National Conference on Beach Preservation Technology

Groundwork for Coastal Defense: Geotechnical Exploration in Key Biscayne's Flood Risk Study

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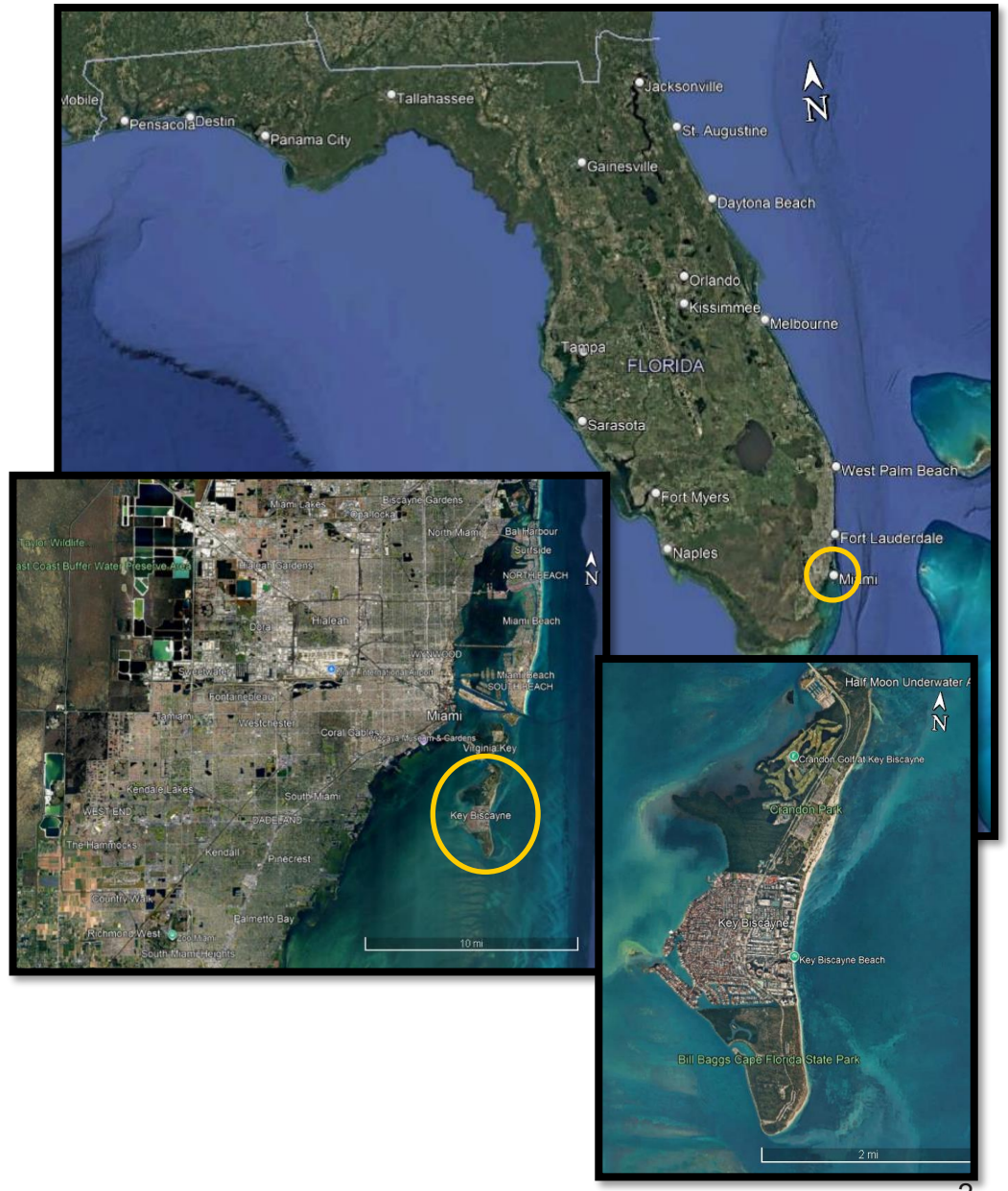
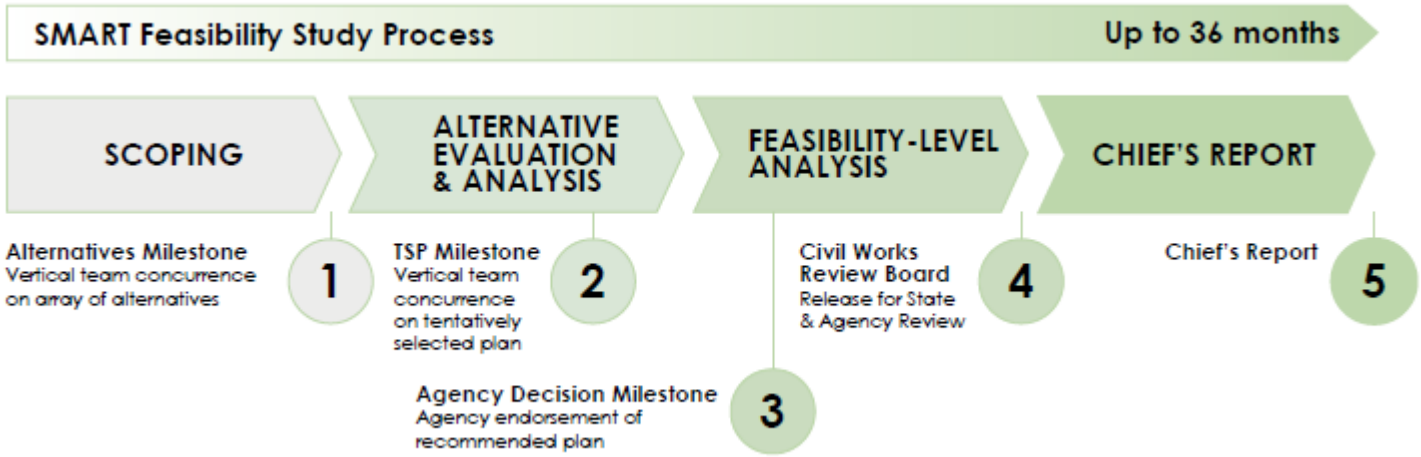
COASTAL STORM RISK MANAGEMENT

- Florida's coastlines provide major economic, recreational, and ecological benefits.
- Increasing storms, sea-level rise, and erosion show the need for proactive coastal planning.
- The USACE Jacksonville District initiated a Key Biscayne Coastal Storm Risk Management feasibility study.



FEASIBILITY STUDY



- Process for Federal water resources development project.
- Identifies problems and opportunities, then recommends a solution to decision makers.
- The final feasibility report gives a clear, well-supported basis for the recommended plan.

KEY BISCAYNE

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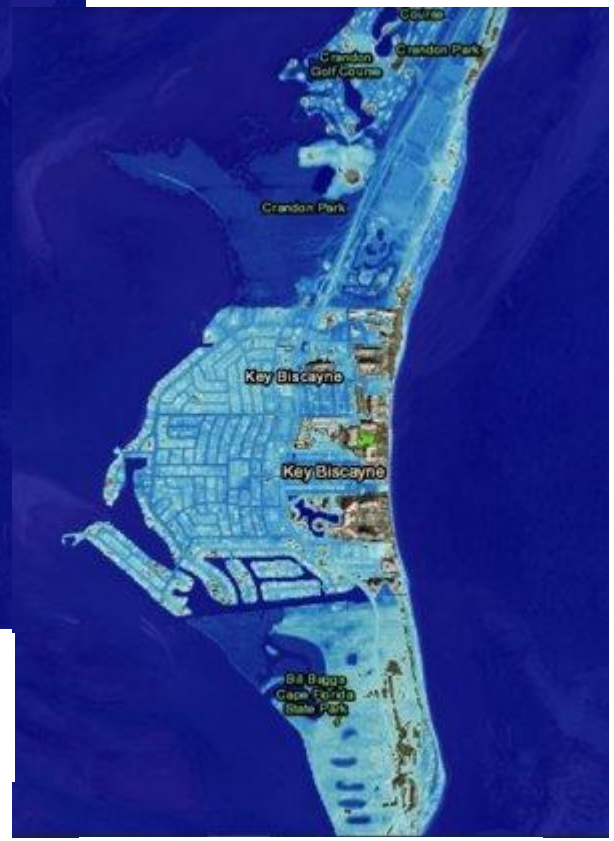
- Key Biscayne sits at a very low elevation (3.4 ft NAVD88), making it highly vulnerable to coastal storms.
- The Village faces flooding risks from both the Atlantic coast and the back bay, driven by storms, surge, tides, wind, and waves.
- Sea-level rise and ongoing erosion further increase these hazards.

3 ft above MHHW
(3.3 ft NAVD88)

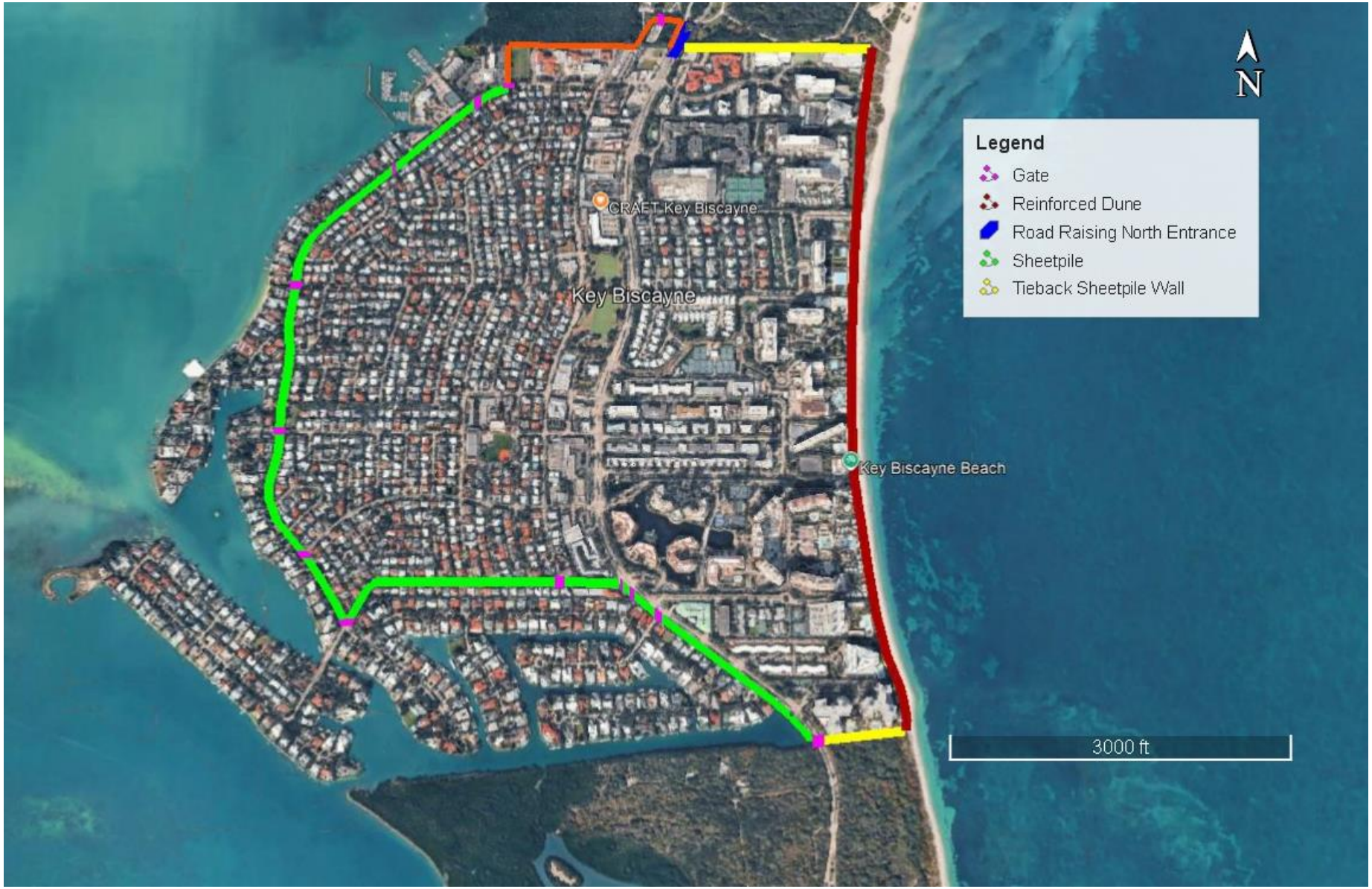


6 ft above MHHW
(6.3 ft NAVD88)

PURPOSE OF THIS STUDY

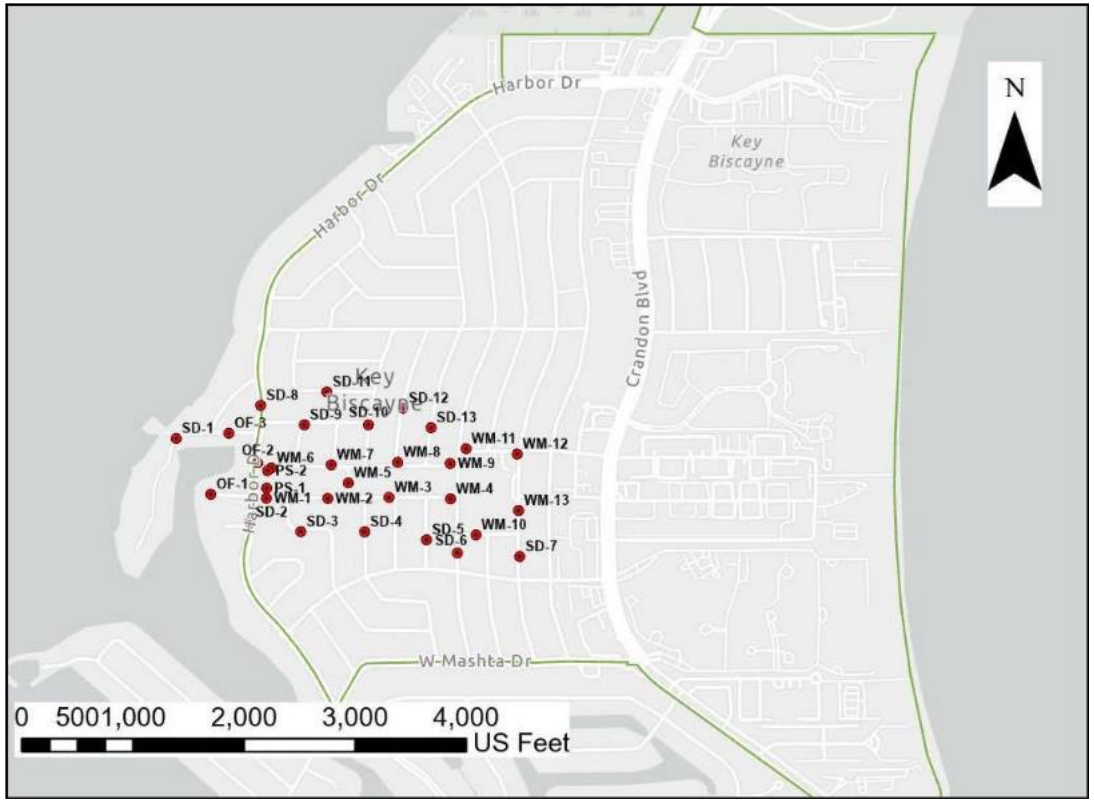
- The study aims to reduce coastal flooding, erosion, and wave damage while considering recreation, tourism, and environmental resources.
- Geotechnical investigations were completed to support the design of flood protection features.
- Key areas include Harbor Drive, Crandon Boulevard, the eastern shoreline, and the Village's northern boundary.

CONCEPTUAL DESIGN



AVAILABLE GEOTECHNICAL INVESTIGATIONS

Residential Investigations



Stormwater Program Design Work

BORING LOCATIONS

Borings	Depth	Location Type	Surface
CB-KB25-02	50	Shoulder of Road	Lawn grass
CB-KB25-03	50	Shoulder of Road	
CB-KB25-05	50	Shoulder of Road	
CB-KB25-06	50	Parking Lot Church	Asphalt, gravel
CB-KB25-07	80	Shoulder of Cul-de-Sac	
CB-KB25-08	80	Beach	Sand
CB-KB25-09	80	Beach	
CB-KB25-10	80	Beach	
CB-KB25-11	80	Parking Lot Condo Complex	Asphalt

FIELD INVESTIGATION METHODS

- **Nine (9)** borings were attained by Standard Penetration Test (SPT) boring methods.
- Utilizing a 140-pound hammer with a 30-inch drop using a 1.5-foot split spoon per ASTM D1586.
- If rock was to be encountered, then coring with a PQ wire line core barrel was completed at those locations.

HARBOR DRIVE

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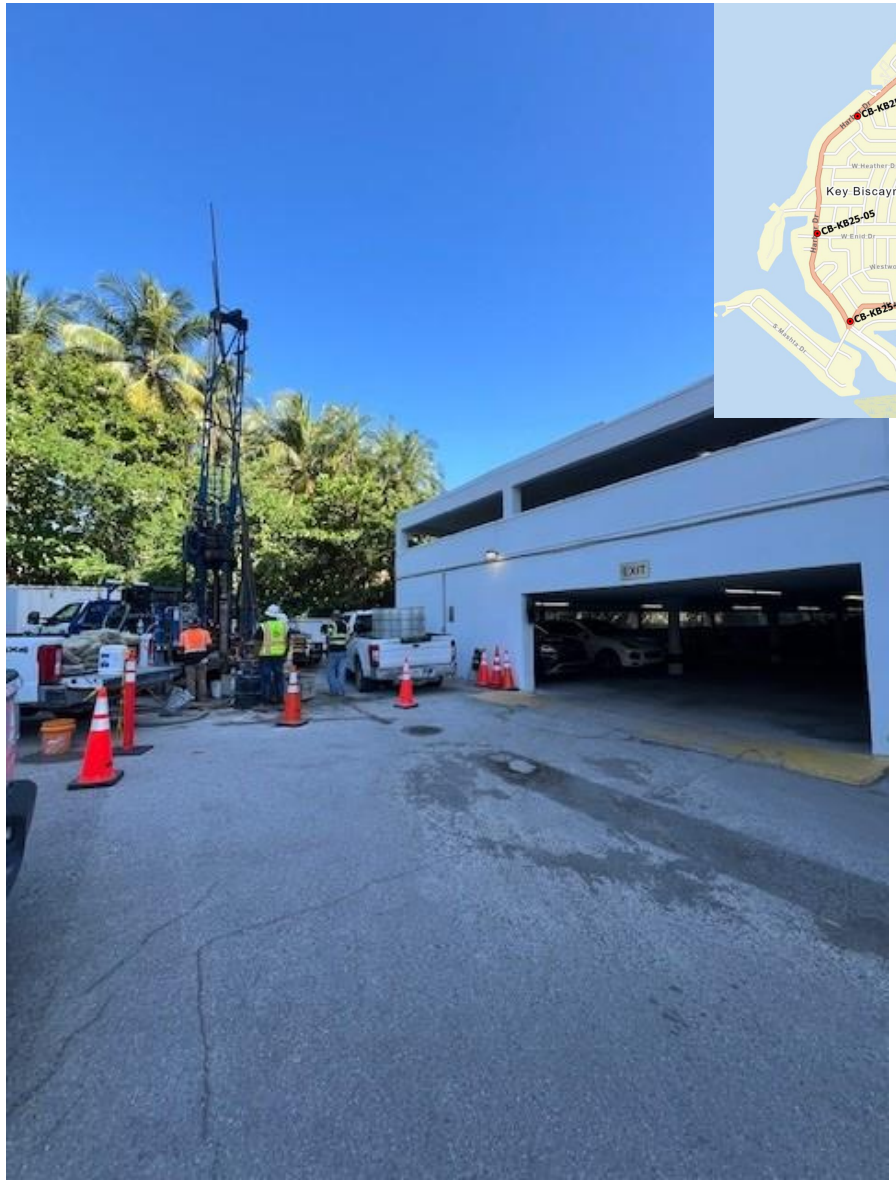
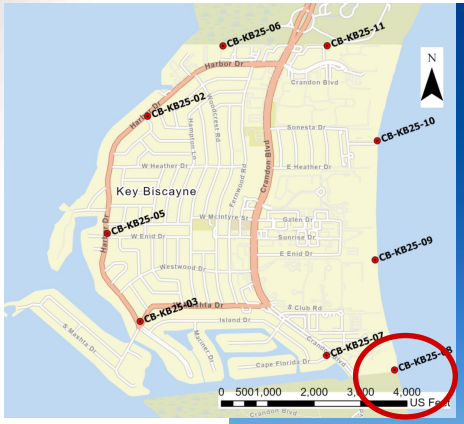
COMMODORE CLUB WEST PARKING



KEY BISCAYNE BEACH



SPLIT SPOON

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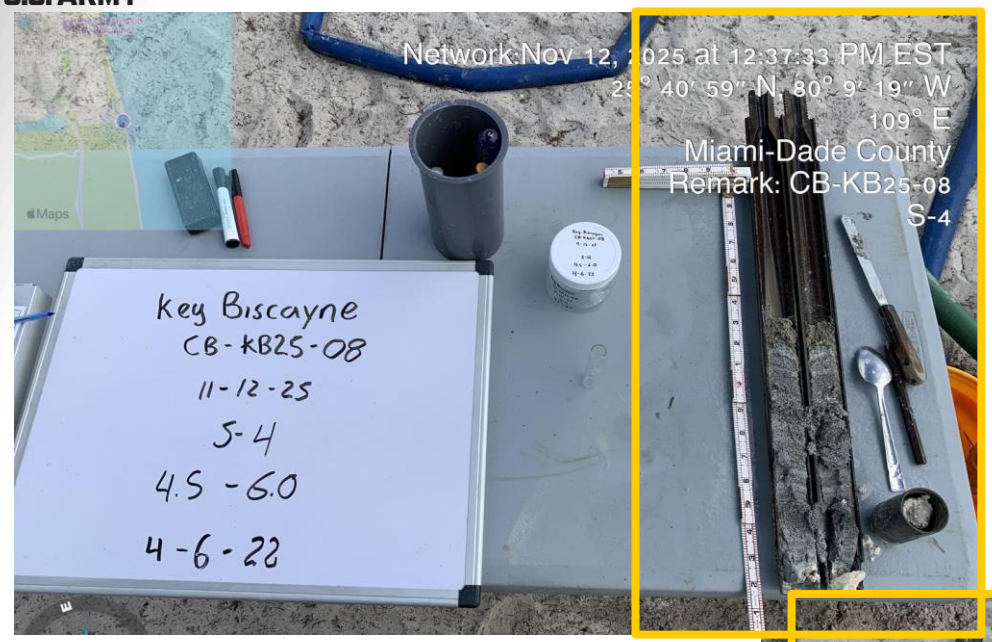

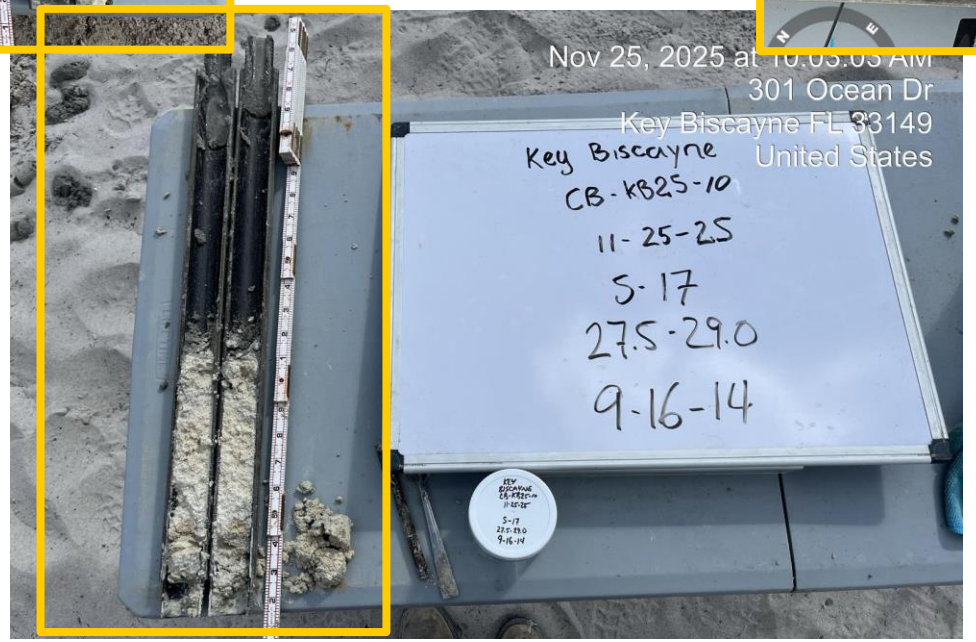

SOIL AND ROCK FIELD OBSERVATIONS

- Initial findings consisted of an upper 1-3 feet of fill, asphalt, or peat.
- Unconsolidated sediments comprised of poorly-graded sand, silty sand, and silt.
- Sandstone and highly weathered limestone with little shell was also encountered.

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LABORATORY ANALYSES

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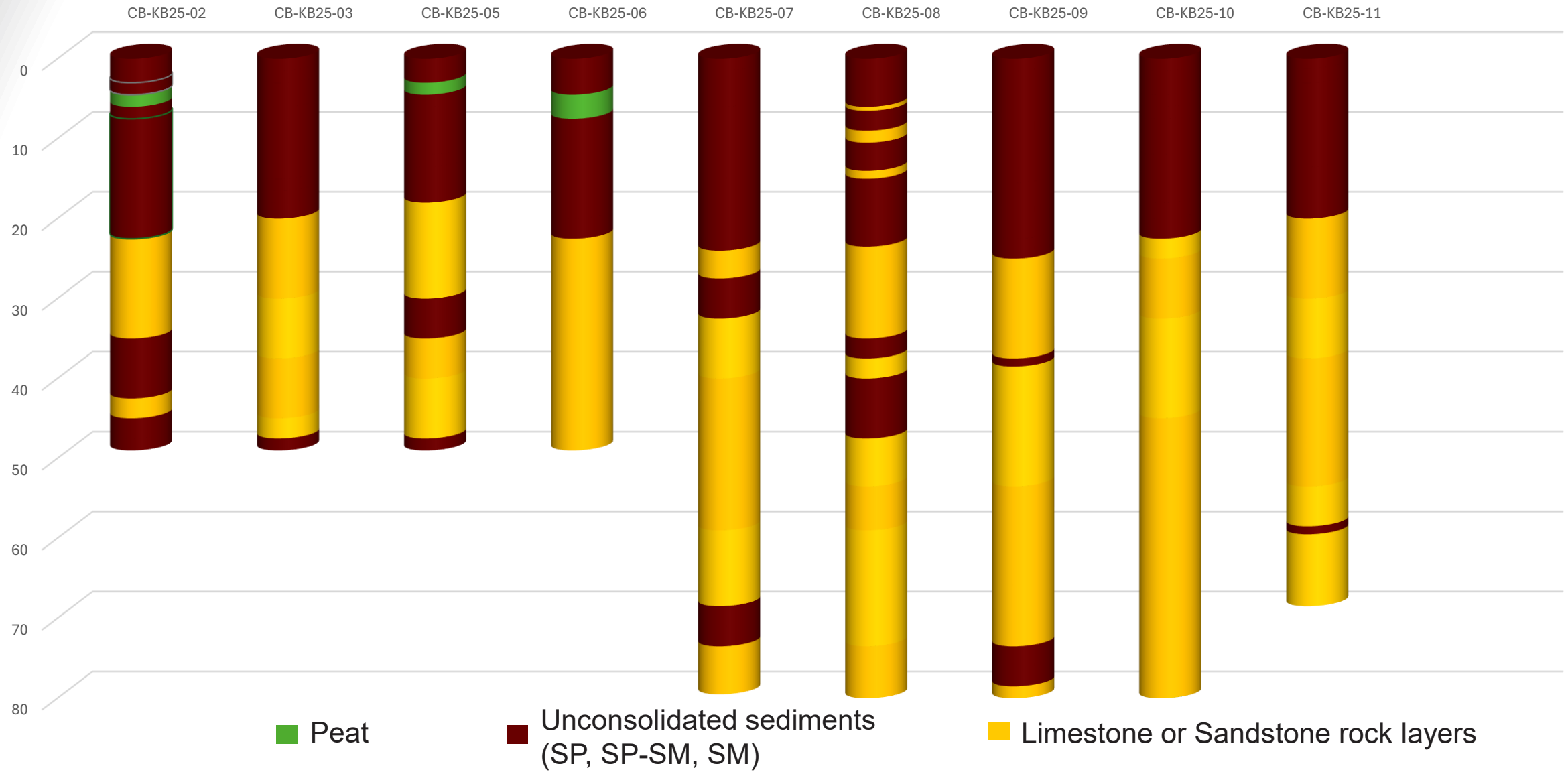
Test Name	Method/Standard
Sieve Analysis (Using Sieve Sizes No. 3/4", 3/8", 4, 10, 20, 40, 60, 100, 200)	ASTM D6913
Visual Percent Shell	Non-ASTM Method
Carbonate Content	Twenhofel and Tyler
Organic Content	ASTM D2974 Method C
Moisture Content	ASTM D2216
Constant Head Permeability	ASTM D 2434
Unit Weight of Rock	RTH 109-93

- Laboratory tests were performed on selected samples using ASTM methods.
- Results help define soil layers, permeability, bearing capacity, and seepage characteristics.
- The geotechnical analysis is essential for assessing the feasibility and performance of structural alternatives.

RESULTS


CB-KB25-02
CB-KB25-03
CB-KB25-05
CB-KB25-06
CB-KB25-07
CB-KB25-08
CB-KB25-09
CB-KB25-10
CB-KB25-11
0
10
20
30
40
50
60
70
80
Peat
Unconsolidated sediments (SP, SP-SM, SM)
Limestone or Sandstone rock layers

QUESTIONS?

THANK YOU!

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