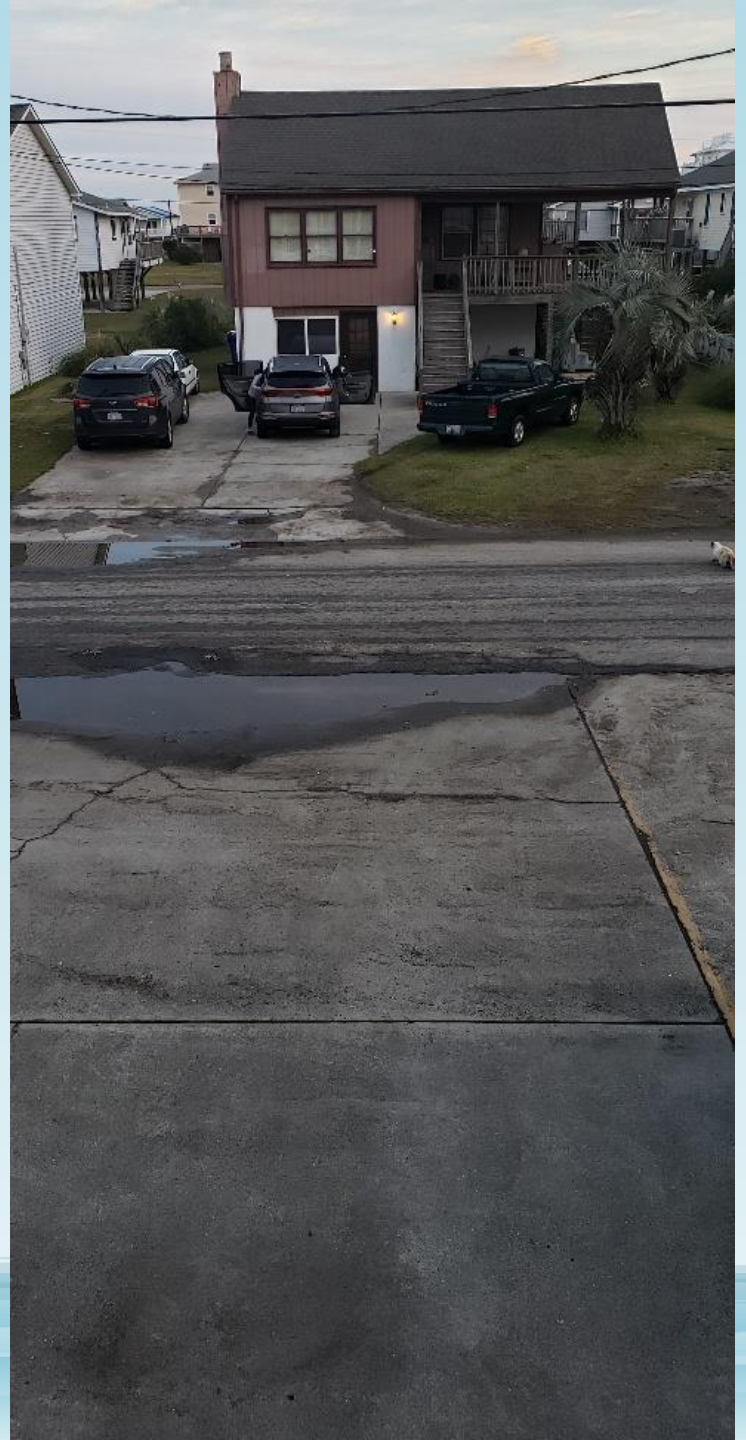
Managing and Measuring Change

A Local Perspective

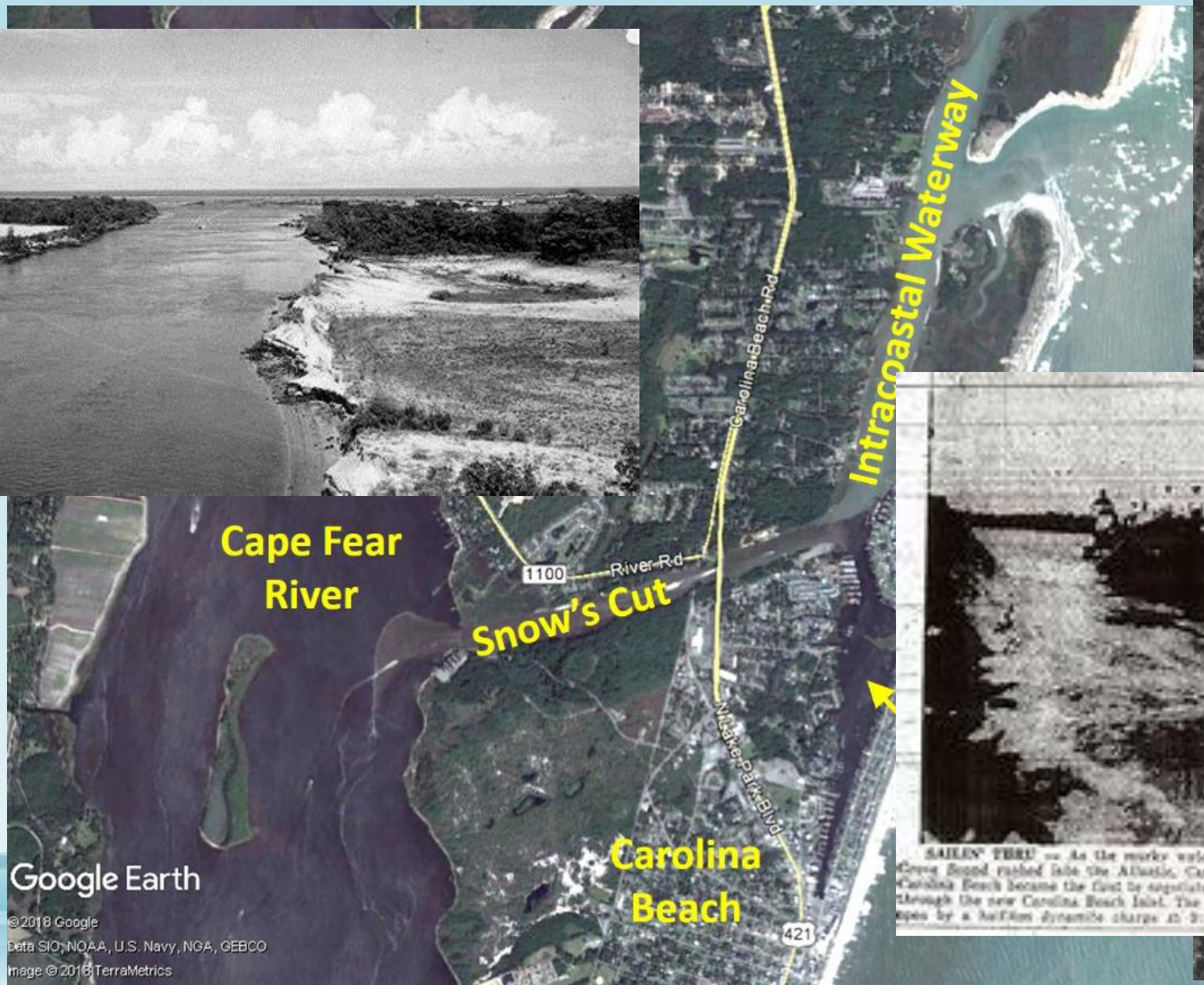
Jeremy Hardison

Planning & Development Director

Area of Concern



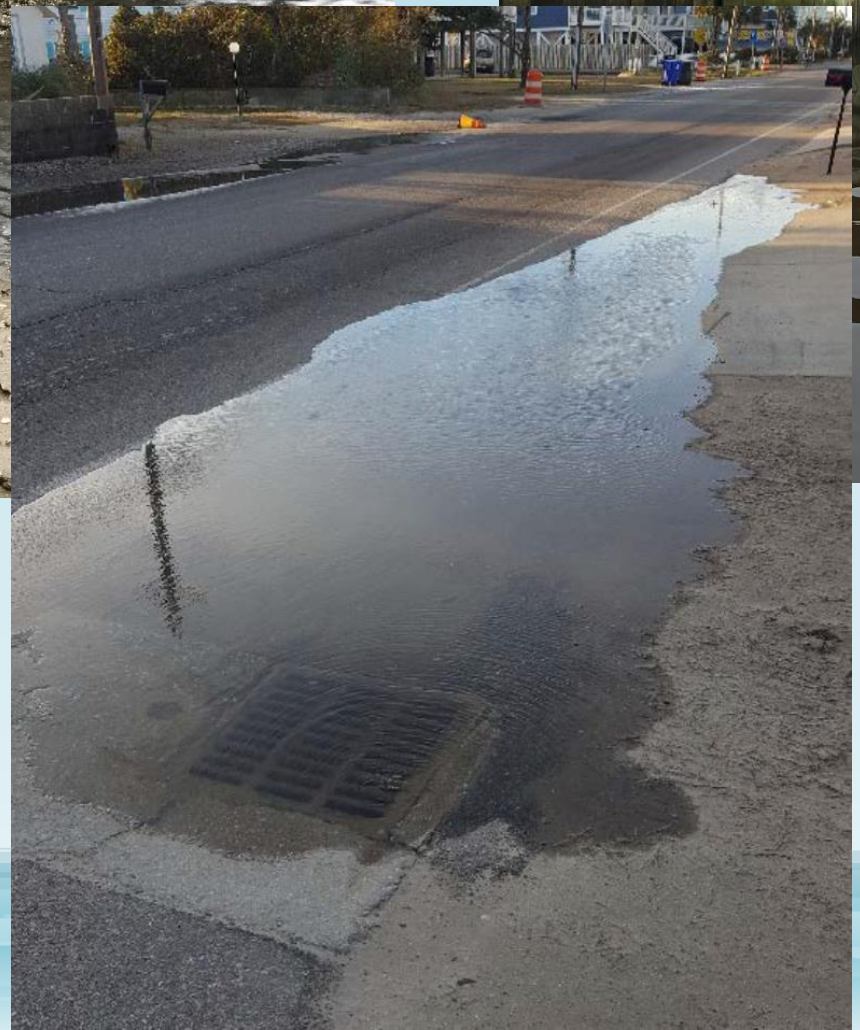
How did we get here?



SAILIN' THRU — As the murky waters of Myrtle Grove Sound rushed into the Atlantic, Carl Winner of Carolina Beach became the first to negotiate the passage through the new Carolina Beach Inlet. The inlet, blasted open by a half-ton dynamite charge at 9:15 yesterday morning, shortly before this picture was taken, had grown to a width of 50 feet, and a depth of about 12 feet at 7:00 p. m. yesterday. The inlet will shorten the distance to the ocean. (Additional pictures on Page 10). — Photo by Schaffner.

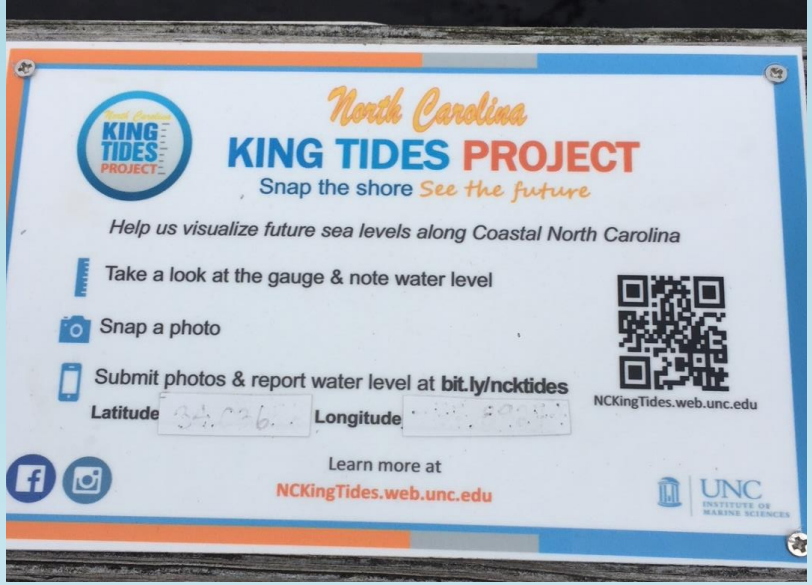
Issue
Shoreline Protection

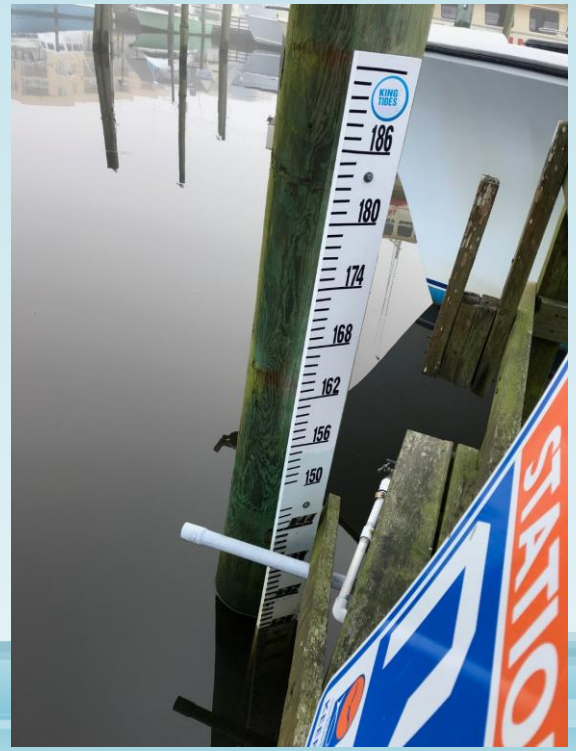
Stormwater Infrastructure

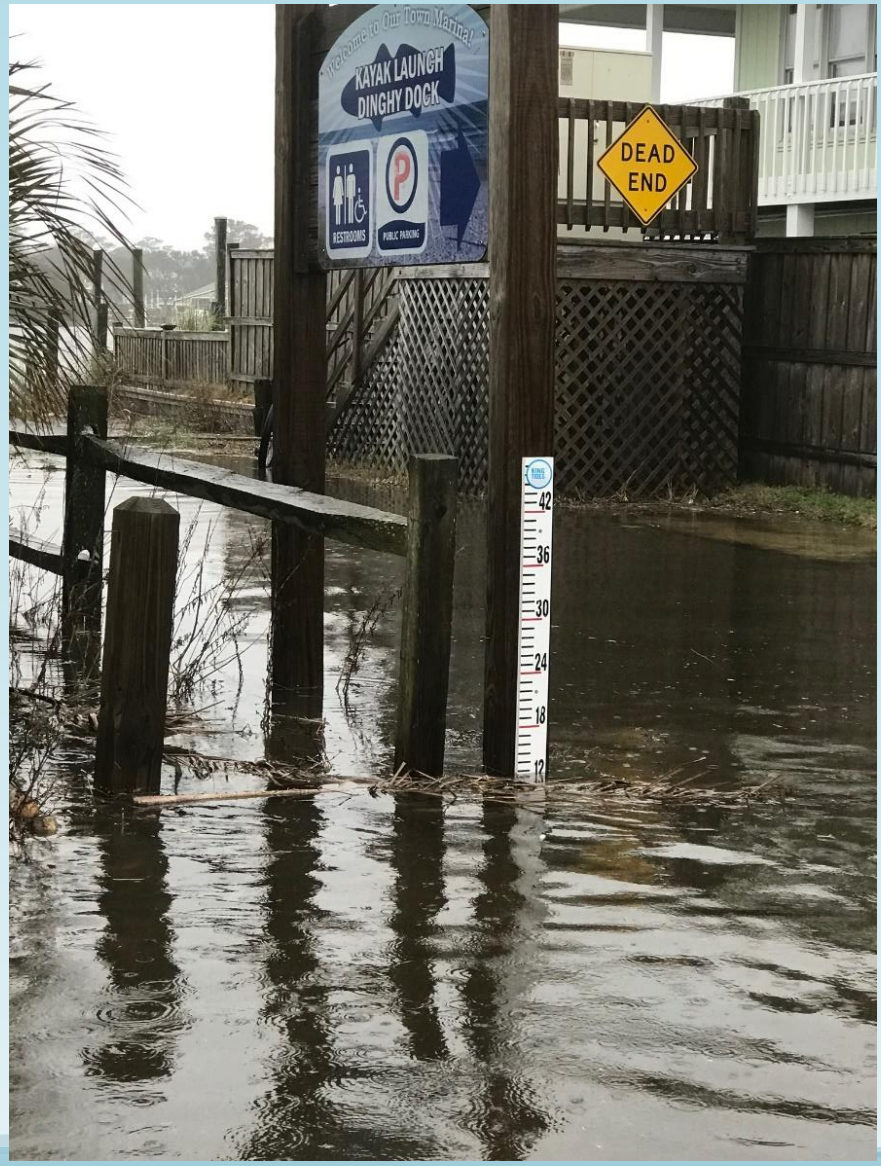


Problem

Monitored & Data Collection

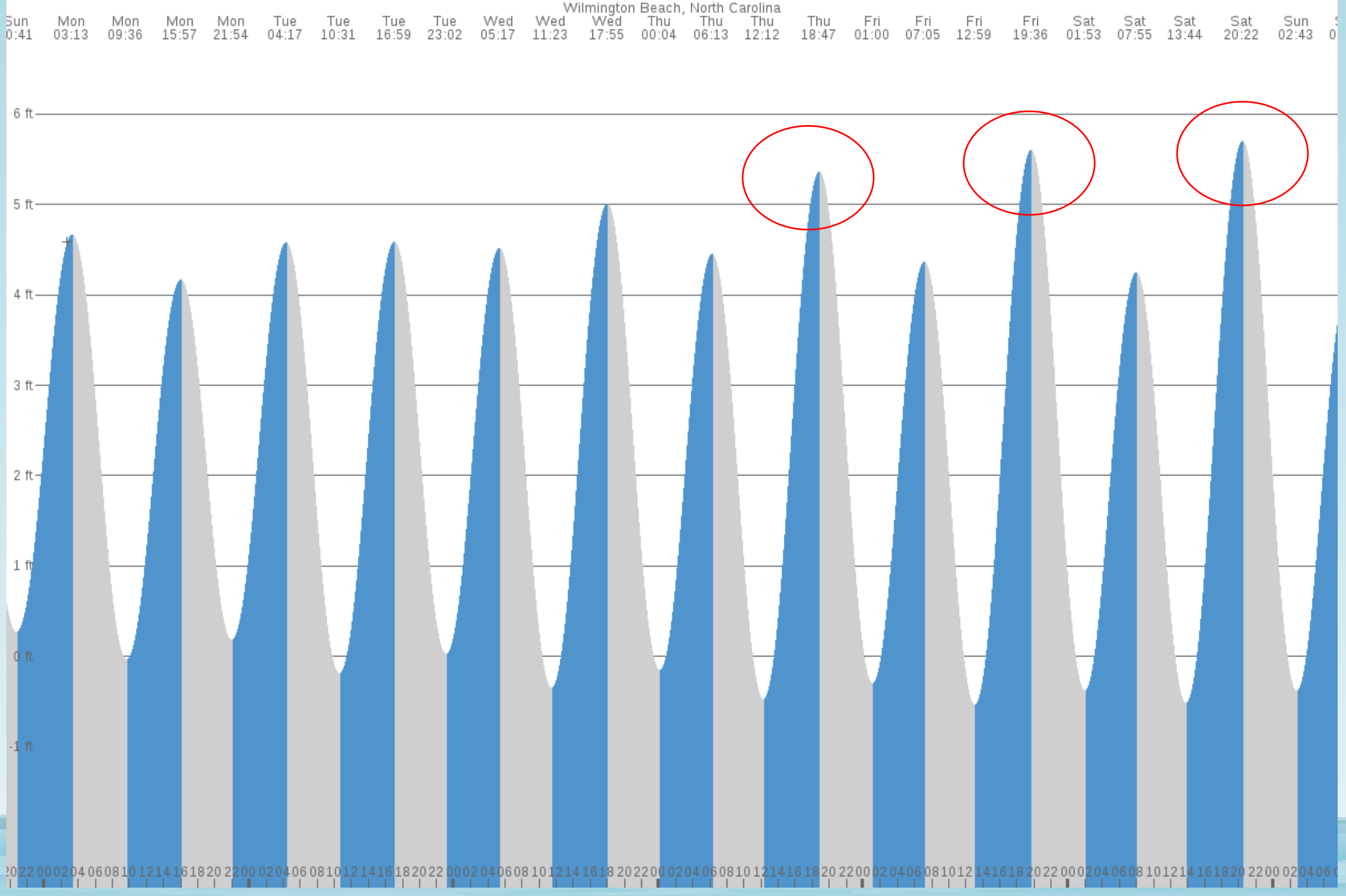






Tides

5 →


Wilmington Beach, North Carolina
Sun 0:41
Mon 03:13
Mon 09:36
Mon 15:57
Mon 21:54
Tue 04:17
Tue 10:31
Tue 16:59
Tue 23:02
Wed 05:17
Wed 11:23
Wed 17:55
Thu 00:04
Thu 06:13
Thu 12:12
Thu 18:47
Fri 01:00
Fri 07:05
Fri 12:59
Fri 19:36
Sat 01:53
Sat 07:55
Sat 13:44
Sat 20:22
Sun 02:43
6 ft
5 ft
4 ft
3 ft
2 ft
1 ft
0 ft
-1 ft

Warning Systems

Canal Drive Flooding Advisory Committee

- Promote awareness of and solve issues related to tidal and stormwater flooding
- To form a visible, vocal and effective coalition of residents, engineers, roadway and stormwater experts to be advocates for improving systems to limit the negative impacts of tidal and stormwater flooding.
- Recommend town ordinances that improve the community's ability to deal with potential sea level rise.
- To develop and implement education program for citizens, visitors and drivers of motor vehicles about the hazards of traveling through flood waters.

Study

1. Create a Bulkhead Ord.

2. Study to recommend bulkhead elevation height to mitigate overtopping

3. Evaluate the elevations and conditions of the bulkheads.

4. To implement a long-term monitoring program aimed at better understanding tidal fluctuations and rainfall totals driving flooding events.

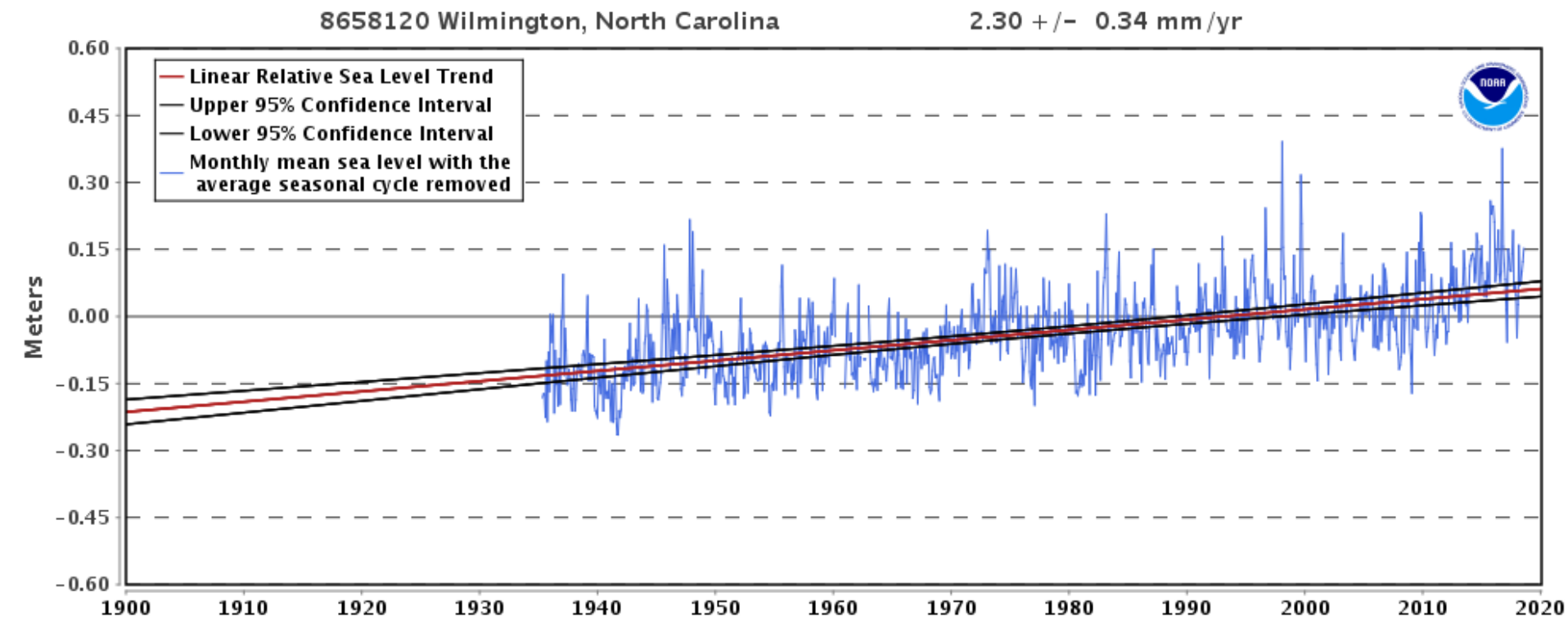
Goal: Develop practical recommendations to reduce the risks of flooding (public and private properties) within the project area

Aim to **REDUCE** flooding and **IMPROVE** resiliency over a 30-year planning horizon, the recommendations are **NOT** intended to **PREVENT** all flooding

APTIM

WATER LEVEL PROJECTION

Sea level rise modeling and analyze return periods of extreme events to develop a recommendation for a minimum bulkhead height for the next 30-year horizon.



Water level projections

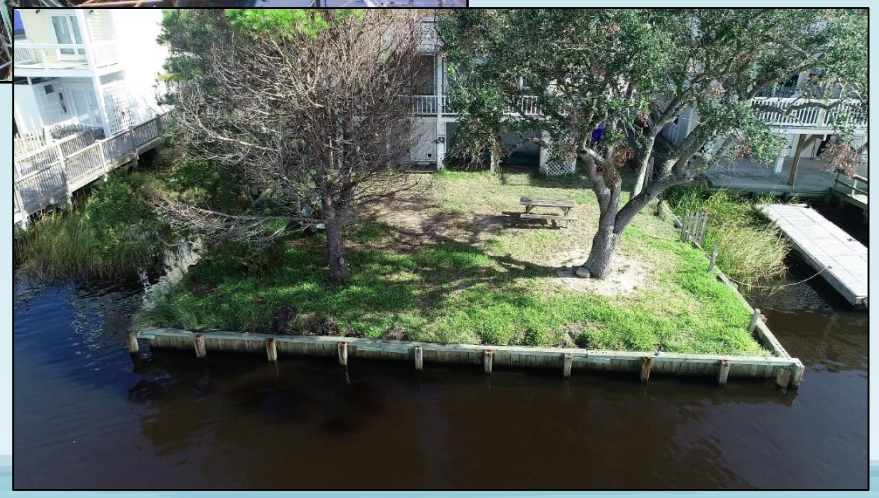
Recommend using water level elevations associated with 1-Year and 2-Year return periods to mitigate the flooding impacts to Canal Drive and Florida Avenue that occur during high tide events.

Summary of Design Planning Water Elevation Projections

	Low Range (1-year Return Period)	Mid Range (1-year Return Period)	Upper Range (2-year Return Period)
SLR 1992-2018 (ft.)	0.20	0.20	0.20
IPCC RCP 2.6 (ft.)	0.49	0.49	-
IPCC RCP 8.5 (ft.)	-	-	0.58
Storm Effects (ft. NAVD)	4.0	4.0	4.4
Structure Freeboard (ft.)	0.0	0.5	0.5
2048 Design Elev. (ft. NAVD)	**4.7**	**5.2**	**5.7**

Surveys conducted

- Bulkhead Elevation Surveys
- Bulkhead Condition Survey
- Stormwater Outfall & Inlet Surveys
- Shoreline Video



Bulkhead Evaluations

Bulkhead Condition Summary

	Good	Satisfactory	Fair	Poor	Serious	Critical	No Structure	Not Rated	All
Public	0	3	5	0	0	0	5	2	15
Private	7	50	50	4	0	0	11	7	129
Total	7	53	55	4	0	0	16	9	144

91% privately owned 91
83% of the private bulkheads in fair to good condition
3% poor condition..

Bulkhead Evaluations

Bulkhead Elevations:

TOTAL STRUCTURES/SHORELINES: 144

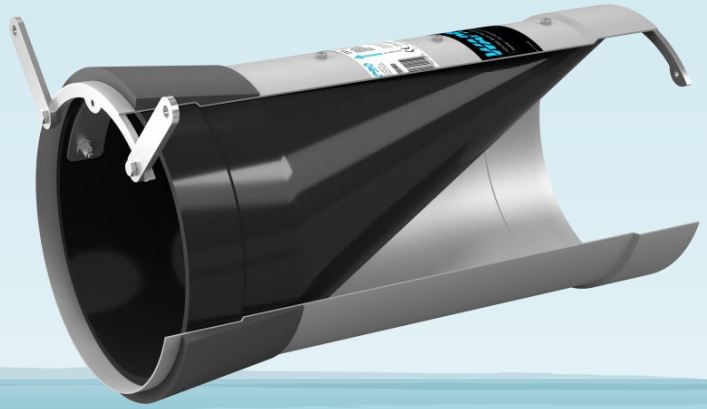
- 72% below Low Range 30-Year Planning Elevation
- 90% below Mid Range 30-Year Planning Elevation
- 97% below High Range 30-Year Planning Elevation

PUBLIC STRUCTURES/SHORELINES: 15

- 73% below Low Range 30-Year Planning Elevation
- 87% below Mid Range 30-Year Planning Elevation
- 93% below High Range 30-Year Planning Elevation

Stormwater System

- Duckbill backflow prevention devices were observed to be encrusted with oysters and barnacles that inhibit proper sealing of the valves.
- Debris or trash can get caught in the opening and prevent the duckbill valve from sealing properly.
- The WaStop® inline check valves that were observed appeared to be unobstructed with marine growth or debris and functioning properly at the time of the observations.



WATER LEVEL/RAIN GAUGE MONITORING STATION

Myrtle Grove Sound @ Canal Dr & Sandpiper Ln

01/30 13:50

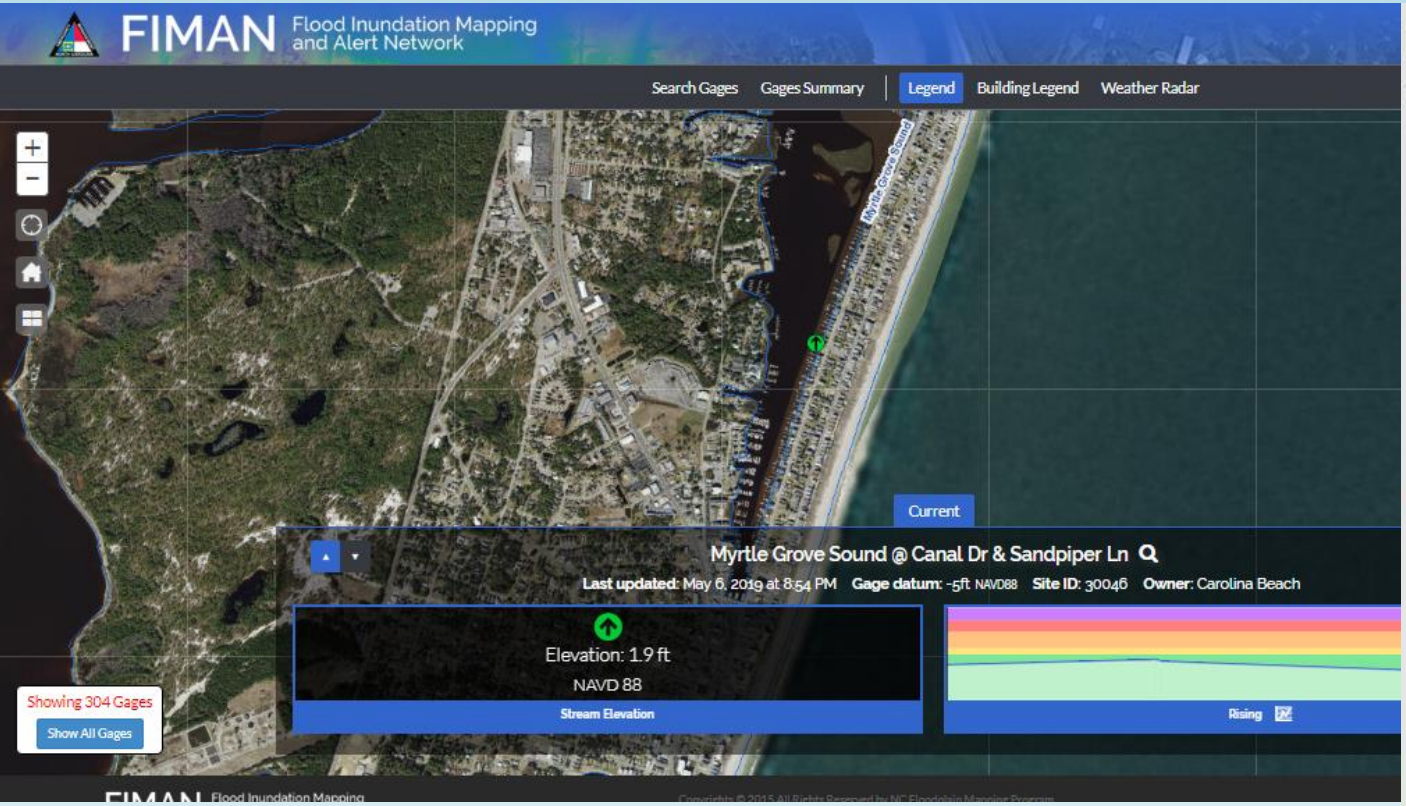
Current Conditions (updated every 10 minutes)

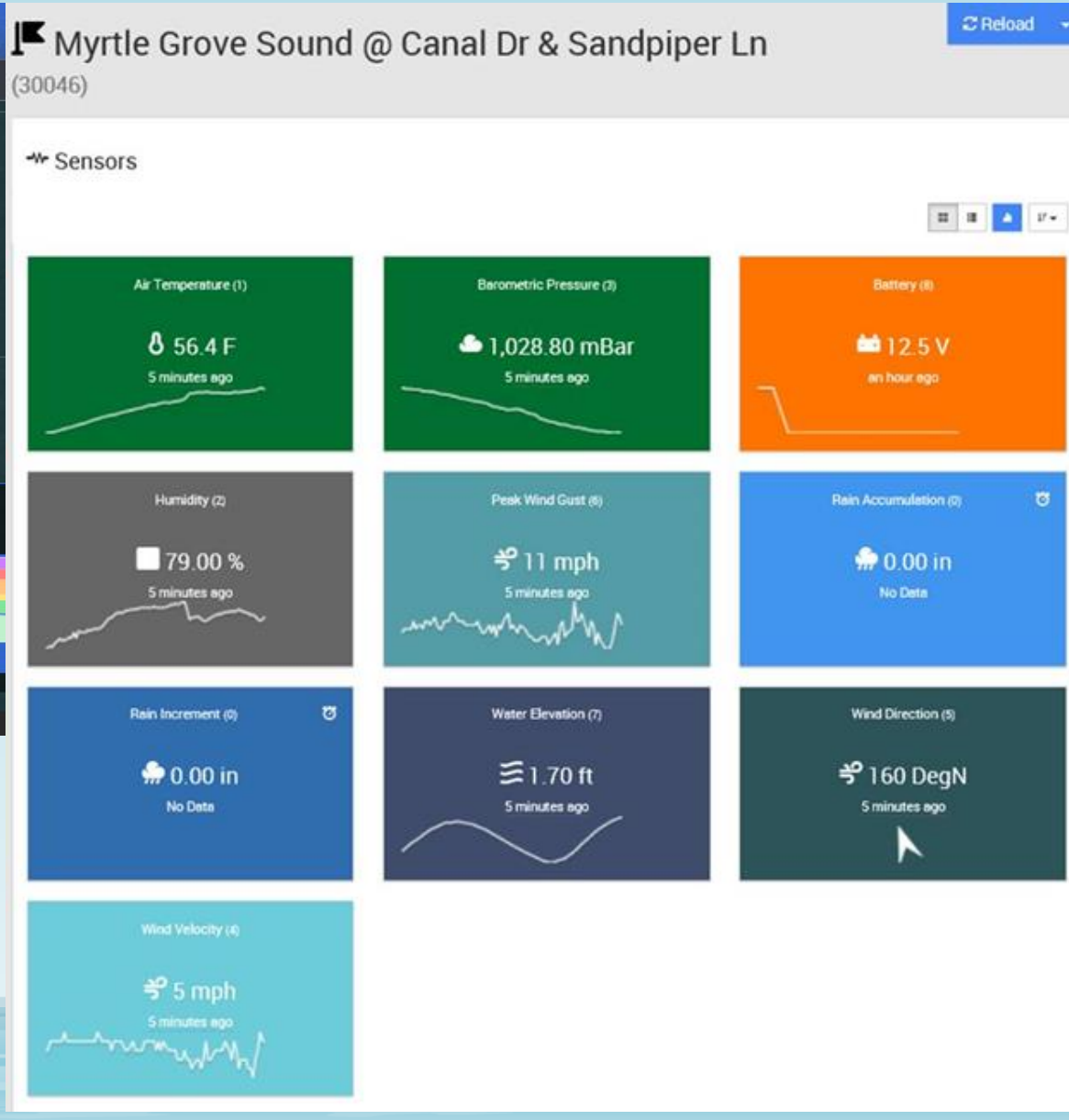
Air Temperature:	68.7 F
Relative Humidity:	24 %
Barometric Pressure:	939.30 mBars
Wind Speed:	7 MPH
Wind Direction:	292 DegsN
Wind Gust:	8 MPH

Rainfall (since midnight & previous day): 0.011 In. 11.000 In.

Resto

Water level/Rain Monitoring





Recommendations

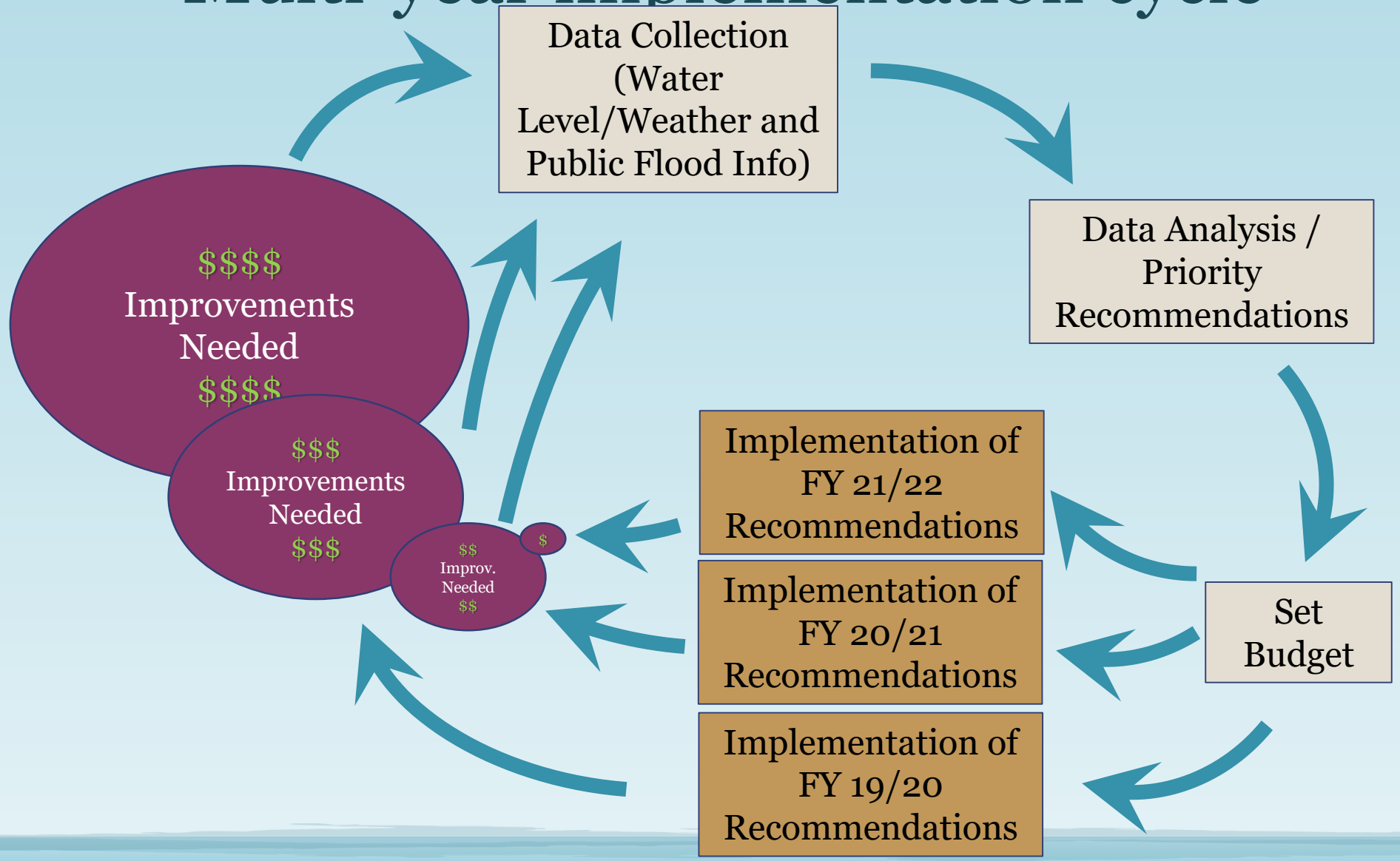
- A comprehensive cost estimate should be developed to include the completion of bulkhead improvements to the design elevation, Installation of bulkheads at locations currently without a structure
- Installation of WaStop® Inline Check Valves backflow prevention devices at the remaining outfall locations along the Carolina Beach Yacht Basin,
- Re-lining the stormwater pipe network, Repair leaks, and other structural improvements
- Evaluate the impacts of abandoned outfalls and seal if needed
- Routine maintenance of stormwater system, including check valves
- The Town should also consider promoting stormwater initiatives that can be implemented by local
- Private Property

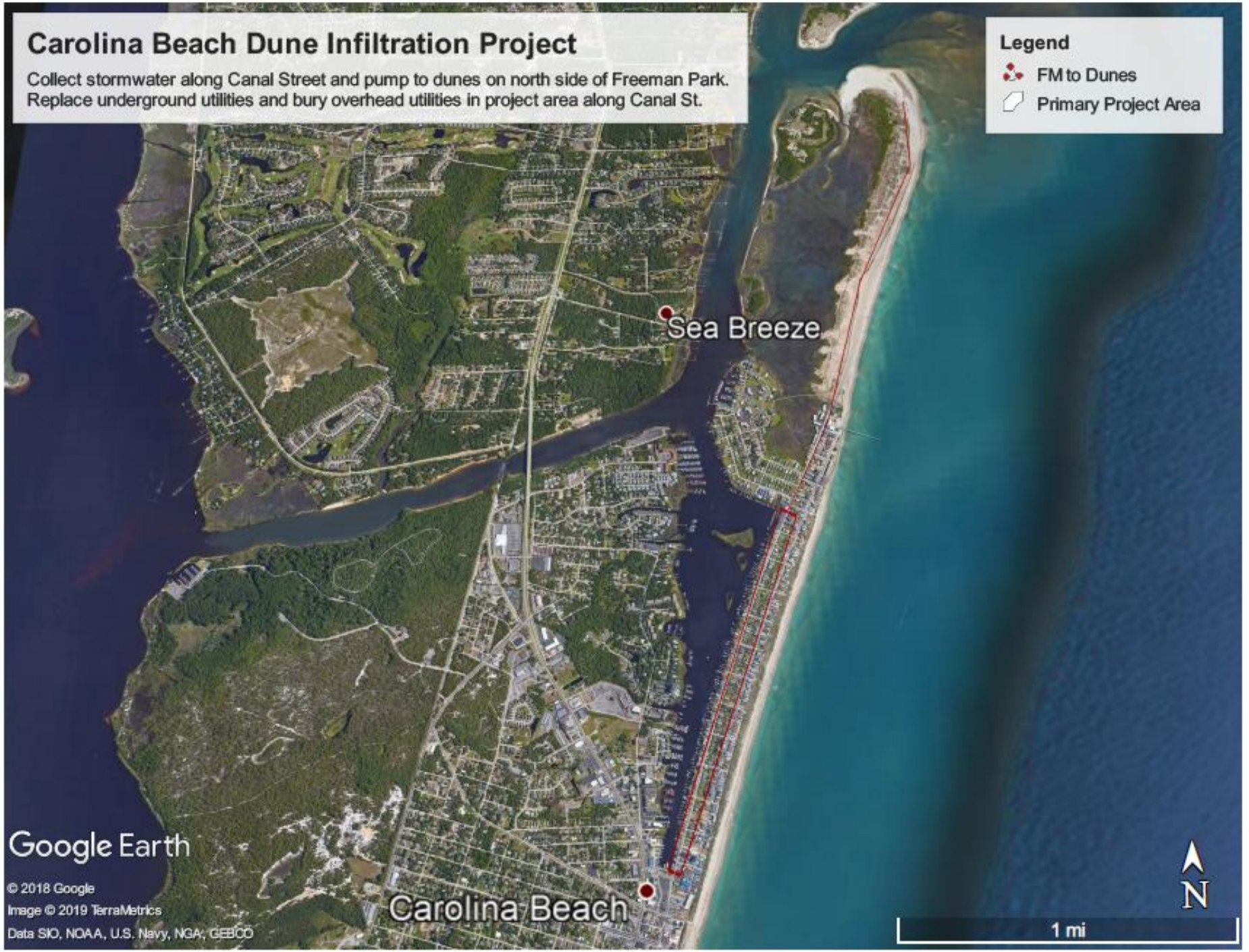
    1) the improvement and/or installation of gutter systems on private homes,

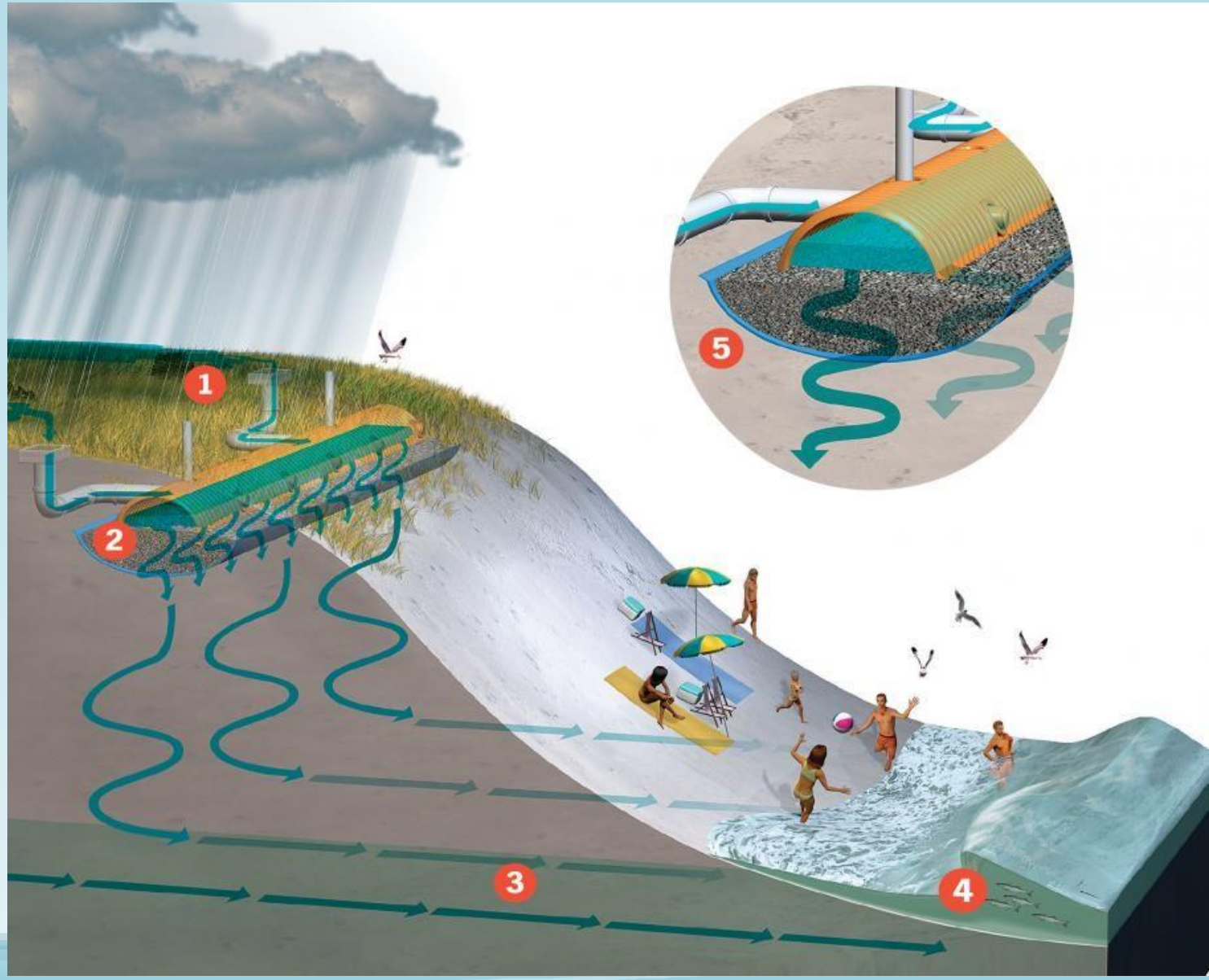
    2) the use of permeable pavements for driveway aprons and any areas typically covered by impervious materials to reduce the amount of impervious surfaces and

    3) the use of private stormwater storage systems (above or below ground) to retain stormwater on the property during an event that is slowly released following the event.

Multi-year implementation cycle




Carolina Beach Dune Infiltration Project
Collect stormwater along Canal Street and pump to dunes on north side of Freeman Park.
Replace underground utilities and bury overhead utilities in project area along Canal St.
Legend
FM to Dunes
Primary Project Area
Sea Breeze
Carolina Beach
Google Earth
© 2018 Google
Image © 2019 TerraMetrics
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
N
1 mi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2019 North Carolina King Tides Calendar