



SUMMARY

Specifies how Quality Assurance Vegetation Management-Asset (QAVM-Asset) performs audits of Vegetation Management (VM) activities along electric transmission facilities. Following this procedure ensures compliance with the following documents and regulatory requirements:

- Utility Procedure TD-7103S “Transmission Vegetation Management Program Standard (TVMPS)
- Utility Procedure TD-7103P-01 “Vegetation Management Transmission Inspection Procedure (TIP)” and all associated Attachments and Job Aids.
- California Public Utilities Commission (CPUC) General Order (G.O.) 95, Rule 35
- Public Resource Codes (PRCs) 4293-4296

STAKEHOLDERS

QAVM-Asset Transmission Audit lead, and all Compliance and Risk Consultants (auditors) who perform VM transmission audits.

ASSOCIATED TOOLS

- Mobile device (e.g., iPad or iPhone)
- Field maps mobile app.
- Survey123 mobile app.
- Laser rangefinder
- Diameter at breast height (DBH) tape

PROCESS

QAVM-Asset supervisor designates at least one audit lead for the transmission audits. The audit lead is responsible for data organization and reporting. Audit lead utilizes data resource trackers to ensure all transmission sample locations that can be safely accessed are reviewed, and that no audit locations have been reviewed in duplicate.

1. TRANSMISSION AUDIT PREP

NOTE:
 Audit lead conducts all sample preparation steps. QAVM-Asset Supervisor or other auditors can assist if necessary and time permits.

- 1.1. Determine audit scope.
 - a. QAVM-Asset Supervisor and audit lead(s) define and finalize audit scope. The following elements may be considered in audit scope determination:
 - Sustained prior years’ audit results
 - QAVM-Asset annual authorized work plan and schedule
 - Geographic areas
 - VM Execution leadership breakdowns



- Fire Responsibility Areas
 - High Fire Threat Districts (HFTDs)
 - Orchard Project Areas
 - LiDAR detection data
- b. Audit lead requests that QAVM-Asset Business Analyst team procure overhead transmission line mileage data from PG&E's GIS department based on the agreed upon audit scope.
- 1.2. Sample Equation and Audit Plan
- a. Once audit lead has received GIS mileage data from the Business Analyst team, audit lead creates sample equation(s) for in-scope areas of the audit.
 - b. Audit lead completes audit plan using the approved Transmission Audit Plan template and sends completed audit plan to QAVM-Asset supervisor for approval and sign-off .
- 1.3. Sample Preparation
- a. Audit lead and QAVM-Asset supervisor discuss minimum mileages to be reviewed for each voltage in audit areas
 - b. Audit lead randomizes list of transmission structures in each audit area stratified by voltage.
 - Transmission lines set at 60kV and 70kV have the same regulatory and PG&E conformance clearances. For purposes of QAVM-Asset audits, lines marked as 60kV and 70kV can be included in the same audit sample area and do not need to be stratified.
 - Microsoft Excel allows a maximum of 30,000 rows to be randomized. If any list of structures carrying the same voltage in an audit area exceeds 30,000 it is necessary to split the Excel file into two and run two separate randomizations.
 - c. Audit lead selects sample structures for each stratified voltage until the minimum mileage thresholds for each voltage are met.
- 1.4. Determining when to include/exclude structures from samples
- a. Due to increased risks associated with higher voltage transmission lines, only include North American Electric Reliability Corporation (NERC) critical lines structures in the sample where visible woody vegetation appears within one line-mile of the structure. Utilize recent aerial imagery (e.g., Google Earth) to determine presence of woody vegetation in or adjacent to transmission rights-of-way.
 - All 500kV and 230kV lines are considered NERC critical lines.
 - Certain high risk 115kV and 60/70kV lines are also considered NERC critical lines.
 - Reach out to VM Execution transmission leadership for most up-to-date NERC line information.

NOTE:

It is imperative that aerial imagery reviewed be recent (newer than one year old). Note on sampling worksheet the date of the most recent aerial imagery.



- b. Ensure that all samples are in areas where auditors can review a minimum of one mile of the sample's named T-Line.
 - For situations in which auditing a minimum of one mile is not possible, audit the maximum amount of mileage available. Examples of this situation may include but are not limited to:
 - Sample structures on named T-lines that are less than one mile long.
 - Sample structures where overlap with other samples is unavoidable.
 - Orchard samples where orchard project spans are not contiguous.
 - Samples where a minimum of one mile in the appropriate fire threat district are not available.
- c. For areas where multiple samples may be within one mile of each other, ensure that the sample miles do not overlap. If overlap is unavoidable, work with QAVM-Asset supervisor to determine if sample should be omitted.
- d. Audit lead works with business analyst team to import sample data into the mapping ArcGIS (desktop) and Field Maps (mobile app.) programs.
- e. Once samples are loaded in ArcGIS/Field Maps app, auditors select samples they wish to review and conduct Project Management Database (PMD) review for those samples.
 - Auditors change "Status" of sample to claim samples they wish to review.
 - Auditors add in pertinent PMD project dates and information to the ArcGIS program (desktop) or Field Maps program (mobile app) prior to conducting field work on their audit samples.
 - For efficiency, auditors should begin conducting transmission field review in their local assigned areas of responsibility and can then assist in neighboring divisions/areas as needs dictate.
 - Auditors should pay close attention to sample spans that appear to cross over cultivated orchards. Auditors shall notate on sample point in ArcGIS/Field Maps app which spans are located on orchard projects. Spans that cross over cultivated orchards can be reviewed on System Transmission samples, however data collection processes may be modified (see section 2.2.f).
 - Unless the sampled T-line is less than one mile long in total, "Projected Mileage" for System Transmission audits will default to 1.00.
 - For samples on T-lines that are less than one mile long in entirety, measure the total length of the T-line and enter the measured distance in the "Projected Mileage" field.

NOTE:

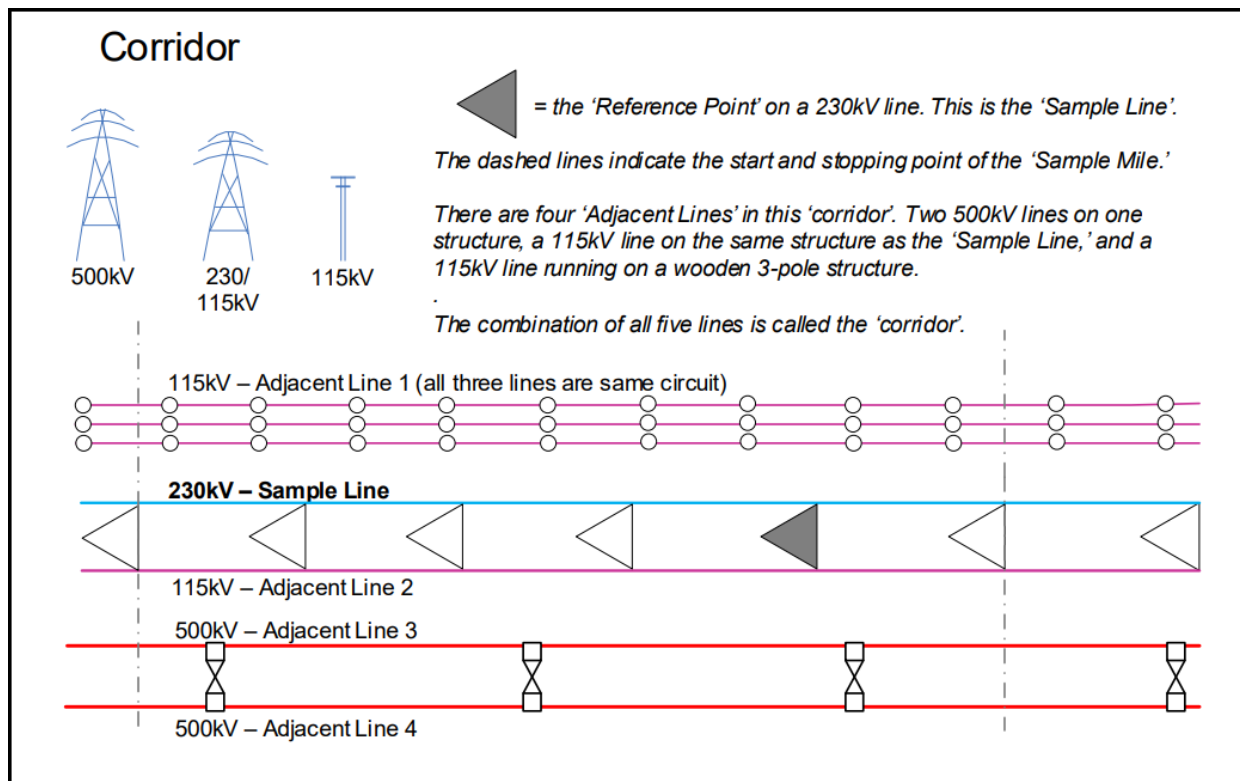
Ensure that no personally identifiable information (PII) is included on any maps or data sheets.
(e.g., gate codes, phone numbers, etc.)

2. TRANSMISSION AUDIT DATA COLLECTION (SYSTEM SAMPLES)

- 2.1. Auditor to work with QAVM-Asset supervisor if access to any transmission audit samples are deemed unsafe. Auditors are to follow guidelines in published version of the QAVM-Asset Sample Omission Standard Work Document.
- 2.2. Auditors have the discretion to audit a minimum of one mile of audit line in either direction from sample structure. If feasible, audit in the direction of denser vegetation.



- a. Unless otherwise instructed by audit lead/supervisor, the line segment audited must be a minimum of one continuous mile and must include the reference point structure.
 - For audit samples whose T-lines are less than one mile in length, audit lead specifies the start/stop points of the sample and enters the measured project sample mileage in the “Projected Mileage” section of the sample location point in the ArcGIS desktop program or Field Maps app.
 - Audit lead has the discretion to specify which spans are to be audited in certain situations (such as areas where samples may overlap or areas that pass in and out of HFTDs).
- b. Auditors will stop auditing at the first sample T-line structure that is one mile past the sample’s starting point.
- c. Auditors will review the sample location information in the ArcGIS desktop program or Field Maps app for information discovered by the Audit lead during the audit prep phase. Auditors will follow all outlined instructions, if any, by the audit lead and/or QAVM-Asset supervisor.
- d. Calculate Grow-In tree population based on whether an observed tree would be considered a “VC1” LiDAR detection type. See **Appendix A** for “VC1” clearance parameters. Parameters differ based on voltage.
- e. Calculate Fall-In tree population for any tree that could strike any transmission facility or cross-phase/cause flashover with any transmission conductor.
- f. For System Transmission samples located in transmission corridors, collect tree populations and audit for findings affecting all PG&E transmission lines in corridor.
 - Some transmission corridors contain a mix of PG&E and non-PG&E owned lines. Only audit for vegetation affecting PG&E owned lines.
 - If auditor identifies a hazard affecting non-PG&E owned facilities, they should follow third party utility notification process.
 - Some System Transmission sample spans may cross over cultivated orchards, and data collection for those spans may need to be modified. Orchard spans along System Transmission samples should have been identified during the audit sample preparation process.
 - If the spans are listed on an orchard project, do NOT count cultivated orchard trees as part of the System Transmission sample.
 - If the spans are not listed on an orchard project, notify the orchard VPM for that division. Count all trees as part of the System Transmission sample if span(s) are not part of an orchard project.
- g. If auditing in a corridor where structures on adjacent lines are offset from the sample T-line, STOP auditing for all lines at the point where the final structure intersects the sample line, even if this means stopping review midspan on an adjacent line (see vertical dashed lines in the figure below).



3. LiDAR ACCURACY/EFFECTIVENESS AUDIT (SYSTEM TRANSMISSION SAMPLES ONLY)

- Most recent LiDAR imagery available within one span (in both directions, if applicable) will be provided to auditor for field review. LiDAR date of acquisition will be provided.
- Auditor chooses one span adjacent to the sample structure and reviews LiDAR detections shown on map and matches up detections with conditions in the field.
 - Span must be included as part of the overall System Transmission audit sample.
 - Span should be the more tree-dense span when possible.
- If an orchard is located within one span of the System Transmission sample structure, it is acceptable to review the orchard trees for LiDAR accuracy/effectiveness.

Situations where LiDAR data is considered **Inaccurate** or **Ineffective** can include, but are not limited to, the following:

- LiDAR map does not show trees observed in the field that should have been detections.
- LiDAR detected vegetation that will never grow tall enough to affect transmission facilities (e.g., grapevines, scrub brush, etc.).
- LiDAR shows detections on the span that are not found in the field.
 - Does NOT include trees that have been removed or mitigated after the LiDAR date of acquisition.



4. TRANSMISSION AUDIT DATA COLLECTION (ORCHARD SAMPLES)

- 4.1. Orchard sample spans may not always be continuous within one mile of sample structure. Audit lead and/or QAVM-Asset supervisor have discretion to specify which orchard spans are to be reviewed within one mile of sample structure.
 - a. Audit lead/supervisor to select spans which would yield the greatest orchard mileage within one mile of sample structure.
- 4.2. Tree populations for orchard samples are only to be collected for cultivated orchard species.
 - a. Do not count species within orchard parcels that are not cultivated orchard species (i.e., willows growing next to canals, etc.)
 - b. Calculate orchard sample Grow-In tree populations based on whether an observed tree would be considered a “VC1” LiDAR detection type. See Appendix A for “VC1” clearance parameters. Parameters differ based on voltage.

NOTE:

There may be instances where a System Transmission sample and an Orchard Transmission sample contain the same span. If this occurs, only count tree populations and findings for cultivated orchard species on Orchard Transmission sample and all other non-orchard VC1 detection species on the System Transmission sample.

5. REPORTING

- 5.1. Audit lead or designee communicates weekly progress to VM execution notating amount of mileage reviewed and what findings have been identified (both weekly and cumulatively).

6. FINDINGS DEFINITIONS

NOTE:

If a tree is a tree/line contact or non-compliance finding type, auditor is to immediately notify the local transmission VPM and remain onsite to secure scene until relieved by VM Execution.

Auditor is only allowed to leave site if site is unsafe, or if movement is needed to attain cellular service. Transmission VPM may also grant permission to leave site depending on the situation.

Tree/Line Contacts:

IF a tree is observed in contact with (or exhibits signs of contact with) a transmission conductor, OR is actively failing and could cause a fault at any moment, regardless of voltage,
 THEN the tree is considered a **Tree/Line Contact** finding type.



Non-Compliances:

IF a tree is observed within the minimum allowable distances outlined in FAC-003-4, GO 95 Rule 35, or PRC 4293, and does not exhibit any signs of contact with a transmission conductor.

THEN the tree is considered a **Non-Compliance** finding type.

- See **Appendix B** for compliance thresholds.

Non-Conformances:

IF a tree is observed within PG&E's Minimum Clearance Distance, but if outside of a regulatory clearance, and does not exhibit any signs of contact with a transmission conductor,

THEN the tree is considered a **Non-Conformance** finding type.

- There may be situations where Non-Conformance clearances are the same as Non-Compliance clearances. If a tree is adjacent to a conductor where the Non-Conformance and Non-Compliance clearances are the same, the finding would default to the more severe finding type (**Non-Compliance**):
 - 60/70kV lines in SRA/USFS-FRA during Fire Season
 - 115kV lines in SRA/USFS-FRA during Fire Season
 - 230kV lines in SRA/USFS-FRA during Fire Season

90 Days to Non-Compliance

NOTE:

It is the auditor's responsibility to research forecast tree crew completion dates.
A tree does not qualify as a 90 Day finding IF:

- The tree is compliant, has been identified for work, and is on a project scheduled for tree crew completion within 90 days of QAVM-Asset observation, OR
- The tree is compliant, has not yet been reviewed by pre-inspection, but is on a project scheduled for tree crew completion within 90 days of QAVM-Asset observation

IF a tree is observed outside of FAC-003-4, GO 95 Rule 35, or PRC 4293 clearance requirements:

AND is outside of PG&E's Minimum Clearance Distance requirements,

AND is likely to either grow or blow within a regulatory clearance distance within 90 days of QAVM-Asset observation,

AND the tree is in one of the following areas:

- 60/70kV lines in SRA/USFS-FRA during Fire Season
- 115kV lines in SRA/USFS-FRA during Fire Season
- 230kV lines in SRA/USFS-FRA during Fire Season

THEN the tree is a **90 Days to Non-Compliance** finding type.



90 Days to Non-Conformance

IF a tree is observed outside of FAC-003-4, GO 95 Rule 35, or PRC 4293 clearance requirements,
 AND is outside of PG&E’s Minimum Clearance Distance requirements,
 AND is likely to either grow or blow within PG&E’s Minimum Clearance Distance within 90 days of QAVM-Asset Observation, but NOT within a regulatory compliance distance,
 THEN the tree is a **90 Days to Non-Conformance** finding type.

Facility Protect Trees

IF a dead or dying tree is observed with strike potential to PG&E transmission facilities, or otherwise contains defects that could cause the tree (or portions of the tree) to strike PG&E transmission facilities or could cause flashover if the tree were to fail.

THEN the tree is considered one of three different **Facility Protect Tree (FPT)** finding types.

- If the tree has been identified for work and is awaiting mitigation, the tree is an **FPT – Identified for Work, Awaiting Mitigation** finding type.
- If it is determined that the tree died or decayed after the most recent pre-inspection, the tree is an **FPT – Declined After Most Recent PI** finding type.
- If the tree died or decayed before the most recent pre-inspection, and the pre-inspector did not identify the tree for work, the tree is an **FPT – Declined Before Most Recent PI** finding type.

Overhang

IF a tree is observed with any vegetation overhanging a transmission conductor, regardless of whether it is green and healthy or dead/decadent,

THEN the tree is considered an **Overhang** finding type.

Tower Clear

IF woody vegetation is observed that is in contact with a transmission structure, guy wire, and/or anchor AND interferes with visual inspection,

THEN the vegetation is considered a **Tower Clear** finding type.

- If reviewing a System Transmission sample that crosses an orchard, and a cultivated orchard tree is observed that would qualify for the Tower Clear finding type, instead list the vegetation as an **FYI**.
- If reviewing an Orchard Transmission sample, and non-cultivated vegetation is observed that would qualify for the Tower Clear finding type, instead list the vegetation as an **FYI**.

NOTE:

Only one tower clear finding is allowed per transmission structure. If multiple trees affect distinct parts of the transmission structure, note the quantity of trees affecting structure and provide comments noting height/DBH ranges.

If multiple distinct species affect the structure and are not considered brush (over 4 inches in diameter), select tree species as “Other” and note which species are present.



Century Plant

IF a non-sprouting century plant is identified in an orientation where the plant could affect transmission lines at full bloom,

THEN list the plant as a **Century Plant** finding type

- If a century plant has begun to produce a stalk, list the plant as a **90 Days to Non-Compliance** or **90 Days to Non-Conformance**, as appropriate.

End of Instructions



APPENDIX A: Tree Clearance

Tree Clearance Parameters						Clearance Distance				VMPI POLYGON
RANK	TYPE	STATUS	ACRONYM	DESCRIPTION	AREA OF APPLICATION	500 kV	230 kV	115 kV	69 kV	
1	As Flown Grow-In	URGENT	VC1U_AF	Vegetation within a specified distance of the conductor based on line voltage as described in columns under the header "Clearance Distance".	HFTD and Non HFTD	15	10	10	4	
2	Max Op Grow-In	URGENT	VC1U_MO	Vegetation within a specified distance of the conductor based on line voltage as described in columns under the header "Clearance Distance". Conductor is modeled under maximum operating conditions.	NERC only	15	10	10 (NERC only)	4 (NERC only)	
3	As Flown Grow-In	conformance	VC1c_AF	Vegetation within a specified distance of the conductor based on line voltage as described in columns under the header "Clearance Distance".	HFTD and Non HFTD	25	15	15	10	
4	Max-op Grow-In	conformance	VC1c_MO	Vegetation within a specified distance of the conductor based on line voltage as described in columns under the header "Clearance Distance". Conductor is modeled under maximum operating conditions.	HFTD and Non HFTD	25	15	15	10	
5	As Flown Grow-in	potential	VC1p_AF	Vegetation within a specified distance of the conductor based on line voltage as described in columns under the header "Clearance Distance".	HFTD and Non HFTD	40	25	25	15	
6	Max-op Grow-in	potential	VC1p_MO	Vegetation within a specified distance of the conductor based on line voltage as described in columns under the header "Clearance Distance". Conductor is modeled under maximum operating conditions.	HFTD and Non HFTD	40	25	25	15	
7	As Flown OVERHANG (0 - 2 feet)	conformance	VC1c_OV	Vegetation above and within 2 ft. of the upward vertical plane of the conductor. Applies to Non High Fire Threat Districts only.	Non HFTD only	2	2	2	2	
7	As Flown OVERHANG (0 - 6 feet)	conformance	VC1c_OV	Vegetation above and within 6 ft. of the upward vertical plane of the conductor. Applies to High Fire Threat Districts only.	HFTD only	6	6	6	6	
8	As Flown OVERHANG (2 - 12 feet)	potential	VC1p_OV	Vegetation above and within 2 -12 ft. of the upward vertical plane of the conductor. Applies to Non High Fire Threat Districts only.	Non HFTD only	12	12	12	12	
8	As Flown OVERHANG (6 - 12 feet)	potential	VC1p_OV	Vegetation above and within 6-12 ft. of the upward vertical plane of the conductor. Applies to High Fire Threat Districts only.	HFTD only	12	12	12	12	
9	Modeled Blowout	conformance	VC1c_BO	Model conductor movement at 46 mph	HFTD and NERC only	10	6	4 (NERC only)	4 (NERC only)	
10	Modeled Blowout	potential	VC1p_BO	Model conductor movement at 46 mph	HFTD and NERC only	15	12	10 (NERC only)	10 (NERC only)	
11	As Flown Fall-in (inside ROW)	conformance	VC2c_AF	Vegetation inside ROW capable of striking conductor as specified by the average half ROW width by voltage as described in columns under "Clearance Distance"	HFTD and Non HFTD	60	40	25	20	
12	As Flown Fall-in (outside ROW)	conformance	VC3c_AF	Vegetation outside ROW capable of striking conductor as specified by the average half ROW width by voltage as described in columns under "Clearance Distance"	HFTD and Non HFTD areas	>60	>40	>25	>20	
13	As Flown Fall-in Tower and Attachment (inside ROW)	routine	VC2r_AT	Vegetation inside ROW capable of striking tower or pole and any attached wires as specified by the average half ROW width by voltage as described in columns under "Clearance Distance"	HFTD and NERC only	60	40	25	20	
14	As Flown Fall-in Tower and Attachment (outside ROW)	routine	VC3r_AT	Vegetation outside ROW capable of striking tower or pole and any attached wires as specified by the average half ROW width by voltage as described in columns under "Clearance Distance"	HFTD and NERC only	>60	>40	>25	>20	
15	As Flown Fall-in (inside ROW)	potential	VC2p_AF	Vegetation inside ROW as specified by the average half ROW width by voltage as described in columns under "Clearance Distance". Tree is tall enough to strike within 6 ft. of conductor.	HFTD and Non HFTD areas	60	40	25	20	
16	As Flown Fall-in (outside ROW)	potential	VC3p_AF	Vegetation outside ROW as specified by the average half ROW width by voltage as described in columns under "Clearance Distance". Tree is tall enough to strike within 6 ft. of conductor.	HFTD and Non HFTD	>60	>40	>25	>20	



Appendix B:

Non-Compliance Thresholds

Table 1			
GO 95, Rule 35 Compliance Clearance Distance			
60/70kV	115kV	230kV	500kV
18 inches	1.6 feet	2.6 feet	10 feet

Table 2			
PRC 4293 Compliance Clearance Distance*			
60/70kV	115kV	230kV	500kV
4 feet	10 feet	10 feet	10 feet

*Note: PRC 4293 applies to SRA/USFS FRA areas during fire season

Outside of declared fire season, SRA/USFS-FRA Non-Compliance thresholds default to GO 95 Rule 35 thresholds. Work with supervisor to discuss clearances for any non-USFS FRA sample clearances.

Table 3				
NERC Minimum Vegetation Clearance Distance (MVCD) in Feet				
Elevation (feet)	60/70kV	115kV	230kV	500kV
0 – 500	1.1	1.9	4.0	7.0
501 – 1000	1.1	1.9	4.1	7.1
1001 – 2000	1.1	1.9	4.2	7.2
2001 – 3000	1.2	2.0	4.3	7.4
3001 – 4000	1.2	2.0	4.3	7.5
4001 – 5000	1.2	2.1	4.4	7.6
5001 – 6000	1.2	2.1	4.5	7.8
6001 – 7000	1.3	2.2	4.6	7.9
7001 – 8000	1.3	2.2	4.7	8.1
8001 – 9000	1.3	2.3	4.8	8.2
9001 – 10000	1.4	2.3	4.9	8.3
10001 – 11000	1.4	2.4	5.0	8.5
11001 – 12000	1.4	2.5	5.1	8.6
12001 – 13000	1.5	2.5	5.2	8.8
13001 – 14000	1.6	2.6	5.3	8.9
14001 – 15000	1.6	2.7	5.4	9.1

Note: The minimum clearances listed above for 115kV and 230kV lines are farther away than those outlined in the Tables 1 and 2 above. **Please keep track of what elevation you are working at when auditing for NERC lines**

Non-Conformance Thresholds

Table 4			
PG&E Clearance Requirements			
60/70kV	115kV	230kV	500kV
4 feet	10 feet	10 feet	15 feet



QAVM-Asset Transmission Audit of Vegetation Management Activities



REVISION REQUIREMENTS

To remain active document must be reviewed and approved annually within one month of anniversary of previous approval.

REVISION NOTES

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00	0814/2024	Original Publication

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