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REFERENCE

Beach Profile Analysis System (BPAS)

Volume III

BPAS User's Guide: Analysis Module SURVY1

by

Marilyn V. Fleming and Timothy J. Lawler

TECHNICAL REPORT NO. 82-1 (III)

JUNE 1982



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Automated data processing	Beach profile changes							
Beach evaluation program	Computer programs							
Beach profile analysis system	Survey data analysis							
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) <p>A package of computer programs for editing, analyzing, and displaying beach profile survey data has been developed. The eight-volume package, named the Beach Profile Analysis System (BPAS), consists of an overview of the BPAS program, two editing programs, five analysis programs, and supporting appendixes.</p> <p style="text-align: right;">(continued)</p>								

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The first editing program checks for missing or unreasonable data, surveying or note-reducing errors, and improper arrangement of data cards. The second editing program assumes that most errors have been corrected and, while it does some minor editing, its major function is to sort, reformat, and store the data on the selected permanent storage media. It is also used to update or extract data from existing files and performs some preliminary data analysis.

The analysis programs compute changes in shoreline position, selected contour positions, sand level, sand volume, and statistical trends and correlations. The results are plotted in a number of ways for display purposes. Output can be specified for English or metric units and can be referenced to any horizontal or vertical datum. Contour positions, including the shoreline position, are interpolated linearly between adjacent surveyed points on the profile. If a survey does not cross the datum elevation, but does reach a specified minimum elevation (e.g., +2 feet MSL), the shoreline position can be extrapolated using the two seawardmost points. Before computing volume changes, common bonds are established relative to the landward and seaward extent of the surveys on each profile line. The computed area under each profile is then expressed in terms of a "unit volume" for a shore-normal slice that is one unit wide. Rates of change in shoreline position and unit volume are computed by linear regression analysis.

The BPAS package has been designed for use primarily on the CDC 6600 computer, although much of the coding was done in standard FORTRAN for use on other systems.

PREFACE

This report is published to provide coastal engineers with the documentation of a package of computer programs for editing, analyzing, and displaying beach profile survey data. This package, named the Beach Profile Analysis System (BPAS), was needed for the analysis of a large data bank of field and laboratory profile surveys. The work was carried out under the U.S. Army Coastal Engineering Research Center's (CERC) Beach Profile Studies work unit, Shore Protection and Restoration Program, Coastal Engineering Area of Civil Works Research and Development.

This report (Vol. III), the third of eight volumes, contains user instructions for the analysis module SURVY1, which produces comparative plots of beach profiles.

The report was prepared by Marilyn V. Fleming and Timothy J. Lawler, Systems Analysts, under the supervision of P. Pierce, Chief, ADP Office, with the assistance of Allan E. DeWall, Geologist, under the supervision of C.J. Galvin, formerly Chief, Coastal Processes Branch, and Mr. R.P. Savage, Chief, Research Division.


Instrumental insight concerning a previous version of the Beach Profile Analysis System was provided by B. Sims. Programing was accomplished by M. Fleming and T. Lawler with the assistance of D. French, J. Alquist, R. Hylton, and F. Wilson.

The authors acknowledge the helpful discussions and review comments of Drs. C. Everts, C. Galvin, R. Hallermeier, and C. Vincent, and W. Birkemeier, M. Hemsley, A. DeWall, H.C. Miller, B. Sims, and P. Vitale.

Technical Director of CERC was Dr. Robert W. Whalin, P.E., upon publication of this report.

Comments on this publication are invited.

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TED E. BISHOP
Colonel, Corps of Engineers
Commander and Director

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CONVERSION FACTORS, U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U.S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	by	To obtain
inches	25.4	millimeters
	2.54	centimeters
square inches	6.452	square centimeters
cubic inches	16.39	cubic centimeters
feet	30.48	centimeters
	0.3048	meters
square feet	0.0929	square meters
cubic feet	0.0283	cubic meters
yards	0.9144	meters
square yards	0.836	square meters
cubic yards	0.7646	cubic meters
miles	1.6093	kilometers
square miles	259.0	hectares
knots	1.852	kilometers per hour
acres	0.4047	hectares
foot-pounds	1.3558	newton meters
millibars	1.0197×10^{-3}	kilograms per square centimeter
ounces	28.35	grams
pounds	453.6	grams
	0.4536	kilograms
ton, long	1.0160	metric tons
ton, short	0.9072	metric tons
degrees (angle)	0.01745	radians
Fahrenheit degrees	5/9	Celsius degrees or Kelvins ¹

¹To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use formula: $C = (5/9) (F - 32)$.

To obtain Kelvin (K) readings, use formula: $K = (5/9) (F - 32) + 273.15$.

BEACH PROFILE ANALYSIS SYSTEM (BPAS)

Volume III. BPAS User's Guide: Analysis Module SURVY1

by
Marilyn V. Fleming and Timothy J. Lawler

I. INTRODUCTION

This report, the third of eight volumes, provides user instructions for processing analysis module SURVY1, a part of the Beach Profile Analysis System (BPAS) (Fig. 1). The BPAS is a package of computer programs which edit and analyze beach profile data. The objective of the analysis is to compute and display changes in unit volume, shoreline position, and profile geometry. SURVY1 displays beach profile changes, through time, at a locality by providing plots of the actual profile cross sections. Also available is a tabular listing of distance to, and slope of, the profile at the shoreline position.

Volumes I and VIII contain information concerning data collection, formatting and restrictions, and program computations, assumptions, and error messages not repeated in this volume. It is recommended that Volumes I and VIII be used in conjunction with this volume. Volume II, which is a user's guide for processing the editing routines, EDIT1 and EDIT2, contains guidelines for the initial preparation of survey data. These guidelines are not repeated in this volume. Other volumes available in the series are:

(a) Volume IV, "BPAS User's Guide: Analysis Module SURVY2," which produces plots and tables of contour positions.

(b) Volume V, "BPAS User's Guide: Analysis Module BEACH," which produces plots and tables of unit volume and shoreline position changes.

(c) Volume VI, "BPAS User's Guide: Analysis Module VOLCTR," which produces tables and plots of change in unit volume between specific contour segments.

(d) Volume VII, "BPAS User's Guide: Analysis Module ELVDIS," which produces tables and plots of change and maximum and minimum elevations at specific distances.

Each of these volumes contains instructions for processing only the module with which it is concerned.

II. PROGRAM DESCRIPTION

The survey input data processed by program SURVY1 (Fig. 2) are assumed to have already been processed through the editing routines, EDIT1 and EDIT2. These edit routines perform a thorough edit and a partial analysis of the data. The result of this preliminary analysis is contained on the first record in the survey data input file, the header record. The information on the header record, along with information specifying desired outputs and optional data specifications, is used to determine whether the data will exceed the program capabilities. If capabilities will be exceeded or the job has been improperly set up, SURVY1 will print an appropriate error message and stop execution after this initial test. Otherwise, the program will continue.

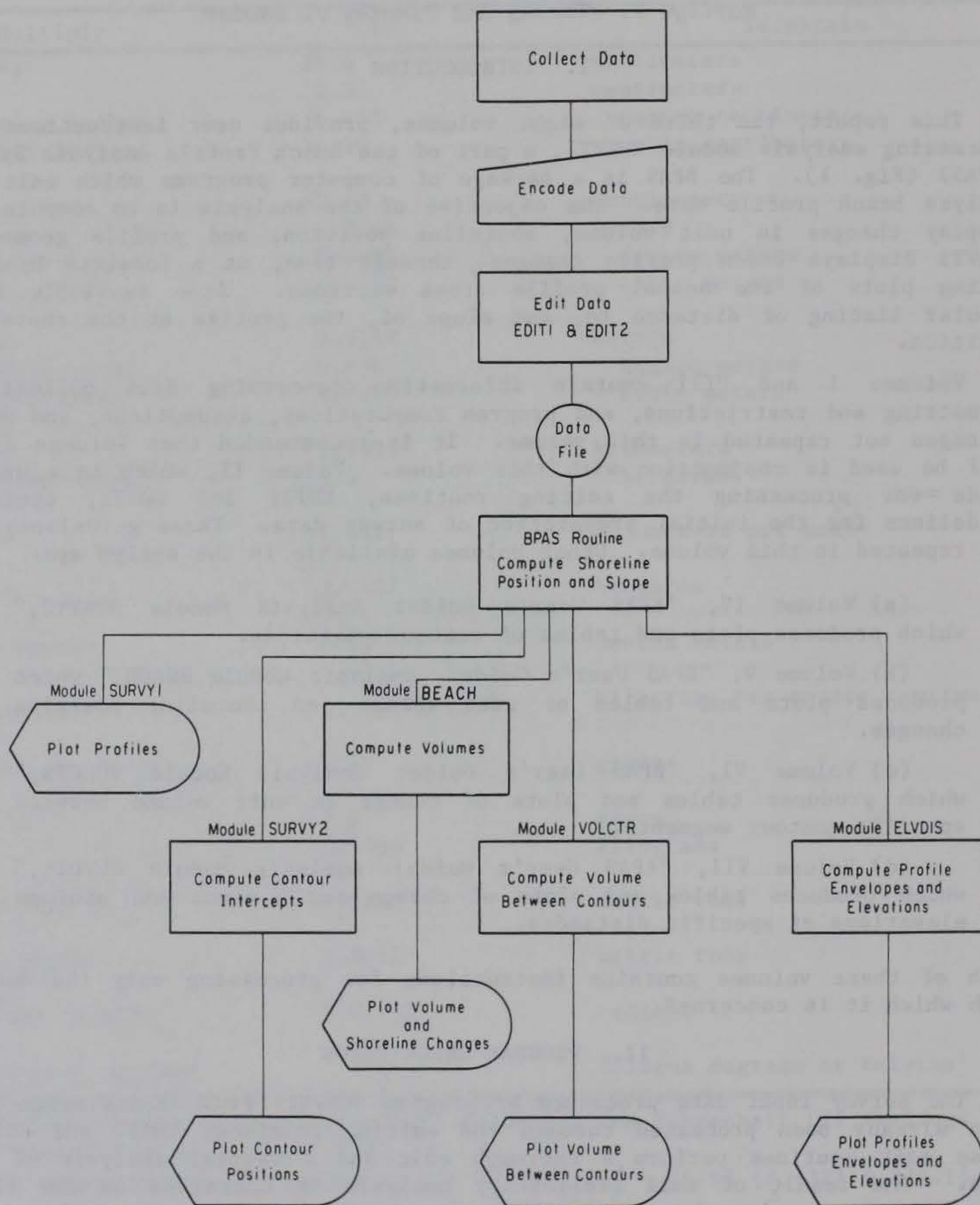


Figure 1. Beach Profile Analysis System.

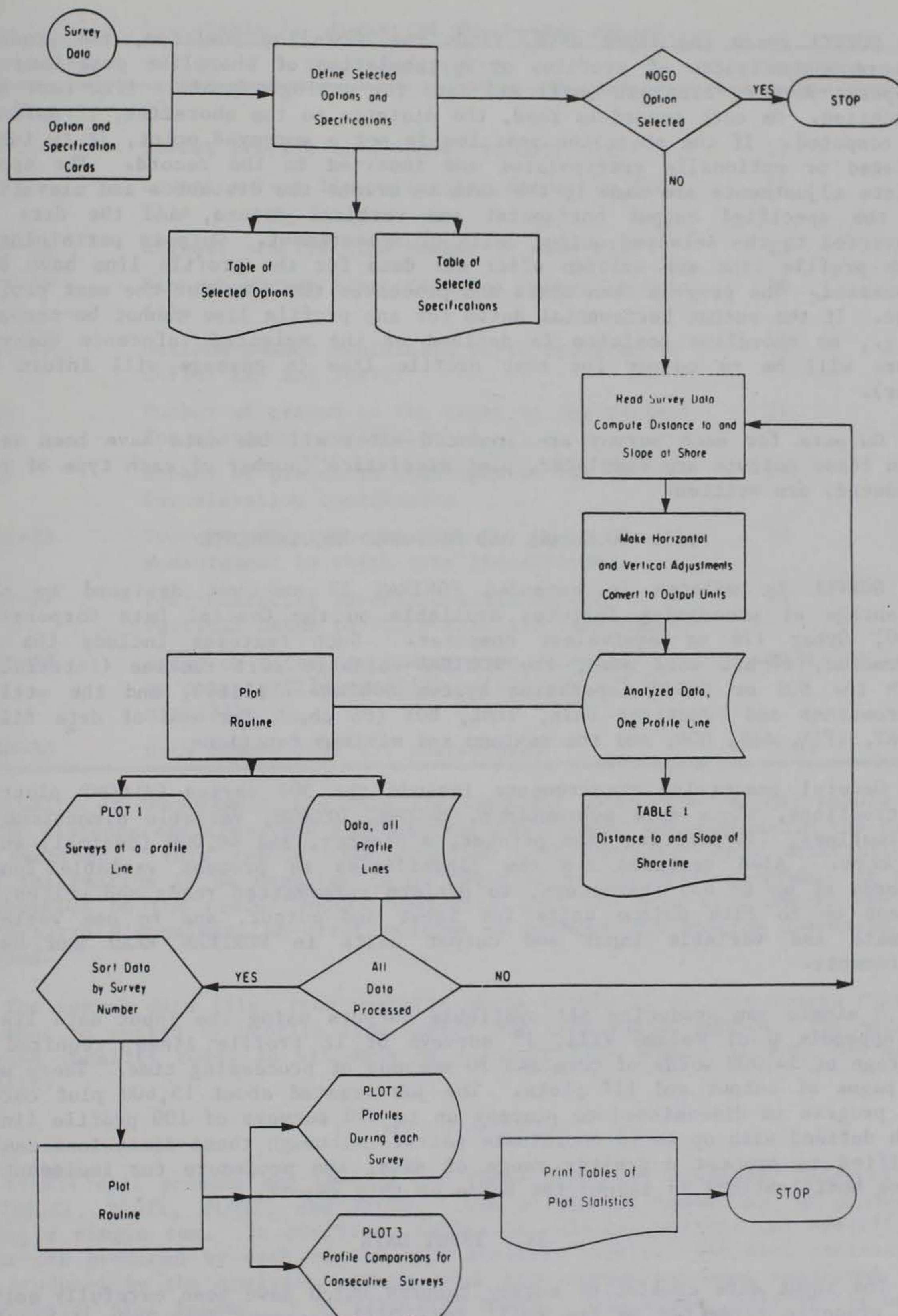


Figure 2. Analysis module SURVY1.

SURVY1 reads the input data, finds the shoreline position, and produces the requested plots of profiles or a tabulation of shoreline positions and slopes. Records are read until all data for a single profile line have been processed. As each record is read, the distance to the shoreline, if defined, is computed. If the shoreline position is not a surveyed point, it is interpolated or optionally extrapolated and inserted in the record. The appropriate adjustments are made to the data to orient the distances and elevations to the specified output horizontal and vertical datums, and the data are converted to the selected output units of measurement. Outputs pertaining to each profile line are written after all data for the profile line have been processed. The program then reads and processes the data for the next profile line. If the output horizontal datum for any profile line cannot be computed (e.g., no shoreline position is defined on the selected reference survey), there will be no output for that profile line (a message will inform the user).

Outputs for each survey are produced after all the data have been read. When these outputs are completed, plot statistics (number of each type of plot produced) are written.

III. HARDWARE AND SOFTWARE REQUIREMENTS

SURVY1 is written in extended FORTRAN IV and was designed to take advantage of processing features available on the Control Data Corporation 6600, Cyber 176 or equivalent computer. Such features include the 10-character, 60-bit word size, the FORTRAN-callable sort routine (interfacing with the NOS or NOS/BE operating system SORTMRG utility), and the utility subroutines and functions DATE, TIME, EOF (to check for end of data file), FLOAT, IFIX, ABS, MOD, and the maximum and minimum functions.

General processing requirements include the 500 series CALCOMP plotting instructions, block data subroutines, ENCODE, DECODE, variable dimensions in subroutines, 132-position line printer, a plotter, and 40,000 (decimal) words of core. Also required are the capabilities to process variable length records of up to 635 characters, to perform unformatted reads and writes, to access up to five unique units for input and output, and to use variable formats and variable input and output units in FORTRAN READ and WRITE statements.

A single run producing all available outputs using the input data listed in Appendix G of Volume VIII, 15 surveys of 12 profile lines, required an average of 34,000 words of core and 70 seconds of processing time. There were 30 pages of output and 117 plots. The job created about 15,600 plot cards. The program is dimensioned to process up to 150 surveys of 100 profile lines, each defined with up to 60 coordinate pairs. Although these dimensions can be modified to process a greater range of data, the procedure for implementing these modifications is beyond the scope of this report.

IV. INPUT DATA

The input data consist of survey records which have been carefully edited and properly formatted by the EDIT1 and EDIT2 programs (see Vol. II). The first record in the survey data file, the header record (Table 1), supplies the range of profile line numbers, survey numbers, and dates. It specifies in

Table 1. Format of the header record.

Position No.	Entry description	FORTRAN format
1-2	00	A2
3-5	Lowest profile line number in data file	I3
6-9	Lowest survey identification number in data file	I4
10-12	Highest profile line number in data file	I3
13-16	Highest survey identification number in data file	I4
17-19	Maximum number coordinate pairs required to define any one survey	I3
20	Number of places to the right of the decimal for distance coordinates	I1
21	Number of places to the right of the decimal for elevation coordinates	I1
22-23	Two-character abbreviation for units of measurement in which data are recorded	A2
24-27	Four-character acronym describing the vertical datum to which data are referenced	A4
28-49	Range of dates, including time, covered by data (yr(I2), mon(I2), d(I2), hr(I3), min(I2))	2(3I2,I3,I2)
50-80	Data description (31 characters)	31A1

what units of measurement the data are recorded, where the decimal should be in the distance and elevation coordinates, and to what vertical datum the data are recorded. This record also contains a 31-character data description. This information is as supplied to or computed by the EDIT2 program. If the information on the header record indicates that the data will exceed any of the program dimensions, an error message is printed and program execution is stopped.

The survey data file, from magnetic media (Table 2) or card images (Table 3), must be sorted by profile line number and then survey number. The module ignores locality codes so all data on a single file should be from the same locality.

V. MODULE OUTPUTS

SURVY1 will produce one tabular and three graphical displays, referred to as TABLE1, PLOT1, PLOT2, and PLOT3. Any or all of these may be produced during a single run. In addition, tables of selected options and specifications are produced by each run of each analysis module. The plot statistics are produced by the analysis modules when plot output has been requested. A footnote or plot legend, "X EXTRAPOLATED DATUM," will appear only if the user has elected to allow extrapolation of the shoreline position. Sample outputs shown in the following figures have been photo-reduced.

Table 2. Format of final data file, recorded on magnetic media.

Position No.	Entry description	FORTTRAN format
1-2	Locality code	A2
3-5	Profile line number	I3
6-9	Survey identification number	I4
10-15	Date of survey	3I2
16-20	Time of survey	I3,I2
21-23	Number of coordinate pairs in the record	I3
24-28	Minimum elevation on the record	I5
29-35	Blank	7X
36-end	Distance and elevation coordinate pairs, five positions per coordinate, no decimal	I5

Table 3. Format of final data file--card image data.

Position No.	Entry description	FORTTRAN format
First card in each record		
1-2	Locality code	A2
3-5	Profile line number	I3
6-9	Survey identification number	I4
10	Card number (1)	A1
11-16	Date of survey	3I2
17-21	Time of survey	I3,I2
22-24	Number of coordinate pairs in the record	I3
25-29	Minimum elevation this record	I5
30-40	Blank	
41-80	First four distance, elevation coordinate, five columns each coordinate, no decimals ¹	8I5
Second and following cards in each record		
1-9	Same as for first card	
10	Card number (1-9, then A-Z)	A1
11-80	Seven distance, elevation coordinate pairs, five positions each coordinate	14I5

¹Position of decimal is defined on the header record (see Table 5).

NOTE.--If there are exactly four coordinate pairs (first card only needed, filled to position 80), the second and the last card in the record must be a blank card.

1. Table of Options Selected (Fig. 3).

This table, produced after all option cards have been read by the program, prints the value assigned to each variable which can be defined on an option card. This table should be examined to ensure that the values assigned to these variables are as anticipated.

```

                                O P T I O N S
                                -----
                                KLJ RUN 01/21/81 AT 09.31.13.

ANALYSIS MODULE SELECTED== SURVY1
USER SELECTED RUN ID==      KLJ
LOCALITY DESCRIPTOR IS TEST BEACH
EACH SURVEYED LINE WILL BE CALLED A PROFILE
INPUT DISTANCES ARE COMPUTED FROM THE BENCHMARK
INPUT DISTANCES TO FT X 10**=0, ELEVATIONS TO FT X 10**=1
VERTICAL DATUM IS MSL
A CORRECTION OF      0.000 FT WILL BE MADE TO EACH VERTICAL CO-ORDINATE.
TIME WILL ApPEAR ON OUTPUT. 24-HOUR SYSTEM WILL BE USED.

HORIZONTAL DATUM IS
THE SHORELINE POSITION ON
REFERENCE SURVEY
THERE ARE NO MORE THAN      2 PROFILE LINES.
THE INITIAL SURVEY OF EACH PROFILE LINE WILL BE THE REFERENCE SURVEY.

A CONVERSION FACTOR OF      1.00000 WILL BE USED TO GO FROM INPUT UNITS (FT) TO
                                OUTPUT UNITS (FT)
A CONVERSION FACTOR OF      .03704 WILL BE USED TO GO FROM SQUARE FT TO YD3/FT

EXTRAPOLATION WILL BE DONE TO MSL IF THE LAST SURVEYED POINT REACHES A MINIMUM
ELEVATION OF      2.000 FT

SURVEY INPUT DATA WILL BE READ FROM UNIT 7 IN THIS FORMAT==
(2X,I3,I4,3I2,I3,I2,I3,F5.0,7X,12OF5.0)
```

Figure 3. Sample SURVY1 output--table of options selected.

2. Table of Specifications Selected (Fig. 4).

This table is produced after all special processing and output selection specifications have been read by the program. Anticipated processing specifications and outputs should be compared with those actually selected.

3. TABLE1 (Fig. 5).

TABLE1 displays the distance to and slope of the profile at the shoreline position during each survey. There will be at least one page of output for each profile line in the survey data file.

SPECIFICATIONS SELECTED FOR ANALYSIS MODULE SURVY1

KLJ RUN 01/21/81 AT 09.31.13.

TABLE 1 WILL BE OUTPUT.

	PLOT 1	PLOT 2	PLOT 3
HORIZONTAL AXIS			
MINIMUM	-300.00		
INCREMENT	100.00		
LENGTH	7.00		
VERTICAL AXIS			
MINIMUM	-5.00		
INCREMENT	5.00		
LENGTH	8.00		
OFFSET	0.00		
LINES PER PLOT	5.00		
OVERLAP	YES		
FACTORING	YES		

PLOT COMMANDS WILL BE WRITTEN ON UNIT 3

Figure 4. Sample SURVY1 output--table of specifications selected.

KLJ RUN 01/21/81 AT 09.31.13. PAGE 1

DISTANCE TO AND SLOPE AT MSL FOR SURVEYS OF LINE 1 AT TEST BEACH
6JAN75/1000 - 15DEC76/0900

HORIZONTAL DATUM IS
THE SHORELINE POSITION ON
6JAN75/1000

DATE/TIME	DISTANCE(FT) TO MSL	SLOPE AT MSL
6JAN75/1000	0.000	-.113
3MAR75/1100	4.067	-.113
28APR75/1100	12.714	-.144
2JUN75/1100	20.330	-.144
2JUL75/1000	34.932	-.121
9SEP75/1500	39.714	-.117
28OCT75/0700	36.381	-.041
25NOV75/1100	32.303	-.113
5JAN76/1100	33.139	-.114
11MAR76/0800	27.270	-.072
6APR76/1400	34.714	-.113
8JUN76/1300	13.509	-.195
7JUL76/1200	30.335	-.116
27SEP76/0900	22.548	-.600
15DEC76/0900	16.159	-.072

Figure 5. Sample SURVY1 output--TABLE1.

4. PLOT1 (Fig. 6).

This plot displays profiles during surveys at a profile line. Up to 10 surveys may be displayed on a single plot. The user may request that profiles be vertically offset by a fixed amount or that the lines be superimposed. If the lines are superimposed, unique symbols will be plotted on each line so that surveys can be differentiated. The user may also specify overlapping of plots when all surveys cannot be drawn on a single plot (e.g., the last line drawn on each plot is the first drawn on the next). Figure 6 contains samples of offset (a), superimposed (b), overlapped (b), and not overlapped (a) plots. A new axis is drawn each time the profile line number changes and there will be at least one plot for each profile line in the survey data file.

5. PLOT2 (Fig. 7).

This plot displays profiles at different profile lines during a single survey. There will be a new axis drawn each time the survey number changes; thus, there will be at least one plot for each survey in the input file. There may be up to 10 profiles, offset or superimposed, drawn on a single plot. When the profiles are to be superimposed, each profile line will be distinguished by a unique symbol. The plots may be overlapped when all profile lines cannot be drawn on a single plot. Figure 7 provides an example of plots which are offset (a), superimposed (b), overlapped (b), and not overlapped (a).

6. PLOT3 (Fig. 8).

This plot emphasizes changes in profiles between surveys. Profiles during two consecutive surveys at the profile lines are superimposed. There will be a minimum of one plot less than the number of surveys in the input data file. A new axis is drawn each time a different set of surveys is to be compared. Up to 10 superimposed pairs of surveys at the various profile lines may be displayed on a single axis. The plots may be overlapped so that the last profile line represented on one plot will be first drawn on the next. An offset must always be specified. If a profile line is surveyed during only one of the two surveys to be compared, only one profile of that line will be plotted. If a profile line is not surveyed during either survey, the profile line will not be represented on the plot. The earlier survey of the profile is drawn using a dashline; a solid line represents the later survey. Figure 8 provides examples of plots which are overlapped (a) and not overlapped (b).

7. PLOT Statistics (Fig. 9).

At the end of each run for which PLOT1, PLOT2, or PLOT3 output was produced, there is a printed table identifying how many sets of axes were drawn for each type of plot. This information may be used to determine how many plots to expect.

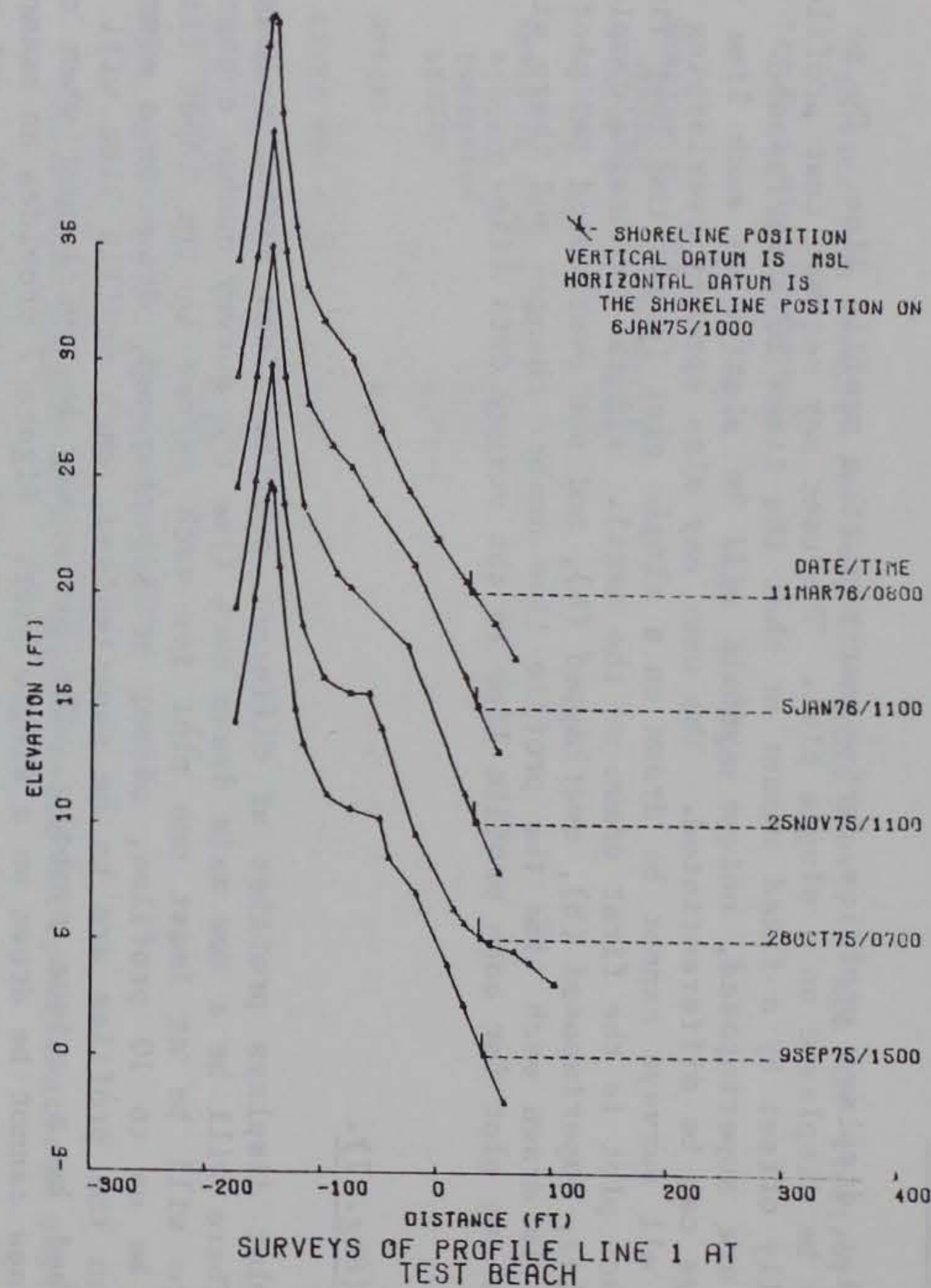
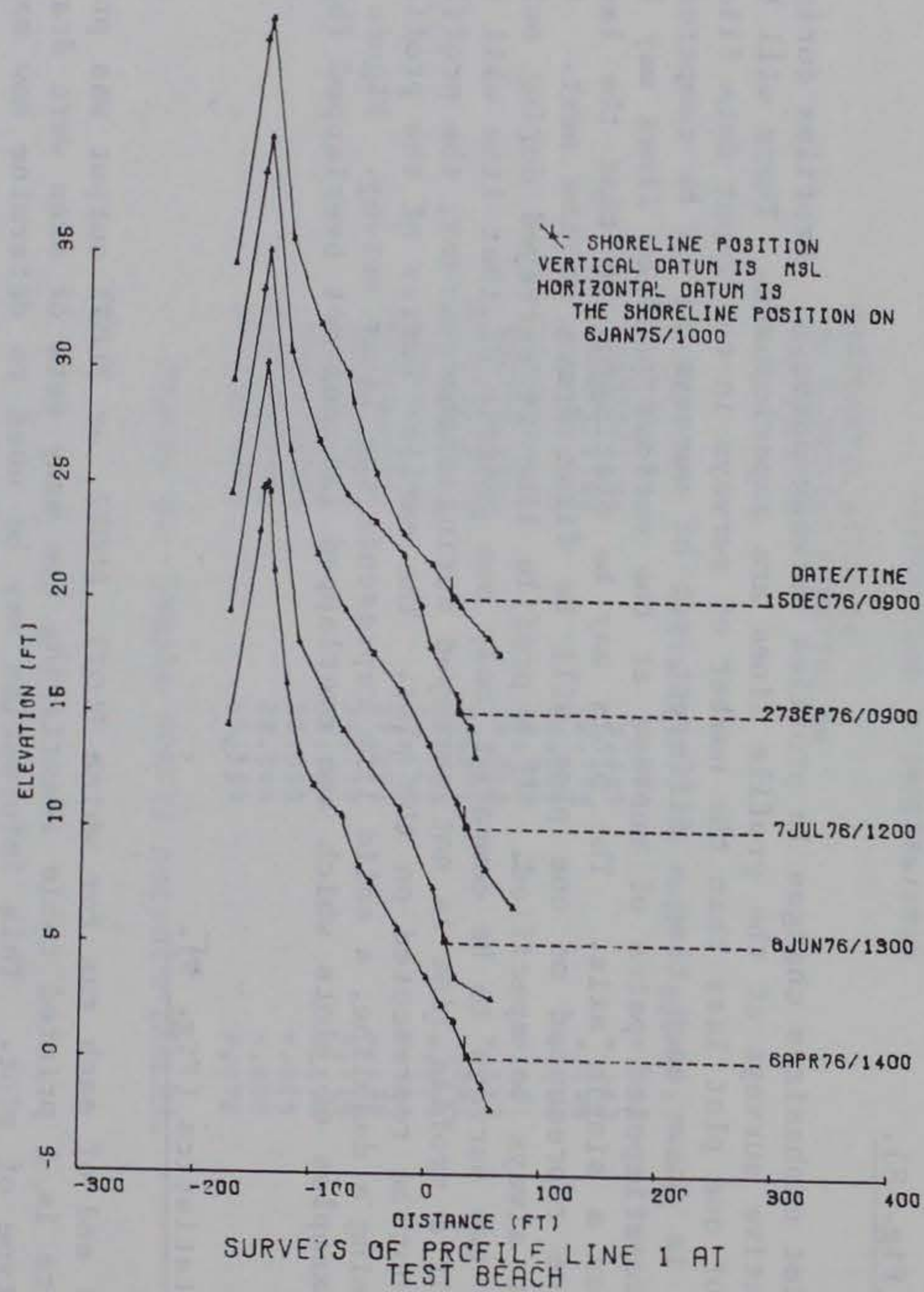


Figure 6a. SURVY1 sample output--PLOT1.

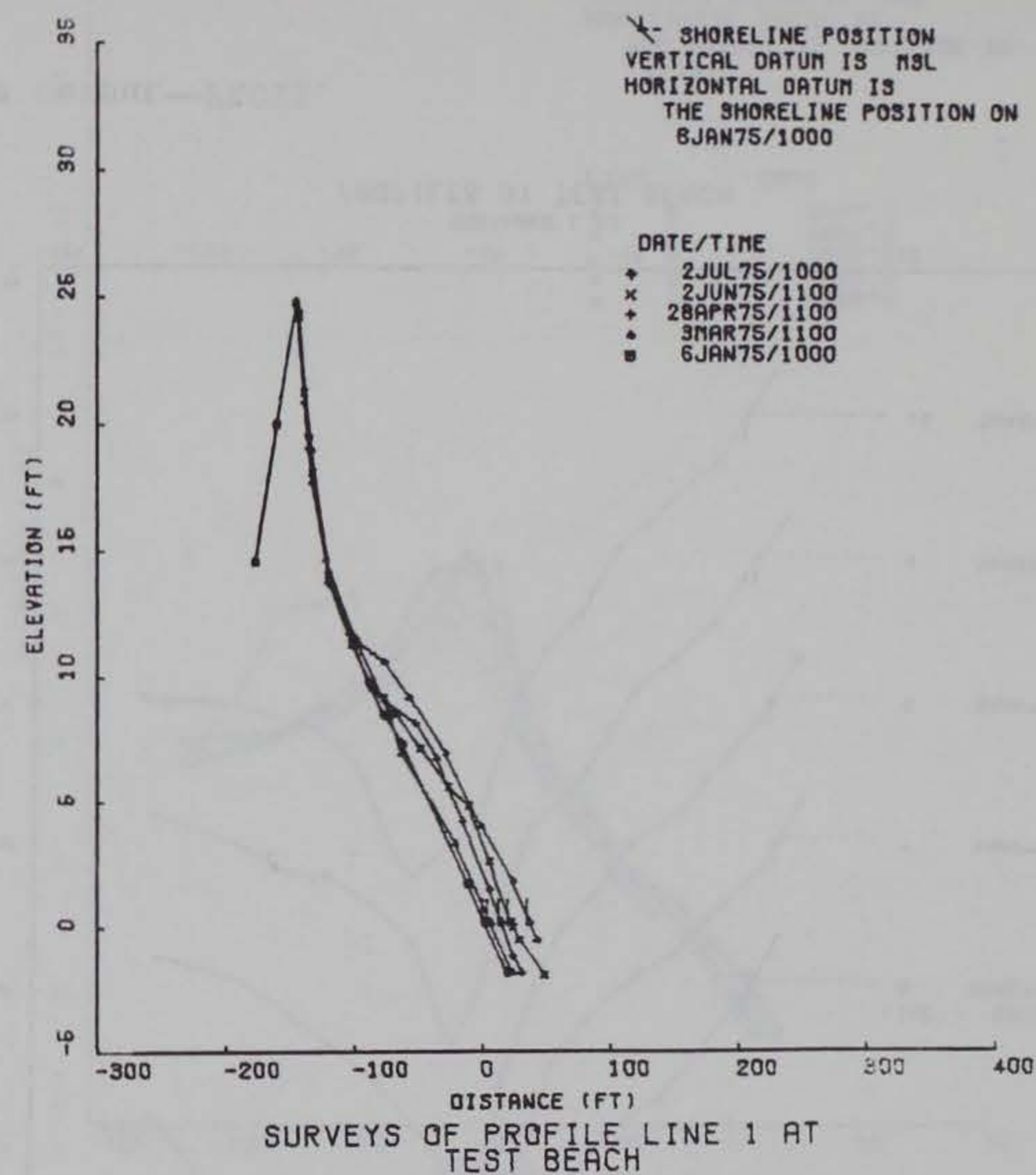
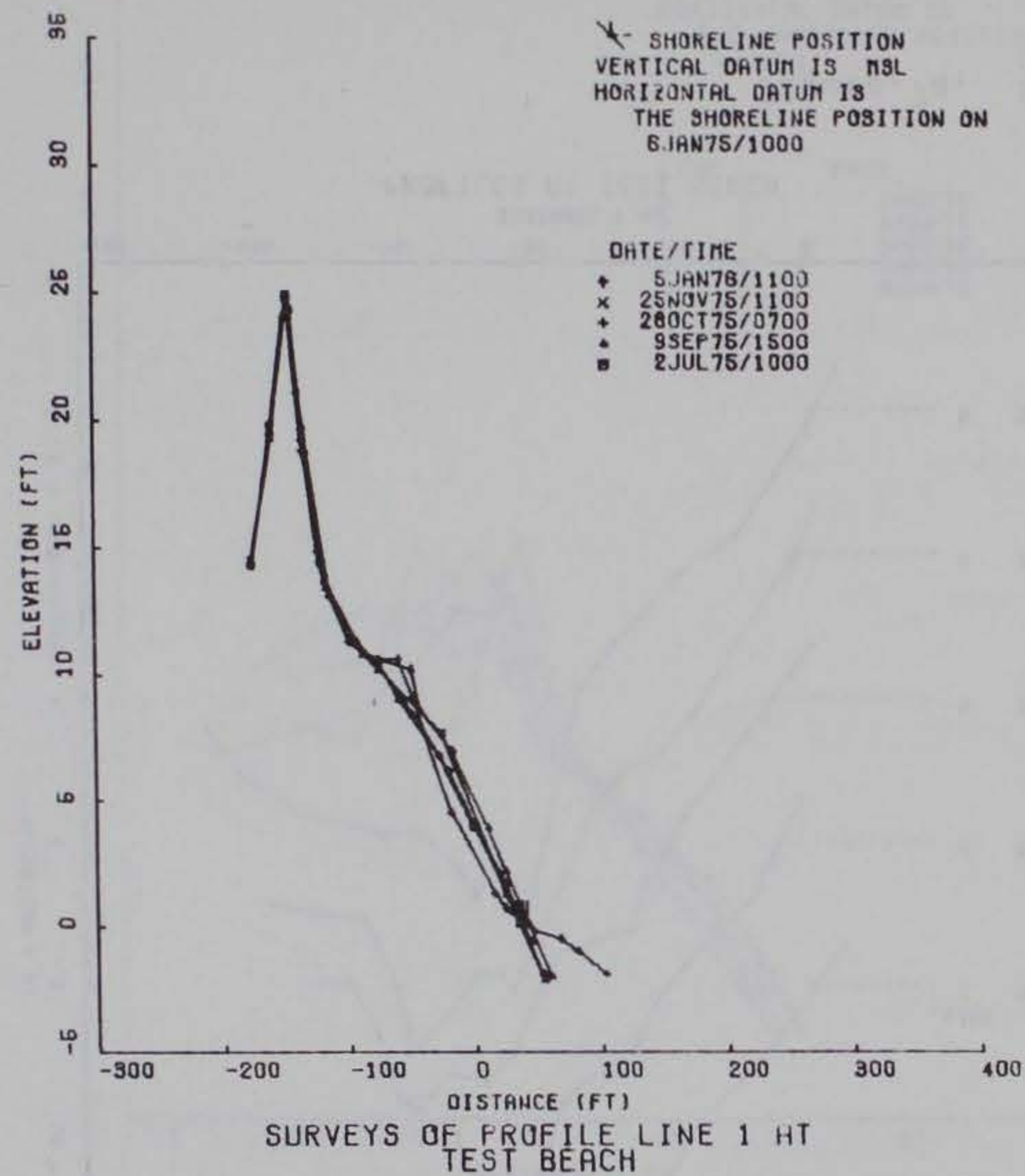


Figure 6b. SURVY1 sample output--PLOT1.

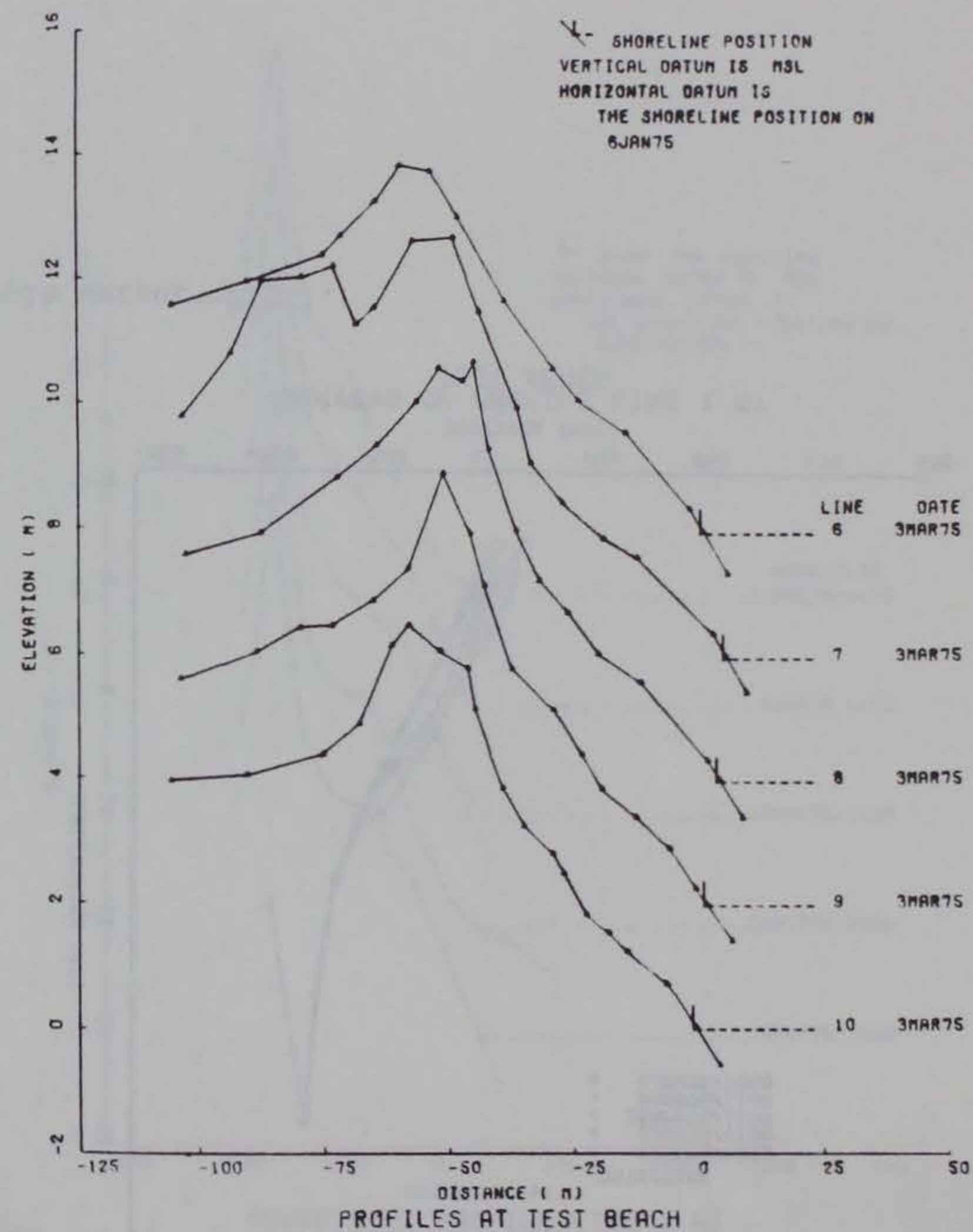
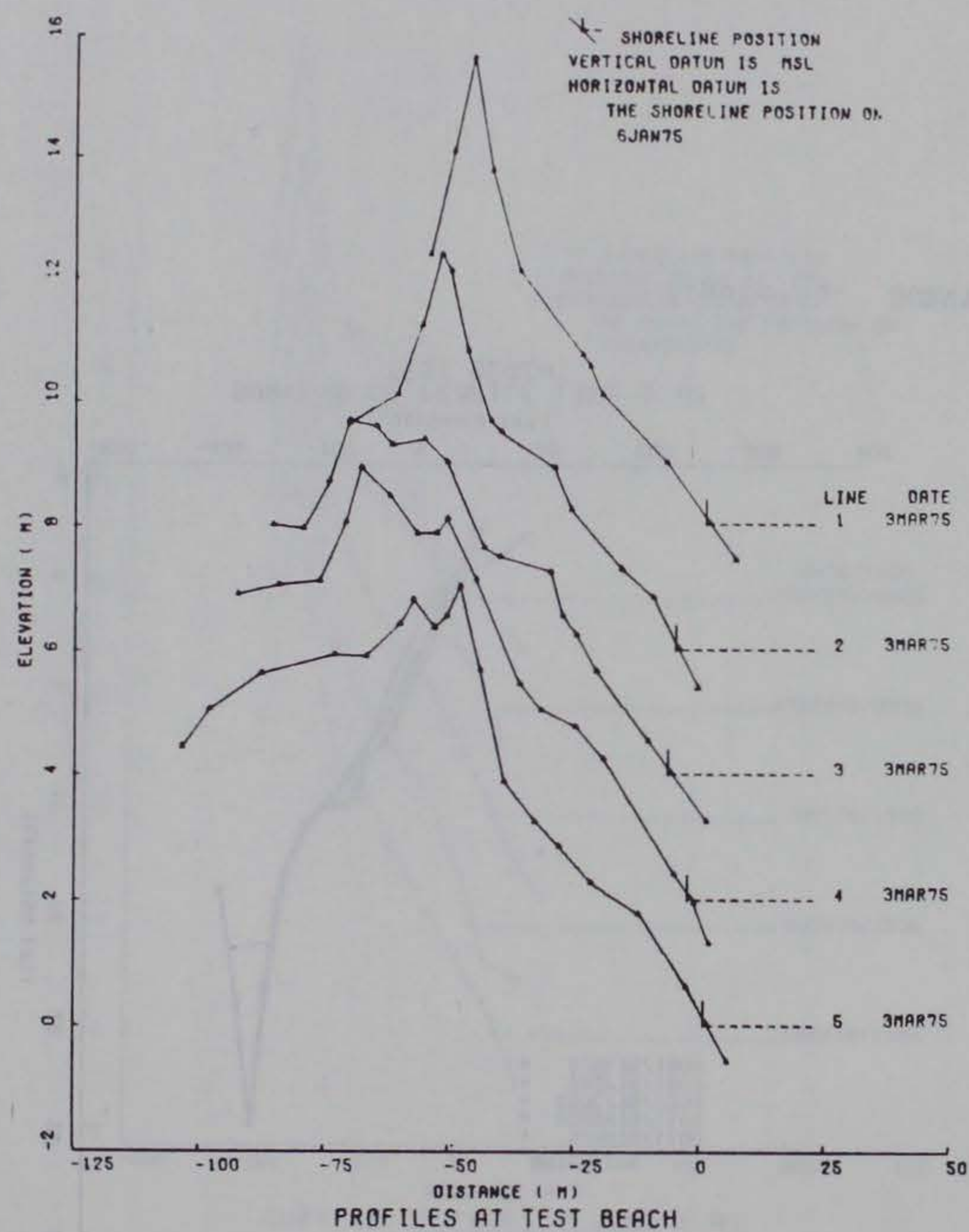


Figure 7a. SURVY1 sample output--PLOT2.

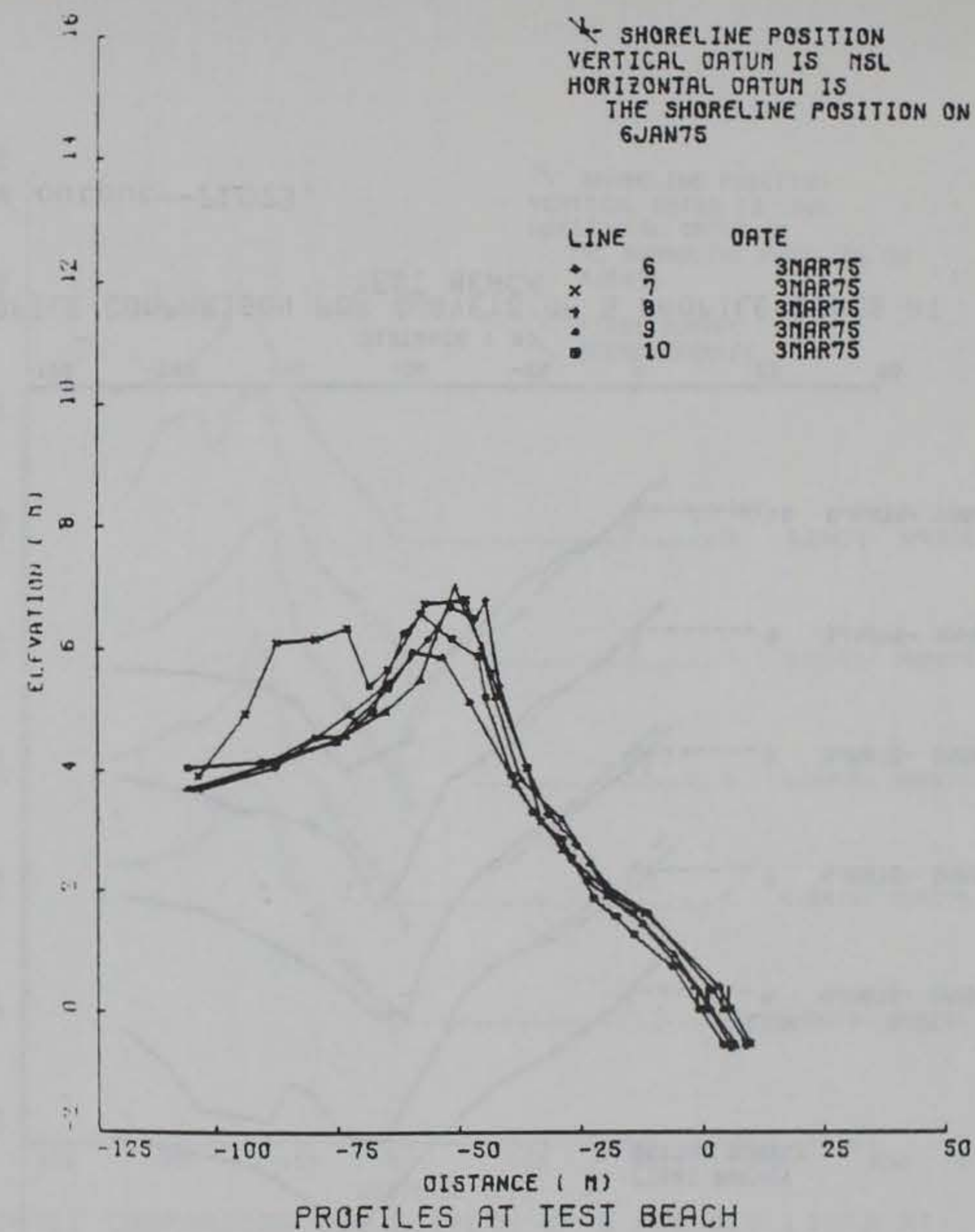
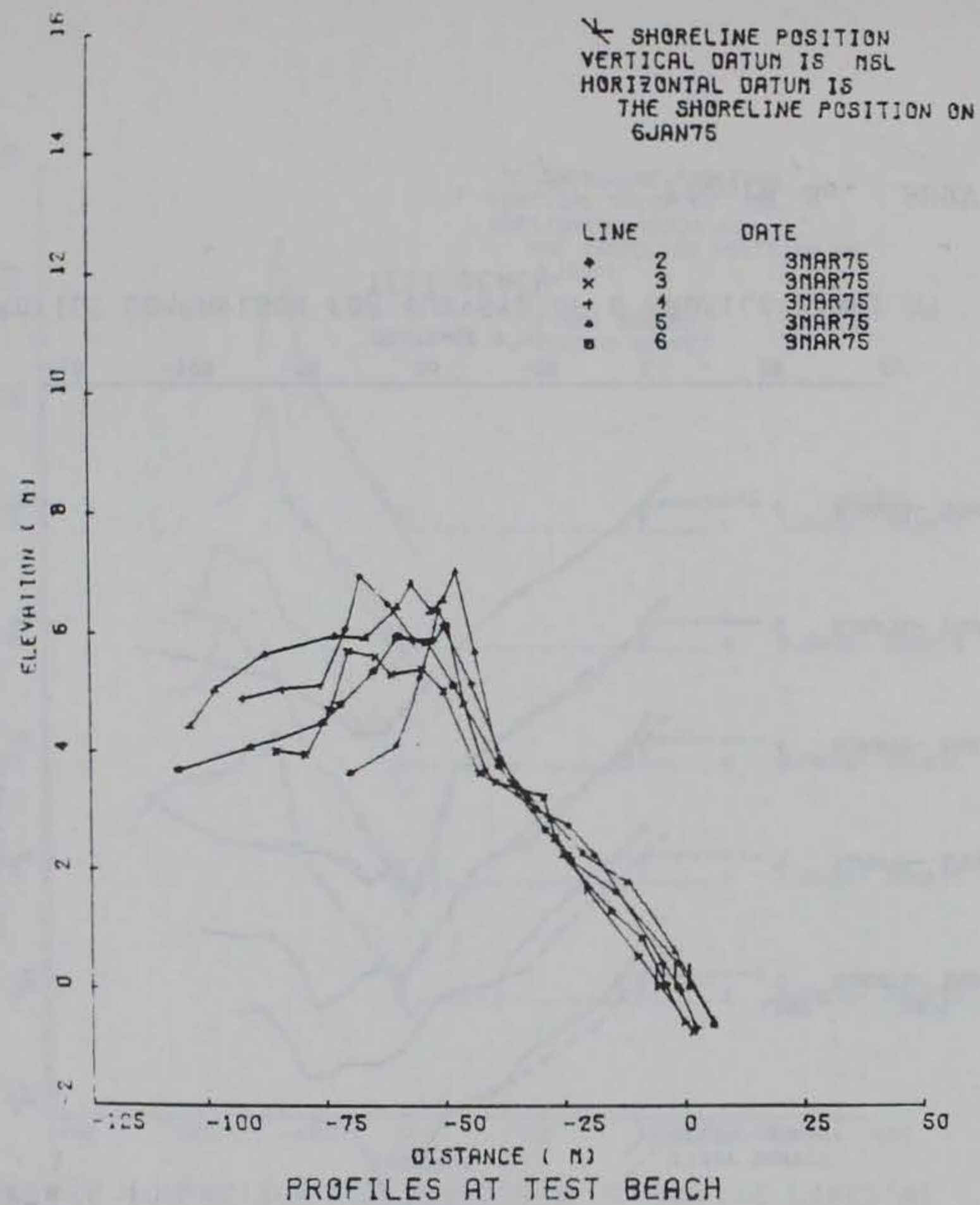


Figure 7b. SURVY1 sample output--PLOT2.

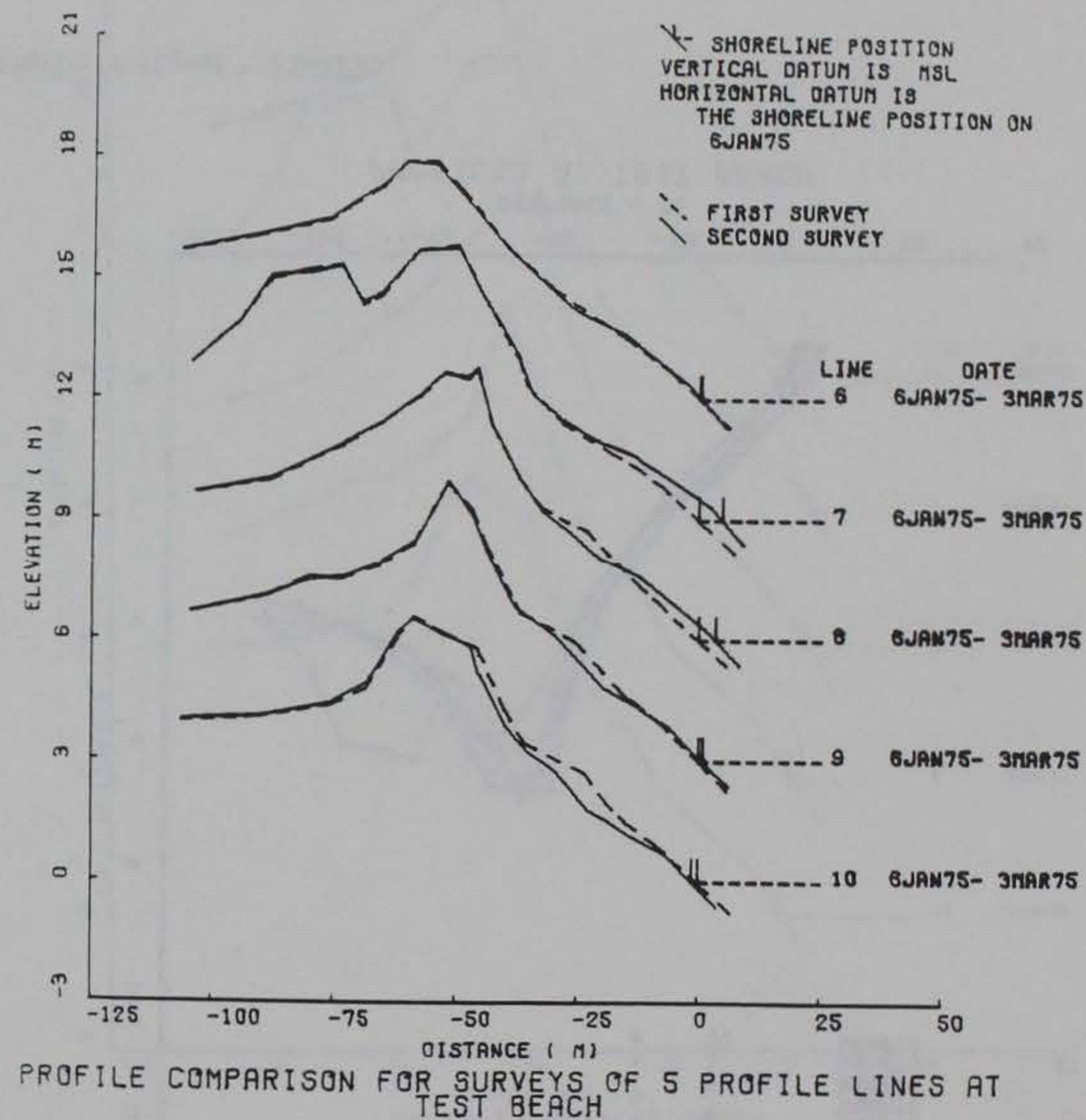
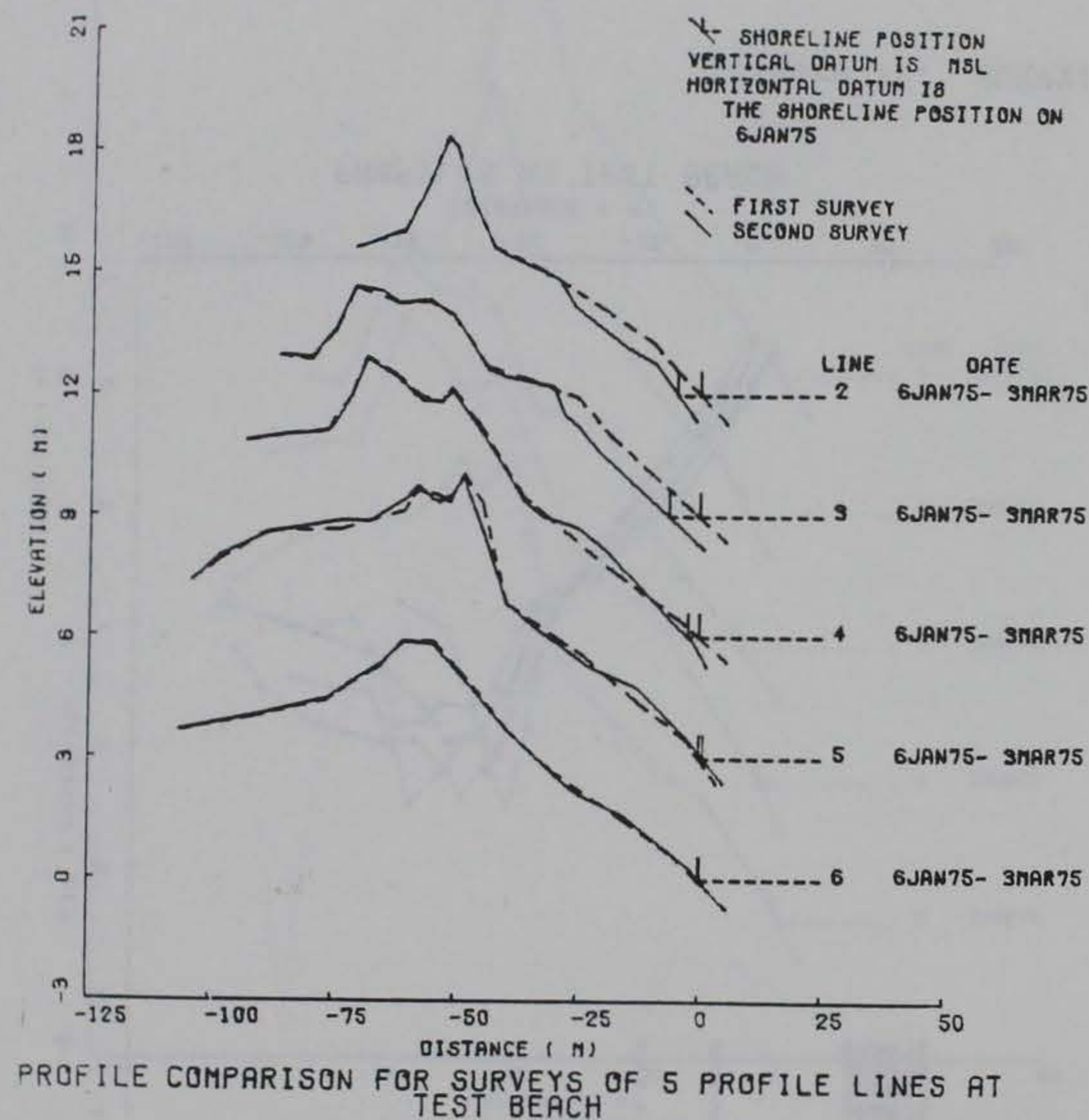


Figure 8a. SURVY1 sample output--PLOT3.

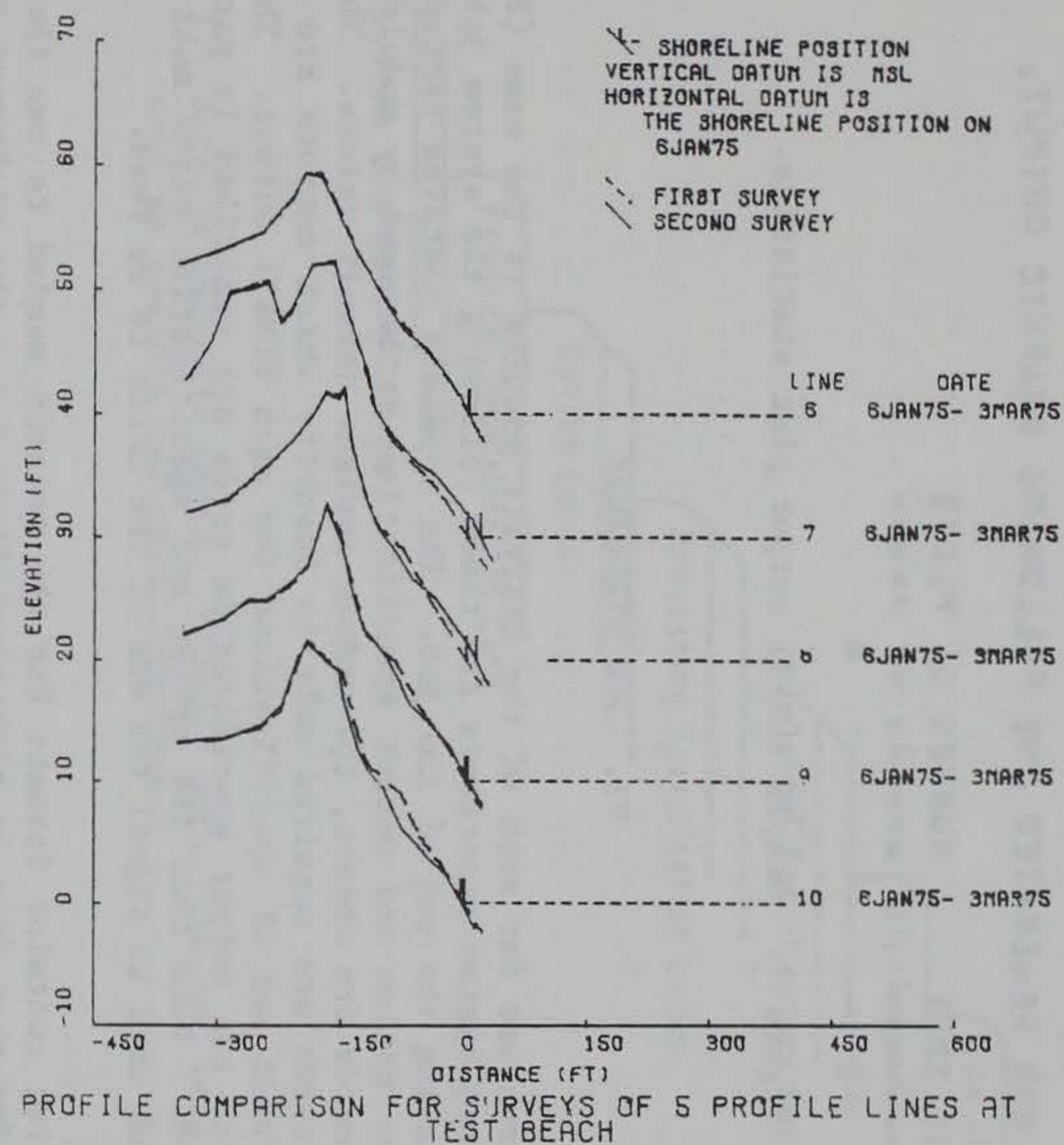
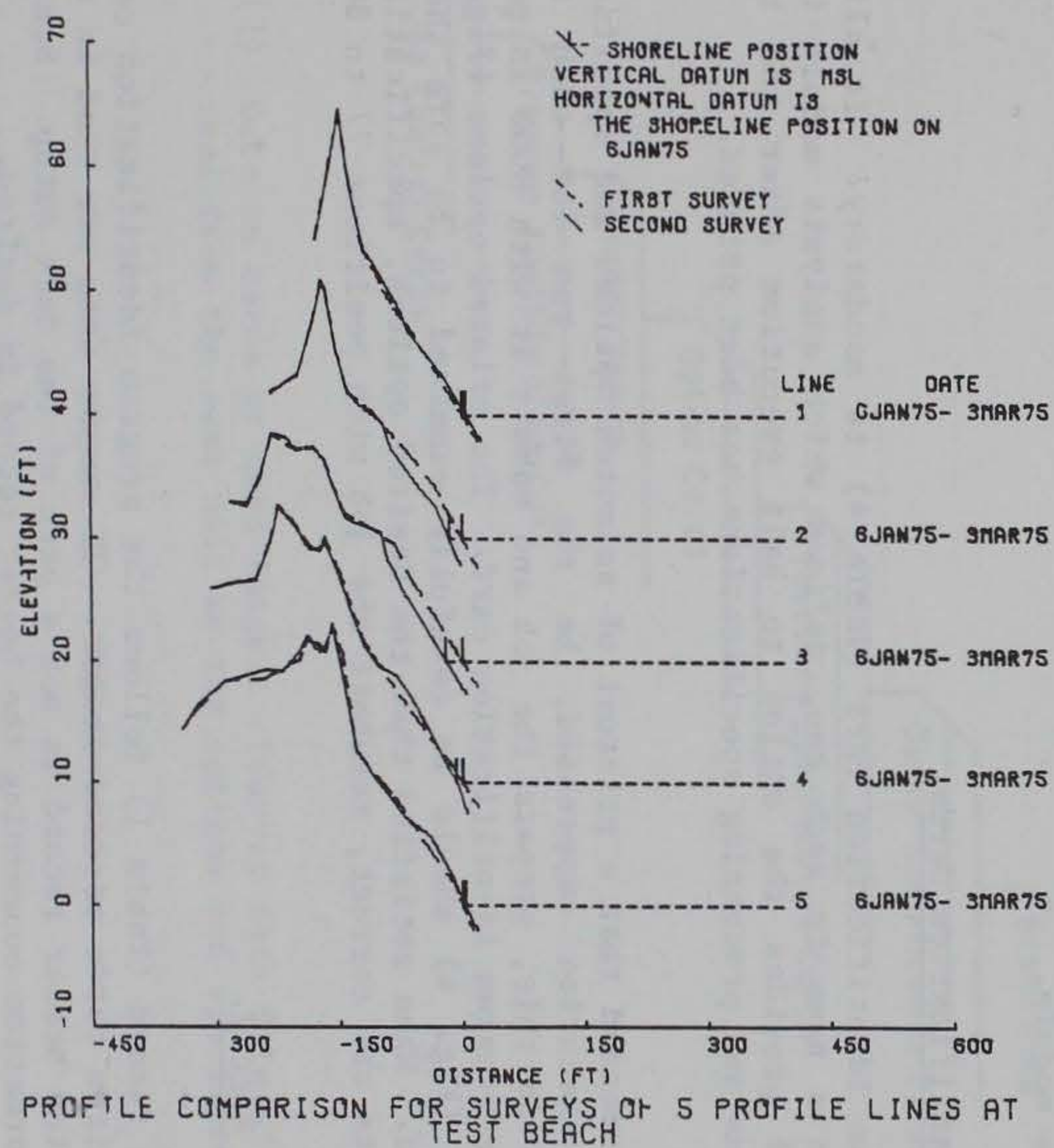


Figure 8b. SURVY1 sample output--PLOT3.

THIS RUN GENERATED THE FOLLOWING GRAPHIC OUTPUT.

PLOT TYPE	NUMBER OF PLOTS
-----	-----
1	8

Figure 9. Sample SURVY1 output plot statistics.

VI. JOB STRUCTURE

The job structure for each of the analysis modules is the same (Fig. 10). The only required system separators are those following the system job control cards and signaling the end of the job. The Appendix contains record layouts for each of the option and output specification cards used by module SURVY1. If the option cards are absent, the module assigns default values. The output specification cards are required only to identify which outputs are desired; there is a default set of specifications for each SURVY1 output. The format and defaults for the output specification cards are described in paragraph 5 of this section. Note that the option and specification cards must be followed by a blank card to signal the end of the cards to be read.

The following contains formats for the records needed to run the module. It is recommended that data be right-justified; i.e., the rightmost character or number always occupies the rightmost position in the field. This will ensure that extra zeros are not added to the end of numeric entries when they are read by the module.

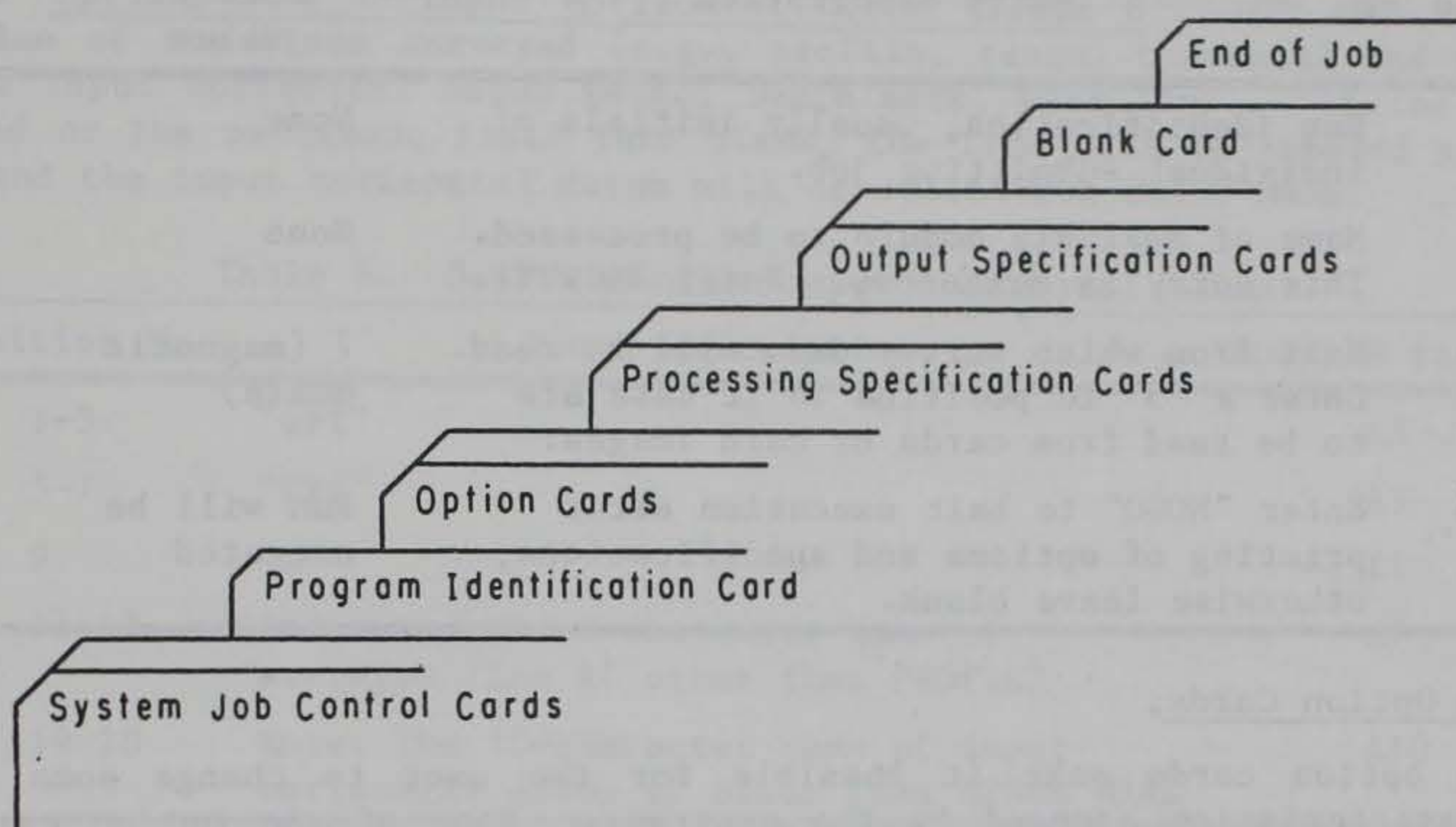
1. Program Identification Cards.

The program identification card (Table 4) is mandatory. It allows the user to assign a name to each run, defines which analysis module is to be processed, and provides the option to halt execution after the table of selected options and processing specifications has been printed.

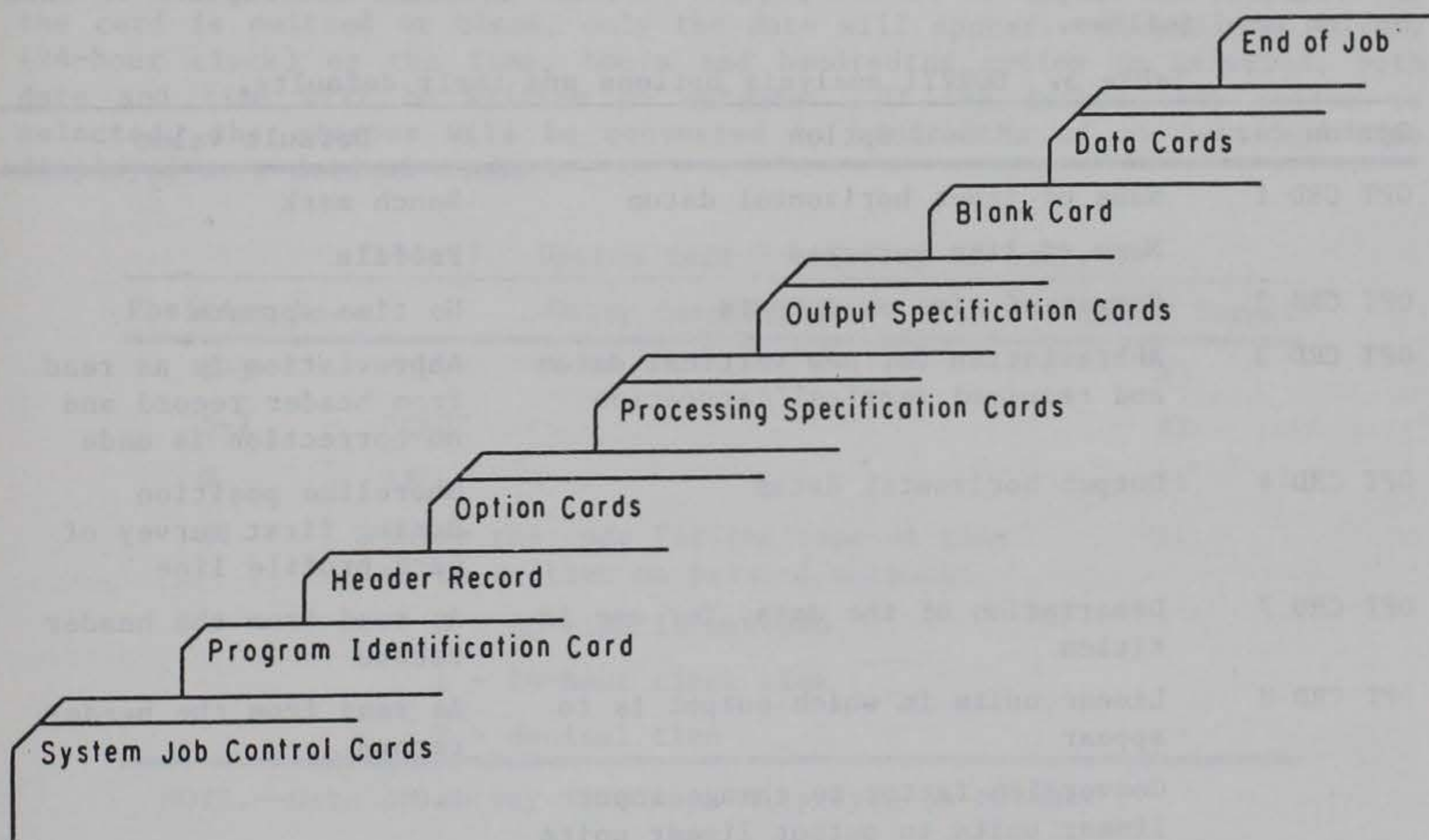
It is recommended that a printout of selected options and specifications, with further execution suppressed, be the first run for each analysis attempted. To do this, prepare the job and submit it with NOGO in positions 77 to 80 of the program identification card. The printed options (Fig. 3) and specifications (Fig. 4) should be carefully examined to be sure they match those requested. When satisfied that the desired options, specifications, and selected outputs are correct, resubmit the job with positions 77 to 80 blank.

2. The Header Record.

The header record (Table 1) follows the program identification card when data are read from cards or card images. If survey data are read in magnetic media format, the header record is not a part of the deck setup. See Section IV if more information concerning the header record is desired.



- (1) Data on magnetic media. (Survey data file not read from same unit as options and specifications.)



- (2) Data on cards or card images. (Survey data file will be read from the same unit as the options and specifications.)

Figure 10. Job structure.

Table 4. Program identification card.

Position No.	Entry description	Default value	FORTRAN format
1-6	Run identification, usually initials of individual submitting job.	None	A6
8-13	Name of analysis module to be processed. This entry is <i>mandatory</i> . Enter "SURVY1."	None	A6
15-16	Unit from which survey data will be read. Enter a "5" in position 16 if data are to be read from cards or card images.	7 (magnetic media)	I2
77-80	Enter "NOGO" to halt execution after printing of options and specifications, otherwise leave blank.	Run will be executed	A4

3. The Option Cards.

The option cards make it possible for the user to change some of the data characteristics assumed by the programs. None of the option cards are required. Table 5 contains the values assigned when option cards are omitted. If any of the values are to be changed, only the option cards defining the value to be changed need be submitted and only the fields on the card pertaining to that value need be completed. A more detailed description of each option card follows.

Table 5. SURVY1 analysis options and their defaults.

Option card	Option	Default value
OPT CRD 1	Name of input horizontal datum	Bench mark
	Name of line surveyed	Profile
OPT CRD 2	Format of time on outputs	No time appears
OPT CRD 3	Abbreviation for new vertical datum and required vertical correction	Abbreviation is as read from header record and no correction is made
OPT CRD 4	Output horizontal datum	Shoreline position during first survey of each profile line
OPT CRD 7	Description of the data, for use in titles	As read from the header record
OPT CRD 8	Linear units in which output is to appear	As read from the header record
	Conversion factor to change input linear units to output linear units	1.0
OPT CRD 9	Minimum elevation from which extrapolation is considered valid (>0)	No extrapolation is performed
OPT CRD 10	Format in which the final data file is to be read	As necessary to read data as formatted in Table 3 if input is on cards, otherwise as in Table 2

a. Option Card 1--Input Horizontal Datum (Table 6). OPT CRD 1 defines the name of the lines surveyed (e.g., profile, range, transect) and the name of the input horizontal datum (e.g., bench mark, base line). If the card is omitted or the pertinent field left blank, the line will be labeled a PROFILE line and the input horizontal datum will be called the BENCH MARK.

Table 6. Option card 1--input horizontal datum.

Position No.	Entry description	FORTTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
9	"1"	I1
11-17	Enter the seven-character name of surveyed line if other than PROFILE	A7
19-28	Enter the 10-character name of input horizontal datum if other than BENCH MARK	A10

b. Option Card 2--Display of Time (Table 7). The date of a survey always appears on outputs, but the time of the survey does not. OPT CRD 2 allows the user to define the type of time, if any, which is to appear on outputs. If the card is omitted or blank, only the date will appear. If the time of day (24-hour clock) or the time, hours and hundredths option is selected, both date and time will be written on outputs. If the latter time option is selected, the minutes will be converted to hundredths of an hour and time displayed as a decimal number.

Table 7. Option card 2--display of time.

Position No.	Entry description	FORTTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
9	"2"	I1
11	Enter the code for the type of time to be written on printed outputs: 0 - no time is written 1 - 24-hour clock time 2 - decimal time	I1

NOTE.--Date of survey is always displayed on output.

c. Option Card 3--Output Vertical Datum (Table 8). OPT CRD 3 allows the user to change the vertical datum to which the survey data are referenced. If the card is omitted or left blank, the vertical datum will be as defined on the header record and there will be no change to the vertical coordinates. If a change is desired, enter the four-character abbreviation of the new vertical datum and the amount, in selected *output units*, which must be *added* to each vertical coordinate to make the adjustment.

Table 8. Option card 3--output vertical datum.

Position No.	Entry description	FORTTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
9	"3"	I1
11-14	Enter the four-character abbreviation for output vertical datum if other than that on header record.	A4
15-25	Enter the amount, in <i>output</i> units, to be <i>added</i> to each vertical coordinate.	F10.3

d. Option Card 4--Output Horizontal Datum (Table 9). OPT CRD 4 allows the user to select the reference horizontal datum to which the output is to be adjusted. If this card is omitted or left blank, the shoreline position during the first survey of each profile line is the output horizontal datum. The distance to the shoreline during the first survey at each profile is computed and this amount is *subtracted* from each distance coordinate. Other choices for the output horizontal datum are: (1) the shoreline position during a survey other than the first, (2) the mean shoreline position, (3) the input horizontal datum (i.e., bench mark--in this case the distance coordinates are unaltered), and (4) a user-supplied correction. If the reference is not user-supplied, use the OPT CRD 4, format 1, shown in the Appendix; otherwise, use OPT CRD 4, format 2.

Table 9. Option card 4--output horizontal datum.

Position No.	Entry description	FORTTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
9	"4"	I1
11-13	Enter the number of profile lines. <i>Used only when the output horizontal datum is to be user-supplied.</i> If left blank, the number of profile lines will be as defined on the header record. ¹ The program will expect to read an adjustment for the number of lines entered here.	I3
15 (IXDTM)	Enter the type of output horizontal datum selected: 1 or blank - shoreline position during first or defined reference survey of each line. 3 - mean shoreline position. 4 - no adjustment to distance coordinates. 5 - user-supplied. Adjustments entered on SUP 4A cards.	I1
16-19 (IXDTM = 1 only)	Enter the reference survey number. If blank, program uses the first survey of each line, which may or may not be the same for all profile lines. All profile lines not surveyed during the selected reference are eliminated from processing.	I4
16-38 (IXDTM = 5 only)	Enter the first line of description of user-supplied horizontal datum.	2A10,A3
39-67 (IXDTM = 5 only)	Enter the second line of description of user-supplied horizontal datum.	2A10,A9

¹The header record contains the largest and smallest profile line number. If there is not a profile line associated with each number between, this field should not be left blank.

If the correction is supplied, the user must provide SUP 4A (Table 10) cards to define the amount, in *output* units, which is to be *subtracted* from each distance coordinate at each profile line. The SUP 4A cards must immediately follow OPT CRD 4, be sequentially numbered, and cannot be included if the output horizontal datum adjustment is not user-supplied. While there need not be an entry on the SUP 4A cards for every profile line in the data set, only those represented will be processed by SURVY1.

Table 10. Supplementary option cards 4A--
distance to output horizontal
datum, user-supplied.

Position No.	Entry description	FORTTRAN format
1-3	"SUP"	A3
5-6	"4A"	A2
7-9	Sequential card number	I3
11-13	Profile line number	I3
14-23	Corresponding adjustment in <i>output</i> units, to be <i>subtracted</i> from each distance coordinate	F10.3
24-26	Profile line number	I3
27-36	Corresponding adjustment	F10.3
37-39	Profile line number	I3
40-49	Corresponding adjustment	F10.3
50-52	Profile line number	I3
53-62	Corresponding adjustment	F10.3
63-65	Profile line number	I3
66-75	Corresponding adjustment	F10.3

The output horizontal datum option has proven to be useful for plotting profiles with horizontal datums well inland of the active beach, or for comparing lines with datums at varying distances from the shoreline. By adjusting the horizontal datum, profiles are effectively "lined up" at the shoreline, dune crest, or other selected reference distance. Care must be taken to ensure that the horizontal datum exists on the reference survey of each profile line. For example, under default conditions the reference survey is the first survey of each profile line and the horizontal datum is the distance to the zero elevation at the time of that survey. If this position is not defined (i.e., the survey did not extend far enough seaward), the profile line is eliminated from the data set and any output from that particular line is suppressed.

Care must also be taken to ensure that subsequent runs of the data file have the same reference. When data are extracted from larger sets or new data are added to existing sets, it is possible that the first survey of a line will change; it is certain that the mean shoreline position will change. Under these circumstances, the user should record the distance to the horizontal datum for the original data set and supply it on SUP 4A card during subsequent runs.

e. Option Card 7--Data Description (Table 11). The description of the data (e.g., locality or site name) contained on the header record will appear on each output. If the user wishes to change this description, OPT CRD 7 may be used. If the card is omitted or left blank, the data description will be as defined on the header record.

Table 11. Option card 7--data description.

Position No.	Entry description	FORTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
9	"7"	I1
11-41	Enter the 31-character data description which supersedes the description on the header record.	3A10,A1

f. Option Card 8--Linear Output Units (Table 12). OPT CRD 8 is used to define the linear output units. If the card is omitted or left blank, the linear output units will be the same as the input. If output units are to be meters or centimeters and the input is in feet, the conversion factor is supplied by the program; otherwise, the user must supply the required conversion factor. Each distance and elevation read from the input survey file will be multiplied by this factor.

Table 12. Option card 8--linear output units.

Position No.	Entry description	FORTRAN format
1-3	"OPT"	A3
5-9	"CRD"	A3
9	"8"	I1
11-12	Enter the abbreviation for linear output units of measurement. If blank, these will be as defined on the header record.	A2
13-22	Enter the conversion factor. Input units are multiplied by this number to convert to output units. This field may be blank if: (a) Input and output units are the same (factor set to 1). (b) Input units are FT, output units are M (factor set to 0.3048). (c) Input units are FT, output units are CM (factor set to 30.48).	F10.3

g. Option Card 9--Extrapolation to Zero Elevation (Table 13). Since the shoreline position is of major interest in the analysis of beach profile data, there may be cases when the user decides that extrapolating the distance to the zero elevation is valid. In this case, OPT CRD 9 can be used to specify the elevation, in output units relative to the output vertical datum, that the last surveyed point must reach before the shoreline position can be extrapolated. If the card is omitted or left blank, no extrapolation occurs. When any computation is performed using data for which the shoreline position was extrapolated, output of the results of that computation is flagged. No extrapolation will be performed for profiles where the last line segment is not sloping seaward.

Table 13. Option card 9--extrapolation to zero elevation.

Position No.	Entry description	FORTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
9	"9"	I1
11-20	Enter the maximum elevation above the output vertical datum, in output units, which the last surveyed point must reach in order that the shoreline position be extrapolated. If this is blank or zero, the shoreline position will not be extrapolated.	F10.3

h. Option Card 10--Format of Input Data (Table 14). If the format specified for card image data (Table 3) or magnetic media data (Table 2) does not fit the format of the user's input data, an alternate format may be specified using OPT CRD 10. Knowledge of FORTRAN format specifications is required to use this option effectively. All the data elements but the locality code are used in the analysis computations. Thus, while this card can be used to change the field length, order, or format in which data elements are read, all elements must be present. The expected order of the variables is shown in Tables 2 and 3; the order in which the variables are read may be changed by using the FORTRAN tab or T format specification. The T format specification is described in most FORTRAN texts and reference manuals, e.g., Stuart (1970)¹.

Table 14. Option card 10--format of input data.

Position No.	Entry description	FORTRAN format
1-3	"OPT"	A3
5-7	"CRD"	A3
8-9	"10"	I2
11-80	Enter the survey data format. If this card is blank or omitted, data will read as follows: (a) Input unit is 5: (2X,I3,I4,1X,3I2,I3,I2,F5.0,11X,8F5.0/(10X,13F5.0)). (b) Input unit is 7: (2X,I3,I4,3I2,I3,I2,I3,F5.0,7X,120F5.0).	7A10

4. Processing Specification Cards.

Some analysis modules allow the definition of special processing requirements on processing specification cards. SURVY1 does not require these cards; however, if cards prepared for processing other analysis modules are read, they will be ignored and will not affect processing.

¹Stuart, F., *FORTRAN Programming*, John Wiley & Sons, Inc., 1970.

5. Output Specification Cards.

SURVY1 will produce one tabular and three graphical displays: TABLE1, PLOT1, PLOT2, and PLOT3. These outputs are described in detail in Section V. Any or all of the outputs may be produced during a single run. An output and any required specifications for the output are selected by entering an output specification card. One, and only one, card must be entered for each output selected.

a. Table Output. Table 15 describes the format of the output specification card for TABLE1 (Fig. 5). There are no specifications for the table.

Table 15. Format of TABLE1 specification card.

Position No.	Entry description	FORTTRAN format	Default value
1-5	"TABLE"	A5	None
9	"1"	I1	None

b. Plot Output. Table 16 describes the format for the output specification cards for plot output (Figs. 6, 7, and 8) and defines the defaults which will be assigned if the card is not completed. A separate card must be prepared for each type of plot to be output. With the exception of the plot output unit, it is not necessary that each type of plot have the same specifications when more than one type is output during a single run; format specifications for each type of plot are read and processed separately.

(1) Output Unit for Plot Commands. The plot commands may be written either to unit 3 (normally signaling card output) or 8 (normally signaling output to magnetic tape). The user must ensure that data written to these units are handled properly in the job control stream.

(2) Default Plot Specification. If the defaults for values supplied in positions 13 to 80 are acceptable and the selected output units of measurement are feet, positions 13 to 80 need not be completed. However, if any plot specifications are to be supplied or output units are not feet, all fields must be completed. (The unit onto which plot commands are to be written may be changed without affecting other default specifications.)

(3) Lines Per Plot. Up to 10 profiles, or pairs of profiles, may be drawn on a single plot.

(4) Offset. When more than one profile (or pairs of profiles) is drawn on a single plot, the second and subsequent profiles may be offset. The offset will be added to vertical coordinates before additional lines are plotted. The offset may be positive or negative; for plot types 1 and 2, it may be zero. The profile line with the largest number is drawn first and the others offset on plot types 2 and 3. On plot type 1, the profile with the smallest survey number is drawn first.

Table 16. Plot specifications for SURVY1 plot output.

Position No.	Entry description	FORTTRAN format	Default value
1-4	"PLOT"	A4	None
9	Plot type. Enter 1, 2, or 3	I1	None
11	Output unit for plot commands: "3" - cards "8" - magnetic tape	I1	3
12	Use default specifications: blank - yes (use only if output units are feet) "1" - no, remainder of card will be read	I1	Yes
Horizontal axis:			
13-20	origin	F8.2	-600.00 (ft)
21-27	increment (units per inch on plot)	F7.2	150.0 (ft/in)
28-31	length in inches	F4.1	6.0 (in)
Vertical axis (distance):			
33-40	origin	F8.2	-10.0 (ft)
41-47	increment (units per inch on plot)	F7.2	10.0 (ft/in)
48-51	length in inches	F4.1	5.0 (in)
53-54	Lines per plot (maximum 10)	I2	5
55-60	Offset	F6.2	5.0 (ft)
62-67	Overlap: blanks - there will be no overlap "OVERLAP" - plots will be overlapped	A6	No overlap
69	Factoring: "0" - size of plot not altered "1" - size of plot altered	I1	No factoring

(5) Overlap. For plot type 1, a new axis is automatically drawn when all data collected at a single profile line have been processed. For plot types 2 and 3, a new axis is drawn when all data collected during each survey or pair of surveys have been processed. When the number of profiles drawn on a single plot (lines per plot) is greater than 1, the user may specify that plots be overlapped. The last profile depicted on each plot will be the first drawn on the next until a change occurs in the profile line or survey number. The overlapped profile counts toward the number of lines per plot.

(6) Factoring. The factoring option is used to specify whether or not the final plot size is to be altered before being output. The user has no control over the factor used; this is determined by the length of the longer axis. When plots are factored, the x-axis will be no longer than 5 inches and the y-axis no longer than 6 inches. Plot size will be increased if both axes are shorter and decreased if either is longer.

(7) Defining Axis Length, Increment, and Origin. The maximum and minimum distance and elevation tabular outputs from program EDIT2 can be used to define optimal axis length, origin, and increment. Allow an extra inch on both the horizontal and vertical axes so that the plot legend will not interfere with the plotted data. When a large number of plots are to be produced, some test plots should be run and examined before the final production run is submitted.

VII. SUMMARY

SURVY1 produces one table and three graphical displays. The major function of the module is to display profiles at a locality through time. Shoreline position is emphasized. The outputs have also proven to be useful in finding surveying or data reduction errors which have not been corrected during the preliminary edit. The outputs have been designed so that they can be used in reports without being redrafted.

APPENDIX

SURVY1 RECORD LAYOUTS FOR OPTION AND OUTPUT SPECIFICATION CARDS

Program ID Card

[illegible]

Option Card 1

[illegible]

Option Card 2

$$(F1)$$

Time on computer:

○ → NO

1 → 24 hour clock

2 → Hours and hundredths

[illegible]

Option Card 3

[illegible]

Option Card 4, Format 1
(may not be followed by SUP 4A cards)

(I1) (I4)

[illegible]

[illegible]

(must be preceded by option card 4, Format 2)

[illegible]

Option Card 7

$$(3A10, A1)$$

31 character description of data if that on the header record is not acceptable

[illegible]

Option Card 8

(only positions 1 to 22 are used by ELVDIS)

[illegible]

Option Card 9

(F10.3)

Minimal elevation, output units from output vertical datum, of last surveyed point from which shoreline can be extrapolated

[illegible]

(7A10)

[illegible]

1	NAME	2	DOB	3	2900	4	4. Read as provided from end of this column or, authorized after desired information is filled-in.																				80 COLUMN KEY PUNCH TRANSCRIPT LAYOUT SHEET	SHEET	OF	SHEETS
---	------	---	-----	---	------	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	---	-------	----	--------

PLOT1, PLOT2, and PLOT3 Output Specification Cards

(H)(T)												(E2)												(F6.2)												(A6)												(T1)																															
Horizontal (x) Axis												Vertical (y) Axis												Offset												Enter												Enter																															
(F8.2) (F7.2) (F4.1)												(F8.2) (F7.2) F4.1												# lines per plot												Enter amount to be added to vertical coordinates of second and subsequent lines drawn on a single plot												"OVERLAP" if last line drawn on one plot is to be the first on the next												Enter '1' if plot is to be factored																			
Origin Increment Length												Origin Increment Length																																																																			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
PLOT												1																																																																			
PLOT												2																																																																			
PLOT												3																																																																			

Fleming, Marilyn V.

Beach Profile Analysis System (BPAS). Volume III. BPAS user's guide: analysis module SURVY1 / by Marilyn V. Fleming and Timothy J. Lawler.--Fort Belvoir, Va. : U.S. Army, Corps of Engineers, Coastal Engineering Research Center ; Springfield, Va. : available from NTIS, 1982.

[46] p. ill. ; 27 cm.--(Technical report / Coastal Engineering Research Center; no. 82-1 v.(III)). Cover title.

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TC203

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