

Electric Substation and Power Generation Powerhouse and Switchyard Defensible Space

SUMMARY

This procedure provides instructions for the Defensible Space Inspections of the permanently installed Tier 2 and Tier 3, High Fire-Threat District (HFTD), Zone 1 HFTD, and High Fire Risk Area (HFRA) Powerhouse Switchyards, Substations and Equipment, when applicable:

- Performing inspections.
- Managing vegetation for the purpose of fire hardening and creating defensible space.

The execution of inspections and subsequent mitigations in this procedure are intended to minimize the risk of a fire ignition event within powerhouse switchyards and substations that could propagate outward from electrical equipment. The defensible space program intends to ensure public safety and generally follows California Public Resource Code Section 4291 (under the CA Department of Forestry and Fire Protection).

This procedure also considers regionally appropriate vegetation management suggestions to minimize erosion, minimize water consumption, and permit trees near facilities for shade, aesthetics, and habitat.

Level of Use: Informational Use

TARGET AUDIENCE

All Pacific Gas & Electric (PG&E) Utility personnel (employees and contractors) responsible for vegetation management in and around PG&E powerhouse switchyards and substations including employees from:

- Power Generation
- Electric Substation
- System Inspections
- Natural Resource Management

SAFETY

Personnel injury could result from performing inspections in the field due to numerous safety hazards that may exist Powerhouse Switchyards, Substations and Equipment, including:

- Arc-flash and electrical hazards
- Slip, trip, and fall hazards, such as stairways and uneven terrain
- Hazards associated with heights

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- Overhead hazards such as overhead lines
- Chemical or environmental hazards including inclement weather.
- Wildlife, varmint, pest, reptile, poison plant or insect hazards.
- Drowning could result from working near water sources such as lakes, reservoirs, and other water conveyance systems.

BEFORE YOU START

- 1.1 OBTAIN the latest version of the guidance document from the Guidance Document Library (GDL).
 1. IF using an existing copy

THEN COMPARE the publication date AND version number on your working copy of this document against the most recently published electronic version to verify that it is current.
- 1.2 Inspectors, internal Land Program Managers, and external Contractors must meet specific minimum qualifications to perform inspections.
- 1.3 REVIEW forecasted and current weather conditions and MAINTAIN awareness of weather in the field.
 1. IF conditions become unsafe to work

THEN STOP work.
- 1.4 EXERCISE caution to ensure safety while working in the field, including wearing proper PPE including but NOT limited to:
 - Hardhat
 - Sturdy boots
 - Pants/long sleeve shirt
 - Fire Resistant clothing, as required
 - EH boots, as required
- 1.5 All Contractors performing work as part of this procedure REVIEW and FOLLOW the following Standards and Procedures:
 1. [SAFE-3001S, "Contractor Safety Standard"](#)

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2. [SAFE-3001P-17, "Land and Environmental Management Contractor Safety Procedure"](#)
3. [ENV-10002S, "Environmental Release to Construction \(ERTC\) for Land and Environmental Evaluations"](#)
4. EMER-4102S Preventing and Mitigating Fires While Performing PG&E Work
 - Wildfire Mitigation Matrix (EMER-4102P-01-Att01, Attachment 1)
 - Wildfire Risk Assessment Form (EMER-4102P-01-F01)
5. TD-3320P-31, "Arc Flash Hazards and Controls for Substation Facilities," Attachment 4, "Natural Fiber AFB Map for Staffed Substation Facilities."
6. TD-2509P-02, "Electric Transmission and Distribution Footwear Requirements."

1.6 REVIEW the following:

- Powerhouse AND Switchyard OR Substation parcel boundaries and land ownership
- Defensible space requirements and equipment boundary
- Site specific defensible space GIS maps prepared by Natural Resources Management (NRM) for the following:
 - Tier 2 HFTD Powerhouse switchyards or Substations
 - Tier 3 HFTD Powerhouse switchyards or Substations
 - Zone 1 HFTD powerhouse switchyards or substations
 - HFRA powerhouse switchyards or substations

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PROCEDURE STEPS

1 General Rules on Inspections

1.1 At least once during the planned inspection timeframe, Natural Resources Management (NRM) PERFORM inspections in the following to ensure maintenance AND compliance with this procedure:

- Tier 3 High Fire-Threat District (HFTD) powerhouse switchyards AND substations
- Tier 2 High Fire-Threat District (HFTD) powerhouse switchyards AND substations.
- Zone 1 HFTD powerhouse switchyards AND substations.
- High Fire Risk Area (HFRA) powerhouse switchyards AND substations.

1.2 CONDUCT ground-based inspections by end of calendar year as committed in the Wildfire Mitigation Plan (WMP)

1.3 INCLUDE the following in inspections:

1. IDENTIFY need for vegetation work, including but not limited to:
 - Tree removals, weeds AND grass abatement
 - Encroaching brush
 - Cut-stump regrowth

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- Downed logs
- Other woody debris

1.4 Performing Inspections and Collecting Data:

NOTE

Inspectors, internal Land Program Managers, and external Contractors must meet specific minimum qualifications to perform inspections. Inspections are rated low risk. Sourcing is responsible for contracting with vendors that meet PG&E and industry requirements and adherence to safety standards and procedures. Land Operations selects vendors from the pool of approved contractors and vets their qualifications before assigning to a project per SAFE-3001P-17, "Land and Environmental Management Contractor Safety Procedure."

1. Land Program Manager DETERMINE which inspections should be performed internally OR by contracted professionals (Contractors).
2. IF inspections are performed by Contractors,

THEN Land Program Manager CONFIRM minimum qualifications including, but NOT limited to:
 - a. State Registered as a Professional Forester (RPF)
 - b. International Society of Arboriculture (ISA) Certified Arborist
 - c. Individual trained AND working under supervision of an RPF OR ISA Certified Arborist

2 Inspections - Defensible Space for Tier 2, Tier 3, Zone 1 HFTD, and HFRA Powerhouse Switchyards, Substations and Equipment

2.1 EO Substation Asset Management and Power Generation Asset Management ENSURE site-specific defensible space maps are created AND maintained by Natural Resources Management (NRM) for Electric Substation Assets and Power Generation Assets.

1. REFER TO Figure 1, Example of Defensible Space Zones
2. STORE in Enterprise Records and Information (ERIM) compliant SharePoint.

2.2 IDENTIFY inspection area by taking actual measurements on the ground for:

- Zone 0 – Ember Resistant Zone (0 to 5 feet, SEE details below).
- Zone 1 - Clean Zone (5 to 30 feet, SEE details below).

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- Zone 2 - Reduced Fuel Zone (30 to 100 feet, SEE details below).
- REFER TO Example 1, Defensible Space Zones.

Example 1, Defensible Space Zones



2.3 Natural Resources Management (NRM) PERFORM inspections of Defensible Space Zone 0 Ember-resistant zone and Zone 1 - Clean Zone, as follows:

1. INSPECT Zone 0 - Ember-resistant zone and ENSURE there is no combustible material like leaves, needles, or debris.
2. INSPECT Zone 1 – Clean Zone. MEASURE 30 feet from all outermost buildings OR energized equipment for the firebreak.
 - (1) IDENTIFY and PRESCRIBE for removal all flammable vegetation within 30 feet of each building or structure, with certain exceptions pursuant to PRC §4291(a).

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NOTE

Branches, leaves, and pine needles will be removed from the ground when they are acting as surface fuels. The expectation is not to remove dead leaves or pine needles from standing trees.

3. PRESCRIBE removal for the following flammable vegetation from Zone 0 – Ember Resistant Zone and/or Zone 1 – Clean Zone:

- Grass
- Plants
- Shrubs
- Trees
- Branches
- Leaves
- Weeds
- Pine needles

- 2.4 NRM PERFORM inspections of Zone 2 - Reduced Fuel Zone, as follows:

1. MEASURE from 30-foot clean zone to 100 feet away from outermost building OR energized equipment for the firebreak.
2. ENSURE the following:
 - a. Area has reduced fuel load to inhibit progression AND reduce risk of fire moving through zone.
 - b. Area clear of loose surface litter exceeding depth of 3 inches.
 - (1) IF surface litter such as the following can be removed reasonably OR safely from site:
 - Fallen leaves
 - Needles
 - Twigs
 - Bark

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- Cones
- Small branches, etc.

THEN PRESCRIBE removal of surface litter.

- (2) IF surface litter is in an area that CANNOT be removed reasonably OR safely from site (such as on steep cliffs AND rocky slopes),

THEN PERMIT surface litter to remain in excess of 3 inches.

- c. Annual dead OR dying grasses/forbs does NOT exceed maximum height of 4 inches.

- (1) IF a situation exists for either of the following:

- Fuels are isolated from other fuels
- Necessary to stabilize soil

THEN PERMIT grasses AND forbs to reach a height of 18 inches.

- d. Riparian vegetation OR habitat next to waterbodies for protection of sensitive fish AND wildlife species.

- (1) IF a situation exists for either of the following:

- Riparian vegetation
- OR habitat next to waterbodies for protection of sensitive fish AND wildlife species.

THEN PERMIT habitat to remain.

- e. Irrigated landscape plants OR areas with existing erosion issues.

- (1) IF a situation exists for any of the following:

- Irrigated landscape plants
- OR areas with existing erosion issues

THEN PERMIT plants or grasses to remain

- f. Shrubs AND grass on steep cliffs where NO fuel continuity exists AND worker safety is a concern in rappelling over cliff face.

- (1) IF the following situation exists:

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- Shrubs AND grass on steep cliffs where NO fuel continuity exists.
 - AND worker safety is a concern in rappelling over cliff face.
- THEN PERMIT shrubs or grasses to remain.
3. ENSURE minimum vertical clearance between limbs.
- a. ENSURE minimum vertical clearance of 6 feet between tree limbs AND ground

Figure 2, Minimum Vertical Clearance

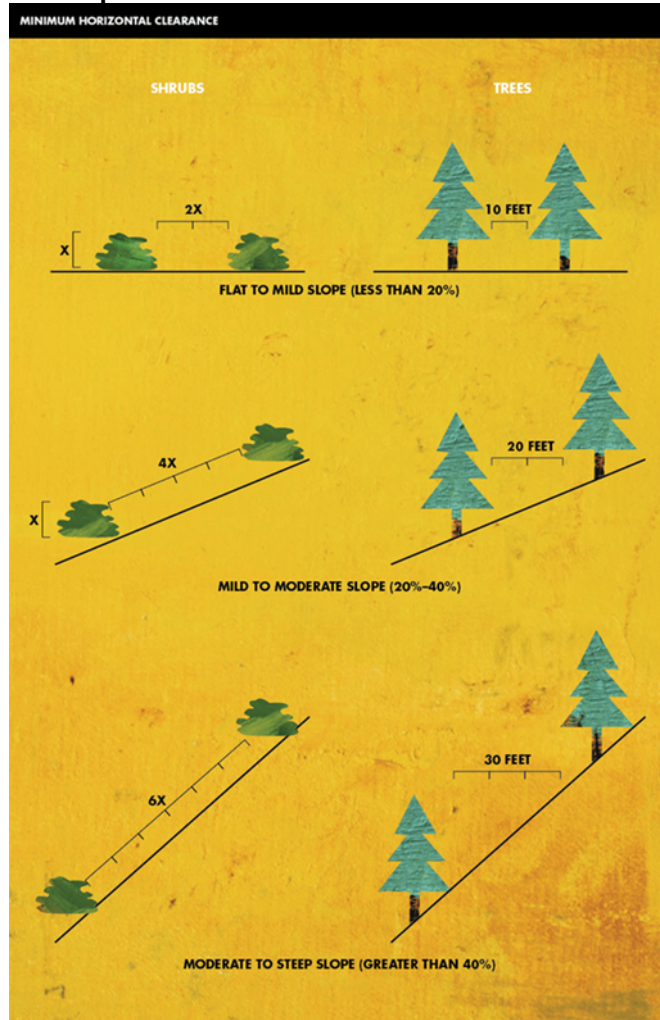


- (1) IF tree limbs are identified to be less than 6 feet to the ground,
 THEN PRESCRIBE removal of:
- Identified tree branches
 - Resprouting branches
- b. DETERMINE proper vertical spacing between shrubs AND lowest branches of trees by multiplying height of shrub by three (3):
- Example: If shrub is 5 feet high, then minimum vertical clearance is 15 feet (5 feet x 3 = 15 feet).
4. DETERMINE horizontal spacing distances of trees AND shrubs by slope of land.
- a. For tree spacing, REFER TO the following two acceptable methods:
- (1) Crown spacing based on slope.

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- (2) Continuous tree canopy.
- 5. When Horizontal Crown spacing is based on slope, ENSURE the following horizontal spacing of trees AND shrubs (when feasible).

Figure 3, Horizontal Spacing With Slope



- a. SPACE tree crowns PER the following formula:
 - (1) Flat to mild slope (less than 20 percent) - Minimum of 10 feet apart.
 - (2) Mild to moderate slope (20 to 40 percent) - Minimum of 20 feet apart.
 - (3) Moderate to steep slope (greater than 40 percent) - Minimum 30 feet apart.

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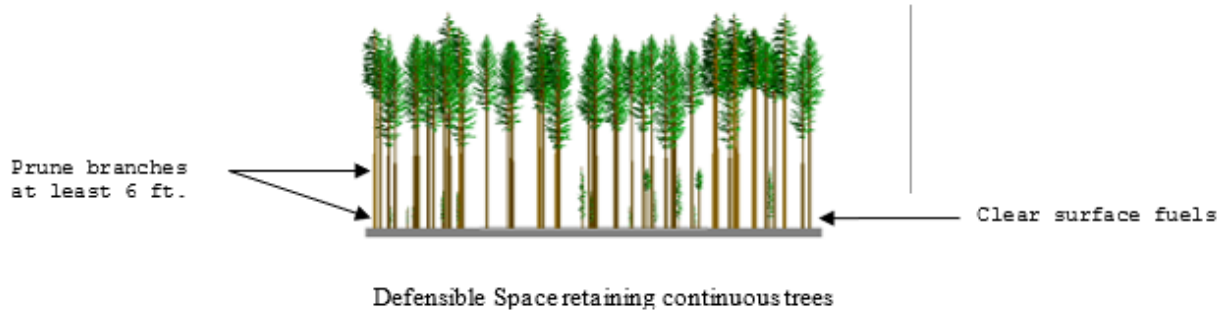
NOTE

Groups of vegetation (numerous plants growing together less than 10 feet in total foliage width) may be treated as a single plant. For example, three individual manzanita plants growing together with a total foliage width of eight feet can be “grouped” and considered as one plant and spaced according to the Plant Spacing Guidelines in this document.

- b. SPACE shrubs PER the following formula:
 - (1) Flat to mild slope (less than 20 percent) - Minimum 2 times height of shrub.
 - Example: If shrub is 2 feet high, space shrubs 4 feet apart (2 ft. x 2 = 4 ft.)
 - (2) Mild to moderate slope (20 to 40 percent) - Minimum 4 times height of shrub.
 - Example: If shrub is 2 feet high, space shrubs 8 feet apart (2 ft. x 4 = 8 ft.).
 - (3) Moderate to steep slope (greater than 40 percent) – Minimum 6 times height of shrub.
 - Example: If shrub is 2 feet high, space shrubs 12 feet apart. (2 ft. x 6 = 12 ft.).
6. To provide Horizontal Spacing based on Continuous Tree Canopy, APPLY the following treatments in Reduced Fuel Zone (Zone 2) to ensure defensible space while retaining a stand of larger trees with a continuous tree canopy:
 - a. Generally, PRESCRIBE removal for all surface fuels greater than 3 inches in height.
 - b. REFER to Figure 4, Continuous Tree Canopy

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Figure 4, Continuous Tree Canopy



(1) ALLOW single specimens of trees OR other vegetation to remain, provided they:

- Are well-spaced
- Are well-pruned
- Create a condition that avoids spread of fire to other vegetation OR to a building OR structure.

c. PRESCRIBE removal of lower limbs of trees (“prune”) to at least 6 feet up to 15 feet (OR lower 1/3 branches for small trees).

d. IF properties have greater fire hazards, such as steeper slopes OR more severe fire danger,

THEN PRESCRIBE removal on lower limbs of trees (“prune”) in the upper end of the range.

7. IF 100 feet of defensible space must be obtained beyond PG&E’s property line, THEN before conducting clearance NRM OBTAIN consent from landowner.

a. IF landowner declines to provide permission to inspect,

THEN NRM only PERFORMS defensible space inspection to property line.

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2.5 Documentation

1. Inspection documentation must include:
 - a. Photo of facility sign if possible.
 - b. A live GPS stamp of the inspection should be recorded at the time of inspection.
 - c. Photos of Defensible Space zones around the facility
 - Photos should be taken from a variety of directions around the facility at a distance sufficient to include the Defensible Space Zone in the foreground and the facility in the background.
 - There should be between four and eight photos around the facility to provide a variety of perspectives.
2. NRM will perform Quality Assurance review of the inspection documents and save them in the system of record.

3 Mitigation work - Defensible Space for Tier 2, Tier 3, Zone 1 HFTD, and HFRA Powerhouse Switchyards, Substations and Equipment

3.1 PERFORM Mitigation based upon inspection findings in Section 2.

1. Natural Resource Management (NRM) PERFORM mitigation work for Defensible Space in Zone 0 – Ember Resistant Zone and Zone 1 - Clean Zone as prescribed by inspection documentation.
 - a. IF unable to mitigate as prescribed in inspection findings AND the residual vegetation listed below are proposed to remain within Zone 0 – Ember Resistant Zone or Zone 1 - Clean Zone:
 - Riparian vegetation OR habitat next to waterbodies for protection of sensitive fish AND wildlife species.
 - Live AND healthy green grasses OR irrigated landscape plants OR areas with existing erosion issues.
 - Single specimens of trees OR other vegetation that are well-pruned AND maintained that are not a threat to switchyard equipment in the event of full OR partial failure.
 - Shrubs AND grass on steep cliffs where NO fuel continuity exists AND worker safety is a concern in rappelling over cliff face.

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THEN Asset Management may EVALUATE vegetation for exception using the process listed in Section 5, "Defensible Space Exception Evaluation Process" for Zone 0 – Ember Resistant Zone and Zone 1 – Clean Zone.

- (1) IF unable to mitigate as prescribed in inspection findings within Zone 0 – Ember Resistant Zone and/or Zone 1 – Clean Zone AND a Defensible Space Exception Evaluation per Section 5 is NOT completed,

THEN communicate reduced defensible space completion status to asset owner in Section 4.1.6.

2. NRM PERFORM mitigation of Zone 2 - Reduced Fuel Zone as inspections dictate.
 - a. IF 100 feet of defensible space must be obtained beyond PG&E's property line,

THEN before conducting clearance NRM OBTAIN written consent from landowner.
 - b. IF landowner declines to provide permission,

THEN NRM only PERFORMS defensible space clearing work to property line.
 - c. IF unable to mitigate as prescribed in inspection findings within Zone 2 – Reduced Fuel Zone

THEN communicate reduced defensible space completion status to asset owner in Section 4.1.6.

4 Work Verification

4.1 PG&E employee OR designated contractor PERFORM the following:

1. COLLECT and RECORD all vegetation treatment data as completed, if verified.
 - a. IF identified as part of inspection,

THEN COMMUNICATE existence of any non-vegetative combustibles (lumber, pallets, boards etc.) within 30 feet of each building OR structure to the responsible maintenance headquarters to be addressed through routine work management process.
2. NRM will provide QA to the inspection and mitigation records to ensure that all information is accurate and thorough.
3. STORE Records of Work Verification data in PG&E managed Hydro Vegetation Management (HVM) database for Power Generation.
 - a. PROVIDE Power Generation official document of record.

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4. STORE Records of Work Verification data in PG&E managed Systemwide Defensible Space (SW-DS) Database for Electric Substation.
 - a. PROVIDE Electric Substation official document of record.
5. NRM will provide a list of sites to SIPT where mitigation work has been completed under Distribution Substation, Transmission Substation, and Power Generation and Powerhouse Switchyards WMP initiatives for a 20% post-mitigation quality control inspection of each category.
6. Annually, PROVIDE defensible space completion status for all facilities inspected as part of this procedure to Substation Asset Strategy AND Power Generation Asset Management for incorporation into the risk prioritization model as part of TD-3328P-01, "Development of the Annual Supplemental Inspection Plan".
7. Reasons for NOT meeting requirements may include the following:
 - a. Worker Safety Concerns OR dangerous working conditions.
 - b. NOT able to obtain permits (including, but not limited to, CA Department of Fish & Wildlife 1600 permit or Army Core of Engineers 404).
 - c. Customer or Agency Refusals - Adjacent property owners or agency (i.e. USFS or BLM land) will NOT allow vegetation management.
 - d. Protection of rare, threatened, OR endangered species AND requirements to protect those species through the following:
 - United States Forest Service (USFS)
 - Bureau of Land Management (BLM)
 - Federal Energy Regulatory Commission (FERC)
 - United States Fish and Wildlife Service (USFWS)
 - California Department of Fish and Wildlife (CDFW)
 - e. Structures on adjacent properties within Defensible Space
 - f. Protection of cultural resources

5 Defensible Space Exception Evaluation Process

- 5.1 IF NRM identifies Defensible Space Not Met in Zone 0 – Ember Resistant Zone and/or Zone 1 – Clean Zone as in section 3.1,

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THEN Power Generation Asset Management OR Substation Asset Management EVALUATE locations where 100% of the defensible space was NOT achieved due to one OR more of the following conditions:

1. Riparian vegetation OR habitat next to waterbodies for protection of sensitive fish AND wildlife species.
2. Live AND healthy green grasses OR irrigated landscape plants OR areas with existing erosion issues.
3. Single specimens of trees OR other vegetation that are well-pruned AND maintained that are not a threat to switchyard equipment in the event of full OR partial failure.
4. Shrubs AND grass on steep cliffs where NO fuel continuity exists AND worker safety is a concern in rappelling over cliff face.

NOTE

Exception review process is initiated by Defensible Space Inspection findings that identify a change to previously established vegetation condition or location.

- 5.2 DOCUMENT residual risk AND alternative mitigation measures implemented following the steps outlined in [LAND-5201P-F01, "Documenting Exceptions and Alternative Mitigation for PGEN Switchyards and EO Substations that have not Achieved 100% Defensible Space"](#).
- 5.3 For exceptions, ESTABLISH an evaluation team comprised of individuals AND subject matter experts (SMEs) to represent the following groups and CONFIRM alignment on [LAND-5201P-F01, "Documenting Exceptions and Alternative Mitigation for PGEN Switchyards and EO Substations that have not Achieved 100% Defensible Space,"](#)
 - Electric Substation Asset Management
 - Natural Resource Management
 - Substation Fire Marshall
 - Power Generation Fire Safety Program Manager
 - Safety Infrastructure Protection Team (SIPT)
 1. ROUTE [LAND-5201P-F01, "Documenting Exceptions and Alternative Mitigation for PGEN Switchyards and EO Substations that have not Achieved 100% Defensible Space,"](#) in the Electronic Document Routing System (EDRS) to document approval for the facility.

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- a. Power Generation OR Substation Asset Management CONSIDER additional measures applied PER [LAND-5201P-F01, "Documenting Exceptions and Alternative Mitigation for PGEN Switchyards and EO Substations that have not Achieved 100% Defensible Space."](#)
 - b. DOCUMENT reduced defensible space remaining in the risk prioritization model as part of TD-3328P-01, "Development of the Annual Supplemental Inspection Plan".
- 5.4 RE-EVALUATE Defensible Space Inspections Exceptions when triggered by one of the following conditions OR on a three (3) year cycle:
1. Drought conditions prevent maintenance of irrigated landscape and plants.
 2. There are equipment additions or changes to a facility layout that affect the defensible space zone map.

END of Instructions

DEFINITIONS

Defensible Space - The area within the perimeter of a facility where basic wildfire protection practices are implemented, providing the key point of defense from an approaching wildfire or escaping fire.

Riparian – means the banks and other adjacent terrestrial environs of lakes, watercourses, estuaries, and wet areas, where transported surface and subsurface freshwaters provide soil moisture to support mesic vegetation.

Surface Fuels - Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branches and downed logs.

Tier 1/Zone 1 consists of Tier 1 High-Hazard Zones (HHZs) from the United States Forest Service (USFS) and California Department of Forestry and Fire Protection (CAL FIRE) joint map of Tree Mortality HHZs. Tier 1 HHZs (CAL FIRE) are in direct proximity to communities, roads, and utility lines, and are a direct threat to public safety.

IMPLEMENTATION RESPONSIBILITIES

Natural Resources Management (NRM) and Land Management is responsible for approving, issuing, and revising this procedure.

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NRM is responsible for implementing this procedure and communicating this procedure to all users.

GOVERNING DOCUMENT

Pacific Gas and Electric Wildfire Mitigation Plan

COMPLIANCE REQUIREMENT / REGULATORY COMMITMENT

Information and Records Management:

PG&E Data, Information, and Records are company assets that must be traceable, verifiable, accurate, and complete and can be retrieved upon request. Functional Areas are responsible for complying with the Information & Records Governance Policy, Standards, and the Information and Records Retention Schedule. Refer to [GOV-7101S, "Enterprise Records and Information Management Standard"](#) for further guidance or contact Information & Records Governance at Information&RecordsGovernance@pge.com.

REFERENCE DOCUMENTS

Developmental References:

- [LAND-4001S "System-wide Facility Vegetation Control"](#)
- TD-7102S "Distribution Vegetation Management Standard (DVMS)
- [TD-7103S "Transmission Vegetation Management Standard"](#)
- [SEC-2010S "Enterprise Perimeter Barrier/Fencing Standard"](#)

Supplemental References:

- [California Public Resource Code Section 4291 \(under the CA Department of Forestry and Fire Protection\)](#)
- [General Guidelines for Creating Defensible Space, State Board of Forestry and Fire Protection \(BOF\) California Department of Forestry and Fire Protection, 2006](#)
- [California Code of Regulations 14 CCR § 1299.03](#)
- [California Public Resource Code \(PRC\) 4292](#)

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- [California Public Resource Code \(PRC\) 4293](#)
- [General Order 95, Rule 35](#)
- [California Public Utilities Commission \(CPUC\) High Fire-Threat District Map](#)
- [California Board of Forestry and Fire Protection – State Responsibility Area \(SRA\) Fire Safe Regulations, Section 1273.10](#)

APPENDICES

N/A

ATTACHMENTS

[F01, “Documenting Exceptions and Alternative Mitigation for PGEN Switchyards and EO Substations that have not Achieved 100% Defensible Space”.](#)

[Att01 “Process Flow”](#)

DOCUMENT REVISION

This document supersedes LAND-5201P-01, Electric Substation and Power Generation Powerhouse and Switchyard Defensible Space, Rev. 3 dated 11/09/2023.

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REVISION NOTES

Where?	What Changed?
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Section 2	Changed language to reflect ACTIONS referring to the inspection process rather than the maintenance process
2.3	Added Zone 0
2.3	Removed Exception Evaluation Process from Zone 0 and Zone 1
2.4.2	Added language to PERMIT vegetation formerly required to go through exception process in Zone 2
2.5	Added to reflect new required documentation during the inspection
2.5.1	Added photos that must be documented including facility sign and specific instructions for photos taken in DS zones and recording of live GPS coordinates
2.5.2	Added NRM requirement of QA process
Section 3	Added to discuss mitigation requirements base upon findings of inspections
4.1.2	Added to reflect NRM's responsibility of QA/QC of inspection and mitigation reports
4.1.7	Describe some situations why full defensible space completion could not be achieved
5.1	Added language to describe exception process is only for Zone 0 and Zone 1