

COMPUTER PROGRAMS FOR COMPUTING PARTICLE-SIZE STATISTICS
OF FLUVIAL SEDIMENTS

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EXPLANATORY SYMBOLS

see page

C_ϕ	Mean phi value of a normal-probability distribution.....	5
D	Grain diameter, in millimeters.....	3
D_i	Geometric mean grain size, in millimeters, of the i^{th} size fraction.....	13
D_p	Grain diameter, in millimeters, corresponding to a given percentage.....	6
M	Mean of a normal-probability distribution.....	4
M_ϕ	Inman's phi mean diameter.....	7
Md	Median diameter, in millimeters, at which 50 percent is finer..	6
Md_ϕ	Phi median diameter.....	7
M_z	Folk's graphic mean diameter, in phi units.....	8
n	Number of defined size fractions in the distribution.....	13
P_i	Percentage of material in the i^{th} size fraction.....	13
Sk	Trask's skewness coefficient.....	6
Sk_I	Folk's inclusive graphic skewness.....	8
So	Trask's sorting coefficient.....	6
X	Dimensionless deviation from the mean, expressed as a multiple of the standard deviation, in the standardized normal-probability distribution function.....	4
X'	Observed value from a normal-probability distribution.....	4
α_1	Inman's phi skewness measure.....	7
α_2	Inman's second phi skewness measure.....	7
β_ϕ	Inman's phi kurtosis measure.....	7
ϕ	Grain diameter, in phi units.....	3
ϕ_p	Grain diameter, in phi units, corresponding to a given percentage.....	7
σ	Standard deviation, in phi units, of a normal-probability distribution.....	5
σ'	Standard deviation of a normal-probability distribution.....	4
σ_I	Folk's inclusive graphic standard deviation.....	8
σ_ϕ	Inman's sorting or phi deviation measure.....	7

COMPUTER PROGRAMS FOR COMPUTING PARTICLE-SIZE STATISTICS OF FLUVIAL SEDIMENTS

H. H. Stevens, Jr. and D. W. Hubbell

ABSTRACT

Two versions of computer programs for inputting data and computing particle-size statistics of fluvial sediments are presented. The FORTRAN 77 language versions are for use on the Prime computer, and the BASIC language versions are for use on microcomputers. The size-statistics programs compute Inman, Trask, and Folk statistical parameters from phi values and sizes determined for 10 specified percent-finer values from inputted size and percent-finer data. The program also determines the percentages of gravel, sand, silt, and clay, and the Meyer-Peter effective diameter. Documentation and listings for both versions of the programs are included in the report.

INTRODUCTION

The size distribution of particles in a sediment sample can be characterized by plotting either a histogram, which shows the percentages of particles whose sizes are within specified size classes, or a cumulative-frequency curve, which shows the percentage of particles whose size is either finer or coarser than a specified size. These curves provide visual images of the distribution and facilitate the division of the sample into various size grades, such as clay, silt, and sand, and the determination of the sizes for which preselected proportions of the sample are finer or coarser. However, for comparisons between samples, and for other analytical purposes, characterizing size distributions numerically is considerably more convenient. For this reason, various investigators have developed sets of statistical measures to quantitatively describe certain features of a size distribution. The statistical measures invariably involve expressions of central tendency and dispersion; however, in addition to being somewhat different from one another, they also use different notation. Statistical measures devised by Trask (1932) describe the grain-size distribution in dimensional (millimeter) notation; whereas, the measures used by Inman (1952) and Folk (1968) describe distributions in the dimensionless phi notation developed by Krumbein (1936).

The statistical measures in each of these sets are based on the sizes of particles for which certain percentages of the sample are either finer or coarser. Ordinarily, these sizes are obtained from cumulative-frequency curves. However, to eliminate the necessity of manually plotting and reading the curves, and then computing the various measures, a computer program has been prepared that determines the required size values by interpolation (or extrapolation) between points defined by a particle-size analysis. The program then uses the size values to calculate the Trask, Inman, and Folk statistical measures. The "effective diameter," which is a bed-material parameter used in the Meyer-Peter and Müller (1948) equation for determining bedload discharge, also is computed for all size distributions, whether they are suspended-sediment or bed-material distributions.

This report describes two computer programs. Program SIZEDATA allows for keyboard entry of particle-size analysis data and storage into a data file, and program SEDSIZE reads the data from the data file and computes the size statistics. Both programs are written in FORTRAN and MS-BASIC^{1/} for use on a variety of computers. A general explanation of the computational procedures and statistical measures used in the programs is expressed using common symbols (see Explanatory Symbols). The computer programs are explained using assigned variable names (see Supplemental Data Sections A and B at the back of this report.) Program listings, examples of output from SIZEDATA and SEDSIZE, and a flowchart for program SEDSIZE are included at the back of this report in Supplemental Data Sections C through J.

FUNDAMENTALS OF THE PARTICLE-SIZE STATISTICS PROGRAM

Particle-Size Notation

In most particle-size analyses, regardless of the method, particles are separated into classes according to the Wentworth grade scale (Wentworth, 1922) for sieving. With this classification, the area of the screen-mesh opening changes by a factor of 2; therefore, particle sizes, which are expressed in terms of the length of a side of a square mesh, change by $\sqrt{2}$. When these kinds of particle-size data are plotted as histograms, using an arithmetic scale for the size axis, the distributions invariably appear highly skewed toward the fine sizes. However, when the data are plotted using the logarithms of the sizes, the histograms usually are reasonably symmetrical and generally correspond to normal (Gaussian) distributions. As a result, cumulative-frequency curves (percent-finer values versus size values) tend to plot as straight lines whenever the frequency (percent-finer) axis is a normal-probability scale and the size axis is a logarithmic scale. The degree to which such size distributions correspond or deviate from a logarithmic normal distribution can be used to characterize the size distribution.

^{1/} Microsoft BASIC language developed by the Microsoft Corporation.

The use of trade names in this report is for identification only and does not constitute endorsement by the U.S. Geological Survey.

With the above factors in mind, Krumbein (1936) introduced the use of phi, the negative logarithm (base 2) of grain diameter, for statistical computation. Because values of standard size divisions vary with $\sqrt{2}$, Krumbein chose the logarithmic base 2 so that phi would change by 1 unit whenever the size doubled or halved. He also used negative logarithms to avoid negative phi values for sizes finer than 1.0 mm, which are dominant in most fluvial sediments. Krumbein's phi equation is

$$\Phi = -\log_2 D = -3.322 \log_{10} D,$$

where D is grain diameter, in millimeters.

McManus (1963) pointed out that logarithms can be obtained only from dimensionless numbers. Therefore, phi should be redefined as a logarithmic transformation of the ratio of the grain diameter, in millimeters, to a standard grain diameter of 1.0 mm. The revised equation is

$$\Phi = -\log_2 \frac{D}{1.0 \text{ mm}} .$$

Size numbers and corresponding particle diameters, and phi values used in program SIZEDATA are shown in table 1.

Table 1.--Corresponding size numbers, particle diameters, in millimeters, and phi values used in program SIZEDATA.

Size number	Particle diameter	Phi	Size number	Particle Diameter	Phi	Size Number	Particle Diameter	Phi
1	0.002	9.0	12	0.088	3.5	23	4.00	-2.0
2	.003	8.5	13	.125	3.0	24	5.66	-2.5
3	.004	8.0	14	.177	2.5	25	8.00	-3.0
4	.006	7.5	15	.250	2.0	26	11.3	-3.5
5	.008	7.0	16	.354	1.5	27	16.0	-4.0
6	.011	6.5	17	.500	1.0	28	22.6	-4.5
7	.016	6.0	18	.707	.5	29	32.0	-5.0
8	.022	5.5	19	1.00	0.0	30	45.2	-5.5
9	.031	5.0	20	1.41	-.5	31	64.0	-6.0
10	.044	4.5	21	2.00	-1.0	32	90.5	-6.5
11	.062	4.0	22	2.83	-1.5	33	128.0	-7.0

Linear Interpolation

Because particle-size distributions expressed as log-normal cumulative-frequency curves tend to be linear, the curves usually can be approximated by a series of straight-line segments between the defined points of the distribution. Therefore, if the linear function for any line segment is

derived, all points in the distribution that lie on the segment can be determined. This is the principle applied in the SEDSIZE program to obtain the various size values that are required to compute the size statistics.

The normal-distribution function with mean equal to zero and standard deviation equal to 1.0 (standardized normal-probability distribution function) is used to determine the parameters of the linear functions. This distribution function gives the probability that an observed value of X will be less than or equal to any specified X value, where

$$X = \frac{X' - M}{\sigma'}$$

where X' is a value from a normal distribution, and

M and σ' are the distribution mean and standard deviation.

A graph of the function is shown in figure 1. In figure 1, probabilities have been multiplied by 100 to represent percentage values, and L is the counter (matrix-element number) for obtaining the probability for a specific X from a standardized table of values, generated by the SEDSIZE program for internal use, in which the X increment is 0.02. Throughout the text and within the program, probabilities are expressed as percentages.

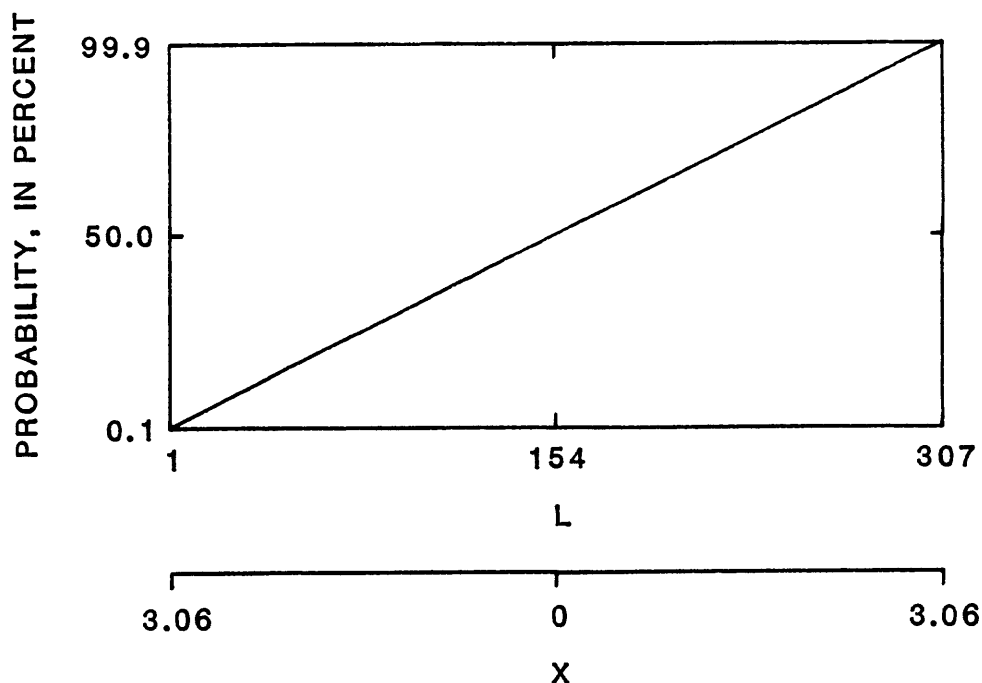


Figure 1.--Standardized normal-probability distribution function as used in the SEDSIZE program. L is the matrix-element number of corresponding probability and X values in the standardized normal-probability table generated for internal use by the SEDSIZE program.

To determine the phi value for a given percent-finer value from any linear function defined by two points with known size and percent-finer values, the known sizes are converted to phi values, Φ_1 and Φ_2 . Then, using the known percent-finer values (probabilities), corresponding X values, X_1 and X_2 , are determined from the standardized probability table. By definition, the deviations, in phi units, of the known points from the mean phi value, C_Φ , of the linear function are:

$$\Phi_1 - C_\Phi = X_1 \sigma \quad \text{and} \quad \Phi_2 - C_\Phi = X_2 \sigma .$$

Thus,

$$\Phi_1 - \Phi_2 = X_1 \sigma - X_2 \sigma = \sigma (X_1 - X_2) ,$$

and

$$\sigma = \frac{\Phi_1 - \Phi_2}{X_1 - X_2} ,$$

where σ is the standard deviation, in phi units, of the defined function.

Also,

$$C_\Phi = \Phi_1 - X_1 \sigma \quad \text{or} \quad C_\Phi = \Phi_2 - X_2 \sigma .$$

After computing the X value for the given percent-finer (probability) value, the unknown corresponding phi value is determined from

$$\Phi = C_\Phi + X \sigma .$$

In the SEDSIZE program, C_Φ is CENTER, σ is SIGMA, Φ_1 is DEV1, and Φ_2 is DEV2. Percent-finer values and corresponding probability and X values, for which phi values are determined in program SEDSIZE, are shown in table 2. CP values given in table 2 are identical to X values, except for probabilities greater than 50 percent, in which case, they are equal to X times -1.0. CP values are used in the SEDSIZE program to facilitate computation of phi values, because of the way in which X values for probabilities greater than 50 percent are determined from data statements in the program.

Table 2.--Percent-finer values and corresponding probability, X, and CP values for which phi values are determined in program SEDSIZE.

Percent finer	Probability (percent)	X value	CP value
5	5.0	1.645	1.645
16	15.87	1.0	1.0
25	25.0	.6745	.6745
35	35.0	.3854	.3854
50	50.0	0.0	0.0
65	65.0	.3854	-.3854
75	75.0	.6745	-.6745
84	84.13	1.0	-1.0
90	90.0	1.282	-1.282
95	95.0	1.645	-1.645

Particle-Size Statistics

Statistical measures commonly used to characterize size distributions include the median, mean, sorting or uniformity, skewness or asymmetry, and kurtosis or peakedness. Each of these measures can be computed in a variety of ways. Relations derived by Trask (1932), Inman (1952), and Folk (1968) are computed in program SEDSIZE. The original equations developed by each of these authors were expressed in terms of percent-coarser size values; however, in this report and computer program, all terms are based on percent-finer values.

Trask Statistics

Trask's (1932) quartile measures are computed from size values expressed in millimeters. The measures are:

Coefficient of sorting, S_o ,

$$S_o = \frac{D_{75}}{D_{25}} ;$$

Coefficient of skewness, S_k ,

$$S_k = \frac{D_{25}D_{75}}{M_d^2} ;$$

where D_{25} is the particle diameter, in millimeters, at which 25 percent of the material, by weight, is finer;
 D_{75} is the particle diameter, in millimeters, at which 75 percent of the material, by weight is finer; and
 M_d is the median particle diameter, in millimeters, at which 50 percent of the material, by weight, is finer.

Inman Statistics

The statistics computed with Inman's (1952) formulas are based on particle diameters converted to phi units and are derived from analogies to central-moment measures. The statistics are:

Phi mean diameter, M_{Φ} ,

$$M_{\Phi} = \frac{\Phi_{16} + \Phi_{84}}{2} ;$$

Sorting or phi deviation, σ_{Φ} ,

$$\sigma_{\Phi} = \frac{\Phi_{16} - \Phi_{84}}{2} ;$$

Phi-skewness measure, α_1 ,

$$\alpha_1 = \frac{M_{\Phi} - Md_{\Phi}}{\sigma_{\Phi}} ;$$

Second phi-skewness measure, α_2 ,

$$\alpha_2 = \frac{0.5 (\Phi_{95} + \Phi_5) - Md_{\Phi}}{\sigma_{\Phi}} ;$$

Phi-kurtosis measure, β_{Φ} ,

$$\beta_{\Phi} = \frac{0.5 (\Phi_5 - \Phi_{95}) - \sigma}{\sigma_{\Phi}} ;$$

where Φ_{16} is the particle diameter, in phi units, at which 16 percent of the material, by weight, is finer;
 Φ_{84} is the particle diameter, in phi units, at which 84 percent of the material, by weight, is finer;
 Md_{Φ} is the particle diameter, in phi units, at which 50 percent of the material, by weight, is finer;
 Φ_{95} is the particle diameter, in phi units, at which 95 percent of the material, by weight, is finer; and
 Φ_5 is the particle diameter, in phi units, at which 5 percent of the material, by weight, is finer.

Folk Statistics

The formulas used to compute Folk's (1968) statistics are modifications of the Inman (1952) equations. They also are based on particle diameters converted to phi units, and are derived from analogies to central-moment measures. The statistics are:

Graphic mean diameter, M_z ,

$$M_z = \frac{\Phi_{16} + \Phi_{50} + \Phi_{84}}{3} ;$$

Inclusive graphic standard deviation, σ_I ,

$$\sigma_I = \frac{\Phi_{16} - \Phi_{84}}{4} + \frac{\Phi_5 - \Phi_{95}}{6.6} ;$$

Inclusive graphic skewness, Sk_I ,

$$Sk_I = \frac{\Phi_{84} + \Phi_{16} - 2 \Phi_{50}}{2 (\Phi_{16} - \Phi_{84})} + \frac{\Phi_{95} + \Phi_5 - 2 \Phi_{50}}{2 (\Phi_5 - \Phi_{95})} ;$$

where Φ_{50} is the particle diameter, in phi units, at which 50 percent of the material, by weight, is finer.

COMPUTER PROGRAMS

Program SIZEDATA

The FORTRAN program for entering size-distribution data is organized in the form of a main program called SIZEDATA, six executable subroutines, and one BLOCK DATA subprogram (see Supplemental Data Section C). The counterpart BASIC program (see Supplemental Data Section E) contains minor variations from the FORTRAN program because of differences between the two languages. FORTRAN- and BASIC-program variable definitions are presented in Supplemental Data Section A. The main difference between the two versions is that the FORTRAN data file is random access, so that data sets are read and stored individually and the maximum number of data sets in the file is not fixed; whereas, the BASIC data file is sequential access, so that all data sets are read or stored in a single disk operation. To prevent loss of data, the BASIC program automatically stores data on the disk whenever ten data sets are entered into memory. The maximum number of data sets allowable in a single sequential file is 30.

Data Input

Size-distribution data are entered by keyboard and stored in a file called SIZE.DATA or a user-specified file. The following variables form a data set:

LOC	- Location/description of sample;
DATE	- Date of sample (MM/DD/YY);
TIME	- Time of sample (2400);
NO	- Number of entered sizes;
SIZDIA(33)	- Size-analysis separation sizes, in millimeters; and
PCTFN(33)	- Percent-finer value for each size.

A percent-finer value of 0 is entered for sizes for which no value was defined. Also, a value of 99.9 may be entered whenever the percent-finer value is 100 percent; the program converts all entered 100 percent values to 99.9. A data file containing eight data sets is shown in Section H of the supplemental data at the back of this report.

Program Description

The program is initiated by opening a data file called SIZE.DATA or a user-named file. A program option code, NC, is entered to perform one of the following functions:

- 1 is to start a new data file;
- 2 is to add to an existing data file;
- 3 is to correct one or more data sets;
- 4 is to list data on screen; and
- 5 is to list data on printer.

If NC >1, the number of data sets, NSAMP, is read from the data file; otherwise, NSAMP is set to 0.

When NC = 1 or 2, data sets are added by the following procedure.

A. A diameter input-option code, INOPT, is entered to select the method for determination of SIZDIA values.

- 1 is to input the number of sizes to be entered, NO, and the corresponding size numbers (see table 1). First, the value of NO is entered, and subroutine TABLE is called to display table 1 on the screen. Then, appropriate size numbers are entered and corresponding SIZDIA values are stored in memory.
- 2 is to input minimum and maximum diameter numbers and a diameter-number increment (see table 1). First, subroutine TABLE is called to display Table 1 on the screen. Then, values of NMIN, NMAX, and NINC from the table are entered. Subsequently, SIZDIA values corresponding to the size numbers from NMIN to NMAX, at an increment of NINC, are stored in memory. Also, NO is set equal to the number of SIZDIA values.

- 3 is to input the number of sizes to be entered, NO, and to enter user-selected diameter values.
- 4 is to input minimum and maximum phi values and the phi-value increment. First, subroutine TABLE is called to display table 1 on the screen. Next, the selected values of PMIN, PMAX, and PINC are entered. Then, SIZDIA values corresponding to phi values from PMIN to PMAX, at an increment of PINC, are computed from

$$\text{SIZDIA} = 0.5(\text{phi value}),$$

and NO is set equal to the number of SIZDIA values.

B. After SIZDIA values are listed, they are indicated to be correct or incorrect (Y/N). If diameters are not correct, step A is repeated.

C. The sample location/description, LOC, is entered.

D. A value of JOPTN, the data-input option, is entered to retain or alter the input sequence.

- 1 is for no change in the input sequence. Program goes to step E.
- 2 permits data from a new location/description to be entered. Program goes back to step C.
- 3 allows a new diameter-input option to be selected. Program goes back to step A.
- 4 ends the run. The value of NSAMP is written on record one of the data file and the run is terminated.

E. NSAMP is increased by one.

F. Values of DATE and TIME are entered.

G. Defined percent-finer values for each corresponding SIZDIA value are entered.

H. After subroutine DALIST is called to list the data set on the screen, an option code is entered.

- 1 is to accept the data as correct.
- 2 is to re-enter the entire data set.
- 3 is to correct part of the data set.

If the data set is correct, subroutine DAWRITE is called to write the data set on the data file, and the program goes back to step D for another data set. If the entire data set is to be re-entered, the program goes back to step F. With option 3, subroutine DACORR is called. In subroutine DACORR, one of the following options is selected by entering the corresponding data-correction number.

0 is to continue by entering the next data set.

1 is to change LOC.

2 is to change DATE.

3 is to change TIME.

4 is to change one or more SIZDIA values.

5 is to change one or more PCTFN values.

For number 0, the program goes back to step H. For numbers 1-3, after the current value is displayed, a new value is entered; then the above menu is redisplayed so a new data-correction number can be selected. For numbers 4 and 5, first, all current SIZDIA and PCTFN values are displayed by size number. Then, the size number for which SIZDIA or PCTFN is to be changed is selected, and the new value is entered. This process is repeated, until a zero is entered; at that time the above menu is redisplayed to permit selection of a new data-correction number.

Data sets are corrected (NC = 3) by the following procedure.

- A. The number of the data set to be corrected is entered; a value of zero ends the corrections, and the run is terminated. In sequence, subroutine DAREAD is called to input the data set from the data file, subroutine DALIST is called to list the data set on the screen, and subroutine DACORR is called to permit values in the data set to be corrected. Correction procedures are identical to those previously described in step H.
- B. Lastly, subroutine DALIST is called to list the corrected data set. If the data set still is not correct, the appropriate "change" option is selected. Otherwise, zero is entered, and subroutine DAWRITE is called to write the data set on the data file. The program then goes back to step A.

Data sets are listed on the screen (NC = 4) in the following manner.

- A. The starting and ending numbers of the data sets to be listed are entered.
- B. For each data set, subroutine DAREAD is called to input the data set from the data file, and subroutine DALIST is called to list the data set on the screen. The display is held on the screen until any number key is pressed.

Data sets are listed by the printer (NC = 5) by the following sequence.

- A. The starting and ending numbers of the data sets to be printed are entered.
- B. For each data set, subroutine DAREAD is called to input the data set from the data file. The data set then is directed to an output file called SIZEDATA.LIST in the FORTRAN version of the program, or to a line printer in the BASIC version. The file SIZEDATA.LIST is printed using the line printer. Output from a SIZEDATA.LIST file containing eight data sets is shown in Supplemental Data Section H.

Program SEDSIZE

The SEDSIZE program is divided into two parts. Part 1 computes both the Meyer-Peter effective diameter and phi and diameter values for 10 specified percent-finer values (see table 2) from entered size and associated percent-finer values. Part 2 computes Inman, Trask, and Folk statistical parameters, and percent gravel, sand, silt, and clay from the computed phi values and diameters. Input to the program is obtained from data files created by the SIZEDATA program.

Definitions of all FORTRAN and BASIC variable names used in the SEDSIZE program are presented in Supplemental Data Section B. The FORTRAN program is organized in the form of a main program called SEDSIZE and a subroutine called INTERP (see Supplemental Data Section D). Supplemental Data Section G presents a flow chart which illustrates the computation procedure. The BASIC program (see Supplemental Data Section F) contains minor variations from the FORTRAN program because of differences between the two languages; however, the FORTRAN program description can be used along with the BASIC variable definitions (Supplemental Data Section B) to understand the BASIC program.

Program Output

Output from the FORTRAN version of program SEDSIZE is stored on a file named SIZE.OUT or a user-specified file, and later is printed using the line printer at a page width of 128 columns. The BASIC version causes the output to be printed directly, without intermediate storage, on an 80-column line printer.

FORTRAN-version outputs from eight data sets are shown in Supplemental Data Section I. The upper left section of the output lists entered data for sizes with percent-finer values greater than zero. Computed phi values and diameters for the 10 critical percent-finer values used in the SEDSIZE program to determine the various statistical measures are given in the upper right. The note "EXTRAPOLATED FROM POINTS AND " is printed to indicate sizes that are obtained by extrapolation from either larger or smaller entered data values (see Supplemental Data Section I, p. I2-I5). Whenever an extrapolated size is unrealistically small (phi value >14), the computed phi value and diameter are listed as "UNDEFINED" (see Supplemental Data Section I, p. I4).

The lower section of the output lists the computed Inman, Trask, and Folk statistical measures; the percent gravel, sand, silt and clay; and the Meyer-Peter effective diameter. A "*" symbol is printed after computed statistics that are based on extrapolated phi or diameter values. Statistical measures involving sizes having undefined phi or diameter values are not computed, and a "+" symbol is printed to indicate no value. Whenever an "*" has been printed, the explanatory footnote "* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE" also is printed; if a "+" has been printed, the footnote "+ UNDEFINED" is added. Whenever the percentage of material in the finest or coarsest size fraction is not defined, the Meyer-Peter effective diameter is not computed, and an explanatory note is printed.

Program Description

Main program SEDSIZE

The main program opens the data file created by program SIZEDATA --either SIZE.DATA or the counterpart user-specified file; reads the number of data sets, NSAMP; and starts a computation loop (NS=1,NSAMP) for each data set.

First, the Meyer-Peter effective diameter, DMP, is computed from

$$DMP = \frac{\sum_{i=1}^n D_i P_i}{100} ;$$

where n is the number of size fractions;

D_i is the geometric mean size of the i^{th} size fraction, in millimeters; and

P_i is the percentage of material in the i^{th} size fraction.

The Meyer-Peter effective diameter is not computed for data sets for which 0 and 100 (99.9) percent-finer values have not been defined.

Next, entered SIZDIA values are converted to SIZPHI values with

$$SIZPHI = -3.322 \log_{10} SIZDIA .$$

Then, arrays of DIA, PCT, and PHI, each M values long, are formed by eliminating values of SIZDIA, PCTFN, and SIZPHI for sizes for which PCTFN equals zero.

The PCT-value counter, N, is set equal to 1, and a loop (I=1 to 10) is entered to compute phi, H, and diameter values for 10 preselected probability values, TP. The 10 probability values and corresponding CP values are shown in table 2. For each value of TP(I), N is increased until TP(I) is less or equal to PCT(N). If N equals 1, the footnote code number (ICD(I)) is set equal to 1 for extrapolation below PCT values 1 and 2. If N is greater than M, 1 is subtracted from N, and ICD(I) is set equal to 2 for extrapolation above the last 2 PCT values. Otherwise, 1 is subtracted

from N, and ICD(I) is set equal to 0 for interpolation between points. Subroutine INTERP is called to compute DEV, SIGMA, and CENTER. If DEV is less than or equal to 0, erroneous data has been entered, and the error message "DEV = 0 input data in error" is printed. Immediately, computation is terminated, and the program goes back for the next set of data. Otherwise, the phi value is computed from

$$H(I) = CENTER + CP(I) SIGMA ,$$

and diameter is computed from

$$D(I) = 0.5H(I) .$$

Whenever extrapolation produces an H value greater than 14, the H and D values are declared undefined by setting the ICD(I) value equal to -20.

The DIA, PHI, and PCT arrays, together with the 10 specified TP values and computed H and D values, are printed with appropriate footnotes.

Part 2 computes and prints the Inman, Trask, and Folk statistical measures as follows:

Inman mean diameter, M_{Φ} ,

$$AB(1) = 0.5 (H(2)+H(8)) ;$$

Inman sorting, σ_{Φ} ,

$$AB(2) = 0.5 (H(2)-H(8)) ;$$

Inman skewness, α_1 ,

$$AB(3) = (AB(1)-H(5))/AB(2) ;$$

Inman second skewness, α_2 ,

$$AB(4) = (0.5 (H(10)-H(1))-H(5))/AB(2) ;$$

Inman kurtosis, β_{Φ} ,

$$AB(5) = (0.5 (H(1)-H(10))-AB(2))/AB(2) ;$$

Trask sorting, S_o ,

$$AB(6) = (D(7)/D(3)) ;$$

Trask skewness, S_k ,

$$AB(7) = (D(7) D(3))/D(5) ;$$

Folk graphic mean diameter, M_z ,

$$AB(8) = (H(8)+H(5)+H(2))/3 ;$$

Folk inclusive graphic standard deviation, σ_{Φ} ,

$$AB(9) = (H(2)-H(8))/4 + (H(1)-H(10))/6.6; \text{ and}$$

Folk inclusive graphic skewness, Sk_I ,

$$X1 = (H(8)+H(2)-2 H(5)) / 2 (H(2)-H(8))$$

$$X2 = (H(10)+H(1)-2 H(5)) / 2 (H(1)-H(10))$$

$$AB(10) = X1+X2 .$$

The last section of the program computes and prints the percent clay (PCTCL), percent silt (PCTSL), percent sand (PCTSD), and percent gravel (PCTGR) by entering a loop, NN = 1 to 3. When NN is equal to 1, and PHI(M) is greater than -1, PROBD is set equal to 100, and the loop is restarted for NN equal to 2. Otherwise, D9 is set equal to -1, the value of phi for the division between gravel and sand. Next, N is set equal to 1 and incremented by 1, until PHI(N) is equal to or less than D9. Then, if PHI(N) is equal to D9, PROBD is set equal to PCT(N); otherwise, PROBD is computed by first calling subroutine INTERP to compute DEV, SIGMA, and CENTER. If DEV is less than or equal to 0, erroneous data has been entered, and the error message "DEV=0 input data in error" is printed. Subsequently, computation is terminated, and the program goes back to the start of the next data set; otherwise, computation continues. If D9 is equal to CENTER, PROBD is set equal to 50. If D9 is less than CENTER, DEVD is computed from

$$DEVD=(CENTER-D9)/SIGMA .$$

Then, if DEVD is greater than 3.06, PROBD is set equal to 100; otherwise, N is set equal to 154 and incremented by 1, until DEVD is greater than or equal to X(N). If DEVD is equal to X(N), PROBD is set equal to PROB(N); otherwise, PROBD is computed by interpolation. If D9 is greater than CENTER, DEVD is computed from

$$DEVD=(D9-CENTER)/SIGMA .$$

Then, if DEVD is greater than 3.06, PROBD is set equal to 0; otherwise, N is set equal to 1 and incremented by 1, until DEVD is greater than or equal to X(N). If DEVD is equal to X(N), PROBD is set equal to PROB(N); otherwise, PROBD is computed by interpolation.

When NN is equal to 2, PROB1 is set equal to the rounded value of PROBD, and D9 is set equal to 4, the value of phi for the division between sand and silt. Then, a new value for PROBD is computed using the previous procedure.

When NN is equal to 3, PROB4 is set equal to the rounded value of PROBD, and D9 is set equal to 8, the value of phi for the division between silt and clay. Next, a new value for PROBD is computed, and PROB8 is set equal to PROBD.

Then, the percent values for clay, silt, sand, and gravel are computed from:

$$PCTCL = PROB8 ;$$

$$PCTST = PROB4 - PROB8 ;$$

$$PCTSD = PROB1 - PROB4 ;$$

and

$$PCTGR = 100 - PROB1 .$$

The values of PCTGR, PCTSD, PCTST, PCTCL, and DMP subsequently are printed. If the Meyer-Peter effective diameter has not been computed, a explanation note is printed (see Supplemental Data Section I). The program then goes back for the next set of data.

Subroutine INTERP

Subroutine INTERP computes values of DEV, SIGMA, and CENTER from values of PCT, PROB, and X, using an entered value of N. First, DEV1 is computed. If PCT(N) is greater than or equal to 50, L is set equal to 1; otherwise, L is set equal to 154. Then L is incremented by 1, until PROB(L) is greater than or equal to PCT(N). If PCT(N) is less than 0.1, DEV1 is set equal to X(1); otherwise, DEV1 is computed by interpolation. Then L1 is set equal to the value of L. Next, DEV2 is computed by the same procedure using N+1, and L2 is set equal to the new value of L. If L1 is greater than 154, L3 is set equal to 1; otherwise, L3 is set equal to -1. Likewise, if L2 is greater than 154, L4 is set equal to 1; otherwise, L4 is set equal to -1. L5 is then set equal to the sum of L3 and L4. An L5 value of less than 3 indicates that the CENTER is above both points and DEV is computed from

$$DEV = DEV1 - DEV2 .$$

An L5 value of 3 indicates that the center is between the two points and DEV is computed from

$$DEV = DEV1 + DEV2 .$$

If DEV is less than or equal to 0, control is returned to the main program; otherwise, SIGMA and CENTER are obtained from

$$SIGMA = (PHI(N) - PHI(N+1)) / DEV \text{ and}$$

$$CENTER = PHI(N) - DEV1 * SIGMA .$$

Control then is returned to the main program.

An L5 value greater than 3 indicates that CENTER is below both points and DEV is computed from

$$DEV = DEV2 - DEV1 .$$

If DEV is less than or equal to 0, control is returned to the main program; otherwise, SIGMA and CENTER are determined from

$$\text{SIGMA} = (\text{PHI}(\text{N}) - \text{PHI}(\text{N}+1)) / \text{DEV} \text{ and}$$

$$\text{CENTER} = \text{PHI}(\text{N}) + \text{DEV1} * \text{SIGMA} .$$

Control then is returned to the main program.

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SUPPLEMENTAL DATA

SUPPLEMENTAL DATA--SECTION A.
DEFINITION OF PROGRAM SIZEDATA VARIABLES

PROGRAM		DEFINITION
FORTTRAN	BASIC	
<u>VARIABLES IN COMMON BLOCK /AA/</u>		
DATE	DATE\$	Date of sample (MM/DD/YY)
DIAM	DIAM	Diameters listed in size table, in millimeters
LOC	LO\$	Location of sample
NO	NS	Number of sizes in data set
NREC	--	Random file record number
PCTFN	PCTFN	Entered percent finer values to be stored
SIZDIA	SIZDIA	Diameters selected from size table or entered values
SIZE	SIZE	Stored diameters - same as SIZDIA
TIME	TIME	Time of sample (2400)
<u>VARIABLES IN MAIN PROGRAM NOT IN COMMON BLOCK /AA/</u>		
DFILE	DFILE\$	Data file name
I	I	Loop counter
INOPT	INOPT	Diameter input option
J	J	Loop counter
JOPTN	JOPTN	Data input option
N	I	Temporary computation value
NC	NC	Program option flag
NINC	NINC	Table diameter number increment to be used
NMAX	NMAX	Maximum table diameter number to be used
NMIN	NMIN	Minimum table diameter number to be used
NS	--	Data set number
NS1	--	Start data set number to list or print
NS2	--	End data set number to list or print
NSAMP	NU	Number of data sets - maximum is 30 in BASIC program
P1	P1	Used in the conversion from phi units to diameters, in millimeters
P2	P2	Used in the conversion from phi units to diameters, in millimeters
PINC	PINC	Phi value increment to be used - usually 1.0 or 0.5
PMAX	PMAX	Maximum phi value to be used
PMIN	PMIN	Minimum phi value to be used
STA	L\$	Temporary value of location of sample

NOTE: Variables in all subroutines not in common block /AA/ are loop counters.

SUPPLEMENTAL DATA--SECTION B.

DEFINITION OF PROGRAM SEDSIZE VARIABLES

PROGRAM		DEFINITION
FORTRAN	BASIC	
<u>VARIABLES IN COMMON BLOCK</u>		
L	L	Counter for entering the PROB versus X table
N	N	Counter for PCT values
PCT	PCT	Percent-finer values after elimination of zero values
PHI	PHI	Phi values for corresponding PCT values
PROB	PROB	Cummulative probability times 100 for a given X value
x	X	Dimensionless deviation from the mean, expressed as a multiple of the standard deviation, in the standardized normal probability distribution function
TOL	--	Tolerance factor used to compare equal or nonequal values
<u>VARIABLES IN MAIN PROGRAM NOT IN COMMON BLOCK</u>		
AB	AB	Array containing Inman, Trask and Folk size statistic values
ASK	--	Footnote symbol "*"
BLK	--	Footnote symbol "blank"
CENTER	CENTER	Mean value
CP	CP	X values for corresponding TP values
D	D	Diameters obtained from computed phi values (H)
D9	D9	Temporary phi values used in the computation of percent of clay, silt, sand and gravel
DATE	DATE\$	Date of sample (MM/DD/YY)
DEV	DEV	Deviation value in phi units
DEVD	DEVD	Deviation value in phi units computed from D9 values
DFILE	DFILE\$	Data file name
DIA	DIA	Diameter for corresponding PCT values
DMP	DMP	Meyer-Peter effective diameter
FMAT	--	Variable format used to print Inman, Trask and Folk size statistic values
FNT	--	Footnote print format
H	H	Computed phi values from the 10 TP values
I	I	Loop counter
I1	--	Temporary value used to determine NPL
ICD	ICD	Footnote code number for the 10 computed diameters DIA
ITIME	--	Integer value of TIME for printing
KMAT	--	Components of variable format FMAT
LOC	LO\$	Location of sample

DEFINITION OF PROGRAM SEDSIZE VARIABLES--Continued

PROGRAM		DEFINITION
FORTRAN	BASIC	
<u>VARIABLES IN MAIN PROGRAM NOT IN COMMON BLOCK--Continued</u>		
M	M	Number of sizes after elimination of zero percent-finer values
MP	MP	Meyer-Peter effective diameter computation flag
N9	N9	Footnote print flag
NCD	NCD	Footnote code numbers for Inman, Trask and Folk size statistic values
NF	--	Variable format FMAT counter
NN	NN	Loop counter
NO	NO	Number of sizes in data set
NP	--	Variable VA counter
NPL	--	Page line counter
NS	NS	Data set counter
NSAMP	NSAMP	Number of data sets - maximum equals 30 in BASIC program
NTOT	NTOT	Sum of NCD values
OFIL	--	Output file name
P1	P1	Temporary value for computation of DMP
PCTCL	PCTCL	Percent clay in sample
PCTFN	PCTFN	Entered percent-finer values
PCTGR	PCTGR	Percent gravel in sample
PCTSD	PCTSD	Percent sand in sample
PCTST	PCTST	Percent silt in sample
PF	PF	Rounded TP values
PLS	--	Footnote symbol "+"
PROB1	PROB1	Computed percent finer value for upper limit of sand fraction
PROB4	PROB4	Computed percent finer value for upper limit of silt fraction
PROB8	PROB8	Computed percent finer value for upper limit of clay fraction
PROBD	PROBD	Computed percent finer value from D9 values
S1	S1	Temporary value of SIZDIA for computation of DMP
SIGMA	SIGMA	Standard deviation
SIZDIA	SIZDIA	Entered diameter values
SIZPHI	SIZPHI	Computed phi values from entered diameter values
TIME	TIME	Time of sample (2400)
TP	TP	Percent finer values for which phi values (H) are computed
VA	--	Inman, Trask and Folk size statistics values that are printed using variable format FMAT

DEFINITION OF PROGRAM SEDSIZE VARIABLES--Continued

PROGRAM		DEFINITION
FORTTRAN	BASIC	
<u>VARIABLES IN MAIN PROGRAM NOT IN COMMON BLOCK--Continued</u>		
X1	X1	Temporary computation value
X2	X2	Temporary computation value
<u>VARIABLES IN SUBROUTINE INTERP NOT IN COMMON BLOCK</u>		
CENTER	CENTER	Mean value
DEV	DEV	Deviation value in phi units
DEV1	DEV1	Deviation value in phi units
DEV2	DEV2	Deviation value in phi units
L1	L1	Temporary computation value
L2	L2	Temporary computation value
L3	L3	Temporary computation value
L4	L4	Temporary computation value
L5	L5	Temporary computation value
SIGMA	SIGMA	Standard deviation

SUPPLEMENTAL DATA--SECTION C.

FORTTRAN PROGRAM SIZEDATA LISTING

PROGRAM SIZEDATA	SZDA 10
C	SZDA 20
C ENTER DATA FOR SEDSIZE PROGRAM TO INPUT FILE SIZE.DATA OR	SZDA 30
C USER SPECIFIED FILE	SZDA 40
C	SZDA 50
COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	SZDA 60
1 SIZE(33),NREC,NO	SZDA 70
CHARACTER*80 LOC,STA	SZDA 80
CHARACTER*10 DATE	SZDA 90
CHARACTER*20 DFILE	SZDA 100
CHARACTER*1 RESP	SZDA 110
1 FORMAT ('ENTER PCT FINER VALUE FOR ',F8.3)	SZDA 120
2 FORMAT (A80)	SZDA 130
3 FORMAT ('NUMBER DATA SETS = ',I4)	SZDA 140
4 FORMAT (A20)	SZDA 150
5 FORMAT (1H1,'DATA STORED IN FILE ',A20)	SZDA 160
6 FORMAT (1H ,'DATA SET NUMBER',I4 / 1H)	SZDA 170
7 FORMAT (1H0,'DATA SET NUMBER',I4 / 1H ,A80)	SZDA 180
8 FORMAT (1H ,'DATE ',A10,5X,'TIME ',F5.0,5X,'NO. SIZES = ',I4)	SZDA 190
9 FORMAT (1H ,15F8.3)	SZDA 200
10 FORMAT ('ENTER TABLE NUMBER FOR DIAM NO. ',I3)	SZDA 210
11 FORMAT ('ENTER DIAM. IN MM (INCLUDE DECIMAL) SIZE NO. ',I3)	SZDA 220
12 FORMAT (1H ,15F8.1)	SZDA 230
13 FORMAT ('ENTER START SET NUMBER TO BE LISTED 0 TO END RUN')	SZDA 240
14 FORMAT ('ENTER END SET NUMBER TO BE LISTED MAX =',I4)	SZDA 250
15 FORMAT ('ENTER START SET NUMBER TO BE PRINTED 0 TO END RUN')	SZDA 260
16 FORMAT ('ENTER END SET NUMBER TO BE PRINTED MAX =',I4)	SZDA 270
17 FORMAT (1H ,5X,'1. START DATA ENTRY INTO ',A20 / 1H ,5X,'2. ADD DATA	SZDA 280
1TA TO ',A20 / 1H ,5X,'3. CORRECT DATA IN ',A20 / 1H ,5X,'4. DISPLAY	SZDA 290
2 DATA IN ',A20 / 1H ,5X,'5. PRINT DATA IN ',A20)	SZDA 300
18 FORMAT (10I8)	SZDA 310
19 FORMAT (10F8.3)	SZDA 320
20 FORMAT (1H ,'DATA STORED IN FILE ',A20)	SZDA 330
21 FORMAT (A10)	SZDA 340
22 FORMAT (A1)	SZDA 350
23 FORMAT (1H0,15I8)	SZDA 360
DFILE='SIZE.DATA'	SZDA 370
CALL CLSCR(25)	SZDA 380
WRITE (1,*) 'ESTABLISH FILE NAME:'	SZDA 390
WRITE (1,*) ' '	SZDA 400
WRITE (1,*) ' 1. USE PROGRAMMED FILE NAME (SIZE.DATA)'	SZDA 410
WRITE (1,*) ' 2. PROVIDE FILE NAME'	SZDA 420
CALL CLSCR(3)	SZDA 430
WRITE (1,*) 'ENTER NUMBER OF SELECTION'	SZDA 440
CALL CLSCR(10)	SZDA 450
READ (1,*) I	SZDA 460
IF (I.LT.2) GO TO 50	SZDA 470

FORTRAN PROGRAM SIZEDATA LISTING--Continued

CALL CLSCR(25)	SZDA 480
WRITE (1,*) 'ENTER DESIRED FILE NAME'	SZDA 490
CALL CLSCR(10)	SZDA 500
READ (1,4) DFILE	SZDA 510
50 CALL CLSCR(25)	SZDA 520
WRITE (1,17) DFILE,DFILE,DFILE,DFILE,DFILE	SZDA 530
CALL CLSCR(3)	SZDA 540
WRITE (1,*) 'ENTER NUMBER OF SELECTION'	SZDA 550
CALL CLSCR(10)	SZDA 560
READ (1,*) NC	SZDA 570
IF (NC.EQ.1) GO TO 80	SZDA 580
OPEN (10,FILE=DFILE,STATUS='OLD',ACCESS='DIRECT',RECL=40)	SZDA 590
READ (10,REC=1) NSAMP	SZDA 600
GO TO (80,70,600,700,800),NC	SZDA 610
C ADD DATA TO EXISTING FILE	SZDA 620
70 NREC=NSAMP*6+1	SZDA 630
GO TO 90	SZDA 640
C START NEW SET OF DATA	SZDA 650
80 OPEN (10,FILE=DFILE,STATUS='NEW',ACCESS='DIRECT',RECL=40)	SZDA 660
NSAMP=0	SZDA 670
NREC=1	SZDA 680
90 IST=0	SZDA 690
CALL CLSCR(25)	SZDA 700
WRITE (1,*) 'METHOD OF ENTERING PARTICLE DIAMETERS:'	SZDA 710
WRITE (1,*) '	SZDA 720
WRITE (1,*) ' 1. INDIVIDUAL DIAMETER NUMBERS FROM SIZE TABLE'	SZDA 730
WRITE (1,*) ' 2. SEQUENTIAL DIAMETERS BETWEEN MIN-MAX TABLE	SZDA 740
1MBERS'	SZDA 750
WRITE (1,*) ' 3. INDIVIDUALLY ENTERED DIAMETERS (IN MILLIMETERS	SZDA 760
1S)'	SZDA 770
WRITE (1,*) ' 4. SEQUENTIAL PHI VALUES BETWEEN MIN-MAX VALUES'	SZDA 780
CALL CLSCR(3)	SZDA 790
WRITE (1,*) 'ENTER NUMBER OF SELECTION'	SZDA 800
CALL CLSCR(10)	SZDA 810
READ (1,*) INOPT	SZDA 820
IF (INOPT.GT.4) GOTO 90	SZDA 830
GO TO (100,120,140,180),INOPT	SZDA 840
100 CALL CLSCR(25)	SZDA 850
WRITE (1,*) 'ENTER NUMBER DIAMETERS TO BE USED (MAX 33)'	SZDA 860
CALL CLSCR(10)	SZDA 870
READ (1,*) NO	SZDA 880
IF (NO.GT.33) GO TO 100	SZDA 890
DO 110 I=1,NO	SZDA 900
104 CALL TABLE	SZDA 910
CALL CLSCR(3)	SZDA 920
WRITE (1,10) I	SZDA 930
CALL CLSCR(3)	SZDA 940
READ (1,*) J	SZDA 950
IF (J.GT.33) GO TO 104	SZDA 960

FORTRAN PROGRAM SIZEDATA LISTING--Continued

SIZDIA(I)=DIAM(J)	SZDA 970
110 CONTINUE	SZDA 980
GO TO 300	SZDA 990
120 CALL TABLE	SZDA1000
WRITE (1,*) 'ENTER MIN TABLE DIAMETER NO.'	SZDA1010
READ (1,*) NMIN	SZDA1020
IF (NMIN.LT.1) GO TO 120	SZDA1030
130 WRITE (1,*) 'ENTER MAX TABLE DIAMETER NO.'	SZDA1040
READ (1,*) NMAX	SZDA1050
IF (NMAX.GT.33) GO TO 130	SZDA1060
WRITE (1,*) 'ENTER DIAMETER NUMBER INCREMENT'	SZDA1070
READ (1,*) NINC	SZDA1080
NO=0	SZDA1090
DO 132 J=NMIN,NMAX,NINC	SZDA1100
NO=NO+1	SZDA1110
IF (NO.GT.33) GO TO 135	SZDA1120
SIZDIA(NO)=DIAM(J)	SZDA1130
132 CONTINUE	SZDA1140
GO TO 300	SZDA1150
135 WRITE (1,*) '**** NUMBER DIAMETERS > 33 ****'	SZDA1160
GO TO 120	SZDA1170
140 CALL CLSCR(25)	SZDA1180
WRITE (1,*) 'ENTER NUMBER OF SIZES TO BE ENTERED (MAX 33)'	SZDA1190
CALL CLSCR(10)	SZDA1200
READ (1,*) NO	SZDA1210
IF (NO.GT.33) GO TO 140	SZDA1220
DO 160 I=1,NO	SZDA1230
CALL CLSCR(3)	SZDA1240
WRITE (1,11) I	SZDA1250
CALL CLSCR(3)	SZDA1260
READ (1,*) SIZDIA(I)	SZDA1270
160 CONTINUE	SZDA1280
GO TO 300	SZDA1290
180 CALL TABLE	SZDA1300
WRITE (1,*) 'ENTER MAX PHI VALUE'	SZDA1310
READ (1,*) PMAX	SZDA1320
WRITE (1,*) 'ENTER MIN PHI VALUE'	SZDA1330
READ (1,*) PMIN	SZDA1340
WRITE (1,*) 'ENTER PHI INCREMENT (1.0 OR 0.5)'	SZDA1350
READ (1,*) PINC	SZDA1360
NO=INT((PMAX-PMIN)/PINC+1.0)	SZDA1370
IF (NO.LE.33) GO TO 200	SZDA1380
WRITE (1,*) '**** NUMBER DIAMETERS > 33 ****'	SZDA1390
GO TO 180	SZDA1400
200 P1=PMAX	SZDA1410
SIZDIA(1)=0.5**(P1)	SZDA1420
DO 220 I=2,NO	SZDA1430
P2=P1-PINC	SZDA1440
SIZDIA(I)=0.5**(P2)	SZDA1450

FORTRAN PROGRAM SIZEDATA LISTING--Continued

P1=P2	SZDA1460
220 CONTINUE	SZDA1470
300 CALL CLSCR(25)	SZDA1480
N1=-9	SZDA1490
310 N1=N1+10	SZDA1500
N2=N1+9	SZDA1510
IF (N2.GT.NO) N2=NO	SZDA1520
WRITE (1,18) (N,N=N1,N2)	SZDA1530
WRITE (1,19) (SIZDIA(N),N=N1,N2)	SZDA1540
WRITE (1,*)	SZDA1550
IF (N2.LT.NO) GO TO 310	SZDA1560
CALL CLSCR(3)	SZDA1570
WRITE (1,*) 'DIAMETERS OK (Y/N)'	SZDA1580
CALL CLSCR(10)	SZDA1590
READ (1,22) RESP	SZDA1600
IF (.NOT.(RESP.EQ.'Y'.OR.RESP.EQ.'y')) GO TO 90	SZDA1610
320 CALL CLSCR(25)	SZDA1620
WRITE (1,*) 'ENTER LOCATION/DESCRIPTION (MAX 80 CHARACTERS)'	SZDA1630
CALL CLSCR(10)	SZDA1640
READ (1,2) STA	SZDA1650
IF (IST.EQ.0) GO TO 400	SZDA1660
IST=IST+1	SZDA1670
350 CALL CLSCR(25)	SZDA1680
WRITE (1,*) 'REQUIREMENT FOR NEXT DATA-SET ENTRY:'	SZDA1690
WRITE (1,*)	SZDA1700
WRITE (1,*) ' 1. NO CHANGE IN INPUT SEQUENCE'	SZDA1710
WRITE (1,*) ' 2. CHANGE LOCATION/DESCRIPTION'	SZDA1720
WRITE (1,*) ' 3. CHANGE PARTICLE DIAMETERS'	SZDA1730
WRITE (1,*) ' 4. END RUN'	SZDA1740
CALL CLSCR(3)	SZDA1750
WRITE (1,*) 'ENTER NUMBER OF SELECTION'	SZDA1760
CALL CLSCR(10)	SZDA1770
READ (1,*) JOPTN	SZDA1780
IF (JOPTN.GT.4) GO TO 350	SZDA1790
GO TO (400,320,90,560),JOPTN	SZDA1800
400 NSAMP=NSAMP+1	SZDA1810
420 CALL CLSCR(25)	SZDA1820
WRITE (1,6) NSAMP	SZDA1830
LOC=STA	SZDA1840
WRITE (1,2) LOC	SZDA1850
WRITE (1,*)	SZDA1860
WRITE (1,*) 'ENTER DATE (MM/DD/YY)'	SZDA1870
WRITE (1,*)	SZDA1880
READ (1,21) DATE	SZDA1890
WRITE (1,*)	SZDA1900
WRITE (1,*) 'ENTER TIME (2400 HR)'	SZDA1910
WRITE (1,*)	SZDA1920
READ (1,*) TIME	SZDA1930
DO 430 I=1,33	SZDA1940

FORTRAN PROGRAM SIZEDATA LISTING--Continued

	SIZE(I)=0	SZDA1950
	PCTFN(I)=0	SZDA1960
430	CONTINUE	SZDA1970
	DO 450 I=1,NO	SZDA1980
	SIZE(I)=SIZDIA(I)	SZDA1990
	WRITE (1,*) '	SZDA2000
	WRITE (1,1) SIZDIA(I)	SZDA2010
	WRITE (1,*) '	SZDA2020
	READ (1,*) PCTFN(I)	SZDA2030
	IF (PCTFN(I).LT.99.9) GO TO 450	SZDA2040
	PCTFN(I)=99.9	SZDA2050
	GO TO 500	SZDA2060
450	CONTINUE	SZDA2070
500	CALL DALIST (NSAMP)	SZDA2080
	WRITE (1,*) '	SZDA2090
	WRITE (1,*) ' 1. DATA SET OK'	SZDA2100
	WRITE (1,*) ' 2. RE-ENTER COMPLETE DATA SET'	SZDA2110
	WRITE (1,*) ' 3. CORRECT PART OF DATA SET'	SZDA2120
	WRITE (1,*) '	SZDA2130
	WRITE (1,*) 'ENTER NUMBER OF SELECTION'	SZDA2140
	CALL CLSCR(3)	SZDA2150
	READ (1,*) I	SZDA2160
	GO TO (520,420,510),I	SZDA2170
510	CALL DACORR (NSAMP)	SZDA2180
520	CALL DAWRITE	SZDA2190
	GO TO 350	SZDA2200
560	CALL CLSCR(25)	SZDA2210
	WRITE (1,3) NSAMP	SZDA2220
	WRITE (10,REC=1)NSAMP	SZDA2230
570	CLOSE (10)	SZDA2240
	WRITE (1,20) DFILE	SZDA2250
	WRITE (1,*)	SZDA2260
	WRITE (1,*) 'END OF RUN'	SZDA2270
	CALL CLSCR(10)	SZDA2280
	CALL EXIT	SZDA2290
C	CORRECT DATA	SZDA2300
600	CALL CLSCR(25)	SZDA2310
	WRITE (1,*) 'ENTER DATA NUMBER TO BE CORRECTED 0 TO END RUN'	SZDA2320
	CALL CLSCR(10)	SZDA2330
	READ (1,*) NS	SZDA2340
	IF (NS.EQ.0) GO TO 560	SZDA2350
	IF (NS.GT.NSAMP) GO TO 600	SZDA2360
	NREC=(NS-1)*6+1	SZDA2370
	CALL DAREAD	SZDA2380
	CALL DACORR (NS)	SZDA2390
	NREC=(NS-1)*6+1	SZDA2400
	CALL DAWRITE	SZDA2410
	GO TO 600	SZDA2420
C	LIST ON SCREEN	SZDA2430

FORTTRAN PROGRAM SIZEDATA LISTING--Continued

700	CALL CLSCR(25)	SZDA2440
	WRITE (1,13)	SZDA2450
	CALL CLSCR(3)	SZDA2460
	READ (1,*) NS1	SZDA2470
	IF (NS1.EQ.0) GO TO 850	SZDA2480
	IF (NS1.GT.NSAMP) GO TO 700	SZDA2490
	NREC=(NS1-1)*6+1	SZDA2500
710	CALL CLSCR(3)	SZDA2510
	WRITE (1,14) NSAMP	SZDA2520
	CALL CLSCR(3)	SZDA2530
	READ (1,*) NS2	SZDA2540
	IF (NS2.GT.NSAMP) GO TO 710	SZDA2550
	DO 720 NS=NS1,NS2	SZDA2560
	CALL DAREAD	SZDA2570
	CALL DALIST (NS)	SZDA2580
	WRITE (1,*) 'PRESS RETURN TO CONTINUE'	SZDA2590
	READ (1,22) RESP	SZDA2600
720	CONTINUE	SZDA2610
	GO TO 700	SZDA2620
C	LIST DATA ON PRINT FILE SIZEDATA.LIST	SZDA2630
800	OPEN (11,FILE='SIZEDATA.LIST',STATUS='NEW')	SZDA2640
	WRITE (11,5) DFILE	SZDA2650
810	CALL CLSCR(25)	SZDA2660
	WRITE (1,15)	SZDA2670
	CALL CLSCR(3)	SZDA2680
	READ (1,*) NS1	SZDA2690
	IF (NS1.EQ.0) GO TO 840	SZDA2700
	IF (NS1.GT.NSAMP) GO TO 810	SZDA2710
	NREC=(NS1-1)*6+1	SZDA2720
820	CALL CLSCR(3)	SZDA2730
	WRITE (1,16) NSAMP	SZDA2740
	CALL CLSCR(3)	SZDA2750
	READ (1,*) NS2	SZDA2760
	IF (NS2.GT.NSAMP) GO TO 820	SZDA2770
	DO 830 NS=NS1,NS2	SZDA2780
	CALL DAREAD	SZDA2790
	WRITE (11,7) NS,LOC	SZDA2800
	WRITE (11,8) DATE,TIME,NO	SZDA2810
	N1=-14	SZDA2820
825	N1=N1+15	SZDA2830
	N2=N1+14	SZDA2840
	IF (N2.GT.NO) N2=NO	SZDA2850
	WRITE (11,23) (N,N=N1,N2)	SZDA2860
	WRITE (11,9) (SIZE(N),N=N1,N2)	SZDA2870
	WRITE (11,12) (PCTFN(N),N=N1,N2)	SZDA2880
	IF (N2.LT.NO) GO TO 825	SZDA2890
830	CONTINUE	SZDA2900
	GO TO 810	SZDA2910
840	ENDFILE (11)	SZDA2920

FORTRAN PROGRAM SIZEDATA LISTING--Continued

	CLOSE (11)	SZDA2930
850	CLOSE (10)	SZDA2940
	CALL CLSCR(25)	SZDA2950
	WRITE (1,*) 'END OF RUN'	SZDA2960
	CALL CLSCR(15)	SZDA2970
	CALL EXIT	SZDA2980
	END	SZDA2990
	 BLOCK DATA	BKDA 10
	COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	BKDA 20
1	SIZE(33),NREC,NO	BKDA 30
	CHARACTER*80 LOC	BKDA 40
	CHARACTER*10 DATE	BKDA 50
	DATA DIAM/0.002,0.003,0.004,0.006,0.008,0.011,0.016,0.022,0.031,	BKDA 60
1	0.044,0.062,0.088,0.125,0.177,0.250,0.354,0.500,0.707,1.0,1.4,	BKDA 70
2	2.0,2.8,4.0,5.6,8.0,11.3,16.0,22.6,32.0,45.2,64.0,90.5,128.0/	BKDA 80
	END	BKDA 90
	 SUBROUTINE DAWRITE	WRIT 10
C	WRITE ONE SET OF DATA TO FILE	WRIT 20
	COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	WRIT 30
1	SIZE(33),NREC,NO	WRIT 40
	CHARACTER*80 LOC	WRIT 50
	CHARACTER*10 DATE	WRIT 60
	NREC=NREC+1	WRIT 70
	WRITE (10,REC=NREC) LOC	WRIT 80
	NREC=NREC+1	WRIT 90
	WRITE (10,REC=NREC) DATE,TIME,NO	WRIT 100
	NREC=NREC+1	WRIT 110
	WRITE (10,REC=NREC) (SIZE(I),I=1,17)	WRIT 120
	NREC=NREC+1	WRIT 130
	WRITE (10,REC=NREC) (SIZE(I),I=18,33)	WRIT 140
	NREC=NREC+1	WRIT 150
	WRITE (10,REC=NREC) (PCTFN(I),I=1,17)	WRIT 160
	NREC=NREC+1	WRIT 170
	WRITE (10,REC=NREC) (PCTFN(I),I=18,33)	WRIT 180
	RETURN	WRIT 190
	END	WRIT 200
	 SUBROUTINE DAREAD	READ 10
C	READ ONE SET OF DATA FROM FILE	READ 20
	COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	READ 30
1	SIZE(33),NREC,NO	READ 40
	CHARACTER*80 LOC	READ 50
	CHARACTER*10 DATE	READ 60
	NREC=NREC+1	READ 70
	READ (10,REC=NREC,ERR=100,END=200) LOC	READ 80
	NREC=NREC+1	READ 90
	READ (10,REC=NREC,ERR=100,END=200) DATE,TIME,NO	READ 100

FORTRAN PROGRAM SIZEDATA LISTING--Continued

NREC=NREC+1	READ 110
READ (10,REC=NREC,ERR=100,END=200) (SIZE(I),I=1,17)	READ 120
NREC=NREC+1	READ 130
READ (10,REC=NREC,ERR=100,END=200) (SIZE(I),I=18,33)	READ 140
NREC=NREC+1	READ 150
READ (10,REC=NREC,ERR=100,END=200) (PCTFN(I),I=1,17)	READ 160
NREC=NREC+1	READ 170
READ (10,REC=NREC,ERR=100,END=200) (PCTFN(I),I=18,33)	READ 180
RETURN	READ 190
100 WRITE (1,*) 'ENDING WITH READ ERROR'	READ 200
CLOSE (10)	READ 210
CALL EXIT	READ 220
200 WRITE (1,*) 'STOPPED AT END-OF-FILE'	READ 230
CLOSE (10)	READ 240
CALL EXIT	READ 250
END	READ 260
SUBROUTINE DACORR (NSAMP)	CORR 10
C CORRECT ONE SET OF DATA	CORR 20
COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	CORR 30
1 SIZE(33),NREC,NO	CORR 40
CHARACTER*80 LOC	CORR 50
CHARACTER*10 DATE	CORR 60
1 FORMAT (A80)	CORR 70
2 FORMAT ('ENTER NEW DATE TO REPLACE ',A10)	CORR 80
3 FORMAT (A10)	CORR 90
4 FORMAT ('ENTER NEW TIME TO REPLACE ',F5.0)	CORR 100
5 FORMAT ('ENTER SIZE NUMBER MAX= 'I3,' 0 TO END')	CORR 110
6 FORMAT ('ENTER NEW DIAM VALUE TO REPLACE ',F8.3)	CORR 120
7 FORMAT ('ENTER NEW PCT FINER VALUE TO REPLACE ',F6.1)	CORR 130
100 CALL DALIST (NSAMP)	CORR 140
WRITE (1,*) '	CORR 150
WRITE (1,*) '0. ALL CORRECTIONS COMPLETED	3. CHANGE TIME' CORR 160
WRITE (1,*) '1. CHANGE LOCATION/DESCRIPTION	4. CHANGE DIAMETECORR 170
1R VALUES'	CORR 180
WRITE (1,*) '2. CHANGE DATE	5. CHANGE PCT FINCORR 190
1ER VALUES'	CORR 200
WRITE (1,*) '	CORR 210
WRITE (1,*) 'ENTER NUMBER OF SELECTION'	CORR 220
READ (1,*) I	CORR 230
IF (I.GT.5) GO TO 100	CORR 240
IF (I.EQ.0) RETURN	CORR 250
GO TO (110,120,130,140,150),I	CORR 260
110 WRITE (1,*) 'ENTER NEW LOCATION/DESCRIPTION TO REPLACE'	CORR 270
WRITE (1,1) LOC	CORR 280
READ (1,1) LOC	CORR 290
GO TO 100	CORR 300
120 WRITE (1,2) DATE	CORR 310
READ (1,3) DATE	CORR 320

FORTRAN PROGRAM SIZEDATA LISTING--Continued

	GO TO 100	CORR 330
130	WRITE (1,4) TIME	CORR 340
	READ (1,*) TIME	CORR 350
	GO TO 100	CORR 360
140	WRITE (1,5) NO	CORR 370
	READ(1,*) N	CORR 380
	IF (N.EQ.0) GO TO 100	CORR 390
	IF (N.GT.NO) GO TO 140	CORR 400
	WRITE (1,6) SIZE(N)	CORR 410
	READ (1,*) SIZE(N)	CORR 420
	GO TO 140	CORR 430
150	WRITE (1,5) NO	CORR 440
	READ (1,*) N	CORR 450
	IF (N.EQ.0) GO TO 100	CORR 460
	IF (N.GT.NO) GO TO 150	CORR 470
	WRITE (1,7) PCTFN(N)	CORR 480
	READ (1,*) PCTFN(N)	CORR 490
	GO TO 150	CORR 500
	END	CORR 510
	 SUBROUTINE DALIST (NSAMP)	LIST 10
C	LIST ONE SET OF DATA ON SCREEN	LIST 20
	COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	LIST 30
1	SIZE(33),NREC,NO	LIST 40
	CHARACTER*80 LOC	LIST 50
	CHARACTER*10 DATE	LIST 60
1	FORMAT ('DATA SET NUMBER',I4)	LIST 70
2	FORMAT (A80)	LIST 80
3	FORMAT ('DATE ',A10,5X,'TIME ',F5.0,5X,'NO. SIZES = ',I4)	LIST 90
4	FORMAT (10I8)	LIST 100
5	FORMAT (10F8.3)	LIST 110
6	FORMAT (10F8.1)	LIST 120
	CALL CLSCR(25)	LIST 130
	WRITE (1,1) NSAMP	LIST 140
	WRITE (1,*) ' '	LIST 150
	WRITE (1,2) LOC	LIST 160
	WRITE (1,*) ' '	LIST 170
	WRITE (1,3) DATE,TIME,NO	LIST 180
	WRITE (1,*) ' '	LIST 190
	N1=-9	LIST 200
50	N1=N1+10	LIST 210
	N2=N1+9	LIST 220
	IF (N2.GT.NO) N2=NO	LIST 230
	WRITE (1,4) (N,N=N1,N2)	LIST 240
	WRITE (1,5) (SIZE(N),N=N1,N2)	LIST 250
	WRITE (1,6) (PCTFN(N),N=N1,N2)	LIST 260
	WRITE (1,*) ' '	LIST 270
	IF (N2.LT.NO) GO TO 50	LIST 280
	RETURN	LIST 290
	END	LIST 300

FORTRAN PROGRAM SIZEDATA LISTING--Continued

	SUBROUTINE TABLE	TABL 10
C	LIST SIZE TABLE ON SCREEN	TABL 20
	COMMON /AA/ LOC,DATE,TIME,DIAM(33),SIZDIA(33),PCTFN(33),	TABL 30
	1 SIZE(33),NREC,NO	TABL 40
	CHARACTER*80 LOC	TABL 50
	CHARACTER*10 DATE	TABL 60
	CALL CLSCR(25)	TABL 70
	WRITE (1,*) 'SIZE NO. AND CORRESPONDING DIAM. IN MM AND PHI UNITS'	TABL 80
	WRITE (1,*) '	TABL 90
	WRITE (1,*) ' NO MM PHI NO MM PHI NO MM	TABL 100
	1PHI'	TABL 110
	WRITE (1,*) ' 1 0.002 9.0 12 0.088 3.5 23 4.00	-TABL 120
	12.0'	TABL 130
	WRITE (1,*) ' 2 0.003 8.5 13 0.125 3.0 24 5.66	-TABL 140
	12.5'	TABL 150
	WRITE (1,*) ' 3 0.004 8.0 14 0.177 2.5 25 8.00	-TABL 160
	13.0'	TABL 170
	WRITE (1,*) ' 4 0.006 7.5 15 0.250 2.0 26 11.3	-TABL 180
	13.5'	TABL 190
	WRITE (1,*) ' 5 0.008 7.0 16 0.354 1.5 27 16.0	-TABL 200
	14.0'	TABL 210
	WRITE (1,*) ' 6 0.011 6.5 17 0.500 1.0 28 22.6	-TABL 220
	14.5'	TABL 230
	WRITE (1,*) ' 7 0.016 6.0 18 0.707 0.5 29 32.0	-TABL 240
	15.0'	TABL 250
	WRITE (1,*) ' 8 0.022 5.5 19 1.00 0.0 30 45.2	-TABL 260
	15.5'	TABL 270
	WRITE (1,*) ' 9 0.031 5.0 20 1.41 -0.5 31 64.0	-TABL 280
	16.0'	TABL 290
	WRITE (1,*) ' 10 0.044 4.5 21 2.00 -1.0 32 90.5	-TABL 300
	16.5'	TABL 310
	WRITE (1,*) ' 11 0.062 4.0 22 2.83 -1.5 33 128.0	-TABL 320
	17.0'	TABL 330
	WRITE (1,*) '	TABL 340
	RETURN	TABL 350
	END	TABL 360
	 SUBROUTINE CLSCR(N)	CLSC 10
C		CLSC 20
C	MOVE CURSOR DOWN N LINES	CLSC 30
C		CLSC 40
	DO 10 I=1,N	CLSC 50
	WRITE (1,*) '	CLSC 60
10	CONTINUE	CLSC 70
	RETURN	CLSC 80
	END	CLSC 90

SUPPLEMENTAL DATA--SECTION D.

FORTTRAN PROGRAM SEDSIZE LISTING

	PROGRAM SEDSIZE	SIZE 10
C		SIZE 20
C	COMPUTE SIZE STATISTICS FROM PERCENT FINER VALUES	SIZE 30
C		SIZE 40
	COMMON PROB(307),X(307),PCT(33),PHI(33),N,L,TOL	SIZE 50
	INTEGER PF,PCTCL,PCTST,PCTSD,PCTGR,PROB1,PROB4,PROB8	SIZE 60
	CHARACTER*80 LOC	SIZE 70
	CHARACTER*1 BLK,ASK,PLS,FNT(14)	SIZE 80
	CHARACTER*8 FMAT(15),KMAT(2)	SIZE 90
	CHARACTER*10 DATE,CLS	SIZE 100
	CHARACTER*20 DFILE,OFIL	SIZE 110
	DIMENSION PCTFN(33),DIA(33),TP(10),CP(10),SIZPHI(33),VA(10),	SIZE 120
	1 H(10),D(10),SIZDIA(33),ICD(10),AB(10),NCD(10)	SIZE 130
C		SIZE 140
	1 FORMAT (' COMPUTING SIZE STATISTICS FOR DATA ON FILE ',A20)	SIZE 150
	5 FORMAT (A20)	SIZE 160
	39 FORMAT (1H+,61X,'-- UNDEFINED')	SIZE 170
	40 FORMAT (1H+,61X,'-- EXTRAPOLATED FROM POINTS 1 AND 2')	SIZE 180
	41 FORMAT (1H+,61X,'-- EXTRAPOLATED FROM POINTS',I3,' AND ',I3)	SIZE 190
	42 FORMAT (1H0,'PCT GRAVEL PCT SAND PCT SILT PCT CLAY',10X,SIZE 200	
	1 'MEYER-PETER EFFECTIVE DIAMETER IS 'F8. 3,' MM')	SIZE 210
	43 FORMAT (1H0,'PCT GRAVEL PCT SAND PCT SILT PCT CLAY',10X,SIZE 220	
	1 'MEYER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED	SIZE 230
	2 ')	SIZE 240
	44 FORMAT (1H0,'PCT GRAVEL PCT SAND PCT SILT PCT CLAY',10X,SIZE 250	
	1 'MEYER-PETER EFF.DIAM. NOT COMPUTED - 100% FINER SIZE NOT DEFINED	SIZE 260
	2 ')	SIZE 270
	45 FORMAT (1H ,I5,A1,9X,I3,A1,9X,I3,A1,9X,I3,A1)	SIZE 280
	46 FORMAT (1H0,10X,'* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXC	SIZE 290
	1ESSIVE')	SIZE 300
	47 FORMAT (1H+,76X,'+ UNDEFINED')	SIZE 310
	51 FORMAT (1H1)	SIZE 320
	52 FORMAT (21H0SIZE STATISTICS FOR , A80,5X,A10,I6 /	SIZE 330
	1 1H0,' INPUT SIZE DISTRIBUTION',12X,'SPECIFIED COMPUTED SIZES' /	SIZE 340
	2 1H , ' PARTICLE SIZE PERCENT',9X,'PERCENT PARTICLE SIZE'/	SIZE 350
	3 1H , 'MILLIMETER PHI FINER',11X,'FINER PHI MILLIMETER'/	SIZE 360
	4 1H)	SIZE 370
	53 FORMAT (1H0,13('-----'))	SIZE 380
	54 FORMAT (1H ,F8.3,F9.2,F9.1,10X,I5,F9.3,F10.3)	SIZE 390
	55 FORMAT (1H ,36X,I5,F9.3,F10.3)	SIZE 400
	56 FORMAT (1H0,18X,'INMAN VALUES',24X,'TRASK VALUES',14X,'FOLK VALUE	SIZE 410
	1' / 1H , ' MEAN SORT ALPH1 ALPH2 BETA',9X,'SORT	SIZE 420
	2 SKEW',9X,'MEAN SORT SKEW' / 1H ,5(8X,A1),4X,2(8X,A1),	SIZE 430
	3 4X,3(8X,A1))	SIZE 440
	57 FORMAT (38H0*** DEV = 0 INPUT DATA IN ERROR *** / 1H0)	SIZE 450
	58 FORMAT (1H , 'OUTPUT ON FILE ',A20 /)	SIZE 460
	59 FORMAT (1H0,'*** READ ERROR ON FILE ',A20,' ***')	SIZE 470

FORTRAN PROGRAM SEDSIZE LISTING--Continued

60	FORMAT (1H0,'*** END-OF-FILE ON FILE ',A20,' ***')	SIZE 480
C		SIZE 490
	DATA (PROB(I),I=1,154)/0.10,0.11,0.12,0.13,0.14,0.15,0.16,0.18,	SIZE 500
1	0.19,0.20,0.21,0.23,0.24,0.26,0.27,0.29,0.31,0.33,0.35,0.37,	SIZE 510
2	0.39,0.41,0.44,0.47,0.49,0.52,0.55,0.59,0.62,0.66,0.69,0.73,	SIZE 520
3	0.78,0.82,0.87,0.91,0.96,1.02,1.07,1.13,1.19,1.25,1.32,1.39,	SIZE 530
4	1.46,1.54,1.62,1.70,1.79,1.88,1.97,2.07,2.17,2.28,2.39,2.50,	SIZE 540
5	2.62,2.74,2.87,3.01,3.14,3.29,3.44,3.59,3.75,3.92,4.09,4.27,	SIZE 550
6	4.46,4.65,4.85,5.05,5.26,5.48,5.71,5.94,6.18,6.43,6.68,6.94,	SIZE 560
7	7.21,7.49,7.78,8.08,8.38,8.69,9.01,9.34,9.68,10.03,10.38,10.75,	SIZE 570
8	11.12,11.51,11.90,12.30,12.71,13.14,13.57,14.01,14.46,14.92,	SIZE 580
9	15.39,15.87,16.35,16.85,17.36,17.88,18.41,18.94,19.49,20.05,	SIZE 590
A	20.61,21.19,21.77,22.36,22.97,23.58,24.20,24.83,25.46,26.11,	SIZE 600
B	26.76,27.43,28.10,28.77,29.46,30.15,30.85,31.56,32.28,33.00,	SIZE 610
C	33.72,34.46,35.20,35.94,36.69,37.45,38.21,38.97,39.74,40.52,	SIZE 620
D	41.29,42.07,42.86,43.64,44.43,45.22,46.02,46.81,47.61,48.40,	SIZE 630
E	49.20,50.00/	SIZE 640
	DATA CP/1.645,1.0,0.6745,0.3854,0.0,-0.3854,-0.6745,-1.0,-1.282,	SIZE 650
1	-1.645/	SIZE 660
	DATA TP/5.0,15.87,25.0,35.0,50.0,65.0,75.0,84.13,90.0,95.0/	SIZE 670
	DATA BLK,ASK,PLS/' ','*','+'/	SIZE 680
	DATA FMAT(1),FMAT(7),FMAT(10),FMAT(14)/'(1H+ ',',4X',',4X',')'/	SIZE 690
	DATA KMAT/' ,F8.3,1X',',9X '/	SIZE 700
C		SIZE 710
	DO 70 I=155,307	SIZE 720
	J=308-I	SIZE 730
	PROB(I)=100.0-PROB(J)	SIZE 740
70	CONTINUE	SIZE 750
	DO 80 I=1,153	SIZE 760
	X1 = 3.06 -FLOAT(I-1)*0.02	SIZE 770
	X(I) = X1	SIZE 780
	X(308-I) = X1	SIZE 790
80	CONTINUE	SIZE 800
	X(154) = 0.0	SIZE 810
	TOL=0.001	SIZE 820
C		SIZE 830
C	INPUT DATA	SIZE 840
C		SIZE 850
	DFILE='SIZE.DATA'	SIZE 860
	CALL CLSCR(25)	SIZE 870
	WRITE (1,*) 'ESTABLISH DATA FILE NAME:'	SIZE 880
	WRITE (1,*) '	SIZE 890
	WRITE (1,*) ' 1. USE PROGRAMMED FILE NAME (SIZE.DATA)'	SIZE 900
	WRITE (1,*) ' 2. PROVIDE FILE NAME'	SIZE 910
	CALL CLSCR(3)	SIZE 920
	WRITE (1,*) 'ENTER NUMBER OF SELECTION'	SIZE 930
	CALL CLSCR(10)	SIZE 940
	READ (1,*) I	SIZE 950
	IF (I.LT.2) GO TO 160	SIZE 960

FORTRAN PROGRAM SEDSIZE LISTING--Continued

CALL CLSCR(25) WRITE (1,*) 'ENTER DESIRED FILE NAME' CALL CLSCR(10) READ (1,5) DFILE 160 OPEN (5,FILE=DFILE,STATUS='OLD',FORM='UNFORMATTED') OFILE='SIZE.OUT' CALL CLSCR(25) WRITE (1,*) 'ESTABLISH OUTPUT FILE NAME' WRITE (1,*) ' WRITE (1,*) '1. USE PROGRAMMED FILE NAME (SIZE.OUT)' WRITE (1,*) '2. PROVIDE FILE NAME' CALL CLSCR(3) WRITE (1,*) 'ENTER NUMBER OF SELECTION' CALL CLSCR(10) READ (1,*) I IF (I.LT.2) GO TO 170 CALL CLSCR(25) WRITE (1,*) 'ENTER DESIRED FILE NAME' CALL CLSCR(10) READ (1,5) OFILE 170 OPEN (6,FILE=OFILE,STATUS='NEW') NPL=100 READ (5) NSAMP CALL CLSCR(25) WRITE (1,1) DFILE CALL CLSCR(10) DO 980 NS=1,NSAMP READ (5,ERR=1000,END=1010) LOC READ (5,ERR=1000,END=1010) DATE,TIME,NO READ (5,ERR=1000,END=1010) (SIZDIA(I),I=1,17) READ (5,ERR=1000,END=1010) (SIZDIA(I),I=18,33) READ (5,ERR=1000,END=1010) (PCTFN(I),I=1,17) READ (5,ERR=1000,END=1010) (PCTFN(I),I=18,33) ITIME=TIME C C COMPUTE MEYER-PETER EFFECTIVE DIAMETER C P1=0.0 DMP=0.0 IF (PCTFN(1).GT.0.0) GO TO 220 DO 180 I=1,NO IF (PCTFN(I+1).GT.0.0) GO TO 190 180 CONTINUE 190 S1=SIZDIA(I) I1=I+1 DO 200 I=I1,NO IF (PCTFN(I).LT.TOL) GO TO 200 DMP=DMP+SQRT(S1*SIZDIA(I))*(PCTFN(I)-P1) S1=SIZDIA(I)	SIZE 970 SIZE 980 SIZE 990 SIZE1000 SIZE1010 SIZE1020 SIZE1030 SIZE1040 SIZE1050 SIZE1060 SIZE1070 SIZE1080 SIZE1090 SIZE1100 SIZE1110 SIZE1120 SIZE1130 SIZE1140 SIZE1150 SIZE1160 SIZE1170 SIZE1180 SIZE1190 SIZE1200 SIZE1210 SIZE1220 SIZE1230 SIZE1240 SIZE1250 SIZE1260 SIZE1270 SIZE1280 SIZE1290 SIZE1300 SIZE1310 SIZE1320 SIZE1330 SIZE1340 SIZE1350 SIZE1360 SIZE1370 SIZE1380 SIZE1390 SIZE1400 SIZE1410 SIZE1420 SIZE1430 SIZE1440 SIZE1450	
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FORTRAN PROGRAM SEDSIZE LISTING--Continued

P1=PCTFN(I)	SIZE1460
IF (P1.GE.99.9) GO TO 250	SIZE1470
200 CONTINUE	SIZE1480
MP=3	SIZE1490
GO TO 400	SIZE1500
220 MP=2	SIZE1510
GO TO 400	SIZE1520
250 MP=1	SIZE1530
DMP=DMP/100.0	SIZE1540
400 DO 450 I=1,NO	SIZE1550
P1=-3.322*(ALOG10(SIZDIA(I)))	SIZE1560
SIZPHI(I)=INT(P1*10.0+SIGN(0.5,P1))/10.0	SIZE1570
450 CONTINUE	SIZE1580
C	SIZE1590
C ELIMINATION OF ZERO PCTFN VALUES	SIZE1600
C	SIZE1610
550 M = 0	SIZE1620
DO 570 I=1,NO	SIZE1630
IF (PCTFN(I).LT.TOL) GO TO 570	SIZE1640
M = M+1	SIZE1650
DIA(M) = SIZDIA(I)	SIZE1660
PCT(M) = PCTFN(I)	SIZE1670
PHI(M) = SIZPHI(I)	SIZE1680
570 CONTINUE	SIZE1690
I1=M+16	SIZE1700
IF (M.LT.10) I1=26	SIZE1710
NPL=NPL+I1	SIZE1720
IF (NPL.GT.57) GO TO 580	SIZE1730
WRITE (6,53)	SIZE1740
GO TO 600	SIZE1750
580 NPL = I1	SIZE1760
WRITE (6,51)	SIZE1770
600 WRITE (6,52) LOC,DATE,ITIME	SIZE1780
C	SIZE1790
C COMPUTE STATISTICS	SIZE1800
C	SIZE1810
N = 1	SIZE1820
DO 670 I=1,10	SIZE1830
ICD(I)=0	SIZE1840
625 IF (TP(I).LE.PCT(N)) GO TO 645	SIZE1850
IF (N.LT.M) GO TO 640	SIZE1860
C	SIZE1870
C IF ABOVE STAT. WAS FALSE, EXTRAPOLATION ABOVE GIVEN POINTS	SIZE1880
C	SIZE1890
ICD(I)=2	SIZE1900
GO TO 650	SIZE1910
640 N = N+1	SIZE1920
GO TO 625	SIZE1930
645 IF (N.GT.1) GO TO 650	SIZE1940

FORTRAN PROGRAM SEDSIZE LISTING--Continued

C		SIZE1950
C	IF STAT. 645 WAS TRUE, INTERPOLATION BETWEEN POINTS. IF FALSE	SIZE1960
C	EXTRAPOLATION BELOW GIVEN POINTS	SIZE1970
C		SIZE1980
	IF (ABS(TP(I)-PCT(N)).GT.TOL) ICD(I)=1	SIZE1990
	GO TO 652	SIZE2000
650	N = N-1	SIZE2010
652	CALL INTERP (DEV,SIGMA,CENTER)	SIZE2020
	IF (DEV.LE.0.0) GO TO 950	SIZE2030
	PF = INT(TP(I)+0.3)	SIZE2040
	H(I) = CENTER+CP(I)*SIGMA	SIZE2050
	IF (H(I).LE.14) GO TO 658	SIZE2060
	ICD(I)=-20	SIZE2070
	IF (M.LT.I) GO TO 654	SIZE2080
	WRITE (6,54) DIA(I),PHI(I),PCT(I),PF	SIZE2090
	GO TO 656	SIZE2100
654	WRITE (6,55) PF	SIZE2110
656	WRITE (6,39)	SIZE2120
	GO TO 670	SIZE2130
658	D(I)=0.5**H(I)	SIZE2140
	IF (M.LT.I) GO TO 660	SIZE2150
	WRITE (6,54) DIA(I),PHI(I),PCT(I),PF,H(I),D(I)	SIZE2160
	GO TO 662	SIZE2170
660	WRITE (6,55) PF,H(I),D(I)	SIZE2180
662	N9=ICD(I)+1	SIZE2190
	GO TO (670,664,666),N9	SIZE2200
664	WRITE (6,40)	SIZE2210
	GO TO 670	SIZE2220
666	WRITE (6,41) M-1,M	SIZE2230
670	CONTINUE	SIZE2240
	IF (M.LE.10) GO TO 690	SIZE2250
	DO 680 I=11,M	SIZE2260
680	WRITE (6,54) DIA(I),PHI(I),PCT(I)	SIZE2270
C		SIZE2280
C	COMPUTE INMAN, TRASK AND FOLK VALUES	SIZE2290
C		SIZE2300
690	AB(1) = 0.5*(H(2)+H(8))	SIZE2310
	AB(2) = 0.5*(H(2)-H(8))	SIZE2320
	AB(3) = (AB(1)-H(5))/AB(2)	SIZE2330
	AB(3) = AINT(AB(3)*100.0)/100.0	SIZE2340
	AB(4) = (0.5*(H(10)+H(1))-H(5))/AB(2)	SIZE2350
	AB(4) = AINT(AB(4)*100.0)/100.0	SIZE2360
	AB(5) = (0.5*(H(1)-H(10))-AB(2))/AB(2)	SIZE2370
	AB(6) = (D(7)/D(3))*0.5	SIZE2380
	AB(7) = (D(7)*D(3))/(D(5)**2)	SIZE2390
	AB(8) = (H(8)+H(5)+H(2))/3.0	SIZE2400
	AB(9) = (H(2)-H(8))/4.0+(H(1)-H(10))/6.6	SIZE2410
	X1 = (H(8)+H(2)-2.0*H(5))/(2.0*(H(2)-H(8)))	SIZE2420
	X2 = (H(10)+H(1)-2.0*H(5))/(2.0*(H(1)-H(10)))	SIZE2430

FORTRAN PROGRAM SEDSIZE LISTING--Continued

AB(10) = X1+X2	SIZE2440
NCD(1)=ICD(2)+ICD(8)	SIZE2450
NCD(2)=NCD(1)	SIZE2460
NCD(3)=NCD(1)+ICD(5)	SIZE2470
NCD(8)=NCD(3)	SIZE2480
NCD(5)=NCD(1)+ICD(1)+ICD(10)	SIZE2490
NCD(9)=NCD(5)	SIZE2500
NCD(4)=NCD(5)+ICD(5)	SIZE2510
NCD(10)=NCD(4)	SIZE2520
NCD(6)=ICD(3)+ICD(7)	SIZE2530
NCD(7)=NCD(6)+ICD(5)	SIZE2540
NTOT=0	SIZE2550
NF=1	SIZE2560
NP=0	SIZE2570
DO 698 I=1,10	SIZE2580
NTOT=NTOT+ICD(I)	SIZE2590
NF=Nf+1	SIZE2600
IF (NCD(I).GE.0) GO TO 692	SIZE2610
FMAT(NF)=KMAT(2)	SIZE2620
FNT(I)=PLS	SIZE2630
GO TO 694	SIZE2640
692 FNT(I)=BLK	SIZE2650
IF (NCD(I).GT.0) FNT(I)=ASK	SIZE2660
FMAT(NF)=KMAT(1)	SIZE2670
NP=NP+1	SIZE2680
VA(NP)=AB(I)	SIZE2690
694 IF (I.NE.5.AND.I.NE.7) GO TO 698	SIZE2700
NF=Nf+1	SIZE2710
698 CONTINUE	SIZE2720
WRITE (6,56) (FNT(I),I=1,10)	SIZE2730
WRITE (6,FMAT) (VA(I),I=1,NP)	SIZE2740
C	SIZE2750
C COMPUTATION OF PERCENT CLAY, SILT, SAND, AND GRAVEL	SIZE2760
C	SIZE2770
DO 820 NN=1,3	SIZE2780
IF (NN-2) 700,710,715	SIZE2790
700 IF (PHI(M).GT.-1.0) GO TO 705	SIZE2800
D9=-1.0	SIZE2810
GO TO 720	SIZE2820
705 PROBD=100.0	SIZE2830
GO TO 820	SIZE2840
710 PROB1=PROBD+0.5	SIZE2850
D9=4.0	SIZE2860
GO TO 720	SIZE2870
715 PROB4=PROBD+0.5	SIZE2880
IF (M.EQ.1) GO TO 830	SIZE2890
D9=8.0	SIZE2900
720 N=1	SIZE2910
725 IF (D9-PHI(N)) 730,735,740	SIZE2920

FORTRAN PROGRAM SEDSIZE LISTING--Continued

730 IF (N.GE.M) GO TO 745	SIZE2930
N=N+1	SIZE2940
GO TO 725	SIZE2950
735 PROBD=PCT(N)	SIZE2960
GO TO 820	SIZE2970
740 IF (N.EQ.1) GO TO 750	SIZE2980
745 N=N-1	SIZE2990
750 CALL INTERP (DEV,SIGMA,CENTER)	SIZE3000
IF (DEV.LE.0.0) GO TO 950	SIZE3010
IF (D9-CENTER) 755,785,790	SIZE3020
755 DEVD=(CENTER-D9)/SIGMA	SIZE3030
IF (DEVD.GT.3.06) GO TO 780	SIZE3040
N=154	SIZE3050
760 IF (DEVD-X(N)) 775,770,765	SIZE3060
765 N=N+1	SIZE3070
GO TO 760	SIZE3080
770 PROBD=PROB(N)	SIZE3090
GO TO 820	SIZE3100
775 PROBD=PROB(N-1)+(DEVD-X(N-1))*(PROB(N)-PROB(N-1))/0.02	SIZE3110
GO TO 820	SIZE3120
780 PROBD=100.0	SIZE3130
GO TO 820	SIZE3140
785 PROBD=50.0	SIZE3150
GO TO 820	SIZE3160
790 DEVD=(D9-CENTER)/SIGMA	SIZE3170
IF (DEVD.GT.3.06) GO TO 810	SIZE3180
N=1	SIZE3190
795 IF (DEVD-X(N)) 800,805,775	SIZE3200
800 N=N+1	SIZE3210
GO TO 795	SIZE3220
805 PROBD=PROB(N)	SIZE3230
GO TO 820	SIZE3240
810 PROBD=0.0	SIZE3250
820 CONTINUE	SIZE3260
PROB8=PROBD+0.5	SIZE3270
PCTCL=PROB8	SIZE3280
PCTST= PROB4-PROB8	SIZE3290
PCTSD=PROB1-PROB4	SIZE3300
PCTGR=100-PROB1	SIZE3310
GO TO 850	SIZE3320
830 PCTCL=0	SIZE3330
PCTST= PROB4	SIZE3340
PCTSD=PROB1-PROB4	SIZE3350
PCTGR=100-PROB1	SIZE3360
850 FNT(11)=BLK	SIZE3370
IF (PCTGR.EQ.0) GO TO 860	SIZE3380
IF (PHI(M).LE.-1.0.OR.ABS(PCT(M)-99.9).LT.TOL) GO TO 860	SIZE3390
FNT(11)=ASK	SIZE3400
NTOT=NTOT+1	SIZE3410

FORTRAN PROGRAM SEDSIZE LISTING--Continued

860	FNT(12)=BLK	SIZE3420
	IF (PCTSD.EQ.0) GO TO 870	SIZE3430
	IF (PHI(M).LE.-1.0.OR.ABS(PCT(M)-99.9).LT.TOL.AND.PHI(1).GT.4.0.OR	SIZE3440
	1.ABS(PCT(1)-0.1).LT.TOL) GO TO 870	SIZE3450
	FNT(12)=ASK	SIZE3460
	NTOT=NTOT+1	SIZE3470
870	FNT(13)=BLK	SIZE3480
	IF (PCTST.EQ.0) GO TO 880	SIZE3490
	IF (PHI(M).GT.4.0.OR.ABS(PCT(M)-99.9).LT.TOL.AND.PHI(1).GT.8.0.OR	SIZE3500
	1ABS(PCT(1)-0.1).LT.TOL) GO TO 880	SIZE3510
	FNT(13)=ASK	SIZE3520
	NTOT=NTOT+1	SIZE3530
880	FNT(14)=BLK	SIZE3540
	IF (PCTCL.EQ.0) GO TO 900	SIZE3550
	IF (PHI(1).GT.8.0.OR.ABS(PCT(1)-0.1).LT.TOL) GO TO 900	SIZE3560
	FNT(14)=ASK	SIZE3570
	NTOT=NTOT+1	SIZE3580
900	GO TO (910,920,930),MP	SIZE3590
910	WRITE (6,42) DMP	SIZE3600
	GO TO 970	SIZE3610
920	WRITE (6,43)	SIZE3620
	GO TO 970	SIZE3630
930	WRITE (6,44)	SIZE3640
970	WRITE (6,45) PCTGR,FNT(11),PCTSD,FNT(12),PCTST,FNT(13),PCTCL,	SIZE3650
	1 FNT(14)	SIZE3660
	IF (NTOT.EQ.0) GO TO 980	SIZE3670
	WRITE (6,46)	SIZE3680
	IF (NTOT.LT.0) WRITE (6,47)	SIZE3690
	GO TO 980	SIZE3700
950	WRITE (6,57)	SIZE3710
	WRITE (6,46)	SIZE3720
980	CONTINUE	SIZE3730
	GO TO 1020	SIZE3740
1000	WRITE (6,59)DFILE	SIZE3750
	GO TO 1020	SIZE3760
1010	WRITE (6,60)DFILE	SIZE3770
1020	ENDFILE (6)	SIZE3780
	CLOSE (5)	SIZE3790
	CLOSE (6)	SIZE3800
	WRITE (1,58) OFILE	SIZE3810
	WRITE (1,*) 'END OF RUN'	SIZE3820
	CALL CLSCR(5)	SIZE3830
	CALL EXIT	SIZE3840
	END	SIZE3850
	SUBROUTINE INTERP (DEV,SIGMA,CENTER)	INTR 10
	COMMON PROB(307),X(307),PCT(33),PHI(33),N,L,TOL	INTR 20

FORTRAN PROGRAM SEDSIZE LISTING--Continued

IF (PCT(N).GE.50.0) GO TO 40	INTR 30
L=1	INTR 40
10 IF (PROB(L).GE.PCT(N)) GO TO 20	INTR 50
L = L+1	INTR 60
GO TO 10	INTR 70
20 IF (PCT(N).GT.0.1) GO TO 30	INTR 80
DEV1 = X(1)	INTR 90
GO TO 60	INTR 100
30 DEV1=X(L-1)-((PCT(N)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))	INTR 110
GO TO 60	INTR 120
40 L=154	INTR 130
45 IF (PROB(L).GE.PCT(N)) GO TO 50	INTR 140
L = L+1	INTR 150
GO TO 45	INTR 160
50 DEV1=X(L-1)+((PCT(N)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))	INTR 170
60 L1 = L	INTR 180
IF (PCT(N+1).GE.50.0) GO TO 90	INTR 190
L=1	INTR 200
70 IF (PROB(L).GE.PCT(N+1)) GO TO 80	INTR 210
L = L+1	INTR 220
GO TO 70	INTR 230
80 DEV2=X(L-1)-((PCT(N+1)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))	INTR 240
GO TO 110	INTR 250
90 L=154	INTR 260
95 IF (PROB(L).GE.PCT(N+1)) GO TO 100	INTR 270
L = L+1	INTR 280
GO TO 95	INTR 290
100 DEV2=X(L-1)+((PCT(N+1)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))	INTR 300
110 L2 = L	INTR 310
L3 = 1	INTR 320
L4 = 1	INTR 330
IF (L1.GT.154) GO TO 120	INTR 340
L3 = -1	INTR 350
120 IF(L2.GT.154) GO TO 130	INTR 360
L4 = -1	INTR 370
130 L5 = L3+L4+3	INTR 380
IF (L5-3) 150,160,140	INTR 390
C	INTR 400
C CENTER IS ABOVE BOTH POINTS	INTR 410
C	INTR 420
140 DEV = DEV2-DEV1	INTR 430
IF (DEV.LT.TOL) RETURN	INTR 440
SIGMA = (PHI(N)-PHI(N+1))/DEV	INTR 450
CENTER = PHI(N)+DEV1*SIGMA	INTR 460
RETURN	INTR 470
C	INTR 480
C CENTER IS BELOW BOTH POINTS	INTR 490
C	INTR 500
150 DEV = DEV1-DEV2	INTR 510

FORTTRAN PROGRAM SEDSIZE LISTING--Continued

	GO TO 170	INTR 520
C		INTR 530
C	CENTER IS BETWEEN POINTS	INTR 540
C		INTR 550
	160 DEV = DEV1+DEV2	INTR 560
	170 IF (DEV.LT.TOL) RETURN	INTR 570
	SIGMA = (PHI(N)-PHI(N+1))/DEV	INTR 580
	CENTER = PHI(N)-DEV1*SIGMA	INTR 590
	RETURN	INTR 600
	END	INTR 610
	 SUBROUTINE CLSCR(N)	CLSC 10
C		CLSC 20
C	MOVE CURSOR DOWN N LINES	CLSC 30
C		CLSC 40
	DO 10 I=1,N	CLSC 50
	WRITE (1,*)	CLSC 60
	10 CONTINUE	CLSC 70
	RETURN	CLSC 80
	END	CLSC 90

SUPPLEMENTAL DATA--SECTION E.

BASIC PROGRAM SIZEDATA LISTING

```

10 REM PROGRAM SIZEDATA
20 REM ENTER DATA FOR SIZE STATISTIC PROGRAM TO INPUT FILE
30 REM STORES DATA ON SEQUENTIAL FILE DFILE$ AFTER EACH 10 ENTERED DATA SETS
40 DIM LO$(30),DIAM(33),SIZDIA(33),PCTFN(30,33),SIZE(30,33),DATE$(30),TIME(30),
NS(30)
50 DATA 0.002,0.003,0.004,0.006,0.008,0.011,0.016,0.022,0.031,0.044,0.062,0.088,
0.125,0.177,0.25,0.354,0.5,0.707,1,1.4,2,2.8,4,5.6,8,11.3,16,22.6,32,45.2,64,90.
5,128
60 FOR I=1 TO 33 : READ DIAM(I) : NEXT I
70 DFILE$="SIZE.DAT"
80 NN=25 : GOSUB 2980
90 PRINT "TURN ON PRINTER" : PRINT : PRINT "ESTABLISH FILE NAME:" : PRINT
100 PRINT "      1. USE PROGRAMMED FILE NAME (SIZE.DAT)"
110 PRINT "      2. PROVIDE FILE NAME"
120 NN=3 : GOSUB 2980
130 PRINT "ENTER NUMBER OF SELECTION"
140 NN=10 : GOSUB 2980 : INPUT " ",I
150 IF I=1 THEN 190
160 NN=25 : GOSUB 2980
170 PRINT "ENTER DESIRED FILE NAME"
180 NN=10 : GOSUB 2980 : INPUT " ",DFILE$
190 NN=25 : GOSUB 2980
200 PRINT "      1. START DATA ENTRY INTO ";DFILE$
210 PRINT "      2. ADD DATA TO ";DFILE$
220 PRINT "      3. CORRECT DATA IN ";DFILE$
230 PRINT "      4. DISPLAY DATA IN ";DFILE$
240 PRINT "      5. PRINT DATA IN ";DFILE$
250 NN=3 : GOSUB 2980
260 PRINT "ENTER NUMBER OF SELECTION"
270 NN=10 : GOSUB 2980 : INPUT " ",NC
280 NU=0 : ND=0 : IST=0
290 IF NC=1 GOTO 420
300 REM LOAD DATA FROM DISK * * * * *
310 OPEN "I",#1,DFILE$
320 INPUT #1,NU
330 FOR I=1 TO NU
340 INPUT #1,LO$(I),DATE$(I),TIME(I),NS(I)
350 NO=NS(I)
360 FOR N=1 TO NO : INPUT #1,SIZE(I,N) : NEXT N
370 FOR N=1 TO NO : INPUT #1,PCTFN(I,N) : NEXT N
380 NEXT I
390 CLOSE
400 ON NC GOTO 420,420,1820,2220,2380
410 REM ENTER DATA * * * * *
420 NN=25 : GOSUB 2980
430 PRINT "METHOD OF ENTERING PARTICLE DIAMETERS:"
440 PRINT

```

BASIC PROGRAM SIZEDATA LISTING--Continued

```

450 PRINT "      1. INDIVIDUAL DIAMETER NUMBERS FROM SIZE TABLE
460 PRINT "      2. SEQUENTIAL DIAMETERS BETWEEN MIN-MAX TABLE NUMBERS
470 PRINT "      3. INDIVIDUALLY ENTERED DIAMETERS (IN MILLIMETERS)
480 PRINT "      4. SEQUENTIAL PHI VALUES BETWEEN MIN-MAX VALUES
490 NN=3 : GOSUB 2980
500 PRINT "ENTER NUMBER OF SELECTION"
510 NN=10 : GOSUB 2980 : INPUT " ",INOPT
520 IF INOPT>4 THEN 420
530 ON INOPT GOTO 540,670,830,930
540 NN=25 : GOSUB 2980
550 PRINT "ENTER NUMBER DIAMETERS TO BE USED (MAX 33)"
560 NN=10 : GOSUB 2980 : INPUT " ",NO
570 IF NO>33 THEN 540
580 FOR I=1 TO NO
590 GOSUB 2820
600 NN=3 : GOSUB 2980
610 PRINT USING "ENTER TABLE NUMBER FOR DIAM NO. ##";I
620 NN=3 : GOSUB 2980 : INPUT " ",J
630 IF J>33 THEN 590
640 SIZDIA(I)=DIAM(J)
650 NEXT I
660 GOTO 1090
670 GOSUB 2820
680 INPUT "ENTER MIN TABLE DIAMETER NUMBER ";NMIN
690 IF NMIN<1 THEN 670
700 INPUT "ENTER MAX TABLE DIAMETER NUMBER ";NMAX
710 IF NMAX>=33 THEN 700
720 INPUT "ENTER DIAMETER NUMBER INCREMENT ";NINC
730 NO=0
740 FOR J=NMIN TO NMAX STEP NINC
750 NO=NO+1
760 IF NO>33 THEN 800
770 SIZDIA(NO)=DIAM(J)
780 NEXT J
790 GOTO 1090
800 PRINT : PRINT "***** NUMBER DIAMETERS > 33 *****"
810 PRINT : PRINT "PRESS ANY KEY TO CONTINUE" : S$=INPUT$(1)
820 GOTO 670
830 NN=25 : GOSUB 2980
840 PRINT "ENTER NUMBER SIZES TO BE ENTERED (MAX 33)"
850 NN=10 : GOSUB 2980 : INPUT " ",NO
860 IF NO>33 THEN 830
870 FOR I=1 TO NO
880 NN=3 : GOSUB 2980
890 PRINT USING "ENTER DIAM. IN MM SIZE NUMBER ##";I
900 NN=3 : GOSUB 2980 : INPUT " ",SIZDIA(I)
910 NEXT I
920 GOTO 1090
930 GOSUB 2820

```


BASIC PROGRAM SIZEDATA LISTING--Continued

```

940 INPUT "ENTER MAX PHI VALUE ",PMAX
950 INPUT "ENTER MIN PHI VALUE ",PMIN
960 INPUT "ENTER PHI INCREMENT (1.0 OR 0.5) ",PINC
970 NO=INT((PMAX-PMIN)/PINC+1)
980 IF NO<34 THEN 1020
990 PRINT : PRINT "***** NUMBER DIAMETERS > 33 *****"
1000 PRINT : PRINT "PRESS ANY KEY TO CONTINUE" : S$=INPUT$(1)
1010 GOTO 930
1020 P1=PMAX
1030 SIZDIA(1)=.5^(P1)
1040 FOR I=2 TO NO
1050 P2=P1-PINC
1060 SIZDIA(I)=.5^(P2)
1070 P1=P2
1080 NEXT I
1090 NN=25 : GOSUB 2980
1100 PRINT "NUMBER DIAMETERS = ";NO : PRINT
1110 N1=-9
1120 N1=N1+10 : N2=N1+9
1130 IF N2>NO THEN N2=NO
1140 FOR I=N1 TO N2 : PRINT USING "#####";I; : NEXT I : PRINT
1150 FOR I=N1 TO N2 : PRINT USING "####.###";SIZDIA(I); : NEXT I : PRINT
1160 PRINT
1170 IF N2<NO THEN 1120
1180 NN=3 : GOSUB 2980
1190 PRINT "DIAMETERS OK (Y/N)"
1200 NN=10 : GOSUB 2980 : INPUT " ",S$
1210 IF NOT (S$="Y" OR S$="y") THEN 420
1220 NOD=NO
1230 NN=25 : GOSUB 2980
1240 PRINT "ENTER LOCATION/DESCRIPTION (MAX 80 CHARACTERS)"
1250 NN=10 : GOSUB 2980 : LINE INPUT L$
1260 IF IST=0 THEN 1400
1270 IST=IST+1
1280 IF NU=30 THEN 1880
1290 N=25 : GOSUB 2980
1300 PRINT "REQUIREMENT FOR NEXT DATA-SET ENTRY:" : PRINT
1310 PRINT "      1. NO CHANGE IN INPUT SEQUENCE
1320 PRINT "      2. CHANGE LOCATION/DESCRIPTION
1330 PRINT "      3. CHANGE PARTICLE DIAMETERS
1340 PRINT "      4. STOP DATA ENTRY (END RUN)"
1350 NN=3 : GOSUB 2980
1360 PRINT "ENTER NUMBER OF SELECTION"
1370 NN=3 : GOSUB 2980 : INPUT " ",JOPTN
1380 IF JOPTN>4 THEN 1290
1390 ON JOPTN GOTO 1400,1230,420,1880
1400 NU=NU+1 : ND=ND+1
1410 IF ND<11 THEN 1440
1420 GOSUB 1690

```

BASIC PROGRAM SIZEDATA LISTING--Continued

```

1430 ND=0
1440 NN=25 : GOSUB 2980
1450 PRINT "DATA SET NO. ";NU; : PRINT "    MAX = 30" : PRINT
1460 PRINT L$: PRINT
1470 LO$(NU)=L$
1480 PRINT : INPUT "ENTER DATE (MM/DD/YY) ",DATE$(NU)
1490 PRINT : INPUT "ENTER TIME (2400 HR) ",TIME(NU)
1500 NS(NU)=NOD : NO=NOD
1510 FOR I=1 TO NO
1520 SIZE(NU,I)=SIZDIA(I)
1530 PCTFN(NU,I)=0
1540 NEXT I
1550 FOR I=1 TO NO
1560 PRINT : PRINT USING "ENTER PCT FINER VALUE FOR ###.### ";SIZDIA(I); : INPU
T PCTFN(NU,I)
1570 IF PCTFN(NU,I)<99.9 THEN 1600
1580 PCTFN(NU,I)=99.9
1590 GOTO 1610
1600 NEXT I
1610 N=NU : GOSUB 2670
1620 PRINT
1630 PRINT "    1. DATA SET OK
1640 PRINT "    2. RE-ENTER COMPLETE DATA SET
1650 PRINT "    3. CORRECT PART OF DATA SET
1660 PRINT : INPUT "ENTER NUMBER OF SELECTION ",I
1670 IF I>3 THEN 1610
1680 ON I GOTO 1280,1450,1950
1690 REM STORE DATA ON DISK * * * * *
1700 OPEN "O",#1,DFILE$
1710 WRITE #1,NU
1720 FOR I=1 TO NU
1730 WRITE #1,LO$(I),DATE$(I),TIME(I),NS(I)
1740 NO=NS(I)
1750 FOR N=1 TO NO : WRITE #1,SIZE(I,N) : NEXT N
1760 FOR N=1 TO NO : WRITE #1,PCTFN(I,N) : NEXT N
1770 NN=25 : GOSUB 2980
1780 NEXT I
1790 CLOSE
1800 RETURN
1810 END
1820 REM CORRECT DATA * * * * *
1830 NN=25 : GOSUB 2980
1840 PRINT "ENTER DATA SET NUMBER TO BE CORRECTED    0 TO END RUN"
1850 NN=10 : GOSUB 2980 : INPUT " ",N
1860 IF N>NU THEN 1830
1870 IF N>0 THEN 1940
1880 GOSUB 1690
1890 NN=25 : GOSUB 2980
1900 PRINT "NUMBER DATA SETS = ";NU

```

BASIC PROGRAM SIZEDATA LISTING--Continued

```

1910 PRINT : PRINT "DATA STORED IN FILE ";DFILE$
1920 PRINT : PRINT "END OF RUN"
1930 NN=10 : GOSUB 2980 : END
1940 NO=NS(N)
1950 GOSUB 2670
1960 PRINT
1970 PRINT "0. ALL CORRECTIONS COMPLETED          3. CHANGE TIME"
1980 PRINT "1. CHANGE LOCATION/DESCRIPTION          4. CHANGE DIAMETERS"
1990 PRINT "2. CHANGE DATE                          5. CHANGE PCT FINER VALUES"
2000 PRINT : INPUT "ENTER NUMBER OF SELECTION ",I
2010 IF I>5 THEN 1950
2020 IF I>0 THEN 2050
2030 IF NC=3 THEN 1830
2040 GOTO 1280
2050 ON I GOTO 2060,2080,2100,2120,2170
2060 PRINT : PRINT "OLD LOCATION/DESCRIPTION IS " : PRINT LO$(N) : PRINT "ENTER N
EW STATION DESCRIPTION (MAX 80 CHARACTERS)"
2070 LINE INPUT LO$(N) : GOTO 1950
2080 PRINT : PRINT "OLD DATE IS ";DATE$(N) : INPUT "ENTER NEW DATE ",DATE$(N)
2090 GOTO 1950
2100 PRINT : PRINT "OLD TIME IS ";TIME(N) : INPUT "ENTER NEW TIME ",TIME(N)
2110 GOTO 1950
2120 PRINT : PRINT USING "ENTER SIZE NUMBER MAX = ##";NO; : PRINT " 0 TO END
"; : INPUT I
2130 IF I=0 THEN 1950
2140 IF I>NO THEN 2120
2150 GOSUB 2670
2160 PRINT : PRINT "OLD DIAMETER IS ";SIZE(N,I) : INPUT "ENTER NEW DIAMETER ",SI
ZE(N,I) : GOTO 2120
2170 PRINT : PRINT USING "ENTER SIZE NUMBER. MAX = ##";NO; : PRINT " 0 TO END
"; : INPUT I
2180 IF I=0 THEN 1950
2190 IF I>NO THEN 2170
2200 GOSUB 2670
2210 PRINT : PRINT "OLD PCT FINER VALUE IS ";PCTFN(N,I) : INPUT "ENTER NEW PCT F
INER VALUE ",PCTFN(N,I) : GOTO 2170
2220 REM LIST DATA ON SCREEN * * * * *
2230 NN=25 : GOSUB 2980
2240 PRINT "ENTER START SET NUMBER TO BE LISTED 0 TO END RUN "
2250 NN=3 : GOSUB 2980 : INPUT " ",NS1
2260 IF NS1=0 THEN 2640
2270 IF NS1>NU THEN 2230
2280 NN=3 : GOSUB 2980
2290 PRINT USING "ENTER END SET NUMBER TO BE LISTED MAX = ## ";NU
2300 NN=3 : GOSUB 2980 : INPUT " ",NS2
2310 IF NS2>NU THEN 2280
2320 FOR N=NS1 TO NS2
2330 NO=NS(N)
2340 GOSUB 2670

```

BASIC PROGRAM SIZEDATA LISTING--Continued

```

2350 PRINT : PRINT "PRESS ANY KEY TO CONTINUE" : S$=INPUT$(1)
2360 NEXT N
2370 GOTO 2230
2380 REM LIST DATA ON PRINTER * * * * *
2390 LPRINT "DATA STORED ON FILE ";DFILE$ : LPRINT
2400 NN=25 : GOSUB 2980
2410 PRINT "ENTER START SET NUMBER TO BE PRINTED      0 TO END RUN "
2420 NN=3 : GOSUB 2980 : INPUT " ",NS1
2430 IF NS1=0 THEN 2640
2440 IF NS1>NU THEN 2400
2450 NN=3 : GOSUB 2980
2460 PRINT USING "ENTER END SET NUMBER TO BE PRINTED      MAX = ## ";NU
2470 NN=3 : GOSUB 2980 : INPUT " ",NS2
2480 IF NS2>NU THEN 2450
2490 FOR N=NS1 TO NS2
2500 NO=NS(N)
2510 LPRINT : LPRINT : LPRINT "SET NUMBER  "N
2520 LPRINT : LPRINT LO$(N) : LPRINT
2530 LPRINT "DATE  ";DATE$(N); : LPRINT USING "      TIME  ###";TIME(N); : LPRINT
    USING "      NO. SIZES  ##";NO
2540 LPRINT : N1=-9
2550 N1=N1+10 : N2=N1+9
2560 IF N2>NO THEN N2=NO
2570 FOR I=N1 TO N2 : LPRINT USING "#####";I; : NEXT I : LPRINT
2580 FOR I=N1 TO N2 : LPRINT USING "####.###";SIZE(N,I); : NEXT I : LPRINT
2590 FOR I=N1 TO N2 : LPRINT USING "#####.##";PCTFN(N,I); : NEXT I
2600 LPRINT : LPRINT
2610 IF N2<NO THEN 2550
2620 NEXT N
2630 GOTO 2410
2640 NN=25 : GOSUB 2980 : PRINT "END OF RUN"
2650 NN=10 : GOSUB 2980 : END
2660 REM LIST ONE SET OF DATA ON SCREEN * * * * *
2670 NN=25 : GOSUB 2980
2680 PRINT USING "SET NUMBER  ##";N
2690 PRINT : PRINT LO$(N) : PRINT
2700 PRINT "DATE  ";DATE$(N); : PRINT USING "      TIME  ###";TIME(N); : PRINT US
    ING "      NO. SIZES  ##";NO : PRINT
2710 N1=-9
2720 N1=N1+10 : N2=N1+9
2730 IF N2>NO THEN N2=NO
2740 FOR K=N1 TO N2 : PRINT USING "#####";K; : NEXT K : PRINT
2750 FOR K=N1 TO N2 : PRINT USING "####.###";SIZE(N,K); : NEXT K : PRINT
2760 FOR K=N1 TO N2 : PRINT USING "#####.##";PCTFN(N,K); : NEXT K
2770 PRINT : PRINT
2780 IF N2<NO THEN 2720
2790 RETURN
2800 END
2810 REM SUBROUTINE TO PRINT SIZE TABLE * * * * *

```

BASIC PROGRAM SIZEDATA LISTING---Continued

```

2820 NN=25 : GOSUB 2980
2830 PRINT "    SIZE NO. AND CORRESPONDING DIAM. IN MM AND PHI UNITS" : PRINT
2840 PRINT "NO      MM      PHI      NO      MM      PHI      NO      MM      PHI" : PRINT
2850 PRINT " 1  0.002  9.0   12  0.088  3.5   23   4.00  -2.0"
2860 PRINT " 2  0.003  8.5   13  0.125  3.0   24   5.66  -2.5"
2870 PRINT " 3  0.004  8.0   14  0.177  2.5   25   8.00  -3.0"
2880 PRINT " 4  0.006  7.5   15  0.250  2.0   26  11.3   -3.5"
2890 PRINT " 5  0.008  7.0   16  0.354  1.5   27  16.0   -4.0"
2900 PRINT " 6  0.011  6.5   17  0.500  1.0   28  22.6   -4.5"
2910 PRINT " 7  0.016  6.0   18  0.707  0.5   29  32.0   -5.0"
2920 PRINT " 8  0.022  5.5   19  1.00   0.0   30  45.2   -5.5"
2930 PRINT " 9  0.031  5.0   20  1.41  -0.5   31  64.0   -6.0"
2940 PRINT "10  0.044  4.5   21  2.00  -1.0   32  90.5   -6.5"
2950 PRINT "11  0.062  4.0   22  2.83  -1.5   33 128.0   -7.0" : PRINT
2960 RETURN
2970 END
2980 REM SUBROUTINE TO MOVE CURSOR DOWN NN LINES * * * * *
2990 FOR LL=1 TO NN : PRINT : NEXT LL
3000 RETURN
3010 END

```

SUPPLEMENTAL DATA--SECTION F.

BASIC PROGRAM SEDSIZE LISTING

```

10 REM PROGRAM SEDSIZE
20 REM COMPUTE SIZE STATISTICS FROM PERCENT FINER VALUES
30 DIM PROB(307),X(307),PCT(33),PHI(33),FMT$(10),FM$(3),PCTFN(33),DIA(33),AB(10)
40 DIM TP(10),CP(10),SIZPHI(33),H(10),D(10),SIZDIA(33),ICD(10),NCD(10)
50 DATA 0.10,0.11,0.12,0.13,0.14,0.15,0.16,0.18,0.19,0.20
60 DATA 0.21,0.23,0.24,0.26,0.27,0.29,0.31,0.33,0.35,0.37
70 DATA 0.39,0.41,0.44,0.47,0.49,0.52,0.55,0.59,0.62,0.66
80 DATA 0.69,0.73,0.78,0.82,0.87,0.91,0.96,1.02,1.07,1.13
90 DATA 1.19,1.25,1.32,1.39,1.46,1.54,1.62,1.70,1.79,1.88
100 DATA 1.97,2.07,2.17,2.28,2.39,2.50,2.62,2.74,2.87,3.01
110 DATA 3.14,3.29,3.44,3.59,3.75,3.92,4.09,4.27,4.46,4.65
120 DATA 4.85,5.05,5.26,5.48,5.71,5.94,6.18,6.43,6.68,6.94
130 DATA 7.21,7.49,7.78,8.08,8.38,8.69,9.01,9.34,9.68,10.03
140 DATA 10.38,10.75,11.12,11.51,11.90,12.30,12.71,13.14,13.57,14.01
150 DATA 14.46,14.92,15.39,15.87,16.35,16.85,17.36,17.88,18.41,18.94
160 DATA 19.49,20.05,20.61,21.19,21.77,22.36,22.97,23.58,24.20,24.83
170 DATA 25.46,26.11,26.76,27.43,28.10,28.77,29.46,30.15,30.85,31.56
180 DATA 32.28,33.00,33.72,34.46,35.20,35.94,36.69,37.45,38.21,38.97
190 DATA 39.74,40.52,41.29,42.07,42.86,43.64,44.43,45.22,46.02,46.81
200 DATA 47.61,48.40,49.20,50.00
210 FOR I=1 TO 154 : READ PROB(I) : NEXT I
220 DATA 1.645,1.0,0.6745,0.3854,0.0,-0.3854,-0.6745,-1.0,-1.282,-1.645
230 FOR I=1 TO 10 : READ CP(I) : NEXT I
240 DATA 5.0,15.87,25.0,35.0,50.0,65.0,75.0,84.13,90.0,95.0
250 FOR I=1 TO 10 : READ TP(I) : NEXT I
260 FOR I=1 TO 153
270 X1=3.06-(I-1)*.02
280 X(I)=X1 : X(308-I)=X1
290 NEXT I
300 X(154)=0!
310 FOR I=155 TO 307
320 J=308-I
330 PROB(I)=100!-PROB(J)
340 NEXT I
350 FM$(1)=" " : FM$(2)="*" : FM$(3)="+"
360 DEF FNL(X)=LOG(X)/2.30259
370 REM INPUT DATA * * * * *
380 DFILE$="SIZE.DAT"
390 NN=25 : GOSUB 3510
400 PRINT "TURN ON PRINTER" : PRINT : PRINT "ESTABLISH FILE NAME:" : PRINT
410 PRINT "      1. USE PROGRAMMED FILE NAME (SIZE.DAT)"
420 PRINT "      2. PROVIDE FILE NAME"
430 NN=3 : GOSUB 3510
440 PRINT "ENTER NUMBER OF SELECTION"
450 NN=10 : GOSUB 3510 : INPUT " ",I
460 IF I=1 THEN 500
470 NN=25 : GOSUB 3510

```

BASIC PROGRAM SEDSIZE LISTING--Continued

```

480 PRINT "ENTER DESIRED FILE NAME"
490 NN=10 : GOSUB 3510 : INPUT " ",DFILE$
500 OPEN "I",#1,DFILE$
510 INPUT #1,NSAMP
520 FOR NS=1 TO NSAMP
530 INPUT #1,LO$,DATE$,TIME,NO
540 FOR N=1 TO NO : INPUT #1,SIKDIA(N) : NEXT N
550 FOR N=1 TO NO : INPUT #1,PCTFN(N) : NEXT N
560 NN=25 : GOSUB 3510
570 PRINT "DATA SET NUMBER ";NS : PRINT LO$
580 PRINT DATE$; : PRINT SPC(10);TIME
590 NN=10 : GOSUB 3510
600 REM COMPUTE MEYER-PETER EFFECTIVE DIAMETER * * * * *
610 P1=0
620 DMP=0
630 IF PCTFN(1)>0 THEN 780
640 FOR I=1 TO NO
650 IF PCTFN(I+1)>0 THEN 670
660 NEXT I
670 S1=SIKDIA(I)
680 I1=I+1
690 FOR I=I1 TO NO
700 IF PCTFN(I)=0 THEN 750
710 DMP=DMP+SQR(S1*SIKDIA(I))*(PCTFN(I)-P1)
720 S1=SIKDIA(I)
730 P1=PCTFN(I)
740 IF P1>=99.9 THEN 800
750 NEXT I
760 MP=3
770 GOTO 820
780 MP=2
790 GOTO 820
800 MP=1
810 DMP=DMP/100
820 FOR I=1 TO NO
830 P1=-3.322*(FNL(SIKDIA(I)))
840 SIKPHI(I)=FIX(P1*10+.5*SGN(P1))/10
850 NEXT I
860 REM ELIMINATION OF ZERO PCTFN VALUES * * * * *
870 M = 0
880 FOR I=1 TO NO
890 IF PCTFN(I)=0 THEN 940
900 M = M+1
910 DIA(M) = SIKDIA(I)
920 PCT(M) = PCTFN(I)
930 PHI(M) = SIKPHI(I)
940 NEXT I
950 LPRINT "SIZE STATISTICS FOR:" : LPRINT LO$
960 LPRINT DATE$; : LPRINT SPC(10);TIME : LPRINT

```

BASIC PROGRAM SEDSIZE LISTING--Continued

```

970 LPRINT "INPUT SIZE DISTRIBUTION    SPECIFIED COMPUTED SIZES"
980 LPRINT " PARTICLE SIZE  PERCENT    PERCENT    PARTICLE SIZE"
990 LPRINT "MILLIMETER  PHI  FINER    FINER  PHI  MILLIMETER" : LPRINT
1000 REM COMPUTE STATISTICS * * * * *
1010 N = 1
1020 FOR I=1 TO 10
1030 ICD(I)=0
1040 IF TP(I)<=PCT(N) THEN 1100
1050 IF N<M THEN 1080
1060 ICD(I)=2
1070 GOTO 1130
1080 N = N+1
1090 GOTO 1040
1100 IF N>1 THEN 1130
1110 IF TP(I)<>PCT(N) THEN ICD(I)=1
1120 GOTO 1140
1130 N = N-1
1140 GOSUB 2970
1150 IF DEV<=0 THEN 2900
1160 PF = INT(TP(I)+.3)
1170 H(I) = CENTER+CP(I)*SIGMA
1180 IF H(I)<=14 THEN 1270
1190 ICD(I)=-20
1200 IF M<I THEN 1240
1210 LPRINT USING "####.###";DIA(I);
1220 LPRINT USING "#####.##";PHI(I),PCT(I); : LPRINT USING "#####";PF;
1230 GOTO 1250
1240 LPRINT SPC(27); : LPRINT USING "####";PF;
1250 LPRINT SPC(17);"-- UNDEFINED"
1260 GOTO 1420
1270 D(I)=.5^H(I)
1280 IF M<I THEN 1320
1290 LPRINT USING "####.###";DIA(I);
1300 LPRINT USING "#####.##";PHI(I),PCT(I); : LPRINT USING "#####";PF;
1310 GOTO 1330
1320 LPRINT SPC(27); : LPRINT USING "####";PF;
1330 LPRINT USING "####.###"; H(I),D(I);
1340 N9=ICD(I)+1
1350 ON N9 GOTO 1410,1360,1380
1360 LPRINT " -- EXTRAPOLATED FROM PTS  1 &  2"
1370 GOTO 1420
1380 LPRINT USING " -- EXTRAPOLATED FROM PTS ##";M-1; : LPRINT " & ";
1390 LPRINT USING "##";M
1400 GOTO 1420
1410 LPRINT
1420 NEXT I
1430 IF M<=10 THEN 1490
1440 FOR I=11 TO M
1450 LPRINT USING "####.###";DIA(I);

```


BASIC PROGRAM SEDSIZE LISTING--Continued

```

1460 LPRINT USING "####.#";PHI(I),PCT(I)
1470 NEXT I
1480 REM COMPUTE INMAN, TRASK AND FOLK VALUES * * * * *
1490 AB(1)=.5*(H(2)+H(8))
1500 AB(2)=.5*(H(2)-H(8))
1510 AB(3)=(AB(1)-H(5))/AB(2)
1520 AB(3)=FIX(AB(3)*100)/100
1530 AB(4)=(.5*(H(10)+H(1))-H(5))/AB(2)
1540 AB(4)=FIX(AB(4)*100)/100
1550 AB(5)=(.5*(H(1)-H(10))-AB(2))/AB(2)
1560 AB(6)=(D(7)/D(3))^.5
1570 AB(7)=(D(7)*D(3))/(D(5)^2)
1580 AB(8)=(H(8)+H(5)+H(2))/3!
1590 AB(9)=(H(2)-H(8))/4!+(H(1)-H(10))/6.6
1600 X1=(H(8)+H(2)-2*H(5))/(2*(H(2)-H(8)))
1610 X2=(H(10)+H(1)-2*H(5))/(2*(H(1)-H(10)))
1620 AB(10)=X1+X2
1630 NCD(1)=ICD(2)+ICD(8)
1640 NCD(2)=NCD(1)
1650 NCD(3)=NCD(1)+ICD(5)
1660 NCD(8)=NCD(3)
1670 NCD(5)=NCD(1)+ICD(1)+ICD(10)
1680 NCD(9)=NCD(5)
1690 NCD(4)=NCD(5)+ICD(5)
1700 NCD(10)=NCD(4)
1710 NCD(6)=ICD(3)+ICD(7)
1720 NCD(7)=NCD(6)+ICD(5)
1730 NTOT=0
1740 FOR I=1 TO 10
1750 NTOT=NTOT+ICD(I)
1760 IF NCD(I)>=0 THEN 1790
1770 FMT$(I)=FM$(3)
1780 GOTO 1840
1790 X=FIX(AB(I)*1000+.5*SGN(AB(I)))/1000+.0001*SGN(AB(I))
1800 X$=STR$(X)
1810 IF ABS(X)<1 THEN X$=LEFT$(X$,1)+"0"+MID$(X$,2,5)
1820 FMT$(I)=LEFT$(X$,LEN(X$)-1)+FM$(1)
1830 IF NCD(I)>0 THEN FMT$(I)=LEFT$(X$,LEN(X$)-1)+FM$(2)
1840 NEXT I
1850 LPRINT : LPRINT SPC(18);"INMAN VALUES"
1860 LPRINT "      MEAN      SORT      ALPH1      ALPH2      BETA"
1870 FOR I=1 TO 5 : LPRINT SPC(9-LEN(FMT$(I)));FMT$(I); : NEXT I
1880 LPRINT:LPRINT : LPRINT "      TRASK VALUES"; : LPRINT SPC(14);"FOLK VALUES"
1890 LPRINT "      SORT      SKEW      MEAN      SORT      SKEW"
1900 LPRINT SPC(9-LEN(FMT$(6)));FMT$(6);SPC(9-LEN(FMT$(7)));FMT$(7);SPC(4);
1910 FOR I=8 TO 10 : LPRINT SPC(9-LEN(FMT$(I)));FMT$(I); : NEXT I
1920 LPRINT : LPRINT
1930 LPRINT "PCT GRAVEL      PCT SAND      PCT SILT      PCT CLAY"
1940 REM COMPUTATION OF PERCENT CLAY, SILT, SAND, AND GRAVEL * * * * *

```

BASIC PROGRAM SEDSIZE LISTING--Continued

```

1950 FOR NN=1 TO 3
1960 ON SGN(NN-2)+2 GOTO 1970,2020,2050
1970 IF PHI(M)>-1 THEN 2000
1980 D9=-1
1990 GOTO 2080
2000 PROBD=100
2010 GOTO 2430
2020 PROBI=FIX(PROBD+.5)
2030 D9=4
2040 GOTO 2080
2050 PROBI=FIX(PROBD+.5)
2060 IF M=1 THEN 2500
2070 D9=8
2080 N=1
2090 ON SGN(D9-PHI(N))+2 GOTO 2100,2130,2150
2100 IF N>=M THEN 2160
2110 N=N+1
2120 GOTO 2090
2130 PROBD=PCT(N)
2140 GOTO 2430
2150 IF N=1 THEN 2170
2160 N=N-1
2170 GOSUB 2970
2180 IF DEV<=0 THEN 2900
2190 ON SGN(D9-CENTER)+2 GOTO 2200,2320,2340
2200 DEVD=(CENTER-D9)/SIGMA
2210 IF DEVD>3.06 THEN 2300
2220 N=154
2230 ON SGN(DEVD-X(N))+2 GOTO 2280,2260,2240
2240 N=N+1
2250 GOTO 2230
2260 PROBD=PROB(N)
2270 GOTO 2430
2280 PROBD=PROB(N-1)+(DEVD-X(N-1))*(PROB(N)-PROB(N-1))/0.02
2290 GOTO 2430
2300 PROBD=100
2310 GOTO 2430
2320 PROBD=50
2330 GOTO 2430
2340 DEVD=(D9-CENTER)/SIGMA
2350 IF DEVD>3.06 THEN 2420
2360 N=1
2370 ON SGN(DEVD-X(N))+2 GOTO 2380,2400,2280
2380 N=N+1
2390 GOTO 2370
2400 PROBD=PROB(N)
2410 GOTO 2430
2420 PROBD=0
2430 NEXT NN

```

BASIC PROGRAM SEDSIZE LISTING--Continued

```

2440 PROB8=FIX(PROBD+.5)
2450 PCTCL=PROB8
2460 PCTST= PROB4-PROB8
2470 PCTSD=PROB1-PROB4
2480 PCTGR=100-PROB1
2490 GOTO 2540
2500 PCTCL=0
2510 PCTST= PROB4
2520 PCTSD=PROB1-PROB4
2530 PCTGR=100-PROB1
2540 P$=STR$(PCTGR) : X$=P$+FM$(1)
2550 IF PCTGR=0 THEN 2590
2560 IF PHI(M)<=-1 OR PCT(M)=99.9 THEN 2590
2570 X$=P$+FM$(2)
2580 NTOT=NTOT+1
2590 LPRINT SPC(6-LEN(X$));X$;
2600 P$=STR$(PCTSD) : X$=P$+FM$(1)
2610 IF PCTSD=0 THEN 2650
2620 IF PHI(M)<=-1 OR PCT(M)=99.9 AND PHI(1)>4 OR PCT(1)=.1 THEN 2650
2630 X$=P$+FM$(2)
2640 NTOT=NTOT+1
2650 LPRINT SPC(13-LEN(X$));X$;
2660 P$=STR$(PCTST) : X$=P$+FM$(1)
2670 IF PCTST=0 THEN 2710
2680 IF PHI(M)>4 OR PCT(M)=99.9 AND PHI(1)>8 OR PCT(1)=.1 THEN 2710
2690 X$=P$+FM$(2)
2700 NTOT=NTOT+1
2710 LPRINT SPC(13-LEN(X$));X$;
2720 P$=STR$(PCTCL) : X$=P$+FM$(1)
2730 IF PCTCL=0 THEN 2770
2740 IF PHI(1)>8 OR PCT(1)=.1 THEN 2770
2750 X$=P$+FM$(2)
2760 NTOT=NTOT+1
2770 LPRINT SPC(13-LEN(X$));X$ : LPRINT
2780 ON MP GOTO 2790,2810,2830
2790 LPRINT USING "MEYER-PETER EFFECTIVE DIAMETER IS ####.### MM";DMP
2800 GOTO 2840
2810 LPRINT "MEYER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED"
2820 GOTO 2840
2830 LPRINT "MEYER-PETER EFF. DIAM. NOT COMPUTED - 100% FINER SIZE NOT DEFINED"
2840 LPRINT
2850 ON SGN(NTOT)+2 GOTO 2860,2910,2880
2860 LPRINT "* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE      + UNDE
FINED"
2870 GOTO 2910
2880 LPRINT "* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE"
2890 GOTO 2910
2900 LPRINT : LPRINT "*** DEV = 0      INPUT DATA IN ERROR ***"
2910 LPRINT CHR$(12)

```

BASIC PROGRAM SEDSIZE LISTING--Continued

```

2920 NEXT NS
2930 NN=25 : GOSUB 3510
2940 PRINT "END OF RUN"
2950 NN=10 : GOSUB 3510
2960 END
2970 REM SUBROUTINE INTERP * * * * *
2980 IF PCT(N)>=50! THEN 3080
2990 L=1
3000 IF PROB(L)>=PCT(N) THEN 3030
3010 L = L+1
3020 GOTO 3000
3030 IF PCT(N)>.1 THEN 3060
3040 DEV1 = X(1)
3050 GOTO 3130
3060 DEV1=X(L-1)-((PCT(N)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))
3070 GOTO 3130
3080 L=154
3090 IF PROB(L)>=PCT(N) THEN 3120
3100 L = L+1
3110 GOTO 3090
3120 DEV1=X(L-1)+((PCT(N)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))
3130 L1 = L
3140 IF PCT(N+1)>=50! THEN 3210
3150 L=1
3160 IF PROB(L)>=PCT(N+1) THEN 3190
3170 L = L+1
3180 GOTO 3160
3190 DEV2=X(L-1)-((PCT(N+1)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))
3200 GOTO 3260
3210 L=154
3220 IF PROB(L)>=PCT(N+1) THEN 3250
3230 L = L+1
3240 GOTO 3220
3250 DEV2=X(L-1)+((PCT(N+1)-PROB(L-1))*0.02/(PROB(L)-PROB(L-1)))
3260 L2 = L
3270 L3 = 1
3280 L4 = 1
3290 IF L1>154 THEN 3310
3300 L3 = -1
3310 IF L2>154 THEN 3330
3320 L4 = -1
3330 L5 = L3+L4+3
3340 ON SGN(L5-3)+2 GOTO 3420,3450,3360
3350 REM CENTER IS BELOW BOTH POINTS * * * * *
3360 DEV = DEV2-DEV1
3370 IF DEV<=0 THEN RETURN
3380 SIGMA = (PHI(N)-PHI(N+1))/DEV
3390 CENTER = PHI(N)+DEV1*SIGMA
3400 RETURN

```

BASIC PROGRAM SEDSIZE LISTING--Continued

```

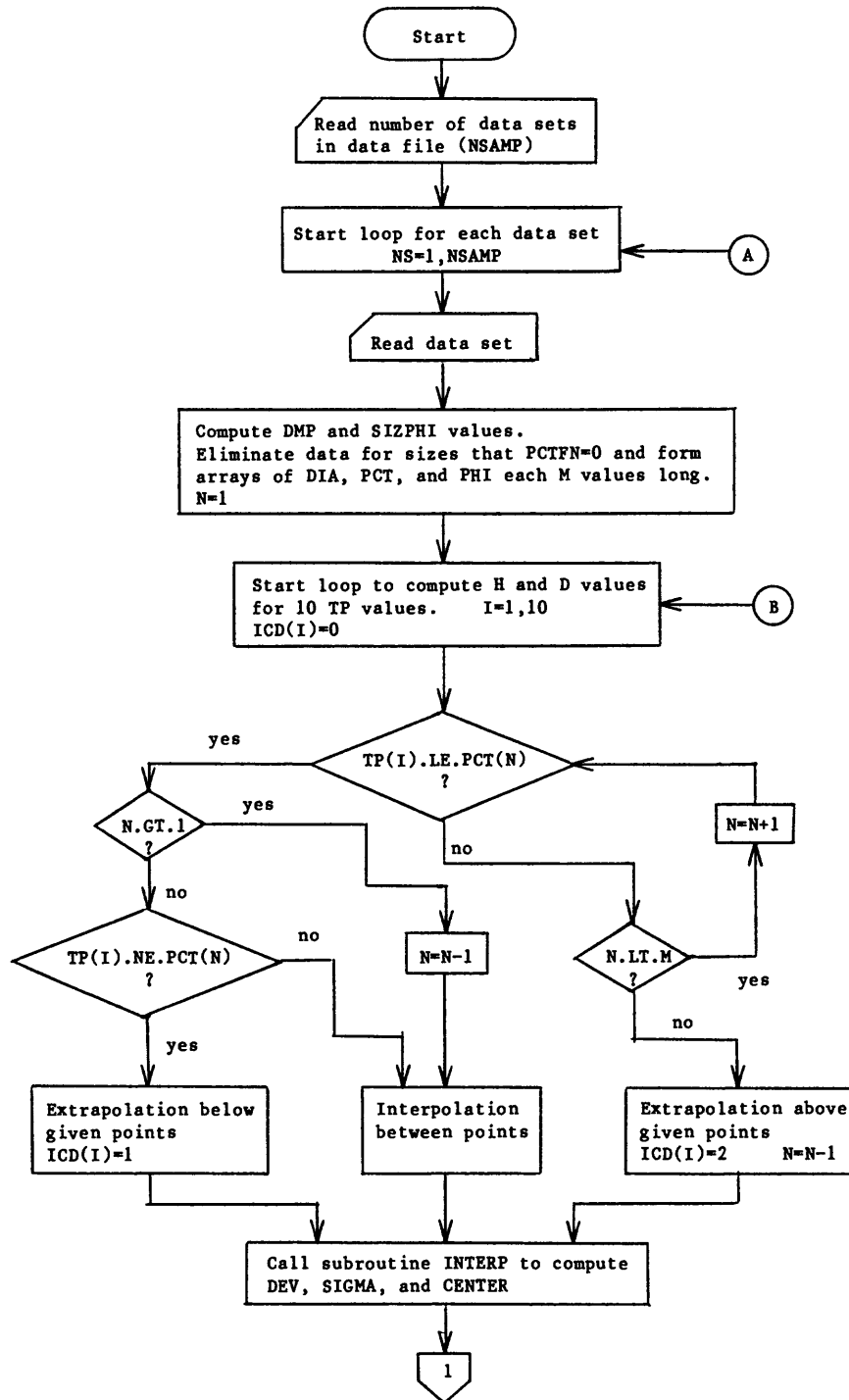
3410 REM CENTER IS ABOVE BOTH POINTS * * * * *
3420 DEV = DEV1-DEV2
3430 GOTO 3460
3440 REM CENTER IS BETWEEN POINTS * * * * *
3450 DEV = DEV1+DEV2
3460 IF DEV<=0 THEN RETURN
3470 SIGMA = (PHI(N)-PHI(N+1))/DEV
3480 CENTER = PHI(N)-DEV1*SIGMA
3490 RETURN
3500 END
3510 REM SUBROUTINE TO MOVE CURSOR DOWN NN LINES * * * * *
3520 FOR LL=1 TO NN : PRINT : NEXT LL
3530 RETURN
3540 END

```

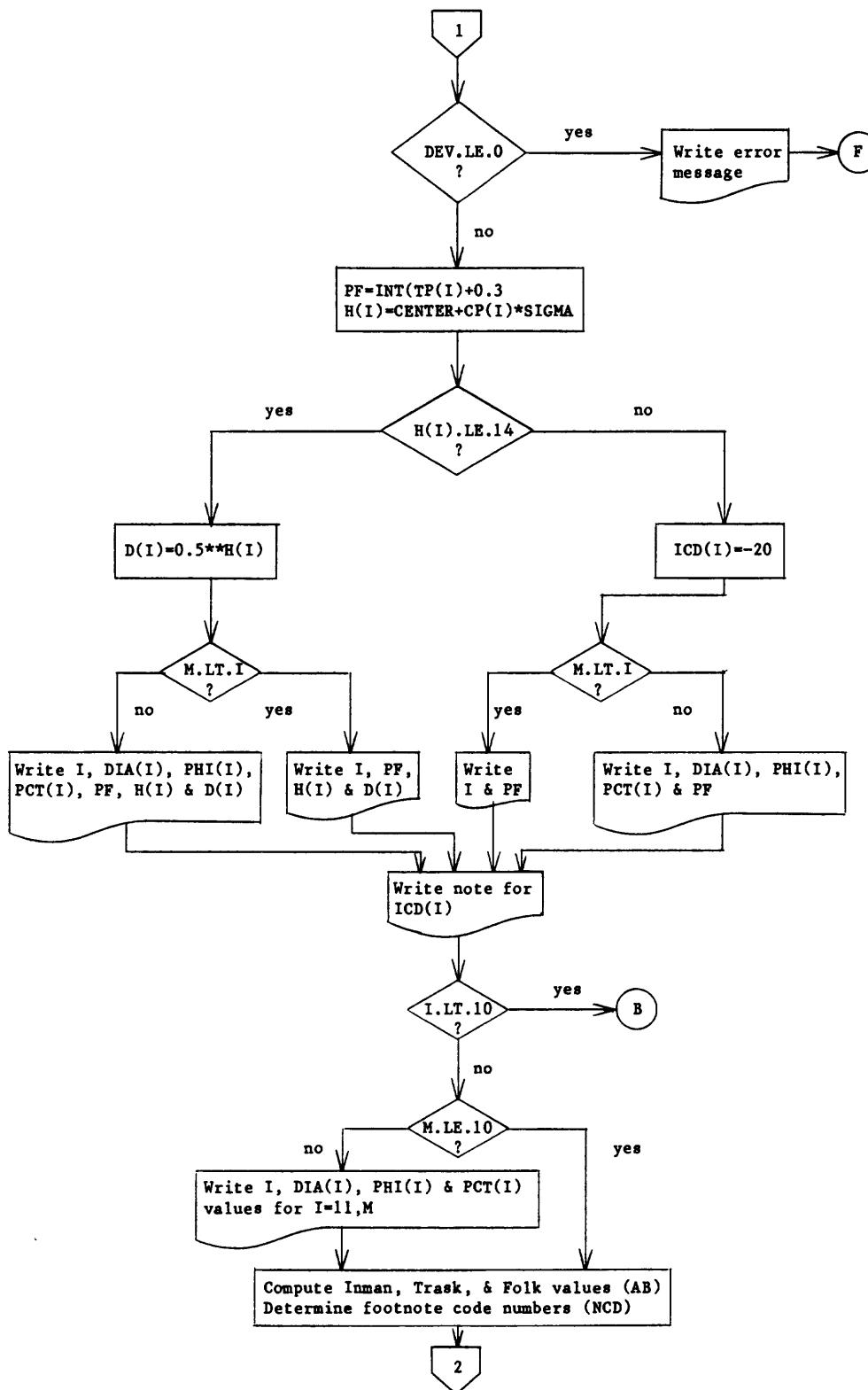
SUPPLEMENTAL DATA--SECTION G.

FLOW CHART OF PROGRAM SEDSIZE

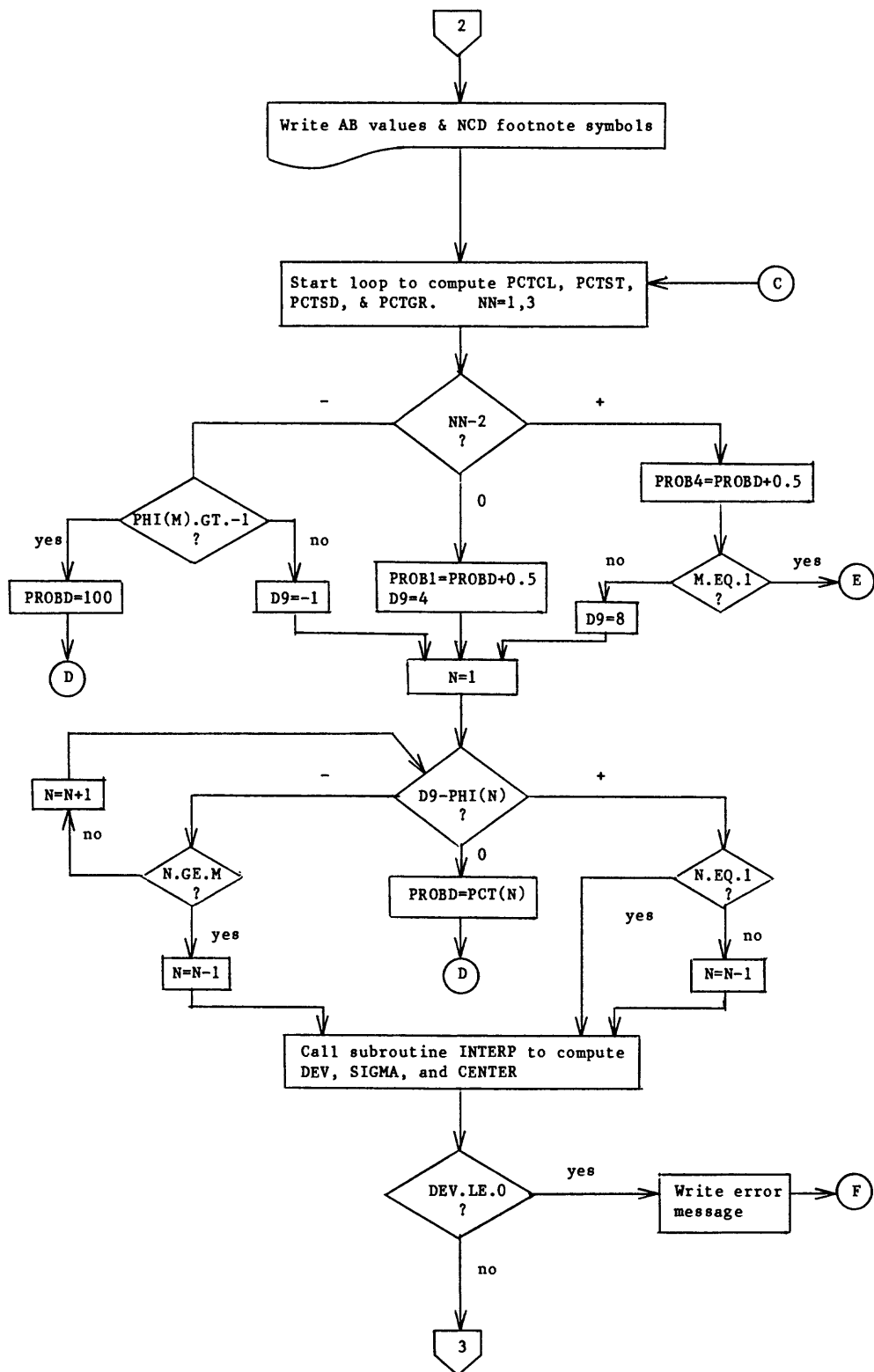
MAIN PROGRAM



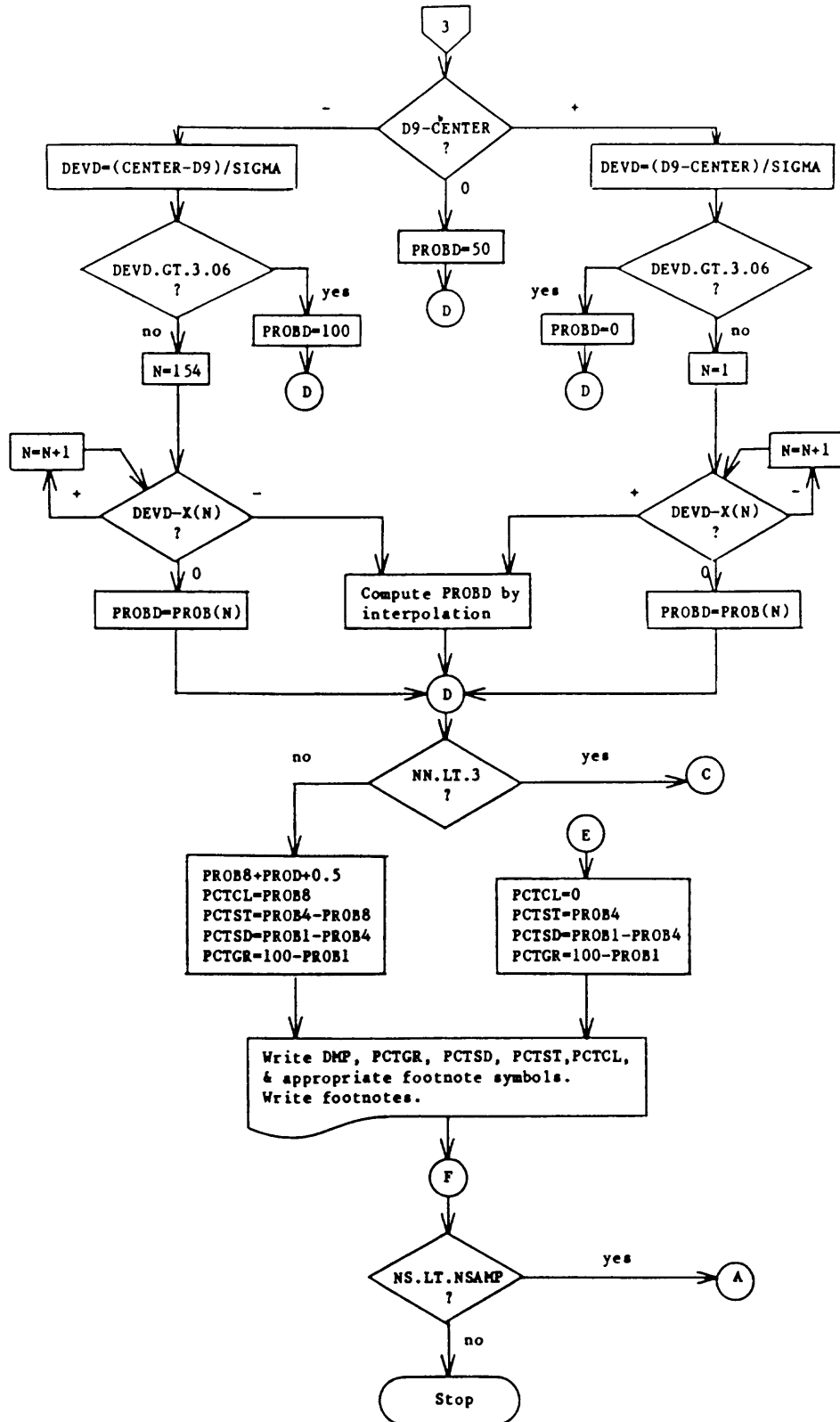
FLOW CHART OF PROGRAM SEDSIZE--Continued



FLOW CHART OF PROGRAM SEDSIZE--Continued

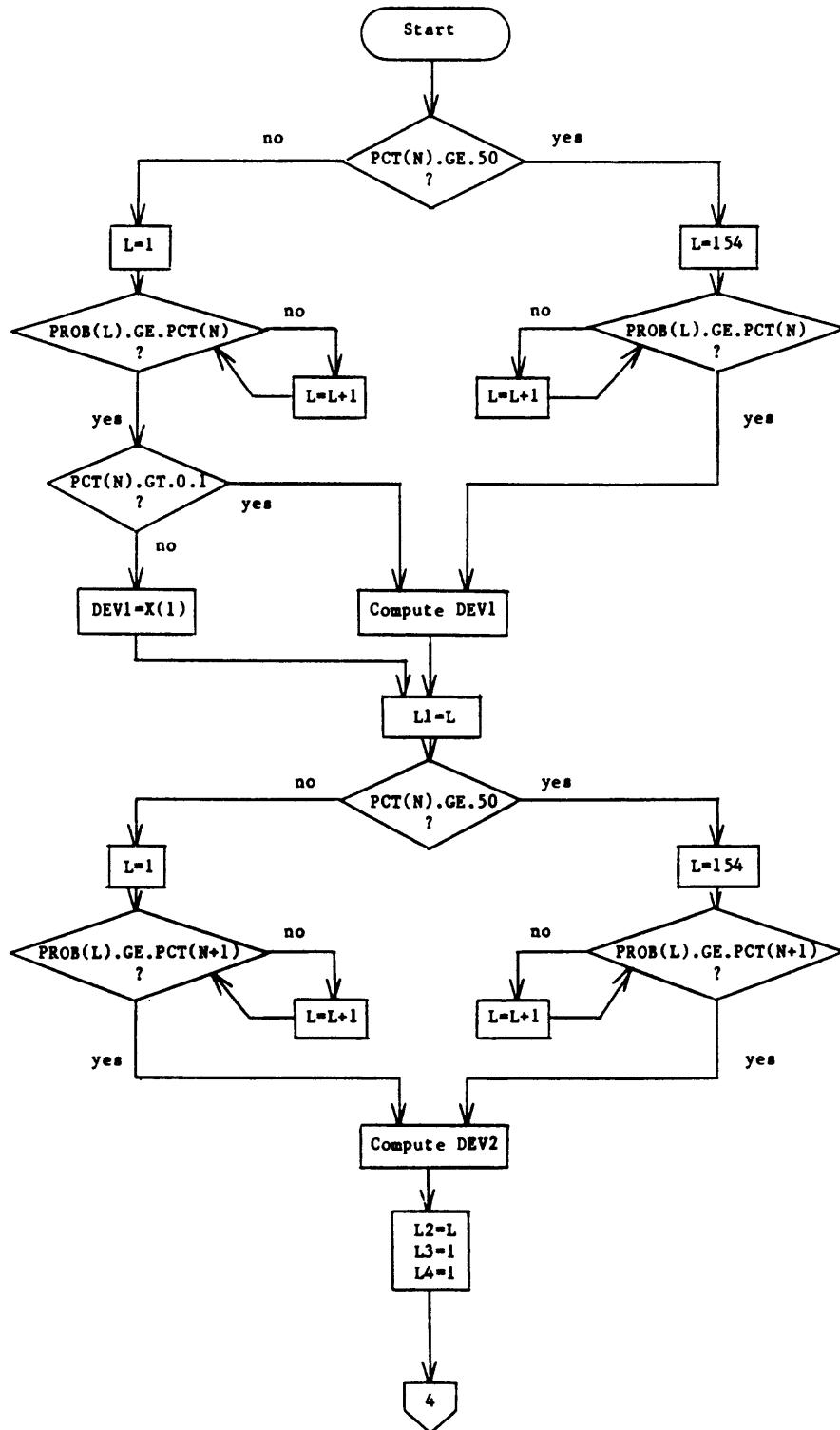


FLOW CHART OF PROGRAM SEDSIZE--Continued

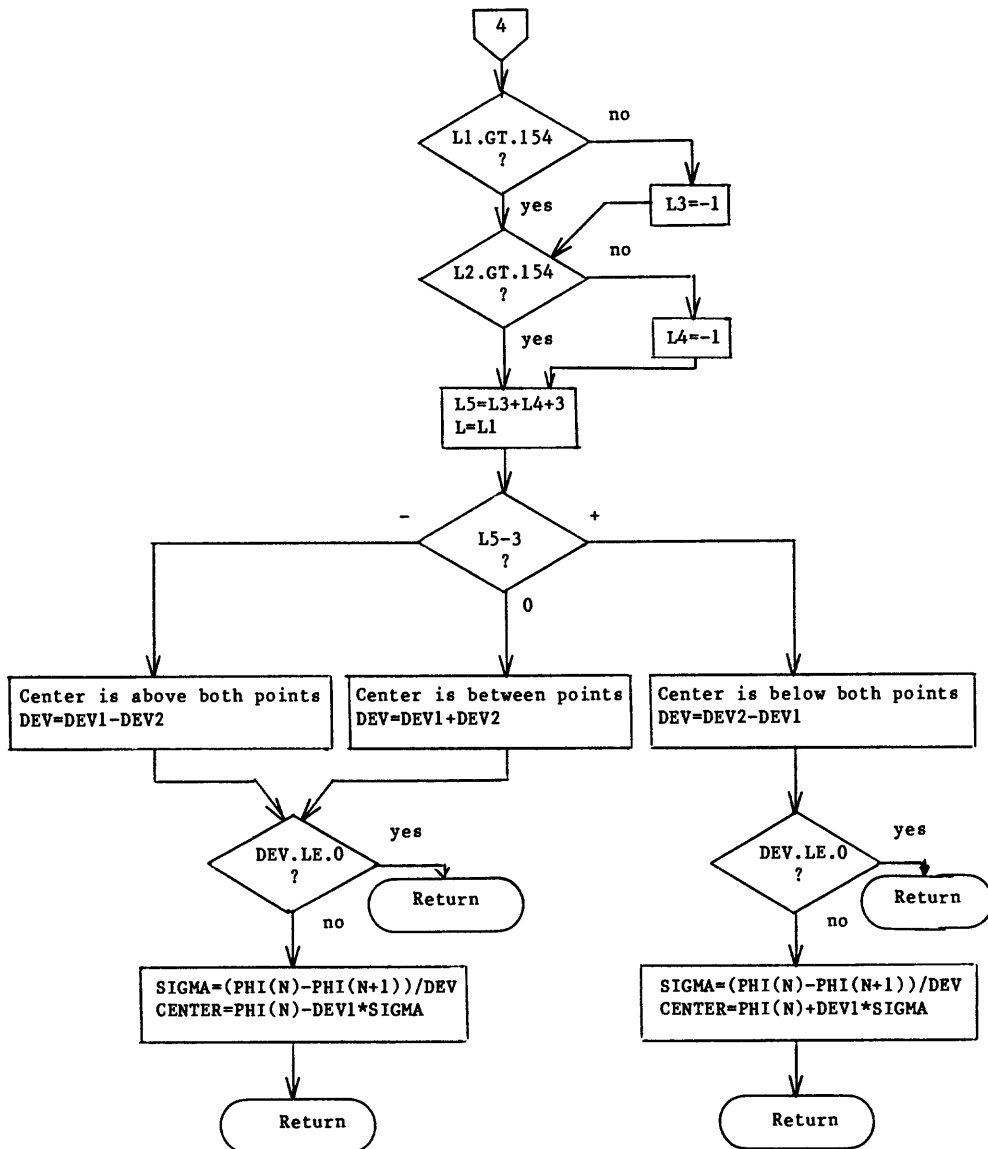


FLOW CHART OF PROGRAM SEDSIZE--Continued

SUBROUTINE INTERP



FLOW CHART OF PROGRAM SEDSIZE--Continued



SUPPLEMENTAL DATA--SECTION H.

EXAMPLES OF PROGRAM SIZEDATA OUTPUT

DATA STORED IN FILE SIZE.DATA

DATA SET NUMBER 1

BED MATERIAL SAMPLES FROM COLUMBIA RIVER AT VANCOUVER, WA
DATE 12/14/76 TIME 1630. NO. SIZES = 18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.031	0.044	0.062	0.088	0.125	0.177	0.250	0.354	0.500	0.707	1.000	1.400	2.000	2.800	4.000
1.1	0.0	1.6	3.9	11.9	34.9	67.7	85.6	90.3	92.0	93.1	93.8	94.5	95.1	95.7

16	17	18
5.600	8.000	11.300
96.3	97.9	99.9

DATA SET NUMBER 2

BED MATERIAL SAMPLES FROM COLUMBIA RIVER AT VANCOUVER, WA
DATE 1/4/77 TIME 1230. NO. SIZES = 18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.031	0.044	0.062	0.088	0.125	0.177	0.250	0.354	0.500	0.707	1.000	1.400	2.000	2.800	4.000
0.0	0.0	0.3	0.6	0.9	3.0	11.9	28.6	45.3	55.7	70.0	0.0	86.7	98.1	99.3

16	17	18
5.600	8.000	11.300
99.6	99.9	0.0

DATA SET NUMBER 3

DEPTH INTEGRATED SAMPLES FOR COLUMBIA RIVER AT BEAVER ARMY TERMINAL, OR
DATE 6/23/67 TIME 1800. NO. SIZES = 10

1	2	3	4	5	6	7	8	9	10
0.002	0.004	0.008	0.016	0.031	0.062	0.088	0.125	0.177	0.250
13.0	21.0	26.0	31.0	43.0	58.0	62.0	66.0	74.0	92.0

DATA SET NUMBER 4

BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY
DATE 12/22/68 TIME 1200. NO. SIZES = 21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.002	0.003	0.004	0.006	0.008	0.011	0.016	0.022	0.031	0.044	0.062	0.088	0.125	0.177	0.250
33.0	0.0	45.0	0.0	57.0	0.0	80.0	0.0	95.0	0.0	96.0	96.1	96.2	97.0	97.1

16	17	18	19	20	21
0.354	0.500	0.707	1.000	1.400	2.000
97.2	97.3	0.0	97.4	0.0	99.9

EXAMPLES OF PROGRAM SIZEDATA OUTPUT--Continued

DATA SET NUMBER 5
 BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY
 DATE 9/3/68 TIME 1200. NO. SIZES = 21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.002	0.003	0.004	0.006	0.008	0.011	0.016	0.022	0.031	0.044	0.062	0.088	0.125	0.177	0.250
0.0	0.0	0.0	0.0	1.0	0.0	1.1	0.0	2.0	0.0	2.1	2.2	2.3	6.0	33.0

16	17	18	19	20	21
0.354	0.500	0.707	1.000	1.400	2.000
53.0	86.0	0.0	98.0	0.0	0.0

DATA SET NUMBER 6
 BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY
 DATE 12/12/68 TIME 1200. NO. SIZES = 21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.002	0.003	0.004	0.006	0.008	0.011	0.016	0.022	0.031	0.044	0.062	0.088	0.125	0.177	0.250
29.0	0.0	30.0	0.0	43.0	0.0	65.0	0.0	86.0	0.0	96.0	96.1	96.2	96.3	97.0

16	17	18	19	20	21
0.354	0.500	0.707	1.000	1.400	2.000
99.0	0.0	0.0	0.0	0.0	0.0

DATA SET NUMBER 7
 BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY
 DATE 12/13/68 TIME 1200. NO. SIZES = 21

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.002	0.003	0.004	0.006	0.008	0.011	0.016	0.022	0.031	0.044	0.062	0.088	0.125	0.177	0.250
19.0	0.0	20.0	0.0	34.0	0.0	60.0	0.0	85.0	0.0	96.0	96.1	96.2	96.3	97.0

16	17	18	19	20	21
0.354	0.500	0.707	1.000	1.400	2.000
99.0	0.0	0.0	0.0	0.0	0.0

DATA SET NUMBER 8
 BED SAMPLE FROM FLUME DURING MIXTURE RUN
 DATE 8/19/81 TIME 1200. NO. SIZES = 13

1	2	3	4	5	6	7	8	9	10	11	12	13
0.500	0.707	1.000	1.400	2.000	2.800	4.000	5.600	8.000	11.300	16.000	22.600	32.000
12.0	0.0	36.0	47.0	62.0	68.0	77.0	81.0	88.0	92.0	93.0	96.0	99.9

SUPPLEMENTAL DATA--SECTION I.

EXAMPLES OF PROGRAM SEDSIZE OUTPUT

SIZE STATISTICS FOR BED MATERIAL SAMPLES FROM COLUMBIA RIVER AT VANCOUVER, WA

12/14/76 1630

INPUT SIZE DISTRIBUTION
 PARTICLE SIZE PERCENT
 MILLIMETER PHI FINER

0.031 5.00 1.1 5 3.399 0.095
 0.062 4.00 1.6 16 2.886 0.135
 0.088 3.50 3.9 25 2.681 0.156
 0.125 3.00 11.9 35 2.498 0.177
 0.177 2.50 34.9 50 2.271 0.207
 0.250 2.00 67.7 65 2.044 0.243
 0.354 1.50 85.6 75 1.822 0.283
 0.500 1.00 90.3 84 1.552 0.341
 0.707 0.50 92.0 90 1.036 0.488
 1.000 0.00 93.1 95 -1.412 2.661
 1.400 -0.50 93.8
 2.000 -1.00 94.5
 2.800 -1.50 95.1
 4.000 -2.00 95.7
 5.600 -2.50 96.3
 8.000 -3.00 97.9
 11.300 -3.50 99.9

I 1

INMAN VALUES
 MEAN SORT ALPHA ALPH2 BETA
 2.219 0.667 -0.070 -1.910 2.605
 FOLK VALUES
 SORT SKEW
 1.347 1.028 2.236 1.063 -0.304

PCT GRAVEL 5 PCT SAND 93 PCT SILT 2* PCT CLAY 0 MEYER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED

* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE

SIZE STATISTICS FOR BED MATERIAL SAMPLES FROM COLUMBIA RIVER AT VANCOUVER, WA

INPUT SIZE DISTRIBUTION				SPECIFIED COMPUTED SIZES	
PARTICLE SIZE MILLIMETER	PHI	PERCENT FINER		PERCENT FINER	PARTICLE SIZE MILLIMETER
0.062	4.00	0.3		5	2.331
0.088	3.50	0.6		16	1.854
0.125	3.00	0.9		25	1.589
0.177	2.50	3.0		35	1.299
0.250	2.00	11.9		50	0.774
0.354	1.50	28.6		65	0.182
0.500	1.00	45.3		75	-0.255
0.707	0.50	55.7		84	-0.809
1.000	0.00	70.0		90	-1.088
2.000	-1.00	86.7		95	-1.276
2.800	-1.50	98.1			
4.000	-2.00	99.3			
5.600	-2.50	99.6			
8.000	-3.00	99.9			
			INMAN VALUES		
MEAN	SORT	ALPH1	ALPH2	BETA	
0.522	1.331	-0.180	-0.180	0.355	
			TRASK VALUES		
			SORT	SKREW	FOLK VALUES
			1.895	1.160	MEAN SORT
					0.606 1.212 -0.163
PCT GRAVEL	PCT SAND	PCT SILT	PCT CLAY	MEYER-PETER EFFECTIVE DIAMETER IS	
13	87	0	0	0.905 MM	

SIZE STATISTICS FOR DEPTH INTEGRATED SAMPLES FOR COLUMBIA RIVER AT BEAVER ARMY TERMINAL, OR

INPUT SIZE DISTRIBUTION			SPECIFIED COMPUTED SIZES		
PARTICLE SIZE		PERCENT	PARTICLE SIZE		
MILLIMETER	PHI	FINER	PHI	MILLIMETER	
0.002	9.00	13.0	5	10.620	0.001 ---
0.004	8.00	21.0	16	8.605	0.003
0.008	7.00	26.0	25	7.191	0.007
0.016	6.00	31.0	35	5.654	0.020
0.031	5.00	43.0	50	4.534	0.043
0.062	4.00	58.0	65	3.126	0.115
0.088	3.50	62.0	75	2.480	0.179
0.125	3.00	66.0	84	2.266	0.208
0.177	2.50	74.0	90	2.081	0.236
0.250	2.00	92.0	95	1.843	0.279 ---
INMAN VALUES			FOLK VALUES		
MEAN	SORT	ALPH1	BETA	SORT	MEAN
5.435	3.169	0.280	0.385*	5.118	0.658
PCT SAND			PCT SILT	MEYER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED	
PCT GRAVEL	42*	37*	21		
0					

* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE

EXAMPLES OF PROGRAM SEDSIZE OUTPUT--Continued

SIZE STATISTICS FOR BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY 12/22/68 1200

INPUT SIZE DISTRIBUTION			SPECIFIED COMPUTED SIZES		
PARTICLE SIZE	PERCENT		PERCENT	PARTICLE SIZE	
MILLIMETER	PHI	FINER	FINER	PHI	MILLIMETER
0.002	9.00	33.0	5	12.832	0.000 -- EXTRAPOLATED FROM POINTS 1 AND 2
0.004	8.00	45.0	16	10.781	0.001 -- EXTRAPOLATED FROM POINTS 1 AND 2
0.008	7.00	57.0	25	9.746	0.001 -- EXTRAPOLATED FROM POINTS 1 AND 2
0.016	6.00	80.0	35	8.826	0.002
0.031	5.00	95.0	50	7.584	0.005
0.062	4.00	96.0	65	6.686	0.010
0.088	3.50	96.1	75	6.251	0.013
0.125	3.00	96.2	84	5.803	0.018
0.177	2.50	97.0	90	5.452	0.023
0.250	2.00	97.1	95	5.000	0.031
0.354	1.50	97.2			
0.500	1.00	97.3			
1.000	0.00	97.4			
2.000	-1.00	99.9			

INMAN VALUES			TRASK VALUES			FOLK VALUES		
MEAN	SORT	ALPH1	ALPH2	BETA	SORT	MEAN	SORT	SKEW
8.292*	2.489*	0.280*	0.530*	0.573*	3.357*	0.563*	8.056*	2.431*
PCT GRAVEL	PCT SAND	PCT SILT	PCT CLAY					
0	4	51	45					

* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE

SIZE STATISTICS FOR BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY 9/3/68 1200

INPUT SIZE DISTRIBUTION			SPECIFIED COMPUTED SIZES		
PARTICLE SIZE	PERCENT		PERCENT	PARTICLE SIZE	
MILLIMETER	PHI	FINER	FINER	PHI	MILLIMETER
0.008	7.00	1.0	5	2.602	0.165
0.016	6.00	1.1	16	2.251	0.210
0.031	5.00	2.0	25	2.105	0.232
0.062	4.00	2.1	35	1.947	0.259
0.088	3.50	2.2	50	1.573	0.336
0.125	3.00	2.3	65	1.346	0.393
0.177	2.50	6.0	75	1.202	0.435
0.250	2.00	33.0	84	1.040	0.486
0.354	1.50	53.0	90	0.793	0.577
0.500	1.00	86.0	95	0.420	0.747
1.000	0.00	98.0			

INMAN VALUES			TRASK VALUES			FOLK VALUES		
MEAN	SORT	ALPH1	ALPH2	BETA	SORT	MEAN	SORT	SKEW
1.646	0.606	0.110	-0.100	0.802	1.368	0.894	1.621	0.633
PCT GRAVEL	PCT SAND	PCT SILT	PCT CLAY					
0	98*	1*	1*					

* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE

EXAMPLES OF PROGRAM SEDSIZE OUTPUT--Continued

SIZE STATISTICS FOR BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY 12/12/68 1200

INPUT SIZE DISTRIBUTION				SPECIFIED COMPUTED SIZES			
PARTICLE SIZE		PERCENT		PARTICLE SIZE		PERCENT	
MILLIMETER	PHI	FINER		FINER	PHI	MILLIMETER	
0.002	9.00	29.0		5			-- UNDEFINED
0.004	8.00	30.0		16			-- UNDEFINED
0.008	7.00	43.0		25	13.180	0.000	-- EXTRAPOLATED FROM POINTS 1 AND 2
0.016	6.00	65.0		35	7.601	0.005	
0.031	5.00	86.0		50	6.686	0.010	
0.062	4.00	96.0		65	6.000	0.016	
0.088	3.50	96.1		75	5.584	0.021	
0.125	3.00	96.2		84	5.116	0.029	
0.177	2.50	96.3		90	4.699	0.038	
0.250	2.00	97.0		95	4.158	0.056	
0.354	1.50	99.0					
INMAN VALUES				FOLK VALUES			
MEAN	SORT	ALPH1	ALPH2	BETA	TRASK VALUES	TRASK VALUES	TRASK VALUES
+	+	+	+	+	SORT	SKEW	MEAN
					13.911*	0.024*	+
							+
							+
PCT GRAVEL	PCT SAND	PCT SILT	PCT CLAY	PCT CLAY	MEYER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED		
0	4*	66*	30				
* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE							
+ UNDEFINED							

SIZE STATISTICS FOR BED MATERIAL SAMPLES FROM COLUMBIA RIVER ESTUARY 12/13/68 1200

INPUT SIZE DISTRIBUTION				SPECIFIED COMPUTED SIZES			
PARTICLE SIZE		PERCENT		PARTICLE SIZE		PERCENT	
MILLIMETER	PHI	FINER		FINER	PHI	MILLIMETER	
0.002	9.00	19.0		5			-- UNDEFINED
0.004	8.00	20.0		16	12.391	0.000	-- EXTRAPOLATED FROM POINTS 1 AND 2
0.008	7.00	34.0		25	7.610	0.005	
0.016	6.00	60.0		35	6.959	0.008	
0.031	5.00	85.0		50	6.381	0.012	
0.062	4.00	96.0		65	5.831	0.018	
0.088	3.50	96.1		75	5.462	0.023	
0.125	3.00	96.2		84	5.047	0.030	
0.177	2.50	96.3		90	4.656	0.040	
0.250	2.00	97.0		95	4.148	0.056	
0.354	1.50	99.0					
INMAN VALUES				FOLK VALUES			
MEAN	SORT	ALPH1	ALPH2	BETA	TRASK VALUES	TRASK VALUES	TRASK VALUES
8.719*	3.672*	0.630*	+	+	SORT	SKW	SKW
					2.105	0.806	7.939* +
PCT GRAVEL	PCT SAND	PCT SILT	PCT CLAY	PCT CLAY	MEYER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED		
0	4*	76*	20				
* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE							
+ UNDEFINED							

EXAMPLES OF PROGRAM SEDSIZE OUTPUT--Continued

8/19/81 1200

SIZE STATISTICS FOR BED SAMPLE FROM FLUME DURING MIXTURE RUN

INPUT SIZE DISTRIBUTION		SPECIFIED COMPUTED SIZES	
PARTICLE SIZE	PERCENT	PARTICLE SIZE	
MILLIMETER	PHI	FINER	PHI
0.500	1.00	12.0	1.576
1.000	0.00	36.0	0.336
1.400	-0.50	47.0	0.786
2.000	-1.00	62.0	0.387
2.800	-1.50	68.0	0.765
4.000	-2.00	77.0	0.333
5.600	-2.50	81.0	0.977
8.000	-3.00	88.0	1.514
11.300	-3.50	92.0	2.372
16.000	-4.00	93.0	3.683
22.600	-4.50	96.0	5.523
32.000	-5.00	99.9	9.397
			19.808

EXTRAPOLATED FROM POINTS 1 AND 2

INMAN VALUES				TRASK VALUES				FOLK VALUES			
MEAN	SORT	ALPH1	ALPH2	BETA	SORT	SKW	MEAN	SORT	SKW	MEAN	SKW
-0.960	1.746	-0.200	-0.430*	0.685*	2.195	1.228	-0.840	1.764*	-0.234*		
PCT GRAVEL	PCT SAND	PCT SILT	PCT CLAY								
38	62	0	0								

METER-PETER EFF. DIAM. NOT COMPUTED - 0% FINER SIZE NOT DEFINED

* BASED ON EXTRAPOLATED VALUES - ERROR MAY BE EXCESSIVE

SUPPLEMENTAL DATA--SECTION J.

LOADING AND RUNNING THE PROGRAM ON THE PRIME COMPUTER

After the FORTRAN source code for the two programs (SIZEDATA.F77 and SEDSIZE.F77) have been entered into the Prime computer, they need to be compiled and loaded before they can be run.

Compiled programs SIZEDATA.BIN and SEDSIZE.BIN are created by entering and executing in sequence, the commands F77 SIZEDATA and F77 SEDSIZE.

The compiled programs are loaded by entering and executing the following command sequences:

SEG -LOAD	and	SEG -LOAD
\$ LO SIZEDATA		\$ LO SEDSIZE
\$ LI		\$ LI
LOAD COMPLETE		LOAD COMPLETE
\$ Q		\$ Q

Files SIZEDATA.SEG and SEDSIZE.SEG are created.

The command SEG SIZEDATA or SEG SEDSIZE is entered and executed to run the desired program.

