LMNED-SP (NOD 1 Oct 83) 2nd Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity Hurricane Protection Project - Model Study, Request for Authorization

DA, New Orleans District, Corps of Engineers, P. O. Box 60267, New Orleans, LA 70160 12 December 1983

TO: Commander, Lower Mississippi Valley Division,
ATTN: LMVED-WH

1. Before addressing the 1st Ind comments to the subject letter, I believe that it may be useful to reiterate the intended purpose of this request. Our intent herein was to inform higher authority of the status of various engineering studies for the authorized Lake Pontchartrain project as they relate to the Orleans Parish Outfall Canals and to request approval to model test one of the plans under consideration. It is also important to understand that this letter is not intended to be a plan selection report and that all plans mentioned or discussed herein, at this time, are considered viable. Also, the list of plans contained herein should not be considered all inclusive as other plans will undoubtedly be considered during the preparation of the GDM for this project feature. The GDM on this project feature will address the pros and cons of the various plans as to whether they meet design objective and operational requirements for the project. One should not construe this request to be an indorsement of the plan to be tested. The District is of the opinion that a properly designed and functioning vertically pinned butterfly control valve structure will satisfy the overall objectives of the hurricane protection project as well as meet requirements of local interest regarding interior drainage. There may well be other plans, yet identified which equally well satisfy these objectives. It must be emphasized that our optimism regarding this plan is tempered with the full knowledge and understanding that many engineering questions are as yet unresolved. These questions can only be resolved through a model study. Our discussions with the Waterways Experiment Station in connection with this plan and the likelihood of a successful resolution of engineering problems and developing a functional design for the butterfly control valve appear very good. Put in probabilistic terms, it is the Hydraulic Laboratory opinion that the successful testing and development of a functional plan has a 90% probability of success. However I must again emphasize that this does not constitute an endorsement of this plan. We are cognizant that there exist at least a 10% probability that this plan can not be satisfactorily designed. Also, it is possible that model testing of the butterfly control valve may leave us with sufficient residual doubt about the engineering feasibility of the plan to make its recommendation unwise. If the latter senario of testing does occur then a basis for eliminating the plan will have been established. I can not over emphasize the sensitivity of the issues surrounding interior drainage for the City of New Orleans and the necessity for any hurricane

protection plan to accommodate interior drainage to the fullest extent possible. Any hurricane protection plan which employs the concept of fronting protection must also incorporate a capability to allow the Sewerage and Water Board of New Orleans (SWBNO) a maximum latitude of operation. Finally, the District is of the opinion that informed decisions regarding plan selection can only be made with the benefit of model test results available to the designer during preparation of the GDM for this project feature.

2. Relative to comments contained in paragraphs 1.a. thru 1.c., the following responses are offered.

a. Simply put, design objectives and plan type mandate operational requirements for this particular project feature. From the standpoint of the hurrricane protection project, the primary and only authorized purpose of any plan under consideration is to prevent tidal inundation of the developed areas of the city via the lake/canal connection. Due to the fact that the canals in question serve as the major drainage outfalls for the City of New Orleans, any plan which uses fronting protection at the lake end of the canals must also satisfy to the fullest extent possible operational requirements of the SWBNO. The SWBNO operational requirements are quite simply, to provide drainage to the fullest extent possible regardless of stages in Lake Pontchartrain. Inclosure 6 is a letter from SWBNO dated December 7, 1982, which provides some insight into their capability at Pumping Station No. 6 and their position in this matter. Note that the 30-35 percent reduction in capacity is for a static condition and that pump efficiency is somewhat "self-adjusting" by virtue of the fact that tailwater stages will go up as pump efficiency reduces.

Project operational requirements for any plan which employs lateral parallel protection must insure that levee or floodwall heights are sufficient to prevent overtopping during a design hurricane. These heights have been preliminarily established by backwater analysis conducted by the District. This information will be expanded and presented in detail in the GDM for this project feature. Hydraulic grade due to a range of pumping capabilities will of course be considered during these studies.

b. Concur. During the preparation of the GDM, all alternatives which appear to have merit will be developed to an equal basis so that a recommendation of a tentatively selected plan can be made. It is obvious even at this time that if one examines inclosure 2 of this chain, plans 3a and 3b from a cost stand point alone enjoy a high

ranking in any selection process. Furthermore, plan 3b, the vertically pinned butterfly control valve structure appears to have received favorable acceptance by local interest whereas plan 3a has initially generated an unfavorable (mildly put) reaction by the SWBNO.

c. Concur. The District agrees that comparative studies are necessary and in studying the various plans it is important to insure, if possible, that each plan fully satisfies all operational and design constraints. Also, in the event that they don't fully satisfy these constraints, to weigh these facts in the decision process. We fully intend to spell out in detail and follow these precepts during the GDM process. However, the unresolved design questions for the butterfly control valve plan make model testing this plan a necessity so that an informed decision can be made during the GDM process. The District would not recommend an expensive model test of a plan that it did not believe enjoyed a high probability of satisfying design objectives for the Lake Pontchartrian project and operational constraints of the SWBNO.

3. The following responses by like paragraph numbers are offered in response to LMV technical comments contained in inclosure 5 of this chain.

a. Para 1. Concur.

b. Para 4.

(1) Concur. The feasibility of this plan will be considered during the preparation of the GDM. However it would appear at this time that the "self-adjusting" aspects of the SWBNO system may make the overall reduction in pumping capacity minor (see para 2.a. above).

Pumping rate reduced because of overtopping

(2) Concur. The District is more than willing to entertain consideration of this plan and any other plan that the Division office recommends during the preparation of the GDM for the Outfall Canals feature. We have however, run preliminary estimates on the U-frame plan and find that its cost would exceed $600 million. Cost alone most probably will eliminate it from detailed study when the GDM is prepared.

c. Para 6. Concur.

d. Para 7.

(1) We do not agree that the situation presented is impossible. As evidence of the capability of the SWBNO to pump under high lake stages, please refer to inclosure 6. Also, the SWBNO is of the opinion that regardless of whether or not gated structures are placed at the lake end of the Outfall Canals, that they must provide sufficient freeboard to allow them to pump throughout the design storm. As we mentioned in paragraph 7 of the basic letter local interest are for the 17th Street Canal currently attempting, through the permit process to meet our hurricane protection design criteria for their proposed upgrade of the canal and levees. This office has been working closely with the SWBNO in an effort to insure that their designs are compatible with the Lake Pontchartrain project. To date we have not been afforded the opportunity to review all of the designs for this work. The protected side stability analysis as well as seepage analysis data have not been developed and/or furnished to the District. We remain cautiously optimistic that these designs may be incorporated into the Lake Pontchartrain project. However, independent study conducted by the District leave us with sufficient doubt about the economic feasibility of the SWBNO plan when compared to a fronting protection plan. Our doubt is sufficient to recommend that we proceed with developing fronting protection plans and, in particular, model testing the butterfly control valve structure. I believe that the important point here is that the SWBNO is making every effort to satisfy our design criteria. If for cost reasons they can not meet every aspect of the Corps design criteria, it is reasonable to assume that the degree of protection afforded by these works will increase the current freeboard and prolong their ability to pump under storm conditions. It is important to understand that if the Lake Pontchartrain Hurricane Protection project ultimately adopts a fronting protection plan, the responsibility of the lateral parallel levees along the Outfall Canals is solely the responsibility of the SWBNO.

The stability and integrity of the return levees and floodwalls under the full range of loading will be investigated and presented in the GDM on this project feature. If in the event a fronting protection plan is ultimately recommended under the Lake Pontchartrain Hurricane Protection project, the operation of the pumping station/return levee and any interior drainage facility is purely the responsibility of the SWBNO. Given a fronting protection senario, it would be incumbent for the District to inform SWBNO of recommended safe limits of operation as defined by our engineering studies. If they so choose to operate

outside these limits, it must be emphasized that the responsibility for doing so rest solely on the SWBNO. The authorization for the Lake Pontchartrain project specifically relegates interior drainage to the local interest responsibility.

(2) NOD's position relative to increase time afforded for pumping with the butterfly control valve rest on the assumption that with a conventional structure, from a practical operational standpoint, there would come a time during the passage of a critical hurricane in which safe operation of that structure under severe conditions could no longer be achieved. For the purpose of preliminary analysis it has been assumed that this time would correspond to a lake stage on the south shore of the +6 NGVD. The ambient wind speed associated with this stage is 50 miles per hour for the design hurricane. The hydrograph for the design hurricane, Plate A-14, taken from the Interim Survey Report, Lake Pontchartrain , Louisiana and Vicinity, dated 21 Nov 1962, is attached as inclosure 7. It can be seen that this corresponds to a duration of 12 hours or more that the stage exceeds +6 NGVD. Theoretically at least a conventional structure would have to remain closed during this time. With the butterfly control valve structure, it is possible that the structure would not close at all during this storm.

(3) Concur. The District is making every effort to coordinate closely with the SWBNO in this matter. The SWBNO is well informed about our design constraints under the Lake Pontchartrain project and we are working closely with their A/E design firm to insure that undue delays in our design reviews do not occur.

(4) See comment (2) above regarding potential increases in pump time for the butterfly control valve structure over a conventional structure. In the event that short period oscillatory operations of the gates are required, a case that may be produced by a pump on pump off etc. condition. The dampening produced by the hydraulic system, which can be used to mechanically override the self-activating mode, will be tuned to prevent undue dynamic shock on the gate systems and structure. The rate of opening and closing of the gates would be "tuned" to respond to the shortest reasonable operating cycle that could be expected for large pumping plant operations.

The use of sensors to monitor water levels on either side of a conventional structure will be considered to achieve an automatic operation of a conventional type of structure. The District is of the opinion that a "passive" type structure, one which relies on an external stimulus or signal from a control device, is inherently less reliable

than an "active" type of structure which responds directly to the movement of water. This position assumes that the "active" structure is properly designed and capable of sensing and responding to the water level changes in question. A model test of the butterfly control valve is required to answer this question.

e. Para 8. It would seem that the District has made every effort to explain the compelling reasons to investigate the butterfly control valve structure in a model. The estimates contained in inclosure 2 are of a survey scope and the $5 million greater cost listed for the butterfly control valve is somewhat artificial. It is reasonable to assume that a structure which employs unconventional gates will likely cost more than a conventional design. However the estimates at this time are not of a sufficient accuracy to warrent an economic evaluation for a $5 million difference in plans. If one extended and applied the logic contained in this comment, it is apparent that the remaining plans that are to be studied in the GDM should be eliminated without any further study at this time.

The total duration of the model test program is estimated to be 1 1/2 years; however, concept feasibility and design data that would be needed for the GDM are expected to be available 7 months after the testing program begins. It also should be pointed out that if concept feasibility can not be demonstrated the model study cost would be $340,000 not $547,000. It is urgent that initiation of this model study begin at the earliest practical date so that the GDM for this critical project feature can be processed in the shortest possible time. Deficiencies in the level of protection at the Orleans Parish Outfall Canal levees still remain the single most critical areas within the project.

f. Cost Table, Inclosure 2.

(1) Concur, if such a plan exist and it can be demonstrated that this plan fully satisfies the project objectives and at the same time does not impede or create an impediment to interior drainage, we would be obligated to construct the least costly implemental plan. Any additional cost associated with another plan would be considered a betterment.

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(2) The basis for selecting an 80% nominal pumping capacity came from pump efficiency curves furnished by the SWBNO. This type of detail will be discussed and displayed in the GDM for this project feature. The District early on coordinated this particular plan with the SWBNO and they have responded unfavorably to its potential application here. Inclosure 8 is a letter from SWBNO dated October 14, 1980, stating their position relative to this plan.

FOR THE COMMANDER:

FREDERIC M. CHATRY
Chief, Engineering Division

BARTON
LMNED-SP

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LMNED-S

CHATRY
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8 Incl
Added 3 incl
6. SWBNO letter dated 7 Dec 82
7. Plate A-14
8. SWBNO letter dated 14 Oct 80