

Repetitive Nourishments

Predicted vs. Observed

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Overview

- ▶ The Idea
 - ▶ Geek Element → Academic
 - ▶ Pragmatic Element → Funding, Planning and Management
- ▶ Basis for Idea
- ▶ Case Studies
- ▶ Conclusions

The Idea...

- ▶ Expanding Renourishment Interval
Dette, *et al.*, Dean most well-known
Subsequent Events Last Longer
- ▶ Has this been observed?

Formulas

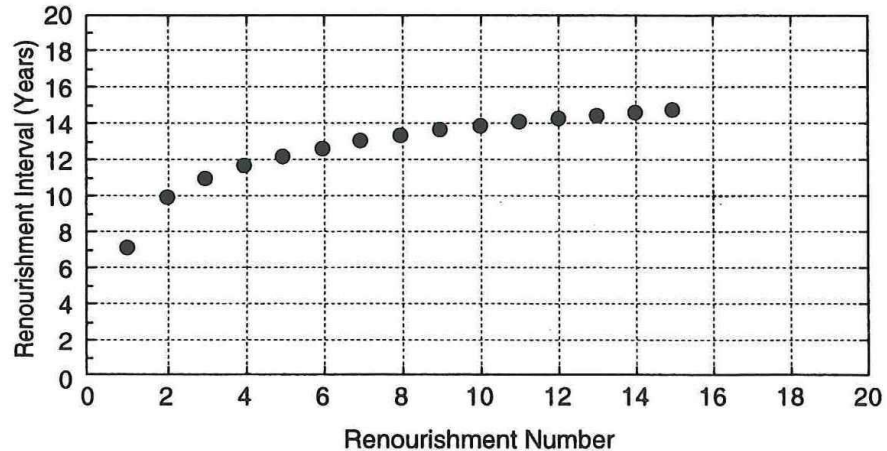
- ▶ Remaining Project Volume
 - ▶ Dette, et al. (Half-Life Model)

$$M(t) = 2^{-t/T_{50}}$$

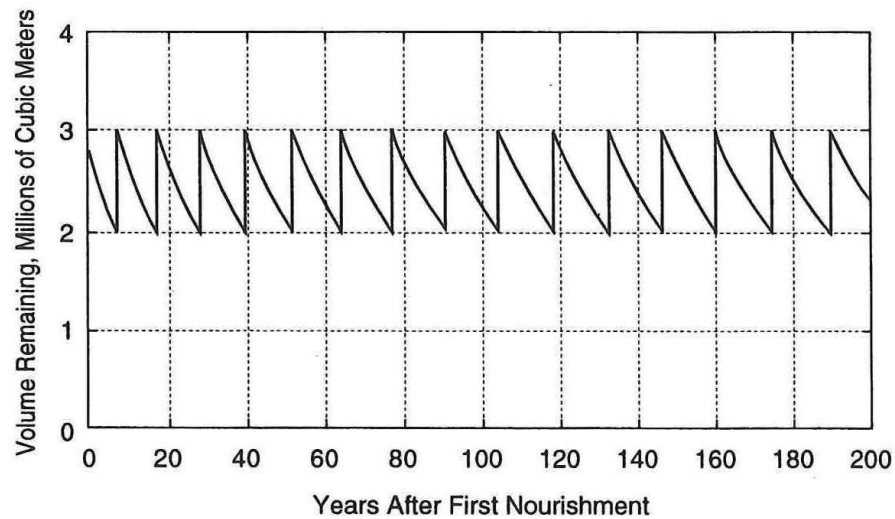
- ▶ Dean (Pelnard-Considere Model)

$$M(t) = \frac{\sqrt{4Gt}}{\ell\sqrt{\pi}} \left(e^{-(\ell/\sqrt{4Gt})^2} - 1 \right) + \operatorname{erf}(\ell/\sqrt{4Gt}) - \frac{\partial R}{\partial t} \frac{t}{\Delta y_0}$$

Dean – Textbook Example



(a) Years Between Successive Renourishments



(b) Volume Remaining in Nourishment Area

Fig. 6.19. Renourishment characteristics. Background erosion only in nourishment area and equal to 1 m/yr.

Moving Standard



Seawall

Moving Standard



Seawall

Dean (Delray Beach – Added Volume)

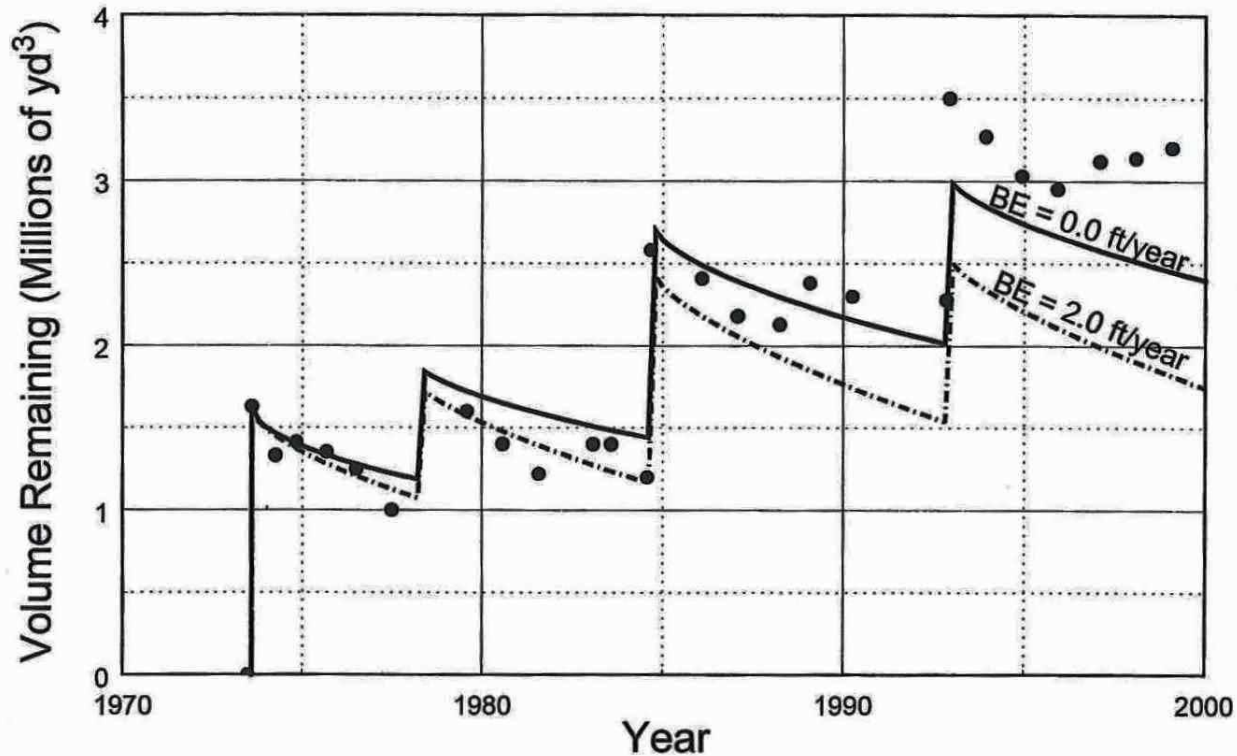


Fig. 11.29. Evolution of Delray Beach nourishment project, prediction and monitoring results.

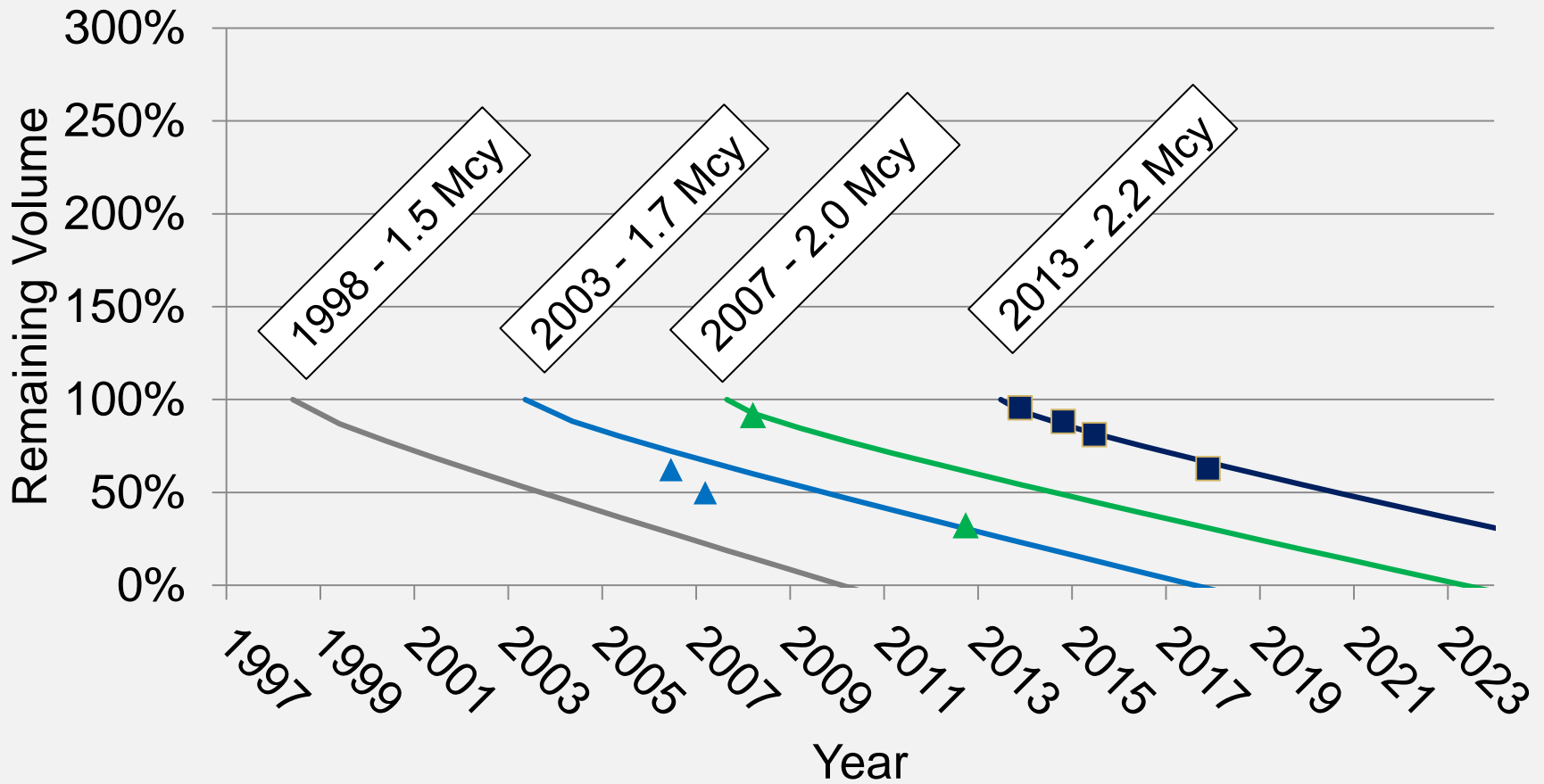
Case Studies

- ▶ Multiple Nourishment Events
- ▶ Open Coast Cases
- ▶ Minimal Changes to Design
 - ▶ Length - Unchanged
- ▶ Generally Federal Projects

Case Studies

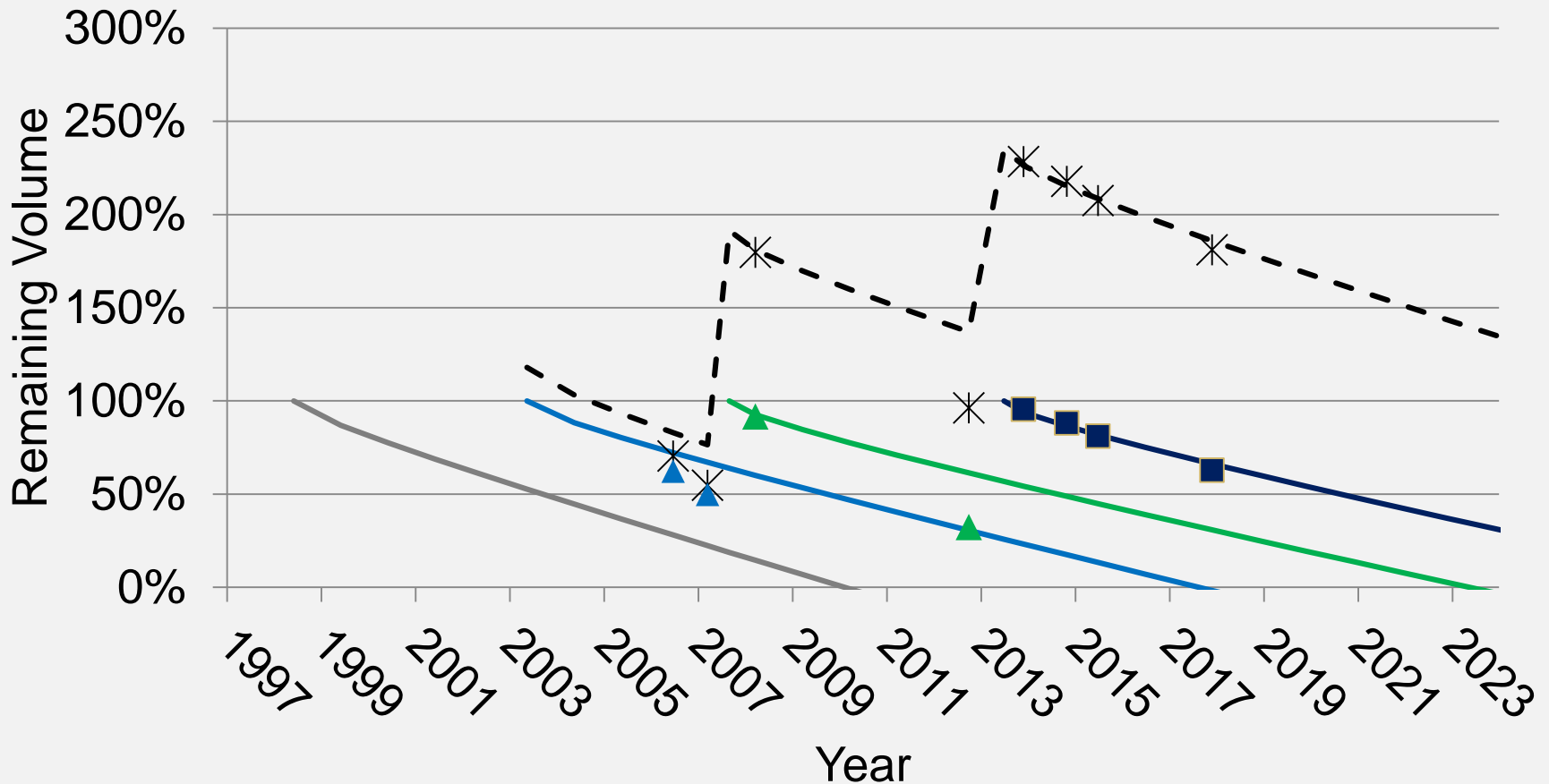
- ▶ Sandbridge, VA
 - ▶ 5.3 miles
 - ▶ 4 Projects since 1998
- ▶ Brevard Co. – South Reach Project
 - ▶ 3.8 miles
 - ▶ 4 Projects since 2003
- ▶ City of Boca Raton – North Boca Project
 - ▶ 1.5 miles
 - ▶ 4 Projects since 1988

Sandbridge, VA



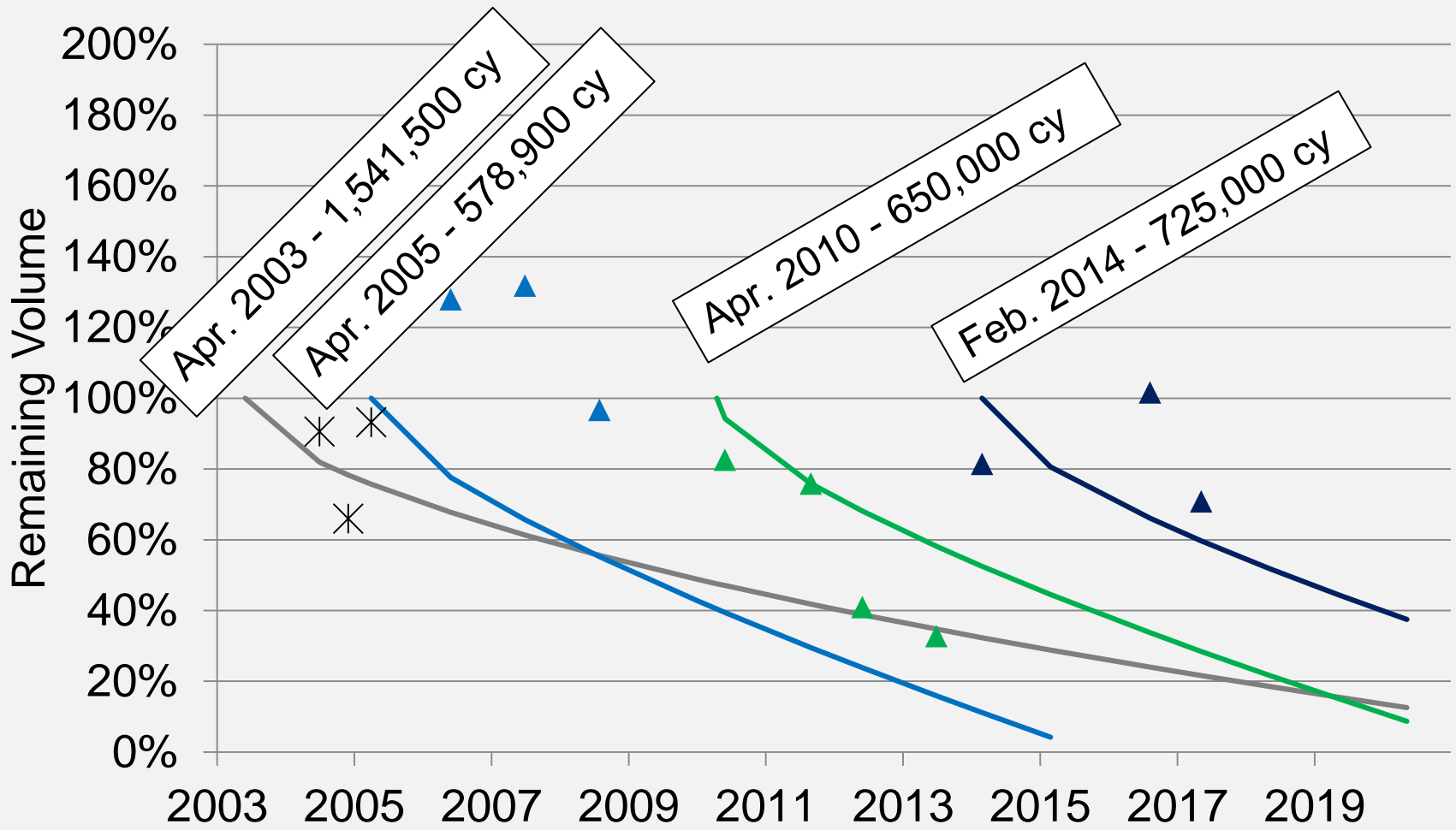
Data and Volumes Provided by City of Virginia Beach

Sandbridge, VA



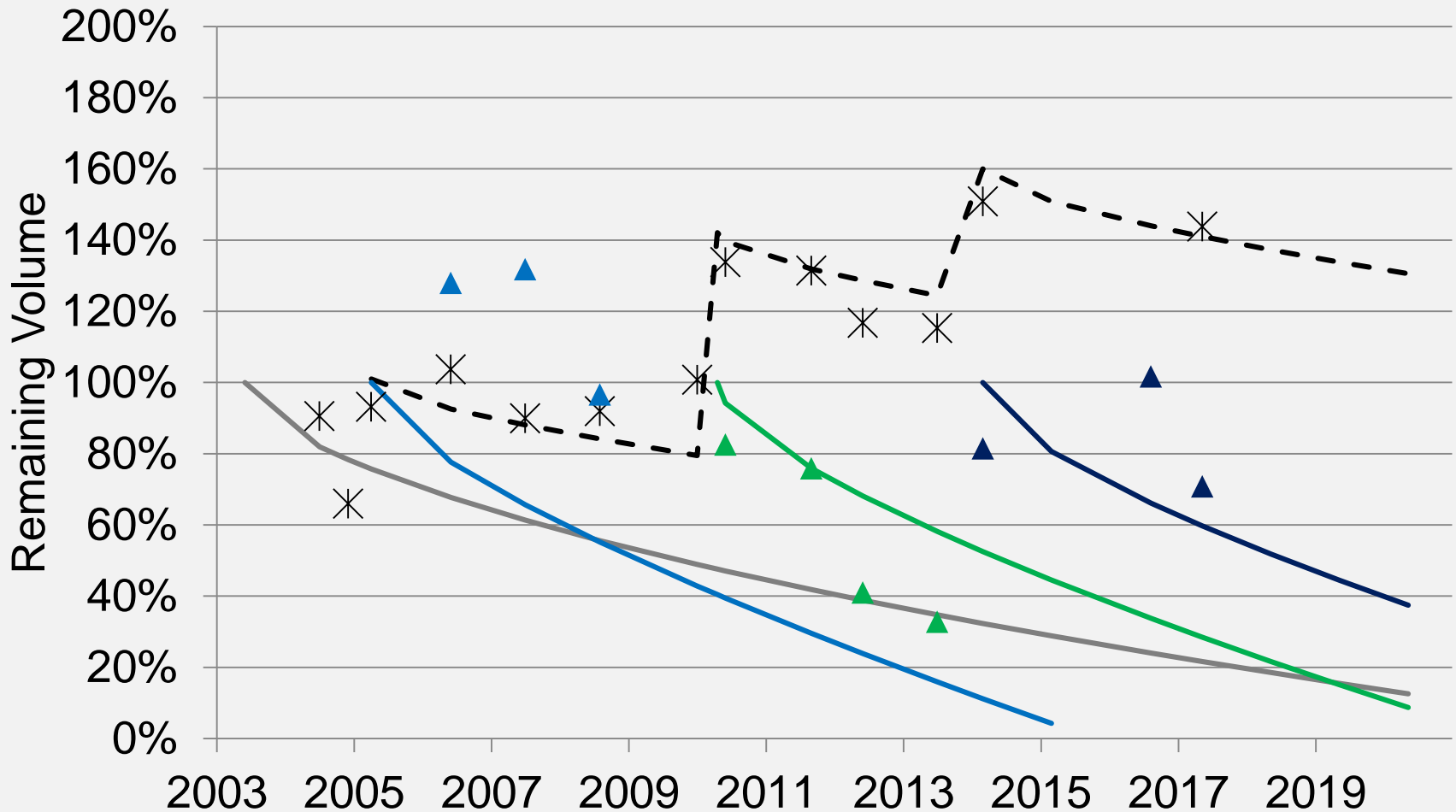
Data and Volumes Provided by City of Virginia Beach

Brevard Co. – South Reach Project



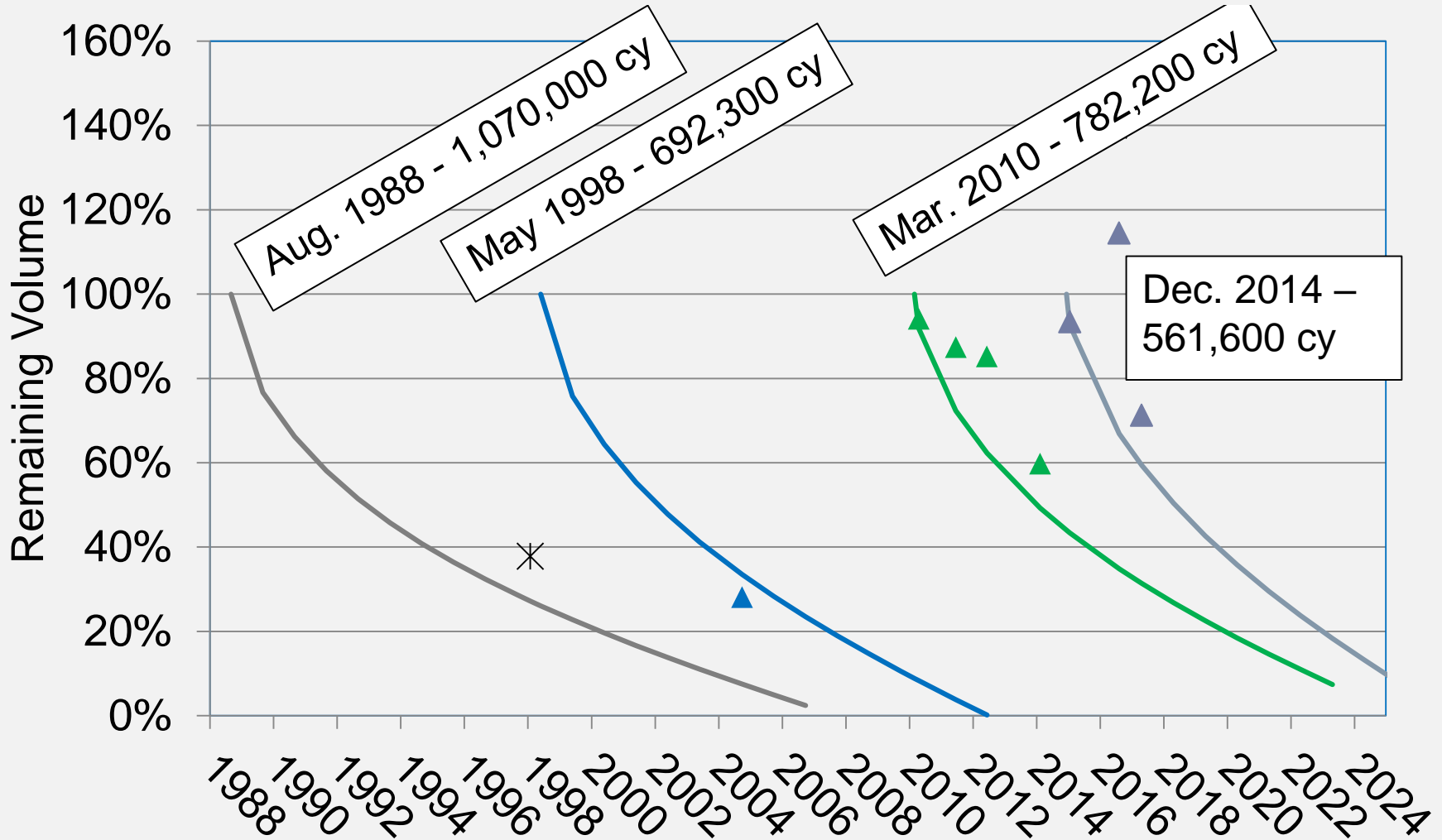
Data and Volumes Provided by Olsen Assoc., Inc. and Brevard Co.

Brevard Co. – South Reach Project

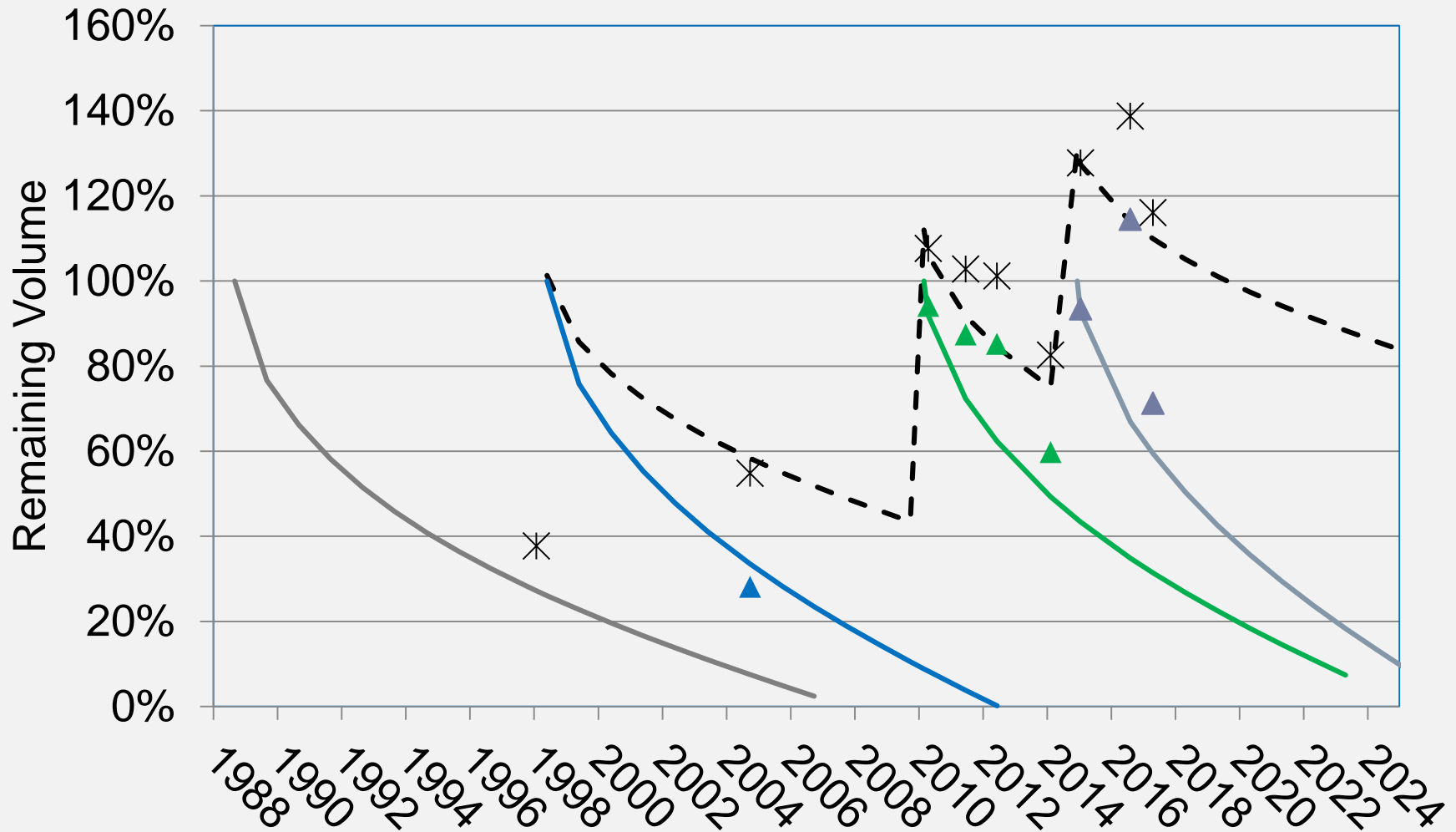


Data and Volumes Provided by Olsen Assoc., Inc. and Brevard Co.

Boca Raton – North Boca Project



Boca Raton – North Boca Project



Conclusions

- ▶ Observations vs. long-term analytical predictions have variability
 - ▶ Storm response projects skew “The Idea” of expanding design life
 - ▶ Applying analysis to overall program is more accurate than individual projects
- ▶ Observed volumes increase over time
 - ▶ Dune Evolution
 - ▶ Sandbar Evolution

Take-Home Message

Take Homes

- ▶ This volume-based analysis can be applied to long-term planning/budgeting
- ▶ Analyses can be further developed for more complex situations

Acknowledge:

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