



Static vs. Dynamic Sea Level Rise Inundation Mapping in Hollywood, Florida

**FSBPA 35th Annual National Conference on Beach
Preservation Technology
February 3, 2022**

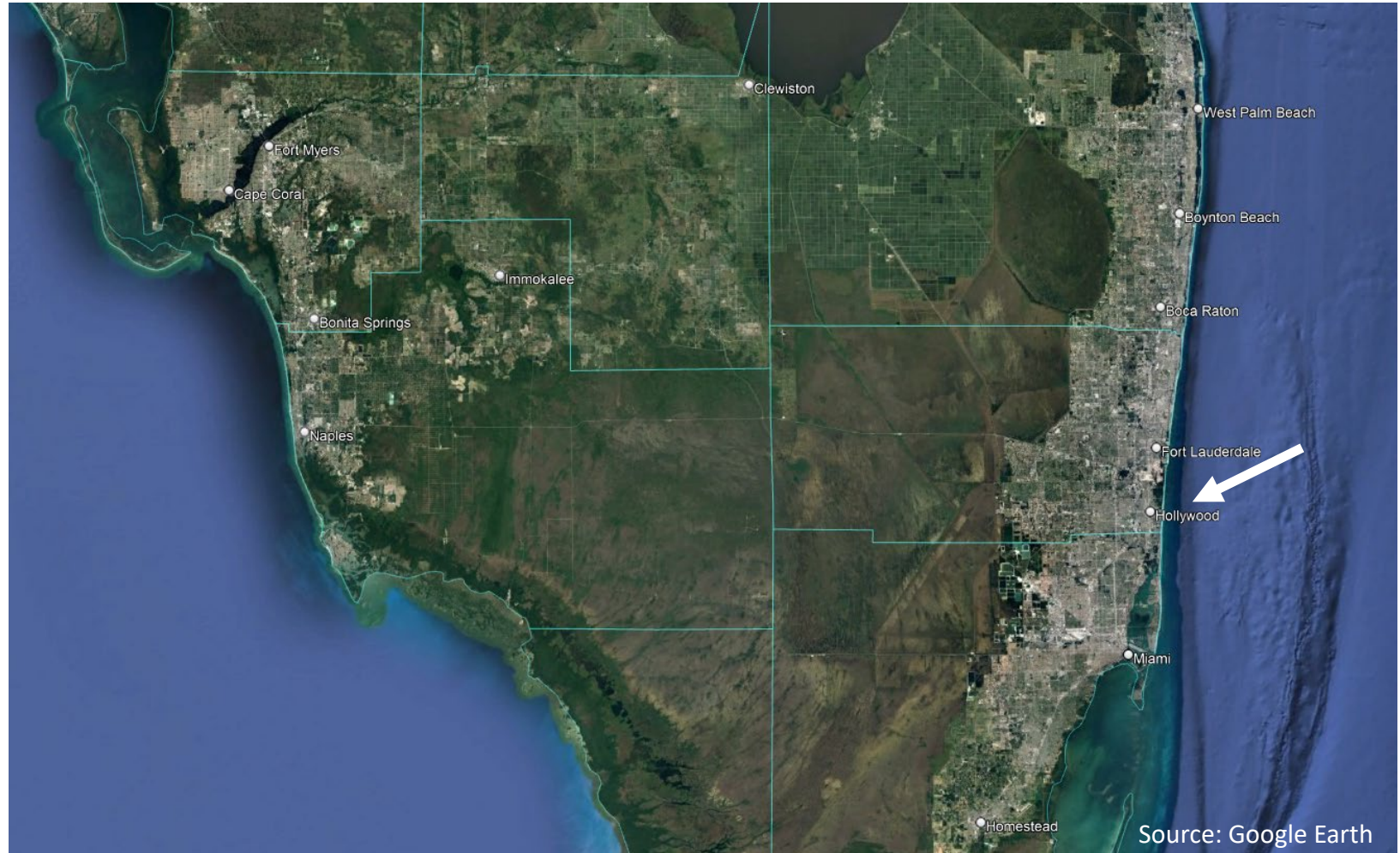
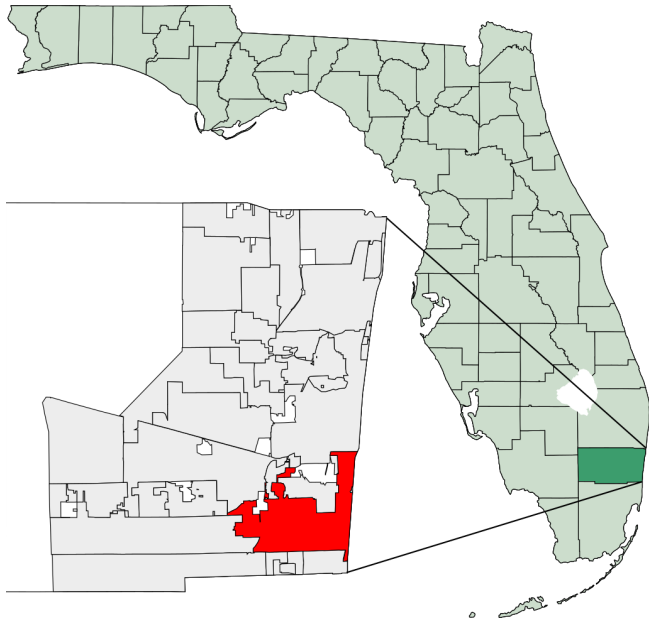
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Is Inundation
Static or
Dynamic?

Project Location

- Tidally Influenced Shoreline



Tidal Flooding Mitigation & Shoreline Protection

- Mitigate Tidal Flooding
- Green Solutions
- Waterfront Access
- County Ordinance





October 2020
King Tide



- Permanent solutions prioritized over deployable ones
- Consider Broward County's Ordinance 2020-11 which requires all property owners to maintain tidal flood barriers that prevent tidal waters from flowing unimpeded through and/or over barriers and onto adjacent properties and/or the public-right-of-way.
- Minimum elevations (+4 ft by 2035 & +5 ft by 2050)
- Design Criteria
 - Extreme water levels
 - Sea level rise
 - Stormwater runoff
 - Wave forces/currents
 - Marine resources
 - Environmental permitting
 - Public waterfront access

Rock revetments



Mangroves & Boat Ramps



Seawalls

TOOLS AVAILABLE

- Berms
- Mangroves
- Fill
- Landscaping
- Living Shorelines
- Seawalls
- Revetments
- Pumps
- Gabions
- Terraces
- Permeable Pavement
- Trench Drains
- Traffic Patterns
- Overwater Boardwalks
- Retention Ponds



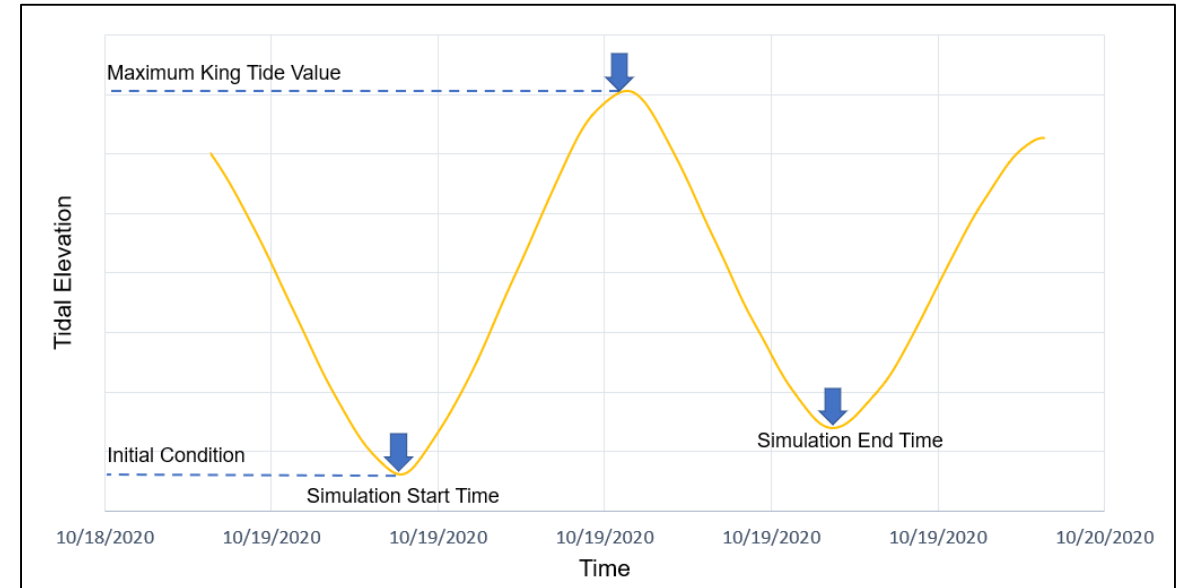
Introduction



Static



Dynamic

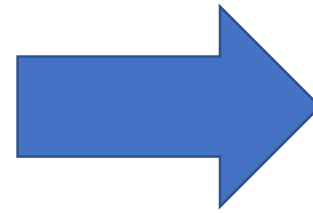


Where is the water going?

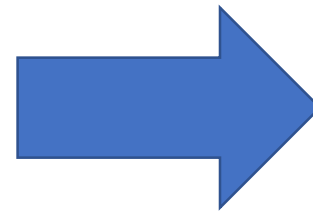
How much water do we get?

How does the water get there?

How long does the water stay?



Static



Dynamic

Data Collection and Processing

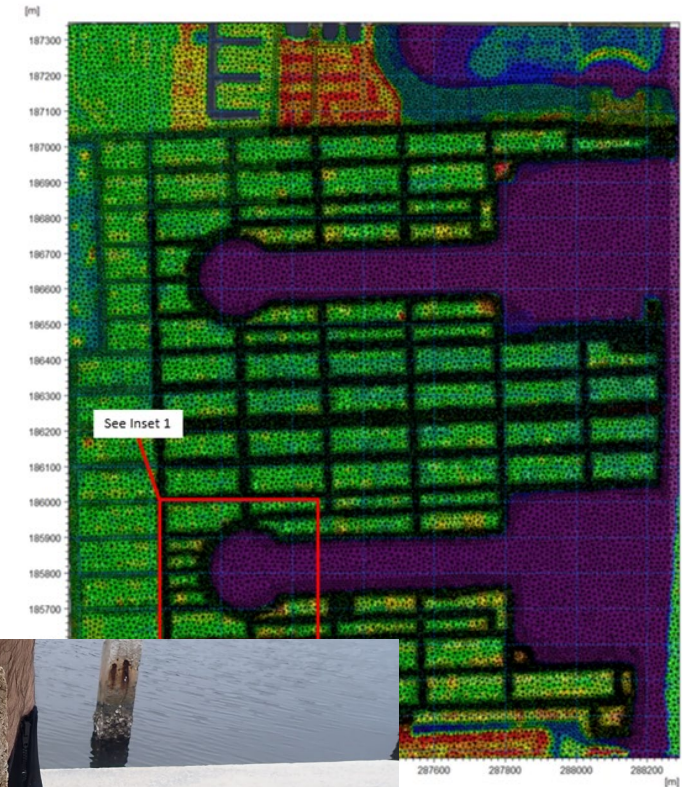
- Data Collection: Tide gage deployment, topographic surveys, bathymetric surveys, LiDAR and DEM compilation.
- Data Processing: LiDAR data, DEM generation, Tide gage data analysis

Scenario Development

- Tidal datums and king tide identification
- Sea level rise projection selection
- Planning periods selection

Model Setup and Flood Mapping

- Numerical model computational domain generation
- Scenario boundary conditions and initial conditions determination
- Mapping of numerical model results



Surface Roughness

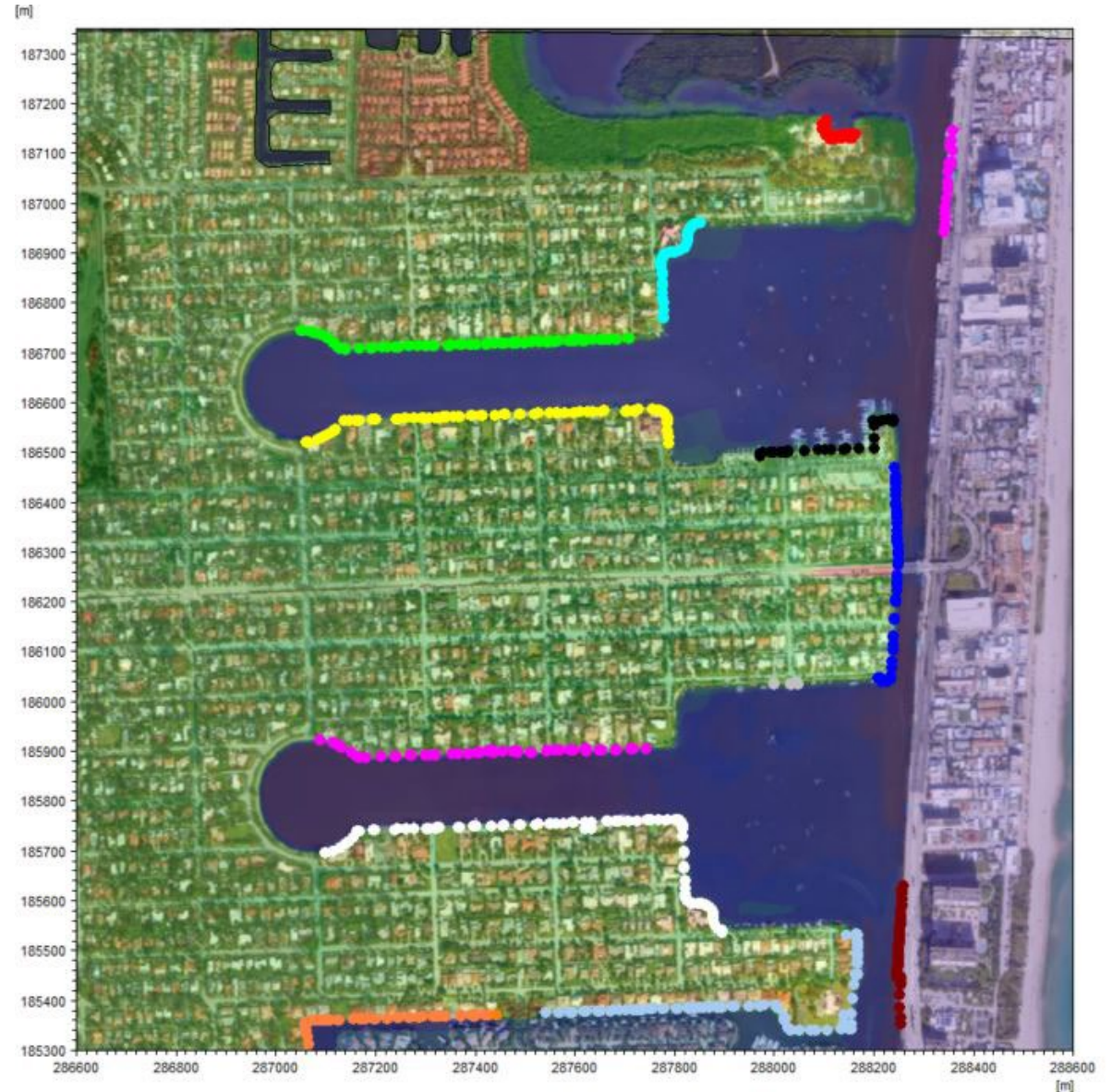
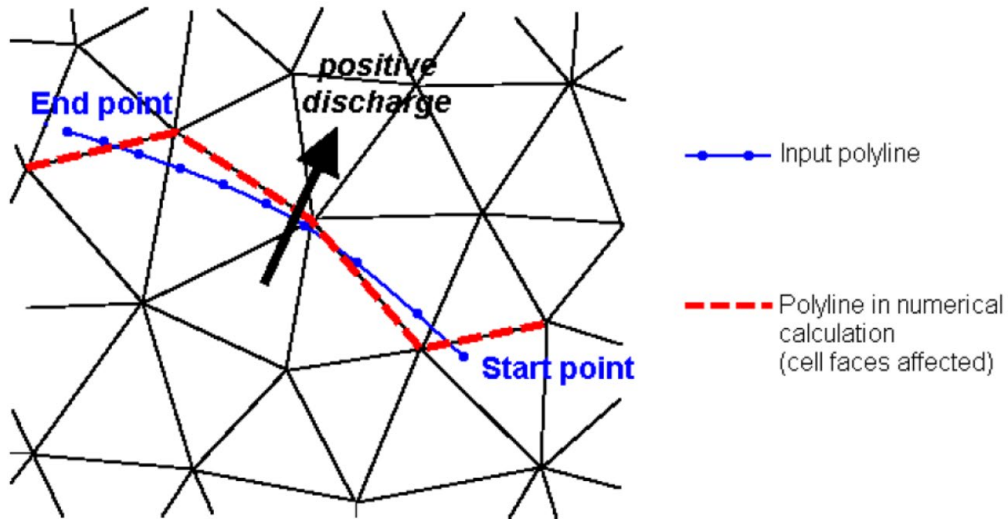
- Based on LiDAR Return Classes
- Manning Values Assigned

Area Type	Manning number ($ft^{1/3}/s$)	Manning number ($m^{1/3}/s$)
Road	74.3	50
Water	59.5	40
Building	10.4	7
Mangrove and Parks	32.7	22



Seawalls

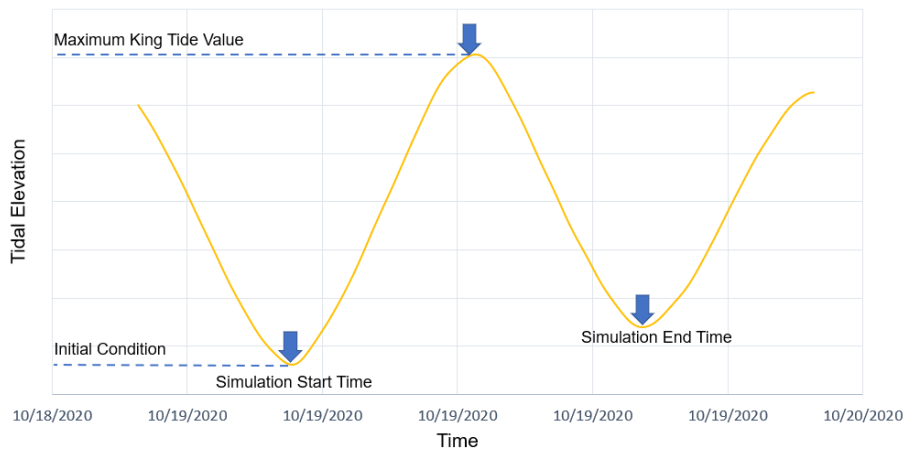
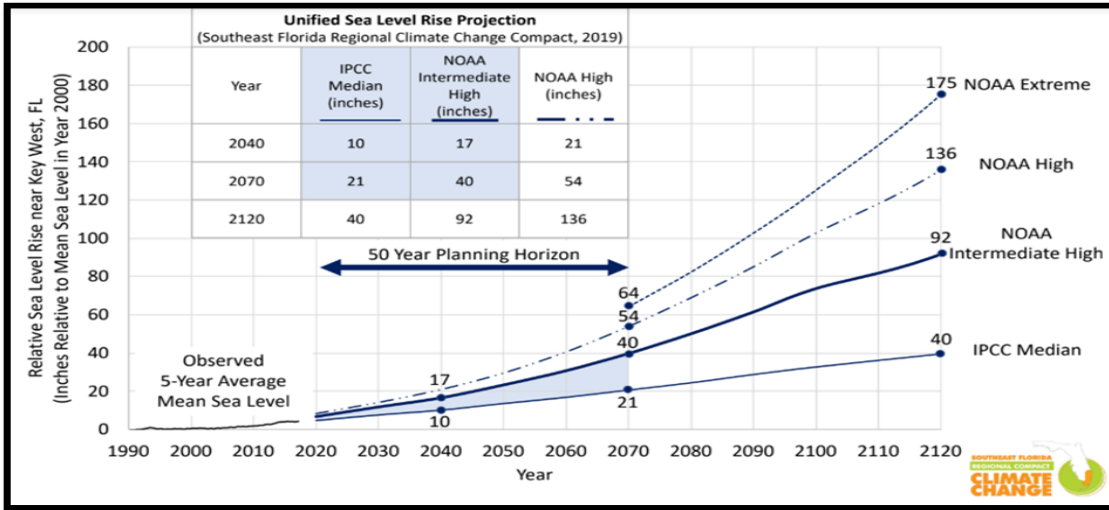
- Mesh resolution
- Parcel-level analysis



Seawalls

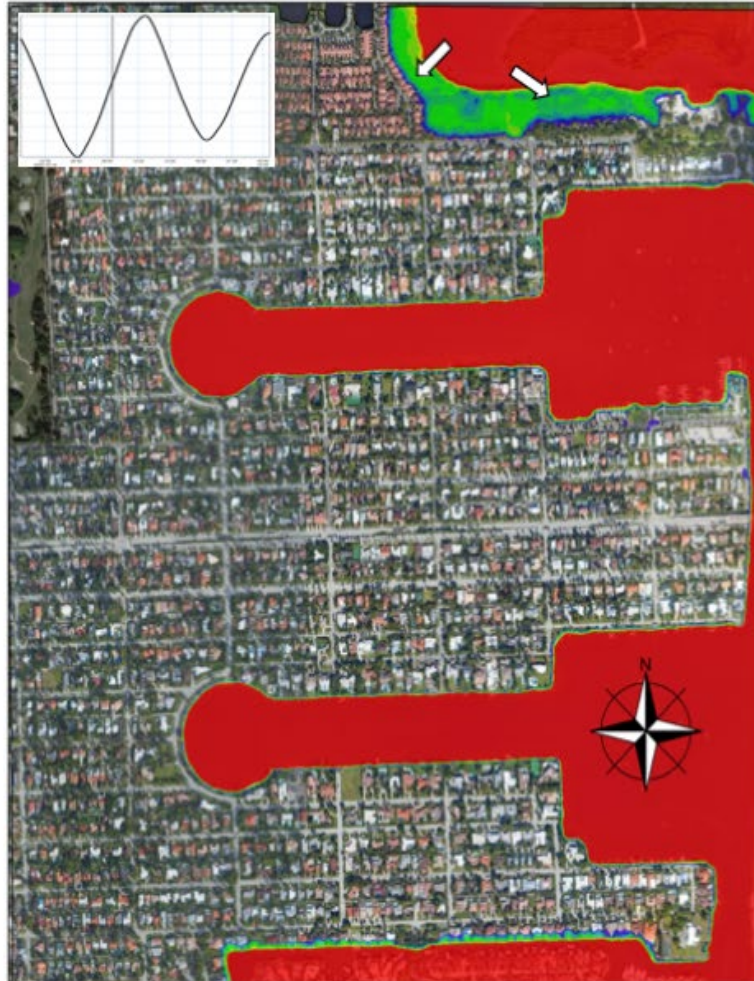


Scenarios



Simulation #	SLR Projection	Year	Peak tidal elevation [ft, NAVD88]	Boundary Conditions
1	-	2020	2.53	King Tide
2	Intermediate Low ¹	2020	0.74	MHW
3	Intermediate High ¹	2020	1.04	MHW
4	Intermediate Low	2035	1.00	MHW
5	Intermediate Low	2040	1.10	MHW
6	Intermediate Low	2050	1.29	MHW
7	Intermediate Low	2070	1.65	MHW
8	Intermediate High	2035	1.61	MHW
9	Intermediate High	2040	1.82	MHW
10	Intermediate High	2050	2.31	MHW
11	Intermediate High	2070	3.69	MHW
12	Intermediate Low	2035	2.79	King Tide
13	Intermediate Low	2040	2.89	King Tide
14	Intermediate Low	2050	3.08	King Tide
15	Intermediate Low	2070	3.44	King Tide
16	Intermediate High	2035	3.10	King Tide
17	Intermediate High	2040	3.31	King Tide
18	Intermediate High	2050	3.80	King Tide
19	Intermediate High	2070	5.18	King Tide

2020 King Tide

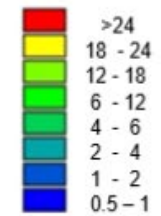


King Tide @ 9:30



King Tide @ 10:30

Total Water Depth [in]

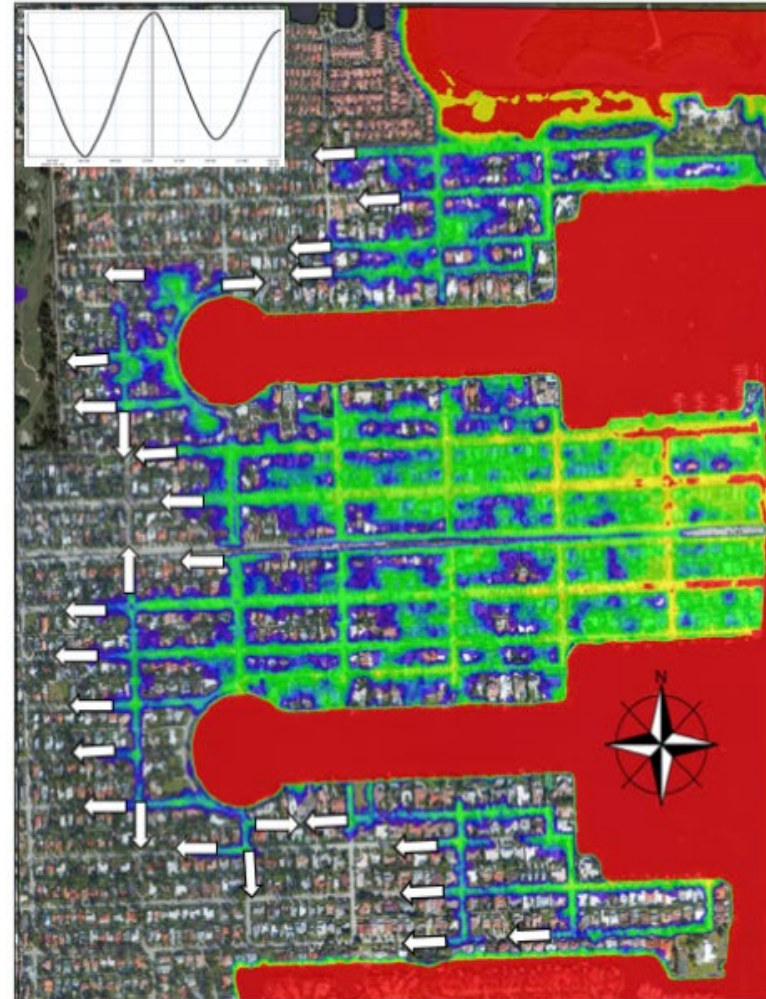


* Below 0.5 in is considered dry

2020 King Tide

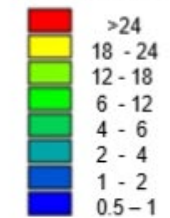


King Tide @ 11:30



King Tide @ 12:30

Total Water Depth [in]



* Below 0.5 in is considered dry

2020 King Tide



King Tide @ 1:30



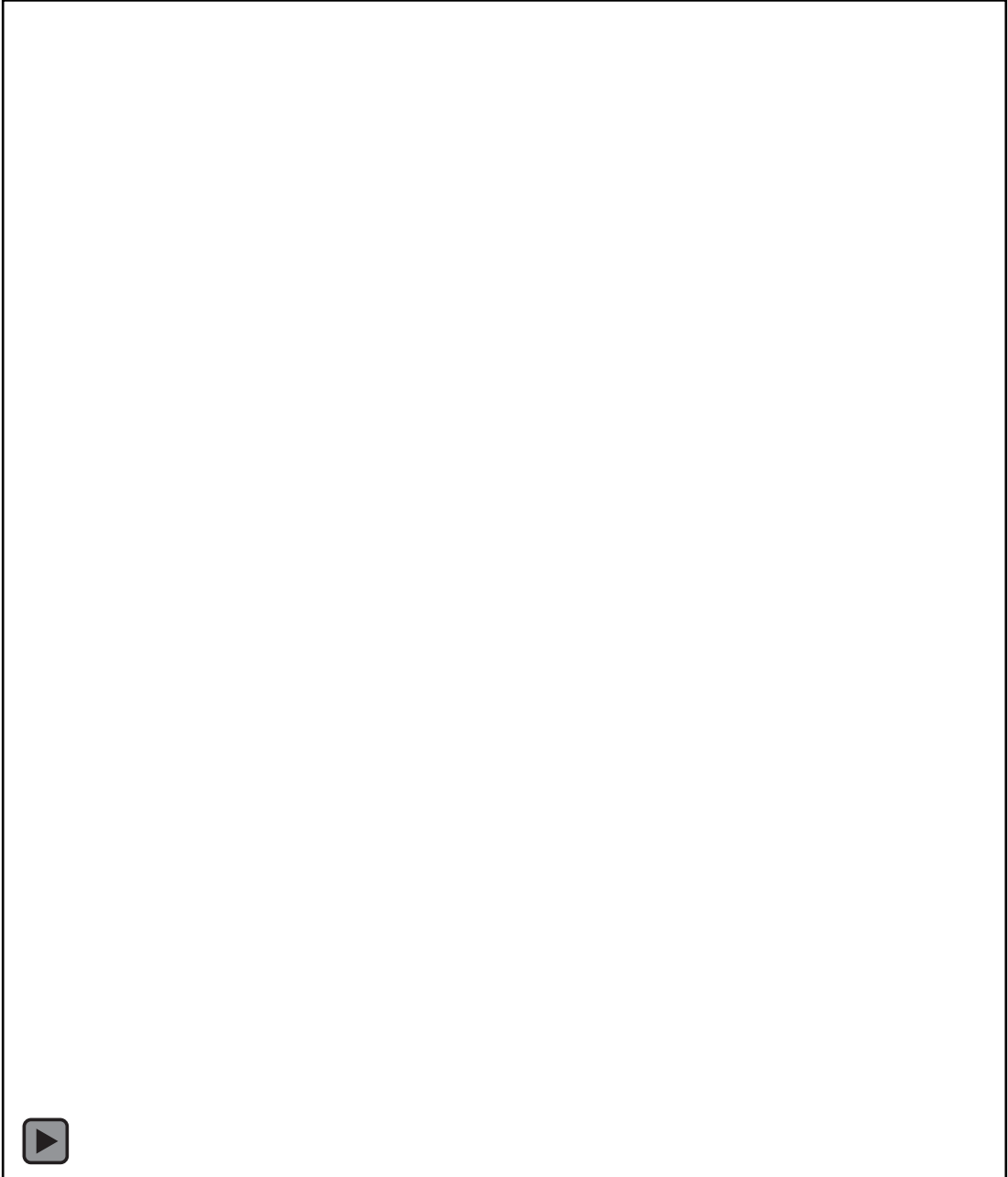
King Tide @ 2:30

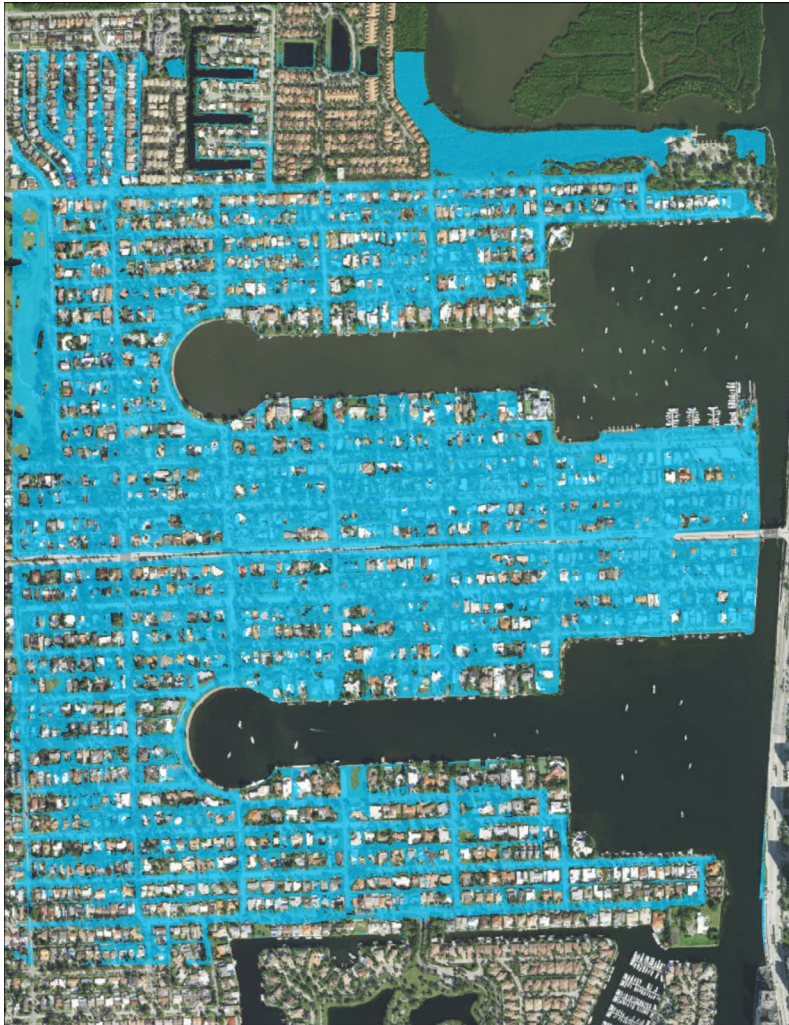
Total Water Depth [in]



* Below 0.5 in is considered dry

Results





Static – King Tide @ 12:30 (+2.53' NAVD)
(353.8 acres)



Dynamic – King Tide @ 12:30 (+2.53' NAVD)
(273.7 acres)

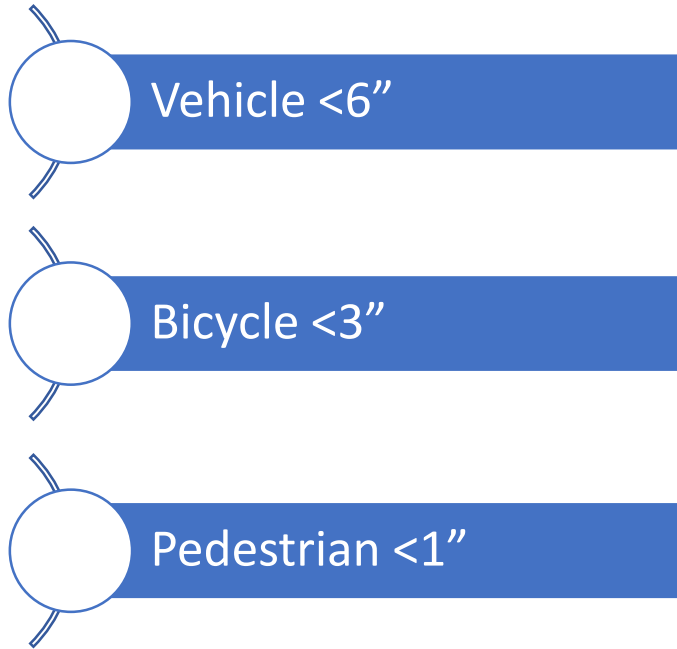


Static – King Tide @ 2:30 (+1.69' NAVD)
(133.4 acres)

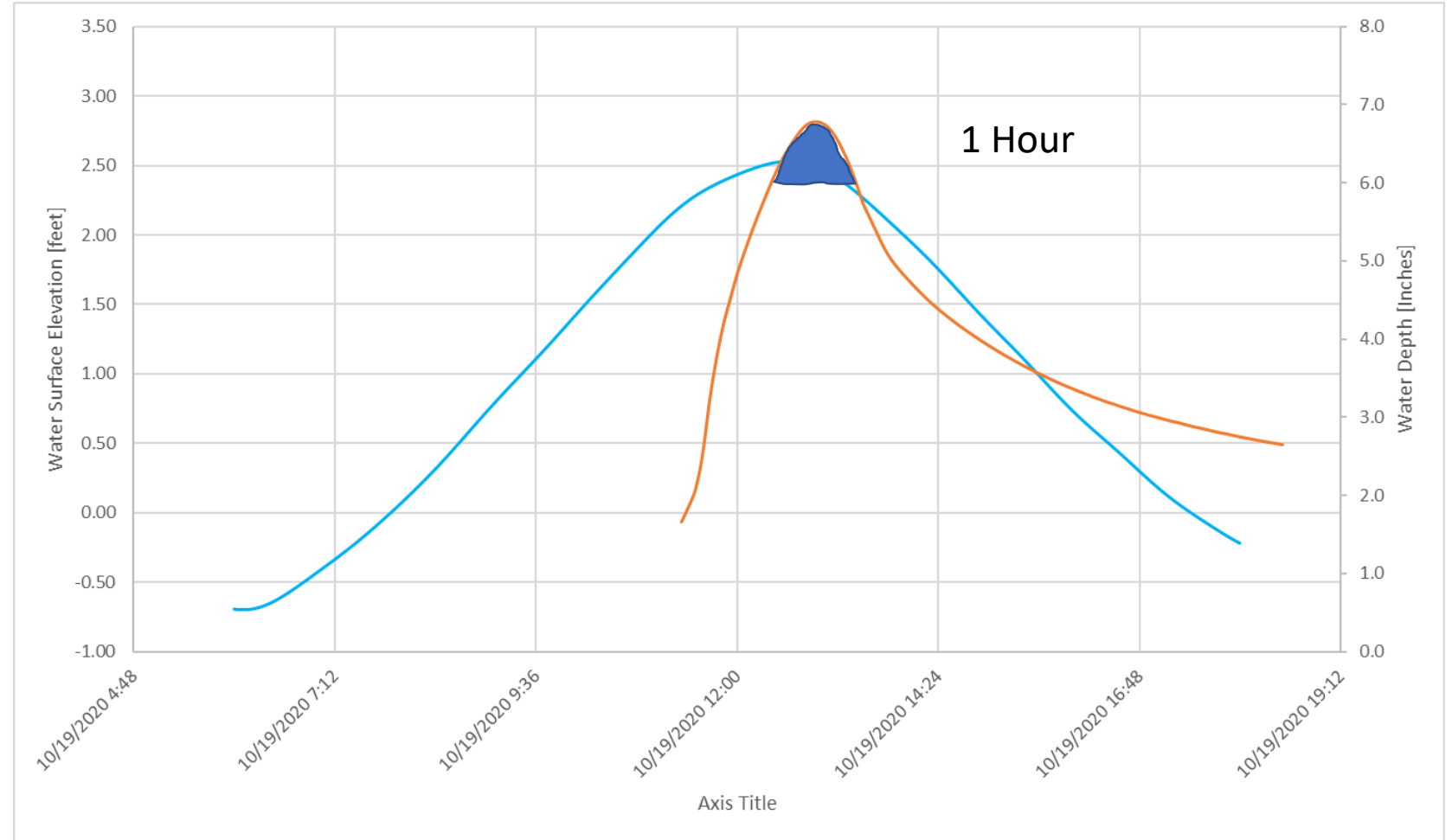


Dynamic – King Tide @ 2:30 (+1.69' NAVD)
(384.6 acres)

Duration of Accessibility



- Peak tide @ 12:30 pm
- Peak water depth @ 1:00 pm



Static vs. Dynamic

- Cost vs. Speed
- Peak Water Level Lag
- Duration of Flooding vs. Use
- Underestimation
- Seawalls
- Limitations
 - Stormwater Systems
 - Groundwater
 - Rainfall
 - Seawall Construction
 - Evaporation





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