SAND BYPASSING at STABILIZED INLETS:

Sustaining Restored Beaches in Broward County

BROWARD COUNTY FLORIDA

Sand Bypassing

- Used when inlet navigation features block the alongshore drift of sand
- 85% of beach erosion in FL is caused by the interruption of the alongshore drift by stabilized inlets
- Goal of bypassing is to capture sand on updrift side of inlet and move material to downdrift beaches

Sand Bypassing

- Two main types of bypassing
  - Intercept, whereby a device or series of devices continuously or episodically moves material as it arrives.
  - Storage, whereby a deposition area is constructed to capture arriving sand and is periodically excavated. The sand is then piped or transported to target beaches.
- Hybrid or combination systems also exist

Examples of Sand Bypassing Types

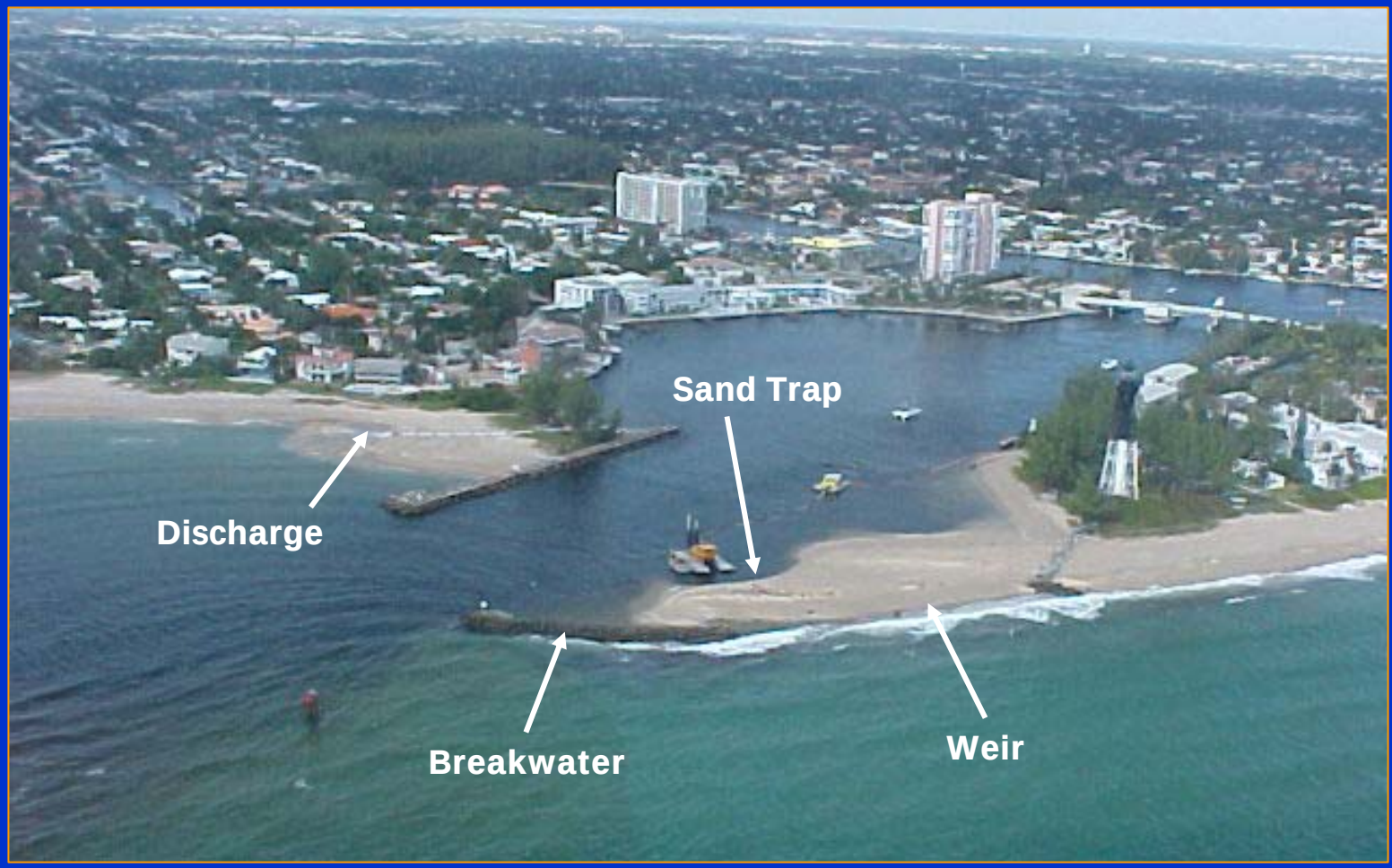
Intercept - Tweed Head, NSW, Aus

- Multiple Jet Pumps on Pier
- Material piped across inlet
- Four outlets for sand

- Jet pumps fluidize sand and pumps transport the material to target

Examples of Sand Bypassing Types

Weir/Sand Trap (Storage)



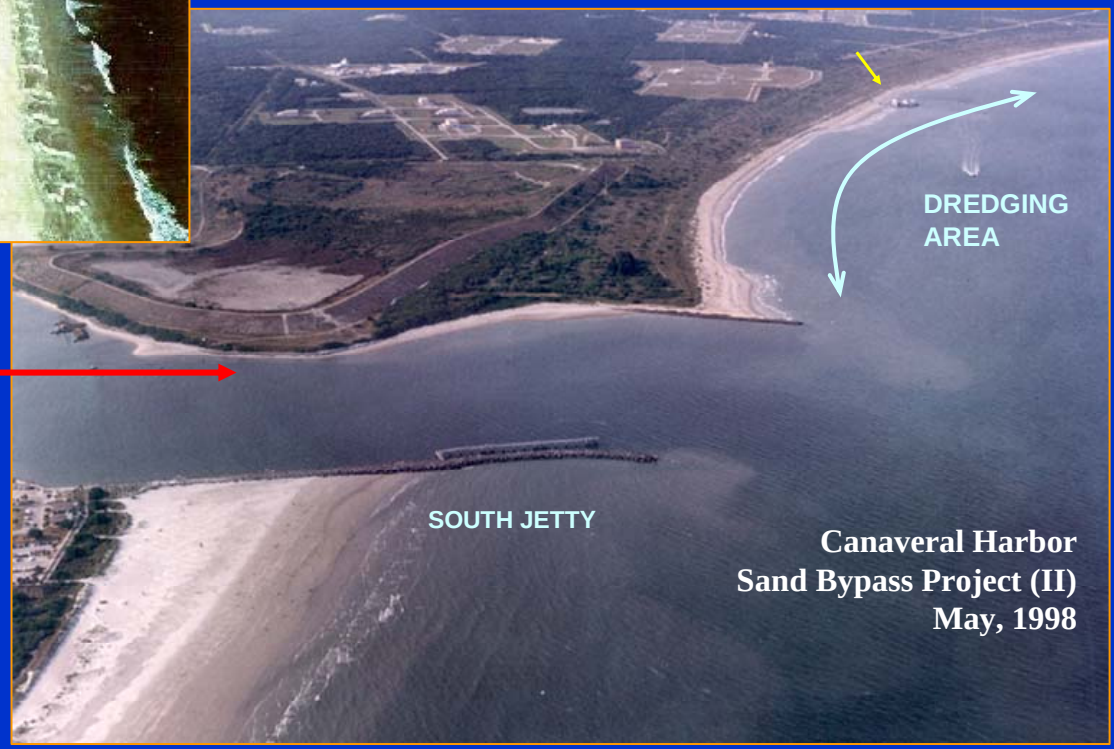
Hillsboro Inlet, FL

Examples of Sand Bypassing Types

Hybrid Systems – Beach Mining

- **Indian River Inlet, DE**
- **Crane-mounted jet pump**
- **Sand piped to downdrift beach**

- **Canaveral Harbor**
- **Hydraulic cutterhead dredge mines the nearshore beach sand and pumps to downdrift beach**



Sustainable Beaches

Pompano Beach is the Beneficiary of Bypassing at Hillsboro Inlet

SAND BYPASSING at PORT EVERGLADES

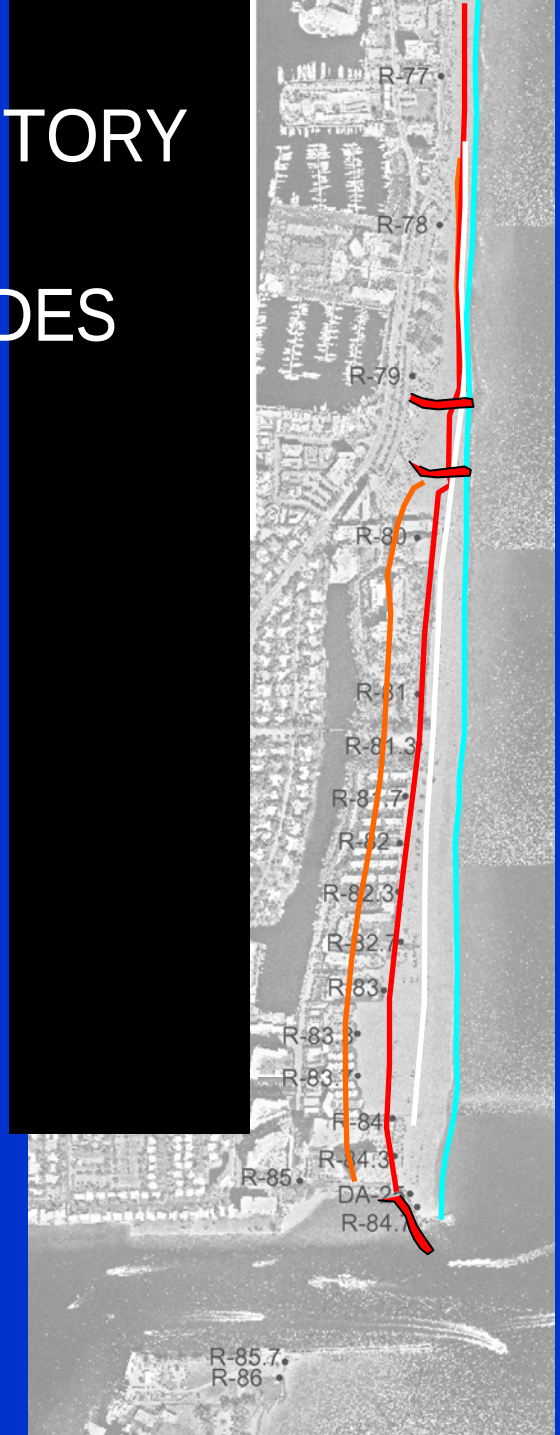
Historical Studies

- **1963: Corps Countywide Bch Erosion Study**
- **1985: Alternative Sand Source Study**
- **1988: Reconnaissance-Level Study**
- **1994: State-sponsored Inlet Mgmt Plan**
- **1997: Economic Update to Inlet Mgmt Plan**
- **1999: State adopts Inlet Management Plan**
- **2003: Detailed Feasibility Study**
- **2006: Engineering/Design, Permitting**
- **2008/9: Construction/Operation**

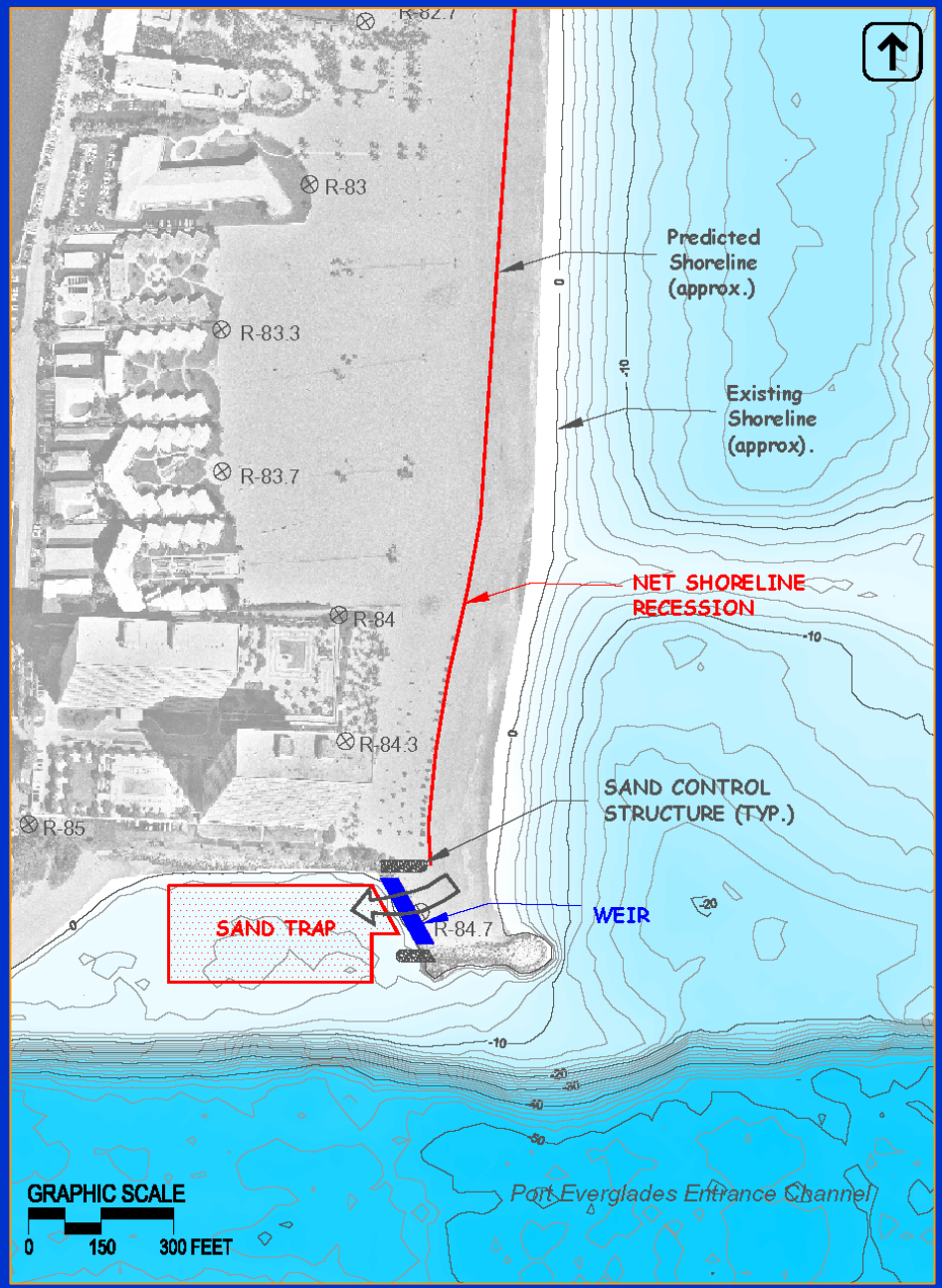
CURRENT STUDY ELEMENTS
Use of Current Data/Technology

- Detailed Site Investigation
- Review of Historical Data/Constraints
- Quantify Sediment Transport Conditions
  - Historical data
  - Numerical models
- Formulate/Evaluate Alternatives
  - Consider constraints
  - Evaluate
    - Physical performance
    - Effects to adjacent shorelines, inlet
    - Economics

SHORELINE HISTORY NORTH OF PORT EVERGLADES



1935
1961 (Pre-shoal)
1979
2002



Bypassing Configuration Recommended in the Inlet Management Plan

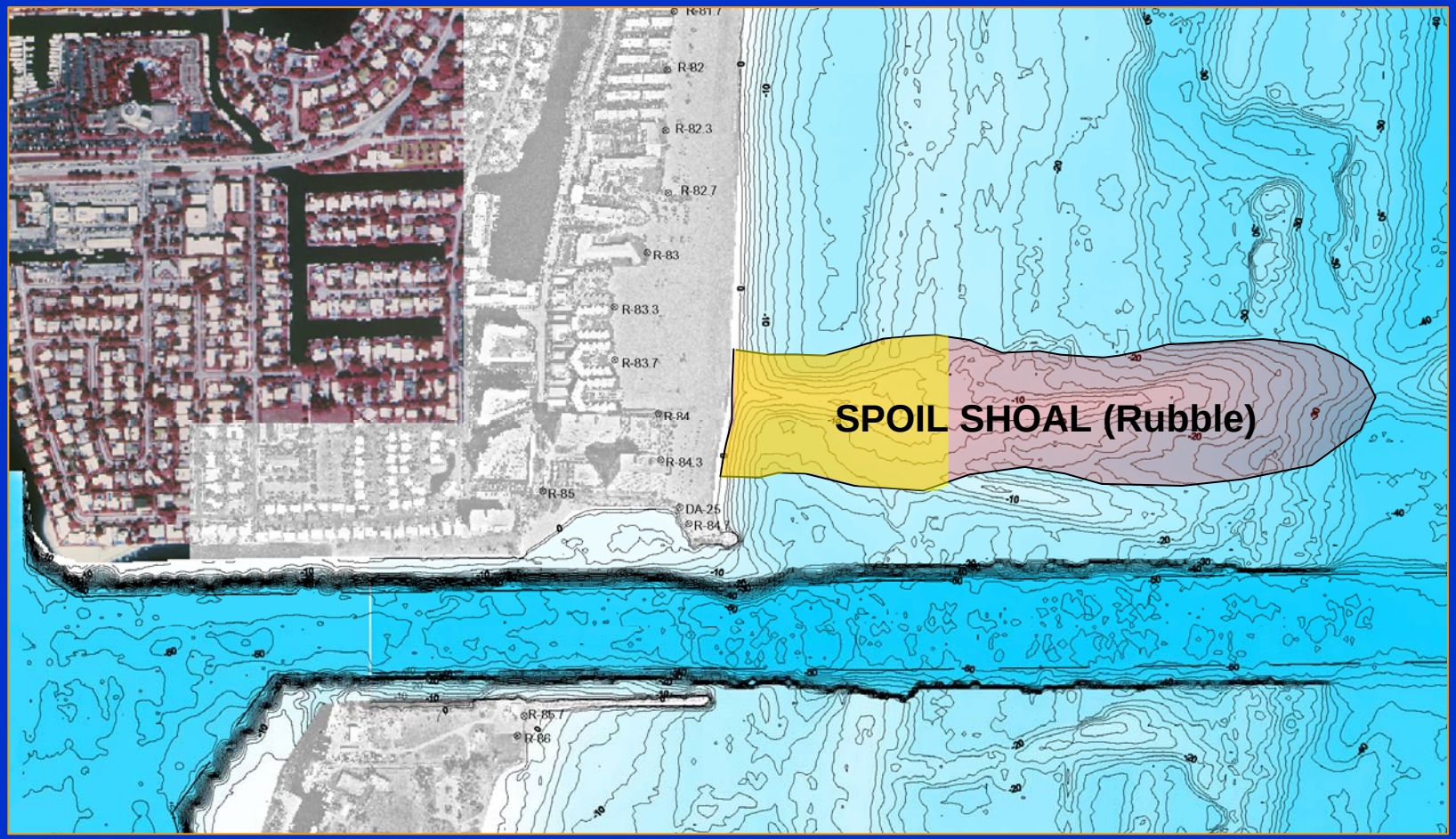
- **Significant NET Shoreline Recession**
- **Proximity of Sand Trap To Upland Development**

ALTERNATIVE FORMULATION - CONSTRAINTS

- COLLECT sufficient volume of sand to justify project Costs
- AVOID adverse impacts to shoreline position, beach use, upland development north of the inlet
- LIMIT infrastructure along north jetty and north shoreline
- PROVIDE clean sand to downdrift shoreline
- AVOID impacts to navigation
    - Channel shoaling
    - Impedance to commercial traffic
    - Cross-currents in navigation channel
- AVOID adverse environment impacts
- AVOID adverse impacts to JUL Beach State Park

SAND BYPASSING MUST INCLUDE

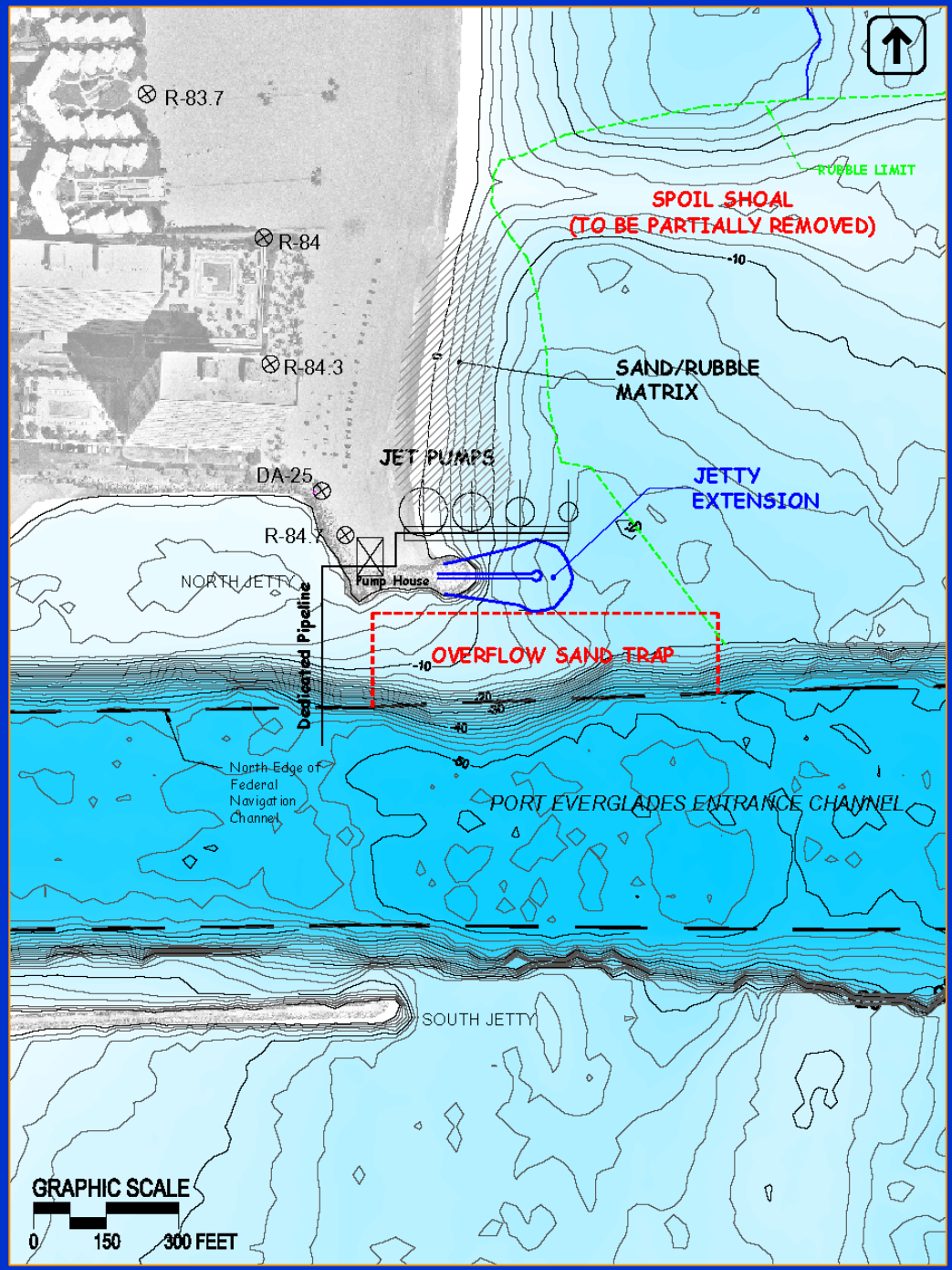
- Partial Removal of Spoil Shoal



SAND BYPASSING MUST INCLUDE

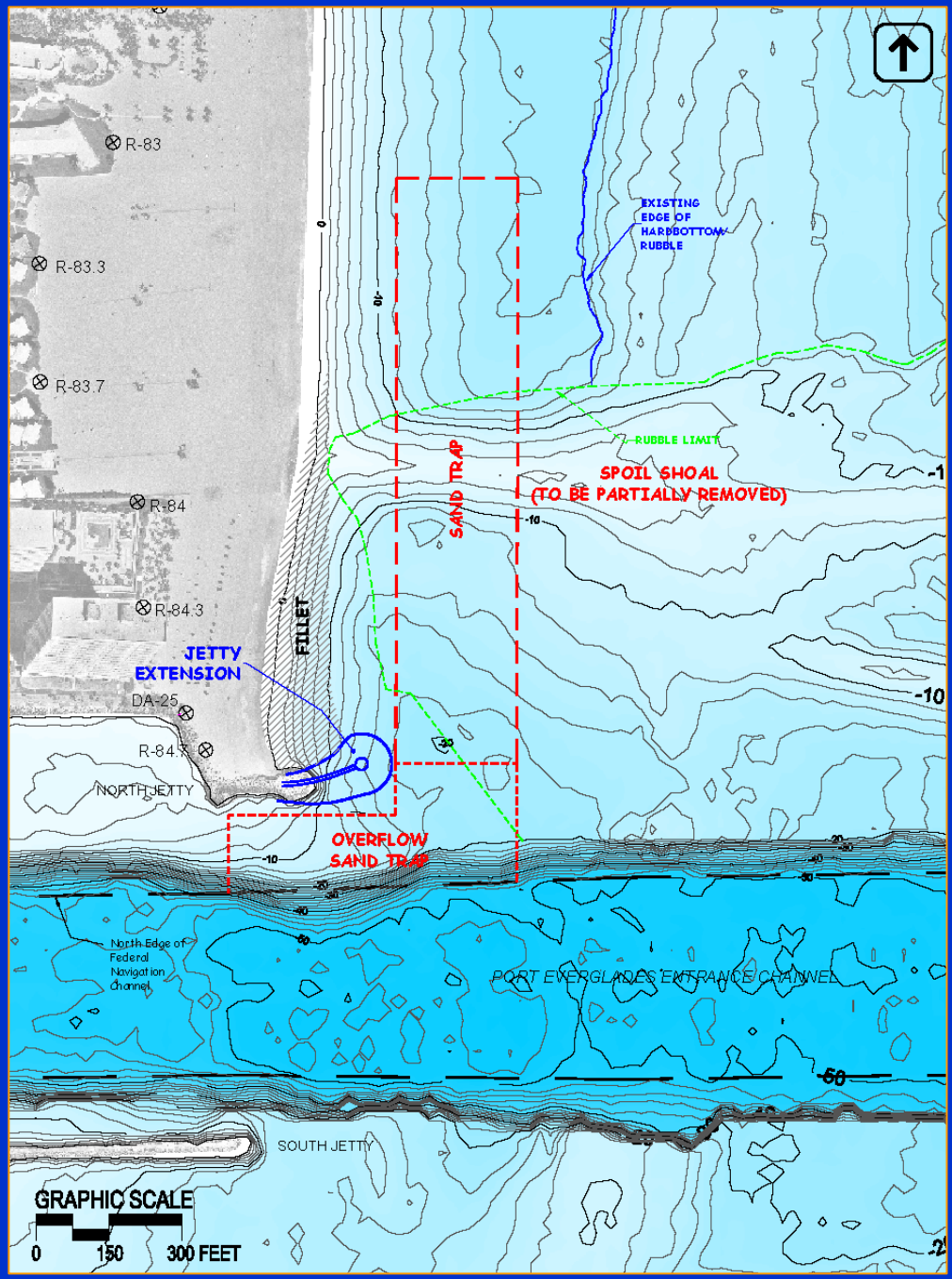
- Partial Removal of Spoil Shoal
- North Jetty Extension
- Initial (at least) Rubble Separation
- Activities Only on Public Areas

Concept of Fixed Plant System



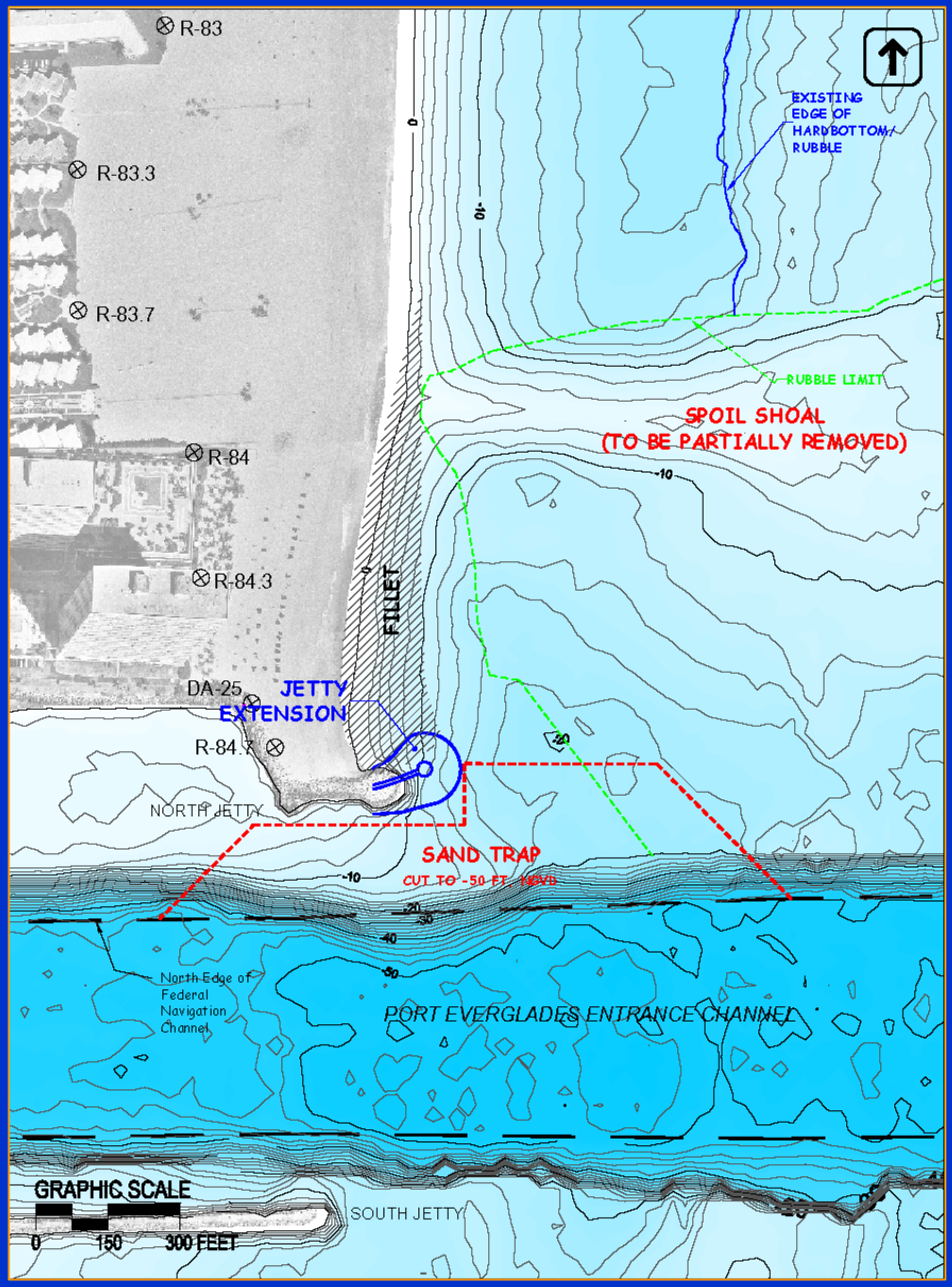
- **Significant Infrastructure on North Shoreline**
- **Fixed Pump Location**
- **Limited Control Over Sand Arriving at Plant**
- **Rubble/Debris will Limit Productivity**
- **Frequent Maintenance to Clear Rubble**
- **Fluctuations in Shoreline Location**
- **Craters Following Bypassing**

SHORE-PARALLEL OFFSHORE SAND TRAP (Alt No. 1)



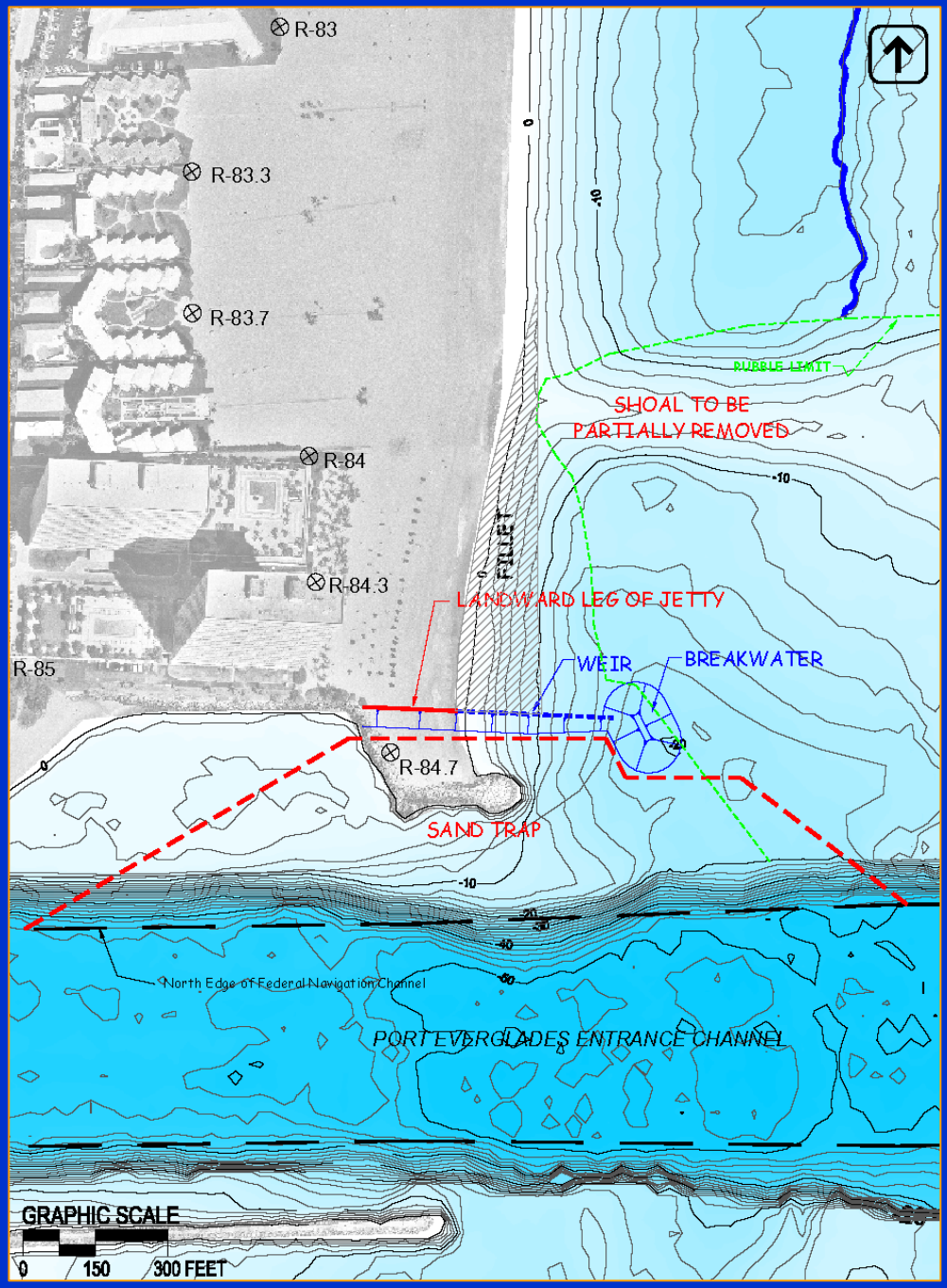
- **Efficient Sand Collection Rate**
- **High Likelihood for Fine-Grained Sands in Sand Trap**
- **Persistent Rubble Contamination**
- **Shoreline Fluctuations between Dredging**
- **Steep Beach Slopes Following Dredging**

OFFSHORE SAND TRAP at NORTH JETTY (Alt No. 1A)



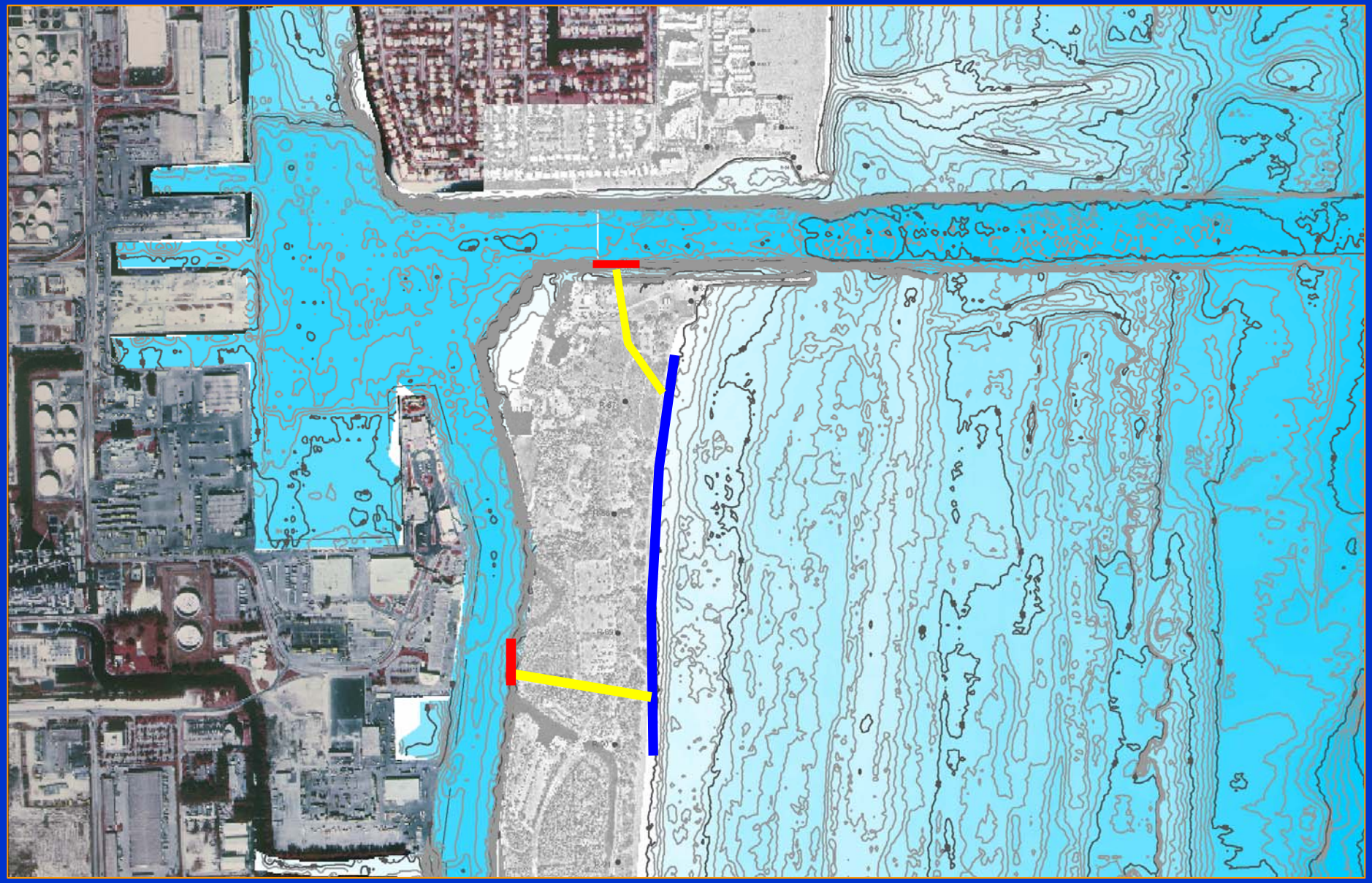
- **Minimal Shore Fluctuations**
- **Lower Initial Cost**
- **Potentially Lower Sand Collection Rate**
- **Some Probability for Fine-Grained Sands in Deep Sand Trap**
- **Potential for Rubble Contamination of Sand**

WEIR/INTERIOR SAND TRAP (Alt. No. 2)



- **Allows Collection of Highest Quality Sediments**
- **Reliable North Shoreline Stability**
- **Least Potential for Long-term Rubble Contamination**
- **Provides Protected Area for Dredging**
- **Allow Broad Range of Dredge Types and Techniques**
- **Eliminates Sand Shoaling of Port Channel**
- **Highest Initial Cost**
- **Highest Interior Exposure to Wave Action**

PUMPOUT and SAND PLACEMENT



SAND BYPASSING ALTERNATIVES
COST SUMMARY (2004)

Bypassing Alternative	Initial Construction Cost	Unit Cost of Bypass Sand *Including* Initial Construction Cost ($/cy)	Unit Cost of Bypass Sand *Excluding* Initial Construction Cost ($/cy)
1	$ 9,273,000	$ 20.76	$ 16.05
1A	$ 8,904,000	$ 19.06	$ 14.55
2	$ 11,748,000	$ 16.47	$ 10.50

Unit Cost of Sand for current Segment III Project
= $ 24/cy (+/-)
(including engineering/environmental monitoring)

SUMMARY – Sand Bypassing At Port Everglades:

- Will benefit navigation, beach management, environment
- Will reduce the demand for remote sand sources
- Will reduce/eliminate potential for reef impacts from dredging
- Will reduce/eliminate shoaling along north side of Port channel
- Will require shoal modification, jetty extension
- May require rock separation to deliver clean sand
- Is likely most feasible with Alternative 1A or 2

NEXT STEPS:

- Formalize contract amendment with Consultant
- Perform additional analyses as requested by State DEP
- Select alternative (1A, 2, or other) to implement
- Develop Design and initiate permitting
- Perform environmental & geophysical inventories and studies
- Seek public input, assemble NEPA documentation
- Acquire permits and build plans & specifications
- Bidding and commencement of construction (late 2008?)

THANK YOU!