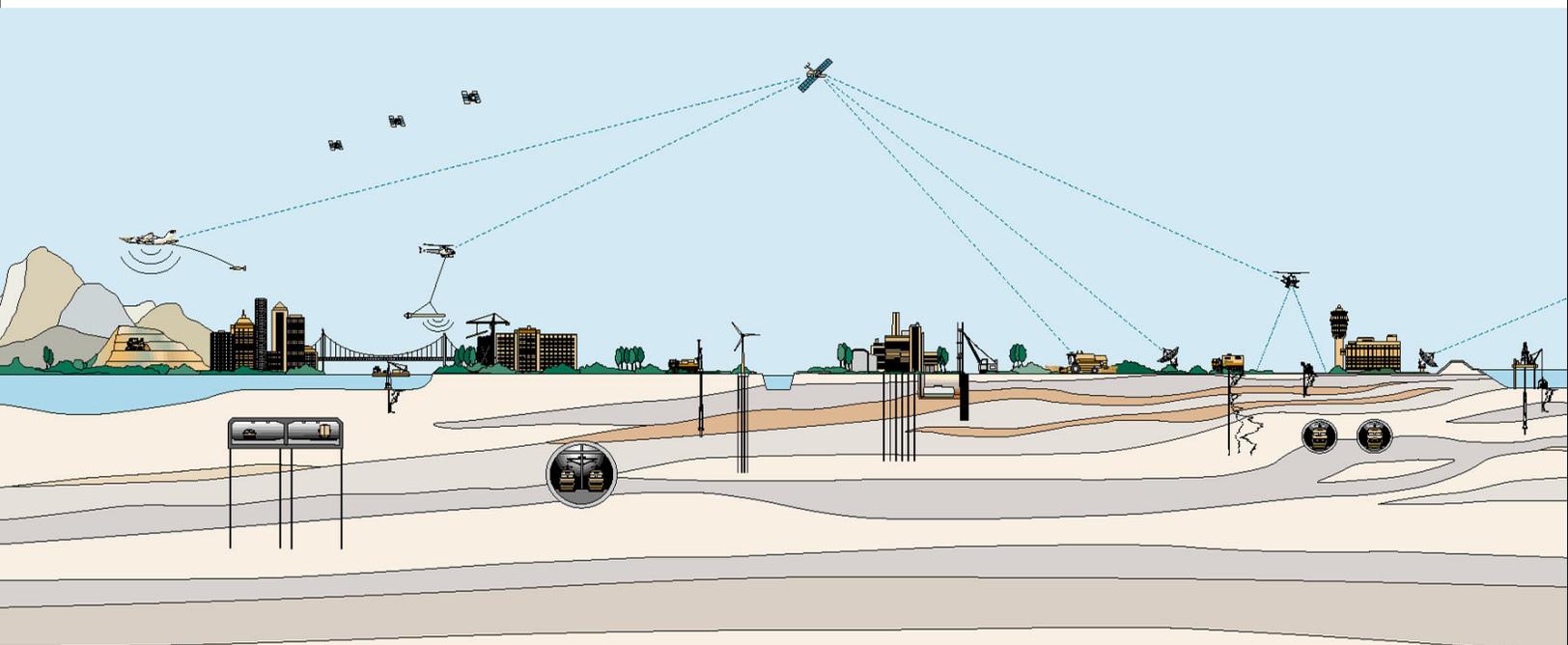

FUGRO CONSULTANTS, INC.



**ANNUAL REPORT
JULY 2014 THROUGH JUNE 2015
CALLE DEL BARCO
LANDSLIDE ASSESSMENT DISTRICT
MALIBU, CALIFORNIA**

Prepared for:
CITY OF MALIBU

November 2015
Fugro Project No. 04.62140605





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Attention: Mr. Rob Duboux

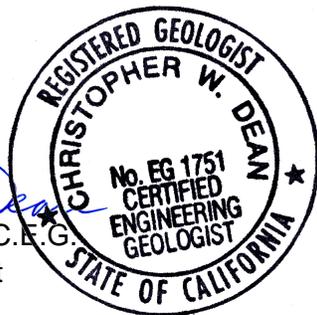
Subject: Annual Report, July 2014 through June 2015, Calle del Barco Landslide Assessment District, Malibu, California

Dear Mr. Duboux:

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 2014 through June 2015.

Fugro appreciates this opportunity to be of service to the City of Malibu and the District homeowners. Please contact Chris Dean at (310) 456-2489, x306 or Loree Berry at (805) 289-3830 if you have any questions regarding this report.


Christopher Dean, C.E.G.
Associate Geologist
Program Manager



Sincerely,
FUGRO CONSULTANTS, INC.


Loree A. Berry, P.E.
Senior Engineer/Project Manager




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(2) City of Malibu- Geotechnical staff and PDF



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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) and consistent with the cost estimate document "Exhibit A - FY 2014-2015 Maintenance Cost Estimate" presented in the Annual Assessment Report (Taussig, 2014).

1.2 BACKGROUND

The Calle del Barco Landslide Assessment District (Assessment District) was established in 1986 by the County of Los Angeles (County) 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. The Assessment District was reauthorized in May 1998 under Resolution No. 98-033. The City has since 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, 2014, and June 30, 2015 (herein after, 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 standpipes;
- Periodic groundwater level measurements from 19 pneumatic piezometers;
- Monthly dewatering production readings from 11 dewatering wells;
- Monthly dewatering production readings from 11 horizontal drains;
- Quarterly ground deformation measurements from 12 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 on field observations and preliminary data evaluation, and correspondence from concerned homeowners and tenants.



The scope of our services is limited to monitoring and maintaining the Assessment District facilities. The services that are provided on an annual basis for the Assessment District do not include geologic or engineering evaluations of the stability of the landslide.

1.4 REPORT ORGANIZATION

This report summarizes the monitoring data collected during the July 1, 2014, to June 30, 2015, 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 facilities are shown on Plate 2 - Assessment District Map. Tabulated and graphic summaries of monitoring data are presented in Appendices A through C as indicated in the table of contents.

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 exclusively on recorded values from the Los Angeles County Rainfall Station 1239 located at Big Rock Mesa since 2004 and on an average of three Rainfall Stations referred to as the "Malibu Area" between 1968 and 2004. A graph of historical monthly rainfall and average annual rainfall through September 30, 2015 is shown on Plate 3, Rainfall Graph.

Rainfall data indicate that approximately 8.70 inches of precipitation fell during the monitoring period from July 1, 2014, through June 30, 2015. The average annual rainfall from 1968 to 2015 in the "Malibu Area" for the monitoring period is approximately 15.6 inches.

Rainfall data are usually analyzed in terms of the annual "rain season" that covers the time period October 1 through September 30. Rainfall for October 1, 2014, through September 30, 2015, was approximately 10.75 inches. This is approximately 33 percent of the average annual rainfall of 16.0 inches for the "rain seasons" between 1968 and 2015.

2.2 GROUNDWATER MONITORING

The groundwater level data collected during the current 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 such as water, irrigation, sewer, and storm drain lines as well as swimming pools; and
- Dewatering activities from 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 have typically peaked around late-March to mid-April and gradually decline from late September through November.

A summary graph of mean high groundwater elevations for the Assessment District is presented on Plate 5. Plate 5 also shows the average dewatering output (gallons per day, gpd) and the yearly magnitude of deviation from the mean annual rainfall. The average annual rainfall used for the chart was computed using data from 1988 through the present. That graph illustrates that since 2010-2011, annual rainfall has been generally decreasing. During the same period, the average dewatering output has been decreasing.

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. Standpipe piezometers are constructed from a length of pipe, usually PVC, inserted into a borehole and then backfilled in place with grout, sand, or other approved backfill materials. The pipe contains perforations along selected depth intervals that allow groundwater to enter from the formation and fill the pipe to a height equivalent to the water head at the perforated interval. Some of the standpipes in Calle del Barco may be perforated along most of their length and are therefore effective at measuring the average water head at their location, which is typically the equivalent of the water table. Other standpipes are perforated only at the bottom five feet of the casing and measure water head specific to that depth interval. The water level inside piezometers is measured directly by lowering an electric sounder down the standpipe into contact with the water surface. The locations of the standpipe piezometers are depicted on Plate 2 - Assessment District Map, and groundwater elevation data are presented in Appendix A.

2.2.2 Pneumatic Piezometers

Inclinometers installed within the Assessment District after 1996 were outfitted with two-to-four pneumatic piezometer sensors nested at varying depths along the length of the inclinometer. Each sensor records the saturated pore water pressure at its nested depth by measuring differential air pressure between the instrument sensor and the groundwater surface across a flexible bladder. Differential pressure is converted into water head, which is translated to a relative groundwater elevation.

Measuring pore pressures at specific elevations along a vertical profile can be used to measure flow gradients for groundwater migrating through the formation above and within the water table and to infer the presence of perched or confined groundwater zones. However, the sensors can give inconsistent results when reading low pore pressures and in dry, unsaturated soils. Following four years of below average rainfall (2011 to 2015), the pneumatic piezometers located above the water table reflect dry, unsaturated conditions, and show that there has not been sufficient recharge to maintain perched water. Due to the inconsistent results and generally historical low groundwater levels, the pneumatic piezometers were only monitored intermittently to assess and confirm continued unsaturated conditions.

The locations of the piezometers are shown on Plate 2 and groundwater elevation data are presented in Appendix A. The pneumatic piezometers were tested and assessed for functionality and damage during May and June. The results of the assessment are presented in Appendix A.

2.2.3 Groundwater Level Discussion

General. 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 and compared with those of previous years (Appendix A, Plate A-2).

Rambla Vista. Groundwater levels in the Rambla Vista area generally show a drop between the June and July 2014 readings, followed by a more gradual decline to June 2015. SI-4 water levels reached near record lows in November 2014 and have since begun to increase after rain events during the winter. SI-7 levels have continued to decline and are at a historical low since 1991. Pneumatic piezometer SI-10 Tip-1 is the only sensor on SI-10 located within a saturated zone but it is suspected to be blocked and is considered unreadable.

Calle Del Barco. With the exception of SI-15, groundwater levels measured in standpipes located in the Calle del Barco area show a marked drop between the June and July 2014 readings. By the end of June 2015, SI-9, SI-16, and SI-5 all measured historical lows since their respective installations between 1991-2003. Standpipe, SI-5 showed a notable decline of 17.7 feet over that time period, which may be complicated by a change in monitoring personnel as well as the presence of fine roots that have infiltrated the piezometer casing which tend to trap moisture and can set off electric sounders. Measured water levels within standpipe SI-15 did not experience the same drop. We suspect that it may be receiving recharge from nearby leaking irrigation lines, which have flooded the well vault and saturated the ground around it on several occasions. Pneumatic piezometer SI-15 Tip-1 is placed deeper than the SI-15 standpipe measured water level and continues to read pressures approximately equivalent to water levels measured in the standpipe. SI-15 Tip-2 was determined to be unreliable and data was not presented. Data for pneumatic tips on SI-16 were not reported as both sensors are reading pressures too low to be considered reliable (less than 2 psi). June 2015 data were reported for pneumatic piezometer SI-12 Tips 1 and 2 and show that they are



probably both within the same saturated zone and indicate piezometric surfaces within about a foot of each other.

Rambla Pacifico. Groundwater levels in the Rambla Pacifico area continue to show a steady decline since the peaks measured in 2005 and remain at historical low levels. Pneumatic piezometers associated with those standpipes were not reported due to pore pressure readings that were either zero or too low to be considered reliable (less than 2 psi). However, the low differential pressures indicated by SI-14 Tip-1 and SI-15 Tip 1 may be reasonable since they are consistent with water levels in the adjacent standpipes, measured within a foot or two above the sensor elevations.

Summary. Groundwater levels in individual piezometers were generally lower relative to the previous year. The annual average and peak groundwater elevations were lower than the prior year averages in the Rambla Vista, Calle del Barco, and Rambla Pacifico areas. Table 1 presents the average and highest annual groundwater levels by area.

Table 1. Summary of Average Groundwater Elevations by Area

Location	Average Groundwater Elevation 2014-2015	Change from Prior Year Average	Peak Groundwater Elevation 2014-2015	Change from Prior Year Peak
Rambla Orienta/ Rambla Vista	163.8	-2.5	165.4	-3.0
Calle Del Barco	250.3	-3.0	250.1	-4.4
Rambla Pacifico	348.6	-1.7	348.7	-2.5

Note: 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. A summary of the dewatering output based on groundwater levels and rainfall is depicted on Plate 5.

2.3.1 Dewatering Well Production

A graph of the production rate for all dewatering wells is presented on Plate 4. Graphs showing production rates for individual wells are provided in Appendix B. Production data for the dewatering wells indicates the following:

- The average total well production rate for this monitoring period was approximately 442 gallons per day (gpd). That represents a decrease of about 21 percent from the previous monitoring period of 560 gpd.

2.3.2 Hydrauger Production

A graph of the production rate for all hydraugers is presented on Plate 4. Graphs of individual production rates for all hydraugers are included in Appendix B. Data for the hydraugers indicate the following:

- The average production rate for all hydraugers over the monitoring period is approximately 139 gpd. This represents a decrease of approximately 9 percent from the average production rate of 153 gpd for the previous monitoring period.

2.3.3 Total Dewatering Production

A combined graph of the total dewatering rate for all dewatering wells and hydraugers is presented on Plate 4. Total dewatering production data for the measured hydraugers and wells indicates the following:

The average total dewatering rate during the monitoring period was approximately 583 gpd. This represents an 18 percent decrease in the average rate relative to the 713 gpd average recorded during the previous monitoring period

2.4 SLOPE INCLINOMETER MEASUREMENTS

Fugro monitored 12 slope inclinometers on a quarterly basis to check for subsurface ground deformation. Plots of slope inclinometer measurements (four plots for each monitored slope inclinometer) are presented in Appendix C. The first plot, for each inclinometer, shows the cumulative deflection and incremental deflection for the A-direction and the second plot shows the cumulative deflection and incremental deflection for the B-direction. Those two plots show approximately one curve per year from about 2006 through the current monitoring year. The third and fourth plots show displacement versus time for the same period, but all of the readings are included on those plots.

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 in Appendix C. Some slope inclinometer plots show minor amounts of displacement measured at the ground surface during the 2014 through 2015 monitoring period. Measurement along identified slide planes during the 2014 through 2015 monitoring period is less than 0.1 inch.

Inclinometer SI-9 exhibits a pattern of movement measured at the ground surface at a rate of about 0.05 inch/year since 2005, resulting in approximately 0.4 inch of cumulative displacement since the 2004-05 monitoring period. Movement of the inclinometer appears to be both translational at specific depths between 30 and 55 feet and rotational about a hinge point at about 55 feet below the ground surface.

Inclinometer SI-16 exhibits a pattern of movement measured at the ground surface at an average rate of up about 0.08 inches/year since 2005, resulting in approximately 0.5 inches of cumulative displacement at the ground surface since the 2004-05 monitoring period. Movement of the inclinometer appears to be both translational at specific depths between 0 to 10 feet and between 40 and 50 feet and rotational about a hinge point at about 50 feet below the ground surface. This is similar to the movement observed in inclinometer SI-9 located in close proximity to SI-16.

Although the movement observed in inclinometers SI-9 and SI-16 has not produced observed distress in pavements or other development of which Fugro is aware, the movement is nevertheless quantifiable and can be defined by a clear trend.

3.0 FACILITY MAINTENANCE

3.1 MAINTENANCE SUMMARY

The operating status of each dewatering well and hydrauger was checked monthly. When necessary, repair work is scheduled and undertaken as expeditiously as possible, typically within a matter of a few hours or days. Generally, repairs and maintenance consisted of brush and debris clearance for well and hydrauger locations for the 2014 through 2015 monitoring year.

3.2 CAPITAL IMPROVEMENT PROJECTS

No capital improvements were performed during the monitoring period.

3.3 MAJOR FACILITY MAINTENANCE INVENTORY

Some maintenance and repair tasks are of a scope such that their cost would exceed the normal maintenance budget. Those larger tasks are identified below and should be considered a priority when additional funding can be made available.

Dewatering well W-B (installed in 1991) continues to experience low production (yearly average less than 3 gpd) despite measuring sufficient water above the pump level that should allow greater production. W-B should be evaluated by a well contractor to determine if it is operating efficiently or if it needs to be re-developed or improved.

Dewatering well W-H (installed in 1998) has had low production (yearly average less than 5 gpd) for most of its operation and has not produced at all since March 2014. W-H should be evaluated by a well contractor to determine if it is operating efficiently or if it needs to be re-developed, improved, or replaced.

Production from Dewatering well W-K (installed in 1998) has been declining, producing less than 10 gallons per day since January 2014. W-K should be evaluated by a well contractor to determine if it is operating efficiently or if it should be re-developed or improved.

Hydraugers HD-7 to HD-13 are located at the base of a steep slope with loose soil and are repeatedly buried by debris, especially during and following rain events. A slope retention system or protective structure should be constructed around the hydraugers.

All hydraugers are showing steady declines in production and should undergo routine flushing to clear perforations and prolong their lifespan.

4.0 SUMMARY AND CONCLUSIONS

4.4 SUMMARY

The status of monitoring facilities within the Calle del Barco Landslide Assessment District can be summarized as follows:

- Measured rainfall during the 2014 - 2015 monitoring year (July 1 through June 30) was 8.70 inches of precipitation. Rainfall during that monitoring period was below the "Malibu Area" historical average of 15.6 inches per monitoring year measured from 1968 through 2015.
- In general, groundwater levels in the assessment district were slightly lower than average for the Rambla Vista/Rambla Orienta and Calle Del Barco areas relative to the previous year. Average and peak groundwater levels in the Rambla Pacifico area were below the prior year averages. Groundwater levels are generally continuing to decrease from the levels observed in the record winter of 2004 through 2005.
- In the standpipe piezometers, measured groundwater levels were generally lower than groundwater levels in monitoring year 1997-1998 when major slope failure occurred.
- Total dewatering production decreased about 18 percent when compared to last year's total production. Decreased production is thought to be contributed to 1) well-below average rainfall for the monitoring period, and 2) generally static to declining groundwater levels under the District since the last normal rainfall year.
- Despite rainfall amounts, groundwater production from existing dewatering wells and hydraugers should be expected to continually decline as the efficiency of the wells and hydraugers decrease due to mineralization and aging.
- Slope inclinometer readings indicate a maximum localized displacement at the ground surface of about 0.4 inch (SI-9) and 0.5 inch (SI-16) located on Calle del Barco with the majority of inclinometers indicating no significant ground movement since 2006.
- Water conservation is encouraged throughout the Calle Del Barco District to reduce the infiltration of domestic water and the potential for future groundwater level increases. Control of groundwater levels within the landslide district is a critical component to maintaining its stability.

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.
- _____ (1997), 'Annual Observation & Maintenance Report for the Period July 1996 to July 1997, Calle Del Barco, Malibu, California,' dated July.
- _____ (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.
- _____ (2000), 'Annual Observation & Maintenance Report for the Period April 1999 to June 2000, Calle Del Barco, Malibu, California,' dated August.
- _____ (2001), 'Annual Observation & Maintenance Report for the Period April 2000 to June 2001, Calle Del Barco, Malibu, California,' dated August.
- _____ (2003), 'Annual Observation & Maintenance Report for the Period April 2001 to June 2002, Calle Del Barco, Malibu, California,' dated January.
- _____ (2003), 'Annual Observation & Maintenance Report for the Period April 2002 to June 2003, Calle Del Barco, Malibu, California,' dated October 2003.
- David Taussig & Associates, Inc. (2014), "Annual Assessment Report for Fiscal Year 2014-2015, City of Malibu, Assessment District No. 98-2 (Calle del Barco)," dated June 22.



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

_____ (2005), 'Annual Report, July 2004 through June 2005, Calle Del Barco Landslide Assessment District, Malibu, California,' dated October.

_____ (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.

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

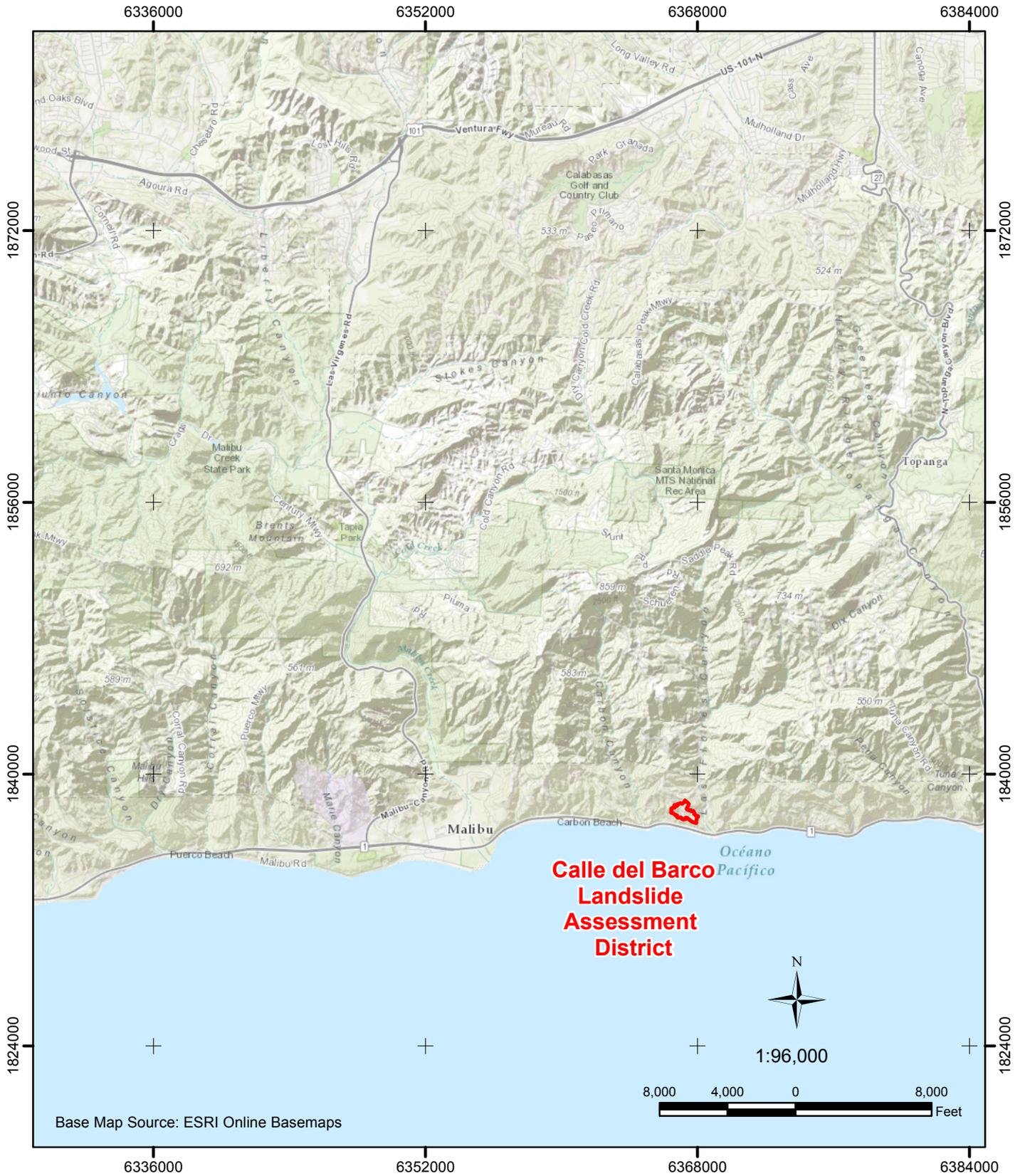
Fugro Consultants, Inc. (2011), 'Annual Report, July 2010 through June 2011, Calle Del Barco Landslide Assessment District, Malibu, California,' dated November.

_____ (2012), "Annual Report, July 2011 through June 2012 Calle del Barco Landslide Assessment District, Malibu, California," dated September 2012.

_____ (2014), "Annual Report, July 2012 through June 2013 Calle del Barco Landslide Assessment District, Malibu, California," dated January 2014.

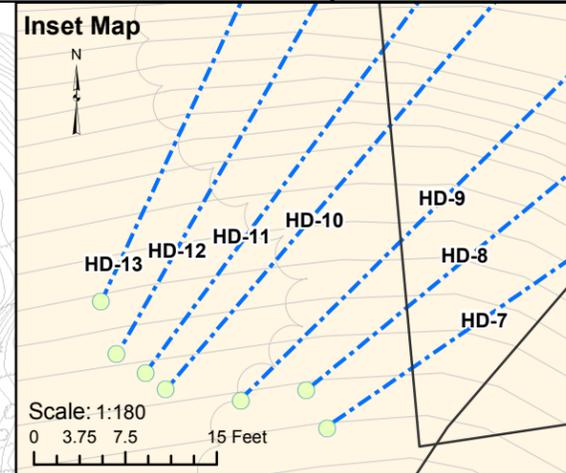
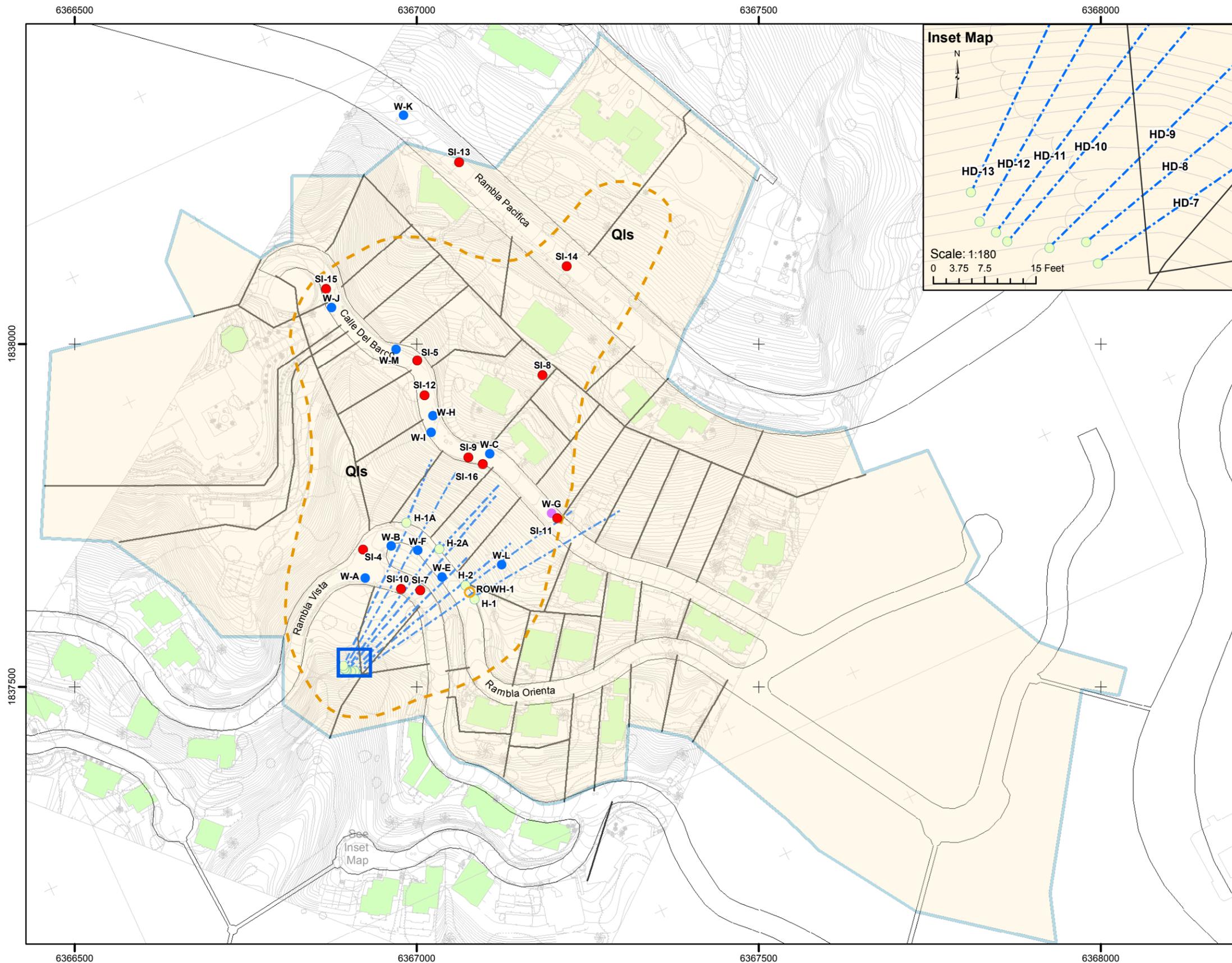
_____ (2015), "Annual Report, July 2013 through June 2014 Calle del Barco Landslide Assessment District, Malibu, California," dated April 2015.

PLATES



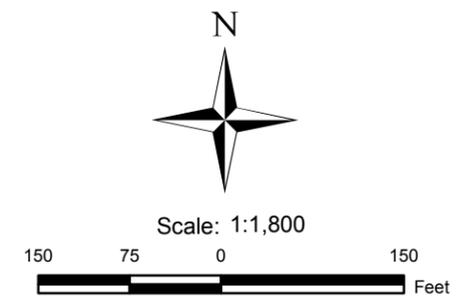
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SITE LOCATION MAP
Calle del Barco Landslide Assessment District
Malibu, California



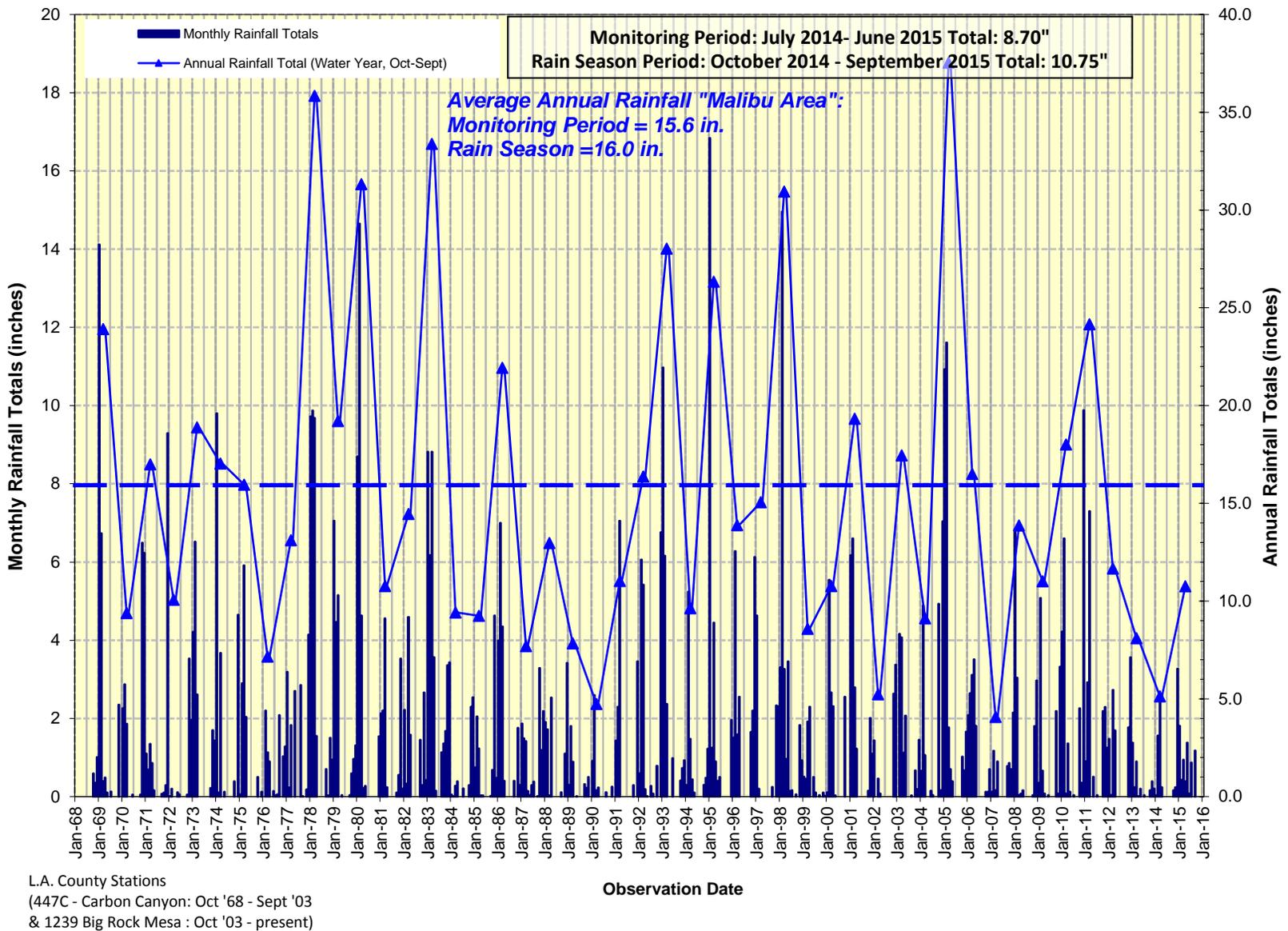
LEGEND

- Active Dewatering Well
- Inactive Dewatering Well
- Slope Inclinometer/Standpipe
- ROWH-1 -Conveyance Line for H-2
- - - Horizontal Drain (Hydrauger)
- QIs Approximate Limits of Landslide
- Assessment District Boundary
- Extent of Horizontal Drain (Hydrauger) Inset
- +
- Coordinate Grid: California State Plane, Zone 5, NAD 83, Feet



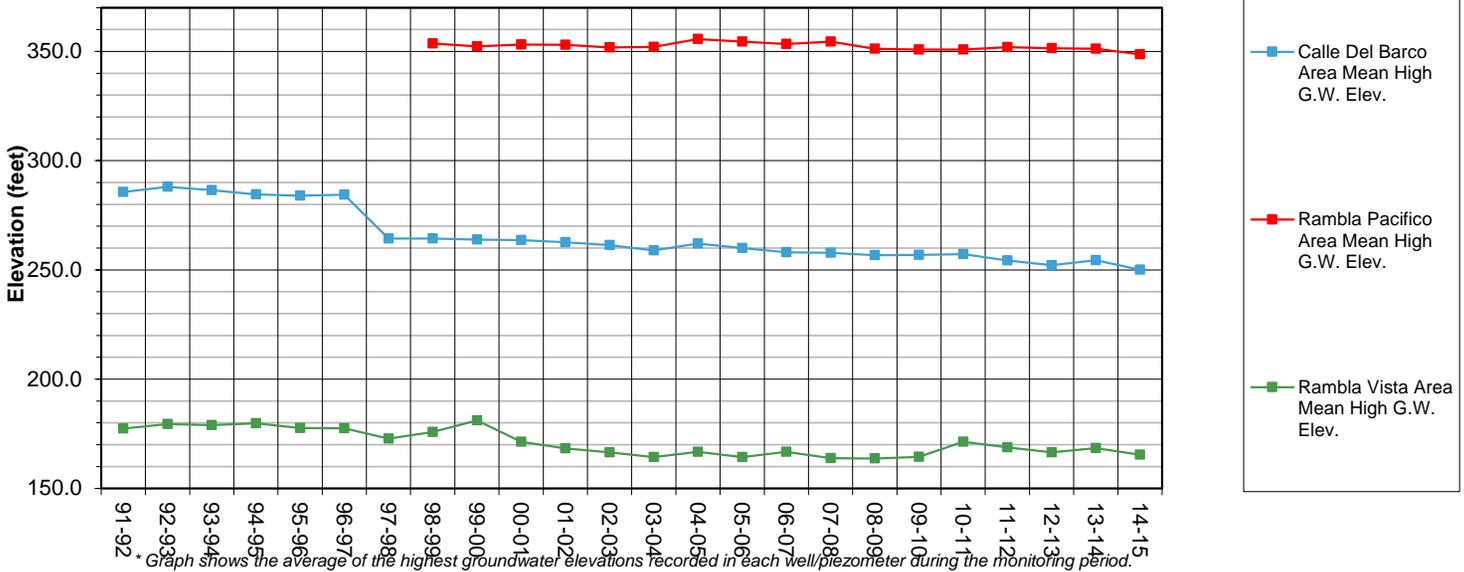
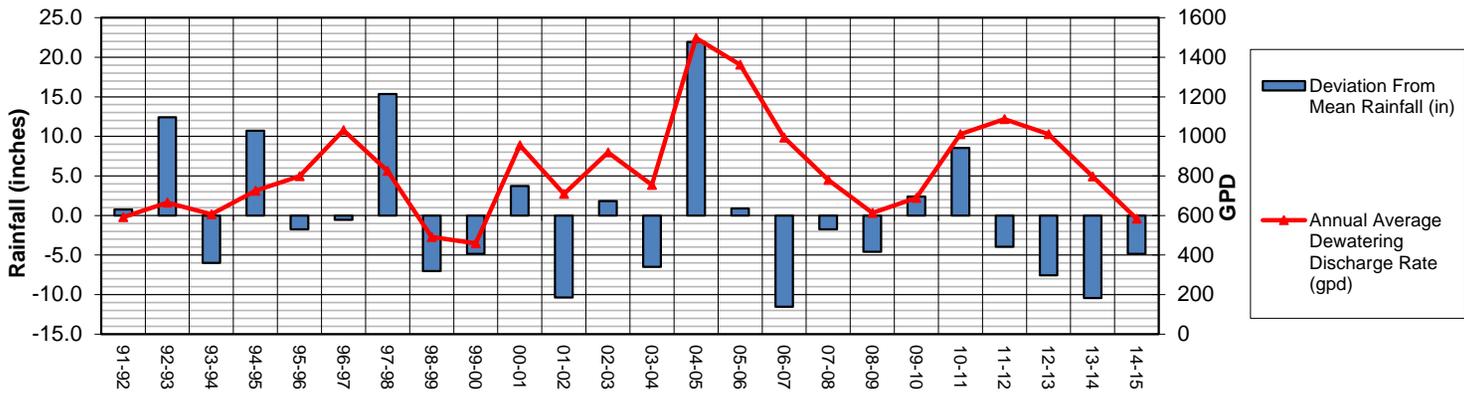
ASSESSMENT DISTRICT MAP
 Calle del Barco Landslide Assessment District
 Malibu, California

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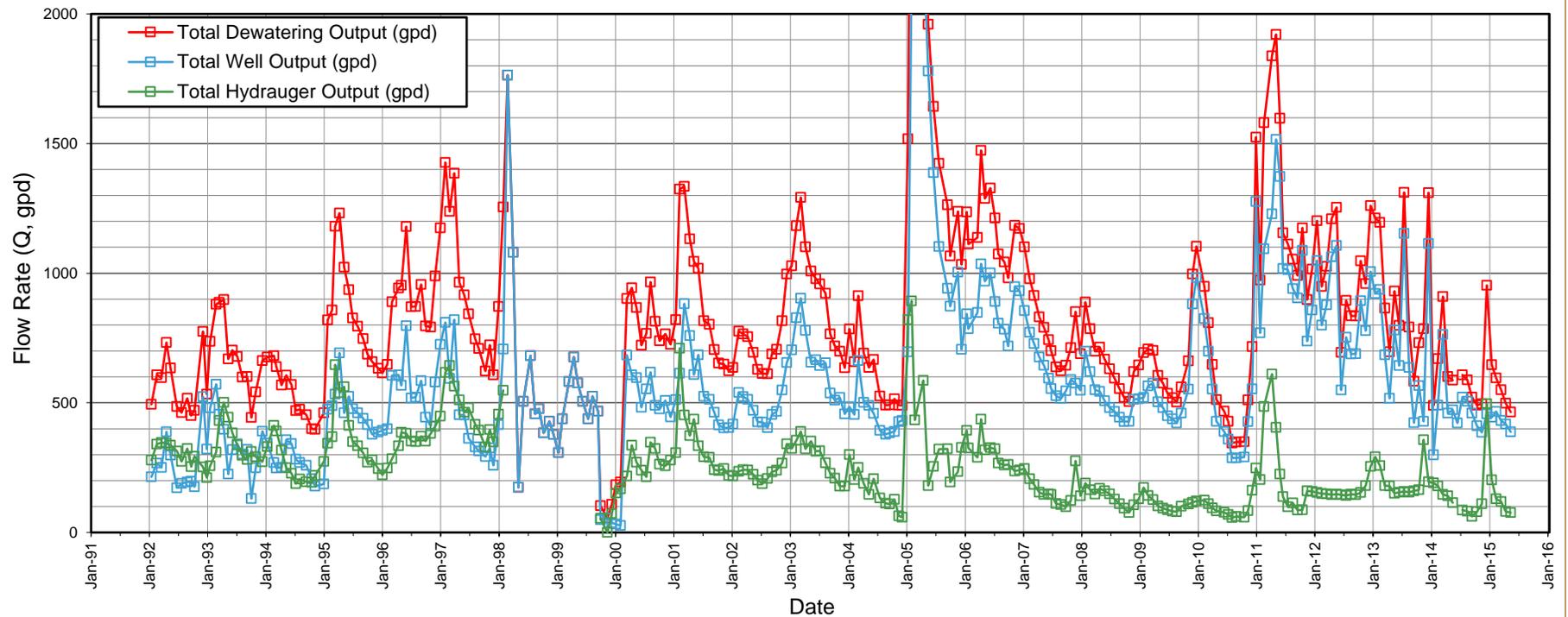
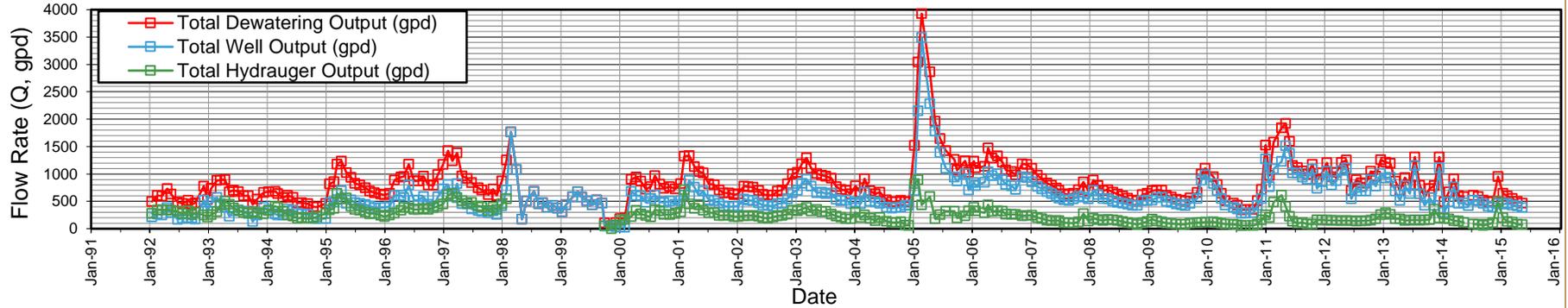
RAINFALL GRAPH
 Calle del Barco Landslide Assessment District
 Malibu, California





GROUNDWATER LEVELS, DEWATERING AND RAINFALL
 Calle del Barco Landslide Assessment District
 Malibu, California





TOTAL DISCHARGE - WELLS AND HYDRAUGERS
Calle del Barco Landslide Assessment District
Malibu, California



**APPENDIX A
GROUNDWATER DATA**



CALLE DEL BARCO LAD - Standpipe Piezometer Information					
Standpipe ID	Reference Elevation (ft)	Casing Depth (ft)	Perforation Interval (ft)	Installed By	Notes
SI-4	207.0	81.0	Unknown	Unknown	
SI-5	302.0	100.0	Unknown	Unknown	
SI-7	201.0	106.0	Unknown	Unknown	
SI-8	352.0	131.0	Unknown	Unknown	
SI-9	298.0	100.0	Unknown	Unknown	
SI-13	424.0	82.0	75-80	BYA	
SI-14	408.0	80.0	73-78	BYA	
SI-15	301.0	78.0	71-76	BYA	
SI-16	297.0	90.0	Unknown	Unknown	

CALLE DEL BARCO LAD - Pneumatic Piezometer Information						
Piezometer ID	Tip No.	Reference Elev. (ft)	Tip depth (ft)	Tip Elev. (ft)	Installed By	Notes
SI-9	1	298	68	230	BYA	readings <2 PSI
	2		38	260	BYA	readings <2 PSI
SI-10	1*	202	60	142	BYA	blocked air line
	2*		50	152	BYA	not functioning
	3		40	162	BYA	readings <2 PSI
	4*		20	182	BYA	not functioning
SI-11	1	291.5	60	231.5	BYA	readings <2 PSI
	2		50	241.5	BYA	readings <2 PSI
	3*		40	251.5	BYA	air line leak
	4*		20	271.5	BYA	blocked air line
SI-12	1	301	60	241	BYA	functioning
	2		50	251	BYA	functioning
	3		40	261	BYA	readings <2 PSI
	4		20	281	BYA	readings <2 PSI
SI-13	1	424	70	354	BYA	readings <2 PSI
	2*		50	374	BYA	not functioning
SI-14	1	408	68	340	BYA	water level at probe
	2		48	360	BYA	readings <2 PSI
SI-15	1	301	66	235	BYA	water level at probe
	2*		36	265	BYA	water in lines
SI-16	1	297	70	227	BYA	readings <2 PSI
	2		40	257	BYA	readings <2 PSI

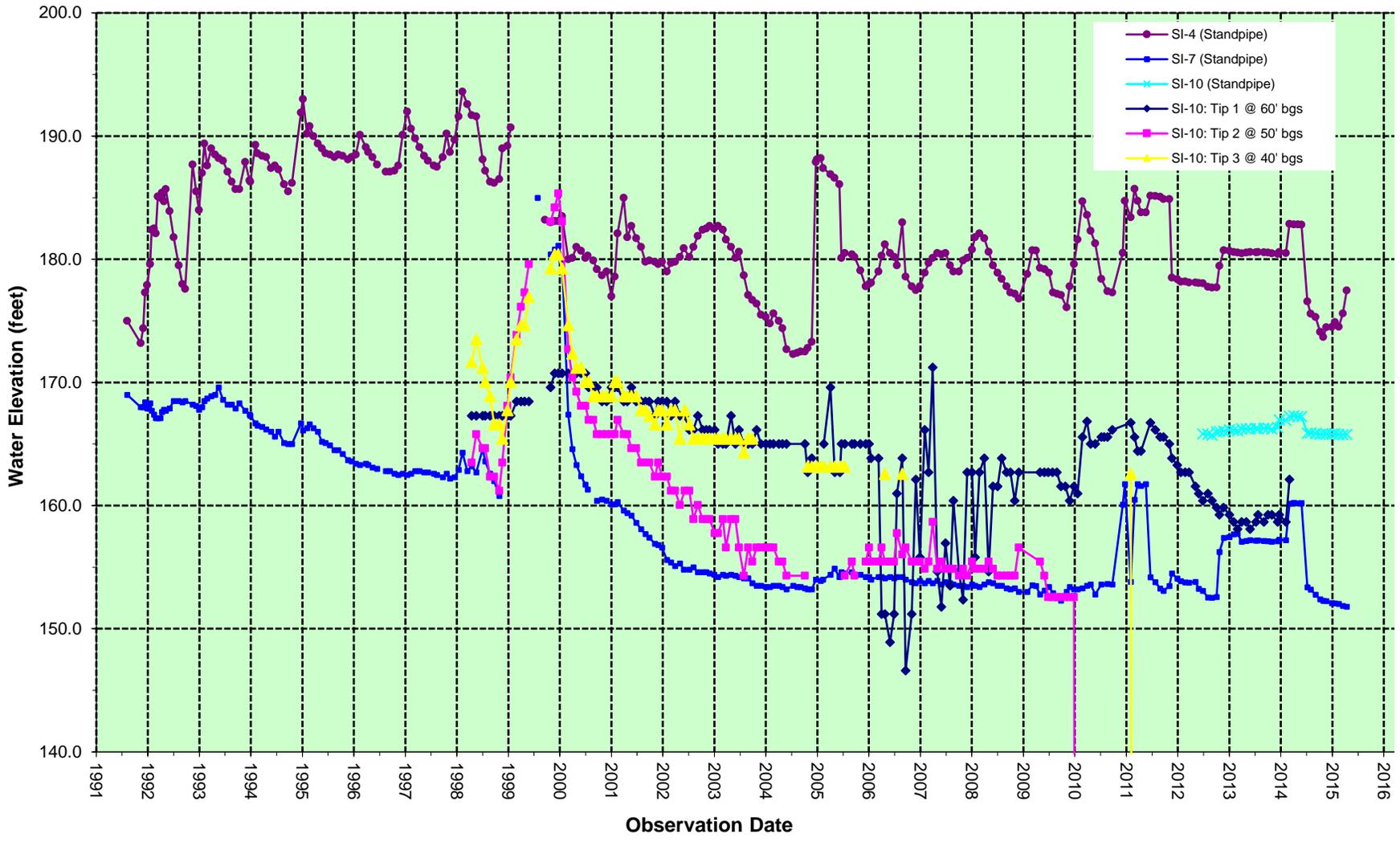
* - Piezometer not functioning

Note: Where noted that readings <2 PSI, functionality not certain

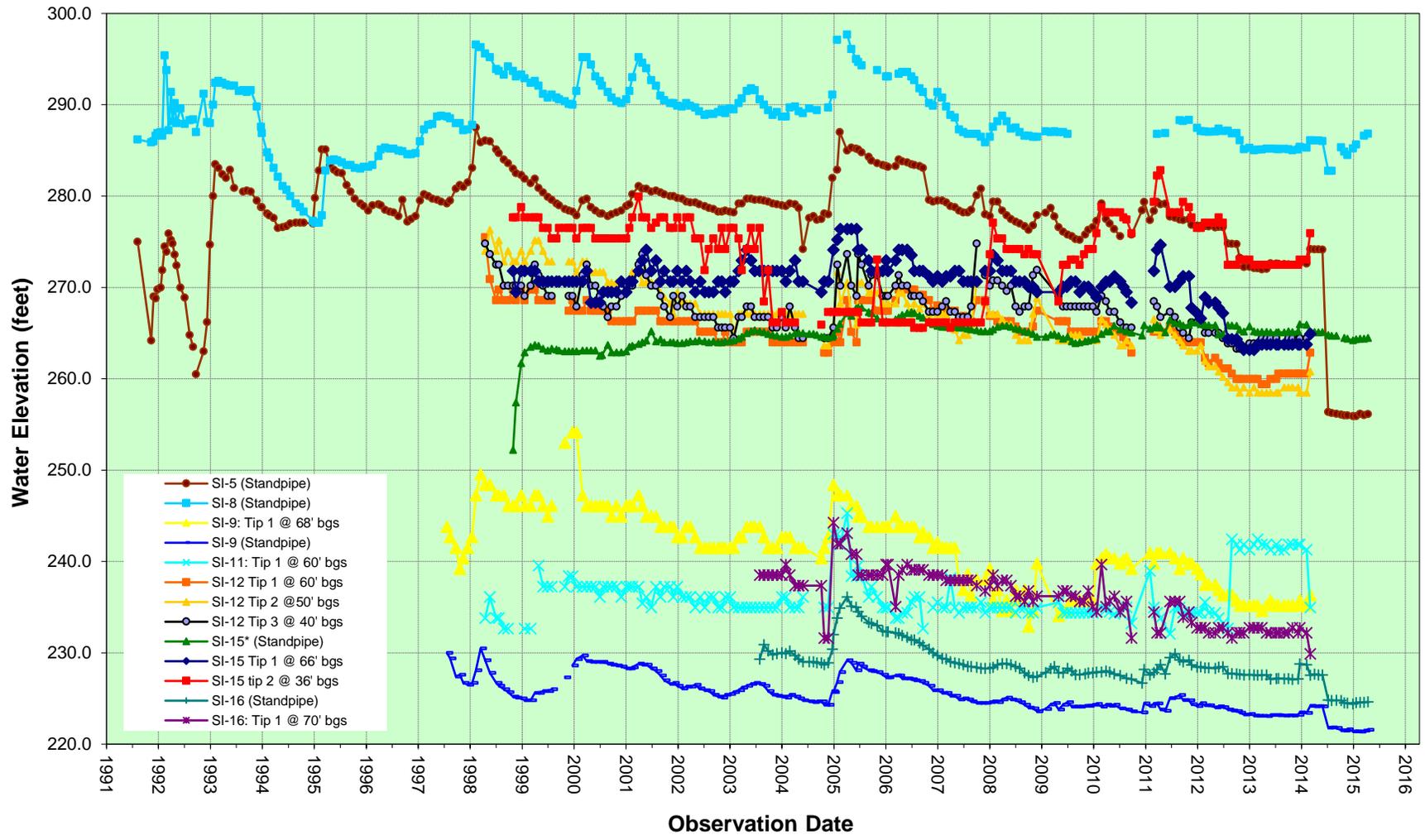
PIEZOMETER INFORMATION
 Calle del Barco Landslide Assessment District
 Malibu, California



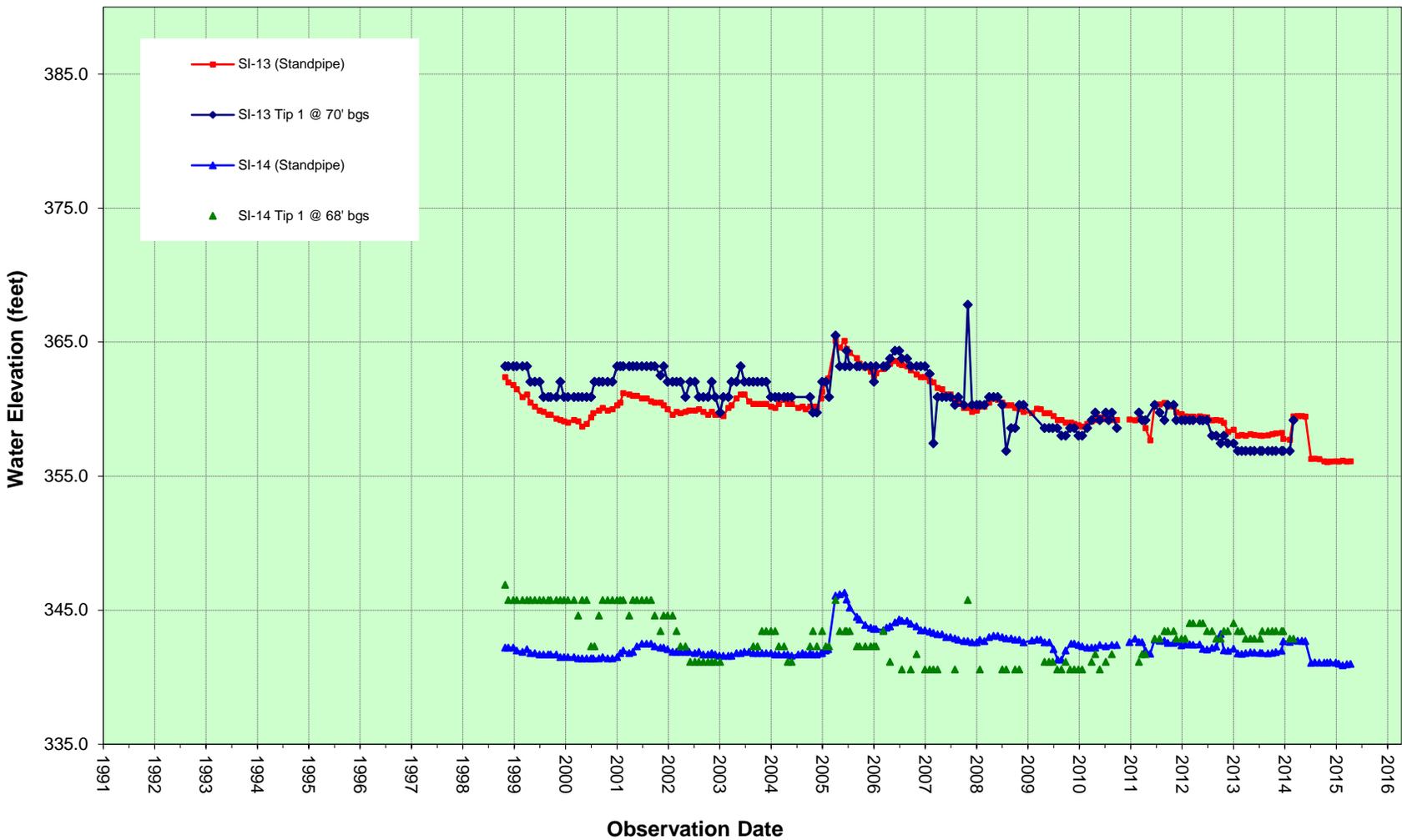
CALLE DEL BARCO - SUMMARY OF GROUNDWATER DATA																																
Piezometer I.D.		91-92*	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00**	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	Highest Ever Recorded	Mean '91 - '15	Stand. Dev.	14-15 vs 97-98	14-15 vs 13-14	14-15 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	181.1	179.6	181.3	175.2	Mar-98	182.3	4.2	-14.9	-6.1	-7.1	
	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	185.2	180.7	182.9	177.5	193.6	185.4	4.4	-16.1	-5.4	-7.9	
SI-7	Mean El.	167.8	168.5	167.3	165.8	163.9	162.7	162.8	162.7	173.9	160.3	156.5	154.5	153.6	153.8	154.3	153.9	153.6	153.2	153.1	158.2	153.7	155.7	158.2	152.4	Aug-99	159.2	6.2	-10.4	-5.8	-6.8	
	Max El.	169.0	169.6	168.6	166.7	165.1	163.0	164.3	164.6	185.0	161.7	158.6	155.0	154.2	154.9	154.6	154.2	153.8	153.6	153.6	161.8	154.5	157.7	160.2	153.4	185.0	160.7	7.6	-10.9	-6.8	-7.4	
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	163.9	159.3	159.3	Apr-07		3.9					
	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	166.7	161.0	162.1	171.2		3.0					
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		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		10.0					
Area Average	Mean El.	174.4	176.7	177.3	177.4	176.3	175.7	171.2	171.7	175.9	169.0	166.8	165.3	162.7	163.3	162.6	161.9	161.8	162.3	162.1	168.6	166.2	164.9	166.3	163.8		168.5	5.8	-7.4	-2.5	-4.7	
	Max El.	177.4	179.5	179.0	179.9	177.6	177.5	172.8	175.8	181.2	171.4	168.4	166.6	164.4	166.8	164.4	166.8	163.8	163.7	164.4	171.4	168.8	166.5	168.4	165.4		170.9	6.0	-4.3	-3.0	-5.5	
Change vs Prior	Mean El.		2.3	0.6	0.0	-1.1	-0.5	-4.5	0.5	4.1	-6.8	-2.2	-1.5	-2.6	0.6	-0.7	-0.7	-0.1	0.4	-0.1	6.4	-2.3	-1.4	1.4	-2.5							
	Max El.		2.2	-0.6	0.9	-2.3	-0.1	-4.8	3.1	5.3	-9.8	-3.0	-1.8	-2.2	2.4	2.4	-2.4	2.4	-3.0	-0.1	0.7	7.0	-2.6	-2.3	1.9	-3.0						
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	277.1	273.3	273.1	256.1	Mar-98	277.5	5.5	-26.5	-17.0	-21.4	
	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	277.8	276.6	274.2	256.4	287.5	280.0	6.1	-31.1	-17.8	-23.6	
SI-8	Mean El.	288.6	290.0	287.5	279.8	283.8	286.0	290.7	293.0	291.9	292.2	290.5	289.8	289.6	293.2	293.7	290.7	287.2	286.9	286.8	286.9	--	--	285.5	285.0	Apr-05	288.6	3.5	-5.7	-0.5	-3.6	
	Max El.	295.4	292.6	292.1	284.0	285.3	288.7	296.6	294.2	295.2	295.2	292.7	291.8	291.6	297.7	294.7	293.6	288.8	287.5	286.8	286.9	--	--	286.1	282.8	297.7	290.9	4.4	-13.8	-3.4	-8.2	
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	224.6	223.4	223.5	221.6	Apr-98	225.5	1.9	-6.6	-2.0	-3.9	
	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	225.4	224.1	224.2	221.8	230.5	226.5	2.4	-8.7	-2.4	-4.7	
SI-15	Mean El.							261.0	263.1	263.3	264.2	264.3	264.9	265.5	266.9	266.3	265.5	264.9	264.6	265.4	265.9	265.4	265.3	264.5	Jul-05 & Aug-05	264.8	1.4		-0.8	-0.3		
	Max El.							263.7	263.3	264.2	265.2	265.2	267.7	267.8	267.3	268.8	267.8	265.8	265.5	265.8	266.4	265.9	266.0	264.8	267.8	265.6	1.3		-1.2	-0.9		
SI-16	Mean El.							229.8	231.6	232.7	230.1	228.5	227.9	227.9	227.7	228.8	227.6	227.6	224.6	223.1	222.8	222.8	224.8	Apr-05	228.7	2.1		-2.9	-4.1			
	Max El.							230.9	236.1	234.5	231.7	228.8	228.3	228.7	229.9	228.5	228.8	224.8	223.1	222.8	224.8	223.1	223.1	236.1	230.0	3.0		-4.0	-5.1			
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	228.5	237.6	240.2	239.0	235.5	235.4	--	Jan-Feb-00		4.2					
	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	240.9	236.3	236.3	--	254.2		4.8					
SI-9 TIP-2	Mean El.						267.8	263.8	261.2	262.9				266.5	261.2										Mar-98		2.8					
	Max El.						274.3	266.9	261.2	263.5				270.4	261.2										274.3		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	234.3	240.3	240.9	--	Apr-05		2.2					
	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	235.5	242.4	241.9	--	245.3		2.9					
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	242.8	242.5	242.1	242.1	242.1	242.1	242.3	--	Jan-00		0.5				
	Max El.						242.7	245.0	246.1	243.8	243.8	242.7		245.0	243.2	243.2	242.8	243.8	242.7	242.1	242.1	242.1	243.2	--	246.1		1.1					
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	263.6	260.1	260.7	--	May-98		3.1					
	Max El.						275.5	269.8	268.6	267.5	267.5	265.2	268.6	269.8	269.8	268.6	267.5	266.3	265.7	265.7	265.7	261.1	262.9	--	275.5		3.2					
SI-12 TIP-2	Mean El.						275.2	273.9	272.5	270.9	268.7	266.9	267.1	267.1	269.2	269.2	266.7	265.2	264.8	264.6	263.0	258.9	259.0	--	Jun-98		4.5					
	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	266.5	265.4	260.2	260.8	--	276.3		4.4					
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	266.6	265.6	263.9	264.4	--	Oct-07		2.6					
	Max El.						274.8	272.5	272.5	273.7	270.2	267.9	273.7	273.7	269.1	274.8	271.9	269.1	268.5	267.3	264.5	265.0	--	274.8		3.3						
SI-15 TIP-1	Mean El.						271.2	270.4	270.6	271.1	271.0	271.6	274.0	273.7	273.7	271.6	270.1	270.2	271.3	269.0	264.0	263.9	--	Mar-05 & Apr-05		2.7						
	Max El.						271.8	271.8	274.1	273.0	274.1	273.0	276.4	274.1	273.5	273.5	270.7	271.2	274.7	271.2	267.2	264.9	--	276.4		2.9						
SI-15 TIP-2	Mean El.						277.7	276.1	276.4	276.8	274.8	268.9	267.1	266.8	266.0	270.8	273.1	275.2	279.1	277.7	273.0	273.0	--	May-11		4.2						
	Max El.						278.8	276.5	280.0	277.7	276.5	276.5	267.3	273.1	266.2	277.1	274.2	278.8	282.8	279.4	277.1	275.9	--	282.8		4.3						
SI-16 TIP-1	Mean El.												238.3	239.3	238.5	238.5	237.7	236.2	236.1	233.7	233.7	232.4	232.0	--	Jan-05		2.7					
	Max El.												239.7	244.3	239.7	239.1	238.5	236.8	239.7	235.6	235.6	232.8	232.8	--	244.3		3.4					
SI-16 TIP-2	Mean El.												259.9	262.9	259.4	257.6	257.6	257.6	257.6	257.6	257.6	257.6	257.6	--	Mar-05		1.8					
	Max El.												261.6	265.1	260.5	257.6	257.6	257.6	257.6	258.2	257.6	257.6	257.6	--	265.1		2.6</					



GROUNDWATER HYDROGRAPH
Rambla Vista
Calle del Barco Landslide Assessment District
Malibu, California



GROUNDWATER HYDROGRAPH
Calle del Barco
Calle del Barco Landslide Assessment District
Malibu, California



GROUNDWATER HYDROGRAPH
Rambla Pacifico
Calle del Barco Landslide Assessment District
Malibu, California

**APPENDIX B
DEWATERING DATA**



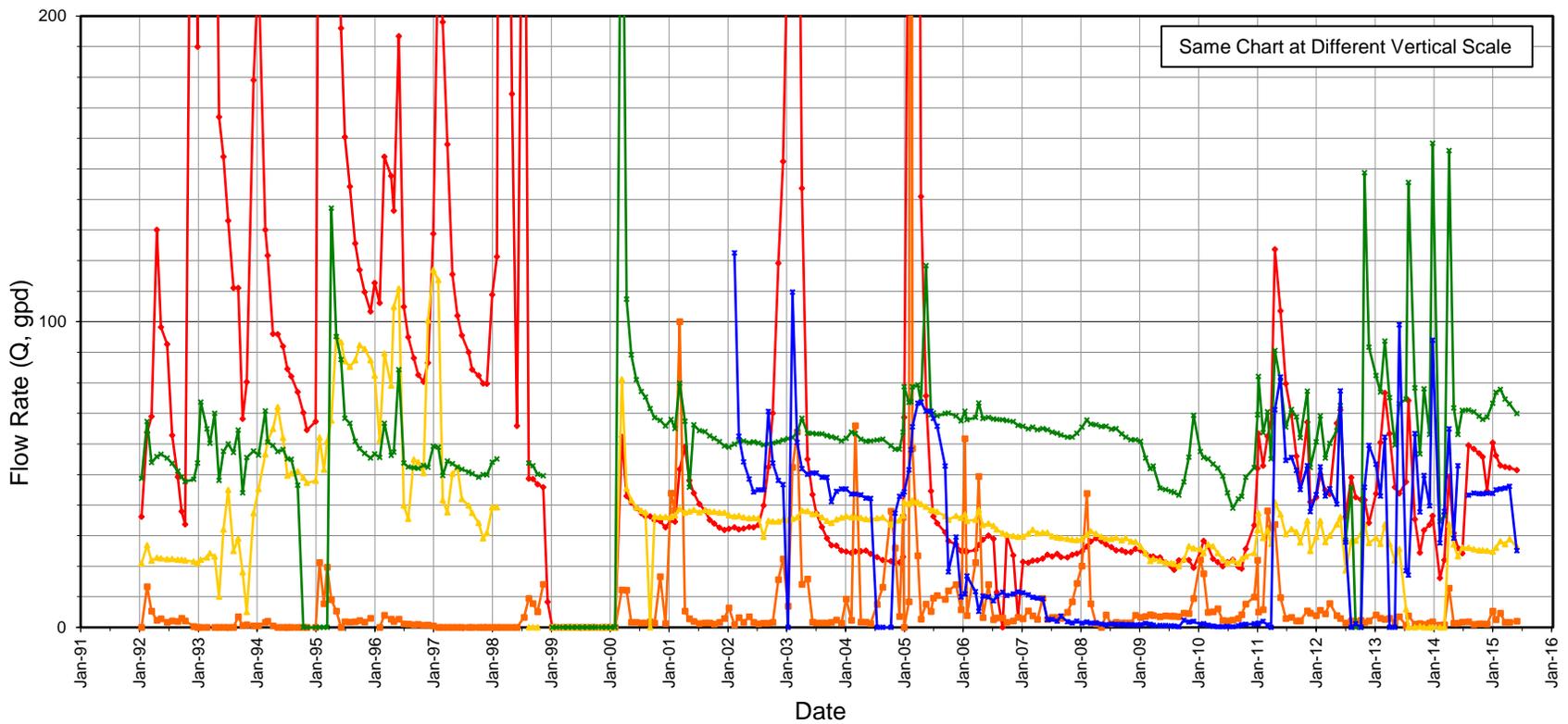
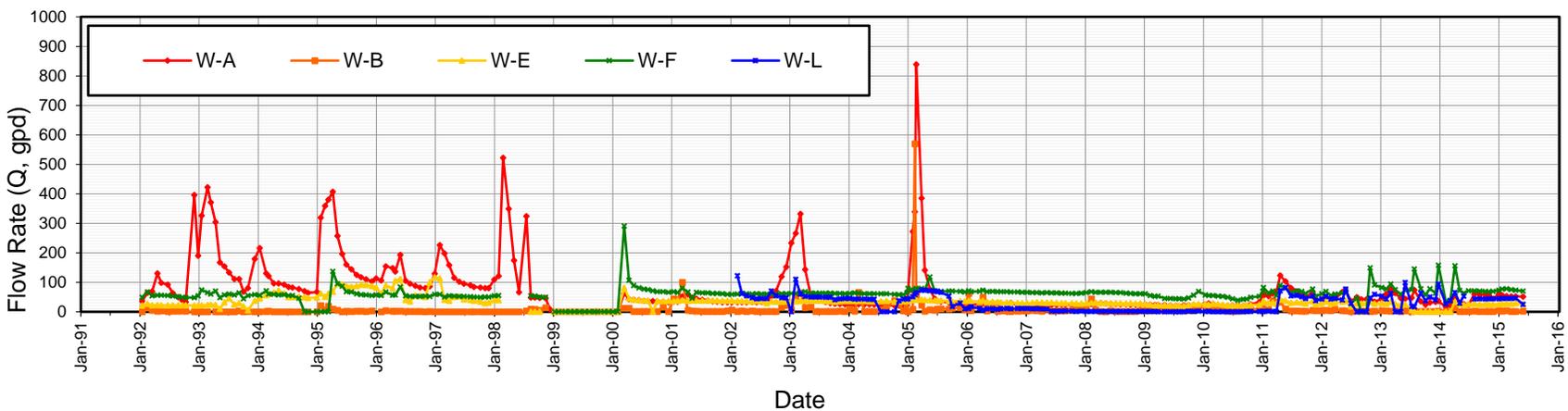
Dewatering Well Information							
Well ID	Vault Elevation (ft.)	Bottom Elevation (ft.)	Pump Elevation (ft.)	Pump Size (hp)	2014-2015 Pumping Rate (gpd)	% of Total Well Production	Comment
W-A	196.0	Unknown	45.0	1/2	52	12%	
W-B*	204.0	Unknown	54.0	1/2	2	0%	
W-C	295.0	Unknown	233.0	1/2	31	7%	
W-D*	297.0	Unknown	Unknown	removed	0	0%	Destroyed
W-E	215.0	Unknown	116.5	1/2	26	6%	
W-F	210.0	109.0	112.0	1/2	72	16%	
W-G*	292.0	222.0	223.0	1/3	0	0%	Disconnected
W-H**	299.5	234.5	242.5	1/3	0	0%	
W-I	298.0	238.0	248.0	1/3	24	5%	
W-J	304.0	244.0	254.0	1/3	136	31%	
W-K	430.0	370.0	380.0	1/3	6	1%	
W-L	258.0	189.0	192.5	1/2	43	10%	
W-M	302.0	237.0	Unknown	Unknown	54	12%	

Note: * Non-functioning Dewatering Wells
 ** water level at or below pump intake

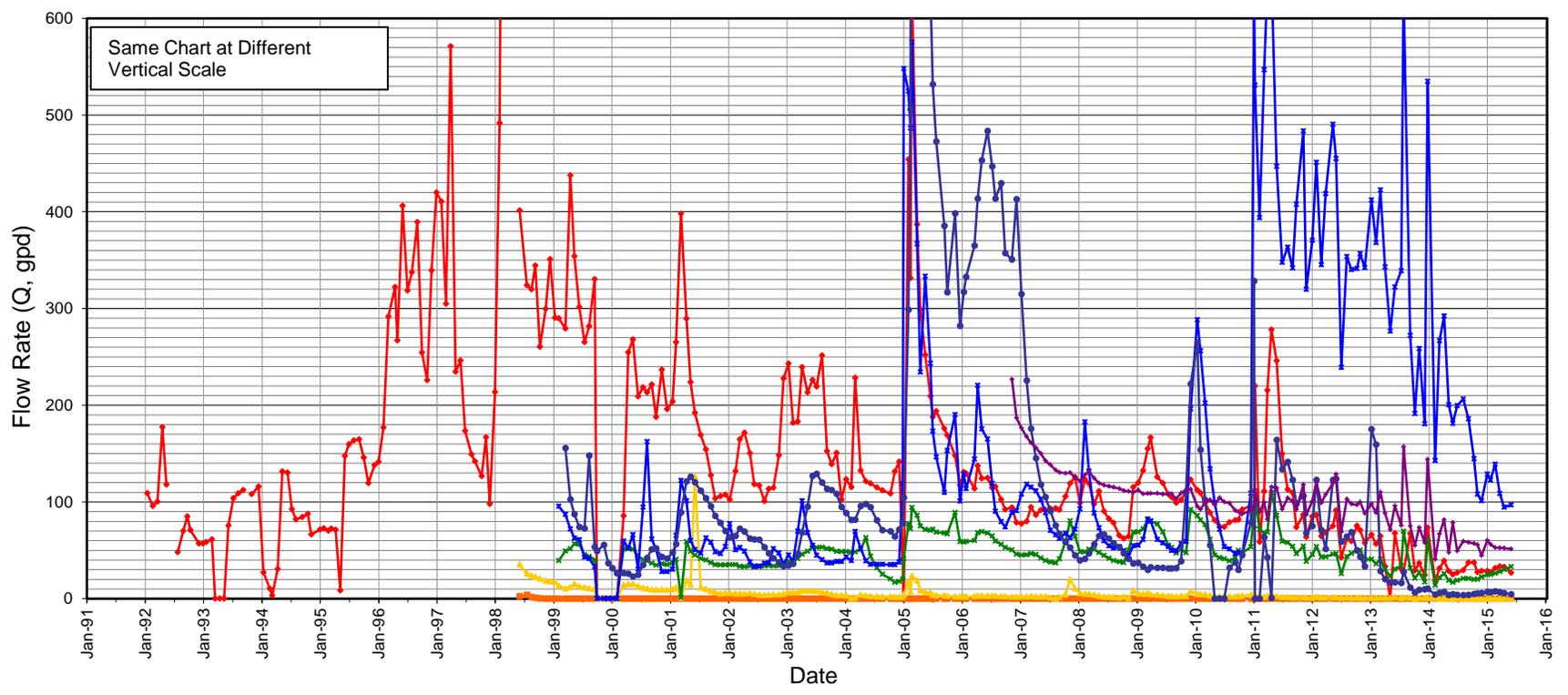
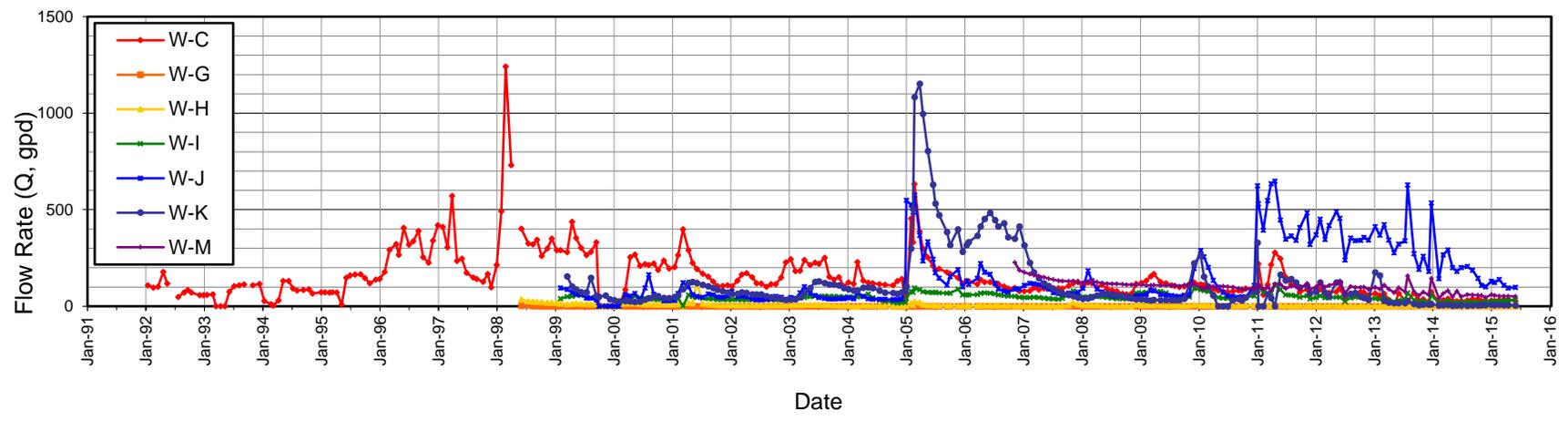
Hydrauger Information						
Hydrauger ID	Installed Length (ft)	Functional Length (ft)	2014-2015 Flow Rate (gpd)	% of Total Production	Installed By	Comment
HD-1 ²	93	unknown	0	0%	BYA	
HD-2 ²	127	unknown	0	0%	BYA	
HD-3 ²	155	unknown	0	0%	BYA	
HD-4 ²	80	unknown	0	0%	BYA	
HD-5 ²	65	unknown	0	0%	BYA	
HD-6 ²	97	unknown	0	0%	BYA	
HD-7 ²	227	unknown	0	0%	BYA	
HD-8 ²	290	unknown	0	0%	BYA	
HD-9	230	unknown	0	0%	BYA	
HD-10 ²	330	unknown	0	0%	BYA	
HD-11 ²	230	unknown	0	0%	BYA	
HD-12 ²	330	unknown	0	0%	BYA	
HD-13	210	unknown	33	23%	BYA	
H-1	240	unknown	109	76%	LA County	
H-2	180	unknown	0	0%	LA County	No outlet to monitor
ROWH-1	--	unknown	0	0%	BYA	discharge diverted from H-2
H-3 ¹	235	unknown	0	0%	LA County	
H-4 ¹	140	unknown	0	0%	LA County	
H-5 ¹	260	unknown	0	0%	LA County	
H-6 ¹	140	unknown	0	0%	LA County	
H-7 ¹	205	unknown	0	0%	LA County	
H-1A	100	92	1	1%	Fugro	
H-2A	130	125	0	0%	Fugro	

Note: 1 - Destroyed in 1998 Landslide
 2 - Non-producing Hydraugers

DEWATERING WELL / HYDRAUGER INFORMATION
 Calle del Barco Landslide Assessment District
 Malibu, California

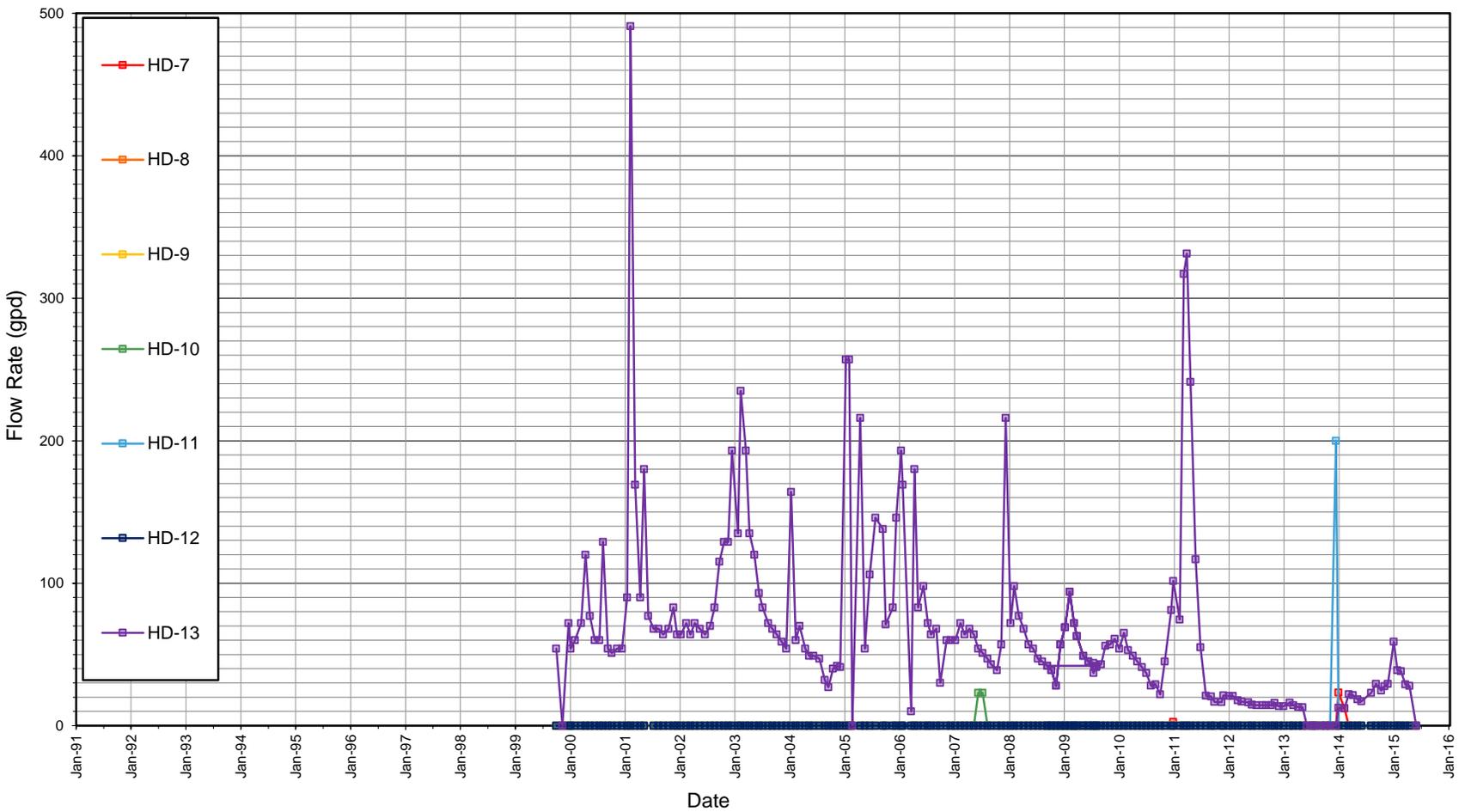


DEWATERING WELL DISCHARGE RATE GRAPH
Rambla Orienta and Slope
Calle del Barco Landslide Assessment District
Malibu, California

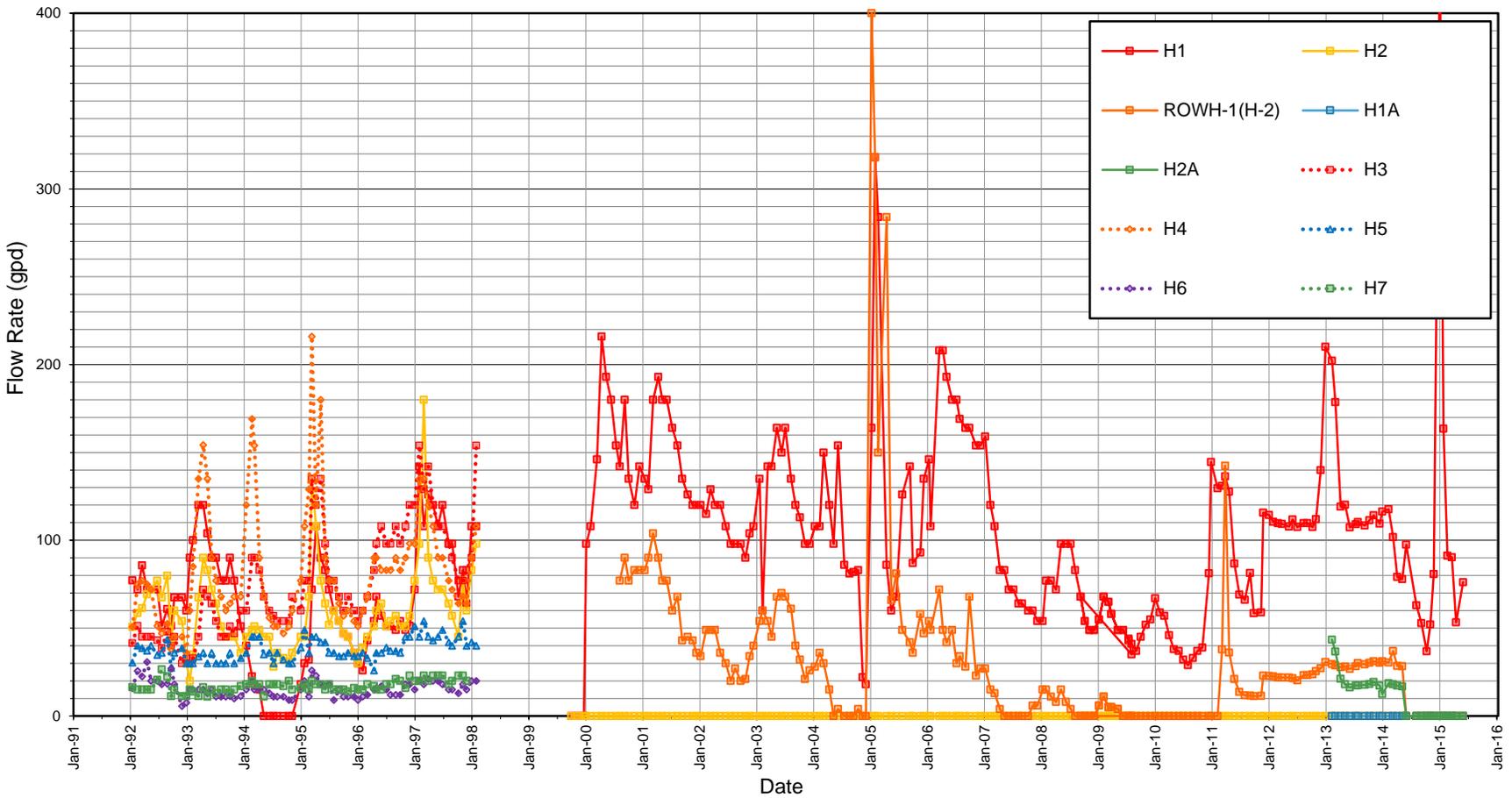


DEWATERING WELL DISCHARGE RATE GRAPH
Calle del Barco and Rambla Pacifico
 Calle del Barco Landslide Assessment District
 Malibu, California





HYDRAUGER DISCHARGE RATE GRAPH
Rambla Orienta
Calle del Barco Landslide Assessment District
Malibu, California



HYDRAUGER DISCHARGE RATE GRAPH
Landslide Toe
Calle del Barco Landslide Assessment District
Malibu, California



APPENDIX C
SLOPE INCLINOMETER DATA



Slope Incliner 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	NI	NI	NI	76.0	100.0	NI	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	NI	NI	NI	78.0	96.0	NI	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	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	3/13/98	3/12/98	3/12/98	9/1998	9/1998	9/1998	8/8/03
DATE FIRST BASE READING	NI	NI	NI	NI	NI	NI	NI	NI	NI	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)***	NI	NI	NI	NI	17-22	0-10, 36-38	15.0	40.0	15-17	53.0	35-38	0-55	54	0-30	8.0	0-25, 77	46, 87
A+ Axis orientation	NI	NI	NI	NI	0	38.0	NI	28.0	22.0	212.0	244.0	258.0	238.0	210.0	224.0	190.0	210 est.
Interpretation Movement (inches)																	
2014-2015	NR	NR	NR	NR	<0.1	0.1	NR	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2013-2014	NR	NR	NR	NR	<0.1	0.1	NR	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2012-2013	NR	NR	NR	NR	<0.1	0.1	NR	<0.1	<0.1	0.15	0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.2
2011-2012	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	0.1	0.15	<0.1	0.2	<0.1	<0.1	0.1	0.1	0.35
2010-2011	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2009-2010	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
2008-2009	NR	NR	NR	NR	<0.1	<0.1	NR	NA	<0.1	0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1
2007-2008	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
2006-2007	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.2
2005-2006	NR	NR	NR	NR	<0.1	<0.1	NR	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.15	<0.1	0.1
2004-2005	NR	NR	NR	NR	--	0.45	NR	<0.1	0.1	0.5	--	<0.1	0.11	--	--	--	0.35
2003-2004	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2002-2003	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2001-2002	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
2000-2001	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
1999-2000	NR	NR	NR	NR	--	--	NR	--	--	--	--	--	--	--	--	--	--
1998-1999	NR	NR	NR	NR	--	0.16	NR	0.11	--	2.19	--	--	--	--	--	--	--
1997-1998	NR	NR	NR	NR	0.22	0.4	NR	0.66	0.32	13	0.22	--	--	NR	NR	NR	NR
1996-1997	NR	NR	NR	NR	NA	NA	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1995-1996	NR	NR	NR	NR	NA	NA	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR

KEY:

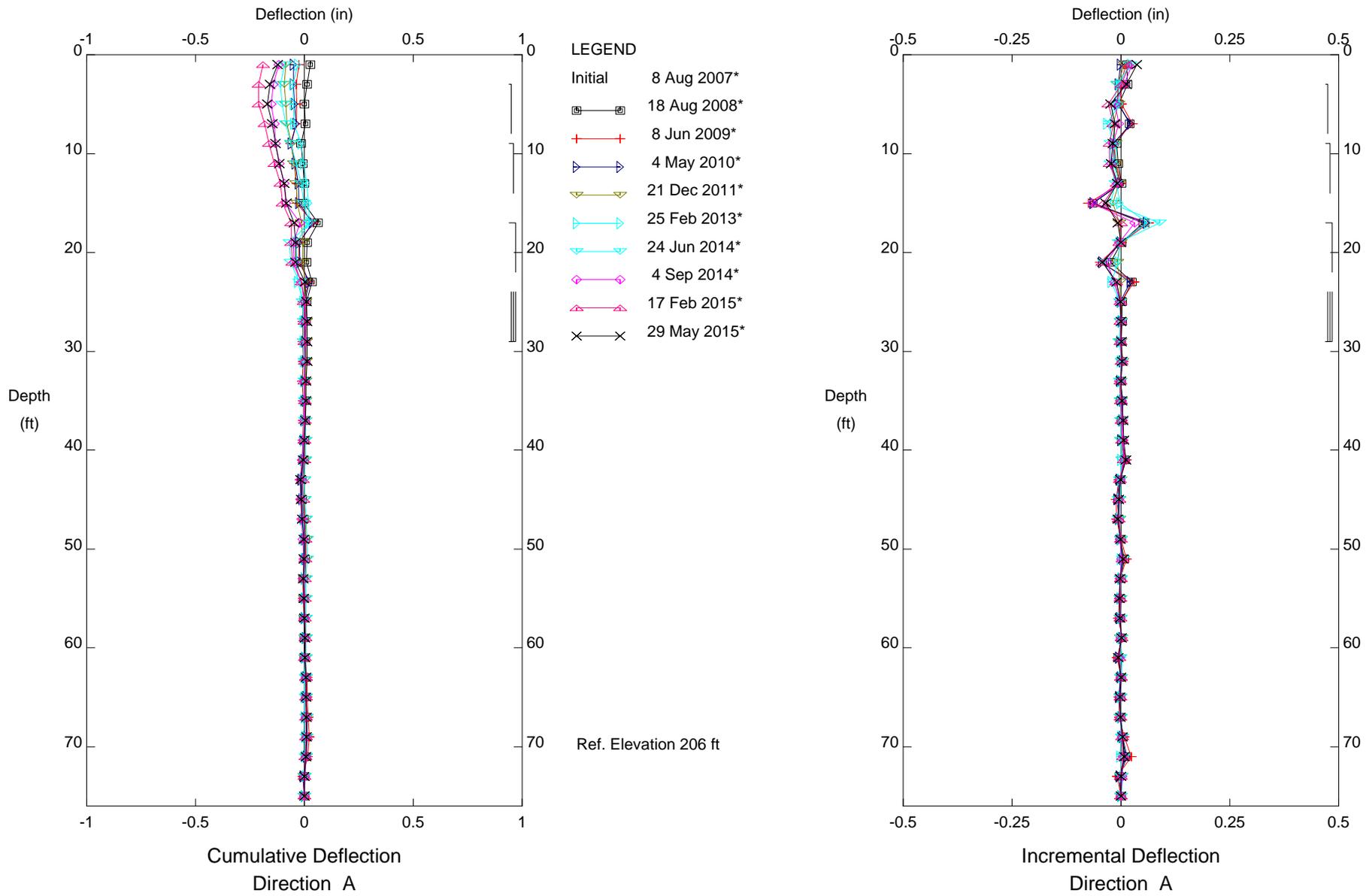
D Destroyed	-- No clearly defined interpreted movement
F Functioning	NR No reading
B New baseline in 1999	NA Data not available
NI No information	
-- Shaded yellow to indicate inclinometer does penetrate basal rupture.	
-- Shaded blue to indicate inclinometer does NOT penetrate basal rupture.	
-- Shaded gray to indicate inclinometer is no longer monitored.	

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 note below)
- ****SI-4, SI-7, and SI-10 were extended 6 feet upwards during reconstruction of the road in 1999 and interpretations are referenced to their current depth.

SUMMARY OF SLOPE INCLINOMETERS
Calle del Barco Landslide Assessment District
Malibu, California

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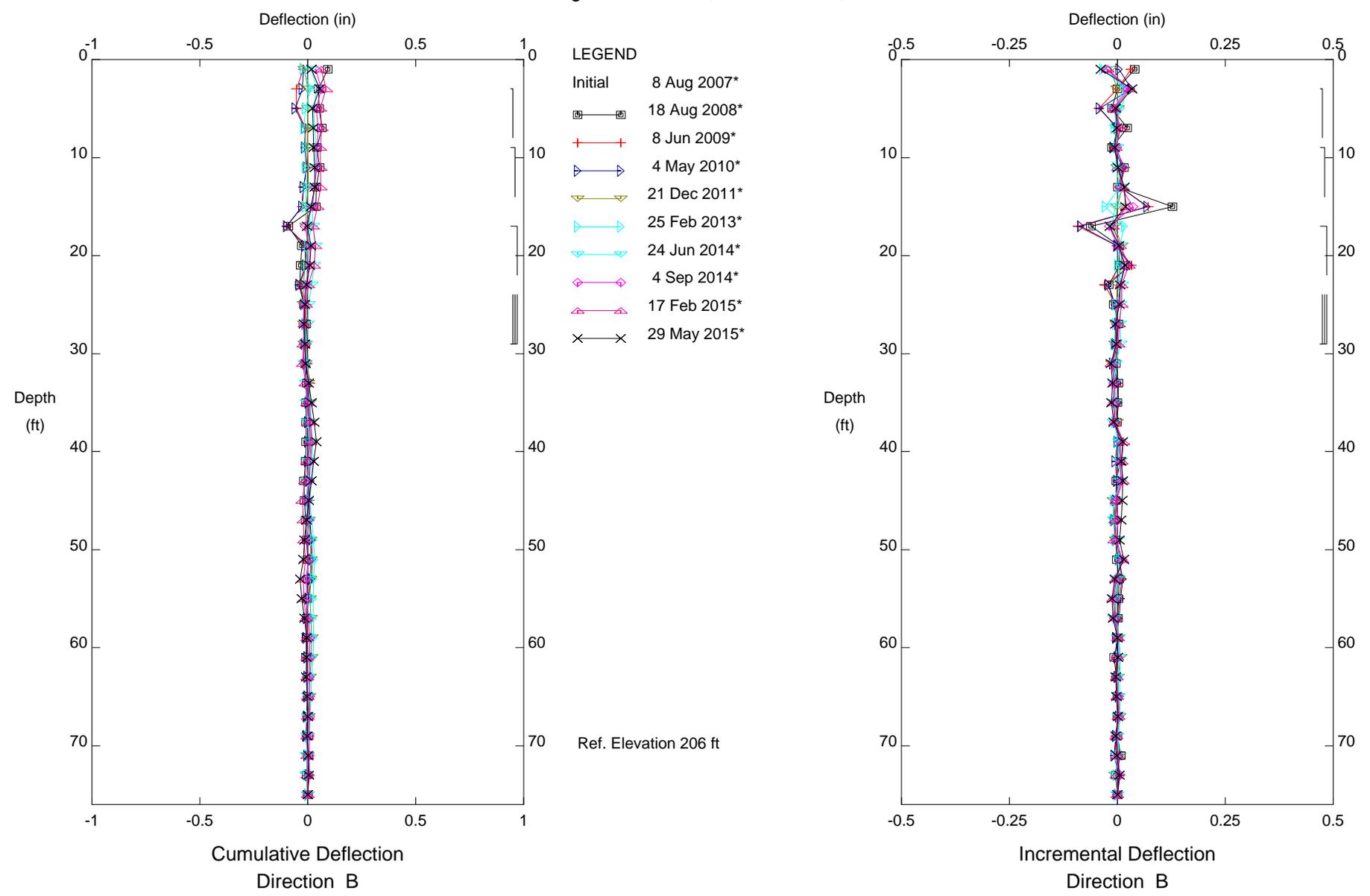
Assessment District 98-2, Inclinometer SI-4
 City of Malibu

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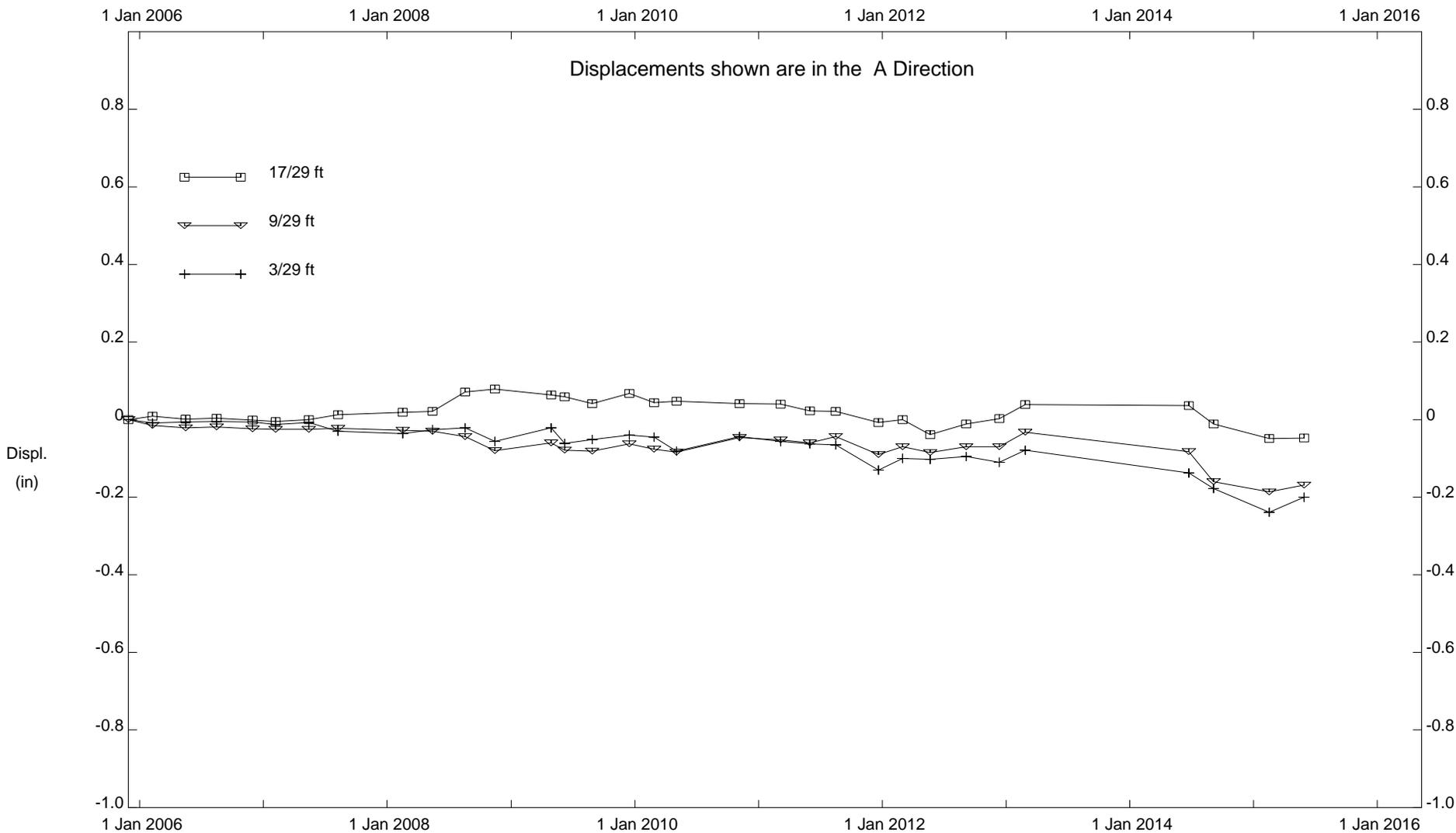
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Assessment District 98-2, Inclinometer SI-4
 City of Malibu

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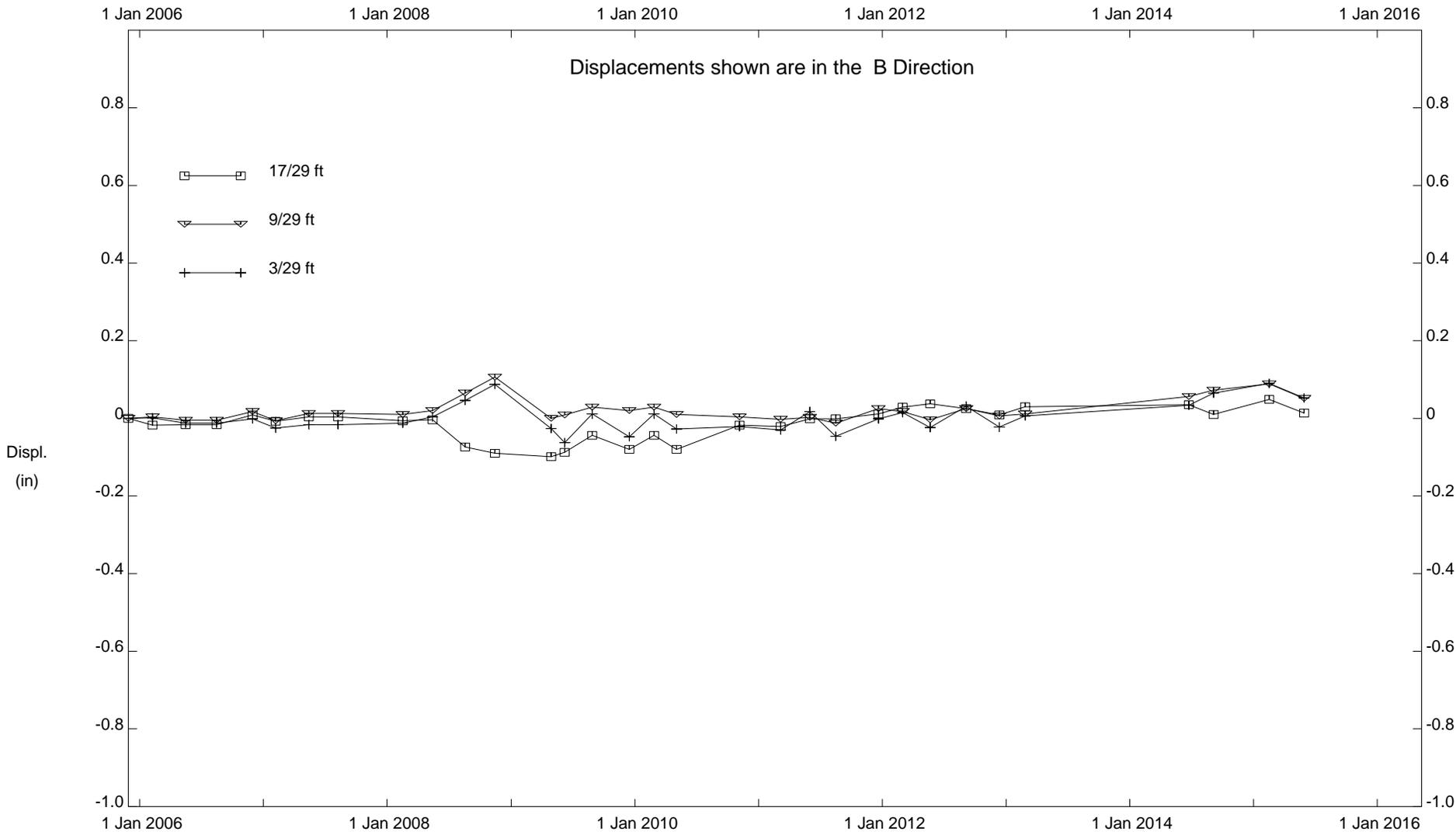


Assessment District 98-2, Inclinator SI-4

City of Malibu



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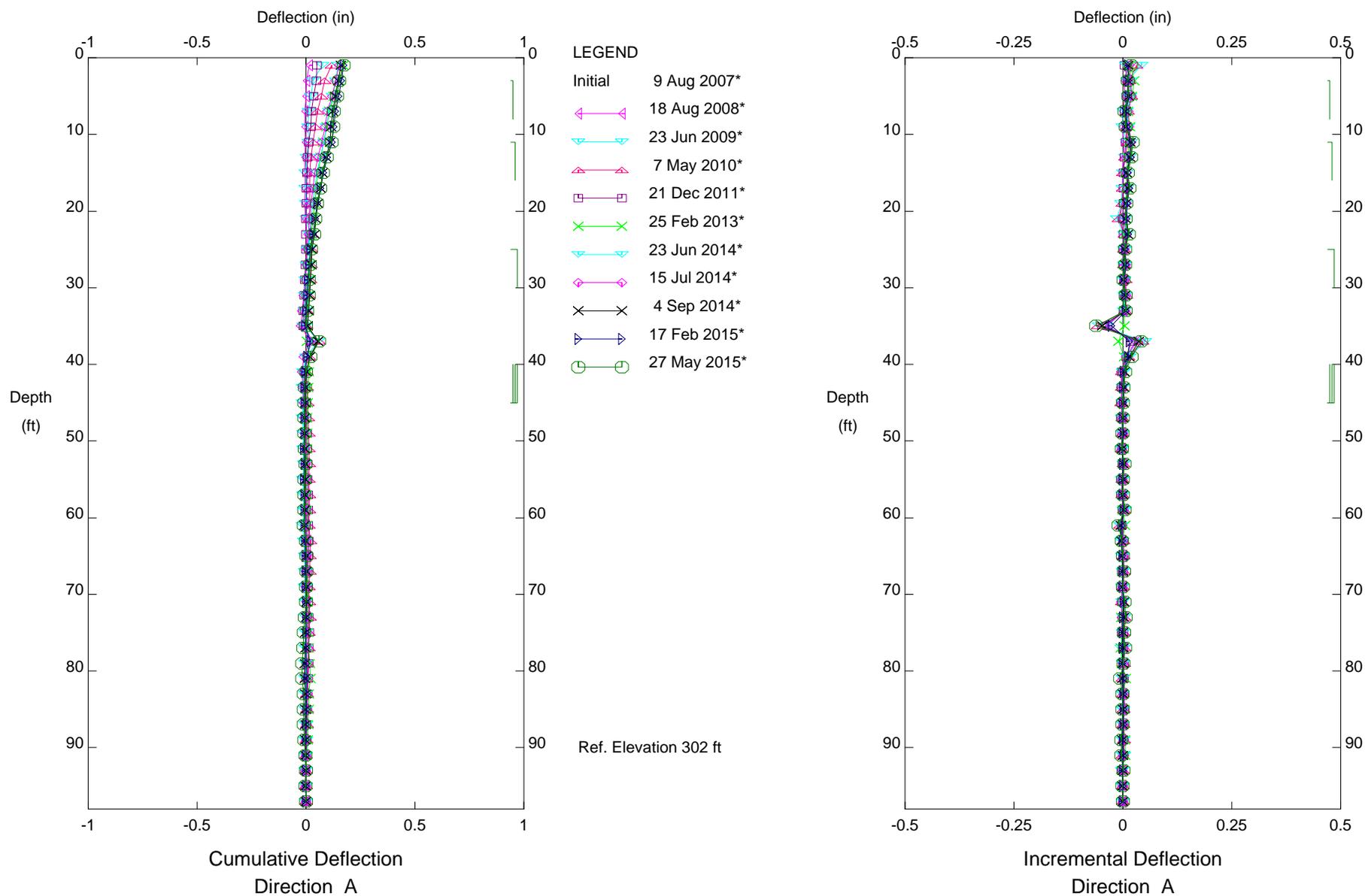
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Assessment District 98-2, Inclinator SI-4

City of Malibu



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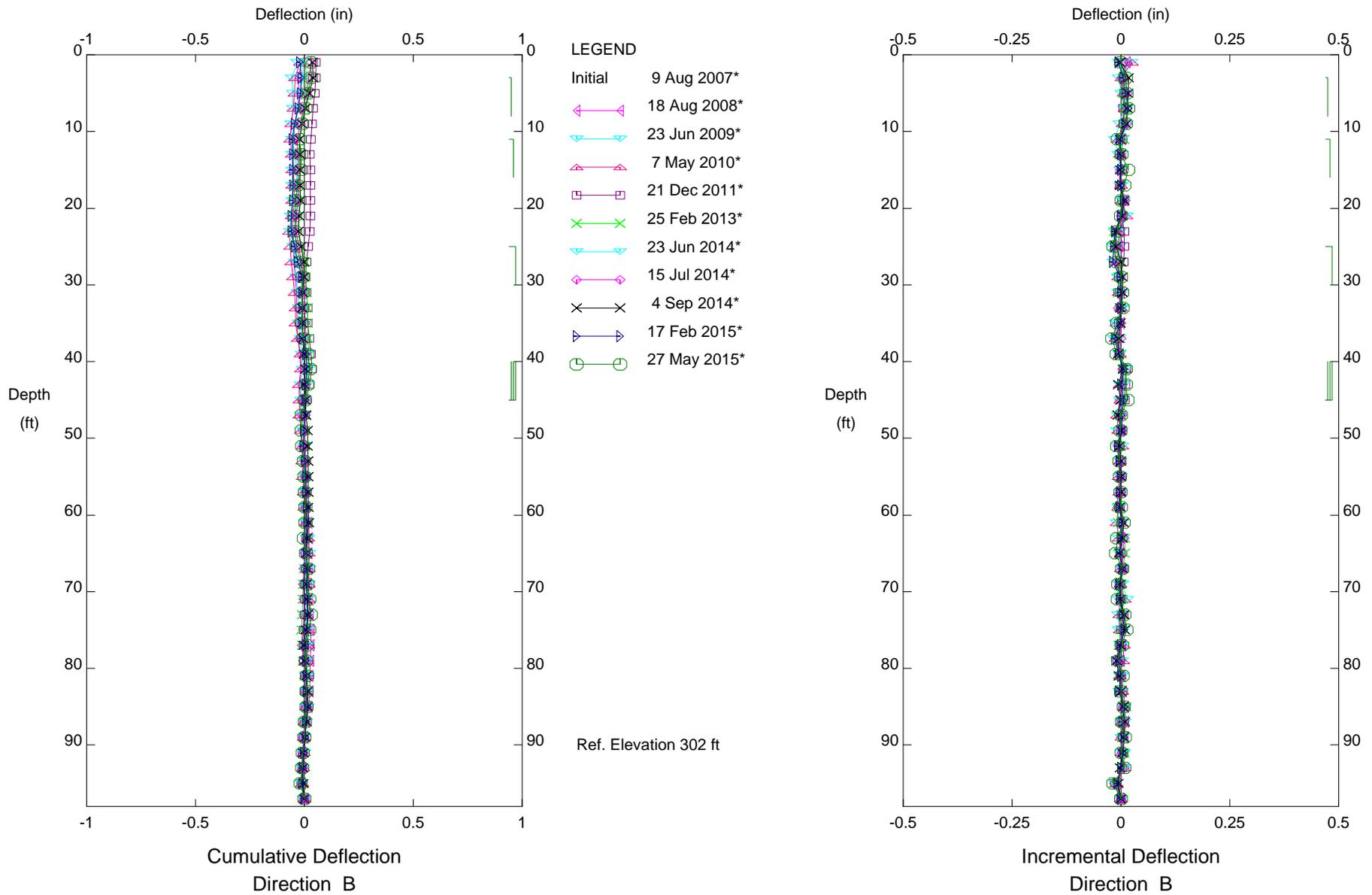
Assessment District 98-2, Inclinometer SI-5
 City of Malibu

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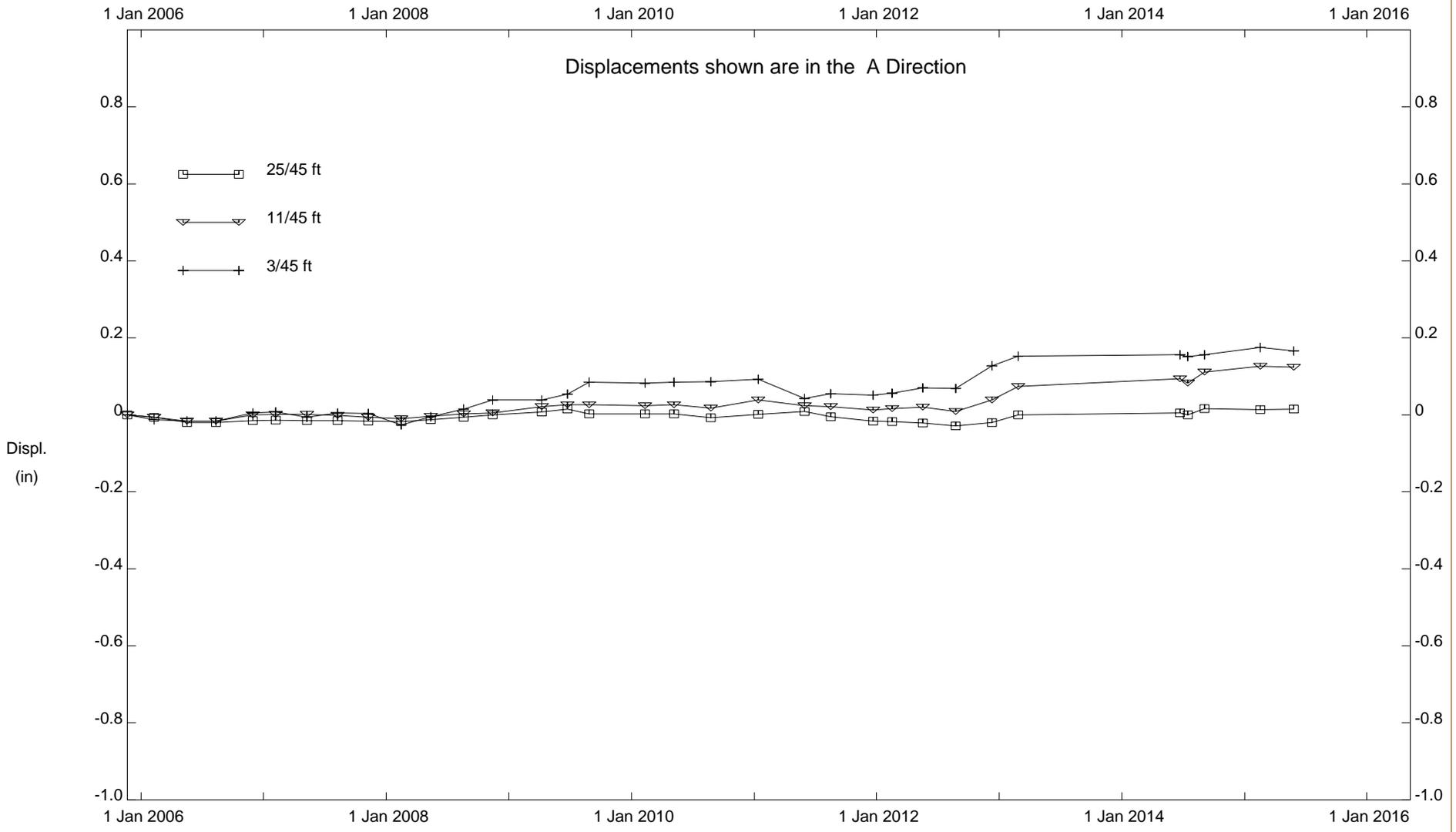
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Assessment District 98-2, Inclinometer SI-5
 City of Malibu

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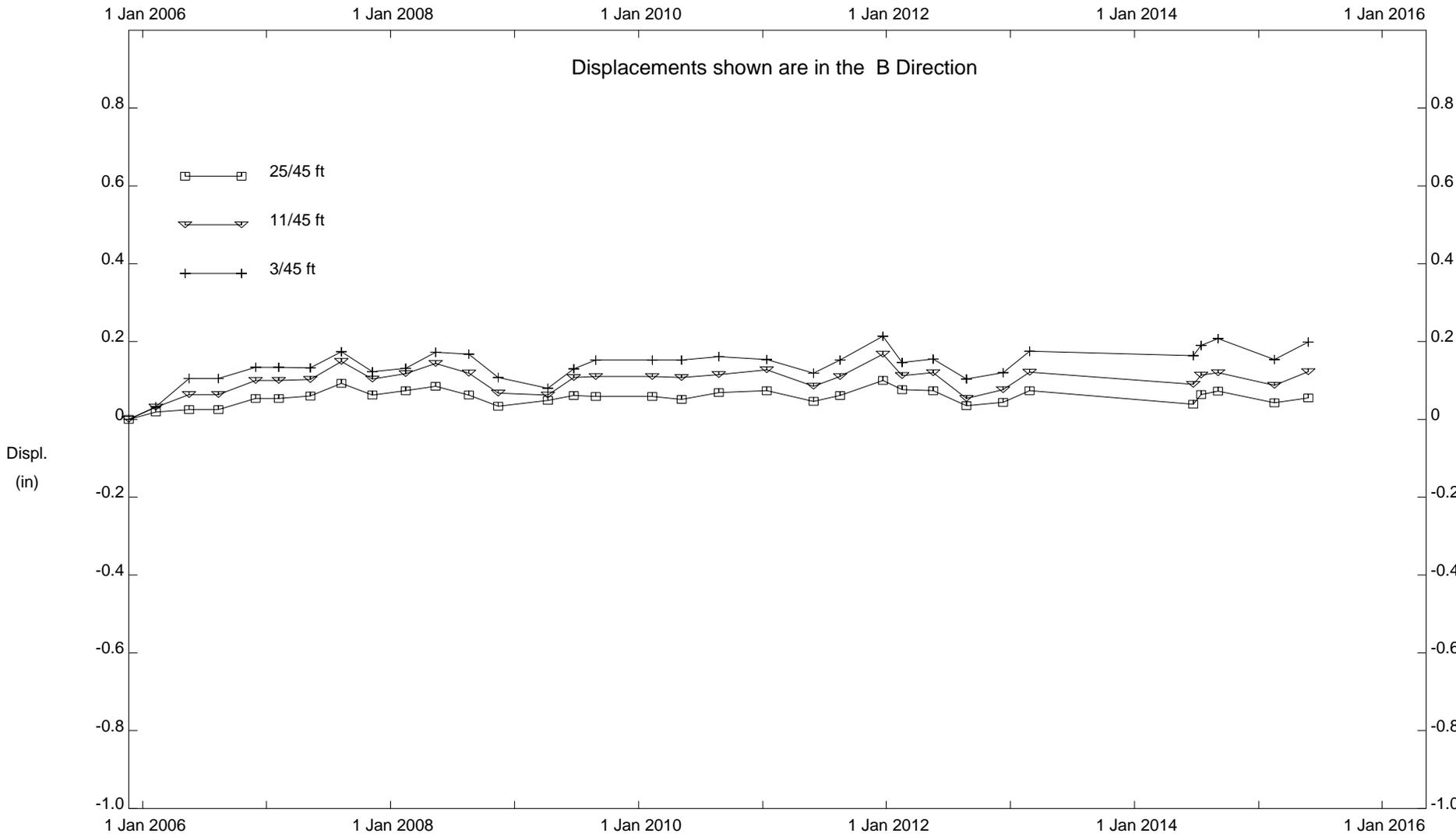
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Assessment District 98-2, Inclinator SI-5

City of Malibu



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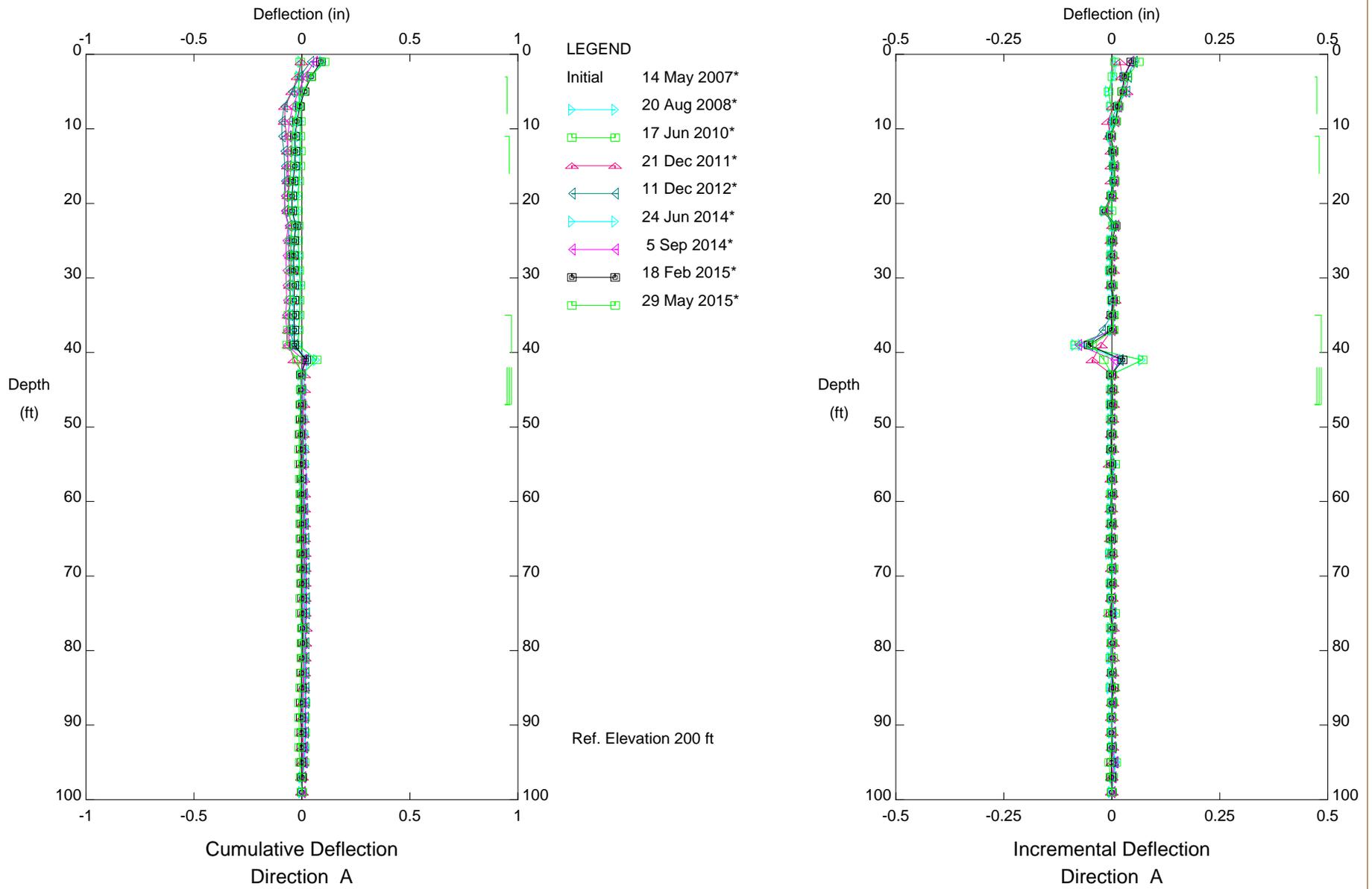
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Assessment District 98-2, Inclinator SI-5

City of Malibu



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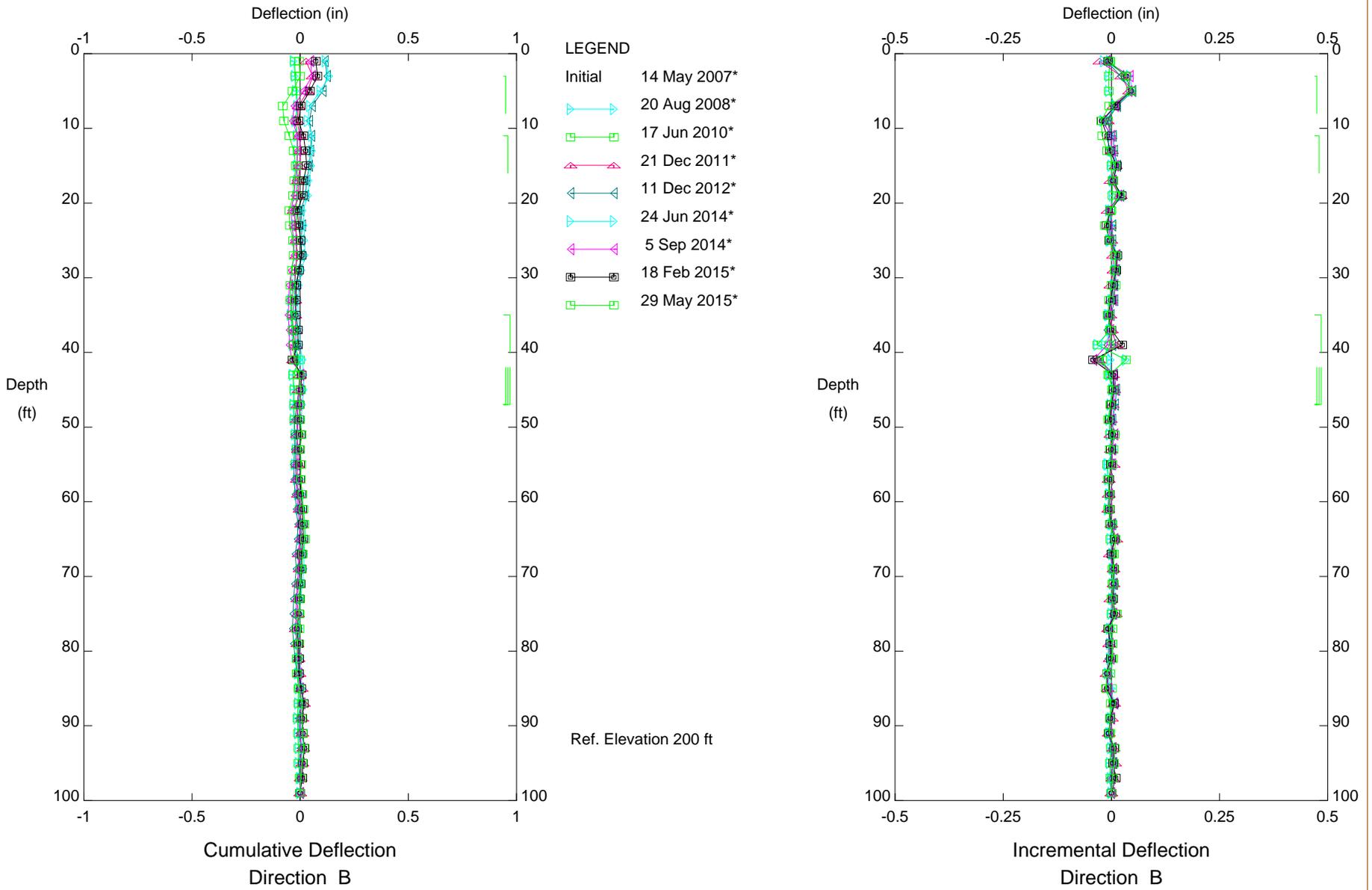
Calle del Barco, Inclinometer SI-7
 City of Malibu

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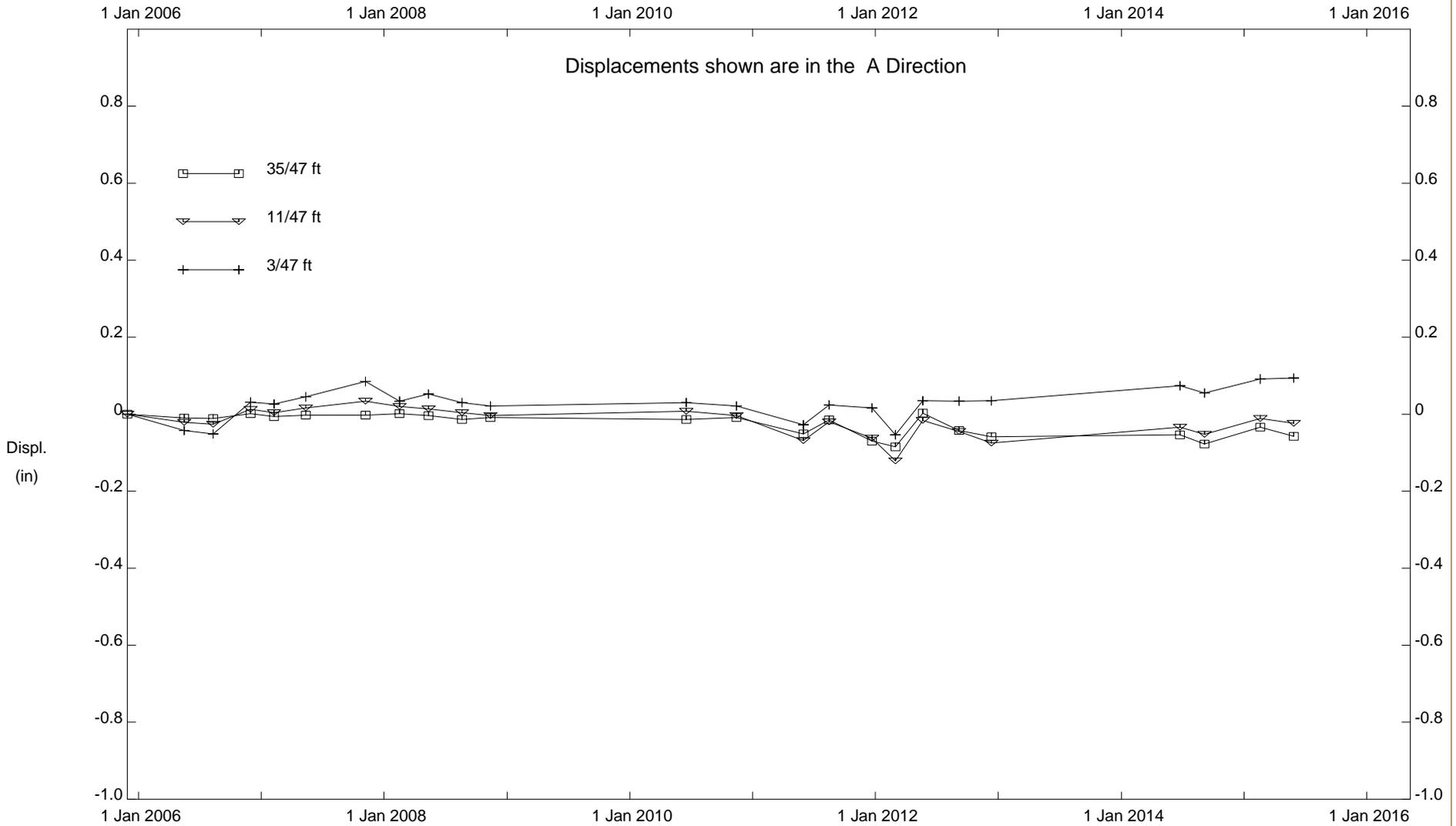


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Calle del Barco, Inclinometer SI-7
 City of Malibu

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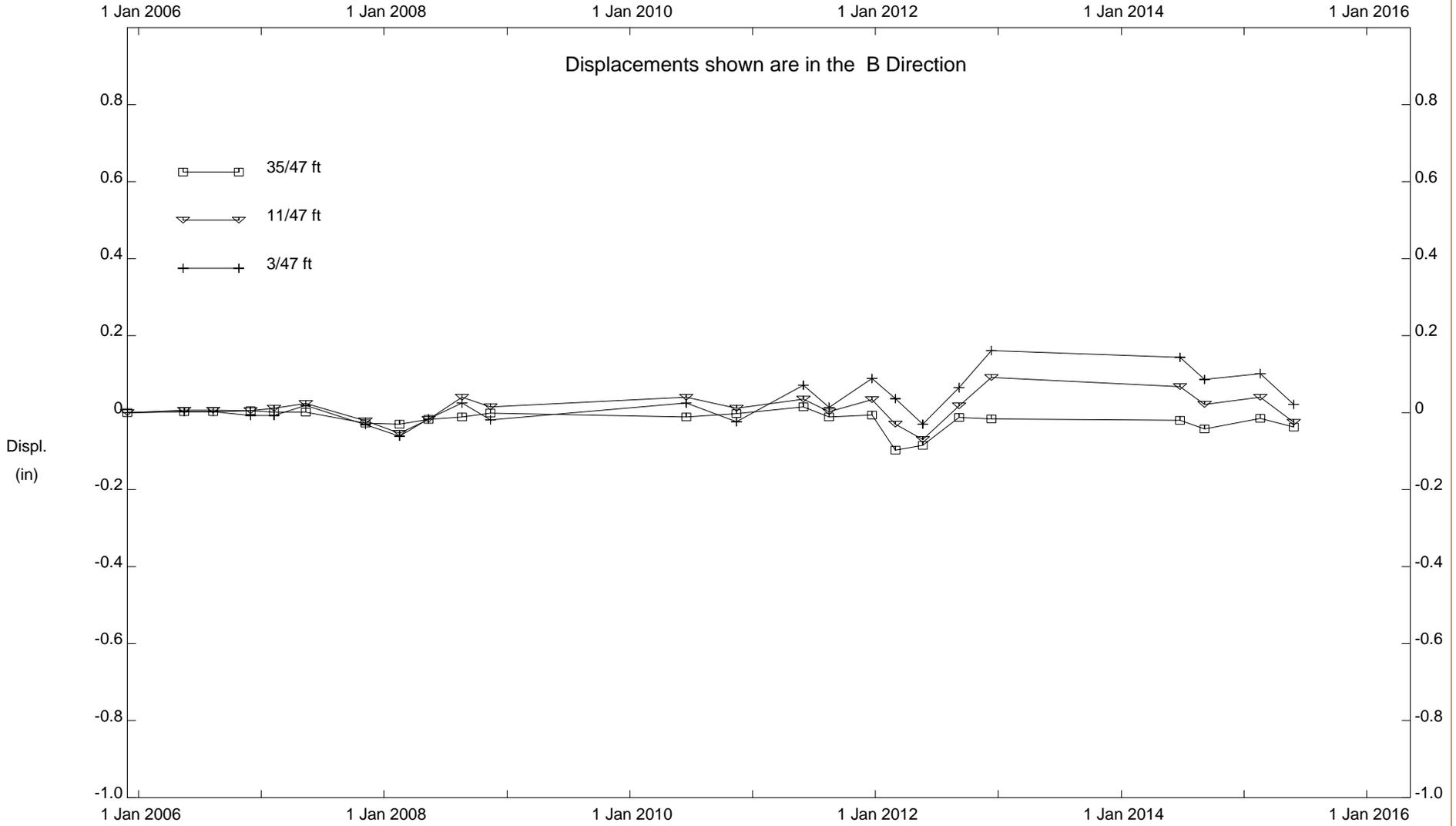


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Calle del Barco, Inclinator SI-7

City of Malibu

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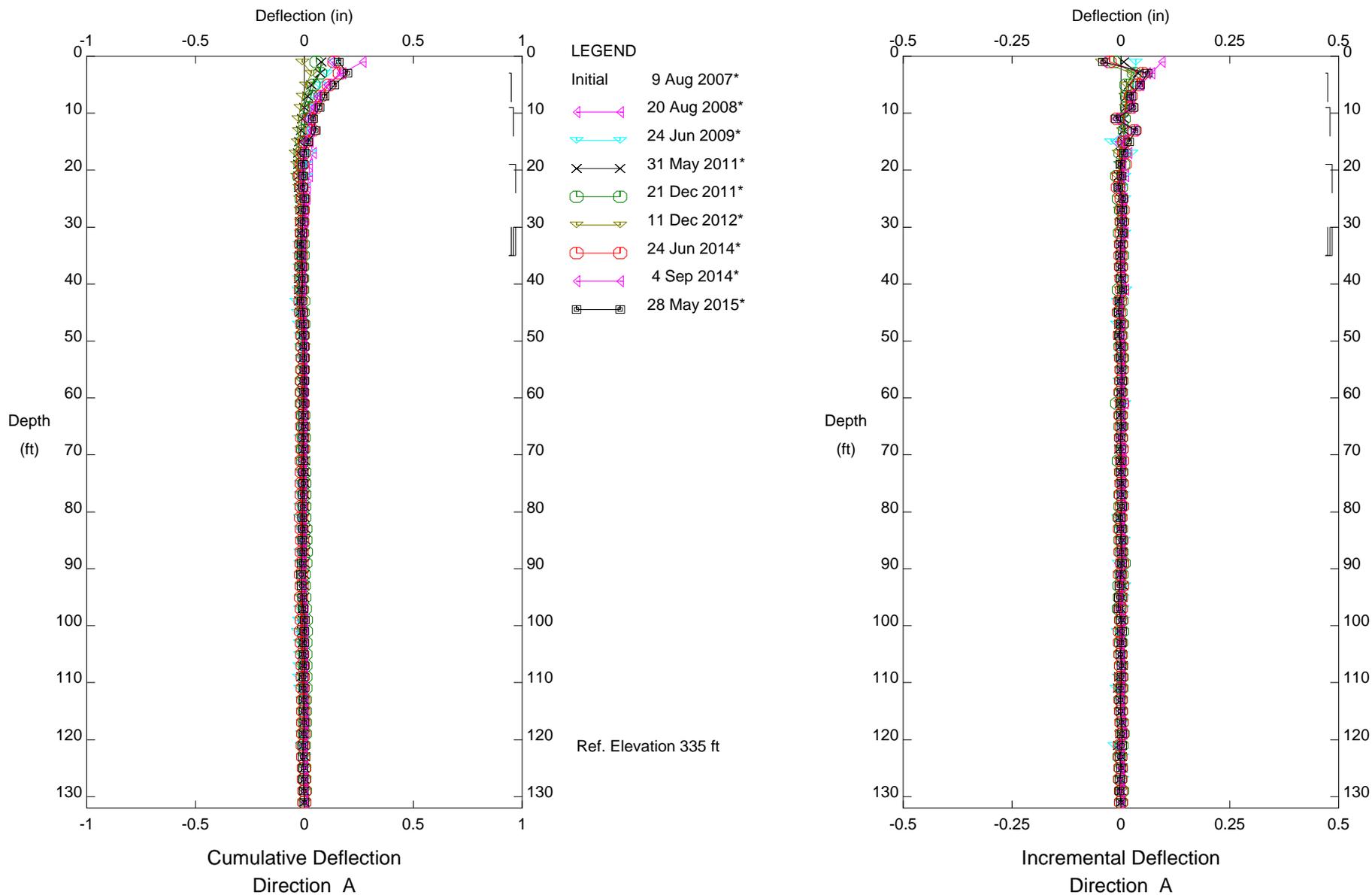


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Calle del Barco, Inclinator SI-7

City of Malibu

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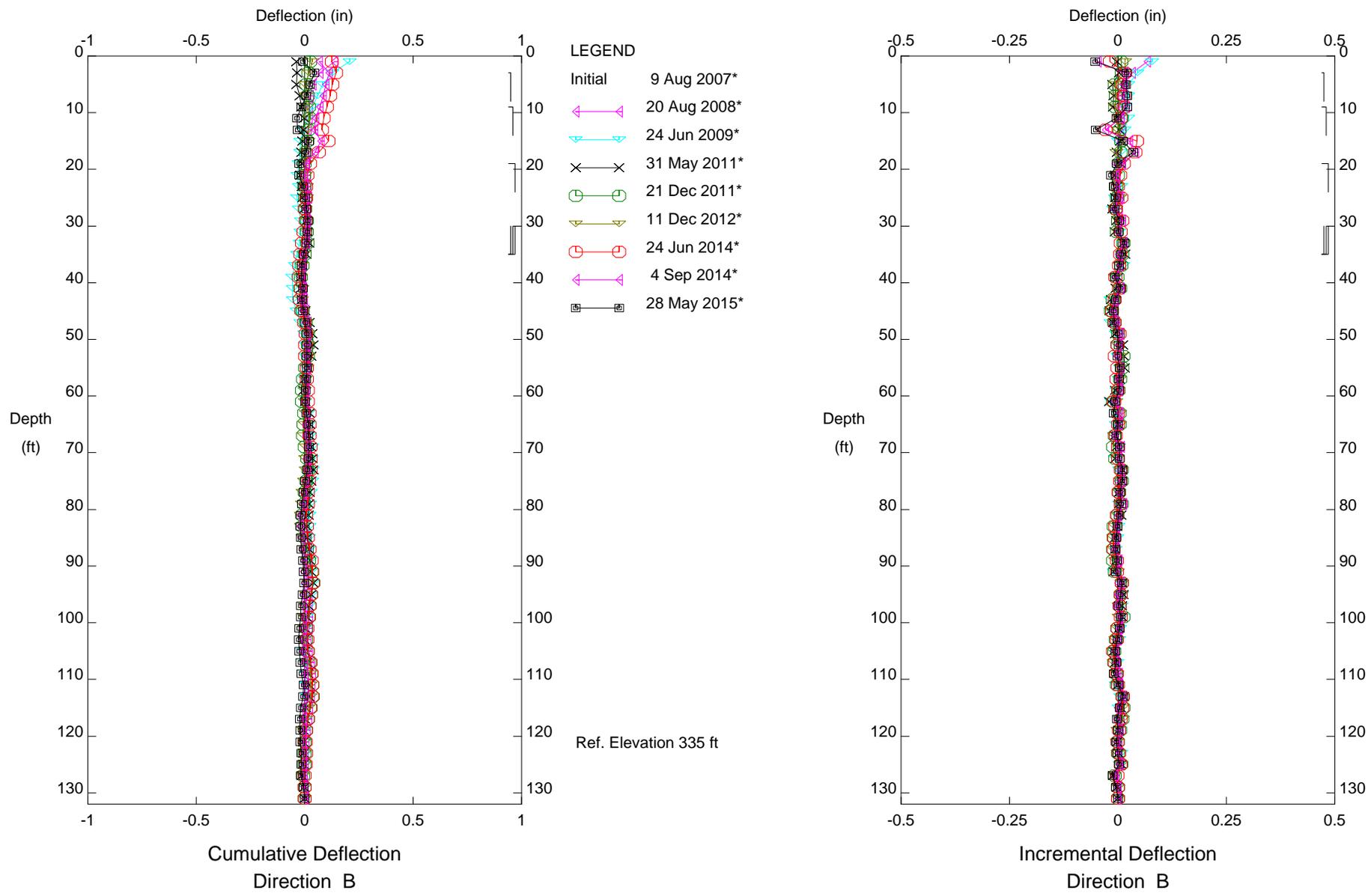


Assessment District 98-2, Inclinometer SI-8
 City of Malibu

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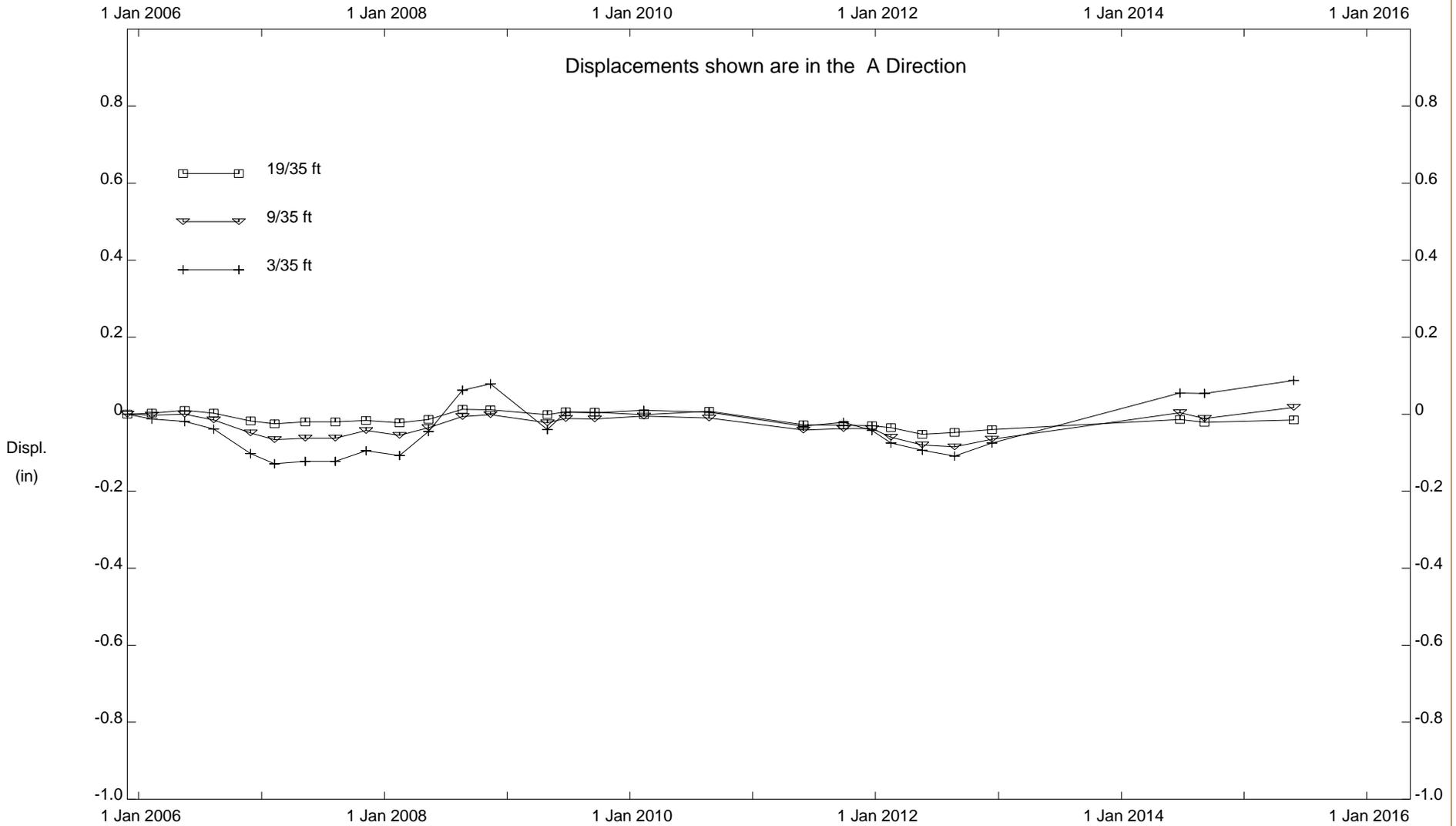


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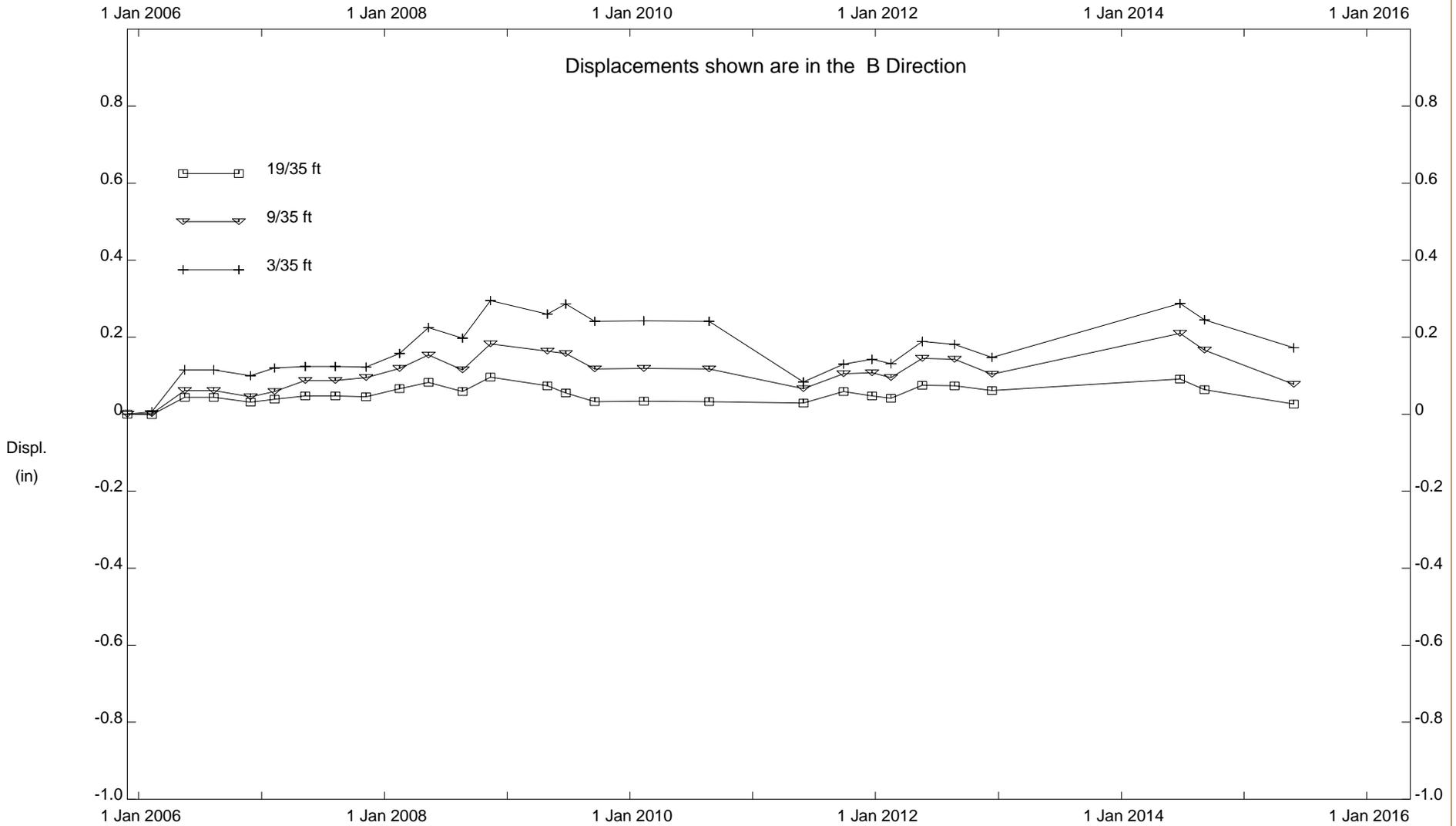
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Assessment District 98-2, Inclinator SI-8

City of Malibu

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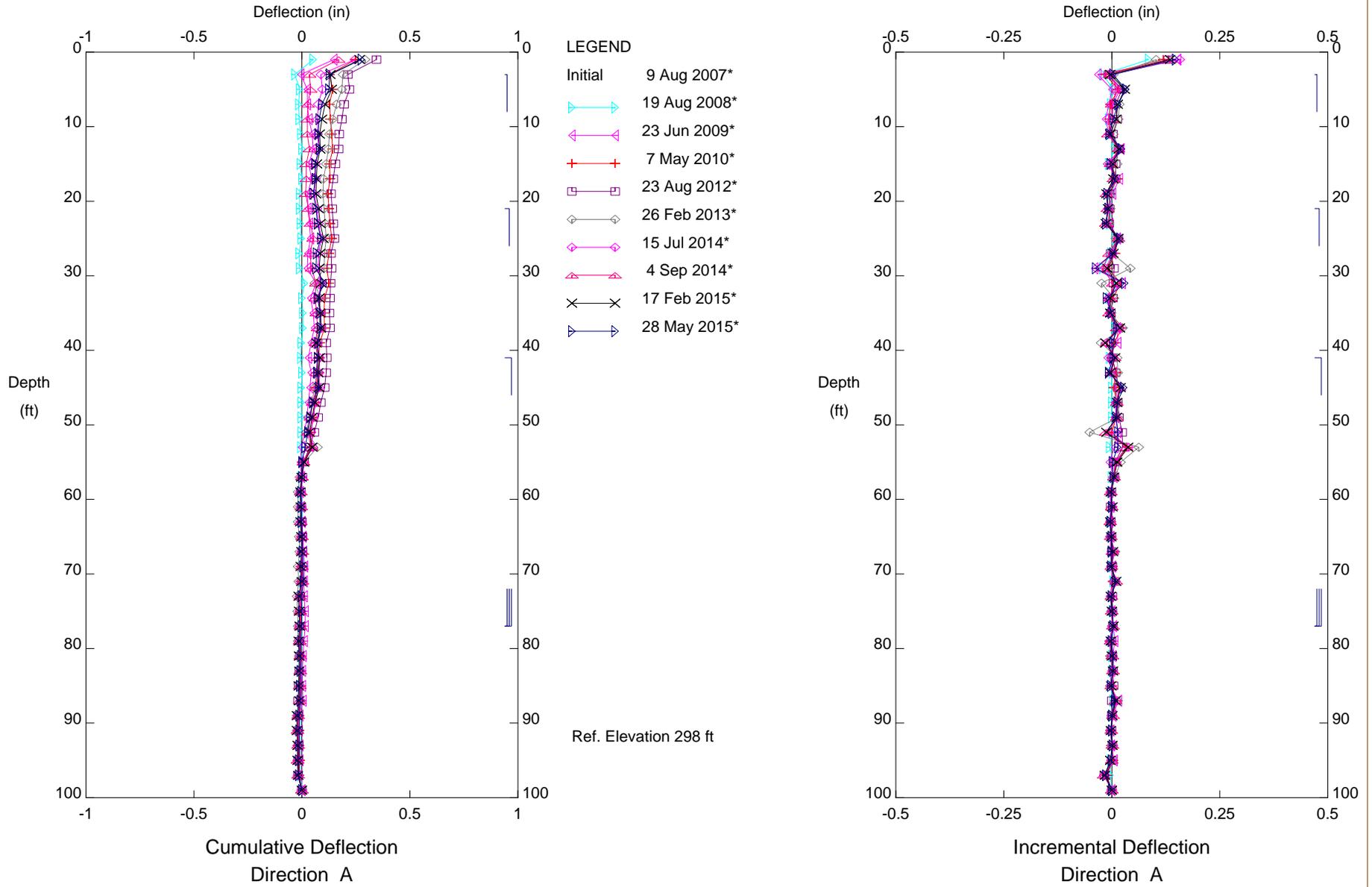
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Assessment District 98-2, Inclinometer SI-8

City of Malibu



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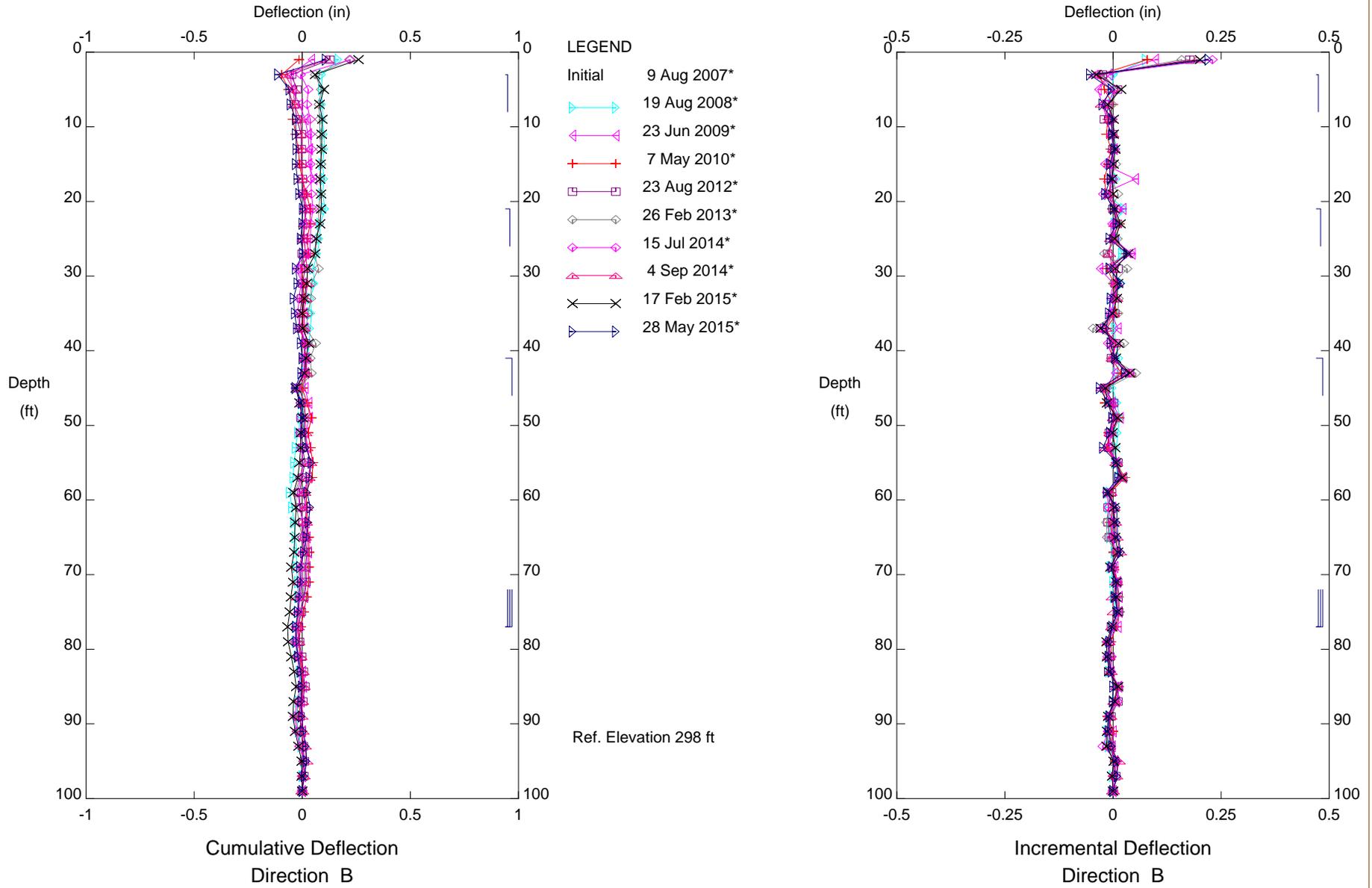


Calle del Barco, Inclinometer SI-9
 City of Malibu

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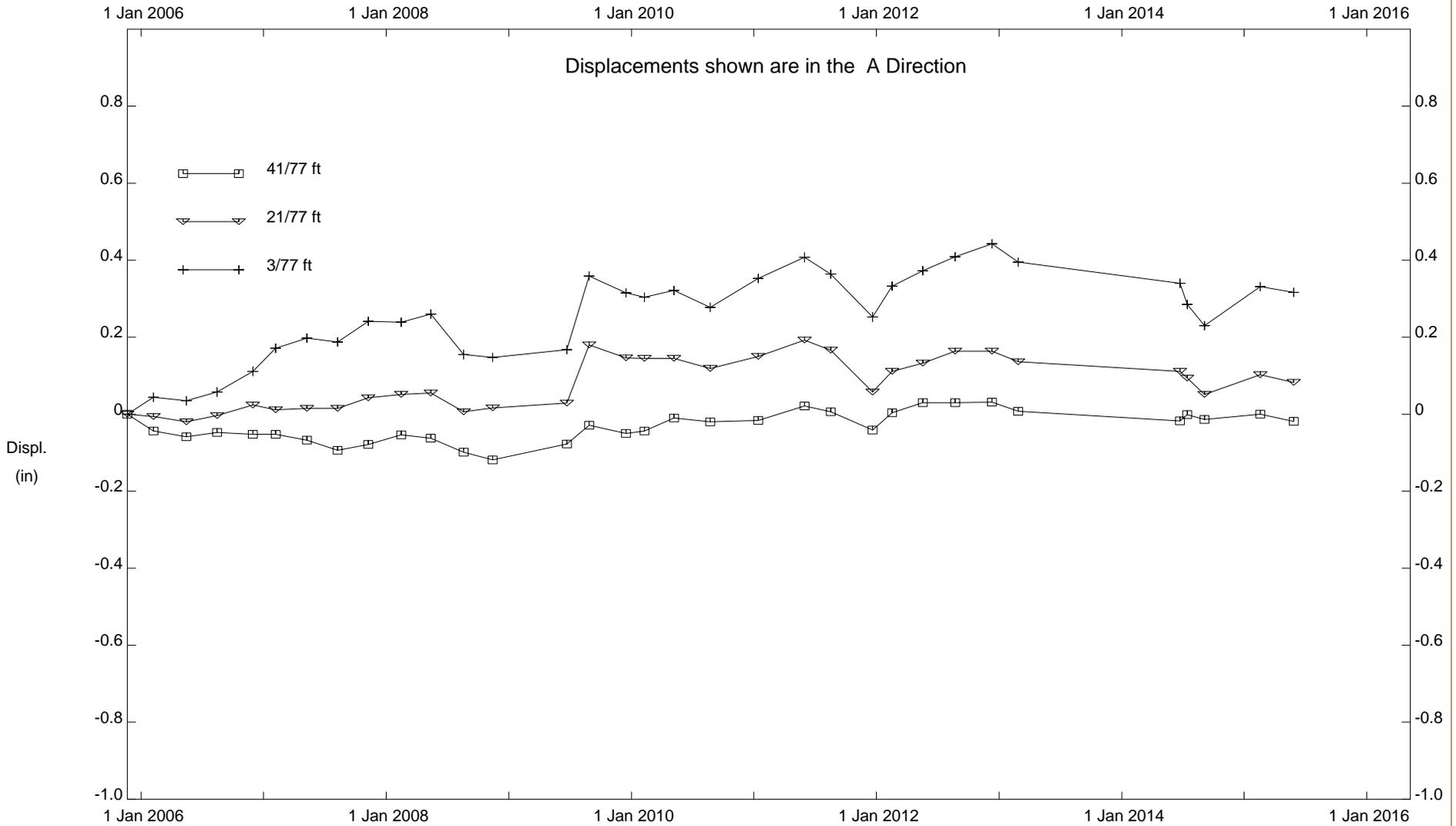


Calle del Barco, Inclinometer SI-9
 City of Malibu

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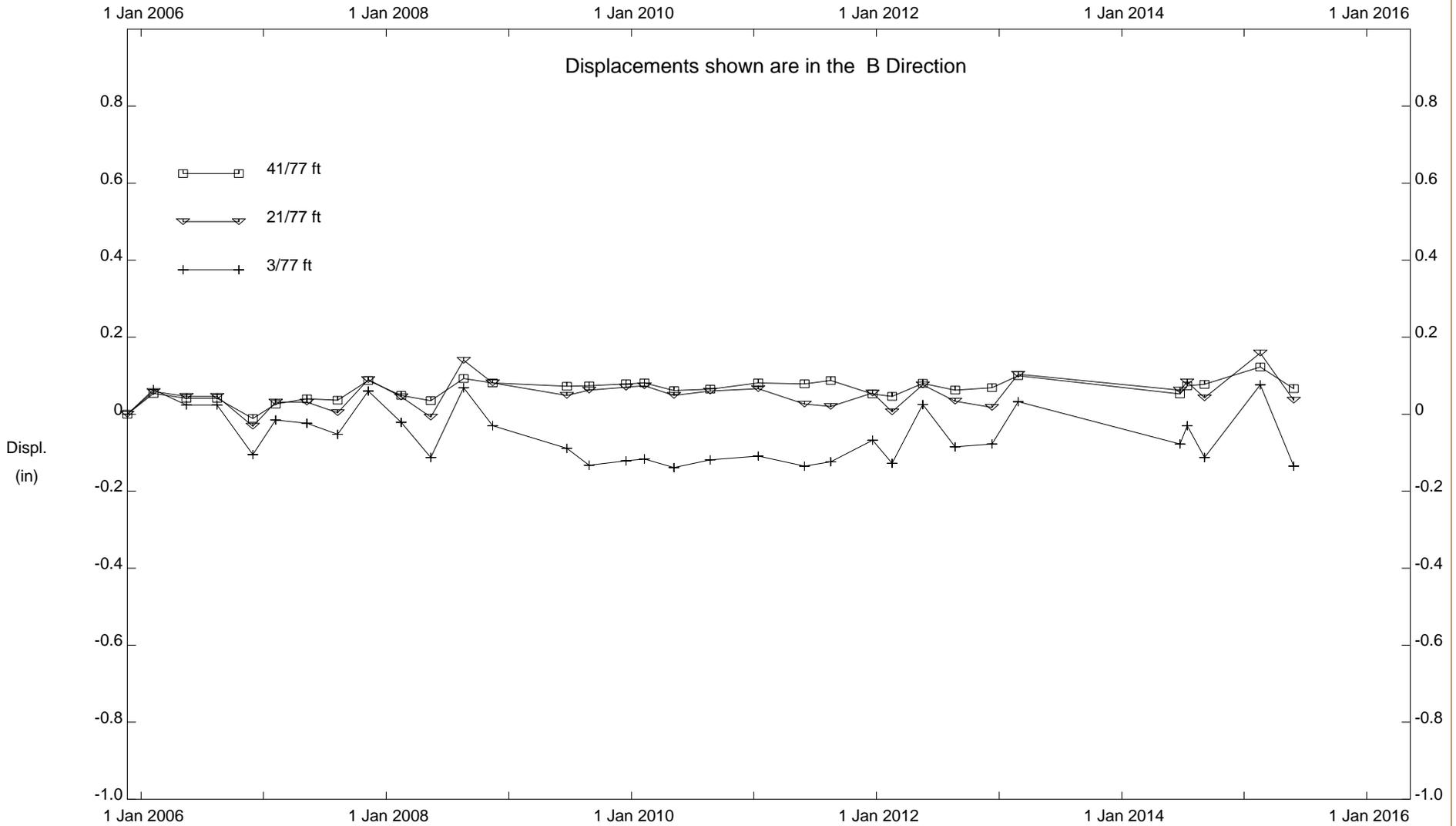
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Calle del Barco, Inclinator SI-9

City of Malibu

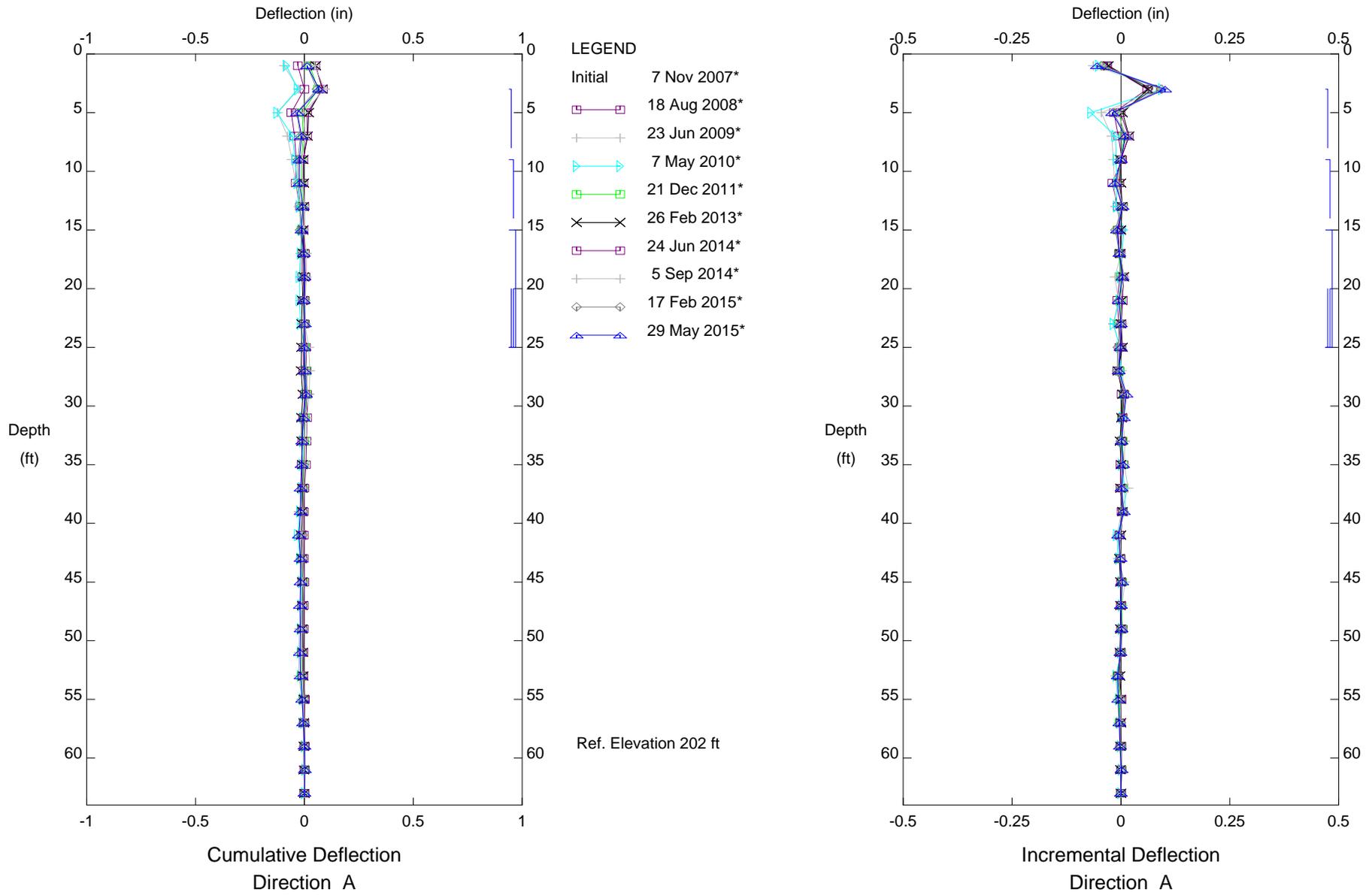


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Calle del Barco, Inclinator SI-9

City of Malibu

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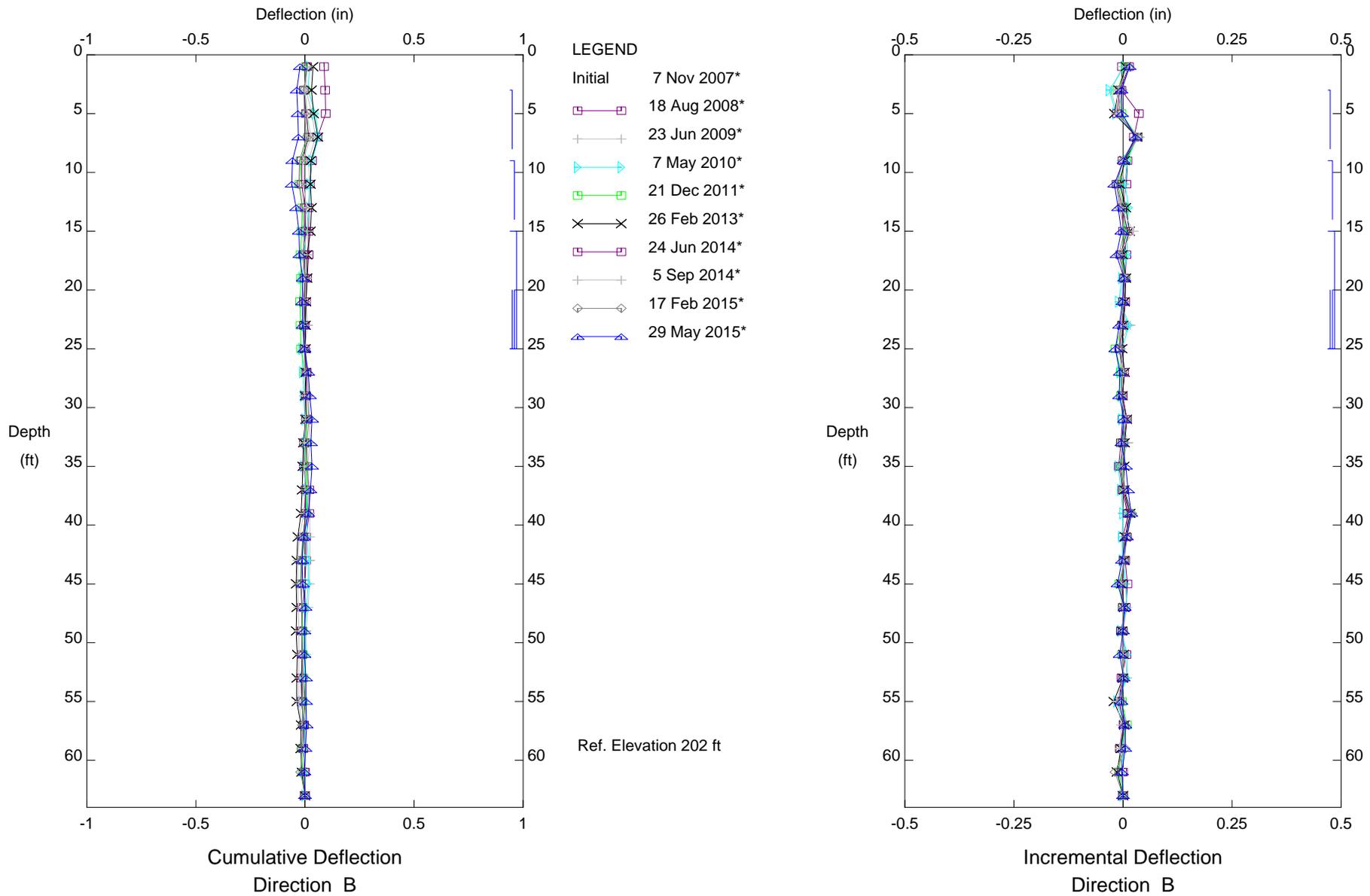


Calle del Barco, Inclinometer SI-10
 City of Malibu

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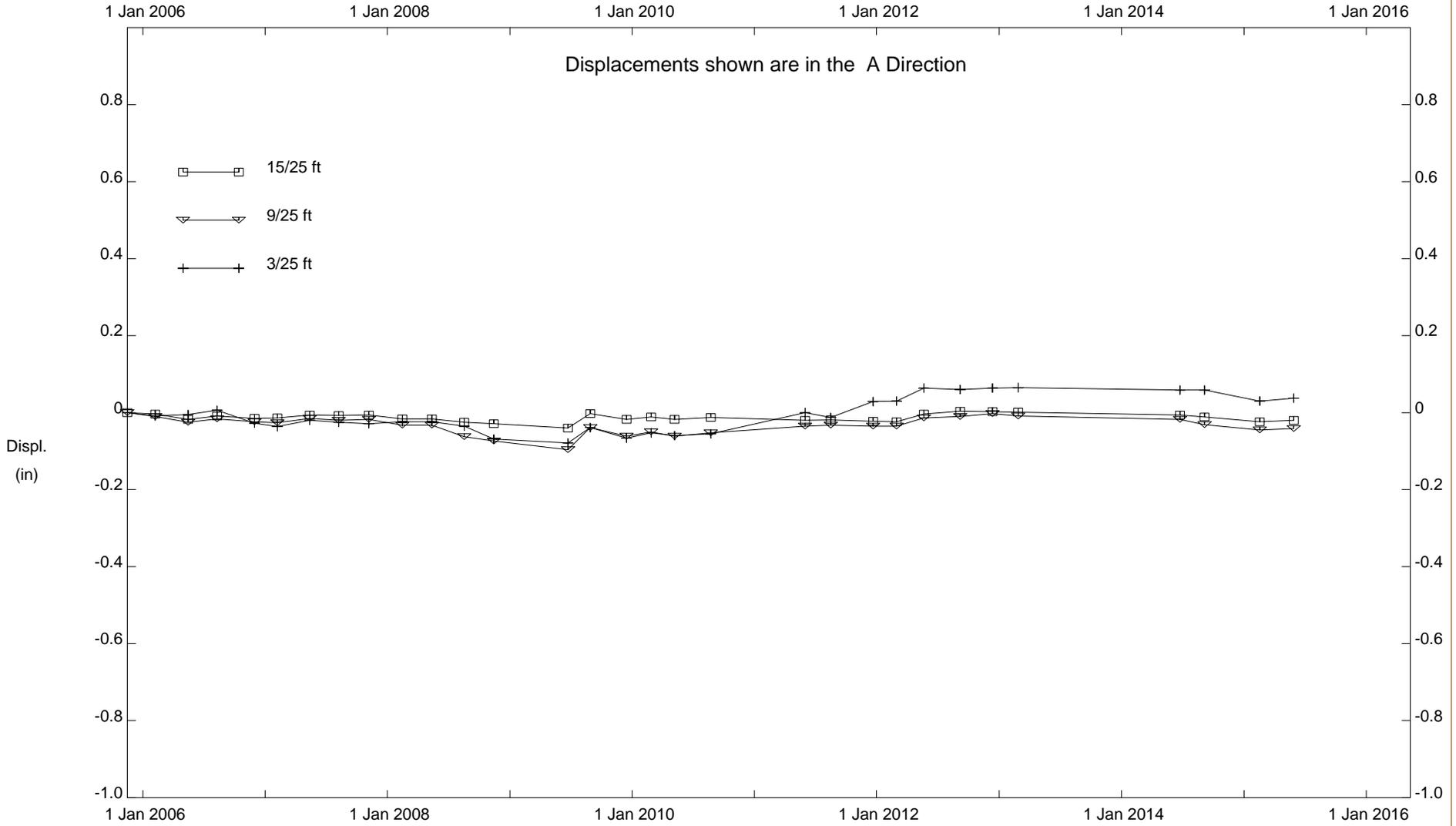


Calle del Barco, Inclinometer SI-10
 City of Malibu

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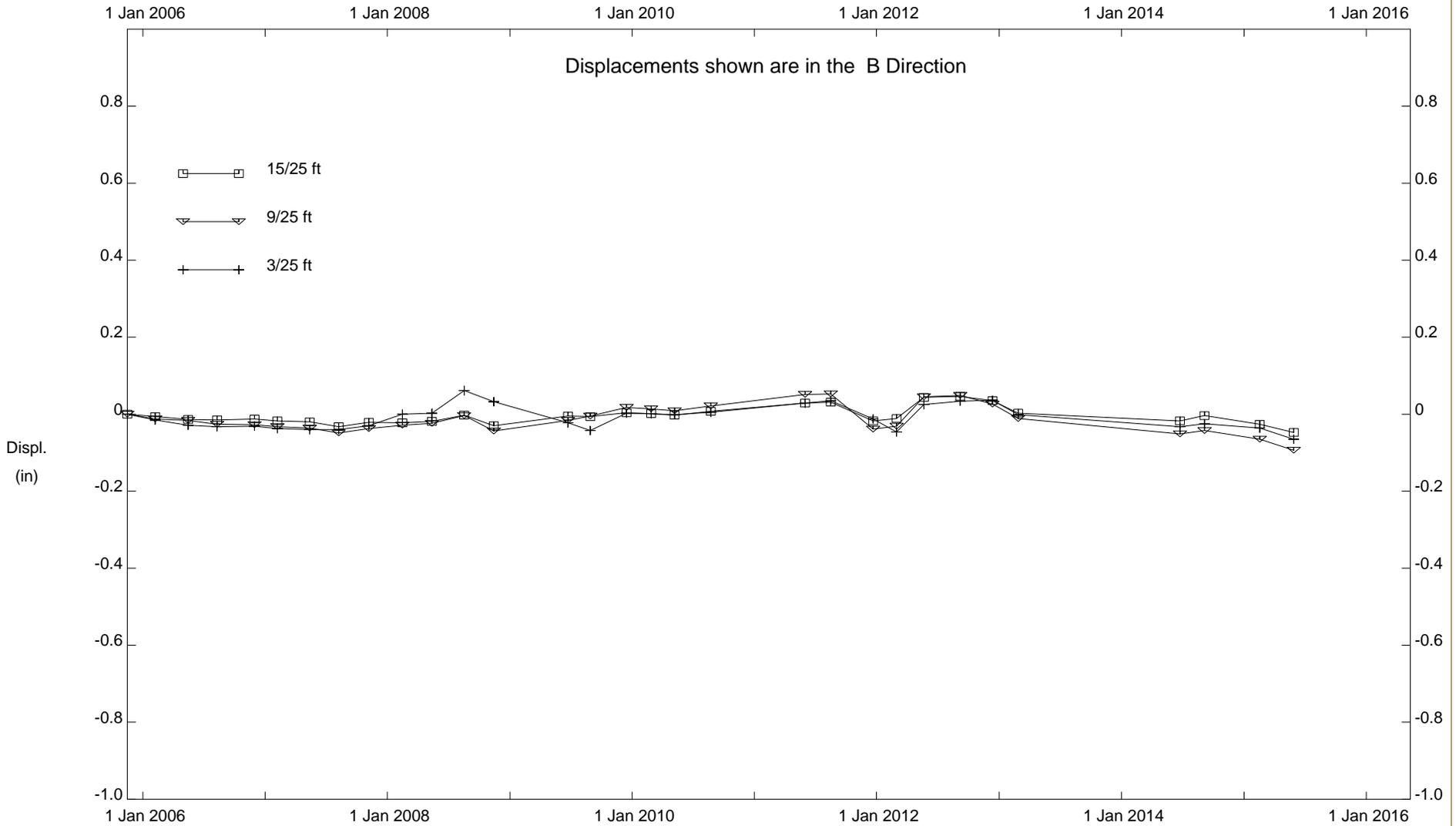
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Calle del Barco, Inclinator SI-10

City of Malibu



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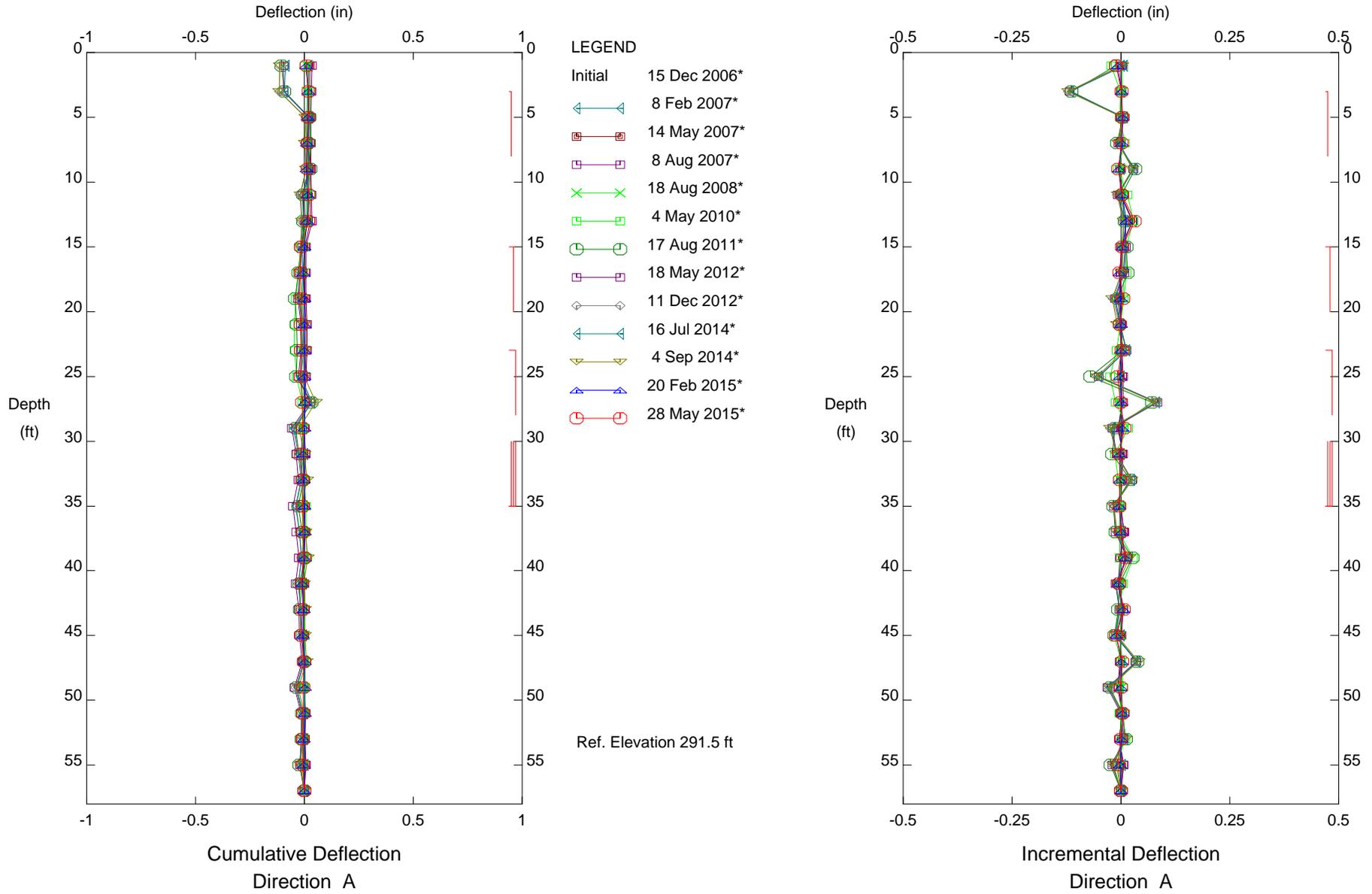
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Calle del Barco, Inclinator SI-10

City of Malibu



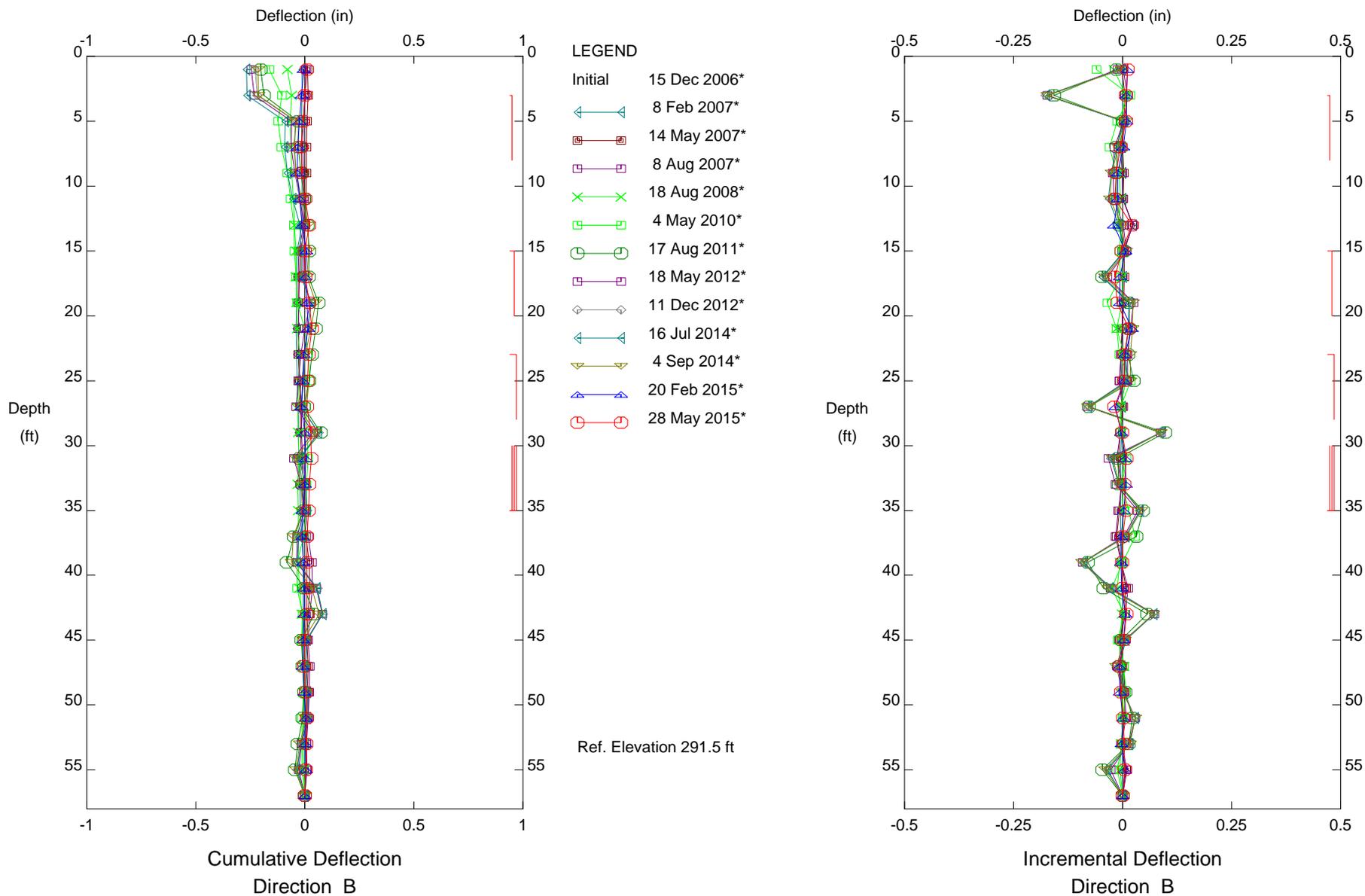
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Assessment District 98-2, Inclinometer SI-11
 City of Malibu

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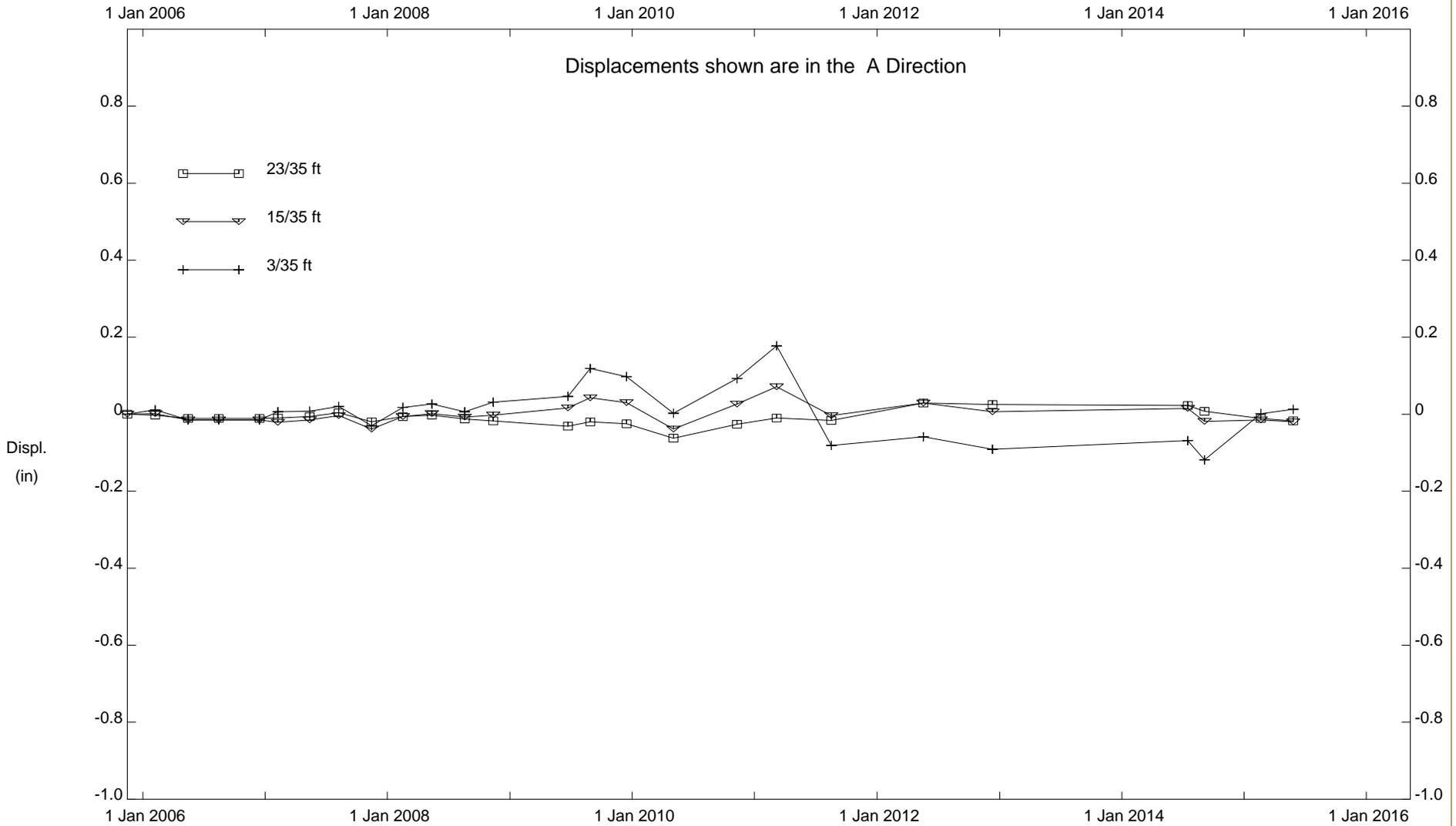


Assessment District 98-2, Inclinometer SI-11
 City of Malibu

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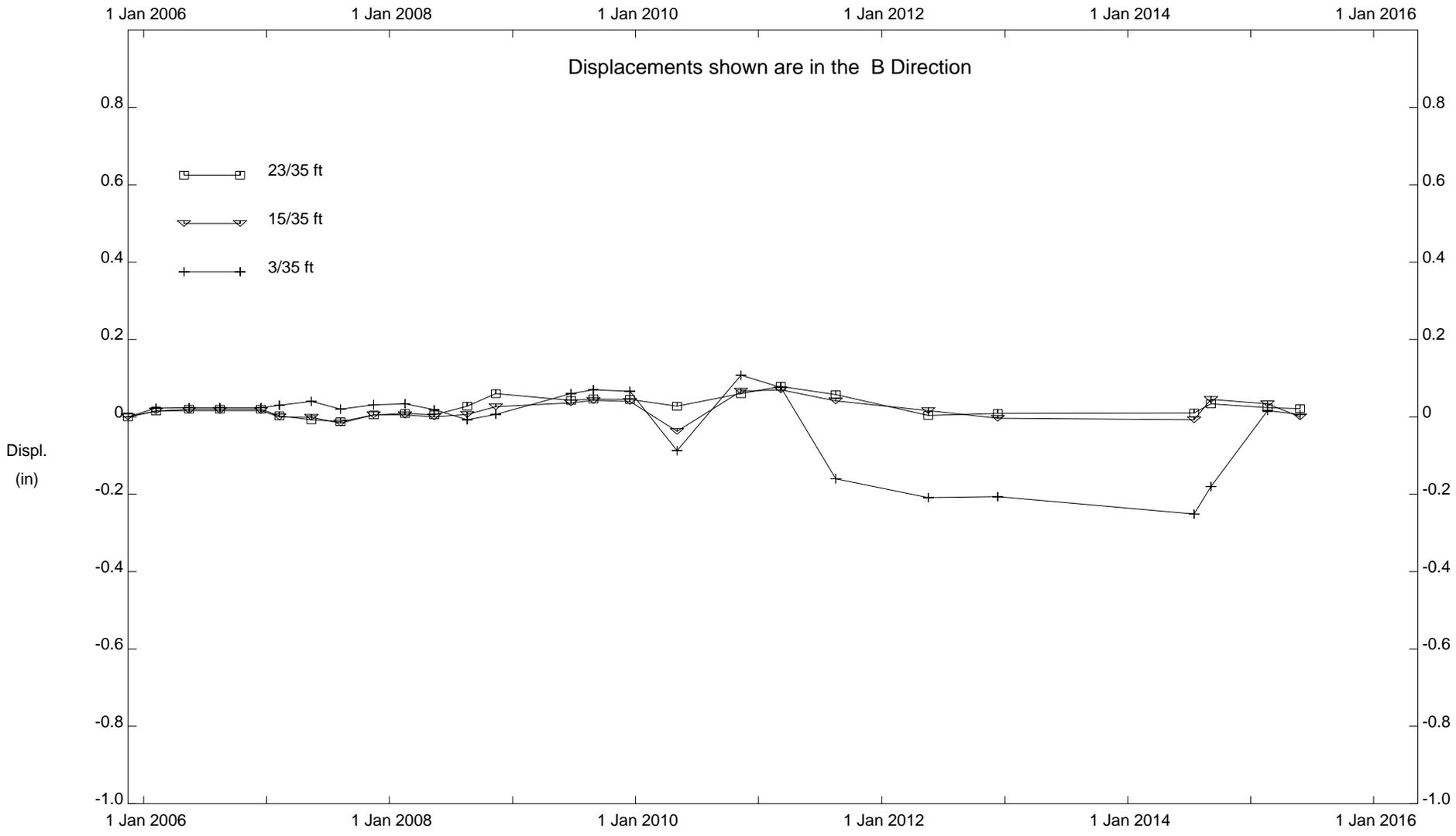


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Assessment District 98-2, Inclinometer SI-11

City of Malibu

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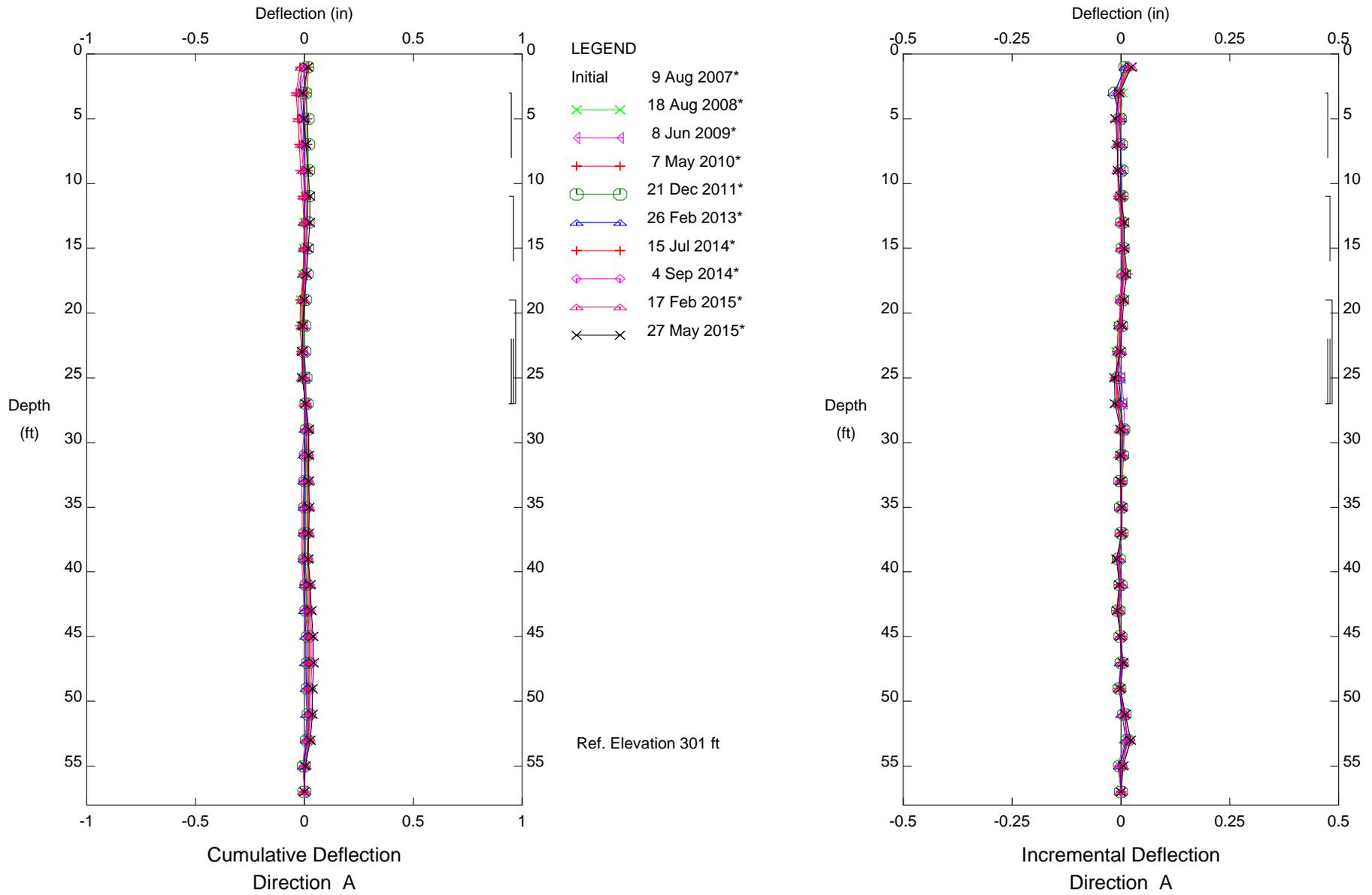


Assessment District 98-2, Inclinometer SI-11

City of Malibu



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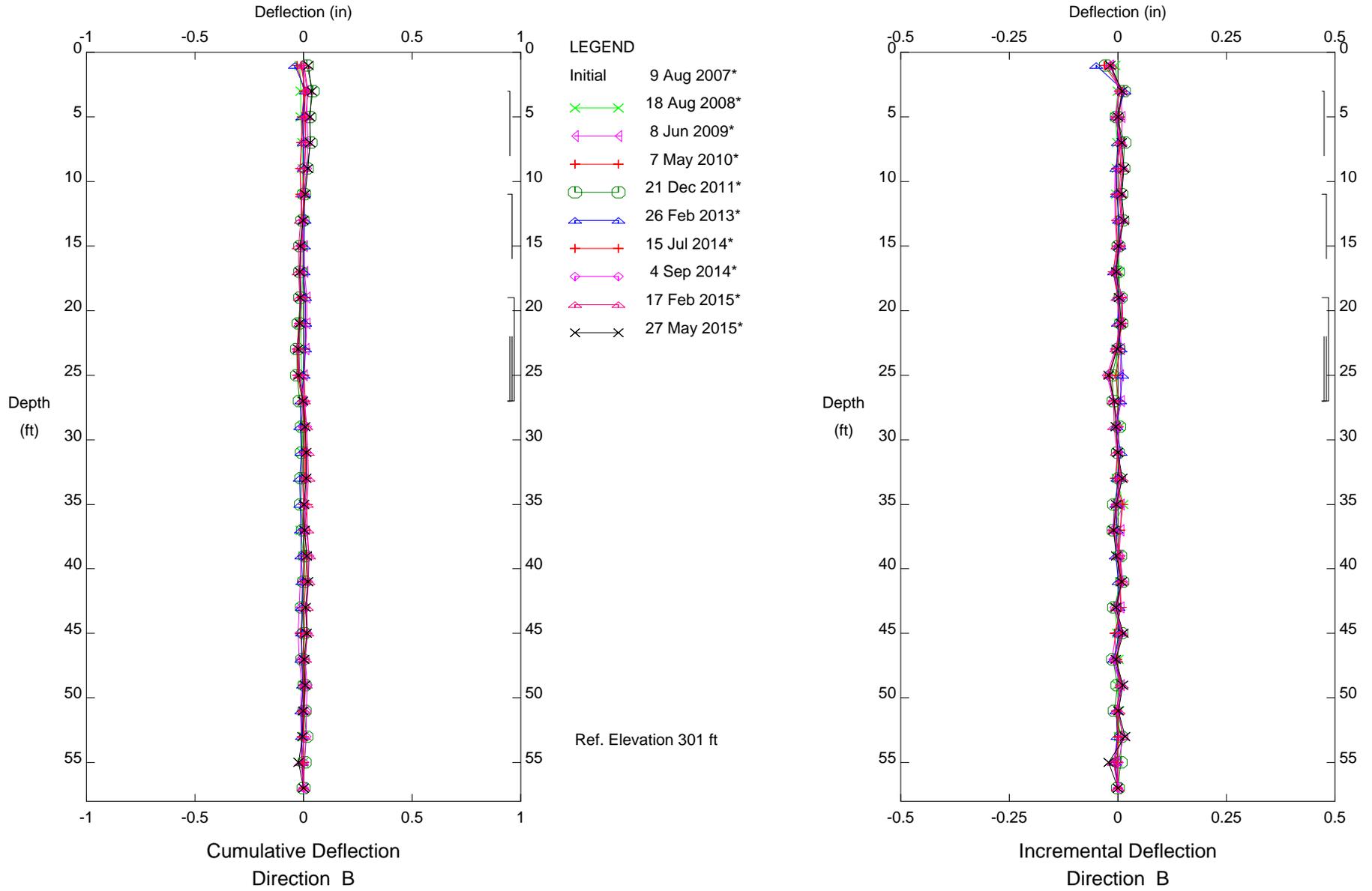


Assessment District 98-2, Inclinometer SI-12
 City of Malibu

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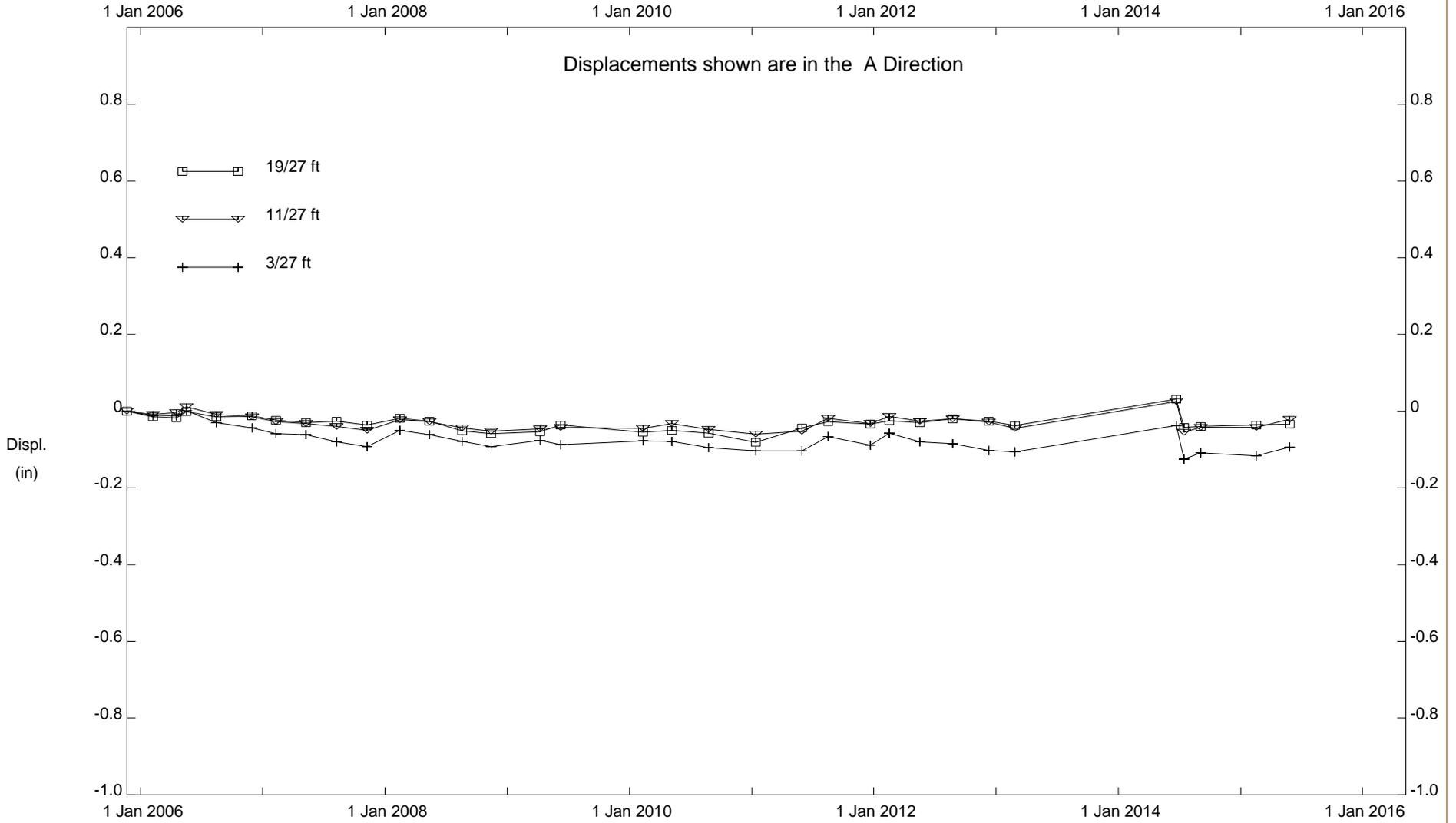


Assessment District 98-2, Inclinometer SI-12
 City of Malibu

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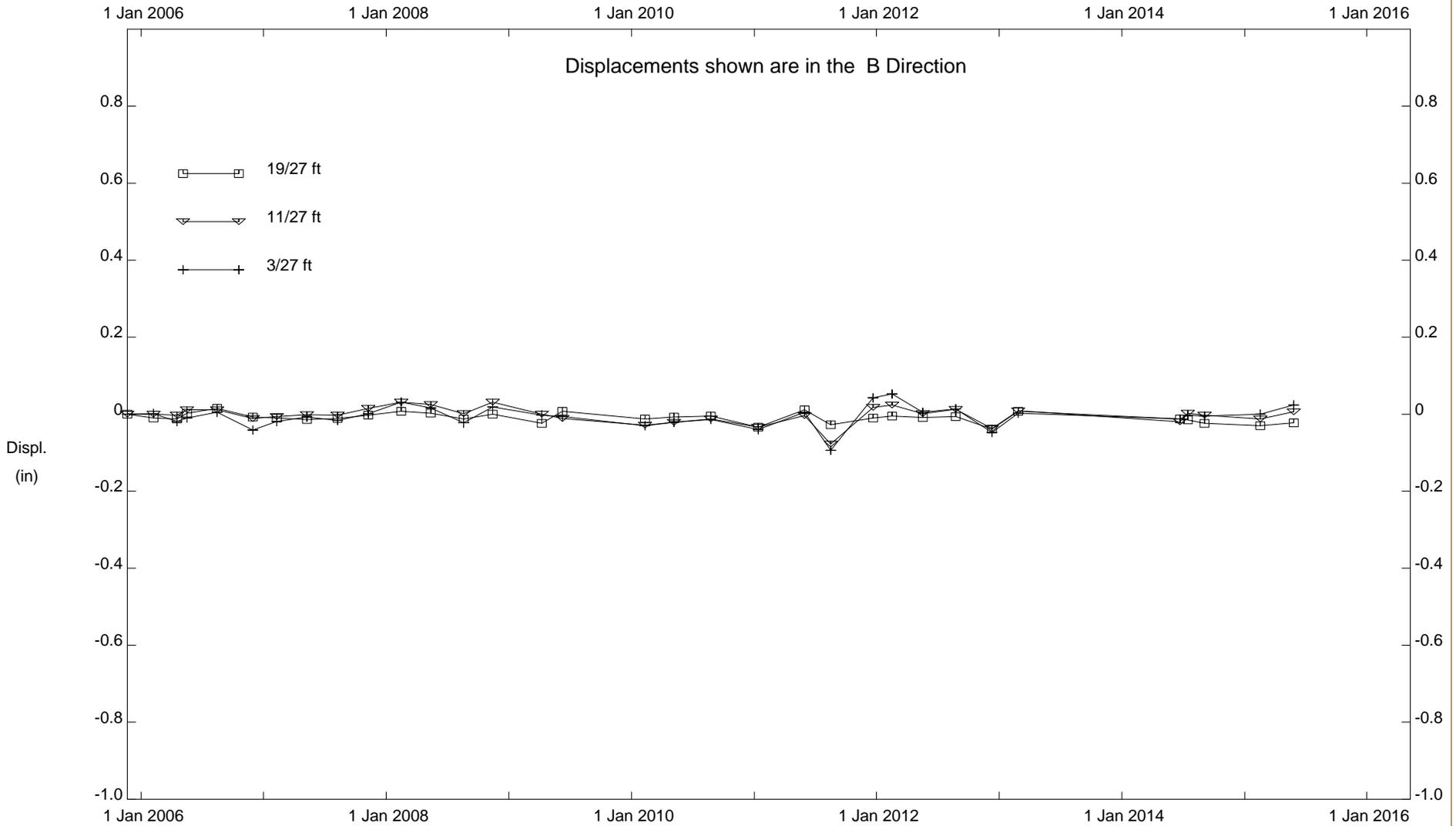


Assessment District 98-2, Inclinator SI-12

City of Malibu



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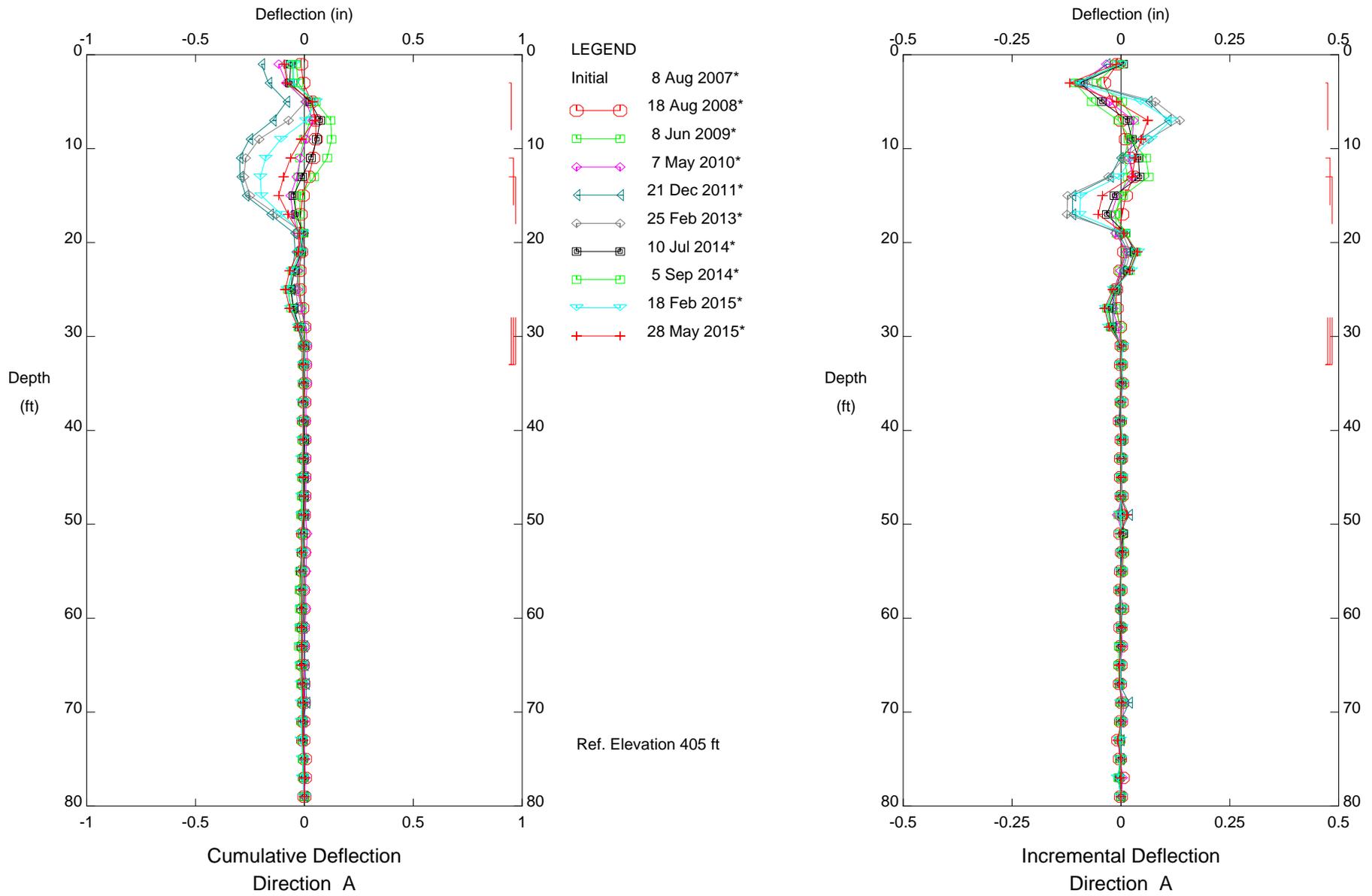


Assessment District 98-2, Inclinometer SI-12

City of Malibu



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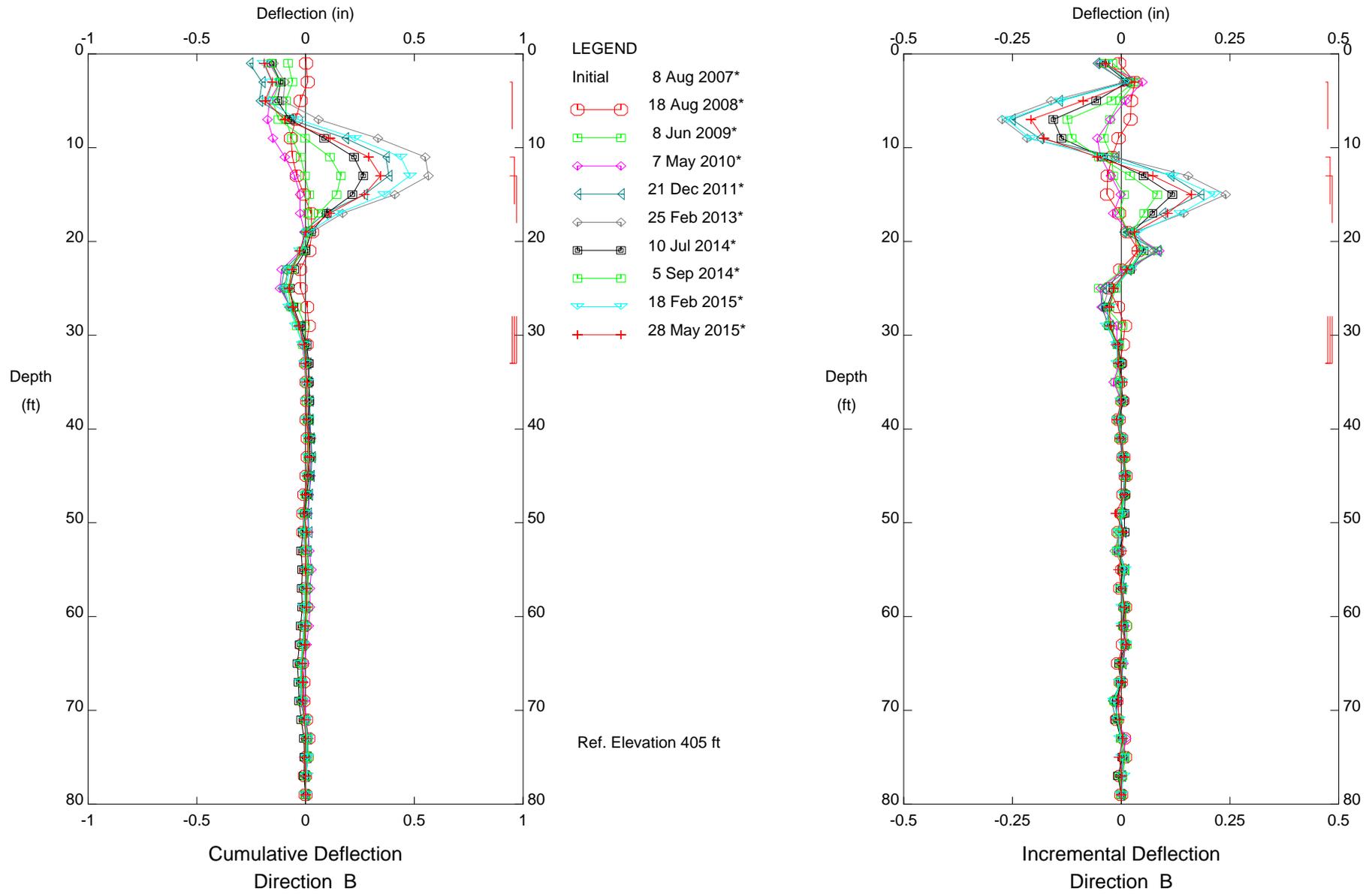


Assessment District 98-2, Inclinometer SI-13
 City of Malibu

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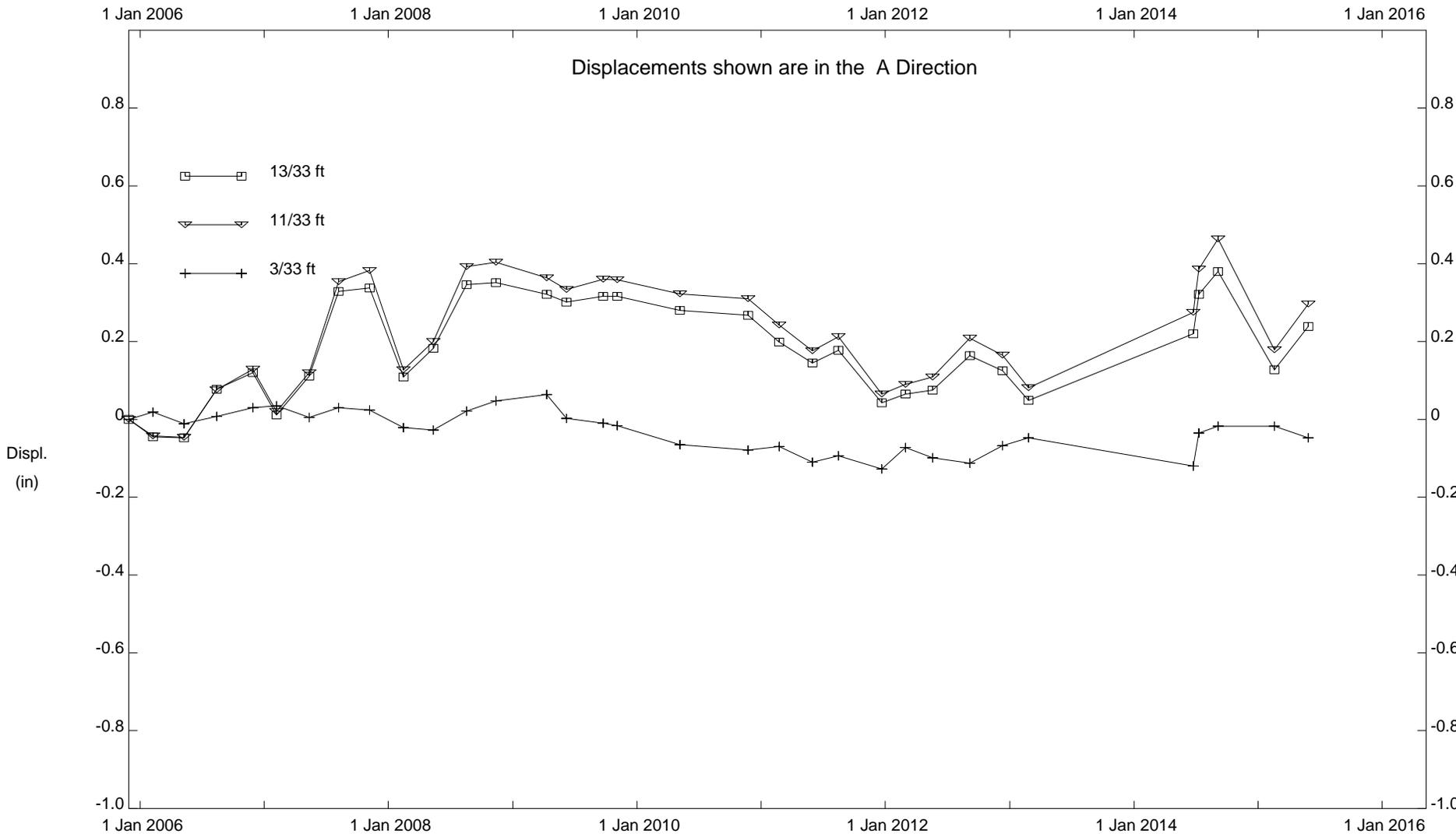


Assessment District 98-2, Inclinometer SI-13
 City of Malibu

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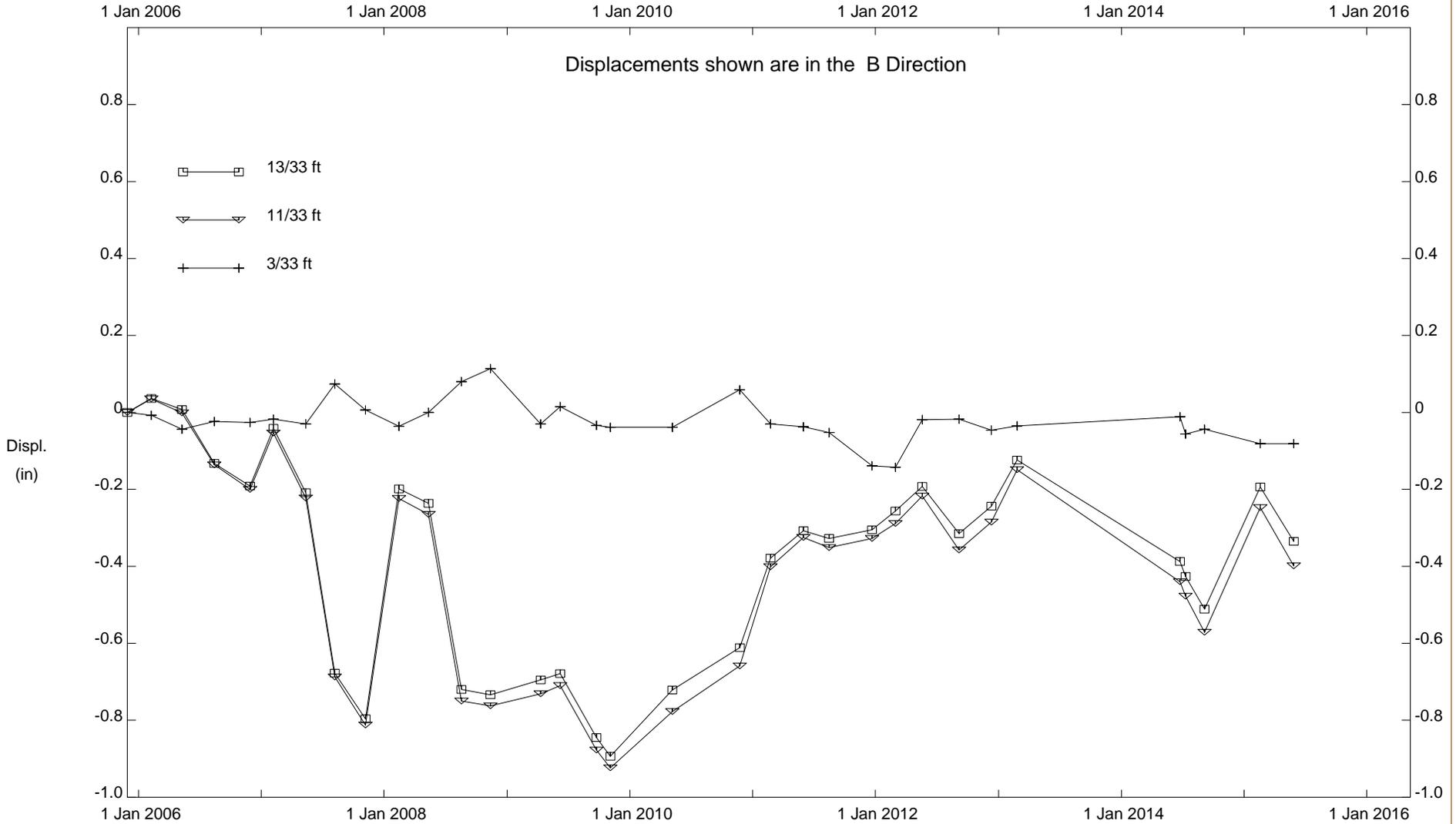


Assessment District 98-2, Inclinometer SI-13

City of Malibu



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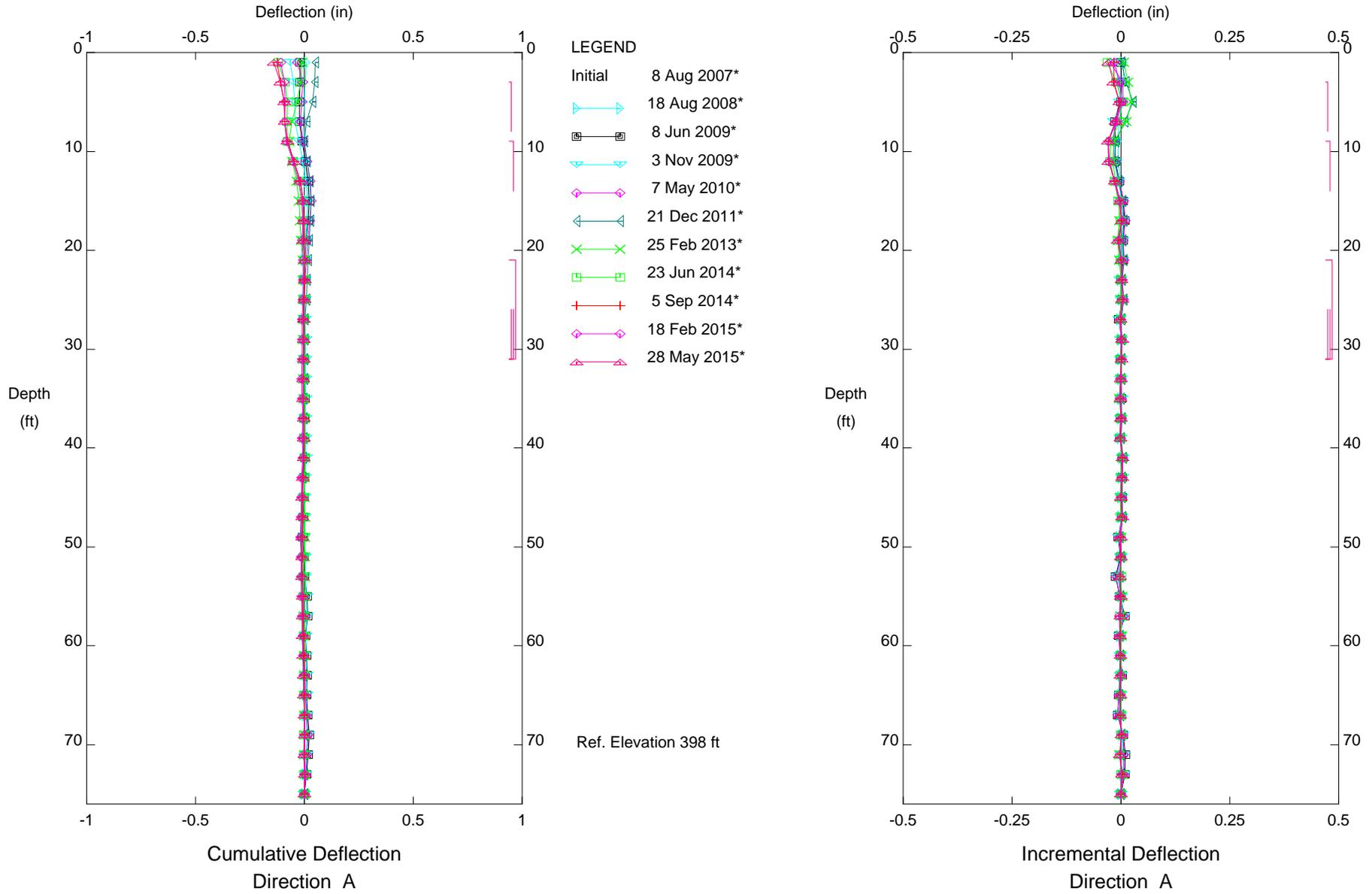


Assessment District 98-2, Inclinometer SI-13

City of Malibu



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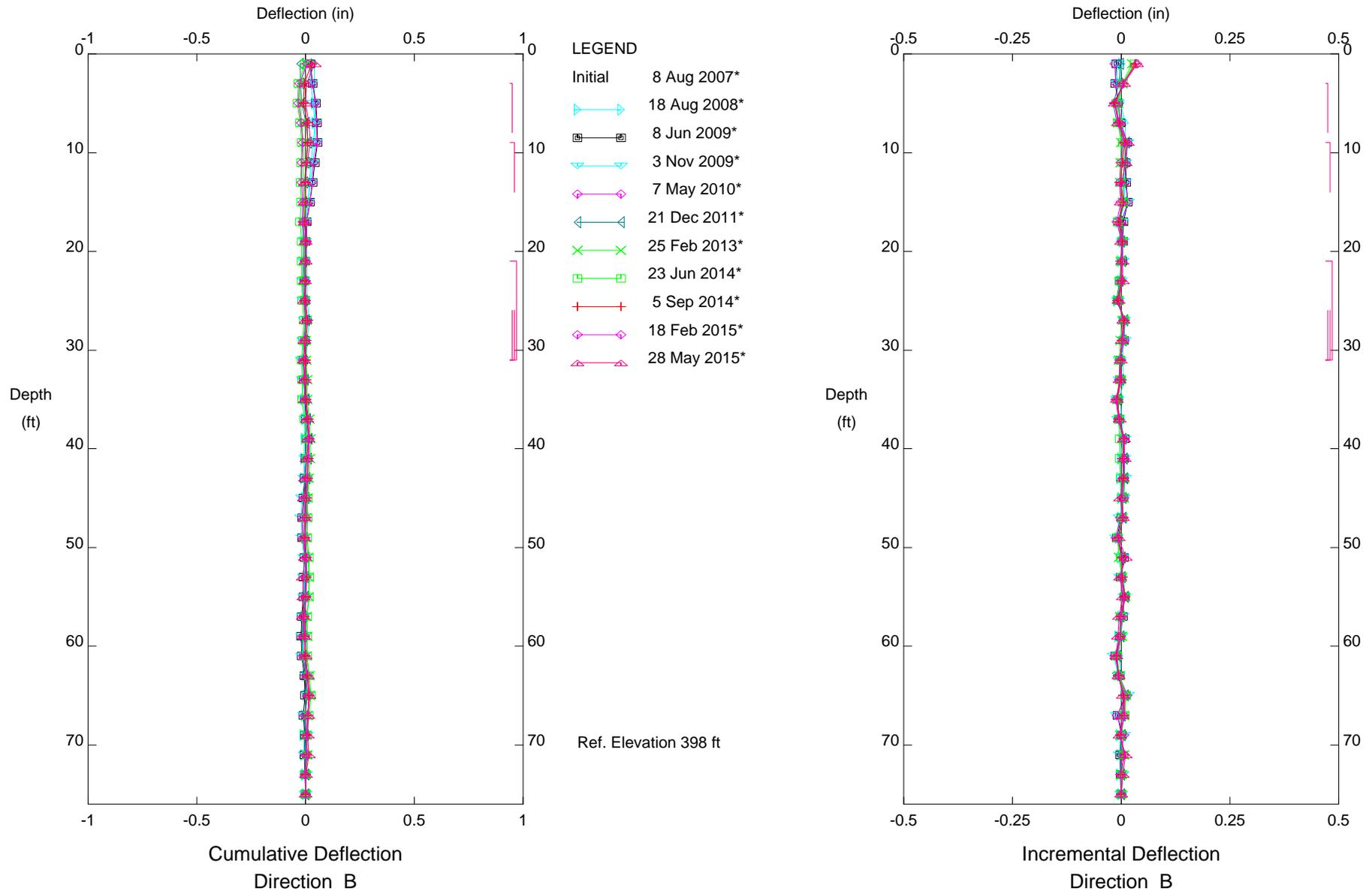


Assessment District 98-2, Inclinometer SI-14
 City of Malibu

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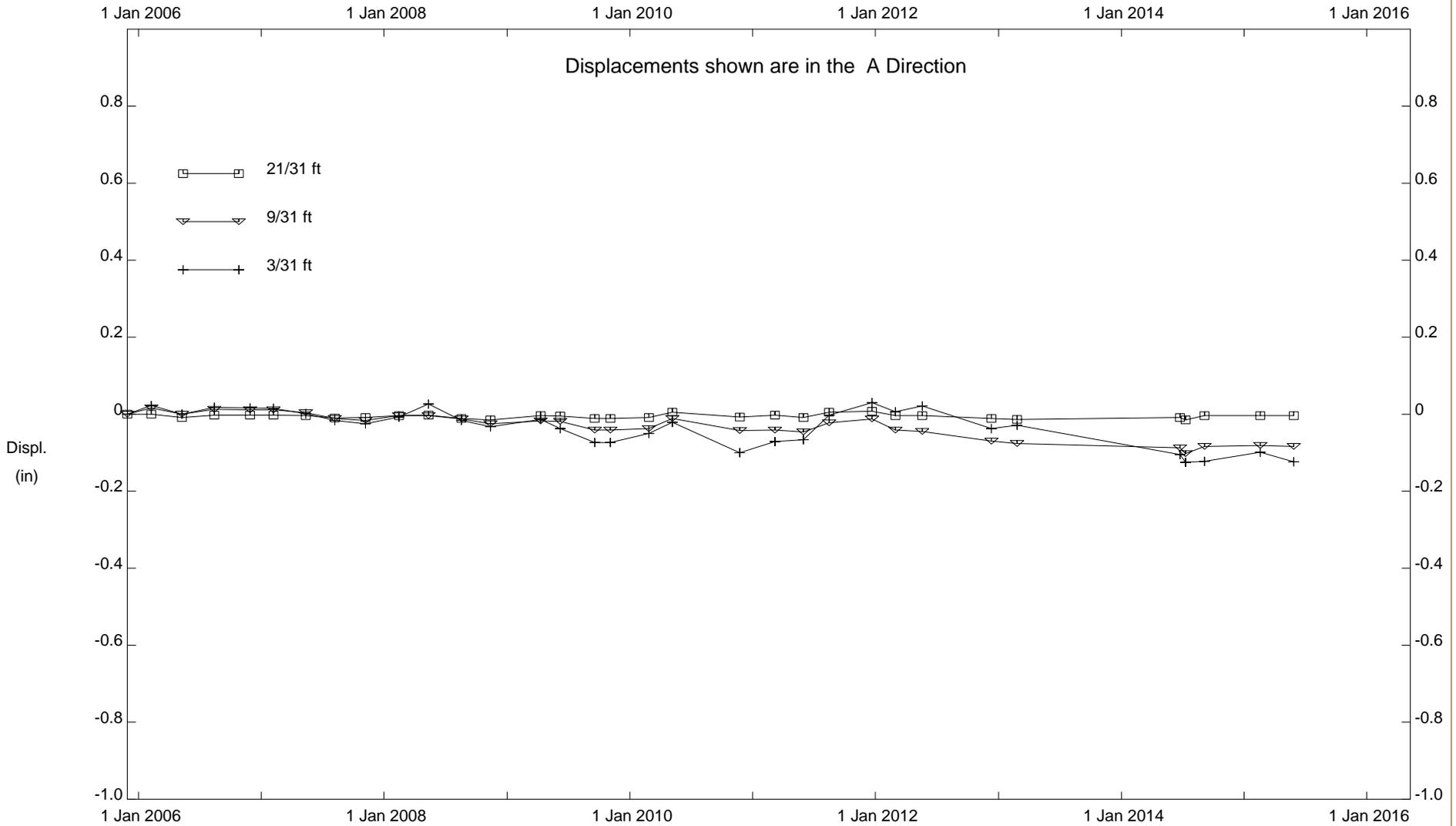


Assessment District 98-2, Inclinometer SI-14
 City of Malibu

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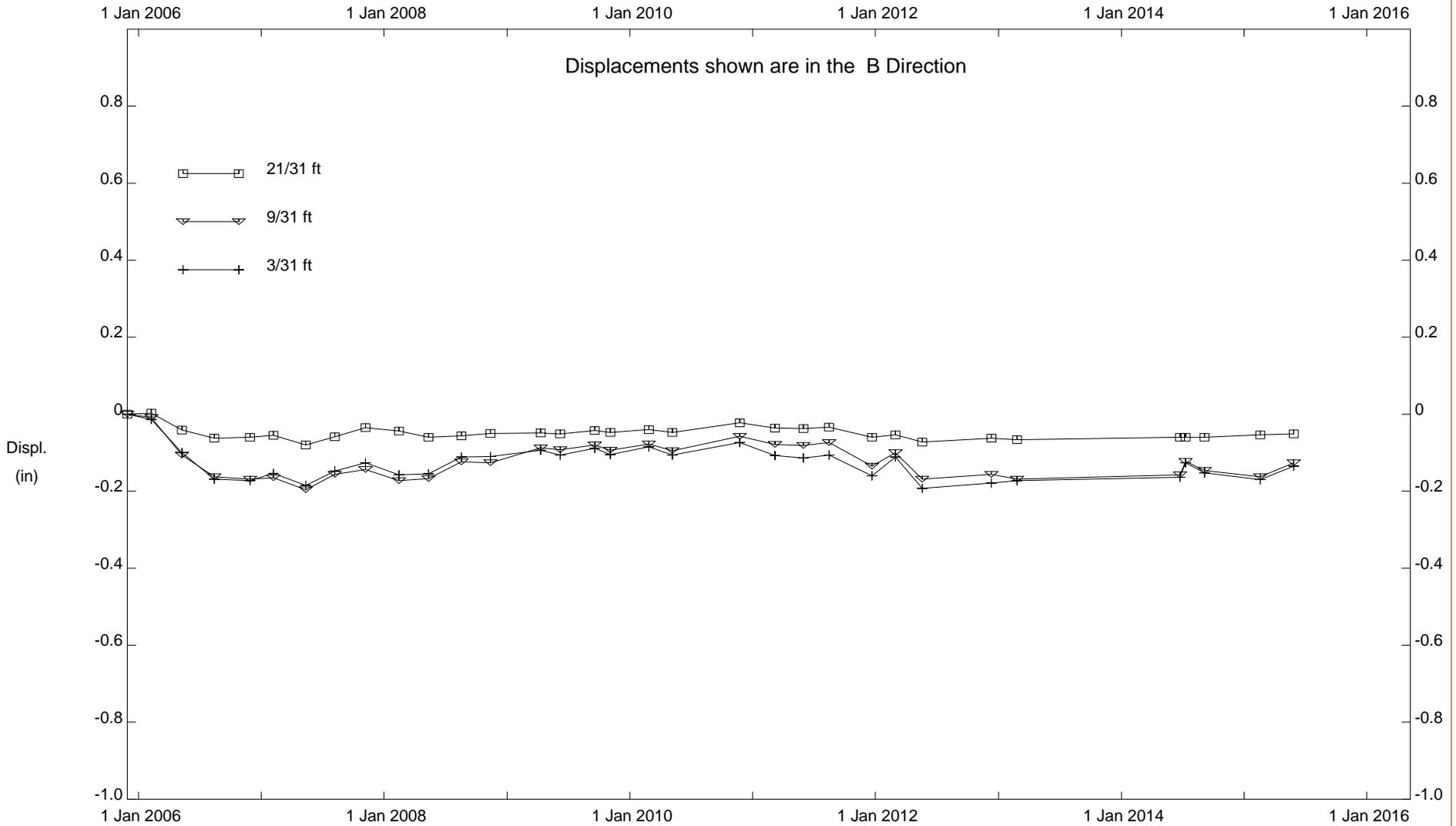


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Assessment District 98-2, Inclinometer SI-14

City of Malibu

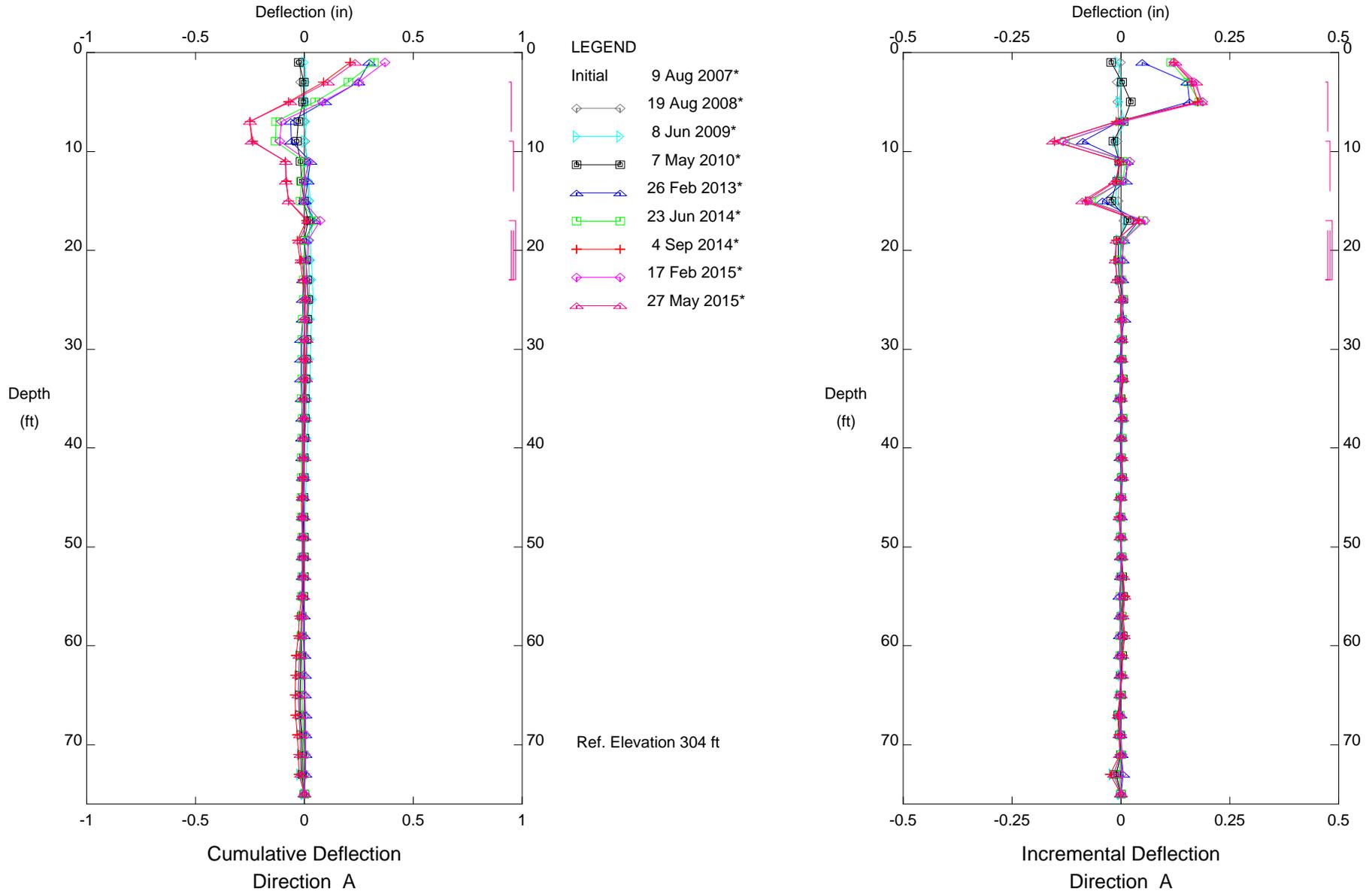
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Assessment District 98-2, Inclinometer SI-14

City of Malibu

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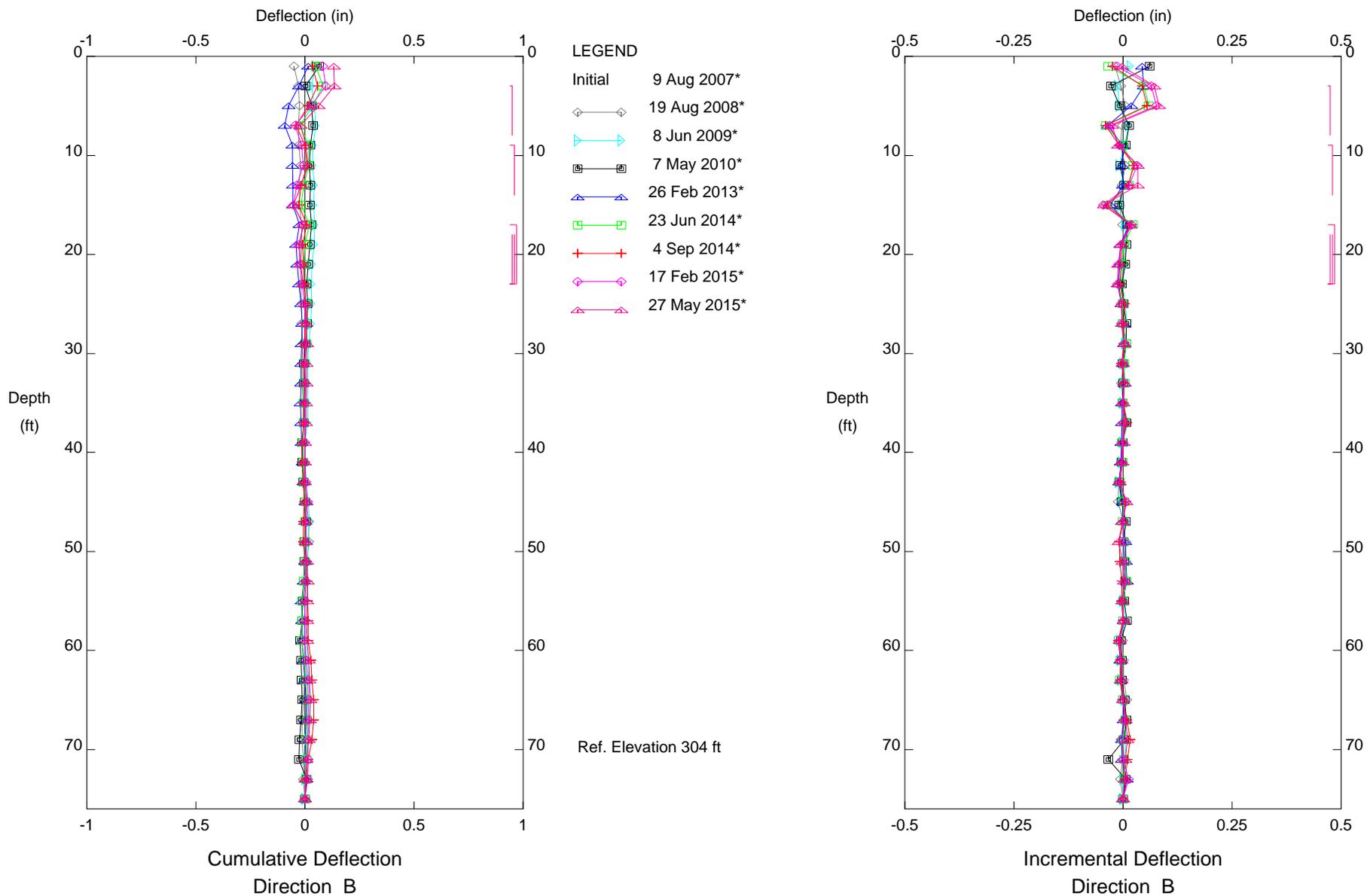


CALLE DEL BARCO, Inclinometer SI-15
 Depth of readings = 72 ft

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



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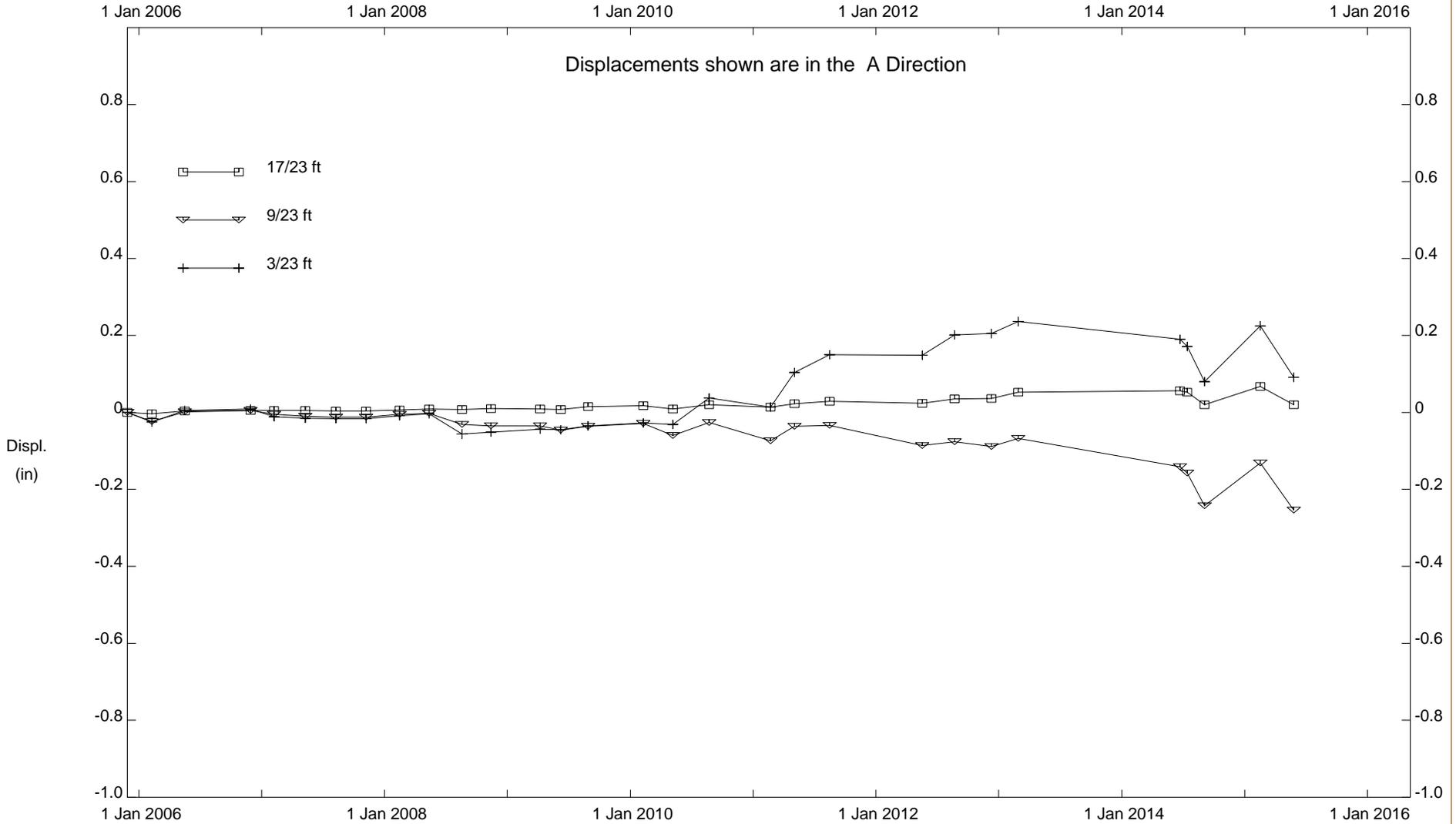
CALLE DEL BARCO, Inclinometer SI-15

Depth of readings = 72 ft

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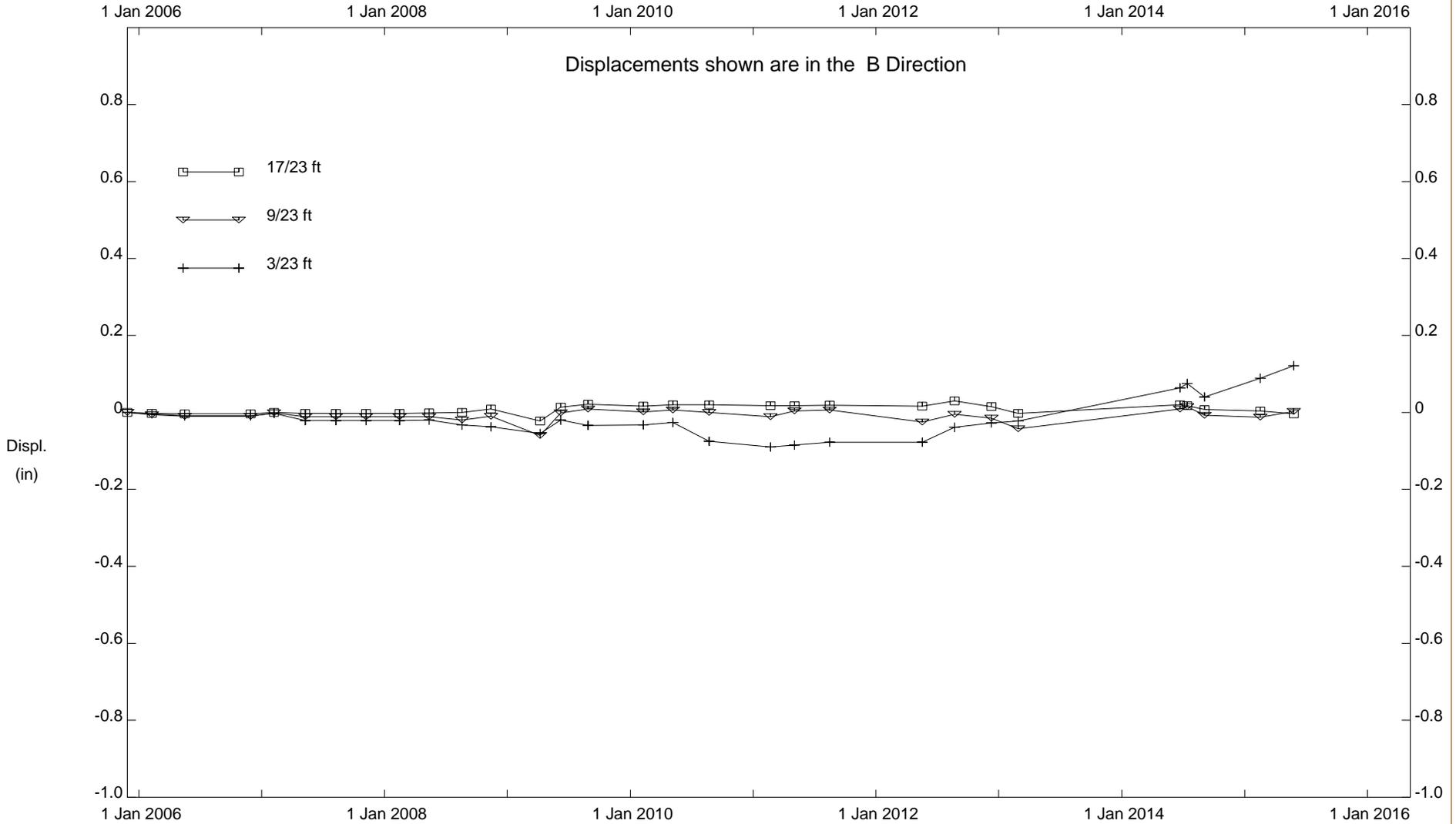


Displ.
(in)

CALLE DEL BARCO, Inclinator SI-15

Depth of readings = 72 ft

Fugro Consultants, Inc. - Ventura, CA



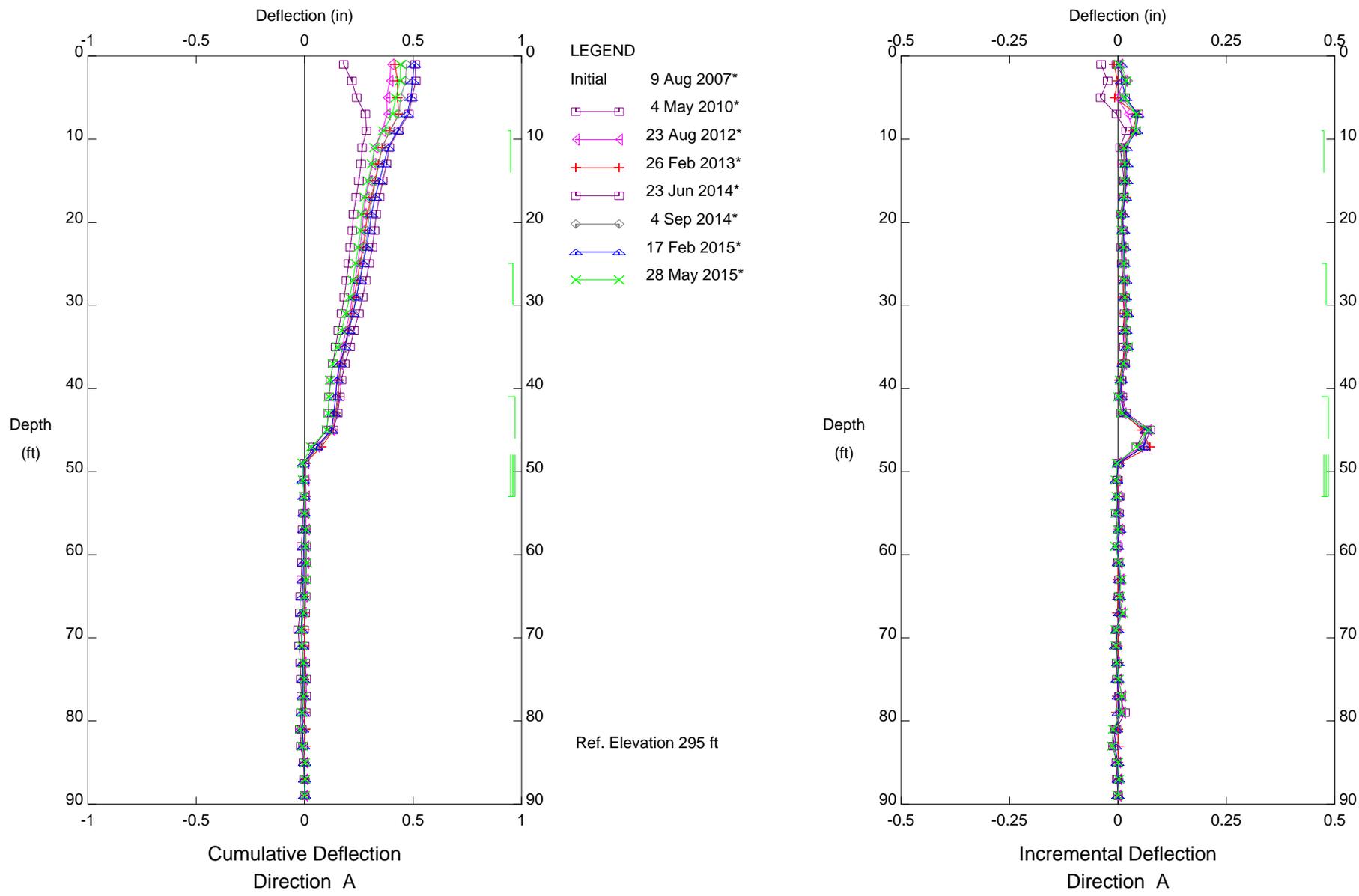
Displ.
(in)

CALLE DEL BARCO, Inclinator SI-15

Depth of readings = 72 ft



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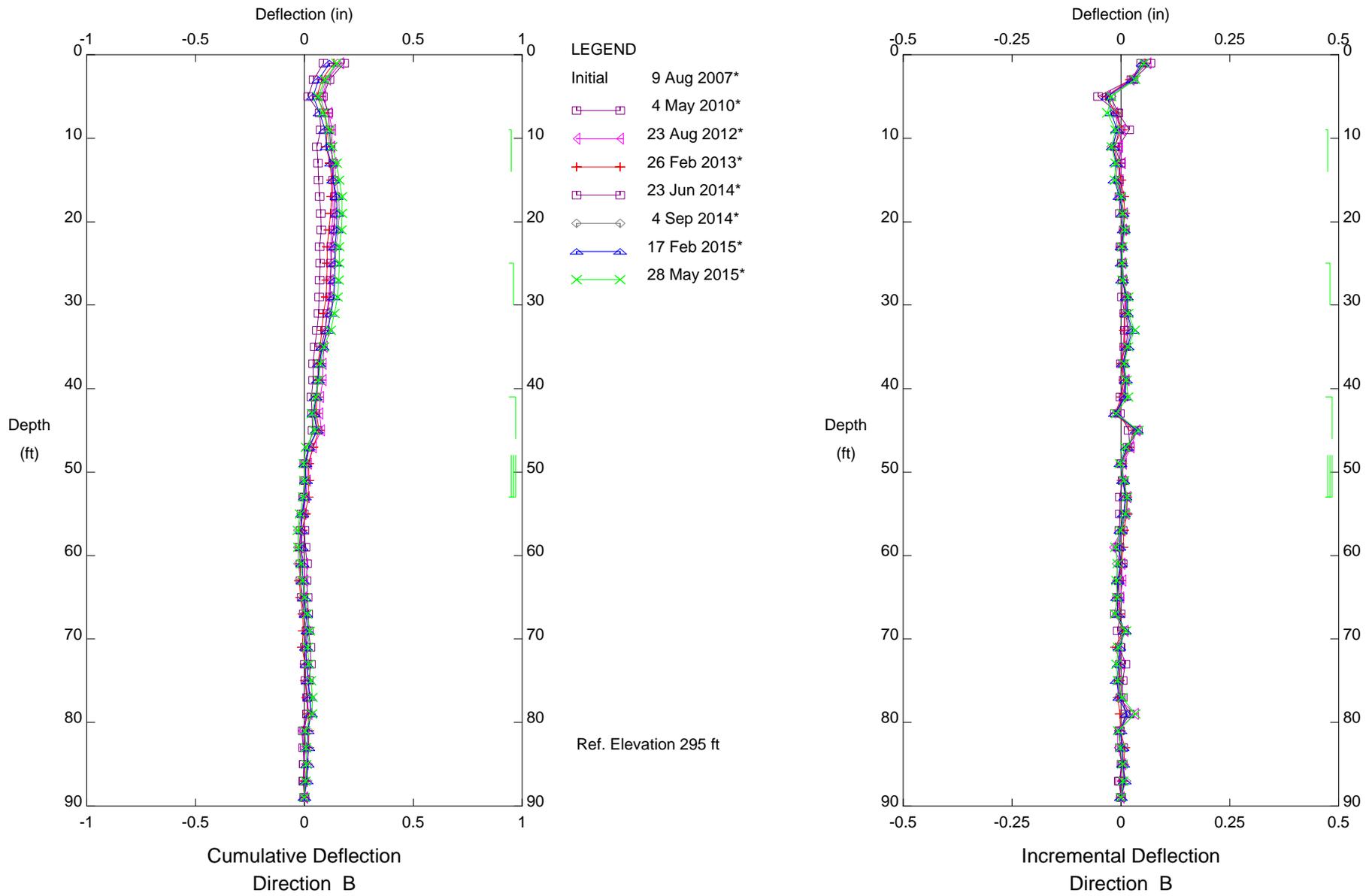
Assessment District 98-2, Inclinometer SI-16
 City of Malibu

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



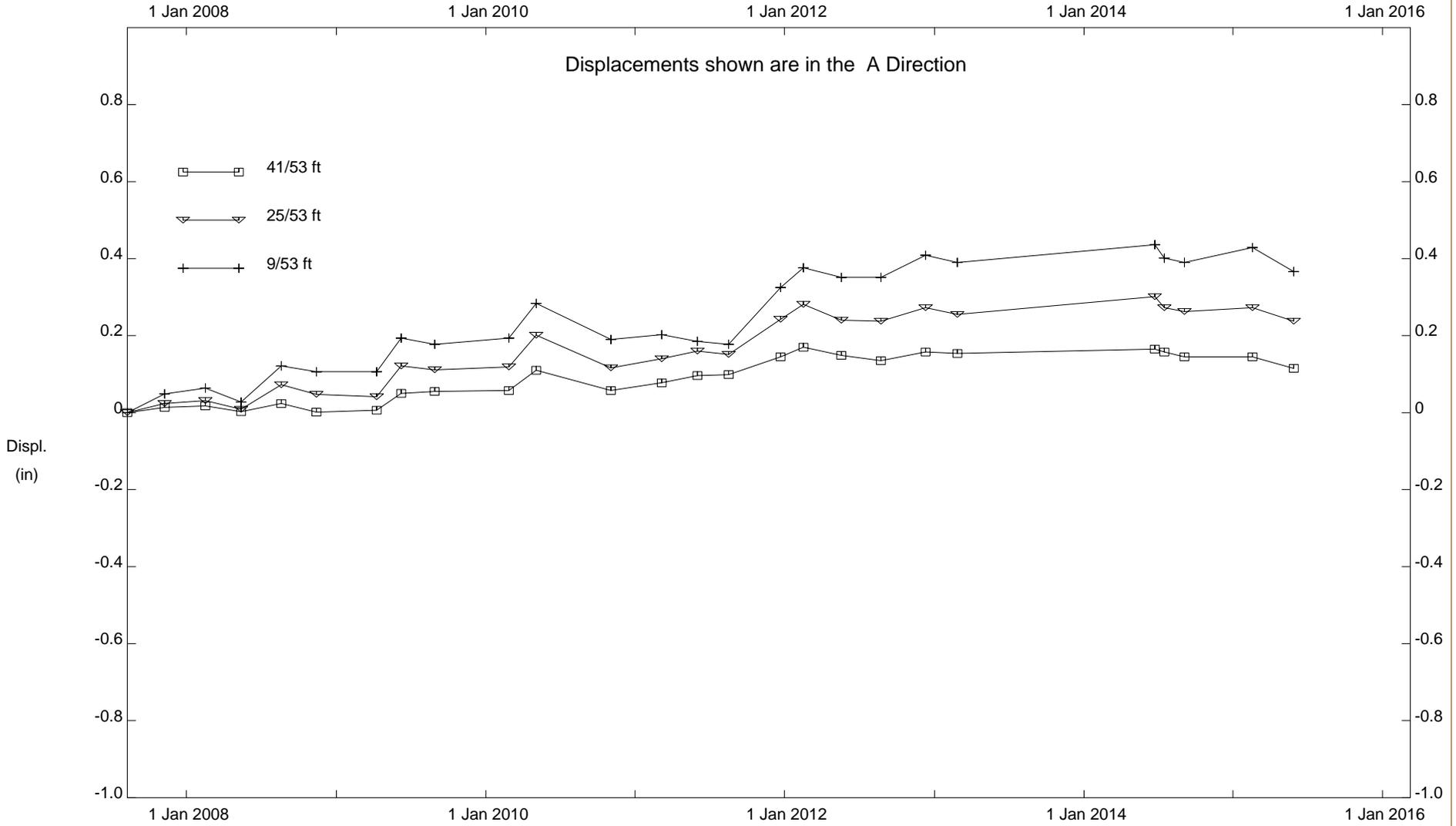


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Assessment District 98-2, Inclinometer SI-16
 City of Malibu

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

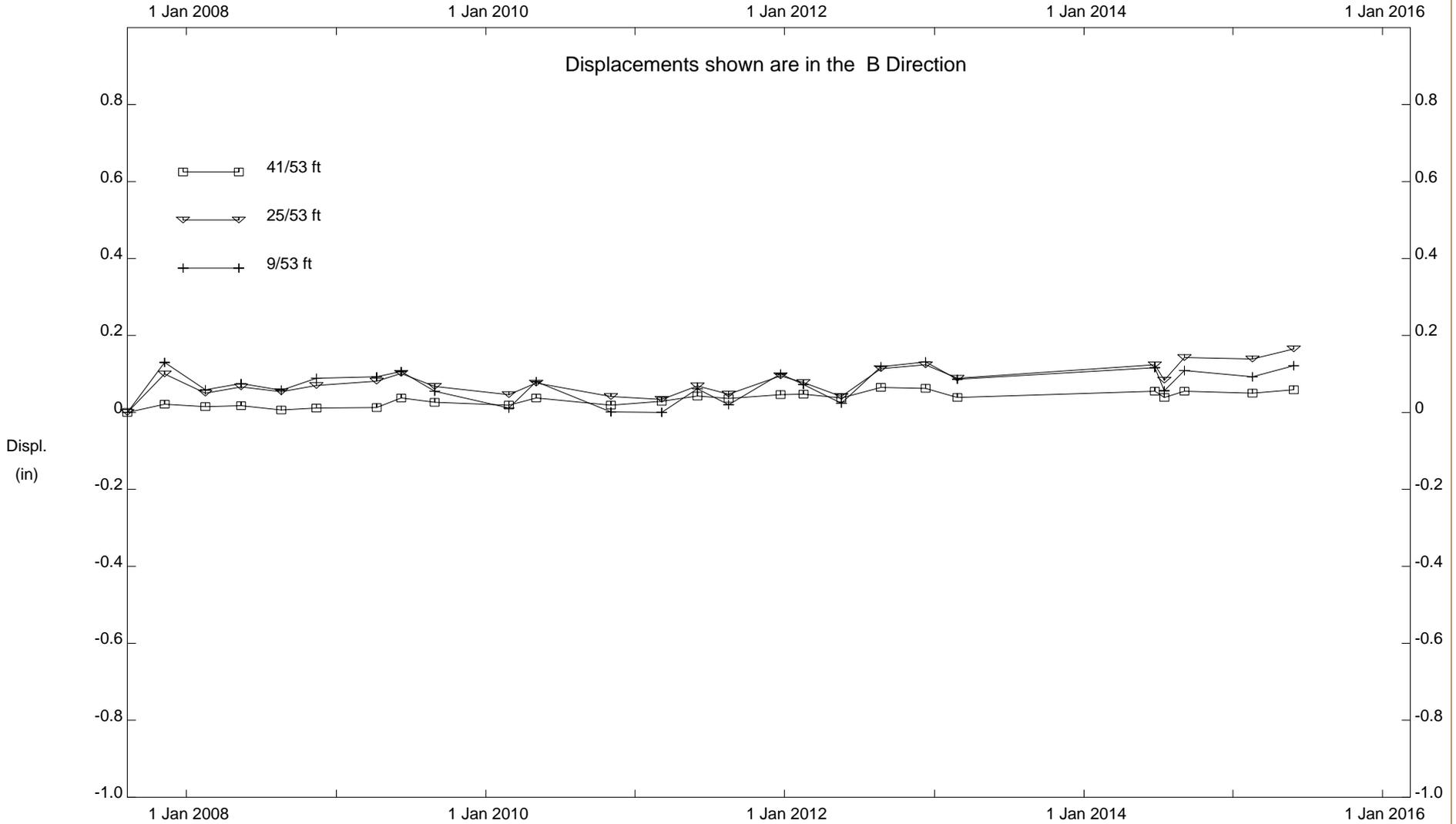


Displ.
(in)

Assessment District 98-2, Inclinometer SI-16

City of Malibu

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Displ.
(in)

Assessment District 98-2, Inclinometer SI-16

City of Malibu

