APPENDIX A

LAKE WORTH INLET

Palm Beach Harbor

NAVIGATION STUDY FOR
LAKE WORTH INLET, FLORIDA

DRAFT INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A

ENGINEERING

U.S. ARMY CORPS OF ENGINEERS
JACKSONVILLE DISTRICT

LAKE WORTH INLET NAVIGATION PROJECT
PILOT FEASIBILITY STUDY

Engineering Appendix - Attachment D
VALUE ENGINEERING REPORT

25 JULY 2012

DOD SERVICE: USACE **VALUE ENGINEERING OFFICER:** Jimmy Matthews, PE, CVS
CONTROL NO: CESAJ-VE-2012-003C

REPORT INFORMATION

VALUE ENGINEERING FIRM: U. S. Army Corps of Engineers
Jacksonville District
701 San Marco Blvd
Jacksonville, FL 32232-0019
(904) 232-1903

VALUE ENGINEERING WORKSHOP CONDUCTED: 18-25 June 2012

VALUE ENGINEERING STUDY TEAM LEADERS: Frank Vicidomina, CVS and Jimmy Matthews, PE, CVS

VALUE ENGINEERING STUDY TEAM MEMBERS: Team member names and contact information are listed in Appendix A.

POINTS OF CONTACT: Frank Vicidomina, PE, CVS, CEMVN-PM, (504) 862-1251

Stacey Roth, PE, Planning Technical Lead, CESAJ-PD-PN, (904) 232-1055

Jimmy Matthews, PE, CVS, Value Engineering Officer, CESAJ-EN-Q, (904) 232-2087

STUDY RESULTS:

Number of Proposals: 4
Number of Accepted Proposals: 4

Number of Quantitative Proposals: 4
Number of Qualitative Proposals: 0

Maximum Cost Avoidance (Gross): $34,000,000
Accepted Cost Avoidance (Gross): $19,500,000

Study Cost to Government: $80,000

Return on Investment: *TBD*

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EXECUTIVE SUMMARY

This report contains the results of the Value Engineering (VE) Workshop that was performed June 18 – 22, 2012 using the USACE six step Value Engineering Job Plan. The objective of this workshop was to incorporate VE analysis into the development and validation of the proposed Tentatively Selected Plan (TSP). This was achieved by refinement of the current proposed TSP with focus on high-cost items and high risk issues including, but not limited to the following aspects of this navigation project:

- Mitigation options
- Disposal options
- Advanced channel maintenance issues
- Jetty stabilization issues

The results indicated 4 Potential Cost Avoidance opportunities as listed below and 25 comments that should be considered during subsequent project refinements. It is recommended that below proposals 1 and 2 be budgeted and scheduled for further investigation during the Pre-construction, Engineering and Design (PED) Phase. The reason is that authorization is not expected for two to three years and the PED phase start for two to four years. Expending current funding may not add value at the present time as these disposal sites may not be available in out years. Refer to Appendix H and Appendix G for supporting documentation.

PROPOSAL NUMBER	DESCRIPTION	POTENTIAL AVOIDANCESS	RECOMMENDED ACTION
1	Consider potential alternate and/or beneficial use disposal sites for non-beach suitable dredged material	$16,500,000	Adopt
2	Utilize FIND DMMA on Peanut Island for a portion of dredged material generated from the Inner Channel and Turning Basin	$14,500,000	Adopt **
3	Increase beach template (south of the inlet)	$6,500,000	Adopt
4	Eliminate reinforcement and deepening of Marginal Wharves bulkheads	$13,000,000	Adopt
	Estimated Total First Cost Savings	$19,500,000 to $34,000,000	
	Estimated Total Life Cycle Cost Savings	Same	

****** The Florida Inland Navigation District has near term plans for the DMMA that may make it unavailable.

INTRODUCTION

As stated above, this report documents the VE workshop conducted 18-22 June 2012. This workshop was conducted using the six-phase Value Engineering Job Plan as sanctioned by USACE and the Society of American Value Engineers International (SAVE). This process, as explained below, was executed as part of daily activities as described in the Workshop Agenda exhibited in Appendix A. The VE Team was comprised of project team members, representatives from the non-Federal sponsor and the Florida Department of Environmental Protection (FDEP). A roster of workshop participants can be found at Appendix B. As part of the workshop, the Team identified important project issues and developed project performance attributes. These are tabulated in Appendix C. A Function Analysis System Technique (FAST) diagram was developed to map the project function analysis. It is displayed in Appendix D. Next, creative project improvement ideas were compiled and screened. Appendix E lists all ideas (Speculation List) with their disposition. The VE Workshop culminated in the development phase where ideas were captured as either Quantitative Potential Cost Avoidances or Comments. Appendices G and H provide the related documentation.

Value Engineering Job Plan:

Information Phase

At the beginning of the study, the project team presents current planning and design status of the project. This includes a general overview and various project requirements. Project details are presented as appropriate. Discussion with the VE Team enhances the Team's knowledge and understanding of the project. A field trip to the project site may also be included as part of information gathering.

Function Analysis Phase

Key to the VE process is the Function Analysis Process. Analyzing the functional requirements of a project is essential to assuring an owner that the project has been designed to meet the stated criteria and its need and purpose. The analysis of these functions is a primary element in a value study, and is used to develop alternatives. This procedure is beneficial to the team, as it forces the participants to think in terms of functions and their relative value in meeting the project's need and purpose. This facilitates a deeper understanding of the project.

Creativity Phase

The Creativity Phase involves identifying and listing creative ideas. During this phase, the team participates in a brainstorming session to identify as many means as possible to provide the necessary project functions. Judgment of the ideas is not permitted in order to generate a broad range of ideas.

Evaluation Phase

The purpose of the Evaluation Phase was to systematically assess the potential impacts of ideas generated during the Creativity Phase relative to their potential for value improvement. Each idea is evaluated in terms of its potential impact to cost and overall project performance. Once each idea is fully evaluated, it is given a rating to identify whether it would be carried forward and developed as an

alternative, presented as a design suggestion, dismissed from further consideration or is already being done.

Development Phase

During the Development Phase, ideas passing evaluation are expanded and developed into value alternatives. The development process considers such things as the impact to performance, cost, constructability, and schedule of the alternative concepts relative to the baseline concept. This analysis is prepared as appropriate for each alternative, and the information may include an initial cost and life-cycle cost comparisons. Each alternative describes the baseline concept and proposed changes and includes a technical discussion.

Presentation Phase

The VE Workshop concludes with a preliminary presentation of the value team's assessment of the project and value alternatives. The presentation provides an opportunity for the owner, project team, and stakeholders to preview the alternatives and develop an understanding of the rationale behind them.

PROJECT DESCRIPTION

Lake Worth Inlet is in Palm Beach County, Florida. The Port of Palm Beach is located 1.1 miles west of the entrance to Lake Worth Inlet. The north side of the harbor is Riviera Beach and the south side of the harbor is West Palm Beach. Palm Beach Harbor is 259 miles south of Jacksonville and 68 miles north of Miami.

The inlet and harbor provide access to deep draft vessel traffic using terminal facilities located at the Port of Palm Beach. As exhibited below, the existing authorized channel is comprised of: an entrance channel 35 feet deep, 400 feet wide, and 0.8 miles long;, an inner channel 33 feet deep, 300 feet wide and 0.3 miles long; a turning basin, 1,400 feet north-south along the north of the project turning basin to 24 feet; and jetties and shore revetments at the inlet. The entire length of the project is approximately 1.6 miles. Maintenance of the northern turning basin including the area of slip 1 is authorized to 24 feet; however much of this area is constructed to 33 feet by the non-Federal sponsor.

Lake Worth Inlet

The Port of Palm Beach is the fourth busiest container port in Florida and the eighteenth busiest in the continental United States. The port has evolved into an export port and is a major nodal point for the shipment of bulk sugar, molasses, cement, utility fuels, water, produce, and break bulk items. In addition, the Bahamas Celebration cruise ship is based at the port. Located in the heart of south Florida's tourism enclave, the port also serves significant recreational boat traffic.

Based on modern vessel sizes, the port is operating with insufficient channel width and depth. These deficiencies cause the local harbor pilots and the U.S Coast Guard to place restrictions on vessel transit to ensure safety. In turn, these restrictions lead to time delays and light loading – resulting in economic inefficiencies that translate into costs to the national economy. Lake Worth Inlet, serving as the entrance channel to the port, is inadequate both in width and depth, negatively impacting future port potential and creating economic inefficiencies with the current fleet of vessels. Project problems, objectives and constraints are further defined and illustrated in Appendix F.

The current feasibility study is being executed under the USACE Accelerated Feasibility Study Pilot Program. This program tests streamlined applications of planning principles while completing a feasibility study on an accelerated schedule. A number of alternative options that will address problems and needs have been identified and evaluated. Optimization of benefits, costs and risks has resulted in the current determination of a proposed Tentatively Selected Plan as presented below.

PROPOSED TENTATIVELY SELECTED PLAN

At the time of this workshop, the PDT has performed a preliminary evaluation of channel enlargement alternatives ranging from maintaining a 33-foot depth and just widening the channel, to establishing a 43-foot channel depth with widening. Benefits and costs for alternatives at one-foot depth increments in between these min and max limits were developed and resulted in alternative 'net benefits' (equivalent annual benefits minus equivalent annual costs) as illustrated in the below graph. Having the highest net benefits, channel deepening to 38-feet with widening was identified as the preliminary TSP.

The preliminary TSP is further defined as follows (reference below map):

E

- Widening and deepening of the entrance channel, ocean-side settling basin, interior channel and turning basin.

- Total dredged material quantity of approximately 1.2 million cubic yards (CY) of which 200,000 CY is designated for hydraulic beach fill re-nourishment and 1 million CY to be sent via scow barge transport to the designated offshore disposal site (ODMDS).

- Dredging of the entrance channel and settling basin assumed to be accomplished by cutter head plant with hydraulic pipeline discharge (pipeline dredging)

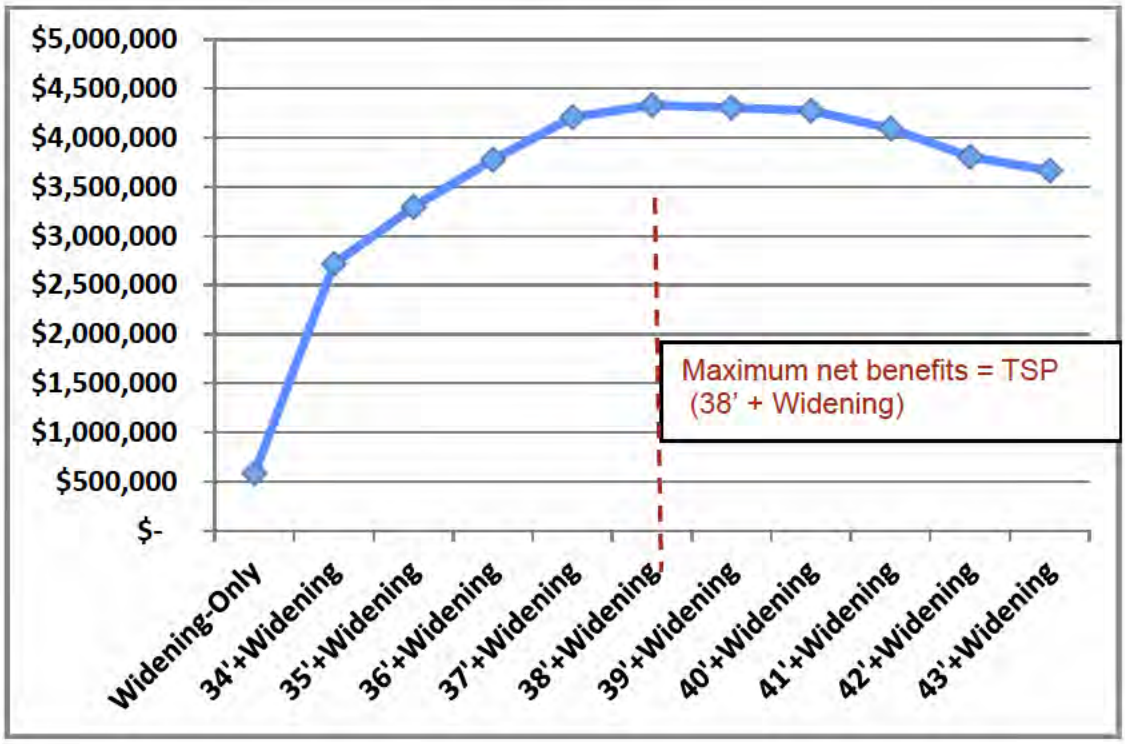
- Interior channel and turning basing dredging assumed to be performed via mechanical excavation (mechanical dredging)

- Bulkhead stabilization and/or berth deepening to three existing wharfs

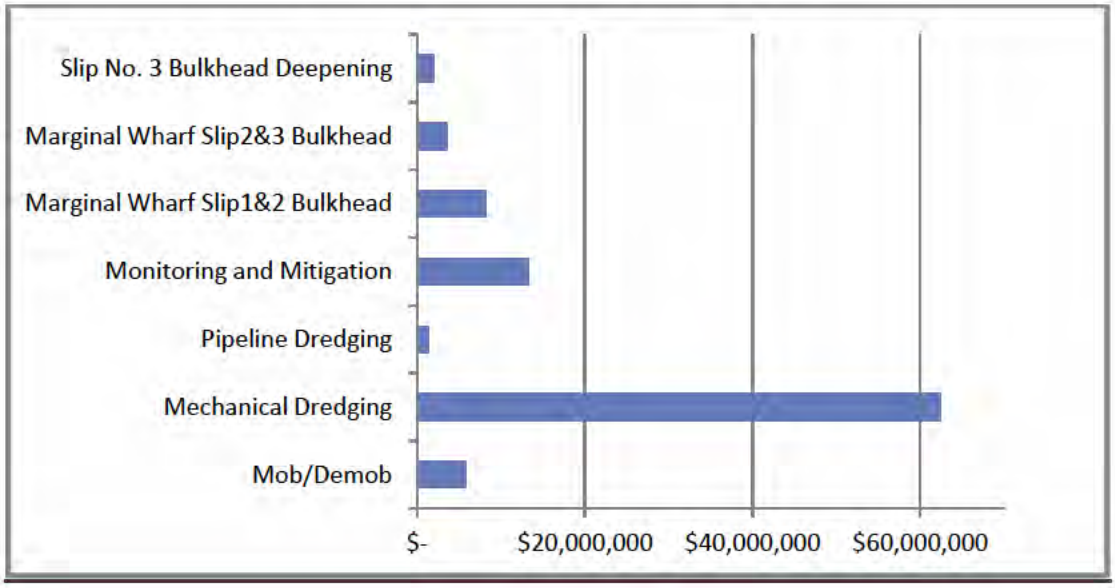
- Associated environmental mitigation of anticipated disturbance to seagrass, hard bottom and reef areas; a specific project environmental impact mitigation plan is to be developed.

Preliminay Average Annual Equivalent (AAEQ) Net Benefits and preliminary estimated costs were developed and are illustrated below.

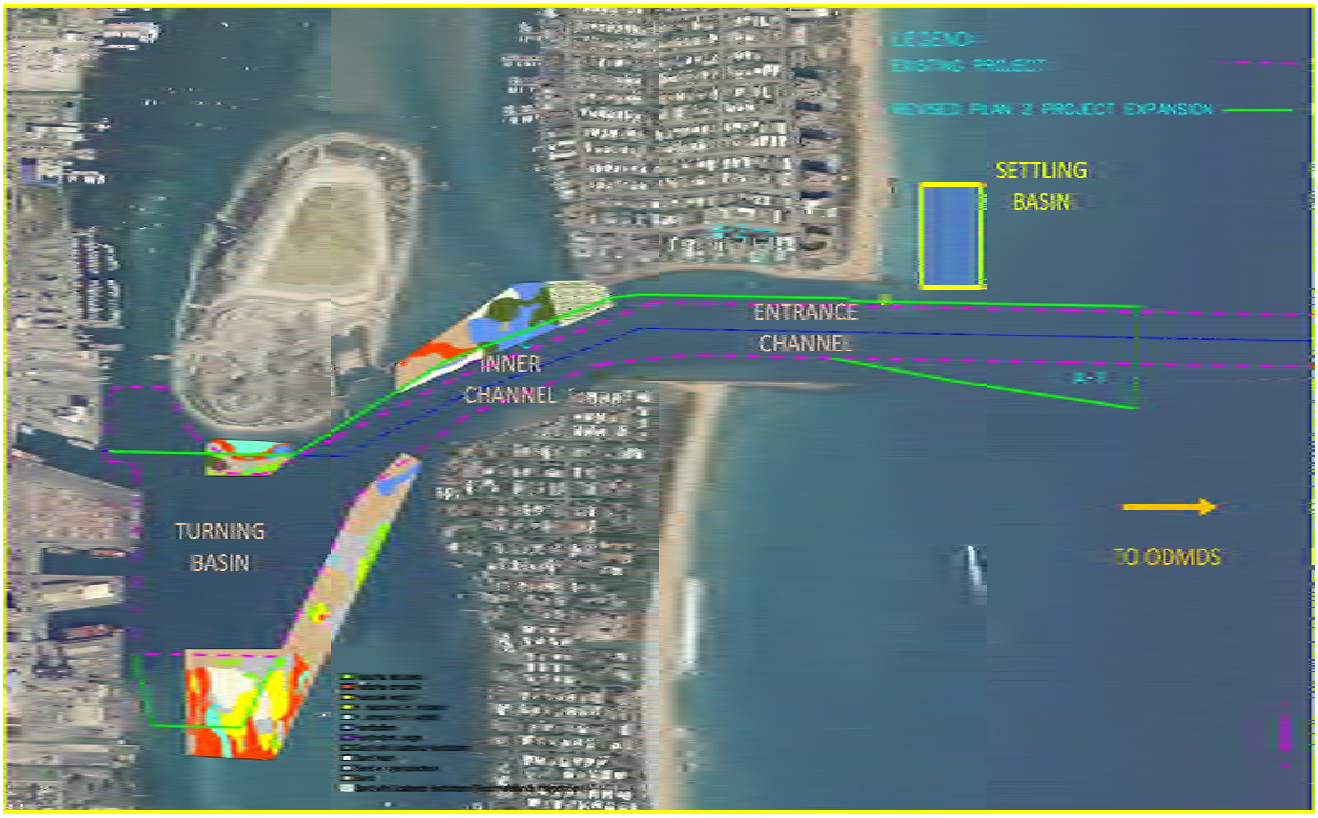
AAEQ Net Benefits



Preliminary Cost Model for 38-Foot Alternative



Current Plan with Environmental Resources



STUDY RESULTS

Study results are summarized below in findings where overall concepts have been summarized, in proposals where quantitative cost avoidance opportunities can be realized and in comments where ideas are captured that could add value during subsequent stages of development. Four VE 'Proposals' are illustrated in a structured format and indicate potential cost-savings relative to the current preliminary plan. The remaining items are presented as non-structured comments that further discuss each potential refinement. Refer to Appendices G and H for supporting documentation.

It should be noted that these proposals and comments were developed in a very short period of time and are intended to present conceptual measures for consideration. Further evaluation and design is required to substantiate each recommendation and provide rationale for its implementation or rejection.

Also, a number of recommendations may 'conflict' with others. That is to say that one idea cannot be implemented with the other. No decision as to preference was made by the VE Team and all options are presented for further consideration by the PDT.

FINDINGS

Use pipeline dredging instead of mechanical dredging for the inner channel and turning basin. Preliminary soils testing data presented at the workshop indicates that there may be no significant hard rock content of the channel bottom. If further testing validates such conditions throughout the area, it will be possible to utilize cutter head and pipeline dredge plant. As discussed below there are apparent locations within pumping distance of the project that may accept the majority or all of the required dredged material removal. This will result in significant cost-avoidance versus the current plan of mechanical excavation with scow barge transport to the designated off-shore disposal site (ODMDS).

Develop additional alternatives that would reduce and could totally eliminate disposal at ODMDS. A number of locations appear to be available to receive beach suitable sand from the entrance channel and settling basin or mixed material from the inner channel and turning basin with resulting reduction or total elimination of the need to deliver material to the ODMDS. Possible options include:

- Expand beach template – Nearby beaches designated for dredged sand placement can be enlarged and accept additional material.
- Mid-town beach placement – Additional dredged material pumping distance is possible and delivery to beaches further south (Mid-town) of the currently planned sand placement area can be considered.
- Use of FIND DMMA on Peanut Island for dredged material placement – The previously utilized dredged material placement area on Peanut Island may apparently accept significantly more material. Its close proximity to the inner channel and turning basin would make its use a most cost-effective option.
- Possible placement locations in the lagoon- Several lagoon locations are within reasonable distance from the project and are in apparent need of beneficial (submerged) fill (Little Lake Worth, Turtle Cove and Ibis Isle). Significant fill capacity is available in one or more of these sites

and if used in combination with the above mentioned Peanut Island area, it appears possible to place all project dredged material from the inner channel and turning basin (mixed material) to these sites.

Explore other mitigation considerations. Comments that could possibly improve and/or expedite mitigation are:

- Mitigation work may be performed by non-fed sponsor or other agencies – Several non-federal entities have experience and on-going mitigation activities and/or needs that may efficiently accommodate project mitigation requirements.
- Possibility of having non-federal sponsor do work in advance with credit towards project – The non-federal sponsor may perform (either directly or via other appropriate /approved entities) mitigation work in advance of project construction. Cost-sharing credit may be obtained by the sponsor for approved cost.
- Consideration of presenting multiple mitigation locations in approved report – It may be advantageous to draft and present several mitigation plan options in lieu of a single plan. This will provide flexibility and pre-arranged adaptation if future conditions change prior to implementation of mitigation measures.

PROPOSALS

PROPOSAL NUMBER	DESCRIPTION	POTENTIAL AVOIDANCES	RECOMMENDED ACTION
1	Consider potential alternate and/or beneficial use disposal sites for non-beach suitable dredged material	$16,500,000	Adopt
2	Utilize FIND DMMA on Peanut Island for a portion of dredged material generated from the Inner Channel and Turning Basin	$14,500,000	Adopt**
3	Increase beach template (south of the inlet)	$6,500,000	Adopt
4	Eliminate reinforcement and deepening of Marginal Wharves bulkheads	$13,000,000	Adopt
	Estimated Total First Cost Savings	$19,500,000 to $34,000,000	
	Estimated Total Life Cycle Cost Savings	Same	

**** The Florida Inland Navigation District has near term plans for the DMMA that may make it unavailable.

COMMENTS

5. Obtain permit variances to allow greater flexibility with turbidity

6. Consider capping non-select dredged material with sand to meet fill area requirements

7. Develop the Port's DMMA on Peanut Island; raise dikes on FIND DMMA and improve dikes on Port DMMA and empty the port side of Peanut Island and use it for beneficial use

8. Segregate rock and/or other select material for various specific utilizations

9. Use peanut island DA for processing

10. Investigate Upland Disposal Options

11. Use controlled placement scheme to place rock at interim ODMDS to create habitat

12. Use sand shooter (rainbow) to create seagrass in substrate limited areas

13. Optimize “expanded” settling basin design and advanced maintenance footprints

14. Optimize channel advanced maintenance/ vertical settling basin

15. Optimize Sand Transfer Plant

16. Consider construction of a groin north of “expanded” settling basin

17. Consider Canaveral-type sand bypass to beach

18. Optimize the reef at Peanut Island

19. Dredge the Peanut Island shoal and use the area to create seagrass mitigation –

20. Use of dredged rock for placement into existing county approved reef sites

21. Buy privately owned submerged lands, then put them under conservation easement and donate them to state park

22. Partner with the resource agencies to identify mitigation and beneficial use sites

23. Allow non-federal interests to complete project and/or work-in-kind mitigation and beneficial use features

24. Install mitigation features early to avoid temporal loss of habitat

25. Create mangrove islands

26. Have a suite of mitigation options, rather than one option, for authorized report (and have NEPA cover all options)

27. Develop recreation alternatives for inclusion into recommended plan evaluations and explore the use of dredged materials in the same

28. Combine entrance channel area deepening with regular dredging maintenance cycle

29. Execute multiple dredging contracts

VALUE ENGINEERING RECOMMENDATIONS

The VE Team identified **29** items that are believed to either improve project performance and/or cost-effectiveness. The results indicated Potential Cost Avoidance opportunities and 25 comments that should be considered during subsequent project refinements. It is recommended that proposals 1 and 2 be budgeted and scheduled for further investigation during the Pre-construction, Engineering and Design (PED) Phase. The reason is that authorization is not expected for two to three years and the PED phase start for two to four years. Expending current funding may not add value at the present time as these disposal site opportunities may not be available in out years. Refer to Appendix H and Appendix G for supporting documentation.

APPENDIX A: VALUE ENGINEERING WORKSHOP AGENDA

LAKE WORTH INLET – VALUE ENGINEERING WORKSHOP AGENDA

(ALL MEETINGS HELD AT USACE OFFICE – PRUDENTIAL OFFICE BUILDING, 12TH FLOOR CONFERENCE ROOM)

MONDAY
18Jun12:

Scope: To refine the Tentatively Selected Plan (TSP) in terms of high cost and high risk issues: 1) mitigation options, 2) disposal options, 3) advanced maintenance issues, and 4) jetty stability issues. Goal is for the VE to act as a catalyst to launch the team into detailed design and refined costs of TSP.

12:30-1:00	Introductions and Workshop Purpose - Tim Murphy VE Process, How it will be used, and Agenda - Jimmy Matthews
1:00-5:00	*Information Phase:* Presentation of Project Status and Summary of Tentatively Selected Plan (TSP) – Project Delivery Team Project background presentation – Stacey Roth PDT Site Visit Presentation with Google Earth – Stacey Roth and PDT Plan Formulation – Stacey Roth Design – Steve Conger Project depths and associated added depths – PDT Economics (Restrictions) – Max Millstein Shoaling Analysis (advanced maintenance and settling basin) – Steve Bratos Geotechnical and Geology – Felicia Copeland and Barbara Nist ▪ Jetty stabilization issue ▪ Types of dredged materials Environmental – Pat Griffin and Angie Dunn ▪ Seagrass, Hardbottoms, Manatees Cost Overview and Cost Model – Jennifer Tyler Final Array and Net benefits – TSP Net Benefits Stakeholders Presentation Summary of Project Issues, Risks, and Constraints – VE Team (Mitigation, Material Disposal and Beneficial Use, Advanced Maintenance and Settling Basin Configuration, Jetty Stability Risk Avoidance) VE Study Performance Attributes - Frank Vicidomina Summarize TSP and Re-cap for the day – Stacey Roth and Tim Murphy
Hourly	Break

TUESDAY
19Jun12:

8:30 – 9:30 *Day One Re-cap and Function Analysis Phase:* - Frank Vicidomina

9:45-11:30 *Creativity Phase:* (Brainstorming – Ideas by PDT/VE Team) - Frank Vicidomina

Hourly Break

11:30-12:30 Lunch

12:30-1:00 *Complete Creativity Phase:* (Brainstorming – Ideas by PDT/VE Team) - Frank Vicidomina

1:00 – 4:00 *Evaluation Phase:* (Critical assessment of Brainstorming - Includes determination of priority ideas and assignments for PDT/VE members) – Frank Vicidomina

4:00-5:00 *Proposal and Comment Development Assignments*: - Frank Vicidomina

Hourly Break

WEDNESDAY
20Jun12:

8:30 – 10:30 *Explain and Start Development Phase:* (Start PDT development of priority ideas recommended to be incorporated into BCR Comparison and TSP Selection/Refinement) - Frank Vicidomina

Hourly Break

11:30-12:30 Lunch

10:30 – 5:00 *Continue Development Phase:* (Start PDT development of priority ideas recommended to be incorporated into BCR Comparison and TSP Selection/Refinement)

THURSDAY
21Jun12:

8:30-2:00 *Complete Development Phase:* Team Touch base on Development Phase progress

2:00-4:00 *Summarize Proposals for IPR and Start Presentation Prep:* - PM, PDT, & Jimmy Matthews

Work Shop Completion Activities and IPR Preparation:

MONDAY
25Jun12: **To be determined**
10:00 AM PDT/VE Meeting - Discuss final proposals and submit proposals

Presentation Phase: Presentation of Workshop Results – Jimmy Matthews and Frank Vicidomina

Where do we go from here?

11:00-5:00 Continue to build IPR4 Presentation
*Goal is to have PowerPoint presentation which includes:

TUESDAY
26Jun12:
2:30 – 5:00 PM **IPR4 –** VE/PDT Briefs Vertical team of TSP and early VE findings, receives feedback and input for incorporation and development of VE Study – Jimmy Matthews and Frank Vicidomina

6Jul12: Draft Value Engineering Study Report submittal to PDT – Jimmy & Frank

13Jul12: PDT Comments on Draft Value Engineering Study Report - PDT

20Jul12: Final Comment Resolution by PDT/VE Team Leader – Jimmy & Frank

24Jul12: Submit Final VE Report to PDT (VE Complete) – Jimmy & Frank

APPENDIX B: WORKSHOP PARTICIPANT ROSTER

LAKE WORK INLET VALUE ENGINEERING WORKSHOP
18-21 June 2012 ATTENDANCE

DATE:
PROJECT:
LOCATION:

NAME	AGENCY	PHONE	E-MAIL
Frank Vicidomina	CEMVN-PM	504-862-1251	Frank.Vicidomina@us.army.mil
Jimmy Matthews	CESAJ-EN-Q	904-232-2087	Jimmy.D.Matthews@usace.army.mil
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Max Millstein	CESAJ-PD-D	904-232-2481	Max.J.Millstein@usace.army.mil
Samantha Borer	CESAJ-PD-PN	904-232-1066	Samantha.J.Borer@usace.army.mil

APPENDIX C: PROJECT ISSUES, PERFORMANCE ATTRIBUTES AND GENERAL NOTES

(Project Issues)

1. Potential hydraulic condition changes due to reconf of channel and settling basin and impacts.
2. Potential change in mitigation impact conditions if there is a lag between project authorization and construction.
3. Expensive mechanical dredging.
4. Possibility of windows for dredging (manatees and sea turtles).
5. North jetty stability – deeper depths, more likely jetty impact.
6. Potential mitigation sites may get used and might be available when project is constructed.
7. Limited beach disposal capacity.
8. Limited capacity in ODMDS (per SMMP, 2004)
9. Potential impact to long term coastal sediment budget.
10. How the final array is clustered. Note the undocumented 5% rule.
11. The unknown material is a big cost. No blasting currently in cost estimate.
12. 24 hr vs 12 hr work for mechanical (excavator)
13. Mitigation and monitoring cost %.
14. Effectiveness of settling basin.
15. Cost limitations for non-fed sponsor. Could eventually have a locally preferred plan.
16. Construction duration of project ranges. Mechanical dredging drives the duration.
17. How much material is available for beneficial use? Is the sand/rock mix appropriate for beneficial use?
18. Try to keep lagoon sediments (even rock/sand) in the lagoon.
19. Dredged holes are still available to accept material for seagrass mitigation.
20. Hydraulic placement has been prohibited on past PBC filling projects.

(Performance Attributes)

The following 'performance attributes' list and describe critical factors that impact project performance and/or cost. Their purpose is to provide some order of measure as to whether or not a specifically proposed project change is justified or not.

While not quantifiably 'weighted' relative to one another, the relative order of importance of each attribute is reflected in the numbering as indicated:

1) ***Enhance Navigation*** - This is the project's highest order function; recommendations that further improve channel navigation over and beyond present conceptual design should be fully considered. Specific objectives include, but are not limited to, reducing vessel light loading, tidal delays and improving ship traffic safety.

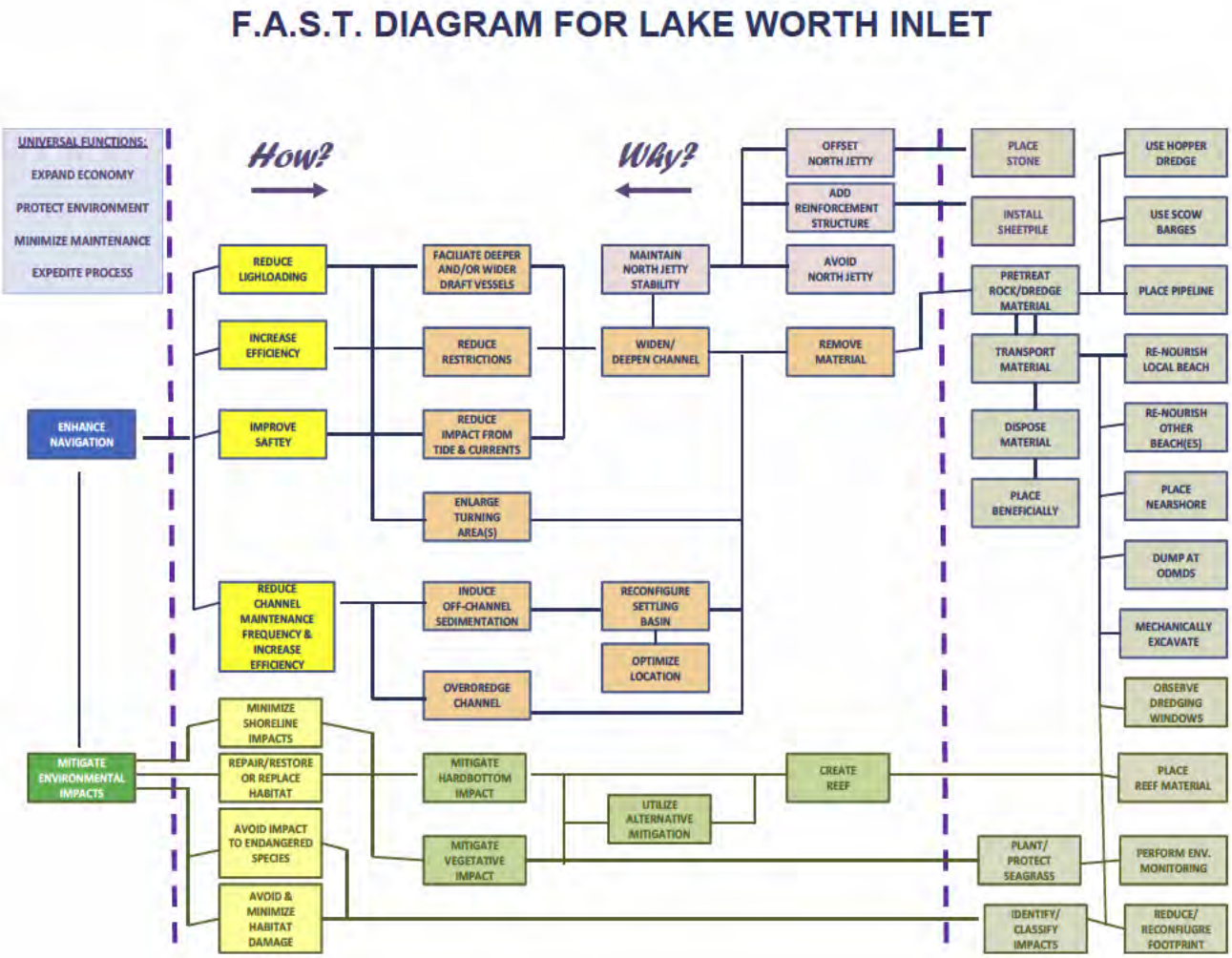
2) ***Reduce Project Cost Risk*** - Cost variance for several critical aspects of this project can have a significant effect on overall project cost and may affect plan selection. Such uncertainty risk must be covered in project funding. Alternatives that reduce such uncertainty ultimately reduce total project cost.

3) ***Expedite Process*** – Measures that facilitate both completion of the Pilot Feasibility study, project authorization and execution bring forward significant project benefits.

4) ***Optimize Disposal*** - Dredged material disposal options vary considerably and have a direct and significant effect on project cost. Disposal alternatives do, however have varying benefits depending on utilization. Options that balance and further optimize disposal should be considered.

5) ***Optimize Channel Maintenance*** - The benefits of over dredging to lengthen the interval until maintenance is required must be weighed against cost. Additionally, any adverse impacts to harbor maintenance through increased shoaling should be avoided. Recommendations that improve overall channel maintenance should be considered.

APPENDIX D: FUNCTION ANALYSIS SYSTEM TECHNIQUE (F.A.S.T.) DIAGRAM



APPENDIX E: SPECULATION LIST

LAKE WORTH INLET VALUE ENGINEERING STUDY IDEA SPECULATION LIST			PAGE 1 of 4
P,C,ABC,X	NO.	IDEA	Notes
x	1	relocate the Warm Water Discharge from FP&L (location currently in vicinity of G)	would be helpful to project and possible savings - could dredge in winter
c	2	screen dregding material from turning basin and put it on beach/nearshore or break into little pieces, no ODMDS	best would be to screen if upland; but bigger screens can work on scows; or "grizzly"
c	3	Look at putting more of the material from inner channel onto beach	will be done once material is known
x	4	extend north jetty	good idea but possibly not cost effective; would be better to define toe of north jetty
x	5	install teleportation system at port	
x	6	put in breakwaters at singer island	interupt sand transport
x	7	tighten the north jetty so no sand transports through it	
x	8	move south part of peanut island so no tight left turn in channel	cost prohibitive
c	9	optimize the reef at peanut island	potential cost savings for hard ground mitigation
x	10	shut down the port	
c	11	dredge the peanut island shoal and use the area to create seagrass mitigation	same as 9, except use for seagrass mitigation
c	12	use the material on the port side of peanut for mitigation	estimated 300,000 cy capacity (per Julie Bishop)
x	13	identify HSRD benefits and recreation benefits for beach nourishment	would be good only if marginal on BCR. Locals have never had to renourish since feds put O&M material there. Beach fx time consuming and costly
c	14	let the resource agencies choose the out of kind mitigation	potential cost savings. Ref Lake worth Inlet Mgmt Plan. (per Julie Bishop)
c	15	Allow credit to be given or pay into a mitigation bank for non-fed agency (via port) to perform mitigation	reduce BCRs and will ensure mitigation sites not used by time of construction; risk to non-fed
c	16	install mitigation features early to avoid temporal loss of habitat	tradeoff - build early, spend money sooner, lower BCR vs. incurring interest
x	17	prebase year ecosystem restoration benefits	don't think we can claim extra ecosystem benefits for additional mit
c	18	optimize settling basin and adv main footprints	
x	19	deepen intracoastal and include mega yacht benefits	being done by others
P	20	increase beach template (south of inlet)	similar to #3; compare to taking to mid-town
P = Proposal			
C = Comment			
ABC = Already Being Considered			
X = Idea Eliminated			

P C ABC X	NO.	IDEA	Notes
x	21	coordinate section 107 for NED benefits	
P	22	identify and auth beneficial use disposal sites (specific locations)	proposal will ID a menu of specific potential sites and quantify ROM costs; can use for dredge disposal and/or for mitigation
P/22	23	use interim ODMDS for rock placement	explore using it or for placement of harder substrate (rock) to create hardbottom mitigation; would need to coordinate with EPA. Premise is it would be less cost than placement at more recent ODMDS.
c/18	24	optimize sand transfer plant (expand capacity) and intake reach	
c/15	25	work with non-federal interests to do out of kind mitigation opportunities	
x	26	sink a ship as an art reef for mitigation	not as favorable in terms of artificial reef; more recreational. Cost prohibitive.
x	27	buy out homeowners that border the jetty and move jetty	
x	28	expand peanut island for project mitigation opportunities	possible con: fed agencies don't often allow open water fill
c	29	create mangrove islands	would be out of kind for mitigation, but could be use for dredge material and incidental ben use
c	30	coordinate with FDOT to beneficially recycle bridges for hardbottom mitigation	currently being used in big pieces and placed outisde of the lagoon. Could be cut into smaller pieces though and placed inside lagoon.
x	31	use submerged geotubes to extend the jetties	too deep
ABC	32	arrange local agreement with town of PB to place at mid-town	cost share agreement already in place
c/18	33	consider vertical settling basins	4 ft adv main in entrance channel is authorized; identify smaller reach for deeper depths
ABC	34	maximize project depth based on entrance channel configuration	
x	35	have port take over peanut island to expand port operations	
c	36	consider topping non-sand disposal with sand disposal	filling of holes with non-sand, and top with sand to then be used for seagrass mit. (Ref: Material used for peanut was similar to what will be found during this project - and was good for seagrass. Per Julie Bishop)
c	37	groins on the north side	would have to be longer than jetty to be effective, might not be cost effective. Present depths are 10-15 feet deep. Possibly use local stone (vs. georgia stone) since not life safety issue. Could install it farther south than the barge shown in photo and would still be effective. (per Bratos)
x	38	put a wide underground sand tunnel from settling basin under the channel to the south side of channel	
ABC	39	designate 37 ft channel as TSP	address at IPR4
c/37	40	install terminal groin north of jetty (backpass north of terminal jetty)	

P C ABC X	NO.	IDEA	Notes
c/2	41	reuse any rock to stabilize shoreline to the south	
c	42	do two construction contracts (one for interior/ext)	
c$	43	do the entrance channel construction concurrent with O&M (timing)	potential $ savings with mob/demob
P	44	fill FIND's DMMA on peanut instead of ODMDS	
P/44	45	develop the Port's disposal area on peanut; make it adequate for use	
c/44	46	use peanut island DA for processing	
x	47	use seismic testing (resistivity analysis) to detemine rock content	
c	48	use permit variances to allow for greater flex with turbidity	temp turbidity will be assoc, with hyd dredging
c/2	49	use project rock to build breakwaters for seagrasses (inshore)	
c/2	50	sell rock from turning basin for inland riprap construction	
c	51	use control placement scheme for rock at interim ODMDS to create habitat	to be done durin PED
c	52	hyd pump to lagoon area	current project would use mech with low turbidity. To do it hyd., corps would need to get special permit for turbidity variance to allow contractor to do it.
c/3	53	consider pipeline delivery for nearshore and offshore placement areas	
x	54	use confined placement scheme in interim ODMDS for pump out area	too far out in the ocean for the pipeline
ABC	55	for sediment basin - look at seasonal or partial backpass of sediments/sand	
x	56	use rock to create land and put sand on it to create new land and sell it	
c	57	use sand shooter (rainbow) to create seagrass in substrate limited areas	
P/22	58	use hyd placement to build dredged holes (little lake worth and turtle cove - could take about 600K cy)	
x	59	expand northern peanut island	
c	60	investigate upland disposal	check to see if real estate search was ever done
x	61	small area in port facilities or nearby - find real estate	
c/2	62	mining operation - segregate it - then give it away for free	
c	63	create temp barge area at peanut island to give away material	
x	64	transform port and vessels	
x	65	offshore loading area for vessels and port	
c	66	buy privately owned submerged lands and put them under conservation easement and donate it to state park	Info from Julie Bishop
c/44	67	empty the port side of peanut island and use it for ben use	
c	68	build a recreation area	
x	69	put a bridge on peanut island	
x	70	buy out the maritime museum	

P,C,ABC,X	NO.	IDEA	Notes
x	1	rainbow the material from the settling basin to the south of inlet	
ABC	2	model design vessel with a naval arch to quantify the amount of heave and pitch tolerance (entrance channel underkeel clearance)	done
x	3	wave attenuation device or reef to alter currents	
x	4	line channel with "soft bumper"	
ABC	5	get larger tugs at port (port-owned) to big in bigger ships with lower cost to shippers	non-structural
ABC	6	don't enlarge turning basins, use tugs, increase risk	
x	7	remove/reconsider area D or capture cruise ship benefits	coordinate with Tim M and Sponsor
x	8	cut the southwest corner of peanut and make a slip for cruise ships for passenger recreation during delays	
x	9	big suction pipe next to sand transfer plant	
c/24	10	portable pump that you can put in with a crane next to sand transfer plant	
x	11	permanent pump and sump insitu	
ABC	12	size the settling basin to avoid adv main	
c/24	13	look at canaveral style sand bypass to beach	
x	14	dredge turning basin down to only 25 ft where cruise vessels transit	
x	15	dredge side slopes to recreate hard bottom habitat faster	habitat will already re-establish fairly fast
x	16	johnson sea grass - have fed delist	
x	17	install sheetpile in strategic places to serve mitigation and stability (ref. hard bottoms growing on port sheetpile)	
c/52	18	allow hydraulic dredging in interior	
P/44	19	raise dikes on FIND and improve dikes on south of peanut island; or combine both	
P/44	20	segregate/process dredge material for future DA unloading	
c/52	21	containment dike around hyd pumping in lagoon (turbidity control)	
ABC	22	equivalent to an industry day with resource agencies to go over current dredging methods and controls	
c	23	coordinate with EPA on 500K ODMDS capacity	
ABC	24	re-assess marginal wharfs for slips 1&2 (non-fed)- no benefits associated and high cost	
x	25	water chiller in front of FPL discharge	
x	26	wave attenuation device (WAD) in settling basin to catch sand and mitigate hardbottoms	
c	97	use dredged rock for hardbottom mitigation in existing sites provided by county approved sites	
c	98	have a suite of mitigation options, rather than one option, for authorized report (and have NEPA cover all options).	coordinate permit and shorter time lag.

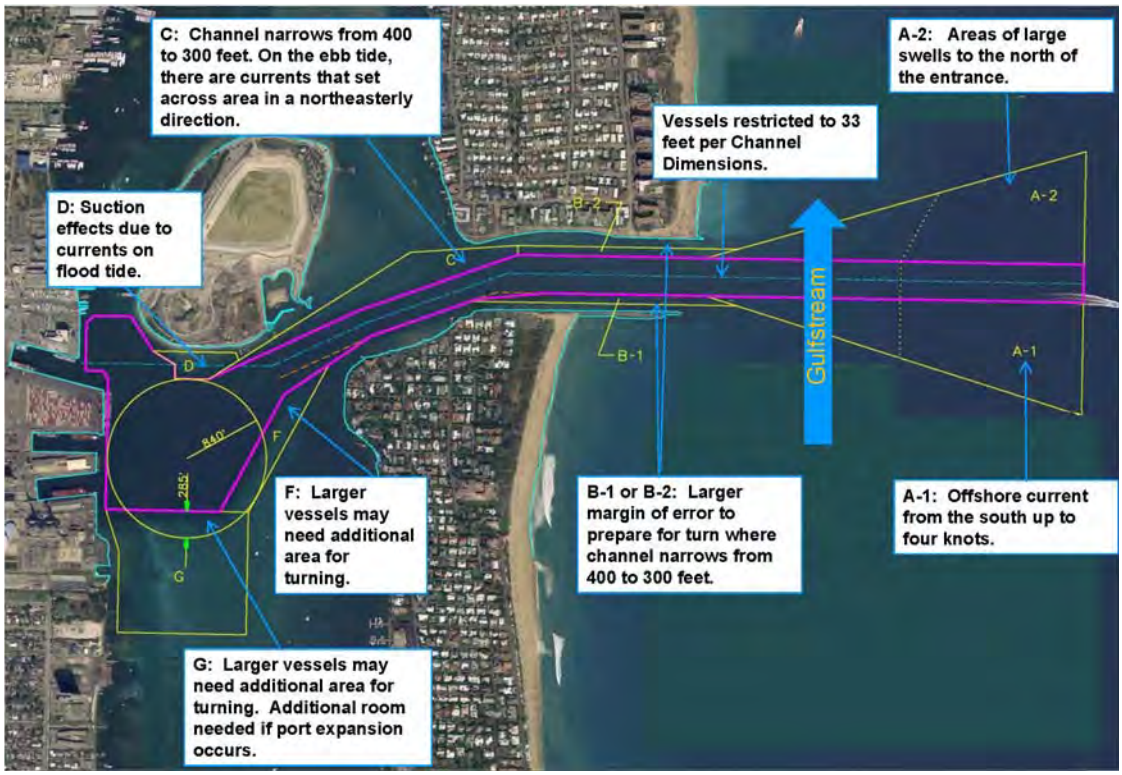
APPENDIX F: PROJECT PROBLEMS, OBJECTIVES AND CONSTRAINTS (Information obtained from Pilot Re-scoping Plan – Oct 2011)

Problems

The existing conditions in Palm Beach Harbor cause vessels to be restricted by light loading, tidal delays, and maneuvering difficulties due to three navigation concerns (see below map):

- Insufficient Depth: Depths are limited to 33 feet in the inner entrance channel and turning basin.
- Insufficient Width: The channel width decreases from 400 feet to 300 feet at a turn in the inner entrance channel, limiting the safe transit of vessels. The turning basin dimensions also limit the vessel size that can safely turn.
- Currents: The proximity of the Gulf Stream current to the entrance channel and perpendicular direction to the channel make entering the entrance channel and slowing to safe speeds problematic. Additional currents occur in the area C on ebb tide that effect the turning of vessels to stay in the channel.

Problems in Palm Beach Harbor



Opportunities

The opportunity at Palm Beach Harbor is more efficient navigation, resulting from a reduction in light loading, tidal delays, easier maneuvering, and shoaling. See map below.

Opportunities in Palm Beach Harbor

Objectives

The following project objectives have been established:

- Reduce transportation costs via a reduction in vessel light loading, tidal delays, or other transportation cost savings for commercial navigation from the entrance channel to the inner channel and to the main turning basin that serves Slips 1, 2 and 3, which include Berths 7 through 17.

- Reduce transportation costs via a reduction in vessel light loading, tidal delays, or other transportation cost savings for commercial navigation for the northern turning basin and, northern marginal wharf.

- Reduce navigation concerns and improve ship traffic safety by widening the harbor in areas A-1, A-2, B, C, D, F, and G.

- Determine if beneficial uses of dredged material such as manufactured soils, recycling of dredge material for construction fill, development of artificial reefs, or use of beach quality material for placement along adjacent beaches would provide appropriate alternatives for disposal of dredged material. This was requested at the NEPA Scoping meeting on 9-January-2008 by two

town residents, a Surf rider member and the Town Manager for the Town of Palm Beach. In a letter dated 22 January 2008 from Palm Beach County, there is another request for placement of beach quality material to be placed on the beach.

Constraints

The following project constraints have been identified:

- Avoid adverse impacts to harbor maintenance through increases in shoaling.

- Avoid adverse impacts of shoreline erosion along Lake Worth Inlet.

- Avoid or minimize potential impacts to manatees and grass beds along the reefs as requested by the Coalition for Wilderness Islands in their 12 January 2008 letter (see map below). Two area residents also requested the no-action alternative at the NEPA scoping meeting on 9 January 2008; Manatees congregate, by the hundreds, at the Florida Power & Light (FP&L) warm water discharge that is located in Area G. While manatees use this area year-round, they congregate at the warm water outfall when water temperatures drop (especially Jan and Feb and pretty much limited to mid-Dec to mid-March). All of Lake Worth inlet is designated Critical Habitat for Manatees (50 CFR 17.95). All of the inner Harbor area is a "Manatee Protection Zone" (speed of water craft is regulated). The area is not considered a Manatee "refuge" or "sanctuary". Most of the harbor is considered an Important Manatee Area (IMA). See http://www.fws.gov/northflorida/Manatee/federal-manatee-protection-areas.htm

- Avoid or minimize impacts to environmental resources including seagrass, hardbottom and soft bottom resources found in the study areas A1, A2, B, C, D, F, and G.

- Placement of material on the beaches shall occur outside the sea turtle nesting season (April through November) to the maximum extent practicable.

Seagrass Distribution and Potential Project Impact Zone

APPENDIX G: PROPOSAL DOCUMENTATION

(1) – (Proposal) Consider potential alternate and/or beneficial use disposal sites for non-beach suitable dredged material

ORIGINAL DESIGN: Current plan indicates mechanical (excavator) dredging of material in the inner channel and turning basin area with scow barge transported offshore disposal (ODMDS). Current data indicates that most of this material is a sand/soft-rock mixture not suitable for beach re-nourishment. See below map.

PROPOSED DESIGN: Consider local alternate disposal sites including potential beneficial use at nearby proposed area restoration projects in Lake Worth Lagoon. **Potential sites and their potential material utilization quantities and benefits are listed /illustrated below**. Dredged material placement to closer locations could facilitate use of cost-effective means of hydraulic pipeline delivery of dredged material versus scow barge transport. Some sites may also be considered for project mitigation.

Sites 1) and 2), Little Lake Worth and Turtle Cove are about 5-miles away from the project and appear to have needed fill capacity (over 1.5 MCY) to accommodate project dredged material removal requirements (inner channel and turning basin). This distance is at the maximum limits of a single pump pipeline discharge but is within the means of this type of operation. Ibis Isle 8.5 miles south of the project also has significant receiving capacity (600,000 CY) and may also be considered. A second 'booster pump' would likely have to be employed for this conveyance but is also within the means of such dredging operation.

If material in the inner channel and turning basin cannot be hydraulically dredged and/or transported, placement to the proposed nearby potential beneficial use sites should still be considered, via mechanical excavation and scow barge transport. Cost difference between this and transport/disposal to the ODMDS would likely be negligible.

ADVANTAGES:

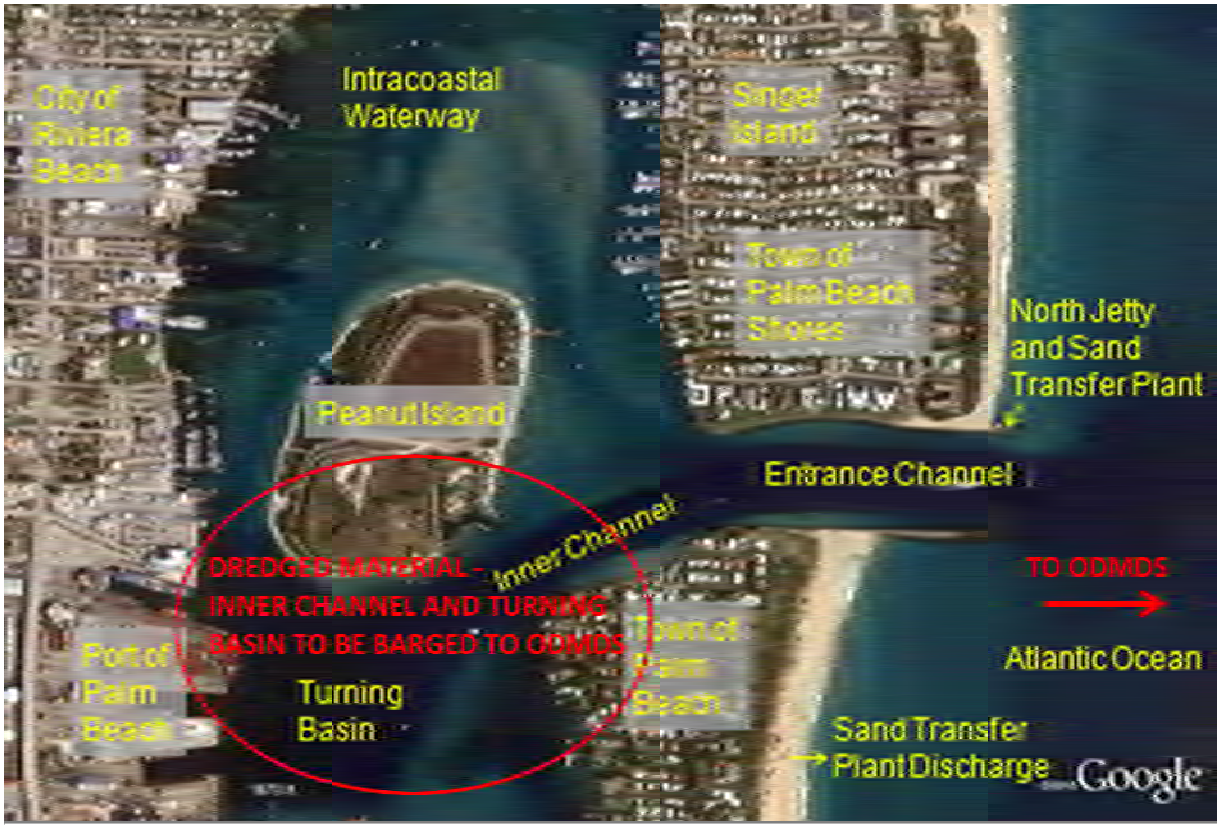
1. Dredged material could be utilized with some benefit as opposed to non-use offshore disposal.
2. Potential for local hydraulic placement would significantly reduce cost.

DISADVANTAGES:

1. If hydraulic material placement is used, turbidity control and permits would be required.
2. Hydraulic delivery and placement several miles or more away from the channel would require a long pipeline that would need special care and attention in relatively high vessel use area.

JUSTIFICATION: There is the potential for nearby placement and beneficial use of dredged material that will be obtained from the inner channel and turning basin. If in-situ material is soft enough to allow cutter head removal then hydraulic transport and delivery of dredged material to such locations is possible. Hydraulic pipeline delivery to the currently designated offshore disposal site is not possible via pipeline and scow barge delivery will still be necessary regardless of material removal means. Temporary turbidity control/permitting and care in pipeline placement through a high vessel traffic area would have to be addressed. Potential cost-avoidance would be significant if hydraulic pipeline material delivery can be utilized.

If material in the inner channel and turning basin cannot be hydraulically dredged and/or transported, placement to the proposed nearby potential beneficial use sites should still be considered, via mechanical excavation and scow barge transport. Cost difference between this and transport/disposal to the ODMDS would likely be negligible.



Current Plan

Project #	Project Name	Project Type	Site Conditions	Habitat Created
1	Little Lake Worth	Dredged Hole Capping/Filling	30 ac (-30'NGVD) ; contains muck sediments 900,000 cy3 capacity to -12' NGVD	Limited potential for seagrass Art reef <10 ac
2	Turtle Cove	Dredged Hole Capping/Filling	+42 ac (-18'NGVD); contains muck sediments. 660,000 cy3 capacity to -4.5' NGVD	<10 ac seagrass 6-10 ac art reef
3	Singer Island Seagrasses	Acquisition Conservation	147 ac of privately held submerged lands w/ healthiest seagrass bed in LWL	Purchase & Preservation by adjoining to J.D. MacArthur Beach State Park
4	Kelsey Park Reef	Artificial Reef	6 ac permitted site contains 2 ac art reef 4 ac remain for new reef creation	4 ac art reef
5	Sugar Sands Reef	Artificial Reef	10 ac permitted site contains 7ac art reef 3 ac remain for new reef creation	3 ac art reef
6	Singer Island Reef Pods	Artificial Reef	Permitted nearshore site 4ac art reef built & under 5yr monitoring plan. 2 ac remain for new reef creation	2 ac art reef
7	Peanut Island shoal	-Dredging -Artificial Reef	30 ac shoal >100,000 cy3 sand to be dredged	10 ac seagrass (temporary-may accrete) 1 ac art reef
8	Peanut Island Breakwaters	Artificial Reef	SE Peanut has existing breakwaters 3 ac remain for new reef creation	3 ac area for additional breakwaters
9	Rybovich Reef	Artificial Reef	5 ac permitted site contains 3 ac art reef 2 ac remain for new reef creation	2 ac art reef
10	Ibis Isle	-Filling/Capping	41 ac dredged hole, muck sediments Located 8.5 mi south of LW inlet >600,000 cy3 capacity	<20 ac seagrass
Note	All sites		Require verification of resources & conditions	

Lake Worth Lagoon Proposed Restoration Projects - North

Palm Beach County
Department of Environmental Resources Management
2300 N. Jog Road, 4th Floor
West Palm Beach, FL 33411

0 0.5 1 2 Miles
Scale 1:37,000

Updated June 2012

ASSUMTIONS AND ESTIMATES:

(For cost comparison purposes, dredged material placement at the Turtle Cove site is considered)

If **mechanical excavation dredging** is required for the inner channel and turning basin, the cost difference of transportation and placement to Turtle Cove, about 5 miles, would likely be negligible versus the current plan of transport and disposal to the ODMDS – about 7 miles **(negligible cost difference)**.

If **hydraulic (pipeline) dredging** can be performed significant cost-avoidance may be realized is calculated below with the following assumptions and estimates:

Current unit cost estimate for mechanical excavation and scow barge transport and disposal from the inner channel and turning basin to the ODMDS is approximately $45/cy with 24 hr operation.

Pipeline dredging from inner channel and/or turning basin to Turtle Cove site estimated between $15 and $20/cy; Assume **$17.50/cy.**

Assume about 90% of available capacity of 650,000 cy or **600,000 cy** dredged material quantity.

Potential cost avoidance calculated in the following table.

COST ESTIMATE WORKSHEET				
DELETIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
Mechanical excavation	CY	600,000	$45	$27,000,000
with scow barge transport				$0
and disposal at ODMDS				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Deletions		**$27,000,000**
ADDITIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
Pipeline dredging and	CY	600,000	$17.50	$10,500,000
placement on Peanut Isl.				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Additions		**$10,500,000**
	Net Cost Decrease			**$16,500,000**
	Mark-ups	**0.00%**		**$0**
	Total Cost Decrease			**$16,500,000**

(2) – (Proposal) Utilize FIND DMMA on Peanut Island for a portion of dredged material generated from the Inner Channel and Turning Basin

ORIGINAL DESIGN: The original design disposes all dredge materials in the Offshore Dredged Material Dispose Site (ODMDS). The overall reason was that channel materials could not be hydraulically dredged (pipeline dredging) and upland disposal areas were not available for the LWI New Work Navigation Project.

PROPOSED DESIGN: The proposed design will use a hydraulic cutter head suction dredge to dispose new work dredged materials in the Florida Inland Navigation District (FIND) Dredged Material Management Area (DMMA) on Peanut Island. The site can also be used for any material separation that is needed for project purposes. The FIND site has a capacity of about **500,000 cy** and according to the non-Federal sponsor, is available of use. In addition, the current analysis indicates that the substrate rock is softer than initially envisioned and can be dredged with a hydraulic cutter head dredge.

Peanut Island is exhibited in the below map. The FIND site is the DMMA immediately under the Peanut Island Label. The FIND DMMA was recently unloaded as part of another project. The Site also has roads and barge unloading areas that are available for other new work project purposes such as material separation, processing and re-handling. Existing containment dikes appear to be adequate, as is, to accept an additional 500,000 cy hydraulically dredged material. Even if some dike restoration and/or raising is necessary, it is believed that this work can be accomplished with earth graders and dozers on the site and not be cost-prohibitive.

ADVANTAGES:

1. Lowered cost to dredge and dispose new work materials.
2. Increased material availability for other project and non-project purposes such as habitat creation.
3. Material separation location and re-handling. Examples could be rock separation for re-use as wetland slope protection and/or low height breakwaters for seagrass establishment areas.

DISADVANTAGES:

1. Utilization of FINDS not considered as 'high' beneficial use of material; other 'higher' beneficial use sites, albeit more expensive, may be available to receive this material (see **Item 1**).
2. A Consent-to-Use agreement will need to be executed with FIND. A successful outcome is uncertain at this time. The idea still has merit for investigation during PED.

JUSTIFICATION:

There are potentially significant quantifiable project savings that will support the additional field investigations and design costs associated with material classification and DMMA design and incidental site modification costs. If material can be hydraulically dredged, this appears to be the 'least cost' disposal alternative.
Other higher beneficial use sites would not receive this material under this plan. This may also include beach placement if beach-suitable sands are identified in the inner channel and turning basin.

PALM BEACH HARBOR

ASSUMTIONS AND ESTIMATES:

Current unit cost estimate for mechanical excavation and scow barge transport and disposal from the inner channel and turning basin to the ODMDS is approximately $45/cy with 24 hr operation.

Pipeline dredging from inner channel and/or turning basin to Peanut Island site estimated between $10 and $15/cy; Assume **$12.50/cy.**

Assume 90% of available capacity of 500,000 cy or **450,000 cy** dredged material quantity and site is available. Subsequent to the VE Workshop, it was discovered that FIND had a permit to use the DMMA. The site will only be evaluated during the PED Phase, if available.

Potential cost avoidance calculated in the following table.

COST ESTIMATE WORKSHEET				
DELETIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
Mechanical excavation	CY	450,000	$45	$20,250,000
with scow barge transport				$0
and disposal at ODMDS				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Deletions		**$20,250,000**
ADDITIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
Pipeline dredging and	CY	450,000	$12.50	$5,625,000
placement on Peanut Isl.				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Additions		**$5,625,000**
	Net Cost Decrease			**$14,625,000**
	Mark-ups	**0.00%**		**$0**
	Total Cost Decrease			**$14,625,000**
			Rounded:	**$14,500,000**

(3) – (Proposal) Increase beach template (south of the inlet)

ORIGINAL DESIGN: For past O&M events in the Lake Worth Inlet, beach quality sand has been obtained. This material has been placed south of the inlet, as the least cost disposal plan. The capacity of the beach can vary anywhere from 0 cy to 400,000 cy per nourishment event, depending on when the last O&M event occurred. An O&M event will occur in Fall 2012 which will fill the current remaining capacity of 150,000 cy. The template is from R-76 to R-79, making it roughly 4,000 ft long. The berm is at elevation 8.68 ft MLW with a 1:20 slope.

PROPOSED DESIGN: Areas C and G (inner channel and turning basin) have not had sufficient core borings to date, and therefore the material that will be dredged in those areas is largely unknown. Roughly 996,000 cy of material, largely from those areas of C and G, is of unknown composition. It is relatively certain that approximately 209,000 cy of sand will be dredged throughout the rest of the channel. If areas C and G have more than 200,000 cy of sand in them, then increasing the existing beach template would provide a cost savings to the project as it is the least cost disposal option.

ADVANTAGES:

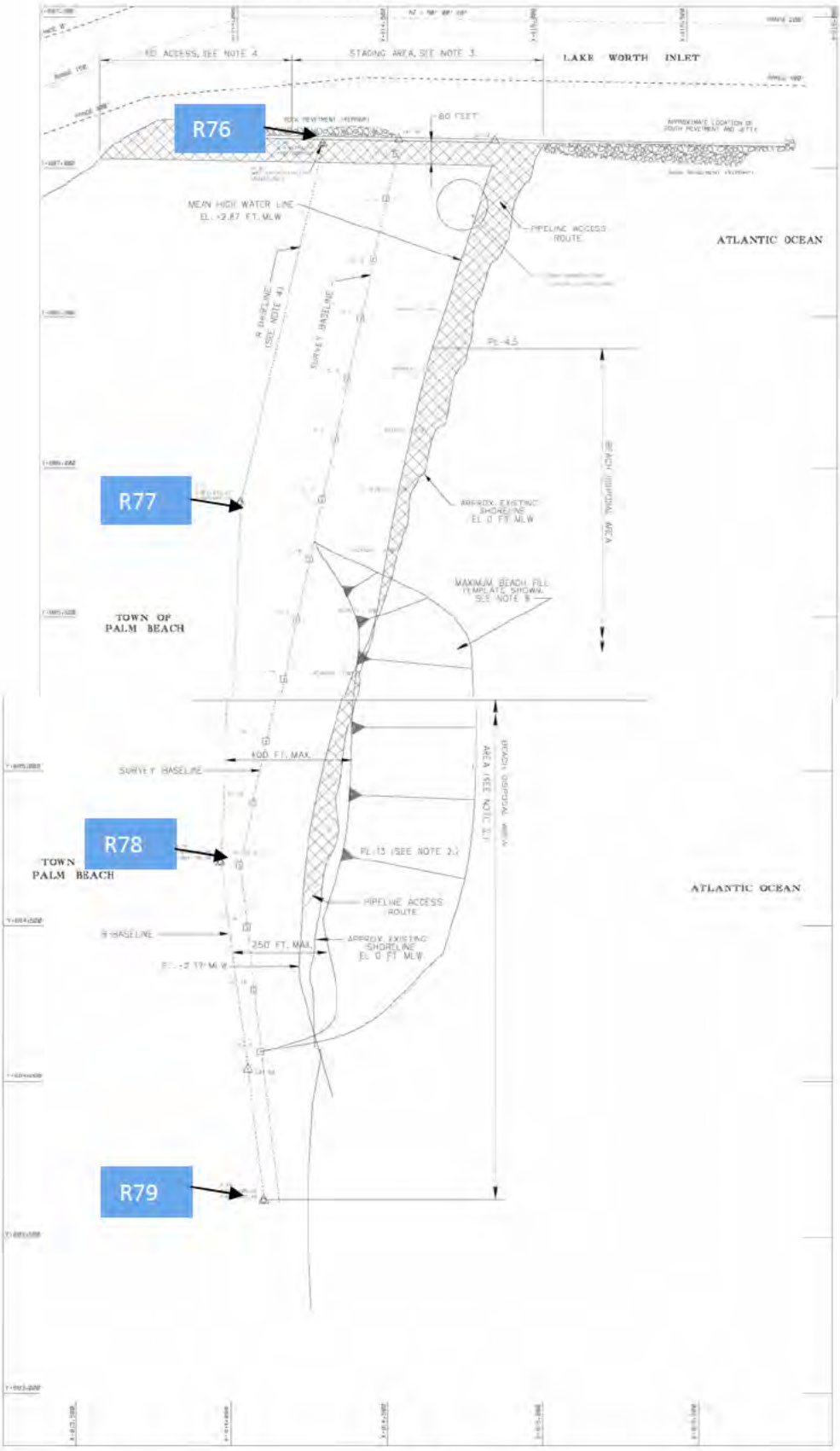
1. Close proximity of beach to the project would provide cost savings to project (least cost disposal).
2. Incidental benefits of the sand on the beach:
    a. Hurricane and storm damage protection
    b. Sea turtle nesting habitat
    c. Recreation

DISADVANTAGES:

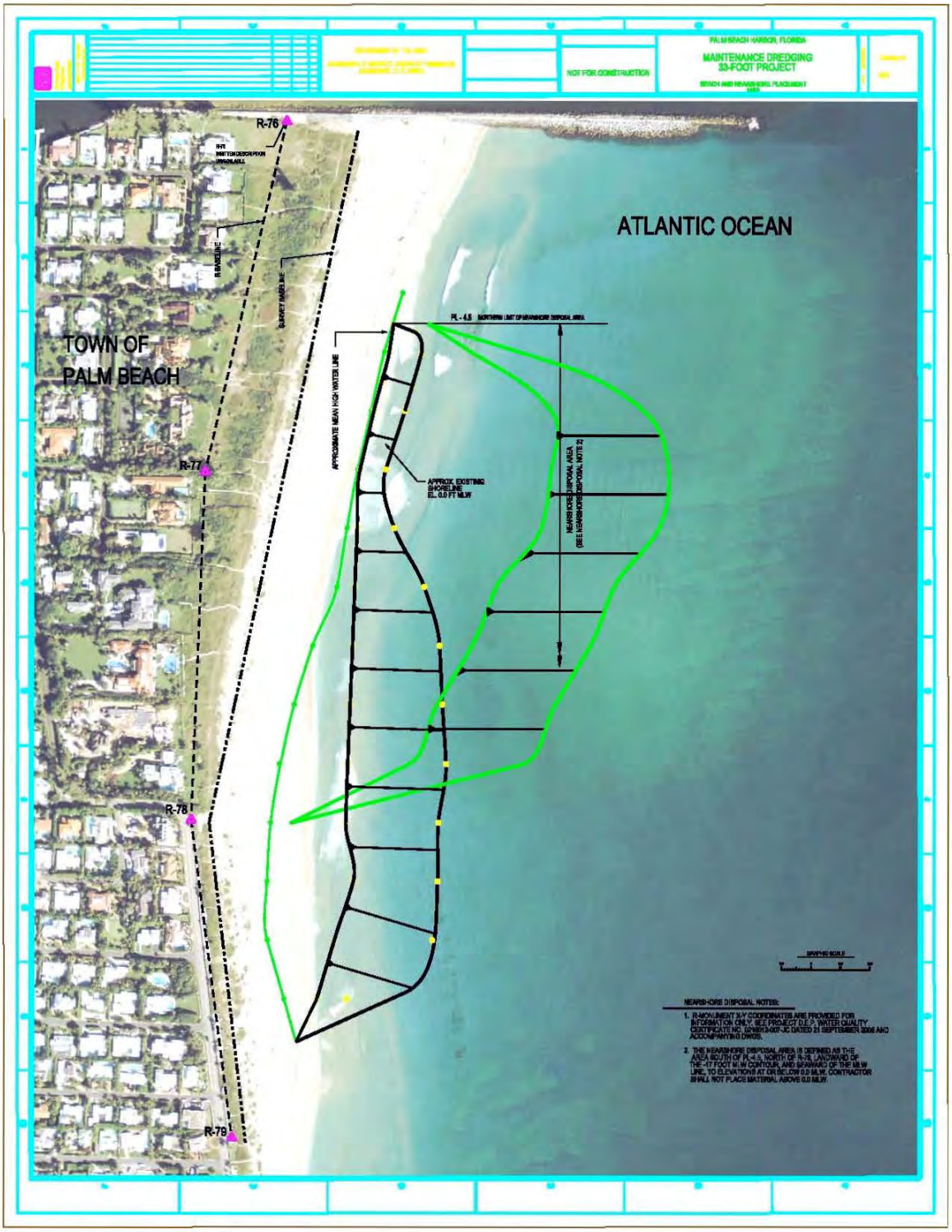
1. There could be hard bottom impacts if the beach template is increased, as hardbottoms are known to exist to the south, and the original permitted template was created to avoid those impacts.
2. Additional coordination will be required to affirm adequacy of existing NEPA documentation and FEDP permit which includes the Water Quality Certificate.

JUSTIFICATION: If suitable material exists in Areas C and G, then pipeline dredging with nearshore placement along the beachfront south of the inlet will be both cost effective and beneficial. Potential local impacts would have to be assessed.

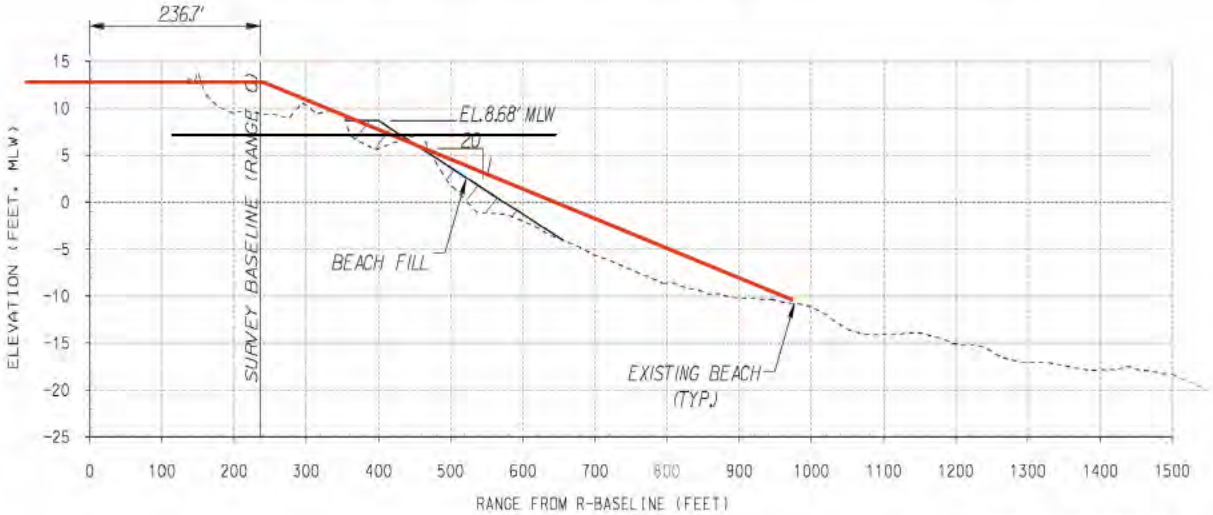
(EXISTING PLAN)



(PROPOSED CHANGE)



Option 1 – Build higher berm and stack beach higher



STA. - PL8

GRAPHIC SCALES

SCALE "A" (HORIZ.) 100' 0 100' 200'

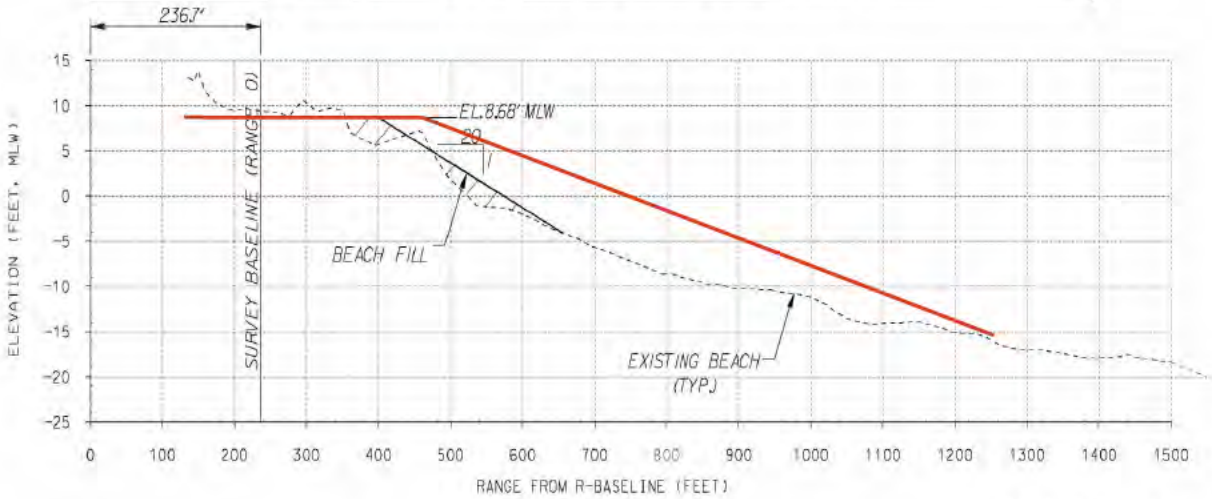
SCALE "B" (VERT.) 10' 0 10' 20'

NOTES:

1. SEE DWG. C 103 FOR BEACH DISPOSAL AREA SURVEY NOTES.

2. PERMITTED BEACH FILL TEMPLATE IS FULL AT THIS STATION. CONTRACTOR SHALL PERFORM PRE-FILL SURVEY OF BEACH DISPOSAL AREA FOR USE BY CONTRACTING OFFICER TO ADJUST DISPOSAL WHERE NEEDED.

Option 2 – Keep same berm elevation and extend toe farther out



STA. - PL8

GRAPHIC SCALES

SCALE "A" (HORIZ.) 100' 0 100' 200'

SCALE "B" (VERT.) 10' 0 10' 20'

NOTES:

1. SEE DWG. C 103 FOR BEACH DISPOSAL AREA SURVEY NOTES.

2. PERMITTED BEACH FILL TEMPLATE IS FULL AT THIS STATION. CONTRACTOR SHALL PERFORM PRE-FILL SURVEY OF BEACH DISPOSAL AREA FOR USE BY CONTRACTING OFFICER TO ADJUST DISPOSAL WHERE NEEDED.

ASSUMTIONS AND ESTIMATES:

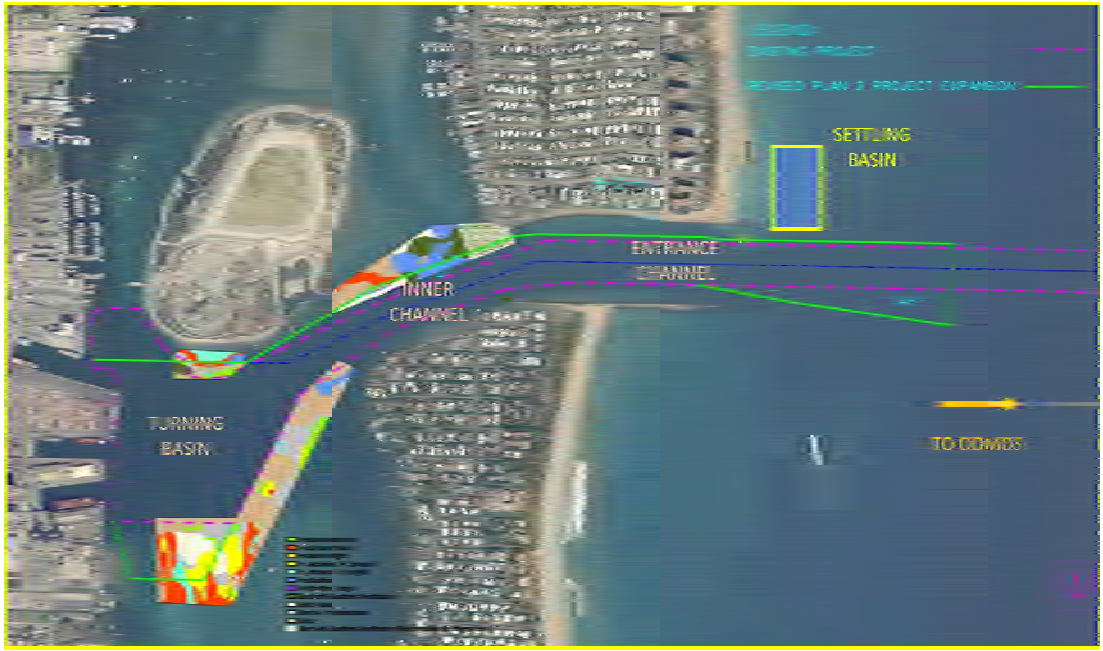
Current Area C and G unit cost estimate for mechanical excavation and scow barge transport and disposal to the ODMDS is approximately $60/cy with 12 hr operation restriction. If operation time restriction is removed, price will lower to perhaps **$45/cy**; Assume lower cost for this comparison.

Pipeline dredging from Area C and G to beach nearshore estimated between $10 and $15/cy; Assume **$12.50/cy.**

Quantity can vary, assume **200,000 cy** for comparison.

Potential cost avoidance calculated in the following table.

COST ESTIMATE WORKSHEET				
DELETIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
Mechanical excavation	CY	200,000	$45	$9,000,000
with scow barge transport				$0
and disposal at ODMDS				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Deletions		**$9,000,000**
ADDITIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
Pipeline dredging and	CY	200,000	$12.50	$2,500,000
placement at beach				$0
nearshore				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Additions		**$2,500,000**
	Net Cost Decrease			**$6,500,000**
	Mark-ups	**0.00%**		**$0**
	Total Cost Decrease			**$6,500,000**


SETTLING
BASIN
ENTRANCE
INNER
CHANNEL
TURNING
BASIN
TO COMIDS

(4) – (Proposal) Eliminate reinforcement and deepening of slip bulkheads

ORIGINAL DESIGN: Current plan calls for bulkhead reinforcement and/or deepening for Slips 1,2 and 3 (see map below).

PROPOSED DESIGN: Updated project footprint indicates that there may be no significant stability degradation of existing bulkheads negating need for this work.

ADVANTAGES:

Keeps project strictly within scope.

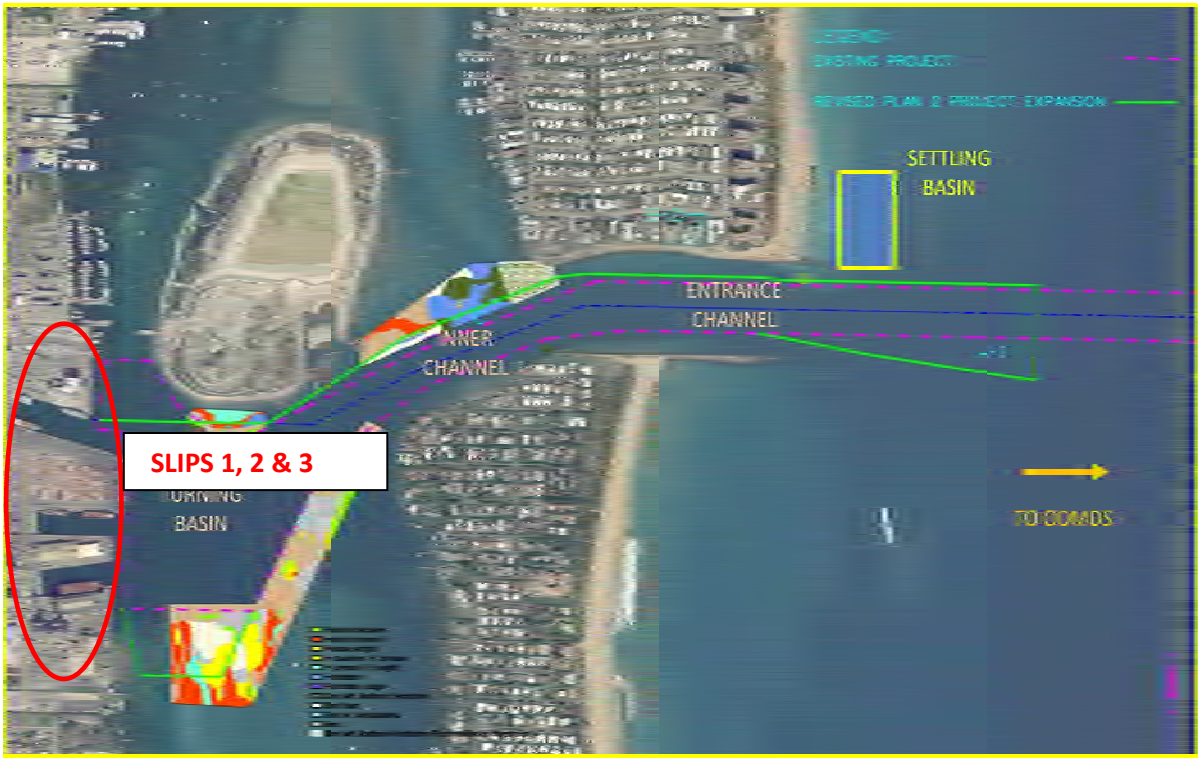
DISADVANTAGES:

Possible anticipation of slip Port regarding bulkhead improvements.

JUSTIFICATION: Deeper drafting vessels berth on the north-south docks and not in these slips. The slips themselves do not need to be deepened as part of this project. Updated channel alignment indicates that proposed channel deepening excavation will not impact the stability of the existing slip bulkheads. Cost avoidance and the potential for unanticipated structural need once if the bulkheads are improved are significant.

Estimated cost avoidance is shown on the following table.

Current Plan



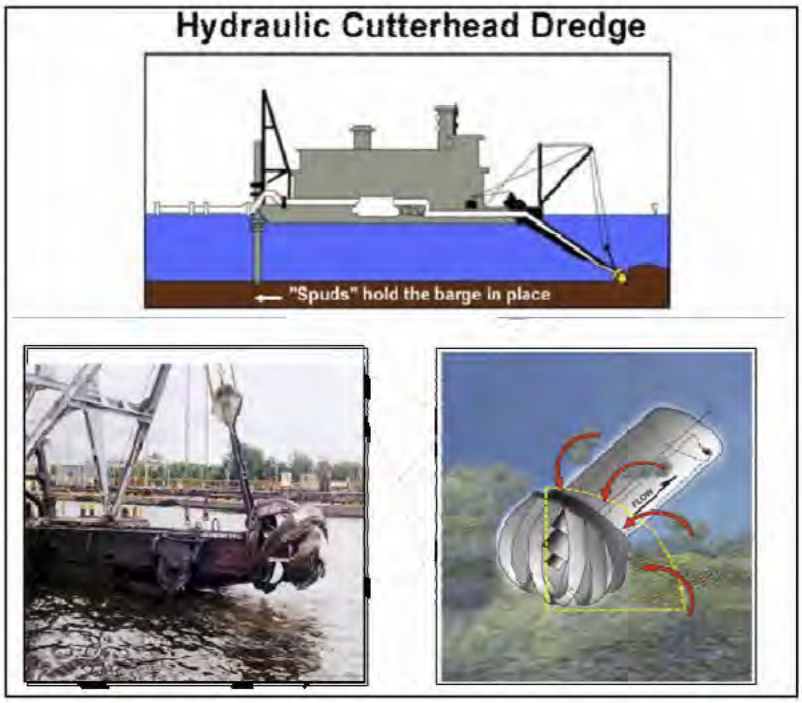
COST ESTIMATE WORKSHEET				
DELETIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
(From Current Plan		0	$0	$0
Cost Model)				$0
Marginal Wharf Slip 1 & 2	LS	1	$8,000,000	$8,000,000
Bulkheads				$0
				$0
Marginal Wharf Slip 3	LS	1	$3,000,000	$3,000,000
Bulkheads				$0
				$0
Slip 3 Bulkhead Deepening	LS	1	$2,000,000	$2,000,000
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Deletions		**$13,000,000**
ADDITIONS				
ITEM	**UNITS**	**QUANTITY**	**UNIT COST**	**TOTAL**
				$0
(none)		0	$0.00	$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
				$0
==========	==========	==========	==========	==========
		Total Additions		**$0**
	Net Cost Decrease			**$13,000,000**
	Mark-ups	**0.00%**		**$0**
	Total Cost Decrease			**$13,000,000**

(5) Obtain permit variances to allow greater flexibility with turbidity – Dredging equipment uses either pipeline or mechanical means to transport material from the substrate to the surface. Pipeline dredges use water to pump the dredged material as slurry to the surface and mechanical dredges use a bucket-type device to excavate and raise the material from the *channel* bottom. The most common pipeline dredges include cutter head-suction, and hopper dredges; the most common mechanical dredges include clamshells, backhoes, and marine excavator dredges.

Pipeline dredging (as opposed to mechanical) could be a great cost savings to the project. However, if used, it may contribute to temporary increased turbidity at the discharge area, as the slurry mix is pumped out. Permit variances of this nature are not uncommon, and could be obtained, as long as the project demonstrates that no adverse impacts to the environmental resources due to short term increase in turbidity would occur.

Pipeline delivery to water bottoms may also cause temporary turbidity that may exceed normal allowable limits. Measures to minimize such should be implemented but a temporary variance may be necessary.

First, it should be confirmed that a pipeline dredge could operate within the permitted turbidity allowable threshold (permitted amount such as 29NTUs). The permit variance should only be pursued if increased turbidity will be foreseeable. Second, in order to show that higher turbidity cannot be avoided, it may be helpful to check past O&M information which should show where higher NTUs have occurred in the past in the project area.



(6) Consider capping non-select dredged material with sand to meet fill area requirements While no specific location(s) has been indentified to date, a situation may arise where an upland and/or submerged area may need a significant dept of fill but should be surfaced with select sand. It is possible to utilize interior dredged material (believed to be a mixture of sand and soft rock) to fill the base of the receiving void and cap it with sand from exterior area (or identified suitable sand interior area). While this would not be appropriate for a beach section, possible application to such an area such as a deep submerged hole to be raised, capped with the intent for seagrass growth, or, perhaps an upland fill area (no exposed to regular wave action) where a mixed sub-base and sand surface would be suitable.

(7) Develop the Port's DMMA on Peanut Island; raise dikes on FIND DMMA and improve dikes on Port DMMA and empty the port side of Peanut Island and use it for beneficial use

The Port of Palm Beach has an existing DMMA on Peanut Island that is approximately half full. Should the port agree and capacity can be obtained within the Port's DMMP, it is suggested that this area also be considered for new or O&M dredged material measures. Dike raising and other activities could make these attractive dredged material management measures. It has also been stated that contained dredged sediments can be used for habitat creation opportunities. In a like manner, the FIND DMMA dikes could be raised to gain additional capacities.

(8) Segregate rock and/or other select material for various specific utilizations - It is recommended that beneficial use options for rock and other select be considered. While processing dredged material is costly and will require a processing site, potentially high-cost offshore disposal can be avoided. Options include, but may not be limited to the following:

Placing rock inshore to build breakwaters for sea grasses. The project may get credits for required mitigation. For this purpose the rock would not need to be further processed, i.e. crushed or segregated and it would be easily feasible for both the rock from the Turning Basin and from the Entrance Channel, cut-1 and cut-2.

Mining and processing non-beach compatible dredged material composed of rock fragments and unconsolidated sediments from the Turning Basin for industrial upland use (i.e. rip-rap, cement production, roadway construction). Additional sampling and testing would be required to see if the dredged material would be of the required quality. However, it could be an option with potentially significant cost savings and should be considered, especially if fuel prices raise and ODMDS disposal would get too expensive.

Processing the rock from Entrance Channel, cut-1 and cut-2 into sand-sized fractions so that it can be placed on beach. This may be feasible only for dredged material composed of sandstone. The rock present in the entrance channel, cut-1 and cut-2 is composed of sand and shell and is often described as coquina rock and could be processed like described in attached article. If approximately 300,000 cy dredged rock would be processed potential revenue of $24 million could be produced, which could offset the costs for processing or even leave a profit. However permitting could be an issue.

(Rough cost estimate notes):

- Processing to prepare rock for beach placement:

$500,000 Assume three crushers are needed to convert big rock to medium size, medium

size to small, and small to sand; ref. information located at:
http://www.alibaba.com/product-gs/443820285/Stone_crusher_machine_price.html?s=p

- Rock from scow to land:

Processed sand (retrieved from sandstone) is sold $110/ton – 1 cy sand is 2700lb = 1.35 ton = $80/cy sand
Estimated 300,000 cy dredged rock could potentially create $24 million in revenue, which could offset the costs for processing or even leave a profit; ref. information located at:
http://fuelfix.com/blog/2011/09/15/sand-mines-boom-along-with-fracking/

(9) Use peanut island DA for processing - This comment suggests that Peanut Island be considered as a material processing area if needed. The island has an existing unloading area with roads and sufficient lay down areas. The island FIND DMMA was recently unloaded and recreation facilities installed.

(10) Investigate Upland Disposal Options – There are currently no known opportunities for upland disposal in the Lake Worth Inlet Area, other than Peanut Island, which was specified in the Palm Beach Harbor Preliminary Assessment (PA) (see **Item 2**). The PA was completed in 1996 to assess 20 years of capacity for maintenance dredged material. The PA concluded that there are 5 major options for placement of material. First, any beach suitable material should be placed on the beach south of the inlet. Any material not suitable for direct beach placement can go into four areas: 1) nearshore (the state allows material with higher percentages of fines not suitable for beach placement to be placed), 2) upland area on Peanut Island (in the sponsor owner disposal area on the southern portion of the island), 3) in the borrow pit near interstate 95 (was currently available at the time for beneficial use), and in the 4) interim ODMDS. (PA, pg. 16). The new ODMDS was since established to replace the interim site. The new site is 4.8 nmi offshore, has a depth range of 525 to 625 feet, and an area of 1 nmi. (Palm Beach Harbor 2004 SMMP,pg. 2).

Placement of dredged material in upland locations should be processed/segregated such that re-use and utilization may be optimized.

(11) Use controlled placement scheme to place rock at interim ODMDS to create habitat
The comment suggests that a controlled disposal scheme can be used at the interim ODMDS to create additional habitat. As exhibited below, mounds can create subsurface ridges that can develop habitat. Turbidity and other concerns can be addressed by using a specified release scheme to place material at specific locations within the interim ODMDS. Releases can be made at specific coordinates within prescribed boundaries such that subsequent releases are contained to limit material migration and turbidity.

(12) Use sand shooter (rainbow) to create seagrass in substrate limited areas – This type of operation should be mentioned in project documentation so it can be allowed for consideration during later stages of project development. Rainbow material placement is known to be a favorable means that accommodates seagrass.

(13) Optimize "expanded" settling basin design and advanced maintenance footprints

Longshore sediment transport from the north to south creates a chronic shoal in the entrance channel which requires annual and emergency maintenance. An existing settling basin north of the entrance channel has not prevented the chronic shoaling and maintenance requirements. An "expanded" settling basin has recently been authorized separate from the navigation feasibility study. The design of the "expanded" settling basin was based on the existing sediment transport capabilities available at the time. Advances in sediment transport modeling capability allow a reanalysis and improvement of the "expanded" settling basin design which has the potential to increase performance and decrease cost. The settling basin performance has a significant impact on entrance channel design, including advanced maintenance within the channel. Modification of the original "expanded" settling basin size, shape, and location will result in more efficient trapping of littoral sediment and reducing the volume of the shoal in the entrance channel. However, preliminary analysis indicates that the settling basin, due to limitations related to north jetty stability impacts, may not trap enough sediment to eliminate the shoal in the channel. Solutions which would work in combination with an optimized "expanded" settling basin to reduce the entrance channel shoal, so that maintenance events can be limited to every other year,

include modifying existing channel advanced maintenance, optimizing the sand transfer plant, and construction of a groin north of the settling basin.

(14) Optimize channel advanced maintenance/ vertical settling basin – Advanced Maintenance of 4 feet is authorized uniformly across the entrance channel and along a portion of its length. Since the chronic shoal occurs in a relatively small area just south of the north jetty, it would be advantageous to provide additional advanced maintenance depth in this area and reduce advanced maintenance in other parts of the entrance channel where it is not required. This design is potentially limited by the TSP project depth and its impact on jetty stability.

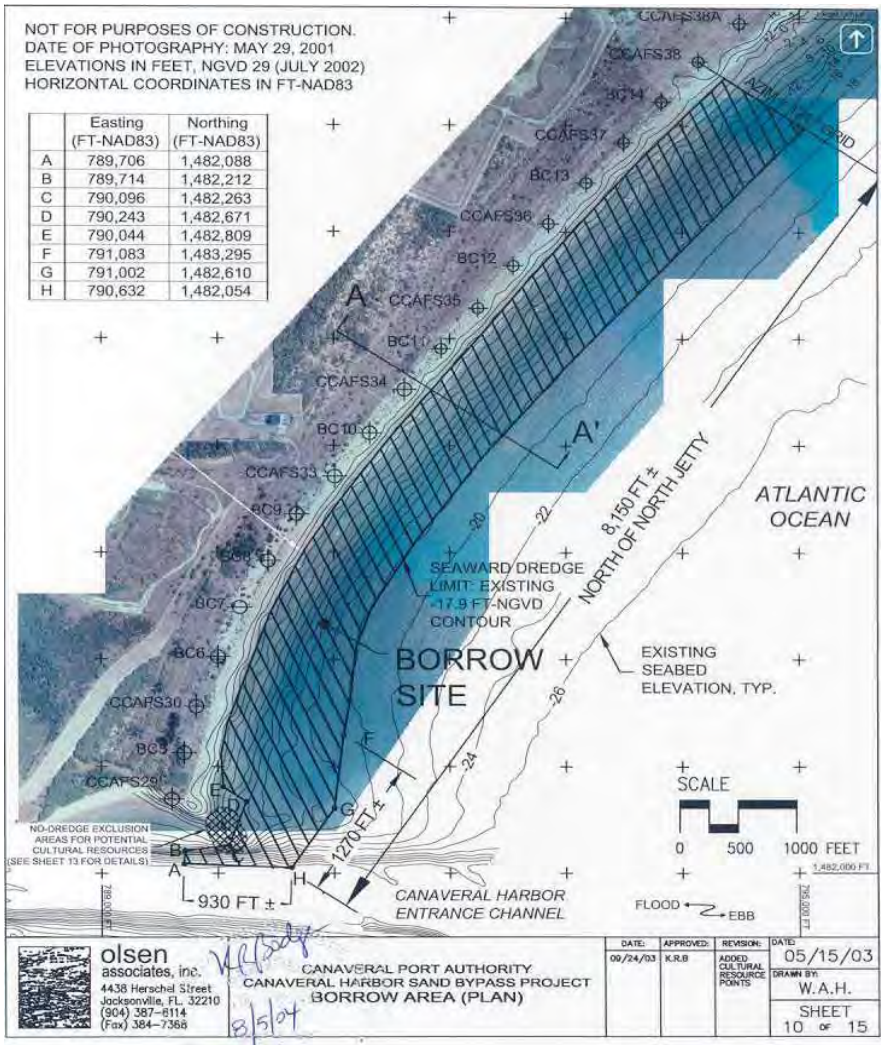
(15) Optimize Sand Transfer Plant – The existing sand transfer plant (STP) is a moveable hydraulic suction dredge with a suction head suspended from a rotating boom which pumps 250,000 cy/yr. However, the plant does not operate during the summer because of lack of sediment within the reach of the existing boom during these months. Increasing the area which the STP can reach could reduce the amount of sediment that is transported between the north jetty and settling basin and into the channel. The STP reach could be extended by extending the boom length or changing the design of the plant. Several options include suspension of the suction head and or a pump from a crane which would allow a longer boom, adding a track along the north jetty on which the crane/ suction head/ pump could travel and more extensive modifications which include submerged pump(s) and fluidizers.

(16) Consider construction of a groin north of "expanded" settling basin – Construction of a groin north of the settling basin would work in combination with an optimized "expanded" settling basin to reduce the entrance channel shoal by diverting sediment from the nearshore into the "expanded" settling basin. The length of the groin would need to be similar to the north jetty to be effective. Depending on stone required this option may not be cost effective. Use of local stone, if allowed, could make this option more cost effective. Additionally, the sediment captured by the groin would be available to back-pass to the beach north of jetty if needed. There will likely be significant public opposition, however, to any new beach structure in the reach.

(17) Consider Canaveral-type sand bypass to beach – Canaveral bypasses about 1 MCY every 6 years from the north jetty fillet to the beaches south of the inlet. This is generally similar to the present operation at Lake Worth Inlet but dredging extends to Mean High Water north of the jetty. The dredge (borrow) area is between the existing mean high water line and the -17.9 ft NGVD'29 contour, between the inlet's north jetty and 8350 ft north thereof (see figure below). If the Lake Worth Inlet optimized settling basin extended to the MHW line, then entrance channel shoaling may be reduced significantly with no other measure required. However, this would impact sediment available to the Sand Transfer Plant. Reference information may be found at:

http://bcs.dep.state.fl.us/env-prmt/brevard/issued/0220629_(Canaveral%20Harbor%20Bypassing)/001_JC/Final%20Order/APPROVED%20Phys_Mon_Plan%20(Rev%202009).pdf

http://bcs.dep.state.fl.us/env-prmt/brevard/issued/0220629_(Canaveral%20Harbor%20Bypassing)/001_JC/Final%20Order/Canaveral%20Harbor%20Bypass%20Plans%20(08-25-04).pdf



<u>(18) Optimize the reef at Peanut Island</u> – ***This and related comments below regarding the beneficial use of dredged material also recommend that project disposal measures address Section 204 and Section 207 implications and opportunities.*** The County of Palm Beach has identified several non-Federal restorations areas that could be used for the Beneficial Placement of Dredged Materials or mitigation areas (see list and map in **Item 1**). There are two sites at Peanut Island. One is a reef and the other is a shoal area. New work dredged materials will be a mixture of sand and rock varying in sizes. This comment suggests that the existing reef site should be included as a likely candidate for beneficial placement. New work rock could be sorted and used for reef materials. Transport and sorting of dredged materials can be done efficiently because there is an existing barge unloading area and interior roads that were recently used to unload the DMMA. The site can readily receive and distribute materials as needed. The existing transportation facilities also make Peanut Island a cost effective material handling and re-handling site.

(19) Dredge the Peanut Island shoal and use the area to create seagrass mitigation –
The Peanut Island shoal contains good quality sands that could be used in capping work that may be needed to beneficially dispose project new work materials at other locations (see map in **Item 1)**. The shoal area has been offered by non-Federal interests as a likely candidate for a sea grass creation area. This comment suggests that this site be dredged to a depth needed to establish sea grasses, the excavated sand be re-used at another location and new work rock be used to install small breakwater mounds for energy dissipation to facilitate establishment.

(20) Use of dredged rock for placement into existing county approved reef sites –
This comment suggests that the use of county approved reef sites be included as beneficial use opportunities and sites in project documentation (see map, **Item 1**). Coordination with PBC for size and available locations for adding to already approved sites could be done during later stages of project development.

(21) Buy privately owned submerged lands, then put them under conservation easement and donate them to state park – It may be possible to obtain privately owned water bottoms and place dredged material (beneficial use) to create land for purposes to include public recreation, education, and outreach. Such locations are not identified at this time and further investigation is needed.

(22) Partner with the resource agencies to identify mitigation and beneficial use sites -Several options have been identified in the project area that could be implemented for needed mitigation and/or beneficial use. This comment suggests that USACE and the non-Federal sponsor coordinate with the resource agencies to determine the most effective sites for mitigation and the beneficial use of dredged materials. Actual implementation of mitigation by local entities may also be considered (see next item).

**(23) Allow non-federal interests to complete project and/or work-in-kind mitigation and beneficial use features – **This comment suggests that the mitigation and beneficial use of dredged material opportunities be screened to form a set of likely work that could be more efficiently performed by the non-Federal sponsor or their selected sub-entities. The County of Palm Beach has an extensive history and staff expertise in successfully installing these type public works. Increased efficiency and better quality could be realized by having county lead these efforts. The proposed mechanism would have the Implementation Section of the Decision Document identify having the non-Federal sponsor perform this work as part of the project and/or work-in-kind.

(24) Install mitigation features early to avoid temporal loss of habitat – This comment piggybacks the above comment by suggesting that the non-Federal sponsor be permitted to install mitigation features pre-base year in an effort to avoid temporal habitat loss. Temporal lag is used to calculate mitigation acreage needed but in this case, anticipated loss of habitat from temporal lag may be small and may not result in significant mitigation cost saving. However, this beneficial use of dredged material for mitigation could lower disposal costs.

(25) Create mangrove islands – Creation of mangrove islands should be considered as one of the beneficial use opportunities for later project development and documented in the decision document. These are likely opportunities available in Lake Worth Lagoon System.

(26) Have a suite of mitigation options, rather than one option, for authorized report (and have NEPA cover all options) This comment suggests that a suite of mitigation options and sites be included in project documentation to reduce cost risks and to afford flexibility for prospective contractors to adjust to the most suitable equipment mix at the time of offering. This comment will also reduce long term risks associated with the time gap between project feasibility studies and mitigation features installation (sometimes 3 or more years). Providing a suite of options would further support the USACE required Adaptive Management plan. Finally, working with Palm Beach County will allow for multiple options since the County has a proven success record with similar project planning and implementation activities.

(27) Develop recreation alternatives for inclusion into recommended plan evaluations and explore the use of dredged materials in the same. (Spec Item 68) Recreation opportunities exist in the project area. This comment suggests that recreation measures be developed and evaluated as recreation alternatives for inclusion in recommended plan evaluations. In addition, project dredged material should be considered to enhance related lands and resources.

(28) Combine entrance channel area deepening with regular dredging maintenance cycle - Current entrance channel maintenance dredging occurs on a fairly regular annual frequency unless there is a storm event. Implementing construction concurrent with this annual cycle would eliminate an extra contract execution, contractor mobilization, etc. and avoid an extra cost currently estimated at $5 - $6 million.

(29) Execute multiple dredging contracts – It would appear that multiple dredging contracts would be a more efficient means of implementing this project versus a single procurement. First, overall contract value currently estimated in the $50 - $100 million range, while not unprecedented, would be a very large individual contract. Additionally, the current plan indicates two different required dredging and disposal means for the entrance channel/settling basin (exterior) area versus that for the interior channel and turning basin. The former calls for probable cutterhead dredging with hydraulic pipeline material transport to nearby beaches with
possible scow barge transport of excess material to the designated offshore disposal site (ODMDS). The latter, currently indicates mechanical excavation with scow barge transport to the ODMDS. Interior channel/turning basin dredging will also be constrained with manatee protection requirements that will likely restrict operations. Planning and design may, however further develop and identify that cutterhead dredging with hydraulic pipeline material transport can be employed in the interior area as well as the exterior (see **Item 1**). Total project cost may also be significantly reduced for a number of factors including this possible change. As such, execution of a single or multiple contract projects should be further evaluated with consideration given to these possible changes.