SEDIMENT MANAGEMENT AND NAVIGATION OPTIMIZATION AT COLLIER CREEK, FL

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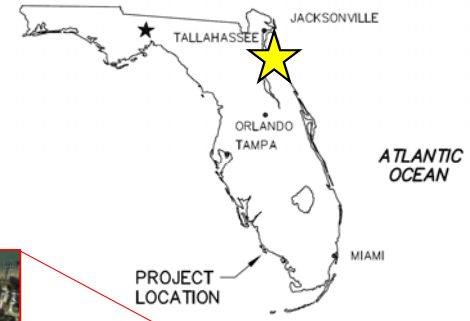
[2]Coastal Zone Management, Collier County Government

COLLIER CREEK
COLLIER COUNTY, FL



PROBLEM OVERVIEW

- Access to 1/3 of Marco Island boaters
- High traffic area + strong currents
- Turbulence

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Credit: Ben Farnsworth (VDMW)

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2009-2011: 4 accidents causing structural damage

PROBLEM OVERVIEW

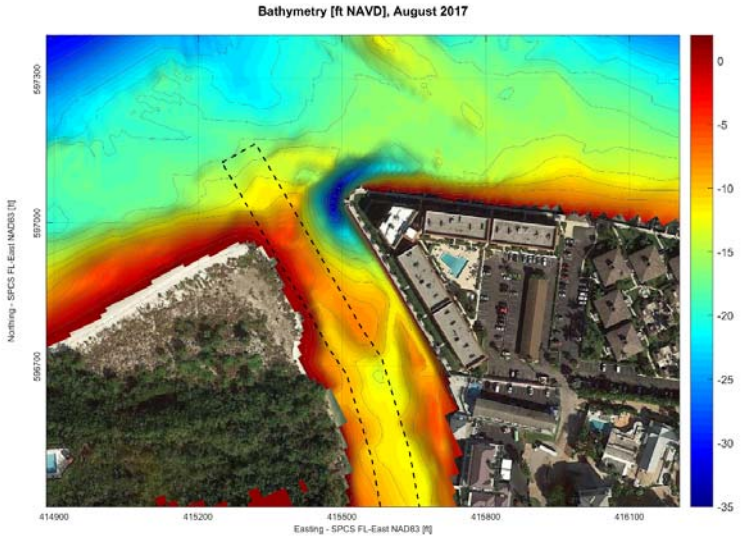
Collier Creek Dredging (24,100 cy)

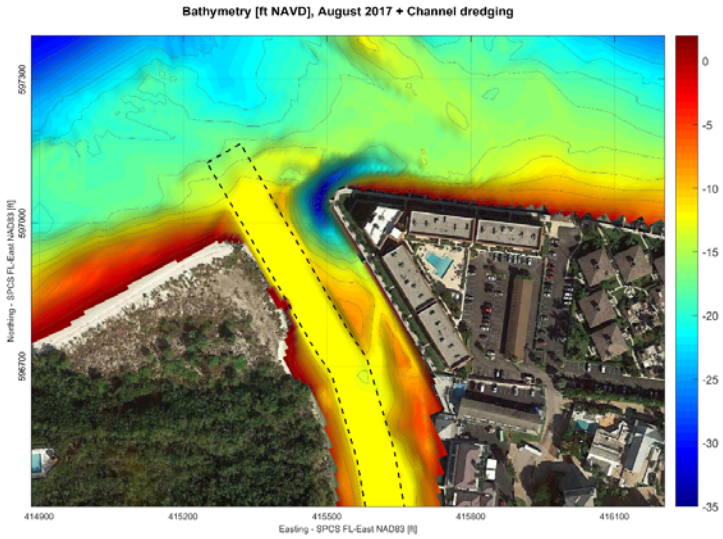
Collier Creek Dredging (9,300 cy)

Collier Creek Dredging (12,000 cy)

Collier Creek Dredging (13,600 cy)

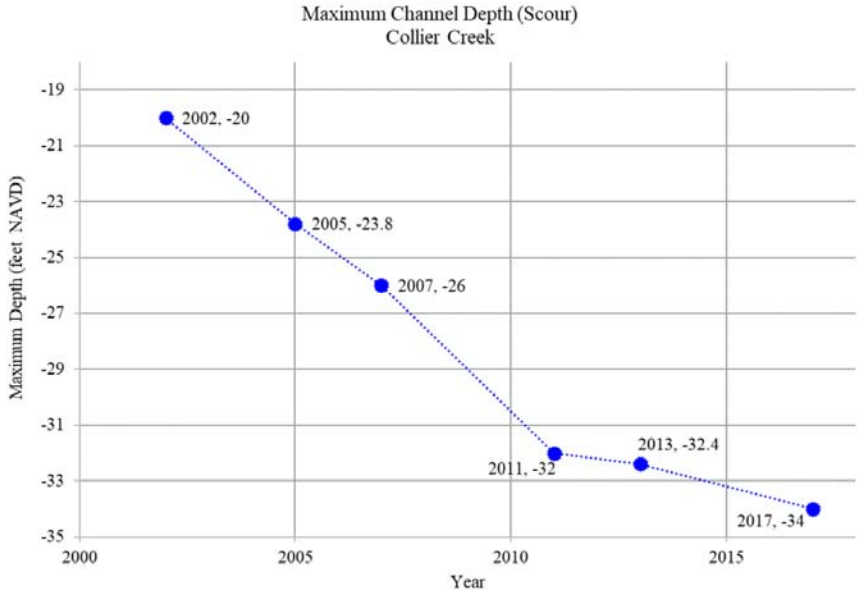
2001 2002 2003 2005 2010 2012 2013 2016 2017 2018

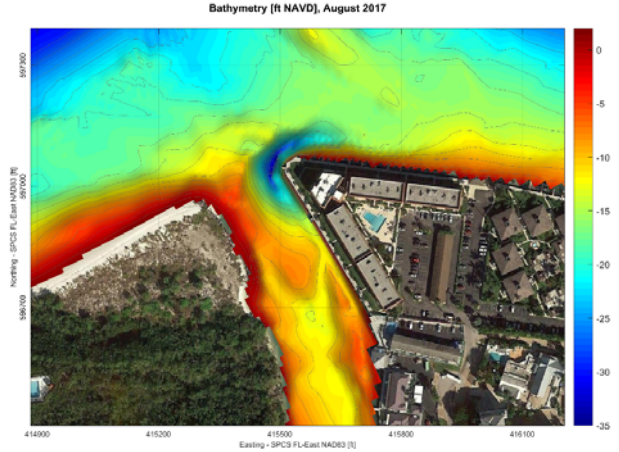




PROBLEM OVERVIEW

- Regional coastal dynamics (water & sediment)
- Scour hole deepening (cause/consequence)





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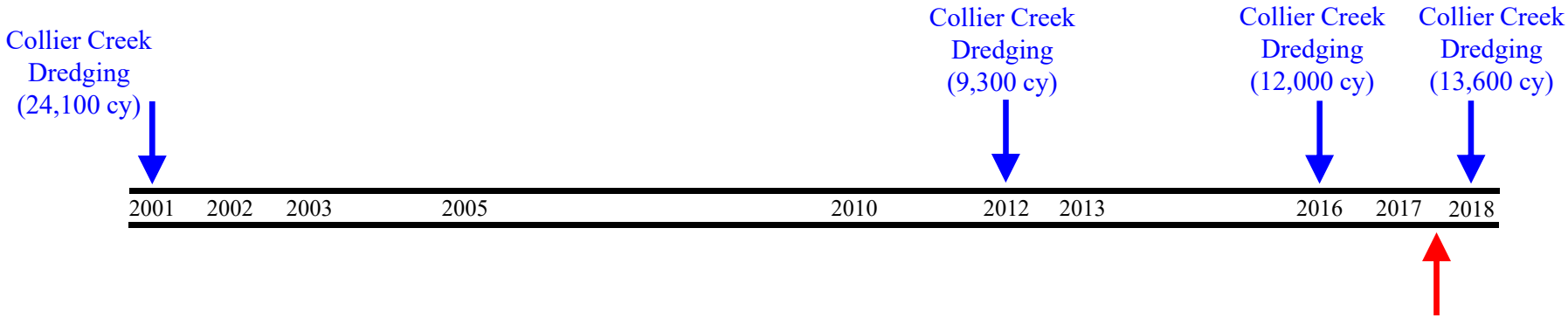


MANAGEMENT PLAN DEVELOPMENT

nts/tides

nt fluxes

Collier County

Engagement of local stakeholders from start:

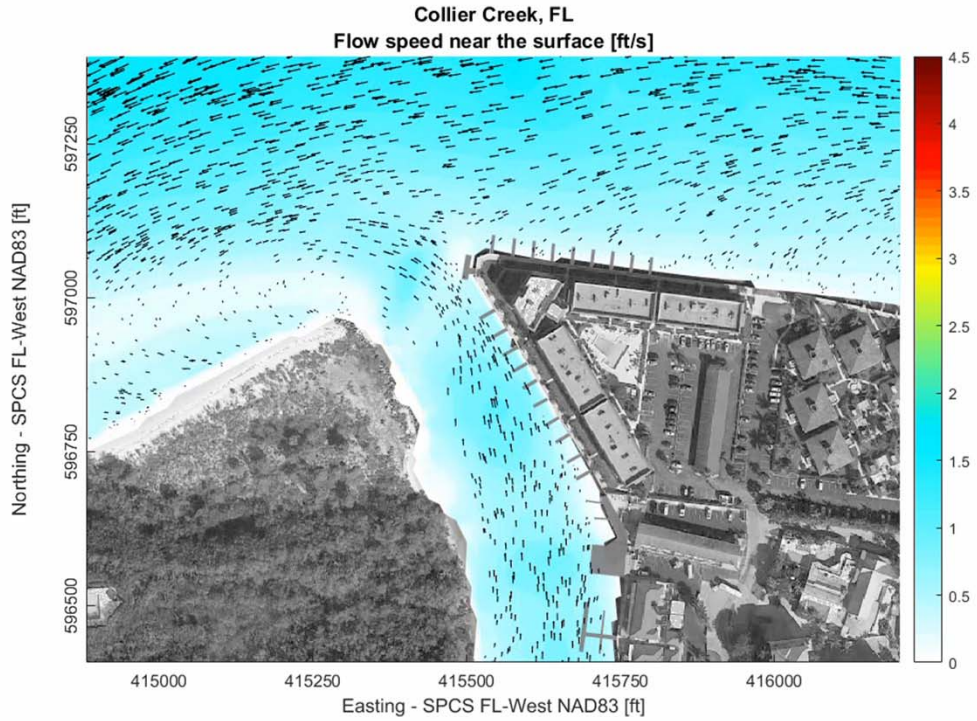
- City of Marco Island
- VDMW Condominium

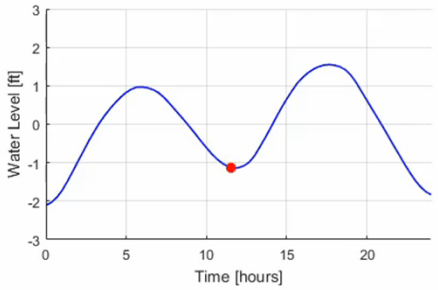
HYDRODYNAMIC MODELING

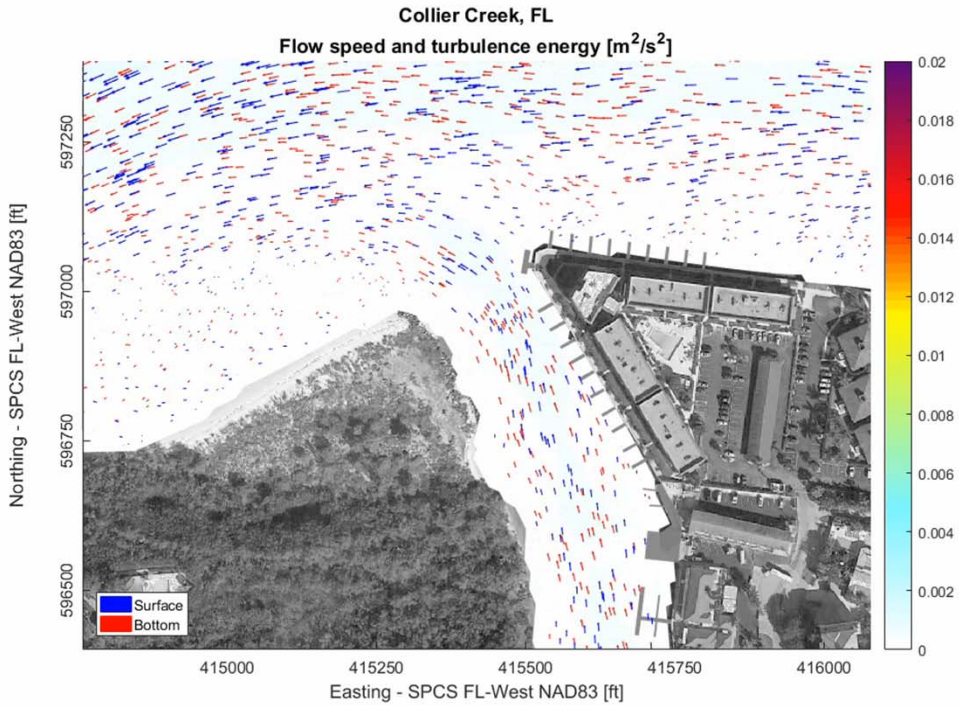
HYDRODYNAMIC MODELING

- Model calibration: model vs. measurements (waves, currents and tides)

- Model application
  - Understand existing conditions
  - Evaluate the performance of alternatives


Collier Creek, FL
Flow speed near the surface [ft/s]
Northing - SPCS FL-West NAD83 [ft]
597250
597000
596750
596500
415000
415250
415500
415750
416000
Easting - SPCS FL-West NAD83 [ft]
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0


Water Level [ft]
3
2
1
0
-1
-2
-3
0
5
10
15
20
Time [hours]


Collier Creek, FL
Flow speed and turbulence energy [m²/s²]
Northing - SPCS FL-West NAD83 [ft]
597250
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Surface
Bottom
0.02
0.018
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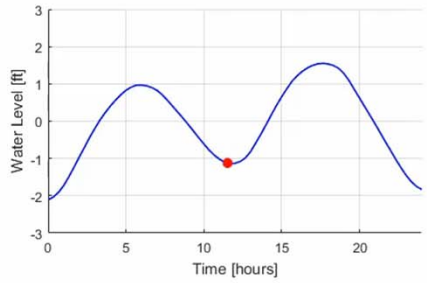
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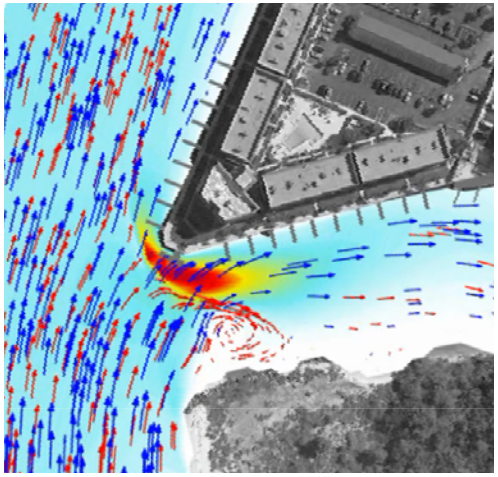
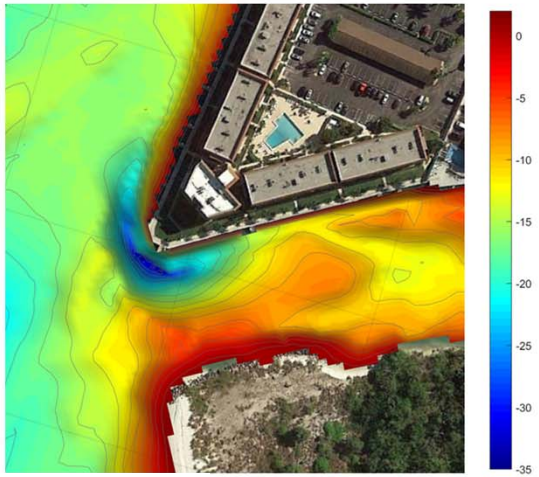
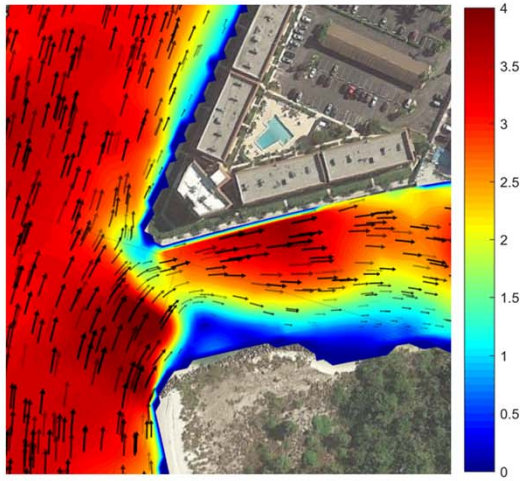
Turbulence

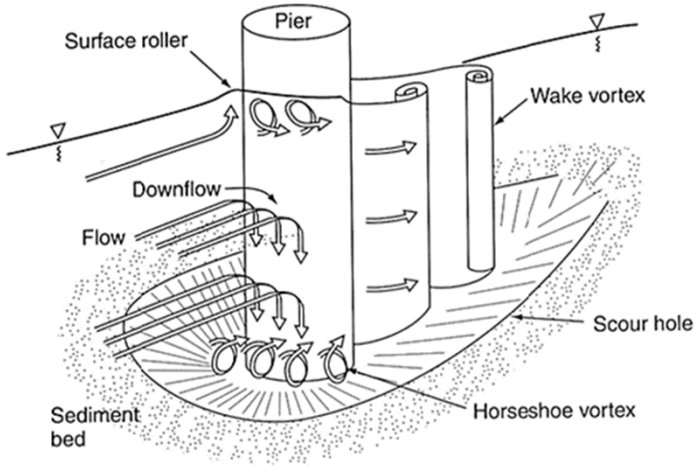


Bathymetry [feet NAVD]



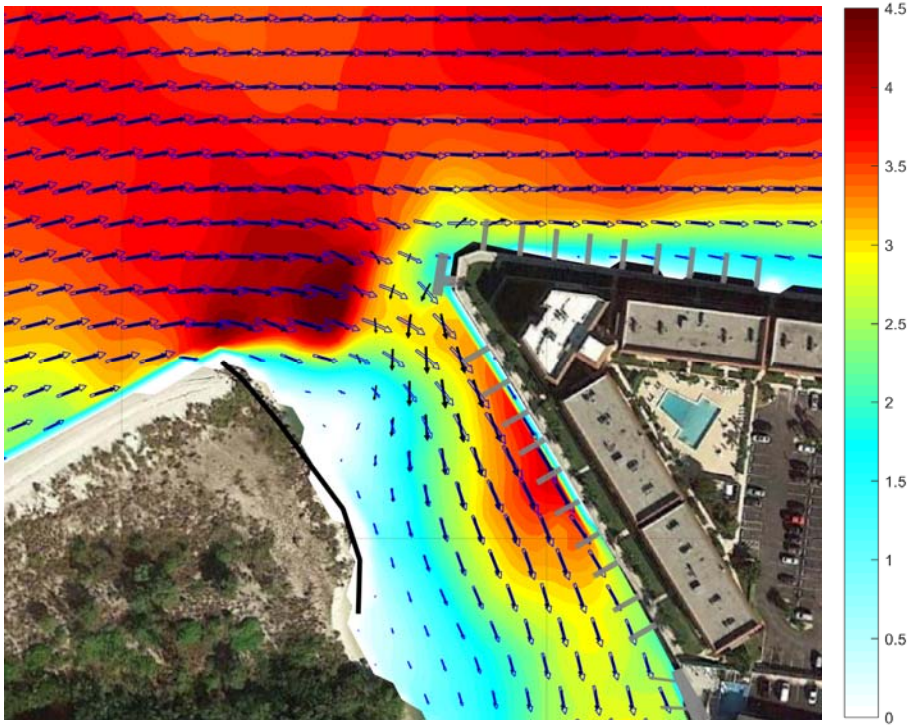
Current speed [feet/s]





HYDRODYNAMIC MODELING

Surface current velocity [feet/second]



Flood tide → driving conditions

- Current speed along the piers
- Cross-current
- Current along the navigation channel
- Turbulence (scour & navigation threat)

(overall scoring)

USE MODEL TO TEST ALTERNATIVES

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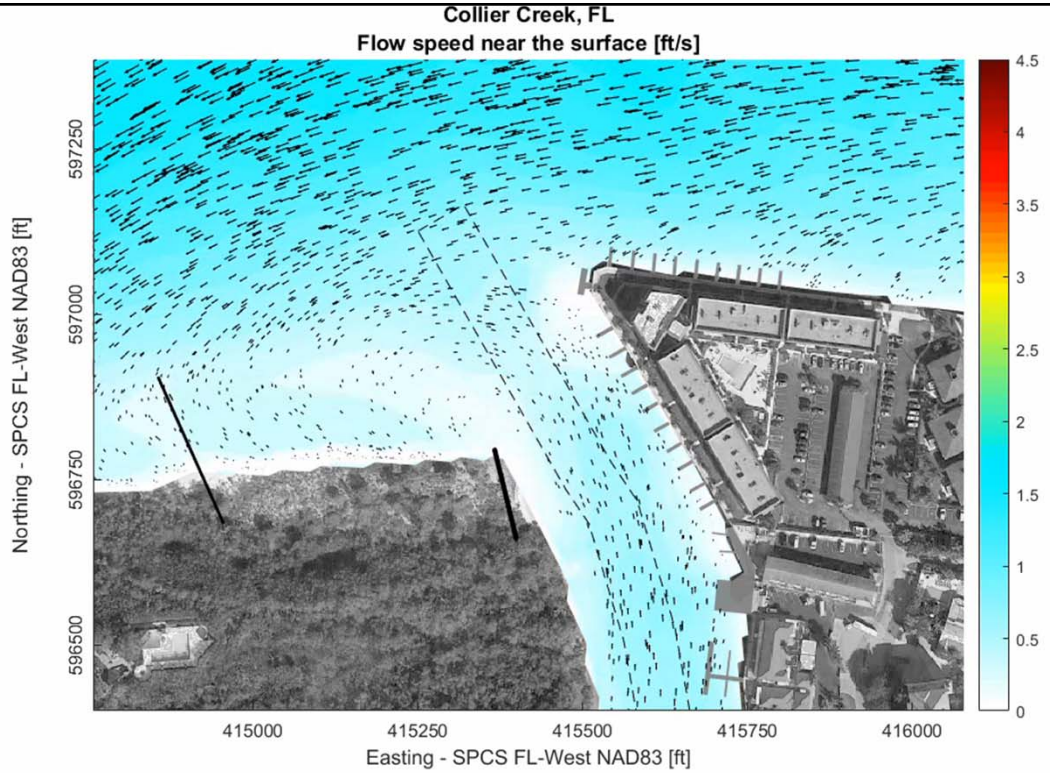
7x benefit of *baseline* alternative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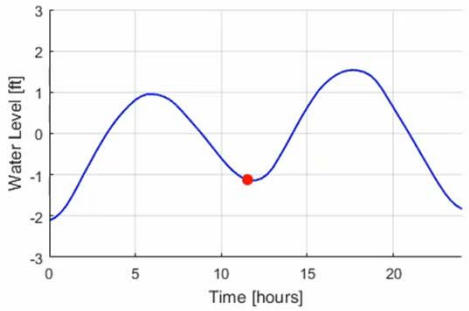
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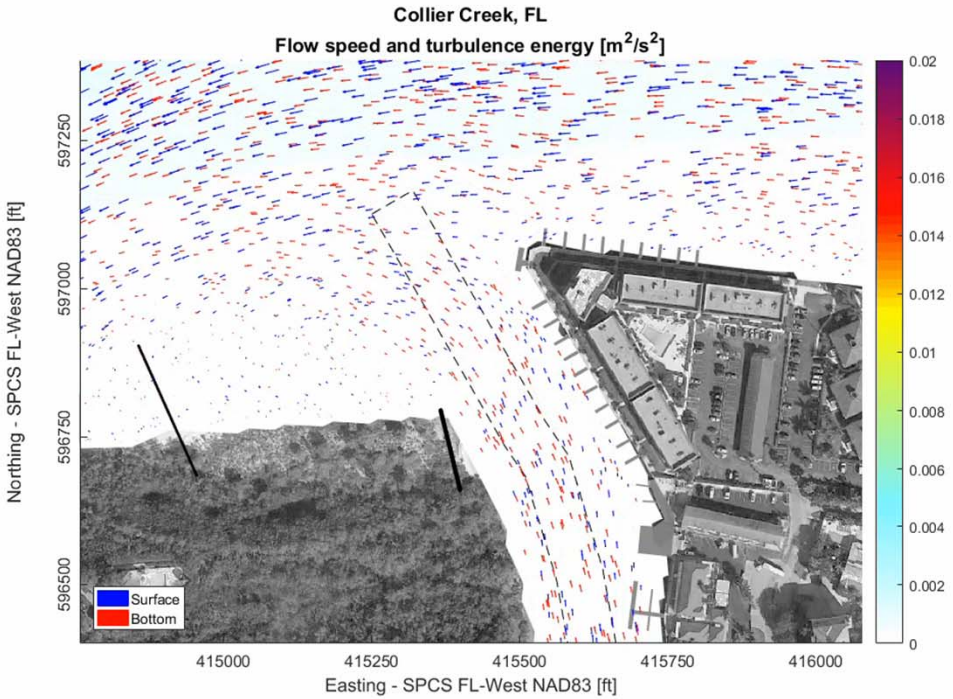
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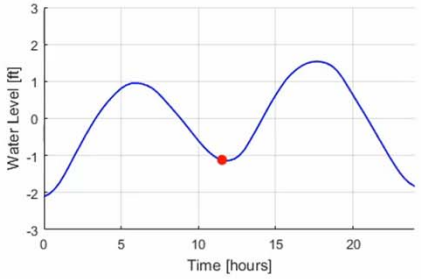
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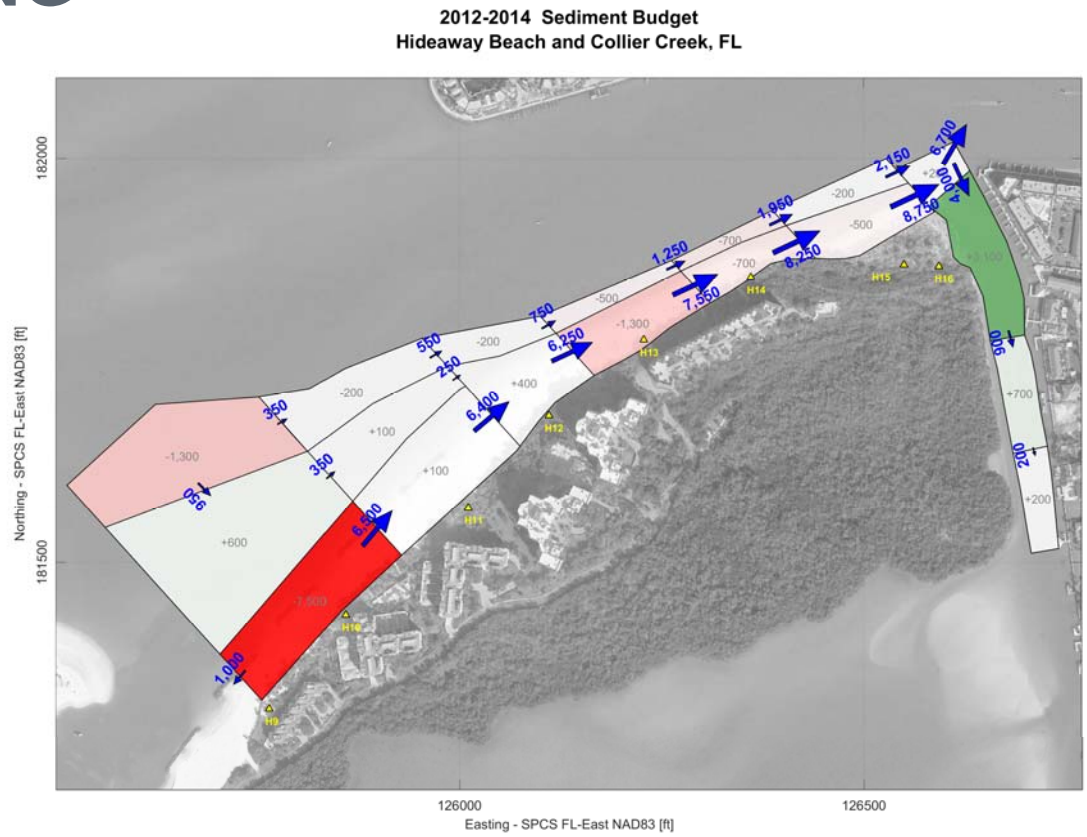
Model calibration (replicate sed. budget)



MORPHOLOGY MODELING

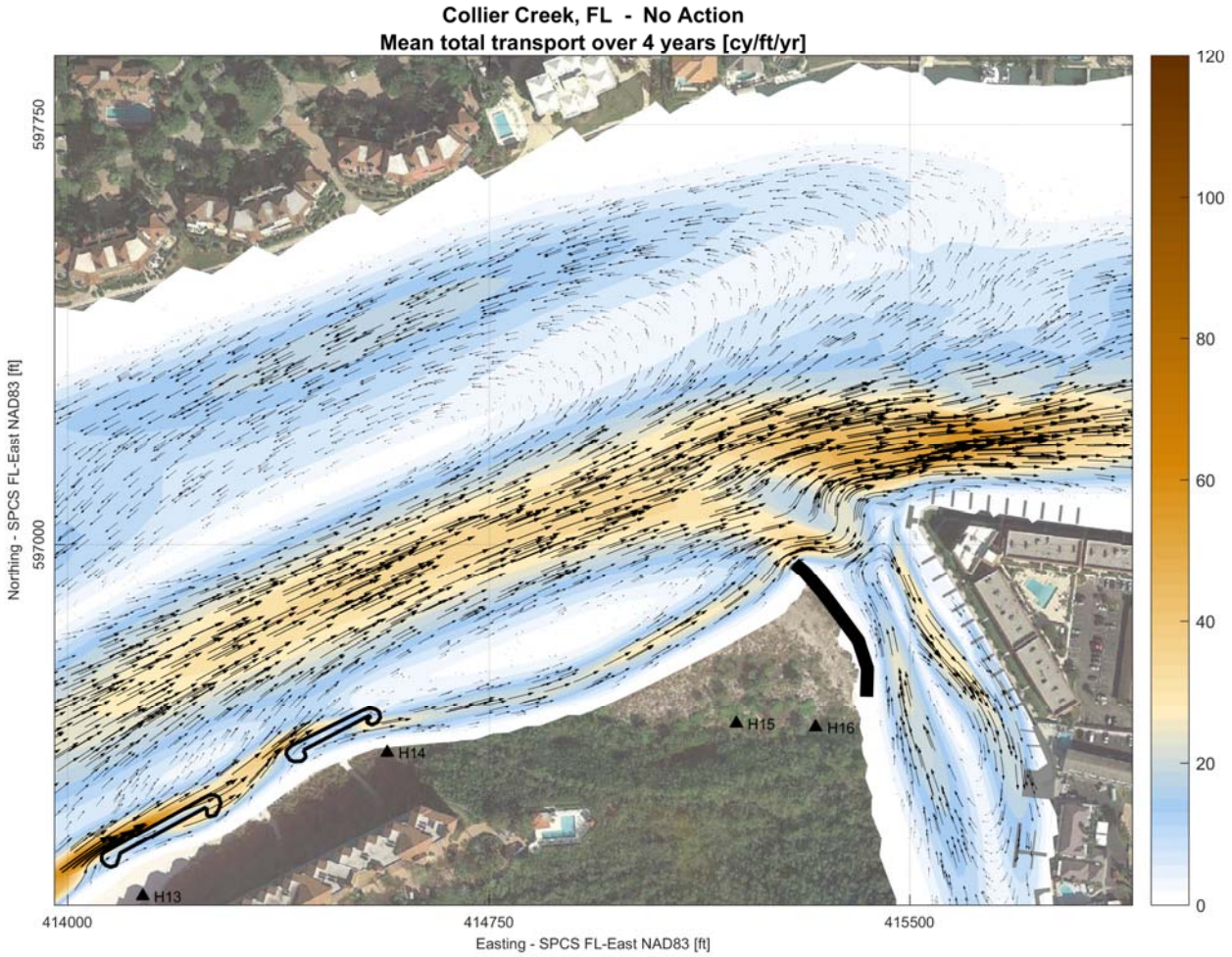
Model calibration (replicate sed. budget)

4-year simulations

MORPHOLOG

Model calibration (repl

4-year simulations



MORPHOLOG

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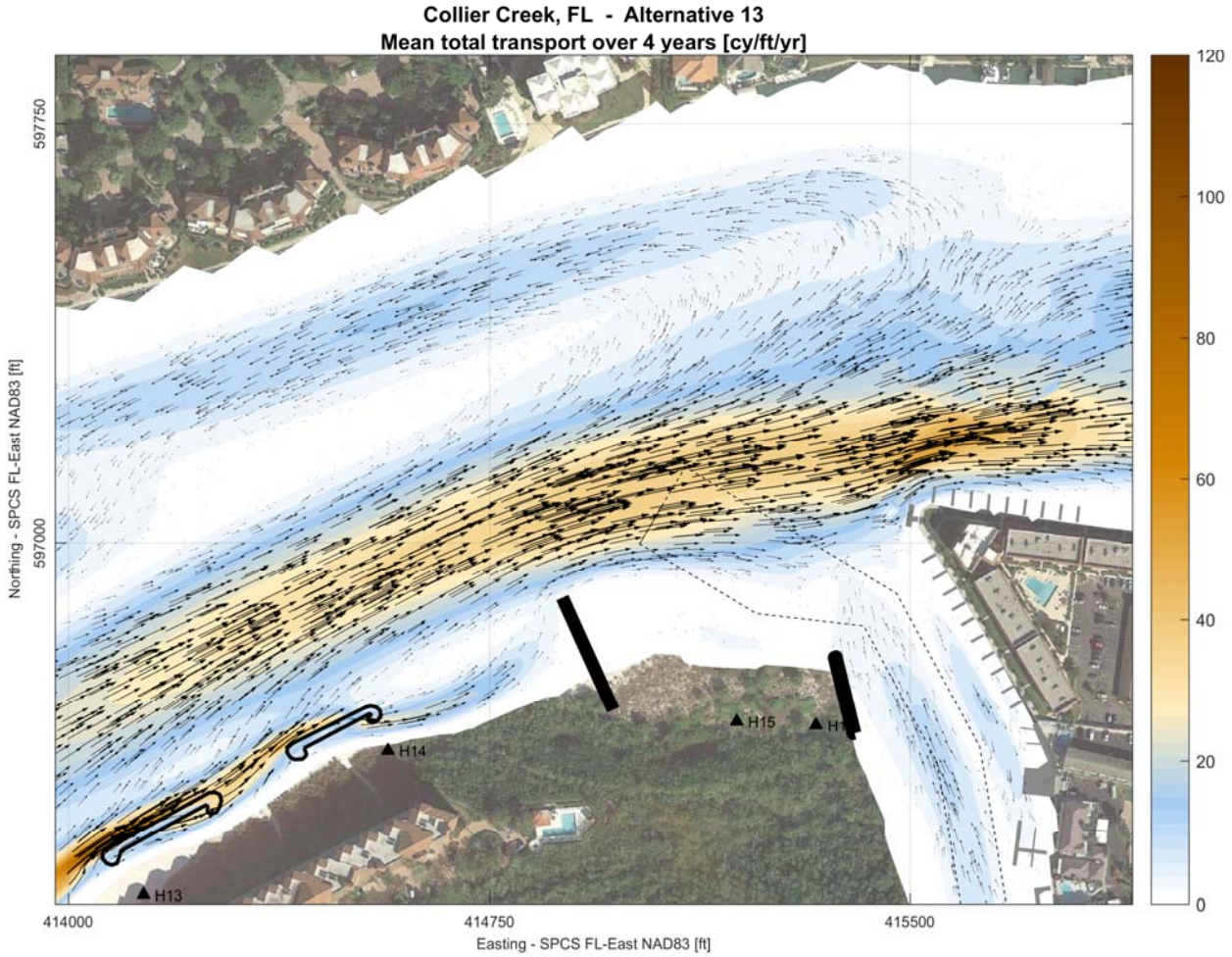

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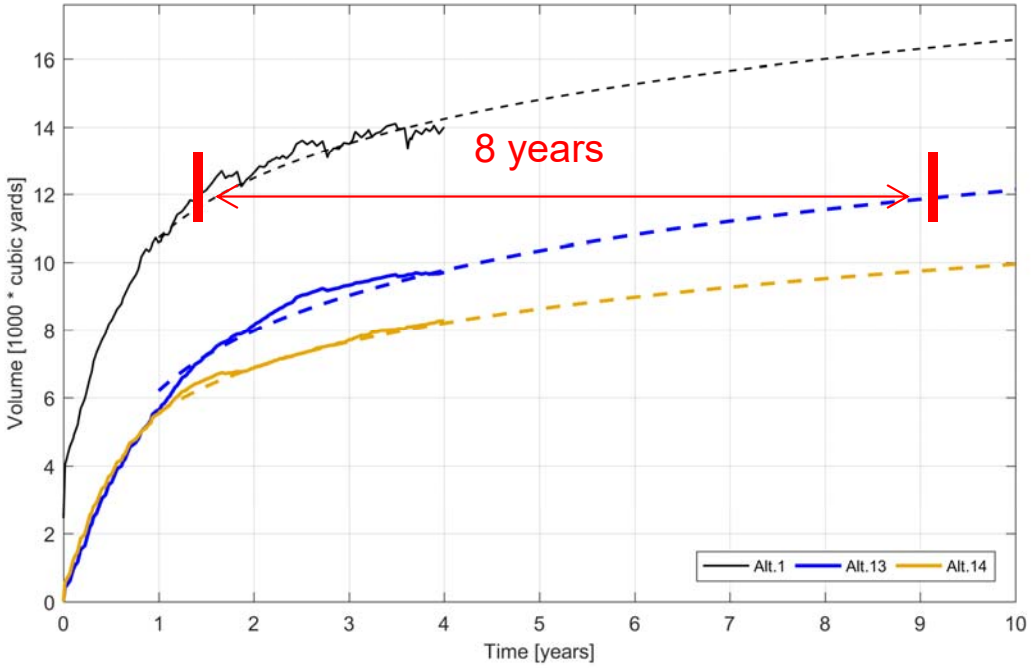

- Engineering (feasibility and economic analysis)

  Cost of Alternative vs. Operational Savings(*)

- Permitting (pre-consultation is ongoing)

CONCLUSIONS

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Collier Creek's shoaling & scour problem required 3D modeling to illuminate the underlying processes

Results pointed towards a non-intuitive solution that may alleviate the problem

QUESTIONS

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Expect the Extraordinary.