



Preliminary Ignition Investigation Report

Ignition Database Index:	20240862
Electric Incident Investigation (EII) Number:	N/A
Incident Name:	Upland – 05 Jul 2024
PG&E Facility Ignition?	Yes
CPUC Reportable Ignition?	Yes
Date & Time of Incident:	July 5, 2024 @ 1420 hours
Street Address:	██████████
City:	Kentfield
County:	Marin
Latitude/Longitude:	██████████
State Responsibility Area (SRA) / Local Responsibility Area (LRA) / Federal Responsibility Area (FRA)	State Responsibility Area (SRA)
PG&E Division:	North Bay
High Fire Threat District (HFTD):	Tier 3
High Fire Risk Area (HFRA):	Yes
EPSS Buffer:	No
Fire Index Area (FIA):	190
Fire Potential Index (FPI) Rating: FIA	R3
Fire Potential Index (FPI) Rating: Circuit	R2
Was there a PSPS event at the time of ignition?	No
Suspected Initiating Event:	Vegetation
Failure Driver:	Contact from object
Failure Sub-driver:	Contact - Vegetation
Circuit:	San Rafael 1107
Circuit Protection Zone:	San Rafael 11071166
Nominal Voltage:	12kV
Pole SAP Equipment ID:	102234538
Subject to PRC 4292 Veg Pole Clearance:	No
PG&E Equipment associated with ignition:	Conductor - Primary (#6 Solid Cu)
EPSS enabled at time of ignition?	Yes
Fault Type:	Line-to-Ground
Wire Down (Primary)?	Yes
Lead Agency/Agency Having Jurisdiction:	Kentfield Fire Department
Fire Size:	3 meters – 0.25 Acres
FAS Field Remarks:	“Found 2 of 2 fuses blown at cutouts 4979. Large Live Oak tree broke off at base near ██████████ and fell onto down guys of primary corner pole.

	When tree fell it caused one wire, one span of 6-solid copper primary conductor to break and come to the ground. Wire down started small vegetation fire (approximately 800 sq ft). Crew with vegetation crew support needed to repair wire down and damaged down guy/anchor. Reference Kentfield Fire incident #F24021455. 4979 open and tagged M.O.L.”
HAWC Summary:	“Resources responded to a vegetation fire, the Upland Incident. It was located at [REDACTED] in Marin County. This is a Tier 3 area. The fire was listed as extinguished on arrival. No fire size was reported. There was an outage associated with this incident. The outage was on the San Rafael 1107 circuit with 2862 customers impacted. The OIS number(s) was/were- 2506113. The closest circuit was the San Rafael 1107, it was an EPSS circuit. There was not damage to assets reported. An Everbridge message was sent. A SIPT Engine responded to this incident and performed the following activities: unknown. A(n) Incident Report(s) was not sent. A Preliminary Fire Report was not sent. Notifications were made to: HAWC Sup [REDACTED], PSS [REDACTED] (Voicemail left) No other notifications were made as the threat had been mitigated upon arrival of the first fire units. Trouble report stated: TREE IN WIRE; WIREGOING FROM POLE TO POLE; TREE IS GREEN, no additional information available.”
Injuries / Fatalities / Property Damage / Media Attention:	None
Weather Conditions:	It was a very hot and sunny day near the incident location. Conditions at the time of the incident: Temperature 86°F, relative humidity 42%, 4 mph sustained winds from the south with up to 7 mph gusts
Red Flag Warning (RFW) / High Wind Warning (HWW):	No/No
911 Standby Relief Time:	4 minutes
OIS #:	2506113
ILIS #:	24-0084348
FAS #:	T006439540, T006439544, T006439567
Assigned Attorney:	N/A
Ignition Investigator & Phone:	[REDACTED] [REDACTED] [REDACTED] [REDACTED]

Executive Summary

On July 5, 2024, at 1420 hours, Line Recloser (LR) 1166 on the EPSS-enabled, two-phase San Rafael 1107 12kV Overhead Distribution Circuit opened when multiple line-to-ground faults occurred, de-energizing approximately 2,862 customers. At 1425 hours, PG&E dispatched two troubleshooters (Troubleshooter #1, Troubleshooter #2) to investigate the incident. At 1430 hours, the Marin County Fire Department ("MCFD") notified PG&E of a small vegetation fire and a wire down at [REDACTED] ("Incident Location") in Kentfield, California (Figure 1, Figure 2, Figure 3 and Figure 4). The Incident Location is located within a Tier 3 HFTD.

By 1450 hours, both troubleshooters arrived to the Incident Location and observed MCFD clearing hot spots from a small vegetation fire (Figure 5), a single hot phase of #6 solid copper primary overhead conductor broken¹ ("Incident Conductor") and the source side on the ground between wood pole SAP ID 102234538 ("Incident Pole", source side) and wood pole SAP ID #102234530 ("Pole 2", load side) ("Incident Span"), a broken guy wire, and arc marks on the adjacent primary conductor and a secondary line². Both fuses of Fuse Cutout 4979 had blown. Troubleshooter #1 discovered a tree ("Incident Tree"), located load side of the Incident Pole on top of the broken guy wires for the Incident Pole.³ Troubleshooter #2 speculated the Incident Tree had fallen on the guy wires and pulled the Incident Pole causing one conductor on the Incident Span to break underneath a tap guard located about two feet from a dead-end insulator at Pole 2 (Figure 6).

By 1525 hours, the troubleshooters patrolled the San Rafael 1107 12kV circuit between the Incident Location and LR 1166 and observed no additional abnormalities. At 1530 hours, the Distribution Control Center ("DCC") closed LR 1166, restoring power to approximately 2,816 customers. At 1550 hours, Troubleshooter #1 created a corrective notification (EC 129175534) to repair the broken guy wire and replace both phases on the Incident Span. By 1950 hours, a PG&E repair crew completed replacing the broken guy wire and the Incident Span and closed FUCO 4979, restoring power to all remaining impacted customers.

On July 9, 2024, Vegetation Management ("VM") patrolled the Incident Location and observed burnt vegetation covering an area approximately 15-feet by 20-feet directly beneath the Incident Span. VM identified the Incident Tree as a 35-foot-tall coast live oak with a trunk growing close to guy wires at the Incident Pole. VM observed the Incident Tree having a small amount of foliage on the branches, decayed wood at the failure point, and black fungal discharge on the bark at the base of the tree (Figure 7). VM determined the Incident Tree broke at the base (at soil level and below) and had fallen downhill across the guy wires due to advanced decay and was in declining health at the time of the incident (Figure 8). Given that the decay would not have been visible from the exterior, it could not have been identified by the Vegetation Management program.⁴ VM also performed an extent of condition patrol in the vicinity of the Incident Pole on the same day and did not identify any trees requiring priority mitigation work.

On February 7, 2019, a Wildfire Safety Inspection Program (WSIP) overhead inspection identified vegetation overgrowth issues with the incident guy wires and created a priority E tag (EC 117170692) with a due date of

¹ The Incident Conductor was observed to have failed underneath a tap guard located about two feet from a dead-end insulator at Pole 2; the Incident Conductor was cut at the Incident Pole to remove it from the roadway as part of making the Incident Location safe. Verbal Communication with Troubleshooter #2 on August 19, 2024

² Observed damage to secondary was assessed as being minor and did not warrant any further action. Electronic Communication with Troubleshooter #1 on August 16, 2024

³ There is no evidence supporting the Incident Tree fell into either the Incident Span or Incident Pole

⁴ Conversation with VM on August 1, 2024.

November 6, 2019 to trim trees growing around the Incident Pole guy wires.⁵ Subsequent Field Safety Reassessments (FSRs) extended the due date multiple times while also noting the need for trimming overgrowth affecting the guy wires.⁶ Figure 9 shows vegetation overgrowth on the guywires in March 2021. This work was overdue at the time of the incident, but it is unclear whether this tree work would have uncovered the tree's condition and prompted additional actions that may have prevented the tree failure and subsequent ignition. The guy wire overgrowth condition was not identified during the January 2024 VM annual patrol.⁷

A weather station located 1.5 miles southeast of the Incident Location recorded a temperature of 86°F and a relative humidity of 42% with sustained winds of 4 mile per hour (mph) and wind gusts up to 6 mph at the time of the incident.

This information is preliminary, and all times, customer numbers and measurements mentioned in this report are approximate.

System Protection Analysis

The San Rafael 1107 12kV circuit was equipped with EPSS-enabled device, LR 1166, at the time of the incident. Protective devices upstream of the Incident Location, listed in the order of closest proximity, include Fuse 4979 (Brand: Part 24, Type 20T), Fuse 6465 (Brand: Part 63, Type 40E), Fuse 4183 (Brand: Part 44, Type 50T), and LR 1166 (Brand: WE, Type 7679). At the time of the incident, LR 1166 was equipped with EPSS settings, including Sensitive Ground Fault ("SGF") and Downed Conductor Detection ("DCD") capabilities.

Distribution Protection Engineering reviewed the oscillography for LR 1166 (see Figure 10) and identified a B phase-to-ground fault shortly followed by an A-phase-to-ground fault at 1422 hours. These faults caused LR 1166 to open to clear the fault on ground instantaneous overcurrent (fault magnitude: A: 1067A, B: 1057A, G: 1128A) and both fuses on FUCO 4979 to operate.⁸ LR 1166 responded to clear the fault after 50ms, within the EPSS response time of 100ms or less for high-current fault conditions. The protective device operated as expected.

The oscillography captured from LR 1166 (see figure 10) is consistent with both conductors coming into contact with a ground at two different times. However, it is unclear what the point of ground was. The specific sequence of events that resulted in the ignition event could not be determined at this time.

Ignition Impact

Vegetation contact with a guy wire caused one phase wire down, damaged the Incident Pole guy wire and ignited a small ground vegetation fire that spread to approximately 200 square feet. There was no other damage to surrounding property, no individuals were injured, and there was no reported media exposure. The outage associated with this event affected 2,816 customers for approximately one hour, 46 customers for approximately five-and-a-half hours.

⁵ On June 3, 2019, EC 117170692 was updated to include addressing damage at the top of the pole and pole leaning.

⁶ No EV notification was created to address vegetation overgrowth issues with the guy wires; thus, VM was unaware of this condition and did not schedule tree work.

⁷ Per discussion with VM SME, the tree overgrowth condition should have been identified (per TD-7102P-01. Section 3.1, Item 1 which requires identification of vegetation that may fall into or otherwise impact PG&E facilities), and the overgrowth condition reported (per TD-7102P-09 – Reporting Abnormal Field Conditions for Vegetation Management).

⁸ Due to EPSS enablement, LR 1166 was set to overreach the fuse operation to ensure the circuit would de-energize due to trouble. In the current instance, the LR operated and both fuses blew concurrently/simultaneously.

Sequence of Events

July 5, 2024

- 1420 hours, LR 1166 and Fuse 4979 opens; PG&E records first no light (FNL)
- 1425 hours, PG&E dispatched two troubleshooters to the Incident Location
- 1430 hours, MCFD informs PG&E of wire down and small fire at the Incident Location
- 1440 hours, Troubleshooter #1 arrives at Incident Location
- 1450 hours, Troubleshooter #2 arrives at Incident Location
- 1455 hours, Troubleshooter #2 reports Fuse 4979 blown (two-of-two phases), one #6 solid copper primary overhead conductor down and another with arc fault damage on the Incident Span; fire department on scene clearing hot spots from a small vegetation fire
- 1525 hours, Troubleshooter #2 reports patrol from trouble location back to LR 1166 complete with no additional trouble found
- 1530 hours, LR 1166 closed by DCC restoring power to 2816 customers
- 1540 hours, Troubleshooter #2 leaves Incident Location
- 1550 hours, Troubleshooter #1 creates EC Notification #129175534 to repair the broken guy wire and replace both wires on Incident Span
- 1555 hours, Troubleshooter #1 leaves Incident Location
- 1640 hours, Repair crew dispatched to Incident Location
- 1950 hours, Repairs complete. Fuse 4979 closed returning power to the remaining 46 customers

Corrective Notification Associated with Ignition

Corrective Notification EC 129175534 was created to replace the guy wire as well as the damaged primary conductors. Replacement of the guy wire and both phases of 6-solid copper primary conductor were completed on July 5, 2024.

Pending Work

Type	Number	Description	Priority	Date Identified	Due Date
EC Notification	117170692	Incident Pole – Trees overgrown around guys – Need to trim; damage at top of pole, leaning resulting from PR 116191599 –	E	May 6, 2019	Original: November 6, 2019 Reassessments: June 18, 2024
		Hot line clamps are the wrong style; tap clamps being used as jumpers to feed two or more transformers: they need to replace. The presence of these clamps did not cause or contribute to this ignition.		3/25/2021 (FSR)	Original: September 26, 2021 Reassessment: June 18, 2024
COE Notification	N/A				
LC Notification	N/A				

Type	Number	Description	Priority	Date Identified	Due Date
Veg Work Order	N/A	No prior or scheduled Veg work orders for this tree; however, there was a pending WSIP EC tag for vegetation overgrowth on guywires at the time of the incident, as previously discussed			

Please note this may not include pending major program or project work at the Incident Location.

Asset Info & Most Recent Inspections and Tests

Incident Pole (Source Side)		
Info / Inspection	Most Recent Dates	Findings
Install Date:	1954	Wood Pole, 45-feet high
Inspections:	May 7, 2022	GO165 Detailed Ground Inspection: Pole leaning/ out-of-plumb and showing signs of cracking, rotten or decay. Guy wire broken, damaged, clearance issues, corroded, covered by vegetation, overgrown, strain or abrasion. Tree causing strain or abrasion to single-service service drop. No vegetation issues or compelling abnormal conditions to report. Notes pending EC 117170692.
	March 25, 2021	GO 165 Detailed Ground Inspection: Does not report damage or compelling abnormal conditions to pole, conductor, anchors, guys, or hardware framing. No vegetation issues or compelling abnormal conditions identified.
Patrol:	April 16, 2023	No abnormal conditions identified.
Corrective History:	March 12, 2014	EC # 107890789 Rotten primary crossarms/missing guy markers/trim bobs. Work completed January 16, 2015.
Infrared Inspection	N/A	
VM Inspection:	January 26, 2024	Inspection did not identify any conditions requiring work on this tree. No prior work on the Incident Tree.
EVM Inspection:	N/A	No Enhanced Vegetation Inspection (EVM) records for this location.
Equipment Test:	N/A	
Pole Intrusive Test:	February 7, 2024	Status: Pass; Visual sound and bore test revealed no issues / no treatment recommended. Pole is serviceable - exhibits some shell rot and decay.
WSIP Inspection:	February 7, 2019	EC notification 117170692 created for: trees grown around guys – need to trim. Updated to include pole leaning – damage at top of pole. December 14, 2023, FSR identified trim vegetation around guys and assigned a due date of June 18, 2024.

*Incident Location: Pole SAP ID: 102234538

Hazard Barrier Analysis

Hazard	Vegetation Contact	Sub-Hazard	Fallen Tree
	Tree falling on guy wires leading to downed conductor and 800 square foot ignition.		
Barrier	Expected vs. Observed Performance	Why did the barrier not prevent the ignition event?	Comments
Barriers that Positively Affected Ignition			
Enhanced Powerline Safety Settings - Instantaneous Trip Settings Document: TD-2700P-26 TD-1470S	Expected Performance: Automatically turn off power when a hazard is detected. Observed Performance: Barrier performed as expected	A1B2C2D3 - Limitation: Equipment Limitation; EPSS Limitation; Device tripping time is limited	LR operated on instantaneous overcurrent target detecting / clearing the fault within 50 ms /97 ms, within the EPSS target of 100 ms or less, thus limiting ignition impact.
Circuit Protection - Fuse	Expected Performance: Provide overcurrent protection to upstream components from downstream faults Observed Performance: Barrier performed as expected	A1B2C2D3- Limitation: Equipment Limitation; EPSS Limitation; Device tripping time is limited	FUCO (Brand: Part 24, Type 20T) operated simultaneously with LR and within the 100 ms EPSS response target to reduce ignition impact.
Barriers that were Assessed as Opportunities			
Level 2 Basic Tree Assessment	Expected Performance: Identify conditions or obvious defects of concern on back side of tree. Observed Performance: Barrier did not exist	N/A	Annual and Second Patrols did not identify defects at the Incident Tree during the Level 1 inspection that would have led to a Level 2 inspection.

Potential Next Steps / Associated CAP Items:

- Development of a five-minute meeting for VM inspectors to reinforce inspection of the entire facility, including guy wires, reiterate abnormal vegetation conditions associated with guy wires, and remind VM inspectors of reporting requirements when abnormal conditions are encountered. CAP #00129510249 has been submitted to track to completion.

Single Line Diagram –



Photos and Diagrams of Events

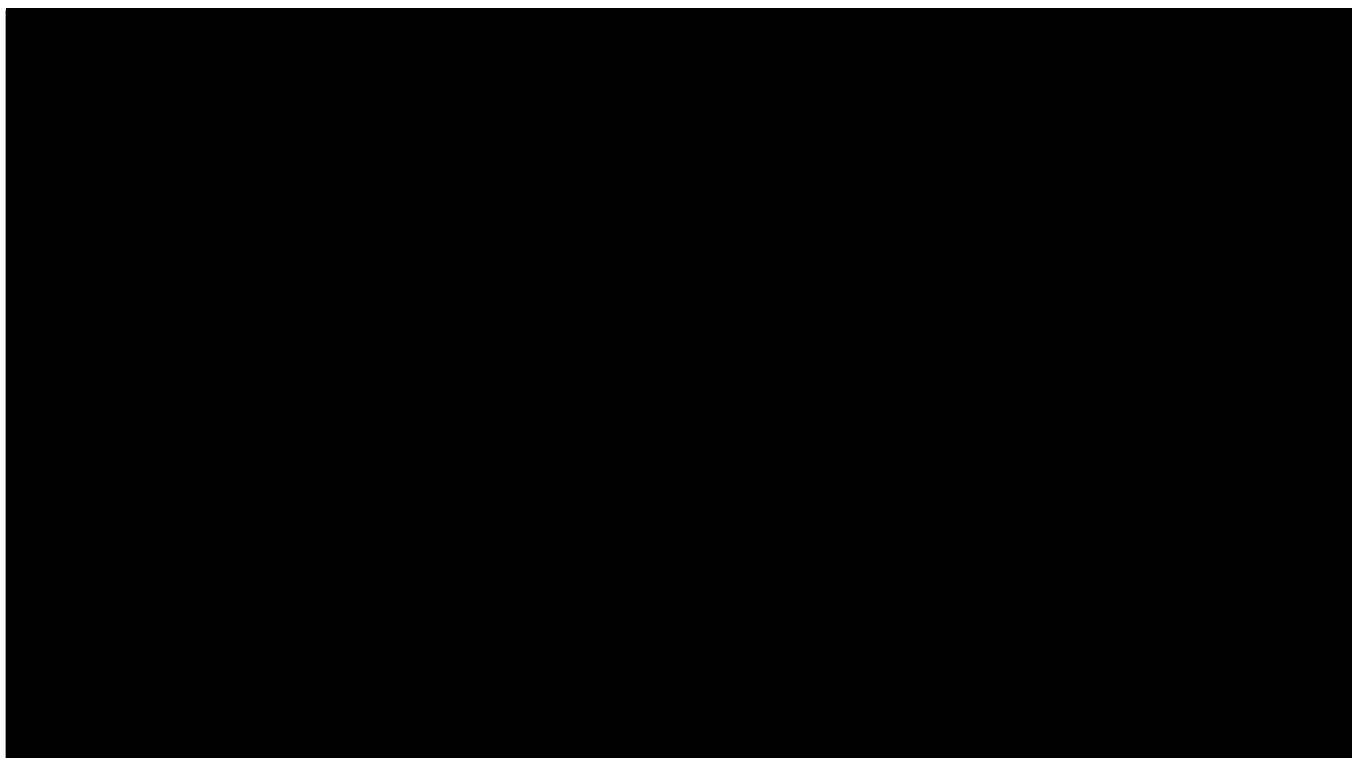


Figure 1 Aerial view showing the Incident Location (indicated with red "X") and closest upstream protective devices (marked with yellow pins). Source: Google Earth, image undated.

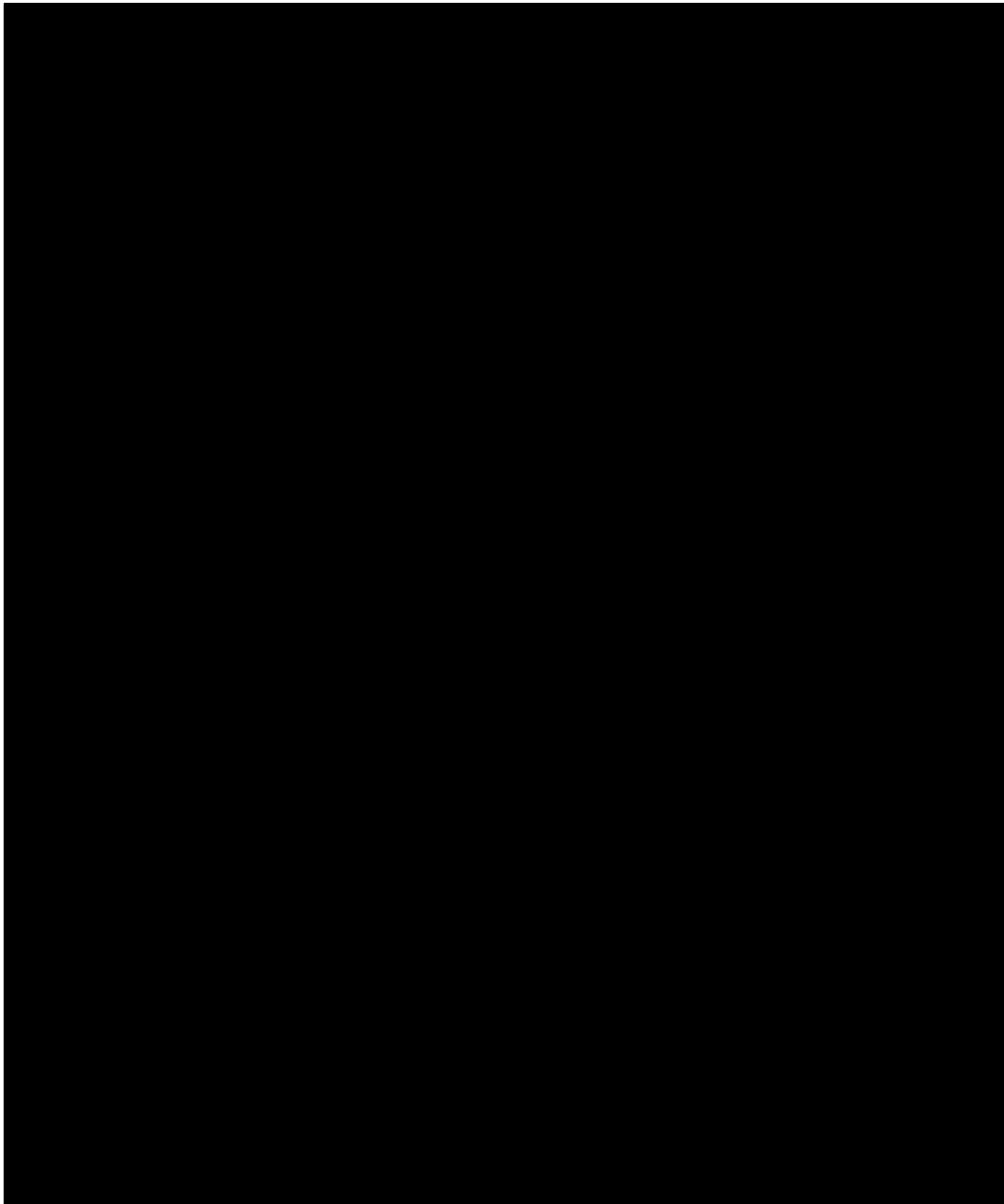


Figure 2: EDGIS line layout in vicinity of Incident Location (indicated with red "X"). Source: EC 129175534.

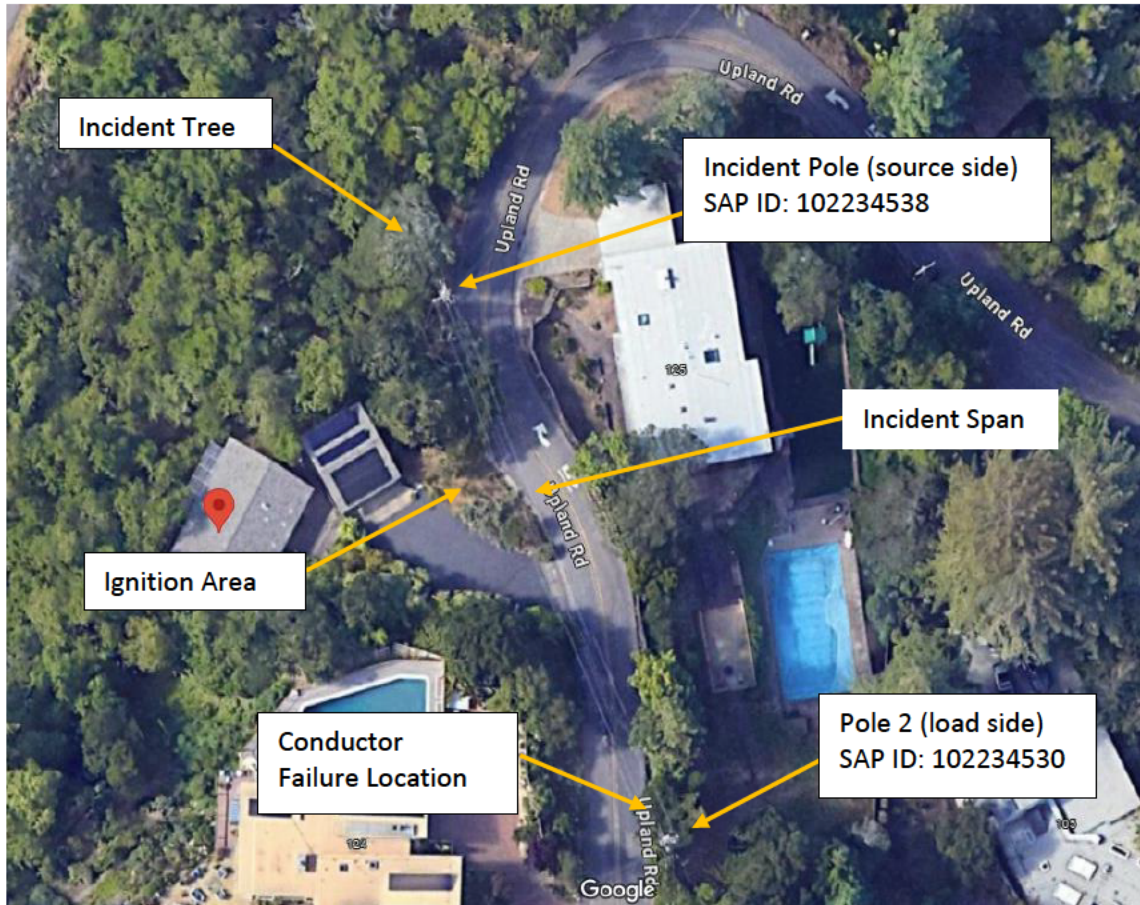


Figure 3 Aerial view of incident site. Source: Google Maps.

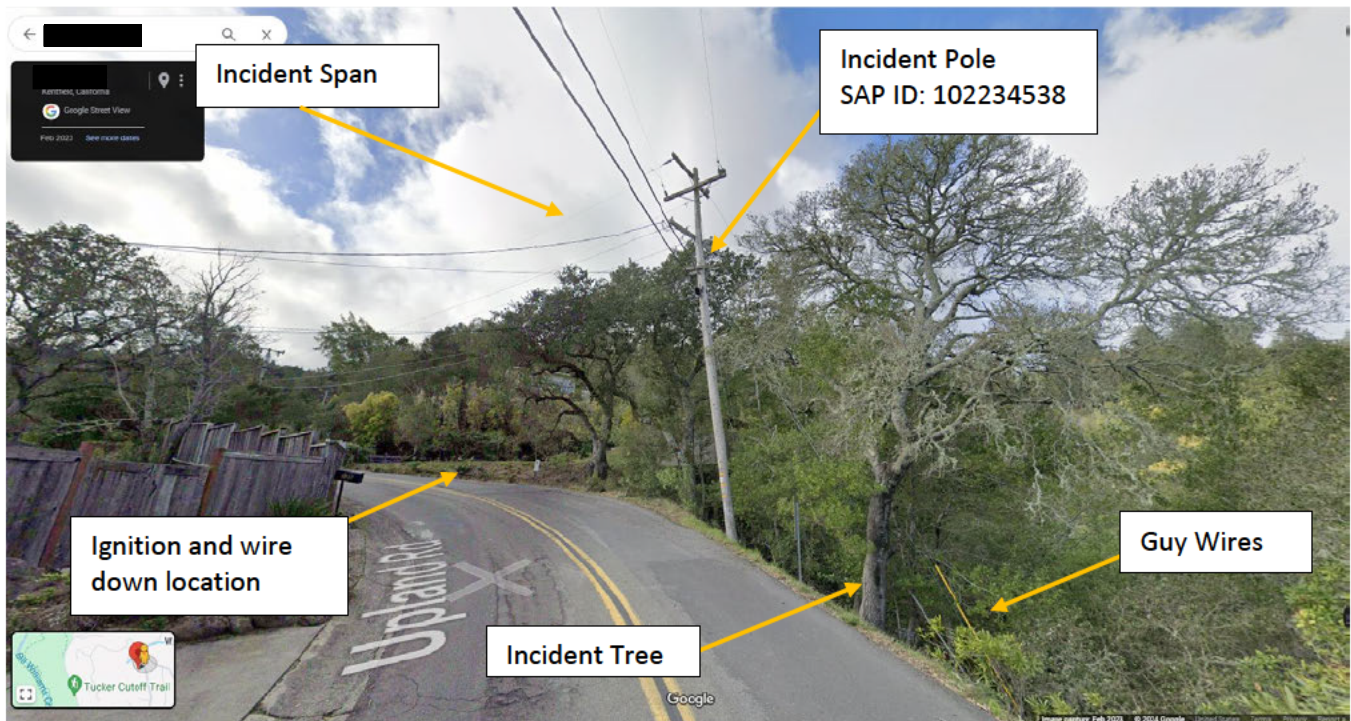


Figure 4 View of Incident Location prior to incident. The Incident Tree and guy wires are visible in the photograph. Source: Google Maps image dated February 2023.



Figure 5 Views of burnt vegetation caused by downed Incident Conductor and downed wire (red arrows in bottom photograph indicate location). Source: Troubleshooters images taken on July 5, 2024.



Figure 6 Location where Incident Conductor broke at Pole 2 prior to the incident (top, source Google Maps, February 2023) and after the incident (bottom, Source: EC # 129175534). The failure location is indicated with a circle and the tap guard is indicated with arrows in the photographs.

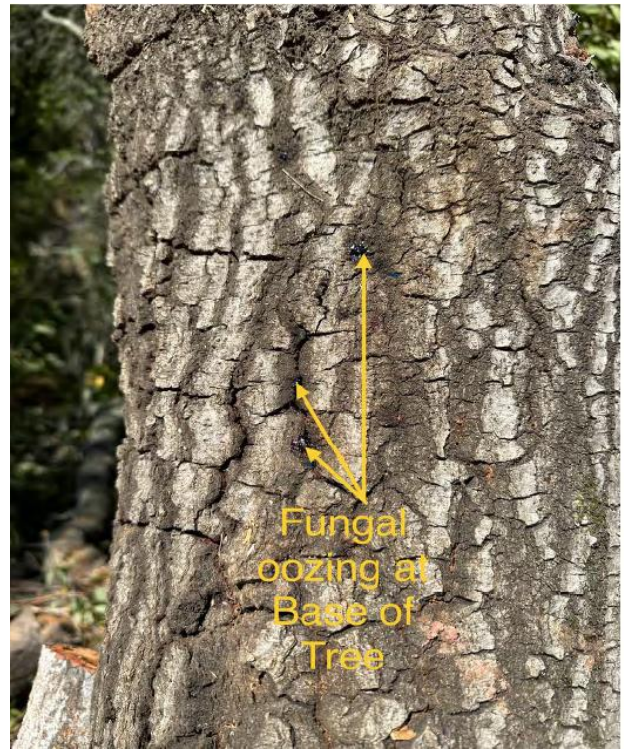


Figure 7 View of decayed wood at failure point (left) and black fungal oozing on bark (right). Source: VM Incident Report, images taken on July 9, 2024.



Figure 8 View of fallen tree (top) and remaining tree trunk (bottom). Source: VM Incident Report, images taken on July 9, 2024.



Figure 9 Photographs of guywire overgrowth on March 25, 2022. Source: EC Notification 11717069, 2021 FSR.



Event Captures/Analysis

1166 Oscillography

- Fault Amps:
 - A: 1067A rms
 - B: 1057A rms
 - G: 1128A rms
- LR response time: 50ms
- LR clearing time: 97ms

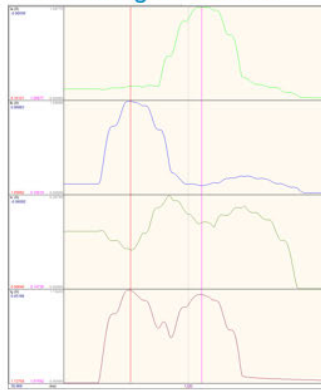
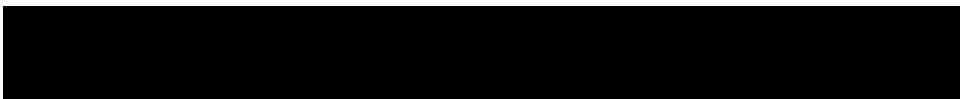


Figure 10 LR 1166 Oscillography showing fault load at time of incident. Source: EPSS investigation report.

Attachments

Attachments and references can be located in the ESA folder, located below:



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