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Eucalyptus and Monterey Cypress Tree Failure Analysis and Risk Assessment

Prepared for:

Bolinas Community Public Utility District
270 Elm Road
Bolinas, CA. 94924

Prepared by:

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ASSIGNMENT:

Ray Moritz, Senior Urban Forestry Consultant for Urban Forestry Associates (UFA), was contacted by Jennifer Blackman, General Manager of the Bolinas Community Public Utility District (BCPUD) to inspect several sites for the cause(s) of tree failures and the potential risk of associated trees. Ray Moritz is a SAF Certified Forester #241, NW ISA Chapter Certified Tree Risk Assessor, and ISA Tree Risk Assessor Qualified (TRAQ). I inspected the 270 Elm Road and the East Mesa Road X Olema Bolinas Road grove (aka Zone 5) sites on numerous occasions from January,1983 to July 12, 2023. I inspected the 290 Mesa Road "tank farm" trees on May 12, 2023 and July 5, 2023.

LOCATIONS:

1. 270 Elm Road - (Cypress trees along the west side of Elm Rd. and north side of Nymph/Jute Road)
2. East Mesa Road eucalyptus grove (70 Mesa Road to 16 Olema Bolinas Road)
3. 290 Mesa Road (along frontage of water tank facility)

TREE RISK ASSESSMENT:

Risk assessment is the analysis of the likelihood of a failure event and the severity of potential consequences. Tree risk assessment combines the likelihood of a tree failure and impacting a target with the severity of its associated consequences (personal injury, property damage, or disruption of activities). All trees or tree parts have some level of risk is they are likely to impact a target of significant value. Where there is no target of significant value, there is no risk. The level of risk aversion of the tree owner or property manager determines what action, if any, is taken. The manager also decides what trees are to be assessed and the level of assessment. The role tree risk assessor is to identify, analyze and evaluate tree risk, and recommend mitigation or abatement practices. Recommendations may also include target management practices.

Levels of Risk Assessment (as defined by the ANSI A300 Standards for Tree Care Operations)

- Level 1 - Limited Visual: A limited visual risk assessment is sometimes referred to as a *walk by* or a *drive by* assessment. It is most common in urban forest scenarios where trees are abundant and resources for inspection are relatively scarce. A limited visual is not necessarily a complete 360-degree inspection and may be employed in situations where access is limited. Professionals conducting a limited visual assessment identify high-risk trees that are mitigation priorities. This level of assessment is the most common level used by cities, government agencies and large forested property owners. This level assessment may include recommendations for higher assessment levels for specific trees.

- Level 2 – Basic Visual: A basic visual assessment is a 360-degree inspection from the ground that is more thorough and typically includes height and diameter measurements. An assessor may use binoculars for crown inspections, a mallet for sounding hollows, a probe for inspecting cavities, and other common tools to conduct the inspection. This is the most common level used on residential properties.

- Level 3 – Advance Assessment: An advanced assessment can be an aerial assessment or an assessment that includes quantitative decay detection, health evaluation, wind load assessment, and static load assessment. Given the more advanced tools and methodologies employed, this service is often offered at a premium to the customer and typically reserved for heritage or high value trees.

The recommended level for this assessment was a Level 1 inspection, but in practice a Level 2 inspections were performed on trees with serious defects targeting sites with moderate or frequent occupancy, potentially medium to high impacts, with potentially significant to severe consequences. (See Figure below)

Target Occupancy Rates:

1. Constant: Target(s) is or are constantly present or a steady stream of mobile targets in the target zone.
2. Frequent: A target that is occupied during a large portion of the day or week. A target zone with moderate volumes of traffic such as, a suburban street, playgrounds or sidewalks in shopping areas.
3. Occasional: Sites infrequently occupied by targets of value, such as country roads, low-use foot paths, or low-use sections of parks.
4. Rare: Rarely used trails or roads, remote areas of parks, areas with low mobile occupancy resident time for only part of the day, such as a low-use trail or country road with virtually no use at night.

Risk Categorization

Condition number	Tree part	Conditions of concern	Part size	Fall distance	Target number	Target protection	Likelihood												Consequences				Risk rating of part (from Matrix 2)
							Failure				Impact				Failure & Impact (from Matrix 1)								
							Improbable	Possible	Probable	Imminent	Very low	Low	Medium	High	Unlikely	Somewhat	Likely	Very likely	Negligible	Minor	Significant	Severe	
1																							
2																							
3																							
4																							

Matrix 1. Likelihood matrix.

Likelihood of Failure	Likelihood of Impacting Target			
	Very low	Low	Medium	High
Imminent	Unlikely	Somewhat likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2. Risk rating matrix.

Likelihood of Failure & Impact	Consequences of Failure			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Target Occupancy rates:

1. 270 Elm Road: Frequent occupancy by partially protected targets (people in cars), occasional use at night, except during events. Frequent occupancy for parked cars during the day and frequent occupancy for people protected by vehicles or the building.

2. Nymph/Jute Road: Occasional occupancy for exposed people. Frequent occupancy for protected people. Constant occupancy by house, but low impact with minor consequences.

3. 290 Mesa Road: Occasional occupancy by mobile targets during the day by partially protected people. Rare occupancy at night by mobile targets with partially protected people.

4. 70 Mesa Road to 16 Olema Bolinas Road: Frequent use by mobile targets with partially protected people. Occasional use late night to early morning by mobile targets with partially protected people.

5. "Zone 5" east Mesa and Olema Bolinas Roads Eucalyptus Grove trail and bike path: Occasional occupancy by mobile, exposed people during the day, rare occupancy at night.

Disruption of Activities:

1. 270 Elm Road: Moderate disruption.

2. Nymph/Jute Road: Minor disruption.

3. Maple Road: Moderate inconvenience.

4. 290 Mesa Road: Highly significant impact.

5. Travel along East Mesa Road from 70 Mesa Road to Olema Bolinas Road: Highly Significant disruption.

6. Olema Bolinas Road from Masa Road to 16 Olema Bolinas Road: Highly Significant disruption.

7. Emergency access/egress: Highly significant disruption and delays.

SPECIES CHGRACTERISTICS:

Blue Gum (*Eucalyptus globulus 'globulus'*) WCISA group #4 class coast #5, inland #3

Tasmanian Blue Gum (*Eucalyptus globulus 'globulus'*), commonly known as Blue Gum is a shallow rooted species, often with poor anchorage relative to the height and mass of mature trees. This species frequently grows rapidly to a mature height and canopy spread far greater than the available growing space in urbanized landscapes. It is one of the fastest growing trees in the world. This species resprouts prolifically from dormant buds below the bark when it is been aggressively topped or cut to a stump.

This species is one of the more failure prone species in northern California, along with Monterey pine, coast live oak and Monterey cypress. It has heavy wood and is prone to developing over-extended limbs. Tasmanian Blue Gum may grow rapidly to a mature height and spread far greater than the available growing space. It sprouts prolifically from dormant buds below the bark when it has been aggressively trimmed or topped.

Fire hazard studies have found that Blue Gum produces more dead and down material (branches, exfoliated bark, twigs and leaves) per annum than any other species in California. It contains approximately 8,500 BTU's to the pound and an unmaintained mature forest may contain 30.84 tons per acre of down and dead debris.

The leaves and bark contain high amounts of volatile oils. It has deciduous bark that may litter the ground around the tree, collect in crotches and persist in long hanging strips on the trunks and branches. Unmaintained Blue Gum forest may support high intensity fire and is highly prone to "fire brand" production that can ignite wildland, landscape and structural fuels well ahead of the flame front.

Excerpt from Gilman, E.F. 1997. Trees for Urban and Suburban Landscape. Delamar Publishers. Albany, NY.

Height: 60 to 165 feet
Width: 30 to 80 feet
Form: strongly decurrent (spreading umbrella canopy); massive trunk and limbs
Fruit: persistent, woody capsule
Growth Rate: rapid, 36 inches per year
Habit: decurrent; evergreen, moderate density; symmetrical; course texture
Light Requirements: full sun
Heat Tolerances: can tolerate cool coastal or intense heat
Soil Tolerances: all textures; slightly alkaline to acidic; droughty
Pest Problems: Eucalyptus Longhorn Borer tortoise shell beetle, psyllid
Diseases: Armillaria, Phytophthora root rots
Pruning Requirements: needs occasional safety pruning, deadwood removal
Limb Breakage: medium weak
Water Requirement: No irrigation to moderate water once established
Climactic Zones: Sunset Western Garden Book Zones: 5, 6, 8-24; H1, H2

Monterey Cypress (*Hesperocyparis macrocarpa*) WCISA group #2 class coast #3, inland #3

Monterey cypress is considered to long-lived but its life and utility in the urban environment may be much shorter. “Trees from 14 to 19 inches in diameter are from 60 to 85 years old. Some of the larger trees are doubtless over 200 years old.” “It is most important as one of the rare forest trees capable of forming a cover on the wind-swept coast.” (1908, Sudworth, “Forest Trees of the Pacific Slope) It is highly valued for its dense, dark green foliage, its spreading, craggy, contorted form, and its rapid growth up to maturity but it can be maintained as a clipped hedge.

This tree is well-adapted to developed sites. It can thrive under an extraordinary amount of site development. This species is one the most commonly used landscape trees in California. It is typically recommended as specimen tree but also as a hedge or windbreak. Under ideal conditions it lives for more than 200 years but in many urban settings its useful life may be 100 years or less.

Height: 40 to 80 feet (often pruned to a lower height by sea blast).
Width: 25 to 35 feet
Form: strongly pyramidal in youth; developing a massive trunk and limbs
Fruit: persistent, woody one inch round cones
Growth Rate: rapid, 36 inches per year
Habit: excurrent in youth, becoming decurrent at maturity; evergreen, moderate density
Light Requirements: full sun to partial
Heat Tolerances: can tolerate cool coastal or heat
Soil Tolerances: prefers well-drained, but tolerates all textures; slightly alkaline to acidic; droughty
Pest Problems: Cypress Tip Miner, cedar, and cypress Bark Beetles, and termites.
Diseases: Armillaria root disease**,** Phytophthora root rots, cypress canker (Cytospora cardinale), Coryneum Canker, brown-rots enter through wounds and fractures
Pruning Requirements: needs occasional safety pruning in advanced age, poor would closure.
Limb Breakage: medium weak, often forming poor attachments
Water Requirement: Irrigate until established; no irrigation once established
Climactic Zones: Sunset Western Garden Book Zones: 17, 16 and 15

1. Excerpt from Gilman, E.F. 1997. Trees for Urban and Suburban Landscape. Delamar Publishers. Albany, NY
2. SelecTree. UFEI. "Hesperocyparis macrocarpa Tree Record." 1995-2023. Cal Poly State University, San Luis Obispo. Accessed on Jul 22, 2023. https://selectree.calpoly.edu/tree-detail/476

270 ELM ROAD RISK ASSESSMENT

Limb and whole tree failures have been occurring in this cypress boundary/roadside planting for many years. The major storms of 1982, 1983, 1986, 1995, 2005/2006, 2016/2017, the 2013-2016 drought, the 2020-2022 drought and now in 2023 seven atmospheric rivers and two other severe storms have all hade significant pact on these trees, weakening their stability with a long chain of storm blasts. These environmental impacts are in addition to the fact that these Monterey cypresses have far outlived their utility life expectancy.

Like many Monterey pine, Monterey cypress and blue gum wind rows or boundary plantings, these trees were planted too close to one another, causing them to interfere with each other's root systems as well as providing very limited growing space for canopy spread (See Figures 2, 3 & 4). Consequently, there has been severe competition for light and growing space resulting in excessive height growth and unbalanced canopies (See Figures 3 & 4). The canopies have been "lion's tailed" by competition and lower limb failures. This created tall lever arms exerting force on the inadequate root systems and resulted in long trunk and branch wave lengths under wind loads. The remaining trees are now at maximum height for the species, 85 feet. (See Figure 3)

The depletion down to just 17 trees remaining from the original planting of about 50 trees along these two roads attest to the common structural defects of the entire windrow.

Recommendation: Directional fell the entire windrow into the field. Remove and chip branches for fire prevention. If the border planting is replaced consult a consulting arborist about species selection and spacing.

Figure 1 – The crowded planting of the cypress boarder planting allowed little room for root growth.

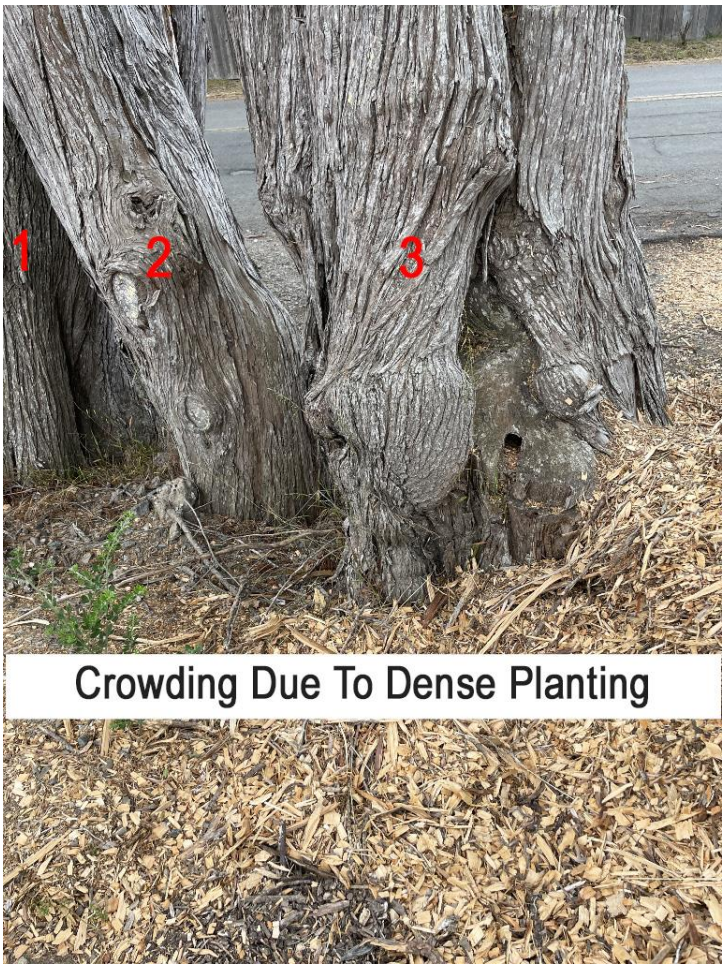


Figure 2 – The crowding of the trees has led to abnormal root and canopy development.

Figure 3 - Competition for growing space has led to excessive height growth, lion's tailing and lever force on the compromised root systems.

Figure 4 - Lack of adequate growing space has asymmetric canopies with over-extended limbs and in many cases lion's tailed branches.

290 MESA ROAD EUCALYPTUS WINDROW

The Blue Gum Eucalyptus windrow along the 290 Mesa Road tank farm was planted too densely. The high density caused some trees to be dominant over less vigorous trees that became suppressed. (See Figure 5) Crowding also caused inadequate canopy growing space, which deformed the canopies and individual branches. (See Figure 6) The east-west orientation of the windrow and a second windrow across the road also contribute to the poor form and vigor of the trees.

The health and stability of the windrow can be improved by removing subordinate/suppressed trees and safety pruning the trees recommended for retention.

Methods:

Transect: A transect (measured line along which trees are located) was started at the east end of the windrow at the center of Tree 1 and continued west 246 feet to tree number 17. A transect number was taken for each tree at the approximate center of each tree. Notes were taken of the tree numbers and recommended pruning or removals.

Photographs were taken of the bases and canopies of the trees. The photographs were then marked for the recommended pruning. (See APPENDIX A)

Figure 5– Suppressed trees left, dominant tree center, deformed tree right.

Figure 6- Crowding resulted in crossing branches and asymmetric canopies.

290 Mesa Rd. Tree Data:

Tree 1:

Transect: 000.0'	T-1 is the east most tree in the windrow, closest to the gate to the tank area.
Condition:	T-1 is a dominant tree. It has two over-extended limbs to the south (S) & southeast (SE)
Recommendation:	Shorten these tow limb with reduction cuts. See APPENDIX A Photos 1 & 2

Tree 2:

Transect: 022.0'	T-2 is less crowded than many of the trees in the windrow, but the canopy is overtopped
Condition:	T-2 is in the intermediate crown class. Crowded canopy. Two over-extended branches.
Recommendation:	Shorten two over extended limbs with reduction cuts. See APPENDIX A Photo 2

Tree 3:

Transect: 040.0'	T-3 is dominant and crowds both T-2 and T-3b. There is a stump between T-3 and T-3b.
Condition:	T-3 is asymmetric to the SE. It has one massive over-extended limb to the ESE into T-2
Recommendation:	Remove the over-extended limb extending ESE into the canopy of T-2

Tree 3b:

Transect: 048.5'	T-3b is severely crowded by T-3 & T-4. See APPENDIX A Photo 3
Condition:	T-3b is suppressed and malformed. It has two leaders with a weak acute angle crotch
Recommendation:	The subordinate leader could be removed or it could be removed, benefiting T-3 & T-4

Tree 4:
Transect: 061.0' T-4 is a dominant tree that suppresses T-3b, T-5 and T-6. APPENDIX A, Photo 5
Condition: T-4 has an asymmetric canopy to the south and has 3 over extended limbs to the S.
Recommendation: Reduce the asymmetry with reduction cuts on the three over-extended limbs. Photo 6.

Tree 5:
Transect: 066.5' T-5 is severely suppressed by T-4. See APPENDIX A, Photo 5
Condition: T-5 is suppressed and over-extended with poor taper. Photo 6
Recommendation: Remove and well cover stump with black plastic topped by black geotextile to kill..

Tree 6:
Transect: 069.0' T-6 is severely suppressed by T-4. See APPENDIX A, Photo 5
Condition: T-6 is suppressed and over-extended with poor taper. Photo 6
Recommendation: Remove and well cover stump with black plastic topped by black geotextile to kill..

Tree 7:
Transect: 078.0' T-7 has a Dominant Canopy height over T-5 & T-6. See APPENDIX A, Photo 5
Condition: T-7 has a relatively small canopy behind T-8
Recommendation: No Action necessary.

Tree 8:
Transect: 090.5' T-8 is a dominant tree. It forces T-9 to the north and the T-9 canopy to the west. Photo 7
Condition: T-8 is rooted at the base of the cut bank and has cracked the pavement. Its canopy is asymmetric to the south over the road. It has 4 over-extended limbs over the road.
Recommendation: Remove one limb with poor taper and reduce three as shown in Photo 8.

Tree 9:
Transect: 096.0' T-9 is rooted close to and somewhat behind T-8. APPENDIX A, Photo 7.
Condition: T-9 has been extensively pruned in the past. Its canopy is asymmetric to the west.
Recommendation: Reduce one SW extending limb See Photo 8.

Tree 10:
Transect: 115.0' T-10 is rooted within a few feet of T-11 and is in the suppressed crown class. Photo 9.
Condition: It is subordinated/suppressed by T-11 and has a small canopy to the north of T-10.
Recommendation: Remove and well cover stump with black plastic topped by black geotextile to kill.

Tree 11:
Transect: 121.0' T-11 is in the dominant crown class.
Condition: T-11 has four over-extended limbs with poor taper. See APPENDIX A, Photo 9
Recommendation: Remove one over-extending limb to the south and reduce one limb. Photo 10

Tree 12:
Transect: 130.5' T-12 is highly suppressed between T-11 and T-13 See APPENDIX A, Photo 11
Condition: T-12 is a highly suppressed stump sprout (second growth) Photo 11.
Recommendation: Remove and well cover stump with black plastic topped by black geotextile to kill.

Tree 13:
Transect: 139.5' T-13 is a codominant two stem tree. See APPENDIX A, Photo 11
Condition: It has one south over-extended branch with poor taper. See Photo 12
Recommendation: Reduce over-extended branch. Photo 12

Tree 14:
Transect: 149.0' T-14 is rooted close to T-15 and slightly up slope. See APPENDIX A, Photo 13
Condition: It is forced to the north by the more dominant Trees 13, 15 & 16. See Photo 14.

Recommendation: No action necessary on T-14..

Tree 15:
Transect: 153.0' T-15 is rooted down the cut bank. See APPENDIX A, Photo 13
Condition: It has one SW over-extending limb. See Photo 14.
Recommendation: Reduce the over-extended limb as shown in Photo 14.

Tree 16:
Transect: 164.0' T-16 is upslope and NW of the base of T-15 See APPENDIX A, Photo 13
Condition: It has one over-extended limb to the south.
Recommendation: Remove over-extended limb as shown in Photo 14.

Tree 17:
Transect: 246.0' T-17 stands alone 80 west of T-16 See APPENDIX A, Photo 15
Condition: T-17 has two trunks, one of which is heavily bowed to the SW. See Photo 15.
Recommendation: Remove SW bowed trunk.

EAST MESA ROAD GROVE (ZONE 5)

This approximate seven acre grove largely composed of Blue Gum Eucalyptus (*Eucalyptus globulus 'globulus'*) has expanded from Mesa and Olema Bolinas roadside plantings of Blue Gums and Monterey Cypresses on both BCPUD and private properties, and has been under active management of many years. In 1964 PG&E cut back the Mesa and Olema Bolinas roadside Blue Gums to high stumps that sprouted second growth stems which are now over-mature. Pacific Slope Tree Cooperative, founded in 1978, has safety-pruned these roadside trees for decades, particularly after severe storm years. In 2011 debris and undergrowth were removed and the stand was aggressively thinned for fire hazard mitigation.

During the almost unprecedented 2022/2023 storm season of seven atmospheric rivers and two other severe storms, soils became highly saturated and heavy sea blast up to 100 mph caused the failure of numerous Monterey Cypresses and Blue Gum Eucalyptuses throughout the San Francisco Bay area and beyond.

Private and BCPUD trees in the east Mesa Road stand failed.

March, 2023 Gaman report: The Bolinas Eucalyptus Project Inventory: Zone 5

Tom Gaman, a highly respected Registered Professional Forester, produced an inventory and a diagnosis of the "Zone 5" Eucalyptus grove. His survey and analysis is rigorous and thorough. However, I believe he makes a number of errors, or attributes the conditions of some original roadside trees to the entire grove.

Mr. Gaman typifies the East Mesa grove as a stand in decline or senescence due to drought, winds, over-crowding, over-maturity, disease and poor management practices, such as topping to high stumps and then allowing unrestrained sprout growth. Below please find my counter opinions:

- While the original planting of roadside trees may date back to the early 1900s, the majority of "volunteer" trees are much younger than the original roadside trees.
- While he states that "Today Eucalyptus trees have grown up to 170 feet tall and many are over 60" in diameter at breast height." ***Only the original roadside trees reachhave grown to 60" in dimeter. The vast majority of trees in the grove are far smaller. The 63" tree that fell was a road side tree on private property. Three other Mesa road side trees located on private property also fell.***
- Mr. Gaman's statement that in 2023 over a few days, storms "… blew down 24 large trees measuring up to 63" in diameter." ***Actually, one approximate 63" diameter Blue Gum tree on the edge of a ponding area on private property fell due to poor soil cohesion due to saturation, poor canopy***

balance and root disease. The majority, if not all, of the BCPUD trees in this failure zone were not blown down. They were felled by the impact of the massive original growth tree that fell from the private property. I counted 15 BCPUD trees that were felled by this "domino effect".

Of the other BCPUD trees that suffered storm related failures, most were "edge trees" around a small meadow in the NE corner of the grove and across the grove on the south side of the lower grove. Fewer then ten trees fell due to a combination of seven atmospheric river storm blast events, extreme soil saturation, poor root to shoot ratio, and root and canopy decline due to recent droughts.

- Mr. Gaman did consider the potential for tree or branch failure. ***However, he is not a qualified tree risk assessor (ISA TRAQ qualified), and he did not conduct a standard tree risk assessment.***
- He concluded the 69% of the surveyed trees (greater than 19.5 " DBH) had "some local target", and "Fifty-nine percent of the trees could potentially impact a road or trail." ***However, he did not differentiate between the "local targets" which are not equivalent to one another, and he did not address the likelihood that a tree would impact a failure zone when a significant target was present. A road or trail is not a significant target unless it is occupied by a significant target such as a hiker, a bicyclist, driven vehicle or pedestrian. A low use trail, particularly during a storm, has a very low probability of harm.***
- Mr. Gaman thoroughly documents the over-stocking of the stand which is a significant issue for tree health and form. ***Stand density has been an issue for years in the East Mesa Grove. That is why it has been thinned twice, once in 1989 and again in 2011. While stand density is an important issue, canopy and root decline is also caused by drought and prolonged soil saturation. Additional thinning should be considered in ongoing stand management.***
- Turning his attention to fuels and fire behavior, he cites the role of Eucalyptus fuels as a contributing factor to the intense fire behavior in the 1991 Oakland/Berkeley "Tunnel Fire". ***The initial fuels of the Tunnel Fire were brush, an unfinished structure, habited structures and Monterey pine forest. Fire modeling has ignored the role of houses (zero enthalpy), but residential structures have many times the enthalpy (combustion heat yield) of forest types, including Eucalyptus. This is not to say that Eucalyptus crowning fire did not play an important role in the Tunnel Fire, but canopy fire can be controlled with undergrowth management, especially where the trees have high canopies. The 2011 thinning and undergrowth management significantly reduced the possibility of canopy fire in the grove. After the 2011 fire management treatment most of the grove was comparable to a Wright and Vihnanek EBE 2 level. Measuring understory branch debris and grass fuels after a series of severe storms does not provide an accurate picture of long-term fuel loading and architecture. Ongoing undergrowth management is critical to reduce the probability of crowning fire to a low level of significance. My inspection of the grove indicates that most of the grove is still at a EBE 2 level (8.2 tons per acre)*** **(See Figures 7, 8 & 9)**

June 21, 2023 Julin Eucalyptus Hazard Assessment and Management Recommendations Zone 5

Kent Julin an experienced, respected Registered Professional Forester and ISA Certified Arborist. He came to many of the same conclusions regarding tree health and stability as Tom Gaman.

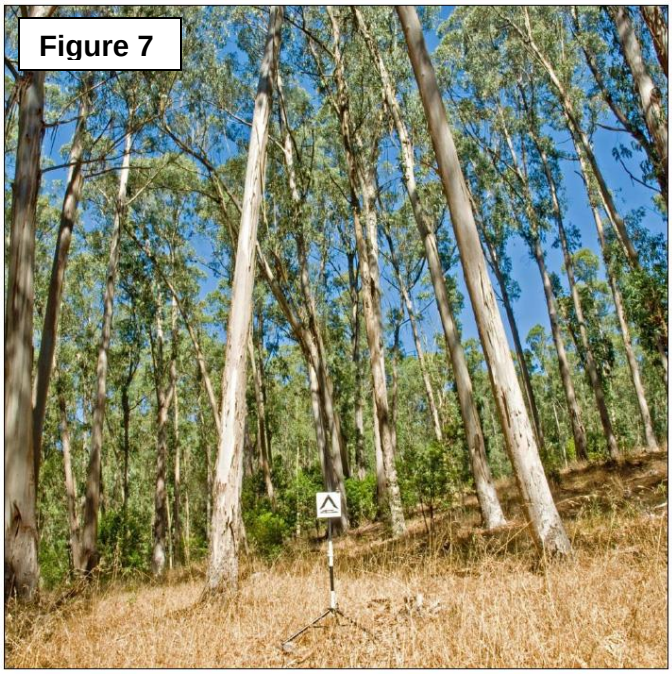
►Mr. Julin concludes tree taper and vigor were in decline due to a Eucalyptus Tortoise Beetle infestation. **Our close examination of the fallen leaves, leaves attached to fallen trees, and living leaves on standing trees indicate that Tortoise Beetles are not a significant defoliator in the grove. Canopy decline is more likely related to recent droughts and low taper is more likely due to stand density.**

►He concludes that "a strong earthquake would cause the high stump second growth trees to fail. **While UFA agrees that these trees have an elevated risk of failure, there are no published studies of tree stability under earthquake acceleration. I have studied earthquake photography and found such relationship.**

►Regarding the potential for severe wildfire behavior Mr. Julin acknowledges that high fire hazards are due to "leaves, bark and branches that collect in the understory." **UFA recommends ongoing understory clearling.**

EBE 02 EAST BAY EUCALYPTUS FOREST

Figure 7



EBE 03 EAST BAY EUCALYPTUS FOREST

Figure 8

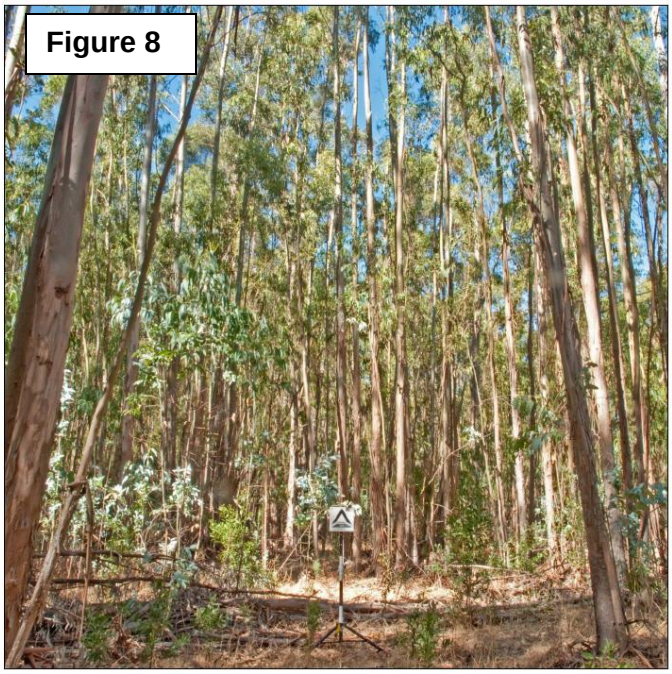


Figure 9 - Grove Fuels in May, 2023 – Comparing grove fuels to Wright and Vihnanek Fuel load photo series.

PEER REVIEW CONCLUSIONS:

►While I do not agree with some of the conclusions of my colleagues. I find their alarmist and dramatic references to the Oakland Tunnel Fire and the Paradise Camp Fire were neither necessary or accurate. The Oakland Berkeley Tunnel Fire zone had high development densities mixed with fire prone urban forest. The Camp fire was on a butte in the Sierra foothills where extremely low humidity, high temperatures and poor over-night fuel moisture recovery prevails. Also, the fuel types were quite different. The forest types were dominated by Ponderosa pine and Douglas fir. UFA has done extensive consulting work on both of these fires. We have worked in Magalia and Paradise for three years. Both Magalia and Paradise had rough topography with steep ascending canyons, and areas of dense development. The forest and chapparal fuels were significantly different than the Bolinas urban forest and coastal scrub. The comparison to these devastating fires in their reports was obviously intended for more dramatic effect than for reasoned fire behavior analysis.

►That being said, I find that Mr. Gaman's data collection, research in his report are an important and useful resource for ongoing management of the East Mesa Grove.

►Mr. Julin's report states that he "prioritized treatment of 13 other Eucalyptus stands in Bolinas". Yet neither he nor Mr. Gaman prioritized treatments of the "Zone 5" stand. I would he would do the same for Zone 5.

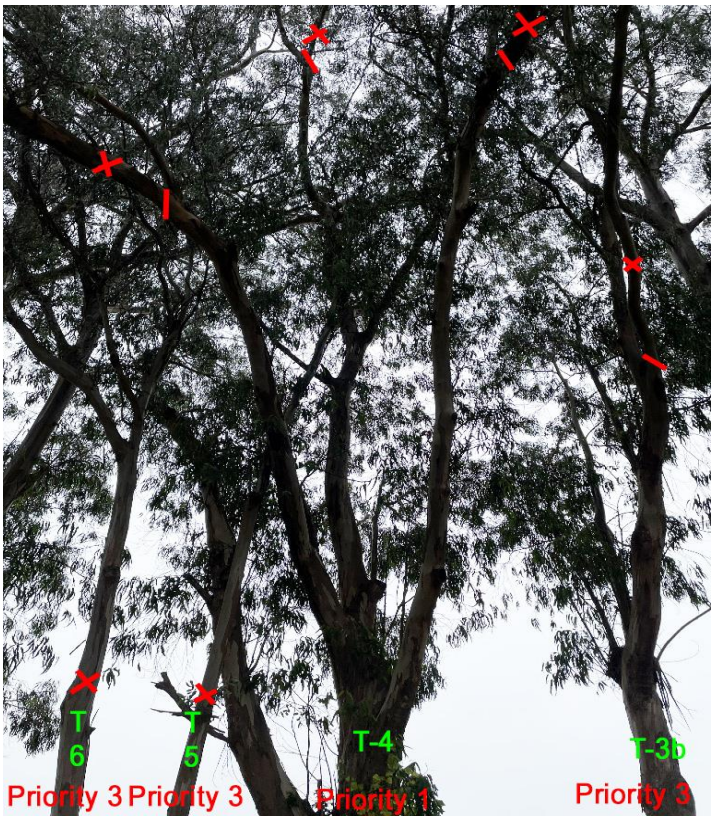
EAST MESA GROVE FAILURE ANALYSIS:

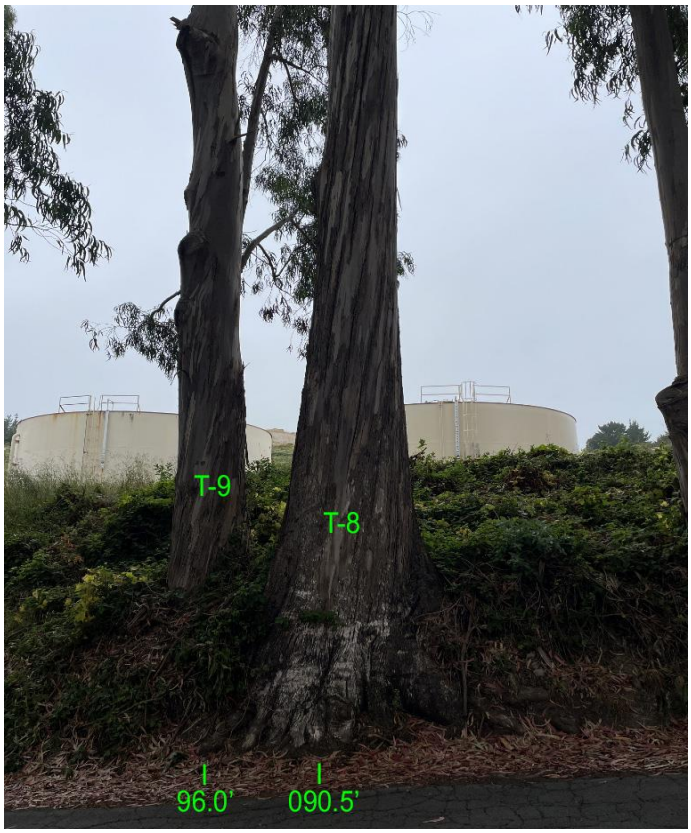
Urban Forestry Associates conducted an ISA Tree Risk Assessment of selected trees in the grove on July 5th & 6th 2023. For this assessment we inspected the trees and tree parts for structural defects. We rated the targets, tree defects, the likelihood of target impact, the severity of consequences, and prioritized our recommendations for risk mitigation.

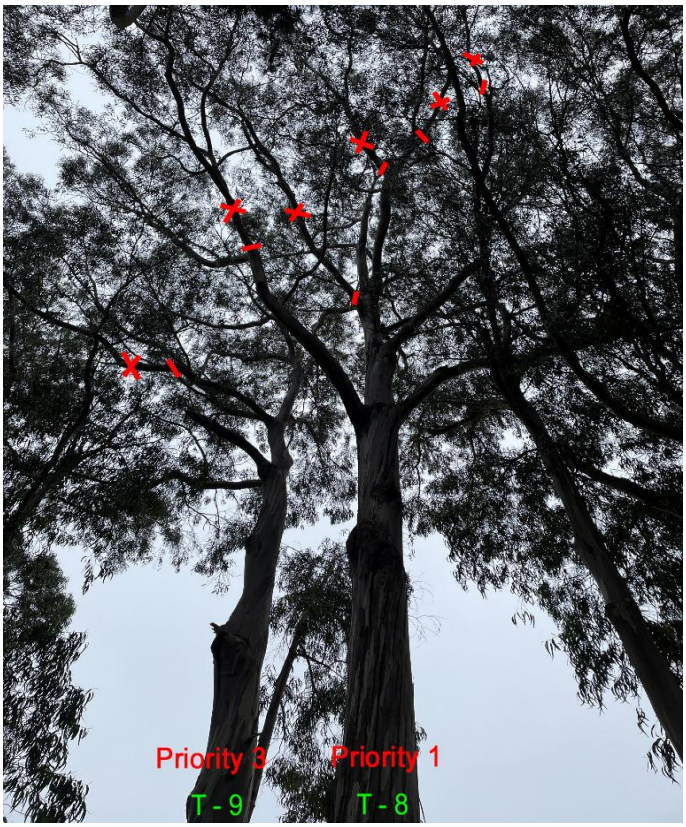
A. The relatively low use of the trails, the fact that the trails are at most rarely used at night and during storms, and the fact that the potential targets are in motion indicate that the probability of impact to a trail target is very low. The potential for harm to people or property is quite low. Therefore, the priority for risk mitigation should be focused on Mesa and Olema Bolinas roads.
B. The original roadside trees that were cut to high stumps and allowed to sprout deserve special consideration. They should be removed, or Level 3 inspections should be conducted of the sprout attachments. We have made recommendations for branch failure mitigation on the basis of Level 1 and Level 2 inspections.
C. Trees that were not numbered in the Gaman survey but were inspected and recommendations were made were tagged by UFA and listed in our spread sheet. (See attached pdf of our spreadsheet)
D. We have made our recommendations based on the assumption that the removal of the entire grove and forest type conversion is not feasible at this time and a prioritized tree risk mitigation plan is the only particle approach.
E. We have provided a list of practical actions to significantly reduce risk to people and property. UFA's recommendations and prioritizations are presented in the attached pdf spreadsheet.
F. We urge the BCPUD to consider what their long range goal is for the East Mesa Grove. If long term retention of the grove is the goal, then long term progressive thinning, annual ground and shrub layer fuels removal, and regular tree risk reduction inspections be conducted every 3 years and after severe storm seasons.

APPENDIX A – 290 MESA ROAD TREE RISK MITIGATION PHOTOGRAPHY


T-7
T
6
T
5
T-4
078.0'
069
066.5'
061.0'


T
6
T
5
T-4
T-3b
Priority 3
Priority 3
Priority 1
Priority 3

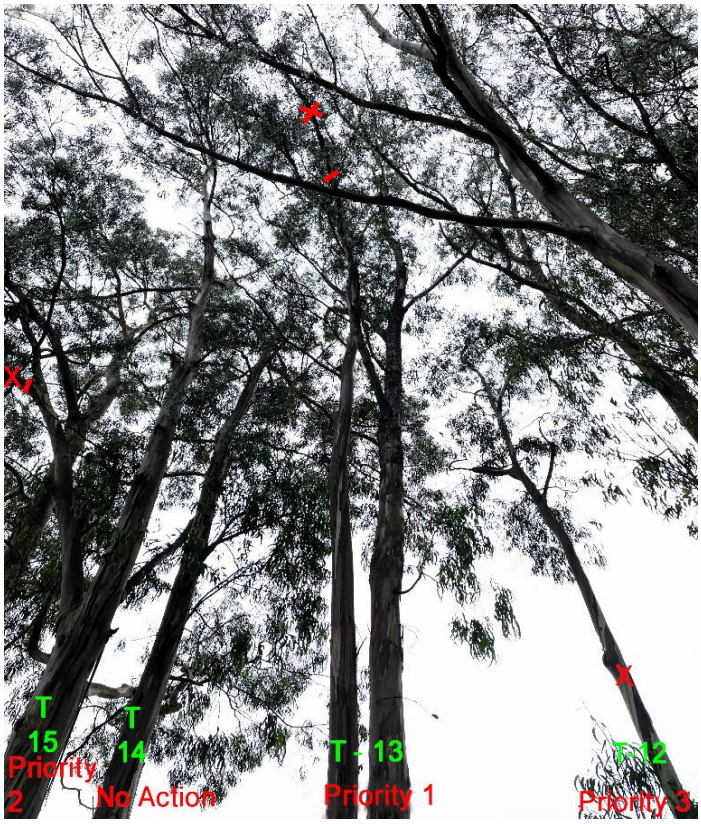

T-9
T-8
96.0'
090.5'

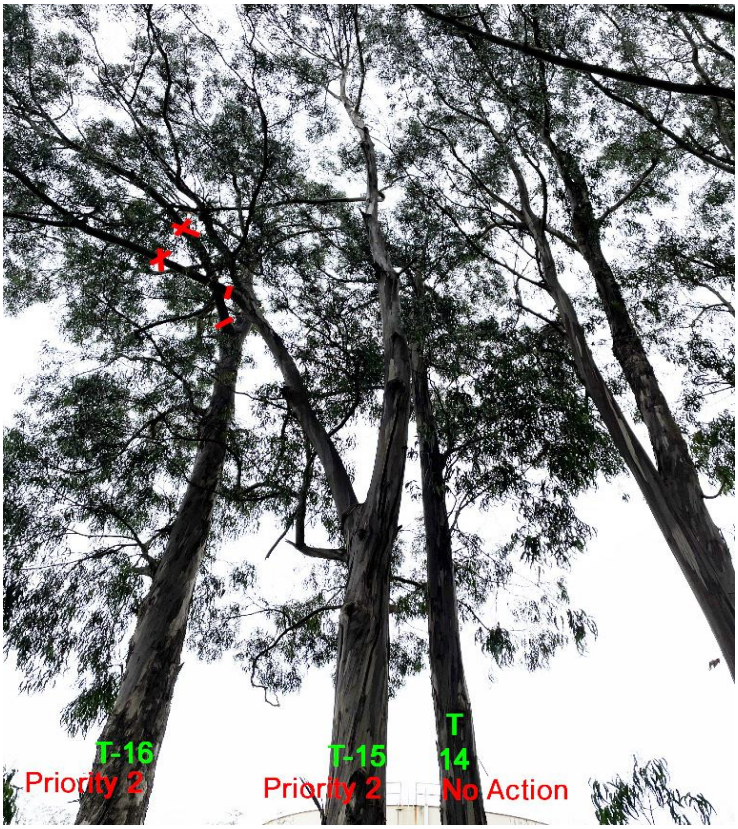

Priority 3
Priority 1
T - 9
T - 8


T-11
T-10
121.0'
115.0'


T-11
Priority 2


T-13
T-12
T-11
139.5'
130.5
121.5'


T 15
Priority 2
T 14
No Action
T - 13
Priority 1
T-12
Priority 3



SCOPE OF WORK AND LIMITATIONS

All observations regarding trees in this report were made by UFA, independently, based on our education and experience. All determinations of health condition, structural condition, or hazard potential of a tree or trees at issue are based on our best professional judgment. The health and hazard assessments in this report are limited by the visual nature of the assessment. Defects may be obscured by soil, brush, vines, aerial foliage, branches, multiple trunks or other trees. Even structurally sound, healthy trees are wind thrown during severe storms or fail due to other weather conditions. Consequently, a conclusion that a tree does not require corrective surgery or removal is not a guarantee of no risk, hazard, or sound health.

Information regarding property boundaries, land ownership, and tree ownership was evident from property description.

TREE WORK STANDARDS AND QUALIFICATION

All tree work, removal, pruning, planting, shall be performed using industry standards as established by the International Society of Arboriculture. Contractors must have a State of California Contractors License for Tree Service (C61-D49) or Landscaping (C-27) with general liability, worker's compensation, and commercial auto/equipment insurance.

Contractor standards of workmanship shall adhere to current Best Management Practices (where possible) of the International Society of Arboriculture (ISA) and the American National Standards Institute (ANSI) for tree pruning, fertilization and safety (ANSI A300 and Z133.1). However, safety is the primary goal.

Ray Moritz, SAF Certified Forester #241
ISA Qualified Tree Risk Assessor

Zachary Vought, Urban Forester
Registered Consulting Arborist #691
ISA BCMA WE-9995B

DRAFT