# DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT
## (PENNSYLVANIA, NEW JERSEY, AND DELAWARE)

**Comprehensive Economic Reanalysis Report**
**U.S. Army Corps of Engineers**
**December 2002**

**Economic Benefits Independent Technical Review**

In a letter dated 17 December 2002, Dr. Michael S. Bronzini, Ph.D., P.E. indicated that *"Based upon this review it is my opinion that the benefit analysis in the December 2002 report meets the standard of technical adequacy".* However, Dr. Bronzini indicated that there remain three areas where documentation could be improved.

Below is a list of the three areas where documentation could be improved along with Corps response.

**Comment.**

  (1)     In the estimation of lightering vessel VOCs (Appendix C, pp. 32-35), reference is made to a number of regression models that were used to relate various cost factors to vessel size. There is no documentation of these models, so a reviewer is unable to judge the statistical quality of the resulting estimates.

 **Corps Response**.

For oil tankers, the regression models referred to in the comment are included within the model spreadsheets and can be found in the spreadsheet entitled <u>VOC_Nov2002.xls</u>. The hourly at sea and at port vessel cost constant and slopes shown on the inputs page of the analytical models for each benefiting commodity are actively linked to this spreadsheet. The regressions are generated using the LINEST function in Microsoft Excel. The regression input values are taken directly from the tables contained in *Economic Guidance Memorandum 02-02, Deep Draft Vessel Operating Costs.* The regression equations are used to interpolate between the deadweight tonnage categories identified in the VOC tables, so that accurate operating costs can be used for vessels whose deadweight tonnage fall between the table entries. Because the regressions are derived exclusively from the table entries and are used solely for interpolation, any statistical analysis of the regression results will show very favorable (i.e., high $R^2$), but not very informative, results.

For lightering vessels, a separate Independent Technical Review of the propriety data was conducted the Corps of Engineers Institute Water Resources.

**Comment.**

(2)     There is no set of spreadsheets documenting the sensitivity analyses. While it is recognized that this would be a rather large set, and that a reviewer with access to the models could readily replicate any of the cases, it might be advisable to have the spreadsheets that were used archived, and referenced in the project documentation.

**Corps Response.**

Considering the number of separate models and the size of the spreadsheets needed to calculate each condition, creating a set of sensitivity analysis archives that could be checked by a reviewer would be a burdensome task that would offer little utility. However, the sensitivity analysis results can be replicated by future reviewers with instruction from the model authors regarding the input cells that need to be changed to generate each sensitivity analysis. These instructions will be developed and kept on file in the Corps of Engineers. Philadelphia District.

**Comment.**

(3)     The report (Appendix C) and model documentation do not impart a sense of how the macro-level commodity flow forecast was used to forecast the tonnage of each vessel call, and how the overage was allocated to additional vessels. In other words, there needs to be a description of the models used. The procedure for allocating commodity growth to the applicable fleet is not documented in sufficient detail. It is very hard to follow in the spreadsheets, and it is not explained verbally anywhere. Such a description should be in the report, or at least in the spreadsheets.

**Corps Response.**

Each analytical model spreadsheet documents the way that growth in tonnage is allocated to additional vessels. The input page identifies the DWT of the additional vessels. The Distribute Commodity growth page shows the amount of tonnage on each vessel including the additional vessels, which are identified as such. Additional documentation is also included in the QC report. A verbal description of the calculations was not included in the report because multiple variables are changing throughout the process, making a verbal description overly complicated and hard to follow.

The Benefits Appendix does include a discussion in Section 3.7.2 of how future commodity growth was allocated the vessels in the future Bulker fleet. The same general process was applied for all commodity types and consisted of the following steps:

➢  1. Assign future commodity growth to the existing fleet until the vessels "fill up" to the lesser of a) their design drafts, or b) the channel depth constraint;

➢  2. Add enough new vessels to the fleet in each year of the project evaluation period to handle the commodity growth in that year, and then fill the vessels up as in step 1. The selection of the type of vessel to add differs under with and without project conditions and is documented in each analytical model.