BING YEN & ASSOCIATES, INC
Geotechnical Consultants, Established 1979

January 17, 1993

BYA Project No. 54-247

Mr. George Wentz
Panel Administrator
City of Rancho Palos Verdes
30940 Hawthorne Blvd.
Rancho Palos Verdes, CA 90274

SUBJECT: Abalone Cove Landslide Monitoring Results.

Dear Mr. Wentz,

As requested, Bing Yen and Associates (BYA) completed a round of monitoring of the Abalone Cove Landslide instrumentation between January 12th and January 18th of this year. This report presents the results of that monitoring.

Presently, four of the seven slope inclinometers installed at the site remain functional. The other three inclinometers (ACL-2, 4, & 6A) have been deformed by landslide movement to the extent that the sensor can no longer be lowered below the active slide plane. The approximate locations of the slope inclinometers are illustrated in Figure 1. One of the inclinometers - ACL-4 - has become non-functional since our last round of monitoring in August of 1992. In addition, passage of the sensor below the depth of the failure surface in ACL-3 ($\approx$170') has become increasingly difficult over the last six to eight months. It is anticipated that this inclinometer will remain functional for only a few more months if the landslide deformation continues at its current rate.

Deformation plots for the functional inclinometers are presented in Appendix A. These results indicate that movement of the landslide has continued to occur since the last round of monitoring was completed in August of 1992. The deformation measured over this 4½ month period ranged from $\approx$0.15" in ACL-3 to $\approx$0.3" in ACL-1 and 7B. This corresponds to average rates of deformation of 0.4 and 0.8 inches per year, respectively. The depth and magnitude of the offsets as well as the apparent direction of movement for each inclinometer is summarized in Table 1. The approximate direction of movement is also illustrated in Figure 1.

It should be noted that plots which illustrate the deformation of the inclinometer casings in the immediate vicinity of the active failure surface are also included in Appendix A. These plots have been included at the request of several of the Panel Members. It is hoped that they will facilitate interpretation of the inclinometer results.

A graph illustrating the displacement time-history of inclinometer ACL-3 has been produced and is included in Appendix B. This figure illustrates the cumulative deformation as well as

Deform
ACL-2
ACL-4
ACL-6A

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the approximate average rate of movement of this inclinometer since its installation in November of 1988. The deformation plots for ACL-3 upon which the displacement time-history is based are also included in Appendix B. It should be noted that the velocity time-history curve (solid line in Figure B-1) is not uniquely defined by the displacement data (dashed line in Figure B-1). For example, 0.6 inches of displacement over a six month monitoring interval could be represented by a uniform rate of deformation of 0.1 inches per month during that period; or by no movement during the first three months followed by 0.2 inches per month for the last three months; or by an infinite number of other velocity combinations. The velocity time-history curve which has been presented is intended to represent a reasonable interpretation of the existing data for ACL-3 and provide the Panel Members with an indication of the velocity response of this particular inclinometer. BYA has not been authorized to produce similar displacement and velocity time histories for the rest of the inclinometers, however those figures can be produced at the Panel's request.

The monthly rainfall recorded at Los Angeles County Flood Control District Station 43D since 1988 is illustrated in Figure 2. As shown, the rainfall in the Palos Verdes area over the last two months has been quite high. However, as is illustrated in Figure B-1, any effect which this rainfall may be having on the rate of the movement of the landslide is not yet apparent from the inclinometer results.

At the present time, 18 of the piezometers and two of the standpipes installed by BYA within the landslide remain functional. The results from these installations are summarized graphically in plots presented in Appendix C. As illustrated by these figures, significant increases in piezometric levels were recorded in three of the piezometers during this monitoring interval (i.e. ACL-1/Tip #1, ACL-3/Tip #5, & ACL-8/Tip #5). The magnitude of these increases ranged from 10 to 20 feet of water. The remaining piezometers showed steady or declining piezometric levels during this period. In the figures presented in Appendix C, the bottom of the arrows represent the elevations of the piezometers while the tips of the arrows represent the recorded piezometric levels. A reduced scale cross section through the landslide has been inset on each of these plots to illustrate the location of each piezometer. The alignments of the inset cross sections are shown in Figure 1.

I hope this information is helpful to the City and the members of the Technical Panel. Please feel free to contact me if you have any comments or questions.

Sincerely,
BING YEN & ASSOCIATES, INC.

Glenn D. Tofani

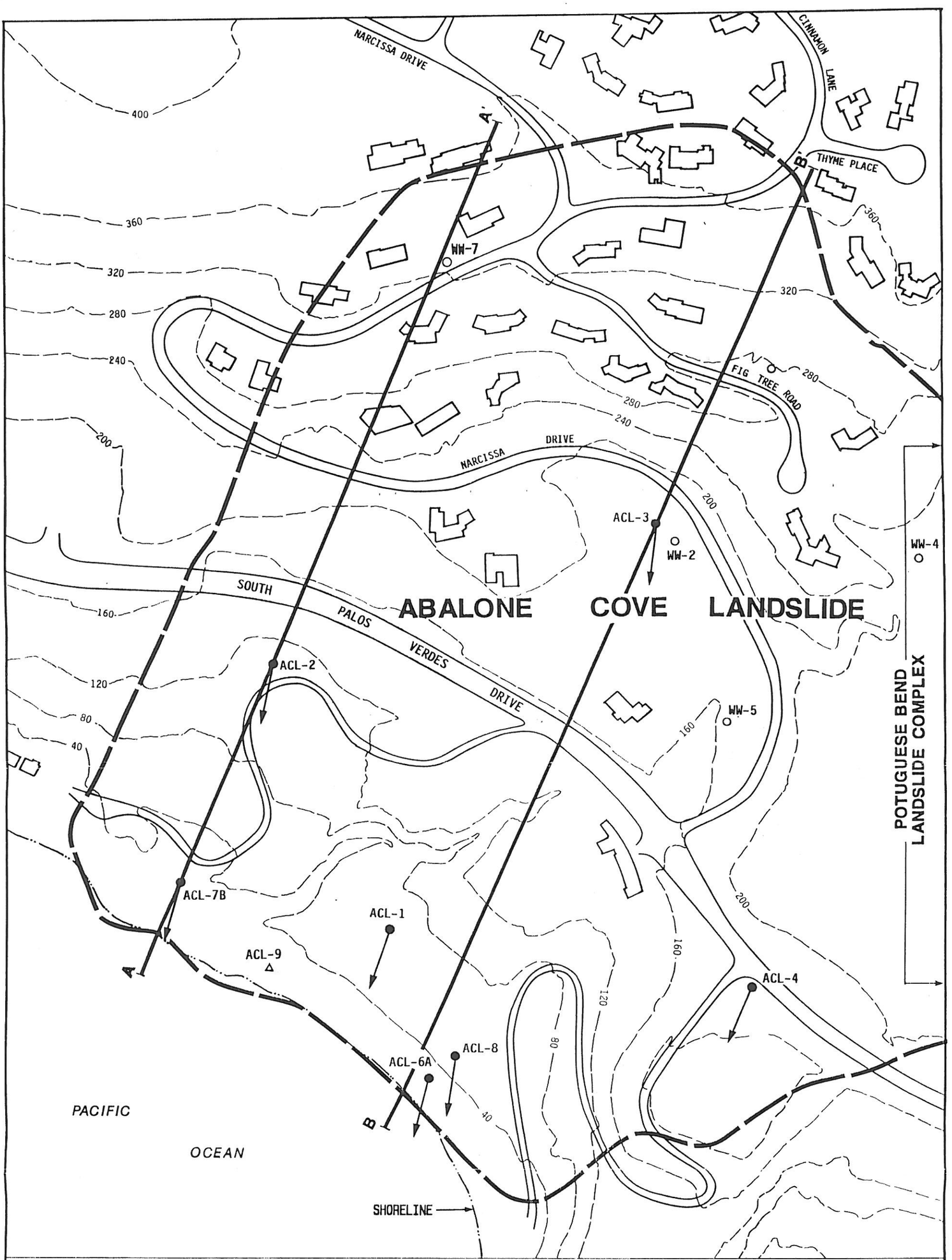
Glenn D. Tofani, RCE/REA
Vice President

Attachments.

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

SLOPE INCLINOMETER	DEPTH TO OFFSET	ELEVATION OF OFFSET	TOTAL DISPLACEMENT	DIRECTION OF MOVEMENT	STATUS[1]
ACL-1	150 FT.	-85 FT.	3.0 INCHES	S25°W	FUNCT.
ACL-2	55 FT.	50 FT.	1.7+ INCHES	S10°W	DEST.
ACL-3	170 FT.	0 FT.	1.7 INCHES	S15°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.	0.6 INCHES	S10°W	FUNCT.
ACL-8	168 FT.	-87 FT.	1.3 INCHES	S25°W	FUNCT.

[1] Functional or Destroyed.



EXPLANATION

ACL-8 — APPROXIMATE LOCATION OF SLOPE INCLINOMETER/PIEZOMETER, ARROW INDICATES DIRECTION OF RECORDED MOVEMENT

ACL-9 △ — APPROXIMATE LOCATION OF PIEZOMETER

WW-2 ○ — APPROXIMATE LOCATION OF DEWATERING OR MONITORING WELL

RESIDENCE OR OTHER STRUCTURE

POSSIBLE BOUNDARY OF ACTIVE ABALONE COVE LANDSLIDE

LOCATION OF CROSS SECTION

A — A'

N

0 200 400 FEET

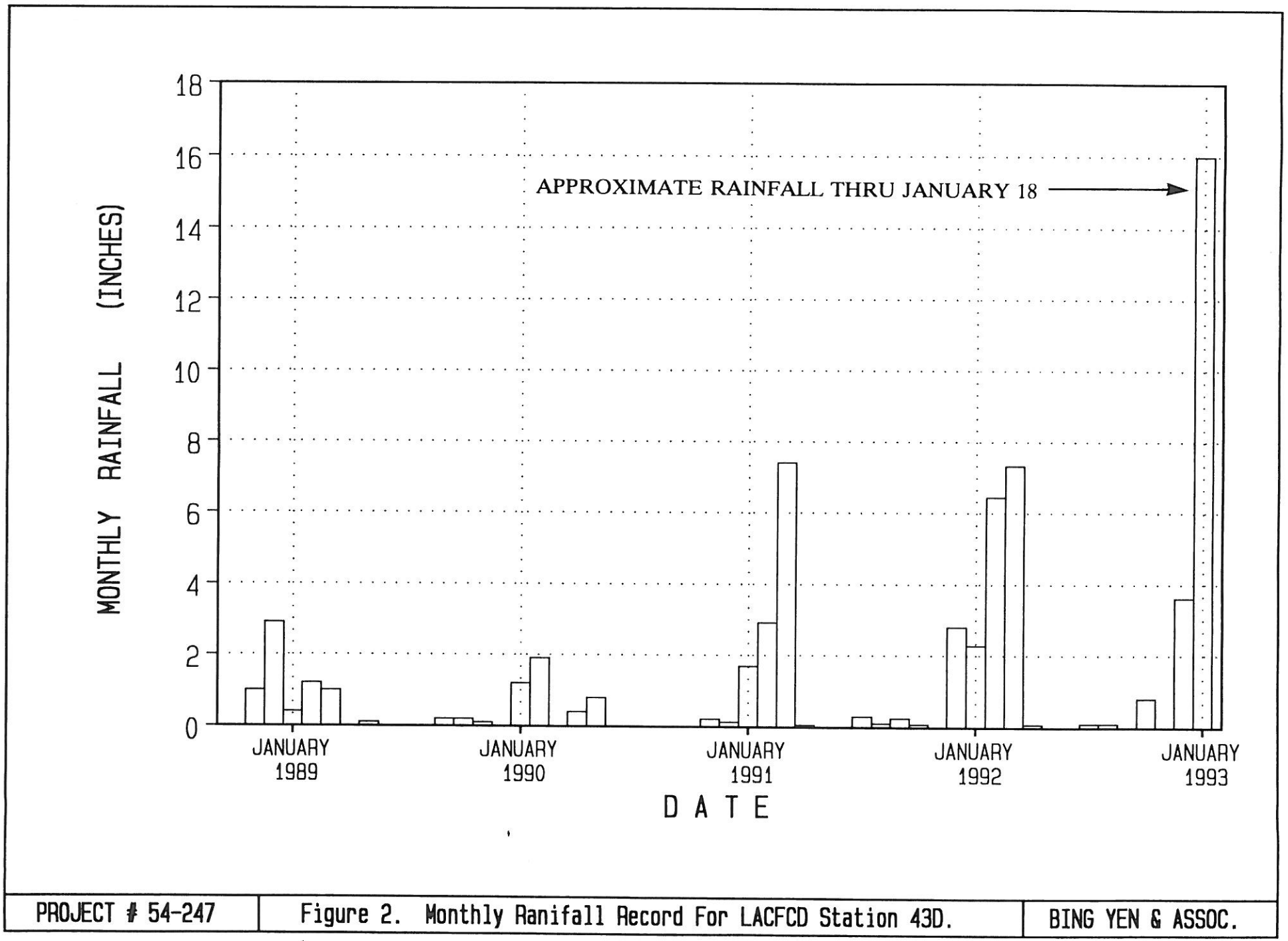
BING YEN & ASSOCIATES

PROJECT NAME: ABALONE COVE LANDSLIDE

PROJECT NO.: 54-247 | DATE: SEPTEMBER 1992

LOCATIONS OF SLOPE INCLINOMETER/PIEZOMETERS AND DIRECTION OF RECORDED MOVEMENT

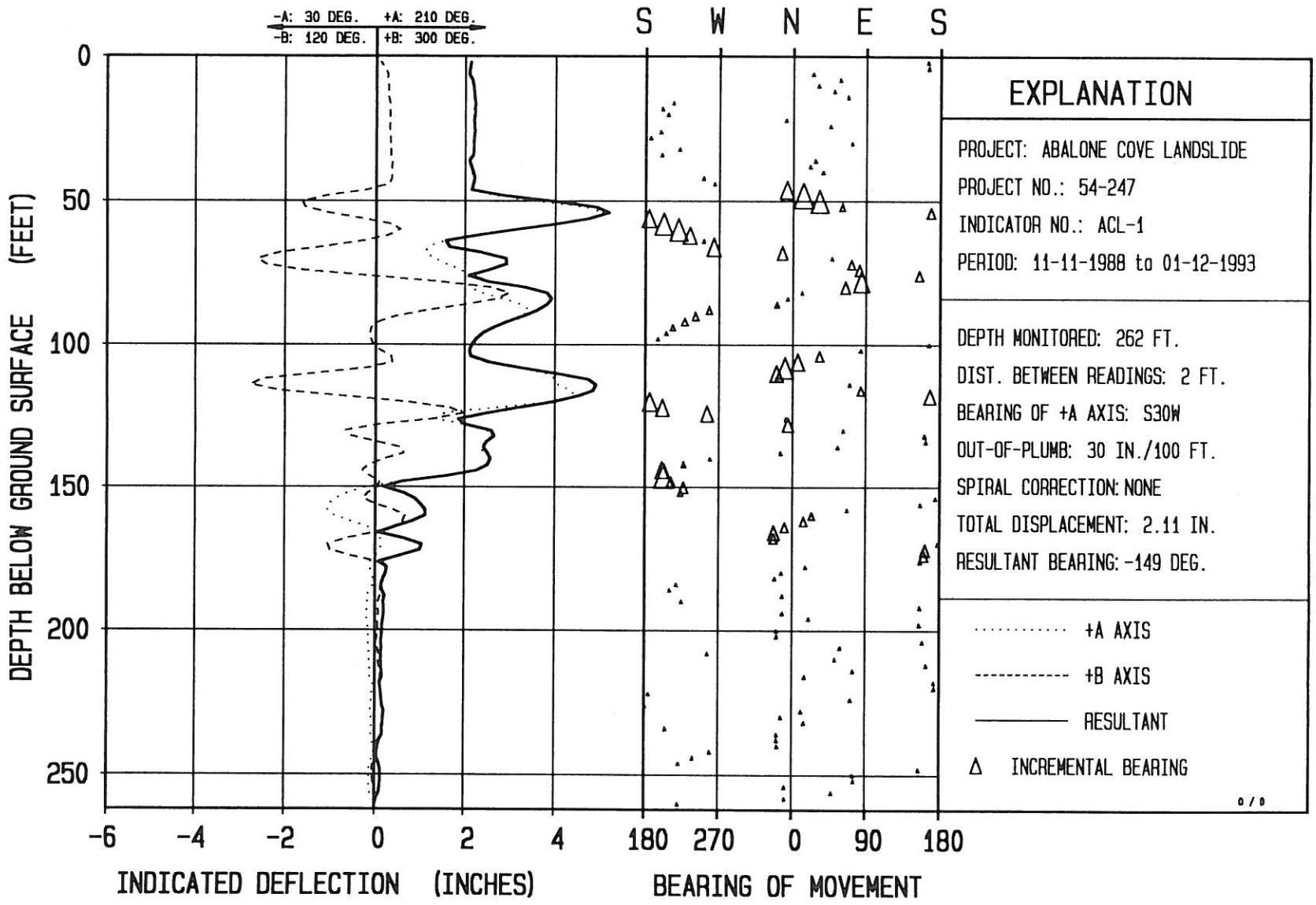
FIGURE 1



PROJECT # 54-247	Figure 2. Monthly Ranifall Record For LACFCD Station 43D.	BING YEN & ASSOC.

APPENDIX A

(SLOPE INCLINOMETER RESULTS)



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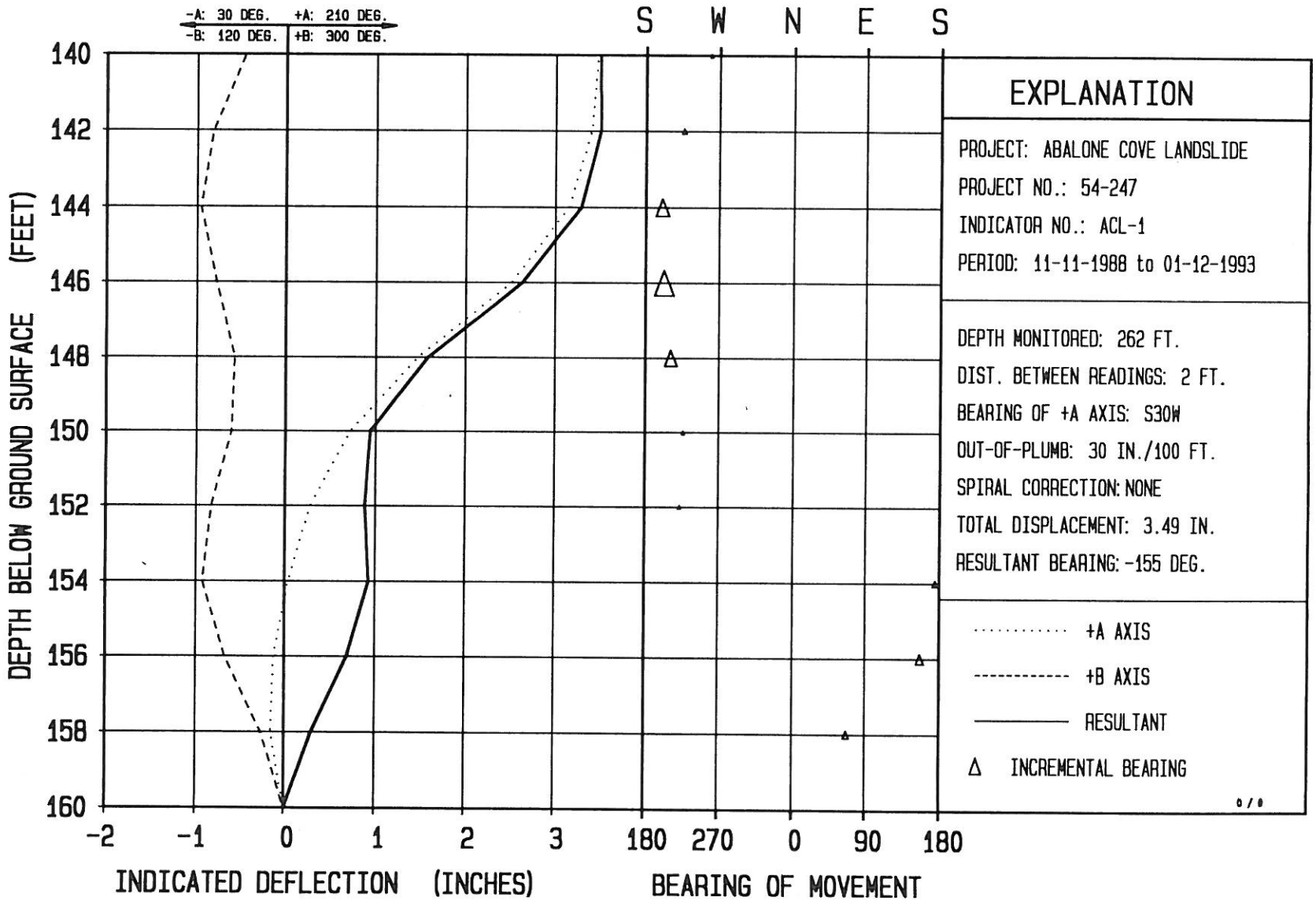

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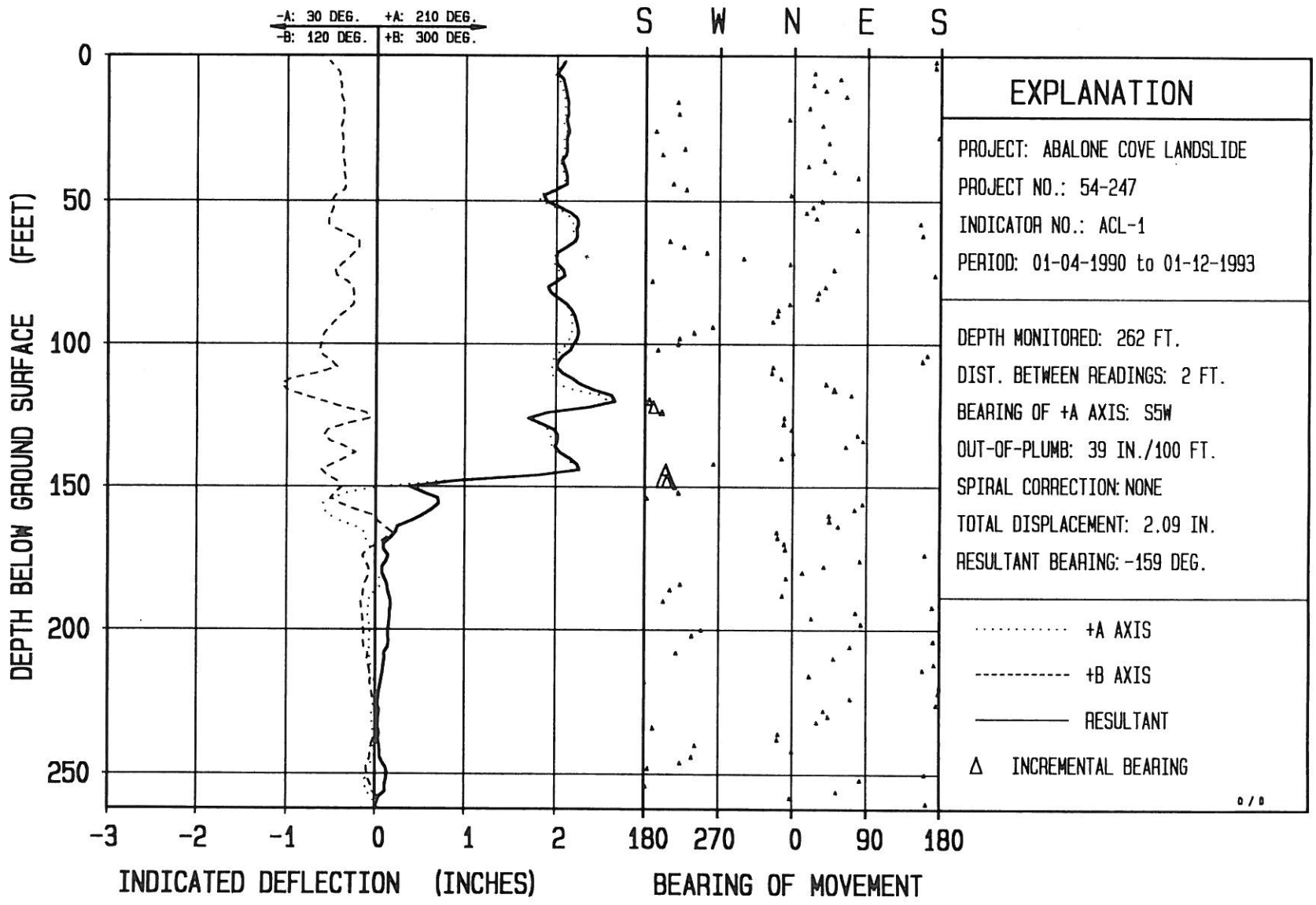

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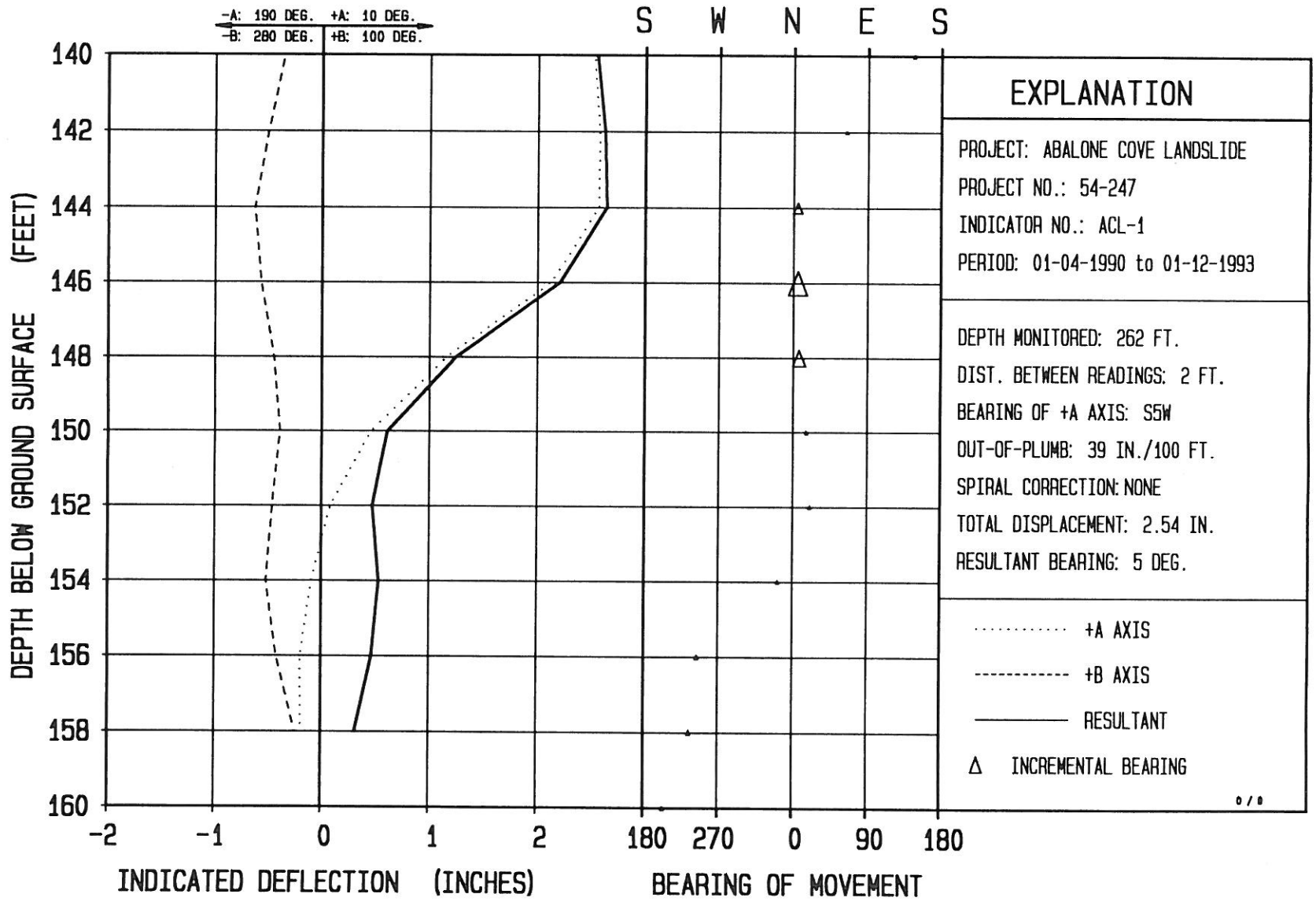

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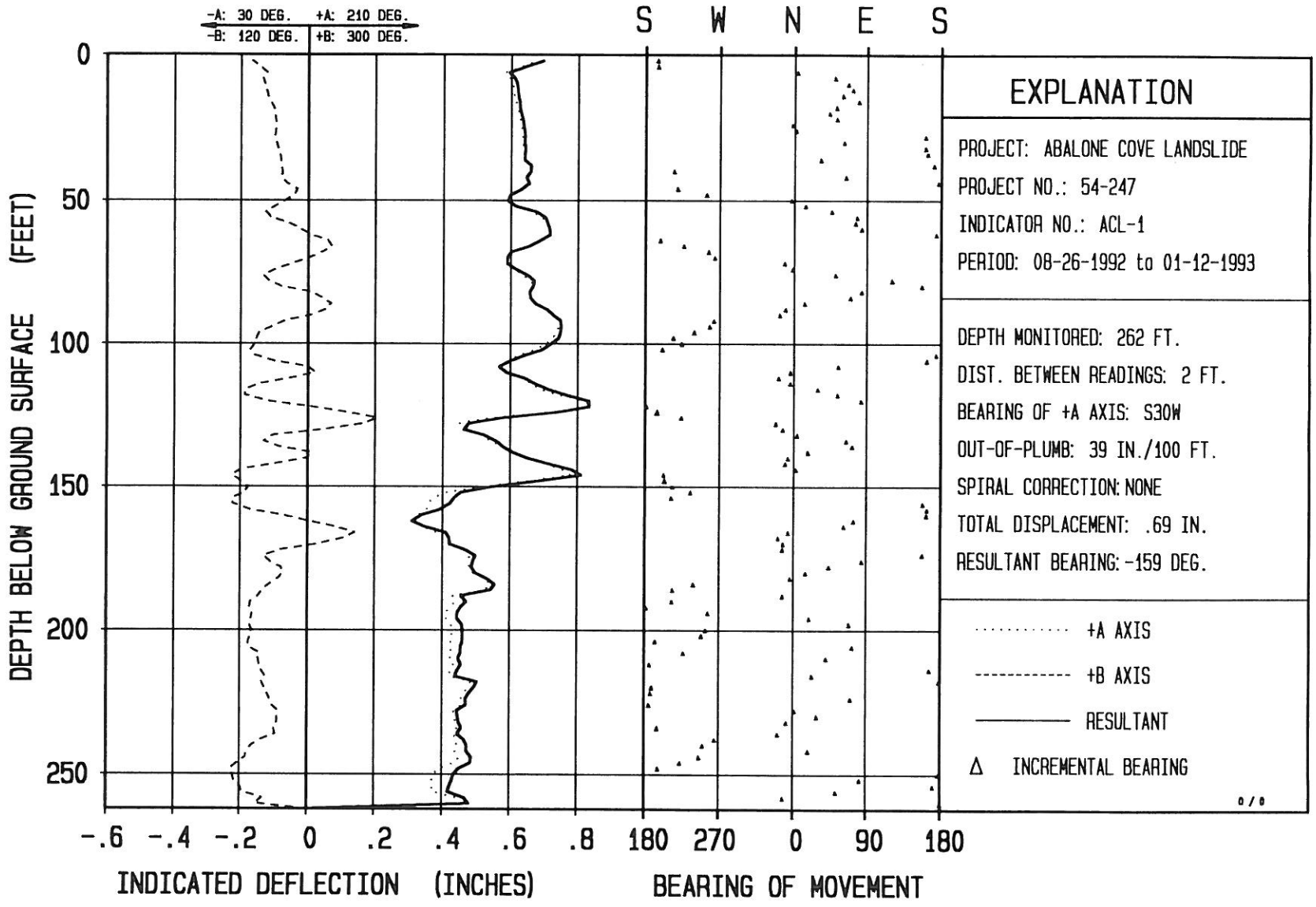

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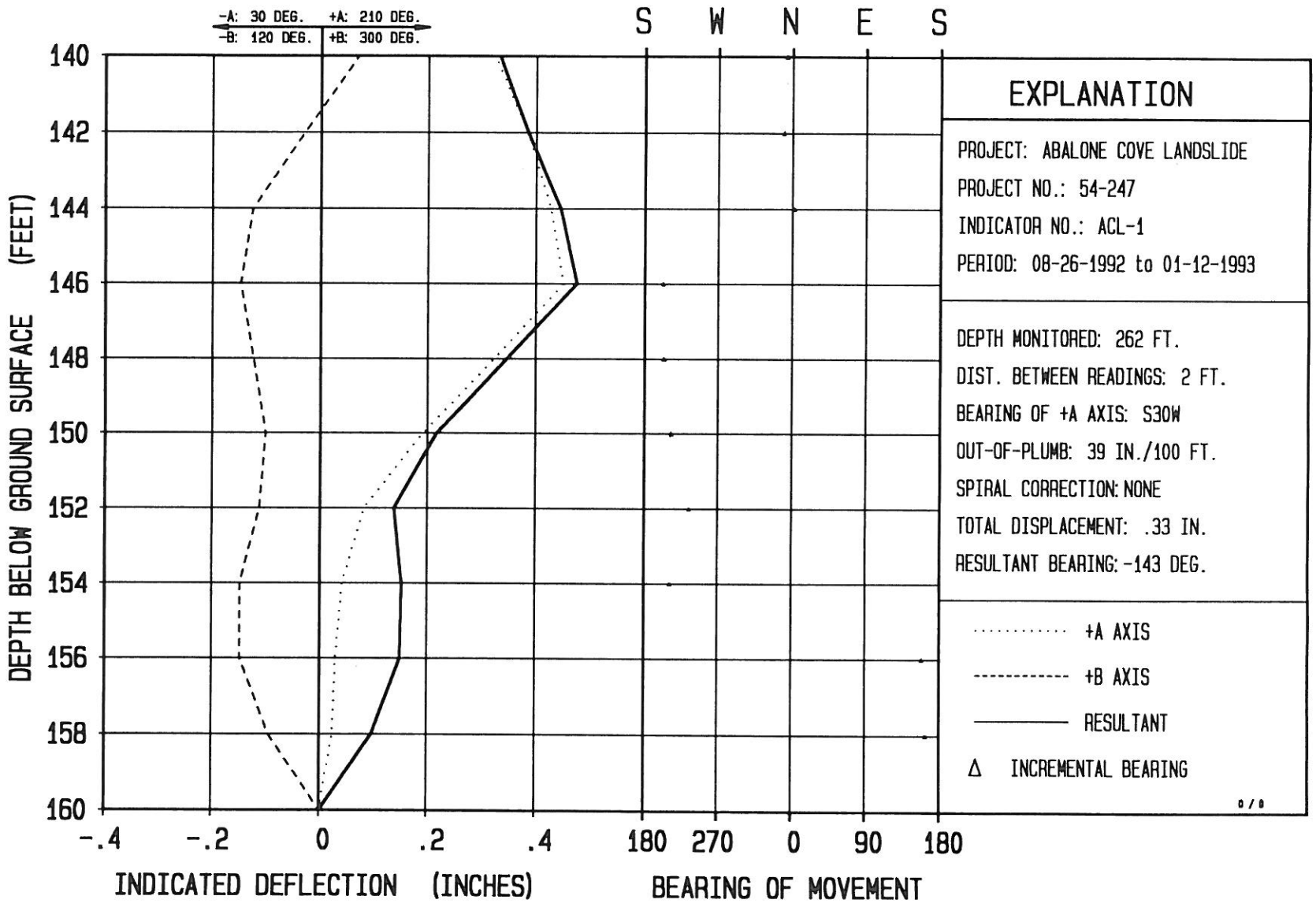

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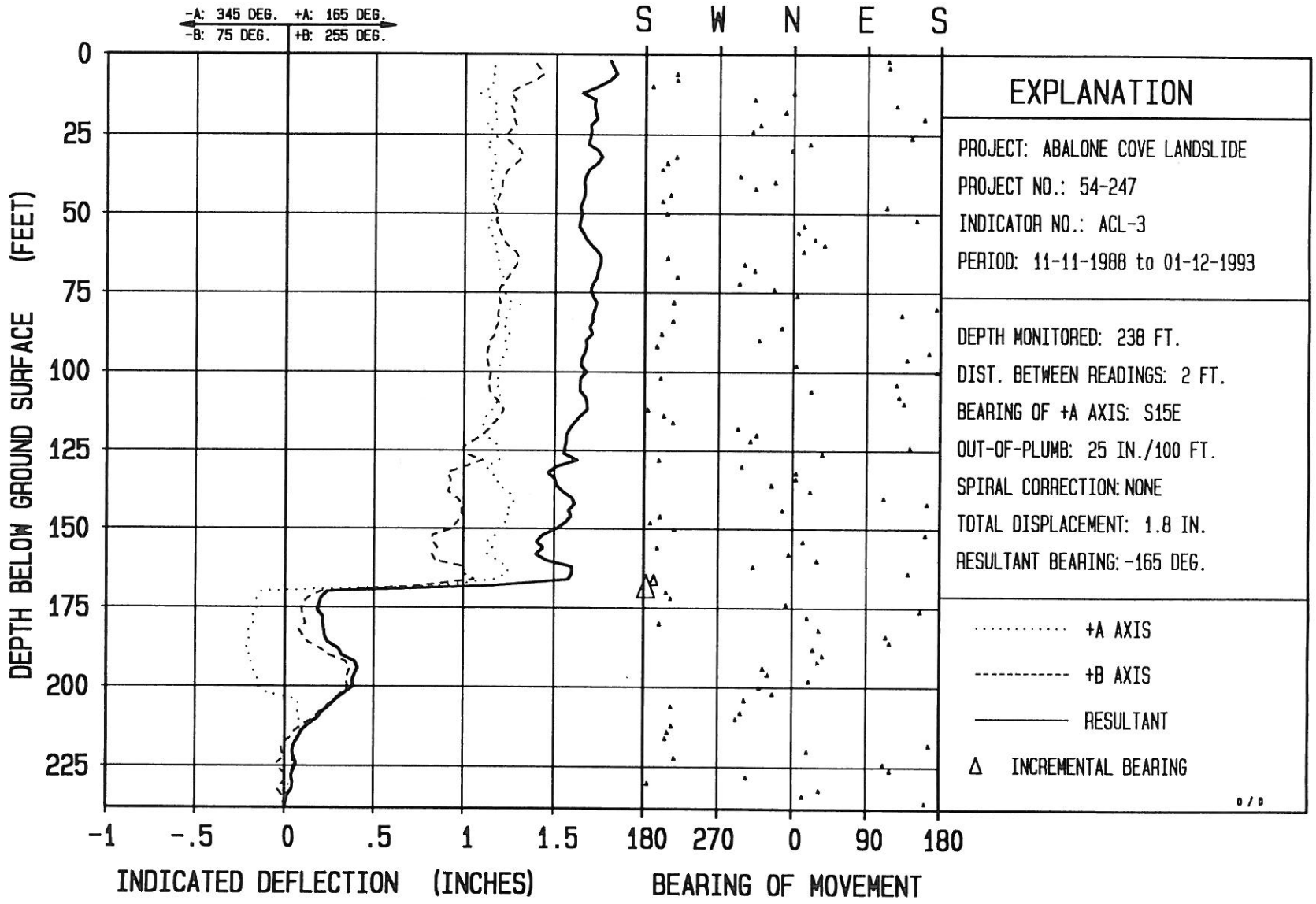

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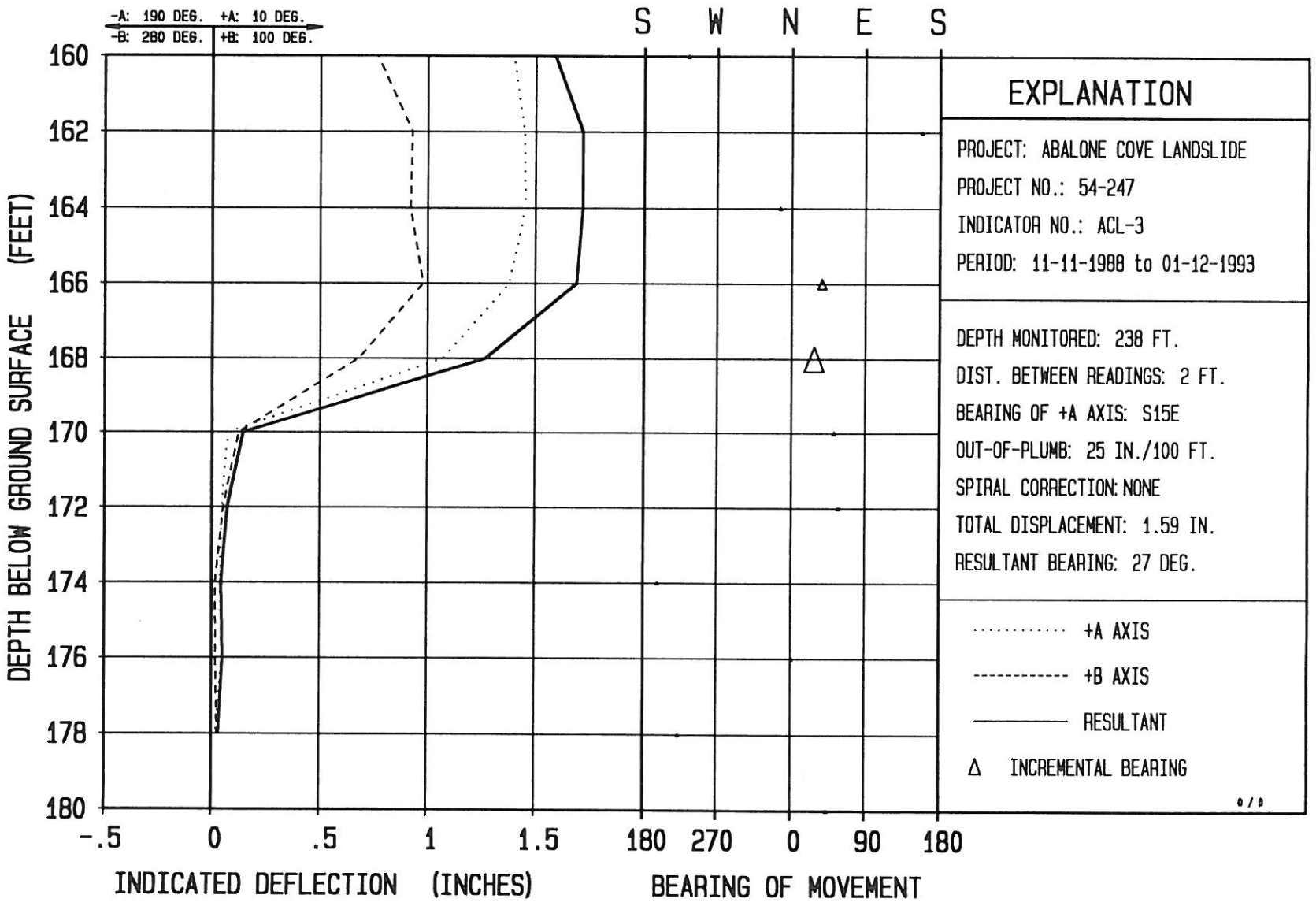

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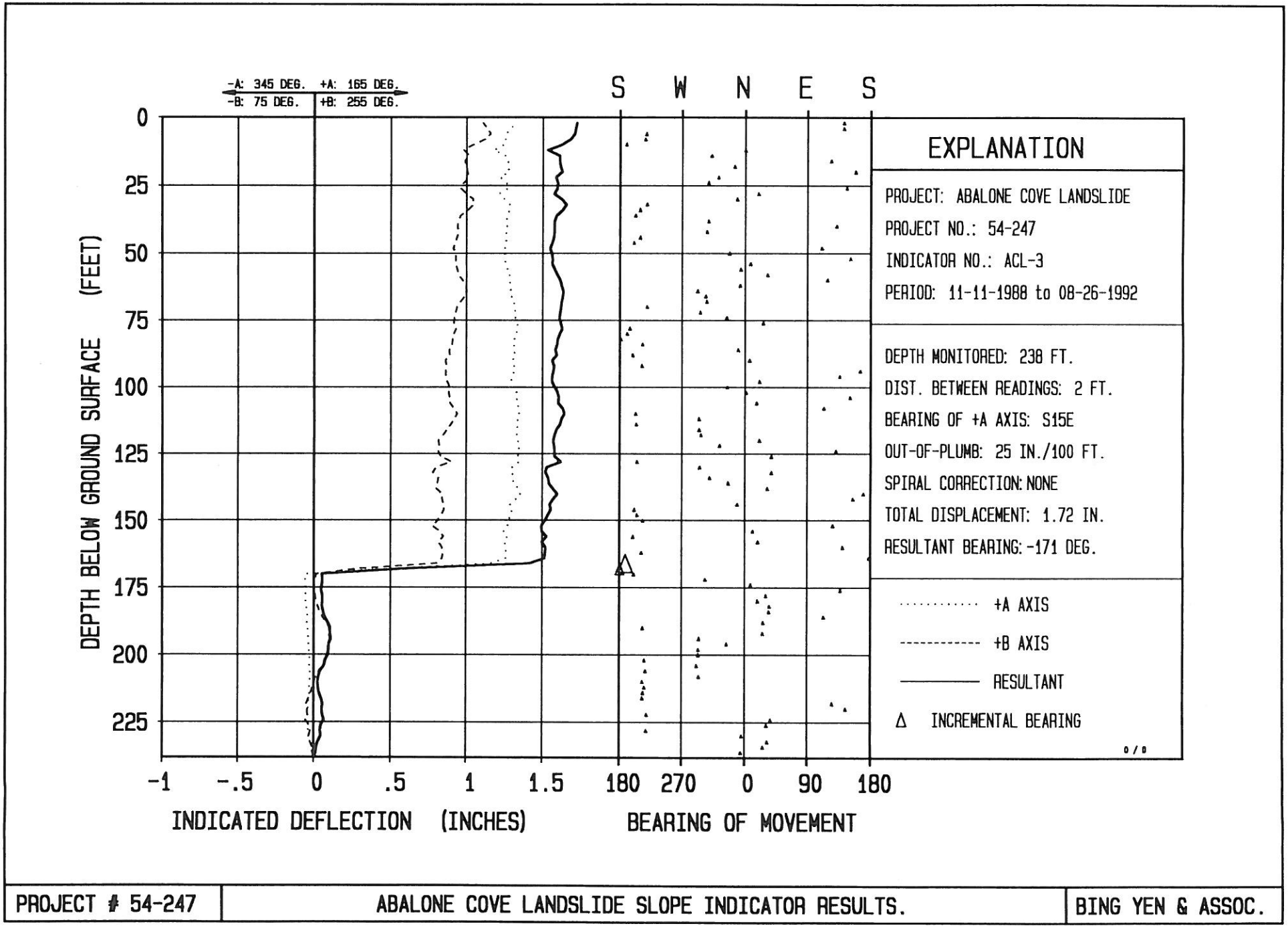

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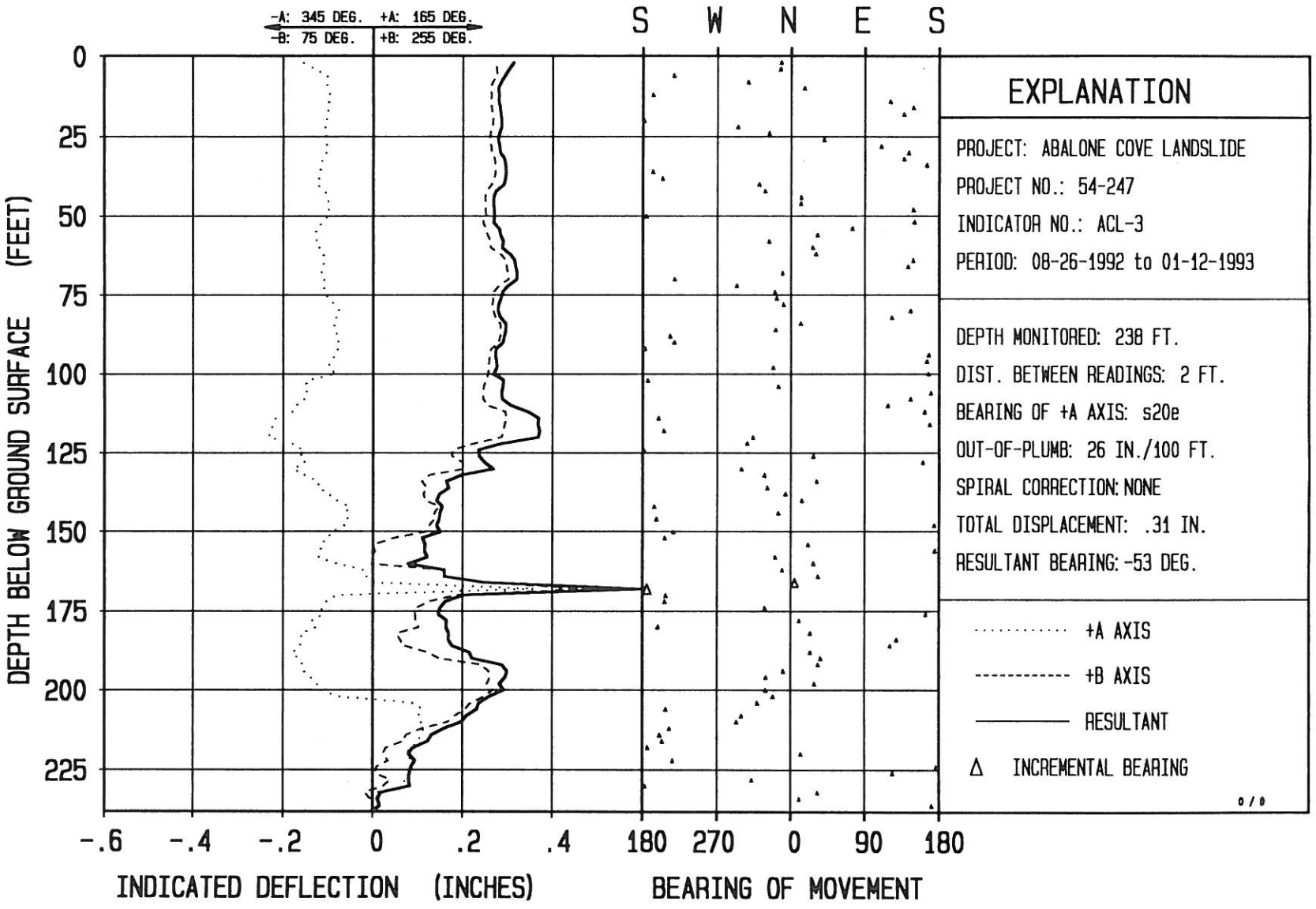

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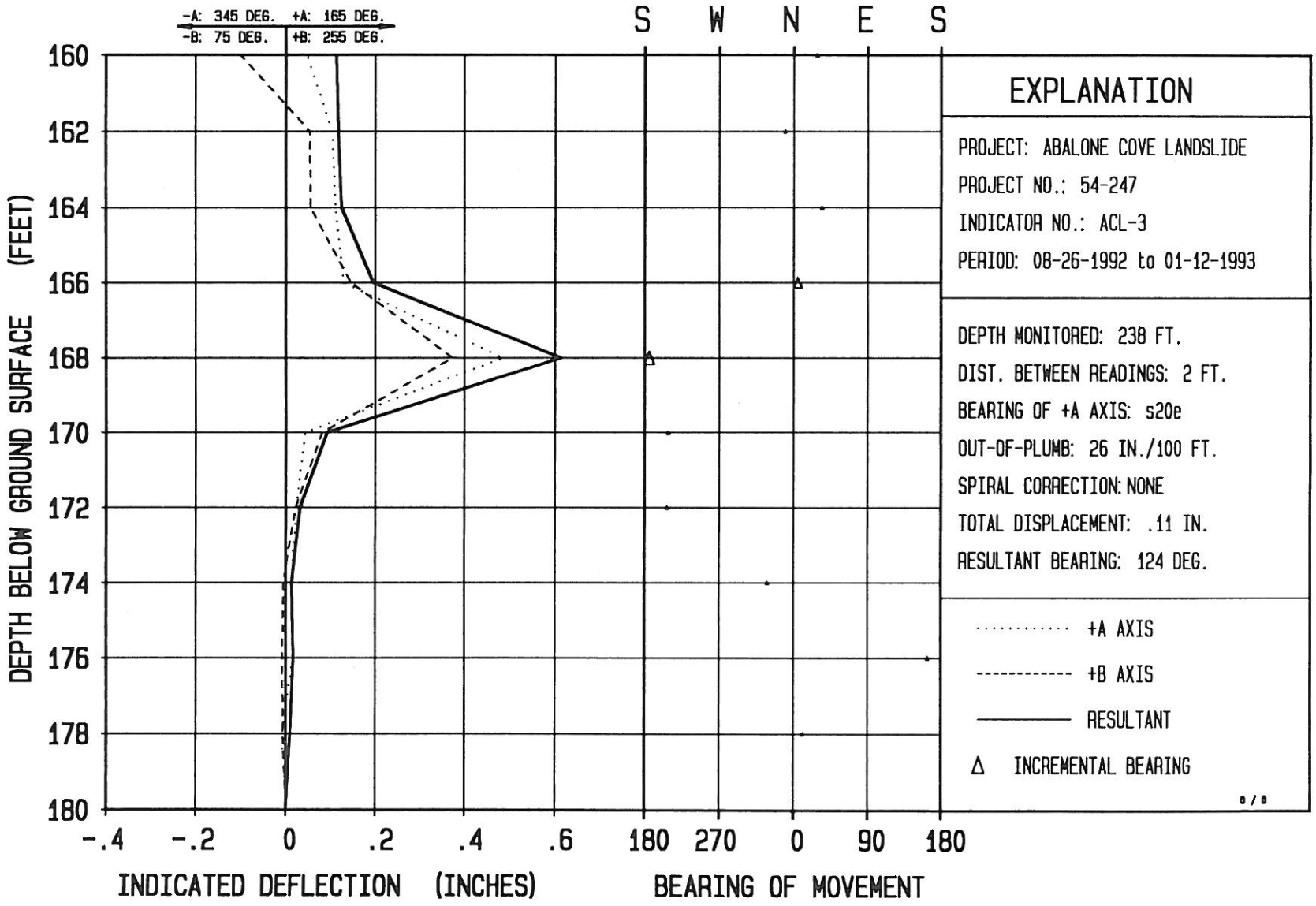

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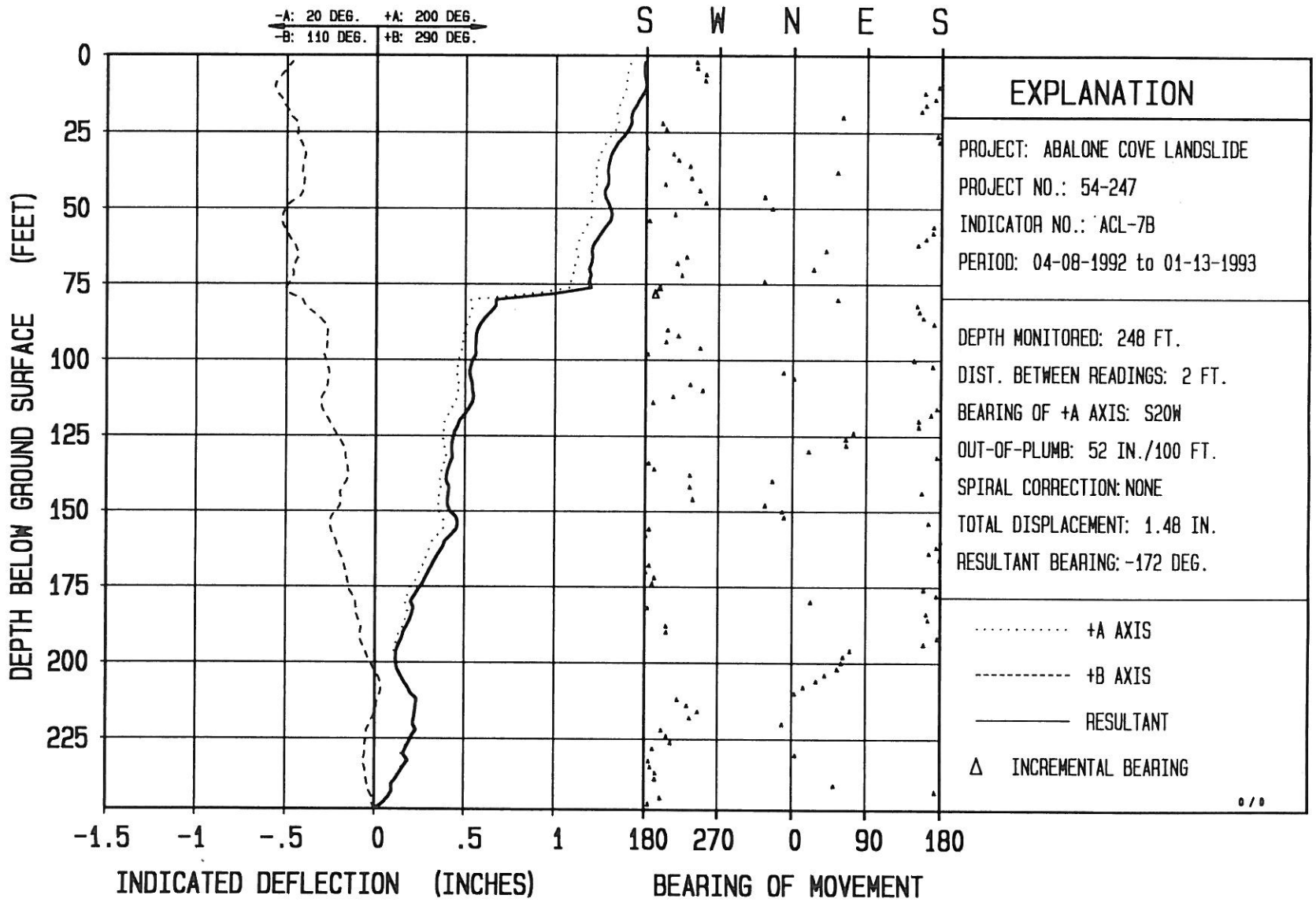

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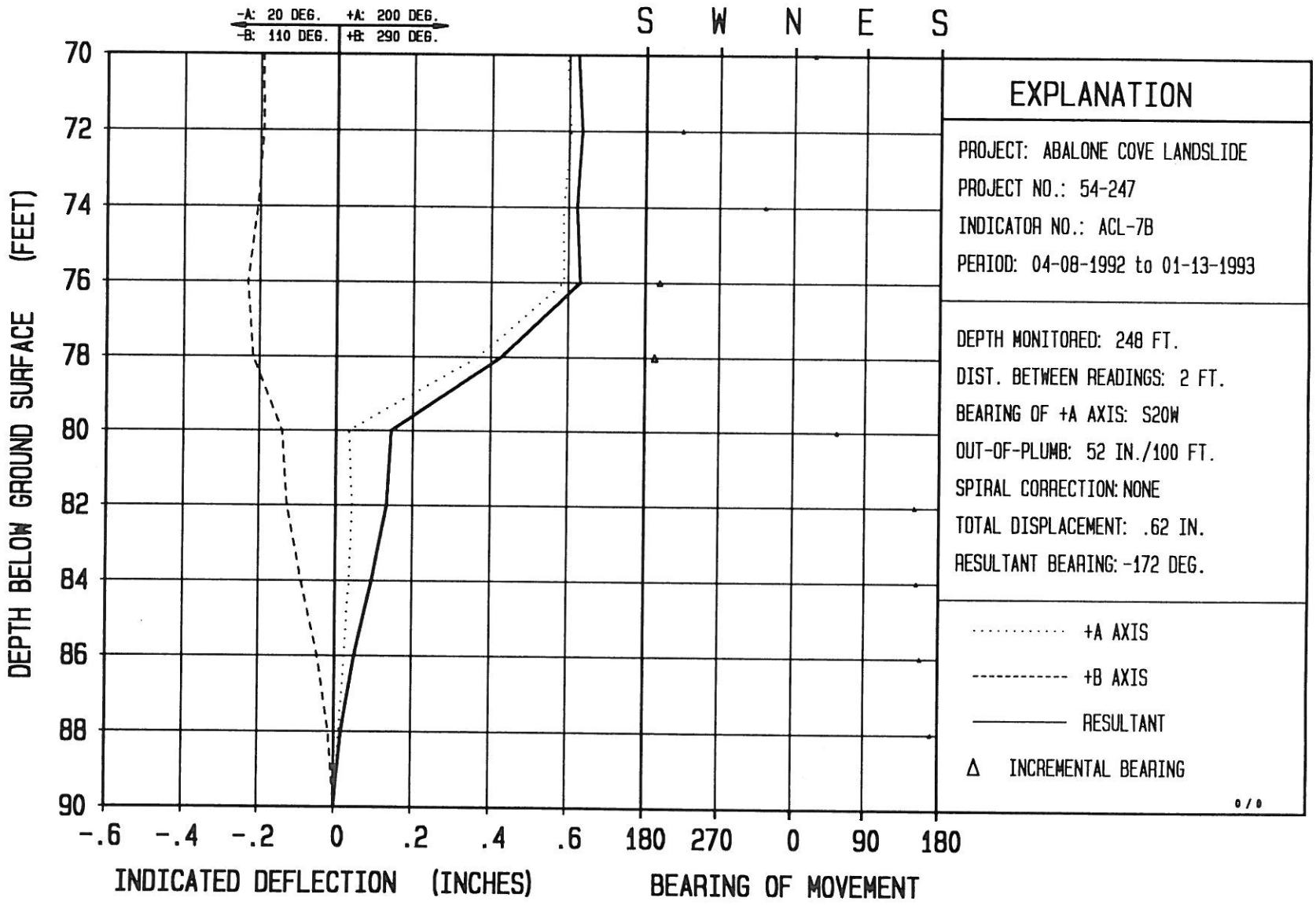

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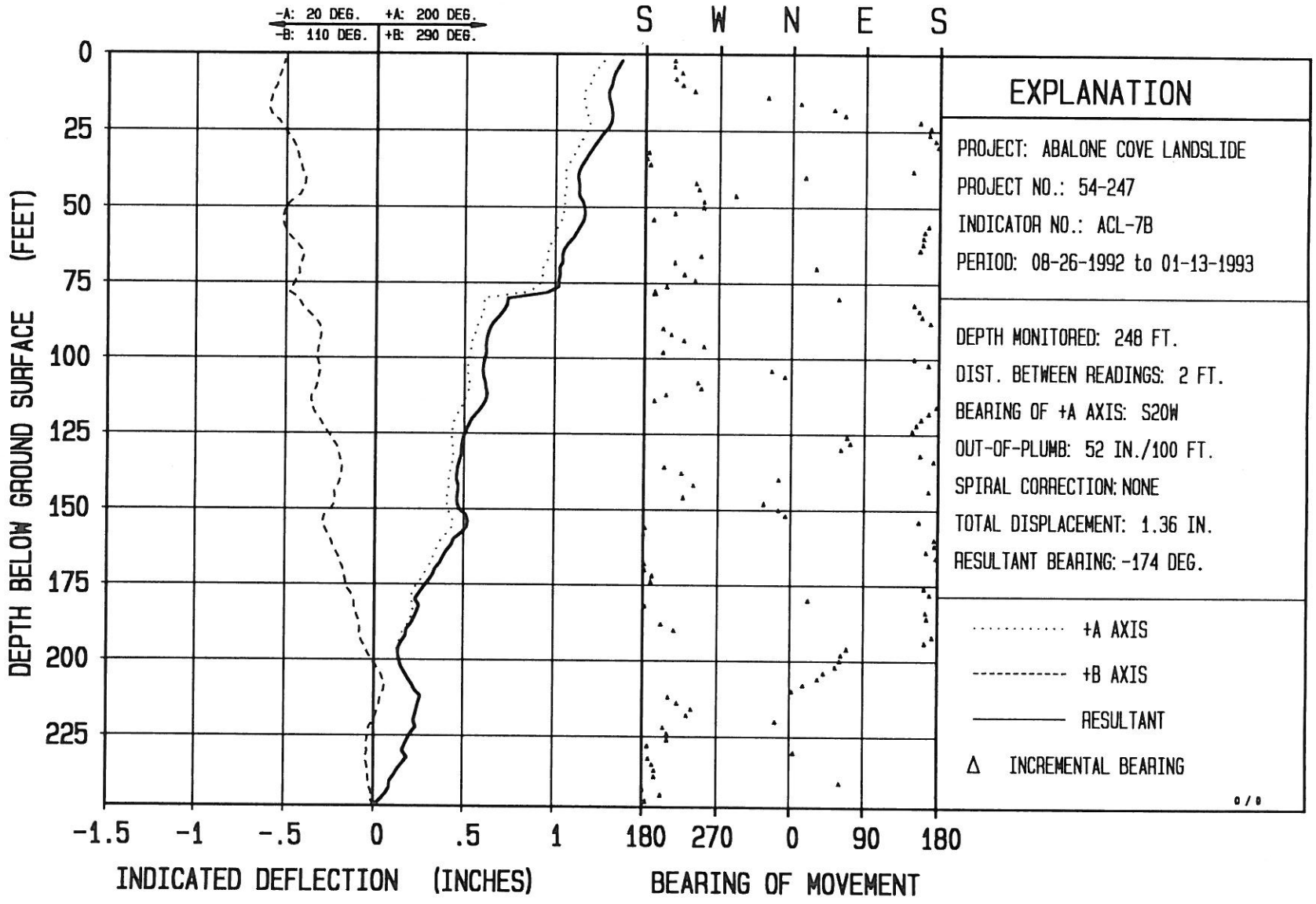

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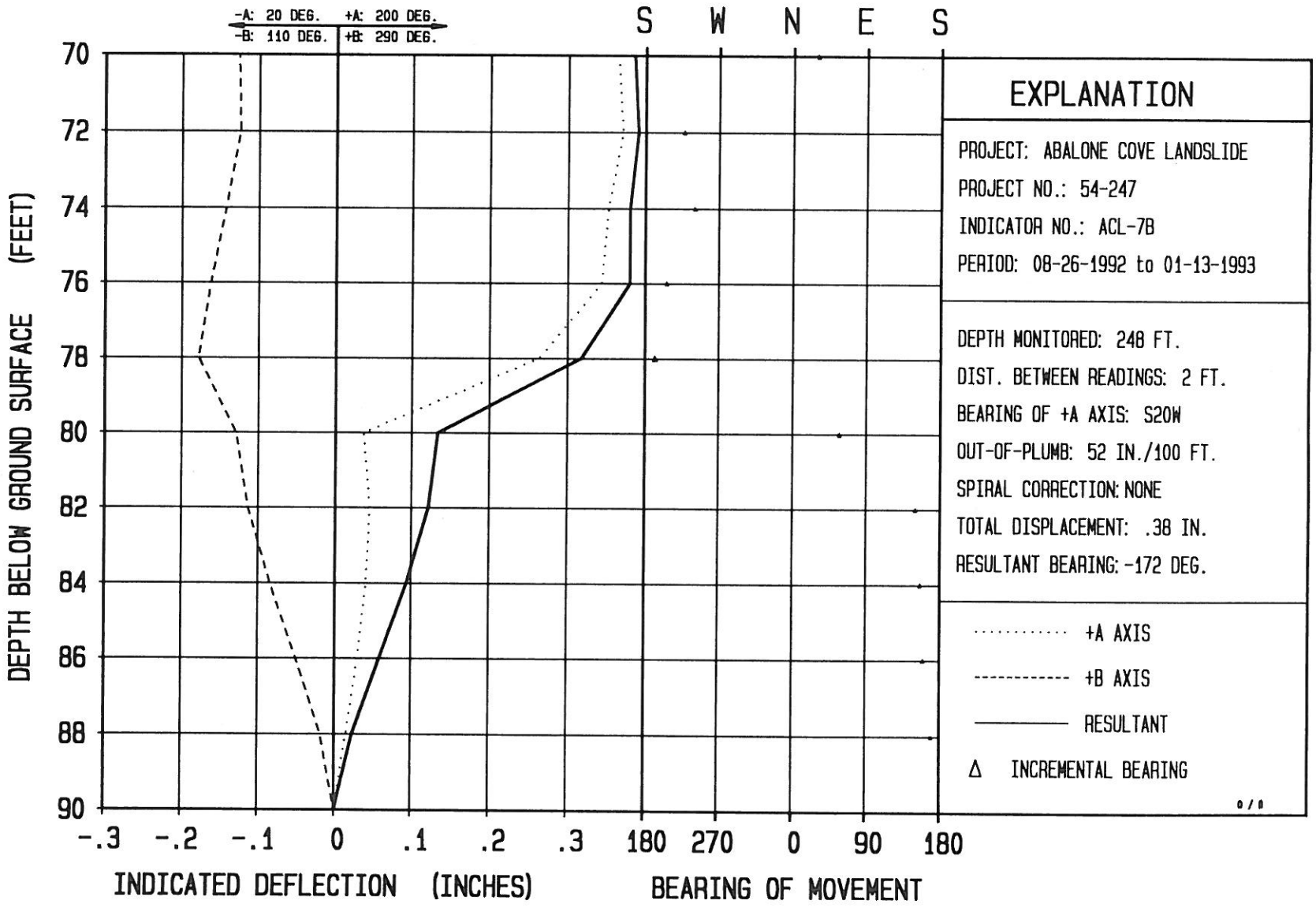

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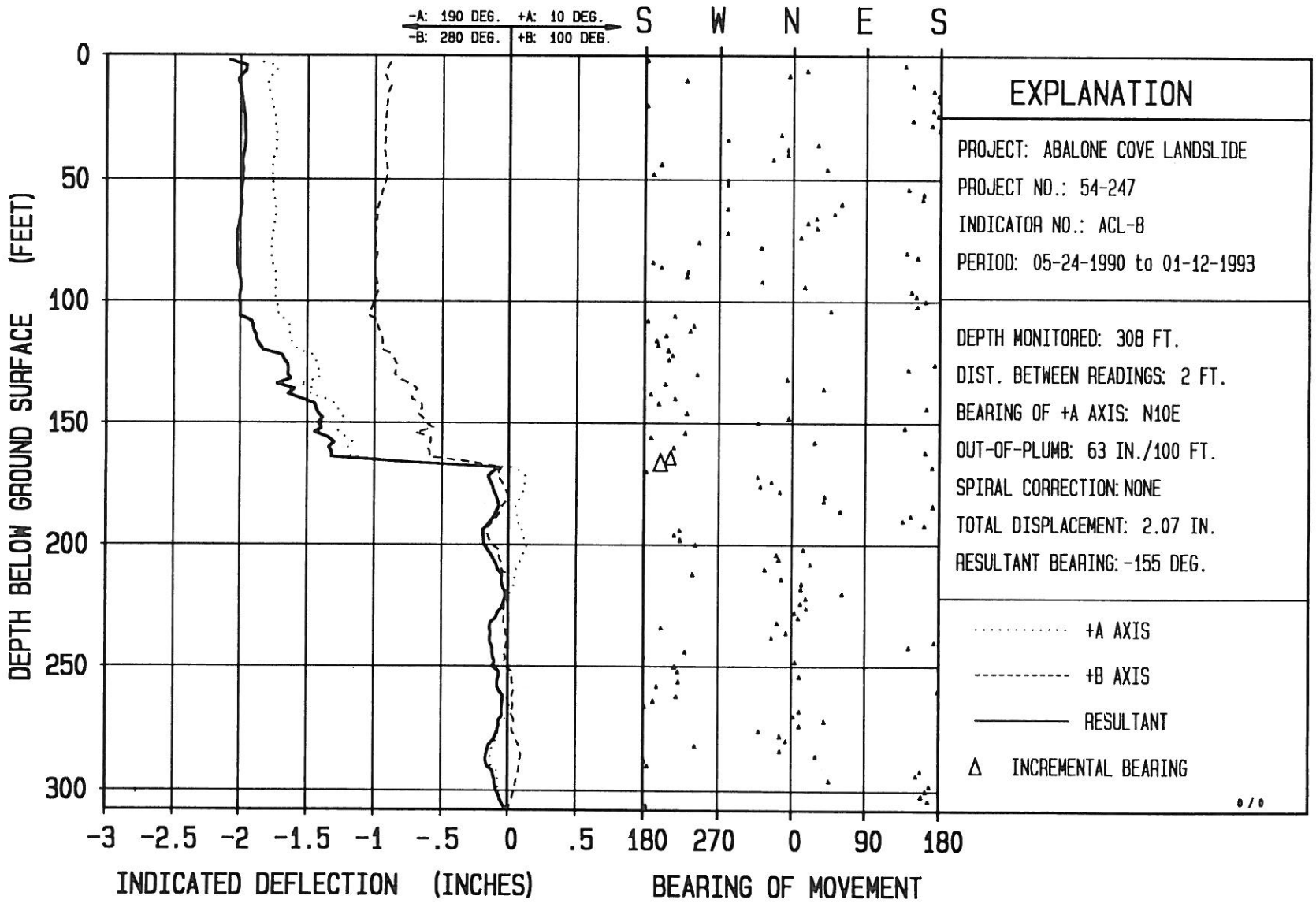

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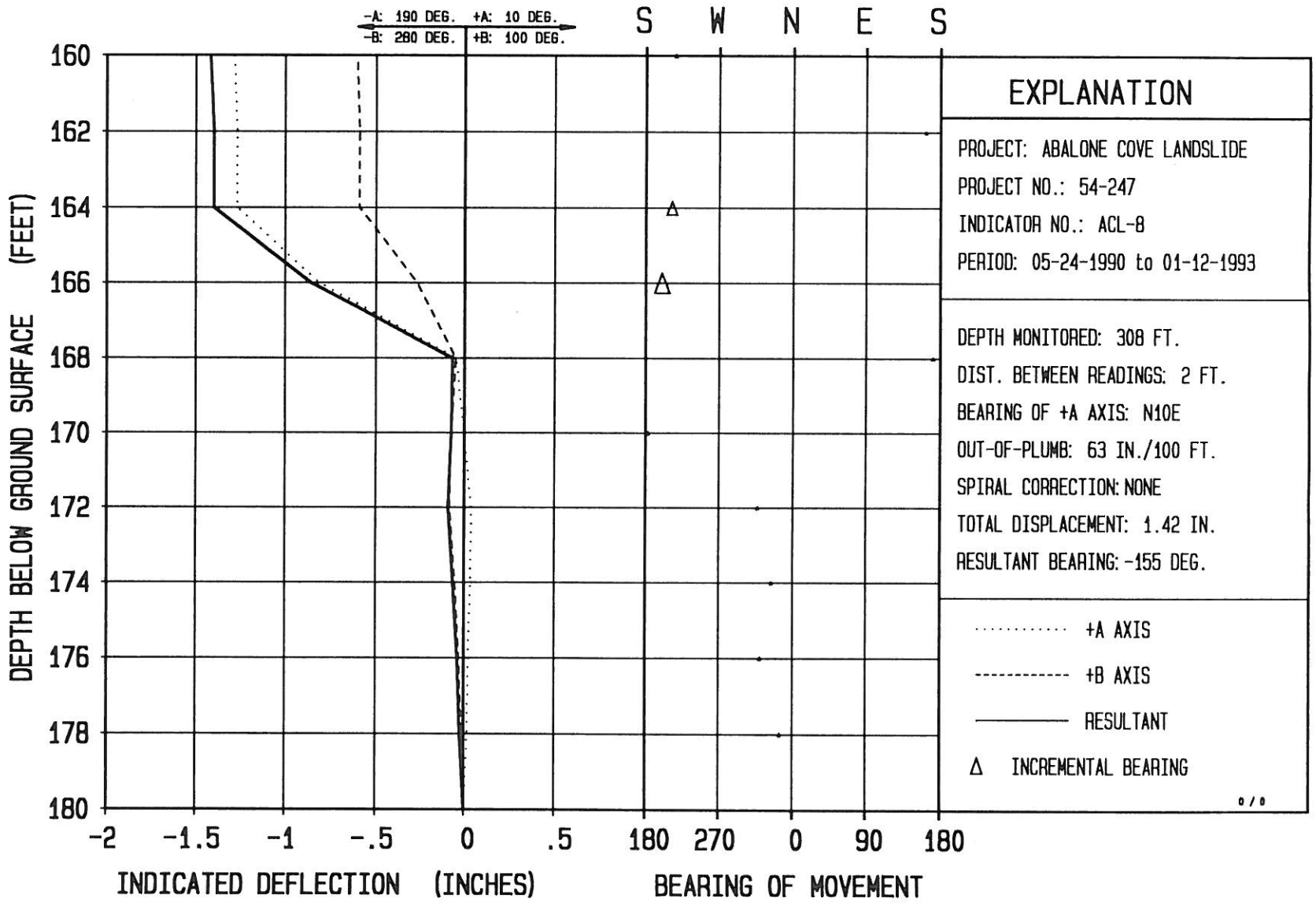

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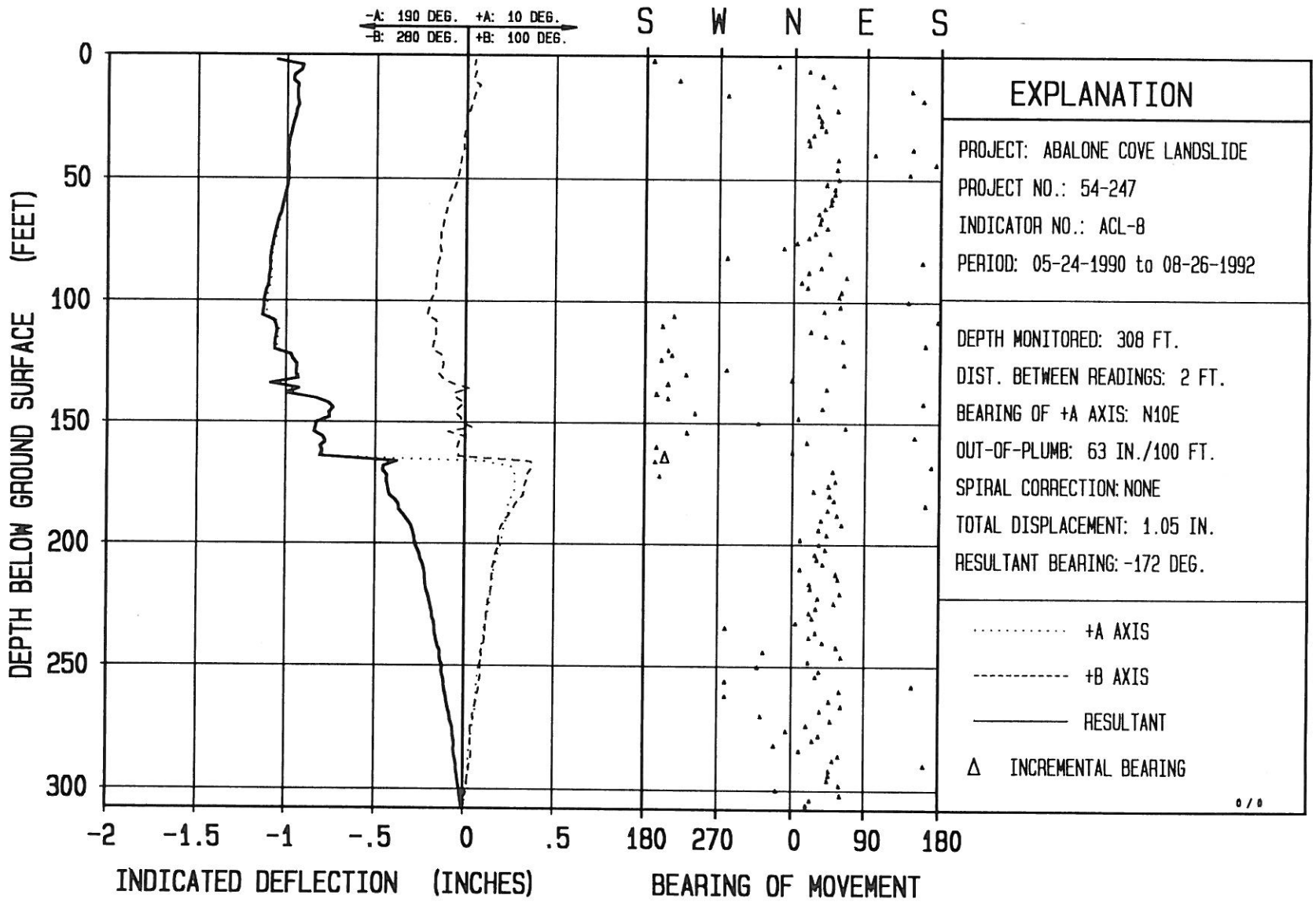

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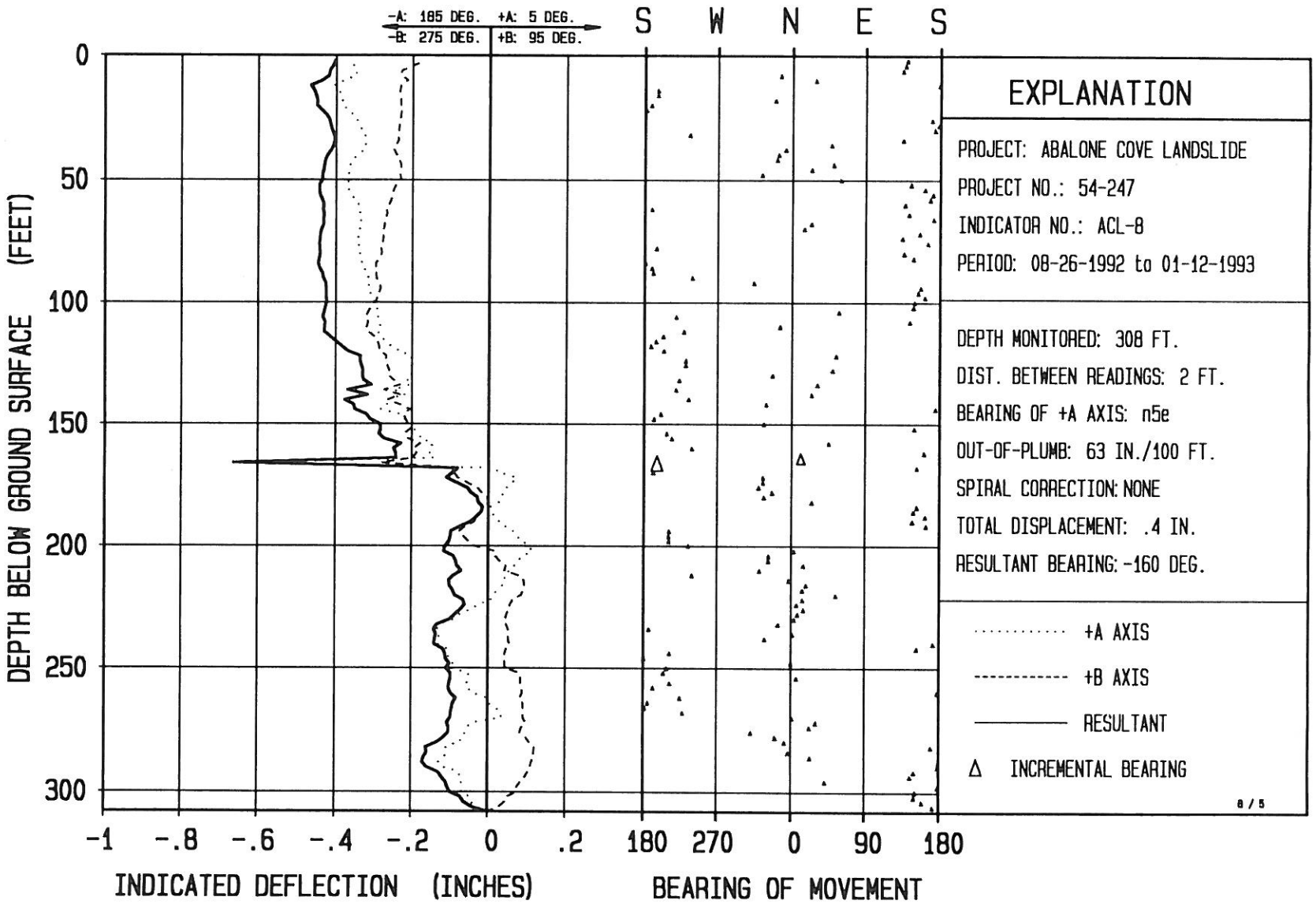

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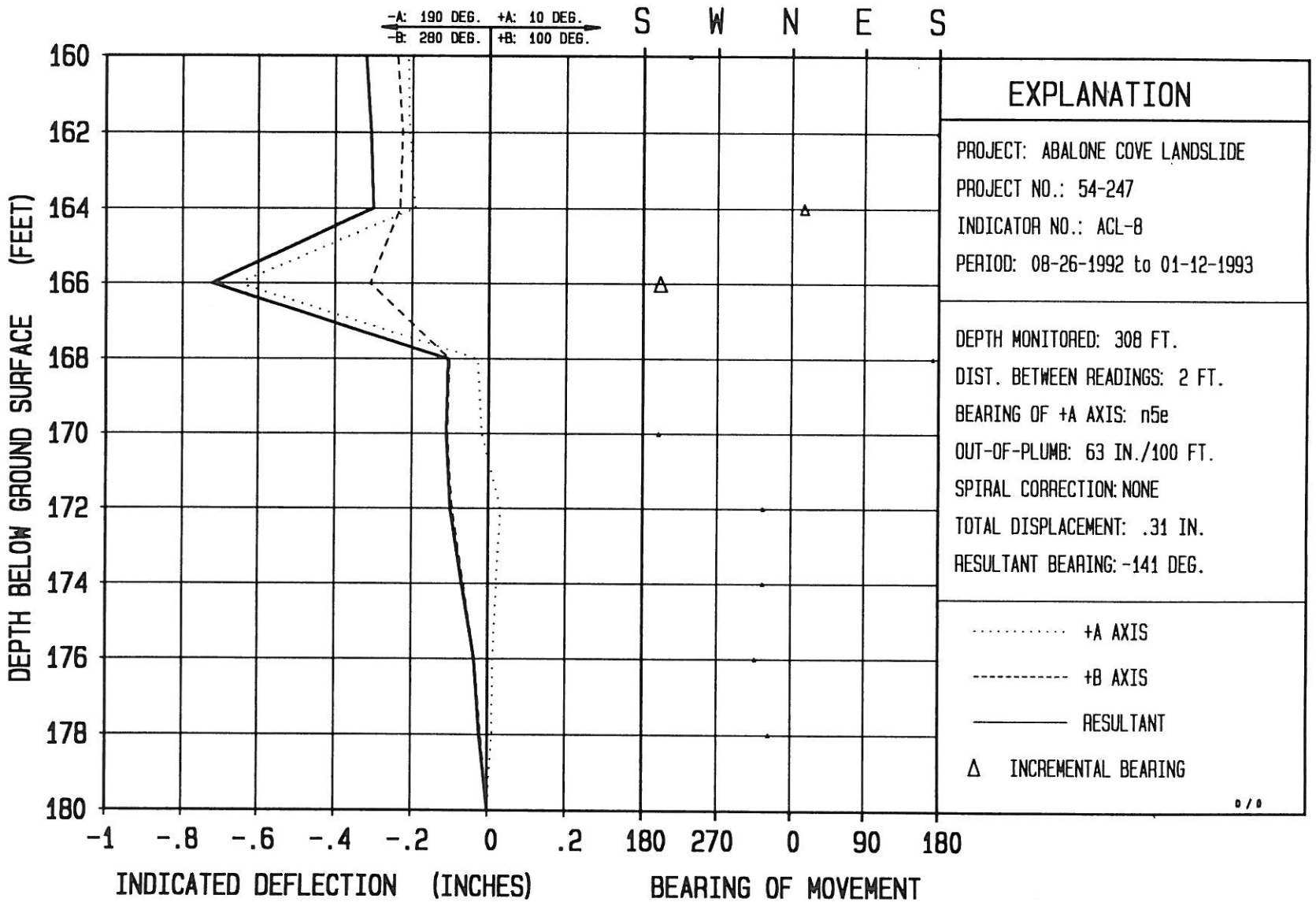
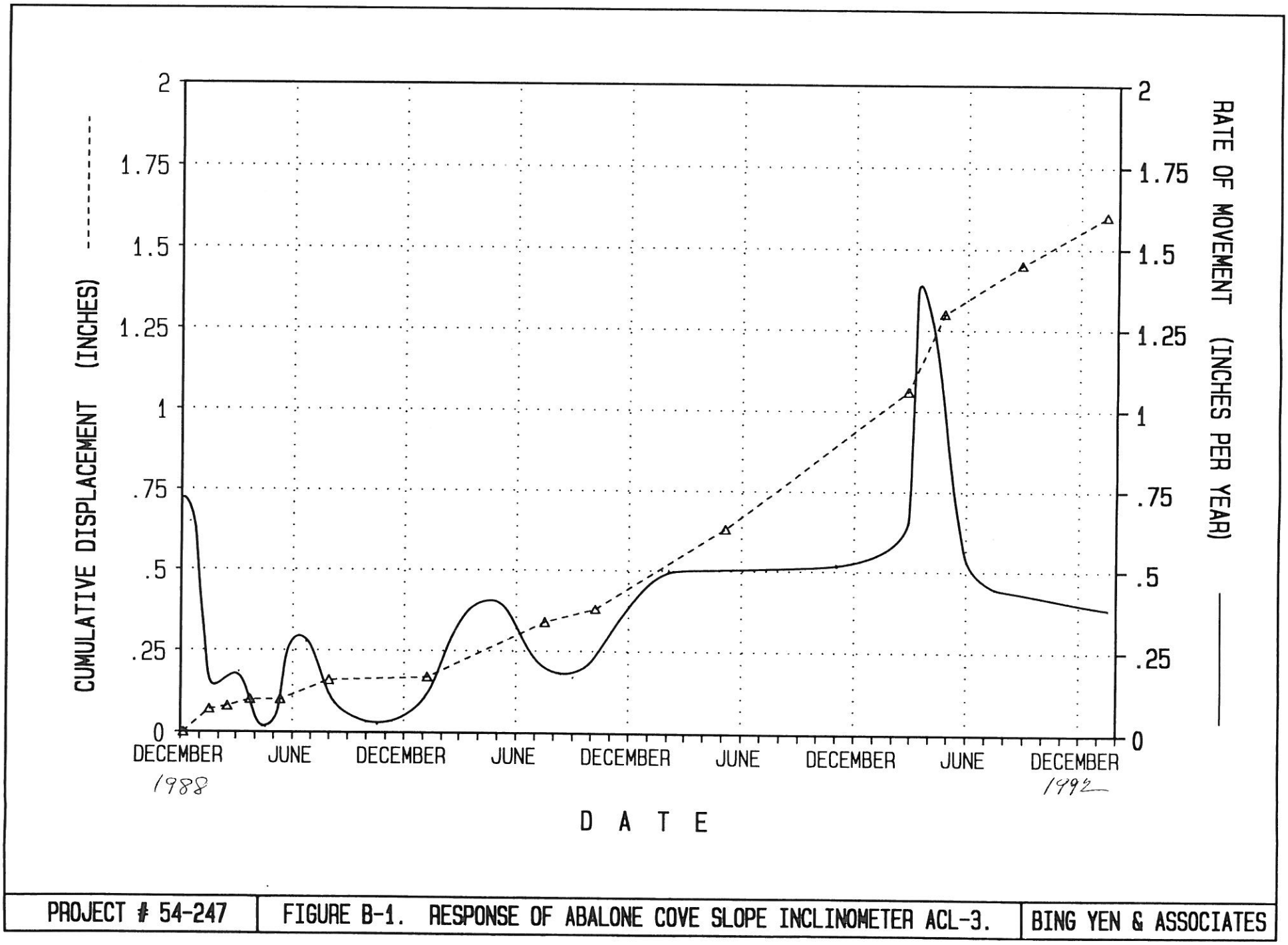


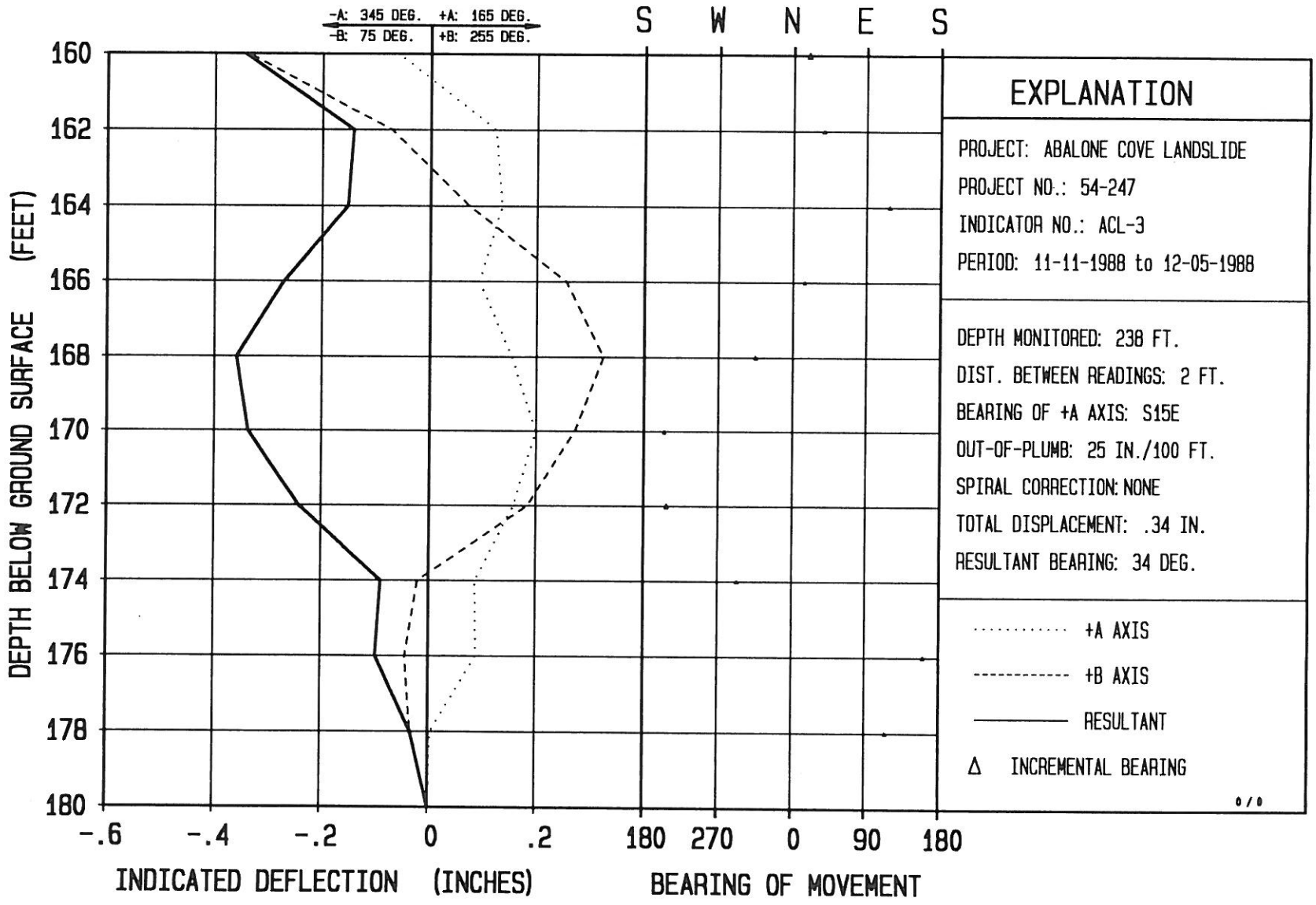
PROJECT # 54-247	ABALONE COVE LANDSLIDE SLOPE INCLINOMETER RESULTS.	BING YEN & ASSOC.

APPENDIX B

(DISPLACEMENT TIME-HISTORY FOR ACL-3)



PROJECT # 54-247	FIGURE B-1. RESPONSE OF ABALONE COVE SLOPE INCLINOMETER ACL-3.	BING YEN & ASSOCIATES



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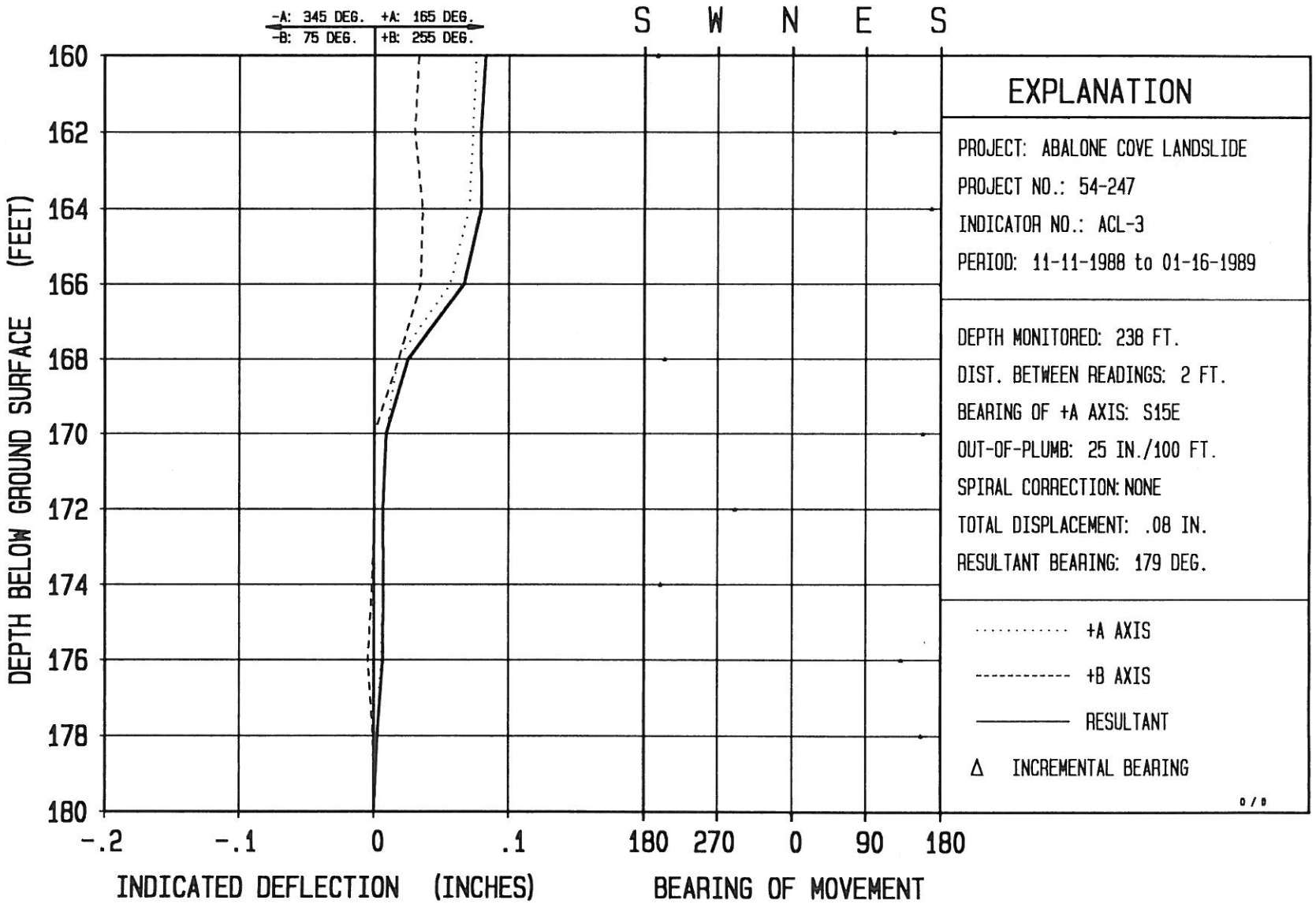

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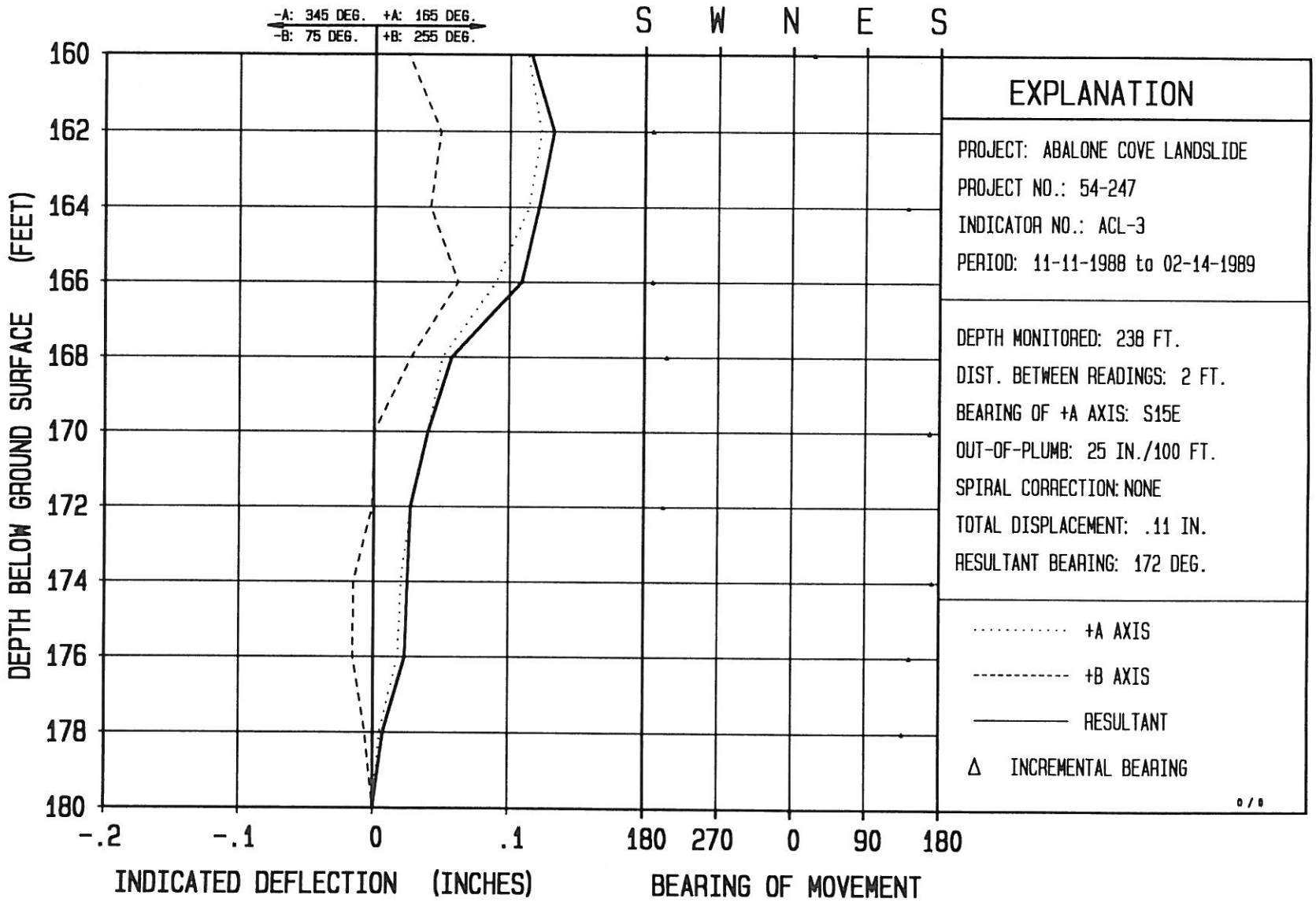

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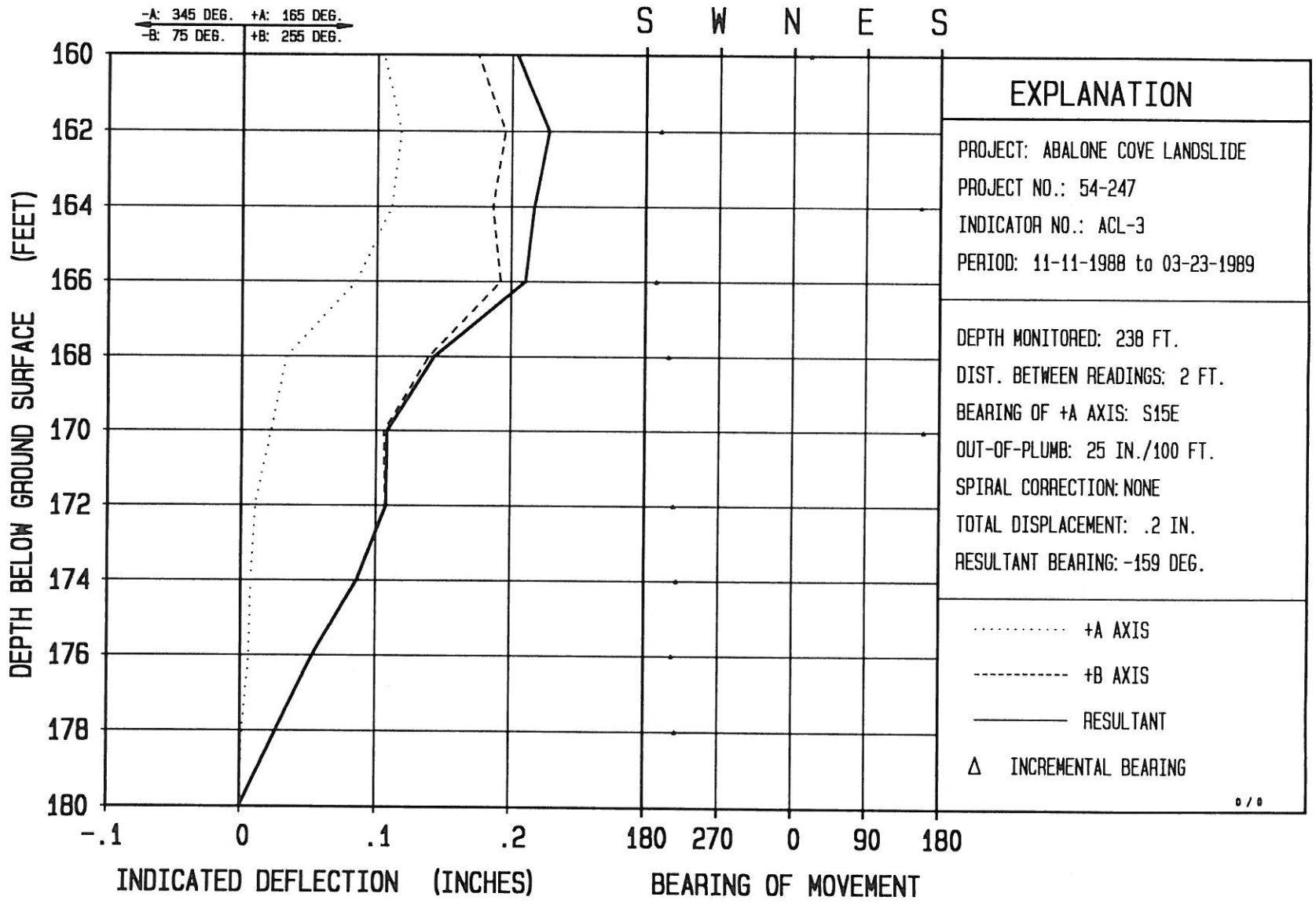

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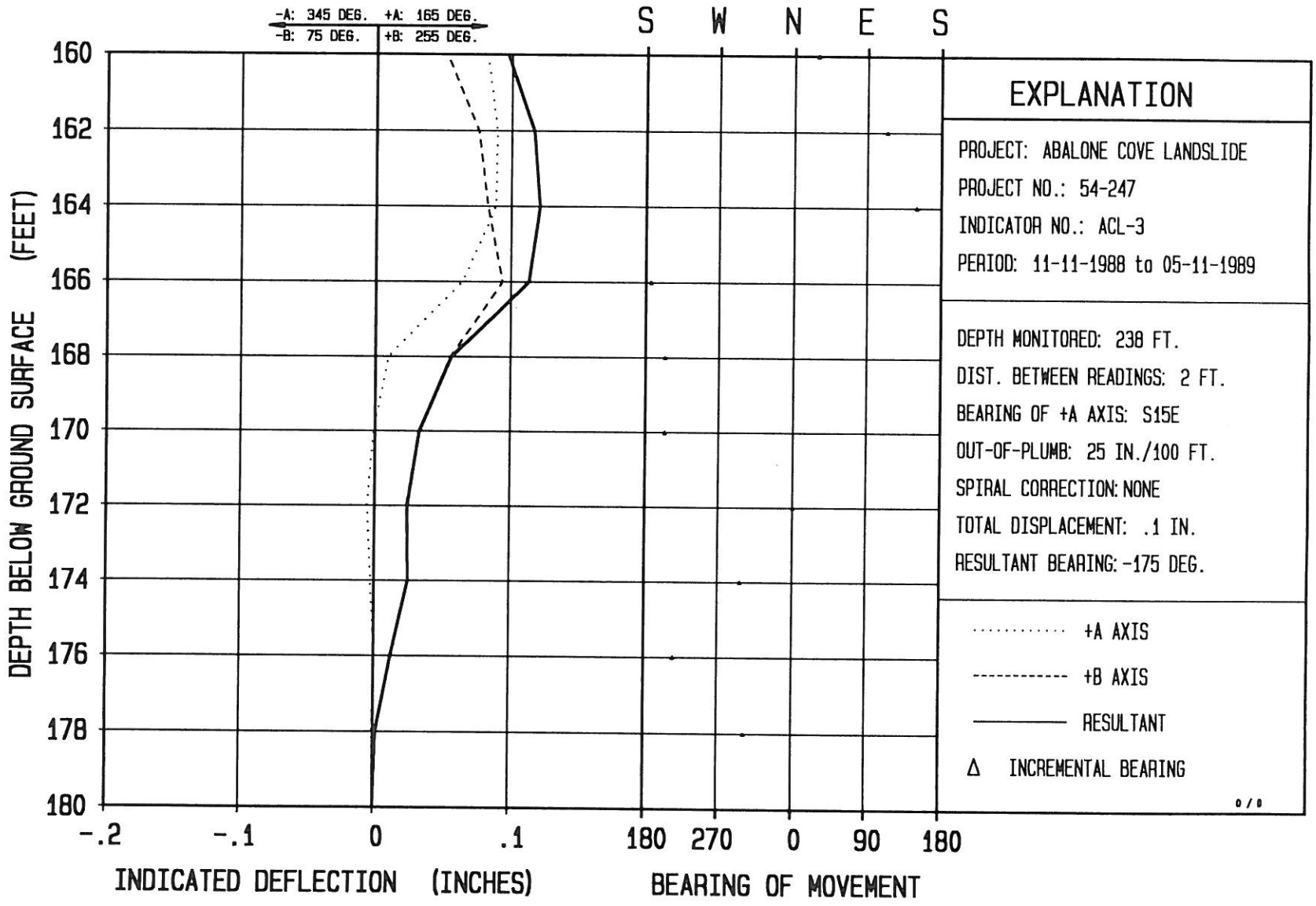

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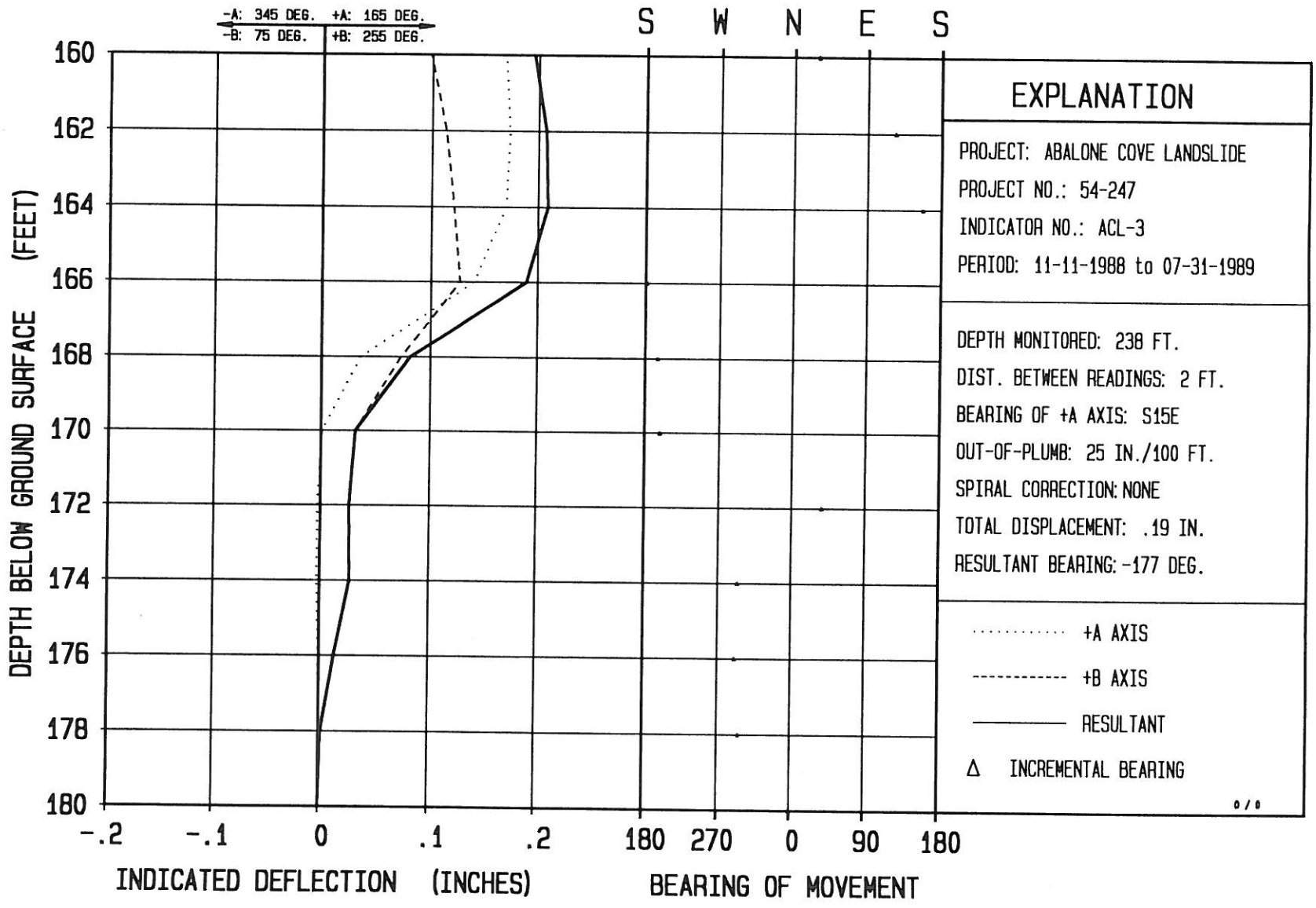

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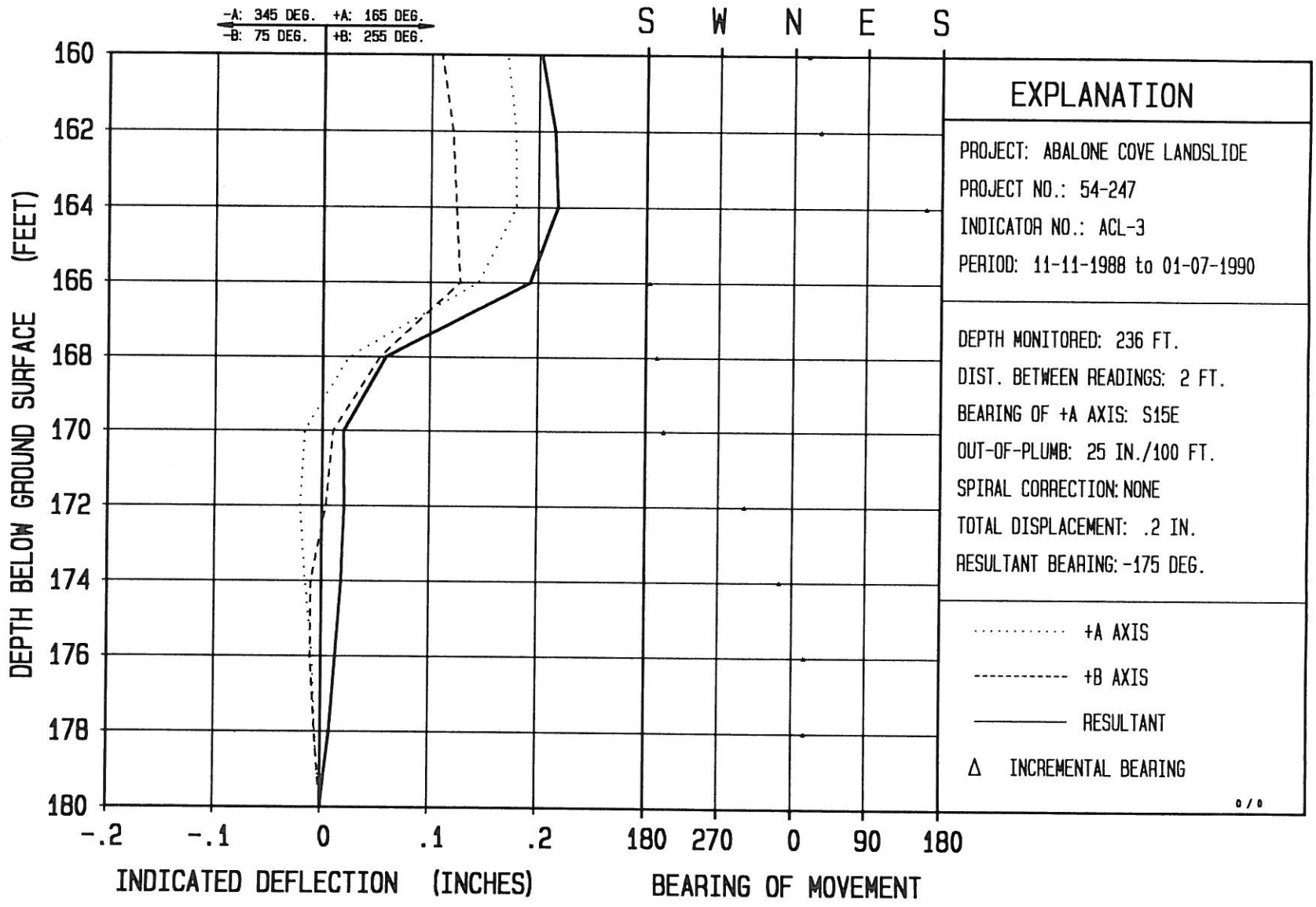

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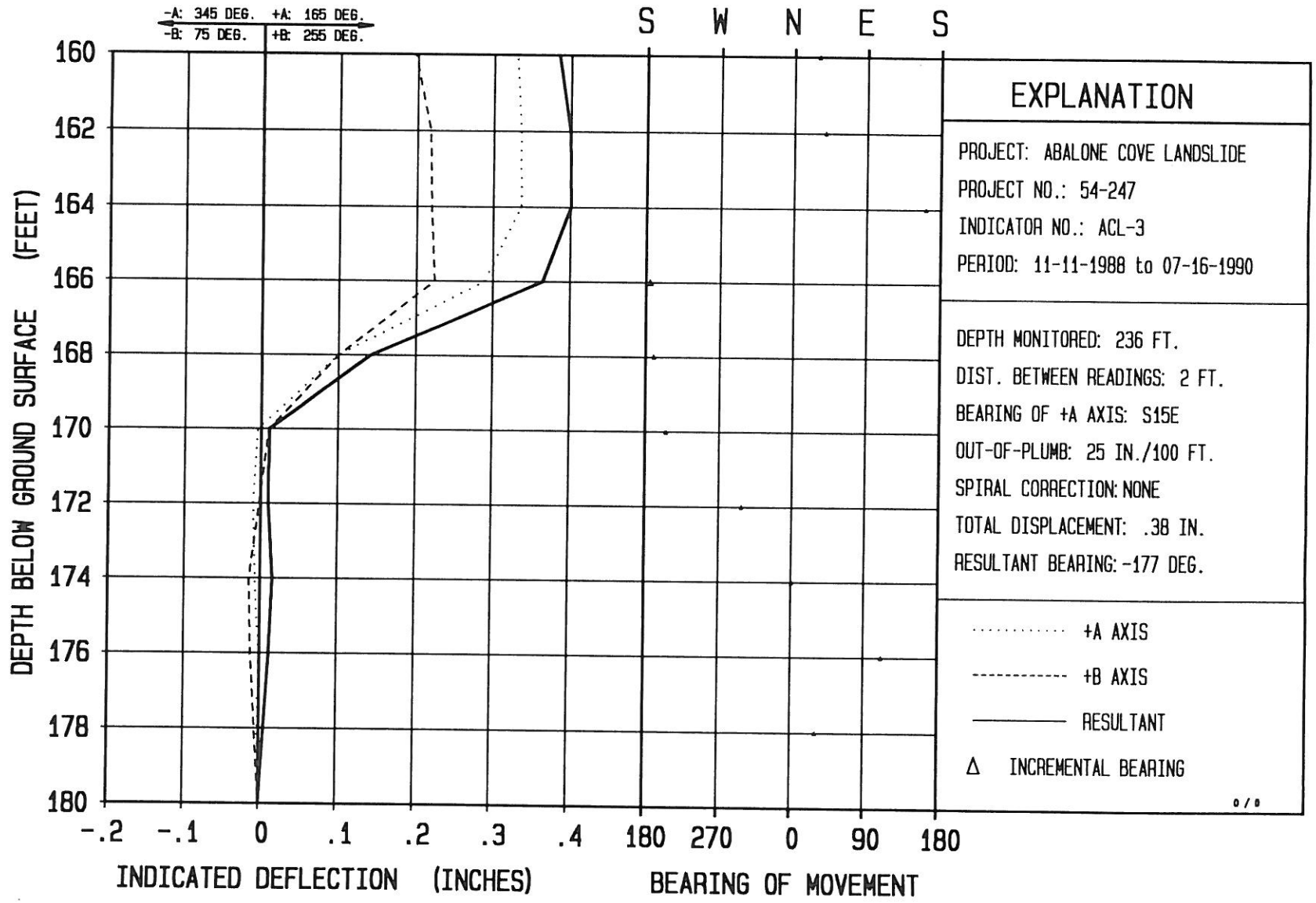

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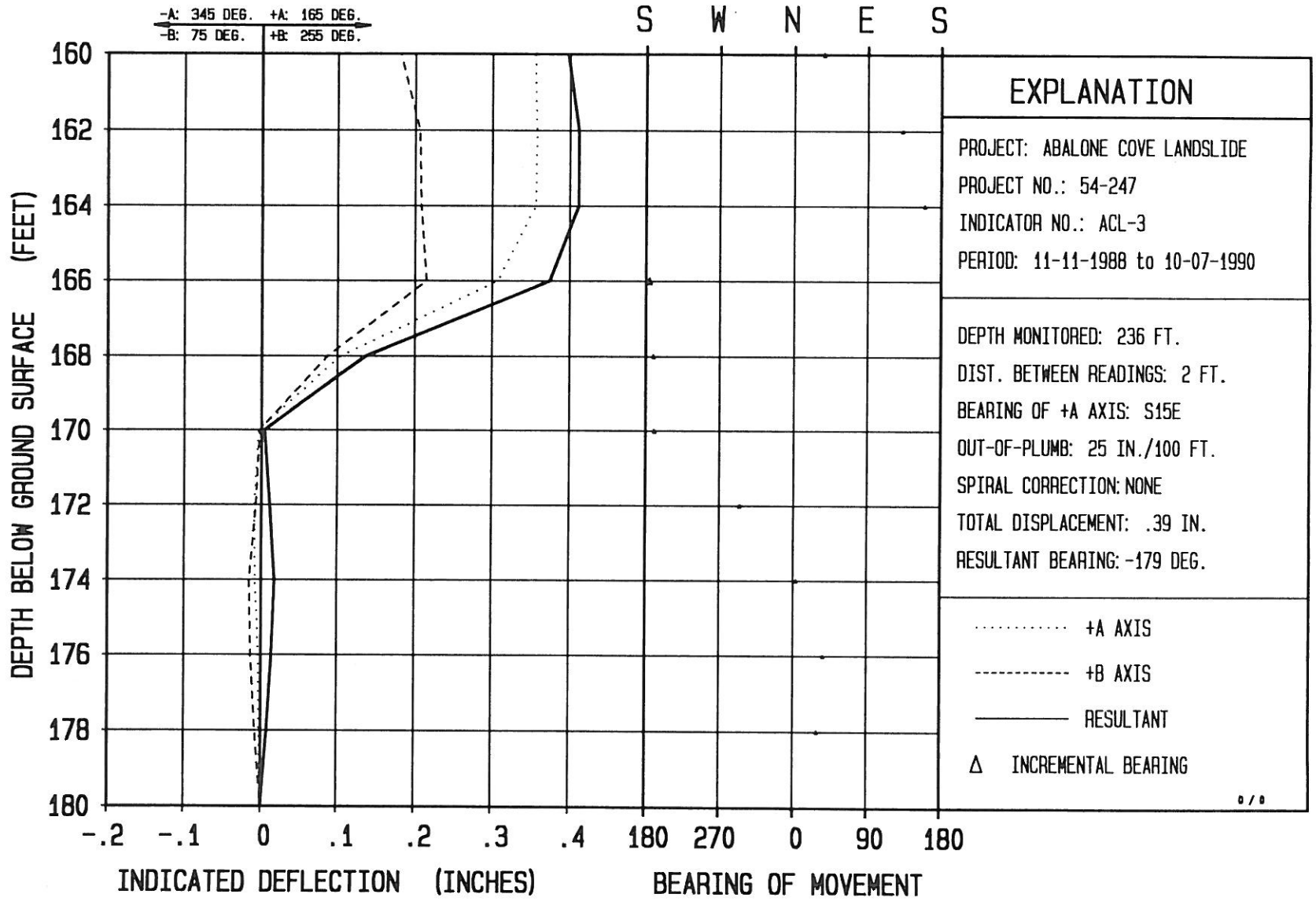

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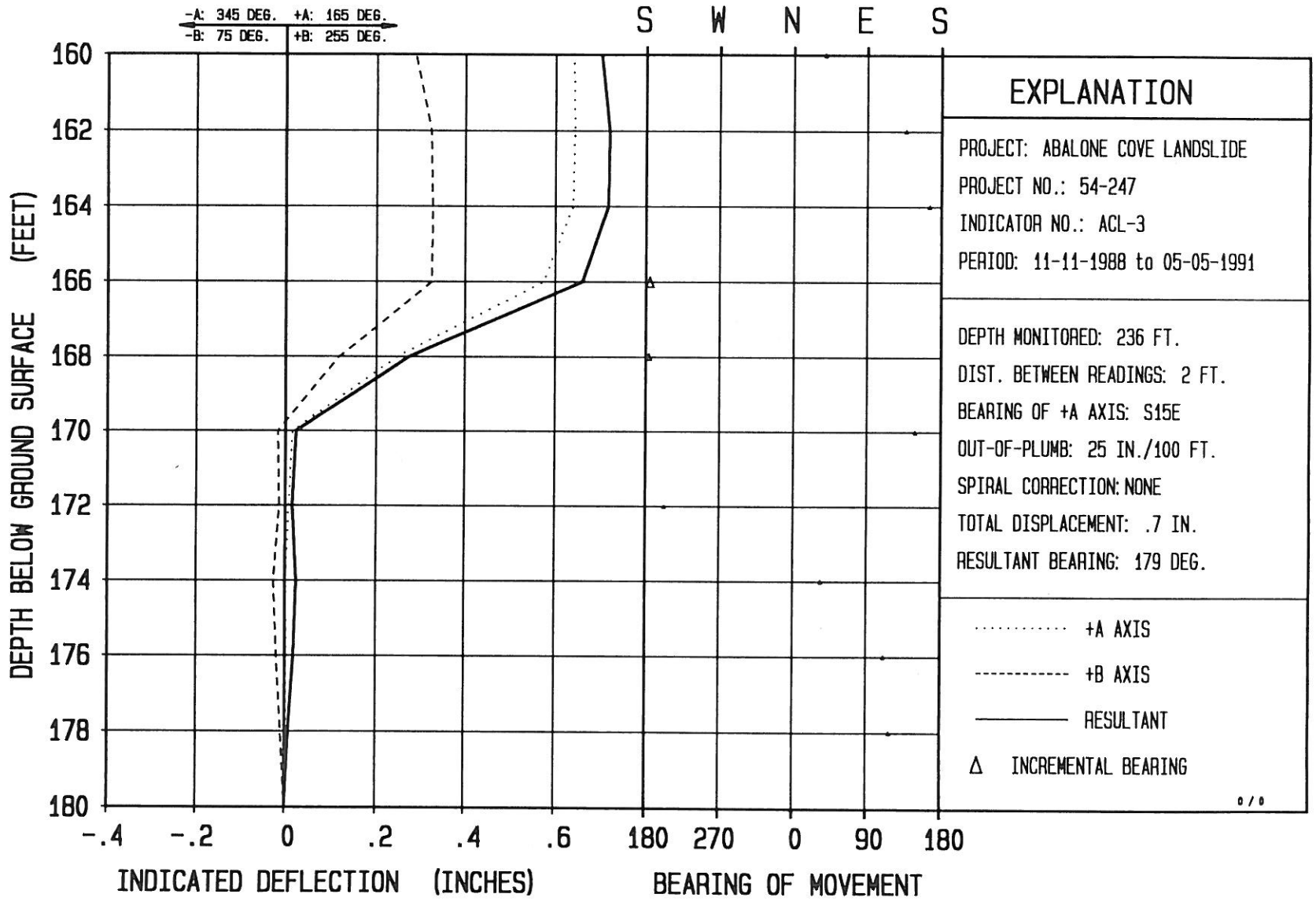

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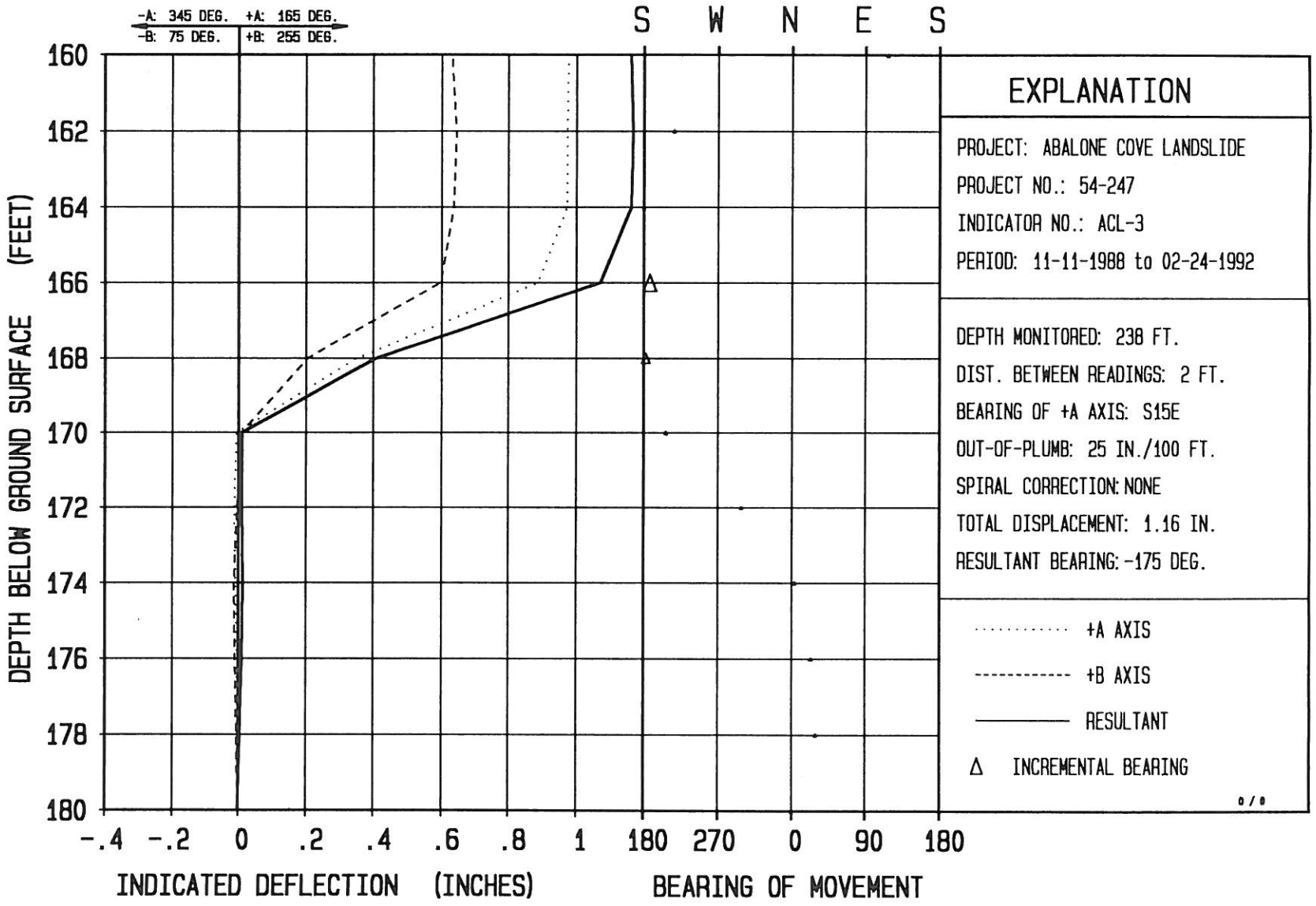

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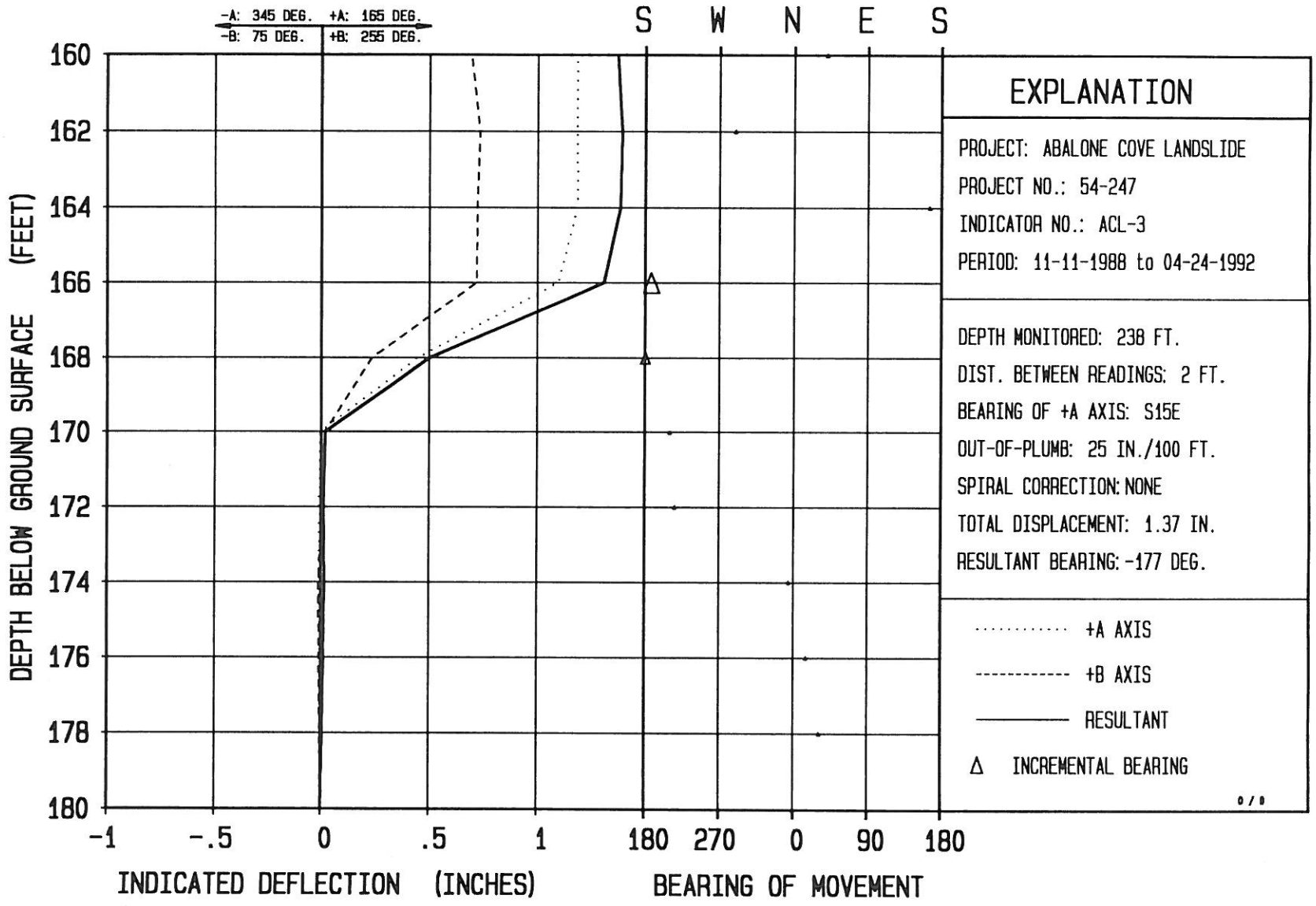

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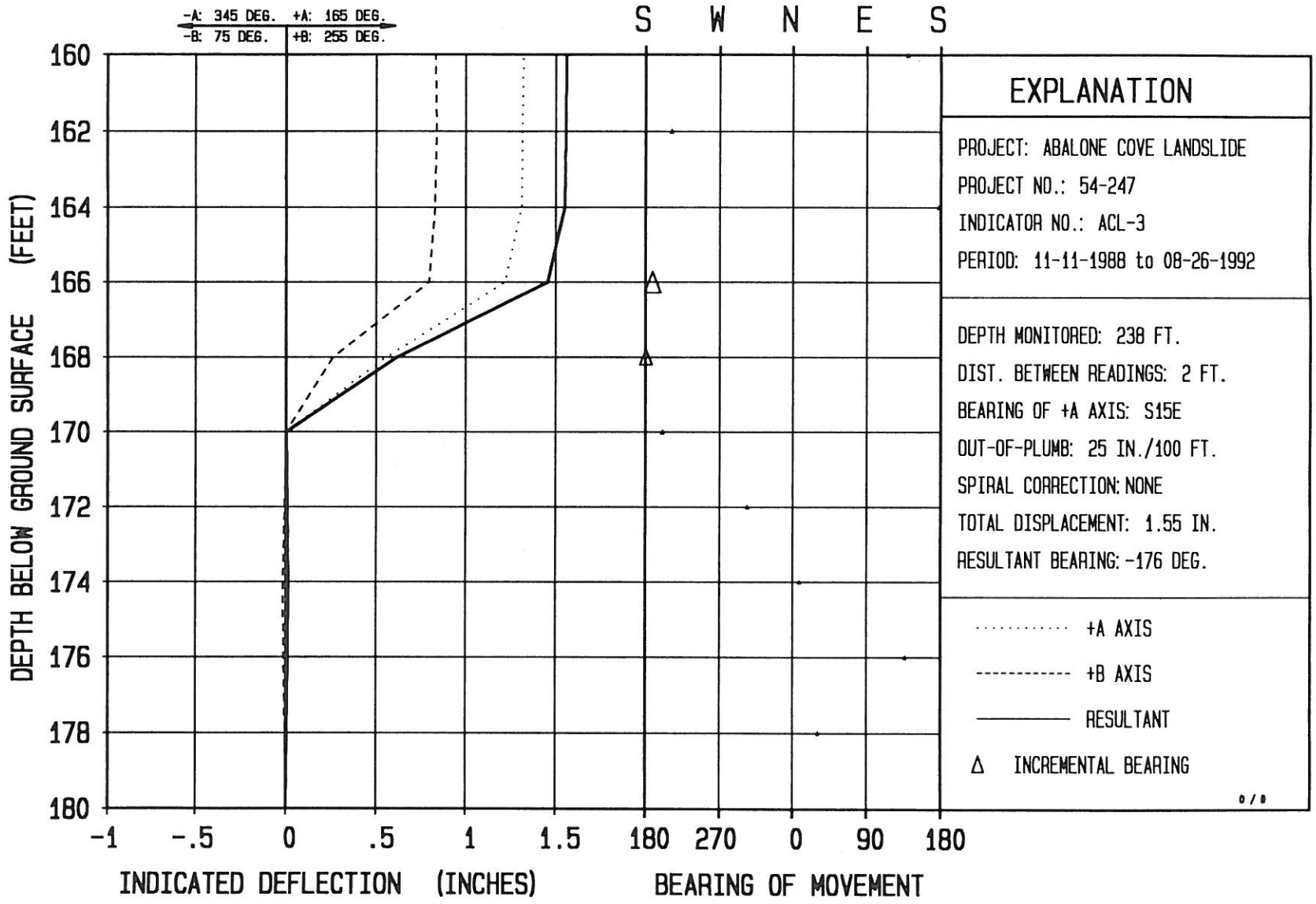

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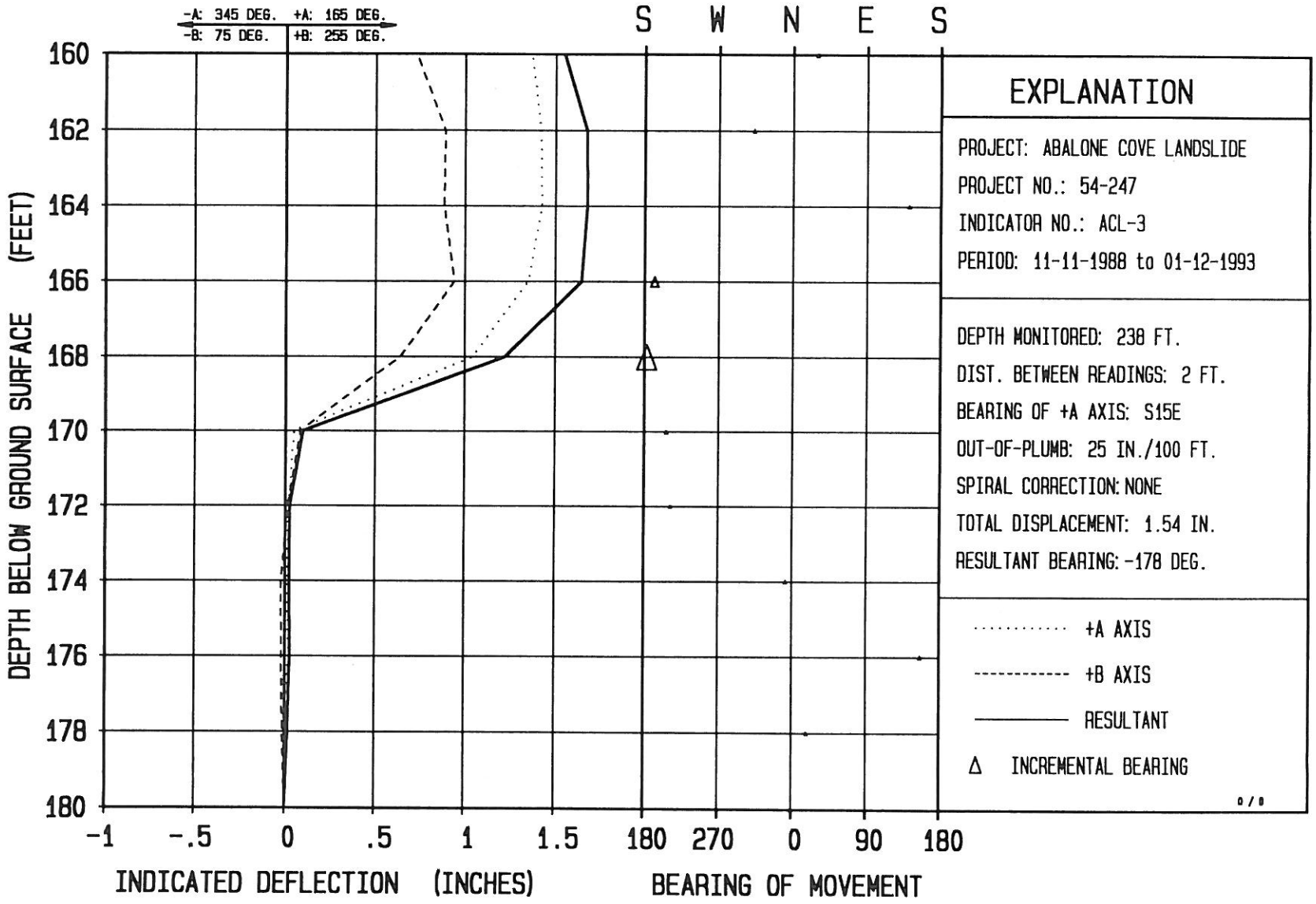
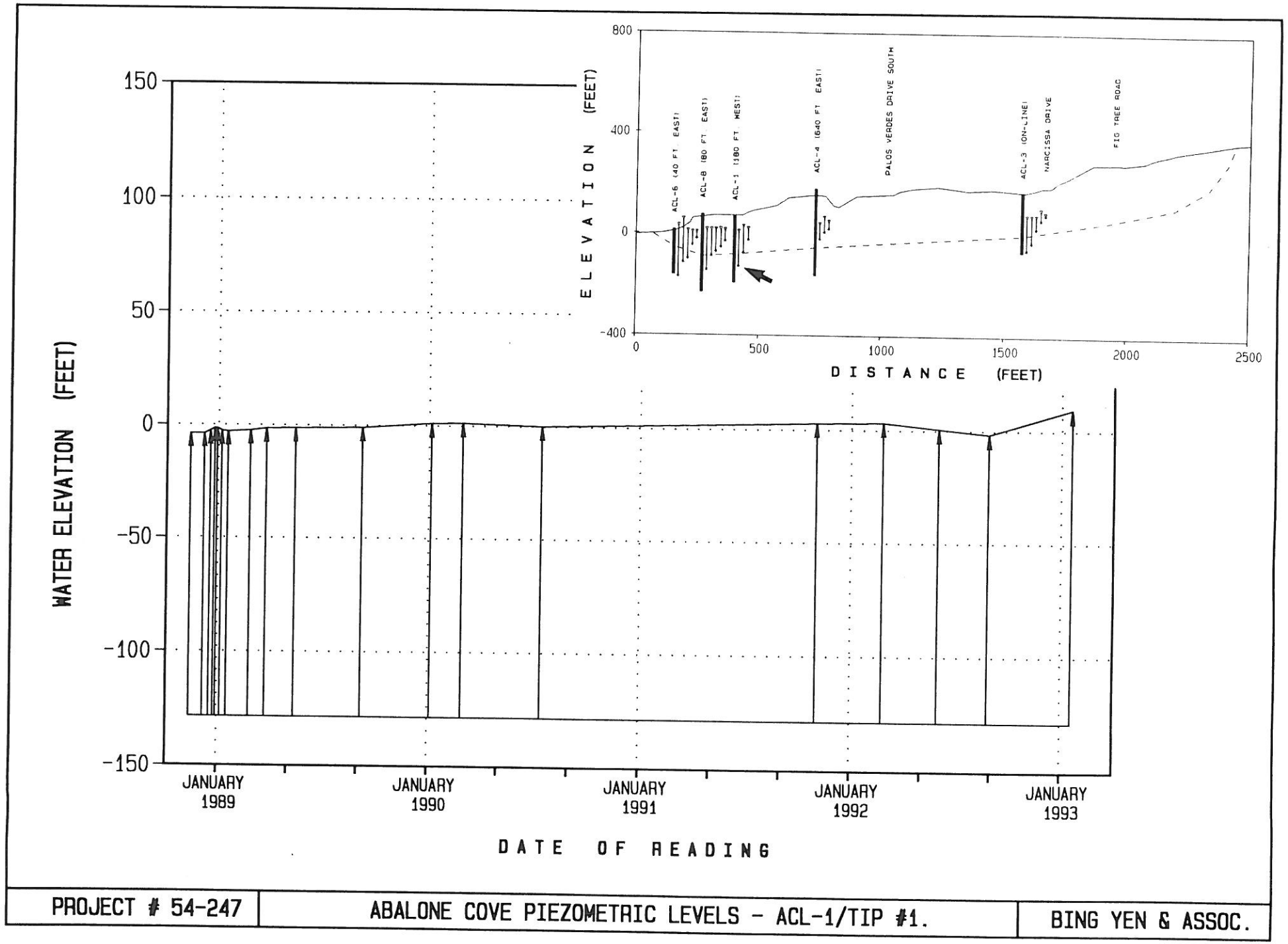


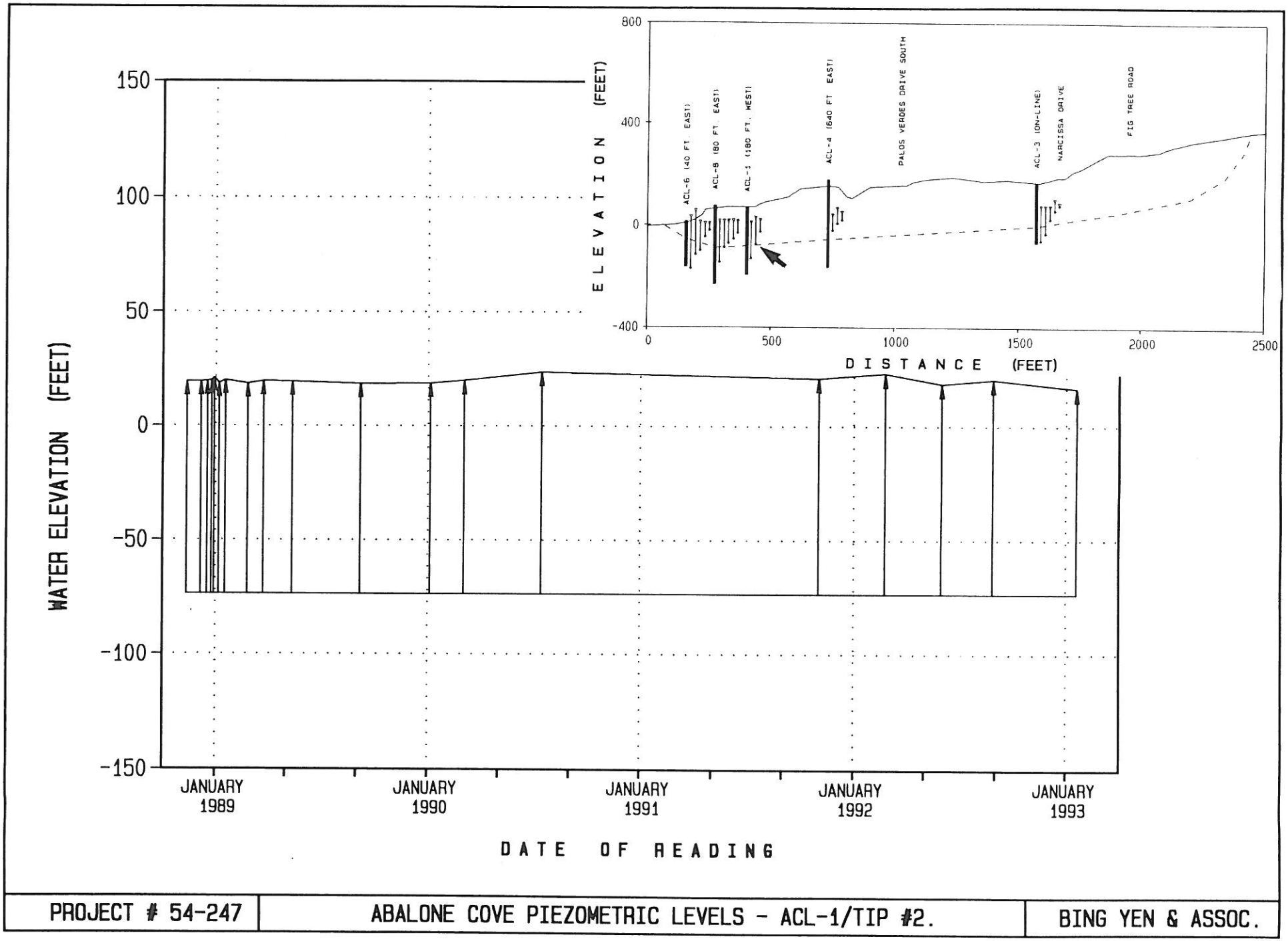
PROJECT # 54-247	ABALONE COVE LANDSLIDE SLOPE INCLINOMETER RESULTS.	BING YEN & ASSOC.

APPENDIX C

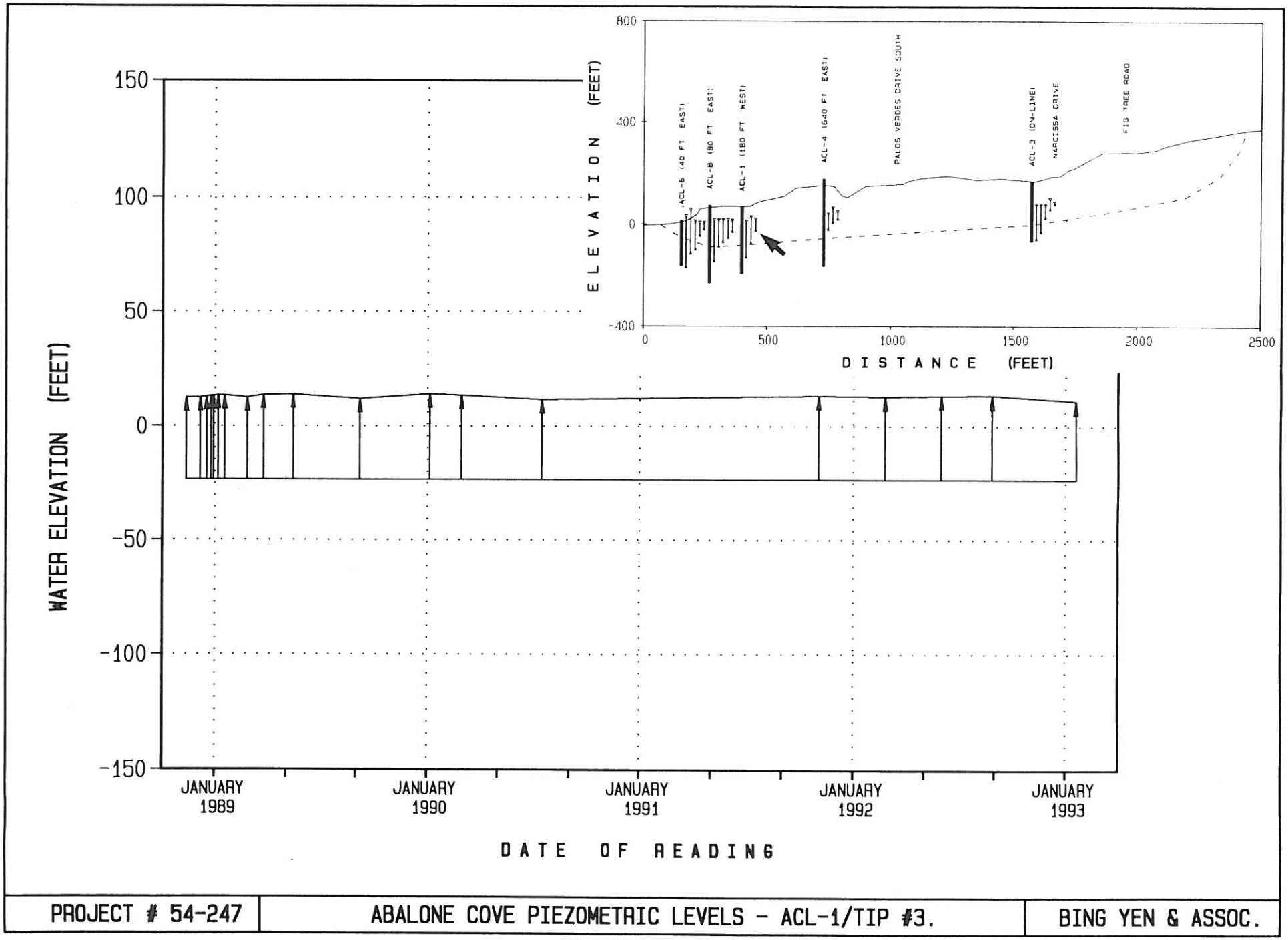
(PIEZOMETER & STANDPIPE RESULTS)



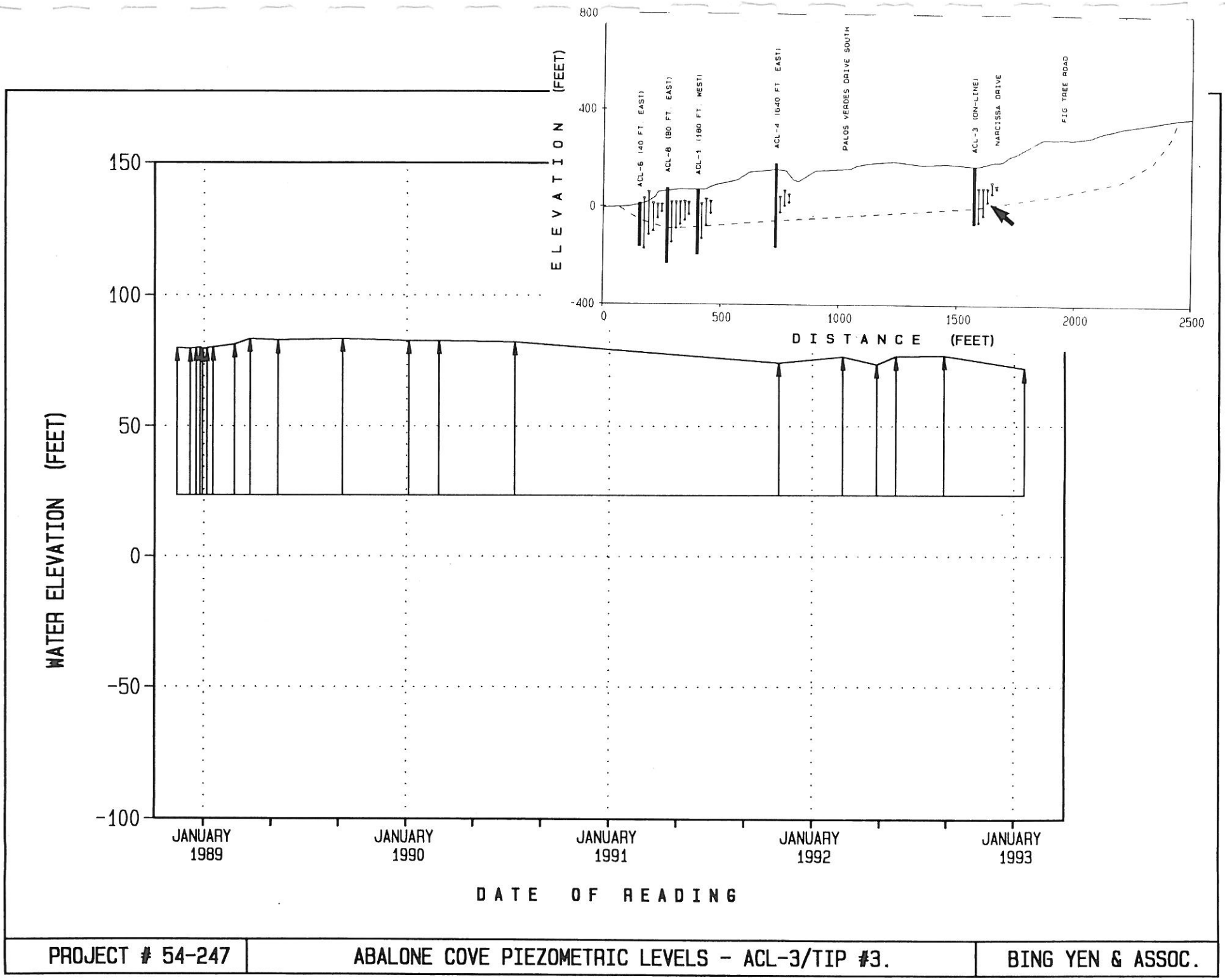
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-1/TIP #1.	BING YEN & ASSOC.



PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-1/TIP #2.	BING YEN & ASSOC.

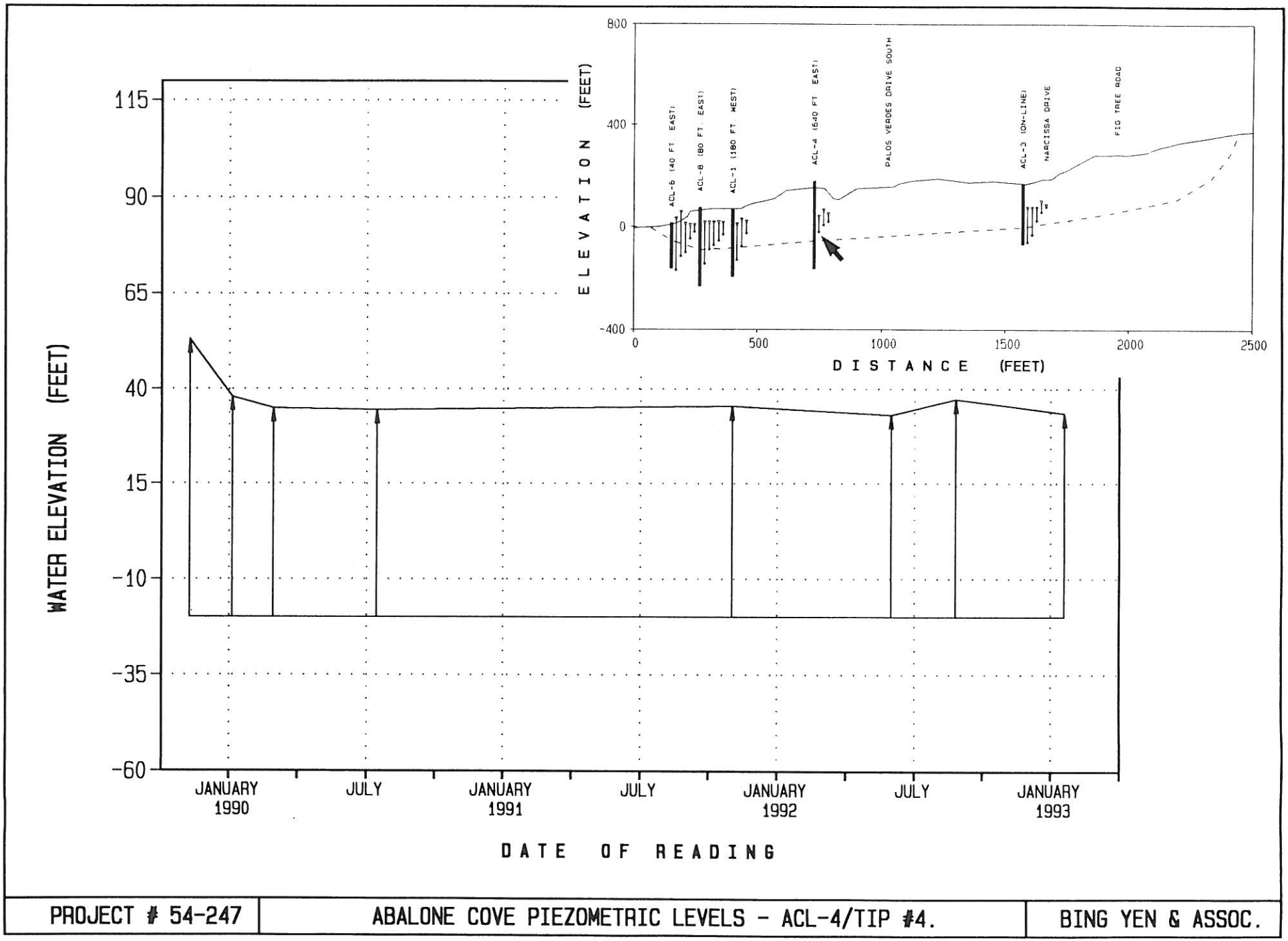


PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-1/TIP #3.	BING YEN & ASSOC.

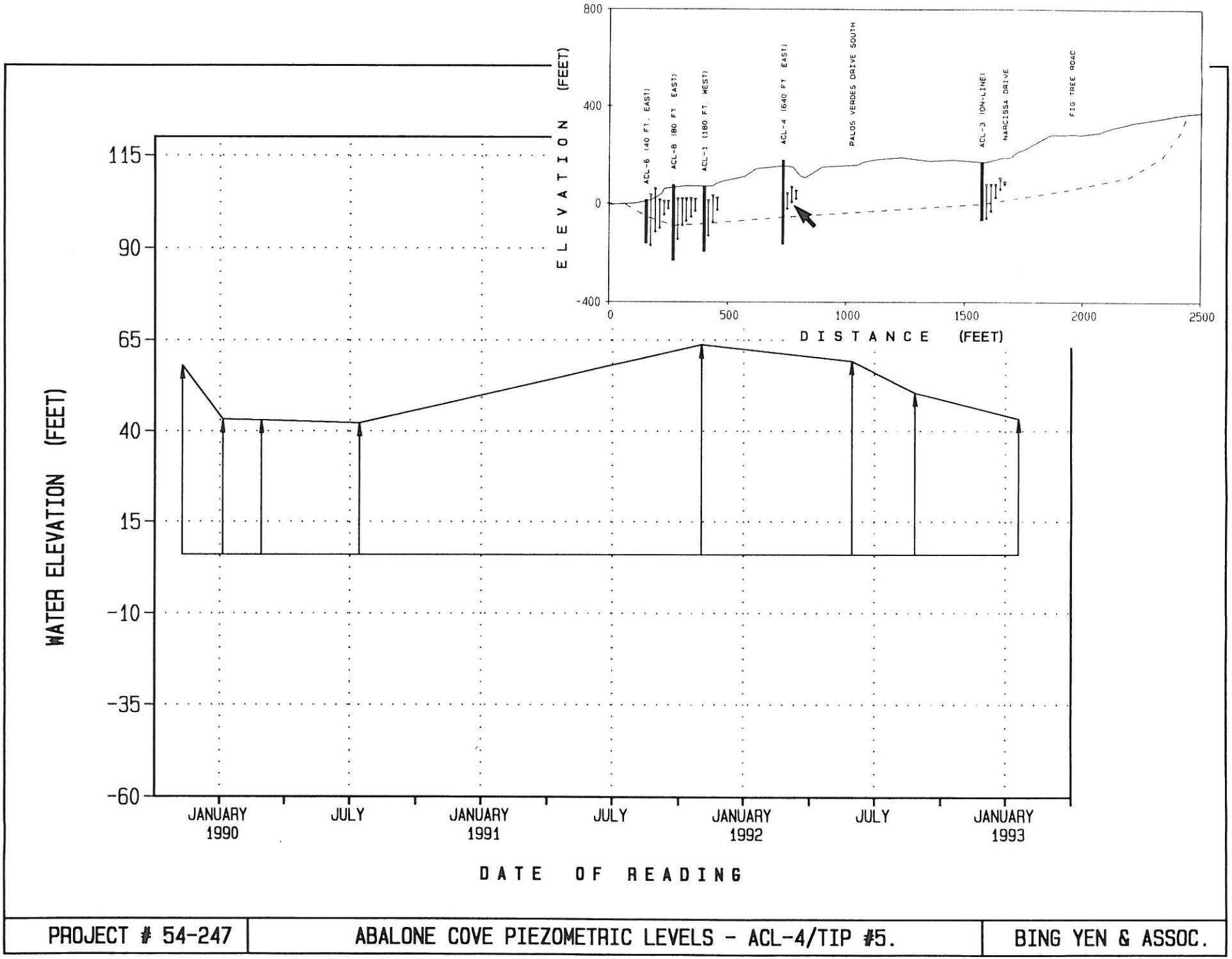


PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-3/TIP #3.	BING YEN & ASSOC.

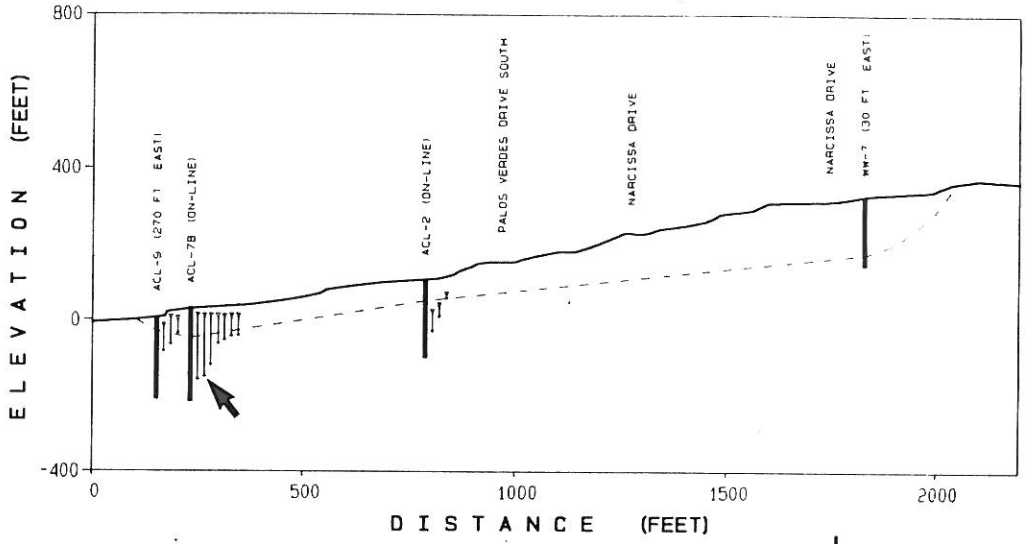
BING YEN & ASSOC.
ACL-3/TIP #4.
DATE OF READING
JANUARY 1989
JANUARY 1990
JANUARY 1991
JANUARY 1992
JANUARY 1993
WATER ELEVATION (FEET)
150
100
50
0
-50
-100
ELEVATION (FEET)
800
400
0
-400
DISTANCE (FEET)
2500
2000
1500
1000
500
0
ACL-6 (40 FT. EAST)
ACL-8 (80 FT. EAST)
ACL-1 (180 FT. WEST)
ACL-4 (640 FT. EAST)
PALOS VERDES DRIVE SOUTH
ACL-3 (ON-LINE)
NARCISSA DRIVE
FIG TREE ROAD

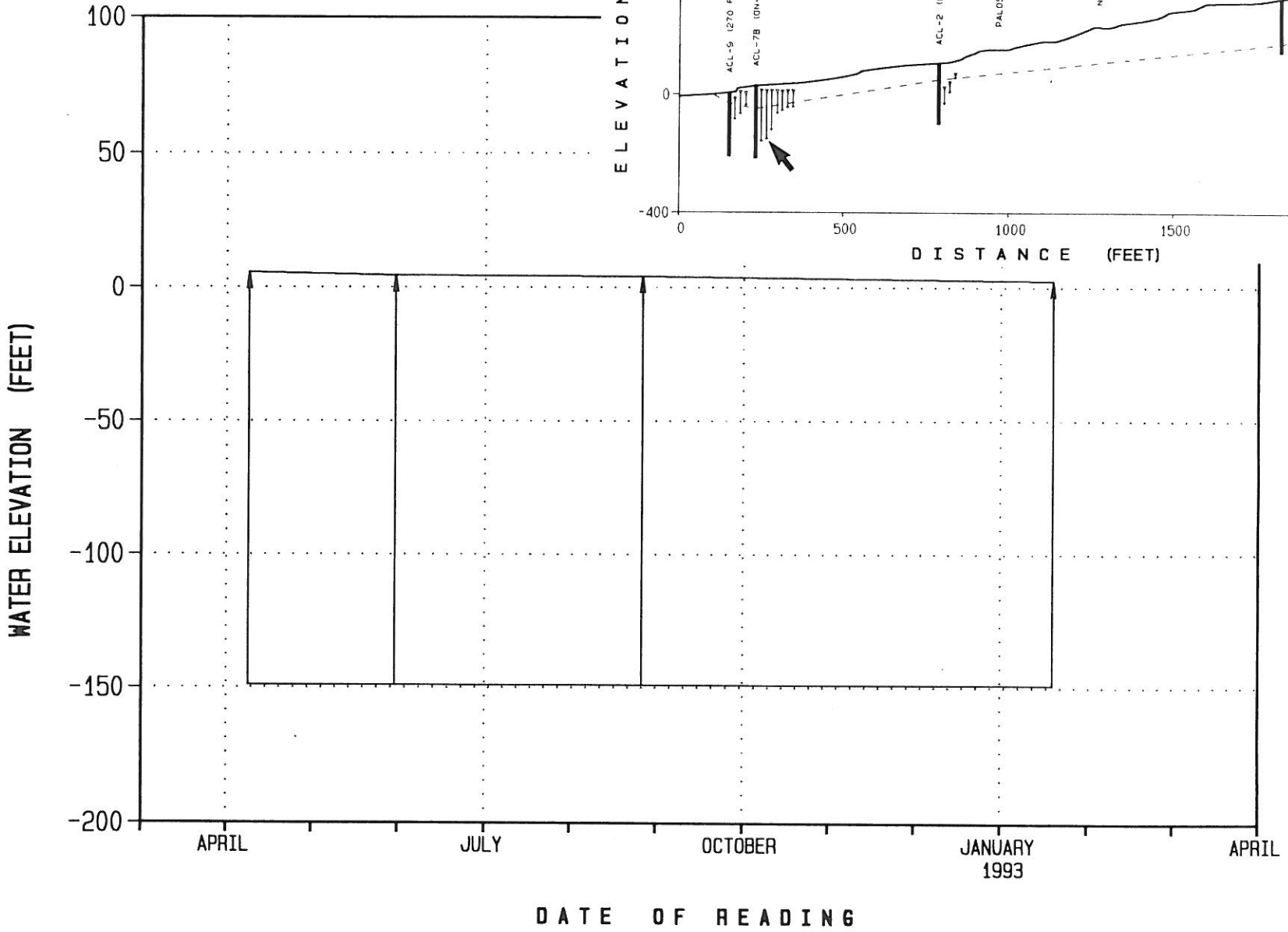


PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-4/TIP #4.	BING YEN & ASSOC.

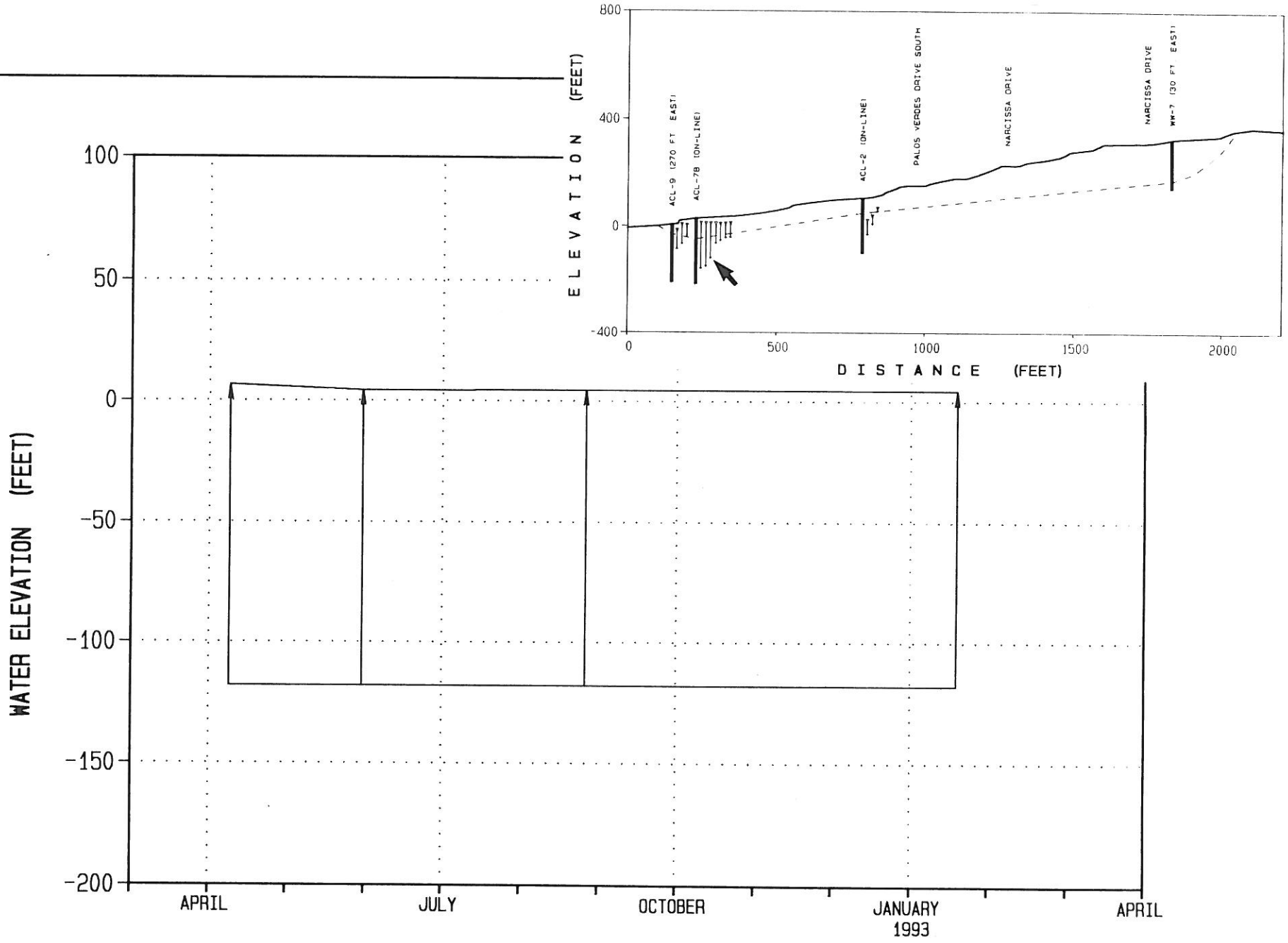


PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-4/TIP #5.	BING YEN & ASSOC.

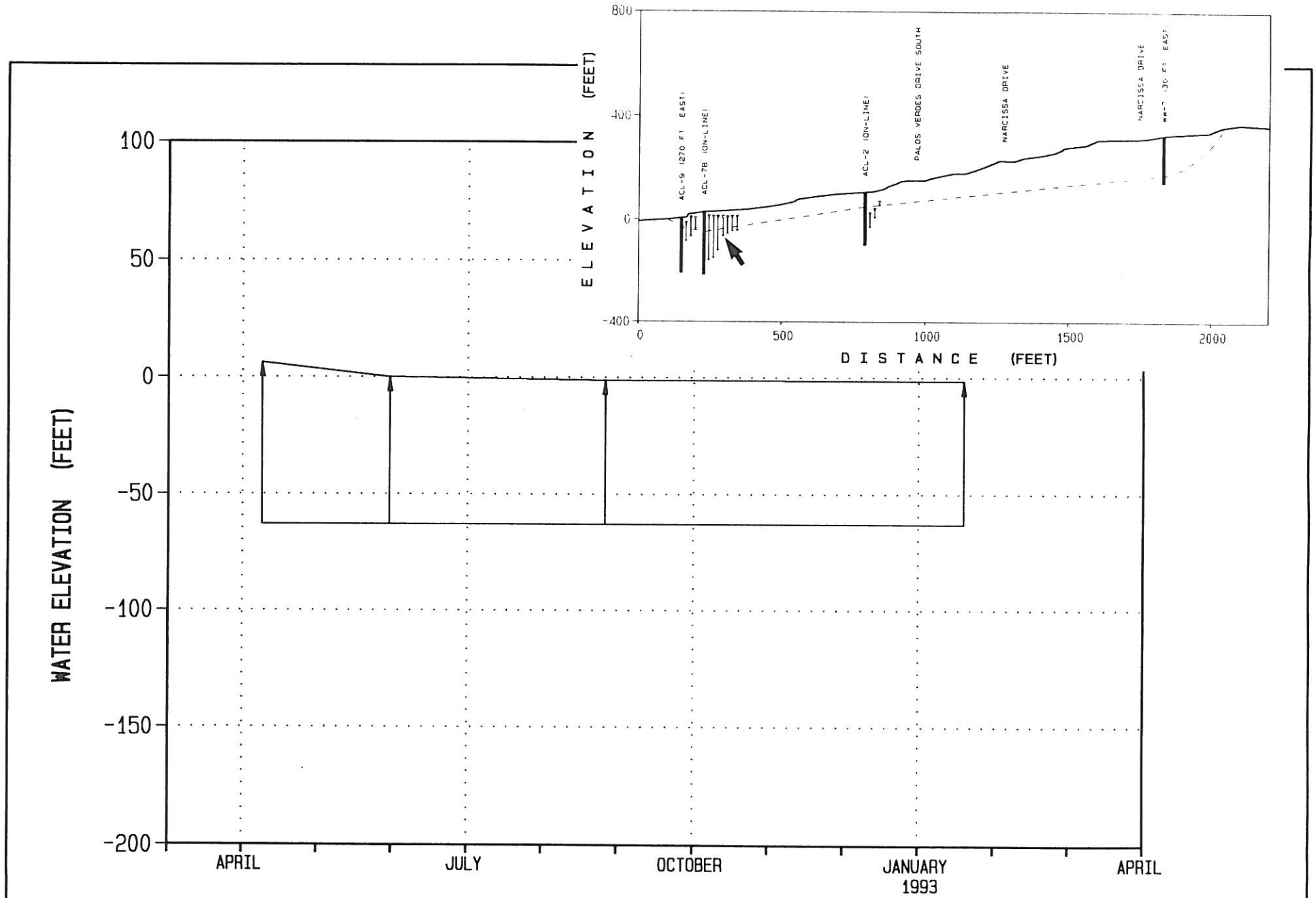




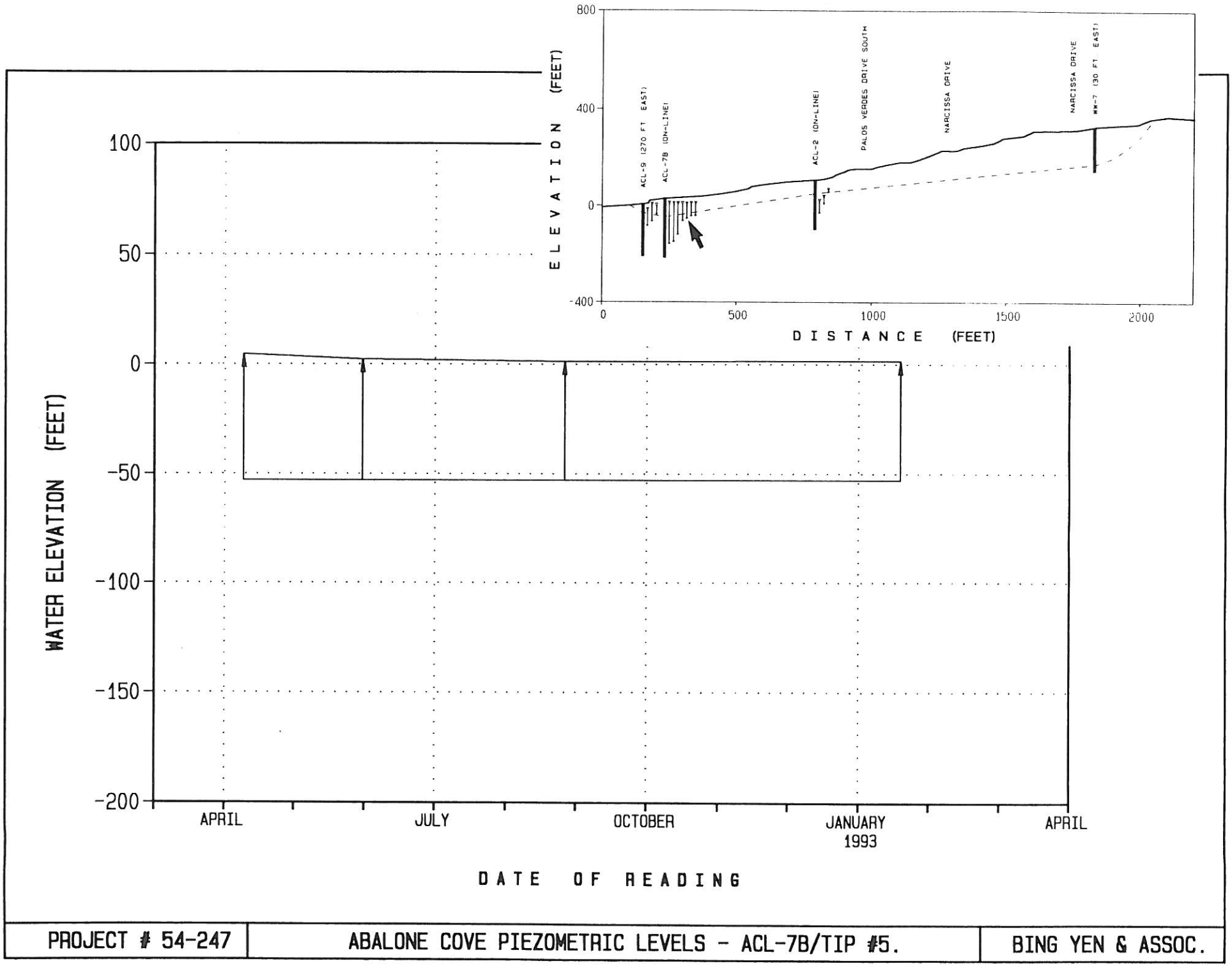
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-7B/TIP #2.	BING YEN & ASSOC.



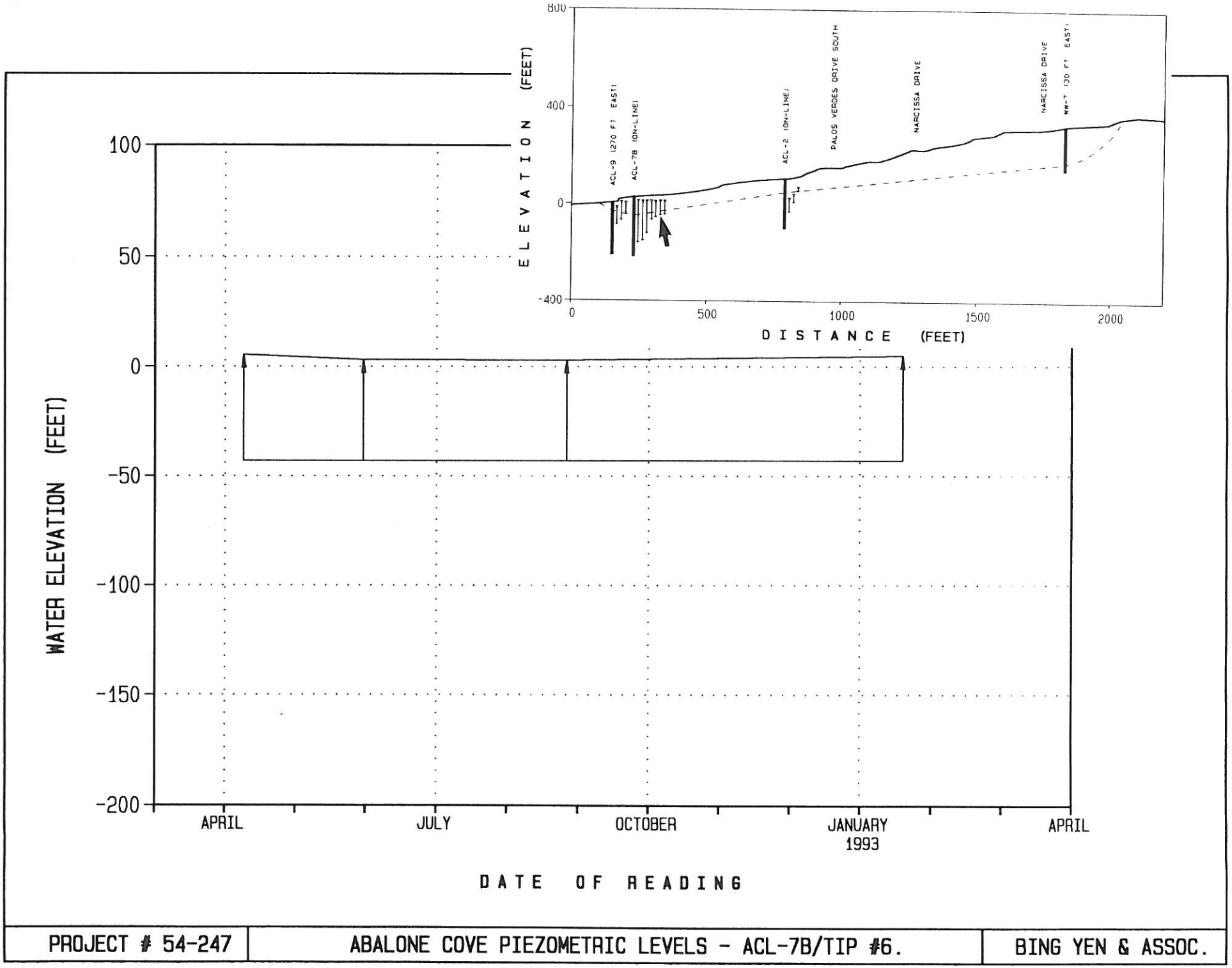
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-7B/TIP #3.	BING YEN & ASSOC.



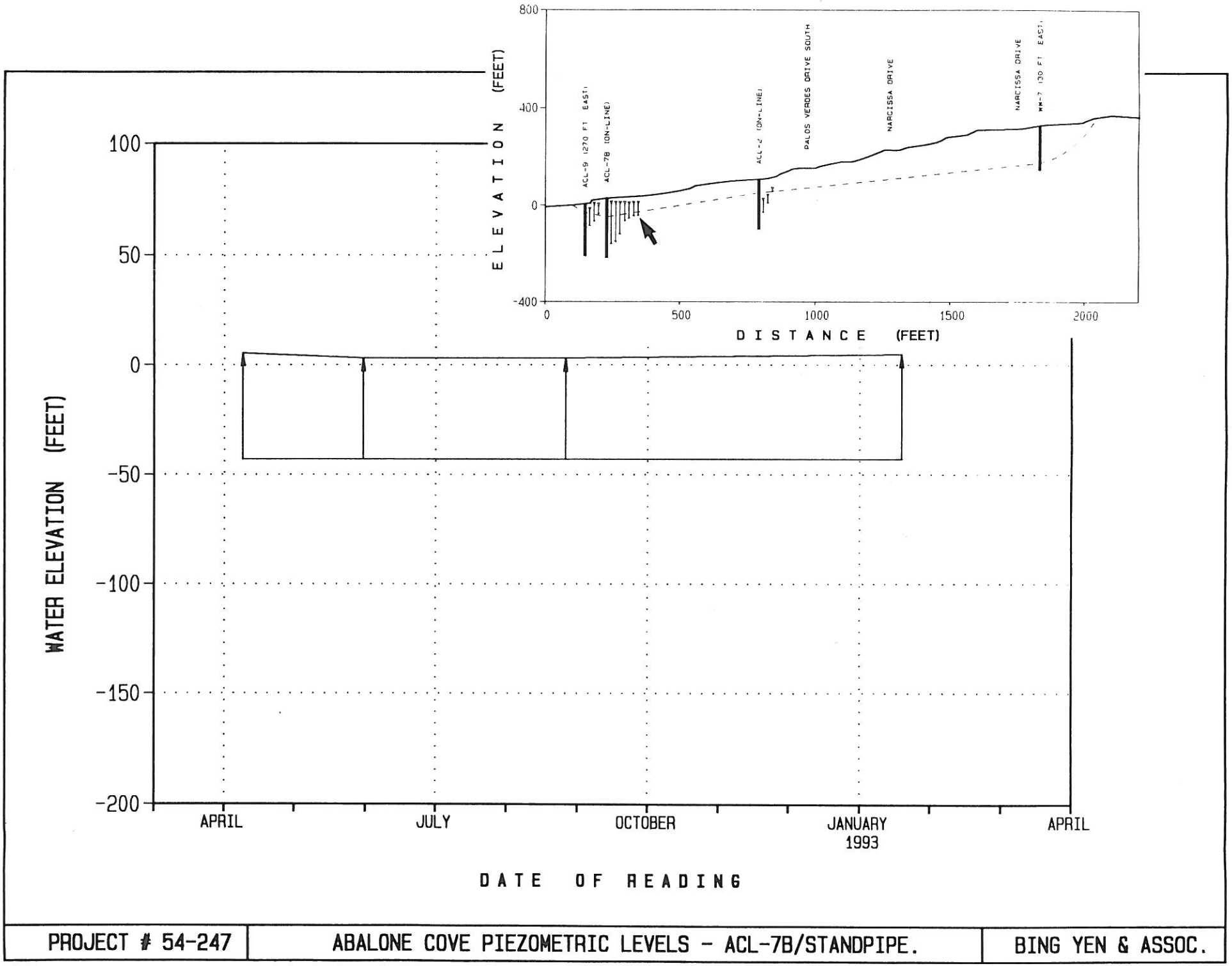
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-7B/TIP #4.	BING YEN & ASSOC.



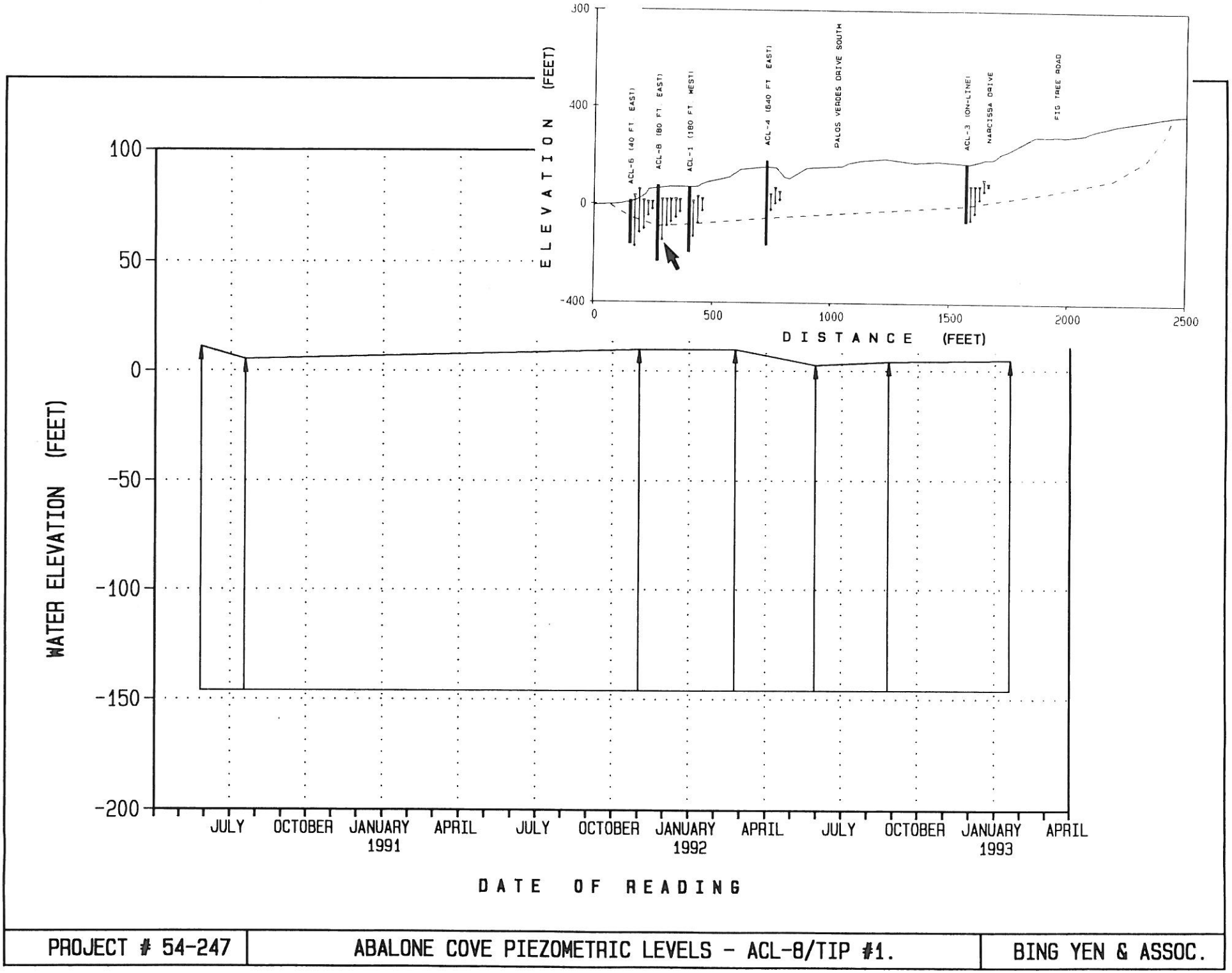
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-7B/TIP #5.	BING YEN & ASSOC.



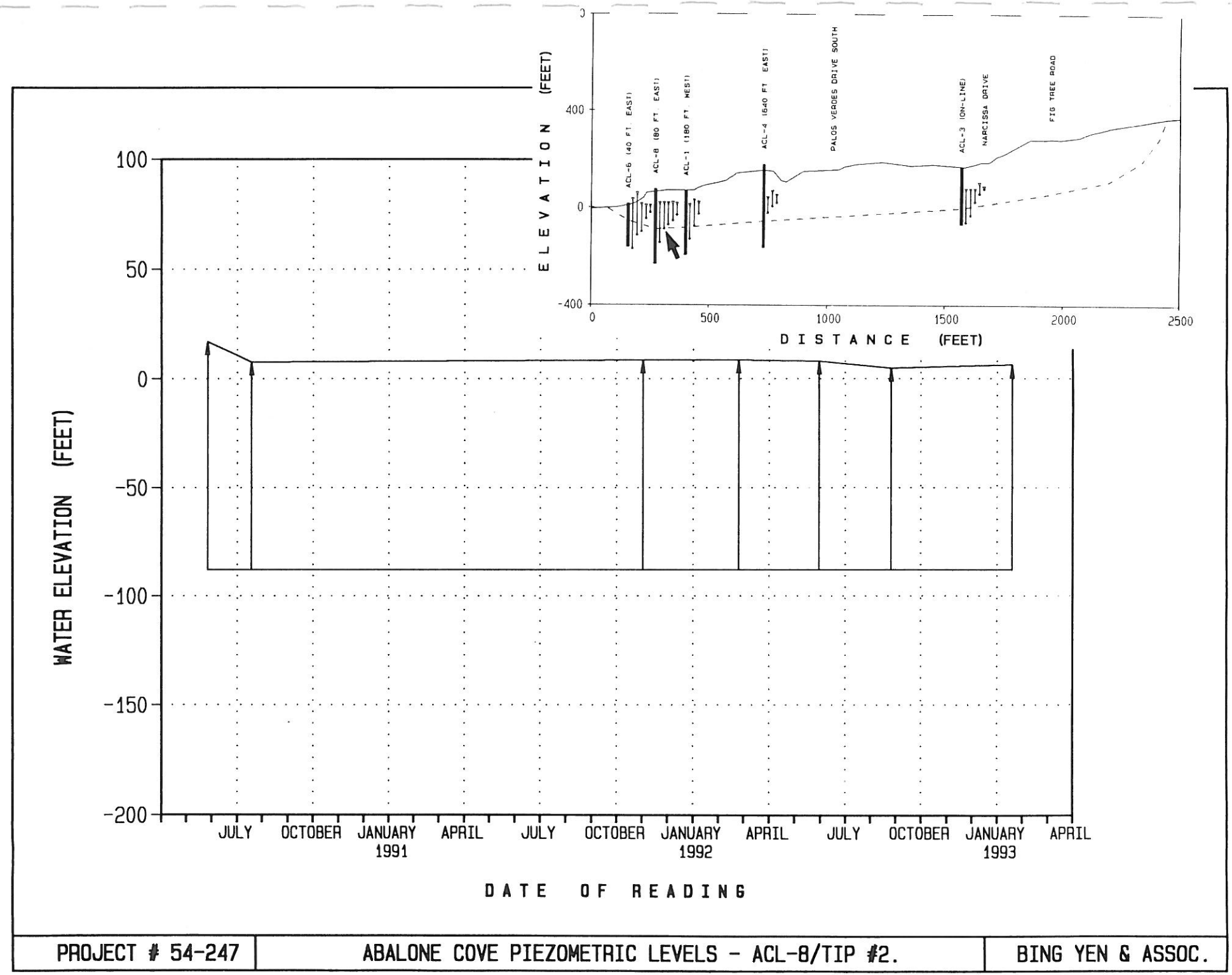
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-7B/TIP #6.	BING YEN & ASSOC.



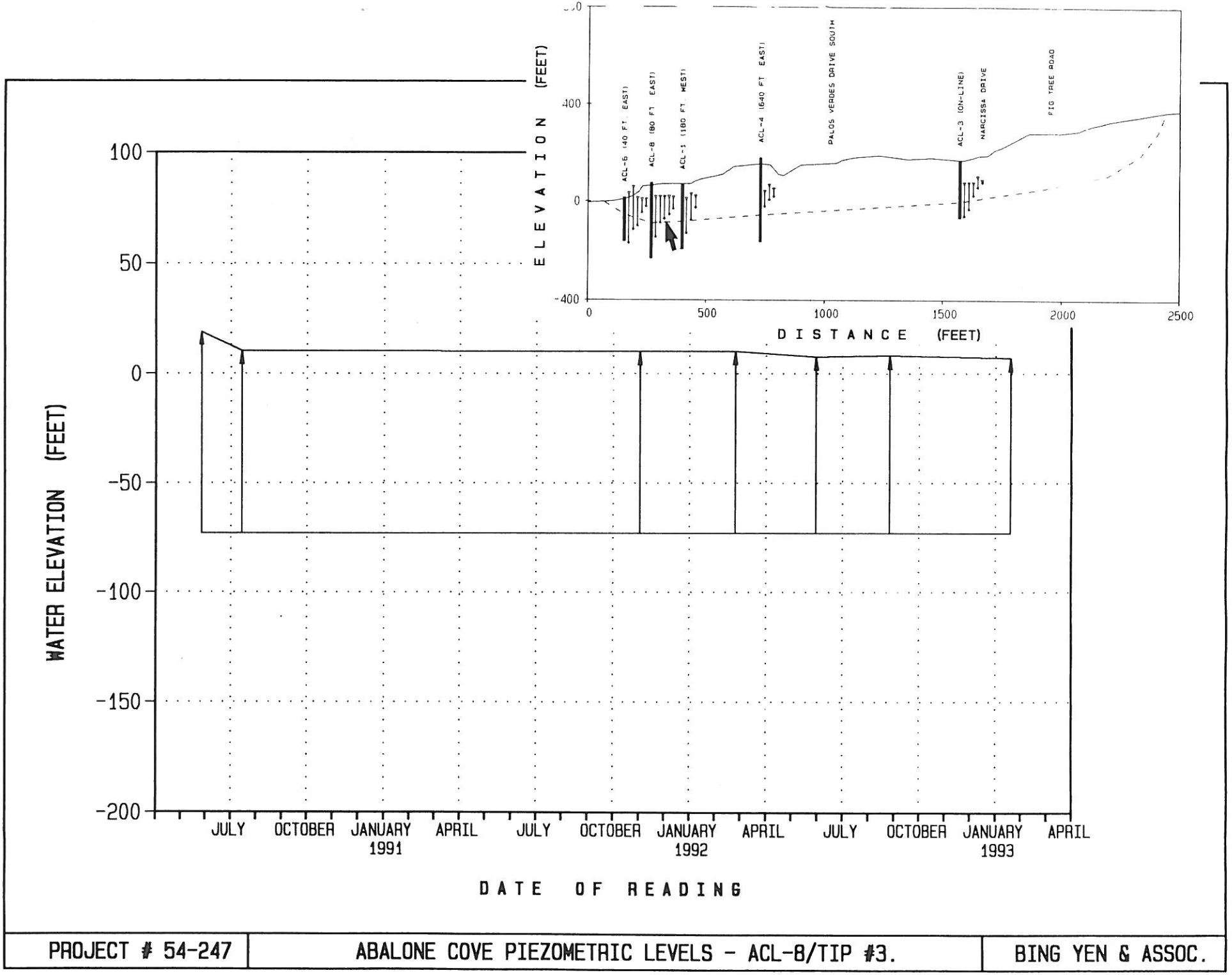
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-7B/STANDPIPE.	BING YEN & ASSOC.



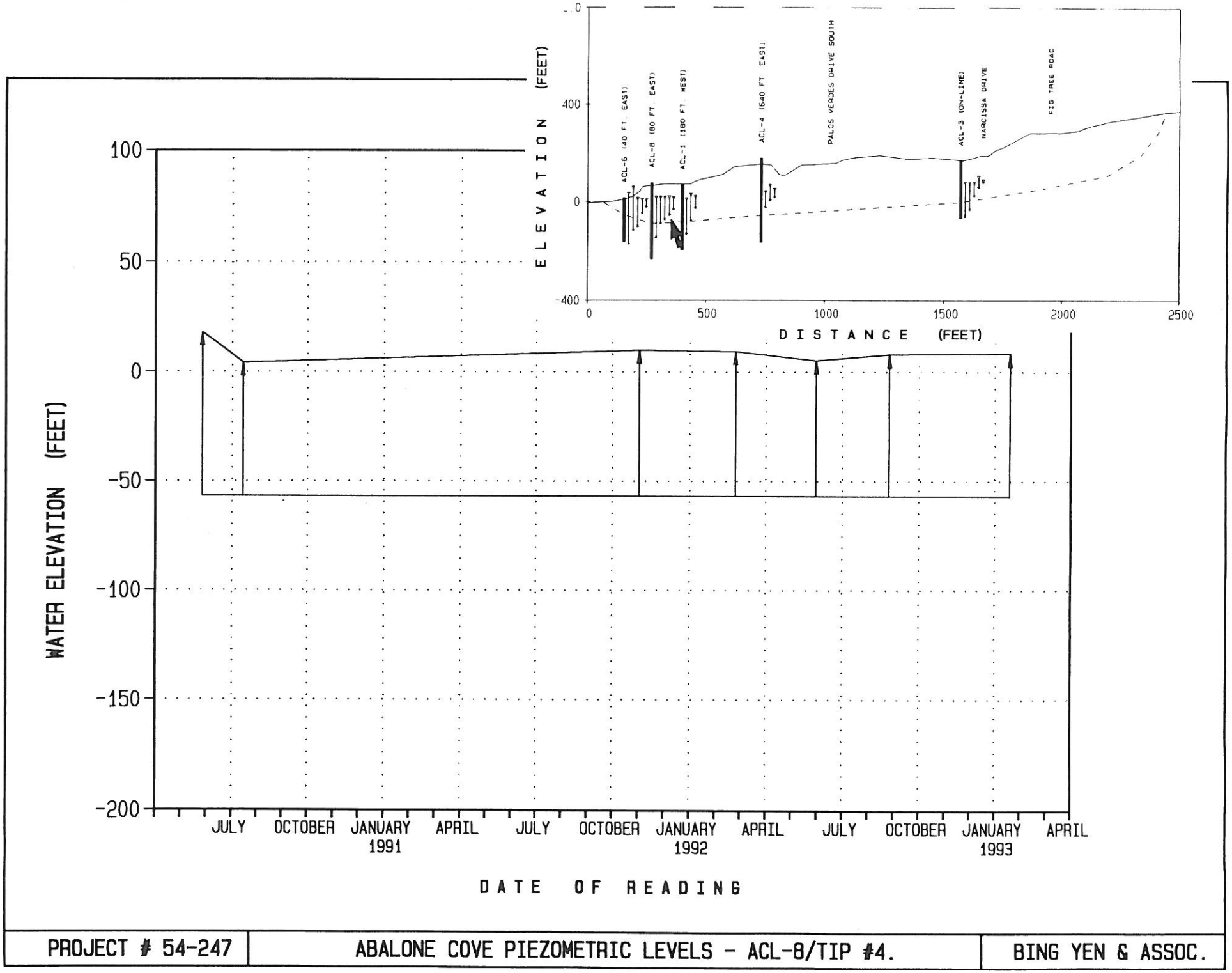
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-8/TIP #1.	BING YEN & ASSOC.



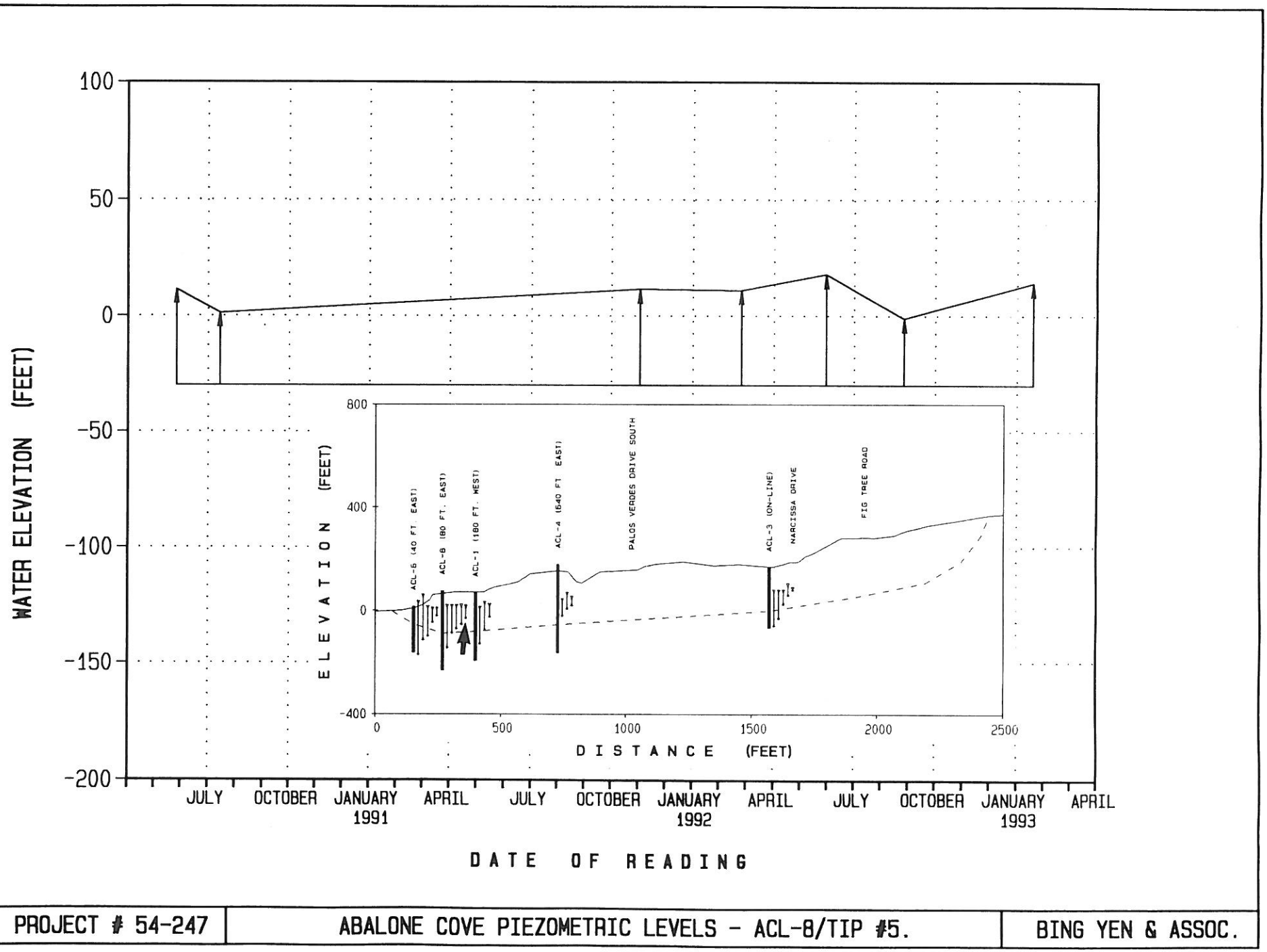
PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-8/TIP #2.	BING YEN & ASSOC.



PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-8/TIP #3.	BING YEN & ASSOC.



PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-8/TIP #4.	BING YEN & ASSOC.



PROJECT # 54-247	ABALONE COVE PIEZOMETRIC LEVELS - ACL-8/TIP #5.	BING YEN & ASSOC.