

**25th Annual National Conference on
Beach Preservation Technology
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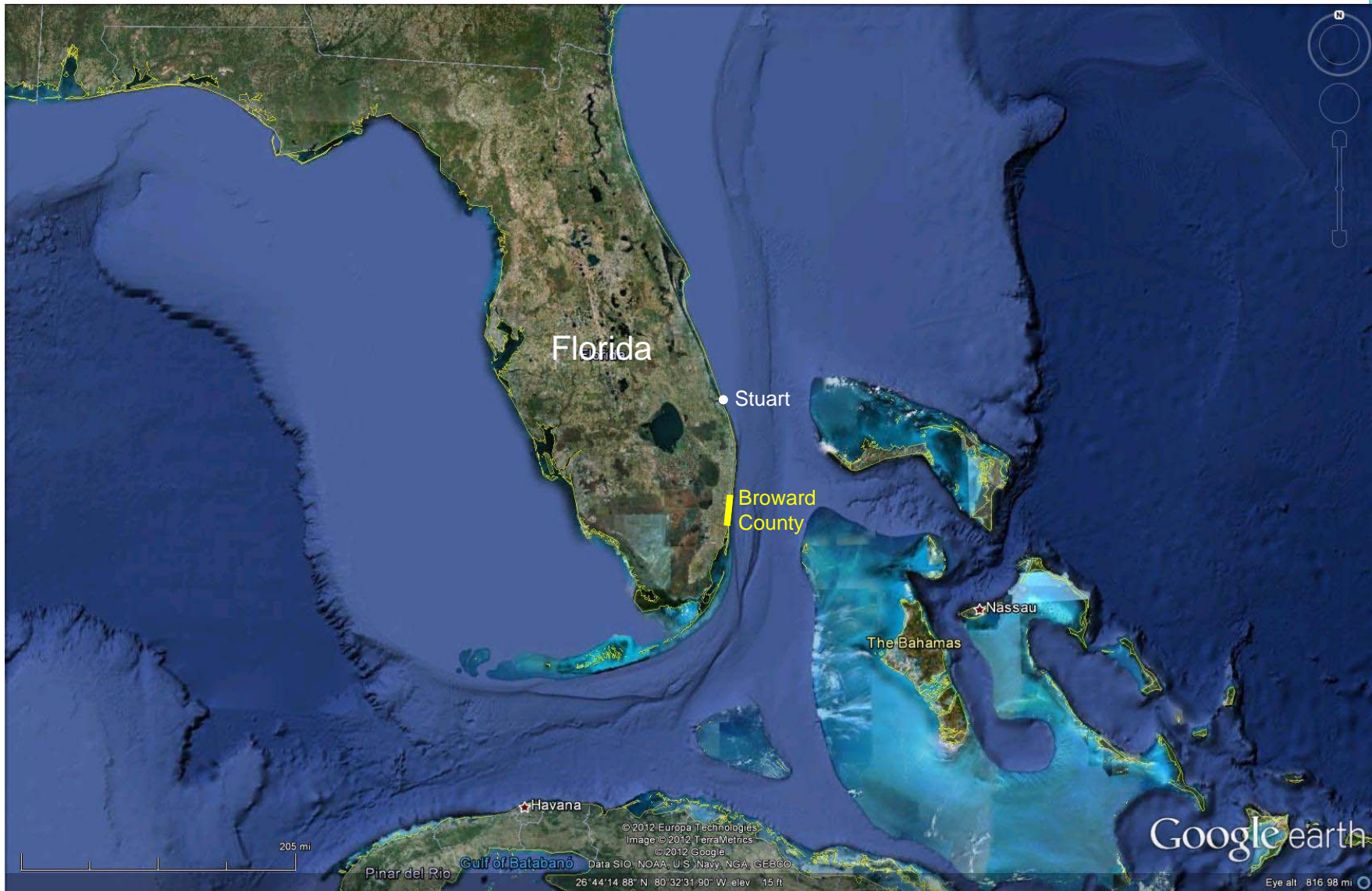


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THE REALITIES OF FUTURE SAND SOURCES FOR SOUTHEAST FLORIDA BEACHES

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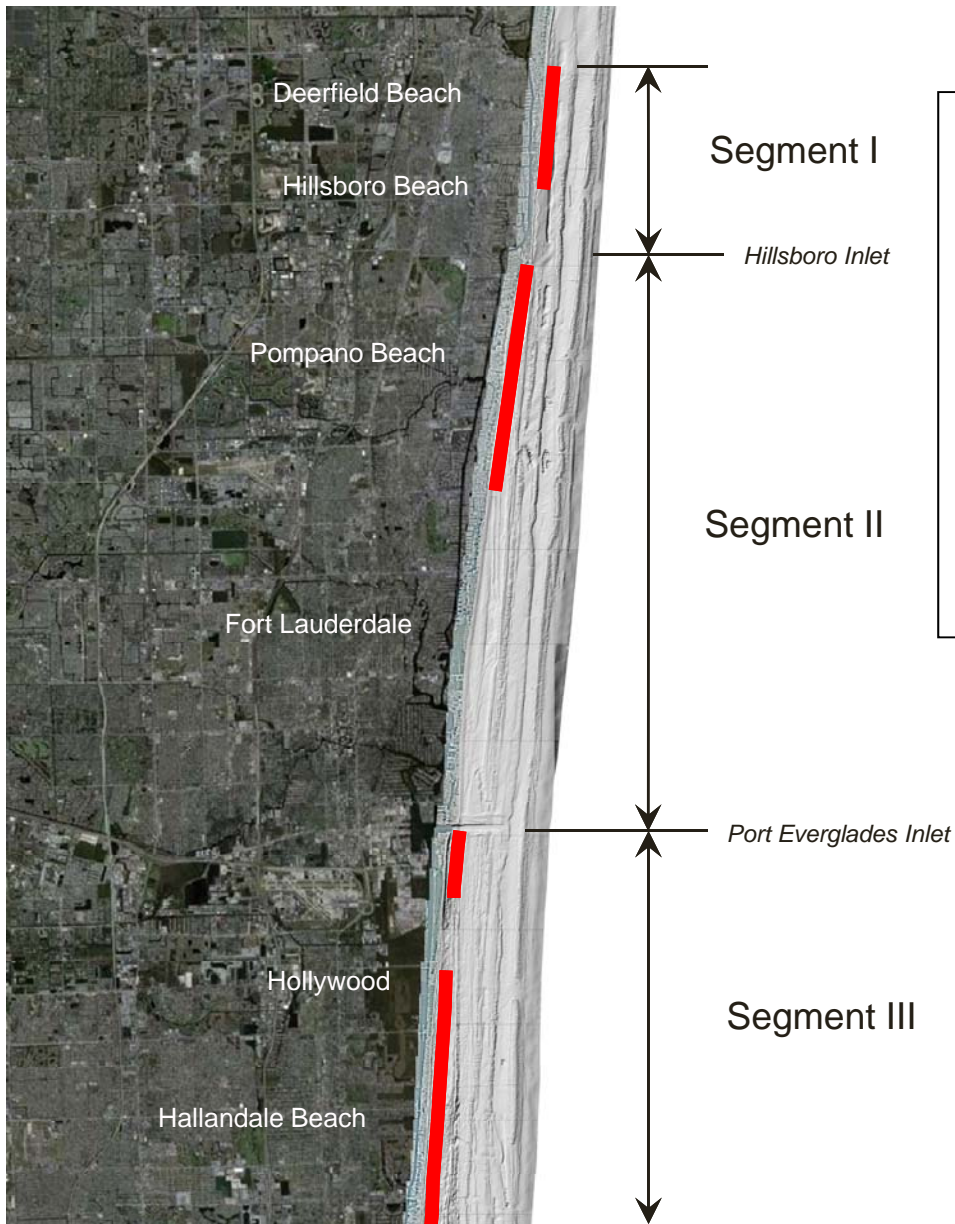


Broward County, Florida

Overview

- **Future Sand Requirements**
- **Remaining, Accessible Offshore Sand Sources**
- **Possible Alternative Sources and Cost**
 - Upland
 - Domestic Offshore (beyond Broward County)
 - Non-Domestic Offshore (Bahamas and beyond)





- Initial restoration in 1970
- More than a dozen projects
- 12+ million cubic yards of sand placed from offshore borrow areas
- 300,000 cy/yr

Historical Broward County Beach Projects

Future Sand Requirements

**USACE ... ~25 million cubic yards over
the next 50 years**

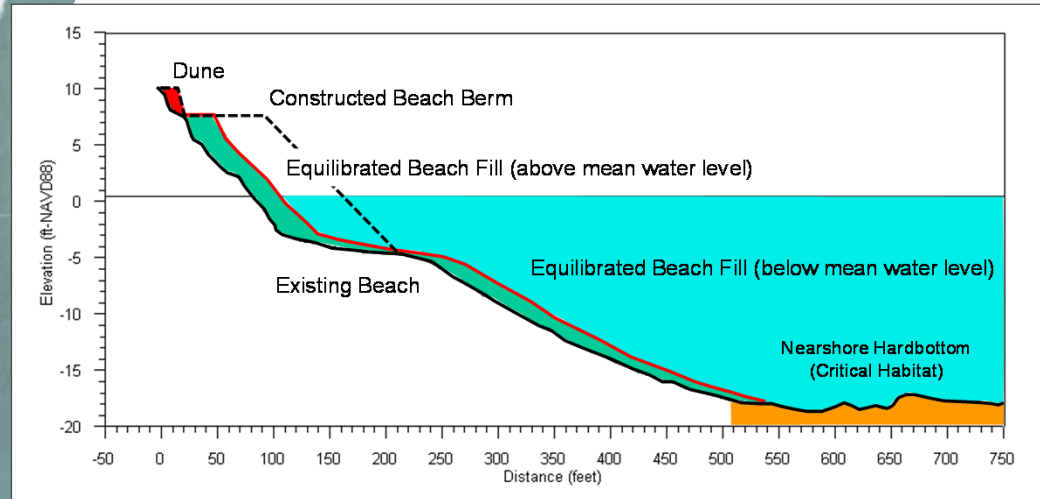
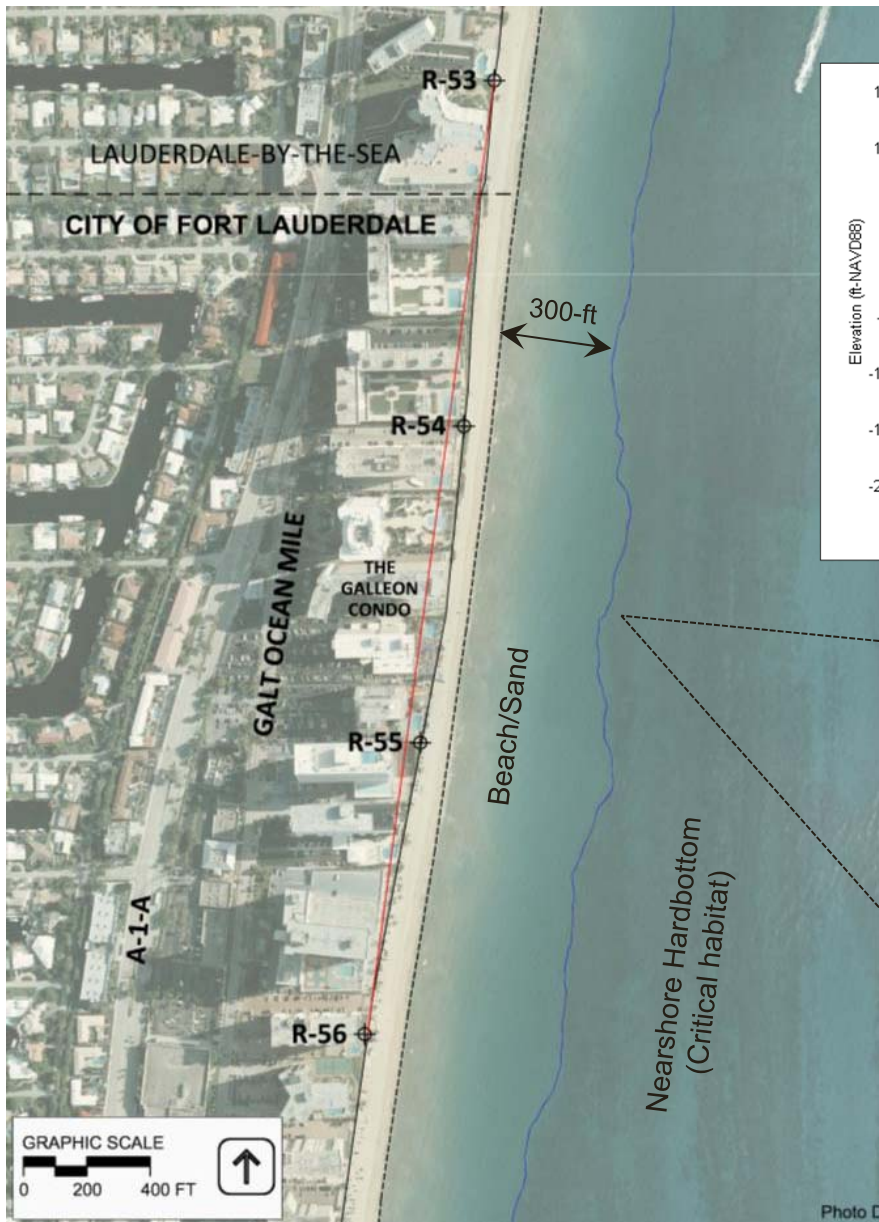
Based primarily on...

- Authorized project specifications (pre-1970 shoreline conditions)
- Past sand placement experience (initial restoration and maintenance)

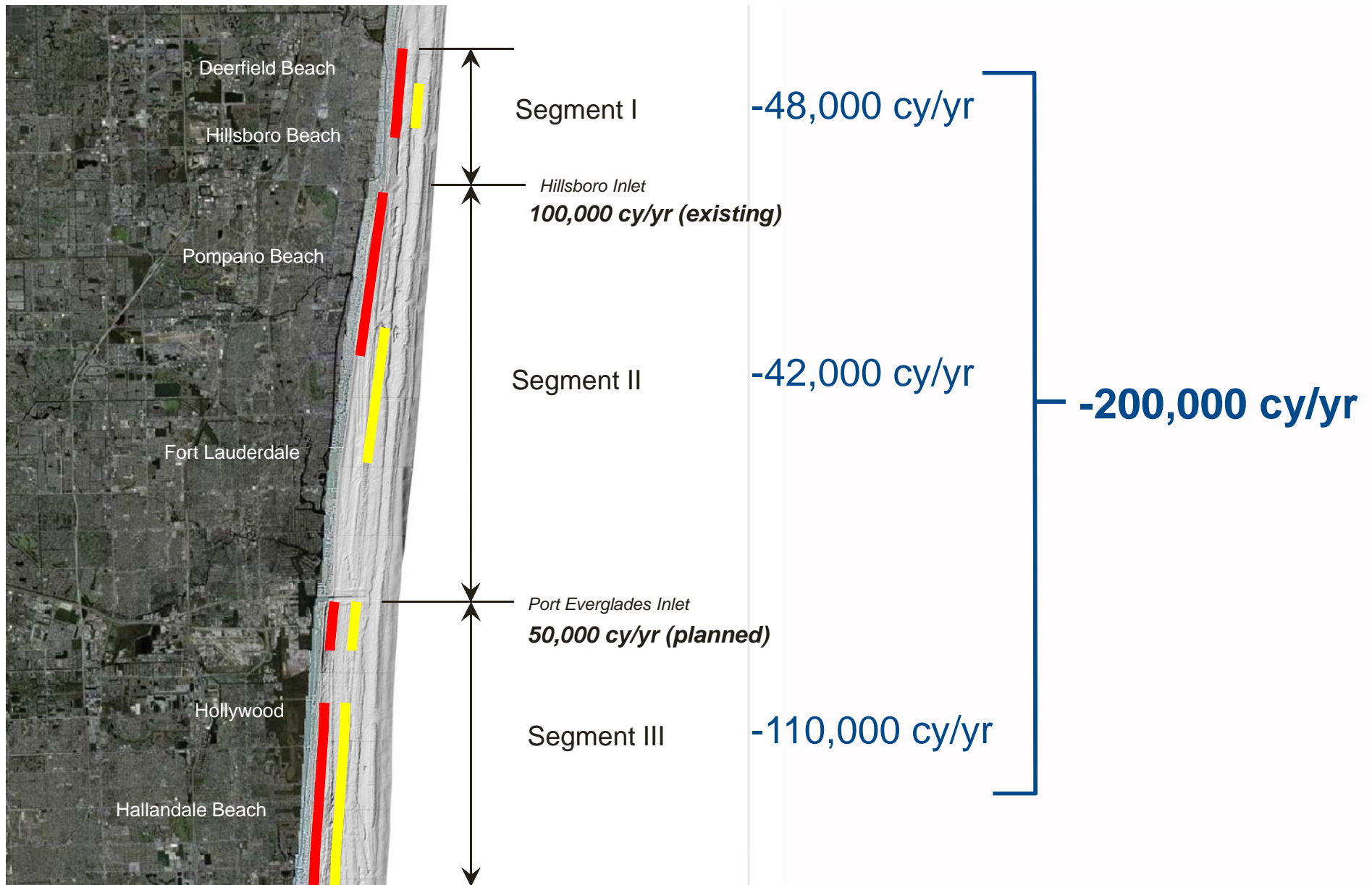
Past Criteria are not Expected to Represent Future Conditions



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Enhanced Protection to Nearshore Hardbottom



Observed Annual Sand Demand (1980 – present)

Future Sand Requirement

Realistic ... ~8-10 million cubic yards over the next 50 years

Influenced by...

- Environmental Resource Protection
 - No significant future widening of beaches
 - Maintain established conditions only
- Improved Management at Boca Raton and Hillsboro Inlets
- Sand Bypassing at Port Everglades Inlet



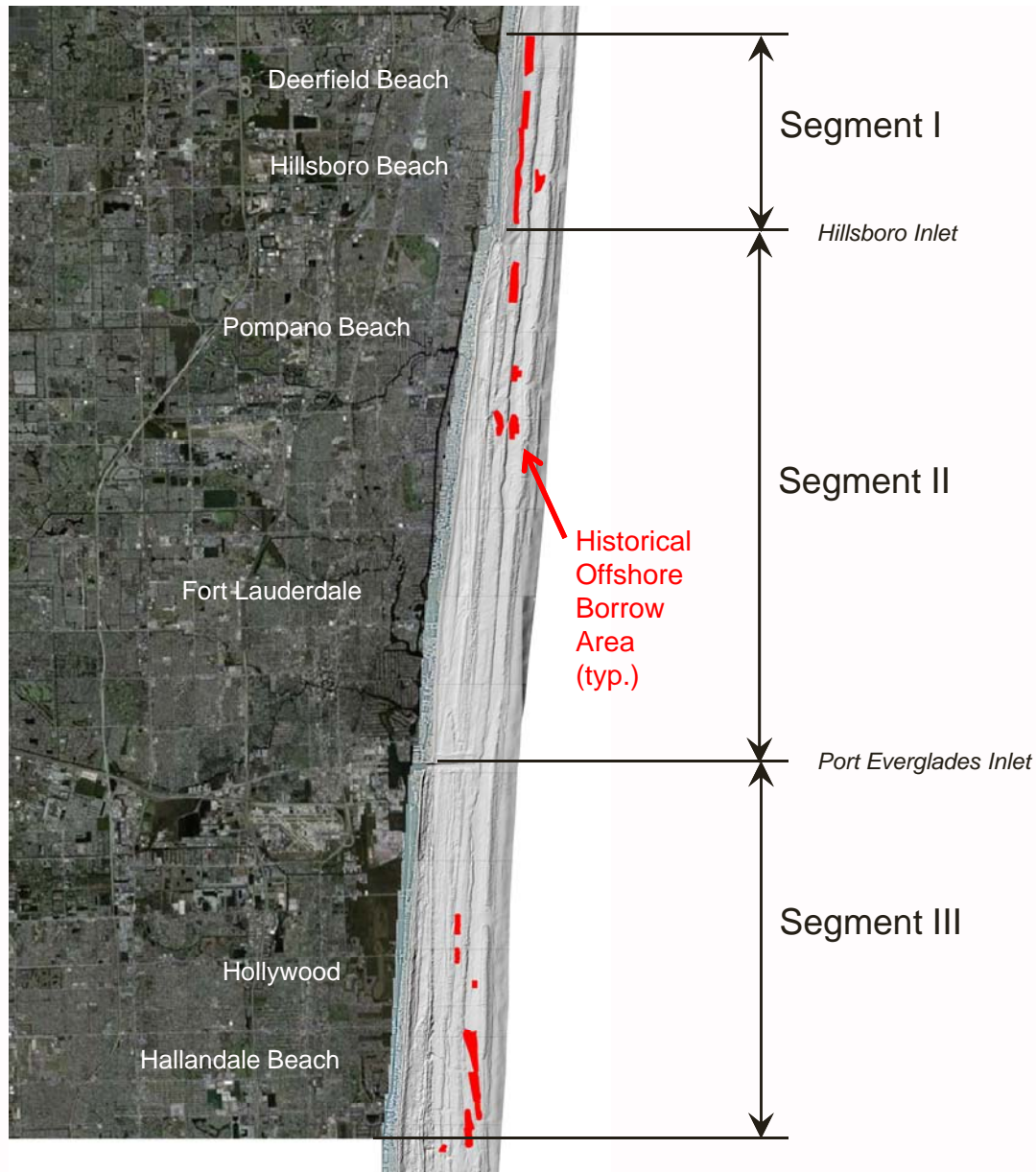
Future Sand Availability

Remaining accessible sources offshore of Broward County are limited...

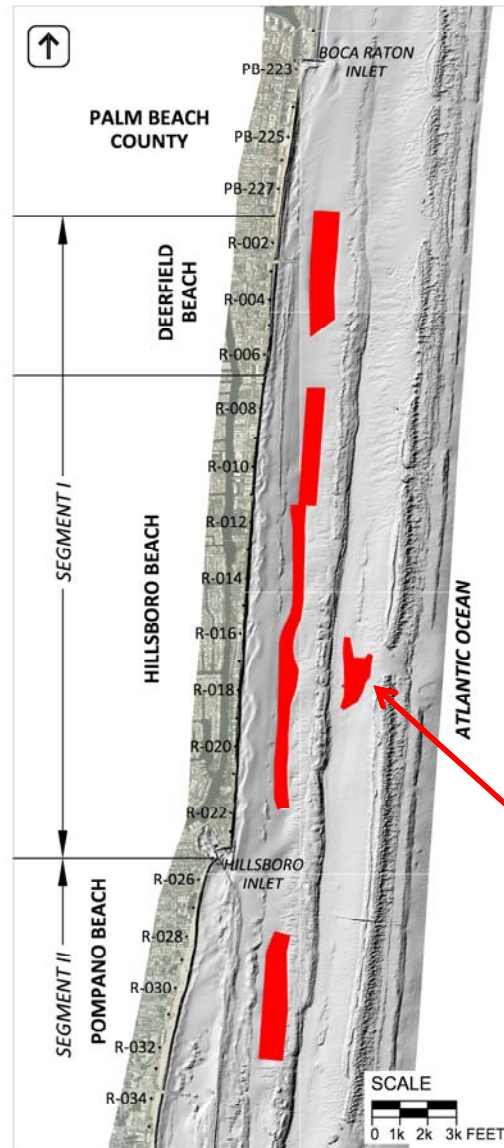
Due to...

- Past use
- Increased protection to adjacent hardbottom resources



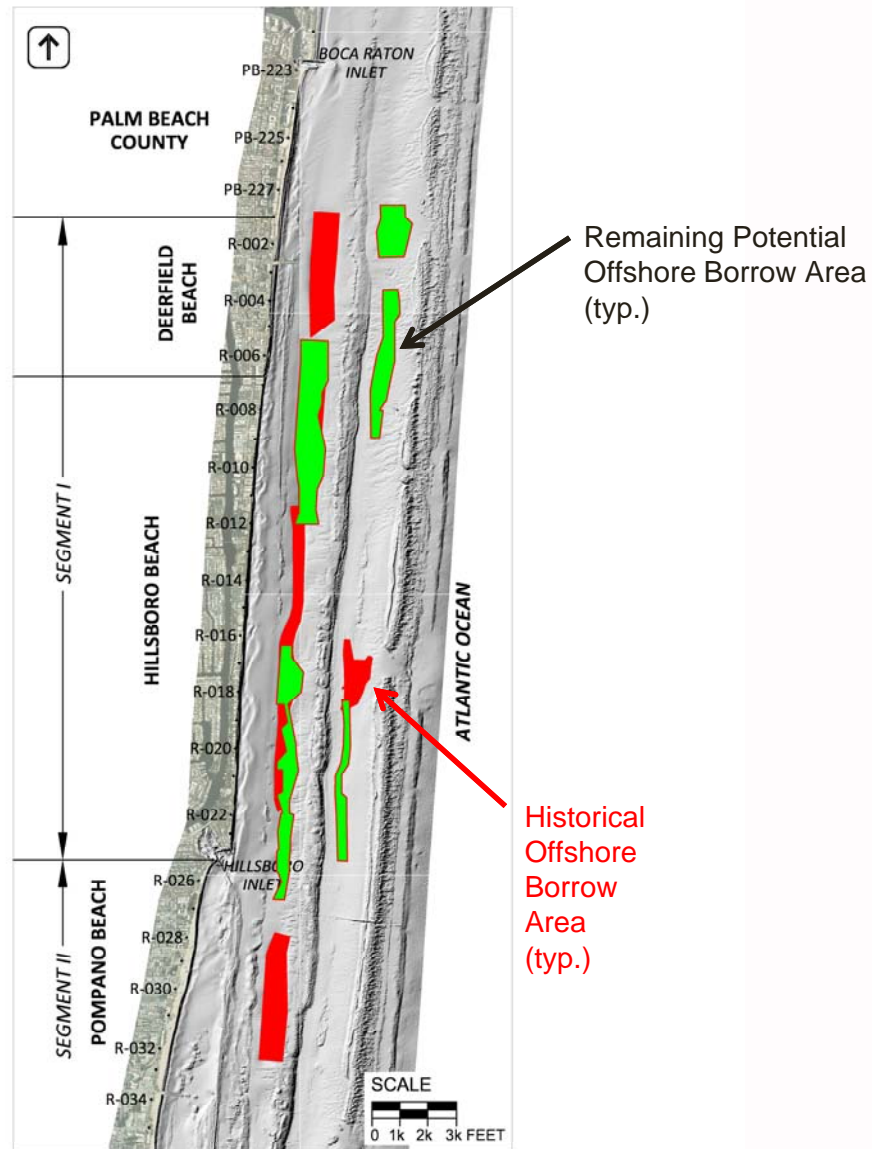


Historical Offshore Sand Sources

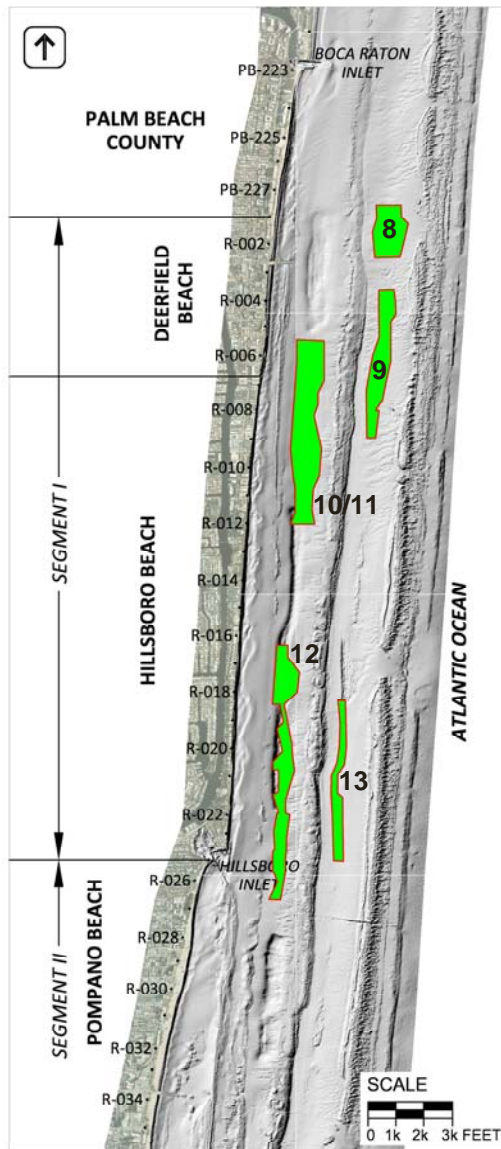


Historical
Offshore
Borrow
Area
(typ.)

Historical Offshore Sand Sources – Northern County



Remaining, Accessible Offshore Sand Sources



	400-ft	600-ft
Broward County Offshore Borrow Area	Potentially Accessible <i>Sand</i> Volume (400-ft Buffers) (cy)	Potentially Accessible <i>Sand</i> Volume (600-ft Buffers) (cy)
Most Desirable		
10/11	829,000	622,000
12	560,000	224,000
subtotal	1,389,000	846,000
Less Desirable		
8	407,000	220,000
9	395,000	178,000
13	83,000	-
subtotal	885,000	398,000
Total	2,274,000	1,244,000

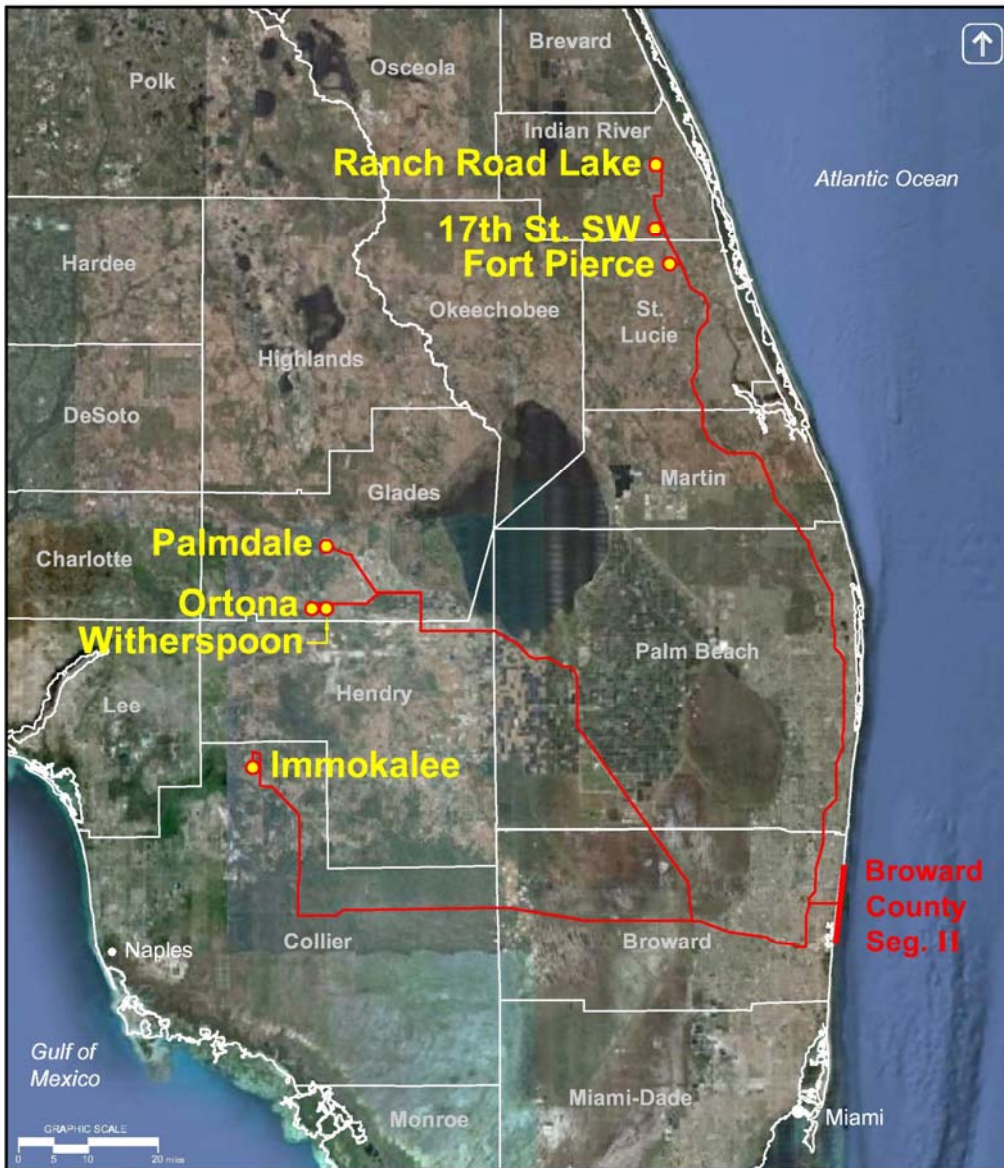
5-7 yrs

Remaining, Accessible Offshore Sand Sources

Future Sand Sources – Options and Cost

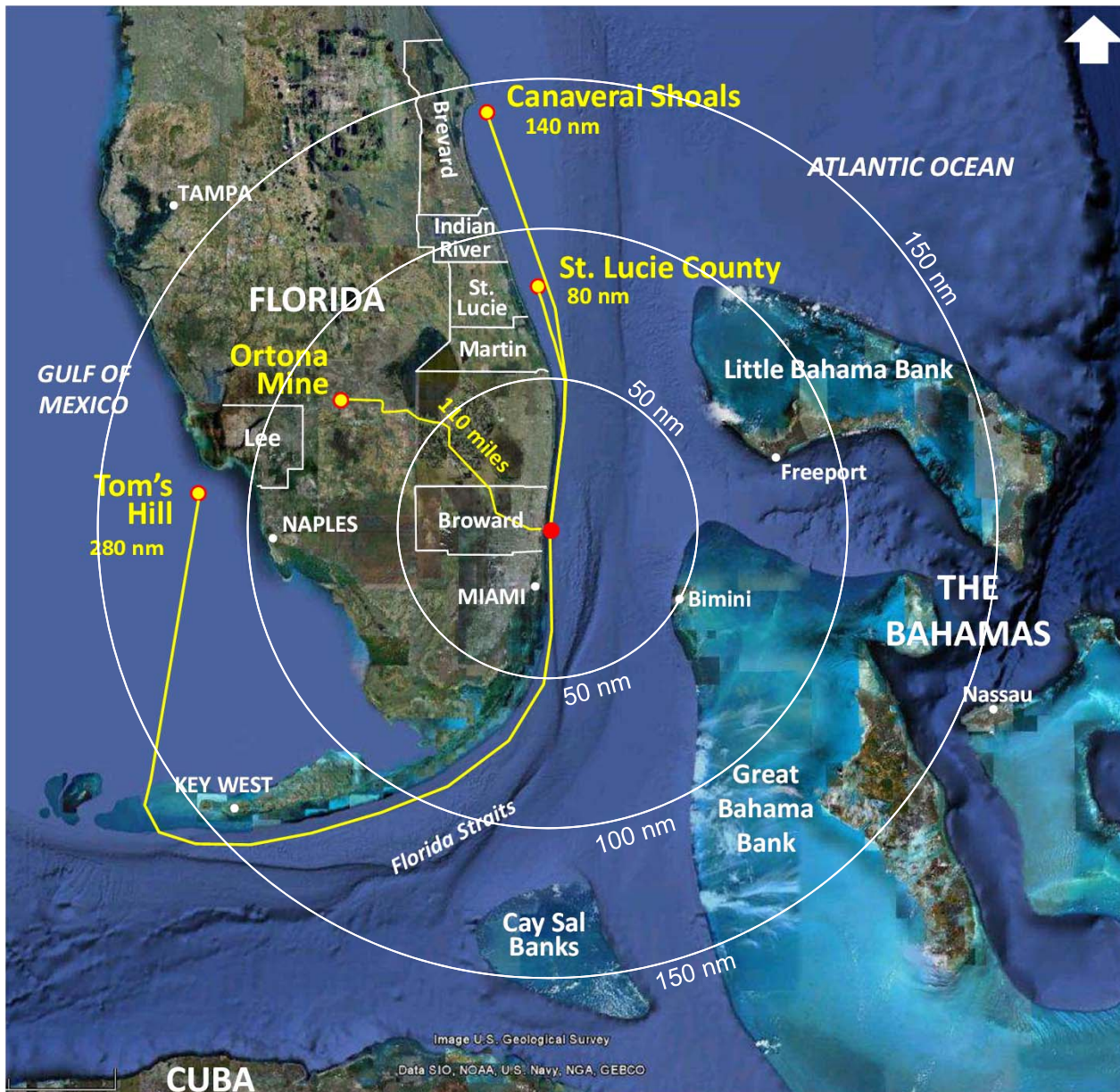
- **Remaining Offshore** (\$24/cy assumed)
- **Upland**
- **Domestic Offshore (OCS)** (beyond Broward County)
- **Bahamian**
- **Distant Non-Domestic**





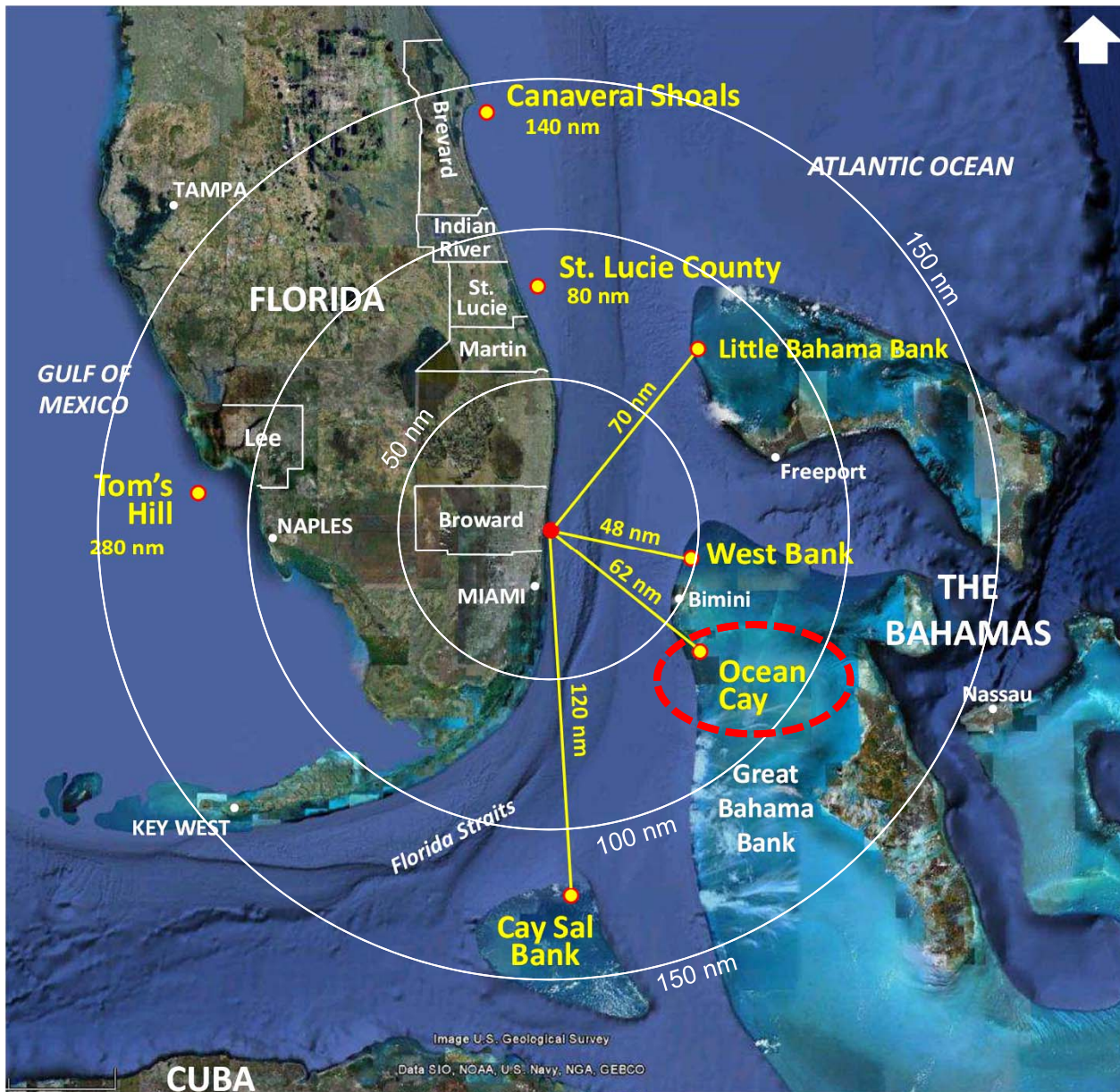
- Numerous sources within 125 miles of Broward County
- Recent experience with these upland sources in Broward County suggests the unit cost for sand would be about \$35-37/cy

Upland Sources



- Several developed sources on the central and southern Florida OCS (Outer Continental Shelf)
- Total volume of sand available on OCS is unknown
- Amount expected to be orders of magnitude higher than anticipated demand

Domestic Offshore (OCS) Sources



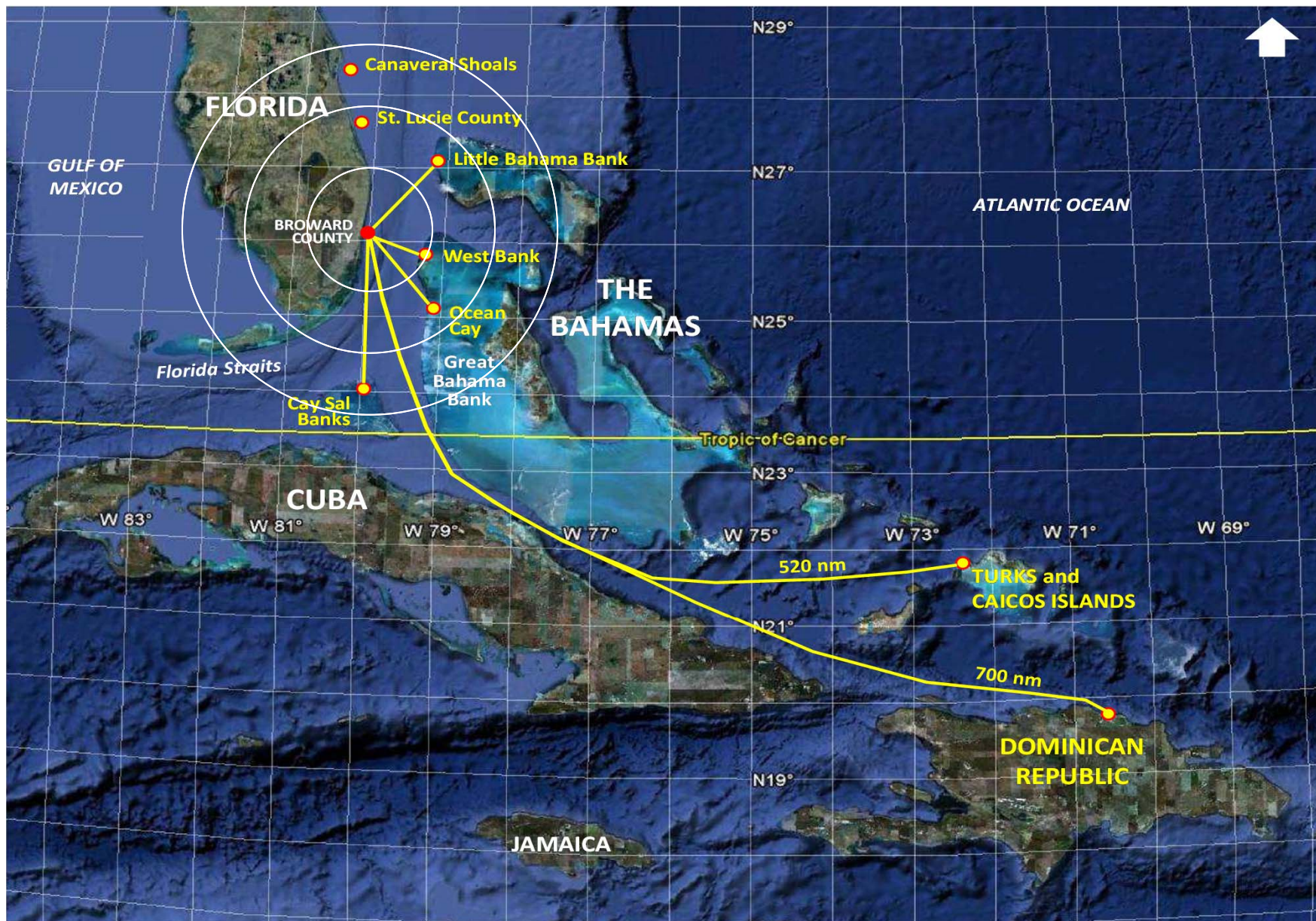
Presently...

- There are two lease holders with permission to export sand for use and beach nourishment
- Only one of the leases is developed as a commercial source capable of providing large quantities of sand

Bahamian Sources



Ocean Cay, Bahamas



Distant Non-Domestic Sources

Cost Assessment Parameters

- **Source Location**
- **Sand Loading**
 - Self-loading Equipment
 - Assisted loading (mechanical/hydraulic)
- **Sand Hauling**
 - Hopper Dredge (typical for short distances)
 - Tug and Scow (typical for long distances)
- **Sand Delivery and Placement**
 - Direct from Offshore
 - Port Everglades Rehandling and Truck-Haul Delivery



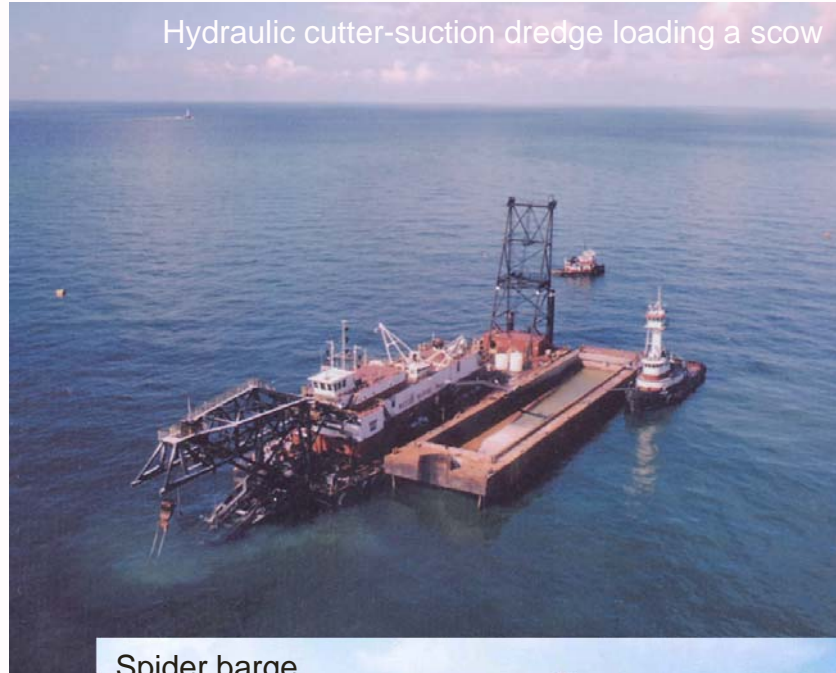
- **Remaining Offshore of Broward County** (14 nm)
- **West Bank, Bahamas** (48 nm)
- **Ocean Cay, Bahamas** (62 nm) - *Commercial*
- **East Central Florida (OCS)** (80 nm)
- **Cay Sal Bank, Bahamas** (120 nm)
- **East Central Florida (OCS)** (140 nm)
- **Southwest Florida (OCS)** (280 nm)
- **Turks and Caicos Islands** (520 nm)
- **Dominican Republic** (700 nm)

Source Locations

Trailing-Suction Hopper Dredge (self-loading)



Hydraulic cutter-suction dredge loading a scow



Mechanical loading from upland stockpile



Spider barge



Sand Loading



Hopper Dredge

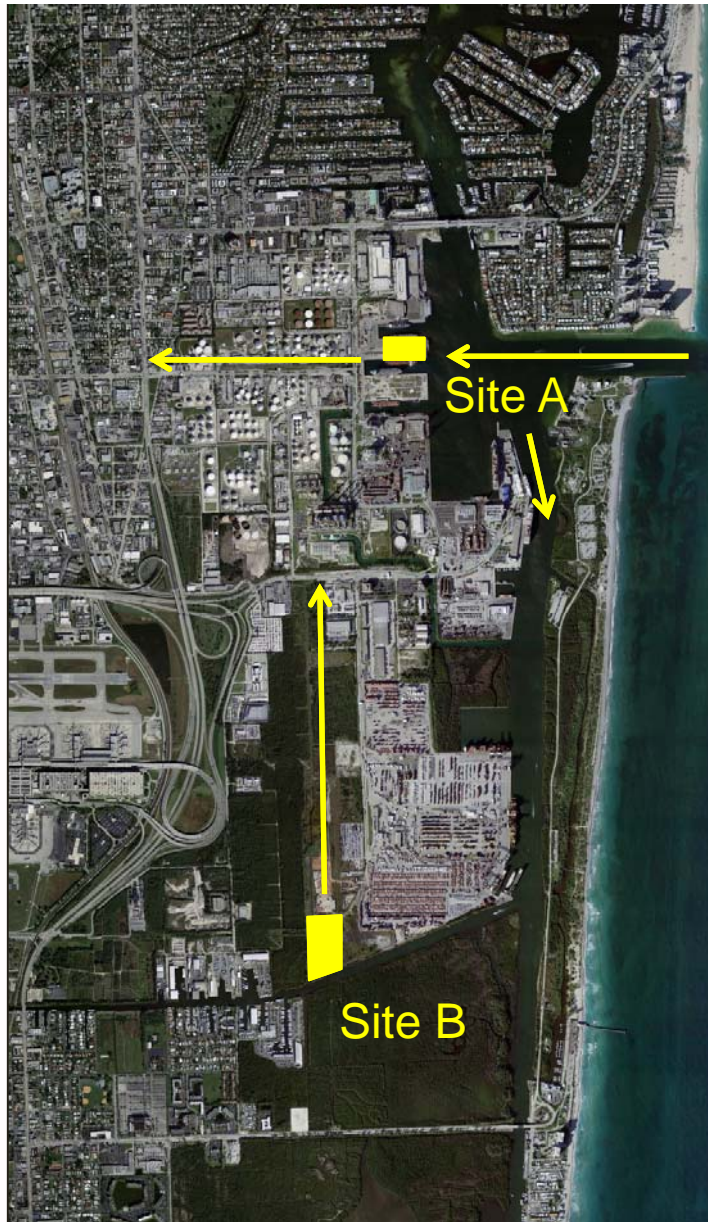
Tug and Scow(s)



Sand Hauling



Delivery and Placement - Hopper Dredge from Offshore

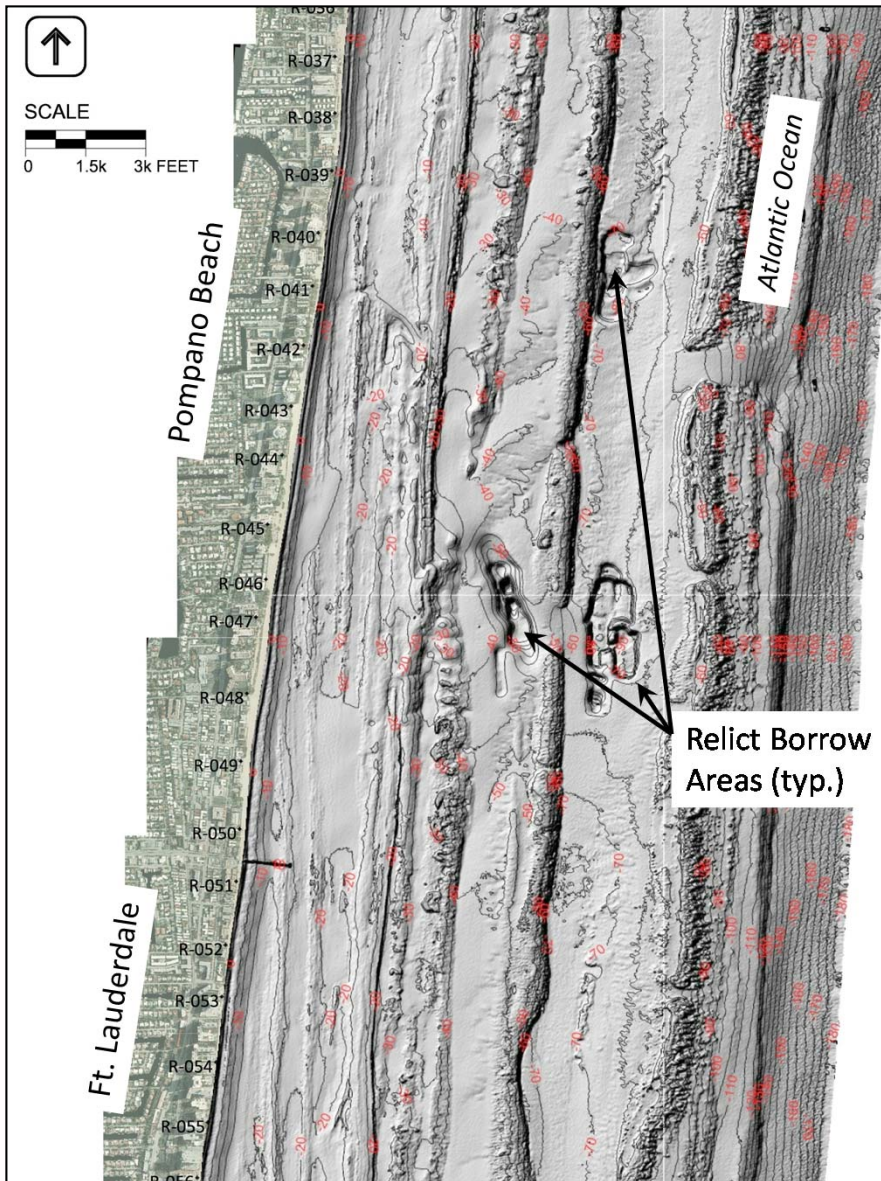


Delivery and Placement - Port Everglades to Truck-Haul



Not Considered Feasible for Broward County
-- Limited by Offshore Wave Climate --

Delivery and Placement – Hydraulic Unloader Offshore



- The presence of hardbottom resources in and around potential rehandling areas
- Sedimentation and turbidity concerns during disposal of material and transfer from storage area to beach

**Not Considered Feasible for
Broward County**

Delivery and Placement – Nearshore Rehandling

Project Methods

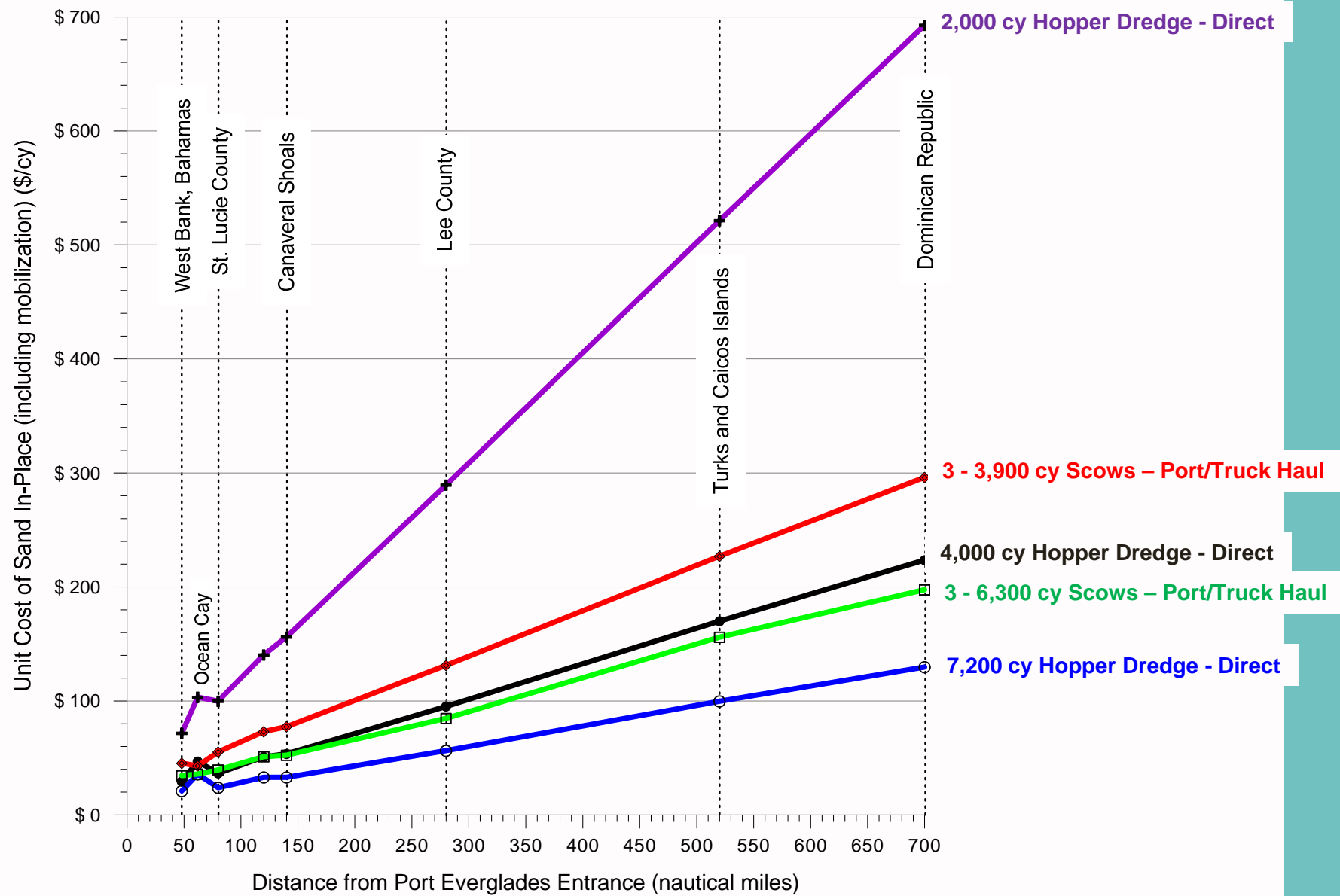
- **Trailing-Suction Hopper Dredge (Distant Offshore)**
 - Self-load, Self-transport, Direct Self-unload
 - Ocean Cay not included (self-load not an option at this site)
- **Trailing-Suction Hopper Dredge (Ocean Cay)**
 - Mechanical Load, Self-transport, Direct Self-unload
- **Tug and Scow (Distant Offshore)**
 - Hydraulic load, Self-transport, Mechanical Unload to Port, Truck-Haul
- **Tug and Scow (Ocean Cay)**
 - Mechanical load, Self-transport, Mechanical Unload to Port, Truck-Haul



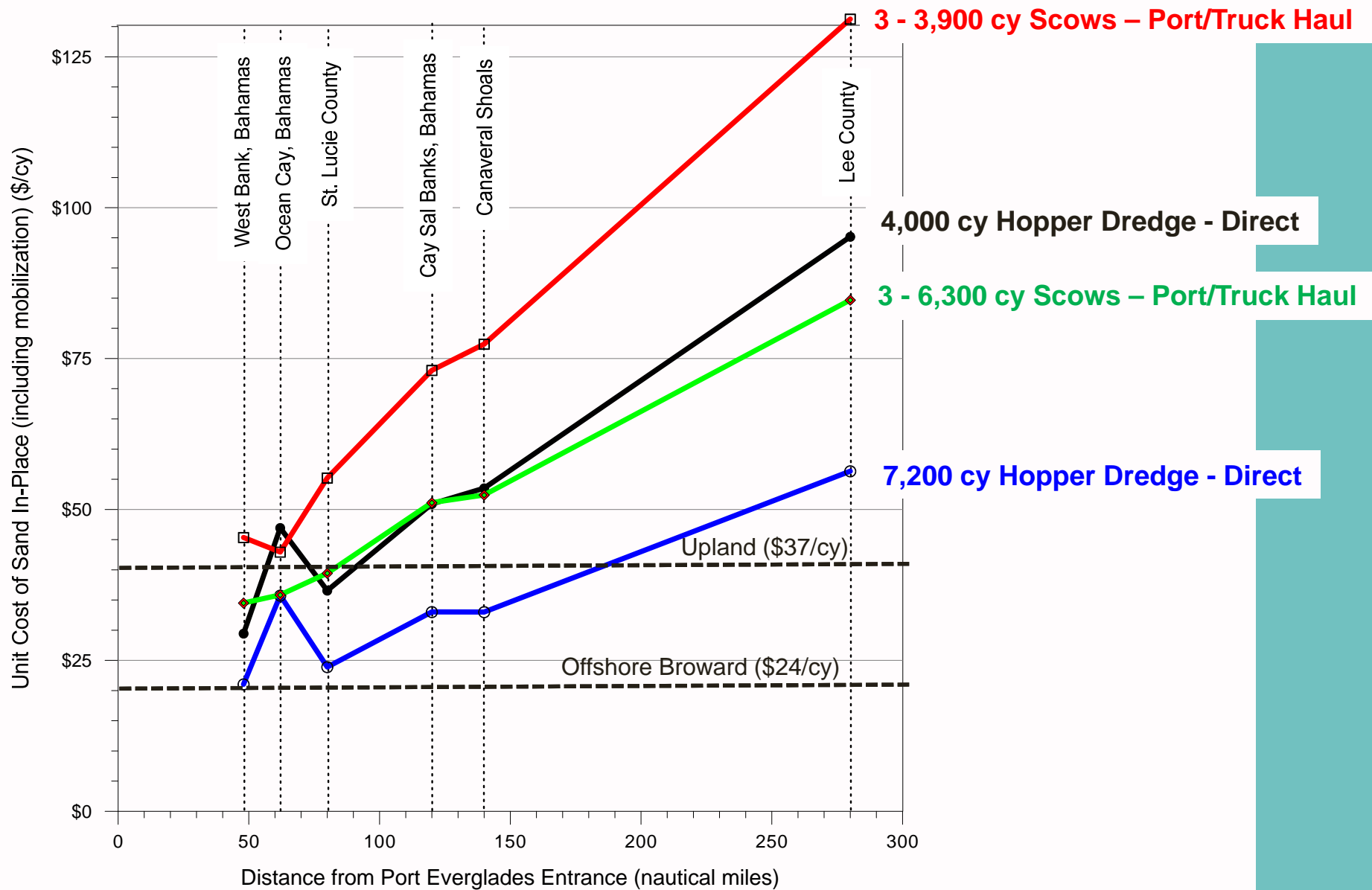
Cost Analysis Assumptions

- **Hopper Dredges (Self-loading and Unloading)**
 - 2,000 cy : 4,000 cy : 7,200 cy
- **Tug and Scows (Mechanical/Hydraulic Load and Unload)**
 - 3-3,900 cy : 3-6,300 cy
- **Consistent Unit Costs for Equipment**
 - Emphasis on the effect of haul capacity, haul time (distance), and unloading method to cost
- **Cost for Bahamian and other Non-Domestic Sand will include Government Royalty and Lease Holder Expenses**





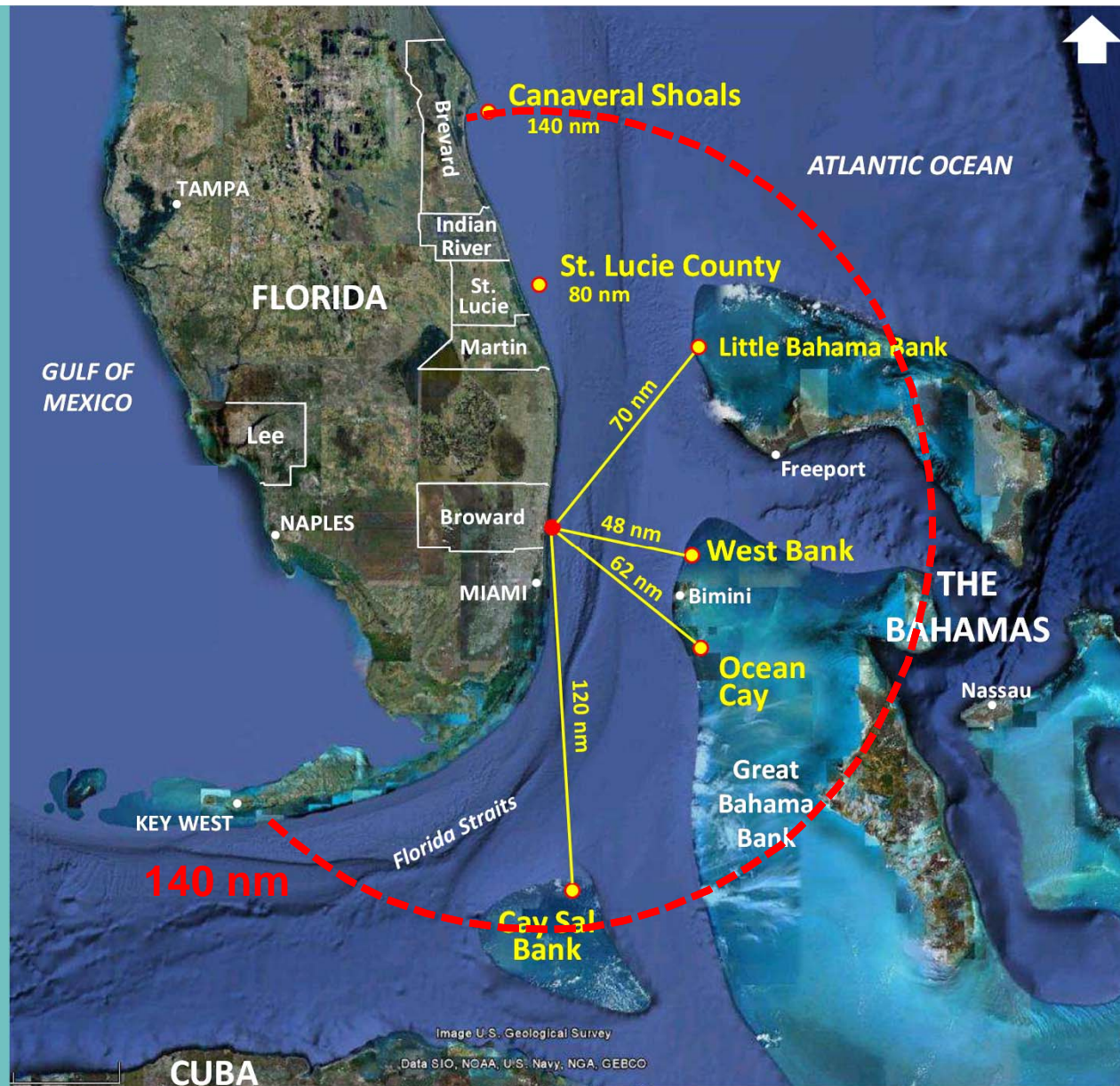
Effect of Capacity, Distance and Unloading Method to Cost



Effect of Capacity, Distance and Unloading Method to Cost

Sand Source	One-way Distance to Sand Source (nm)	Probable Unit Price for Sand In-Place on Beach (with Mob/Demob) (\$/cy)					
		Hopper Dredge 2,000 cy	Hopper Dredge 4,000 cy	Hopper Dredge 7,200 cy	Tug and Scows (3-3,900 cy scows) Deliver to Upland Stockpile in Port Everglades	Tug and Scows (3-6,500 cy scows) Deliver to Upland Stockpile in Port Everglades	Tug and Scows (3-6,500 cy scows) Direct Pipeline to Beach from Port Everglades***
West Bank, Bahamas	48	\$ 71.69	\$ 29.45	\$ 21.05	\$ 45.37	\$ 34.52	\$ 25.61
Ocean Cay, Bahamas	62	\$ 103.27	\$ 46.95	\$ 35.75	\$ 42.95	\$ 35.87	\$ 27.15
St. Lucie County	80	\$ 99.86	\$ 36.57	\$ 23.91	\$ 55.22	\$ 39.45	\$ 29.56
Cay Sal Bank, Bahamas	120	\$ 140.41	\$ 50.92	\$ 33.03	\$ 73.06	\$ 51.13	\$ 40.01
Canaveral Shoals, Brevard County	140	\$ 156.11	\$ 53.53	\$ 33.01	\$ 77.40	\$ 52.40	\$ 40.50
Tom's Hill, Lee County	280	\$ 289.44	\$ 95.19	\$ 56.34	\$ 131.25	\$ 84.71	\$ 68.34
Turks and Caicos Islands (TCI)	520	\$ 521.36	\$ 169.97	\$ 99.69	\$ 226.90	\$ 155.99	\$ 119.05
Dominican Republic (DR)	700	\$ 692.79	\$ 223.54	\$ 129.69	\$ 296.13	\$ 197.53	\$ 154.89
						*** Northern Segment III Only	

Comparison of Costs for Sand Sources and Handling Methods



Location of Potentially Feasible Future Sources

Realities...

- **Future sand source needs in Broward County are expected to be ~8 to 10 Mcy over the next 50 years**
(2.5 to 3 time less than prevailing estimated quantities)
- **Remaining sand resources offshore of Broward County may only be between 0.8 and 1.5 Mcy**
- **Broward County will be faced with using distance sand sources in the near future to maintain their beaches (5-7 yrs)**



Realities...


- Sand sources on the Florida east coast Outer Continental Shelf (OCS) with 140 miles of Broward County may be cost-effective future alternatives
- The cost-effectiveness of currently available Bahamian sand (compared to upland truck haul) is limited due to delivery restrictions, government and lease holder expenses, and the reliability of availability
- Project size, equipment type, haul distance, and unloading conditions will influence cost-effectiveness of distant sources



Considerations...

- Pursue an expanded evaluation of potentially available sand resources on the OCS
- Relate potentially available OCS sources to realistic future expected sand requirements for all SE Florida communities





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