Committee on Tidal Hydraulics

Minutes of the 105th Meeting

26-28 March 1996

Executive Summary

The U.S. Army Corps of Engineers Committee on Tidal Hydraulics (CTH) met in New Orleans, LA on 26-28 March 1996 at the request of the New Orleans District.

The New Orleans District briefed the CTH on four major projects. Three briefings were new to the CTH and one was an update of a project presented to the CTH at the 104th meeting in San Francisco, CA. The Mississippi River project Phase III, involves the deepening to 55 feet of the Mississippi River Ship Channel from the Gulf of Mexico to Baton Rouge, LA. The District presented information on the existing project, dredging requirements, and the challenges of maintaining the navigation channel. Numerical model studies evaluating channel maintenance requirements as the result of different

scenarios of channel design and the Mississippi River Ship Channel Improvements study to determine the feasibility of means to significantly reduce the O&M costs of the navigation channel were also discussed. Questions presented to the CTH involved modeling efforts and alternatives, effectiveness of advanced maintenance and sediment traps, salinity intrusion in drought years and dredging alternatives at the Head of Passes.

The Atchafalaya Basin, particularly in the Lower Atchafalaya River, study involves the reevaluation of the project to investigate potential changes to the existing project that could result in improvements of flood protection, navigation, and environmental management techniques. The status of the existing project plus proposals for modeling studies and methods for moving sediment through the system were presented. Questions presented to the CTH related to modeling the effects on water and sediment movement of a proposed jetty at Point Cheveuil and a "sediment ramp" in the Wax Lake Channel.

Coastal Wetlands Protection, Preservation, and Restoration Act (CWPPRA) has a goal of no net loss of coastal wetlands due to developmental activities. The information presented to the CTH centered on two themes, the uses and benefits of barrier islands and possible techniques of sediment diversion to create or maintain wetlands. Questions presented to the CTH involved the potential effects of these restoration efforts on tidal prism and range and the chances for success of some sediment diversion schemes.

The CTH also heard a presentation of results of the modeling efforts relating to the Bonnet Carré Freshwater Diversion project discussed at the 104th meeting in 1995. The model has been validated to existing conditions and various scenarios of Bonnet Carré diversion flows have been run. The model shows tidal phase differences within the MRGO and salt influx into Lake Borgne. Additional model runs are ongoing.

In Executive Session the CTH considered the questions presented by the District and formed four subcommittees to prepare and draft responses. Items of other business considered included the draft recommendations for future CTH activities and consideration for additional members and consultants.

Minutes of the 105th Meeting

26-28 March 1996

---

1. The 105th meeting of the Committee on Tidal Hydraulics (CTH) was held 26-28 March 1996 in New Orleans, LA at the invitation of COL Kenneth Clow, District Engineer, U.S. Army Engineer District, New Orleans.

2. On 26-27 March, the CTH held Technical Sessions on several aspects of the current and future New Orleans Coastal Louisiana projects involving navigation, water quality, and wetlands preservation and restoration. The CTH met in Executive Session during the afternoon of 27 March and the morning of 28 March. All sessions were held at the New Orleans District Office.

3. Attendees were:

Committee on Tidal Hydraulics

William H. McAnally, Jr., Chairman	Waterways Experiment Station
Virginia R. Pankow, Executive Secretary	Water Resources Support Center
Lincoln C. Blake	Charleston District

A. Jay Combe	New Orleans District
Jaime R. Merino	South Pacific Division
Michael R. Palermo	Waterways Experiment Station
A. David Schuldt	Seattle District
Ronald G. Vann	Norfolk District
Samuel B. Powell, 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 Kenneth Clow	New Orleans District
Tim Axtman	New Orleans District
Charlie Berger	Waterways Experiment Station
Troy Constance	New Orleans District
Jack Fredine	New Orleans District
Sue Hawes	New Orleans District
Janis Hote	New Orleans District
Arthur Laurent	New Orleans District
Joaquin Mujica	New Orleans District
Al Naomi	New Orleans District
Tom Podany	New Orleans District
Hasan Pourtaheri	New Orleans District
Donna Richey	Waterways Experiment Station
Fred Schilling	New Orleans District
R. H. Schroeder, Jr.	New Orleans District
Jim St. Germain	New Orleans District
D. Vann Stutts	New Orleans District
Les Waquespack	New Orleans District
Kevin Wagner	New Orleans District

Guests[2]

Len Bahr	Louisiana Governor's Office
James R. Buchtel	Louisiana Dept of Natural Resources

[1] Attended Technical Sessions only
[2] Attended Technical Sessions only.

Carrol Clark	Louisiana Dept of Natural Resources
Mark Davis	Coalition to Restore Coastal Louisiana
Karl DeRonen	Louisiana Dept of Natural Resources
Steve Gilbreath	T. Baker Smith & Son
Paul Kemp	Louisiana State University
Mervin Morehiser	Louisiana Dept of Transportation
Jeanine Peeklun	U.S. Environmental Protection Agency
Carl Robichaux	Louisiana Dept of Natural Resources
Angela D. Sago	Louisiana Dept of Transportation
Stephen C. Smith	T. Baker Smith & Son
Joe Suyhada	Louisiana State University

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 Kenneth Clow, New Orleans District Engineer, welcomed the CTH members and guests. He presented a brief history of the importance of water to New Orleans and South Louisiana. New Orleans District is responsible for South Louisiana which includes the rivers and drainage basins of the Mississippi and Atchafalaya Rivers as well as the Gulf Intracoastal Waterway (GIWW) and the Mississippi River Gulf Outlet (MRGO). The Mississippi River is vital to New Orleans, the state of Louisiana, and the nation in terms of navigation, commerce, and flood control. Louisiana was formed by river sedimentation and with the construction of the levee system, natural flooding and sedimentation in the marshes has been largely prevented. There has been a loss of 25-35 square miles of coastal marsh annually. Such a loss is of national significance when the productivity of the intricate coastal marsh/water system is considered. Such a complex, interwoven system is difficult to manage. He highlighted the Barrier Island Study as an interagency effort to restore coastal Louisiana and endorsed the prospect of having an outside group take a fresh look at the study including the works in progress and planned for the future.

6. Mr. William H. McAnally, Jr., Chairman of the CTH and Chief of the Waterways & Estuaries Division, Hydraulics Laboratory, Waterways Experiment Station (WES), thanked COL Clow for the welcome and the opportunity for the CTH to be of service to the New Orleans District. He noted that the last CTH meeting held in New Orleans was in 1988. The session continued with the introduction of the committee members and guests.

Mississippi River Project - Mississippi River Ship Channel

7. Mr. Al Naomi, LMN, opened the discussion with some background information and a presentation

on Phase I and II of this project. The Mississippi River Ship Channel, authorized in 1985 for a depth of 55 feet, has been constructed to the 45 foot depth. There is concern regarding the environmental effects of the final deepening to the authorized 55 foot depth. The Mississippi River is central to all activity in South Louisiana. New Orleans depends on the river for water supply, transportation and abundant natural resources.

8. South Louisiana was formed by delta growth as the Mississippi River meandered and deposited the sediment load it carried. The Old River Control Structure is a Corps project designed to keep the major flow in the Mississippi River and prevent it from changing course and flowing to the Gulf via the Atchafalaya River. The control structure maintains a flow of 30% to the Atchafalaya and 70% to the Mississippi. This insures the viability of New Orleans as a major thriving river city. However, land loss through time as a result of subsidence, sea level rise and loss of sediment (due to river control and levees) is having a significant impact on the stability and health of coastal Louisiana.

9. The banks of Southwest Pass have been reconstructed and lined with rock to prevent flow loss over or through the banks. Jetties constrict river flows enabling some scouring which somewhat reduces dredging requirements. By maintaining Southwest Pass, the inland navigation system is able to keep transportation costs low. This is good for navigation but limits sediment flow into the marshes. Attempts to prevent or limit marsh loss include some controlled fresh water river flows and the placement of dredged material into marsh areas.

10. Phase I of the Mississippi River project, completed in 1988, was the deepening of the navigation channel from 40 feet to 45 feet from the mouth to river mile 181. The project included mitigation for salt water intrusion that might effect drinking water sources. In addition to the construction and continual upgrading of water treatment plants and water distribution systems, an underwater weir (sill) can be constructed in the river to slow or prevent salt water from progressing upstream to normally fresh water communities in times of low river flow (200,000 cfs or less). When necessary fresh water is barged to affected communities. With these scenarios the cost for mitigation is greater than the cost for navigation.

11. Phase II, completed in 1994, involved dredging the channel to 45 feet from river mile 181 to mile 232.4. Those who use the channel want it maintained and open 100% of the time. This requires much dredging with all dredged material being placed in nearby marsh areas.

12. Discussion and Questions

Dr. Pritchard: The 40 foot project had some water barging - there were trade offs - the deeper channel benefitted industry but presented salt water intrusion problems.

Dr. Krone: What is the sand, silt, clay composition of the material being dredged?

Answer: Mostly silt and sand not clay although clay is sometimes found in new work dredging.

Mr. Schuldt: Who pays for beneficial uses of the material?

Answer: The cost for deepening to 45 feet is a federal cost. The cost will be shared 50% federal and 50% state for the 5 feet to go to the 50 foot depth.

Mr. Vann: The laws and regulations state that if the cost is increased because of beneficial uses of the

material it must be cost shared.

13. Fred Schilling, LMN, discussed the challenges of providing a reliable and deepened channel for navigation channel users. The current channel to Baton Rouge is maintained at 45 feet and from mile 4 AHP (Above Head of Passes) the downstream 26 miles of the river is shallow and requires deepening. The remainder of the channel through Southwest Pass can be considered as three sections each with different requirements and dredging techniques. The section from mile 4 AHP to mile 1 BHP (Below Head of Passes) is dredged by hopper dredges with the material, about 7-10 million cubic yards (mcy) annually, placed in South Pass and Pass a Loutre. Safety is an issue in this area, cutterhead dredges are not used because it is difficult for ships to navigate around them. Their (cutterhead) presence in the channel increases the collision potential. Tides and currents in this area can be problematic to ship traffic and dredges. The section from mile 1 BHP to mile 18.8 BHP is dredged by cutterhead dredges with the material placed behind levees into wetlands. Annually about 5-7 mcy of material is beneficially used. The section from mile 18.8 BHP to mile 20 BHP is dredged by hopper dredges because of the dredge maneuverability and its ability to safely move out of the way of river traffic. About 7 mcy of fine sands and silt (50-50%) are dredged annually and placed in a gulf disposal site. Dredging continues to mile 22 BHP, about 2 miles below the jetty.

14. Although South Pass is a shorter route to the Gulf, Southwest Pass is maintained for traffic because it is actually a shorter route to deep water. South Pass is also more difficult to navigate because of many bends and turns. Since the 1970's most ships use Southwest Pass.

15. Alternate types of dredges are being investigated for use in the Head of Passes area (mile 4 AHP to mile 1 BHP). A dustpan dredge, which has high production rates (almost 3 times more than hoppers) and is maneuverable could be highly successful if the discharge pipe could be modified or replaced with a long flexible discharge line. Another possibility is a pin-point or submerged dredge which has been used in Europe.

16. Federal and state pilots (from three state groups) share piloting responsibilities. The Bar Pilots are responsible from the Gulf to Pilot Town, the Crescent Pilots then take over and proceed to New Orleans and the final leg of the trip is handled by the New Orleans to Baton Rouge Pilots. They receive same day survey information and, since the channel bottom is soft and advanced maintenance techniques are used, are willing to take 46 and 47 foot draft ships through the 45 foot channel. They would like the anchorage to be deepened to 45 feet to have a safe anchorage in situations like heavy fog. However, such a deepening may adversely effect the navigation channel.

17. About 23 mcy is dredged annually from Southwest Pass although it varies from 35 mcy in 1990 to only 11 mcy in 1992. Even if all the dredged material were beneficially used to nourish marshlands it would be only a small part of the solution, there would still be significant marsh loss. The sediment load in the river has decreased drastically from the 1940's to about half the amount by the 1980's.

18. Discussion and Questions

Dr. Palermo: Is agitation dredging performed?

Answer: Not in the Head of Passes.

Mr. Vann: How are hopper jobs paid?

Answer: Hopper contracts are rental contracts.

Dr. Pritchard: What time of the year does the river rise?

Answer: Generally spring, the February to June period.

Mr. Powell: Do single hull tankers have to keep more water under the keel? This is an issue in the Federal register for comments.

Answer: This is a big issue and will restrict draft.

Dr. Pritchard: Is it possible to establish a sediment trap at Pass A Loutre and then redredge the material?

Answer: To do that would require a cost shared operation.

Dr. Pritchard: Is the greatest deposit at the toe of the salt wedge?

Answer: No there is too much sand (fluff is not a problem here).

Mr. Merino: What is the proportion of river flow?

Answer: From the river 5% into Baptiste Collette Bayou, 5-7% into Tiger Pass, and 10% into Cubits Gap. Of the remaining flow, Southwest Pass 40%, South Pass 20%, Pass a Loutre 40%.

Mr. Vann: There is a need to coordinate with the environmental groups to determine how thick the sand layer (from dredged material disposal) should be as it is deposited in the marshes. There is an appreciation here (in the District) for navigation and the environment. This is important, however, don't lose sight of navigation as primary.

19. Al Naomi continued the Mississippi River Project presentations with a synopsis of Phase III. This involves the deepening of the entire channel from the Gulf to Baton Rouge to 55 feet. In this phase the state of Louisiana is a cost sharing partner. Benefits and costs, i.e. dollars, environment, impact on fresh water sources, etc. are being evaluated.

20. Hasan Pourtaheri, LMN, discussed plans for numerical model studies of the 12 crossings between Baton Rouge and the Gulf. The river will be modeled with a 1D hydrodynamic and sediment model while a 3D hydrodynamic and sediment model will be used at the crossings. The models will be used to predict channel maintenance as the result of different scenarios of channel design, dike configuration and deepening. There are 5 series of plans each with sub-series for a total of 60 different plans. He described the 1975 physical model study of the 40 foot channel test at Head of Passes in the Mississippi River Passes model at WES. The model was a fixed bed, distorted (1:500 horizontal, 1:100 vertical) model using D_{35} = 2.0 mm granular polystyrene as model shoaling material. He discussed some of the configurations and results from the physical model tests.

Plan V series - channel relocation eastward at Head of Passes as it enters Southwest Pass.

Plan R series - removal of the west headland structure (between South Pass and Southwest Pass) and the same channel alignment as the Plan V series.

Plan W series - removal of the west headland structure with the existing channel alignment.

Plan T series - existing channel alignment with dike additions or extensions

Plan Z series - recurvature of the channel above Head of Passes to divert sediment towards Pass a Loutre

Sediment basin tests - different combinations of length and depth of a sediment basin above Head of Passes near Cubits Gap.

21. Some base-to-plan test results indicated maintenance dredging reductions of 93-96%. There was some discussion about the validity of this value. It was acknowledged that the configuration probably would reduce dredging requirements, but the model's 90 percent plus reduction should be interpreted simply as indicating only that a significant reduction would be achieved. The fixed bed physical model could not scale sediment size and extreme changes must be interpreted carefully. Numerical modeling now offers some advantages over the previous physical modeling techniques..

22. Discussion and Questions

Mr. Merino: South Pass wants to maintain itself naturally at about 17 feet. In the early 1990's it shoaled to 10 feet and attempts are being made to maintain it at 20 feet, primarily for oil and gas supply boats.

Dr. Palermo: Is there a potential to promote South Pass shoaling by putting more flow into Southwest Pass?

Answer: A model study of a 50% flow restriction of South Pass only gave 1% more flow to Southwest Pass but also more sediment. It would not be cost effective to execute such a plan.

Mr. Powell: The Mouth of the Columbia River model was a moveable bed model and performed very well.

Mr. Schuldt: Grays Harbor model, 20 years ago, predicted a 6 foot deepening would be beneficial and these results were proven correct by prototype data taken after construction.

Mr. McAnally: Any change of 30% or greater in model results must be treated as qualitative.

Mr. Combe: Pilots using the WES simulator didn't like the plan - it was not much different from base conditions.

23. Les Waquespack, LMN, spoke on the Mississippi River Ship Channel Improvements study, the purpose of which is to determine the feasibility of means to significantly reduce the O&M costs of the navigation channel. The Corps was given the authority to construct, operate and maintain the navigation channel and because of shrinking O&M funds, must find ways to lower these costs. The reconnaissance study, which is 100% federal cost, has not yet been funded but efforts are underway to identify problems to be addressed. Alternative plans to improve navigation include: a gated navigation pass; MRGO locks; Breton Sound Ship Channel locks; South Pass - open channel; risk based analyses to optimize maintenance projects and prioritize the funding of projects; accelerated repair of Southwest Pass dikes (about 150 pile dike structures, many in various stages of deterioration or damaged by ship traffic); and an alternate channel alignment for a gated navigation pass.

24. The O&M activities are budgeted for an "average" year. However an increase in dredging requirements results in less funds available for dike repair. Many structures are not large enough to be considered a major rehabilitation and a backlog of repairs now exist.

25. It was explained that Southwest Pass is longer than South Pass but South Pass is far from the 40 foot contour in the Gulf. The two mile jetty (at Southwest Pass) has settled significantly and one can expect the same settling with a new jetty at South Pass if one were constructed. This option would be too

costly.

26. Discussion and Questions

Dr. Palermo: Do you need to control the water level as locks do?

Answer: No it would be a gated structure for sediment elimination.

Mr. Merino: Can we see the pictures of the jetties again? There are sediment patterns indicating much leakage of sediment laden water through the jetties.

Dr. Pritchard: The questions you are presenting to the CTH deal with channel maintenance. What about environmental questions?

Answer: Any action taken must always be mindful of the environmental and other impacts.

Dr. Pritchard: Any 55 foot channel model test performed will have to test the 1988 drought conditions with an underwater salinity weir constructed to 45 feet.

27. During the presentations several guests from state agencies joined the proceedings. For their benefit, Mr. McAnally summarized the technical role of the CTH and stressed that the CTH does not set policy, its function is to supply technical advice. The Committee has no enforcement authority.

Atchafalaya Basin

28. Troy Constance, LMN, reviewed the history of some existing projects in the Atchafalaya basin. Levees were constructed in 1915 to protect land from flooding and to keep sediment out of these protected areas. A later basin study suggested using segments of levees to allow some flooding and sediment distribution. In 1936 a controlled spillway was constructed to collect all runoff, additional protection levees were built and in 1941 the Wax Lake outlet was completed. By 1946 the levee was extended to the east past Morgan City with the inclusion of breakwater protection. The area is now completely enclosed and the locals operate pumps to control flows. The Corps participates by performing major pump repairs. Over time there were several attempts to control runoff and flow. Wax Lake was completed in 1941 and the levees extended until today, almost all of the basin area is enclosed. During the period from 1960 to 1975 the north end of the basin silted in resulting in the formation of a delta. The Wax Lake weir was constructed in 1987 to constrict flow in order to scour the lower river, first at an 80/20 and later at a 70/30 split. The weir was removed in 1994. The present uncontrolled river flow is difficult to maintain for the navigation project.

29. The Flood Control Study, a reevaluation of the present project, is in the feasibility stage. To model the backwater areas, which are growing, models such as: UNET - unsteady state; HEC-6; CH3D-WES; HEC-2 - flow lines; TABS with salinity and direction of flow; and the LSU Mary White habitat prediction model will be considered for use. For Houma, LA hurricane protection, HEC-1; HEC-2; UNET; and habitat models may be employed.

30. Questions presented to the CTH regarding the Atchafalaya basin were:

a. An option being considered is to build a 12 mile levee at Point Chevreuil. Is the TABS model the correct one for evaluating the effects of this structure?

b. A "sediment ramp" - a ramp from the -40 foot river bottom up to -8 foot shallow lake - is being tested to determine if sediment from the deep water will move up the ramp and out of the system. To date no data have been collected to prove ramp effectiveness. Is there a model that will evaluate the effectiveness of such a sediment ramp?

c. The ramp is cut through clay, and the high water velocity is 8 ft/sec. If the sediment is moved (via the ramp) into Wax Lake the problem will be to get the sediment past the GIWW. Can you suggest a sampling program to evaluate the sediment ramp?

31. Discussion and Questions

Mr. Merino: Is there a phase difference between the east and west ends of the study area?

Answer: Yes, diurnal tide and semidiurnal tide

Dr. Pritchard: What is the depth of the water in the marshes? This question came up in the 1988 CTH and I believe a model radio controlled boat was used.

LSU Guest: Marsh porosity is important - how long water stays in a marsh.

Mr. McAnally: What do you expect to come out of the study?

Answer: Modification of distribution of flow for navigation projects. There are many conflicting views and factors, some plans may be acceptable to some but not others.

Mr. Powell: You can't have two unregulated outlets, one will capture the flow. You need to develop sediment tools to look at the problems. TABS is a good delta predicting model.

Mr. Constance: Any plans for flow distribution must be considered in light of the Old River Control Structure. Care must be taken because of the head differential problems and the integrity of the structure.

Mr. Merino: How much subsidence occurs?

Answer: It varies from 1.5 cm/yr in the delta to about 0.5 cm/yr further north.

Barrier Island Study

32. Jim St. Germain, LMN, briefly discussed aspects of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA). This is a multi-agency group chaired by the Army and assigned to the New Orleans District Engineer. It is funded at $40M per year from 1991 - 1997, must be completed by 2005 and its intent is to have no net loss to coastal wetlands due to developmental activities. The area is divided into 9 hydrologic basins. At Bayou LaBranche 2.5 mcy of material were used to restore wetlands at a cost of $3.7M. There are 350 acres of perimeter, 250 acres marsh and the rest is open water. Bank stabilization was performed at Freshwater Bayou, and the Vermillion River cutoff has just been completed. Things to consider are: major river stages, navigation, barrier Islands, and shoreline erosion.

33. Discussion Questions

Mr. Powell: What is the rate of savings over loss?

Answer: Savings: 75,000 acres at $200M; Loss: 16,000 acres/year

Dr. Krone: Do you calculate sediment load?

Answer: Yes

Mr. Powell: What are you using for sea level rise?

Answer: Subsidence rates vary with each site. In the delta it's about 5 ft/100 yr.

Mr. Vann: Is the rate of subsidence increased with marsh building?

Answer: There is some subsidence but there is a net gain. The area is overfilled so after a few years of compaction it is at marsh elevation.

Mr. Powell: Is there a value system to put a price on an acre of wetlands?

Answer: We use a "habitat unit" to evaluate each study, the % of vegetative wetlands, % shallow open water, salinity, and water depth. We will consider the future with and without the project over the 20 year project life and come up with average annual acres and average annual habitat.

Mr. Vann: You might consider conducting an analysis of areas that will be of value due to subsidence such as uplands going to marsh, and let nature work for you.

Dr. Palermo: This is not done under a broad Corps authority such as navigation, flood control, or environmental restoration, but is specific for coastal Louisiana.

Answer: There are provisions in the act that provides funding of 75% for LA and 25% for others states. This competes with other CW projects for funds. The maintenance costs are included in the 20 year program life. Planning costs are about $5M annually and are not cost shared. Construction costs are shared and depends on the program authority. On federal environmental restoration projects the share

is 75% federal and 25% state.

Mr. McAnally: There is the least cost rule for Corps O&M projects. Is CWPPRA paying the increased cost of dredge disposal, which is constrained by O&M?

Mr. Vann: It takes a given number of cubic yards to build a marsh. Have you looked at the cost of dredging with beneficial use versus the cost of buying mined material as cheeper?

Answer: We have looked at it with the hopper dredging of Southwest Pass and found the opportunity costs were not there.

Dr. Pritchard: Have you considered the cost of using rehandled material from a sediment trap?

Answer: Wetlands need silts, not the sands of dredging.

34. Steve Smith of T. Baker Smith is the lead contractor of the Barrier Shoreline Feasibility Study. This is a part of CWPPRA and concerns habitat, recreation, infrastructure and shoreline retreat. It is a $2.5M - three year effort consisting of:

Mississippi and Atchafalaya - Phase 1
West Louisiana - Chenier plane - Phase 2
East Louisiana - Chandeleur and Breton Sound - Phase 3

The Technical Review Committee is a team of economic, environmental, modeling (wave, hydrologic, environmental) and engineering talents.

35. Joseph Suhayda, LSU, discussed the modeling efforts to quantify the impacts of barrier islands in terms of hydraulics, particularly hydrology. Barrier islands are modeled as an open system, very flat (0.9 feet NGVD) with large expanses of vegetation as the roughness elements. As the water level changes, the marsh acts as a low pass filter. He used an existing model which is vertically averaged, employees a finite difference approach, and allows nesting of grids. The Mannings coefficient is a function of water depth. The model, which can not resolve small scale features, has a 1D model nested in it. It handles wet/dry cycles and geometric properties. Using a 10,000 foot grid, the model proved qualitatively the concept that barrier islands work. He wants to study the effect of barrier islands on tide and hurricane surge in order to evaluate the effects on plants on the depth and duration of flooding. It is very difficult to establish the mean water level.

36. Discussion and Questions

Mr. Merino: Have you input salt and mud into the model?

Answer: Not yet we want to get a handle on the hydraulics -- depth and duration first.

Dr. Pritchard: There are differences that could be significant for this study between NGVD and the North American Vertical datum. Also have you considered a boundary fitted model?

Answer: The computational load for the boundary fitted model is too great. Another model, the NWS "slosh" model is not available to the public.

Mr. Vann: There should be tidal gage data available along with temperature and some long term tidal phase information.

37. Paul Kemp, LSU continued with the study attempts to translate the hydrologic effects on habitat. They are trying to separate the processes that effects the project areas and are using the "ST wave" model. They are attempting to model salt and brackish marches (but not floating freshwater areas) to predict habitat change. The habitat model is a simplified version of Joe Suhayda's hydrologic model. It has three time scales: hourly, daily, and annual. To verify it, they are using sediment erosion tables and are trying to track subsidence, accretion rates and elevations to match historical maps of habitat and land loss distribution.

38. Discussion and Questions

Mr. Merino: Do you have mass balance in your erosion model?

Answer: Eventually but not there yet.

Dr. Pritchard: Do you have swells in the area?

Answer: It is surprising at the amount of wave energy in the area.

Dr. Palermo: Substrate accumulation model contains water, sediment, salt, sun, wind, rain, evaporation - it seems extremely complex. Has this or other models like this been used before?

Answer: This district has used it before.

Mr. Merino: Sometimes there are problems connecting models. What is the boundary transport mechanism?

Answer: We use a finite difference movement across cells.

Dr. Krone: How much detail for episodic events?

Answer: It is in the model on an hourly time scale.

Dr. Palermo: Sounds like you are still in the calibration mode.

Sediment Diversion Study

39. Tim Axtman, LMN, outlined some provisions of the Mississippi River Sediment, Nutrient and Freshwater Redistribution Study which is a task under the Coastal, Wetlands, Planning, Protection and Restoration Act. The purpose of the study is to restore components of wetland growth. The study involves identifying, designing, evaluating and recommending a feasible means of supplying freshwater, nutrients and sediments to wetland areas using different schemes of freshwater and sediment

diversion. One aspect of the study is to review previous planning efforts and select the most promising for further study. To date about 70 projects have been identified for consideration. The study is in year 1 of its 3.5 year time frame.

40. Discussion and Questions

Dr. Palermo: Are you looking at the interaction these 70 projects might have on each other? There can be synergy - two projects may be better than each alone or the opposite, an action in one sub-basin can be detrimental to another.

Mr. Merino: The study output should be as detailed as funds permit to allow other studies to go on. You will probably have to go to a GDM.

DNR Guest: How much resources (water and sediment) do we have to meet navigation, fresh water, and marsh restoration needs. We should try to reproduce nature and use available excess water such as high spring flows for these diversions.

41. Kevin Fagot, LMN, discussed Mississippi River modeling efforts for the freshwater diversion study. The model extends 330 miles from the Old River Control Structure through Southwest Pass to the Gulf of Mexico. The aim is to study the effects of freshwater diversions on navigation and water surface elevation in the river. He is using the HEC-6 moveable boundary model with the ability to reintroduce dredged material into the system. The Base model has 9 outflow points and the planned tests will have up to 19 local inflow and outflow points. The model contains the geometry, suspended sediment, bed material gradation, flow and temperature from data obtained from the 1983-1985 Mississippi River hydrographic survey. It was verified using a 300,000 cfs low flow, 700,000 cfs medium flow and a 1,100,000 cfs high flow condition. The model data of water level elevations were within the band of observed prototype date and the suspended sediment trends of model to prototype comparisons were good. When using 7 years (1985-1991) of dredging data, the following results were obtained:

	Model	**Observed**
MS River Crossings	64 million cy	69 million cy
SW PASS	114 million cy	116 million cy

After each adjustment was completed the model was checked to be sure previous unadjusted conditions remained unchanged. Adjustments were made only to input parameters not hydraulic conditions. The model was run simulating the 16 year period 1978 - 1993 which included two Bonnet Carré operations (1979 and 1983).

42. Discussion and Questions

Dr. Pritchard: What is the suspended load of fines in the Mississippi River? Have any studies addressed this?

Answer: In the Mississippi River fine sands are 25% of the suspended load. This is about 200 million tons/yr and the concentrations are about 300 ppm.

43. Charlie Berger, WESHL, concluded the technical sessions with an update on the Bonnet Carré Freshwater Diversion modeling effort. This work is an outgrowth of the last CTH meeting in which the Bonnet Carré Freshwater Diversion project was presented. The 3-dimensional model has been validated to existing conditions and various scenarios of Bonnet Carré

diversion flows have been run. The model uses a boundary salinity of 35 ppt and tides constructed from prototype data. Each boundary node has tide phase and range which varies with location within the grid. The model shows that when it floods at the Gulf entrance to the MRGO, it is still ebbing in the MRGO by the second outlet and there is noticeable salt influx into Lake Borgne. The modeling effort has progressed with the completion of base and some plan experiments and the beginning of the report. The current experiment has all passes connecting Lake Borgne to the MRGO closed.

44. Discussion Questions

Dr. Pritchard: Events that cause the lake and MS Sound levels to change (fetch, meteorological frontal passage etc) may be important on the prototype but may not be significant on monthly mean salinity.

Mr. Merino: How stable was the model?

Answer: There were places that misbehaved especially with high salinity gradients. We considered cutting the time step and this would work, however, it would be a considerable effort to change the boundary file. We use 1 hour time steps.

45. Two field trips were planned in association with the Bonnet Carré Freshwater Diversion Study which was presented to the CTH at the 104th meeting. Midway through the this year's Technical Sessions a trip to the IHNC lock was taken by the Committee members. The lock operation, location, and use were part of the Committee deliberations in formulating answers to the Bonnet Carré questions. A second field trip to the Bonnet Carré Spillway was planned at the conclusion of the Technical Sessions. The Committee agreed to cancel this outing because of poor weather conditions and the concern that the committee had much to do and could use the extra afternoon to its advantage. The Technical Sessions ended the Committee began the Executive Session.