



March 20, 1993

BYA Project No. 54-247

Mr. George Wentz
Abalone Cove Technical Panel Administrator
City of Rancho Palos Verdes
30940 Hawthorne Boulevard
Rancho Palos Verdes, CA 90274

SUBJECT: Abalone Cove Landslide Monitoring Results.

Dear Mr. Wentz,

As requested, Bing Yen & Associates (BYA) completed another round of monitoring of the Abalone Cove Landslide instrumentation on March 15th. This letter presents a summary of those monitoring results.

The previous round of monitoring at the landslide was completed on February 17th and 18th of this year. At that time it was reported that only two (ACL-1 & 7B) of the seven slope inclinometers that had been installed within the landslide remained functional - the rest had been deformed by landslide movement to the extent that the inclinometer sensor could not be lowered below the zone of deformation. However, during the most recent round of monitoring, we modified the configuration of the inclinometer sensor, and with some difficulty, were able to lower the sensor below the deformed section of one of the previously non-functional slope inclinometers (ACL-3). Attempts to do this with the other non-functional inclinometers (ACL-2, 4 and 8) were not successful.

Deformation plots for the three inclinometers (ACL-1, 3 & 7B) for which readings could be taken are presented in Appendix A. Since the last round of monitoring on February 17th/18th the offsets in ACL-1 & 7B have enlarged by 0.5" and 0.6", respectively. These results indicate movement of the southeasterly portion of the landslide has continued to occur over the last month at an average rate of approximately 8 inches per year. This is approximately 20% slower than the average rate recorded over the previous monitoring period between February 2nd and February 18th of this year. Accordingly, it would appear that the rate of landslide movement may have peaked in January or early February, and that the failure is now gradually slowing.

The results obtained for ACL-3 between January 12th and March 15th of this year indicate a ≈ 0.5 " enlargement of the offset over this 62 day period. This corresponds to an average rate of movement of approximately 3 inches per year. Based upon these results, it would appear the inland portion of the landslide in the area of ACL-3 has been moving more slowly than the seaward portion of the failure south of Palos Verdes

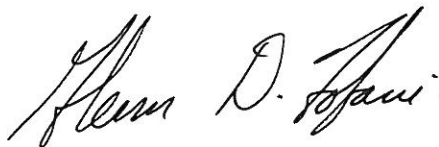
Drive South. The inclinometer results obtained between 1989 and 1993 seem to substantiate a similar tendency, although the disparity in the movement rates was much more subtle prior to the recent heavy rainfall.

The status of the various inclinometers along with the depth, elevation, magnitude and bearing of the recorded offsets are summarized in Table 1. The locations of the inclinometers are shown along with the directions of the recorded displacements in Figure 1. The graph illustrating the progressive enlargement of the offset in ACL-3 which was presented in our January 17, 1993 report, has been updated with the most recent data for this inclinometer and is attached as Figure 2. A summary of the rainfall records for the Palos Verde area from Los Angeles County Flood Control District Station 1011C is presented in Figure 3.

At the present time, 18 of the piezometers installed within the landslide remain functional. Summary plots for these 18 piezometers and two standpipes are presented in Appendix B. As indicated on cross sections which are inset on these plots, seven of the remaining piezometers extend below the active landslide failure surface and are therefore likely to have rather limited life spans. The alignments of the inset cross sections are shown in Figure 1. No significant increases in piezometric levels were recorded since the last round of monitoring, while slight reductions were noted in several areas. However, even with these slight reductions, the recorded piezometric levels, on average, remain ≈ 5 feet above those recorded prior to the heavy rains of January and February of this year.

I hope this information is helpful to the City and the members of the Technical Panel. As you have requested, BYA will complete another round of monitoring at the site at the end of this month. If you have any comments or questions in the meantime, please do not hesitate to call.

Sincerely,
BING YEN & ASSOCIATES, INC.

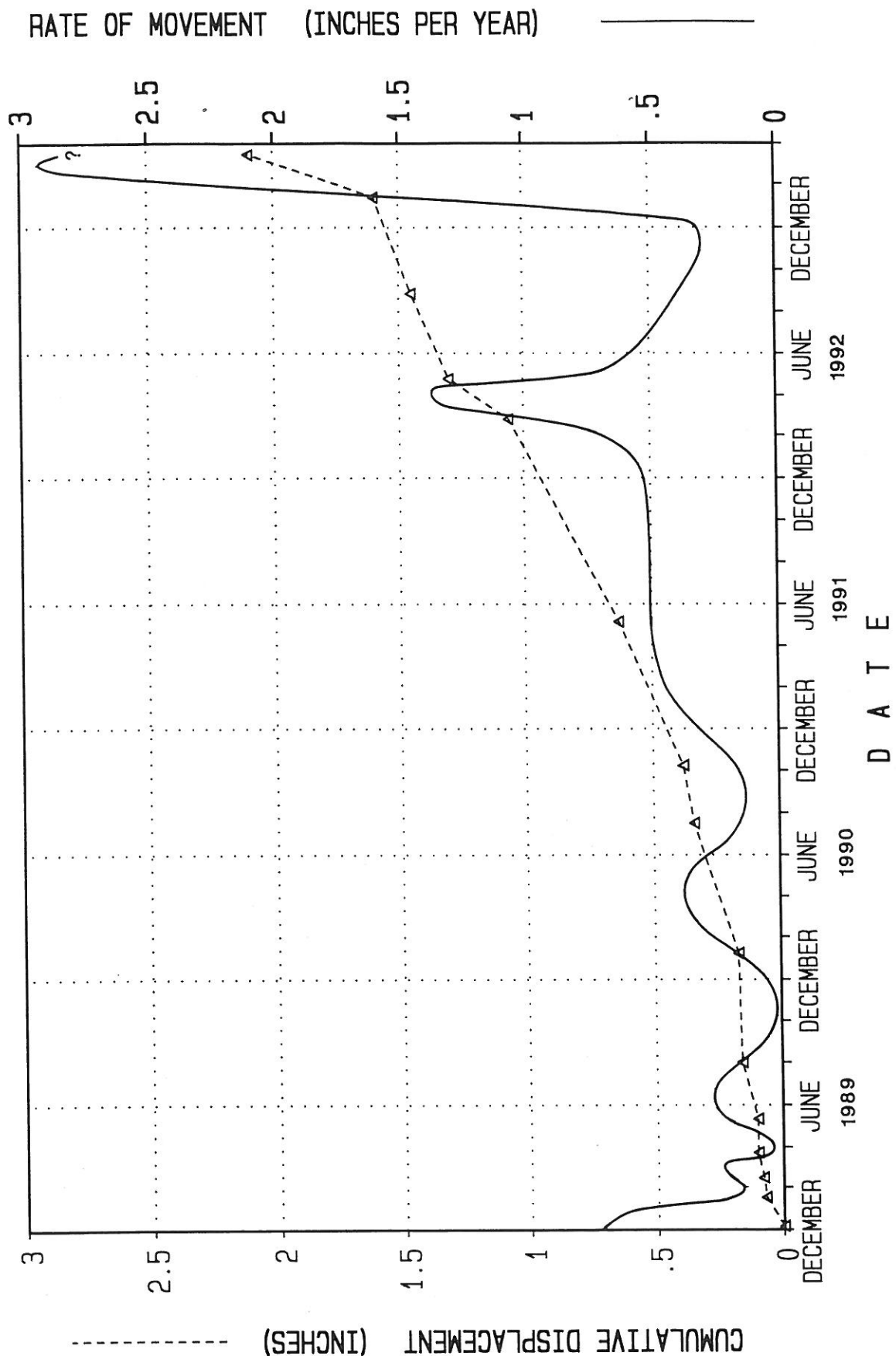
A handwritten signature in black ink, appearing to read "Glenn D. Tofani". The signature is fluid and cursive, with the first name "Glenn" being more prominent.

Glenn D. Tofani, RCE/REA
Vice President

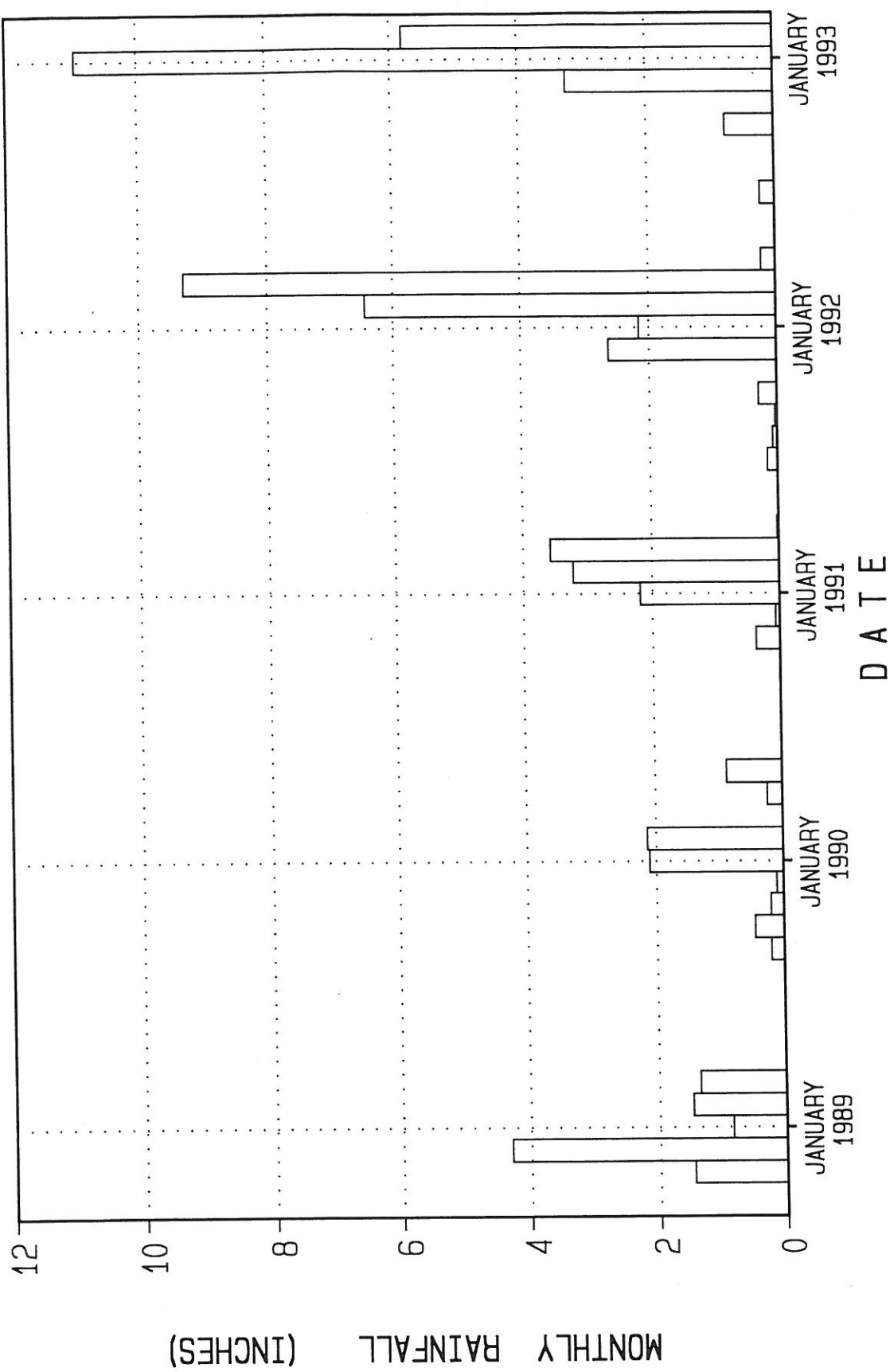
TABLE 1. STATUS OF ABALONE COVE SLOPE
INCLINOMETERS - AS OF MARCH 1993.

SLOPE INCLINOMETER	DEPTH TO OFFSET	ELEVATION OF OFFSET	TOTAL DISPLACEMENT	DIRECTION OF MOVEMENT	STATUS ¹
ACL-1	150 FT.	-85 FT.	3.8 INCHES	S20°W	FUNCT.
ACL-2	55 FT.	50 FT.	1.7 INCHES	S10°W	DEST.
ACL-3	170 FT.	0 FT.	2.5 INCHES	S10°W	FUNCT.
ACL-4	235 FT.	-55 FT.	2.2 INCHES	S20°W	DEST.
ACL-6A	70 FT.	-55 FT.	0.6 INCHES	S10°W	DEST.
ACL-7B	80 FT.	-48 FT.	2.2 INCHES	S15°W	FUNCT.
ACL-8	165 FT.	-90 FT.	1.0 INCHES	S10°W	DEST.

¹ Functional or Destroyed.

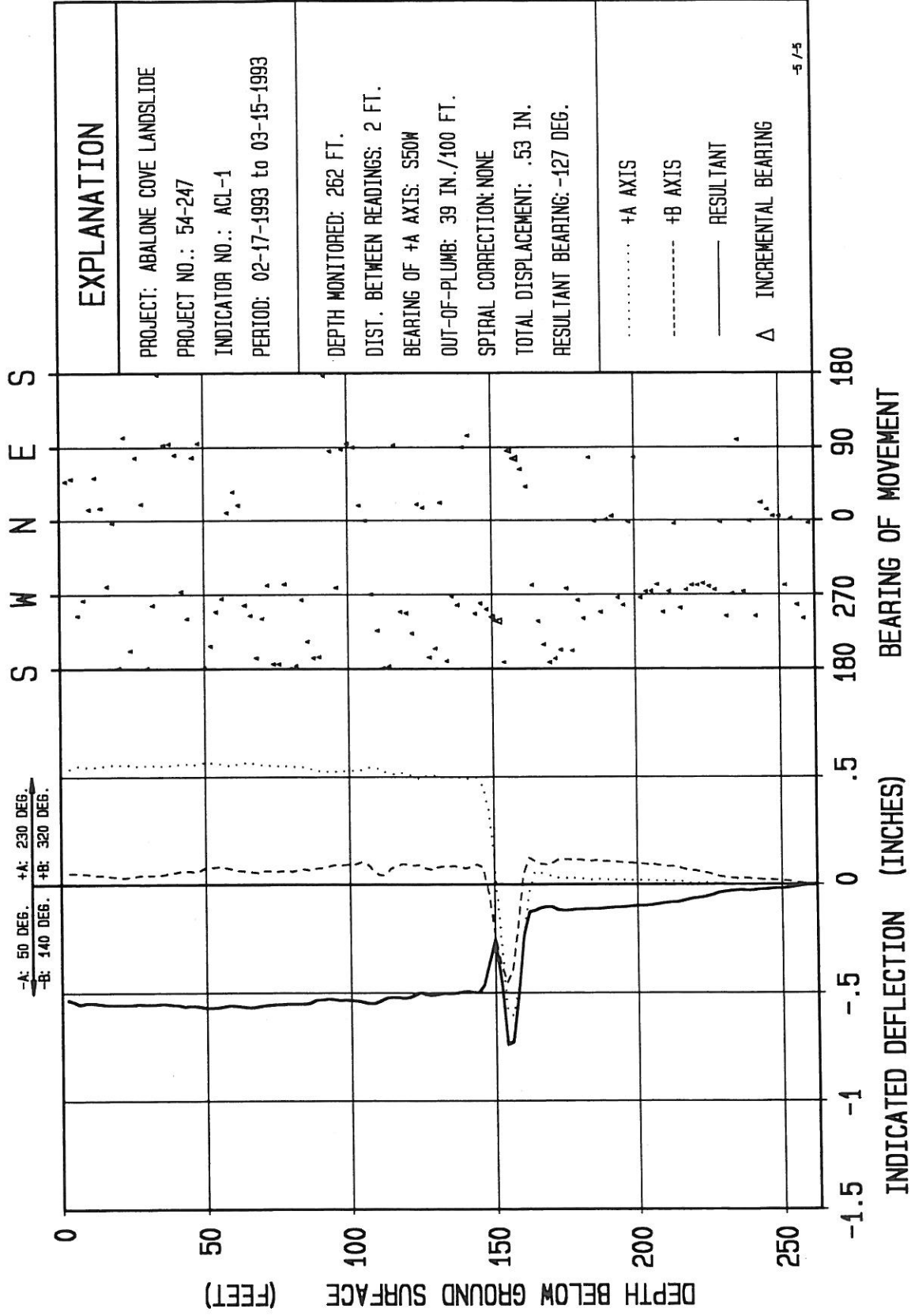


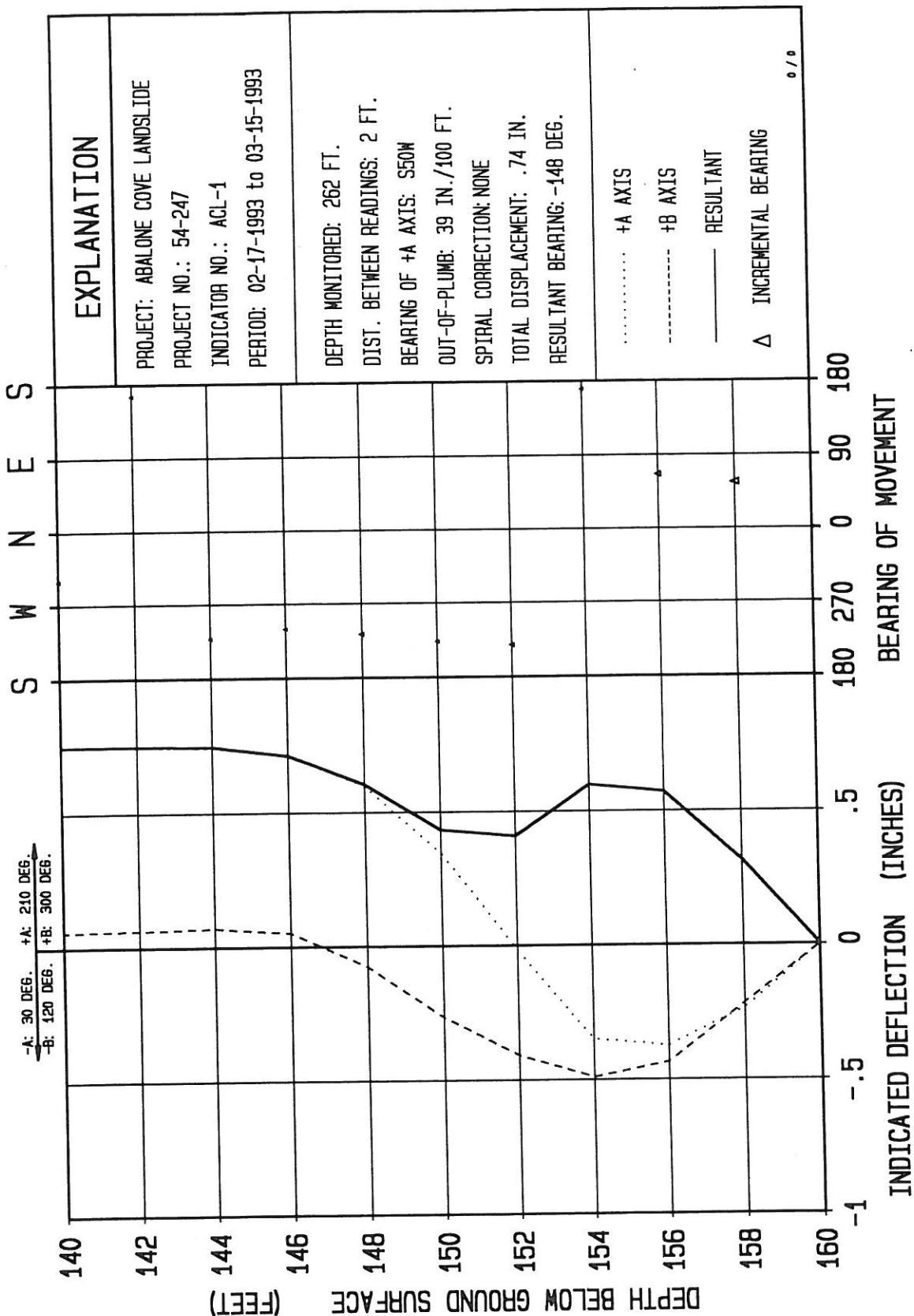
PROJECT # 54-247 FIGURE 2. RESPONSE OF ABALONE COVE SLOPE INCLINOMETER ACL-3. BING YEN & ASSOCIATES

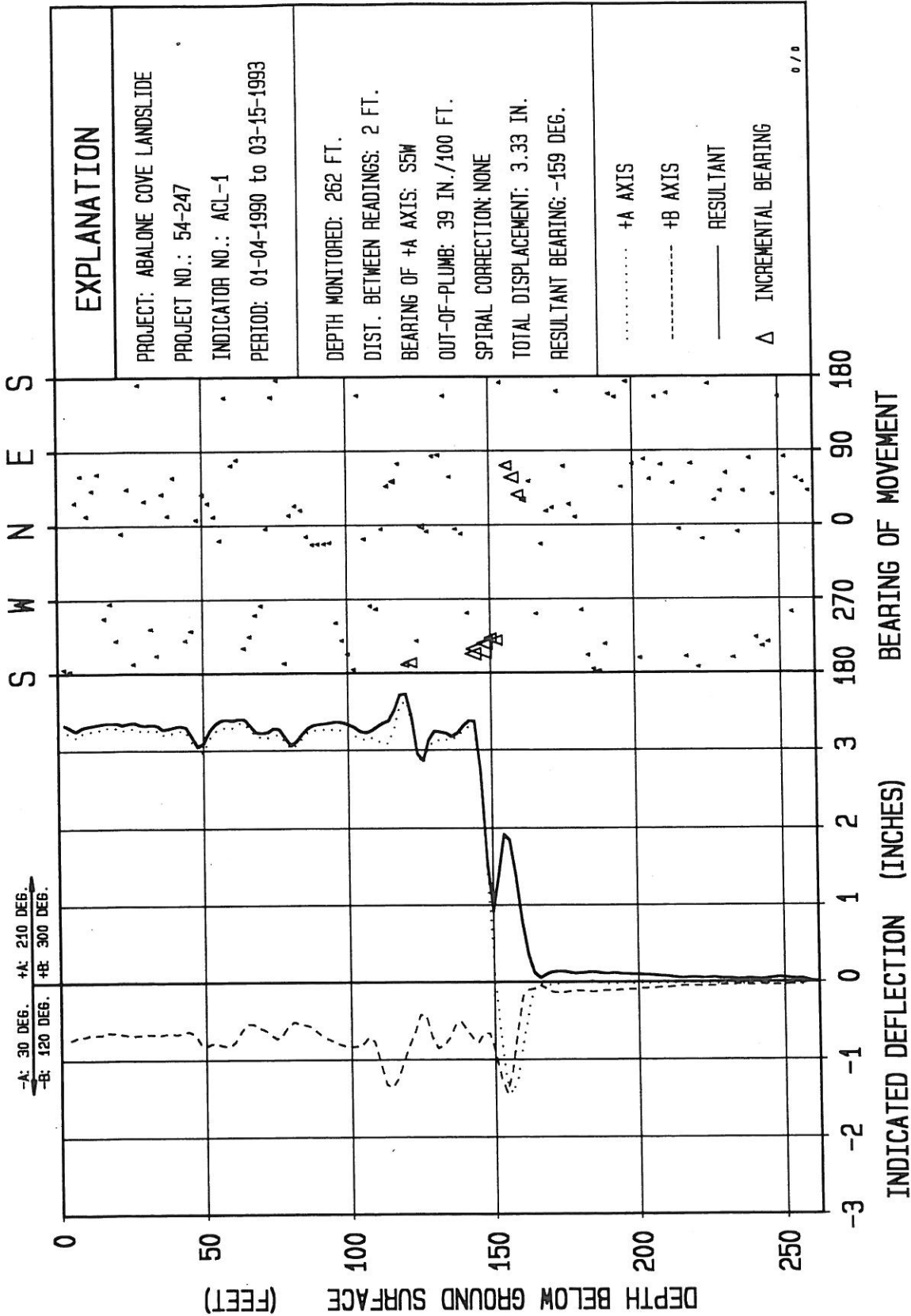


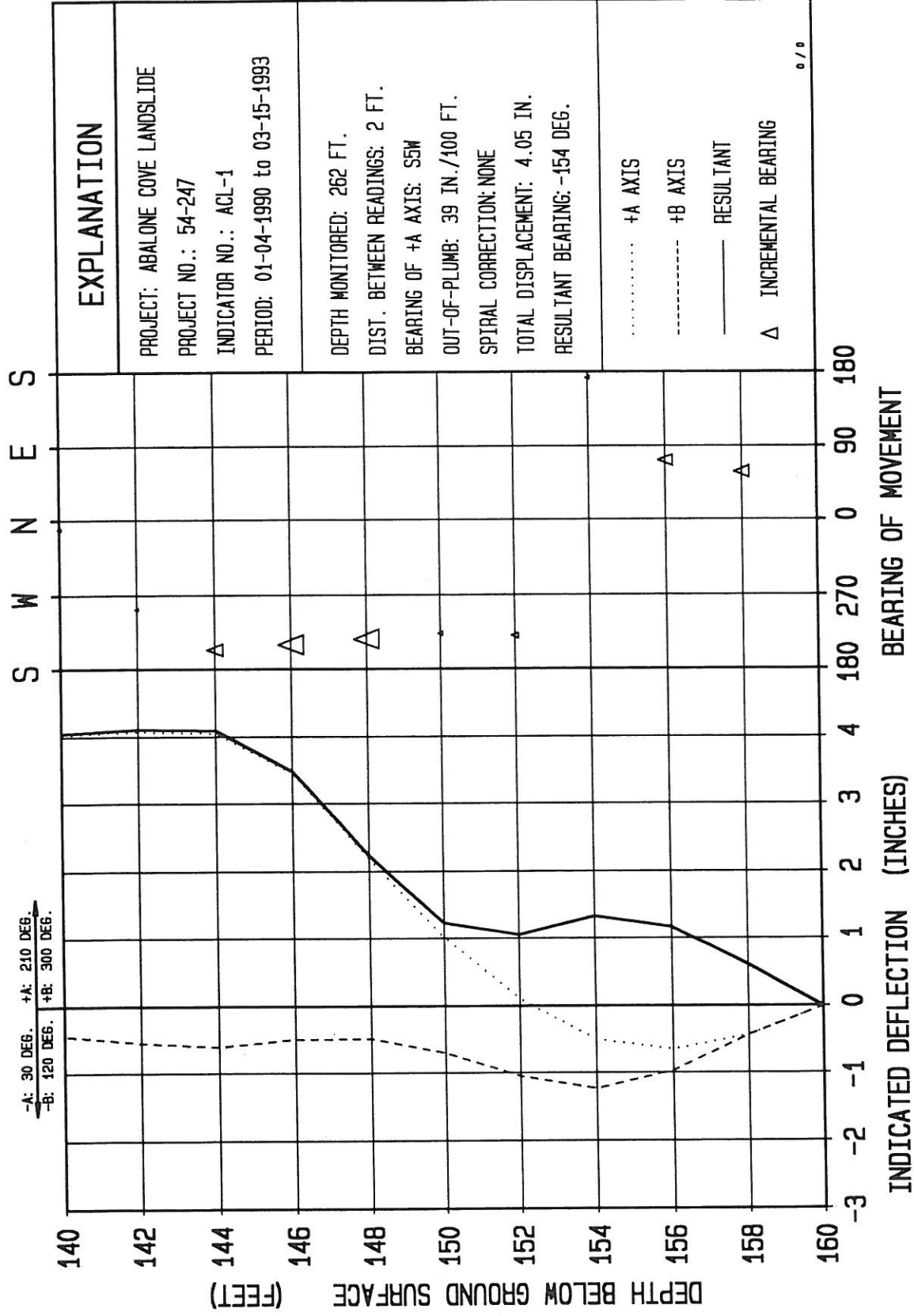
PROJECT # 54-247 FIGURE 3. RAINFALL IN P.V. AREA FROM LACFCD STATION 1011C. BING YEN & ASSOC.

APPENDIX A
(SLOPE INCLINOMETER RESULTS)









EXPLANATION

PROJECT: ABALONE COVE LANDSLIDE

PROJECT NO.: 54-247

INDICATOR NO.: ACL-1

PERIOD: 01-04-1990 to 03-15-1993

DEPTH MONITORED: 262 FT.

DIST. BETWEEN READINGS: 2 FT.

BEARING OF +A AXIS: SSW

OUT-OF-PLUMB: 39 IN./100 FT.

SPIRAL CORRECTION: NONE

TOTAL DISPLACEMENT: 4.05 IN.

RESULTANT BEARING: -154 DEG.

..... +A AXIS

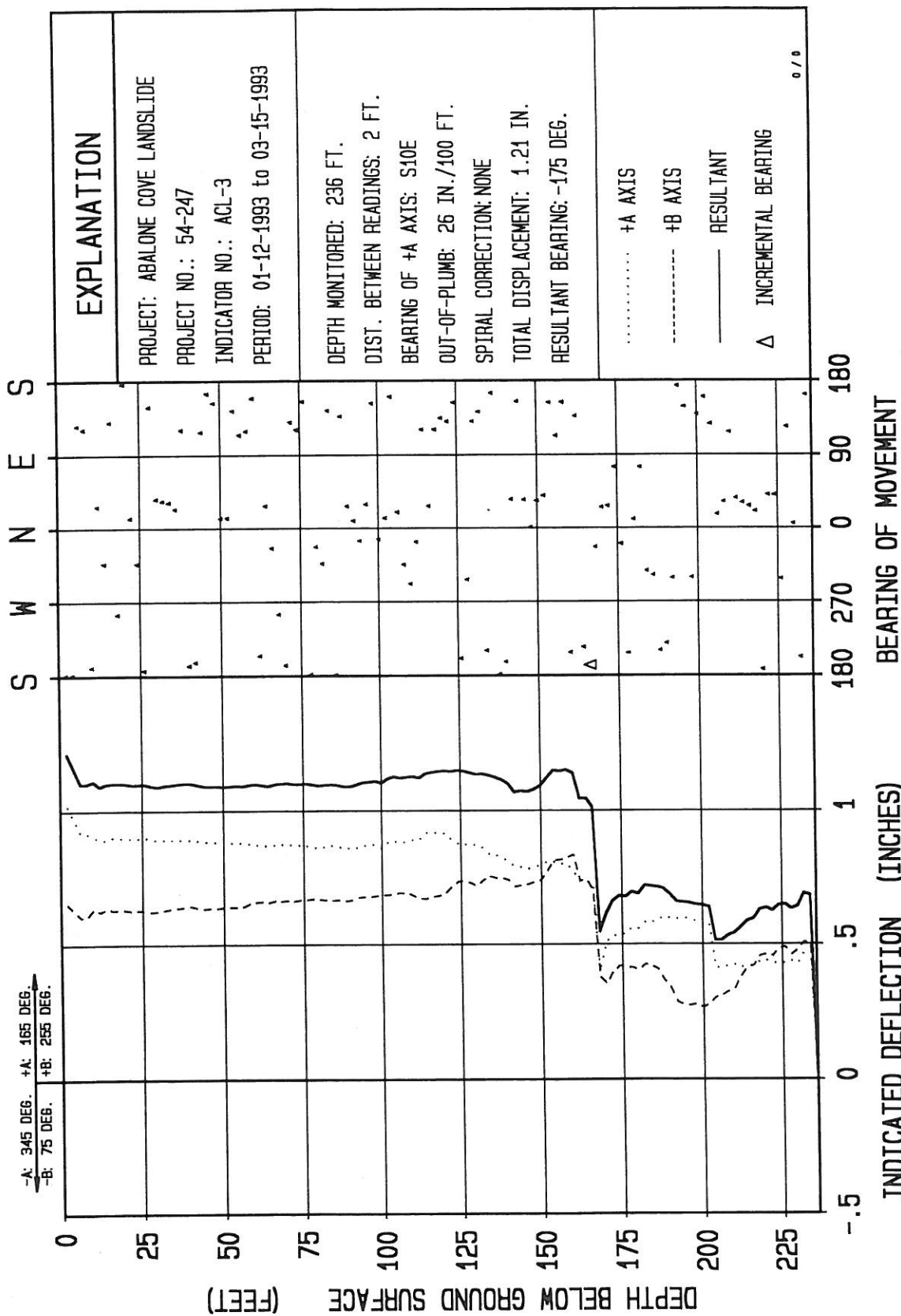
----- +B AXIS

———— RESULTANT

Δ INCREMENTAL BEARING

0/0

INDICATED DEFLECTION (INCHES) BEARING OF MOVEMENT



EXPLANATION

PROJECT: ABALONE COVE LANDSLIDE

PROJECT NO.: 54-247

INDICATOR NO.: ACL-3

PERIOD: 01-12-1993 to 03-15-1993

DEPTH MONITORED: 236 FT.

DIST. BETWEEN READINGS: 2 FT.

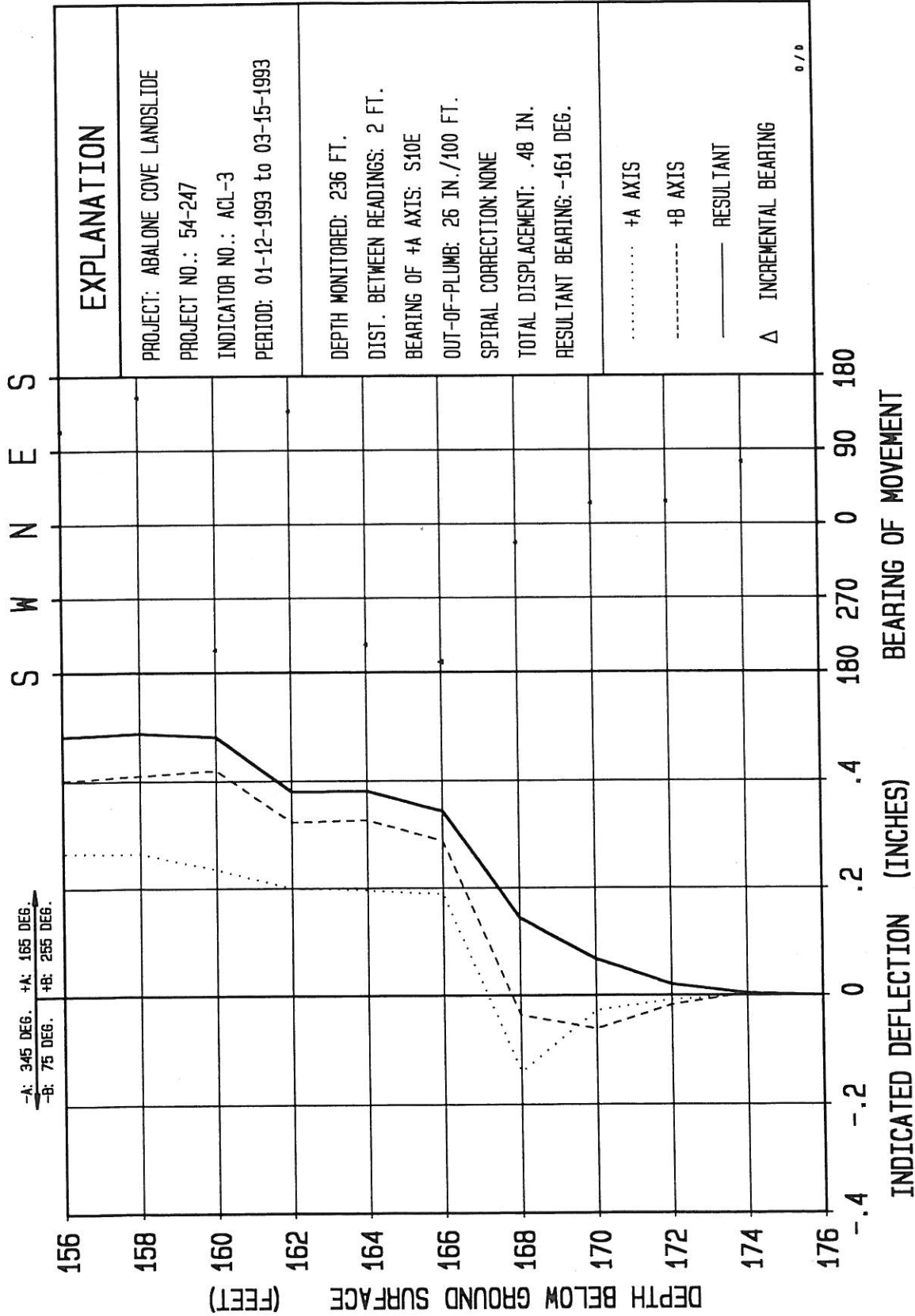
BEARING OF +A AXIS: S10E

OUT-OF-PLUMB: 26 IN./100 FT.

SPIRAL CORRECTION: NONE

TOTAL DISPLACEMENT: 1.21 IN.

RESULTANT BEARING: -175 DEG.



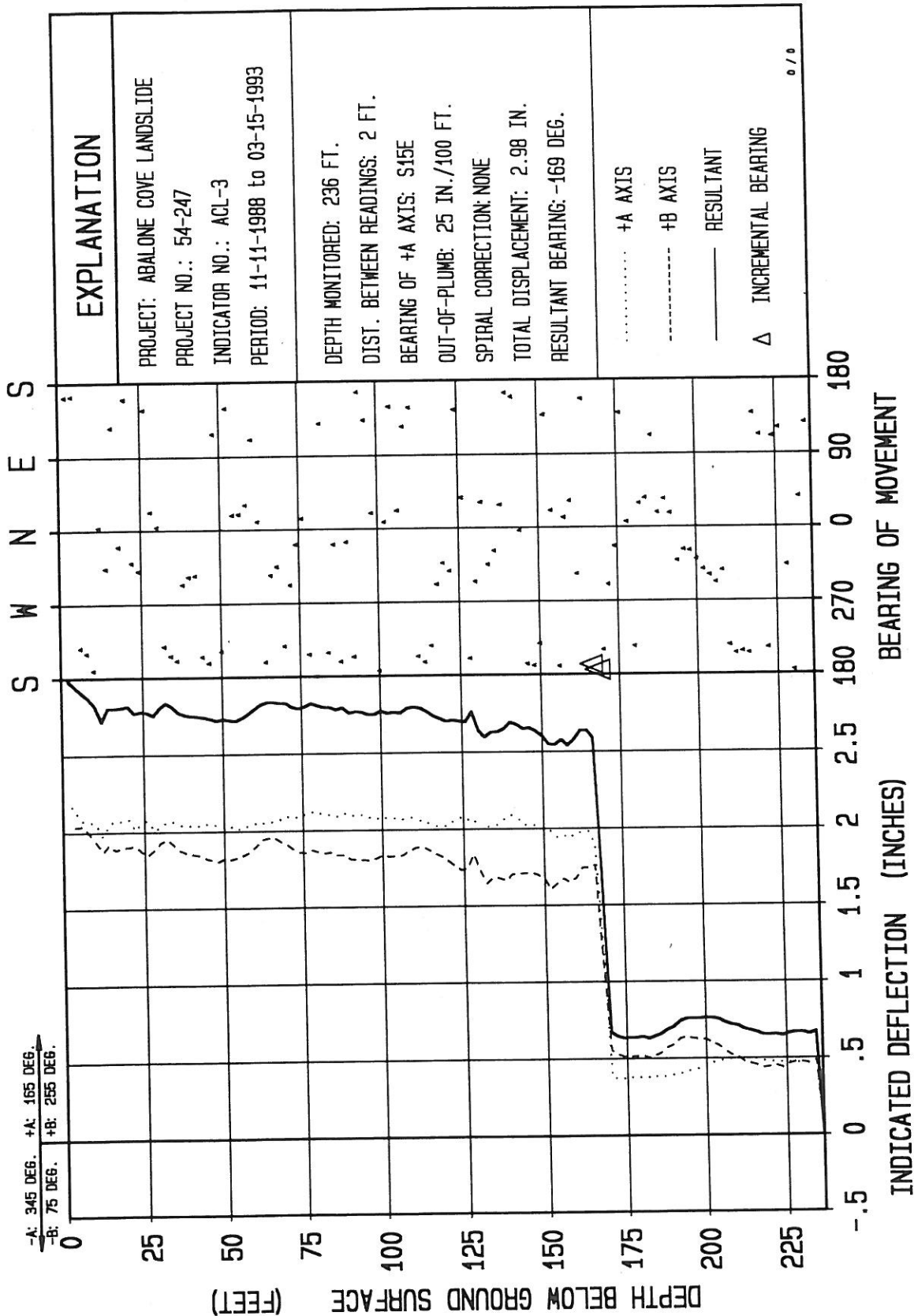
EXPLANATION

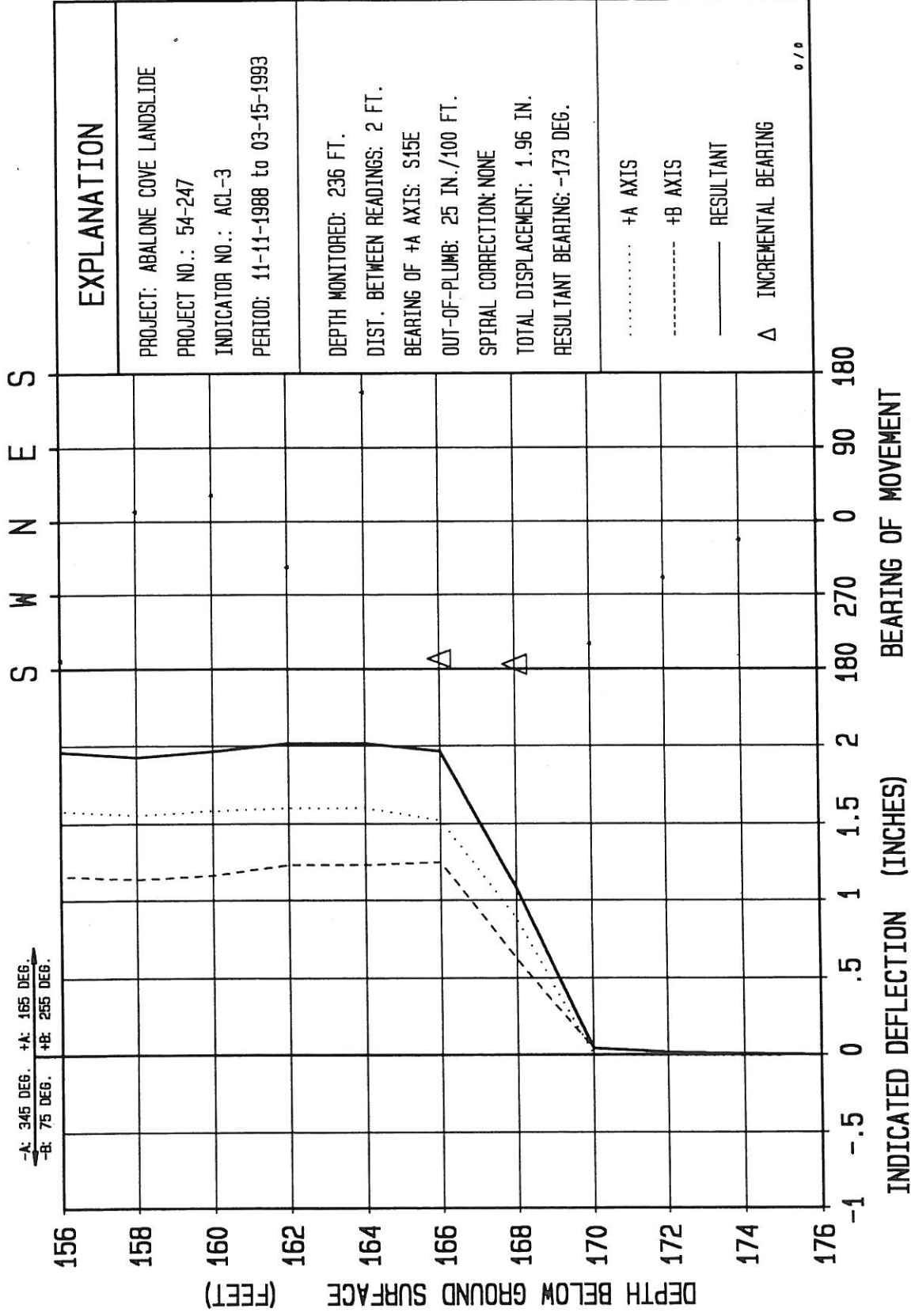
PROJECT: ABALONE COVE LANDSLIDE
 PROJECT NO.: 54-247
 INDICATOR NO.: ACL-3
 PERIOD: 01-12-1993 to 03-15-1993

DEPTH MONITORED: 236 FT.
 DIST. BETWEEN READINGS: 2 FT.
 BEARING OF +A AXIS: S10E
 OUT-OF-PLUMB: 26 IN./100 FT.
 SPIRAL CORRECTION: NONE
 TOTAL DISPLACEMENT: .48 IN.
 RESULTANT BEARING: -161 DEG.

..... +A AXIS
 ----- +B AXIS
 ————— RESULTANT
 Δ INCREMENTAL BEARING

0/0



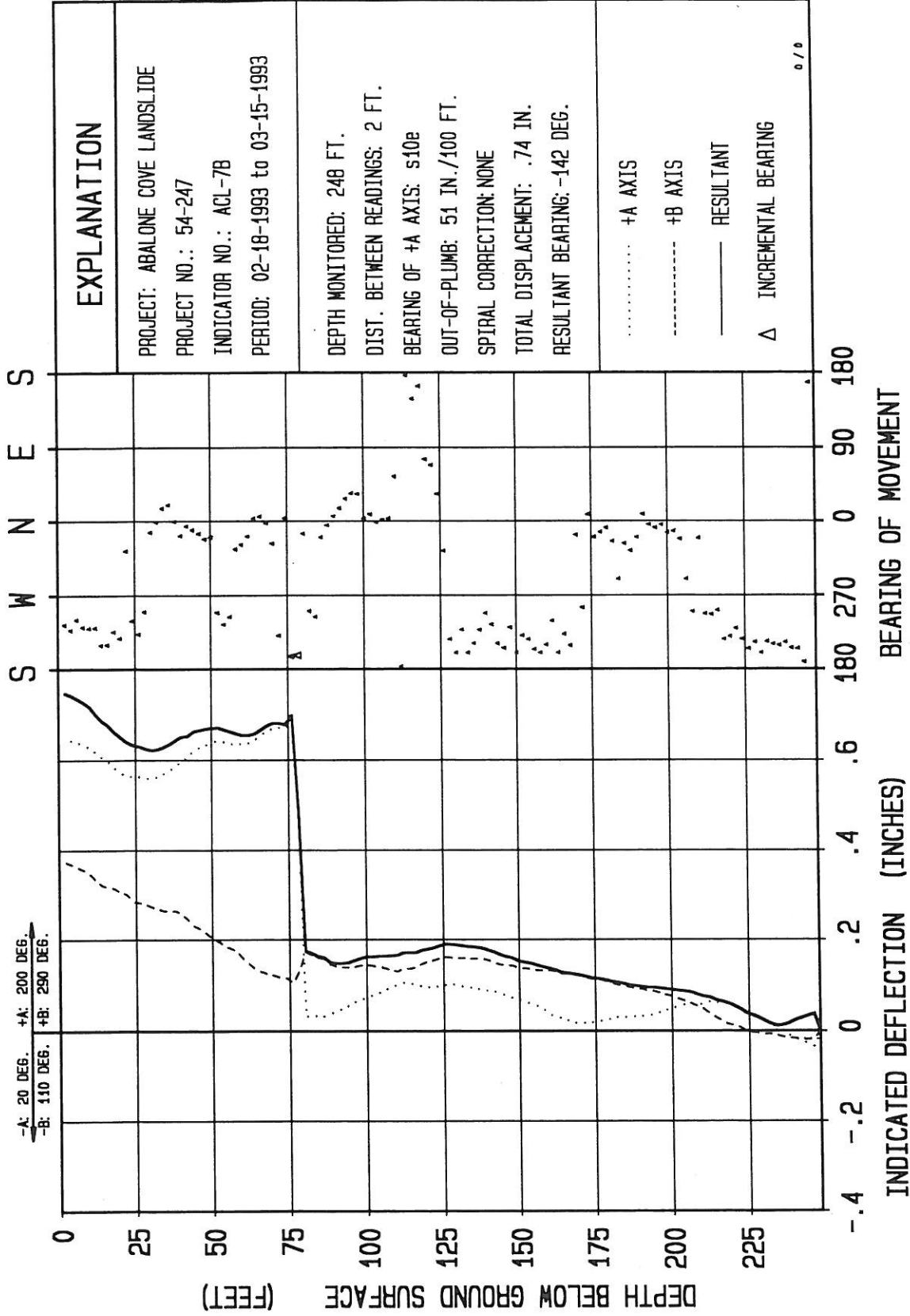


EXPLANATION

PROJECT: ABALONE COVE LANDSLIDE
PROJECT NO.: 54-247
INDICATOR NO.: ACL-3
PERIOD: 11-11-1988 to 03-15-1993

DEPTH MONITORED: 236 FT.
DIST. BETWEEN READINGS: 2 FT.
BEARING OF +A AXIS: S15E
OUT-OF-PLUMB: 25 IN./100 FT.
SPIRAL CORRECTION: NONE
TOTAL DISPLACEMENT: 1.96 IN.
RESULTANT BEARING: -173 DEG.

..... +A AXIS
----- +B AXIS
——— RESULTANT
Δ INCREMENTAL BEARING

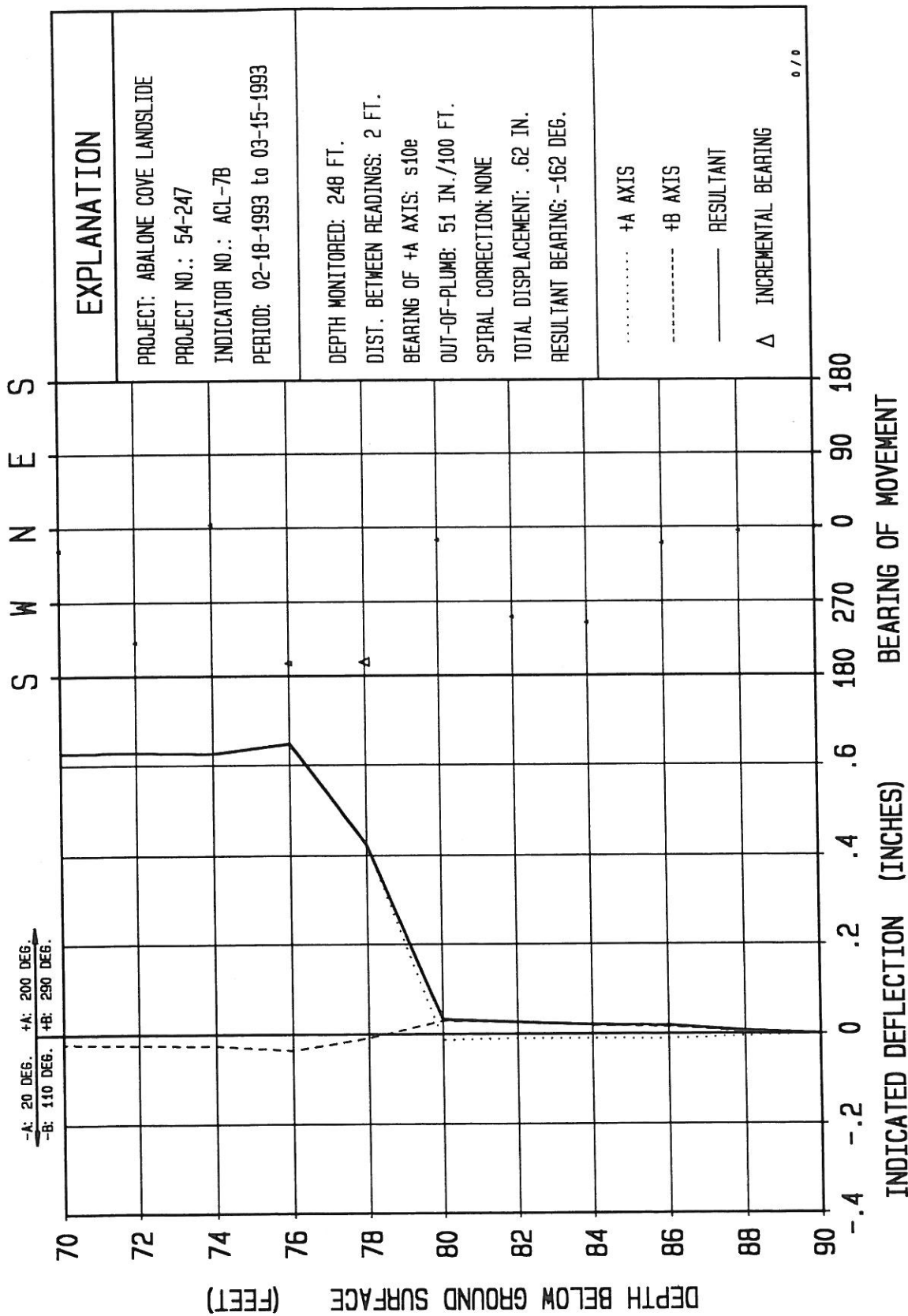


EXPLANATION

PROJECT: ABALONE COVE LANDSLIDE
PROJECT NO.: 54-247
INDICATOR NO.: ACL-7B
PERIOD: 02-18-1993 to 03-15-1993

DEPTH MONITORED: 248 FT.
DIST. BETWEEN READINGS: 2 FT.
BEARING OF +A AXIS: 510e
OUT-OF-PLUMB: 51 IN./100 FT.
SPIRAL CORRECTION: NONE
TOTAL DISPLACEMENT: .74 IN.
RESULTANT BEARING: -142 DEG.

..... +A AXIS
----- +B AXIS
——— RESULTANT
Δ INCREMENTAL BEARING



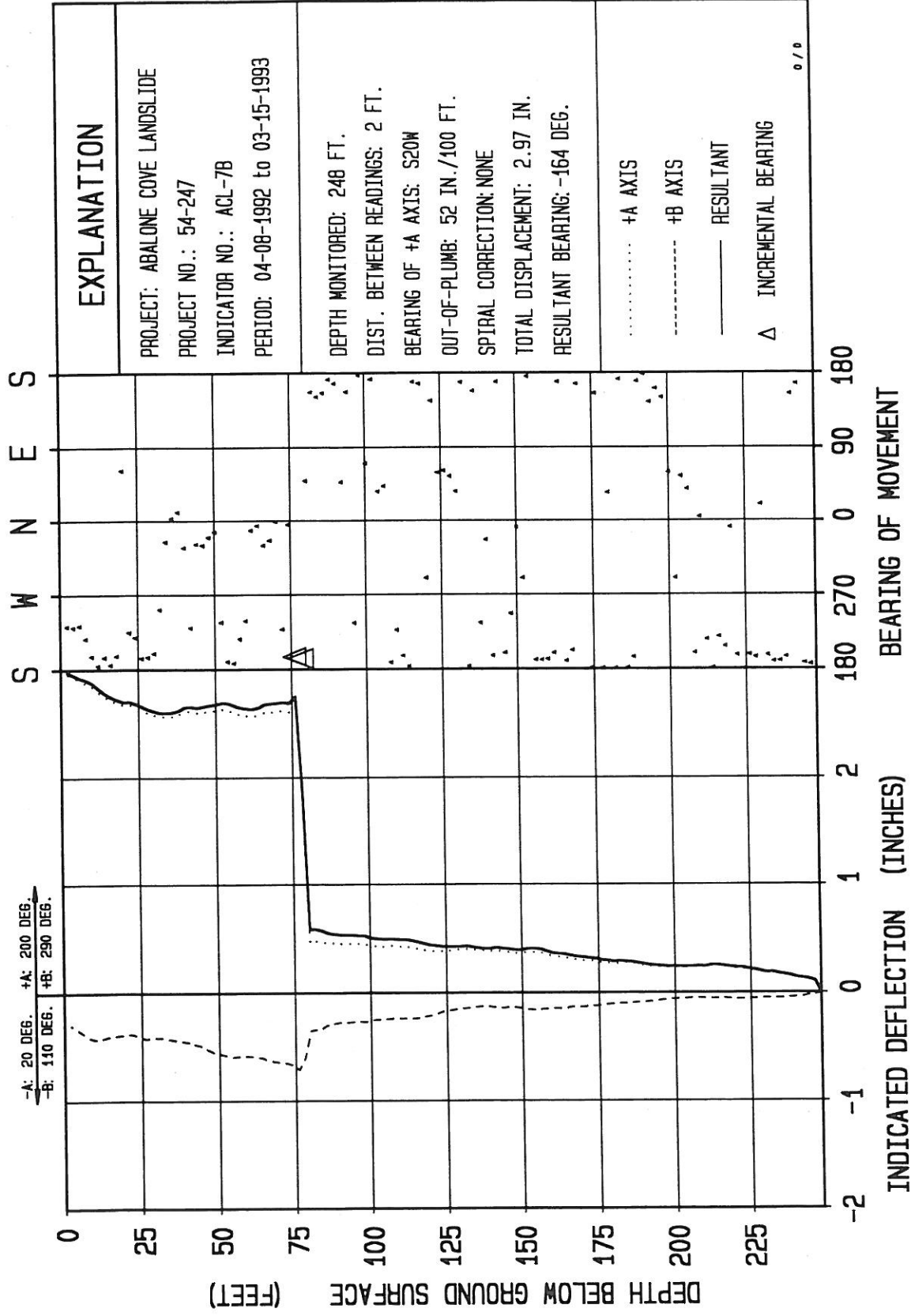
-A: 20 DEG. +A: 200 DEG.
-B: 110 DEG. +B: 290 DEG.

EXPLANATION

PROJECT: ABALONE COVE LANDSLIDE
PROJECT NO.: 54-247
INDICATOR NO.: ACL-7B
PERIOD: 02-18-1993 to 03-15-1993

DEPTH MONITORED: 248 FT.
DIST. BETWEEN READINGS: 2 FT.
BEARING OF +A AXIS: S10E
OUT-OF-PLUMB: 51 IN./100 FT.
SPIRAL CORRECTION: NONE
TOTAL DISPLACEMENT: .62 IN.
RESULTANT BEARING: -162 DEG.

..... +A AXIS
----- +B AXIS
——— RESULTANT
Δ INCREMENTAL BEARING

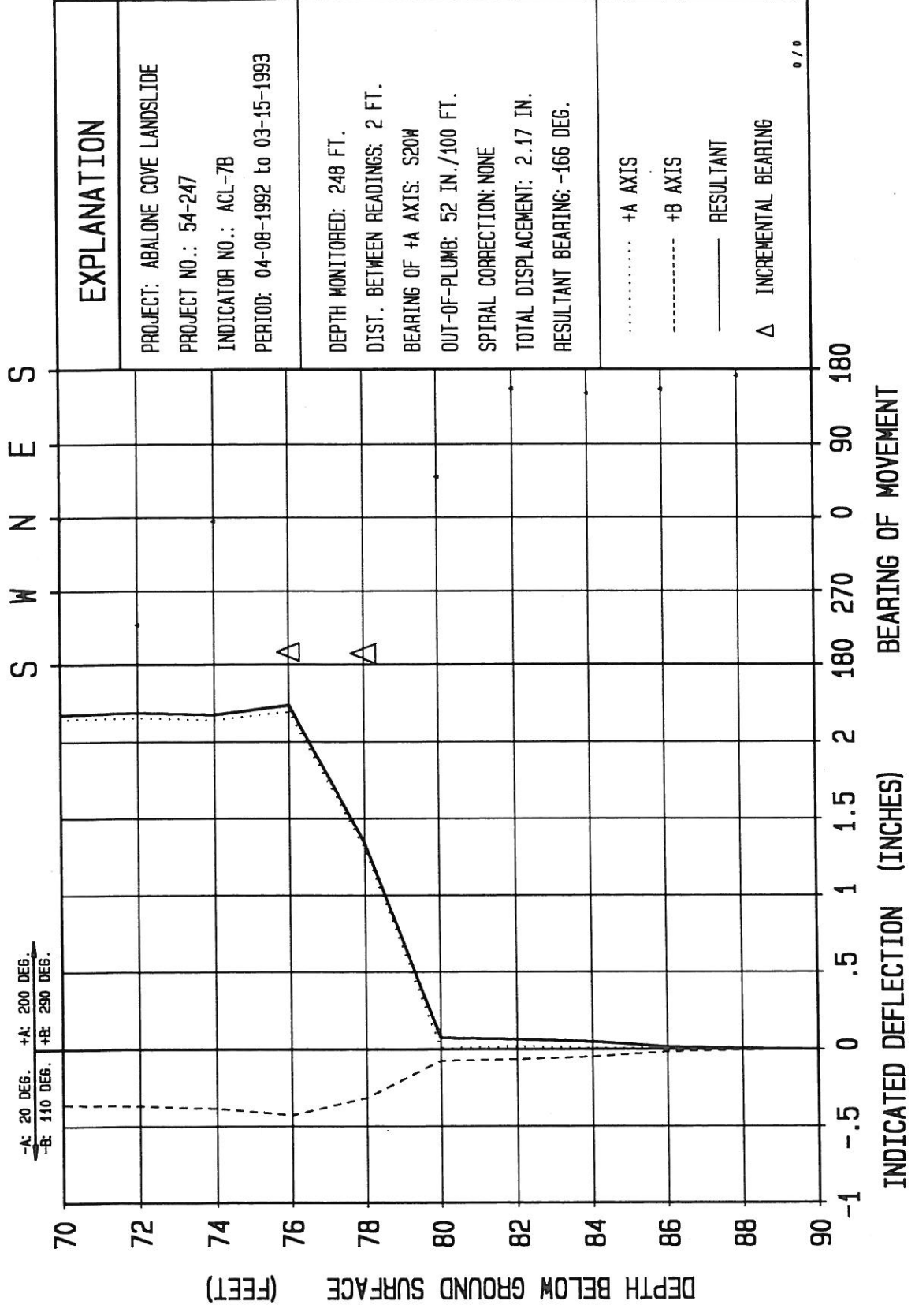


EXPLANATION

PROJECT: ABALONE COVE LANDSLIDE
PROJECT NO.: 54-247
INDICATOR NO.: ACL-7B
PERIOD: 04-08-1992 to 03-15-1993

DEPTH MONITORED: 248 FT.
DIST. BETWEEN READINGS: 2 FT.
BEARING OF +A AXIS: S20W
OUT-OF-PLUMB: 52 IN./100 FT.
SPIRAL CORRECTION: NONE
TOTAL DISPLACEMENT: 2.97 IN.
RESULTANT BEARING: -164 DEG.

..... +A AXIS
----- +B AXIS
——— RESULTANT
Δ INCREMENTAL BEARING



EXPLANATION

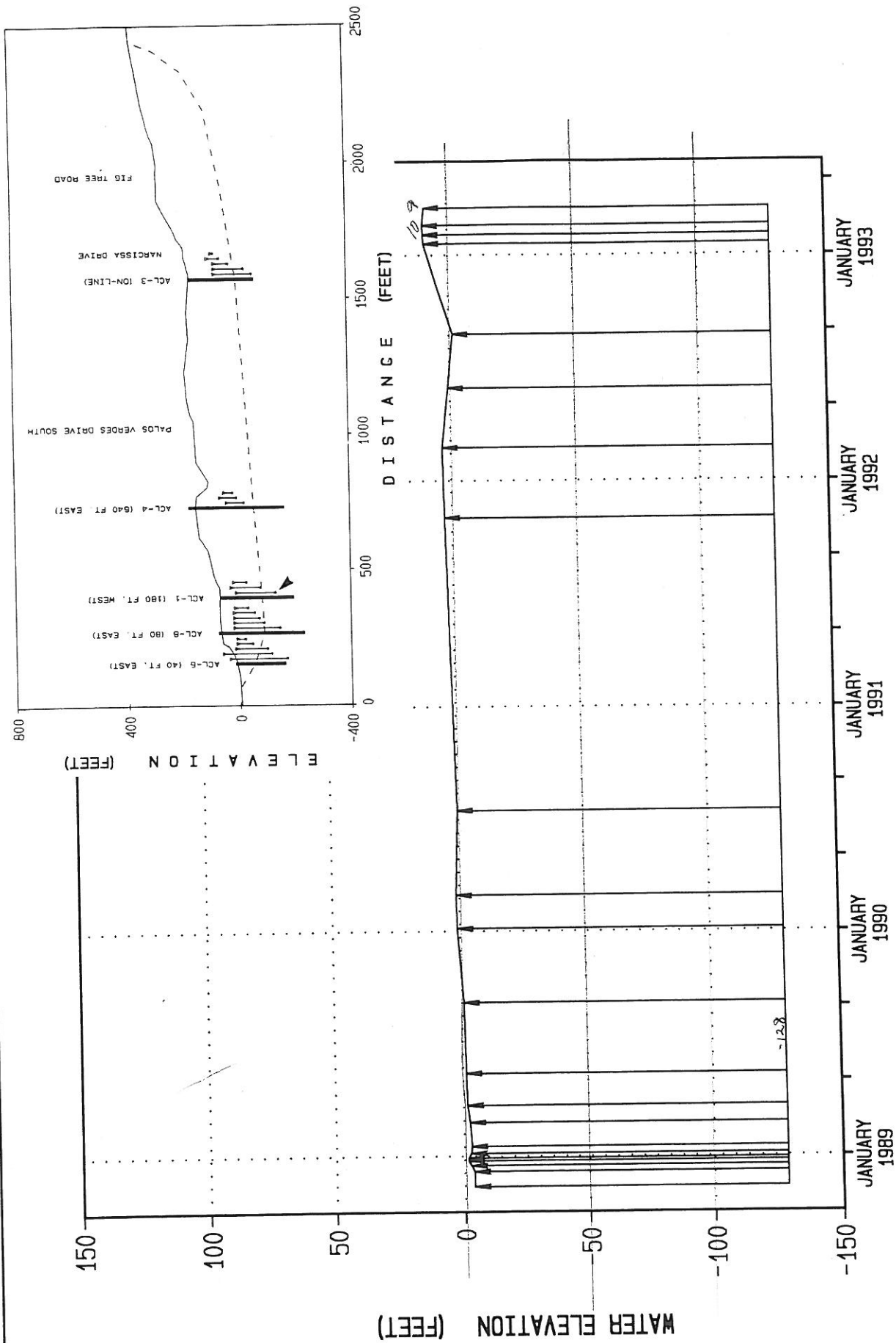
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 PROJECT NO.: 54-247
 INDICATOR NO.: ACL-7B
 PERIOD: 04-08-1992 to 03-15-1993

DEPTH MONITORED: 248 FT.
 DIST. BETWEEN READINGS: 2 FT.
 BEARING OF +A AXIS: S20W
 OUT-OF-PLUMB: 52 IN./100 FT.
 SPIRAL CORRECTION: NONE
 TOTAL DISPLACEMENT: 2.17 IN.
 RESULTANT BEARING: -166 DEG.

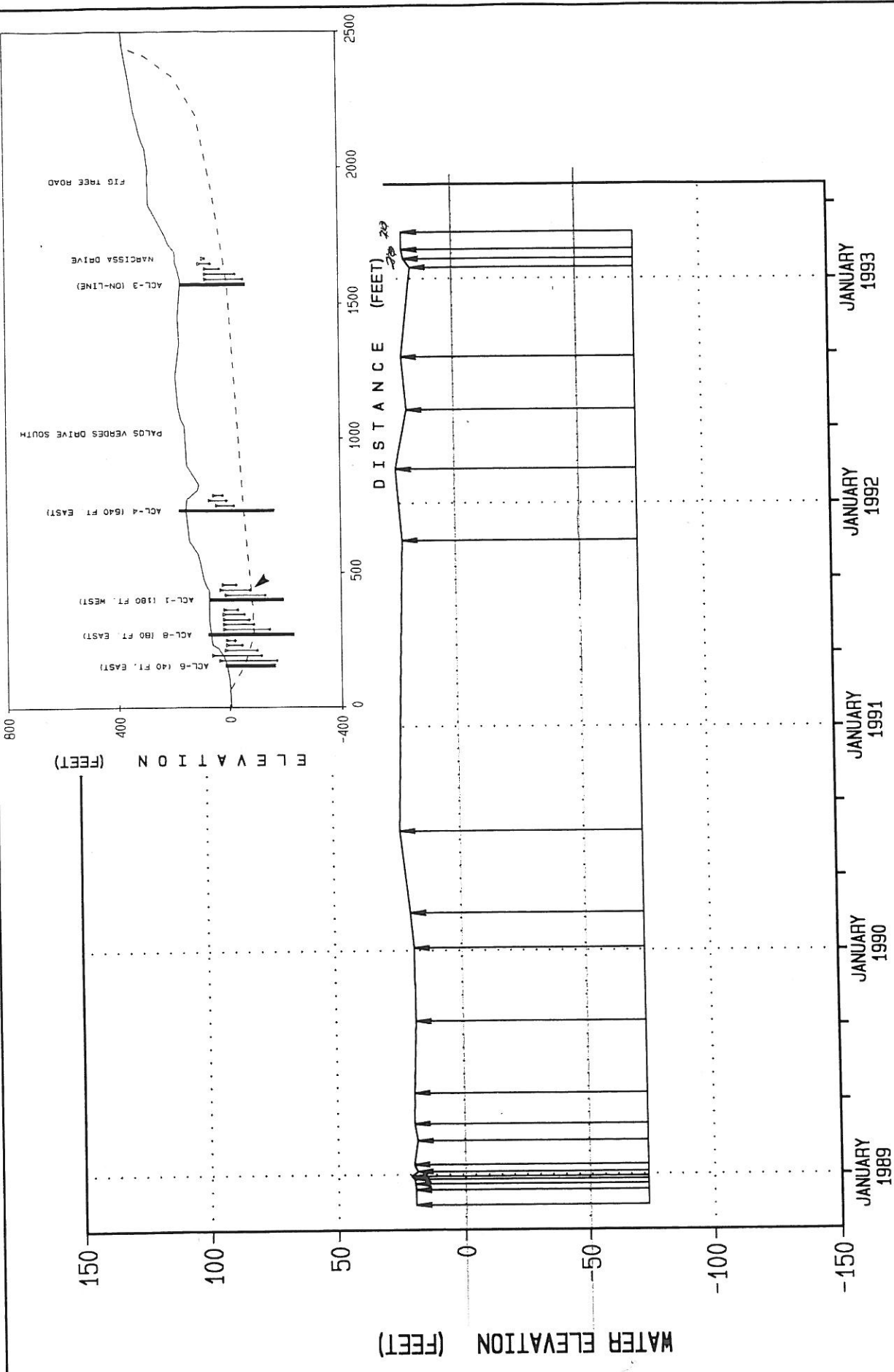
..... +A AXIS
 ----- +B AXIS
 —— RESULTANT
 Δ INCREMENTAL BEARING

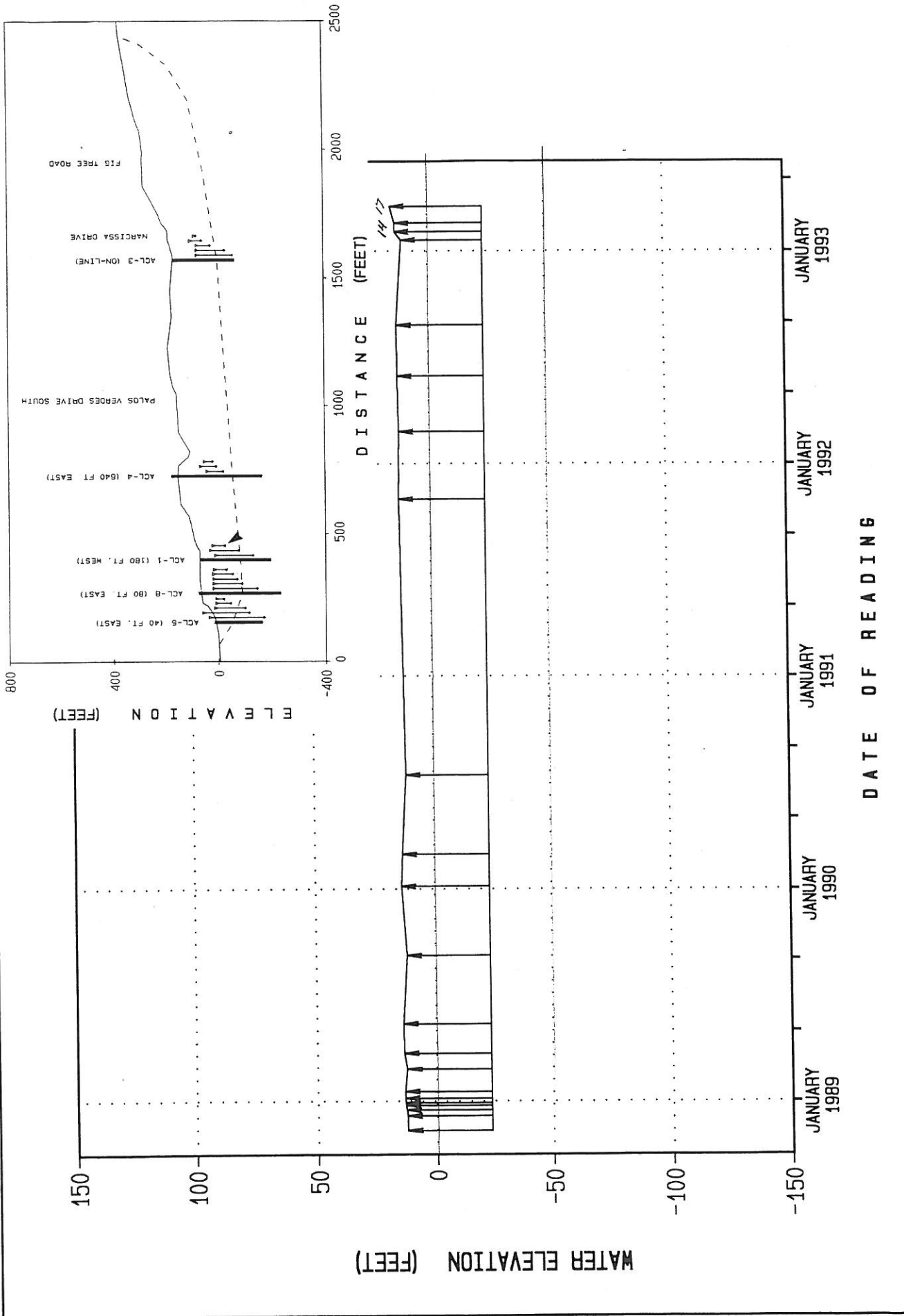
APPENDIX B

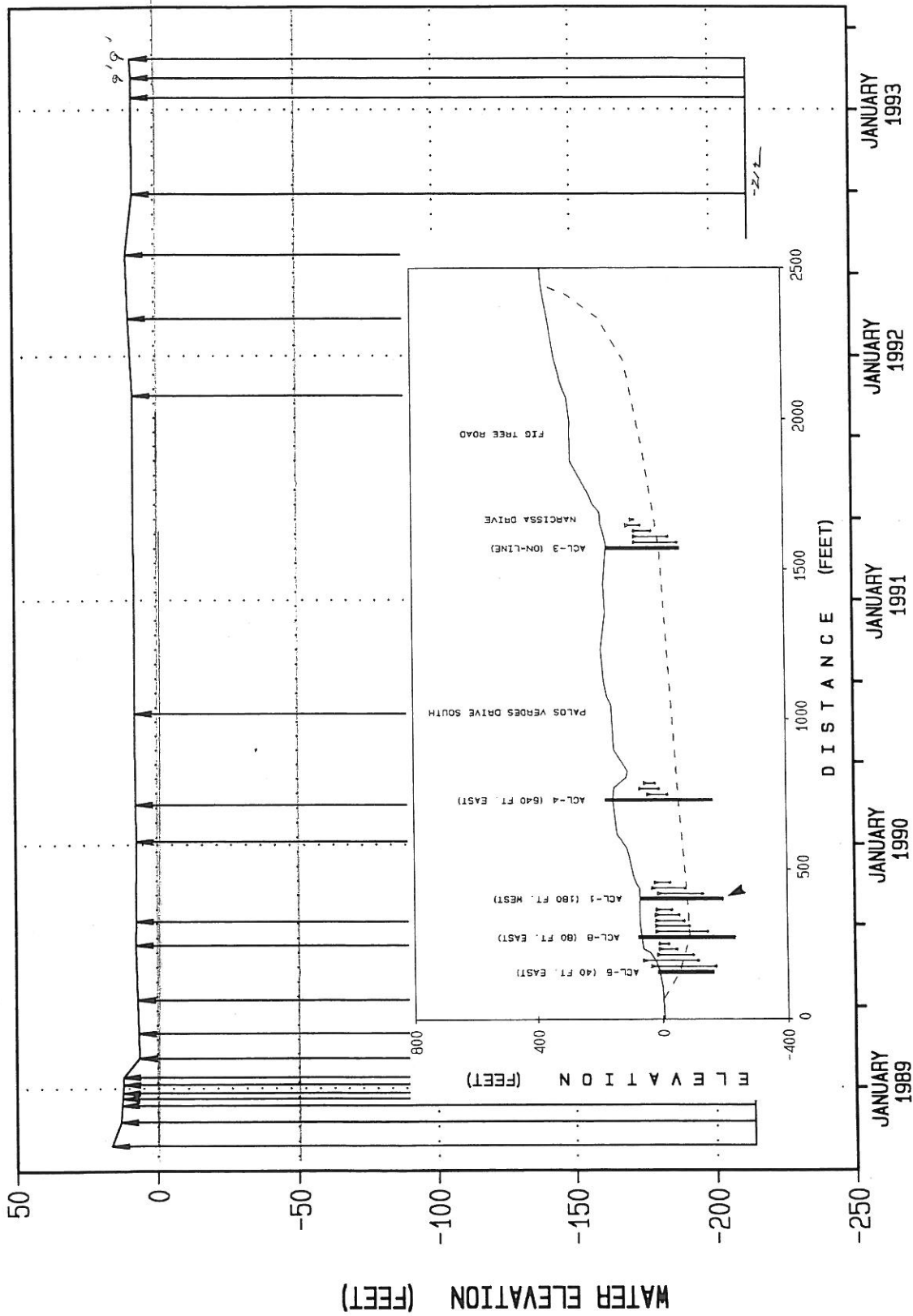
PIEZOMETER/STANDPIPE RESULTS

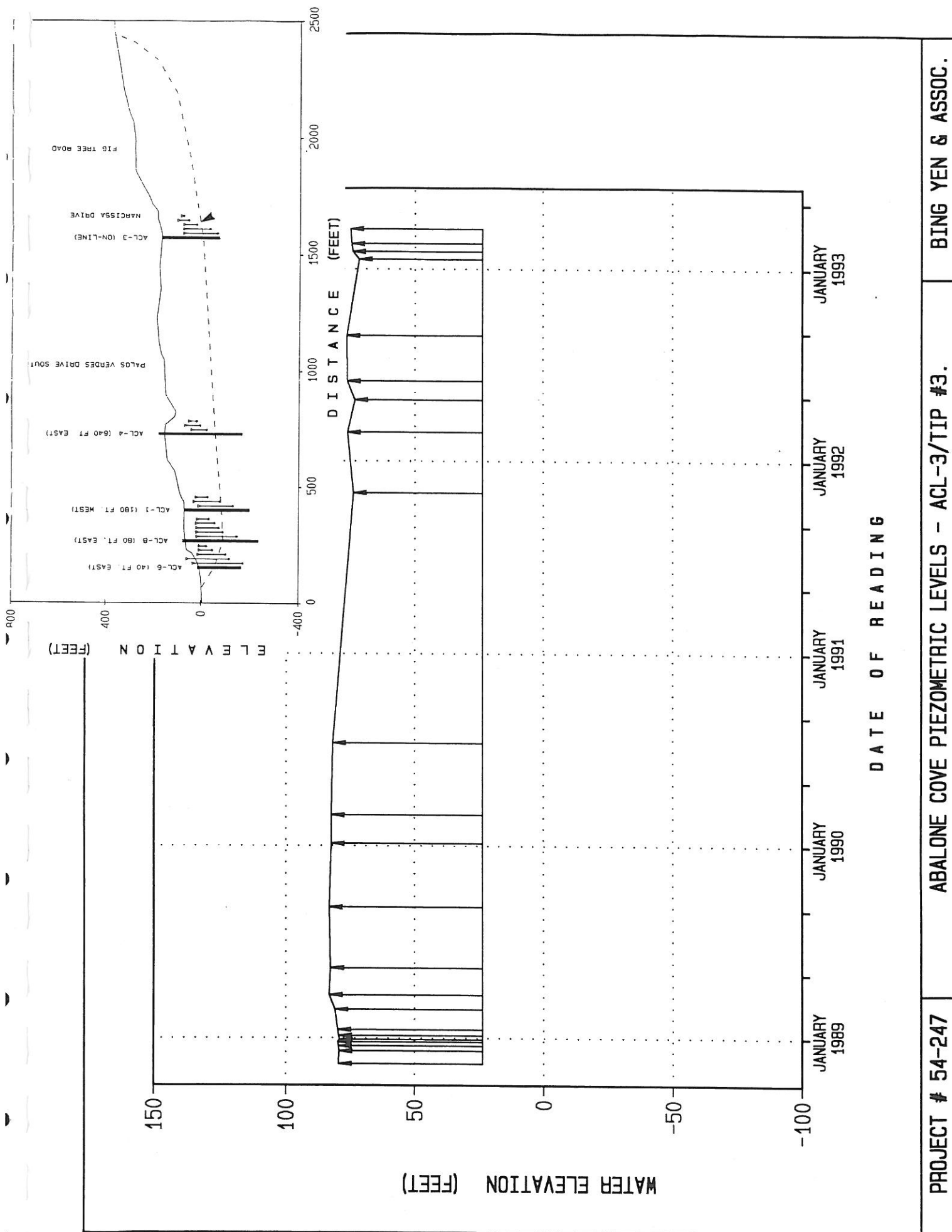


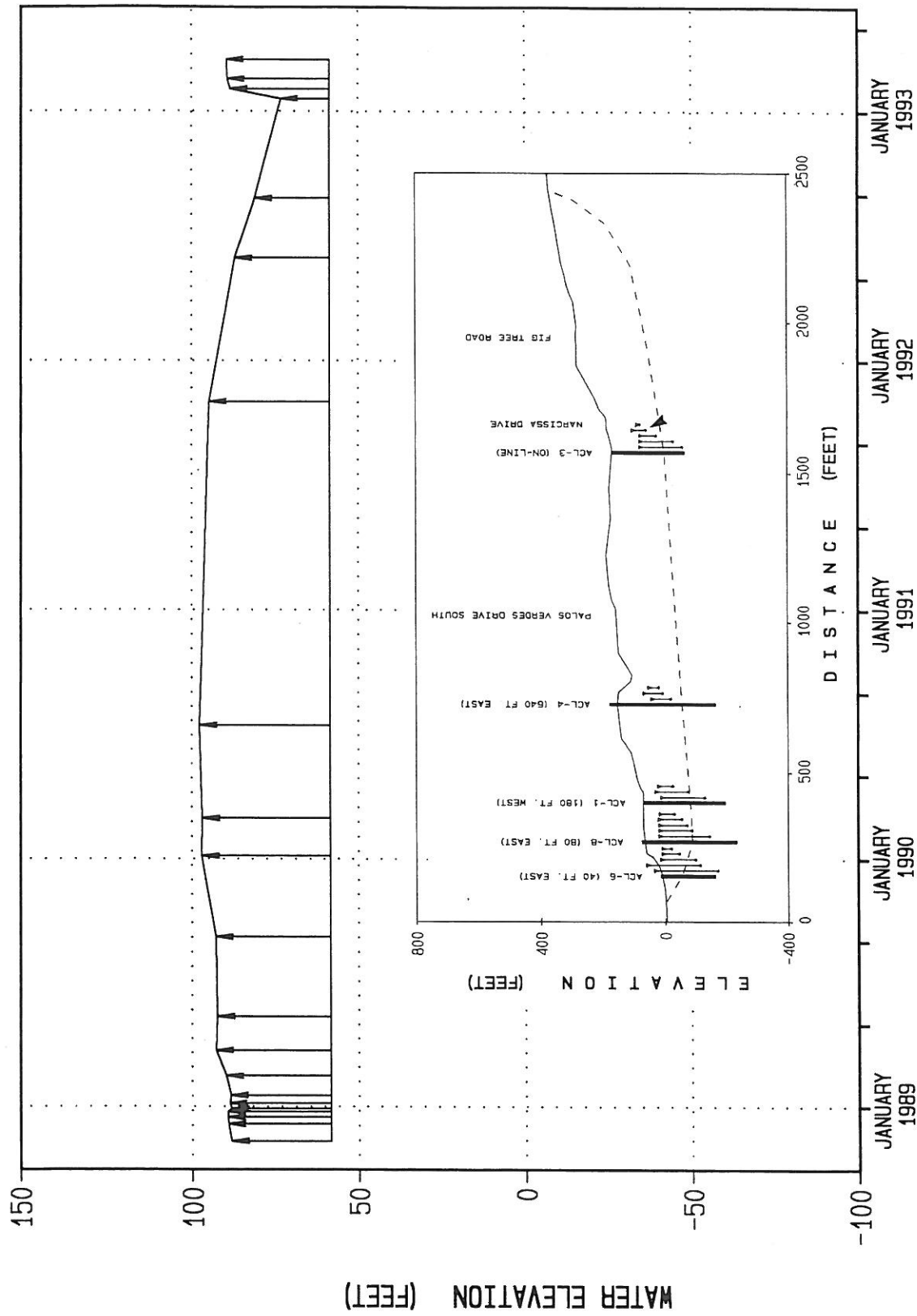
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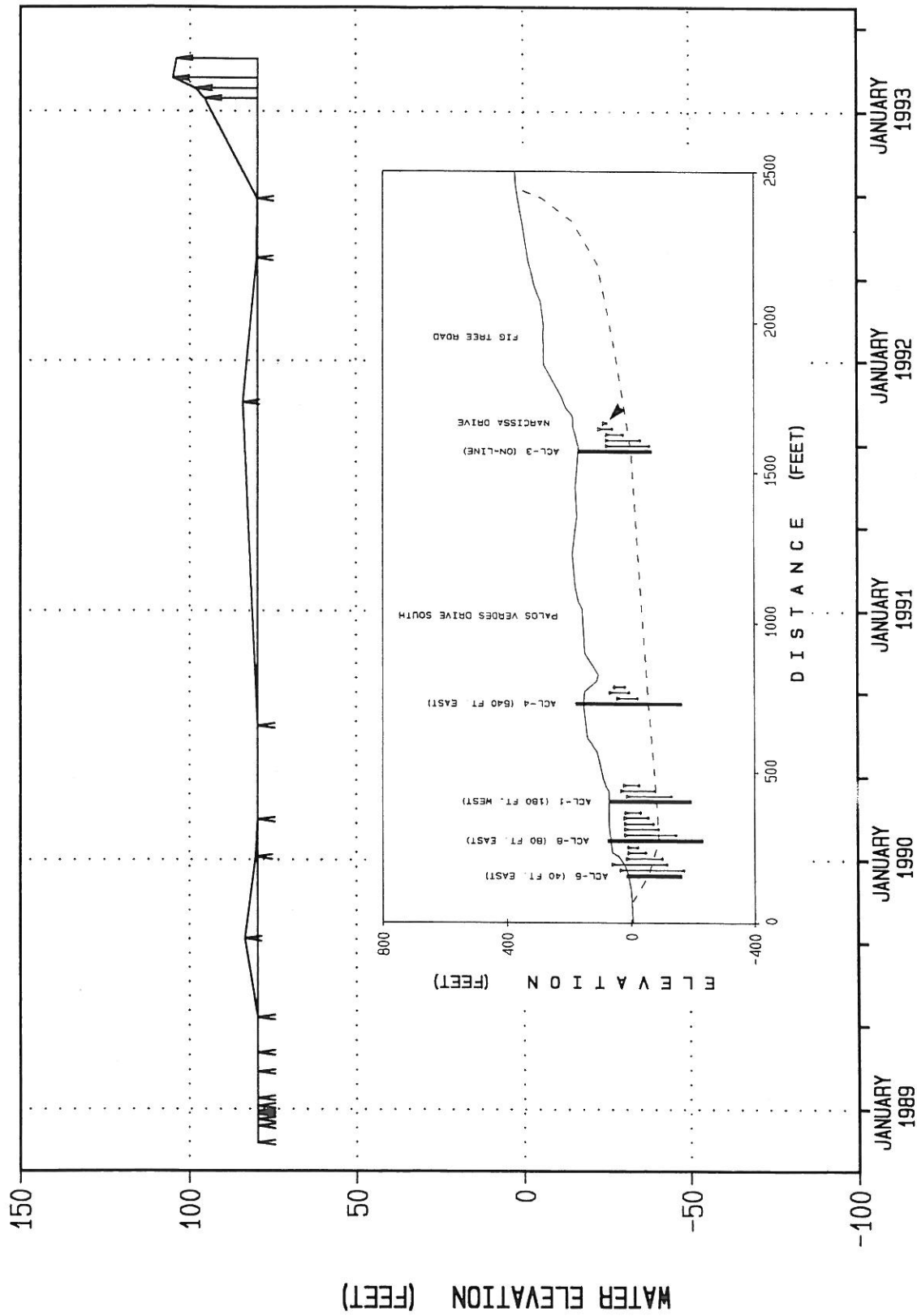


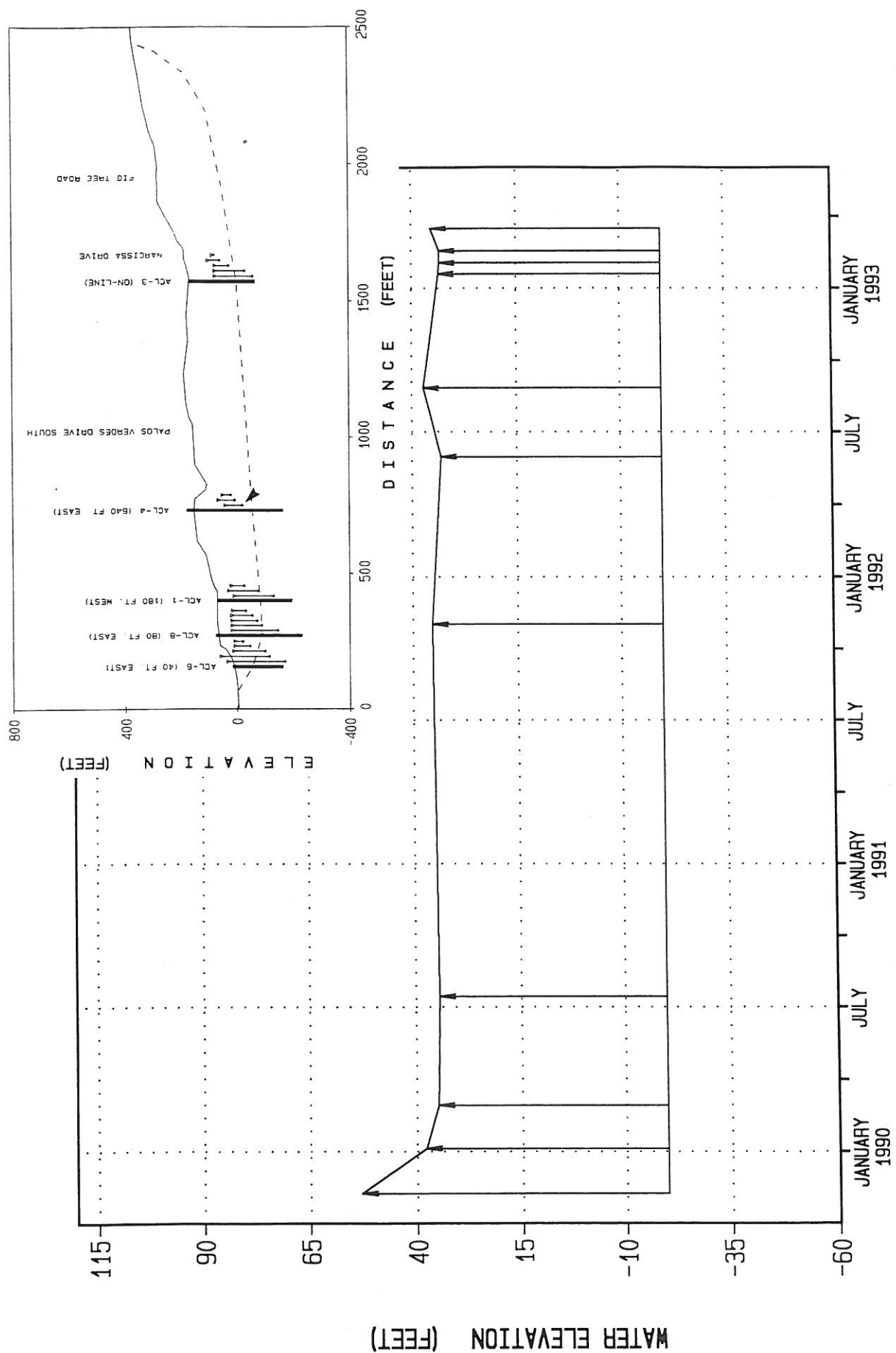


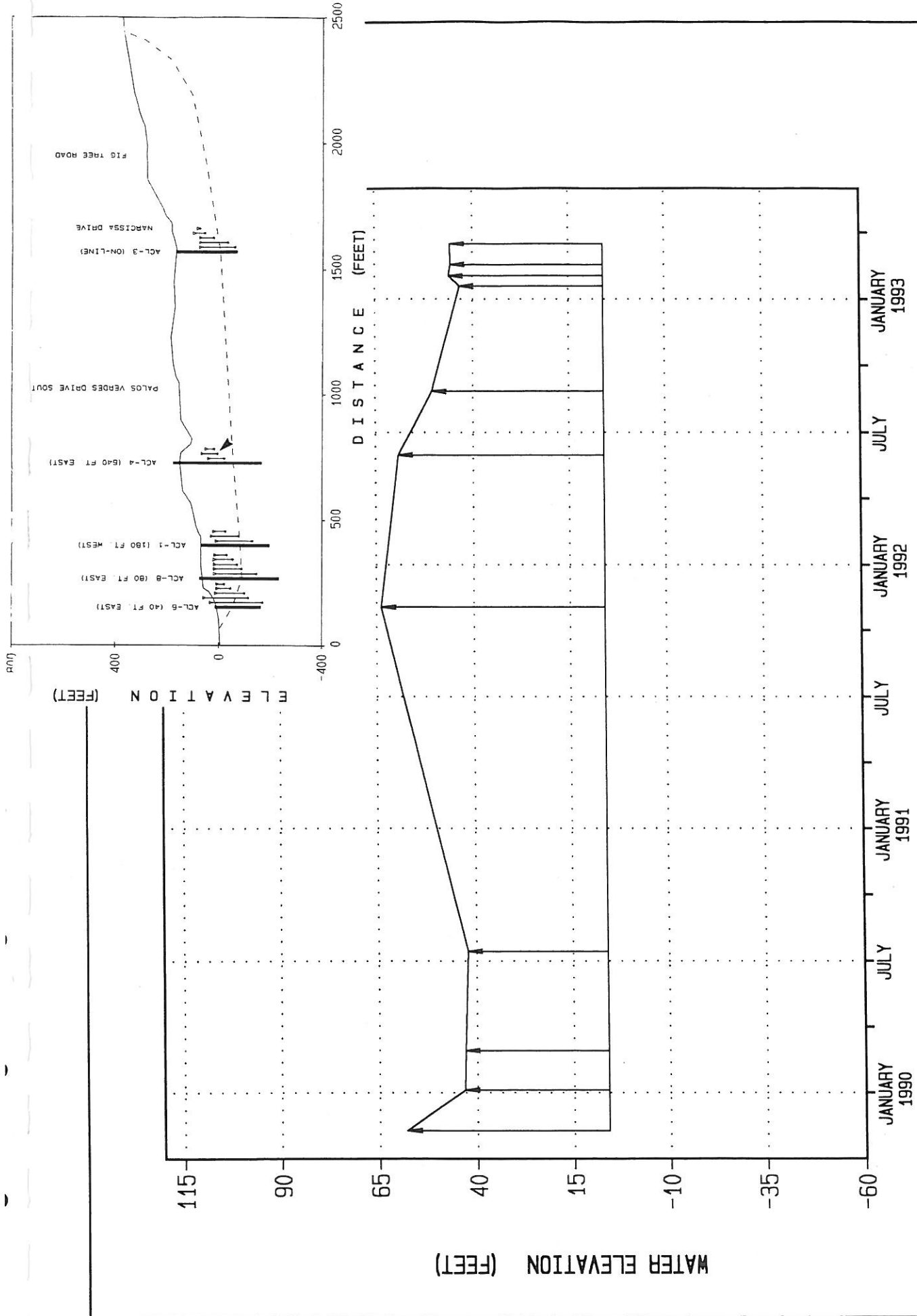


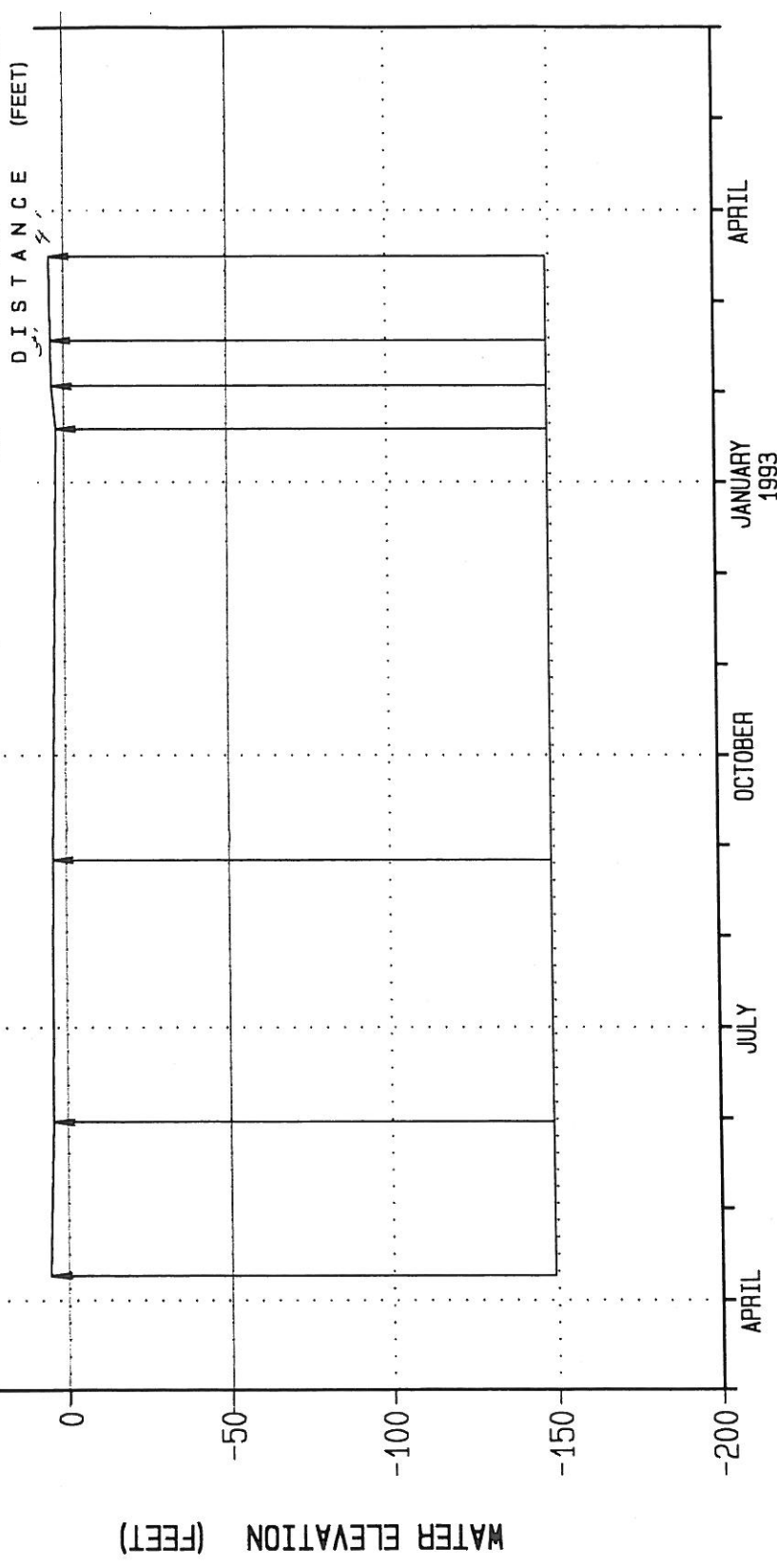
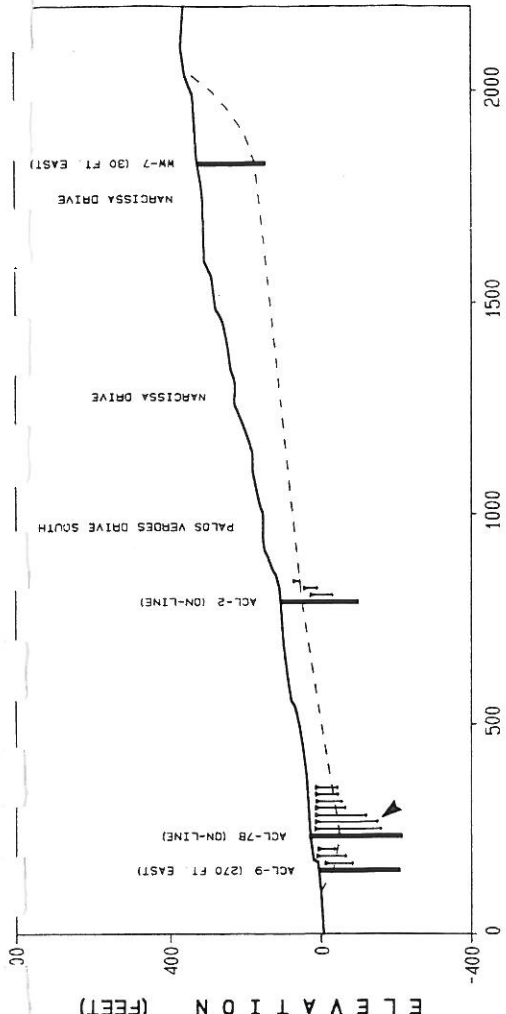




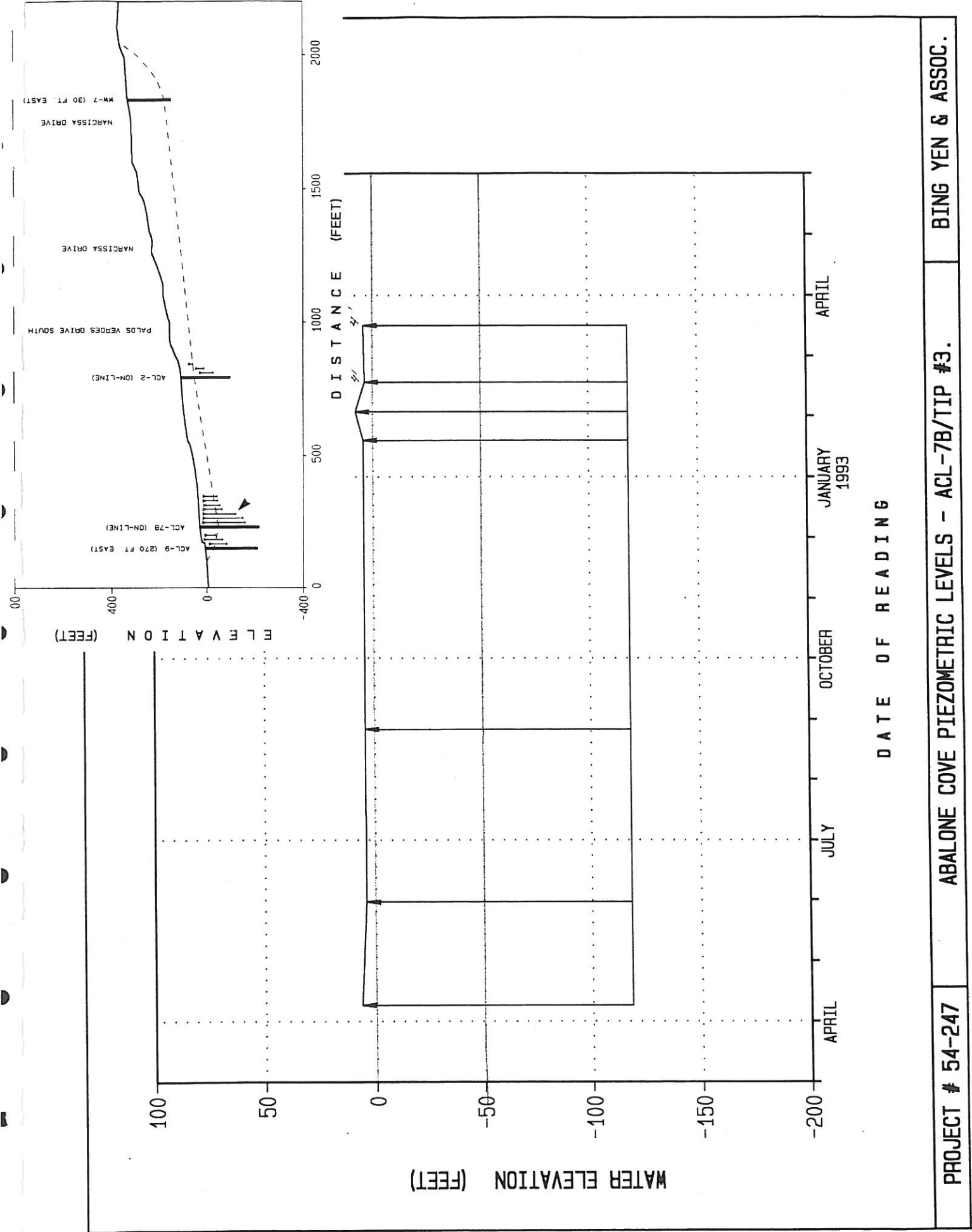


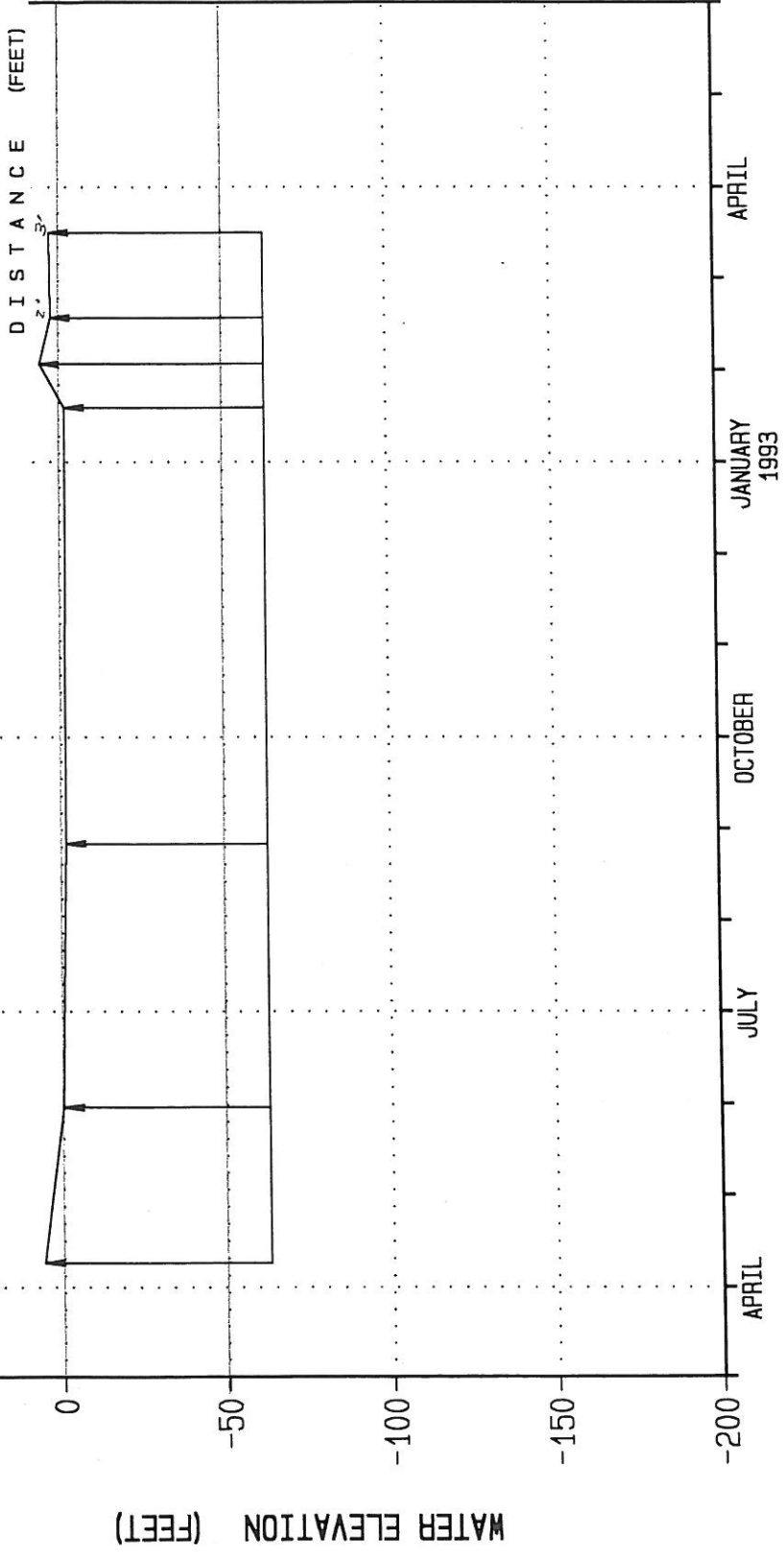
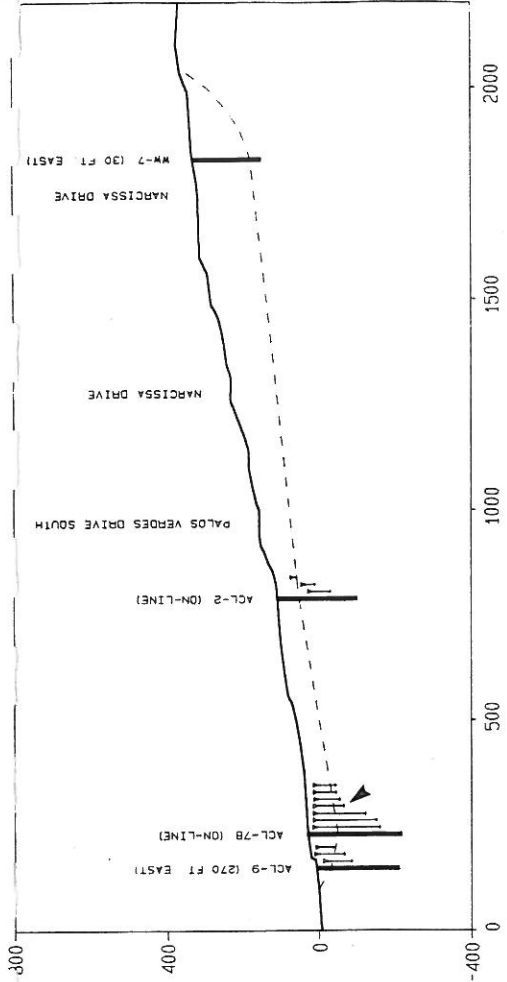


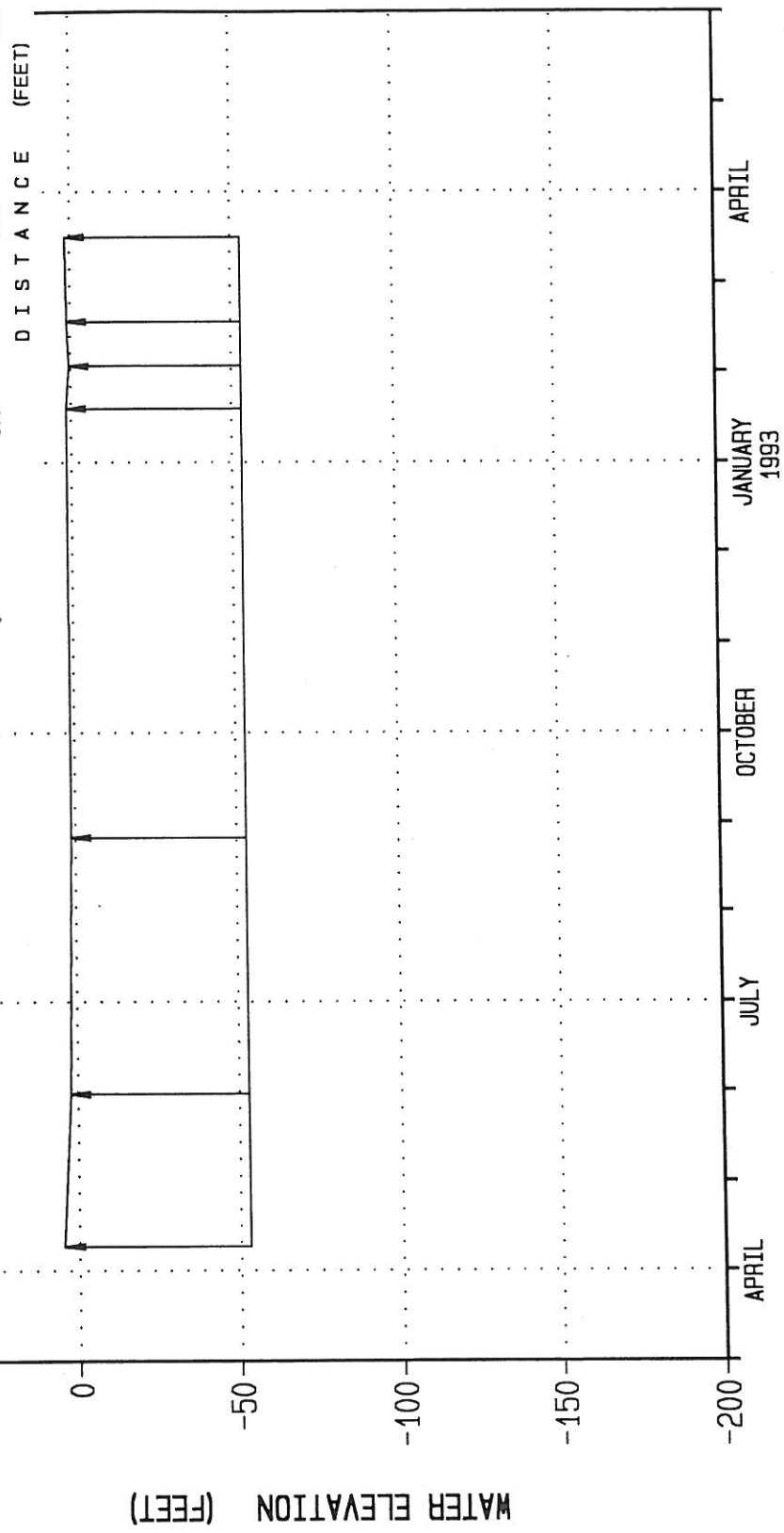
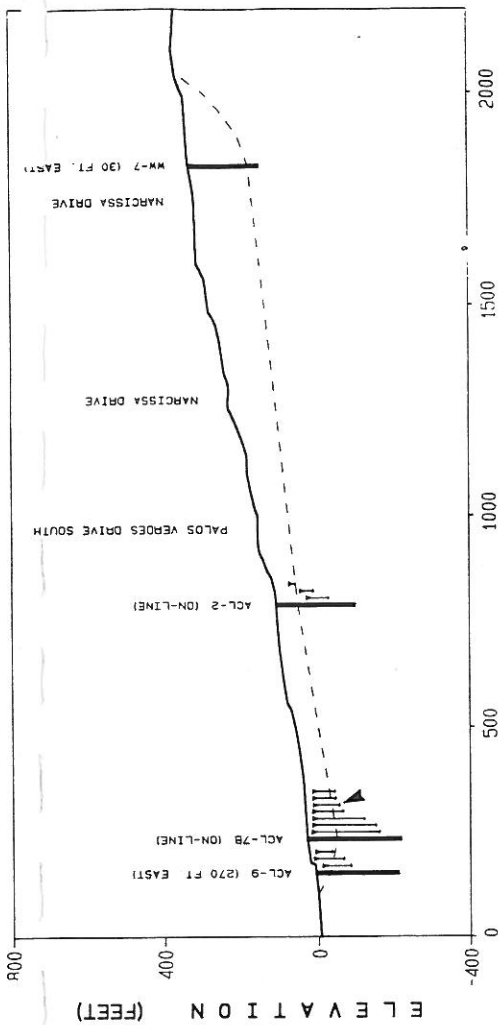




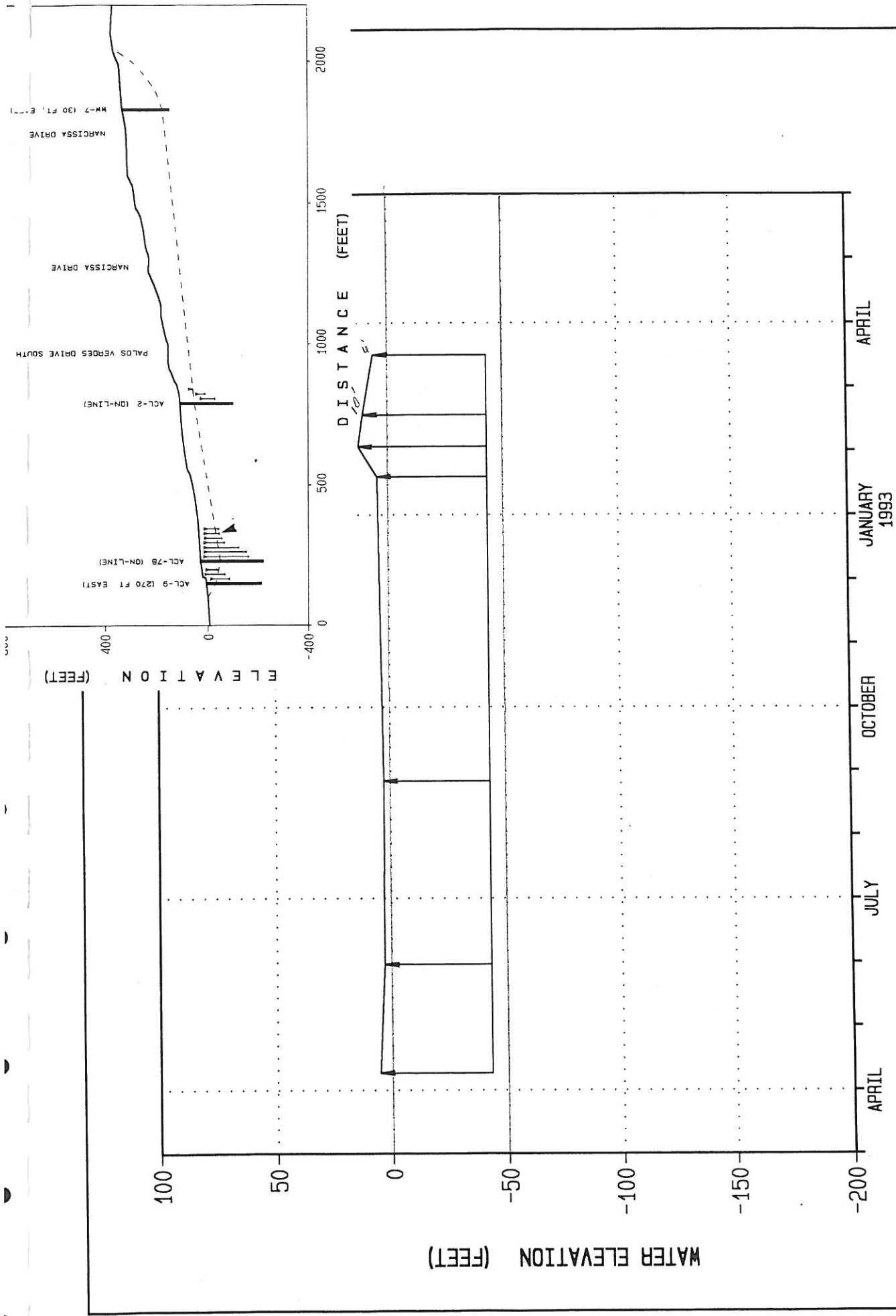
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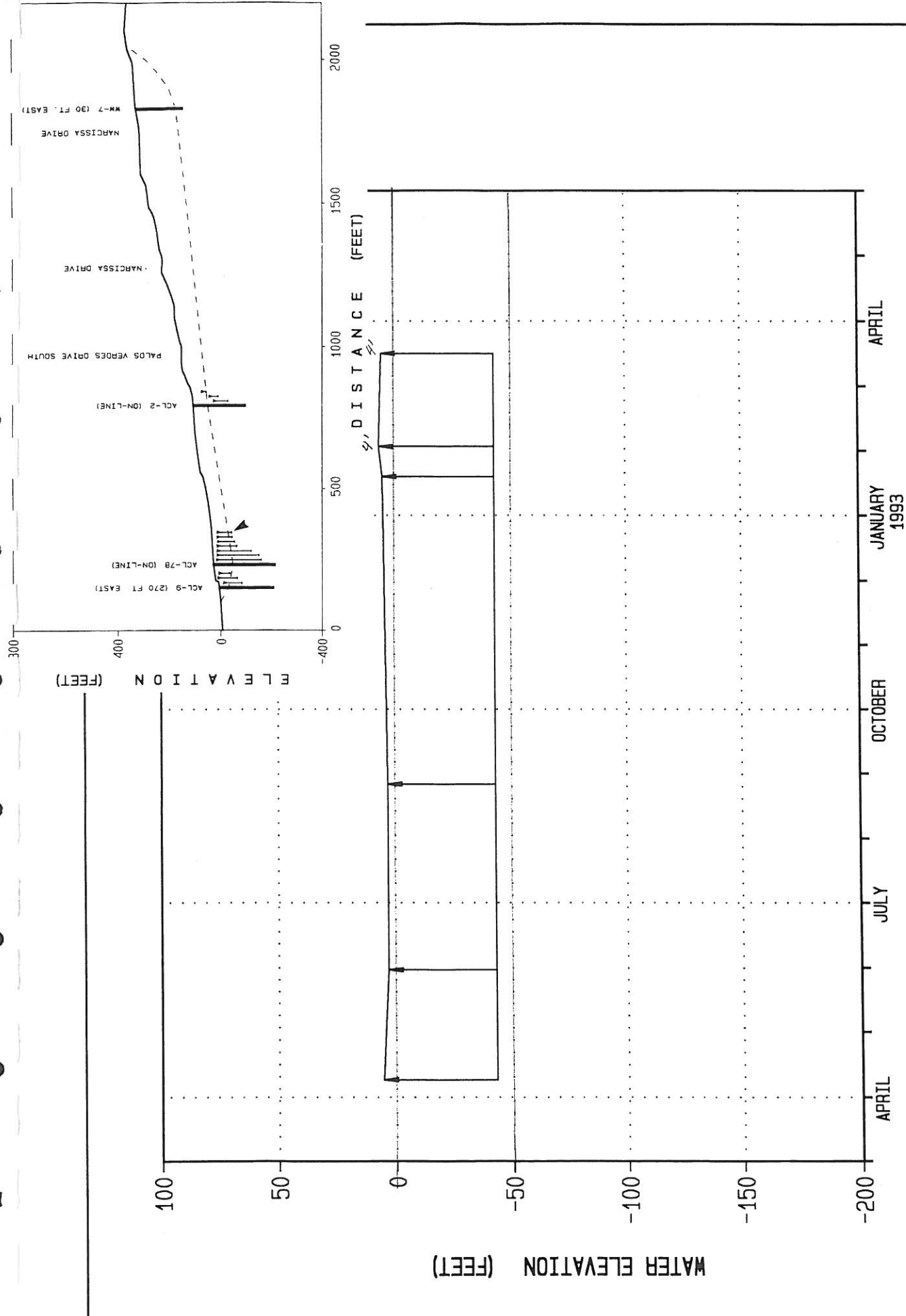


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APRIL JULY OCTOBER JANUARY 1993 APRIL



DATE OF READING

