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MEMORANDUM

To:	Catherine Mondkar, City of Palo Alto; Peter Gollinger, City of Palo Alto; Amy French, City of Palo Alto
From:	Michele Laskowski, Dudek
Subject:	Update to Castilleja School Tree Impact Assessment
Date:	November 12, 2021
cc:	Katherine Waugh, Dudek
Attachment(s):	Castilleja School Tree Impact Assessment, Sept 2, 2021

1 Scope

The purpose of this memo is to provide an update to Dudek's previous assessment of tree impacts provided in the Tree Impact Assessment Memo prepared Sept 2, 2021 (see Attachment). This update is based on review of the supplemental information and drawings submitted on behalf of Castilleja School on October 14, 2021. This includes the Tree Protection Measures Clarification Memo, Supplemental TPZ Detail Slip Sheets and Garage Studies Update.

2 Protected Tree Impact Analysis Update

There were 13 protected trees identified in the initial assessments as having anticipated impacts greater than 25% of the TPZ (Tree Protection Zone). The supplemental information submitted in October 2021 demonstrates proposed modifications that would be made to the final construction plan set to relocate various utilities and other features outside of the impact area for these trees. In addition, detail and clarification has been provided on the techniques and methods to be used within the TPZ to minimize impacts. Based on the comprehensive detail outlined in the Tree Protection Measures Clarification Memo, the proposed project modifications are sufficient to reduce tree impacts to tolerable levels for each of the 13 trees. This section provides a brief statement regarding each tree based on evaluation of the supplemental project information.

Tree 1. With the realignment of the fire lane, routing of the storm drain and fire lines to the perimeter of the TPZ and clarification on other protection measures, the impacts would be reduced to a tolerable level for this tree.

Trees 38 & 39. The impact concerns noted in the September 2021 Tree Impact Assessment are adequately addressed by the supplemental information, specifically: clarification on how the retaining wall would be preserved, the measures that would be taken to mitigate impacts to tree roots, relocation of the storm drain line, and arborist oversight in the construction process. Thus, the impacts would be reduced to a tolerable level for these trees.

Trees 54 & 55. Relocation of the storm drain outside of the TPZ of these trees addresses the main impact concern identified in the September 2021 Tree Impact Assessment. Thus, the impacts would be reduced to a tolerable level for this tree.

Trees 63 & 64. The supplemental information states that the bioretention area and storm drain lines would be relocated outside of the TPZ of tree 63 and that impacts from these two elements would be reduced to less than 10% of the TPZ of tree 64. These modifications reduce the impact concerns identified in the September 2021 Tree Impact Assessment substantially. The re-route of the fire main line and hydrant outside of the TPZ of Tree 64 further helps to reduce impacts. Thus, the impacts would be reduced to a tolerable level for these trees.

Tree 89. The routing of storm drains and fire lines outside of the TPZ will reduce impacts. The boring at 5 feet depth for electrical, communication and fire lines within TPZ also addresses impact concerns. Details on the construction and implementation approach clarifies the protection measures to be taken in removing and replacing such a large area of pavement around this tree and the installation of the fire lane. With the project arborist oversight in the construction process, the impacts can be minimized to a tolerable level for this tree. The proposed alternative site design (Garage Scheme E) would provide further protection for this tree.

Tree 102. The Garage Studies Update drawings included in the supplemental information show relocation of a stairwell previously proposed to be located within the TPZ. This addresses the main impact concern from September 2021 Tree Impact Assessment and impacts would be reduced to a tolerable level for this tree.

Tree 113. The supplemental information states that the bioretention facility, storm drains, and fire line would be relocated outside of the TPZ of this tree. This would address the concerns from the September 2021 Tree Impact Assessment and impacts would be reduced to a tolerable level for this tree.

Transplanting and Removals

There are two trees that are proposed for transplanting on-site – trees 6 and 13. The September 2021 Tree Impact Assessment found that both trees were proposed to be transplanted to locations adjacent to the new building but that those locations are within the footprint of the existing building. In addition, both trees would be removed from the site during construction of a new driveway during Phase 1 of the project, but the transplant location would not be available until a later phase of the project (Phase 4).

The supplemental information identifies a proposed new site for tree 6, located between the perimeter of the underground parking garage and Embarcadero Road. This location is reasonable and can accommodate the tree at the appropriate time. Tree 13 is proposed to remain near the originally proposed transplant location; however, the supplemental information states that this tree would be centered in the planter. Tree 13 will need protection during the building demolition and construction.

While these sites are feasible as transplant locations, the survival and establishment of these mature coast live oaks in their proposed new locations is uncertain. They will require long-term and extensive maintenance and even with that may not survive or result in healthy establishment.

As discussed in the September 2021 Tree Impact Assessment, the proposed project originally included removal of two protected trees from the project site – Trees 140 and 155. The proposed alternative site design (Garage Scheme E) provides for preservation of Tree 155.

TPZ Accuracy

Another concern identified in the September 2021 Tree Impact Assessment addressed the accuracy of the TPZs shown on the plan drawings. The Supplemental TPZ Slip Sheets more accurately show the TPZs on the drawings. It is recommended that the Final Project Construction Plan Set that would be submitted for the building permit show this TPZ detail to aid in that review.

3 Conclusions

There were 50 protected trees evaluated as part of the September 2021 initial inventory update and Tree Impact Assessment at Castilleja School. Of those 50 trees, 13 protected trees were identified as having greater than tolerable level of impact. Based on review of the most recent supplemental materials, the tree updates and plan revisions provide improved tree preservation and protection. Measures and modifications demonstrated in the proposed project plans, including the supplemental information, would reduce the impacts to these trees to tolerable levels.

Attachment A

Castilleja School Tree Impact Assessment

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MEMORANDUM

To:	Catherine Mondkar, City of Palo Alto; Peter Gollinger, City of Palo Alto; Amy French, City of Palo Alto
From:	Michele Laskowski, Dudek
Subject:	Castilleja School Tree Impact Assessment
Date:	September 2, 2021
cc:	Katherine Waugh, Dudek
Attachment(s):	Tree Locations

1 Background and Scope

1.1 Project Location and Proposed Project

The project site is located at the Castilleja School campus located at 1310 Bryant Street in the City of Palo Alto. The site also includes two separate adjacent parcels which are owned by Castilleja School but do not currently support classrooms or other academic facilities and activities. These parcels are located at 1235 and 1263 Emerson Street in Palo Alto, California.

Castilleja School is an all-girls private school in Palo Alto that has been educating 6th- to 12th-grade girls since 1907 and has been located at the current site since 1910. The school's facilities include administrative buildings, a chapel theater, classrooms, a gymnasium, a pool, an aboveground parking area, a playing area, and a track. Castilleja has submitted applications to the City for review of a tentative map and amendment of the school's Conditional Use Permit to allow for increased enrollment. To accommodate the increased enrollment, Castilleja proposes to demolish several of the existing buildings within the campus and construct a new underground parking structure, a new swimming pool, and a new classroom building.

1.2 Scope and Purpose

Dudek was contracted by the City of Palo Alto to conduct a tree survey and impact assessment to assist with better understanding how the proposed demolition and construction will impact the protected trees at Castilleja School. As part of the scope of this work Dudek carried out the following components: (1) reviewed the existing tree inventory for the site prepared by Michael Bench and last updated in July of 2020, (2) evaluated all site engineering and design plans to understand the footprint of construction and design concepts (3) conducted an assessment of all protected trees to collect attribute and condition information needed for the impact analysis, including the diameter at breast height (dbh), and (4) prepared this memo outlining any revisions from the previous tree inventory

and detailing the percent impact from construction within the tree protection zones from construction related encroachments, as well as recommendations for site plan modifications to improve protected tree preservation.

1.3 Regulatory Framework

Municipal Code Title 8 addresses street trees, shrubs, and plants (Chapter 8.04); weed abatement (Chapter 8.08); and Tree Preservation and Management Regulations (Chapter 8.10). Municipal Code Section 8.10.20 defines a "protected tree" as:

"(1) Any tree of the species *Quercus agrifolia* (Coast Live Oak) or *Quercus lobata* (Valley Oak) which is eleven and one-half inches in diameter (thirty-six inches in circumference) or more when measured four and one-half feet (fifty-four inches) above natural grade; and

(2) Any Redwood tree (species *Sequoia sempervirens*) that is eighteen inches in diameter (fifty-seven inches in circumference) or more when measured four and one-half feet (fifty-four inches) above natural grade.

(3) A heritage tree designated by the city council in accordance with the provisions of this chapter." (City of Palo Alto 2021a)

The Tree Preservation and Management Regulations encourage preservation but also allow for removal of protected trees when preservation is not feasible. Municipal Code Section 8.10.030(b) states that the City's Tree Technical Manual must contain standards and specifications regarding "replacement of trees allowed to be removed pursuant to this chapter." Section 8.10.050 requires replacement of removed trees under the standards of the Tree Technical Manual.

The Tree Technical Manual establishes regulations, standards and specifications that provide for implementation of the municipal code requirements and achieve the City's tree preservation goals. Section 2.10 requires a Tree Protection and Preservation Plan be prepared when construction activities will occur within the dripline of a protected tree. This plan must identify a Tree Protection Zone (TPZ) for each tree, tree protection measures to be implemented prior to and during construction, a monitoring schedule, and tree maintenance measures to be followed during construction (City of Palo Alto 2021b).

The TPZ is defined as having a radius that is 10 times the dbh of the trunk plus the radius of the trunk; thus, the TPZ extends a distance of 10 times the dbh measured from the trunk perimeter. For example, a tree with a dbh of 10 inches would have a TPZ extending 100 inches from the trunk perimeter. The Tree Technical Manual provides that soil disturbance may be permitted in the TPZ subject to City approval. Section 2.20 identifies the specific conditions under which this approval can be granted. One example includes if pipe installation has been approved within the TPZ, then the trench will be cut by hand, air-spade, hydraulic vac-on excavation or, by mechanical boring the tunnel under the roots with a horizontal directional drill and hydraulic or pneumatic air excavation technology.

After City approval of the Tree Protection and Preservation Plan but prior to issuance of a demolition, grading or building permit, the project arborist or contractor must prepare a Verification of Tree Protection report to demonstrate that all pre-construction tree protection measures, such as irrigation, mulching, tree fencing, erosion

control, and pruning have been implemented. The project arborist must also meet with the construction contractors at the project site prior to beginning construction to review and confirm tree protection measures. During construction the project arborist must conduct monitoring and submit a Monthly Inspection Report to the City. Inspections are required during all construction activities within a tree's TPZ, including rough grading, trenching, demolition, and construction.

Chapter 3 of the Tree Technical Manual establishes requirements for tree removal, replacement, and planting. It requires that any protected tree removed from a site must be replaced, unless the tree was dead, dangerous or a nuisance. Section 3.20 sets the requirements for replacement trees – they must be of the same species as the removed tree, their planting location must be approved, and they must be replaced with a tree of equal canopy or in accordance with the replacement standard provided in Table 3-1 of the Tree Technical Manual. This standard requires a certain number of 24-inch or 36-inch box trees based on the size of the removed tree's canopy. Section 3.15 provides alternatives to the tree canopy replacement based on a tree value replacement standard; remaining sections in this chapter present standards for planting stock, materials, site preparation, and planting each tree.

2 Protected Tree Inventory and Impact Analysis

2.1 Field Tree Inventory and Evaluation

A Dudek International Society of Arboriculture (ISA) Certified Arborist conducted a site evaluation on June 11, 2021. The trees evaluated for this memo included all protected trees on campus within and adjacent to the proposed new development where the construction activities could encroach within the TPZ of the trees and impacts may be realized.

During the site evaluation, tree attribute information was collected including species, trunk diameter, canopy spread, height, health condition, structural condition and presences of observable pests or other tree maladies. Table 1 contains the results of the inventory. The inventory includes only protected trees. The Tree ID shown in Table 1 corresponds with the trees numbering used in the previous arborist assessments prepared by Michael Bench. The tree numbers skipped in the inventory correspond to non-protected trees that were included in the previous arborist inventory. Trunk diameters were measured using a diameter tape which provides adjusted figures for diameter measurements when wrapping the tape around a trunk's circumference. Trunk diameter measurements were taken at 4.5 feet above the ground along the trunk axis, with a few common exceptions. In cases where a tree's trunk split into multiple stems at approximately 4.5 feet above ground, the measurement was made at the location that best represented the trunk's diameter following the guidance in the most recent Guide to Plant Appraisal (2019). In cases where a tree's trunk split into multiple stems below 4.5 feet above the ground, individual measurements were made for each trunk. Tree canopy radius measurements were documented by measuring the radius of the canopy in one or more locations and estimating the canopy width.

Tree health and structure were evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Each tree component was assessed with regard to health factors such as insect, fungal or pathogen damage, mechanical damage, presence of decay, presence of wilted or dead leaves, and wound closure. Components were graded as excellent (1), good (2), fair (3), poor (4) and very poor (5). For the purposes of this memo, trees were rated according to their "natural setting attributes." Good condition trees exhibit acceptable vigor, healthy foliage, adequate structure, and lack of any major maladies. Fair condition trees are typical, with few maladies, but declining vigor. Poor condition trees exhibit declining vigor, unhealthy foliage, poor branch structure or excessive lean.

It should also be noted that tree health assessments consider several observable tree characteristics. For example, a tree with a 'Fair (3)' health rating is one that exhibits average overall health. There is nothing necessarily wrong with a tree given a 'Fair' rating, but it is simply not exhibiting good health. Trees with 'Fair' ratings can live for a very long time. Structural condition relates to the architecture of the tree. Trees with 'Poor (4)' structural ratings usually have trunk issues (cavities, cracks, etc.), poor branch attachments that can lead to branch failure, or other structural soundness issues. This relates to the risk of the tree or tree part failing. From a wildlife habitat perspective, trees with fair or poor ratings would be perfectly normal in a woodland or forest setting, in which one would find trees of all rating categories. Poor structured trees typically provide great habitat value.

Tree photos were taken to document each of the protected tree. Tree photos will be delivered digitally as part of the scope of this project. Each tree is within a numbered folder corresponding with the Tree ID.

2.2 Tree Impact Analysis

Impact assessments presented in Table 2 are based on an evaluation of the engineering and design plans available at the time this memo was prepared. Given the numerous revisions to various plans, it was, at times, difficult to determine which sheet sets had the most current information. Where there was doubt, the impacts were noted and assessed as current until it is further clarified that the impacts have already been mitigated or plans revised to address the impact.

The impact analysis was conducted using the most recent set of engineering and design plans including all sheets within the Supplemental Information #2 to Planning Resubmission #4 dated 5/17/2021 that was available at the time of the assessment (WRNZ Studio 2021). Where impacts are anticipated, it is noted which sheet(s) within this package was referenced in making that evaluation.

Tree Protection Zones (TPZ) was calculated based on the City's standard of 10 times the dbh measured from the trunk perimeter. In the case of trees with multiple stems, the sum of diameters (DBH in inches) by stem (adjusting if they do not contribute equally to the canopy) and multiply by 10 (TPZ factor) to determine the TPZ radius in feet.

Potential tree impacts resulting from construction activity within the TPZ were assessed based on evaluation of the proposed plans, the overall structural and health condition of the tree, and its overall suitability for preservation. One limitation in this analysis was that engineering plans with surveyed trees did not present the actual TPZ on all the project drawings and plans. Therefore, the extent of the project limits in relation to the trees and the respective TPZ was estimated based on the provided scale on the drawing.

Several factors were considered when evaluating the project related impact. One major consideration for this project is the proximity of the trees to excavation, trenching, grading and other root damaging activities. Most tree roots occur in the top 24" of the soil. The roots tend to spread radially in all directions for distances often beyond the TPZ of the tree. Soil conditions, compaction, and obstacles like utilities result in variable and unpredictable root distribution. It is difficult to know the extent of the root systems existing within the footprint of the project.

Soil and root disturbance within the TPZ of the tree is not advisable. This zone is intended to protect the roots and soil to ensure future tree health and stability. Given the location of the trees within proximity of existing infrastructure on campus it will be impossible to avoid all work within the TPZ of the protected trees for this project. Root disturbance and impacts are likely to be considerable for some trees. As a best practice, minimizing root disturbance and avoiding impact of greater than 30% of the total root system is recommended to preserve and protect the trees in the long term.

Table 1. Protected Tree Attributes and Conditions

Tree ID	Scientific Name	Common Name	DBH (inches)	Canopy Width (feet)	Height (feet)	Health Condition	Structural Condition	Condition Notes
1	*Sequoia sempervirens*	Coast Redwood	76.7	60	125	1	1	
6	*Quercus agrifolia*	Coast Live Oak	19.9	55	45	1	2	Roots lifting asphalt in the parking lot
10	*Quercus agrifolia*	Coast Live Oak	12.7	40	35	1	1	
13	*Quercus agrifolia*	Coast Live Oak	17.4	45	30	2	1	Overall branch structure would require large cuts (12" & 10") to prune back prior to transplanting, minor mechanical damage, and wetwood infection
14	*Quercus agrifolia*	Coast Live Oak	9.6	30	20	1	1	
16	*Quercus agrifolia*	Coast Live Oak	20.5	55	35	1	3	nest present
38	*Quercus agrifolia*	Coast Live Oak	16	45	35	1	3	DBH estimate due to fencing around tree, lean
39	*Quercus agrifolia*	Coast Live Oak	19.5	55	50	1	3	lean, 8 ft from retaining wall, landscape edging cannot be removed without damage to the root crown
40	*Quercus agrifolia*	Coast Live Oak	20.5	45	45	3	3	Canopy thin, overextended branches, unbalanced crown
41	*Quercus agrifolia*	Coast Live Oak	17.3	45	40	2	1	minor bark staining
54	*Quercus agrifolia*	Coast Live Oak	15.4	50	30	3	1	small leaves and branch tip dieback
55	*Quercus agrifolia*	Coast Live Oak	18.3	45	50	2	3	thinning at top, girdling roots

Table 1. Protected Tree Attributes and Conditions

Tree ID	Scientific Name	Common Name	DBH (inches)	Canopy Width (feet)	Height (feet)	Health Condition	Structural Condition	Condition Notes
56	*Quercus agrifolia*	Coast Live Oak	35.9	65	45	3	2	crown containment for utilities, sprouting
60	*Sequoia sempervirens*	Coast Redwood	6.5	20	25	1	2	
62	*Sequoia sempervirens*	Coast Redwood	X	X	X	X	X	dead
63	*Sequoia sempervirens*	Coast Redwood	47.3	45	120	4	1	chlorosis at top, drought stress
64	*Quercus agrifolia*	Coast Live Oak	24.3/ 20.3/ 18.6/ 15.4	55	70	2	3	restricted crown by neighboring trees
84	*Quercus agrifolia*	Coast Live Oak	27.6	45	50	1	3	restricted crown by neighboring tree
85	*Quercus agrifolia*	Coast Live Oak	13.8	30	45	1	3	restricted crown by neighboring tree
87	*Quercus agrifolia*	Coast Live Oak	26.6/ 18.6	55	55	1	3	
89	*Quercus agrifolia*	Coast Live Oak	45	80	40	2	3	DBH at 24 inches above grade due to codominant stems, crown thinning on West side
98	*Quercus agrifolia*	Coast Live Oak	24.2	60	50	1	1	
99	*Quercus agrifolia*	Coast Live Oak	24.8	55	50	1	2	
100	*Quercus agrifolia*	Coast Live Oak	16	35	45	1	3	crown restricted

Table 1. Protected Tree Attributes and Conditions

Tree ID	Scientific Name	Common Name	DBH (inches)	Canopy Width (feet)	Height (feet)	Health Condition	Structural Condition	Condition Notes
102	*Quercus agrifolia*	Coast Live Oak	33.6	55	60	2	4	large branch failure, pruned to balance crown, crown lifted and some severe heading back on some branches that are now sprouting
111	*Quercus agrifolia*	Coast Live Oak	24.8	40	50	1	3	Co-dominant stems, included bark, few lower branches, crown restricted and reaching
112	*Sequoia sempervirens*	Coast Redwood	X	X	X	X	X	Dead
113	*Quercus agrifolia*	Coast Live Oak	34.6	70	65	2	2	Wetwood staining, rooting zone heavily compacted, girdling roots
115	*Sequoia sempervirens*	Coast Redwood	16.4	30	80	1	1	Compacted root zone
116	*Sequoia sempervirens*	Coast Redwood	18.6	30	85	1	1	Compacted root zone
117	*Sequoia sempervirens*	Coast Redwood	18.9	30	90	1	1	Compacted root zone
118	*Sequoia sempervirens*	Coast Redwood	20.1	35	90	1	1	Compacted root zone
119	*Sequoia sempervirens*	Coast Redwood	24.2	35	90	1	1	Compacted root zone
120	*Sequoia sempervirens*	Coast Redwood	28.4	40	90	1	1	Compacted root zone
121	*Quercus agrifolia*	Coast Live Oak	31.2	55	55	1	3	
122	*Quercus agrifolia*	Coast Live Oak	23.8	55	60	2	1	artificial turf in rooting zone, epicormic sprouts
126	*Quercus agrifolia*	Coast Live Oak	22.8	55	45	1	1	
131	*Quercus agrifolia*	Coast Live Oak	10.2	20	25	2	4	crown raised, restricted roots

Table 1. Protected Tree Attributes and Conditions

Tree ID	Scientific Name	Common Name	DBH (inches)	Canopy Width (feet)	Height (feet)	Health Condition	Structural Condition	Condition Notes
132	*Quercus agrifolia*	Coast Live Oak	15.1	20	30	2	2	crown raised, restricted roots, mechanical damage, bark cracking
133	*Quercus agrifolia*	Coast Live Oak	16.0/ 15.6	35	25	1	3	girdling and restricted roots
138	*Quercus agrifolia*	Coast Live Oak	28.2	65	60	1	1	
140	*Quercus agrifolia*	Coast Live Oak	37.5	75	60	4	4	DBH at 36 inches above grade, foliage thinning, bark cracking, staining, East extending stem in better condition; targets bench, walkway, lunch tables
155	*Quercus agrifolia*	Coast Live Oak	27.5	60	40	2	2	root zone highly compacted, some thinning in crown
157	*Quercus agrifolia*	Coast Live Oak	17.5	50	40	1	2	balance of crown to the East
159	*Quercus agrifolia*	Coast Live Oak	25	50	40	2	2	DBH is an estimate, tree on property fence line
160	*Quercus agrifolia*	Coast Live Oak	28.3	65	45	1	3	DBH at 2 ft above grade, tree on property fence line
161	*Quercus agrifolia*	Coast Live Oak	10.1	15	35	1	3	lean, reaching crown
162	*Quercus agrifolia*	Coast Live Oak	27.4	65	40	1	3	overextended branches, utility pruning
165	*Quercus agrifolia*	Coast Live Oak	26	60	65	1	4	DBH is an estimate, tree on private property; visual assessment was limited by fence.
166	*Sequoia sempervirens*	Coast Redwood	9/8	20	25	2	2	DBH is an estimate, tree on private property; visual assessment was limited by fence.
167	*Quercus lobata*	Valley oak	12	25	25	2	2	DBH is an estimate, tree on private property; visual assessment was limited by fence.

Table 1. Protected Tree Attributes and Conditions

Tree ID	Scientific Name	Common Name	DBH (inches)	Canopy Width (feet)	Height (feet)	Health Condition	Structural Condition	Condition Notes
168	*Quercus agrifolia*	Coast Live Oak	24	35	35	1	1	DBH is an estimate, tree on private property; visual assessment was limited by fence.

Note: DBH – Diameter at Breast Height

Table 2. Protected Tree Impact Table

Tree ID	Common Name	DBH (inches)	TPZ Radius (feet)	% Impact in TPZ	% Impact in TPZ with Treatment	Preserve Relocate Remove	Proposed Construction	Impact Notes 2021	Recommended Treatment or Modification (Arborist 2020)	Recommended Treatment or Modification (City of Palo Alto)	Recommended Treatment or Modification (Arborist 2021)	Sheet(s) Referenced
									Project Arborist 2020	City of Palo Alto	Dudek Arborist 2021	
1	*Coast Redwood*	76.7	64	40	Depends upon relocation of utilities	Preserve	Fire hydrant, fire water line, sanitary sewer, water, communications conduit, fire lane, storm drain, new foot/bike path within the TPZ	Proposed fire hydrant is within 20 feet of this tree. Trenching for the new fire water line is within 10 feet of the tree. Bike/foot path and fire lane is within 15 feet of the tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Install root buffer over walking path (4) Restore soil under paving for new root growth (5) relocation Bioretention outside of TPZ to extent possible	Construct fire lane with permeable geoblock paver and structural soil within Tree Protection Zone	(1) Relocate fire hydrant and water line, sanitary sewer, and all other utilities outside of the TPZ. (2) if not feasible, use directional boring and airspade to place the waterline and other utilities under the root system while avoiding damage to the roots (3) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB 201, G.034, CB 301, CB 300
6	*Coast Live Oak*	19.9	17	100	100	Relocate	New Driveway	Tree is proposed for transplant. Mature trees of this size are not good candidates for relocation and may not survive. In addition, the transplant location is adjacent to the new building and is within the footprint of the existing building. This is not feasible. The new driveway construction will happen in earlier phase of the project (Phase 1) the transplant location is not available until a later phase of the project (Phase 4). The proposed relocation spot will not work.	n/a	n/a	(1) Determine a relocation spot that will be available at the time of transplanting and will not be impacted by later phases of the project.	L.2.0, G.003
10	*Coast Live Oak*	12.7	11	5	5	Preserve	Ramp into the new garage	The down ramp into the underground parking garage is within 14 feet of this tree.	(1) Protective Fencing Type 1 (2) Irrigation/Mulching	Avoid excavation within TPZ with soil nail wall construction	(1) Prune tree for clearance and access. Ensure the pruning cuts are made to branch unions and do not remove an excessive amount of foliage (no more than ¼ of total crown). (2) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2.01
13	*Coast Live Oak*	17.4	15	100	100	Relocate	New Driveway	Tree is proposed for transplant. Mature trees of this size are not good candidates for relocation. Tree branch structure will require very large branches to be cut to facilitate transplanting. It is unlikely to survive. In addition, the transplant location is adjacent to the new building and is within the footprint of the existing building. This is not feasible. The new driveway construction will happen in earlier phase of the project (Phase 1) the transplant location is not available until a later phase of the project (Phase 4). The proposed relocation spot will not work.	n/a	n/a	(1) Determine a relocation spot that will be available at the time of transplanting and will not be impacted by later phases of the project.	L.2.0, G.003
14	*Coast Live Oak*	9.6	8	65	20	Preserve	New parking lot	Existing parking lot will be modified and resurfaced. Tree is currently in planting island in the existing parking lot. Resurfacing will impact an estimated 65% of the TPZ. However, the expanded planting island size and use of structural soils and permeable paving will lessen the negative impact.	(1) Preserve E Island Planter (2) Protective Fencing Type 2 (3) Irrigation/Mulching (4) Root Barrier	Replace existing pavement subgrade 8' wide from both side of each tree planter with structural soil mix per City tree planting standard detail 603A.	(1) Prune tree for clearance and access. Ensure the pruning cuts are made to branch unions and do not remove an excessive amount of foliage (no more than ¼ of total crown). (2) Given the extent of the work within the TPZ of this tree, have an ISA Certified Arborist monitor the construction activities while executing work within the TPZ. (3) Avoid use of heavy machinery in the TPZ while resurfacing. (4) Follow all previous recommendations and	AA2.01

Table 2. Protected Tree Impact Table

Tree ID	Common Name	DBH (inches)	TPZ Radius (feet)	% Impact in TPZ	% Impact in TPZ with Treatment	Preserve Relocate Remove	Proposed Construction	Impact Notes 2021	Recommended Treatment or Modification (Arborist 2020)	Recommended Treatment or Modification (City of Palo Alto)	Recommended Treatment or Modification (Arborist 2021)	Sheet(s) Referenced
											mitigation requests from the project arborist and City of Palo Alto except root barriers	
16	*Coast Live Oak*	20.5	17	65	20	Preserve	New parking lot	Existing parking lot will be modified and resurfaced. Tree is currently in planting island in the existing parking lot. Construction will impact 65% of the TPZ. However, the expanded planting island size and use of structural soils and permeable paving will lessen the negative impact.	(1) Preserve E Island Planter (2) Protective Fencing Type 2 (3) Irrigation /Mulching (4) Root Barrier	New porous paving will include a structural soil base with Tensar Biaxial fabric per city details.	(1) Prune tree for clearance and access. Ensure the pruning cuts are made to branch unions and do not remove an excessive amount of foliage (more than ¼ of total crown). (2) Given the extent of the work within the TPZ of this tree, have an ISA Certified Arborist monitor the construction activities while executing work within the TPZ. (3) Avoid use of heavy machinery in the TPZ while resurfacing. (4) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto except root barriers	AA2.01
38	*Coast Live Oak (Quercus agrifolia)*	16	13	30	Depends upon retention of existing retaining wall	Preserve	New building	Tree is rooted very close to the foundation of the existing building and adjacent to existing retaining wall. Part of the mitigation plan is to keep the current retaining wall in place to protect the tree root structure. The Tree Impact plan shows root loss immediately adjacent to the base of this tree on the building side. This tree has a 40 degree lean away from the building. Any root loss on the side opposite the lean and close to the tree base raises concern about the structural integrity of the root system and overall safety of this tree.	(1) Protective Fencing Type 1 (2) Irrigation /Mulching (3) Root Baiting	(1) Remove turf grass and spray irrigation from TPZ (2) Retain adjacent retaining wall to protect tree root structure	(1) Determine if current retaining wall will be retained per mitigation requests	T.3.3, CB.101
39	*Coast Live Oak*	19.5	16	30	Depends upon retention of existing retaining wall	Preserve	New building, curb, and gutter replacement	Tree is rooted within 8 feet of an existing retaining wall. Part of the mitigation plan is to keep the current retaining wall in place to protect the tree root structure. The Tree Impact drawing shows root loss on the building side of this tree. This tree has a 15 degree lean away from the building. New curb and gutter replacement will be within the TPZ of this tree.	(1) Protective Fencing Type 1 (2) Irrigation /Mulching (3) Root Baiting	(1) Remove turf grass and spray irrigation from TPZ (2) Retain adjacent retaining wall to protect tree root structure	(1) Determine if current retaining wall will be retained per mitigation requests	CB.101, T.3.3
40	*Coast Live Oak*	20.5	17	10	10	Preserve	Construction parking and traffic	Tree is in planting island between Kellogg Ave and driveway next to existing building. It appears that little change will happen in this location so impacts are minimized. The new building construction is about 20 feet from this tree.	(1) Protective Fencing Type 2 (2) Irrigation / Mulching	(1) Restrict excavation within 10 feet of tree base. (2) New porous paving will include a structural soil base with Tensar Biaxial fabric per city details.	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.101
41	*Coast Live Oak*	17.3	14	10	10	Preserve	Construction parking and traffic	Tree is in planting island between Kellogg Ave and driveway next to building. It appears that little change will happen in this location so impacts are minimized. The new building construction is about 20 feet from this tree.	(1) Protective Fencing Type 2 (2) Irrigation / Mulching	(1) Restrict excavation within 10 feet of tree base. (2) New porous paving will include a structural soil base with Tensar Biaxial fabric per city details.	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.101
54	*Coast Live Oak*	15.4	13	30	Depends upon relocation of utilities	Preserve	Storm drain	Storm drain is proposed to bisect the TPZ and will be approximately 5 feet from the base of this tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Replace driveway and parking with new planting area.	(2) Relocate the storm drain outside of the TPZ (3) if not feasible, use directional boring and airspade to place the storm drain under the root system while avoiding damage to the roots (3) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.300

Table 2. Protected Tree Impact Table

Tree ID	Common Name	DBH (inches)	TPZ Radius (feet)	% Impact in TPZ	% Impact in TPZ with Treatment	Preserve Relocate Remove	Proposed Construction	Impact Notes 2021	Recommended Treatment or Modification (Arborist 2020)	Recommended Treatment or Modification (City of Palo Alto)	Recommended Treatment or Modification (Arborist 2021)	Sheet(s) Referenced
55	*Coast Live Oak*	18.3	15	30	Depends upon relocation of utilities	Preserve	Storm drain, new parking lot	Storm drain is proposed to bisect the TPZ and will be approximately 5 feet from the base of this tree. The parking lot will be redesigned, and parking stalls will be added 10 feet of this tree within the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Replace driveway and parking with new planting area.	(1) Relocate the storm drain outside of the TPZ (2) if not feasible, use directional boring and airspade to place the storm drain under the root system while avoiding damage to the roots (3) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.300
56	*Coast Live Oak*	35.9	30	30	Depends upon relocation of utilities	Preserve	New driveway and parking lot, storm drain	The driveway and new paving for the parking lot is proposed to be within 10-15 feet of this tree within the TPZ. The storm drain is proposed to pass through the TPZ within 10 feet of this tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	(1) Replace driveway and parking with new planting area. (2) For new paving, include a structural soil base with Tensar Biaxial fabric per city details.	(1) Relocate the storm drain outside of the TPZ (2) if not feasible, use directional boring and airspade to place the storm drain under the root system while avoiding damage to the roots (3) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.300
60	*Coast Redwood*	6.5	5	5	5	Preserve	New parking lot	New driveway and parking lot will be installed near this tree	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Utilize structural soil under new driveway within TPZ of adjacent trees	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.300
63	*Coast Redwood*	47.3	39	40	Depends upon relocation of utilities	Preserve	New parking lot, storm drain, bioretention area	Roots will be impacted by new paving in the parking lot within the TPZ. Storm drain is proposed to bisect the TPZ approximately 5 feet from the base of this tree. There is also a proposed bioretention area within the TPZ of this tree. The construction of the bioretention area involves excavating to a depth of 36 inches to install permeable rock, pea gravel and bioretention soils. Tree is in poor condition and is unlikely to tolerate excavation within the TPZ with much resiliency.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	(1) Replace driveway and parking with new planting area. (2) For new paving, include a structural soil base with Tensar Biaxial fabric and porous paving per city details	(1) Relocate the storm drain outside of the TPZ (2) if not feasible, use directional boring and airspade to place the storm drain under the root system while avoiding damage to the roots (3) Move bioretention outside of the TPZ (4) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.300
64	*Coast Live Oak*	24.3/ 20.3/ 18.6/ 15.4	48	35	Depends upon relocation of utilities	Preserve	New parking lot, storm drain, bioretention area	Roots will be impacted by new paving in the parking lot within the TPZ. Storm drain is proposed to bisect the TPZ approximately 5 feet from the base of this tree. There is a proposed bioretention area within the TPZ of this tree. The construction of the bioretention area involves excavating to a depth of 36 inches to install permeable rock, pea gravel and bioretention soil.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	(1) Replace driveway and parking with new planting area. (2) For new paving, include a structural soil base with Tensar Biaxial fabric and porous paving per city details	(1) Relocate the storm drain outside of the TPZ (2) if not feasible, use directional boring and airspade to place the storm drain under the root system while avoiding damage to the roots (3) Move bioretention outside of the TPZ (4) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB.300
84	*Coast Live Oak*	27.6	23	20	20	Preserve	Acoustic wall for pool	Acoustic wall for new pool is proposed to be approximately 10 feet from this tree within the TPZ. A portion of the TPZ will have impermeable paving removed.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation within the TPZ with soil nail wall construction.	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto (2) Avoid use of heavy machinery in the TPZ while removing existing pavement.	CB.103, T.3.4
85	*Coast Live Oak*	13.8	12	20	20	Preserve	Acoustic wall for pool	Acoustic wall for new pool is proposed to be 8 feet from this tree within the TPZ. A portion of the TPZ will have impermeable paving removed.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation within the TPZ with soil nail wall construction.	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto (2) Avoid use of heavy machinery in the TPZ while removing existing pavement.	CB.103, T.3.4
87	*Coast Live Oak*	26.6/ 18.6	34	25	25	Preserve	Acoustic wall for pool, bike parking, pedestrian/ bike pathway	Acoustic wall for new pool is proposed to be approximately 15 feet from this tree within the TPZ and will impact roots (20%). New bike parking is about 20 ft from this tree. Where existing impermeable pavement will be replaced	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Remove existing paving and construct new walks and bike parking with permeable paving and Tensar Biaxial fabric to limit compaction.	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto (2) Avoid use of heavy machinery in the TPZ while removing existing pavement. (3) Given the extent of the work within the TPZ of this tree, have an ISA Certified	CB.103, T.3.5

Table 2. Protected Tree Impact Table

Tree ID	Common Name	DBH (inches)	TPZ Radius (feet)	% Impact in TPZ	% Impact in TPZ with Treatment	Preserve Relocate Remove	Proposed Construction	Impact Notes 2021	Recommended Treatment or Modification (Arborist 2020)	Recommended Treatment or Modification (City of Palo Alto)	Recommended Treatment or Modification (Arborist 2021)	Sheet(s) Referenced
								with pavers (5%). Other areas of the TPZ with have paving removed (20%).			Arborist monitor the construction activities while executing work within the TPZ.	
89	*Coast Live Oak*	45	38	40	Depends on the relocation and redesign outside of TPZ	Preserve	Garage ramp, fire lane, pedestrian/ bike pathways, bike parking, acoustic wall for pool, fire water line	Tree is within a planting island in an existing parking lot. Fire lane is proposed to run adjacent to this tree on the west side. It is presumed that geoblock cells will be installed in the fire lane. Garage exit will be 35 feet from this tree on the west side. On the east side (within 8 feet) and north (within 5 feet) of the tree there is a proposed pedestrian walkway to access bike parking. This will involve installing new pavers throughout more than half of the planting island where this tree is located as well as replacing the existing pavement with pavers throughout most of the rest of east side TPZ. Replacement of the pavement and installation of pavers and the installation of geoblock cells for the fire line will be occurring in nearly the entire TPZ of this tree. In addition, there will be loss of roots from the construction of the garage exit and the pool and pool wall. Also, there is a proposed fire waterline that will run 3 feet from the base of this tree through the entire TPZ.	(1) Protective Fencing Type 2 Initially, Type 1 in Pool Area During Garage; Type 2 during Bike Rack Const. Construction (2) Irrigation / Mulching (3) Fertilization if Needed (4) Use Structural Soil for Root Baiting (5) Protective mulch over root zone during construction	1. Remove existing paving and construct new walks and bike parking with permeable paving and Tensar Biaxial fabric to limit compaction 2. If required, use geoblock cells for fire lane with structural soil and Tensar Biaxial fabric. 3 Install electrical conduit within canopy using directional boring and soil spade. 4. Construct new walk and electrical pads at existing grade with porous paving.	(1) Relocate fire water line outside of the TPZ (2) If not feasible, use directional boring and airspade to place the fire water line under the root system while avoiding damage to the roots (3) Relocate bike parking outside of the TPZ of this tree, remove pavement, and remediate soils on the east side (4) If bike parking cannot be relocated follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto (5) Given the extent of the work within the TPZ of this tree, have an ISA Certified Arborist monitor the construction activities while executing work within the TPZ. (6) Avoid use of heavy machinery in the TPZ while working in this area.	CB 301, CA.400, CB 103, CB 203
98	*Coast Live Oak*	24.2	20	5	5	Preserve	New garage exit	New exit of garage will be within approximately 20 feet of the tree and will impact a small part of the TPZ of this tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching		(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB 103
99	*Coast Live Oak*	24.8	21	0	0	Preserve	New garage exit	New exit of garage will be within approximately 25 feet of the tree and will impact the root zone of this tree, but it will not impact the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching		(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB 103
100	*Coast Live Oak*	16	13	25	25	Preserve	New garage exit	New exit of garage will be within approximately 5 feet of the tree and will impact the TPZ this tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Root Baiting	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CB 103
102	*Coast Live Oak*	33.6	28	40	Depends upon relocation of stairs	Preserve	Parking garage and exit, stair well from garage	New parking garage and exit will impact the TPZ of this tree within approximately 14 feet of the tree base. Stairwell exit from the underground garage is within the TPZ of this tree. It is unclear if this is still part of the current garage plan. Tree is in fair to poor structural condition due recent branch failure and subsequent heavy pruning to balance the crown.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Seal Severed Roots 1" in dia. Or larger (4) Fertilization if Needed (5) Root Baiting	Limit excavation with soil nail wall construction	(1) Relocate the stairwell outside of the TPZ of this tree. (2) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	CA 400, CB 103, CB 203
111	*Coast Live Oak*	24.8	21	0	0	Preserve	New garage	Impacts are outside of the TPZ.			(1) Include this tree within the tree protection zone using Type 2 Protective Fencing with nearby protected trees 115-120 and 102.	AA1.00, AA2.02
113	*Coast Live Oak*	34.6	29	55	30 or greater depends upon relocation of bioretention facility	Preserve	Fire lane, pedestrian walkway, bioretention facility	Proposed fire lane encroaches on the TPZ of this tree. Much of the area is already heavily compacted, proposed permeable paving will be added to the TPZ (20%). A small portion will have existing pavement removed (5%) or replaced with permeable paving (5%). A bioretention facility is proposed to be within 5 feet of this tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Root Baiting (4) Protective mulching over root zone for construction access (5) Delete bioretention within TPZ	1. Remove existing paving and construct new walks and bike parking with permeable paving and Tensar Biaxial fabric to limit compaction 2. If required, use geoblock cells for fire lane with structural soil and Tensar Biaxial fabric. 3 Install electrical conduit within canopy	(1) Relocation bioretention facility outside of TPZ (2) Avoid use of heavy machinery in the TPZ while working in this area. (3) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	T.3.5

Table 2. Protected Tree Impact Table

Tree ID	Common Name	DBH (inches)	TPZ Radius (feet)	% Impact in TPZ	% Impact in TPZ with Treatment	Preserve Relocate Remove	Proposed Construction	Impact Notes 2021	Recommended Treatment or Modification (Arborist 2020)	Recommended Treatment or Modification (City of Palo Alto)	Recommended Treatment or Modification (Arborist 2021)	Sheet(s) Referenced
										using directional boring and soil spade. 4. Construct new walk and electrical pads at existing grade with porous paving. 5. Relocate bioretention zone outside of tree TPZ		
115	*Coast Redwood*	16.4	14	5	5	Preserve	New garage	New exit from underground parking will be approximately 14 feet from this tree and will encroach into the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
116	*Coast Redwood*	18.6	16	5	5	Preserve	New garage	New underground parking will be approximately 14 feet from the tree and will encroach into the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
117	*Coast Redwood*	18.9	16	6	6	Preserve	New garage	New underground parking will be within 14 feet of the tree and will encroach into the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
118	*Coast Redwood*	20.1	17	8	8	Preserve	New garage	New underground parking will be within 14 feet of the tree and will encroach into the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
119	*Coast Redwood*	24.2	20	15	15	Preserve	New garage	New underground parking will be approximately 14 feet from this tree and will encroach into the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Root Baiting	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
120	*Coast Redwood*	28.4	24	20	20	Preserve	New garage	New underground parking will be within 14 feet of the tree and will encroach into the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Root Baiting	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
121	*Coast Live Oak*	31.2	26	0	0	Preserve	New garage	Impacts are outside of the TPZ.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching	Limit excavation with soil nail wall construction	(1) Include this tree within a tree protection zone using Type 1 protective fencing with nearby protected trees 122 and 126.	AA2-02
122	*Coast Live Oak*	23.8	20	15	15	Preserve	New garage	New garage from underground parking will encroach into the TPZ appear to be within approximately 15 feet of this tree	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Root Baiting		(1) Limit excavation with soil nail wall construction (2) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
126	*Coast Live Oak*	22.8	19	0	0	Preserve	New garage	Impacts are outside of the TPZ.	Precautionary (1) Protective Fencing Type 2		(1) Include this tree within a tree protection zone using Type 1 protective fencing with nearby protected trees 121 and 122.	AA2-02
131	*Coast Live Oak*	10.2	9	0	0	Preserve	New garage	Impacts are outside of the TPZ.	Precautionary (1) Protective Fencing Type 2		(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
132	*Coast Live Oak*	15.1	13	0	0	Preserve	New garage	Impacts are outside of the TPZ.	Precautionary (1) Protective Fencing Type 2		(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
133	*Coast Live Oak*	16.0/ 15.6	26	5	5	Preserve	New garage	New underground garage and parking at grade is within 24 ft of this tree, which is outside of the TPZ.	Precautionary (1) Protective Fencing Type 2		(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA2-02
138	*Coast Live Oak*	28.2	24	40	10	Preserve	New path	Tree is within a planter next to the Admin and Chapel Building that will not be impacted by construction. The path that runs along the southeast side of this tree is proposed to be re-paved within the TPZ.	Precautionary (1) Protective Fencing Type 1 (2) Irrigation / Mulching	Construct new site walks with structural soil subgrade and permeable concrete pavers for walking surfaces.	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	T.3.3

Table 2. Protected Tree Impact Table

Tree ID	Common Name	DBH (inches)	TPZ Radius (feet)	% Impact in TPZ	% Impact in TPZ with Treatment	Preserve Relocate Remove	Proposed Construction	Impact Notes 2021	Recommended Treatment or Modification (Arborist 2020)	Recommended Treatment or Modification (City of Palo Alto)	Recommended Treatment or Modification (Arborist 2021)	Sheet(s) Referenced
140	*Coast Live Oak*	37.5	31	100	100	Remove	New building	Tree is within the footprint of the proposed new building. Tree is in declining health and is showing obvious signs of stress. It is possible the tree could recover with supplemental irrigation and soil zone enhancements. However, in its current state it is not suitable for preservation.			(1) Current recommendation of removal would be required.	T.3.3
155	*Coast Live Oak*	27.5	23	100	Depends upon redesign	Remove	Truck delivery ramp, below ground trash enclosure	Tree is within the footprint of the proposed below ground new underground truck delivery location and trash enclosure. Tree is in overall good health and structural condition. It is suitable for preservation.			(1) Relocate truck delivery and below ground trash enclosure outside of the root zone of this tree (2) If major redesign is not possible no other treatment would allow for preservation and removal would be required.	T.3.4
157	*Coast Live Oak*	17.5	15	5	5	Preserve	New garage	New garage from underground parking will encroach into the TPZ within approximately 16 feet of this tree.	(1) Protective Fencing Type 1 (2) Irrigation / Mulching (3) Root Baiting	Limit excavation with soil nail wall construction	(1) Follow all previous recommendations and mitigation requests from the project arborist and City of Palo Alto	AA1.00, AA2.02
159	*Coast Live Oak*	25	21	0	0	Preserve	New garage	Impacts are outside of the TPZ.			None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
160	*Coast Live Oak*	28.3	24	0	0	Preserve	New garage	Impacts are outside of the TPZ.			None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
161	*Coast Live Oak*	10.1	8	0	0	Preserve	New garage	Impacts are outside of the TPZ.			None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
162	*Coast Live Oak*	27.4	23	0	0	Preserve	New garage	Impacts are outside of the TPZ.			None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
165	*Coast Live Oak*	26	22	0	0	Preserve	New garage	Impacts are outside of the TPZ.			None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
166	*Coast Redwood*	9/8	14	0	0	Preserve	New garage	Impacts are outside of the TPZ.	(1) Existing Boundary Fencing (2) Irrigation / Mulching (3) Root Baiting		None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
167	*Valley oak*	12	10	0	0	Preserve	New garage	Impacts are outside of the TPZ.	(1) Existing Boundary Fencing (2) Irrigation / Mulching (3) Root Baiting		None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02
168	*Coast Live Oak*	24	20	0	0	Preserve	New garage	Impacts are outside of the TPZ.	(1) Existing Boundary Fencing (2) Irrigation / Mulching (3) Root Baiting		None needed. No construction activities are anticipated in the vicinity of this tree. Current existing fencing will prevent any unintended encroachment.	AA1.00, AA2.02

Note: DBH – Diameter at Breast Height; TPZ – Tree Protection Zone

3 Conclusions

There were 50 protected trees evaluated as part of this inventory update and assessment at the Castilleja School. Of those 50 trees, 14 trees will be preserved, and no impacts are expected within their TPZ. Nineteen of the trees will be preserved and impacts were determined to be 20% or less of the TPZ. For most good condition trees this is a tolerable amount of impact. Thirteen of the trees have impacts in the TPZ of 25% or greater. Two trees are proposed for transplanting on-site. Two are proposed for removal. In all cases, where impacts are expected, treatment and modification measures are suggested to reduce the impacts.

Many of the impacts in the TPZ can be partially mitigated if the treatments and/or plan modification are made. One common concern was the encroachment of utilities, for example, water lines, storm drains, etc. In these cases, if the utility can be relocated outside of the TPZ or moved further away from the protected trees the percent impact within the TPZ will be lower or completely mitigated. Where that may not be possible other options such as directional boring and the use of an airspade can be used to avoid damaging roots while installing the utilities as another option.

In other cases, the impact within the TPZ is due to the proposal to remove impermeable pavement and replace it with permeable alternatives. While this is considered a positive treatment, it will still have impact within the TPZ and on the roots of the trees. While most trees in good condition would be expected to recover from such activity, avoiding or minimizing the extent of this activity within the TPZ would be a better alternative especially in those cases where new pavement is being introduced.

Two of the protected trees are planned to be relocated. The relocation site will need to be reevaluated and a new site selected that will be appropriate and available at the time of the anticipated transplanting. The current relocation site is within the footprint of existing building. This site will not be available as a transplant site until Phase 4 of the project is underway. The trees that are scheduled for relocation are within the Phase 1 & 2 part of the project.

Two of the trees are planned removals. This includes Tree 140 and Tree 155. Both trees are mature coast live oaks. Tree 140 was determined to be unsuitable for preservation due to it declining health and potential structural failure. Tree 155 was assessed to be in good health and structural condition. It is suitable for preservation. The modification recommendation is to relocate the proposed underground truck delivery outside of the TPZ of this tree.

4 References

City of Palo Alto. 2021a. Municipal Code, Chapter 8.10 Tree Preservation and Management Regulations. https://canopy.org/tree-info/trees-in-palo-alto/city-tree-regulations/

City of Palo Alto. 2021b. Department of Planning and Community Environment, 2001, Tree Technical Manual: City of Palo Alto Standards and Specifications, Palo Alto Municipal Code, Chapter 8.10.030 https://canopy.org/wp-content/uploads/Tree%20Tecnical%20Manual.pdf

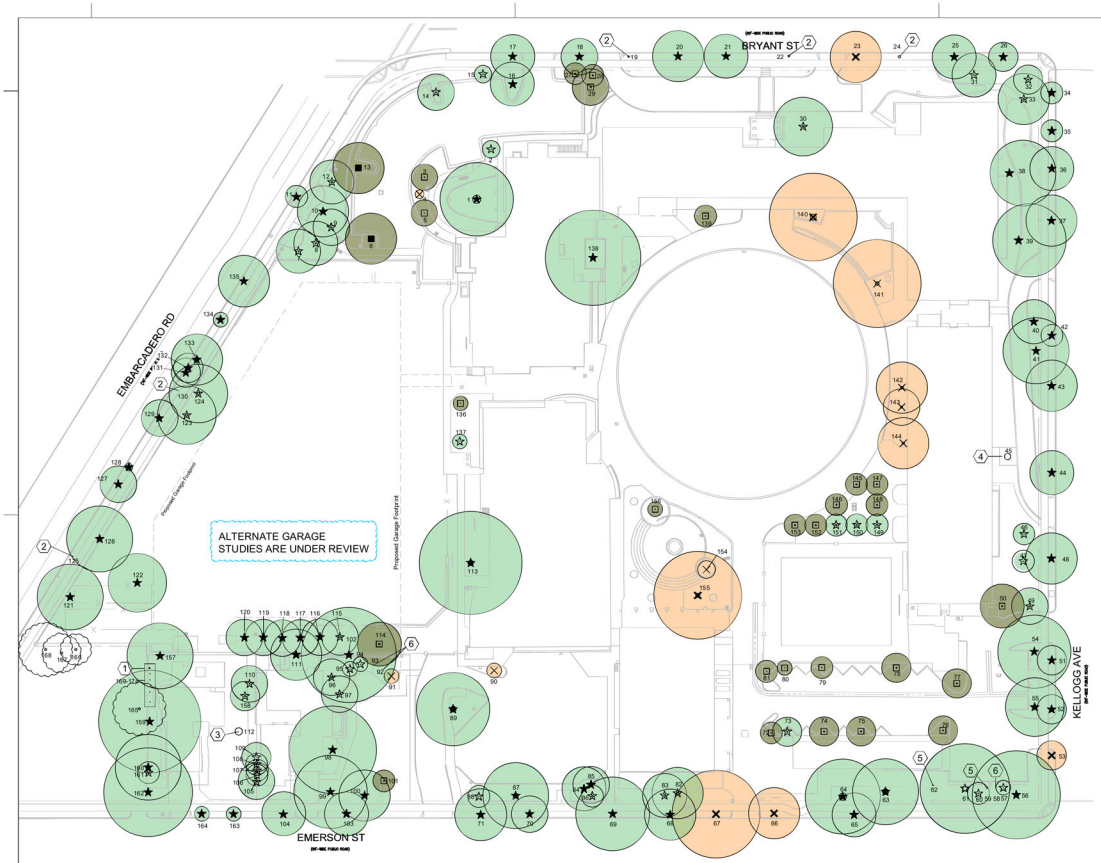
Fite, K., T. Smiley. 2016. Best Management Practices – Managing Trees During Construction, Second Edition. International Society of Arboriculture.

Council of Tree and Landscape Appraisers (CTLA). 2019. Guide for Plant Appraisal. 10th Ed. Second Printing. International Society of Arboriculture. Champagne, Illinois.

WRNZ Studio. 2021. Supplemental Information #2 to Planning Submission #4, dated 5-17-21, various sheets in the set.

Attachment A

Tree Locations



TREE DISPOSITION LEGEND

Indicates tree number as referenced in Arborist Report

Regulated Trees	Qty
Tree to be Preserved	69
Tree to be Relocated: See Planting Plan	2
Tree to be Removed	6

Unregulated Trees	Qty
Tree to be Preserved	41
Tree to Be Preserved. Tree included in Arborist Report but not within project Property. Separated from project by existing fence.	4
Tree to be Relocated	26
Tree to be Removed	8
Already dead or removed prior to project start - see Reference Notes. 19, 22, 24, 45, 58, 59, 62, 92, 93, 112, 125, and 130. Only 45, 59, 62, and 112 require mitigation.	12
Total	168

REFERENCE NOTES

1. Existing Tawhiwhi hedge to Remain, except tree #172, as it is already dead. Not included in Arborist Report as Trees.
2. Street Trees #19, #22, #24, #125, and #130 were included in the Arborist Report, but removed by City prior to project start, so not included in tree removal total.
3. Tree #112 was removed previously. Tree mitigation is listed in tree removal table. See Sheet L.2.0
4. Tree #45 was removed separately from this project. Tree mitigation is listed in tree removal table. See Sheet L.2.0
5. Tree #59 and #62 were included in the Arborist Report, but died prior to project start. Tree mitigation is listed in tree removal table. See Sheet L.2.0
6. Tree #58, #92 and #93 were included in the Arborist Report, but died prior to project start. Less than 4" in diameter so not included in tree removal total

See Sheet T.2.0 to T.2.2 for Tree Protection and Relocation Standards

40 0 40 80

TREE INVENTORY LIST

#	Tree Name	DBH 2020	Height / Spread	TPZ	Canopy area (sf)	Regulated	Disposition
1	Sequoia sempervirens	73	120 / 50	122	1963	P	P
2	Arbutus 'Marina'	5	10 / 12	8	113		P
3	Arbutus 'Marina'	6	10 /18	10	254		RL
4	Cornus sp.	2	8 / 6	4	28		X
5	Arbutus 'Marina'	7	10 / 18	12	254		RL
6	Quercus agrifolia	20	30 / 35	34	962	P	RL
7	Pyrus calleryana 'Aristocrat'	10	35 / 30	17	707		P
8	Pyrus calleryana 'Aristocrat'	12	35 / 30	17	707		P
9	Pyrus calleryana 'Aristocrat'	9	35 / 25	16	491		P
10	Quercus agrifolia	12	30 / 35	18	962	P	P
11	Crataegus laevigata	6	15 / 15	10	177	ST	P
12	Magnolia grandiflora	12	20 / 30	20	707		P
13	Quercus agrifolia	17	25 / 35	28	962	P	RL
14	Quercus agrifolia	9	15 / 25	16	491		P
15	Liquidambar styraciflua	8	10 / 12	26	113		P
16	Quercus agrifolia	19	25 / 30	32	707	P	P
17	Liquidambar styraciflua	25	80 / 30	42	707	ST	P
18	Liquidambar styraciflua	21	70 / 25	36	491	ST	P
19	Liquidambar styraciflua	-	-			ST	-
20	Liquidambar styraciflua	17	60 / 35	28	962	ST	P
21	Liquidambar styraciflua	19	55 / 30	32	707	ST	P
22	Liquidambar styraciflua	-	-			ST	-
23	Liquidambar styraciflua	21	60 / 35	36	962	ST	X
24	Liquidambar styraciflua	-	-			ST	-
25	Liquidambar styraciflua	20	75 / 30	34	707	ST	P
26	Acer rubrum	6	20 / 20	10	314	ST	P
27	Acer palmatum	5/4/3	10 / 15	14	177		RL
28	Prunus sp.	8	10 / 15	14	177		RL
29	Acer palmatum	5/4/3	15 / 25	14	491		RL
30	Acer buegerianum	12	40 / 40	18	1257		P
31	Fagus sylvatica 'Atropunicea'	8	30 / 30	14	707		P
32	Fagus sylvatica 'Atropunicea'	7	30 / 20	12	314		P
33	Ligustrum japonicum	13 /13	45 / 35	30	962		P
34	Acer rubrum	6	15 / 15	10	177	ST	P
35	Acer rubrum	5	15 / 15	8	177	ST	P
36	Magnolia grandiflora	12	30 / 30	20	707	ST	P
37	Magnolia grandiflora	15	40 / 35	26	962	ST	P
38	Quercus agrifolia	16	35 / 45	27	1590	P	P
39	Quercus agrifolia	19	50 / 50	32	1963	P	P
40	Quercus agrifolia	23	40 / 30	38	707	P	P
41	Quercus agrifolia	17	35 / 45	28	1590	P	P
42	Magnolia grandiflora	8	20 / 15	14	177	ST	P
43	Magnolia grandiflora	19	30 / 35	32	962	ST	P
44	Magnolia grandiflora	14	30 / 30	24	707	ST	P
45	Cedrus atlantica 'Glauca' *see note	-	-				-
46	Citrus sp.	5/4/3	12 / 15	7	177		P
47	Fagus sylvatica 'Atropunicea'	4	15 / 15	7	177		P
48	Magnolia grandiflora	12	30 / 35	20	962	ST	P
49	Eriobotrya japonica	11	20 / 25	18	491		P
50	Pistacia chinensis	10	30 / 30	17	707		RL
51	Celtis australis	6	25 / 20	10	314	ST	P
52	Celtis australis	8	35 / 20	14	314	ST	P
53	Celtis australis	6	20 / 20	10	314	ST	X
54	Quercus agrifolia	15	30 / 50	26	1963	P	P
55	Quercus agrifolia	18	50 / 40	30	1257	P	P
56	Quercus agrifolia	34	40 / 60	57	2827	P	P
57	Pittosporum tenuifolium	3 / 3	10 / 10	8	79		P
58	Pittosporum tenuifolium	-	-			ST	-
59	Pittosporum tenuifolium	-	-			ST	-
60	Sequoia sempervirens	7	20 / 15	12	177		P
61	Acacia melanoxylon	15/ 15/11	60 / 60	48	2827		P
62	Sequoia sempervirens	-	-			ST	-
63	Sequoia sempervirens	52	120 / 45	87	1590	P	P
64	Quercus agrifolia	23/20/19/17	70 / 50	85	1963	P	P
65	Ulmus parvifolia	19	40 / 30	32	707	ST	P
66	Ulmus parvifolia	14	30 / 35	24	962	ST	X
67	Ulmus parvifolia	21	35 / 60	36	2827	ST	X
68	Ulmus parvifolia	16	30 / 35	27	962	ST	P
69	Ulmus parvifolia	20	35 / 50	34	1963	ST	P
70	Ulmus parvifolia	17	35 / 25	28	491	ST	P
71	Ulmus parvifolia	18	40 / 35	30	962	ST	P
72	Pistacia chinensis	6	15 / 15	10	177		RL
73	Arbutus 'Marina'	9	15 / 20	16	314		P
74	Arbutus 'Marina'	9	15 / 20	16	314		RL
75	Arbutus 'Marina'	9	15 / 20	16	314		RL
76	Pistacia chinensis	8	15 / 20	14	314		RL
77	Pistacia chinensis	8	20 / 20	14	314		RL
78	Arbutus 'Marina'	7	10 / 15	12	314		RL
79	Arbutus 'Marina'	4	10 / 15	7	177		RL
80	Arbutus 'Marina'	6	10 / 10	10	79		RL
81	Pistacia chinensis	5	15 / 15	8	177		RL
82	Acacia melanoxylon	23	70 / 35	38	962		P
83	Acacia melanoxylon	12/ 12	45 / 30	30	707		P
84	Quercus agrifolia	28	45 / 30	30	707	P	P
85	Quercus agrifolia	15	40 / 25	26	491	P	P
86	Umbellularia californica	7/6	30 / 15	17	177		P
87	Quercus agrifolia	27 / 19	50 / 45	62	1590	P	P
88	Crataegus laevigata	4	10 / 15	7	177		P

TREE INVENTORY LIST

#	Tree Name	DBH 2020	Height / Spread	TPZ	Canopy area (sf)	Regulated	Disposition
89	Quercus agrifolia	45	35 / 50	76	1963	P	P
90	Laurus nobilis	3	10 / 10	6	79		X
91	Crataegus sp.	4	10 / 10	7	79		X
92	Crataegus sp.	3	10 / 10	6	79		-
93	Crataegus sp.	3	10 / 10	6	79		-
94	Crataegus sp.	3	10 / 10	6	79		P
95	Crataegus sp.	3	10 / 10	6	79		P
96	Acer palmatum	5/5/3/3	20 / 25	16	491		P
97	Acer palmatum	4 / 6	20 / 25	14	491		P
98	Quercus agrifolia	24	50 / 60	40	2827	P	P
99	Quercus agrifolia	23	50 / 50	38	1963	P	P
100	Quercus agrifolia	16	35 / 35	27	962	P	P
101	Crataegus laevigata	7	25 / 15	12	177		RL
102	Quercus agrifolia	39	60 / 65	66	3318	P	P
103	Pistacia chinensis	9	25 / 30	16	707	ST	P
104	Pistacia chinensis	9	25 / 30	16	707	ST	P
105	Pittosporum tenuifolium	9	25 / 25	16	491		P
106	Pittosporum tenuifolium	4/3	20 / 15	9	177		P
107	Pittosporum tenuifolium	6/6/3	20 / 15	15	177		P
108	Pittosporum tenuifolium	5/4	25 / 15	12	177		P
109	Pittosporum tenuifolium	10/7/6	25 / 20	23	314		P
110	Pittosporum tenuifolium	9/8/6	35 / 25	21	491		P
111	Quercus agrifolia	24	50 / 35	40	962	P	P
112	Sequoia sempervirens	-	-				-
113	Quercus agrifolia	34	55 / 70	57	3848	P	P
114	Pistacia chinensis	14	30 / 30	24	707		RL
115	Sequoia sempervirens	16	80 / 25	27	491		P
116	Sequoia sempervirens	18	85 / 25	30	491	P	P
117	Sequoia sempervirens	19	90 / 25	32	491	P	P
118	Sequoia sempervirens	20	90 / 25	34	491	P	P
119	Sequoia sempervirens	24	95 / 25	40	491	P	P
120	Sequoia sempervirens	27	95 / 25	46	491	P	P
121	Quercus agrifolia	29	35 / 45	48	1590	P	P
122	Quercus agrifolia	24	45 / 40	40	1257	P	P
123	Cedrus deodara	20	60 / 40	34	1257		P
124	Cedrus deodara	20	75 / 40	34	1257		P
125	Celtis australis	-	-			ST	-
126	Quercus agrifolia	23	35 / 45	38	1590	ST	P
127	Celtis australis	9	15 / 25	16	491	ST	P
128	Crataegus laevigata	3	10 / 5	6	20	ST	P
129	Celtis australis	9	20 / 25	16	491	ST	P
130	Celtis australis	-	-			ST	-
131	Quercus agrifolia	11	25 / 20	18	314	ST	P
132	Quercus agrifolia	15	30 / 20	26	314	ST	P
133	Quercus agrifolia	26	25 / 35	44	962	ST	P
134	Crataegus laevigata	4	15 / 10	7	79	ST	P
135	Celtis australis	12	25 / 35	18	962	ST	P
136	Cercis canadensis	4	8 / 10	6	79		RL
137	Cercis canadensis	4	8 / 10	6	79		P
138	Quercus agrifolia	28	55 / 65	47	3318	P	P
139	Acer palmatum	9	10 / 15	16	177		RL
140	Quercus agrifolia	36	35 / 60	60	2827	P	X
141	Pinus pinea	33	35 / 60	56	2827		X
142	Afrocarpus gracilior	25	60 / 35	42	962		X
143	Magnolia grandiflora	18/ 10	40 / 25	38	491		X
144	Xylosma congestum	16	35 / 35	27	962		X
145	Syagrus romanzoffiana	10	25 / 15	17	177		RL
146	Syagrus romanzoffiana	10	25 / 15	17	177		RL
147	Syagrus romanzoffiana	9	20 / 15	16	177		RL
148	Syagrus romanzoffiana	9	25 / 15	16	177		RL
149	Syagrus romanzoffiana	8	25 / 15	14	177		P
150	Syagrus romanzoffiana	10	20 / 15	17	177		P
151	Syagrus romanzoffiana	9	20 / 15	16	177		P
152	Syagrus romanzoffiana	8	20 / 15	14	177		RL
153	Syagrus romanzoffiana	8	20 / 15	14	177		RL
154	Acer palmatum	5	6 / 12	8	113		X
155	Quercus agrifolia	27	30 / 60	46	2827	P	X
156	Olea europea	5 / 4	8 / 10	12	79		RL
157	Quercus agrifolia	18	35 / 45	30	1590	P	P
158	Prunus cerasifera	4/2/2	20 / 20	8	314		P
159	Quercus agrifolia	23	45 / 70	38	3848	P	P
160	Quercus agrifolia	31	40 / 45	52	1590	P	P
161	Quercus agrifolia	11	35 / 15	18	177		P
162	Quercus agrifolia	27	35 / 60	46	2827	P	P
163	Ginkgo biloba	4	12 / 10	7	79	ST	P
164	Ginkgo biloba	4	12 / 10	7	79	ST	P
165	Quercus agrifolia	26	50 / 35	44	962		P
166	Sequoia sempervirens	9/8	25 / 20	23	314		P
167	Quercus lobata	12	25 / 25	20	491		P
168	Quercus agrifolia	24	35 / 35	40	962		P

"24" box Blue Atlas Cedar has been planted to replace this tree. Additional mitigation (equal to ten 24" box trees) for Tree #45 will be through in-lieu payment to Forestry Fund.

Regulated:
P City protected tree
ST Street Tree

Disposition:
P Tree to be preserved
RL Tree to be relocated
X Tree to be removed
- Tree previously removed or dead

If this drawing is not 24"x36", then the drawing has been revised from its original size. Noted scales must be adjusted. This line should be equal to one inch

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ISSUES	DATE
SUPPLEMENTAL INFO TO SUB #4	02/02/21
Supplemental Info #2 to ARB submission #4	05/17/21

LICENSED LANDSCAPE ARCHITECT — MICHAEL R. BELLINGER — No. 2742 — STATE OF CALIFORNIA

Castilleja School

Palo Alto, CA

KEYPLAN

PROJECT NO.: 18.095
DATE: SEPTEMBER 28, 2020
SCALE: AS SHOWN

SHEET TITLE:

Tree Disposition Plan

SHEET NO:

T.4.0

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