ELEPHANT BUTTE RESERVOIR

1980 Sedimentation Survey

U. S. Department of the Interior
Bureau of Reclamation

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1980 SEDIMENTATION SURVEY

by

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CONTENTS

TABLES

FIGURES

FIGURES - Continued

FIGURES - Continued

INTRODUCTION

Elephant Butte Dam (originally called Engle Dam) was one of the first major structures built by the Reclamation Service (now the Bureau of Reclamation) after its formation in 1902. Construction of the dam began in 1908, but progress was delayed when difficulty was encountered in obtaining reservoir land. Construction of the dam resumed in 1912 and was completed in 1916, although water storage operations began in January 1915. Located about 125 miles north of El Paso, Texas, on the Rio Grande, the dam is part of the multipurpose Rio Grande Project that controls floods, generates power, and stores and delivers irrigation water.

The dam is a 301-foot-high concrete gravity structure that is 1,674 feet long and impounds 2,110,298 acre-feet of water. The spillway is an uncontrolled concrete ogee weir structure. A spillway channel below the dam was added in 1921 and modified in 1947. Service outlet deflectors were added in 1944. The general plan and sections of the dam and spillway are shown in figure 1 1/.

In 1915, the surface area of Elephant Butte Reservoir was 40,064 acres and the capacity was 2,634,800 acre-feet at a spillway crest elevation of 4,407 feet 2/. The 1980 survey showed a surface area of 36,897 acres and a capacity of 2,110,298 acre-feet at the same spillway crest elevation. This difference indicates a loss of 524,502 acre-feet in capacity in the 65.1 years since the dam was built.

The reservoir has a length of 41 miles and an average width of 1.39 miles. The average width was determined for the entire reservoir including the portion known as "The Narrows" which separates the upper and lower reservoir areas.

The total Rio Grande drainage area above the dam is 25,923 square miles, of which 11,803 square miles are the net sediment contributing area. Sediment from the remaining drainage area is being trapped by upstream dams such as Abiquiu, which closed in 1963; Galisteo, closed in 1970; and Cochiti, closed in 1973.

A plot of monthly inflows to the reservoir is shown in figure 2 for the period January 1916 through June 1980. The average annual inflow, based on 63.3 years of record, is 845,300 acre-feet. An inflow-duration curve based on the monthly inflow discharge is shown on figure 3. Information from curves of this type is useful in making reservoir operation studies. Streamflow records of the gaging station at San Marcial, New Mexico, were used to represent the inflow for the period through water year 1951. Beginning with water year 1952, the combined streamflow records of the floodway and conveyance channel at San Marcial were used. These records, however, did not reflect the total inflow since additional downstream tributaries to the reservoir, such as Monticello and Nogal Canyons, also contribute to the inflow.

1/ All figures and tables follow the text.
2/ All elevations quoted are based on the original project datum. To adjust the elevations to mean sea level datum, 43.3 feet should be added.

Monthly outflow records were plotted on figure 4 for the period October 1916 through September 1980 (63.9 years). An average annual outflow of 701,400 acre-feet was computed for this period.

Reservoir stages at the end of each month from March 1915 through January 1980 are plotted on figure 5. Elephant Butte Reservoir operation ranged from a minimum elevation of 4,258.03 feet in 1954 to a maximum elevation of 4,409.15 feet in 1942.

SUMMARY AND CONCLUSIONS

This report includes a discussion of methods used to measure and study 65.1 years of reservoir sediment accumulations. It also briefly describes the field surveying procedures and equipment.

The primary purpose of running the 1980 survey was to gather data needed to compute the capacity of Elephant Butte Reservoir as required by the Rio Grande Compact.

Standard land surveying methods were used to establish horizontal control points for the survey. The hydrographic survey used sonic depth recording equipment and an automated survey system with a line-of-sight electronic positioning unit. The system continuously recorded reservoir depths and horizontal distances from a fixed point as the boat was steered across the range line. Reservoir water surface elevations read on the gage at the dam were used as control in converting sonic depth measurements to true bottom elevations and to delineate the cross-sectional profiles.

The capacity of the reservoir from the 1980 survey was determined to be 2,110,298 acre-feet, with a surface area of 36,897 acres at a spillway crest elevation of 4,407 feet. The reservoir area and capacity tables were produced by a computer program which used measured contour surface areas and a curve-fitting technique to compute both area and capacity at prescribed elevation increments.

A comprehensive summary of the reservoir sediment data for the 1980 survey is contained in table 2. The volume of sediments that have accumulated in the reservoir since the original survey amounted to 524,502 acre-feet, indicating a loss in capacity of about 20 percent. An average annual sediment accumulation rate of 8,057 acre-feet was found for the period from 1916 to 1980. The sediment yield rate from the drainage area was 0.311 acre-foot per square mile per year for the same period.

DESCRIPTION OF BASIN

Topography of the drainage area is varied. In the extreme northern portion, it is mountainous and rugged. South of Santa Fe, New Mexico, the topography is less rugged, consisting of isolated mountains separated by desert plains and the Rio Grande Valley. The elevations of the drainage area vary from 12,000 feet above mean sea level at the Continental Divide to 4,450 feet above mean sea level in the reservoir headwaters area.

The higher elevations are forested with pine and fir trees, and the slopes are sprinkled with cedars along the foothills. Natural cover of the plains consists chiefly of creosote bush, sagebrush, greasewood, cactus, and natural grasses. Thick stands of salt cedars, willows, and cottonwoods grow along the riverbanks above the reservoir.

The Rio Grande begins in the San Juan Mountains of Colorado and flows between the Conejos Mountains and La Garita Hills. Stream channel slopes are steep in the mountainous headwater regions. Most of the surface rock in these regions is igneous or metamorphic and not easily eroded. Just above the New Mexico State line, the river enters a deep canyon flowing through a stretch of low sediment contribution until it enters Espanola Valley near the confluence with the Rio Chama. Upon leaving the valley, it enters White Rock Canyon in the vicinity of Otow Bridge. The unconsolidated sediments of the Santa Fe Formation (Miocene and Pliocene continental deposits) have been eroded to form the valley of the Rio Grande from the lower end of White Rock Canyon near Cochiti Diversion Dam to near San Acacia. The flood plains and terraces of the valley are composed of alluvium that is available for transport and contributes substantial quantities of sediment to the Rio Grande. From the mouth of the Rio Salado, just upstream from San Acacia, to the headwaters of Elephant Butte Reservoir, the Palomas Formation of the Quaternary period has been eroded to form the river valley. The major geologic formations of the Rio Grande Valley are of the Cenozoic era.

SURVEYS AND EQUIPMENT

Nine different surveys were conducted previously, beginning in 1916. The 1925, 1935, 1940, and 1957 surveys were run by the contour method, while the range method was used for the 1947, 1969, 1974, and 1980 surveys. Fieldwork for the 1980 survey began in June 1979 and ended January 24, 1980. A layout of the reservoir sedimentation range system is shown in figure 6.

Surveying Methods

The fieldwork consisted of locating the existing sedimentation range end markers and relocating those which had been lost or destroyed. To prepare for the range line survey, an extensive line clearing program was conducted in the reservoir area above the Narrows. Range lines 41 through 61 and portions of 40, 37, and 36 were not cleared because of high ground water or surface water. To develop range end control for the 1980 hydrographic survey, a traverse was surveyed from Range 85 through Range 50 and tied into a triangulation point at Range 38 west. Precise electronic distance measuring equipment that could be interfaced with a digital computer to process the data was used for this traverse work. Control points established by the traverse facilitated the profiling of inundated ranges by the sonic sounding equipment described in the following paragraph. Results of the old traverse established for previous surveys were used for control points in running the 1980 survey for ranges in the reservoir area upstream from Range 50. The above water portion of most existing range lines was profiled from the range end to water's edge using standard land surveying procedures and equipment.

A hydrographic survey was run in January 1980, using sonic depth recording equipment to sound the underwater portion of 45 range lines. A depth recorder was interfaced with an automated positioning system (fig. 7) to give continuous reservoir depth and sounding position as the sounding boat traversed each range line. The positioning system transmitted a line-of-sight, microwave signal to fixed shore stations (fig. 8), and converted the time of reply to range distances, which were then used to compute the coordinate position of the sounding boat. The controls required for the system included reservoir elevation, horizontal grid coordinates for all range ends and fixed shore stations, and the elevations of the shore station antenna. Upon activating the system, the boat (fig. 9) was steered across the range line at a velocity of 8 feet per second. The system also gave directions to the boat operator for maintaining course. During each run, the depth and position data were recorded on magnetic tape for later processing on an electronic computer. A graph plotter was used to track the boat and to give an immediate plot of each range profile. Auxiliary field equipment included radios for communication between shore and boat personnel and another boat to move equipment and personnel around the reservoir.

A "cutting in" or triangulation procedure was used to resurvey 15 ranges in the area beginning with Range 60 on upstream through the Narrows.

RESERVOIR SEDIMENT DISTRIBUTION

Longitudinal Distribution

The longitudinal profiles were plotted for the original, 1969, and 1980 reservoir conditions (fig. 10). Longitudinal profile data were also plotted in dimensionless form (fig. 11) for the original and 1980 conditions relating percent of depth to percent of distance. Percent of depth was computed as the ratio of the thalweg depth at each range to the total depth. Thalweg depth was computed as a difference between the thalweg elevation (lowest point) at a section and the lowest point on the profile (elevation 4,210). Total depth, 197 feet, was taken as the difference in lowest point on the profile (elevation 4,210) and the spillway crest elevation 4,407. Percent of distance was computed as a ratio of the distance between the dam and each range to the total distance 41.33 miles measured between the dam and the point where the longitudinal profile intersects the thalweg elevation 4,407 upstream. The graph on figure 10 indicates that between the 1915 and 1980 surveys, sediments had deposited longitudinally to depths shown below:

Interval distances above dam (miles)	Average depth of sediment (feet)
0-8	30
8-11	38
11-14	46
14-16	54
16-20	44
20-29	21
29-38	15
38-41	5

The greatest depths of longitudinal sediment deposits occurred between 14 and 16 miles above the dam. This reflects a morphological effect that the Narrows region has on sediment deposition. The Narrows has an average width of 0.36 mile compared to the average width of 1.39 miles for the total reservoir.

As a matter of further practical interest, a theoretical distribution of sediment within the reservoir was computed using the Empirical Area-Reduction Method [1]*. It was assumed that the sediment inflow volume to be distributed would be 524,502 acre-feet, the volume measured by the 1980 survey. A plotting of the depth-capacity relationship (fig. 12) using the original data indicated the reservoir to be type II. Results of the sediment distribution computations are listed in columns (8), (9), and (10) of table 1 for a type II reservoir. These computations predicted the sediment would reach an elevation of 4,259.4 feet by 1980. This estimate compares favorably to the elevation of 4,234 feet determined from the 1980 survey. The sediment distribution curves on figure 13 show how the actual distribution compares with the theroretical distribution of a type II reservoir. The curves show percentages of depth plotted against sediment deposited. The greatest differences between the actual and type II curves are in the 60 to 80 percent depths.

Using the end-of-month data (fig. 5), a stage-duration curve (fig. 14) was derived. This type of curve has a twofold use: (1) classifying the reservoir for sediment distribution computations, and (2) predicting the delta formation of a reservoir [1]. For delta computations, data from the curve are used to determine the pivot point (where the topset and foreset beds intersect). Using the 50 percent duration as a mean, the curve shows an end-of-month elevation stage of 4,337 feet. This indicates the pivot point occurs at Range 60 as seen in the longitudinal profile (fig. 10). For a sediment distribution study, the end-of-month stage of 4,337 feet indicates the reservoir is operated with a normally moderate to considerable reservoir drawdown. This would classify the reservoir as a type II (flood plain-foothill) reservoir as indicated by the depth-capacity curve (fig. 12).

Lateral Distribution

Ground profiles of the 75 reservoir sedimentation ranges are shown on figures 15 through 89. The profiles illustrate the general lateral distribution of sediments in the reservoir.

The orignal and 1980 profiles do not fully agree in the lateral direction for all ranges. The original profiles were transcribed from a 1915 topographic map with a contour interval of 10 feet. Thus, the point locations from the 1980 survey were of much higher accuracy than the location of points read from the 1915 topographic map. Also, it was necessary to estimate a portion near the end of some profiles to show how the original survey data connect with the 1980 data and to facilitate the reservoir area computations.

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* Numbers in brackets refer to entries in bibliography.

SEDIMENT ANALYSES

Sediment Accumulation

Sediments have accumulated in Elephant Butte Reservoir to a total volume of 524,502 acre-feet since the dam was constructed over 65 years ago. An average annual accumulation rate of 8,057 acre-feet was computed for the 65.1-year period. The net sediment accumulation rate from the contributing basin was 0.311 acre-foot per square mile per year for the same period.

Reservoir Sedimentation Survey

A summary of the reservoir sediment data for the 1980 survey is contained in table 2. The data include a tabulation of incremental sediment inflow volume and sediment accumulation computed for the periods between the original (1915) and the 1957, 1969, and 1980 surveys. Both types of data are valuable in practical and research studies.

RESERVOIR AREA AND CAPACITY

The 1980 reservoir surface areas were computed by the Width Adjustment Method described by Pemberton [2]. Briefly, the method used entails computing the 1980 contour areas between any two ranges by applying an adjustment factor to the 1915 contour area between the two ranges. The adjustment factor was determined as a ratio of the new average width to the original average width for both the upstream and downstream ranges at a specified contour. Computations were facilitated by subdividing the reservoir into segments using the sedimentation range lines to delineate the limit of each segmental boundary. For any given contour elevation, the 1915 surface areas were multiplied by the adjustment factor to compute the 1980 surface area of each segment. The total surface area at a given contour elevation was computed as the summation of all segmental areas at that elevation.

The 1980 surface areas were used as control parameters for computing the reservoir capacities by electronic computer. The program procedure included computation of 0.01- to 1-foot area increments by linear interpolation between 10-feet contour intervals. The progressive computational procedure began by testing the initial capacity equation over successive intervals to determine whether it was within an allowable error limit (0.0001 in this case). This capacity equation was then used over the whole range that fit within the allowable error limit. For the next interval, beginning where the initial allowable error limit was exceeded, a new capacity equation (integrated from the basic area equation over that interval) began testing the fit until the limit was exceeded. Thus, the capacity curve was defined by a series of curves or splines, each falling within a specific elevation interval as constrained by the limiting error. The final area equations were subsequently derived by differentiation of the capacity equations. Capacity equations are of second order polynomial form:

$$y = a_1 + a_2 x + a_3 x^2$$

where: y = capacity
x = elevation above an elevation base
a_1 = intercept
a_2 and a_3 = coefficients

Results of the 1980 area and capacity computations are listed in columns (4) and (5) of table 1. Listed in columns (2) and (3) of this table are the original area and capacity values. A special set of area-capacity tables has been published separately for the 0.01-, 0.10-, and 1-foot elevation increments [3]. Both the original and 1980 area-capacity curves are plotted on figure 90. At spillway crest elevation 4,407, the 1980 capacity is 2,110,298 acre-feet and the surface area is 36,897 acres.

During the course of the area and capacity computations, it was discovered that the capacity had increased in some segments of the reservoir since the last complete survey in 1969. These gains in capacity were attributed in part to the effects of compaction of sediments in those segments. An additional factor influencing the increased capacities was the precision used to measure the profiles during the 1980 survey. The 1915 profiles were measured from the original topographic map (contour interval, 10 feet). As a result, the apparent profile width changes indicated between the 1915 and 1980 surveys were, in many instances, due to inaccuracies in the original profile data.

BIBLIOGRAPHY

[1] Design of Small Dams, Bureau of Reclamation, Denver, Colorado, pp. 767-796, 1973.

[2] Pemberton, E. L., "Survey and Prediction of Sedimentation in Reservoirs," Application of Stochastic Processes in Sediment Transport, Water Resources Publications, Littleton, Colorado, Chapter 15, 1980.

[3] "Elephant Butte Reservoir Area and Capacity Tables," Rio Grande Project, Southwest Region, Bureau of Reclamation, April 1981.

Table 1. - Summary of 1980 Survey Results and Sediment Distribution Computations

(1) Elevation (feet)	(2) 1915 area (acres)	(3) 1915 capacity (acre-feet)	(4) 1980 area (acres)	(5) 1980 capacity (acre-feet)	(6) Measured sediment volume (acre-feet)	(7) Percent of measured sediment	(8) 1980 computed capacity (acre-feet)	(9) Computed sediment volume (acre-feet)	(10) Percent of computed sediment
4407	40,060	2,634,800	36,897	2,110,298	524,502	100.0	2,110,300	524,500	100.0
4400	37,328	2,363,900	34,357	1,860,910	502,990	95.9	1,845,893	518,007	98.8
4390	33,451	2,010,300	29,688	1,540,685	469,615	89.5	1,514,512	495,788	94.5
4380	30,191	1,692,800	25,588	1,264,305	428,495	81.7	1,225,097	467,703	89.2
4370	26,620	1,408,000	21,746	1,027,635	380,365	72.5	972,087	435,913	83.1
4360	23,563	1,162,100	18,537	826,220	335,880	64.0	760,532	401,568	76.6
4350	19,194	954,400	15,710	654,985	299,415	57.1	588,947	365,453	69.7
4340	16,595	775,600	13,306	509,905	265,695	50.7	447,429	328,171	62.6
4330	14,240	621,400	11,211	387,320	234,080	44.6	331,174	290,226	55.3
4320	11,894	490,800	9,636	283,085	207,715	39.6	238,745	252,055	48.1
4310	10,202	380,800	7,493	197,440	183,360	35.0	166,741	214,059	40.8
4300	8,923	285,400	6,114	129,405	155,995	29.7	108,780	176,620	33.7
4290	7,715	202,100	4,200	77,835	124,265	13.7	61,992	140,108	26.9
4280	6,145	132,800	2,577	43,950	88,850	16.9	27,899	104,901	20.0
4270	4,691	78,600	2,130	20,465	58,135	1.1	7,218	71,382	13.6
4260	3,257	39,700	894	5,395	34,305	6.5	25	39,700	7.6
4259.4	3,061	37,984	851	4,871	33,113	6.3	0	37,984	7.2
4250	1,684	15,800	185	0	15,800	4.0		15,800	3.0
4240	671	4,660			4,660	0.9		4,660	0.9
4230	376	2,960			2,960	0.6		2,960	0.6
4220	98	490			490	0.1		490	0.1
4210	0	0			0	0.0		0	0.0

Explanation of columns:

(1) Elevation of reservoir water surface.
(2) Original reservoir surface area surveyed in 1915.
(3) Original reservoir capacity from 1915 survey.
(4) Reservoir surface area surveyed in 1980.
(5) Reservoir capacity from 1980 survey.
(6) Measured sediment volume = column (3) minus column (5).
(7) Measured sediment expressed in percentage of total sediment (524,502 acre-feet).
(8) Computed 1980 reservoir capacity using Empirical Area-Reduction method.
(9) Computed sediment volume for period 1915-1980 = column (3) minus column (8).
(10) Computed sediment expressed in percentage of total sediment (524,502 acre-feet).

Table 2. - Reservoir Sediment Data Summary

RESERVOIR SEDIMENT DATA SUMMARY

Elephant Butte — NAME OF RESERVOIR

57 — DATA SHEET NO.

DAM

1. OWNER USBR Dept. of Interior	2. STREAM Rio Grande	3. STATE New Mexico
4. SEC. 30 TWP. 13S RANGE 3W	5. NEAREST P O. Truth or Consequences, NM 4E	6. COUNTY Sierra
7. LAT 33 ° 09 ′ 15 ″ LONG 107 ° 11 ′ 28 ″	8. TOP OF DAM ELEVATION [1] 4,414	9. SPILLWAY CREST ELEV. 4,407

RESERVOIR

10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. ORIGINAL SURFACE AREA, ACRES	13. ORIGINAL CAPACITY, ACRE-FEET	14. GROSS STORAGE, ACRE-FEET	15. DATE STORAGE BEGAN
a. FLOOD CONTROL					
b. MULTIPLE USE [2]	4,407	40,064	2,631,585	2,634,800	Jan. 6, 1915
c. POWER					
d. WATER SUPPLY					16. DATE NORMAL OPER. BEGAN
e. IRRIGATION					
f. CONSERVATION					
g. INACTIVE	4,231.5	[3] 420	3,215	3,215	Feb. 1, 1915

WATERSHED

17. LENGTH OF RESERVOIR 41 MILES		AV. WIDTH OF RESERVOIR 1.39	MILES
18. TOTAL DRAINAGE AREA 25,923 SQ. MI.		22. MEAN ANNUAL PRECIPITATION 15.1 (8-22)	INCHES
19. NET SEDIMENT CONTRIBUTING AREA [4] 11,803 SQ. MI.		23. MEAN ANNUAL RUNOFF .65	INCHES
20. LENGTH 305 MILES	AV. WIDTH 85 MILES	24. MEAN ANNUAL RUNOFF [5] 904,900 (79)	AC.-F T.
21. MAX. ELEV. 12,000	MIN. ELEV. 4,210	25. ANNUAL TEMP MEAN 52.3 RANGE 38.8-61.2	

SURVEY DATA

26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA, ACRES	32. CAPACITY, ACRE-FEET	33. C/I. RATIO, AC.-FT. PER AC.-FT.
Jan. 6, 1915			Contour (D)	10 ft (CI)	40,064	2,634,800	
Feb. 12, 1957[6]	–	42.1	Range (D)	73 (R) 10 ft (CI)	35,584	2,206,780	2.20
Apr. 1, 1969	12.2	54.3	Range (D)	60 (R)	36,569	2,137,219	2.31
Jan. 24, 1980	10.8	65.1	Range (D)	81 (R)	36,897	2,110,298	2.33

26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW, ACRE-FEET			36. WATER INFL. TO DATE, AC.-FT.	
		a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	a. MEAN ANNUAL	b. TOTAL TO DATE
Jan. 6, 1915						
Feb. 12, 1957		918,439	2,440,000	38,647,900	918,439	38,647,900
Apr. 1, 1969		537,075	1,391,000	6,552,317	832,416	45,200,217
Jan. 24, 1980		700,818	1,554,710	7,568,829	810,584	52,769,046

26. DATE OF SURVEY	37. PERIOD CAPACITY LOSS, ACRE-FEET			38. TOTAL SED. DEPOSITS TO DATE, ACRE-FEET		
	a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR
Jan. 6, 1915						
Feb. 12, 1957	[7]	–	–	428,000	10,200	0.390
Apr. 1, 1969	69,561	5,702	0.220	497,581	9,164	0.354
Jan. 24, 1980	26,921	2,493	0.211	524,500	8,057	0.311

26. DATE OF SURVEY	39. AV. DRY WGT., LBS. PER CU. FT.	40. SED. DEP., TONS PER SQ. MI.-YR.		41. STORAGE LOSS, PCT.		42. SED. INFLOW, PPM	
		a. PERIOD	b. TOTAL TO DATE	a. AV. ANN.	b. TOT. TO DATE	a. PERIOD	b. TOT. TO DATE
Jan. 6, 1915							
Feb. 12, 1957	60	–		0.463	19.4	–	–
Apr. 1, 1969	62	357	478	0.348	18.9	12,650	10,940
Jan. 24, 1980	62*	285	420	0.305	19.9	3,532	9,876

Table 2. - Reservoir Sediment Data Summary - Continued

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION											
	193-175.5	175.5-167	167-147	147-127	127-107	107-87	87-67	67-47	47-27	27-11	11-CR	CR+3
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION											
Jan. 24, 1980	0.6	0.2	5.0	9.4	11.4	8.6	10.4	13.7	19.0	14.0	7.3	2.0

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
[8] 1915	4321.81		1,302,250	1930	4384.5	4372.27	930,000
1916	4346.85	4306.6	1,421,000	1931	4374.17	4349.74	418,000
1917	4353.8	4331.8	1,305,000	1932	4384.5	4351.75	1,440,000
1918	4337.0	4290.3	379,100	1933	4377.9	4365.02	717,000
1919	4358.8	4285.5	1,527,000	1934	4367.8	4325.0	298,300
1920	4393.87	4350.9	1,970,000	1935	4342.2	4322.8	917,600
1921	4392.5	4377.5	1,470,000	1936	4354.9	4331.83	872,900
1922	4389.5	4370.7	1,044,000	1937	4380.7	4333.87	1,597,000
1923	4377.4	4366.5	964,000	1938	4377.1	4365.6	1,004,000
1924	4395.8	4368.9	1,662,000	1939	4378.4	4351.2	615,700
1925	4382.1	4354.7	321,000	1940	4357.04	4323.2	333,100
1926	4378.1	4354.6	1,120,000	1941	4399.2	4324.3	2,440,000
1927	4373.95	4363.02	1,180,000	1942	4409.15	4397.0	2,322,000
1928	4379.10	4359.70	773,000	1943	4398.96	4380.82	441,600
1929	4374.8	4353.7	1,240,000	1944	4385.68	4369.16	982,500

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY
1915 Survey			4320	11,894	490,800	1980 Survey		
4210	0	0	4330	14,240	621,400	4250	185	0
4220	98	490	4340	16,595	775,600	4260	894	5,395
4230	376	2,960	4350	19,194	954,400	4270	2,120	20,465
4240	671	4,660	4360	22,563	1,162,100	4280	2,577	43,950
4250	1,684	15,800	4370	26,620	1,408,000	4290	4,200	77,835
4260	3,157	39,700	4380	30,191	1,692,800	4300	6,114	129,405
4270	4,691	78,600	4390	33,451	2,010,300	4310	7,493	197,440
4280	6,145	132,800	4400	37,328	2,363,900	4320	9,636	283,085
4290	7,715	202,100	4407	40,060	2,634,800	4330	11,211	387,320
4300	8,923	285,400	4410	41,283	2,756,600	4340	13,306	509,905
4310	10,202	380,800						

47. REMARKS AND REFERENCES

[1] All elevations are project datum. Add 43.3' to adjust to m.s.l.
[2] Irrigation and power.
[3] Estimated by interpolation.
[4] Represents loss of contributing area since closing of Albiquiu in 1963, Galisteo in 1970, and Cochiti in 1973.
[5] Rio Grande at San Marcial.
[6] For intermediate survey. See data sheet 57-1 and 57-1a.
[7] Total storage showed gain of 9,180 acre-feet since 1947 survey.
[8] From Jan. 1915 through Sept. 1915.

48. AGENCY MAKING SURVEY — Bureau of Reclamation
49. AGENCY SUPPLYING DATA — Bureau of Reclamation
50. DATE March 15, 1982

April 1966

Table 2. - Reservoir Sediment Data Summary - Continued

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION											
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION											

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														

45. RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
1945	4385.60	4372.28	851,500	1960	4339.04	4322.40	563,400
1946	4375.66	4339.52	224,900	1961	4329.10	4301.99	437,700
1947	4339.36	4311.94	419,200	1962	4329.80	4304.38	748,100
1948	4349.22	4313.08	1,036,000	1963	4327.52	4282.07	405,500
1949	4351.3	4329.69	1,031,000	1964	4299.23	4275.51	164,200
1950	4346.01	4315.46	364,100	1965	4323.01	4277.46	821,700
1951	4315.79	4262.30	132,900	1966	4338.30	4311.03	725,340
1952	4324.59	4261.64	967,000	1967	4321.84	4293.03	391,600
1953	4220.49	4283.19	286,800	1968	4319.70	4295.09	646,230
1954	4297.30	4258.03	198,500	1969	4335.0	4308.77	787,600
1955	4295.46	4276.58	257,900	1970	4339.43	4303.02	729,200
1956	4304.40	4268.44	174,800	1971	4326.41	4271.19	413,100
1957	4337.12	4267.10		1972	4319.02	4279.67	427,900
1958		4336.2	1,391,000	1973	4355.52	4319.22	1,309,000
1959	4362.8	4334.46	341,900	1974	4360.94	4321.20	451,400
				1975	4345.91	4326.08	875,900

46. ELEVATION-AREA-CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY
4350	15,710	654,985						
4360	18,537	826,220						
4370	21,746	1,027,635						
4380	25,588	1,264,305						
4390	29,688	1,540,685						
4400	34,357	1,860,910						
4407	36,897	2,110,298						
4410	37,985	2,222,620						

47. REMARKS AND REFERENCES

48. AGENCY MAKING SURVEY — Bureau of Reclamation

49. AGENCY SUPPLYING DATA — Bureau of Reclamation

50. DATE March 15, 1982

Apr. 1966

Table 2. - Reservoir Sediment Data Summary - Continued

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET BELOW, AND ABOVE, CREST ELEVATION											
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION											

26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														

45 RANGE IN RESERVOIR OPERATION

WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW, AC.-FT.
1976	4353.05	4318.02	580,900				
1977	4325.18	4295.78	243,200				
1978	4314.70	4290.20	385,100				
1979	4364.95	4305.88	1,427,000				

46. ELEVATION–AREA–CAPACITY DATA

ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY

47. REMARKS AND REFERENCES

48. AGENCY MAKING SURVEY — Bureau of Reclamation

49. AGENCY SUPPLYING DATA — Bureau of Reclamation

50. DATE March 15, 1982

April 1966

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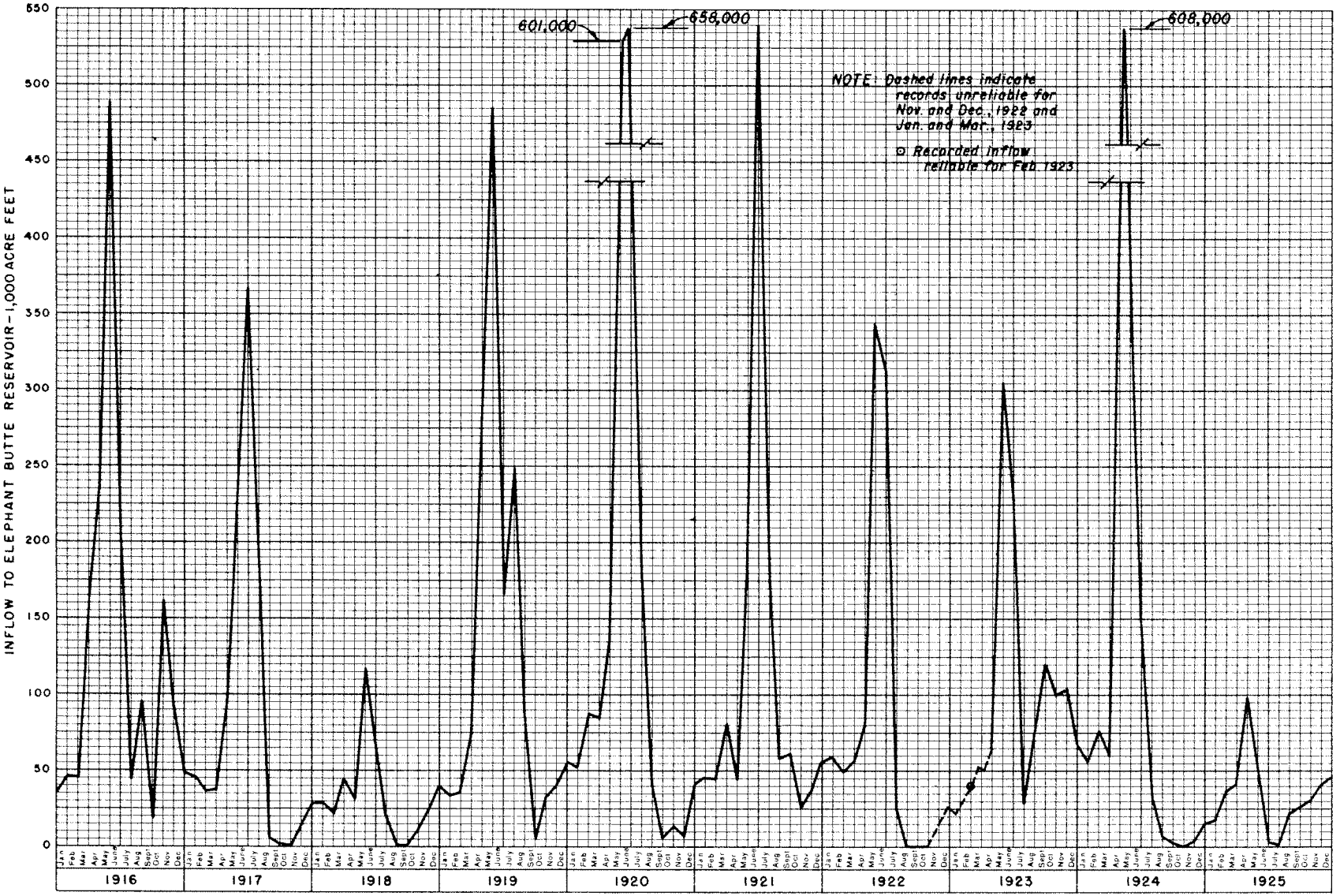

Figure 2. - Elephant Butte Reservoir Inflows

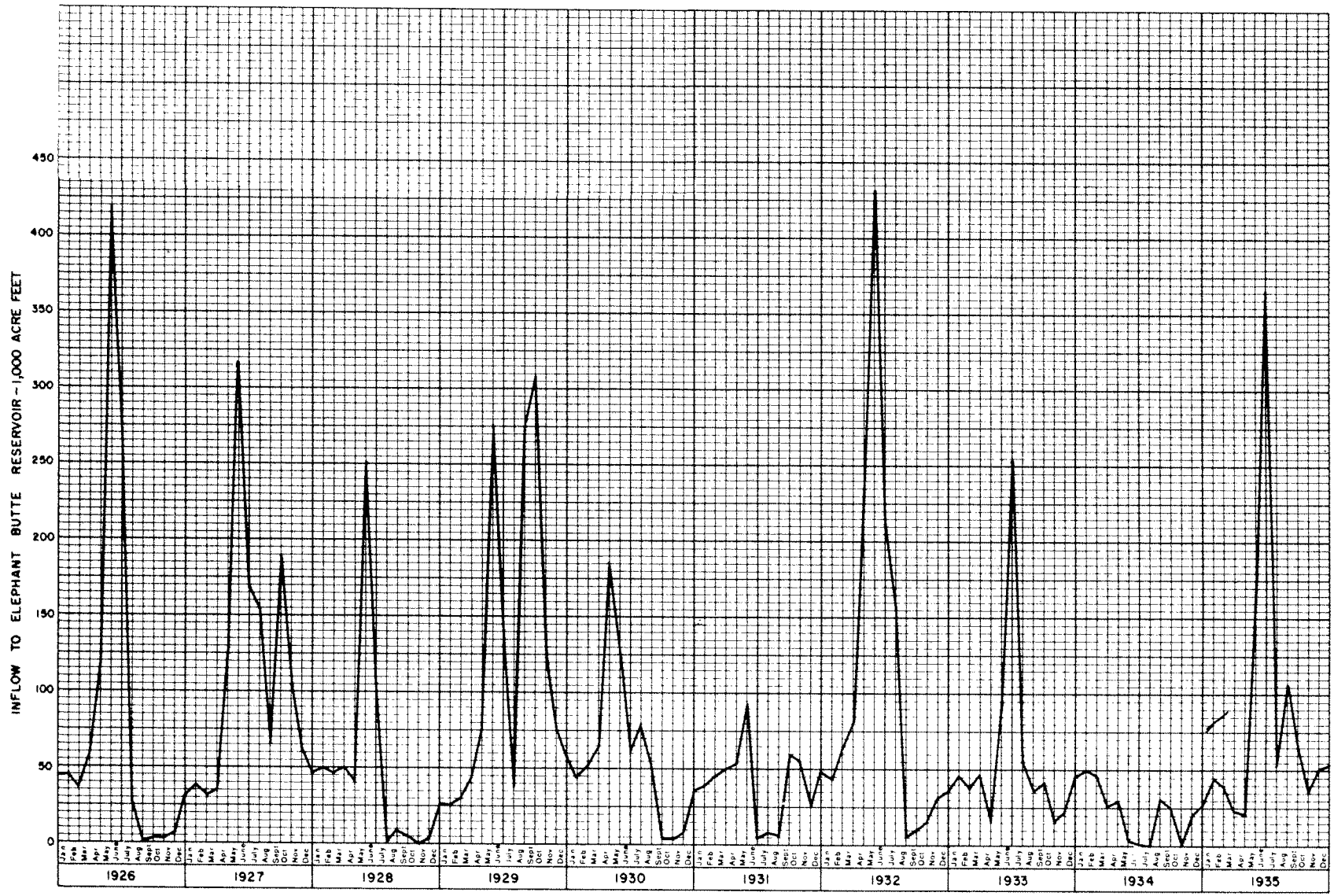

Figure 2. - Elephant Butte Reservoir Inflows - Continued

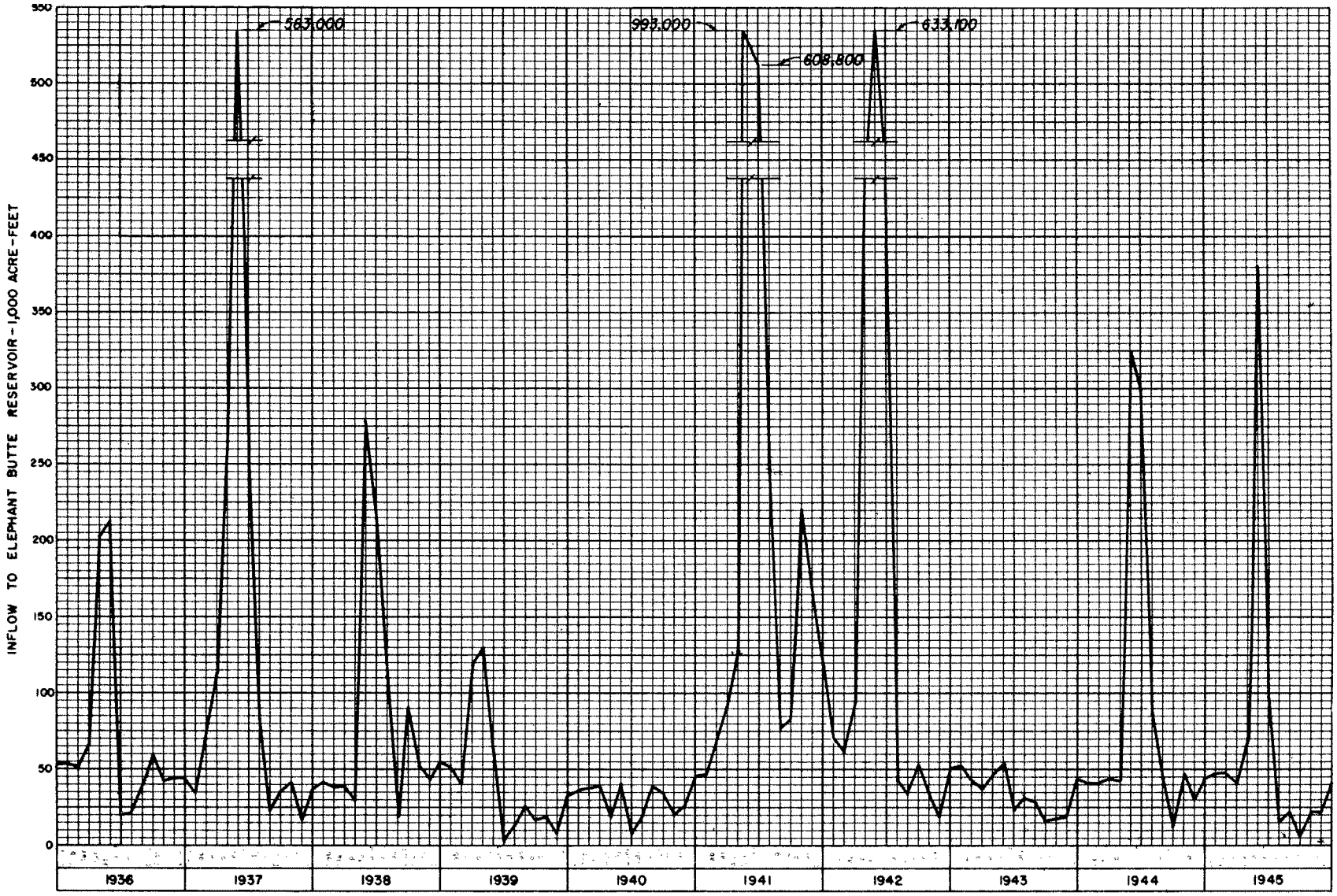

Figure 2. - Elephant Butte Reservoir Inflows - Continued

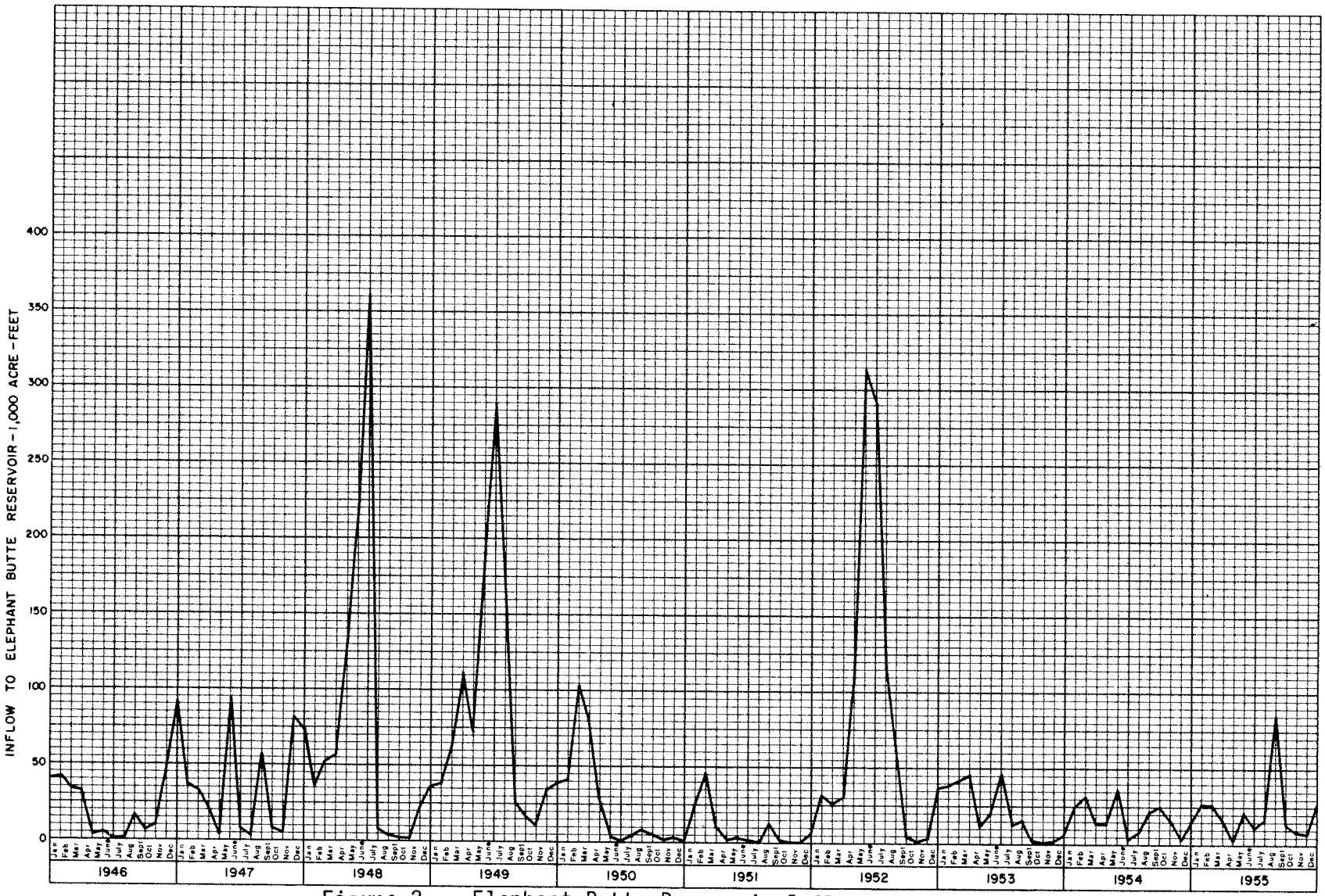

Figure 2. - Elephant Butte Reservoir Inflows - Continued

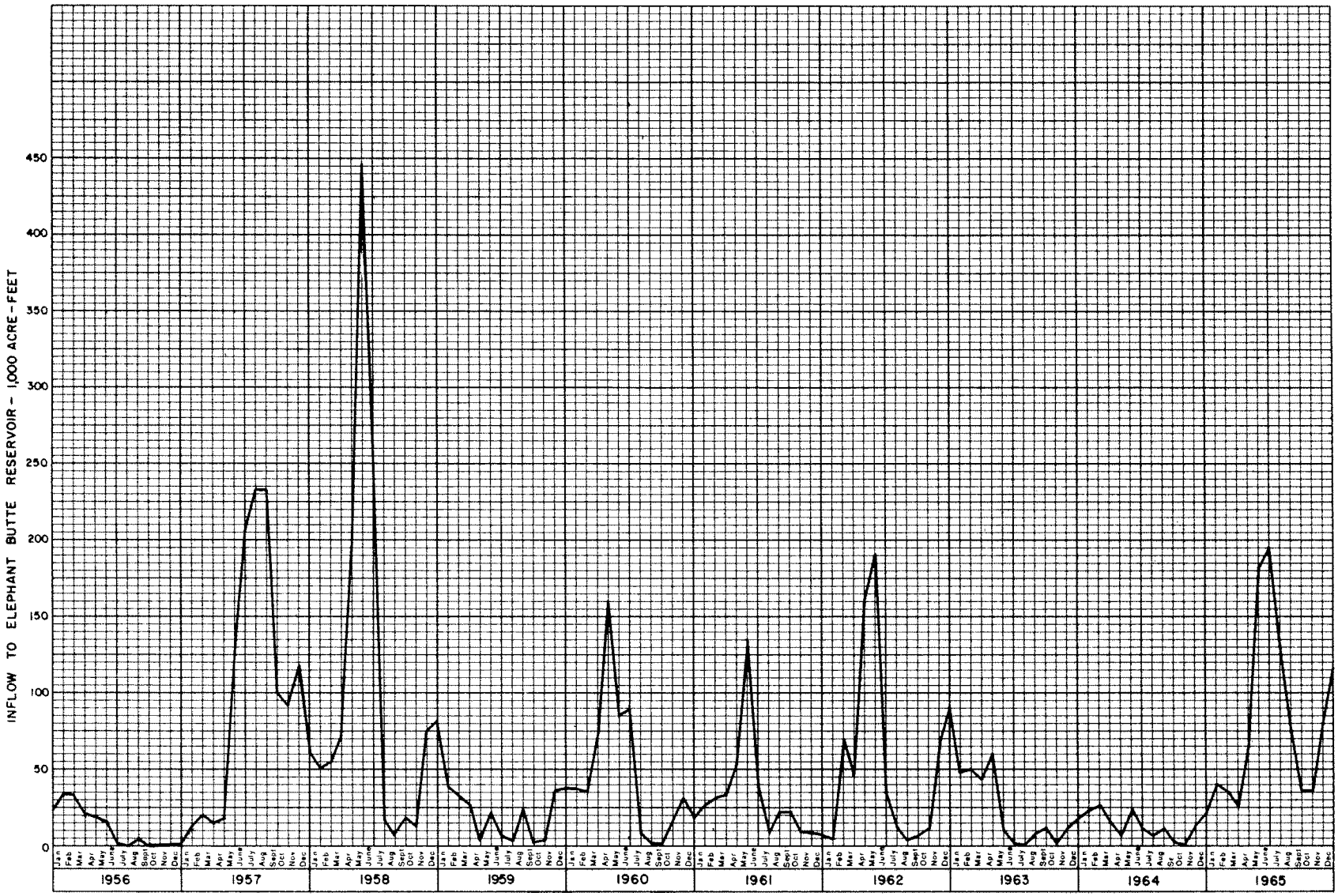

Figure 2. - Elephant Butte Reservoir Inflows - Continued

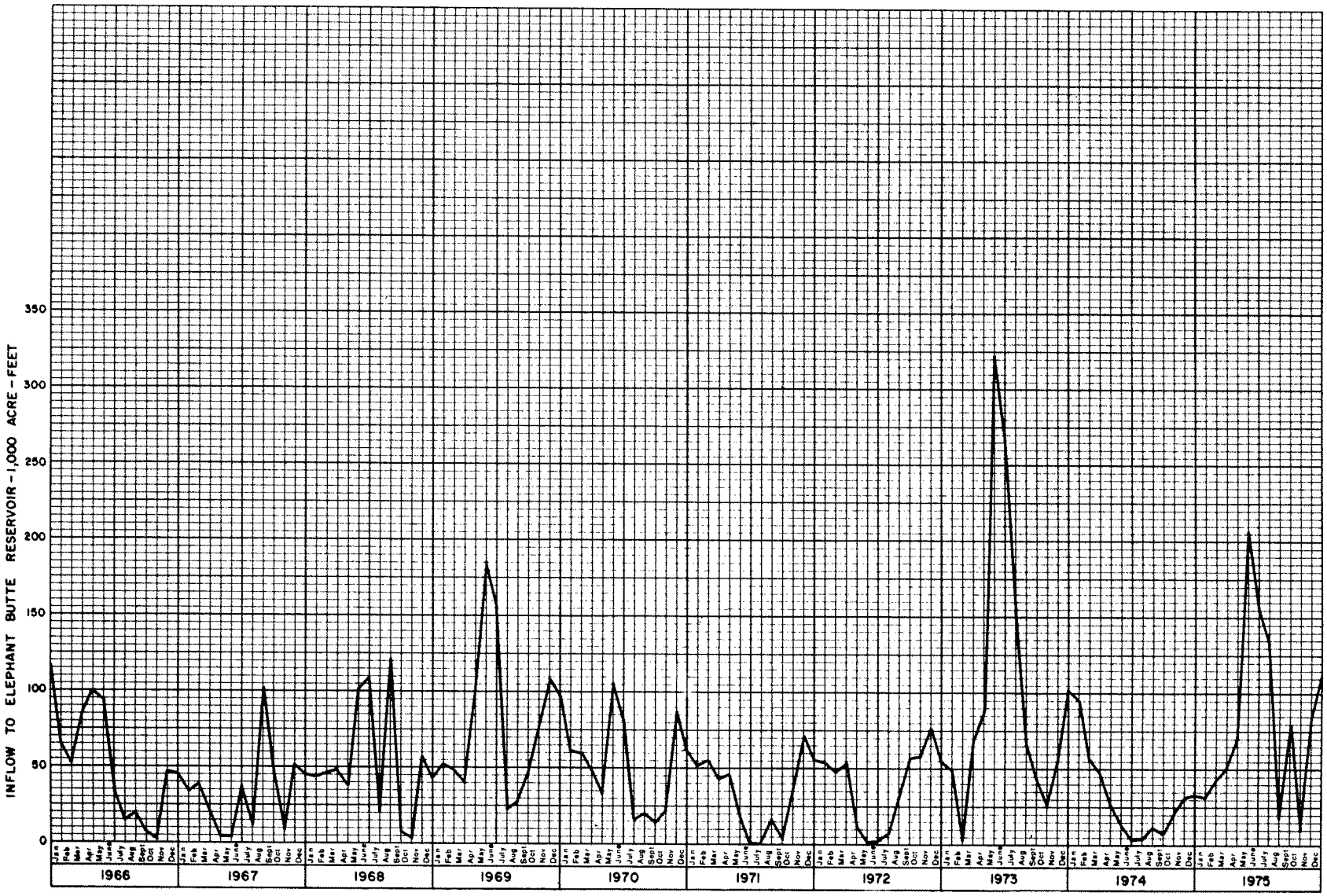

Figure 2. - Elephant Butte Reservoir Inflows - Continued

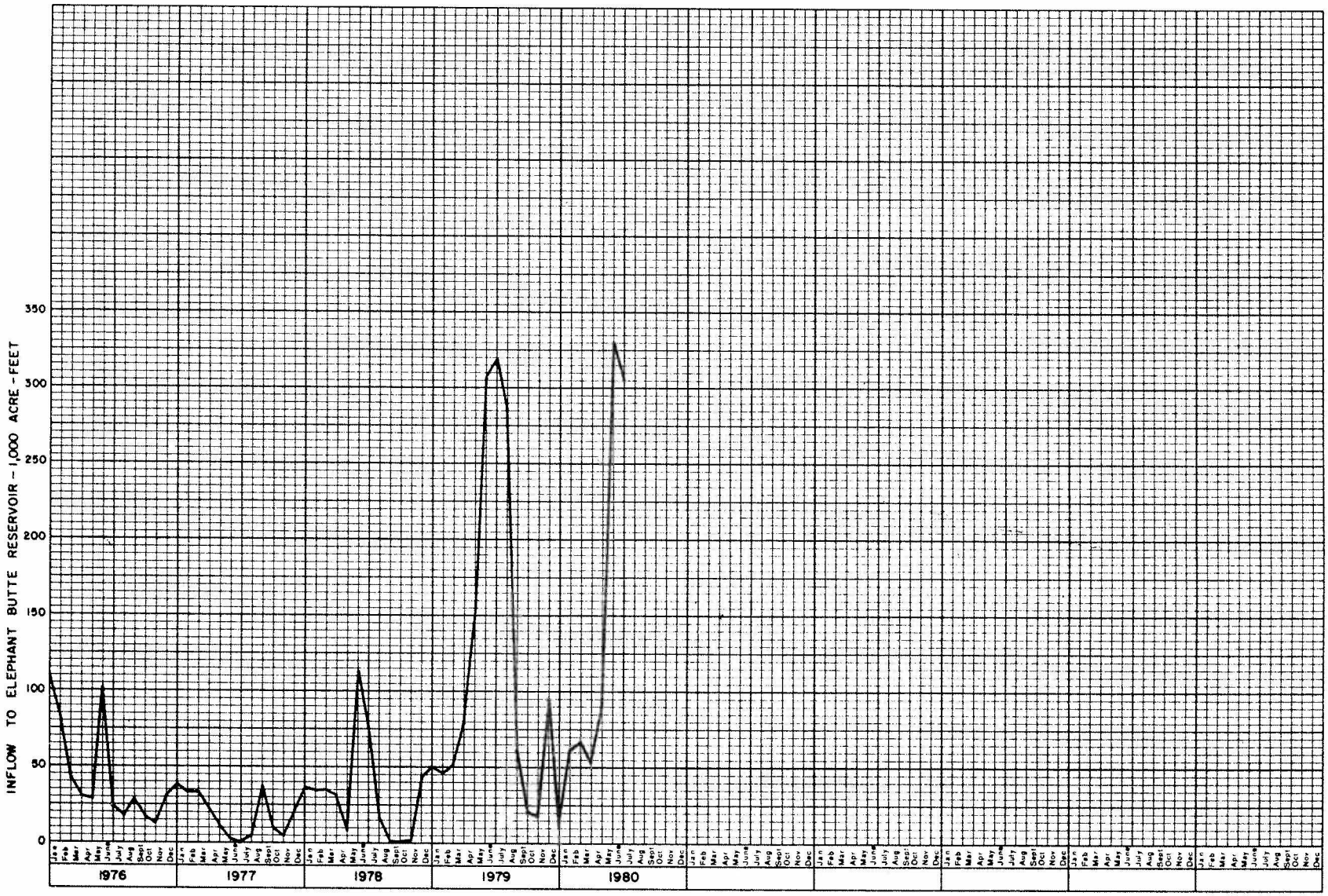

Figure 2. - Elephant Butte Reservoir Inflows - Continued

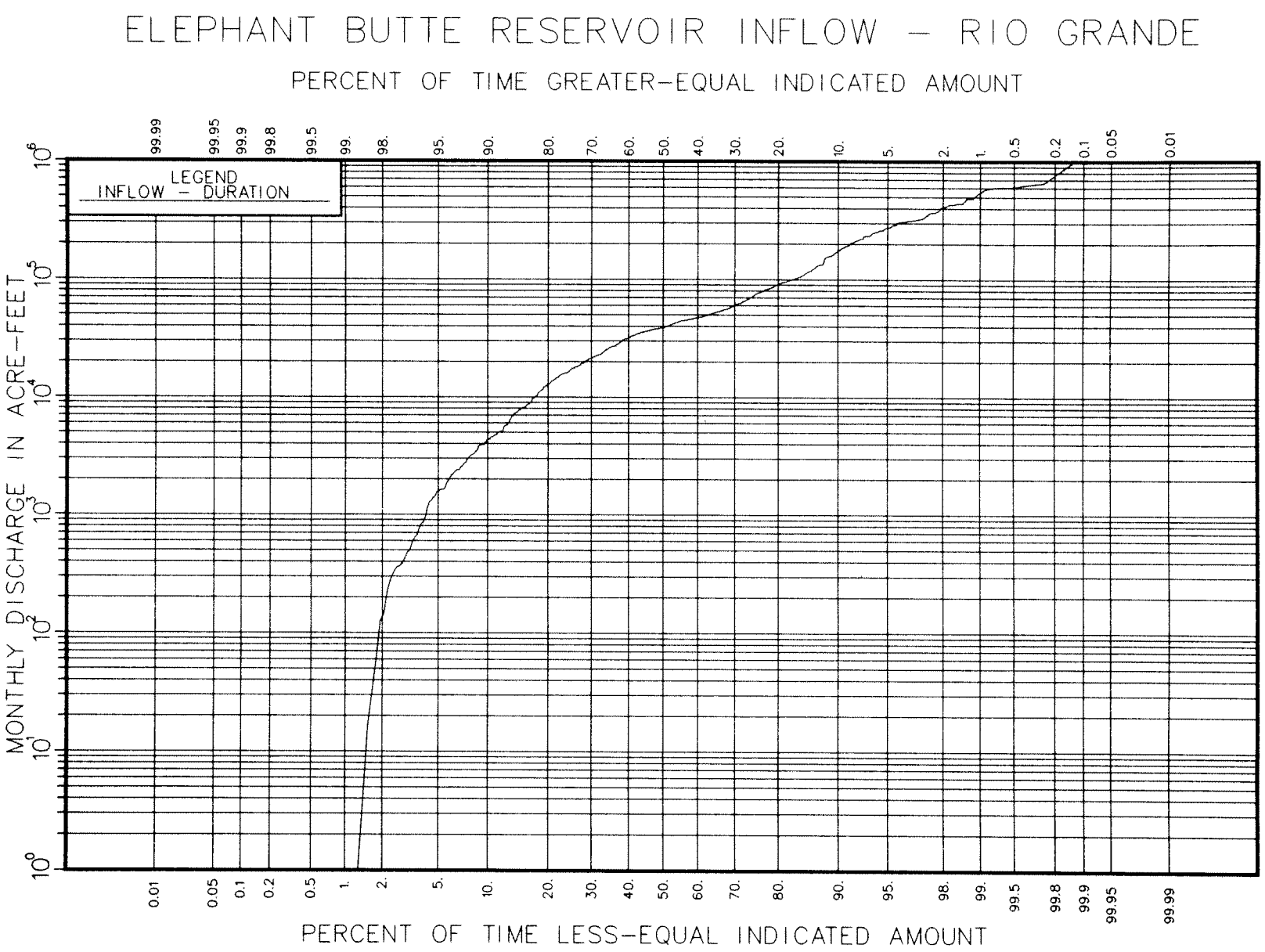

Figure 3. - Inflow Duration Curve for Monthly Inflow Discharges

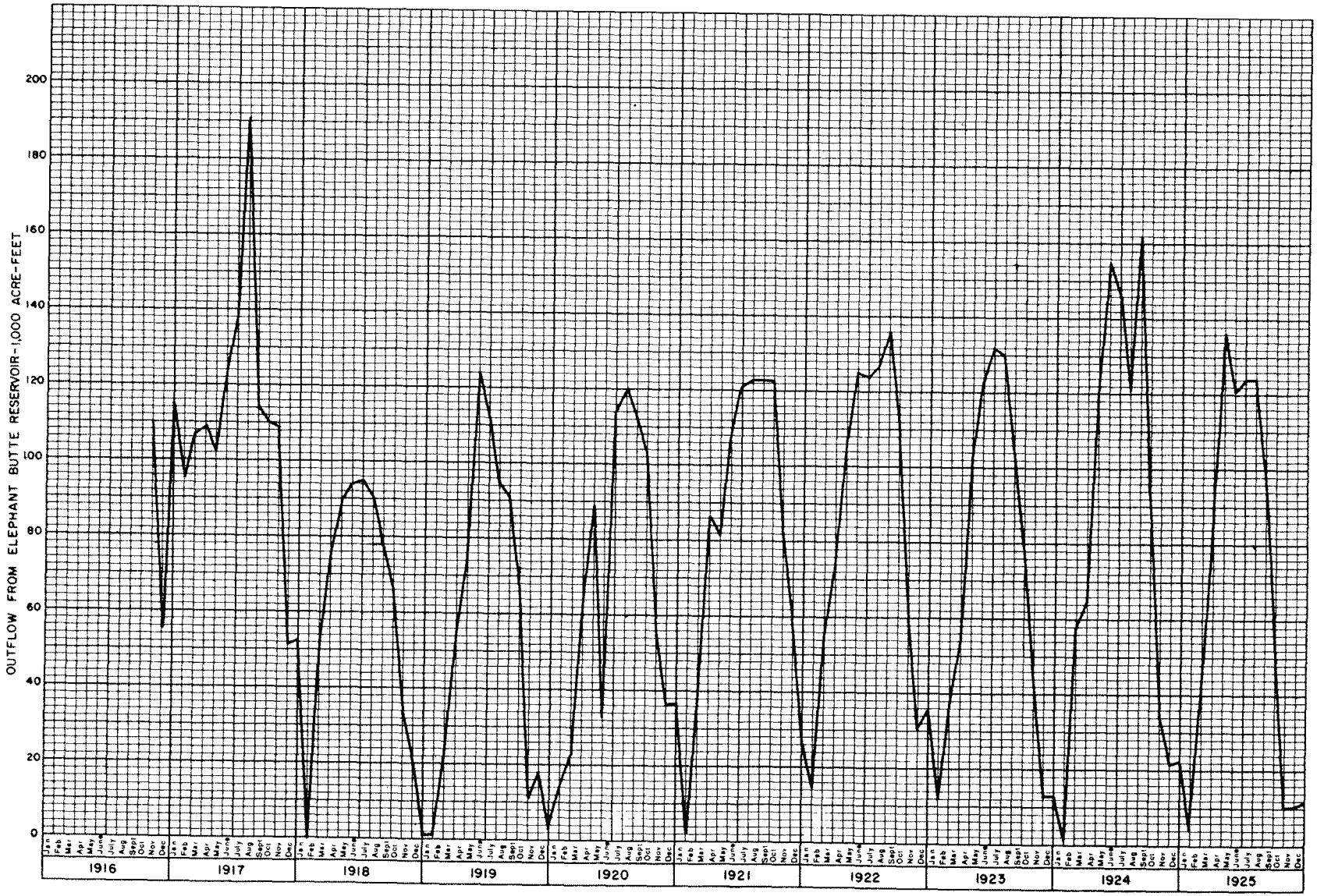

Figure 4. - Elephant Butte Reservoir Outflows - Continued

Figure 4. - Elephant Butte Reservoir Outflows

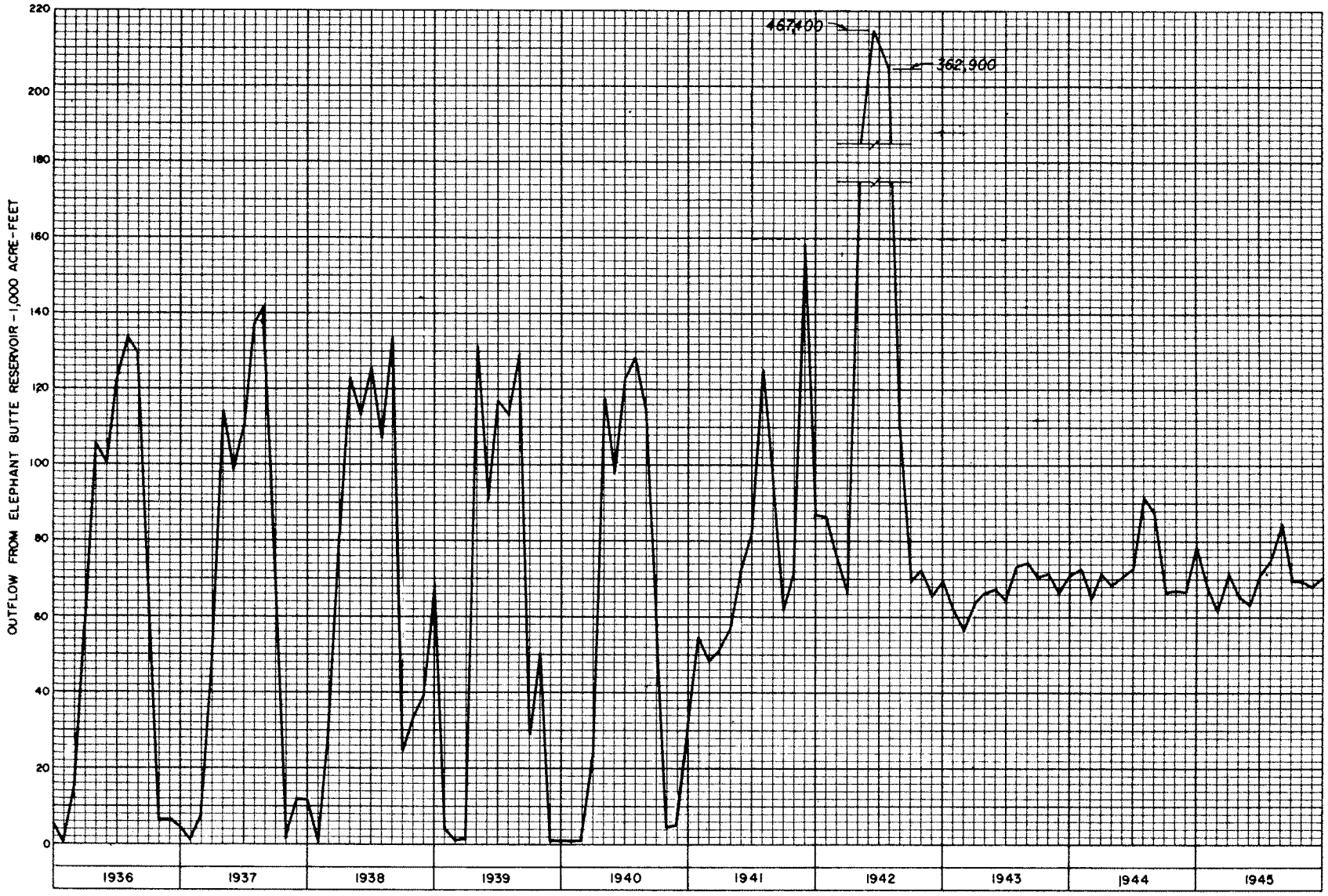

Figure 4. - Elephant Butte Reservoir Outflows - Continued

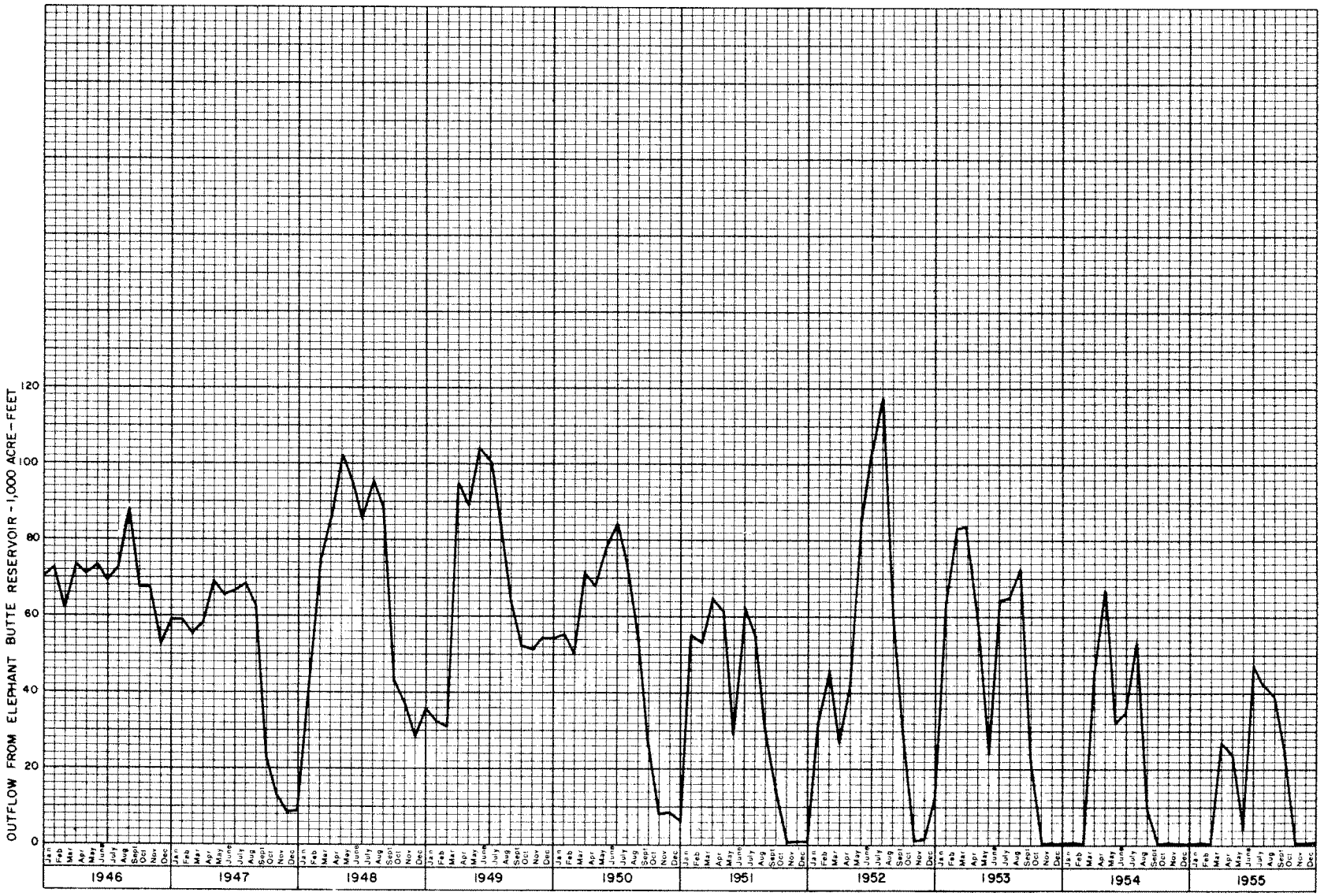

Figure 4. - Elephant Butte Reservoir Outflows - Continued

Figure 4. - Elephant Butte Reservoir Outflows - Continued

Figure 4. - Elephant Butte Reservoir Outflows - Continued

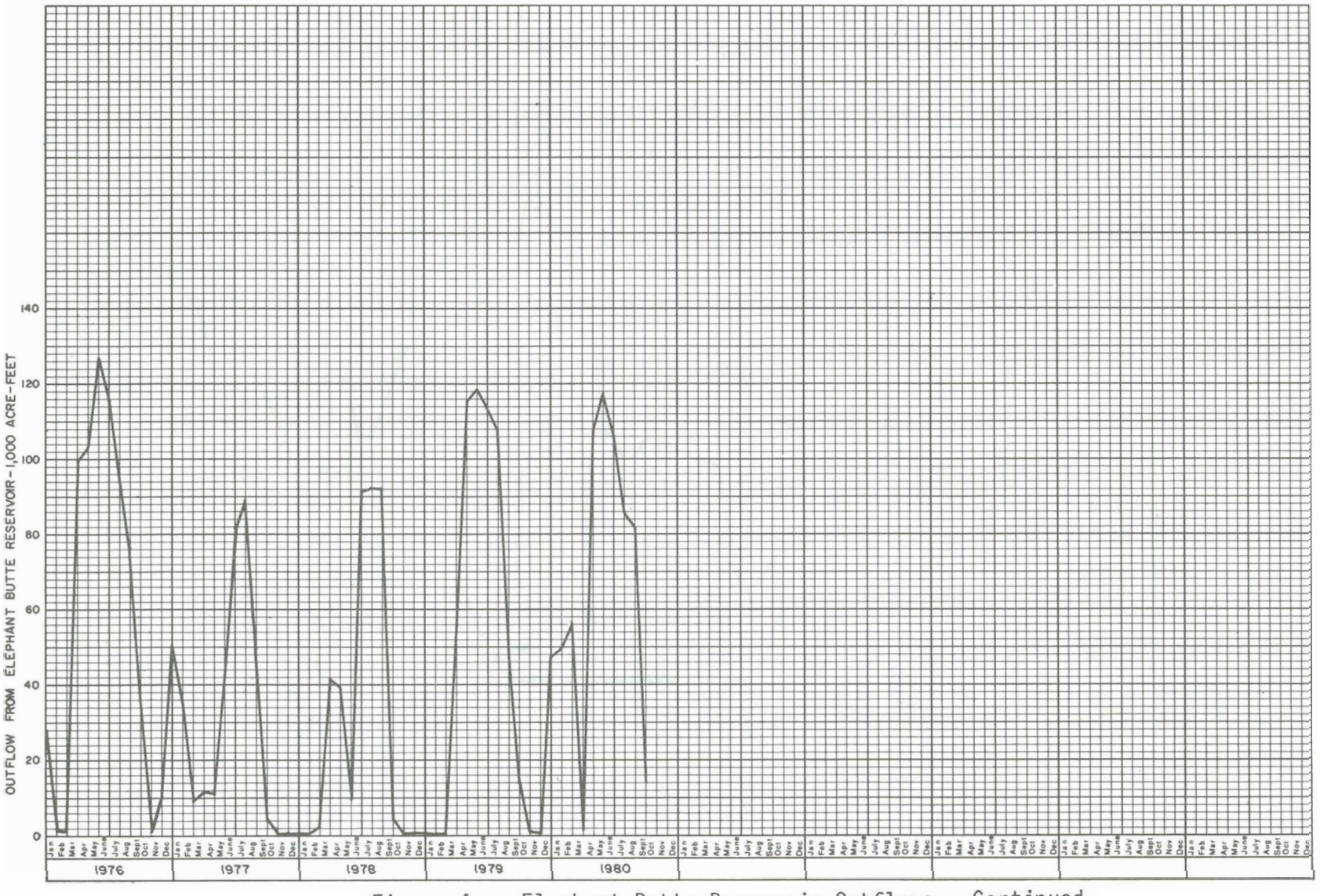

Figure 4. - Elephant Butte Reservoir Outflows - Continued

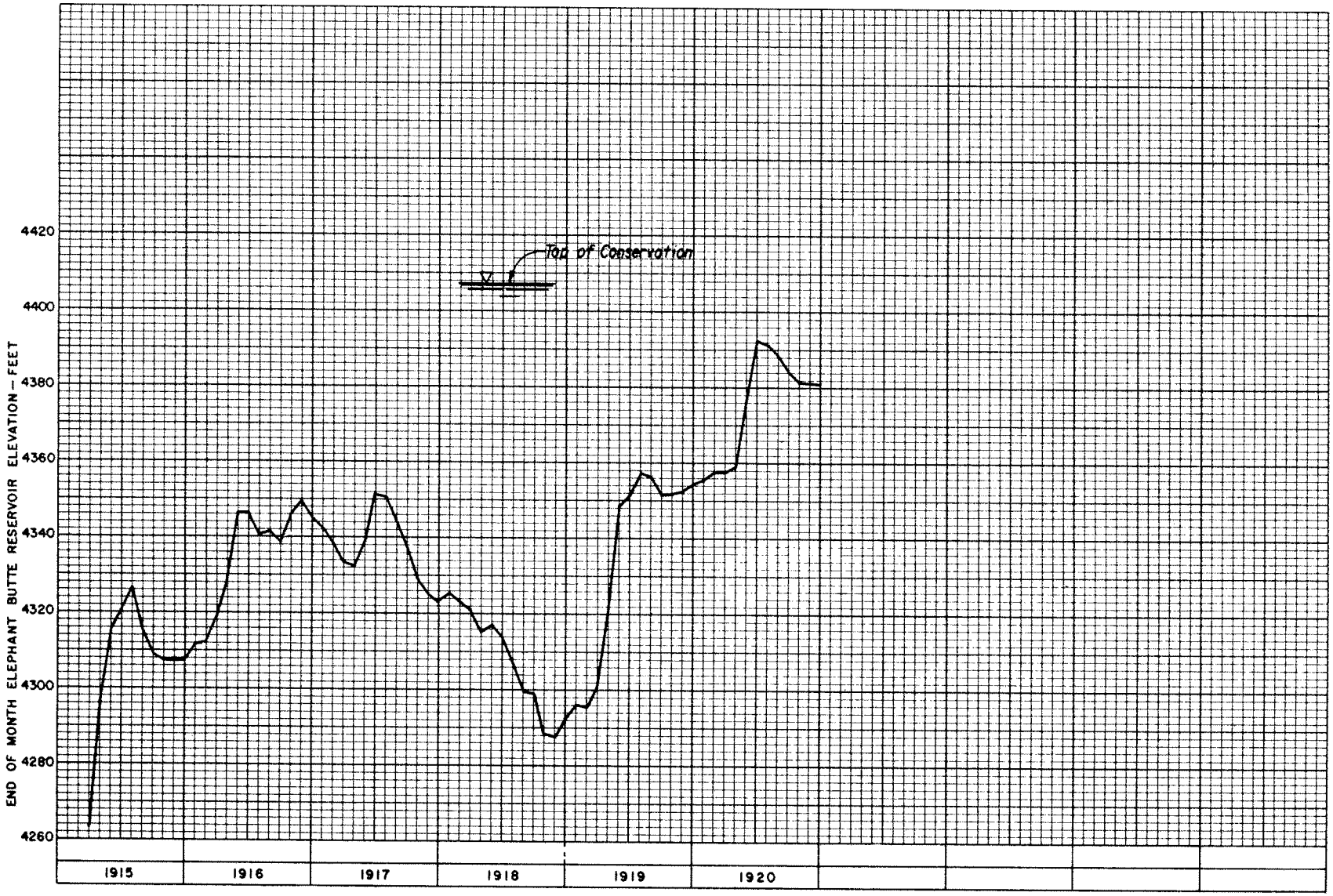

Figure 5. - End of Month Elephant Butte Reservoir Elevations

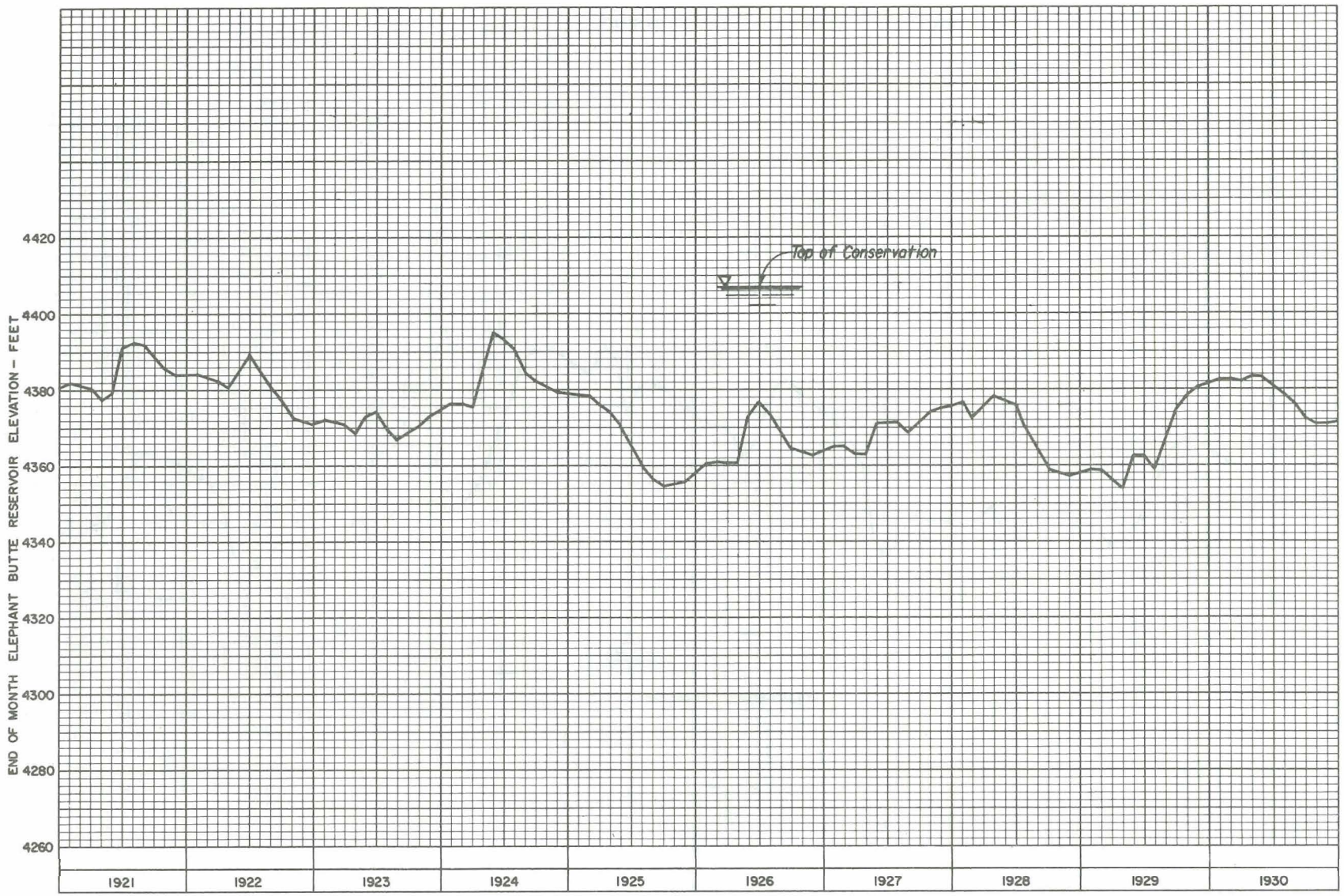

Figure 5. - End of Month Elephant Butte Reservoir Elevations - Continued

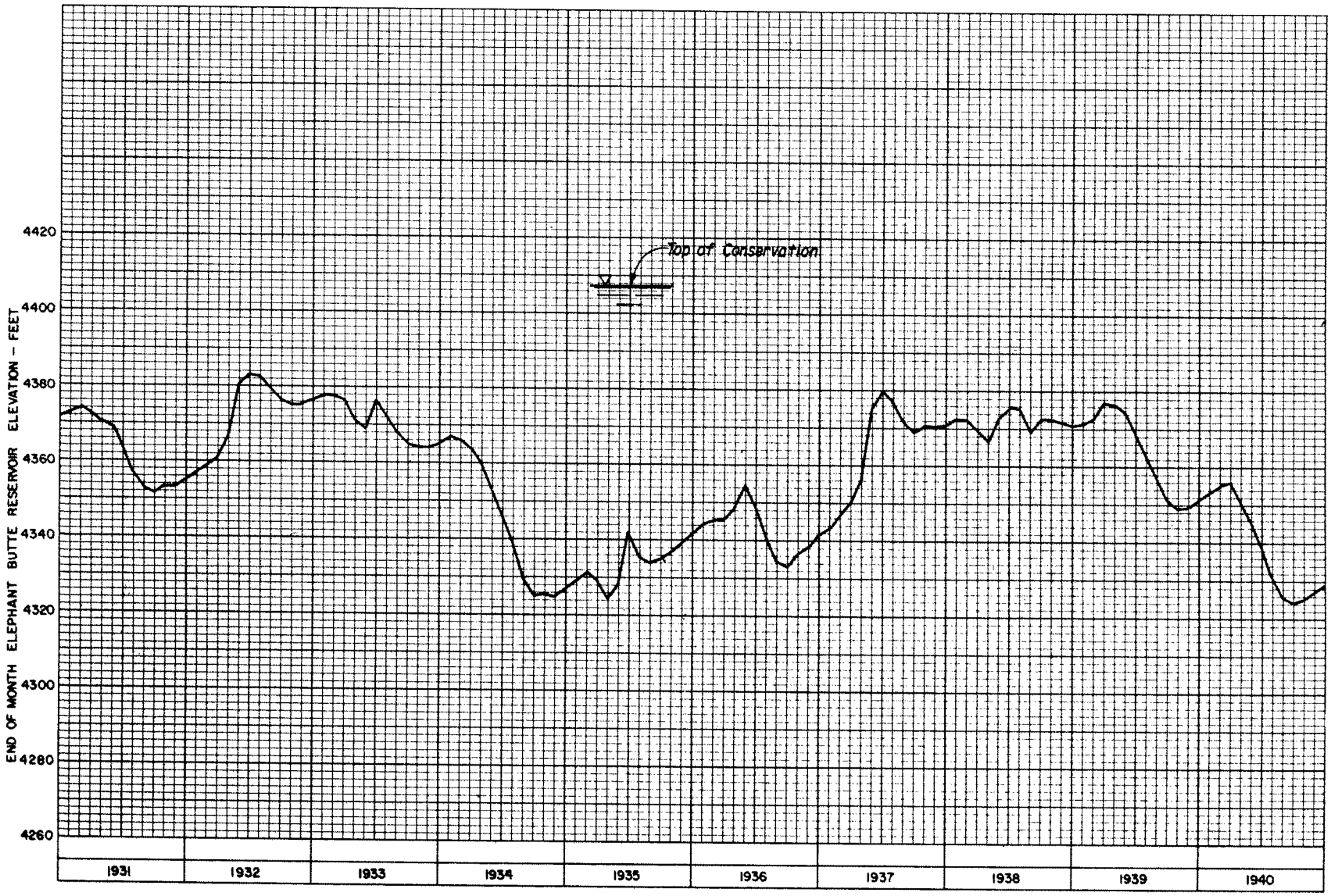

Figure 5. - End of Month Elephant Butte Reservoir Elevations - Continued

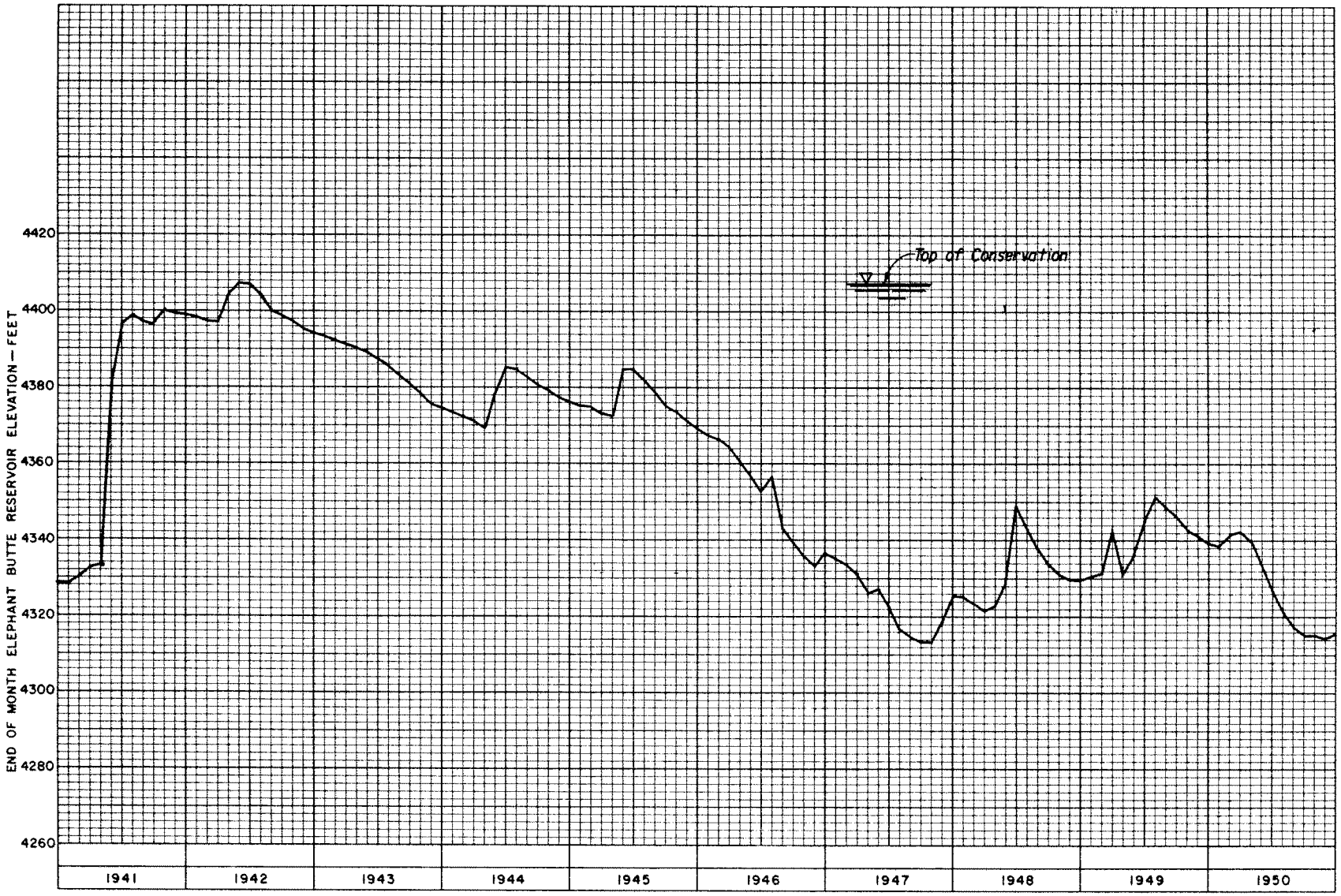

Figure 5. - End of Month Elephant Butte Reservoir Elevations - Continued

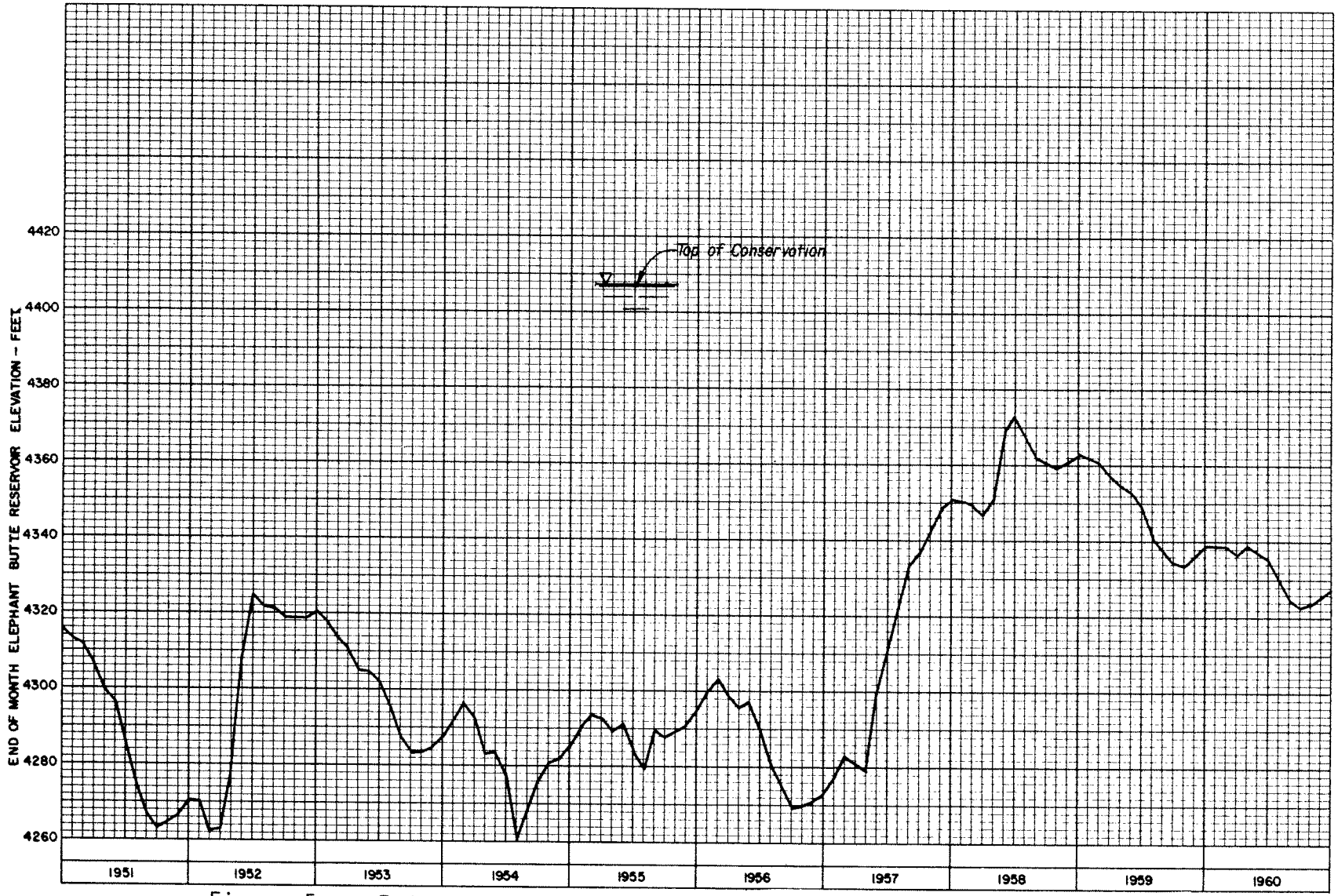

Figure 5. - End of Month Elephant Butte Reservoir Elevations - Continued

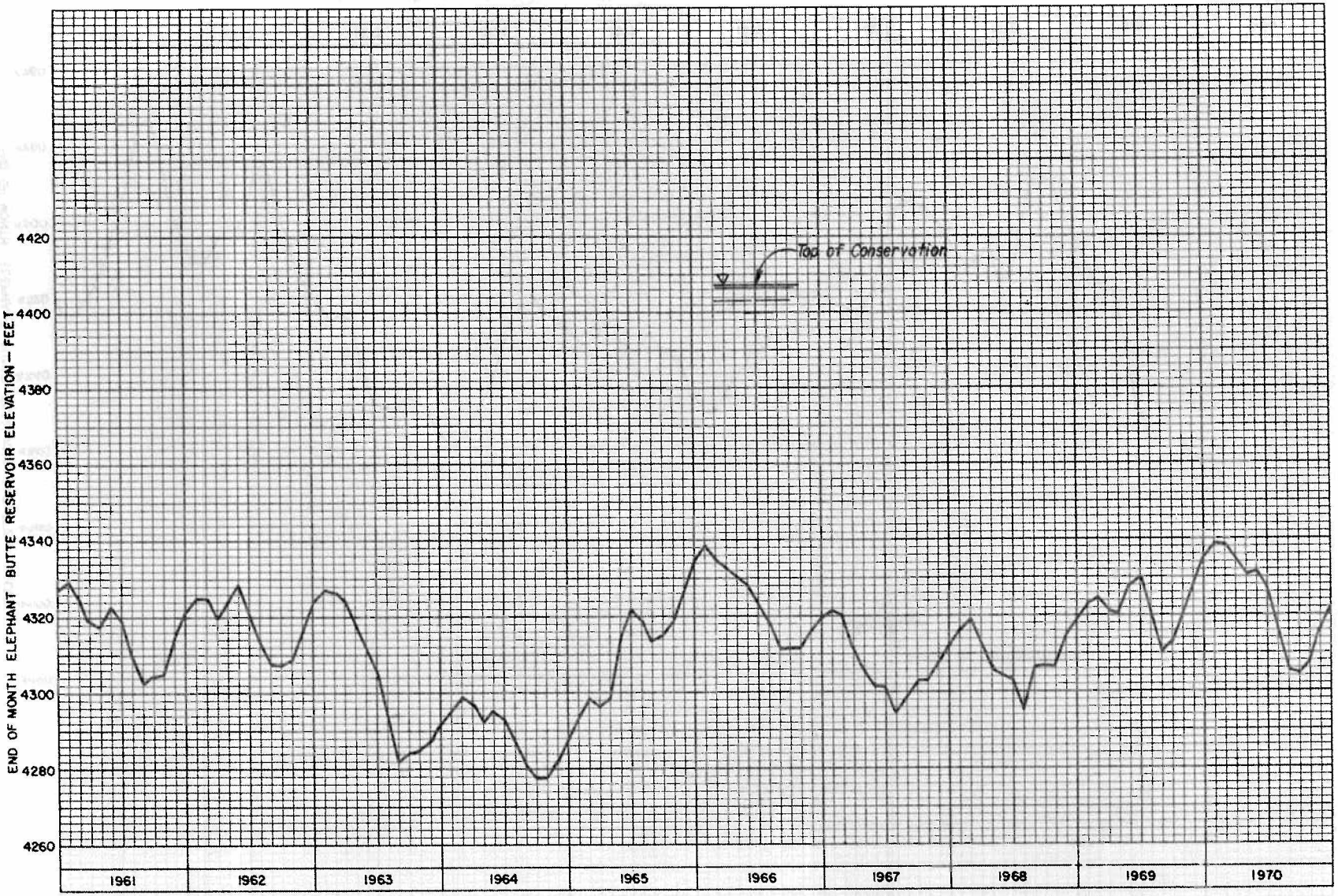

Figure 5. - End of Month Elephant Butte Reservoir Elevations - Continued

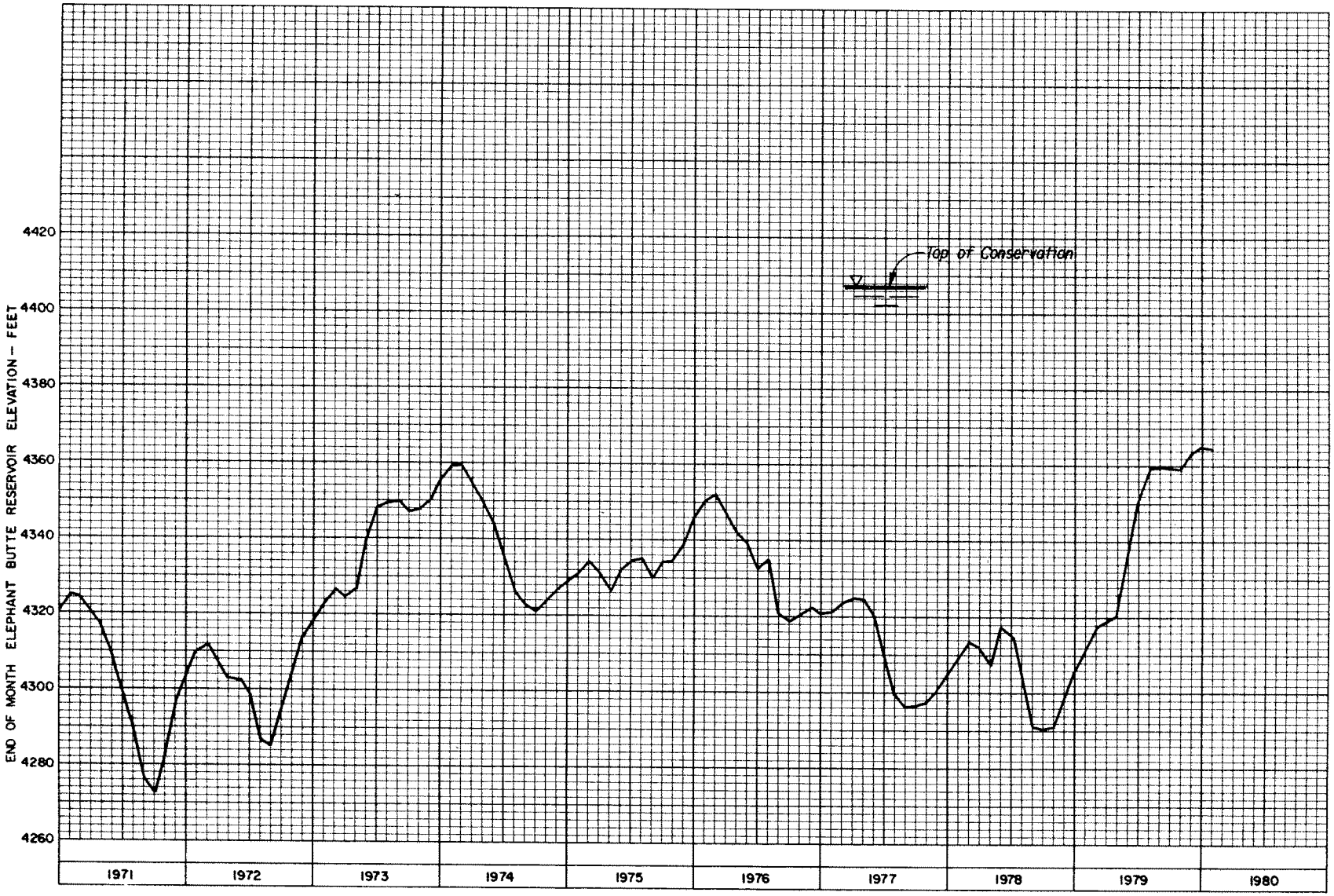

Figure 5. - End of Month Elephant Butte Reservoir Elevations - Continued

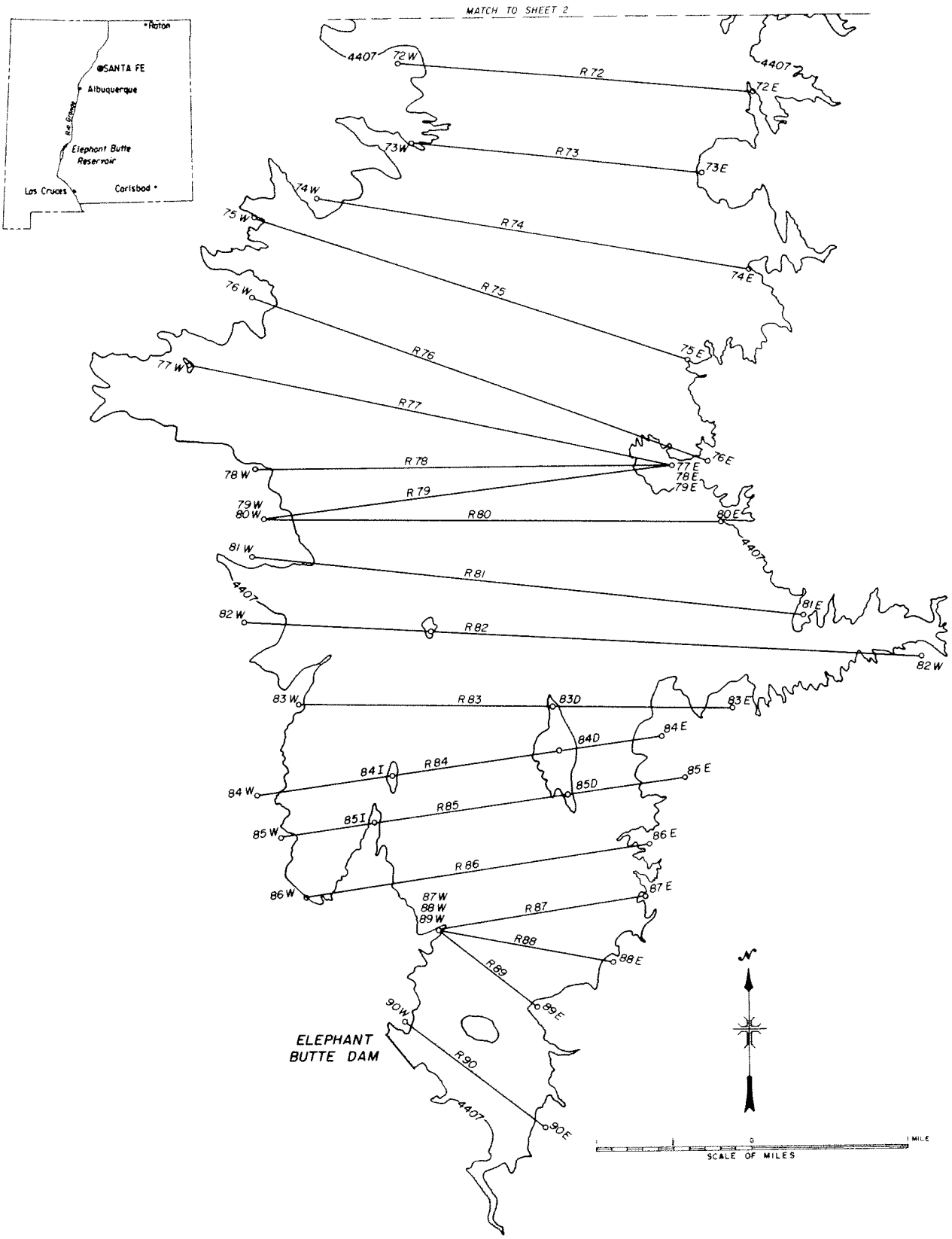

Figure 6. - Layout of Reservoir Sedimentation Ranges

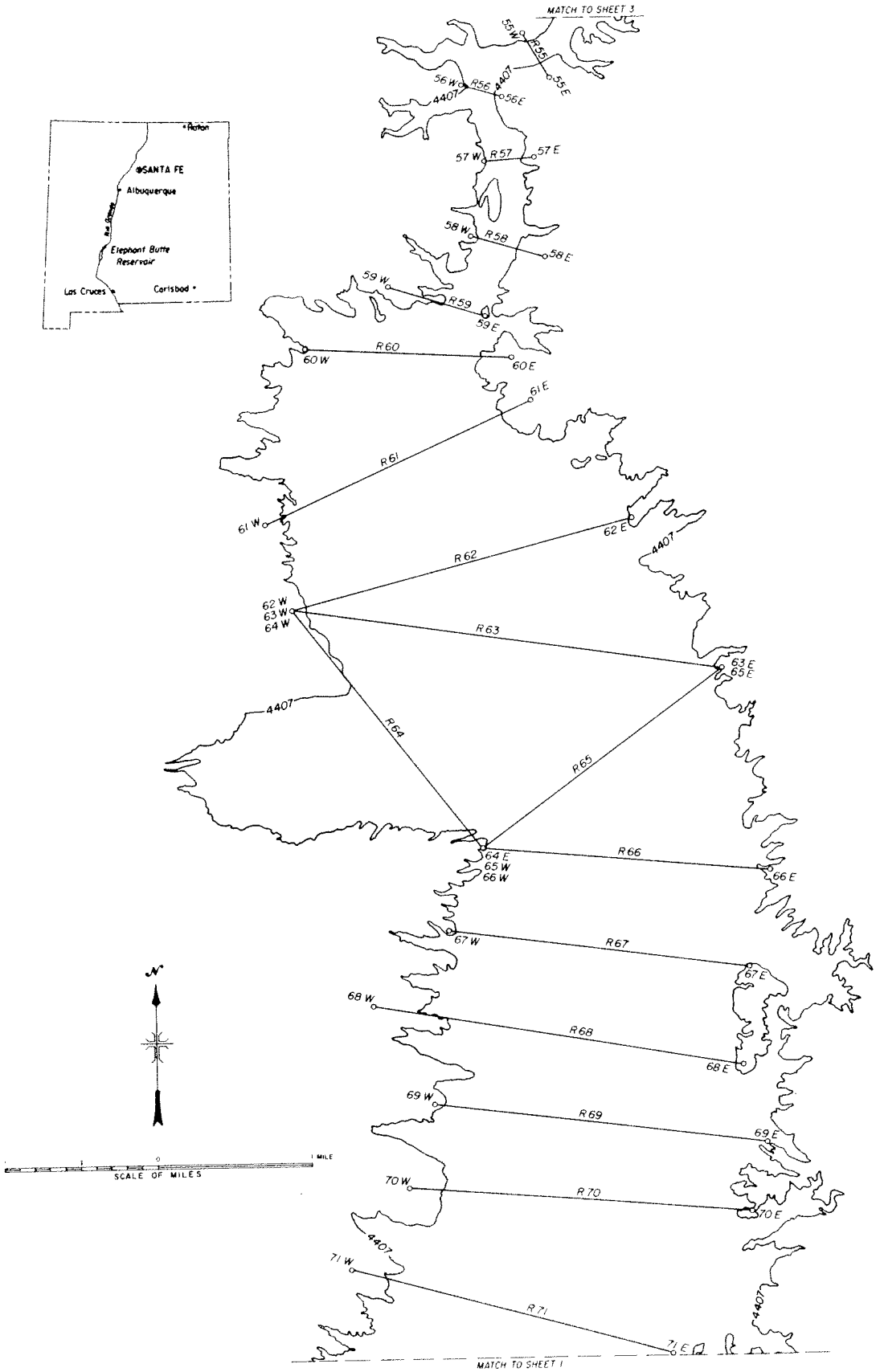

Figure 6. - Layout of Reservoir Sedimentation Ranges - Continued

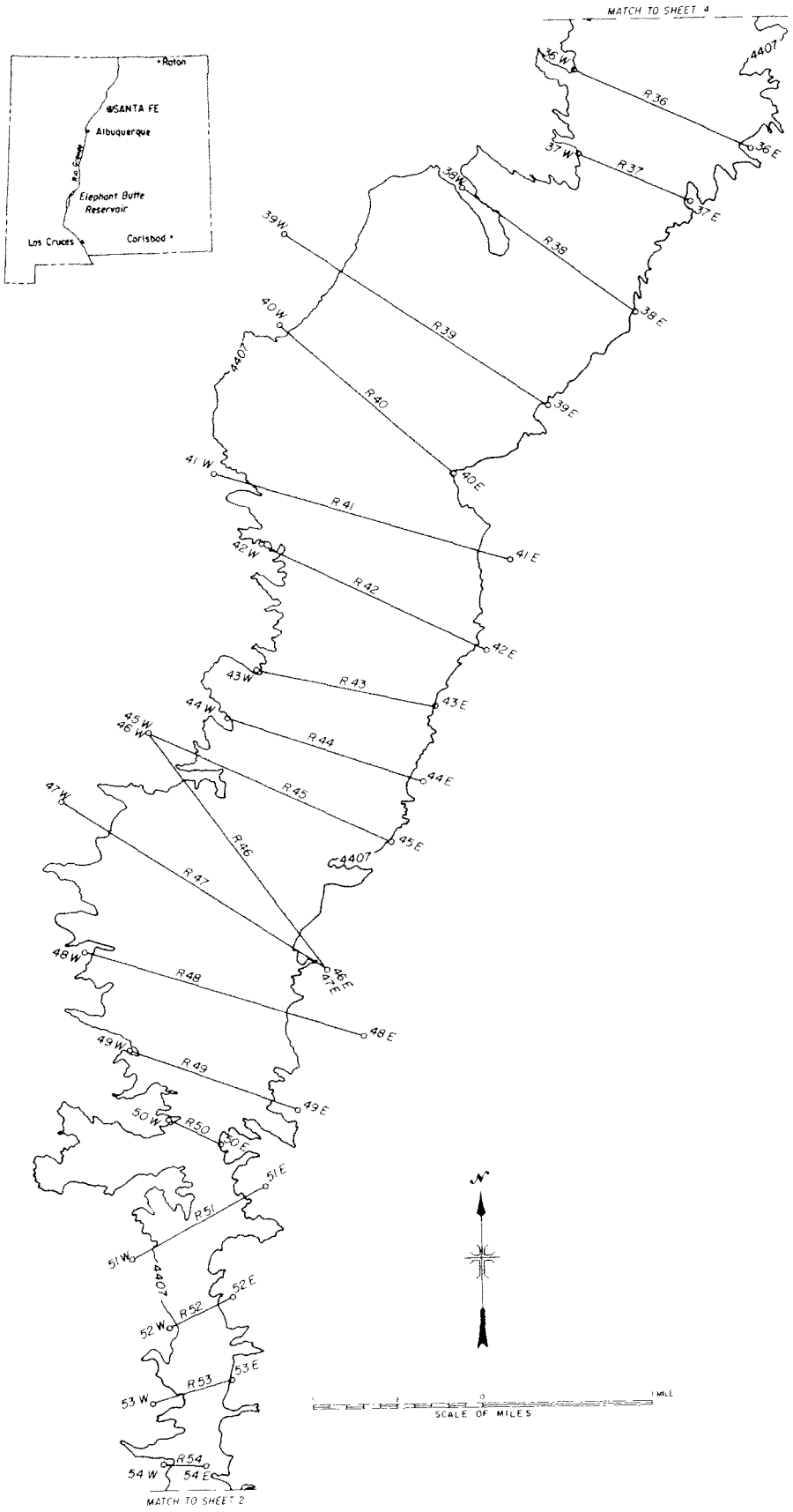

Figure 6. - Layout of Reservoir Sedimentation Ranges - Continued

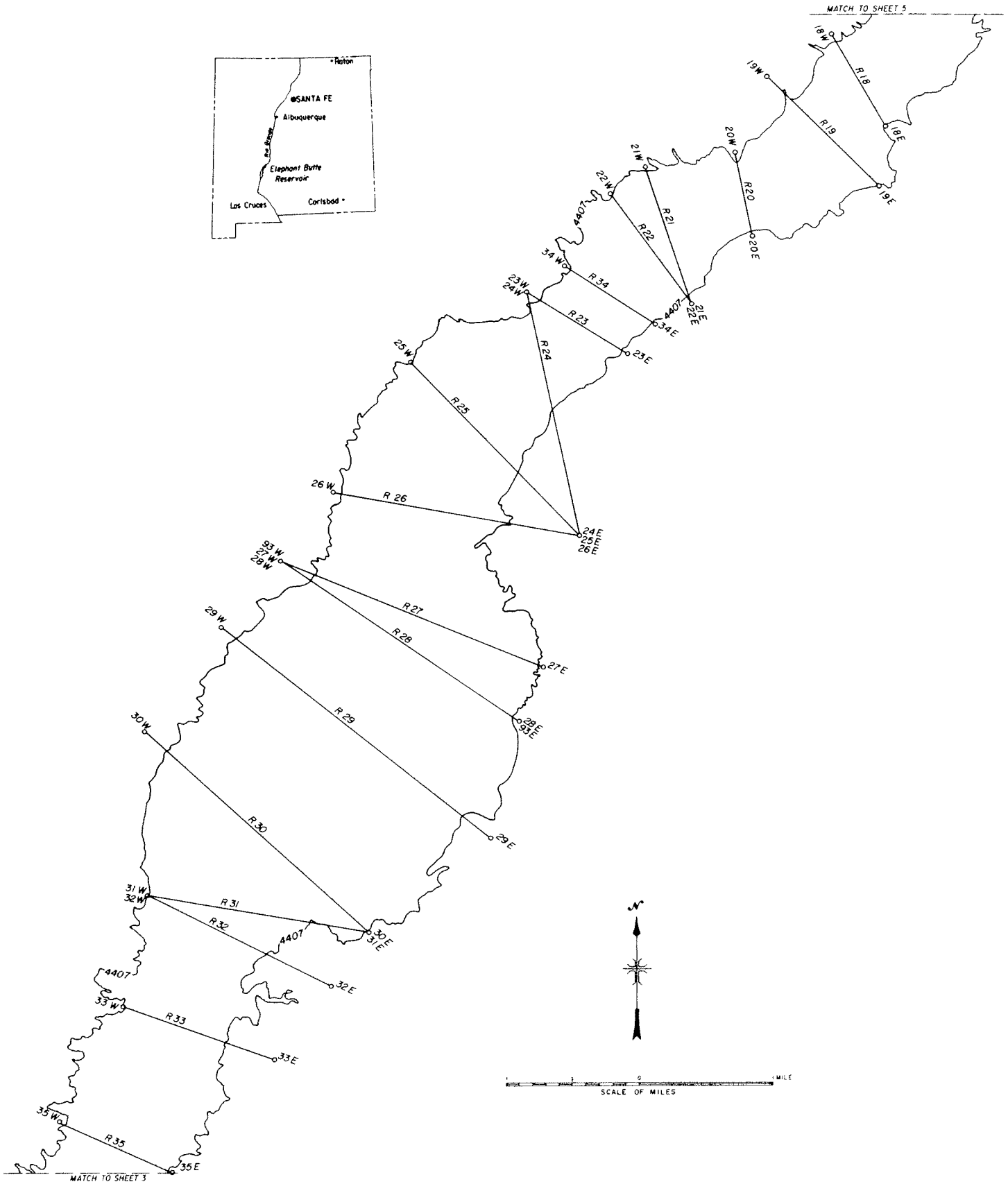

Figure 6. - Layout of Reservoir Sedimentation Ranges - Continued

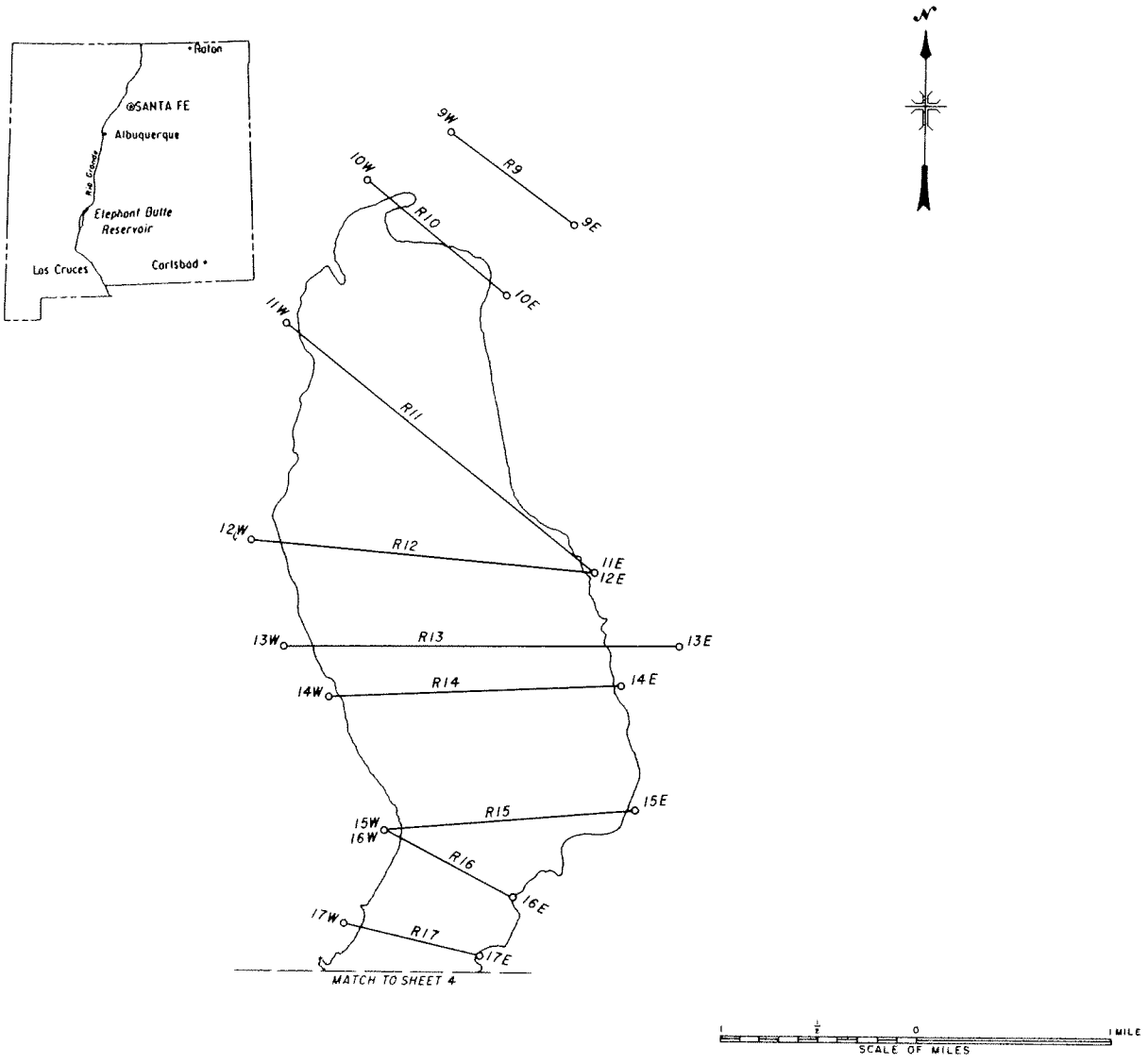

Figure 6. - Layout of Reservoir Sedimentation Ranges - Continued

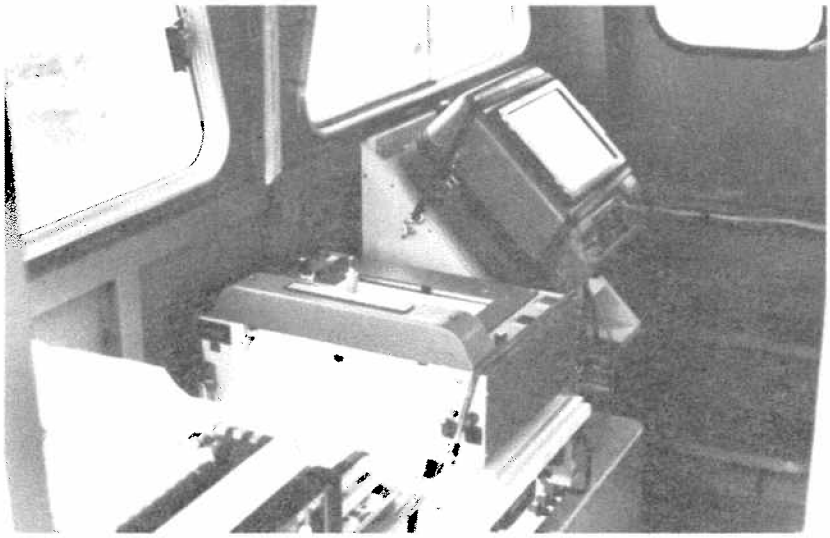

Figure 7. - Depth Recorder Interfaced with Automated Positioning System

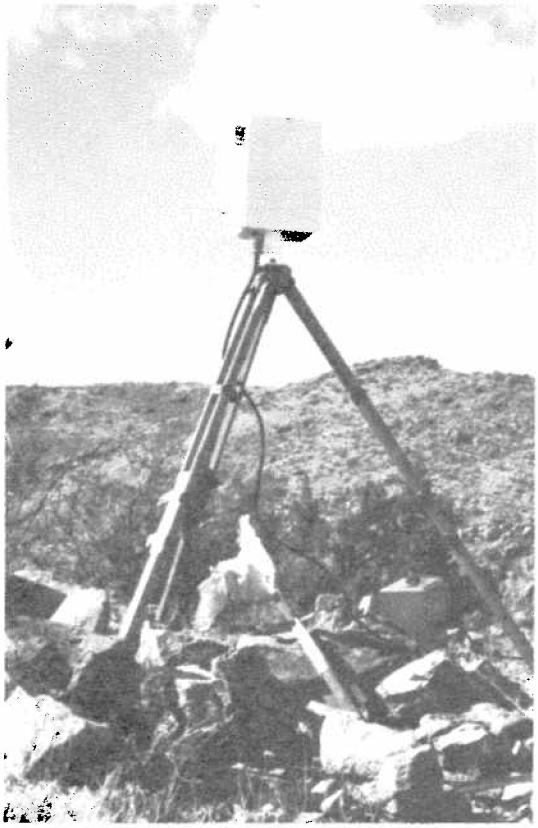

Figure 8. - Fixed Shore Station

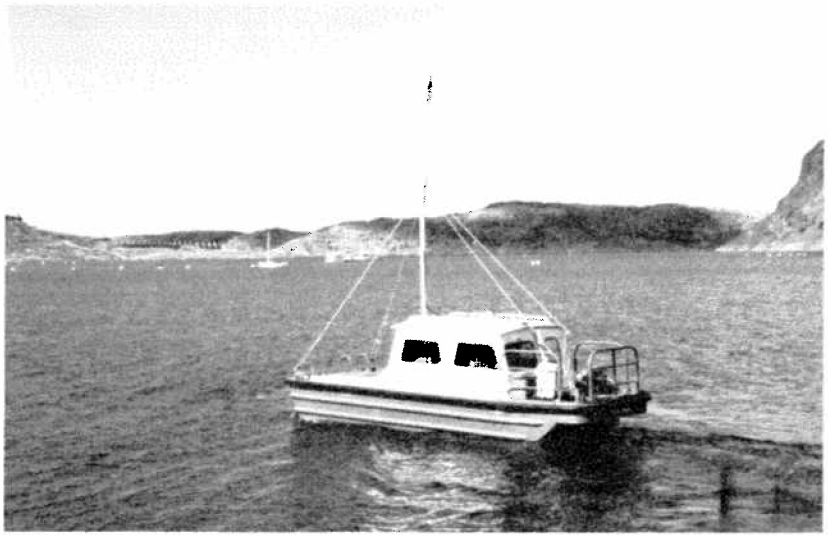

Figure 9. - Sounding Boat for Hydrographic Survey

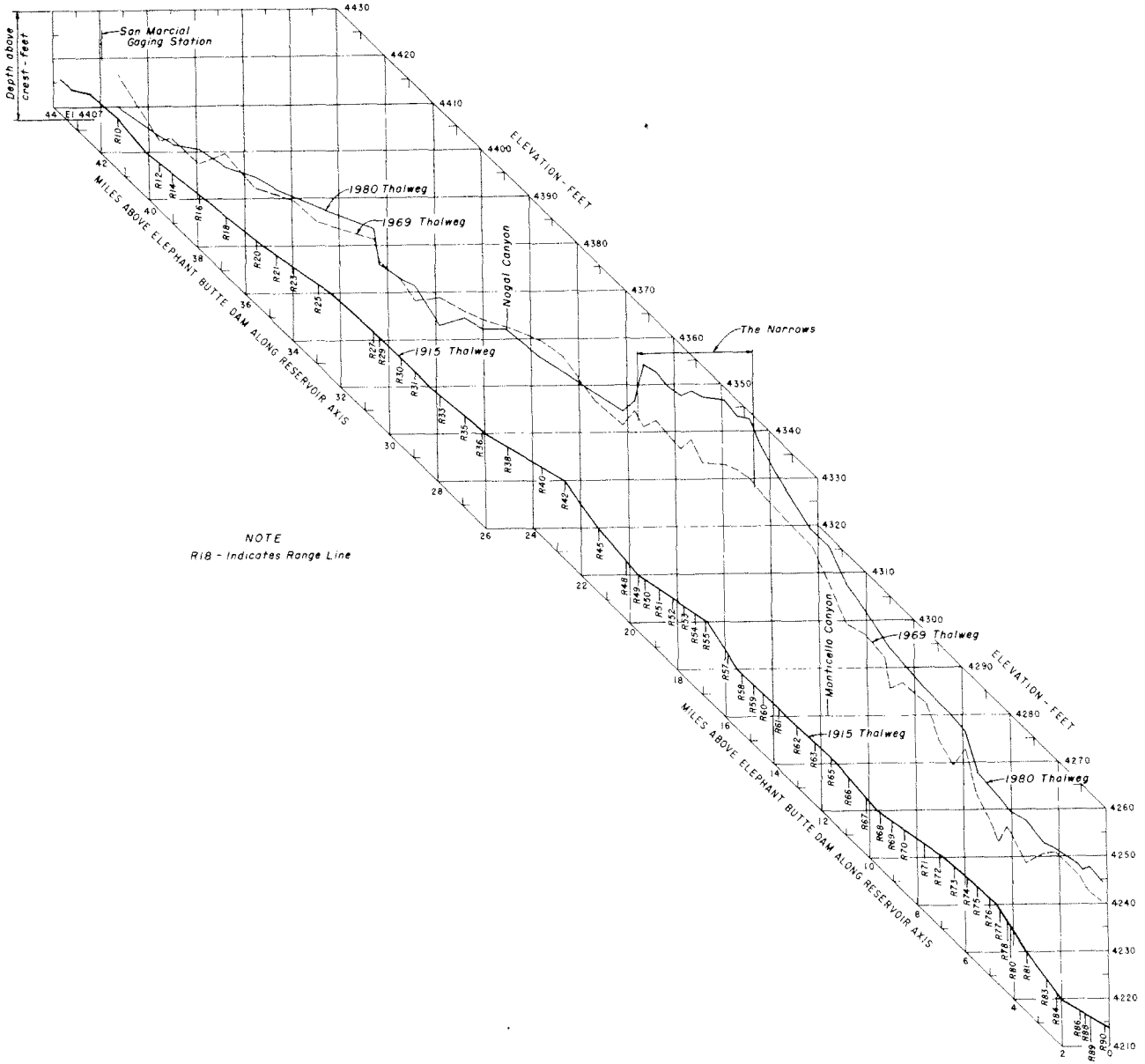

Figure 10. - Longitudinal Profiles

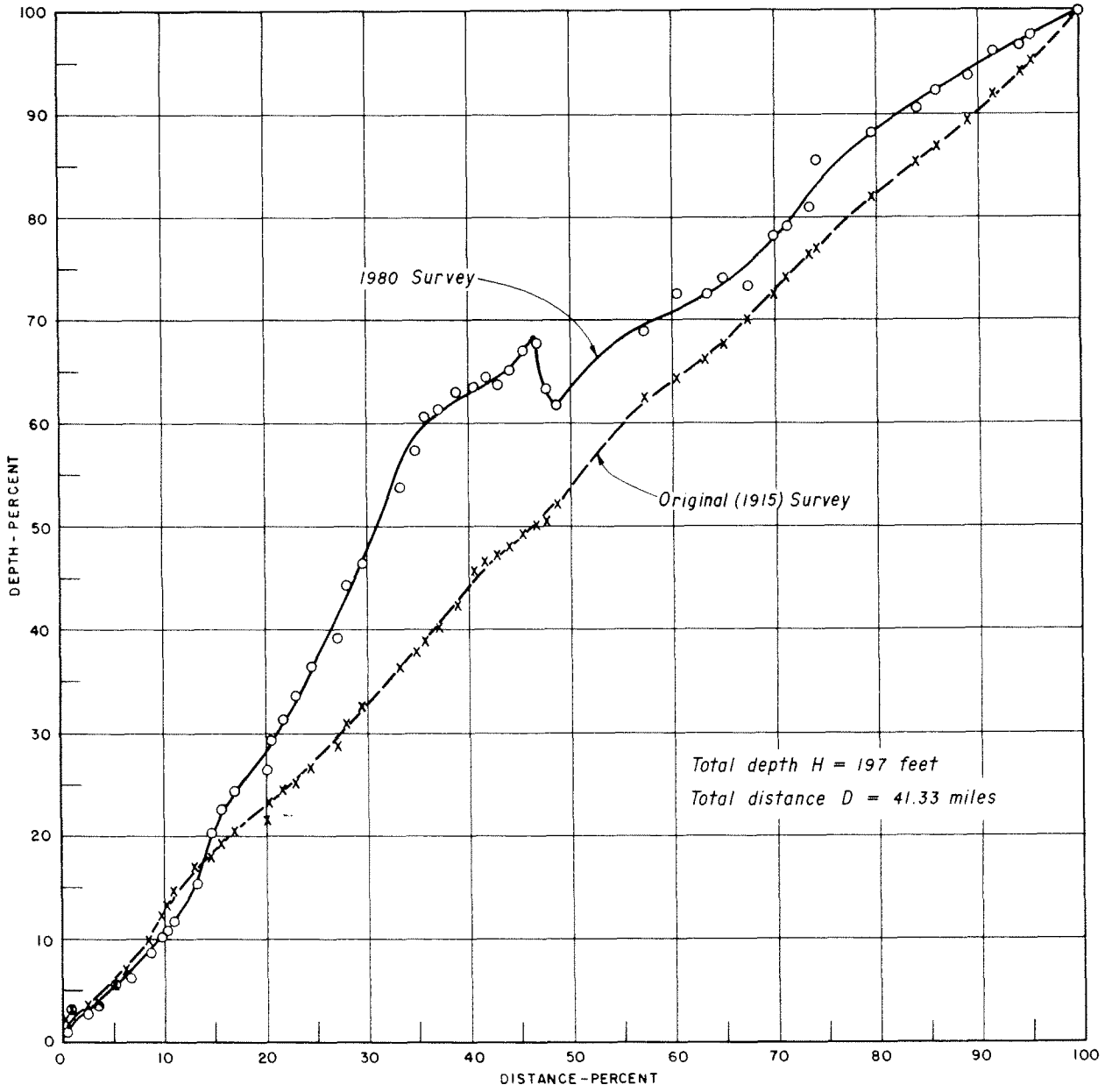

Figure 11. - Percent Depth-percent Distance Relationship for Rio Grande Above Elephant Butte Dam

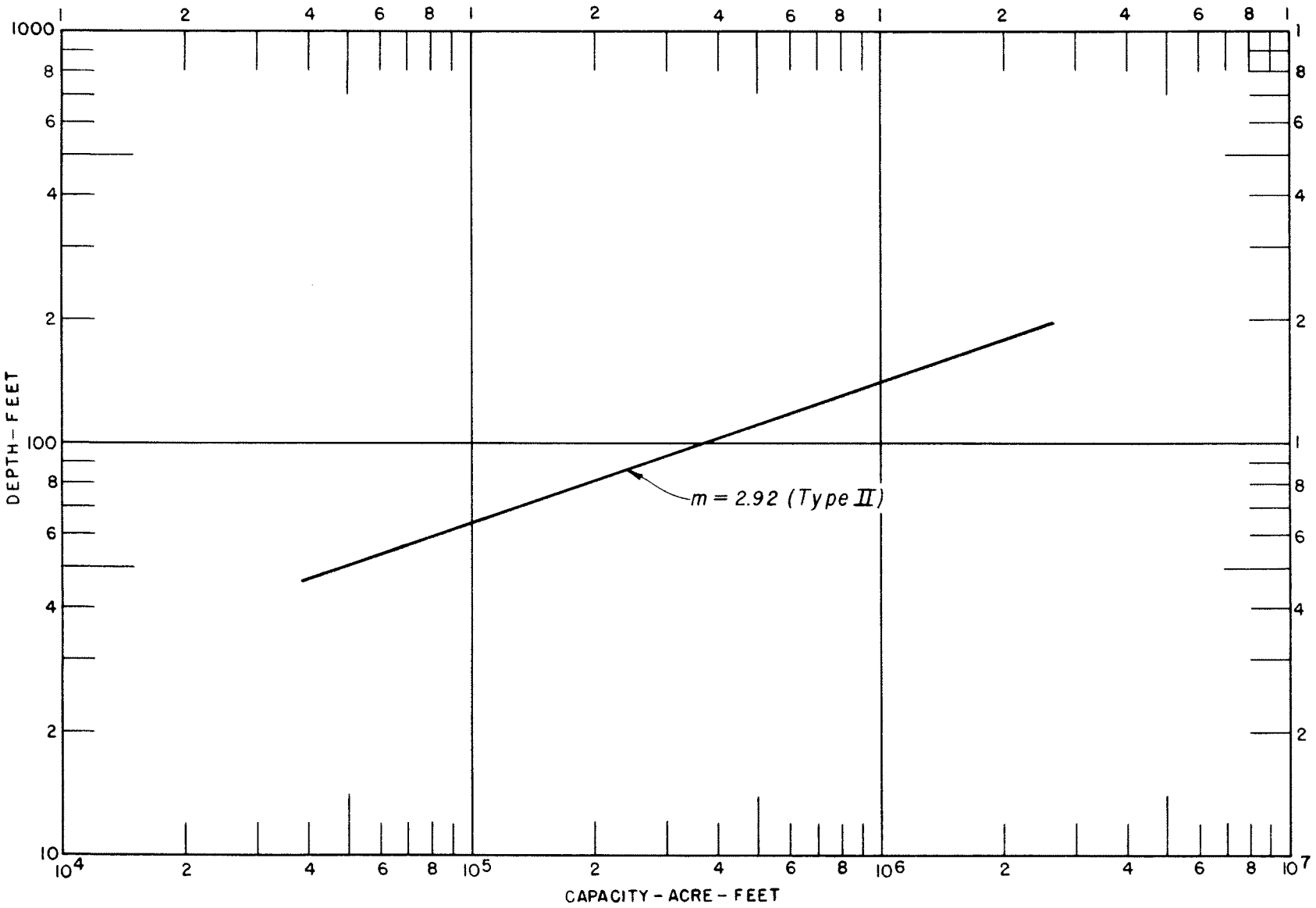

Figure 12. - Elephant Butte Reservoir Depth-capacity Relation

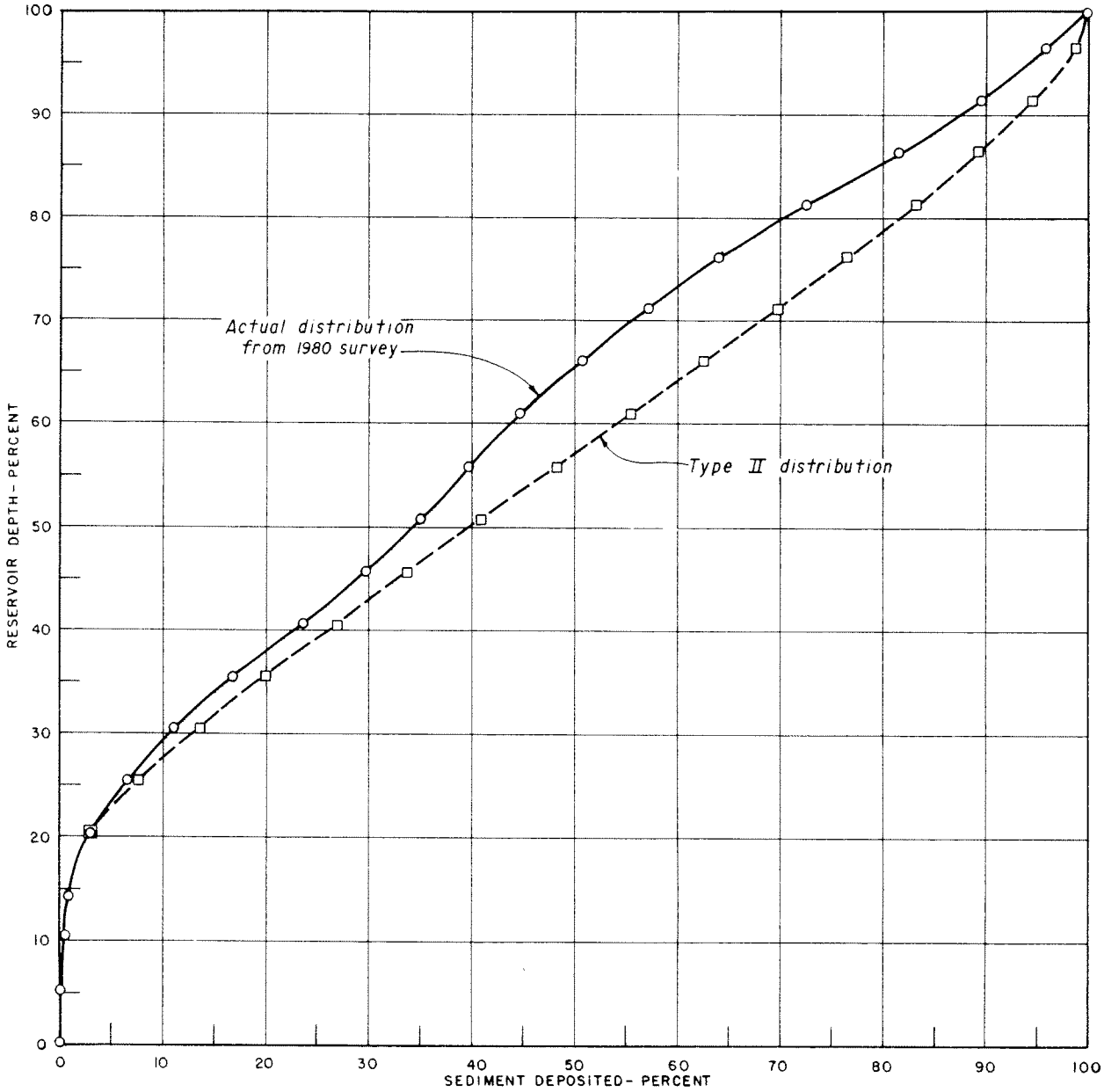

Figure 13. - Sediment Distribution Curves - Elephant Butte Reservoir

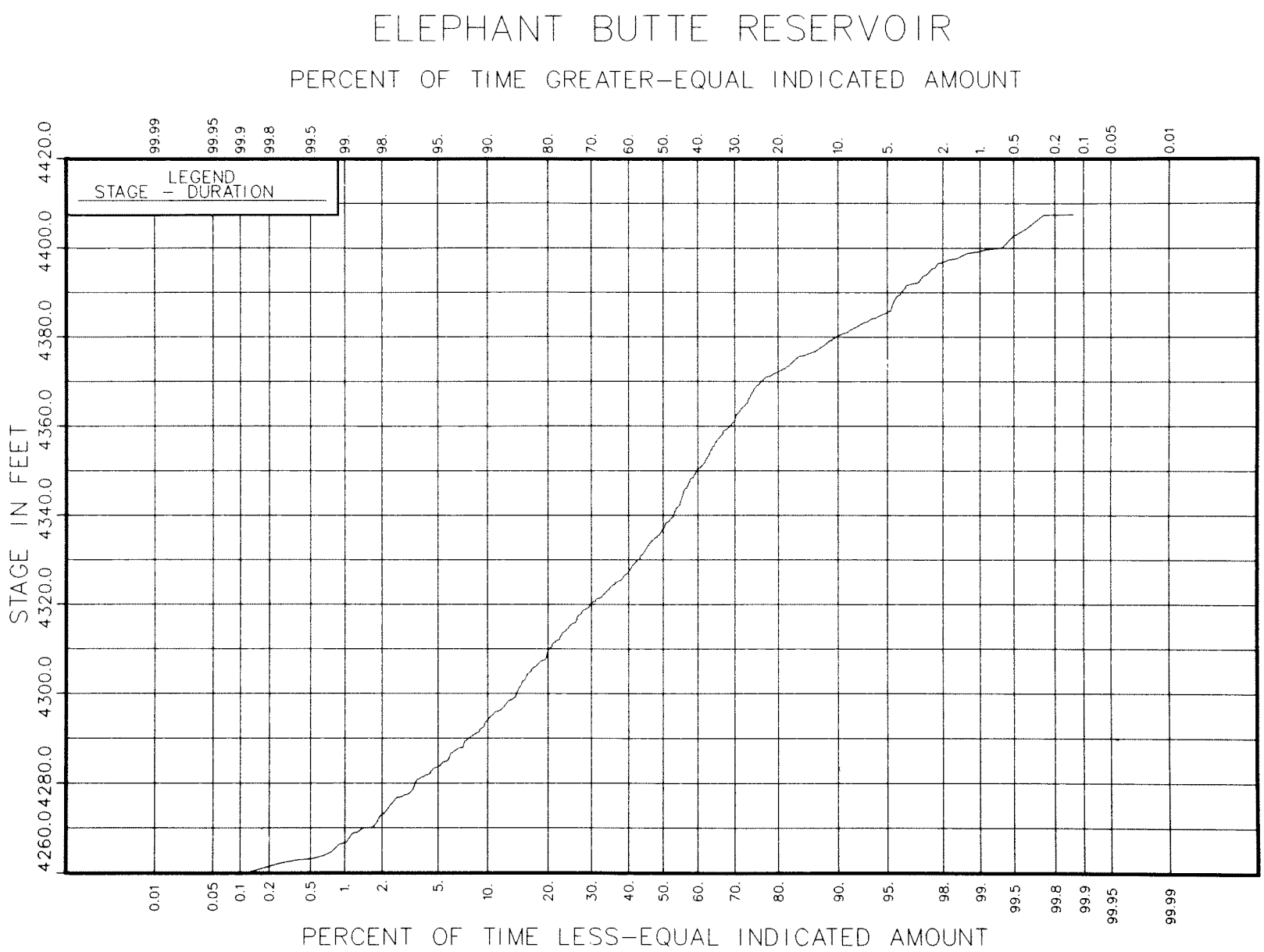

Figure 14. - Stage-duration Curve for End-of-month Elevations

PLOT 1 14.25.00 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

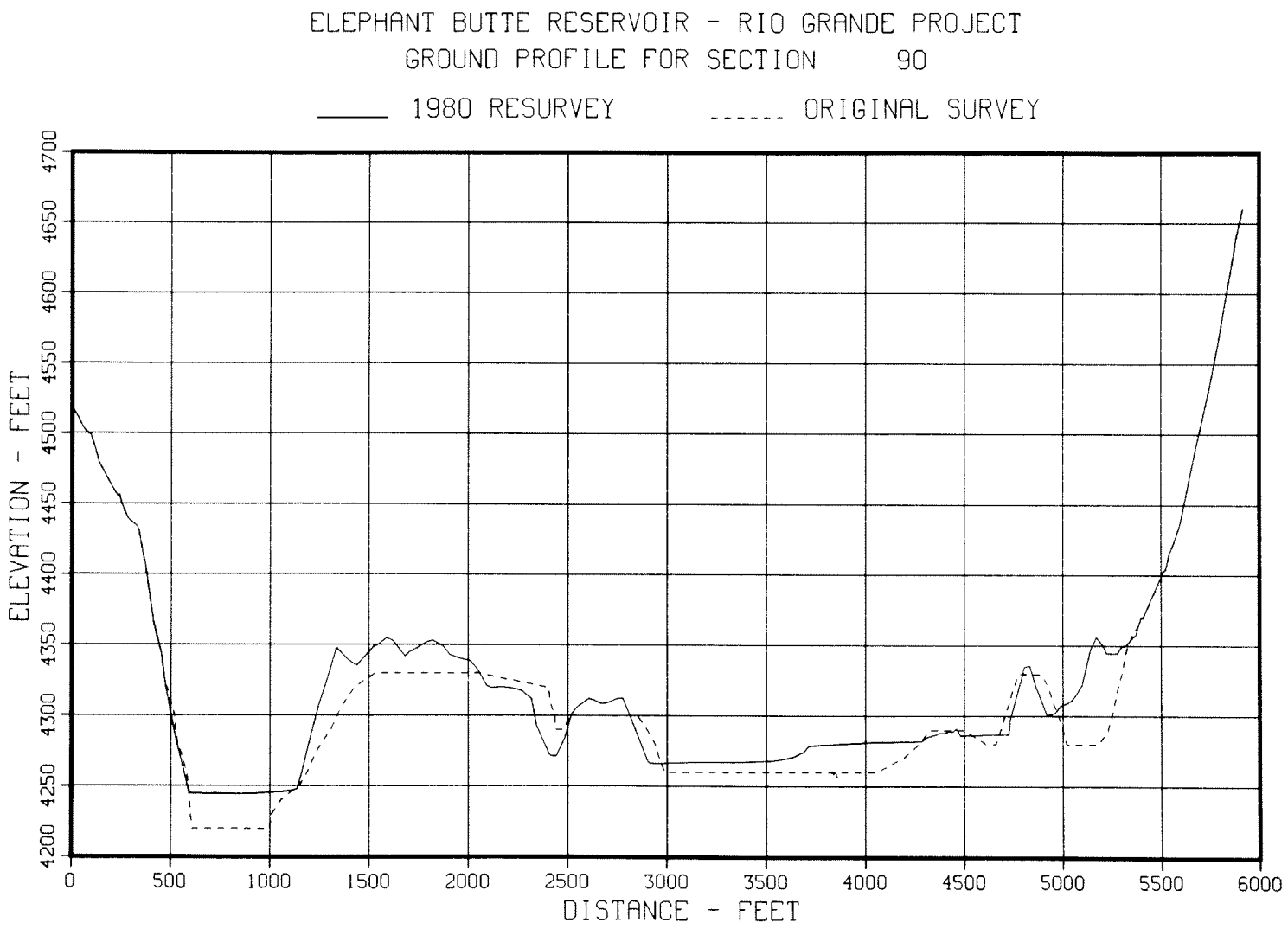

Figure 15. - 1915 and 1980 Sedimentation Range Profiles - Range 90

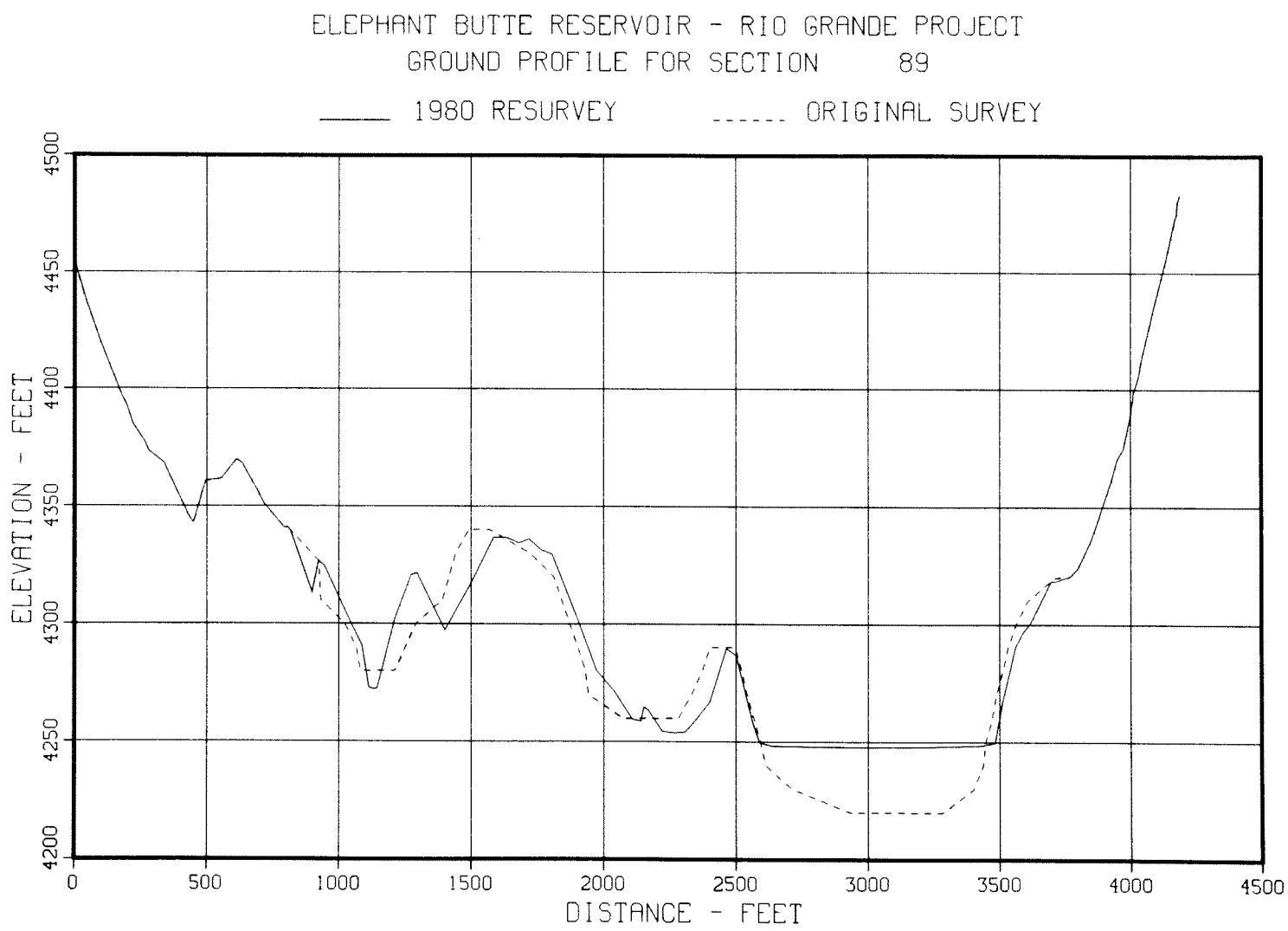

Figure 16. - 1915 and 1980 Sedimentation Range Profiles - Range 89

PLOT 3 14.25.15 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

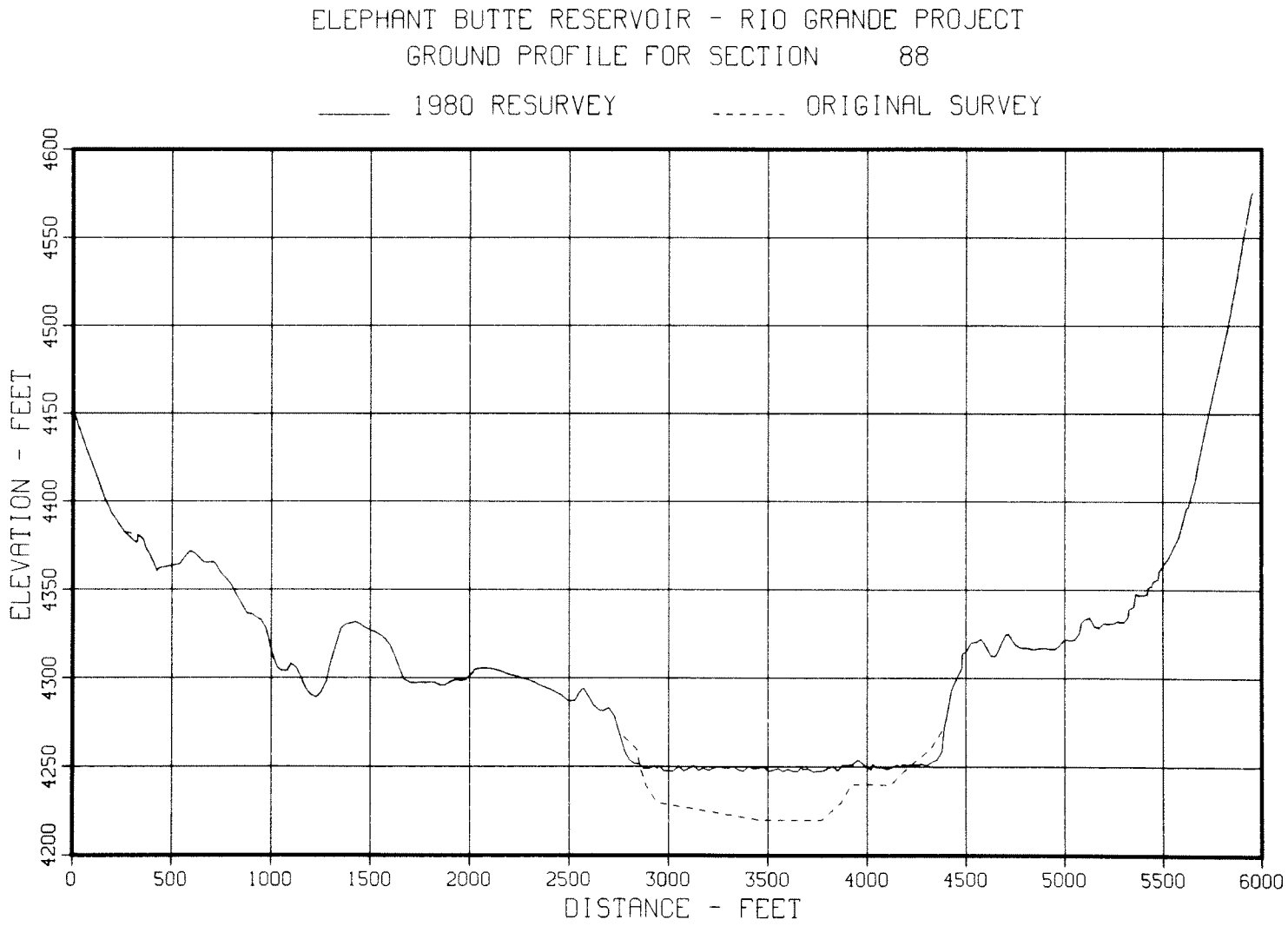

Figure 17. - 1915 and 1980 Sedimentation Range Profiles - Range 88

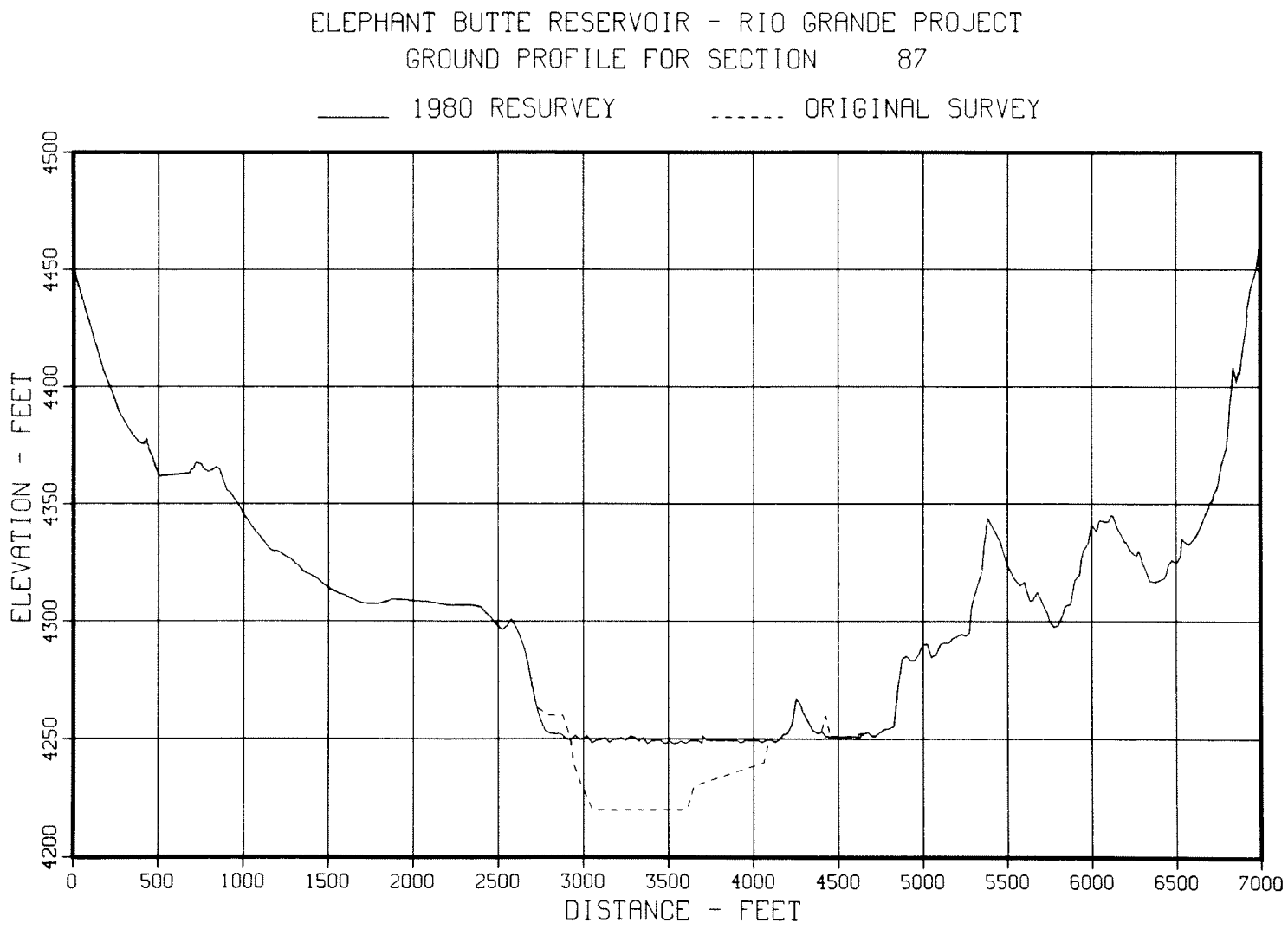

Figure 18. - 1915 and 1980 Sedimentation Range Profiles - Range 87

PLOT 5 14.25.31 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

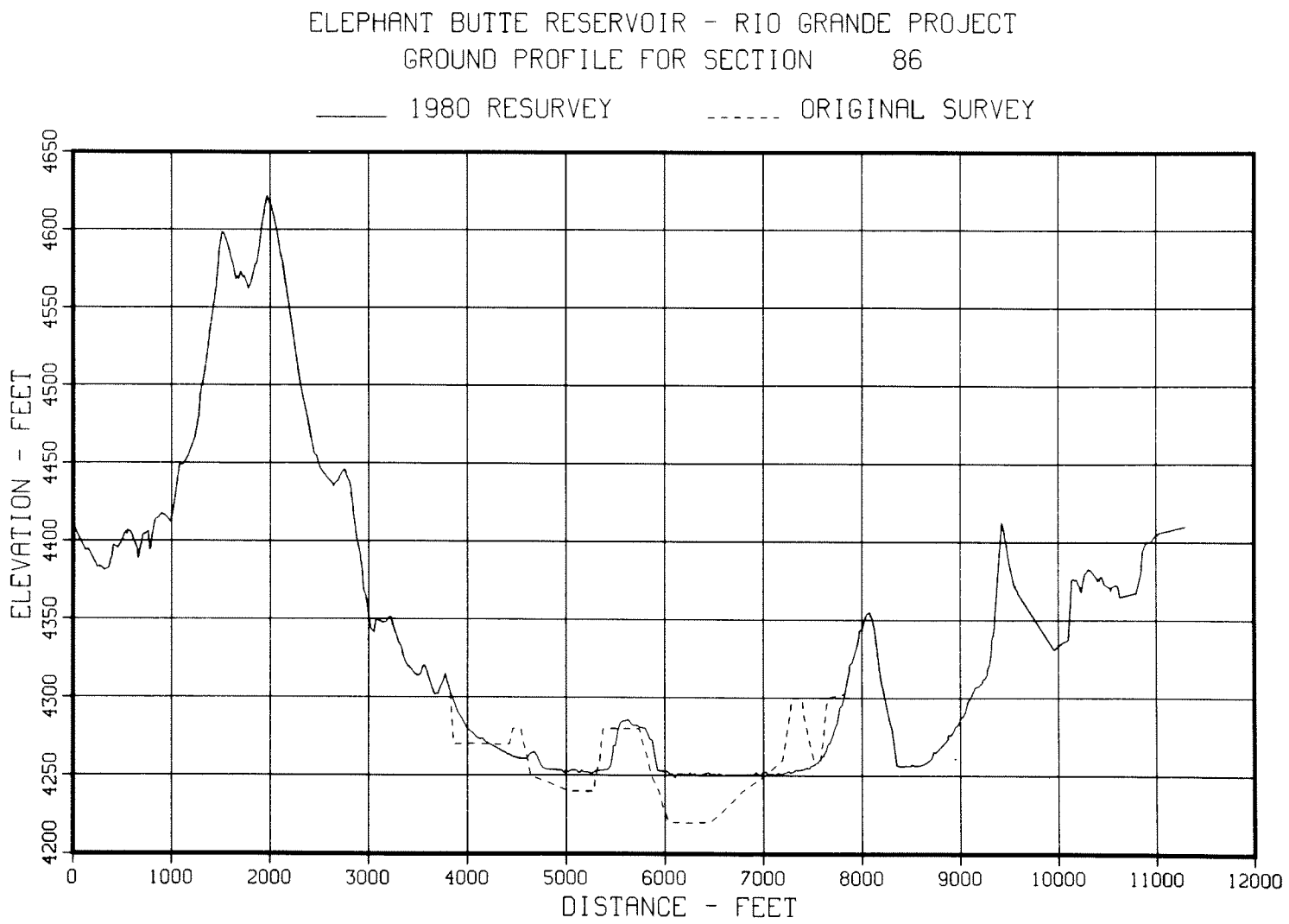

Figure 19. - 1915 and 1980 Sedimentation Range Profiles - Range 86

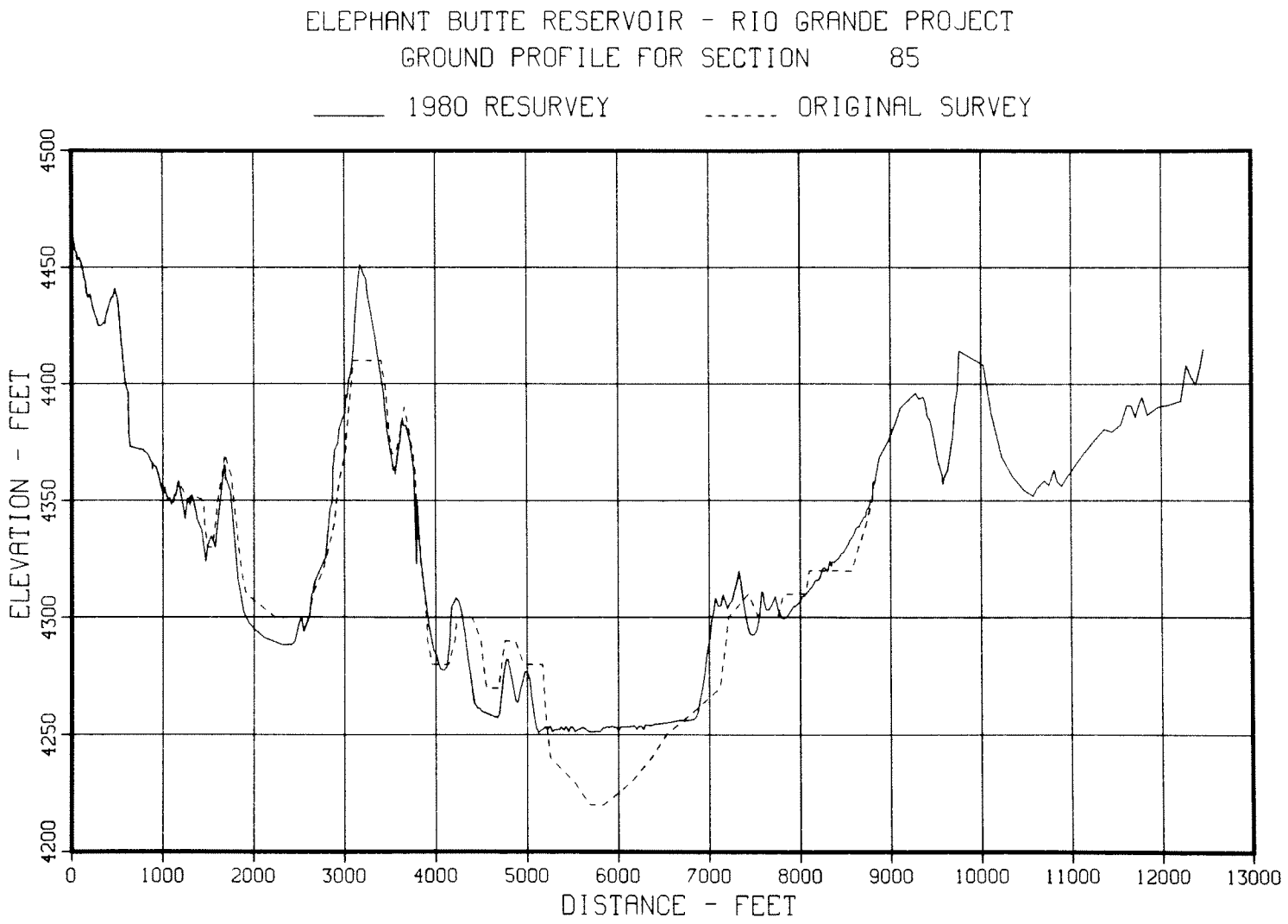

Figure 20. - 1915 and 1980 Sedimentation Range Profiles - Range 85

PLOT 7 14.25.47 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

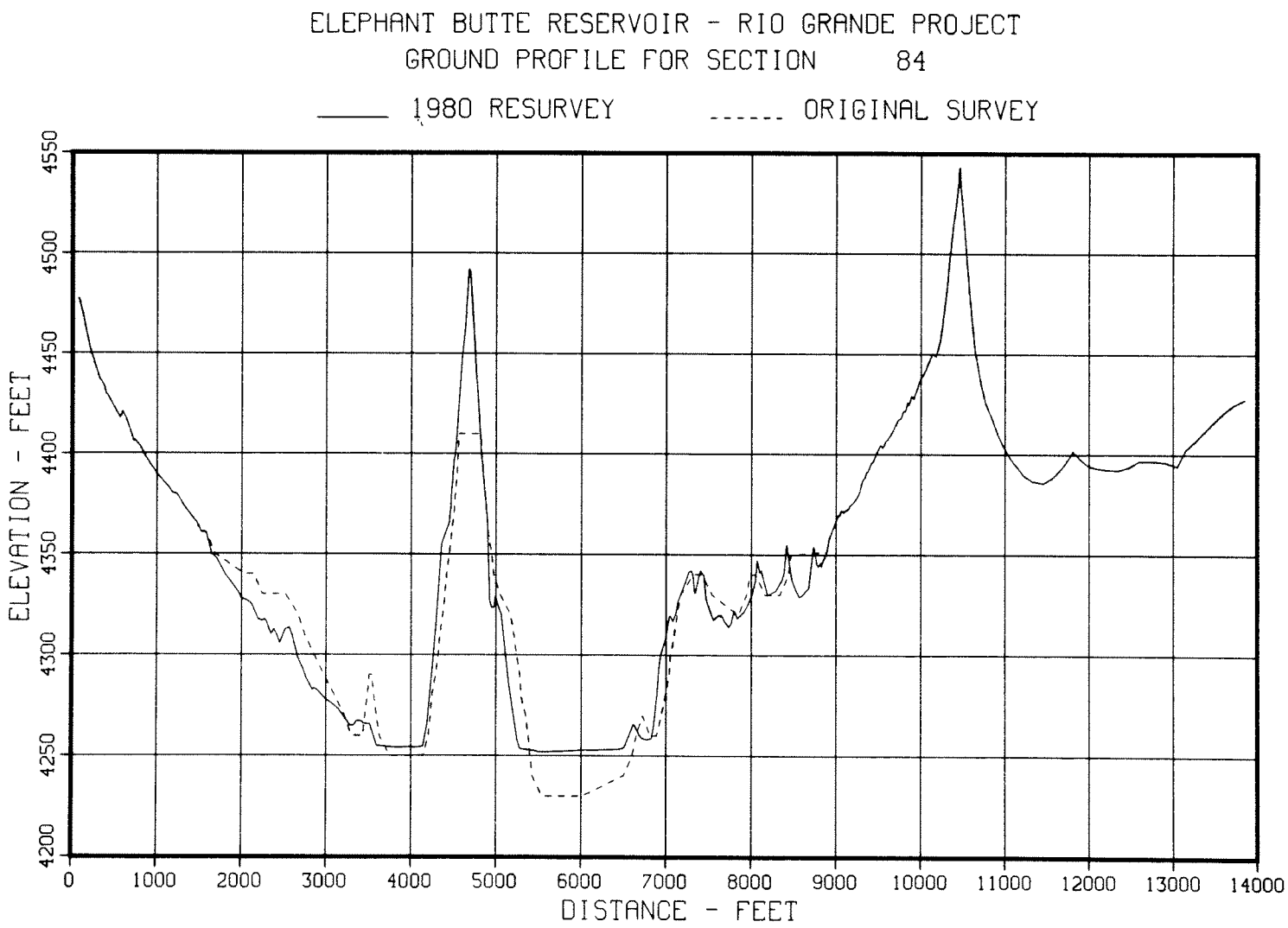

Figure 21. - 1915 and 1980 Sedimentation Range Profiles - Range 84

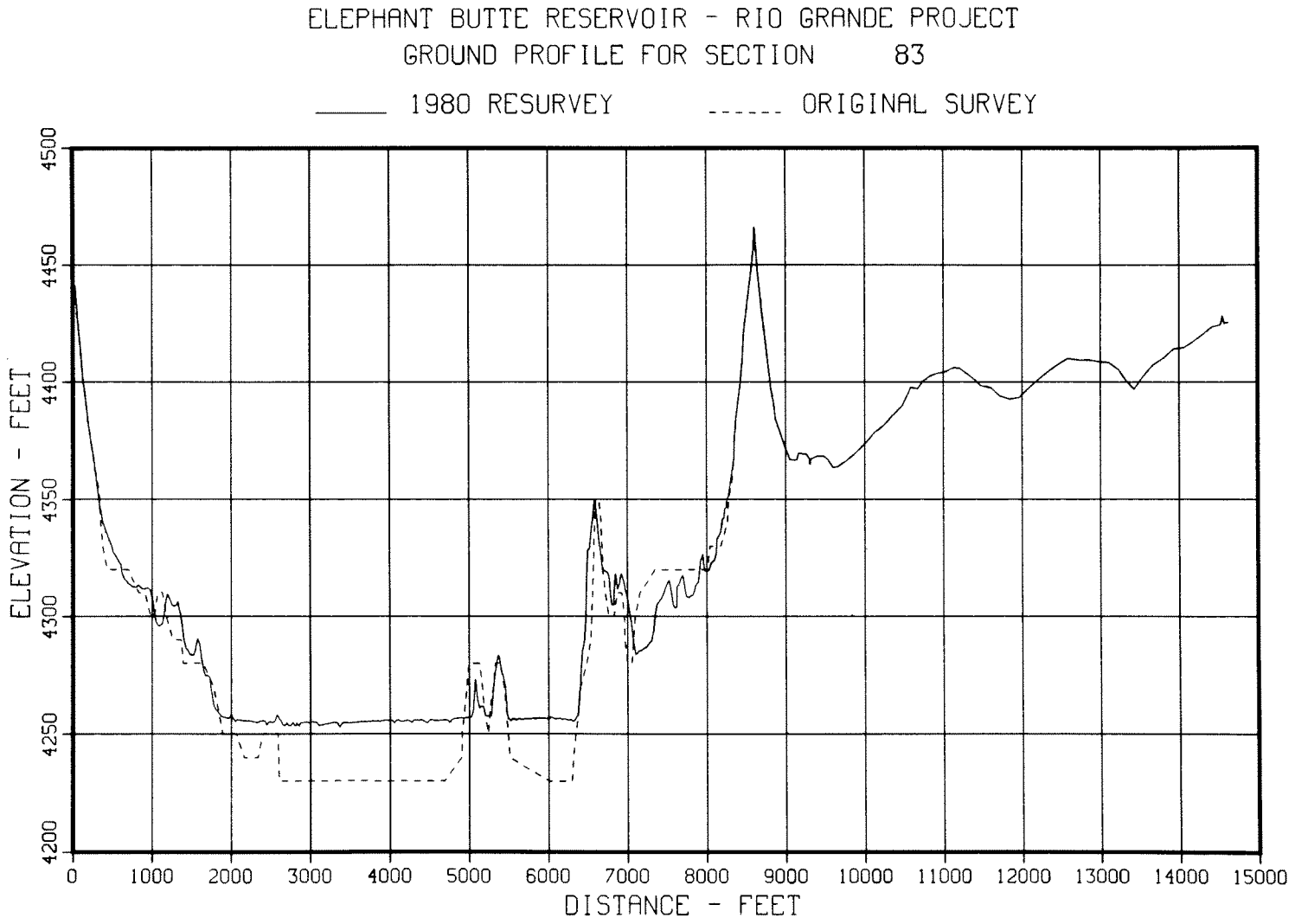

Figure 22. - 1915 and 1980 Sedimentation Range Profiles - Range 83

PLOT 9 14.26.26 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

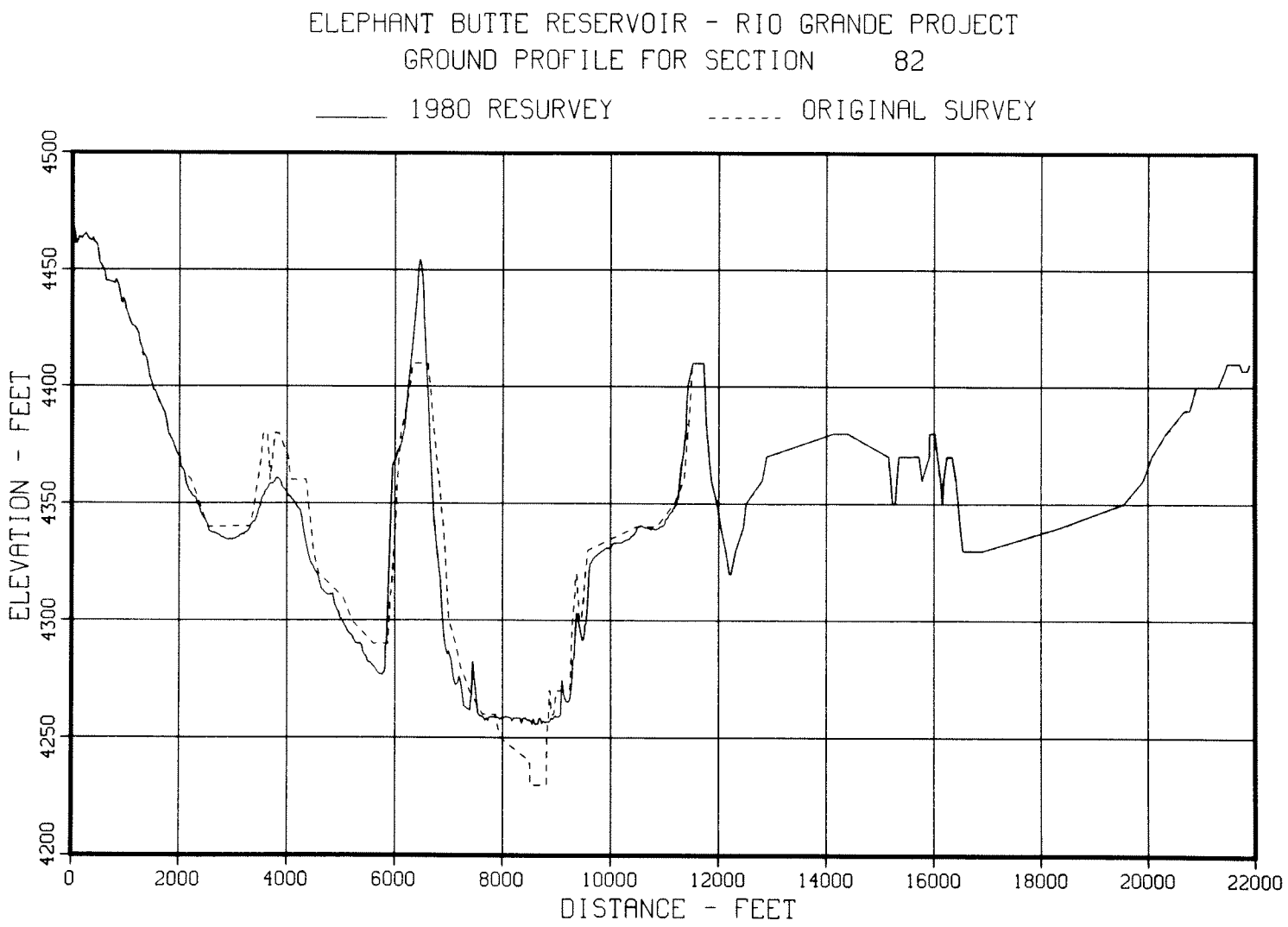

Figure 23. - 1915 and 1980 Sedimentation Range Profiles - Range 82

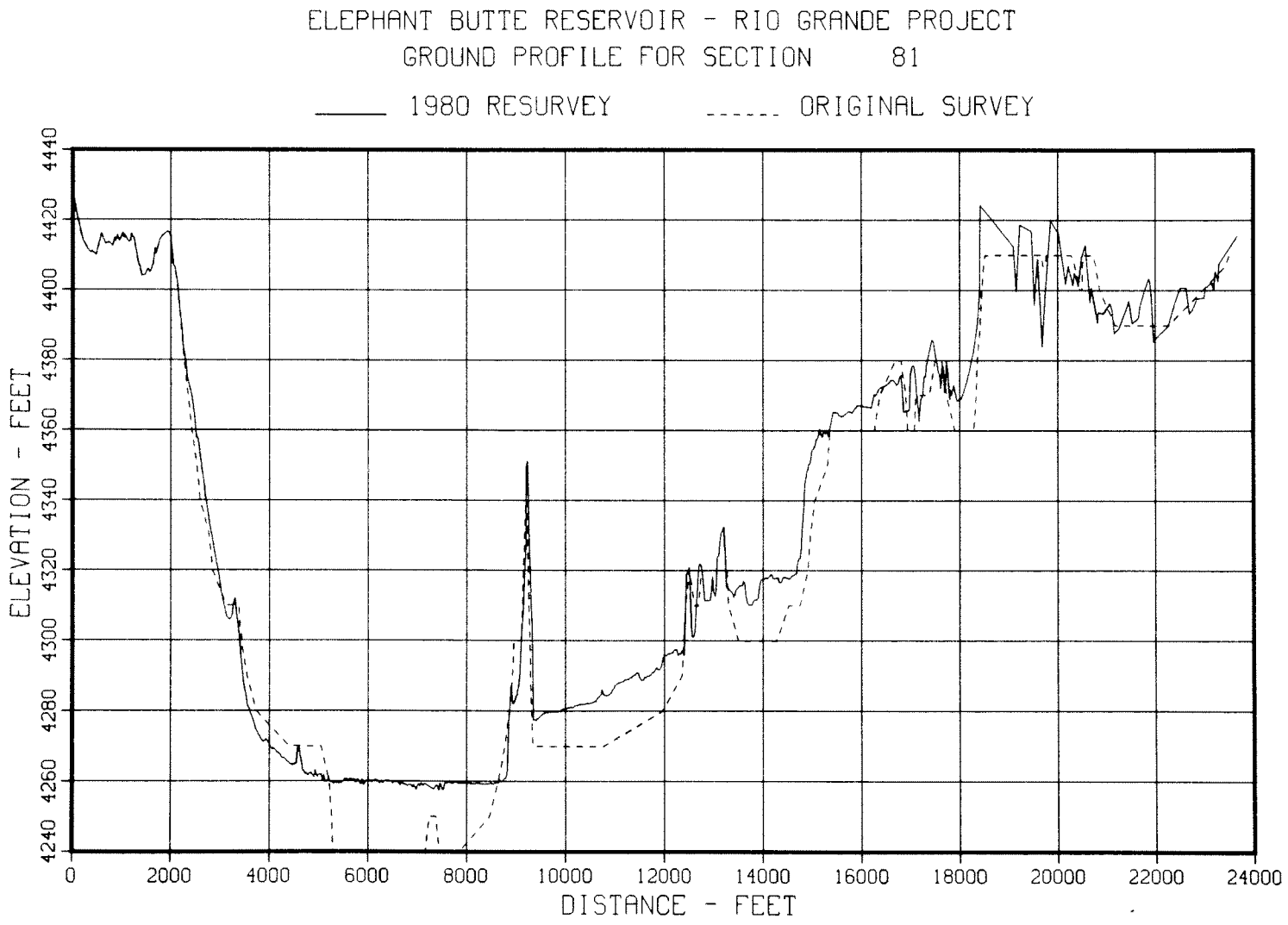

Figure 24. - 1915 and 1980 Sedimentation Range Profiles - Range 81

PLOT 11 14.26.44 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

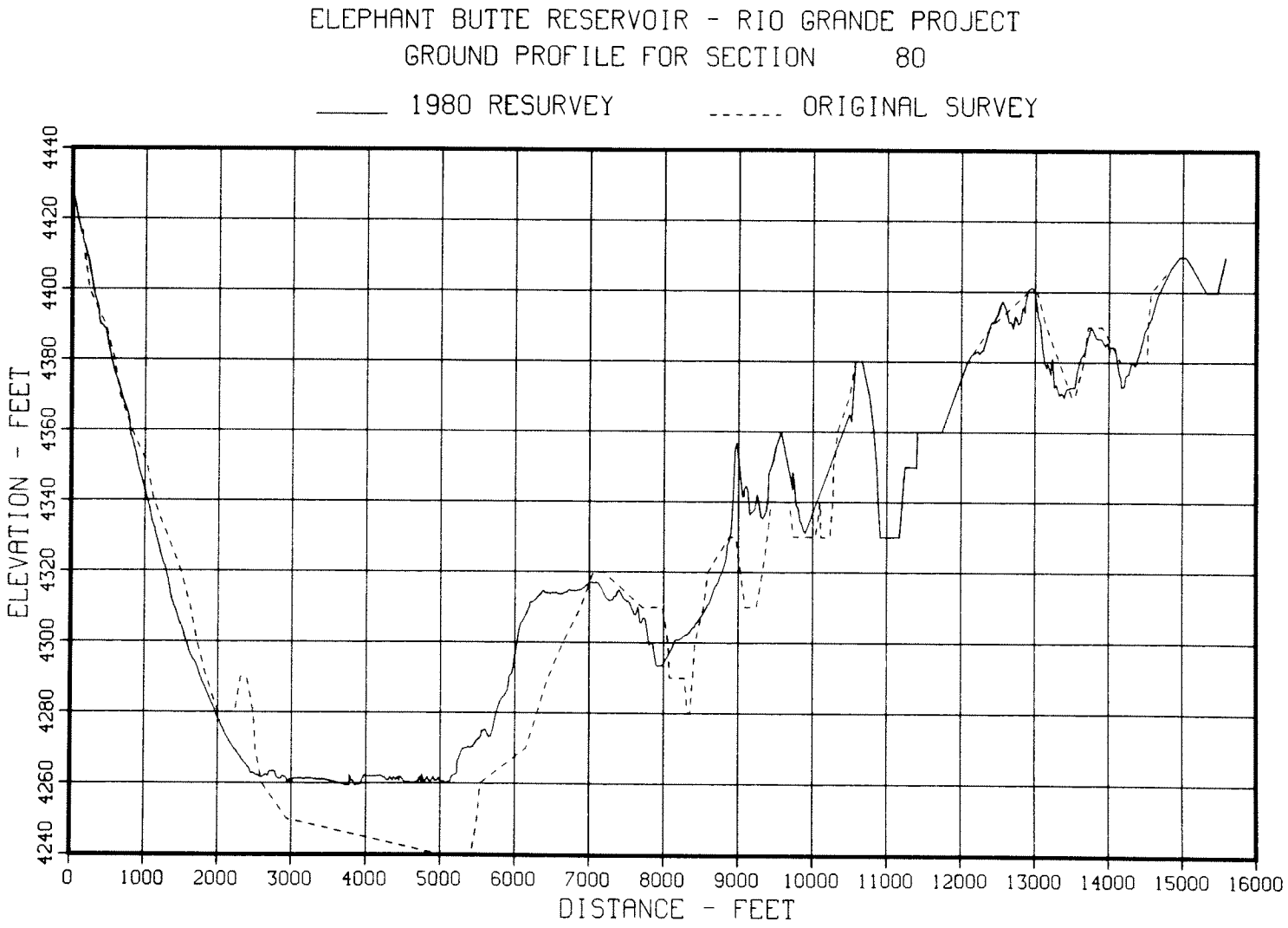

Figure 25. - 1915 and 1980 Sedimentation Range Profiles - Range 80

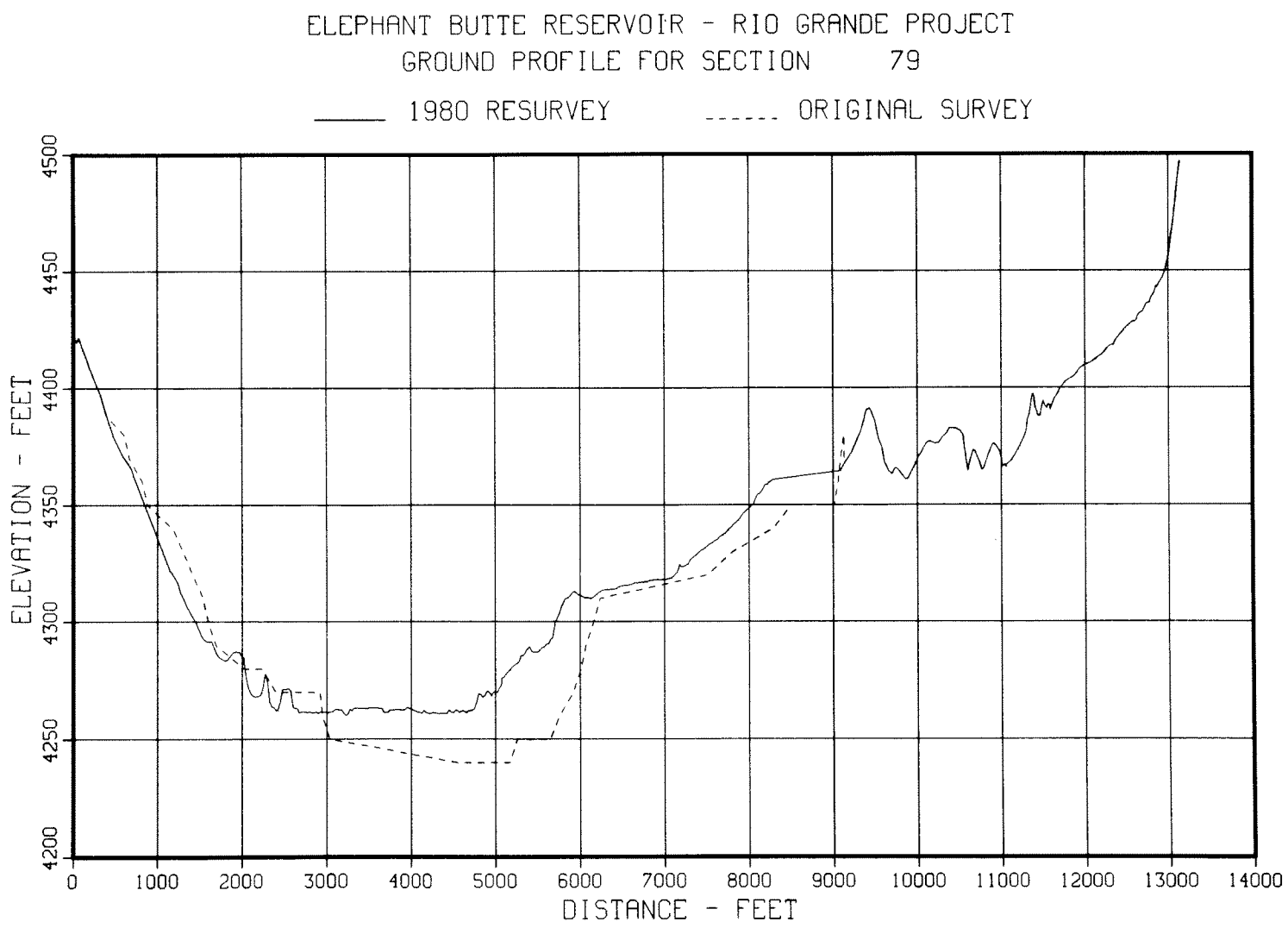

Figure 26. - 1915 and 1980 Sedimentation Range Profiles - Range 79

PLOT 13 14.31.21 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

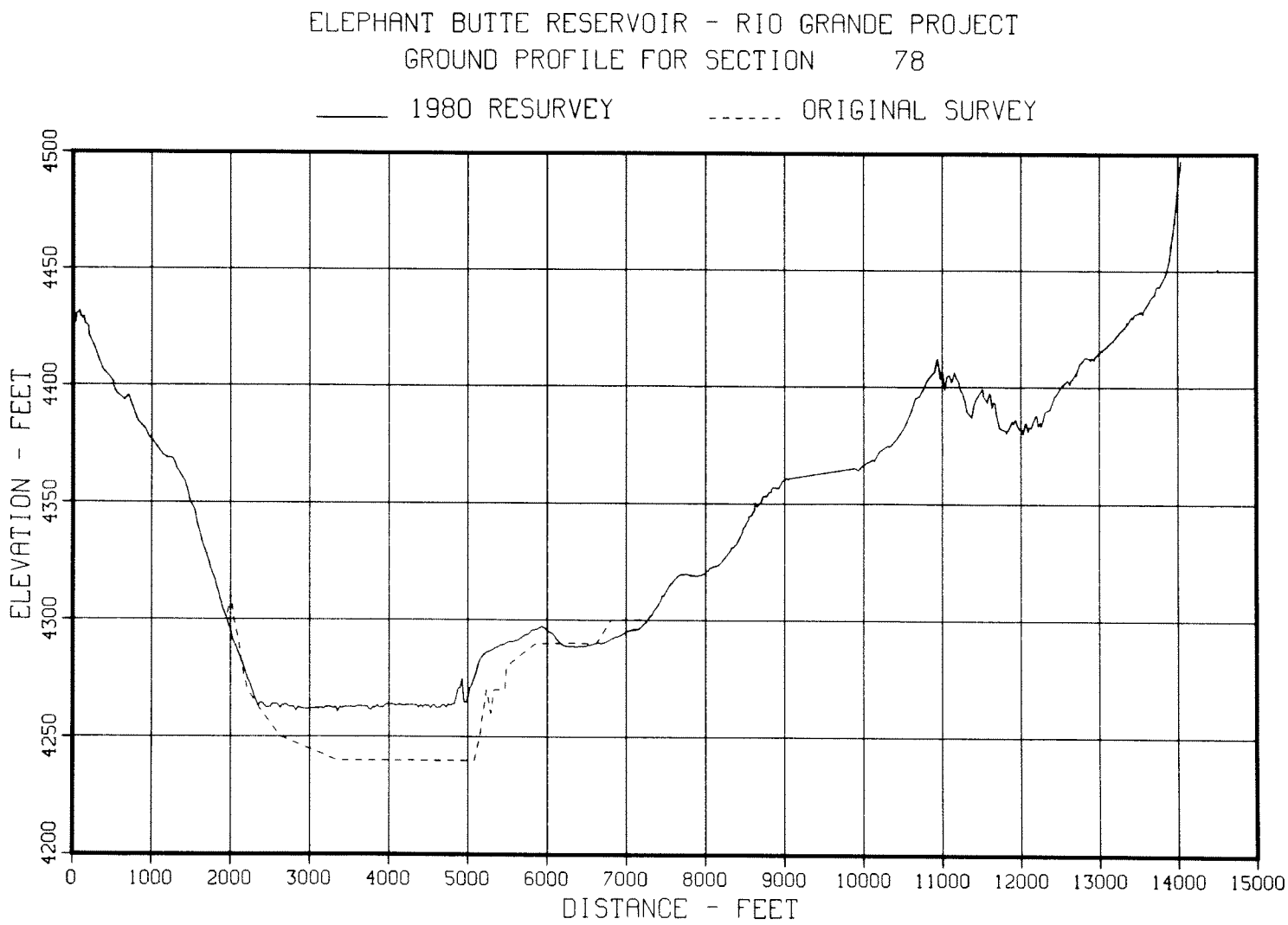

Figure 27. - 1915 and 1980 Sedimentation Range Profiles - Range 78

PLOT 14 14.33.21 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

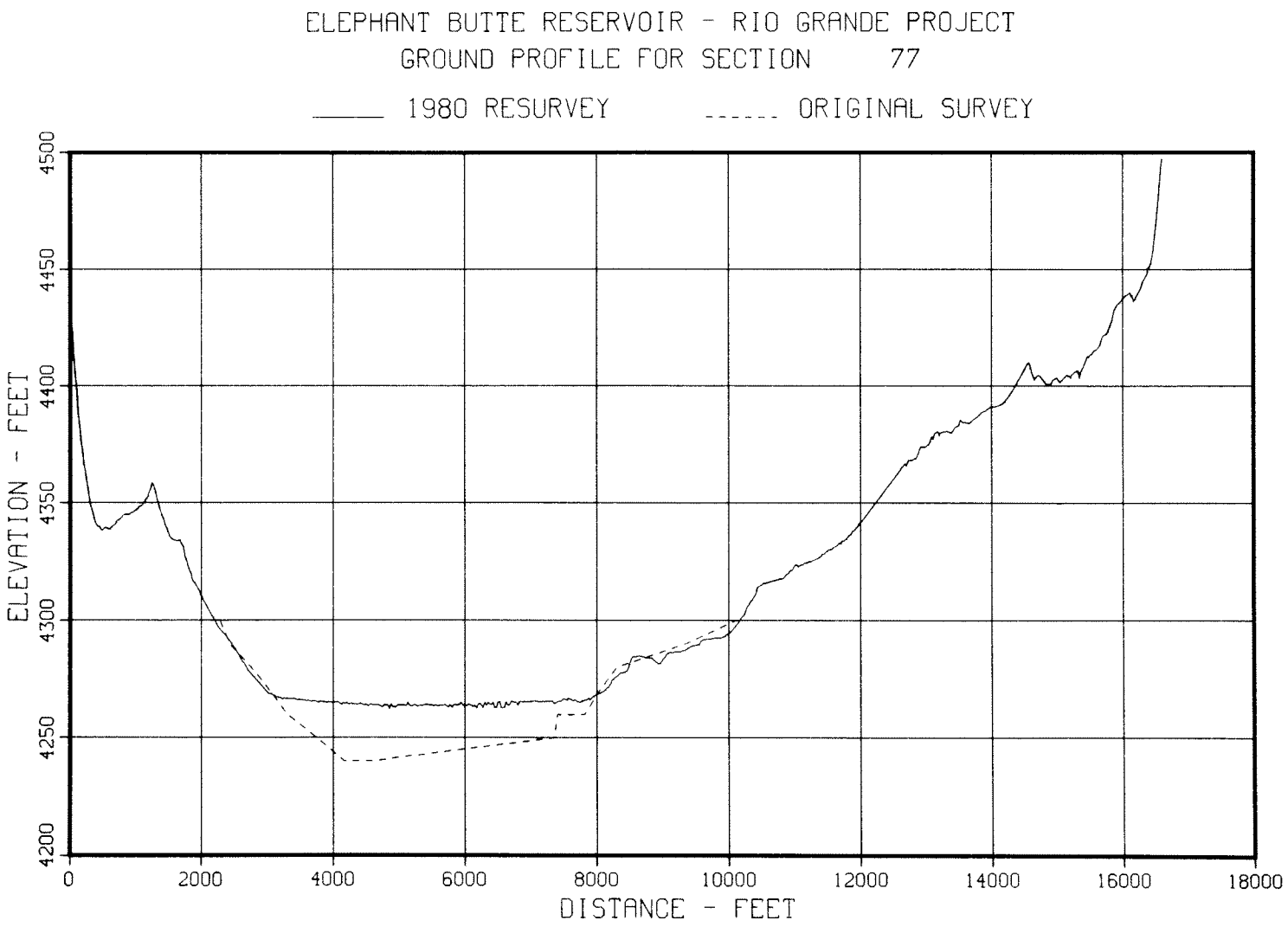

Figure 28. - 1915 and 1980 Sedimentation Range Profiles - Range 77

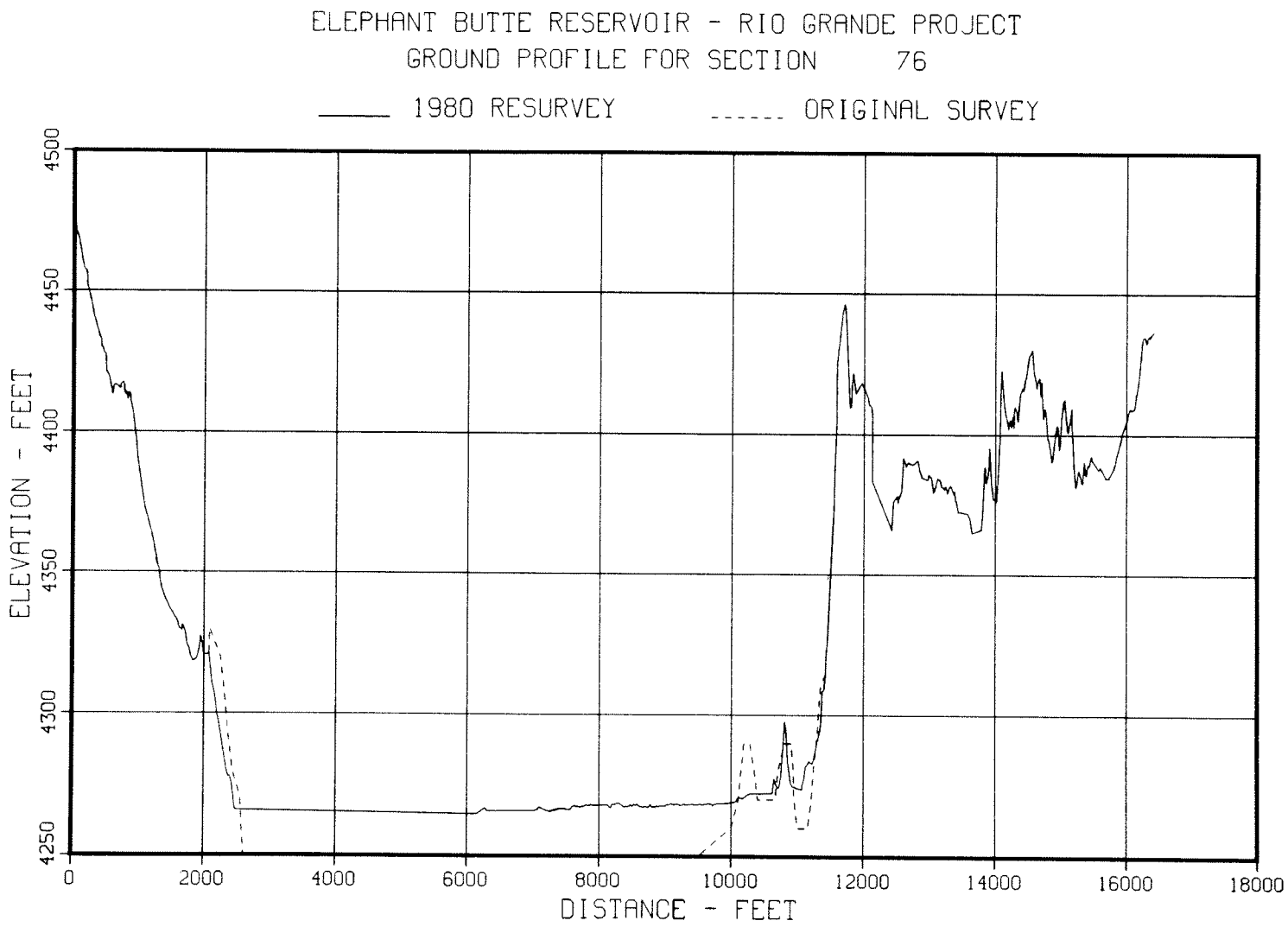

Figure 29. - 1915 and 1980 Sedimentation Range Profiles - Range 76

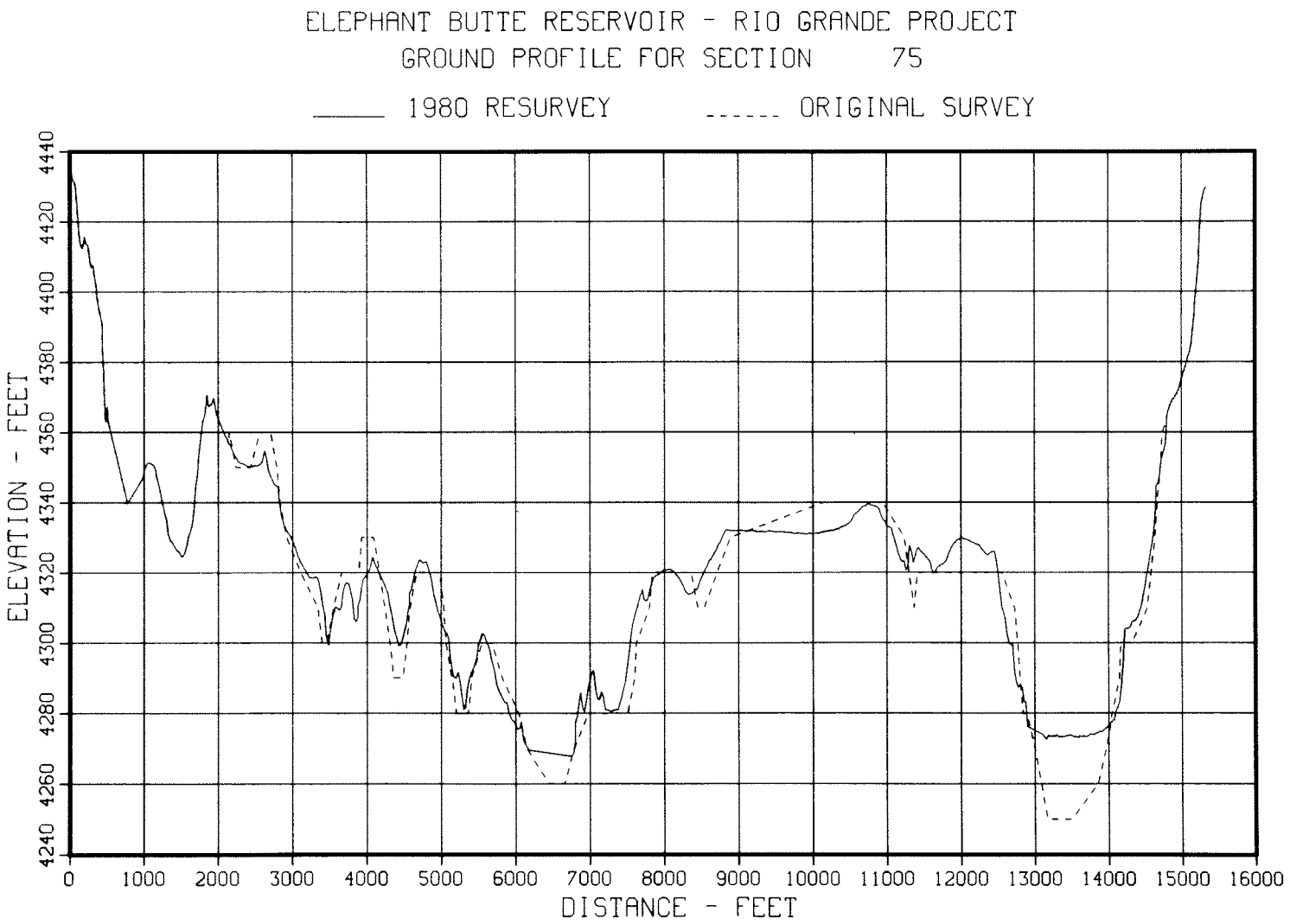

Figure 30. - 1915 and 1980 Sedimentation Range Profiles - Range 75

PLOT 17 14.34.01 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

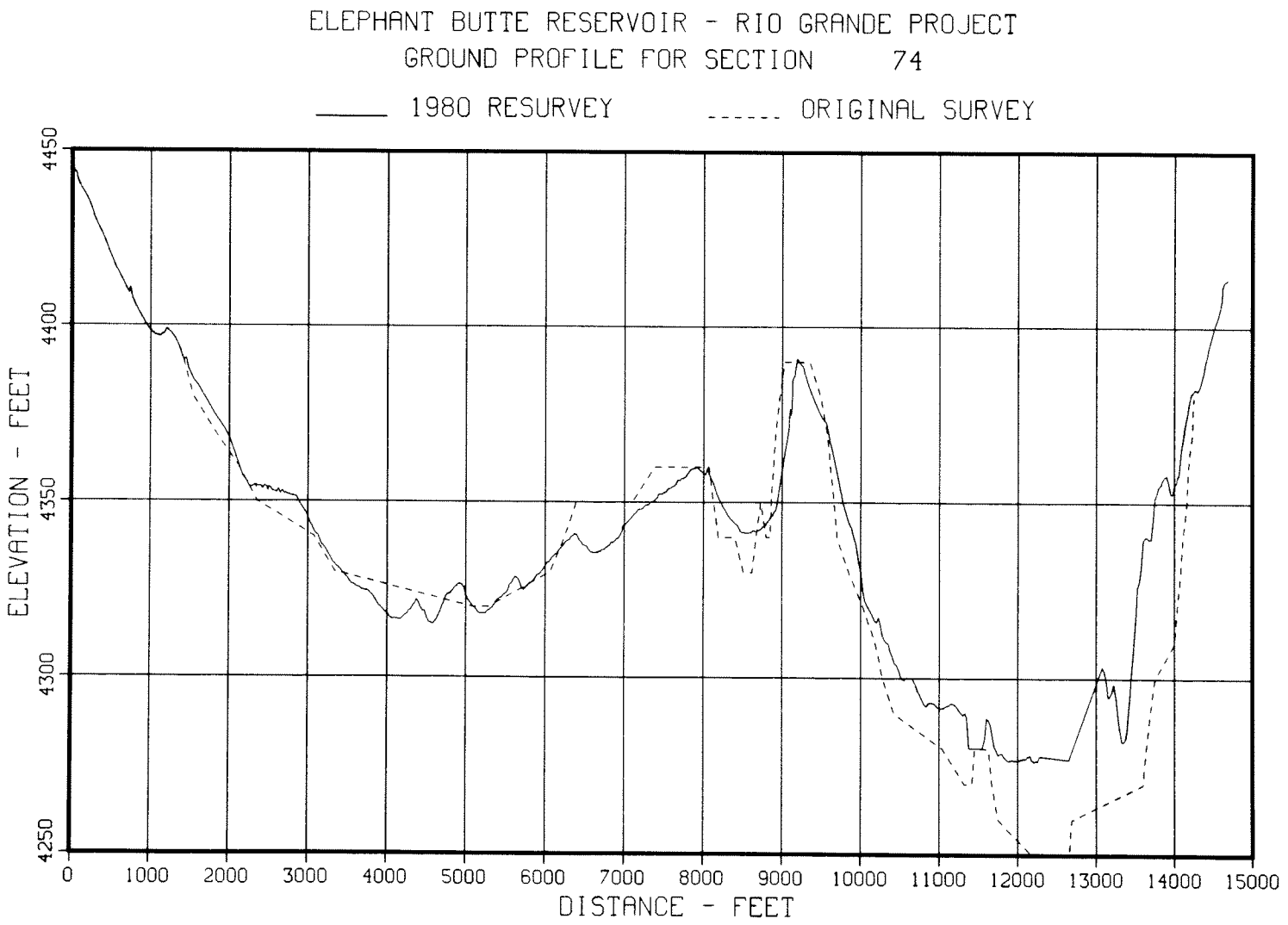

Figure 31. - 1915 and 1980 Sedimentation Range Profiles - Range 74

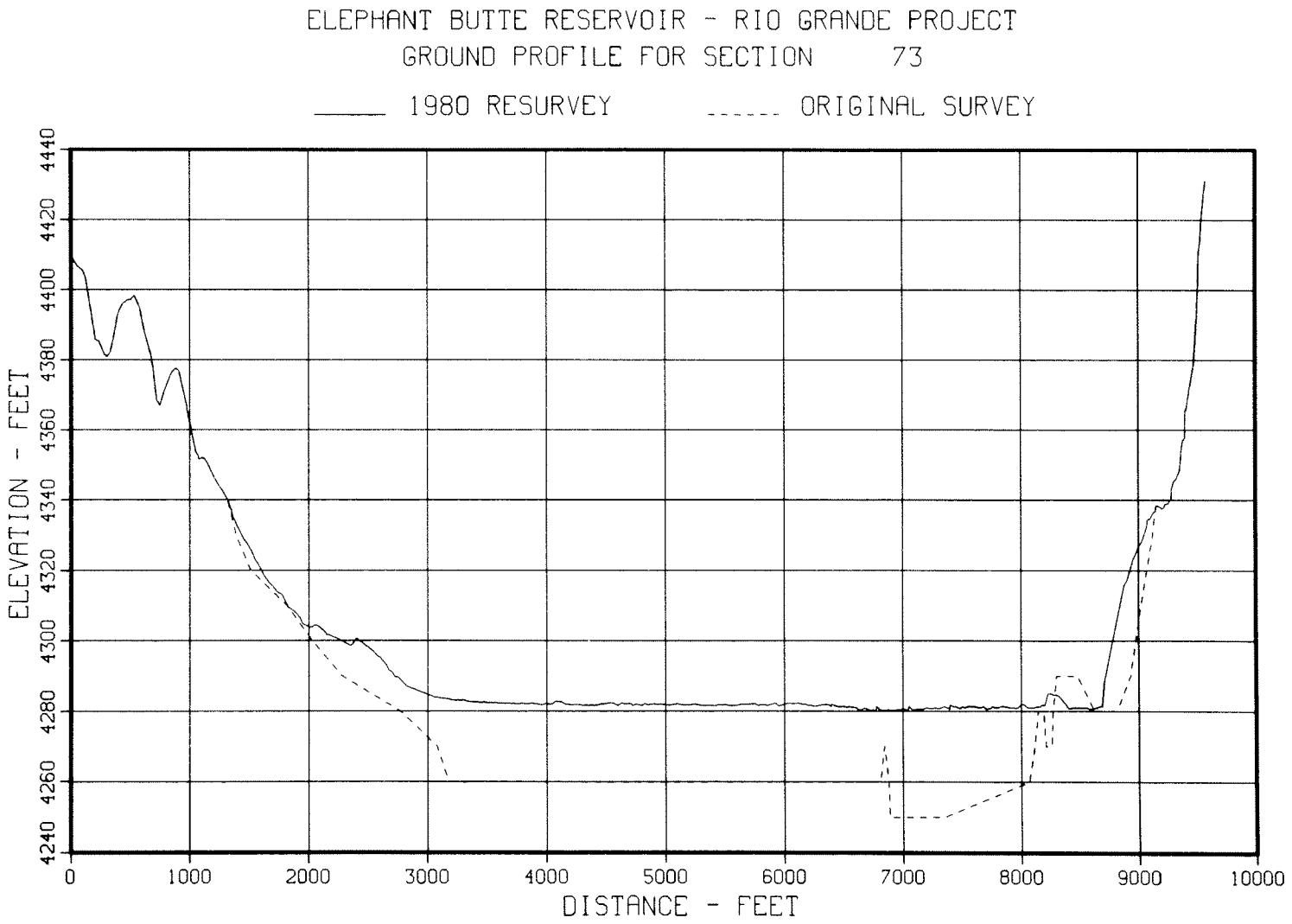

Figure 32. - 1915 and 1980 Sedimentation Range Profiles - Range 73

PLOT 19 14.34.20 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

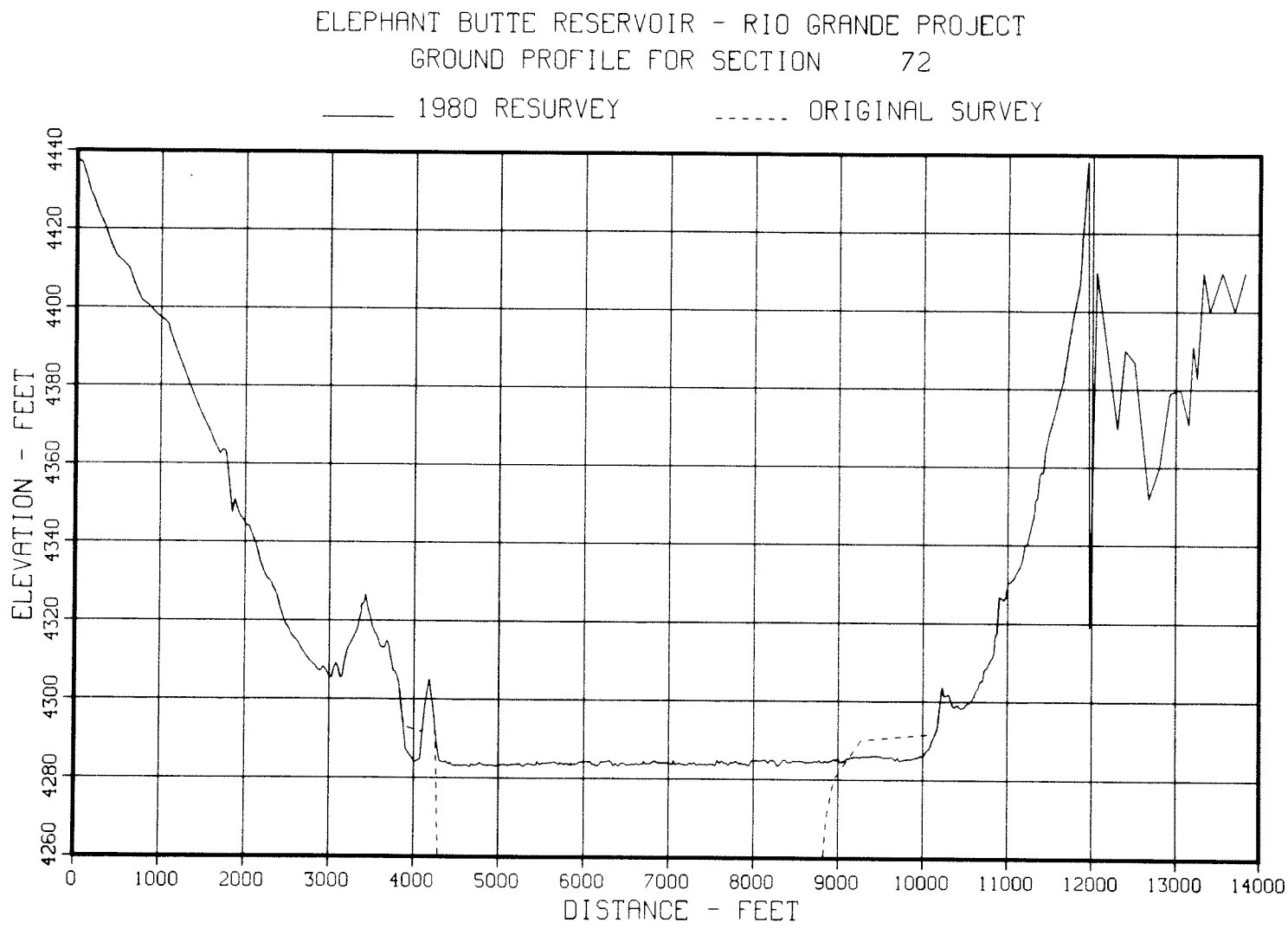

Figure 33. - 1915 and 1980 Sedimentation Range Profiles - Range 72

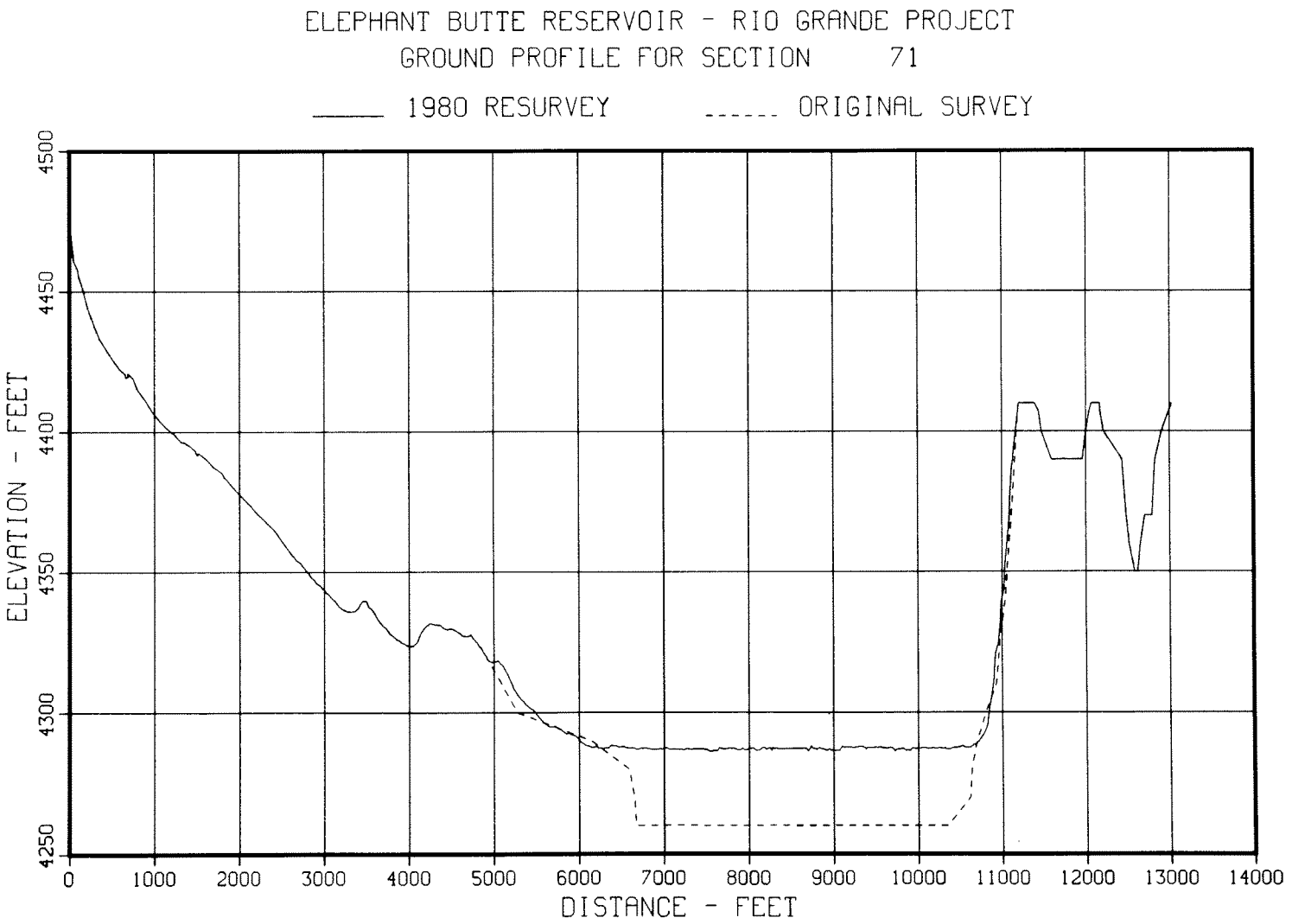

Figure 34. - 1915 and 1980 Sedimentation Range Profiles - Range 71

PLOT 21 14.34.34 THUR 12 AUG, 1982 JOB-AMUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

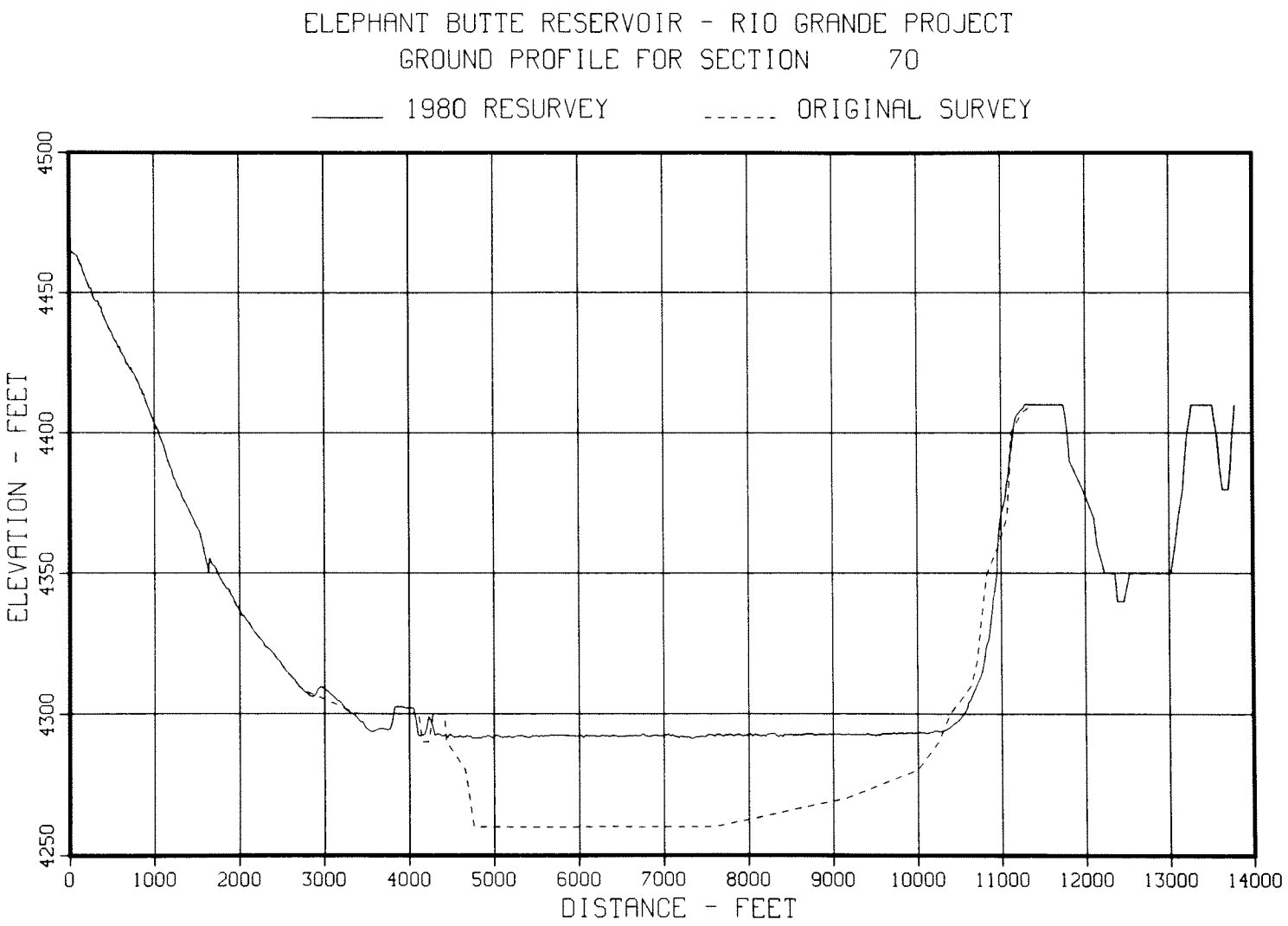

Figure 35. - 1915 and 1980 Sedimentation Range Profiles - Range 70

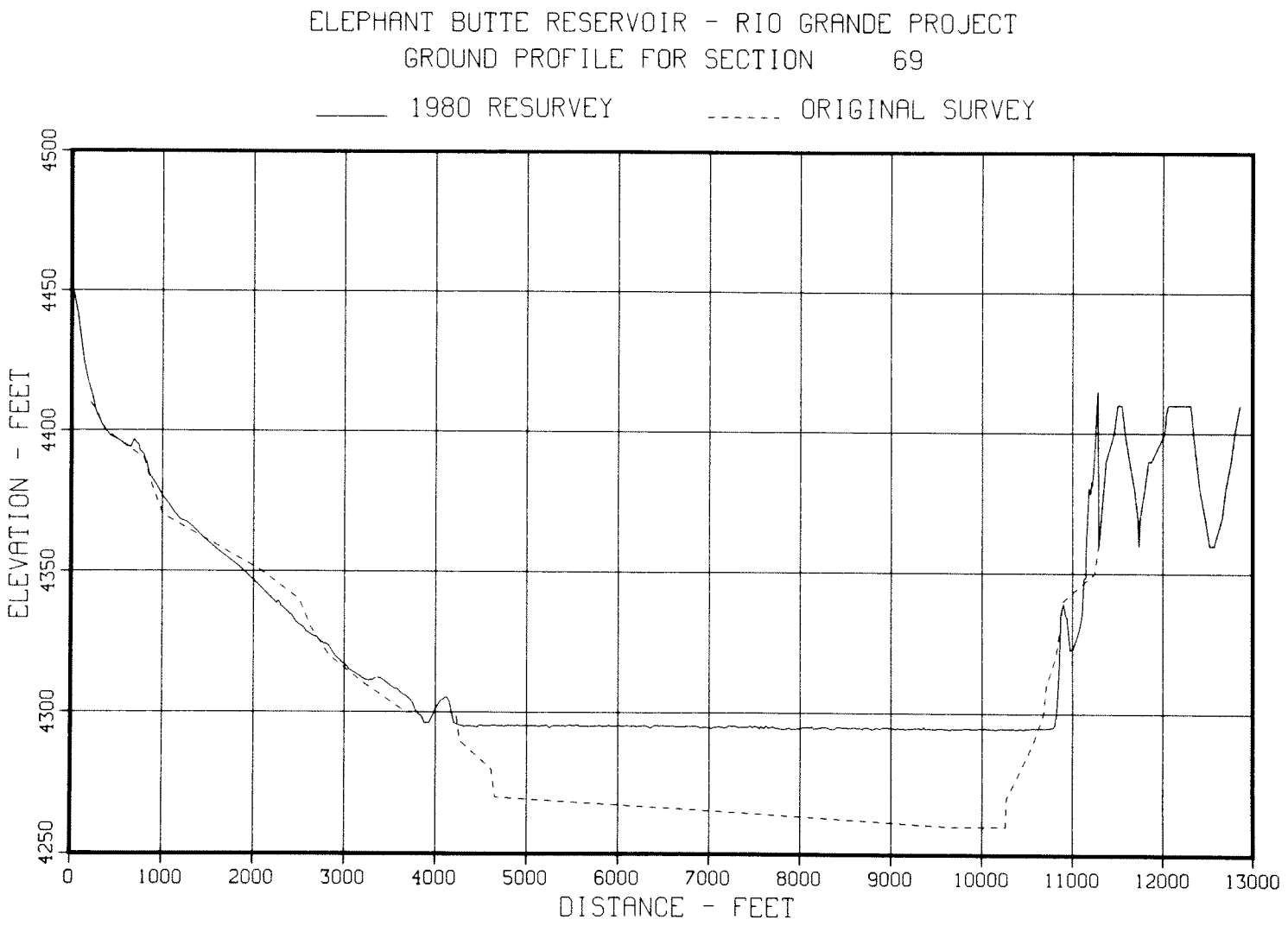

Figure 36. - 1915 and 1980 Sedimentation Range Profiels - Range 69

PLOT 23 14.34.46 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

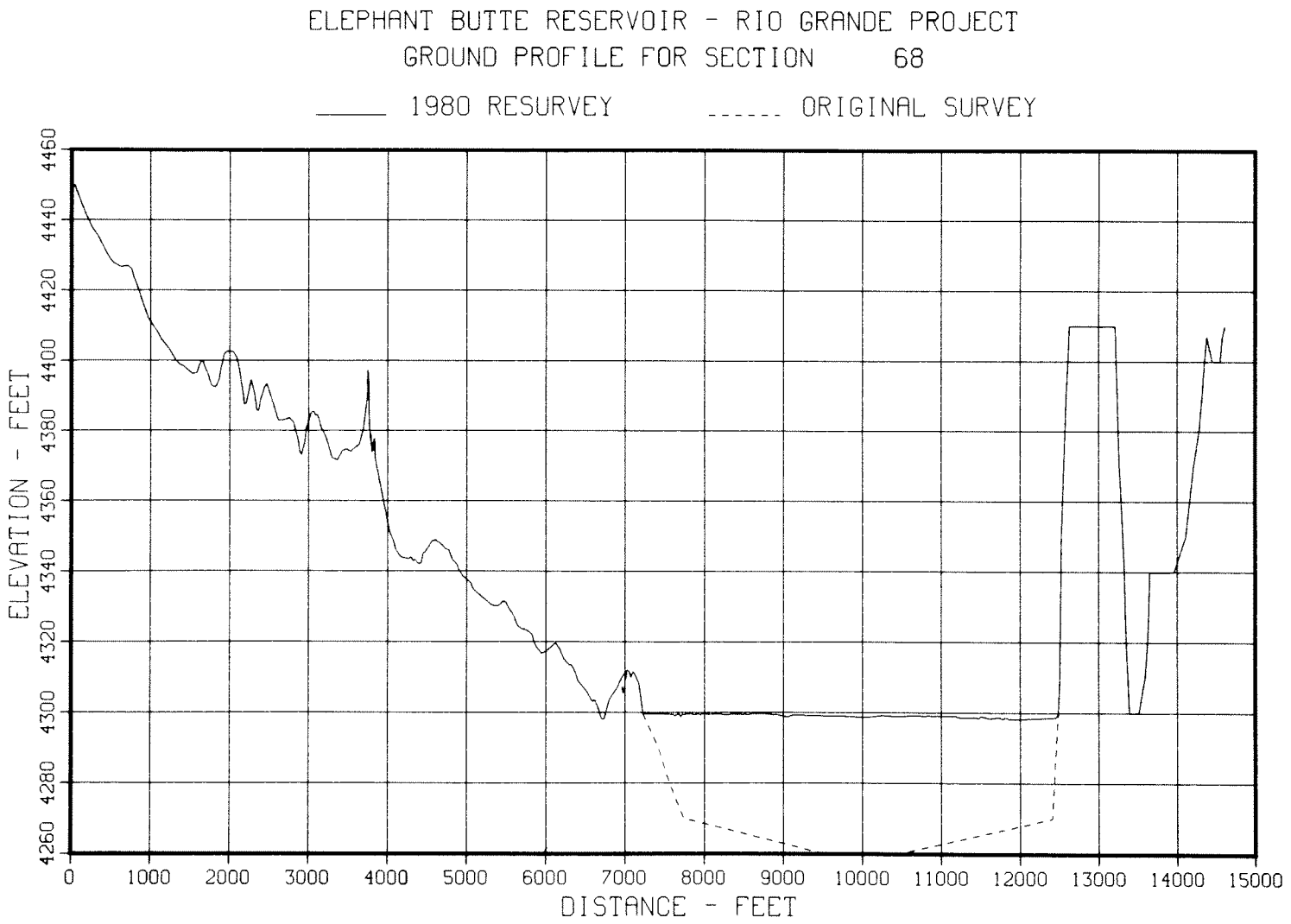

Figure 37. - 1915 and 1980 Sedimentation Range Profiles - Range 68

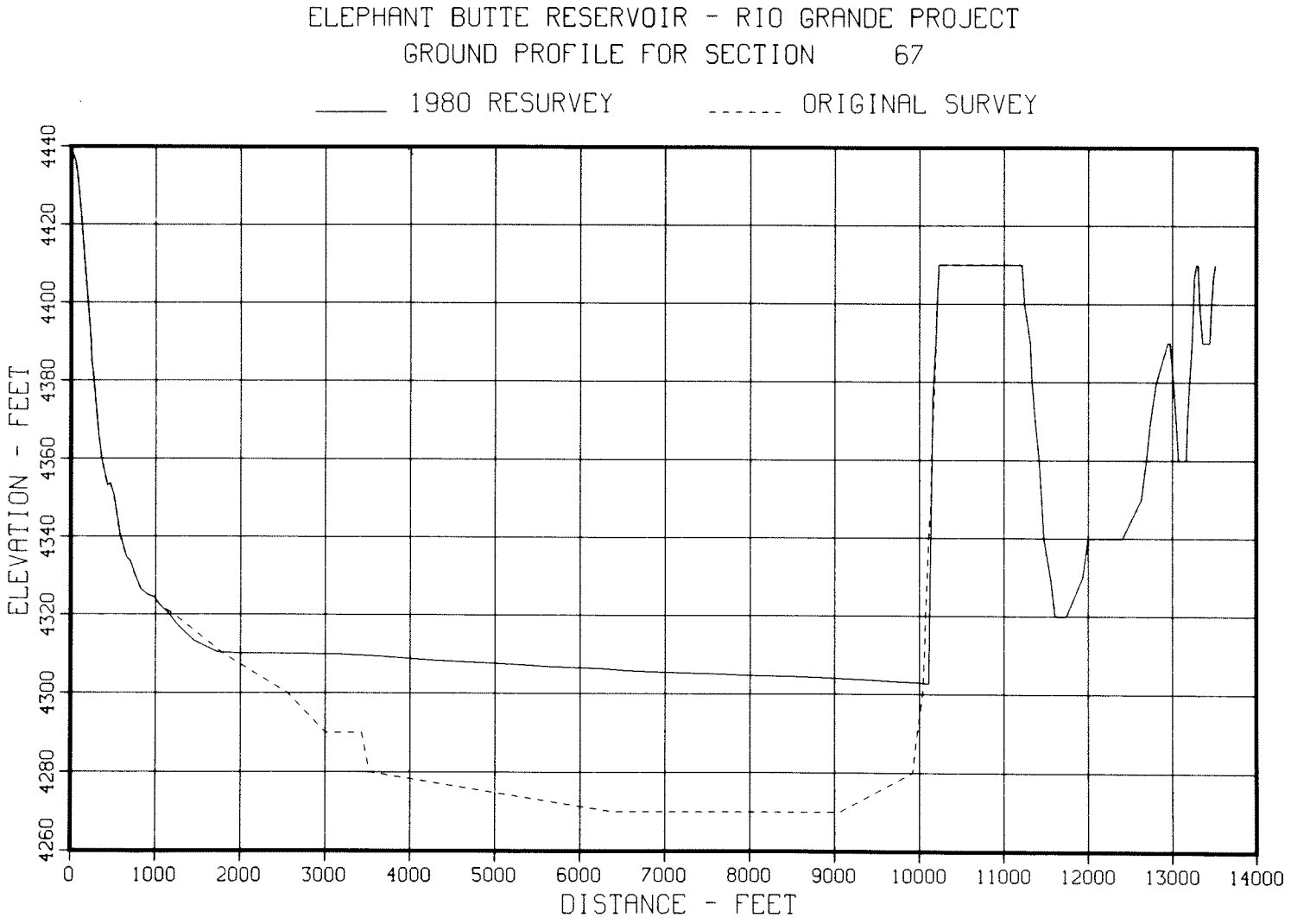

Figure 38. - 1915 and 1980 Sedimentation Range Profiles - Range 67

PLOT 25 14.34.56 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

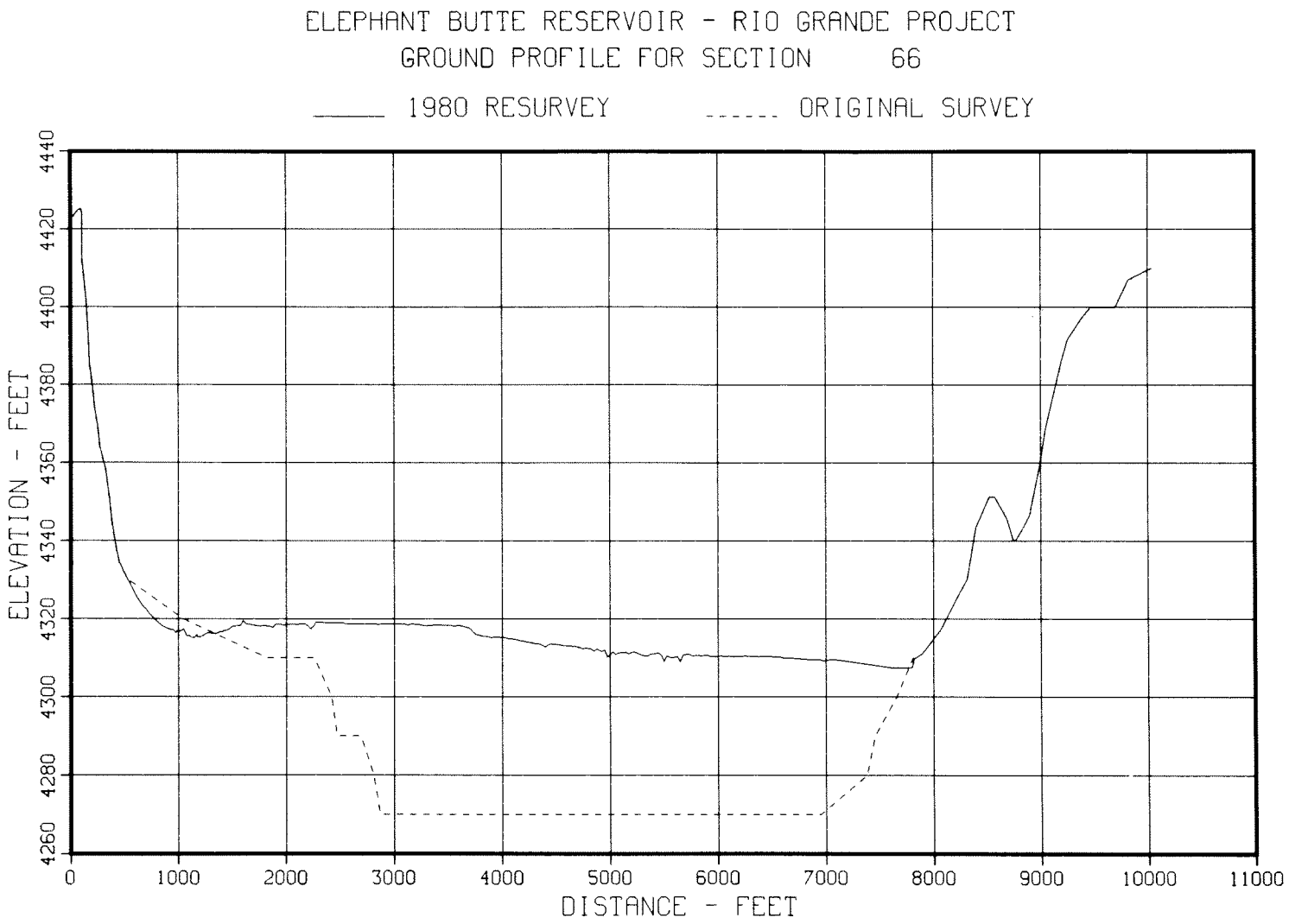

Figure 39. - 1915 and 1980 Sedimentation Range Profiles - Range 66

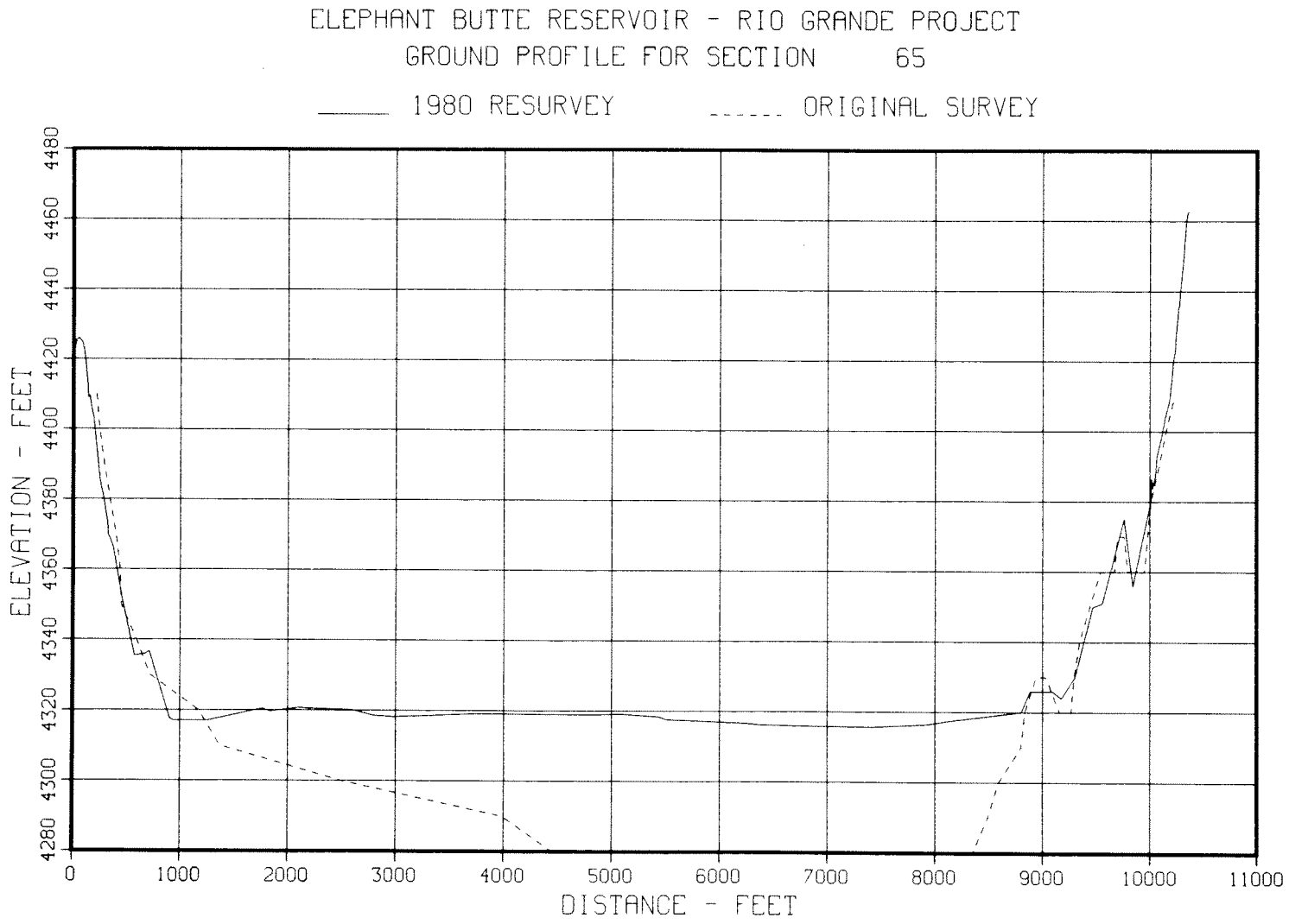

Figure 40. - 1915 and 1980 Sedimentation Range Profiles - Range 65

PLOT 27 14.35.04 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

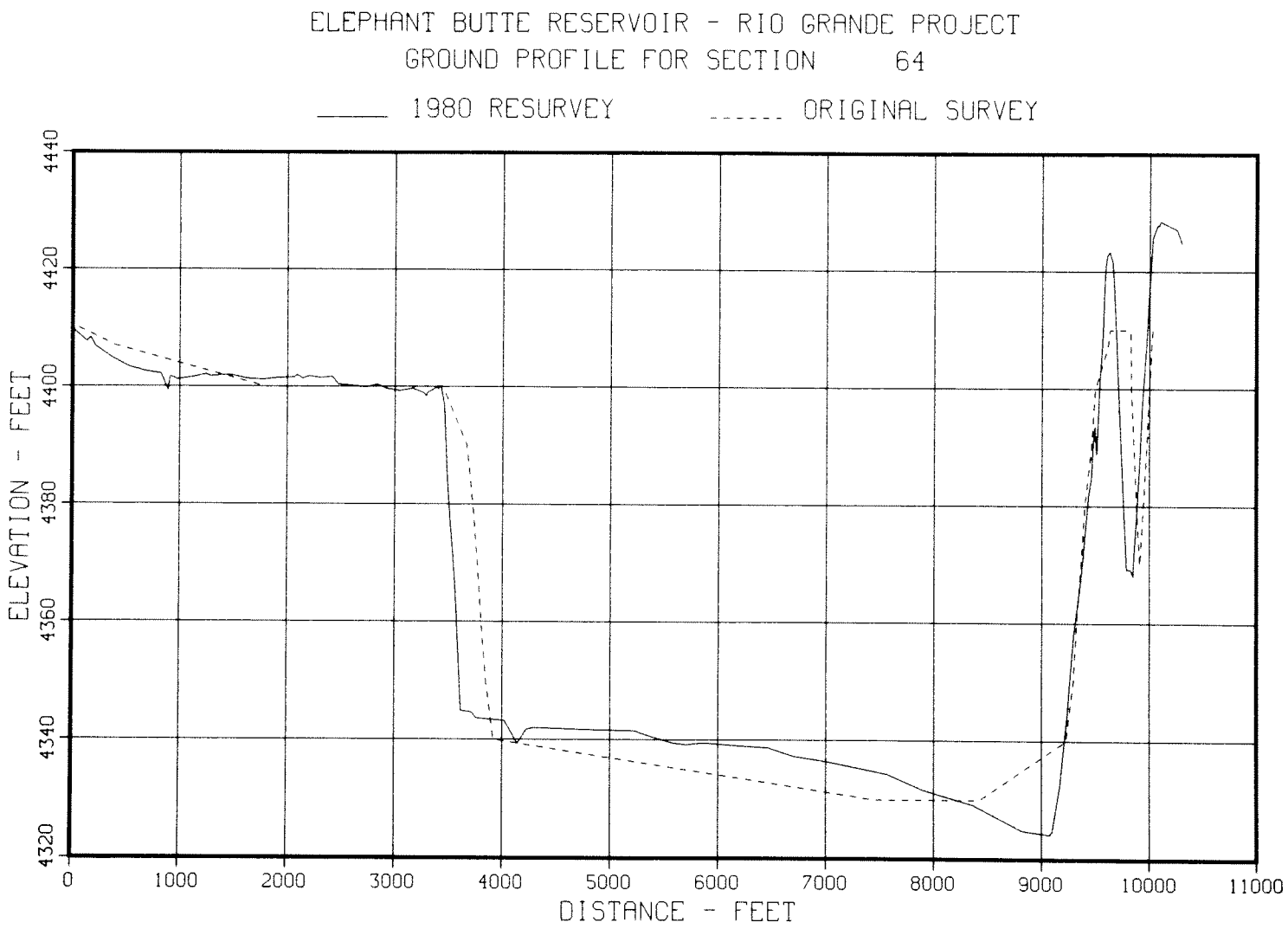

Figure 41. - 1915 and 1980 Sedimentation Range Profiles - Range 64

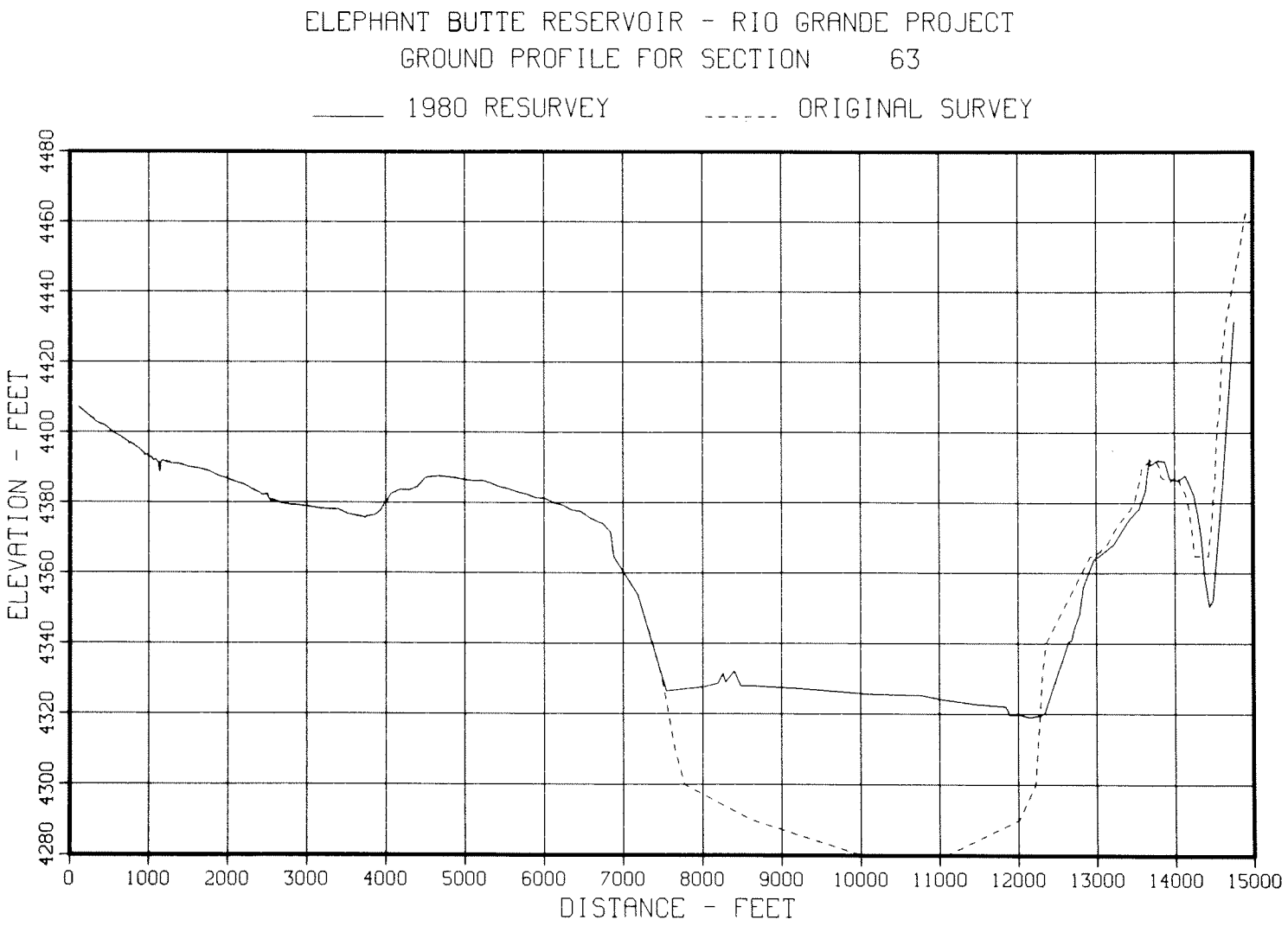

Figure 42. - 1915 and 1980 Sedimentation Range Profiles - Range 63

PLOT 29 14.36.08 THUR 12 AUG, 1982 JOB-AHUYMLA , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

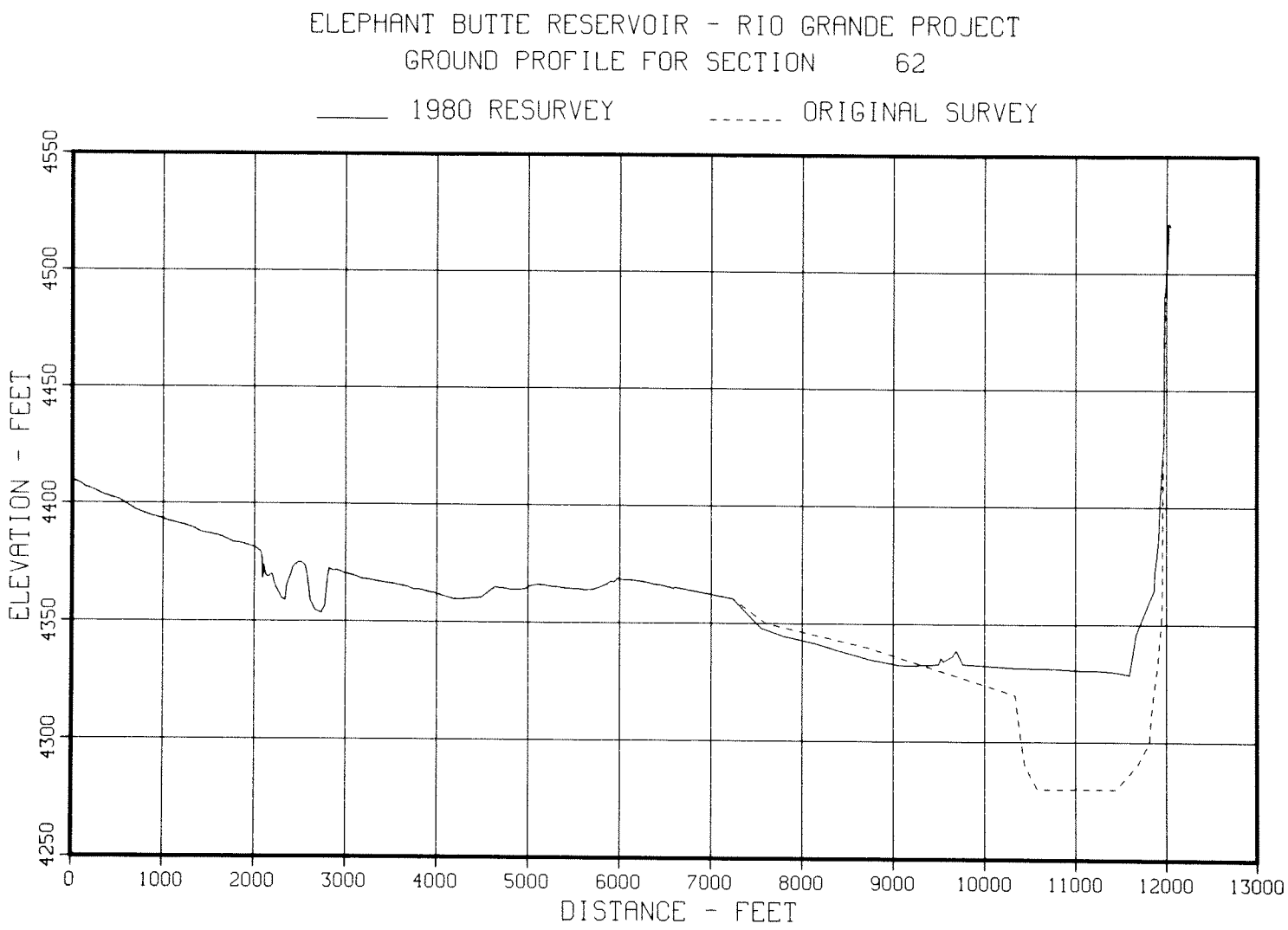

Figure 43. - 1915 and 1980 Sedimentation Range Profiles - Range 62

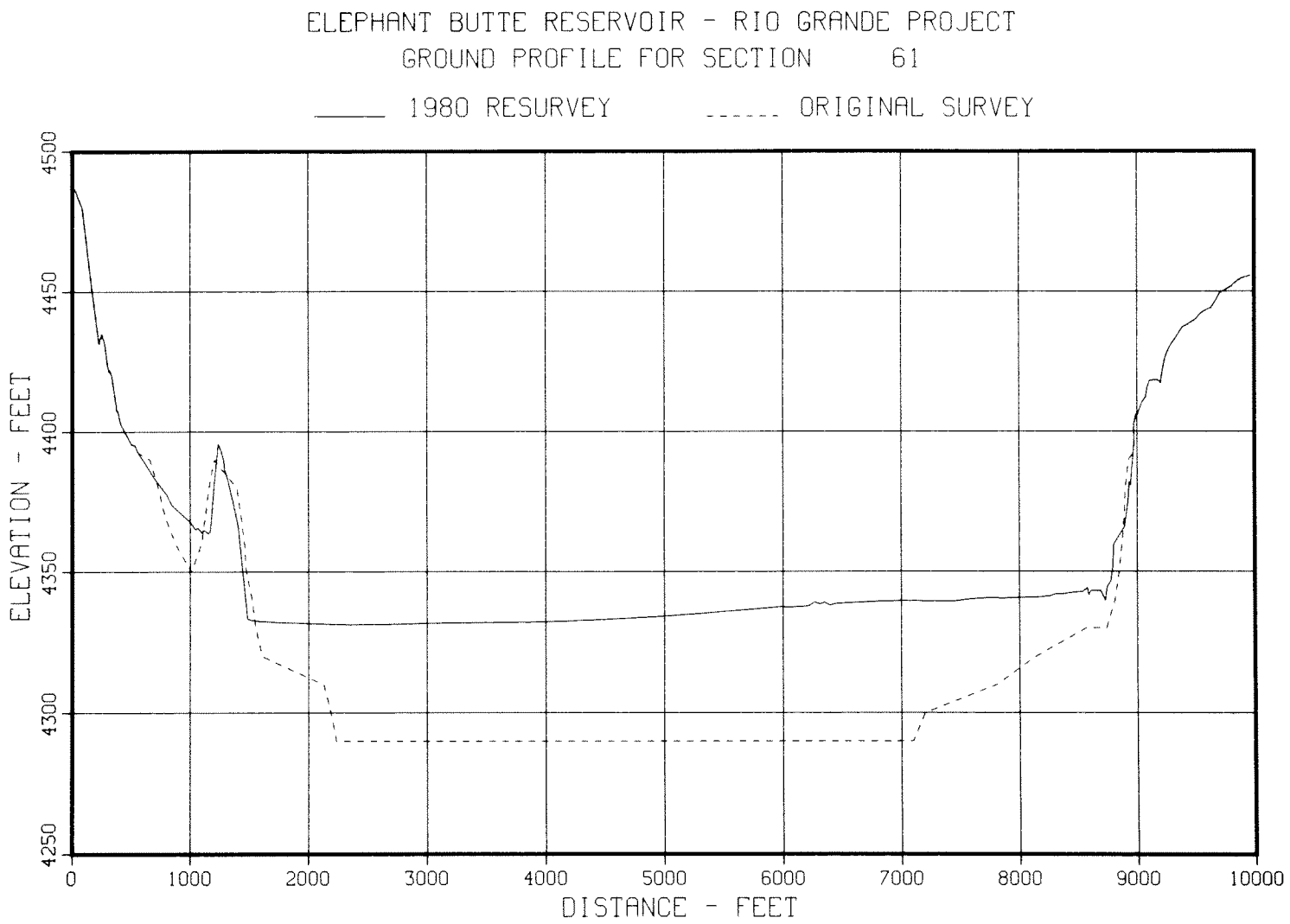

Figure 44. - 1915 and 1980 Sedimentation Range Profiles - Range 61

PLOT 1 07.13.13 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

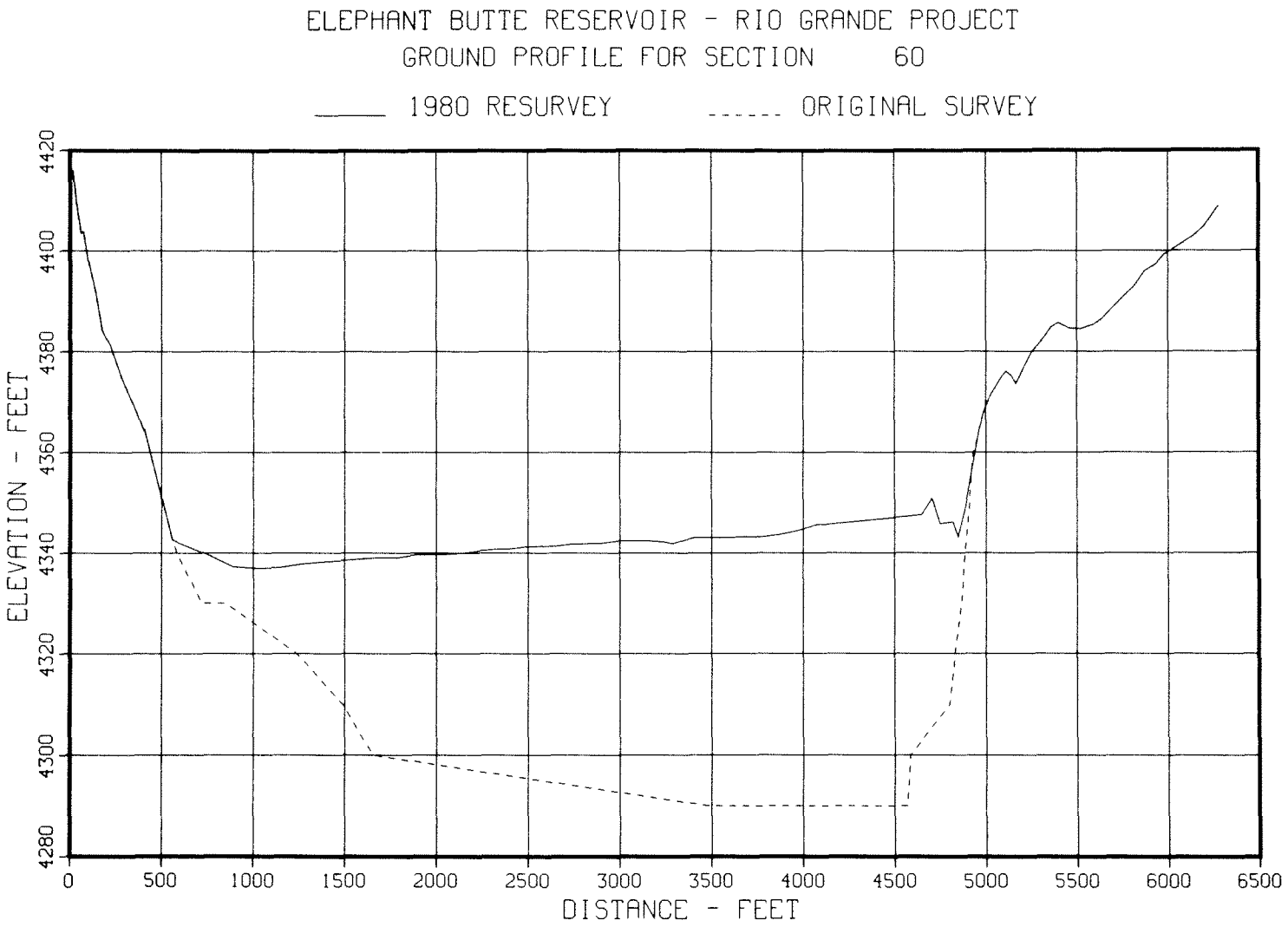

Figure 45. - 1915 and 1980 Sedimentation Range Profiles - Range 60

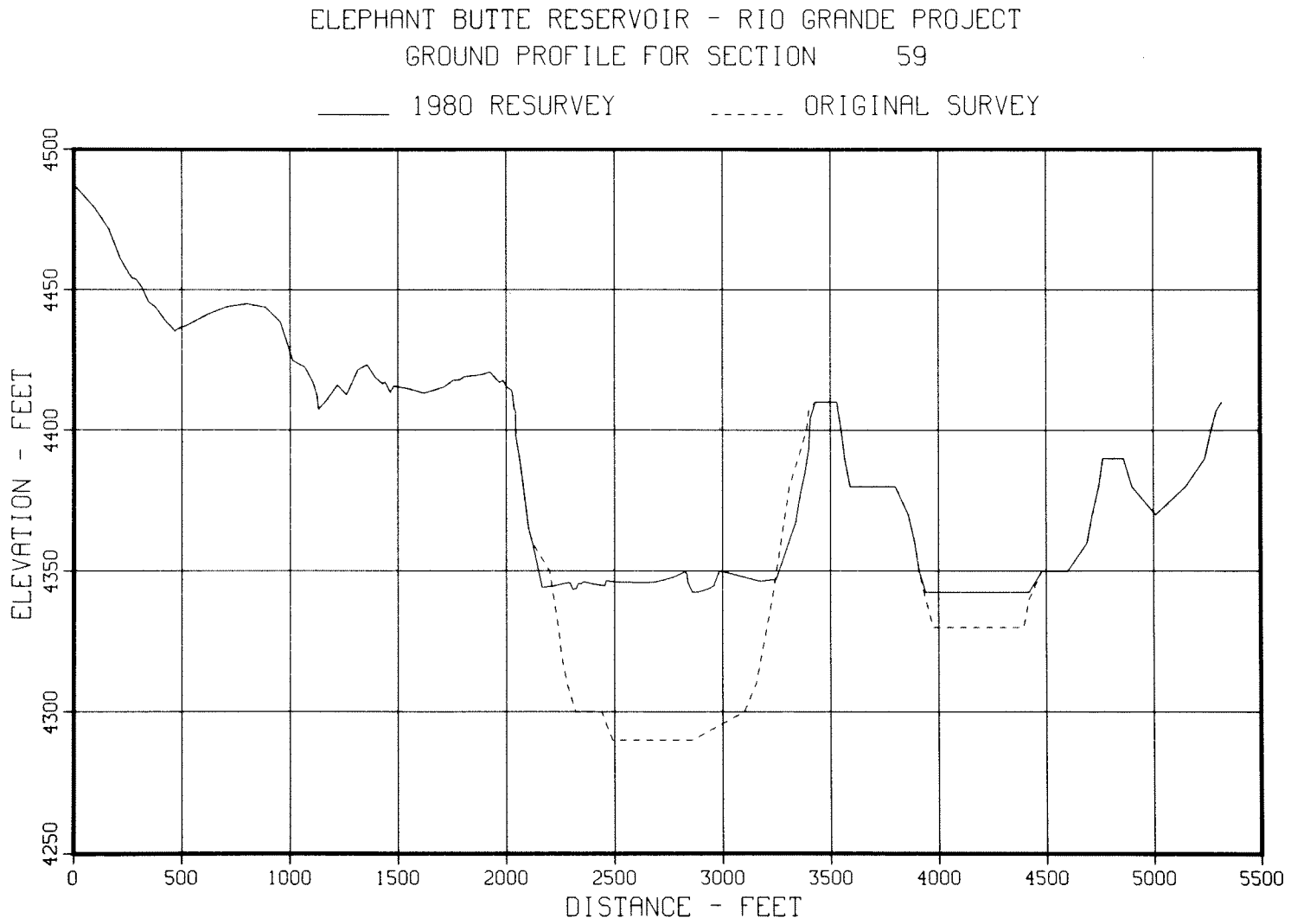

Figure 46. - 1915 and 1980 Sedimentation Range Profiles - Range 59

PLOT 3 07.13.20 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

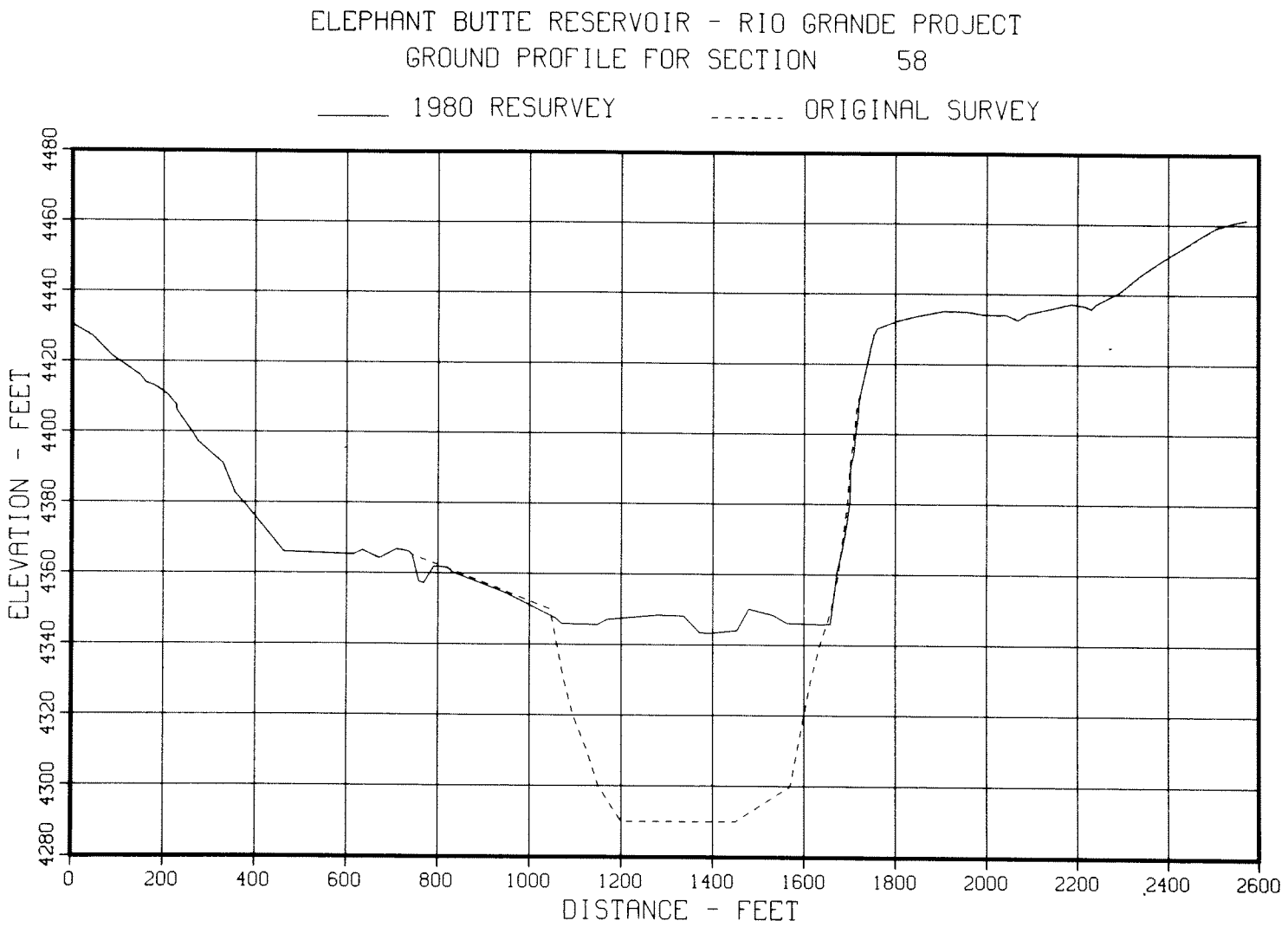

Figure 47. - 1915 and 1980 Sedimentation Range Profiles - Range 58

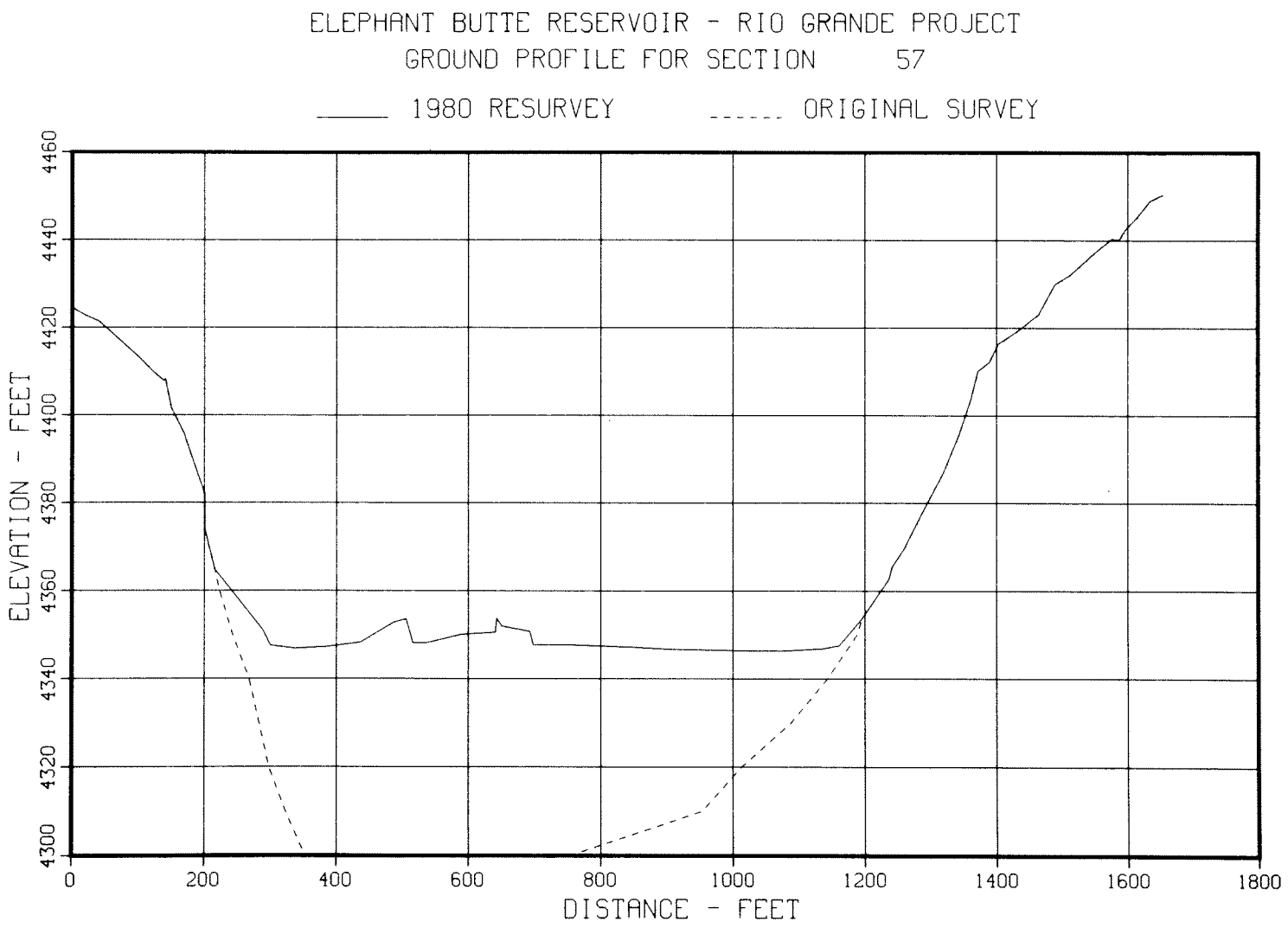

Figure 48. - 1915 and 1980 Sedimentation Range Profiles - Range 57

PLOT 5 07.13.26 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

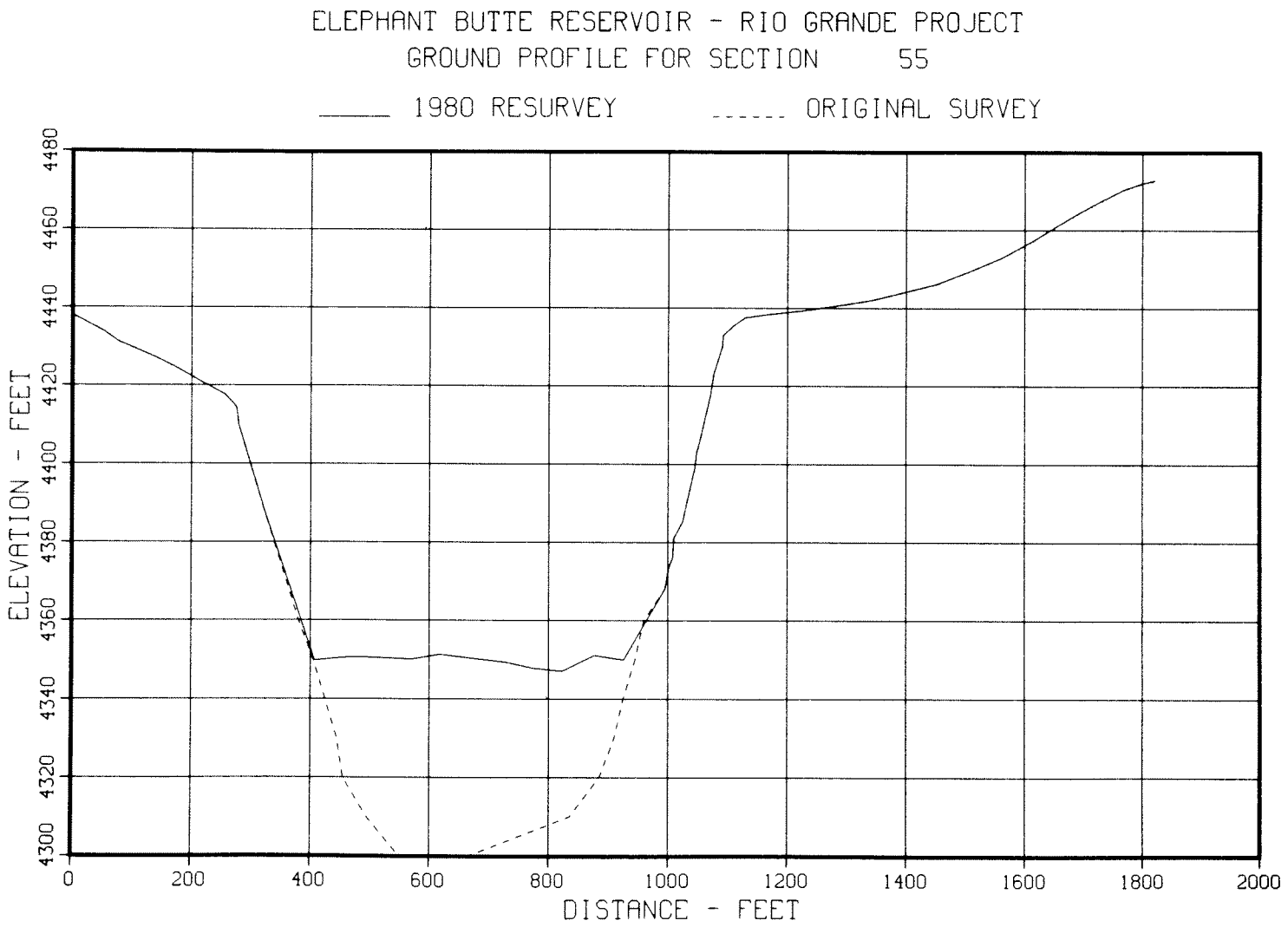

Figure 49. - 1915 and 1980 Sedimentation Range Profiles - Range 55

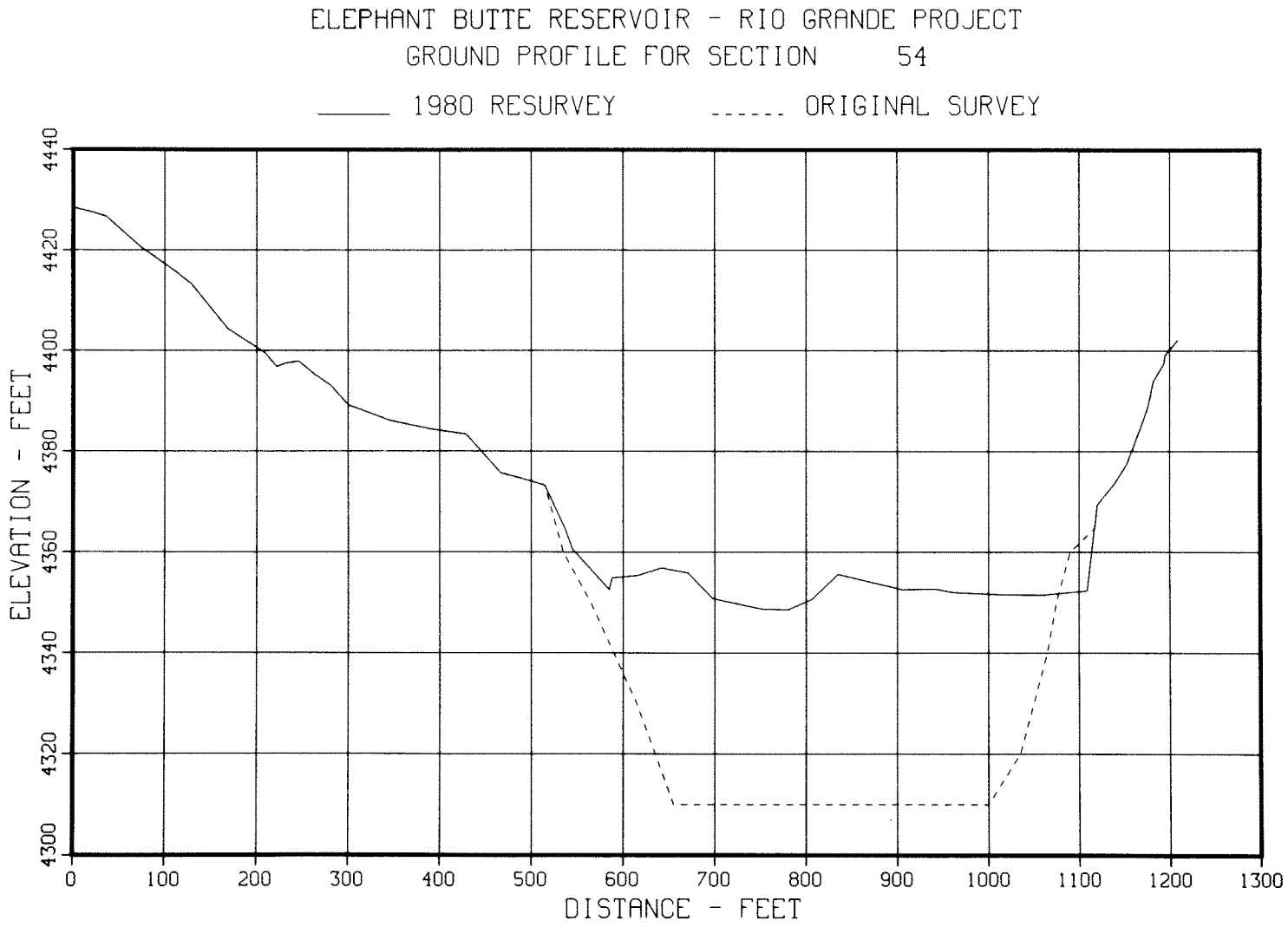

Figure 50. - 1915 and 1980 Sedimentation Range Profiles - Range 54

PLOT 7 07.13.32 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

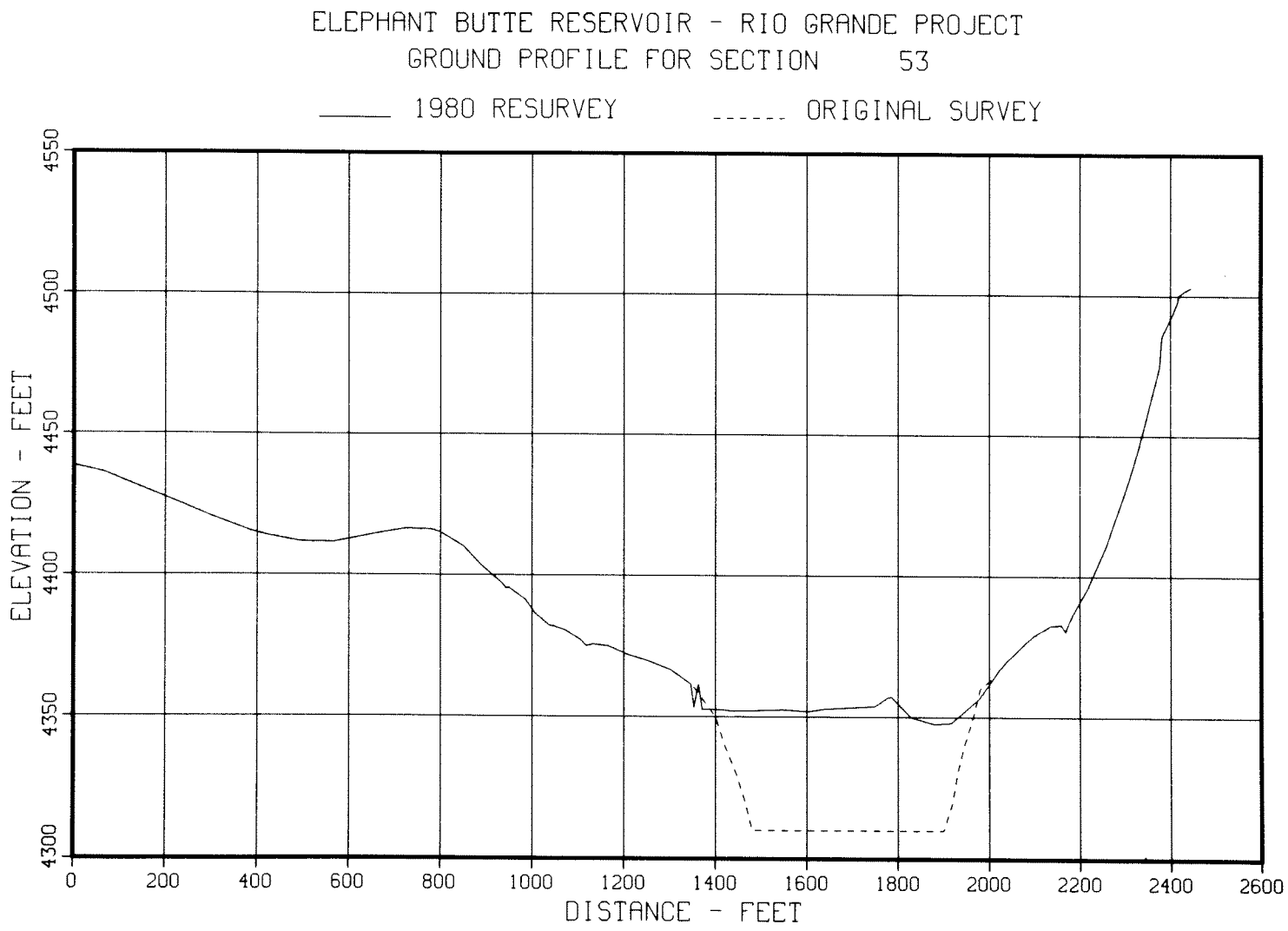

Figure 51. - 1915 and 1980 Sedimentation Range Profiles - Range 53

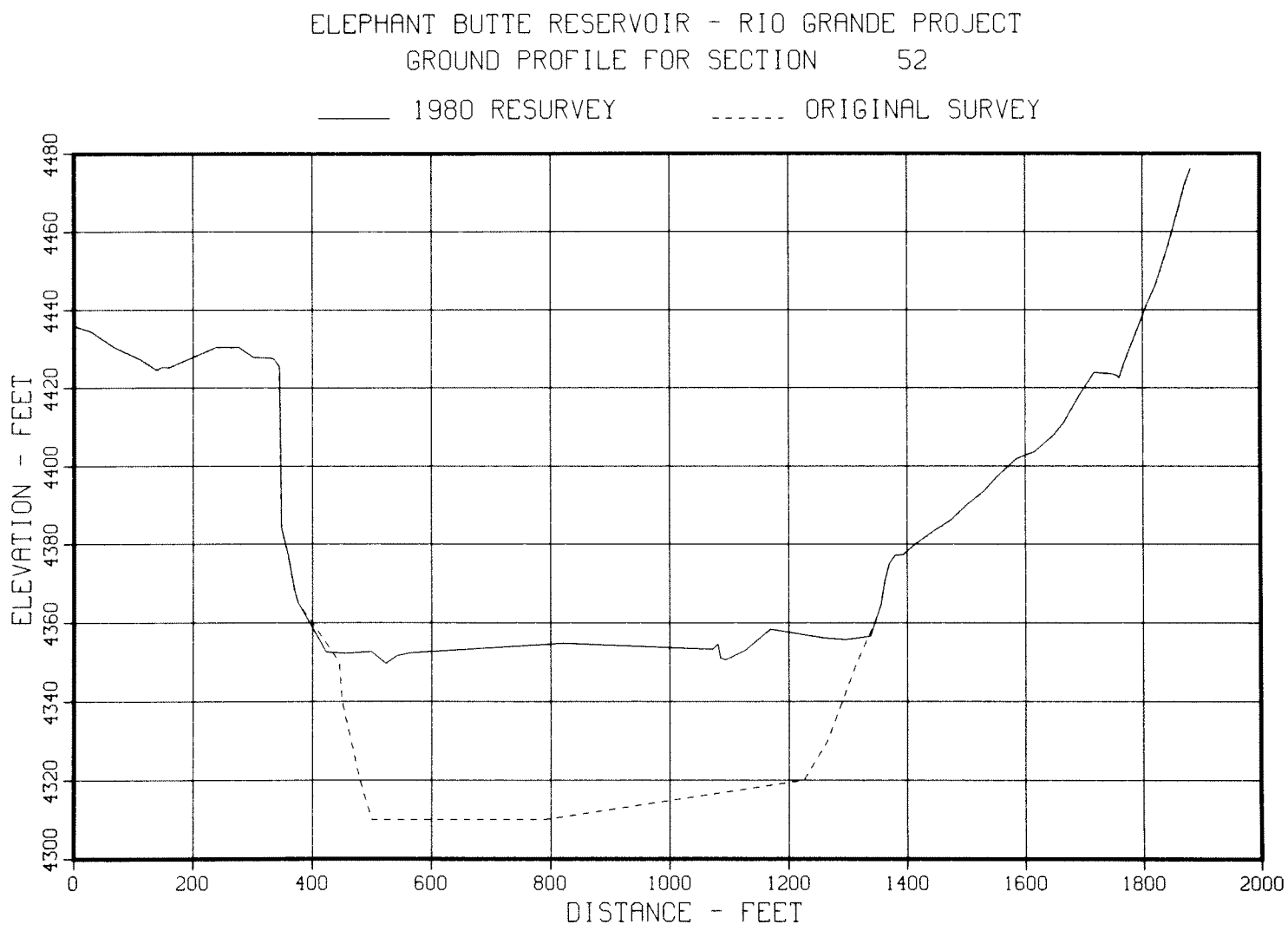

Figure 52. - 1915 and 1980 Sedimentation Range Profiles - Range 52

PLOT 9 07.13.38 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

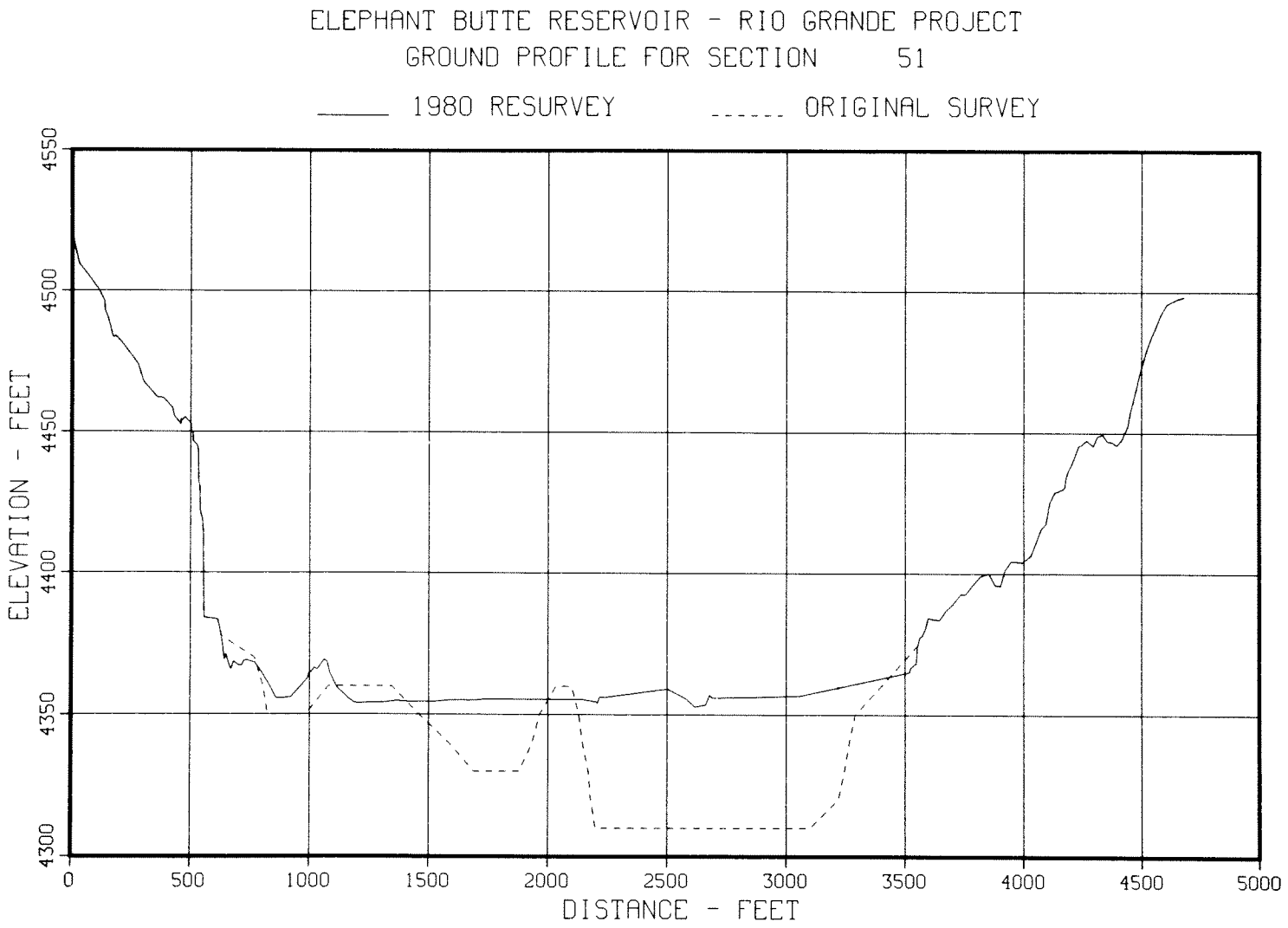

Figure 53. - 1915 and 1980 Sedimentation Range Profiles - Range 51

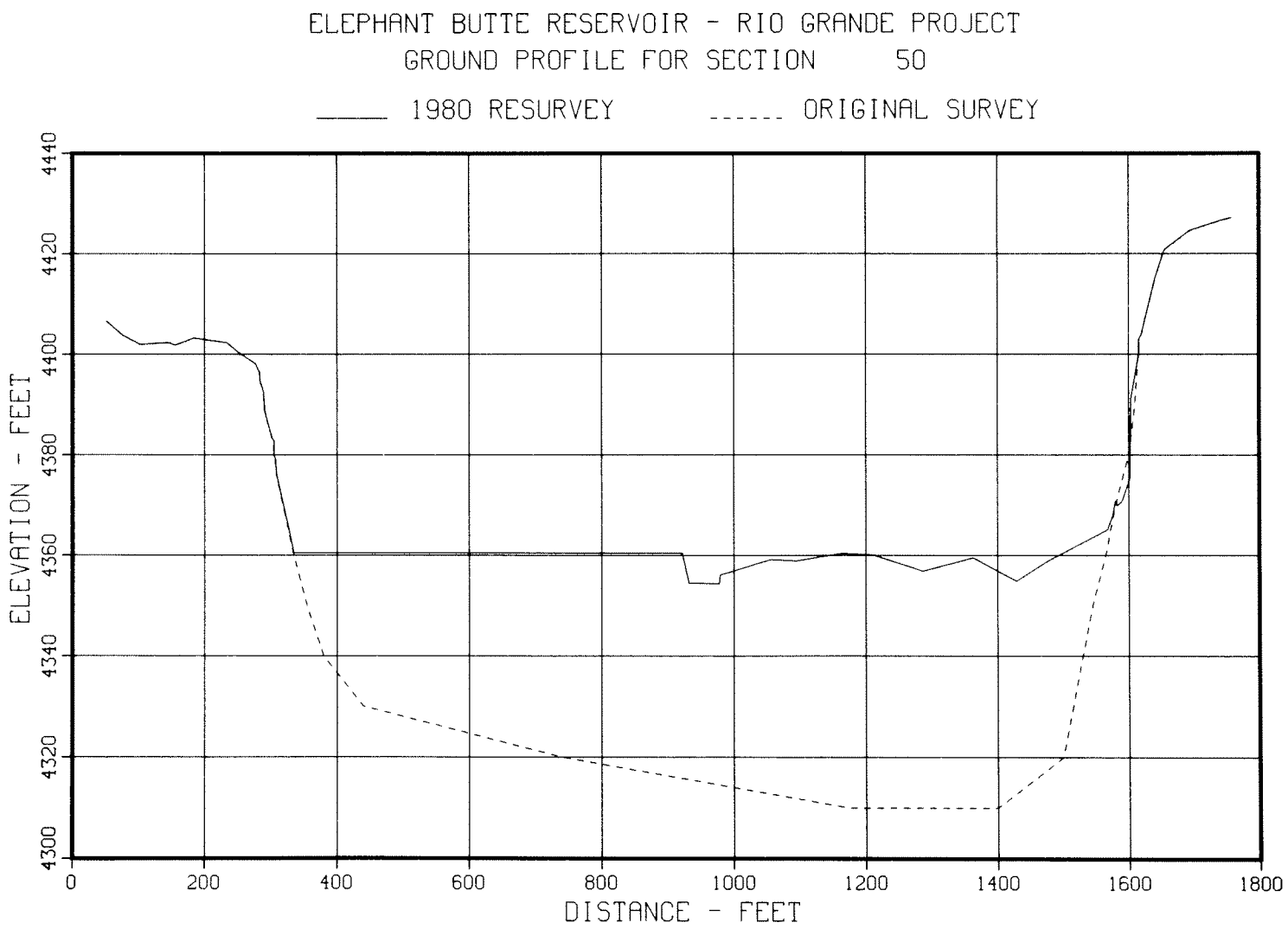

Figure 54. - 1915 and 1980 Sedimentation Range Profiles - Range 50

PLOT 11 07.13.43 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

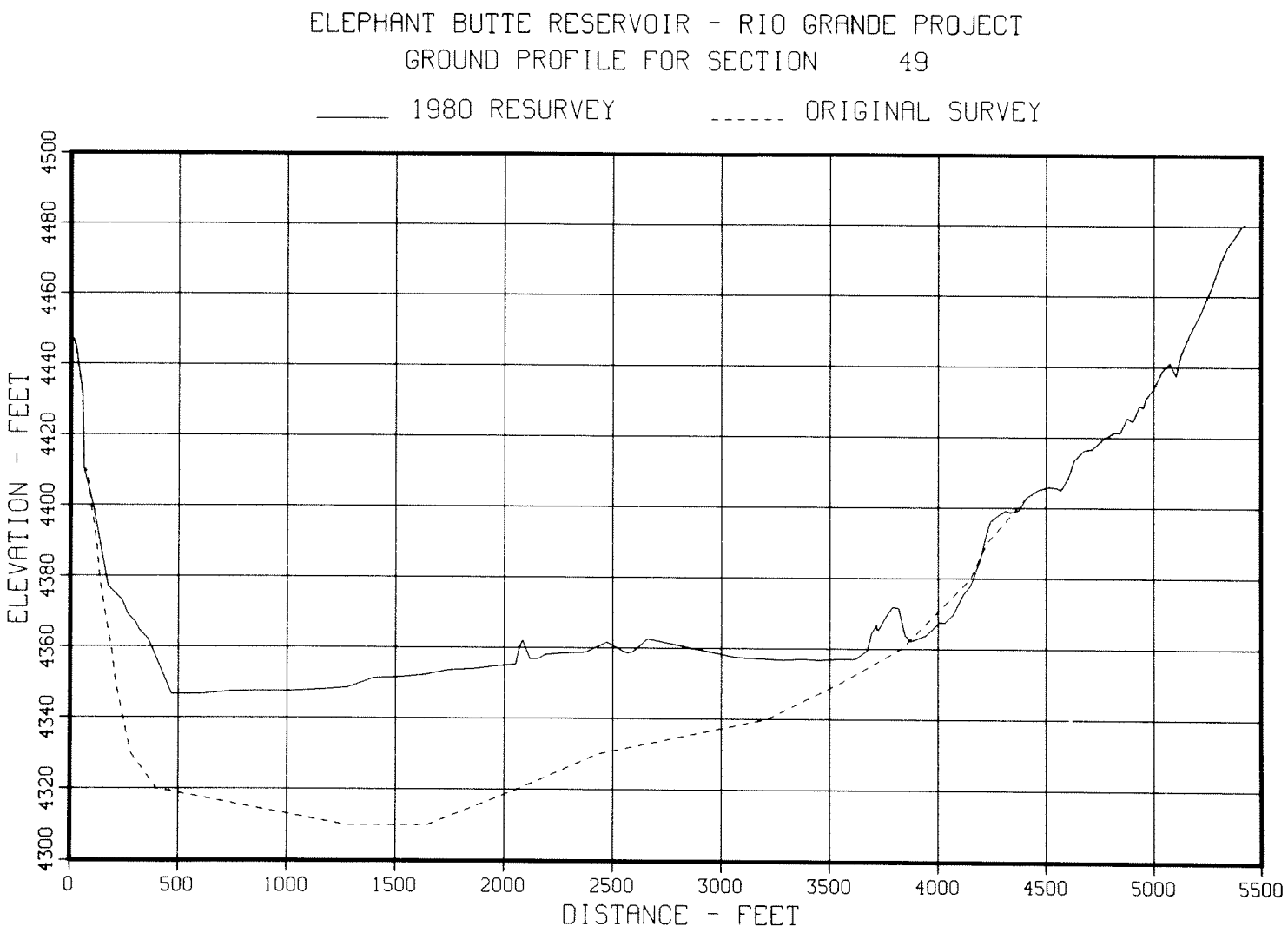

Figure 55. - 1915 and 1980 Sedimentation Range Profiles - Range 49

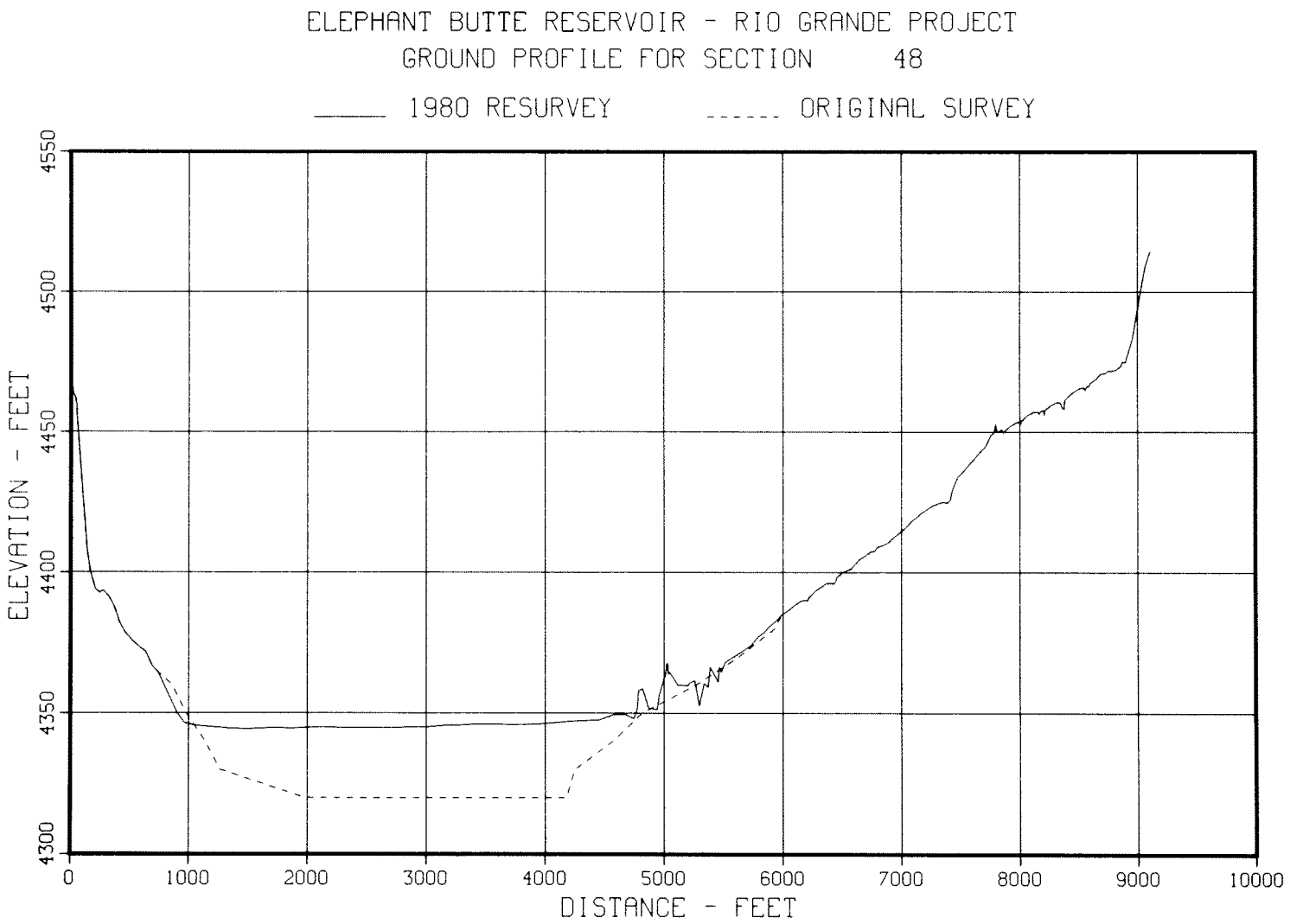

Figure 56. - 1915 and 1980 Sedimentation Range Profiles - Range 48

PLOT 13 07.13.49 FRI 13 AUG, 1982 JOB-AHUYBCC , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

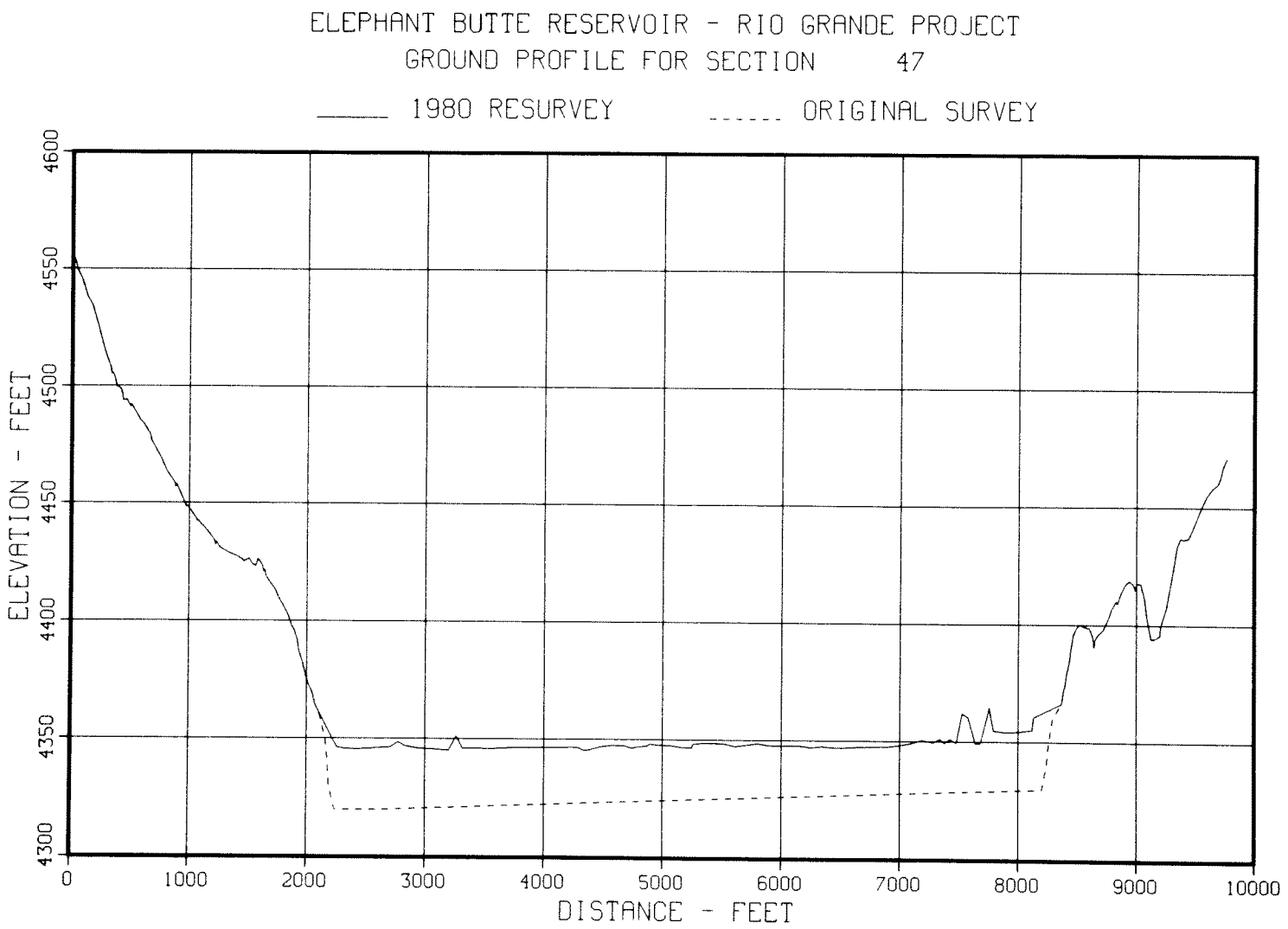

Figure 57. - 1915 and 1980 Sedimentation Range Profiles - Range 47

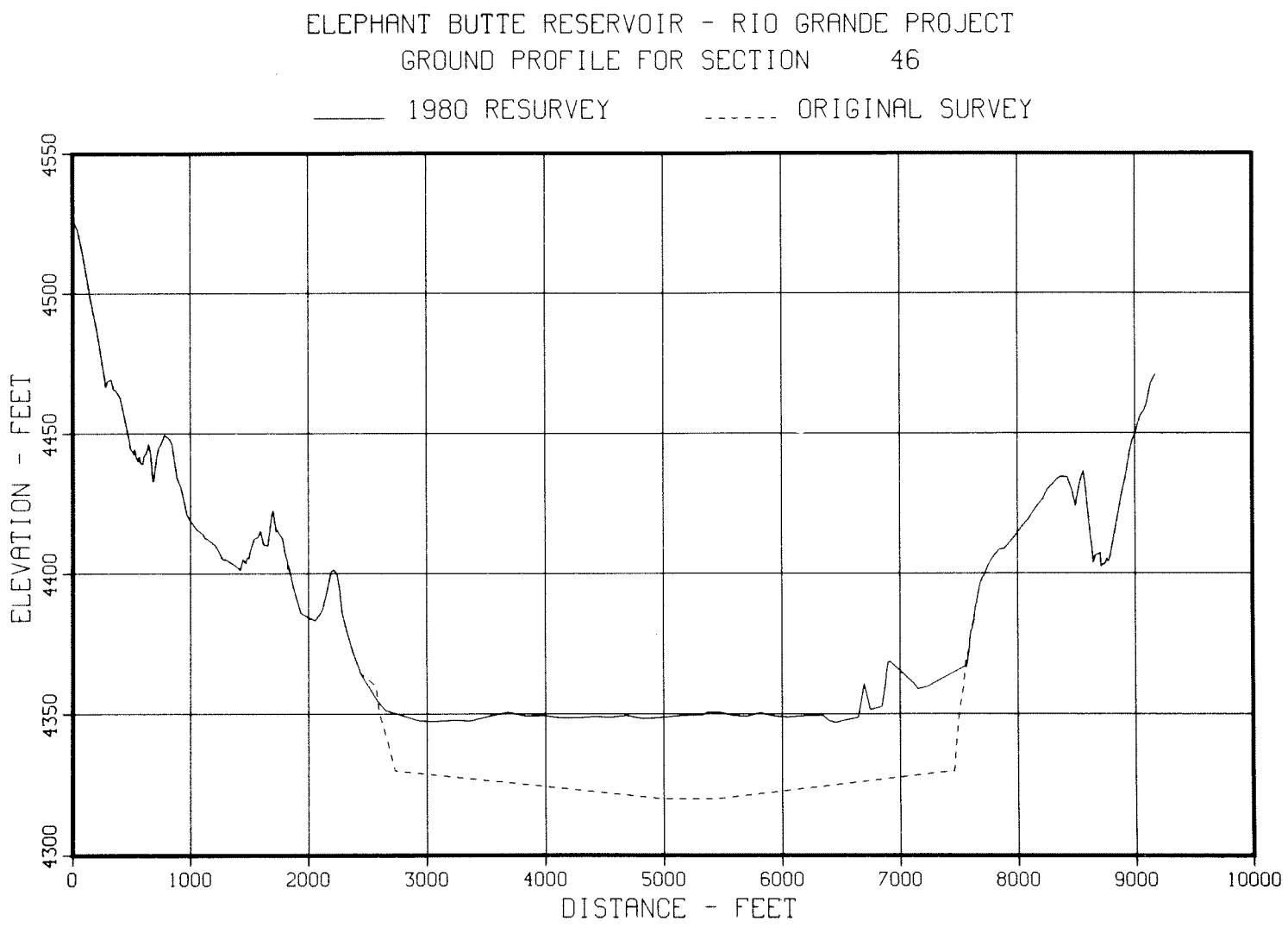

Figure 58. - 1915 and 1980 Sedimentation Range Profiles - Range 46

PLOT 3 15.33.04 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

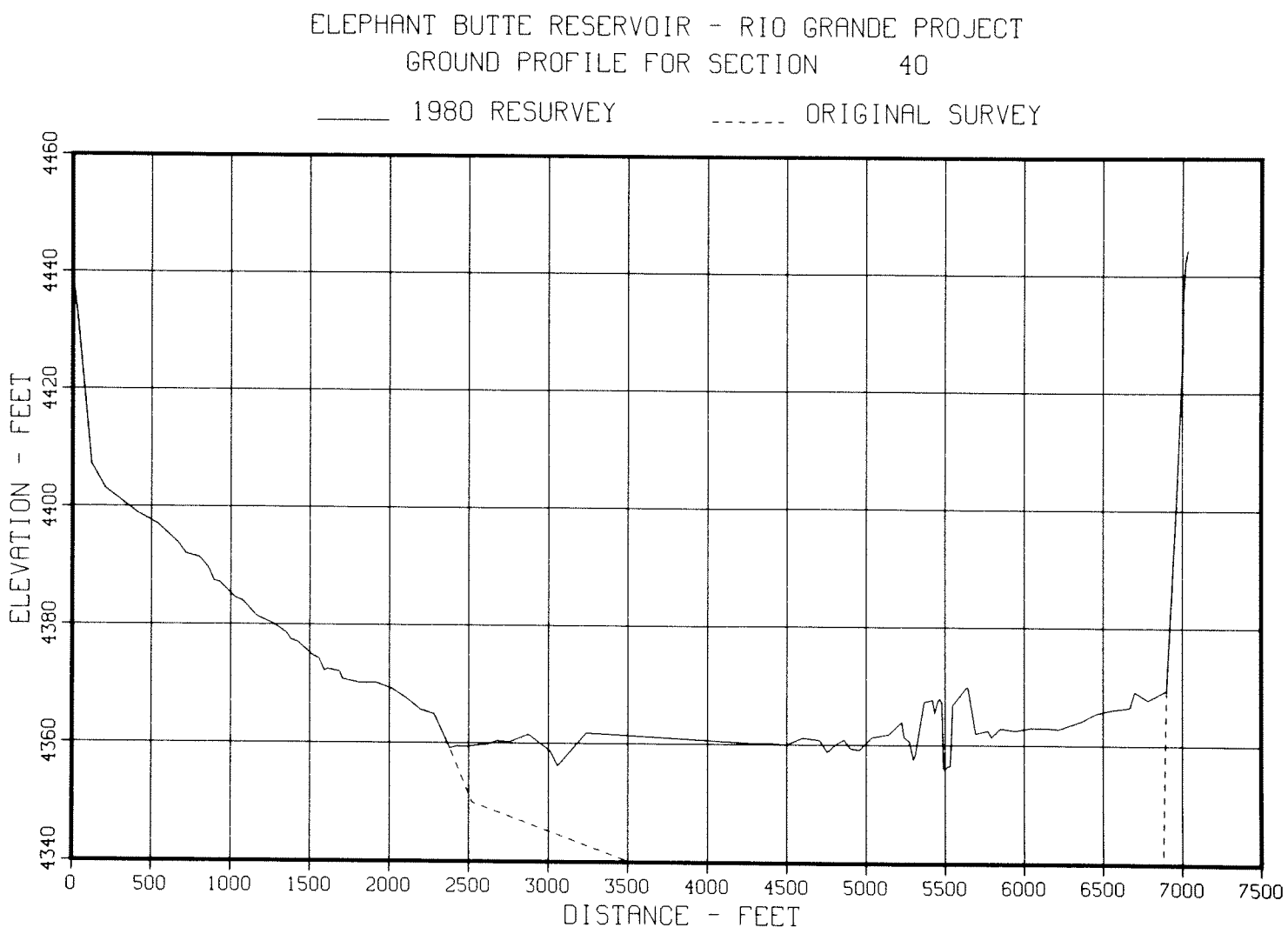

Figure 59. - 1915 and 1980 Sedimentation Range Profiles - Range 40

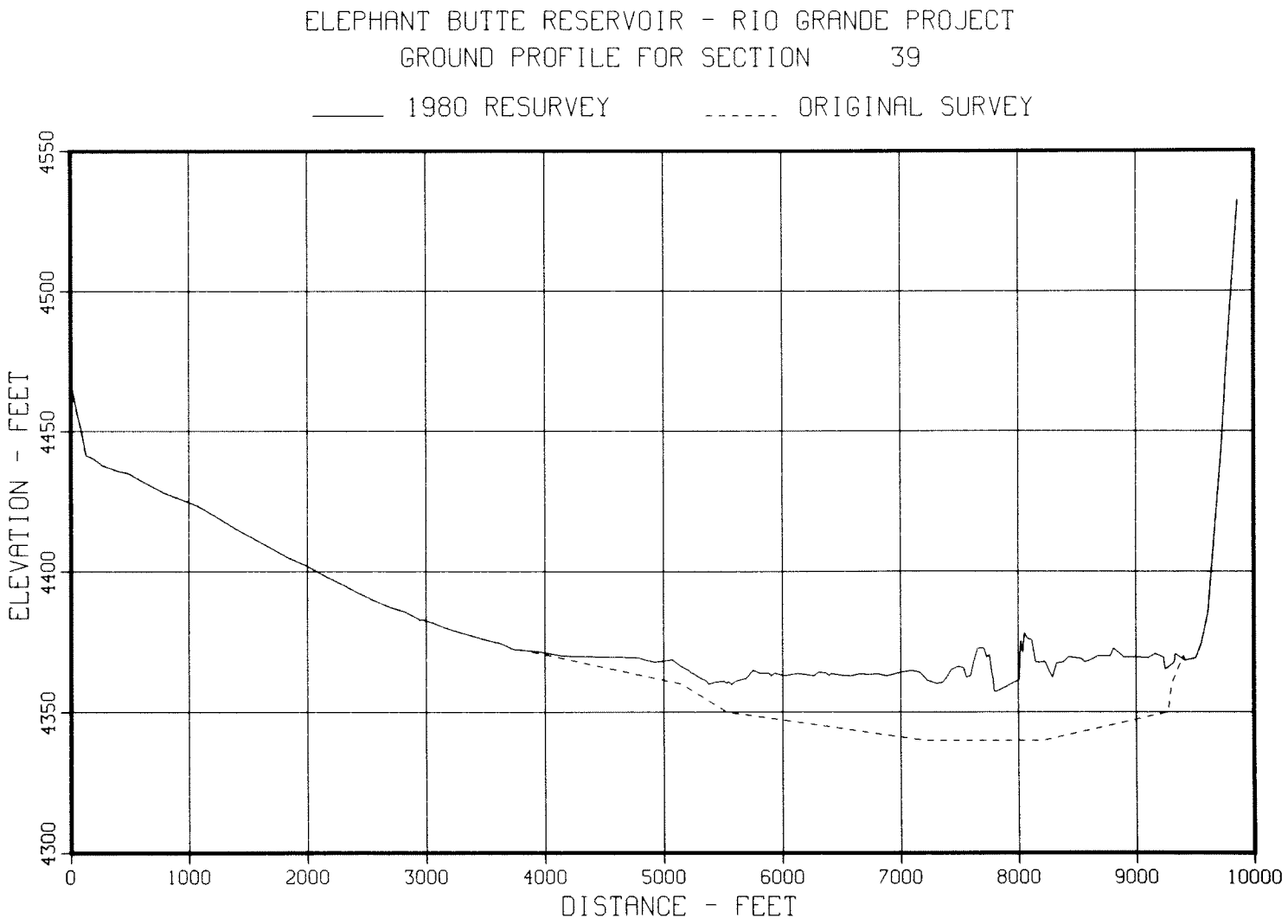

Figure 60. - 1915 and 1980 Sedimentation Range Profiles - Range 39

PLOT 5 15.33.16 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

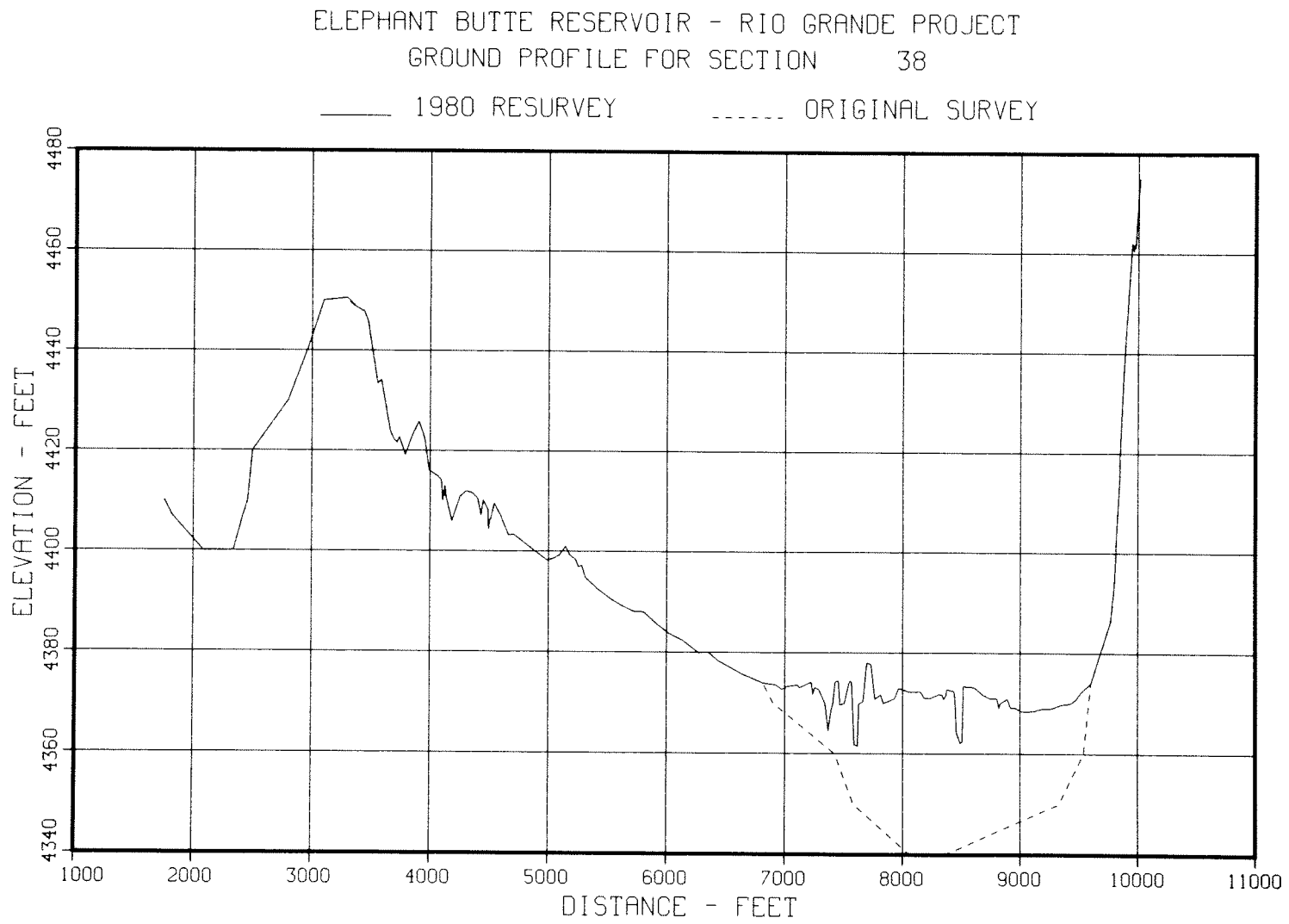

Figure 61. - 1915 and 1980 Sedimentation Range Profiles - Range 38

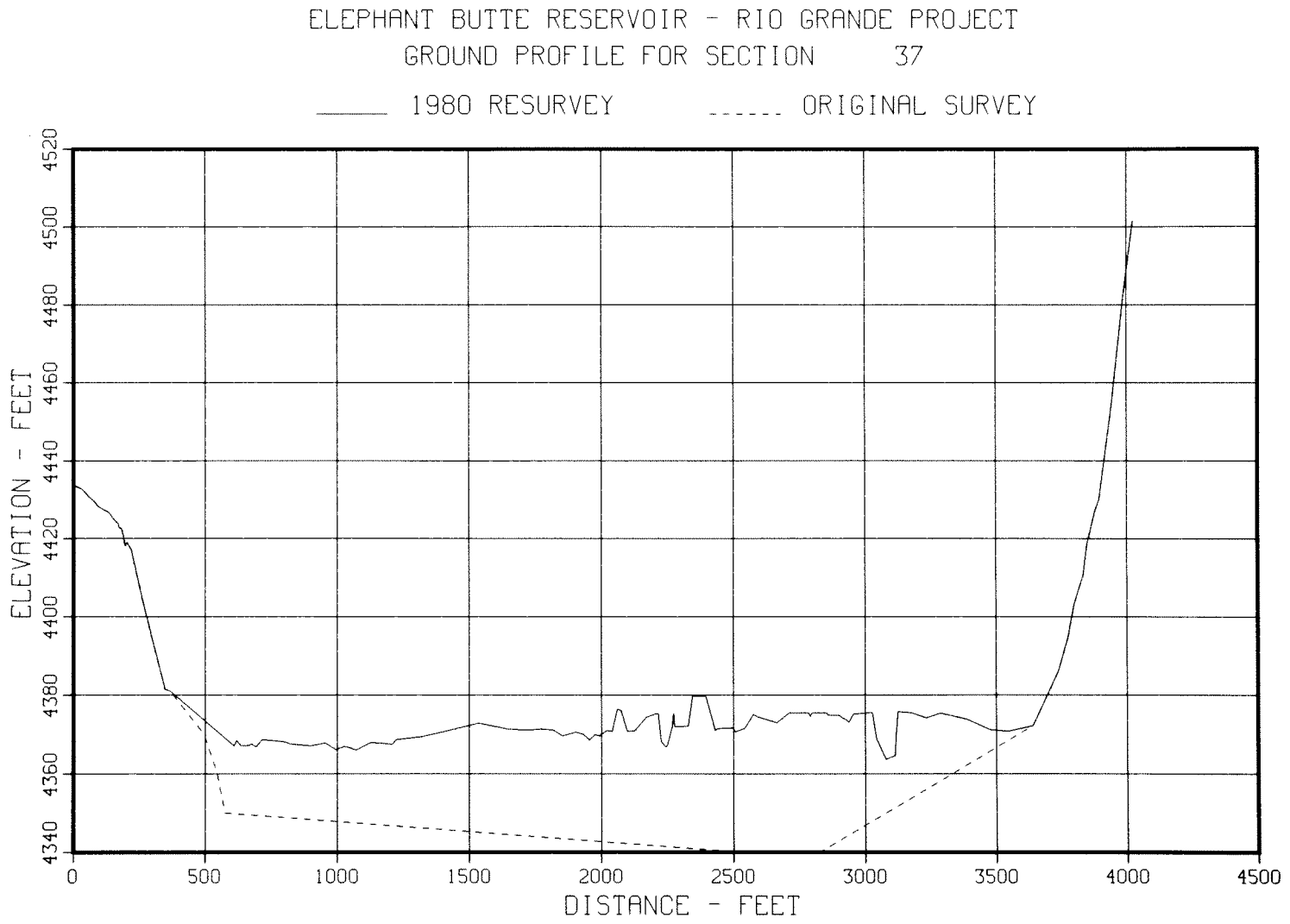

Figure 62. - 1915 and 1980 Sedimentation Range Profiles - Range 37

PLOT 7 15.33.26 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

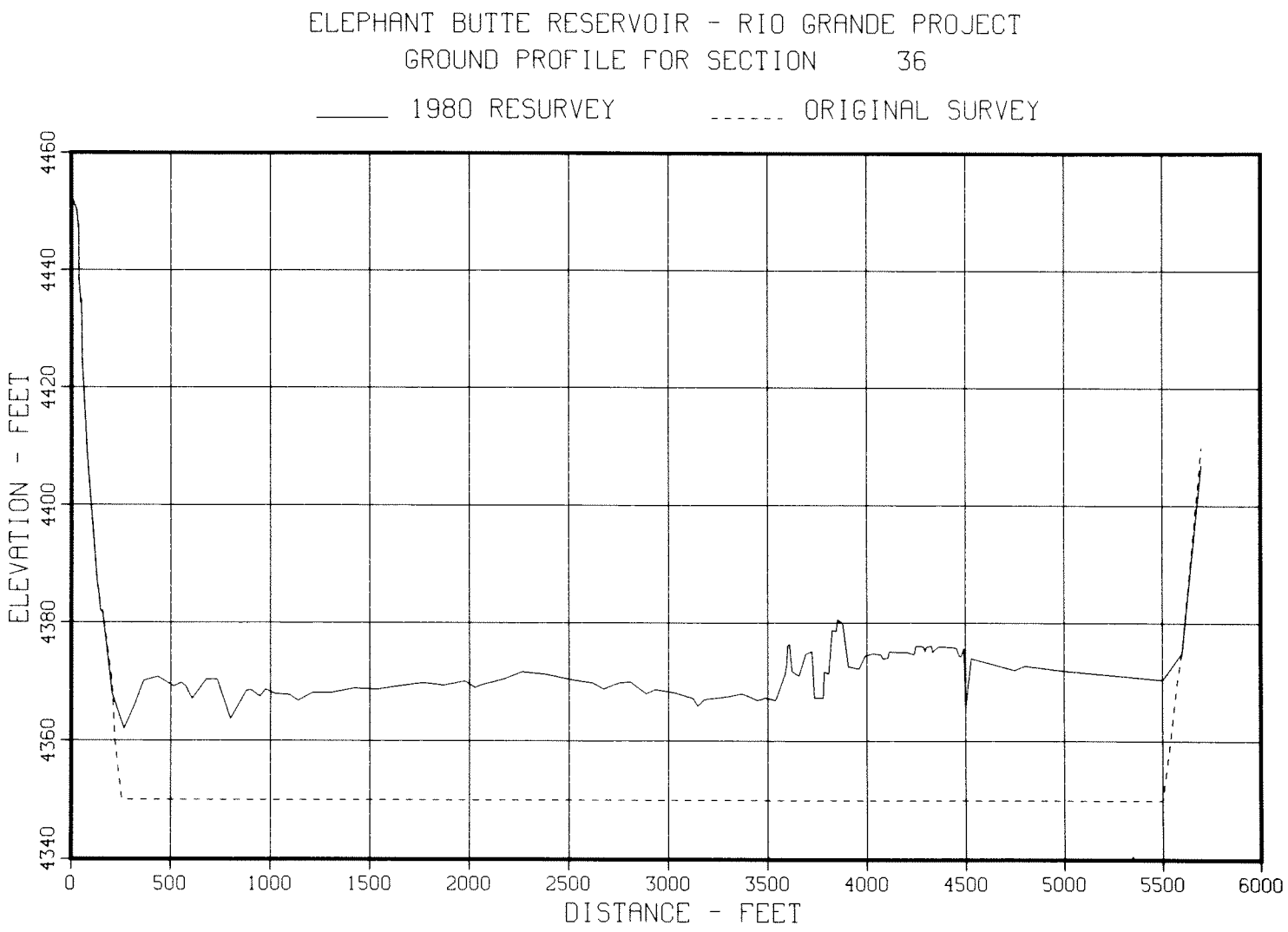

Figure 63. - 1915 and 1980 Sedimentation Range Profiles - Range 36

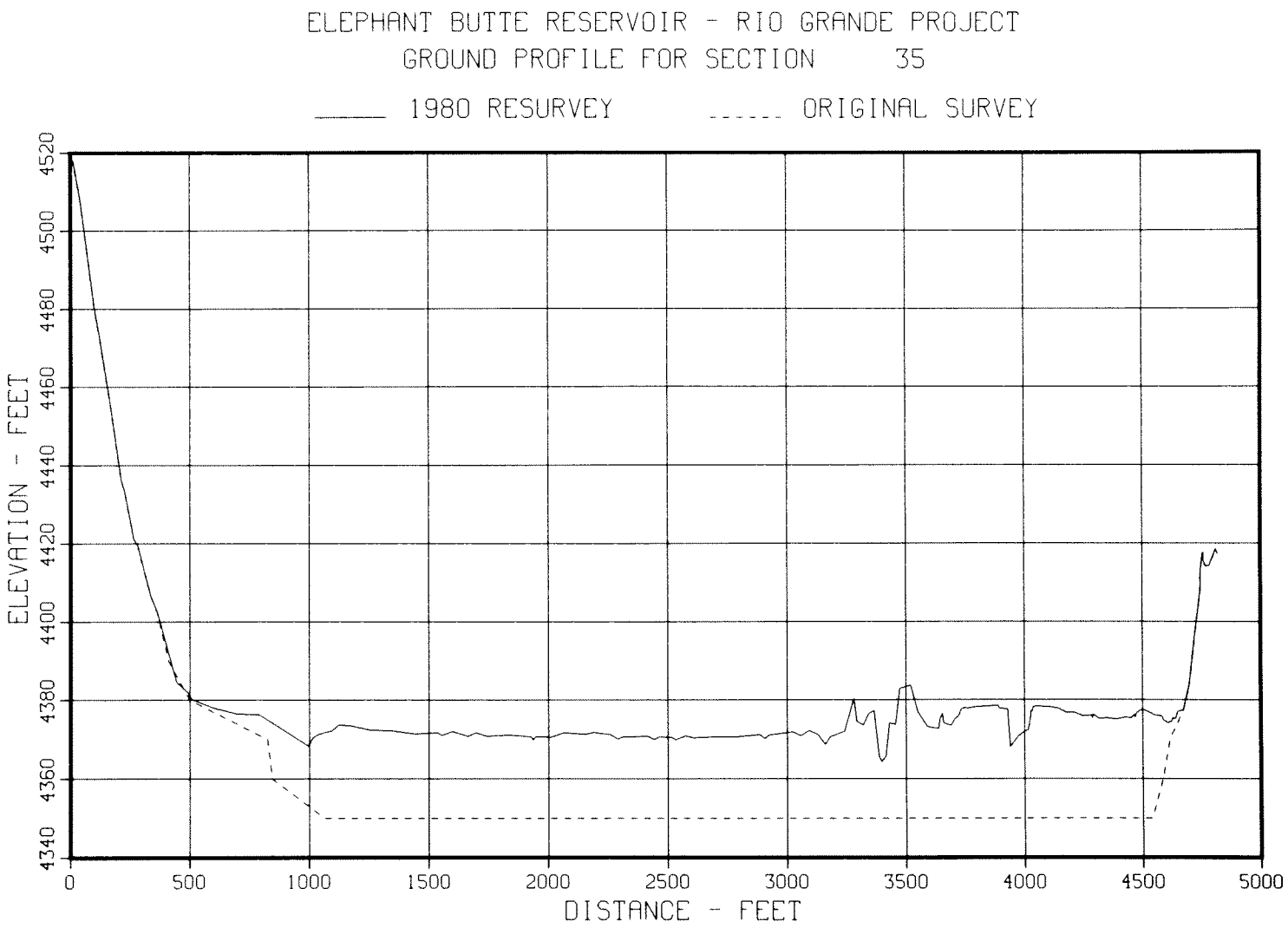

Figure 64. - 1915 and 1980 Sedimentation Range Profiles - Range 35

PLOT 9 15.33.40 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

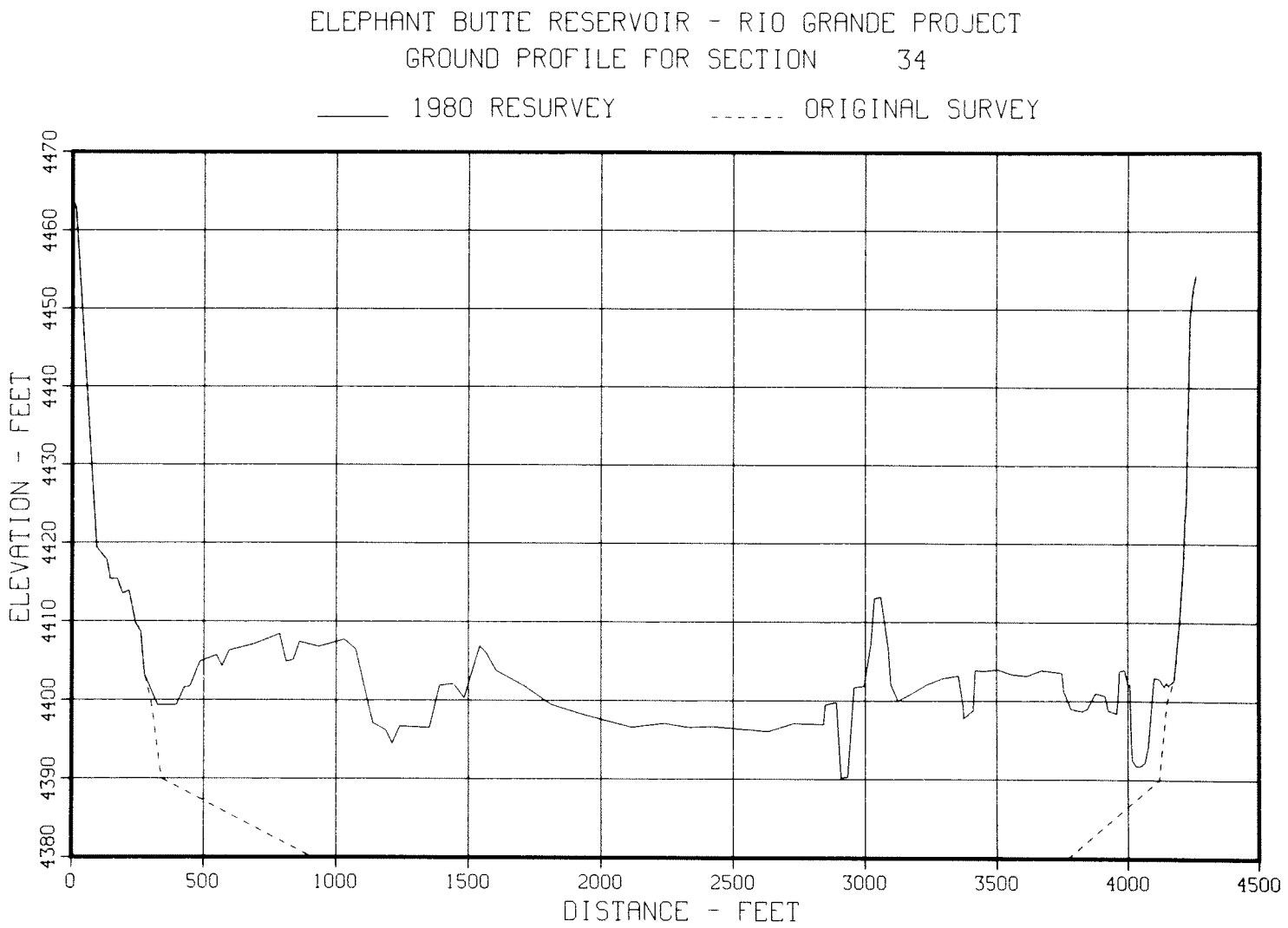

Figure 65. - 1915 and 1980 Sedimentation Range Profiles - Range 34

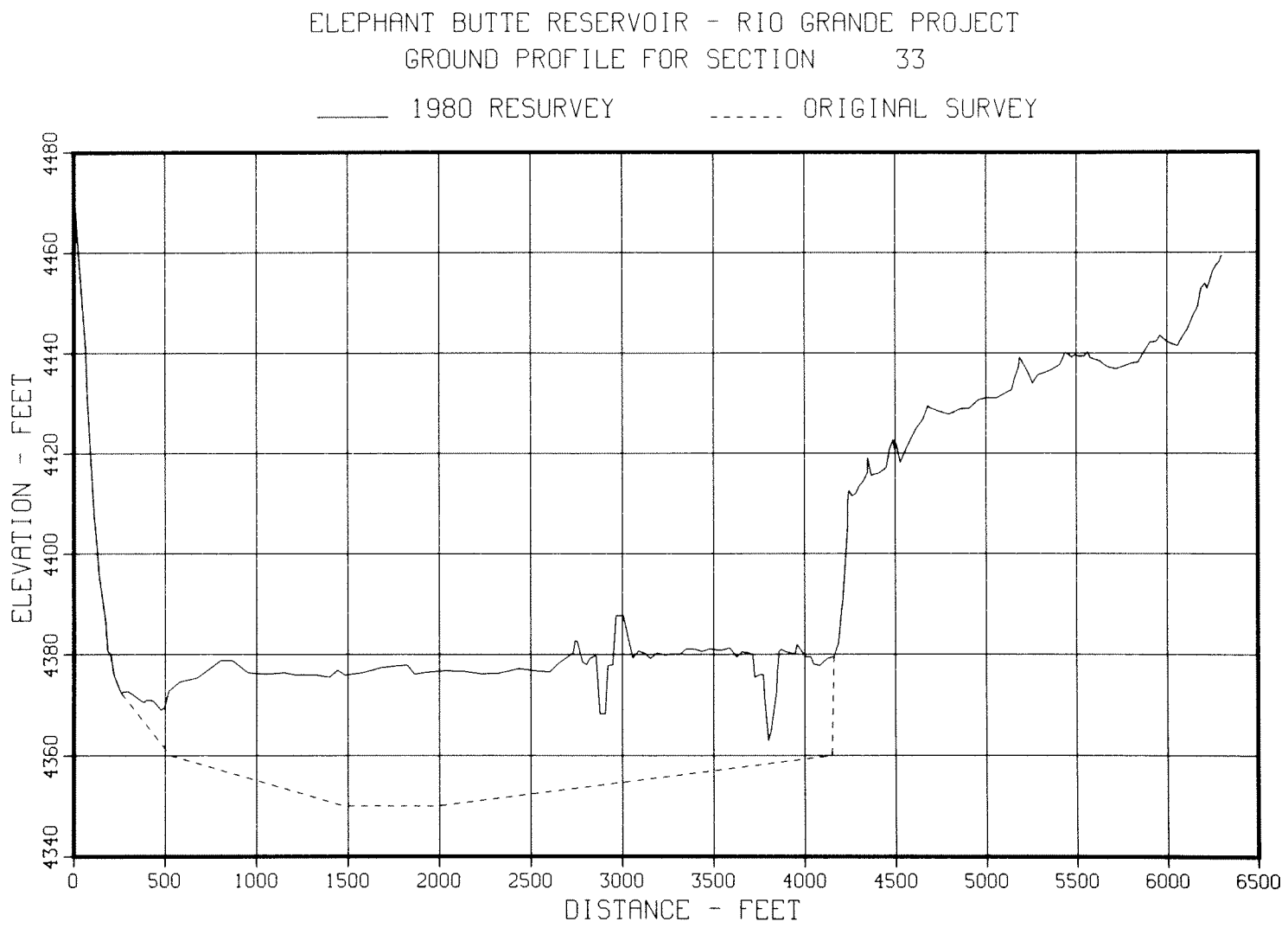

Figure 66. - 1915 and 1980 Sedimentation Range Profiles - Range 33

PLOT 11 15.33.50 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

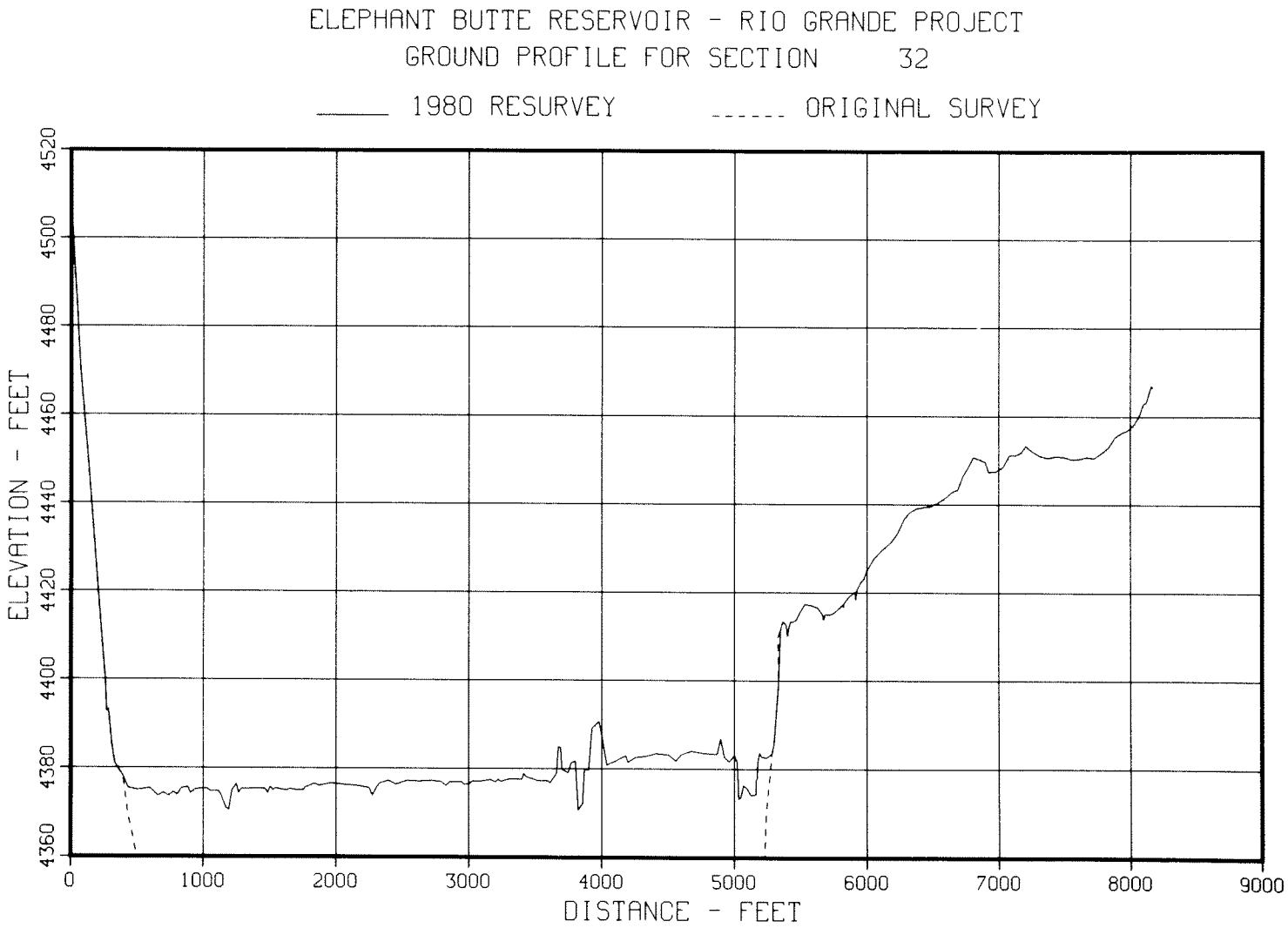

Figure 67. - 1915 and 1980 Sedimentation Range Profiles - Range 32

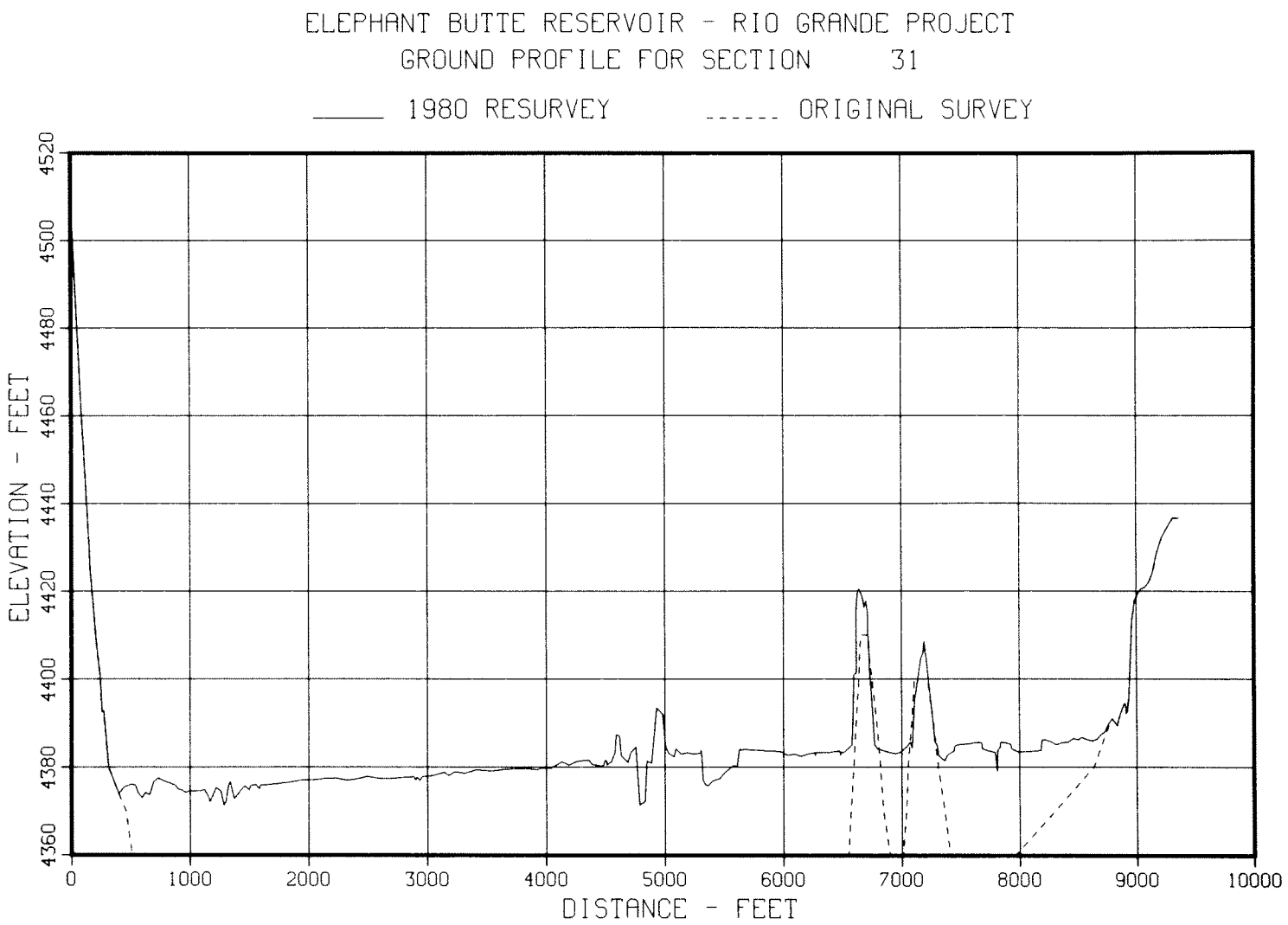

Figure 68. - 1915 and 1980 Sedimentation Range Profiles - Range 31

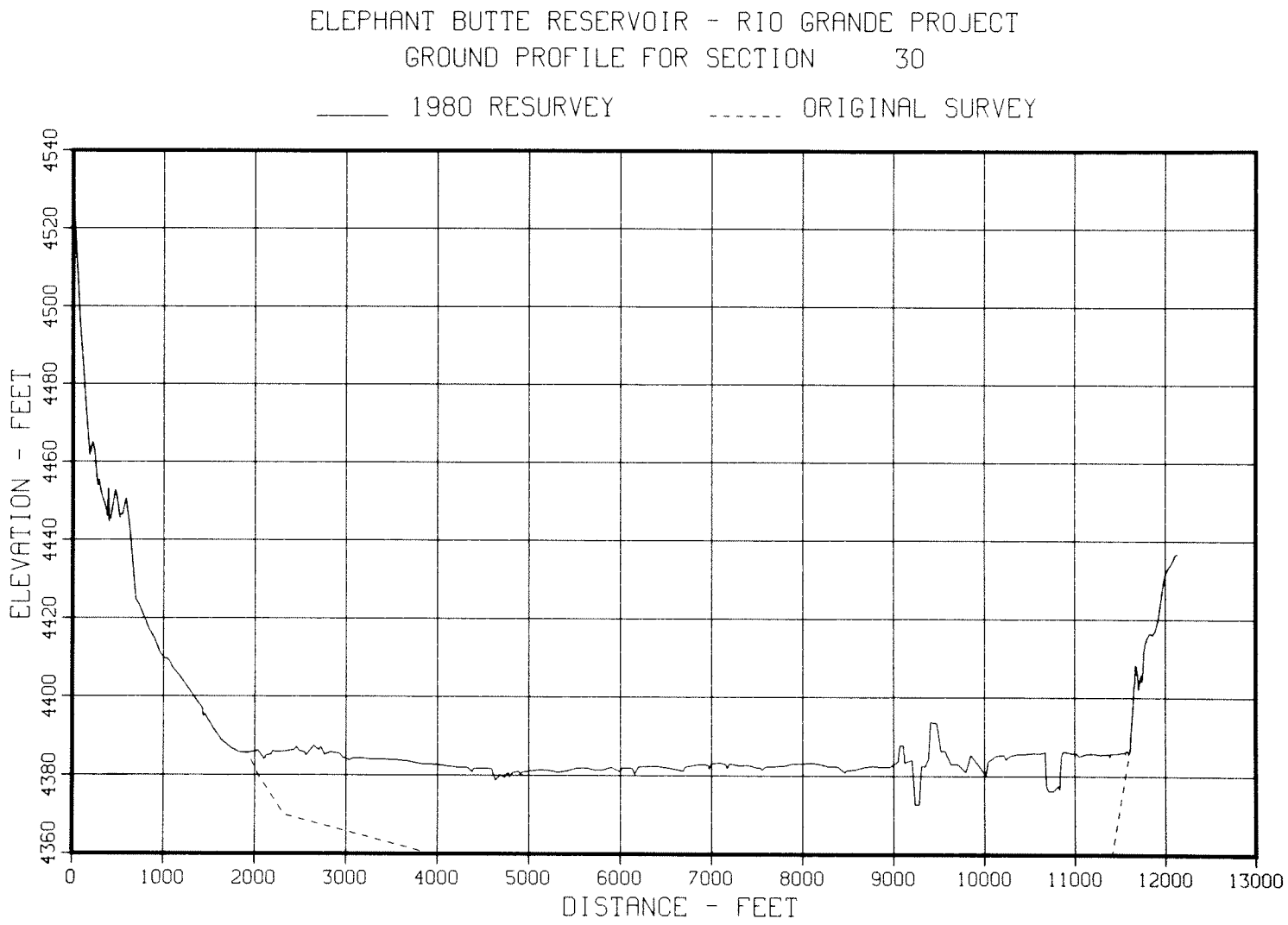

Figure 69. - 1915 and 1980 Sedimentation Range Profiles - Range 30

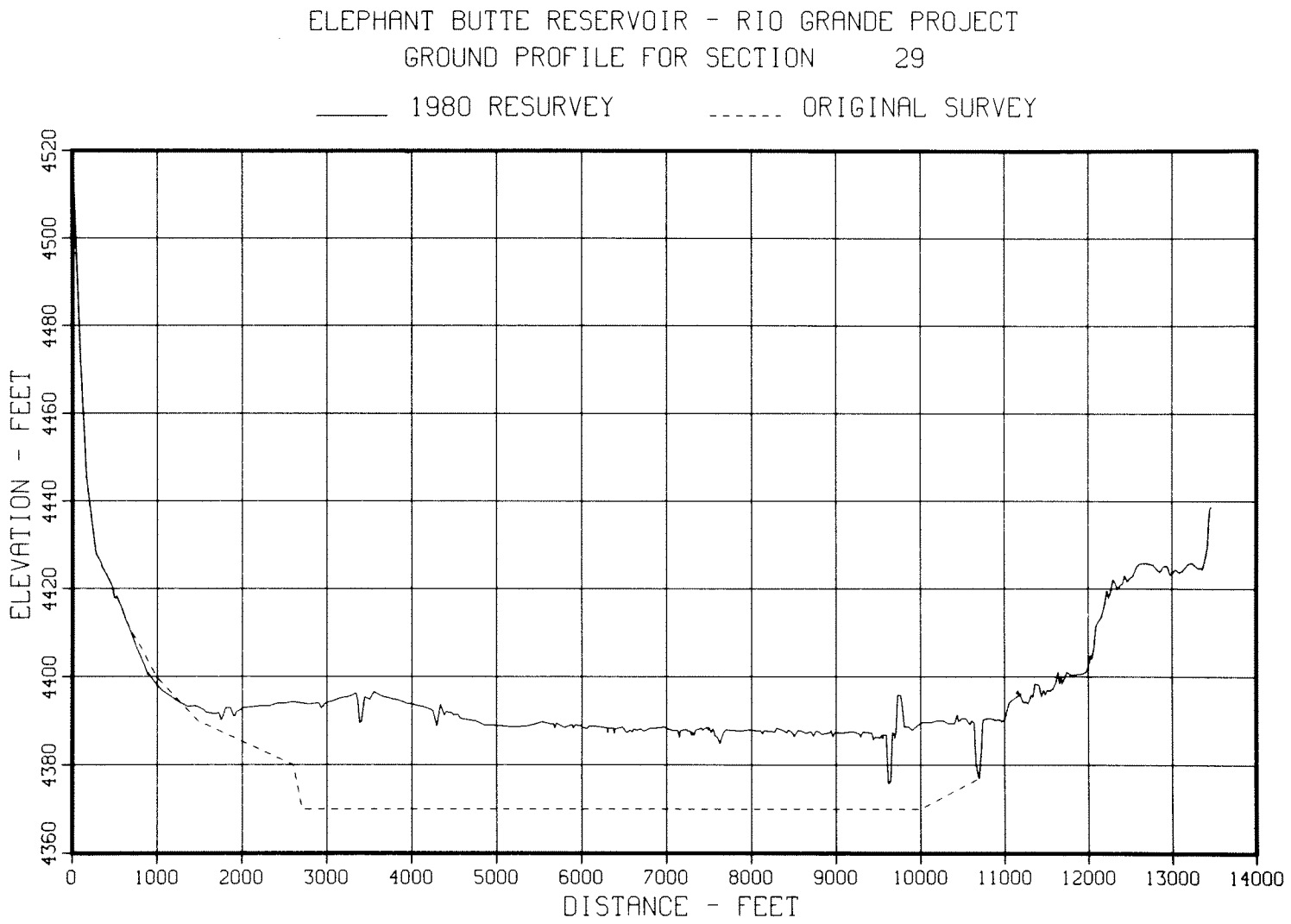

Figure 70. - 1915 and 1980 Sedimentation Range Profiles - Range 29

PLOT 15 15.34.07 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

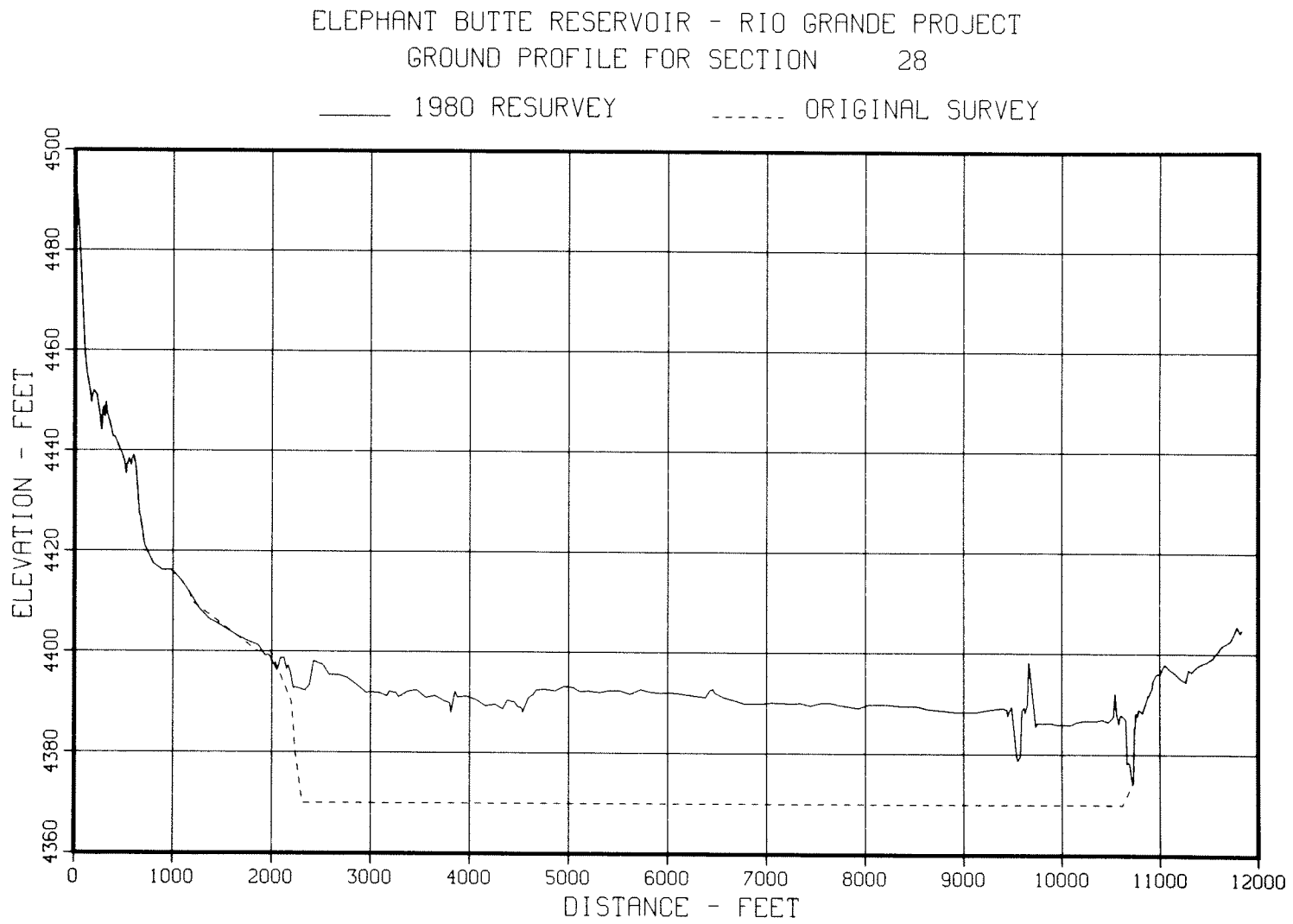

Figure 71. - 1915 and 1980 Sedimentation Range Profiles - Range 28

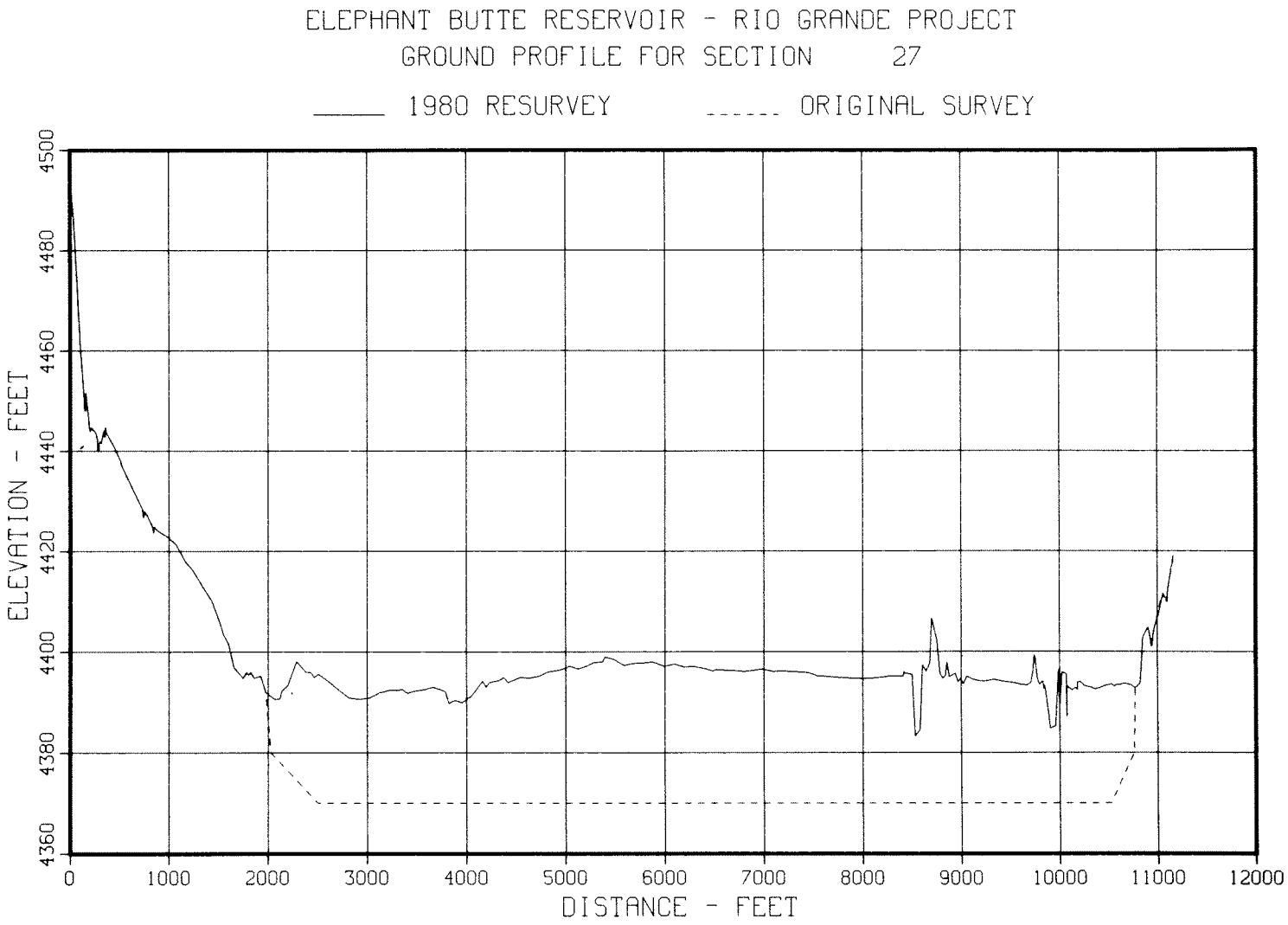

Figure 72. - 1915 and 1980 Sedimentation Range Profiles - Range 27

PLOT 17 15.34.55 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

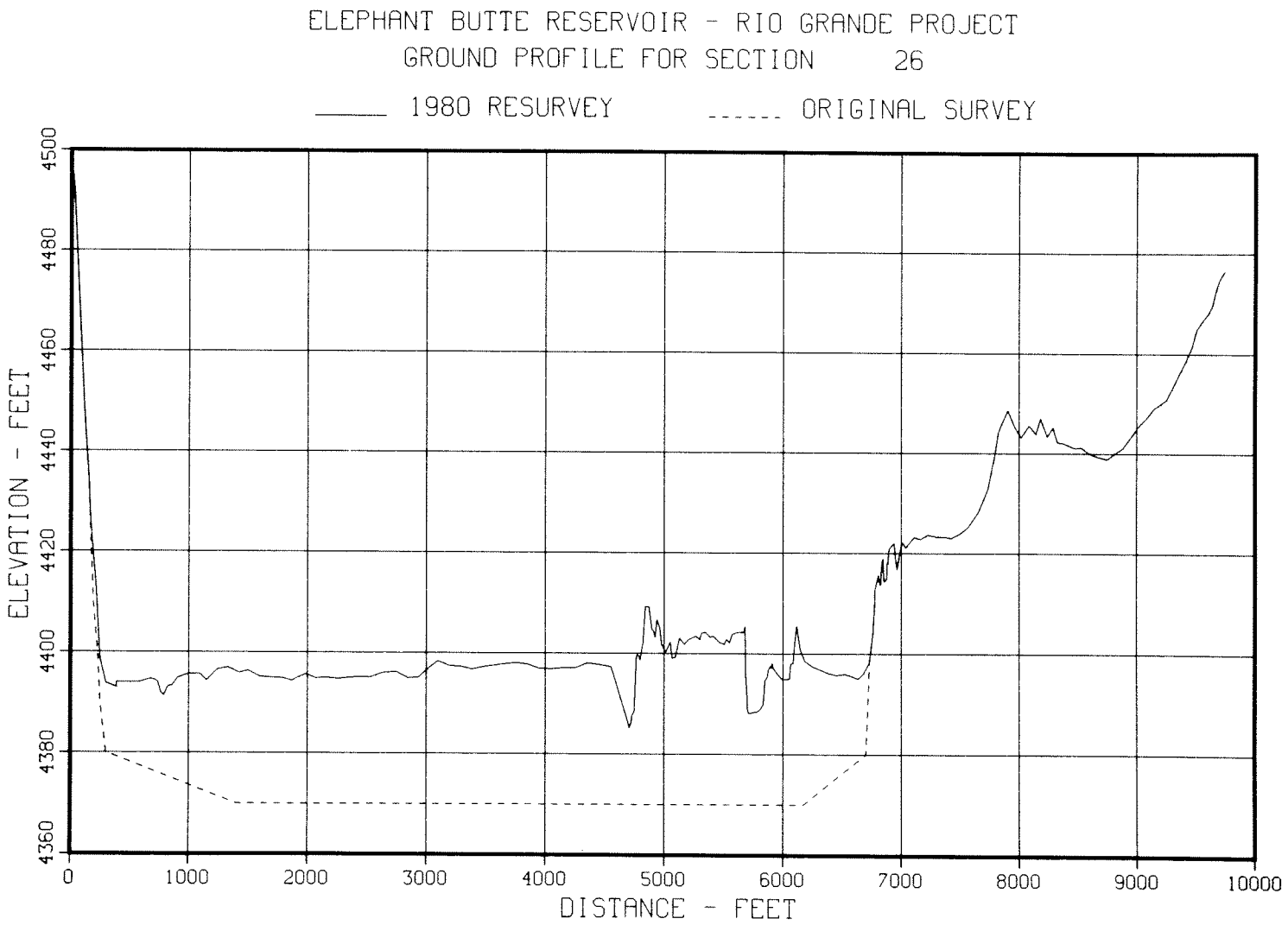

Figure 75. - 1915 and 1980 Sedimentation Range Profiles - Range 24

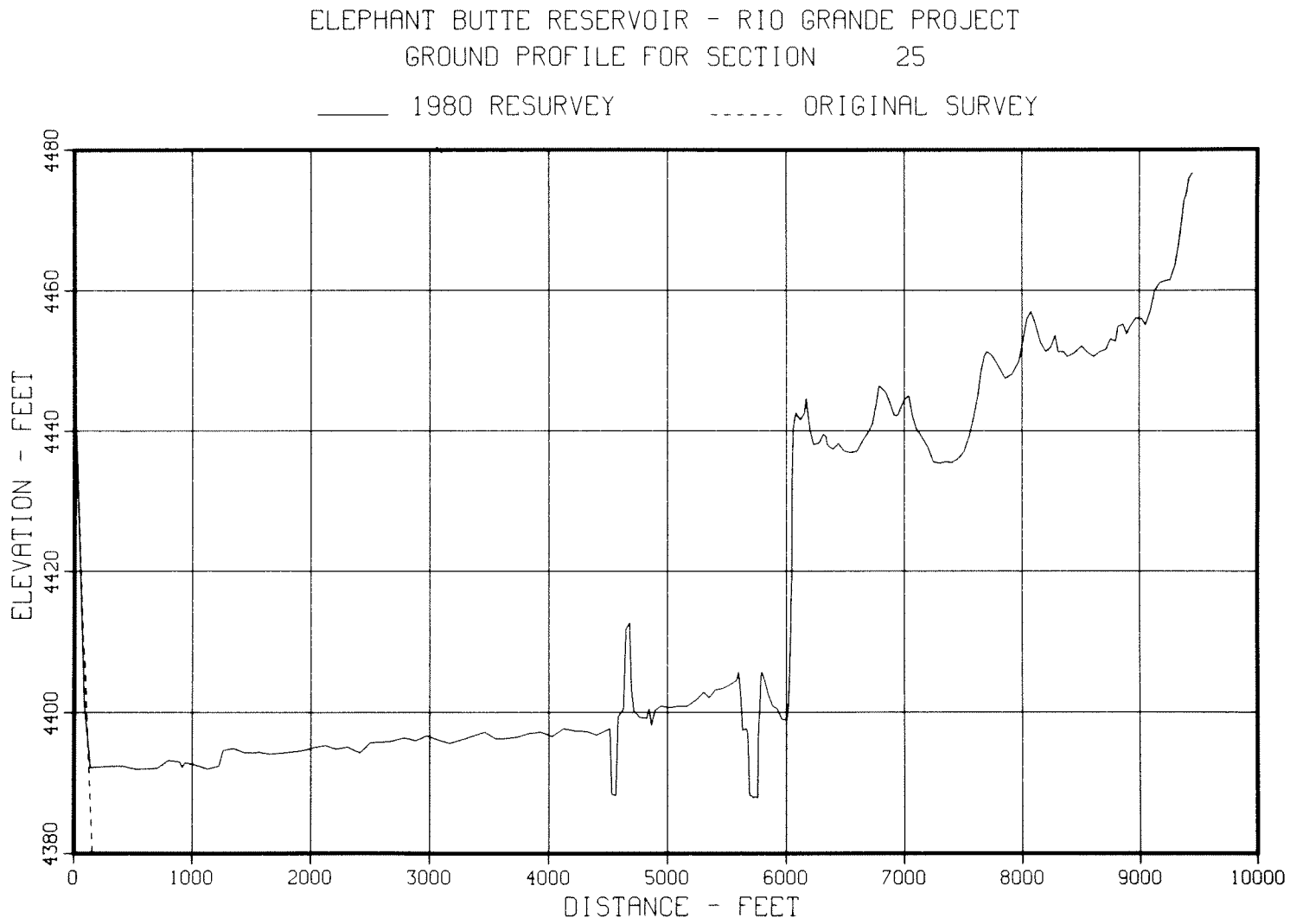

Figure 74. - 1915 and 1980 Sedimentation Range Profiles - Range 25

PLOT 19 10.52.45 MON 23 AUG, 1982 JOB-AHUYLME , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

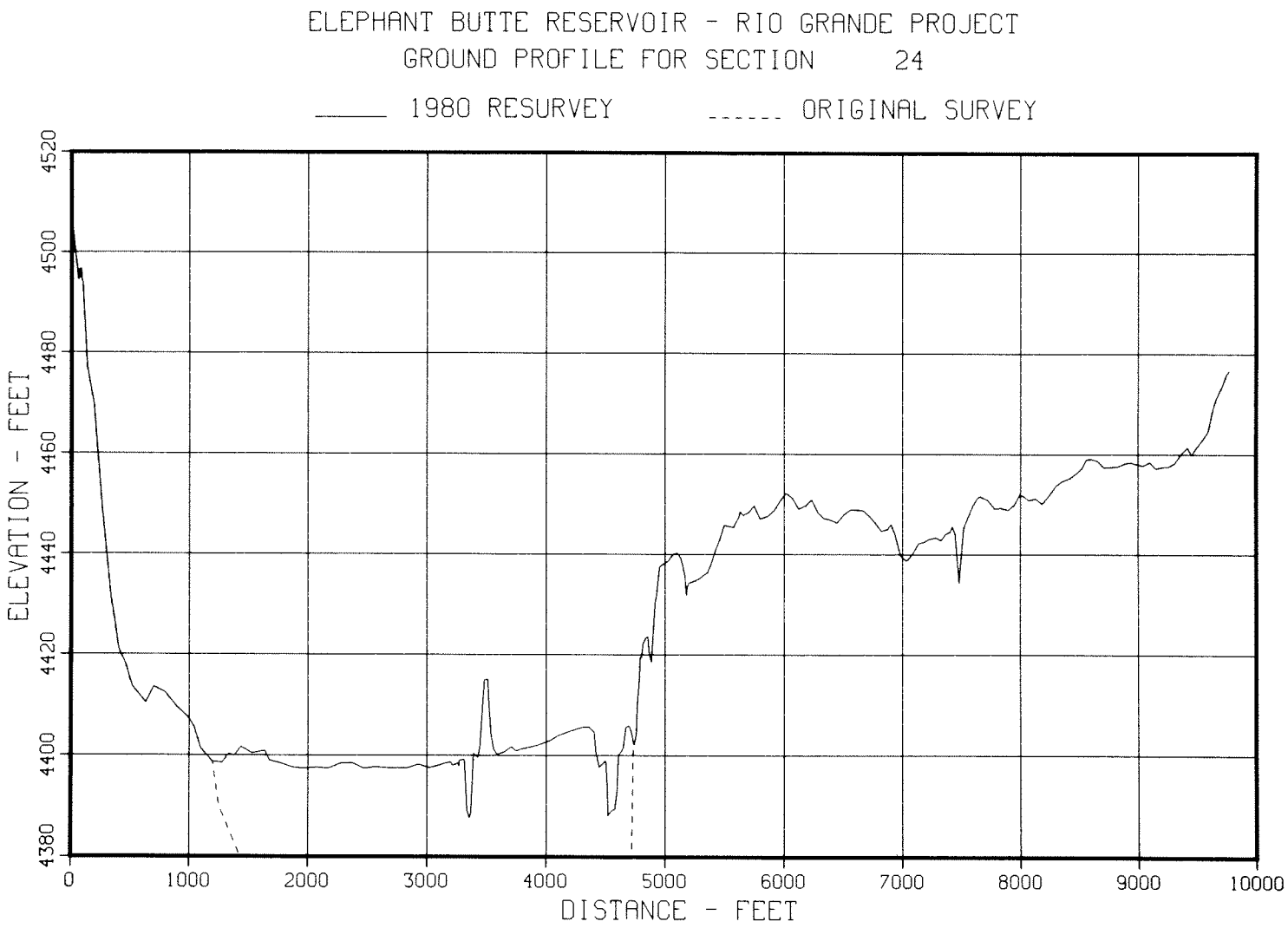

Figure 73. - 1915 and 1980 Sedimentation Range Profiles - Range 26

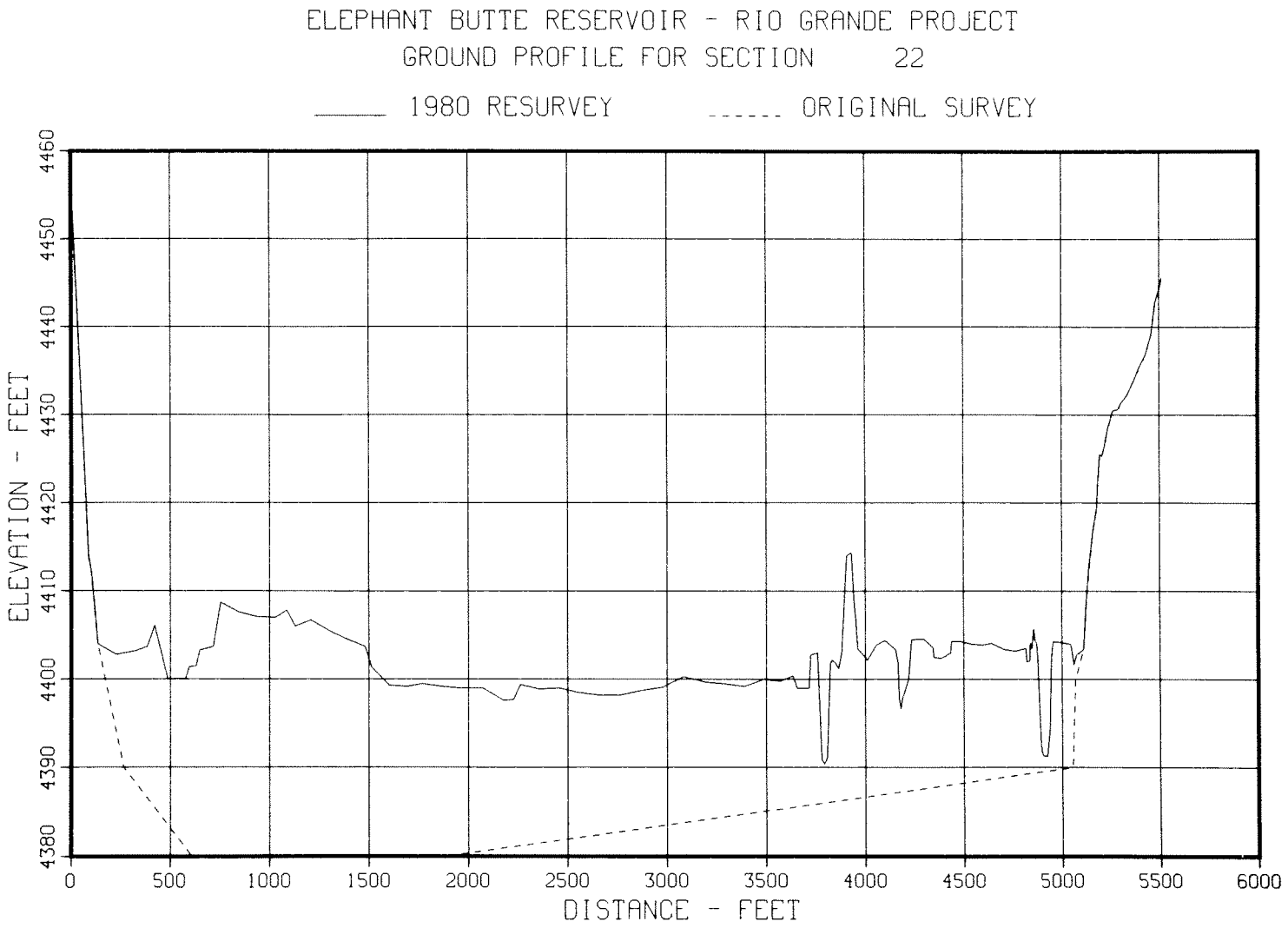

Figure 76. - 1915 and 1980 Sedimentation Range Profiles - Range 22

PLOT 21 15.35.30 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

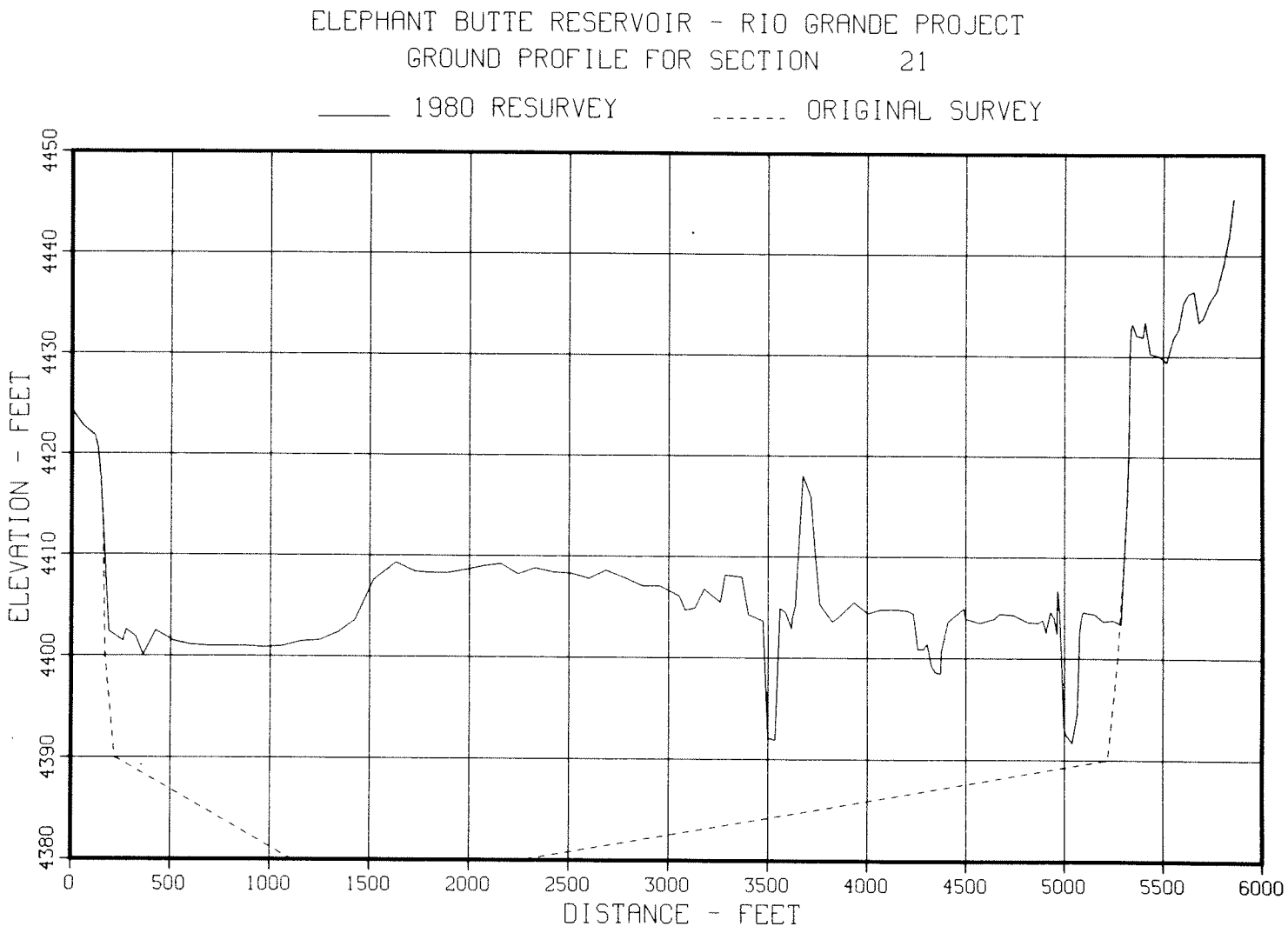

Figure 77. - 1915 and 1980 Sedimentation Range Profiles - Range 21

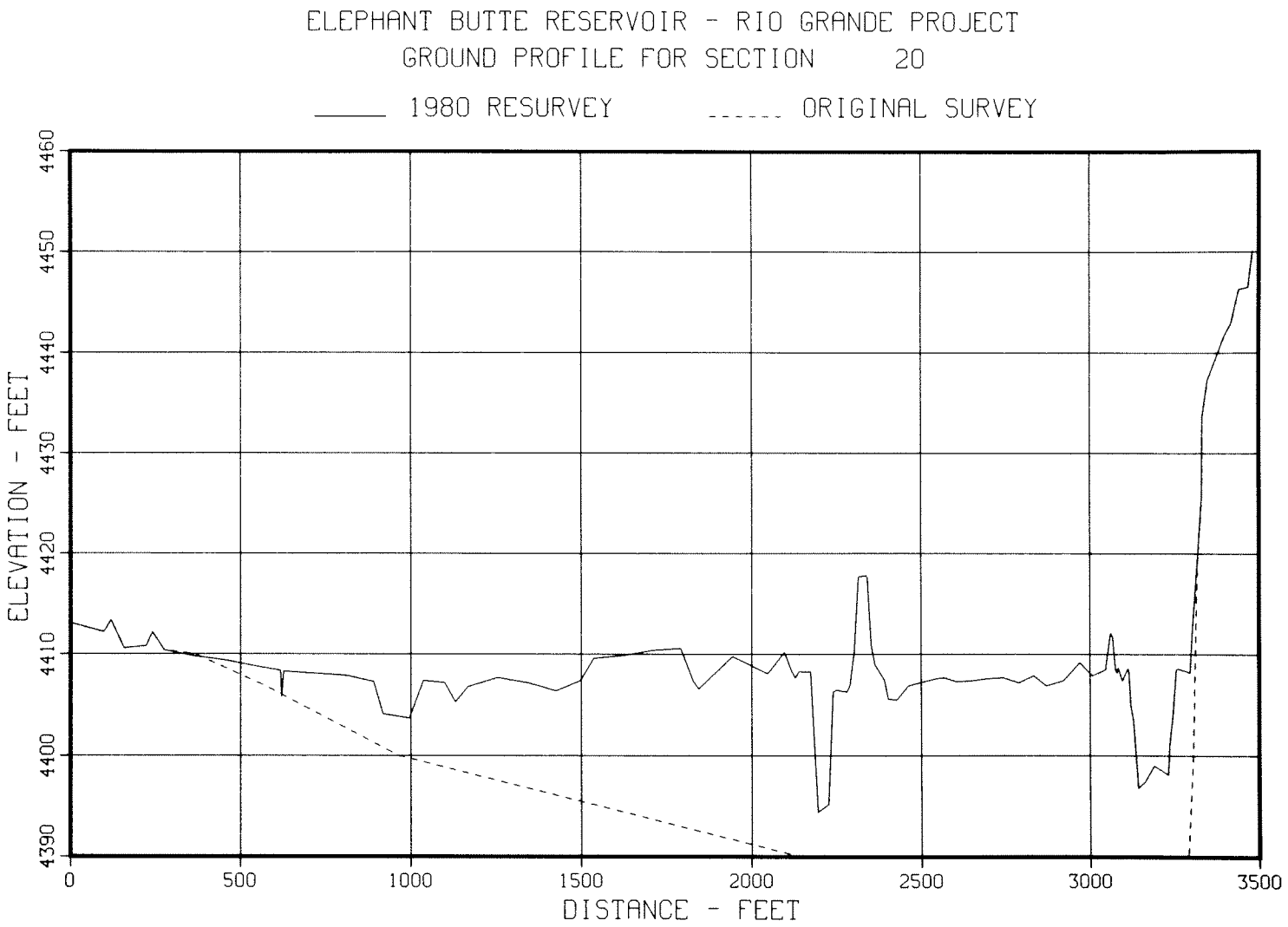

Figure 78. - 1915 and 1980 Sedimentation Range Profiles - Range 20

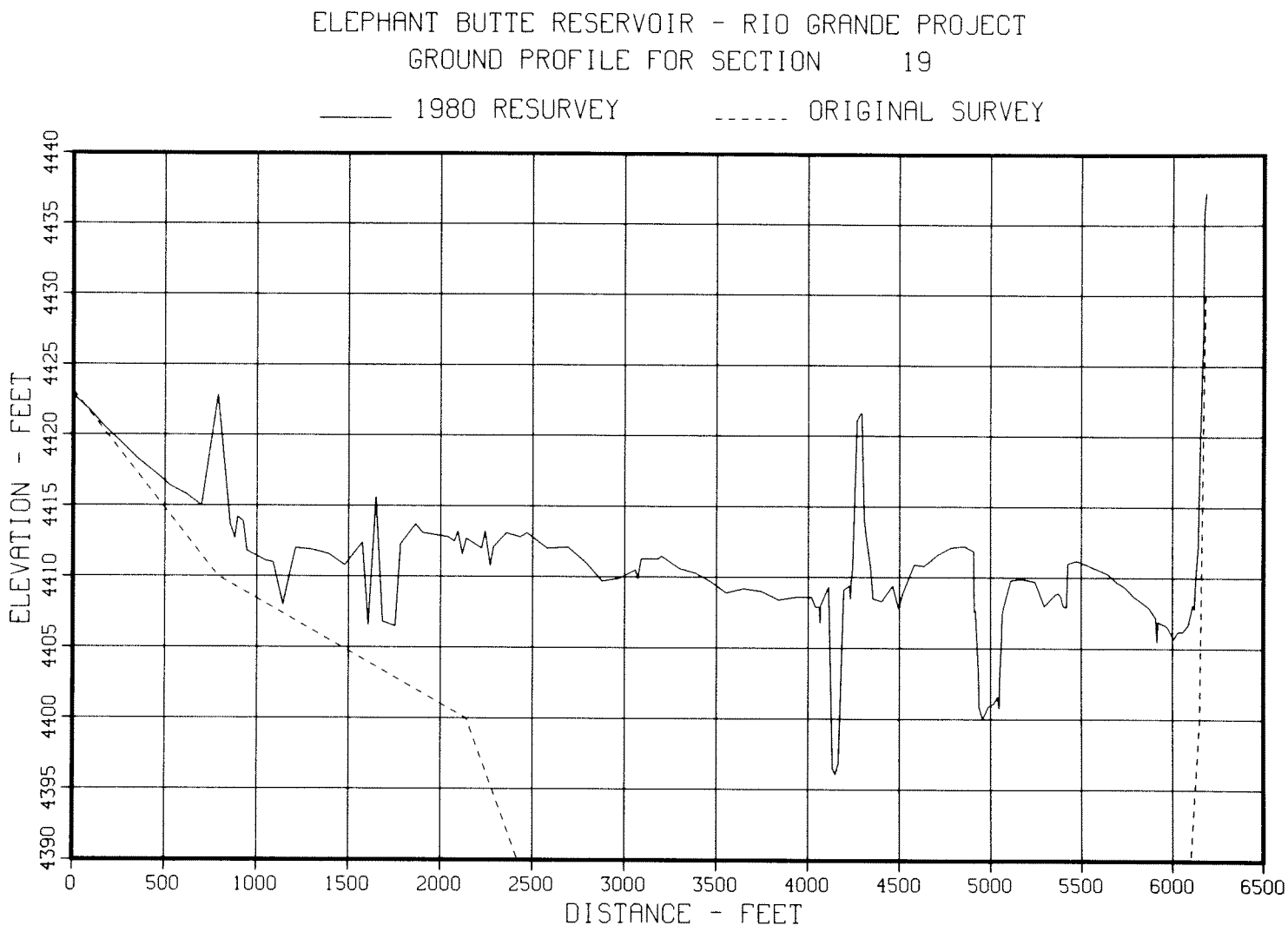

Figure 79. - 1915 and 1980 Sedimentation Range Profiles - Range 19

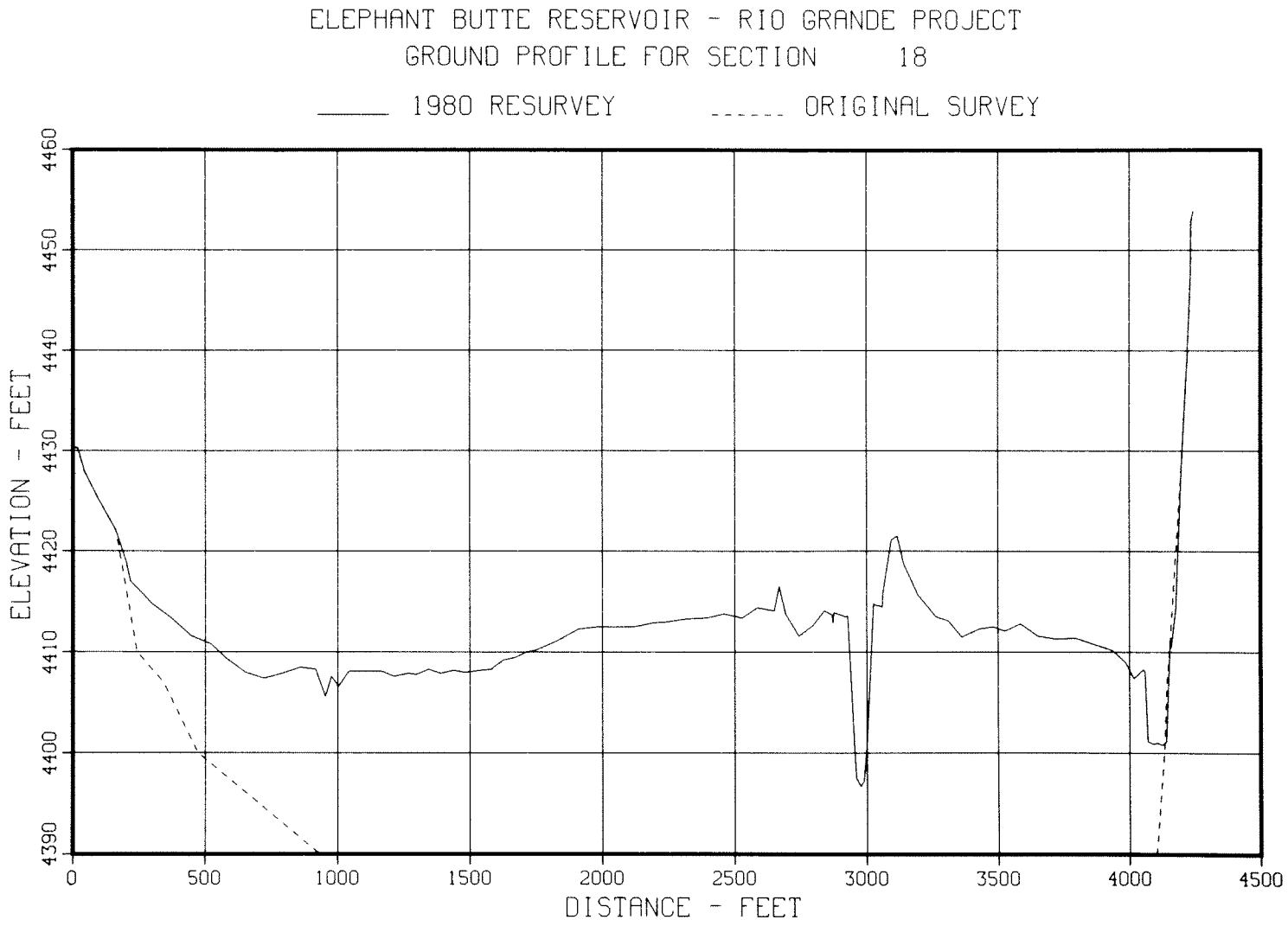

Figure 80. - 1915 and 1980 Sedimentation Range Profiles - Range 18

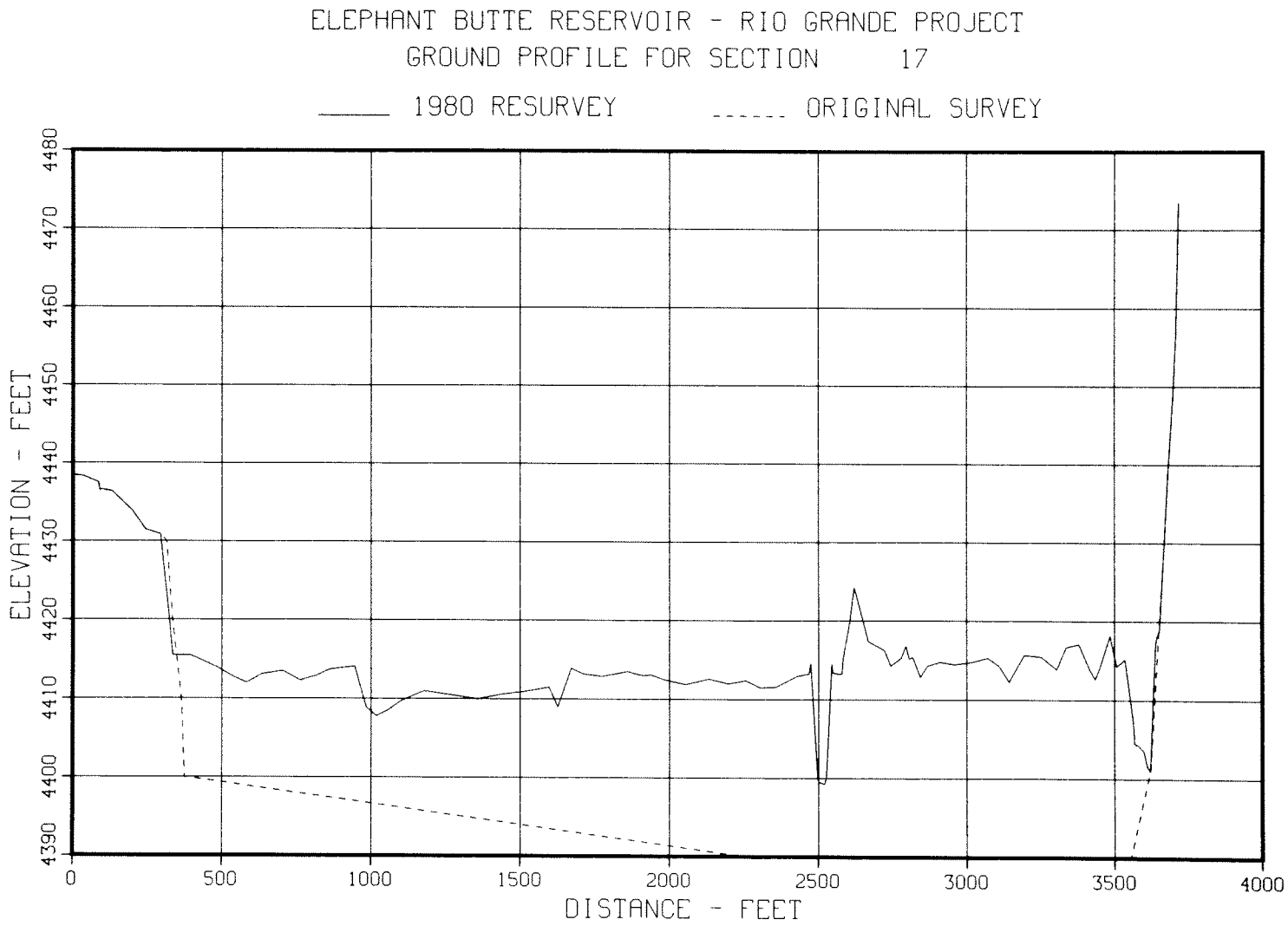

Figure 81. - 1915 and 1980 Sedimentation Range Profiles - Range 17

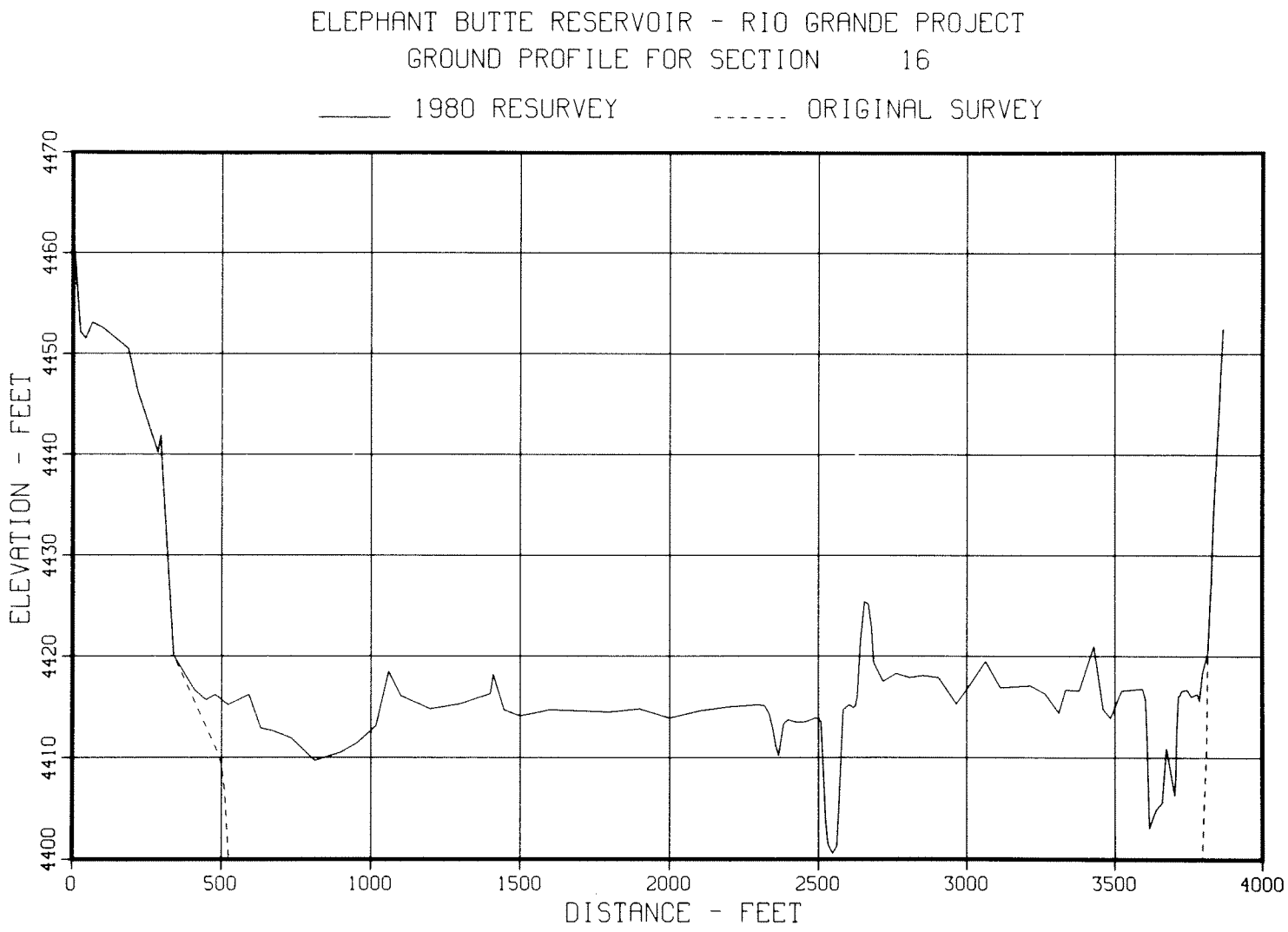

Figure 82. - 1915 and 1980 Sedimentation Range Profiles - Range 16

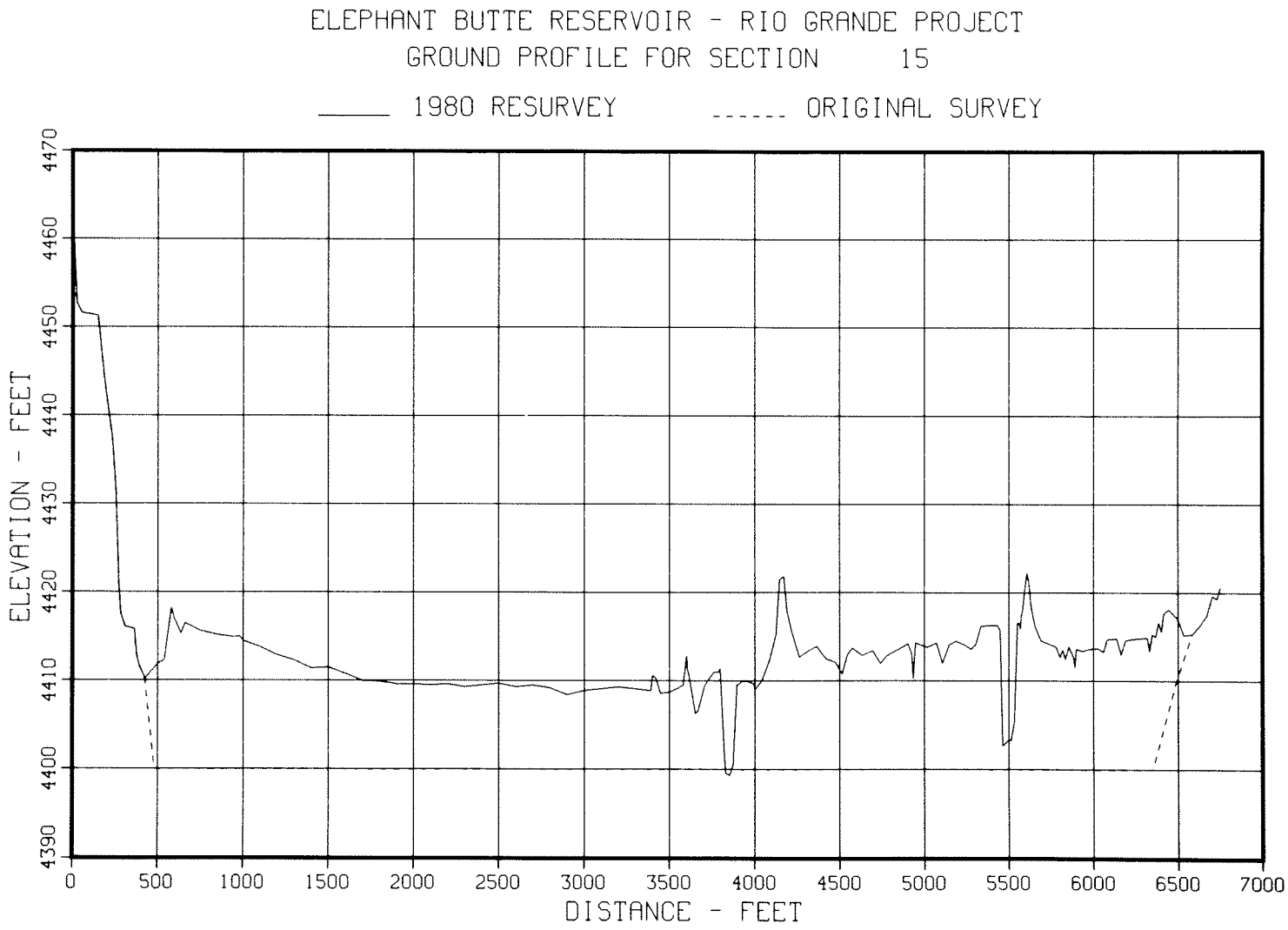

Figure 83. - 1915 and 1980 Sedimentation Range Profiles - Range 15

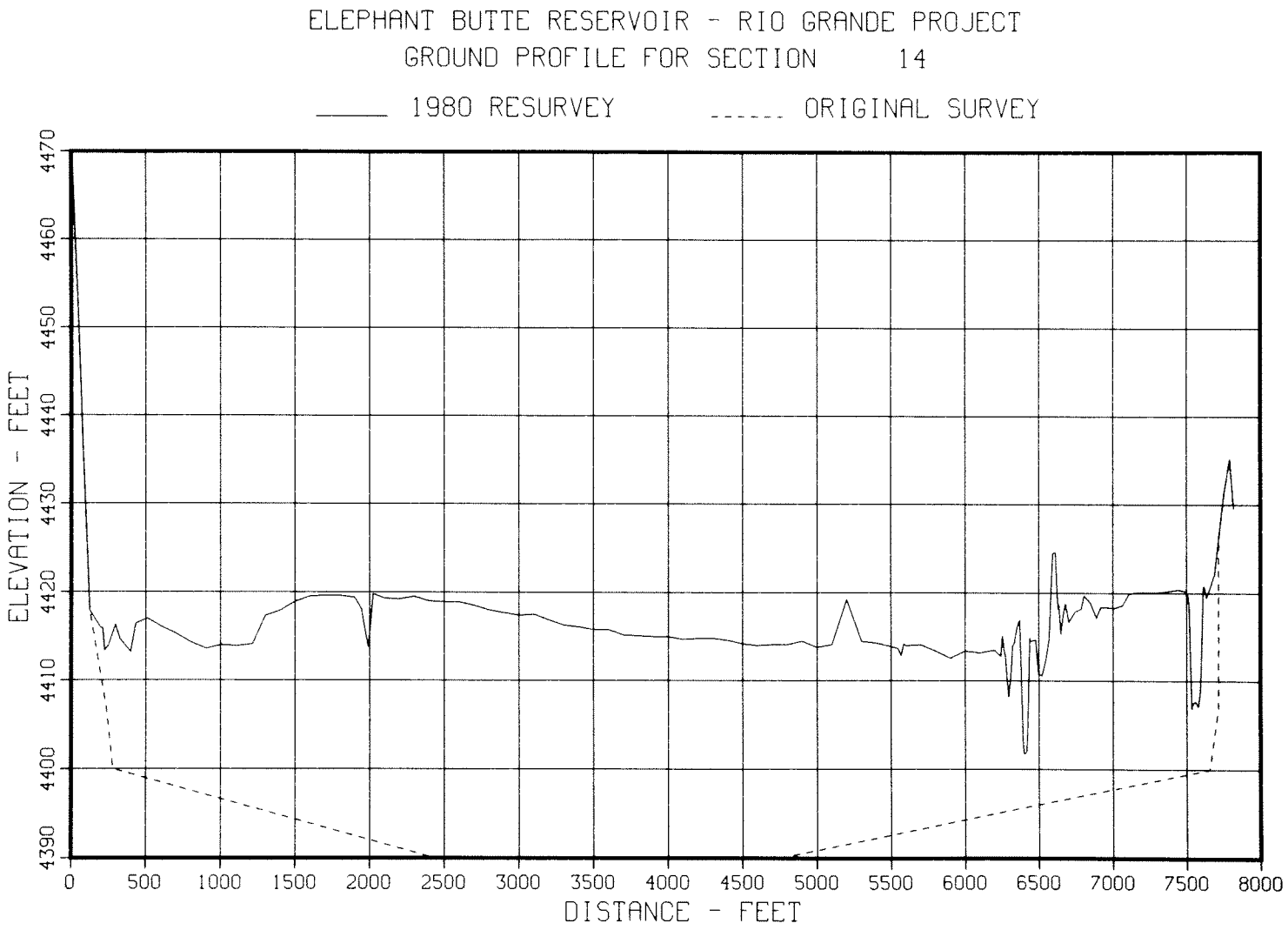

Figure 84. - 1915 and 1980 Sedimentation Range Profiles - Range 14

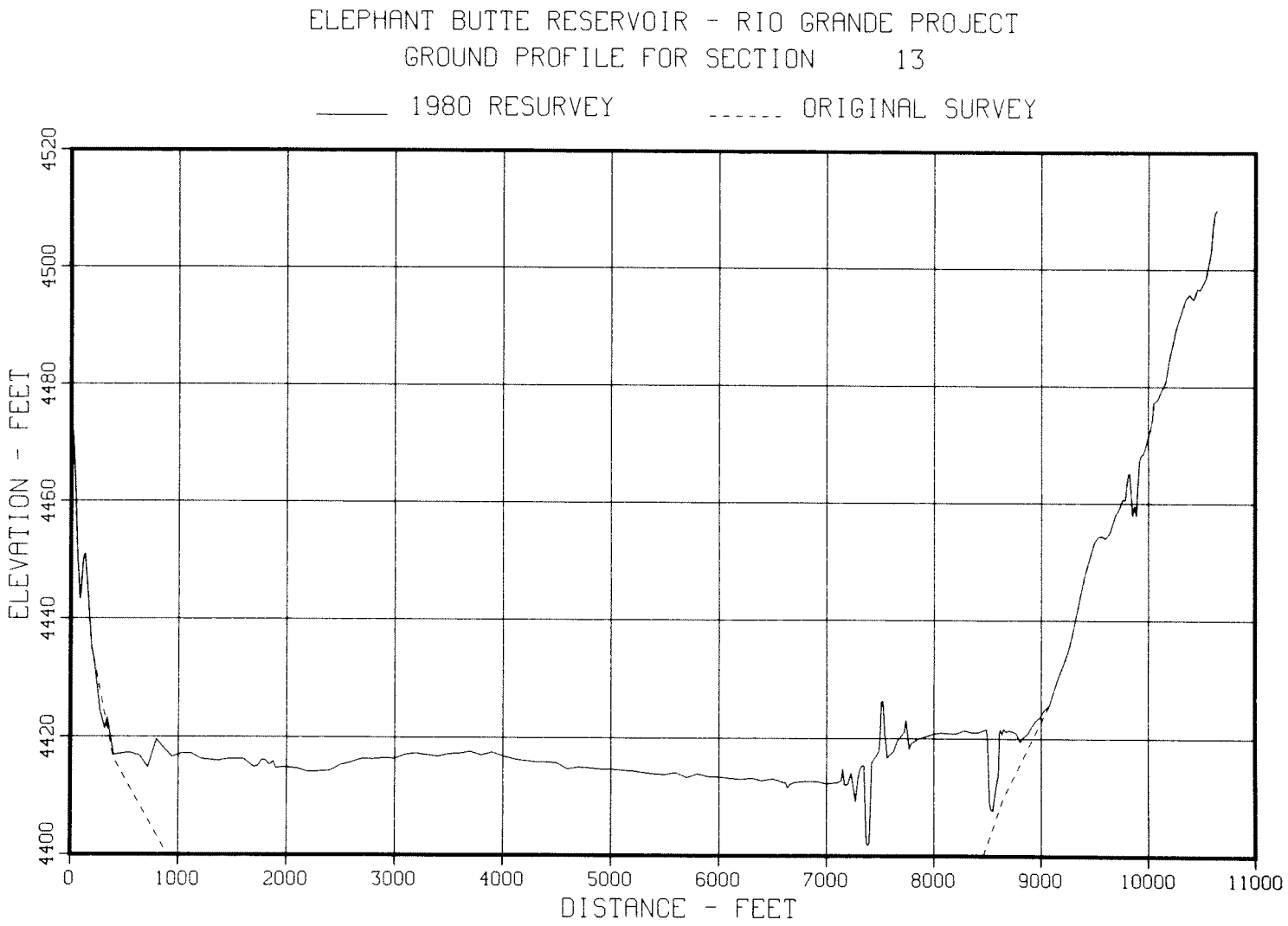

Figure 85. - 1915 and 1980 Sedimentation Range Profiles - Range 13

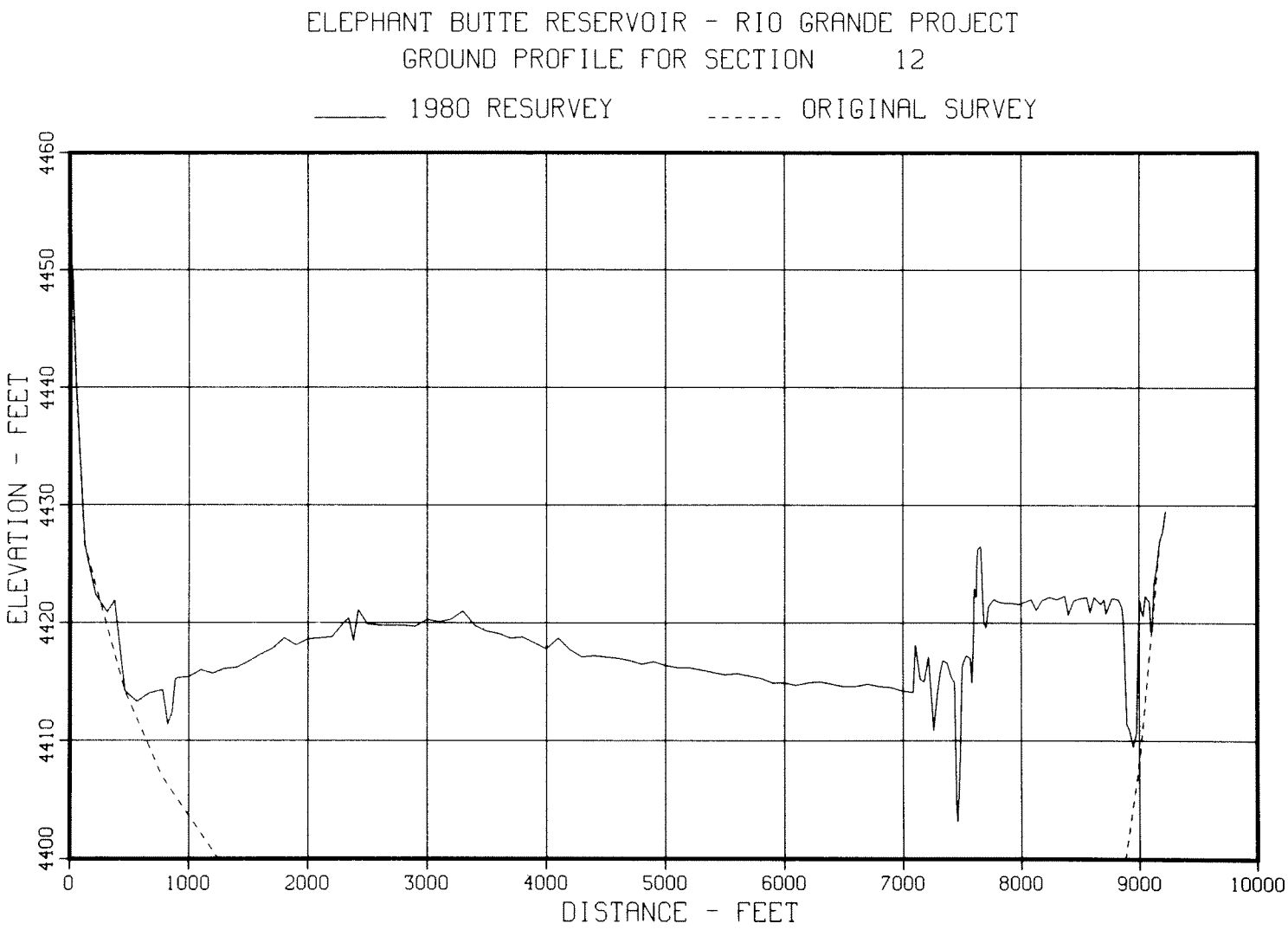

Figure 86. - 1915 and 1980 Sedimentation Range Profiles - Range 12

PLOT 31 15.37.31 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

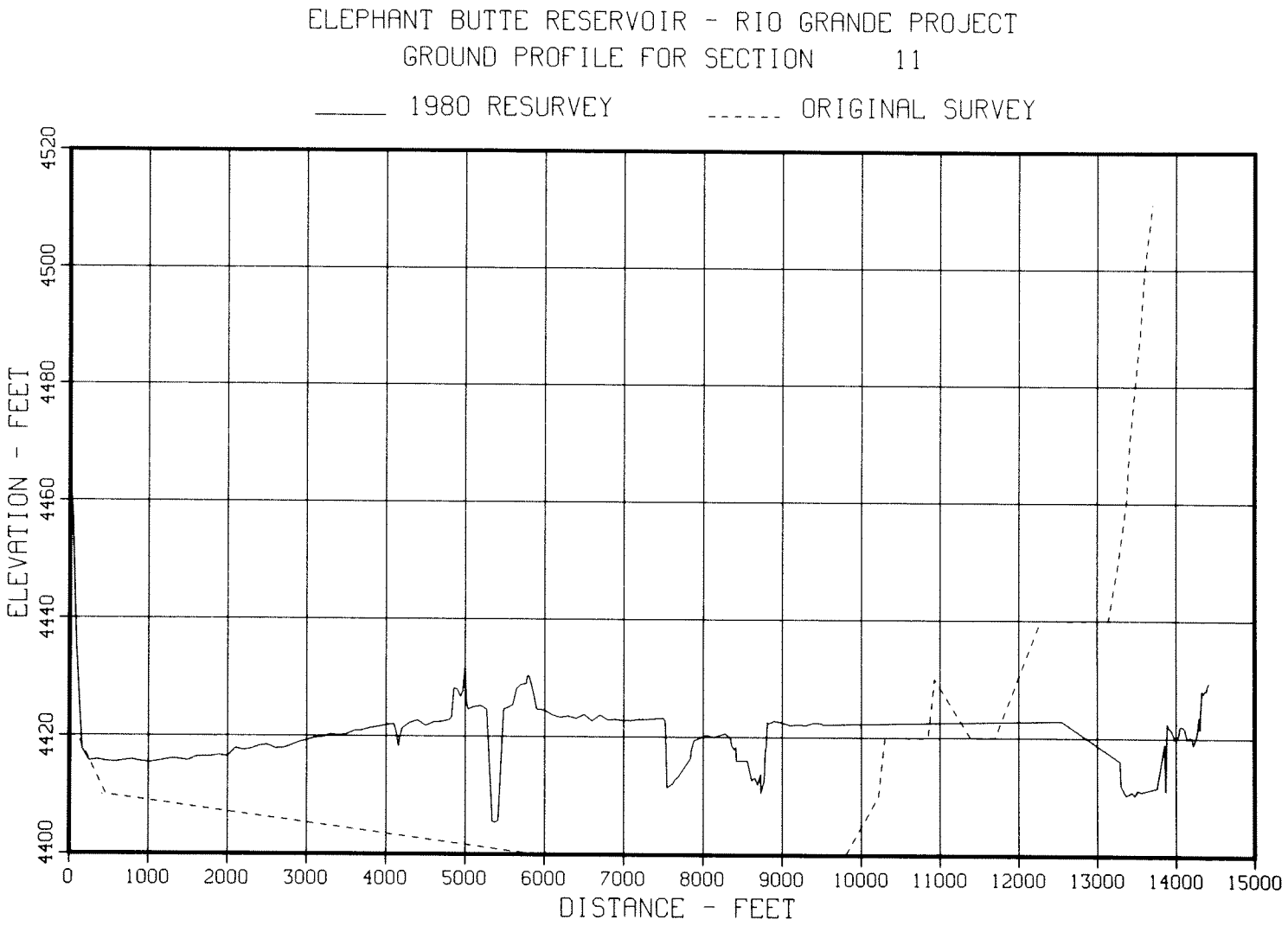

Figure 87. - 1915 and 1980 Sedimentation Range Profiles - Range 11

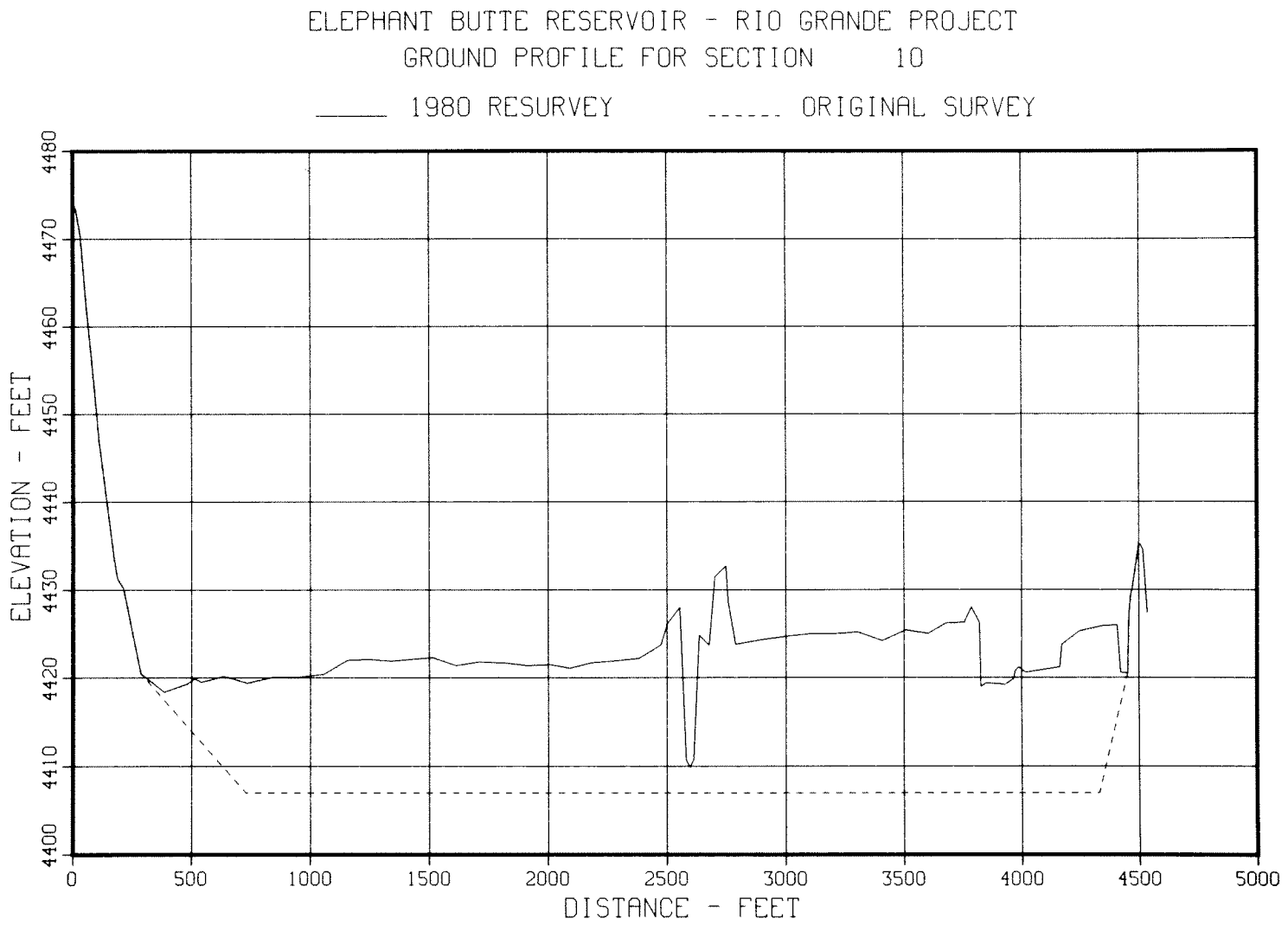

Figure 88. - 1915 and 1980 Sedimentation Range Profiles - Range 10

PLOT 34 15.37.41 FRI 20 AUG, 1982 JOB-AHUYFCS , WATER AND POWER RESO REL-8.2 DISSPLA VER 8.2

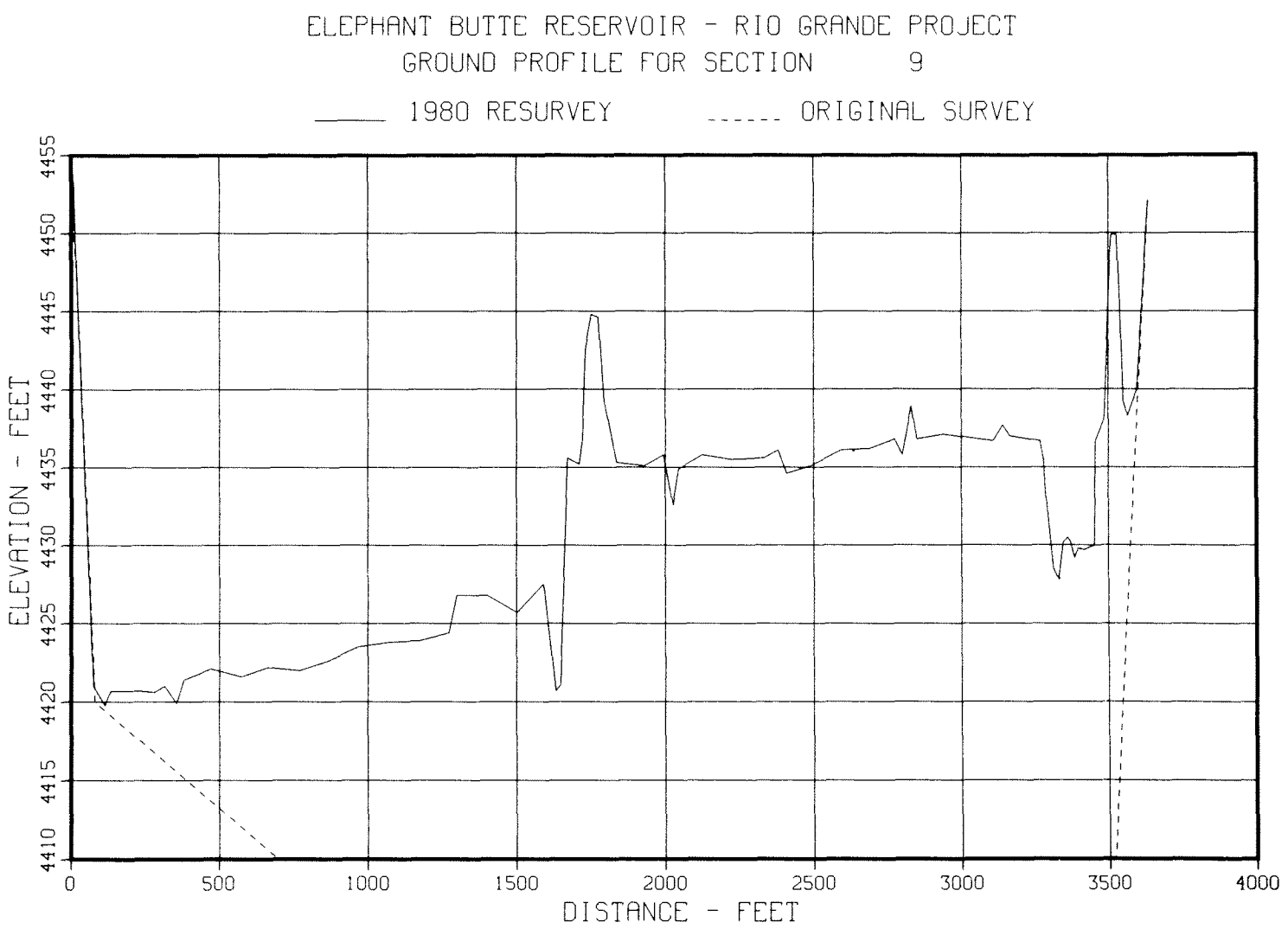

Figure 89. - 1915 and 1980 Sedimentation Range Profiles - Range 9

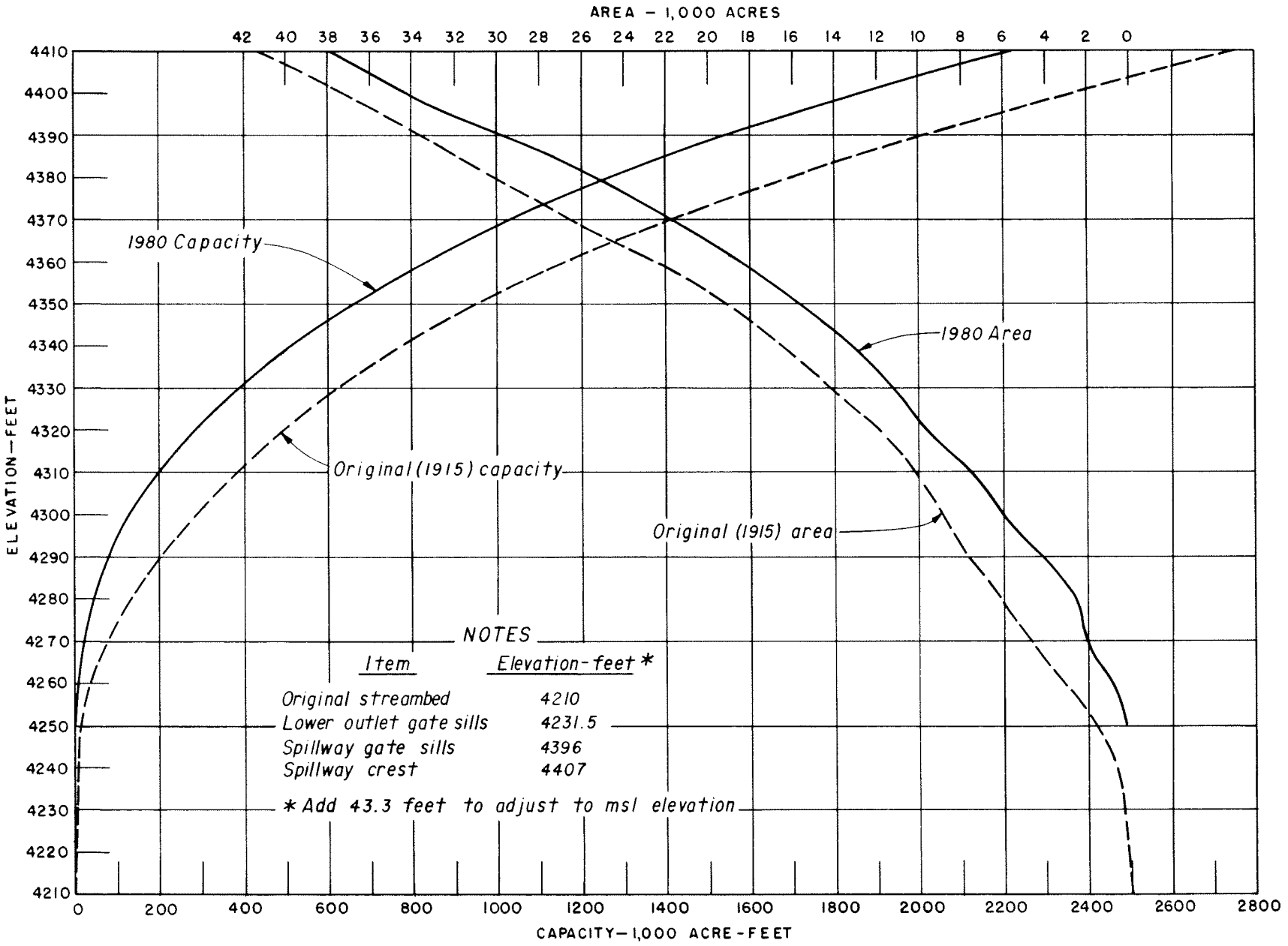

Figure 90. - Area-capacity Curves - Elephant Butte Reservoir

GPO 841-058

Mission of the Bureau of Reclamation

The Bureau of Reclamation of the U.S. Department of the Interior is responsible for the development and conservation of the Nation's water resources in the Western United States.

The Bureau's original purpose "to provide for the reclamation of arid and semiarid lands in the West" today covers a wide range of interrelated functions. These include providing municipal and industrial water supplies; hydroelectric power generation; irrigation water for agriculture; water quality improvement; flood control; river navigation; river regulation and control; fish and wildlife enhancement; outdoor recreation; and research on water-related design, construction, materials, atmospheric management, and wind and solar power.

Bureau programs most frequently are the result of close cooperation with the U.S. Congress, other Federal agencies, States, local governments, academic institutions, water-user organizations, and other concerned groups.

A free pamphlet is available from the Bureau entitled "Publications for Sale." It describes some of the technical publications currently available, their cost, and how to order them. The pamphlet can be obtained upon request from the Bureau of Reclamation, Attn D-922, P O Box 25007, Denver Federal Center, Denver CO 80225-0007.