Minutes of the 106th Meeting

6-9 May 1997

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1. The 106th meeting of the Committee on Tidal Hydraulics (CTH) was held 6-9 May 1997 in Norfolk Virginia at the invitation of COL Robert H Reardon, Jr, Commander, U.S. Army Engineer District, Norfolk (CENAO).

2. On 6-7 May, the CTH held Technical Sessions on historical and current dredging issues on the James River with special emphases on the Upper James (Hopewell to Richmond) issues and problems. A site visit to the Turkey Island Cut-Off project and the proposed Shirley Plantation dredged material disposal area was also included on the agenda. USACE Tidal Hydraulics R&D was discussed followed by a CTH Executive Session on 8 May. The morning of 9 May was devoted to a sub-committee working session. All sessions, except the site visit, were held in the Omni Waterside Hotel, Norfolk, Virginia.

3. Attendees were:

Committee on Tidal Hydraulics

William H. McAnally, Chairman	Waterways Experiment Station
Virginia R. Pankow, Executive Secretary	Water Resources Support Center
A. Jay Combe	New Orleans District
James Hilton for Barry Holliday	Headquarters, U.S. Army Corps of Engineers
Jaime R. Merino	South Pacific Division
Michael R. Palermo	Waterways Experiment Station
Edward A. Reindl, Jr.	Galveston District
A. David Schuldt	Seattle District
Ronald G. Vann	Norfolk District
Charles J. Wener	New England District
John H. Lockhart, Liaison	Headquarters, U.S. Army Corps of Engineers

Consultants

Ray. B. Krone	Professor Emeritus, University of California at Davis
Donald W. Pritchard	Professor Emeritus, State University of New York at Stony Brook

Other Corps of Engineers Representatives[1]

Col. Robert H. Reardon	Commander, Norfolk District
Eugene Batty	Norfolk District
Beth Byrne	Norfolk District
Thomas Friberg	Norfolk District
Debbie Gray	Norfolk District
Richard Klein	Norfolk District
Tom Lochen	Norfolk District
Rob McAdory	Waterways Experiment Station
Nana Parchure	Waterways Experiment Station
Roger Pruhs	Norfolk District
Linda Sue Roche	Norfolk District
W. Meade Stith	Norfolk District
Kevan Taylor	Norfolk District
James N. Thomasson	Norfolk District
Betty Grey Waring	Norfolk District
Dennis Webb	Waterways Experiment Station
T. D. Woodward	Norfolk District

Other Presenters and Guests[2]

L. D. Amory	Virginia Pilot Association
Willie Barnes	Maritime Administration
Holly Lane Bonham	Virginia Port Authority
Judy Bunch	Easco Aluminum
W. L. Counselman	Virginia Pilot Association
Rick Downing	Norton Lilly, Intl.
Rebecca Francese	Waterway Surveys & Engineering
Than Green	Virginia Pilot Association
Mitch Harvey	US Coast Guard
Woody Holton	Waterway Surveys & Engineering
David F. Host	T. Parker Host, Inc.

[1] Attended Technical Sessions only

[2] Attended Technical Sessions only

Nuns Jain	Maritime Administration
Jeff Keever	Hampton Roads Maritime Assoc.
Tou Kennedy	Independent Container Line
Frand Louthan	Port of Richmond
L. Frank Mach	Maritime Administration
Roderick Mather	Tidewater Atlantic Research
Marty Moynihan	Port of Richmond
Chandoris Smith	IMT, Richmond
W. E. Turner	US Coast Guard
John Walsh	Waterway Surveys & Engineering
Gordon Watts	Tidewater Atlantic Research
Edward Westfall	US Coast Guard

4. The minutes are divided into discussions of presentations made at the Technical Sessions and actions taken at the Executive Session. The order of the minutes is not necessarily the chronological order in which these matters were considered at the meeting.

TECHNICAL SESSIONS

5. COL Robert Reardon, Jr., District Commander, welcomed the CTH members and informed us that this was also the third meeting of the James River Partnership a group whose goal is to keep the James River open and safe and to promote and maintain the vitality of the shipping industry. He noted that a specific Upper James River problem area was the Turkey Island Cut-Off and was pleased that the resources of the CTH were available to assist the District.

6. Mr. William H McAnally, Chairman of the CTH and Chief of the Waterways & Estuaries Division, Coastal & Hydraulics Laboratory, Waterways Experiment Station (WES) thanked COL Reardon for the welcome and the opportunity for the CTH to serve the Norfolk District. For the benefit of those unfamiliar with the CTH, he briefly highlighted the purpose and functions of the committee and stressed that it is a Corps of Engineers committee composed of a diverse range of talents from different Divisions, Districts, Laboratories and FOA's who offer technical advice and consulting services on an as needed basis. The committee was established in 1948 and this is the 106th meeting. The session continued with the introduction of the committee members and the numerous guests representing the Corps of Engineers, Coast Guard, James River Pilots, Port of Richmond and numerous private and public organizations.

7. Mr. Eugene Batty, CENAO, presented an overview of the meeting, reviewed the agenda, and introduced the speakers.

8. Mr. Richard Klein, CENAO, reviewed the district maintenance dredging program. There are 73 authorized navigation projects, almost all in tidal waters, 23 that need no maintenance dredging and 13 that have material disposal problems. Of the remaining 37 navigation projects, 5 are deep draft, 31 are shallow draft and one is a shallow draft lock and dam project. At this time there are no multi-purpose projects. Tonnage figures quoted for 1995 were 72.5 million tons for the Hampton Roads area and 6 million tons for the James River. Citing figures representing a 10

year average, 3.8 million cubic yards are dredged in 12 dredging events each year mostly (78%) from deep draft projects. Of 119 projects in the sample, only two were performed by government hopper dredges, while the majority (75%) were performed by cutterhead dredges. By volume, about half of the material dredged is placed in the Craney Island facility, but by the number of dredging events, 75% have placement at sites other than Craney Island. Four major dredged material placement categories are used. They are, upland/dikes areas, open water/ocean areas, beach/shoreline areas, and a mixed category employing more than one placement type. If Craney Island is not used, the method of choice is open water disposal. Beneficial use of dredge material is mainly from small projects using cutterhead dredges and account for about 42% of the material dredged. Beneficial use categories are: Beach/shoreline -sand (41%), Open water - habitat (40%), and Upland - reuse or recycle of material (19%).

9. Mr. Meade Stith, CENAO, reviewed the history and status of the Craney Island dredged material placement area. The site was designated in 1946 to be a placement site for public and privately dredged material. With construction completed in 1958, it was estimated that it would be filled by 1980 after receiving 100 million cubic yards of material. To date, the Craney Island placement area has received over 200 million cubic yards, double the project design. Effective site management techniques such as dividing the area into three cells, utilizing one cell at a time and allowing the other two cells to dewater and compress, have improved site efficiency about 25%. There are two methods of delivering dredged material to the site; direct pumping into the site, and placement or dumping of clamshell or hopper dredge material outside the site in a rehandling area where it is ultimately pumped into the disposal area. About 60% of the disposal facility use is by the Corps of Engineers. To help defray the cost of operation, tolls are charged to non-Corps users. The fee is $0.86/cy for direct pumping into the site and $2.06/cy for use of the rehandling area. Of the rehandling fee, $1.20/cy remains in the District revolving fund. The direct pumping toll and that part of the rehandling toll that pays for direct pumping go to the Treasury to pay O&M expenses. The site has 7 spillways and the effluent meets all clean water requirements. Foundation strength concerns are always present due to the presence of soft underlying soils. If no changes in current site management practices occur, it is estimated the site will last until 2005. Factors that will affect the future use and capacity of the placement area are: the amount of material, the rate at which the material is placed, and the height of the containment levee. Strip drains have been successfully used to increase settlement at a measured rate of 2 feet/year. This technique can be used in the disposal area to increase capacity and under the levees to increase the soil strength and therefore allow the levees to be raised. Strip drains have been placed under the east levee and the west levee of the south cell with completion to include all levees in 2000. There is concern that levee settlement may cause damage to the spill boxes. Careful even drain placement around these areas and a good monitoring plan are being used to follow progress. With the use of the strip drain technique under the levees the placement area life expectancy may be 20 years or more. When asked if there was a limit to the elevation of the levees, Mr. Stith indicated that preliminary indications are between 38 and 48 feet. He also informed the Committee that the material came from dredging the Norfolk harbor and adjacent waters. Also discussed was the potential to expand Craney Island on the eastern side to create additional land area for commercial use.

JAMES RIVER PROJECT

10. Mr. Gene Batty, CENAO, provided an overview of the James River project. As early as 1829 the city of Richmond petitioned the Federal government to provide funds for the removal of obstructions to navigation in the James River so ships could safely sail to the harbor at Richmond. The James River project was authorized in the River and Harbor Act of 1884, and modified several times with the last modification in 1962. The project covers 90 miles from Hampton Roads to Richmond Locks. In the lower James River, Hampton Roads to Hopewell, there are 7 shoals that need maintenance dredging. The upper James River, Hopewell to Richmond, contain 6 reaches with shoals, the Richmond Deepwater Terminal plus the deepwater turning basin at Richmond. The tide progresses to Richmond and salinity generally goes no further than Jamestown in the lower river. The navigation channel in the lower James River is 25 feet deep, and 300 feet wide and continues at 25 feet deep in the upper James to the Deepwater Terminal at Richmond where the channel becomes 18 feet deep by 200 feet wide into Richmond. The City of Richmond is responsible for providing dredged material placement sites and presently in the upper James there are 25 placement sites either in use or being evaluated.

11. Mr. Martin Moynihan, Port of Richmond, represented the user's view on the importance of the James River. The river is an important commercial highway and is estimated to be responsible for generating 25,000 jobs in the Richmond to Hopewell area. About 2,800 of these are direct river related jobs. The wages and taxes paid and generated by these jobs are important to the upper James economy. An indication of growing river traffic is the increase in draw bridge openings from 1995 to 1996 at the James River Bridge near Newport News and the Benjamin Harrison Bridge near Hopewell. In 1996, 227 ocean going vessels navigated the upper James to Richmond along with 350 oil and covered chemical hopper barges. This is in addition to the numerous sand and gravel barges and the 473 passenger vessel sorties, carrying over 69,000 passengers, that use this part of the river. He estimated that 4.6 million tons of commodities (general and bulk cargo, petroleum products and sand and gravel) arrived in Richmond in 1996 but preferred Richard Klein's number of 6 million tons. Vessel draft of 22 feet has been established by the Virginia Pilots for the 18 miles of river from Hopewell to the Richmond Deepwater terminal. In the upper James, three man made cuts have been made to shorten travel distance and time. One of these cuts, Turkey Island Cut-Off has a particularly troublesome shoaling problem. Attachment 1 shows the Cut-Off.

12. The goal of the James River Partnership is to keep the James River open and at the full project depth of 25 feet all year. Navigation restrictions due to the occurrence of shoals result in the light loading of vessels, an expense to industry. In four of the last six years there have been 2-3 consecutive months of navigation restrictions at Turkey Island Cut-Off. There is a need to find a permanent solution to this reoccurring problem. The Corps is looking for an engineering solution to reduce annual dredging, especially at Turkey Island, as the disposal sites are rapidly filling. In the interim a set of self imposed restrictions have been implemented. There is no navigation after dark of vessels greater than 250 feet in length. There are also tide considerations and when combined with the reoccurring shoaling problems and operation limited to daylight hours, the result can severely restrict navigation. The City of Richmond is having trouble meeting the feasibility study cost share because they don't have unrestricted navigation year round and

commercial interests are not willing to invest with the current limitations. The Corps Reconnaissance Study is for a 27 foot deep and 300 foot wide upper James River navigation channel. The cost of the feasibility study is shared, 50% by the City of Richmond and 50% by the Federal Government. In the past 10 years, over $16 million dollars have been invested in Port infrastructure. It is critical to the City of Richmond that the James River be kept fully open all year.

13. A question was raised about the design vessel used in the study. When the project was authorized (in the 1960's) the design vessel was one with 22 foot draft. However, with time the vessel length has been increasing. There also have been changes in underkeel clearance requirements. The maximum vessel to navigate the channel is 559 ft long, 85.5 ft beam and 22 ft draft. The average length is between 450 and 500 ft.

14. Mr. James Thomasson, CENAO, briefly discussed the expectations of the James River Partnership. The Partnership was formed a year ago to address the reasons for the many navigation restrictions on the river. There have been two meetings and this is the third. The expectations of the Partnership are to have no restrictions and a depth that can handle a vessel draft of 25 ft. They would like to see the authorization for a wider channel with a depth greater than 25 ft. It is estimated that it will take $5.3 million dollars to meet these expectations and if the funds are reduced navigation restrictions will probably result. Last year the weather was good with no heavy flooding and the Corps was able to dredge the three critical areas keeping the river open with no restriction.

15. Debbie Gray and Richard Klein, CENAO, informed the Committee of the plan to improve the contracting procedure and reduce the time from dredging need to actual deployment. An Indefinite Delivery contract is being announced in the Commerce Business Daily for James River dredging. The bids are due in June for a base year plus two option years with an annual limit of $3.8 million. The contract will stipulate a response time of 20 days and will be implemented with the use of Task Orders ($25,000 minimum). An annual minimum of $100,000 is guaranteed to the winning contractor. The Tasks Order and the Notice to Proceed will be issued together. The purpose of this contracting tool is to quickly address shoal problems without time delays. The method should greatly reduce the lead time from need to dredging.

16. Several questions from the CTH were addressed by Mr. Klein.

Q. Does the contract require a dredge be kept in the river at all times?
A. No this is not a requirement. The dredge will be kept busy only about 6 months.

Q. Do you use river forecasting methods to predict shoaling rates? Are there upstream reservoirs to control flows?
A. There is only one upstream Corps reservoir but this does not have much flow control, it does not trap the sediment upstream.

Q. What will happen if the plant is committed to another contract?
A. Then the Contracting Dept will have to go to another source.

Q. Do you use advanced maintenance?
A. Yes we do. We want to optimize our efforts especially at Turkey Island.

Comment: You should anticipate the amount of shoaling so you can initialize mobilization before it becomes critical or the springtime restrictions (environmental) go into effect.

Q. Will we hear about the environmental restrictions?
A. Yes, that will be covered in other presentations. Environmental restrictions are based on water temperature, spawning species and things like that.

Q. Are there problems with contaminated sediment?
A. Kepone was a severe problem in the 1970's but studies and agreements enabled progress to be made. The material, located in the river below Hopewell, is buried with clean sediment. Mr Vann added that the Kepone situation has improved because of this sensible approach but it had to be proven with demonstration projects and extensive monitoring practices.

17. Mr. Thomas Lochen, CENAO, presented an update on the Reconnaissance Study. He discussed the desire to expand the turning basin. About five miles downstream from the Richmond City Lock, improvements to the terminal have resulted in the arrival of newer, larger ships. They now have problems making the 180 degree turn to return downstream. There is an FY99 proposal for a new feasibility study start. A letter report has been written that indicates a federal interest in having some larger ships navigate the area. The project goes from 200 feet to 600 feet and returns to 200 feet in width. The original authorization for the basin was 700 feet and in 1962 was increased to 825 feet. With the average vessel length of 485 - 510 feet and a maximum to date of 559 feet, there is a need to enlarge the turning basin. In response to the question concerning the use of O&M funds, Mr. Lochen indicated he is looking into it but thought the project could justify the use of other funds as well.

18. CPT L. R. (Rick) Amory, Virginia Pilot Association, highlighted the concerns from the Ship Pilots point of view. He indicated that the Pilot's responsibility was to evaluate and judge every trip and pass that information on to the other pilots. Communication is essential among the 13 James River Pilots. The number one issue is safety and closely followed by maintaining viable commerce (improved and increased traffic) on the river.

Q. How many groundings have you had since the channel was deepened to 25 feet?
A. I don't have statistics on that. The river can change very rapidly and conditions can vary overnight. In the upper river the problem is more with rubbing the toe of the slopes. There are very few groundings where ships stop and can't move. NOAA has a program called PORTS that provides real time river information. We would like to get a program like that in the James River to improve navigation.

Q. Do you have access to computer simulators to use as training aids and simulate bridge and other problems?

A. We have used these but not on a regular basis. One problem with simulators is that, in

time, you can learn to predict the program and it is not as effective. There is a good facility in France that is a lake with model vessels.

Q. Which vessels are required to use Pilots?
A. Foreign registered vessels must use Pilots. The Navy is not required but may use if desired. The Pilots are in contact with each other and in the Hopewell to Richmond area can schedule ships to meet, although in certain areas in the river they will make all efforts to not meet.

Q. What are navigation conditions at the cut-off like?
A. The Turkey Island Cut-Off is narrow and there is no option to turn around. On flood tide a deeper draft vessel can move up the river. In high river flow conditions a strong ebb can result in limitations on certain ships. The maximum draft of 21.6 feet in a 25 foot channel is allowed. A pilot must know the ship handling characteristics. When the proper keel clearance is maintained, a 21.6 foot draft vessel can move any time. If the draft is 22 feet, we must wait for favorable tides.

Q. Would it help if flows in the ox-bow were cut off?
A. Stronger currents would not be a benefit to navigation.

19. Mr. Thomas Woodward, CENAO, gave an overview of the engineering approach to maintaining unrestricted navigation. The goal is to have safe and unrestricted navigation on the James River throughout the Corps budget year. The 25 foot deep, 200-300 foot wide project extends 90 miles up the river with about a third of the project needing some maintenance dredging. The cut-offs were made in the 1930's. Turkey Island Cut-Off has active erosion of the shoreline along the cut off. The barges using the cut-off are 495 feet long by 76 feet wide.

20. Problem: In the last five years navigation restrictions placed by the Pilots have resulted in a loss of one foot of vessel draft. This is due to an increase in Pilot liability and their increased sensitivity to shoaling which is very unpredictable. These restrictions have resulted in lost time and cargo with a corresponding economic loss to Richmond and the surrounding area.

21. Approach: The engineering approach to the problem consists of a three pronged approach with short and long term solutions. The budget of $2 million was increased to $3.9 million in FY 96 with $3.3 million in FY 97.

Prong 1: Continue dredging - 3-4 dredging events per year. This is not the final solution. It is costly and utilizes too much of the budget and will increase the usage of disposal sites.

Prong 2: Sediment analysis to identify the source and deposit areas of eroded soil.

Prong 3: Conduct the engineering evaluation of channel realignment. Identifying the optimum channel redesign is the most promising solution. It involves much background work such as documenting archeological findings in the study area. Ship tracking studies have been performed and the analysis completed. Field investigations of currents, sediments and waves have also been completed. The field effort will produce data for model studies and analysis. The model studies will be done when funds become available. A comprehensive soils classification

and analysis will be preformed by a contractor as well as current drogue studies.

22. Throughout the study safety is the key issue. To date six plans are being evaluated for implementation cost and dredge material placement cost and impact. The solution might be something that keeps currents strong enough to prevent shoaling or a plan to move the channel away from the inner bend. The area shoals quickly to 22 feet and then equalizes. The shoaling rate slowly decreases while the affected area increases. One promising option includes a wider channel in deep water. Ship tracking studies proved very valuable. Of 12 tracks (six in and six out), only one track used the old channel.

Q. Why is the navigation channel on the inside of the bend? They are usually on the outside.
A. It is not a good design but is hard to change once established.

Q. Is the deep water staying in the same location?
A. Yes, we have looked at the long term surveys.

23. Mr. Richard Klein, CENAO, continued with a more detailed explanation of dredging and material placement. The Lower James must be maintained and kept open in order to have access to the Upper James. Most of the James River dredging takes place in the lower portion of the river and is performed primarily by medium to large pipeline dredges with open water placement of the material. Periods when no dredging is allowed in the Lower James for oyster and migrating fish reasons are 1 July to 30 September and 15 March to 30 June, respectively. There appears to be an upward trend in the volume and frequency of dredging although the data show no significant change in shoaling rates. The more frequent dredging is done to compensate for the environmental restrictions and overdepth dredging (non-pay yards) may account for the increased volume. Surveys of the open water placement areas show some building. However, the soft clay and silty material does not appear to be returning to the channel but instead moving to other areas.

24. Annual dredging in the narrow Upper James River uses upland and shore disposal. Dredging in the Turkey Island Cut-Off is more frequent than in other upper river areas. The trend toward increased dredging is a result of more frequent surveys to detect shoaling and initiate dredging before the accumulation gets too great. Whereas surveys were performed every 1-2 years, now they are done 2-3 times a year. The material is a mixture of clay, sand and silt and the turbidity maximum is near Jamestown, well below Turkey Island. The quantity of dredged material in the cut-off is small compared to the total James River quantity but it is the majority of the dredging in the Upper James. The District recognizes the need to keep the river open but can not maintain the increased dredging costs and the more rapid filling of disposal sites. Advanced maintenance has been used and is approved if it can be justified to maintain the channel through the budget year.

Q. Has the shoaling rate remained constant over the last 30 years?
A. I can't speculate. The trend of recent maintenance dredging shows an increase over time

from 1986 to 1997 but it varies greatly, with very little dredging in 1993 and a great deal in 1994. The trend toward more dredging is not a result of an increased shoaling rate.

Q. Have you been able to correlate fresh water inflow from storm events with increased shoaling?
A. We have not yet developed a correlation, but we will examine this.

25. Mr. Thomas Woodward, CENAO, concluded the dredging and placement topic with a briefing on the Shirley Plantation placement area as a possible long term solution through beneficial use of dredged material. The Shirley Plantation has an abandoned 80 acre borrow pit that was used for sand and gravel mining. The land owner, using the mitigation banking process, plans to restore wetlands to the site. Recent modification to his original plan have reduced the site capacity for dredged material from 1,800,000 cubic yards to 700,000 cubic yards. The City of Richmond has the responsibility of finding disposal sites and the Corps is responsible for using the site including any dike construction. The City has identified 18 sites that the Corps is evaluating for acceptability. The dike at the current Turkey Island site has been raised from 16 to 35 feet and should accommodate disposal material for another 5 years.

26. Mr. Woody Holton, Waterway Surveys and Engineering, discussed the sediment fate analysis of Turkey Island Cut-Off sediments. The findings were preliminary as the data analyses were ongoing. At the cut there is a deep hole that has been developing since the 1930's. There is a shallow 5 - 8 foot shoal that at one time was the bank. The bank is vertical with an 80 degree angle of repose. The bank erosion is generally continuous over time as it is composed of erodible clays and silts. Surface current measurements were taken at ebb flow on a spring tide (probably high flow). The maximum surface ebb velocity, located in the narrowest part of the cut, was 3.8 ft/sec. The river discharge was unknown. The data show the flow splits on the downstream end of the cut and measured a slight return circulating pattern over the shoal area. There is a substantial flood surface current into the old channel. It was measured at a maximum of 3.25 ft/sec and was concentrated in the center. Two small areas of reversal currents over erosion areas were also measured. Upstream sand waves may represent high bottom velocities.

27. Ms. Rebecca Francese, Waterway Surveys and Engineering, continued with details of the sediment sampling. Two to three and as many as five sediment samples per station were taken along the 9000 feet of channel length in the study area. Using a 2.5 inch diameter, 6 foot long core sampler, 131 vibracore samples with recovery lengths of 2 to 6 feet were taken. A chart was used to show the locations of clean sand, gravel, silty sand, clay and marl, a calcareous clay which is very dense. General findings are: a) there appears to be no correlation between upstream and downstream and grain size, b) the erosional process is weathering and c) the undercut at the toe is probably from craft wakes and freshetts. The river is a turbid orange color after heavy rains. Also observed and measured was a tide range of 2.5 - 3 feet and an 0.8 - 0.9 foot drawdown at the bank from a passing ship.

28. Mr. Gordon Watts of Tidewater Atlantic Research has researched and documented the archaeological sites on the James River as part of the channel realignment effort. The early Jamestown area was noted for tobacco, plantations, cotton and during the Civil War for boat

building and battles. After the Civil War passenger and coal traffic was important on the river. The 19th Century fishing and oyster industries and WWI are historical activities that have artifacts deposited and submerged in the river sediments. There is legislation to protect these artifacts and resources. As good stewards of the past, the impacts of projects on these resources must be documented. All efforts should be made to preserve, protect or recover these items of historical significance.

29. Mr. Roderick Mather, also of Tidewater Atlantic Research, discussed the use of a geographic information system (GIS) in displaying these sites in relation to proposed projects. Using the GIS software, Archview 3.0, and data from quad sheets, the James River, the navigation channel, known archaeological sites, charted wrecks and historic sites can be displayed. The database contains information of 204 wrecks and obstructions from historic maps, and information of 264 historic sites. There are links to text descriptions of these entries. The GIS is used to define sensitivity zones of known sites as well as surveyed areas with no archaeological significance. This GIS is a valuable analytical tool that can find (using keywords) selected features in a given area. This technology can optimize the protection of archaeological sites while maintaining project capability. The analyses of the Turkey Island Cut-Off area indicates it is free of significant archaeological artifacts. This finding opens up the realignment option for further serious consideration. Once established, the GIS can be updated and make information easily available without having to dig out old documents each time a data need arises.

30. Mr. Dennis Webb, CEWES, reviewed the results of the prototype ship tracking study. Proposed changes to a navigation channel can be evaluated for vessel safety and optimal channel design by using navigation study tools such as ship simulation, physical models or prototype ship tracking using differential global positioning (DGPS). Ship tracking was chosen as an appropriate tool for the Turkey Island Cut-Off channel realignment designs. The initial test was an evaluation of the existing navigation conditions and ships. The paths taken by ships through the cut-off and particularly around the shoal area were recorded and plotted to track the course actually taken. This was done for both upbound and downbound trips. Three Independent Container Line vessels with a length of 485 feet and beam of 76 feet were used. Rudder angle and engine speed were also recorded during the tracking tests. Six trips in and 6 trips out of the cut were recorded. Each of the tracks appeared to favor the location of the proposed Plan 6 realignment. If the channel is realigned, the researchers suggested that the old channel not be allowed to shoal up. This can cause bank effects and although traffic can be maintained, it may not necessarily be maintained to 28 feet of channel. Another suggestion was to widen the area to assure a 28 foot channel, and after the pilots use the realigned channel, repeat the tracking study. If this is successful there may not be a need to do a ship simulation study.

31. Dr. T.M. (Nana) Parchure, CEWES, completed the technical session with a presentation on the hydrodynamic and sedimentation modeling plan. The numerical model is a tool that can be used to test options and evaluate the merits of each plan. There are 1D, 2D and 3D sediment models uncoupled or coupled to hydrodynamic models. Although the coupled models are more dynamic, more reliance is placed on uncoupled models in this case because of the variety of sediments involved. Cohesive and non-cohesive sediments must be treated separately because

the equations are different. Numerical models provide quantitative information on hydrodynamic parameters and qualitative answer to the sedimentation problems.

32. Field data collected in April 1997, by WES, NAO, and contractor personnel included:

a. tidal elevation - 5 days at 5 locations using submersible, self-recording, differential pressure-gages.
b. tidal currents - anchored meters at 4 locations and acoustic doppler current profiler at 15 transects.
c. wind/vessel generated waves - wave measuring devices at 2 erosion areas using submersible, self-recording, absolute pressure-gages. A separate gage was kept on land to measure atmospheric pressure.
d. suspended sediment - optical backscatter sensors - 2 locations 3-5 sensors in the vertical water column plus the collection of water samples. The devices were calibrated for the site and can give concentration but not necessarily particle size, the water samples supply grain size information.
e. salinity - water samples - 3 ft below the surface, mid-depth and 3 feet above the bed at 10 locations. (All samples were fresh with no salinity measured)
f. bed sediment samples - grab or push core samplers collected 30 samples.
g. archived samples were offered to WES by a private contractor. The samples were measured for water content and bulk density.

33. The field and model data can be analyzed to supply information of the physical system and processes such as the tidal current direction and magnitude at any stage of flood or ebb throughout the study area, vertical and lateral velocity distribution, tidal phase difference between any two locations, quantify tidal volumes at various locations, distribution of the tidal flow in the oxbow and main channel, effect of shoal dredging or channel deepening or widening on current patterns, estimation of changes in main channel tidal currents resulting from closure of the oxbow, effect of structural alternatives on the flow and sediment patterns, and sediment transport trends in the area. Given the above model capabilities, three alternatives can be studied, they are:

a. flow redistribution
b. structural - bank protection/shoreline stabilization
c. advanced maintenance

The Corps of Engineers has the opportunity to determine how best to spend the maintenance dollars.

34. Mr. Eugene Batty reviewed the day’s proceedings and briefed the Committee for the field trip to Turkey Island Cut-Off and Shirley Plantation.

35. Wednesday 7 May 1997 was spent aboard the ADAMS survey boat which traveled from Hopewell Virginia to the Turkey Island Cut-Off. In addition to the excellent hospitality of the crew, the CTH members were given the opportunity to observe all aspects of the survey crew's responsibilities and duties. They were also given demonstrations of the many instruments and

computer programs used by the crew. The ADAMS moved slowly through Turkey Island Cut-Off which allowed the observation of the banks and the depth readings taken during the vessel passage.

36. The 8 May 1997 session started with comments and questions generated by the previous days proceedings. The group consisted of the CTH members plus T.D. Woodward, T. M. Parchure, Rob McAdory and Gene Batty. The questions expressed were:

a. River flow - Would like to know the river flow when the field data were collected especially for the sediment fate analysis.
b. Data analyses - Concerning the WES field data using the acoustic doppler current profile velocity data processing. The analysis should separate the tide frequencies to identify the long term mean. However, this may not have been included in the Scope of Work.
c. Data report - Will there be a field data collection report?
d. Subsurface data - Availability of subsurface information was a concern. It appears that only the information from the contractor core samples is available. It was suggested to try to locate the data of the original borings taken when the cut-off was made as well as any data in the unconstructed 35 foot channel.
e. Erosion - Is the erosion continuous or has it changed over time? The left descending bank has more erosion but it is decreasing with time. A volume comparison between the erosion and the shoaling does not tell the whole story. The observation of less erosion and more shoaling does not equate. A comparison of the shoal sand with the bank material should be done.
f. Pilot liability - The Pilots appear extra cautious and place restrictions when the channel shoals. This may not be a safety problem but a liability problem.
g. Changes over time - Certain changes have occurred over time such as the increase in recreational craft using this part of the river, At one time the shoal was next to the bank and now it is away from the bank.
h. Dredging quantity - Design 6 may have a one time dredging of 80,000 cubic yards. Current maintenance costs are $400,000 - $500,000 each time and it is dredged twice a year.
i. Dredged material placement - Should consider placing the material in the deep hole in the cut.

USACE RESEARCH & DEVELOPMENT

37. The session continued with the Committee review of the USACE Tidal Hydraulics research and development (R&D.) Mr. McAnally lead the discussion. In the past, Committee R&D recommendations have not always been acted upon. The Committee has been requested by the HQUSACE R&D Directorate (CERD) to provide written advice and recommendations on research and development issues that will be given to the R&D committee. Committee responses and suggestions will be compiled and sent forward to CERD.

38. Dr. Rob McAdory, CEWES discussed the existing and proposed R&D efforts specifically those involving the estuarine sediment transport process. The purpose of this effort is to reduce maintenance costs for estuarine deep draft navigation channels. Estuaries are good sediment traps of cohesive sediments due to the presence of salinity. The occurrence of a null point produces a dredging "hot spot". He discussed the tide gate removal in Savannah and the increased cost of dredging by $5 million a year. The Port wants to deepen to 50 feet and is paying for the work. However, it is believed that the null point as well as salinity will be moved upstream. Models can be used to look at 3D salinity effects. The mechanism is known and researchers have used these proven tools. It is proposed to use and extend these models to develop cost saving guidance for sediment management in estuaries. The models are not intended to predict where the material will go but to compare different sets of conditions such as pre and post channel changes. Using existing 3D numerical models coupled with salinity, guidance for shoaling studies and sediment transport can be developed and tested. It is also proposed to revise the EM on Tidal Hydraulics to provide guidance and integrate tools to address specific estuary problems. Current models deal with only one type of sediment. There is no existing model that can handle cohesive and non-cohesive sediments and their interaction. The current modeling tools need to be extended to be capable of handling multiple grain sizes. It should include single grain size non-cohesive sediment, interaction between grain sizes and types and be integrated with the river bed.

39. Comments generated from this discussion included:

a. Research should be spent on sharpening modeling tools by improving the understanding of the basic process, developing appropriate software, and field verification of research efforts. (Krone)
b. Rapid timely dissemination is essential. Tech notes available on a web site should be used to get the information rapidly out to the Corps user. These should include documented examples of real problems. The EM process is too slow. (Palermo)
c. Tech transfer is an important part of R&D and in addition to good documentation there should be technical assistance for districts when they are running the models. There needs to be more interaction between districts and researcher so the districts can carry on the work after the study. (Wener & Comb)
d. Research should address the cost savings to the Corps. (Pritchard)
e. There should be a database or inventory of all products resulting from R&D efforts. There should also be a central list of all Civil Works projects. (Palermo)
f. Research needs to address sediment placement sites and the fate of material that is coming out of a pipeline. Shallow water placement, transport and fall out of sediment all influence where the pipeline is placed in relation to the bottom as well as the angle of pipeline. These all have an influence on the near field fate of the material. (Vann)
g. Investigate thermal plume and sinking plume models. (Merino)
h. A coupled near field model of plume and multi jet discharge embedded into a 3D hydrodynamic model would provide valuable information. (Pritchard)
i. Two phase process should include the mud flow phase. The model must represent the physical process.

j. Must focus on the coefficients used in the models. The answer can be off by an order of

magnitude if incorrect values are used. Laboratory evaluation on sediments to find the proper coefficient(s) must be done. Sediment behavior can easily change with dredging, tide, salinity and other influences. (Palermo)
k. Need standardization. Over 100 parameters for modeling have been identified and 18 are regularly used. However, there are still no standard procedures world wide for all parameters.
l. There is still a need to get field information to calibrate the coefficients in models. Perhaps an index could be developed.
m. A literature search would be a good place to start. (Merino)
n. Current research programs such as DOER does not have a unit to address near term fate. A one page memo should be prepared to sent to the Program Manager to identify this need. (Merino & Vann)
o. Districts should not wait for research results in order to proceed with their projects. If the need is immediate project funds should be used to address that need. (Pritchard)
p. There might be more success at getting funds if dredging R&D were put into the O&M pot.
q. The R&D administration needs to utilize the technical people to maximum advantage. There should to be more input from the field to address the field needs. Perhaps a CERD homepage to receive suggestions would be a means of tapping these ideas. Dave Mathis and Joe Wilson of HQUSACE are good listeners.