UNITED STATES DEPARTMENT OF THE INTERIOR
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Stratigraphic Analysis Techniques System (STRATS) User's Manual

by

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Acknowledgements

Stratigraphic Analysis Techniques System (STRATS) was obtained from Computing Associates Inc. in 1977., and since then, it has been considerably enhanced. Larry Hanson of the Information Systems Division (ISD), and Mark Kochanski and Sharon Crowley of the National Coal Resources Data System (NCRDS) of the Branch of Coal Resources (BCR) made changes and improvements to STRATS before I inherited and made extensive enhancements to the system.

Laura Biewick of the BCR in Denver acted as the liason between the geologists and the computer persons, and the tester and evaluator of STRATS when it was on the Honeywell Multics System. M. Devereux Carter of the BCR in Reston tested and evaluated STRATS at various stages on the Prime 9750 Computer System.

Also, Kathleen K. Krohn and Antoinette L. Medlin provided many helpful answers to questions.

Introduction

STRATS allows the user to obtain a graphics presentation of cross sections of one or more drillholes within user-specified geographical boundaries on either a Tektronix CRT display or a Calcomp 936 Plotter. The Plane Rectangular Cartesian System is used for the plots.

Various options allow the user to choose one of three distances between the drillholes, to select one or more drillholes within specified boundaries, to align the drillholes relative to a datum, to specify various combinations for display of lithologies and descriptors, and to designate the scale for the axes.

The purpose of this document is to provide the information necessary to use STRATS. This will be done by explaining how to obtain and preview data for input to STRATS, detailing the process of creating a STRATS input file, delineating the STRATS, describing the intermediate and final outputs, and explaining how to obtain a plotter tape.

It is assumed that the user has a working knowledge of PACER, VLATLONG, and GARNET which are components of the NCRDS. STRATS is currently installed on the Prime computers of the BCR at the U.S. Geological Survey (USGS) in Reston, Virginia, and Denver, Colorado.

How to Obtain and Preview Data for Input to STRATS

Prior to using STRATS, one process must be performed, and two optional processes are recommended. The required process is to create an intermediate data set containing the drillhole data desired by retrieving data from the USTRAT data base in NCRDS using PACER. The name of the intermediate data set is assigned by the user, and may be any eight or fewer alphabetic characters. The user should verify that the drillholes have accurate information in all the spatial data fields, that is, latitude, longitude, surface elevation, total depth, and from and to which denote unit thickness.

One caution is necessary at this point relative to the number of drillholes that may be legibly plotted. As of December, 1985, the limit for the horizontal axis is 47 inches, and the limit for the vertical axis is 28 inches. Twenty-two drillholes spaced two inches apart may be plotted in the maximum plotting area without overlap. The user is responsible for avoiding overlap. The user should read about projected, user-specified and actual distances between drillholes near the beginning of the "How to Use STRATS" section in order to prevent overlapping.

If surface elevation is to be used as the datum, the collective maximum and minimum elevations of all the drillholes are required by STRATS. If these values are not known, the user has the option to determine them by using PACER which is recommended. First, a new variable to define the minimum elevation of a drillhole must be created using the DEFINE command. For example, MINELV = SURFELV - (TOTDEPT/12). The names SURFELV and TOTDEPT are variable names for data fields in

the USTRAT data base. Next the MEAN function under the FUNCTION command should be used as follows: MEAN SURFELV MINELV.

Alternatively, if the user wishes to use a datum other than surface elevation, the collective maximum distance in feet above and below the datum are required by STRATS. The user may determine these values by using PACER. Again, the DEFINE command would be used to define the distance in feet above the datum, for example, as HEIGAB = FROM/12.0, and the depth in feet below the datum as HEIGBE = (TOTDEPT - TO/12.0) where FROM, TO, and TOTDEPT are variable names for data fields in the USTRAT data base. Then the MEAN function under the FUNCTION command should be used as follows: MEAN HEIGAB HEIGBE.

The second recommended optional procedure is to preview the distribution of the drillholes in the selected area using the LOCATE command in GARNET. The purpose of this step is to help in determining the range. The range is necessary only when the distance between the drillholes is the projected distance which is explained in "How to Use STRATS".

Creating a STRATS Input File

A Prime Command Procedure Language (CPL) program named STRATFE.CPL is used to create the input file for STRATS. An abbreviation should be created on the Prime computer so that the program may be accessed without typing in the entire file pathname. On the BCR Prime in Reston, the abbreviation, which should be entered as an argument abbreviation, would be:

STRATFE <NCRDS1>PUBLIB>PACER_PROGRAM_OBJECT>STRATFE

while on the BCR Prime in Denver, it would be:

STRATFE <DNCRDS>PUBLIB>PACER_PROGRAM_OBJECT>STRATFE.

Subsequently, to initiate the program, type the following on the terminal and press RETURN:

CPL STRATFE PACERFILENAME ANYNAME PACERDATABASE

In place of PACERFILENAME, insert the name given to the intermediate data set previously created by PACER. In place of ANYNAME, insert any label of eight or less alphabetic characters which is used by this program to create two intermediate data sets named ANYNAME.STR, ANYNAME.LIST, and the data set named ANYNAME which will be input to STRATS. In place of PACERDATABASE, insert either USTRAT or WRKSTRAT. It is beyond the scope of this document to explain the concept underlying WRKSTRAT. Thus, an NCRDS person should be contacted for further information on the distinction between USTRAT and WRKSTRAT.

The two intermediate data sets are oriented to allow the computer specialist to trace progress if necessary. However, large portions of the printed version of ANYNAME.LIST could be helpful to the user. Thus, brief comments on the printed version of ANYNAME.LIST will be furnished. The portion after the line imprinted with "DSPL REQUESTED" whose length is dependent on the number of drillholes in the data set is intelligble to the user except for a few lines or columns. The

simplest way to explain this portion is to say that if the text is unintelligible to the user, then it should be ignored. This section of the printed version will end with a line as follows:

1 DRILLHOLE DATA DISPLAY COMPLETED.

The user should then proceed a few more lines to a line containing:

DRILLHOLE DATA BASE INDEX.

This is a short portion which simply lists the drillhole identifications. The record (rec) numbers are not user important except for counting the drillholes. This section ends with a line containing

END OF INDEX X DRILLHOLES LISTED

where x is the number of drillholes. Only a few more lines appear after this section and the printed version will end with

THIS RUN ENDED.

The data in this data set make a more readable representation of the ANYNAME data set.

The user may print ANYNAME.LIST on the line printer in the computer room by typing SPOOL ANYNAME.LIST and pressing RETURN.

How to Use STRATS

A precaution is necessary at this point concerning the actual distance option. As background for this warning, the user should read the discussion associated with the following prompts: "ENTER "0" IF YOU WISH DRILLHOLE LOCATIONS PROJECTED ONTO SECTION LINE, "1" IF YOU WISH ACTUAL DISTANCE BETWEEN HOLES, "2" IF WANT FIXED DISTANCE BETWEEN HOLES" and "ENTER LENGTH OF CROSS SECTION IN DECIMAL INCHES", all of which follow within this section under the subsection titled "LONG PROMPTING PATH". The length of the cross section line must be greater than the actual distances between the drillholes that are to be plotted. This means the user must measure the actual map distance between each drillhole to appear on a single plot and sum these distances, and choose a length for the cross section line which is greater than the accumulated actual distances. If this is not done, only the drillholes whose accumulated actual distances between them from the beginning of the cross section is less than the cross section line length will be plotted, and the remaining ones will not be plotted.

An abbreviation should be created on the Prime computer so that STRATS may be executed without typing in the entire file pathname. On the BCR Prime in Reston, the abbreviation, which should be a command abbreviation, would be:

STRATS SEG <NCRDS1>PUBLIB>PACER_PROGRAM_OBJECT>STRATS

while on the BCR Prime in Denver, it would be:

STRATS SEG <DNCRDS>PUBLIB>PACER_PROGRAM_OBJECT>STRATS.

To subsequently initiate STRATS, type STRATS and press RETURN. STRATS will answer as follows:

```
**********************************************************
    STRATIGRAPHIC ANALYSIS TECHNIQUES SYSTEM(STRATS)
**********************************************************

              WOULD YOU LIKE TO BE PROMPTED FOR INFO?
```

The user should answer either "YES" or "NO" and press RETURN. If the answer is "YES", the user will be led through numerous prompts. If the answer is "NO", there will only be a few prompts. Each time the "YES" path is taken, a new control file is produced which records the user's answers to the prompts. If the user names the control file the same as a current control file, the new file will replace the current file. This control file may be used in subsequent runs using the short prompting path.

The "YES" path will now be explained in detail with the word "Prompt", proceeding each prompt. Following each prompt will be a discussion of the user's possible answers. The short prompting path will be covered later. Remember to press RETURN after typing in each answer.

A. Long Prompting Path

Prompt:

ENTER "0" IF YOU WISH DRILLHOLE LOCATIONS PROJECTED ONTO SECTION LINE; "1" IF YOU WISH ACTUAL DISTANCES BETWEEN HOLES; "2" IF WANT FIXED DISTANCE BETWEEN HOLES:

Discussion:

Figure 1 illustrates range and projected distance. The rectangular border represents the cross section area defined by the beginning and ending latitudes and longitudes subsequently furnished by the user. Dots delineate drillhole locations. On the plot which STRATS outputs, the cross section line becomes the X axis. The distances between a and b, a and c, and a and d are examples of projected distance between drillholes. The range is required in degrees, minutes, and seconds. It is the distance on either side of the cross section line within which drillholes inside the rectangular area defined by the user will be used. Thus, the range delineated in Figure 1 would exclude drillhole 4 and include drillholes 1, 2, and 3. Actual distance is the real distance between the drillholes. Fixed distance, which means that the distance between all holes will be the same, is supplied by the user as an answer to the next prompt if this option is chosen.

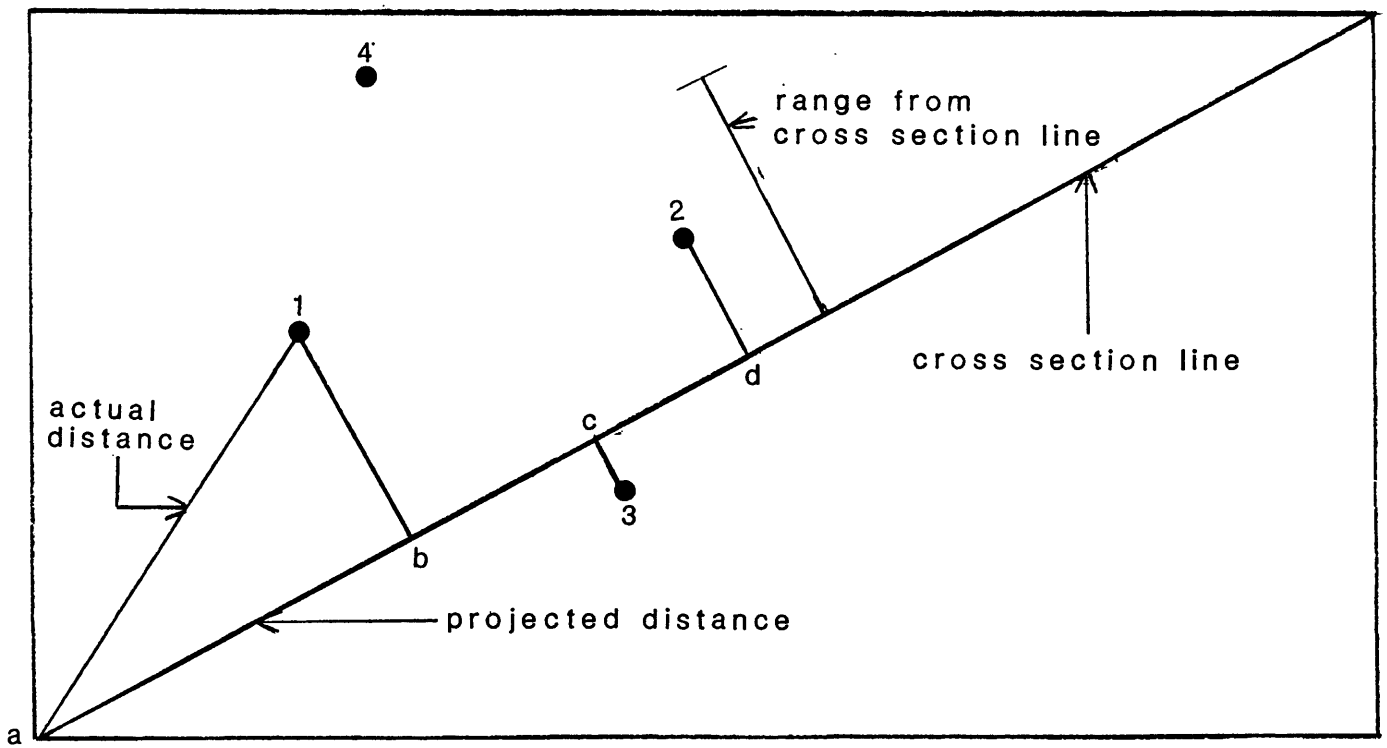

FIGURE 1. - Example of Projected Distance and Range

If this option is not chosen, there will of course be no prompt for the fixed distance. Irregardless of which of these options is chosen, the drillholes are sorted into ascending order by their projected distances before plotting using the chosen distance.
The next prompt is dependent upon the answer to this prompt.

Prompt:

ENTER DISTANCE IN DECIMAL INCHES:

Discussion:

This prompt will only appear if the user answered "2" to the preceding prompt. The answer is the fixed (constant) distance the user wants between drillholes.

Prompt:

ENTER OUTPUT FILE NAME FOR CONTROL FILE:

Discussion:

This prompt always occurs. As was pointed out at the beginning of this section, if the user asks for prompting, a new control file will be produced. The name of the file should be eight or less alphabetic characters.

Prompt:

DO YOU WISH TO NAME DRILLHOLES TO BE PLOTTED (Y OR N):

Discussion:

The user may choose to use only certain drillholes among the total available. If the user answers "Y", then two prompts will follow which are related to this prompt. If the user answers "n", then the next prompt will be the one marked with "Prompt (*)".

Prompt:

HOW MANY DRILLHOLE NAMES WILL YOU USE? ANSWER MUST BE TWO DIGITS; USE LEADING ZERO IF NECESSARY; NO DECIMAL POINT:

Discussion:

This prompt only occurs when the user wishes to name the drillholes to be used. The answer must be a two digit number such as 03, 25, etc.

Prompt:

PLEASE START EACH DRILLHOLE NAME UNDER A "B"; YOU MAY ENTER SIX NAMES PER LINE; PRESS RETURN AFTER FINISHING LINE OR AFTER LAST ENTRY.

B B B B B B

Discussion:

Type the point identification(s) supplied for the drillhole(s) by PACER under the "B"(s), and follow prompt instructions. If more than six drillholes are to be used, another row of "B"s will appear after RETURN is pressed.

Prompt(*):

YOU MAY EITHER HAVE BED NAME OR LITHMOD PLOTTED NEXT TO BED. ENTER 1 FOR BEDNAME OR 2 FOR LITHMOD.

Discussion:

The answer to this prompt is self-explanatory. If 1 is chosen, then the following prompt will appear. If 2 is chosen, then the next prompt will be the one marked with "Prompt(*)".

Prompt:

THERE ARE FOUR OPTIONS FOR PLOTTING LITHOLOGIES:

3) COAL BEDS ONLY WITH THICKNESS AND BEDNAMES. NDE WILL NOT BE PLOTTED.
4) ALL LITHOLOGIES WITH THICKNESS AND BEDNAME. NDE WILL NOT BE PLOTTED
) PLOT ALL LITHOLOGIES WITH THICKNESS OF BEDS WHICH HAVE BEDNAMES, WITH THICKNESS OF COAL EVEN IF IT HAS NO BEDNAME, AND WITH BEDNAMES OF ALL BEDS. NDE WILL NOT BE PLOTTED.
6) PLOT ALL LITHOLOGIES WITHOUT THICKNESS AND BEDNAME ANNOTATIONS.

PLEASE ENTER 3,4,5, or 6.

Discussion:

The answer is self-explanatory. If "NDE", which means not determined, appears in place of bedname in your file, then the annotation "NDE" will not be plotted next to the bed. Information on the lithologies displayed by STRATS are presented in Table 1.

Prompt(*):

THERE ARE TWO LITHMOD OPTIONS.

1) PLOT COAL BEDS ONLY WITH THICKNESS AND LITHMOD.
2) PLOT ALL LITHOLOGIES WITH THICKNESS AND LITHMOD.

PLEASE ENTER 1 OR 2.

Discussion:

The answer is self-explanatory.

Prompt:

DO YOU WANT HOLE DEPTH CALIBRATION?

Discussion:

The answer to this prompt is "Y" for yes or "N" for no. If the user answers "Y", then foot markers with tics will be plotted on the left side of each drillhole spaced according to the answer to the prompt "Enter interval for border tics (ft. - use decimal):" which will subsequently be explained.

Prompt:

DO YOU WANT TO USE A DATUM OTHER THAN ELEVATION?

Discussion:

The answer should be "Y" for yes or "N" for no. In order to use this option, the alignment bed must appear only once in each of the drillholes to be used. The following prompt only occurs if the user answers "Y" to this prompt.

Prompt:

ENTER NAME OF CONTROL BED (3 CHAR):

Discussion:

Enter the first three characters of the name of the control bed. This prompt only appears if a datum other than elevation is desired.

Prompt:

BASE LINE AT TOP, BOTTOM, OR MIDDLE?

Discussion:

This refers to the top, bottom, or middle of the chosen

Table 1. - STRATS Lithologies

Lithologies*	PACER Lithology Notations	STRATS Lithology Abbrevs	Plot Symbols and Legend Notations
COAL	COAL	CO	COAL
LIGNITE	LIG	LI	LIG
SANDSTONE	SS	SS	SS
SILTSTONE	SLST	SL	SLST
SHALE	SH	SH	SH
LIMESTONE	LS	LS	LS
CHERT	CH	CH	CH
FLINTCLAY	FLCY	FL	FL
CLAY	CLAY	CL	CL
CLAYSTONE	CLST	CL	CL
UNDERCLAY	UC	UC	UC
CONGLOMERATE	CG	CG	CG
GRAVEL	GRVL	GR	GR
SURFACE MATERIAL	SURF	SU	SU

*CAUTION: STRATS reads and stores the first two characters of the PACER lithologies; for example, "CO" represents coal while "SL" means siltstone. Therefore, "LIME" in PACER becomes "LI" in STRATS and plots as the coal/lignite symbol, and "SLATE" becomes "SL" and plots as the siltstone symbol, etc.

control bed for the datum. The answer should be "T" for top, "B" for bottom, or "M" for middle.

Prompt:

TITLE BLOCK (1) (16 CHAR):
TITLE BLOCK (2) (16 CHAR):
TITLE BLOCK (3) (16 CHAR):
TITLE BLOCK (4) (16 CHAR):
TITLE BLOCK (5) (24 CHAR):
TITLE BLOCK (6) (24 CHAR):
TITLE BLOCK (7) (24 CHAR):

Discussion:

Please refer to Figure 4 and the Prime COMO session in the Appendix to see where the title blocks appear in the legend rectangle which is plotted below the plot boundary at the right. Whatever you enter for each of the titles will be plotted in the legend box.

Prompt:

BEGINNING LONGITUDE (DDD MM SS):

Discussion:

Enter the longitude in degrees, minutes, and seconds of the southwest or southeast corner of the desired cross section area. Degrees must be a three digit number; use a leading zero if necessary, for example, 035 22 30.

Prompt:

BEGINNING LATITUDE (DD MM SS):

Discussion:

Enter the latitude in degrees, minutes, and seconds of the southwest or southeast corner of the desired cross section area.

Prompt:

ENDING LONGITUDE (DDD MM SS):

Discussion:

Enter the longitude in degrees, minutes, and seconds of the northwest or northeast corner of the desired cross section area. Degrees must be a three digit number; use a leading zero if necessary.

Prompt:

ENDING LATITUDE (DD MM SS):

Discussion:

Enter the latitude in degrees, minutes and seconds of the northwest or northeast corner of the desired cross section area.

Note: Two sets of two prompts follow, the first for when the datum is surface elevation and the second for when the datum is other than surface elevation.

Prompt:

ENTER MAX ELEVATION:

Discussion:

This prompt occurs when no datum other than surface elevation has been selected. Enter a maximum elevation in feet with a decimal; elevation should be great enough to accommodate all drillholes in the selected cross section area with room for three lines of header information at the top. Refer to "How to Obtain and Preview Data for Input to STRATS" to see how PACER may be used to provide this answer.

Prompt:

ENTER MIN ELEVATION:

Discussion:

This prompt occurs when no datum other than elevation is used. Enter a minimum elevation in feet which will accommodate the full length of all drillholes in the selected cross section area. If the user does not specify a deep enough elevation, the plot will be truncated just above the specified minimum elevation with no disruption to the plot and no warning to the user.

Prompt:

ENTER HEIGHT ABOVE DATUM TO PLOT:

Discussion

This prompt occurs when a datum other than surface elevation is selected. Enter this height in feet such that the full length of each drillhole and its header information may be plotted. Again, refer to "How to Obtain and Preview Data for Input to STRATS" to see how PACER may be used to provide this answer.

Prompt:

ENTER HEIGHT BELOW DATUM TO PLOT:

Discussion:

This prompt occurs when a datum other than surface elevation is selected. Enter this height in feet such that the full length of each drillhole may be plotted.

Prompt:

ENTER LENGTH OF CROSS SECTION IN DECIMAL INCHES

Discussion:

The user should supply the length of the cross section in inches. This will be the length of the X axis on the final hard copy plot (not the plot on the Tektronix screen), and 47 inches is the maximum at this time. In order to have the scale of the plot equal to the scale of the map used, this length should be the same length as the diagonal of the cross section on the map. If matching of the plot scale to the map scale is not important, then the length of the cross section may be any value which allows the plot to be fully drawn. STRATS uses the beginning and ending latitudes and longitudes to calculate the length in decimal seconds of the diagonal of the rectangle which would be formed if the beginning and ending geographic points furnished were joined. The cross section line in seconds computed by the STRATS is then divided by the user furnished length supplied by answering this prompt to get an X axis scale of seconds per inch. This scale is graphically depicted in the legend of the plot.

Prompt:

ENTER VERTICAL SCALE (FT./INCH - USE DECIMAL):

Discussion:

The length of the plotted Y axis is determined by the user's answers to this prompt and the prompts for the maximum and minimum elevation or the prompts for the heights above and below the datum. If surface

elevation is used as the datum, then the length of the Y axis in inches is determined as follows:

$$\frac{\text{maximum elev. - minimum elev.}}{\text{answer to this prompt}}$$

If a datum other than surface elevation is used, then the length of the Y axis in inches is determined by:

$$\frac{\text{height above datum - (- height below datum)}}{\text{answer to this prompt}}$$

Thus, for example, if the maximum elevation provided is 3200 feet, the minimum elevation supplied is 1500 feet, and the answer to this prompt is 100 feet per inch, then the length of the Y axis would be 3200 - 1500 / 100 = 17 inches which actually represents 1700 feet. No matter what datum is used , this vertical scale should divide evenly into each of the terms in the numerator of the above two equations. The y axis limit is 28 inches. Thus, the maximum size for a cross section is 28 inches high by 47 inches long regardless of scale.

Prompt:

ENTER INTERVAL FOR BORDER TICS (FT. - USE DECIMAL):

Discussion:

The answer to this prompt, which should be in decimal feet, defines the spacing between foot markers along the Y axis. For example, if the user answers 100, then there will be a tic mark every 100 feet with the appropriate numerical footage beside it. Also, if hole depth calibration was chosen in a previous prompt, then the answer to this prompt will determine the foot distance between tics beside each drillhole. Appropriate numerical footage is printed next to each tic. The answer to this prompt should divide evenly into each of the terms in the numerator in the equations in the discussion portion of the preceding prompt.

Prompt:

ENTER SEARCH RANGE (DDD MM SS):

Discussion:

This prompt only appears when projected distance is chosen. Refer to the prompt where projected distance is selected.

Prompt:

WHAT IS THE RANDOM DATA BASE NAME?

Discussion:

Refer to the section titled "Creating a STRATS Input File", and use the name which was used in place of ANYNAME as the answer to this prompt.

Prompt:

PLEASE SUPPLY SPEED OF YOUR TERMINAL IN CHARACTERS PER SEC. - 300, 1200, OR 9600 MOST LIKELY - NO DECIMAL.

Discussion:

The answer should be the speed of your terminal in

characters per seconds without decimal. After this prompt is answered, the screen will be cleared, and the plot will subsequently appear on the screen. A beep will sound when the plot is finished. To continue, press the RETURN key. Some proprietary messages for the DISSPLA software system will appear on the screen before the next prompt.

Prompt:

DO YOU WANT TO SEND OUTPUT TO PLOTTER?

Discussion:

The answer should be "Y" for yes or "N" for no. If the answer is "N", this will be the last prompt, the STRATS will end, and the operating system of the computer will issue its "OK" prompt. If the answer is "Y", a few more prompts will follow.

Prompt:

WHAT IS DATA BASE NAME?

Discussion:

Refer to the section titled "Creating a STRATS Input File", and use the name which was used in place of ANYNAME as the answer to this prompt.

Prompt:

ENTER PLOT FILE NAME

Discussion:

STRATS will produce a plot data set on a disk. The user must supply a name for this plot data set of eight or fewer alphabetical characters. This will be the last prompt, the plot data set will be created (This takes varying amounts of time depending on the size and density of the plot.), and the STRATS will end by printing a proprietary message about the plot package DISSPLA which it uses. After this, the computer's operating system will issue its "OK" prompt. The user may then plot the data set as explained in the section titled "How to Create a Plot".

B. Short Prompting Path

The STRATS must be initialized, as was previously explained, by typing "STRATS" and pressing RETURN. STRATS will answer as follows:

```
**************************************************

STRATIGRAPHIC ANALYSIS TECHNIQUES SYSTEM (STRATS)

**************************************************

    WOULD YOU LIKE TO BE PROMPTED FOR INFO?
```

The "NO" path will now be delineated. The "NO" path is used only after a control file has been created during a previous STRATS session. The subsequent prompts will be explained in the same format previously used.

Prompt:

DO YOU WANT PLOT TO GO TO PLOTTER?

Discussion:

Answer with "Y" if a plot data set is desired or "N" if not necessary. If the answer is "N", a plot will appear on the screen after a few more prompts.

Prompt:

PLEASE ENTER NAME OF CONTROL FILE:

Discussion:

Refer to the similar prompt in "Long Prompting Path" near the beginning of this section. The control file is the file created during a previous STRATS session.

Prompt:

WHAT IS THE DATA BASE NAME?

Discussion:

Refer to the section titled "Creating a STRATS Input File," and use the name which was used in place of ANYNAME as the answer to this prompt. The next prompt to appear if going to the plotter will be the one marked "Prompt(*):".

Prompt:

PLEASE SUPPLY SPEED OF YOUR TERMINAL IN CHARACTERS PER SEC. - 300, 1200, OR 9600 MOST LIKELY - NO DECIMAL. This prompt appears only if not going to the plotter.

Discussion:

The answer should be the speed of your terminal in characters per second without a decimal. After this prompt is answered, the screen will be cleared, and the plot will subsequently appear on the screen. A beep will sound when the plot is finished. To continue, press the RETURN key. Some proprietary messages for the DISSPLA software system will appear on the screen before the next prompt.

Prompt:

DO YOU WANT TO SEND OUTPUT TO PLOTTER?

Discussion:

The answer should be "Y" for yes or "N" for no. If the answer is "N", this will be the last prompt. The STRATS will end, and the operating system of the computer will issue its "OK" prompt. If the answer is "Y", a few more prompts will follow.

Prompt:

WHAT IS DATA BASE NAME?

Discussion:

Refer to the section titled "Creating a STRATS Input File", and use the name which was used in place of ANYNAME as the answer to this prompt.

Prompt(*):

ENTER PLOT FILE NAME

Discussion:

STRATS will produce a plot data set on a disk. The user must supply a name for this plot data set of eight or fewer alphabetical characters. This will be the last prompt, the plot data set will be created (This takes varying amounts of time depending on the size and density of the plot.), and the STRATS will end by printing a proprietary message about the plot package

DISSPLA which it uses. After this, the computer's operating system will issue its "OK" prompt. The user may then plot the data set as explained in the section titled "How to Create a Plot".

Description of Output

The three final outputs of STRATS are the stratigraphic cross section plot, a control file which allows the user to subsequently use the short prompting path, and a file called STRATLST which allows the user to determine if the STRATS ran properly or was terminated by errors. They will now be discussed.

The first final output is the stratigraphic cross section plot. Figures 2, 3, and 4 show examples of stratigraphic cross section plots at a reduced size. Figure 2 illustrates the projected distance option, Figure 3 the actual distance option, and Figure 4 the user-specified-distance option; each Figure also contains other options such as lithmod and bed name notations, hole depth and vertical axis calibrations, and datum alignment. Figure 4 shows the seven lithology symbols currently available which in this illustration represent coal, sandstone, siltstone, shale, limestone, clay, and conglomerate. The legend in the lower right corner below the plot boundary contains the user-specified titles provided in answer to the prompts pertaining to titles, credits,and the bar scale in seconds per inch for the horizontal scale. The Appendix explains how the STRATFE.CPL and STRATS were used to produce Figure 4.

The second final output is a control data set which contains all the essential information necessary to recreate the plot defined by the user in a STRATS session. With this data set, the user may then start a new STRATS session, and may use the short prompting path to create a disk plot file or recreate a plot on the screen. Note that, as previously stated, the user supplies the name for this data set during the initial STRATS session where the long prompting path was required. A document which will supplement this document is planned to more fully explain the control data set for the advanced user.

The third final output is the STRATLST data set which is essentially a tool for the computer specialist. However, the user should scan the printed version of the data set for error messages if the STRATS abnormally terminates without producing a plot on the graphics terminal screen or the plot on the screen does not seem correct. The possible errors will be described in a subsequent section titled "Errors Detected by STRATS".

How to Create a Plot

The user supplies a disk file name when responding to the prompt "ENTER PLOT FILE NAME:", and a disk file is subsequently created. However, to be able to plot in Reston, the disk file must be transferred to tape. This is accomplished by mounting the tape, assigning the tape drive, typing in

```
TOTAPE
```

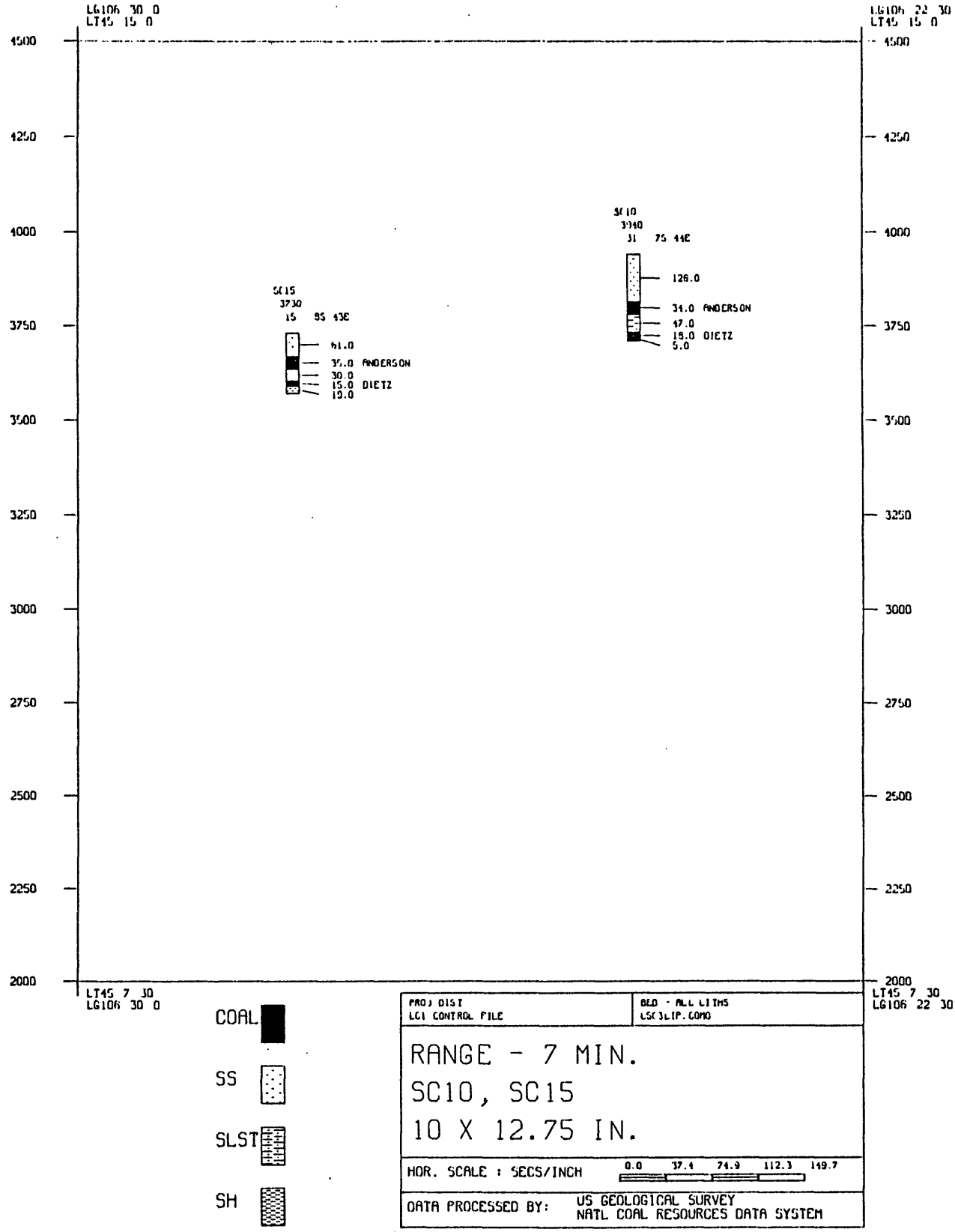

Figure 2. - Projected Distance Option and Lithology Option 5

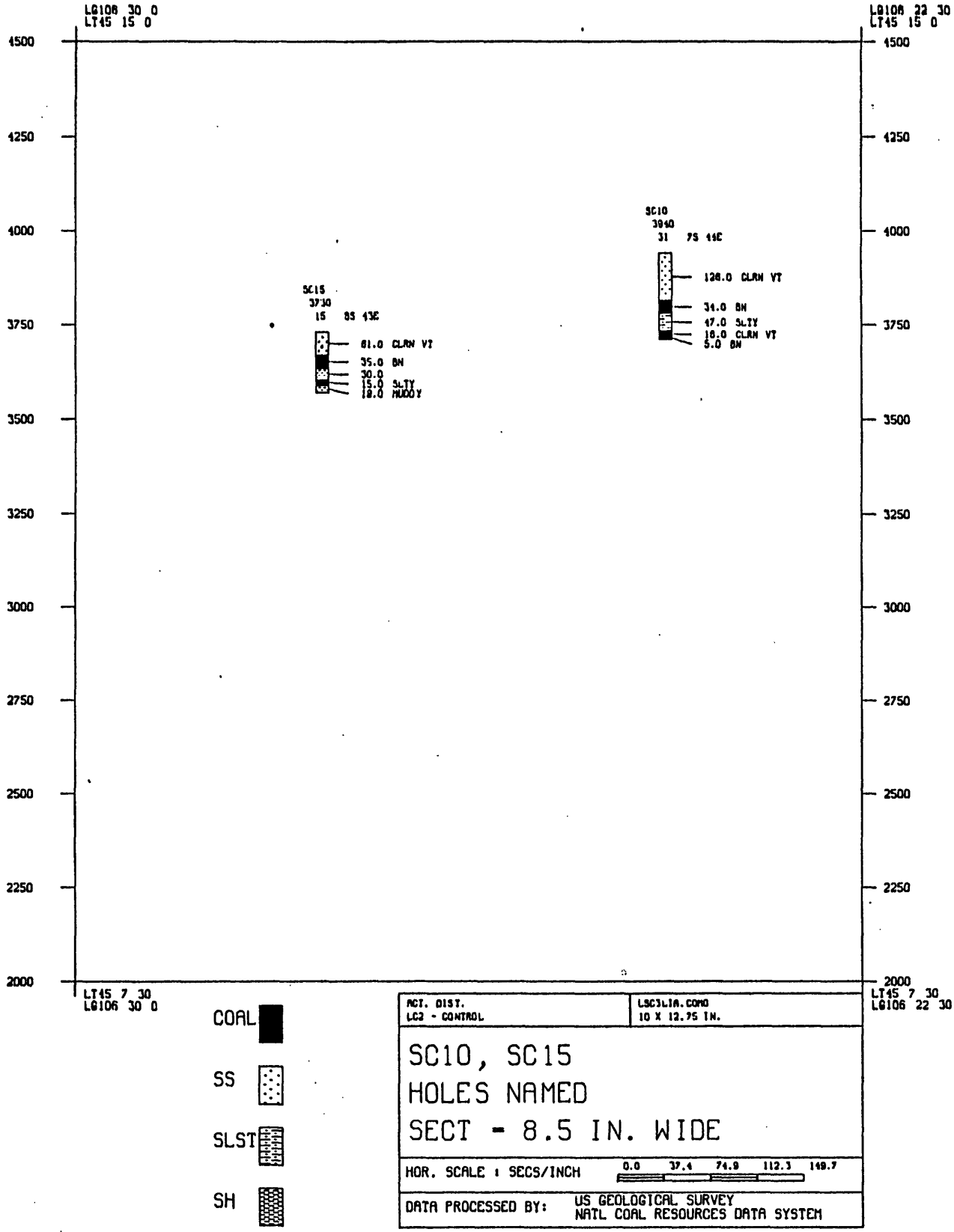

Figure 3. - Actual Distance, User-Specified Holes Option and Lithmod Option 2

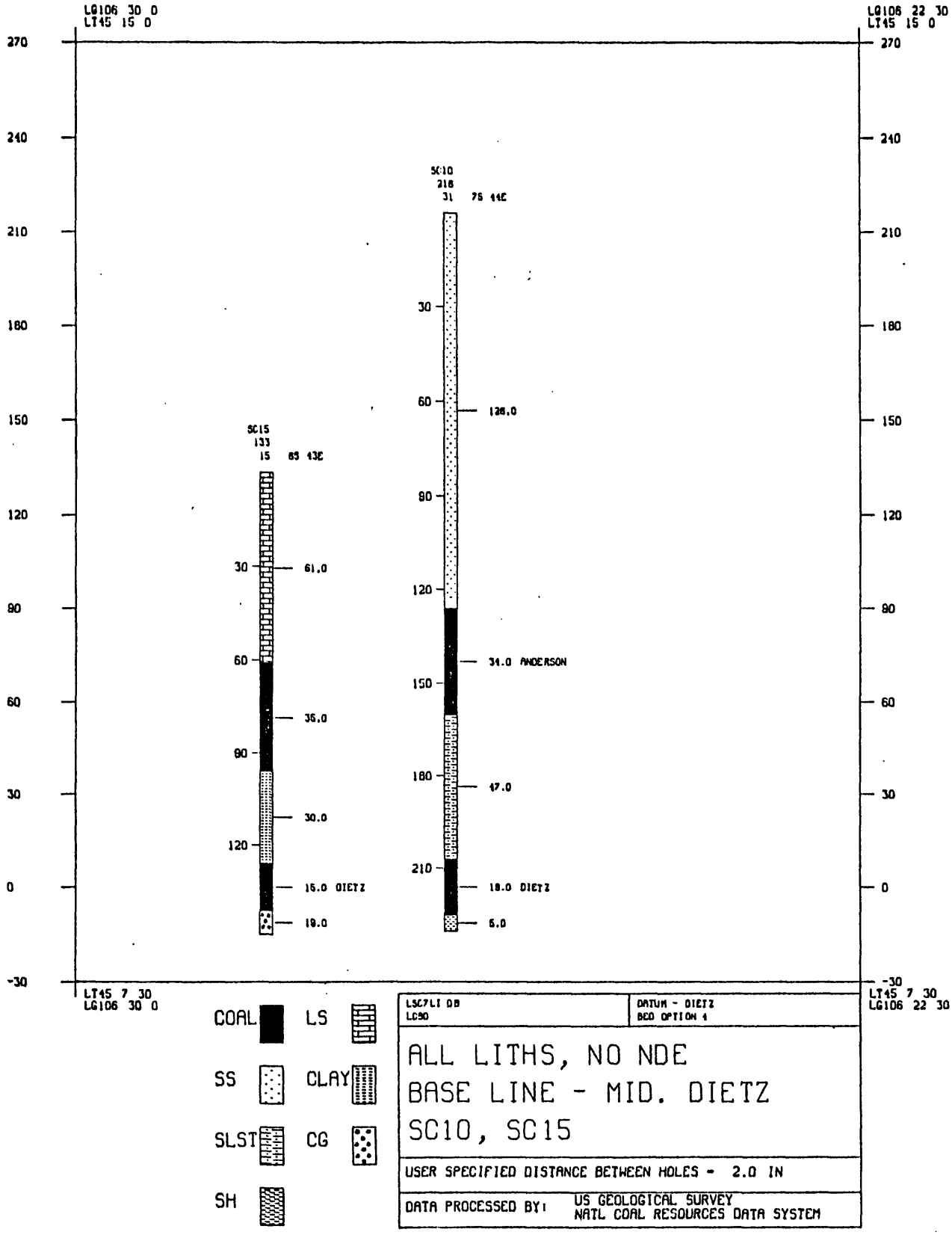

Figure 4 - User-Specified Distance, Datum, Hole Depths Calibrations, and User-Specified Holes Option with Lithology Option 4

and following the prompts. After using the program TOTAPE, the user should unassign the tape drive and dismount the tape which is now ready for plotting..

In Denver, a plot tape is not required since the Calcomp plotter is directly connected to the computer.

It is beyond the scope of this document to describe how to use the Calcomp plotters. Thus, the user must obtain help from an NCRDS computer person.

Errors Detected by STRATS

This Section will cover only the fatal errors detected by STRATS. These errors are recorded in a the file named STRATLST which is produced when STRATS is executed, and which is briefly described in "Description of Output." For each error, the error message will be shown followed by a discussion of the error.

Error Message:

ERROR --- A SWITCH IS INCORRECT ---

Discussion:

A computer person should be consulted for this error. As was mentioned in the section "Description of Output", a supplementary document is planned to explain the control data set, and it is there where the switches will be described.

Error Message:

ERROR --- YDIM LE ZERO ---

Discussion:

The variable YDIM is the length of the diagonal in seconds of the rectangle formed if the user-supplied beginning and end points of the desired section are joined together. Thus, check the user-supplied beginning and ending longitudes and latitudes to see if they are the same.

Error Message:

ERROR --- MAXS NE ZERO AND ELMN GE ELMX2 ---

Discussion:

This means that the user-supplied minimum elevation is greater than or equal to the user-supplied maximum elevation.

Error Message:

ERROR --- SCALE LE ZERO ---

Discussion:

Refer to the definition of the X axis scale included in the discussion accompanying the prompt "ENTER LENGTH OF CROSS SECTION IN DECIMAL INCHES" under the section "How to Use STRATS." This is the scale referred to in this error. Check the beginning and ending latitudes and longitudes, and the cross section length supplied to STRATS.

Error Message:

--- FTPIN LE ZERO ---

Discussion:

This means that an incorrect answer was supplied to the prompt "ENTER VERTICAL SCALE (FT./INCH - USE DECIMAL)".

Error Message:

ERROR --- ELINT LE ZERO AND MARKS NE 1 ---

Discussion:

The variable ELINT is the user-supplied distance between tic marks along the vertical axis. This error means this value is less than or equal to zero which is not permitted.

Error Message:

ERROR --- SCINT LE ZERO ---

Discussion:

The reason for this error is the same as the cause of the previous error.

Error Message:

ERROR --- AXSINC LE ZERO ---

Discussion:

The reason for this error is the same as the cause of the previous two errors.

Error Message:

ERROPR --- RANGE LE ZERO ---

Discussion:

If the distance between drillholes on the plot was chosen to be the projected distance, then the user-supplied search range must be greater than zero.

APPENDIX

This Appendix consists of three sections:

1) A Prime COMO session which illustrates how STRATFE.CPL was used to produce the data base LSC7LI for subsequent input to STRATS.
2) A printout of the data base LSC7LI.
3) A Prime COMO session showing how STRATS was executed to produce Figure 4.

Prime COMO Session of Use of STRATFE.CPL

```
CPL STRATFE SC1015 LSC7LI USTRAT
ENTER DATABASE NAME: USTRAT
ENTER FILE NAME:
SC1015
ENTER OUTPUT FILE NAME:
LSC7LI.STR
ENTER THREE LINES OF FILE INFORMATION
(MAX OF 64 CHARACTERS PER LINE)
TITLE(1):
USTRAT
TITLE(2):
SC1015
TITLE(3):
LSC7LI.STR
EDIT
BOTTOM
INSERT
INPUT
DSPL
ALL
INDX
EXIT

EDIT
FILE LSC7LI.STR
 WHAT IS THE INPUT FILE NAME (A32)?
LSC7LI.STR
 ENTER OUTPUT FILE NAME (A32)
LSC7LI.LIST
 ENTER DATA BASE NAME (32 OR LESS CHARS.) :
LSC7LI
 NEW FILE OPENED
**** STOP

OK
```

Printout of Data Base LSC7LI

```
  1   1   0   5   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0
5.SC10              7S 44E 313940.0   45.1873321  106.3870850
5.                CROCDP-MAPELSTROUD CREEKNDE          800130MONTANA     ROSEBUD
 5.                   0.00  126.00RKNDENDE
10.                 126.00  160.00COANDANDERSON
15.                 160.00  207.00RKNDENDE
20.                 207.00  225.00CODIEDIETZ
25.                 225.00  230.00RKNDENDE
  1   1   0   5   0   0   0   0   0   0
  0   0   0   0   0   0   0   0   0   0
5.SC15              8S 43E 153730.0   45.1396484  106.4477081
5.                CROCDP-MAPELSTROUD CREEKNDE          800130MONTANA     BIG HORN
 5.                   0.00   61.00RKNDENDE
10.                  61.00   96.00COANDANDERSON
15.                  96.00  126.00RKNDENDE
20.                 126.00  141.00CODIEDIETZ
25.                 141.00  160.00RKNDENDE
OK,
```

Prime COMO Session Showing How STRATS Was Executed to Produce Figure 4

```
OK,     STRATS

**************************************************

STRATIGRAPHIC ANALYSIS TECHNIQUES SYSTEM (STRATS)

**************************************************

WOULD YOU LIKE TO BE PROMPTED FOR INFO?
Y
  ENTER "0" IF YOU WISH DRILLHOLE LOCATIONS PROJECTED
   ONTO SECTION LINE; "1" IF YOU WISH ACTUAL DISTANCES
   BETWEEN HOLES; "2" IF WANT FIXED DIST. BETWEEN HOLES-
2
  ENTER DISTANCE IN DECIMAL INCHES :
2.
  ENTER OUTPUT FILE NAME FOR CONTROL FILE:
LC80
  DO YOU WISH TO NAME DRILLHOLES TO BE PLOTTED [Y OR N]:
Y
  HOW MANY DRILLHOLE NAMES WILL YOU USE?
   ANSWER MUST BE TWO DIGITS; USE LEADING ZERO IF
   NECESSARY; NO DECIMAL POINT:
02
 PLEASE START EACH DRILLHOLE NAME UNDER A "B";
   YOU MAY ENTER SIX NAMES PER LINE; PRESS RETURN
   AFTER FINISHING LINE OR AFTER LAST ENTRY.
B           B           B           B           B           B
SC15        SC10
YOU MAY EITHER HAVE BED NAME OR LITHMOD PLOTTED
NEXT TO BED. ENTER 1 FOR BEDNAME OR 2 FOR LITHMOD.
1
THERE ARE FOUR OPTIONS FOR PLOTTING LITHOLOGIES :
  3) COAL BEDS ONLY WITH THICKNESS AND BEDNAME.
     NDE WILL NOT BE PLOTTED.
  4) ALL LITHOLOGIES WITH THICKNESS AND BEDNAME.
     NDE WILL NOT BE PLOTTED.
  5) PLOT ALL LITHOLOGIES WITH THICKNESS OF BEDS
     WHICH HAVE BEDNAMES, WITH THICKNESS OF COAL
     EVEN IF IT HAS NO BEDNAME, AND WITH BEDNAMES OF
     ALL BEDS. NDE WILL NOT BE PLOTTED IN PLACE OF
     BEDNAME.
  6) PLOT ALL LITHOLCGIES WITHOUT THICKNESS AND
     BEDNAME ANNOTATIONS.

PLEASE ENTER 3,4,5, OR 6.
4
DO YOU WANT HOLE DEPTH FEET CALIBRATIONS?
Y
DO YOU WANT TO USE A DATUM OTHER THAN ELEV.?
Y
```

```
 ENTER NAME OF CONTROL BED (3 CHAR):
DIE
BASE LINE AT TOP, BOTTOM, OR MIDDLE?
M
+TITLE BLOCK(1) (16 CHAR):
LSC7LI DB
+TITLE BLOCK(2)  (16 CHAR):
LC80
+TITLE BLOCK(3) (16 CHAR):
DATUM - DIETZ
+TITLE BLOCK(4)  (16 CHAR):
BED OPTION 4
+TITLE BLOCK (5)  (24 CHAR):
ALL LITHS, NO NDE
+TITLE BLOCK(6) (24 CHAR):
BASE LINE - MID. DIETZ
+TITLE BLOCK(7)  (24 CHAR):
SC10, SC15
 BEGINNING LONGITUDE (DDD MM SS):
106 30 00
 BEGINNING LATITUDE (DD MM SS):
45 07 30
 ENDING LONGITUDE (DDD MM SS):
106 22 30
 ENDING LATITUDE (DD MM SS):
45 15 00
ENTER HEIGHT ABOVE DATUM TO PLOT - USE DECIMAL:
270.
ENTER HEIGHT BELOW DATUM TO PLOT - USE DECIMAL:
30.
 ENTER LENGTH OF CROSS SECTION LINE IN DECIMAL INCHES:
8.5
 ENTER VERTICAL SCALE (FT/INCH-USE DECIMAL):
30.
 ENTER INTERVAL FOR BORDER TICS(FT.-USE DECIMAL):
30.
     WHAT IS DATA BASE NAME?  (10 CHARS OR LESS)
LSC7LI
LSC7LI
 PLEASE SUPPLY SPEED OF YOUR TERMINAL IN CHARACTERS
  PER SEC. - 300,1200, OR 9600 MOST LIKELY - NO DECIMAL.
1200
```

The screen cleared at this point, and the plot appeared. A beep sounded when the plot was finished. To continue, the RETURN key was pressed.)

```
 END OF DISSPLA 9.2 -- 5786 VECTORS IN 1 PLOTS.
 RUN ON 9/13/85 USING SERIAL NUMBER 0 AT USGS/WRD
 PROPRIETARY SOFTWARE PRODUCT OF ISSCO, SAN DIEGO, CA.
 1319 VIRTUAL STORAGE REFERENCES; 4 READS; 0 WRITES.
DO YOU WANT TO SEND OUTPUT TO PLOTTER?
Y
     WHAT IS DATA BASE NAME?  (10 CHARS OR LESS)
LSC7LI
LSC7LI
 ENTER PLOT FILE NAME ( 8 CHARS. OR LESS) :
LSC7TEST
 END OF DISSPLA 9.2 -- 5786 VECTORS IN 1 PLOTS.
 RUN ON 9/13/85 USING SERIAL NUMBER 0 AT USGS/WRD
 PROPRIETARY SOFTWARE PRODUCT OF ISSCO, SAN DIEGO, CA.
 1319 VIRTUAL STORAGE REFERENCES; 4 READS; 0 WRITES.
**** STOP

OK,
```