AD-A258 784

US Army Corps of Engineers
Lower Mississippi Valley Division

Particle Size Distributions of Bed Sediments Along the Thalweg of the Mississippi River, Cairo, Illinois, to Head of Passes, September 1989

Potamology Program (P-1)

Report 7

Prepared by

Carl F. Nordin and Bryan Scott Queen
Department of Civil Engineering
Engineering Research Center
Colorado State University
Fort Collins, CO 80521

Monitored by

Hydraulics Laboratory
US Army Engineer Waterways Experiment Station
3909 Halls Ferry Road, Vicksburg, MS 39180-6199

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE
September 1992

3. REPORT TYPE AND DATES COVERED
Final report

4. TITLE AND SUBTITLE
Particle Size Distributions of Bed Sediments Along the Thalweg of the Mississippi River, Cairo, Illinois, to Head of Passes, September 1989

5. FUNDING NUMBERS

6. AUTHOR(S)
Carl F. Nordin
Bryan Scott Queen

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Department of Civil Engineering, Engineering Research Center, Colorado State University, Fort Collins, CO 80521

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
US Army Engineer Division, Lower Mississippi Valley
PO Box 80, Vicksburg, MS 39181-0080
USAE Waterways Experiment Station, Hydraulics Laboratory, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
Potamology Program (P-1) Report 7

11. SUPPLEMENTARY NOTES
Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*
Changes in Mississippi River bed material gradations between Cairo, IL, and Head of Passes, LA, between 1932 and 1989 were determined. In September 1989, bed material samples were collected from the thalweg of the river along the 955-mile reach. In all, 504 samples were collected at 417 locations. Results were compared to a similar sampling program conducted in 1932. In general, the 1989 bed contained less coarse sand and gravel and less very fine sand than the 1932 bed. Upstream of the Old River Structure near river mile 300 the bed was generally finer in 1989 than in 1932. Downstream from river mile 300 the median grain size was about the same, but the distribution was more uniform, with less very fine sand.

14. SUBJECT TERMS
Bed material sampling
Mississippi River
Particle size distribution
River morphology
Sedimentation

15. NUMBER OF PAGES
93

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED		

PREFACE

The study reported herein is a component of the river engineering studies of the US Army Engineer Division, Lower Mississippi Valley (LMVD). These studies are conducted under the direction of the Commander, LMVD, and are a comprehensive analysis of physical forces that influence the flood-carrying capacity and navigability of the lower Mississippi River. The purpose of these studies is to define cause-and-effect relationships that result in short- and long-term changes in the stage-discharge relationships of the lower Mississippi River and to develop improved design concepts and criteria for construction of channel stabilization works that will improve flood control and navigation along this river.

This investigation is directly related to the following previous studies of the sediment regime of the Mississippi River Basin:

Phase I, conducted under the earlier LMVD Potamology Program (T-1), resulted in the publication of WES Technical Report M-77-1, "Inventory of Sediment Sample Collection Stations in the Mississippi River Basin," in March 1977.

Phase II resulted in LMVD Potamology Program (P-1) Report 1, "Characterization of the Suspended-Sediment Regime and Bed-Material Gradation of the Mississippi River Basin," published in August 1981. The Phase II study identified a downward trend in Mississippi River suspended-sediment loads that apparently began around the middle of the 20th century.

Phase III dealt with suspended-sediment sampling, analysis, and load computation procedures used at key stations on major streams in the Mississippi River Basin and the possible correlation of these procedures with the downward trend in suspended-sediment loads. Results of Phase III were reported in Potamology Program (P-1) Report 5, "Downward Trend in Mississippi River Suspended-Sediment Loads," published in July 1990.

Phase IV examined existing regime equations and their applicability to major alluvial systems, with a principal focus on the effects of changes in suspended-sediment loads as they relate to the regime of alluvial rivers. Phase IV results were published in October 1990, as Potamology Program (P-1) Report 6, "Impact of Changes in Suspended-Sediment Loads on the Regime of Alluvial Rivers."

The study reported herein was conducted, under contract, by Colorado State University, Fort Collins, CO. The contract was administered by the US Army Engineer Waterways Experiment Station (WES). Results of the study were reviewed by LMVD and WES. Funding for the study was provided jointly by US Army Engineer Districts,

New Orleans, Vicksburg, and Memphis. The study was conducted between June 1989 and June 1991.

The study was conducted by Dr. Carl F. Nordin and Mr. Bryan Scott Queen of the Department of Civil Engineering at Colorado State University; Mr. Robert H. Meade, US Geological Survey; and Dr. Stanley A. Shumm, Colorado State University. Mr. Robert E. Rentschler, US Army Engineer District, Vicksburg, assisted in the sampling program. Messrs. Charles Elliott, LMVD; Ronald R. Copeland, WES; and Robert E. Rentschler provided general guidance and review of the research.

This report was published under the general supervision of Messrs. Frank A. Herrmann, Jr., Director, Hydraulics Laboratory (HL), WES; Richard A. Sager, Assistant Director, HL; Marden B. Boyd, Chief, Waterways Division, HL; and Michael J. Trawle, Chief, Math Modelling Group, Waterways Division.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander and Deputy Director was COL Leonard G. Hassell, EN.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

INTRODUCTION

In 1932, the Chief of Engineers, U.S. Army, directed that studies be undertaken to determine the force of flowing water required to move materials composing the bed of the Lower Mississippi River (WES, 1935). The studies were initiated that same year and were carried out in two parts. The first part consisted of a series of flume studies of materials moved by hydraulic traction. The second part consisted of systematic sampling and analyses of bed sediments from the Mississippi River channel thalweg along a 1,070-mile reach between Cairo, Illinois, and Head of Passes (572 samples in all) and some additional sampling in major tributaries and in the passes to the Gulf, 1091 miles downstream of Cairo. The results of these investigations were published in 1935 in Waterways Experiment Station Paper Number 17, "Studies of River Bed Material and Their Movement, with Special Reference to the Lower Mississippi River" (WES, 1935). The field data were to become, and are still, the classic example of bed sediment size reduction along a river. Leopold, Wolman, and Miller (1964), in their book "Fluvial Process in Geomorphology", stated "The changes in grain size in the Mississippi River...are as well documented as in any large river of the world." and "Few, if any, sets of data extant are as consistent and voluminous".

Many changes have taken place on the Mississippi River since 1932. The river has been shortened by cutoffs and channel realignment. Bank revetments and protection works have substantially eliminated bank erosion as a source of sediments. In addition, dams on the Missouri River, the largest contributor of sediment to the system, have reduced the sediment contributions from that river to a fraction of their historic values. Sediment discharges to the Gulf of Mexico by the Mississippi River today are about one-half of what they were prior to 1952 (Meade and Parker, 1985). In view of these changes, one would expect the bed sediments of the Mississippi to be coarser today than they were in 1932. However, until now, data to confirm this were not available, and in fact, the results of recent fairly extensive sampling programs in the Vicksburg District suggested that the bed may be finer (Robbins, 1977). However, procedures in sampling were not the same as in 1932, so the results are not directly comparable, as pointed out by Robbins (1977, p. 14). Many of Robbins' values were averages of 4 to 12 samples across a section, and because some of the samples may contain finer bed sediments in regions of low velocities, the average size distribution values are not directly comparable to the size distributions of the thalweg samples of 1932. In order to make comparisons, samples needed to be collected from the thalweg during the low flow season, August-October, in the same way that they were collected in 1932.

In 1989, the Corps of Engineers contracted with Colorado State University to undertake a sampling program to duplicate as closely as possible the program carried out in 1932. The purposes of the study were (1) to determine if the size distributions of bed sediments in the river thalweg have changed since 1932, and (2) to provide baseline information against which future changes can be monitored. This report presents our findings.

ACKNOWLEDGEMENTS

Many groups and individuals assisted us. We acknowledge with thanks the logistical support by LUMCON and the excellent efforts by the crew of R/V ACADIANA. Robert H. Meade, U.S. Geological Survey, and Stanley A. Schumm, Colorado State University, assisted in the sampling between Cairo, Illinois, and Greenville, Mississippi. We appreciate their help. R.E. Rentschler, U.S. Army Corps of Engineers, Vicksburg, took part in the entire campaign. His assistance and knowledge of the river were invaluable. We also thank R.R. Copeland and Charles Elliott, U.S. Army Corps of Engineers, Vicksburg, for their encouragement and support of this research.

BACKGROUND

The Research Vessel

Work was carried out aboard the research vessel R/V ACADIANA owned and operated by Louisiana Universities Marine Consortium (LUMCON), Cocodrie, Louisiana. The vessel, shown in Figure 1, displaces 52 tons and is 58 ft long with an 18-ft beam and 4-ft draft. It is equipped with a stern mounted A-frame and hydraulic winch with 8,000 lb. capacity and a davit winch on each side with 1,000 lb. capacity. The vessel is self-contained with galley, sleeping quarters for six, and a laboratory.

R/V ACADIANA left Cocodrie August 27, 1989 and arrived at Wickcliffe, Kentucky on August 31, 1989. We began sampling September 1, 1989 at Cairo, Illinois (RM 954.6), and finished at Head of Passes (RM 0) on September 24, 1989. A map of the reach showing river miles and a few key locations along the river is contained in Plate 1.

Figure 1. The R/V Acadiana

The Samplers

Most of the samples were collected with the WES drag sampler (WES, 1935). The sampler consists of a 4-inch inside diameter steel pipe four feet long, closed at one end and flared to about eight inches diameter at the other end (see Plate 2). The device is attached by means of a bail to the cable over the A-frame. In addition to the WES drag sampler, we carried the US BM-54 bed material sampler (Interagency Committee, 1963) and two shorter drag samplers, as shown in Figure 2. These drag samplers were constructed from pieces of thick-wall steel pipe four inches and eight inches inside diameter and about 20 inches long. One end was welded shut and the other end was beveled from the inside to a cutting edge. A length of chain four or five times the length of the sampler was attached to two holes drilled near the cutting edge. A shackle was mounted at the center of the chain to attach the sampler to the winch cable for sampling. A light weight shackle was used as a safety measure so that the shackle would break rather than the cable if the sampler were to become caught on sunken trees, bedrock outcrops, or debris.

Figure 2. The bed material samplers used during the 1989 field data collection campaign. From left to right: WES sampler, 4" USGS pipedredge, 8" pipedredge, and the US BM-54

Sampling Procedure

When sampling with the US BM-54, the vessel is held stationary. With the drag sampler, however, the vessel is allowed to drift with the current while the sampler is lowered and dragged along the bed. Usually, a length of cable two to three times the flow depth is played out before dragging so that the sampler drags almost horizontally along the bed well upstream from the sampling vessel. When recovering the sample, the boat is held stationary and the sampler is retrieved slowly so that the open end is not exposed to high velocities, which would wash out some of the finer material.

After the sampler was brought on deck, its contents were emptied into a steel pan, a representative subsample of the bed material was placed in a plastic bag that was sealed and labeled for shipment to the sediment laboratory at Colorado State University, and the diameter of the largest gravel particle in the remainder of the sample was recorded.

On many occasions, the drag samplers became caught on objects on the bed. When this happened, it was necessary to back the vessel upstream over the sampler in order to retrieve it. On one occasion, we lost one of the WES drag samplers, but on all other occasions, it was possible to loosen the sampler and recover it. Several times a day we collected samples with both the drag samplers and the US BM-54 in order to compare results from the different samplers.

Sampling sites were selected in advance after studying the navigation charts and most recent bathymetry to locate the thalweg and position along the channel. Usually, we sampled at mile markers and beacons, or other permanent and easily identified features shown on the navigation charts so that we could return to the identical location at a later date if additional sampling is required. All sample locations are identified by River Mile and distance from a reference bank determined from the ship's radar. All information at each sampling site was entered in a sample log for permanent record. In all, 504 samples were collected from 417 locations.

SAMPLE ANALYSES

The samples were shipped to the sediment laboratory at Colorado State University Engineering Research Center for analyses. Each sample was dried and weighed. The entire sample was sieved for 10 minutes to determine the particle size distribution of gravel (material coarser than 2 mm). The material passing the 2 mm sieve was split to 50 grams or less and analyzed by sieving for 15 minutes. If the samples contained silts or clays, these finer size distributions were determined by pipet analyses. Hydrometer analyses were also carried out on these samples. In 1932, samples containing silts and clays were analyzed by the hydrometer method (WES, 1935).

In our particle size analyses and classification, we used the extended Wentworth scale (Vanoni, 1975, p.20).

RESULTS

1989 Data

The grain size distribution of material coarser than 0.062 mm for samples collected with the WES sampler are given in Table 1. At three locations, cross channel samples were taken with the WES sampler. The grain size distributions for these samples are shown in

Table 2. Grain size distributions (for the material coarser than 0.062 mm) for samples collected with the USGS 4" pipedredge, the US BM-54 sampler, and the 8" pipedredge, are shown in Tables 3, 4, and 5, respectively. Some of the samples collected using the WES sampler and the USGS 4" pipedredge contained significant amounts of clay and silt. The grain size distribution of the clays and silts were determined by pipet analysis, and are shown in Table 6. Additionally, a hydrometer analysis was performed on these samples. The results of the hydrometer analysis are shown in Table 7. Table 8 shows the maximum gravel particle size in each sample.

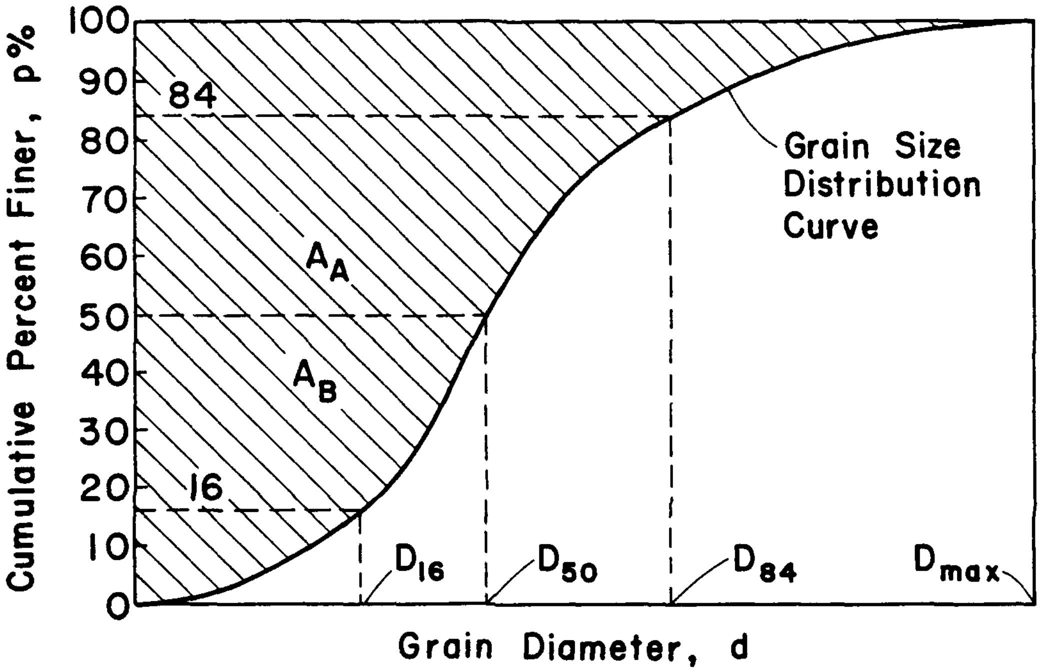
Several statistical parameters were computed using the grain size distributions for the collected samples. These statistics are the D_{16}, the D_{50}, the D_{84}, the sorting coefficient, the uniformity modulus, and the mean grain diameter. The D_{16} is defined as the size of particle for which 16% of the sample is finer, by weight. The D_{50} and the D_{84} are defined similarly. The sorting coefficient is defined as follows:

$$\sigma = 1/2\ (D_{84}/D_{50} + D_{50}/D_{16})$$

The sorting coefficient provides a measure of the uniformity of the sample. As the sample approaches perfect uniformity (i.e. the entire sample is composed of the same size grains), the sorting coefficient approaches 1.0. The wider the variation of grain sizes present in the sample, the larger the value for the sorting coefficient becomes.

The uniformity modulus is defined as the ratio of the area below to the area above the D_{50} line, A_b/A_a, as shown in Figure 3. It is also a measure of sorting, the larger the range of size distributions, the smaller the value of the uniformity modulus. For a uniform grain size, its value is 1.0, its maximum value.

The mean grain diameter is a weighted average grain size for the sample. It is determined by multiplying a grain size by the percentage of the sample it represents, summing over the range of sizes, and dividing by the sum of the percentages representing each size. This is shown on Figure 3. The computation of mean diameter tends to emphasize the larger particles. Even a very small quantity of large material can significantly raise the mean grain diameter. In some cases, the computed mean grain diameter was larger than the D_{84} of the material.



Mean Grain Diameter:

$$D_m = \frac{\Sigma d_i \Delta p_i}{\Sigma \Delta p_i} = \frac{A_A + A_B}{100}$$

Uniformity Modulus:

$$u = \frac{A_B}{A_A}$$

Figure 3. Definition sketch for grain size distribution plotted on a linear scale

The plot shown in Figure 3 is a grain size distribution plotted on linear axes. Note how the D_{16}, the D_{50}, and the D_{84} are determined. The mean grain diameter and the uniformity modulus for each of the samples collected in 1989 were computed using such a linear representation (in order to compare these statistics for the 1989 samples with those published in the WES report, 1935).

A second method of showing a grain size distribution curve is on a log-normal plot, as shown in Figure 4. On this type of plot, the size axis is a logarithmic scale while the cumulative-frequency axis is a normal-probability scale. This method is desired because the grain size distribution tends to plot as a straighter line on a log-normal plot than a linear plot. This allows more accurate interpolation for various statistical parameters (Stevens, 1986). Using the normal-probability scale, the distance between the 50th percentile and the 16th percentile represents one standard deviation unit. Likewise, the distance between the 50th percentile and the 84th percentile is one standard deviation unit, as shown in Figure 4. The statistics cited in this report were determined using log-normal distributions (except for the mean grain diameter and the uniformity modulus). A computer program (using information from Stevens, 1986) was used to compute the pertinent statistics. The statistics for the samples collected in 1989 are shown in Table 9.

The variation in composition of samples along the river is shown in Figure 5. This figure was developed by averaging the grain size distributions of samples in 25-mile reaches. It clearly indicates a progressive increase in percentage of finer materials in the downstream direction. It also shows that the 1989 samples are composed mostly of medium and fine sand.

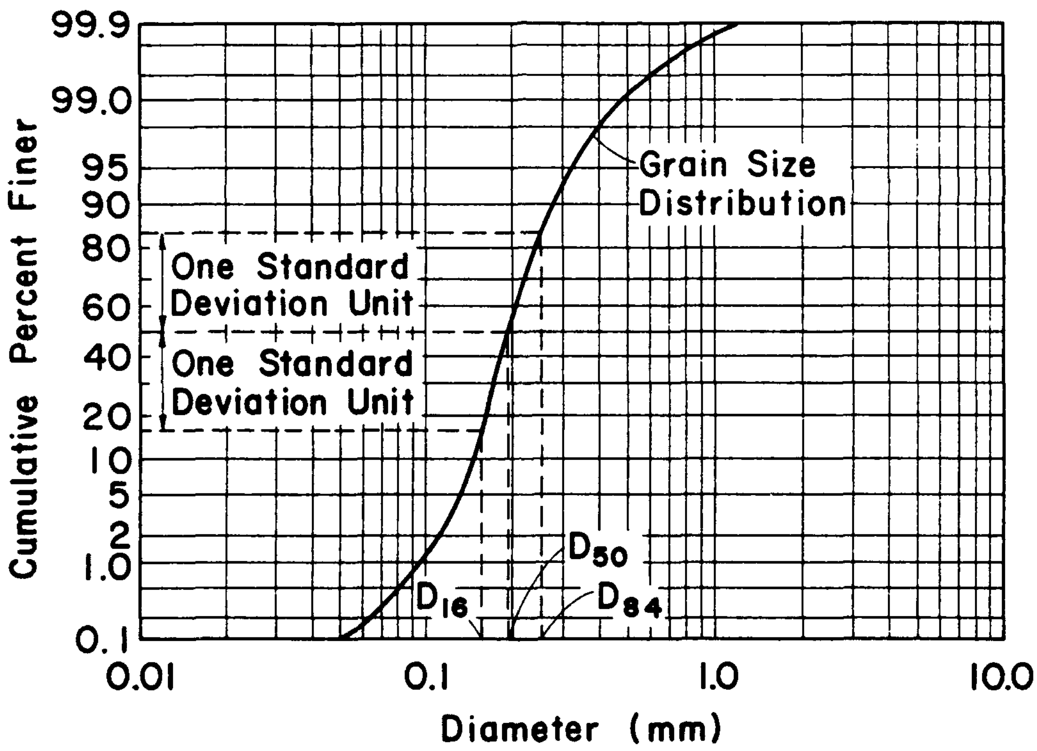


Figure 4. Definition sketch for grain size distribution plotted on a log-normal probability scale

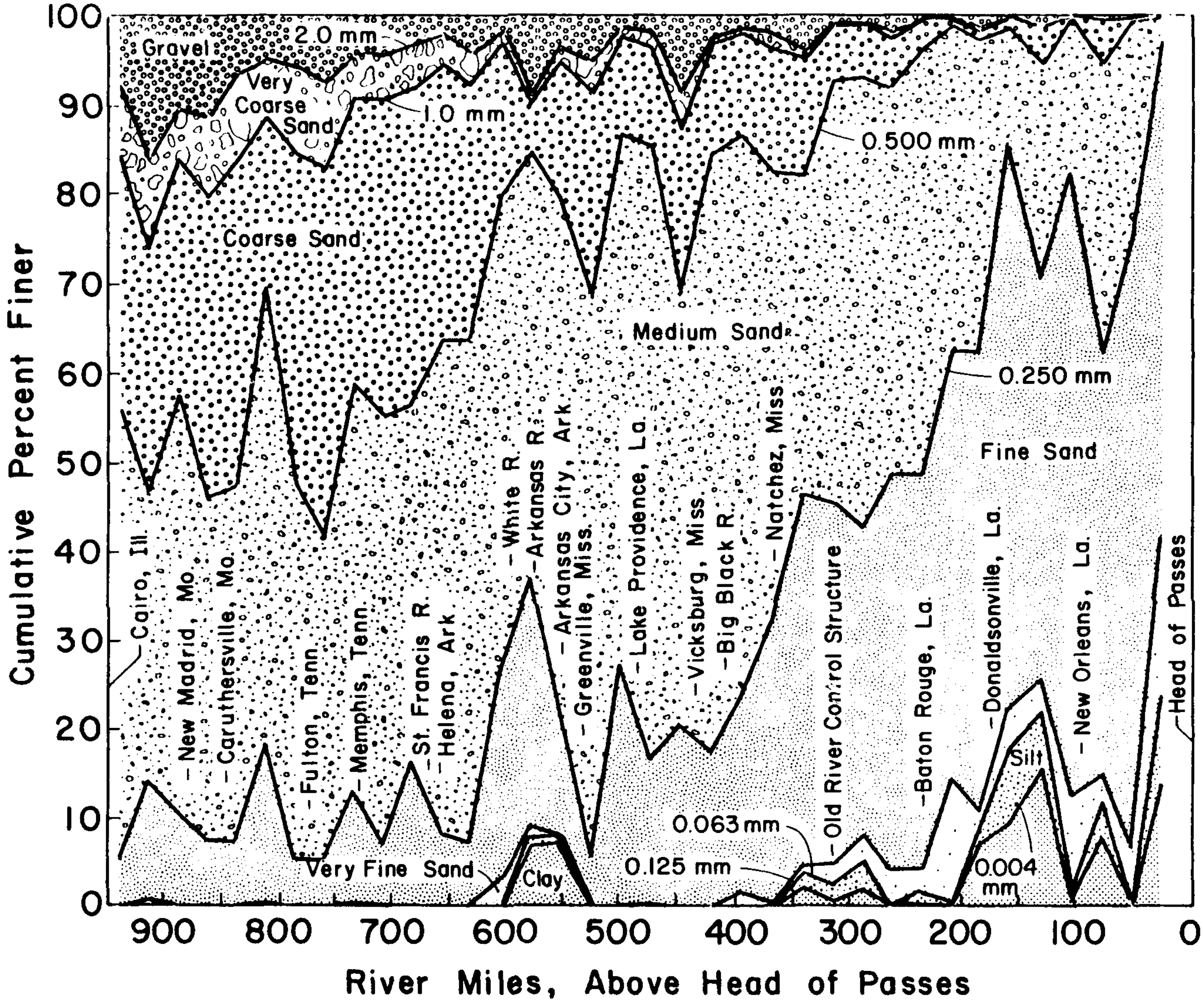


Figure 5. Composition of 1989 Bed Material, averaged by 25 mile reaches

COMPARISON OF 1989 RESULTS WITH 1932 RESULTS

Matching 1932 Locations to 1989 Locations

In 1932, sample locations were identified by river miles downstream of Cairo, Illinois. Cairo was River Mile (RM) 0 and the Head of Passes was RM 1069.5. Since 1932, many changes have taken place along the Mississippi River. In the late 1930's and early 1940's, many of the large meander bends were cut off, shortening the overall channel length by 160 miles. In 1962, the delineation of river mileage was changed, with river miles beginning at 0 at the Head of Passes and increasing upstream. Cairo is now at RM 954.6.

To make a useful comparison between the 1932 data and the 1989 data, it was necessary to obtain the current river mileages of the 1932 sample locations and identify samples taken in parts of the river which were later cut off. Using the descriptions of sample locations in Paper No. 17, (WES, 1935) and a set of navigation maps of the lower Mississippi River dated 1938, it was possible to identify most of the 1932 sample locations. These locations were then transferred to 1988 navigation charts using latitude and longitude lines for reference.

As can be expected for a river as dynamic as the Mississippi, the current channel does not occupy the same alignment as it did in 1932. Cutoffs and lateral migration have resulted in significant changes in channel location. Because of these changes, many of the 1932 sample locations are no longer in the river channel, complicating the comparison between 1932 and 1989. In choosing samples for the comparison, the following procedure was used. Where the channel simply migrated laterally, the river mileage for the 1932 sample location was chosen such that a line perpendicular to the river channel would intersect the 1932 sample location. If the 1932 samples were located in a part of the river that has since been cut off, they were eliminated from the comparison. Only the 1989 samples obtained with the WES sampler were used for the comparison.

Grain size distributions and statistics for the 1932 samples

Due to the difference in the sediment grade scales used in the analysis of the 1932 and 1989 samples (U.S. Bureau of Soils classification in 1932 and the extended Wentworth scale in 1989), it was necessary to convert the results of the 1932 analysis to the extended Wentworth scale. This was accomplished using log-normal interpolation as described by Stevens (1986).

For the 1932 samples, percent finer quantities were computed for the following grain sizes: 2.0 mm, 1.0 mm, 0.5 mm, 0.25 mm, 0.125 mm, and 0.062 mm. The resulting distributions are shown in Table 10. Both the 1932 and 1989 river miles have been included in this table for convenience. Where "NC" appears in the 1989 river mile column, the 1932 sample location is no longer represented by the current river alignment. These samples were not included in the comparison.

Additionally, the pertinent statistics for the 1932 COE samples were computed using a log-normal interpolation. Those statistics are presented in Table 11. Finally, the complete grain size distributions for the 1932 samples are listed in Table 12. These are included here because the 1932 WES report is out of print and not readily available.

Comparison of 1989 and 1932 grain size distributions

The converted grain size distributions for the 1932 samples were averaged by 25-mile reaches and plotted, as shown in Figure 6. This plot was developed so that comparison could be made with Figure 5; however, this is obviously difficult. To simplify the comparison, the difference between the 1989 percentage and the 1932 percentage of material in a given class was computed, averaged over 25 mile reaches, and plotted. The percentage difference for gravel, very coarse sand, coarse sand, medium sand, fine sand, and very fine sand are shown in Figures 7, 8, 9, 10, 11, and 12, respectively. A negative value on these plots indicates a smaller percentage of material in that class in 1989 compared to 1932. In particular, Figure 7 indicates that from Cairo, Illinois, downstream to approximately Baton Rouge, Louisiana, there is significantly less gravel in 1989 than there was in 1932. Downstream of Baton Rouge, the percentages of gravel in the 1989 and 1932 samples are virtually the same. Figure 8 indicates that there is generally less very coarse sand upstream of Baton Rouge in 1989 than in 1932, with slightly more very coarse sand (approximately 0.3%) downstream of Baton Rouge in 1989. Figure 9 shows that there is generally less coarse sand upstream of Baton Rouge in 1989 than there was in 1932. Downstream of Baton Rouge there is more coarse sand in 1989 than there was in 1932. Figure 10 reveals a general increase in the amount of medium sand in 1989 over that in 1932. There is a reach between Baton Rouge and New Orleans, however, where there is significantly less medium sand in 1989 than in 1932. There was a general increase in the quantity of fine sand between 1932 and 1989 over nearly the entire reach of river sampled, as shown in Figure 11. Two exceptions to this general trend lie in the vicinities of Helena, Arkansas, and Greenville, Mississippi. Downstream of Vicksburg, the increase in the amount of fine sand is quite large, up to nearly 40%. Figure 12 indicates a decrease in the quantity of very fine sand over the entire reach sampled from 1932 to 1989.

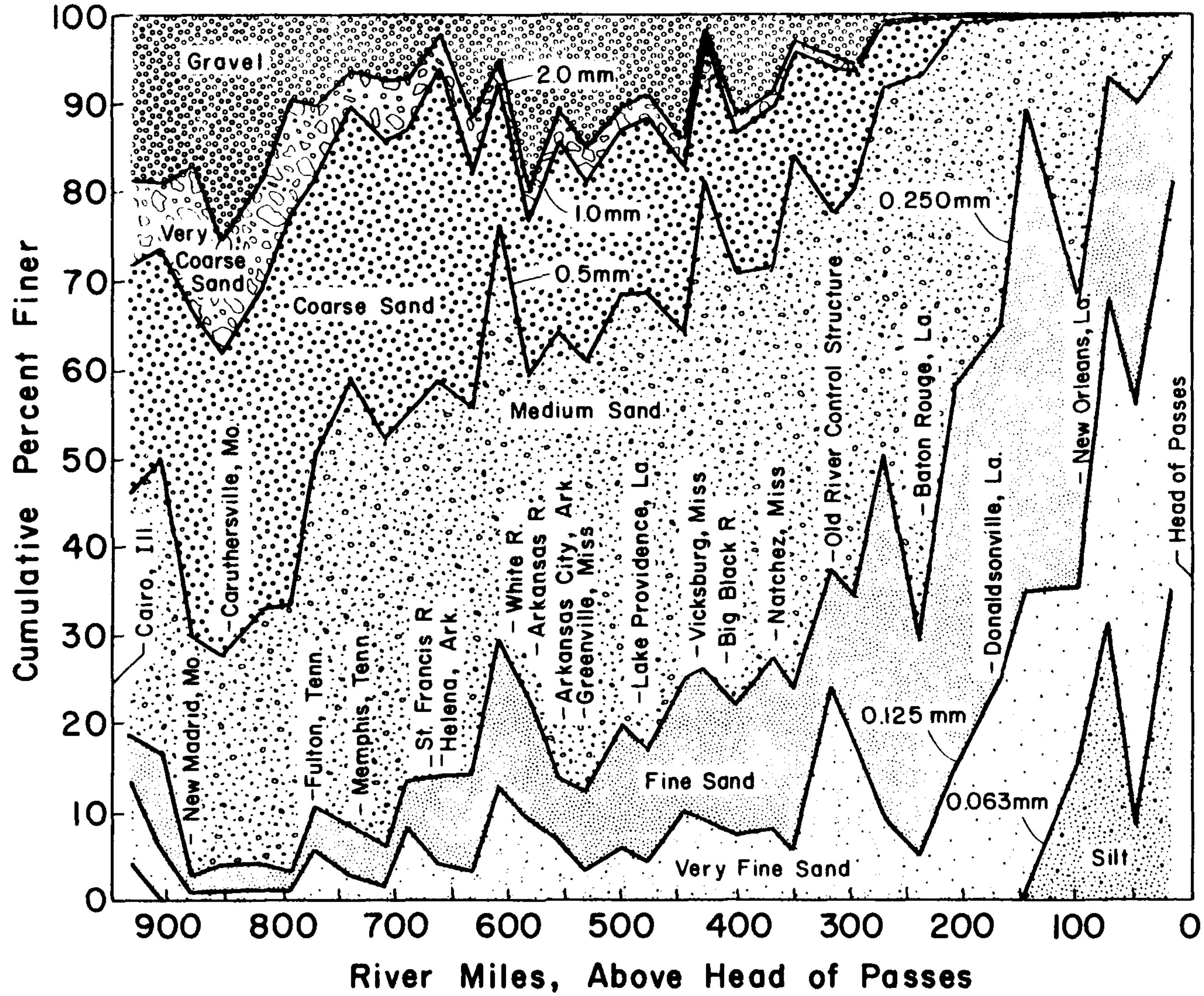


Figure 6. Composition of 1932 bed material using the extended Wentworth scale, averaged by 25 mile reaches

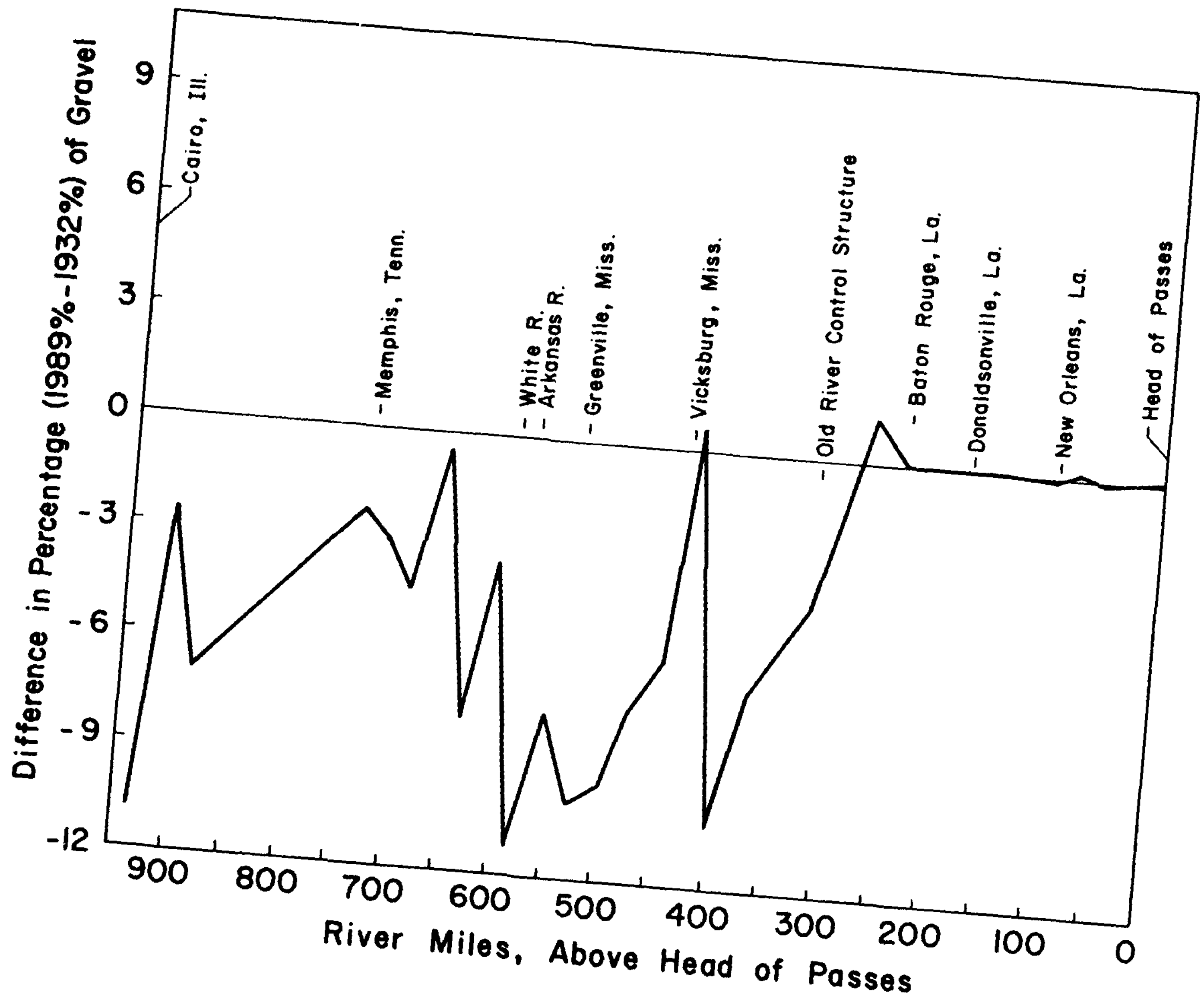


Figure 7. Difference in percentage of gravel between 1989 and 1932 samples averaged by 25 mile reaches

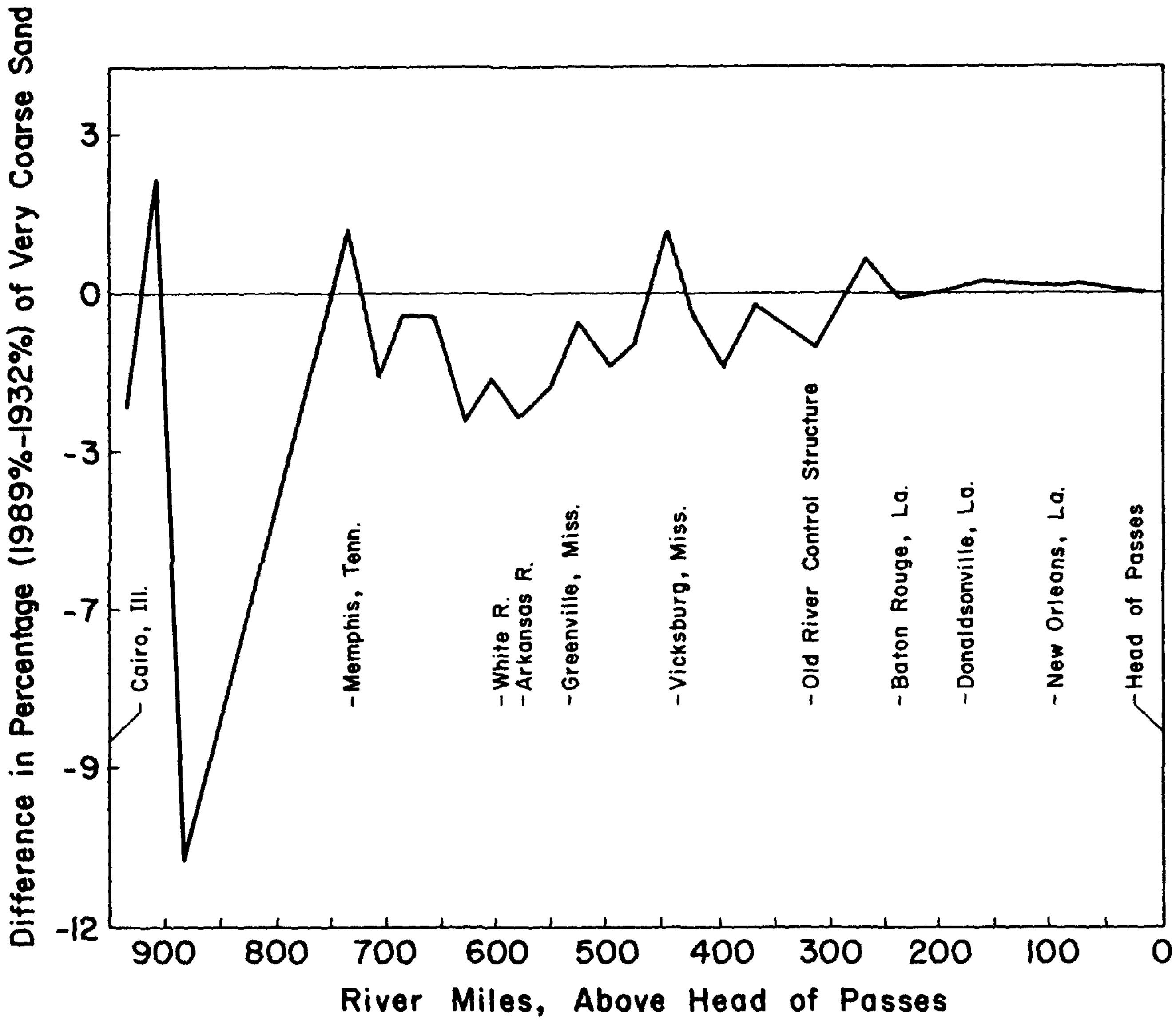


Figure 8. Difference in percentage of very coarse sand between 1989 and 1932, averaged by 25 mile reaches

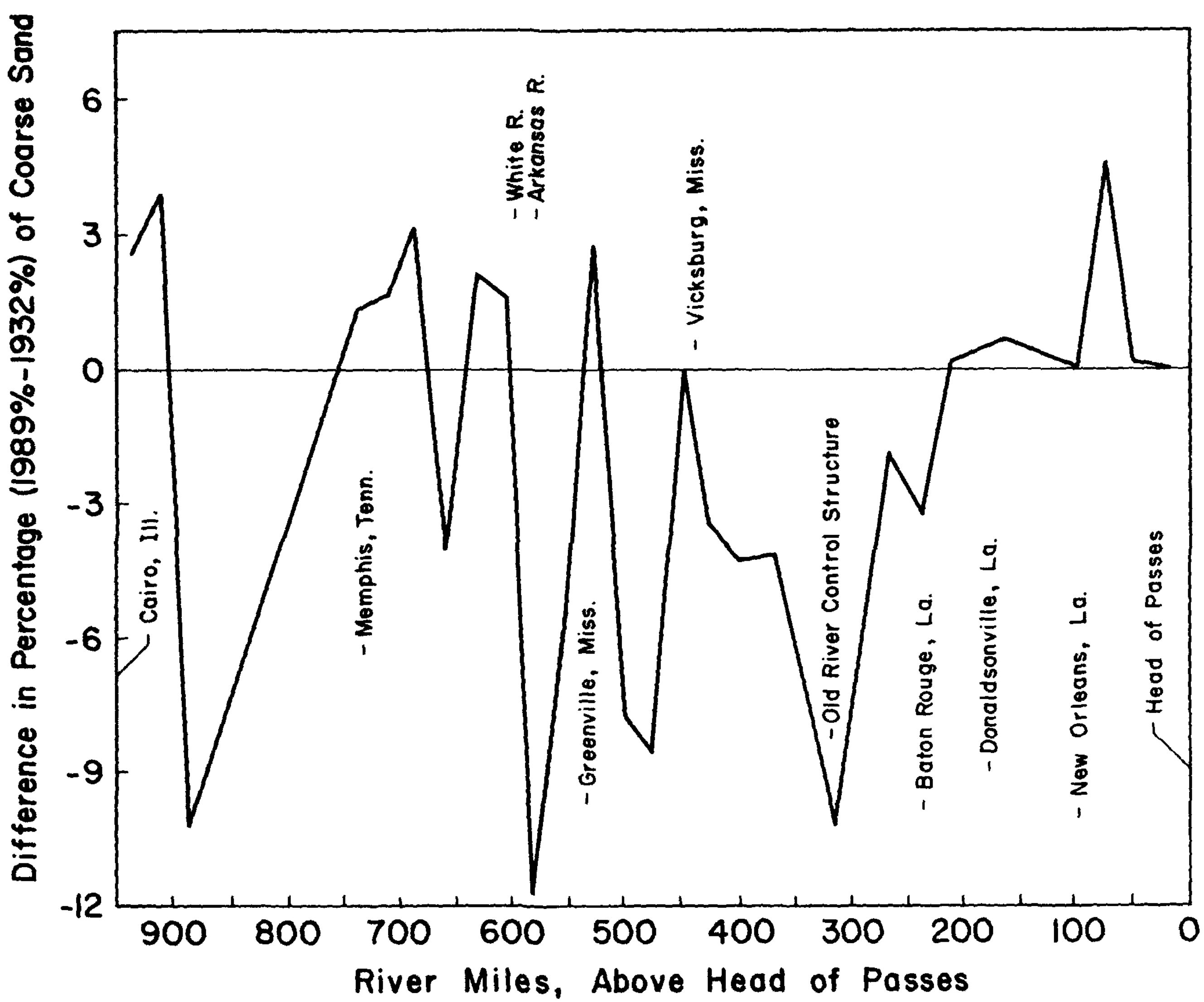


Figure 9. Difference in percentage of coarse sand between 1989 and 1932, averaged by 25 mile reaches

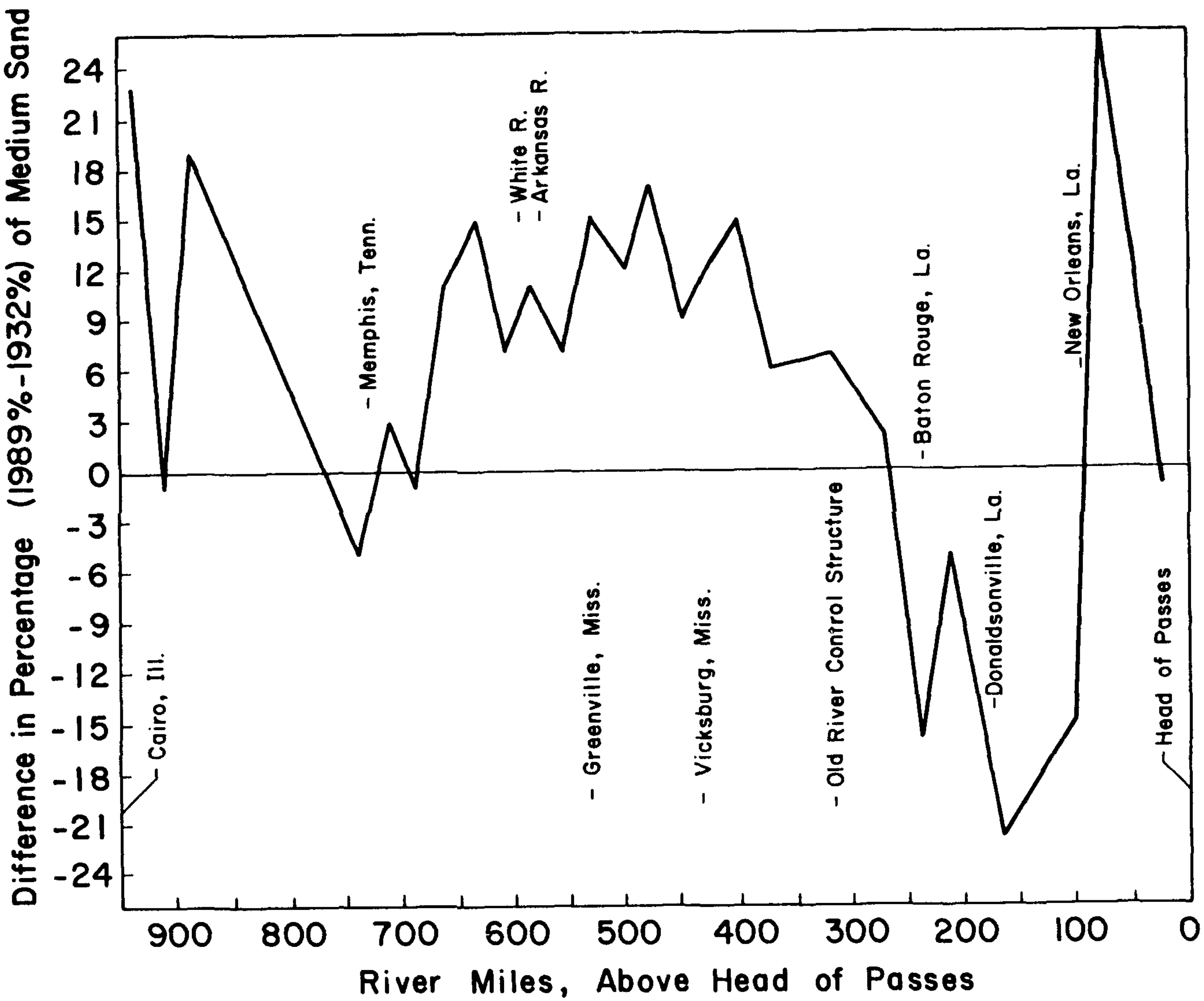


Figure 10. Difference in percentage of medium sand between 1989 and 1932, averaged by 25 mile reaches

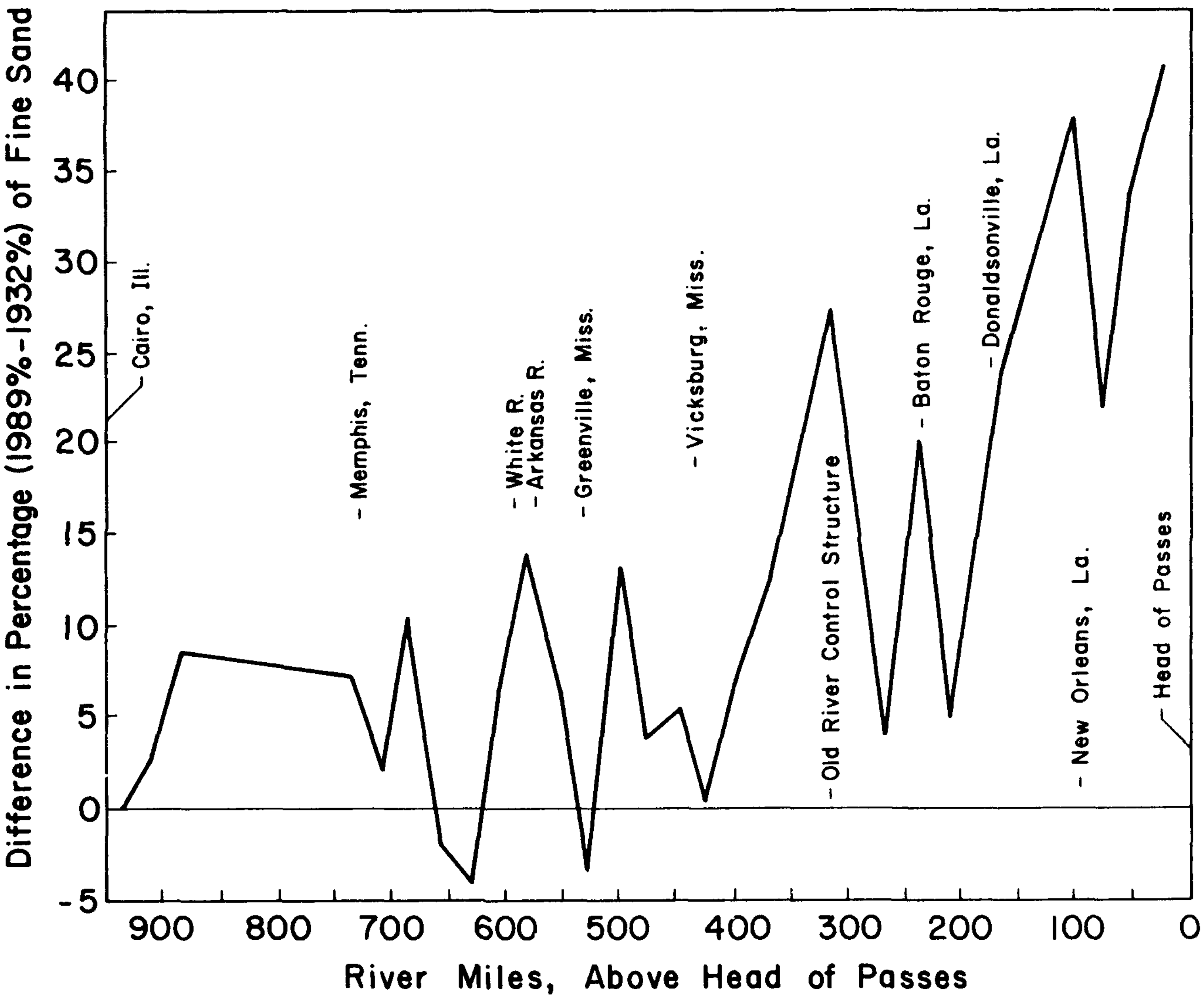


Figure 11. Difference in percentage of fine sand between 1989 and 1932, averaged by 25 mile reaches

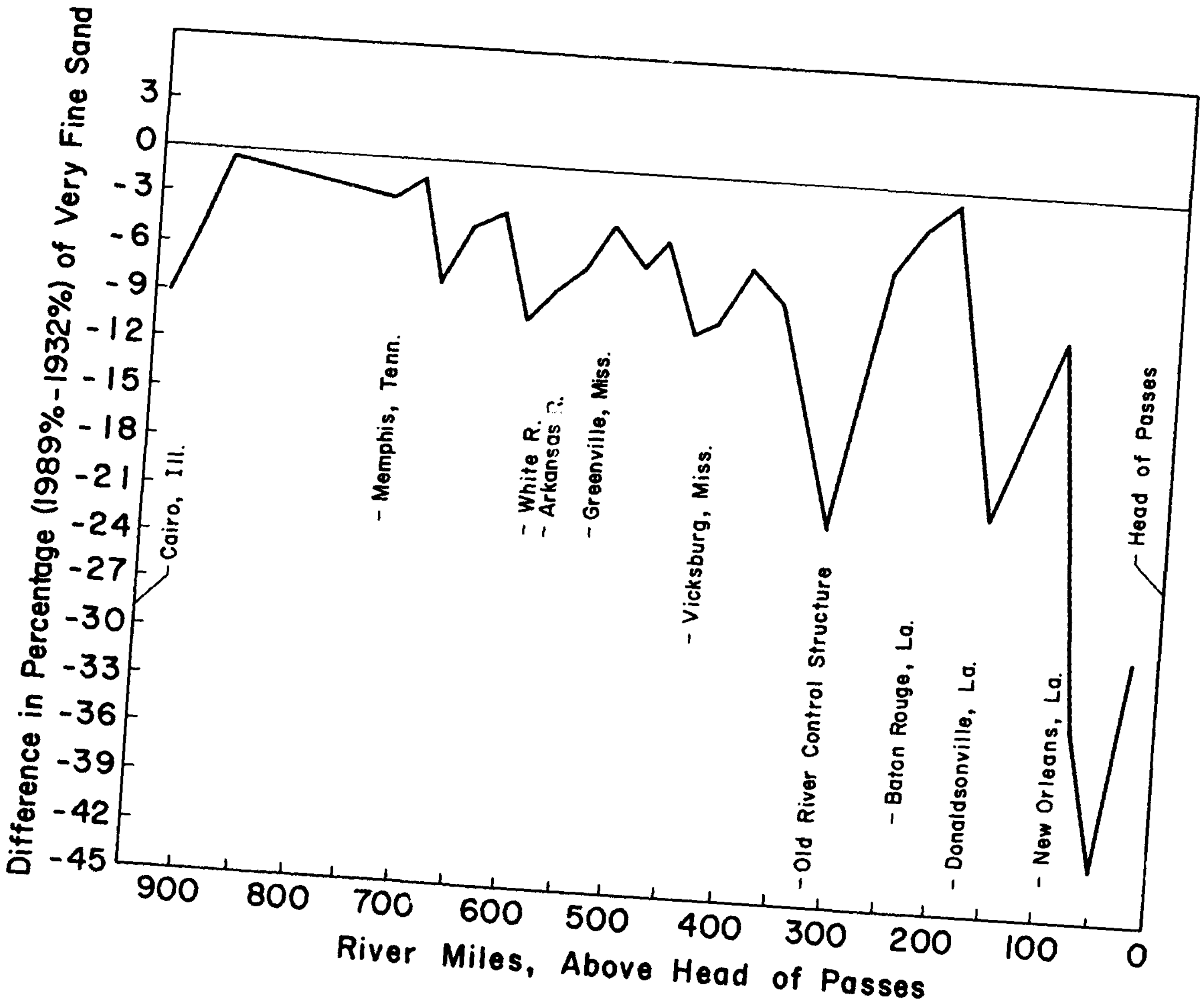


Figure 12. Difference in percentage of very fine sand between 1989 and 1932, averaged by 25 mile reaches

These plots, particularly Figures 7 and 12, indicate that the bed material has become more uniform between 1932 and 1989, as they indicate reductions in the quantity of the extreme sizes of bed material.

This conclusion if further supported by Figure 13, which shows the comparison of sorting coefficients for the 1989 and 1932 samples, averaged by 25 mile reaches. For a perfectly uniform grain size distribution, the value of the sorting coefficient would equal 1.0. It can be seen in Figure 13 that the sorting coefficients for the 1989 samples are closer to 1.0 than the 1932 sorting coefficients, indicating more uniform material in 1989. The presence of clay and silt near the downstream end of the study reach is responsible for the larger values of sorting coefficient shown there. The large spike in the 1989 sorting coefficient is caused by one sample, located at RM 343.7, which consisted of mostly gravel and clay, with very little intermediate sized material.

Comparison of Median and Mean Grain Diameters

The median grain diameter, D_{50}, is the diameter such that half of the sample by weight is smaller, and half is larger. A comparison between the median grain diameters, averaged over 25 mile reaches for the 1989 and 1932 samples, Figure 14, shows that the bed material sampled in 1989 is generally finer upstream of Vicksburg, Mississippi, than it was in 1932. The D_{50}'s for the 1932 samples are significantly larger than for the 1989 samples upstream of Vicksburg; between Vicksburg and New Orleans, the 1932 D_{50}'s are slightly larger than those computed for the 1989 samples; and downstream of New Orleans, the D_{50}'s for the 1989 samples are actually slightly larger than those computed for the 1932 samples.

There was some concern that the difference in sampling frequency (with respect to distance) would skew this comparison. The 1989 samples were collected at approximately 2 mile intervals, while the 1932 samples were collected at much smaller intervals (as small as 0.125 miles) in gravel bearing reaches. This was addressed in two ways: by choosing 1932 samples at approximately 2 mile intervals for the median diameter computations, and by computing a length-weighted median diameter. Both of these efforts were met with the same results as shown in Figure 14. It is apparent, then, that the frequency of sampling in 1932 did not affect the results of the comparison.

Values of D_{16} and D_{84} were also plotted for comparison. The D_{16} values showed about the same trends as the D_{50} values. The D_{84} values in 1932 were larger than the values in 1989, confirming that the bed sediments were more uniform in 1989.

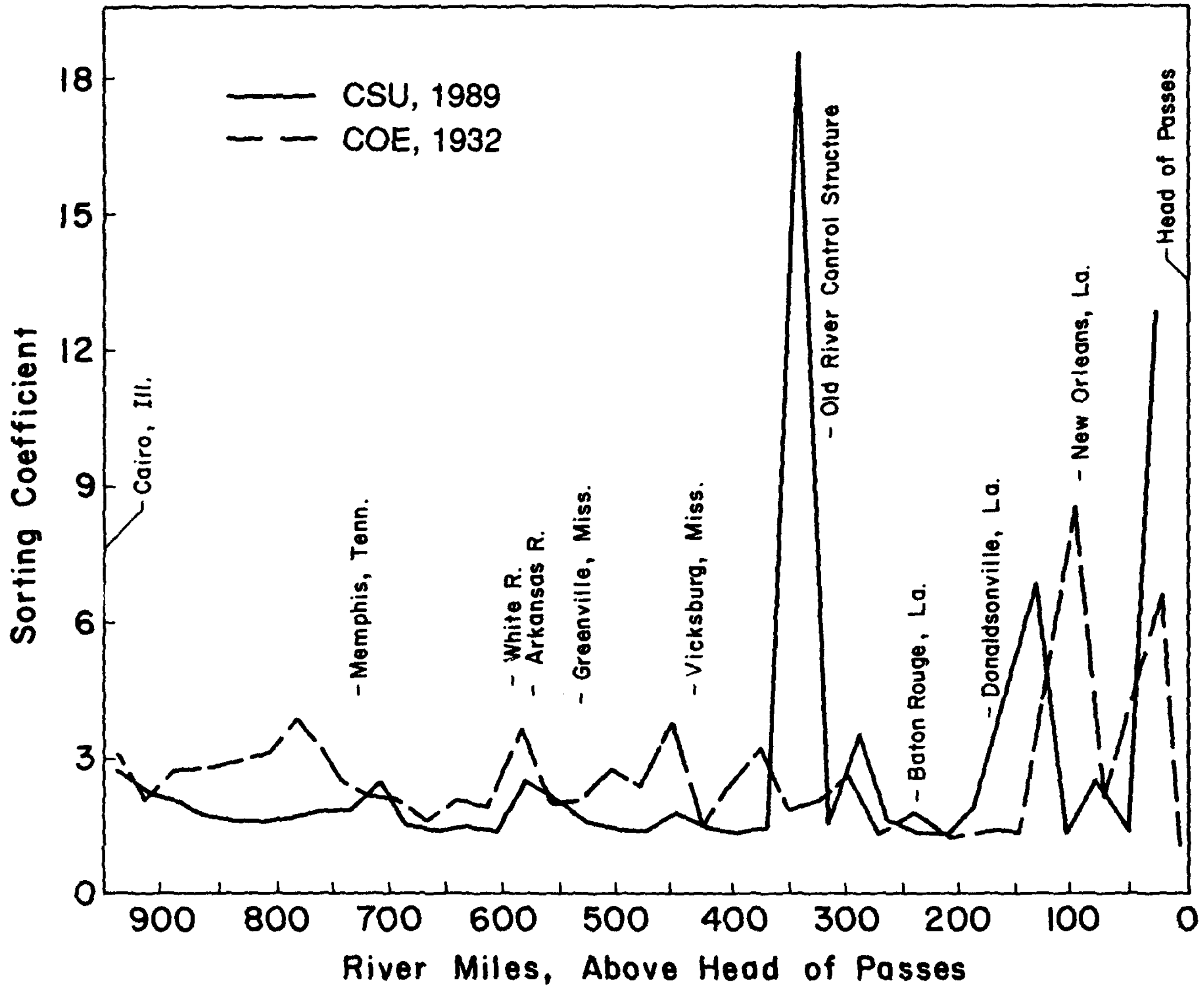


Figure 13. Comparison of sorting coefficients for the 1989 and 1932 samples averaged by 25 mile reaches

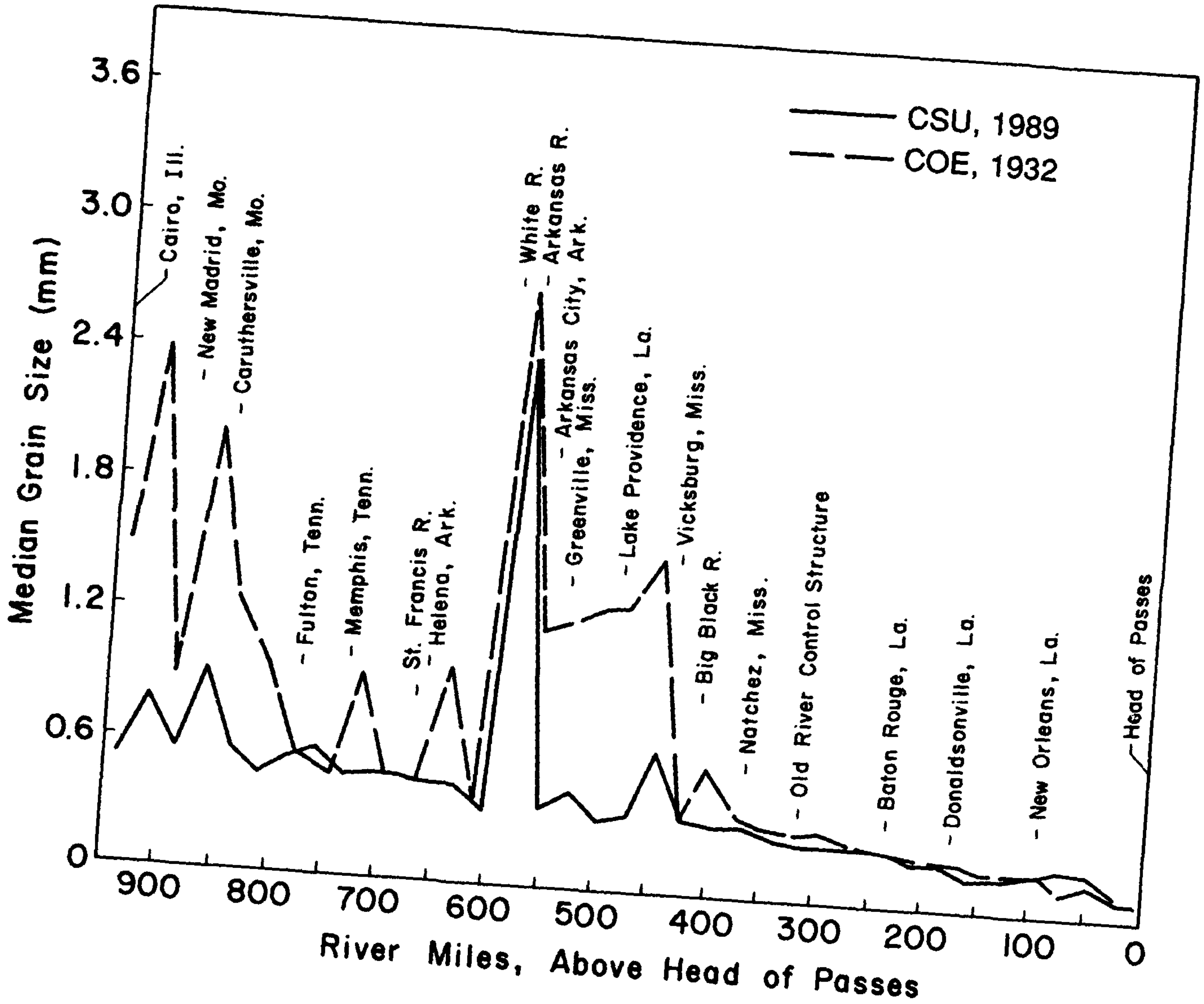


Figure 14. Comparison of median grain diameters for the 1989 and 1932 samples averaged by 25 mile reaches

Another comparison, between the mean grain diameters for the 1989 and 1932 samples, is shown in Figure 15. It leads to the same conclusions as those reached concerning Figure 14, although it shows that more large material was collected between Vicksburg and Baton Rouge in 1932 (indicated by the relatively larger mean diameter).

Comparison of the Mean Sand Grain Diameters

The mean diameter for the sands between 0.062 mm and 2.0 mm in size were computed for the 1989 and 1932 samples. The mean sand grain diameter was computed by multiplying the percentage of sand in a given size range by the average size in that range (i.e. 0.75mm for the 0.5 mm to 1.0 mm range), summing over the size ranges, and dividing by the total percentage of sand in the sample. For the 1932 samples, it was necessary to use the log-normal interpolated percentages for the sand sizes. The results of these computations were averaged over 25 mile reaches, and the comparison between 1989 and 1932 is shown in Figure 16. This figure reveals that the 1989 mean sand grain diameter is slightly smaller between Cairo, Illinois, and Baton Rouge, Louisiana than the 1932 mean sand diameters. Downstream of there, the 1989 mean sand grain diameters are slightly larger than in 1932.

Finally, the diameter of the largest gravel particle recorded for each sample is plotted against river mile in Figure 17. Gravel was found in samples almost to New Orleans, but none was detected downstream from there. There is a great amount of scatter in this figure, but the general trend is toward a reduction of size downstream.

COMPARISON OF SAMPLERS

At approximately 25 mile intervals bed material samples were collected with the WES sampler and one or more additional samplers in order to compare the material obtained by each. All samples were taken from as close to the same location as was possible. Three additional samplers were used for the comparisons. They were the USGS 4" pipedredge, the US BM-54 sampler, and an 8" pipedredge.

The comparison of the D_{16} for the WES sampler and the 4" USGS pipedredge and for the WES sampler and the US BM-54 sampler are shown in Figure 18. Similarly, the comparisons of the D_{50} and the D_{84} for these samplers are shown in Figures 19 and 20. These plots indicate that there is no systematic difference between the WES and the 4" USGS samplers, or the WES and the US BM-54 samplers.

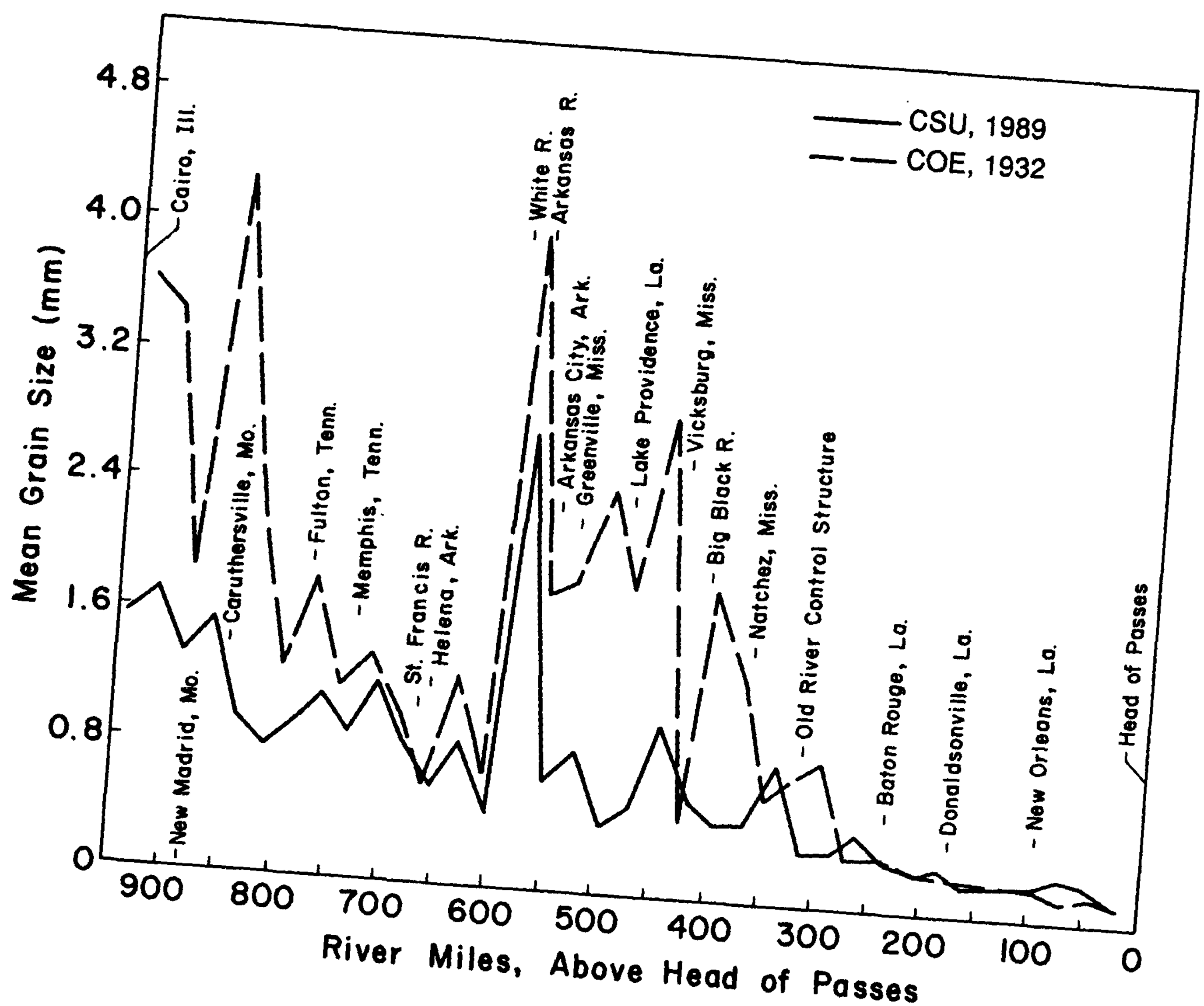


Figure 15. Comparison of mean grain diameters for the 1989 and 1932 samples averaged by 25 mile reaches

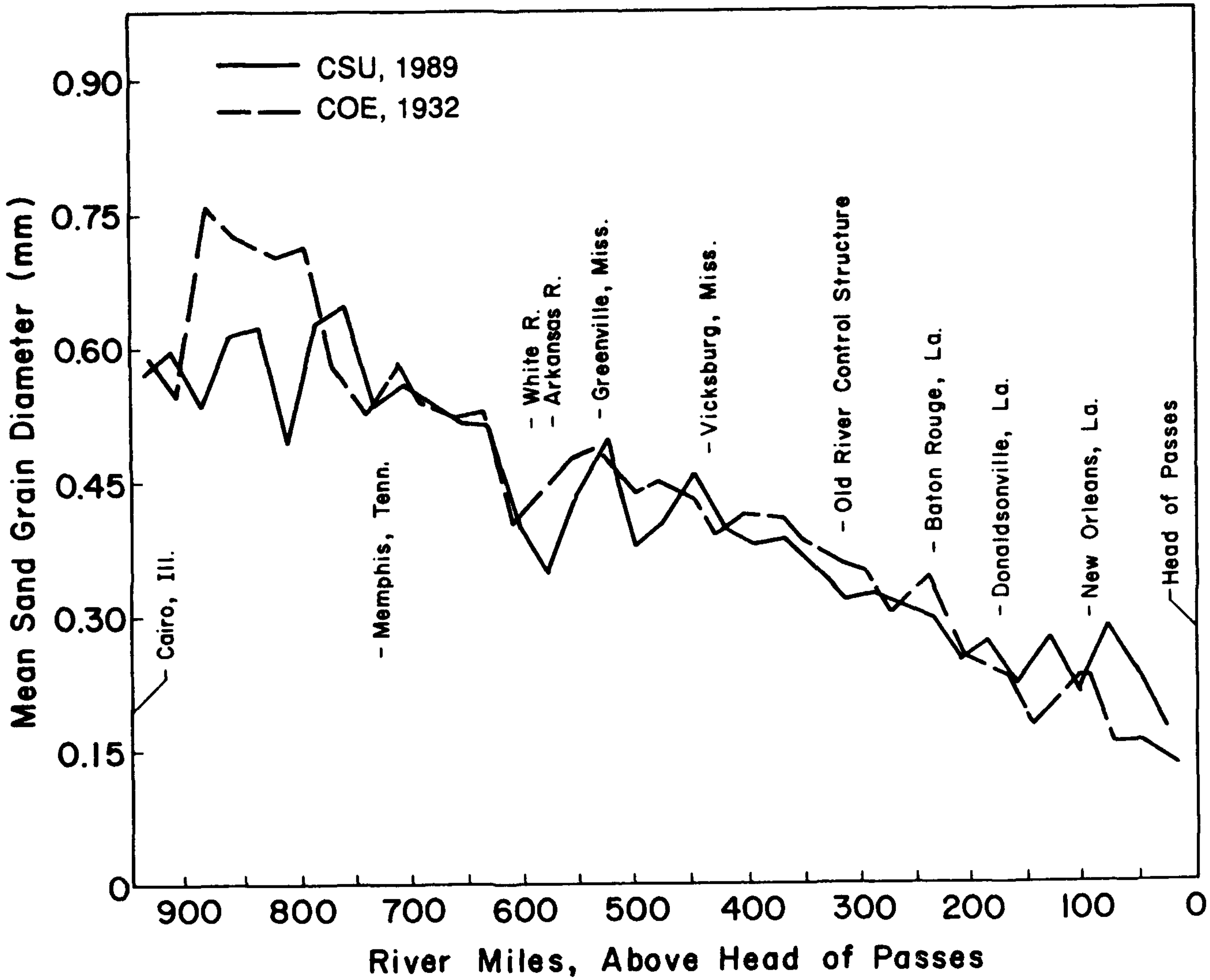


Figure 16. Comparison of mean sand grain diameters for the 1989 and 1932 samples averaged by 25 mile reaches

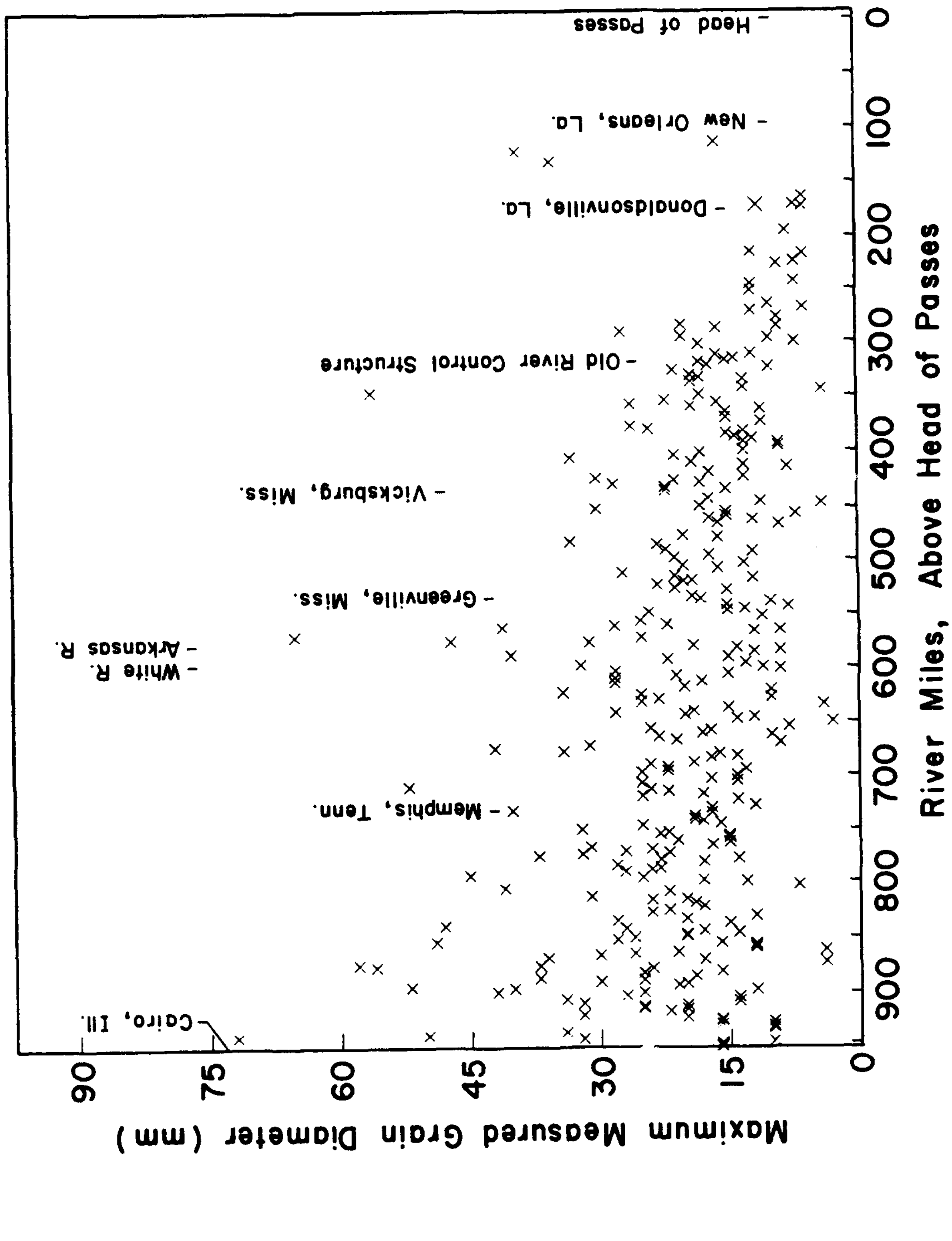


Figure 17. Largest particle size plotted against river mile

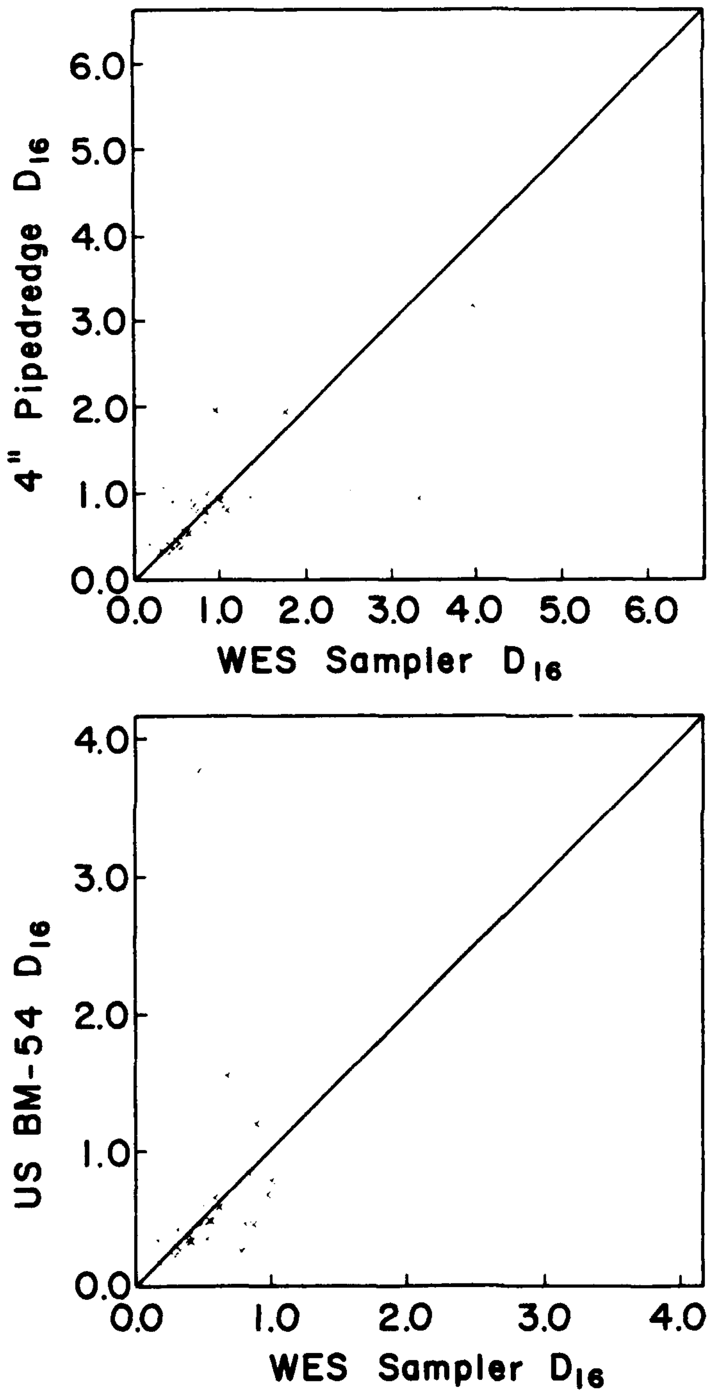


Figure 18. D_{16} comparisons between the WES
and the 4" USGS pipedredge and US BM-54 samplers

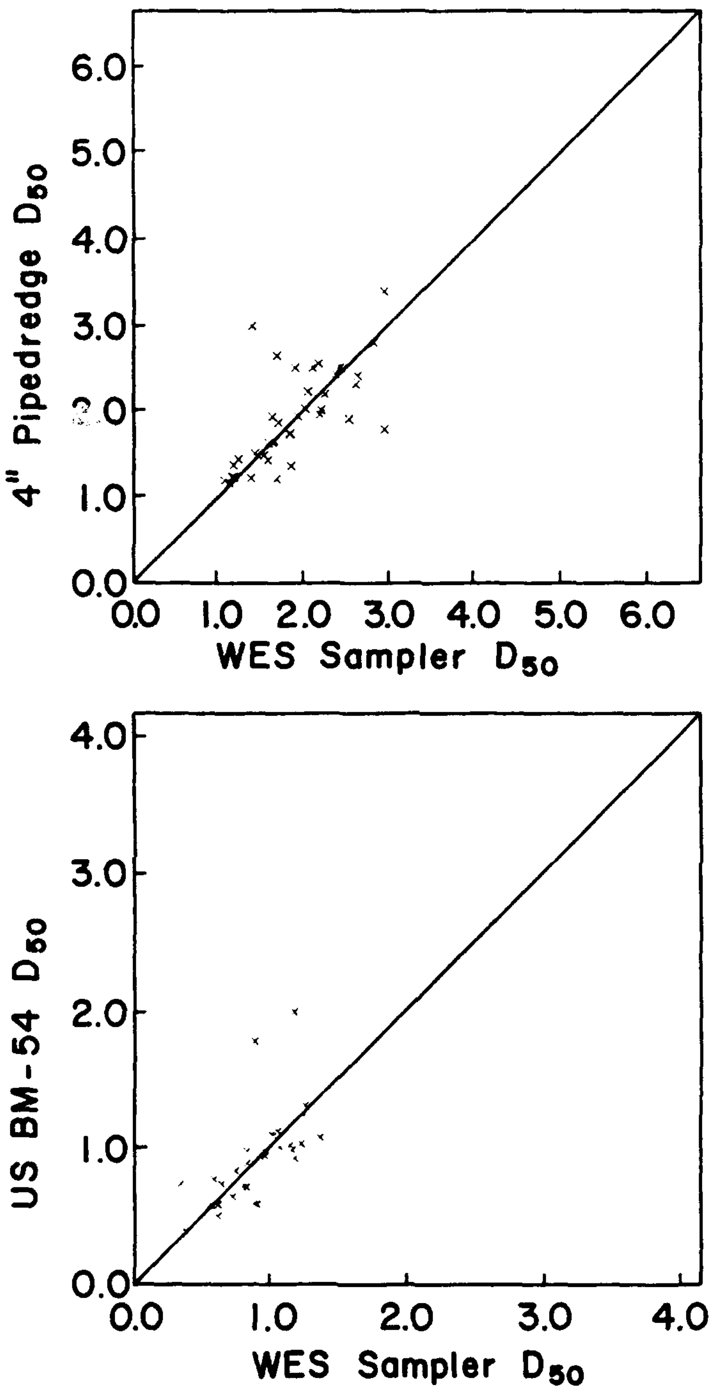


Figure 19. D_{50} comparisons between the WES and the 4" USGS pipedredge and US BM-54 samplers

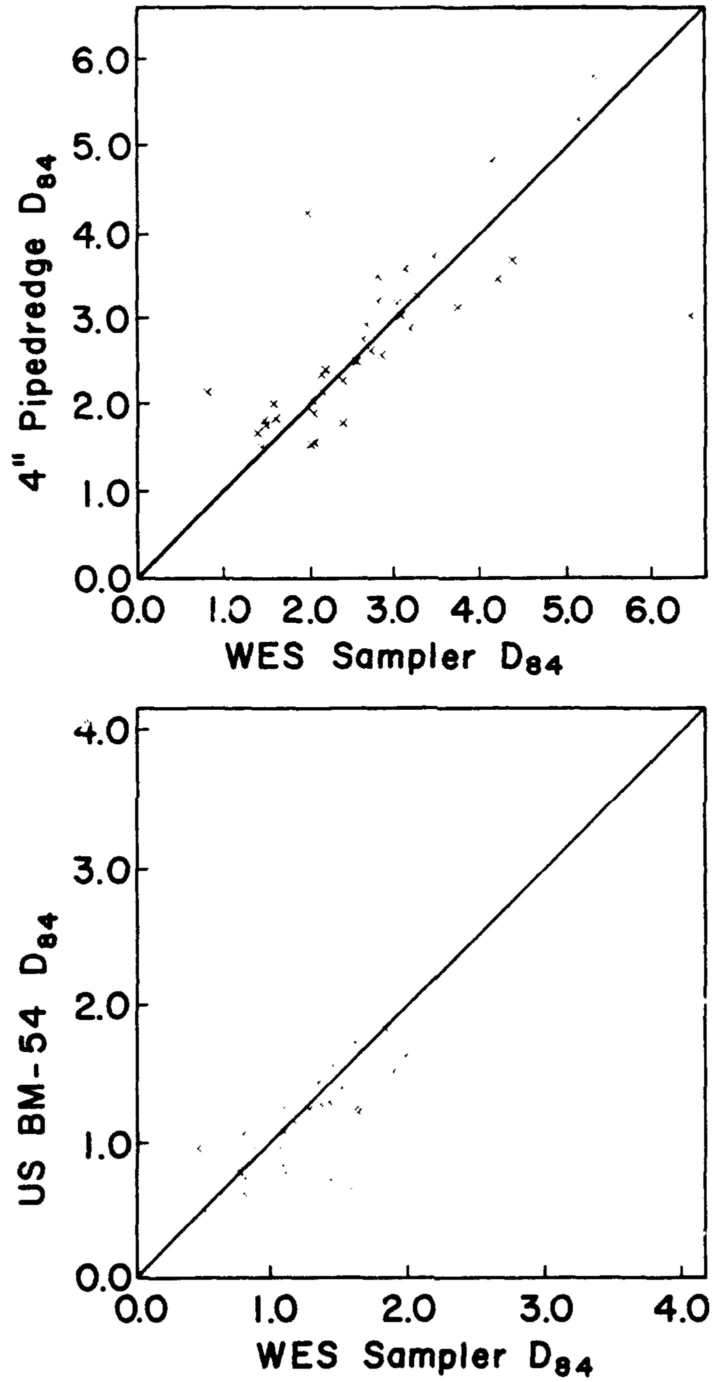


Figure 20. D_{84} **comparisons between the WES and the 4" USGS pipedredge and US BM-54 samplers**

Of particular interest was the question as to whether or not the fine material was washed out of the WES sampler during sample procurement and retrieval. A comparison between the relative quantity of fine material collected in the WES sampler and the quantity collected in the US BM-54 sampler is shown in Figure 21. The US BM-54 sampler was chosen for this comparison because it has a spring loaded scoop in which the sample is collected. Once the scoop shuts (with the bed material inside), the sample is isolated and no material can be washed out (Interagency Committee, 1963). This comparison indicates that the finer material is not being removed from the WES sampler.

Similar comparisons were made for other combinations of samplers, all with the same results: there is no systematic difference between the samplers and there is no evidence of fine material being washed from the pipedredge samplers.

COMPARISON OF PIPET AND HYDROMETER ANALYSIS

A comparison was made between the percentages of sand, silt, and clay determined using the pipet method, Table 6, with those percentages determined using the hydrometer method, Table 7. For the fine samples analyzed by both pipet and hydrometer methods, the hydrometer method consistently produced a higher percentage of sand than the pipet method did. For the silt fraction, the use of the hydrometer method consistently resulted in a smaller percentage of silt than determined using the pipet method. For the clay fraction, both methods produced about the same results.

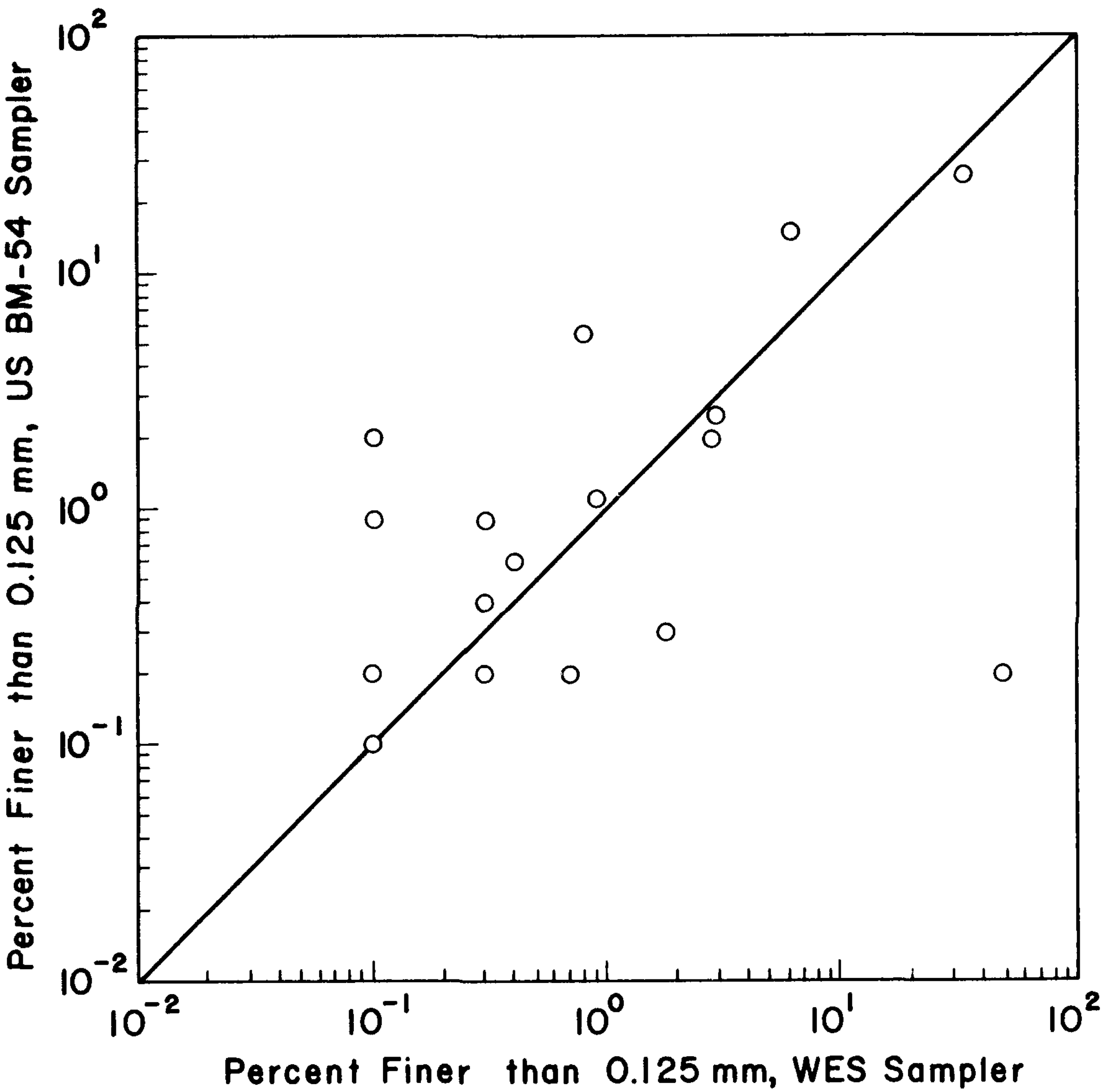


Figure 21. Comparison of the relative quantity of fine material collected with the WES and US BM-54 samplers

DISCUSSION OF RESULTS

Of the many changes imposed on the Mississippi River since 1932, three were identified as most likely to influence the bed sediment sizes. First, meander cutoffs have shortened the reach and increased the overall slope between Cairo and the Gulf. Second, reservoirs on the tributaries, especially those on the Missouri River, along with watershed management, soil conservation, and other measures, have reduced sediment inflow into the reach by almost 50 percent (Meade and Parker, 1985; Keown and others, 1981; Dardeau and Causey, 1990). Third, the extensive bank protection works have reduced substantially bank erosion as a source of very fine sediments. In view of these factors, we postulated that the thalweg sediments in 1989 would be coarser than they were in 1932. In fact, this was not the case. The analyses show that upstream of RM 300 both mean and median diameters were generally smaller in 1989 than in 1932; downstream of RM 300 they were about the same. The 1989 samples, compared to the 1932 samples, contained less gravel and very fine sand and larger quantities of fine sand, especially in the reach below Old River. The changes in size distributions were rather subtle.

It is possible that variations in bed sediment size distributions from one low flow period to another might be caused by differences in the prior flood hydrographs. To test this possibility, we superimposed the hydrographs for 1930-1933 and 1987-1990, Plate 3. There are small differences in fine detail, but overall, the flood hydrographs for 1932 and 1989 are strikingly similar. The previous years hydrographs are not so similar, but none of them contain periods of sustained high flows that might modify bed sediment size distributions. The low flows in August 1932 and August 1989 were about the same, approximately 200,000 cfs. During September, the flows increased in 1932 and decreased in 1989, but the differences probably were not significant. We postulate that the differences in bed sediment sizes reflect long-term changes rather that short-term variations due to differences of previous flood flows. This can not be proven with the data at hand, so it would be useful to undertake some sampling of selected reaches through a range of flows to determine if the bed sediments sizes in the thalweg change with changes in stage.

Geologic and Other Controls

In the sampling program, we sounded the bed along the approach to each station, and generally we could distinguish bedrock and clay outcrops and gravel deposits from sand beds (Queen and others, 1990). Geologic controls, fine-grained deposits (clays), and gravel outcrops and bars seem to control the low-water profile along much of the reach. The importance of geologic controls on the Mississippi River was emphasized in earlier studies by Fisk (1944, 1947, 1949). Elliott and others (1991) show that the low-water profile along the reach between RM 580 and 780 was almost 10 ft lower in 1988 than it was in 1962. Upstream and downstream of this reach, the profile has not changed much, perhaps reflecting the stabilizing influence of geologic controls.

During low flows, gravel bars are exposed at a number of locations along the river. Two of these were inspected during 1989; one at Wolf Island Bar, RM 935, and another downstream at RM 764. At both locations, the bars were armored with coarse gravel and cobbles, and at the head of Wolf Island, some probing in the shallow flows indicated that the gravel extended into the channel beneath a veneer of sand. Perhaps the gravel extends across the entire channel and is only covered with a veneer of sand during low flows. If this were the case, the gravel bar might serve as a local control for the stage and water surface slope during floods. This could easily be verified by sampling the same locations during the flood season.

At numerous places along the 700-mile reach between Cairo and Baton Rouge (from RM 950 to about RM 250) the river is eroding into low bluffs situated along the left bank. The bluffs contain conglomerates and other erosion-resistant materials, and at some places outcrops of these materials extend under the river. At RM 709.9, we recovered a large particle of siltstone about 180 mm in diameter, and at RM 568.7, a large chunk of conglomerate about 160 mm in diameter was recovered. Both of these materials crop out in bluffs at various locations. We did not include these two particles in Table 8 or Figure 17.

Although the influence of geologic controls on the behavior of the river cannot be specified, it is likely that such controls have a stabilizing effect, as suggested by Winkley (1977), and Elliott and others (1991). The channel will tend to adjust to various factors such as meander cutoffs, channelization, and reductions in sediment load, but the locations along the channel and the rates at which these adjustments take place probably are influenced by the controls.

Other Factors

Elliott and others (1991) identify a number of probable causes of changes in the low-flow stage-discharge relations, among which are tectonic activities, continuing long-term natural geomorphic adjustments, changes in flows and sediment loads, and gravel mining. Certainly the New Madrid Earthquake of 1811-1812 had substantial impact on the channel, and long-term geomorphic adjustments to this event or to prior tectonic activities may still be underway. Probably, these adjustments include changes in bed sediment sizes, but the earlier records are not complete enough to identify any changes or trends. Also, it is likely that any changes due to long-term natural geomorphic adjustments are obscured by the impacts of the other factors listed above.

Although records of the quantities of gravel mined from the Lower Mississippi River are not available, there is substantial evidence that gravel supplies in the river bed have declined as a result of the mining (Keown and others, 1981; Lagasse and others, 1980). The reduction in the fraction of gravel between the 1932 and 1989 samples perhaps reflects the impact of the mining.

The reduction of the suspended sediment load of the Lower Mississippi River is well documented (Dardeau and Causey, 1990; Meade and Parker, 1985), but the impact of changes in the suspended sediments on the bed sediment sizes is difficult to quantify. Most of the sediments trapped in the Missouri River reservoirs are fine-grained sediments, and this trapping, together with the bank protection works along the Lower Mississippi River have reduced the sources of fine sediments and could account for the reduction of very fine sand in the bed sediments. When one size fraction of the bed sediments is reduced or eliminated, the other size fractions are increased proportionately, but the reduction of the very fine sand alone is not enough to account for the prevalence of fine sand (0.125 -0.25 mm) downstream of RM 350 as shown in Figure 11. Perhaps this fine sand is material that is stored and re-entrained on a seasonal basis (Meade and Parker, 1985) or perhaps it is material moving through the system that was flushed from the bed of the Missouri River as it degraded and armored downstream of Gavins Point Dam or that was winnowed from the bed of the Lower Mississippi in response to meander cutoffs. The time scales of these later processes are probably on the order of decades to centuries. It should be possible to sort out the seasonal storage and re-entrainment from the impacts of upstream reservoirs using a one-dimensional mathematical model.

In summary, the thalweg bed sediments did not become coarser between 1932 and 1989, but there were changes in the overall size distributions. The 1989 samples contained smaller proportions of gravel and very fine sand, and downstream from about RM 350, the samples contained larger proportions of fine sand. Mining of gravel perhaps accounts for the reduction in the proportion of gravel, and reservoir sedimentation in the tributaries and bank protection works have reduced the supply of very fine sand to the reach. The larger proportion of fine sand observed in the 1989 samples along the downstream part of the reach could reflect either seasonal storage and re-entrainment of sediments from suspension or long-term adjustments from degradation below reservoirs and meander cutoffs, or possibly a combination of both of these factors.

SUMMARY AND CONCLUSIONS

During September, 1989, we collected 504 samples at 417 locations along the thalweg of the Mississippi River between Cairo, Illinois, and the Head of Passes. Most samples were collected using the same equipment and sampling techniques used by the Corps of Engineers in 1932 when they collected samples along the same reach. At a few locations, samples were also collected using the US BM-54 sampler and shorter drag samplers to determine if there were any systematic differences in size distributions that could be attributed to the samplers.

Particle size distributions of sands and coarser material were determined by sieving. Particle size distributions of finer sediments were determined by pipet analyses and also by hydrometer. The basic data are given in Tables 1-8. The main conclusions of this investigation are as follows:

1. The 1989 samples contained less coarse sand and gravel and less very fine sand than the 1932 samples; generally, they were more uniform in distribution that the 1932 samples.
2. Between Cairo, Illinois, and RM 300, near the Old River Control Structure, the bed sediments were generally finer in 1989 than they were in 1932. Downstream of the Old River Control Structure, the median and mean diameters were about the same for both sets of samples, but the 1989 samples contained less very fine sand (0.062mm-0.125mm) and more fine sand (0.125mm-0.250mm) than the 1932 samples.
3. The mean diameters of the sample fractions between 0.062 mm and 1.0 mm were generally slightly smaller in 1989 upstream of about RM 300, and generally slightly larger in 1989 downstream of there, compared to 1932.
4. There were no systematic differences in size distributions of samples collected with the different samplers.

REFERENCES

Dardeau, E.A. and Causey, E.M., 1990, "Downward Trend in Mississippi River Suspended-Sediment Loads," Potamology Program (P-1), Report 5, U.S. Army Engineers WES, Vicksburg, MS.

Elliott, C.M., Rentschler, R.E. and Brooks, J.H., 1991, "Response of the Lower Mississippi River Low-Flow Stages," Proceedings of the 5th Fed. Interagency Sedimentation Conf., Las Vegas, NV.

Fisk, H.N., 1944, "Geological Investigation of the Alluvial Valley of the Lower Mississippi," Mississippi River Commission, Corps of Engineers, Vicksburg, MS.

Fisk, H.N., 1947, "Fine-Grained Alluvial Deposits and their Effects of Mississippi River Activity," Mississippi River Commission and WES, Corps of Engineers, Vicksburg, MS.

Fisk, H.N., 1949, "Geological Investigation of Gravel Deposits in the Lower Mississippi Valley and Adjacent Uplands," Mississippi River Commission and WES, Tech. Memo. No. 3-273, Corps of Engineers, Vicksburg, MS.

Interagency Committee, 1963, "Determination of Fluvial Sediment Discharge," Report No. 14, Subcommittee on Sedimentation, Interagency Committee on Water Resources, St. Anthony Falls Hydraulic laboratory, Minneapolis, Minn.

Keown, M.P., Dardeau, E.A. and Causey, E.M., 1981, "Characterization of the Suspended-Sediment Regime and Bed-Material Gradation of the Mississippi River Basin," Potamology Program (P-1), Report 1, Vol. 1 and 2, U.S. Army Engineer WES, Vicksburg, MS.

Lagasse, P.F., Winkley, B.R. and Simons, D.B., 1980, Impact of gravel mining on river system stability: Proceedings, ASCE, V. 106, No. WW3, p. 389-404.

Leopold, L. B., Wolman, M. G., and Miller, J. P., 1964, Fluvial processes in geomorphology: W. H. Freeman and Co., San Francisco, 522 p.

Meade, R. H., and Parker, R. S., 1985, Sediment in rivers of the United States: U. S. Geological Survey Water-Supply Paper 2275, p. 49-60.

Queen, B.S., Nordin, C.F. and Rentschler, R.E., 1990, Bed sediments and bed forms of the Lower Mississippi River: Proceedings, ASCE, 1990 National Conference, Vol. 1, p. 281-286.

Robbins, L.G., 1977, Suspended sediment and bed material studies on the lower Mississippi River: Potamology Investigations Report 300-1, U.S. Army Engineer District, Vicksburg, Corps of Engineers, 29 p.

Stevens, H.H., 1986, Computer programs for computing particle-size statistics of fluvial sediments: U.S. Geological Survey Water-Resources Investigations Report 86-4141.

Vanoni, V. A. (editor), 1975, Sedimentation engineering: Manuals and Reports on Engineering Practice no. 54, American Society of Civil Engineers, New York, 745 p.

Waterways Experiment Station, 1935, Studies of river bed materials and their movement, with special reference to the lower Mississippi River: Corps of Engineers, U. S. Army, U. S. Waterways Experiment Station paper no. 17, 161 p.

Winkley, B.R., 1977, A Geomorphic Study of the Lower Mississippi River, Preprint No. 2990, Fall Convention, American Society of Civil Engineers, N.Y.

APPENDIX A

Data Tables

TABLE 1
GRAIN SIZE DISTRIBUTIONS OF MATERIAL COARSER THAN 0.062 MM FOR
SAMPLES COLLECTED WITH THE WES SAMPLER

1989 River Mile above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
952.6	100.0	100.0	100.0	98.2	94.7	90.2	81.4	49.7	5.8	0.2	0.1
951.4	100.0	100.0	100.0	97.1	93.8	86.2	66.5	18.6	1.3	0.1	0.0
949.2	100.0	100.0	100.0	99.8	99.4	98.8	96.8	63.6	0.5	0.0	0.0
947.3	100.0	100.0	100.0	99.1	98.6	97.9	96.1	84.3	5.6	0.0	0.0
945.0	100.0	96.6	92.9	87.0	82.4	76.7	68.3	49.8	5.4	0.0	0.0
942.8	100.0	88.2	82.8	80.4	76.9	71.9	61.2	35.5	4.2	0.1	0.0
941.2	100.0	100.0	100.0	100.0	99.9	99.4	96.9	72.3	3.4	0.1	0.0
938.8	100.0	100.0	100.0	99.5	98.4	97.2	92.7	65.4	1.5	0.0	0.0
937.0	100.0	100.0	100.0	100.0	99.9	99.9	99.9	99.0	14.6	0.2	0.1
935.2	100.0	100.0	100.0	100.0	99.9	99.8	98.8	85.5	12.1	0.0	0.0
933.0	100.0	100.0	100.0	99.4	98.6	96.4	86.5	20.6	1.7	0.0	0.0
931.2	100.0	100.0	100.0	99.9	99.3	98.4	95.4	72.8	5.6	0.1	0.1
929.1	100.0	100.0	98.8	97.7	95.5	90.6	74.2	33.5	6.2	0.0	0.0
927.9	100.0	100.0	100.0	98.5	94.8	85.8	70.3	35.7	5.3	0.0	0.0
926.7	100.0	100.0	100.0	100.0	100.0	99.7	98.9	80.2	29.1	0.1	0.1
924.5	100.0	100.0	100.0	99.9	99.6	99.4	98.1	61.5	5.3	0.0	0.0
923.0	100.0	100.0	100.0	98.3	95.6	90.7	77.9	39.4	14.3	0.1	0.0
919.1	100.0	100.0	100.0	97.5	88.0	71.3	51.4	20.1	3.5	0.0	0.0
917.1	100.0	100.0	97.5	92.5	82.2	63.9	44.6	20.8	6.9	0.3	0.0
916.8	100.0	100.0	94.2	78.7	57.0	37.0	21.3	4.6	2.6	0.7	0.0
915.4	100.0	100.0	99.4	96.6	89.8	78.1	57.1	16.6	0.3	0.0	0.0
913.5	100.0	100.0	99.2	98.5	96.5	92.9	83.3	46.2	8.0	0.1	0.0
911.9	100.0	100.0	94.1	92.8	91.4	88.3	79.5	56.8	16.9	0.3	0.0
909.8	100.0	100.0	100.0	98.8	96.2	92.0	81.1	48.6	15.7	0.0	0.0
908.1	100.0	100.0	93.1	88.1	85.6	84.4	82.8	42.1	5.8	0.1	0.0
905.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.8	39.0	0.2	0.0
904.6	100.0	100.0	99.7	98.9	96.2	90.7	90.7	77.1	38.7	7.5	0.0
902.3	100.0	100.0	100.0	98.1	93.4	84.2	69.0	35.1	11.4	0.1	0.1
901.0	100.0	100.0	99.4	94.1	86.3	75.2	59.3	27.2	2.3	0.0	0.0
898.9	100.0	100.0	100.0	99.8	99.3	99.0	95.6	60.6	23.2	0.2	0.0
897.9	100.0	100.0	96.2	89.9	84.3	75.6	59.7	33.2	12.7	0.1	0.0
896.7	100.0	100.0	93.9	90.0	88.3	87.0	83.8	38.5	6.9	0.2	0.0
894.8	100.0	100.0	100.0	99.9	99.8	99.5	97.2	55.7	4.0	0.2	0.0
893.5	100.0	100.0	100.0	99.9	99.0	98.8	98.5	88.9	7.7	0.2	0.0
891.8	100.0	100.0	97.8	96.0	94.8	93.4	89.6	67.6	16.8	0.1	0.0
890.5	100.0	100.0	100.0	97.2	93.7	90.1	85.1	61.3	17.0	0.1	0.0
888.3	100.0	100.0	100.0	99.5	99.0	97.3	88.0	28.9	0.6	0.0	0.0
886.4	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.3	20.1	0.0	0.0
884.0	100.0	100.0	100.0	98.1	97.3	96.1	95.9	92.0	29.7	0.8	0.0
882.2	100.0	100.0	100.0	99.7	99.2	98.4	96.2	70.7	3.4	0.1	0.1
879.8	100.0	100.0	100.0	99.2	98.4	97.9	96.0	69.0	5.6	0.0	0.0
878.1	100.0	97.9	97.9	93.9	87.7	80.6	68.6	39.1	3.9	0.1	0.0
877.0	100.0	100.0	100.0	92.9	71.7	57.2	47.3	34.2	5.5	0.2	0.0
875.7	100.0	100.0	87.9	61.4	28.9	6.5	2.7	2.5	2.1	0.9	0.2
873.7	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.4	21.0	0.0	0.0
871.3	100.0	100.0	100.0	99.6	98.8	97.0	91.6	69.5	17.3	0.0	0.0
870.0	100.0	100.0	90.6	89.7	87.2	80.9	66.8	30.3	10.1	0.1	0.0
867.3	100.0	100.0	100.0	97.3	95.3	90.8	76.2	25.7	4.0	0.0	0.0
865.7	100.0	100.0	99.0	98.5	97.0	93.3	83.0	42.4	3.6	0.0	0.0
864.5	100.0	100.0	99.4	99.4	99.2	98.1	84.8	10.7	1.1	0.0	0.0
862.7	100.0	100.0	100.0	100.0	99.7	99.1	95.8	65.0	1.6	0.0	0.0
860.4	100.0	100.0	100.0	98.6	98.0	96.2	72.3	17.0	0.3	0.0	0.0
858.6	100.0	100.0	98.8	98.3	97.6	96.0	91.0	66.9	7.4	0.1	0.0
857.0	100.0	100.0	100.0	100.0	99.1	97.0	93.2	81.6	22.5	0.2	0.0
856.0	100.0	100.0	100.0	100.0	99.5	98.8	95.0	57.7	10.9	0.0	0.0
855.0	100.0	100.0	100.0	99.2	97.4	94.4	88.6	48.6	3.9	0.0	0.0
853.0	100.0	100.0	100.0	97.1	95.5	93.9	89.7	53.5	2.2	0.0	0.0
851.0	100.0	100.0	99.5	98.0	94.8	87.6	65.2	19.5	4.3	0.1	0.0
849.4	100.0	100.0	99.2	97.3	93.5	81.6	42.5	3.8	1.6	0.1	0.0
848.2	100.0	100.0	100.0	98.6	95.2	87.1	66.4	14.9	0.6	0.1	0.0
846.5	100.0	100.0	99.6	99.1	98.7	98.5	96.4	39.6	2.4	0.0	0.0
844.6	100.0	100.0	100.0	99.3	99.2	98.9	98.9	97.1	46.9	0.8	0.0
842.5	100.0	100.0	100.0	99.5	98.9	97.0	88.1	52.9	0.7	0.0	0.0
840.1	100.0	100.0	99.5	98.6	97.7	96.5	92.1	47.2	2.9	0.1	0.0
835.5	100.0	100.0	98.7	96.0	93.3	87.4	78.2	44.7	0.8	0.0	0.0
833.6	100.0	100.0	100.0	98.1	97.5	97.3	95.2	56.2	1.0	0.0	0.0
831.0	100.0	100.0	100.0	100.0	99.7	99.2	96.3	78.1	17.9	0.2	0.0
828.0	100.0	100.0	100.0	99.1	98.0	96.0	90.6	51.6	4.6	0.0	0.0
825.4	100.0	100.0	100.0	98.9	97.2	92.4	78.8	33.6	0.8	0.0	0.0
822.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	97.2	19.6	0.1	0.0
818.4	100.0	100.0	100.0	99.8	99.6	99.2	98.1	90.0	16.5	0.1	0.0
816.2	100.0	100.0	100.0	99.6	98.7	96.4	89.7	56.1	5.8	0.0	0.0
814.8	100.0	100.0	100.0	100.0	99.8	99.8	99.8	74.7	6.6	0.0	0.0
813.0	100.0	100.0	97.1	93.4	87.4	76.4	60.1	32.7	2.7	0.2	0.1
810.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	91.2	2.9	0.0
807.9	100.0	100.0	98.4	97.0	95.3	87.2	56.2	9.6	0.2	0.0	0.0

1989 River Mile above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
804.5	100.0	100.0	99.3	98.9	98.7	98.5	97.9	93.0	17.4	0.2	0.0
802.1	100.0	100.0	100.0	100.0	100.0	100.0	99.4	97.2	27.6	0.1	0.0
799.0	100.0	100.0	100.0	99.5	99.5	99.5	99.2	69.0	2.9	0.1	0.0
797.5	100.0	100.0	100.0	99.9	98.7	91.8	76.9	43.9	8.9	0.1	0.0
795.5	100.0	100.0	100.0	98.7	96.0	89.6	70.6	31.3	1.8	0.0	0.0
792.5	100.0	100.0	100.0	96.5	94.2	90.7	83.4	54.0	3.8	0.0	0.0
789.5	100.0	100.0	100.0	99.1	97.6	93.9	80.5	46.2	8.2	0.0	0.0
788.0	100.0	100.0	98.6	97.2	95.1	87.7	62.7	17.1	1.1	0.0	0.0
786.2	100.0	100.0	100.0	98.9	97.5	94.3	81.1	33.6	1.0	0.0	0.0
783.4	100.0	100.0	98.3	97.2	95.2	92.6	83.4	31.4	2.9	0.0	0.0
780.2	100.0	100.0	100.0	99.9	99.5	98.0	90.6	62.1	14.5	0.1	0.0
778.2	100.0	100.0	100.0	99.9	99.0	97.6	89.7	50.2	2.4	0.1	0.0
777.4	100.0	100.0	100.0	100.0	100.0	99.8	97.9	56.1	2.9	0.2	0.0
775.2	100.0	100.0	98.9	98.8	98.6	98.0	95.9	72.1	10.7	0.2	0.0
773.4	100.0	100.0	99.4	99.2	97.5	94.6	88.4	58.9	2.9	0.1	0.0
771.9	100.0	100.0	100.0	99.9	99.7	98.7	93.0	60.7	9.9	0.1	0.0
770.3	100.0	100.0	100.0	98.5	96.6	92.8	82.9	52.0	7.2	0.0	0.0
768.8	100.0	100.0	98.4	92.6	87.3	80.7	68.7	36.8	6.3	0.1	0.0
766.8	100.0	100.0	99.4	96.3	90.5	78.3	55.5	15.9	2.0	0.0	0.0
764.8	100.0	100.0	100.0	99.0	98.9	98.0	91.7	48.4	3.6	0.1	0.0
762.2	100.0	100.0	100.0	100.0	99.9	99.6	95.4	30.9	1.6	0.0	0.0
760.1	100.0	100.0	99.2	98.7	97.4	95.2	81.9	32.3	1.9	0.0	0.0
757.8	100.0	100.0	100.0	100.0	100.0	100.0	99.5	90.0	21.5	0.3	0.0
755.7	100.0	100.0	100.0	100.0	99.5	97.9	85.2	29.2	4.2	0.1	0.0
754.3	100.0	100.0	100.0	100.0	99.6	98.9	92.1	37.3	1.3	0.0	0.0
752.7	100.0	100.0	100.0	97.4	96.1	94.2	88.3	61.8	7.0	0.1	0.1
750.2	100.0	100.0	97.2	93.0	88.5	81.6	68.3	26.6	4.1	0.1	0.0
746.5	100.0	100.0	99.6	97.8	96.5	94.5	88.2	34.6	0.6	0.0	0.0
744.7	100.0	100.0	100.0	99.9	98.9	97.2	92.3	51.9	2.3	0.1	0.0
742.0	100.0	100.0	100.0	99.8	99.2	96.1	85.2	44.7	3.0	0.0	0.0
740.6	100.0	100.0	100.0	98.8	98.1	97.0	92.3	45.8	2.5	0.0	0.0
737.4	100.0	100.0	100.0	100.0	99.7	99.1	96.3	69.0	10.5	0.0	0.0
734.6	100.0	100.0	100.0	99.6	98.7	95.6	84.7	42.3	13.8	0.2	0.0
732.7	100.0	100.0	91.7	84.4	81.2	76.8	63.5	13.4	2.7	1.9	1.4
730.3	100.0	100.0	100.0	100.0	99.9	99.6	99.3	73.6	7.8	0.1	0.0
727.7	100.0	100.0	100.0	99.8	99.8	99.7	99.1	70.3	2.1	0.0	0.0
725.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	66.0	0.3	0.0
722.3	100.0	100.0	100.0	100.0	99.8	99.3	97.2	76.7	20.9	0.1	0.0
719.5	100.0	100.0	100.0	100.0	99.6	99.4	97.2	64.6	6.6	0.0	0.0
716.8	100.0	100.0	100.0	99.0	98.6	97.9	93.5	52.2	3.8	0.0	0.0
714.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.7	5.4	0.0	0.0
712.9	100.0	100.0	99.4	98.8	97.8	95.8	91.1	75.8	17.0	0.2	0.0
709.9	100.0	92.0	84.7	83.3	82.7	82.1	79.5	49.3	4.3	0.0	0.0
707.2	100.0	100.0	100.0	99.2	98.2	95.0	80.2	19.7	0.5	0.0	0.0
705.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7	47.7	0.7	0.2	0.0
702.9	100.0	100.0	100.0	100.0	99.8	99.6	98.5	86.1	25.1	0.1	0.0
700.3	100.0	100.0	100.0	99.2	98.6	97.2	90.4	42.9	5.2	0.0	0.0
697.5	100.0	100.0	100.0	98.9	96.5	91.4	76.9	30.8	2.1	0.0	0.0
695.6	100.0	100.0	100.0	99.0	98.3	96.9	92.1	51.1	3.9	0.1	0.0
694.0	100.0	100.0	100.0	100.0	99.8	99.5	97.2	58.0	1.7	0.0	0.0
692.0	100.0	100.0	97.6	96.3	94.9	92.9	84.1	41.3	0.6	0.0	0.0
689.9	100.0	100.0	98.1	97.5	96.1	94.0	83.4	24.8	1.6	0.0	0.0
687.6	100.0	100.0	100.0	98.7	97.8	97.2	94.2	53.5	2.6	0.2	0.0
683.4	100.0	100.0	100.0	100.0	99.8	99.6	96.2	41.1	1.1	0.0	0.0
681.7	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.6	17.8	0.2	0.0
679.4	100.0	100.0	100.0	100.0	99.8	99.8	99.5	96.4	96.0	0.5	0.0
677.5	100.0	100.0	100.0	99.3	98.7	97.4	85.5	36.9	7.9	0.0	0.0
674.5	100.0	100.0	95.6	94.4	94.3	93.9	91.6	67.0	13.4	0.2	0.0
672.1	100.0	100.0	98.3	97.7	97.0	94.7	79.5	22.9	3.0	0.0	0.0
669.9	100.0	100.0	100.0	100.0	100.0	100.0	99.8	83.0	32.0	0.5	0.0
666.8	100.0	100.0	99.1	99.1	99.1	99.0	98.2	64.4	3.1	0.0	0.0
664.9	100.0	100.0	100.0	99.6	99.6	99.6	99.5	96.8	33.0	0.2	0.0
663.9	100.0	100.0	100.0	100.0	100.0	100.0	99.5	72.2	4.5	0.0	0.0
662.4	100.0	100.0	100.0	100.0	100.0	99.9	99.4	91.9	27.6	0.4	0.0
660.2	100.0	100.0	100.0	99.6	99.3	98.6	94.6	48.0	2.4	0.0	0.0
658.1	100.0	100.0	100.0	99.1	98.2	96.8	89.8	27.0	0.3	0.0	0.0
656.5	100.0	100.0	100.0	99.9	98.3	94.4	85.0	47.6	3.6	0.1	0.0
654.6	100.0	100.0	100.0	100.0	100.0	100.0	99.6	82.7	1.3	0.0	0.0
650.2	100.0	100.0	100.0	100.0	99.9	99.9	99.8	77.6	3.8	0.0	0.0
647.6	100.0	100.0	100.0	99.9	99.6	98.8	94.8	51.3	5.6	0.0	0.0
645.7	100.0	100.0	100.0	100.0	99.8	99.8	99.7	91.2	12.5	0.1	0.0
643.4	100.0	100.0	100.0	98.9	97.4	93.9	79.6	14.7	0.6	0.0	0.0
641.7	100.0	100.0	95.7	94.3	94.3	94.1	89.9	28.7	0.3	0.0	0.0
640.0	100.0	100.0	100.0	99.7	99.1	97.7	95.2	78.5	10.1	0.0	0.0
637.2	100.0	100.0	99.9	99.2	98.3	96.2	91.1	58.7	2.4	0.0	0.0
634.1	100.0	100.0	100.0	100.0	100.0	99.9	99.8	89.0	15.5	0.4	0.0
632.1	100.0	100.0	100.0	98.7	97.5	95.5	90.9	67.8	4.0	0.0	0.0
629.3	100.0	100.0	99.0	93.4	89.6	84.5	70.1	13.1	0.6	0.2	0.0
628.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	78.3	1.1	0.0	0.0

1989 River Mile above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
625.5	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.5	26.5	1.0	0.0
623.1	100.0	100.0	99.8	97.0	94.7	91.8	86.0	55.4	4.5	0.0	0.0
620.8	100.0	100.0	100.0	100.0	99.8	99.4	97.5	53.5	1.0	0.0	0.0
617.7	100.0	100.0	98.3	98.1	98.1	98.0	97.8	81.3	12.8	0.1	0.1
614.7	100.0	100.0	100.0	99.2	98.3	97.0	93.8	73.9	0.9	0.0	0.0
612.5	100.0	100.0	100.0	98.7	97.6	96.0	92.2	55.3	3.7	0.2	0.2
610.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	92.7	2.5	0.0
607.3	100.0	100.0	100.0	99.3	98.9	98.7	98.0	86.2	4.3	0.0	0.0
605.9	100.0	100.0	100.0	99.5	99.4	99.1	98.4	86.2	33.2	0.7	0.0
603.5	100.0	100.0	100.0	99.3	98.3	96.7	92.6	56.3	5.0	0.0	0.0
601.0	100.0	100.0	100.0	99.8	99.7	99.7	99.7	99.5	95.8	34.5	0.4
599.4	100.0	100.0	100.0	99.8	99.5	99.2	97.6	59.8	1.1	0.2	0.0
598.2	100.0	100.0	100.0	99.7	99.4	99.1	98.4	75.3	1.6	0.1	0.0
595.6	100.0	100.0	100.0	99.8	99.7	99.7	99.6	97.6	19.1	0.3	0.1
592.1	100.0	100.0	100.0	100.0	100.0	99.9	99.9	98.2	56.3	0.4	0.0
590.3	100.0	100.0	100.0	99.7	99.5	99.3	98.6	69.0	5.7	0.0	0.0
588.5	100.0	100.0	97.3	95.8	94.3	91.9	86.7	68.8	20.3	0.1	0.0
585.2	100.0	100.0	100.0	100.0	100.0	99.8	99.7	98.0	17.5	0.1	0.0
583.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.0	22.1	0.3	0.1
581.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	81.3	5.5	0.0
579.4	100.0	100.0	100.0	100.0	99.6	99.3	98.9	97.6	48.7	1.8	0.2
576.5	100.0	100.0	99.2	97.7	97.2	96.8	95.6	76.6	3.3	0.3	0.1
575.0	100.0	100.0	97.7	94.8	94.2	94.1	94.1	93.8	64.8	3.2	0.1
572.2	100.0	100.0	97.8	97.2	97.2	97.1	97.0	94.0	28.0	0.6	0.0
*568.7	100.0	100.0	100.0	100.0	100.0	100.0	99.1	98.5	98.1	96.4	94.4
570.3	100.0	61.2	29.7	22.3	18.6	16.7	15.8	15.3	10.0	2.0	0.2
566.0	100.0	100.0	100.0	99.8	99.5	98.8	97.1	77.1	12.1	0.7	0.0
565.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.5	36.0	0.0	0.0
562.8	100.0	100.0	93.6	86.8	82.5	78.8	70.9	31.4	7.7	0.5	0.0
561.3	100.0	100.0	100.0	100.0	99.5	98.7	97.4	87.5	14.6	0.3	0.0
559.8	100.0	100.0	100.0	98.7	97.9	97.3	96.4	85.8	25.5	0.2	0.0
*556.8	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.4	54.8	0.7	0.0
*554.1	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.6	99.4	98.3	97.1
551.8	100.0	100.0	99.4	99.0	97.2	94.1	87.5	30.3	0.2	0.0	0.0
548.8	100.0	100.0	100.0	99.8	99.3	99.0	98.1	80.5	1.5	0.0	0.0
546.8	100.0	100.0	100.0	99.2	98.6	97.4	95.7	78.3	2.7	0.0	0.0
545.0	100.0	100.0	100.0	99.9	99.6	99.5	99.3	88.9	8.4	0.1	0.0
542.9	100.0	100.0	100.0	100.0	100.0	100.0	99.6	96.3	17.4	0.2	0.0
541.5	100.0	100.0	100.0	98.7	98.3	97.9	97.5	80.5	5.9	0.1	0.0
538.2	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.0	28.3	0.1	0.0
535.4	100.0	100.0	100.0	99.2	98.6	98.2	97.7	87.7	8.4	0.1	0.0
532.9	100.0	100.0	100.0	98.1	96.2	94.4	91.9	73.7	7.2	0.1	0.0
527.4	100.0	100.0	100.0	99.8	99.4	99.0	98.3	88.4	4.2	0.1	0.0
525.3	100.0	100.0	100.0	99.4	98.5	97.7	96.4	88.0	3.4	0.0	0.0
522.5	100.0	100.0	98.2	93.7	89.2	82.2	71.5	44.5	6.3	0.0	0.0
519.1	100.0	100.0	99.8	97.2	94.5	90.4	77.8	24.7	3.3	0.1	0.0
518.1	100.0	100.0	100.0	99.5	99.4	98.9	96.8	52.0	1.6	0.0	0.0
516.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	86.0	5.3	0.1	0.0
514.1	100.0	100.0	100.0	99.0	98.2	97.8	97.0	88.5	14.7	0.1	0.0
511.5	100.0	100.0	97.8	96.0	94.5	92.4	88.0	53.0	1.2	0.0	0.0
508.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	32.2	0.2	0.0
507.0	100.0	100.0	100.0	100.0	99.3	98.5	95.4	73.0	15.8	0.0	0.0
504.5	100.0	100.0	100.0	98.7	98.4	98.2	98.0	96.3	45.6	0.3	0.0
502.4	100.0	100.0	100.0	100.0	99.8	99.7	99.4	86.3	7.2	0.2	0.0
497.3	100.0	100.0	100.0	99.5	99.3	98.8	97.9	86.2	18.4	0.2	0.0
495.1	100.0	100.0	100.0	99.6	99.6	99.2	97.9	70.7	2.0	0.0	0.0
491.8	100.0	100.0	100.0	100.0	100.0	99.8	99.3	94.7	35.5	0.3	0.2
490.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	91.5	18.9	0.2	0.0
488.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	71.6	0.5	0.0
485.5	100.0	100.0	100.0	99.3	98.4	96.8	92.5	72.0	22.7	0.0	0.0
482.8	100.0	100.0	97.8	95.4	93.7	90.8	82.1	38.9	1.6	0.0	0.0
480.6	100.0	100.0	100.0	99.7	99.7	99.4	97.1	90.9	14.3	0.1	0.0
478.6	100.0	100.0	100.0	100.0	100.0	100.0	99.6	94.0	36.5	1.0	0.1
476.6	100.0	100.0	100.0	100.0	99.7	99.6	99.4	95.7	17.3	0.2	0.0
469.6	100.0	100.0	100.0	100.0	99.9	99.8	99.5	90.1	4.1	0.1	0.0
468.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.5	3.3	0.0	0.0
466.7	100.0	100.0	100.0	100.0	99.5	99.3	98.7	96.0	63.1	1.5	0.0
465.2	100.0	100.0	100.0	98.8	98.2	97.4	93.1	68.3	19.9	0.5	0.0
462.0	100.0	100.0	100.0	100.0	99.5	99.0	97.7	85.0	1.7	0.0	0.0
460.8	100.0	100.0	100.0	99.5	99.3	98.9	98.1	91.2	8.2	0.1	0.0
458.6	100.0	100.0	100.0	99.5	99.4	99.1	98.7	94.2	13.5	0.1	0.0
456.8	100.0	100.0	100.0	100.0	99.6	99.4	99.4	98.3	19.8	0.2	0.0
454.8	100.0	100.0	99.3	98.5	97.9	97.3	94.7	67.2	12.6	0.1	0.0
452.4	100.0	100.0	100.0	98.1	95.7	92.6	86.5	67.8	4.9	0.1	0.0
449.2	100.0	100.0	100.0	99.8	99.2	97.9	94.4	69.5	3.0	0.1	0.0
446.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9	49.9	0.5	0.0
445.2	100.0	100.0	100.0	100.0	100.0	100.0	99.6	93.2	36.5	0.6	0.1
442.8	100.0	100.0	98.0	77.8	53.7	38.4	28.2	14.6	11.1	0.3	0.0
439.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.2	76.3	0.7	0.1

1989 River Mile above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
434.9	100.0	100.0	99.5	97.2	94.6	91.8	84.6	53.8	5.8	0.0	0.0
433.8	100.0	100.0	100.0	98.8	96.5	92.4	84.7	41.9	5.0	0.0	0.0
432.0	100.0	100.0	100.0	98.3	97.6	96.3	90.9	52.3	1.0	0.2	0.2
429.3	100.0	100.0	100.0	98.7	98.2	97.5	96.4	63.0	0.6	0.0	0.0
427.5	100.0	100.0	100.0	99.2	98.8	98.4	97.3	85.2	22.7	0.4	0.0
425.6	100.0	100.0	100.0	99.1	98.5	98.0	97.2	74.3	6.4	0.2	0.0
424.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.5	14.4	0.1	0.0
422.3	100.0	100.0	100.0	100.0	99.7	99.2	98.7	88.4	3.5	0.0	0.0
420.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	1.1	0.0	0.0
418.3	100.0	100.0	100.0	100.0	99.9	99.7	99.1	73.3	5.0	0.1	0.0
415.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	47.2	0.2	0.0
413.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.7	16.8	0.1	0.0
411.5	100.0	100.0	100.0	98.5	97.4	96.8	95.8	82.1	23.9	0.1	0.0
409.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	32.5	0.4	0.0
408.7	100.0	100.0	100.0	98.9	98.3	97.6	96.2	78.0	42.8	0.2	0.0
404.9	100.0	100.0	95.1	89.7	86.9	85.1	83.0	64.2	10.6	0.3	0.0
402.3	100.0	100.0	99.0	99.0	98.9	98.5	97.6	84.0	5.8	0.0	0.0
399.4	100.0	100.0	100.0	99.3	99.3	99.1	99.1	82.8	15.6	0.3	0.0
397.9	100.0	100.0	100.0	99.6	99.1	98.4	97.2	83.1	19.9	0.3	0.0
393.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.0	13.6	0.3	0.0
391.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.1	18.7	0.1	0.0
389.8	100.0	100.0	100.0	100.0	99.7	99.4	99.0	94.9	42.7	0.3	0.0
387.0	100.0	100.0	100.0	99.7	99.5	99.5	99.5	93.9	13.7	0.0	0.0
385.0	100.0	100.0	100.0	99.8	99.6	99.5	98.6	88.7	22.1	0.2	0.0
382.2	100.0	100.0	100.0	99.4	99.1	98.7	98.7	98.0	91.5	16.6	0.0
380.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	79.4	11.8	1.2	0.7
378.1	100.0	100.0	99.6	97.8	96.3	94.8	92.1	56.4	5.6	0.1	0.0
375.5	100.0	100.0	100.0	98.7	96.9	93.5	85.4	57.9	25.2	0.3	0.0
371.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.0	27.4	1.0	0.1
367.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	66.6	1.8	0.1
364.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	34.1	1.0	0.0
362.4	100.0	100.0	100.0	100.0	99.8	99.8	99.7	92.8	16.6	0.3	0.1
359.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	66.0	0.6	0.0
357.0	100.0	100.0	100.0	99.6	99.3	99.1	98.7	95.2	70.0	0.6	0.1
355.0	100.0	100.0	100.0	99.3	98.1	96.7	93.8	63.9	11.7	0.2	0.2
353.7	100.0	100.0	100.0	98.1	96.1	94.1	89.4	45.8	4.0	0.0	0.0
351.3	100.0	100.0	100.0	99.8	99.6	99.4	98.8	78.1	3.6	0.0	0.0
346.1	100.0	100.0	100.0	95.7	93.2	90.3	87.4	74.7	52.4	2.4	0.0
*343.7	100.0	100.0	81.1	74.6	73.1	72.7	72.4	72.0	63.0	53.4	51.7
341.3	100.0	100.0	100.0	100.0	100.0	100.0	99.9	69.5	8.6	1.1	0.0
340.0	100.0	100.0	100.0	99.4	99.3	99.0	97.9	26.4	0.4	0.0	0.0
338.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.5	39.5	0.3	0.0
334.4	100.0	100.0	100.0	98.9	96.0	93.4	90.4	67.2	13.9	0.1	0.0
332.2	100.0	100.0	100.0	99.5	98.5	96.8	93.9	74.2	8.9	0.0	0.0
330.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	85.2	0.7	0.0
328.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	51.8	0.3	0.0
325.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.8	0.7	0.0
323.9	100.0	100.0	100.0	99.1	99.1	99.0	98.8	92.3	59.9	0.7	0.0
322.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	84.1	1.6	0.0
321.1	100.0	100.0	100.0	100.0	100.0	99.9	99.8	97.2	45.9	0.5	0.0
319.3	100.0	100.0	100.0	100.0	99.7	99.6	99.5	88.5	59.3	1.0	0.0
317.6	100.0	100.0	100.0	99.9	99.7	99.6	99.5	98.2	68.8	3.5	0.0
316.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.5	8.8	0.1	0.0
314.5	100.0	100.0	100.0	100.0	99.6	99.3	99.2	95.5	18.6	0.9	0.0
312.8	100.0	100.0	100.0	100.0	99.7	99.5	98.7	81.9	34.7	0.4	0.2
*311.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	95.0	53.3	31.4
309.8	100.0	100.0	100.0	100.0	99.6	99.6	99.3	84.6	20.4	0.3	0.0
308.5	100.0	100.0	100.0	100.0	99.6	99.2	98.5	84.9	5.4	0.0	0.0
306.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	96.2	1.7	0.0
304.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	90.9	1.7	0.1
303.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	84.9	2.1	0.3
299.7	100.0	100.0	100.0	99.2	98.9	98.4	97.6	85.8	3.3	0.1	0.0
297.5	100.0	100.0	100.0	100.0	99.9	99.9	99.8	96.3	7.2	0.0	0.0
*294.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	89.0	84.1	61.8
292.9	100.0	100.0	100.0	98.6	98.4	98.3	98.0	92.0	66.9	5.2	0.1
289.8	100.0	100.0	100.0	100.0	99.9	99.8	99.8	99.2	62.9	2.0	0.0
288.6	100.0	100.0	100.0	100.0	100.0	99.9	99.9	96.6	14.2	0.3	0.0
285.4	100.0	100.0	100.0	100.0	100.0	100.0	99.8	98.9	56.6	0.5	0.0
283.3	100.0	100.0	100.0	100.0	100.0	99.8	99.5	87.6	22.9	2.8	0.0
282.0	100.0	100.0	100.0	99.0	98.7	98.5	98.5	98.4	29.6	1.4	0.1
279.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	86.0	4.7	0.2
277.2	100.0	100.0	100.0	100.0	100.0	100.0	99.2	94.5	4.1	0.1	0.0
275.5	100.0	100.0	100.0	99.8	99.5	99.3	98.4	86.8	0.4	0.0	0.0
272.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.7	0.3	0.0
269.5	100.0	100.0	100.0	100.0	100.0	100.0	99.6	66.4	3.4	0.3	0.0
268.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.1	16.9	0.7	0.0
266.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.9	1.7	0.0	0.0
265.3	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.8	79.9	1.4	0.0
263.0	100.0	100.0	100.0	100.0	99.9	99.8	99.2	77.6	9.6	0.3	0.0

1989 River Mile above Head of Passes	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
	--- Percent finer than indicated size ---										
260.9	100.0	100.0	100.0	100.0	100.0	100.0	99.5	92.8	56.0	8.3	0.1
258.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	68.0	1.3	0.0
*257.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.1	26.6	0.0
254.9	100.0	100.0	100.0	100.0	100.0	99.7	99.0	93.6	72.0	11.2	0.7
253.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	43.2	0.7	0.0
251.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	99.3	96.9	4.8	0.0
249.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9	58.1	0.8	0.0
244.8	100.0	100.0	100.0	96.3	88.8	80.4	71.1	51.9	12.3	0.1	0.0
244.8	100.0	100.0	100.0	100.0	99.8	99.1	97.5	87.9	31.5	0.8	0.0
247.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	40.1	0.2	0.0
242.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.4	2.2	0.2	0.0
240.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	5.6	0.0
238.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.7	1.1	0.0	0.0
*235.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.7	29.4	15.0
227.8	100.0	100.0	100.0	100.0	100.0	99.9	99.8	94.4	43.3	1.0	0.1
226.6	100.0	100.0	100.0	100.0	99.8	99.5	98.2	86.3	28.1	0.6	0.1
224.2	100.0	100.0	100.0	100.0	99.8	99.7	99.6	98.6	14.2	0.1	0.0
221.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	91.2	0.9	0.0
220.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	59.4	0.4	0.0
217.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	70.8	1.2	0.0
215.6	100.0	100.0	100.0	99.6	99.5	99.4	99.2	94.6	41.0	1.5	0.0
213.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9	7.9	0.2	0.1
211.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	15.2	0.4
209.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	91.5	4.1	0.3
206.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	10.3	0.2	0.0
204.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	48.6	0.2
202.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	95.7	6.1
200.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	56.9	6.5	0.0
198.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	81.3	1.5	0.1
196.2	100.0	100.0	100.0	100.0	99.7	99.7	99.5	97.5	52.3	0.7	0.0
193.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	40.8	0.4	0.0
191.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	56.2	0.5	0.0
189.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	97.6	8.6	1.7
186.8	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.2	73.3	1.4	0.0
184.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	79.3	1.2	0.0
181.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	53.4	1.4	0.1
179.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	85.4	3.1	0.0
*177.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7
173.7	100.0	100.0	100.0	100.0	99.7	99.5	99.3	97.8	64.5	0.9	0.0
172.0	100.0	100.0	100.0	100.0	99.9	99.2	98.7	94.6	17.7	1.3	0.1
170.6	100.0	100.0	100.0	99.4	95.1	91.4	88.9	84.3	53.7	2.9	1.4
168.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	5.6	0.0	0.0
164.8	100.0	100.0	100.0	100.0	99.8	99.3	97.8	89.8	60.3	0.4	0.0
162.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.2	4.4	0.1
160.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	81.9	1.1	0.0
*157.7	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.3	8.6	2.9
156.4	100.0	100.0	100.0	100.0	100.0	100.0	99.6	99.3	86.4	2.4	0.2
152.9	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	95.6	9.5	0.5
*150.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	89.3	73.5
147.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	41.2	0.8	0.0
*144.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0
142.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	95.5	7.2	0.1
136.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	71.6	3.0	0.3
*133.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	97.1	80.3	70.4
*132.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	99.1	98.4	90.1	77.3
127.5	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.6	71.0	2.9	0.8
*125.7	100.0	100.0	98.1	95.8	94.4	93.4	93.0	92.1	80.2	49.1	47.7
123.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	84.3	43.1	3.0	0.7
118.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.8	0.8	0.0
116.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	78.9	1.1	0.0
114.1	100.0	100.0	100.0	99.8	99.4	98.6	97.5	78.8	9.3	1.1	0.1
*110.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	25.9	5.2
107.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	97.0	4.3	0.2
*104.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.4	33.7	7.2
103.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	65.0	3.5	0.2
96.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	87.8	8.9	0.0
91.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	20.4	2.3	1.3
89.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	15.5	1.1
86.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	98.7	89.7	7.4	0.9
82.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	66.4	0.8	0.0
81.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	83.4	8.7	0.1
78.0	100.0	100.0	100.0	100.0	99.4	98.7	98.5	96.9	20.1	1.7	0.0
75.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.4	10.4	0.3
73.1	100.0	100.0	100.0	100.0	99.9	99.9	99.5	97.5	58.6	3.0	0.1
65.8	100.0	100.0	100.0	99.7	99.7	99.7	99.7	99.5	71.3	0.6	0.0
63.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	66.4	1.9	0.2	0.0
*59.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	99.2	97.5	94.6	92.9
57.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7	6.1	1.3
55.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	86.0	3.3	0.2

1989 River Mile above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
52.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.2	1.1	0.0
51.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	25.5	0.8
47.3	100.0	100.0	100.0	100.0	100.0	99.8	99.5	98.7	56.2	7.9	0.2
44.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.0	6.0	0.3
42.8	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.3	59.8	3.0	0.4
40.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.8	16.9	0.2
37.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	83.2	0.4	0.0
35.2	100.0	100.0	100.0	100.0	100.0	100.0	99.7	99.6	55.0	1.7	0.1
33.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	12.8	1.7	0.3
*30.4	100.0	100.0	100.0	100.0	99.6	99.6	99.5	99.2	95.3	22.3	15.8
26.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	94.6	0.2	0.0
*23.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	63.6
21.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	91.7	4.6	1.4
*18.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	99.2
13.5	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.2	33.3	0.3
*11.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	58.7	7.0
*5.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	15.2	4.5
2.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	14.2	1.4

* Samples contain a significant amount of clay and silt; breakdown of clay and silt is presented in Table 6.

TABLE 2

GRAIN SIZE DISTRIBUTIONS OF CROSS CHANNEL SAMPLES
Thalweg samples are listed first

1989 River Mile Above Head of Passes	Ref. Bank	Distance to Ref. Bank (Naut. Miles)	--- Percent finer than indicated size --- 63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
777.4	L	0.250	100.0	100.0	100.0	100.0	100.0	99.8	97.9	56.1	2.9	0.2	0.0
		0.055	100.0	100.0	100.0	100.0	99.8	99.4	93.1	30.4	6.0	1.0	0.0
663.9	L	0.128	100.0	100.0	100.0	100.0	100.0	100.0	99.5	72.2	4.5	0.0	0.0
		0.066	100.0	100.0	93.9	90.8	87.3	81.0	63.0	24.6	0.4	0.0	0.0
257.6	R	0.081	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.1	26.6	0.0
*		0.134	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.0	78.8	36.4

* sample contains a significant amount of clay and silt; breakdown of clay and silt is presented in Table 6.

TABLE 3

GRAIN SIZE DISTRIBUTIONS FOR COMPARISON SAMPLES COLLECTED WITH THE 4" USGS PIPEDREDGE SAMPLER

1989 River Mile Above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
949.2	100.0	100.0	100.0	98.9	97.4	95.0	89.7	55.8	0.4	0.0	0.0
919.1	100.0	100.0	99.5	98.3	96.4	92.8	86.3	56.6	12.8	0.3	0.1
897.9	100.0	100.0	96.3	92.5	87.0	77.4	61.3	26.8	6.0	0.1	0.0
896.7	100.0	91.7	81.8	76.3	74.7	74.1	70.5	30.3	3.3	0.1	0.0
894.8	100.0	100.0	100.0	99.1	98.7	98.4	95.5	40.9	1.2	0.1	0.1
893.5	100.0	100.0	100.0	99.1	98.9	98.7	98.5	95.9	40.3	0.2	0.0
891.8	100.0	100.0	99.2	98.1	97.1	95.6	91.2	63.3	16.0	0.1	0.0
890.5	100.0	100.0	100.0	99.4	97.8	94.8	86.6	52.2	9.8	0.1	0.0
888.3	100.0	100.0	99.1	96.2	92.3	84.5	69.0	27.3	1.4	0.0	0.0
886.4	100.0	100.0	100.0	100.0	100.0	100.0	99.5	95.1	33.1	0.1	0.0
884.0	100.0	100.0	100.0	99.8	98.9	97.5	90.7	22.7	0.8	0.0	0.0
882.2	100.0	100.0	100.0	98.7	97.7	95.1	87.7	45.7	1.1	0.0	0.0
851.0	100.0	100.0	99.3	95.9	93.3	85.0	59.5	14.9	3.0	0.0	0.0
804.5	100.0	100.0	100.0	100.0	99.4	98.4	95.5	81.8	16.8	0.2	0.2
792.5	100.0	100.0	100.0	99.8	98.8	96.3	90.4	64.2	6.4	0.1	0.0
755.7	100.0	100.0	100.0	99.7	99.0	96.9	87.5	46.7	11.0	0.1	0.0
740.6	100.0	100.0	100.0	99.6	98.4	95.2	84.7	41.5	2.6	0.0	0.0
697.5	100.0	100.0	100.0	99.5	98.3	95.3	86.4	41.8	2.7	0.0	0.0
692.0	100.0	100.0	99.0	97.9	97.1	95.9	90.5	57.0	1.9	0.0	0.0
650.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	66.3	2.1	0.1	0.0
637.2	100.0	97.4	97.4	97.0	96.4	95.1	91.4	59.8	3.3	0.0	0.0
595.6	100.0	100.0	100.0	100.0	100.0	99.8	99.6	97.6	16.9	0.6	0.0
583.8	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.3	26.2	0.2	0.0
*556.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	97.7	95.8	95.2
535.4	100.0	100.0	100.0	100.0	99.8	99.5	99.0	90.9	12.0	0.2	0.0
495.1	100.0	100.0	100.0	99.7	99.1	98.9	98.4	81.0	5.6	0.1	0.0
480.6	100.0	100.0	94.2	86.3	78.9	68.4	54.1	25.0	4.8	0.1	0.1
458.6	100.0	100.0	100.0	100.0	99.6	98.8	97.2	88.2	7.5	0.2	0.0
432.0	100.0	100.0	100.0	98.5	97.4	95.9	89.7	50.3	0.7	0.0	0.0
418.3	100.0	100.0	100.0	100.0	99.7	99.5	98.9	79.6	4.2	0.2	0.0
402.3	100.0	100.0	100.0	100.0	99.8	99.5	98.7	83.4	5.9	0.1	0.0
367.7	100.0	100.0	100.0	100.0	100.0	100.0	99.8	98.0	62.6	1.1	0.0
346.1	100.0	100.0	100.0	98.5	96.6	94.5	92.3	76.4	44.4	1.6	0.1
312.8	100.0	100.0	100.0	100.0	99.6	99.3	99.2	94.7	59.8	0.5	0.0
283.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.4	20.6	1.8	0.1
263.0	100.0	100.0	100.0	99.6	99.4	99.1	98.3	76.8	13.3	1.6	0.0
224.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	57.2	0.8	0.1
204.8	100.0	100.0	100.0	99.8	99.7	99.7	99.2	96.3	13.6	0.1	0.0
173.7	100.0	100.0	99.3	95.1	90.2	86.4	83.9	77.5	46.4	1.3	0.0
127.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	46.7	2.1	0.4
82.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	32.1	0.7	0.0
57.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.5	6.1	2.2

* Samples contain a significant amount of clay and silt; breakdown of clay and silt is presented in Table 6.

TABLE 4

GRAIN SIZE DISTRIBUTIONS FOR COMPARISON SAMPLES COLLECTED WITH THE US BM 54 SAMPLER

1989 River Mile above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
949.2	100.0	100.0	98.4	89.4	87.3	85.3	82.0	51.3	0.8	0.1	0.0
886.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	46.4	0.0	0.0
855.0	100.0	100.0	100.0	98.9	98.2	96.6	76.5	7.9	1.8	0.3	0.0
837.6	100.0	100.0	98.5	95.8	93.5	88.5	72.1	19.5	0.7	0.0	0.0
822.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	91.3	7.9	0.1	0.0
773.4	100.0	100.0	100.0	99.8	99.6	99.3	99.2	92.0	7.3	0.2	0.0
742.0	100.0	100.0	100.0	99.8	99.3	98.9	96.8	64.5	8.2	0.0	0.0
740.6	100.0	100.0	100.0	99.0	98.6	97.5	91.7	46.0	2.6	0.0	0.0
692.0	100.0	100.0	100.0	100.0	98.8	97.7	93.2	56.8	7.0	0.2	0.0
650.2	100.0	100.0	100.0	100.0	99.8	99.7	99.6	88.5	6.6	0.1	0.0
637.2	100.0	100.0	100.0	100.0	100.0	100.0	99.6	90.8	12.2	0.2	0.0
595.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	14.8	0.2	0.0
583.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	34.5	0.9	0.0
556.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	36.6	0.2	0.0
535.4	100.0	100.0	100.0	99.7	99.3	98.9	98.1	89.2	10.5	0.2	0.0
495.1	100.0	100.0	100.0	98.7	98.5	98.3	98.1	76.2	7.4	4.4	3.3
480.6	100.0	100.0	100.0	93.5	85.0	71.7	48.0	15.2	1.9	0.1	0.0
418.3	100.0	100.0	100.0	100.0	99.7	99.3	98.2	63.3	4.2	0.0	0.0
402.3	100.0	100.0	100.0	100.0	99.6	98.7	97.0	76.8	3.4	0.0	0.0
367.7	100.0	100.0	100.0	100.0	99.6	99.6	99.4	94.7	28.1	0.3	0.0
334.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	82.9	0.9	0.0
312.8	100.0	100.0	100.0	99.4	98.6	98.2	98.0	96.7	60.7	0.6	0.2
283.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.9	18.2	2.0	0.2
263.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	87.6	8.7	0.4	0.0
224.2	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.0	68.5	2.0	0.2
204.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	36.3	0.2	0.0
173.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	80.4	1.1	0.0
127.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	64.9	2.5	0.4
82.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.1	5.5	0.0
57.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.8	15.2	2.6
13.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	26.2	0.1

TABLE 5

GRAIN SIZE DISTRIBUTIONS FOR COMPARISON SAMPLES COLLECTED WITH THE 8" PIPEDREDGE SAMPLER

1989 River Mile Above Head of Passes	--- Percent finer than indicated size ---										
	63.5mm	31.75mm	16.00mm	8.00mm	4.00mm	2.00mm	1.00mm	0.50mm	0.25mm	0.125mm	0.063mm
902.3	100.0	100.0	98.3	95.0	90.4	82.6	67.3	28.9	5.8	0.0	0.0
901.0	100.0	100.0	100.0	97.2	94.8	90.4	82.8	52.3	7.6	0.2	0.0
898.9	100.0	100.0	100.0	99.0	97.4	93.0	82.7	52.9	21.4	0.5	0.0
816.2	100.0	100.0	99.5	98.8	97.9	95.3	85.5	43.7	2.9	0.0	0.0
709.9	100.0	100.0	100.0	99.6	98.7	96.0	84.1	32.8	1.3	0.0	0.0
570.3	80.4	32.5	12.5	8.9	7.4	6.7	6.2	4.6	2.6	0.6	0.1

TABLE 6

GRAIN SIZE DISTRIBUTIONS OF SILTS AND CLAYS DETERMINED WITH THE PIPET METHOD

1989 River Mile above Head of Passes	Sampler	--- Percent finer than indicated size --- 0.063mm	0.031mm	0.016mm	0.008mm	0.004mm	0.002mm
568.7	WES	94.4	92.7	89.9	88.1	83.0	64.1
556.8	4" USGS	95.2	92.0	84.6	80.4	74.4	66.9
554.1	WES	97.1	95.6	92.5	91.3	87.0	80.5
343.7	WES	51.7	44.4	39.4	34.4	28.9	24.5
311.4	WES	31.4	20.4	13.1	9.8	7.9	6.9
294.2	WES	61.8	48.6	39.1	31.8	24.9	21.1
257.6	WES	36.4	20.6	14.8	11.9	8.9	8.1
235.0	WES	15.0	8.7	6.4	5.1	4.1	4.0
177.0	WES	91.7	91.4	87.6	87.4	78.7	67.7
157.7	WES	2.9	2.0	1.9	1.8	1.5	0.6
150.0	WES	73.5	58.2	37.4	33.8	27.2	22.9
144.3	WES	99.0	94.9	84.0	74.4	63.8	50.3
133.6	WES	70.4	58.0	47.1	39.9	34.0	27.3
132.0	WES	77.3	60.7	55.0	50.7	45.1	39.9
125.7	WES	94.3	87.8	76.2	69.2	62.1	52.4
110.0	WES	5.2	4.3	3.8	3.3	2.9	2.8
104.5	WES	52.0	4.8	4.4	3.6	2.9	1.9
59.0	WES	92.9	86.7	79.4	73.7	62.9	55.9
30.4	WES	30.9	23.3	18.2	13.4	11.2	10.0
23.9	WES	63.6	55.0	43.8	35.9	29.2	26.0
18.0	WES	99.2	93.2	86.2	78.1	70.1	59.1
11.9	WES	7.0	4.4	3.4	2.8	2.0	1.2
5.5	WES	4.5	3.3	2.5	0.5	0.3	0.2

TABLE 7

PERCENTAGES OF SAND, SILT, AND CLAY DETERMINED WITH THE HYDROMETER METHOD

1989 River Mile above Head of Passes	Sampler	% Sand	% Silt	% Clay
568.7	WES	10.0	22.0	68.0
556.8	4" USGS	8.0	14.0	78.0
554.1	WES	8.0	10.0	82.0
343.7	WES	50.0	20.0	30.0
311.4	WES	72.0	19.0	9.0
294.2	WES	49.0	27.0	24.0
257.6	WES	70.0	20.0	10.0
235.0	WES	89.0	5.0	6.0
177.0	WES	12.0	14.0	74.0
157.7	WES	98.0	<1.0	2.0
150.0	WES	36.0	38.0	26.0
144.3	WES	18.0	20.0	63.0
133.6	WES	39.0	27.0	34.0
132.0	WES	32.0	26.0	42.0
125.7	WES	12.0	30.0	58.0
110.0	WES	96.0	2.0	2.0
104.5	WES	92.0	3.5	4.5
59.0	WES	16.0	26.0	58.0
30.4	WES	70.0	15.0	15.0
18.0	WES	6.0	26.0	68.0
11.9	WES	92.0	4.0	4.0
5.5	WES	96.0	2.0	2.0

TABLE 8

DIAMETER OF LARGEST GRAVEL PARTICLE RECORDED FOR EACH SAMPLE, 1989

1989 River Miles above Head of Passes	Grain Size (mm)
952.6	16
951.4	16
949.2	16
947.3	10
945	32
942.8	72
941.2	50
938.8	34
935.2	10
933	10
931.2	16
929.1	10
927.9	16
926.7	16
924.5	20
923	32
919.1	22
917.1	20
916.8	25
915.4	25
913.5	20
911.9	32
909.8	14
908.1	34
905.9	14
904.6	27
902.3	25
901	42
898.9	12
897.9	40
896.7	52
894.8	21
893.5	20
891.8	30
890.5	25
888.3	37
886.4	19
884	25
882.2	16
879.8	24
878.1	56
877	37
875.7	58
873.7	4
871.3	18
870	36
867.3	30
865.7	26
864.5	21
862.7	4
860.4	12
858.6	12
857	12
856	16
855	49
853	28
851	26
849.4	20
848.2	20
846.5	14
844.6	18
842.5	27
840.1	48
837.6	15
835.5	28
833.6	20
831	12
828	24
825.4	22
822	18
818.4	19
816.2	24
814.8	20
813	31

1989 River Miles above Head of Passes	Grain Size (mm)
807.9	22
804.5	41
802.1	7
799	13
797.5	18
795.5	25
792.5	45
789.5	27
788	24
786.2	23
783.4	28
780.2	18
778.2	23
777.4	14
775.2	37
773.4	32
771.9	22
770.3	27
768.8	24
766.8	31
764.8	17
762.2	15
760.1	21
757.8	15
755.7	15
754.3	23
752.7	22
750.2	32
746.5	25
744.7	16
742	18
740.6	19
737.4	19
734.6	17
732.7	40
730.3	17
727.7	12
722.3	14
719.5	25
716.8	18
714.3	22
712.9	24
709.9	52
707.2	25
705	14
702.9	17
700.3	14
697.5	25
695.6	22
694	13
692	22
689.9	24
687.6	19
683.4	17
681.7	14
679.4	16
677.5	34
674.5	42
672.1	31
669.9	9
666.8	21
663.9	23
662.4	10
660.2	18
658.1	17
656.5	24
654.6	8
650.2	3
647.6	14
645.7	12
643.4	20
641.7	28
640	19
637.2	15
634.1	4

Miles above Head of Passes	Grain Size (mm)
632.1	25
629.3	23
628	10
625.5	25
623.1	34
620.8	10
617.7	20
614.7	28
612.5	18
610	28
607.3	21
605.9	15
603.5	28
601	9
599.4	11
598.2	32
595.6	13
592.1	22
590.3	15
588.5	40
585.2	12
583.8	9
581.3	14
579.4	19
576.5	31
575	47
572.2	25
570.3	65
566	12
565.2	9
562.8	41
561.3	28
559.8	22
556.8	25
551.8	11
548.8	24
546.8	15
545	13
542.9	8
541.5	15
538.2	10
535.4	18
532.9	19
527.4	15
525.3	21
522.5	23
519.1	20
518.1	19
516	12
514.1	21
511.5	27
507	16
504.5	20
502.4	13
497.3	21
495.1	17
491.8	12
490	22
485.5	23
482.8	33
478.6	16
476.6	20
466.7	9
465.2	16
462	12
460.8	17
458.6	15
456.8	7
454.8	15
452.4	30
449.2	18
446.8	4
445.2	11
442.8	17

Miles above Head of Passes	Grain Size (mm)
434.9	22
433.8	15
432	22
429.3	28
427.5	18
425.6	21
424	30
422.3	13
418.3	17
413.3	8
411.5	13
408.7	19
404.9	33
402.3	21
399.4	18
397.9	13
393.8	9
391	9
389.8	13
387	12
385	14
382.2	15
380	13
378.1	24
375.5	26
371.2	11
367.7	15
362.4	15
359.3	11
357	19
355	26
353.7	16
351.3	22
346.1	18
343.7	56
341.3	4
340	13
334.4	19
332.2	13
330.4	18
328.3	19
323.9	21
321.1	10
319.3	17
316	18
314.5	15
312.8	14
309.8	16
308.5	12
299.7	18
297.5	7
294.2	10
292.9	20
288.6	27
285.4	16
283.3	9
282	20
275.5	9
269.5	12
266.4	6
263	10
251	12
244.8	12
242.4	7
226.6	9
224.2	7
217.3	6
215.6	12
196.2	8
173.7	6
172	7
164.8	6
132	35
123	39
114.1	16

TABLE 9

COMPUTED STATISTICS FOR THE 1989 WES SAMPLES

1989 River Mile above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
952.6	0.32	0.50	1.20	1.98	0.19	1.11
951.4	0.47	0.80	1.82	1.98	0.23	1.50
949.2	0.36	0.46	0.68	1.37	0.42	0.58
947.3	0.29	0.38	0.50	1.31	0.36	0.58
945.0	0.33	0.50	5.11	5.85	0.05	4.10
942.8	0.36	0.74	18.70	13.65	0.03	8.04
941.2	0.32	0.42	0.62	1.41	0.47	0.51
938.8	0.34	0.45	0.74	1.48	0.34	0.68
937.0	0.25	0.31	0.38	1.23	0.60	0.36
935.2	0.26	0.36	0.49	1.37	0.51	0.42
933.0	0.45	0.67	0.96	1.46	0.39	0.90
931.2	0.30	0.41	0.64	1.47	0.40	0.55
929.1	0.35	0.66	1.44	2.04	0.19	1.36
927.9	0.35	0.66	1.82	2.32	0.20	1.29
926.7	0.22	0.33	0.54	1.56	0.41	0.41
924.5	0.31	0.45	0.66	1.45	0.43	0.55
923.0	0.27	0.60	1.34	2.25	0.19	1.12
919.1	0.45	0.97	3.28	2.78	0.17	1.97
917.1	0.41	1.21	4.44	3.30	0.12	2.90
916.8	0.85	3.15	9.60	3.37	0.15	5.52
915.4	0.49	0.90	2.74	2.43	0.18	1.92
913.5	0.31	0.53	1.05	1.84	0.20	1.08
911.9	0.25	0.45	1.40	2.47	0.07	2.23
909.8	0.25	0.51	1.17	2.16	0.19	0.99
908.1	0.33	0.56	1.77	2.42	0.07	2.91
905.9	0.21	0.27	0.37	1.34	0.50	0.31
904.6	0.16	0.30	0.68	2.05	0.14	0.81
902.3	0.30	0.68	1.99	2.61	0.17	1.38
901.0	0.41	0.82	3.42	3.08	0.13	2.15
898.9	0.23	0.42	0.71	1.76	0.32	0.56
897.9	0.29	0.78	3.94	3.89	0.08	2.80
896.7	0.33	0.59	1.07	1.80	0.08	2.58
894.8	0.33	0.47	0.70	1.46	0.43	0.57
893.5	0.28	0.36	0.47	1.30	0.47	0.46
891.8	0.25	0.40	0.80	1.81	0.12	1.30
890.5	0.25	0.43	0.96	2.00	0.15	1.11
888.3	0.43	0.63	0.93	1.48	0.39	0.83
886.4	0.24	0.31	0.41	1.31	0.56	0.35
884.0	0.21	0.30	0.43	1.43	0.22	0.63
882.2	0.32	0.43	0.65	1.43	0.40	0.57
879.8	0.30	0.42	0.66	1.48	0.33	0.64
878.1	0.36	0.64	2.75	3.04	0.09	2.61
877.0	0.35	1.21	5.57	4.01	0.09	2.93
875.7	2.90	6.31	14.00	2.20	0.27	8.75
873.7	0.24	0.30	0.37	1.24	0.58	0.34
871.3	0.25	0.39	0.74	1.74	0.29	0.62
870.0	0.32	0.73	2.79	3.05	0.07	3.28
867.3	0.40	0.70	1.38	1.86	0.23	1.27
865.7	0.35	0.56	1.06	1.74	0.21	1.11
864.5	0.54	0.73	0.99	1.36	0.41	0.98
862.7	0.34	0.45	0.69	1.42	0.44	0.56
860.4	0.49	0.77	1.27	1.61	0.34	1.10
858.6	0.30	0.43	0.77	1.63	0.21	0.93
857.0	0.23	0.34	0.56	1.56	0.32	0.53
856.0	0.28	0.46	0.74	1.62	0.37	0.59
855.0	0.34	0.51	0.89	1.63	0.27	0.85
853.0	0.35	0.49	0.86	1.58	0.21	1.02
851.0	0.45	0.81	1.74	1.98	0.23	1.45
849.4	0.70	1.13	2.24	1.80	0.25	1.89
848.2	0.51	0.82	1.76	1.88	0.27	1.37
846.5	0.37	0.55	0.77	1.44	0.34	0.79
844.6	0.19	0.26	0.37	1.39	0.33	0.39
842.5	0 37	0.49	0.89	1.57	0.32	0.75
840.1	0.35	0.52	0.83	1.53	0.26	0.89
835.5	0.38	0.55	1.52	2.09	0.15	1.54
833.6	0.36	0.48	0.74	1.43	0.29	0.80
831.0	0.24	0.36	0.58	1.55	0.40	0.47
828.0	0.33	0.49	0.84	1.60	0.29	0.79
825.4	0.41	0.64	1.25	1.76	0.27	1.05
822.0	0.24	0.31	0.40	1.29	0.57	0.35
818.4	0.25	0.34	0.46	1.36	0.45	0.43
816.2	0.32	0.47	0.85	1.65	0.31	0.72
814.8	0.29	0.40	0.56	1.38	0.50	0.47
813.0	0.39	0.78	3.16	3.04	0.11	2.39
810.6	0.15	0.19	0.23	1.24	0.62	0.20
807.9	0.58	0.93	1.82	1.78	0.23	1.75

1989 River Mile above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
804.5	0.25	0.33	0.44	1.34	0.28	0.60
802.1	0.22	0.30	0.39	1.32	0.52	0.34
799.0	0.32	0.43	0.60	1.36	0.44	0.54
797.5	0.31	0.56	1.32	2.09	0.25	0.91
795.5	0.40	0.69	1.56	1.99	0.24	1.20
792.5	0.33	0.48	1.06	1.83	0.17	1.19
789.5	0.31	0.54	1.15	1.94	0.24	0.93
788.0	0.49	0.84	1.75	1.91	0.21	1.63
786.2	0.41	0.63	1.13	1.67	0.29	0.99
783.4	0.39	0.63	1.05	1.64	0.19	1.37
780.2	0.26	0.43	0.80	1.77	0.32	0.61
778.2	0.35	0.50	0.87	1.58	0.35	0.71
777.4	0.34	0.48	0.68	1.42	0.46	0.55
775.2	0.27	0.40	0.64	1.53	0.24	0.77
773.4	0.34	0.47	0.87	1.63	0.24	0.89
771.9	0.28	0.44	0.76	1.64	0.37	0.59
770.3	0.31	0.49	1.07	1.89	0.22	0.97
768.8	0.34	0.66	2.80	3.09	0.11	2.15
766.8	0.50	0.92	2.66	2.37	0.19	1.92
764.8	0.34	0.51	0.83	1.56	0.32	0.75
762.2	0.41	0.59	0.81	1.41	0.49	0.68
760.1	0.40	0.63	1.09	1.66	0.26	1.09
757.8	0.23	0.33	0.46	1.40	0.50	0.38
755.7	0.38	0.64	0.98	1.60	0.40	0.79
754.3	0.39	0.57	0.85	1.47	0.43	0.69
752.7	0.30	0.45	0.86	1.71	0.21	0.95
750.2	0.40	0.74	2.52	2.63	0.12	2.26
746.5	0.41	0.60	0.92	1.50	0.25	1.07
744.7	0.35	0.49	0.81	1.52	0.35	0.69
742.0	0.36	0.54	0.97	1.66	0.32	0.79
740.6	0.36	0.52	0.83	1.52	0.31	0.81
737.4	0.28	0.41	0.66	1.54	0.41	0.52
734.6	0.27	0.56	0.99	1.93	0.27	0.81
732.7	0.53	0.85	7.52	5.24	0.08	3.80
730.3	0.29	0.40	0.58	1.41	0.48	0.47
727.7	0.33	0.43	0.60	1.34	0.48	0.51
725.0	0.18	0.23	0.30	1.27	0.52	0.25
722.3	0.24	0.36	0.59	1.58	0.40	0.46
719.5	0.30	0.44	0.66	1.48	0.43	0.54
716.8	0.34	0.49	0.78	1.53	0.33	0.73
714.3	0.29	0.37	0.48	1.29	0.59	0.41
712.9	0.25	0.37	0.69	1.68	0.22	0.77
709.9	0.34	0.51	12.03	12.61	0.03	6.22
707.2	0.47	0.71	1.14	1.56	0.36	1.00
705.0	0.38	0.51	0.69	1.35	0.48	0.58
702.9	0.23	0.33	0.48	1.46	0.43	0.40
700.3	0.34	0.54	0.87	1.60	0.32	0.78
697.5	0.40	0.66	1.34	1.84	0.26	1.10
695.6	0.34	0.50	0.81	1.56	0.30	0.77
694.0	0.35	0.47	0.69	1.41	0.45	0.57
692.0	0.40	0.57	1.00	1.60	0.16	1.48
689.9	0.43	0.67	1.04	1.55	0.22	1.35
687.6	0.35	0.49	0.77	1.49	0.30	0.77
683.4	0.39	0.54	0.77	1.41	0.46	0.63
681.7	0.24	0.32	0.41	1.29	0.58	0.36
679.4	0.16	0.19	0.22	1.17	0.55	0.22
677.5	0.33	0.59	0.97	1.73	0.32	0.82
674.5	0.26	0.41	0.76	1.70	0.10	1.66
672.1	0.43	0.69	1.17	1.65	0.23	1.32
669.9	0.21	0.31	0.51	1.56	0.42	0.38
666.8	0.33	0.45	0.64	1.40	0.31	0.72
664.9	0.21	0.29	0.39	1.35	0.43	0.37
663.9	0.31	0.42	0.58	1.37	0.51	0.47
662.4	0.22	0.31	0.44	1.41	0.48	0.36
660.2	0.36	0.51	0.78	1.48	0.38	0.67
658.1	0.44	0.63	0.91	1.43	0.37	0.88
656.5	0.34	0.52	0.98	1.70	0.29	0.82
654.6	0.33	0.41	0.51	1.25	0.57	0.44
650.2	0.31	0.41	0.54	1.32	0.53	0.46
647.6	0.32	0.49	0.76	1.54	0.40	0.62
645.7	0.26	0.34	0.45	1.32	0.55	0.39
643.4	0.51	0.74	1.18	1.53	0.35	1.08
641.7	0.44	0.62	0.90	1.44	0.15	1.83
640.0	0.27	0.38	0.59	1.47	0.36	0.55
637.2	0.34	0.47	0.81	1.55	0.30	0.76
634.1	0.25	0.34	0.47	1.36	0.53	0.39
632.1	0.32	0.43	0.77	1.57	0.27	0.78
629.3	0.53	0.80	1.96	1.98	0.17	1.99
628.0	0.33	0.42	0.53	1.26	0.56	0.46

1989 River Mile above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
625.5	0.22	0.30	0.40	1.36	0.53	0.34
623.1	0.33	0.48	0.94	1.72	0.18	1.13
620.8	0.37	0.49	0.70	1.39	0.46	0.58
617.7	0.26	0.37	0.54	1.43	0.20	0.84
614.7	0.34	0.43	0.66	1.40	0.33	0.66
612.5	0.33	0.48	0.80	1.56	0.28	0.80
610.0	0.15	0.19	0.23	1.23	0.64	0.20
607.3	0.30	0.38	0.49	1.28	0.42	0.53
605.9	0.21	0.31	0.48	1.53	0.34	0.44
603.5	0.32	0.47	0.79	1.57	0.31	0.73
601.0	0.10	0.14	0.20	1.38	0.39	0.19
599.4	0.36	0.47	0.68	1.38	0.43	0.58
598.2	0.33	0.42	0.58	1.33	0.45	0.52
595.6	0.24	0.31	0.39	1.29	0.52	0.38
592.1	0.19	0.24	0.34	1.34	0.48	0.28
590.3	0.30	0.42	0.61	1.42	0.43	0.54
588.5	0.24	0.39	0.88	1.96	0.11	1.42
585.2	0.25	0.31	0.39	1.27	0.58	0.36
583.8	0.23	0.30	0.39	1.29	0.57	0.34
581.3	0.15	0.20	0.26	1.33	0.55	0.22
579.4	0.18	0.25	0.36	1.41	0.41	0.32
576.5	0.31	0.41	0.61	1.39	0.23	0.85
575.0	0.16	0.22	0.36	1.50	0.08	1.16
572.2	0.22	0.30	0.42	1.39	0.15	0.92
570.3	1.06	25.14	38.26	12.66	0.25	27.22
568.7	0.00	0.00	0.00	3.37	0.02	0.03
566.0	0.27	0.38	0.58	1.48	0.40	0.51
565.2	0.21	0.28	0.36	1.31	0.52	0.31
562.8	0.34	0.69	5.13	4.72	0.07	3.23
561.3	0.25	0.35	0.48	1.37	0.44	0.45
559.8	0.23	0.33	0.49	1.47	0.26	0.59
556.8	0.19	0.24	0.32	1.32	0.02	0.02
554.1	*	0.00	0.00	6.98	0.03	0.01
551.8	0.43	0.62	0.94	1.47	0.28	1.03
548.8	0.33	0.41	0.54	1.29	0.47	0.51
546.8	0.32	0.41	0.59	1.36	0.35	0.62
545.0	0.28	0.36	0.47	1.31	0.51	0.44
542.9	0.25	0.32	0.41	1.29	0.57	0.36
541.5	0.29	0.39	0.55	1.36	0.34	0.61
538.2	0.22	0.30	0.40	1.34	0.52	0.34
535.4	0.28	0.36	0.48	1.31	0.37	0.54
532.9	0.29	0.41	0.70	1.56	0.23	0.83
527.4	0.30	0.38	0.48	1.27	0.49	0.47
525.3	0.30	0.38	0.48	1.26	0.39	0.56
522.5	0.33	0.57	2.37	2.95	0.10	1.97
519.1	0.41	0.69	1.35	1.81	0.23	1.32
518.1	0.36	0.49	0.72	1.42	0.40	0.64
516.0	0.29	0.38	0.49	1.29	0.57	0.42
514.1	0.25	0.35	0.47	1.36	0.33	0.56
511.5	0.36	0.49	0.90	1.59	0.15	1.42
508.6	0.21	0.27	0.33	1.25	0.54	0.32
507.0	0.25	0.38	0.64	1.60	0.37	0.53
504.5	0.20	0.26	0.38	1.38	0.26	0.47
502.4	0.28	0.37	0.49	1.31	0.54	0.43
497.3	0.24	0.34	0.49	1.42	0.39	0.47
495.1	0.33	0.43	0.62	1.37	0.44	0.54
491.8	0.21	0.29	0.40	1.39	0.47	0.34
490.0	0.24	0.33	0.45	1.36	0.53	0.37
488.2	0.18	0.22	0.28	1.27	0.53	0.24
485.5	0.23	0.37	0.70	1.75	0.26	0.63
482.8	0.38	0.59	1.15	1.74	[illegible]	1.60
480.6	0.26	0.34	0.45	1.34	0.45	0.44
478.6	0.20	0.28	0.41	1.43	0.47	0.33
476.6	0.25	0.32	0.42	1.30	0.54	0.38
469.6	0.30	0.37	0.47	1.26	0.58	0.42
468.8	0.29	0.35	0.43	1.21	0.66	0.38
466.7	0.17	0.23	0.35	1.42	0.39	0.30
465.2	0.24	0.39	0.72	1.75	0.25	0.67
462.0	0.32	0.40	0.50	1.25	0.51	0.47
460.8	0.28	0.36	0.46	1.29	0.44	0.48
458.6	0.26	0.33	0.43	1.30	0.45	0.44
456.8	0.24	0.31	0.39	1.27	0.52	0.37
454.8	0.27	0.41	0.69	1.62	0.23	0.79
452.4	0.31	0.43	0.89	1.73	0.21	0.94
449.2	0.32	0.43	0.69	1.46	0.39	0.59
446.8	0.19	0.25	0.34	1.33	0.49	0.29
445.2	0.20	0.29	0.42	1.43	0.46	0.33
442.8	0.54	3.39	9.08	4.47	0.14	5.10
439.8	0.17	0.21	0.28	1.28	0.54	0.23

1989 River Mile above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
434.9	0.32	0.48	0.99	1.78	0.17	1.17
433.8	0.34	0.56	0.99	1.70	0.24	0.99
432.0	0.37	0.49	0.83	1.52	0.27	0.85
429.3	0.36	0.46	0.69	1.38	0.32	0.71
427.5	0.23	0.33	0.49	1.47	0.32	0.52
425.6	0.30	0.41	0.61	1.43	0.34	0.61
424.0	0.25	0.31	0.39	1.24	0.62	0.35
422.3	0.30	0.38	0.48	1.26	0.54	0.44
420.1	0.30	0.35	0.40	1.15	0.70	0.37
418.3	0.31	0.41	0.58	1.38	0.49	0.48
415.0	0.20	0.26	0.33	1.29	0.50	0.29
413.3	0.25	0.32	0.42	1.30	0.58	0.36
411.5	0.23	0.34	0.54	1.53	0.24	0.65
409.5	0.21	0.28	0.35	1.28	0.54	0.32
408.7	0.20	0.29	0.59	1.73	0.22	0.56
404.9	0.28	0.43	1.44	2.46	0.07	2.44
402.3	0.29	0.38	0.50	1.31	0.29	0.68
399.4	0.25	0.36	0.51	1.43	0.39	0.49
397.9	0.24	0.35	0.52	1.48	0.36	0.50
393.8	0.26	0.31	0.38	1.22	0.62	0.35
391.0	0.24	0.32	0.42	1.32	0.56	0.36
389.8	0.20	0.27	0.39	1.40	0.41	0.34
387.0	0.26	0.33	0.43	1.30	0.49	0.42
385.0	0.23	0.33	0.46	1.42	0.43	0.42
382.2	0.12	0.17	0.22	1.35	0.30	0.29
380.0	0.27	0.38	0.53	1.42	0.50	0.43
378.1	0.32	0.47	0.80	1.59	0.22	0.96
375.5	0.22	0.43	0.96	2.08	0.18	0.87
371.2	0.21	0.30	0.41	1.39	0.52	0.34
367.7	0.17	0.22	0.31	1.35	0.50	0.25
364.8	0.20	0.28	0.36	1.33	0.52	0.31
362.4	0.25	0.33	0.44	1.33	0.53	0.38
359.3	0.18	0.23	0.29	1.28	0.52	0.25
357.0	0.18	0.22	0.33	1.38	0.34	0.33
355.0	0.27	0.43	0.73	1.64	0.29	0.68
353.7	0.34	0.53	0.88	1.60	0.24	0.97
351.3	0.31	0.41	0.56	1.34	0.48	0.49
346.1	0.17	0.25	0.81	2.36	0.09	1.07
343.7	0.00	0.05	16.62	223.46	0.00	5.46
341.3	0.29	0.41	0.57	1.41	0.48	0.47
340.0	0.44	0.59	0.76	1.32	0.47	0.74
338.0	0.20	0.27	0.36	1.33	0.50	0.31
334.4	0.26	0.41	0.78	1.74	0.22	0.83
332.2	0.28	0.40	0.66	1.53	0.32	0.62
330.4	0.17	0.20	0.25	1.22	0.59	0.22
328.3	0 19	0.25	0.33	1.30	0.49	0.28
325.8	0.16	0.20	0.24	1.20	0.63	0.20
323.9	0.18	0.23	0.39	1.48	0.29	0.40
322.6	0.16	0.20	0.25	1.25	0.56	0.22
321.1	0.19	0.26	0.37	1.37	0.47	0.30
319.3	0.18	0.24	0.43	1.58	0.37	0.33
317.6	0.16	0.22	0.31	1.40	0.42	0.28
316.0	0.27	0.34	0.43	1.27	0.61	0.38
314.5	0.24	0.32	0.42	1.32	0.50	0.39
312.8	0.21	0.31	0.52	1.59	0.37	0.40
311.4	0.02	0.11	0.19	3.54	0.24	0.13
309.8	0.24	0.34	0.50	1.45	0.45	0.42
308.5	0.29	0.38	0.50	1.30	0.50	0.46
306.3	0.15	0.18	0.22	1.20	0.67	0.19
304.2	0.16	0.19	0.23	1.22	0.63	0.20
303.1	0.16	0.20	0.25	1.25	0.57	0.22
299.7	0.31	0.39	0.49	1.27	0.40	0.55
297.5	0.28	0.34	0.42	1.24	0.62	0.38
294.2	0.00	0.03	0.13	27.42	0.06	0.08
292.9	0.15	0.22	0.37	1.57	0.22	0.45
289.8	0.17	0.23	0.31	1.36	0.48	0.27
288.6	0.25	0.32	0.41	1.27	0.59	0.36
285.4	0.19	0.24	0.33	1.33	0.49	0.27
283.3	0.22	0.33	0.47	1.49	0.47	0.38
282.0	0.21	0 29	0.37	1.35	0.33	0.46
279.7	0.15	0.19	0.25	1.29	0.57	0.21
277.2	0.29	0.36	0.44	1.23	0.63	0.39
275.5	0.34	0.41	0.49	1.20	0.51	0.47
272.2	0.18	0.22	0.27	1.23	0.56	0.23
269.5	0.32	0.44	0.60	1.36	0.50	0.50
268.4	0.25	0.32	0.40	1.28	0.59	0.35
266.4	0.31	0.38	0.46	1.22	0.64	0.40
265.3	0.16	0.21	0.26	1.27	0.56	0.23
263.0	0.28	0.39	0.55	1.41	0.49	0.45

1989 River Mile above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
260.9	0.15	0.23	0.39	1 62	0.39	0.29
258.8	0.17	0.22	0.30	1.33	0.51	0.25
257.6	0.02	0.08	0.14	3.03	0.27	0.09
254.9	0.14	0.20	0.34	1.59	0.39	0.27
253.0	0.19	0.26	0.36	1.35	0.49	0.30
251.0	0.14	0.17	0.21	1.22	0.62	0.20
249.0	0.18	0.24	0.33	1.34	0.49	0.27
244.8	0.27	0.49	2.64	3.60	0.11	1.60
244.8	0.21	0.31	0.47	1.50	0.11	1.60
247.5	0.21	0.26	0.33	1.27	0.51	0.30
242.4	0.31	0.38	0.46	1.22	0.64	0.40
240.3	0.14	0.17	0.20	1.19	0.67	0.18
238.1	0.31	0.36	0.43	1.18	0.69	0.38
235.0	0.07	0.14	0.18	1.73	0.45	0.15
227.8	0.19	0.27	0.40	1.44	0.45	0.32
226.6	0.22	0.32	0.48	1.50	0.42	0.40
224.2	0.25	0.31	0.39	1.24	0.58	0.37
221.3	0.16	0.19	0.23	1.21	0.63	0.20
220.0	0.19	0.24	0.31	1.30	0.50	0.27
217.3	0.17	0.22	0.29	1.31	0.52	0.24
215.6	0.19	0.27	0.40	1.45	0.37	0.37
213.3	0.27	0.33	0.39	1.21	0.66	0.36
211.4	0.13	0.15	0.18	1.19	0.62	0.17
209.0	0.15	0.18	0.23	1.25	0.61	0.20
206.2	0.26	0.31	0.37	1.19	0.65	0.36
204.8	0.10	0.13	0.17	1.30	0.49	0.14
202.1	0.00	0.08	0.10	1.24	0.62	0.10
200.7	0.15	0.23	0.32	1.43	0.47	0.26
198.2	0.16	0.20	0.26	1.27	0.56	0.22
196.2	0.19	0.25	0.35	1.38	0.43	0.30
193.5	0.20	0.27	0.35	1.32	0.50	0.30
191.4	0.19	0.24	0.31	1.29	0.50	0.27
189.4	0.14	0.17	0.20	1.23	0.62	0.19
186.8	0.17	0.22	0.29	1.31	0.52	0.24
184.8	0.17	0.21	0.27	1.28	0.55	0.23
181.5	0.18	0.24	0.31	1.32	0.49	0.27
179.2	0.15	0.20	0.25	1.27	0.58	0.21
177.0	0.00	0.00	0.01	7.77	0.04	0.01
173.7	0.18	0.23	0.33	1.36	0.44	0.28
172.0	0.24	0.32	0.42	1.33	0.51	0.39
170.6	0.17	0.24	0.50	1.74	0.14	0.73
168.5	0.28	0.32	0.38	1.18	0.68	0.37
164.8	0.19	0.24	0.42	1.52	0.36	0.33
162.2	0.14	0.17	0.20	1.18	0.68	0.19
160.2	0.17	0.21	0.26	1.25	0.58	0.22
157.7	0.13	0.16	0.19	1.20	0.63	0.18
156.4	0.16	0.20	0.25	1.25	0.57	0.22
152.9	0.13	0.17	0.21	1.26	0.61	0.19
150.0	0.00	0.02	0.10	24.80	0.09	0.05
147.3	0.20	0.26	0.33	1.31	0.51	0.30
144.3	0.00	0.00	0.02	7.80	0.07	0.01
142.4	0.14	0.17	0.22	1.25	0.63	0.19
136.6	0.16	0.21	0.28	1.33	0.52	0.24
133.6	0.00	0.02	0.14	23.84	0.08	0.06
132.0	*	0.01	0.09	13.72	0.02	0.05
127.5	0.16	0.21	0.29	1.34	0.50	0.24
125.7	0.00	0.00	0.02	15.54	0.02	0.02
123.0	0.18	0.28	0.50	1.67	0.38	0.35
118.1	0.16	0.20	0.24	1.21	0.63	0.21
116.7	0.17	0.21	0.27	1.27	0.56	0.23
114.1	0.28	0.39	0.56	1.43	0.41	0.51
110.0	0.10	0.14	0.17	1.33	0.53	0.16
107.5	0.14	0.17	0.21	1.21	0.66	0.19
104.5	0.09	0.14	0.18	1.45	0.48	0.15
103.0	0.16	0.22	0.30	1.36	0.50	0.25
96.4	0.14	0.18	0.24	1.32	0.56	0.20
91.5	0.23	0.29	0.36	1.26	0.58	0.34
89.9	0.13	0.15	0.18	1.21	0.61	0.17
86.0	0.14	0.18	0.23	1.29	0.53	0.21
82.7	0.18	0.23	0.29	1.28	0.52	0.25
81.5	0.14	0.19	0.25	1.35	0.54	0.21
78.0	0.23	0.31	0.40	1.32	0.47	0.39
75.2	0.13	0.16	0.20	1.23	0.63	0.18
73.1	0.17	0.23	0.34	1.43	0.45	0.28
65.8	0.18	0.22	0.29	1.29	0.44	0.28
63.0	0.34	0.45	0.60	1.34	0.51	0.50
59.0	*	0.00	0.02	10.82	0.02	0.03
57.0	0.14	0.18	0.23	1.27	0.60	0.20
55.4	0.15	0.19	0.25	1.27	0.58	0.21

1989 River Mile above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
52.8	0.17	0.21	0.26	1.25	0.58	0.22
51.2	0.11	0.14	0.18	1.27	0.56	0.16
47.3	0.15	0.23	0.33	1.49	0.43	0.28
44.8	0.14	0.17	0.20	1.20	0.66	0.19
42.8	0.17	0.23	0.32	1.38	0.48	0.26
40.0	0.12	0.16	0.20	1.28	0.58	0.18
37.0	0.17	0.21	0.25	1.22	0.59	0.22
35.2	0.18	0.24	0.32	1.34	0.48	0.28
33.0	0.26	0.30	0.36	1.19	0.63	0.35
30.4	0.01	0.14	0.19	6.69	0.27	0.13
26.0	0.17	0.20	0.23	1.17	0.66	0.20
23.9	0.00	0.02	0.07	79.03	0.08	0.04
21.9	0.15	0.18	0.23	1.25	0.61	0.20
18.0	0.00	0.00	0.01	10.77	0.05	0.01
13.5	0.11	0.14	0.18	1.30	0.52	0.16
11.9	0.08	0.11	0.15	1.41	0.45	0.13
5.5	0.13	0.15	0.18	1.19	0.59	0.17
2.8	0.13	0.16	0.20	1.24	0.61	0.18

* undefined

TABLE 10
GRAIN SIZE DISTRIBUTIONS FOR THE 1932 CORPS OF ENGINEERS SAMPLES,
CONVERTED TO THE EXTENDED WENTWORTH SCALE

Interpolated (log-normal probability) from COE data

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	--- Percent finer than indicated size --- 2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
2.00	953.8	62.9	44.9	19.2	2.3	.6	.1
6.00	950.0	99.9	99.9	99.9	99.9	99.3	41.5
7.00	949.0	99.8	99.4	93.6	7.8	1.0	.1
10.00	945.5	87.1	75.6	47.7	8.9	1.6	.1
12.00	943.0	57.9	44.9	27.8	11.1	2.8	.1
13.00	NC	91.4	86.3	39.2	3.0	.9	.1
13A	NC	54.7	51.3	31.9	3.3	.9	.1
14.00	NC	99.9	99.9	99.6	89.5	28.2	.1
16.50	NC	52.2	50.1	48.0	46.4	45.3	1.2
19.25	NC	74.1	59.0	26.6	2.0	.5	.1
19.50	939.0	82.9	74.2	49.3	9.0	1.6	.1
21.00	937.4	98.5	94.6	80.2	44.4	24.1	.2
22.50	935.5	27.8	20.9	11.1	3.6	2.0	.1
23.50	NC	76.2	69.5	29.1	3.3	1.3	.1
25.00	NC	68.9	58.2	47.4	23.6	7.9	.1
27.00	930.7	57.5	33.9	11.0	1.5	.5	.1
29.50	927.9	98.9	92.7	20.7	1.8	.8	.1
31.00	926.8	91.0	69.0	12.7	1.0	.4	.1
32.00	926.4	95.0	86.6	53.3	5.0	1.1	.1
35.00	922.7	96.8	92.2	68.7	30.5	11.9	.1
37.50	921.1	59.4	33.9	17.3	14.2	10.1	.3
38.50	920.2	5.2	3.3	1.0	.3	.2	.1
41.00	917.8	90.8	78.3	34.5	2.7	.6	.1
43.00	915.4	89.6	81.7	40.8	11.5	8.4	.3
44.00	NC	99.9	99.8	94.3	11.3	2.8	.1
44.25	NC	98.5	97.8	89.1	6.1	1.2	.1
48.50	NC	99.4	95.2	73.4	20.4	7.9	.2
51.00	910.0	96.6	86.2	39.4	9.2	4.7	.1
55.50	905.7	95.3	90.0	53.5	3.4	.6	.1
56.00	905.1	98.7	95.5	84.3	40.5	10.7	.1
56.25	904.8	99.4	98.9	85.0	21.3	5.2	.1
60.00	901.4	65.3	54.1	30.2	7.1	2.8	.1
61.00	900.4	95.8	95.1	91.7	40.4	8.6	.1
65.00	896.0	47.8	34.4	14.6	1.0	.3	.1
70.00	890.5	92.4	58.8	35.4	2.4	.6	.1
71.00	889.4	52.4	43.5	19.5	1.9	.5	.1
72.50	888.0	83.9	68.7	34.9	3.0	.7	.1
76.50	884.2	85.8	56.7	10.0	.4	.2	.1
78.00	882.7	92.6	80.2	28.9	.7	.2	.1
80.00	881.0	84.5	58.5	15.7	4.4	1.8	.1
81.00	878.5	96.1	86.9	44.1	1.2	.2	.1
87.00	873.0	98.2	92.9	58.7	3.7	.8	.1
88.50	871.3	94.8	83.4	35.0	7.4	2.3	.1
91.00	868.0	56.9	44.5	16.8	1.9	.6	.1
92.00	867.0	96.3	83.7	19.7	.9	.3	.1
94.00	864.8	94.8	79.6	21.5	1.7	.5	.1
98.00	860.0	16.9	13.6	8.3	2.8	1.1	.1
100.50	858.0	99.9	99.5	96.6	17.8	2.7	.1
102.00	856.6	69.3	50.3	21.7	8.2	2.2	.1
106.00	851.7	88.6	75.2	27.3	1.3	.3	.1
106.50	851.0	79.6	63.6	36.5	5.1	1.1	.1
108.00	850.0	91.9	75.8	21.5	.9	.3	.1
113.00	845.5	76.7	53.0	6.4	.1	.1	.1
115.50	843.0	45.4	40.2	26.2	3.2	.7	.1
124.00	833.6	95.7	82.1	48.4	9.4	1.9	.1
128.00	829.5	98.8	94.6	58.5	6.7	1.3	.1
131.50	826.0	97.7	92.6	46.5	1.8	.4	.1
137.00	819.5	51.8	41.9	19.2	2.7	.7	.1
138.00	817.2	95.8	85.7	36.1	1.3	.3	.1
141.50	813.0	71.7	49.7	12.8	2.3	.9	.1
142.00	811.5	87.7	70.3	19.6	1.4	.5	.1
144.00	808.9	52.5	35.2	21.4	7.9	2.8	.1
146.00	806.0	99.3	94.8	39.3	3.4	1.2	.1
150.50	800.4	92.5	76.3	31.3	2.7	.7	.1
155.25	795.5	76.6	62.0	28.9	4.5	1.3	.1
158.50	791.5	87.7	67.0	29.6	3.0	.7	.1
160.50	790.3	92.6	78.2	28.6	2.9	1.1	.1
161.50	789.2	91.4	75.9	37.5	3.6	1.1	.1
163.75	787.9	93.6	86.9	38.3	1.7	.4	.1
170.75	780.9	94.8	86.8	41.9	2.3	.5	.1
172.50	780.0	93.7	78.8	31.1	1.8	.5	.1
176.00	775.6	99.9	99.9	95.2	16.4	2.9	.1
178.50	NC	89.8	75.1	19.7	.5	.2	.1
181.75	772.5	77.1	57.2	17.8	3.1	1.0	.1

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	--- Percent finer than indicated size ---					
		2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
182.75	771.3	96.1	87.8	56.7	34.7	31.9	.9
186.50	767.9	69.0	67.7	43.3	5.3	1.2	.1
194.00	NC	91.3	78.8	16.0	.8	.3	.1
195.00	NC	94.5	82.6	35.1	1.0	.2	.1
200.00	757.0	97.9	92.5	62.7	11.1	2.4	.1
201.50	755.3	77.8	65.2	16.2	.8	.3	.1
205.00	NC	93.7	80.1	18.9	.6	.2	.1
209.00	NC	63.6	53.4	20.4	3.0	1.4	.1
210.75	NC	99.2	96.1	38.8	2.1	.7	.1
215.50	746.9	97.6	91.8	37.3	3.1	.9	.1
219.25	742.6	99.9	99.8	92.9	9.3	1.7	.1
221.50	739.5	93.2	88.1	66.6	40.0	16.0	.1
225.00	736.5	99.1	96.7	69.4	7.2	2.0	.1
229.00	734.0	99.9	99.5	82.4	3.7	.8	.1
230.00	732.8	82.4	78.7	40.7	2.1	.6	.1
231.00	731.7	99.8	98.9	65.5	1.5	.3	.1
236.75	725.9	99.9	99.9	94.5	5.9	1.1	.1
241.00	721.6	98.8	95.7	59.2	2.3	.6	.1
243.00	719.7	96.8	92.1	51.3	6.1	1.1	.1
244.00	719.0	97.6	89.9	43.7	2.4	.6	.1
247.50	715.9	99.5	97.3	62.4	2.3	.4	.1
249.75	714.0	99.9	99.9	91.1	8.6	1.9	.1
250.50	712.8	99.9	99.8	89.7	11.2	1.8	.1
251.00	712.0	98.0	90.1	58.7	10.5	2.2	.1
251.75	711.2	40.9	34.1	19.5	5.3	1.4	.1
252.25	710.5	91.8	80.9	28.7	.6	.2	.1
252.50	710.0	90.0	79.2	25.7	.8	.2	.1
253.25	709.5	99.7	99.1	85.0	5.9	.7	.1
254.00	708.7	99.9	99.9	94.0	9.7	1.1	.1
254.13	708.6	95.0	83.2	40.9	6.9	1.3	.1
254.25	708.5	72.2	56.2	30.8	4.7	1.0	.1
254.50	708.2	84.8	75.0	48.7	21.1	6.7	.1
254.75 A	707.9	86.0	55.4	8.3	1.3	.4	.1
254.75 B	707.9	95.9	89.1	58.3	11.1	1.9	.1
255.00	707.6	92.7	85.2	33.3	2.5	.6	.1
255.50	706.9	97.7	91.7	46.5	2.8	.7	.1
255.75 A	706.6	99.3	97.2	55.4	4.4	1.1	.1
255.75 B	706.6	84.0	70.6	17.6	.5	.2	.1
256.25	706.0	92.4	86.4	48.7	4.5	1.0	.1
256.50	705.3	98.5	75.6	20.0	4.1	1.0	.1
258.00	704.2	98.7	97.0	48.5	5.6	1.4	.1
259.00	703.3	93.7	85.9	53.4	7.2	3.7	.3
260.25	701.9	99.0	93.3	47.4	7.9	1.5	.1
261.50	700.7	98.5	97.4	79.7	15.1	3.5	.1
263.25	698.9	95.6	85.3	36.9	1.3	.2	.1
264.50	697.5	95.9	88.8	51.4	10.8	2.5	.1
266.00	696.0	82.3	77.4	38.8	3.6	.8	.1
266.50	695.5	91.1	77.7	29.9	1.4	.2	.1
267.00	695.0	86.8	78.7	51.3	35.9	33.4	.9
269.50	691.9	99.9	98.8	80.9	9.6	1.3	.1
270.50	690.3	99.5	96.3	48.7	3.9	.6	.1
271.50	689.3	94.7	87.0	40.5	2.4	.5	.1
272.50	688.6	98.9	97.9	89.0	14.8	3.2	.1
272.75	688.0	93.3	90.1	41.7	1.4	.3	.1
273.00	687.5	99.9	99.6	93.5	56.9	36.9	.7
273 A	687.5	90.3	79.6	41.3	3.3	.7	.1
273.75	686.4	80.9	72.9	53.8	44.0	43.0	1.1
277.50	681.6	99.4	97.6	72.9	11.0	1.7	.1
280.75	NC	93.3	75.8	33.0	4.0	1.1	.1
281.50	NC	93.9	87.7	45.9	2.1	.3	.1
283.50	NC	98.6	95.2	45.7	5.4	1.6	.1
286.75	NC	97.7	78.5	7.2	.6	.3	.1
287.25	NC	99.5	98.6	60.6	2.5	.5	.1
289.25	NC	99.4	97.5	64.7	4.5	1.1	.1
292.50	NC	98.6	91.4	34.4	2.0	.6	.1
293.00	NC	26.5	24.9	13.2	2.0	.7	.1
293.75	677.0	77.3	67.8	27.5	1.5	.4	.1
296.00	674.0	99.4	95.0	67.2	33.0	11.1	.1
298.50	672.5	96.9	90.2	49.4	5.0	1.3	.1
300.00	670.0	97.4	83.9	18.4	.7	.3	.1
300.75	669.2	95.3	87.8	40.1	.9	.2	.1
301.50	668.4	93.7	84.8	44.6	5.7	1.9	.1
302.75	667.1	99.6	98.7	60.4	2.9	.6	.1
303.25	NC	99.8	99.6	90.9	5.7	.8	.1
303.50	NC	99.9	99.7	94.9	11.7	1.7	.1
303.75	NC	95.4	89.4	34.4	1.1	.2	.1
304.00	666.9	99.9	99.9	99.4	87.5	32.1	.1
306.75	663.7	99.9	99.6	34.6	2.0	.8	.1
310.00	660.3	98.9	98.5	92.3	34.4	5.5	.1
310.75	659.4	92.9	86.3	42.1	.8	.2	.1

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	--- Percent finer than indicated size --- 2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
313.75	656.7	99.5	97.9	74.5	9.2	1.7	.1
314.25	656.4	99.9	99.8	95.5	11.1	1.6	.1
316.25	654.2	98.3	96.3	33.4	3.6	2.1	.1
317.50	653.0	98.2	97.0	82.7	8.7	1.3	.1
321.50	649.0	99.2	95.3	47.3	5.1	1.2	.1
324.50	646.0	95.6	86.4	51.1	8.5	1.9	.1
329.50	640.6	25.6	16.9	7.0	1.0	.4	.1
330.00	640.1	99.9	99.0	30.5	.6	.2	.1
331.00	639.0	99.9	99.6	68.8	.8	.2	.1
332.00	637.8	99.9	99.4	90.5	22.9	3.1	.1
333.50	635.8	97.9	92.8	54.3	22.5	13.5	.2
337.00	632.1	92.1	78.1	14.2	.6	.3	.1
338.75	630.2	99.7	98.9	95.9	48.9	5.9	.1
339.50	629.3	99.6	99.2	94.5	15.6	1.6	.1
342.75	NC	99.9	99.7	93.8	25.0	4.8	.1
344.00	NC	99.9	99.8	99.2	50.2	6.2	.1
348.00	625.8	75.5	50.3	28.0	7.9	3.7	.2
349.00	NC	97.4	93.4	80.3	16.0	4.0	.1
350.00	NC	32.5	28.8	19.8	3.1	.8	.1
351.00	NC	99.9	99.5	87.4	2.9	.4	.1
352.25	NC	97.7	94.6	43.2	.7	.2	.1
352.50	NC	99.9	99.9	97.1	15.4	1.6	.1
353.00	NC	98.9	96.8	70.0	3.4	.5	.1
356.00	NC	95.8	88.8	23.4	2.7	1.4	.1
357.50	NC	81.4	72.0	28.4	.7	.2	.1
359.00	NC	98.8	98.5	91.2	26.3	3.8	.1
360.75	624.1	62.6	52.6	30.3	10.5	3.2	.1
362.50	622.0	99.1	96.7	63.1	7.4	1.4	.1
363.25	621.5	99.9	99.8	94.1	37.8	6.4	.1
366.50	618.0	99.7	99.5	91.5	11.0	2.0	.1
371.75	613.0	98.7	96.9	64.7	11.5	2.6	.1
372.00	612.4	99.9	99.7	94.7	54.4	25.2	.2
372.75	611.5	97.1	96.0	80.4	32.1	26.9	.8
375.00	608.9	91.2	89.4	62.9	20.6	7.7	.1
376.75	607.1	80.5	66.7	49.4	15.5	5.3	.2
378.50	605.0	99.9	99.7	97.2	38.5	10.7	.1
381.00	603.4	91.1	84.5	51.9	9.8	4.7	.3
382.00	NC	99.9	99.8	95.8	53.3	21.3	.2
390.50	593.1	99.1	98.6	93.6	72.5	31.1	.1
391.50	591.3	99.9	99.8	96.9	65.7	29.2	.1
393.00	590.5	99.9	99.7	96.0	51.2	20.8	.3
394.00	590.0	66.8	49.1	22.0	10.5	7.8	.2
395.00	589.0	99.4	97.2	61.6	8.5	5.6	.2
396.00	587.2	99.8	97.7	59.9	9.1	6.4	.2
396.25	586.9	79.6	64.5	19.9	2.6	1.5	.1
397.00	586.3	25.4	25.1	21.4	1.8	.3	.1
397.25	586.0	99.5	99.0	97.4	86.7	45.8	.1
397.50	585.5	99.9	99.9	98.0	26.8	4.4	.1
397.5 A	585.5	96.7	94.5	71.7	2.9	.4	.1
398.00	585.1	98.4	97.3	52.0	1.6	.4	.1
398.25	N/A	99.9	99.5	92.6	56.8	36.4	.6
398.50	585.0	99.9	99.5	82.7	3.6	.7	.1
399.00	584.8	99.8	99.6	98.5	59.5	14.7	.1
399.75	584.0	99.9	99.8	98.9	73.8	18.7	.1
401.00	581.6	98.3	95.1	77.0	52.2	25.6	.1
401.50	581.3	22.4	20.5	16.1	7.1	3.8	.2
402.00	580.7	25.0	16.7	7.6	1.2	.4	.1
403.00	579.9	6.8	5.0	2.0	.2	.1	.1
404.00	576.3	93.0	87.9	55.8	1.9	.4	.1
404.50	NC	99.9	99.9	99.0	11.6	1.4	.1
406.00	NC	99.9	99.8	98.5	54.5	15.3	.1
407.50	NC	99.9	99.9	99.9	99.9	99.7	87.1
410.00	NC	99.9	99.7	98.7	28.2	2.6	.1
411.50	NC	51.1	48.4	30.1	3.3	1.3	.1
412.50	NC	56.3	38.8	15.6	.8	.2	.1
413.50	NC	92.8	85.6	60.0	12.9	2.7	.1
416.00	NC	99.5	98.5	70.6	2.8	.6	.1
419.00	NC	98.1	97.4	88.2	15.7	3.1	.1
420.00	NC	99.9	99.6	85.2	6.2	1.1	.1
423.00	NC	99.0	97.9	86.1	30.3	7.1	.1
424.50	NC	99.9	99.9	99.9	99.9	99.6	78.7
425.50	571.2	69.1	63.9	29.8	5.0	2.3	.1
426.50	568.3	99.9	99.9	99.9	99.9	99.3	66.9
428.00	566.9	99.8	99.4	80.8	9.2	5.3	.2
429.50	565.4	98.7	96.2	62.0	5.8	2.0	.1
429.75	565.1	99.2	98.9	94.3	21.3	5.3	.1
430.50	564.5	8.1	5.4	2.6	.2	.1	.1
431.50	563.5	95.2	85.6	29.3	.9	.2	.1
433 A	560.4	99.9	99.9	97.9	36.8	11.7	.1
433 B	560.4	84.2	80.6	51.7	1.4	.3	.1

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	--- Percent finer than indicated size ---					
		2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
433.50	559.8	86.6	80.3	53.4	5.3	1.1	.1
435.50	557.0	99.9	99.4	92.5	22.6	10.6	.4
436.75	NC	99.9	99.9	99.1	55.0	20.6	.1
438.50	NC	99.2	98.8	92.9	33.8	10.9	.1
439.50	554.5	99.9	99.3	92.7	41.2	27.2	.6
441.00	553.1	95.5	94.7	86.7	55.3	45.2	.7
441.50	552.2	98.5	94.6	60.9	6.5	3.4	.2
442.50	551.8	99.9	99.7	90.7	1.4	.3	.1
443.50	549.7	99.9	99.9	98.9	10.6	.9	.1
447.50	NC	79.6	59.5	20.7	8.4	4.0	.1
449.00	NC	99.1	97.2	82.9	24.0	6.3	.1
451.50	NC	99.9	99.9	99.9	99.9	99.9	92.1
452.50	NC	99.9	99.8	80.7	1.5	.6	.1
454.00	NC	99.9	99.9	99.9	99.9	99.8	91.1
454.50	NC	30.0	21.7	8.2	.5	.2	.1
455.50	NC	99.9	99.6	83.1	.9	.1	.1
456.50	548.2	99.4	98.9	87.0	8.8	1.3	.1
457.50	547.3	94.2	83.3	43.4	1.6	.3	.1
459.00	546.0	48.6	43.4	15.8	.9	.3	.1
459.25	545.5	94.1	86.4	59.6	24.6	12.1	.2
460.50	544.4	96.0	84.2	43.5	10.3	2.4	.1
461.50	543.6	99.9	99.6	60.9	7.0	2.1	.1
462.00	NC	51.9	46.2	24.2	2.2	.5	.1
464.00	NC	96.6	92.5	53.2	1.3	.3	.1
464.25	NC	99.4	98.3	85.4	8.6	1.2	.1
465.50	NC	95.8	93.6	77.7	12.4	1.9	.1
466.00	NC	99.9	99.9	98.1	21.5	2.5	.1
466.50	NC	99.5	99.1	96.1	39.0	6.8	.1
468.00	NC	97.7	92.4	63.4	34.9	12.2	.1
469.50	NC	81.9	59.0	41.0	37.9	20.1	.1
470.50	NC	96.3	95.0	47.3	1.9	.9	.1
472.50	540.0	97.3	81.8	8.7	.2	.2	.1
474.00	NC	99.9	98.9	58.4	1.4	.3	.1
475.00	NC	99.9	99.9	77.1	2.2	.4	.1
475.75	NC	89.3	89.1	82.5	3.6	.4	.1
476.25	NC	99.9	99.7	93.3	2.1	.3	.1
477.50	NC	98.0	96.9	79.4	28.7	4.6	.1
479.75	NC	98.0	97.0	78.9	10.2	2.8	.1
481.00	NC	99.9	99.9	99.2	36.1	10.3	.2
481.25	NC	44.2	41.1	25.6	3.6	.9	.1
481.75	NC	71.7	66.7	42.6	8.0	1.4	.1
482.00	NC	99.9	99.9	99.4	22.3	2.5	.1
483.00	NC	99.9	99.8	87.4	9.0	1.4	.1
484.00	538.6	99.9	99.8	82.7	8.5	1.9	.1
484.25	538.4	.1	.1	.1	.1	.1	.1
484.75	537.9	60.4	29.2	5.0	.4	.2	.1
485.25 A	537.4	99.7	96.9	48.3	1.5	.4	.1
485.25 B	537.4	18.2	10.1	4.0	.4	.1	.1
486.00	536.7	99.5	98.7	65.7	5.9	1.1	.1
487.00	535.8	97.4	93.6	47.6	19.6	9.9	.1
488.5 A	534.4	99.9	99.9	99.1	22.3	3.3	.1
488.5 B	534.4	99.5	95.8	50.0	2.3	.5	.1
489.00	534.1	99.1	98.0	83.2	8.9	1.6	.1
489.25	533.9	99.9	99.9	99.9	99.9	99.6	65.8
489.50	533.7	99.6	99.5	97.1	20.9	2.1	.1
489.75	533.6	86.8	84.3	55.9	1.8	.3	.1
490.00	533.4	99.9	99.9	99.2	28.6	3.0	.1
490.5 A	532.8	99.9	99.9	95.3	13.2	1.6	.1
490.5 B	532.8	93.7	89.6	66.6	2.6	.3	.1
491.00	532.1	99.7	99.2	96.6	15.8	1.8	.1
491.25	531.8	99.8	99.7	97.9	16.1	1.8	.1
492.50	530.4	99.6	97.8	91.0	65.0	29.4	.2
493.50	529.4	41.5	29.6	9.5	1.9	.6	.1
494.00	528.9	46.8	40.6	15.9	2.9	1.2	.1
494.50	528.4	96.1	95.7	73.8	2.0	.4	.1
496.00	526.0	99.9	99.7	96.5	14.9	3.0	.1
497.00	525.9	96.2	89.4	66.9	17.8	5.2	.1
498.75	524.4	99.8	99.2	95.0	55.3	20.9	.2
500.00	523.0	92.8	83.8	41.2	1.2	.3	.1
501.50	521.4	44.6	39.2	26.9	5.9	2.1	.1
502.00	520.9	99.4	97.6	60.3	2.7	.5	.1
503.50	519.0	98.8	96.5	75.6	9.2	1.4	.1
505.50	516.3	90.7	87.5	72.2	22.3	8.4	.2
507.00	NC	99.9	99.9	94.4	20.0	4.4	.1
508.75	NC	98.6	94.6	53.3	5.4	1.4	.1
510.50	NC	98.9	98.1	81.6	4.4	1.0	.1
512.25	NC	99.9	99.9	97.0	48.3	21.0	.2
513.00	513.0	99.9	99.8	99.3	52.9	19.9	.2
514.00	511.6	1.0	.9	.6	.2	.2	.1
514.50	511.2	67.4	67.0	59.8	6.4	1.0	.1

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	2.0 mm	1.0 mm	--- Percent finer than indicated size --- 0.5 mm	0.250 mm	0.125 mm	0.062 mm
515.00	510.8	97.8	95.4	81.9	6.8	.8	.1
517.00	508.8	91.9	90.5	75.8	36.5	13.1	.1
518.00	507.6	90.7	81.5	39.0	4.8	1.4	.1
519.50	NC	85.1	75.0	39.2	3.5	.9	.1
520.50	NC	99.9	99.9	92.5	10.2	1.5	.1
521.75	NC	99.4	98.7	95.3	22.0	2.2	.1
522.50	NC	99.8	99.2	83.6	11.1	2.2	.1
523.50	NC	99.8	98.8	93.9	64.8	47.5	.3
526.00	NC	98.2	96.9	84.8	21.0	9.2	.1
526.75	NC	99.8	99.4	96.6	47.0	6.5	.1
527.25	NC	99.9	99.9	99.3	51.9	5.9	.1
528.00	NC	99.8	99.5	97.6	38.6	3.8	.1
530.00	499.8	99.9	99.9	98.4	17.6	1.8	.1
530.50	499.6	99.9	99.9	97.6	42.9	7.9	.1
532.00	497.7	99.9	99.9	99.5	61.4	10.0	.1
533.50	496.5	99.2	98.1	87.9	26.5	4.6	.1
536.00	494.1	98.9	95.0	61.2	7.0	1.9	.1
537.00	492.9	74.2	65.6	38.3	8.8	2.2	.1
537.50	492.3	99.6	98.6	65.7	4.1	.9	.1
538.50	491.0	97.6	94.3	65.3	6.8	1.6	.1
538.75	490.7	91.4	87.8	55.6	2.6	.6	.1
539 A	490.4	95.9	91.0	56.4	2.4	.5	.1
539 B	490.4	99.9	99.8	97.9	37.1	6.9	.1
539.25	490.0	99.8	99.8	98.3	34.3	6.3	.1
539.75	489.4	99.5	99.2	98.1	86.6	51.4	.2
540.00	489.1	99.7	98.2	72.5	4.4	1.2	.1
540.25	488.8	86.8	83.6	51.6	1.7	.3	.1
540.25 A	488.8	94.8	87.8	37.4	.9	.3	.1
541.25	487.5	99.9	99.9	99.7	54.0	8.3	.1
541.50	487.5	99.9	99.9	99.1	56.5	24.5	.5
543.75	485.8	99.9	99.9	88.7	5.6	1.0	.1
546.25	483.4	99.9	99.8	90.5	2.4	.3	.1
548.00	480.7	92.5	89.1	70.8	17.5	3.5	.1
548.50	480.2	19.2	15.1	7.4	1.1	.3	.1
549.00	479.6	87.4	81.0	54.4	3.5	.6	.1
549.50	479.1	99.9	99.9	96.7	15.9	3.4	.1
551.00	477.5	84.2	71.2	29.9	1.8	.5	.1
554.00	474.3	99.7	98.5	47.4	4.9	2.4	.1
555.00	473.2	81.2	73.7	18.4	1.8	.8	.1
556.00	472.5	99.5	98.7	87.7	38.9	10.0	.1
558.50	470.6	99.3	98.3	81.4	23.8	9.1	.1
560.00	469.1	99.5	98.3	85.3	21.7	3.0	.1
560.50	468.6	98.7	97.7	86.4	15.5	2.2	.1
563.50	465.6	99.5	95.6	57.3	8.2	2.6	.1
565.00	NC	90.2	82.3	36.2	.7	.2	.1
566.50	NC	99.3	98.4	82.8	3.8	.6	.1
568.00	NC	88.1	73.5	38.7	1.4	.3	.1
569.50	NC	97.2	96.7	91.6	9.8	1.1	.1
570.75	NC	99.9	99.9	99.9	99.9	99.9	73.3
572.50	NC	99.9	99.8	82.1	13.0	5.8	.1
573.50	NC	81.0	76.7	37.9	1.9	.6	.1
575.00	NC	.1	.1	.1	.1	.1	.1
575.50	NC	21.4	17.6	6.6	.3	.2	.1
577.00	NC	89.6	81.6	34.6	.8	.2	.1
578.00	460.0	99.9	99.6	83.2	10.5	1.8	.1
579.00	458.9	98.8	97.6	80.6	13.0	1.9	.1
580.00	458.1	98.6	97.9	69.2	11.4	4.3	.1
581.00	457.0	31.1	27.3	15.0	4.6	2.0	.1
581.75	455.8	99.8	98.3	49.7	10.1	4.7	.1
583.00	454.8	63.0	57.6	21.5	1.1	.4	.1
583.50	454.0	84.6	79.1	29.8	.7	.2	.1
586.25	451.0	92.6	90.0	64.2	5.7	1.6	.1
586.75	NC	95.1	89.6	50.8	4.1	2.4	.3
588.00	NC	56.8	53.4	21.9	3.1	1.2	.1
589.00	NC	99.8	99.4	84.6	4.9	.8	.1
590.00	NC	99.9	99.9	99.9	99.9	99.8	85.1
591.00	NC	98.0	96.8	80.8	8.9	2.1	.2
593.00	NC	99.5	97.7	84.3	18.1	2.6	.1
595.00	444.1	95.9	88.7	54.1	9.2	4.0	.1
595.25	443.8	90.4	90.2	86.6	28.0	8.5	.1
595.50	443.6	63.8	52.9	19.9	2.1	.9	.1
595.5 A	443.6	99.9	99.9	99.8	84.0	34.5	.2
595.75	443.3	20.2	19.4	12.6	1.1	.3	.1
595.75 A	443.3	99.9	99.8	99.7	94.5	61.5	.2
596.25	442.8	58.2	56.4	36.6	2.4	.5	.1
596.50	442.5	.1	.1	.1	.1	.1	.1
596.5 A	442.5	97.7	91.1	45.4	[illegible]	.9	.1
596.75	442.3	99.9	99.8	93.6	11.5	1.4	.1
597.00	442.0	63.9	60.3	51.4	16.3	2.8	.1
597 A	442.0	99.9	99.9	99.8	95.2	52.3	.1

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	-- Percent finer than indicated size --- 2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
597.50	441.5	88.0	68.9	14.4	.5	.2	.1
597.5 A	441.5	99.9	99.9	91.9	11.5	1.5	.1
598.00	441.0	99.9	99.8	98.6	60.4	13.4	.1
598.25	440.7	76.1	65.9	20.4	.8	.3	.1
598.50	440.4	92.4	89.8	49.7	.9	.2	.1
598.5 A	440.4	99.9	99.9	98.6	66.7	22.8	.1
599.00	439.9	89.5	86.4	62.4	5.2	.8	.1
599 A	439.9	99.9	99.9	98.9	84.3	32.6	.1
599.50	439.4	91.9	80.5	31.0	1.1	.3	.1
599.5 A	439.4	99.9	99.7	82.0	13.4	3.3	.1
599.75	439.1	99.7	97.8	77.9	43.8	28.4	.3
600.00	438.9	99.7	98.8	78.3	4.3	.7	.1
600 A	438.9	99.7	99.3	79.2	5.4	1.1	.1
600.50	438.3	99.9	99.9	98.4	38.7	5.3	.1
601.60	437.2	99.9	99.9	98.8	46.9	6.7	.1
601.75	437.0	99.9	99.8	95.2	33.9	4.9	.1
602.50	436.2	99.9	99.3	98.2	92.2	60.3	.2
603.00	435.7	60.7	59.4	51.9	34.0	19.0	.3
604.75	434.0	98.9	97.1	50.5	5.4	1.8	.1
605.75	433.1	99.9	99.9	99.4	48.9	6.8	.1
606 A	432.9	99.9	99.9	99.8	73.6	11.9	.1
606.00	432.9	99.9	99.5	48.9	2.4	.7	.1
606.50	432.4	99.9	99.9	99.5	56.8	8.0	.1
606.75	432.2	99.9	99.9	91.2	6.9	1.1	.1
607.50	431.5	99.9	99.9	99.3	80.1	31.8	.1
608.00	431.0	99.1	97.5	82.8	14.1	2.2	.1
608.25	430.8	98.9	97.2	81.7	9.2	1.6	.1
608.50	430.6	99.9	99.9	91.5	35.9	13.9	.1
609.00	430.1	99.9	99.9	99.4	43.0	7.5	.1
609.50	429.7	84.2	79.3	55.5	7.1	1.4	.1
610.00	429.2	99.2	98.6	83.9	10.9	1.5	.1
611.00	428.5	99.8	99.5	91.8	6.4	.9	.1
612.00	427.3	91.1	86.3	40.2	5.8	3.2	.1
612.25	427.0	99.6	99.3	91.2	19.2	4.8	.1
613.00	426.1	99.9	99.6	91.3	6.1	1.2	.1
614.00	NC	99.9	99.9	99.8	80.8	18.6	.2
614 A	NC	99.9	99.9	99.1	81.1	65.4	1.3
615.00	NC	99.9	99.7	83.1	11.9	3.8	.2
617.00	NC	99.5	98.5	77.0	13.7	3.8	.1
619.00	NC	62.5	60.1	40.7	17.1	14.1	.5
620.00	NC	99.9	99.9	99.9	99.9	99.6	66.1
625.00	NC	85.5	72.1	24.8	1.5	.3	.1
628.00	421.6	99.9	99.9	98.6	95.0	79.1	.3
630.00	418.3	96.4	93.0	57.4	5.9	2.0	.1
631.00	417.0	99.9	99.9	95.9	22.0	3.7	.1
631 A	417.0	99.9	99.5	83.5	4.0	.6	.1
633.00	415.3	99.2	98.6	88.7	65.4	36.4	.2
633 A	415.3	97.2	94.0	49.2	2.1	.5	.1
635.00	412.3	99.9	99.8	84.5	4.6	1.1	.1
638.00	409.0	99.9	99.9	99.9	99.9	99.9	92.1
639.00	NC	99.9	99.9	89.3	30.1	10.8	.1
640.00	NC	99.9	99.9	99.6	98.8	95.8	.9
642.00	NC	99.9	99.9	99.5	97.9	90.9	.5
643.00	NC	99.9	99.9	99.9	99.9	99.6	84.8
647.00	NC	99.9	99.9	99.9	99.9	99.6	81.3
648.00	406.8	99.9	99.5	82.0	6.9	1.9	.1
650.00	405.1	99.9	99.7	96.3	54.2	19.7	.1
657.00	396.8	50.2	46.3	21.4	2.4	.9	.1
659.00	395.3	99.8	99.3	91.3	29.2	3.8	.1
659 A	395.3	99.9	99.4	82.1	9.2	1.7	.1
662.00	392.1	93.4	88.4	63.5	18.6	10.8	.4
666.00	NC	96.9	94.2	60.4	3.7	.8	.1
670.00	NC	55.4	52.8	32.5	2.9	1.0	.1
671.00	NC	99.5	99.1	94.4	14.6	1.8	.1
676.00	381.7	66.1	63.6	38.4	6.2	2.2	.1
683.00	374.5	94.7	88.2	51.7	9.8	3.3	.1
687.00	370.7	99.9	99.8	89.5	13.4	1.9	.1
689.00	368.7	99.9	99.9	96.6	69.1	29.8	.2
693.00	NC	99.6	98.7	88.1	23.5	5.0	.1
696.00	NC	99.9	99.9	97.5	13.8	1.7	.1
701.00	NC	95.7	92.8	27.2	1.1	.4	.1
708.50	360.7	96.0	94.2	51.7	4.6	.9	.1
709.00	360.2	99.9	99.9	99.2	39.6	5.9	.1
710.00	359.2	99.9	99.9	99.4	71.7	22.0	.1
710.75	358.5	77.0	69.7	32.1	.9	.2	.1
711.00	358.2	99.9	99.8	98.8	58.3	15.3	.1
712.25	357.0	83.6	82.8	59.8	2.1	.4	.1
713.00	356.2	99.9	99.8	94.6	14.6	1.8	.1
713 A	356.2	99.9	99.9	99.7	73.5	20.1	.1
715.75	353.2	99.9	99.6	95.3	47.6	14.0	.1

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	--- Percent finer than indicated size ---					
		2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
716.25	352.7	81.9	80.2	61.4	10.4	3.2	.1
718.50	350.3	99.9	99.8	93.4	20.3	2.6	.1
720.00	348.7	98.3	97.5	81.7	11.3	2.2	.1
722.00	346.0	99.9	99.7	91.1	17.1	3.6	.1
723.50	NC	99.9	99.9	98.1	77.1	50.1	.2
725.50	NC	97.6	95.0	59.2	2.9	.8	.1
728.50	NC	99.9	99.9	99.6	98.4	86.8	.3
733.00	NC	97.5	95.3	81.0	20.4	5.4	.1
736.00	NC	99.9	99.9	98.3	28.0	6.7	.1
740.00	337.1	98.7	97.8	91.4	16.3	3.0	.1
742.00	335.4	94.3	85.9	34.9	3.6	1.4	.1
745.00	331.8	99.9	99.8	98.7	24.4	4.8	.1
749.00	326.5	95.3	88.3	36.2	1.3	.4	.1
752.00	323.5	99.9	99.9	99.8	96.5	58.0	.1
756.50	318.9	99.9	99.2	93.2	80.8	75.1	1.5
757.00	318.4	99.9	99.9	99.9	99.9	99.9	99.9
758.50	316.6	98.8	96.0	61.1	13.9	10.5	.3
759.50	315.6	99.9	99.9	99.6	39.3	4.8	.1
760.00	315.1	99.9	99.9	98.6	10.7	1.9	.1
760.25	314.8	99.9	99.9	99.8	91.7	37.0	.1
760.50	314.6	99.8	99.4	85.2	5.9	.8	.1
760.75	314.3	87.2	84.0	36.3	1.6	.5	.1
761.50	313.5	99.9	99.8	99.1	94.3	65.7	.2
763.00	312.0	99.9	99.8	99.5	99.1	91.1	.3
766.00	309.0	95.2	94.4	49.7	4.9	2.4	.1
767.00	308.3	99.9	99.9	97.7	20.7	3.9	.1
767.50	307.6	66.8	66.0	39.0	3.2	.7	.1
768.00	307.1	99.9	99.9	99.9	99.1	89.9	.4
770.00	304.6	92.2	90.6	75.9	18.7	6.7	.2
770.50	303.9	96.0	94.1	66.6	6.4	2.0	.1
771.00	303.2	98.6	98.2	78.2	7.6	2.3	.1
771.50	302.7	85.6	80.4	58.0	15.1	4.9	.1
773.50	300.4	99.9	99.8	98.0	86.0	65.5	.2
777.50	296.2	78.1	76.3	50.0	6.8	2.5	.1
785.75	288.0	98.6	98.0	81.1	23.1	7.1	.1
786.75	287.1	98.7	98.4	94.1	43.4	11.5	.1
787.00	286.9	96.8	95.7	79.6	13.4	2.6	.1
800.00	273.5	99.9	99.9	99.7	81.2	15.7	.1
807.00	266.3	99.3	98.4	77.5	16.1	7.0	.1
814.00	259.4	99.9	99.9	98.5	53.3	5.8	.1
826.50	246.2	99.9	99.9	99.8	80.4	14.0	.1
835.50	236.6	99.9	99.6	87.3	17.7	3.5	.1
838.00	234.2	99.9	99.9	99.9	99.9	99.5	82.7
840.50	231.4	99.9	99.9	98.7	22.8	3.3	.1
842.00	230.0	99.8	98.9	81.1	7.3	1.8	.1
847.50	224.8	99.9	99.8	98.7	18.6	3.0	.1
860.00	211.5	99.9	99.9	99.6	86.2	21.4	.1
861.00	210.5	99.9	99.9	99.7	40.7	4.4	.1
867.50	204.0	99.9	99.8	99.7	86.8	31.5	.2
882.50	188.3	99.9	99.8	97.6	18.8	2.9	.1
896.00	174.8	99.9	99.9	99.2	22.6	3.5	.1
911.00	159.6	99.9	99.9	99.8	88.2	46.9	.6
917.00	153.2	99.9	99.9	99.9	84.2	25.4	.1
924.00	146.4	99.9	99.9	99.7	88.5	27.0	.1
937.00	133.6	99.9	99.9	99.9	90.2	43.0	.5
967.50	103.0	99.9	99.9	99.8	78.7	21.7	.1
968.50	102.0	99.9	99.9	99.9	99.0	75.4	.2
972.25	97.6	99.9	99.9	99.6	16.6	3.1	.1
977.00	93.0	99.9	99.9	99.9	99.3	98.9	96.8
979.50	90.6	99.9	99.9	99.8	59.2	16.1	.2
983.00	87.0	99.9	99.9	99.9	70.4	11.4	.1
986.75	83.5	99.9	99.9	99.4	74.7	49.0	30.0
990.25	79.8	99.9	99.9	99.7	40.7	8.9	.1
992.75	77.7	99.9	99.9	99.6	97.1	96.4	95.2
994.50	76.0	99.9	99.9	99.9	78.6	21.9	.1
997.75	72.3	99.9	99.9	99.7	98.4	97.3	89.9
999.50	70.7	99.9	99.9	99.4	94.2	62.8	.3
1001.50	68.7	99.9	99.9	99.9	99.9	99.9	98.0
1004.25	64.8	99.9	99.9	99.9	8[illegible].4	26.1	.1
1007.00	63.0	99.9	99.9	99.8	89.[illegible]	55.2	.2
1010.00	60.0	99.9	99.9	99.9	99.5	95.8	.8
1014.25	55.3	99.9	99.9	99.9	94.2	54.7	.1
1017.25	52.6	99.9	99.9	99.9	96.9	65.1	.2
1019.00	50.8	99.9	99.9	99.9	99.7	90.6	.2
1021.25	48.5	99.9	99.9	99.9	84.7	30.4	.2
1023.50	46.5	99.9	99.9	99.9	89.0	44.0	.1
1027.25	42.8	99.9	99.9	99.9	93.0	66.3	.6
1030.00	39.8	99.9	99.9	99.9	92.5	55.7	.2
1033.00	37.0	99.9	99.9	99.9	71.1	15.2	.2
1037.00	33.0	99.9	99.9	99.8	89.6	81.5	68.5

1932 River Mile below Cairo, Ill.	1989 River Mile Above Head of Passes	--- Percent finer than indicated size --- 2.0 mm	1.0 mm	0.5 mm	0.250 mm	0.125 mm	0.062 mm
1040.75	29.0	99.9	99.9	99.9	95.8	54.5	.2
1044.00	25.7	99.9	99.9	99.7	91.5	42.0	.2
1047.50	22.3	99.9	99.9	99.8	85.7	49.6	.2
1050.00	19.6	99.9	99.9	99.9	98.0	78.7	.2
1052.50	18.0	99.9	99.9	99.8	98.7	83.3	.3
1057.00	12.6	99.9	99.9	99.7	98.9	95.5	39.1
1058.25	11.6	99.9	99.9	99.9	99.9	99.9	97.2
1060.00	9.7	99.9	99.9	99.9	99.9	99.9	99.0
1062.25	7.7	99.9	99.9	99.9	92.4	57.0	.2
1064.00	6.0	99.9	99.9	99.9	98.1	92.4	73.9
1065.50	4.1	99.9	99.9	99.9	98.6	82.8	.2
1066.00	3.6	99.9	99.9	99.9	99.8	94.0	.2
1066.75	2.8	99.9	99.9	99.8	98.0	93.4	69.9
1067.75	1.8	99.9	99.9	99.9	96.5	92.1	78.3
1069.00	0.5	99.9	99.9	99.9	99.9	99.9	99.5
1069.50	0.0	99.9	99.9	99.9	83.4	45.9	.3

TABLE 11

COMPUTED STATISTICS FOR THE 1932 WES SAMPLES

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
2.00	953.8	0.46	1.21	4.57	3.20	0.15	2.38
6.00	950.0	0.01	0.06	0.11	4.88	--	--
7.00	949.0	0.27	0.33	0.40	1.22	0.64	0.36
10.00	945.5	0.27	0.53	1.58	2.46	0.17	1.14
12.00	943.0	0.27	1.26	0.33	2.44	0.02	11.85
13.00	NC	0.38	0.55	0.90	1.54	0.14	1.70
13.00 A	NC	0.38	0.82	15.16	10.35	0.03	8.79
14.00	NC	0.16	0.20	0.24	1.23	0.67	0.21
16.50	NC	0.06	0.95	16.79	16.48	0.01	7.77
19.25	NC	0.41	0.76	3.81	3.43	0.13	2.10
19.50	939.0	0.28	0.51	2.34	3.22	0.10	1.78
21.00	937.4	0.15	0.28	0.56	1.95	0.27	0.39
22.50	935.5	0.67	8.66	17.70	7.49	0.12	12.73
23.50	NC	0.41	0.65	8.77	7.57	0.07	3.54
25.00	NC	0.21	0.58	4.03	4.89	0.07	2.01
27.00	930.7	0.59	1.58	5.59	3.10	0.13	3.55
29.50	927.9	0.47	0.63	0.83	1.32	0.54	0.71
31.00	926.8	0.53	0.77	1.45	1.67	0.36	1.09
32.00	926.4	0.32	0.48	0.89	1.67	0.28	0.80
35.00	922.7	0.19	0.37	0.68	1.91	0.24	0.58
37.50	921.1	0.38	1.51	13.67	6.50	0.06	6.48
38.50	920.2	8.37	20.54	0.00	1.23	0.39	23.16
41.00	917.8	0.38	0.59	1.27	1.84	0.21	1.24
43.00	915.4	0.34	0.54	1.24	1.95	0.25	0.92
44.00	NC	0.27	0.34	0.41	1.24	0.65	0.36
44.25	NC	0.30	0.36	0.46	1.24	0.55	0.43
48.50	NC	0.23	0.36	0.65	1.70	0.39	0.45
51.00	910.0	0.34	0.56	0.93	1.66	0.36	0.73
55.50	905.7	0.33	0.48	0.77	1.54	0.30	0.79
56.00	905.1	0.19	0.27	0.50	1.65	0.35	0.39
56.25	904.8	0.22	0.34	0.49	1.48	0.48	0.39
60.00	901.4	0.35	0.82	5.79	4.72	0.09	2.70
61.00	900.4	0.20	0.26	0.37	1.37	0.22	0.59
65.00	896.0	0.52	2.23	8.25	4.00	0.12	4.14
70.00	890.5	0.39	0.58	1.17	1.75	0.30	0.93
71.00	889.4	0.46	1.61	14.25	6.17	0.06	5.88
72.50	888.0	0.37	0.64	2.03	2.46	0.14	1.69
76.50	884.2	0.56	0.89	1.88	1.86	0.32	1.29
78.00	882.7	0.44	0.60	1.14	1.64	0.32	0.96
80.00	881.0	0.50	0.88	1.96	1.99	0.26	1.41
81.00	878.5	0.37	0.53	0.90	1.57	0.33	0.80
87.00	873.0	0.33	0.46	0.71	1.47	0.44	0.58
88.50	871.3	0.36	0.59	1.03	1.68	0.34	0.81
91.00	868.0	0.49	1.32	13.84	6.61	0.06	5.69
92.00	867.0	0.48	0.67	1.01	1.46	0.45	0.83
94.00	864.8	0.47	0.67	1.12	1.56	0.39	0.88
98.00	860.0	1.55	15.12	20.45	5.57	0.27	20.03
100.50	858.0	0.24	0.31	0.38	1.26	0.62	0.33
102.00	856.6	0.39	0.99	7.12	4.84	0.07	4.13
106.00	851.7	0.42	0.66	1.39	1.83	0.17	1.63
106.50	851.0	0.33	0.68	2.59	2.94	0.16	1.47
108.00	850.0	0.47	0.68	1.29	1.68	0.32	1.04
113.00	845.5	0.59	0.94	3.22	2.51	0.18	2.15
115.50	843.0	0.37	3.87	16.11	7.28	0.05	8.71
124.00	833.6	0.28	0.52	1.06	1.95	0.27	0.79
128.00	829.5	0.30	0.47	0.68	1.50	0.46	0.55
131.50	826.0	0.37	0.51	0.75	1.42	0.44	0.65
137.00	819.5	0.46	1.68	13.64	5.89	0.06	6.05
138.00	817.2	0.40	0.56	0.94	1.54	0.38	0.78
141.50	813.0	0.53	1.01	5.13	3.49	0.11	3.16
142.00	811.5	0.47	0.72	1.57	1.85	0.19	1.61
144.00	808.9	0.38	1.83	6.49	4.21	0.13	3.31
146.00	806.0	0.39	0.54	0.75	1.38	0.53	0.60
150.50	800.4	0.38	0.64	1.27	1.82	0.31	0.94
155.25	795.5	0.36	0.76	5.95	4.95	0.08	3.21
159.50	791.5	0.38	0.71	1.69	2.13	0.26	1.12
160.50	790.3	0.43	0.62	1.20	1.69	0.29	1.01
161.50	789.2	0.37	0.57	1.35	1.94	0.28	0.95
163.75	787.9	0.39	0.55	0.88	1.51	0.23	1.14
170.75	780.9	0.37	0.54	0.90	1.57	0.28	0.92
172.50	780.0	0.39	0.64	1.14	1.71	0.34	0.89
176.00	775.6	0.24	0.33	0.42	1.31	0.62	0.34
178.50	NC	0.48	0.69	1.35	1.71	0.21	1.48
181.75	772.5	0.48	0.84	2.88	2.59	0.20	1.65

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
182.75	771.3	0.07	0.45	0.85	4.32	0.16	0.56
186.50	767.9	0.34	0.53	20.58	20.03	0.02	8.09
194.00	NC	0.50	0.69	1.17	1.54	0.25	1.31
195.00	NC	0.39	0.59	1.05	1.65	0.33	0.88
200.00	757.0	0.27	0.43	0.71	1.63	0.39	0.55
201.50	755.3	0.50	0.75	6.34	4.99	0.11	2.78
205.00	NC	0.48	0.67	1.12	1.53	0.38	0.94
209.00	NC	0.46	0.83	7.03	5.12	0.09	3.21
210.75	NC	0.42	0.54	0.72	1.31	0.57	0.59
215.50	746.9	0.38	0.56	0.80	1.44	0.40	0.73
219.25	742.6	0.28	0.36	0.45	1.28	0.64	0.37
221.50	739.5	0.17	0.30	0.79	2.19	0.14	0.81
225.00	736.5	0.32	0.45	0.55	1.33	0.55	0.50
229.00	734.0	0.32	0.41	0.51	1.26	0.63	0.43
230.00	732.8	0.39	0.54	6.43	6.66	0.07	3.33
231.00	731.7	0.36	0.46	0.57	1.26	0.63	0.49
236.75	725.9	0.30	0.36	0.44	1.22	0.67	0.38
241.00	721.6	0.36	0.47	0.62	1.31	0.54	0.54
243.00	719.7	0.30	0.49	0.75	1.58	0.33	0.72
244.00	719.0	0.27	0.53	0.81	1.49	0.44	0.66
247.50	715.9	0.35	0.46	0.60	1.31	0.57	0.51
249.75	714.0	0.28	0.39	0.47	1.30	0.61	0.40
250.50	712.8	0.26	0.35	0.46	1.33	0.60	0.37
251.00	712.0	0.27	0.45	0.80	1.71	0.37	0.58
251.75	711.2	0.43	9.27	18.46	11.82	0.06	12.96
252.25	710.5	0.43	0.61	1.12	1.63	0.28	1.06
252.50	710.0	0.44	0.64	1.21	1.67	0.25	1.19
253.25	709.5	0.28	0.37	0.49	1.33	0.58	0.41
254.00	708.7	0.26	0.34	0.44	1.29	0.62	0.36
254.13	708.6	0.29	0.57	1.03	1.88	0.30	0.81
254.25	708.5	0.34	0.82	4.68	4.05	0.09	2.68
254.50	708.2	0.22	0.51	1.86	2.98	0.07	2.21
254.75 A	707.9	0.60	0.93	1.85	1.77	0.32	1.36
254.75 B	707.9	0.26	0.44	0.81	1.75	0.28	0.69
255.00	707.6	0.40	0.58	0.96	1.55	0.18	1.42
255.50	706.9	0.36	0.52	0.78	1.48	0.40	0.69
255.75 A	706.6	0.34	0.48	0.65	1.37	0.54	0.53
255.75 B	706.6	0.49	0.71	2.02	2.15	0.16	1.88
256.25	706.0	0.33	0.51	0.89	1.64	0.16	1.35
256.50	705.3	0.45	0.77	1.11	1.59	0.46	0.84
258.00	704.2	0.34	0.51	0.69	1.43	0.41	0.65
259.00	703.3	0.32	0.48	0.92	1.71	0.24	0.90
260.25	701.9	0.29	0.51	0.76	1.64	0.45	0.58
261.50	700.7	0.25	0.37	0.53	1.46	0.39	0.48
263.25	698.9	0.40	0.55	0.96	1.56	0.40	0.74
264.50	697.5	0.28	0.49	0.82	1.73	0.27	0.78
266.00	696.0	0.36	0.56	3.41	3.82	0.09	2.54
266.50	695.5	0.41	0.62	1.27	1.77	0.26	1.09
267.00	695.0	0.07	0.49	1.44	5.21	0.04	1.73
269.50	691.9	0.27	0.36	0.52	1.40	0.53	0.41
270.50	690.3	0.34	0.50	0.69	1.44	0.54	0.55
271.50	689.3	0.38	0.54	0.88	1.53	0.26	1.01
272.50	688.6	0.25	0.34	0.46	1.35	0.48	0.42
272.75	688.0	0.40	0.53	0.77	1.38	0.20	1.25
273.00	687.5	0.07	0.23	0.38	2.46	0.30	0.24
273.00 A	687.5	0.35	0.55	1.28	1.94	0.26	0.96
273.75	686.4	0.06	0.44	3.14	7.10	0.02	1.92
277.50	681.6	0.26	0.40	0.58	1.48	0.47	0.45
280.75	NC	0.37	0.63	1.28	1.88	0.32	0.89
281.50	NC	0.37	0.51	0.82	1.49	0.28	0.92
283.50	NC	0.35	0.52	0.73	1.45	0.47	0.60
286.75	NC	0.62	0.81	1.06	1.31	0.55	0.90
287.25	NC	0.34	0.47	0.61	1.33	0.54	0.52
289.25	NC	0.33	0.45	0.60	1.35	0.53	0.51
292.50	NC	0.42	0.56	0.79	1.38	0.50	0.66
293.00	NC	0.55	18.60	0.58	17.05	0.24	21.66
293.75	677.0	0.43	0.66	4.14	3.90	0.09	2.79
296.00	674.0	0.19	0.35	0.68	1.92	0.33	0.44
298.50	672.5	0.34	0.50	0.80	1.54	0.36	0.71
300.00	670.0	0.49	0.66	1.01	1.44	0.49	0.79
300.75	669.2	0.39	0.54	0.86	1.49	0.35	0.81
301.50	668.4	0.34	0.53	0.97	1.70	0.25	0.94
302.75	667.1	0.35	0.47	0.60	1.32	0.59	0.50
303.25	NC	0.29	0.36	0.45	1.25	0.63	0.39
303.50	NC	0.26	0.33	0.40	1.24	0.64	0.35
303.75	NC	0.42	0.56	0.81	1.39	0.30	0.96
304.00	666.9	0.15	0.20	0.24	1.27	0.65	0.21

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
306.75	663.7	0.45	0.53	0.65	1.20	0.69	0.55
310.00	660.3	0.21	0.27	0.38	1.34	0.42	0.38
310.75	659.4	0.38	0.54	0.90	1.53	0.28	0.95
313.75	656.7	0.28	0.39	0.57	1.43	0.50	0.45
314.25	656.4	0.26	0.33	0.41	1.26	0.64	0.35
316.25	654.2	0.44	0.55	0.72	1.28	0.48	0.68
317.50	653.0	0.27	0.36	0.51	1.37	0.36	0.55
321.50	649.0	0.34	0.51	0.73	1.47	0.49	0.58
324.50	646.0	0.30	0.49	0.92	1.77	0.28	0.77
329.50	640.6	0.90	5.92	12.94	4.39	0.21	6.95
330.00	640.1	0.45	0.55	0.68	1.22	0.67	0.58
331.00	639.0	0.37	0.46	0.55	1.23	0.67	0.48
332.00	637.8	0.23	0.29	0.43	1.36	0.54	0.34
333.50	635.8	0.19	0.48	0.73	2.05	0.36	0.55
337.00	632.1	0.51	0.70	1.19	1.54	0.37	1.01
338.75	630.2	0.21	0.25	0.29	1.17	0.61	0.28
339.50	629.3	0.25	0.30	0.39	1.26	0.58	0.34
342.75	NC	0.22	0.31	0.42	1.39	0.55	0.33
344.00	NC	0.21	0.25	0.29	1.17	0.69	0.26
348.00	625.8	0.35	0.99	2.64	2.76	0.18	1.62
349.00	NC	0.25	0.35	0.54	1.48	0.38	0.49
350.00	NC	0.42	6.11	12.29	8.24	0.16	6.71
351.00	NC	0.31	0.39	0.48	1.24	0.65	0.41
352.25	NC	0.42	0.52	0.69	1.27	0.53	0.62
352.50	NC	0.25	0.30	0.38	1.25	0.64	0.32
353.00	NC	0.31	0.42	0.59	1.36	0.49	0.50
356.00	NC	0.46	0.62	0.87	1.37	0.35	0.93
357.50	NC	0.43	0.63	2.87	3.01	0.14	1.94
359.00	NC	0.23	0.28	0.42	1.37	0.37	0.43
360.75	624.1	0.29	0.88	6.25	5.05	0.08	2.98
362.50	622.0	0.29	0.45	0.64	1.48	0.48	0.51
363.25	621.5	0.21	0.27	0.40	1.40	0.56	0.30
366.50	618.0	0.27	0.35	0.45	1.30	0.58	0.39
371.75	613.0	0.27	0.44	0.62	1.52	0.45	0.51
372.00	612.4	0.16	0.23	0.40	1.62	0.44	0.28
372.75	611.5	0.07	0.35	0.53	3.27	0.16	0.57
375.00	608.9	0.21	0.44	0.72	1.88	0.09	1.72
376.75	607.1	0.25	0.51	2.43	3.42	0.13	1.29
378.50	605.0	0.19	0.27	0.35	1.36	0.57	0.29
381.00	603.4	0.29	0.49	0.97	1.84	0.24	0.86
382.00	NC	0.16	0.24	0.36	1.50	0.50	0.27
390.50	593.1	0.15	0.20	0.28	1.38	0.38	0.29
391.50	591.3	0.15	0.20	0.33	1.49	0.50	0.25
393.00	590.5	0.15	0.24	0.34	1.51	0.51	0.26
394.00	590.0	0.43	1.04	3.86	3.07	0.14	2.14
395.00	589.0	0.33	0.46	0.62	1.37	0.52	0.50
396.00	587.2	0.32	0.47	0.63	1.40	0.52	0.49
396.25	586.9	0.47	0.75	2.80	2.67	0.15	1.96
397.00	586.3	0.40	15.86	21.12	20.74	0.32	21.42
397.25	586.0	0.14	0.18	0.23	1.29	0.54	0.22
397.50	585.5	0.22	0.29	0.38	1.31	0.61	0.31
397.5 A	585.5	0.32	0.41	0.58	1.35	0.35	0.65
398.00	585.1	0.40	0.50	0.61	1.24	0.52	0.60
398.25	N/A	0.09	0.23	0.40	2.20	0.33	0.26
398.50	585.0	0.32	0.40	0.51	1.27	0.63	0.42
399.00	584.8	0.18	0.23	0.29	1.28	0.61	0.26
399.75	584.0	0.17	0.22	0.26	1.25	0.64	0.23
401.00	581.6	0.15	0.24	0.60	2.04	0.27	0.40
401.50	581.3	0.49	14.35	19.74	15.30	0.21	16.67
402.00	580.7	0.92	6.12	15.18	4.56	0.17	8.42
403.00	579.9	9.23	16.70	21.86	1.56	0.46	23.77
404.00	576.3	0.35	0.47	0.80	1.53	0.21	1.05
404.50	NC	0.26	0.31	0.37	1.19	0.69	0.32
406.00	NC	0.17	0.24	0.31	1.34	0.59	0.26
407.50	NC	0.01	0.01	0.04	2.98	--	--
410.00	NC	0.23	0.27	0.33	1.21	0.63	0.29
411.50	NC	0.40	1.52	16.06	7.18	0.03	7.86
412.50	NC	0.50	1.56	14.14	6.08	0.06	6.54
413.50	NC	0.26	0.43	0.90	1.88	0.25	0.75
416.00	NC	0.34	0.45	0.55	1.27	0.60	0.48
419.00	NC	0.25	0.34	0.46	1.37	0.41	0.46
420.00	NC	0.30	0.39	0.49	1.29	0.61	0.41
423.00	NC	0.20	0.30	0.48	1.54	0.41	0.38
424.50	NC	0.01	0.01	0.06	4.38	--	--
425.50	571.2	0.42	0.65	10.08	8.58	0.06	4.20
426.50	568.3	0.01	0.02	0.11	4.43	--	--
428.00	566.9	0.31	0.42	0.51	1.29	0.58	0.43

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
429.50	565.4	0.33	0.47	0.58	1.33	0.52	0.53
429.75	565.1	0.23	0.31	0.40	1.32	0.49	0.37
430.50	564.5	4.20	11.81	18.11	2.17	0.37	12.19
431.50	563.5	0.44	0.59	0.95	1.48	0.39	0.81
433.00 A	560.4	0.19	0.29	0.37	1.42	0.54	0.29
433.00 B	560.4	0.36	0.49	1.93	2.65	0.06	3.28
433.50	559.8	0.31	0.48	1.41	2.24	0.15	1.29
435.50	557.0	0.22	0.32	0.43	1.39	0.51	0.34
436.75	NC	0.16	0.23	0.33	1.43	0.52	0.25
438.50	NC	0.19	0.30	0.41	1.48	0.45	0.34
439.50	554.5	0.07	0.28	0.42	2.66	0.35	0.29
441.00	553.1	0.07	0.21	0.46	2.59	0.06	0.79
441.50	552.2	0.33	0.46	0.66	1.42	0.47	0.54
442.50	551.8	0.33	0.39	0.47	1.19	0.68	0.41
443.50	549.7	0.26	0.31	0.37	1.19	0.69	0.32
447.50	NC	0.45	0.80	2.60	2.51	0.11	2.48
449.00	NC	0.22	0.32	0.51	1.52	0.42	0.40
451.50	NC	0.00	0.00	0.02	3.65	--	--
452.50	NC	0.35	0.43	0.51	1.20	0.67	0.45
454.00	NC	0.00	0.00	0.02	3.54	--	--
454.50	NC	0.70	5.33	12.71	4.98	0.18	6.62
455.50	NC	0.33	0.41	0.50	1.23	0.65	0.43
456.50	548.2	0.27	0.36	0.48	1.33	0.55	0.41
457.50	547.3	0.36	0.54	1.03	1.70	0.31	0.85
459.00	546.0	0.50	4.71	18.09	6.63	0.04	10.25
459.25	545.5	0.19	0.42	0.90	2.15	0.22	0.70
460.50	544.4	0.27	0.56	1.00	1.92	0.33	0.70
461.50	543.6	0.32	0.47	0.59	1.37	0.60	0.48
462.00	NC	0.44	1.50	15.18	6.78	0.05	6.36
464.00	NC	0.37	0.49	0.71	1.38	0.44	0.65
464.25	NC	0.27	0.35	0.49	1.35	0.54	0.40
465.50	NC	0.26	0.36	0.56	1.49	0.30	0.60
466.00	NC	0.23	0.29	0.36	1.24	0.65	0.31
466.50	NC	0.20	0.26	0.35	1.32	0.54	0.31
468.00	NC	0.18	0.40	0.73	2.01	0.28	0.51
469.50	NC	0.16	0.77	2.17	3.76	0.14	1.10
470.50	NC	0.43	0.51	0.62	1.21	0.41	0.74
472.50	540.0	0.57	0.77	1.03	1.35	0.50	0.90
474.00	NC	0.38	0.48	0.59	1.25	0.64	0.51
475.00	NC	0.33	0.43	0.53	1.25	0.65	0.45
475.75	NC	0.30	0.37	0.52	1.32	0.07	2.28
476.25	NC	0.31	0.37	0.45	1.20	0.68	0.39
477.50	NC	0.22	0.28	0.57	1.65	0.36	0.43
479.75	NC	0.29	0.39	0.53	1.37	0.33	0.60
481.00	NC	0.21	0.27	0.34	1.27	0.62	0.28
481.25	NC	0.38	4.59	16.22	7.74	0.05	8.78
481.75	NC	0.28	0.56	14.65	14.10	0.04	5.55
482.00	NC	0.23	0.28	0.34	1.21	0.67	0.30
483.00	NC	0.27	0.36	0.48	1.33	0.60	0.39
484.00	538.6	0.29	0.40	0.51	1.31	0.60	0.41
484.25	538.4	6.97	9.90	14.32	1.43	0.58	10.79
484.75	537.9	0.74	1.56	4.45	2.48	0.21	2.64
485.25 A	537.4	0.39	0.51	0.67	1.32	0.59	0.55
485.25 B	537.4	1.67	7.47	12.80	3.09	0.27	8.43
486.00	536.7	0.30	0.45	0.58	1.39	0.54	0.48
487.00	535.8	0.20	0.51	0.75	2.01	0.36	0.60
488.50 A	534.4	0.23	0.29	0.35	1.23	0.65	0.30
488.50 B	534.4	0.37	0.50	0.69	1.38	0.55	0.56
489.00	534.1	0.27	0.37	0.51	1.36	0.51	0.43
489.25	533.9	0.00	0.02	0.08	5.26	--	--
489.50	533.7	0.24	0.29	0.37	1.24	0.60	0.32
489.75	533.6	0.34	0.47	0.97	1.72	0.10	1.99
490.00	533.4	0.23	0.27	0.33	1.21	0.67	0.29
490.50 A	532.8	0.25	0.33	0.43	1.31	0.61	0.35
490.50 B	532.8	0.32	0.43	0.68	1.47	0.21	0.97
491.00	532.1	0.25	0.30	0.38	1.24	0.60	0.33
491.25	531.8	0.25	0.30	0.37	1.24	0.64	0.32
492.50	530.4	0.15	0.20	0.37	1.59	0.41	0.29
493.50	529.4	0.62	3.15	14.18	4.78	0.10	6.47
494.00	528.9	0.50	3.01	15.76	5.63	0.06	6.82
494.50	528.4	0.34	0.43	0.54	1.27	0.27	0.83
496.00	526.0	0.25	0.33	0.40	1.26	0.64	0.34
497.00	525.9	0.24	0.38	0.78	1.83	0.30	0.58
498.75	524.4	0.16	0.24	0.34	1.47	0.48	0.27
500.00	523.0	0.39	0.54	1.01	1.63	0.35	0.80
501.50	521.4	0.37	3.60	16.52	7.15	0.05	8.80
502.00	520.9	0.34	0.47	0.62	1.36	0.56	0.51

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
503.50	519.0	0.27	0.39	0.56	1.44	0.47	0.46
505.50	516.3	0.22	0.36	0.73	1.83	0.38	0.45
507.00	NC	0.23	0.31	0.43	1.36	0.57	0.34
508.75	NC	0.33	0.49	0.71	1.48	0.47	0.57
510.50	NC	0.32	0.40	0.51	1.27	0.55	0.46
512.25	NC	0.16	0.25	0.37	1.54	0.51	0.27
513.00	513.0	0.14	0.24	0.30	1.46	0.63	0.25
514.00	511.6	16.86	20.61	25.19	1.22	0.68	27.60
514.50	511.2	0.29	0.40	16.51	21.10	0.02	7.19
515.00	510.8	0.28	0.36	0.53	1.38	0.44	0.48
517.00	508.8	0.18	0.29	0.61	1.84	0.11	1.02
518.00	507.6	0.36	0.56	1.12	1.77	0.21	1.18
519.50	NC	0.36	0.57	1.83	2.39	0.13	1.76
520.50	NC	0.27	0.35	0.45	1.31	0.62	0.37
521.75	NC	0.24	0.28	0.37	1.25	0.56	0.33
522.50	NC	0.27	0.37	0.50	1.37	0.55	0.40
523.50	NC	0.11	0.18	0.38	1.89	0.31	0.25
526.00	NC	0.21	0.35	0.49	1.54	0.42	0.43
526.75	NC	0.21	0.25	0.30	1.20	0.62	0.28
527.25	NC	0.21	0.24	0.28	1.17	0.71	0.26
528.00	NC	0.22	0.26	0.31	1.19	0.65	0.28
530.00	499.8	0.24	0.30	0.37	1.24	0.65	0.31
530.50	499.6	0.20	0.26	0.36	1.35	0.59	0.28
532.00	497.7	0.19	0.23	0.28	1.21	0.69	0.25
533.50	496.5	0.22	0.30	0.46	1.46	0.44	0.38
536.00	494.1	0.31	0.45	0.67	1.47	0.47	0.53
537.00	492.9	0.31	0.61	13.34	11.98	0.04	5.64
537.50	492.3	0.33	0.45	0.58	1.33	0.58	0.48
538.50	491.0	0.31	0.44	0.62	1.41	0.42	0.56
538.75	490.7	0.35	0.48	0.79	1.51	0.13	1.62
539.00 A	490.4	0.35	0.47	0.73	1.46	0.35	0.71
539.00 B	490.4	0.21	0.27	0.35	1.31	0.61	0.29
539.25	490.0	0.21	0.28	0.36	1.32	0.60	0.29
539.75	489.4	0.13	0.17	0.23	1.32	0.54	0.21
540.00	489.1	0.32	0.43	0.56	1.31	0.57	0.47
540.25	488.8	0.36	0.49	1.07	1.77	0.12	1.73
540.25 A	488.8	0.41	0.55	0.85	1.45	0.34	0.85
541.25	487.5	0.20	0.24	0.29	1.21	0.69	0.25
541.50	487.5	0.13	0.24	0.31	1.54	0.53	0.24
543.75	485.8	0.30	0.39	0.48	1.27	0.63	0.40
546.25	483.4	0.32	0.39	0.47	1.22	0.66	0.41
548.00	480.7	0.24	0.36	0.71	1.74	0.20	0.77
548.50	480.2	1.13	15.06	20.40	7.35	0.30	17.25
549.00	479.6	0.32	0.47	1.31	2.13	0.13	1.47
549.50	479.1	0.25	0.33	0.40	1.28	0.64	0.34
551.00	477.5	0.42	0.63	1.99	2.33	0.17	1.59
554.00	474.3	0.40	0.51	0.64	1.27	0.61	0.53
555.00	473.2	0.49	0.67	12.79	10.25	0.05	4.98
556.00	472.5	0.19	0.27	0.46	1.56	0.44	0.34
558.50	470.6	0.20	0.35	0.52	1.60	0.43	0.41
560.00	469.1	0.23	0.30	0.49	1.46	0.47	0.38
560.50	468.6	0.25	0.33	0.48	1.39	0.43	0.43
563.50	465.6	0.31	0.47	0.68	1.43	0.49	0.52
565.00	NC	0.41	0.56	1.10	1.67	0.18	1.40
566.50	NC	0.31	0.39	0.51	1.29	0.56	0.44
568.00	NC	0.37	0.58	1.57	2.14	0.24	1.07
569.50	NC	0.26	0.33	0.41	1.24	0.29	0.60
570.75	NC	0.00	0.02	0.06	4.54	--	--
572.50	NC	0.27	0.40	0.51	1.38	0.57	0.41
573.50	NC	0.40	0.55	4.37	4.65	0.10	2.30
575.00	NC	15.28	19.14	23.97	1.25	0.73	22.53
575.50	NC	0.81	15.27	20.59	10.12	0.28	17.83
577.00	NC	0.41	0.57	1.14	1.70	0.22	1.23
578.00	460.0	0.27	0.38	0.51	1.38	0.56	0.40
579.00	458.9	0.25	0.35	0.53	1.44	0.44	0.44
580.00	458.1	0.30	0.45	0.56	1.37	0.50	0.49
581.00	457.0	0.51	10.05	18.12	10.68	0.13	12.41
581.75	455.8	0.33	0.50	0.67	1.42	0.54	0.52
583.00	454.8	0.46	0.76	15.46	10.99	0.04	6.69
583.50	454.0	0.43	0.59	1.63	2.07	0.08	3.16
586.25	451.0	0.32	0.44	0.70	1.48	0.17	1.15
586.75	NC	0.35	0.50	0.78	1.49	0.33	0.75
588.00	NC	0.46	0.81	16.31	11.00	0.04	7.61
589.00	NC	0.30	0.39	0.50	1.29	0.61	0.41
590.00	NC	0.00	0.01	0.05	3.88	--	--
591.00	NC	0.27	0.37	0.52	1.39	0.45	0.47
593.00	NC	0.24	0.32	0.50	1.45	0.47	0.39

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
595.00	444.1	0.32	0.48	0.79	1.56	0.38	0.65
595.25	443.8	0.21	0.30	0.44	1.44	0.10	1.27
595.50	443.6	0.47	0.88	15.42	9.69	0.03	8.61
595.50 A	443.6	0.14	0.20	0.25	1.32	0.04	2.07
595.75	443.3	0.57	15.72	21.00	14.43	0.33	20.14
595.75 A	443.3	0.12	0.16	0.21	1.31	0.63	0.18
596.25	442.8	0.37	0.62	15.55	13.39	0.03	6.29
596.50	442.5	14.54	18.43	23.37	1.27	0.67	18.49
596.50 A	442.5	0.38	0.52	0.77	1.42	0.47	0.64
596.75	442.3	0.26	0.33	0.41	1.26	0.63	0.35
597.00	442.0	0.24	0.47	15.76	17.88	0.02	6.13
597.00 A	442.0	0.14	0.17	0.21	1.26	0.69	0.19
597.50	441.5	0.51	0.74	1.61	1.82	0.31	1.17
597.50 A	441.5	0.26	0.34	0.44	1.31	0.61	0.36
598.00	441.0	0.18	0.23	0.29	1.29	0.61	0.25
598.25	440.7	0.47	0.71	5.83	4.86	0.08	3.66
598.50	440.4	0.38	0.50	0.75	1.40	0.16	1.45
598.50 A	440.4	0.16	0.21	0.30	1.37	0.57	0.24
599.00	439.9	0.29	0.42	0.82	1.69	0.12	1.48
599.00 A	439.9	0.15	0.19	0.25	1.27	0.64	0.21
599.50	439.4	0.43	0.58	1.18	1.69	0.34	0.90
599.50 A	439.4	0.26	0.38	0.51	1.40	0.56	0.40
599.75	439.1	0.14	0.32	0.55	2.00	0.30	0.37
600.00	438.9	0.30	0.40	0.53	1.32	0.57	0.44
600.00 A	438.9	0.31	0.41	0.52	1.30	0.59	0.44
600.50	438.3	0.21	0.26	0.33	1.26	0.65	0.28
601.60	437.2	0.21	0.25	0.30	1.20	0.67	0.26
601.75	437.0	0.22	0.27	0.38	1.32	0.59	0.30
602.50	436.2	0.13	0.16	0.21	1.27	0.58	0.19
603.00	435.7	0.16	0.46	16.55	19.45	0.01	10.06
604.75	434.0	0.35	0.50	0.67	1.38	0.51	0.57
605.75	433.1	0.21	0.25	0.29	1.19	0.69	0.26
606.00 A	432.9	0.18	0.22	0.26	1.19	0.71	0.23
606.00	432.9	0.40	0.50	0.62	1.25	0.65	0.52
606.50	432.4	0.20	0.24	0.28	1.19	0.71	0.25
606.75	432.2	0.28	0.36	0.46	1.27	0.64	0.38
607.50	431.5	0.15	0.20	0.26	1.30	0.61	0.21
608.00	431.0	0.25	0.34	0.51	1.43	0.47	0.41
608.25	430.8	0.27	0.37	0.52	1.37	0.50	0.44
608.50	430.6	0.18	0.30	0.45	1.59	0.47	0.32
609.00	430.1	0.20	0.26	0.32	1.26	0.65	0.27
609.50	429.7	0.29	0.46	1.98	2.94	0.09	2.06
610.00	429.2	0.26	0.35	0.50	1.39	0.49	0.42
611.00	428.5	0.28	0.35	0.44	1.25	0.64	0.38
612.00	427.3	0.38	0.54	0.85	1.50	0.24	1.06
612.25	427.0	0.23	0.33	0.45	1.38	0.53	0.37
613.00	426.1	0.30	0.40	0.47	1.25	0.60	0.42
614.00	NC	0.16	0.22	0.25	1.25	0.67	0.23
614.00 A	NC	0.06	0.08	0.26	2.23	0.16	0.14
615.00	NC	0.27	0.38	0.51	1.38	0.56	0.40
617.00	NC	0.26	0.39	0.54	1.46	0.50	0.43
619.00	NC	0.22	0.58	13.48	12.94	0.03	5.31
620.00	NC	0.00	0.01	0.09	5.36	--	--
625.00	NC	0.44	0.68	1.76	2.07	0.19	1.54
628.00	421.6	0.11	0.14	0.18	1.28	0.56	0.16
630.00	418.3	0.32	0.46	0.71	1.49	0.34	0.69
631.00	417.0	0.23	0.29	0.39	1.30	0.60	0.32
631.00 A	417.0	0.31	0.39	0.50	1.28	0.62	0.42
633.00	415.3	0.14	0.19	0.44	1.84	0.32	0.30
633.00 A	415.3	0.38	0.50	0.70	1.36	0.44	0.66
635.00	412.3	0.32	0.40	0.50	1.26	0.64	0.42
638.00	409.0	0.00	0.01	0.03	3.03	--	--
639.00	NC	0.19	0.32	0.46	1.55	0.48	0.34
640.00	NC	0.07	0.09	0.13	1.38	0.44	0.09
642.00	NC	0.08	0.12	0.16	1.40	0.50	0.12
643.00	NC	0.01	0.01	0.05	3.46	--	--
647.00	NC	0.00	0.01	0.06	4.60	--	--
648.00	406.8	0.30	0.39	0.51	1.31	0.59	0.42
650.00	405.1	0.16	0.24	0.35	1.46	0.51	0.27
657.00	396.8	0.44	1.86	15.67	6.35	0.04	7.97
659.00	395.3	0.22	0.27	0.42	1.38	0.55	0.32
659.00 A	395.3	0.27	0.38	0.51	1.38	0.56	0.41
662.00	392.1	0.23	0.42	0.77	1.83	0.25	0.64
666.00	NC	0.33	0.46	0.66	1.41	0.38	0.64
670.00	NC	0.38	0.76	16.66	11.92	0.03	8.48
671.00	NC	0.25	0.32	0.40	1.27	0.58	0.35
676.00	381.7	0.34	0.58	14.65	13.48	0.04	5.56

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
683.00	374.5	0.30	0.49	0.82	1.66	0.30	0.73
687.00	370.7	0.25	0.34	0.46	1.35	0.57	0.37
689.00	368.7	0.15	0.21	0.29	1.41	0.53	0.24
693.00	NC	0.22	0.32	0.47	1.45	0.49	0.37
696.00	NC	0.25	0.31	0.39	1.24	0.65	0.33
701.00	NC	0.46	0.57	0.76	1.28	0.41	0.81
708.50	360.7	0.32	0.49	0.69	1.46	0.29	0.83
709.00	360.2	0.21	0.26	0.32	1.21	0.68	0.27
710.00	359.2	0.16	0.22	0.27	1.29	0.63	0.23
710.75	358.5	0.42	0.58	4.91	4.92	0.08	3.00
711.00	358.2	0.17	0.23	0.30	1.31	0.61	0.25
712.25	357.0	0.34	0.46	3.37	4.37	0.08	2.44
713.00	356.2	0.25	0.32	0.41	1.28	0.62	0.34
713.00 A	356.2	0.16	0.22	0.26	1.27	0.65	0.23
715.75	353.2	0.18	0.25	0.37	1.45	0.53	0.28
716.25	352.7	0.29	0.43	4.65	6.11	0.06	2.84
718.50	350.3	0.24	0.30	0.41	1.31	0.59	0.33
720.00	348.7	0.27	0.37	0.52	1.39	0.49	0.50
722.00	346.0	0.24	0.34	0.46	1.38	0.57	0.36
723.50	NC	0.12	0.17	0.29	1.57	0.43	0.20
725.50	NC	0.35	0.47	0.63	1.34	0.46	0.60
728.50	NC	0.11	0.14	0.17	1.24	0.61	0.15
733.00	NC	0.23	0.34	0.54	1.54	0.35	0.49
736.00	NC	0.22	0.29	0.37	1.31	0.61	0.30
740.00	337.1	0.24	0.32	0.41	1.30	0.48	0.39
742.00	335.4	0.42	0.56	0.91	1.49	0.37	0.80
745.00	331.8	0.22	0.30	0.36	1.28	0.63	0.31
749.00	326.5	0.42	0.55	0.83	1.41	0.38	0.79
752.00	323.5	0.13	0.17	0.21	1.24	0.72	0.18
756.50	318.9	0.06	0.07	0.32	2.80	0.12	0.15
757.00	318.4	0.01	0.01	0.01	1.32	--	--
758.50	316.6	0.30	0.48	0.57	1.38	0.51	0.51
759.50	315.6	0.21	0.26	0.31	1.21	0.69	0.27
760.00	315.1	0.26	0.33	0.39	1.21	0.69	0.34
760.25	314.8	0.15	0.19	0.23	1.25	0.68	0.20
760.50	314.6	0.29	0.38	0.49	1.31	0.59	0.41
760.75	314.3	0.42	0.55	1.01	1.57	0.18	1.44
761.50	313.5	0.13	0.16	0.20	1.24	0.65	0.18
763.00	312.0	0.10	0.13	0.16	1.24	0.58	0.14
766.00	309.0	0.37	0.50	0.68	1.35	0.27	0.92
767.00	308.3	0.23	0.30	0.40	1.30	0.61	0.32
767.50	307.6	0.36	0.56	14.41	13.63	0.04	5.98
768.00	307.1	0.10	0.13	0.16	1.25	0.59	0.15
770.00	304.6	0.23	0.36	0.58	1.58	0.15	0.98
770.50	303.9	0.32	0.44	0.59	1.35	0.34	0.68
771.00	303.2	0.31	0.43	0.52	1.29	0.47	0.52
771.50	302.7	0.25	0.45	1.66	2.74	0.16	1.11
773.50	300.4	0.11	0.15	0.22	1.44	0.45	0.18
777.50	296.2	0.34	0.50	6.49	7.23	0.07	2.83
785.75	288.0	0.22	0.35	0.53	1.56	0.40	0.44
786.75	287.1	0.19	0.26	0.37	1.41	0.37	0.38
787.00	286.9	0.26	0.37	0.53	1.44	0.27	0.66
800.00	273.5	0.17	0.22	0.25	1.20	0.70	0.23
807.00	266.3	0.24	0.41	0.53	1.49	0.49	0.43
814.00	259.4	0.21	0.24	0.28	1.15	0.71	0.26
826.50	246.2	0.18	0.22	0.25	1.19	0.71	0.23
835.50	236.6	0.24	0.35	0.48	1.42	0.53	0.38
838.00	234.2	0.01	0.01	0.06	4.35	--	--
840.50	231.4	0.23	0.29	0.36	1.24	0.64	0.30
842.00	230.0	0.29	0.39	0.52	1.34	0.57	0.42
847.50	224.8	0.24	0.30	0.36	1.23	0.66	0.31
860.00	211.5	0.16	0.21	0.24	1.23	0.68	0.22
861.00	210.5	0.22	0.26	0.30	1.19	0.71	0.27
867.50	204.0	0.15	0.20	0.24	1.27	0.64	0.21
882.50	188.3	0.24	0.31	0.38	1.27	0.63	0.32
896.00	174.8	0.23	0.29	0.35	1.22	0.65	0.30
911.00	159.6	0.09	0.18	0.24	1.68	0.49	0.18
917.00	153.2	0.16	0.21	0.25	1.26	0.67	0.22
924.00	146.4	0.16	0.20	0.24	1.24	0.67	0.21
937.00	133.6	0.12	0.19	0.23	1.40	0.59	0.19
967.50	103.0	0.16	0.21	0.26	1.25	0.67	0.22
968.50	102.0	0.13	0.15	0.18	1.21	0.73	0.17
972.25	97.6	0.24	0.31	0.36	1.22	0.69	0.32
977.00	93.0	0.85	0.00	0.01	4.23	--	0.01
979.50	90.6	0.17	0.23	0.29	1.30	0.64	0.24
983.00	87.0	0.18	0.23	0.26	1.19	0.72	0.23
986.75	83.5	0.00	0.18	0.27	56.63	--	0.17

1932 River Mile Below Cairo, Ill.	1989 River Mile Above Head of Passes	D16 (mm)	D50 (mm)	D84 (mm)	Sorting Coefficient	Uniformity Modulus	Mean Diameter (mm)
990.25	79.8	0.19	0.26	0.33	1.30	0.62	0.27
992.75	77.7	0.87	0.00	0.01	4.47	--	0.02
994.50	76.0	0.16	0.21	0.25	1.26	0.66	0.22
997.75	72.3	0.89	0.00	0.03	3.60	--	0.02
999.50	70.7	0.13	0.16	0.20	1.27	0.66	0.18
1001.50	68.7	0.92	0.00	0.01	2.43	--	0.01
1004.25	64.8	0.16	0.20	0.24	1.24	0.67	0.21
1007.00	63.0	0.13	0.17	0.22	1.27	0.66	0.19
1010.00	60.0	0.07	0.11	0.14	1.45	0.47	0.11
1014.25	55.3	0.13	0.17	0.21	1.25	0.69	0.18
1017.25	52.6	0.13	0.16	0.20	1.23	0.69	0.17
1019.00	50.8	0.12	0.14	0.16	1.18	0.69	0.16
1021.25	48.5	0.15	0.20	0.24	1.28	0.63	0.21
1023.50	46.5	0.14	0.18	0.23	1.29	0.66	0.19
1027.25	42.8	0.09	0.15	0.21	1.58	0.52	0.16
1030.00	39.8	0.14	0.17	0.21	1.24	0.67	0.18
1033.00	37.0	0.17	0.23	0.26	1.23	0.68	0.23
1037.00	33.0	0.89	0.00	0.21	28.71	--	0.07
1040.75	29.0	0.14	0.17	0.21	1.24	0.70	0.18
1044.00	25.7	0.14	0.18	0.23	1.26	0.68	0.20
1047.50	22.3	0.14	0.17	0.24	1.33	0.60	0.19
1050.00	19.6	0.12	0.15	0.18	1.23	0.65	0.16
1052.50	18.0	0.12	0.14	0.17	1.21	0.67	0.16
1057.00	12.6	0.00	0.09	0.14	38.44	--	0.09
1058.25	11.6	1.00	0.00	0.01	3.65	--	0.01
1060.00	9.7	0.50	0.00	0.01	2.63	--	0.00
1062.25	7.7	0.13	0.17	0.21	1.27	0.64	0.18
1064.00	6.0	0.91	0.01	0.12	9.53	--	0.05
1065.50	4.1	0.12	0.15	0.17	1.20	0.69	0.16
1066.00	3.6	0.12	0.14	0.16	1.17	0.72	0.16
1066.75	2.8	0.00	0.02	0.12	12.01	--	0.05
1067.75	1.8	1.00	0.01	0.11	10.25	--	0.04
1069.00	0.5	0.50	1.00	0.00	1.00	--	0.00
1069.50	0.0	0.13	0.18	0.25	1.41	0.50	0.18

Table 12. Mechanical Analysis of Mississippi River Bed Material (from Table 39, WES, 1935)

Accumulative Percent Finer

1932 Miles Below Cairo	1989 Miles Above Head of Passes	Size of Opening, in mm 38.1	13.33	6.68	3.327	2.362	1.651	1.168	0.833	0.589	0.417	0.295	0.208	0.104	0.074	0.040	0.008	0.004	0.001
2.0000	953.8	100.0	100.0	91.9	74.8	66.9	58.1	49.1	40.0	27.2	12.3	5.0	1.0	0.1	0.1	0.0	0.0	0.0	0.0
6.0000	950.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	77.0	55.2	36.5	17.2	0.0	0.0
7.0000	949.0	100.0	100.0	100.0	99.9	99.8	99.8	99.6	99.1	96.5	88.5	27.2	1.6	0.2	0.1	0.0	0.0	0.0	0.0
10.0000	945.5	100.0	100.0	97.0	92.6	88.9	84.8	79.1	71.0	55.0	39.8	22.6	3.0	0.2	0.1	0.0	0.0	0.0	0.0
12.0000	943.0	81.1	72.9	68.2	63.8	60.3	55.2	48.5	40.7	31.2	24.3	20.1	5.9	0.2	0.1	0.0	0.0	0.0	0.0
13.0000	NC*	100.0	94.0	92.2	91.9	91.7	91.1	89.3	82.2	57.8	21.3	5.2	1.8	0.1	0.0	0.0	0.0	0.0	0.0
13A	NC	100.0	76.2	64.9	58.0	55.6	53.7	52.1	50.4	43.7	20.7	6.1	1.8	0.1	0.0	0.0	0.0	0.0	0.0
14.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.5	99.3	56.8	0.4	0.1	0.0	0.0	0.0	0.0
16.5000	NC	100.0	66.3	58.5	54.1	52.7	51.6	50.6	49.6	48.5	47.5	46.9	46.0	43.3	43.0	0.0	0.0	0.0	0.0
19.2500	NC	100.0	100.0	90.9	82.1	77.2	70.2	62.9	54.3	37.8	16.5	4.8	0.8	0.1	0.1	0.0	0.0	0.0	0.0
19.5000	939.0	100.0	98.3	91.8	86.1	84.2	81.3	77.1	70.5	56.8	41.0	20.4	3.6	0.1	0.0	0.0	0.0	0.0	0.0
21.0000	937.4	100.0	100.0	100.0	99.7	99.0	97.7	95.8	92.8	85.4	73.3	53.3	36.7	4.4	0.8	0.0	0.0	0.0	0.0
22.5000	935.5	100.0	59.4	44.3	33.6	29.4	25.9	22.4	19.2	14.1	8.4	4.6	2.9	0.6	0.3	0.0	0.0	0.0	0.0
23.5000	NC	100.0	87.8	81.4	78.3	77.0	75.3	72.3	66.1	44.0	16.1	5.7	1.9	0.4	0.3	0.0	0.0	0.0	0.0
25.0000	NC	100.0	99.2	93.3	79.1	71.7	65.5	60.3	55.8	50.4	44.0	33.9	16.1	0.5	0.3	0.0	0.0	0.0	0.0
27.0000	930.7	100.0	93.2	87.3	72.2	62.6	51.5	39.6	27.7	15.6	7.2	2.7	0.8	0.1	0.1	0.0	0.0	0.0	0.0
29.5000	927.9	100.0	100.0	99.7	99.3	[illegible]	98.7	96.6	84.7	39.1	7.8	2.4	1.3	0.2	0.0	0.0	0.0	0.0	0.0
31.0000	926.8	100.0	100.0	99.2	96.3	93.3	87.6	77.1	58.2	22.7	5.8	1.8	0.6	0.1	0.0	0.0	0.0	0.0	0.0
32.0000	926.4	100.0	100.0	98.5	97.3	96.0	93.6	89.4	82.7	67.3	37.3	10.6	2.3	0.1	0.0	0.0	0.0	0.0	0.0
35.0000	922.7	100.0	100.0	98.8	98.1	97.3	96.2	93.9	89.8	78.6	55.9	40.5	22.6	0.9	0.2	0.0	0.0	0.0	0.0
37.5000	921.1	100.0	82.9	79.8	71.5	64.5	53.4	39.9	27.3	18.5	16.1	15.2	13.4	4.0	1.7	0.0	0.0	0.0	0.0
38.5000	920.2	83.8	24.5	12.5	6.9	5.7	4.6	3.7	2.8	1.4	0.7	0.4	0.3	0.1	0.1	0.0	0.0	0.0	0.0
41.0000	917.8	100.0	97.9	96.9	94.5	92.3	88.8	82.5	72.6	49.8	20.1	6.6	1.1	0.1	0.0	0.0	0.0	0.0	0.0
43.0000	915.4	100.0	100.0	99.2	95.1	91.3	87.4	83.4	79.6	61.9	20.5	13.3	10.0	4.9	3.5	0.0	0.0	0.0	0.0
44.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	98.0	85.5	21.7	5.5	0.3	0.1	0.0	0.0	0.0	0.0
44.2500	NC	100.0	100.0	100.0	99.3	98.7	98.3	98.0	97.6	95.5	76.4	14.0	2.5	0.1	0.0	0.0	0.0	0.0	0.0
48.5000	NC	100.0	100.0	100.0	99.8	99.6	99.2	97.2	91.7	80.3	64.6	33.3	11.8	2.1	0.7	0.0	0.0	0.0	0.0
51.0000	910.0	100.0	100.0	99.6	98.7	97.6	94.9	90.2	80.3	55.2	23.8	11.8	7.3	1.1	0.2	0.0	0.0	0.0	0.0
55.5000	905.7	100.0	100.0	98.1	96.7	95.9	94.5	92.1	87.1	69.9	34.7	10.3	1.0	0.1	0.0	0.0	0.0	0.0	0.0
56.0000	905.1	100.0	100.0	100.0	99.4	99.1	98.1	96.7	93.6	89.0	77.7	55.9	27.8	0.1	0.0	0.0	0.0	0.0	0.0
56.2500	904.8	100.0	100.0	100.0	99.6	99.4	99.3	99.2	98.5	92.8	71.4	35.1	12.1	0.2	0.1	0.0	0.0	0.0	0.0
60.0000	901.4	100.0	98.6	86.3	73.7	67.6	62.6	57.0	50.7	38.5	22.1	11.3	4.5	0.6	0.1	0.0	0.0	0.0	0.0
61.0000	900.4	100.0	100.0	98.7	96.2	95.9	95.6	95.3	94.9	93.6	89.0	68.9	18.3	0.4	0.1	0.0	0.0	0.0	0.0
65.0000	896.0	100.0	94.2	77.3	59.3	51.2	43.8	37.3	31.1	21.4	8.9	2.6	0.4	0.1	0.1	0.0	0.0	0.0	0.0
70.0000	890.5	100.0	100.0	98.8	96.2	93.9	90.3	84.2	24.4	51.4	20.3	5.2	1.1	0.1	0.0	0.0	0.0	0.0	0.0
71.0000	889.4	100.0	80.5	66.2	57.9	54.2	50.3	46.1	40.5	28.2	12.1	4.1	0.9	0.1	0.0	0.0	0.0	0.0	0.0
72.5000	888.0	100.0	97.3	94.1	89.9	86.3	80.8	73.2	63.1	46.2	23.8	6.6	1.3	0.1	0.0	0.0	0.0	0.0	0.0
76.5000	884.2	100.0	100.0	99.1	95.0	89.7	80.2	65.4	46.0	20.0	3.8	0.7	0.2	0.1	0.0	0.0	0.0	0.0	0.0
78.0000	882.7	100.0	100.0	98.8	96.2	94.0	90.6	84.7	73.9	49.1	12.5	1.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0
80.0000	881.0	100.0	100.0	97.8	91.9	87.5	80.5	68.1	46.6	22.6	9.8	5.9	3.4	0.2	0.0	0.0	0.0	0.0	0.0
81.0000	878.5	100.0	100.0	98.5	97.9	97.0	94.8	90.4	81.7	60.8	26.9	4.3	0.3	0.1	0.0	0.0	0.0	0.0	0.0
87.0000	873.0	100.0	100.0	100.0	99.3	98.6	97.6	95.0	89.6	75.2	38.5	8.6	1.5	0.1	0.0	0.0	0.0	0.0	0.0
88.5000	871.3	100.0	100.0	99.7	97.7	96.1	93.0	87.5	77.6	50.2	20.6	10.2	5.4	0.1	0.0	0.0	0.0	0.0	0.0
91.0000	868.0	100.0	82.2	69.7	62.6	59.3	54.0	47.9	40.5	25.8	9.6	3.4	1.1	0.1	0.0	0.0	0.0	0.0	0.0
92.0000	867.0	100.0	100.0	99.6	98.8	97.6	94.1	90.2	73.2	35.3	8.4	2.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0
94.0000	864.8	100.0	100.0	99.8	97.7	96.2	92.8	85.6	70.8	37.9	9.3	3.3	0.9	0.0	0.0	0.0	0.0	0.0	0.0
98.0000	860.0	100.0	33.6	23.4	18.6	17.6	16.2	14.5	12.6	9.9	6.8	4.5	1.8	0.2	0.1	0.0	0.0	0.0	0.0
100.5000	858.0	100.0	100.0	100.0	100.0	99.9	99.8	99.6	99.4	98.6	92.0	40.0	6.4	0.1	0.1	0.0	0.0	0.0	0.0
102.0000	856.6	100.0	86.3	83.9	77.0	72.2	65.7	56.1	43.4	27.3	16.4	13.2	5.1	0.1	0.0	0.0	0.0	0.0	0.0
106.0000	851.7	100.0	96.6	95.0	91.7	89.8	87.1	80.7	67.7	41.3	15.1	3.4	0.5	0.1	0.0	0.0	0.0	0.0	0.0
106.5000	851.0	100.0	100.0	97.2	87.8	82.6	75.8	67.9	58.2	43.7	29.1	11.5	2.1	0.1	0.1	0.0	0.0	0.0	0.0
108.0000	850.0	100.0	100.0	98.6	96.3	93.7	89.5	81.6	67.9	37.9	9.3	1.9	0.4	0.1	0.0	0.0	0.0	0.0	0.0

Table 12

113.0000	845.5	100.0	100.0	90.1	84.5	80.2	72.3	60.8	43.7	15.8	1.8	[illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115.5000	843.0	100.0	70.8	55.8	48.4	46.3	44.4	42.0	38.1	30.7	21.7	7.5	1.3	0.0	0.0	0.0	0.0	0.0	0.0
124.0000	833.6	100.0	100.0	99.1	98.2	96.6	94.4	86.9	75.2	56.2	39.9	19.0	4.4	0.1	0.0	0.0	0.0	0.0	0.0
128.0000	829.5	100.0	100.0	100.0	99.5	99.1	98.2	96.2	92.1	76.1	37.0	14.9	2.8	0.1	0.0	0.0	0.0	0.0	0.0
131.5000	826.0	100.0	100.0	99.6	98.7	98.2	97.1	94.8	89.2	67.3	24.8	5.3	0.6	0.1	0.0	0.0	0.0	0.0	0.0
137.0000	819.5	100.0	83.0	60.2	57.0	53.6	49.8	45.0	38.4	26.3	12.8	5.8	1.2	0.1	0.1	0.0	0.0	0.0	0.0
138.0000	817.2	100.0	100.0	99.4	98.1	96.8	94.4	89.5	80.3	55.2	18.5	3.5	0.5	0.1	0.0	0.0	0.0	0.0	0.0
141.5000	813.0	100.0	92.9	86.6	79.5	74.9	67.8	57.1	41.0	21.9	6.3	3.2	1.7	0.1	0.0	0.0	0.0	0.0	0.0
142.0000	811.5	100.0	98.2	93.9	91.8	89.6	85.2	76.5	62.1	34.0	8.9	2.4	0.8	0.1	0.0	0.0	0.0	0.0	0.0
144.0000	808.9	100.0	96.2	84.7	66.8	57.3	47.0	38.2	31.7	24.9	17.9	11.7	5.3	0.3	0.1	0.0	0.0	0.0	0.0
146.0000	806.0	100.0	100.0	100.0	99.8	99.5	98.9	97.0	90.6	61.2	18.8	5.3	2.2	0.2	0.1	0.0	0.0	0.0	0.0
150.5000	800.4	100.0	100.0	99.4	96.9	94.3	90.0	82.0	68.4	43.3	20.1	6.7	1.0	0.2	0.1	0.0	0.0	0.0	0.0
155.2500	795.5	100.0	91.1	84.8	80.5	78.3	74.6	67.6	55.1	35.7	22.1	8.7	2.3	0.2	0.1	0.0	0.0	0.0	0.0
159.5000	791.5	100.0	100.0	99.2	95.0	90.7	83.6	73.1	59.3	38.7	20.9	7.0	1.2	0.1	0.1	0.0	0.0	0.0	0.0
160.5000	790.3	100.0	100.0	98.3	95.9	94.1	90.5	83.4	71.0	46.2	13.9	4.7	1.8	0.2	0.1	0.0	0.0	0.0	0.0
161.5000	789.2	100.0	100.0	99.5	96.2	93.5	88.4	80.5	69.8	53.0	22.5	6.1	2.1	0.1	0.0	0.0	0.0	0.0	0.0
163.7500	787.9	100.0	100.0	95.3	94.7	94.1	92.9	89.9	82.7	57.3	20.3	4.4	0.6	0.1	0.0	0.0	0.0	0.0	0.0
170.7500	780.9	100.0	100.0	97.6	96.4	95.5	93.8	90.1	82.0	58.3	25.4	6.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0
172.5000	780.0	100.0	100.0	99.4	97.6	95.7	90.7	85.0	70.0	43.0	20.0	4.1	0.8	0.1	0.0	0.0	0.0	0.0	0.0
176.0000	775.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	98.9	83.7	33.4	7.0	0.1	0.0	0.0	0.0	0.0	0.0
178.5000	NC	100.0	97.9	94.6	93.0	91.3	87.9	80.9	67.2	35.9	8.1	1.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
181.7500	772.5	100.0	100.0	96.5	86.5	80.4	73.0	63.5	49.6	26.7	10.5	4.9	2.0	0.1	0.0	0.0	0.0	0.0	0.0
182.7500	771.3	100.0	100.0	100.0	98.7	97.1	94.7	90.8	83.6	65.9	46.0	36.9	32.7	29.6	29.0	0.0	0.0	0.0	0.0
186.500	767.9	93.5	73.8	71.5	69.7	69.2	68.8	68.2	67.2	[illegible]	26.1	11.0	2.5	0.1	0.0	0.0	0.0	0.0	0.0
194.000	NC	100.0	98.5	96.1	93.9	92.4	89.8	84.2	71.2	32.9	5.4	1.2	0.5	0.1	0.0	0.0	0.0	0.0	0.0
195.0000	NC	100.0	100.0	98.9	97.5	95.7	92.8	87.1	76.2	49.3	21.5	3.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0
200.0000	757.0	100.0	100.0	100.0	99.3	98.5	97.1	94.4	89.6	75.1	47.3	21.2	5.5	0.1	0.1	0.0	0.0	0.0	0.0
201.5000	755.3	100.0	94.0	84.4	80.6	79.1	76.3	70.2	59.0	31.0	6.3	1.7	0.4	0.1	0.0	0.0	0.0	0.0	0.0
205.0000	NC	100.0	100.0	99.1	97.2	95.1	91.8	85.3	72.7	36.1	7.1	1.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0
209.0000	NC	100.0	95.8	82.7	71.2	65.8	60.9	56.1	50.1	33.0	10.5	4.1	2.2	0.4	0.1	0.0	0.0	0.0	0.0
210.7500	NC	100.0	100.0	100.0	99.7	99.4	99.0	97.7	93.0	64.1	15.9	3.6	1.2	0.1	0.0	0.0	0.0	0.0	0.0
215.5000	746.9	100.0	100.0	99.0	98.6	98.0	97.0	94.7	87.1	55.6	20.1	6.5	1.4	0.2	0.1	0.0	0.0	0.0	0.0
219.2500	742.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	98.6	74.3	20.9	3.7	0.1	0.0	0.0	0.0	0.0	0.0
221.5000	739.5	100.0	99.5	98.5	94.7	93.8	92.4	90.0	85.6	73.6	58.2	49.5	32.0	0.7	0.0	0.0	0.0	0.0	0.0
225.0000	736.5	100.0	100.0	100.0	99.6	99.3	98.8	97.7	95.2	91.3	33.0	12.9	3.9	0.2	0.0	0.0	0.0	0.0	0.0
229.0000	734.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	99.2	95.3	54.1	8.9	1.5	0.1	0.0	0.0	0.0	0.0	0.0
230.0000	732.8	100.0	88.0	84.2	82.9	82.6	82.1	80.5	76.4	61.1	20.9	4.4	1.0	0.1	0.0	0.0	0.0	0.0	0.0
231.0000	731.7	100.0	100.0	100.0	99.9	99.8	99.7	99.4	97.8	87.9	32.5	5.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
236.7500	725.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	[illegible]	99.2	75.7	15.1	2.1	0.1	0.0	0.0	0.0	0.0	0.0
241.0000	721.6	100.0	100.0	100.0	99.5	99.1	98.4	96.9	93.9	81.8	30.4	5.2	1.0	0.1	0.0	0.0	0.0	0.0	0.0
243.0000	719.7	100.0	100.0	98.4	97.6	97.2	96.3	94.2	89.0	69.5	31.0	15.2	2.2	0.1	0.0	0.0	0.0	0.0	0.0
244.0000	719.0	100.0	100.0	100.0	99.1	98.3	96.5	92.9	85.4	62.3	24.7	5.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0
247.5000	715.9	100.0	100.0	100.0	99.8	99.7	99.2	98.1	95.9	83.5	34.0	6.8	0.7	0.0	0.0	0.0	0.0	0.0	0.0
249.7500	714.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	[illegible]	99.2	56.8	19.0	3.6	0.2	0.0	0.0	0.0	0.0	0.0
250.5000	712.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	96.4	75.1	26.8	4.0	0.1	0.0	0.0	0.0	0.0	0.0
251.0000	712.0	100.0	100.0	100.0	99.5	98.7	96.9	93.0	85.7	70.4	44.8	20.6	5.0	0.1	0.0	0.0	0.0	0.0	0.0
251.7500	711.2	100.0	53.0	47.3	44.0	42.0	39.7	36.3	31.5	23.8	15.3	9.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0
252.2500	710.5	100.0	100.0	97.5	95.1	93.1	90.2	85.1	75.0	47.3	13.4	2.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
252.5000	710.0	100.0	100.0	96.6	93.1	91.2	88.5	83.6	73.2	43.0	11.9	2.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0
253.2500	709.5	100.0	100.0	100.0	99.9	99.8	99.6	99.4	98.7	94.9	64.7	21.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0
254.0000	708.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.9	77.2	30.1	2.3	0.0	0.0	0.0	0.0	0.0	0.0
254.1250	708.6	100.0	100.0	99.0	97.4	96.1	93.5	87.6	76.9	52.5	28.9	16.7	2.6	0.1	0.0	0.0	0.0	0.0	0.0
254.2500	708.5	100.0	93.6	87.8	80.0	75.1	68.7	60.8	50.6	36.6	24.9	10.6	2.0	0.1	0.0	0.0	0.0	0.0	0.0
254.5000	708.2	100.0	93.0	91.5	88.4	86.2	83.0	78.2	70.9	56.1	40.6	32.0	13.4	0.5	[illegible]	0.0	0.0	0.0	0.0
254.75 A	707.9	100.0	100.0	98.0	93.6	89.5	81.2	66.0	42.5	14.9	3.9	2.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0
254.75 B	707.9	100.0	100.0	99.0	97.6	96.7	94.9	91.6	85.4	68.6	46.3	25.3	4.3	0.1	0.0	0.0	0.0	0.0	0.0
255.0000	707.6	100.0	96.4	94.4	93.7	93.1	92.1	88.9	79.9	51.1	17.4	6.2	1.0	0.1	0.0	0.0	0.0	0.0	0.0
255.5000	706.9	100.0	100.0	99.0	98.4	98.1	97.2	94.5	87.3	63.8	28.3	5.8	1.3	0.0	0.0	0.0	0.0	[illegible]	0.0
255.75 A	706.6	100.0	100.0	100.0	99.7	99.5	99.1	98.3	95.3	76.8	30.0	8.4	2.3	0.1	0.0	0.0	0.0	0.0	0.0
255.75 B	706.6	100.0	96.5	[illegible]	88.7	85.9	81.7	75.6	64.2	34.2	6.5	1.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
256.2500	706.0	100.0	96.8	[illegible]	93.4	92.9	91.8	88.9	82.9	64.9	31.2	10.2	1.9	0.0	0.0	0.0	0.0	0.0	0.0

Table 12

256.5000	705.3	100.0	100.0	100.0	99.4	99.0	97.8	87.1	57.2	26.9	13.7	8.4	2.0	0.0	0.0	0.0	0.0	0.0	0.0
258.0000	704.2	100.0	100.0	98.9	98.8	98.7	98.6	98.2	94.7	67.8	27.8	10.3	3.0	0.1	0.1	0.0	0.0	0.0	0.0
259.0000	703.3	100.0	100.0	97.5	96.0	94.6	92.5	88.9	81.8	67.8	26.9	11.4	4.5	2.2	2.1	0.0	0.0	0.0	0.0
260.2500	701.9	100.0	100.0	100.0	100.0	99.4	98.4	95.9	88.9	63.9	29.7	17.7	3.2	0.1	0.0	0.0	0.0	0.0	0.0
261.5000	700.7	100.0	100.0	99.4	98.8	98.6	98.4	97.9	96.8	91.3	59.7	31.8	6.2	0.5	0.1	0.0	0.0	0.0	0.0
263.2500	698.9	100.0	100.0	100.0	98.6	96.8	93.8	88.9	80.1	57.9	17.7	6.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0
264.5000	697.5	100.0	100.0	98.5	97.1	96.5	95.0	91.7	84.6	63.8	37.6	19.5	5.6	0.1	0.0	0.0	0.0	0.0	0.0
266.0000	696.0	100.0	93.7	87.5	84.0	82.9	81.7	79.6	74.7	55.4	22.7	8.7	1.4	0.1	0.0	0.0	0.0	0.0	0.0
266.5000	695.5	100.0	100.0	97.4	94.7	92.6	89.0	82.4	71.3	45.7	16.1	5.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0
267.0000	695.0	100.0	94.8	91.5	89.4	87.8	85.5	81.8	74.8	58.6	43.2	38.4	33.7	32.4	32.2	0.0	0.0	0.0	0.0
269.5000	691.9	100.0	100.0	100.0	100.0	99.9	99.8	99.3	97.7	90.5	65.2	26.8	2.7	0.1	0.0	0.0	0.0	0.0	0.0
270.5000	690.3	100.0	100.0	100.0	99.8	99.7	99.3	97.9	93.1	72.1	23.6	12.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0
271.5000	689.3	100.0	98.3	97.7	96.2	95.5	93.7	90.0	82.7	60.0	21.5	6.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0
272.5000	688.6	100.0	100.0	99.8	99.1	99.0	98.8	98.3	97.3	94.8	78.2	26.1	7.9	0.1	0.0	0.0	0.0	0.0	0.0
272.7500	688.0	100.0	97.7	94.6	93.8	93.5	93.0	91.8	87.9	67.2	17.5	4.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0
273.0000	687.5	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.3	96.5	88.2	71.8	42.6	22.8	22.0	0.0	0.0	0.0	0.0
273 A	687.5	100.0	100.0	98.6	95.3	92.1	87.8	82.7	75.5	57.2	25.3	8.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0
273.7500	686.4	100.0	96.4	89.6	84.5	82.2	79.3	75.4	69.9	[illegible]	48.6	44.7	43.3	42.1	42.0	0.0	0.0	0.0	0.0
277.5000	681.6	100.0	100.0	100.0	99.7	99.6	99.2	98.4	96.2	85.5	54.4	27.2	3.7	0.1	0.1	0.0	0.0	0.0	0.0
280.7500	NC	100.0	100.0	99.7	97.7	95.3	90.1	81.5	68.0	45.2	21.4	9.0	1.7	0.3	0.1	0.0	0.0	0.0	0.0
281.5000	NC	100.0	100.0	97.6	95.6	94.6	92.9	89.8	84.9	69.0	22.1	7.5	0.5	0.1	0.0	0.0	0.0	0.0	0.0
283.5000	NC	100.0	100.0	99.8	99.4	98.9	98.1	96.9	92.2	62.7	27.9	8.4	3.5	0.1	0.0	0.0	0.0	0.0	0.0
286.7500	NC	100.0	100.0	100.0	99.1	98.3	96.8	91.3	54.6	11.7	3.9	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0
287.2500	NC	100.0	100.0	99.6	99.5	99.5	99.4	99.1	97.7	81.3	33.8	7.4	0.8	0.1	0.0	0.0	0.0	0.0	0.0
289.2500	NC	100.0	100.0	100.0	99.6	99.5	99.2	98.4	95.8	83.1	39.5	8.5	2.3	0.0	0.0	0.0	0.0	0.0	0.0
292.5000	NC	100.0	100.0	100.0	99.8	99.2	97.3	94.1	87.2	55.6	15.8	4.0	1.0	0.1	0.0	0.0	0.0	0.0	0.0
293.0000	NC	83.3	32.7	28.6	27.1	26.7	26.3	25.5	24.2	18.5	8.6	3.0	1.3	0.1	0.0	0.0	0.0	0.0	0.0
293.7500	677.0	100.0	92.7	88.7	81.7	78.9	75.4	71.0	63.9	42.6	14.6	3.8	0.6	0.1	0.0	0.0	0.0	0.0	0.0
296.0000	674.0	100.0	100.0	100.0	99.8	99.6	99.0	96.9	91.7	75.9	56.4	42.8	25.1	0.3	0.1	0.0	0.0	0.0	0.0
298.5000	672.5	100.0	100.0	98.9	97.9	97.4	96.1	93.1	85.8	65.8	31.5	9.0	2.7	0.1	0.0	0.0	0.0	0.0	0.0
300.0000	670.0	100.0	100.0	100.0	99.5	98.4	95.7	89.6	75.0	37.6	6.1	1.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0
300.7500	669.2	100.0	100.0	98.7	97.0	96.0	94.5	90.9	83.2	59.6	21.2	2.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0
301.5000	668.4	100.0	100.0	97.5	95.8	94.6	92.5	88.2	80.1	59.0	29.6	9.5	3.4	0.3	0.1	0.0	0.0	0.0	0.0
302.7500	667.1	100.0	100.0	100.0	99.8	99.7	99.5	99.2	97.6	82.9	31.0	7.7	1.0	0.1	0.0	0.0	0.0	0.0	0.0
303.2500	NC	100.0	100.0	100.0	99.8	99.8	99.8	99.7	99.5	97.1	76.3	17.6	1.5	0.1	0.0	0.0	0.0	0.0	0.0
303.5000	NC	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.5	97.7	89.0	29.8	3.7	0.1	0.0	0.0	0.0	0.0	0.0
303.7500	NC	100.0	99.0	97.9	96.6	95.9	94.7	92.1	85.5	57.3	14.7	3.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0
304.0000	666.9	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	99.2	98.6	58.2	1.0	0.1	0.0	0.0	0.0	0.0
306.7500	663.7	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.5	71.4	7.2	2.7	1.5	0.1	0.0	0.0	0.0	0.0	0.0
310.0000	660.3	100.0	100.0	99.3	99.0	98.9	98.9	98.7	98.2	94.7	88.9	63.6	14.1	0.1	0.1	0.0	0.0	0.0	0.0
310.7500	659.4	100.0	100.0	97.2	94.9	93.7	91.9	89.0	82.6	60.5	23.7	2.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0
313.7500	656.7	100.0	100.0	100.0	99.8	99.7	99.3	98.6	96.6	86.6	56.3	20.4	3.8	0.1	0.0	0.0	0.0	0.0	0.0
314.2500	656.4	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	98.9	85.0	28.8	3.5	0.1	0.0	0.0	0.0	0.0	0.0
316.2500	654.2	100.0	100.0	98.8	98.4	98.3	98.2	97.7	93.8	60.3	11.6	4.0	3.2	0.5	0.1	0.0	0.0	0.0	0.0
317.5000	653.0	100.0	100.0	98.7	98.4	98.3	98.0	97.5	96.2	91.1	69.0	23.3	2.7	0.1	0.0	0.0	0.0	0.0	0.0
321.5000	649.0	100.0	100.0	100.0	99.6	99.4	98.8	97.3	91.7	64.9	28.5	10.1	2.5	0.1	0.0	0.0	0.0	0.0	0.0
324.5000	646.0	100.0	100.0	98.4	97.2	96.4	94.5	90.1	81.0	62.2	38.7	15.8	4.4	0.1	0.0	0.0	0.0	0.0	0.0
329.5000	640.6	100.0	85.1	53.4	34.2	28.1	22.8	18.4	15.2	10.4	4.3	1.7	0.6	0.1	0.0	0.0	0.0	0.0	0.0
330.0000	640.1	100.0	100.0	100.0	100.0	100.0	99.9	99.6	97.5	63.4	7.3	1.3	0.3	[illegible]	0.0	0.0	0.0	0.0	0.0
331.0000	639.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.3	91.2	32.0	3.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
332.0000	637.8	100.0	100.0	100.0	99.9	99.9	99.8	99.7	98.8	94.9	83.0	50.9	7.6	0.1	0.0	0.0	0.0	0.0	0.0
333.5000	635.8	100.0	100.0	100.0	99.4	98.4	97.2	94.7	89.9	70.9	35.1	25.2	20.2	3.3	0.5	0.0	0.0	0.0	0.0
337.0000	632.1	100.0	100.0	99.3	96.1	93.8	89.8	83.7	70.4	30.8	4.4	1.0	0.4	0.1	0.1	0.0	0.0	0.0	0.0
338.7500	630.2	100.0	100.0	100.0	99.9	99.8	99.6	99.2	98.4	97.0	94.3	87.5	13.9	0.2	0.0	0.0	0.0	0.0	0.0
339.5000	629.3	100.0	100.0	100.0	99.8	99.6	99.5	99.4	98.9	97.0	90.1	45.2	3.5	0.1	0.0	0.0	0.0	0.0	0.0
342.7500	NC	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.5	98.1	82.6	44.8	12.2	0.1	0.0	0.0	0.0	0.0	0.0
344.0000	NC	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.6	98.2	88.0	14.7	0.2	0.1	0.0	0.0	0.0	0.0
348.0000	625.8	100.0	100.0	97.1	89.7	80.8	68.5	55.3	44.5	34.3	21.8	11.6	5.4	1.1	0.4	0.0	0.0	0.0	0.0
349.0000	NC	100.0	100.0	100.0	99.2	98.1	96.3	94.3	92.2	88.4	68.3	31.3	7.3	0.5	0.2	0.0	0.0	0.0	0.0
350.0000	NC	100.0	87.0	51.9	37.2	33.7	31.2	29.5	27.9	24.1	15.6	6.6	1.4	0.1	0.1	0.0	0.0	0.0	0.0
351.0000	NC	100.0	100.0	100.0	100.0	99.9	99.8	99.6	99.3	97.1	62.4	9.9	0.7	0.1	0.0	0.0	0.0	0.0	0.0

Table 12

352.2500	NC	100.0	100.0	100.0	98.6	98.1	97.2	95.9	92.7	74.0	14.2	1.6	0.3	0.1	0.1	0.0	0.0	0.0	0.0
352.5000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.2	91.0	45.0	3.4	0.1	0.0	0.0	0.0	0.0	0.0
353.0000	NC	100.0	100.0	100.0	99.3	99.1	98.7	97.7	95.3	84.6	49.1	11.1	0.9	0.1	0.0	0.0	0.0	0.0	0.0
356.0000	NC	100.0	100.0	97.7	96.6	96.2	95.4	92.7	82.6	43.3	9.0	3.4	2.2	0.3	0.1	0.0	0.0	0.0	0.0
357.5000	NC	100.0	97.3	91.3	85.1	82.8	79.8	75.5	67.6	45.5	14.1	2.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
359.0000	NC	100.0	100.0	99.0	98.9	98.8	98.7	98.6	98.3	95.5	83.5	57.6	8.4	0.2	0.0	0.0	0.0	0.0	0.0
360.7500	624.1	100.0	94.9	85.1	72.9	63.4	61.6	55.7	48.9	37.2	23.5	16.0	6.9	0.2	0.1	0.0	0.0	0.0	0.0
362.5000	622.0	100.0	100.0	100.0	99.6	99.3	98.8	97.8	94.8	79.2	42.3	16.4	3.1	0.1	0.0	0.0	0.0	0.0	0.0
363.2500	621.5	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	97.8	85.6	66.2	16.7	0.1	0.1	0.0	0.0	0.0	0.0
366.5000	618.0	100.0	100.0	99.8	99.7	99.7	99.6	99.5	99.4	97.5	76.3	24.1	4.5	0.1	0.0	0.0	0.0	0.0	0.0
371.7500	613.0	100.0	100.0	100.0	99.2	98.9	98.4	97.7	95.7	81.4	42.3	20.6	6.2	0.1	0.1	0.0	0.0	0.0	0.0
372.0000	612.4	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	98.3	85.7	64.3	45.3	1.4	0.5	0.0	0.0	0.0	0.0
372.7500	611.5	100.0	100.0	97.8	97.4	97.2	96.9	96.4	95.5	90.1	64.8	36.6	28.2	23.4	22.7	0.0	0.0	0.0	0.0
375.0000	608.9	100.0	94.7	92.8	91.8	91.4	90.9	90.2	88.4	77.3	44.6	26.2	16.2	0.4	0.0	0.0	0.0	0.0	0.0
376.7500	607.1	100.0	100.0	98.5	89.5	83.6	76.6	69.4	63.4	55.6	42.6	26.9	8.4	1.1	0.7	0.0	0.0	0.0	0.0
378.5000	605.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.4	98.4	95.0	60.9	21.0	0.7	0.2	0.0	0.0	0.0	0.0
381.0000	603.4	100.0	100.0	99.1	95.1	92.3	89.5	86.7	81.7	64.9	37.3	16.8	5.6	2.7	2.1	0.0	0.0	0.0	0.0
382.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	98.1	90.9	71.7	35.9	2.3	0.5	0.0	0.0	0.0	0.0
390.5000	593.1	100.0	100.0	99.6	99.3	99.2	99.0	98.8	98.2	95.5	90.7	86.5	55.8	1.2	0.1	0.0	0.0	0.0	0.0
391.5000	591.3	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	98.8	92.4	78.4	52.4	1.3	0.2	0.0	0.0	0.0	0.0
393.0000	590.5	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.6	98.1	91.8	75.5	28.7	6.6	3.3	0.0	0.0	0.0	0.0
394.0000	590.0	100.0	98.7	94.2	80.1	71.3	61.2	52.6	44.9	29.7	15.0	11.4	9.7	4.1	1.4	0.0	0.0	0.0	0.0
395.0000	589.0	100.0	100.0	100.0	99.9	99.6	99.2	98.2	95.5	81.4	35.6	10.2	7.1	2.7	0.9	0.0	0.0	0.0	0.0
396.0000	587.2	100.0	100.0	100.0	100.0	99.9	99.6	98.8	95.6	79.4	35.2	11.0	7.6	3.9	1.5	0.0	0.0	0.0	0.0
396.2500	586.9	100.0	97.4	92.3	86.1	82.0	76.7	69.7	58.0	32.1	10.2	3.6	1.9	0.7	0.2	0.0	0.0	0.0	0.0
397.0000	586.3	100.0	27.2	26.2	25.6	25.4	25.3	25.2	25.0	24.1	18.6	5.7	0.5	0.0	0.0	0.0	0.0	0.0	0.0
397.2500	586.0	100.0	100.0	100.0	99.8	99.6	99.4	99.2	98.8	98.1	96.4	94.2	75.7	1.0	0.1	0.0	0.0	0.0	0.0
397.5000	585.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	91.6	51.7	11.2	0.1	0.0	0.0	0.0	0.0	0.0
397.5 A	585.5	100.0	100.0	98.5	98.0	97.1	96.3	95.3	93.4	85.8	50.9	10.2	0.7	0.1	0.0	0.0	0.0	0.0	0.0
398.0000	585.1	100.0	100.0	99.4	98.7	98.5	98.3	97.9	96.5	81.2	19.0	3.7	0.7	0.1	0.1	0.0	0.0	0.0	0.0
398.2500	N/A	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.0	96.2	86.1	70.4	43.8	19.1	13.8	0.0	0.0	0.0	0.0
398.5000	585.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.2	94.8	57.5	9.8	1.2	0.1	0.1	0.0	0.0	0.0	0.0
399.0000	584.8	100.0	100.0	100.0	99.8	99.8	99.7	99.6	99.5	99.2	97.1	86.1	30.2	0.6	0.1	0.0	0.0	0.0	0.0
399.7500	584.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.3	98.2	95.1	39.0	0.5	0.1	0.0	0.0	0.0	0.0
401.0000	581.6	100.0	100.0	100.0	99.5	98.7	97.7	96.2	93.6	83.6	68.3	61.6	43.7	2.1	0.3	0.0	0.0	0.0	0.0
401.5000	581.3	100.0	40.9	29.6	24.3	22.9	21.8	20.9	20.1	18.4	13.8	9.0	5.6	1.1	0.4	0.0	0.0	0.0	0.0
402.0000	580.7	100.0	76.1	52.4	33.9	27.5	22.3	18.3	14.9	10.2	5.4	2.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
403.0000	579.9	100.0	20.2	12.6	8.7	7.3	6.2	5.4	4.5	3.0	1.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0
404.0000	576.3	100.0	98.7	96.4	94.9	93.7	92.2	89.7	85.4	71.7	37.1	5.5	0.6	0.1	0.0	0.0	0.0	0.0	0.0
404.5000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	96.7	35.8	2.6	0.2	0.1	0.0	0.0	0.0	0.0
406.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	99.5	95.9	80.4	29.0	1.0	0.1	0.0	0.0	0.0	0.0
407.5000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.1	90.8	85.4	65.0	0.0	0.0
410.0000	NC	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.6	99.3	97.6	69.2	6.1	0.1	0.0	0.0	0.0	0.0	0.0
411.5000	NC	100.0	71.1	58.9	53.6	51.7	50.3	49.0	47.6	43.2	18.1	5.4	2.0	0.3	0.1	0.0	0.0	0.0	0.0
412.5000	NC	100.0	81.0	77.8	68.0	60.5	51.4	42.7	34.3	23.0	9.5	2.1	0.3	0.1	0.1	0.0	0.0	0.0	0.0
413.5000	NC	100.0	100.0	99.6	96.2	94.0	91.3	87.6	83.0	70.8	47.1	26.0	5.8	0.2	0.1	0.0	0.0	0.0	0.0
416.0000	NC	100.0	100.0	100.0	99.7	99.6	99.4	98.9	97.8	90.8	37.0	7.4	1.0	0.1	0.0	0.0	0.0	0.0	0.0
419.0000	NC	100.0	100.0	99.5	98.3	98.2	98.0	97.7	97.0	94.4	77.0	29.4	7.7	0.1	0.0	0.0	0.0	0.0	0.0
420.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.5	95.8	61.3	15.7	2.2	0.1	0.0	0.0	0.0	0.0	0.0
423.0000	NC	100.0	100.0	100.0	99.5	99.2	98.7	98.3	97.3	93.1	74.1	48.9	17.0	0.2	0.0	0.0	0.0	0.0	0.0
424.5000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.1	88.1	74.2	50.2	0.0	0.0
425.5000	571.2	100.0	88.6	75.7	71.5	69.9	68.1	65.7	61.7	45.7	15.9	8.0	3.2	0.8	0.3	0.0	0.0	0.0	0.0
426.5000	568.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	79.0	73.3	64.3	36.1	0.0	0.0
428.0000	566.9	100.0	100.0	100.0	99.9	99.8	99.7	99.6	99.2	95.3	49.2	12.1	7.0	2.2	1.1	0.0	0.0	0.0	0.0
429.5000	565.4	100.0	100.0	100.0	99.3	99.0	98.2	97.1	94.9	86.1	28.9	11.3	2.9	0.7	0.3	0.0	0.0	0.0	0.0
429.7500	565.1	100.0	100.0	99.7	99.4	99.3	99.1	99.0	98.7	97.4	88.0	40.5	9.8	0.6	0.2	0.0	0.0	0.0	0.0
430.5000	564.5	100.0	56.0	23.9	12.6	9.1	7.0	5.8	5.0	3.8	1.7	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
431.5000	563.5	100.0	100.0	99.7	97.5	96.1	93.9	89.4	80.2	50.5	12.2	3.8	0.2	0.1	0.1	0.0	0.0	0.0	0.0
433 A	560.4	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.4	93.5	52.0	24.6	0.5	0.1	0.0	0.0	0.0	0.0
433 B	560.4	100.0	87.8	86.2	85.7	84.8	83.6	81.9	79.1	69.9	31.3	4.8	0.4	0.1	0.1	0.0	0.0	0.0	0.0
433.5000	559.8	100.0	100.0	94.8	89.6	87.6	85.5	82.4	77.6	65.4	39.8	12.5	2.1	0.1	0.1	0.0	0.0	0.0	0.0

Table 12

435.5000	557.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	99.2	97.1	82.4	38.6	12.1	7.2	7.1	0.0	0.0	0.0	0.0
436.7500	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	96.4	72.1	38.7	1.1	0.1	0.0	0.0	0.0	0.0
438.5000	NC	100.0	100.0	100.0	99.4	99.3	99.1	98.9	98.6	96.8	85.1	48.8	22.2	0.6	0.1	0.0	0.0	0.0	0.0
439.5000	554.5	100.0	100.0	100.0	99.9	99.9	99.8	99.5	99.0	96.8	84.4	52.7	31.4	17.3	16.4	0.0	0.0	0.0	0.0
441.0000	553.1	100.0	97.8	96.0	95.6	95.5	95.4	95.1	94.3	91.1	80.4	61.8	49.4	34.0	20.1	0.0	0.0	0.0	0.0
441.5000	552.2	100.0	100.0	100.0	99.7	99.0	97.8	96.0	92.4	78.7	38.3	10.0	4.2	1.7	0.6	0.0	0.0	0.0	0.0
442.5000	551.8	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.6	98.6	64.0	4.6	0.4	0.2	0.1	0.0	0.0	0.0	0.0
443.5000	549.7	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	96.4	38.1	1.8	0.1	0.1	0.0	0.0	0.0	0.0
447.5000	NC	100.0	94.3	90.3	87.2	82.8	75.5	65.3	52.5	30.6	12.3	9.2	7.8	0.4	0.1	0.0	0.0	0.0	0.0
449.0000	NC	100.0	100.0	100.0	99.3	99.2	98.9	98.0	96.0	89.5	73.1	42.9	11.9	0.6	0.1	0.0	0.0	0.0	0.0
451.5000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.8	90.8	70.8	62.4	0.0
452.5000	NC	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	96.7	41.8	3.1	0.7	0.4	0.2	0.0	0.0	0.0	0.0
454.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.2	93.4	90.1	70.5	52.1	0.0
454.5000	NC	100.0	85.6	56.0	37.6	32.3	27.5	23.6	19.6	12.5	4.9	1.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
455.5000	NC	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.3	96.0	53.3	6.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
456.5000	548.2	100.0	100.0	100.0	99.6	99.4	99.3	99.1	98.6	95.4	69.3	23.9	2.7	0.1	0.1	0.0	0.0	0.0	0.0
457.5000	547.3	100.0	100.0	98.7	96.7	95.2	92.8	87.2	77.7	58.8	27.5	5.8	0.4	0.1	0.1	0.0	0.0	0.0	0.0
459.0000	546.0	100.0	56.2	50.4	49.6	49.0	48.1	45.8	40.7	26.7	7.7	1.7	0.5	0.1	0.1	0.0	0.0	0.0	0.0
459.2500	545.5	100.0	100.0	99.4	96.4	95.0	92.9	89.2	82.5	68.4	49.3	32.1	18.8	2.5	0.8	0.0	0.0	0.0	0.0
460.5000	544.4	100.0	100.0	100.0	99.2	97.1	94.3	88.7	77.7	52.6	33.9	21.8	4.4	0.3	0.1	0.0	0.0	0.0	0.0
461.5000	543.6	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.2	84.0	30.1	13.0	3.7	0.3	0.1	0.0	0.0	0.0	0.0
462.0000	NC	100.0	76.1	62.6	55.9	53.0	50.6	48.5	43.5	37.2	13.3	5.1	0.9	0.1	0.0	0.0	0.0	0.0	0.0
464.0000	NC	100.0	100.0	100.0	97.7	97.0	96.0	94.3	89.9	75.6	27.5	3.2	0.5	0.1	0.1	0.0	0.0	0.0	0.0
464.2500	NC	100.0	100.0	100.0	99.7	99.5	99.2	98.7	97.8	92.3	74.0	26.6	2.1	0.2	0.1	0.0	0.0	0.0	0.0
465.5000	NC	100.0	100.0	99.0	96.9	96.2	95.4	94.4	92.6	86.0	66.0	29.4	4.4	0.1	0.1	0.0	0.0	0.0	0.0
466.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.3	95.2	53.2	5.8	0.1	0.1	0.0	0.0	0.0	0.0
466.5000	NC	100.0	100.0	100.0	99.6	99.5	99.4	99.3	98.9	97.7	93.4	66.8	17.9	0.1	0.1	0.0	0.0	0.0	0.0
468.0000	NC	100.0	100.0	100.0	99.1	98.3	96.9	94.5	89.2	73.2	51.4	41.6	29.2	0.2	0.1	0.0	0.0	0.0	0.0
469.5000	NC	100.0	100.0	100.0	94.2	86.3	75.9	64.4	52.4	42.6	39.3	38.7	37.2	1.2	0.2	0.0	0.0	0.0	0.0
470.5000	NC	100.0	100.0	98.5	96.5	96.3	96.2	95.4	94.6	81.2	13.0	2.2	1.6	0.1	0.1	0.0	0.0	0.0	0.0
472.5000	540.0	100.0	100.0	100.0	99.4	98.6	94.7	92.7	60.5	18.7	3.0	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
474.0000	NC	100.0	100.0	100.0	100.0	99.9	99.8	99.5	97.4	84.2	25.3	3.6	0.5	0.1	0.1	0.0	0.0	0.0	0.0
475.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	94.2	42.9	7.1	0.6	0.1	0.1	0.0	0.0	0.0	0.0
475.7500	NC	100.0	90.5	89.8	89.5	89.3	89.2	89.1	89.0	88.6	73.7	14.4	0.7	0.1	0.1	0.0	0.0	0.0	0.0
476.2500	NC	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.6	98.8	74.5	9.1	0.4	0.1	0.1	0.0	0.0	0.0	0.0
477.5000	NC	100.0	100.0	100.0	98.2	98.0	97.9	97.6	96.0	85.4	71.3	55.5	11.7	0.1	0.1	0.0	0.0	0.0	0.0
479.7500	NC	100.0	100.0	98.4	98.1	98.0	97.9	97.6	96.2	90.4	59.8	17.3	5.9	0.2	0.1	0.0	0.0	0.0	0.0
481.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	97.8	65.1	15.3	2.7	0.6	0.0	0.0	0.0	0.0
481.2500	NC	100.0	70.1	53.6	46.9	44.8	43.5	42.3	39.8	31.8	19.5	7.3	1.7	0.1	0.1	0.0	0.0	0.0	0.0
481.7500	NC	100.0	78.7	75.3	73.1	72.3	71.0	68.6	64.4	53.4	31.3	21.1	2.6	0.2	0.1	0.0	0.0	0.0	0.0
482.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	98.1	57.8	5.2	0.2	0.1	0.0	0.0	0.0	0.0
483.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	95.9	68.6	23.4	2.9	0.1	0.1	0.0	0.0	0.0	0.0
484.0000	538.6	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.5	94.9	57.0	16.0	4.4	0.1	0.1	0.0	0.0	0.0	0.0
484.2500	538.4	100.0	80.2	13.1	0.7	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
484.7500	537.9	100.0	100.0	90.2	78.5	67.0	52.5	36.6	21.6	8.1	2.8	0.8	0.2	0.1	0.1	0.0	0.0	0.0	0.0
485.25 A	537.4	100.0	100.0	100.0	99.9	99.9	99.2	98.2	94.5	73.1	22.0	3.6	0.6	0.1	0.1	0.0	0.0	0.0	0.0
485.25 B	537.4	100.0	85.9	41.8	26.6	20.6	15.7	11.7	8.4	5.1	3.1	1.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
486.0000	536.7	100.0	100.0	100.0	99.6	99.5	99.4	99.2	97.9	84.9	38.6	14.6	2.2	0.1	0.1	0.0	0.0	0.0	0.0
487.0000	535.8	100.0	100.0	100.0	97.7	97.6	97.1	95.8	89.9	63.6	30.5	21.7	17.8	1.1	0.2	0.0	0.0	0.0	0.0
488.5 A	534.4	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	97.5	50.2	7.3	0.2	0.1	0.0	0.0	0.0	0.0
488.5 B	534.4	100.0	100.0	100.0	99.9	99.7	99.1	97.3	93.2	71.7	26.3	5.5	0.9	0.1	0.1	0.0	0.0	0.0	0.0
489.0000	534.1	100.0	100.0	100.0	99.3	99.2	99.0	98.4	97.3	92.3	67.3	23.0	2.9	0.2	0.1	0.0	0.0	0.0	0.0
489.2500	533.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.0	80.6	59.2	34.9	27.3	0.0
489.5000	533.7	100.0	100.0	100.0	99.7	99.6	99.6	99.5	99.4	98.7	93.7	56.0	4.7	0.1	0.1	0.0	0.0	0.0	0.0
489.7500	533.6	100.0	92.5	89.5	88.2	87.2	86.4	85.2	83.2	72.3	36.5	7.0	0.4	0.1	0.1	0.0	0.0	0.0	0.0
490.0000	533.4	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	98.0	66.3	7.3	0.1	0.1	0.0	0.0	0.0	0.0
490.5 A	532.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.3	79.3	36.6	3.5	0.1	0.1	0.0	0.0	0.0	0.0
490.5 B	532.8	100.0	98.4	97.0	95.3	94.4	92.9	90.8	88.0	80.9	47.4	10.4	0.5	0.1	0.0	0.0	0.0	0.0	0.0
491.0000	532.1	100.0	100.0	100.0	99.8	99.7	99.6	99.3	99.0	98.3	93.2	43.8	3.9	0.1	0.1	0.0	0.0	0.0	0.0
491.2500	531.8	100.0	100.0	100.0	99.9	99.8	99.8	99.7	99.7	99.4	93.5	44.6	3.9	0.0	0.0	0.0	0.0	0.0	0.0
492.5000	530.4	100.0	100.0	100.0	100.0	99.8	99.2	98.3	97.0	93.8	86.8	77.3	52.3	1.4	0.4	0.0	0.0	0.0	0.0

Table 12

493.5000	529.4	100.0	80.8	65.4	51.1	44.3	38.4	32.8	26.1	14.2	5.8	3.2	1.1	0.1	0.1	0.0	0.0	0.0	0.0
494.0000	528.9	100.0	72.9	56.6	50.8	48.1	45.3	42.6	38.3	24.8	8.8	4.3	2.0	0.2	0.0	0.0	0.0	0.0	0.0
494.5000	528.4	100.0	100.0	96.4	96.1	96.1	96.0	95.9	95.5	91.1	44.1	5.9	0.6	0.1	0.0	0.0	0.0	0.0	0.0
496.0000	526.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.6	98.9	89.8	30.7	6.4	0.2	0.1	0.0	0.0	0.0	0.0
497.0000	525.9	100.0	100.0	100.0	98.6	97.0	95.0	91.7	86.1	73.8	58.5	29.0	10.4	0.4	0.1	0.0	0.0	0.0	0.0
498.7500	524.4	100.0	100.0	100.0	100.0	99.9	99.7	99.4	99.0	97.2	91.0	78.5	32.4	3.7	0.4	0.0	0.0	0.0	0.0
500.0000	523.0	100.0	100.0	100.0	96.5	94.1	91.1	86.7	80.0	61.8	21.1	3.0	0.5	0.1	0.1	0.0	0.0	0.0	0.0
501.5000	521.4	100.0	68.1	58.6	48.9	45.0	44.2	40.2	38.0	33.6	20.4	9.1	3.9	0.3	0.1	0.0	0.0	0.0	0.0
502.0000	520.9	100.0	100.0	100.0	99.8	99.6	99.2	98.4	96.3	80.4	34.6	8.1	0.8	0.1	0.1	0.0	0.0	0.0	0.0
503.5000	519.0	100.0	100.0	100.0	99.7	99.1	98.4	97.2	95.4	87.6	57.1	24.3	2.9	0.1	0.1	0.0	0.0	0.0	0.0
505.5000	516.3	100.0	100.0	100.0	92.9	91.3	90.0	88.4	86.3	80.1	61.9	36.2	12.9	1.9	1.0	0.0	0.0	0.0	0.0
507.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	98.8	80.0	42.7	7.6	0.7	0.2	0.0	0.0	0.0	0.0
508.7500	NC	100.0	100.0	100.0	99.4	98.9	98.2	96.4	91.6	71.5	32.4	11.2	2.5	0.2	0.1	0.0	0.0	0.0	0.0
510.5000	NC	100.0	100.0	100.0	99.4	99.0	98.7	98.4	97.7	93.7	58.0	9.5	2.0	0.1	0.1	0.0	0.0	0.0	0.0
512.2500	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.1	90.9	66.8	31.9	4.1	1.1	0.0	0.0	0.0	0.0
513.0000	513.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	99.6	98.7	82.1	24.6	9.9	0.9	0.0	0.0	0.0	0.0
514.0000	511.6	100.0	1.5	1.1	1.0	1.0	1.0	0.9	0.8	0.7	0.5	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0
514.5000	511.2	100.0	68.2	68.1	67.6	67.5	67.3	67.1	66.8	65.2	53.5	17.7	2.0	0.1	0.1	0.0	0.0	0.0	0.0
515.0000	510.8	100.0	100.0	100.0	98.6	98.1	97.3	96.2	94.4	88.6	72.1	22.9	1.5	0.1	0.1	0.0	0.0	0.0	0.0
517.0000	508.8	100.0	100.0	93.9	92.5	92.1	91.7	91.1	89.7	83.5	65.4	52.6	23.8	1.2	0.1	0.0	0.0	0.0	0.0
518.0000	507.6	100.0	100.0	96.5	93.4	91.7	89.5	85.0	76.9	54.2	24.1	7.8	2.9	0.1	0.1	0.0	0.0	0.0	0.0
519.5000	NC	100.0	97.3	92.9	89.1	86.7	83.0	78.0	71.2	53.5	24.9	6.6	1.8	0.1	0.1	0.0	0.0	0.0	0.0
520.5000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	98.5	73.6	26.2	3.3	0.1	0.1	0.0	0.0	0.0	0.0
521.7500	NC	100.0	100.0	100.0	99.6	99.5	99.2	98.9	98.3	96.7	93.2	57.9	5.0	0.1	0.1	0.0	0.0	0.0	0.0
522.5000	NC	100.0	100.0	100.0	99.9	99.8	99.7	99.5	98.6	94.0	63.3	22.8	5.0	0.1	0.1	0.0	0.0	0.0	0.0
523.5000	NC	100.0	100.0	100.0	100.0	99.9	99.5	99.0	98.5	96.9	88.3	67.9	62.0	14.0	3.7	0.0	0.0	0.0	0.0
526.0000	NC	100.0	100.0	100.0	99.0	98.4	97.9	97.3	96.3	92.6	71.5	28.2	15.5	1.4	0.3	0.0	0.0	0.0	0.0
526.7500	NC	100.0	100.0	100.0	99.9	99.8	99.7	99.6	99.1	97.9	94.4	83.6	15.3	0.2	0.1	0.0	0.0	0.0	0.0
527.2500	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	98.7	89.1	15.4	0.1	0.1	0.0	0.0	0.0	0.0
528.0000	NC	100.0	100.0	100.0	99.9	99.8	99.7	99.6	99.3	98.5	96.2	80.3	9.4	0.1	0.1	0.0	0.0	0.0	0.0
530.0000	499.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	92.8	49.7	3.9	0.1	0.1	0.0	0.0	0.0	0.0
530.5000	499.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.4	91.8	70.4	20.6	0.1	0.1	0.0	0.0	0.0	0.0
532.0000	497.7	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	98.5	91.8	24.1	0.2	0.1	0.0	0.0	0.0	0.0
533.5000	496.5	100.0	100.0	100.0	99.4	99.3	99.1	98.5	97.5	93.8	77.7	49.7	11.8	0.1	0.1	0.0	0.0	0.0	0.0
536.0000	494.1	100.0	100.0	100.0	99.5	99.2	98.4	96.6	92.5	77.4	40.7	12.9	3.7	0.2	0.1	0.0	0.0	0.0	0.0
537.0000	492.9	100.0	84.1	81.4	78.1	75.6	72.6	68.3	62.3	48.8	27.6	14.8	5.1	0.1	0.0	0.0	0.0	0.0	0.0
537.5000	492.3	100.0	100.0	100.0	99.9	99.7	99.5	99.2	97.3	85.7	37.1	9.5	1.7	0.1	0.1	0.0	0.0	0.0	0.0
538.5000	491.0	100.0	100.0	100.0	98.8	98.1	97.0	95.4	92.7	82.3	42.2	13.0	3.4	0.1	0.1	0.0	0.0	0.0	0.0
538.7500	490.7	100.0	93.8	92.8	92.1	91.7	91.1	89.4	85.8	73.7	34.2	6.4	1.0	0.1	0.1	0.0	0.0	0.0	0.0
539 A	490.4	100.0	100.0	98.8	97.4	96.5	95.2	92.8	88.5	74.1	35.4	6.3	0.9	0.1	0.1	0.0	0.0	0.0	0.0
539 B	490.4	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.2	94.6	65.0	16.5	0.2	0.1	0.0	0.0	0.0	0.0
539.2500	490.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.8	99.5	94.7	59.2	16.4	0.1	0.1	0.0	0.0	0.0	0.0
539.7500	489.4	100.0	100.0	100.0	99.9	99.6	99.3	99.2	99.1	98.7	97.2	93.0	78.1	2.2	0.4	0.0	0.0	0.0	0.0
540.0000	489.1	100.0	100.0	100.0	99.9	99.8	99.5	98.8	97.1	88.9	46.2	9.3	2.0	0.2	0.1	0.0	0.0	0.0	0.0
540.2500	488.8	100.0	97.9	89.9	88.1	87.2	86.4	84.9	81.9	70.2	30.7	5.3	0.5	0.1	0.1	0.0	0.0	0.0	0.0
540.25 A	488.8	100.0	100.0	98.6	96.9	95.5	93.8	90.7	83.6	59.3	17.4	2.2	0.4	0.1	0.1	0.0	0.0	0.0	0.0
541.2500	487.6	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.4	87.6	19.8	0.2	0.1	0.0	0.0	0.0	0.0
541.5000	487.5	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	97.9	81.1	31.5	10.3	10.0	0.0	0.0	0.0	0.0
543.7500	485.8	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	98.1	59.8	14.9	1.9	0.1	0.1	0.0	0.0	0.0	0.0
546.2500	483.4	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.8	98.8	60.5	9.4	0.5	0.1	0.1	0.0	0.0	0.0	0.0
548.0000	480.7	100.0	100.0	98.3	94.6	93.0	91.9	90.3	87.6	79.1	60.2	37.0	7.0	0.3	0.1	0.0	0.0	0.0	0.0
548.5000	480.2	100.0	34.4	27.2	22.2	20.1	18.1	16.1	13.9	9.9	5.3	2.3	0.5	0.1	0.0	0.0	0.0	0.0	0.0
549.0000	479.6	100.0	97.2	93.9	90.8	88.5	86.1	83.1	78.3	65.8	41.3	11.0	1.0	0.1	0.1	0.0	0.0	0.0	0.0
549.5000	479.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.3	87.4	30.7	7.4	0.2	0.1	0.0	0.0	0.0	0.0
551.0000	477.5	100.0	98.5	94.5	89.5	86.2	81.7	75.3	65.9	46.0	15.8	3.5	0.9	0.1	0.0	0.0	0.0	0.0	0.0
554.0000	474.3	100.0	100.0	100.0	99.8	99.7	99.6	99.3	97.2	76.1	17.8	6.5	3.7	0.6	0.2	0.0	0.0	0.0	0.0
555.0000	473.2	100.0	84.2	83.0	82.5	81.9	80.3	77.1	69.4	38.5	5.8	2.4	1.4	0.1	0.0	0.0	0.0	0.0	0.0
556.0000	472.5	100.0	100.0	100.0	99.7	99.5	99.4	99.1	97.9	92.8	79.5	59.3	22.7	0.3	0.0	0.0	0.0	0.0	0.0
558.5000	470.6	100.0	100.0	100.0	99.5	99.4	99.2	98.8	97.4	90.5	66.7	33.2	16.8	0.9	0.1	0.0	0.0	0.0	0.0
560.0000	469.1	100.0	100.0	100.0	99.8	99.6	99.3	98.8	97.5	91.9	74.6	48.2	7.4	0.1	0.0	0.0	0.0	0.0	0.0
560.5000	468.6	100.0	100.0	99.8	98.9	98.8	98.5	98.1	97.2	92.8	75.7	37.3	5.1	0.1	0.0	0.0	0.0	0.0	0.0

Table 12

563.5000	465.6	100.0	100.0	100.0	99.8	99.7	99.2	97.3	92.7	75.6	35.2	14.2	4.6	0.4	0.1	0.0	0.0	0.0	0.0
565.0000	NC	100.0	97.5	94.5	92.5	91.2	88.9	85.2	78.5	57.0	17.3	2.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0
566.5000	NC	100.0	100.0	100.0	99.4	99.4	99.1	98.7	98.0	94.0	60.7	12.5	1.0	0.1	0.1	0.0	0.0	0.0	0.0
568.0000	NC	100.0	100.0	98.6	94.1	90.4	85.1	77.8	68.0	51.0	26.4	4.6	0.4	0.1	0.1	0.0	0.0	0.0	0.0
569.5000	NC	100.0	100.0	97.8	97.4	97.3	97.1	96.9	96.4	94.7	86.9	30.6	2.3	0.1	0.1	0.0	0.0	0.0	0.0
570.7500	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.3	64.3	34.0	27.1	0.0
572.5000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	95.1	54.1	18.8	9.0	1.4	0.3	0.0	0.0	0.0	0.0
573.5000	NC	100.0	95.5	86.2	82.7	81.6	80.3	78.4	74.7	57.8	19.3	3.6	1.0	0.1	0.1	0.0	0.0	0.0	0.0
575.0000	NC	100.0	5.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
575.5000	NC	100.0	32.5	27.4	23.7	22.1	20.6	18.7	16.4	11.0	3.5	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0
577.0000	NC	100.0	100.0	95.5	92.5	90.7	88.3	84.6	77.6	53.8	17.4	2.2	0.3	0.1	0.1	0.0	0.0	0.0	0.0
578.0000	460.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.2	94.0	61.9	24.1	4.0	0.1	0.1	0.0	0.0	0.0	0.0
579.0000	458.9	100.0	100.0	100.0	99.1	98.9	98.6	98.1	96.9	89.5	66.8	32.5	4.2	0.1	0.1	0.0	0.0	0.0	0.0
580.0000	458.1	100.0	100.0	100.0	99.0	98.7	98.5	98.2	97.5	89.3	37.5	14.8	8.9	0.3	0.1	0.0	0.0	0.0	0.0
581.0000	457.0	100.0	55.9	41.5	34.7	32.0	30.0	28.2	26.2	20.8	9.9	5.4	3.9	0.2	0.1	0.0	0.0	0.0	0.0
581.7500	455.8	100.0	100.0	100.0	100.0	99.9	99.7	99.2	96.1	71.9	25.5	12.2	8.4	0.6	0.1	0.0	0.0	0.0	0.0
583.0000	454.8	100.0	74.6	69.9	65.8	63.7	62.1	59.9	54.9	36.6	10.0	1.9	0.6	0.1	0.0	0.0	0.0	0.0	0.0
583.5000	454.0	100.0	89.3	86.5	85.4	84.9	84.2	81.8	75.6	49.9	13.3	1.7	0.3	0.1	0.1	0.0	0.0	0.0	0.0
586.2500	451.0	100.0	98.2	94.5	93.4	92.8	92.3	91.1	88.6	78.9	45.0	10.2	3.1	0.2	0.1	0.0	0.0	0.0	0.0
586.7500	NC	100.0	100.0	99.0	96.6	95.6	94.4	91.6	86.7	69.8	29.7	6.9	2.5	2.0	2.0	0.0	0.0	0.0	0.0
588.0000	NC	100.0	69.5	62.1	58.1	57.3	56.3	55.0	51.6	35.2	11.3	4.1	2.4	0.1	0.0	0.0	0.0	0.0	0.0
589.0000	NC	100.0	100.0	100.0	100.0	99.8	99.8	99.6	99.2	95.7	59.9	14.7	1.4	0.1	0.1	0.0	0.0	0.0	0.0
590.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.2	93.6	80.5	39.4	31.3	0.0
591.0000	NC	100.0	100.0	100.0	98.4	98.1	97.8	97.2	96.2	90.5	65.0	22.7	3.0	0.7	0.6	0.0	0.0	0.0	0.0
593.0000	NC	100.0	100.0	100.0	99.8	99.7	99.3	98.3	96.9	91.8	72.0	44.5	5.4	0.2	0.1	0.0	0.0	0.0	0.0
595.0000	444.1	100.0	100.0	100.0	98.3	96.9	94.5	90.8	85.9	73.6	31.5	11.7	7.3	0.5	0.2	0.0	0.0	0.0	0.0
595.2500	443.8	100.0	97.7	92.6	90.8	90.4	90.3	90.2	90.1	89.3	83.2	46.4	15.3	1.0	0.2	0.0	0.0	0.0	0.0
595.5000	443.6	100.0	74.8	71.8	68.0	65.3	62.0	56.5	48.7	32.1	10.3	2.9	1.6	0.1	0.0	0.0	0.0	0.0	0.0
595.5 A	443.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.6	97.3	56.3	2.6	1.0	0.0	0.0	0.0	0.0
595.7500	443.3	100.0	28.4	23.0	21.0	20.4	20.0	19.6	19.1	16.7	8.9	2.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0
595.75 A	443.3	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.7	99.6	98.9	83.7	5.3	1.2	0.0	0.0	0.0	0.0
596.2500	442.8	100.0	74.1	62.0	60.1	58.6	57.7	56.9	55.8	49.0	24.4	6.1	0.9	0.1	0.1	0.0	0.0	0.0	0.0
596.5000	442.5	100.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
596.5 A	442.5	100.0	100.0	100.0	99.3	98.4	96.7	93.5	87.6	67.6	22.7	3.4	1.8	0.1	0.1	0.0	0.0	0.0	0.0
596.7500	442.3	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.6	97.6	85.4	32.8	3.0	0.1	0.1	0.0	0.0	0.0	0.0
597.0000	442.0	100.0	72.9	68.3	65.9	64.5	63.3	61.4	58.9	54.5	47.9	33.8	6.8	0.1	0.1	0.0	0.0	0.0	0.0
597 A	442.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.5	80.1	1.7	0.2	0.0	0.0	0.0	0.0
597.5000	441.5	100.0	100.0	99.2	93.9	90.4	84.7	75.2	60.7	30.1	4.8	1.0	0.3	0.1	0.1	0.0	0.0	0.0	0.0
597.5 A	441.5	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	97.3	79.2	31.0	3.3	0.1	0.1	0.0	0.0	0.0	0.0
598.0000	441.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.5	96.1	84.3	34.3	0.1	0.1	0.0	0.0	0.0	0.0
598.2500	440.7	100.0	88.9	85.0	80.2	77.7	74.2	69.5	61.4	36.6	8.6	1.8	0.4	0.1	0.1	0.0	0.0	0.0	0.0
598.5000	440.4	100.0	95.8	93.2	92.8	92.6	92.2	91.1	88.0	72.8	24.5	2.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0
598.5 A	440.4	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.5	96.2	82.6	49.1	0.3	0.1	0.0	0.0	0.0	0.0
599.0000	439.9	100.0	97.6	92.1	90.4	89.9	89.1	87.7	84.7	73.0	49.4	16.3	1.4	0.1	0.1	0.0	0.0	0.0	0.0
599 A	439.9	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.4	97.9	95.9	63.5	0.4	0.1	0.0	0.0	0.0	0.0
599.5000	439.4	100.0	100.0	100.0	96.6	93.5	89.7	84.0	75.8	51.8	13.7	2.7	0.4	0.1	0.1	0.0	0.0	0.0	0.0
599.5 A	439.4	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.4	93.6	59.7	21.4	8.2	0.1	0.1	0.0	0.0	0.0	0.0
599.7500	439.1	100.0	100.0	100.0	99.9	99.8	99.4	98.5	96.7	88.5	61.3	45.9	41.9	5.6	1.9	0.0	0.0	0.0	0.0
600.0000	438.9	100.0	100.0	100.0	99.9	99.8	99.6	99.2	98.1	90.9	56.8	13.2	1.2	0.1	0.1	0.0	0.0	0.0	0.0
600 A	438.9	100.0	100.0	100.0	99.8	99.7	99.6	99.5	99.1	93.1	52.7	12.5	2.2	0.1	0.1	0.0	0.0	0.0	0.0
600.5000	438.3	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.5	95.4	73.0	13.6	0.1	0.1	0.0	0.0	0.0	0.0
601.6000	437.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.5	97.1	82.8	15.9	0.2	0.0	0.0	0.0	0.0	0.0
601.7500	437.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	97.9	89.5	65.6	12.5	0.1	0.1	0.0	0.0	0.0	0.0
602.5000	436.2	100.0	100.0	100.0	100.0	99.9	99.9	99.6	98.9	98.4	98.0	96.9	84.6	3.3	0.7	0.0	0.0	0.0	0.0
603.0000	435.7	100.0	67.9	62.4	61.3	60.9	60.5	59.9	58.8	55.4	47.9	40.5	28.6	4.1	2.9	0.0	0.0	0.0	0.0
604.7500	434.0	100.0	100.0	100.0	99.1	99.0	98.7	98.1	95.4	72.4	26.3	8.5	3.5	0.2	0.1	0.0	0.0	0.0	0.0
605.7500	433.1	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	98.7	85.0	16.2	0.2	0.1	0.0	0.0	0.0	0.0
606 A	432.9	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	97.5	28.6	0.2	0.1	0.0	0.0	0.0	0.0
606.0000	432.9	100.0	100.0	100.0	100.0	99.9	99.9	99.8	98.5	77.7	18.3	4.7	1.2	0.1	0.0	0.0	0.0	0.0	0.0
606.5000	432.4	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.3	90.8	19.2	0.2	0.1	0.0	0.0	0.0	0.0
606.7500	432.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	97.8	73.1	19.1	2.1	0.1	0.1	0.0	0.0	0.0	0.0

Table 12

607.5000	431.5	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	98.5	94.0	58.3	0.9	0.1	0.0	0.0	0.0	0.0
608.0000	431.0	100.0	100.0	100.0	99.6	99.3	98.8	98.1	96.6	90.0	71.7	34.8	4.5	0.2	0.1	0.0	0.0	0.0	0.0
608.2500	430.8	100.0	100.0	100.0	99.6	99.1	98.6	97.7	96.6	91.6	64.7	21.6	3.5	0.1	0.1	0.0	0.0	0.0	0.0
608.5000	430.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	97.7	75.3	47.4	26.6	0.9	0.1	0.0	0.0	0.0	0.0
609.0000	430.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	97.5	74.4	17.8	0.2	0.1	0.0	0.0	0.0	0.0
609.5000	429.7	100.0	93.5	89.8	86.5	85.0	83.2	81.0	77.1	66.1	43.3	16.2	2.9	0.1	0.0	0.0	0.0	0.0	0.0
610.0000	429.2	100.0	100.0	100.0	99.3	99.2	99.1	98.9	98.1	92.4	69.2	28.9	3.3	0.1	0.1	0.0	0.0	0.0	0.0
611.0000	428.5	100.0	100.0	100.0	100.0	99.8	99.7	99.6	99.4	97.3	78.7	19.7	1.7	0.1	0.1	0.0	0.0	0.0	0.0
612.0000	427.3	100.0	100.0	95.9	93.2	91.9	90.2	88.2	83.8	61.1	20.1	7.0	4.8	0.9	0.2	0.0	0.0	0.0	0.0
612.2500	427.0	100.0	100.0	100.0	99.6	99.6	99.5	99.4	99.1	97.0	77.9	37.3	8.7	0.6	0.2	0.0	0.0	0.0	0.0
613.0000	426.1	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.3	99.3	56.0	13.7	2.5	0.1	0.1	0.0	0.0	0.0	0.0
614.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.9	99.8	99.8	99.4	27.3	4.5	1.5	0.0	0.0	0.0	0.0
614 A	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.5	98.4	90.1	69.8	52.1	48.8	0.0	0.0	0.0	0.0
615.0000	NC	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.4	94.4	60.3	22.1	6.1	0.8	0.6	0.0	0.0	0.0	0.0
617.0000	NC	100.0	100.0	100.0	99.8	99.5	99.4	99.0	97.6	89.6	56.4	23.5	7.7	0.3	0.1	0.0	0.0	0.0	0.0
619.0000	NC	100.0	83.6	67.8	64.5	63.0	62.0	60.8	59.2	51.0	30.1	19.5	15.2	11.2	10.7	0.0	0.0	0.0	0.0
620.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.8	71.5	63.9	42.8	30.2	0.0
625.0000	NC	100.0	100.0	94.1	89.9	87.1	83.4	77.1	65.5	38.1	13.5	4.4	0.5	0.1	0.1	0.0	0.0	0.0	0.0
628.0000	421.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.3	97.0	95.8	94.1	10.0	1.6	0.0	0.0	0.0	0.0
630.0000	418.3	100.0	100.0	98.4	97.2	96.7	96.0	94.6	90.8	72.6	39.2	10.5	3.3	0.4	0.2	0.0	0.0	0.0	0.0
631.0000	417.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.9	98.7	88.7	50.3	7.0	0.4	0.1	0.0	0.0	0.0	0.0
631 A	417.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.1	94.7	60.5	12.6	1.1	0.1	0.1	0.0	0.0	0.0	0.0
633.0000	415.3	100.0	100.0	100.0	99.4	99.3	99.1	98.8	98.3	93.2	81.5	73.3	57.7	3.2	0.4	0.0	0.0	0.0	0.0
633 A	415.3	100.0	100.0	99.3	98.3	97.5	96.7	95.4	91.9	73.5	23.0	4.6	0.9	0.1	0.1	0.0	0.0	0.0	0.0
635.0000	412.3	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	96.4	55.7	9.8	2.1	0.1	0.1	0.0	0.0	0.0	0.0
638.0000	409.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.4	90.4	42.5	28.7	0.0
639.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	96.1	74.6	43.0	20.3	0.9	0.1	0.0	0.0	0.0	0.0
640.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.5	99.0	98.5	69.5	28.2	0.0	0.0	0.0	0.0
642.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.1	98.3	97.4	36.5	12.1	0.0	0.0	0.0	0.0
643.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	93.8	91.3	81.7	49.9	0.0	0.0
647.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.5	88.5	77.9	47.7	32.4	0.0
648.0000	406.8	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.1	93.8	59.0	15.3	2.9	0.5	0.2	0.0	0.0	0.0	0.0
650.0000	405.1	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.6	98.4	91.6	73.8	35.4	1.5	0.3	0.0	0.0	0.0	0.0
657.0000	396.8	100.0	73.4	56.1	52.2	50.8	49.6	48.0	44.3	29.3	14.3	4.6	1.2	0.4	0.2	0.0	0.0	0.0	0.0
659.0000	395.3	100.0	100.0	100.0	100.0	99.9	99.7	99.5	99.1	95.5	83.7	64.4	8.5	0.2	0.1	0.0	0.0	0.0	0.0
659 A	395.3	100.0	100.0	100.0	99.9	99.9	99.8	99.6	99.0	92.9	62.2	23.9	3.0	0.3	0.1	0.0	0.0	0.0	0.0
662.0000	392.1	100.0	100.0	100.0	97.1	94.4	92.1	89.8	86.6	74.5	50.0	27.3	12.5	6.9	6.3	0.0	0.0	0.0	0.0
666.0000	NC	100.0	100.0	98.6	98.2	97.3	96.5	95.3	92.7	78.7	37.1	9.4	1.4	0.1	0.1	0.0	0.0	0.0	0.0
670.0000	NC	100.0	67.2	60.1	57.2	55.9	54.8	53.6	51.8	44.8	20.8	6.0	1.4	0.3	0.1	0.0	0.0	0.0	0.0
671.0000	NC	100.0	100.0	100.0	99.7	99.6	99.4	99.3	98.9	97.4	88.3	38.4	4.1	0.1	0.1	0.0	0.0	0.0	0.0
676.0000	381.7	100.0	78.7	71.5	67.5	66.4	65.8	64.6	62.4	51.3	25.5	10.0	3.8	0.4	0.1	0.0	0.0	0.0	0.0
683.0000	374.5	100.0	100.0	99.2	97.3	95.4	93.7	90.5	85.0	65.8	35.9	15.7	6.1	0.4	0.2	0.0	0.0	0.0	0.0
687.0000	370.7	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.7	96.3	74.8	32.9	4.4	0.1	0.1	0.0	0.0	0.0	0.0
689.0000	368.7	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	98.6	92.1	84.5	51.4	1.8	0.4	0.0	0.0	0.0	0.0
693.0000	NC	100.0	100.0	100.0	99.9	99.7	99.4	99.0	98.2	94.7	75.7	42.4	11.5	0.2	0.1	0.0	0.0	0.0	0.0
696.0000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.4	91.4	40.0	3.3	0.2	0.1	0.0	0.0	0.0	0.0
701.0000	NC	100.0	100.0	98.9	96.4	96.0	95.4	94.3	90.7	57.2	6.9	1.9	0.6	0.1	0.1	0.0	0.0	0.0	0.0
708.5000	360.7	100.0	100.0	97.4	96.3	96.2	95.7	95.0	93.1	71.3	29.6	11.9	1.6	0.1	0.1	0.0	0.0	0.0	0.0
709.0000	360.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	97.7	77.4	12.0	0.4	0.1	0.0	0.0	0.0	0.0
710.0000	359.2	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	98.9	92.1	42.9	0.8	0.2	0.0	0.0	0.0	0.0
710.7500	358.5	100.0	90.7	86.6	80.6	77.9	75.9	72.1	66.8	51.9	15.1	2.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0
711.0000	358.2	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	99.4	97.7	83.7	31.4	0.6	0.1	0.0	0.0	0.0	0.0
712.2500	357.0	100.0	91.5	85.6	84.1	83.7	83.5	83.2	82.4	75.8	40.1	6.8	0.6	0.1	0.0	0.0	0.0	0.0	0.0
713.0000	356.2	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	98.1	86.0	38.4	4.1	0.1	0.1	0.0	0.0	0.0	0.0
713 A	356.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	95.3	37.7	1.1	0.2	0.0	0.0	0.0	0.0
715.7500	353.2	100.0	100.0	100.0	100.0	100.0	99.8	99.7	99.5	98.1	88.9	69.8	28.0	0.7	0.1	0.0	0.0	0.0	0.0
716.2500	352.7	100.0	91.1	85.4	82.9	82.3	81.5	80.7	79.6	73.5	46.7	16.8	6.4	0.3	0.1	0.0	0.0	0.0	0.0
718.5000	350.3	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.6	97.0	86.2	48.5	6.1	0.1	0.1	0.0	0.0	0.0	0.0
720.0000	348.7	100.0	100.0	99.1	98.4	98.4	98.1	97.8	97.0	91.3	65.4	22.6	5.2	0.1	0.1	0.0	0.0	0.0	0.0
722.0000	346.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	99.6	97.5	74.7	32.7	8.0	0.2	0.1	0.0	0.0	0.0	0.0
723.5000	NC	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.3	95.0	84.9	68.5	9.2	1.0	0.0	0.0	0.0	0.0

Table 12

725.5000	NC	100.0	100.0	99.5	98.6	97.9	97.2	96.0	93.7	81.1	31.3	6.3	1.3	0.2	0.1	0.0	0.0	0.0	0.0
728.5000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.7	99.4	99.0	97.5	11.2	2.3	0.0	0.0	0.0	0.0
733.0000	NC	100.0	100.0	99.5	98.3	97.7	97.2	96.1	94.3	87.0	72.6	35.3	10.9	0.4	0.1	0.0	0.0	0.0	0.0
736.0000	NC	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.6	93.8	51.1	12.9	0.6	0.2	0.0	0.0	0.0	0.0
740.0000	337.1	100.0	100.0	100.0	99.1	98.8	98.6	98.1	97.5	95.2	84.8	39.6	5.2	0.5	0.1	0.0	0.0	0.0	0.0
742.0000	335.4	100.0	100.0	99.7	97.0	95.3	92.9	88.5	82.3	56.5	15.9	5.6	2.3	0.3	0.1	0.0	0.0	0.0	0.0
745.0000	331.8	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	99.6	95.8	46.0	11.0	0.2	0.1	0.0	0.0	0.0	0.0
749.0000	326.5	100.0	100.0	99.1	97.2	95.8	94.6	91.0	84.5	59.6	15.5	2.4	0.7	0.1	0.1	0.0	0.0	0.0	0.0
752.0000	323.5	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.6	85.5	1.5	0.3	0.0	0.0	0.0	0.0
756.5000	318.9	100.0	100.0	100.0	100.0	100.0	99.9	99.5	98.8	95.9	88.8	82.8	78.9	62.8	55.9	0.0	0.0	0.0	0.0
757.0000	318.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	74.3	0.0	0.0
758.5000	316.6	100.0	100.0	100.0	99.9	99.2	98.2	96.6	95.1	88.9	22.4	15.4	12.6	6.0	3.8	0.0	0.0	0.0	0.0
759.5000	315.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.1	76.4	12.2	0.1	0.1	0.0	0.0	0.0	0.0
760.0000	315.1	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	92.8	27.6	3.4	0.3	0.1	0.0	0.0	0.0	0.0
760.2500	314.8	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.3	66.2	0.8	0.1	0.0	0.0	0.0	0.0
760.5000	314.6	100.0	100.0	100.0	99.8	99.8	99.7	99.5	99.2	95.7	61.7	18.6	1.5	0.1	0.0	0.0	0.0	0.0	0.0
760.7500	314.3	100.0	100.0	91.9	88.7	87.7	86.6	85.2	82.6	60.8	14.8	3.4	0.8	0.1	0.1	0.0	0.0	0.0	0.0
761.5000	313.5	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.4	98.7	97.4	89.5	2.6	0.5	0.0	0.0	0.0	0.0
763.0000	312.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.7	99.6	99.4	99.4	98.6	15.6	4.0	0.0	0.0	0.0	0.0
766.0000	309.0	100.0	100.0	95.7	95.2	95.2	95.1	95.0	93.6	74.3	23.0	6.8	3.6	0.7	0.2	0.0	0.0	0.0	0.0
767.0000	308.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	88.1	46.7	7.0	0.5	0.1	0.0	0.0	0.0	0.0
767.5000	307.6	100.0	79.8	68.5	67.2	66.9	66.6	66.4	65.6	54.9	23.4	7.9	1.2	0.1	0.1	0.0	0.0	0.0	0.0
768.0000	307.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.6	98.2	15.9	6.9	0.0	0.0	0.0	0.0
770.0000	304.6	100.0	100.0	95.4	92.9	92.4	91.9	91.0	90.2	84.9	63.2	29.7	11.3	1.1	0.5	0.0	0.0	0.0	0.0
770.5000	303.9	100.0	100.0	98.3	96.9	96.3	95.7	94.9	93.0	84.4	41.5	10.5	3.9	0.2	0.1	0.0	0.0	0.0	0.0
771.0000	303.2	100.0	100.0	99.3	98.7	98.6	98.6	98.4	97.9	94.8	43.7	12.0	4.8	0.2	0.2	0.0	0.0	0.0	0.0
771.5000	302.7	100.0	100.0	97.4	90.2	86.8	84.1	81.5	79.0	70.2	43.5	23.0	9.8	0.4	0.2	0.0	0.0	0.0	0.0
773.5000	300.4	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.7	99.1	95.7	89.3	82.6	13.6	1.1	0.0	0.0	0.0	0.0
777.5000	296.2	100.0	90.2	84.3	79.8	78.5	77.6	76.7	75.8	67.5	30.7	9.6	4.8	0.3	0.0	0.0	0.0	0.0	0.0
785.7500	288.0	100.0	100.0	100.0	98.8	98.6	98.5	98.3	97.6	90.0	66.8	35.6	14.3	0.5	0.1	0.0	0.0	0.0	0.0
786.7500	287.1	100.0	100.0	98.9	98.7	98.7	98.6	98.5	98.3	96.7	89.6	68.3	22.8	0.7	0.1	0.0	0.0	0.0	0.0
787.0000	286.9	100.0	100.0	97.9	97.0	96.8	96.7	96.1	95.3	90.0	62.8	26.6	6.1	0.1	0.1	0.0	0.0	0.0	0.0
800.0000	273.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.4	98.9	35.2	0.3	0.1	0.0	0.0	0.0	0.0
807.0000	266.3	100.0	100.0	100.0	99.7	99.4	99.2	98.8	97.9	91.6	52.7	22.5	11.5	1.3	0.2	0.0	0.0	0.0	0.0
814.0000	259.4	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.5	95.8	91.9	13.5	0.2	0.1	0.0	0.0	0.0	0.0
826.5000	246.2	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.2	29.4	0.5	0.1	0.0	0.0	0.0	0.0
835.5000	236.6	100.0	100.0	100.0	100.0	99.9	99.8	99.6	99.5	96.9	63.3	35.3	7.8	0.2	0.1	0.0	0.0	0.0	0.0
838.0000	234.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.2	86.7	81.0	66.0	0.0	0.0
840.5000	231.4	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	94.7	55.9	6.1	0.4	0.2	0.0	0.0	0.0	0.0
842.0000	230.0	100.0	100.0	100.0	99.9	99.8	99.7	99.3	98.3	92.8	59.4	17.4	2.8	0.4	0.1	0.0	0.0	0.0	0.0
847.5000	224.8	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.7	99.4	97.2	42.3	6.4	0.2	0.1	0.0	0.0	0.0	0.0
860.0000	211.5	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.5	99.4	42.4	0.7	0.2	0.0	0.0	0.0	0.0
861.0000	210.5	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.5	80.4	11.2	0.1	0.1	0.0	0.0	0.0	0.0
867.5000	204.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.7	99.7	98.5	56.8	1.1	0.4	0.0	0.0	0.0	0.0
882.5000	188.3	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	99.4	91.5	43.2	6.3	0.2	0.1	0.0	0.0	0.0	0.0
896.0000	174.8	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	97.9	53.8	6.5	0.4	0.3	0.0	0.0	0.0	0.0
911.0000	159.6	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.8	98.7	59.7	16.5	15.2	0.0	0.0	0.0	0.0
917.0000	153.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	98.5	48.1	0.9	0.3	0.0	0.0	0.0	0.0
924.0000	146.4	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.7	99.7	99.3	53.0	0.6	0.1	0.0	0.0	0.0	0.0
937.0000	133.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.8	99.3	59.9	8.7	8.2	0.0	0.0	0.0	0.0
967.5000	103.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	95.6	49.0	0.2	0.1	0.0	0.0	0.0	0.0
968.5000	102.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	95.0	2.5	0.5	0.0	0.0	0.0	0.0
972.2500	97.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	32.2	7.7	0.1	0.0	0.0	0.0	0.0	0.0
977.0000	93.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	99.1	98.2	97.9	96.3	82.9	75.5	49.2
979.5000	90.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	85.1	31.1	0.9	0.6	0.0	0.0	0.0	0.0
983.0000	87.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	96.4	27.4	0.2	0.1	0.0	0.0	0.0	0.0
986.7500	83.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	98.9	89.3	55.8	30.9	30.6	29.8	24.9	20.8	13.7
990.2500	79.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.4	65.1	21.3	0.2	0.1	0.0	0.0	0.0	0.0
992.7500	77.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	97.6	96.6	95.8	95.5	95.1	80.0	69.6	46.5
994.5000	76.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	97.0	42.6	0.8	0.2	0.0	0.0	0.0	0.0
997.7500	72.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.4	98.8	97.9	95.1	92.4	88.8	63.3	51.1	29.9

Table 12

999.5000	70.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	99.2	98.2	86.4	3.5	1.6	0.0	0.0	0.0	0.0
1001.5000	68.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.4	97.8	87.1	76.1	42.8
1004.2500	64.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	98.7	53.5	0.4	0.1	0.0	0.0	0.0	0.0
1007.0000	63.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	94.5	82.3	1.9	1.3	0.0	0.0	0.0	0.0
1010.0000	60.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.3	39.3	22.4	0.0	0.0	0.0	0.0
1014.2500	55.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.9	82.5	1.6	0.3	0.0	0.0	0.0	0.0
1017.2500	52.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.4	90.1	1.8	0.4	0.0	0.0	0.0	0.0
1019.0000	50.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.3	3.3	0.5	0.0	0.0	0.0	0.0
1021.2500	48.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.0	53.8	1.4	0.5	0.0	0.0	0.0	0.0
1023.5000	46.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	97.4	71.9	1.5	0.2	0.0	0.0	0.0	0.0
1027.2500	42.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	98.2	82.1	16.9	15.1	0.0	0.0	0.0	0.0
1030.0000	39.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	97.3	84.1	1.3	0.4	0.0	0.0	0.0	0.0
1033.0000	37.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	96.1	29.9	0.8	0.5	0.0	0.0	0.0	0.0
1037.0000	33.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.5	94.2	83.7	74.5	70.4	67.7	60.0	51.2	33.0
1040.7500	29.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.5	83.1	1.3	0.7	0.0	0.0	0.0	0.0
1044.0000	25.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.5	98.8	71.9	0.9	0.6	0.0	0.0	0.0	0.0
1047.5000	22.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.6	92.6	76.7	2.0	0.4	0.0	0.0	0.0	0.0
1050.0000	19.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.3	95.3	5.1	0.7	0.0	0.0	0.0	0.0
1052.5000	18.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.5	97.3	4.5	1.6	0.0	0.0	0.0	0.0
1057.0000	12.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.4	99.0	98.8	55.1	42.6	37.8	27.7	23.2	14.9
1058.2500	11.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	98.1	96.7	75.1	63.4	41.4
1060.0000	9.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.6	98.7	87.1	76.4	45.2
1062.2500	7.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	97.5	83.0	2.4	0.5	0.0	0.0	0.0	0.0
1064.0000	6.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.4	95.2	78.2	75.3	73.4	52.9	43.3	27.2
1065.5000	4.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.3	97.4	3.5	0.5	0.0	0.0	0.0	0.0
1066.0000	3.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	3.9	0.7	0.0	0.0	0.0	0.0
1066.7500	2.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.7	99.1	96.2	78.2	74.4	68.1	29.3	23.4	15.5
1067.7500	1.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.8	98.1	94.3	82.9	79.4	77.9	57.1	44.8	21.1
1069.0000	0.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.8	99.3	90.5	81.6	50.8
1069.5000	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	94.5	65.8	[illegible]	2.1	0.0	0.0	0.0	0.0

* Not in Channel

APPENDIX B

Plates - Location Map and Hydrographs, 1930-1933 and 1987-1990

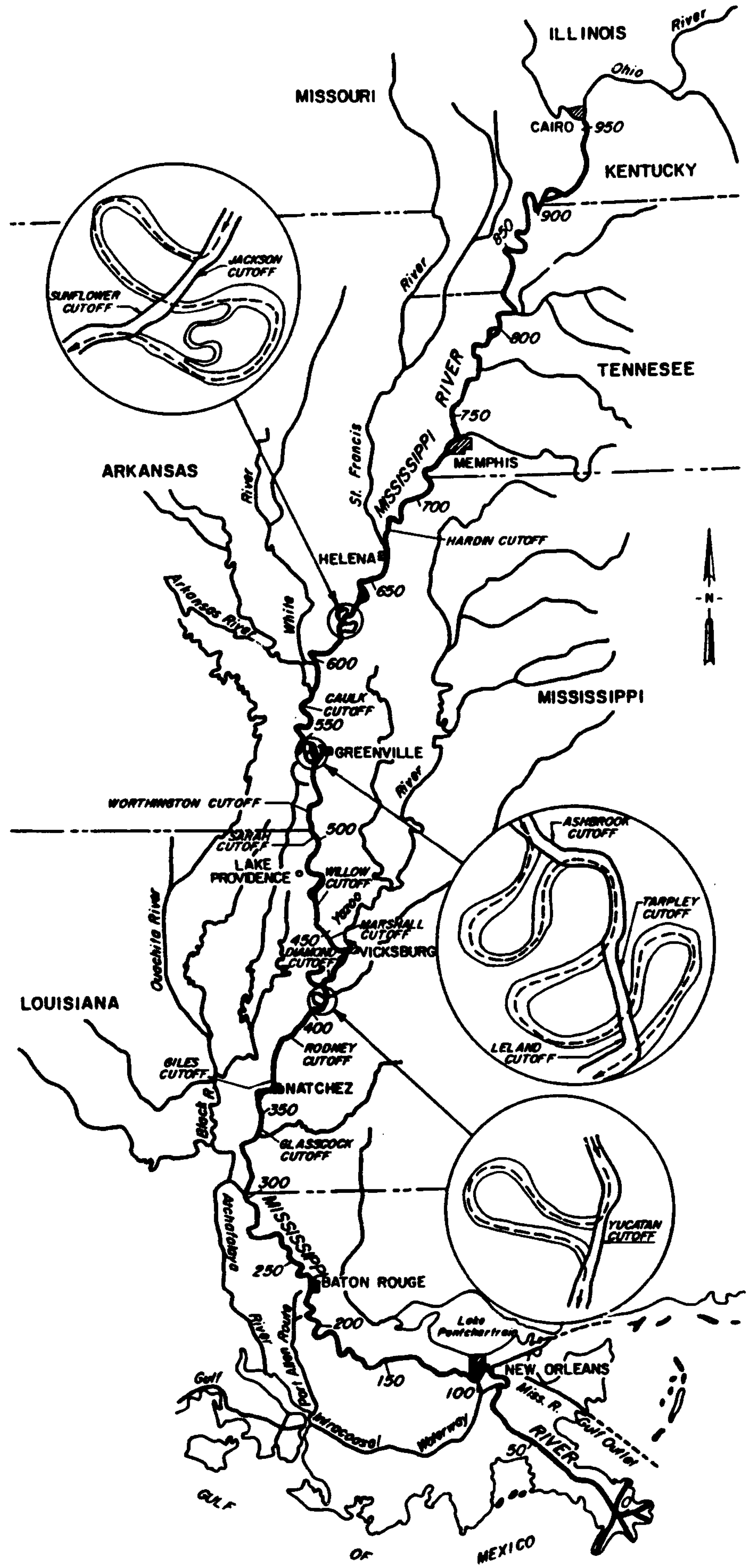


Plate 1. Location Map

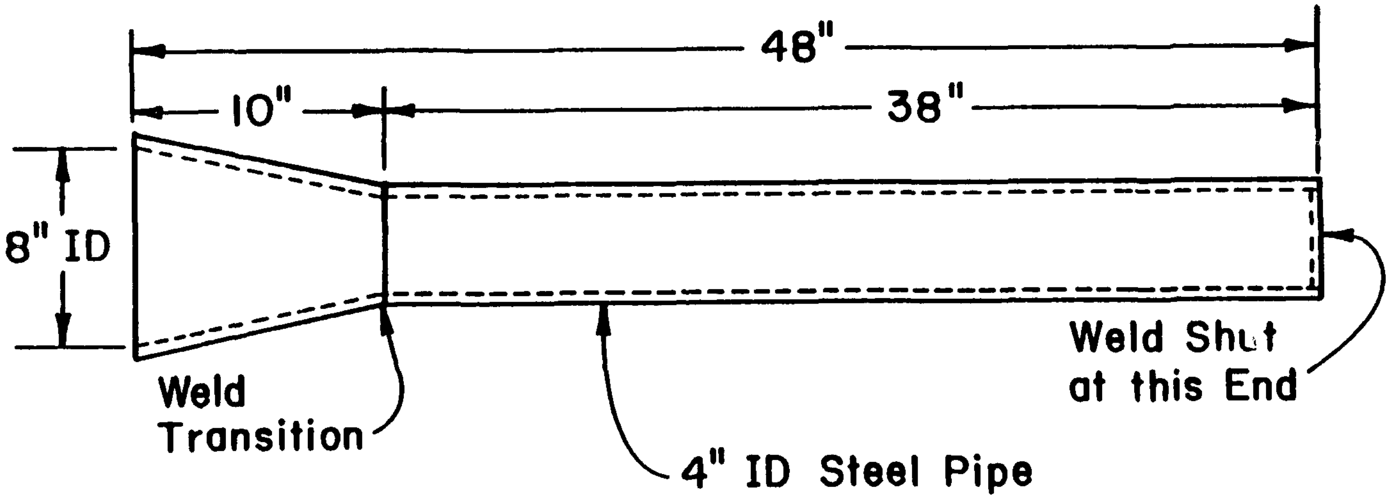


Plate 2. Dimensions of the WES sampler

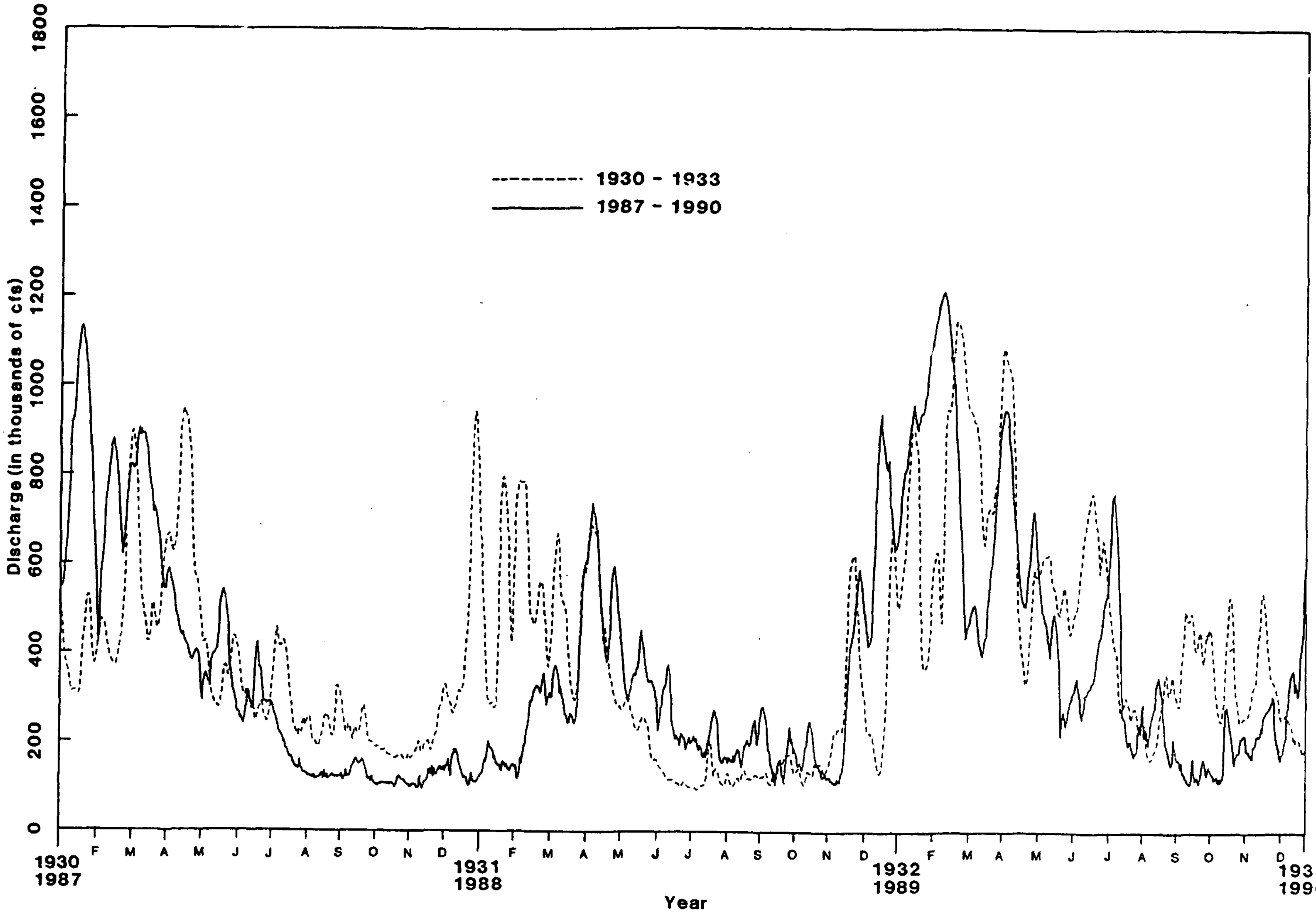


Plate 3. Hydrograph for Hickman, Missouri, 1930-1933 and 1987-1990