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SEDIMENT MANAGEMENT AT MOBILE HARBOR, AL

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I would hope, as I go through my presentation, to illustrate that regardless of how technically complex or simple a sediment management issue may be--implementing a solution at the district level is often extremely difficult and in some cases requires many years to complete. Solutions must be crafted within the realm of political reality, sponsor abilities, funding and operational capabilities, and everchanging regulations and policies. In large part, our successes can be attributed to the long-standing and active partnership with the Corps R&D community at WES & HQ in helping us solve our problems. A strong relationship between the highly technical capabilities of the Corps R & D and District realities is essential. Given the comments Charlie Chestnut just made, makes that relationship even more critical.

Mobile Harbor improvements were first authorized in 1826 ($10,000) to provide for a 13 foot depth across the mouth of the Mobile River. From 1880 when the project was deepened to 17 feet through all the subsequent deepenings, and including all the maintenance material to date, a total 850,000,000 CY of sediment has been 'managed' in this project. Prior to the 1970's, material was pumped to the location closest to the dredging, which for the river section was generally to marsh and low uplands and, in the bay, alongside the channel. The bar material was hauled to a site in the Gulf close to the channel. The existing project includes a 40 feet deep upper harbor (river) section about 5 miles long, a 45-foot bay channel approximately 30 miles through the bay, and a 47 foot channel across the bar. The 45/47 foot deepening through the bay and across the bar was completed in 1990. The Theodore project provides for a 40-foot channel from the main ship channel in the middle of the bay to the western shore. The channel is about 7 miles in length extending to a 12-foot barge channel about a mile in length. The Theodore segment was completed in 1980.

The present disposal practices and challenges are what I want to focus on today. About 96% of our material is not a visibly attractive sand, but fine grained (mud) materials, which are generally more difficult to handle just from a perception standpoint alone. First, I would like to discuss the upper Mobile Harbor. Like many other projects in the nation, the lack of disposal areas was our #1 problem until just a few years ago. I read an article by the Mobile District Engineer published in 1957 from a presentation to a national ASCE conference that mentioned the District's efforts at that time to secure perpetual or long term easements "in order that spoil from future maintenance operations will not present disposal problems." He wasn't able to accomplish that effort even prior to the imposition of environmental constraints, and in the early 1970's, we were still dealing with 90 - day easements. The District developed a long-range plan for the upper Harbor in 1968. In 1969, the NEPA was passed. The environmental coordination required by NEPA and the subsequent opposition from environmental groups led us to seek help from WES as the DMRP was kicking off, specifically in the focus areas concerning development of techniques to extend upland site life and capacity. We dedicated one of our sites to this effort. It wasn't until 1985 though, that a plan was finally approved with a FEIS providing for long term disposal capability for the upper harbor. Conditions of

environmental certification included the extensive site management techniques developed under the DMRP. Those techniques resulted in a 2,000 acre disposal plan being reduced to about 550 acres of previously impacted lands, greatly reducing proposed impacts to adjacent marshes.

During this lengthy period (1968-1985), there were many changing environmental requirements (laws, Corps policies, Executive Orders) that resulted in serious setbacks to the project. For example, WES designed a geotextile test dike across a marsh area that would serve to develop design criteria for the remaining much larger dike system. This system was a major component of the long range disposal plan that had previously received all environmental approvals. The phase I (test) dike was successfully constructed on an extremely soft foundation in 1979 and plans were nearly completed for construction of the entire system when the President signed an Executive Order protecting wetlands ultimately eliminating this site from consideration. In fact, we and the project sponsor are now faced with having to remove the test dike in the light of recent efforts for environmental restoration.

The Corps policies on who pays for diking had also changed during this time, resulting in sponsor delays and now with WRDA 96, we have another change. Many, many alternatives were evaluated, but in the end dumb luck saved us. An Alcoa plant in the midst of a major expansion shut down making lands suitable for disposal potentially available for the sponsor to acquire. The real estate issues, however, were extremely complex and politically sensitive and required the governor's approval for condemnation. Separate court actions to identify ownership and to establish price for the lands were necessary to conclude the legal process. Channel dimensions were impacted for about 10 years due to limited disposal capacity and the requirement for conditioning the old disposal areas for future site management work. We do have though, a long range plan, i.e. 40 years, but it still has some limitations and requires occasional haulout of material to the Gulf. We have been fine tuning that plan, i.e., improving our site management techniques, constructing sumps in the river to better manage dredging frequencies, and recently in concert with WES, developed a proposal for a demonstration of manufactured soil. The manufactured soil proposal has potential to reduce haul out costs and could well lead to the disposal areas providing ample capacity to serve the upper harbor in perpetuity. Such a concept holds considerable environmental appeal, offers an opportunity for significant beneficial uses and strong community involvement, and provides a potential revenue source to the project sponsor.

The next segment of the Mobile harbor project I will discuss is Theodore. The project was authorized in 1970. A primary concern at the time was the effects that construction and placement of material in an island configuration in the Bay would have on the oyster industry. A decision was made to build a physical model at WES for the purpose of evaluating effects of the channel with alternative island placement locations and configurations to maintain the existing salinity regime in the bay. After much concern regarding the ability to construct such an island, the dredging job resulted in an extremely successful island feature in the bay. However, bank stabilization was necessary and WES provided tremendous support in our efforts to provide a marsh buffer as an economical means of stabilizing a portion of the island's shoreline. Birds nesting on this island was soon to be an immediate success and ultimately a problem. We really had a serious bird

issue, endangered brown pelicans and others protected by the Migratory Bird Act, which became even more important after we constructed the channel facilities for a Navy homeport on the Theodore canal. The Navy's National Defense needs made it necessary that the island be available for disposal at all times while environmental interests preferred no use during the nesting season. Again, a WES laboratory helped us develop bird counting techniques and a bird management plan for the island. WES has also been involved with a geotube design for possible ways of compartmentalizing the island.

The next project segment is the bay portion, which extends about 30 miles from the mouth of the river southward to the Gulf of Mexico. Past maintenance methods in the bay were inexpensive and extremely responsive to shipping needs. Pipeline dredges discharged adjacent to the channel, but WRDA '86 authorized deepening (by 15 feet) and widening (by 150 feet) resulting in changed maintenance requirements. The project recommended through the Board of Engineers for Rivers and Harbors consisted of creation of another island in the upper bay together with marsh creation. We envisioned some continued open water/marsh/island disposal. Congress responding to local pressures, changed the project to require that all new work and maintenance material be transported to the ocean for environmental purposes. WRDA '86 tremendously increased our future maintenance costs. Due to cost sharing changes in the law, only phase I of the project was constructed, wherein the project was deepened five feet but was not widened. About this same time, Bill Murden and CERC were developing the concept of beneficial uses associated with underwater berm construction. We volunteered to participate in a national demonstration at Mobile and evaluated a feeder berm as well as a stable berm. Two small hopper dredges were used to dredge maintenance material from the bar and specifically place the material in 18-19 feet of water, creating a feature 6 feet high, and one mile long. About 460,000 CY was placed in this feeder berm area on the Mobile ebb tidal delta shoals. All of the new work material (17-18MCY) from the phase I deepening was placed in a 1000-foot x 9000-foot area in 40-45 feet of water in the gulf. The (stable) berm was 20 feet high together with side slopes creating a footprint about 1-mile x 2 1/2 miles. Extensive physical, biological and equipment development and monitoring was conducted by WES during construction of this feature.

Early maintenance of the deepened project was by bucket dredges, but this proved to be too slow and costly. From a technical standpoint, the face of material needing dredging was too shallow and the time frame for a unit price bucket job was so slow that it was difficult to sufficiently scope a job. Also, this method was not responsive to shipping needs. Even before the project deepening was completed, we knew that we had to determine a more economical means of hauling the light maintenance material to the Gulf (50 miles round trip). We initially believed it possible, or at least worth evaluating, pipeline dredges pumping directly into hopper barges in such a fashion with overflow to increase weight load. A WES laboratory performed biological (including fishery) and physical testing of the overflow and downdrift in the plume. We hired a consulting firm to determine and evaluate equipment needs and we rented a large dredge and barges and configured this equipment to perform the evaluation. The environmental evaluation showed no negative impact to the bay; however, the equipment testing indicated that the gain was insufficient to warrant any further work at that time.

Soon after deepening was completed, we began renting hopper dredges for maintenance of the channel. One normally wouldn't expect this to be economical on a long haul since most of the cycle time is spent hauling rather than dredging. But, it has proven the most reliable and responsive methodology since we are primarily digging only corner shoals in the long bay channel. The significance of the corner shoaling resulted from the project not being widened when it was deepened, in addition to the larger, wider ships which began using the channel. A ship simulation model had been used to demonstrate the suitability of the narrow channel, but perhaps there were some factors overlooked related to the importance of maintenance material in the channel.

Rental of hopper dredges is quite expensive (ranging in costs between $0.6M to $1.8M/month) and the national fleet is extremely limited. This, coupled with competing needs on the East and Gulf Coasts, exacerbated by emergency needs on the Mississippi River often make dredge availability critical. A few years ago, we worked with WES to design and locate areas in the bay where sumps for advanced maintenance could provide for more economical dredging and channel reliability. We are constructing them as O&M funds become available. We are currently working with WES on a couple of activities to improve hopper dredge efficiency. Given increased costs, limited equipment availability and reduced O&M funds, the bay channel while most often providing a usable authorized project depth is sometimes width restricted to a one-way channel.

The bay needs are great, resources are dwindling, but opportunities may be on the horizon. WRDA 96 authorized evaluating other alternatives to Gulf disposal. A national estuary program is now in place for Mobile Bay (2-more years of study). Among other studies, the program will develop a sediment budget for the bay which has the potential to mesh with the WRDA '96 provision allowing a re-look of maintenance dredging techniques. Also, a national demonstration of thin layer disposal (open water placement in less than 12 inch lift thickness) was performed by the District associated with the Gulfport Harbor, MS deepening project. The demonstration included three major study efforts, one performed by WES, one by NMFS and the other by a Contractor. Given the positive results from those studies, we hope to be able to develop open water disposal alternatives having support of EPA, NMFS, F&W, and the state. The District, with WES support, had earlier performed a test of thin layer disposal at a small project in Mobile Bay which served tremendously in designing the Gulfport work. Thin layer disposal will no doubt be a technically viable option to be considered under WRDA '96, but appropriate environmental coordination and public workshops will be necessary. I would note that another extremely effective WES capability that our District has used over the years is the DOTS Program.

My last project segment is the bar channel in the gulf south of Dauphin Island. There are significant public and political concerns regarding how our dredging practices effect erosion on Dauphin Island. Some interests are demanding direct placement of dredged material on the beach at a cost of better than four times the current cost, while others demand placement of the material in the feeder berm location, estimated to increase costs by about 50%. Under current authority, the increased costs require cost sharing. In the meantime, we are seeking clearances for a beneficial uses area that could be used for placement of suitable materials near the channel, but within the littoral system at no increased cost when suitable equipment is under contract. We also plan to evaluate

placement of mixed materials at this site under the DOER Program which could increase opportunities to meet the public demands.

Let me conclude by making a few statements. Things ain't simple. Even simple things ain't simple. Dumb luck counts. Don't second guess Congress. Very importantly, persistence pays. I won't go so far as to say "it takes a village to raise" a project, but a major key to success is to have an active partnership within our Corps family between R&D and District elements, as well as to have an effective interdisciplinary team at your District.