JTL Consultants

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Re: Tree failure of Italian stone pine at Kidspace Museum, Pasadena, California

On Tuesday, July 28, 2015 at approximately 5 p.m. a whole-tree failure of an Italian stone pine (*Pinus pinea*) occurred at the Kidspace Museum, 480 N. Arroyo Blvd., Pasadena, CA 91103. On Wednesday, July 29, 2015 at 10 a.m., Javan Rad from the City of Pasadena Office of the City Attorney contacted me, Ted Lubeshkoff, from JTL Consultants. The City of Pasadena was seeking to hire an independent arborist to evaluate the site and tree and to make a determination as to the cause(s) of the tree failure. At 1:30 p.m. on July 29, 2015, I spent several hours evaluating the site and tree. On July 30, 2015, I visited the City of Pasadena City Yards to closely inspect the lower trunk and root section of the tree.

Observations

- Tree height: 85 feet; canopy width: 60 feet by 60 feet; trunk diameter: 42 inches.
- The tree fell in an easterly direction.
- The tree did not have a root crown (the area at the base of the tree where the roots and trunk merge) on the east side of the tree, in the direction of the fall (Photos B, C, and D).
- The tree did not have a distinct root crown on the west side of the tree, the side opposite the direction of the fall (Photo H). The dislodged root section was asymmetrical, with the narrowest width being in the direction the fall (Photo A).
- The roots that dislodged from the ground did not displace a large area of soil, suggesting that the tree did not have wide-spreading anchoring roots (Photo A).
- There were girdling roots growing on the west side of the tree and on top of the root crown (Photo H).
- There were large girdling roots within the uplifted root system (Photos A and F).
- Sap was oozing out the top of the tree, 75 feet from the roots, approximately 20 hours after the tree became disconnected from the root system (Photo I).
- No spongy wood was found, which would suggest that root rot fungus was not present.
- Black charcoal and white ash were discovered in a cavity on the underneath side of the tree, indicating previous fire damage, possibly from hot barbeque coals (Photo B).
- A Google street view image of the tree taken before the failure showed the tree having a slight lean in the direction on the fall.

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Conclusion

On Tuesday, July 28, 2015 at approximately 5 p.m. a whole-tree failure of an Italian stone pine (*Pinus pinea*) occurred at the Kidspace Museum, 480 N. Arroyo Blvd., Pasadena, CA 91103

Girdling roots prevented the formation of a root crown on the east and the west side of the tree (Photos B and H). Tree trunks typically flare out where they enter the ground, but girdling roots wrapped around the root crown will inhibit the development of the flare and the trunk will appear flattened or sunken (Photos C, D, and H). Girdling roots also prevented the formation of large anchoring roots that would normally extend outward from the tree. Photos A and H show a girdled and underdeveloped root system. Girdling roots prevented the formation of a root crown and the formation of large anchoring roots. The roots left in the ground after the tree fell were girdled and relatively small. This condition resulted in the tree being poorly anchored in the ground.

California is currently in its fourth year of drought, where it is receiving abnormally low rainfall amounts. This probably resulted in the Italian stone pine not receiving adequate amounts of water. According to US Climate Data, the Pasadena area received .61 inches of rain on July 19 and 20, 2015, less than ten days prior to the tree failure. This increased the amount of water uptake in the tree. Trees uptake large amounts of water into their system through their roots and release the water through their leaves or needles, a process known as evapotranspiration. The Italian stone pine probably could not release water as quickly as it was taking water in, causing a substantial increase in weight throughout the tree. The increased water in the tree was visible by the sap still oozing from broken limbs and the trunk approximately 20 hours after the roots were separated from the soil (Photo I).

The Italian stone pine was leaning slightly to the east, the direction of the fall. A lean in a tree, by itself, is not necessarily an indicator of an unstable tree. However, the lean combined with the heavy weight due to increased water uptake and the absence of anchoring roots on the east and west side of the tree most likely contributed to the tree's instability and failure.

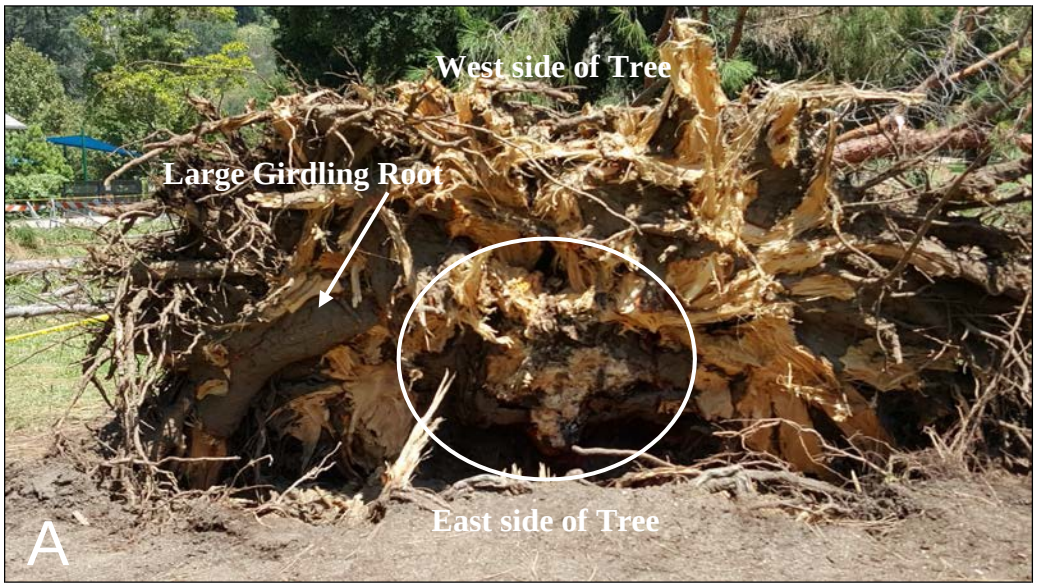

Photo A showing overview of root plate of failed Italian stone pine. The circled area indicates the tree section shown in Photo B. Note the roots in the lower portion of the photo show that the roots left in the ground after e tree fell were girdled and relatively small.

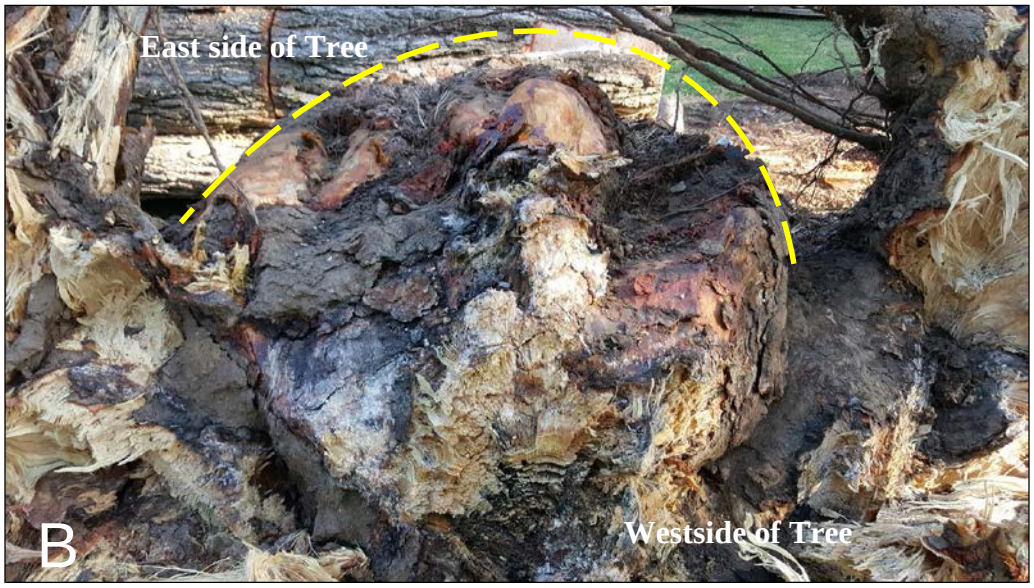

Photo B showing lack of root crown on the east side of tree, indicated by the yellow dashed line, and evidence of burn on the underside of the tree. This photo was taken after the lower section of the trunk was cut and turned over.

Photo C showing underneath the eastside of the tree. Note the absence of a root crown.

Photo D showing side view of eastside of tree. Note that there are no roots growing from the area that has compartmentalized. This area is flattened with no developed root crown.

Photo E showing the root plate that remained in the ground after the tree failed. Note that the area indicated by the circle was not attached to the section of the tree that fell. There is no signs of ripping or tearing of wood. The east side of the tree that was compartmentalized was directly above this section. The tree was not attached at this point. This section is approximately 12 inches by 12 inches.

Photo F showing a section on the underneath side of the tree where the trunk was not attached to the roots.

Photo G showing what appears to be a compressed girdling root on the underneath side of the tree.

Photo H showing lack of a root crown and girdling roots on the west side of the tree.

Photo I showing sap flowing from a broken section at the top of the tree.