PORT EVERGLADES NAVIGATIONAL IMPROVEMENTS PROJECT

IWG Minimization and Modeling Update

April 20, 2018

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."

US Army Corps of Engineers

U.S.ARMY

Agenda

- Modeling Update and Path Forward
- Minimization Measures – Viable/Discounted
- Increased Indirect Effects Mitigation & Basis for Determination
- Summary

US Army Corps of Engineers

U.S.ARMY

Modeling Update

All 25 Dredge Scenarios have been run

- 4 Hydraulic States previously discussed
  - Northward Transport (Wave event late in two week period)
  - Southward Transport
  - Eastward Transport
  - Northward Transport (Wave event early in two week period)

Post-processing of the results is ongoing

Final plots and animations to be summarized in draft report and webinar with IWG: expected end of May

Additional analysis of available data to put hydraulic states in better context

US Army Corps of Engineers

U.S.ARMY

Minimization Measures – Under Evaluation

- Cutter Suction/Pipeline:
  - No overflow
  - No rock chopping
  - Spider barge loading area
- Environmental Windows
  - July-September
- Restricting anchoring outside channel

US Army Corps of Engineers

U.S.ARMY

Minimization Measures - Feasible

- Cutter Suction/Pipeline:
  - No overflow
  - No rock chopping
- Environmental Windows
  - July-September
- Restricting anchoring outside channel

US Army Corps of Engineers

U.S.ARMY

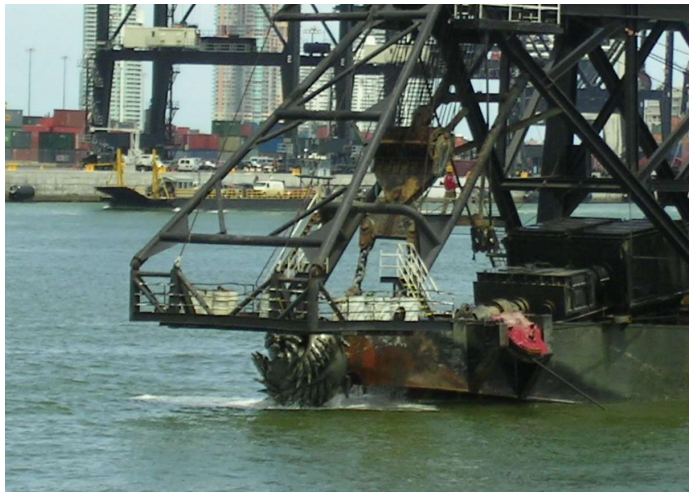
As of: 06 Apr 18
POC Lacy Pfaff, PE PMP

Minimization Measures – No Overflow

- No overflow - during loading of scows associated with cutterhead dredge.
- Decanting must be conducted to make scows able to transit to disposal location with dredged material.
  - Release of water (gravity drained) after loading, before transit.
  - This allows some of the material to settle out of the water column before water is released the surrounding ecosystem. One event (as compared to overflow which occurs during active loading of material) per scow loading cycle.

Minimization Measures – No Rock Chopping

- Rock Chopping (or rock rolling) is the operation of a hydraulic cutterhead without the suction pump turned on to pull the sediment laden water away from the cutterhead and to a disposal location/scow.
- Can be used as a hard rock pre-treatment technique in lieu of blasting.
- Can increase efficiency in that chopped rock can be picked up by a hydraulic hopper dredge (normally cannot dredge rock).



US Army Corps of Engineers

U.S.ARMY

Minimization Measures – Dredging Window

		Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
ESA listedd corals	*Acropora cervicornis*												
	Acropora palmata												
	Agaricia agaricites												
	Orbicella annularis												
	Orbicella faveolata												
	Orbicella franski												
	Mycetophyllia ferox												
Non-ESA Listed corals	*Dendrogyra cylindrus*												
	Montastra cavernosa												
	Dichocoenia stokesi												
	Oculina varicosa												
	Porites asteroides												
	Porites porites												
	Siderastrea siderea												
	Solenastrea bournoni												
	Stephanocoenia intersepta												
	Favia fragum												
		1	0	0	1	4	1	4	11	7	3	1	1

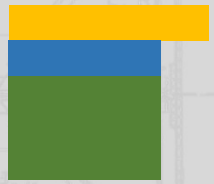
Snook spawning

Main concern is a window for BLASTING in the OEC

2014 Bleaching event

2015 Bleaching event

2016 Bleaching event



50%/50% split between watch and warning

50% watch/25% warning/25% Alert level 1

This was watch conditions throughout the summer - only a short period of time for warning

Source - DEP Bleachwatch/NOAA Bleachwatch - http://www.dep.state.fl.us/coastal/programs/coral/bleachwatch.htm

US Army Corps of Engineers

U.S.ARMY

Minimization Measures – Spider Barge Loading Area Beyond 3rd Reef

- Length of pipeline – floating with joints (leakage due to wear, especially with rock)
- Navigation issues/conflict with larger vessels
- Safety issues with recreational boaters if floating pipe
- Difficult and unsafe conditions for adding and removing pipe while trying to maintain productivity
- Sloshing of material within the scows/overtopping due to higher seas
- Water depth drops very quickly after 3rd reef (100-300ft within ½ mile)

US Army Corps of Engineers

U.S.ARMY

Indirect Effects – Analysis Assumptions

Zones:

- 0-150m
  - Port of Miami: Area of highest concentration of dredged material settling out of water column (sand & flocculated clay sized sediments).
  - Gajewski and Uscinowicz (1993): Hopper dredging operations in the Baltic, noted that the main deposition of sand from hopper dredge overflow was confined to distances within 150 m on each side of the dredge
- 151-450m
  - Port of Miami: the furthest sediment impact was delineated on any of the other reef habitats was 450m (w/the exception of R2N)

US Army Corps of Engineers

U.S.ARMY

Indirect Effects – Analysis Assumptions

Zones:

- 451-750m –
  - Miller *et al. 2016*
  - Port of Miami - Sediment delineation report (Aug 2015)
  - Newell and Siederer (2003)
- 751-1200m – No impacts noted beyond 750m
  - Port of Miami
  - Port Everglades 1980

US Army Corps of Engineers

U.S.ARMY

RECOVERY TIMEFRAMES

- Functional Group Comparison – 1993-2000 & 2009/2010
  - Seven year Recovery Timeframe for Indirect Effects
  - Port of Miami 1991-93 Dredging vs 2000 Miami Harbor GRR Baseline
  - Port of Miami 1991-1993 Dredging vs 2009/2010 baseline study Indirect-effect and reference sites sampled vs other reef areas in southeastern Florida (Gilliam (2007), Moyer et al. (2003))

US Army Corps of Engineers

U.S.ARMY

Average Sediment Depth by Location/ Coral Recruit Density

Row Labels (the numbers refer to distance in meters from channel)	Avg Sediment Depth Dec 2015 (cm)	Avg Sediment Depth Sept 2016 (cm)	Recruit Density
R2N1-RR		0.56	1.2
R2N1-LR		2.19**	1.2
R2N-75-RR		0.44	1.4
R2N-75-LR		0.49	1.2
R2N-100-RR	1.78		
R2N-100-HR	1.65		
R2N-150-RR		0.57	0.7
R2N-150-LR		1.0	0.6
R2N-200-LR	1.68		
R2N-200-HR	4.2		
R2N-250-RR		0.66	1.2
R2N-250-LR		0.6	2.2
R2N-300-RR	0.72		
R2N-300-LR	0.92		
R2N-350-RR		0.46	0.6
R2N-350-LR		0.4	0.8
R2N-450-RR		0.45	0.2
R2N-450-LR		1.0	0.9
R2N-500-LR	1.3		
R2N-500-HR	0.95		
R2N-550-RR		0.49	0.6
R2N-550-LR		0.5	0.9
R2N-650-RR		0.58	0.6
R2N-650-LR		0.5	0.3
R2N-700-HR	2.1		
R2N-750-RR		0.49	0.6
R2N-750-LR		0.6	0.8
R2N-850-RR		0.6	1.4
R2N-875-LR		0.5	0.8
R2NC2-RR		0.3	1.6
R2NC1-LR		0.8	2.6
R2NC3-LR		0.4	1.4
USACE R2N-LR	0.32		
USACE R2N-HR	0.30		

- Based on the 20-month timeframe associated with the Miami Harbor data, the 18-month timeframe associated with monitoring from the Broward County shore protection project and the other monitoring reports that detail even shorter recovery times, the minimum impact recovery timeline would be two years. However, this may be extended to be conservative

.

- During post-construction surveys, all monitoring sites had coral recruits (<3cm in diameter) ranging from 0.2 to 2.2 recruits/m^2 (mean 0.91 $\pm$0.45), while controls ranged from 1.4-2.6 recruits/m^2 (mean 1.87 $\pm$ 0.64).

US Army Corps of Engineers

U.S.ARMY

Recovery Timeframe Durations by Sediment Depth Range

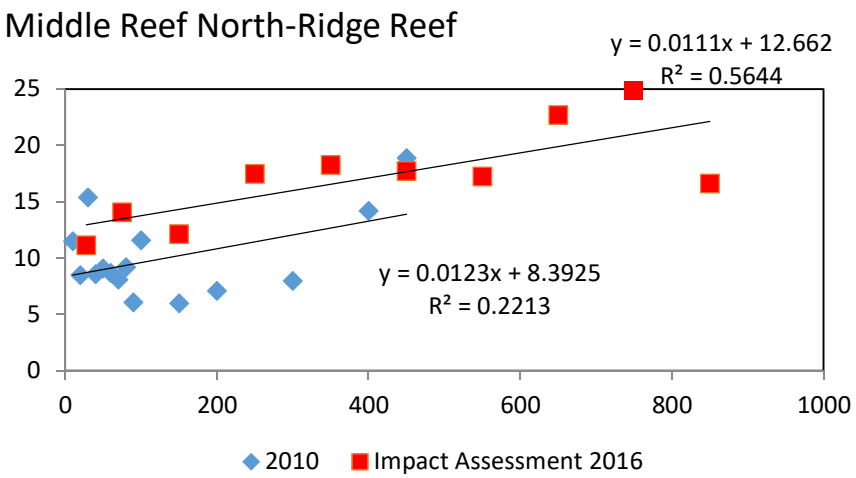
Literature	Sediment Depths	Location	Reported Recovery time
Marszalek, 1981	>1 cm in 2 hours	Nearshore & Reefs 2 & 3 Miami-Dade County	2 months (dredging pulses between 1977-1980)
Blair et al 1994	1 to 4 cm silty clay material	Offshore Miami-Dade County (offshore reefs)	2 months
Welch 2002	2 cm	Reef 2 and 3 Miami-Dade County	1 week
Welch 2002	2.9 cm	Reef 2 and 3 Miami-Dade County	“soon after dredging stopped”
Welch 2002	1.14 cm	Reef 2 and 3 Miami-Dade County	“within a few months”
Prekel et al 2008	Beach quality sand 6 to 8 cm of sand	Nearshore hardbottom Broward County	18 months post construction
DERM 2014	3.7 cm (BAL6)	Reef 2 and 3 Miami-Dade County	6 months

US Army Corps of Engineers

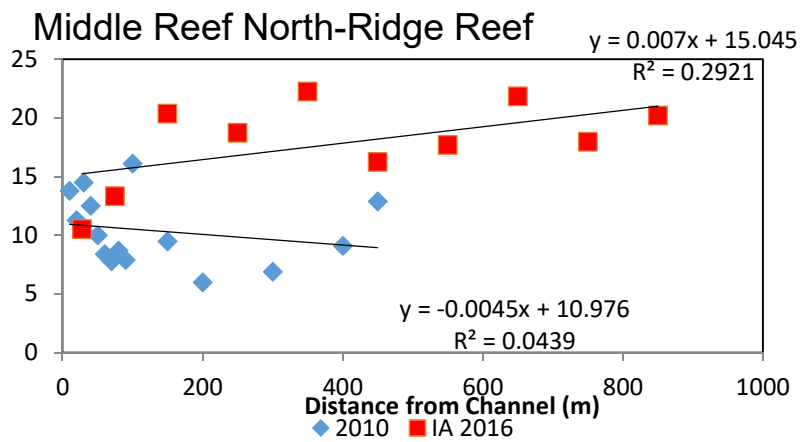
U.S.ARMY

Functional Loss Percentages - Impact

150-450 m – 5%loss/451-750 – 2% loss



Octocoral densities – 2010 vs 2016



Sponge densities – 2010 vs 2016

750m+ - no functional loss

No adverse effects of project noted beyond 750m, resulting in no loss of habitat function

US Army Corps of Engineers

U.S.ARMY

Upfront Mitigation – Indirect Effects

- Coral outplants (based on 1.4 corals/m^2, may decrease based on results of recon study) – 14,676 outplants
- Additional 1.6 acres of artificial reef associated with indirect effects (additional to the 5 acres artificial reef proposed for direct impacts = total 6.6 acres).

US Army Corps of Engineers

U.S.ARMY

Monitoring & Adaptive Management Plan Development

- FDEP strawman – 1,200 meters from the channel edge
- Meeting in June to begin development

US Army Corps of Engineers

U.S.ARMY

Minimization Measures – Spider Barge Loading Area Beyond 3rd Reef

Length of pipeline – floating with joints (leakage due to wear)

- Clogging – longer pipe, lower pressure through the length of the pipe
  - Break open to clean out a blockage – release of dredged material in the pipe into the water column.
- Leakage – potential for loss of material over the reef – since pipe would float over reef – cannot float in the boundaries of the channel – hazard to navigation.
- Maintenance downtown and failures
  - Lights on pipelines – other vessel safety
  - Increased liability, human safety

US Army Corps of Engineers

U.S.ARMY