PRESENTATION

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GIVEN AT THE INTERAGENCY WORKSHOP ON THE BENEFICIAL USES OF DREDGED MATERIAL, PENSACOLA, FL, 7-9 OCT 86

BENEFITS OF UNDERWATER BERMS

LOGO SLIDE

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WHY IS THE CORPS INTERESTED IN UNDERWATER BERMS? WE WANT TO BE PROACTIVE - BE SMART - LOOK FOR OPPORTUNITIES FOR ACCOMPLISHING OUR MISSION MORE COST EFFECTIVELY AND IN AN ENVIRONMENTALLY RESPONSIBLE MANNER.

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WE CERTAINLY HAVE THE OPPORTUNITY HERE. MAINTENANCE DREDGING IS PRESENTLY THE LARGEST SINGLE LINE ITEM IN THE CW O&M BUDGET, AMOUNTING TO ABOUT $450M PER YR. ABOUT 260M CY OF MAINTENANCE MATERIAL IS DREDGED ANNUALLY IN THIS PROGRAM. ONGOING IMPROVEMENTS TO THE NATIONAL WATERWAY SYSTEM RAISE THE TOTAL AMOUNT OF MATERIAL DREDGED ANNUALLY TO ABOUT 300M CY, 50M OF WHICH IS PLACED IN OCEAN WATERS.

HR 6 WOULD AUTHORIZE DEEPENING AND WIDENING OF 35 DEEP DRAFT PROJECTS INVOLVING DREDGING OF MORE THAN 1.0 BILLION CY OF MATERIAL. OBVIOUSLY THIS WORK WOULD BE ACCOMPLISHED IN PHASES OVER A MULTI-YEAR PERIOD.

DREDGING BY OTHERS, FEDERAL, STATE, AND THE PRIVATE SECTOR TOTAL 100 TO 150M CY PER YEAR. THE NAVY, FOR EXAMPLE, HAS AN EXTENSIVE MAINTENANCE DREDGING PROGRAM AND IS PLANNING SOME MAJOR NEW WORK AND DEEPENING PROJECTS ASSOCIATED WITH ITS HOMEPORTING PROGRAM.

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THE UNDERWATER BERM CONCEPT, SIMPLY STATED, IS TO USE RATHER THAN JUST DISPOSE. LARGE QUANTITIES OF DREDGED MATERIAL ARE PRESENTLY BEING TRANSPORTED TO DEEP-WATER SITES AT SEA, MAKING IT UNAVAILABLE IN THE LITTORAL ZONE FOR BENEFICIAL USES. THE PLANS FOR SOME OF THE DEEPENING PROJECTS WOULD CONTINUE THIS TRADITIONAL PRACTICE. FOR THE MOST PART, MAINTENANCE AND NEW WORK DREDGED MATERIAL IS UNCONTAMINATED, IS SUITABLE FOR A WIDE RANGE OF PRODUCTIVE USES, AND SHOULD BE CONSIDERED A RESOURCE TO BE USED WHERE IT IS COST EFFECTIVE.

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THERE ARE TWO APPROACHES TO IMPLEMENTING THE CONSTRUCTION OF UNDERWATER BERMS, EACH WITH ITS OWN ADVANTAGES. THE STABLE CONCEPT INVOLVES PLACEMENT IN DEEPER WATER SO THAT IT IS LESS SUBJECT TO WAVES AND CURRENTS. THEREFORE, THE MATERIAL STAYS IN PLACE. A WIDE VARIETY OF DREDGED MATERIAL CAN BE UTILIZED IN THIS FASHION RANGING FROM FINE GRAINED SILTS AND CLAYS TO COARSE MATERIALS.

THE FEEDER APPROACH INVOLVES SHALLOWER WATER PLACEMENT. THE MATERIAL WOULD BE MOVED IN THE LITTORAL PROCESS. MATERIAL WOULD BE LIMITED TO GOOD QUALITY SAND COMPATIBLE WITH BEACH SAND.

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EACH APPROACH ALSO HAS POTENTIAL BENEFICIAL EFFECTS WHICH CAN BE EXPECTED TO OCCUR IN VARYING DEGREES AT MANY LOCATIONS THROUGHOUT THE COUNTRY.

THE BERM, IF CONSTRUCTED BY THE STABLE PLACEMENT METHOD, OVER TIME WOULD BECOME A SIGNIFICANT, RELATIVELY PERMANENT, BOTTOM FEATURE THAT COULD DISSIPATE WAVE ENERGY THEREBY REDUCING THE POTENTIAL FOR SHORELINE EROSION. CONTINGENT UPON PROPER DESIGN AND ALIGNMENT, THERE WOULD BE A ZONE OF REDUCED WAVE ENERGY BETWEEN THE COMPLETED BERM AND THE SHORELINE IN WHICH ADDITIONAL MATERIALS COULD BE STOCKPILED FOR FUTURE BEACH NOURISHMENT, SUCH AS MAY BE REQUIRED FOLLOWING A MAJOR STORM OR HURRICANE. CONVENTIONAL PIPELINE DREDGES COULD RECOVER THIS MATERIAL FOR DIRECT BEACH PLACEMENT AT A MUCH REDUCED COST. FISHERY BENEFITS ARE ALSO EXPECTED AS TOPOGRAPHIC IRREGULARITIES ARE CREATED ON THE OCEAN FLOOR, ENHANCING THE FISHERY HABITAT. DAVE MATHIS TELLS ME THAT SUCH FISHERY BENEFITS HAVE BEEN OBSERVED AT A NUMBER OF CORPS HISTORICALLY USED OCEAN SITES DURING RECENT DESIGNATION SURVEYS CONDUCTED BY EPA.

SLIDES ____ (DEPICTING PHYSICAL AND FISHERY BENEFITS)

FEEDER PLACEMENT WOULD REPLACE SANDY MATERIAL IN THE LITTORAL PROCESS AND OVER A PERIOD OF TIME REDUCE TO SOME EXTENT THE EROSION TO DOWNDRIFT BEACHES. LIKE THE STABLE PLACEMENT METHOD, THERE WOULD LIKELY BE SOME ENHANCEMENT OF FISHERY HABITAT, BUT THIS WOULD BE TEMPORARY. IF THIS DISPOSAL TECHNIQUE WERE IMPLEMENTED ON A LARGE ENOUGH SCALE AND CONTINUED IN PRACTICE, THE MAGNITUDE OF THE BENEFITS WOULD INCREASE OVER A LONG PERIOD OF TIME.

WITH EITHER APPROACH, DREDGING COSTS COULD BE REDUCED IF HAUL DISTANCES ARE REDUCED. ALSO, THE APPROACHES PARTIALLY SIMULATE NATURAL SEDIMENTARY PROCESSES THAT OCCUR AT TIDAL INLETS.

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HOPPER DREDGES HAVE BEEN USED TO PLACE SAND CLOSE TO SHORE FOR YEARS. CONSIDERABLE DOCUMENTATION, FOR ITS TIME, IS AVAILABLE AT THREE SITES AT WHICH THE CORPS CONDUCTED NEARSHORE PLACEMENT TESTS MANY YEARS AGO. IN 1935, THE CORPS PLACED 200,000 CU YD OF SAND OFFSHORE OF SANTA BARBARA, CA, AND BEGAN A SERIES OF SIMILAR PLACEMENTS NEAR ATLANTIC CITY, NJ, THAT EVENTUALLY TOTALED 3.5 MILLION CU YD. IN 1948, THE CORPS PLACED 600,000 CU YD OF SAND ONE-HALF MILE OFF OF LONG BRANCH, NJ, IN 38 FT OF WATER, CREATING A MOUND 7 FT HIGH, AND 3700 FT LONG. SURVEYS MADE 4 YEARS LATER SHOWED LITTLE CHANGE. ALL CASES INDICATED THE MATERIAL REMAINED STABLE, SUGGESTING THAT BERM CONSTRUCTION AND STOCKPILING ARE VIABLE APPROACHES.

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MORE RECENTLY, THE DREDGING DIVISION OF THE WATER RESOURCES SUPPORT CENTER ARRANGED FOR THE NORFOLK DISTRICT AND THE COASTAL ENGINEERING RESEARCH CENTER TO CONDUCT A PILOT STUDY 4 MILES OFFSHORE OF VIRGINIA BEACH IN THE DAM NECK STORAGE AREA. THE PURPOSES WERE TO DETERMINE WHETHER MAINTENANCE MATERIALS CONSISTING PRIMARILY OF FINE SANDS, SILTS AND CLAYS COULD CREATE A SIGNIFICANT MOUND; TO EVALUATE OR MONITOR THE BEHAVIOR OF THE MOUND; AND TO EVALUATE THE UTILITY OF DREDGING AND MONITORING EQUIPMENT AND TECHNIQUES.

CONSTRUCTION OF AN UNDERWATER BERM DEPENDS VERY MUCH ON PRECISE CONTROL OVER THE EXACT POSITION OF RELEASE. USUALLY DISPOSAL AREAS ARE VERY LARGE AND NO SPECIAL EFFORT IS MADE TO RELEASE THE MATERIAL IN ANY PARTICULAR PLACE WITHIN THE OVERALL DESIGNATED AREAS. AT DAM NECK, APPROXIMATELY 20M CY HAD BEEN DEPOSITED OVER A 20 YEAR PERIOD, CREATING ONLY A BROAD HILL OF RELATIVELY LOW RELIEF.

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DREDGING AND DISPOSAL AT DAM NECK WAS ACCOMPLISHED BY THE SUGAR ISLAND AND THE MANHATTAN ISLAND, TWO SELF PROPELLED, SPLIT HULL CONTRACT HOPPER DREDGES.

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I HAVE SHOWN THIS SLIDE OF THE SMALL DREDGE CURRITUCK WHICH WELL ILLUSTRATES THE SPLIT HULL DESIGN. THIS DREDGE WAS THE PROTOTYPE

FOR MOST OF THE MODERN CORPS AND INDUSTRY HOPPER FLEET. ABOUT 845,000 CY OF SILT AND FINE SAND WERE DEPOSITED BETWEEN AUGUST AND NOVEMBER 1982. THE DREDGING CONTRACT REQUIRED TWO SPECIFIC "POINT DUMP" DISPOSAL SITES WITHIN THE DAM NECK SITE IN 34 TO 36 FT WATER DEPTHS. AT ONE SITE THE DREDGE WAS REQUIRED TO STOP BEFORE RELEASING MATERIAL AND AT THE OTHER THE DREDGE ONLY SLOWED BEFORE DUMPING. THIS REQUIREMENT WAS MADE TO DETERMINE IF THE TWO MODES OF RELEASE WOULD RESULT IN MEASUREABLY DIFFERENT BOTTOM DEPOSITS. INTERIM SURVEYS INDICATED IDENTICAL MOUNDING FROM BOTH RELEASE MODES; THEREFORE, THE REMAINDER OF THE JOB WAS PERFORMED BY DUMPING WHILE UNDER WAY AS THIS IS THE LEAST COSTLY METHOD. THE MATERIAL PRODUCED A MOUND HAVING ABOUT 11 FT OF RELIEF TO THE 23-FT CONTOUR WITH 1:130 SIDE SLOPES, AND COVERED AN AREA 1600 FT BY 2800 FT.

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THE NORFOLK STUDY CONCLUDED THAT CONVENTIONAL HOPPER DREDGES AND THE ELECTRONIC POSITIONING EQUIPMENT ROUTINELY USED BY THE INDUSTRY ARE CAPABLE OF CONSTRUCTING A MODERATE TO HIGH-RELIEF BOTTOM FEATURE IN AN ECONOMICAL MANNER, EVEN WHEN THE PLACEMENT MATERIAL IS A MIXTURE OF FINE SAND AND SILT.

THE MOUND WAS FOUND TO BE STABLE, EVEN WHEN SUBJECTED TO OCEAN STORM CONDITIONS. MOUND PLACEMENT AND PHYSICAL BEHAVIOR, AFTER PLACEMENT, WERE DOCUMENTED BY MULTI-ELEMENT SURVEY TECHNIQUES CONDUCTED JOINTLY BY THE NORFOLK DISTRICT AND CERC. THE MOST RECENT HYDROGRAPHIC SURVEY WAS CONDUCTED IN DECEMBER 1985, FOLLOWING TWO

HURRICANES SINCE PLACEMENT OF THE BERM. IT WAS CONCLUDED FROM THE STUDY THAT THE ONLY LOSS OF DREDGED MATERIAL VOLUME WAS A RESULT OF SETTLEMENT OR SCOUR ALONG THE CREST DUE TO THE STORMS. ALL APPARENT LOSS OF DREDGED MATERIAL WAS FROM THE AREA ABOVE THE 26-FT CONTOUR. HURRICANE CHARLEY, A MINIMAL HURRICANE, PASSED THE AREA ON AUGUST 17, 1986, AND A ROUTINE SURVEY BY THE NORFOLK DISTRICT IS SCHEDULED, WHICH WILL EVALUATE THAT STORM'S IMPACT ON THE BERM.

CERC AND NORFOLK DISTRICT TESTED A VARIETY OF MONITORING EQUIPMENT AND TECHNIQUES TO DETERMINE THE PHYSICAL BEHAVIOR OF AN UNDERWATER BERM. SOME OF THE MORE USEFUL ONES WERE FATHOMETER SURVEYS, SIDE SCAN SONAR, SEDIMENT SAMPLING, AND SHORT SEDIMENT CORES. THE DEMONSTRATION ALSO SHOWED THAT CONSIDERABLE WORK SHOULD BE DONE IN FURTHER DEVELOPING AND STANDARDIZING PHYSICAL MONITORING EQUIPMENT AND TECHNIQUES. WRSC AND CERC HAVE TAKEN STEPS IN THIS DIRECTION BY INCLUDING A NUMBER OF BERM RELATED STUDIES IN THE 2-MONTH SUPERDUCK NEARSHORE PROCESSES EXPERIMENT NOW UNDER WAY AT CERC'S FIELD RESEARCH FACILITY IN DUCK, NC.

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THE BERM CONCEPT HAS BEEN A STRONG INITIATIVE WITHIN WRSC AND PARTICULARLY OF MR. MURDEN FOR AT LEAST THE PAST 4 YEARS. DURING THIS TIME, MR. MURDEN WAS INSTRUMENTAL IN ARRANGING FOR THE NORFOLK EVALUATION AND BASED ON THE POSITIVE RESULTS OBTAINED, HAS BRIEFED THE ENVIRONMENTAL ADVISORY BOARD AND THE COASTAL ENGINEERING RESEARCH BOARD. BOTH OF THESE TECHNICAL ADVISORY GROUPS TO THE CHIEF OF

ENGINEERS HAVE ENDORSED THE CONCEPT IN PRINCIPLE. DISCUSSIONS BETWEEN MR. MURDEN AND MR. GORDON OF NMFS SUBSEQUENTLY LED TO INTEREST BY THE AGENCIES IN UTILITY OF THIS CONCEPT FOR HABITAT DEVELOPMENT FOR FISH AND SHELLFISH.

AS A RESULT OF THESE ENDORSEMENTS, GENERAL HATCH HAS APPROVED A FULL-SCALE DEMONSTRATION THAT WOULD FULLY ASSESS AND DOCUMENT PHYSICAL AND BIOLOGICAL EFFECTS ASSOCIATED WITH CONSTRUCTION OF AN UNDERWATER BERM.

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MOBILE DISTRICT, IN COORDINATION WITH CERC, HAS PROPOSED THAT IT CONDUCT A DEMONSTRATION AT MOBILE HARBOR, IN THE NEARSHORE ZONE OFF DAUPHIN ISLAND. THE PROPOSED DEMONSTRATION WOULD INCLUDE A TWO PRONGED APPROACH UTILIZING BOTH STABLE AND FEEDER PLACEMENT WHICH WOULD PERMIT AN EVALUATION OF ALTERNATIVE LOCATIONS AND CONFIGURATIONS. THE DEMONSTRATION WILL SPECIFICALLY SELECT SITES TO ACHIEVE THE DESIRED PHYSICAL AND BIOLOGICAL EFFECTS. PROTOTYPE TESTS WILL BE CONDUCTED TO ASSESS THE THEORY CONCERNING THE BEHAVIOR OF DREDGED MATERIAL IN VARIOUS WATER DEPTHS AND THE POTENTIAL FOR BIOLOGICAL ENHANCEMENT. HOWEVER, ONLY PHYSICAL TESTING IS SCHEDULED FOR THE FEEDER BERM, DUE TO THE TRANSITORY NATURE OF FISHERY BENEFITS ANTICIPATED. THE RESULTS ARE EXPECTED TO HAVE NATIONWIDE APPLICATION.

THE FEEDER PLACEMENT WILL BE DEMONSTRATED DURING A ROUTINELY SCHEDULED MAINTENANCE HOPPER DREDGING CONTRACT FOR THE BAR CHANNELS

AT PASCAGOULA AND MOBILE HARBORS. BIDS WERE OPENED ON THE 25TH OF SEPTEMBER; CONTRACT AWARD IS EXPECTED VERY SOON. DREDGING UNDER THE CONTRACT COULD BEGIN NEXT MONTH. AT MOBILE, THE DREDGED MATERIAL WILL BE DEPOSITED IN THE SHALLOWEST WATERS THE CONTRACT DREDGE IS CAPABLE OF DUMPING IN TO CREATE A FEATURE OF ABOUT 6 FT IN HEIGHT. THE BERM WILL RUN GENERALLY PARALLEL TO THE SHORELINE ABOUT 3500 FT IN LENGTH.

A STABLE PLACEMENT BERM IS PLANNED TO BE CONSTRUCTED DURING THE FIRST PHASE OF THE MOBILE HARBOR DEEPENING PROJECT (TURNING BASIN AND ANCHORAGE AREA). MOST OF THIS MATERIAL WOULD BE DIFFERENT FROM BAR CHANNEL MATERIAL AND WOULD CONSIST OF FINE GRAINED SILTS AND CLAYS. WHILE THE DESIGN AND CONFIGURATION HAS NOT YET BEEN COMPLETED, THE FEATURE WE WANT TO CREATE FROM THE AVAILABLE MATERIAL WOULD PROVIDE 10 OR MORE FEET OF RELIEF IN 35 TO 40 FT OF WATER AND COVER AN AREA 3/4 TO 1 MILE IN LENGTH.

SUPPORT OF THE ENVIRONMENTAL AGENCIES HAS BEEN OBTAINED FOR THE FEEDER BERM; HOWEVER, ONLY INFORMAL COORDINATION HAS BEGUN FOR THE STABLE PLACEMENT. ENVIRONMENTAL AGENCIES WILL HAVE THE OPPORTUNITY TO REVIEW OUR COMPLETE PLAN FOR PLACEMENT AND MONITORING.

THE DEMONSTRATION WOULD INVOLVE CONSIDERABLE MONITORING OF ENGINEERING AND ENVIRONMENTAL ASPECTS OF THE CONCEPT. MONITORING WOULD COMPARE BEFORE, DURING, AND AFTER CONDITIONS PRIMARILY WITH RESPECT TO THE BOTTOM BATHYMETRY, WAVES, CURRENTS, FISHERIES, AND DIRECTION AND RATE OF SAND MOVEMENT FOR THE FEEDER BERM OR LACK OF MOVEMENT

FOR THE STABLE BERM. SHOULD ANY SIGNIFICANT ADVERSE EFFECTS OCCUR DURING THE DEMONSTRATION, WE ARE PREPARED TO CEASE OPERATIONS.

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THE WATER RESOURCES SUPPORT CENTER, WITH THE HELP OF THE COASTAL ENGINEERING RESEARCH CENTER WILL CONTINUE TO SEEK OTHER CANDIDATE DEMONSTRATION SITES THAT OFFER PROMISE ON A NATIONAL BASIS. WE ARE HOPEFUL THAT THE NORFOLK AREA MAY PROVE TO BE A NATIONAL TEST SITE OF A LARGE STABLE BERM, PERHAPS DURING LATER INCREMENTAL DEEPENING PHASES. ALSO, WE ARE WORKING WITH JACKSONVILLE DISTRICT TO CONSIDER THE POSSIBILITY OF A FEEDER PLACEMENT BERM FOR MAINTENANCE MATERIAL AT PONCE DE LEON INLET. MOST RECENTLY, WE HAVE HAD FAVORABLE CONVERSATIONS WITH CHARLESTON DISTRICT ABOUT THE POSSIBILITY OF CONSTRUCTING A BERM IN CONNECTION WITH THE CHARLESTON HARBOR DEEPENING PROJECT WHICH WOULD BE AUTHORIZED UNDER HR 6.

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