

## **FY22/23 Maintenance and Monitoring**

**AD98-1, Big Rock Mesa**

**City of Malibu, California**

Yeh Project No.: 220-276

December 5, 2023



Prepared for:

City of Malibu  
23825 Stuart Ranch Rd.  
Malibu, California 90265  
Attn: Mr. Arthur Aladjajian

Prepared by:

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December 5, 2023

Project No. 220-276

City of Malibu  
23825 Stuart Ranch Rd.  
Malibu, California 90265

Attn: Mr. Arthur Aladjajian, Public Works Superintendent

**Subject: Annual Monitoring and Maintenance Report FY22/23, City of Malibu Assessment District 98-1, Big Rock Mesa, Malibu, CA**

Dear Mr. Aladjajian:

Yeh and Associates, Inc. is pleased to submit this monitoring and maintenance report FY22/23 City of Malibu Assessment District AD-1, Big Rock Mesa in Malibu, California. This report was prepared in accordance with our Agreement for Professional Services, dated June 22, 2020 between the City of Malibu and Yeh and Associates, Inc. This report provides geotechnical an annual summary of monitoring and maintenance for the project over fiscal year July 1, 2022 to June 30, 2023.

The geotechnical services consisted of monitoring and maintenance, data management, public outreach, reporting, NPDES compliance and capital improvement planning. A map showing the location of the maintenance and monitoring facilities is provided on Plate 1. Plate 2 provides a summary of maintenance activities performed during the monitoring year.

We appreciate the opportunity to be of service. Please contact Nick Simon ([nsimon@yeh-eng.com](mailto:nsimon@yeh-eng.com)) at 805-414-0991 or Loree Berry ([Lberry@yeh-eng.com](mailto:Lberry@yeh-eng.com)) at 805-440-0966 if you have any questions or require additional information.

Sincerely,  
**YEH AND ASSOCIATES, INC.**



Nick Simon, GIT  
Senior Project Geologist



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## 1. INTRODUCTION

Yeh and Associates (Yeh) was retained by the City of Malibu (City) to perform maintenance and monitoring of the existing geotechnical instrumentation and dewatering facilities within the City of Malibu's Big Rock Mesa Landslide Assessment District, 98-1. The project location is shown by the polygon in Figure 1. This report presents monitoring results, a maintenance summary, and facilities status for the monitoring year July 1, 2022 through June 30, 2023 (monitoring year). Yeh monitors groundwater levels, slope inclinometers, crack gauges and tracks dewatering flow from dewatering wells and horizontal drains. During this monitoring year, Yeh acquired and reviewed satellite radar data to monitor surface deformation. Yeh also maintains the monitoring and dewatering facilities. Plate 1 is attached and shows the approximate locations of the specific assessment district monitoring facilities. Table 1 summarizes the equipment inventory and the approximate frequency of monitoring and maintenance over the monitoring year. Section 5.0 of this report and provides detailed summary of the maintenance activities performed during this monitoring year.

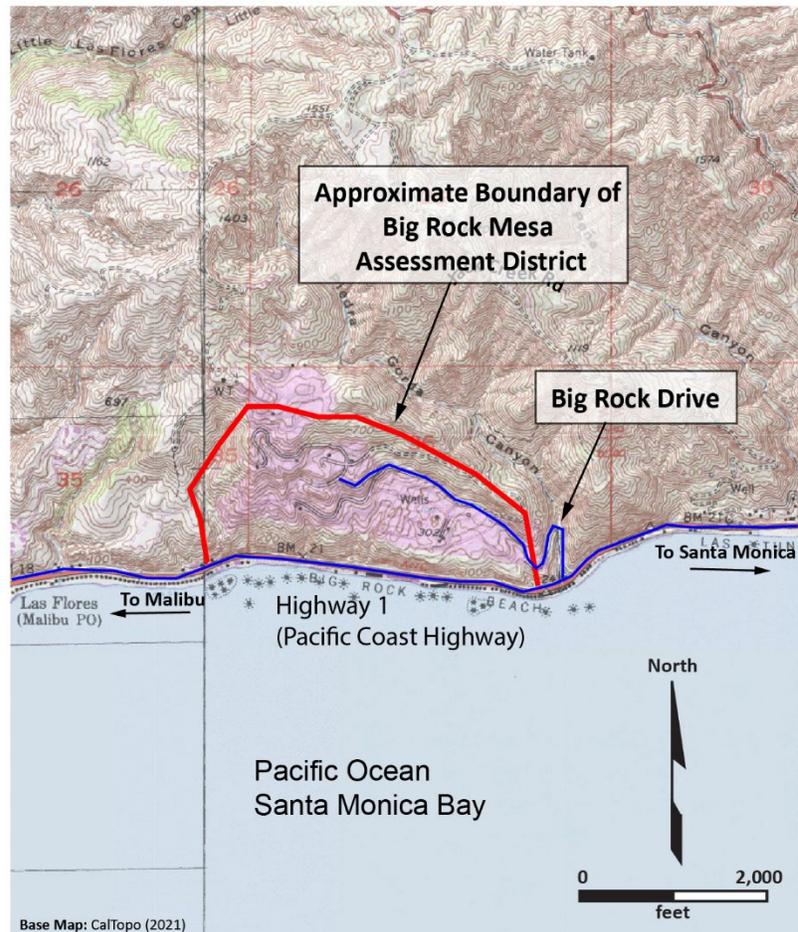


Figure 1: Project Location Map

**Table 1. Summary of Annual Monitoring and Maintenance**

Type of Monitoring Instrument or Dewatering Device	Number of Active Locations	Brief Description	Monitoring Frequency	Maintenance Effort <sup>2</sup>
Standpipe monitoring wells	29 <sup>1</sup>	1.5-inch to 3.25-inch diameter perforated PVC, aluminum, or casing, used to measure depth to groundwater using electric sounder or by a transducer/datalogger	Monthly direct read; hourly data from pressure transducer	low
Inclinometer survey casings	26 <sup>1</sup>	1.5-inch to 3.25-inch diameter grooved casings made of PVC, or aluminum used to survey for shear displacement by a traversing inclinometer probe	quarterly to annually	low
Dewatering wells	24	6-inch diameter steel or PVC casings equipped with 0.5 to 3HP submersible pump and connected to electrical controls, pumped water flows through meter and into conveyance piping to discharge	monthly	high
Horizontal Drains (hydraugers)	36	1-inch to 1.5-inch perforated PVC casings drilled slightly higher than horizontal into the face of the bluff and into the slope for hundreds to thousands of feet and used to drain groundwater that intercepts the casing. Flow can be measured along PCH before it flows to discharge	monthly	high
Big Rock Master Water Meter #0138193	1	Meters imported water to Big Rock Mesa, data obtained from Los Angeles County Public Works	monthly	N/A
Big Rock Mesa Rain Gauge #1239	1	Documented Rainfall, Data obtained from Los Angeles County Public Works	monthly	N/A
PK Nail Crack Gauges	5	PK survey nails set in the pavement to straddle existing cracks within areas of previously documented landslide related distress cracking	Quarterly to annually	low
Discharge Point	10	Water quality sampling and testing in accordance with active LARWQB NPDES Compliance File CI-6893	Monthly/weekly	Low to medium
Notes:				
<sup>1</sup> - standpipe and inclinometer casings are same device. Some casings are no longer usable <sup>3</sup> to survey with a modern inclinometer probe but are used to collect groundwater level measurements. <sup>2</sup> - maintenance effort (generalized): "high" – services monthly, "medium" – services quarterly, "low" – services annually <sup>3</sup> – Unusable inclinometer casings are sheared, twisted, compressed, or otherwise deformed or damaged to an extent that an inclinometer probe cannot traverse the casing or survey data is un-reliable with current standard inclinometer survey equipment.				

**1.1 PHYSIOGRAPHIC SUB-REGIONS**

Monitoring results are discussed with respect to the six physiographic sub-regions within the overall 1983 landslide boundary and are described by BYA (1992, 1999) and similarly by D.A. Evans (1986) as: Headscarp, Eastern, PCH, Central, Bluff and Western Extension. Figure 2 presents the approximate areas associated with the six physiographic sub-regions and they are described below. The South-Facing Slope Region is included as part of the Western Extension Region. Each is composed of landslide blocks or complexes of landslide blocks defined by common structural, tectonic and hydrologic characteristics (BYA, 1992).

- **Headscarp Region:** delineated to the north by cracking and scarps from the 1983 landslide boundary on the steep slopes along the Northeast Ridge and North Peak down to the Central



Region boundary on the south. It includes modern and paleo satellite slides including the Hansch Sub-Slide located below North Peak which activated during the main 1983 event. Small, intermittent or creep movements may still be detectable on the shallow secondary-shear plane in this area and are a priority to monitor and characterize.

- **Eastern Region:** delineated on the north and east by the 1983 landslide boundaries and separated from the Central Region to the west by the Inland Lane fault which trends approximately south-southwest just west of the Piedra Chica and Inland Lane cul-de-sacs. It is delineated on the south by the fracture zone along top of the PCH bluffs which is continuous with the fracture zone mapped across the Central-Bluff Regions boundary. The Eastern Region experienced extensive cracking prior to and during the 1983 landslide. Small intermittent or creep movements may still be detectable in this Region and are a priority to monitor and characterize.
- **Central Region:** comprised of distinct blocks that form upper and lower “Mesas,” it extends west from the Inland Lane Fault to the western boundary of the 1983 landslide. It spans from north to south, from the base of the Head Scarp Region to the fracture zone at the northern boundary of the Bluff Region. This area is mostly residentially developed.
- **Bluff Region:** delineated on its northern boundary from the Central and Eastern Regions by the fracture zone formed along the top of the PCH bluffs that extends along Roca Chica Drive east to the eastern landslide perimeter. It includes numerous, complex sub-slides mapped within the PCH bluff face down to and beneath PCH. Failures of sub-slides and global displacement along a fracture zone at the top of the bluffs caused damage to numerous homes during the late 1970’s and the main 1983 slide. Rockfalls, debris flows, and erosion off the steep, fractured slopes of the Bluff Region are routine especially during heavy rains, differentiating localized or surficial events from precursors to incipient movement is a priority.
- **Pacific Coast Highway (PCH) Region:** delineated east to west along the southern edge of the mapped landslide boundary from the base of the PCH bluffs south across PCH to the mapped toe of the 1983 landslide, where uplift/thrusting damaged numerous homes during the main 1983 landslide and where isolated bulging of the ground surface occurred during the 1990s.
- **Western Extension Region:** Located west of the 1983 landslide boundary and extends from above the upper terminus of Big Rock Drive in the north to PCH in the south. The Western Extension Region was not part of the active 1983 slide but was initially postulated to be a potential westward development of the 1983 slide; however, there is “no convincing evidence that the Western Extension has undergone mass movement” (BYA 1992).
  - **South Facing Slope Sub-Region:** The South Facing Slope Subregion is a complex of sub-slides located within the Western Extension Region. Shallow failures occurred here in the 1970s including the 1975 and 1978 Love and Kubek Slides which necessitated the abandonment of the residence at 20674 Rockpoint Way. A stability analysis was performed for the South Facing Slope Sub-Region in 1996 (BYA, 1996).



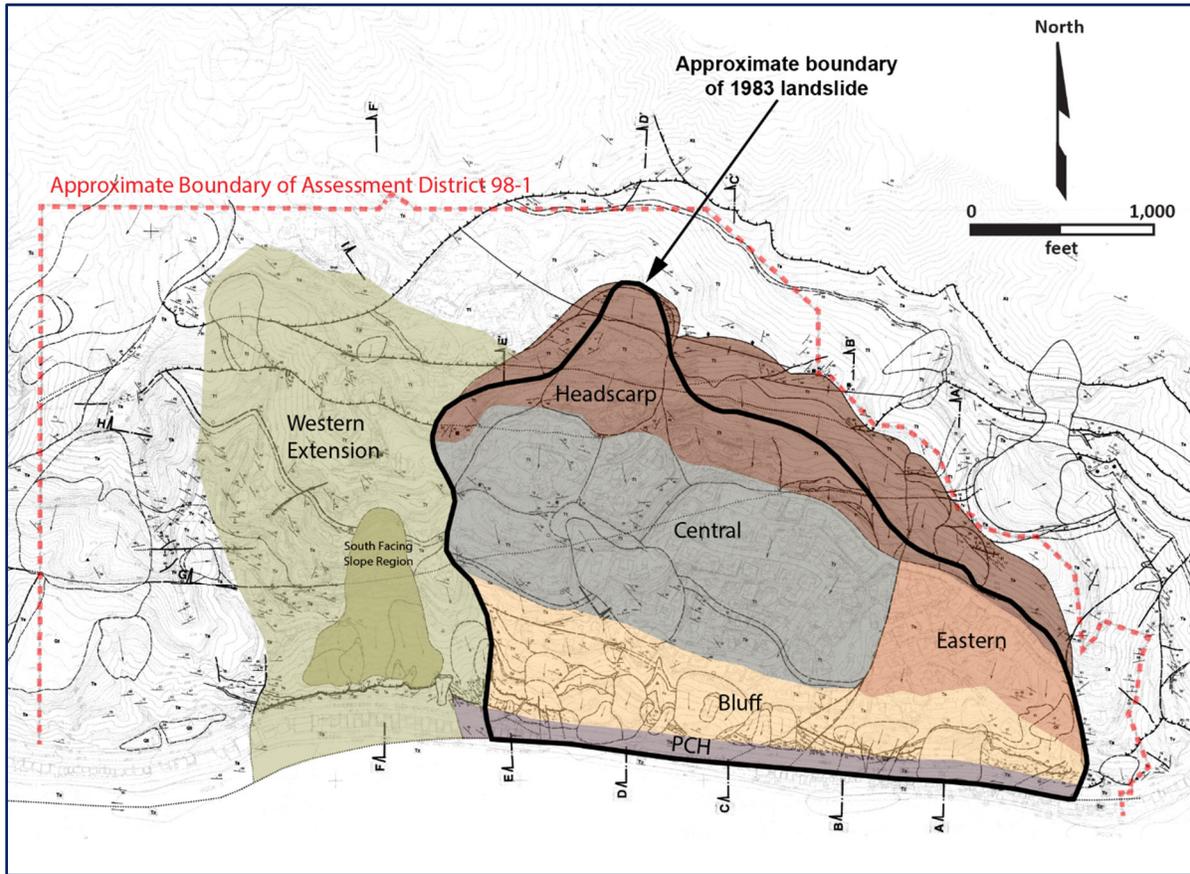


Figure 2: Approximate Boundaries of Physiographic Regions

## 2. MONITORING

The following sections provide monitoring results for groundwater levels, slope inclinometers, InSAR, and crack gauges.

### 2.1 GROUNDWATER LEVELS

Groundwater levels were measured approximately monthly in 29 standpipe monitoring wells and piezometers and are also measured intermittently in select abandoned dewatering wells.

Groundwater levels were measured by lowering an electric probe attached to a measuring tape into the standpipes until contact with the groundwater surface. The depths to water from the top of the casing are manually recorded. When interpreting the manual groundwater data, it should be considered that many of the standpipes installed prior to 1990 were constructed as fully screened monitoring wells and generally screened by drilling ¼-inch holes at 5-foot intervals along the aluminum well casing and then backfilling the annular space between the casing and borehole with clean sand (DAE, 1986 V4). This construction allows perched and shallow water to enter the casing through the filter pack from anywhere along the casing and the ground surface. Therefore, water

levels measured in this type of standpipe may have artificially high readings for some time after rainfall depending on the geology at the specific standpipe.

Data-logging pressure transducers were installed in standpipes PC-1 and SP-3A and various dewatering wells for most of this monitoring year and programmed to record data at 24-hour, 12-hour, one-hour or one-minute intervals depending on the purpose of the transducer.

Pneumatic piezometers are mechanical sensors that were installed with some of the inclinometer casings up until 1998. They had previously been measured intermittently to evaluate perched water conditions. The majority of the existing pneumatic piezometers no longer function, or the reliability of pneumatic systems are not certain. Pneumatic piezometers were not measured during the monitoring year.

The results of the groundwater monitoring by region are discussed in the following sections. Transducer data for standpipes PC-1 and SP-3A is presented in Figures 3 and 4 with the discussion of the Eastern Region groundwater section. Appendix A includes groundwater hydrographs from historic through the end of the FY22/23 monitoring year. An inventory and status of the groundwater monitoring facilities is also included Appendix A.

### 2.1.1 HEADSCARP REGION

Water levels in the Headscarp Region are monitored using SP-26 only. Water levels recorded in SP-26 rose during the monitoring year in response to the December-March rainfall. Groundwater levels in SP-26 have remained consistent since approximately 2006 with moderate, seasonal responses to rainfall. Manual water level monitoring will continue monthly. There are no dewatering facilities in the vicinity of SP-26.

**Table 2: Headscarp Region Water Level Monitoring**

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SP-26	+5.9	553.5	+0.8	549.8	+3.7

### 2.1.2 EASTERN REGION

Water levels in the Eastern Region are monitored with standpipe monitoring wells SP-3, SP-3A and SP-33 and piezometer PC-1. SP-3 was not monitored this year due to lack of property access and because it has been dry to its maximum (post-sheared off and filled in) depth since at least 2014. Groundwater levels in Standpipes PC-1 and SP-3A fluctuated over the monitoring year in response to



the December-March 2023 rainfall and levels in standpipe SP-33 continued to decline since an anomalous peak in January 2017.

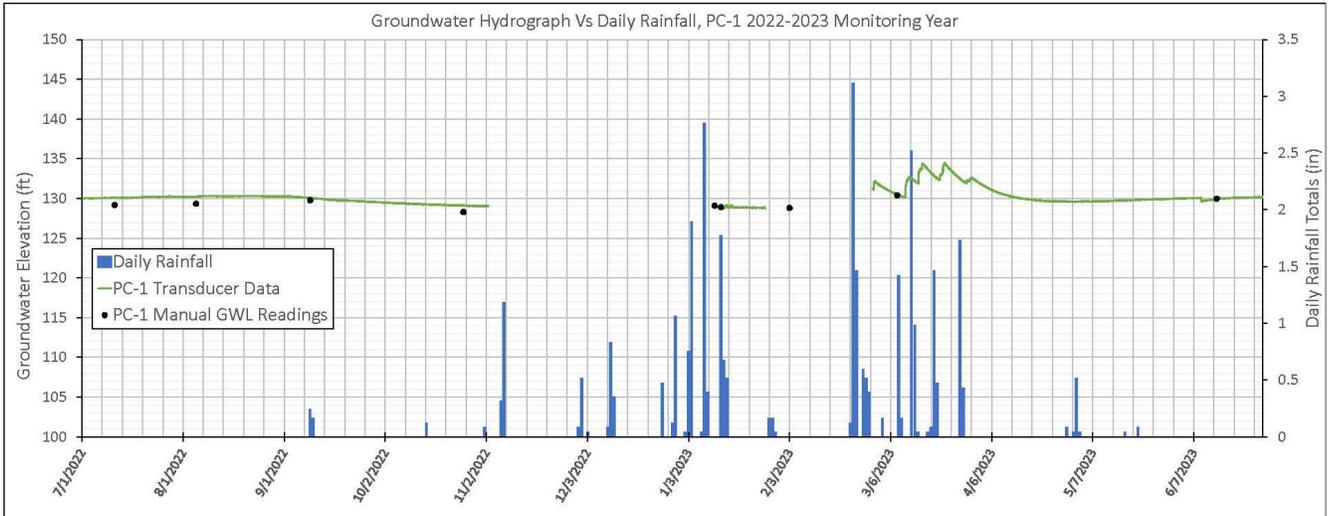
Figures 3 and 4 present plots of transducer data versus daily rainfall totals for PC-1 and SP-3A, respectively, over the monitoring year. Yeh’s observations of groundwater levels in the Eastern Region include:

- PC-1 water levels increased by less than 5 feet, relatively quickly in response to individual rain events and then dissipated over a day to a few days.
- Water levels in SP-3A appeared to rise nearly immediately in response to rainfall and lower quickly to close to previous levels. It is noted that the water level within the well casing rose on the order of up to 60 feet over a few minutes. This is thought to be a result of the surface runoff directly entering the casing. Water levels recorded in SP-3A may not represent the true water levels until surface water that entered the casing has dissipated. A transducer is currently installed in SP-3A and is logging at 1-minute intervals to continue evaluations of water levels responses.

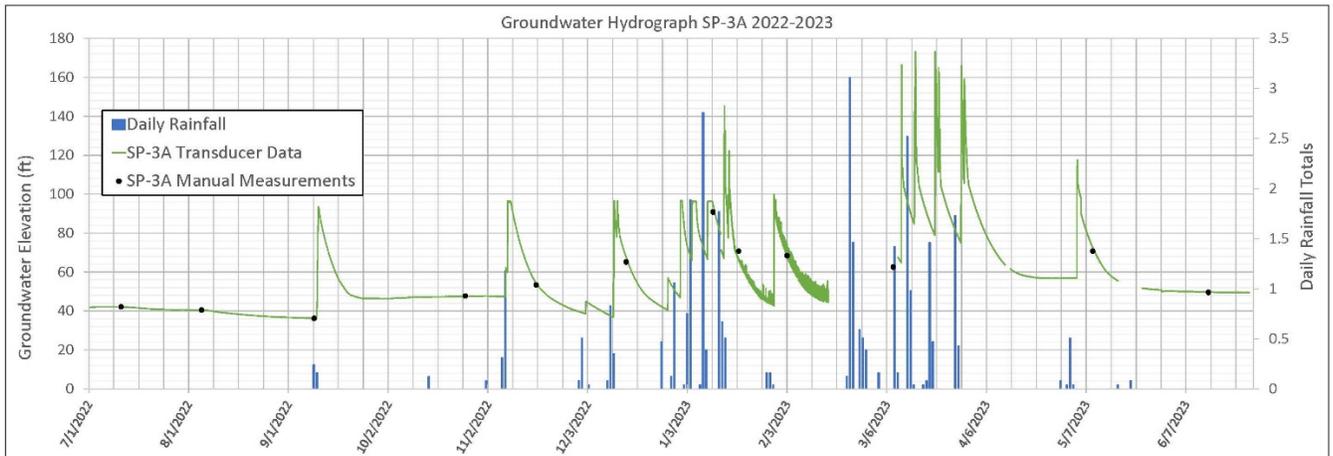
**Table 3: Eastern Region Water Level Monitoring**

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
PC-1	+0.8	129.3	+0.3	137.8	-8.5
SP-3A <sup>1</sup>	+7.4	58.2	+33.1	66.4	-8.2
SP-33	-1.0	-44.0	-2.6	-29.4	-14.6
SP-3	Not Measured				
Notes: Recorded values may not represent true water levels until they can be observed after a period of drier weather and allow time for the additional surface water that has entered the casing to dissipate.					





**Figure 3: PC-1 transducer hydrograph vs daily rainfall, programmed to 1-hour**



**Figure 4: SP-3A transducer hydrograph vs daily rainfall, programmed to 24, 12, 1-hour and 1-minute**

### 2.1.3 CENTRAL REGION

Water levels in the Central Region are monitored with standpipe monitoring wells SP-9A, -16, 16A, -17, -17A, and -24 and piezometers SP-35 and -36. All the standpipe water levels rose beginning in December in response to rainfall and all except SP-9A have since begun to lower. Water levels in SP-16 and SP-16A are highly reactive to pumping rates in Dewatering Well BYA-1 where water levels had begun to rise after December-January rainfall despite continuous pumping. In February the existing pump was exchanged for a higher capacity pump and water levels began to decline through June. Results for SP-17B are not presented because historical review indicates it was installed without a screened section.

**Table 4: Central Region Water Level Monitoring**

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SP-9A	+2.11	220.6	+0.5	226.3	-5.7
SP-16 <sup>1</sup>	+67.83	101.2	+1.2	74.9	+26.3
SP-16A <sup>1</sup>	+28.72	133.8	+7.6	138.2	-4.5
SP-17	+4.38	383	+0.6	386.4	-3.5
SP-17A	+4.34	370	+0.7	374.5	-4.6
SP-24	+1.43	47.2	-0.6	45.1	2.1
SP-35	+1.13	81.2	-3.8	93.1	-11.8
SP-36	+1.29	189.7	+0.5	191.6	-1.9

Note:  
 Water level is reactive to pumping rates in Dewatering Well BYA-1.

**2.1.4 BLUFF REGION**

Water levels in the Bluff Region are monitored with standpipe monitoring wells SP-10, -28, -32 and Piezometer SP-34. Water levels in the Bluff Region remained approximately unchanged or increased slightly after December in response to rainfall.

**Table 5: Bluff Region water level monitoring**

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SP-10	+1.2	45.8	+0.5	44.3	+1.6
SP-28	+0.2	33.4	+0.2	33.3	+0.2
SP-32	+0.5	32.9	-3.8	76.2	-43.4
SP-34	-0.9	23.9	-1.3	53.6	-29.7

**2.1.5 PCH REGION**

Water levels in the PCH Region are monitored with standpipe monitoring wells SP-11, -12, -14, -15, -19, 27A,-29 and -30. Groundwater levels within individual standpipes located in the PCH region remained similar or within about a foot from the previous monitoring year. There were some short-term responses to tidal influences and rainfall events, except for SP-29 and SP-30, which recorded water level rise of 3.4 feet and 2.0 feet, respectively. Direct surface runoff enters Standpipe SP-30 and likely also SP-29 during rainfall events. It is known that the ground surface at SP-30 is often submerged beneath an area of ponding on the PCH shoulder.



Yeh’s observations of groundwater levels in the PCH Region include:

- Average water levels in SP-29 were influenced by a 9.3-foot spike between November and January which had since dissipated prior to a second spike after the March rainfall.
- Water levels in SP-30 spiked in January and then dissipated but remain elevated above previous levels. Water levels in SP-30 have continued to rise since the 1990s and do not appear to be true water levels, a transducer has been installed in SP-30 to perform hydraulic tests.

**Table 6: PCH Region water level monitoring**

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SP-11	-0.2	5.2	+0.1	5.5	-0.2
SP-12	+1.0	5.0	+0.6	5.0	0
SP-14	+0.4	5.0	+0.5	4.8	+0.2
SP-15	+1.1	11.3	-0.3	10.6	+0.7
SP-19	-0.2	3.4	+0.2	3.7	-0.3
SP-27A	-0.3	9.9	+0.3	9.9	0
SP-29	+3.4	15.6	+2.3	16.6	-0.9
SP-30	+2.0	22.5	+1.9	13.5	+9.0

**2.1.6 WESTERN EXTENSION REGION**

Water levels in the Western Region are monitored with standpipe monitoring wells SP-20, -21, -22, -23 and abandoned dewatering well W-10. Standpipes SP-21, -22, and -23 rose in response to rainfall and have since begun to decline. Water levels in Standpipe SP-23 have been generally increasing since approximately January 2021 and a transducer has since been installed in SP-23 to more frequently measure the groundwater level. Water level measurements in standpipe SP-20 remained relatively consistent through early March and then measured an 89-foot rise in May. Water level measurements in SP-20 in April and early May were unsuccessful due to shallow water cascading into the casing and setting off the probe. A transducer that had been installed in SP-20 confirmed that elevated water levels measured in the casing are approximately accurate and are now continuing to dissipate. A manual water level was recorded, and a transducer was installed in nearby abandoned dewatering well W-10 to help with assessing SP-20.



**Table 7: Western Extension Water Level Monitoring**

Standpipe ID	Change in Groundwater Elevation between last and first measurements of monitoring year (ft)	2022-2023 Average Groundwater Elevation (ft)	Change in Average Groundwater Elevation from Prior Monitoring Year (ft)	1991-2023 Historical Mean Groundwater Elevation (ft)	2022-2023 Average Groundwater Elevation from Historical Mean Groundwater Elevation (ft)
SP-20	+97.2	157.8	17.1	184.6	-26.8
SP-21	+5.7	394.2	4.2	381.7	+12.5
SP-22	+0.1	473.5	5.7	467.7	+5.7
SP-23	+2.5	510.5	13.8	496.0	+14.4
W-10	--	214.6	--	--	--

## 2.2 SLOPE INCLINOMETERS

Yeh surveyed a total of 23 inclinometers during the monitoring year. Plate B-1 is a map that summarizes the locations and status of all known, active and abandoned inclinometers, annotated with interpreted movement for the 2022-2023 monitoring year. Inclinometers are surveyed quarterly, semi-annually, annually or on an accelerated schedule depending on the inclinometer location and the past and recent movement history. Inclinometers were surveyed using a vertical traversing probe that measures the tilt of the casing at 2-foot intervals. Inclinometer data were collected via Bluetooth onto a field tablet and processed by comparing each tilt measurement to previous surveys.

Inclinometer data processing and presentation utilized DigiPro2 software (Slope Indicator, 2014) and used a post Q1 2022 survey as a baseline (unless otherwise noted). Updated baselines are generally used following a change or repair to the cable and/or servicing of the inclinometer probe sensors and carriage. Appendix B includes plots of cumulative change and incremental change in the A and B directions for each inclinometer surveyed during the monitoring year. The plots in Appendix B also provide construction details and notes of interpreted past and current movement, as applicable.

Resultant plots in the polar and profile view are attached for inclinometers that display quantifiable movement or interpreted possible movement. Of the inclinometers surveyed, only SP-11 located in the eastern PCH Region showed possible shear displacement on the order of 0.1 inch.

A summary of the inclinometer result by region is presented below.



### **2.2.1 HEADSCARP REGION**

SP-26 is the only usable inclinometer in the Headscarp Region and was surveyed approximately quarterly during the monitoring year. No discernable shear movement was detected.

D.A. Evans Inc. reported that the SP-26 casing had closed off at approximately 41 feet depth by July 1984 and was later repaired by replacing the upper approximately 40 feet of casing (DAE, 1986 V4), which was reportedly backfilled with a foam product (BYA, 95-96). SP-26 continues to display sensor stabilization lag in the upper 40 feet which may indicate an issue with the backfill. The casing is also significantly tilted and/or curved at depths of 30, 40 and 80 feet.

Prior movement on SP-26 has been interpreted to have occurred on a shallow sub-slide and not the basal landslide shear plane.

### **2.2.2 EASTERN REGION**

Two inclinometers were monitored approximately quarterly within the Eastern Region: PC-1 and SP-3A. Neither SP-3A or PC-1 displayed discernable shear-type movement during the monitoring year.

Inclinometer SP-11 is located in the PCH Region directly south of the Eastern Region and near the toe of the 1983 landslide. SP-11 is considered relevant to the Eastern Region and is included in this section. Inclinometer SP-11 displayed possible shear-type displacement of approximately 0.1-inches between the Q1 and Q2 2023 surveys at approximately 16 feet deep and bearing approximately 175 degrees. This depth and bearing are consistent with previous and historical movements reported on SP-11. After the June 6, 2023 survey, SP-11 monitoring was accelerated to monthly surveys. To the date of this report, no additional movement has been interpreted.

SP-11 is tilted and curved at the depth of possible movement. The tilt is thought to have occurred after the casing accumulated approximately 6-inches of shear between January 1983 and April 1984.

PC-1 is a 1.9-inch-inner-diameter casing which is a relatively small size not typically installed on active landslides since even a small amount of movement would make the casing impassable to the survey probe. Reported displacement of the casing during the 1990s has deformed the casing enough to make probe placement difficult and can result in intermittent Depth Positioning Error (DPE). The casing is still considered usable when measured and interpreted with caution.

### **2.2.3 CENTRAL REGION**

Five inclinometers were monitored quarterly, or semi-annually in the Central Region: SP-9A, SP-16A, SP-17B, SP-35 and SP-36. Inclinometers surveyed during this monitoring year did not display discernable shear-type displacement.



### 2.2.4 BLUFF REGION

Two inclinometers were surveyed within the Bluff Region; SP-32 and SP-34. The inclinometers did not display discernable shear-type displacement during the monitoring year.

### 2.2.5 PCH REGION

Eight inclinometers located in the PCH Region were surveyed approximately quarterly: SP-19, SP-11, SP-12, SP-27A, SP-14, SP-15 SP-29 and SP-30. Inclinometer SP-11 recorded possible movement which is discussed in Section 2.2.2 Eastern Region and also addressed in Section 2.2.7. The other seven inclinometers did not display discernable shear-type movement during the monitoring year.

### 2.2.6 WESTERN EXTENSION REGION

Four inclinometers located in the Western Extension Region were surveyed approximately annually; SP-20, SP-21, SP-22 and SP-23. The inclinometers did not display discernable shear-type movement during the monitoring year.

### 2.2.7 ERROR ANALYSIS AND EXAMPLES ON SELECTED INCLINOMETERS

Yeh analyzed five selected inclinometers for various types of error. Inclinometers SP-11, -26, -34, -35, and -36 have for years displayed inconsistent results that remained unresolved after introduction of the AT-System Inclinometer Probe in 2020. The most significant finding is that each of the five

inclinometers have tilted and curved casing at the depth of suspected error. Research indicates that highly tilted casing introduces error in inclinometer surveys due to accelerometer sensor properties (Mikkelson, 2003) (Ru Et Al., 2022) and that curvature affects the repeatability of probe placement. Analysis of the data plots indicate that the largest source of error is likely depth positioning error (DPE). Small changes in probe depth placement along highly curved casing may result in false movement displayed on the profile change plots. The inclinometers reviewed each present with a geometric-congruence between graphical cumulative displacement and tilt magnitude plots which is highly suggestive of DPE (Mikkelson, 2015). An example of geometric-congruence is shown in Figure 5 for SP-36.

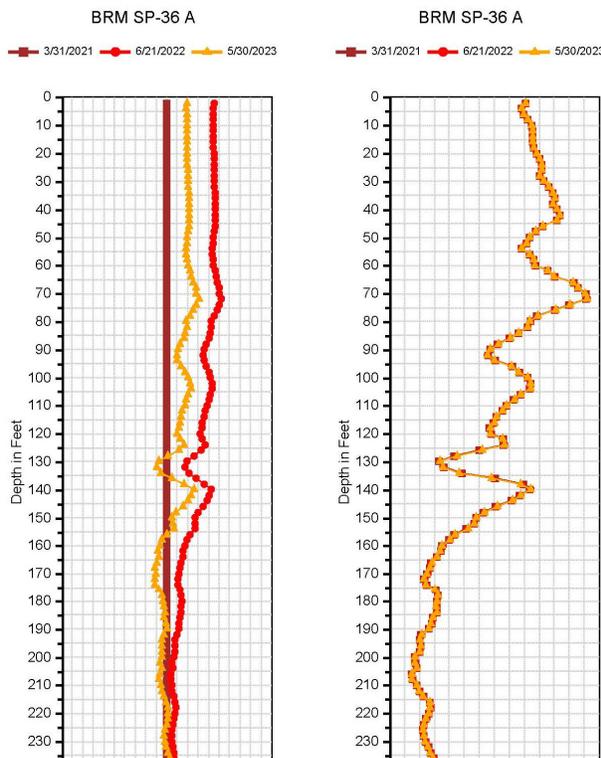


Figure 5: SP-36, Geometric “Mirror” Congruence Between Cumulative Change vs Tilt Magnitude Plots

Inclinometers SP-34, -35 and -36 were installed during the 1998-1999 monitoring year, by the same contractor and are all highly tilted throughout the casing. The casing issues appear to be the result of vertical buckling during the counter-buoyancy techniques used for initial grouting. SP-11 and -26 displayed high tilt in the areas where they were extensively sheared during the 1983 landslide and they have therefore been prone to error at those depths since that time. The use of the AT system inclinometer probe has minimized inconsistent placement and the most likely cause for the DPE is minute changes to the cable length between surveys.

Inclinometers SP-11, -26, -34, -35 and -36 will continue to be surveyed and will be processed and interpreted with additional consideration of the casing conditions. SP-11 and -26 have previously reported possible creep type movement that appears to have continued for some time after major movements ceased. The locations are currently used exclusively to monitor for very small incipient or creep movements but are likely too deformed at the identified shear depths for the traversing probe to reliably measure at the required precision. Future improvements should include fitting these inclinometer casings with non-traversing, in-place sensors across the identified shear zone to confirm the presence or absence of ongoing creep.

### **2.3 SATELLITE COLLECTED INTERFEROMETRIC SYNTHETIC APERTURE RADAR (INSAR)**

Yeh worked with SkyGeo, Inc. to obtain, process and interpret satellite InSAR data coverage between April 2015 and June 30, 2023 as a monitoring tool to remark on the status of the main slide over that time and to observe for potential areas of concern to better direct district monitoring and dewatering resources. A discussion of InSAR and interpretation of the data are presented below. InSAR Overview

InSAR data was acquired by the Sentinel-1 Satellite; for this project satellite imagery corresponding to C-band radar waves was used. With each satellite pass, the radar swath covers the full assessment district boundary and identifies and tracks natural reflectors over repeated passes. The data processing identified and utilized thirty-six thousand natural reflectors distributed throughout the subject area.

InSAR software processes reflectors into either Point Scatter (PS) pixels, which are usually a man-made object, or Distributed Scatter (DS) pixels, where multiple objects show a weaker reflection, at a relatively similar strength. PS pixels are generally more accurate than DS pixels in terms of georeferencing.. Both types of pixels can be filtered, grouped and analyzed to interpret results and vertical displacements. The track of the satellite orbit is approximately parallel to the movement direction of the Big Rock Mesa Landslide which limits the ability to resolve horizontal displacements in that direction with useful accuracy.

Changes in the identified PS and DS pixels are tracked in the return phase of the radar wave signal and have single pass to pass measurement accuracies on the order of 6 to 8 millimeters (mm). With multiple passes over time, the accuracy of each pixel can be improved to approximately 1 to 2mm. InSAR is a precise tool for tracking and quantifying slow or creeping deformation. Large displacements between satellite passes can cause the phase of the return signal to be lost, whereas small changes can be more precisely tracked.

### **2.3.1 IN SAR PROCESSING AND INTERPRETATION**

The following presents the results and our interpretation of the InSAR data that was processed for the project.

- There has been no reportable substantial gross, vertical displacement estimated within the body of the Big Rock Mesa Landslide or its subregions between April 2015 and the end of the current monitoring year.
- There has been no substantial movement estimated along the toe of the landslide. Therefore, we can infer that there is no substantial thrust or uplift along the toe of the landslide.
- Downslope movement estimates that occur on the faces of steep slopes are likely the result of shallow soil movement and can be tracked by DS pixels.

Figure 6 shows the entire Big Rock area with only high-quality PS pixels, which cover most of the developed residential areas. In Figure 7, DS pixels of the same quality are added to the PS pixel map and can be seen covering most of the undeveloped areas, slopes, landscaped areas, sidewalks and roads. Both plots indicate below threshold movement rates for all areas not on a steep slope. Areas of shallow slope failures such as rockfall, debris flow and shallow slumps that occurred during heavy rain were filtered out by algorithm due to either lost coherence as a detectable DS pixel or lost phase tracking.



Figure 6: Highest Quality PS Pixels Only, Displacement Rate  $\pm 5$ mm/year

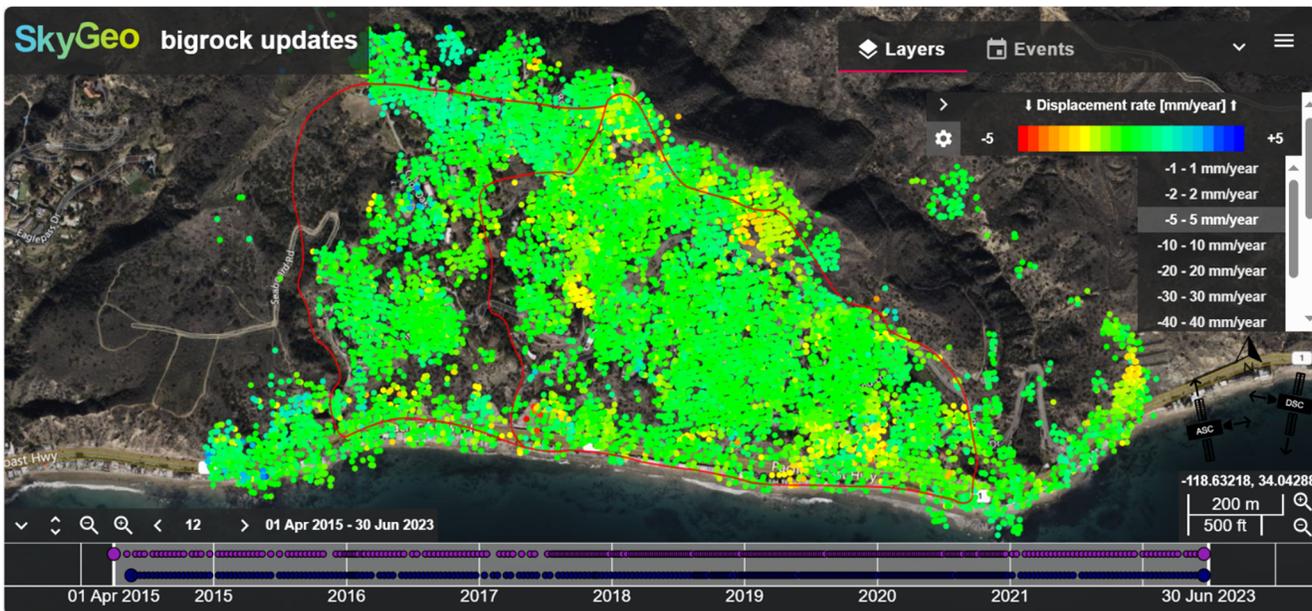


Figure 7: Highest Quality PS and DS Pixels, Displacement  $\pm 5$ mm/year

Figure 8 shows an example of results of using the grouping and statistics interface tool to assess PS pixels for the non-slope areas of the Eastern Region and Lower Central Region. The average displacement interpreted for the area is less than  $\pm 2$ mm/year with no trend of displacement over time and no distinct displacements at a given point. This process was performed for each project subregion and yielded similar results.

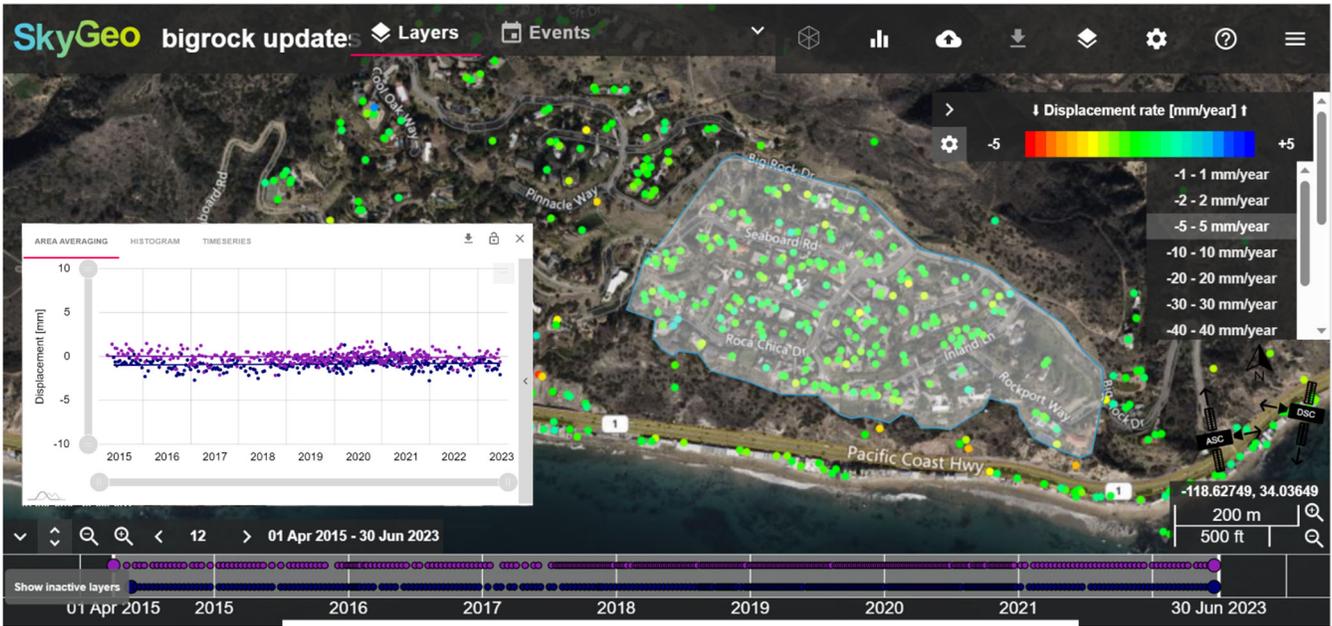


Figure 8: Eastern Region and Lower Central Region, Non-slope Area Averaging, Highest Quality PS Pixels Only

### 2.3.2 AREAS OF FURTHER EVALUATION

Yeh identified four localized areas where clusters of pixels presented with intermittent to consistent downward displacement estimates. Each of the locations are on steep terrain and the amount of interpreted movement is on the order of 2 to 4 mm per year. These movements are interpreted to be localized and shallow and not related to displacement of the greater Big Rock Mesa Landslide.

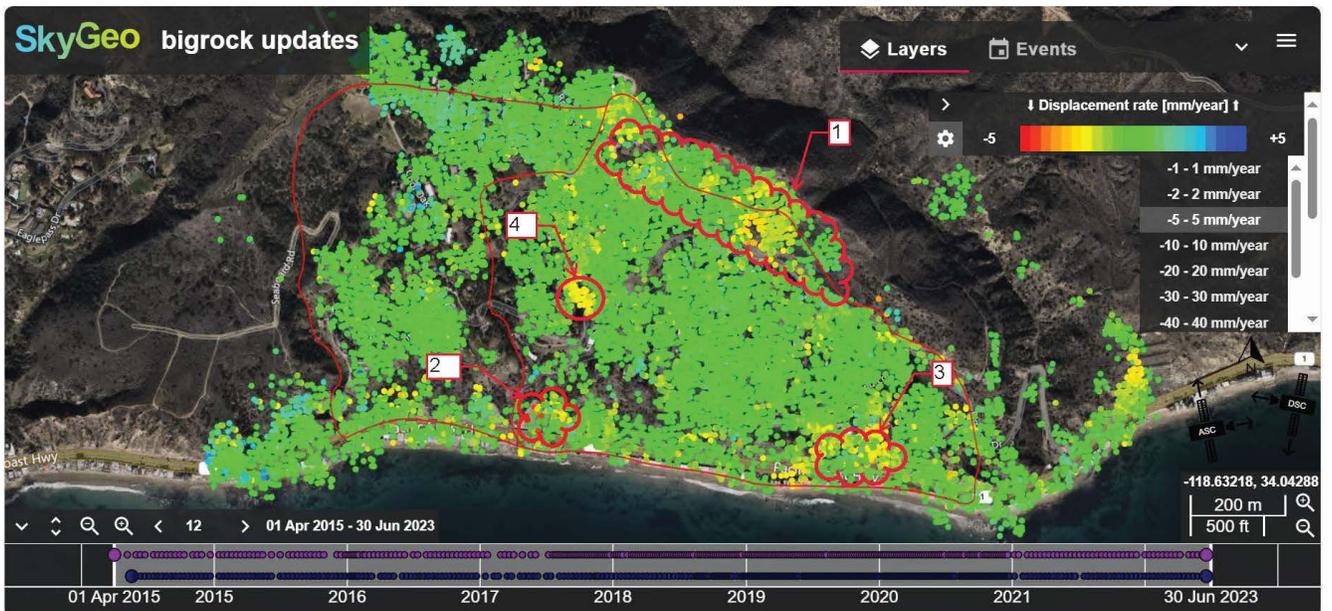


Figure 9: Four localized areas of further investigation

1. One area is throughout the steep faces of the East Ridge and North Peak and the movement is identified as shallow soil creeping or raveling downhill.
2. One area is on the PCH Bluff where soil, rock and a failing anchored mesh are sliding down the slope. The movement is interpreted to be downhill movement of surficial material.
3. One area is located on the Bluff along PCH below Rockport Way and within and near the headscarp of a previously mapped subslide. Portions of this area had been identified as an active shallow slide since at least 1972 (Merrill, 1972) and was subsequently mapped by DA Evans (DA Evans, 1986) as one slide area and later by BYA (BYA, 1992) as two separate smaller areas (BYA, 1992). The sub-slides consist of shallow slide debris within well-defined scarps. Material at the top of the headscarps consist of artificial fill placed over native soils (Merrill, 1972), (Geoconcepts, 2015). DS pixels associated with undeveloped areas show displacements, PS pixels associated with structures do not indicate displacements. See Figure 9.
4. The fourth area is below the intersection of Pinnacle Way and Big Rock Drive. This area is approximately within the headscarp of a previously mapped prehistoric sub-slide. The DS pixels align consistently with the steep slopes of the subslide headscarp and no other pixels across the body of the sub-slide indicate displacement. The movement is interpreted to be surface material creeping downslope. See Figure 10.

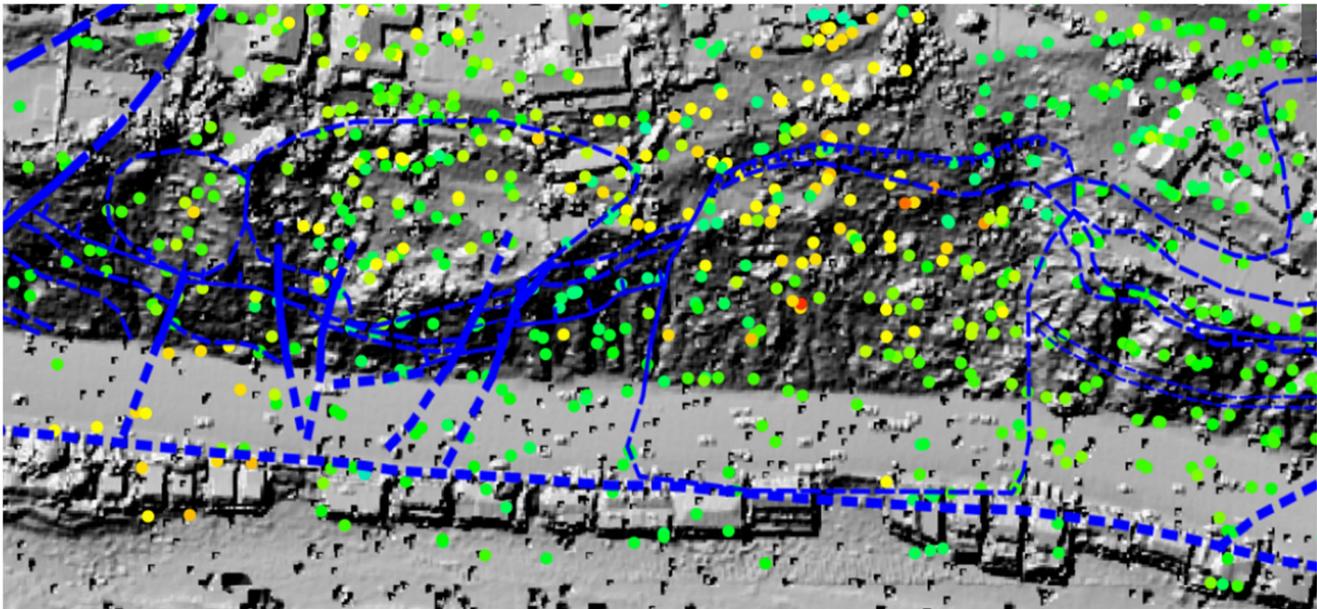
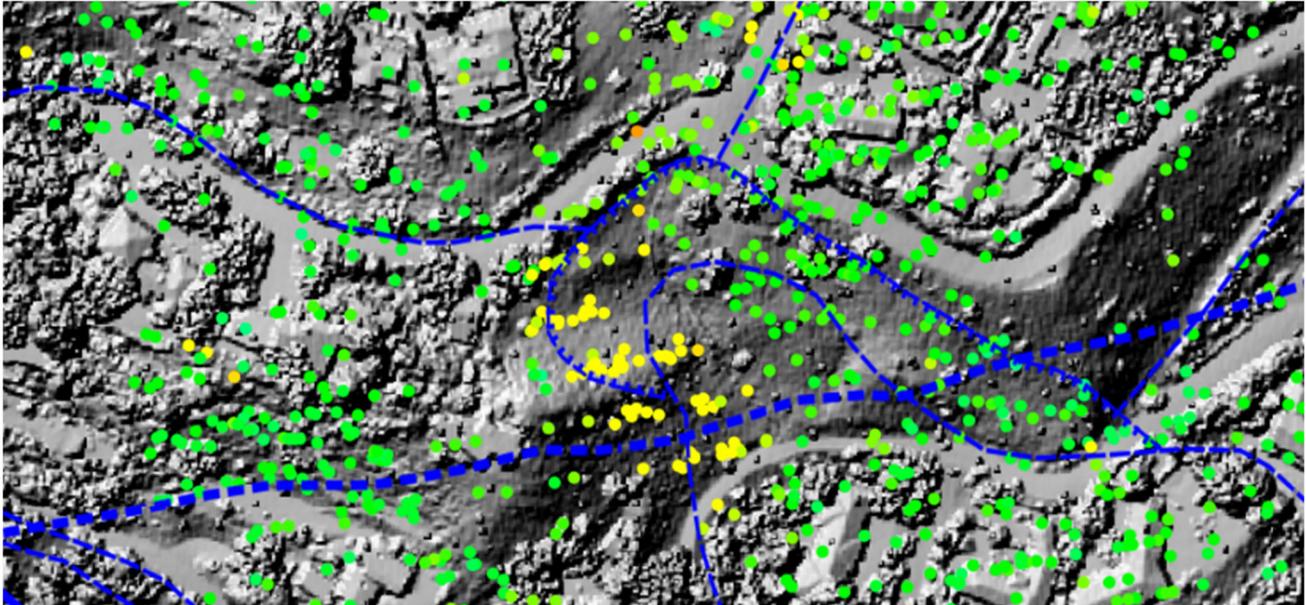


Figure 10: Area 3, bluff below Rockport Way with Geologic map (BYA 1992); Highest Quality all points area of displacement +/-5mm per year



**Figure 11: Area 4, slope below Pinnacle Way at Big Rock Drive with Geologic map (BYA 1992); Highest Quality all points area of displacement +/-5mm per year**

## 2.4 CRACK MONITORING

Yeh measured six PK-nail crack gauges that were installed in January 2021 at the following locations: two on Pinnacle way cul-de-sac, one at the intersection of Pinnacle Way and Big Rock Drive, one at the intersection of Big Rock Drive and Cool Oak Way, one at the hairpin turn on Big Rock Drive south of Rockport Way and one in the Seamoor Drive cul-de-sac. Five of the crack gauges were installed in areas where cracks in the road had been identified and are in areas where cracking had been mapped during the 1983 landslide. Once crack gauge was installed on Seamoor Drive across a crack with similar morphology as other visible cracks in an area but where no previous landslide-related cracking had been mapped.

Results for five of the crack gauges are attached in Appendix C. The crack gauge located on Lower Big Rock Drive near Rockport Way was damaged and no results were recorded. No measurable displacement was observed on the crack gauges since the last monitoring year.

## 3. WATER BUDGET TRACKING

### 3.1 RAINFALL DATA

Yeh obtained rainfall data for the monitoring year from the Big Rock Mesa Rain Gauge #1239 operated by the Los Angeles County Department of Public Works (LADPW). Prior to 1984, rainfall data was obtained from the Carbon Canyon Rain Gauge #447C and after 1984 from the onsite Big

Rock Mesa Rain Gauge #1239. This monitoring year Yeh also obtained complete, historical annual rainfall data from the LADPW for both gauges back to 1968 and updated missing or conflicting data and adjusted historical rainfall amounts and averages accordingly. For this report, the Big Rock Mesa Rain Gauge 40-year rainfall average replaces the previously used “Area Average”. The annual average rainfall from the Big Rock Gauge data is similar to the assumed 16.0-inches used for water budget calculations in the 1992 Geotechnical Report (BYA, 1991).

Plate 3 - Rainfall Graph displays historical monthly and average annual rainfall for the Big Rock Mesa area from October 1968 through September 2023. Recorded rainfall for the Big Rock Mesa area over monitoring year totaled 31.26 inches, which is 15.12 inches above the 40-year Big Rock Mesa Rain Gauge running average of 16.14 inches and was the most annual rainfall recorded at the project since 2005.

Plate 4 – Annual and Cumulative Deviation from Mean Rainfall vs Total Dewatering Production, shows rainfall deviation from the 40-year mean and compares rainfall amounts to total dewatering output changes.

### **3.2 IMPORTED WATER USAGE**

Yeh collected monthly water usage readings for Big Rock Mesa from the Los Angeles County Department of Public Works master water meter #138193 located at the corner of Rockport Way and Big Rock Drive and acquired monthly meter data directly from the LA Country Waterworks District 29. The average water imported to the site for the monitoring year was 116.4 thousand gallons per day (gpd), which is 25-percent less than the 2021-2022 monitoring year and was the lowest annual average since the 1994-1995 monitoring year. Imported water usage typically decreases in response to rainfall, most likely mostly due to reduced landscaping irrigation. A plot of monthly usage and water usage trendline is included on Plate 5 – Total Dewatering Production and Total Water Consumption.

### **3.3 DEWATERING**

Yeh tracks dewatering production for pumping dewatering wells installed throughout the regions and horizontal gravity drains (hydraugers) installed at the base of the Bluff Region. The 2022-2023 monitoring year combined dewatering production averaged 81,308 gpd, which is an increase of 34-percent from the previous monitoring years’ average production of 60,749 gpd and was the highest annual average dewatering production since the 2005-2006 monitoring year. The increase in production was a response to the above average rainfall from December through March. Approximately 82-percent of the total dewatering production was pumped from dewatering wells and 18-percent was measured from hydraugers.



### **3.3.1 DEWATERING WELL PRODUCTION**

Yeh performed monthly monitoring of production for the 24 active dewatering wells. Well production is measured approximately monthly for each well by reading flow totalizers that are installed along the discharge line. A summary of well production and well status is presented on Appendix D-1. A plot for historical production and a plot for monitoring year production vs daily rainfall for individual wells are included in Appendix D. A graph showing total dewatering well production since 1993 is included on Plate 5.

Average total well production for the monitoring year was 66,325 gpd which is 38-percent higher than last year's average production of 47,906 gpd, 28-percent more than the historical production average of 51,978 gpd calculated from 1993 to present and 5-percent less than the maximum recorded production of 69,741 gpd during the 2004-2005 monitoring year. This monitoring years' annual average well production was the highest since the 2004-2005 monitoring year with March 2023 recording the highest average production since March 2005.

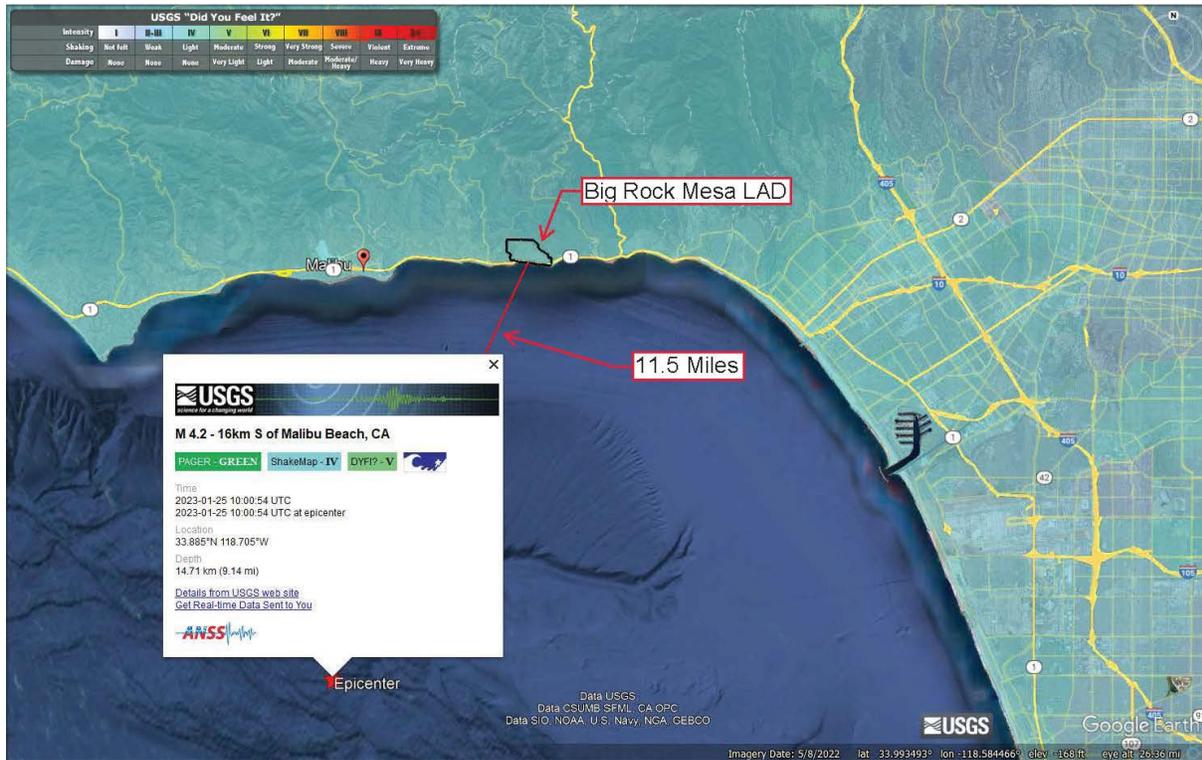
### **3.3.2 HYDRAUGER PRODUCTION**

Yeh performed monthly monitoring for 36 hydraugers. Hydrauger production is measured directly from a sampling port installed on each hydrauger. A graph showing total hydrauger production since 1993 is presented on Plate 5. Production plots and status for individual hydrauger locations are included in Appendix D.

Annual average hydrauger production during the monitoring year was calculated to be 14,984 gpd which is approximately 17-percent higher than last year's average monthly production of 12,843 gpd. Hydrauger production over the monitoring year remained relatively steady and then increased after April and through June in response to the season's rainfall. The June 2023 monthly average production was the highest monthly average recorded since September 2011.

## **4. SEISMIC EVENTS SUMMARY**

One earthquake with a magnitude of 4.0 or greater was recorded within a 100-mile radius of the project area. On January 25, 2023, a M 4.2 event occurred approximately 16 kilometers south of Malibu Beach, a M 3.6 aftershock occurred approximately 3 minutes later. The epicenters were located approximately 11.5 miles southwest from the Big Rock Mesa LAD boundary.



**Figure 12: Epicenter of January 25, 2023 M4.2 EQ relative to Big Rock LAD**

Yeh personnel performed post-earthquake observations and measurements that included surveying of key inclinometers and/or field observations of the ground surface made during scheduled monitoring and maintenance before and after the earthquake event. No movement secondary to the earthquake was interpreted on the inclinometers surveyed. Yeh staff did not observe surface displacements related to the earthquake and is unaware of any reports of damage local to the Big Rock Mesa Landslide AD resulting from the earthquake.

## 5. GROUNDWATER QUALITY MONITORING

The City of Malibu has permitted the dewatering discharge with the Los Angeles Regional Water Quality Control Board (Water Board) under the National Pollutant Discharge Elimination System (NPDES) under permit CAG994004 order number R4-2018-0125. A new permit R4-2018-0125 was received June 10, 2022 and implemented on July 1, 2022. Yeh and the City continue to coordinate with the Water Board regarding our test results, sampling procedures, and future effluent limits.

Yeh and Associates, Inc., as a consultant for the City, performed the NPDES monitoring and reporting for this monitoring year in general accordance with the active permit. Analyses were conducted at certified laboratories, in accordance with current U.S. Environmental Protection Agency procedures. Analytic results of the water quality sampling for each quarter are attached in Appendix E - Quarterly

Results. Quarterly Discharge Monitoring Reports were submitted the Water Board for Q3 and Q4 of 2022 and Q1 and Q2 of 2023 for 2022-2023 monitoring year.

## 6. ADDITIONAL OBSERVATIONS

The following additional field observations were made by Yeh staff over the monitoring year that will continue to be considered and tracked for future improvement projects.

- Yeh performed a visual reconnaissance and reviewed locations where ground cracks had been historically documented in a 1993 Major Ground Crack Check Location map (BYA, 1993).
- Yeh has been observing a water seep along the base of the bluff between hydraugers HD-4 and BYA-H10 since 2020. The location appears to have dried and is no longer visibly seeping as of the date of this report.
- Yeh continued to observe changes and the condition of two intermittent water seeps behind the existing soldier pile wall between hydraugers HD-12 and HD-10. No significant changes were observed over the monitoring year.
- In April, Yeh addressed what had been thought to be a persistent rainfall puddle along PCH west of inclinometer SP-30. Yeh staff performed localized excavations and potholing encountered a historic hydrauger (H-3C) that is thought to be re-activated. Yeh is continuing to observe the location and if the historic hydrauger continues to flow, it will be connected to the conveyance pipeline.
- Yeh performed a field trial utilizing a ground-scanning terrestrial LiDAR system (Trimble SX12) in May 2023. The data allows Yeh to obtain a repeatable, high-quality survey at selected locations. The data can be tied with global survey control.

## 7. MAINTENANCE AND CAPITAL IMPROVEMENTS

A summary table of the maintenance and capital improvement activities performed over this monitoring year is provided on Plate 2. Typical maintenance activities to dewatering wells include evaluating, troubleshooting, and replacing or repairing dewatering well pumps, well electronics and well controls, repairs to well equipment vaults, and repairs to well discharge lines. Typical maintenance to hydraugers included PVC repairs within the PCH Region along Highway 1 or within the conveyance piping for discharge. Capital improvements include replacement and rehabilitation of existing facilities and special projects to improve the monitoring and maintenance capabilities. Yeh performed numerous maintenance and repairs to dewatering facilities and improvements to the project assets throughout the monitoring year.

It should be noted that several hydraugers along the base of the PCH bluffs were damaged or buried by rockfall between December and March following rainfall events. The damaged locations have



either been repaired or have been undergone temporary repairs while the ground surface conditions on the PCH shoulder and base of the bluffs are dry enough to pothole for leaks and to repair damage.

## **8. CAPITAL IMPROVEMENT AND SPECIAL PROJECTS**

### **8.1 WORK IN PROGRESS**

The following capital improvement and special projects have been estimated and are in planning and implementation phases.

- Install one, up to 400-foot-deep inclinometer in the Eastern Region along north side of Rockport Way between BYA-5 and SP-3A.
- Install one, 100-foot-deep inclinometer along PCH below Rockport Way
- Install non-traversing sensors in inclinometers SP-11, PC-1, and SP-26
- Install a grouted time-domain reflectometer cable and vibrating wire piezometer in abandoned inclinometers SP-33, SP-17A, SP-16, SP-24 and SP-28.

### **8.2 FUTURE IMPLEMENTATION**

The following improvement projects have been identified and are being tracked and planned for future consideration.

- Replace corroded well control boxes for dewatering wells BYA-7, W-17, W-2 and BYA-11.
- Continue efforts to install and implement remote transmitting or continuous datalogging flowmeters and pressure transducers for dewatering production and water levels.
- Continue efforts to design and implement well controls that better protect pumps from wear than the current pump-savers alone.
- Rehabilitate dewatering wells W-1 and BYA-9 and attempt to recover well depth by removing existing sediment at well bottom.
- Perform maintenance and chemical treatment on dewatering well FW-1 to improve water quality results for NPDES compliance.
- Install one or more new hydraugers at the observed seep locations behind the soldier-pile wall between HD-12 and HD-10.
- Replace dewatering wells BYA-1 and W-3 to original depths to restore/improve dewatering system capabilities.

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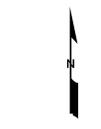
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**Maintenance and Monitoring Facilities  
Assessment District 98-1, Big Rock Mesa  
City of Malibu, California**



- Dewatering Well
- Hydrauger Outfall
- Hydrauger Installation Length
- Conveyance Point
- Ocean Discharge Point
- Approximate Limits of Primary Land Movement
- Western Extension Boundary
- Big Rock Mesa Landslide Assessment
- Slope Inclinerometer/Standpipe Piezometer
- Slope Inclinerometer/Standpipe Piezometer (standpipe only, not usable for inclinometer)
- Catch Basin
- Master Water Meter
- Storm Drain



SCALE 1:2,100  
200 100 0 200 Feet

DATE:	PROJECT NUMBER:	PLATE:
December 2021	220-276	1
DRAWN BY:	APPROVED BY:	
M. Boyd	L. Berry	



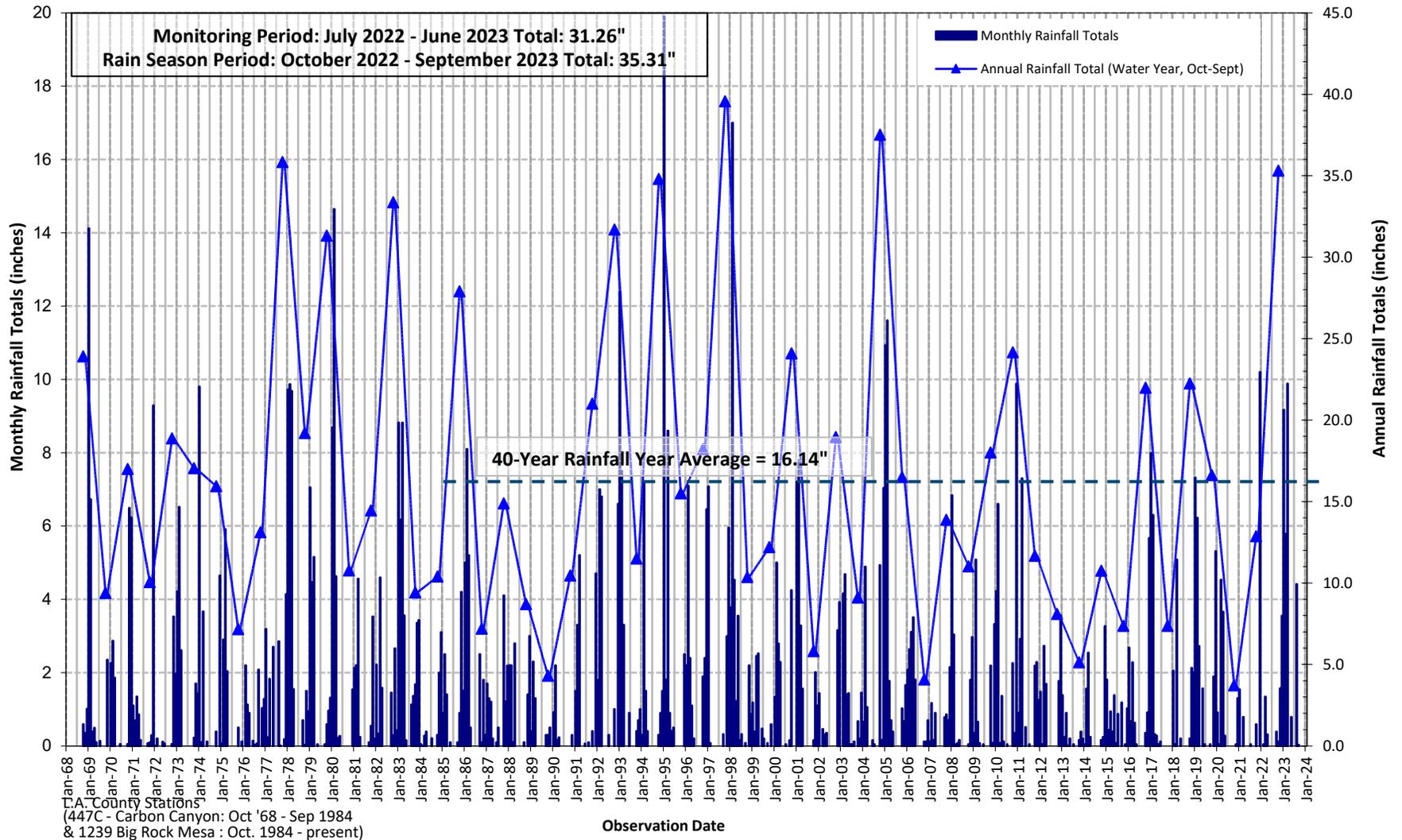
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Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

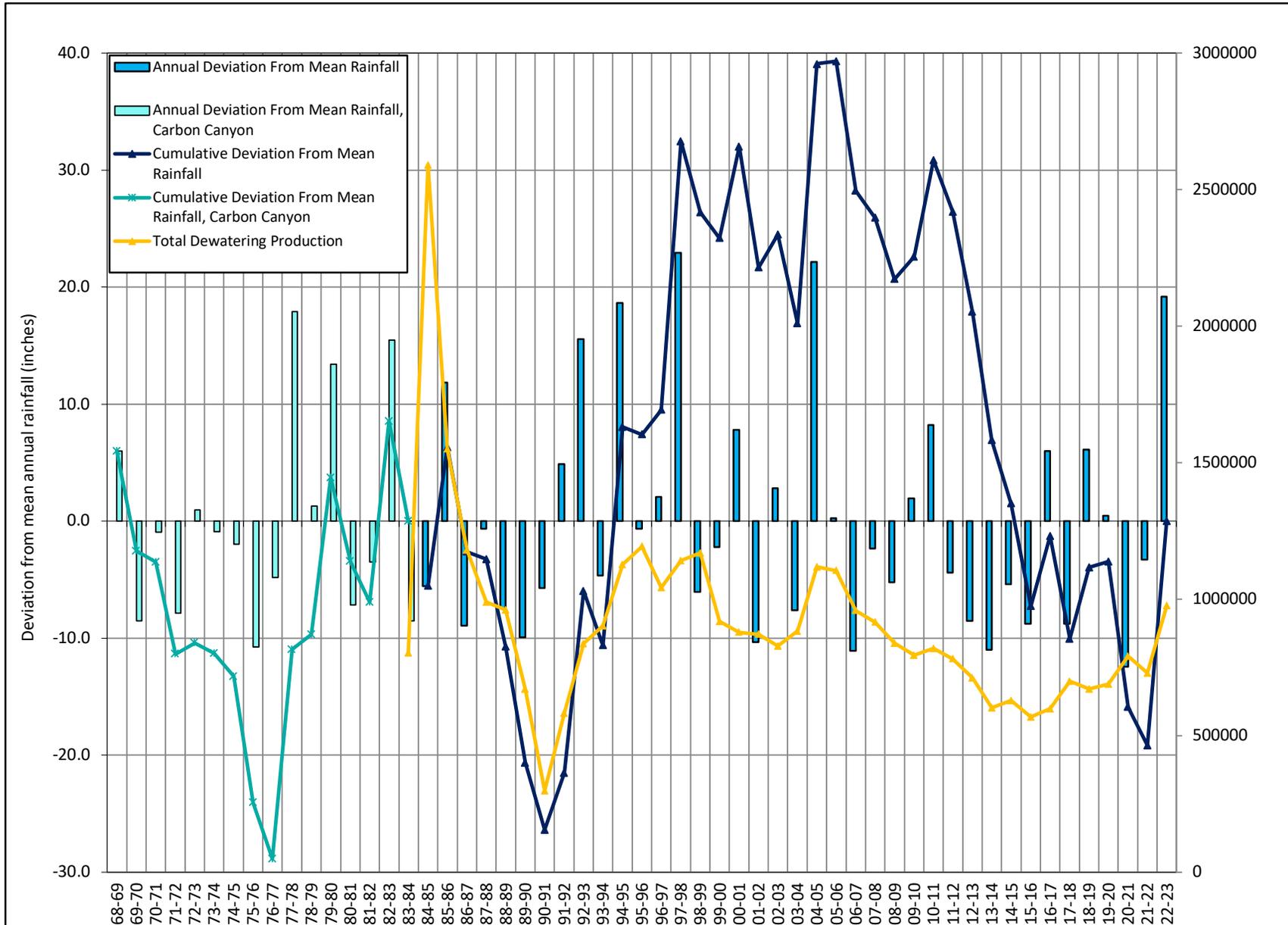
FY 22/23 Facilities Maintenance Log

Row ID	Date Entered	Facility	Description/Observation	Maintenance Performed and Status
<b>Dewatering Wells</b>				
1	5/22	W-2	Reinstalled new pump/motor with original drop pipe and sounding tube after completion of well rehabilitation.	<ul style="list-style-type: none"> <li>7/5/22 CP installs new pump and /motor with the same drop pipe and sounding tube as prior. Well back in service</li> </ul>
2	5/22	W-2	5/24/22 during well assessment for W-2, noted faulty wiring in well vault from junction box to pump, wiring not waterproofed	<ul style="list-style-type: none"> <li>7/5/22: QE installs new wiring and waterproof junction box.</li> </ul>
3	6/22	W-16	6/16/22 during monthly production checks for June, sudden decrease in production noted from 8,000 gpd to 1,400 gpd, technician observed meter was not moving during meter reading and W-16 normally flows nearly continuously. From 6/16/22 to 7/6/22 well production down to 14 gpd.	<ul style="list-style-type: none"> <li>7/6/22: Pump removed by CP, SWL at 164' bgs.</li> <li>Pump was disassembled and evaluated by CP found to be a burned out thrust-bearing, pump and motor need to be replaced.</li> <li>7/19/22: New pump and motor, sounding tube and flow meter installed, returned to service.</li> <li>7/20/23 installed transducer to check new pump performance</li> </ul>
4	8/22	W-2	8/1/22: not producing after recent repairs, well was rehabbed in June-July 2022, new pump/motor installed on 7/5/22.	<ul style="list-style-type: none"> <li>8/12/22: Yeh assessed well runs at 7 amps for less than one second and shut off at pump saver, no production. Yeh check with Quest to see if there was an issue in the panel, per Quest had completed the electrical with no issue.</li> <li>8/22/223 assessed by CP, 240 V, 7 amps, no production, shut off after &lt; 2s at pump saver. CP swapped out control box but same result, will need to pull pump and assess downhole.</li> <li>8/25/22 Yeh set up no parking both sides of Inland lane.</li> <li>8/26/22 CP removes and replaces pump and motor, now running at 6.4A, 14gpm. Well back in service</li> <li>CP assessed that issue was a short in downhole motor wiring caused motor to burn out, replacement work and parts will be warranty per CP.</li> </ul>
5	Pre- 2020	W-1	Well control box and panel are rusted and breaking apart, bottom of box rusted away door falling off.	9/8/22: Quest replaced well control panel and box with new panel, box, wiring and electronics
6	9/23	W-18	9/27/23: Well found to be not producing during water sampling	<ul style="list-style-type: none"> <li>10/3/22 assessed by CP as bad 30 A breaker, restarted and breaker got hot.</li> <li>10/5/22 CP replaces breaker with new 60 A breaker, well pumping 18 gpm at 23.6 A.</li> <li>9/30/22 Yeh sends photos of panel to Quest.</li> <li>10/6/22 assessed by Quest, simplified/cleaned up wiring in control panel, noted burnt components in control box that will need to be replaced, pump is still running and left running.</li> <li>10/27/22 Quest removes and replaces control box.</li> </ul>
7	1/23	BYA-1	1/26/23: routine Yeh assessment and transducer download, pump running continuously at 12.5 gpm, 7.8 A, but water level rising in well, and in SP-16A. DTW in well = 128', pump is not drawing down	<ul style="list-style-type: none"> <li>1/28/23 Yeh re-assessment 11.8 gpm, water level on transducer is rising.</li> <li>1/30/23 Yeh reassessment pumping at 11.25 gpm.</li> <li>2/2/23 CP removes and replaces 10gs10 pump with 13gs10 pump. Old pump intake clogged with rusty colored bacterial slime. Coast tested old pump in tank for possible re-use however it was not salvageable.</li> <li>2/5/23 well only 7 gpm, should be 18 to 23 gpm, possible clogged meter.</li> <li>2/7/23 CP replaces meter pumps about the same gpm,</li> <li>2/9/23 CP measures flow volume without an inline meter and disconnected form discharge line, flow at 18 gpm likely clogged 1" discharge line- make new maintenance item</li> </ul>
8	2/23	BYA-1	2/9/2023: BYA-1, new 13gs10 pump is not discharging per calculations when installed through the discharge line	<ul style="list-style-type: none"> <li>2/8/23 replaced clogged flow meter flow raised up to 7.5 gpm.</li> </ul>

Row ID	Date Entered	Facility	Description/Observation	Maintenance Performed and Status
<b>Dewatering Wells</b>				
				<ul style="list-style-type: none"> <li>2/28/23 yeh observed fittings at top of well head are leaking and spraying water back into vault likely due to back pressure.</li> <li>3/6/2023 CP repaired fittings, pumping 7.5 gpm. Still pumping below calculated rate.</li> <li>Pending review of discharge line status, and confirming as-built plumbing, well continuing to pump at 10k gpd.</li> </ul>
<b>Hydraugers</b>				
9	September	HD-26	broken subsurface discharge line at HD-26 flooding shoulder of PCH	<ul style="list-style-type: none"> <li>Temporary repairs made, hydrauger is discharging into storm drain with temporary flexible pipe, shoulder of PCH has dried up</li> </ul>
10	1/23	HD-43	1/6/23 post storm assessment, rockfall damages observed, conveyance line broken and distal 100 feet buried by rockfall debris	<ul style="list-style-type: none"> <li>2/28/23 Yeh repaired broken pvc lines and excavated and realigned flow to catchment basin</li> </ul>
11	1/23	HD-28, -29	1/6/23 post-storm assessment, Hydraugers buried by rockfall, appear to be leaking through rockfall debris	<ul style="list-style-type: none"> <li>Hydraugers are partially excavated and need repairs, pending assessment of conveyance line to Port 1</li> </ul>
12	1/23	HD-34	1/6/23 post-storm assessment, boulder has fallen onto remains of rock-protection cage previously destroyed by vehicle	<ul style="list-style-type: none"> <li>Hydrauger is typically low-no flowing, pending assessment of conveyance to Port 1</li> <li>Hydrauger is appearing to leak in subsurface, discharge was excavated, and leaks located.</li> <li>Need to troubleshoot if hydrauger was flowing or if it was flow from HD-9 backing up in the conveyance</li> </ul>
13	4/23	HD-9	4/24/23: Assessment of persistent ponding areas of PCH determines likely break of HD-9 in subsurface	<ul style="list-style-type: none"> <li>Hydrauger discharge to Port 1 conveyance has been excavated and leaks located, waiting for soil conditions to dry to reinstall and check for leaks</li> </ul>
14	4/23	HD-43	4/24/23: hydrauger conveyance broken and buried by rockfall during March rain	<ul style="list-style-type: none"> <li>Hydrauger conveyance was repaired after January rain, considering options to improve position of conveyance.</li> </ul>

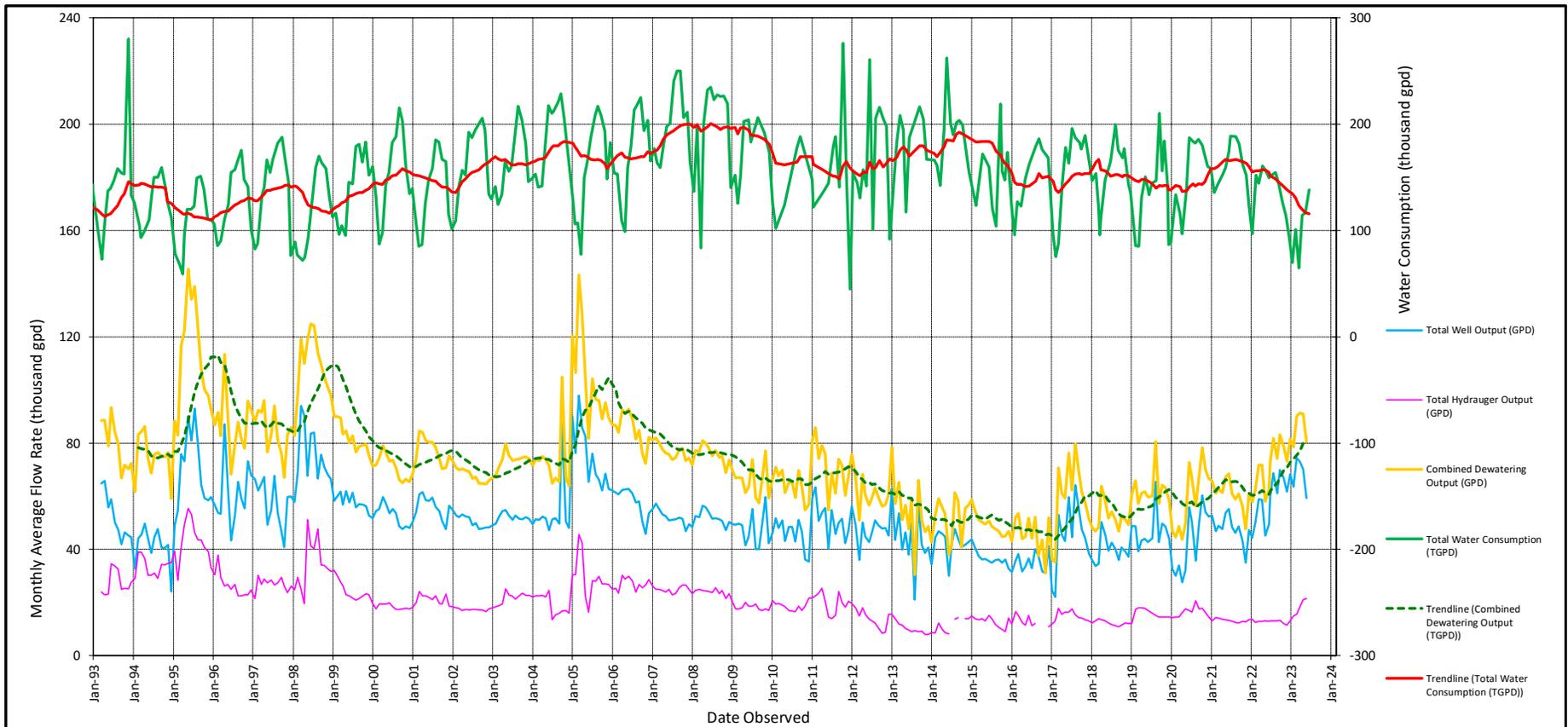


**RAINFALL GRAPH**  
 Landslide Assessment Districts  
 Malibu, California



**ANNUAL AND CUMULATIVE DEVIATION FROM MEAN RAINFALL VS TOTAL DEWATERING PRODUCTION**

Big Rock Mesa Landslide Assessment District  
 Malibu, California



**TOTAL DEWATERING PRODUCTION AND TOTAL WATER CONSUMPTION**  
**Wells and Hydraugers(Combined)/Total Water Consumption**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California

## APPENDIX A - GROUNDWATER LEVELS

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<b>Big Rock Mesa: Standpipe Monitoring Wells and Piezometer Information</b>				
<b>Piezometer ID</b>	<b>Surface Elev. (ft)</b>	<b>Depth (ft)</b>	<b>Perforation Interval Elevation (ft)</b>	<b>Installer</b>
<b>PCH Standpipe Monitoring Wells</b>				
SP-11	27	58	Unknown	Evans
SP-12	26	40	Every 5 feet <sup>1</sup>	Evans
SP-14	25	30	Every 5 feet <sup>1</sup>	Evans
SP-15	20	82	Every 5 feet <sup>1</sup>	Evans
SP-19	25	82	Every 5 feet <sup>1</sup>	Evans
SP-27A	29	94	Every 5 feet <sup>1</sup>	Evans
SP-29	27	138	-111 to -106	Evans
SP-30	29	128	unknown	Evans
<b>Bluff Standpipe Monitoring Wells</b>				
SP-10	295	332	Every 5 feet <sup>1</sup>	Evans
SP-28	270	358	Every 5 feet <sup>1</sup>	Evans
SP-32	233	354	Every 5 feet <sup>1</sup>	Evans
SP-34	270	382	-112 to -107	BYA
<b>Headscarp Standpipe Monitoring Wells</b>				
SP-26	745	346	Every 5 feet <sup>1</sup>	Conv
<b>Central Standpipe Monitoring wells and Piezometers</b>				
SP-9A	365	300	Every 5 feet <sup>1</sup>	Evans
SP-16	285	240	Every 5 feet <sup>1</sup>	Evans
SP-16A	285	392	Every 5 feet <sup>1</sup>	Evans
SP-17	540	192	Every 5 feet <sup>1</sup>	Evans
SP-17A	540	238	Every 5 feet <sup>1</sup>	BYA
SP-24	370	382	Every 5 feet <sup>1</sup>	Conv
SP-35	345	396	-51 to -46	BYA
SP-36	380	254	120 to 125	BYA
<b>Western Standpipe Monitoring Wells</b>				
SP-20	430	326	Every 5 feet <sup>1</sup>	Conv
SP-21	660	280	Every 5 feet <sup>1</sup>	Evans
SP-22	780	332	Every 5 feet <sup>1</sup>	Conv
SP-23	860	398	Every 5 feet <sup>1</sup>	Conv
<b>Eastern Standpipe Monitoring Wells and Piezometers</b>				
PC-1	250	160	87.5 to 90	BYA
SP-3	212	132	Every 5 feet <sup>1</sup>	Evans
SP-3A	203	246	Every 5 feet <sup>1</sup>	Evans
SP-33	208	374	Every 5 feet <sup>1</sup>	Evans

Evans - D.A. Evans

Converse - Converse Consultants

BYA - Bing Yen and Associates

<sup>1</sup> 1/4" holes drilled in casing every 5' (D.A. Evans 1986)

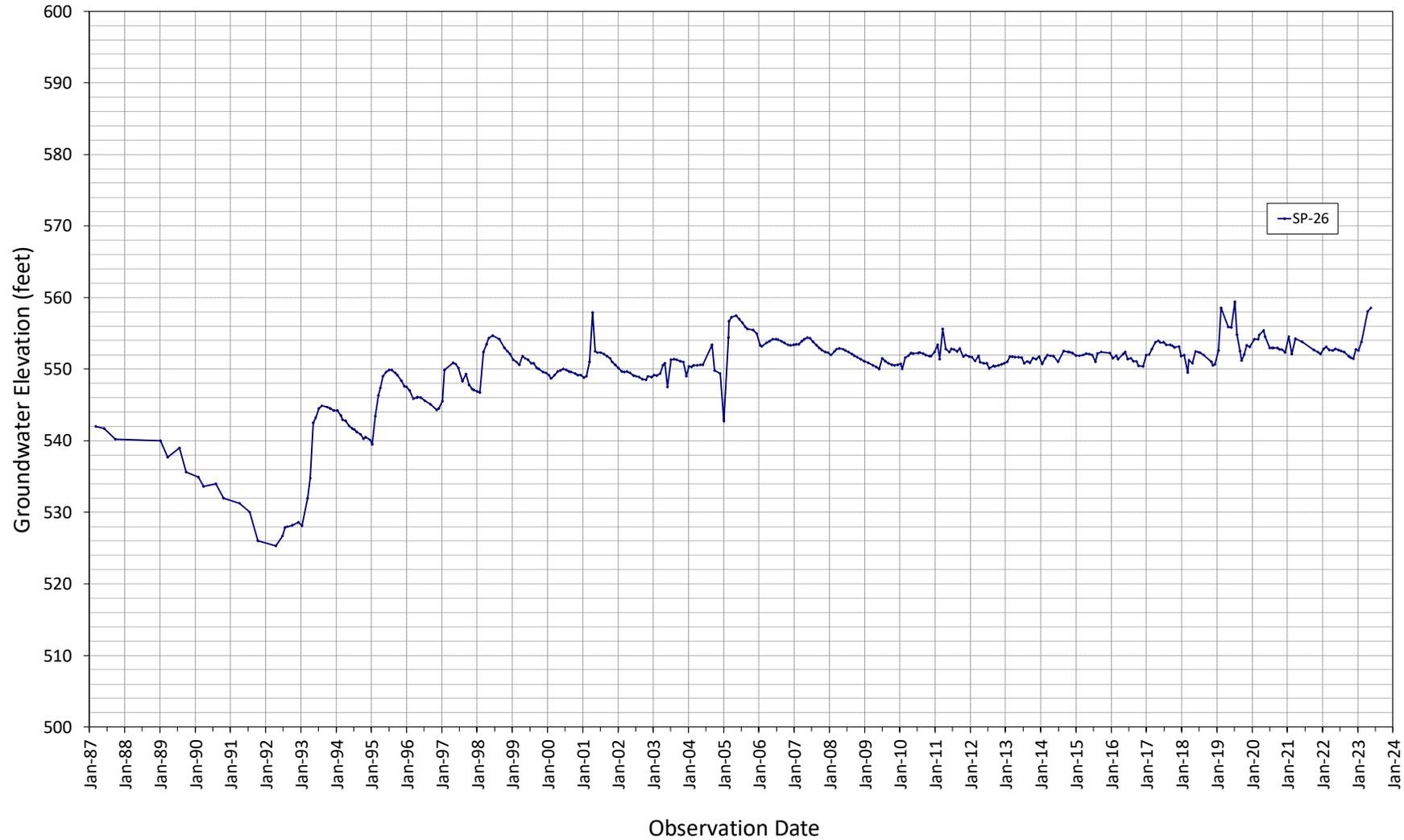
**STANDPIPE MONITORING WELL AND PIEZOMETER INFORMATION**

Big Rock Mesa Landslide Assessment District

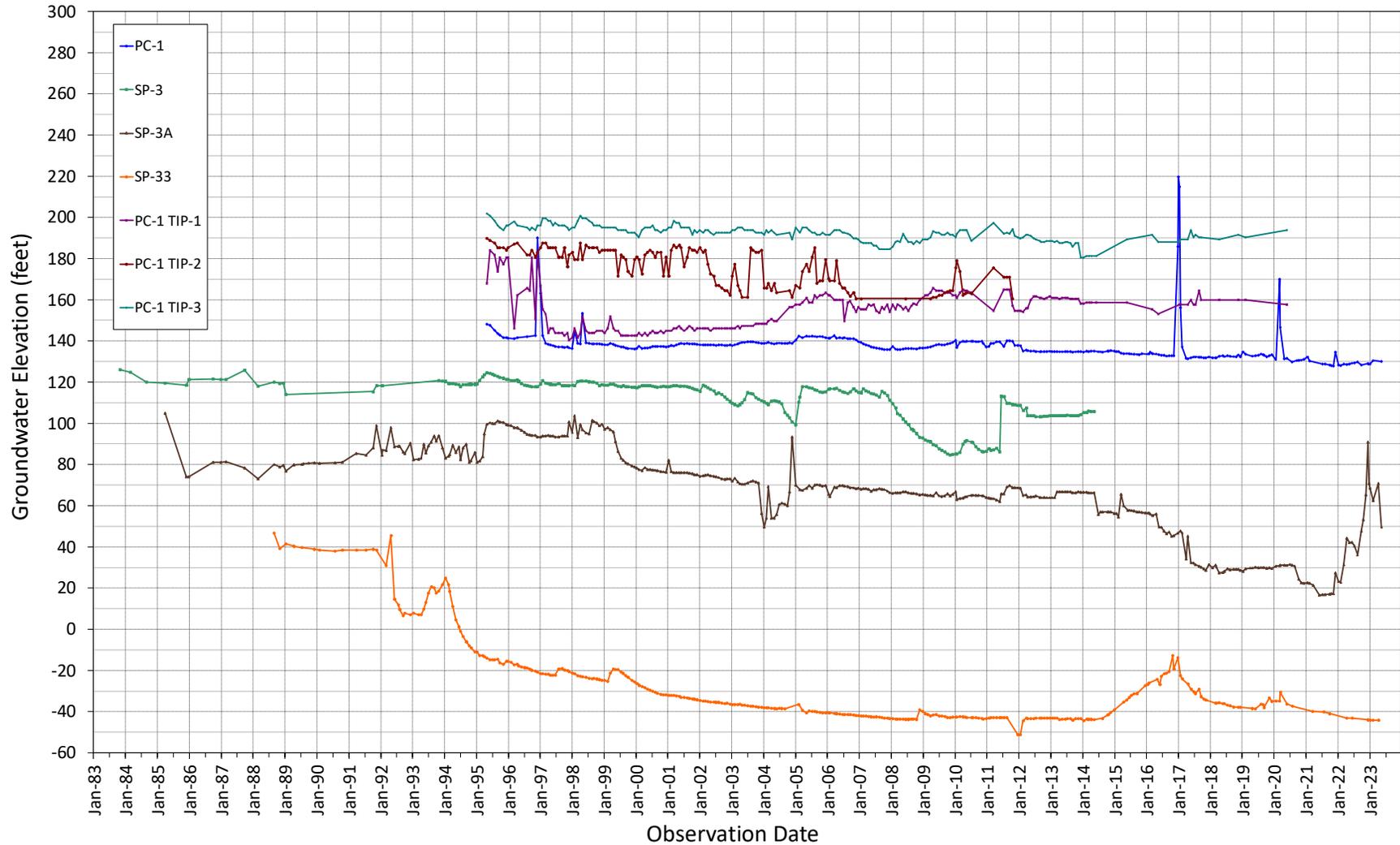
Malibu, California

<b>PNEUMATIC PIEZOMETER INFORMATION</b>					
<b>Piezometer ID</b>	<b>Surface Elev. (ft)</b>	<b>Tip No.</b>	<b>TIP DEPTH (ft.)</b>	<b>INSTALL BY</b>	<b>STATUS</b>
W-10**	432	230	230	BYA	Water level reported, data-logging transducer installed
W-11**	507	214	214	BYA	Air-line present, no sounder access, no data reported
W-15**	295	164	164	BYA	Air-line present, no sounder access, no data reported
PC-1	250	TIP-1	120	BYA	Functioning as of 2020, not measured during monitoring year
		TIP-2	90		0 PSI since November 2011
		TIP-3	70		Functioning as of 2020, not measured during monitoring year
		TIP-4	40		Non-Functioning, no return air flow
		TIP-5	20		Non-Functioning, no return air flow
SP-5A*	NA	TIP-1		BYA	Non-functioning - Covered by asphalt pavement
		TIP-2	NA		
		TIP-3			
SP-8A*	NA	TIP-1		BYA	Non-functioning - Covered by landslide
		TIP-2	NA		
		TIP-3			
SP-17A*	540	TIP-1	Unknown	BYA	Non-functioning, no return air flow
		TIP-2	Unknown		
		TIP-3	Unknown		
		TIP-4	Unknown		
		TIP-5	Unknown		
SP-34	270	TIP-1	381	BYA	Functioning as of 2020, not measured during monitoring year
		TIP-2	282		Functioning as of 2020, not measured during monitoring year
		TIP-3	182		Low PSI since installation, not reported
		TIP-4	82		Non-Functioning, no return air flow
SP-35	345	TIP-1	393	BYA	Functioning as of 2020, not measured during monitoring year
		TIP-2	293		Functioning as of 2020, not measured during monitoring year
		TIP-3	193		Functioning as of 2020, not measured during monitoring year
		TIP-4	98		Non-Functioning, no return air flow, not reported
SP-36	380	TIP-1	255	BYA	Functioning as of 2020, not measured during monitoring year
		TIP-2	195		Functioning as of 2020, not measured during monitoring year
		TIP-3	95		0 PSI since installation, not reported
BYA-2*	665	TIP-1	Unknown	BYA	Non-functioning, no return air flow
		TIP-2	Unknown		
		TIP-3	Unknown		
BYA-3A*	NA	TIP-1		BYA	Non-Functioning
		TIP-2			
		TIP-3	NA		
		TIP-4			
BYA-4A*	NA	TIP-1		BYA	Non-functioning, no return air flow
		TIP-2			
		TIP-3	NA		
		TIP-4			
		TIP-5			
		TIP-6			
BYA-5A*	NA	TIP-1		BYA	Non-Functioning, Paved over
		TIP-2	NA		
		TIP-3			
		TIP-4			
GEO-2 (OB-2)*	305	TIP-1		GS	Non-Functioning
		TIP-2	NA		
		TIP-3			
GEO-1*	NA	TIP-1		GS	Restricted Access (possibly malfunctioning)
		TIP-2	NA		
		TIP-3			

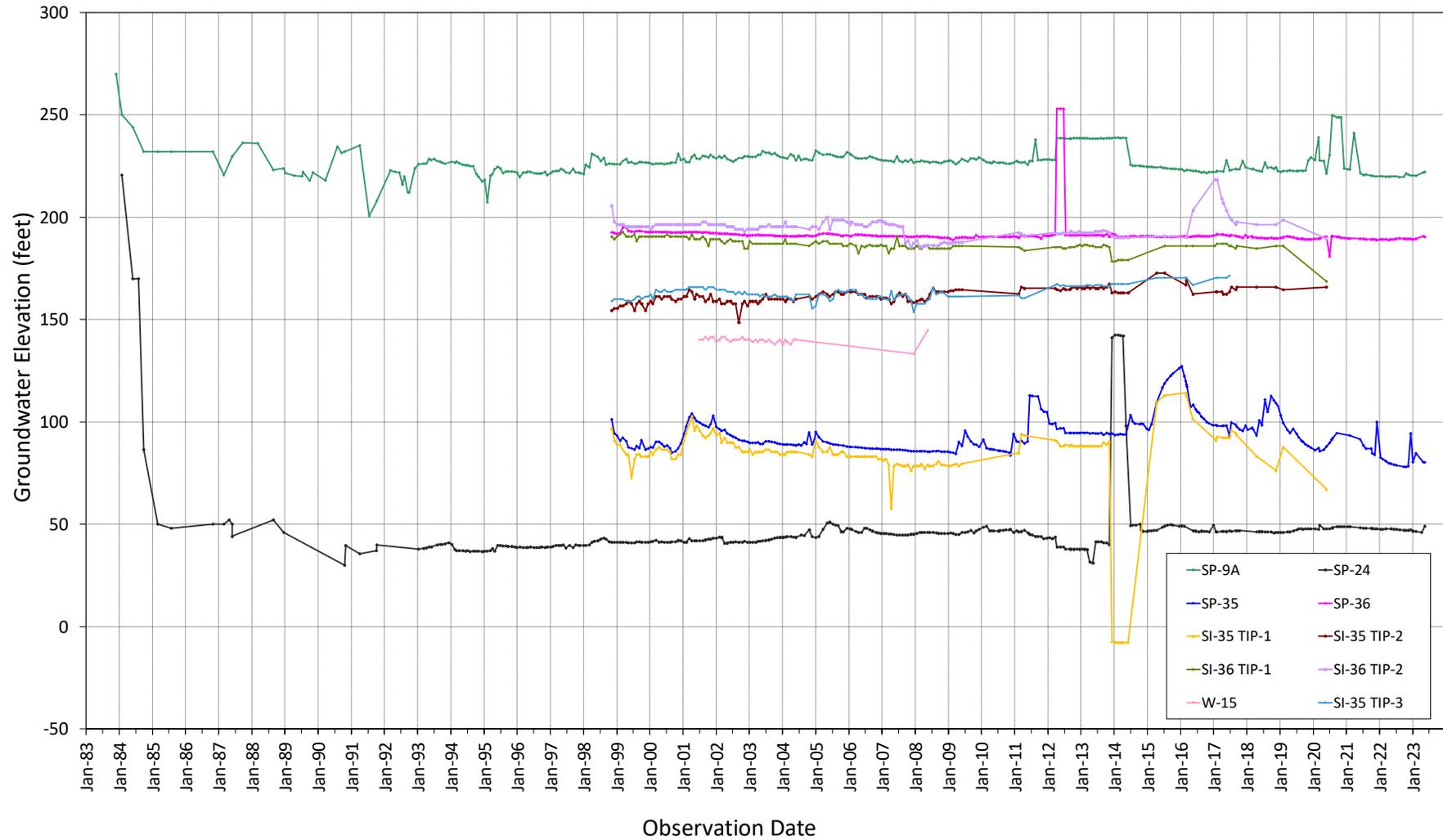
NOTE: \* Not functioning or no longer monitored pneumatic piezometer  
 \*\* Inactive dewatering well air-line



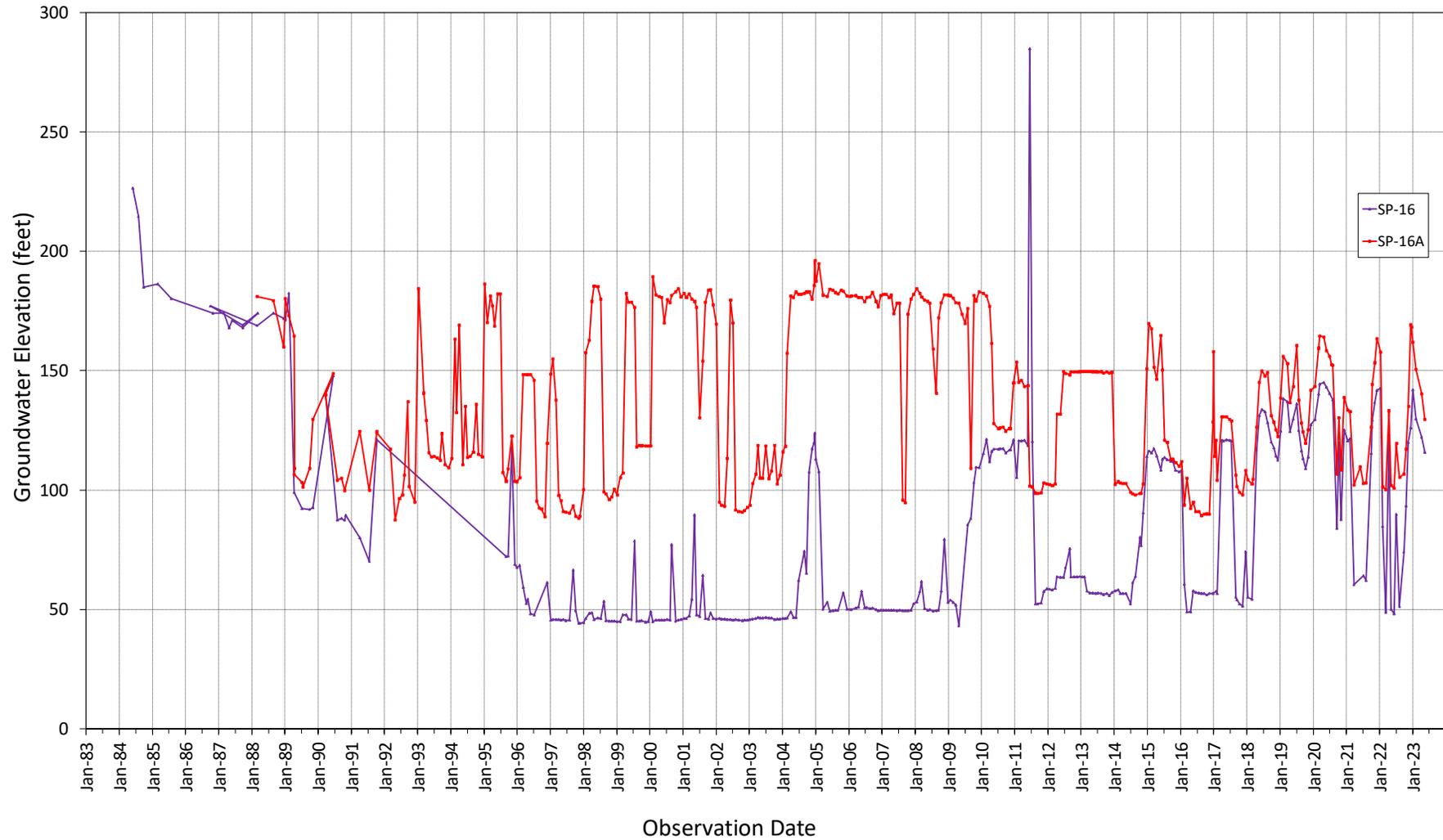
**GROUNDWATER HYDROGRAPH**  
**Headscape Area**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



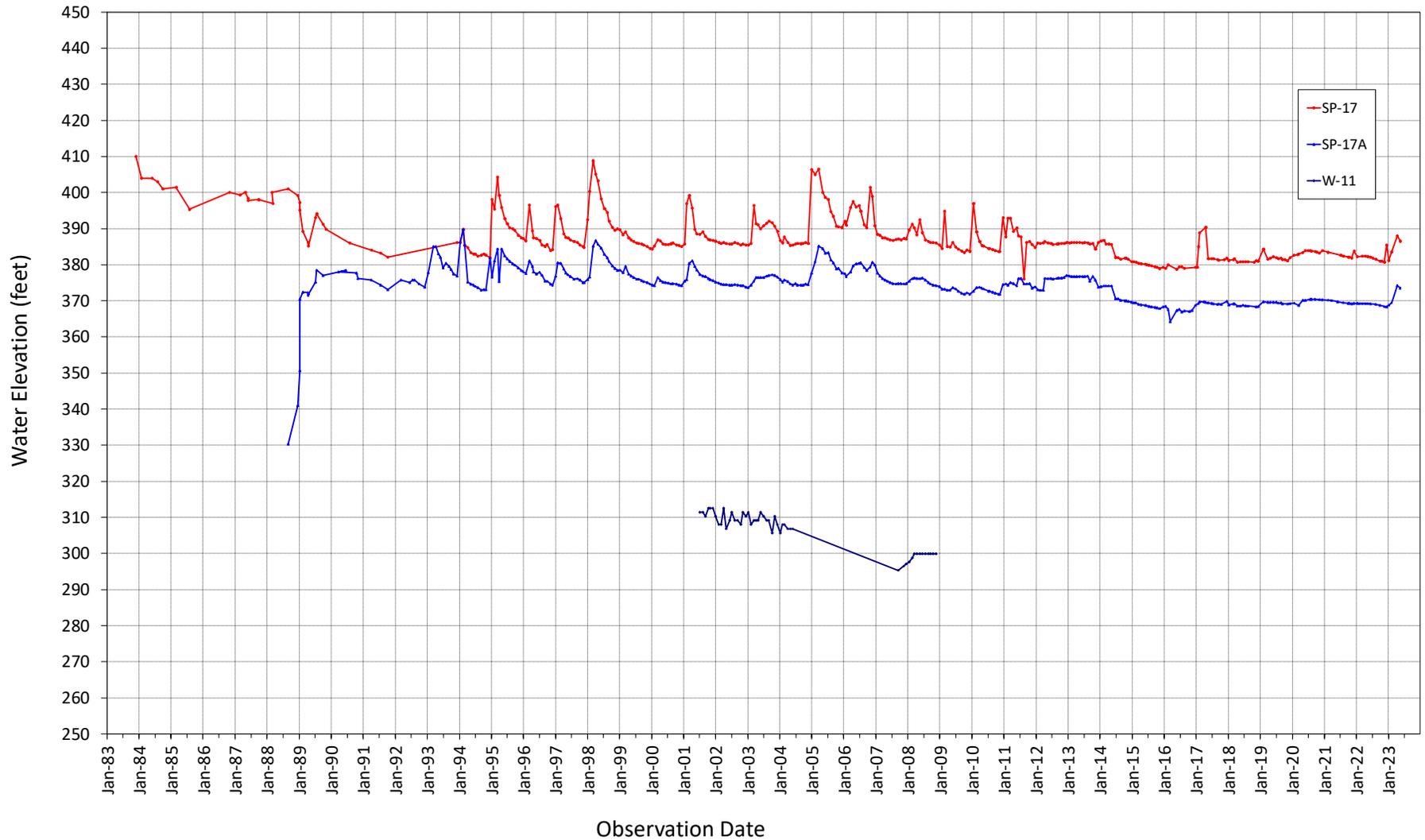
**GROUNDWATER HYDROGRAPH**  
**Eastern Mesa Region**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



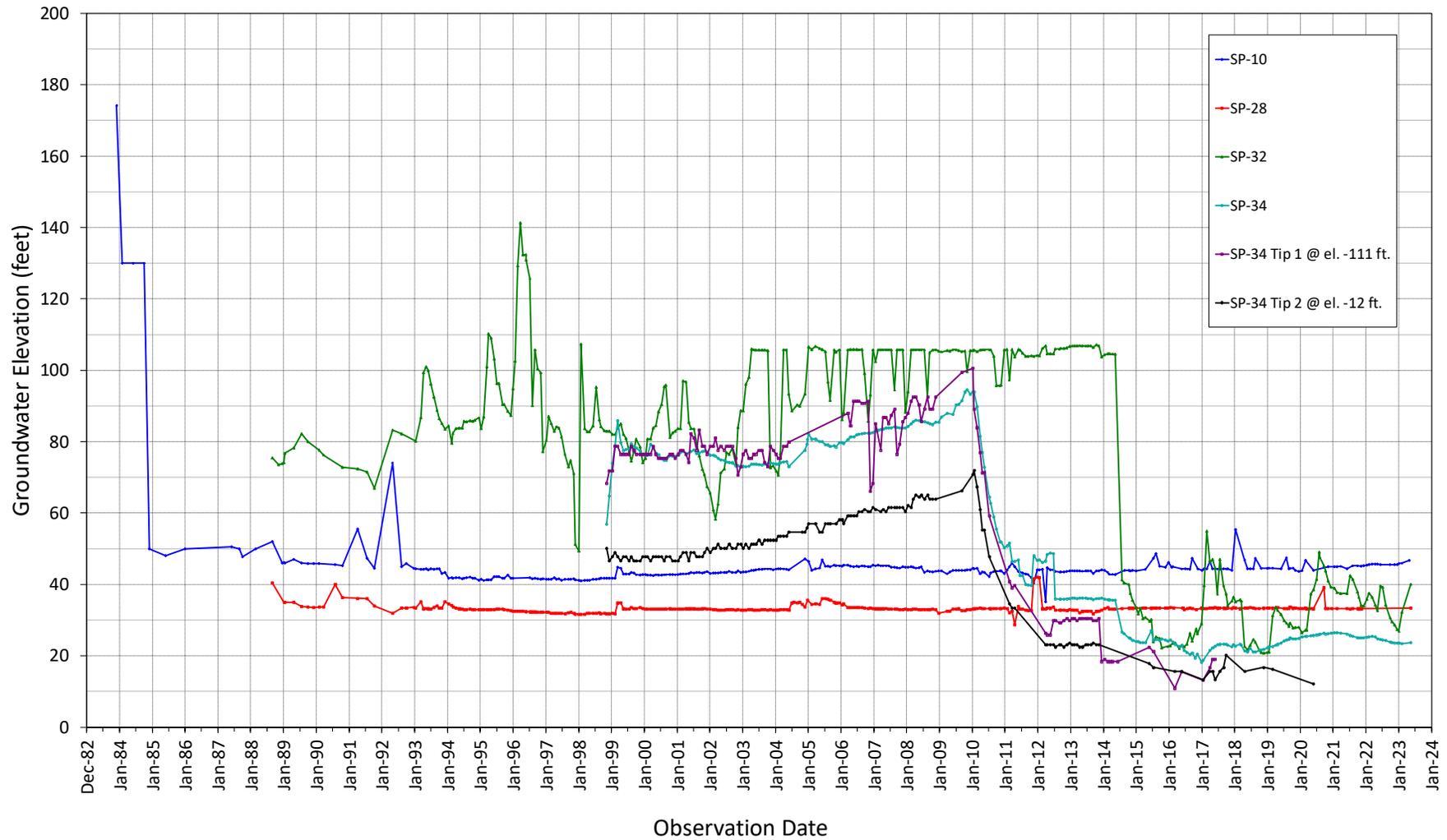
**GROUNDWATER HYDROGRAPH**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



**GROUNDWATER HYDROGRAPH**  
**Central Mesa Region**  
Big Rock Mesa Landslide Assessment District  
Malibu, California

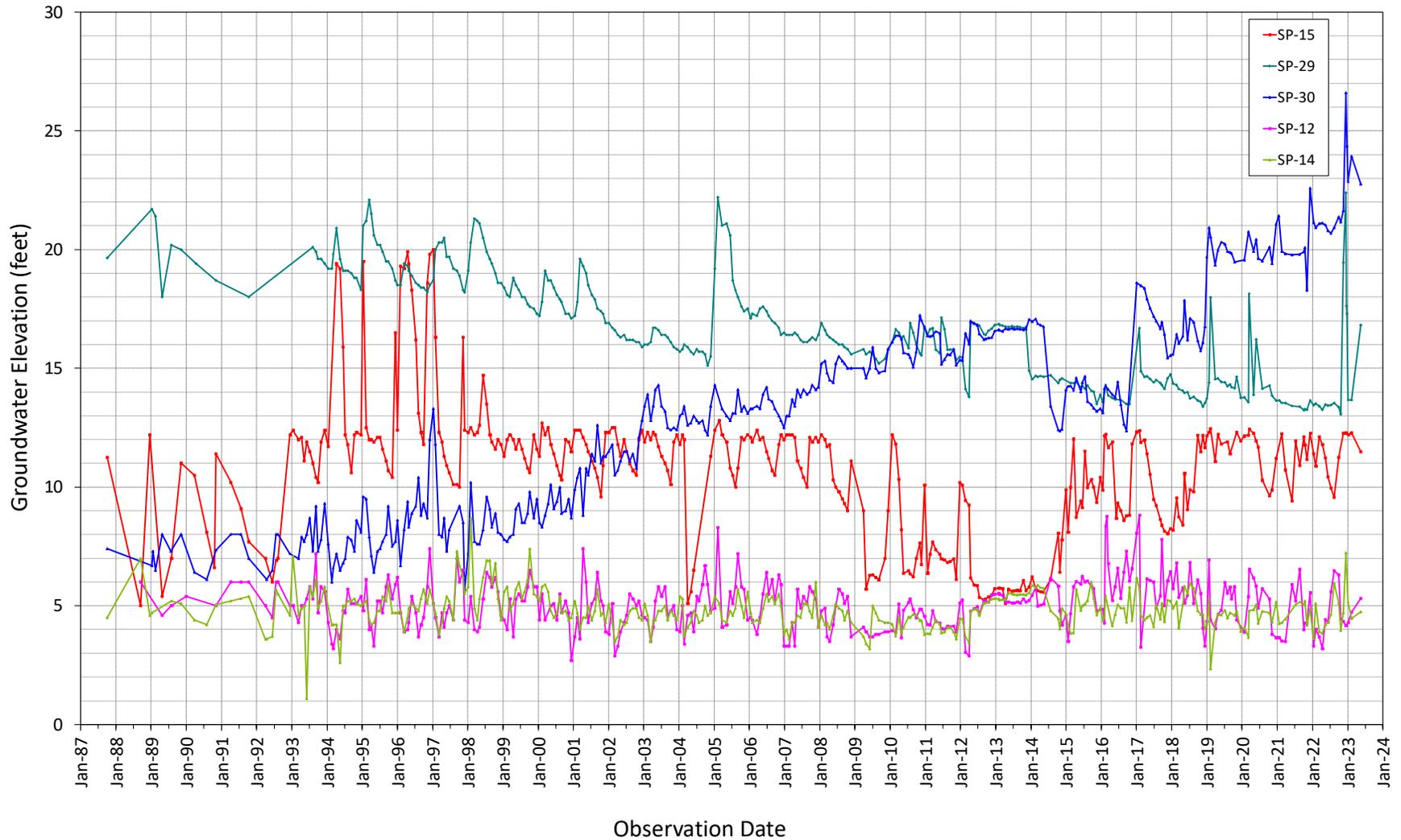


**GROUNDWATER HYDROGRAPH**  
Central Mesa Region  
Big Rock Mesa Landslide Assessment District  
Malibu, California

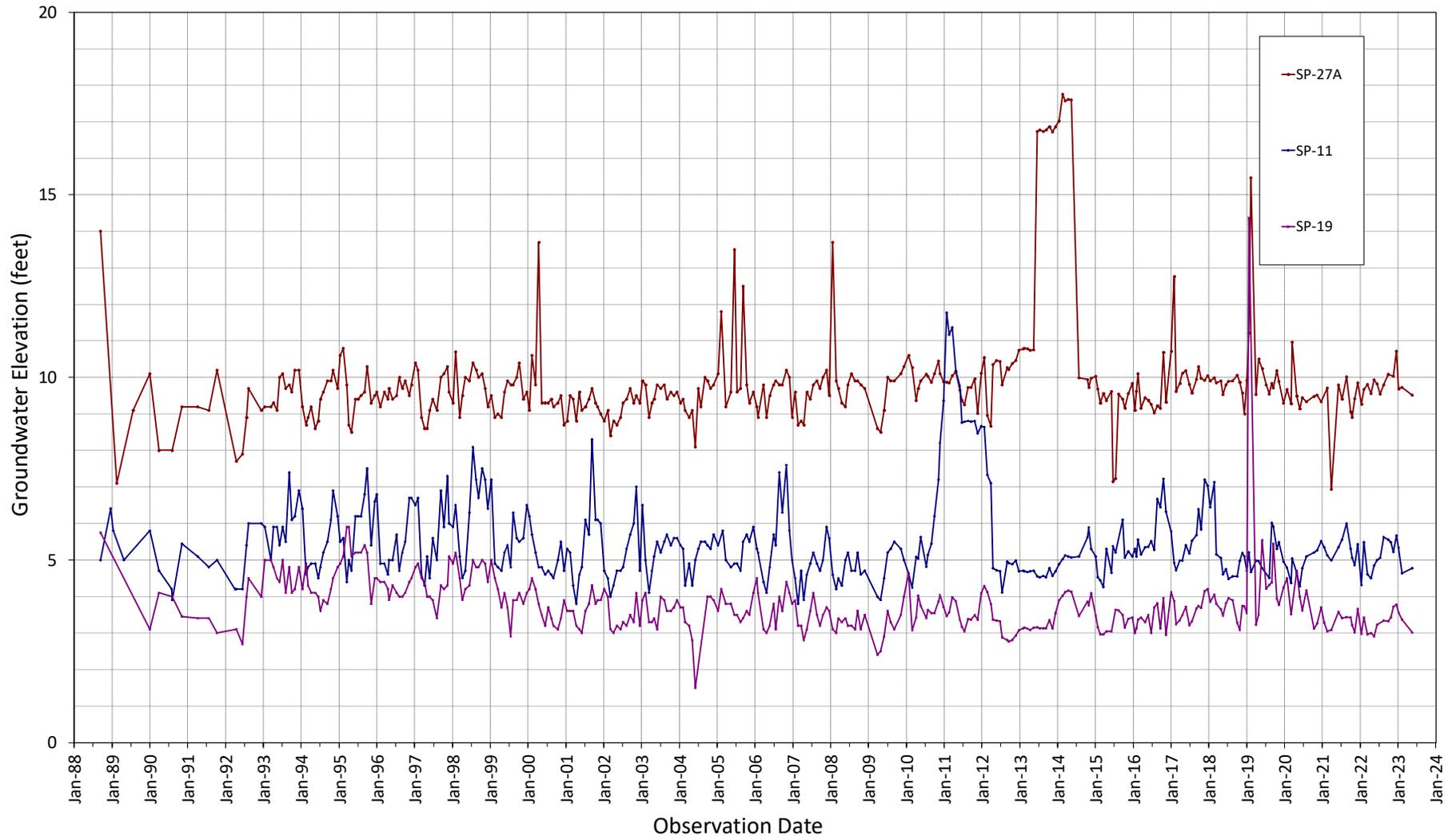


**GROUNDWATER HYDROGRAPH**  
**Bluff Region**

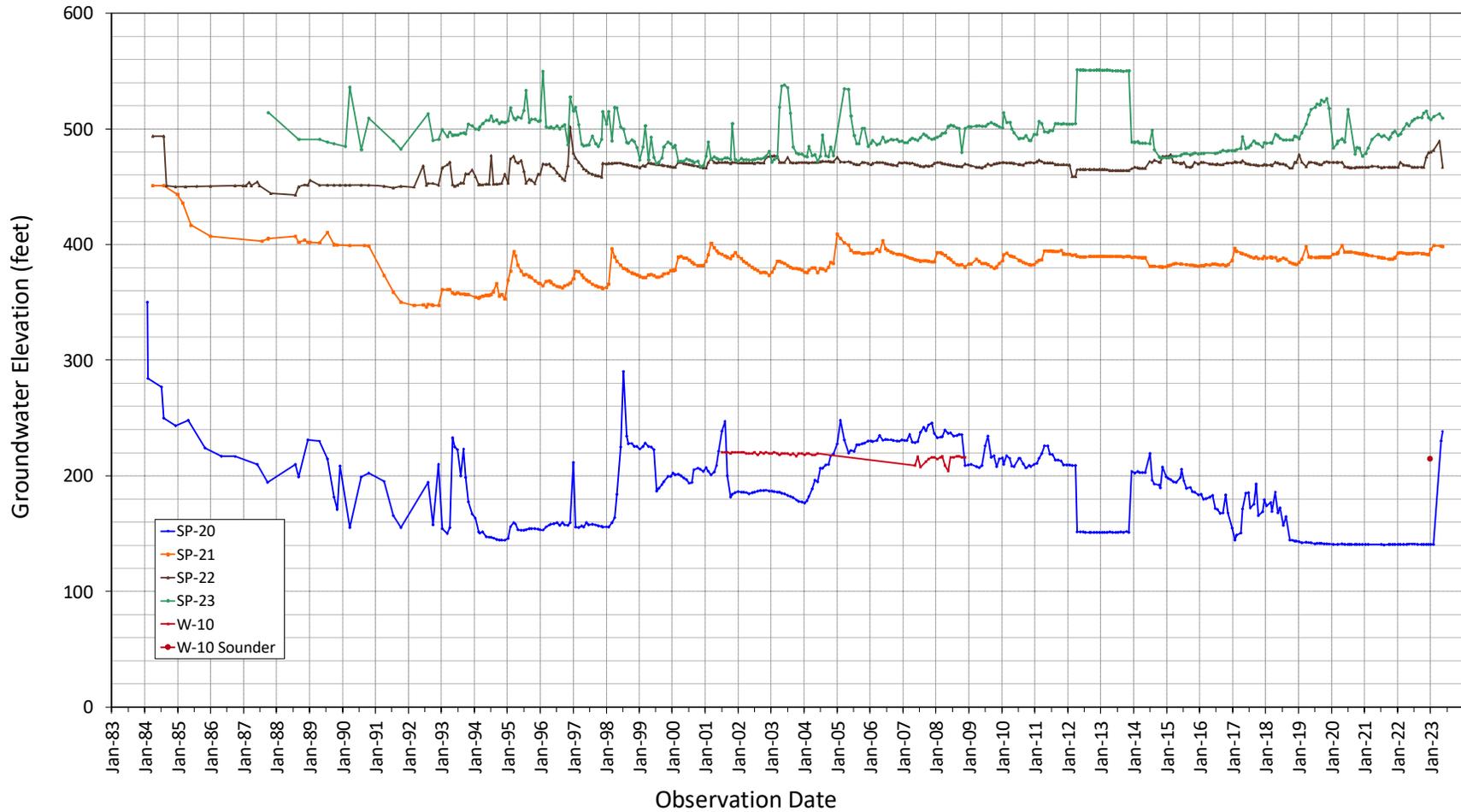
Big Rock Mesa Landslide Assessment District  
 Malibu, California



**GROUNDWATER HYDROGRAPH**  
**Pacific Coast Highway (Western Half)**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



**GROUNDWATER HYDROGRAPH**  
**Pacific Coast Highway (Eastern Half)**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



**GROUNDWATER HYDROGRAPH**  
**Western Extension**  
Big Rock Mesa Landslide Assessment District  
Malibu, California

## APPENDIX B - SLOPE INCLINOMETERS

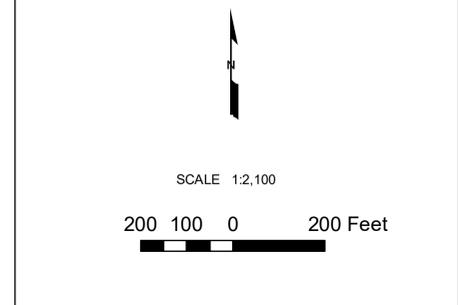
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**Inclinometers**  
**Assessment District 98-1, Big Rock Mesa**  
**City of Malibu, California**

**Yeh and Associates, Inc.**  
 Geotechnical • Geological • Construction Services



- Approximate Limits of Primary Land Movement
  - - - Western Extension Boundary
  - Big Rock Mesa Landslide Assessment Boundary
- Inclinometer Status**
- Abandoned or Destroyed, Other
  - ⊗ SI Closure, Date and Depth of Closure (if known)
  - Functioning, Penetrates Slide Plane
  - Functioning, Installed Above or Outside Slide Plane
  - Monitoring Above Previous Closure, Date and Depth of Closure
  - ➔ Movement Bearing and Magnitude (inches)
  - ➔ Potential Movement Bearing and Magnitude (inches)

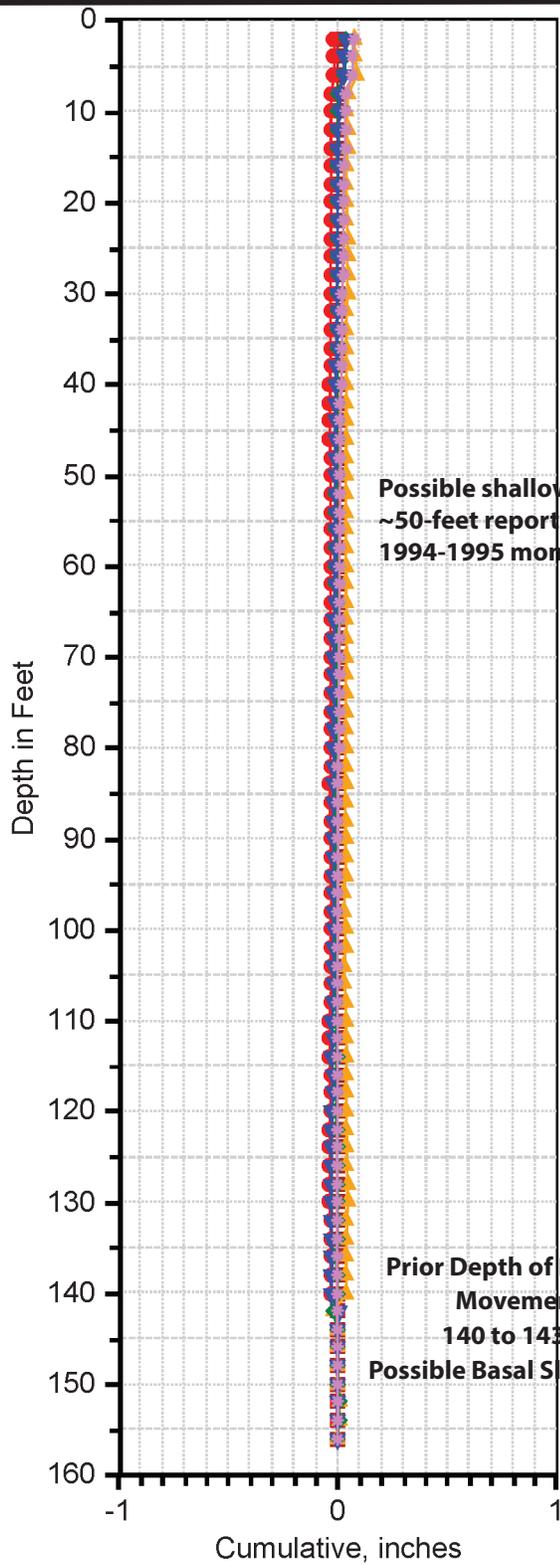


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October 2023	220-276	B-1
DRAWN BY:	APPROVED BY:	
M. Boyd	L. Berry	

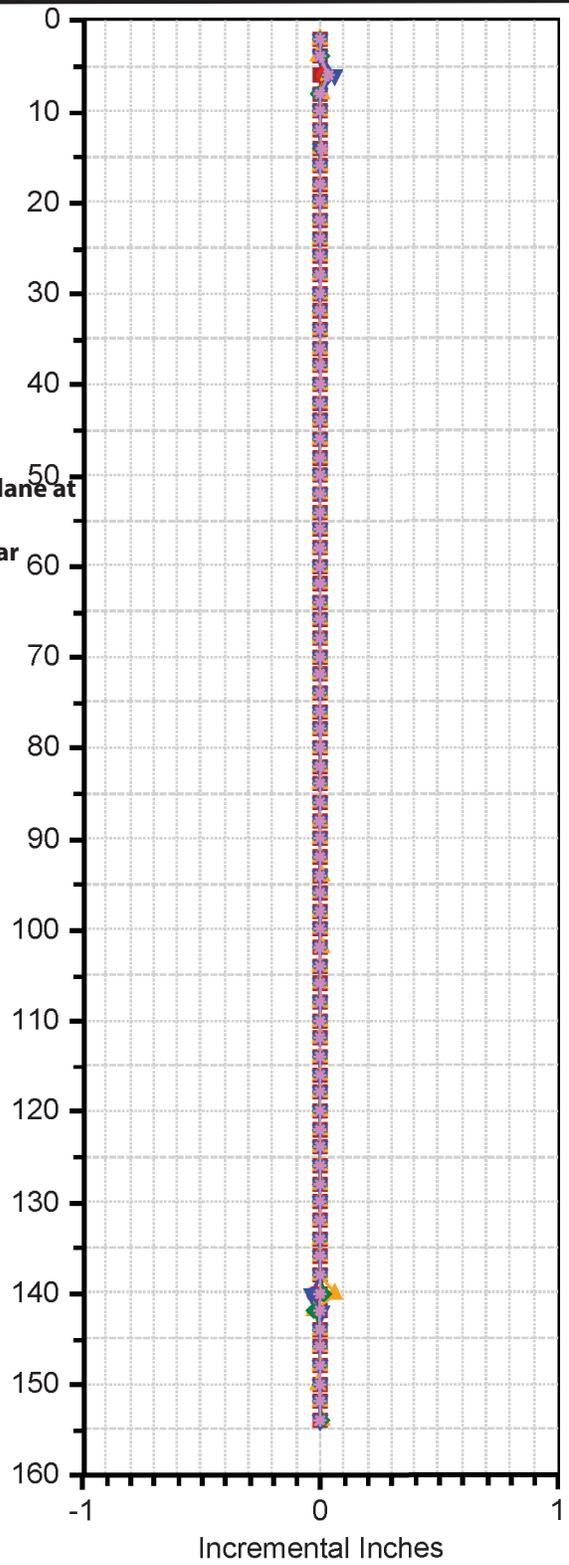
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Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geotalsystreisen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

A-  
10°



A+  
190°



- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/27/2023
- ▼ 6/9/2023
- ◆ 7/7/2023

- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/27/2023
- ▼ 6/9/2023
- ◆ 7/7/2023

Plot of Slope Inclinometer

PC-1

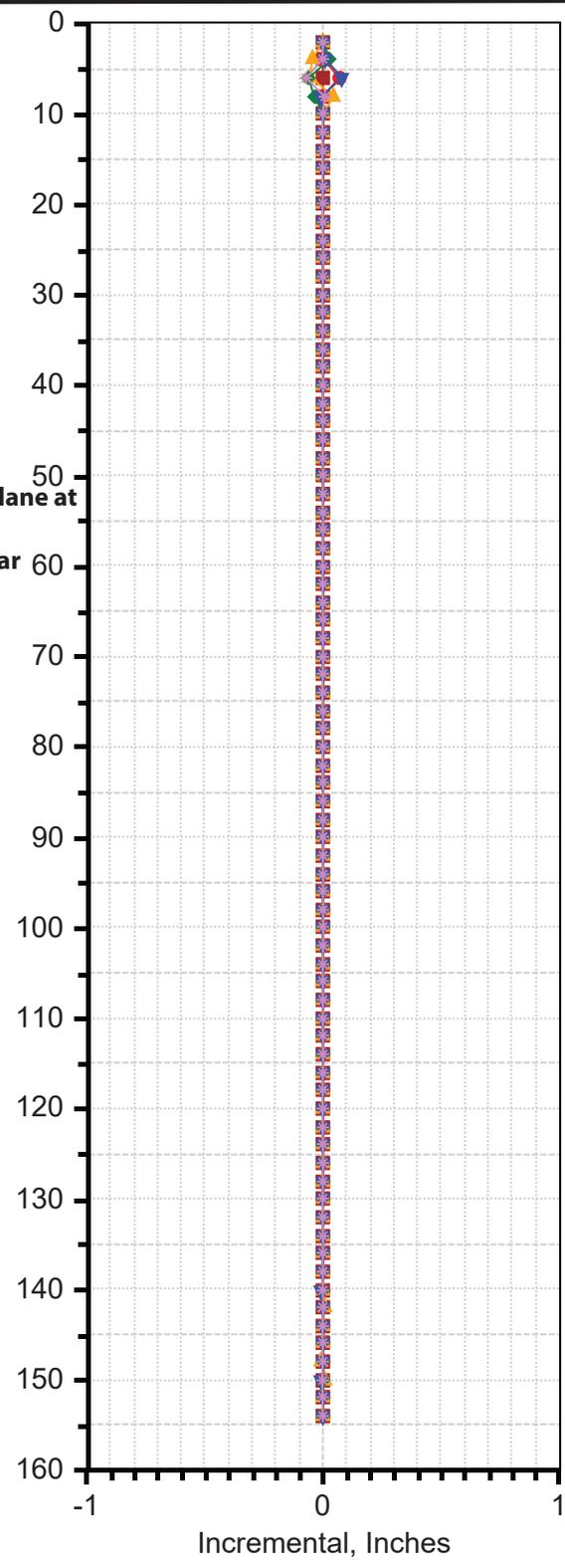
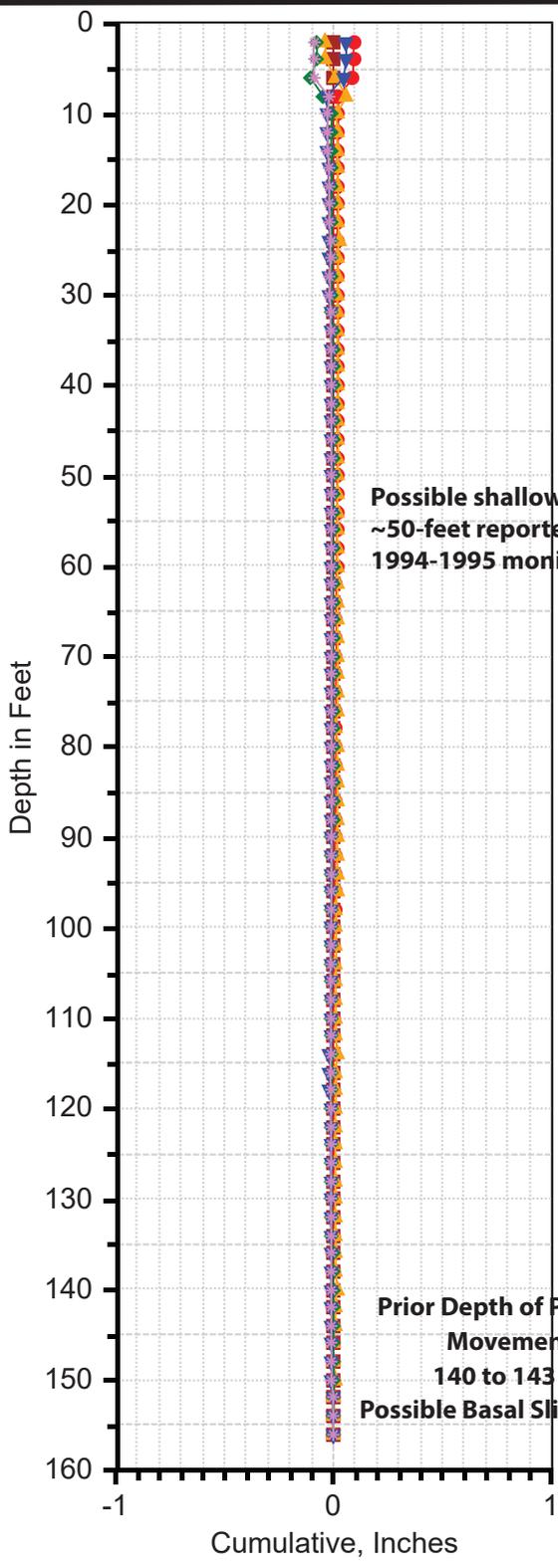
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Depth of Survey (ft): 154	Baseline Date: 11/30/2021	Corrections: None
Install Date: 6/1995	Installed Depth (ft): 160	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0



PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/4/2023	

**B-  
100°**

**B+  
280°**



- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/27/2023
- ▼ 6/9/2023
- ✦ 7/7/2023

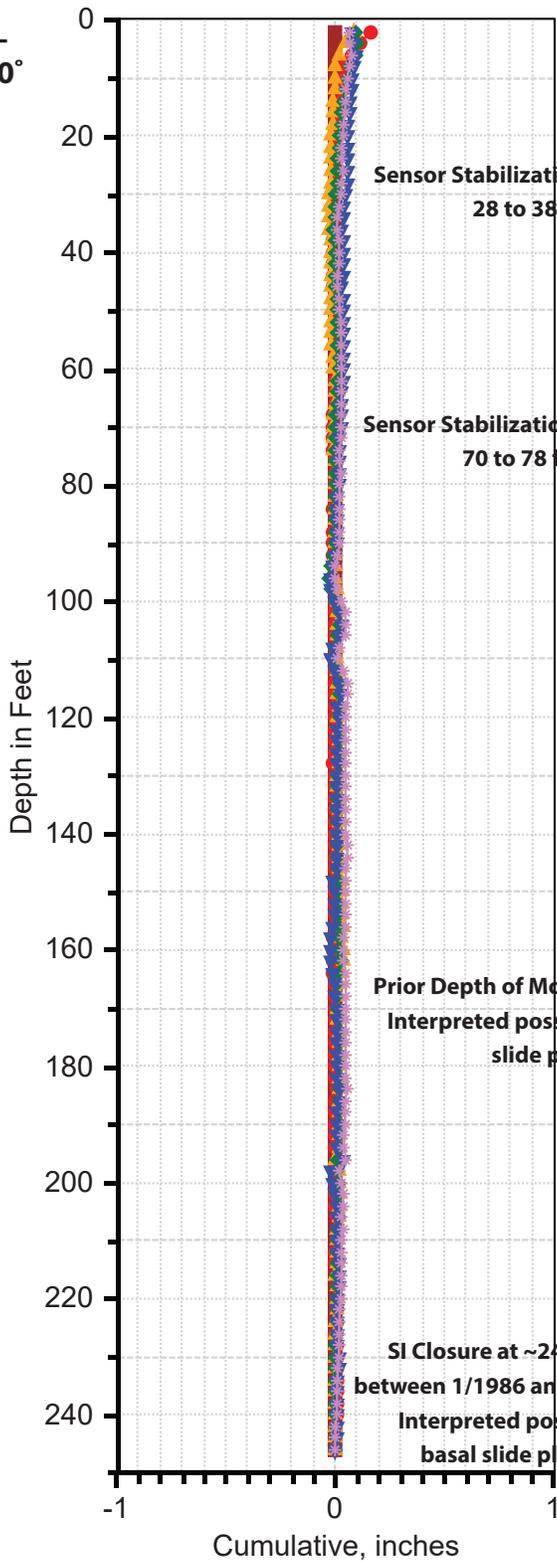
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- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/27/2023
- ▼ 6/9/2023
- ✦ 7/7/2023

<b>Plot of Slope Inclinometer</b>  <b>PC-1</b>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
	Depth of Survey (ft): 158	Baseline Date: 11/30/2021	
	Install Date: 6/1995	Installed Depth (ft): 160	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0	Corrections: None

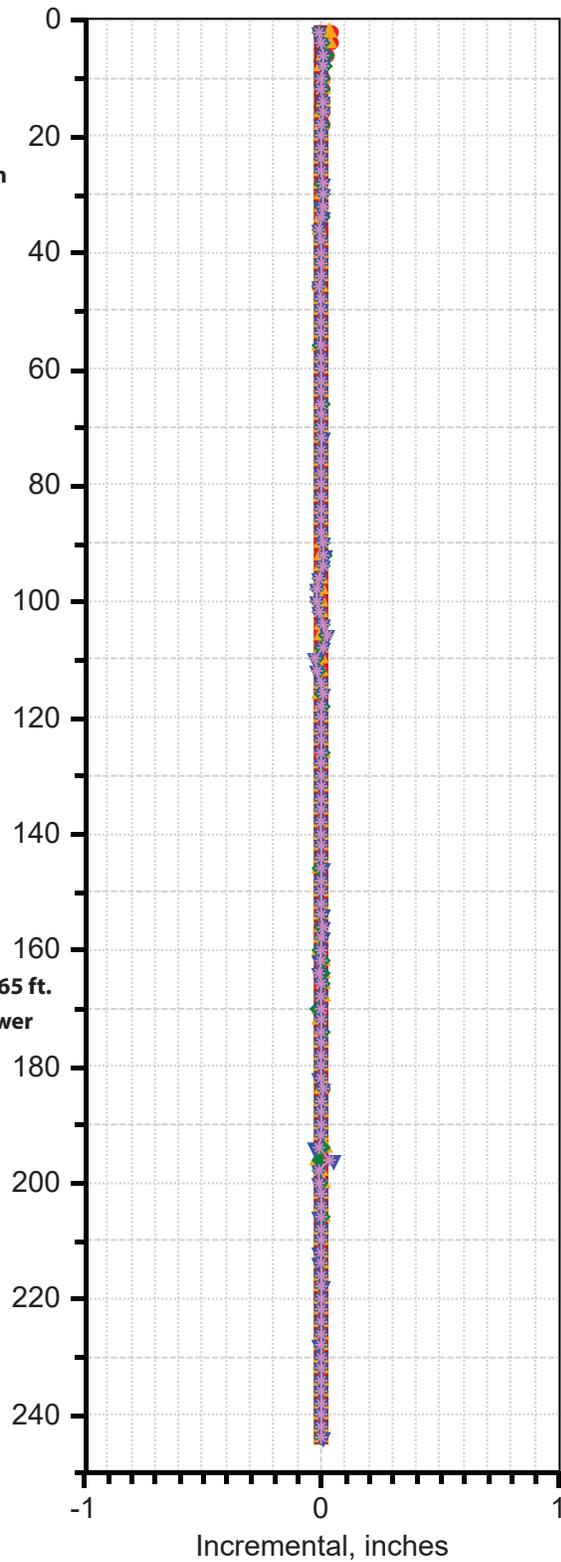
**Yeh and Associates, Inc.**  
Geotechnical • Geological • Construction Services

PROJECT:	<b>Big Rock Mesa LAD</b> Malibu, CA	PROJECT NUMBER:	<b>220-276</b>
REVISION DATE:	8/4/2023		

A-240°



A+60°



- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/17/2023
- ▼ 5/30/2023
- ✦ 7/6/2023

- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/17/2023
- ▼ 5/30/2023
- ✦ 7/6/2023

Plot of Slope Inclinometer

SP-3A

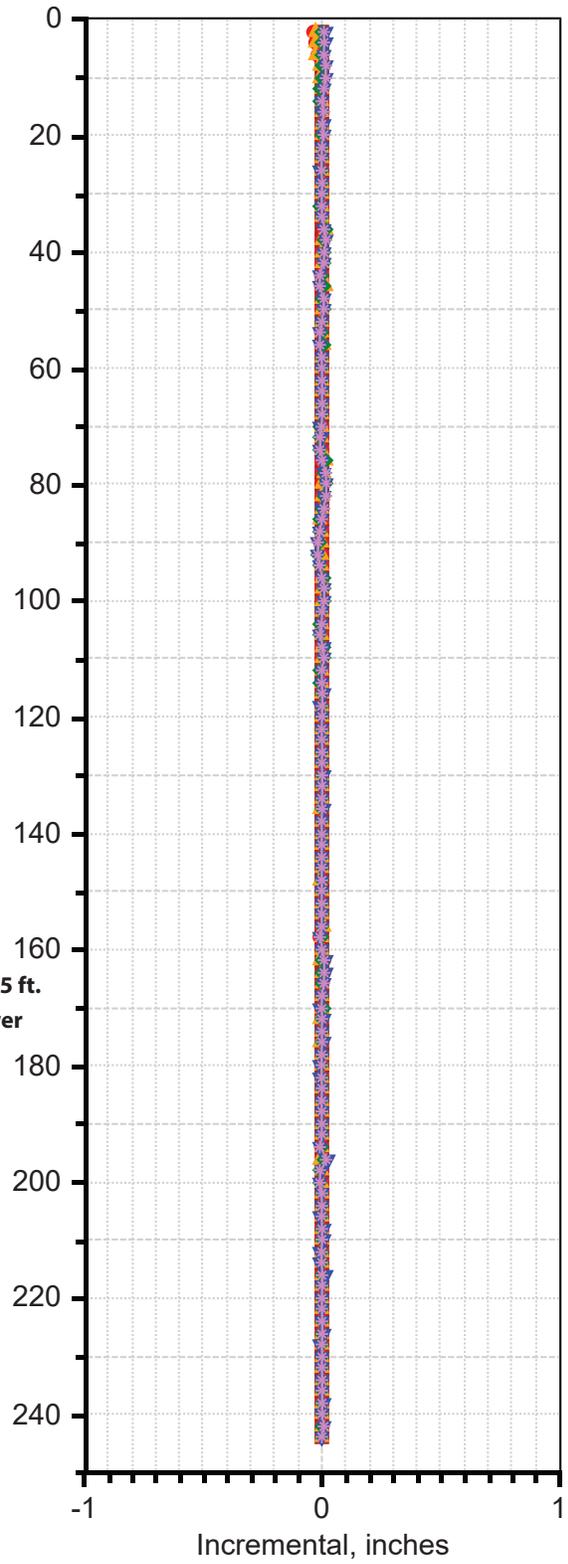
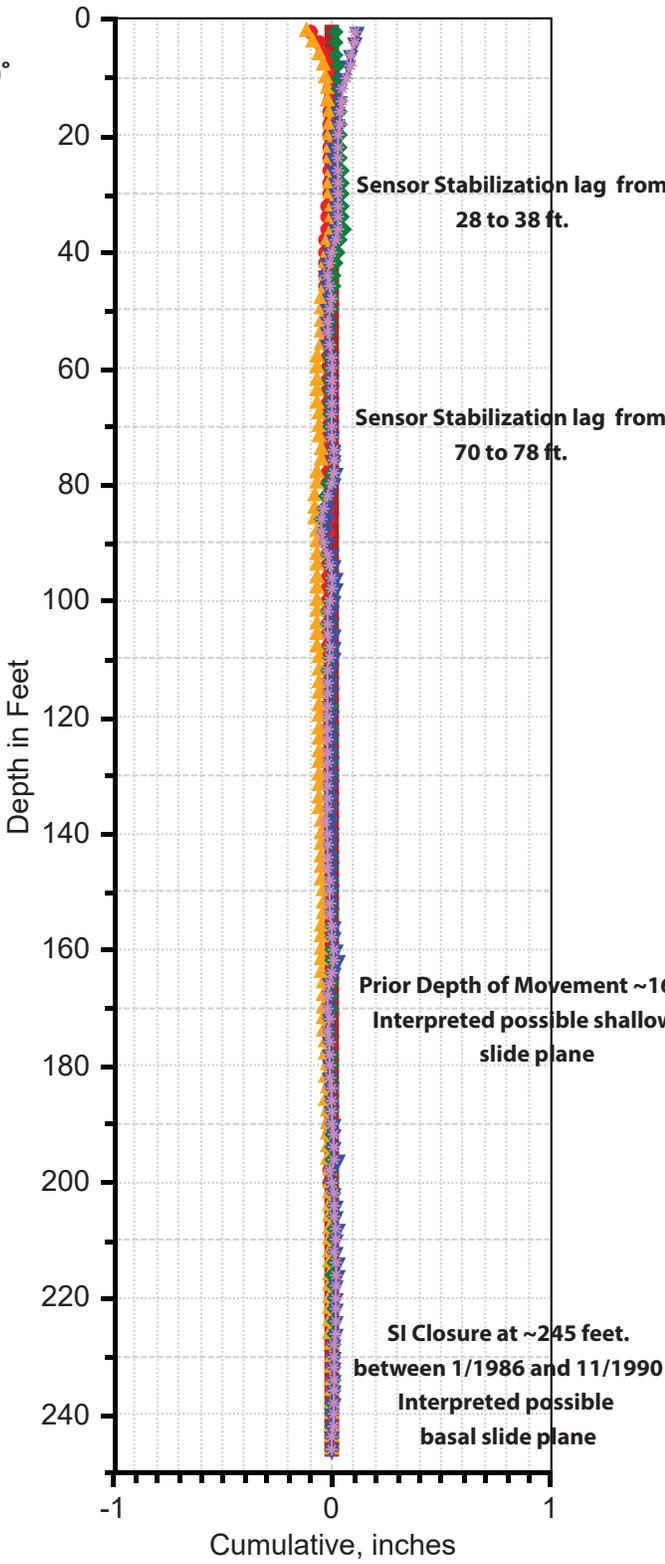
Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 244		Baseline Date: 11/30 /21	
Install Date: 4/1985		Corrections: None	
Installed Depth (ft): 295	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	



PROJECT:	Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE:	8/7/2023	

**B-  
330°**

**B+  
150°**



- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/17/2023
- ▼ 5/30/2023
- ✦ 7/6/2023

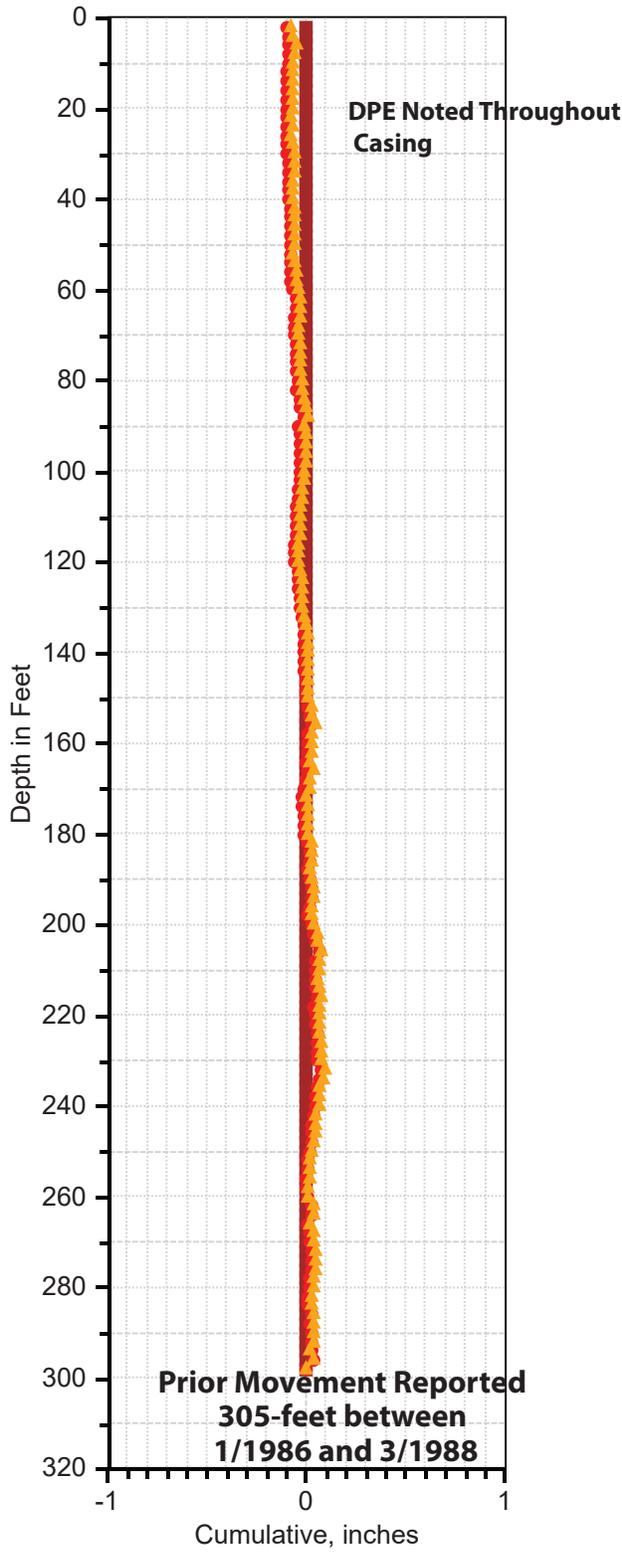
- 11/30/2021
- 5/23/2022
- ▲ 11/2/2022
- ◆ 1/17/2023
- ▼ 5/30/2023
- ✦ 7/6/2023

<b>Plot of Slope Inclinometer</b>  <b>SP-3A</b>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
	Depth of Survey (ft):	244	Baseline Date: 11/30 /20
	Install Date:	4/1985	Interpreted Movement Since Baseline (in): 0
	Installed Depth (ft):	295	Interpreted Movement Monitoring Year (in): 0

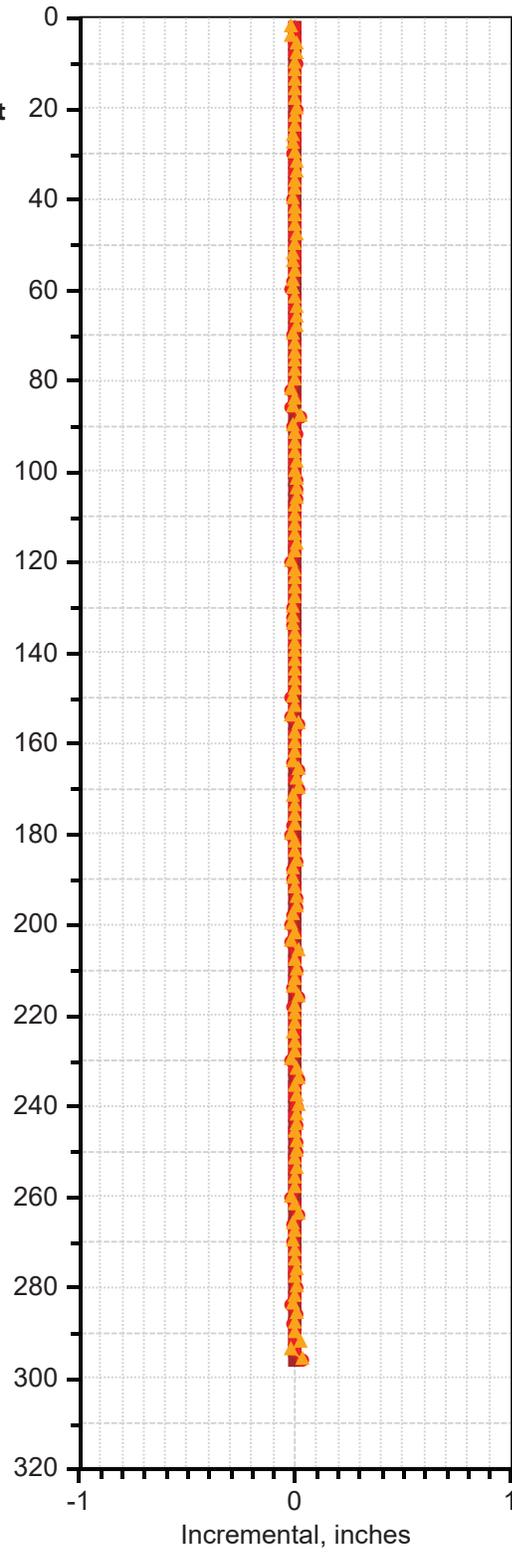
**Yeh and Associates, Inc.**  
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PROJECT: **Big Rock Mesa LAD** PROJECT NUMBER: **220-276**  
 Malibu, CA  
 REVISION DATE: 8/7/2023

A-  
160°



A+  
340°



■ 7/29/2021 ● 6/22/2022 ▲ 5/31/2023

■ 7/29/2021 ● 6/22/2022 ▲ 5/31/2023

Plot of Slope Inclinometer

SP-9A

Plot Type: Cumulative and Incremental

Plot Direction: A-Direction

Depth of Survey (ft):

298

Baseline Date:

7/29/21

Corrections:

Rotation

Install Date:  
6/1985

Installed Depth (ft):  
385

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



Yeh and Associates, Inc.

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PROJECT:

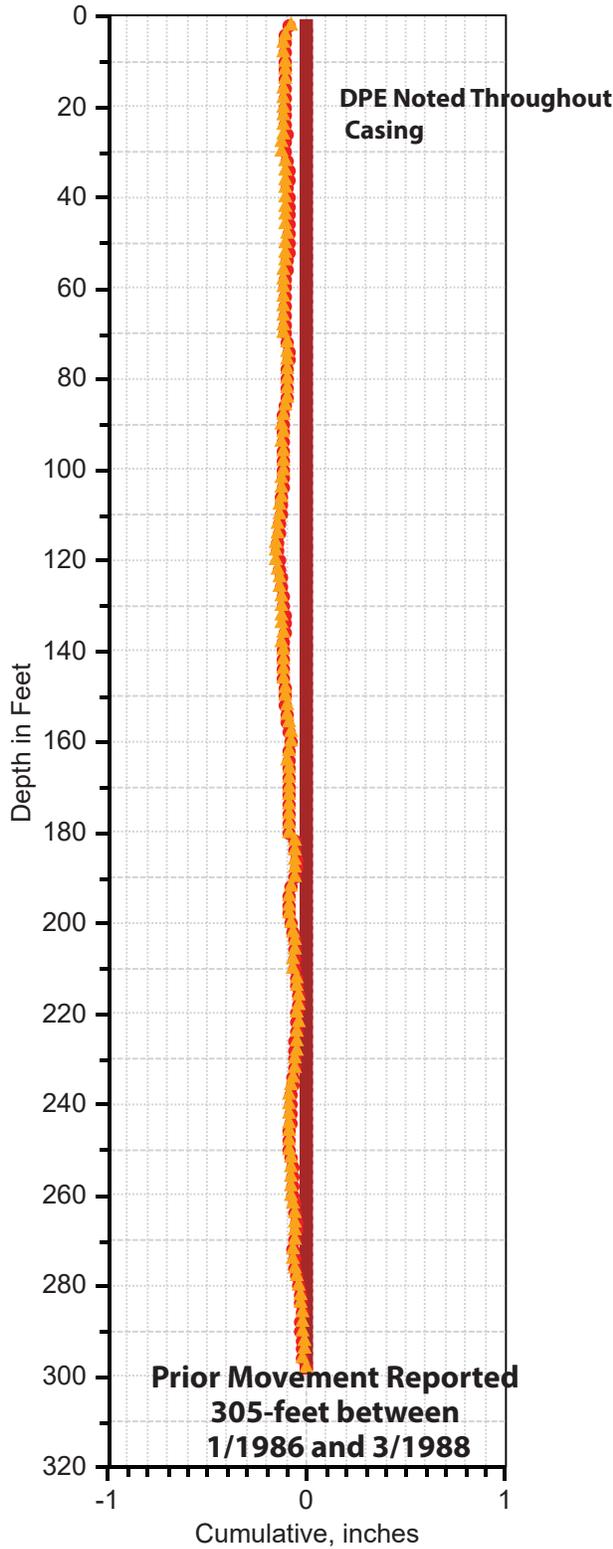
Big Rock Mesa LAD  
Malibu, CA

PROJECT NUMBER:

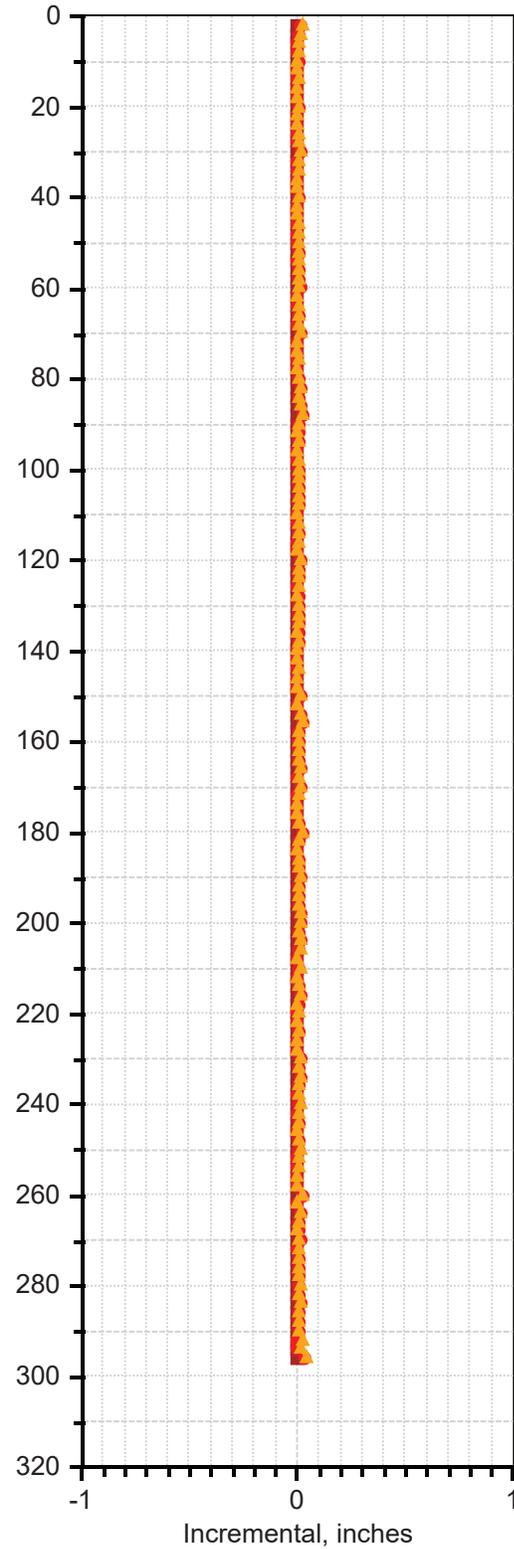
220-276

REVISION DATE: 8/7/2023

B-  
250°



B+  
70°



■ 7/29/2021 ● 6/22/2022 ▲ 5/31/2023

■ 7/29/2021 ● 6/22/2022 ▲ 5/31/2023

Plot of Slope Inclinometer

SP-9A

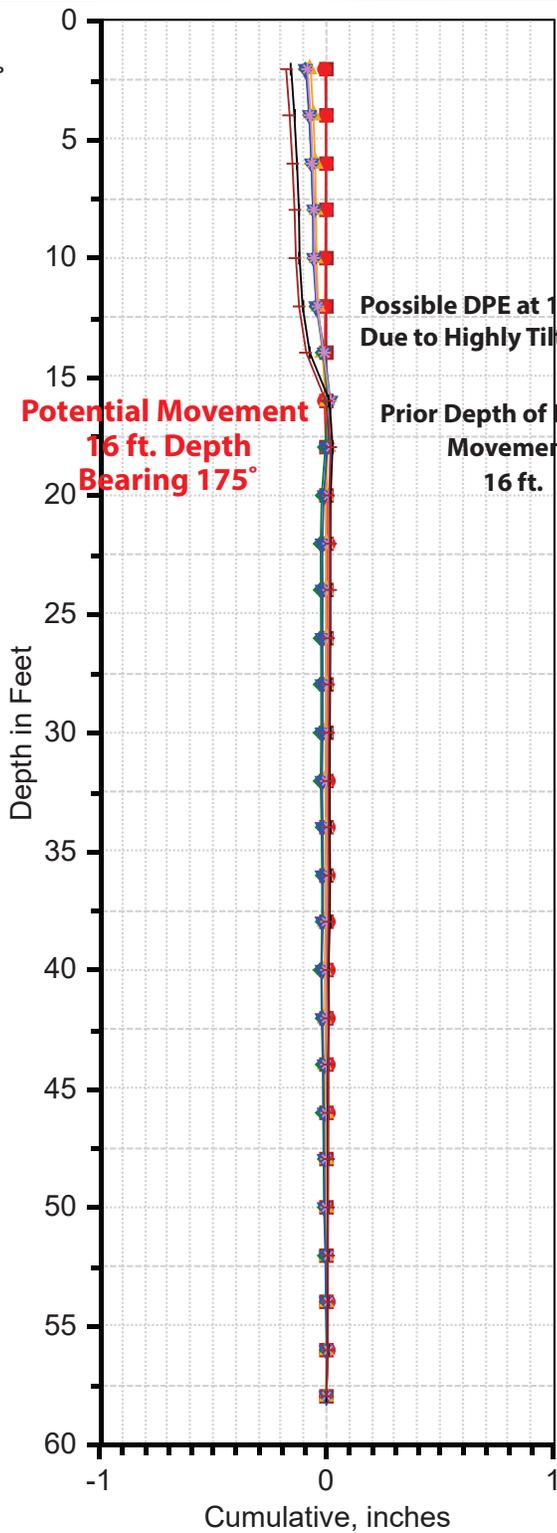
Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 298		Baseline Date: 7/29/21	
Install Date: 6/1985		Corrections: Rotation	
Installed Depth (ft): 385	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	



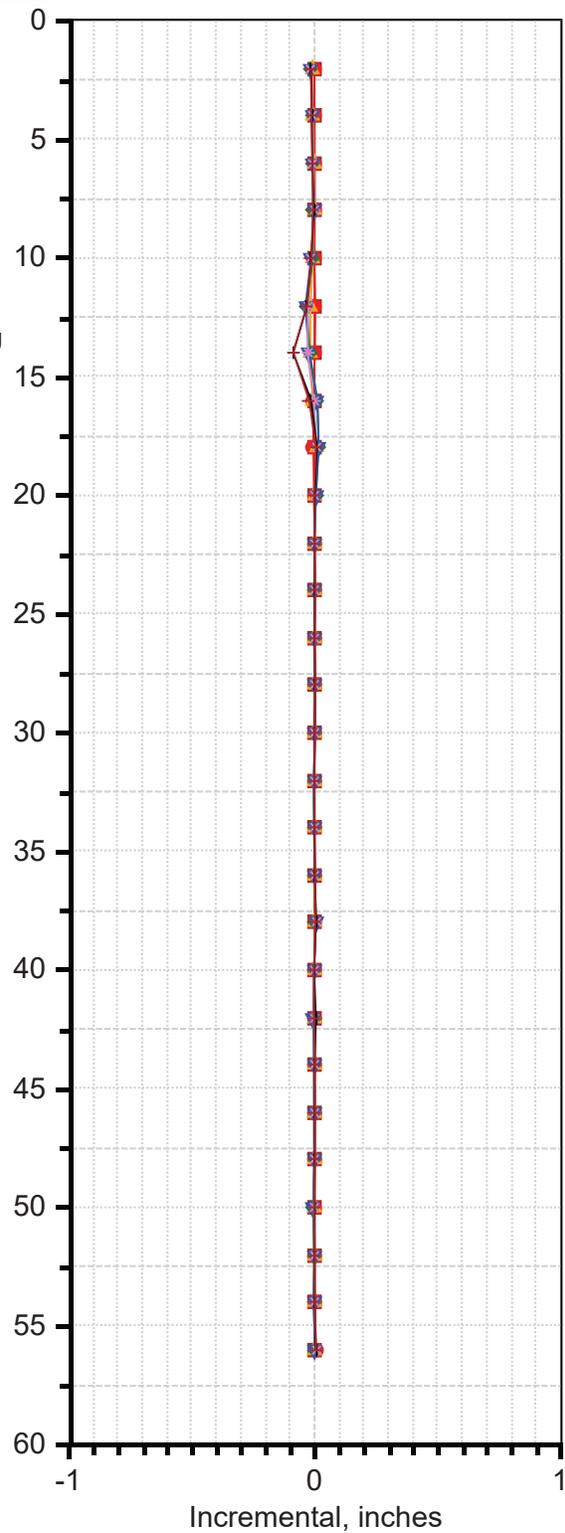
Yeh and Associates, Inc.  
Geotechnical • Geological • Construction Services

PROJECT:	Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER:	220-276
REVISION DATE:	8/7/2023		

A-205°



A+25°



- 8/9/2021
- 12/9/2021
- ▲ 9/28/2022
- ◆ 11/3/2022
- ▼ 1/18/2023
- ✦ 1/27/2023
- ⊕ 6/6/2023
- 7/6/2023

- 8/9/2021
- 12/9/2021
- ▲ 9/28/2022
- ◆ 11/3/2022
- ▼ 1/18/2023
- ✦ 1/27/2023
- ⊕ 6/6/2023
- 7/6/2023

Plot of Slope Inclinometer

SP-11

Plot Type: Cumulative and Incremental

Plot Direction: A-Direction

Depth of Survey (ft): 59

Baseline Date: 8/9/2021

Corrections: None

Install Date: 12/1983

Installed Depth (ft): 60

Interpreted Movement Since Baseline (in): 0.15

Interpreted Movement Monitoring Year (in): 0.10



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PROJECT:

Big Rock Mesa LAD  
Malibu, CA

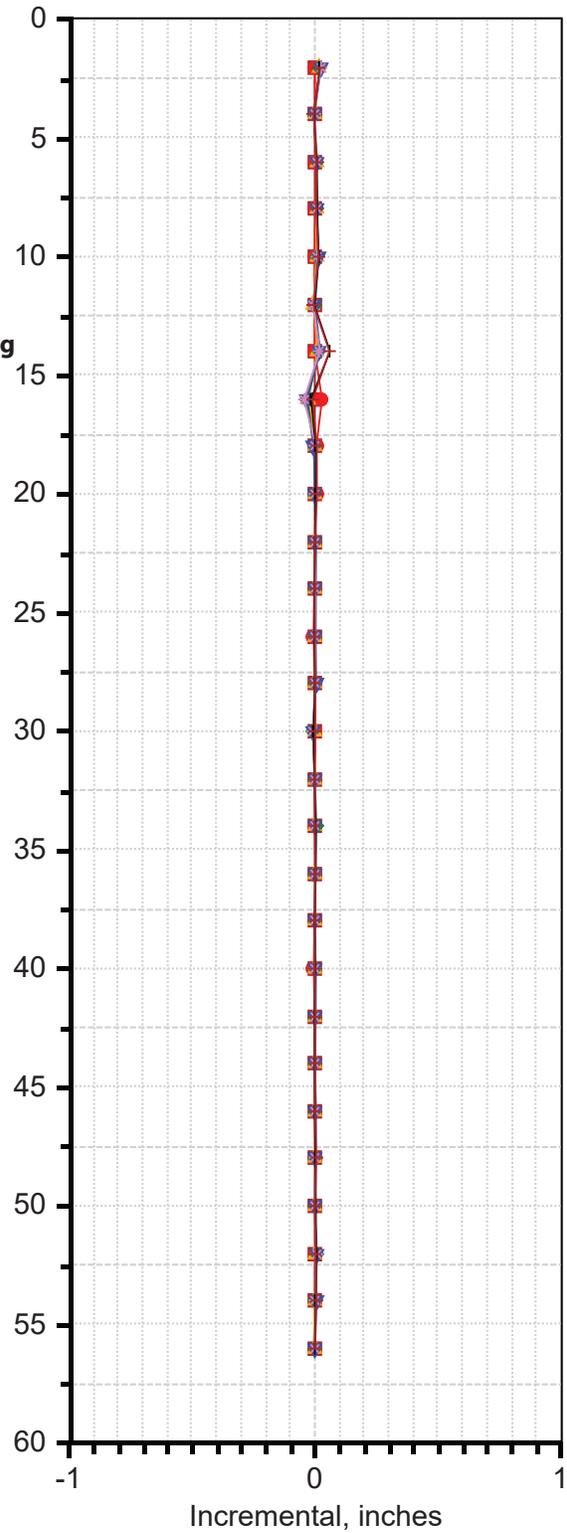
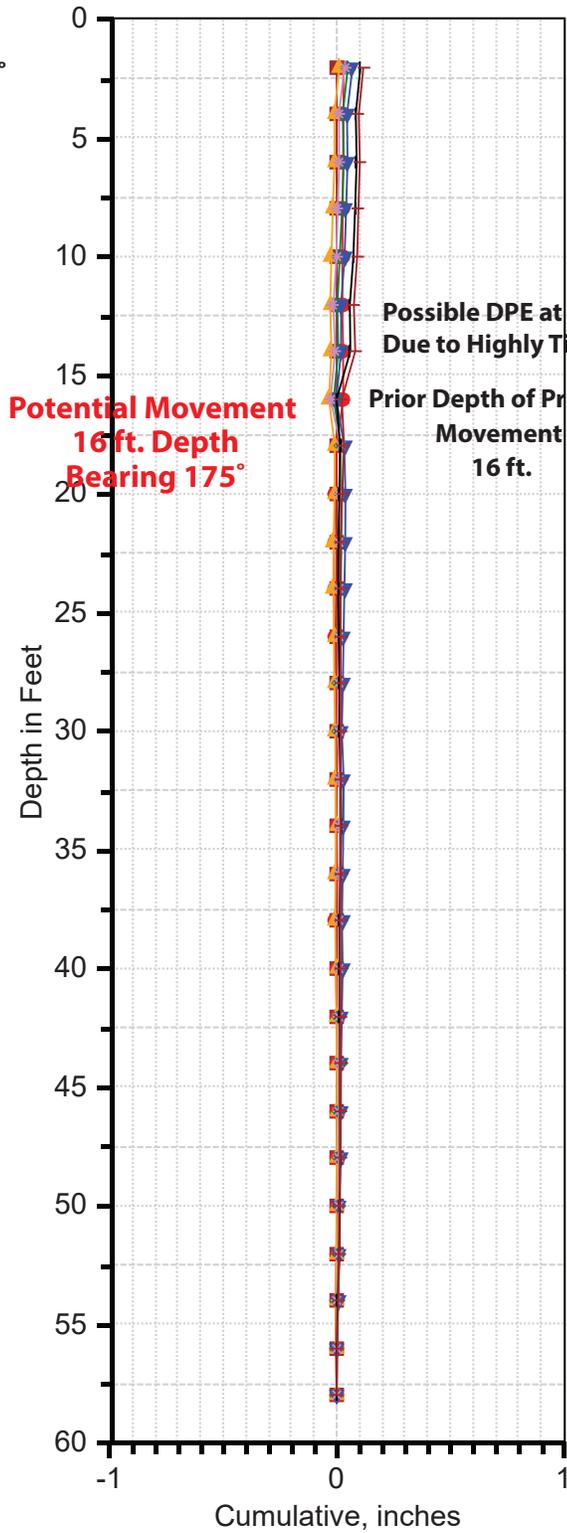
PROJECT NUMBER:

220-276

REVISION DATE: 8/7/2023

**B-  
295°**

**B+  
115°**



- 8/9/2021
- 12/9/2021
- ▲ 9/28/2022
- ◆ 11/3/2022
- ▼ 1/18/2023
- ✦ 1/27/2023
- + 6/6/2023
- 7/6/2023

- 8/9/2021
- 12/9/2021
- ▲ 9/28/2022
- ◆ 11/3/2022
- ▼ 1/18/2023
- ✦ 1/27/2023
- + 6/6/2023
- 7/6/2023

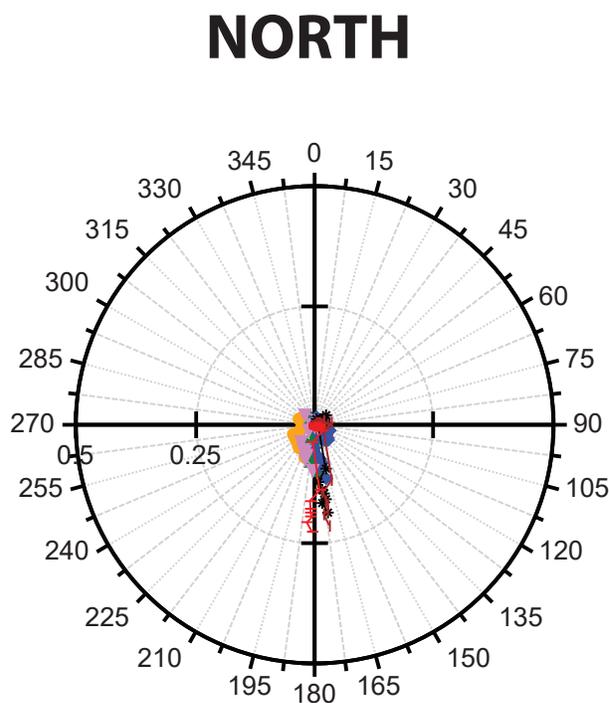
Plot of Slope Inclinometer

**SP-11**

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 59		Baseline Date: 8/9/2021	
Install Date: 12/1983		Corrections: None	
Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0.15 @16 ft. b175°	Interpreted Movement Monitoring Year (in): 0.10 @16ft. b175°	



PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

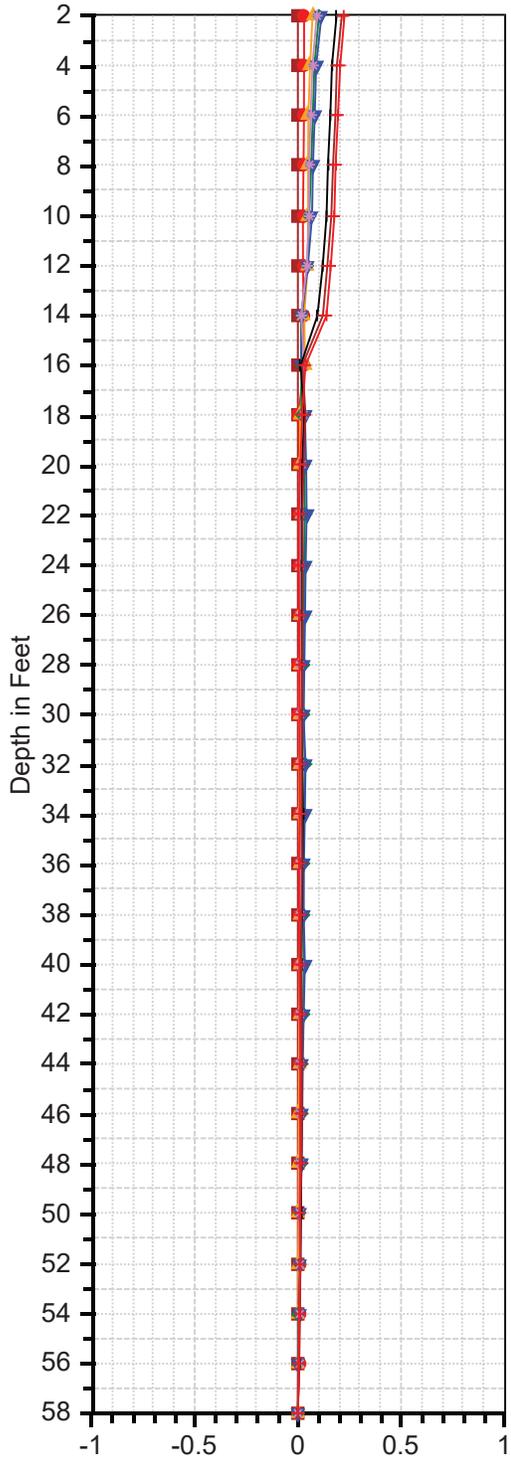


**NORTH**

**SOUTH**

Polar View

Cumulative Resultant, inches



Depth in Feet

Cumulative Resultant, inches

- 12/9/2021
- 9/28/2022
- ▲ 11/3/2022
- ◆ 1/18/2023
- ▼ 1/27/2023
- ◆ 6/6/2023
- + 7/6/2023
- + 8/15/2023

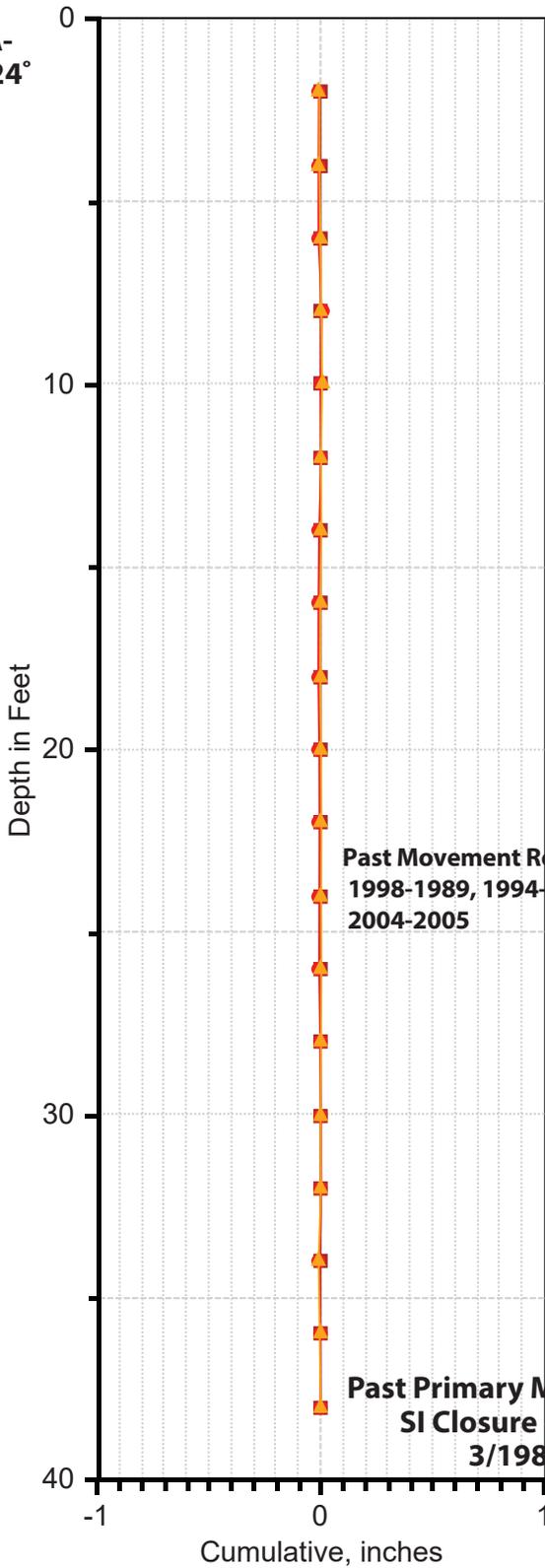
- 8/9/2021
- 12/9/2021
- ▲ 9/28/2022
- ◆ 11/3/2022
- ▼ 1/18/2023
- ◆ 1/27/2023
- + 6/6/2023
- + 7/6/2023
- + 8/15/2023

<b>Plot of Slope Inclinometer</b>  <b>SP-11</b>	Plot Type: Cumulative Resultant, Polar and Profile Views		Plot Direction: Resultant
	Depth of Survey (ft): 59	Baseline Date: 8/9/2021	Corrections: None
	Install Date: 12/1983	Installed Depth (ft): 60	Interpreted Movement Since Baseline (in): 0.15 @ 16 ft. b175°
		Interpreted Movement Monitoring Year (in): 0.10 @ 16 ft. b175°	

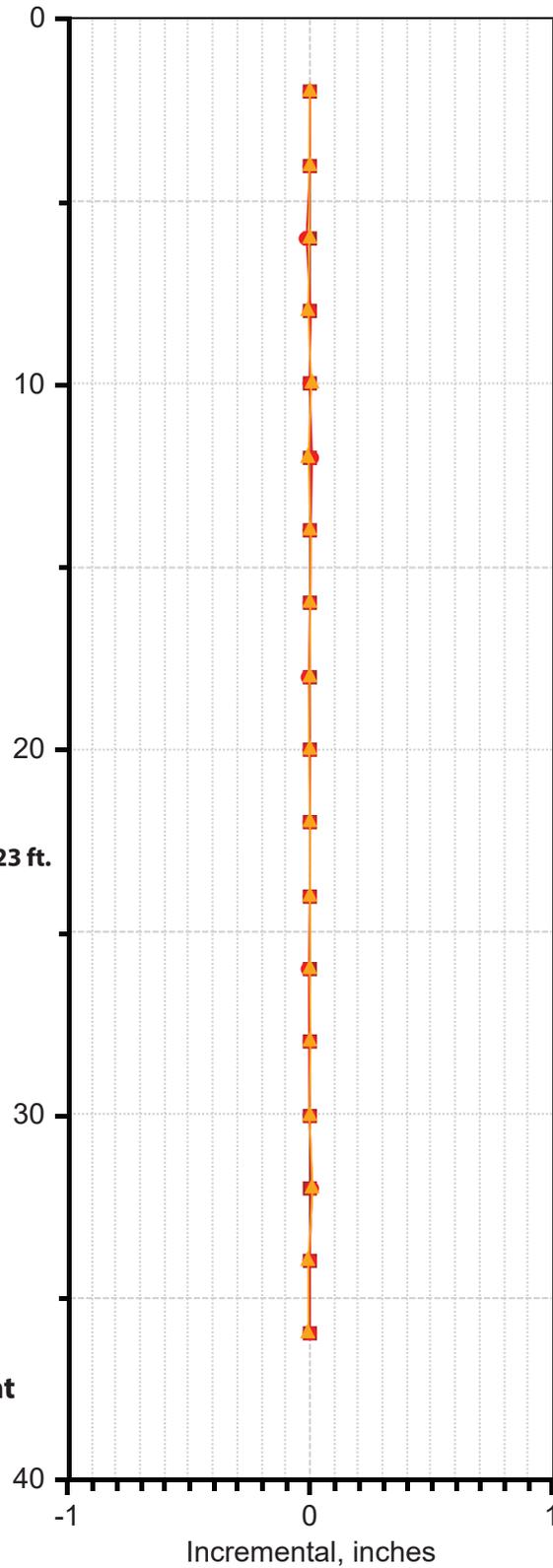
**Yeh and Associates, Inc.**  
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PROJECT: **Big Rock Mesa LAD** PROJECT NUMBER: **220-276**  
 Malibu, CA  
 REVISION DATE: 8/7/2023

A-  
224°



A+  
44°



■ 9/14/2021 ● 11/3/2022 ▲ 6/6/2023

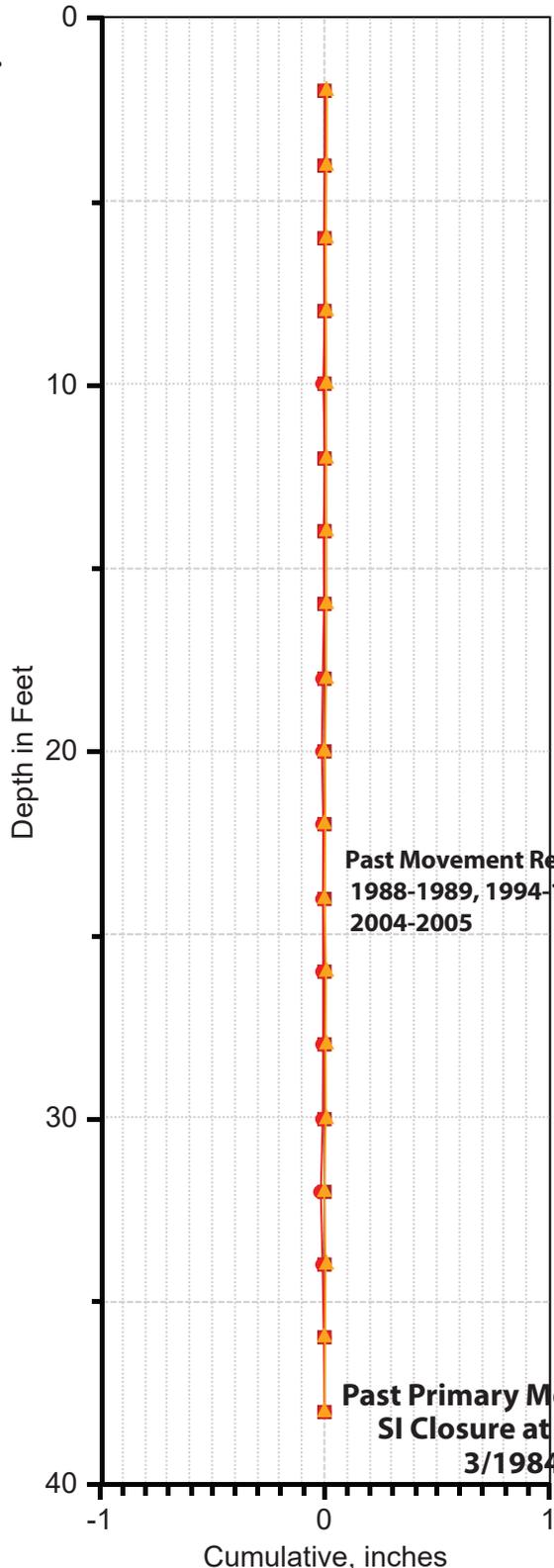
■ 9/14/2021 ● 11/3/2022 ▲ 6/6/2023

Plot of Slope Inclinometer

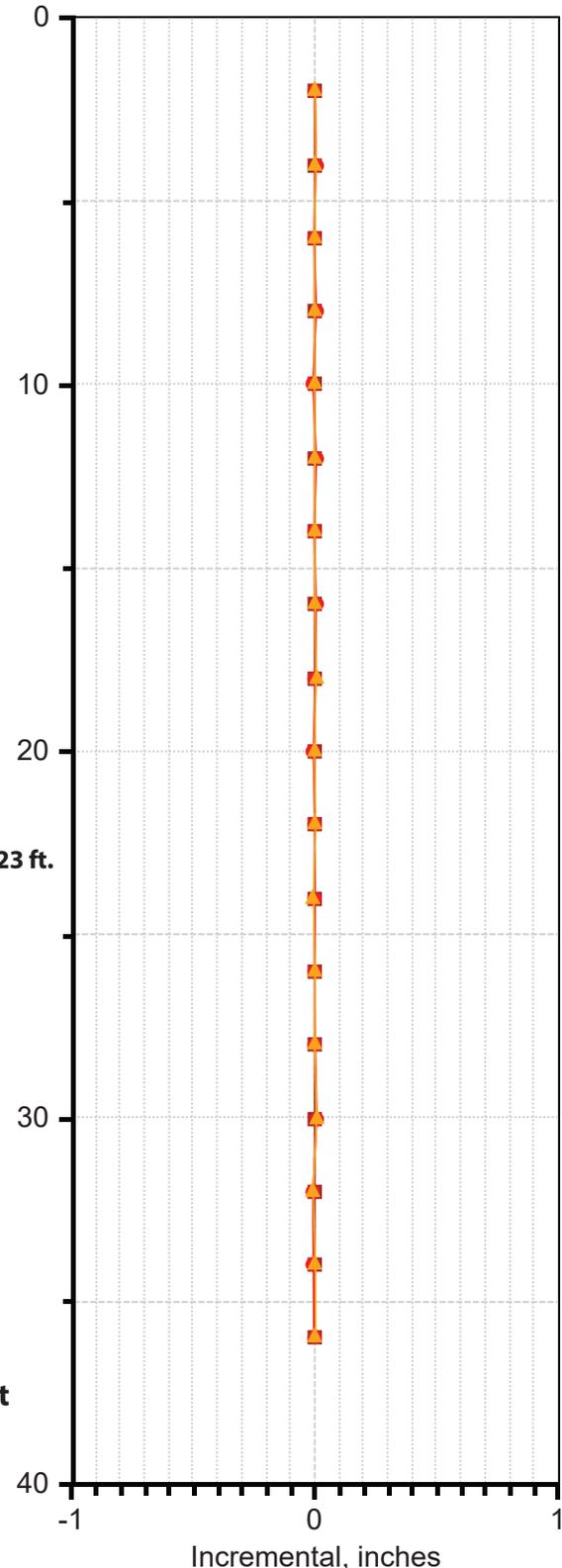
SP-12

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft):	38	Baseline Date:	9/14/2021
Install Date:	1/1984	Installed Depth (ft):	95
Interpreted Movement Since Baseline (in): 0		Interpreted Movement Monitoring Year (in): 0	

**B-  
314°**



**B+  
134°**



■ 9/14/2021   ● 11/3/2022   ▲ 6/6/2023

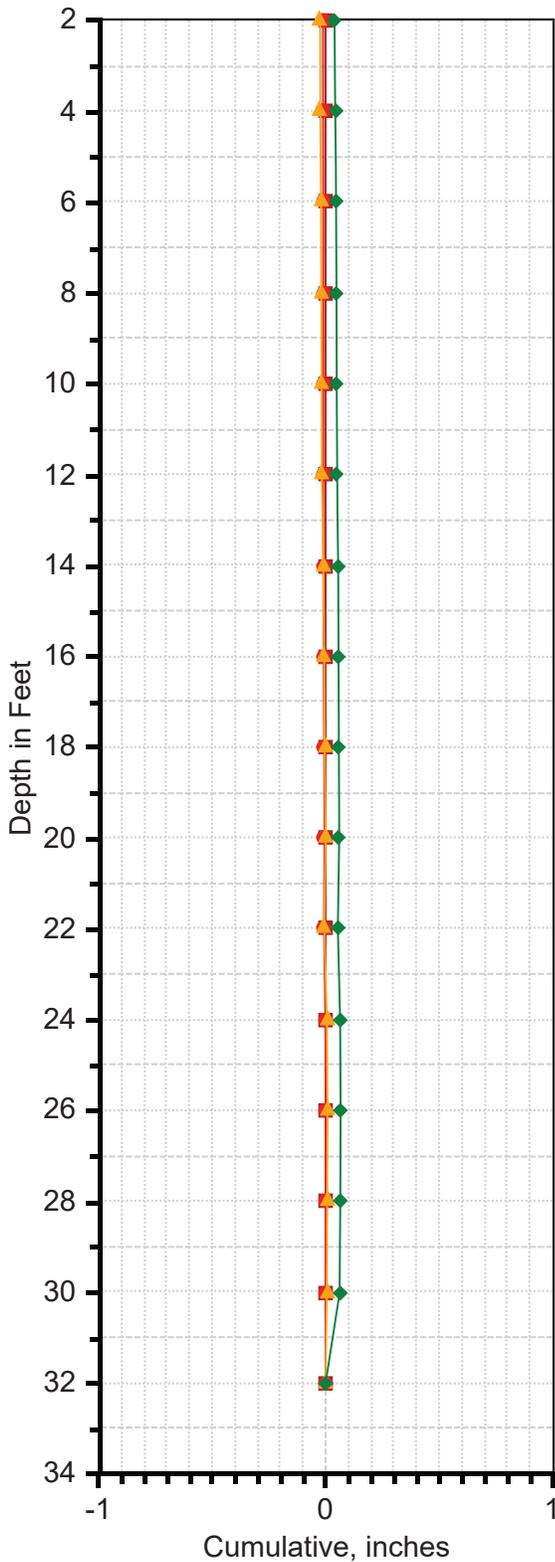
■ 9/14/2021   ● 11/3/2022   ▲ 6/6/2023

<b>Plot of Slope Inclinometer</b>  <b>SP-12</b>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
	Depth of Survey (ft): 38		Baseline Date: 9/14/2021	
	Install Date: 1/1984	Installed Depth (ft): 95	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

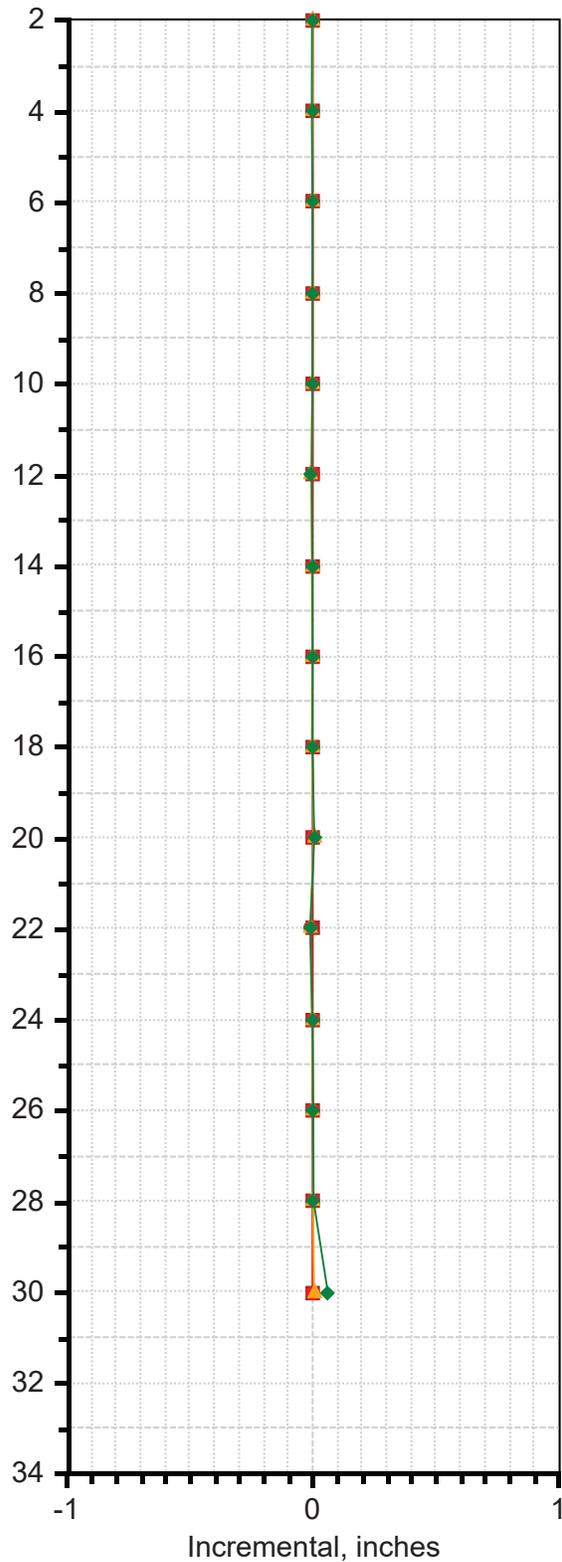
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PROJECT: **Big Rock Mesa LAD** PROJECT NUMBER: **220-276**  
 Malibu, CA  
 REVISION DATE: 8/7/2023

A-  
215°



A+  
35°



4/7/2021 9/14/2021  
6/22/2022 6/6/2023

4/7/2021 9/14/2021  
6/22/2022 6/6/2023

Plot of Slope Inclinometer

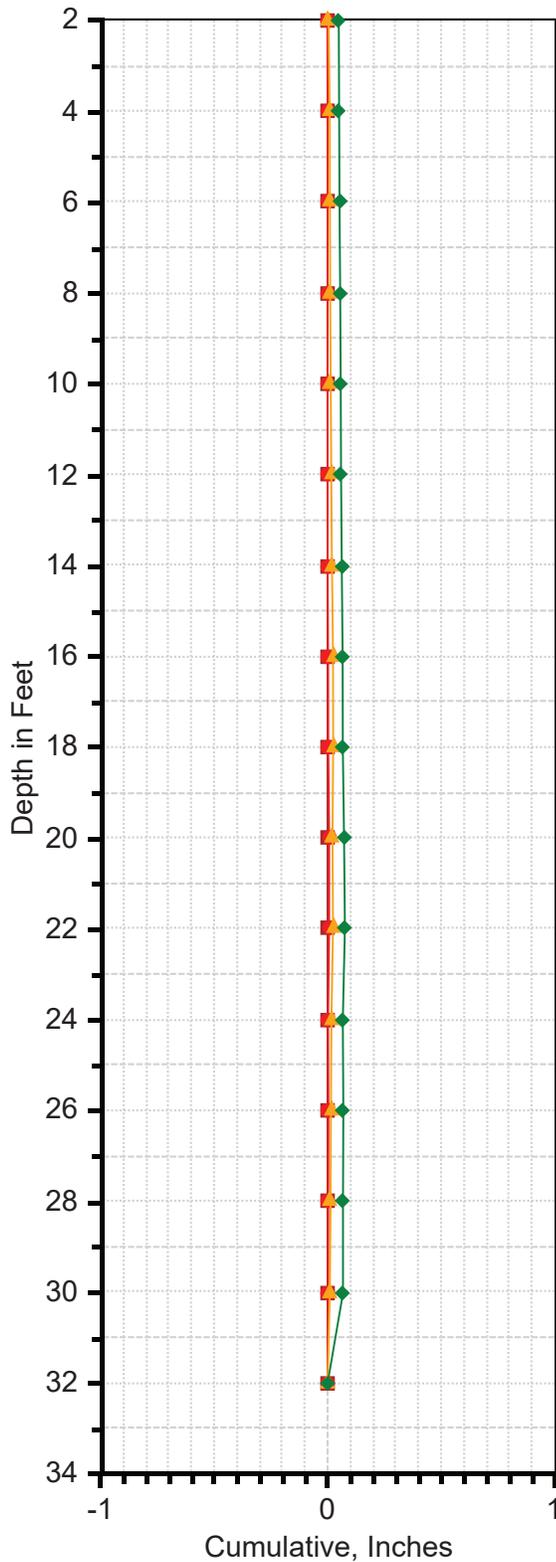
SP-14

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 32	Baseline Date: 4/07/2021	Corrections: None	
Install Date: 4/1984	Installed Depth (ft): 32	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

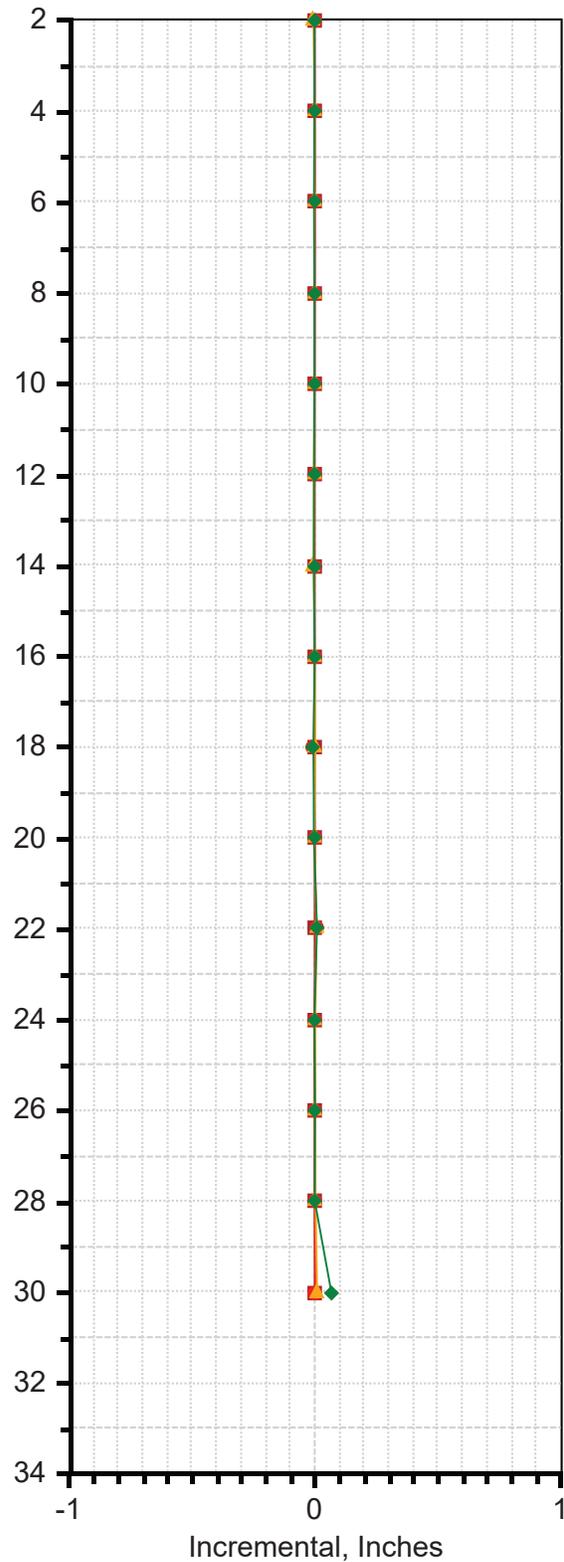


PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

B-305°



B-125°



■ 4/7/2021    ● 9/14/2021  
▲ 6/22/2022    ◆ 6/6/2023

■ 4/7/2021    ● 9/14/2021  
▲ 6/22/2022    ◆ 6/6/2023

Plot of Slope Inclinometer

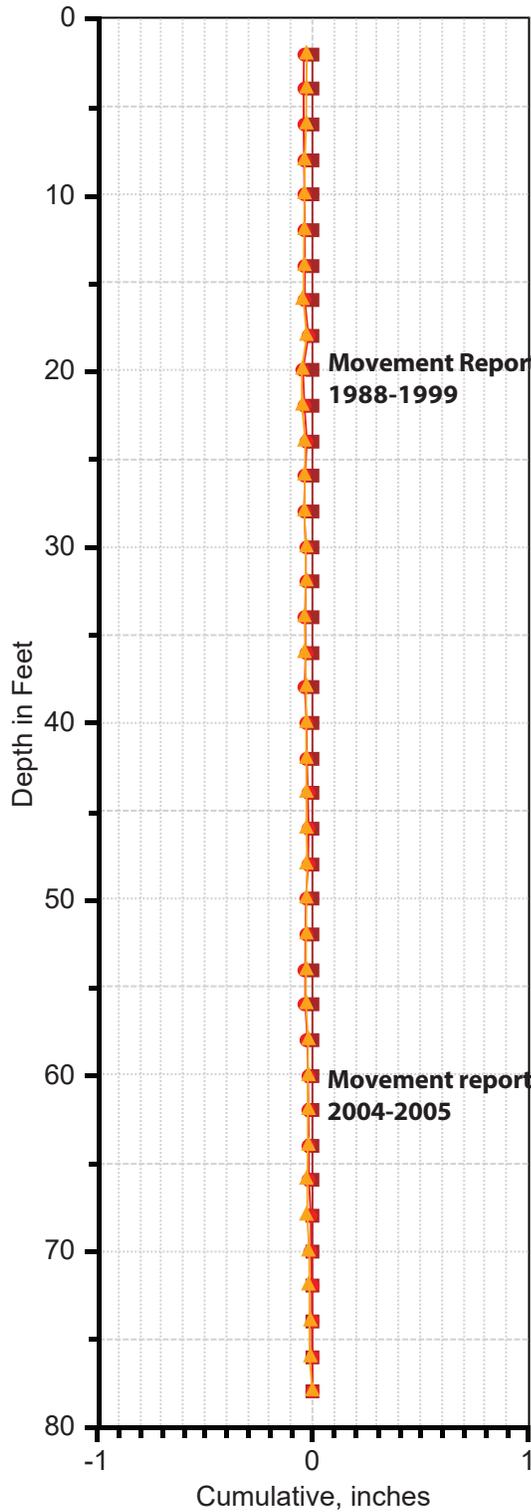
SP-14

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft):	32	Baseline Date:	4/7/2021
Install Date:	4/1984	Installed Depth (ft):	32
Interpreted Movement Since Baseline (in): 0		Interpreted Movement Monitoring Year (in): 0	



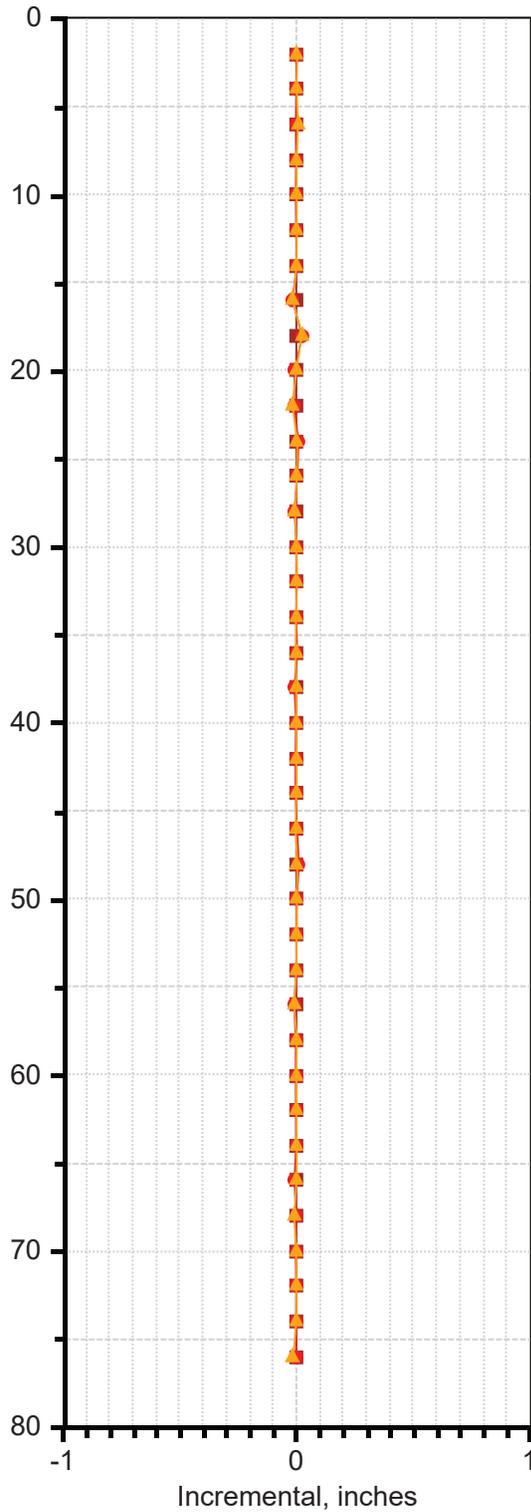
PROJECT:	Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER:	220-276
REVISION DATE:	8/7/2023		

A-  
200°



9/14/2021 6/23/2022 6/6/2023

A+  
20°



9/14/2021 6/23/2022 6/6/2023

Plot of Slope Inclinometer

SP-15

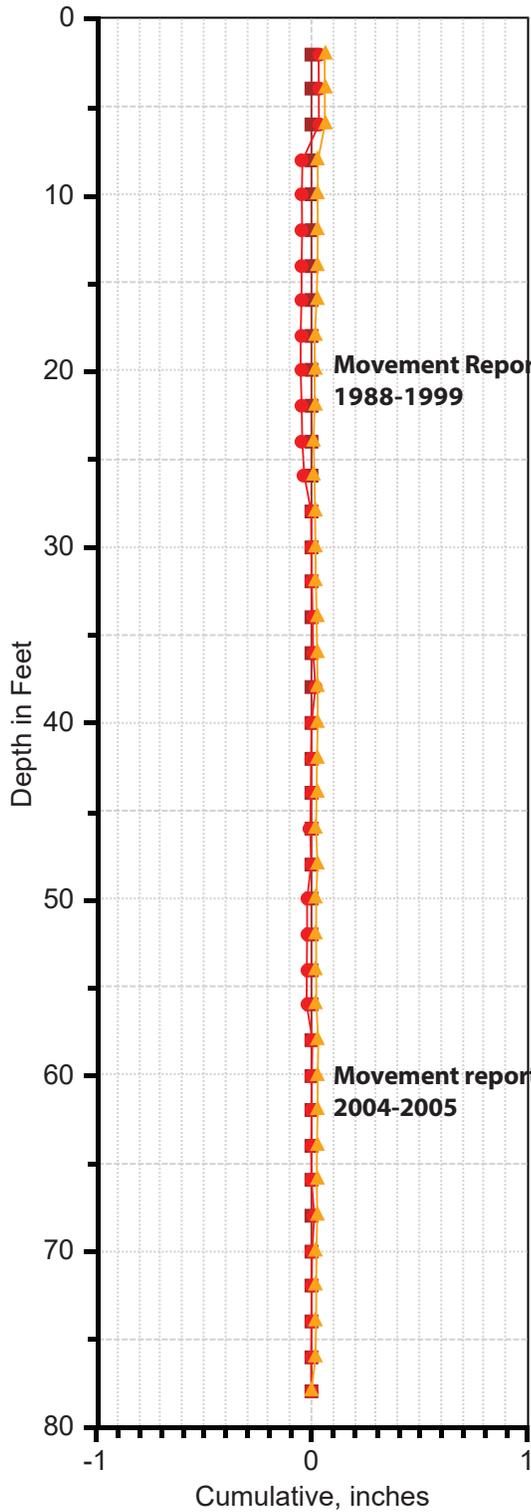
Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 78	Baseline Date: 9/14/2021		Corrections: None
Install Date: 3/1984	Installed Depth (ft): 88	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0



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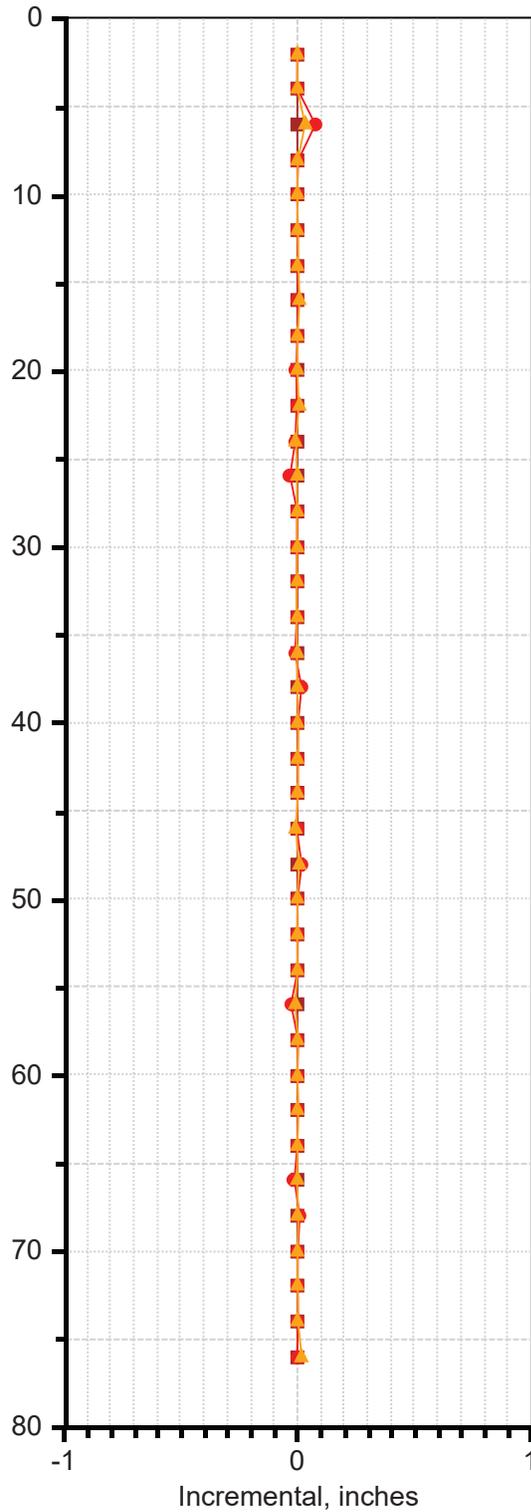
PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

B-  
290°



■ 9/14/2021 ● 6/23/2022 ▲ 6/6/2023

B+  
110°



■ 9/14/2021 ● 6/23/2022 ▲ 6/6/2023

Plot of Slope Inclinometer

SP-15

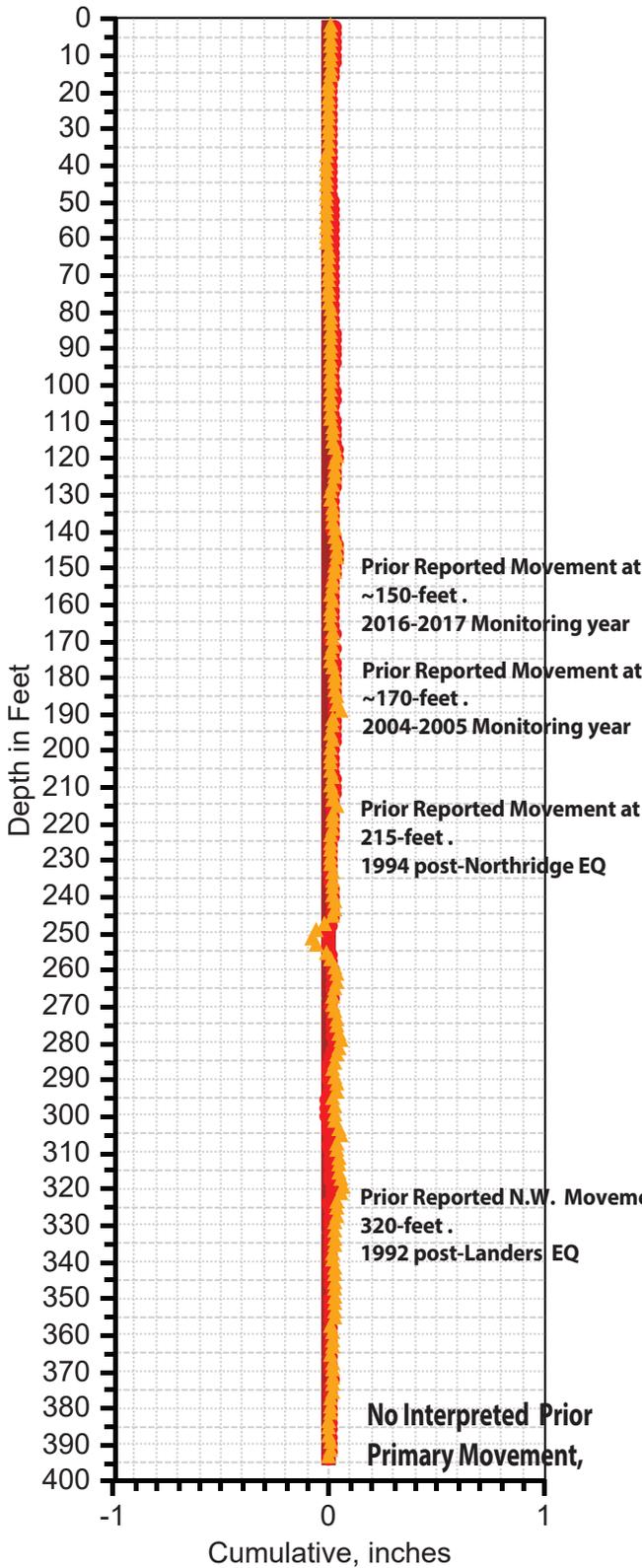
Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft):	78	Baseline Date:	9/14/2021
Install Date:	3/1984	Interpreted Movement Since Baseline (in):	0
Installed Depth (ft):	88	Interpreted Movement Monitoring Year (in):	0



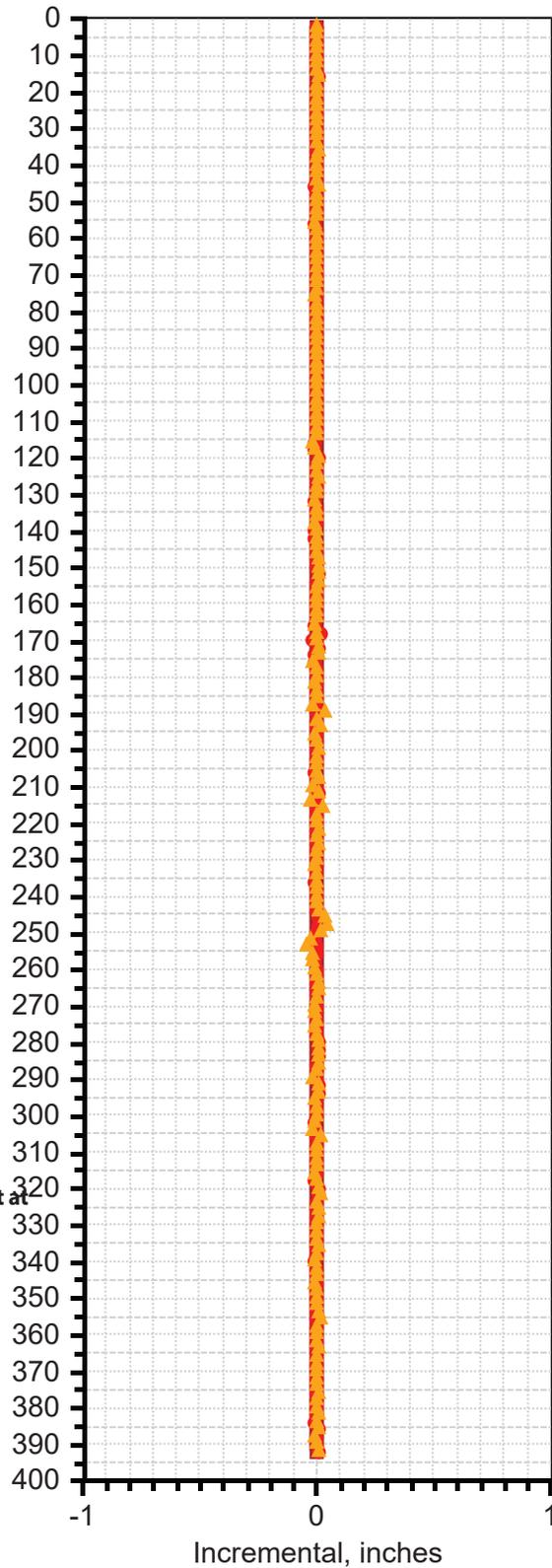
Yeh and Associates, Inc.  
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PROJECT:	Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER:	220-276
REVISION DATE:	8/7/2023		

**A-  
150°**



**A+  
330°**



■ 7/29/2021 ● 9/28/2022 ▲ 5/31/2023

■ 7/29/2021 ● 9/28/2022 ▲ 5/31/2023

Plot of Slope Inclinometer

**SP-16A**

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft):	390	Baseline Date:	7/29/2021
Install Date:	5/1985	Installed Depth (ft):	392
Interpreted Movement Since Baseline (in): 0		Interpreted Movement Monitoring Year (in): 0	



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PROJECT:

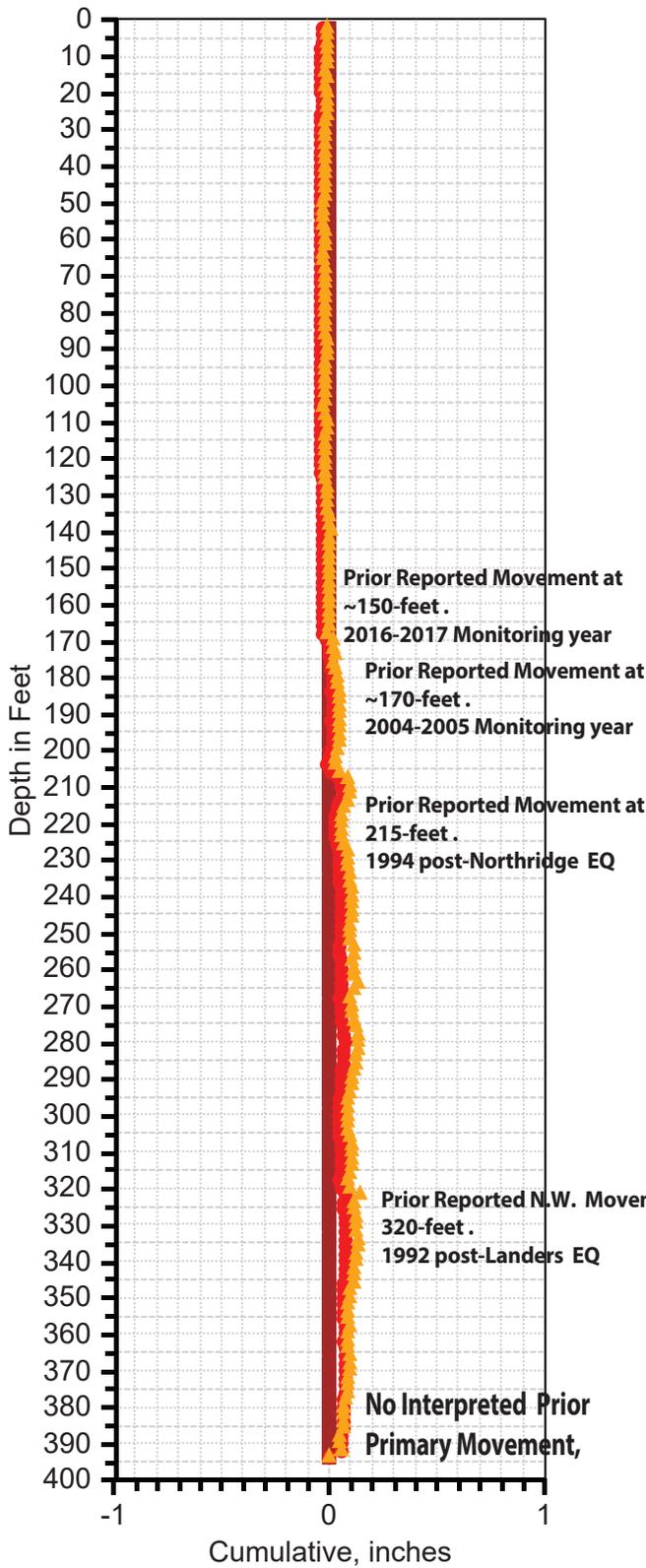
**Big Rock Mesa LAD**  
Malibu, CA

PROJECT NUMBER:

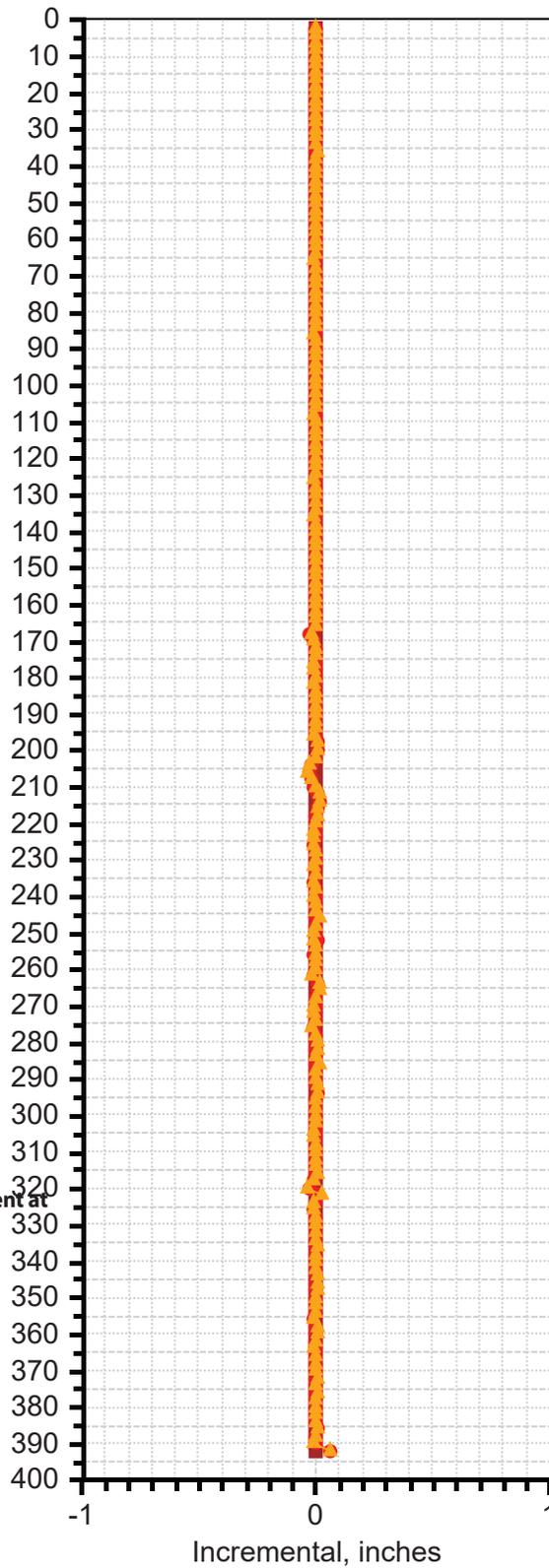
**220-276**

REVISION DATE: 8/7/2023

**B-  
240°**



**B+  
60°**



■ 7/29/2021 ● 9/28/2022 ▲ 5/31/2023

■ 7/29/2021 ● 9/28/2022 ▲ 5/31/2023

Plot of Slope Inclinometer

**SP-16A**

Plot Type: Cumulative and Incremental

Plot Direction: B-Direction

Depth of Survey (ft):

390

Baseline Date:

7/29 /2021

Corrections:

None

Install Date:  
5/1985

Installed Depth (ft):  
392

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



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PROJECT:

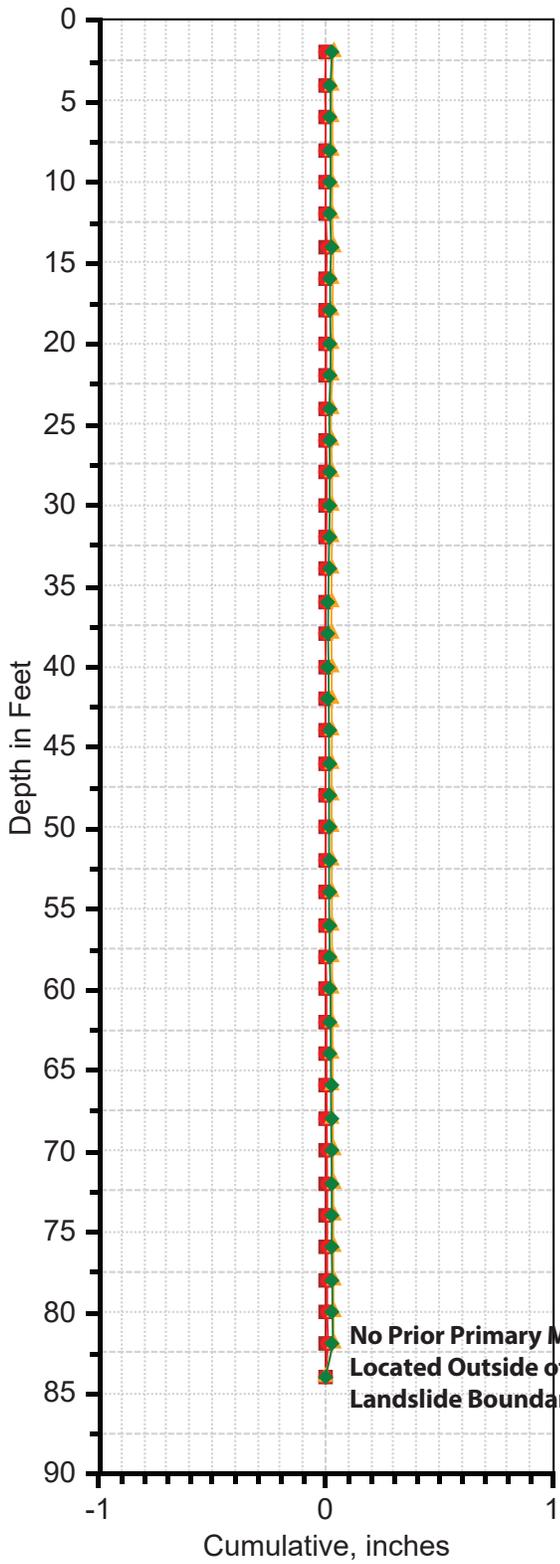
**Big Rock Mesa LAD**  
Malibu, CA

PROJECT NUMBER:

**220-276**

REVISION DATE: 8/7/2023

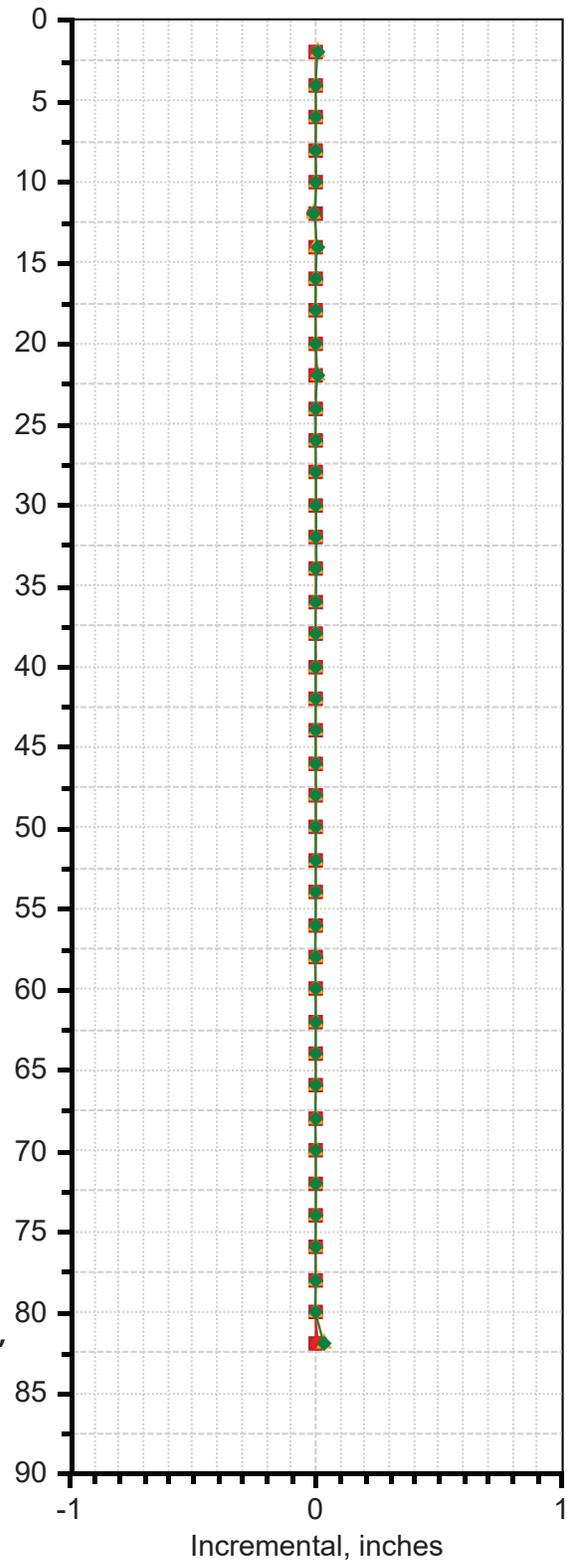
A-  
210°



No Prior Primary Movement,  
Located Outside of Mapped  
Landslide Boundary

9/14/2021 5/23/2022  
2/8/2023 6/6/2023

A+  
30°



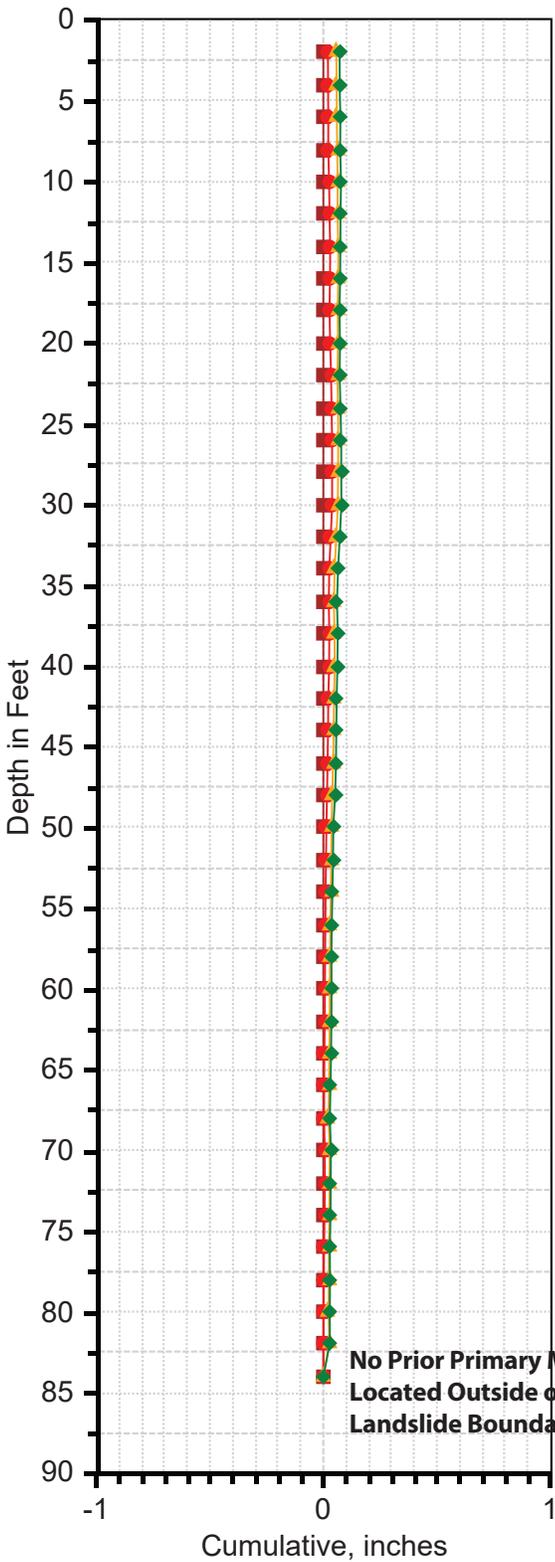
9/14/2021 5/23/2022  
2/8/2023 6/6/2023

<b>Plot of Slope Inclinometer</b>  <b>SP-19</b>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
	Depth of Survey (ft): 84	Baseline Date: 9/14/2021	Corrections: None
	Install Date: 1/1984	Installed Depth (ft): 95	Interpreted Movement Since Baseline (in): 0
			Interpreted Movement Monitoring Year (in): 0

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PROJECT: **Big Rock Mesa LAD** PROJECT NUMBER: **220-276**  
Malibu, CA  
REVISION DATE: 8/7/2023

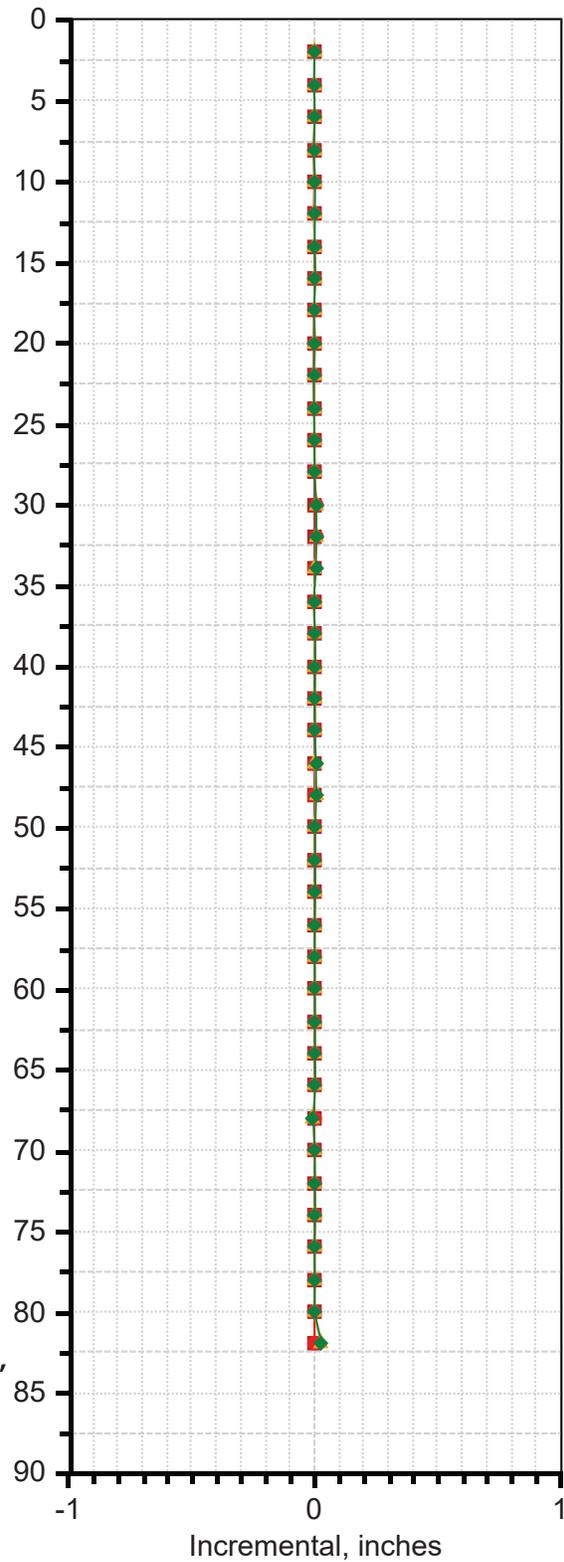
**B-  
300°**



No Prior Primary Movement,  
Located Outside of Mapped  
Landslide Boundary

9/14/2021 5/23/2022  
2/8/2023 6/6/2023

**B+  
120°**



9/14/2021 5/23/2022  
2/8/2023 6/6/2023

Plot of Slope Inclinerometer

**SP-19**

Plot Type: Cumulative and Incremental

Plot Direction: B-Direction

Depth of Survey (ft):

84

Baseline Date:

9/14/2021

Corrections:

None

Install Date:  
1/1984

Installed Depth (ft):  
95

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



**Yeh and Associates, Inc.**

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PROJECT:

**Big Rock Mesa LAD**  
Malibu, CA

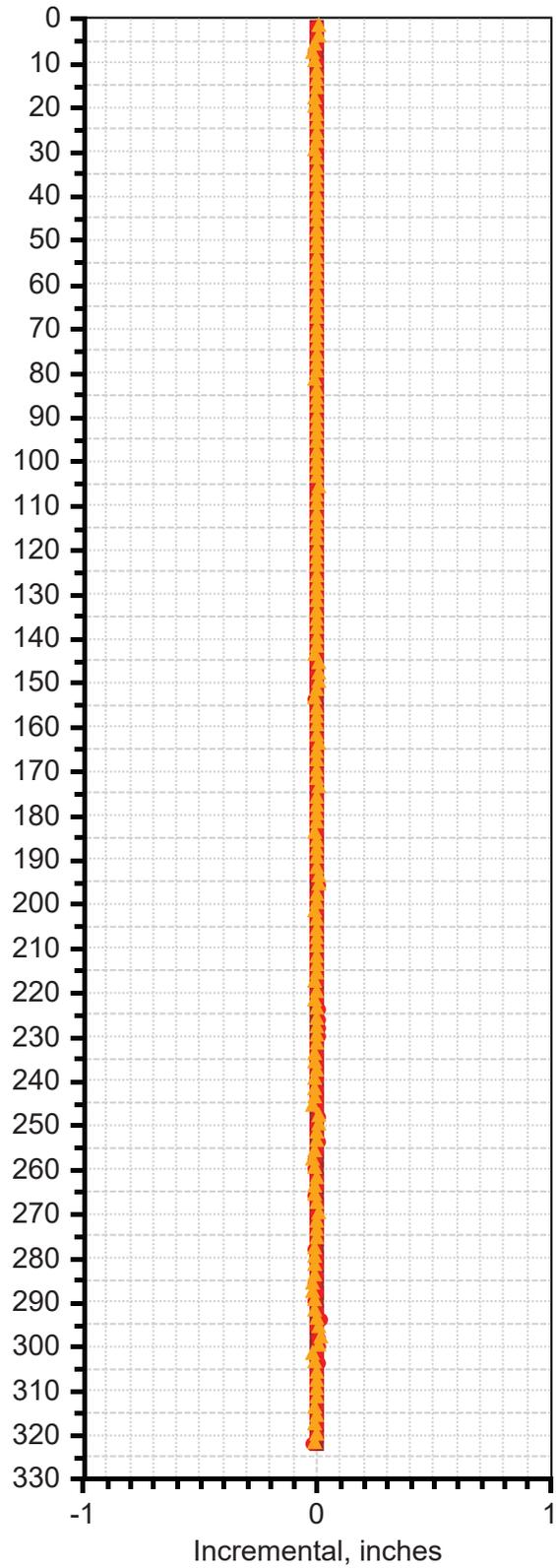
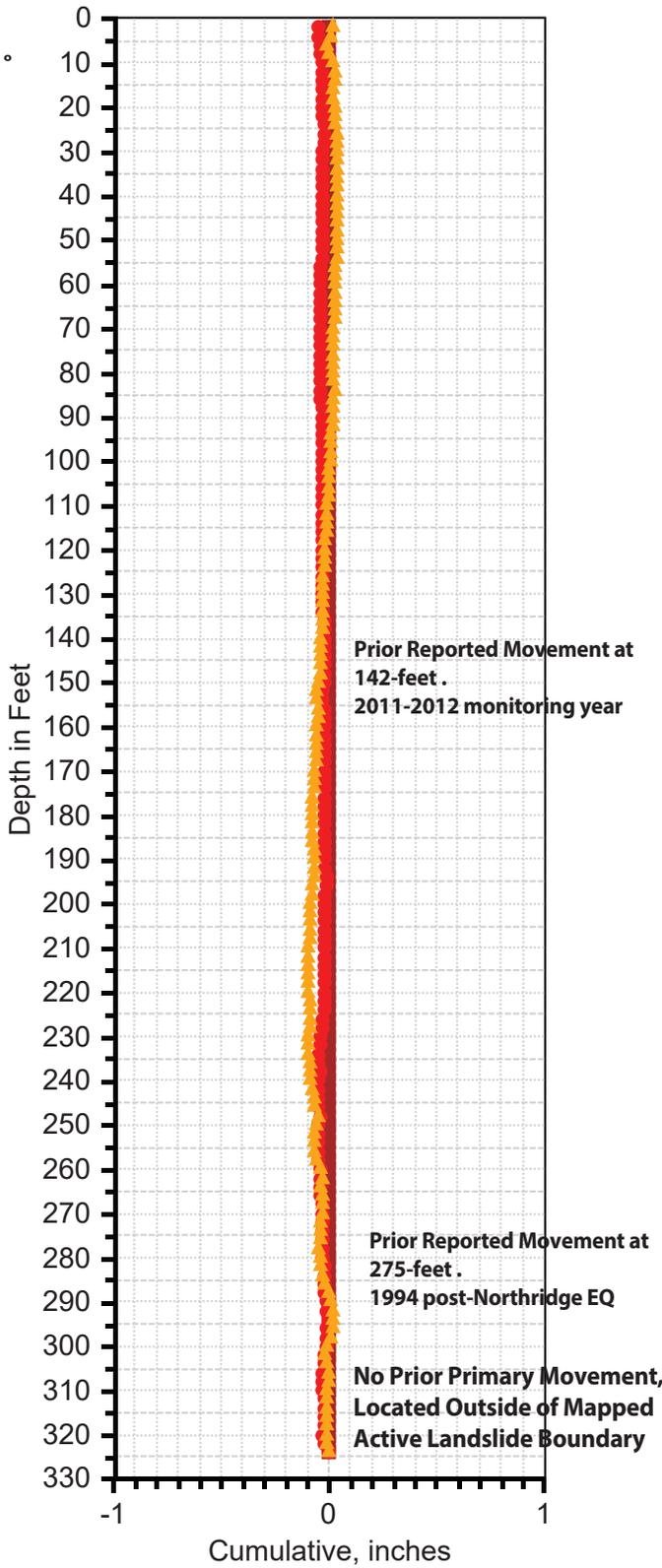
PROJECT NUMBER:

**220-276**

REVISION DATE: 8/7/2023

**A-  
181°**

**A+  
1°**



■ 9/13/2021 ● 5/26/2022 ▲ 6/1/2023

■ 9/13/2021 ● 5/26/2022 ▲ 6/1/2023

**Plot of Slope Inclinometer**

**SP-20**

Plot Type: Cumulative and Incremental

Plot Direction: A-Direction

Depth of Survey (ft):

322

Baseline Date:

9/13/2021

Corrections:

Rotation

Install Date:  
3/1984

Installed Depth (ft):  
330

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



**Yeh and Associates, Inc.**

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PROJECT:

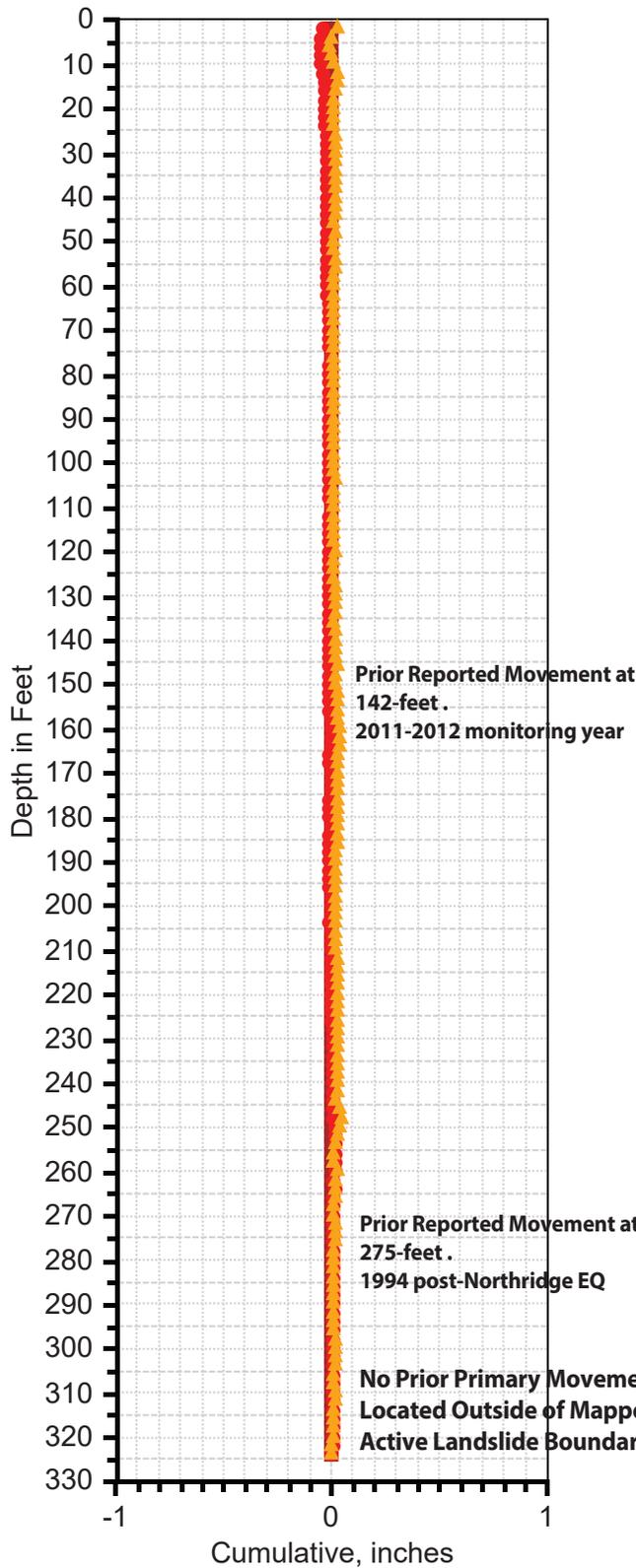
**Big Rock Mesa LAD**  
Malibu, CA

PROJECT NUMBER:

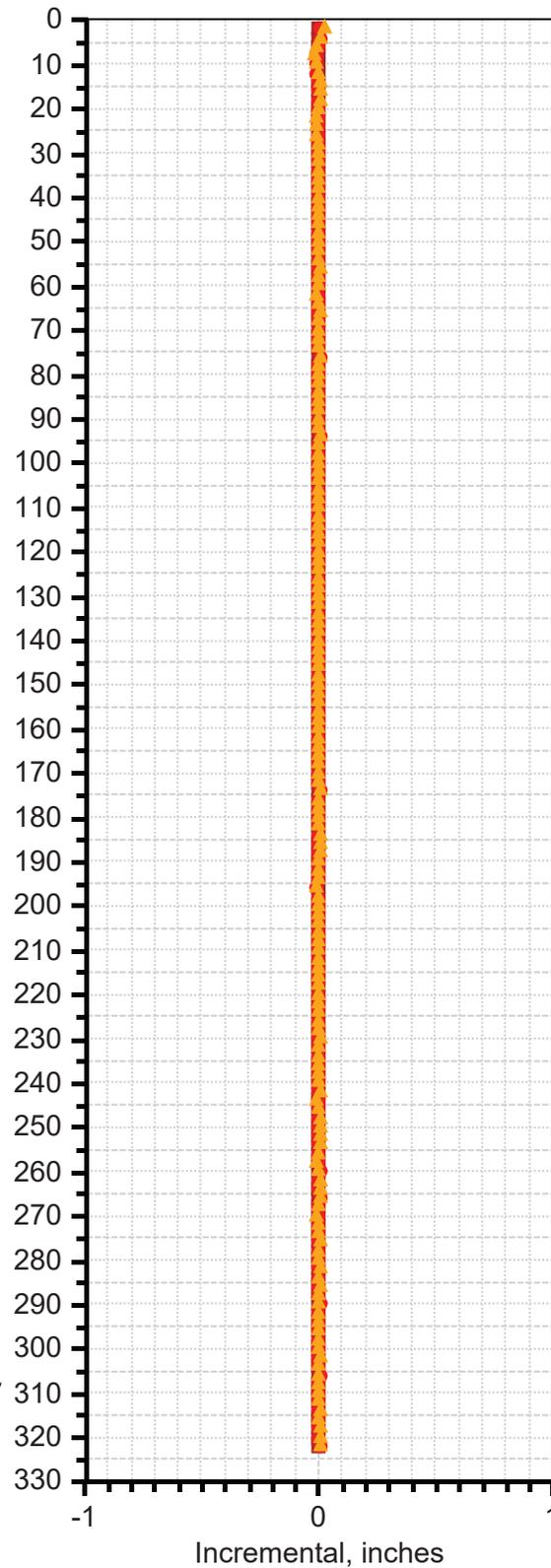
**220-276**

REVISION DATE: 8/7/2023

**B-  
271°**



**B+  
91°**



■ 9/13/2021 ● 5/26/2022 ▲ 6/1/2023

■ 9/13/2021 ● 5/26/2022 ▲ 6/1/2023

Plot of Slope Inclinometer

SP-20

Plot Type: Cumulative and Incremental

Plot Direction: B-Direction

Depth of Survey (ft):

322

Baseline Date:

9/13/2021

Corrections:

Rotation

Install Date:  
3/1984

Installed Depth (ft):  
330

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



Yeh and Associates, Inc.

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PROJECT:

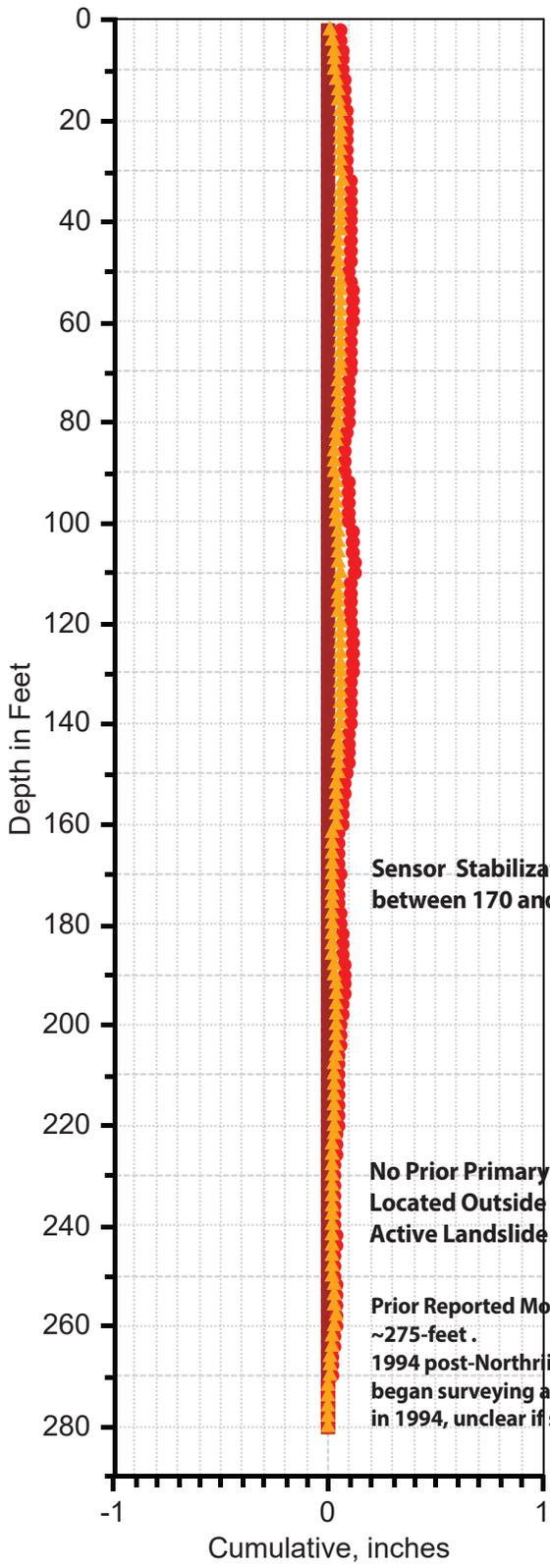
Big Rock Mesa LAD  
Malibu, CA

PROJECT NUMBER:

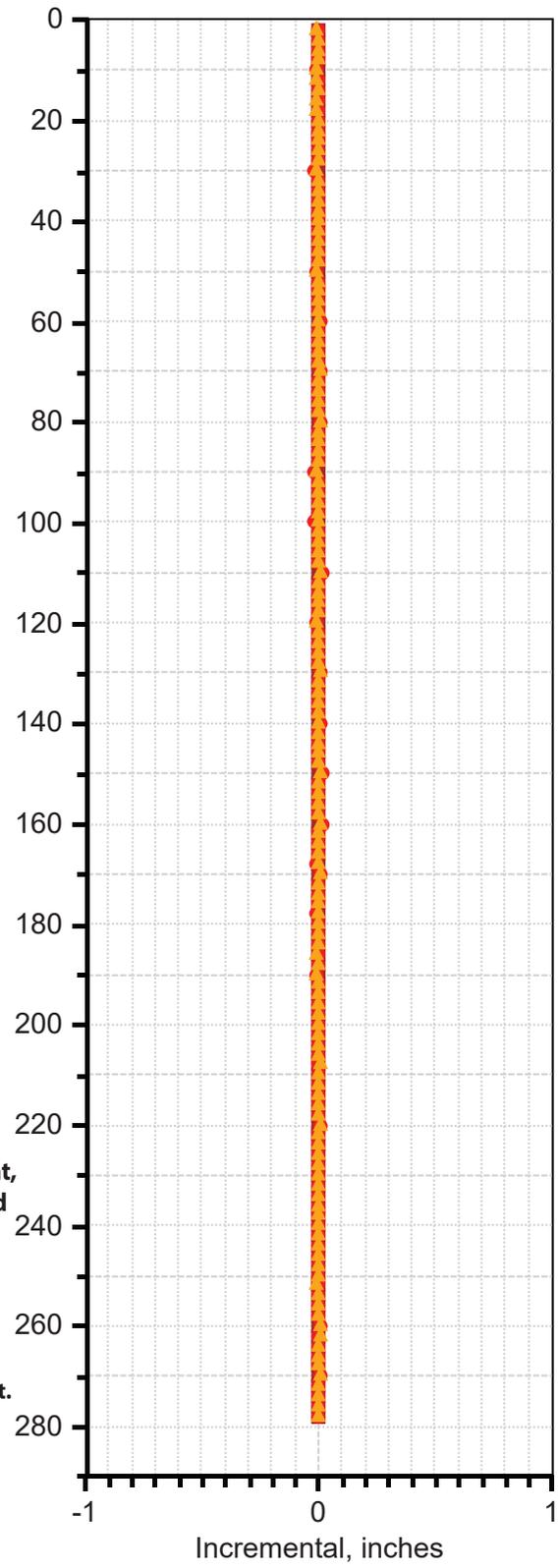
220-276

REVISION DATE: 8/7/2023

A-  
120°



A+  
300°



7/30/2021 6/23/2022 6/1/2023

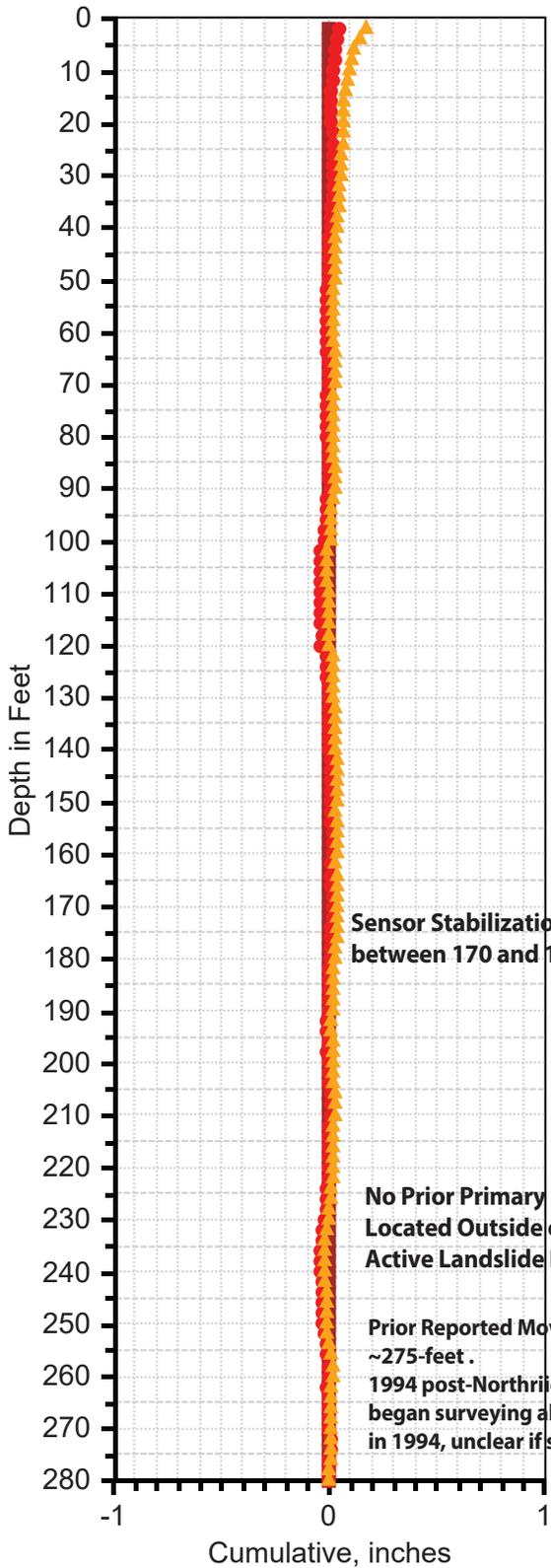
7/30/2021 6/23/2022 6/1/2023

<b>Plot of Slope Inclinometer</b>  <b>SP-21</b>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
	Depth of Survey (ft): 280		Baseline Date: 7/30/2021	
	Install Date: 4/1984	Installed Depth (ft): 380	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

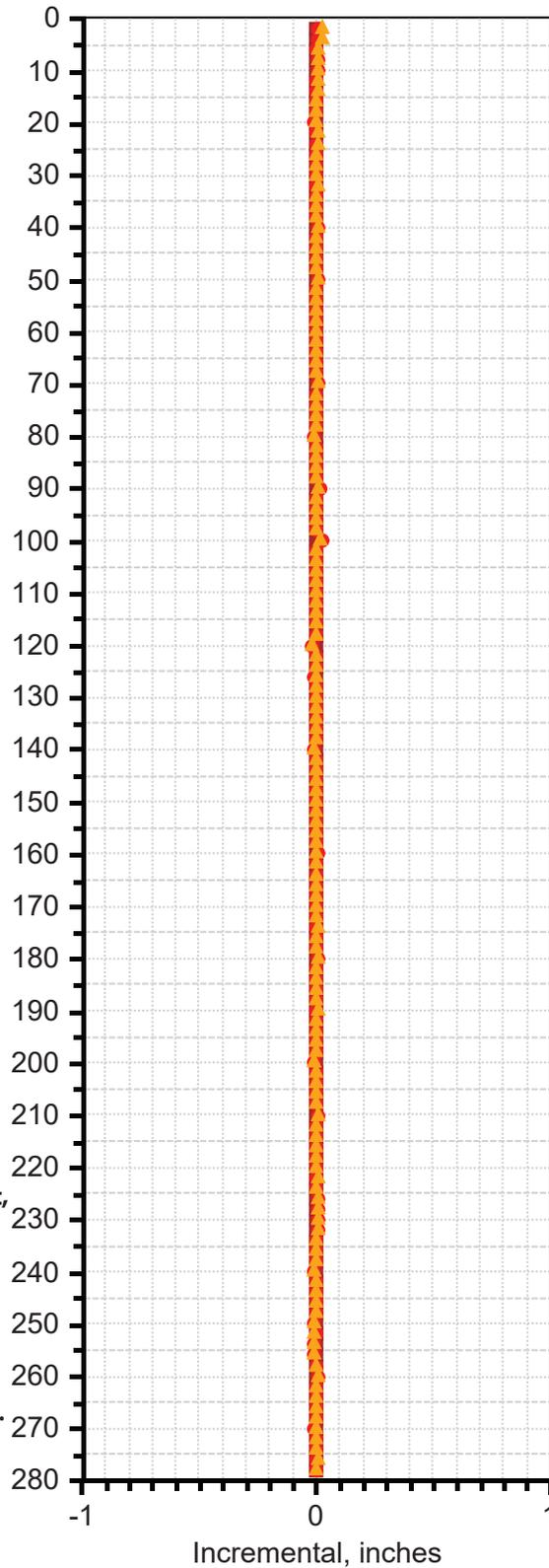
**Yeh and Associates, Inc.**  
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PROJECT: **Big Rock Mesa LAD** PROJECT NUMBER: **220-276**  
 Malibu, CA  
 REVISION DATE: 8/7/2023

**B-  
210°**



**B+  
30°**



■ 7/30/2021 ● 6/23/2022 ▲ 6/1/2023

■ 7/30/2021 ● 6/23/2022 ▲ 6/1/2023

Plot of Slope Inclinometer

**SP-21**

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 280		Baseline Date: 7/30/2021	
Install Date: 4/1984		Corrections: None	
Installed Depth (ft): 380	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	



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PROJECT:

**Big Rock Mesa LAD**  
Malibu, CA

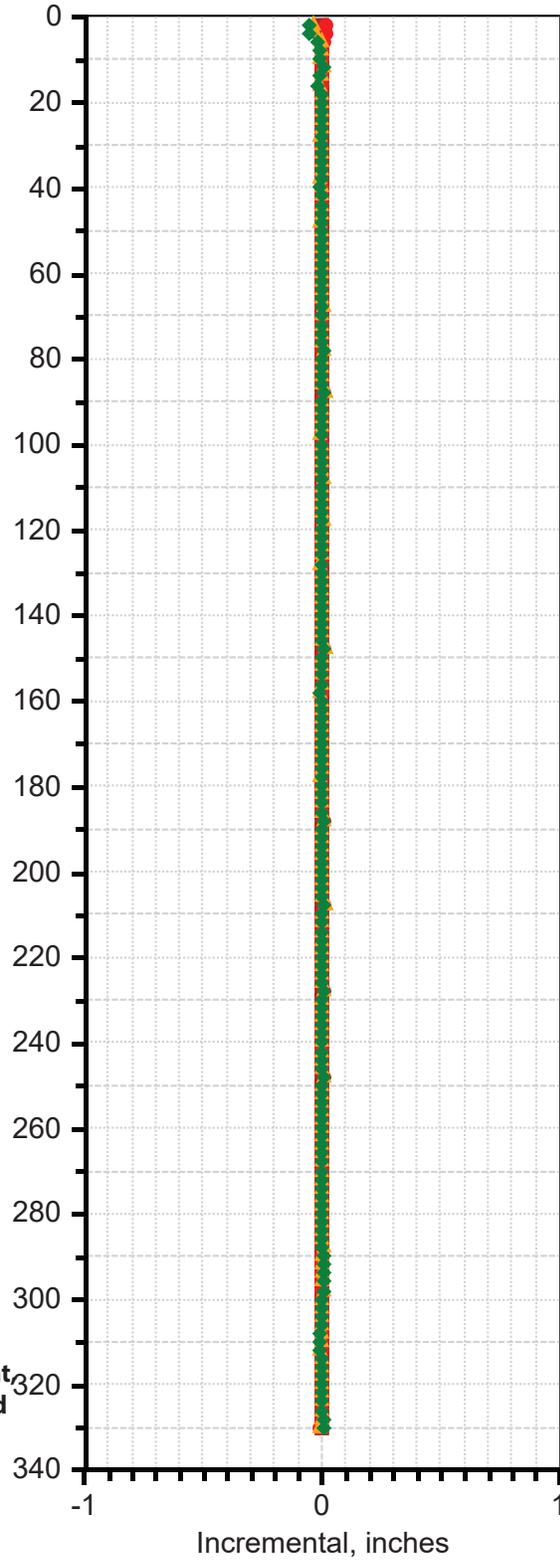
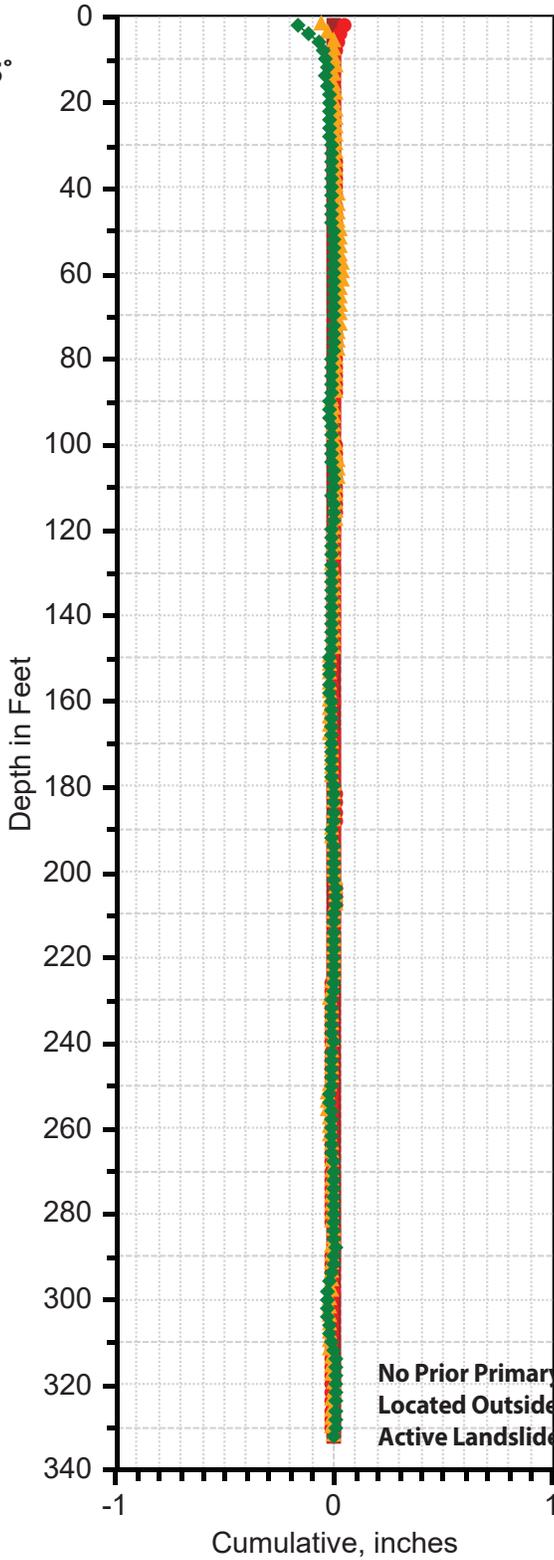
PROJECT NUMBER:

**220-276**

REVISION DATE: 8/7/2023

A-  
165°

A+  
345°



No Prior Primary Movement Located Outside of Mapped Active Landslide Boundary

8/3/2021 9/13/2021  
6/24/2022 6/2/2023

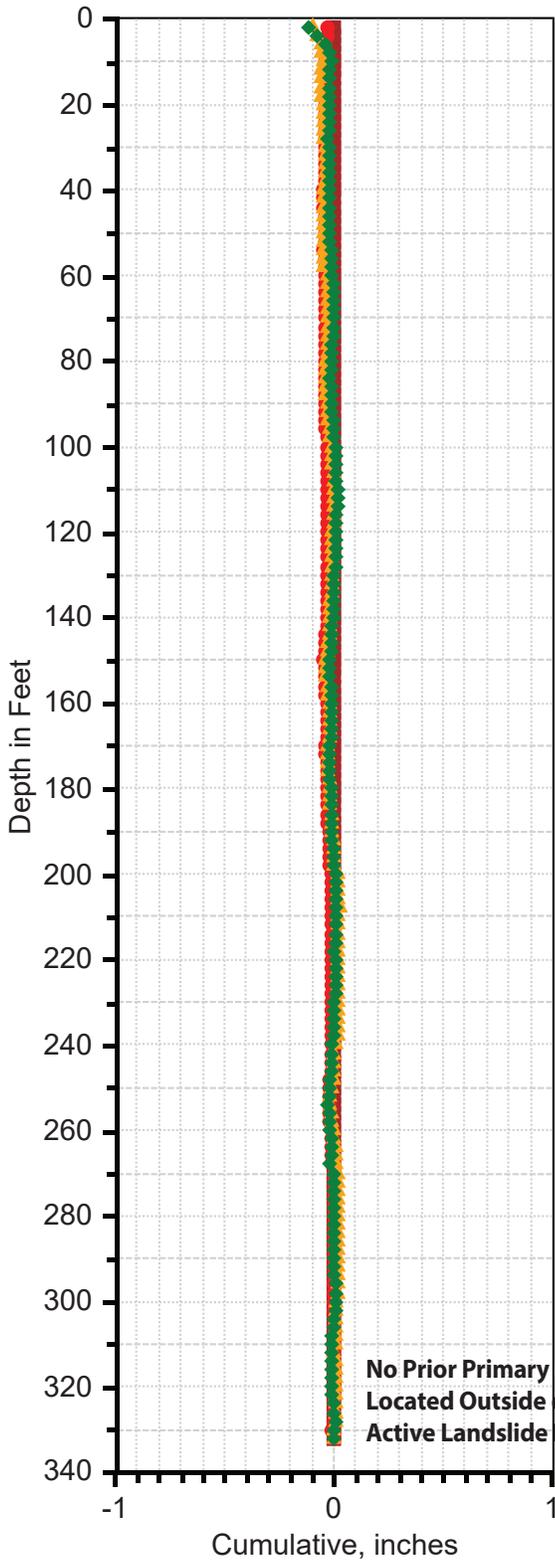
8/3/2021 9/13/2021  
6/24/2022 6/2/2023

<b>Plot of Slope Inclinometer</b>  <b>SP-22</b>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
	Depth of Survey (ft): 330	Baseline Date: 8/3/2021	Corrections: Rotation
	Install Date: 4/1984	Installed Depth (ft): 345	Interpreted Movement Since Baseline (in): 0
			Interpreted Movement Monitoring Year (in): 0

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PROJECT: **Big Rock Mesa LAD** PROJECT NUMBER: **220-276**  
Malibu, CA  
REVISION DATE: 8/7/2023

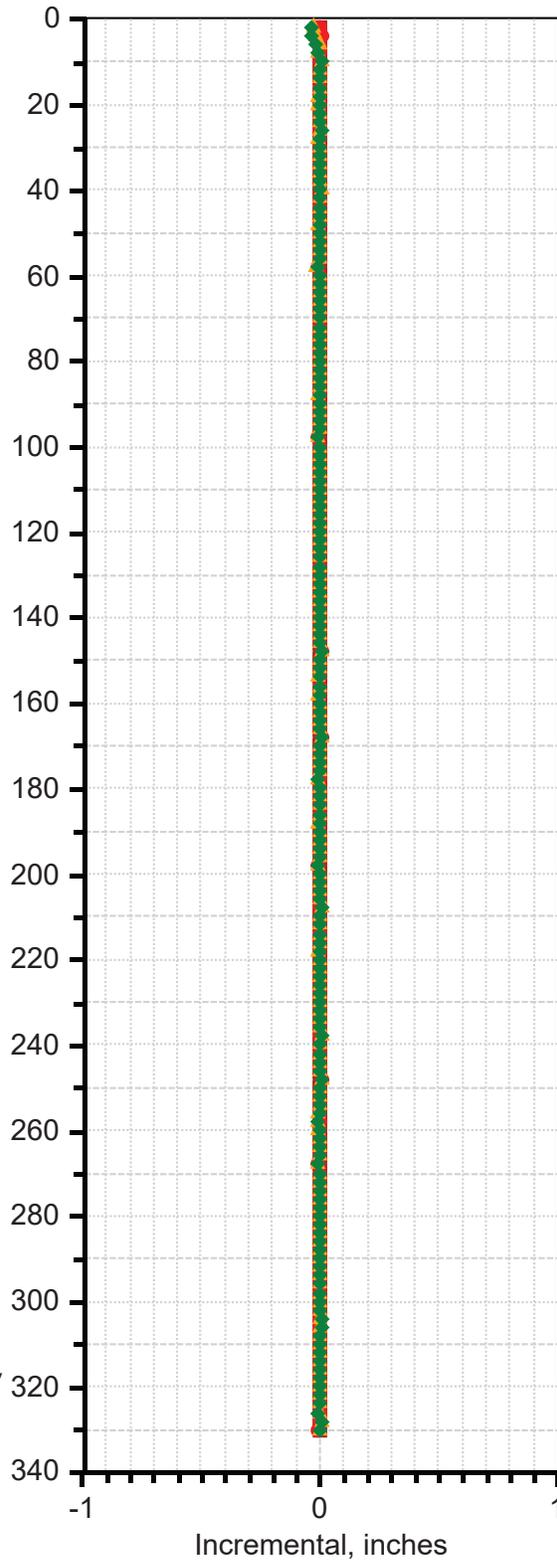
**B-  
255°**



**No Prior Primary Movement,  
Located Outside of Mapped  
Active Landslide Boundary**

8/3/2021 9/13/2021  
6/24/2022 6/2/2023

**B+  
75°**



8/3/2021 9/13/2021  
6/24/2022 6/2/2023

**Plot of Slope Inclinometer**

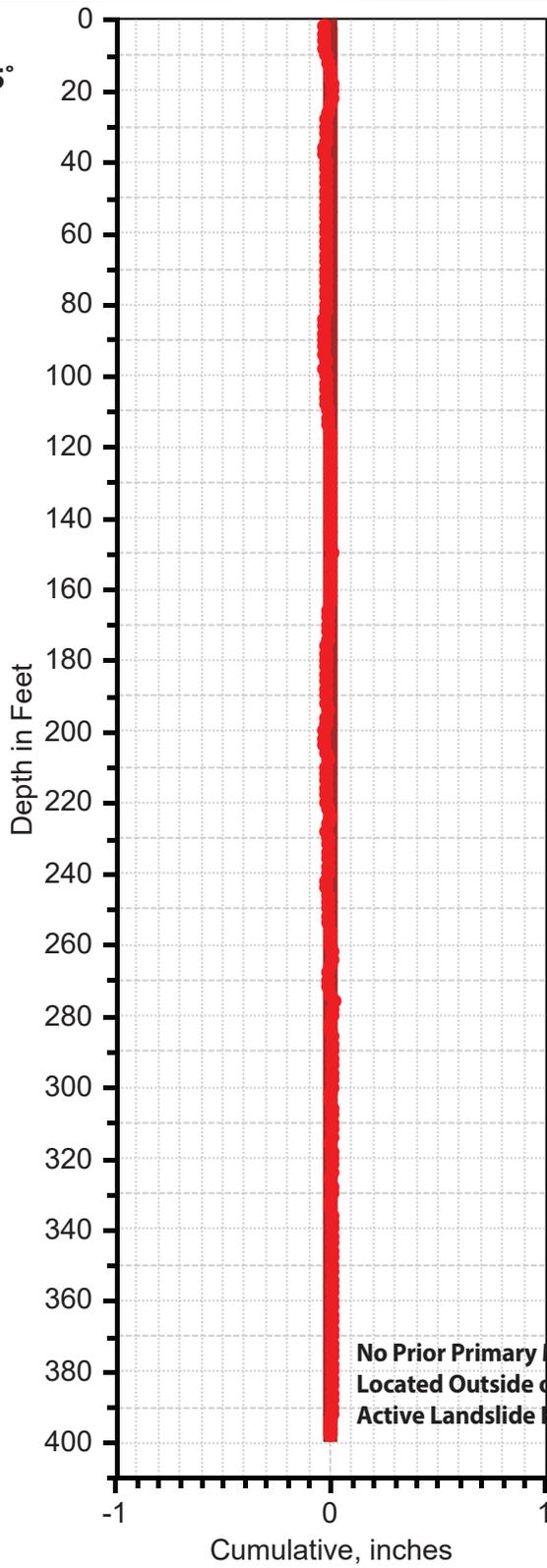
**SP-22**

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
Depth of Survey (ft): 330	Baseline Date: 8/3/2021	Corrections: Rotation
Install Date: 4/1984	Installed Depth (ft): 345	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0



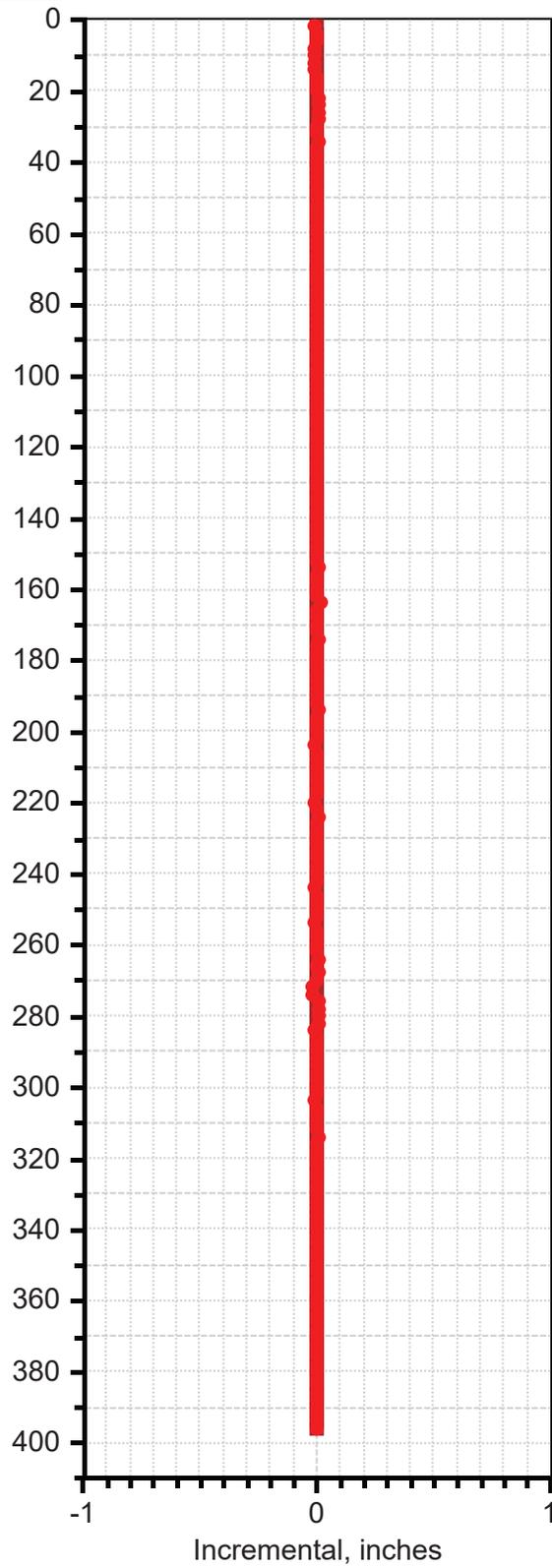
PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

A-  
185°



■ 6/23/2022 ● 6/2/2023

A+  
5°



■ 6/23/2022 ● 6/2/2023

Plot of Slope Inclinometer

SP-23

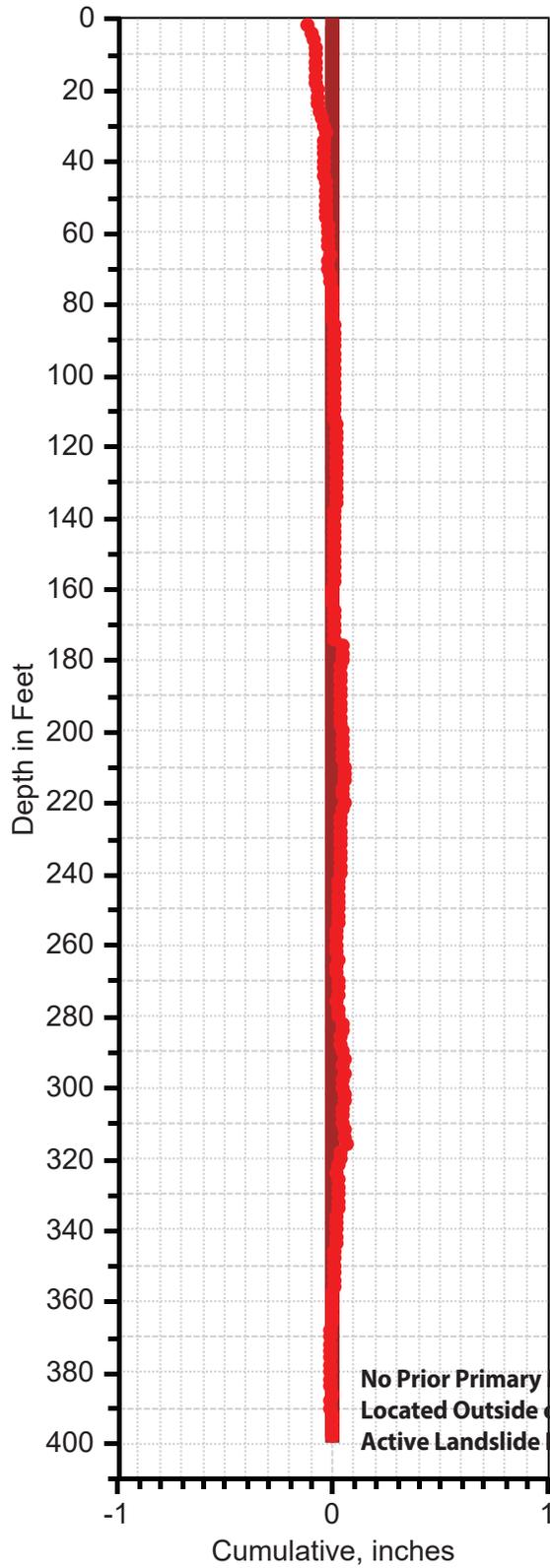
Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft):	396	Baseline Date:	6/23/2022
Install Date:	4/1984	Interpreted Movement Since Baseline (in):	0
Installed Depth (ft):	402	Interpreted Movement Monitoring Year (in):	0
Corrections:		None	



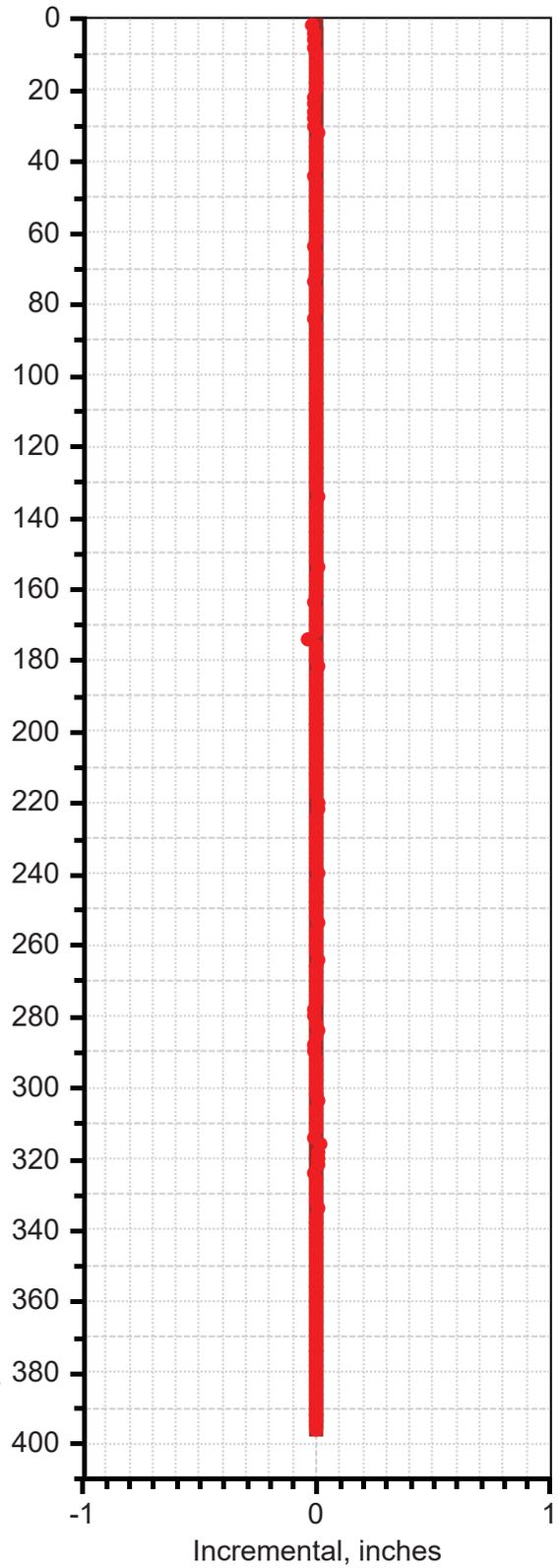
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PROJECT:	Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER:	220-276
REVISION DATE:	8/7/2023		

**B-  
275°**



**B+  
95°**



■ 6/23/2022 ● 6/2/2023

■ 6/23/2022 ● 6/2/2023

Plot of Slope Inclinometer

**SP-23**

Plot Type: Cumulative and Incremental

Plot Direction: B-Direction

Depth of Survey (ft):

396

Baseline Date:

6/23 /2022

Corrections:

None

Install Date:  
4/1984

Installed Depth (ft):  
402

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



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PROJECT:

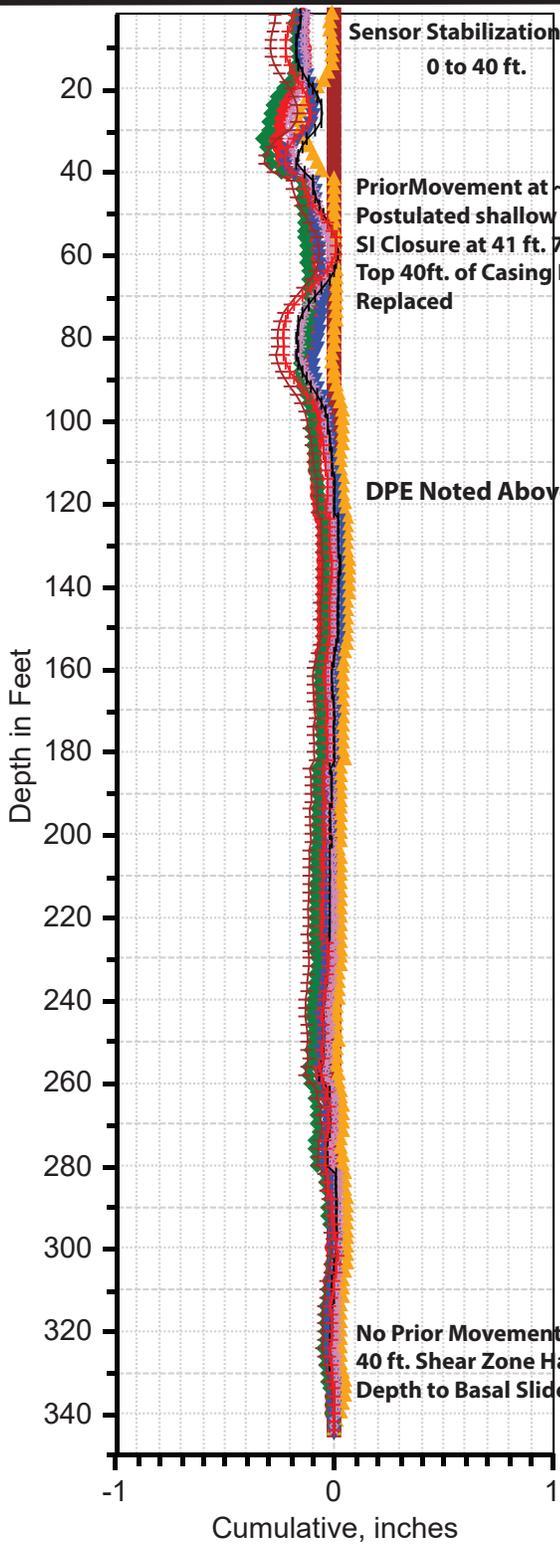
**Big Rock Mesa LAD**  
Malibu, CA

PROJECT NUMBER:

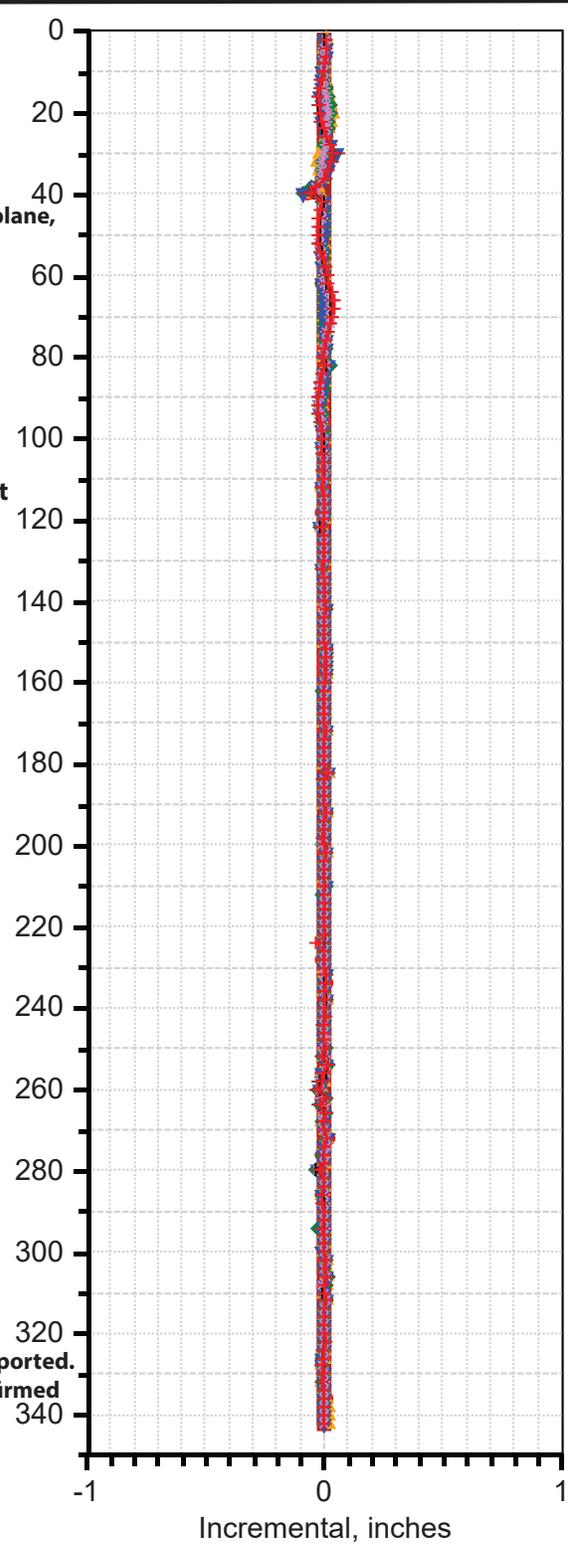
**220-276**

REVISION DATE: 8/7/2023

A-  
225°



A+  
45°



- 4/9/2021
- 8/3/2021
- ▲ 10/1/2021
- ◆ 12/9/2021
- ▼ 2/25/2022
- ✦ 11/3/2022
- + 1/17/2023
- 2/7/2023
- + 6/2/2023

- 4/9/2021
- 8/3/2021
- ▲ 10/1/2021
- ◆ 12/9/2021
- ▼ 2/25/2022
- ✦ 11/3/2022
- + 1/17/2023
- 2/7/2023
- + 6/2/2023

Plot of Slope Inclinometer

SP-26

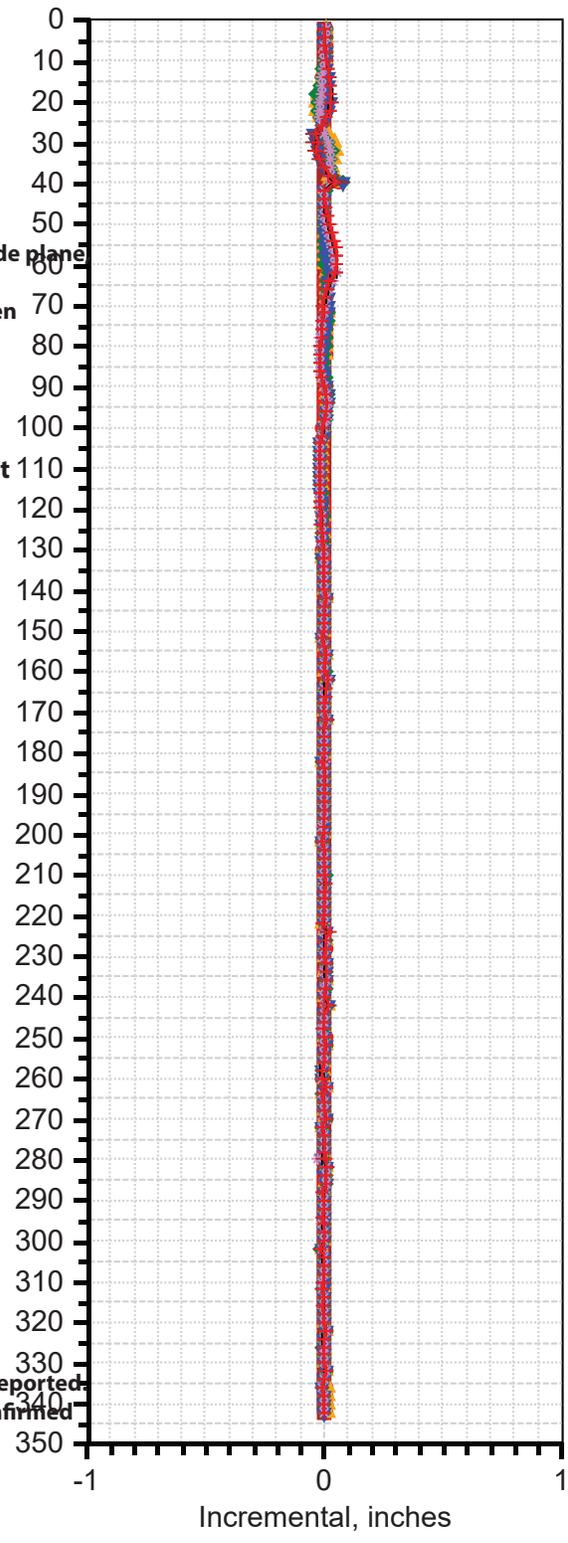
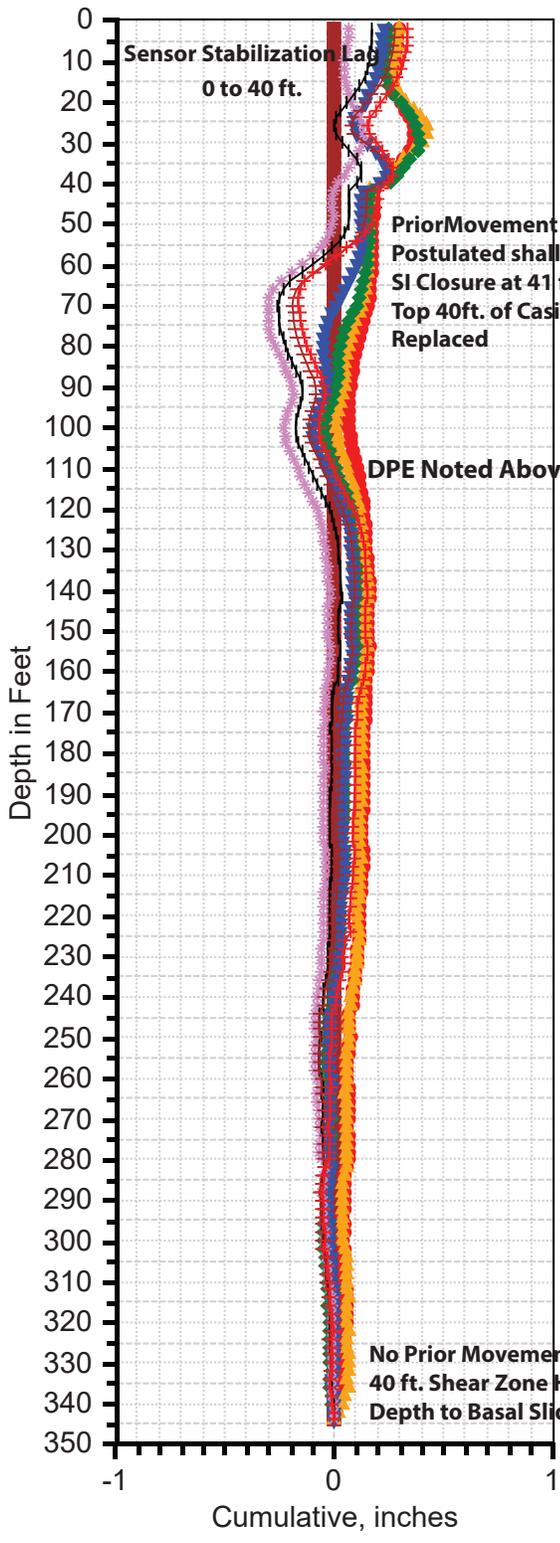
Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
Depth of Survey (ft): 342		Baseline Date: 4/09/2021	
Install Date: 4/1984	Installed Depth (ft): 405	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0



PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

B-  
315°

B+  
135°



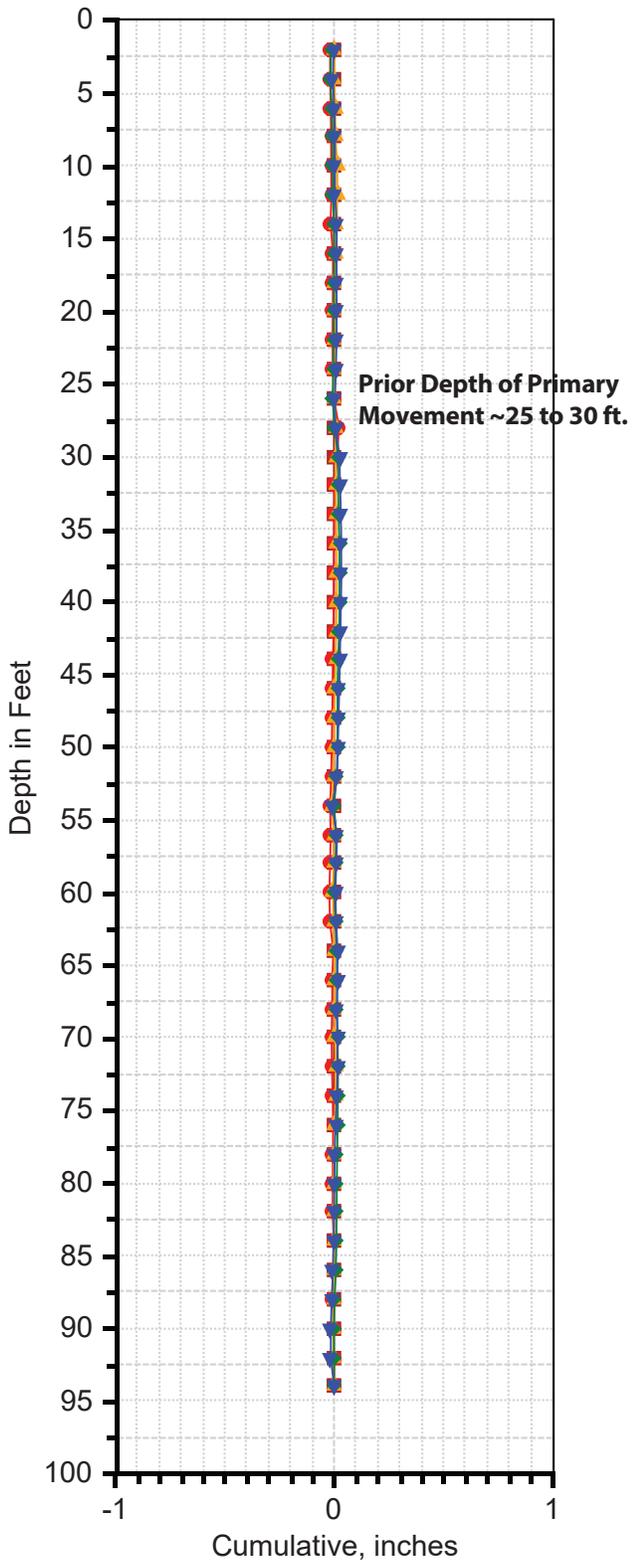
- 4/9/2021
- 8/3/2021
- ▲ 10/1/2021
- 4/9/2021
- 8/3/2021
- ▲ 10/1/2021
- ◆ 12/9/2021
- ▼ 2/25/2022
- ✦ 11/3/2022
- ◆ 12/9/2021
- ▼ 2/25/2022
- ✦ 11/3/2022
- + 1/17/2023
- + 2/7/2023
- + 6/2/2023
- + 1/17/2023
- + 2/7/2023
- + 6/2/2023

<b>Plot of Slope Inclinometer</b>  <span style="font-size: 2em;">SP-26</span>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
	Depth of Survey (ft):	342	Baseline Date: 4/09/2021
	Install Date: 4/1984	Installed Depth (ft): 405	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0	

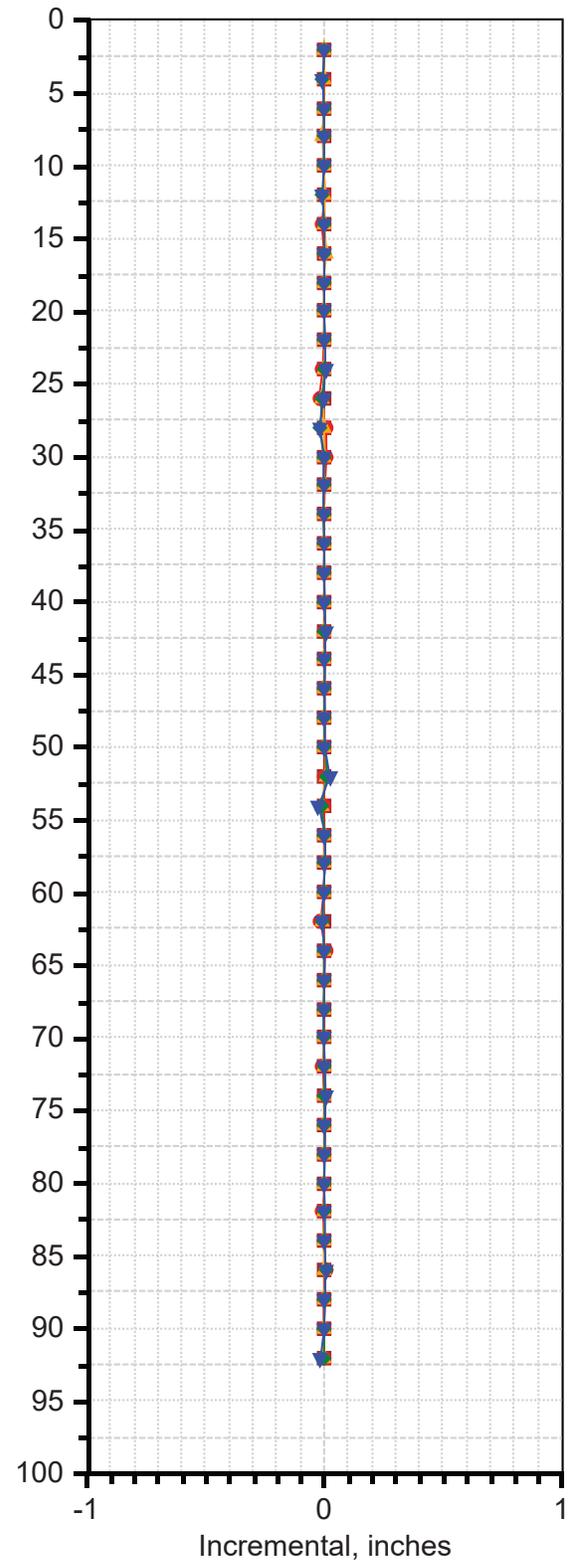


PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

A-  
170°



A+  
350°



■ 9/14/2021    ● 11/3/2022    ▲ 2/8/2023  
◆ 6/6/2023    ▼ 7/6/2023

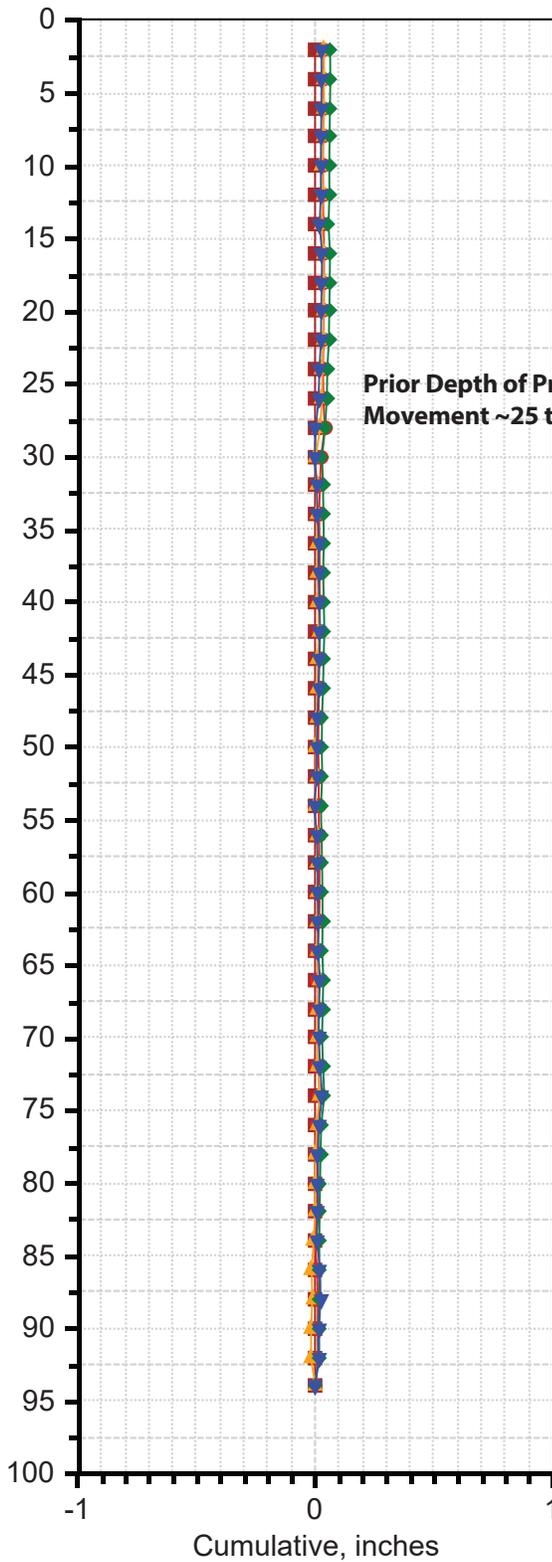
■ 9/14/2021    ● 11/3/2022    ▲ 2/8/2023  
◆ 6/6/2023    ▼ 7/6/2023

Plot of Slope Inclinometer  <b>SP-27A</b>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
	Depth of Survey (ft): 92	Baseline Date: 9/14/21	Corrections: None
	Install Date: 5/1984	Installed Depth (ft): 95	Interpreted Movement Since Baseline (in): 0
			Interpreted Movement Monitoring Year (in): 0

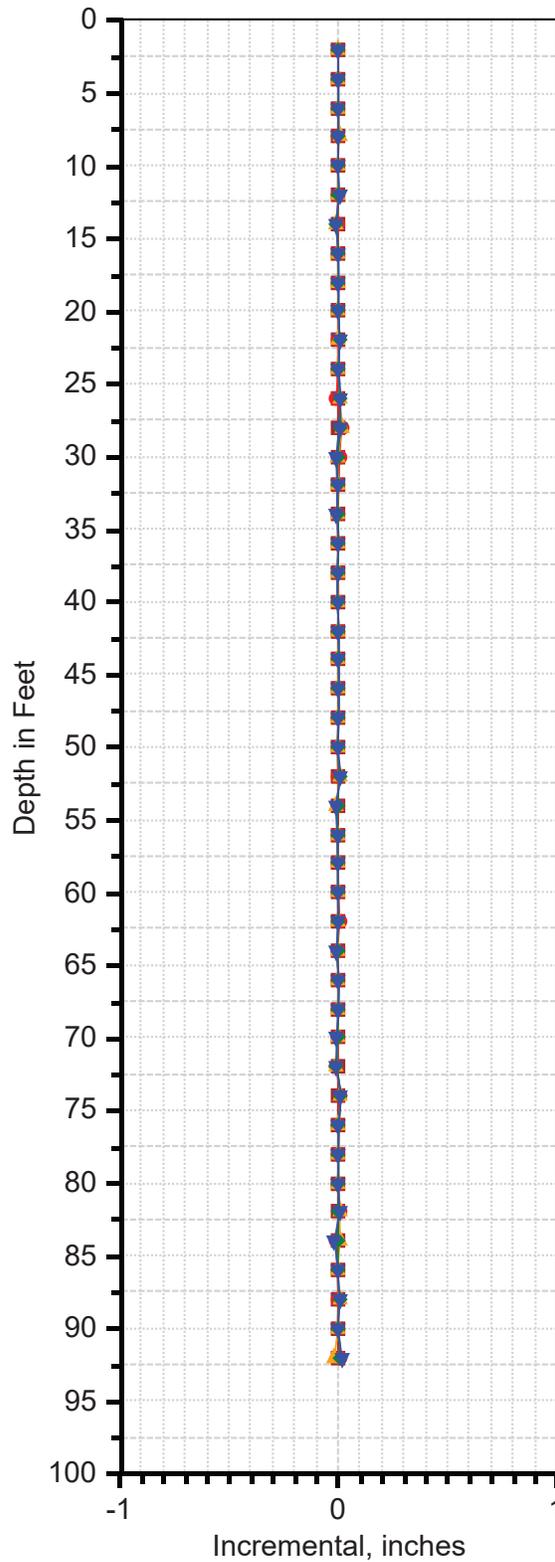
**Yeh and Associates, Inc.**  
 Geotechnical • Geological • Construction Services

PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

B-  
260°



B+  
80°



■ 9/14/2021    ● 11/3/2022    ▲ 2/8/2023  
◆ 6/6/2023    ▼ 7/6/2023

■ 9/14/2021    ● 11/3/2022    ▲ 2/8/2023  
◆ 6/6/2023    ▼ 7/6/2023

Plot of Slope Inclinometer

SP-27A

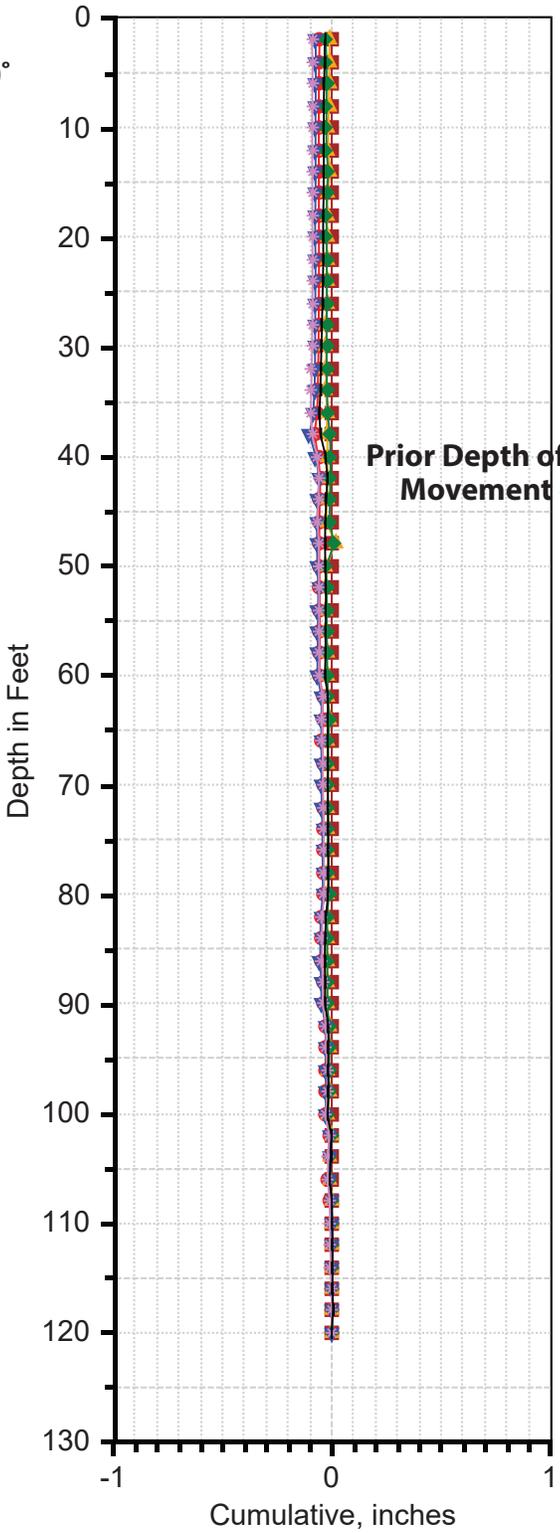
Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 92		Baseline Date: 9/14/2021	
Install Date: 5/1984		Corrections: None	
Installed Depth (ft): 95	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	



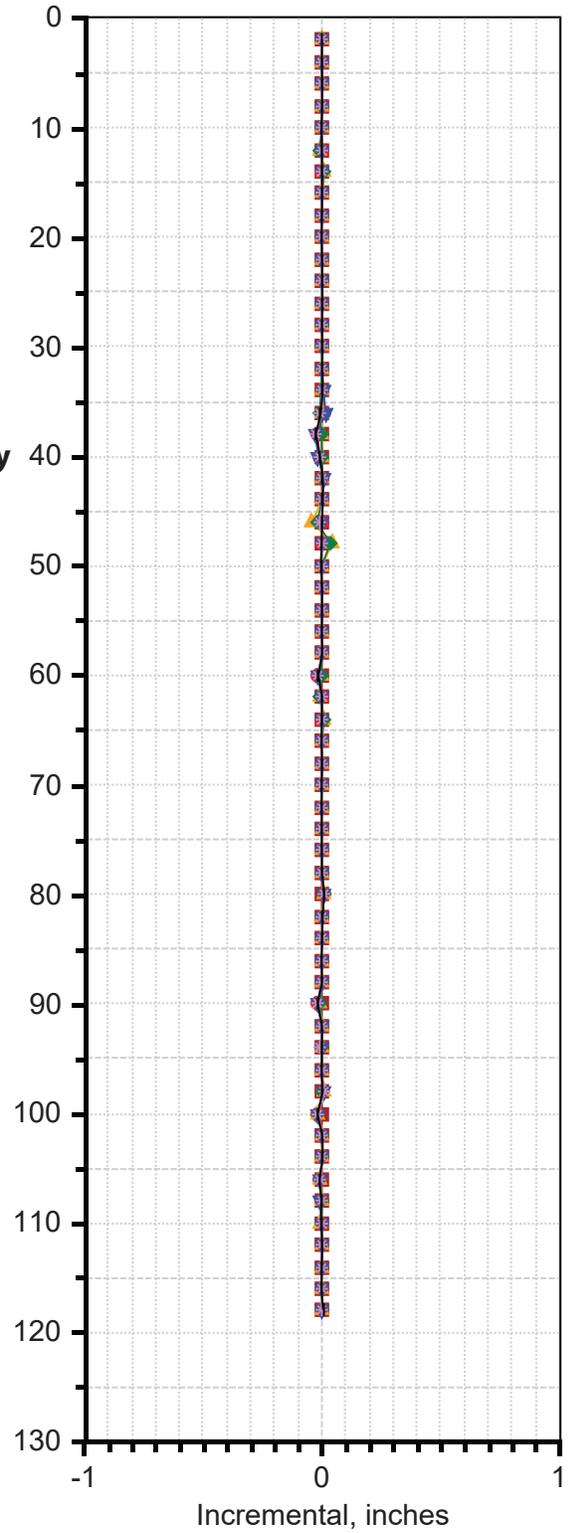
Yeh and Associates, Inc.  
Geotechnical • Geological • Construction Services

PROJECT:	Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER:	220-276
REVISION DATE:	8/7/2023		

A-  
190°



A+  
10°



- 4/7/2021
- 5/23/2022
- ▲ 11/3/2022
- ◆ 1/17/2023
- ▼ 2/8/2023
- ✦ 6/5/2023
- + 7/6/2023

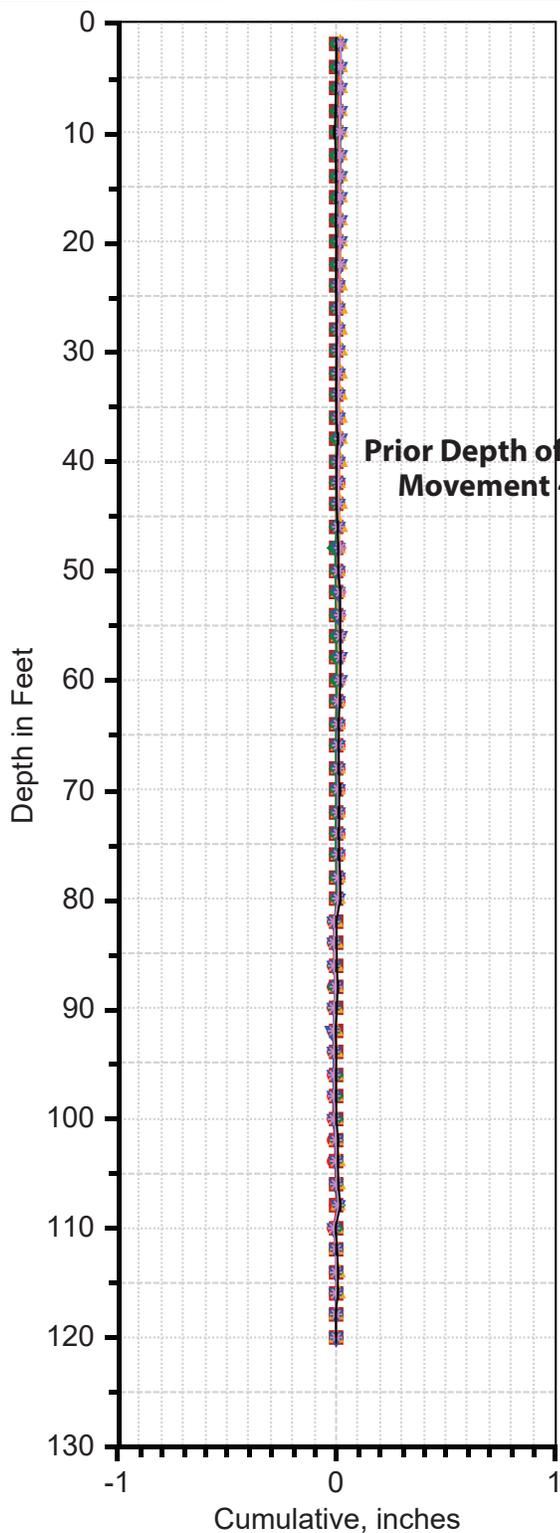
- 4/7/2021
- 5/23/2022
- ▲ 11/3/2022
- ◆ 1/17/2023
- ▼ 2/8/2023
- ✦ 6/5/2023
- + 7/6/2023

<b>Plot of Slope Inclinometer</b>  <span style="font-size: 2em;">SP-30</span>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
	Depth of Survey (ft): 120	Baseline Date: 4/07/2021	Corrections: None
	Install Date: 3/1985	Installed Depth (ft): 155	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0	

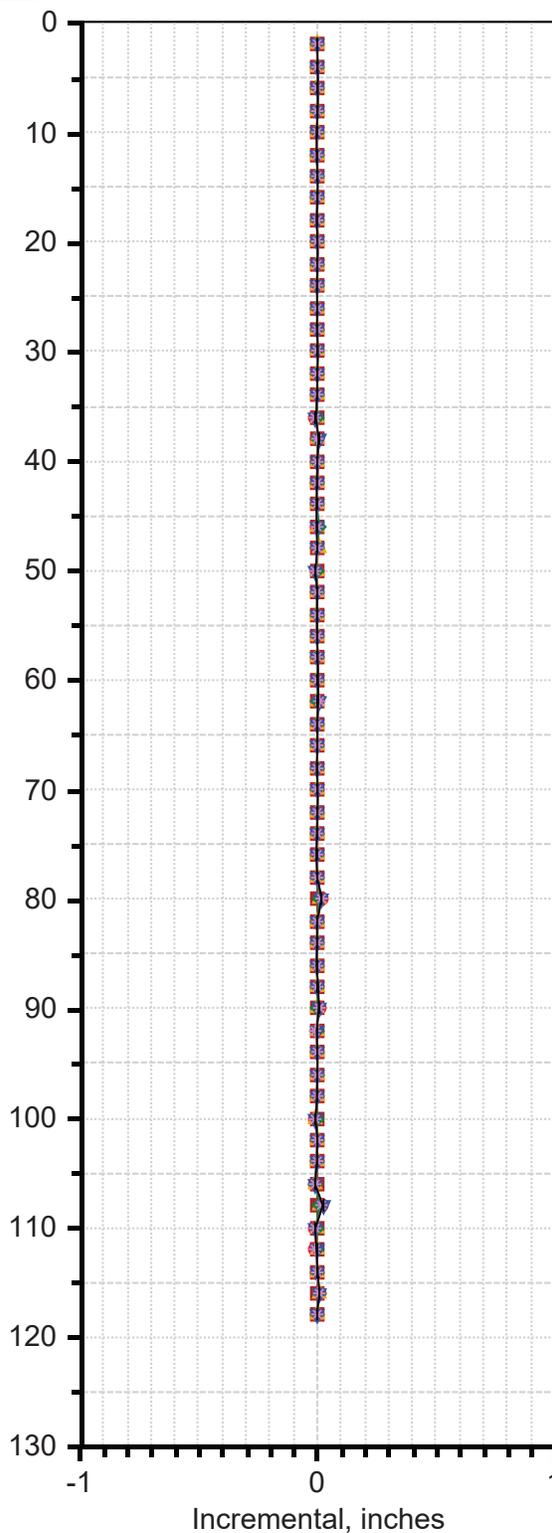
**Yeh and Associates, Inc.**  
Geotechnical • Geological • Construction Services

PROJECT:	<b>Big Rock Mesa LAD</b> Malibu, CA	PROJECT NUMBER: <b>220-276</b>
REVISION DATE:	8/7/2023	

B-  
280°



B+  
100°



- 4/7/2021
- 5/23/2022
- ▲ 11/3/2022
- ◆ 1/17/2023
- ▼ 2/8/2023
- ✦ 6/5/2023
- + 7/6/2023

- 4/7/2021
- 5/23/2022
- ▲ 11/3/2022
- ◆ 1/17/2023
- ▼ 2/8/2023
- ✦ 6/5/2023
- + 7/6/2023

Plot of Slope Inclinometer

SP-30

Plot Type: Cumulative and Incremental

Plot Direction: B-Direction

Depth of Survey (ft):

120

Baseline Date:

4/07/2021

Corrections:

None

Install Date:

3/1985

Installed Depth (ft):

155

Interpreted Movement

Since Baseline (in): 0

Interpreted Movement

Monitoring Year (in): 0



Yeh and Associates, Inc.

Geotechnical • Geological • Construction Services

PROJECT:

Big Rock Mesa LAD

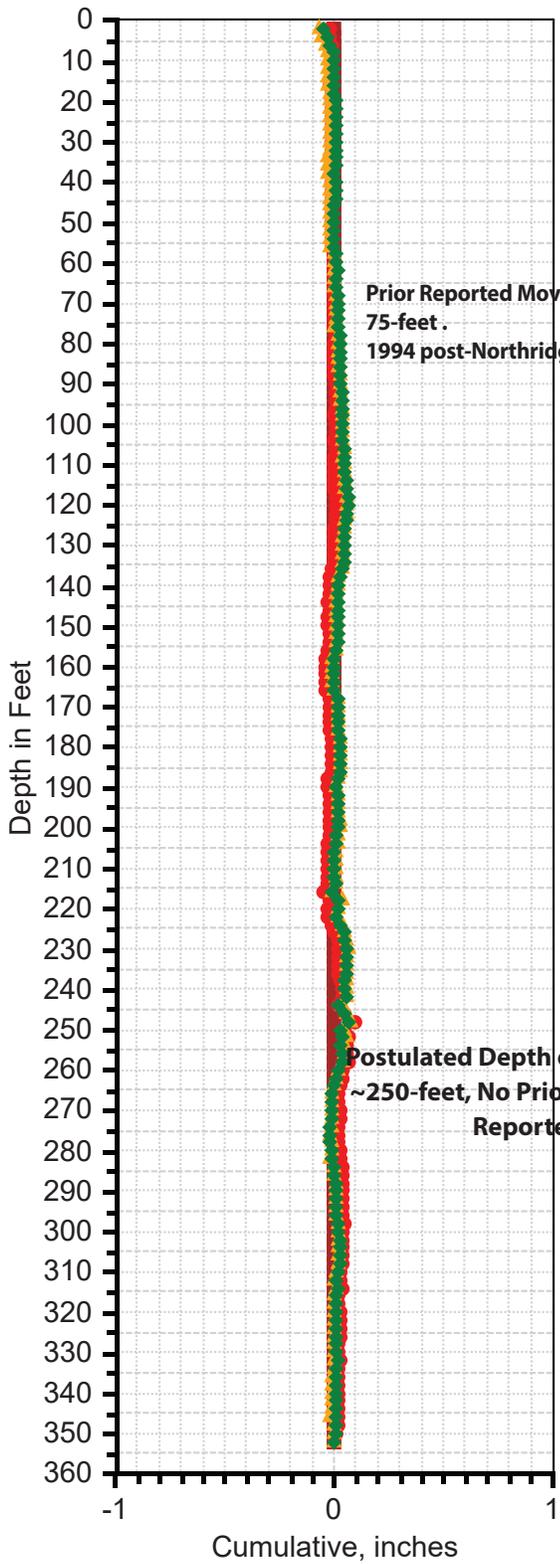
Malibu, CA

PROJECT NUMBER:

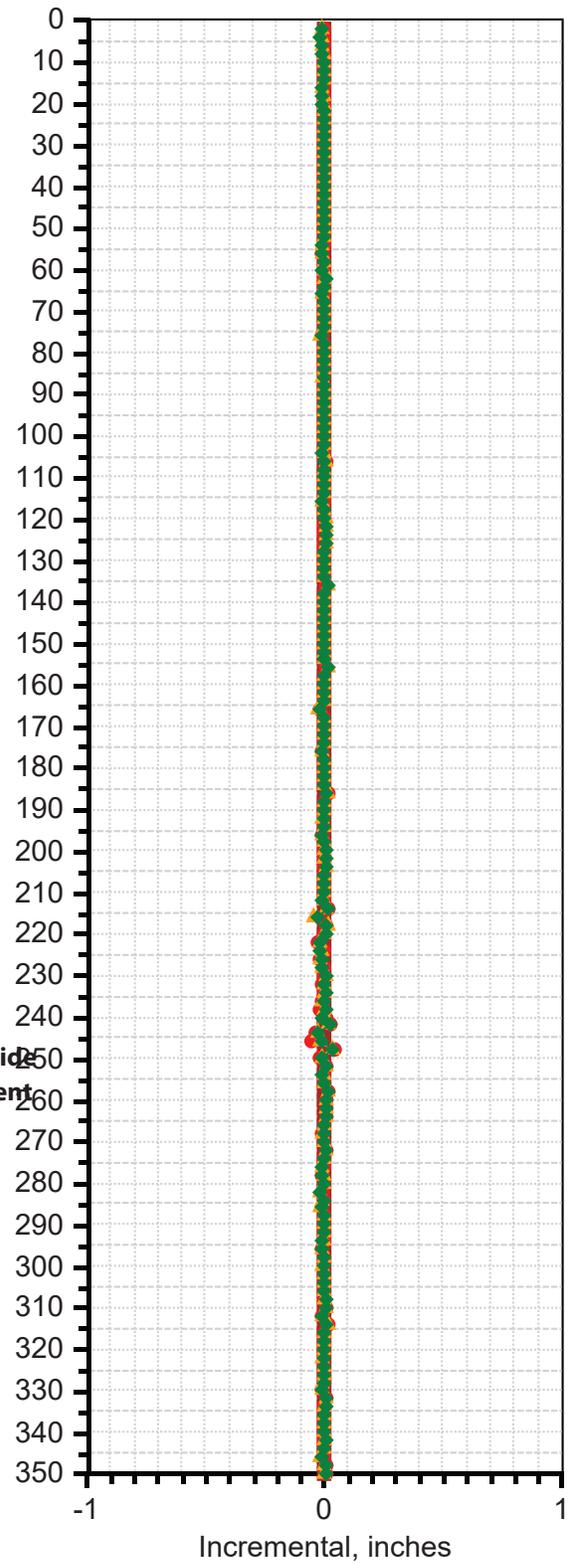
220-276

REVISION DATE: 8/7/2023

A-198°



A+18°



7/29/2021 11/30/2021  
6/23/2022 6/5/2023

7/29/2021 11/30/2021  
6/23/2022 6/5/2023

Plot of Slope Inclinometer

SP-32

Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
Depth of Survey (ft): 350	Baseline Date: 7/29/2021	Corrections: None
Install Date: 3/1985	Installed Depth (ft): 400	Interpreted Movement Since Baseline (in): 0
		Interpreted Movement Monitoring Year (in): 0

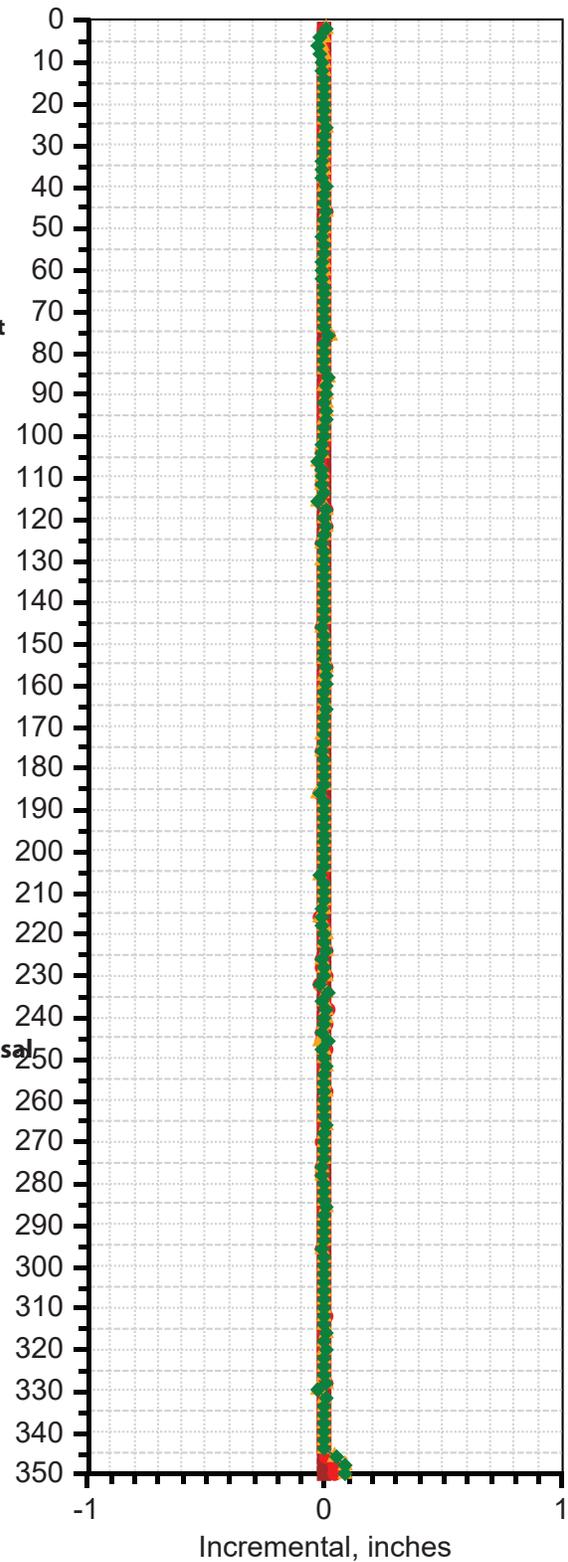
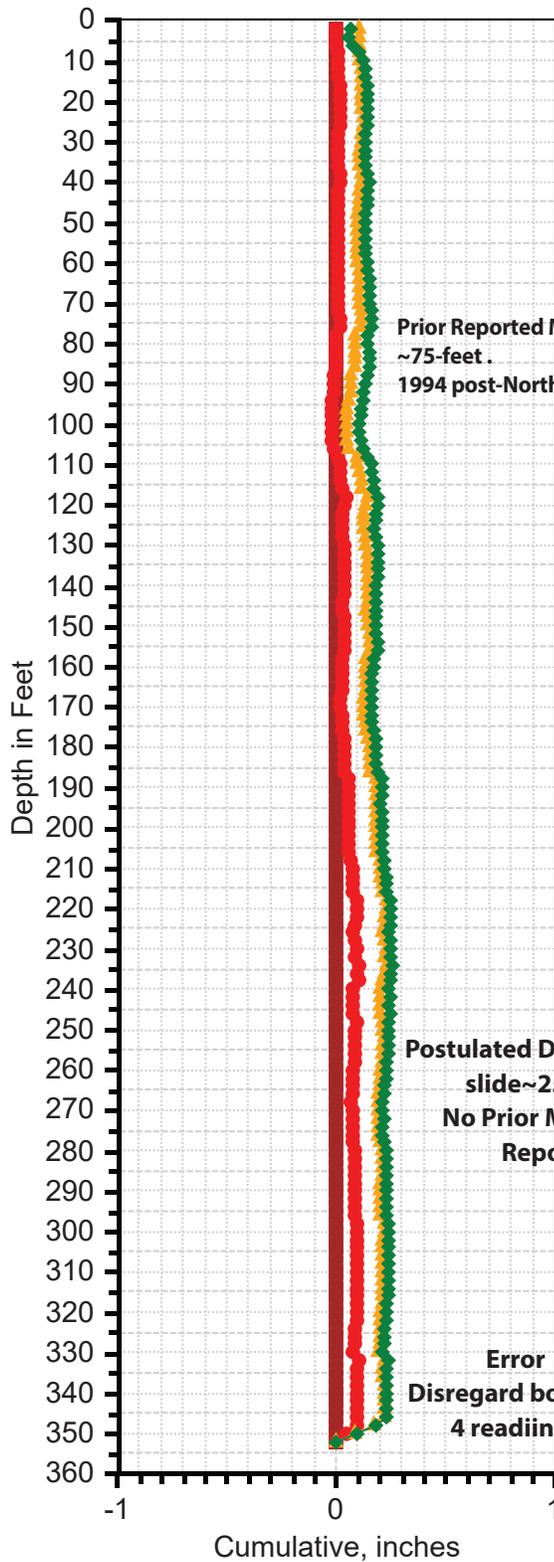


Yeh and Associates, Inc.  
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PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

B-  
288°

B+  
108°



7/29/2021 11/30/2021  
6/23/2022 6/5/2023

7/29/2021 11/30/2021  
6/23/2022 6/5/2023

Plot of Slope Inclinometer

SP-32

Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
Depth of Survey (ft): 350		Baseline Date: 7/29/2021	
Install Date: 3/1985		Corrections: None	
Installed Depth (ft): 400	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0	



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PROJECT:

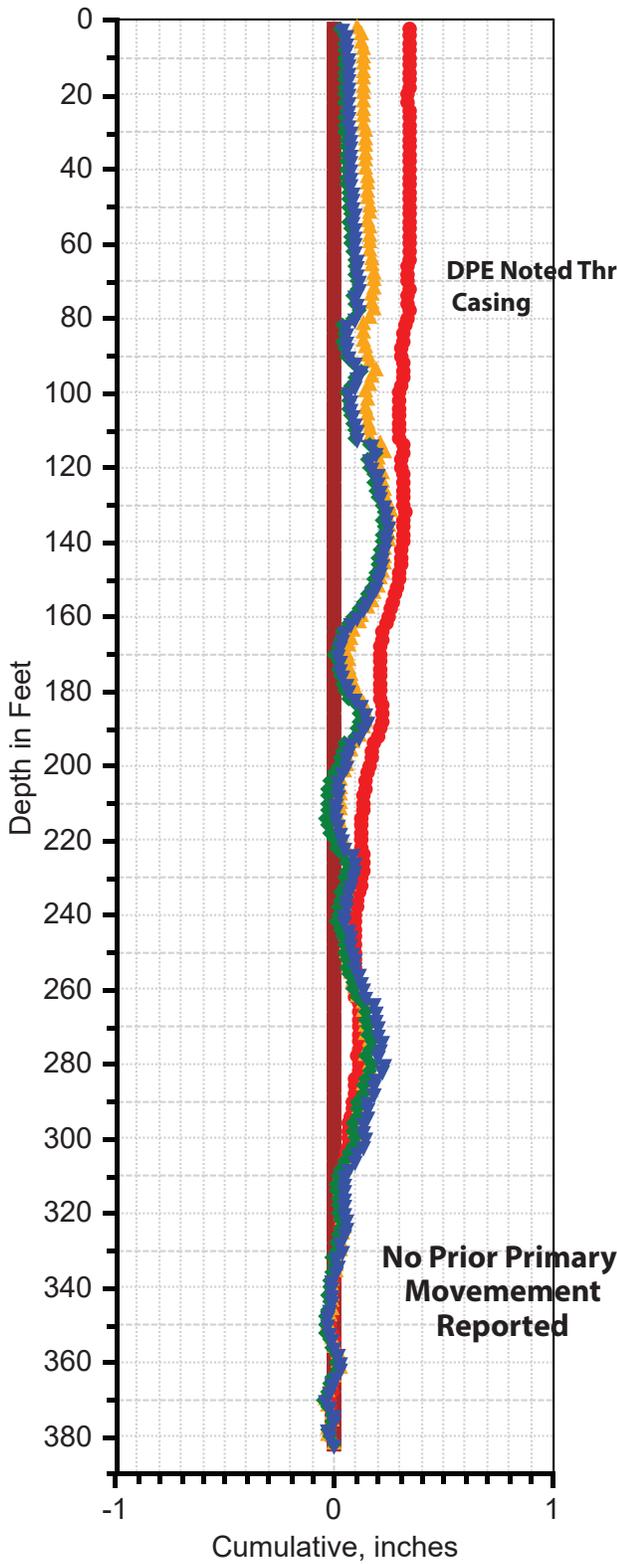
Big Rock Mesa LAD  
Malibu, CA

PROJECT NUMBER:

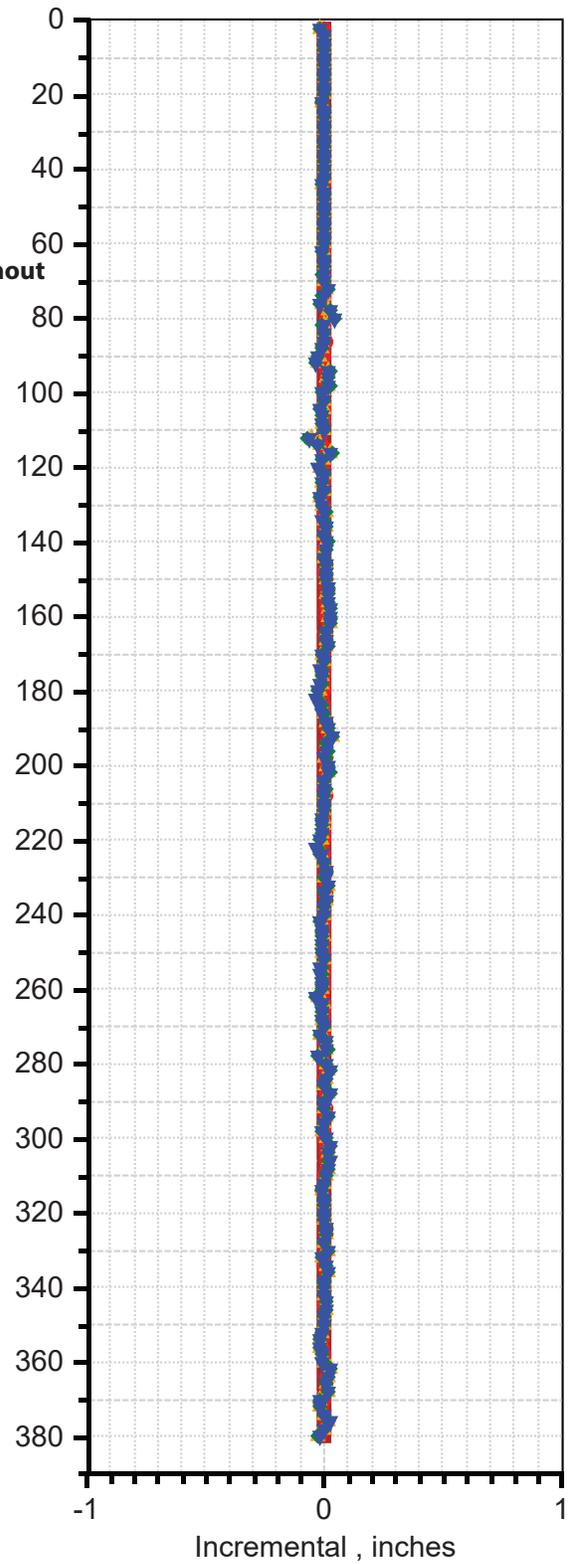
220-276

REVISION DATE: 8/7/2023

A-  
30°



A+  
210°

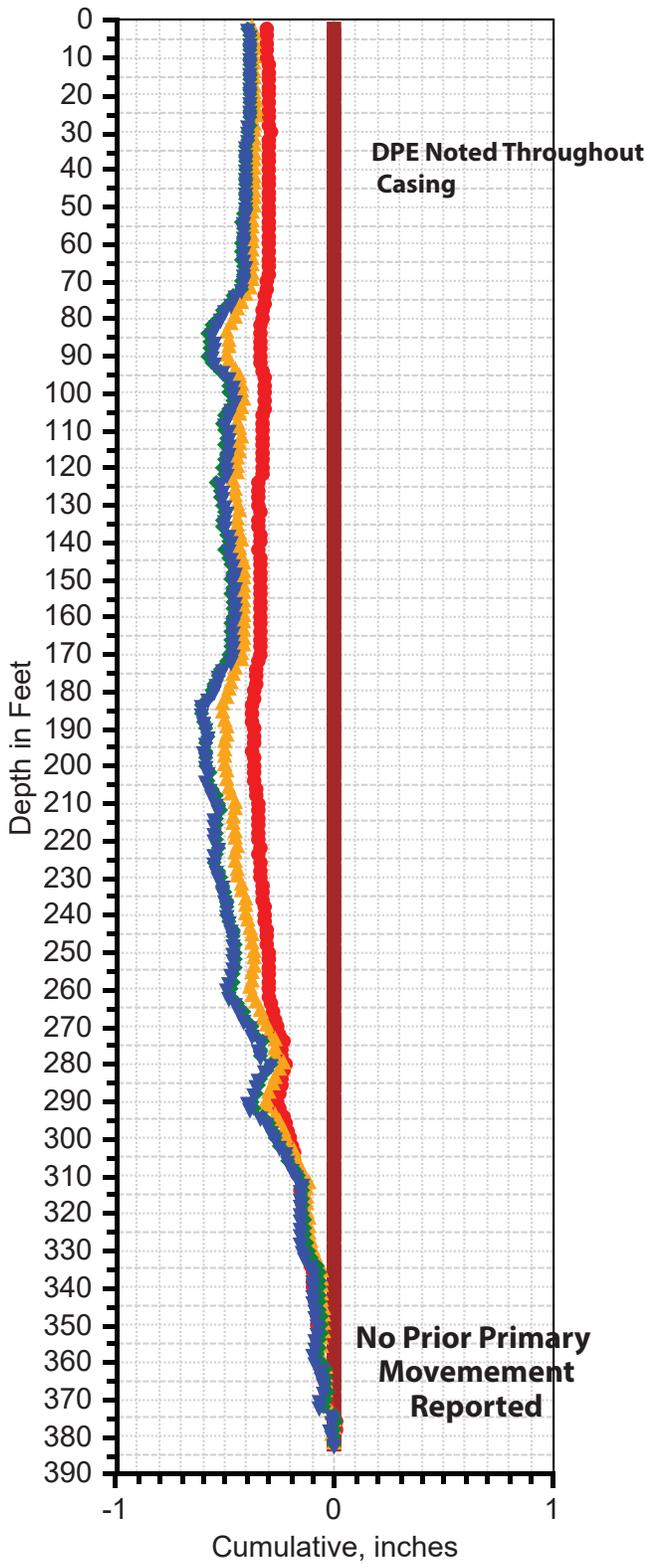


■ 4/1/2021    ● 7/28/2021    ▲ 5/26/2022  
◆ 2/7/2023    ▼ 5/30/2023

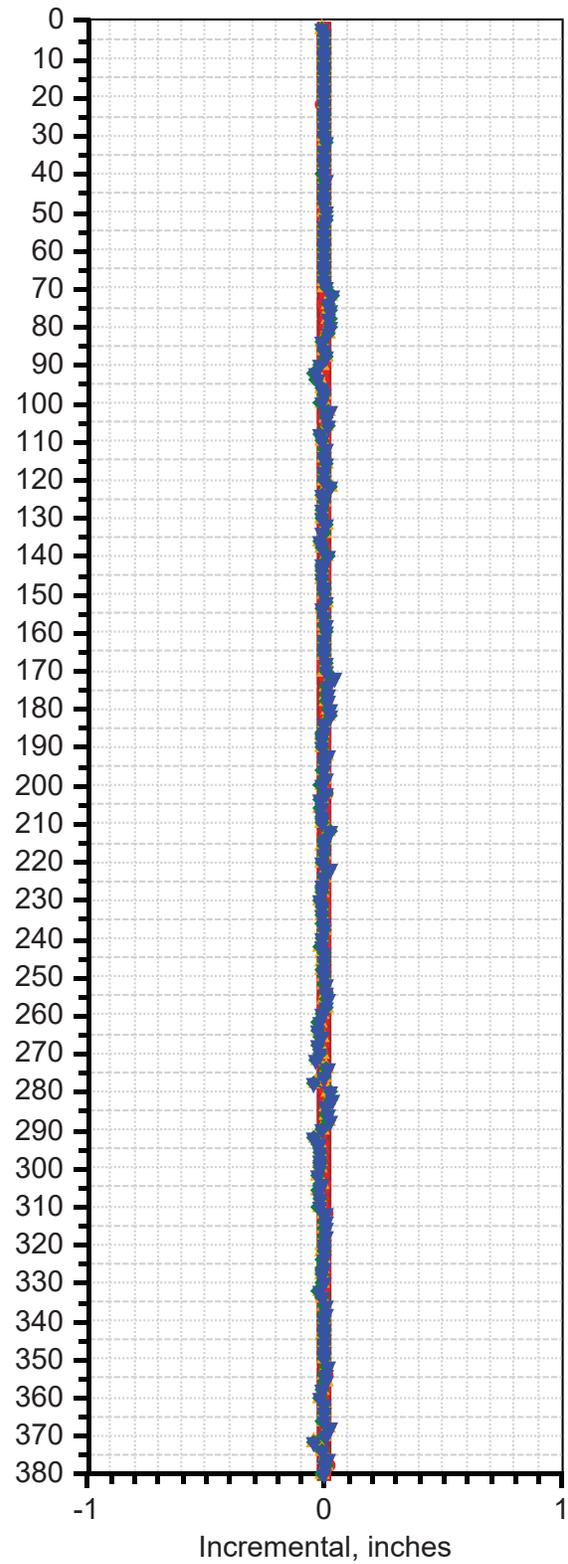
■ 4/1/2021    ● 7/28/2021    ▲ 5/26/2022  
◆ 2/7/2023    ▼ 5/30/2023

Plot of Slope Inclinometer  <b>SP-34</b>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction
	Depth of Survey (ft):	380	Baseline Date: 4/01/2021
	Install Date: 2/1999	Installed Depth (ft): 382	Interpreted Movement Since Baseline (in): 0
			Interpreted Movement Monitoring Year (in): 0

B-  
120°



B+  
300°



■ 4/1/2021    ● 7/28/2021    ▲ 5/26/2022  
◆ 2/7/2023    ▼ 5/30/2023

■ 4/1/2021    ● 7/28/2021    ▲ 5/26/2022  
◆ 2/7/2023    ▼ 5/30/2023

Plot of Slope Inclinometer

SP-34

Plot Type: Cumulative and Incremental

Plot Direction: B-Direction

Depth of Survey (ft): 380

Baseline Date: 4/1/2021

Corrections: None

Install Date: 2/1999

Installed Depth (ft): 382

Interpreted Movement Since Baseline (in): 0

Interpreted Movement Monitoring Year (in): 0



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PROJECT:

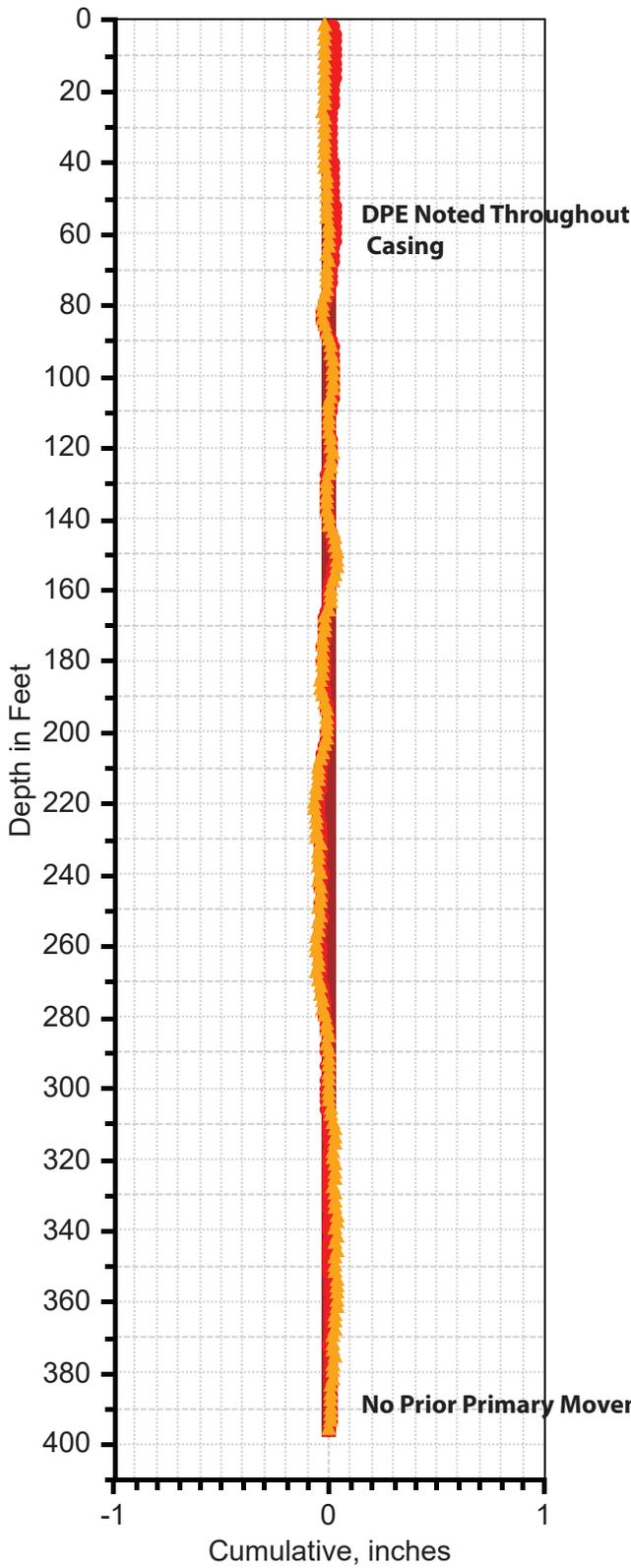
Big Rock Mesa LAD  
Malibu, CA

PROJECT NUMBER:

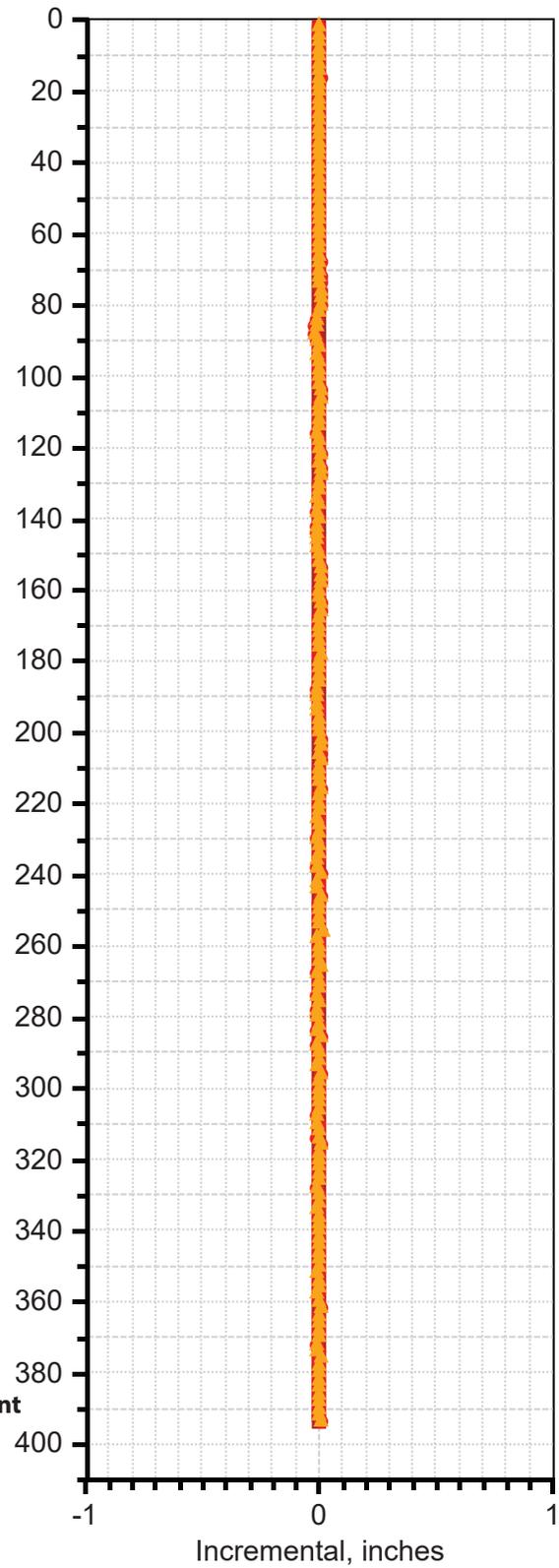
220-276

REVISION DATE: 8/7/2023

A-  
4°



A+  
184°



8/6/2021 6/21/2022 5/31/2023

8/6/2021 6/21/2022 5/31/2023

Plot of Slope Inclinometer

SP-35

Plot Type: Cumulative and Incremental

Plot Direction: A-Direction

Depth of Survey (ft):

394

Baseline Date:

8/06/2021

Corrections:

None

Install Date:  
11/1998

Installed Depth (ft):  
396

Interpreted Movement  
Since Baseline (in): 0

Interpreted Movement  
Monitoring Year (in): 0



Yeh and Associates, Inc.  
Geotechnical • Geological • Construction Services

PROJECT:

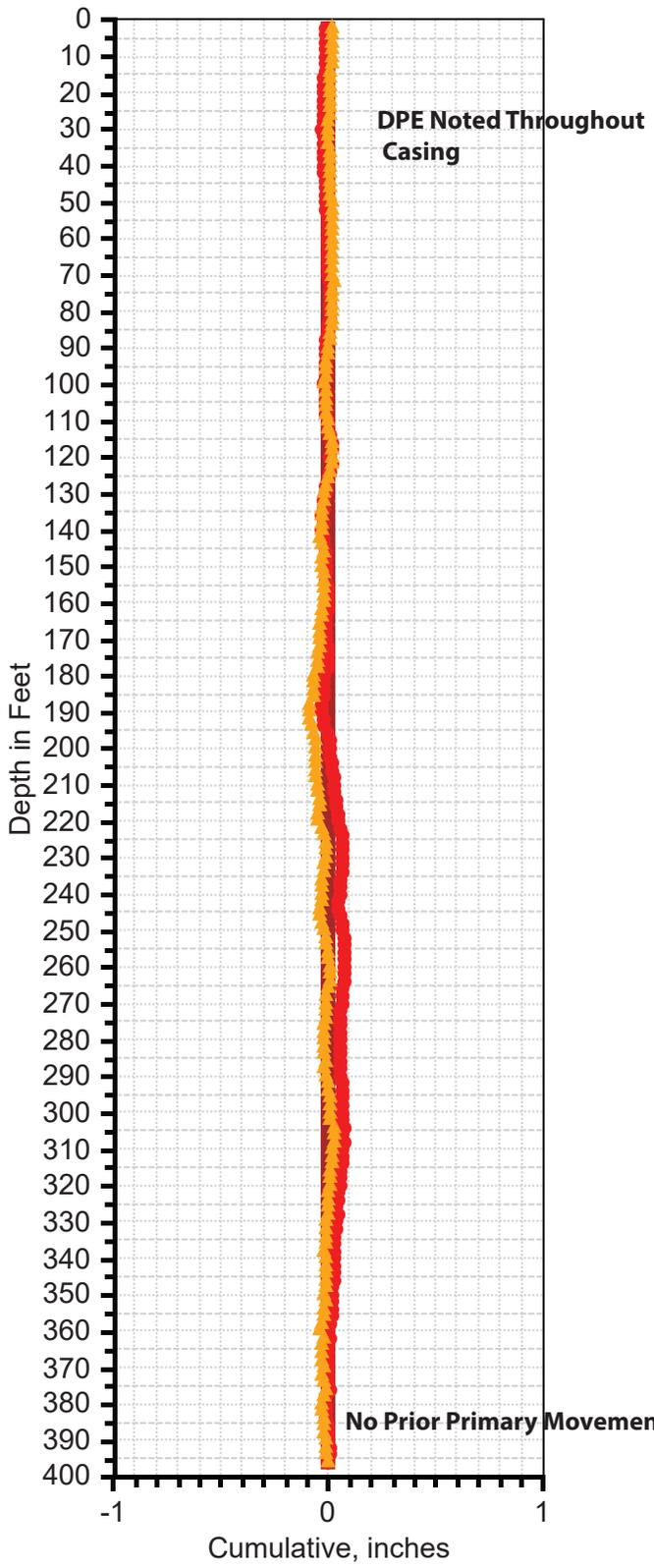
Big Rock Mesa LAD  
Malibu, CA

PROJECT NUMBER:

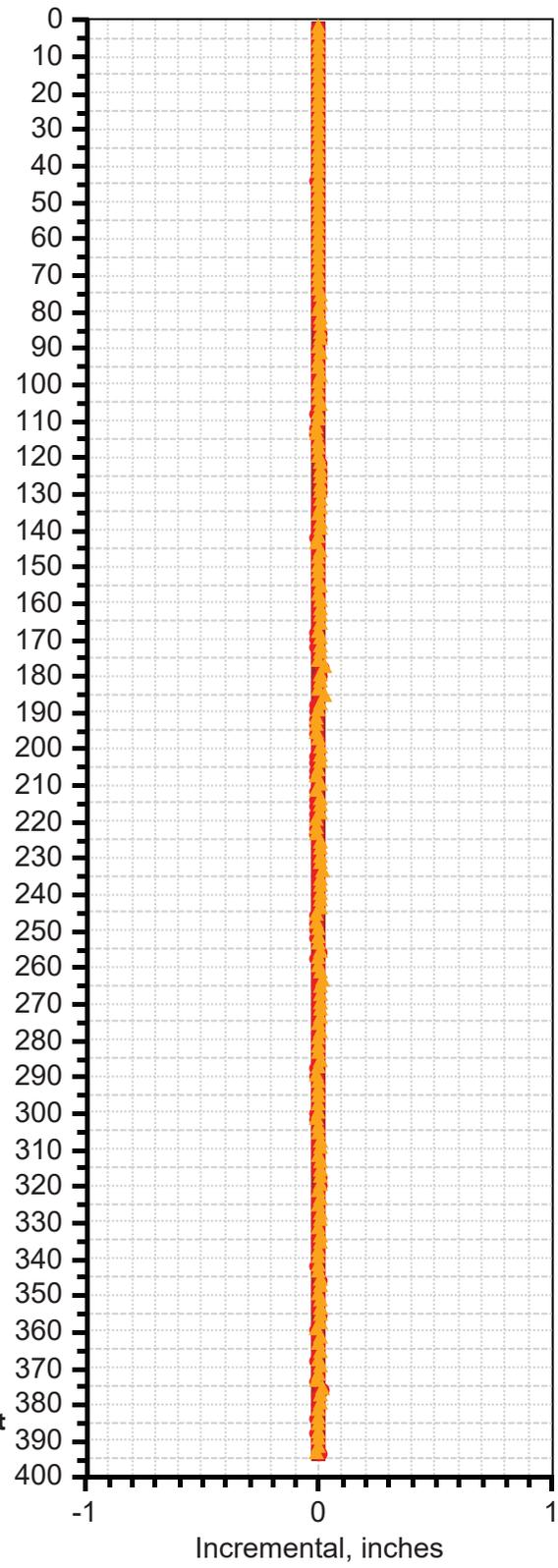
220-276

REVISION DATE: 8/7/2023

B-  
94°



B+  
274°



8/6/2021 6/21/2022 5/31/2023

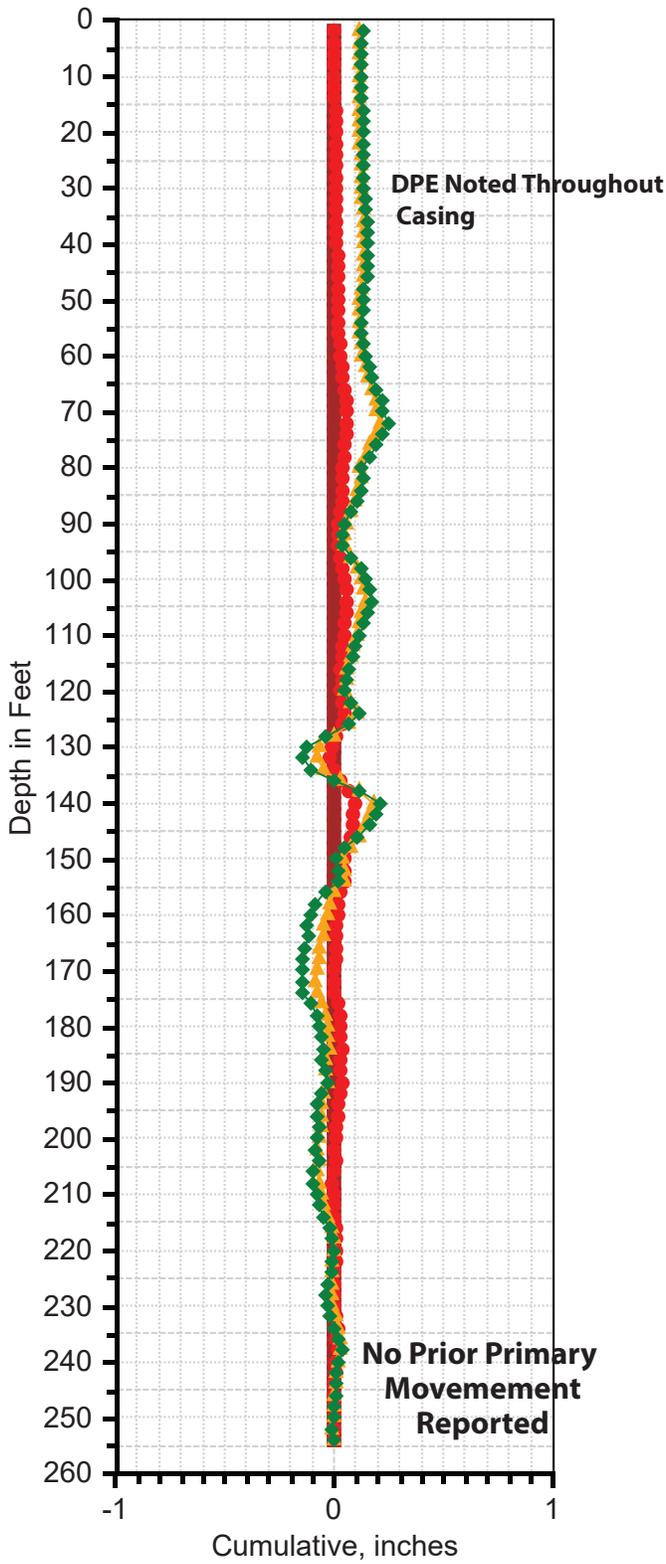
8/6/2021 6/21/2022 5/31/2023

Plot of Slope Inclinometer <b>SP-35</b>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction	
	Depth of Survey (ft): 394		Baseline Date: 8/06/2021	
	Install Date: 11/1998	Installed Depth (ft): 396	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

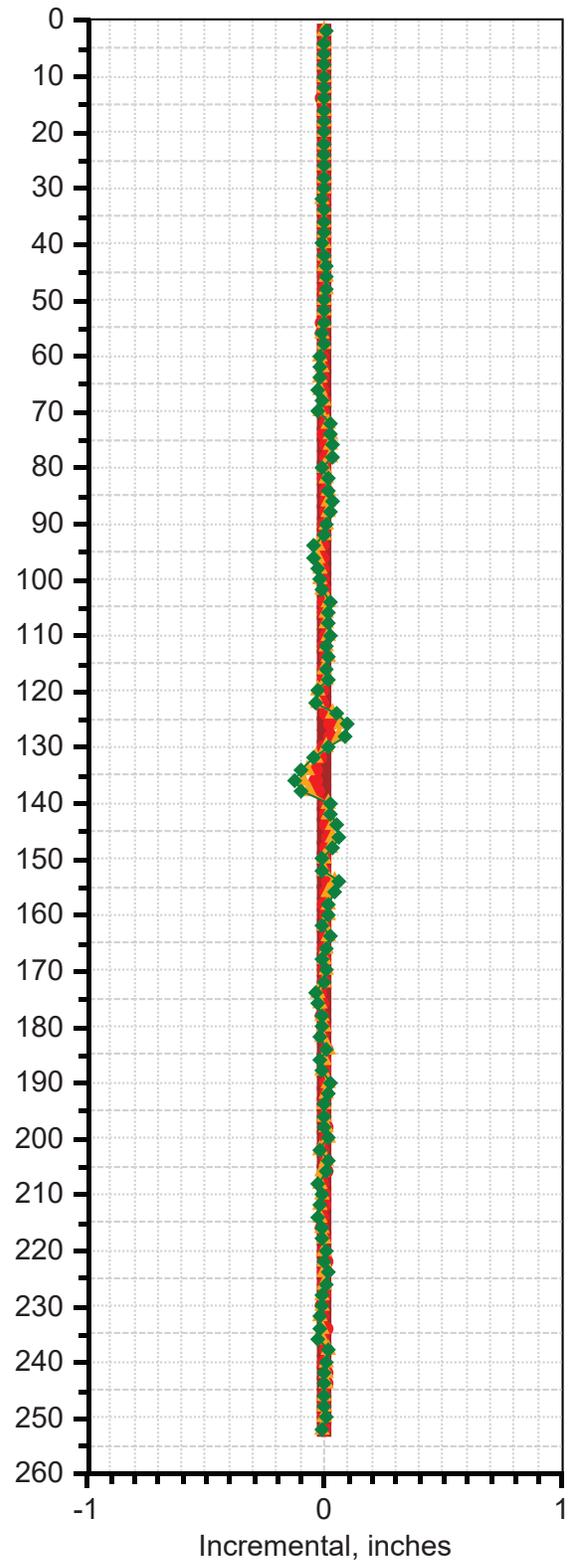
**Yeh and Associates, Inc.**  
 Geotechnical • Geological • Construction Services

PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

A-  
344°



A+  
164°



■ 3/31/2021    ● 7/27/2021  
▲ 6/21/2022    ◆ 5/30/2023

■ 3/31/2021    ● 7/27/2021  
▲ 6/21/2022    ◆ 5/30/2023

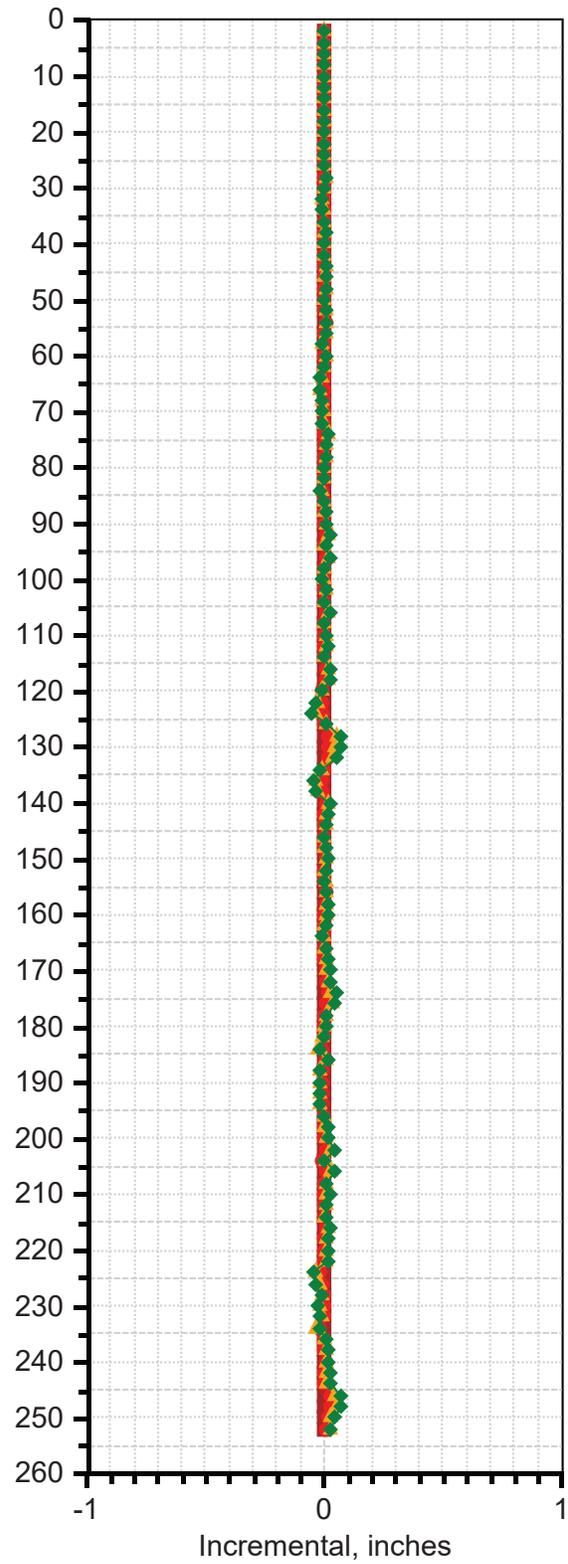
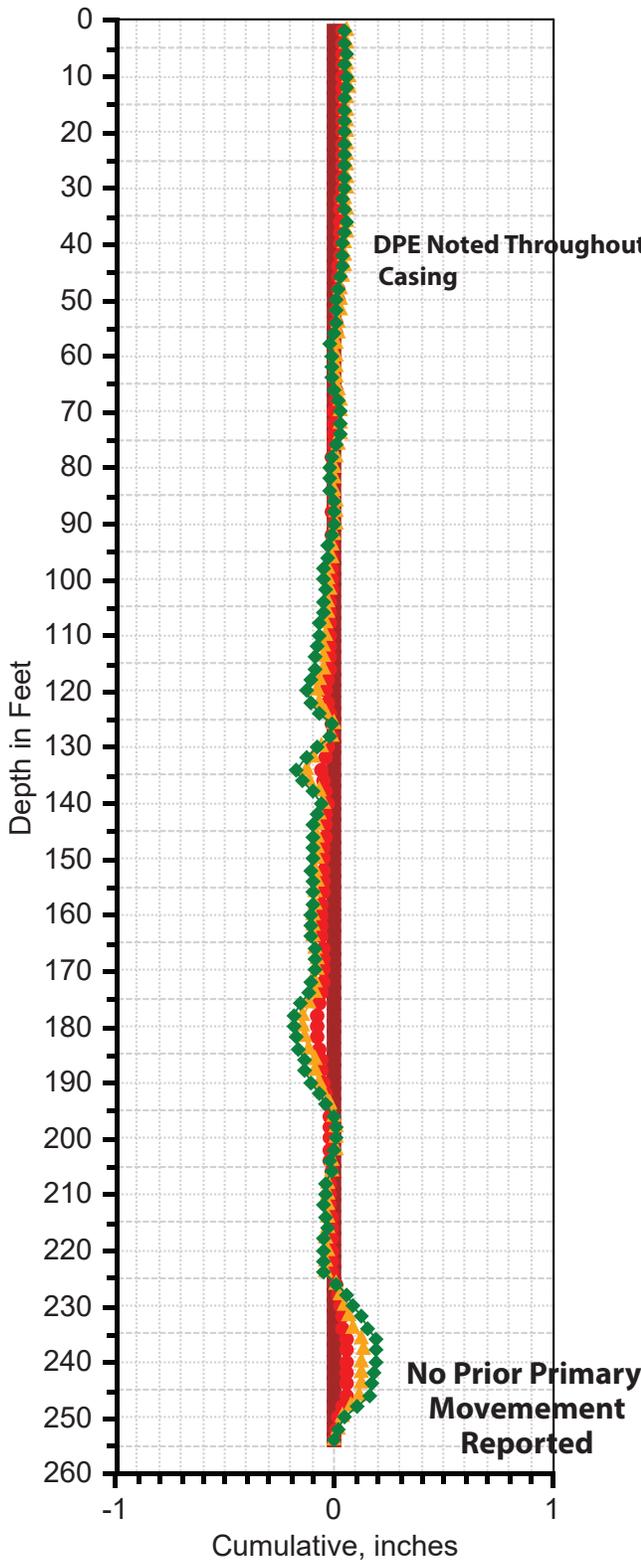
Plot of Slope Inclinometer  <b>SP-36</b>	Plot Type: Cumulative and Incremental		Plot Direction: A-Direction	
	Depth of Survey (ft): 254		Baseline Date: 3/31/2021	
	Install Date: 11/1998	Installed Depth (ft): 255	Interpreted Movement Since Baseline (in): 0	Interpreted Movement Monitoring Year (in): 0

**Yeh and Associates, Inc.**  
 Geotechnical • Geological • Construction Services

PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

B-  
74°

B+  
254°



■ 3/31/2021    ● 7/27/2021  
▲ 6/21/2022    ◆ 5/30/2023

■ 3/31/2021    ● 7/27/2021  
▲ 6/21/2022    ◆ 5/30/2023

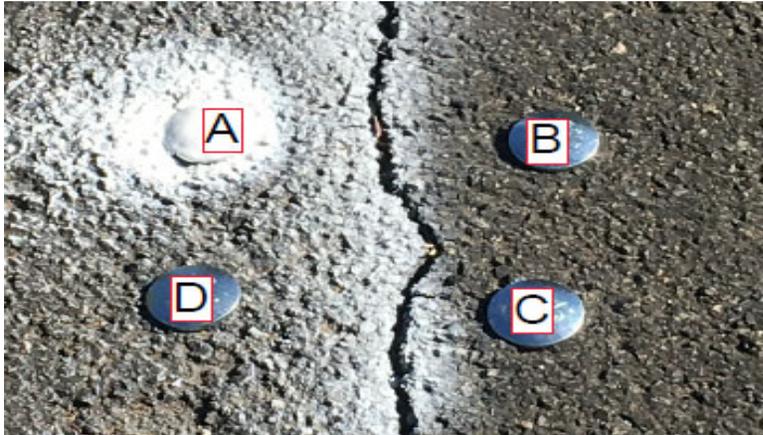
Plot of Slope Inclinometer  <b>SP-36</b>	Plot Type: Cumulative and Incremental		Plot Direction: B-Direction
	Depth of Survey (ft): 254	Baseline Date: 3/31/2021	
	Install Date: 11/1998	Installed Depth (ft): 255	Interpreted Movement Since Baseline (in): 0
			Corrections: None
			Interpreted Movement Monitoring Year (in): 0

**Yeh and Associates, Inc.**  
 Geotechnical • Geological • Construction Services

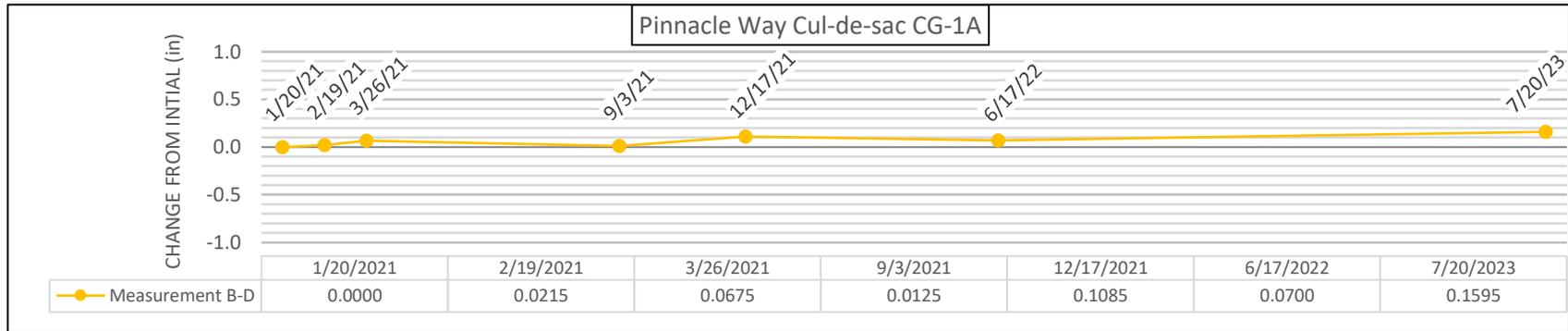
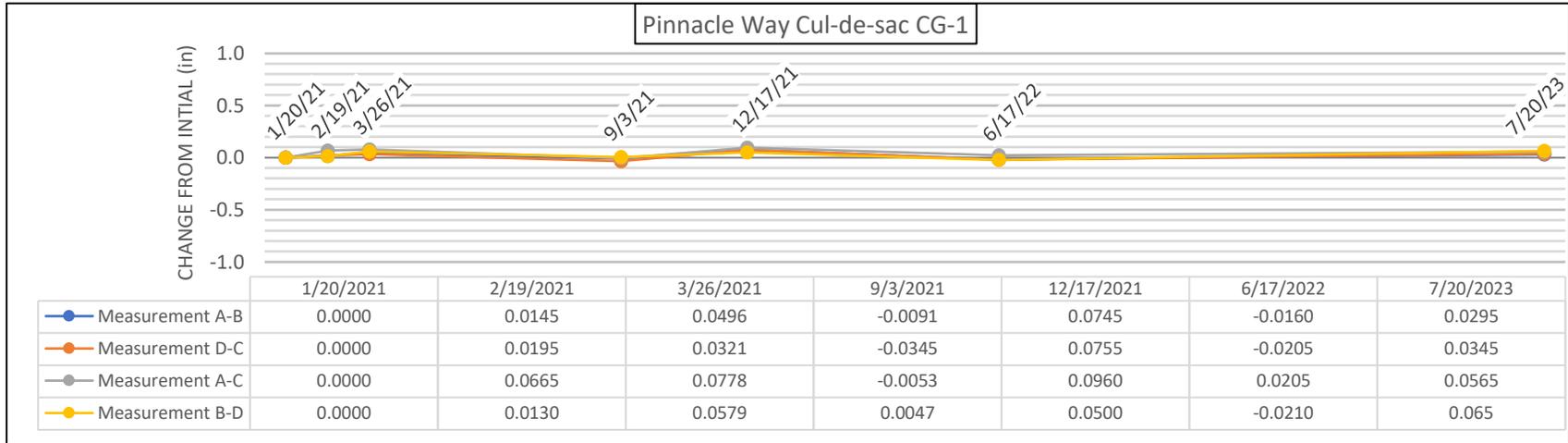
PROJECT: Big Rock Mesa LAD Malibu, CA	PROJECT NUMBER: 220-276
REVISION DATE: 8/7/2023	

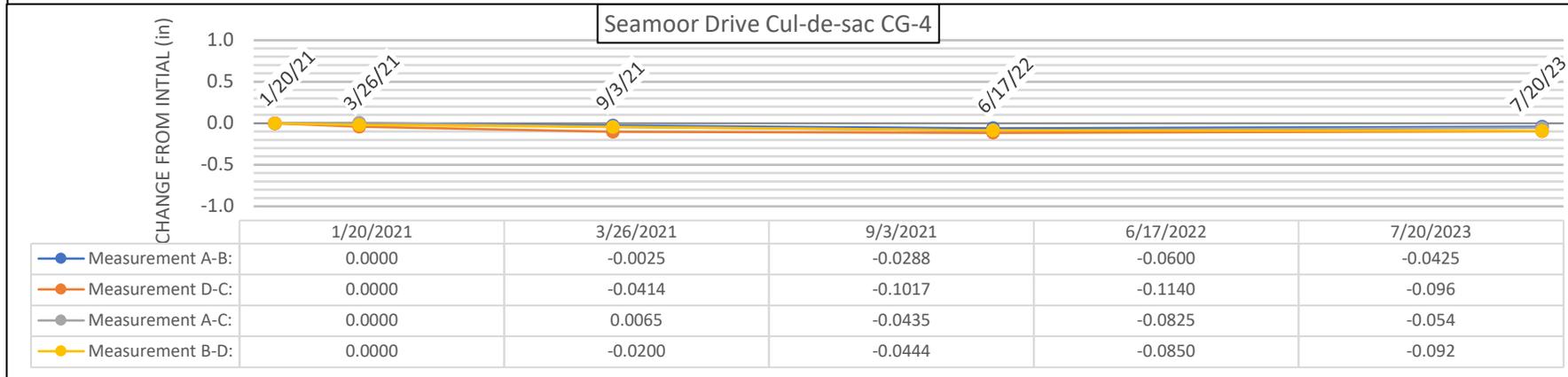
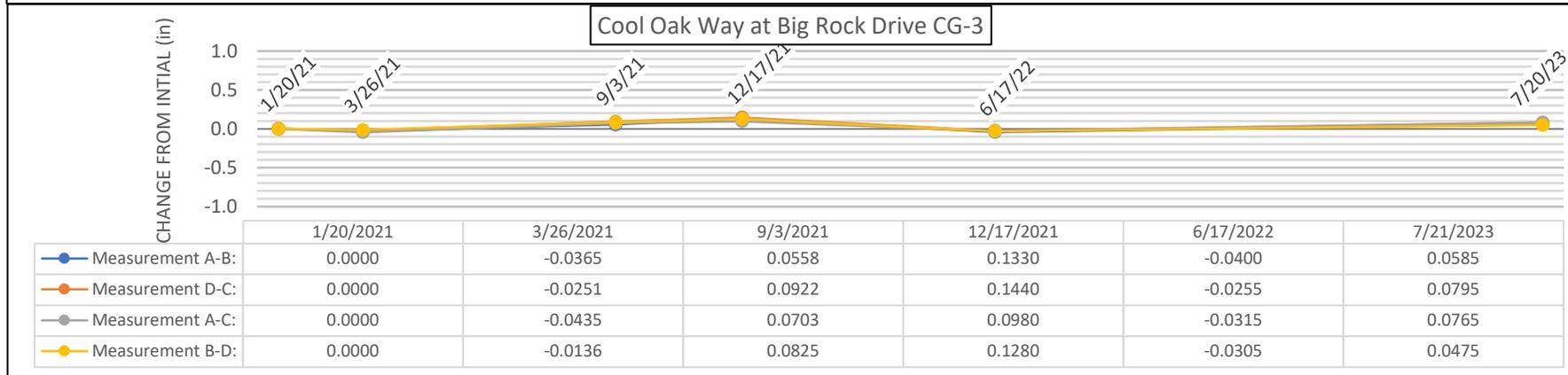
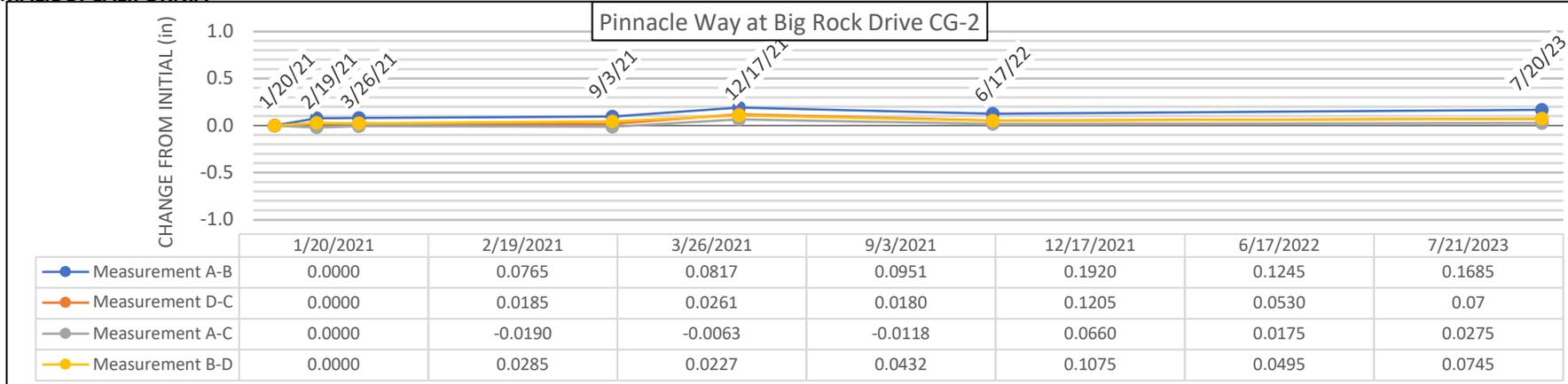
## APPENDIX C – CRACK GAUGE PLOTS

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Northwestern-most Corner is "A"  
 Gauge  
 B, C, and D proceed after in a  
 clockwise rotation





## **APPENDIX D - DEWATERING**

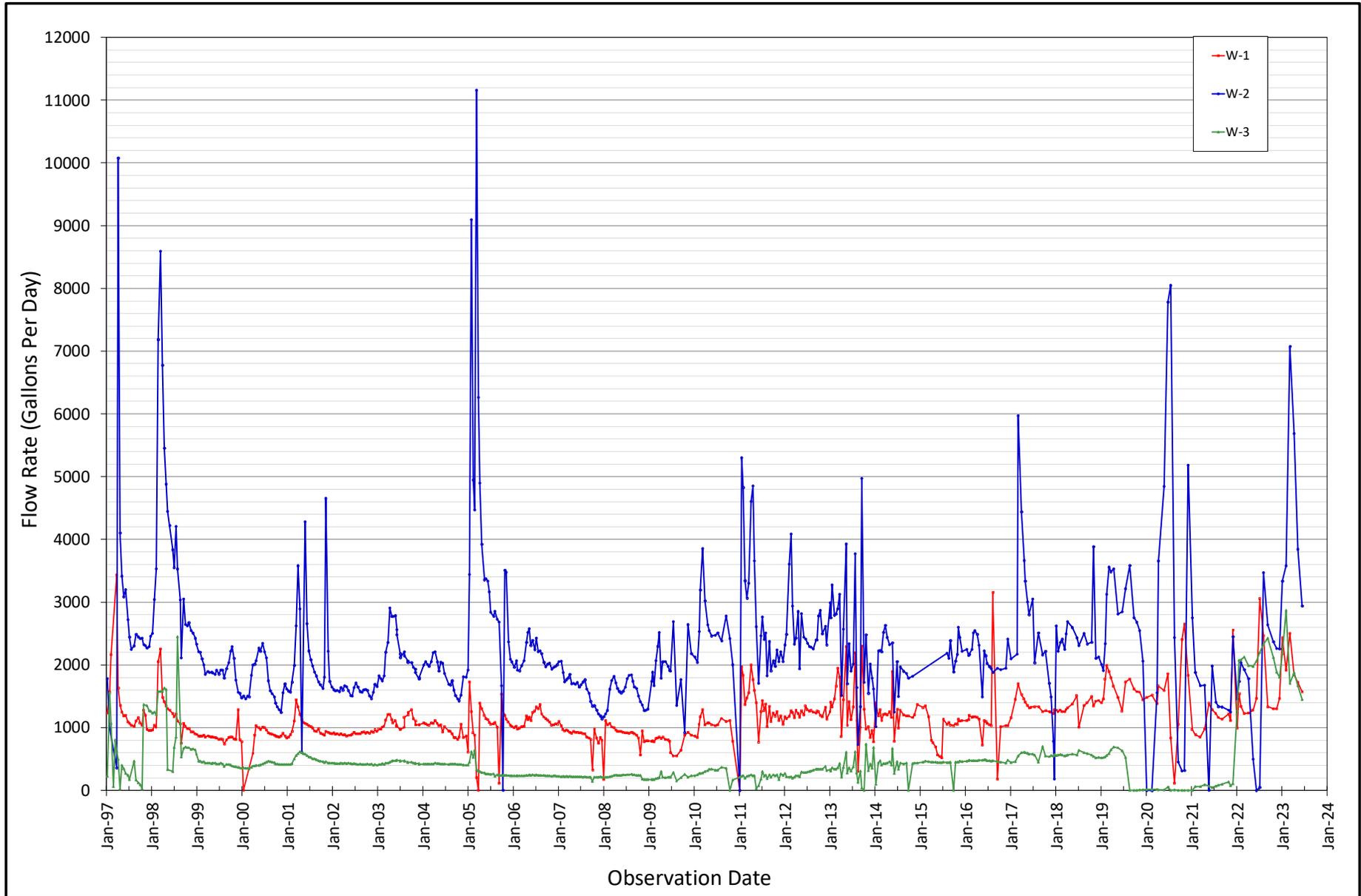
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**SUMMARY OF DEWATERING WELL INFORMATION**

Well I.D.	INSTAL L DATE	TOP ELEV. (ft.)	BOTTOM ELEV. (ft.)	PUMP ELEV. (ft.)	PUMP SIZE (HP)	2022-2023 PUMPING RATE (GPD)	% of TOTAL PRODUCTION	Rank	Drainage Port	Sounding Tube Present	Most Recent Video Log Date	COMMENT
W-1	1977	210.5	-30	14.5	1.5	1,909	3%	11	3	Yes	--	Producing
W-2	1955	219	50	45	0.5	3,292	5%	7	3	Yes	6/21/2022	Producing
W-3	1973	243.5	-9.5	65.5	0.75	2,043	3%	10	3	Yes	8/31/2020	Producing, casing damage at 65.5 feet
W-4	1973	248	-10	N/A	N/A	0	0%	25	N/A	No	--	Non-producing, casing perforations closed due to siltation (BYA 1991)
W-5	1984	280	252	N/A	N/A	0	0%	25	N/A	No	--	Capped 4/4/84 (DA Evans 1986)
W-6	1983	174	80	N/A	N/A	0	0%	25	N/A	No	--	Non-producing, static water level at bottom of casing (BYA 1991)
W-7	1983	257	171	N/A	N/A	0	0%	25	N/A	No	--	Non-producing, static water level at bottom of casing (BYA 1991)
W-8	1983	287	93	98	1	7,538	11%	3	4	No	--	Producing
W-9	1983	282	87	N/A	N/A	0	0%	25	N/A	No	--	Non-producing, static water level at bottom of casing (BYA 1991), replaced with BYA-11
W-10	1983	432	192	194	N/A	0	0%	25	N/A	No	--	Inactive, no pump
W-11	1983	507	285	292	N/A	0	0%	25	N/A	No	--	Inactive, disconnected from electrical, replaced with BYA-10
W-12	1983	375	195	N/A	N/A	0	0%	25	N/A	No	--	Non-producing, casing sheared at 185 ft.elevation (BYA 1991)
W-13	1983	361	184	193	1	2,068	3%	9	5	No	--	Producing
W-14	1984	283	131	N/A	N/A	0	0%	25	N/A		--	Non-producing, static water level at bottom of casing (BYA 1991)
W-15	1984	295	121	130	N/A	0	0%	25	N/A		--	Inactive, replaced with BYA-9
W-16	1984	325	107	113	0.75	4,680	7%	5	5	Yes	--	Producing
W-17	1984	270	41	50	0.75	2,179	3%	8	4	Yes	8/31/2020	Producing
W-18	1984	750	179	225	3	7,544	11%	2	6	No	--	Producing
BYA-1	1990	281	-164	30	1	15,964	24%	1	4	Yes	2/15/2022	Producing, casing damage at 245 feet
BYA-2	1990	665	215	242	1.5	549	1%	19	6	No	--	Producing
BYA-3	1990	510	-40	29	3	1,543	2%	13	6	No	--	Producing
BYA-4	1990	372	-68	-28	1.5	4,718	7%	4	5	No	--	Producing
BYA-5	1990	189	-231	-211	1.5	481	1%	20	1	No	--	Producing
BYA-6	1996	220	-280	-275	0.75	403	1%	21	1	No	--	Producing
BYA-7	1996	240	-120	-115	0.75	979	1%	15	2	No	--	Producing
BYA-9	1996	295	-105	-70	5	4,601	7%	6	5	Yes	5/20/2021	Producing, in-filled -105 to -75 feet
BYA-10	1996	510	210	215	1	650	1%	17	5A	No	--	Producing
BYA-11	1996	275	-125	-120	0.75	1,655	2%	12	5	No	--	Producing
BYA-12	1998	207	-140	-137	0.5	134	0%	23	1	No	--	Producing
BYA-13	1998	329	-14	-18	0.5	1,471	2%	14	3	No	--	Producing
BYA-14	1998	265	38	40	0.5	646	1%	18	1A	No	--	Producing
BYA-15	2002	429	340	300	1	4	0%	24	6	No	8/21/2014	Producing <10 GPD, water level at pump intake, airline functioning
FW-1	2008	170			1	313	0%	22	1A	No	--	Producing
FW-2	2009	270	-130	-115	1.5	962	1%	16	4	No	--	Producing

Note:   - Not functioning or no longer monitored dewatering well

**DEWATERING WELL INFORMATION**

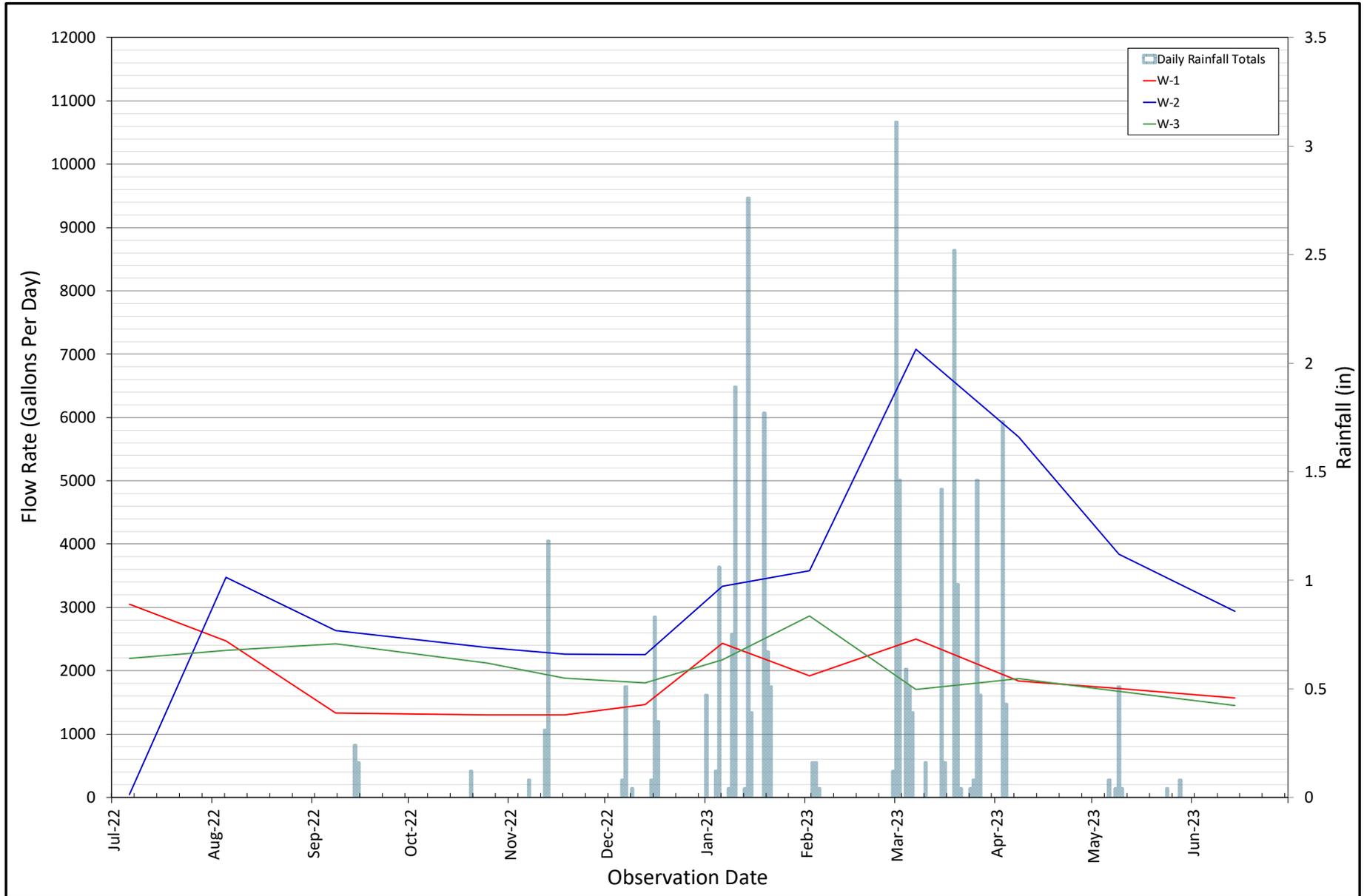


**DISCHARGE RATE FOR DEWATERING WELLS (HISTORIC)**

**Eastern Mesa Region**

Big Rock Mesa Landslide Assessment District

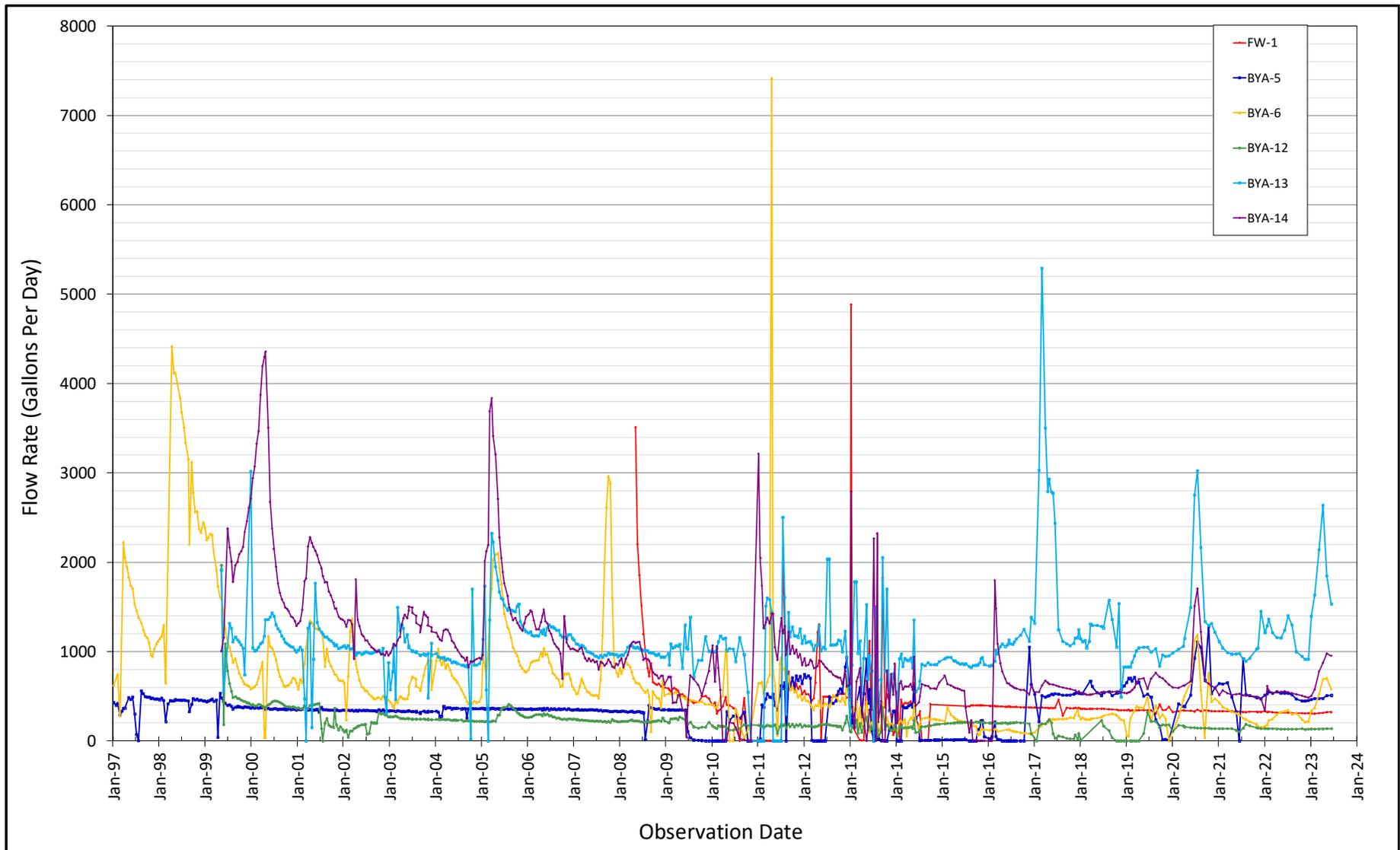
Malibu, California



**DISCHARGE RATE FOR DEWATERING WELLS (MONITORING YEAR)**

**Eastern Mesa Region**

Big Rock Mesa Landslide Assessment District  
 Malibu, California

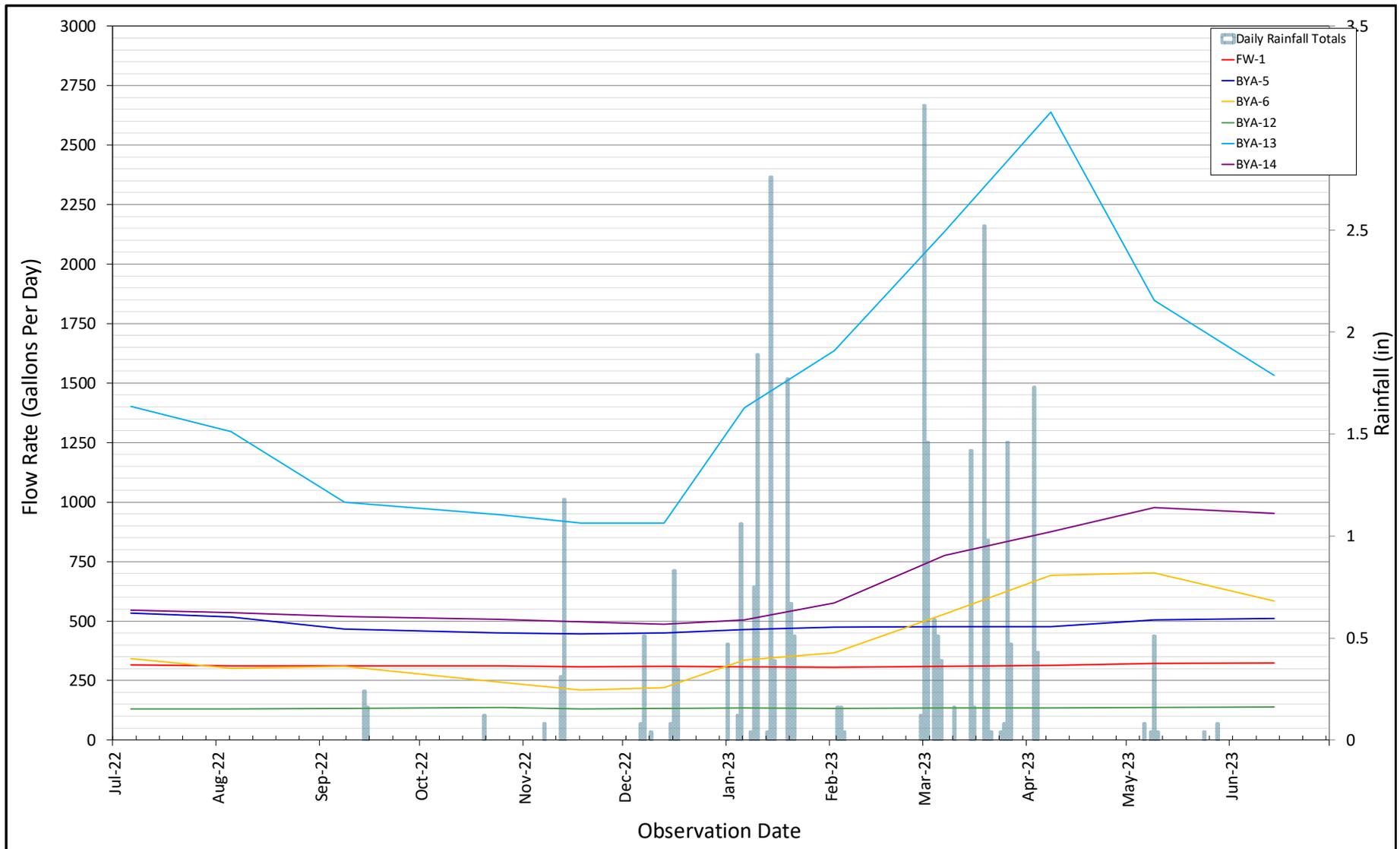


**DISCHARGE RATE FOR DEWATERING WELLS (HISTORIC)**

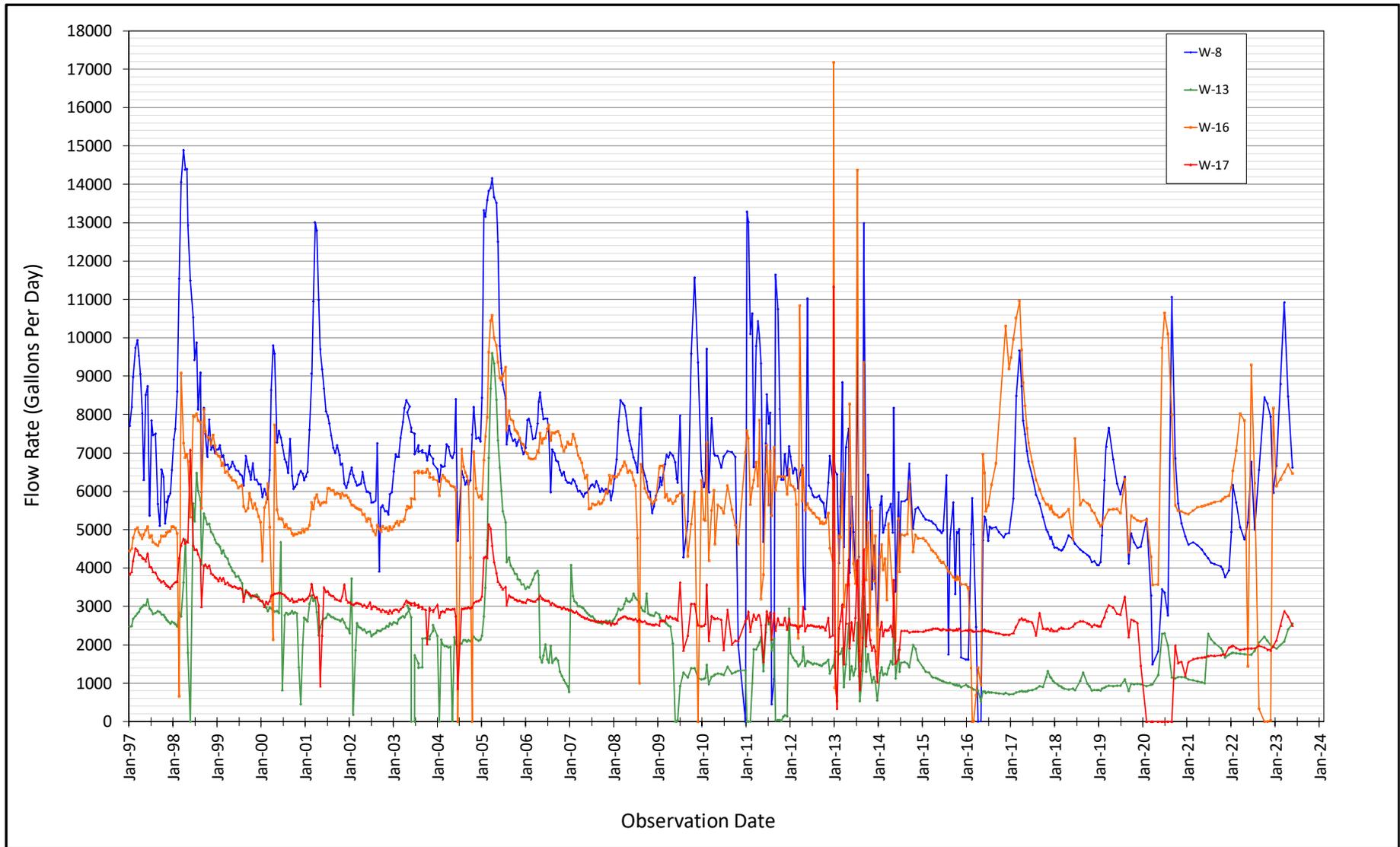
**Eastern Mesa Region**

Big Rock Mesa Landslide Assessment District

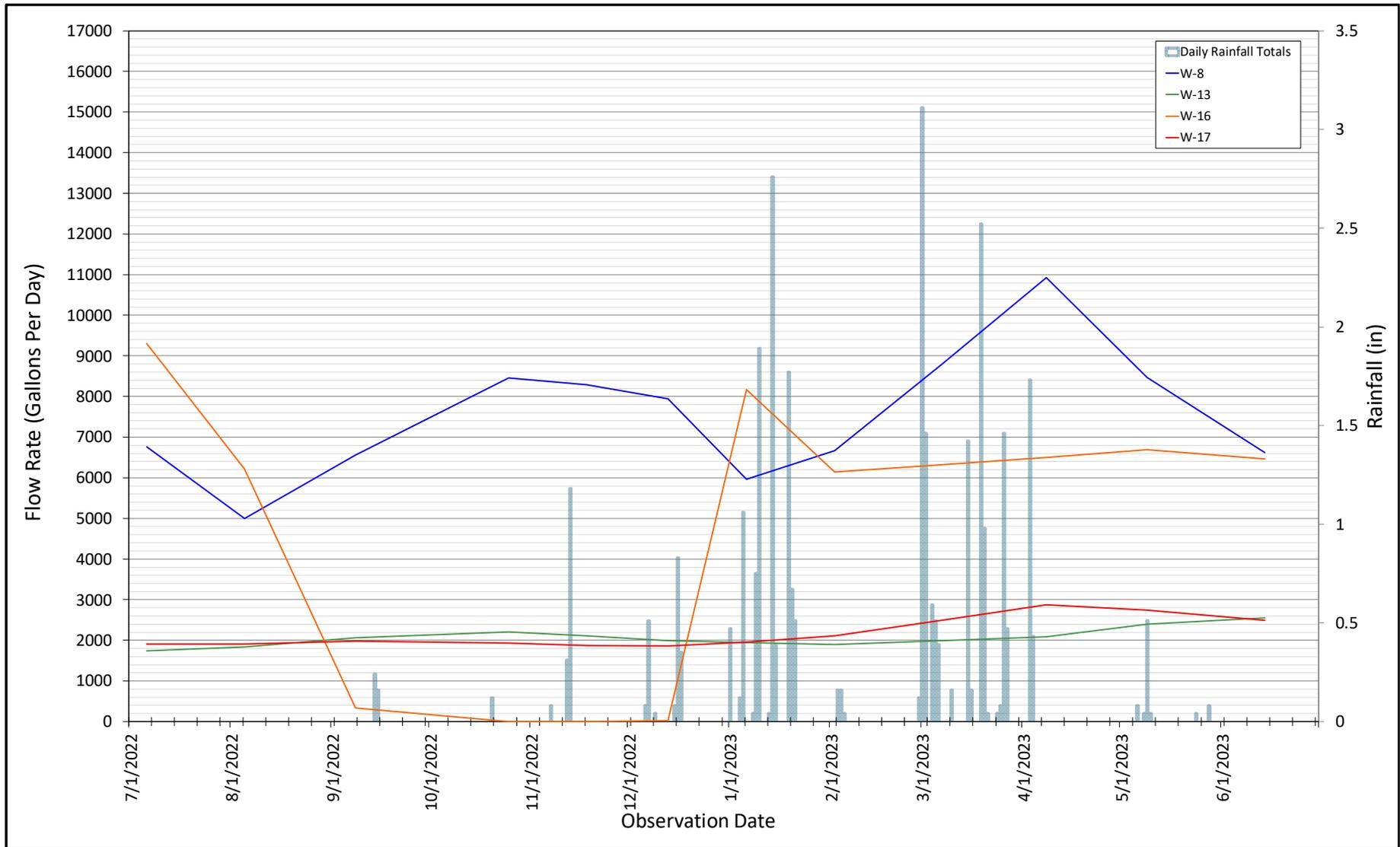
Malibu, California



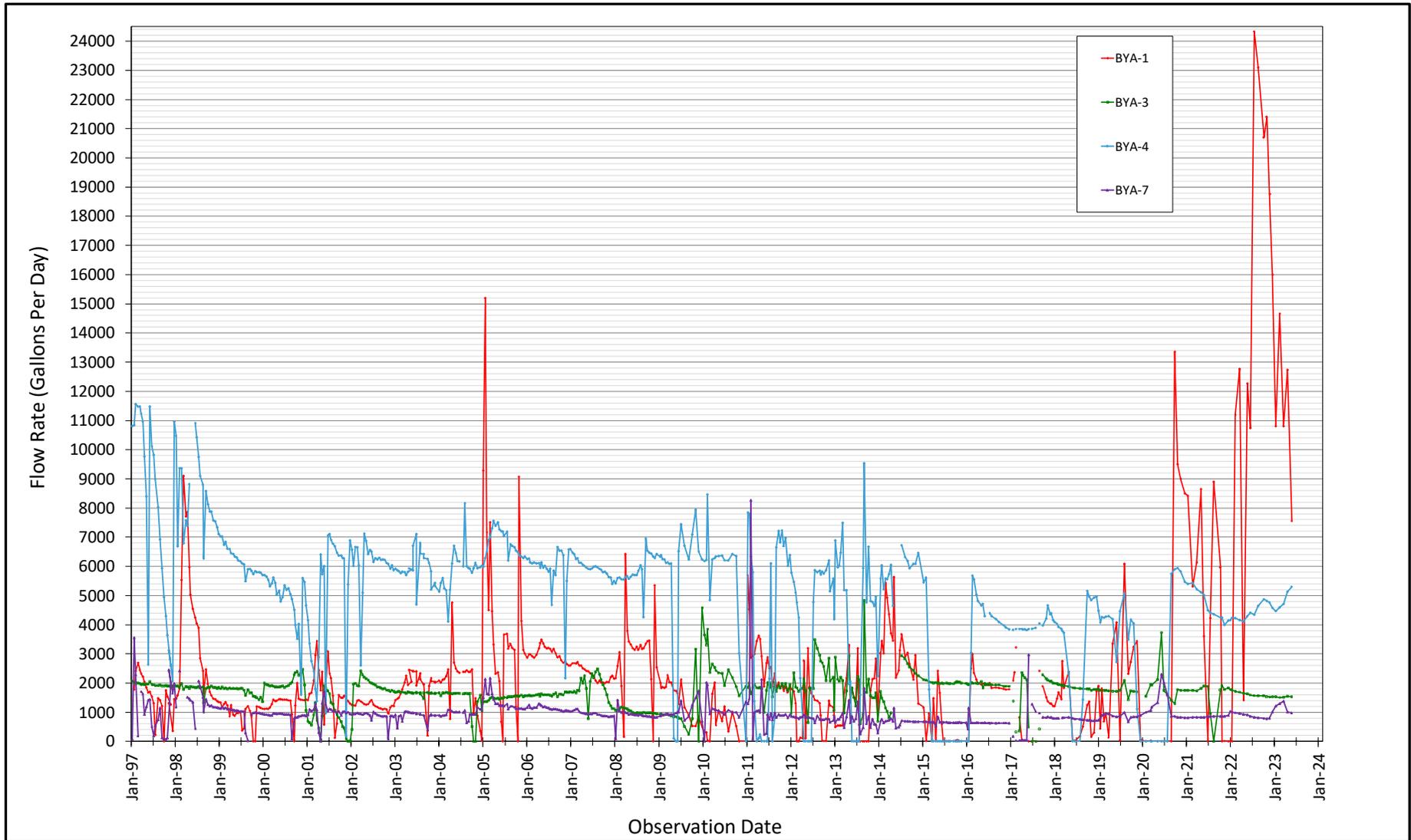
**DISCHARGE RATE FOR DEWATERING WELLS (MONITORING YEAR)**  
**Eastern Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



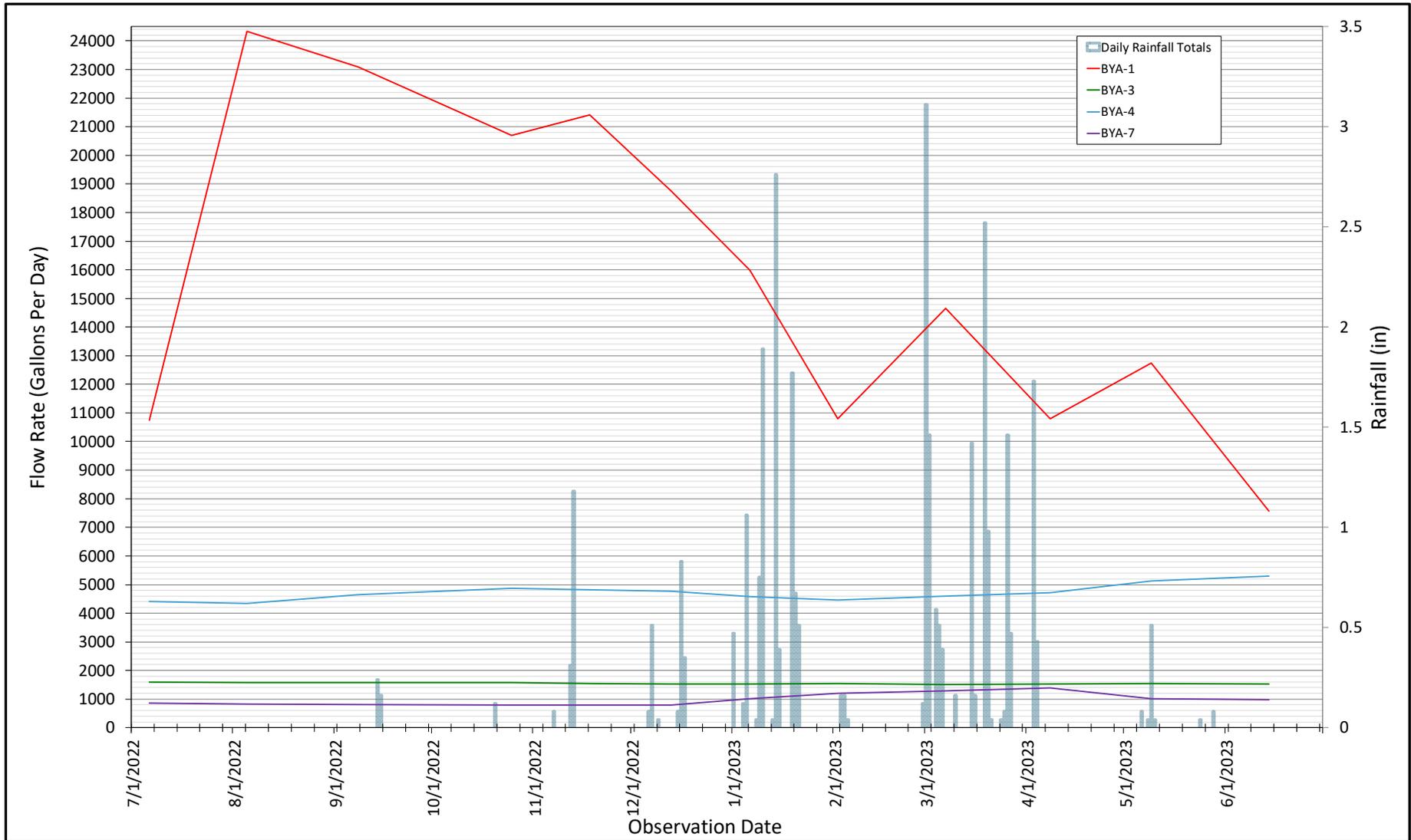
**DISCHARGE RATE FOR DEWATERING WELLS (HISTORIC)**  
**Central Mesa Region**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



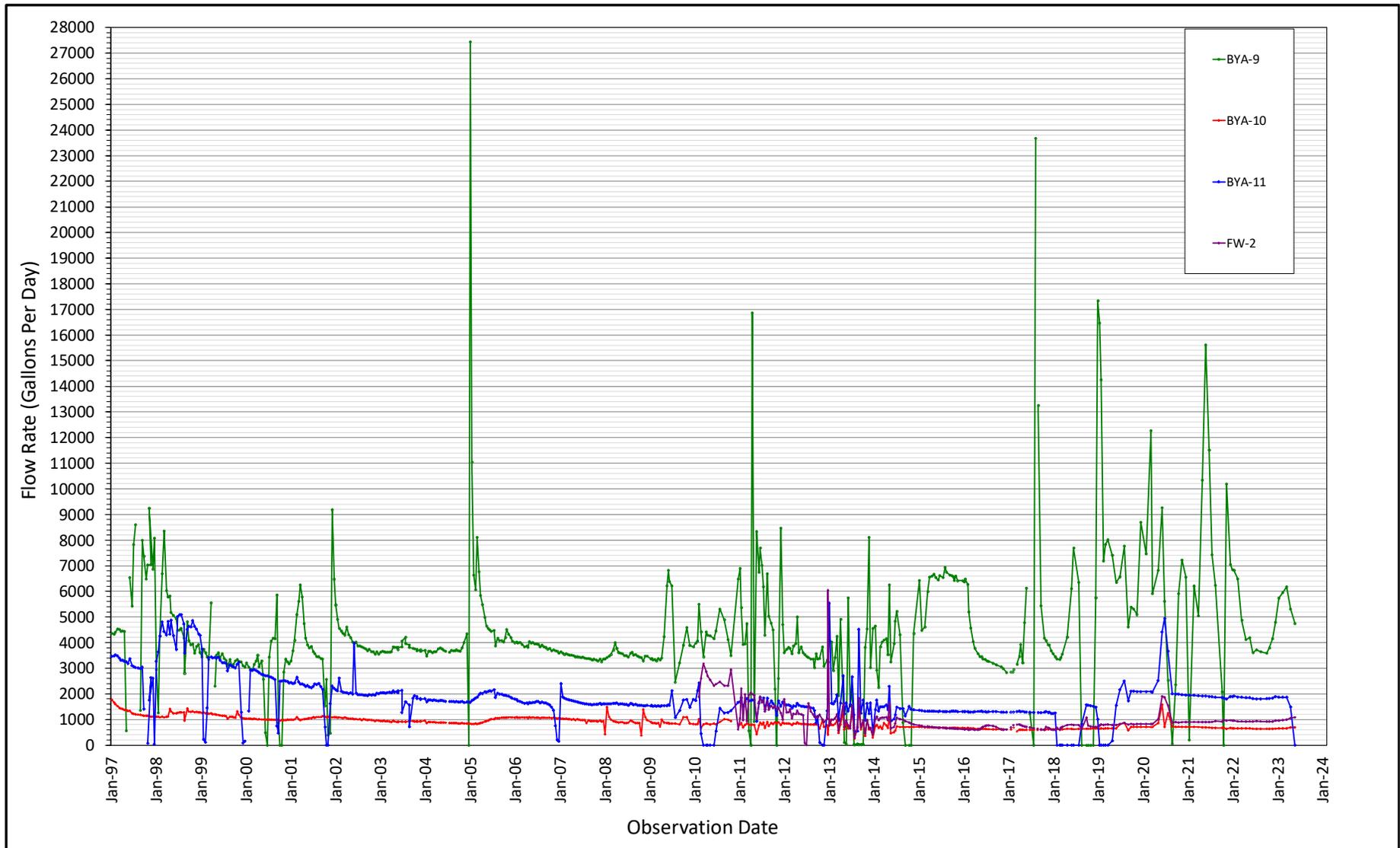
**DISCHARGE RATE FOR DEWATERING WELLS (MONITORING YEAR)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



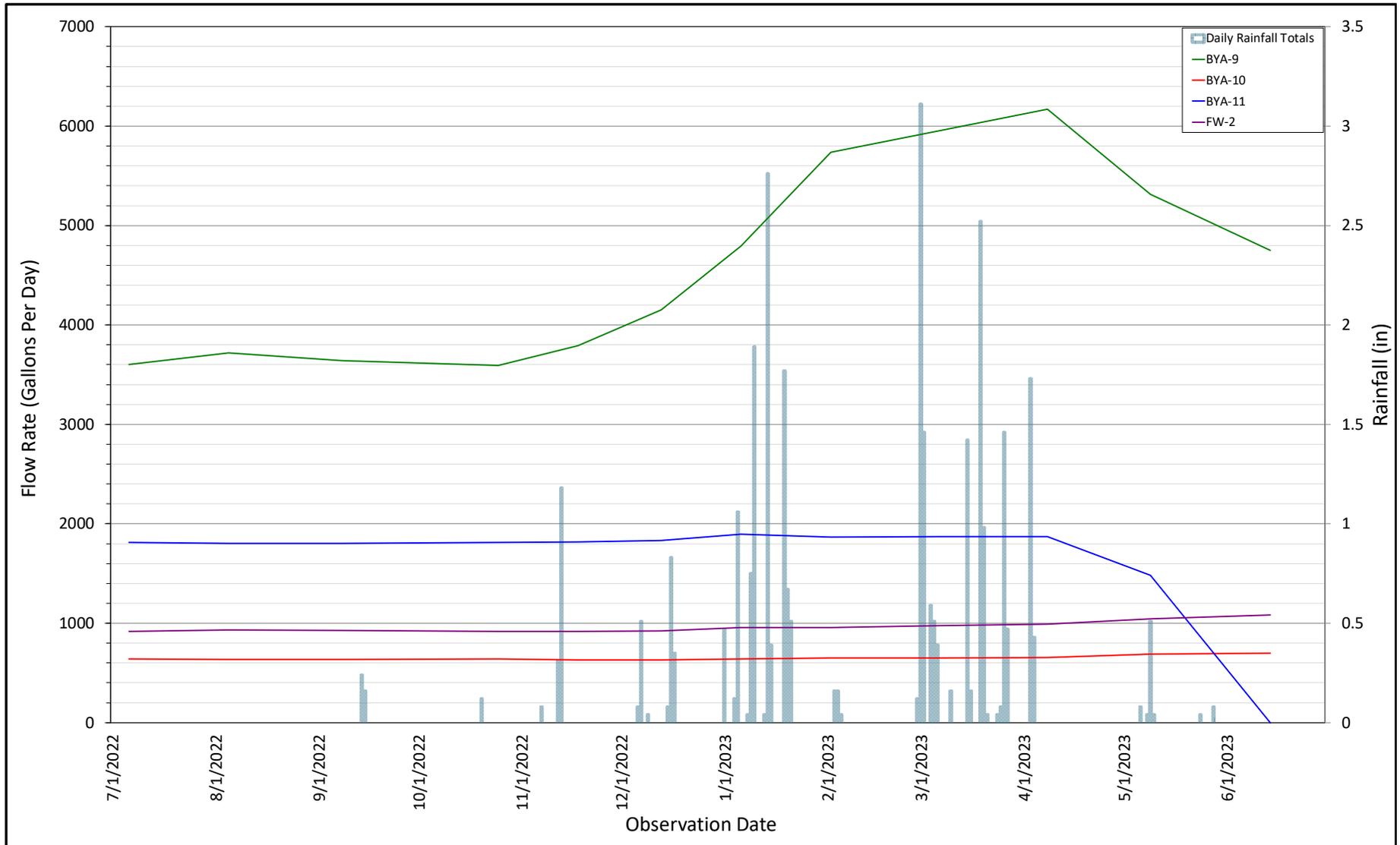
**DEWATERING WELL HYDROGRAPHS (HISTORIC)**  
**Central Mesa Region**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



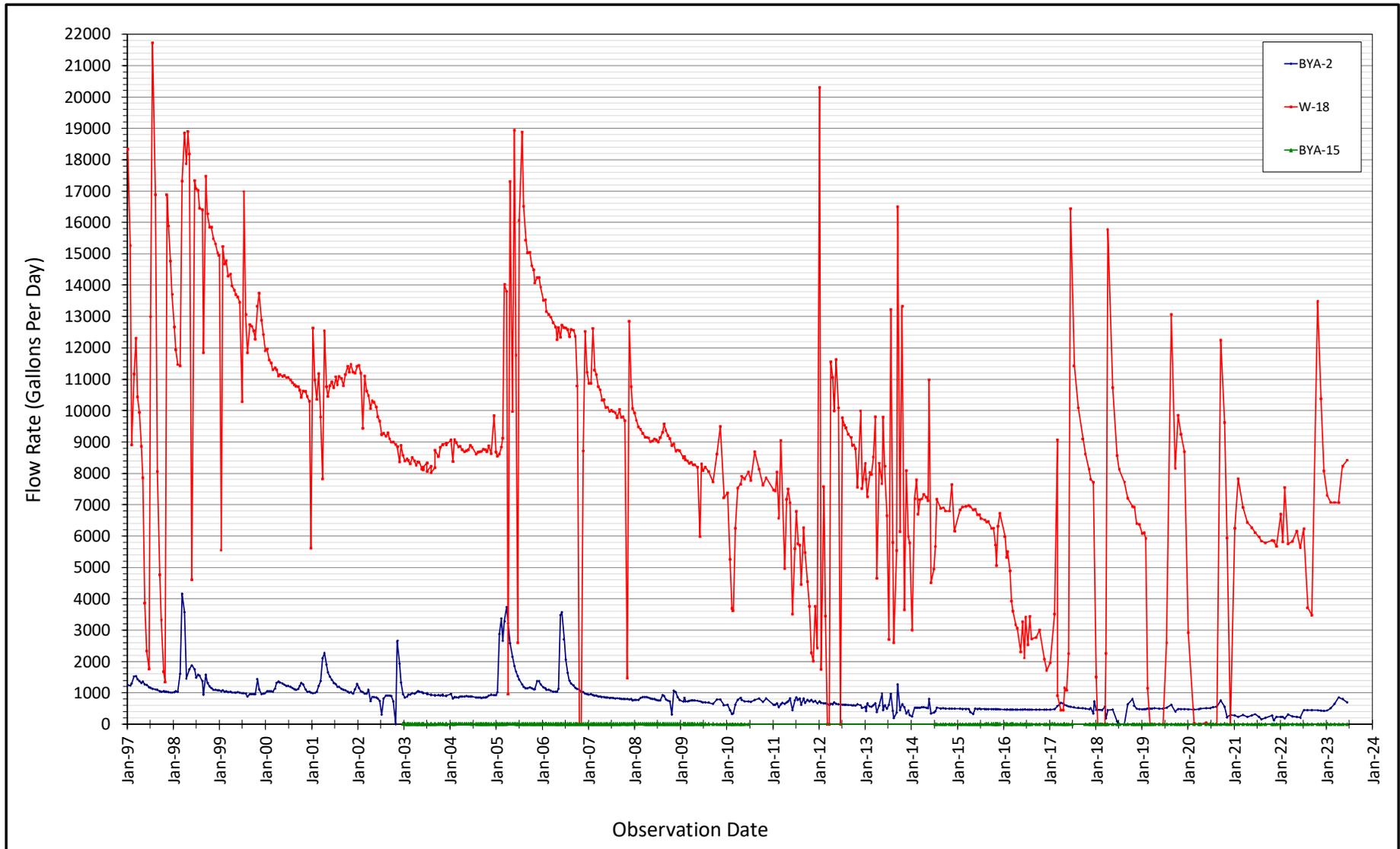
**DEWATERING WELL HYDROGRAPHS (HISTORIC)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



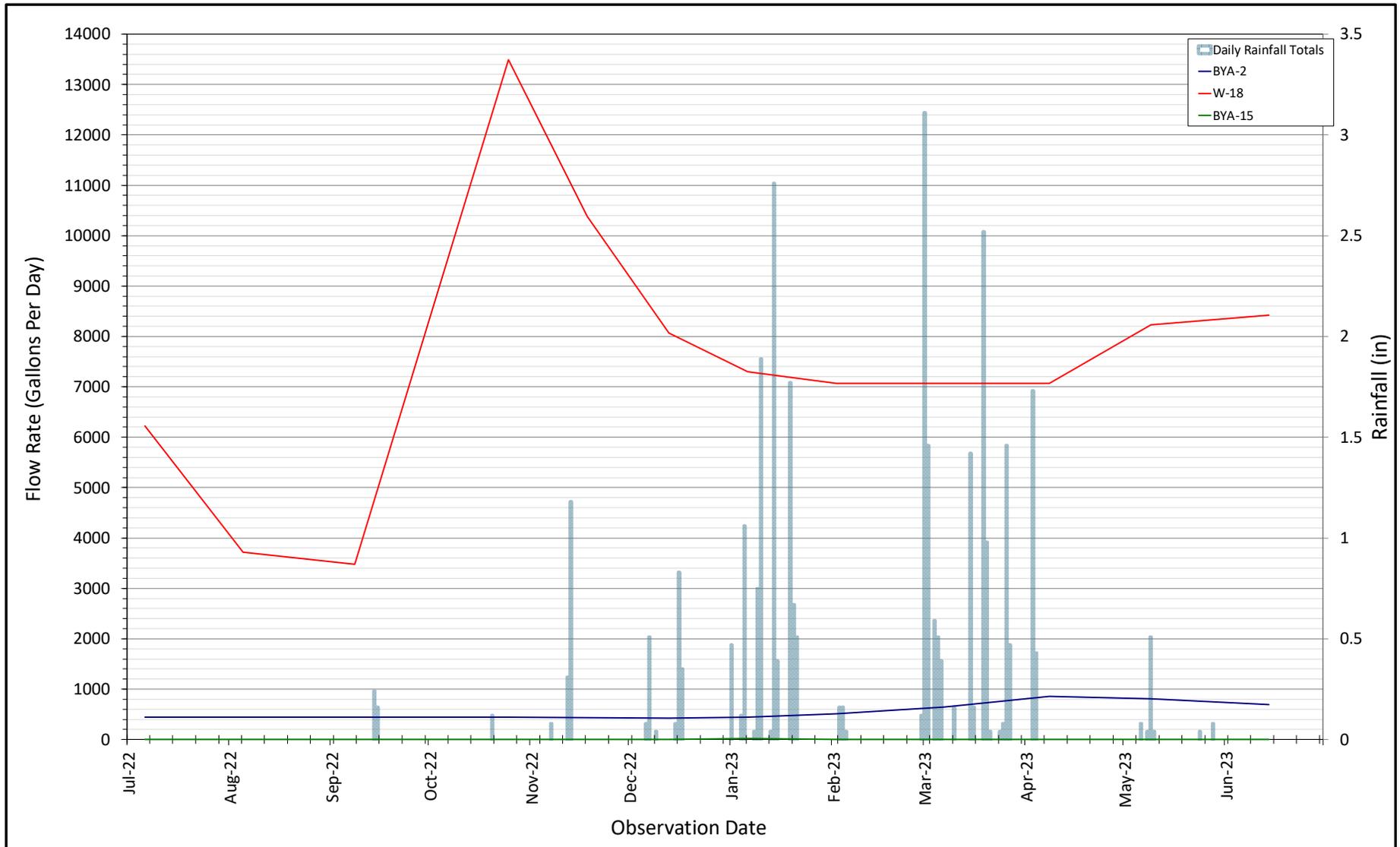
**DISCHARGE RATE FOR DEWATERING WELLS (HISTORIC)**  
**Central Mesa Region**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



**DISCHARGE RATE FOR DEWATERING WELLS (MONITORING YEAR)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



**DISCHARGE RATES FOR DEWATERING WELLS (HISTORIC)**  
**Western Extension**  
Big Rock Mesa Landslide Assessment District  
Malibu, California



**DISCHARGE RATES FOR DEWATERING WELLS (MONITORING YEAR)**  
**Western Extension**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California

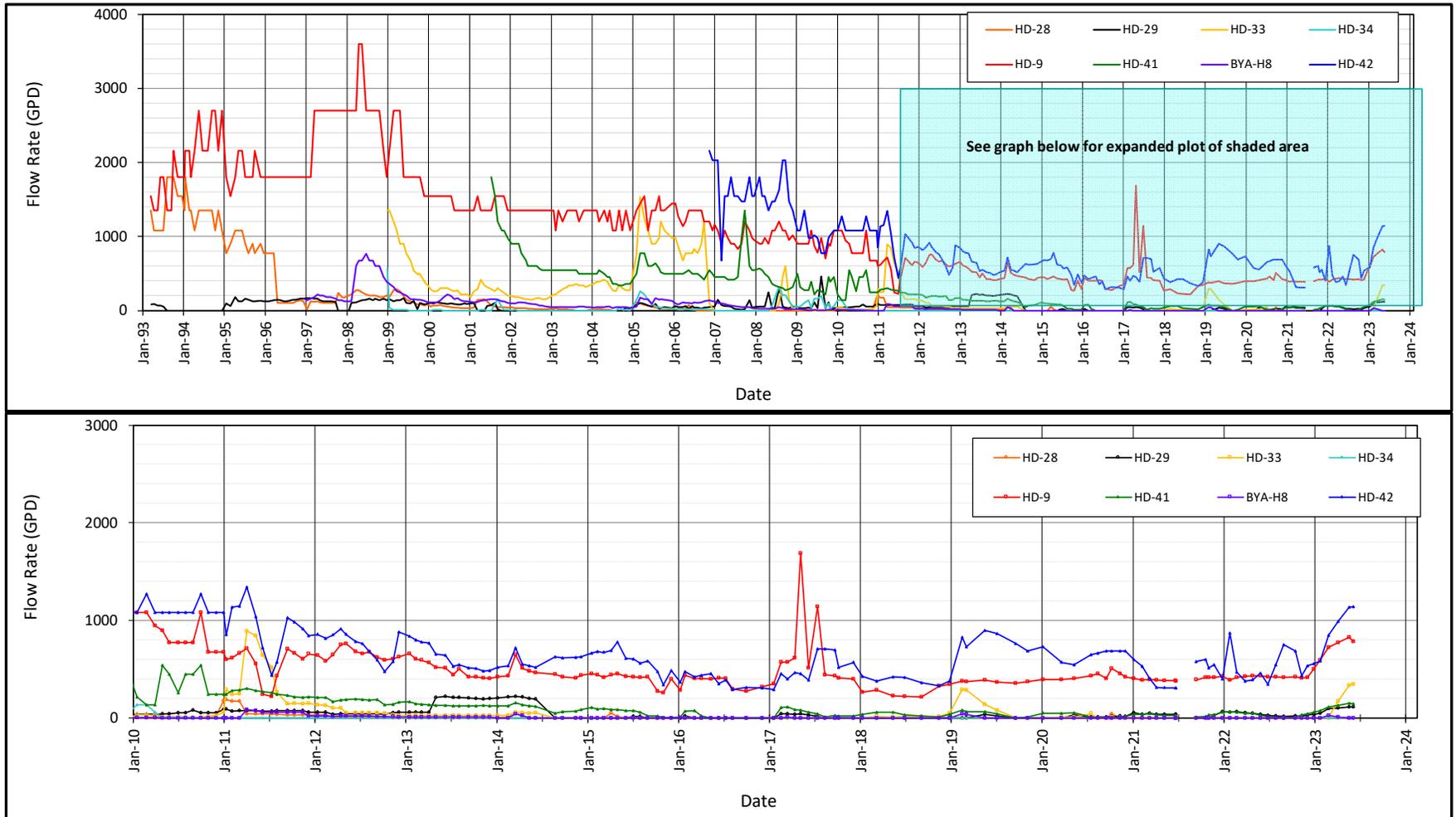
SUMMARY OF HYDRAUGER INFORMATION							
HYDRAUGER ID	INSTALLED LENGTH (ft.)	OPEN LENGTH (ft.)**	Orientation/ Slope	2022-2023 Average Flow (GPD)	% OF TOTAL PRODUCTION	Rank	INSTALLED BY
H-1	700	210**	S115W / 3	6	0.0%	22	MT
HD-4	760	10	-	332	2.2%	10	D.E.
HD-5	890	530**	-	438	3.0%	9	D.E.
HD-6	980	490**	-	18	0.1%	19	D.E.
HD-7	1160	420**	-	68	0.5%	15	D.E.
HD-9	205	205**	-	559	3.8%	6	D.E.
HD-10	990	170**	-	230	1.6%	13	D.E.
HD-11	540	540**	-	273	1.8%	12	D.E.
HD-12	690	385**	-	1704	11.5%	3	D.E.
HD-15	200	200**	-	318	2.1%	11	D.E.
HD-22	568	540**	-	837	5.6%	5	D.E.
HD-23	1280	260**	-	1406	9.5%	4	D.E.
HD-24	1030	580**	-	18	0.1%	20	D.E.
HD-25	1005	360**	-	44	0.3%	18	D.E.
HD-26	1200	410**	S37W / 1	3762	25.4%	1	D.E.
HD-28	1420	595**	-	0	--	--	D.E.
HD-29	1150	450**	-	54	0.4%	17	D.E.
HD-30	1040	10**	S13W / 7	3593	24.2%	2	D.E.
HD-33	340	340	S23W / 5	72	0.5%	14	BYA
HD-41	500	500	S18E / 3	66	0.4%	16	BYA
BYA-H8	500	345**	-	3	0.0%	23	BYA
BYA-H10	500	10**	-	13	0.1%	21	BYA
HD-42	700	700	-	554	3.7%	7	Fugro
HD-43	700	700	-	456	3.1%	8	Fugro
H-2*	Unknown	0	-	0	--	--	MT
H-3a*	Unknown	0	-	0	--	--	MT
H-3b*	Unknown	0	-	0	--	--	MT
H-3c*	Unknown	0	-	0	--	--	MT
H-4	680	115**	-	0	--	--	MT
H-5a*	Unknown	0	-	0	--	--	MT
H-5b*	Unknown	0	-	0	--	--	MT
H-6a*	100	96	-	0	--	--	CT
H-6b*	100	96	-	0	--	--	CT
H-7a*	100	100	-	0	--	--	CT
H-7b*	100	96	-	0	--	--	CT
H-7c*	50	0	-	0	--	--	CT
H-8*	Unknown	0	-	0	--	--	CT
HD-1*	350	340**	-	0	--	--	D.E.
HD-2a*	70	33	-	0	--	--	D.E.
HD-2b*	Unknown	0	-	0	--	--	D.E.
HD-2c*	460	0	-	0	--	--	D.E.
HD-3	560	90**	-	0	--	--	D.E.
HD-8*	530	170**	-	0	--	--	D.E.
HD-13*	650	14	-	0	--	--	D.E.
HD-14*	130	130**	-	0	--	--	D.E.
HD-16	575	575**	-	0	--	--	D.E.
HD-17*	750	176	-	0	--	--	D.E.
HD-18*	870	285	-	0	--	--	D.E.
HD-19*	1000	182	-	0	--	--	D.E.
HD-20*	1000	446	-	0	--	--	D.E.
HD-21*	1560	147	-	0	--	--	D.E.
HD-27*	700	327	-	0	--	--	D.E.
HD-31*	140	113	-	0	--	--	D.E.
HD-32*	835	700**	-	0	--	--	D.E.
HD-34	150	150	S40W / 10	0	--	--	BYA
HD-35*	40	40	-	0	--	--	BYA
HD-36*	150	150	-	0	--	--	BYA
HD-37*	430	50	-	0	--	--	BYA
HD-38A*	140	140	S23W / 5	0	--	--	BYA
HD-38B*	140	140	S18W / 6	0	--	--	BYA
HD-39	400	400	S15E / 5	0	--	--	BYA
HD-40*	595	595	S25W / 6	0	--	--	BYA
BYA-6a	350	20**	-	0	--	--	BYA
BYA-6b	60	60	-	3	0.0%	24	BYA
BYA-7	400	375**	-	0	--	--	BYA
BYA-H9*	550	550**	-	0	--	--	BYA
BYA-H11*	450	400**	S7E / 3	0	--	--	BYA

\* Not functioning or no longer monitored hydrauger

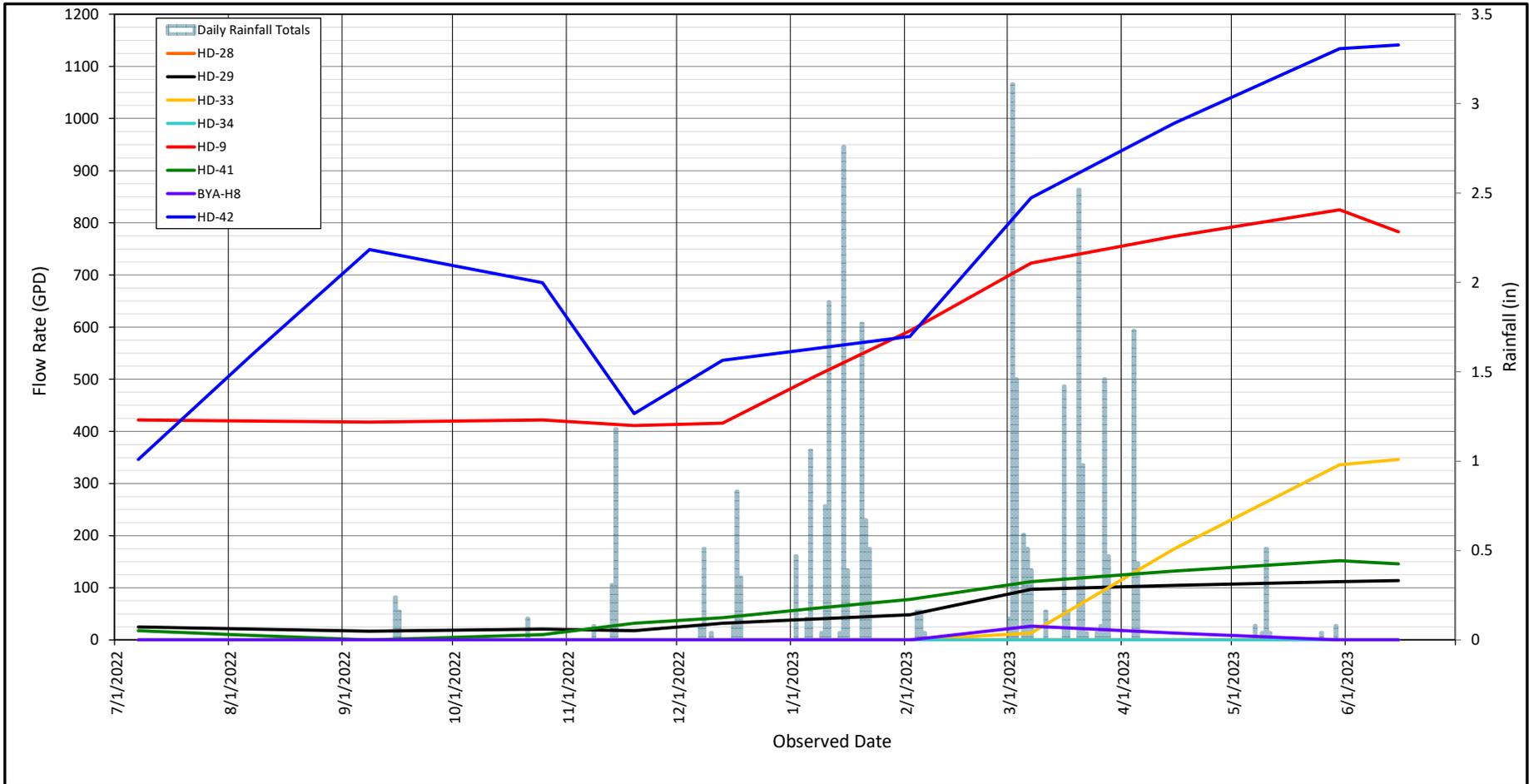
\*\* Open Length is Measured on 10-1997 by BYA

Installed by: MT = Moore & Taber; CT = Caltrans; D.E. = D.A. Evans; BYA = Bing Yen & Associates

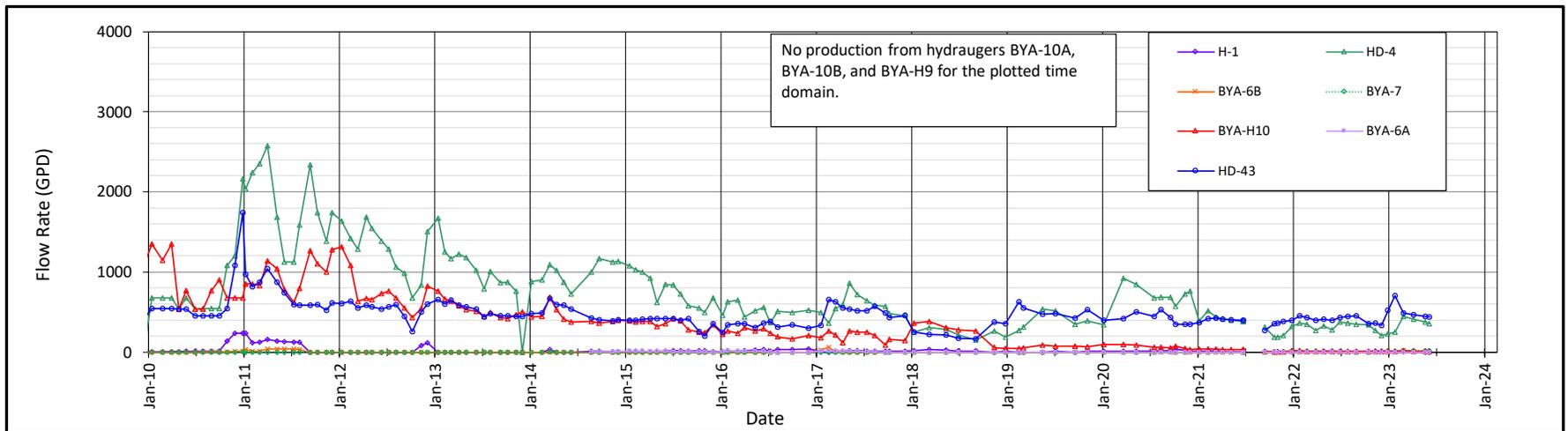
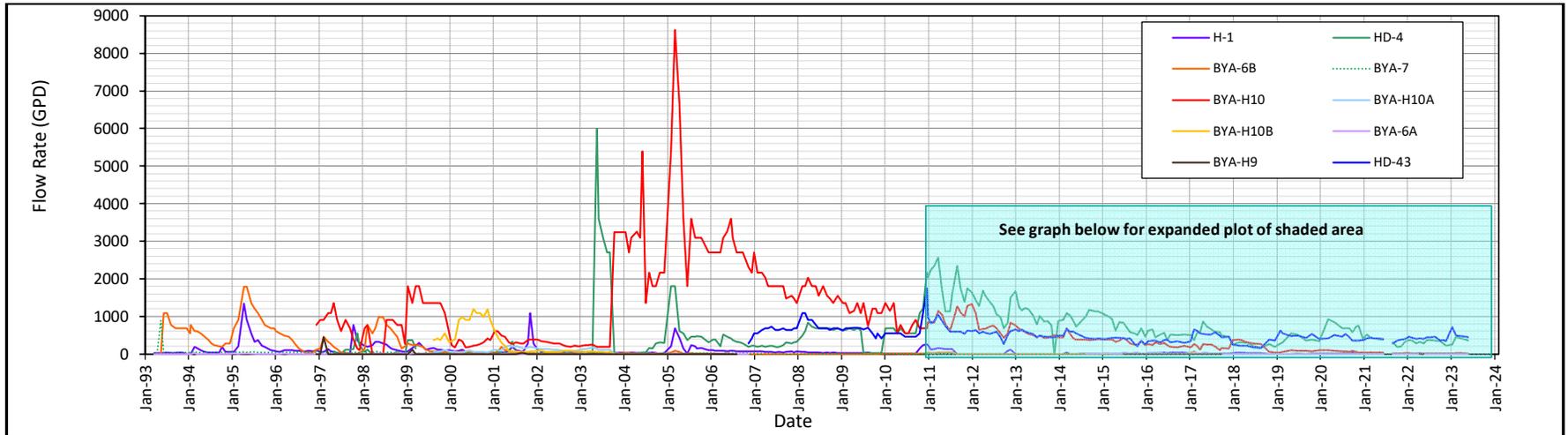
**SUMMARY OF HYDRAUGER INFORMATION**  
 Big Rock Mesa Landside Assessment District  
 Malibu, California



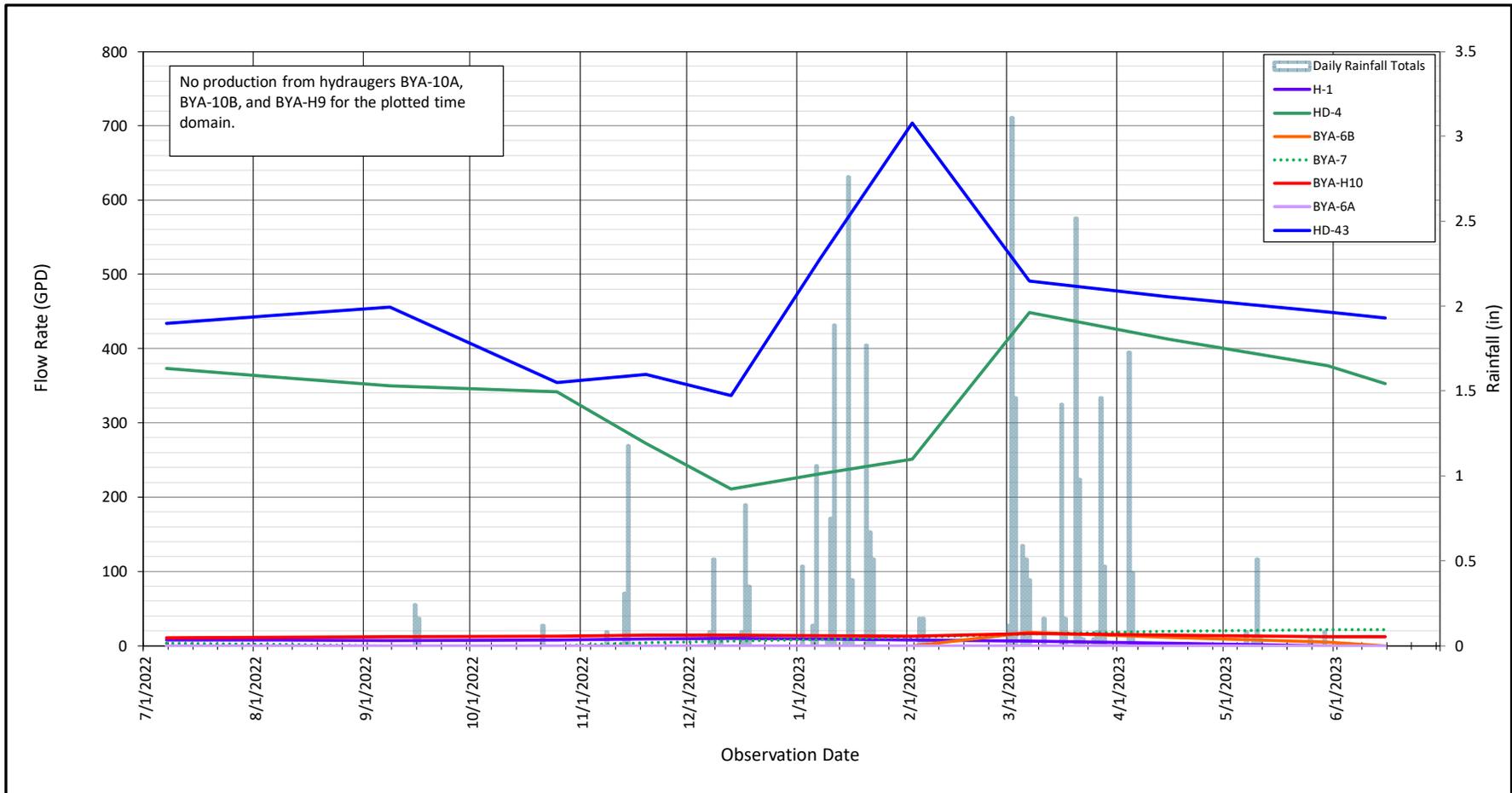
**DISCHARGE RATE FOR HYDRAUGERS (HISTORIC)**  
**Eastern Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



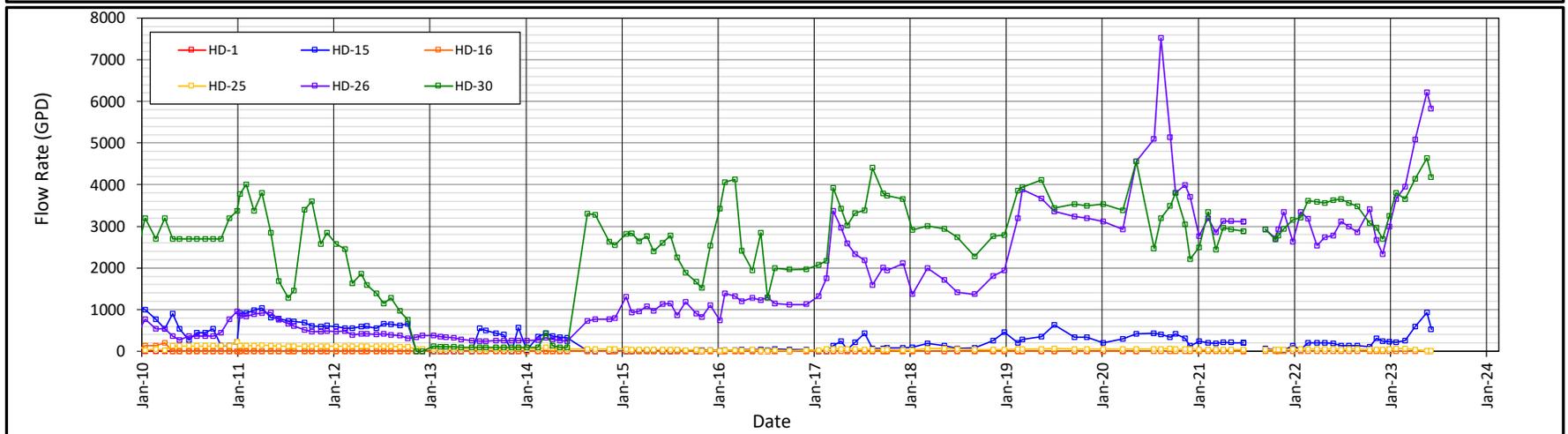
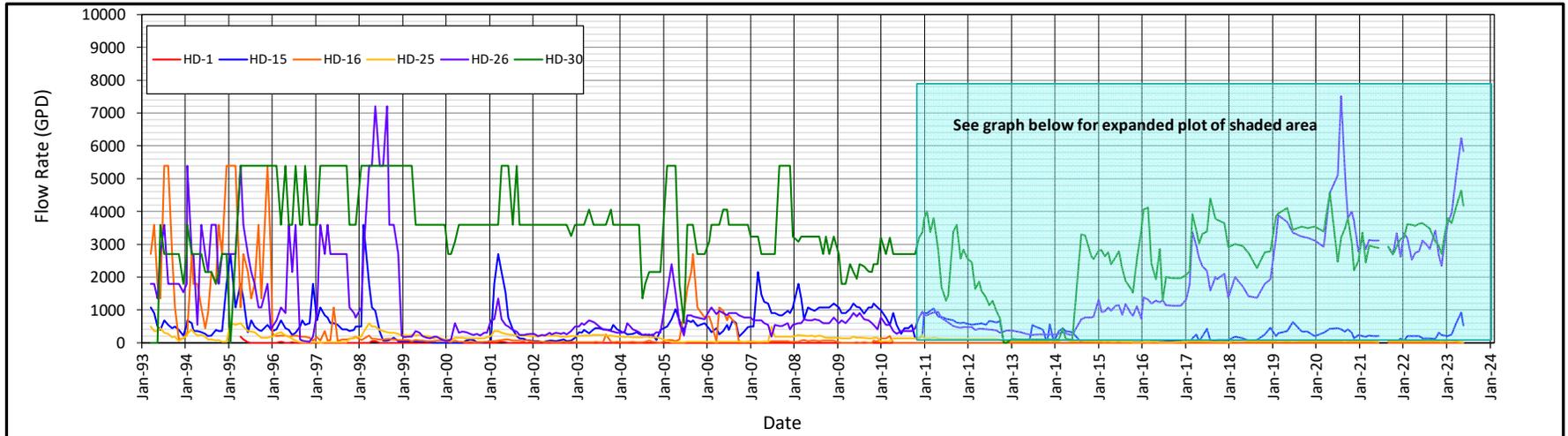
**DISCHARGE RATE FOR HYDRAUGERS**  
 Eastern Mesa Region  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



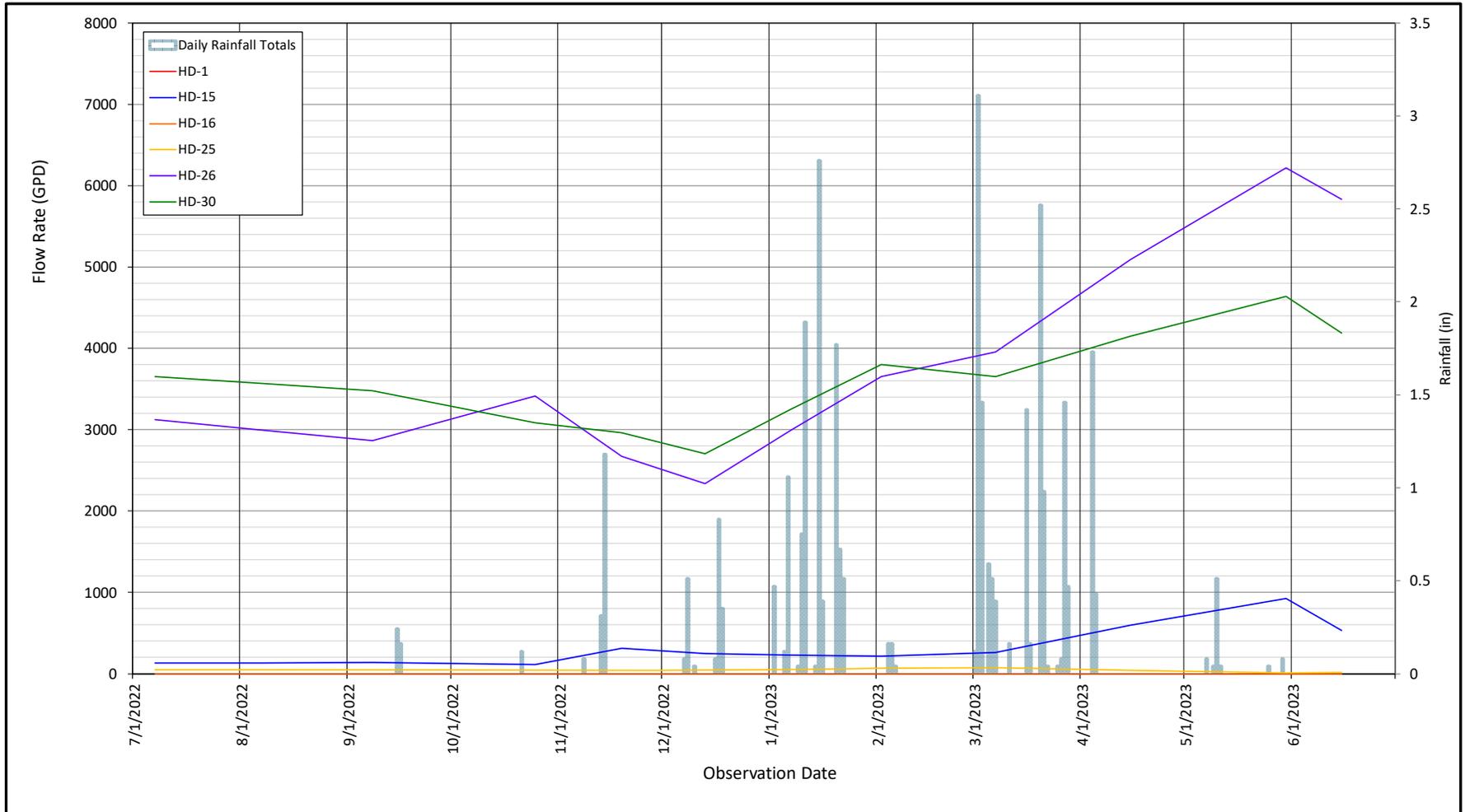
**DISCHARGE RATE FOR HYDRAUGERS (HISTORIC)**  
**Eastern Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



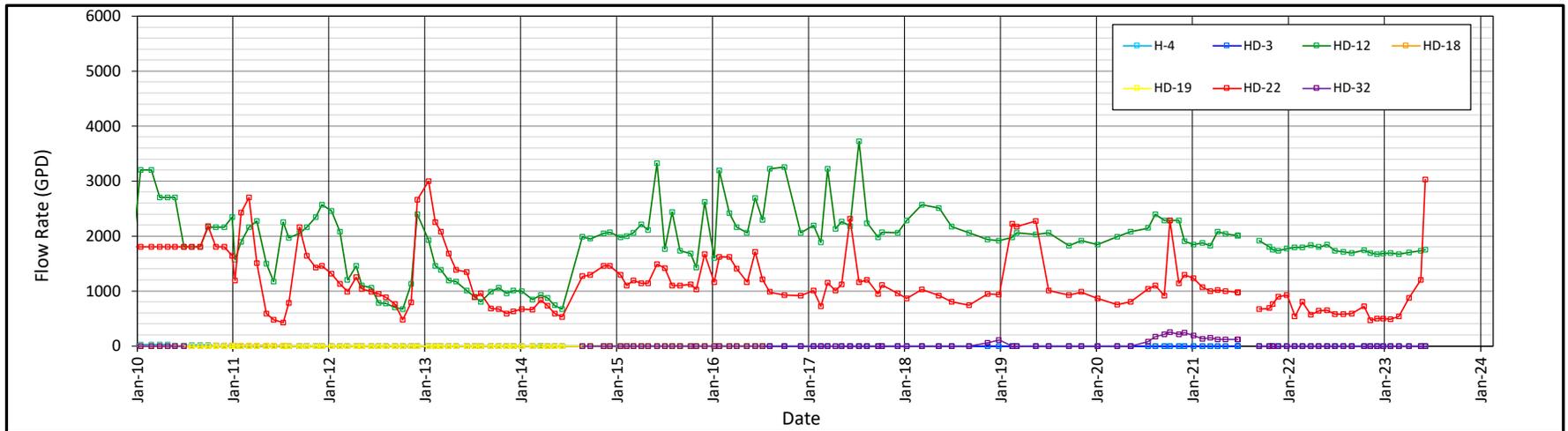
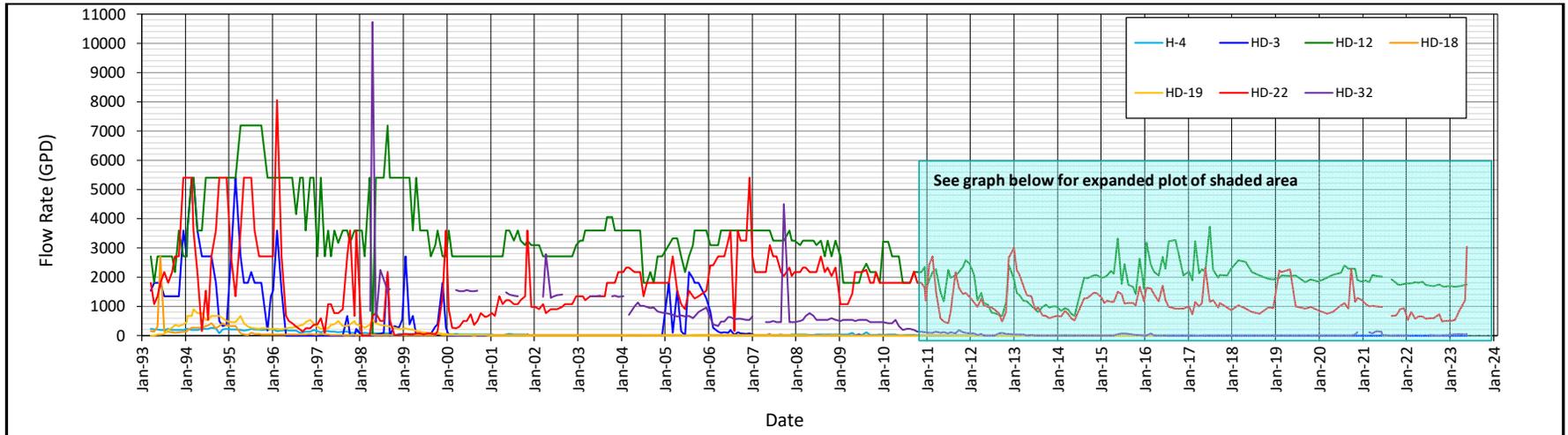
**DISCHARGE RATE FOR HYDRAUGERS (MONITORING YEAR)**  
**Eastern Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



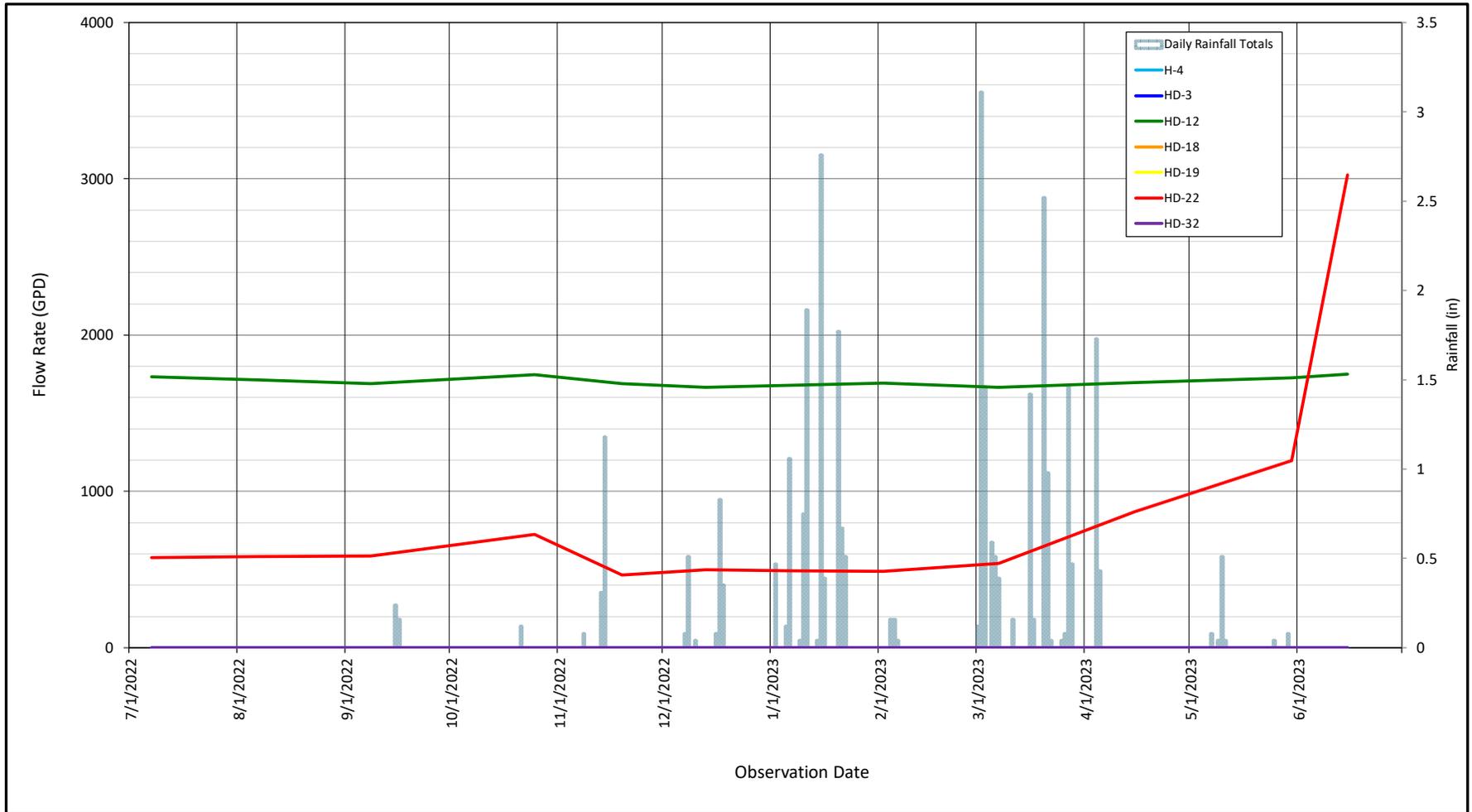
**DISCHARGE RATE FOR HYDRAUGERS (HISTORIC)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



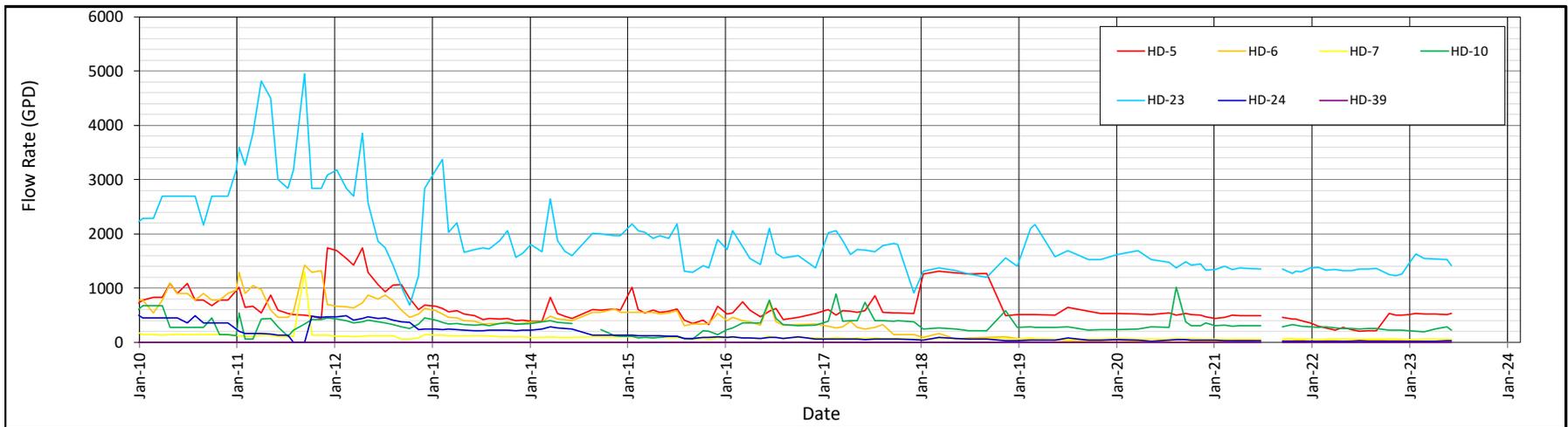
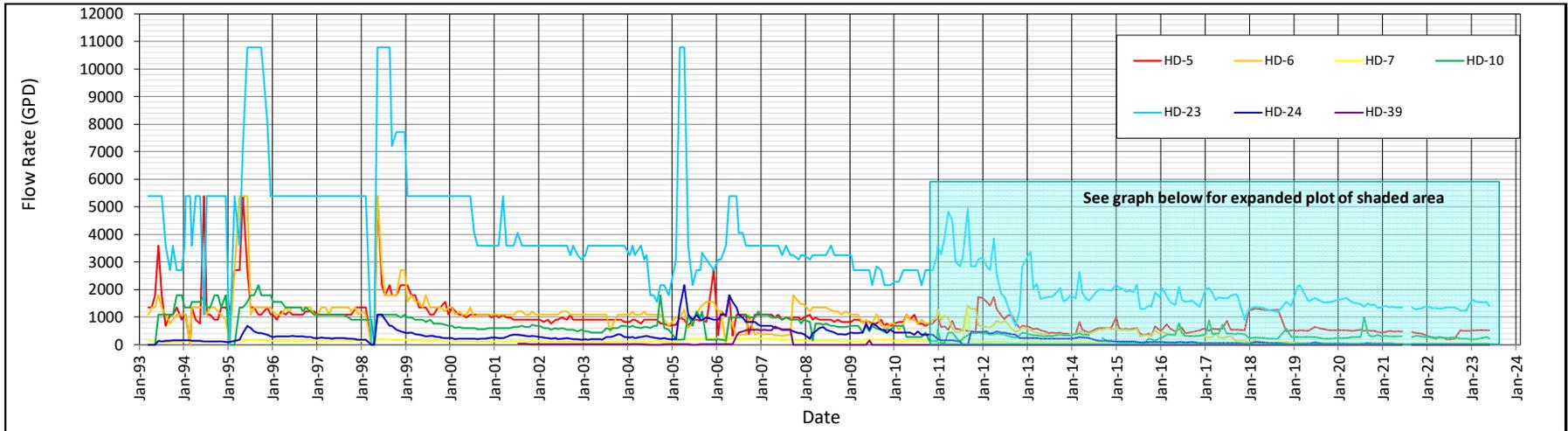
**DISCHARGE RATE FOR HYDRAUGERS (MONITORING YEAR)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



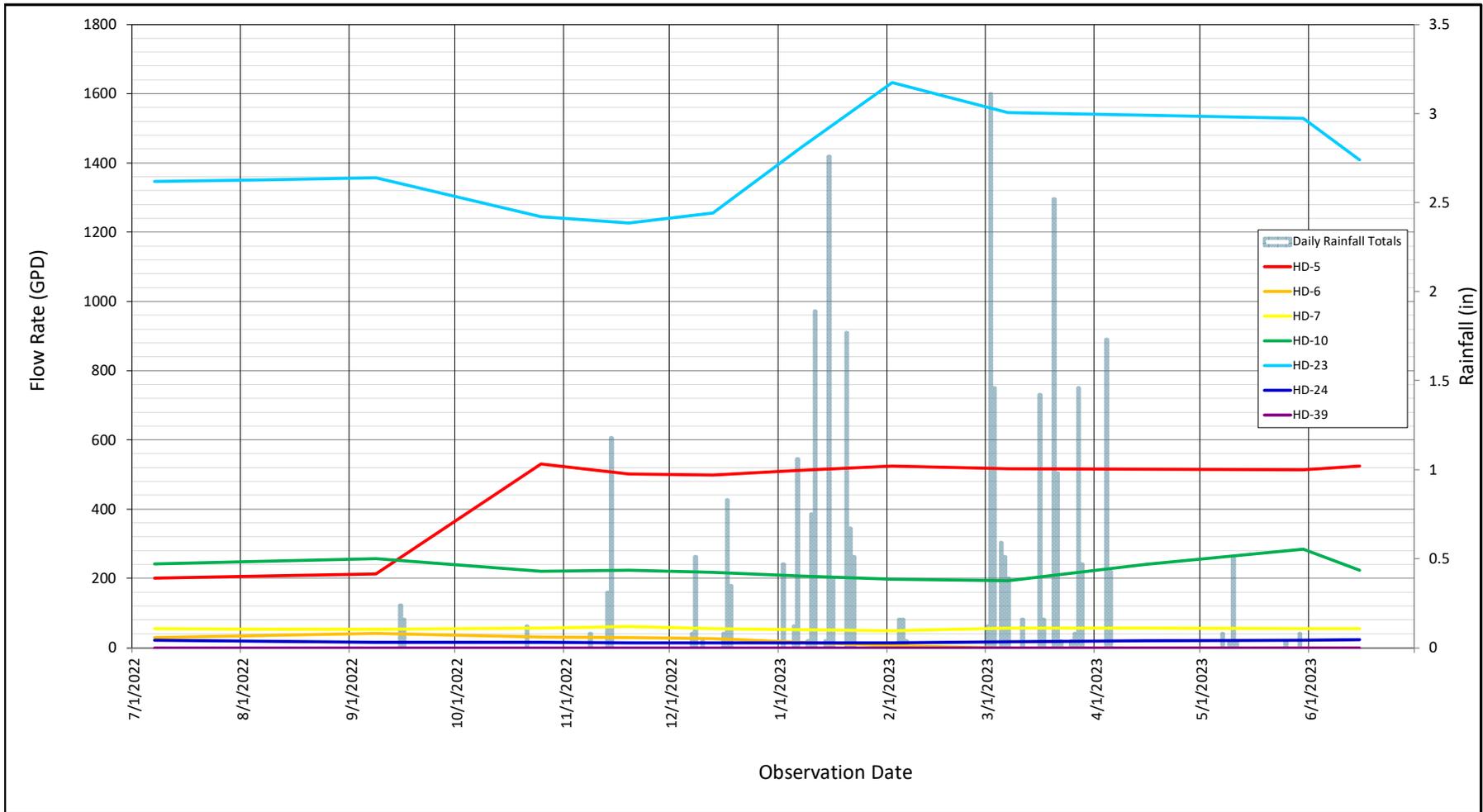
**DISCHARGE RATE FOR HYDRAUGERS (HISTORIC)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



**DISCHARGE RATE FOR HYDRAUGERS (MONITORING YEAR)**  
**Central Mesa Region**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



**DISCHARGE RATE FOR HYDRAUGERS (HISTORIC)**  
**Western Extension**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California



**DISCHARGE RATE FOR HYDRAUGERS (MONITORING YEAR)**  
**Western Extension**  
 Big Rock Mesa Landslide Assessment District  
 Malibu, California

## APPENDIX E - GROUNDWATER QUALITY

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2022 Q3 EFFLUENT TESTING SUMMARY (Aqueous Matrix)

Date Sampled	Sample Point	Percentage of Composite Sample	pH (Field Measured)	Temperature	Biochemical Oxygen Demand	Surfactants (MBAS)	Oil & Grease	Settleable Solids	Sulfides	Phenols	Residual Chlorine (Field Measured)	Total Suspended Solids	Turbidity	Copper	Cyanide	Mercury	Nickel	Zinc	Total Coliform	Fecal Coliform	Fecal/Total Coliform >0.1?	Enterococcus	Acute Toxicity**
				° F	mg/L	mg/L	mg/L	m/L	mg/L	mg/L	mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	MPN/100ml	MPN/100ml		MPN/100ml	% Survival
<b>Discharges to M-001 (Outfall/Port #1a)</b>																							
7/6/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	3.3	4.5 DNQ	ND	3.6	19	--	--	--	--	--
7/15/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.43	2.9 DNQ	13 DNQ	--	--	--	--	--
7/18/2022	BYA-14 FW-1	63% 37%	7.30	73.2	13	ND A10	ND	ND A10	4.4 A10	ND	0.00	2.2 A10	62 A10	ND	15	ND	ND	ND	--	--	--	--	--
7/28/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	ND	9.1	0.038 DNQ	2.7 DNQ	ND	--	--	--	--	--
8/12/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.40	ND	ND	--	--	--	--	--
8/19/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	ND	21	0.040 DNQ	ND	34 DNQ	--	--	--	--	--
	Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	20	ND	ND	31 DNQ	--	--	--	--	--
8/25/2022	BYA-14 FW-1	63% 37%	7.59	73.0	14	ND	ND	ND	15 A10	ND	0.00	3.1 A10	56	ND	19	0.30	ND	ND	--	--	--	--	--
9/2/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	ND	20	ND	ND	ND	--	--	--	--	--
9/9/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	1.3 DNQ	22	ND	2.7 DNQ	ND	--	--	--	--	--
9/13/2022	BYA-14 FW-1	63% 37%	7.20	75.7	2.1	ND A10	ND	ND	0.74	ND	0.02	ND A10	1.5	ND	ND	ND	3.2 DNQ	ND	--	--	--	--	--
9/27/2022	BYA-14 FW-1	63% 37%	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.084 DNQ	ND	ND	>1600	<1.8	No	1.0	--
<b>Discharges to M-002 (Outfall/Port #1)</b>																							
7/6/2022	M-002 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	3.5	ND	0.031 DNQ	2.6	5.0 DNQ	--	--	--	--	--
7/15/2022	M-002 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	3.1	ND	0.19 DNQ	2.9	37	--	--	--	--	--
7/18/2022	M-002 Duplicate	N/A	8.30	69.8	1.5	ND	0.75 DNQ	ND A10	ND	ND	0.00	ND A10	0.23	ND	790 A10	0.031 DNQ	ND	ND	--	--	--	--	--
7/28/2022	M-002 Duplicate	N/A	8.30	69.8	1.8	ND	ND	ND A10	ND	ND	0.00	ND A10	0.32	ND	6.2	0.052 DNQ	ND	ND	--	--	--	--	--
8/12/2022	M-002 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	2.6 DNQ	1.7 DNQ	0.15 DNQ	ND	ND	--	--	--	--	--
8/19/2022	M-002 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	1.3 DNQ	ND	ND	ND	ND	--	--	--	--	--
8/25/2022	M-002 Duplicate	N/A	8.51	63.5	ND	ND	ND	ND	ND	ND	0.01	1.1 A10	0.15	ND	ND	0.028 DNQ	ND	ND	--	--	--	--	--
9/2/2022	M-002 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.033 DNQ	ND	ND	--	--	--	--	--
9/9/2022	M-002 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	--	--	--	--	--
9/13/2022	M-002 Duplicate	N/A	8.00	71.2	1.8 S16	ND S05	ND	ND	ND	ND	0.00	ND A10	0.15 S05	ND	ND	ND	ND	ND	--	--	--	--	--
9/27/2022	BYA-6	17%	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.074 DNQ	ND	15 DNQ	--	--	--	--	--
	BYA-5	29%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	170	46	Yes	13	--
	BYA-12	7%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-9	23%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-29	3%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-42	22%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-003 (Outfall/Port #2)</b>																							
7/6/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/15/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/18/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7/28/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8/12/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8/19/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8/24/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
8/25/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/2/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/9/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/13/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/27/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-004 (Outfall/Port #3)</b>																							
7/6/2022	M-004	N/A	--	--	--	--	--	--	--	--	--	--	--	1.8 DNQ	ND	0.033 DNQ	3.5	2.4 DNQ	--	--	--	--	--
7/15/2022	M-004 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	2.0 DNQ	ND	ND	3.3 DNQ	ND	--	--	--	--	--
7/18/2022	M-004 Duplicate	N/A	8.30	70.0	22	5.2 A10	2.1 DNQ	ND A10	ND	ND	0.00	4.4 A10	3.8	1.6 DNQ	ND	4.3 DNQ	ND	ND	--	--	--	--	--
7/28/2022	M-004 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	5.9 DNQ	5.8	0.044 DNQ	ND	ND	--	--	--	--	--
8/12/2022	M-004 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	1.4 DNQ	ND	2.3 DNQ	ND	ND	--	--	--	--	--
8/19/2022	M-004 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	1.6 DNQ	ND	0.11 DNQ	ND	ND	--	--	--	--	--
8/25/2022	M-004 Duplicate	N/A	8.08	68.0	2.7	ND A10	ND	ND	ND	ND	0.00	ND A10	0.38	3.9 DNQ	ND	2.5 DNQ	23 DNQ	22 DNQ	--	--	--	--	--
9/2/2022	M-004 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	3.1 DNQ	ND	2.4 DNQ	22 DNQ	ND	--	--	--	--	--
9/9/2022	M-004	High Surf, No Access	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.029 DNQ	ND	ND	--	--	--	--	--
9/13/2022	M-004	High Surf, No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/27/2022	M-004	High Surf, No Access	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
9/27/2022	W-2	8%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46.00	<1.8	No	29.00	--
	W-1	14%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-13	12%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	W-3	21%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-30	37%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-4	3%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-43	4%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-005 (Outfall/Port #4)</b>																							
7/6/2022	M-005	N/A	--	--	--	--	--	--	--	--	--	--	--	2.5	ND	0.18 DNQ	3.0	6.4 DNQ	--	--	--	--	--
7/15/2022	M-005	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	--	--	--	--	--
7/18/2022	M-005	N/A	8.40	72.0	1.8	ND	ND	ND A10	ND	ND	0.00	ND A10	0.51	ND	7.5	ND	ND	ND	--	--	--	--	--
7/28/2022	M-005	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	2.1 DNQ	0.034 DNQ	ND	ND	--	--	--	--	--
8/12/2022	M-005 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.066 DNQ	ND	ND	--	--	--	--	--
8/19/2022	M-005 Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	--	--	--	--	--
8/25/2022	M-005 Duplicate	N/A	8.28	67.8	ND	ND	ND	ND	ND	ND	0.02	ND A10	1.7	5.9 DNQ	ND	0.056 DNQ	ND	ND	--	--	--	--	--
9/2/20																							



2022 Q4 EFFLUENT TESTING SUMMARY (Aqueous Matrix)

Date Sampled	Sample Point	Percentage of Composite Sample	pH (Field Measured)	Temperature	Biochemical Oxygen Demand	Surfactants (MBAS)	Oil & Grease	Settleable Solids	Sulfides	Phenols	Residual Chlorine (Field Measured)	Total Suspended Solids	Turbidity	Copper	Cyanide	Mercury	Nickel	Zinc	Total Coliform	Fecal Coliform	Fecal Total Coliform >0.17	Enterococcus	Acute Toxicity**
			°F	mg/L	mg/L	mg/L	mL/L	mg/L	mg/L	mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	MPN/100ml	MPN/100ml		MPN/100ml	% Survival
<b>Discharges to M-001 (Outfall/Port #1a)</b>																							
10/7/2022	BYA-14	63%	--	--	--	--	--	--	--	--	--	--	--	ND	6.7	ND	2.8 DNQ	ND	--	--	--	--	--
	FW-1	37%	--	--	--	--	--	--	--	--	--	--	--	ND	--	ND	ND	ND	--	--	--	--	--
10/20/2022	BYA-14	63%	7.59	73.0	2.0 S05	0.028 DNQ	ND	ND	19 A10	ND	0.00	0.93 A10	110 A10	2.9 DNQ	--	ND	ND	ND	<1.8	<1.8	N/A	<1	--
	FW-1	37%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46	<1.8	No	--	--
11/17/2022	BYA-14	100%	--	--	--	--	--	--	--	--	--	--	--	--	ND S05	--	--	--	280	<1.8	No	--	--
	FW-1	0%	--	--	--	--	--	--	--	--	--	--	--	--	9.0 S05	--	--	--	280	<1.8	No	--	--
11/17/2022	BYA-14	63%	--	--	--	--	--	--	--	--	--	--	--	--	ND S05	--	--	--	280	<1.8	No	--	--
	FW-1	37%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	280	<1.8	No	--	--
11/28/2022	BYA-14	63%	7.48	72.5	23	0.028 DNQ	ND	ND	32 A10	ND	0.00	ND A10	180 A10	3.8 DNQ	26	0.040 DNQ	ND	ND	--	--	--	--	100%
	FW-1	37%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/12/2022	BYA-14	63%	7.50	71.4	16	0.052 DNQ	ND	ND	20 A10	ND	0.00	ND A10	110 A10	1.3 DNQ	32	ND	3.4 DNQ	ND	--	--	--	--	--
	FW-1	37%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
12/15/2022	BYA-14	63%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	FW-1	37%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
<b>Discharges to M-002 (Outfall/Port #1)</b>																							
10/7/2022	M-002	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	ND	ND	ND	--	--	--	--	--
10/14/2022	M-002	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.022 DNQ	ND	ND	--	--	--	--	--
10/20/2022	M-002	N/A	8.51	63.5	ND S05	ND	ND	ND	ND	0.082	0.01	0.93 A10	0.12	1.7 DNQ	--	ND	ND	ND	<1.8	<1.8	N/A	5.2	--
11/29/2022	M-002	N/A	8.20	65.8	ND	ND A10	ND	ND	ND	ND	0.00	ND A10	0.14	ND	2.0 DNQ	0.047 DNQ	ND	ND	--	--	--	--	100%
12/15/2022	BYA-5	32%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	120	--
	BYA-12	8%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	120	--
	HD-9	26%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	120	--
	HD-29	1%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	120	--
	HD-42	33%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	120	--
12/19/2022	M-002	N/A	8.33	65.5	ND	ND A10	ND	ND A10	ND	ND	0.00	ND A10	0.12	ND	ND	ND	ND	ND	--	--	--	--	--
<b>Discharges to M-003 (Outfall/Port #2)</b>																							
10/7/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/14/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/20/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
10/25/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/28/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
11/29/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/12/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/15/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
12/19/2022	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-004 (Outfall/Port #3)</b>																							
10/7/2022	M-004	N/A	--	--	--	--	--	--	--	--	--	--	--	ND	ND	0.048 DNQ	ND	ND	--	--	--	--	--
10/20/2022	M-004	N/A	8.08	68.0	ND S05	ND	ND	ND	ND	ND	0.00	0.80 A10	0.26	2.2 DNQ	--	ND	ND	ND	<1.8	<1.8	N/A	190	--
11/29/2022	M-004	N/A	8.11	70.0	15	8.6 A10	ND	ND	ND	ND	0.00	1.7 A10	2.6	ND	ND	0.057 DNQ	ND	ND	--	--	--	--	--
12/15/2022	W-2	10%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
	W-1	23%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
	BYA-13	11%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
	W-3	19%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
	HD-30	30%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
	HD-4	3%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
	HD-43	4%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
12/19/2022	M-004	N/A	8.04	68.9	55	6.3 A10	2.3 DNQ	ND A10	068 DN	ND	0.02	5.9 A10	20 A10	2.2 DNQ	ND	ND	ND	ND	--	--	--	--	100%
<b>Discharges to M-005 (Outfall/Port #4)</b>																							
10/7/2022	M-005	N/A	--	--	--	--	--	--	--	--	--	--	--	ND A10	ND	0.075 DNQ	ND A10	ND A10	--	--	--	--	--
	Duplicate	N/A	--	--	--	--	--	--	--	--	--	--	--	ND A10	ND	0.15 DNQ	ND A10	ND A10	--	--	--	--	--
10/20/2022	M-005	N/A	8.28	67.8	ND S05	0.028 DNQ	ND	ND	ND	ND	0.02	ND A10	1.3	1.7 DNQ	--	ND	ND	ND	<1.8	<1.8	N/A	140	--
11/29/2022	M-005	N/A	8.30	68.0	1.5	ND	ND	ND	ND	ND	0.01	ND A10	0.28	ND	2.0 DNQ	0.072 DNQ	ND	ND	--	--	--	--	--
12/15/2022	W-8	23%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	W-17	7%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	BYA-1	52%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	BYA-7	3%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	FW-2	3%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	HD-15	1%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
	HD-26	11%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	<1.8	N/A	<1	--
12/19/2022	M-005	N/A	8.25	68.2	ND	ND	ND	ND A10	ND	ND	0.01	ND A10	0.16	1.5 DNQ	ND	0.022 DNQ	ND	ND	--	--	--	--	100%
<b>Discharges to M-006 (Outfall/Port #5)</b>																							
10/7/2022	M-006	N/A	--	--	--	--	--	--	--	--	--	--	--	ND A10	ND	ND	ND A10	ND A10	--	--	--	--	--
10/20/2022	M-006	N/A	8.30	67.1	ND S05	ND	ND	ND	ND	ND	0.00	2.4 A10	0.26	2.1 DNQ	--	ND	ND	ND	<1.8	<1.8	N/A	390	--
11/17/2022	M-006	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	1.0	--
11/29/2022	M-006	N/A	8.35	69.8	1.8	ND	ND	ND	ND	ND	0.02	0.67 A10	0.36	ND	1.8 DNQ	0.13 DNQ	ND	ND	--	--	--	--	--
12/15/2022	BYA-4	36%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13	<1.8	N/A	<1	--
	BYA-9	30%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13	<1.8	N/A	<1	--
	W-13	14%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13	<1.8	N/A	<1	--
	BYA-11	15%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13	<1.8	N/A	<1	--
	HD-22	5%	--	--	--	--																	

2023 Q1 EFFLUENT TESTING SUMMARY (Aqueous Matrix)

Date Sampled	Sample Point	Percentage of Composite Sample	pH (Field Measured)	Temperature	Biochemical Oxygen Demand	Surfactants (MBAS)	Oil & Grease	Settleable Solids	Sulfides	Phenols	Residual Chlorine (Field Measured)	Total Suspended Solids	Turbidity	Copper	Cyanide	Mercury	Nickel	Zinc	Total Coliform	Fecal Coliform	Fecal Total Coliform >0.1?	Enterococcus	Acute Toxicity**
			°F	mg/L	mg/L	mg/L	mL/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	MPN/100ml	MPN/100ml		MPN/100ml	% Survival
<b>Discharges to M-001 (Outfall/Port #1a)</b>																							
1/6/2023	BYA-14	62%	--	--	ND A26,S05	--	--	--	1.9 A10	--	--	--	1.7 A26,S16	--	ND	--	--	--	--	--	--	--	--
	FW-1	38%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/30/2023	BYA-14	62%	7.2	66.6	8.1	ND	ND	ND	11 A10	ND	0.00	0.80 A10	36	ND	1.7 J	0.24	ND	16 J	--	--	--	--	--
	FW-1	38%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/28/2023	BYA-14	62%	7.2	67.1	ND	ND	ND	ND	4.0 A10	ND	0.03	ND A10	4.9	ND	ND	0.18 J	ND	17 J	--	--	--	--	--
	FW-1	38%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3/15/2023	BYA-14	62%	7.3	65.8	2.7	0.025 J	ND	ND	4.1 A10	ND	0.00	0.67 A10	19	ND	ND	0.10 J	ND	ND	--	--	--	--	--
	FW-1	38%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3/30/2023	BYA-14	62%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	>1600	350	Yes	11	--
	FW-1	38%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-002 (Outfall/Port #1)</b>																							
1/30/2023	M-002	N/A	8.0	61.2	1.9	ND	ND	ND	ND	ND	0.01	ND A10	0.14	ND	ND	0.21	ND	ND	--	--	--	--	--
1/31/2023	M-002	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0	--
2/27/2023	M-002	N/A	7.7	54.5	2.3	ND	1.0 J	ND	ND A10	ND	0.05	540 A10	360 A10	32	ND	0.048 J	12	91	--	--	--	--	--
3/15/2023	M-002	N/A	8.0	62.6	ND	0.05 J	ND	ND	0.064 J	ND	0.03	12 A10	12	ND	ND	ND	ND	ND	--	--	--	--	--
3/30/2023	BYA-5	36%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	49	23	Yes	15	--
	BYA-6	64%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-12	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-9	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-29	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-42	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-003 (Outfall/Port #2)</b>																							
1/30/2023	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/31/2023	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2/27/2023	M-003	N/A	7.9	53.4	2.5	ND	1.2 J	10	0.40	ND	0.02	1100 A10	120	59	ND	ND	15	7200	--	--	--	--	--
3/16/2023	M-003	N/A	8.0	58.6	ND	0.048 J	ND	0.9	ND	110	0.00	54 A10	4.4	9.6 J	ND	ND	4.9 J	51	--	--	--	--	--
3/30/2023	M-003	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-004 (Outfall/Port #3)</b>																							
1/30/2023	M-004	N/A	7.9	66.2	2.4	ND	ND	ND	ND	ND	0.03	0.67 A10	0.22	ND	ND	0.15 J	ND	ND	--	--	--	--	--
	Duplicate	N/A	7.9	66.2	2.0	ND	ND	ND	ND	ND	0.03	0.67 A10	0.16	ND	ND	0.37	ND	ND	--	--	--	--	--
1/31/2023	M-004	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	84	--
2/27/2023	M-004	N/A	7.8	54.9	1.7	0.088 J	ND	ND	0.15	ND	0.00	41 A10	41 A10	9.9 J	ND	0.039 J	ND	42 J	--	--	--	--	--
3/16/2023	M-004	N/A	8.0	65.1	4.1	0.41	ND	ND	ND	ND	0.02	6.7 A10	3	3.1 J	ND	ND	2.9 J	14 J	--	--	--	--	--
3/30/2023	W-2	35%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	79	79	Yes	12	--
	W-1	20%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-13	14%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	W-3	32%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-30	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-4	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-43	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-005 (Outfall/Port #4)</b>																							
1/30/2023	M-005	N/A	8.1	66.4	8.2	0.30	ND	ND	ND	ND	0.01	ND A10	0.39	1.3 J	1.7 J	0.16 J	ND	ND	--	--	--	--	--
1/31/2023	M-005	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	390	--
2/27/2023	M-005	N/A	8.1	54.3	2.3	0.050 J	ND	0.11	ND	ND	0.00	23 A10	10	7.2 J	ND	0.052 J	ND	32 J	--	--	--	--	--
	Duplicate	N/A	8.1	54.3	2.2	0.058 J	ND	0.10	ND	ND	0.00	22 A10	10	7.4 J	ND	0.023 J	ND	45 J	--	--	--	--	--
3/16/2023	M-005	N/A	8.1	65.1	ND	0.026 J	ND	ND	ND	ND	0.01	0.80 A10	1	2.0 J	ND	ND	ND	ND	--	--	--	--	--
3/30/2023	W-8	31%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	130	<1.8	No	<1	--
	W-17	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-1	69%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-7	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	FW-2	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-15	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-26	11%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-006 (Outfall/Port #5)</b>																							
1/30/2023	M-006	N/A	8.1	66.2	3.1	0.64 A10	ND	ND	ND	ND	0.03	0.80 A10	0.48	ND	ND	0.096 J	ND	ND	--	--	--	--	--
1/31/2023	M-006	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	27	--
2/27/2023	M-006	N/A	8.1	59.4	2.7	0.054 J	ND	0.20	0.24	ND	0.03	110 A10	60 A10	13	ND	0.036 J	3.7 J	45 J	--	--	--	--	--
3/16/2023	M-006	N/A	8.3	62.6	ND	0.029 J	ND	ND	ND	ND	0.03	ND A10	1.6	ND	ND	ND	ND	ND	--	--	--	--	--
3/30/2023	W-16	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	2	N/A	11	--
	BYA-4	39%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-9	29%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	W-13	15%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	BYA-11	17%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	HD-22	0%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
<b>Discharges to M-007 (Outfall/Port #5a)</b>																							
1/30/2023	BYA-10	100%	7.2	69.4	6.6	ND	ND	ND	ND	ND	0.03	ND A10	0.54	ND	ND	0.24	ND	ND	--	--	--	--	--
2/28/2023	BYA-10	100%	7.2	70.3	ND	ND A10	ND	ND	ND	ND	0.00	ND A10	0.44	ND	ND	ND	ND	ND	--	--	--	--	--
3/15/2023	BYA-10	100%	7.3	70.0	ND	ND	ND	ND	ND	ND	0.01	0.93 A10	0.32	ND	ND	ND	ND	ND	--	--	--	--	--
3/30/2023	Duplicate	N/A	7.30	70.0	ND	ND	ND	ND	ND	ND	0.01	ND A10	0.33	ND	ND	ND	ND	ND	--	--	--	--	--
	BYA-10	100%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	<1	--
<b>Discharges to M-008 (Outfall/Port #6)</b>																							
1/30/2023	M-008	N/A	8.2	57.9	2.7	ND A10	ND	ND A10	ND	ND	0.07	1.1 A10	2.10	ND	ND	0.							

2023 Q2 EFFLUENT TESTING SUMMARY (Aqueous Matrix)

Date Sampled	Sample Point	Percentage of Composite Sample	pH (Field Measured)	Temperature	Biochemical Oxygen Demand	Surfactants (MBAS)	Oil & Grease	Settleable Solids	Sulfides	Phenols	Residual Chlorine (Field Measured)	Total Suspended Solids	Turbidity	Copper	Cyanide	Mercury	Nickel	Zinc	Total Coliform	Fecal Coliform	Fecal Total Coliform >0.17	Enterococcus	Acute Toxicity**
				° F	mg/L	mg/L	mg/L	mL/L	mg/L	mg/L	mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	MPN/100m	MPN/100ml	MPN/100ml	MPN/100ml	% Survival
<b>Discharges to M-001 (Outfall/Port #1a)</b>																							
4/24/2023	BYA-14	63%	7.2	71.7	5.2	ND	ND	ND	24 A10	ND	0.00	ND A10	2.7	ND	11	ND	ND	ND	--	--	--	--	--
	FW-1	37%																					
5/23/2023	BYA-14	63%	7.3	72.8	12	0.046 J	ND	ND A10	20 A10	ND	0.02	ND A10	61	ND	ND	0.042 DNQ	3.4 DNQ	ND	--	--	--	--	--
	FW-1	37%																					
5/31/2023	BYA-14	63%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1600	<1.8	No	2.0	--
	FW-1	37%																					
6/22/2023	BYA-14	63%	N/M	74.3	2.4	0.046 J	ND	ND	6.3 A10	ND	0.03	0.80 A10	17	ND	ND	ND	2.6 DNQ	ND	--	--	--	--	--
	FW-1	37%																					
<b>Discharges to M-002 (Outfall/Port #1)</b>																							
4/24/2023	M-002	N/A	8.0	63.6	ND	ND	ND	ND	ND	ND	0.01	ND A10	0.26	ND	ND	ND	ND	ND	--	--	--	--	--
	HD-41	N/A	8.0	71.1	2.1	0.054 J	ND	ND	ND	ND	0.00	1.3 A10	0.94	2.0 DNQ	ND	0.12 DNQ	2.7 DNQ	ND	--	--	--	--	--
5/31/2023	BYA-5	22%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	240	33	Yes	51	--
	BYA-6	15%																					
	BYA-12	0%																					
	HD-9	29%																					
	HD-29	3%																					
	HD-42	31%																					
6/22/2023	M-002	N/A	N/M	64.9	ND	ND	ND	ND	ND	ND	0.04	0.67 A10	0.36	ND	ND	0.022 DNQ	ND	ND	--	--	--	--	--
<b>Discharges to M-003 (Outfall/Port #2)</b>																							
4/24/2023	M-003	no flow	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/23/2023	HD-41	100%	7.0	72.1	ND	0.058 J	ND	ND	ND	ND	0.00	0.93 A10	ND	2.2 DNQ	ND	0.14 DNQ	3.8 DNQ	ND	--	--	--	--	--
5/31/2023	BYA-7	12%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	33	<1.8	No	2.0	--
	BYA-6A	0%																					
	BYA-6B	6%																					
	HD-41	82%																					
	Duplicate	N/A																					
6/22/2023	HD-41	100%	N/M	74.7	ND	ND	ND	ND	ND	ND	0.05	ND A10	0.12	ND	1.7 DNQ	0.031 DNQ	ND	ND	23	<1.8	No	<1	--
<b>Discharges to M-004 (Outfall/Port #3)</b>																							
4/24/2023	M-004	N/A	7.9	71.0	ND	ND	ND	ND	ND	ND	0.00	0.93 A10	1.5	ND	2.0 DNQ	ND	ND	ND	--	--	--	--	--
5/23/2023	M-004	N/A	8.1	70.9	1.6	0.11	ND	ND	ND	ND	0.00	0.93 A10	0.65	2.7 DNQ	ND	0.047 DNQ	3.0 DNQ	ND	--	--	--	--	--
6/6/2023	W-2	23%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	>1600	<1.8	No	0	--
	W-1	15%																					
	BYA-13	10%																					
	W-3	17%																					
	HD-30	27%																					
	HD-4	2%																					
	HD-43	4%																					
6/22/2023	M-004	N/A	N/M	68.4	ND	0.037 J	ND	ND	ND	ND	0.03	0.80 A10	0.20	ND	ND	0.030 DNQ	2.9 DNQ	ND	--	--	--	--	--
	Duplicate	N/A	--	--	2.6	ND	ND	ND	ND	ND	--	0.80 A10	0.19	ND	ND	0.023 DNQ	ND	ND	--	--	--	--	--
<b>Discharges to M-005 (Outfall/Port #4)</b>																							
4/24/2023	M-005	N/A	8.0	70.0	ND	ND	ND	ND	ND	ND	0.0	ND A10	0.25	ND	ND	ND	ND	ND	--	--	--	--	--
5/23/2023	M-005	N/A	7.9	72.7	2.1	0.13	ND	ND	ND	ND	0.05	1.2 A10	13	8.5 DNQ	ND	0.054 DNQ	3.7 DNQ	13 DNQ	--	--	--	--	--
6/6/2023	W-8	23%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	920	<1.8	No	33	--
	W-17	7%																					
	BYA-1	51%																					
	BYA-7	3%																					
	FW-2	3%																					
	HD-15	1%																					
	HD-26	12%																					
6/22/2023	M-005	N/A	N/M	70.5	1.9	0.026 J	ND	ND	ND	ND	0.05	ND A10	0.22	ND	ND	0.093 DNQ	ND	ND	--	--	--	--	--
<b>Discharges to M-006 (Outfall/Port #5)</b>																							
4/24/2023	M-006	N/A	7.9	68.8	ND	ND	ND	ND	ND	ND	0.03	4.0 A10	1.5	ND	ND	ND	ND	ND	--	--	--	--	--
5/23/2023	M-006	N/A	7.6	71.6	1.5	0.026 J	ND	ND	ND	ND	0.12	0.93 A10	0.30	ND	ND	0.098 DNQ	2.9 DNQ	ND	--	--	--	--	--
6/6/2023	W-16	43%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	240	<1.8	No	37	--
	BYA-4	19%																					
	BYA-9	20%																					
	W-13	8%																					
	BYA-11	8%																					
	HD-22	2%																					
6/22/2023	M-006	N/A	N/M	70.2	2.0	0.026 J	ND	ND	ND	ND	0.07	ND A10	0.24	ND	ND	0.027 DNQ	ND	ND	--	--	--	--	--
<b>Discharges to M-007 (Outfall/Port #5a)</b>																							
4/24/2023	BYA-10	100%	7.3	70.5	ND	ND	ND	ND	ND A10	ND	0.02	ND A10	0.36	ND	1.7 DNQ	ND	ND	ND	--	--	--	--	--
5/23/2023	BYA-10	100%	7.3	72.1	2.2	ND	ND	ND	ND	ND	0.02	1.8 A10	0.17	ND	ND	0.030 DNQ	4.1 DNQ	ND	--	--	--	--	--
5/31/2023	BYA-10	100%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<1.8	<1.8	N/A	2.0	--
6/22/2023	BYA-10	100%	N/M	73.0	ND	0.030 J	ND	ND	ND	ND	0.05	ND A10	0.15	ND	1.9 DNQ	0.025 DNQ	ND	ND	--	--	--	--	--
<b>Discharges to M-008 (Outfall/Port #7)</b>																							
4/24/2023	M-008	N/A	8.1	71.2	ND	ND	ND	ND	ND	ND	0.00	1.2 A10	0.80	ND	ND	0.088 DNQ	ND	ND	--	--	--	--	--
5/23/2023	M-008	N/A	8.2	71.8	1.9	0.039 J	ND	ND	ND	ND	0.022 J	0.00	5.2 A10	0.90	1.2 DNQ	ND	0.036 DNQ	ND	ND	--	--	--	--
	Duplicate	N/A	--	--	2.3	0.078 J	ND	ND A26	ND	ND	--	4.3 A10	2.0	2.3 DNQ	ND	0.093 DNQ	2.9 DNQ	ND	--	--	--	--	--
6/6/2023	W-18	64%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	49	<1.8	No	350	--
	BYA-3	13%																					
	BYA-2	4%																					
	HD-10	2%																					
	HD-11	2%																					
	HD-12	14%																					
6/22/2023	M-008	N/A	N/M	66.7	1.6	ND	ND	ND	ND	ND	0.05	0.80 A10	0.47	ND	2.0 DNQ	0.034 DNQ	ND	ND	--	--	--	--	--
<b>Discharges to M-009 (Outfall/Port #7)</b>																							