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September 6, 2021

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Los Angeles, CA

Ms. ******:

I have prepared a report summarizing my risk assessment of one blue gum eucalyptus (*Eucalyptus globulus*) tree in the front yard of ******. I performed a ground-based all-visual inspection of the subject tree on Thursday, September 2, 2021 at 8:30am. In the risk assessment described below, I concluded that *the risk posed by the tree over the next one year time frame is low*.

I performed a Level 2 Basic Risk Assessment of the subject tree. I assessed the risk posed by the tree to five targets:

(1) the house,
(2) vehicles traveling on the street,
(3) vehicles parked in the driveway,
(4) pedestrians walking along the street or in the yard, and
(5) understory trees and plants.

I assessed two tree parts for likelihood of failure:

(1) the whole tree and
(2) weakly attached 4-6" branches in the canopy.

No other tree parts or targets were assessed as part of this scope of work.

The basic premise of a tree risk assessment is to help tree risk managers make an educated decision on how to reduce their risk to tolerable levels. All trees provide benefits, and all trees pose some risk. Usually, the benefits provided by trees outweigh the risks they pose. The only way to eliminate all tree risk is to eliminate all trees.

Background

Shortly before I was retained for this risk assessment assignment, a branch approximately 4 inches in diameter and 15 feet in length fell out of the canopy of the tree. You became concerned about the risk posed by the tree, and you decided to have an arborist perform an inspection. You asked me to inspect the tree, determine the risk posed, and make recommendations for management, as appropriate. I met with you to inspect the tree and discuss my findings.

Observations and Discussion

The subject tree is a blue gum eucalyptus growing in the front yard of a single family residence in ******. The tree is approximately 60 feet tall and has a spread of approximately 50 feet. At the time of my observation, the canopy appeared green and healthy.

2014 Topping, Response Growth, and Recent Branch Failure

At some point between April and August of 2014, the tree was topped by a prior owner at a height of approximately 40 feet. I observed Google Maps Street View imagery of the tree on each of those dates, and the tree had been topped in the August imagery (Figure 15) and not in the April imagery (Figure 14). Over the following seven years, the tree resprouted from the 2014 topping cuts. The response growth shoots grew out of the perimeter of the parent branches, resulting in weak attachments (Figures 9 and 10). Instead of developing alternating and interlocking layers of new wood at their unions, they pressed up against the stubs of the parent stems. New union wood did not develop in this area of contact between the two stems, resulting in weak attachments. This process occurred in many parts of the trees as a direct result of the 2014 topping cuts.

One of these weakly-attached branches failed shortly before my site visit (Figure 7). I observed the failed portion had not developed sufficient union wood due to the included bark (Figure 8). Moreover, there was a history of wood decay organisms further compromising the attachment union, so there was relatively little sound wood remaining at the time of failure.

I observed other branch unions in the canopy that developed in a similar pattern of growth after the 2014 topping (Figure 9). I did not observe the presence or absence of decay at these unions because I did not perform an aerial inspection, but I did observe that the branch unions had grown out of the perimeters of the 2014 topping cuts, which likely predisposed them to an elevated likelihood of failure.

Eucalyptus trees are one of several species known for dropping branches during times of high temperatures and little wind in a phenomenon known as summer branch drop. Although the direct causal mechanism of summer branch drop is not fully understood, many arborists have observed trees drop branches during periods of high temperatures, often in the late afternoon of a hot summer day. The branch that failed shortly before my site visit failed at some point in the afternoon on a hot summer day. It was predisposed to failure due to its weak attachment union; its catalyst was likely the afternoon heat.

On the subject tree, the 7 year-old branches that grew after the 2014 topping are weakly attached to their parent stems, which predisposes them to failure. But if these identifiable defects were removed from the tree, most of the tree's canopy would be lost. However, as discussed below, the risk posed by branch failure onto each of the five targets assessed is *low* within the next one year time frame.

Landscaping Disturbances and Fungi

The tree had a history of disturbances around its base. I observed that landscape improvements were made in the yard between 2007 and 2012 by inspecting Google Maps Street View imagery. In July 2007, the front yard did not have a garden wall, and the soil was relatively level with the sidewalk (Figure 16), but in July 2012, the front yard had been raised by the addition of fill soil, and a garden wall had been erected along the front sidewalk (Figure 17). Moreover, the turfgrass appeared greener, indicating more frequent irrigation. Turfgrass irrigation was maintained through at least March of 2019, which was the most recent Google Street View image of the tree, showing healthy grass.

At the time of my site visit, the turfgrass around the base of the subject tree had been replaced by drought-tolerant plants (Figure 5). But even though the turfgrass had been removed, irrigation still sprayed the area for several minutes every other day.

Soil disturbances are often indicative of root damage. Root damage typically occurs in one of two ways: excavation or fill soil. It is possible that excavation for the wall's footing resulted in some of the subject tree's roots being severed. If significant roots were cut, these root pruning cuts could become entry points for decay that would be hidden below the soil. I only performed a ground-based all-visual inspection, so I did not excavate to determine the extent of any root damage.

The second way roots can be damaged by soil disturbance is through suffocation due to fill soil. When new soil is placed over natural grade, it can preclude the exchange of oxygen and carbon dioxide into and out of the soil, suffocating the roots. Small amounts of overburden fill soil can restrict gas exchange, suppressing growth. Moreover, fill soil resting against aboveground trunk tissue creates a favorable environment for decay organisms.

Here, it appears that roughly 6-8 inches of fill soil was added around the base of the tree at some point between 2007 and 2012. Using a flathead screwdriver as a probe, I tested several areas around the root crown of the tree by pressing the probe into the trunk and then into the adjacent soil. On the eastern side of the root crown, I was able to insert the probe into the trunk a few inches after applying some force (Figure 11). This indicates that some decay is present, but that the decay is not at an advanced stage. In the other areas I tested, I was not able to insert my probe into the trunk below the bark.

I observed that the root crown transition zone was buried. Ordinarily, the area where the trunk transitions into horizontal roots should be found partially above grade. Here, it was buried by soil. When I inserted my probe into the soil parallel to the trunk, I did not contact buttress roots within the top few inches of the soil. As part of the scope of this inspection, I did not perform a root collar excavation, so I did not determine the depth of the fill soil. However, my observations from the Google Street View imagery from 2007 and 2012 indicate that the fill soil is approximately 6-8 inches deep.

At three places around the tree within 12 feet of the trunk, I observed fungal fruiting bodies of *Pisolithus tinctorius*, the "dead man's foot" fungus (Figures 12 and 13). This fungus is not a harmful a root rot fungus. Rather, it is a beneficial mycorrhizal fungus that has a symbiotic relationship with tree roots. The fungus colonizes small feeder roots and helps them absorb water and minerals from the soil; then the tree provides photosynthates for the fungus. The presence of this fungus did not affect the outcome of the risk assessment for this tree.

Tree Risk Assessment Methodology

There are three components to a tree risk assessment: likelihood of failure, likelihood of impact, and consequences of failure and impact. For each combination of tree part and target, I rated each of these components. Then I combined them according to International Society of Arboriculture (ISA) Best Management Practices for tree risk assessment using the tables in Figures 1 and 2 to produce a risk rating for each tree part and target combination in Figure 3. Lastly, I assigned an overall risk rating for the subject tree equal to the risk rating of the tree part and target combination with the highest risk rating.

Targets

I assessed the risk posed by the subject tree to the following five targets:

- *House*: The house on the subject property is a fixed target. It is present 24/7, and it is not feasible to relocate it to mitigate risk posed by the tree. However, even though the house has a *constant* occupancy rate, the likelihood of either a branch or the whole tree striking it is *low*. If the whole tree were to fail, the most probable direction of fall would be to the south, away from the house. Only a small portion of the drip line of the tree extends over the house, so if a 4"-6" branch failed, there would be only a slight chance that the branch would strike the house. If the whole tree were to strike the house, the consequences would be *significant*. If a 4"-6" branch struck the house, the consequences would be *minor*.

- *Vehicles Traveling Along the Street*: Vehicles traveling on the street are mobile targets. They are only present within the target zone infrequently or irregularly, so their occupancy rate is *occasional*. If either a branch or the whole tree were to fail, there is a *low* likelihood of striking a moving vehicle due to the lower occupancy rate. If the whole tree were to strike a moving vehicle, the consequences would be *severe*. If a 4"-6" branch were to strike a moving vehicle, the consequences would be *significant*.

- *Parked Vehicles*: Vehicles are frequently parked in the driveway below the tree and in the driveway in the neighboring property to the south. Parked vehicles are moveable targets because they are stationary but can be relocated. I assessed the occupancy rate of vehicles parked in the driveways as *frequent*. If either a branch or the whole tree were to fail, there is a *medium* likelihood of striking a parked vehicle because impact could occur, but it is not expected. If one of the assessed tree parts were to strike a parked vehicle, the consequences would be *significant*.

- *Pedestrians*: Pedestrians are mobile targets. They are only present within the target zone infrequently or irregularly, so their occupancy rate is *occasional*. If either a branch or the whole tree were to fail, there is a *low* likelihood of striking a pedestrian due to the lower occupancy rate. If one of the assessed tree parts were to strike a person, the consequences would be *severe*.

- *Landscape Plants*: Various landscape plants are growing in the yard around the subject tree. They have a *constant* occupancy rate because they are fixed in place and cannot be feasibly relocated to mitigate risk posed to them. If either a scaffold branch or the whole tree were to fail, there is a *high* likelihood of striking a landscape plant. If one of the assessed tree parts were to strike a landscape plant, the consequences would be *minor*.

Tree Parts

I assessed only two tree parts for likelihood of failure: the whole tree at the root crown and a 4"-6" branch in the canopy.

- *Whole Tree*: The likelihood of the whole tree failing within a one year time frame is *possible*. It is unlikely to fail in normal weather, but it may fail in extreme weather conditions. I observed there was decay present at the base of the tree, likely resulting from the fill soil applied between 2007 and 2012 and the history of turfgrass irrigation. Based on my observation of sound wood within about 2 inches of the surface, I determined that the decay was not in advanced stages.

- *4" to 6" Branch*: After the 2014 topping, new response growth emerging from the topping cuts was weakly attached. These 7 year-old weakly attached branches are approximately 4"-6" in diameter. The likelihood of one of these branches failing within the next one year is *possible*. One of these branches is unlikely to fail in normal weather conditions, but one could fail in extreme weather.

Risk Rating

For all combinations of target and tree part (Figure 3), I combined the likelihood of failure, likelihood of impact, and consequences of failure and impact using the risk rating matrices in Figures 1 and 2. The highest risk rating combination was *low*, so the overall risk rating for the tree is *low*.

Risk Mitigation

As a risk assessor, my job is to present options for risk mitigation. The property owner or manager's responsibility is to choose one or more that meets the budget and level of risk tolerance. Each mitigation option will have residual risk unless the tree is completely removed:

1) *Retain and Monitor*: Every 1-3 years, hire a Qualified Tree Risk Assessor (TRAQ) to re-assess the risk rating of the tree. If it increases from *low* to *moderate*, *high,* or *extreme*, then alternative mitigation actions may be discussed.

2) *Perform an Additional Level of Assessment*: I only performed an all-visual Level 2 Basic Tree Risk Assessment. A Level 3 Advanced Tree Risk Assessment could potentially provide additional information that could help the tree risk manager decide how to proceed. Such additional testing could include but is not limited to a climbing inspection of the upper scaffold branches, decay assessment of the heartwood of the tree such as sonic tomography or resistance drilling, or a static pull test to measure the change in angle of lean resulting from a precise applied force. Additional testing could provide data that would either confirm this risk assessment or change the likelihood of failure ratings with new information. The disadvantage to a Level 3 Advanced Assessment is the significantly higher cost.

3) *Thin the canopy by 10%*: Reducing the density of the canopy by 10% would have a negligible reduction on the amount of drag force applied to the tree by the wind. It would not reduce the likelihood of failure rating for branches or the whole tree below *possible*. Therefore, the residual risk would remain unchanged.

4) *Thin the canopy by 50%*: Reducing the density of the canopy by 50% would reduce the amount of drag force applied to the tree by the wind. But it would have an offsetting collateral effect of reducing the damping effect. With fewer branches in the canopy, there would be fewer branch unions over which to dissipate the wind energy through the uncoordinated movement of the branches. As a result of the pruning, the amount of force applied to each individual remaining branch union would increase, thereby increasing the likelihood of branch failure. Thinning the canopy by 50% would also stress the tree by reducing its photosynthetic potential to create its own food.

   Thinning by 50% would not reduce the rating for likelihood of branch or whole tree failure below *possible*. Therefore, the residual risk would remain unchanged. Thinning the canopy would not achieve the goal of risk reduction, and it would significantly harm the health of the tree. This option is not recommended.

5) *Remove all weakly-attached branches*: Removing all the weakly-attached branches would not change the tree's risk rating because it is not possible to reduce the risk rating below *low* without removing the tree. Most of the tree's canopy is comprised of the weakly attached branches that resprouted after the 2014 topping, so removing all of these branches would remove a large portion of the tree's living canopy.

6) *Remove the tree*: Removing this tree would reduce its risk from *low* to zero. It would also eliminate the benefits provided by the tree. If the risk posed by the tree is not tolerable, then this would be the only management option that would eliminate the risk posed by the tree.

Glossary of Terms

Consequences of impact: The amount of damage or harm caused by a tree or tree part failing and impacting a target. It may be personal injury, property damage, or disruption of an activity.
There are four possible ratings:

1) **Severe**: Hospitalization or death of a person, or property damage over $20,000.
2) **Significant**: Personal injury that does not require professional medical care, or property damage costing less than $20,000 to repair.
3) **Minor**: Very minor personal injury, or property damage costing less than $1,000 to repair.
4) **Negligible**: Property damage that can be easily repaired. No personal injury.

Extreme Weather: Based on the 30-year historical average weather for the site, extreme weather is uncommon weather events that fall outside the range of storms and wind ordinarily expected to occur within the time frame.

Likelihood of failure: The chance that a tree or tree part could fall within a specified time frame.
There are four possible ratings:

1) **Imminent**: Without regard to the assessed time frame, the tree or tree part is about to fail or has already started to fail.
2) **Probable**: Within the assessed time frame, the tree or tree part may fail in ordinary weather conditions.
3) **Possible**: Within the assessed time frame, the tree or tree part may fail in extreme weather. It is unlikely to fail in normal weather.
4) **Improbable**: Within the assessed time frame, the tree or tree part may not fail, even in extreme weather.

Likelihood of impact: The chance that the subject tree would impact the target if it were to fail. This is primarily determined by the occupancy rate of the targets, the direction of the tree's fall, and any potential protection factors.
There are four possible ratings:

1) **High**: If the tree or tree part were to fail, it may be expected to impact the target.
2) **Medium**: If the tree or tree part were to fail, it may impact the target, but it is not expected to do so.
3) **Low**: If the tree or tree part were to fail, there would be a slight chance of impacting the target.
4) **Very Low**: If the tree or tree part were to fail, the chance of impacting the target is remote.

Mobile target: A target that is constantly moving or stopping intermittently. Such targets include people, animals, bicycles, and vehicles.

Movable target: A target that may be relocated as a mitigation strategy.

Normal weather: Based on the 30-year historical average of weather for a given location, including all ordinary storms and wind that may be expected to occur within a given time frame.

Occupancy rate: The amount of time that a mobile target is present in the target zone. There are four possible ratings:

1) **Constant**: Within the assessed time frame, the target is always or nearly always present in the target zone, 20-24 hours per day.
2) **Frequent**: Within the assessed time frame, the target is present in the target zone for a large portion of the day, month, week, or year, averaging 4-20 hours per day.
3) **Occasional**: Within the assessed time frame, the target is infrequently or intermittently present in the target zone, averaging 0.25-4 hours per day.
4) **Rare**: Within the assessed time frame, the target is present in the target zone for a very small portion of time, averaging 0.25 hours per day or less.

Risk Rating: The combination of likelihood of failure, likelihood of impact, and consequences of impact.
There are four possible ratings:

1) **Extreme**: access to the target zone should be restricted immediately and mitigation should take place as soon as possible.
2) **High**: mitigation should take place as soon as practical.
3) **Moderate**: mitigation should take place as soon as pruning cycle allows.
4) **Low**: The risk may be mitigated as pruning cycle allows, or the tree may be retained and monitored.

Static Target: A target that does not move. It is present in 24 hours per day, seven days per week. Building and landscape fixtures are considered fixed targets.

Target: A person that could be injured, property being damaged, or activities that could be disrupted by a failure of a tree or tree part.

Target zone: The area in which a tree or tree part can reasonably be expected to fall if it were to fail.

Time frame: The period of time over which the likelihood of failure is assessed. Time frame is often one year, but it may be modified to meet the needs of the client. For this assignment, I used a time frame of one year.

Limitations

I relied upon information provided to me regarding the site and the subject tree. For purposes of this report, I assumed all of the information I was provided to be true. If any of the information provided to me is found to be inaccurate, the conclusions in this report may be invalidated.

My observations are based on a strictly visual inspection of the property, and some hidden or buried symptoms and signs may not have been observed. I did not conduct excavation, coring, or aerial inspection to make observations. Specialty arborists would be needed to conduct root crown inspections and extent-of-decay analysis on the tree, if these additional inspections are desired.

Although the condition of the tree will change throughout the year, my analysis is only based on the observations I gathered at the time of inspection. I do not guarantee the safety, health, or condition of the tree. There is no warranty or guarantee, expressed or implied, that problems or deficiencies in the tree may not arise in the future.

Arborists are tree specialists who use their knowledge, education, training, and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living trees. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to structural failure of a tree. Trees are living organisms that fail in ways not fully understood. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like any medicine, cannot be guaranteed.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services such as property boundaries, property ownership, locations of surveyed landmarks, and disputes between neighbors. Arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborist. An arborist should be expected to reasonably rely upon the completeness and accuracy of the information provided.

Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

Conclusion

The overall risk rating for the subject tree is *low* over the next one year time frame. All tree part and target combinations I assessed resulted in a *low* risk rating. Evaluate the risk/benefit tradeoff before considering the subject tree for removal or any further management actions. If it is retained in the landscape, I recommend a Qualified Tree Risk Assessor regularly re-inspect it every 1-3 years.

If you have further questions, feel free to give me a call or email.

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Photos and Figures

Likelihood of Failure	Likelihood of Impacting the 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

Figure 1: Risk assessment matrix (1 of 2). This matrix synthesizes the likelihood of failure and the likelihood of impacting the target.

Likelihood of Failure & Impact	Consequences			
	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

Figure 2: Risk assessment matrix (2 of 2). This matrix synthesizes the likelihood of failure & impact and the consequences of impact.

Tree Part	Likelihood of Failure	Target	Occupancy Rate	Likelihood of Impact	Consequences	Risk Rating	Notes
Whole Tree	Possible	House	*Constant*	Low	Significant	Low	Direction of fall likely south away from house; nearby trees serve as protection factors
Whole Tree	Possible	Vehicles traveling on street	*Occasional*	Low	Severe	Low	Occupancy rate limits likelihood of impact
Whole Tree	Possible	Vehicles parked in driveway	*Frequent*	Medium	Significant	Low	Cars are present for a large part of day, but not with constant occupancy
Whole Tree	Possible	Pedestrians	*Occasional*	Low	Severe	Low	Occupancy rate limits likelihood of impact
Whole Tree	Possible	Landscape Plants	*Constant*	High	Minor	Low	Consequences of striking plants are minor
4"-6" branch	Possible	House	*Constant*	Low	Minor	Low	House is mostly outside drip line
4"-6" branch	Possible	Vehicles traveling on street	*Occasional*	Low	Significant	Low	Occupancy rate limits likelihood of impact
4"-6" branch	Possible	Vehicles parked in driveway	*Frequent*	Medium	Significant	Low	Cars are present for a large part of day, but not with constant occupancy
4"-6" branch	Possible	Pedestrians	*Occasional*	Low	Severe	Low	Occupancy rate limits likelihood of impact
4"-6" branch	Possible	Landscape Plants	*Constant*	High	Minor	Low	Consequences of striking plants are minor

Figure 3: Summary table of each permutation of target and tree part in the risk assessment.

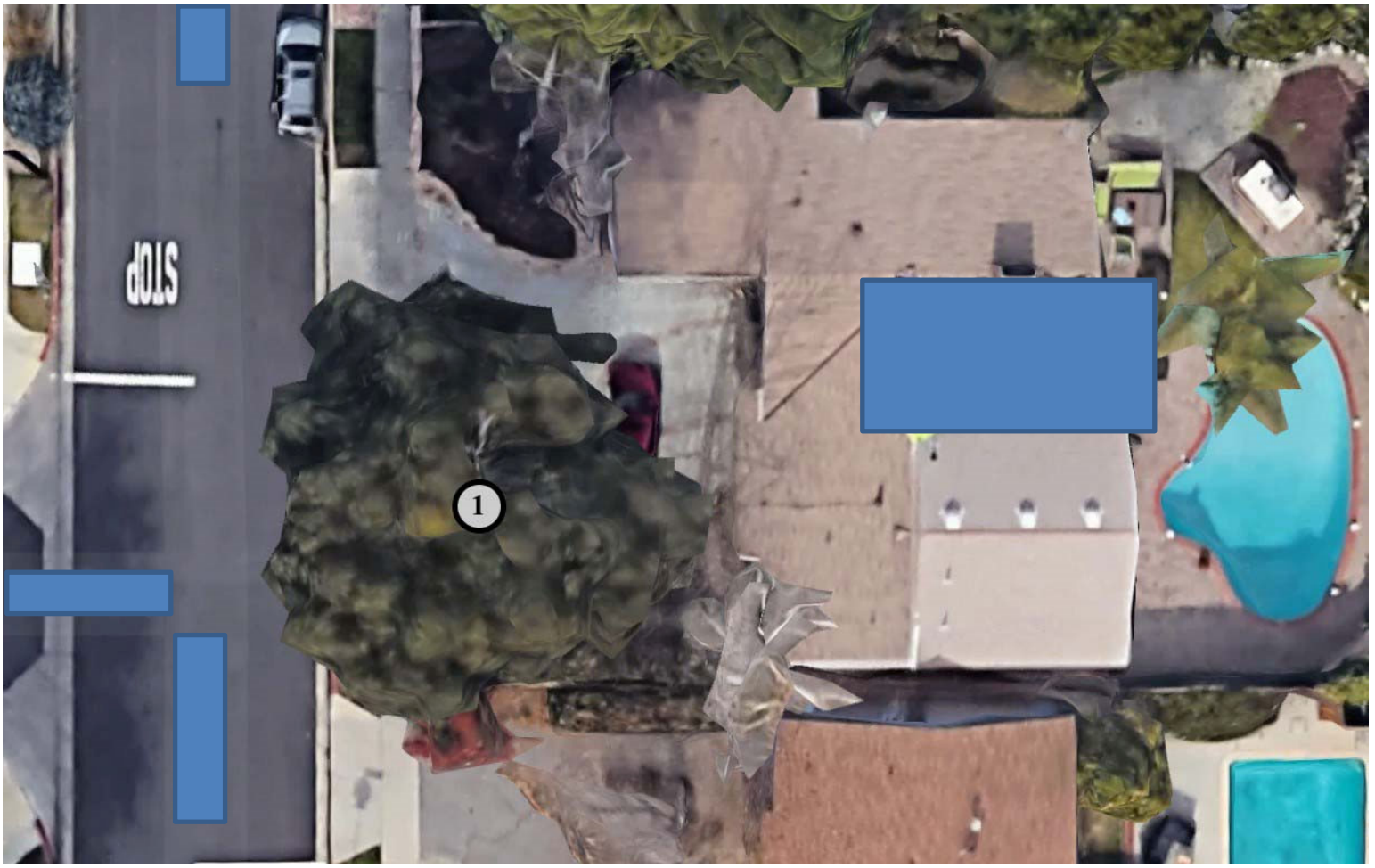

Figure 4: Site map showing the location of the subject tree in the front yard.

Figure 5: Looking east at the subject tree. I took this image on September 2, 2021.

Figure 6: Looking south at the subject tree. I took this image on September 2, 2021.

Figure 7: The branch that had failed shortly before my site visit.

Figure 8: The weak attachment union from the failed branch had included bark and decay.

Figure 9: Location on the tree from where the failed branch fell (red arrow). This branch was a response growth shoot growing out from the perimeter of a topping cut from 2014 (yellow arrow).

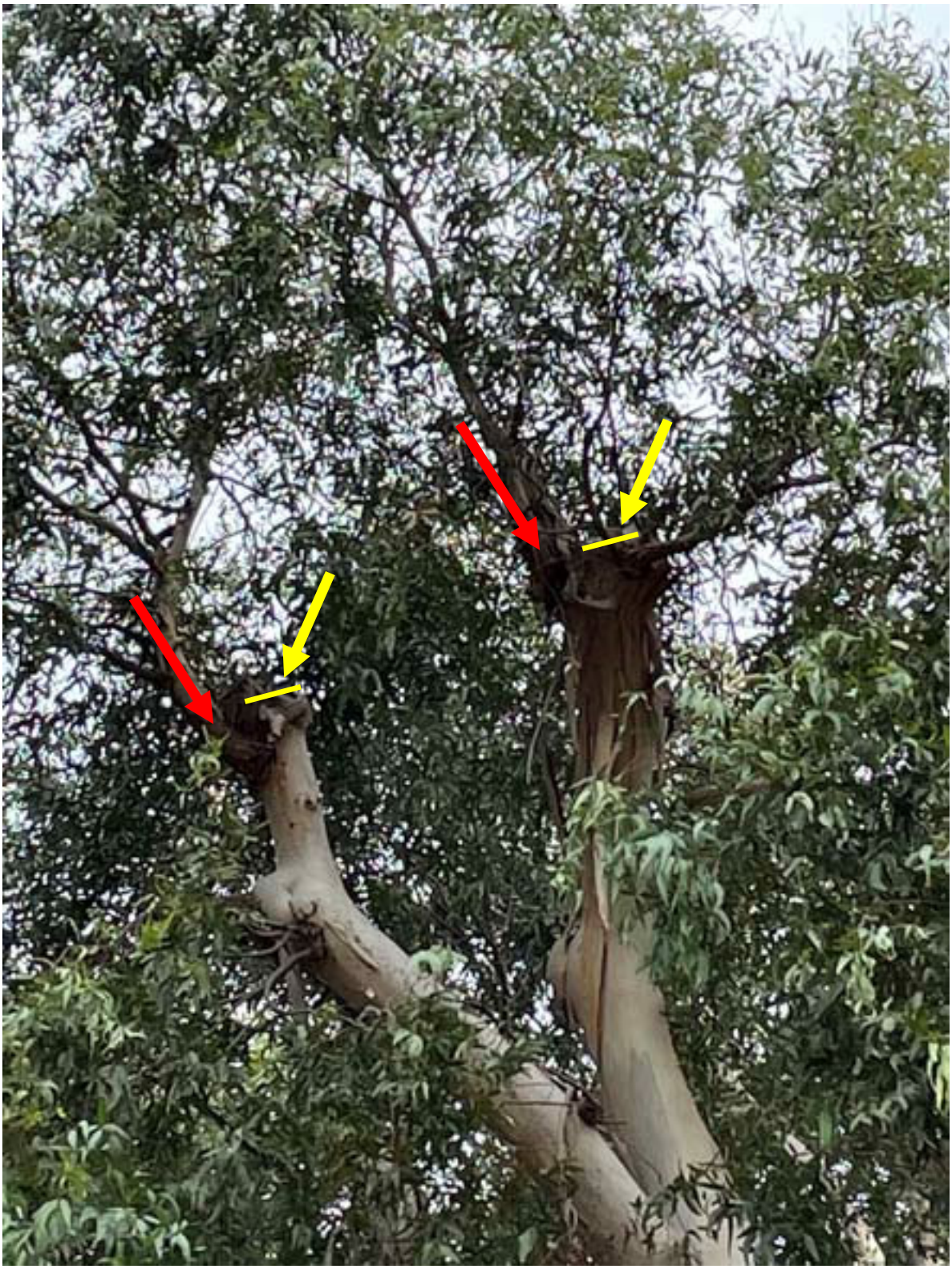

Figure 10: Branch unions similar to the one that failed are present on the tree. A response growth shoot (red arrow) grew out of the side of a 2014 topping cut (yellow arrow). These branches are weakly attached and have a *possible* likelihood of failure in the next one year time frame.

Figure 11: I was able to insert a probe approximately 2 inches into the root crown of the tree. This indicates the presence of some amount of decay at the base of the tree.

Figure 12: I observed three fungal fruiting bodies of *Pisolithus tinctorius* fungus within about 12 feet of the trunk of the tree.

Figure 13: Close up of one of the fungal fruiting bodies I observed.

Figure 14: Google Street View image of the subject property, taken in April 2014, before the topping cuts.

Figure 15: Google Street View image of the subject property, taken in August 2014, after the topping cuts.

Figure 16: Google Street View image of the subject property, taken in July 2007, before landscaping and fill soil were added around the base of the tree.

Figure 17: Google Street View image of the subject property, taken in July 2012, after landscaping and fill soil were added around the base of the tree.