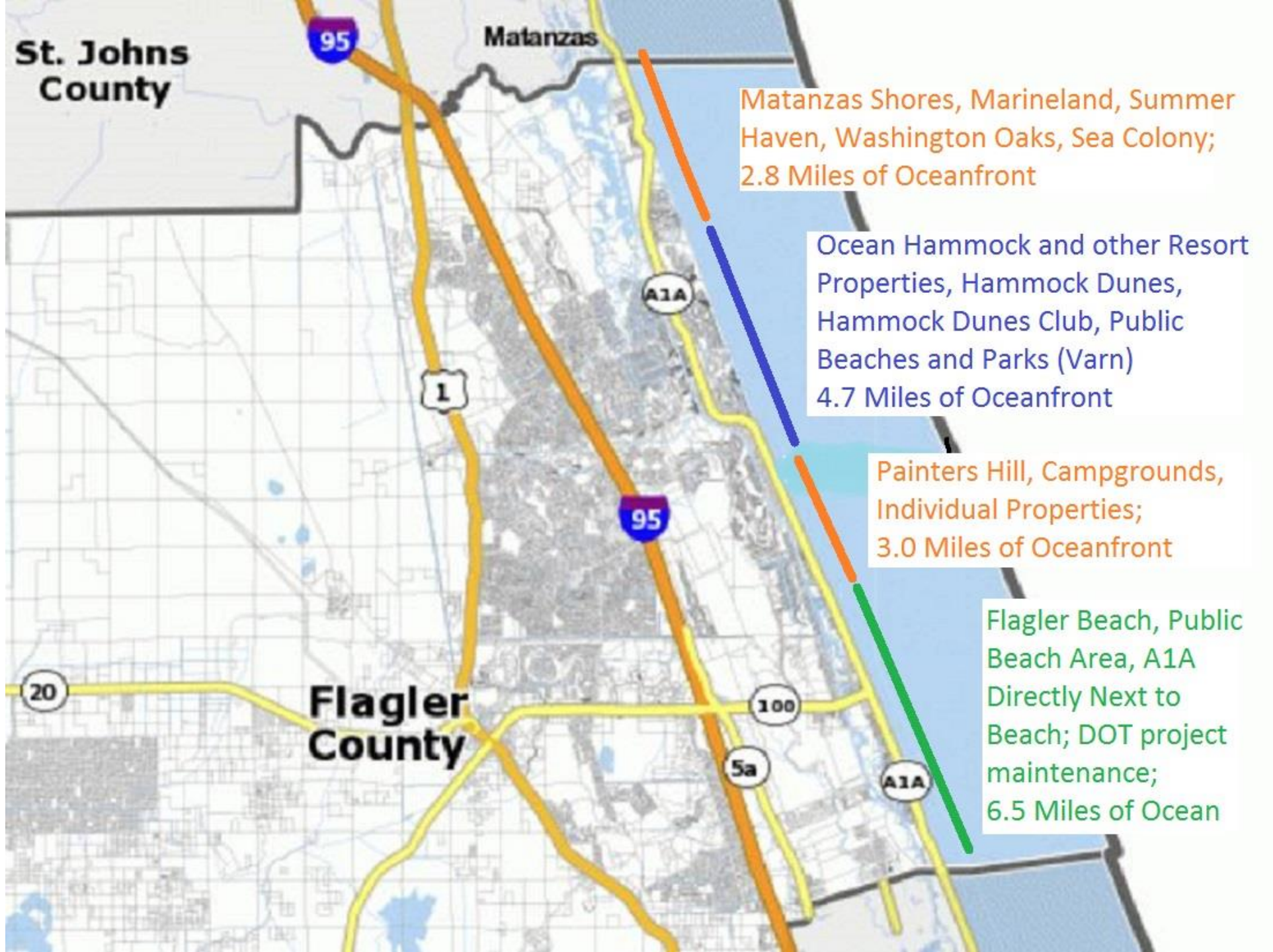
October 7, 2016
Hurricane Matthew Rakes the East Coast
of Flagler County for 18.1 Miles

Hammock Dunes Suffers Penetration of the Ocean
into the Community; has a 15-30 ft. Wide
Triangular Section of the Dune Face
Moved to the Ocean Floor; and
All Walkover Stair Ends Destroyed

Project Team formed one week after Matthew

- David Eckert (Team Leader)
- Mike Gill (Legal and FEMA filing)
- Marge Rooyakkers (County Interface)
- Bruce Aiello (Financing & Budgeting)
- David Yoder (Engineering and Walkovers)


St. Johns County
Matanzas
95
A1A
1
95
20
Flagler County
100
5a
A1A
Matanzas Shores, Marineland, Summer Haven, Washington Oaks, Sea Colony; 2.8 Miles of Oceanfront
Ocean Hammock and other Resort Properties, Hammock Dunes, Hammock Dunes Club, Public Beaches and Parks (Varn) 4.7 Miles of Oceanfront
Painters Hill, Campgrounds, Individual Properties; 3.0 Miles of Oceanfront
Flagler Beach, Public Beach Area, A1A Directly Next to Beach; DOT project maintenance; 6.5 Miles of Ocean

18.1 Miles of Oceanfront is Key to the Financial Health of Flagler County

- Recreation, Restaurant, and other commercial activities thrive on the Ocean
- Hammock Dunes and the Ocean Hammock Resort Properties bring tourism and seasonal business
- A1A is a critical scenic route for local activity
- The County and State want continued population growth

Matthew's Angry Ocean Penetrated the Dune into Communities, or onto roads, in many locations

- All along Flagler Beach
- South of Varn Park to A1A
- The Northern 2000 feet of Hammock Dunes into Grande Mer
- Jungle Hut Road, 16th Street, Sea Colony; Ocean Hammock Breaches
- Washington Oaks formed a new Ocean Inlet
- Completely Flooded Summer Haven
- Nearly breached into Hammock Dunes in three other dune areas of Playa del Sur and Carino la Mer; 2.3 miles of Dunes must be repaired


Dune erosion severe and can breach
Dune totally eroded for 2000 feet; Risk with non-piling HD Clubhouse & Large Houses
N OCEAN SHORE BLVD
OCK DUNES PKWY
A1A
Fox Cut
LBERT LN


Post Hurricane Matthew: Hammock Dunes North,
Dune Breached in Grande Mer; Walkovers and
Plants resting 6 feet below their normal elevation

This 2000 foot section of lost HD Dune must be repaired during December 2016

- A pyramidal shaped dune has been transported underwater
- Emergency FL-DEP Permits allow sand to be trucked from upland sources
- The volume of sand lost is 11,000 compacted cu. yds., or 900 truckloads
- December has 19 work days; 48 truckloads of sand/day or 6 trucks per hour at Jungle Hut Park (This is very difficult to implement)
- An alternative is to place a bulldozer or road scraper on the beach to recover sand from the tidal area for the same 19 days
- This requires the County to receive a FL-DEP Permit and to inspect work with a Marine Engineer


Redline showing dune sand lost during Hurricane Matthew. Also the entire walkover section within the redline was destroyed (for all HD walkovers).


Post Hurricane Matthew, October 2016

Calculation of Sand Lost from Original Dune

- Hammock Dunes has 2.3 miles of oceanfront
- 2.3 miles is 4,048 yards (or 12,144 feet)
- The triangular dune section lost is 3 yards high by 5 yards wide (average)
- Volume of sand lost is 30,360 cu. yds.
- Truckloads of sand are 12 cu. yds. (compacted); so 2530 truckloads
- Approx. cost of coquina sand is $250 per truckload; or $632,500
- This amount excludes the 2000 ft. section of missing dune
- We do not know the cost to place the sand, form the dune, or vegetate the dune.


2010 Photo;
The mound of beach sand naturally transported (mostly during winter) from underwater sand inventory is better seen from this angle. The first lip is the low-tide drop-off and the higher ridge of sand is the mound formed during the low-tide to high-tide cycle.
The "no vegetation" areas under the boardwalks need special membrane design to prevent ocean penetration.
High Tide Mound from Tidal cycle
Low Tide Drop Off, lower lip

There are Alternatives to Trucked-In Sand

- The “Sand System” includes above-water sand and near shoreline underwater sand. Sand is cycled between these areas in a healthy, non-depleted system by natural wave and wind activity.
- Far shoreline sand can also be dredged.
- One 12 inch deep scrape of the lower beach sand, 30 feet wide along the full 2.3 miles would offer 14,520 cu. yds. of sand moved to the dune
- Wave action will refill this void with underwater sand (our coquina rock base protects us from deep erosion)
- Repeating this process 2-3 additional times would recover adequate sand to rebuild the dune, if nature cooperates and replenishes
- If sand recovery has a shortfall, some could be dredged or trucked.

Rough Cost Estimate for “Lower Beach Sand Recovery”

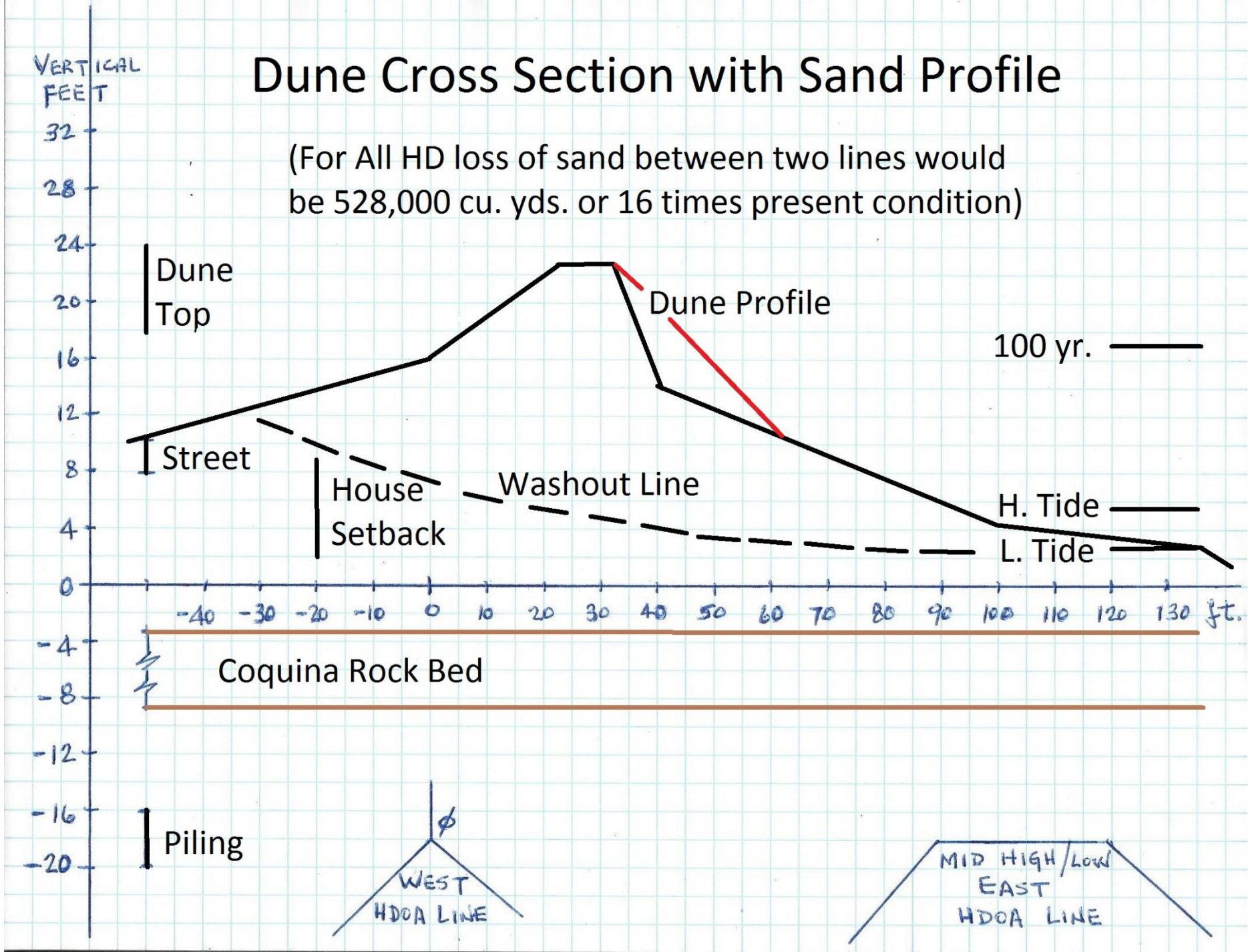
- A bulldozer and scraper can be rented for about $13,000 per month
- Two heavy equipment operators are estimated to be $10,000 per month
- Overhead for the contractor is assumed at 40% or $7,200 per month
- Work would be 8 hours+ per day using surveyed guidance markers; under County and/or DEP supervision
- Work on the beach/dune must take place around tide cycles
- 5 months in 2016/2017 is estimated at $151,000 (for operated equipment only)
- Complete the work before the May turtle nesting season

This work is necessary to Protect Hammock Dunes from Routine 2017 Tropical Storms

- The illustration on the next page shows the 100 year dune removal assumption from FL-DEP.
- This same erosion line may apply to weak dune areas, if a 10 year storm hits us, starting from the position of our damaged dune.
- On the other hand, our dune was remarkably stable for decades before Matthew
- However, to be prudent, the dune should be restored to its original profile by May 2017

Dune Cross Section with Sand Profile

(For All HD loss of sand between two lines would be 528,000 cu. yds. or 16 times present condition)



What should be done?

- Must not cede land to the ocean as there is no “extra” land to be lost
- Immediate action during non-turtle-nesting-season must be to return dune to early 2000s profile and put walkovers back where they were.
- Fill dune breaches fast (major breach has already been filled)
- Move sand or procure sand to rebuild dune by May 2017
- Repair community walkovers as first priority
- Repair residential walkovers in a way that the dune can be restored
- Implement actions for the long term health of the dune: vegetation, hardening, periodic maintenance

We are supporting the County to obtain FL-DEP Permits to Recover Sand from the Lower Beach

- It is the only alternative (except dredging) to be able to move sufficient sand to the 2.3 mile Dune Restoration in 5 months before May 2017.
- Bringing 4000 truckloads of sand through Jungle Hut closes this beach for 5 months, not even considering work to be done by the Ocean Hammock Communities. In 100 work days, this is 40 trucks per day.
- There is no Environmental logic to digging sand inland, burning energy for transport, destroying the beach with all terrain trucks making mile long trips to the sand dumping area of Jungle Hut.
- If we find that the lower beach sand is not naturally replenishing, we can dredge during May-November period to put the sand back.

How is the County Helping?

- Flagler County does not have Emergency Delegated Authority to Permit Lower Dune Sand Recovery
- We must use all paths to obtain this FL-DEP Permit
- We would like Commissioners to accompany us to Tallahassee to gain this permit and win State support for a County length project
- We are willing to be part of a larger County project, but only if our community is protected for the 2017 Hurricane Season
- Last Monday, the Commissioners agreed to assist HD in all these areas; an engineering design and FL-DEP Permit are critical

Design Alternatives

- Truck or Push sand back to reform dune (no reinforcing techniques)
- Truck or Push sand, reform dune and reinforce under all walkovers
- Construct semi-hard core inside dune and cover with sand to original profile (have maintenance program to keep hardening buried)
- Place sheet piling at current vertical face before pushing sand back into position, reforming the dune
- Internal or External Boulder Hardening
- Trucking or dredging for any shortfall in available sand
- County length design of their choice

Alternative	Florida DEP Permit	Flagler County	FEMA	Marine Engineer	Contractor	Rough Estimate	HDOA % Pay
Scrape Beach	Needed	FL-DEP	Emergency	Design	Cline	$500K	25-100%
Restore Dune			Qualified	Inspect	P&S		
				Report	Halifax		
Truck Sand	Not	Emergency	Emergency		Cline	$2.0M	25-100%
Restore Dune	Needed	Permit	Qualified	Inspect	P&S		
					Halifax		
Truck Sand		Emergency	Emergency		Cline	$2.1M	28-100%
Restore Dune	Not	Permit	Qualified	Inspect	P&S		
Harden under	Needed?			Design	Halifax		
walkovers							
Dredge Sand	Needed	FL-DEP	Partial	Design		$3.0M	40-100%
GeoTube	Needed		Emergency	Inspect	???		
Scrape Beach	Needed		Qualified	Report			
Truck Sand			Partial	Design		$4.0M	70-100%
Sea Wall	Needed	FL-DEP	Emergency	Inspect	???		
Truck Sand-Rock			Partial	Design	Cline	$4.0M	70-100%
Boulder Core	Needed	FL-DEP	Emergency	Inspect	Halifax		
Truck Sand-Rock			Partial	Design			
Membrane	Needed	FL-DEP	Emergency	Inspect	???	$5.0M	75-100%
Riprap Surface							
Let County Lead			Unknown				State?
Do Nothing 2017							Damage?

Walkover Plan (Community & Individual)

- Walkovers can only be temporarily repaired as dune restoration may require removal
- Walkover at Playa Del Sur will be the first repair (by end of November)
- The Condos may repair their walkovers if they chose, but they may have to be removed for dune restoration
- The HD Club may repair its walkover, but again it may require removal
- The individual walkovers are unstable and must have new longer legs placed down into the beach; attach to existing legs at “cliff” of dune
- Until these actions are taken, owner-devised-ladders down to the beach are discouraged, and the HDOA must insist on safety

Funding Assistance

- Our dunes and beaches are public and much of the dune is manmade; They are “Facilities” in FEMA terminology
- Jungle Hut, 16th Street and Varn Parks were built and funded as part of the DRI for the full Hammock Project in 1984
- We have reviewed all criteria for FEMA filing (Individual and Public Assistance)
- Retained Legal help for likely FEMA appeals
- Attended meetings with State Senators Jack Latvala & Travis Hudson for State Funding
- Supported County for full-length project funded: Locally, State, and Federal
- Are seeking a meeting with Governor Scott

Questions, Discussion & Feedback