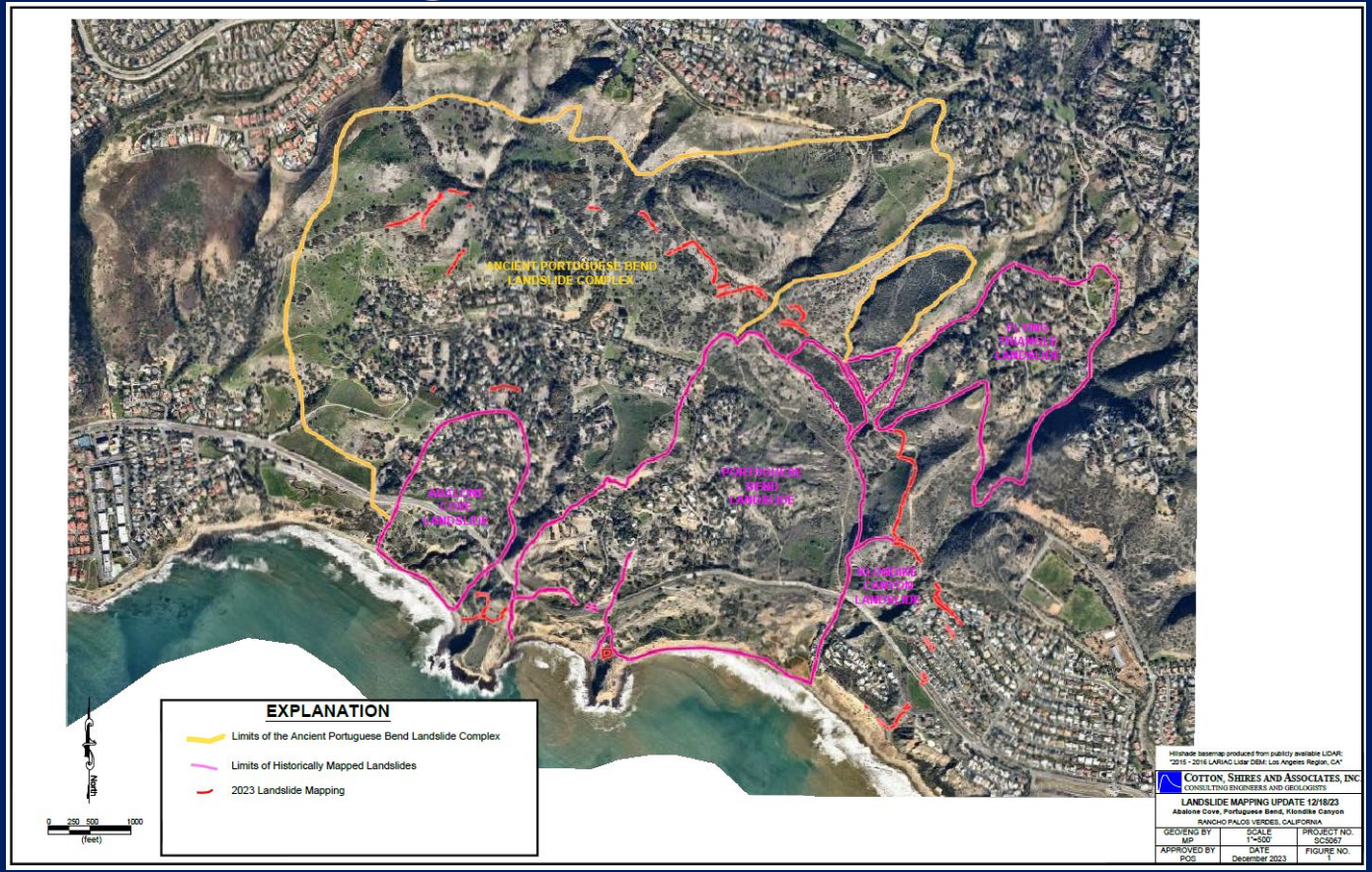
Ancient Portuguese Bend Landslide Complex Town Hall

April 17, 2024

Housekeeping

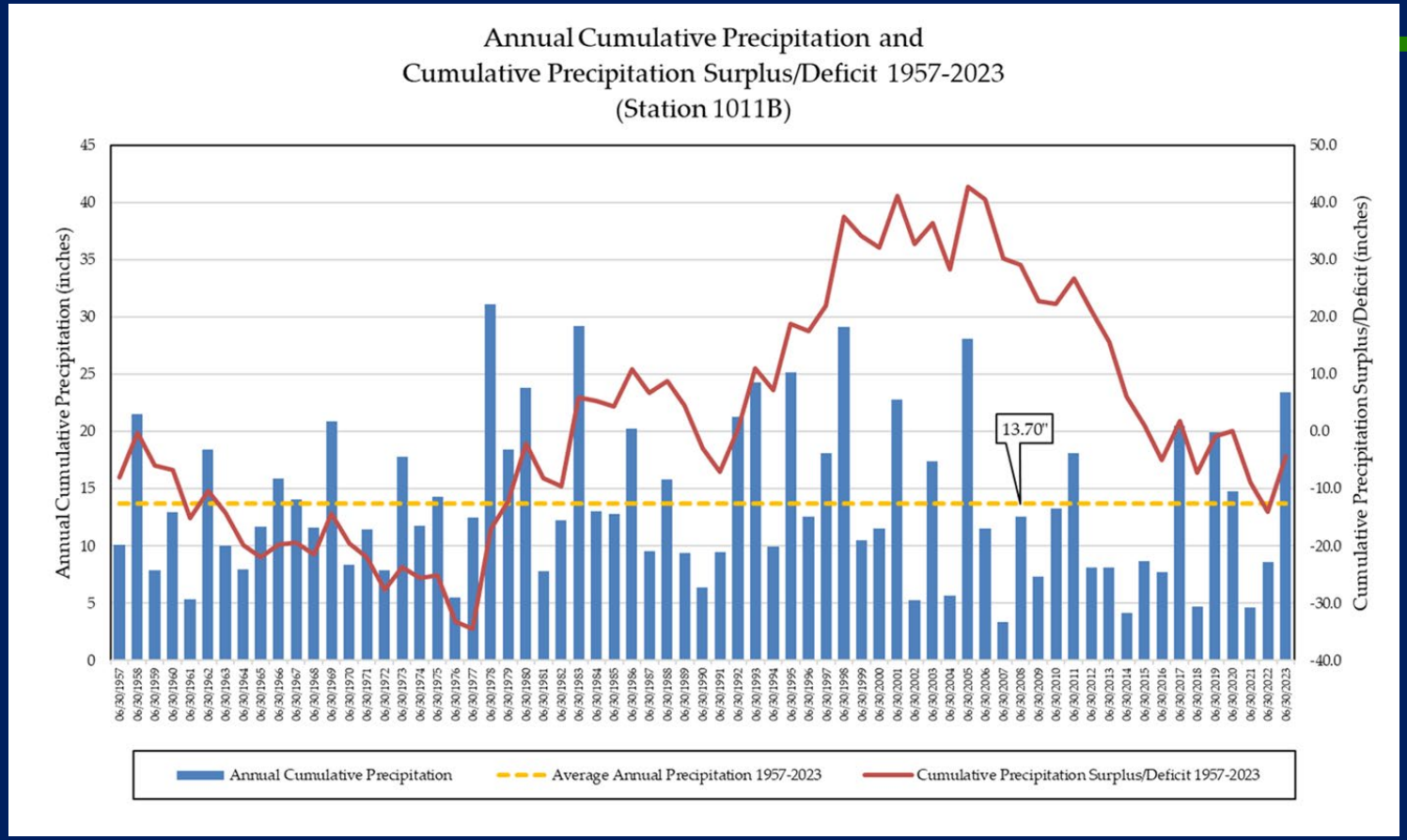
- Welcome to Ladera Linda
- Refreshments
- Restrooms
- Presentation Agenda
- Questions
  - Question Cards
  - Zoom Participants – Q&A Feature

Historic Background



RAINFALL

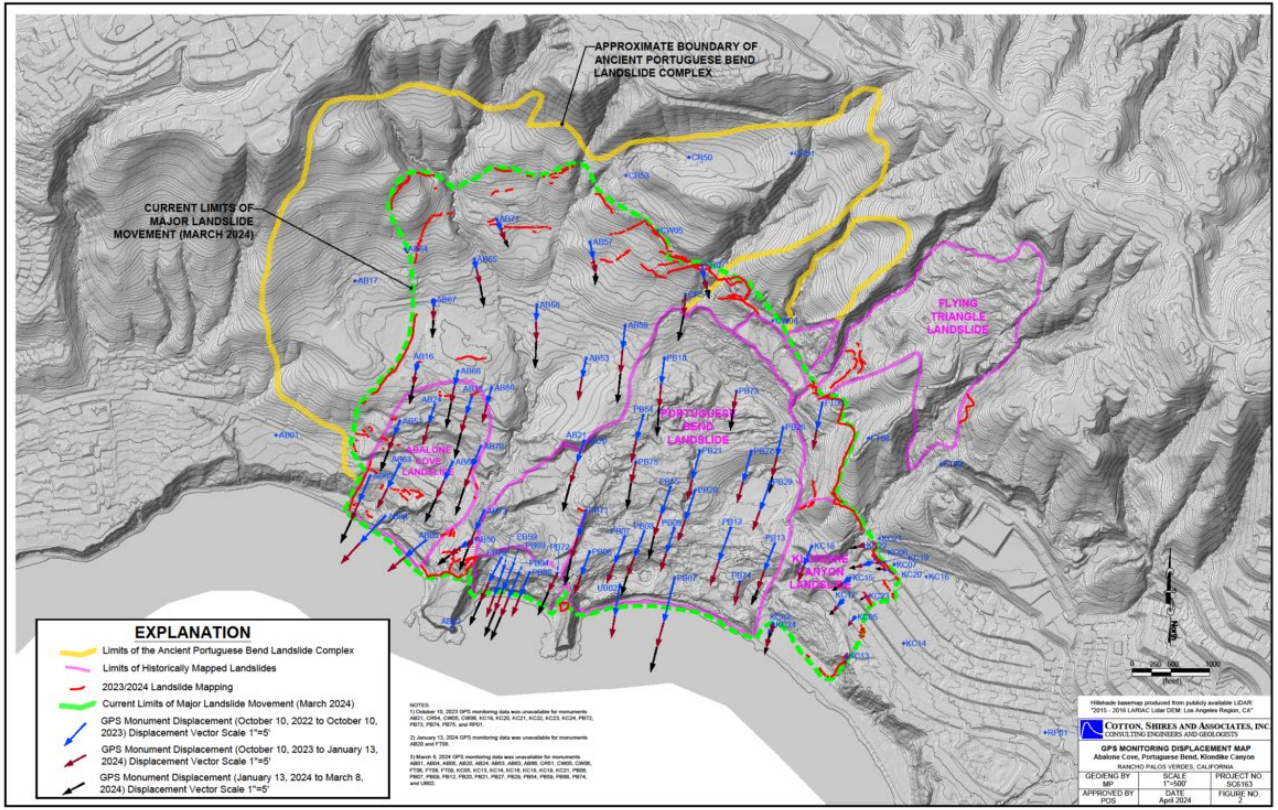
- Two gauges – Point Vicente and Rolling Hills FS
- Rolling Hills FS is more representative of watersheds
- 67-year record
- Mean annual rainfall 13.70 inches
- 2022-23 Season: 26.33 inches (192% of hist. avg.)
- 2023-24 Season: 22.50 inches (164% of hist. avg.)
- 2011-2016: 5 year drought w/below avg rainfall
- 5 of the last 8 years wetter than average
- La Nina conditions forecast for 2024-25


Annual Cumulative Precipitation and
Cumulative Precipitation Surplus/Deficit 1957-2023
(Station 1011B)
Annual Cumulative Precipitation (inches)
Cumulative Precipitation Surplus/Deficit (inches)
13.70"
Annual Cumulative Precipitation
Average Annual Precipitation 1957-2023
Cumulative Precipitation Surplus/Deficit 1957-2023

LAND MOVEMENT

- In Oct 2023 : 3x to 5x acceleration vs. Oct 2022
- In Jan 2024: 4x to 5x acceleration in 3 months
- In Mar 2024: 1.3x to 2.2x acceleration in 2 months
- Expansion of the overall PB Landslide Complex from 380 acres to 675 acres
- Monitoring for further expansion

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS



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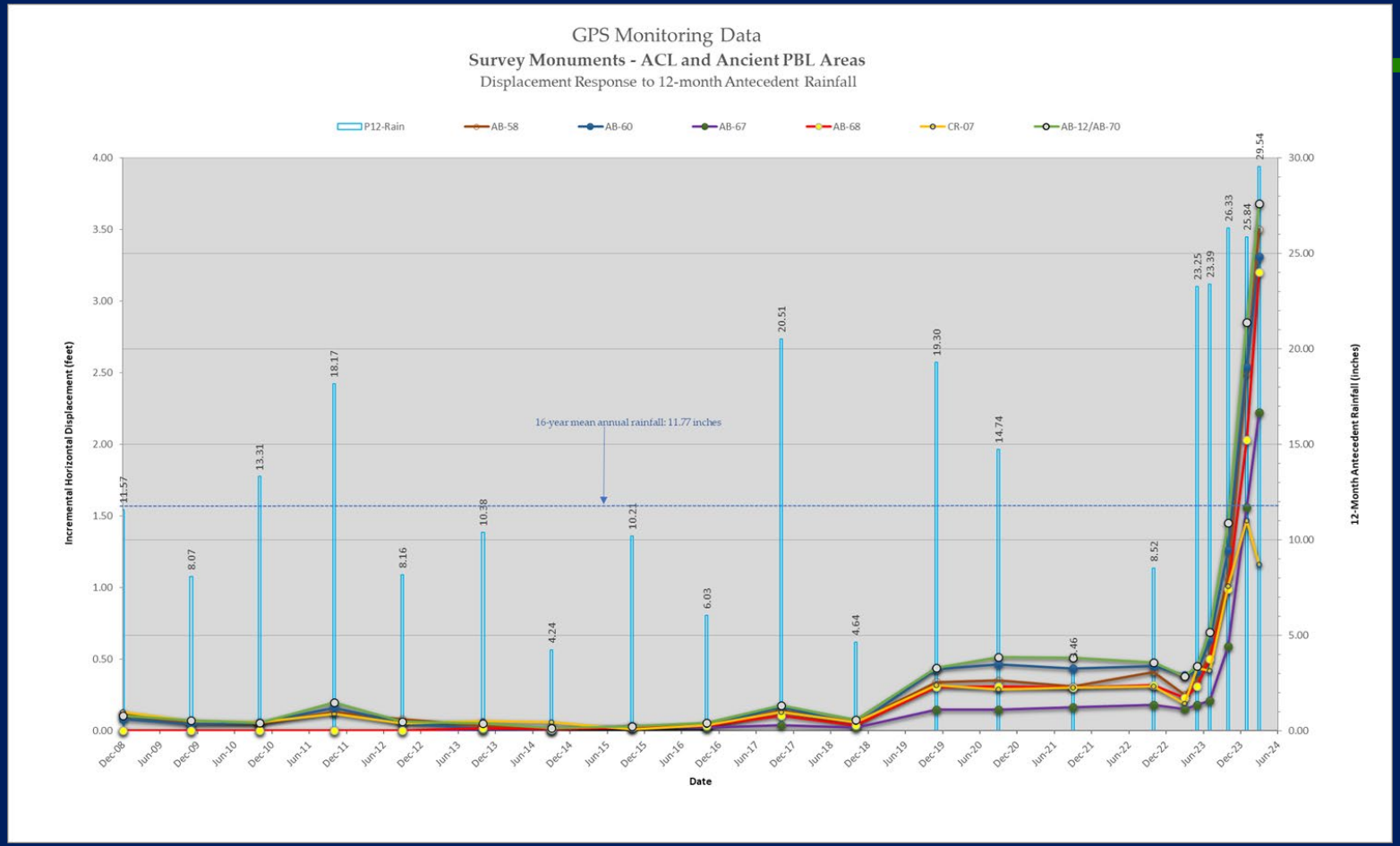
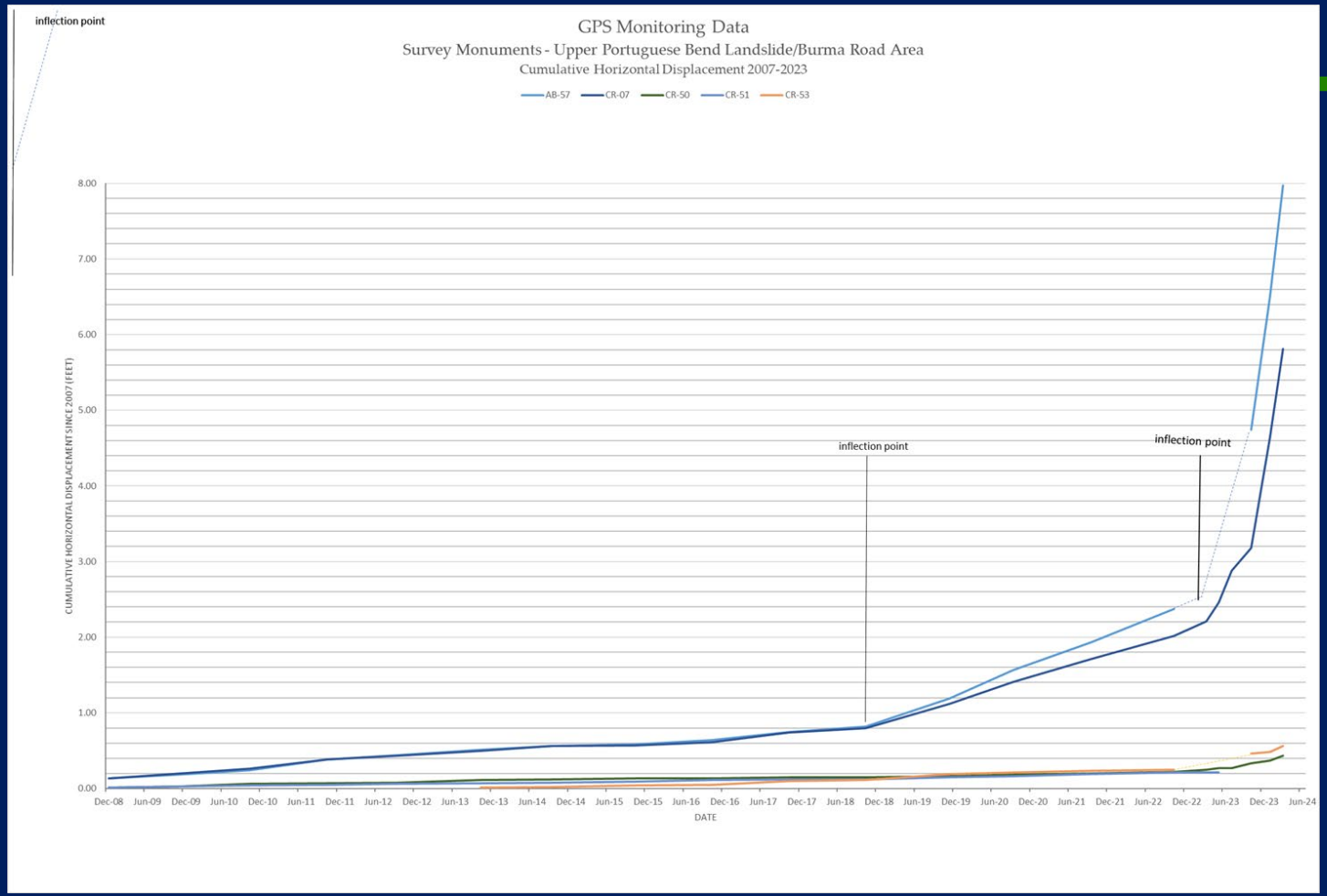

GPS Monitoring Data
Survey Monuments - ACL and Ancient PBL Areas
Displacement Response to 12-month Antecedent Rainfall
P12-Rain
AB-58
AB-60
AB-67
AB-68
CR-07
AB-12/AB-70
Incremental Horizontal Displacement (feet)
12-Month Antecedent Rainfall (inches)
16-year mean annual rainfall: 11.77 inches
11.57
8.07
13.31
18.17
8.16
10.38
4.24
10.21
6.03
20.51
4.64
19.30
14.74
9.46
8.52
23.25
23.39
26.33
25.84
29.54
Date


inflection point
GPS Monitoring Data
Survey Monuments - Upper Portuguese Bend Landslide/Burma Road Area
Cumulative Horizontal Displacement 2007-2023
AB-57
CR-07
CR-50
CR-51
CR-53
CUMULATIVE HORIZONTAL DISPLACEMENT SINCE 2007 (FEET)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
inflection point
inflection point
Dec-08
Jun-09
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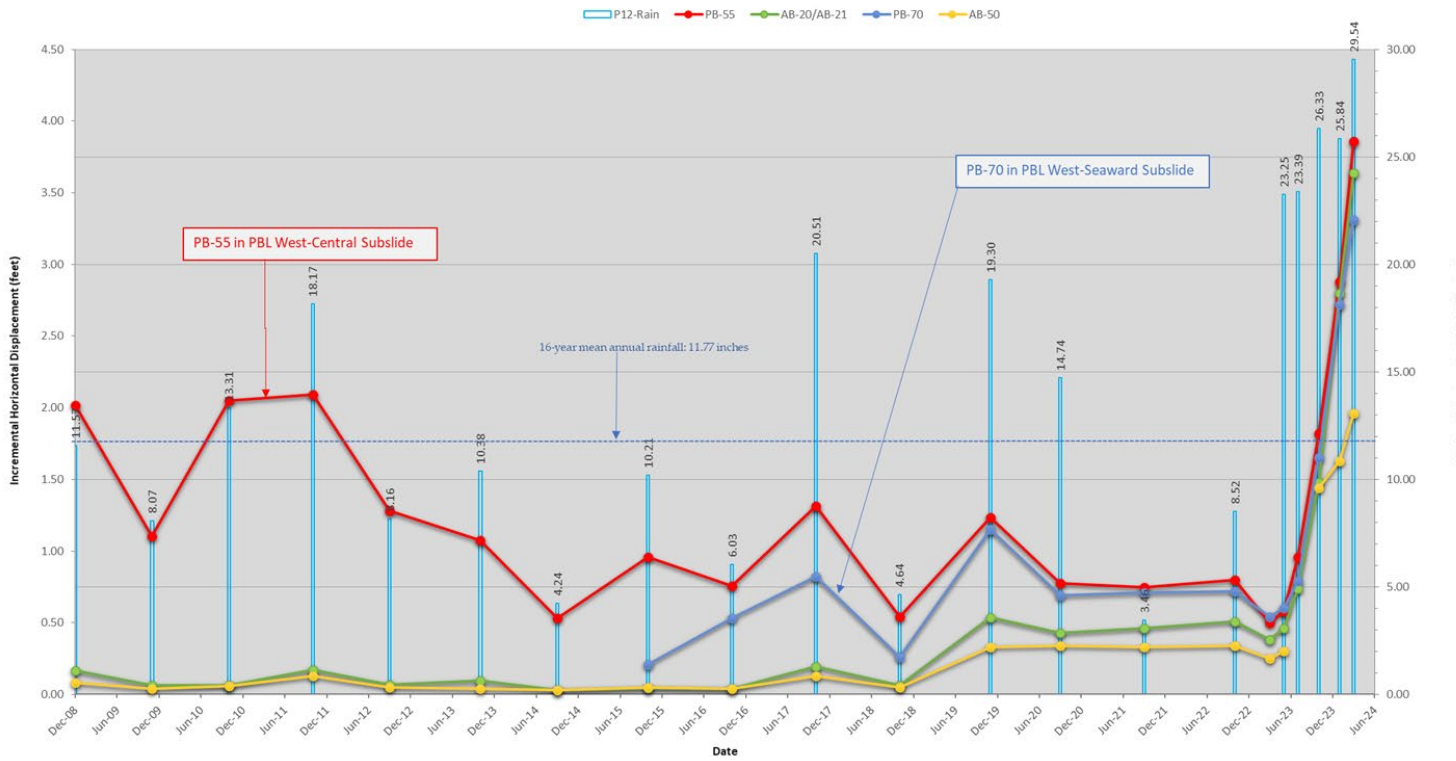
DATE


GPS Monitoring Data
Survey Monuments - ACL and PBL, PVDS "Ski Jump" Area
Displacement Response to 12-month Antecedent Rainfall
P12-Rain
PB-55
AB-20/AB-21
PB-70
AB-50
PB-55 in PBL West-Central Subslide
PB-70 in PBL West-Seaward Subslide
16-year mean annual rainfall: 11.77 inches
Incremental Horizontal Displacement (feet)
12-Month Antecedent Rainfall (inches)
Date
11.57
8.07
13.31
18.17
9.16
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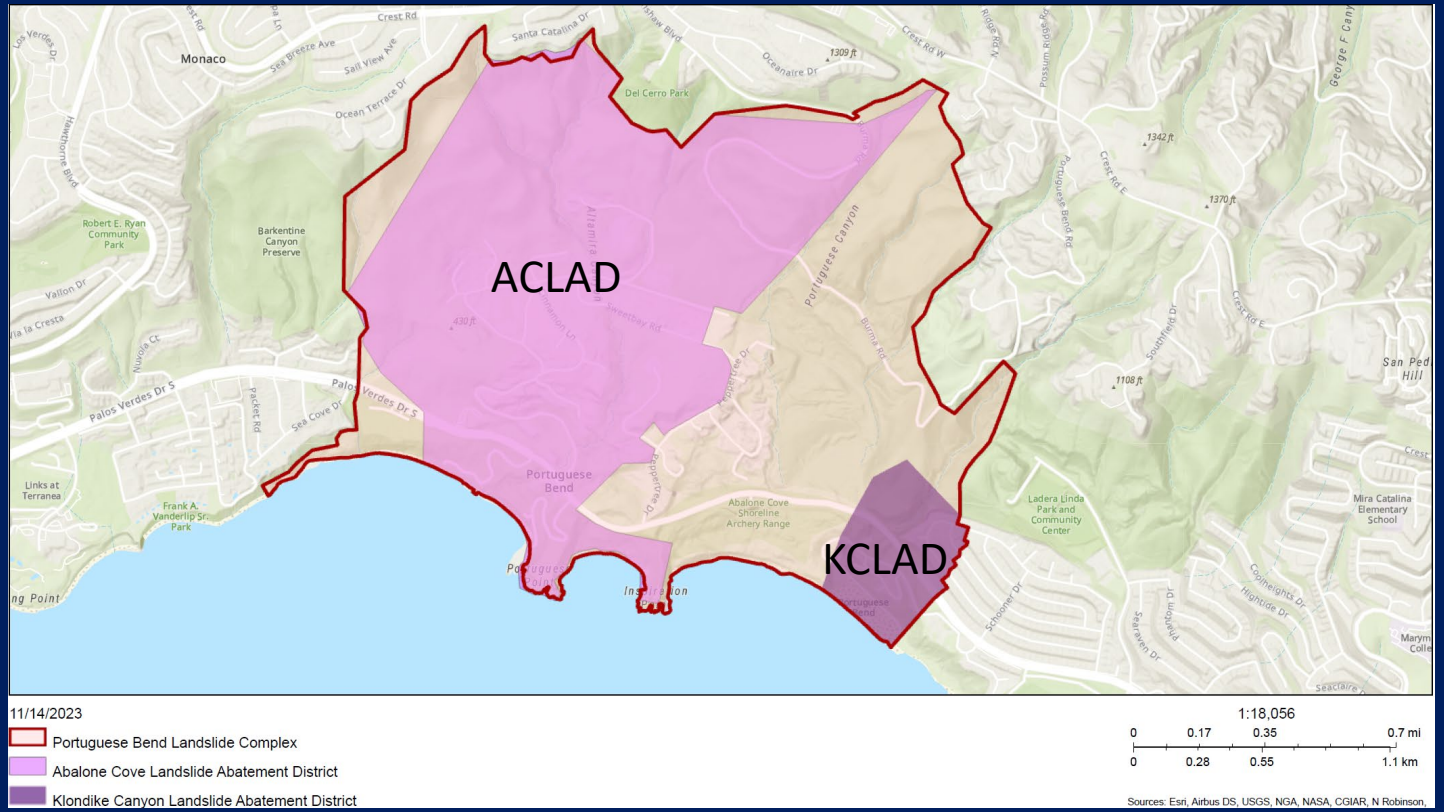
Jun-24

Geologic Hazard Abatement Districts

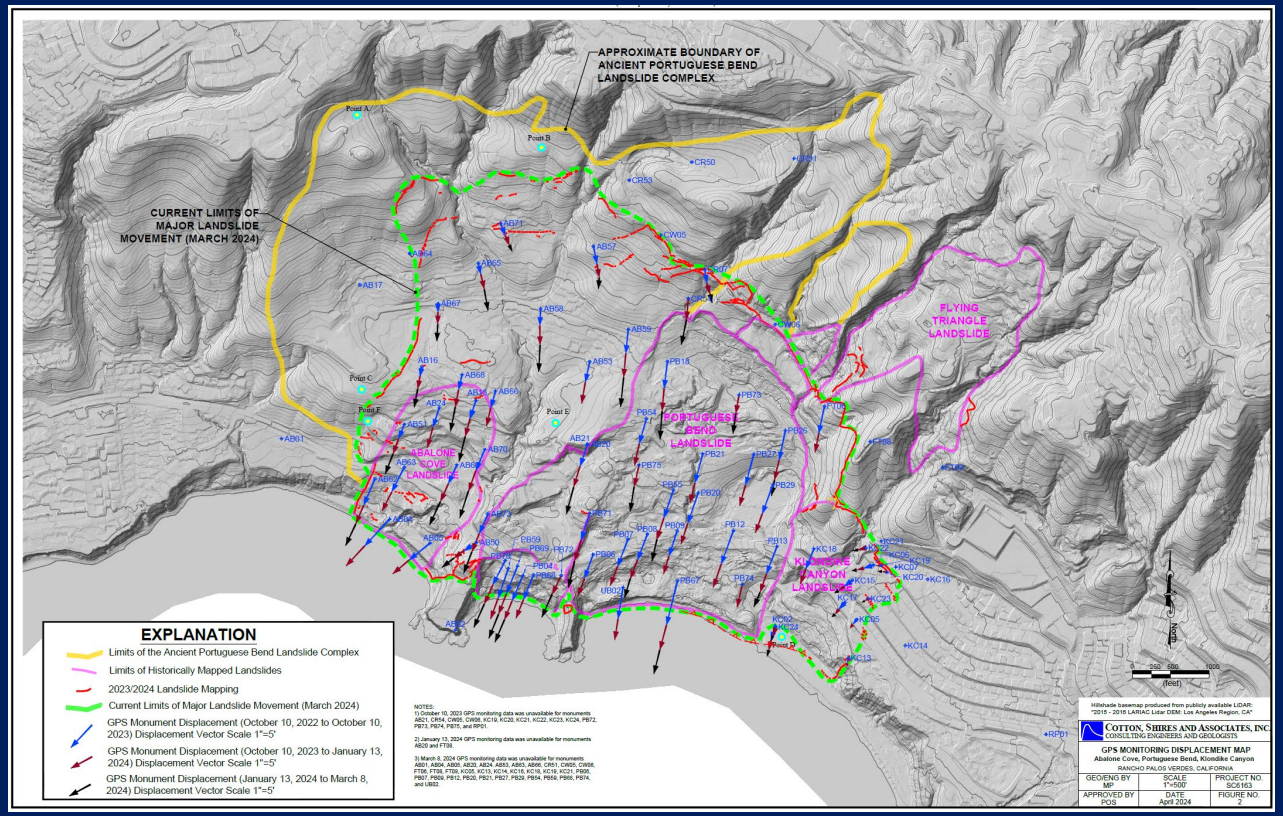
Plan of Control

- Dewatering Systems
- Surface Drainage Improvements

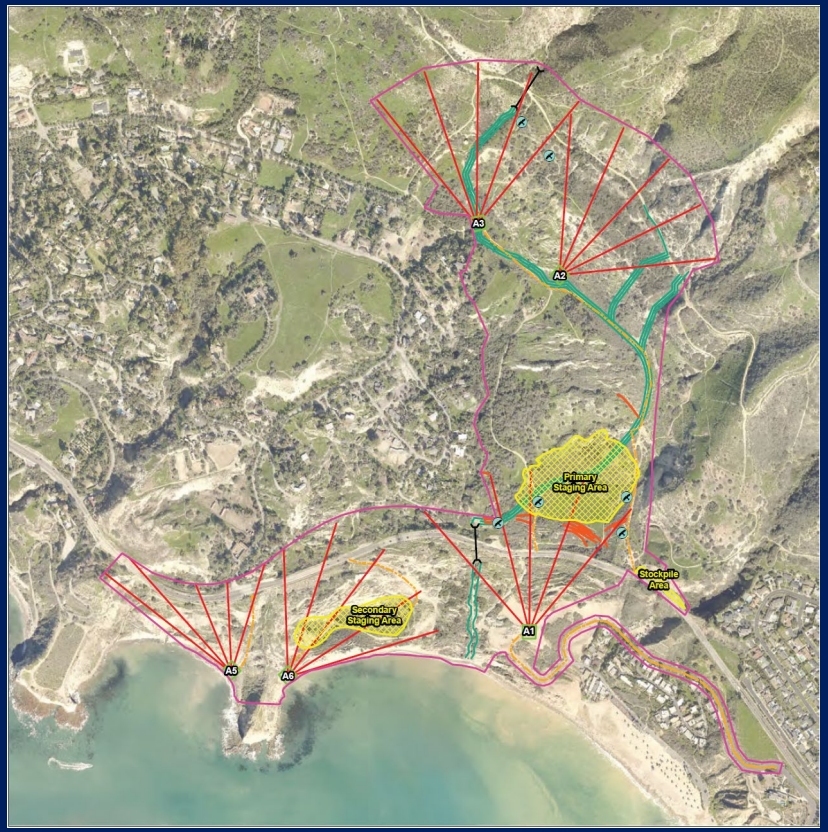
Geologic Hazard Abatement Districts



Current Conditions



Portuguese Bend Landslide Remediation Project



- Proposed Project Limit
- Proposed Hydrauger Work Locations
- Staging Area/Work Location
- Proposed Hydrauger Arrays
- Approximate Surface Fracture Locations
- Proposed Access Route
- Proposed Culvert
- Proposed Swale

Emergency Stabilization Measures
(1 and 2)

- Approximate Portuguese Bend Landslide Limit
- Approximate BRIC Limit
- Approximate Direction of Groundwater Flow
- 7-in. diameter Sacrificial Dual Boreholes
- 1 Emergency Action Hydrauger Array E-1 (Relief of Artesian Pressure)
- 2 Emergency Action Hydrauger Array E-2 (Groundwater Flow Interceptor)
- 1 Originally Planned Hydrauger Arrays (Extent of Hydrauger Pipes Not Shown)
- Approximate Location of 80-in. diameter Drainage Pipe under PVDS (Swale Below PVDS Not Shown)

Portuguese Bend Landslide Costs and Funding

- Portuguese Bend Landslide Cost Estimate:
  - Emergency Hydraugers = $10m
  - PVDS/Peppertree Drainage = $3m ($2m Feinstein)
  - BRIC Project = $23m
    - BRIC Revised Grant Application = $16.1m
  - Total = $36m
    - Supervisor Hahn = $5m Pledge

City Assistance Package to Districts

- Financial Assistance
  - Zero Interest Loan
  - 20 Year Term
  - First Annual Payment in 3 Years
- In-Kind Services
  - Engineering
  - Project Management
  - Geotechnical
  - Geology
- Contingent Upon Peer-Reviewed Plans

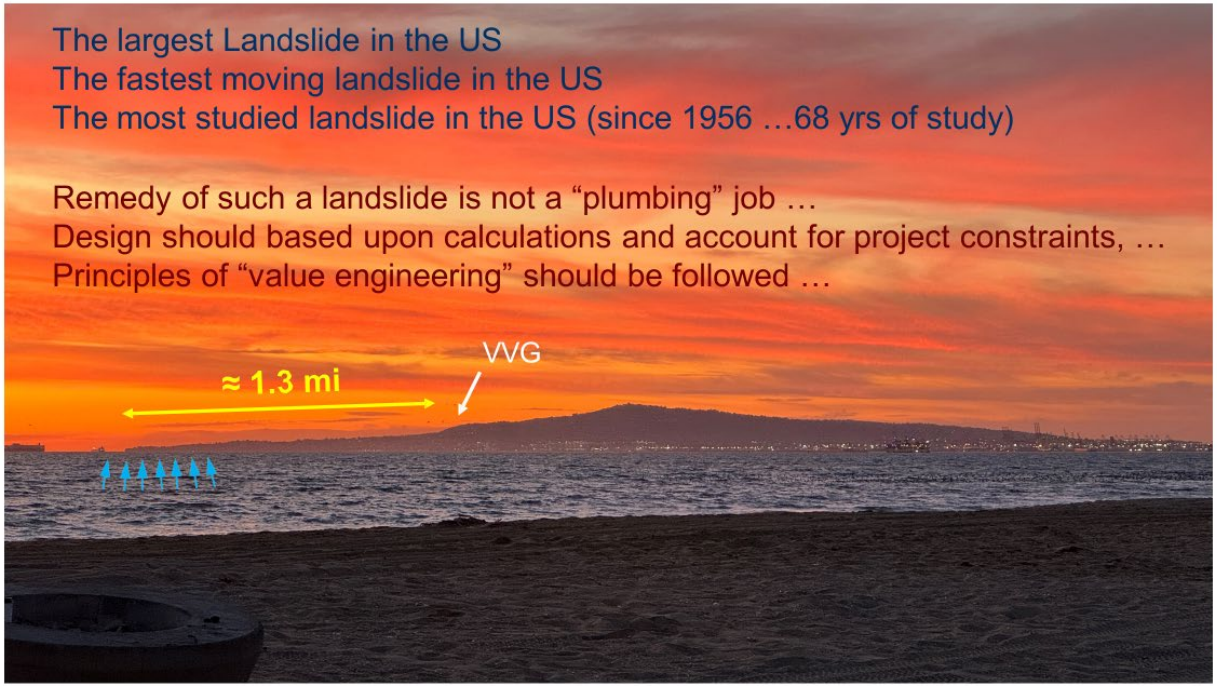
Mitigation of Portuguese Bend Landslide with Directional Drilling Rancho Palos Verdes, California

Neven Matasovic
nmatasovic@geo-logic.com

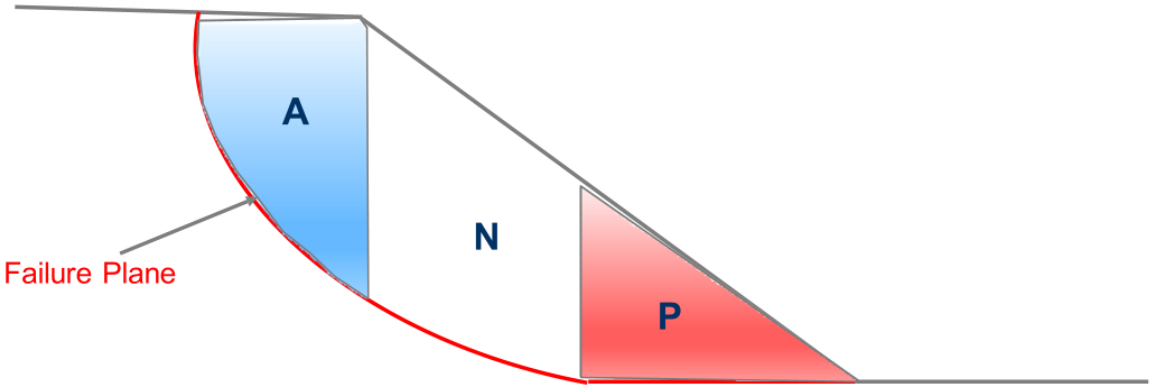
General

The largest Landslide in the US
The fastest moving landslide in the US
The most studied landslide in the US (since 1956 …68 yrs of study)

Remedy of such a landslide is not a “plumbing” job …
Design should based upon calculations and account for project constraints, …
Principles of “value engineering” should be followed …



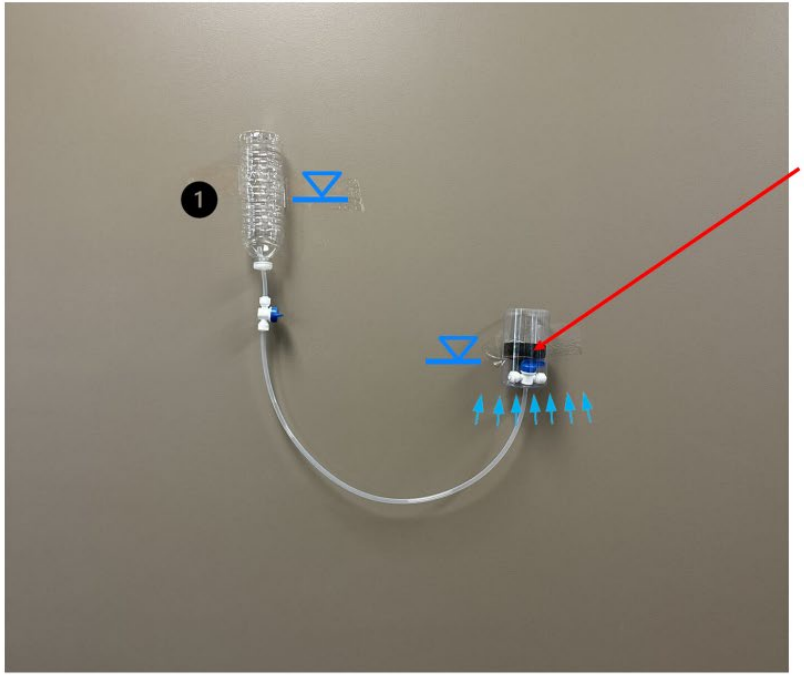
Geotechnical Primer – A, N, & P Zones



Schematic cross-section through a landslide

A = Active Zone (Pushing)
N = Neutral Zone (No Impact)
P = Passive Zone (Resisting)

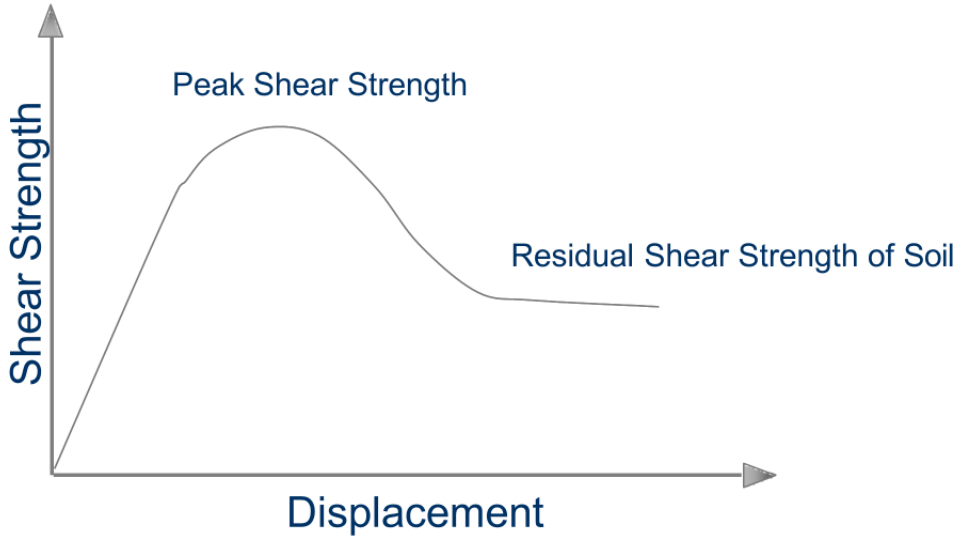
G. Primer – Friction & Artesian Pressure (hands-on demonstration of principles)



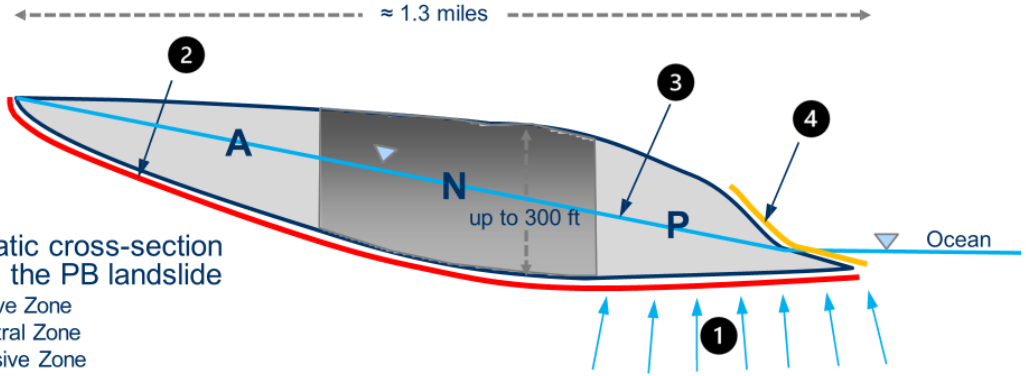
Sandpaper glued at the base of a plastic puck

Pressure on the puck is independent of the size of the tube

Geotechnical Primer – Soil Response



Causes of the PB Landsliding



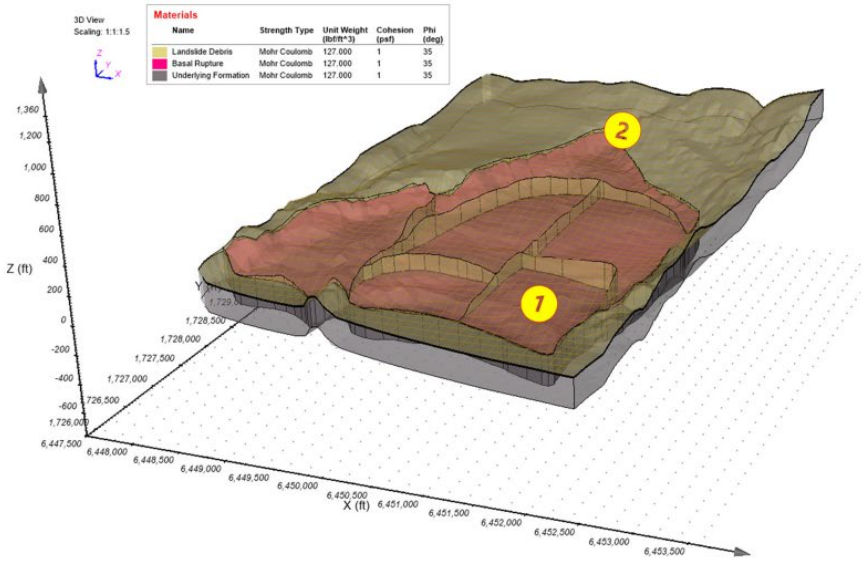
Schematic cross-section through the PB landslide

A = Active Zone
N = Neutral Zone
P = Passive Zone

***Given the site constraints*, mitigation can address a subset of causal factors**

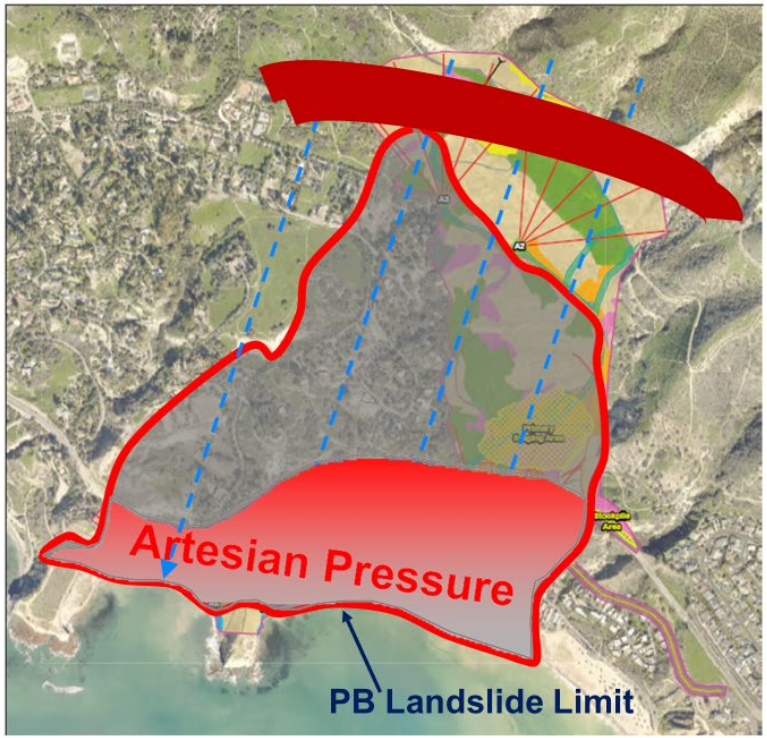
1. Confined water below basal surface (artesian pressure)
2. Bentonite beds with adverse inclinations (incl. basal surf.)
3. Perched water above slip surface
4. Erosion at landslide toe
5. Other (adjacent landslides, Eq, load on A, …)

Proof-of-Concept Modeling - General



- Back-Analysis
- Calibration and Validation
- Forward analysis
  - Existing (without drains)
  - Post-construction (with drains)
- Steady-state seepage (FEM) model
- Limit equilibrium slope stability model

Remedial Measures - Conceptual



- Approximate PB Landslide limit
- Approximate BRIC limit
- Approx. direction of groundwater flow
- Zone of significant artesian pressure
- Conceptual remedy – a hypothetical groundwater flow barrier

Remedial Measures - Implementation

BRIC

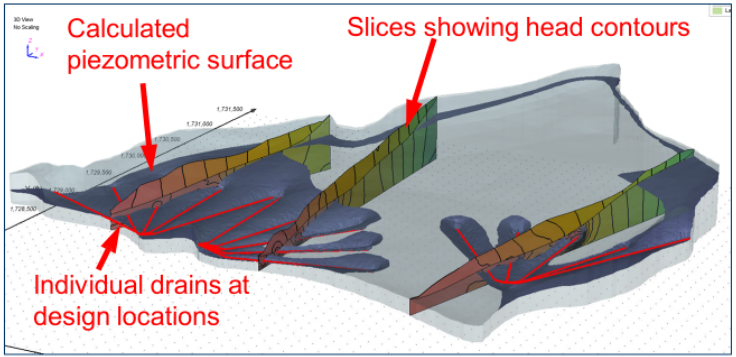
- Proposed Project Limit
- Proposed Hydrauger Work Locations
- Staging Area/Work Location
- Proposed Hydrauger Arrays (1 (E-1), 2 (E-2))
- Approximate Surface Fracture Locations
- Proposed Access Route
- Proposed Culvert
- Proposed Swale

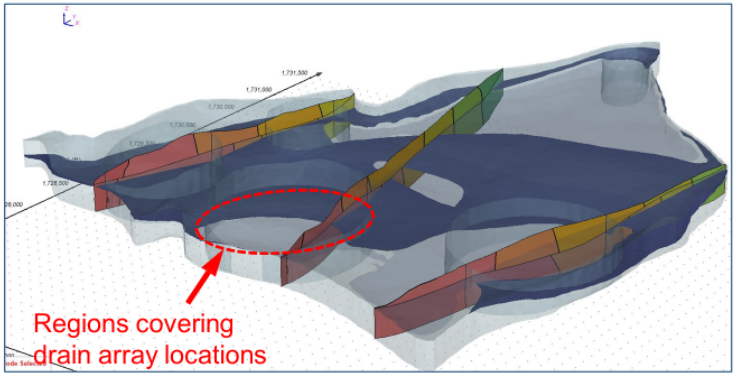
Vegetation Communities

- Coastal Sage Scrub – Rhus Dominated
- Coastal Sage Scrub – Undifferentiated
- Saltbush Scrub
- Exotic Woodland
- Disturbed Vegetation
- Developed
- Rocky Shore

- Flow of Groundwater Direction
- 7-in. dia. pilot sacrificial dual borehole

Positioning & Sizing of Hydraugers (3D Seepage Modeling)

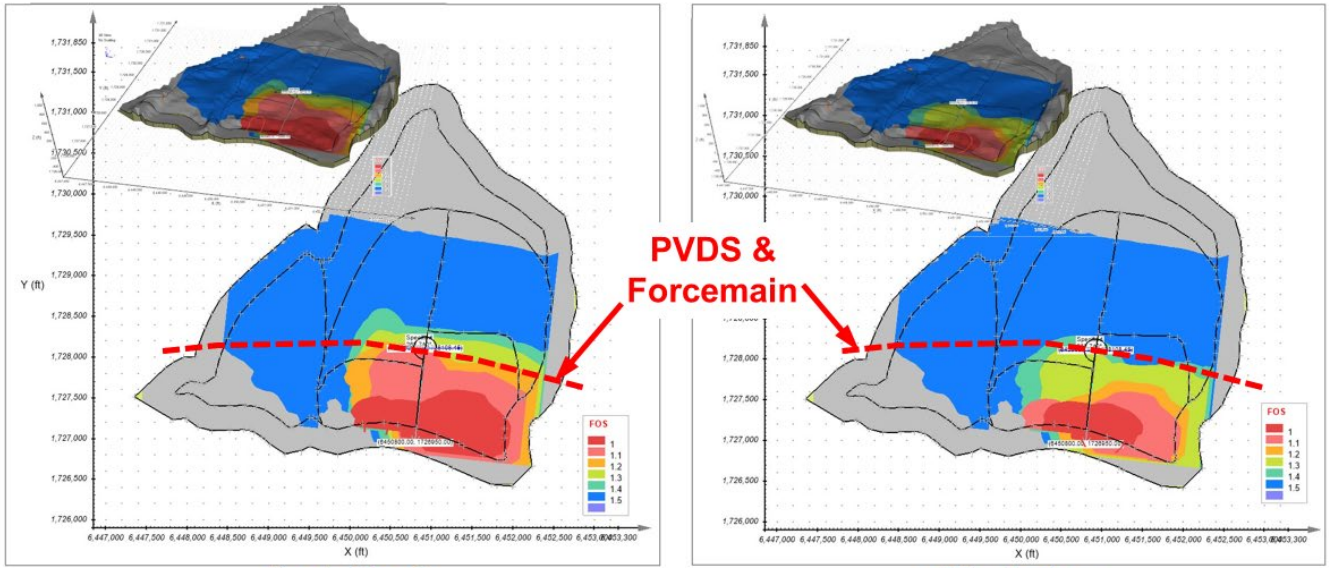




Modeling considerations included:

- Individual drains (top) versus array-wide (bottom)
- Transient versus steady-state seepage
- "Accuracy," computation time, and quality of input information
- "Other" (Public Comment)

3D Slope Stability Modeling – Results



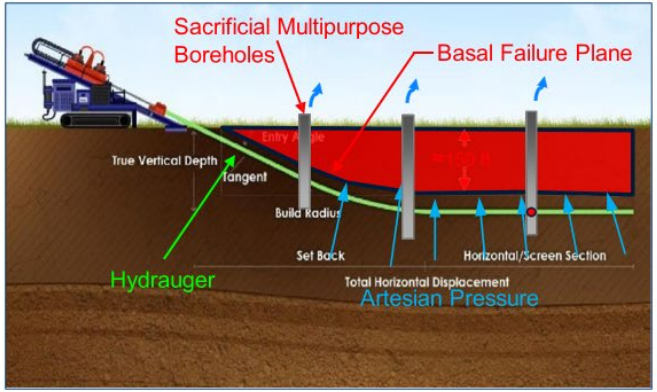
"existing"

with drains

- Reduced extents of fastest movement (red and pink)
- Reduced movement rate at road / forcemain location

Mitigation – Sacrificial Dual Boreholes + Directional Drains (Hydraugers)

1 5 6 (Bottom Hydraugers)



- ≈150-ft deep dual pilot holes (2 holes next to each other to accommodate inclinometers and standpipe piezometers)
- Up to ¼ mile-long artesian pressure relief hydraugers (directionally drilled; sequentially advanced)
- Possibly curved hydrauger alignment (curved in horiz. direction; directed with Gyroscopic Steering Tool, GST)
- Specialty equipment required; Wingwalls might be required at some locations
- Significant artesian pressure may not develop before May – June; may need to pump out
- Discharge to Klondike Canyon, LACSD Sewer Line, with some temporary storage on-site

Mitigation - Horizontal Interceptor Hydraugers

E-2 (2) = (3) (2) (Top Hydraugers)

- "Straight" interceptor hydrauger alignment - gravity-drained (≈2% out of slope)
- No artesian pressure expected
- Installed using "conventional" equipment
- Access is an issue; Can be repaired is sheared off
- Water discharged into canyons

CLOSURE

The mitigation design has been developed by a team of highly qualified (MS and PhD) engineers registered in the State of California.

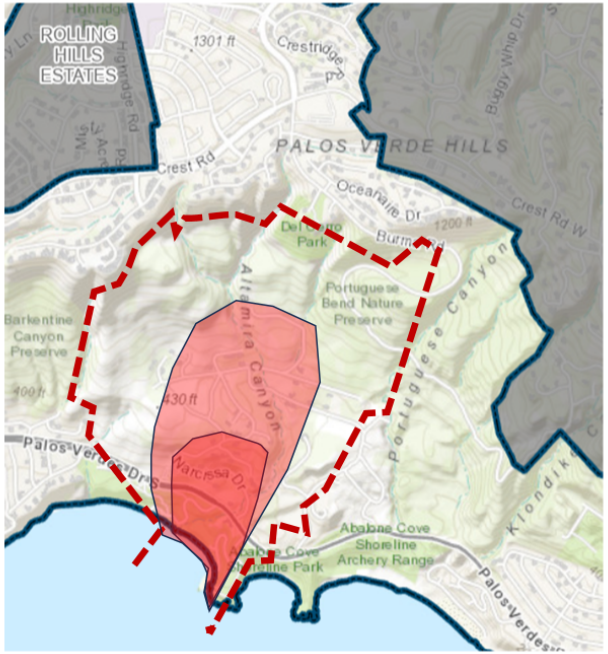
The team gathered and processed information, developed 3D numerical models, ran the models, validated and calibrated the models, and interpreted the results.

The models and interpretations were internally and externally peer-reviewed. Both served as a basis for the remedial design.

As construction progresses, the final design will be improved / revised as additional data for model calibration and validation become available ("value engineering").

Abalone Cove Landslide Abatement District (ACLAD)

- 1974 - Abalone Cove Landslide activated
- 1980 - Geologist Perry Ehlig and 25 residents in Portuguese Bend drilled 7 wells
- 1980 - Beverly Act created Geological Hazard Abatement Districts
- 1982 - ACLAD formed to operate de-watering wells
- Late 80's - Abalone Cove Landslide nearly stopped moving
- Currently, ACLAD has 20 operational wells pumping 130,000 to 160,000 gallons per day



PBCA, ACLAD & RPV Abalone Cove Landslide Mitigation

Roles and Responsibilities

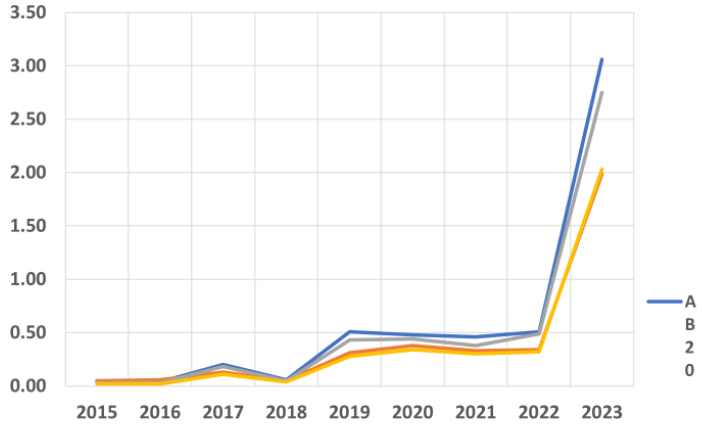
- PBCA (HOA)
  - Maintain private roads
  - Roads in PBCA are the storm drains
- ACLAD (GHAD)
  - Inspect wells and record pumping volume weekly
  - Maintain and Repair wells and drainage system (replace ave 1 pump per month)
  - Drill and Replace Wells (1-2 per year)
- City of Rancho Palos Verdes
  - Allocated funds to reinstate 4 non-operational dewatering wells
  - Portuguese Bend Landslide Mediation Project
    - Create surface water collection system
    - Install drains under landslide with hydro-augers to collect artesian water
    - Received $23M FEMA Grant toward $33M cost estimate - $10M non-Federal funds needed
      - This grant does not include ACLAD or Altamira Canyon mitigation

Recent Landslide Mediation Activities

- Drilled 6 new de-watering wells
- Repaired 10’ Culvert under PVDS
- Replaced Pumps and fixed multiple drainage system breaks
- Added boost pumps to increase water pumping
- Weekly output monitoring and quarterly water table measurement
- Three applications for federal funds to line Altamira Canyon
- Weekly meetings with city, county, and utilities officials to coordinate activities. (Landslide Working Group hosted by RPV)
- Monthly status meetings with ACLAD membership

Abalone Cove Landslide

- Surveys indicate increase in land movement
- Abalone Cove Landslide boundaries have more than double



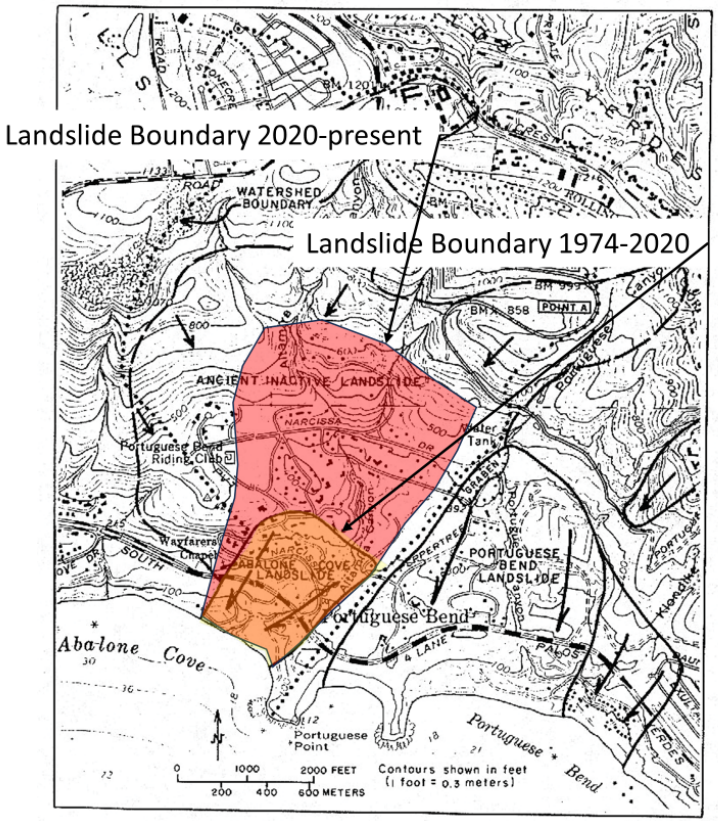


Figure 2
Site Map of the Portuguese Bend and Abalone Cove Landslides

Abalone Cove Landslide Stabilization
3 Part Solution

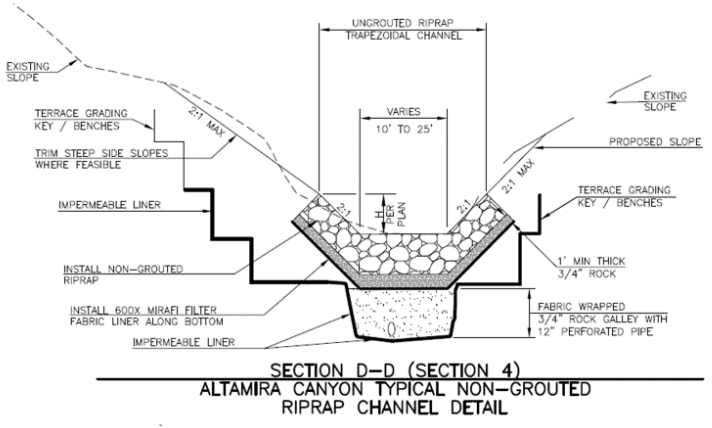
- Remove Ground Water
  - Add more de-watering wells
  - Well repairs and system optimization
  - Move drainage system above ground
- Convey Surface Water to the Ocean
  - Fix stormwater drainage in PBCA
  - Repair known fissures in the canyon
- Fissure Management in residential area
  - Eliminate large depressions / catch basins
  - Fill known fissures

Altamira Canyon is still the Largest Threat to Landslide Stability

- Multiple studies since 1957 have recommended Lining Altamira Canyon Lining Altamira Canyon to manage the runoff that flows through the canyon, minimize erosion and reduce the amount of surface water that infiltrates into the existing canyon fractures and fissures.
- Harris & Associates 2016 project study report: “Altamira Canyon Drainage/Erosion Control Project” developed a comprehensive construction plan
  - Construction of 9.5-foot diameter welded steel pipe (lined and coated) storm drain in above lower Narcissa
  - Remainder of the canyon lined with an un-grouted riprap trapezoidal channel (with an impermeable barrier and sub-drain system).
    - Engineering estimate of total cost (construction plus soft costs) $22.3 million in 2022

Altamira Canyon Lining

- Install Trapezoidal Channel
  - provides natural bedding to seasonal creek
  - Minimizes impact on wildlife in the Land Conservancy
- Stabilizes erosion of the canyon
- Protects the fissures from water intrusion



ACLAD Goals

- ACLAD's primary focus is on operating, maintaining, and optimizing the well system
- ACLAD willing to work on Surface Water drainage, but needs to develop talent pool to manage projects
- ACLAD is dedicated to operating an effective and economical and transparent Landslide Abatement organization and focus the majority of our resources on water removal from the landslide

ACLAD Funding Request

Surface Drainage	$K
Line Fissure in Altamira Canyon at head of landslide above Vanderlip Rd	$300
Line Altamira Canyon from Figtree drain to PVDS culvert	$100
Closing Fissures in residential area	$50
Install swale/ culvert along Narcissa at the riding club	$25
Improve drainage from Narcissa and lower Cinnamon to culvert	$30
Replace swale across the corner of the riding club between Narcissa and Ginger Root	$25
Figtree Rd culvert improvement	$25
Lengthen Thyme Swale into Altamira Canyon	$10
Curbing at Narcissa above Wayfarers	$10
Curbing around 30 Narcissa	$5
Upper Cinnamon curbing	$5
Lower Cinnamon drainage through Ride-to-fly and the adjacent lots	$25
Subtotal	$610
System Improvements	
Four new wells	$800
Place ACLAD drainage system above ground (aprox 10,000' of drains)	$100
Well Repairs and system optimization	$100
Subtotal	$1,000
30% contingency	$483
Total	$1,483

Portuguese Bend Community Association

PO BOX 2908
Palos Verdes Peninsula
CA 90274

Town Hall Meeting
April 17, 2024

Portuguese Bend Community Association (PBCA)

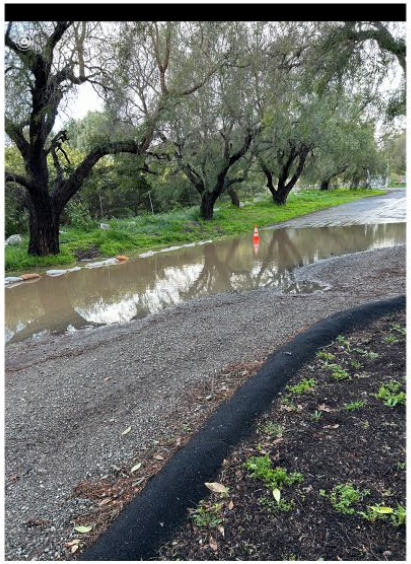
- Private Gated Community
  - 140 Residences
  - 52 Semi-Improved Properties
  - 69 Vacant Lots
- Access Through Only Two Roads
  - Narcissa Drive (West)
  - Peppertree Drive (East)

Road Damage – Lower Cinnamon

Before Repair

With CMB

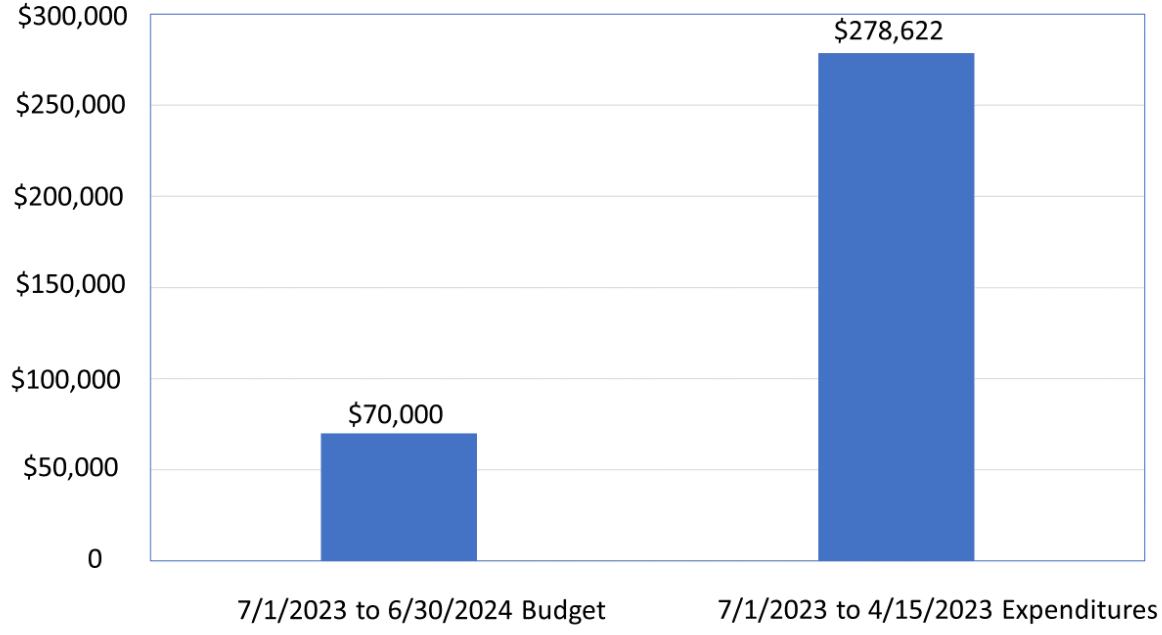
Road Damage - Narcissa



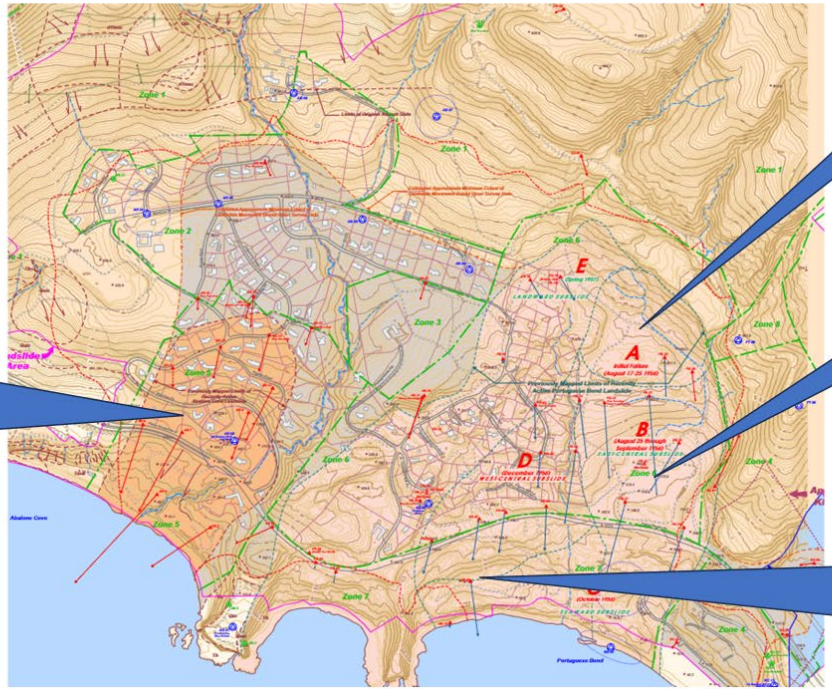
By Riding Club

Above Wayfarers

Road Repair Budget Vs Expenditures

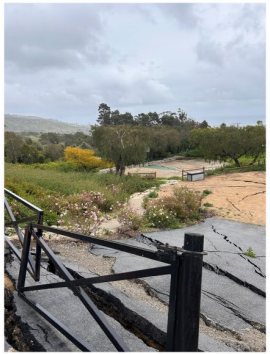


Portuguese Bend Landslide Complex

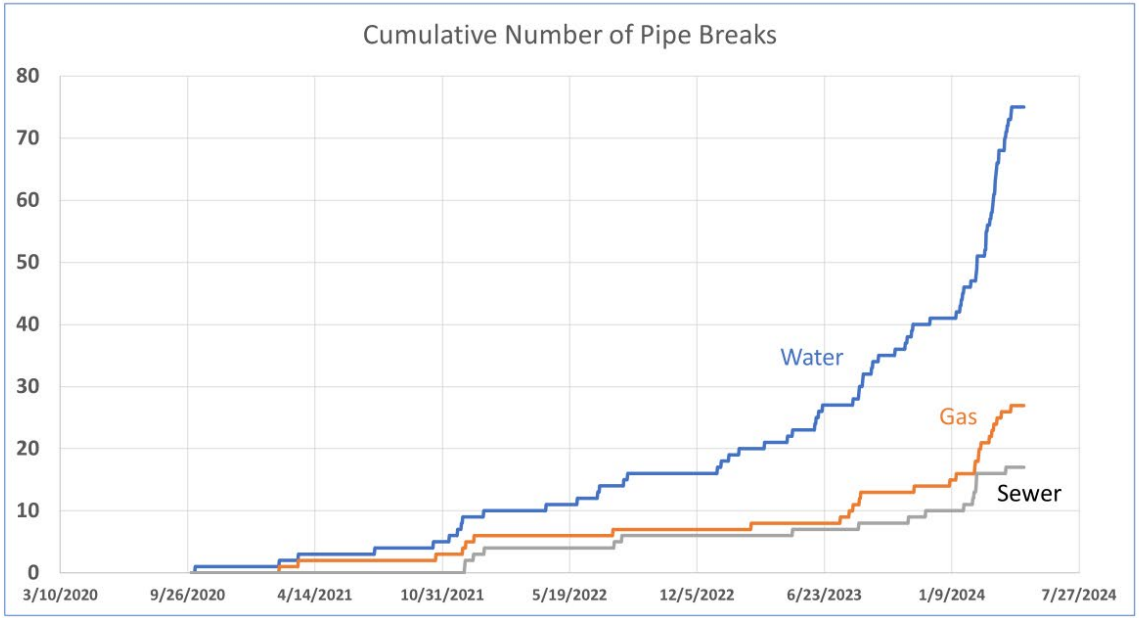


Property Damage (Homes)

Property Damage (Vacant Lot)



Utility Pipe Breaks



Klondike Canyon Abatement District

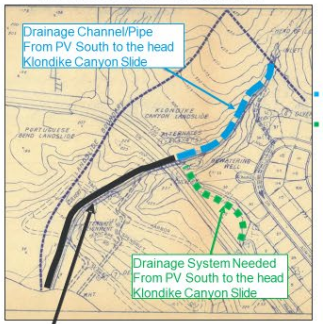
Executive Summary:

KCGHAD Plan Forward: Klondike Canyon Geologic Hazard Abatement District (emergency measures)

Step 1 **$1,275K - Install water removal channel/pipe -** Klondike Canyon from PV South to head of Klondike Canyon Slide
Step 2 **$1,000K -** Add 3 new water extraction wells at beach in Klondike & 1 observation well Head of slide
Step 3 **$1,000K -** Fill fissures at head of Klondike Slide & Remove dirt at interface of Portuguese PB & KC Slide in PBC
Step 4 **$900K -** Create Storm Drain at the head of the Beach Club Slide that channels the water to the Klondike
Step 5 $1,185K - 4 additional tactical drain items to help mitigate slide (added by Steve C Feb 2024)
~$5,400K - Total

Step 1 & Step 4

Klondike Canyon - Drainage Map



Step 1
Step 4

Current Klondike Canyon – Drain
Extends from PV South to the Beach

Step 2

5 active Wells ~ 400K Gal/day
210 days to remove 2023 rains (have 2-wells now)

Step 3

Fill Fissures Head of Klondike Slide

Remove earth to relieve pressure in PBC

Step 5

Repair rain damage to Klondike
48" storm drain
System damage and
3 other rainwater related items

Note: Calculations are estimates

Portuguese Bend Landslide Complex

Approx location of: Portuguese Bend, Klondike Canyon & the Beach Club Landslides

3d – View

2d – View

Weekly Updates from PB-Landslide Committee

RPV Landslide Complex Working Group | Rancho Palos Verdes, CA - Official Website (rpvca.gov).

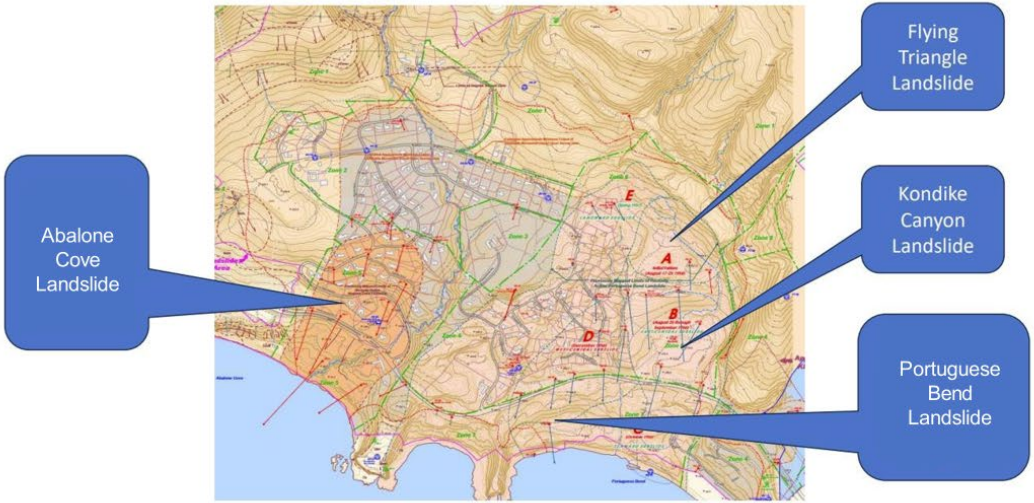
Note: Calculations are estimates

Executive Summary:

Portuguese Bend Landslide Complex

Approx location of: Portuguese Bend, Klondike Canyon & the Beach Club Landslides

Portuguese Bend Landslide Complex

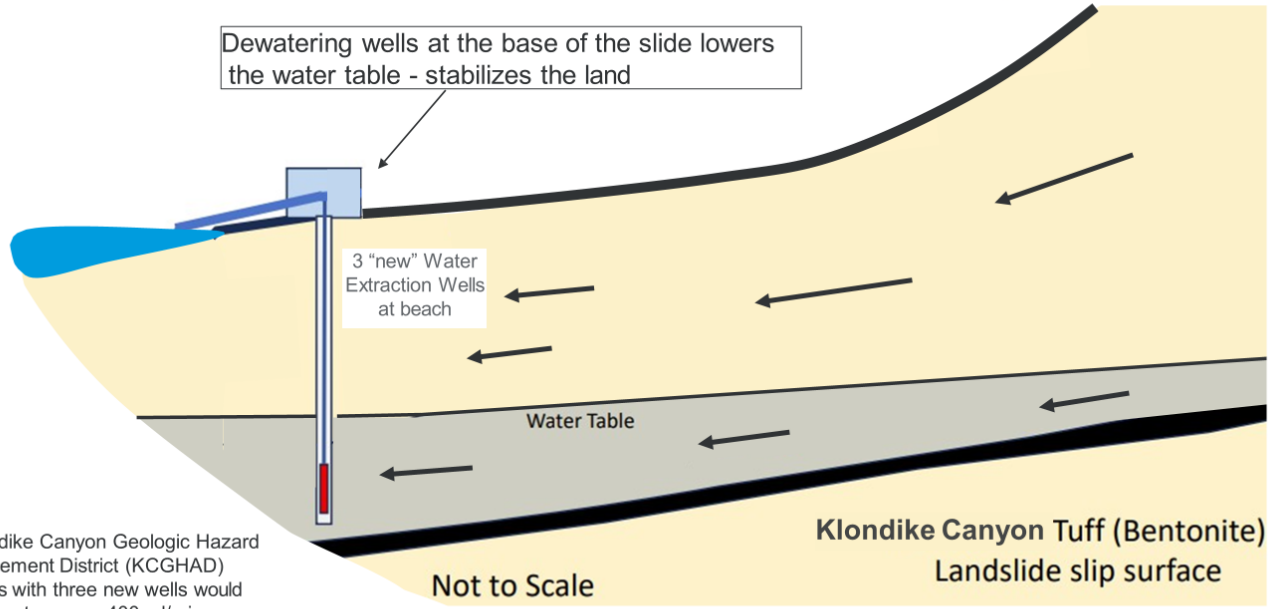


Note: Calculations are estimates

Executive Summary:

Visual Showing Dewatering Wells at base of Slide

Klondike Canyon Landslide Mitigation



Klondike Canyon Geologic Hazard Abatement District (KCGHAD) Wells with three new wells would pump at approx. 400gal/min

Note: Calculations are estimates

Landslide Townhall Meeting

City of Rancho Palos Verdes

California Water Service

April 17, 2024

Quality. Service. Value.®

Cal Water Update

We are taking a multi-pronged approach to address the impacts of accelerated land movement on our infrastructure.

Response Procedures

- All water leak reports in our Palos Verdes service area are elevated to our “Code 4” level, or our highest response priority so crews respond quickly
- Employees stationed 24/7 in the Seaview and Portuguese Bend Community Association neighborhoods to quickly respond to and investigate any reported water leaks

Dedicated Hotline
(855) RPV-LEAK (778-5325)

Webpage
calwater.com/rpv

Sign up for our monthly community newsletters at calwater.com/rpv

Completed Projects

Completed Projects

Completed Projects

Planned Projects

(For illustrative purposes only: pipes not to scale, location approximate; *scope subject to change based on investigative results) Scope Rev. 4.16.24

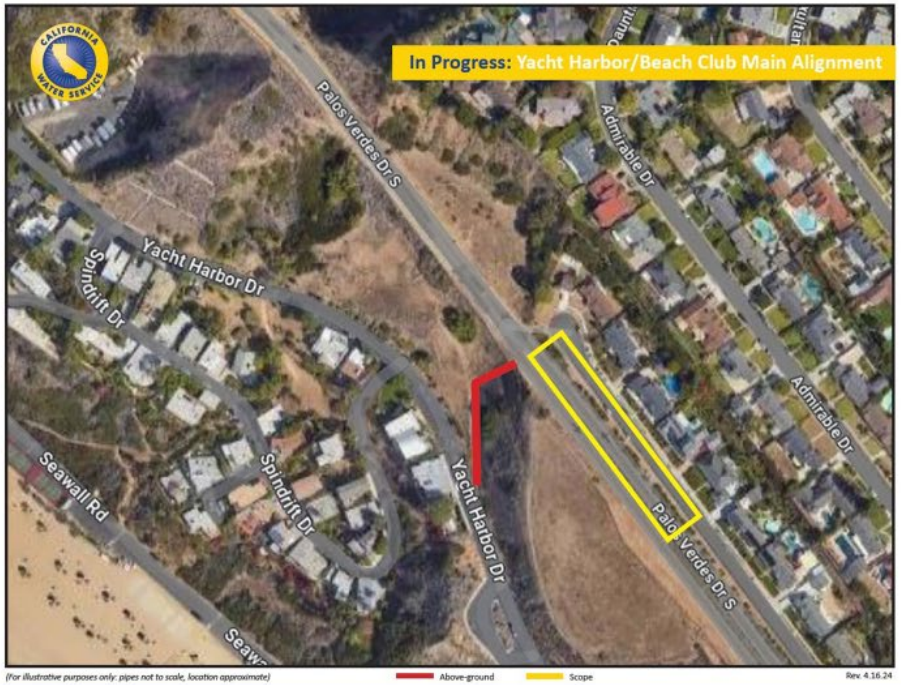
Planned Projects

*(For illustrative purposes only: pipes not to scale, location approximate; *scope subject to change based on investigative results)*

Scope — Swing joint — Rev. 4.16.24

Planned Projects

Planned Projects



THANK YOU

Dedicated Hotline
(855) RPV-LEAK (778-5325)

Webpage
calwater.com/rpv

Sign up for our monthly community newsletters at calwater.com/rpv


Southern California Edison
Rancho Palos Verdes Landslide Update
04/17/2024
SOUTHERN CALIFORNIA
EDISON
Energy for What's Ahead™

About Southern California Edison

- Southern California Edison (SCE) is an Edison International company
- One of the nation's largest electric utilities with more than 130 years of history and headquartered in Rosemead, California
- Regulated by the California Public Utilities Commission (CPUC) and the Federal Energy Regulatory Commission (FERC)
- 50,000 square miles of SCE service area across Central, Coastal, and Southern California
- 15 million residents through 5 million customer accounts. SCE covers 15 counties, 185 cities and 13 Native American tribes

Southern California Edison and Safety

Safety is our top priority at Southern California Edison. We take every precaution to protect our customers, communities and employees. While electricity improves our lives, potential hazards exist, We are committed to safeguarding customers as we move towards a cleaner energy future.

Downed Power Lines? Stay 100 ft. Away and Call 911

Downed power lines near water can electrify puddles, wet grass and the surrounding area. Don't approach or touch anyone or anything in contact with a downed power line. Never attempt to extinguish a fire near a downed power line — **stay 100 ft. away and call 911 immediately**.

To report an outage or public safety hazard, including an object caught in power lines: Call 1-800-611-1911

SCE Contact Information

Issue Type		Contact Info
Outages - Report/Status	www.sce.com/outage	Downed power lines: 911 1-800-611-1911 sceoutage@sce.com
Customer Service	www.sce.com	1-800-655-4555
Vegetation & Power Lines Clearance		1-800-655-4555
Report a Streetlight Out	www.sce.com/outage-center/report-street-light-outage	OR My SCE app or call (800) 611-1911 #3
Medical Baseline	www.sce.com/residential/assistance/medical-baseline	1-800-684-8123 or 800-655-4555
Wildfire	sce.com/wildfire	wildfireoutreach@sce.com
File or Get Claim Status	www.sce.com/claims	1-800-251-3311 claims@sce.com
Vegetation Management	sce.com/safety/power-lines	1-800-655-4555 or safetrees@sce.com

Connect with Us

Website: www.sce.com

Twitter: @SCE_PublicAff

Facebook: www.facebook.com/sce

Instagram: @SCE

Southern California Edison work in Landslide Area

Southern California Edison has managed the following projects in the landslide area:

Burma Trail

Seaview Neighborhood

Portuguese Bend/Narcissa Drive

Abalone Cove Preserve

Rancho Palos Verdes projects in the Landslide Area

SCE Aerial Unit performing work in the Burma Trail.

The SCE Air Unit also regularly pro-actively inspects all poles, equipment and distribution lines in Rancho Palos Verdes, as part of their ongoing wildfire mitigation efforts.

RANCHO PALOS VERDES LANDSLIDE TOWN HALL

APRIL 17TH, 2024

Pipeline Safety and Maintenance

As one of the nation's largest gas distribution utilities, with over 7,800 employees serving 22 million customers, safety is foundational to our business.

- Leak Surveys and other Inspections annually
- Expedited Response Timing
- Call Center Updates

Emergency Preparedness: Monitoring and Response

- Customer Contact Center
- Dispatch
- System Operator
- Watch Desk 24/7

Contact Information

- Public Affairs Manager
  - Ben Steinberger
    - Bsteinbe@socalgas.com
    - 1-310-569-2636
- Customer Care Center

  Call here to report leaks
  - 1-800-427-2200, press 1 for emergency

POTENTIAL FUNDING SCENARIOS

- Public Assistance (City and GHADs)
  - Congressional District Grants
  - Federal Disaster Declaration (FEMA)
  - Hazard Mitigation Grant Funds
  - Building Resiliency Infrastructure Community (BRIC)
  - California Disaster Assistance Act

- Individual Assistance
  - Small Business Administration (SBA) Loans

Senate Bill 1461 - Landslide

- Authored by Senator Allen
- Amends Emergency Services Act (ESA)
- Gives authority to Governor to declare State of Emergency resulting from a landslide
- Senate Committee on Governmental Organization (CGO) on April 9, 2024


Get Updates From the City
1
Sign up for the Land Movement listserv at rpvca.gov/notify
CITY OF RANCHO PALOS VERDES


Have questions about land movement?
Find FAQs at: rpvca.gov/landmovement
Email us at: landmovement@rpvca.gov
CITY OF RANCHO PALOS VERDES

Contact Information

- Building and Safety Division at **310-544-5280** or BuildingSafety@RPVca.gov (please include photos).
- Please report **water leaks** to Cal Water at **855-RPV-LEAK (855-778-5325).**
- If you suspect a **natural gas leak**, evacuate the area immediately, and from a safe location, call SoCalGas at **1-800-427-2200.**
- Please report electrical line matters to SCE at **800-611-1911**

For urgent matters or observation of any sudden shifts on your property, please call 9-1-1.

Question & Answer

Closing Remarks