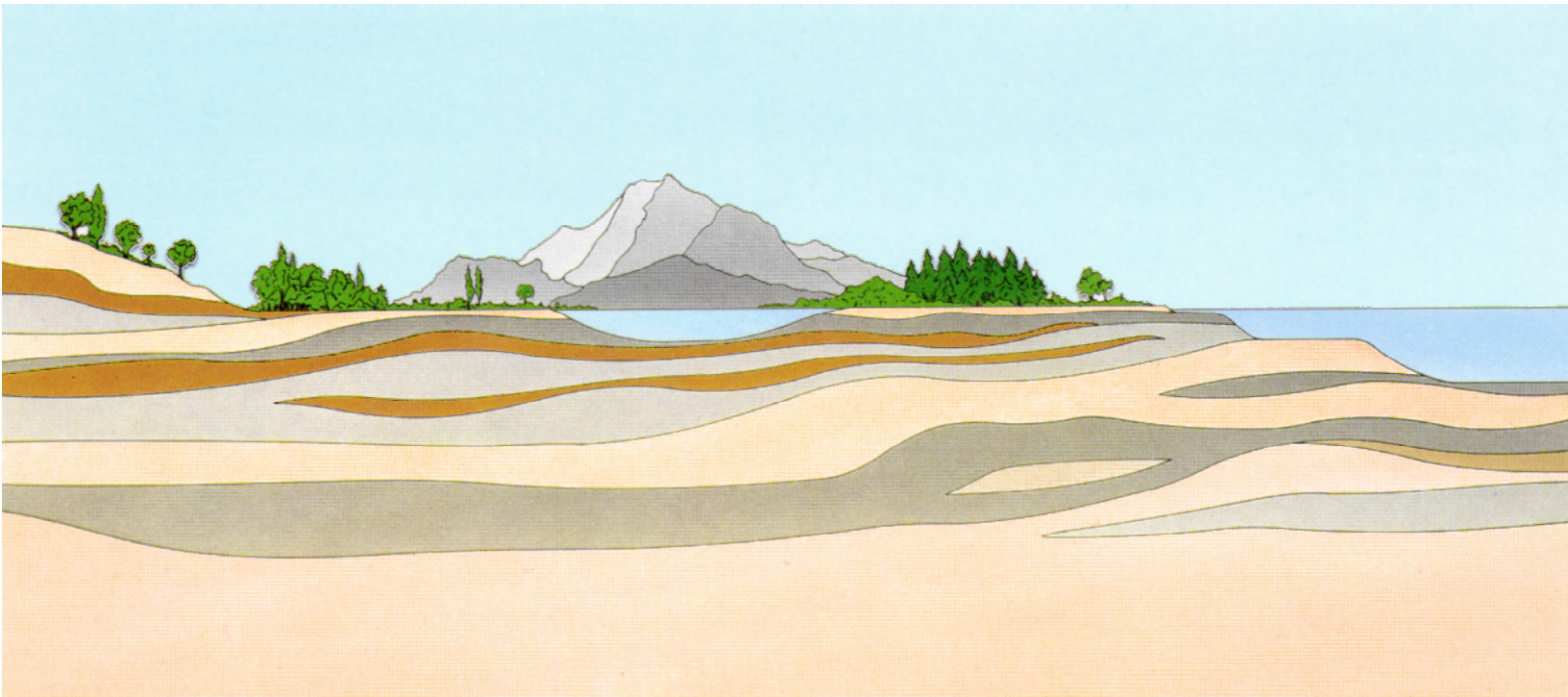
FUGRO CONSULTANTS, INC.

ANNUAL REPORT
JULY 2010 THROUGH JUNE 2011
CALLE DEL BARCO
LANDSLIDE ASSESSMENT DISTRICT
MALIBU, CALIFORNIA

Prepared for:
CITY OF MALIBU

November 2011
Fugro Job No. 04.B3399005



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November 30, 2011
Project No. 3399.005

City of Malibu
23825 Stuart Ranch Road
Malibu, California 90265

Attention: Mr. Rob Duboux

Subject: Annual Report, July 2010 through June 2011, Calle del Barco Landslide Assessment District, Malibu, California

Dear Mr. Sanchez:

Fugro is pleased to present this annual report for the Calle del Barco Landslide Assessment District. This report summarizes the monitoring and maintenance activities completed during the period of July 2010 through June 2011.

Fugro appreciates this opportunity to be of service to the City of Malibu and the District homeowners. Please contact us at our office if you have any questions regarding this report.

Sincerely,

FUGRO CONSULTANTS, INC.

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(1) City of Malibu Geology & Soils Staff

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1.0 INTRODUCTION

1.1 AUTHORIZATION

Fugro prepared this data report in accordance with our contract with the City of Malibu (City), commencing September 2010.

1.2 BACKGROUND

The Calle del Barco Landslide Assessment District (Assessment District) was established in 1986 by the County of Los Angeles following the activation of a landslide between Rambla Orienta and Calle del Barco in 1978. The Assessment District provides permanent funding to maintain and monitor dewatering facilities with the purpose of stabilizing the landslide. The County administered the Assessment District until 1991 when the City of Malibu incorporated. Since then, the City has administered the Assessment District, utilizing consultants to maintain and monitor the district facilities.

1.3 SCOPE OF WORK

This annual report summarizes the monitoring and maintenance of the geotechnical instrumentation and dewatering facilities for the period between July 1, 2010, and June 30, 2011 (hereinafter, the 'monitoring period').

Data collected during this monitoring period included the following:

- Annual rainfall data from a local rain gauge operated by the County of Los Angeles, Department of Public Works - Water Resources Division;
- Monthly groundwater level measurements from 9 standpipe piezometers and 22 pneumatic piezometers;
- Monthly dewatering production readings from 11 dewatering wells;
- Monthly dewatering production readings from 8 horizontal drains;
- Quarterly ground deformation measurements from 11 slope inclinometers; and
- Periodic maintenance of dewatering and monitoring facilities.

The operating condition of the instrumentation and dewatering facilities was checked at each field monitoring/observation location and by evaluating preliminary data in the office as they were received. Maintenance was performed as needed, based upon the field observations and preliminary data evaluation.

The scope of services include monitoring and maintenance of the Assessment District facilities. The services provided on an annual basis for the Assessment District do not include an engineering evaluation of the stability of the landslide.

1.4 REPORT ORGANIZATION

This report summarizes the monitoring data collected during the monitoring period and presents conclusions regarding the annual monitoring results. The location of the Assessment District is illustrated on Plate 1 - Site Location Map. Locations of the geotechnical instrumentation are shown on Plate 2 - Assessment District Map. Tabulated and graphic summaries of monitoring data are presented in Appendices A through C.

1.5 REPORT AVAILABILITY

The annual Assessment District reports are available for review at Malibu City Hall. Reports may also be viewed on the City's website at http://www.malibucity.org.

2.0 MONITORING

2.1 RAINFALL DATA

Rainfall totals were tabulated based on recorded values from the Los Angeles County Rainfall Station 1239 - located at Big Rock Mesa. A combination graph of historical and annual cumulative monthly rainfall totals is shown on Plate 3 - Rainfall Graph.

Rainfall data indicate that approximately 24.16 inches of precipitation fell during the monitoring period from July 2010 through June 2011. The average rainfall total from 1968 to 2011 in the Malibu area for the period July through June is approximately 16.24 inches.

Rainfall data is usually analyzed in terms of the annual "rain season" that covers the time period October 1 through September 30. Rainfall for October 1, 2010, through June 30, 2011, was approximately 24.12 inches. This is approximately 141 percent of the average rainfall total of 17.07 inches for the rain seasons of 1968 through 2011.

2.2 GROUNDWATER MONITORING

The groundwater-monitoring data collected during this monitoring period are summarized in Appendix A. Groundwater levels fluctuate throughout the year and from year to year in response to natural and man-made influences. The primary natural influence is varying precipitation. Man-made influences include:

- Infiltration from septic systems;
- Infiltration from irrigation;
- Alterations to surface drainage by grading, landscaping, storm drains, and rain gutters;
- Accidental water discharges from leaking utilities (water, irrigation, sewer, storm drain) and swimming pools; and
- Dewatering activities including pumping dewatering wells and hydraugers.

Typically, groundwater levels rise relatively quickly following significant rainfall and gradually lower after a wet season ends. Groundwater levels measured in standpipe

piezometers (wells) and pneumatic piezometers are depicted in Appendix A. Groundwater levels recorded in the Assessment District typically peak around late March to mid April and gradually decline from late September through November.

2.2.1 Standpipe Piezometers

Nine standpipe piezometers (SI-4, SI-5, SI-7, SI-8, SI-9, SI-13, SI-14, SI-15, and SI-16) were measured over the monitoring period. The locations of the standpipe piezometers are shown on Plate 2 and hydrographs are presented in Appendix A.

2.2.2 Pneumatic Piezometers

Each of the inclinometers installed within the Assessment District after 1996 were outfitted with two to four pneumatic piezometer sensors. Twenty-two sensors were measured regularly over the monitoring period. Each sensor records groundwater elevations by measuring differential air pressure between the instrument sensor and groundwater surface across a flexible bladder. Differential pressure is converted into inches of water head, and represented as a relative groundwater level. The locations of the piezometers are given on Plate 2, and hydrographs are given in Appendix A.

2.2.3 Groundwater Level Discussion

The groundwater data were reviewed by evaluating changes that occurred during the current monitoring period as well as changes in groundwater levels over extended periods. To analyze trends in seasonal groundwater fluctuations, the average (mean) annual and highest annual recorded groundwater elevation for each piezometer were calculated (Appendix A, Plate A-2).

Groundwater levels in individual piezometers were high relative to the previous year, with annual average groundwater elevations generally lower than the prior year averages. Average and peak groundwater levels for Rambla Vista and Rambla Orienta were generally at or below levels relative to the previous year except for SI-10. Piezometers showed groundwater levels at the levels from the prior year, but still below average. Measured groundwater levels around Calle del Barco were at or below average in standpipes and piezometers, except for SI-15. Measured groundwater levels around Rambla Pacifico were below levels for the prior year and were generally below normal levels. Overall, groundwater levels still show a general decline from the record rainfall of the 2004-2005 monitoring period. The average and highest annual groundwater levels are indicated in the following table:

Table 1. Summary of Average Groundwater Elevations by Area

Location	Average Groundwater Elevation	Change from Prior Period	Peak Groundwater Elevation	Change from Peak Prior
Rambla Orienta/ Rambla Vista	166.2	+5.9	169.1	+6.4
Calle Del Barco	255.4	+0.3	256.6	+0.1
Rambla Pacifico	336.1	+0.4	336.4	0.0

All Units are in feet

2.3 DEWATERING PRODUCTION

Dewatering production data are provided in Appendix B, with dewatering well and hydrauger information presented on Plate B-1

2.3.1 Dewatering Well Production

The average total well production rate for this monitoring period was approximately 789 gallons per day (gpd). This represents an increase of about 33 percent from the previous monitoring period of 590 gpd. A graph of the production rate for all dewatering wells is presented on Plate 4. Graphs showing production rates of individual wells are provided in Appendix B.

2.3.2 Hydrauger Production

The total production rate for all hydraugers from August 1991 through June 2011 is depicted on Plate 4. Hydrauger production rates for individual hydraugers are presented on Plate B-4 (Appendix B). Additional data regarding hydraugers and production rates are included in Appendix B.

The average hydrauger production rate for all hydraugers over the monitoring period was approximately 223 gpd. This represents an increase of approximately 125 percent over last year's hydrauger production rate of 99 gpd.

2.4 SLOPE INCLINOMETER MEASUREMENT

Fugro monitored 11 slope inclinometers on a quarterly basis to observe subsurface ground deformation. Plots of slope inclinometer measurements (two plots for each monitored slope inclinometer) are presented in Appendix C. The first plot has a baseline reading from the final round of monitoring in the 2009 through 2010 monitoring year, showing ground movement within the 2010 through 2011 monitoring year. The second plot has a baseline reading from the spring of 2005 following heavy rains, which led to significant ground movement in winter and

spring of 2005. Only inclinometer readings that have been checksum validated are presented on the data plots[1].

When reviewing and interpreting the slope inclinometer data plots instrument limitations and movement history should be considered. Individual plots have been reviewed and interpreted with regard to movement along identified slide planes. Interpreted movement along the identified slide planes is summarized on Plate C-1. Slope indicator plots show no signs of movement along identified slide planes during the 2010 through 2011 monitoring year. SI-7 and SI-9 both show possible movement of less than 0.05 inches, which is less than the reliable accuracy of the instrument.

During previous years, SI-13 (located on Rambla Pacifico above and outside the deep landslide) showed a variable pattern of compression in the upper 30 feet. However, no significant observable lateral displacement has been associated with this compression. If it appears that lateral movement is occurring, or distress is observed outside the current defined limits of the deep slide, the City may wish to consider replacing the inclinometer or adding other types of monitoring observations in order to monitor or characterize conditions in that area.

3.0 FACILITY MAINTENANCE

3.1 MAINTENANCE SUMMARY

The operating status of each dewatering well and hydrauger was checked monthly. When necessary, repair work was scheduled and undertaken as expeditiously as possible, typically within a matter of a few hours to a few days of identifying a problem. Generally, repairs and maintenance consisted of well pump and electrical repairs, and cleanout of the hydrauger system. These repairs are summarized in the following table:

Table 2. Maintenance Activities

Date	Facility	Work Performed
1/10/11	HD-1 DWW	Repairs to leaking hydrauger Repairs to W-M well box
2/28/11	W-K	New pump, motor, control box, pipe
3/24/11	Hydraugers	Routine maintenance (clearing debris, plants)
4/12/11	Misc	Update facility markings/designations
4/22/11	W-L	New pump, motor, control box

3.2 NEW DEWATERING FACILITIES

No new facilities were installed during the monitoring period.

[1] Checksums are a data validation technique for slope inclinometers where the '0' (downslope) and '180' (upslope) readings are summed and the theoretical result should be zero.

4.0 SUMMARY AND CONCLUSIONS

4.1 SUMMARY

- This year's rainfall was above average with 24.16 inches of precipitation. Rainfall during the monitoring period was above the historical average.
- In general, groundwater levels in the assessment district area were lower than average for Rambla Orienta, and at or below average for Rambla Vista and Calle del Barco. Groundwater levels generally are continuing to decrease from the levels observed in the record winter of 2004 through 2005.
- In the standpipe piezometers, groundwater levels were generally near or lower than groundwater levels in 1998 when major slope failure occurred.
- Total dewatering production increased about 47 percent when compared to last year's total production.
- Slope inclinometer readings indicate no significant ground movement.
- Additional dewatering facilities are recommended in order to increase the dewatering capacity of the landslide stabilization system. Plate 5 indicates decreased production from hydraugers. Over time, hydraugers become clogged and less efficient at removal of water by gravity. Replacement hydraugers should be considered for Rambla Orienta.
- Water conservation is encouraged throughout the Calle Del Barco area to reduce infiltration of domestic water and the potential for future groundwater level increases. Control of groundwater levels within the landslide area is critical to maintaining the stability of the landslides.
- Groundwater production from existing dewatering wells and hydraugers should be expected to gradually decline over time as the efficiency of the wells and hydraugers decrease due to mineralization and aging of the facilities.

5.0 REFERENCES

Bing Yen and Associates, Inc. (1991),'Monitoring, Instrumentation, and Dewatering Facilities at Calle Del Barco, Puerco Beach, Latigo Canyon, and Rambla Pacifico (two wells) Landslide Sites,' dated October 4.

_____ (1992), 'First Quarter Observation Report: Instrumentation and Dewatering Facilities at Calle Del Barco, Puerco Beach, and Latigo Canyon Landslide Sites,' dated April 7.

_____ (1992), 'Second Quarter Observation Report: Instrumentation and Dewatering Facilities at Calle Del Barco, Puerco Beach, and Latigo Canyon Landslide Sites', dated July 9.

_____ (1993), 'Semi-Annual Observation & Maintenance Report for the Period January to July 1993, Calle Del Barco, Malibu, California,' dated September.

_____ (1994), 'Annual Observation & Maintenance Report for the Period July 1993 to July 1994, Calle Del Barco, Malibu, California,' dated September.

_____ (1995), 'Annual Observation & Maintenance Report for the Period July 1994 to July 1995, Calle Del Barco, Malibu, California,' dated September.

_____ (1996), 'Annual Observation & Maintenance Report for the Period July 1995 to July 1996, Calle Del Barco, Malibu, California,' dated August.

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_____ (1998), 'Annual Observation & Maintenance Report for the Period July 1997 to April 1998, Calle Del Barco, Malibu, California,' dated April.

_____ (1999), 'Annual Observation & Maintenance Report for the Period April 1998 to March 1999, Calle Del Barco, Malibu, California,' dated April.

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Fugro West Inc. (2004), 'Annual Report, July 2003 through June 2004, Calle Del Barco Landslide Assessment District, Malibu, California,' dated November.

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_____ (2006), 'Annual Report, July 2005 through June 2006, Calle Del Barco Landslide Assessment District, Malibu, California,' dated August.

_____ (2007), 'Annual Report, July 2006 through June 2007, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (2008), 'Annual Report, July 2007 through June 2008, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (2009), 'Annual Report, July 2008 through June 2009, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (2011), 'Annual Report, July 2009 through June 2010, Calle Del Barco Landslide Assessment District, Malibu, California,' dated April.

PLATES

BASE MAP SOURCE: USGS 1:100,000-scale Metric Topographic Map of Los Angeles, California (1979).

NORTH

0 4000 8000

FEET

SITE LOCATION MAP
2010 through 2011 Annual Report
Calle del Barco Landslide Assessment District
Malibu, California

PLATE 1

City of Malibu
Project No. 04.B3399005

6366500 6367000 6367500

1838500 1838000 1837500

W-K
SI-13
Rambla Pacifica
SI-14
SI-15
W-J
Calle Del Barco
W-M
SI-5
SI-8
SI-12
W-H
W-I
SI-9
W-C
SI-16
W-G
SI-11
W-B
W-F
SI-4
W-L
W-A
SI-10
SI-7
W-E
H-2
H-1
Rambla Vista
Rambla Orienta
See Inset Map

Inset Map
HD-7
HD-8
HD-9
HD-10
HD-11
HD-12
HD-13
1 inch = 15 feet

LEGEND

- Active Dewatering Well
- Inactive Dewatering Well
- Slope Inclinometer/Standpipe
- Horizontal Drain (Hydrauger)
- Approximate Limits of Landslide
- Assessment District Boundary
- Coordinate Grid: California State Plane, Zone 5, NAD 83, Feet

N

100 50 0 100
Feet

ASSESSMENT DISTRICT MAP
2010 through 2011 Annual Report
Calle del Barco Landslide Assessment District
Malibu, California

PLATE 2

N:\Projects\3399_CityofMalibu\3399-005_CalleDelBarco\Outputs\2009_05_29_AnnualReport\mxd\Plate02-CB_AssessmentDist.mxd, 01/26/12, evonthury

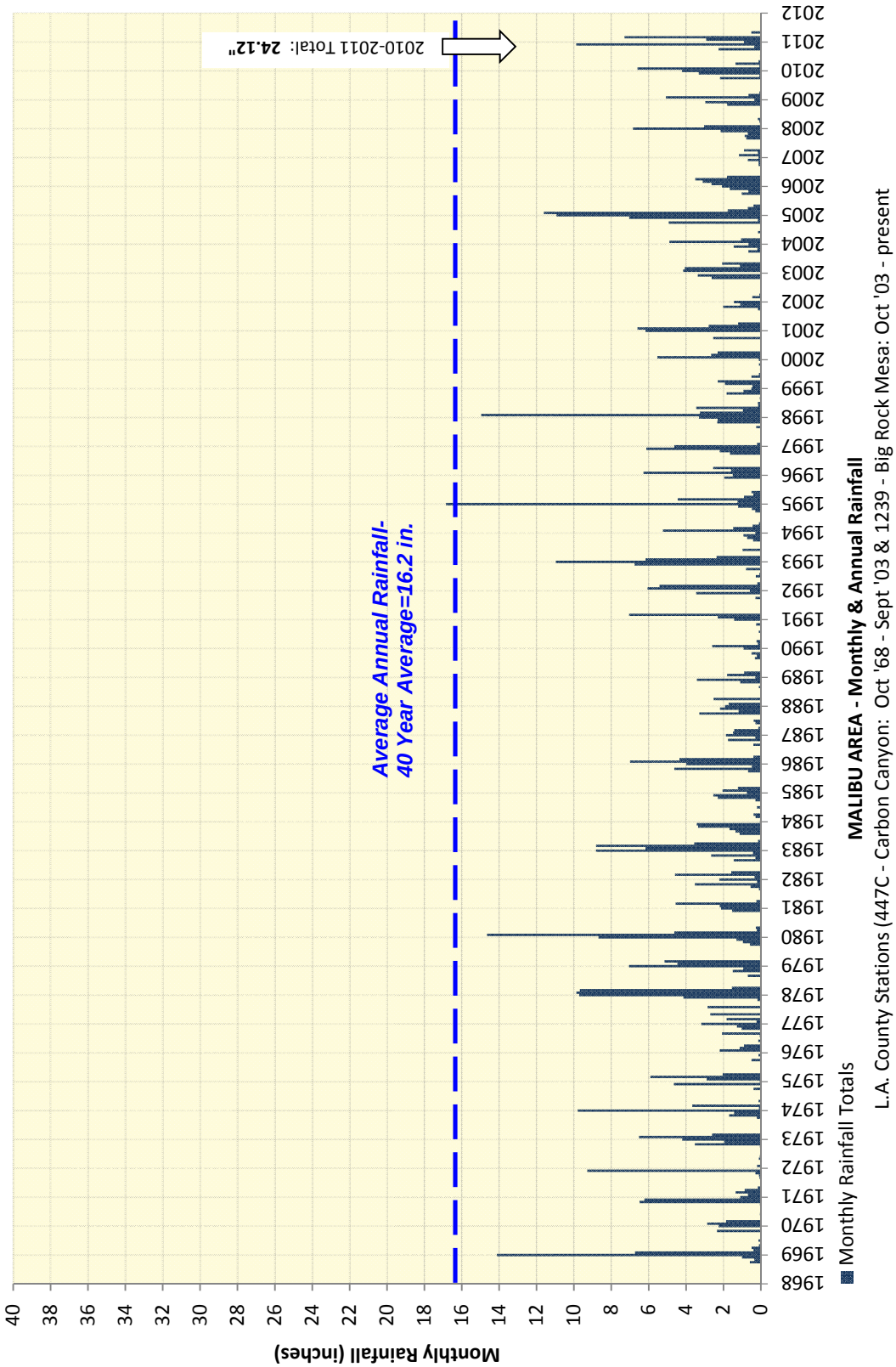

MALIBU AREA - Monthly & Annual Rainfall
L.A. County Stations (447C - Carbon Canyon: Oct '68 - Sept '03 & 1239 - Big Rock Mesa: Oct '03 - present
Monthly Rainfall Totals
Monthly Rainfall (inches)
Average Annual Rainfall-
40 Year Average=16.2 in.
2010-2011 Total: 24.12"

PLATE 3

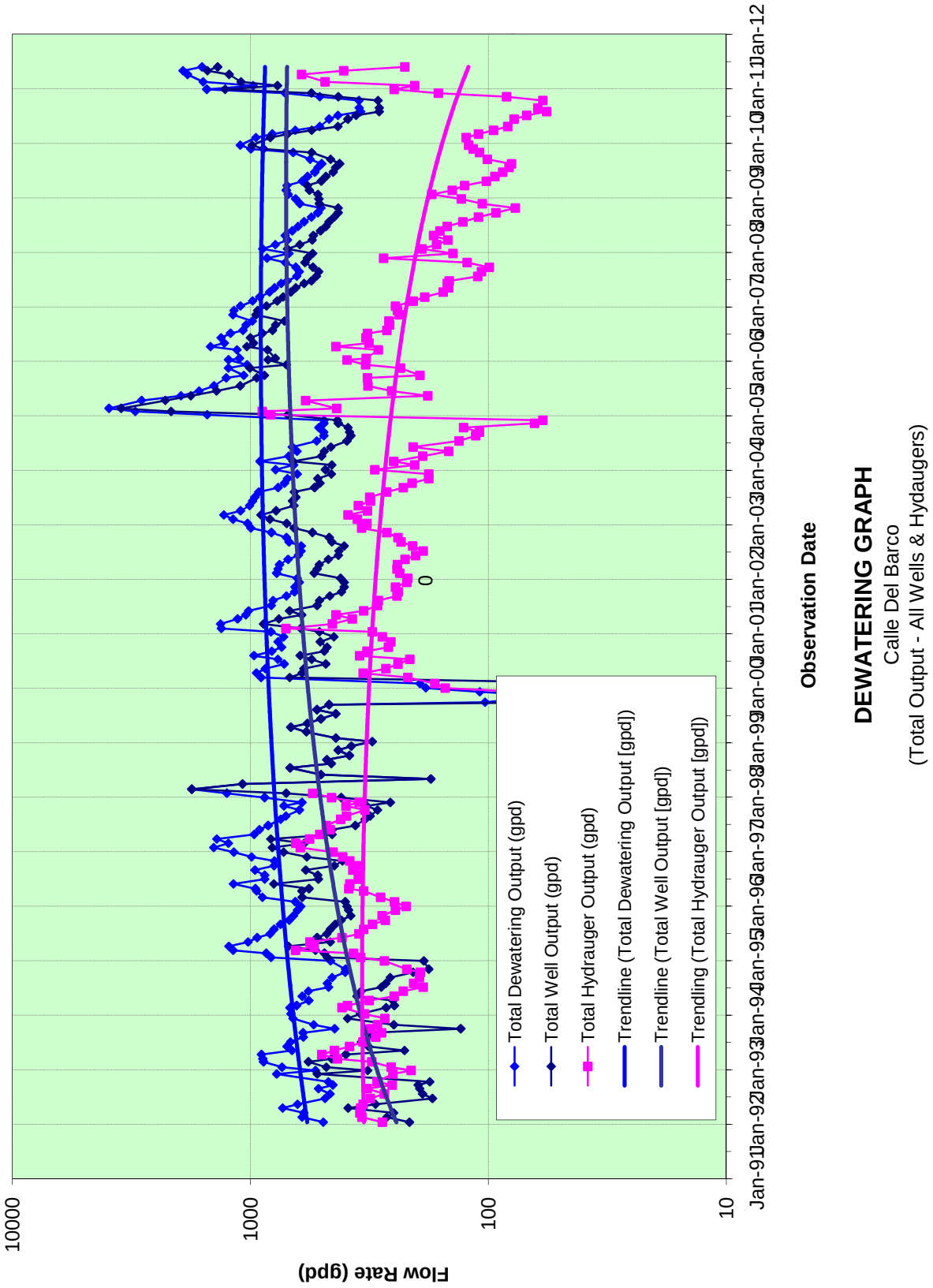
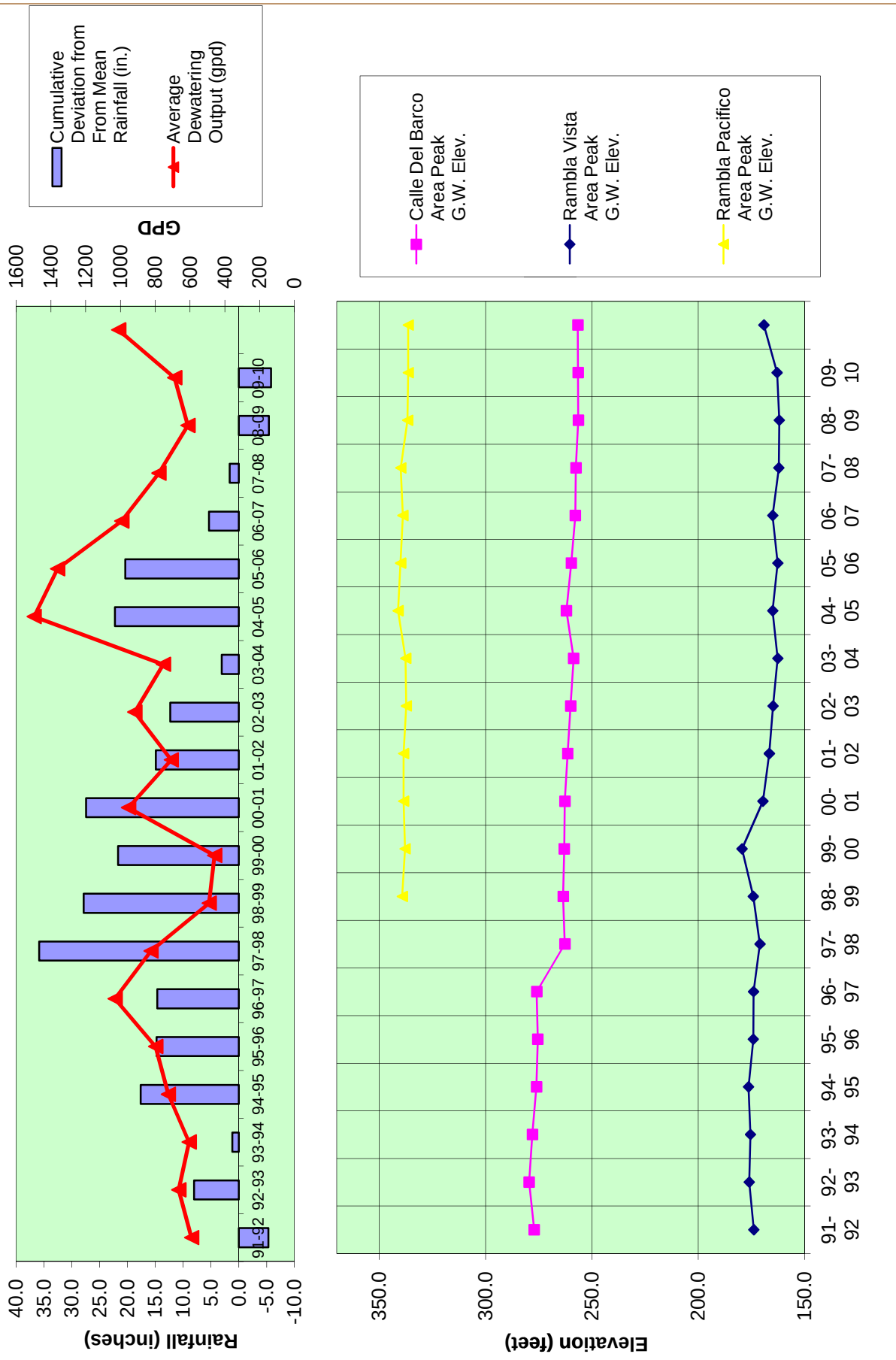

DEWATERING GRAPH
Calle Del Barco
(Total Output - All Wells & Hydaugers)
Flow Rate (gpd)
10000
1000
100
10
Observation Date
Jan-91
Jan-92
Jan-93
Jan-94
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
0
Total Dewatering Output (gpd)
Total Well Output (gpd)
Total Hydrauger Output (gpd)
Trendline (Total Dewatering Output [gpd])
Trendline (Total Well Output [gpd])
Trendling (Total Hydrauger Output [gpd])

PLATE 4



SUMMARY GRAPH
Calle Del Barco
Groundwater Levels, Dewatering, & Rainfall

** Graph shows the average of the highest groundwater elevations recorded in each well/piezometer during the monitoring period.*

APPENDIX A
GROUNDWATER DATA

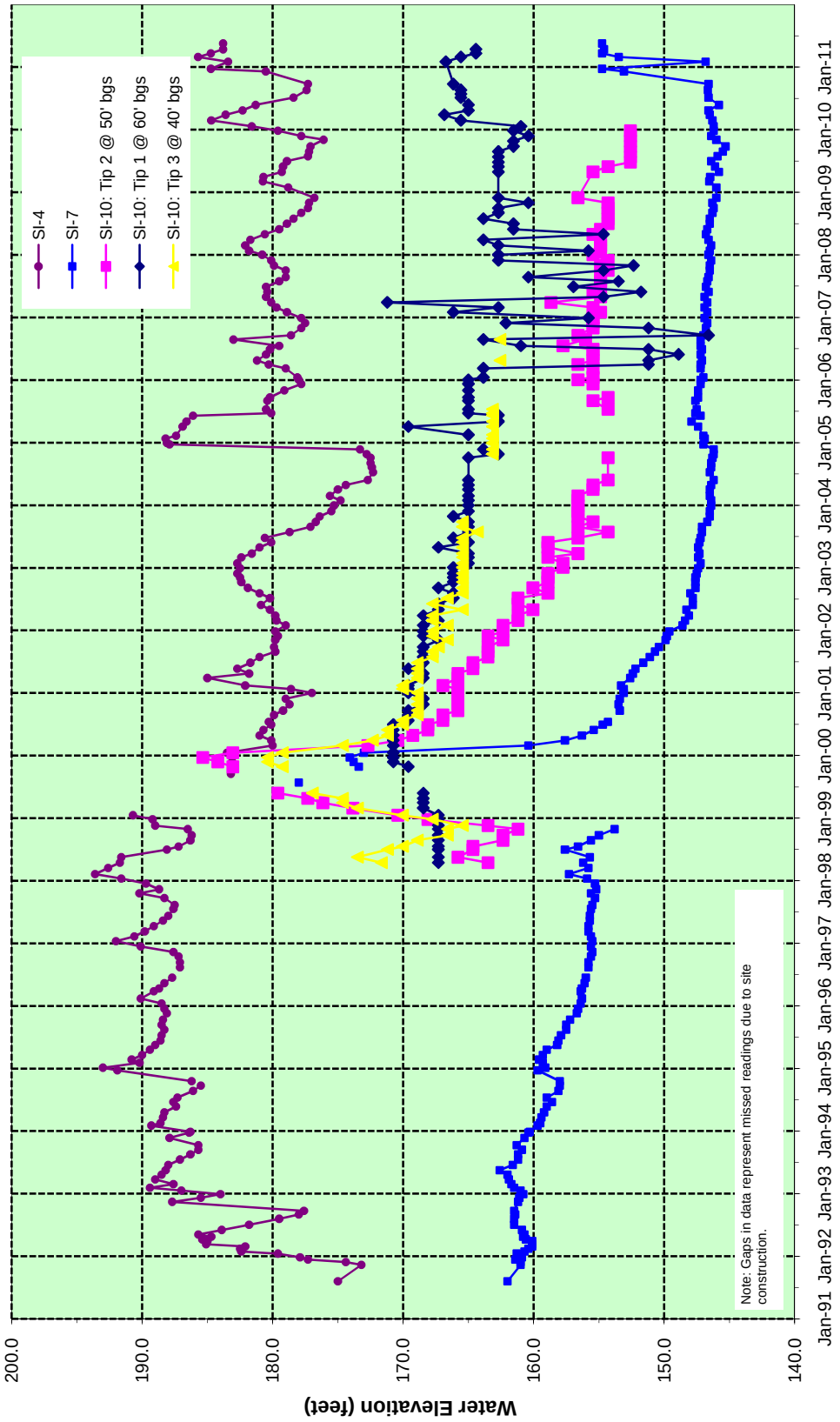
CALLE DEL BARCO - Pnuematic Piezometer Information

Piezomenter ID	Tip No.	Surface Elev. (ft)	Tip depth (ft)	Tip Elev. (ft)	Installed By
SI-9	1	298	71	227	BYA
	2		41	257	BYA
SI-10	1	202	64	138	BYA
	2		54	148	BYA
	3		44	158	BYA
	4		24	178	BYA
SI-11	1	291.5	60	231.5	BYA
	2		50	241.5	BYA
	3		40	251.5	BYA
	4		20	271.5	BYA
SI-12	1	301	60	241	BYA
	2		50	251	BYA
	3		40	261	BYA
	4		20	281	BYA
SI-13	1	405	70	335	BYA
	2		50	355	BYA
SI-14	1	398	68	330	BYA
	2		48	350	BYA
SI-15	1	304	66	238	BYA
	2		36	268	BYA
SI-16	1	298	70	228	BYA
	2		40	258	BYA

CALLE DEL BARCO - SUMMARY OF GROUNDWATER DATA

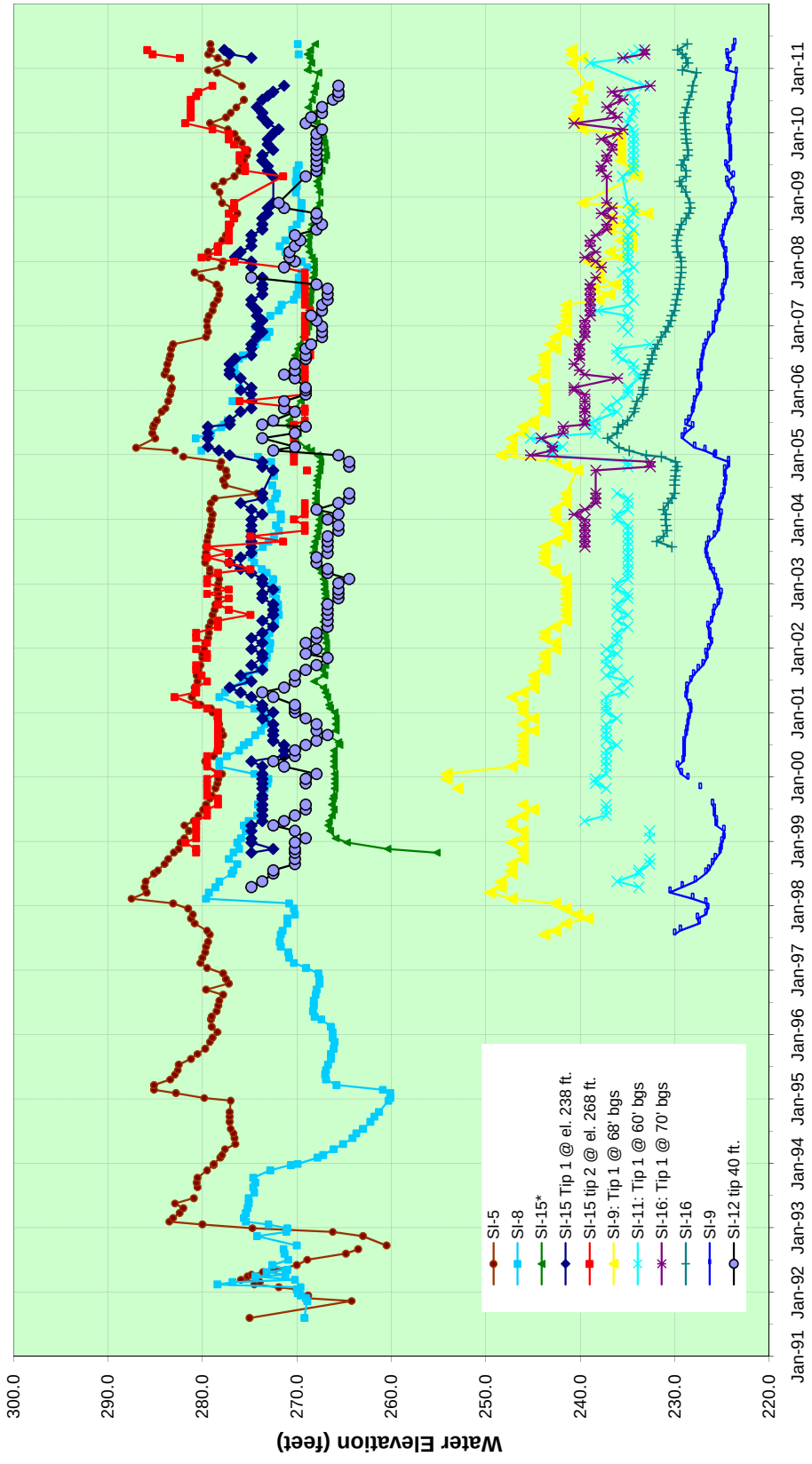
Piezometer I.D.		91-92*	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00**	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	Highest Ever Recorded	Mean '91 - '11	Stand. Dev.	10-11 vs 97-98	10-11 vs 09-10	10-11 vs Mean
Rambla Vista																											
SI-4	Mean El.	180.9	184.9	187.3	188.9	188.6	188.8	190.1	187.9	182.0	180.4	180.1	181.8	176.1	180.5	179.6	179.5	180.4	178.7	179.8	182.0	Mar-98	182.9	4.2	-8.1	**2.2**	-0.9
	Max El.	185.7	189.4	189.3	193.0	190.1	192.0	193.6	190.7	183.5	185.0	181.7	182.7	180.6	188.2	181.2	183.0	182.1	180.7	184.7	185.7	193.6	186.1	4.3	-7.9	**1.0**	-0.4
SI-7	Mean El.	160.8	161.5	160.3	158.8	156.9	155.7	155.8	155.7	166.9	153.3	149.5	147.5	146.6	146.8	147.3	146.9	146.6	146.2	146.1	151.2	Aug-99	153.0	6.4	-4.6	**5.1**	-1.8
	Max El.	162.0	162.6	161.6	159.7	158.1	156.0	157.3	157.6	178.0	154.7	151.6	148.0	147.2	147.9	147.6	147.2	146.8	146.6	146.6	154.8	178.0	154.6	8.0	-2.6	**8.2**	**0.2**
SI-10 TIP-1	Mean El.							167.3	167.7	170.6	169.3	168.1	166.0	165.2	164.5	161.2	158.2	158.5	162.4	163.0	165.5	Apr-07	164.8	3.8	-1.8	**2.5**	**0.7**
	Max El.							167.3	168.5	170.8	170.8	168.5	167.3	166.2	169.6	165.0	171.2	163.9	163.9	166.8	166.7	171.2	167.6	2.4	-0.6	-0.1	-0.9
SI-10 TIP-2	Mean El.							164.7	168.7	177.0	166.2	162.4	158.8	155.9	154.3	155.5	156.0	154.9	154.8	152.6	--	Jan-99	160.1	7.2	--	--	--
	Max El.							165.8	179.6	185.4	168.1	164.7	161.2	156.6	154.3	156.6	158.7	155.5	156.6	152.6	--	185.4	162.7	10.0	--	--	--
Area Average	Mean El.	170.9	173.2	173.8	173.9	172.8	172.2	169.5	170.0	174.1	167.3	165.0	163.5	161.0	161.5	160.9	160.1	160.1	160.5	160.4	166.2		166.8	5.5	-3.2	**5.9**	-0.6
	Max El	173.9	176.0	175.5	176.4	174.1	174.0	171.0	174.1	179.4	169.6	166.6	164.8	162.6	165.0	162.6	165.0	162.1	161.9	162.7	169.1		169.3	5.8	-1.9	**6.4**	-0.2
Change vs Prior	Mean El.		2.3	0.6	0.0	-1.1	-0.5	-2.8	0.5	4.1	-6.8	-2.2	-1.5	-2.6	0.6	-0.7	-0.7	-0.1	0.4	-0.1	5.9						
	Max El.		2.2	-0.6	0.9	-2.3	-0.1	-3.0	3.1	5.3	-9.8	-3.0	-1.8	-2.2	2.4	-2.4	2.4	-3.0	-0.1	0.7	6.4						
Calle Del Barco																											
SI-5	Mean El.	271.9	273.5	278.9	280.1	279.9	278.8	282.6	282.6	278.9	279.1	279.9	278.8	278.8	281.2	283.9	280.6	278.7	277.2	276.5	278.1	Mar-98	279.0	2.8	-4.5	**1.6**	-0.9
	Max El.	275.9	283.5	280.9	285.1	282.6	280.2	287.5	285.1	279.9	281.1	280.6	279.7	279.6	287.0	285.1	283.7	280.8	278.7	279.2	279.4	287.5	281.8	3.0	-8.1	**0.2**	-2.4
SI-8	Mean El.	271.6	273.0	270.5	262.8	266.8	269.0	273.7	276.0	274.9	275.2	273.5	272.8	272.6	276.2	276.7	273.7	270.2	269.9	269.8	269.9	Apr-05	271.9	3.5	-3.8	**0.1**	-2.1
	Max El.	278.4	275.6	275.1	267.0	268.3	271.7	279.6	277.2	278.2	278.2	275.7	274.8	274.6	280.7	277.7	276.6	271.8	270.5	269.8	269.9	280.7	274.6	4.0	-9.7	**0.1**	-4.7
SI-9	Mean El.							228.2	225.6	228.2	228.7	226.8	225.8	225.6	226.1	227.7	226.1	224.7	224.2	224.2	224.0	Apr-98	226.1	1.6	-4.2	-0.3	-2.2
	Max El.							230.5	226.7	229.7	229.0	228.3	226.6	226.7	229.2	228.8	227.2	225.1	224.8	224.6	224.5	230.5	227.3	2.0	-6.0	-0.1	-2.8
SI-15	Mean El.								264.0	266.1	266.3	267.2	267.3	267.9	268.5	269.9	269.3	268.5	267.9	267.6	268.4	Jul-05 & Aug-05	267.6	1.5		**0.8**	**0.8**
	Max El.								266.7	266.3	267.2	268.2	268.2	268.3	270.7	270.8	270.3	268.8	268.5	268.8	268.9	270.8	268.6	1.4		**0.1**	**0.3**
SI-16	Mean El.													230.8	232.6	233.7	231.1	229.5	228.9	228.9	228.7	Apr-05	230.5	1.9		-0.2	-1.9
	Max El.													231.9	237.1	235.5	232.7	229.8	229.5	229.3	229.7	237.1	231.9	3.0		**0.4**	-2.2
SI-9 TIP-1	Mean El.							244.1	246.7	248.7	245.9	243.5	242.1	242.3	245.2	244.1	242.0	236.8	235.7	237.6	240.3	Jan-Feb-98	242.5	3.8	-3.8	**2.7**	-2.2
	Max El.							249.6	247.3	254.2	247.3	245.0	243.8	243.8	248.4	245.0	243.8	239.2	239.8	240.8	240.9	254.2	244.9	4.2	-8.6	**0.1**	-4.0
SI-9 TIP-2	Mean El.							267.8	263.8	261.2	262.9				266.5	261.2						Mar-98	263.9	2.8			
	Max El.							274.3	266.9	261.2	263.5				270.4	261.2						274.3	266.2	5.3			
SI-11 TIP-1	Mean El.							235.0	234.4	237.5	236.8	236.3	235.3	235.2	240.0	235.7	235.3	235.0	234.7	234.5	235.0	Apr-05	235.8	1.5	0.0	**0.5**	-0.8
	Max El.							236.1	239.6	238.4	237.3	237.3	236.1	236.1	245.3	239.6	238.2	235.5	235.5	235.0	239.0	245.3	237.8	2.7	2.9	**4.0**	**1.2**
SI-11 TIP-2	Mean El.							242.7	243.7	243.8	242.8	242.8	242.7		242.9	242.7	242.7	242.8	242.9	242.5	242.1	Jan-00	242.8	0.5	-0.6	-0.4	-0.8
	Max El.							242.7	245.0	246.1	243.8	243.8	242.7		245.0	243.2	243.2	243.2	243.8	242.7	242.1	246.1	243.6	1.1	-0.6	-0.6	-1.6
SI-12 TIP-1	Mean El.							273.2	269.1	268.0	266.9	266.4	264.6	264.4	264.6	268.5	268.1	266.9	265.9	265.5	264.7	May-98	266.9	2.4	-8.5	-0.8	-2.2
	Max El.							275.5	269.8	268.6	267.5	267.5	265.2	265.2	268.6	269.8	269.8	268.6	267.5	266.3	265.7	275.5	268.2	2.6	-9.8	-0.6	-2.5
SI-12 TIP-2	Mean El.							275.2	273.9	272.5	270.9	268.7	266.9	267.1	267.1	269.2	266.7	266.7	265.2	264.8	263.8	Jun-98	268.5	3.4	-11.4	-1.1	-4.7
	Max El.							276.3	275.2	272.9	271.7	270.6	267.1	267.1	271.7	270.6	268.3	270.6	268.8	266.5	264.2	276.3	270.1	3.4	-12.1	-2.3	-5.9
SI-12 TIP-3	Mean El.							274.2	270.8	269.8	269.7	268.3	266.4	266.1	268.8	270.7	267.9	269.9	268.9	267.9	265.7	May-98	268.9	2.2	-8.5	-2.2	-3.2
	Max El.							274.8	272.5	272.5	273.7	270.2	267.9	267.9	273.7	273.7	269.1	274.8	271.9	269.1	266.2	274.8	271.3	2.8	-8.6	-2.9	-5.1
SI-15 TIP-1	Mean El.								274.2	273.4	273.6	274.1	274.0	274.6	277.0	276.0	274.6	274.6	273.1	273.2	274.3	Mar-05 & Apr-05	274.4	1.1		**1.1**	-0.1
	Max El.								274.8	274.8	277.1	276.0	277.1	276.0	279.4	277.1	276.5	276.5	273.7	274.2	277.7	279.4	276.2	1.6		**3.4**	**1.5**
SI-15 TIP-2	Mean El.								280.7	279.1	279.4	279.8	277.8	271.9	270.1	269.8	269.0	273.8	276.1	278.2	282.1	Apr-03	276.0	4.5		**3.9**	**6.1**
	Max El.								281.8	279.5	283.0	280.7	279.5	279.5	270.3	276.1	269.2	280.1	277.2	281.8	285.8	283.0	278.8	4.7		**4.0**	**7.0**
SI-16 TIP-1	Mean El.													239.3	240.3	239.5	239.5	238.7	237.2	237.1	234.7	Jan-05	238.3	1.8		-2.5	-3.6
	Max El.													240.7	245.3	240.7	240.1	239.5	237.8	240.7	236.6	245.3	240.1	2.5		-4.0	-3.5
SI-16 TIP-2	Mean El.													260.9	263.9	260.4	258.6	258.6	258.6	258.6	259.2	Mar-05	259.8	1.9		**0.6**	-0.7
	Max El.													262.6	266.1	261.5	258.6	258.6	258.6	258.6	259.2	266.1	260.4	2.7		**0.6**	-1.3
Area Average	Mean El.	271.8	273.3	274.7	271.4	273.3	273.9	259.7	261.8	261.3	261.0	260.0	258.8	257.0	258.2	258.1	256.3	255.7	255.1	255.1	255.4		262.6	7.3	-4.3	**0.3**	-7.2
	Max El	277.2	279.6	278.0	276.1	275.5	276.0	262.7	263.5	263.0	262.7	261.4	260.0	258.6	261.8	259.7	257.8	257.5	256.4	256.5	256.6		265.0	8.4	-6.0	**0.2**	-8.4
Change vs Prior	Mean El.		1.5	1.4	-3.3	1.9	0.6	-14.2	2.1	-0.5	-0.3	-1.0	-1.2	-1.9	1.2	-0.1	-1.8	-0.7	-0.6	0.0	0.3						
	Max El.		2.4	-1.6	-1.9	-0.6	0.5	-13.3	0.8	-0.5	-0.2	-1.3	-1.4	-1.5	3.2	-2.0	-1.9	-0.3	-1.1	0.1	0.1						
Rambla Pacifico																											
SI-13	Mean El.								342.3	340.3	341.3	341.2	341.0	341.5	342.7	344.4	343.4	341.4	341.0	340.1	340.0	Apr-05	341.6	1.3		-0.1	-1.6
	Max El.								343.4	340.9	342.2	341.8	342.1	342.1	346.1	345.5	344.4	342.1	341.5	340.5	340.3	346.1	342.5	1.8		-0.3	-2.3
SI-13 TIP-1	Mean El.								343.9	342.1	343.5	343.5	342.4	342.5	342.9	344.3	343.3	342.2	340.0	339.6	340.3	Apr-05	342.4	1.5		**0.7**	-2.0
	Max El.								344.2	343.1	344.2	344.2	344.2	343.1	346.5	345.4	345.4	348.8	341.3	340.8	340.8	346.5	344.0	2.3		0.0	-3.2
SI-14	Mean El.								332.0	331.6	331.7	332.2	331.7	331.8	332.8	334.1	333.6	332.8	332.8	332.1	332.4	May-05	332.4	0.8		**0.3**	0.0
	Max El.								332.2	331.7	332.3	332.5	331.9	331.9	336.3	335.8	334.3	333.1	333.0	332.5	332.9	336.3	333.1	1.5		**0.4**	-0.2
SI-14 TIP-1	Mean El.								335.9	335.7	335.0	334.0	331.2	332.5	333.2	332.5	330.7	332.3	330.8	330.8	331.5	Nov-98	332.8	1.9		**0.7**	-1.3
	Max El.								336.9	335.8	335.8	335.8	331.2	333.5	335.8	333.5	331.7	335.8	331.2	331.7	331.7	336.9	333.8	2.2		0.0	-2.1
Area Average	Mean El.								338.5	337.4	337.9	337.7	336.6	337.1	337.9	338.8	337.8	337.2	336.1	335.7	336.1		337.3	1.0		**0.4**	-1.2
	Max El								339.2	337.9	338.6	338.6	337.3	337.6	341.2	340.0	338.9	339.9	336.7	336.4	336.4		338.4	1.5		**0.0**	-2.0
Change vs Prior	Mean El.									-1.1	0.5	-0.2	-1.1	0.5	0.9	0.9	-1.1	-0.6	-1.0	-0.5	0.4						
	Max El.									-1.3	0.8	-0.1	-1.2	0.3	3.5	-1.1	-1.1	1.0	-3.2	-0.4	0.0						

Piezometer Not Installed No Data Recorded



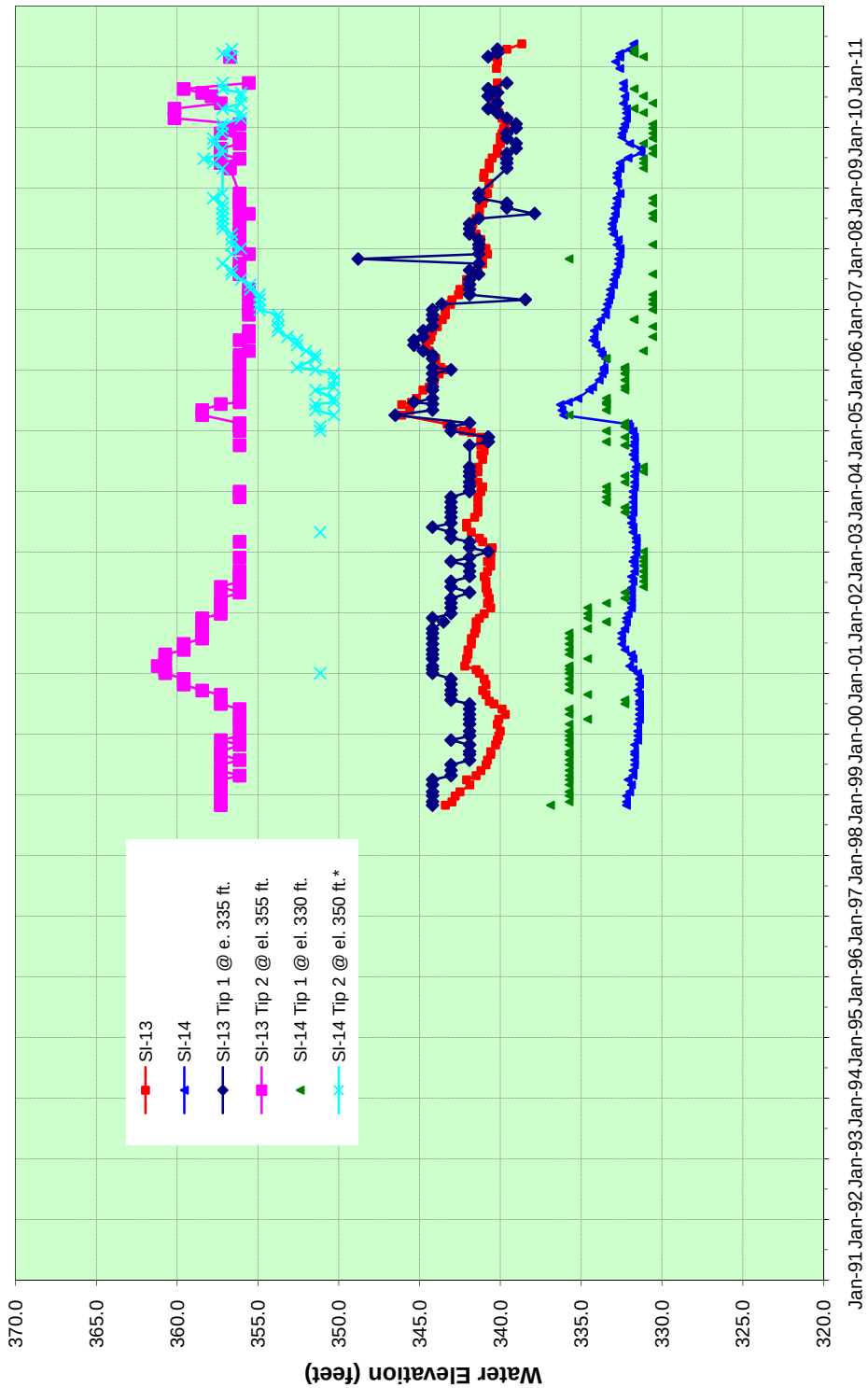
GROUNDWATER HYDROGRAPH
Rambla Vista

PLATE A-3



GROUNDWATER HYDROGRAPH
Calle Del Barco

PLATE A-4



GROUNDWATER HYDROGRAPH
Rambla Pacifico

APPENDIX B
DEWATERING DATA

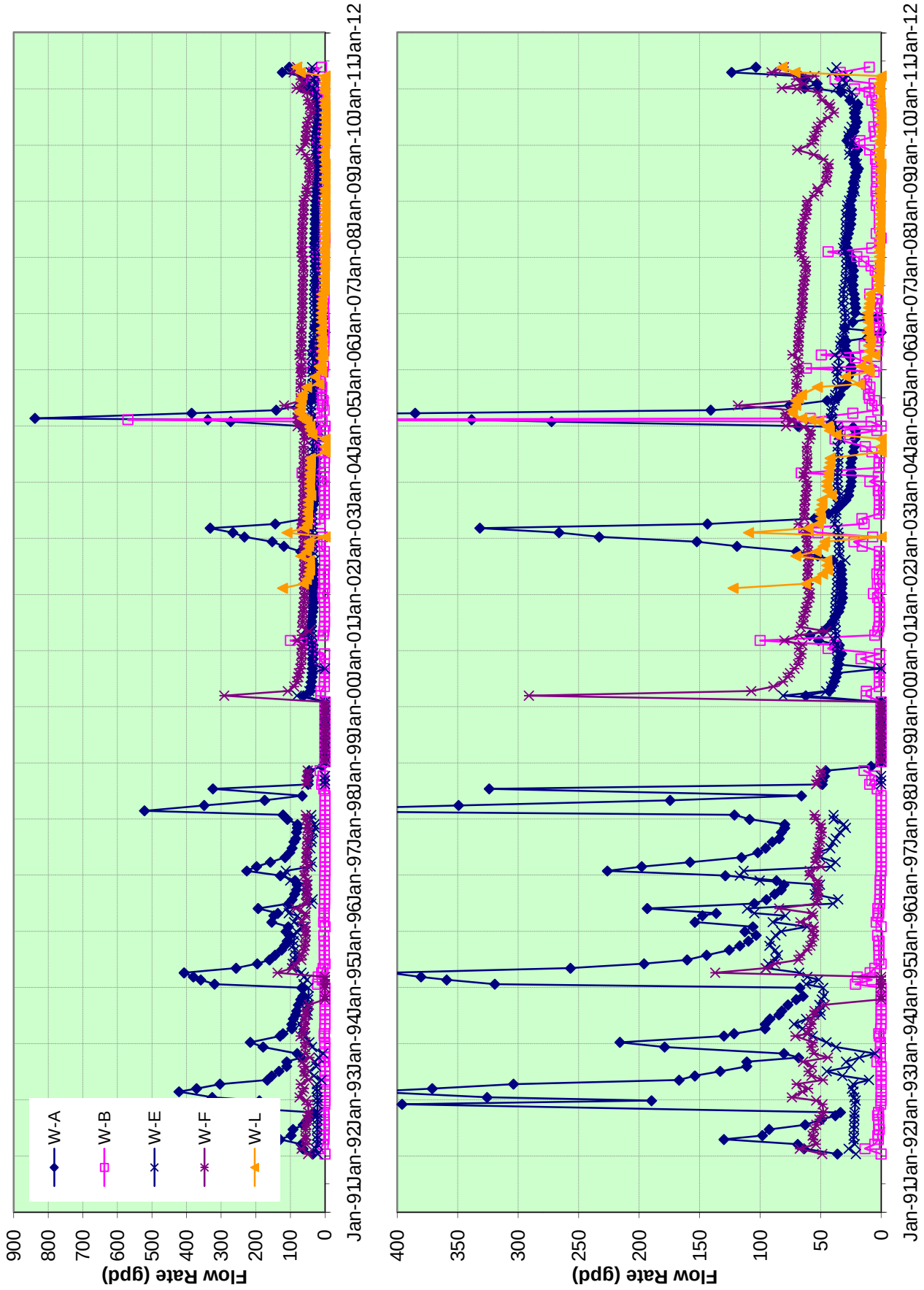
CALLE DEL BARCO - Dewatering Well Information							
Well ID	**Vault Elevation (ft.)**	**Bottom Elevation (ft.)**	**Pump Elevation (ft.)**	**Pump Size (hp)**	**2010-2011 Pumping Rate* (gpd)**	**% of Total Well Production**	**Comment**
W-A	196.0	Unknown	45.0	1/2	51	6%	
W-B	204.0	Unknown	54.0	1/2	14	2%	
W-C	295.0	Unknown	233.0	1/2	131	15%	
W-D	297.0	Unknown	Unknown	none	0	0%	dry - no pump
W-E	215.0	Unknown	116.5	1/2	28	3%	
W-F	210.0	109.0	112.0	1/2	60	7%	
W-G	292.0	222.0	223.0	1/3	0	0%	dry
W-H	299.5	234.5	242.5	1/3	3	0%	
W-I	298.0	238.0	248.0	1/3	67	8%	
W-J	304.0	244.0	254.0	1/3	321	38%	
W-K	430.0	370.0	380.0	1/3	63	7%	
W-L	258.0	189.0	192.5	1/2	13	1%	
W-M	302.0	237.0			98	11%	

*Note: * Average pumping rate during this monitoring period*

CALLE DEL BARCO - Hydrauger Information						
Hydrauger ID	**Installed Length (ft.)**	**Funtional Length** (ft)**	**2010-2011 Flow Rate* (gpd)**	**% of Total Production**	**Installed By**	**Comment**
HD-1	93	unknown	0	0%	BYA	
HD-2	127	unknown	0	0%	BYA	
HD-3	155	unknown	0	0%	BYA	
HD-4	80	unknown	0	0%	BYA	
HD-5	65	unknown	0	0%	BYA	
HD-6	97	unknown	0	0%	BYA	
HD-7	227	unknown	0.2	0%	BYA	
HD-8	290	unknown	0	0%	BYA	
HD-9	230	unknown	0	0%	BYA	
HD-10	330	unknown	0	0%	BYA	
HD-11	230	unknown	0	0%	BYA	
HD-12	330	unknown	0	0%	BYA	
HD-13	210	unknown	119	53%	BYA	
H-1	240	unknown	84	38%	LA County	
H-2	180	unknown	0	0%	LA County	
ROWH-1	--	unknown	20	9%	BYA	diverted from H-2
H-3**	235	unknown	0	0%	LA County	
H-4**	140	unknown	0	0%	LA County	
H-5**	260	unknown	0	0%	LA County	
H-6**	140	unknown	0	0%	LA County	
H-7**	205	unknown	0	0%	LA County	

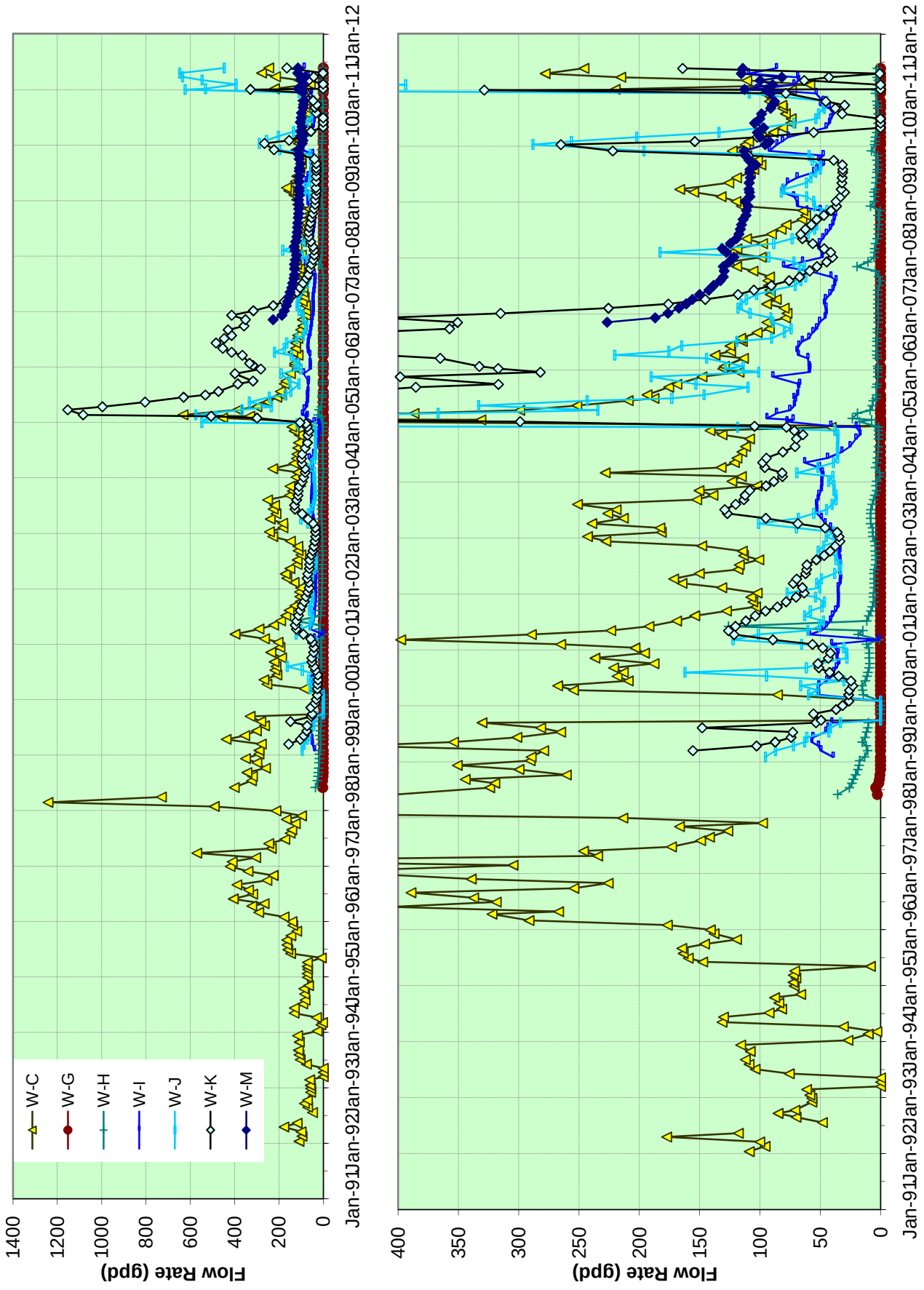
*Note: * Average flow rate during this monitoring period*

*** Destroyed in 1998 Landslide*



DEWATERING WELL GRAPH
Rambla Orienta & Slope
(Same Chart at Different Scales)

PLATE B-2



DEWATERING WELL GRAPH
Calle Del Barco & Rambla Pacifico
(Same Chart at Different Scales)

PLATE B-3

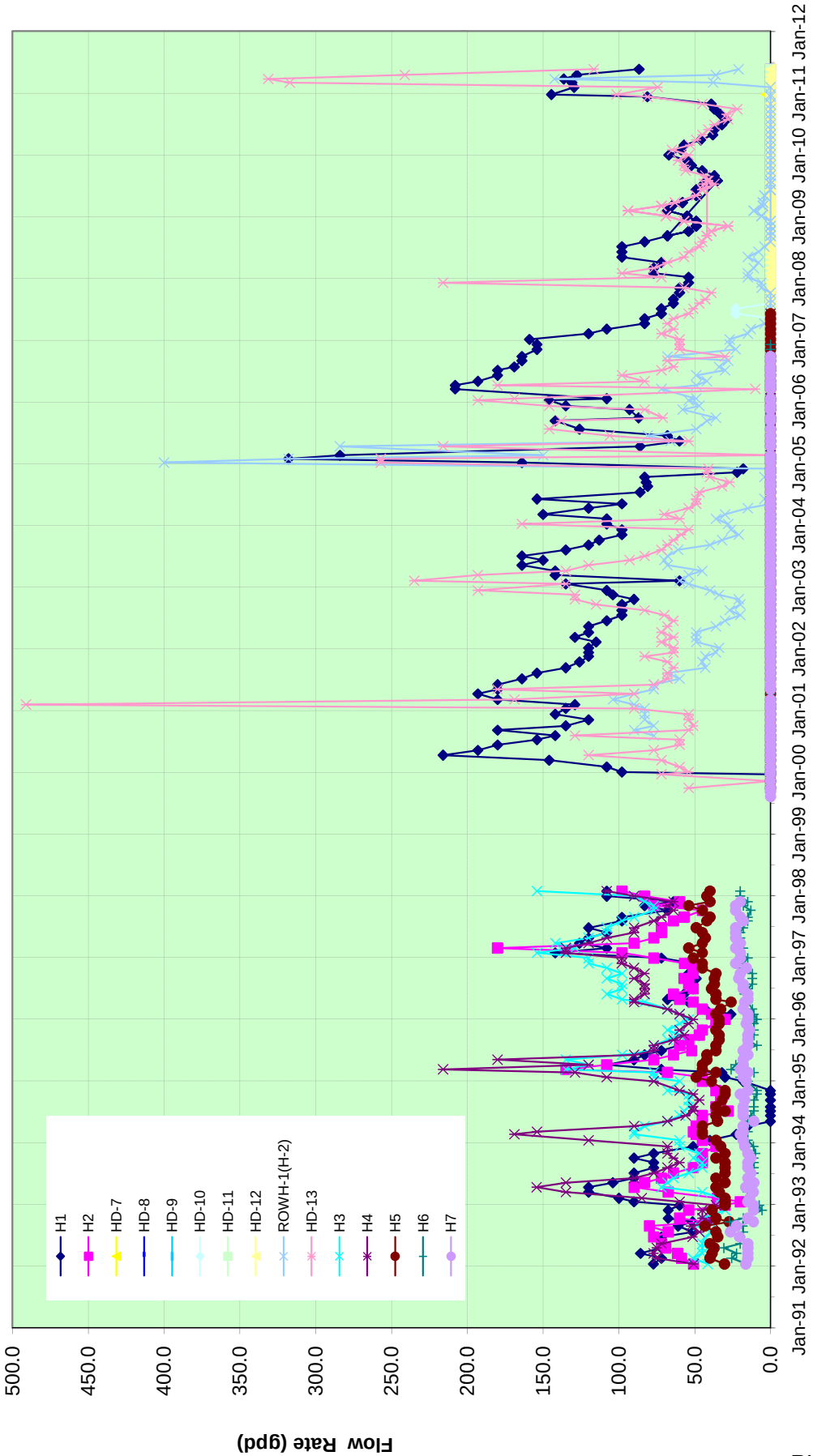

Flow Rate (gpd)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Jan-91 Jan-92 Jan-93 Jan-94 Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05 Jan-06 Jan-07 Jan-08 Jan-09 Jan-10 Jan-11 Jan-12
H1
H2
HD-7
HD-8
HD-9
HD-10
HD-11
HD-12
ROWH-1(H-2)
HD-13
H3
H4
H5
H6
H7

PLATE B-4

APPENDIX C
SLOPE INCLINOMETER DATA

CALLE DEL BARCO - Slope Inclinometer Interpretation Summary																	
	SI-1*	**SI-1A**	**SI-2****	**SI-3**	**SI-4**	**SI-5**	**SI-6**	**SI-7**	**SI-8**	**SI-9**	**SI-10**	**SI-11**	**SI-12**	**SI-13**	**SI-14**	**SI-15**	**SI-16**
Installation Details																	
Surface Elev. (ft) 4/00	295.0	297.0	298.0	207.0	206.0	302.0	295.0	200.0	335.0	298.0	202.0	291.5	301.0	405.0	398.0	304.0	295.0
Original DEPTH (ft.)	64.0	N/A	N/A	N/A	76.0	100.0	N/A	100.0	130.0	100.0	60.0	60.0	60.0	80.0	78.0	76.0	88.0
Current DEPTH (ft.)	64.0	N/A	N/A	N/A	78.0	96.0	N/A	102.0	130.0	96.0	62.0	57.0	56.0	78.0	76.0	72.0	86.0
STATUS	D	D	D	D	F	F	D	F	F	F	F	F	F	F	F	F	F
READING INTERVAL	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly	Qrtly
DATE OF INSTALLATION	NA	NA	NA	NA			NA				3/13/98	3/12/98	3/12/98	9/1998	9/1998	9/1998	8/8/03
DATE FIRST BASE READING	NA	NA	NA	NA			NA			12/22/97	3/16/98	3/13/98	3/16/98	10/12/98	10/12/98	10/23/98	8/13/03
DEPTH of MOVEMENT (ft)***					21-28	40, 68-70	15.0	46.0	20.0	58	41-44		54				
A+ Axis orientation					0	38.0		28.0	22.0	212.0	244.0	258.0	238.0	210.0	224.0	190.0	210 est.
Interpretation Movement (inches)																	
2010-2011	NA	NA	NA	NA	--	--	NA	< 0.05	0.05	< 0.05	--	--	--	--	--	--	--
2009-2010	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
2008-2009	NA	NA	NA	NA	--	--	NA	NA	--	--	--	--	--	--	--	--	--
2007-2008	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
2006-2007	NA	NA	NA	NA	--	<0.1	NA	--	--	--	--	--	--	--	--	--	--
2005-2006	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	<0.1	--	--	--	--
2004-2005	NA	NA	NA	NA	--	0.45	NA	<0.1	0.1	0.5	--	<0.1	0.11	--	--	--	0.35
2003-2004	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
2002-2003	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
2001-2002	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
2000-2001	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
1999-2000	NA	NA	NA	NA	--	--	NA	--	--	--	--	--	--	--	--	--	--
1998-1999	NA	NA	NA	NA	--	0.16	NA	0.11	--	2.19	--	--	--	--	--	--	--
1997-1998	NA	NA	NA	NA	0.22	0.4	NA	0.66	0.32	13	0.22	--	--	NA	NA	NA	NA
1996-1997	NA	NA	NA	NA	NI	NI	NA	NI	NI	NA	NA	NA	NA	NA	NA	NA	NA
1995-1996	NA	NA	NA	NA	NI	NI	NA	NI	NI	NA	NA	NA	NA	NA	NA	NA	NA

KEY:

D	Destroyed	**--**	No clearly defined interpreted movement
F	Functioning	**NA**	Not applicable
B	New baseline in 1999	**NI**	No information

NOTES:

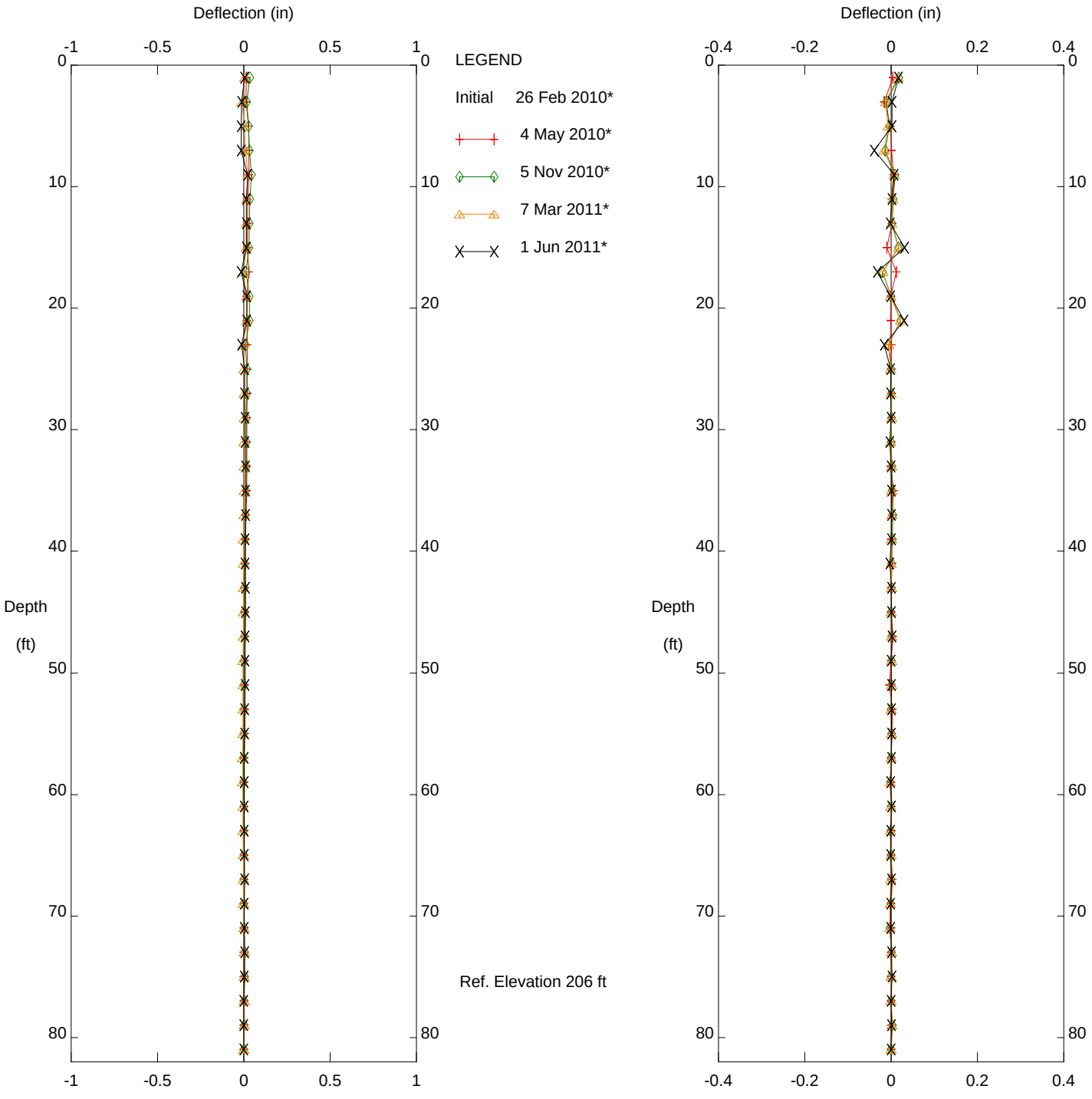
* Original SI-1 installed in 1978, and was destroyed.
SI-65 (installed in 1979) was renamed to SI-1

** Original SI-2 installed in 1978, and was destroyed.
SI-90 (installed in 1979) was renamed to SI-2

*** Referenced to current depth of SI (see above note)

NB: SI-4, SI-7, and SI-10 were extended 6 feet upwards during reconstruction of the road in 1999.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

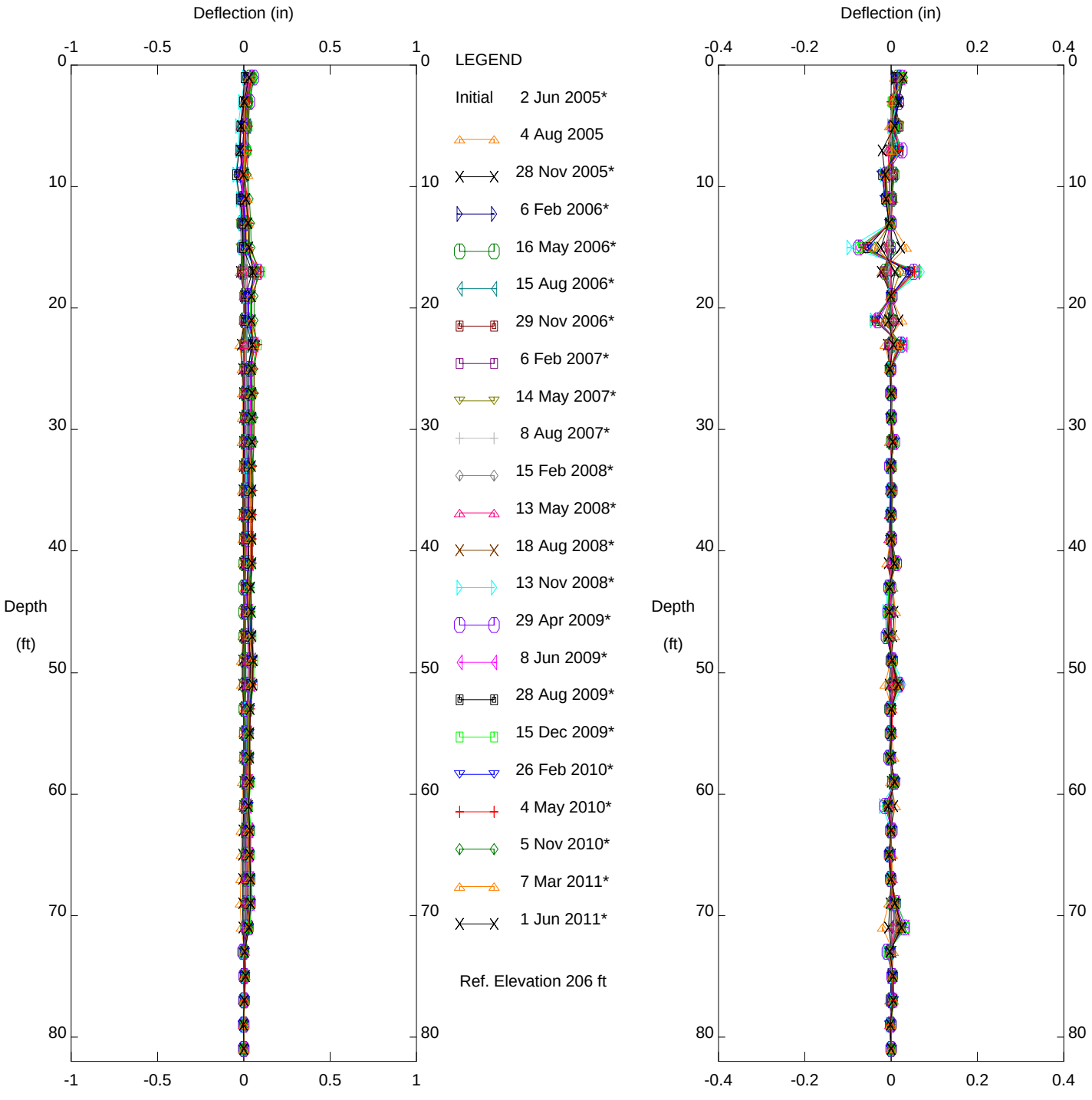
Direction A

CALLE DEL BARCO, Inclinometer SI-4

Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

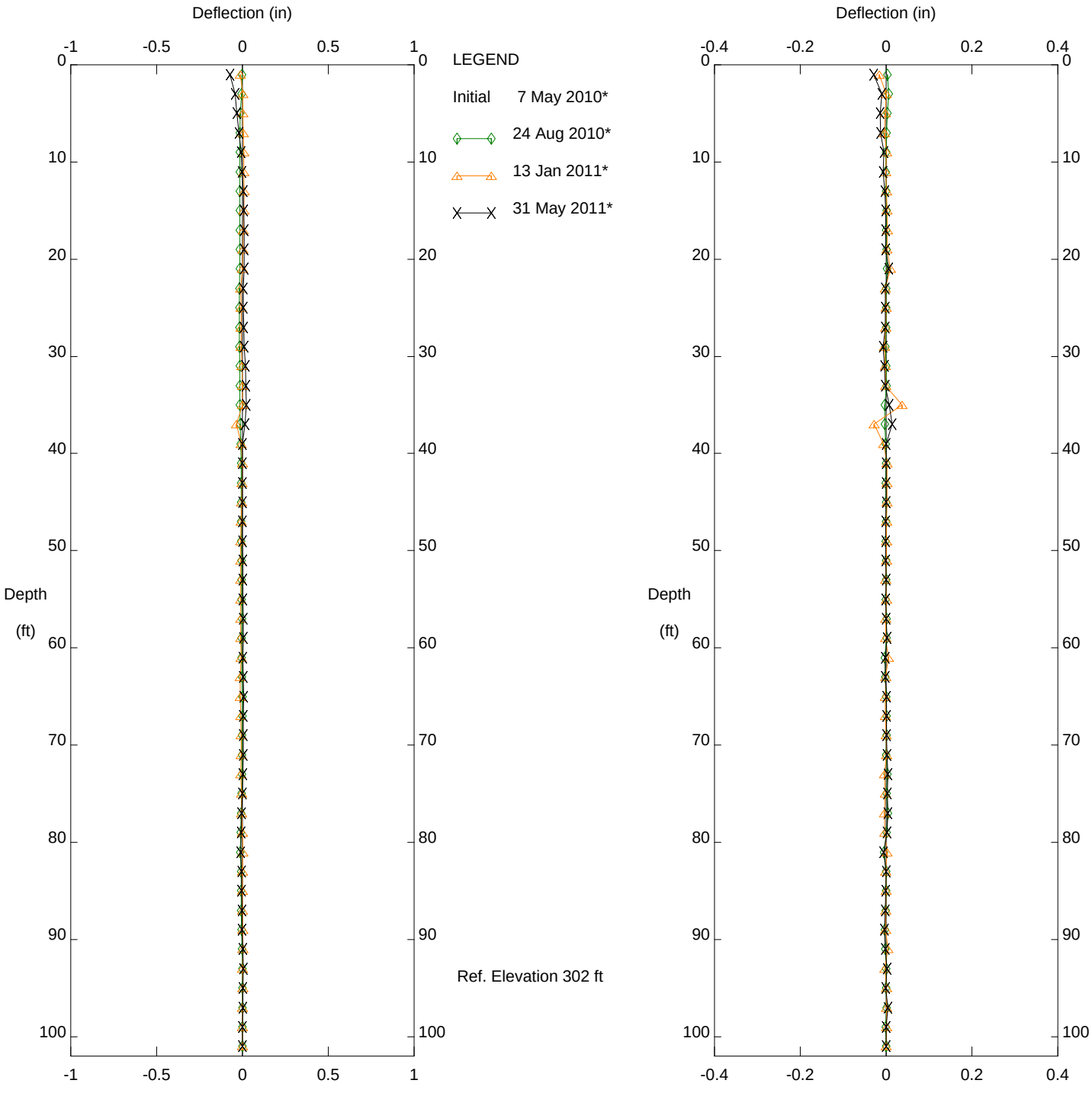
Direction A

CALLE DEL BARCO, Inclinometer SI-4

Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

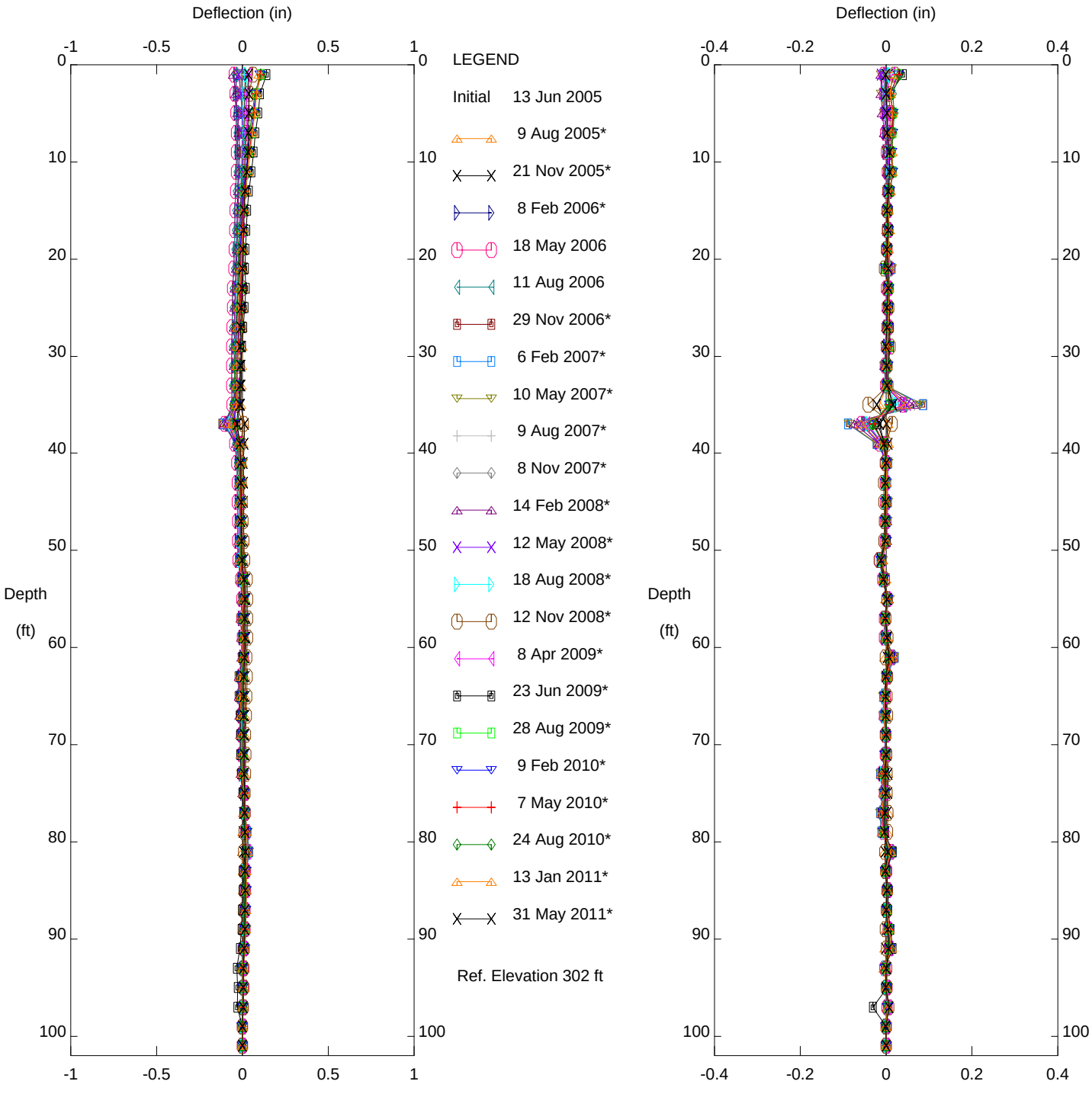
Direction A

CALLE DEL BARCO, Inclinometer SI-5

Depth of readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

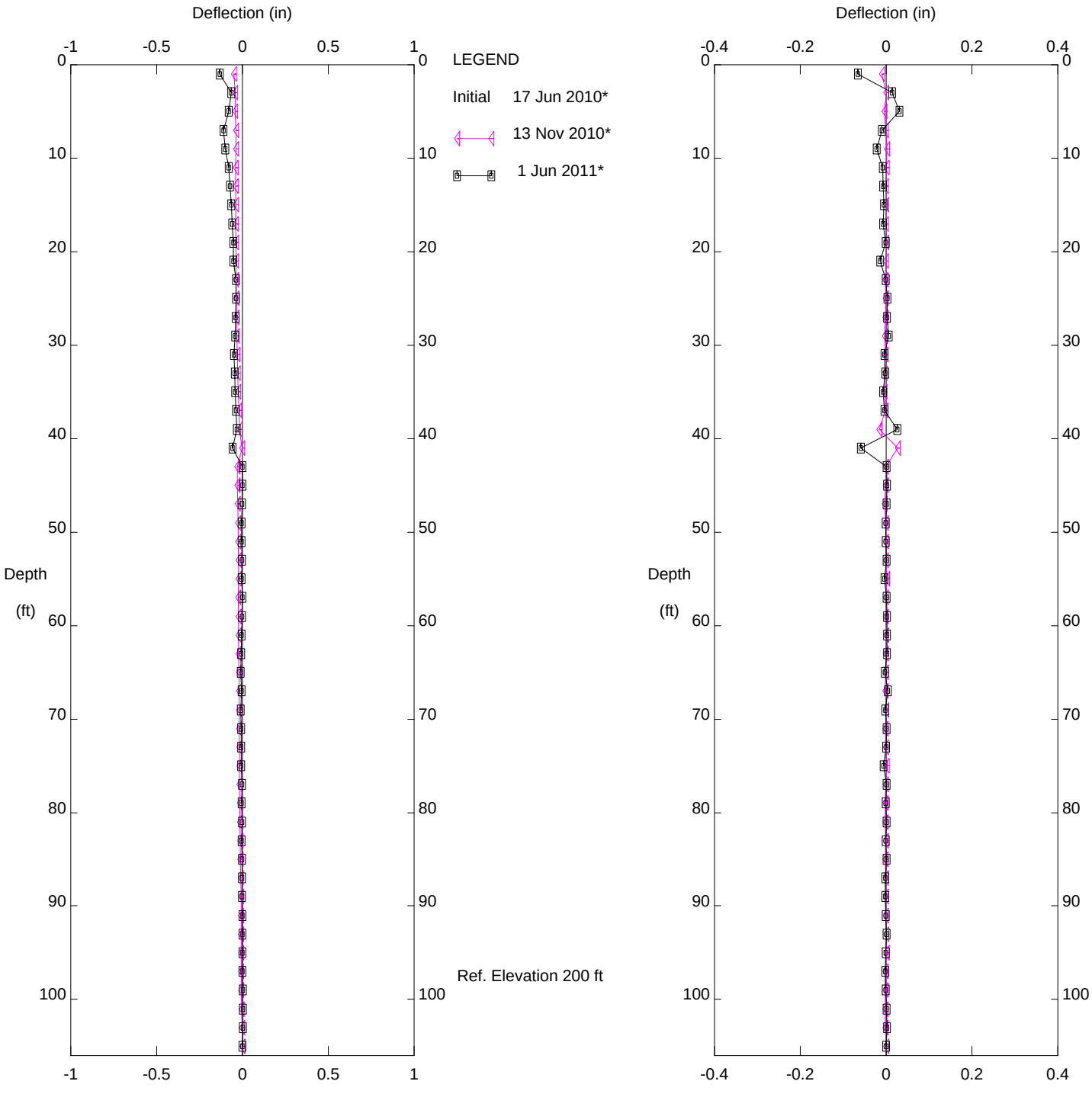
Direction A

CALLE DEL BARCO, Inclinometer SI-5

Depth of readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA

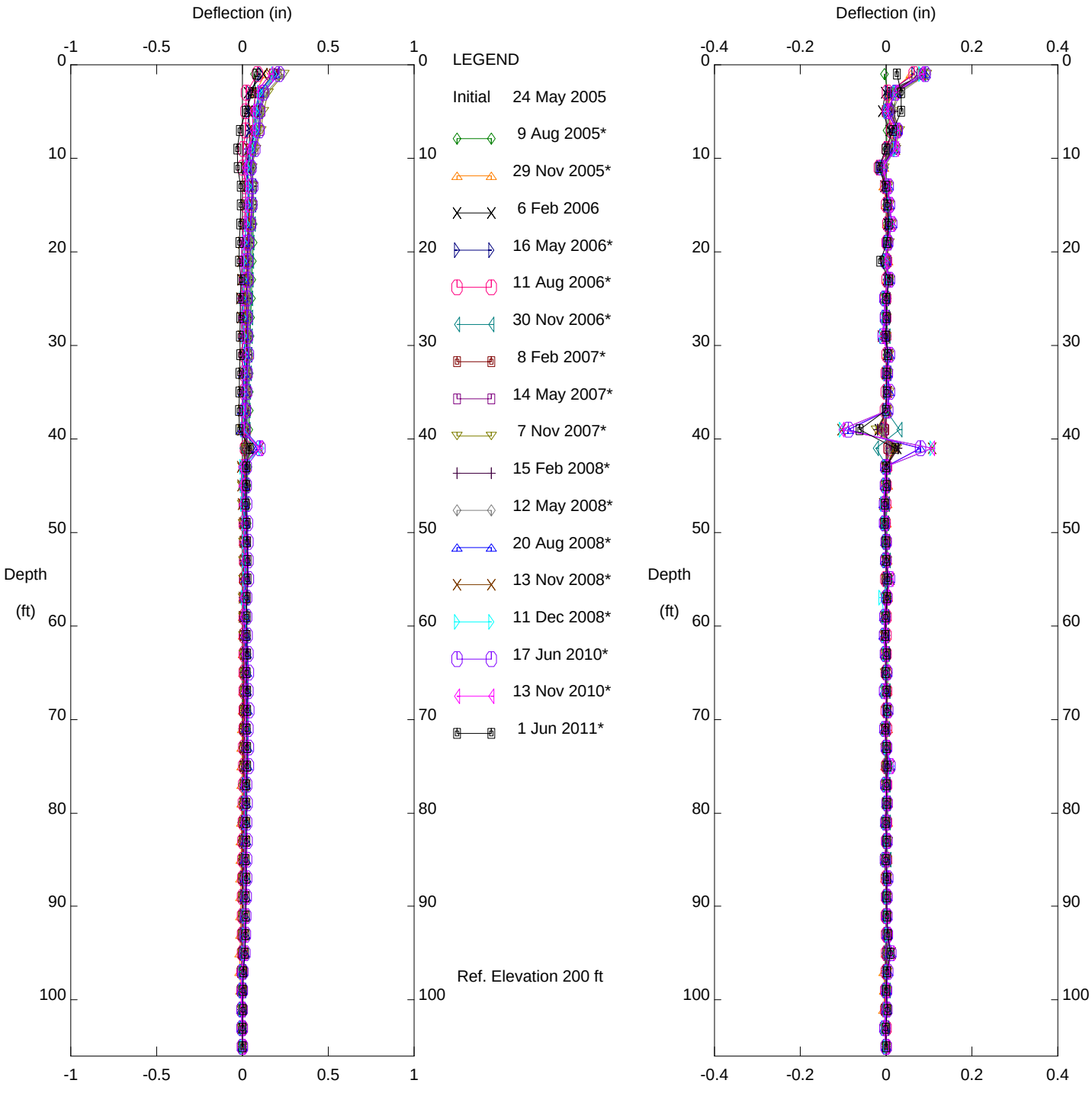


CALLE DEL BARCO, Inclinometer SI-7

Depth of readings = 102 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

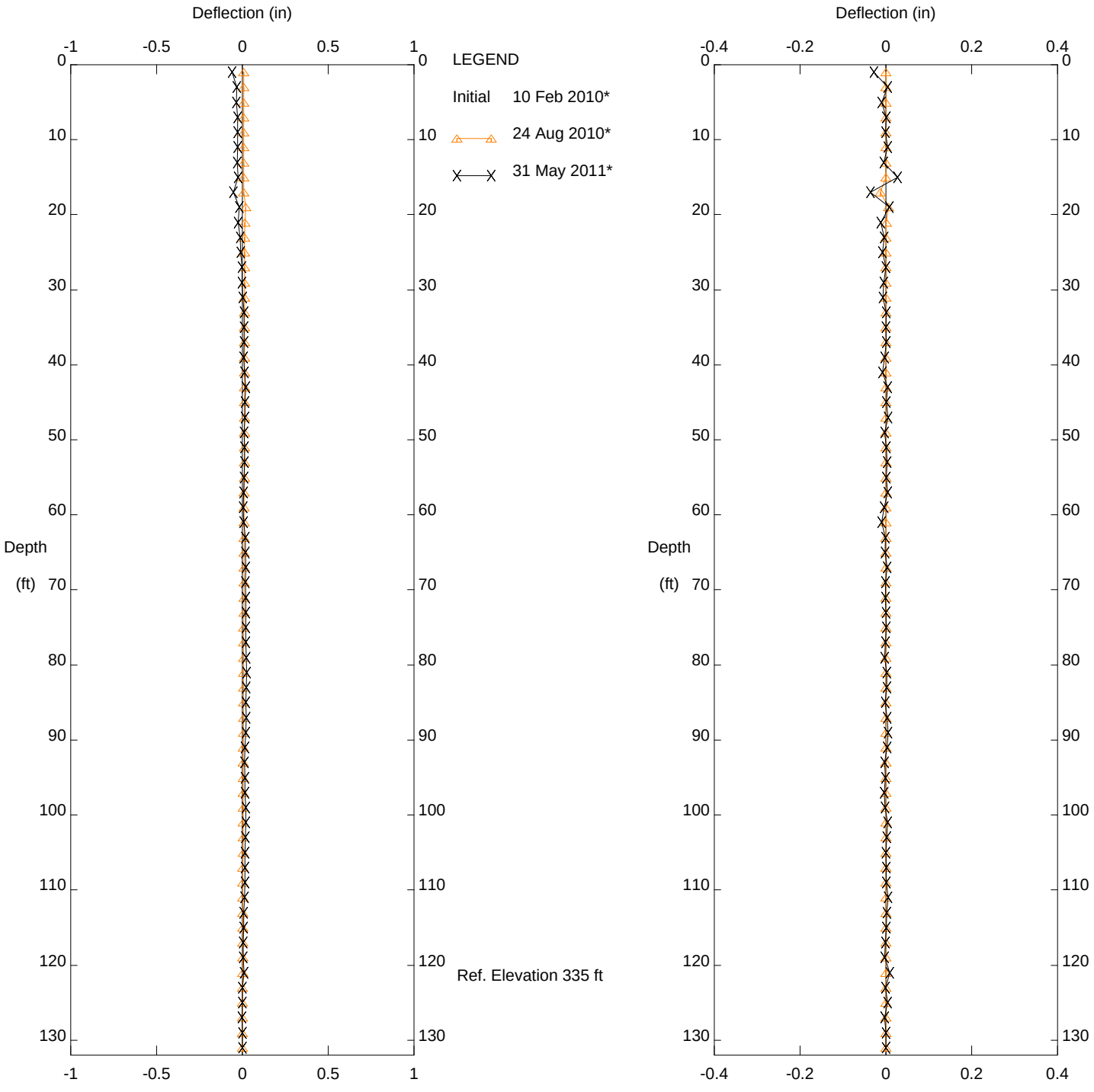
Direction A

CALLE DEL BARCO, Inclinometer SI-7

Depth of readings = 102 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

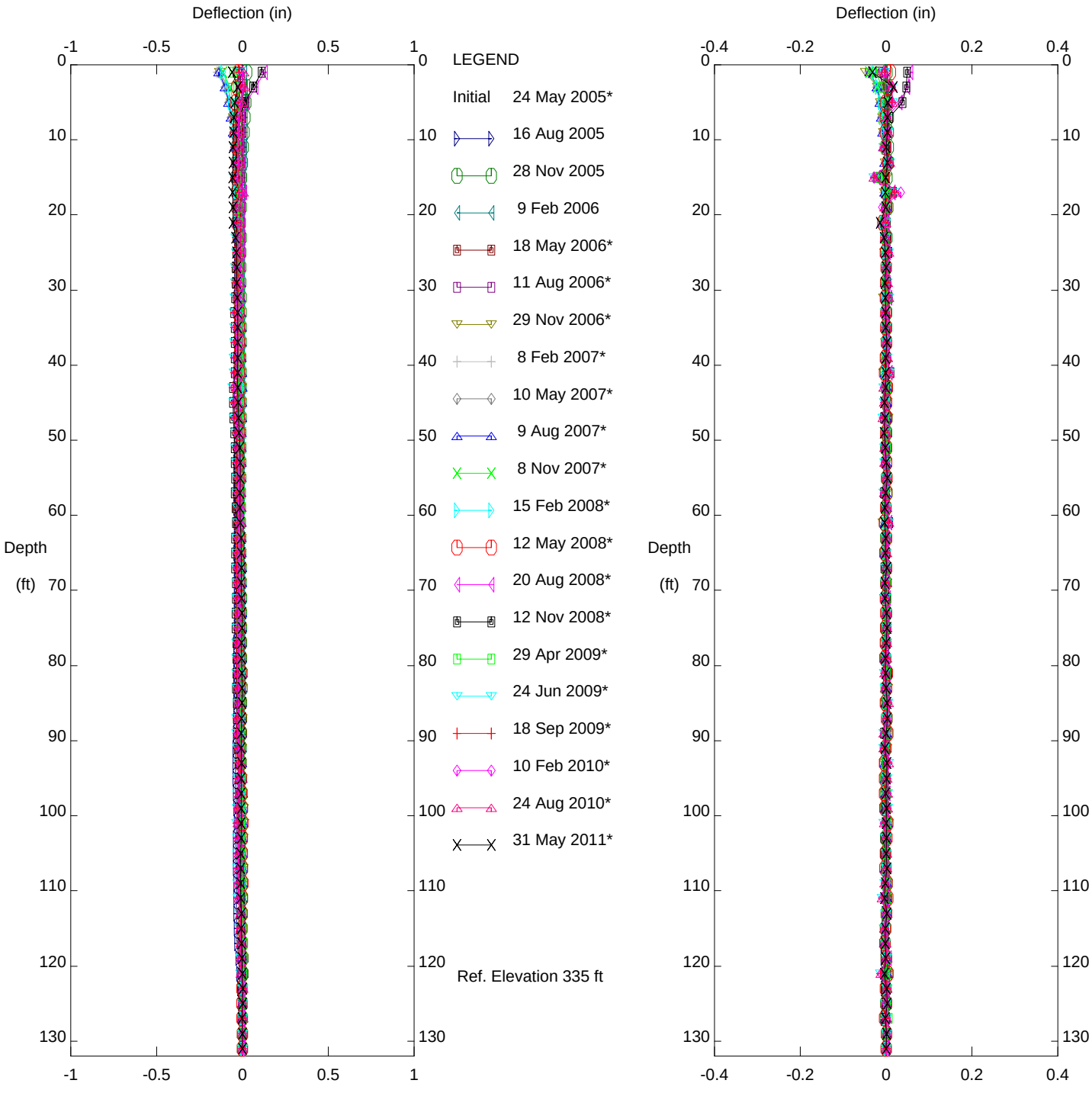
Direction A

CALLE DEL BARCO, Inclinometer SI-8

Depth of readings = 128 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

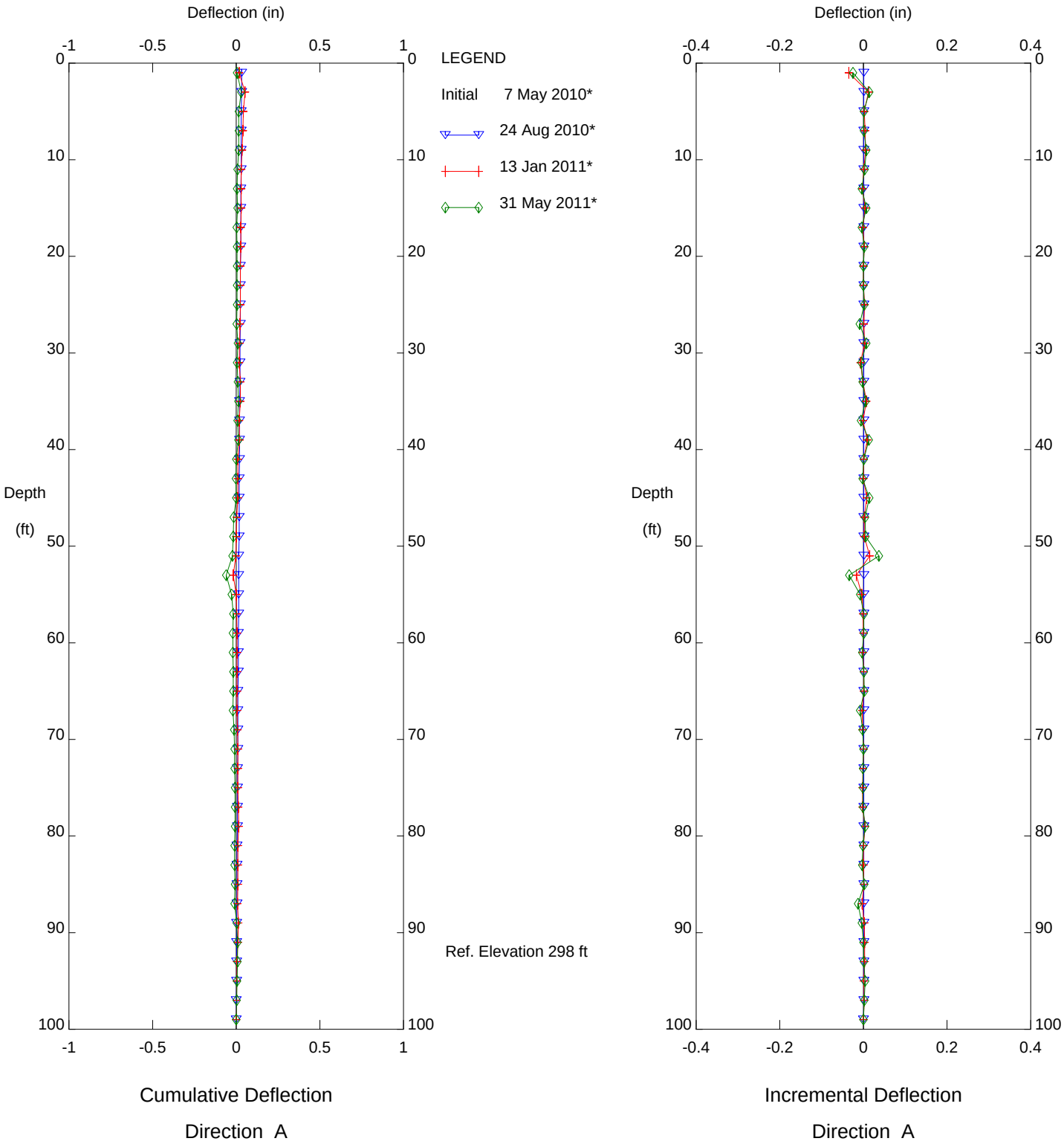
Direction A

CALLE DEL BARCO, Inclinometer SI-8

Depth of readings = 128 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

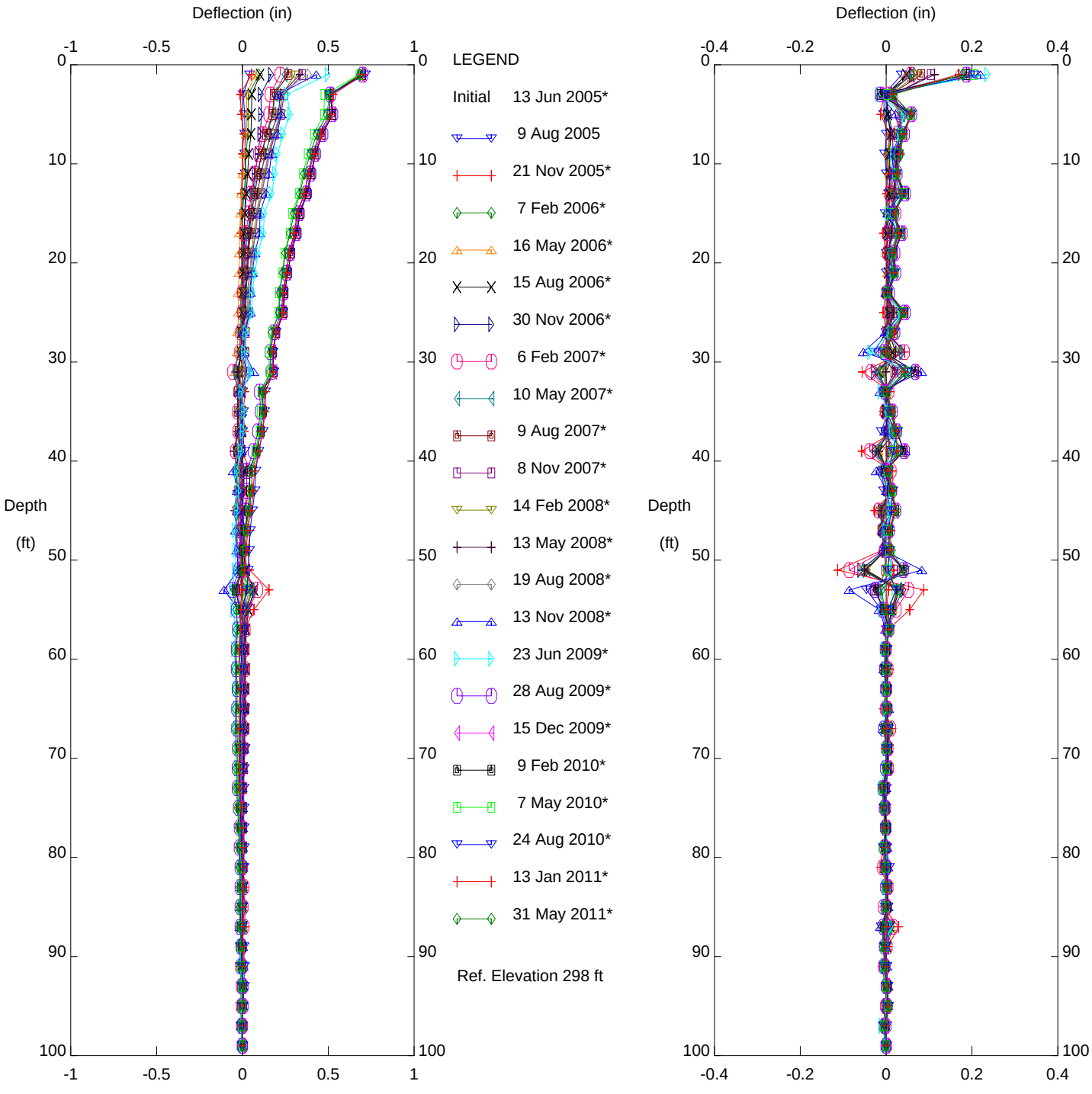
Direction A

CALLE DEL BARCO, Inclinometer SI-9

Depth of Readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

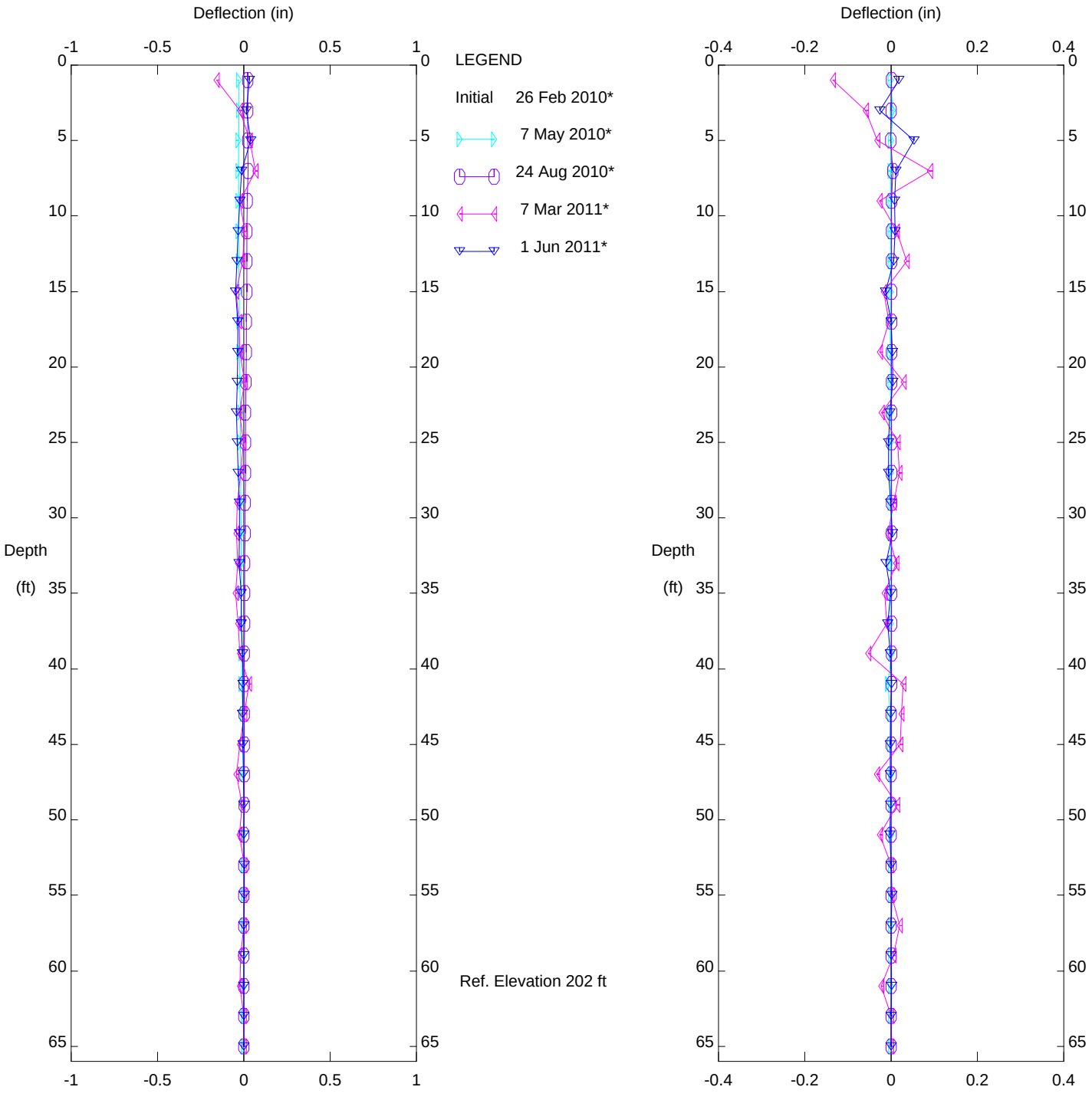
Direction A

CALLE DEL BARCO, Inclinometer SI-9

Depth of Readings = 96 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

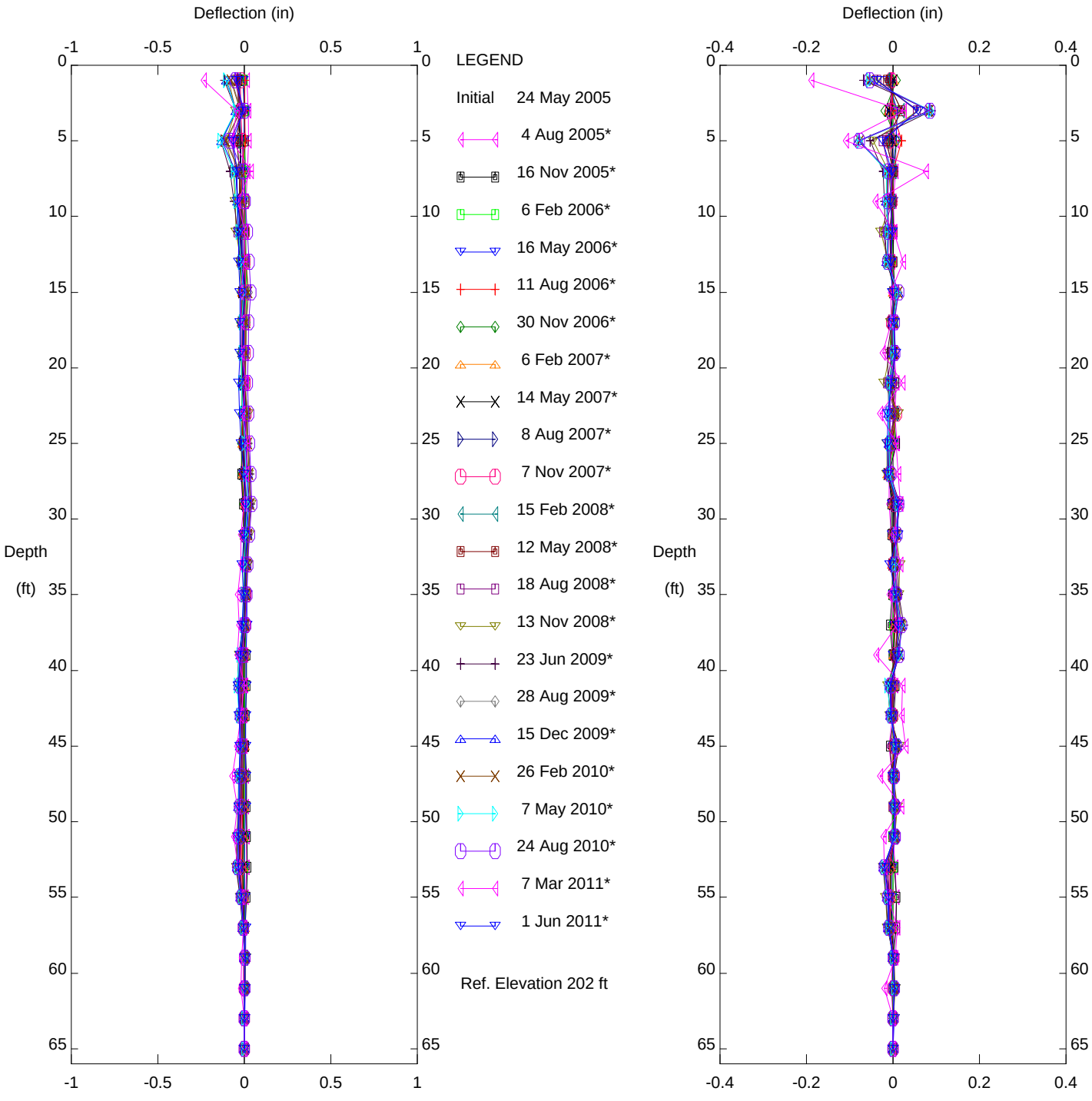
Direction A

CALLE DEL BARCO, Inclinometer SI-10

Depth of readings = 62 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

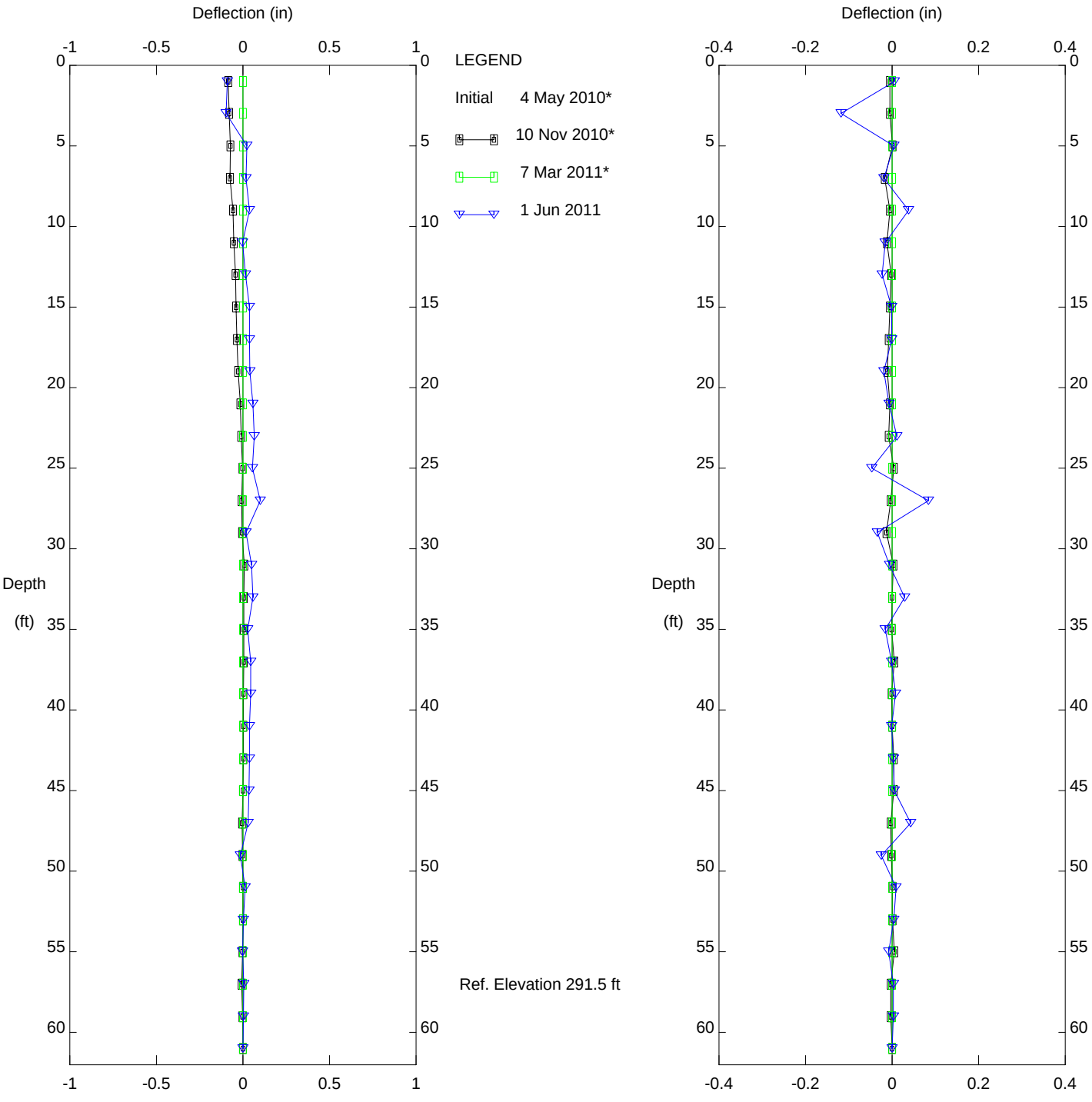
Direction A

CALLE DEL BARCO, Inclinometer SI-10

Depth of readings = 62 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

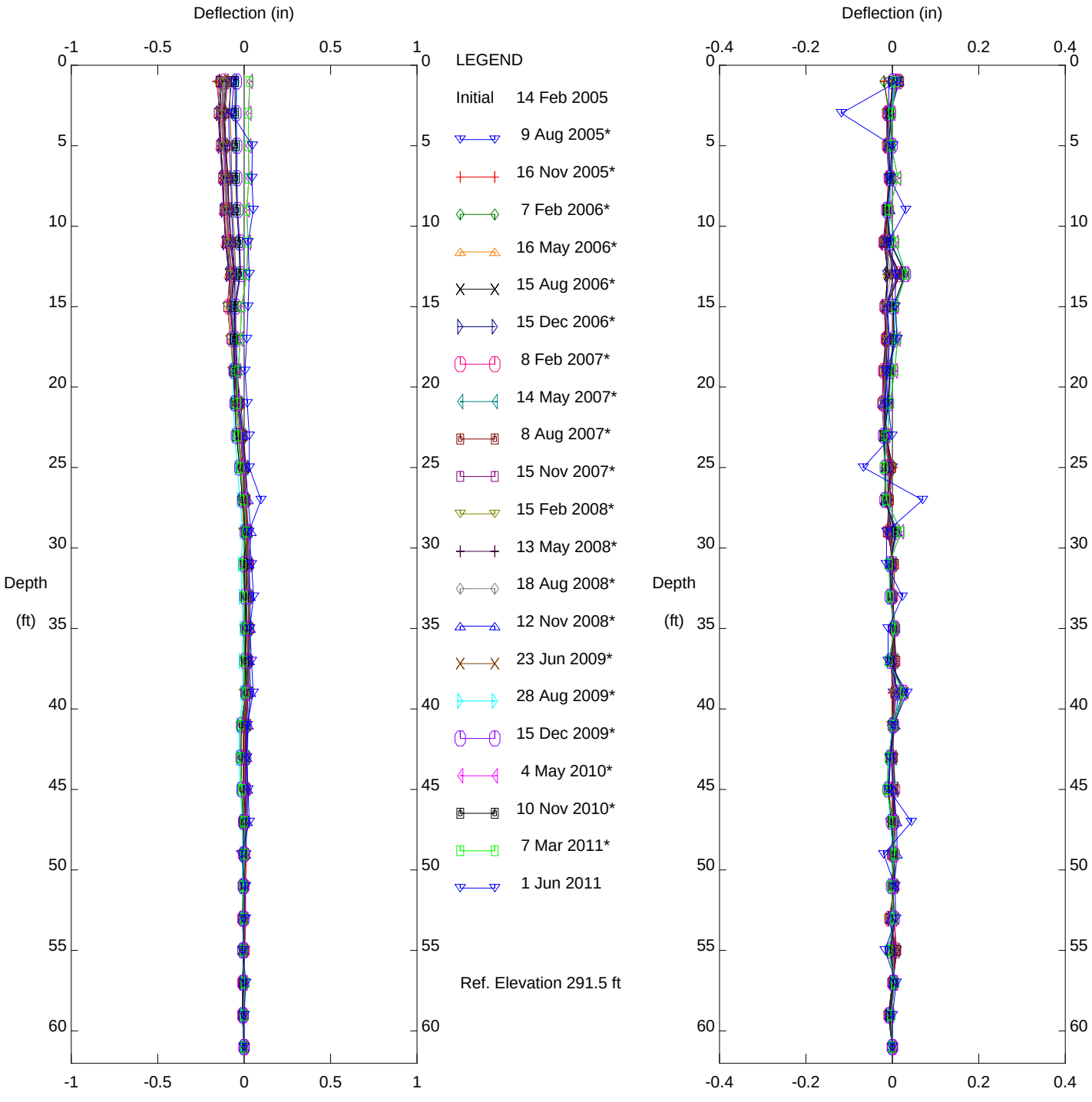
Direction A

CALLE DEL BARCO, Inclinometer SI-11

Depth of readings = 57 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

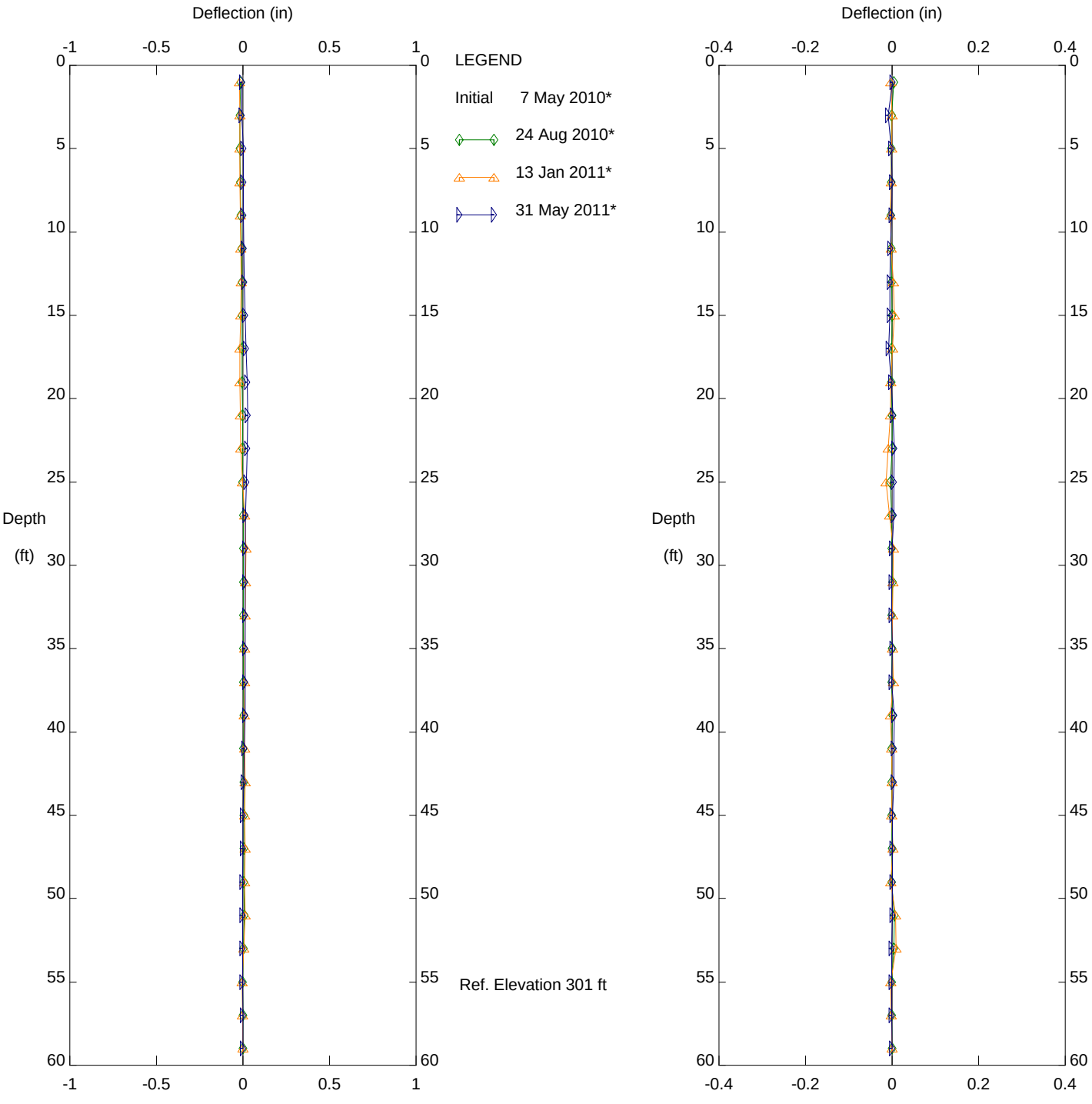
Direction A

CALLE DEL BARCO, Inclinometer SI-11

Depth of readings = 57 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

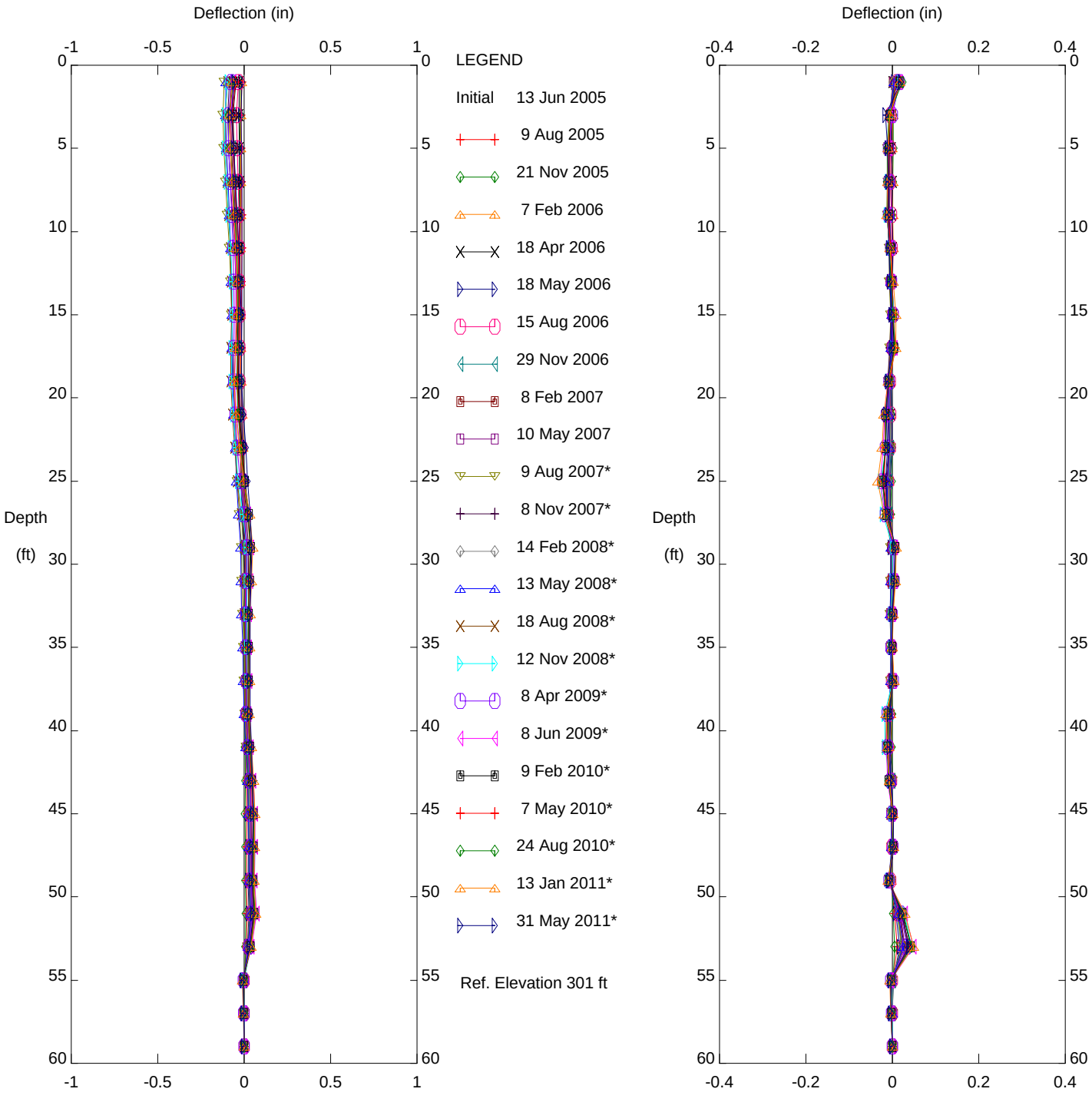
Direction A

CALLE DEL BARCO, Inclinometer SI-12

Depth of readings = 56 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

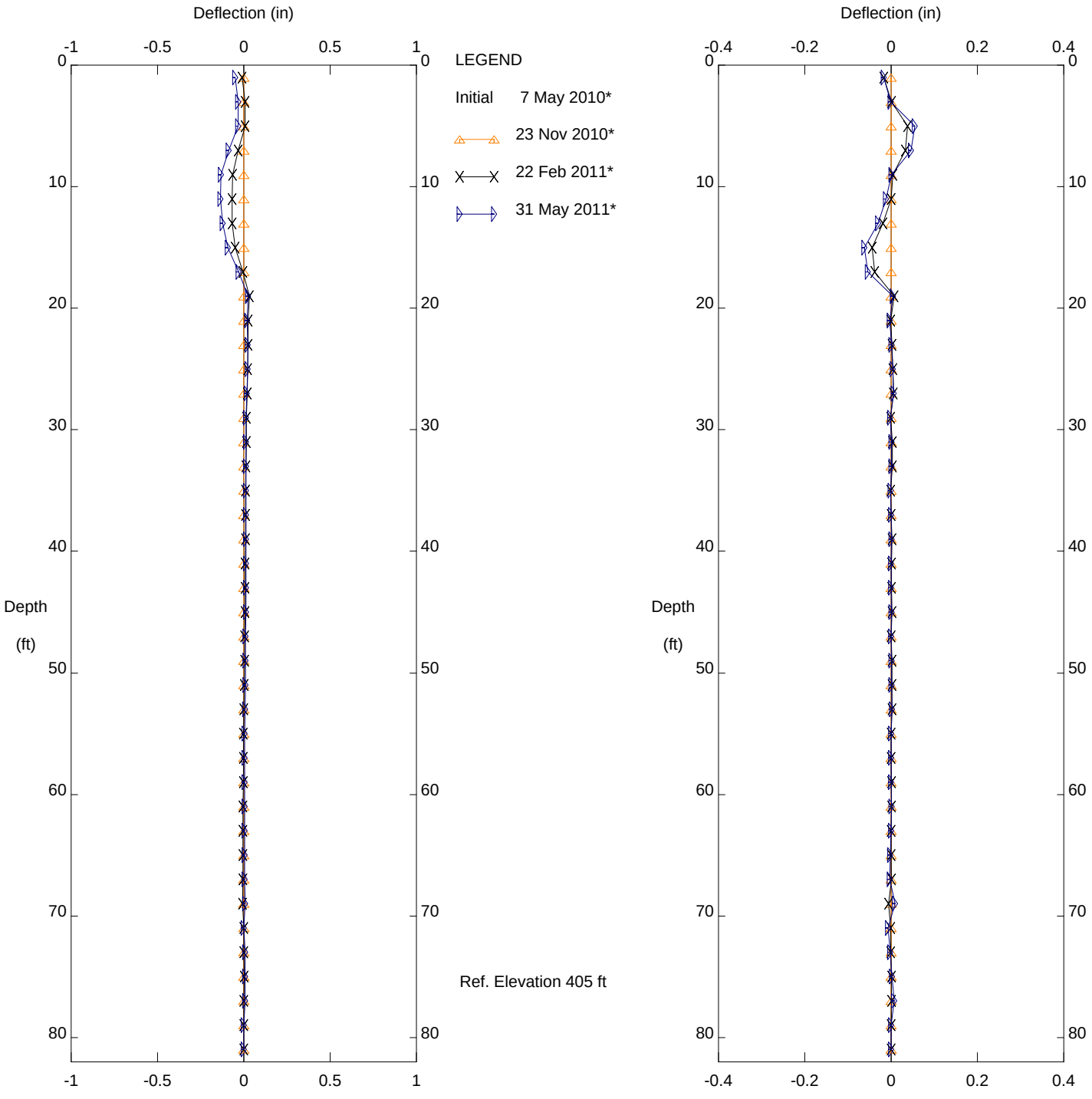
Direction A

CALLE DEL BARCO, Inclinometer SI-12

Depth of readings = 56 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA

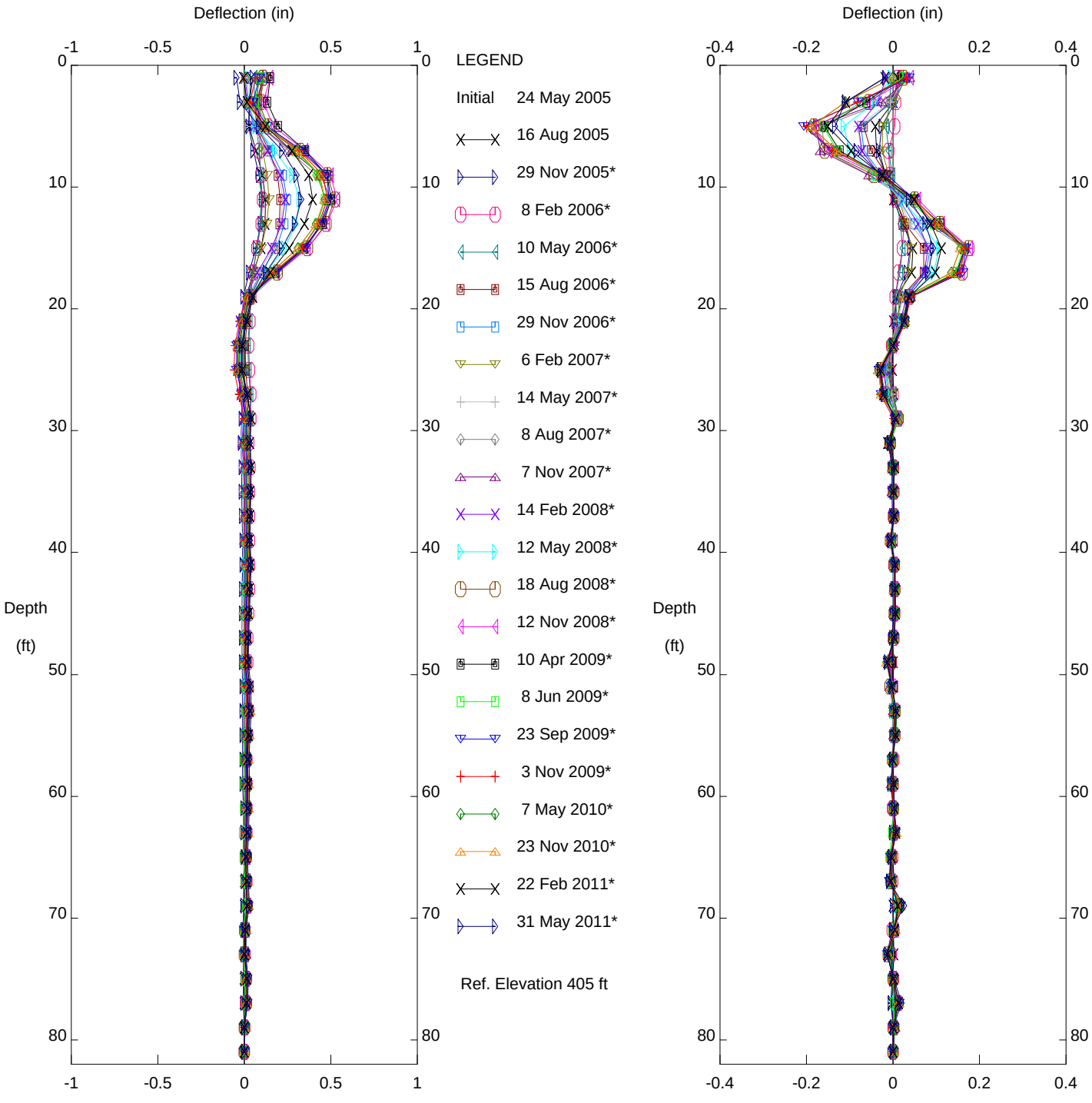


CALLE DEL BARCO, Inclinometer SI-13

Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

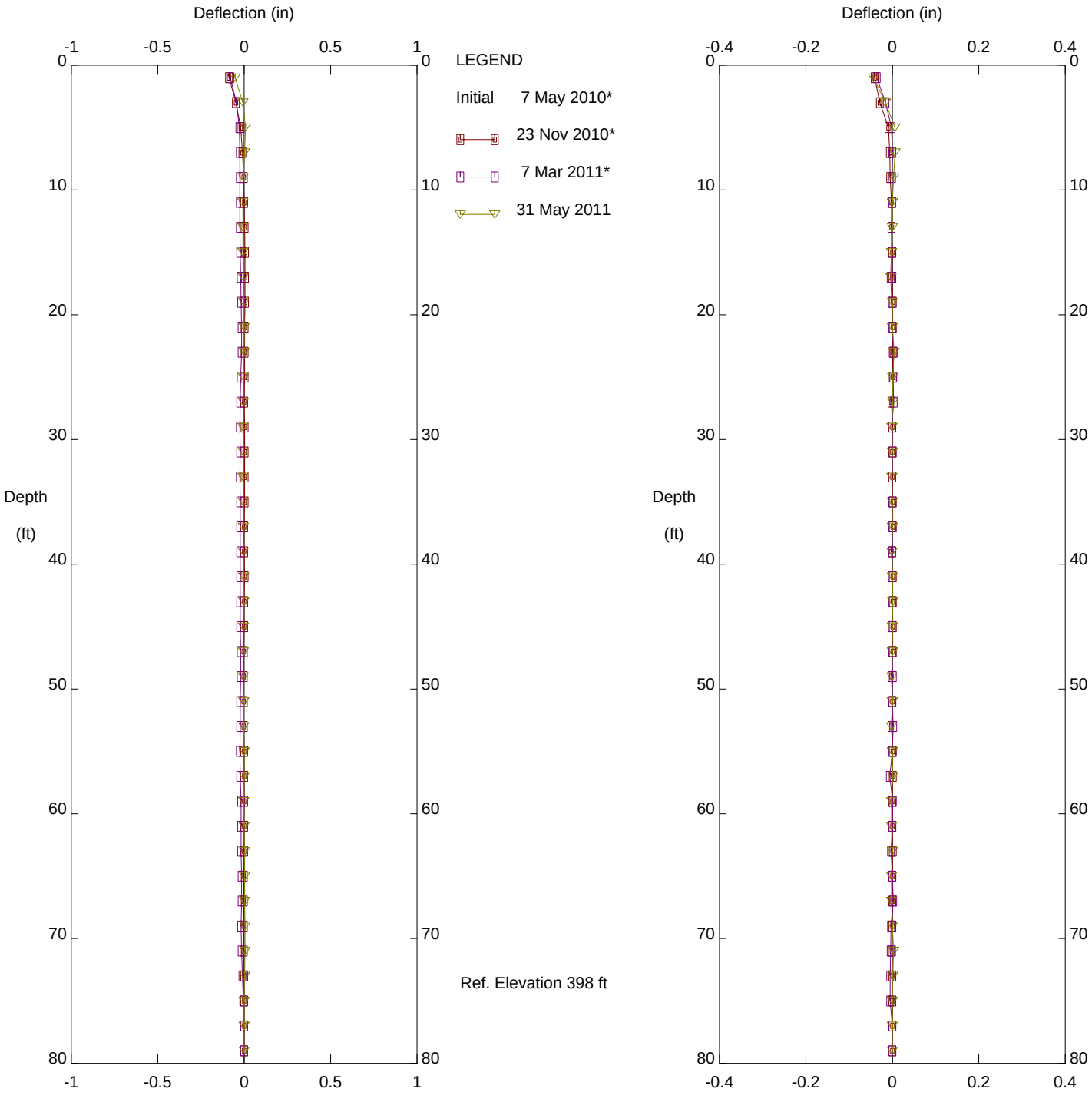
Direction A

CALLE DEL BARCO, Inclinometer SI-13

Depth of readings = 78 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

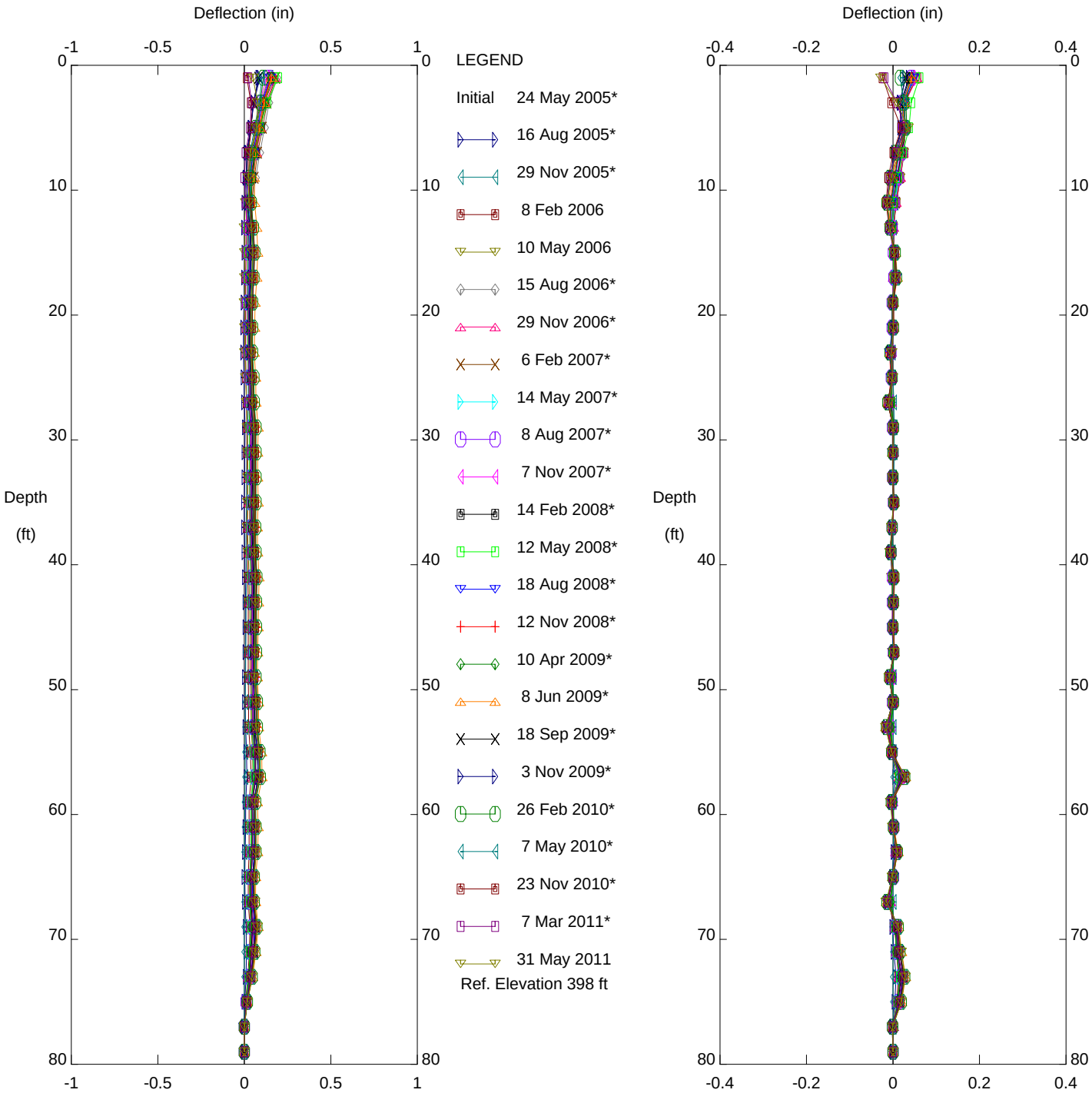
Direction A

CALLE DEL BARCO, Inclinometer SI-14

Depth of readings = 76 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

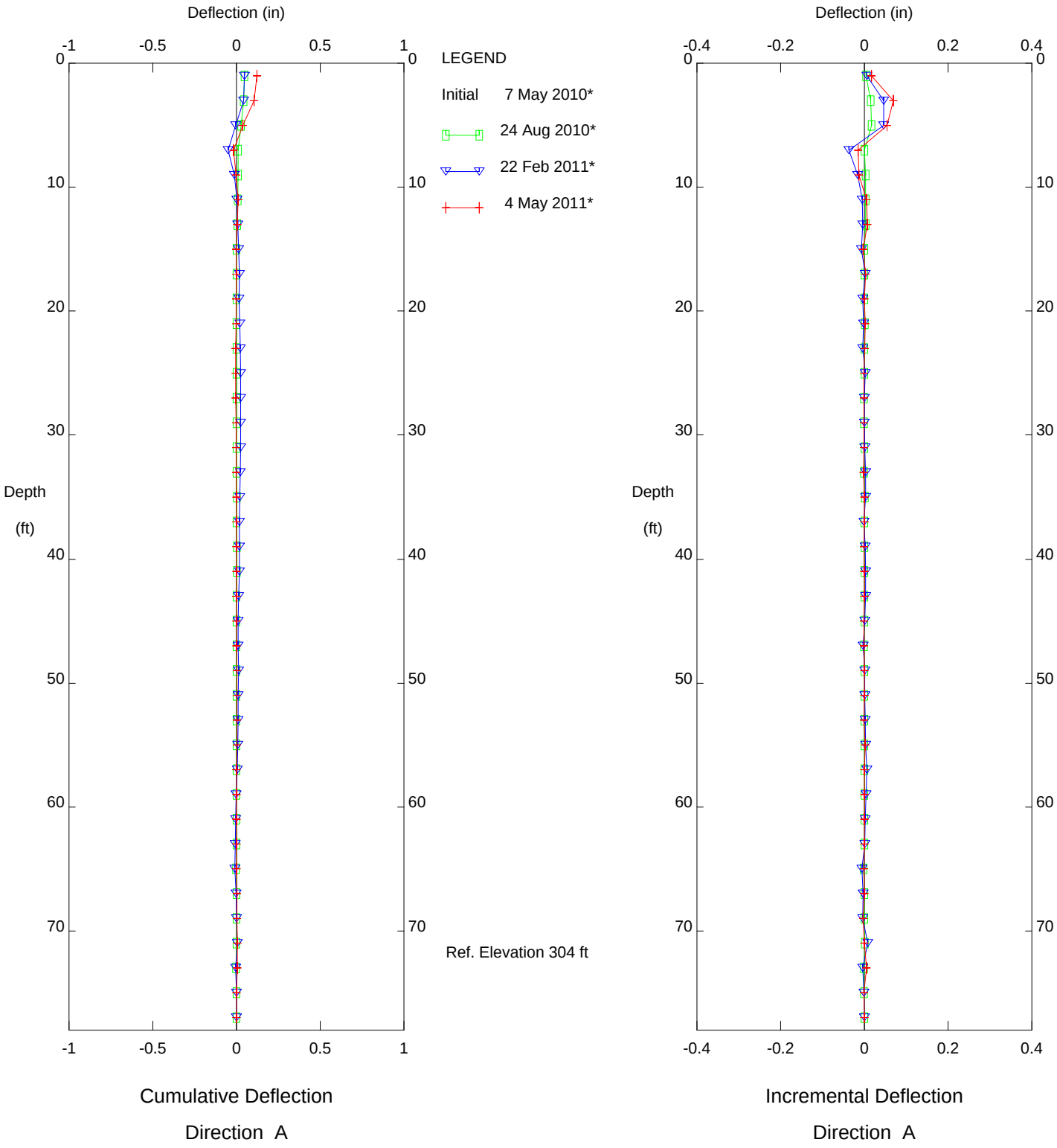
Direction A

CALLE DEL BARCO, Inclinometer SI-14

Depth of readings = 76 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA

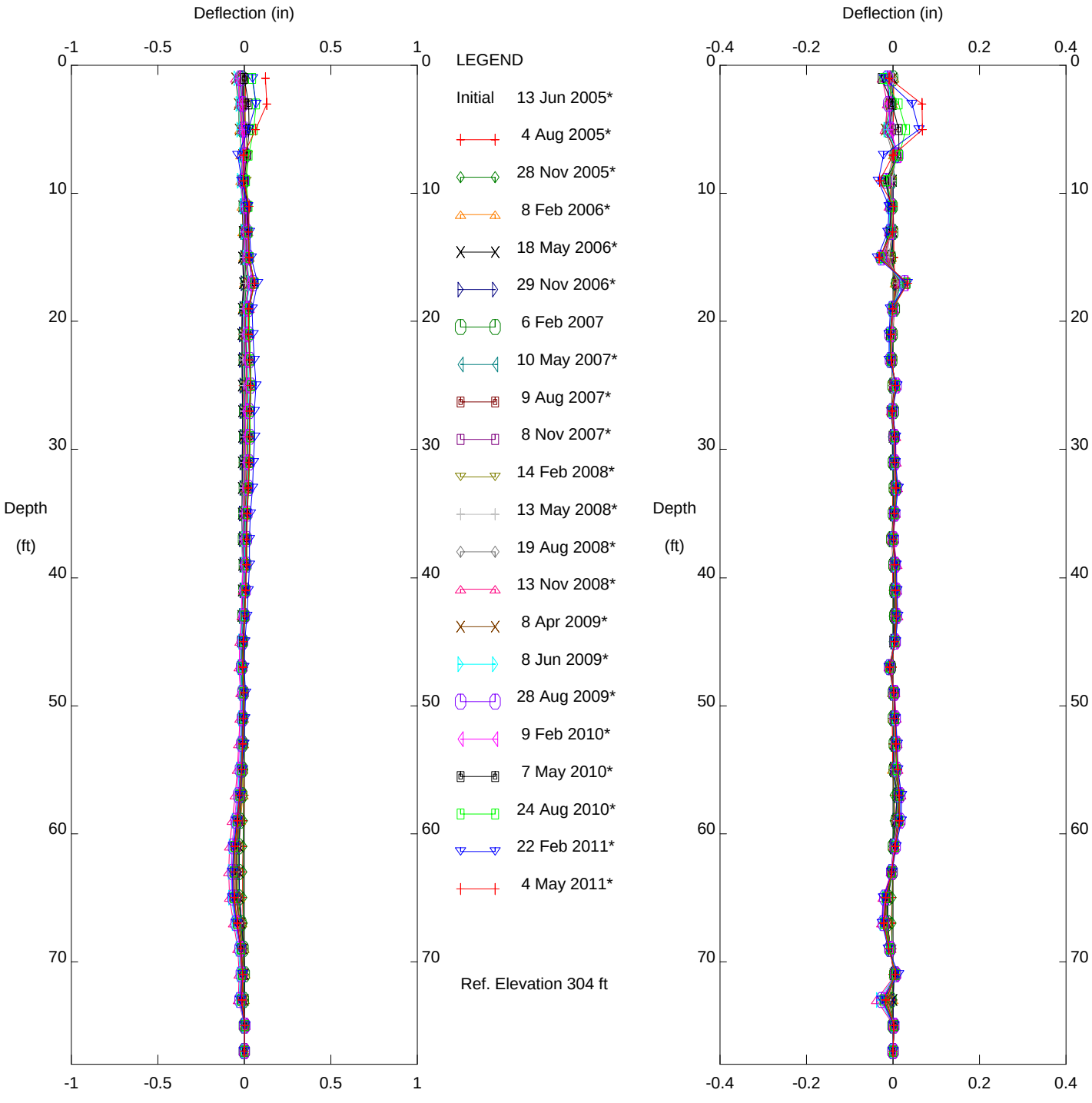


CALLE DEL BARCO, Inclinometer SI-15

Depth of readings = 72 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

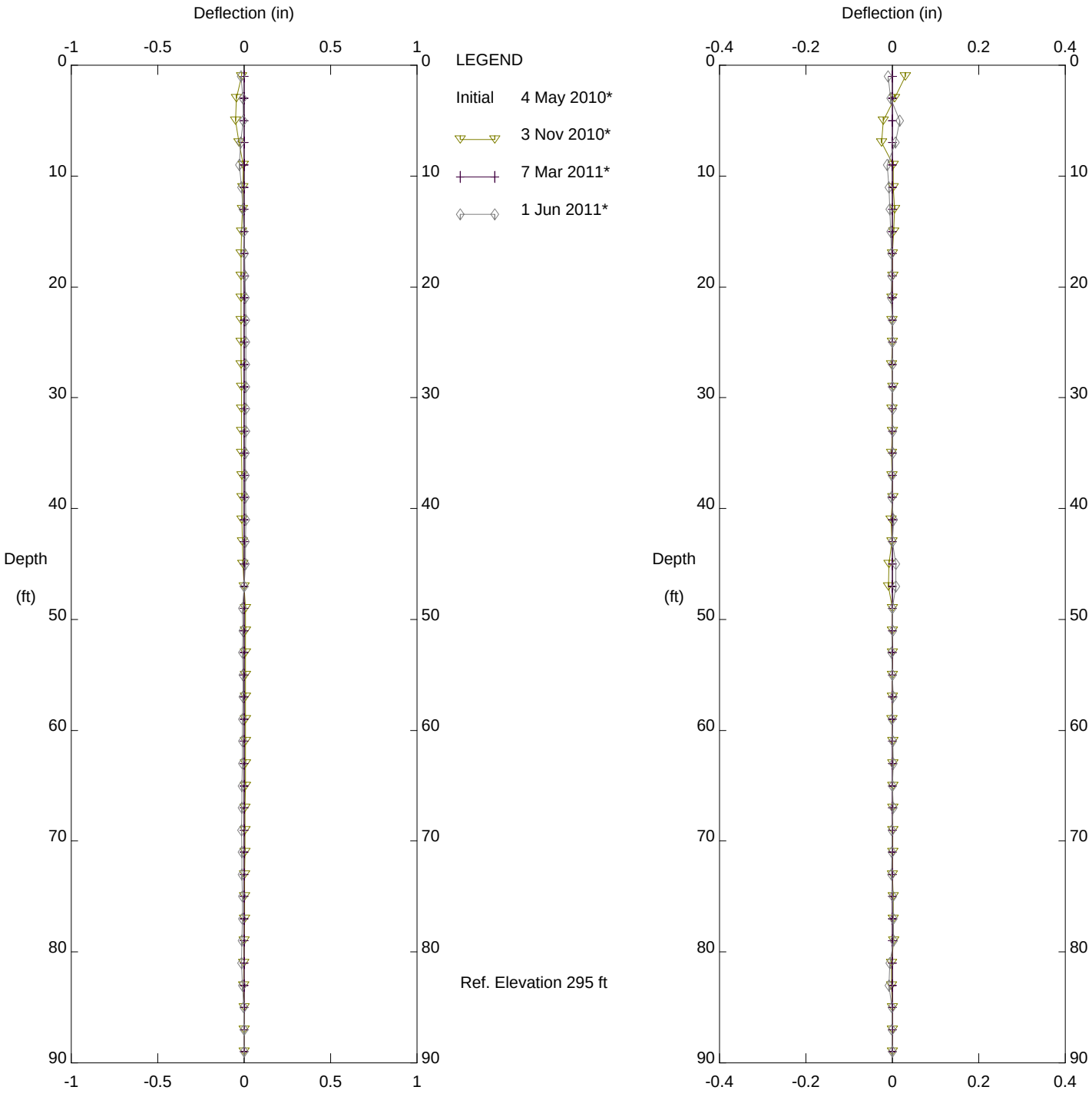
Direction A

CALLE DEL BARCO, Inclinometer SI-15

Depth of readings = 72 ft

Sets marked * include zero shift and/or rotation corrections.

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI16

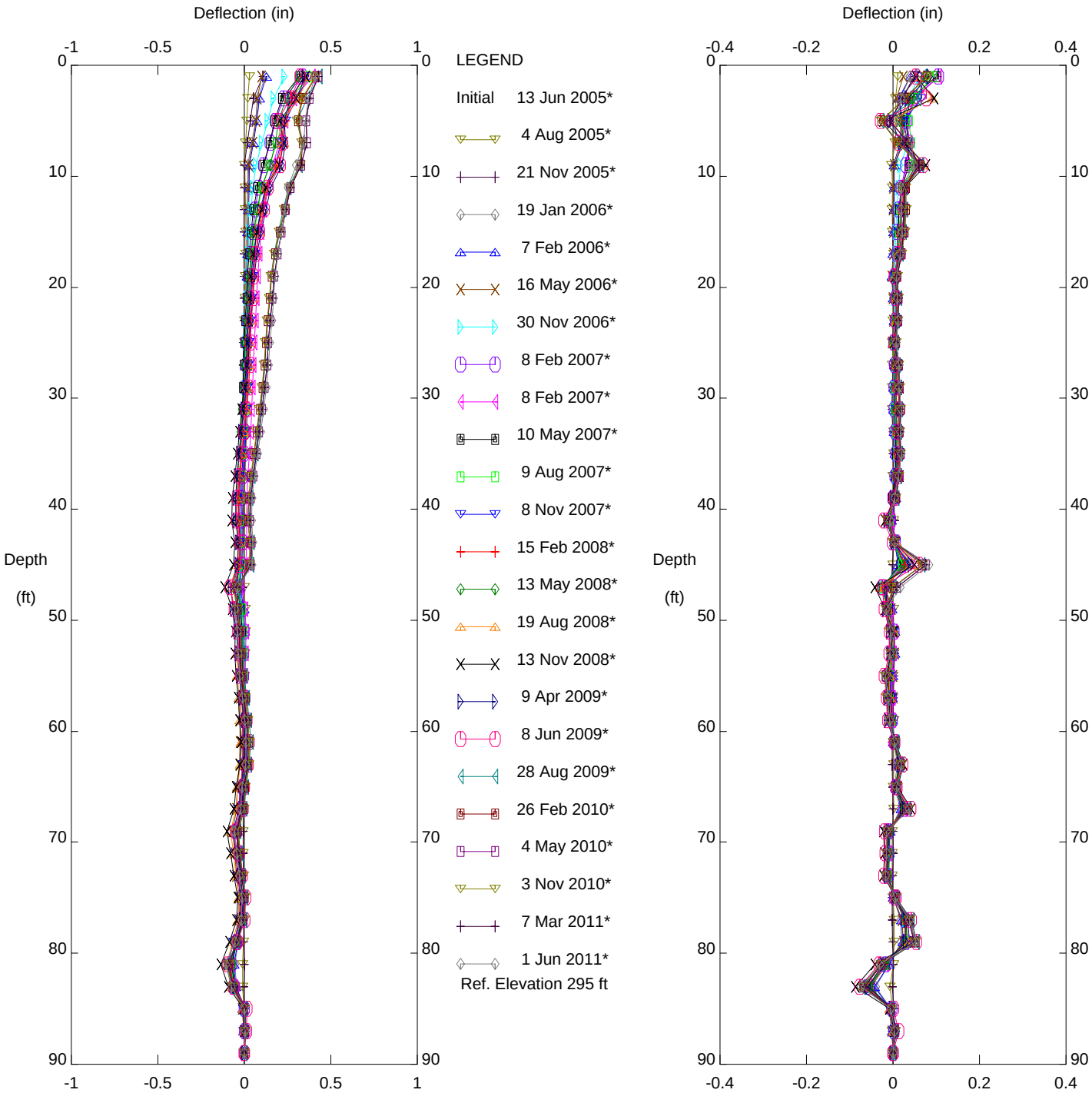
Depth of readings = 86 ft

Sets marked * include zero shift and/or rotation corrections.

E:\Malibu AD\Calle del Barco\SI Data\SI16.gtl

PLATE C-13a

Fugro West, Inc. - Ventura, CA



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

CALLE DEL BARCO, Inclinometer SI16

Depth of readings = 86 ft

Sets marked * include zero shift and/or rotation corrections.