DECLARATION OF JOHANNES VRIJLING

I, Johannes Vrijling, under penalty of perjury, state as follows:

1. I submit this Declaration on behalf of Plaintiffs Norman Robinson, Kent Lattimore, Lattimore & Associates, Tanya Smith, Anthony Franz, Jr., and Lucille Franz in *Robinson v. United States*, Case No. Civ. 06-2268 (SRD) in connection with issues related to the immunity claimed by the Defendants under the Flood Control Act of 1928 (FCA). I have personal knowledge of the matters set forth herein, and if called as a witness, I could and would testify competently to the following:

2. The objective of this declaration is to describe the means by which the various sources of water led to the flooding of the three polders that comprise Greater New Orleans metropolitan area during Hurricane Katrina August 2005. State-of-the-art computer models are used to assess these contributions. Like all computer models simulations, the output quality is dependent upon the input parameters and accuracy of the base grid. I and my team have endeavored to use the best available data in this simulation.

3, My project team consists of M. Kok Ph.D. MSc. (Project manager), B. Maaskant MSc, M. Aalberts BSc (all from the Delft University of Technology, Netherlands) and L. de Wit MSc (Svasek B.V., Netherlands). The project was independently reviewed and monitored by me, and the resulting report, entitled *Polder Flood Simulations for Greater New Orleans - Hurricane Katrina 2005* (Katrina Flood Report) is attached hereto as Exhibit 1. Based on my independent review and monitoring of the team effort which produced the Katrina Flood Simulation Report, I fully agree with its conclusions and opinions.

I. QUALIFICATIONS

4. I completed my Masters study at Delft University of Technology in the City of Delft, Holland in 1974. In 1980, I also received a Masters degree in Economics at the Erasmus University in Rotterdam. After a short period at the engineering office of the Adriaan Volker Group, I was seconded to the Easternscheldt Storm Surge barrier project in the Netherlands. In this project, I developed the probabilistic approach to the design of the barrier. After the completion of the barrier in 1986, I became deputy-head of the Hydraulic engineering branch of the Civil Engineering Division of Rijkswaterstaat, which is the Dutch Directorate for Public Works and Water Management. In 1989, I was responsible for the research and computer activities of the Civil Engineering Division. In 1989, I became a professor in Hydraulic Engineering at Delft University of Technology. Since 1995, I have been a full time professor at Delft, an advisor to the Civil Engineering Division, and, from 2002, Head of the Department of Hydraulic and Probabilistic Design Engineering. My complete curriculum vitae is attached hereto as Exhibit 2.

II. MODELS

5. Attached hereto as Exhibit 3 is a copy of the computer models, utilizing the best available input date, generated to simulate flooding of the three polders or bowls:

- Orleans Metro bowl;
- New Orleans East bowl; and
- St. Bernard bowl

These models show the relative contributions of the main causes of flooding (breaches, overtopping, and rainfall) in the three polders utilizing water depth graphs (hydrographs) for selected locations. See Section 1.3 of the Katrina Flood Report for the general modeling approach and Section 2 for input data and model set-up.

III. CONCLUSIONS

6. In this research project, the team built flood simulation models for the three bowls that comprise the Greater New Orleans metropolitan area. With these models, the inundation of the Greater New Orleans metropolitan area on August 29, 2005 has been simulated, and we obtained good agreement between the model outputs and the eye witness reports.

7. The model is used to assess the following causes of inundation: rainfall (and the operation of the pumping stations), overtopping of the flood control structures, and the breaches of the same. It is concluded that contribution of these sources depend on the location, and the results are shown for a number of locations. It can be concluded that rainfall and overtopping contributed substantially to the inundation of New Orleans East bowl. In the bowls New Orleans Metro and Saint Bernard, the contribution of rainfall and overtopping is relatively small compared with the contributions of the breaches. The Katrina Flood Simulation Report contains figures where the relative contribution of the causes is shown.

8. Further refinements of the modeling may be possible as additional data becomes available, especially as it relates to the operation of the pump stations, *e.g.* how long they pumped for and what their capabilities with changing water levels were both within and without the polders. However, it is my opinion that additional data for the operation of the pump stations will not, or not significantly change the model results.

9. Moreover, the model results could aid in assessing the economic damage and causes of loss of life related to the various water inputs and contributions to the internal flooding of the polders during and after Hurricane Katrina.

10. Even though it doesn't flow from the report, it is my further opinion that the amount of flood protection provided to any given area must be a function of the value of the area to be protected. If you have an urban area as priceless as the greater New Orleans metropolitan area, you must accordingly design and build a hurricane protection system that provides maximum and redundant hurricane protection. In the case of the *Lake Pontchartrain, and Vicinity, Hurricane Protection Project* which was supposed to protect the Greater New Orleans metropolitan area after 1965 from the "most severe combination of meteorological conditions that are considered reasonably characteristic of the region," the structures designed and constructed by the United States Army Corps of Engineers fundamentally failed to do so.

IV. COMPENSATION

11. I received no compensation personally for this report. Any compensation is paid to Delft University of Technology in the Netherlands.

I declare under the laws of the United States that the foregoing is true and correct.

Executed on September 17, 2007 in Delft

JOHANNES VRIJLING