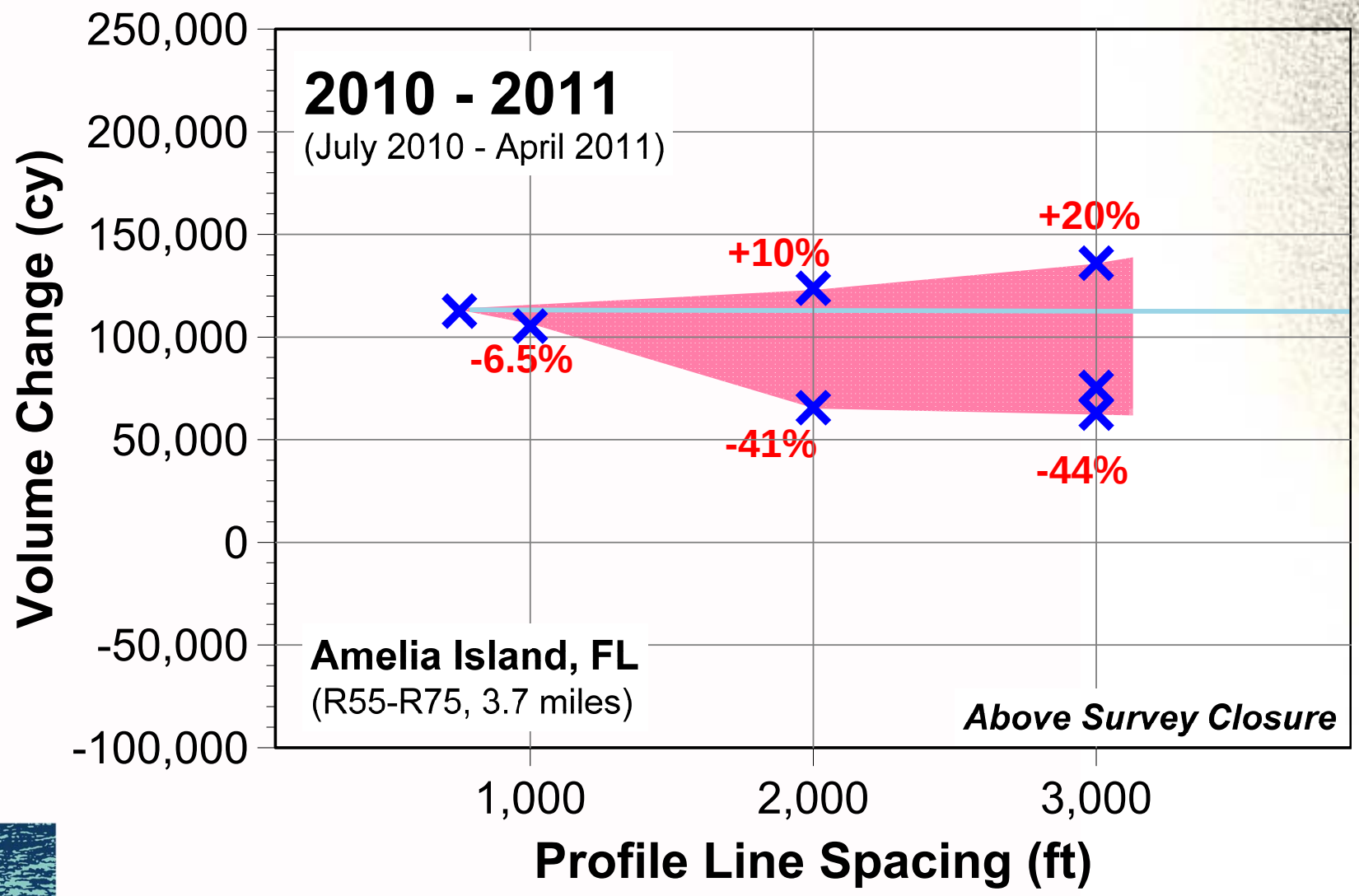
AMELIA ISLAND



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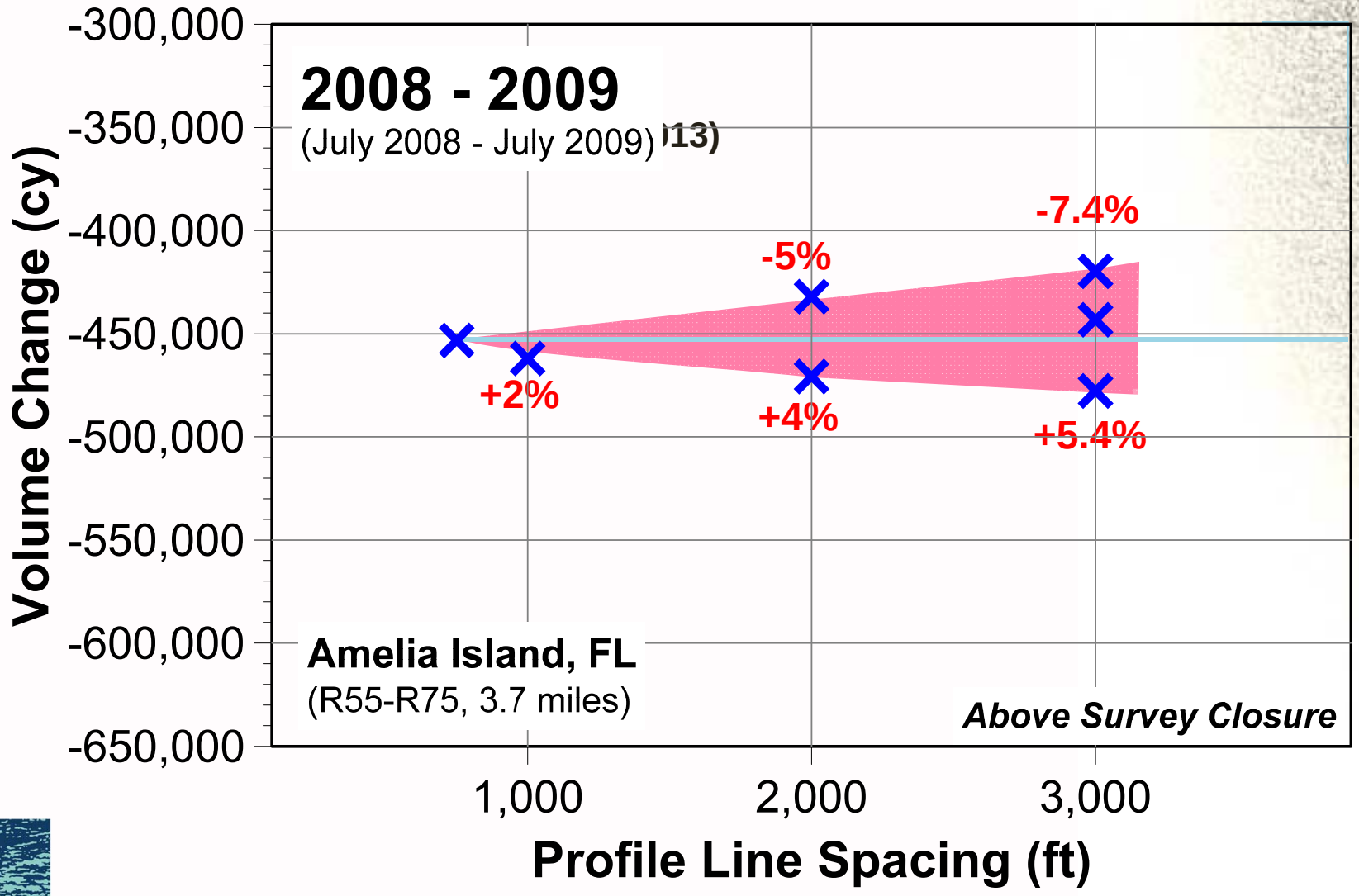

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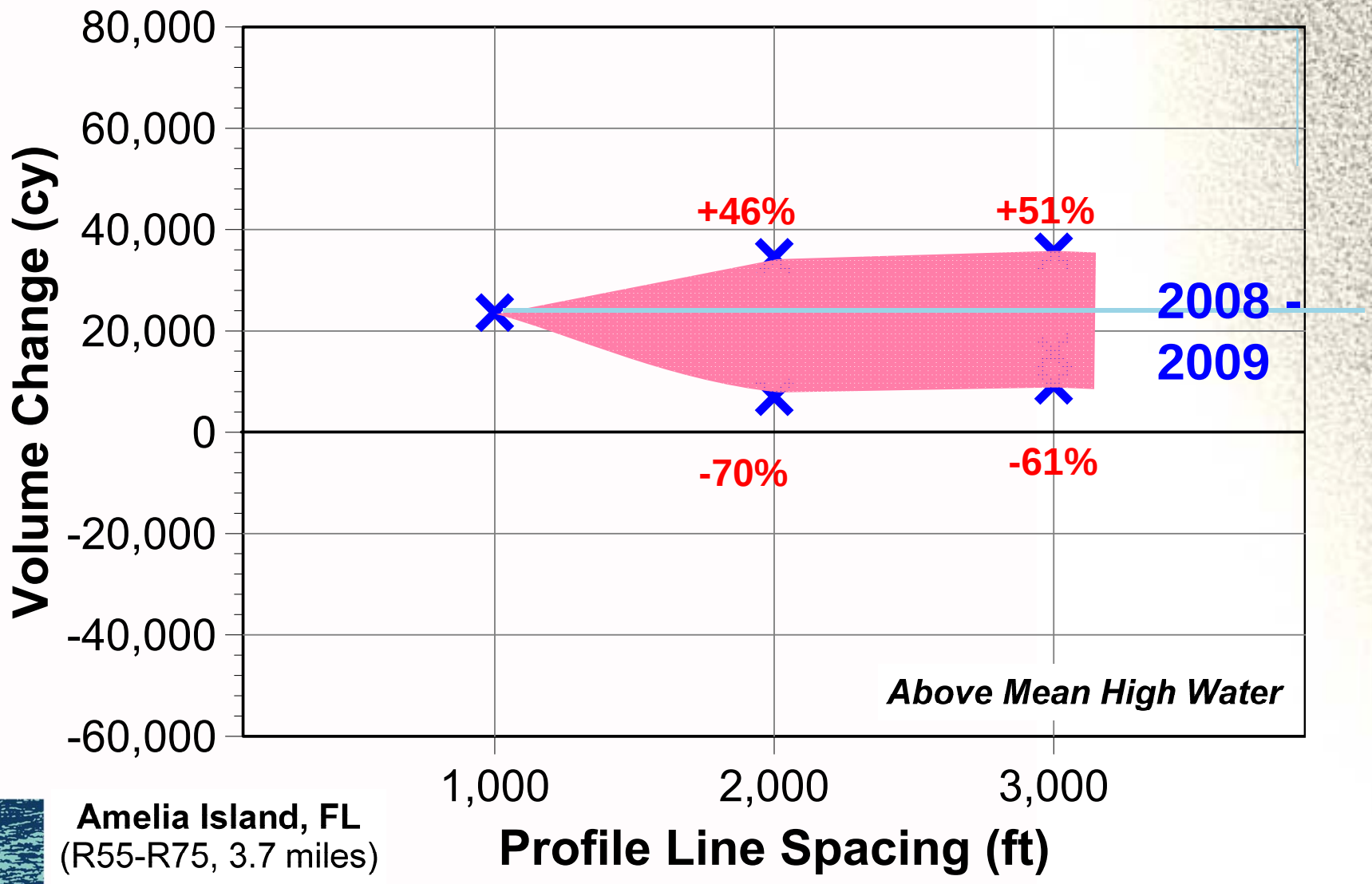
AMELIA ISLAND

Volume Change above Mean High Water



Amelia Island, FL
(R55-R75, 3.7 miles)

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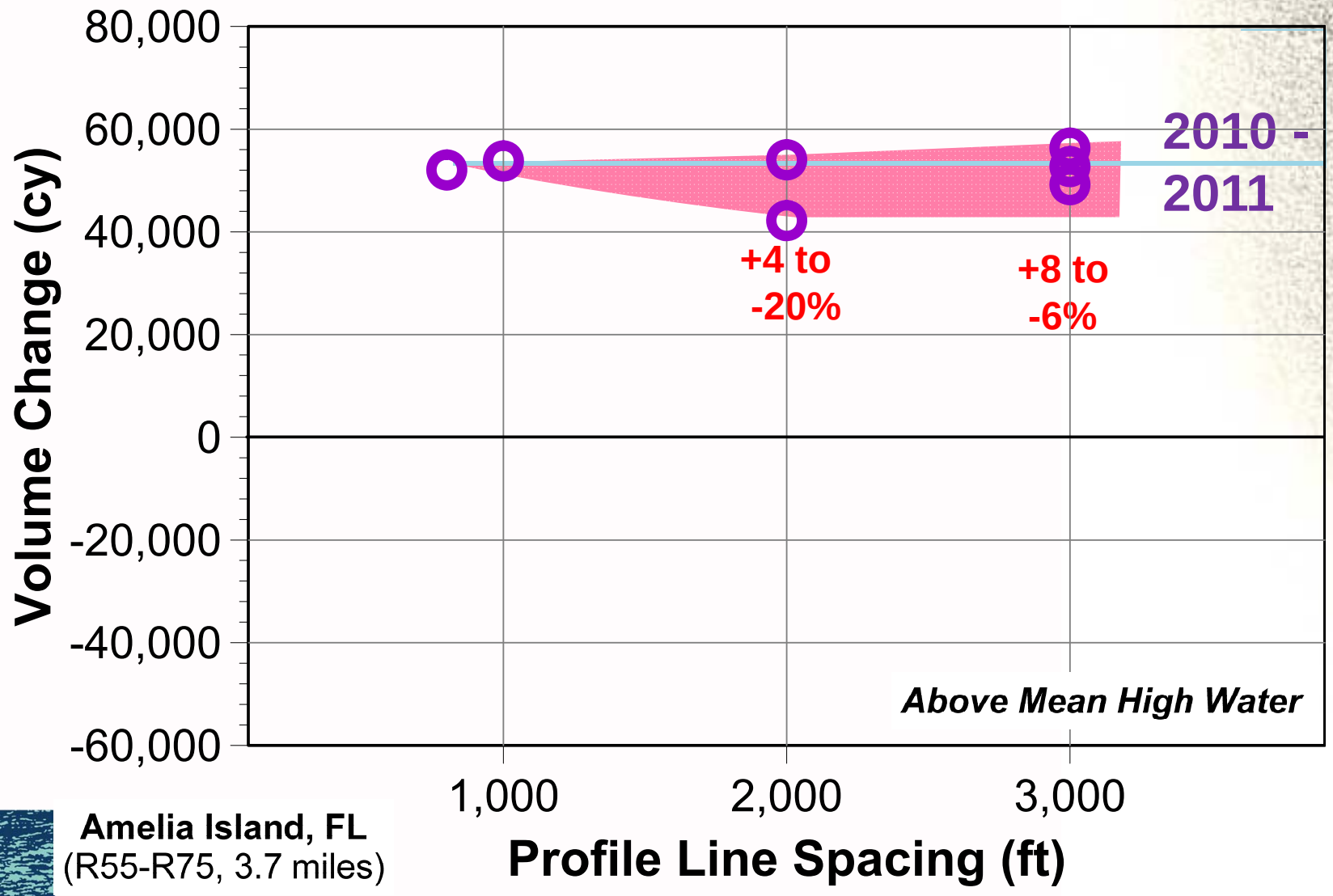
AMELIA ISLAND

Volume Change above Mean High Water



Amelia Island, FL
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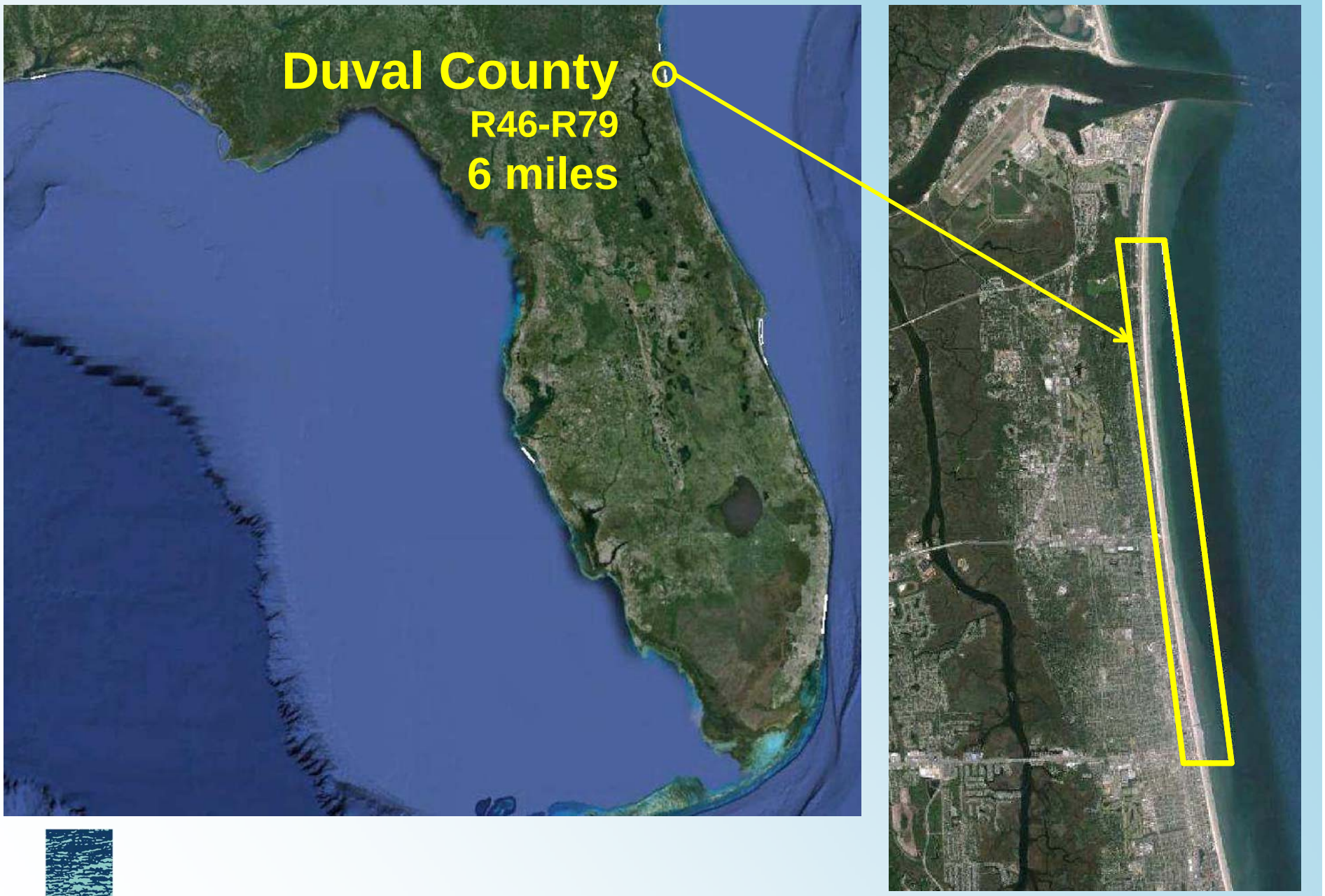

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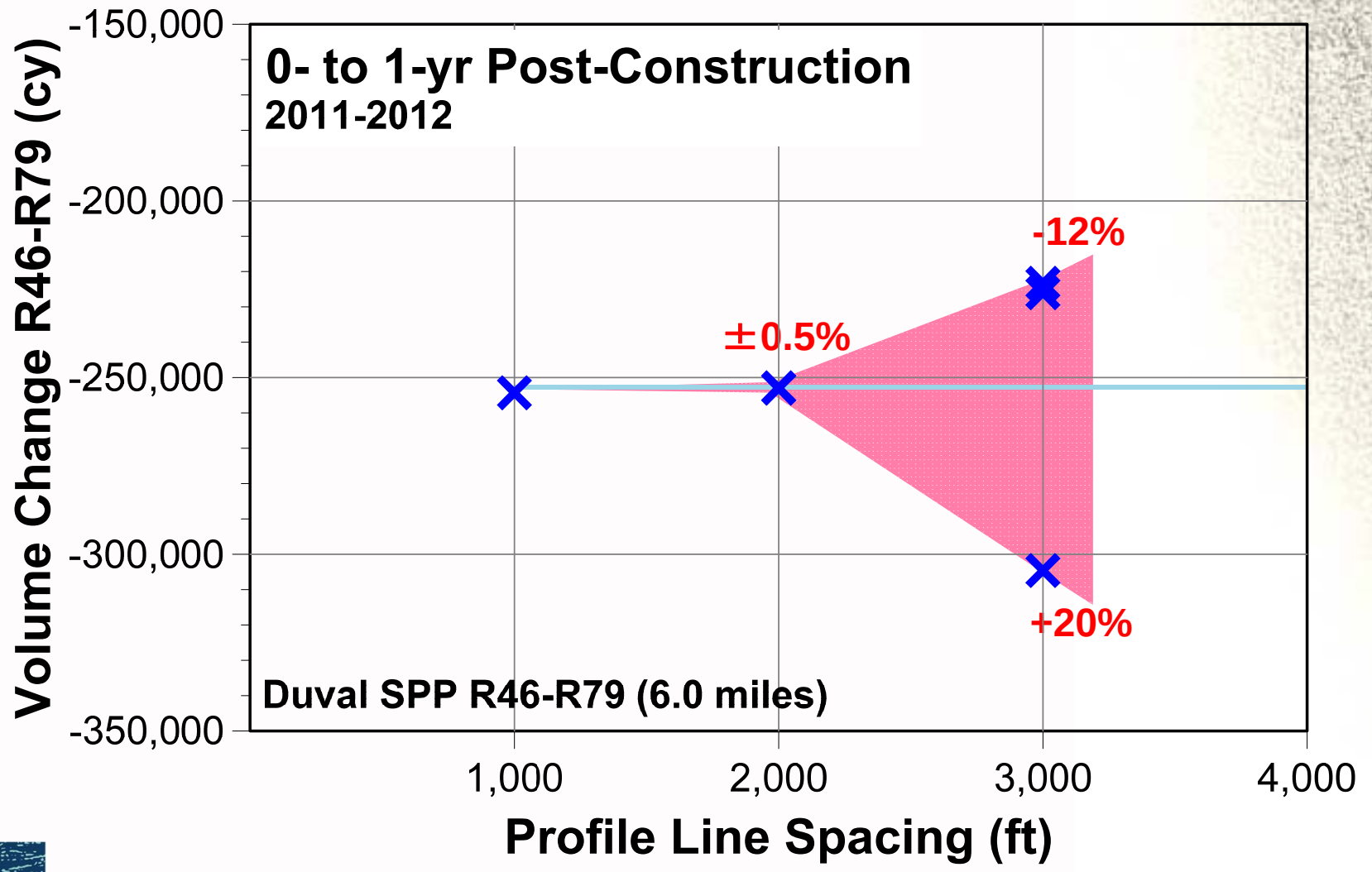
DUVAL COUNTY



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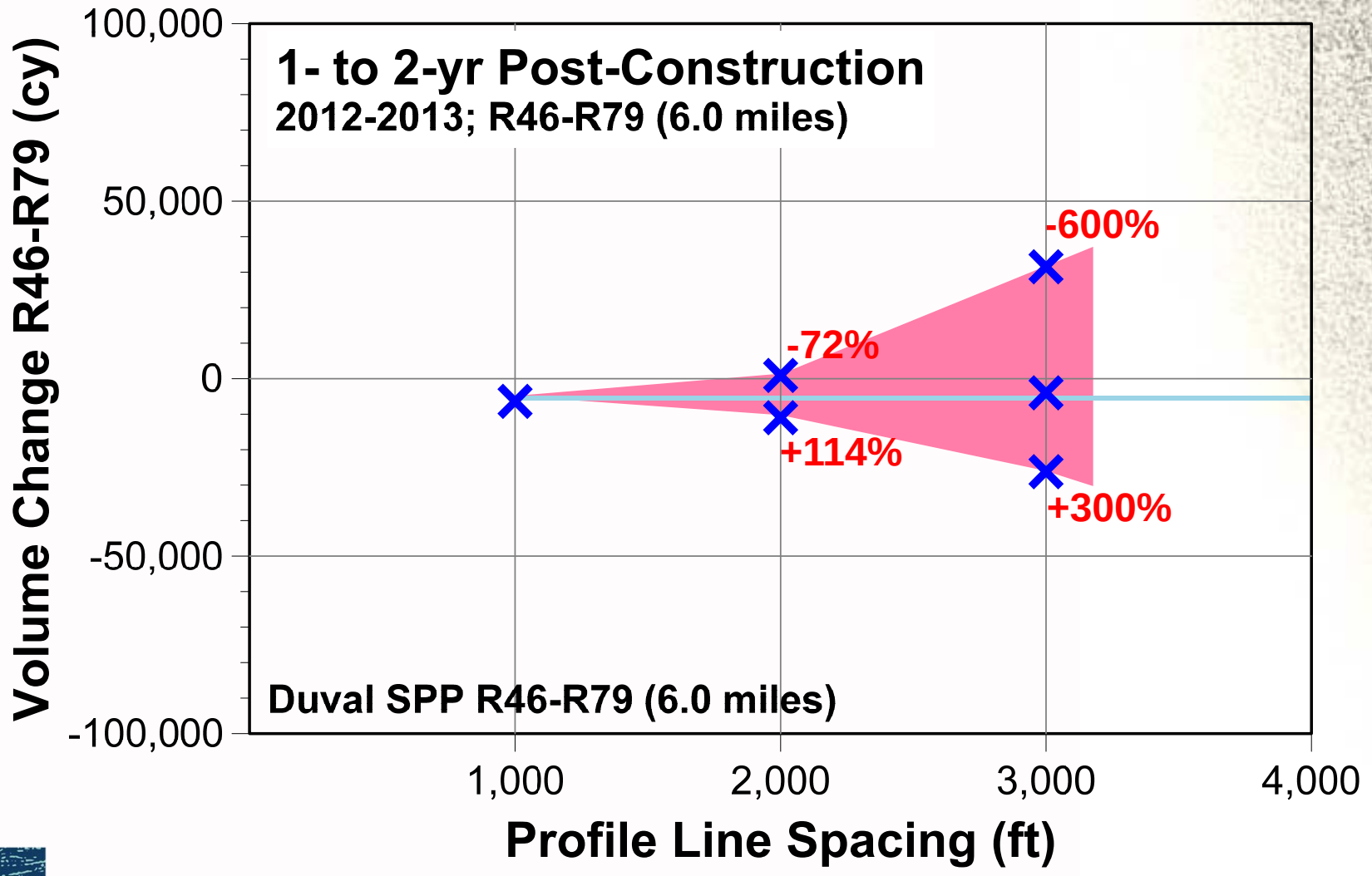
DUVAL COUNTY



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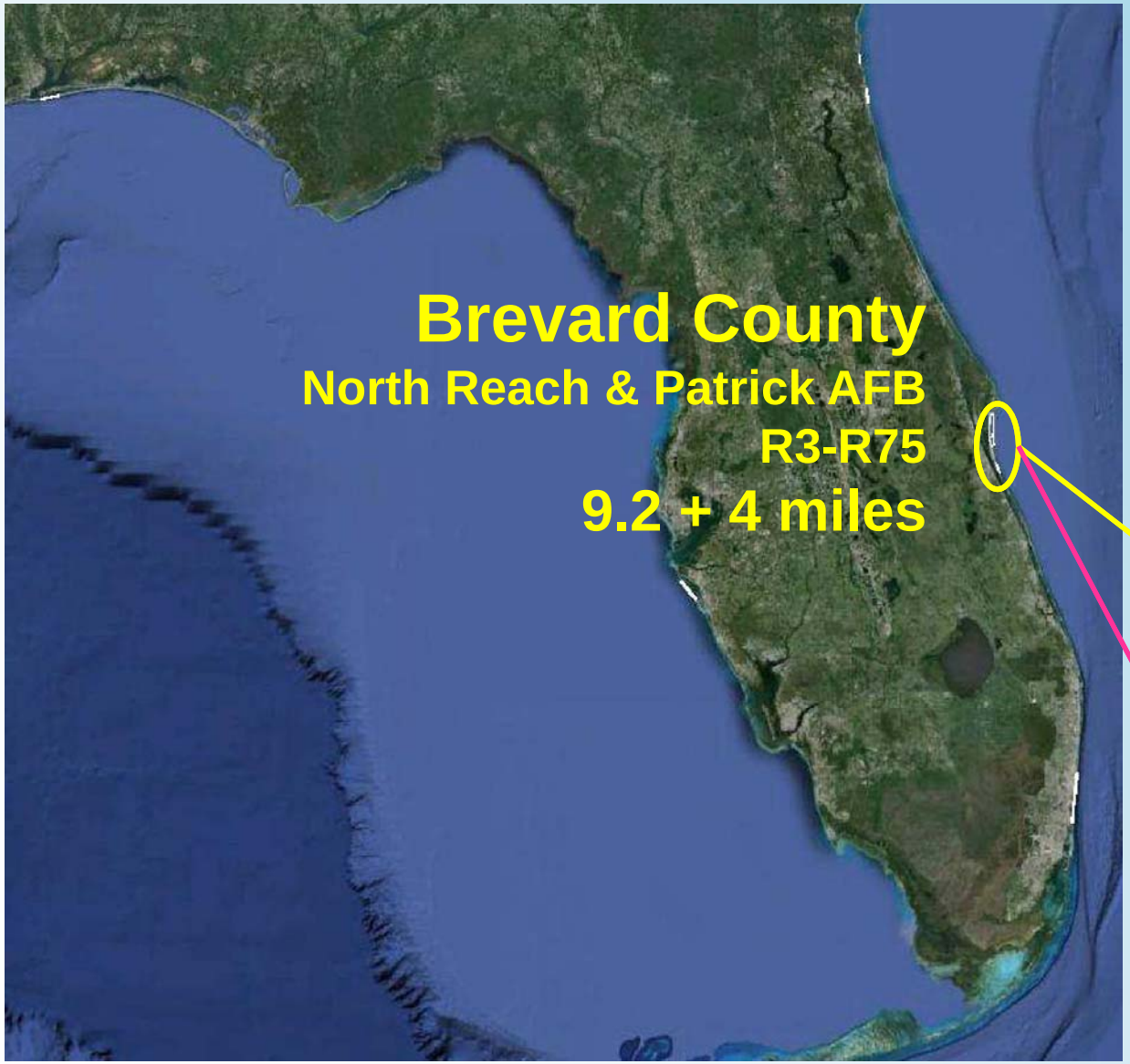

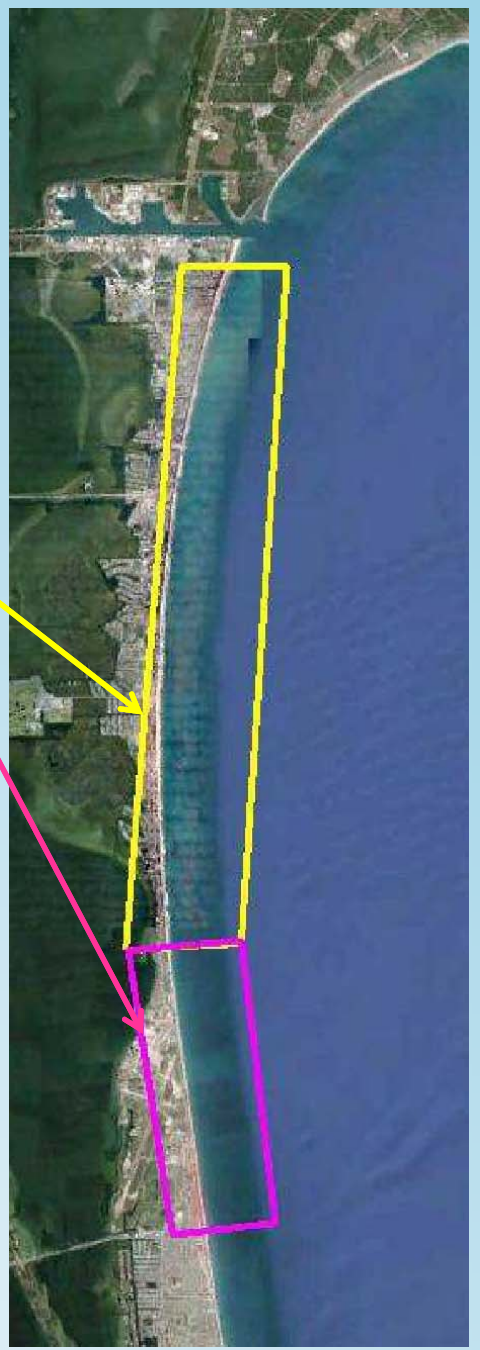

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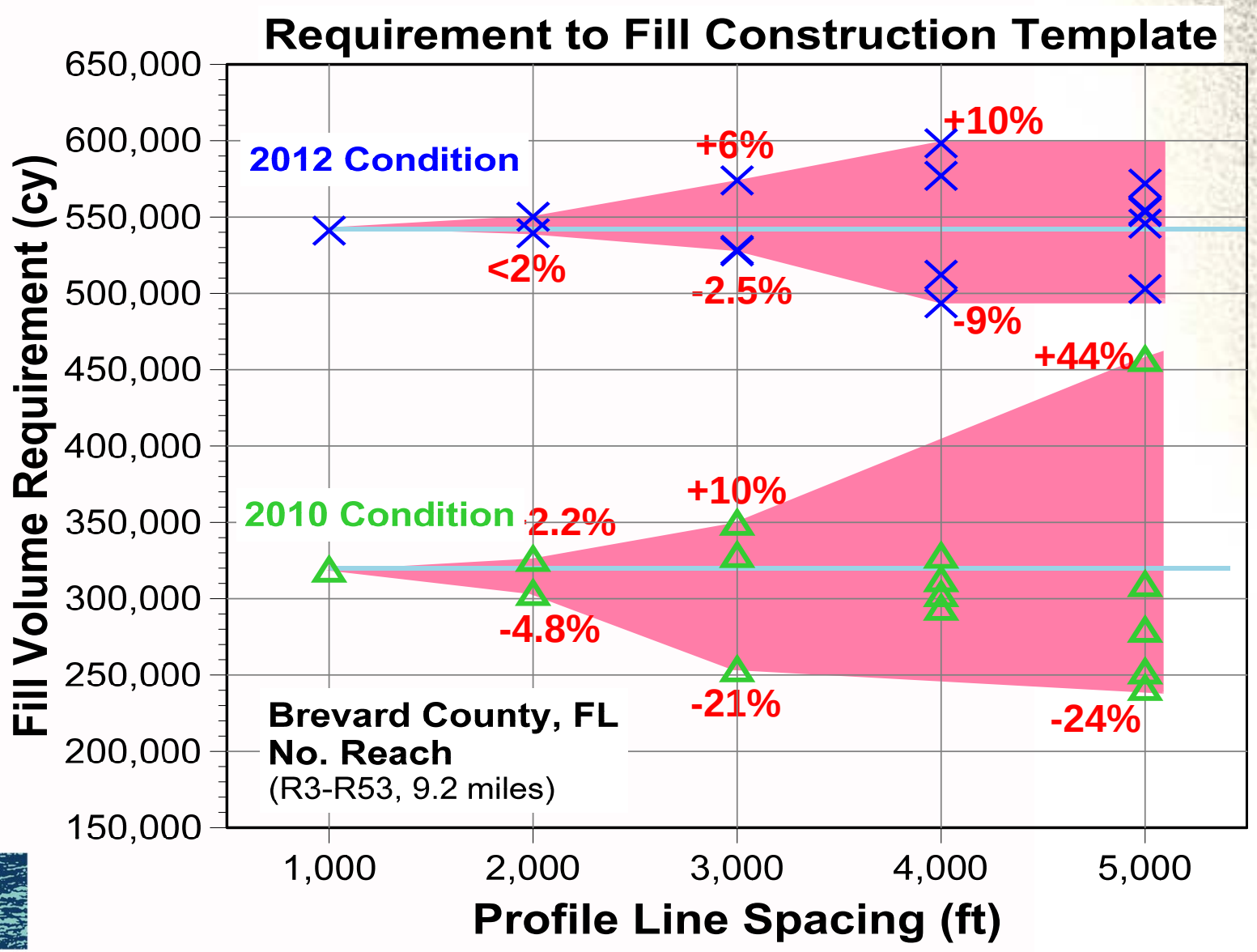
BREVARD – NORTH REACH



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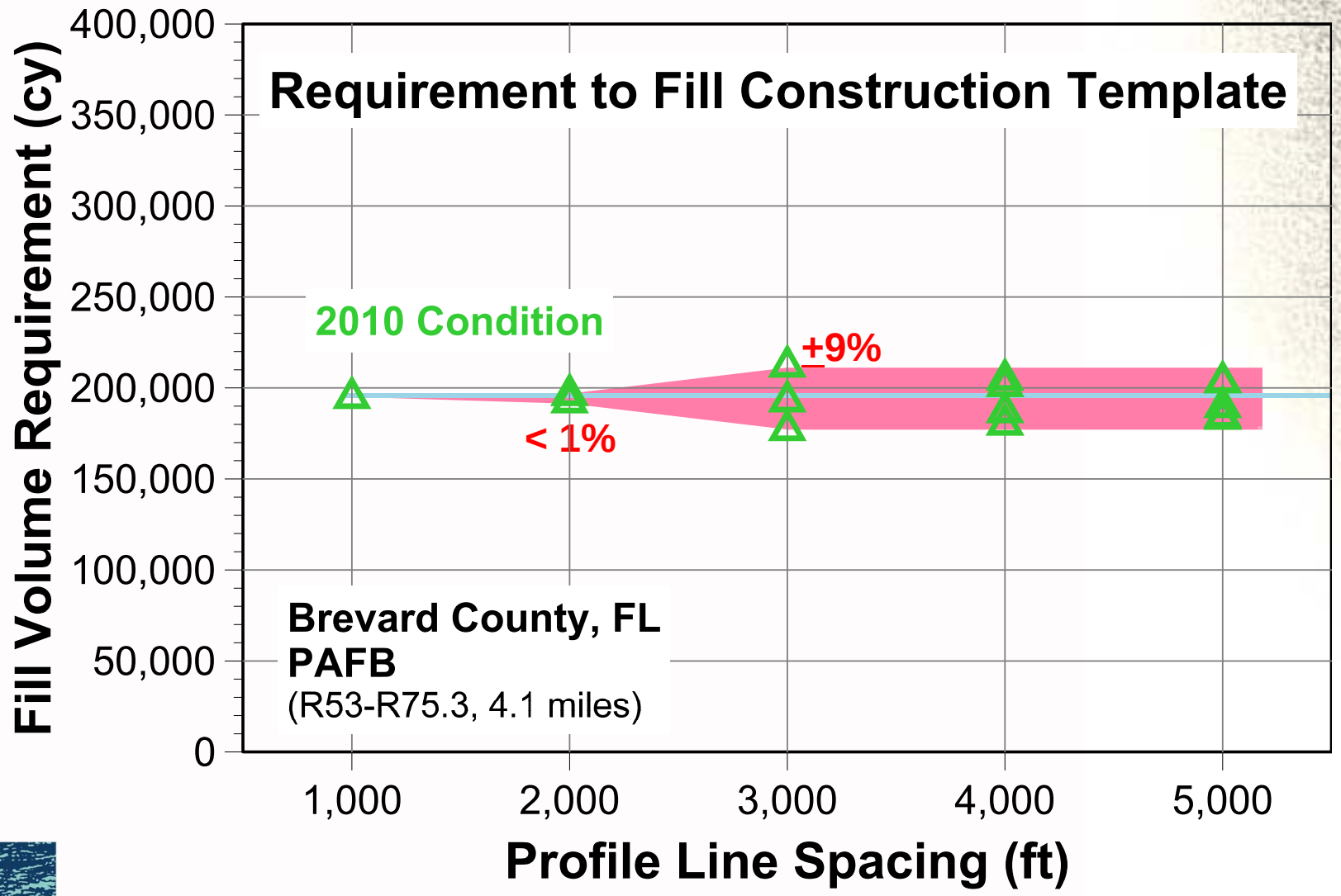
Patrick Air Force Base



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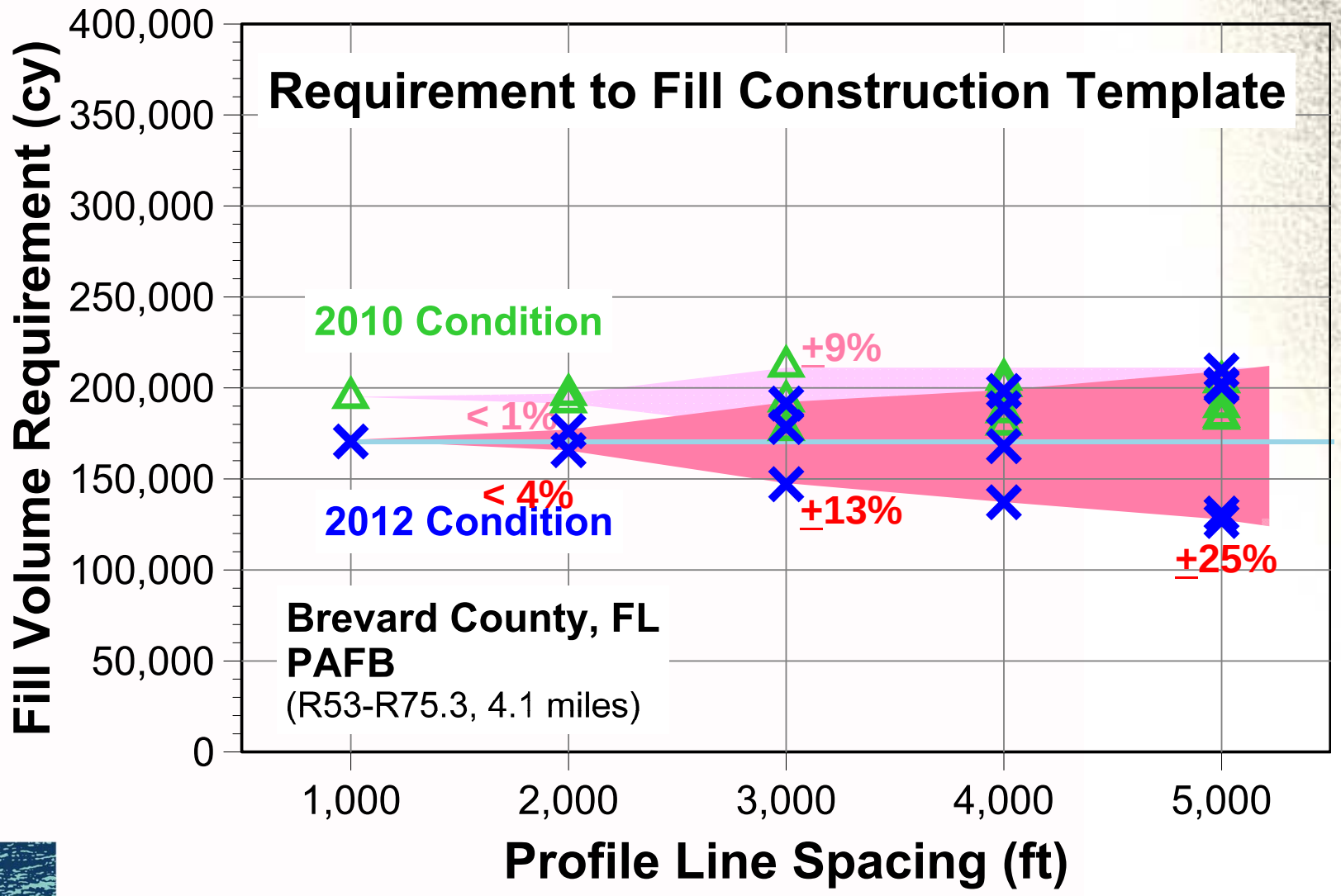

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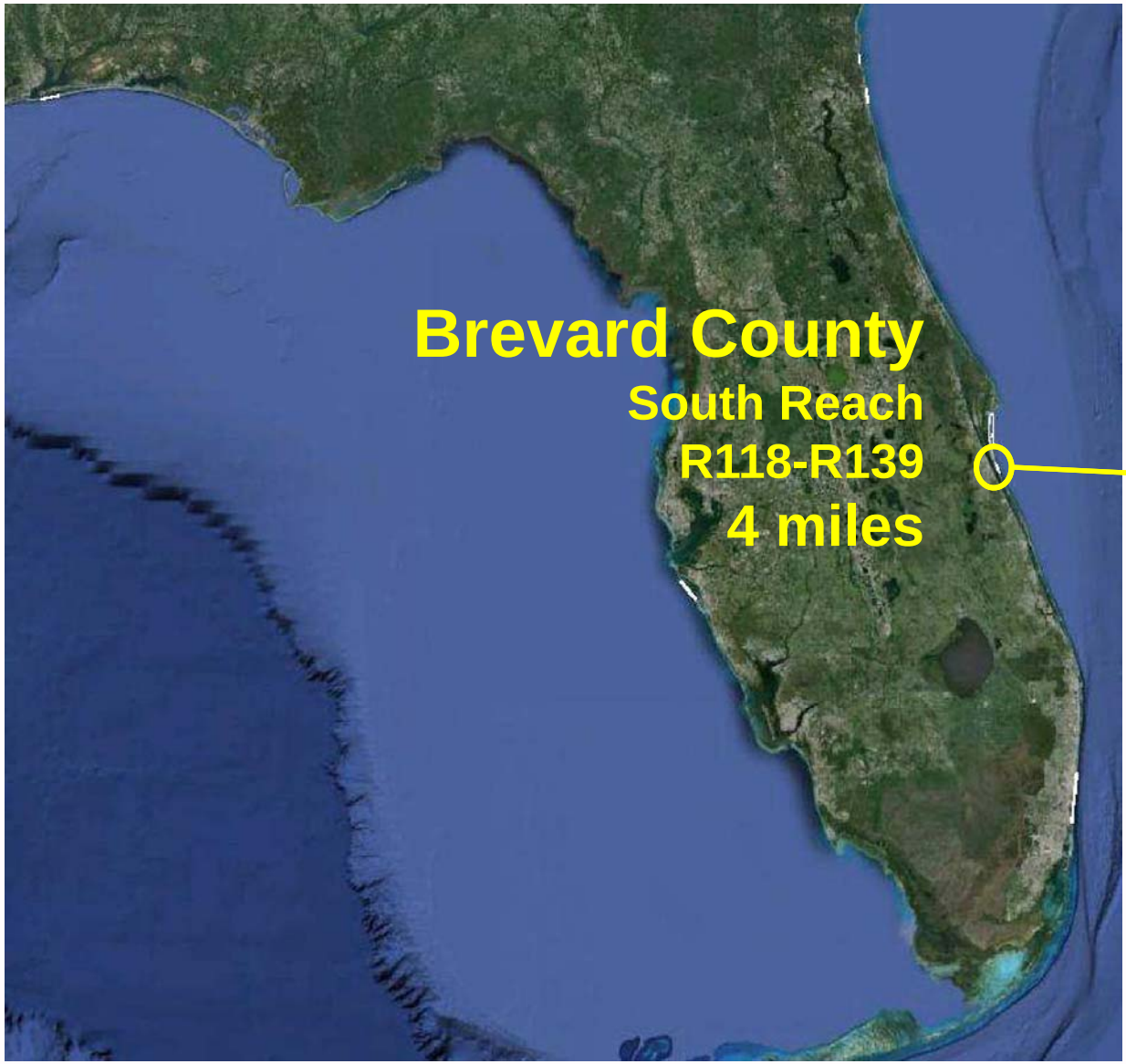

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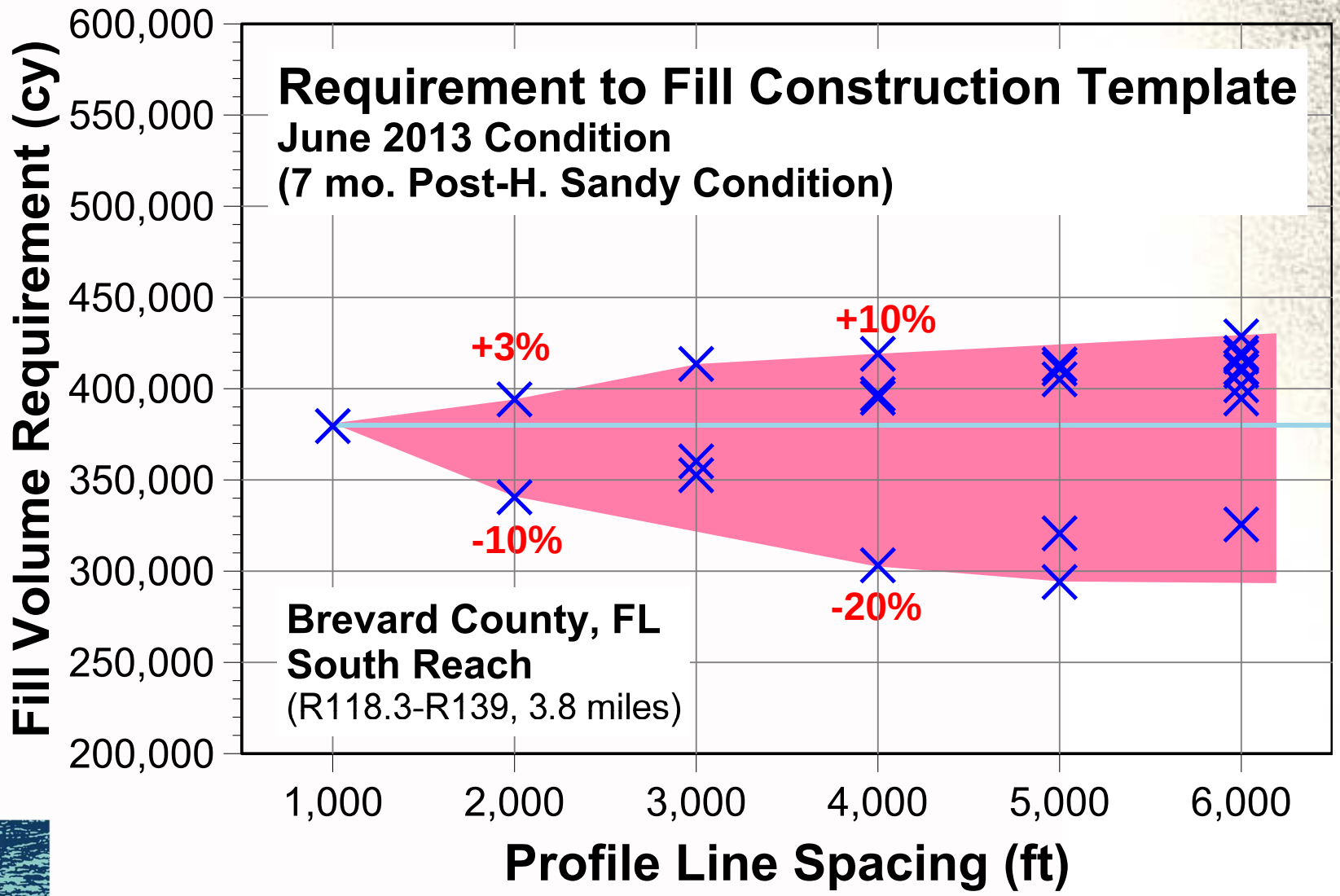
Brevard – South Reach



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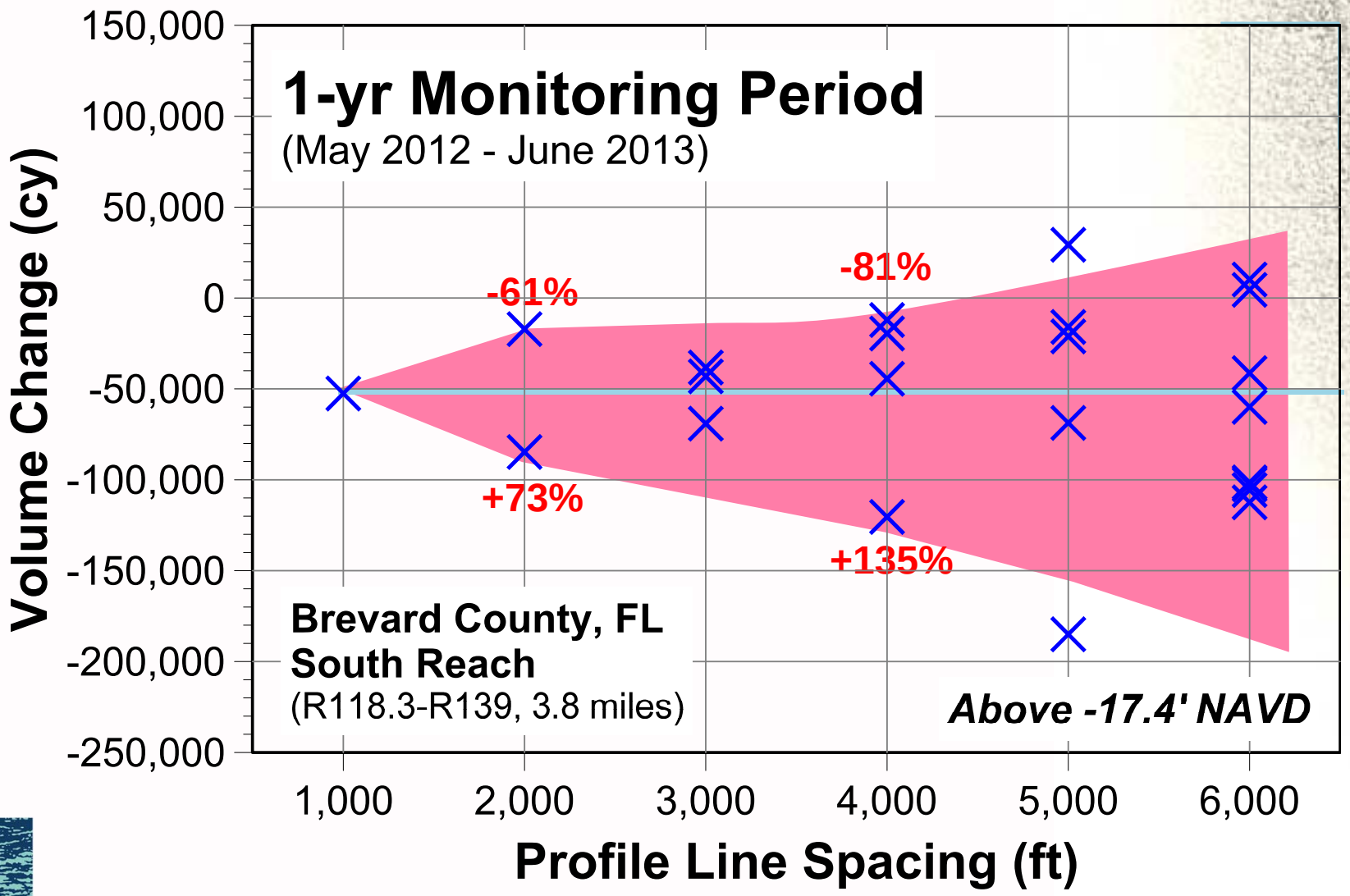
Brevard – South Reach



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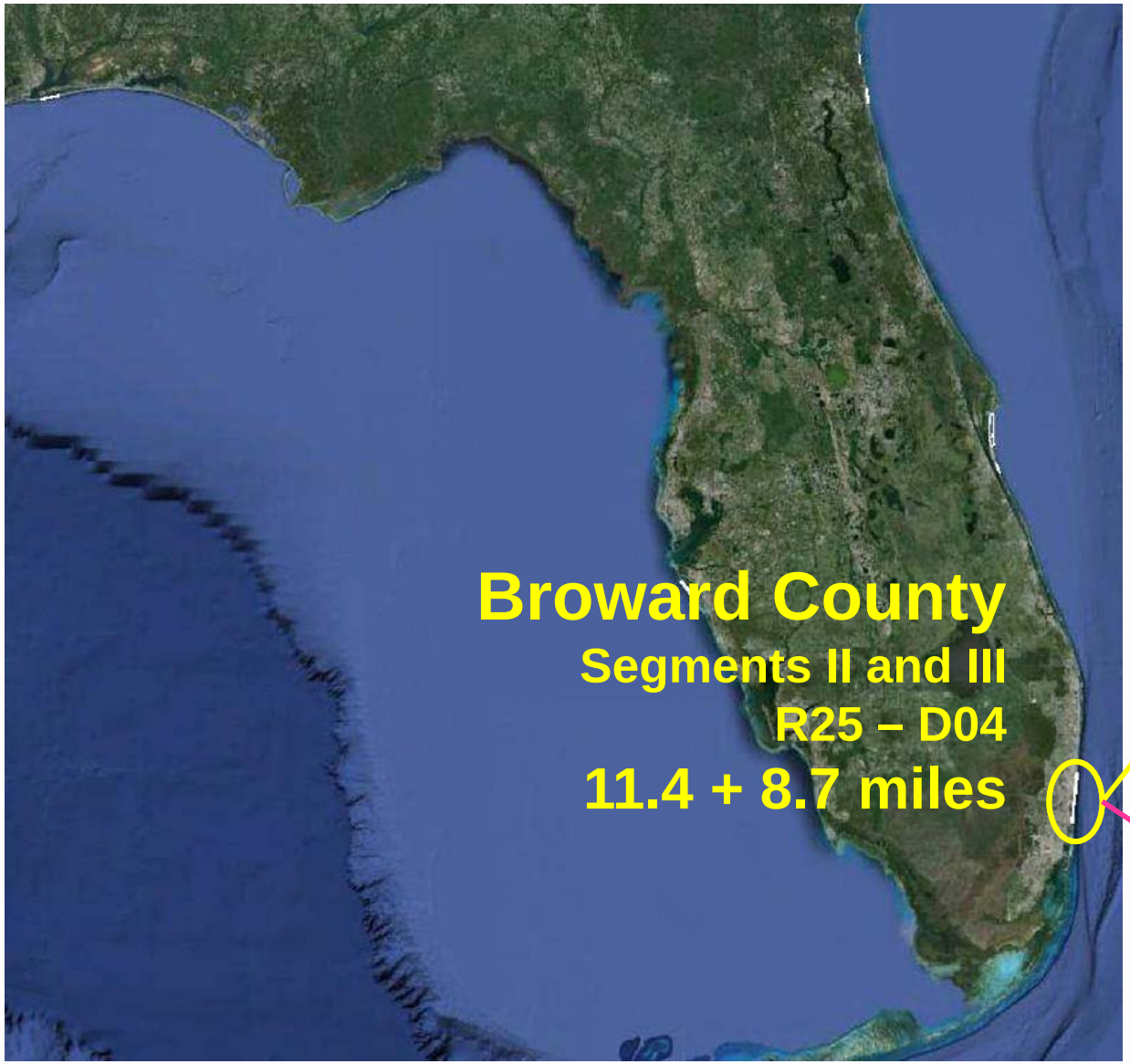

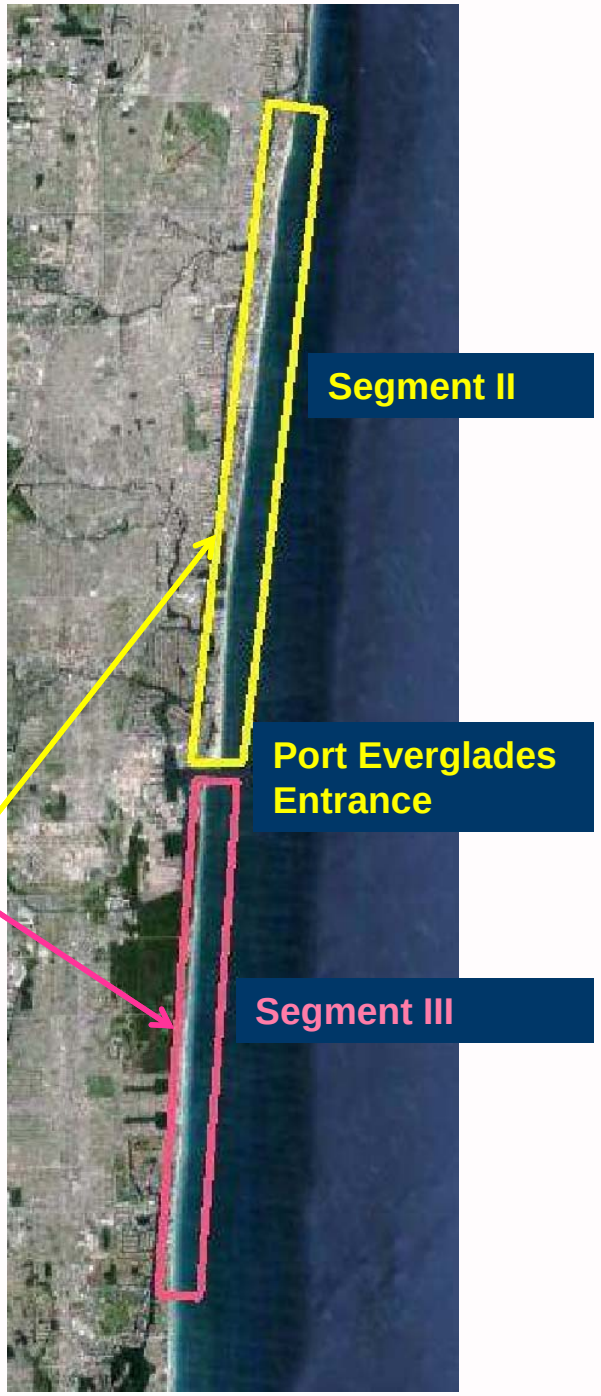

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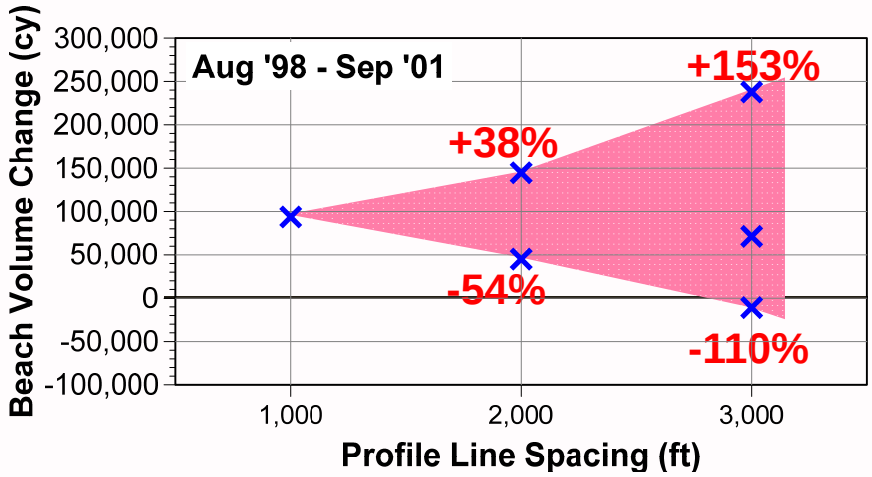
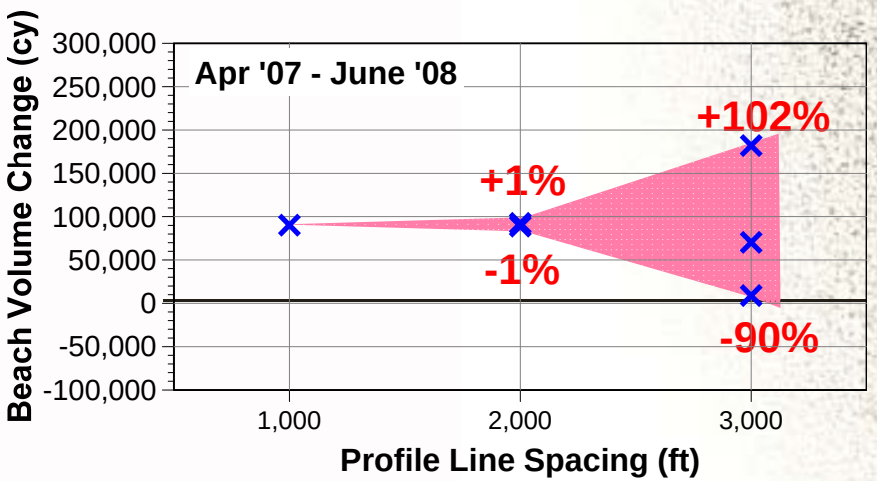
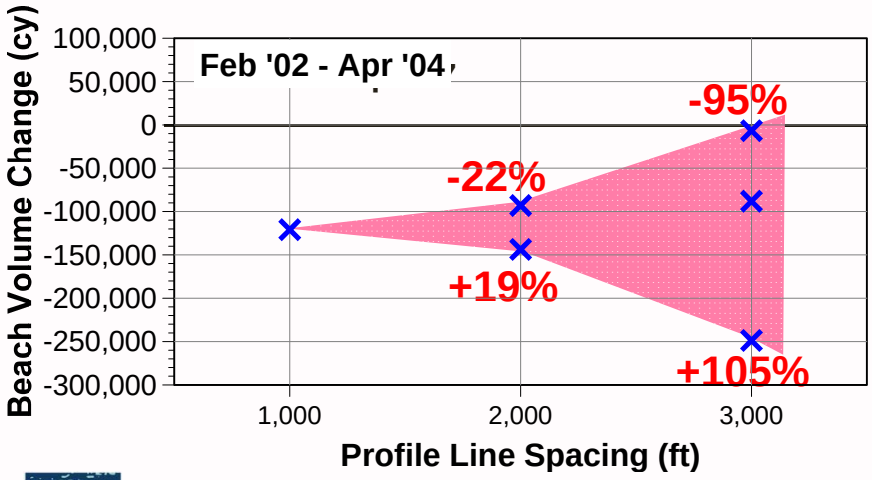
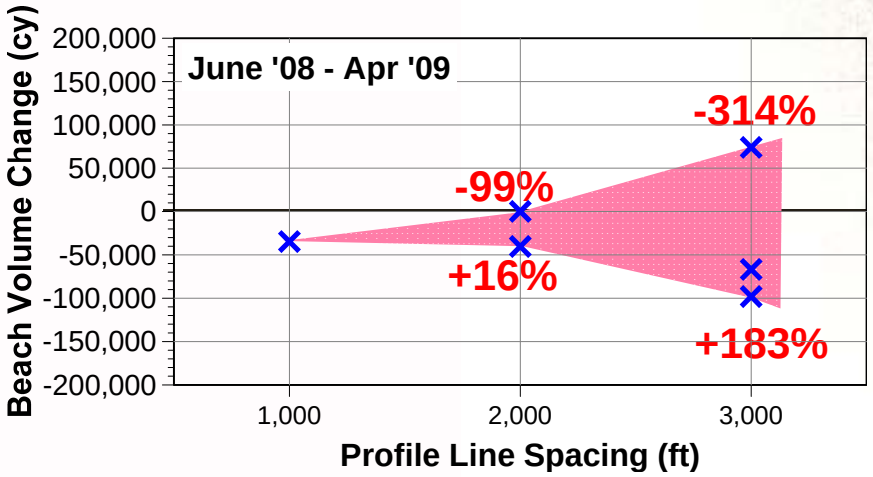
Broward – Segment II

(***R25 – R85***: 11.4 miles north of Port Everglades Entrance)









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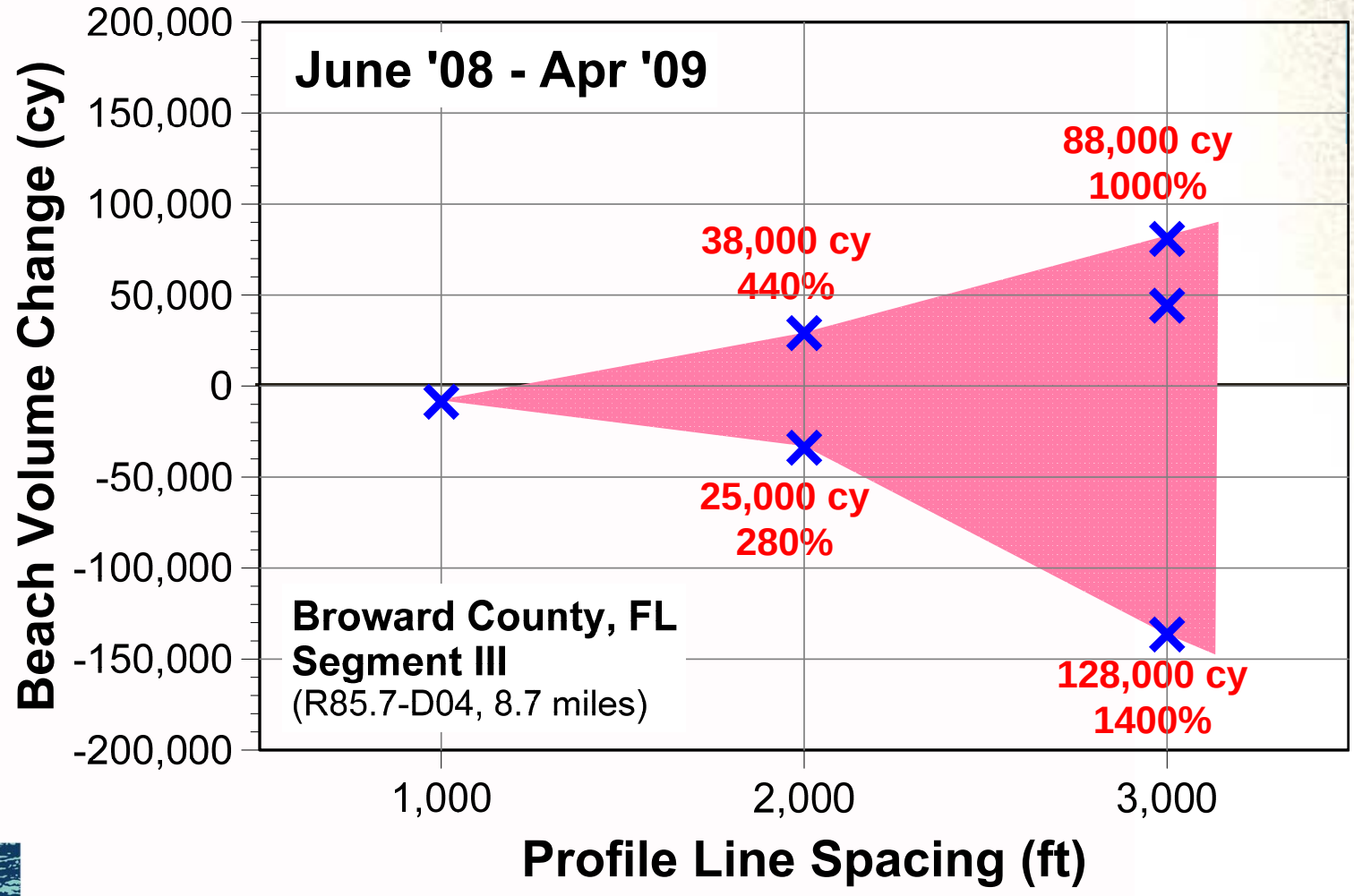
Broward – Segment III

(8.7 miles south of Port Everglades Entrance)



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Broward – Segment III

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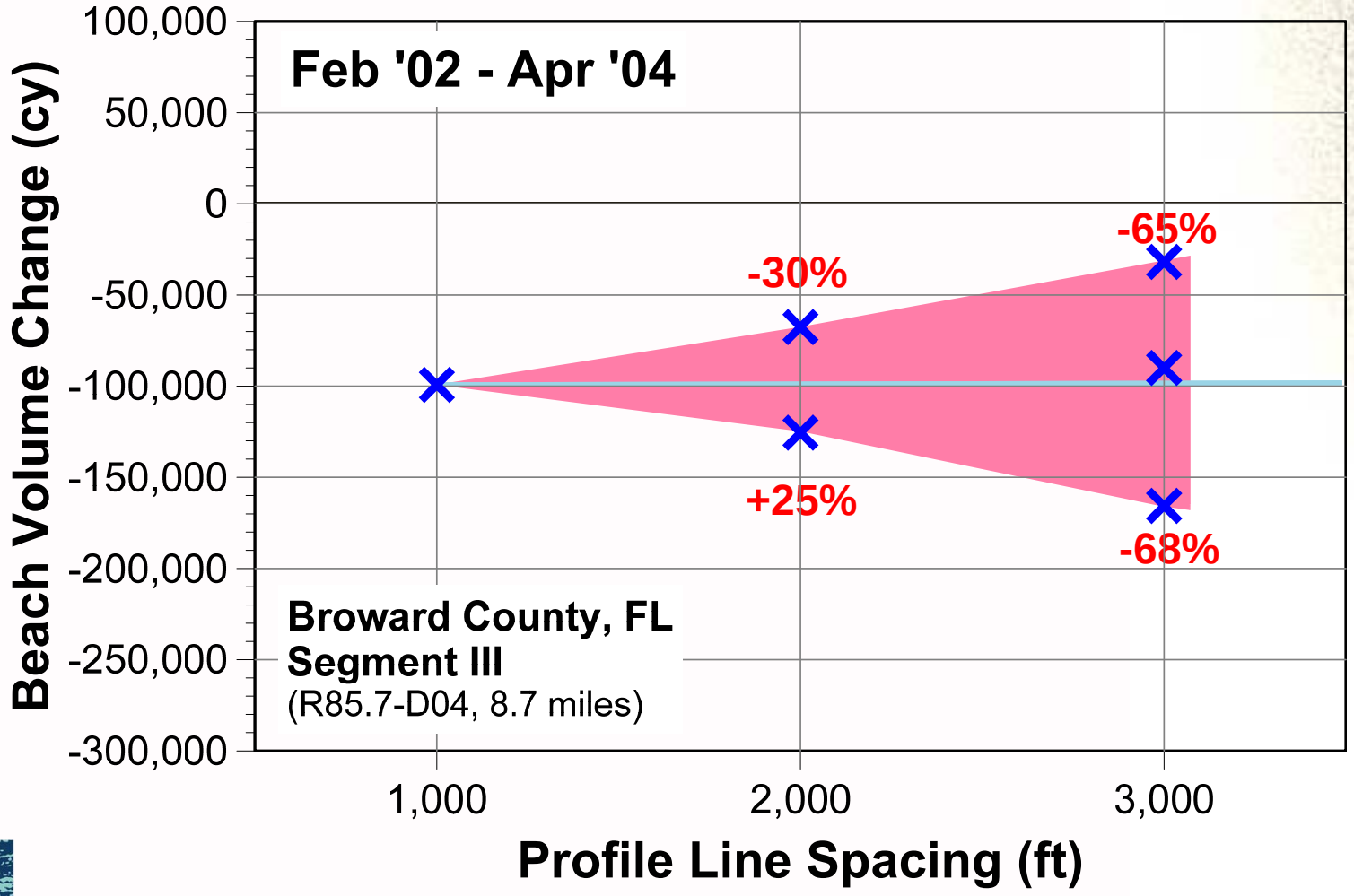

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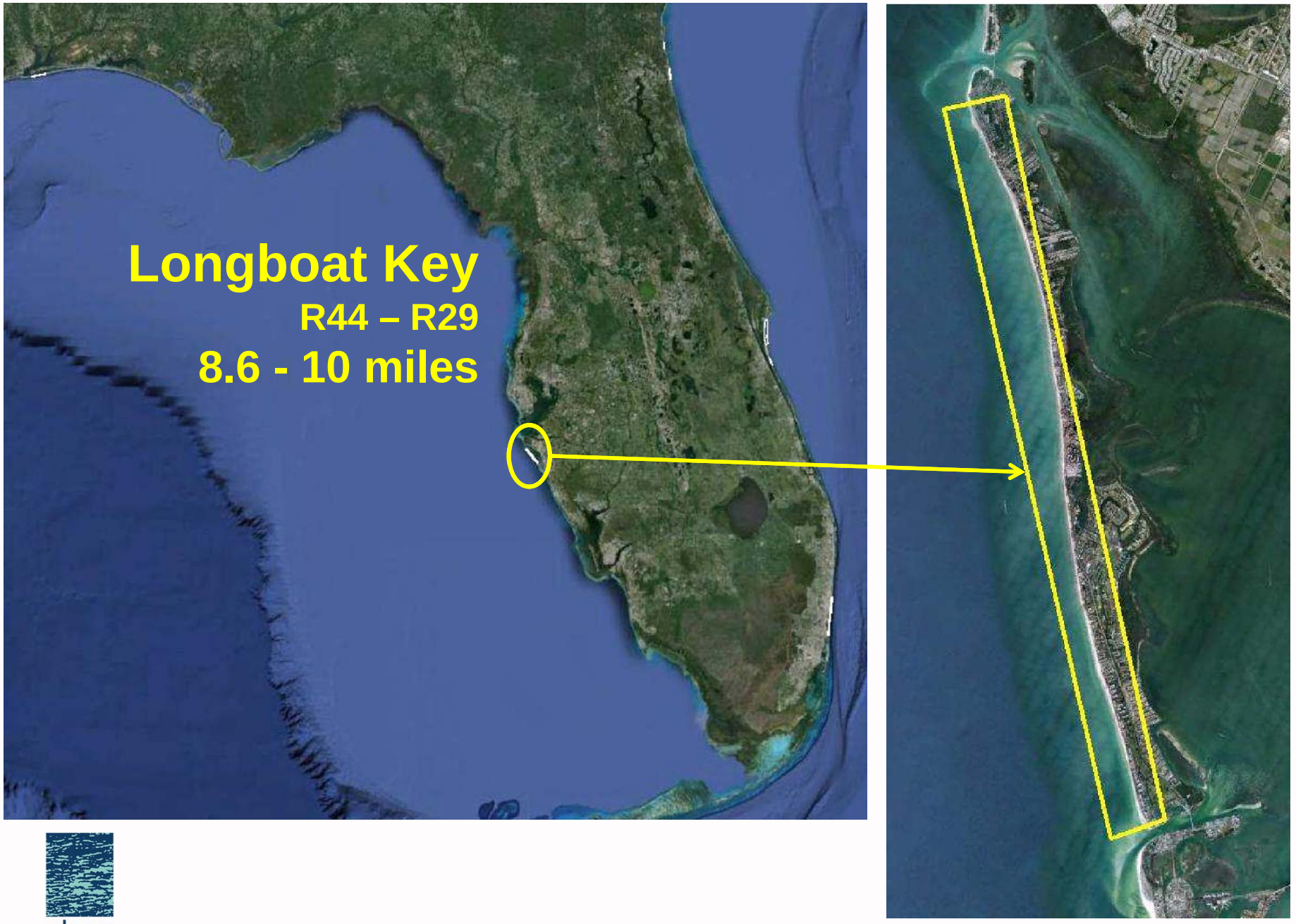

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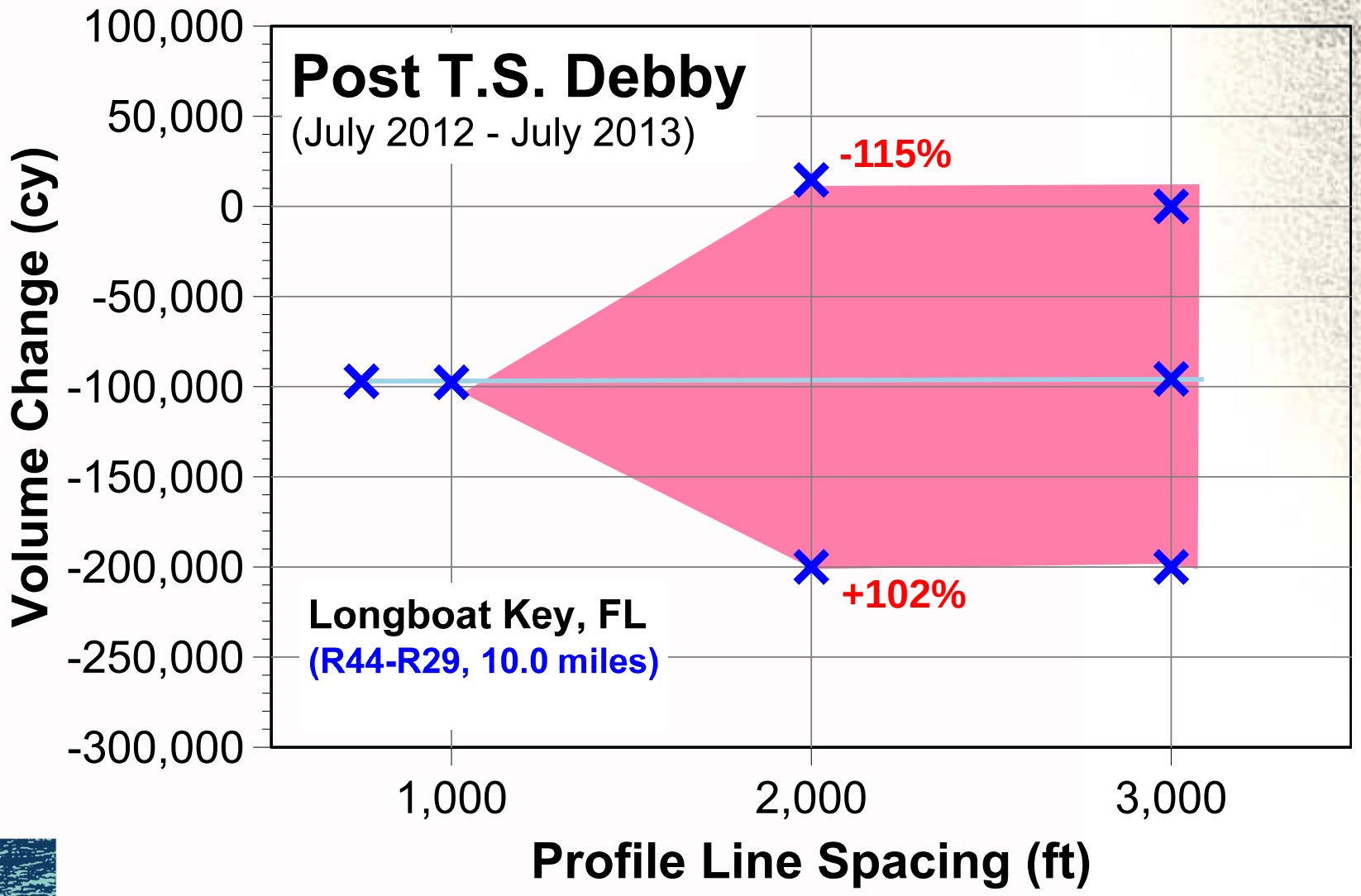
Longboat Key



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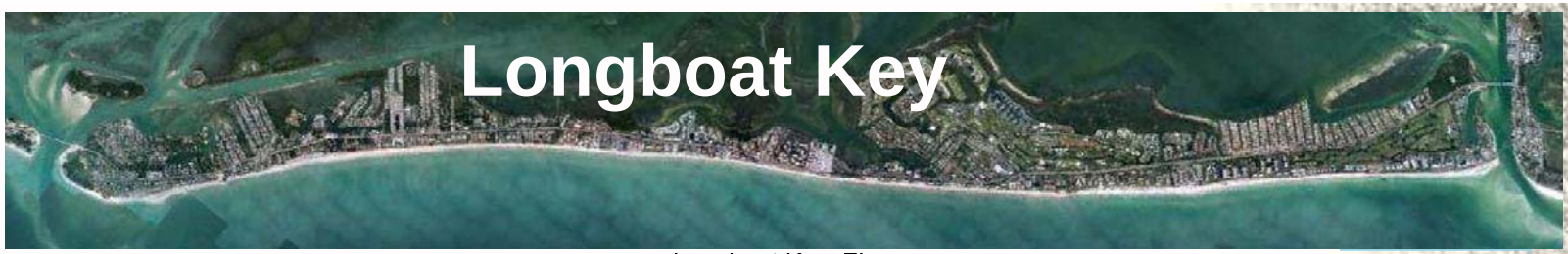

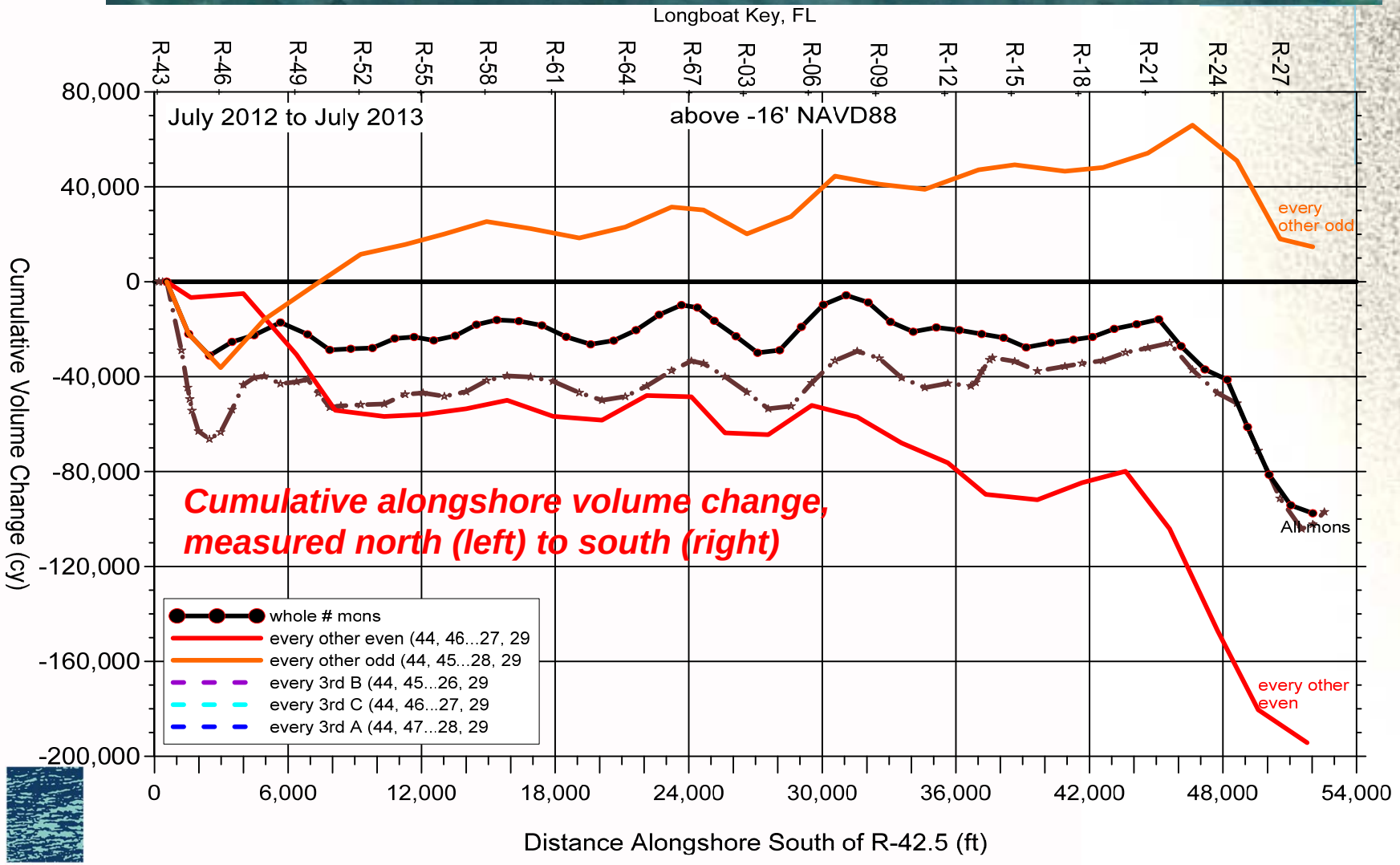

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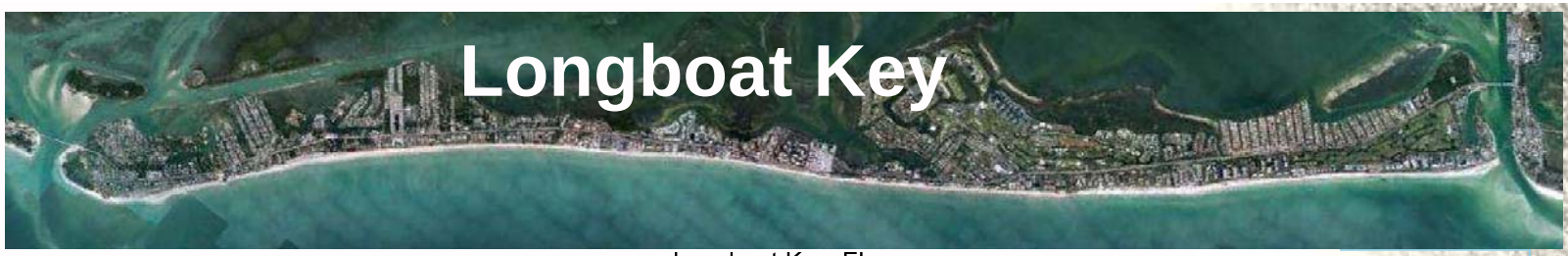
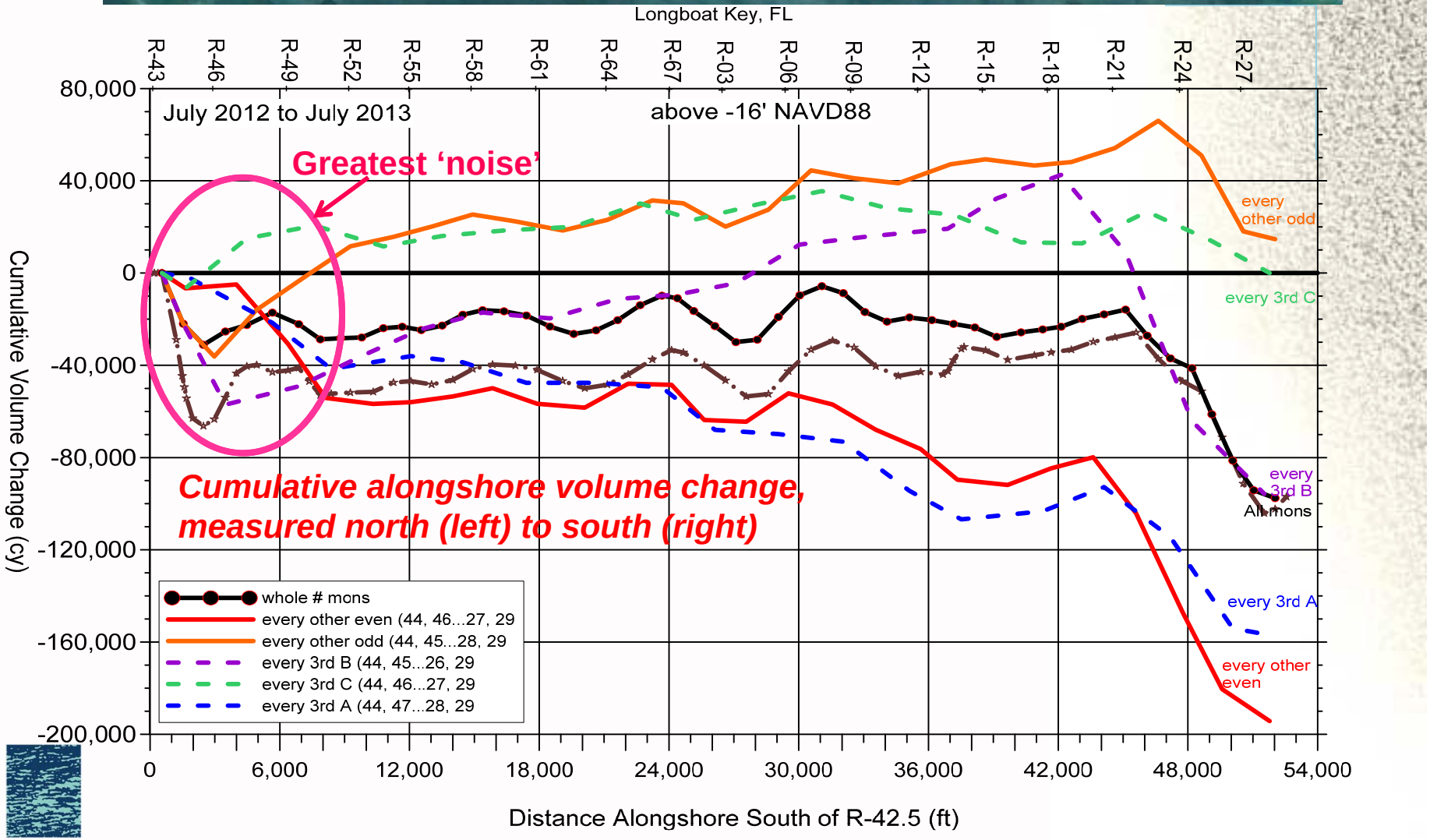
Longboat Key





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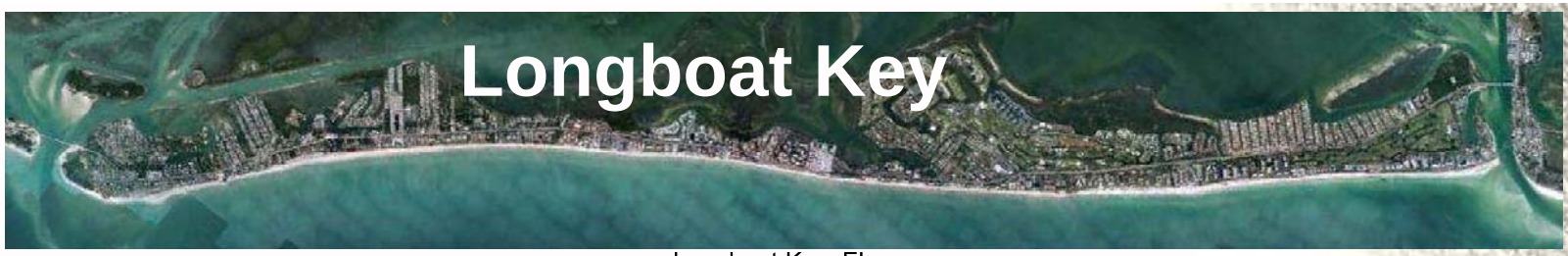
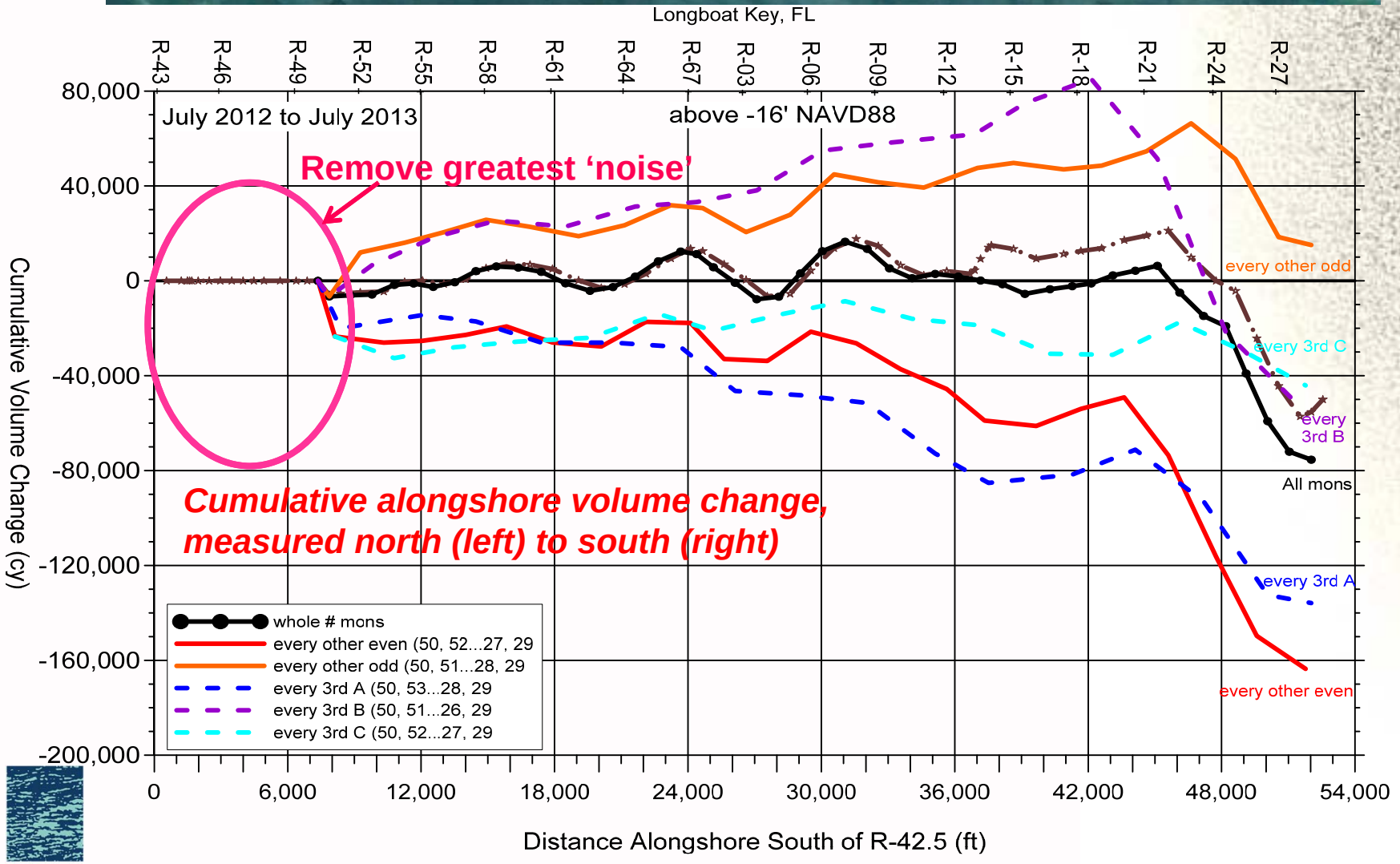
Longboat Key





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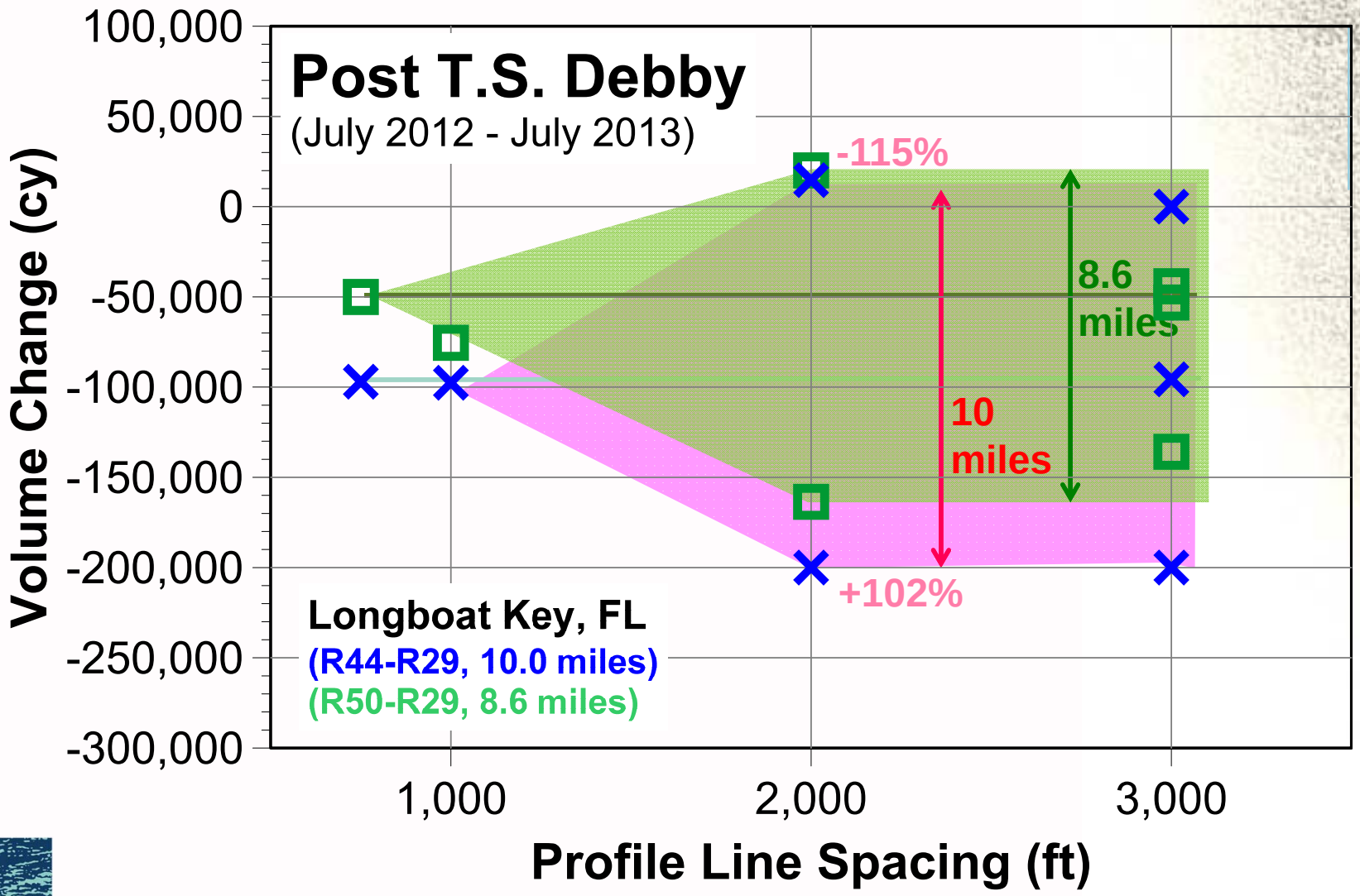

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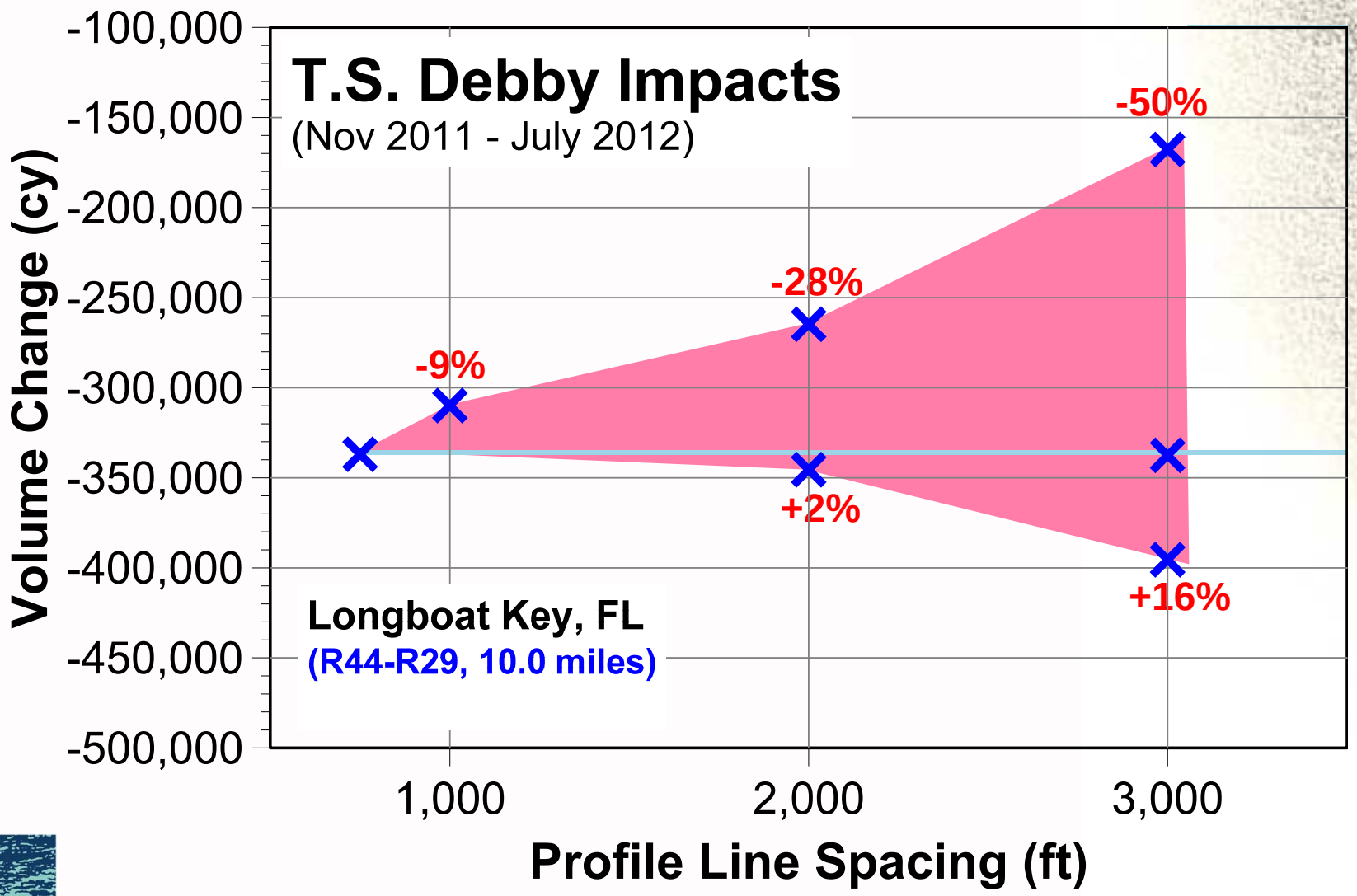
"Error" did not change appreciably when "noisy" northern 1.4 miles of shoreline is removed from analysis.

Longboat Key



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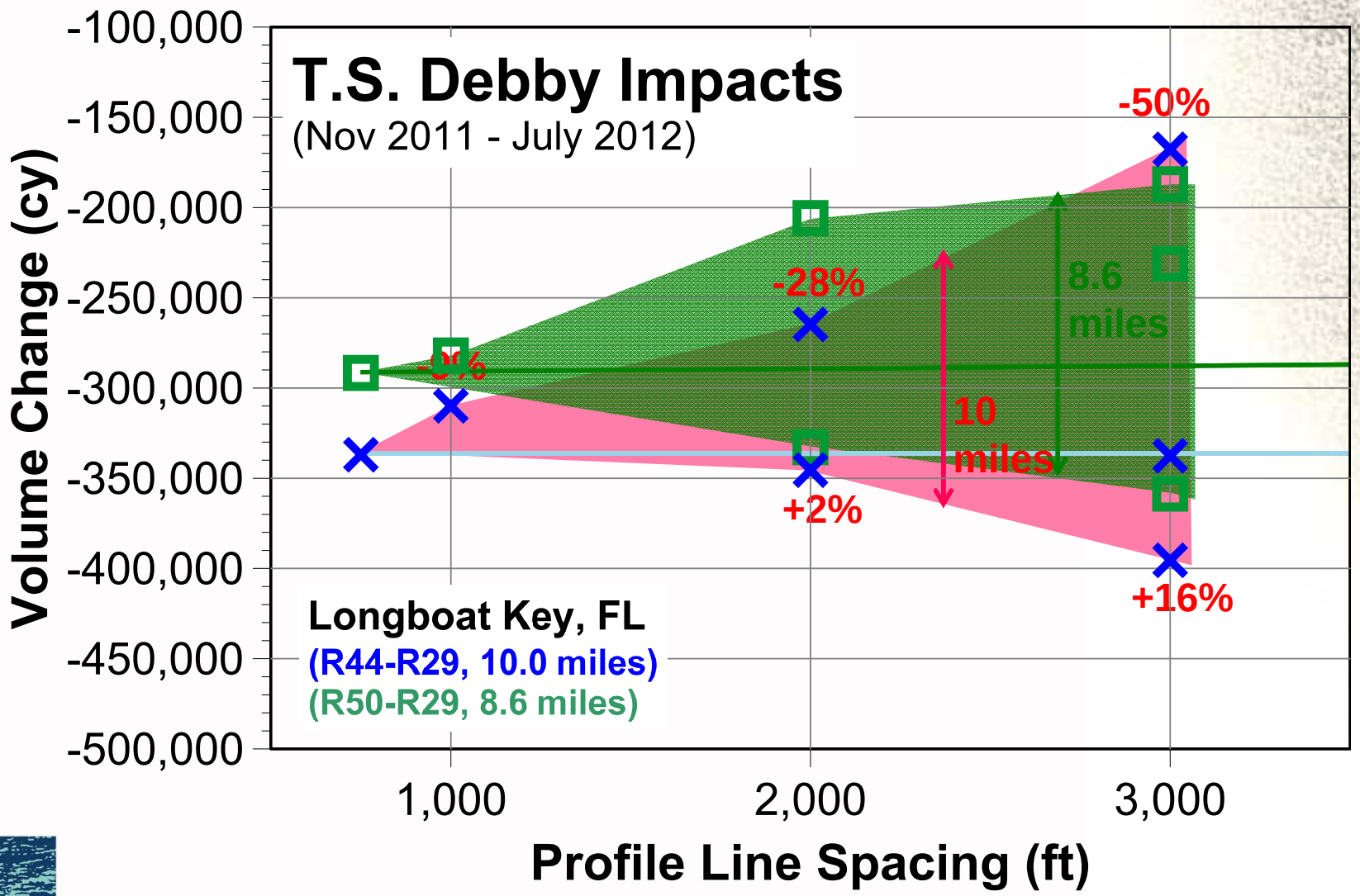
Longboat Key



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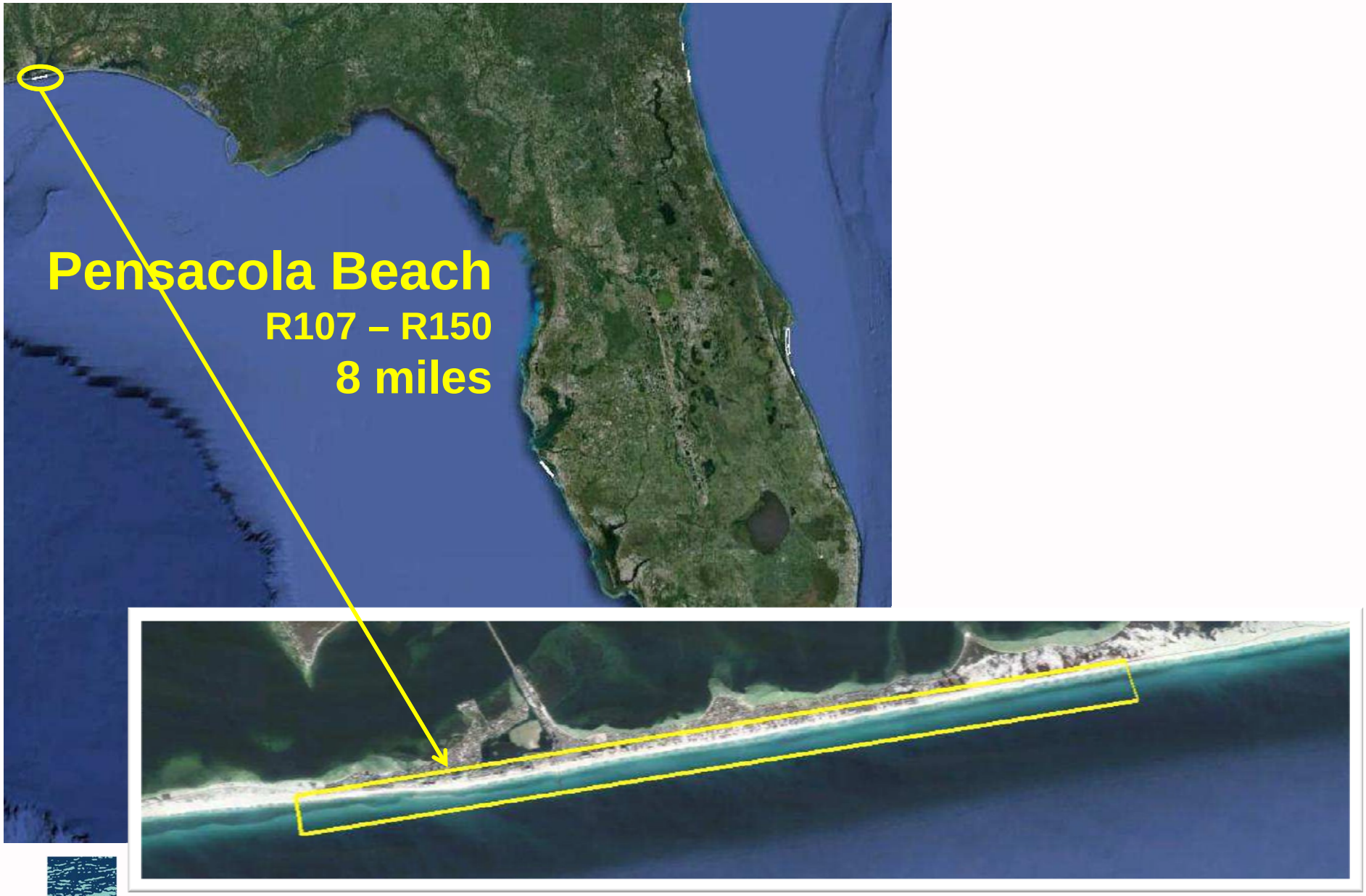

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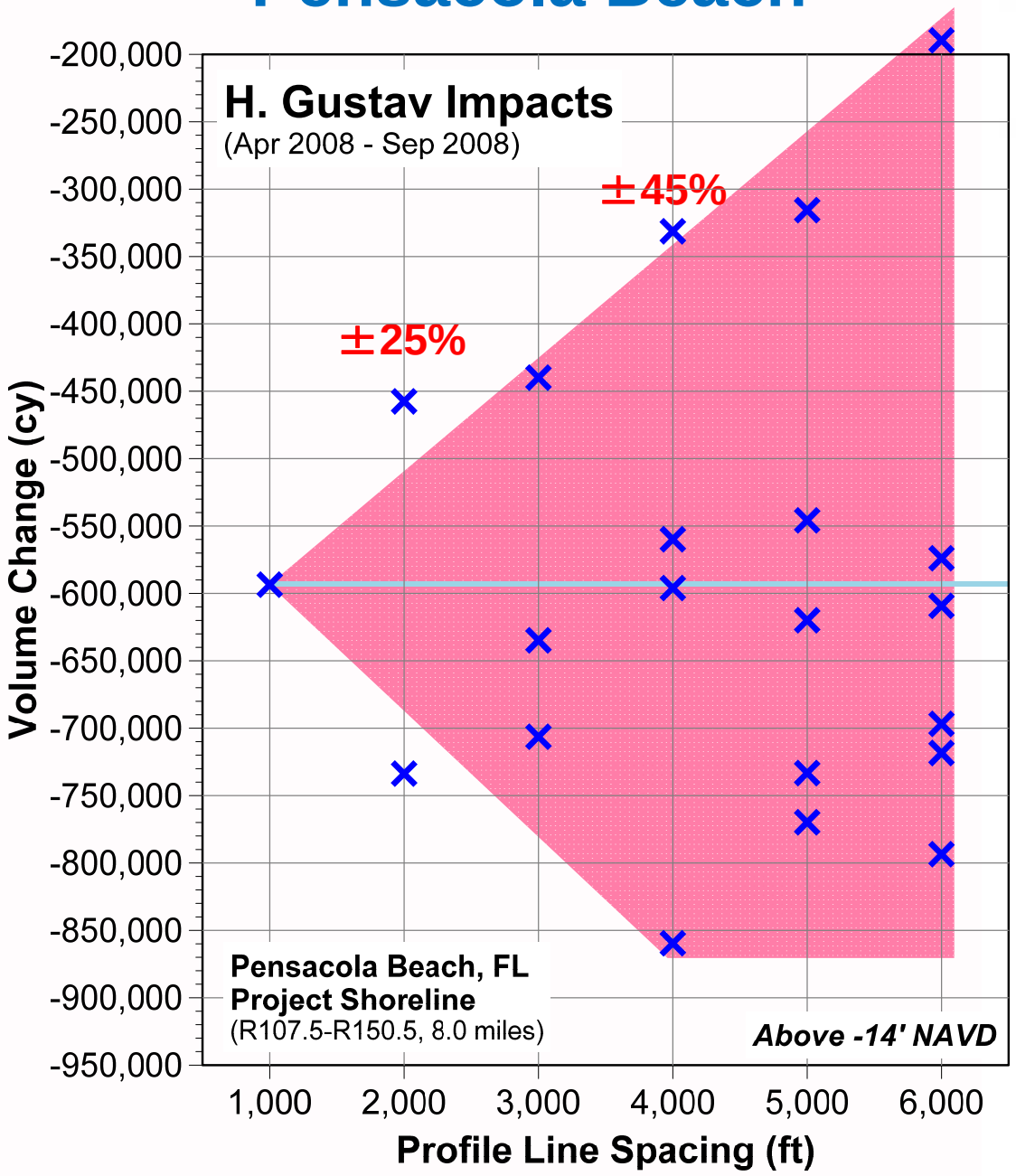
Pensacola Beach

Estimating storm erosion, Florida Panhandle



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Errors inherently increase with cuspate or rhythmic bar shorelines.

(Thus, there is greatest potential error with large profile spacing along Panhandle beaches.)

Pensacola Beach, FL

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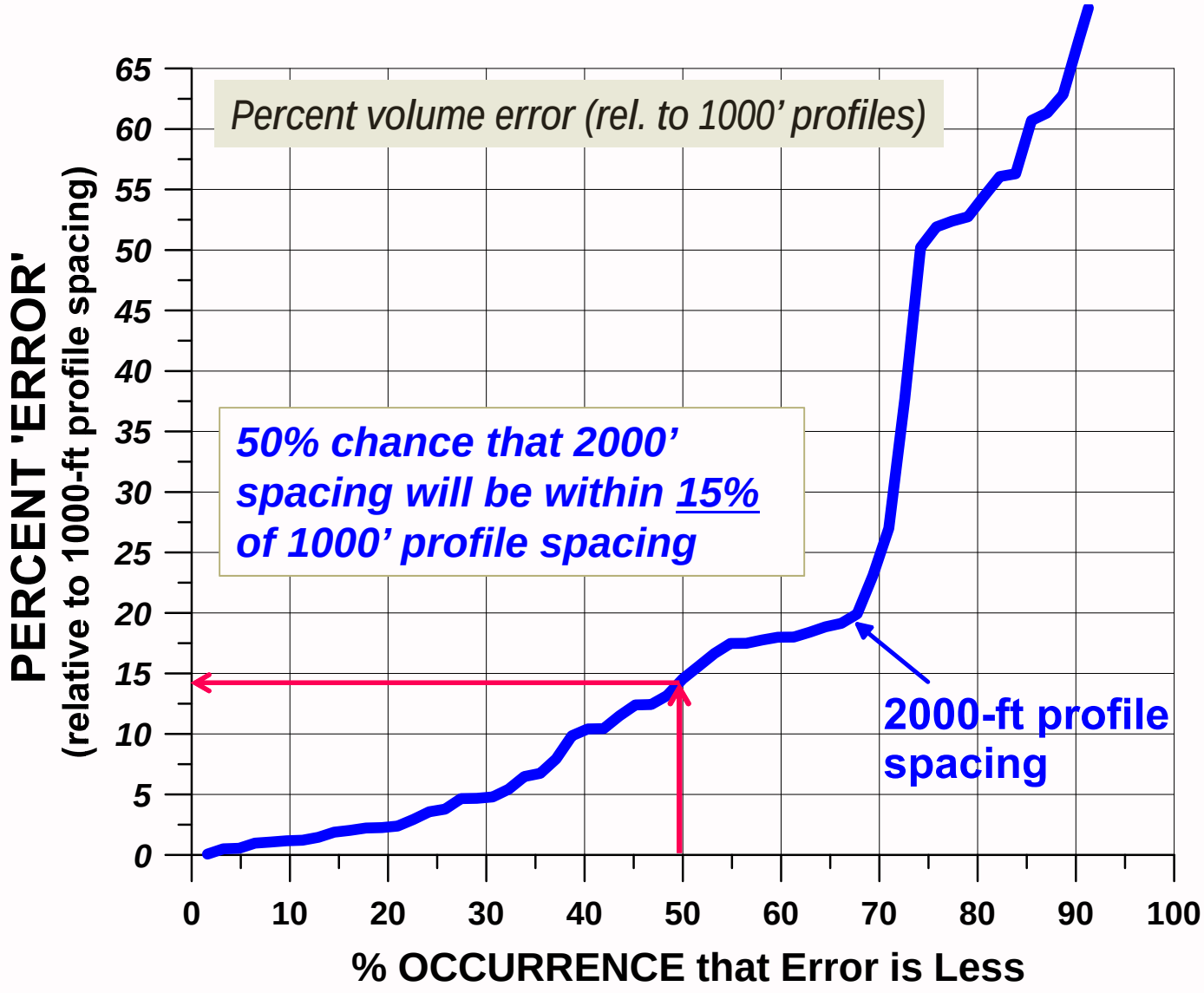
Summary -- All Datasets (volume changes across total profile)



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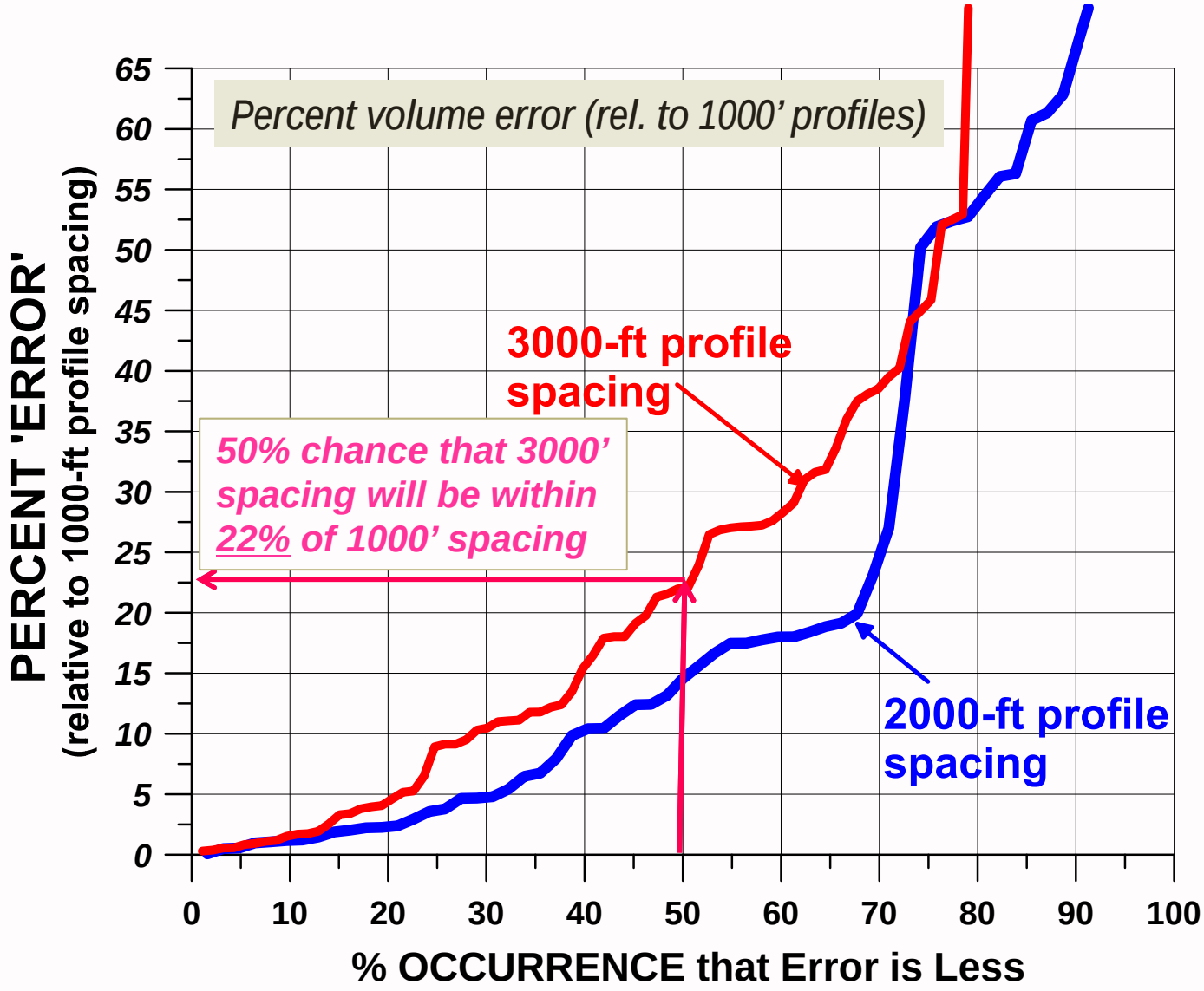
Summary -- All Datasets (volume changes across total profile)



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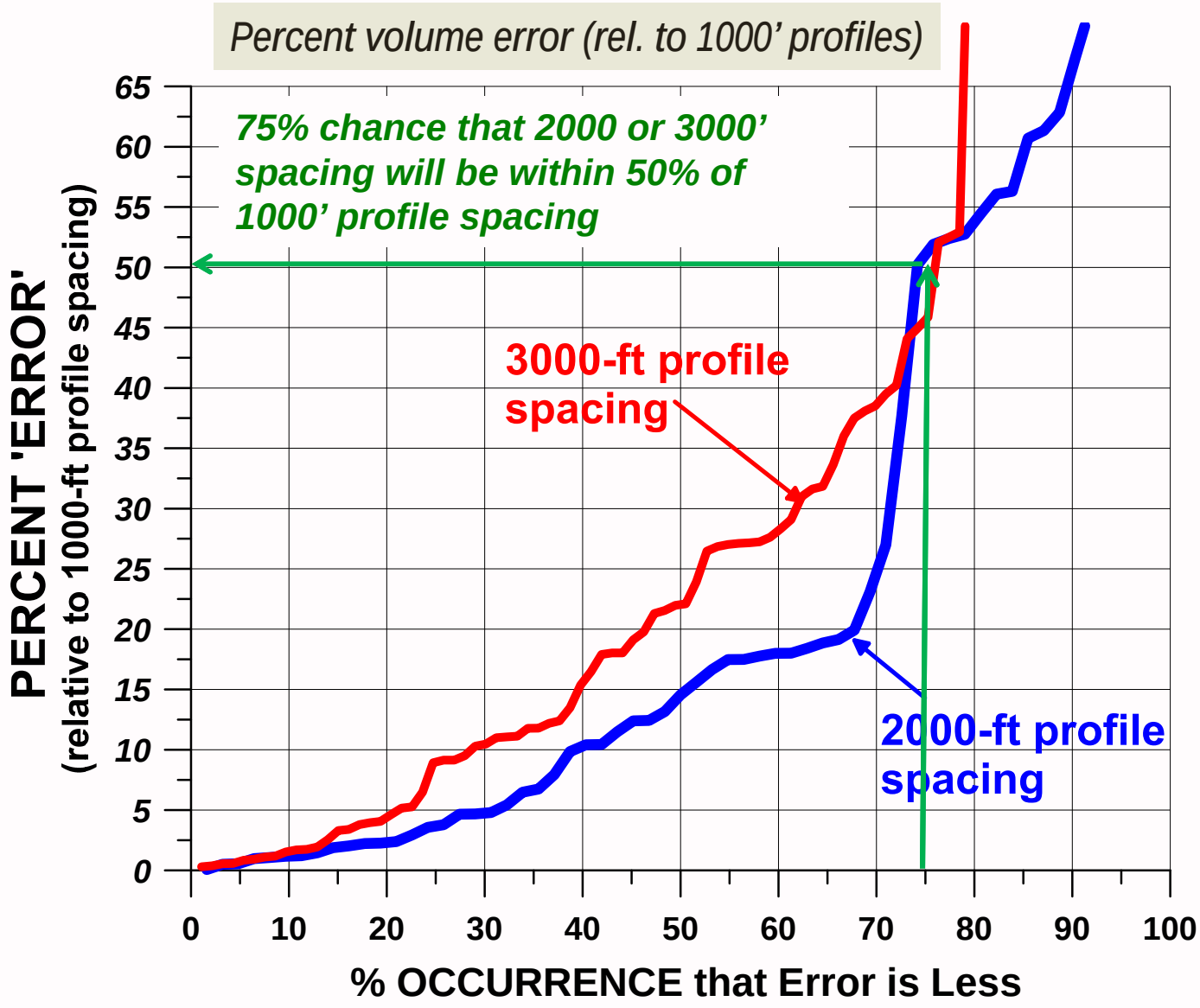

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Percent Error is a poor descriptor of accuracy among profile spacing (particularly in those cases when the absolute volume change is small).

The Absolute Error (volume per ft alongshore) is a more meaningful and consistent descriptor.

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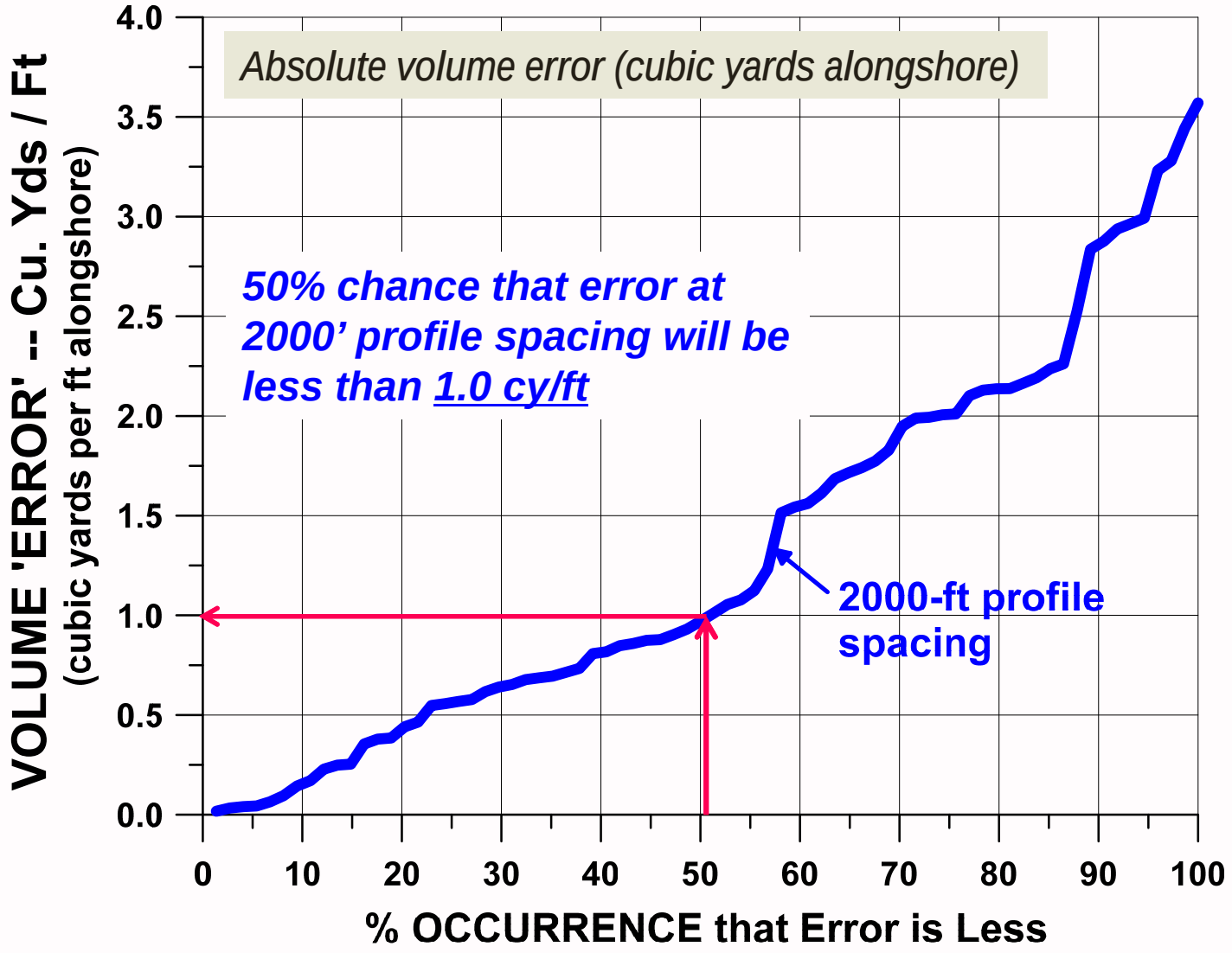
Summary -- All Datasets (volume changes across total profile)



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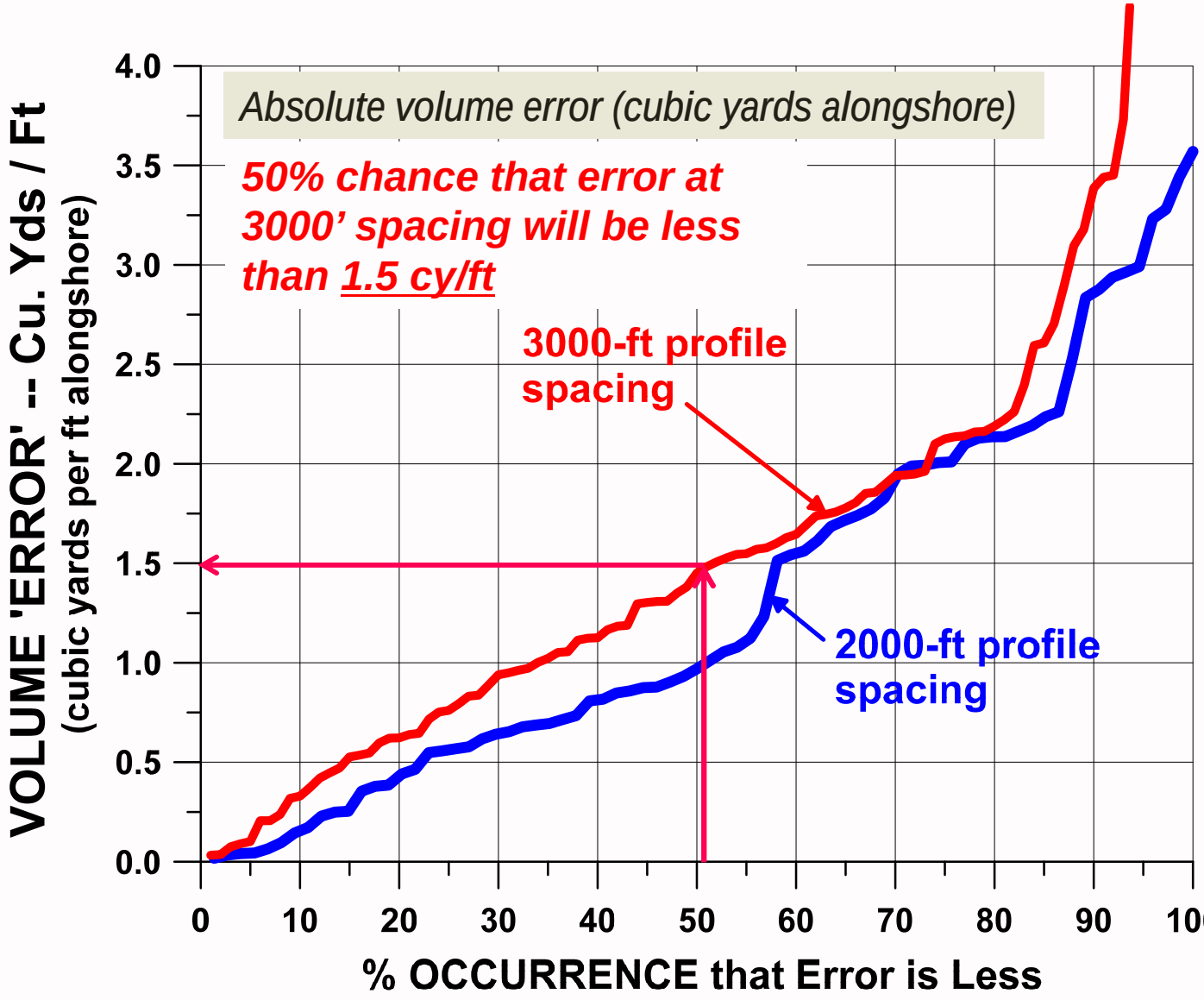

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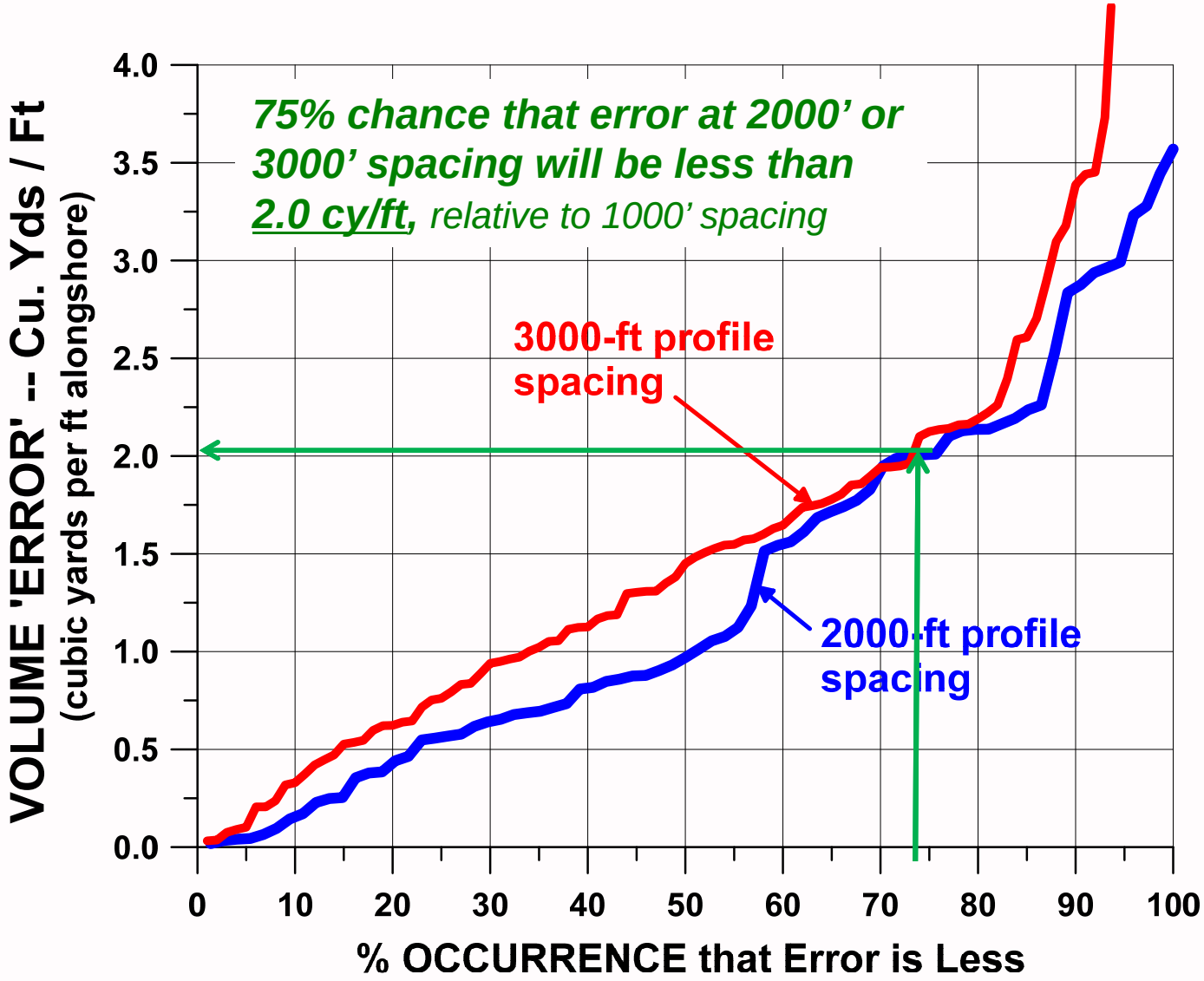

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Observations and Summary

- **Results varied widely within and among all sites – and among survey intervals.**
- **Found no correlation between 'error' and shoreline length.**
- **Found no correlation between 'error' and baseline volume change.**
- **The decision to 'skip' profiles might depend upon:**
  - historical 'error' computed from skipping profiles at the specific site
  - the objective of the survey (e.g., template calculations have low error)

- **Percent error is a poor descriptor of the accuracy of 'skipping' profiles.**

- **Absolute error is a better descriptor of accuracy:**
  Overall, relative to 1000-ft profile spacing:
  - **50% probability that error of 2000' spacing will be less than 1.0 cy/ft**
  - **50% probability that error of 3000' spacing will be less than 1.5 cy/ft**
  - **75% probability that error of 2000' or 3000' spacing will be < 2.0 cy/ft**

The risk of some error in the data is probably less than having no data at all.

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Estimating Beach Volume Change as a function of Beach Profile Spacing

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