

# **Arborist Report for the Sacramento Commons Project Site, City of Sacramento, California**

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### 1.0 INTRODUCTION

This report summarizes Dudek's evaluation and analysis of tree resources on the Sacramento Commons project site, located at 1500 7th Street in Sacramento, California. Field inventory and assessments of the project site's trees were conducted on October 22 and 24, 2013, January 23, 2014, and August 7 and 8, 2014. Additionally, aerial inspections of five select trees<sup>1</sup> were conducted on September 4 and 16, 2014. This report includes a discussion of tree inventory, evaluation, and analysis methods, a summary of findings, identification of anticipated impacts, and tree protection and tree impact mitigation recommendations consistent with the City of Sacramento's City Code and tree removal permit process. The focus of Dudek's field evaluation was to identify and inventory all on-site trees or City Street Trees which may be affected by proposed development.

### 1.1 Summary

There are 291 trees associated with the proposed Sacramento Commons project site, including on-site trees and City Street Trees along the site's perimeter. Of these, 50 meet the criteria of either a City Street Tree or Heritage Tree as defined by the City of Sacramento. Thirty nine (39) trees are located along the project perimeter and meet the definition of a City Street Tree (City Code Section 12.56.020), which includes any tree growing on a public street right-of-way. Eleven (11) trees meet the criteria for classification as a Heritage Tree, as defined by the City of Sacramento (City Code Section 12.64.020), which includes any tree of good quality in terms of health, vigor of growth and conformity to generally accepted horticultural standards of shape and location of its species with a trunk circumference measuring 100 inches or more; any oak, sycamore, buckeye, or riparian tree of good quality in terms of health, vigor of growth and conformity to generally accepted horticultural standards of shape and location of its species with a trunk circumference measuring 36 inches or more; or any tree designated by the City Council to be of special historical or environmental value or of significant community benefit. Of the 39 City Street Trees, 6 meet the size criteria for classification as Heritage Trees. However, for the purposes of this report, these 6 trees are classified as City Street Trees. Finally, the remaining 241 Non-Heritage Trees do not meet the criteria for classification as either a Heritage Tree or City Street Tree but are included in the analysis and impact calculations presented in this report.

Based on an evaluation of the most current Sacramento Commons Conceptual Site Plan, much of the site will need to be graded to accommodate construction of buildings, parking lots, amenities, and the placement of necessary infrastructure (utilities, pathways, parking lots/garages, fire lanes, etc.). Based on this evaluation, a maximum of 4 Heritage Trees located on site are expected to require

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<sup>1</sup> Five American elm trees (*Ulmus americana*) were evaluated at the suggestion of the City Arborist due to their size and age and the potential for decay or disease presence that could affect their suitability for retention on site.

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removal for construction purposes. Canopy pruning of 7 Heritage Trees may also be necessary to accommodate building construction on site (City-issued permits are required for pruning Heritage Trees and will be obtained prior to any pruning activity). The Heritage Tree removal totals presented herein represent the maximum expected quantity for the project. Refinements to the Conceptual Site Plan are expected to result in either no change or in a reduction in Heritage Tree removals for the site. Based on the total of 4 Heritage Trees which will require removal for construction purposes, this report recommends planting four 24-inch box size replacement trees on site, to be incorporated into the project landscape plan. The Sacramento City Code does not specify replacement requirements for removal of Heritage Trees; rather, replacement requirements are determined by the Director of Transportation following Tree Permit Application review. Therefore, the tree replacement recommendations contained herein are based on the City's standards for removal of City Street Trees (City Code Section 12.56.090).

Based on the Sacramento Commons Conceptual Site Plan, construction-related removal of 4 City Street Trees along the project perimeter is also expected in order to facilitate site access or utility installation (as with Heritage Trees, City-issued permits are required for pruning City Street Trees and will be obtained prior to any pruning activity). Canopy pruning of 4 City Street Trees may also be necessary to facilitate fire lane access to the site. None of the 4 City Street Trees identified for removal or 4 City Street Trees identified for canopy pruning meet the minimum size criteria for classification as a Heritage Tree. As with the evaluation of Heritage Tree removals, the City Street Tree removal totals presented herein represent the maximum expected quantity for the project. Refinements to the Conceptual Site Plan are expected to result in no change or a reduction in City Street Tree removals. The City of Sacramento identifies replacement requirements for impacts to City Street Trees (City Code Section 12.56.090). Based on these requirements, this report recommends planting three 24-inch box size replacement trees and one 15-gallon size replacement tree within the City's public street right-of-way adjacent to the project site. If planting within the City's right-of-way is not possible, incorporating plantings into the project landscape plan is recommended.

Construction-related removal of 191 Non-Heritage Trees on site is expected in order to facilitate project development. Efforts were made during the site planning process to retain Non-Heritage Trees meeting minimum health and structural condition criteria, where feasible and conceptual project landscape plans identify a total of 247 new trees to be planted in the post-development landscape. Finally, this report also provides construction-related tree protection recommendations for Heritage Trees, City Street Trees, and Non-Heritage Trees to be retained.

Differences between the findings in this report and those presented in the previous report prepared for the site in 2006 (Sierra Nevada Arborists) are attributed to differences in the extent of the project

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study area, the scope of the tree survey, changes in site conditions, and corrections to previously misidentified tree species. Specifically, the 2006 inventory included City Street Trees along N Street, P Street, and 5<sup>th</sup> Street adjacent to areas which are not a part of this project, resulting in an additional 21 City Street Trees being included in the 2006 report. Changes in site conditions that resulted in differences between this report and the 2006 report include removal of 1 City Street Tree (#52), planting of 3 new City Street Trees (#101-103), and removal of 5 Heritage Trees from the site (#60, 61, 63, 64, and 75), based on recommendations in the 2006 report. Additionally, 3 trees meeting Heritage Tree size requirements (#65, 70, and 74) were removed from the site based on Dudek's recommendations following site evaluations on October 22 and 24, 2013. These three trees exhibited poor or very poor health/structural condition and therefore did not meet the City's Heritage Tree definition. Additionally, 7 trees identified as Heritage Trees in the 2006 report (#58, 59, 62, 68, 71, 78, and 79) were determined to not meet the criteria for classification as a Heritage Tree based on a basic visual inspection by a city arborist on June 17, 2014. The species of 2 trees (#77-78) was initially misidentified and was corrected for this report<sup>2</sup>. Finally, Non-Heritage Trees (#108-341) were not included in the 2006 inventory as they do not meet the minimum size criteria for Heritage Trees and are not City Street Trees. These trees (#108-341) were inventoried by Dudek in August 2014.

### 1.2 Assignment

A Dudek International Society of Arboriculture (ISA) Certified Arborist performed the following key tasks:

- Assessed and inventoried all on-site trees and City Street Trees adjacent to the project site and documented species, general health, general structural condition, size, appearance, and presence of pests.
- Noted which trees meet the City of Sacramento's definition of "Heritage Tree" or "City Street Tree."
- Mapped individual tree locations on surveyed site base data, augmented with global positioning system (GPS) technology where necessary.
- Documented tree canopy extents and conducted an i-Tree Eco assessment on the project site's tree inventory data set to better understand the ecosystem services of the site's trees.
- Coordinated a hazard tree evaluation of five large American elm trees to better understand their suitability for retention in the post-project landscape.

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<sup>2</sup> Trees #77 and 78 were identified as London plane trees (*Platanus x acerifolia*) in the 2006 report and are now accurately identified as California sycamore trees (*Platanus racemosa*) in this report.



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- Analyzed tree attribute data and coordinated with the project design team to promote tree retention on site, where feasible.
- Evaluated tree impacts based on project site development plans.
- Prepared a tree information matrix that details individual tree attributes, including designations of Heritage Tree or City Street Tree status.
- Prepared a tree location exhibit.
- Prepared this report documenting site observations, analysis results, and providing impact mitigation and tree protection recommendations.

### **1.3 Setting**

#### **1.3.1 Location**

The project site is located in downtown Sacramento, California, and is generally bounded by N Street to the north, 5<sup>th</sup> Street to the west, P Street to the south, and 7<sup>th</sup> Street to the east (Figure 1). The project site encompasses Assessor's Parcel Numbers (APN) 006-0300-002, -003, and -004 and covers nearly four blocks, excluding portions of the southwest and northwest corners.

#### **1.3.2 General Physical Characteristics**

The approximately 10-acre property is generally flat with elevations on the site ranging from approximately 15 to 20 feet above mean sea level (AMSL) as one travels from the northeast corner to the southwest corner of the project site. The site is currently fully developed and occupied by the Capitol Towers apartments, which includes numerous building, parking lots, a parking structure, a pool, paved walking paths, landscaped areas, and other associated infrastructure. Tree cover is distributed fairly evenly across the site, and all trees are landscape plantings associated with the current land use.





**FIGURE 1**  
**Project Site Location**

**DUDEK**

SOURCE: Bing 2014

8034-01

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## 2.0 METHODS

The following sections describe the methods for inventorying and evaluating trees on the project site, conducting a canopy cover analysis, evaluating tree-related benefits using i-Tree Eco assessment software, evaluating risk for selected American elm trees, and evaluating project-related tree impacts.

### 2.1 Field Tree Inventory and Evaluation

International Society of Arboriculture (ISA) Certified Arborist, Scott Eckardt (#WE-5914A), conducted the following site tree inventories and/or tree evaluations:

- October 22 and 24, 2013 – tree inventory and evaluation to document tree location and attribute information for all Heritage Trees and City Street Trees.
- January 23, 2014 – evaluation to verify that recommended tree removal (Tree #65, 70, and 74) had been completed.
- August 7 and 8, 2014 – tree inventory and evaluation to document tree location and attribute information for all Non-Heritage Trees.

During the initial site tree inventory, tree attribute information was collected for all on-site trees meeting the minimum size criteria for classification as a Heritage Tree (trunk circumference measurements 100 inches or greater [31.8 inches diameter]) and City Street Trees along the project perimeter where construction conflicts may occur. During the August 2014 site tree inventory, tree attribute information was collected for all on-site trees not meeting the minimum size criteria for classification as a Heritage Tree (Non-Heritage Trees). Tree attribute data collected during site evaluations included species, trunk diameter, tree height, canopy spread, general health condition, structural condition and presences of observable pests or other tree maladies. Trunk diameters were measured using a diameter tape which provides adjusted figures<sup>3</sup> for diameter measurements when wrapping the tape around a tree's circumference. Diameter measurements were collected using standard protocol described by the Council of Tree and Landscape Appraisers in the "Guide for Plant Appraisal," published by the ISA (2000). Finally, in most cases, tree identification tags from the 2006 tree inventory were still in place, so these numbers were used during data collection efforts. All Non-Heritage Trees not included in the 2006 inventory were assigned new identification numbers.

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

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<sup>3</sup> Circumference measurement (inches) divided by 3.14 ( $\pi$ ) provides diameter measurement in inches.

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feet above ground (ISA 2000), the measurement was made at the location that best represented the trunk's diameter. Tree height measurements were estimated by the arborist and tree canopy radius measurements were documented by "pacing-off" the measurement based on the arborist's knowledge of his stride length or visually estimating the canopy width. Tree canopy extents were also drawn on the detailed site base map and later digitized in a geographic information system (GIS) for analysis.

Pursuant to the Guide for Plant Appraisal (ISA 2000), 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 *good*, *good/fair*, *fair*, *fair/poor*, and *poor* with 'good' representing no apparent problems, and 'poor' representing a tree with significant problems or damage.

During initial inventory efforts in October 2013, the location of each individual Heritage Tree or City Street Tree was mapped using a Trimble Pathfinder Pro XH Global Positioning System (GPS) receiver. The Pathfinder has a horizontal accuracy of 1-meter (1-sigma) using differential code positioning techniques. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless electronic distance measuring (EDM) device was also used in mapping tree locations. The EDM/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. For tree inventory efforts conducted in August 2014, Dudek utilized a surveyed base map that included surveyed tree locations for all trees on the project site (Nolte 2012). Surveyed tree locations were confirmed and tree identification numbers were recorded by hand in the field. Using this base map, Dudek then created one master tree inventory data set, inclusive of all Heritage Trees, City Street Trees, and Non-Heritage Trees.

Individual tree locations are presented in Appendix A (Tree Location Exhibit) and individual tree data is presented in Appendix B (Tree Information Matrix). Additionally, representative site photographs were taken in the field and are presented in Appendix C (Representative Photographs).

### 2.2 i-Tree Eco Analysis

In addition to conducting an inventory and assessment of all trees on the Sacramento Commons project site, Dudek conducted an analysis of the project tree inventory data set using the i-Tree Eco software package to better understand the ecosystem services provided by the site's trees. The i-Tree software suite is a peer-reviewed software program developed and provided by the United States Forest Service (USFS). Eco, a component of the i-Tree software suite (i-Tree Eco 2014), is a tool that allows users to

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collect data on an entire tree population and estimate the ecosystem services that the trees provide. Ecosystem services are the environmental benefits provided by urban trees, which include reducing runoff by trapping and/or slowing rain water, sequestering atmospheric carbon, and improving air and water quality, amongst others. Tree inventory data entered into the Eco software package are merged with local hourly weather and air pollution concentration data during the analysis process. These data sets make it possible to calculate structural and functional information using a series of scientific equations or algorithms (i-Tree Eco 2014). As the Sacramento Commons inventory was complete (100% inventory), Eco also calculated characteristics and ecosystem services values for each individual tree.

To initiate the i-Tree Eco analysis, Dudek entered the tree inventory data for the Sacramento Commons project site into the Eco software package. Specifically, tree identification number, species, trunk diameter, tree height, crown (tree canopy) base height, and crown width along 2 axes (North-South and East-West) were entered directly into the software data entry table. Crown base heights were assumed to be 10 feet for trees with overall heights exceeding 20 feet and 5 feet for trees with overall heights equal to or less than 20 feet. Crown base height assumptions were based on an observed average condition onsite for trees that are routinely pruned to maintain vertical clearance. Crown width measurements along two axes were made using geographic information systems (GIS) software and correlated with field-collected data for tree canopy extents. Using mapped tree locations, site base survey data, and geo-referenced aerial imagery (2011 United States Geological Survey (USGS) digital color imagery with 0.5 foot resolution), tree canopy dimensions along the two axes were measured using GIS measurement tools. Additionally, where necessary, National Agriculture Imagery Program (NAIP) 2012 4-band imagery and derived products, including Normalized Difference Vegetation Index (NDVI) and Color infrared (CIR) data sets (CDFW 2012) were used to isolate or identify tree canopies. In areas where trees were part of a larger stand and their canopy dimensions were not easily discernible from remotely-sensed data products, field-based measurements were relied on. Finally, during the process of canopy measurement for the i-Tree Eco analysis, individual tree or tree group canopy extents were digitized in a GIS and coded with tree type (Heritage Tree, City Street Tree, or Non-Heritage Tree) and impact status (Retain or Remove). The digitized tree canopy extents are shown graphically in Appendix A.

Following data entry, the i-Tree Eco software was run and tree characteristics and ecosystem services value estimates were calculated for each tree. The following characteristics and ecosystem services were then summarized for the Sacramento Commons tree inventory data set:

- Canopy Cover (ft<sup>2</sup>): The estimated area of the ground surface covered by tree canopy.

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- Leaf Surface Area (ft<sup>2</sup>): The estimated area of leaf surface for an entire tree. Leaf surface area has a direct relationship with shade that provided, carbon that is sequestered, and rainwater that is intercepted.
- Carbon Storage (lb.): The estimated amount of atmospheric carbon stored in the existing tree tissue. Atmospheric carbon dioxide (CO<sub>2</sub>) is a greenhouse gas.
- Gross Carbon Sequestration (lb./year): The estimated rate at which a tree will sequester atmospheric carbon in new growth each year.
- Avoided Runoff (ft<sup>3</sup>/year): The estimated amount of rainwater intercepted, stored, and evaporated by each tree, annually. In general, deciduous trees intercept less rainfall annually as they are leafless during the winter rainy season (Xiao et al. 1998).

Per tree values for each of the tree characteristics and ecosystem services estimates are presented in Appendix B.

### 2.3 Aerial Inspection and Risk Assessment

At the suggestion of the Sacramento City Arborist, Dudek engaged Tree Associates to conduct an aerial inspection and risk assessment of five American elm (*Ulmus americana*) trees to better understand their structural integrity and the feasibility of their inclusion in the post-development landscape. Tree Associates conducted an assessment of three on-site Heritage Trees (#66, 67, and 76) on September 4, 2014 and two City Street Trees (#49 and 50) on September 16, 2014 and prepared a summary report (Tree Associates 2014) documenting their findings, individual tree risk ratings, and recommendations for mitigating any observed and documented tree risk condition. The Tree Associates report is included in this report as Appendix D.

In summary, none of five inspected the trees warranted removal, but risk mitigation recommendations include canopy pruning, reduction cuts, stub clean up, water sprout management, hazardous limb removal, dead/broken limb removal, and additional aerial inspections in 2 or 3 years and following major storms. The risk mitigation recommendations provided by Tree Associates report have been included in the management recommendations included in Appendix E. Additionally, any management recommendations that warranted immediate action were relayed to the appropriate management entity.

### 2.4 Tree Impact Analysis

Following data collection, processing, and analysis efforts, Dudek worked with project planners and designers to determine which trees would require removal to accommodate project development. All

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City Street Trees, Heritage Trees, and Non-Heritage Trees (with health and structural ratings of 'Fair' or higher and which did not require removal to accommodate project development) were prioritized for retention and inclusion in the post-development landscape. Based on this assessment, an impact status was assigned to each tree, including the following options: 1) Retain (tree to be retained on site); 2) Remove – Construction (tree to be removed to accommodate construction); and 3) Remove – Health (tree to be removed due to poor health and/or structural condition). Following tree impact status assignments, the tree data set was analyzed to determine tree impacts, by attribute. A summary of project-related tree impacts is presented in Section 3.3.

### 2.5 Tree Growth Calculations

To analyze the effect that tree planting would have on the site's ecosystem services, Dudek conducted an i-Tree Eco analysis using projected tree growth information for trees to be planted in the project landscape. Growth projections and i-Tree Eco ecosystem services calculations were conducted at 5-year intervals starting at the time of tree planting (Year 0) out to 25 years. The intent of this analysis was to determine when the future project landscape would exhibit comparable ecosystem services values to the existing condition.

To initiate this analysis, projected tree characteristics (trunk diameter, tree height, canopy width) were derived from the ecoSmart Landscapes (ecoSmart 2014) online software package. The ecoSmart Landscapes software is a suite of tools for the quantitative evaluation of carbon and energy impacts of trees. The application is based on 20 years of research on tree growth dynamics and urban forestry by scientists at the USFS Pacific Southwest Research Station and the University of California Davis (ecoSmart 2014). The ecoSmart Landscapes software generates future estimates for tree trunk diameter, tree height, and tree canopy width for a tree that is to be planted. As the project plant palette has not yet been finalized, ecoSmart Landscapes was used to calculate characteristics for 15 representative tree species that are suitable to the Sacramento Commons project site. Specifically, 10 large tree species and 5 small tree species were evaluated and their characteristics at 5-year intervals were entered into the i-Tree Eco software package to analyze projected ecosystem services values. Large tree species<sup>4</sup> were evaluated separately to reflect those trees to be planted at ground level and small tree species<sup>5</sup> were evaluated to reflect those to be planted on rooftops. Tree

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<sup>4</sup> Large tree species include: London plane tree (*Platanus x acerifolia*), American elm (*Ulmus americana*), Red maple (*Acer rubrum*), Valley oak (*Quercus lobata*), Scarlet oak (*Quercus coccinea*), Hackberry (*Celtis sinensis*), Zelkova (*Zelkova serrata*), Red oak (*Quercus rubra*), Camphor (*Cinnamomum camphora*), and Tulip tree (*Liriodendron tulipifera*).

<sup>5</sup> Small tree species include: Eastern redbud (*Cercis canadensis*), English hawthorn (*Crataegus laevigata*), Crabapple (*Malus floribunda*), Dogwood (*Cornus florida*), and Crape myrtle (*Lagerstroemia indica*).



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species selected for analysis are those that were documented on site or included on the Sacramento Tree Foundation's Shade Tree List<sup>6</sup>.

Dudek then entered the ecoSmart Landscapes-derived tree characteristics into the i-Tree Eco software package, including species, trunk diameter, tree height, crown base height, and crown width along 2 axes (North-South and East-West). As done with the data for existing trees, crown base heights were assumed to be 10 feet for trees with overall heights exceeding 20 feet and 5 feet for trees with overall heights equal to or less than 20 feet. Crown base height assumptions were based on the need for maintaining vertical clearance in the landscape. The resulting ecosystem services values from the i-Tree Eco calculations were then averaged separately across the 10 large tree species and the 5 small tree species to provide a representative value for each ecosystem services variable, at 5-year intervals. These per-tree average values were then multiplied by the proposed tree quantities (147 large trees and 100 small trees) to determine ecosystem services values for the newly-planted tree population. Finally, the values calculated for the newly-planted tree population were added to the values calculated for the retained trees to better understand what site condition may be like at 5-year intervals between Year 0 (time of tree planting) and Year 25. The results of this analysis are presented in Section 3.4 and tree value calculations are presented in Appendix F.

### **2.6 Scope of Work Limitations**

This report presents site tree information as observed in the field on October 22 and 24, 2013, January 23, 2014, and August 7 and 8, 2014. Aside from the detailed hazard tree assessment conducted by Tree Associates (2014), no root crown excavations or investigations, internal probing, or aerial canopy inspections were performed during the tree assessments. Therefore, the presence or absence of internal decay or other hidden or inaccessible inferiorities in individual trees could not be confirmed. It is recommended that any large tree proposed for preservation in an urban setting be thoroughly inspected for internal or subterranean decay by a qualified arborist before finalizing preservation plans.

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<sup>6</sup> <http://www.sactree.com/trees>

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## 3.0 FINDINGS/RESULTS

### 3.1 Tree Quantities

There are 291 trees associated with the proposed Sacramento Commons project site, including on-site trees and City Street Trees along the site's perimeter, including 50 different species, as presented in Table 1<sup>7</sup>. Tree locations are graphically presented in Appendix A.

**Table 1**  
**Summary of Existing Trees**

Scientific Name	Common Name	Tree Quantities			
		Heritage Trees*	City Street Trees	Non-Heritage Trees	Total
<i>Acer buergerianum</i>	Trident maple	0	1	0	1
<i>Acer negundo</i>	Box elder	0	0	2	2
<i>Acer palmatum</i>	Japanese maple	0	0	18	18
<i>Acer saccharinum</i>	Silver maple	0	0	1	1
<i>Acer spp.</i>	Maple	0	2	0	2
<i>Ailanthus altissima</i>	Tree of heaven	0	0	12	12
<i>Albizia julibrissin</i>	Silk tree	0	0	3	3
<i>Arbutus unedo</i>	Strawberry tree	0	0	1	1
<i>Betula pendula</i>	European white birch	0	0	7	7
<i>Calocedrus decurrens</i>	Incense cedar	0	0	1	1
<i>Casuarina spp.</i>	Beefwood	0	0	3	3
<i>Cedrus atlantica</i>	Blue atlas cedar	1	0	0	1
<i>Celtis sinensis</i>	Hackberry	0	0	15	15
<i>Ceratonia siliqua</i>	Carob	0	0	4	4
<i>Chamaerops humilis</i>	Mediterranean fan palm	0	0	2	2
<i>Cinnamomum camphora</i>	Camphor	0	1	13	14
<i>Citrus spp.</i>	Citrus	0	0	5	5
<i>Crataegus laevigata</i>	English hawthorn	0	0	3	3
<i>Eriobotrya deflexa</i>	Bronze loquat	0	0	5	5

<sup>7</sup> Dudek initially assessed 60 trees, but recommended removal of 3 trees (#65, 70, and 74) following field evaluation efforts on October 22 and 24, 2013. These three trees exhibited poor or very poor health/structural condition and therefore did not meet the City's Heritage Tree definition. Removal of these trees was verified on January 23, 2014 and they are not included in the tree totals presented herein. Additionally, 7 trees (#58, 59, 62, 68, 71, 78, and 79) were determined to not meet the criteria for classification as Heritage Trees, based on a basic visual inspection by a city arborist on June 17, 2014. Non-Heritage Trees (#108-341) were not included in the 2006 inventory as they do not meet the minimum size criteria for Heritage Trees and are not City Street Trees.

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**Table 1**

**Summary of Existing Trees**

Scientific Name	Common Name	Tree Quantities			
		Heritage Trees*	City Street Trees	Non-Heritage Trees	Total
<i>Fraxinus oxycarpa</i>	Raywood ash	0	1	0	1
<i>Fraxinus velutina</i>	Modesto ash	2	0	1	3
<i>Ginkgo biloba</i>	Ginkgo	0	3	0	3
<i>Juglans hindsii</i>	Northern California walnut	0	0	1	1
<i>Lagerstroemia indica</i>	Crape myrtle	0	0	12	12
<i>Ligustrum japonicum</i>	Japanese privet	0	0	10	10
<i>Liquidambar styraciflua</i>	Liquidambar	0	3	9	12
<i>Liriodendron tulipifera</i>	Tulip tree	1	10	3	14
<i>Magnolia grandiflora</i>	Southern magnolia	0	0	4	4
<i>Magnolia liliiflora</i>	Lily magnolia	0	0	5	5
<i>Malus spp.</i>	Fruit tree	0	0	7	7
<i>Morus alba</i>	Mulberry	0	0	2	2
<i>Persea spp.</i>	Fruit tree	0	0	1	1
<i>Pinus canariensis</i>	Canary Island pine	1	0	0	1
<i>Pistacia chinensis</i>	Chinese pistache	0	0	1	1
<i>Pittosporum tobira</i>	Mock orange	0	0	5	5
<i>Pittosporum undulatum</i>	Victorian box	0	0	1	1
<i>Platanus × acerifolia</i>	London plane tree	1	4	57	62
<i>Platanus racemosa</i>	California sycamore	2	0	1	3
<i>Podocarpus macrophyllus</i>	Yew pine	0	0	1	1
<i>Pyrus calleryana</i>	Bradford pear	0	1	0	1
<i>Pyrus kawakamii</i>	Evergreen pear	0	0	3	3
<i>Quercus lobata</i>	Valley oak	0	0	1	1
<i>Quercus rubra</i>	Red oak	0	3	0	3
<i>Robinia pseudoacacia</i>	Black locust	0	0	1	1
<i>Salix spp.</i>	Willow	0	0	3	3
<i>Sequoia sempervirens</i>	Coast redwood	0	0	3	3
<i>Ulmus americana</i>	American elm	3	5	5	13
<i>Ulmus parvifolia</i>	Chinese elm	0	0	6	6
<i>Yucca spp.</i>	Yucca	0	0	1	1
<i>Zelkova serrata</i>	Zelkova	0	5	2	7
<b>Total</b>		<b>11</b>	<b>39</b>	<b>241</b>	<b>291</b>

\*Tree quantities in the 'Heritage Trees' column include only non-City Street Trees; however, 6 City Street Trees (#1, 25, 41, 49, 50, and 55) meet the size criteria for classification as Heritage Trees.

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Overall, the City Street Trees present fair to good health and structural conditions, with many good ratings assigned to smaller, more newly-planted trees that are exhibiting more vigorous growth than older, larger trees. Heritage Trees on private property (non-City Street Trees) exhibit primarily fair health and structural conditions. This rating summary is consistent with older, larger trees which meet the size criteria for Heritage Tree status and exhibit less-vigorous growth and other maladies typical of aging urban trees. Non-Heritage Trees exhibit primarily fair to good health, although structural conditions are primarily fair to poor. This rating summary for Non-Heritage Trees is consistent with smaller, suppressed trees exhibiting irregular form. Observed tree health and structural issues for evaluated trees include wood rot, canopy dieback, mistletoe, epicormic (adventitious) sprouting, and previous limb failure, amongst others. Tree health assessments consider a number of observable tree characteristics. For example, a tree with a 'Fair' 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 better than average health. Trees with 'Fair' ratings can live for a very long time. Structural condition relates to the architecture of the tree. Trees with 'Poor' structural ratings usually have trunk issues (cavities, cracks, etc.), poor branch attachments that can lead to branch failure, or other structural soundness issues which relates to the risk of a tree or tree part failing. A summary of tree health conditions is presented in Table 2.

**Table 2**

**Summary of Tree Health for Existing Trees**

Health Rating*	Tree Quantities			
	Heritage Trees	City Street Trees	Non-Heritage Trees	Total
Good	3	12	83	98
Good/Fair	0	0	53	53
Fair	8	24	92	124
Fair/Poor	0	0	8	8
Poor	0	3	5	8
Total	11	39	241	291

\*Of the 6 City Street Trees that meet the size criteria for classification as Heritage Trees, 5 (#1, 25, 41, 49, and 50) have a 'Fair' health rating and 1 (#55) has a 'Good' health rating.

Attributes of each tree included in the inventory are presented in Appendix B (Tree Information Matrix). Additionally, management recommendations were identified for 7 individual trees not identified for removal and are presented in Appendix B. These management recommendations focus on minimizing the potential tree hazard on site and are intended to be implemented during project site preparation activities, or sooner as identified by Tree Associates (2014). Removal of tree #62 is

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recommended due to observed structural inferiorities and poor health condition. Further inspection (aerial, decay assessment) is recommended for tree #68, to be conducted during project site preparation activities. Pruning recommendations for City Street Trees (#49 and 50) and Heritage Trees (#66, 67 and 76) and removal or pruning recommendations resulting from inspections on tree #68, conducted during site preparation activities, will also require a permit from the City of Sacramento prior to implementation. Finally, tree #62 is recommended for removal due to poor health and structural inferiority.

### 3.2 i-Tree Eco Results

The following table (Table 3) summarizes the tree characteristic and ecosystem services estimate calculations for the existing tree population on the Sacramento Commons project site. Individual tree data, including i-Tree Eco ecosystem services values, is presented in Appendix B (Tree Information Matrix).

**Table 3**  
**Tree Characteristics and Ecosystem Services for Existing Trees**

Tree Type	Ecosystem Services				
	Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)
Heritage Trees	27,550	176,153	61,692	2,951	1,057
City Street Trees	46,199	221,065	68,770	4,211	1,330
Non-Heritage Trees	173,653	845,176	231,671	19,166	5,139
<b>Total</b>	<b>247,402</b>	<b>1,242,394</b>	<b>362,133</b>	<b>26,328</b>	<b>7,526</b>

### 3.3 Project-Related Impacts

Impact totals are based on an evaluation of tree locations compared with the Sacramento Commons Conceptual Site Plan. Much of the site will need to be graded to accommodate the construction of buildings, parking lots, and the placement of necessary infrastructure (utilities, access roads, fire lanes, etc.); however, the West/East Promenade and the North/South Promenade (pedestrian walkways) through the central portion of the project site will allow for retention of some trees. Additionally, many of the trees adjacent to Capitol Towers and non-City Street Trees along 7<sup>th</sup> Street, N Street, and P Street will be retained. Refinements to the Conceptual Site Plan are expected to result in either no change or in a reduction in Heritage Tree, City Street Tree, or Non-Heritage Tree

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removals for the site. Trees identified for retention and removal are graphically presented in Appendix G (Tree Impact Exhibit).

### **3.3.1 Individual Trees**

The following summarizes the impact status of all trees currently regulated under the City of Sacramento Municipal Code (Heritage Trees and City Street Trees):

- 4 Heritage Trees will require removal for construction purposes (#72, 73, 105, and 107).
- 7 Heritage Trees will be retained onsite (#66, 67, 69, 76, 77, 104, and 106).
- 4 City Street Trees will require removal for construction purposes (#3, 20, 26, and 48). Of the City Street Trees that will require removal, none meet the size criteria for classification as Heritage Trees.
- 35 City Street Trees will be retained on site (#1, 2, 4-8, 19, 21-25, 37-47, 49-51, 53-57, and 101-103). All City Street Trees that meet the size criteria for classification as Heritage Trees will be retained on site (#1, 25, 41, 49, 50, and 55).
- Canopy pruning of 4 City Street Trees (#23, 24, 37, and 51) may be necessary to provide 13.5 feet of vertical clearance along 20-foot wide fire access lanes into the site, pursuant with City Code Section 15.100.110. Of the 4 City Street Trees that may require canopy pruning for fire lane access, none meet the size criteria for classification as Heritage Trees.
- Canopy pruning of 6 Heritage Trees (#66, 67, 69, 76, 77, and 106) may be necessary to accommodate building construction.

In addition to the impacts presented above for Heritage Trees and City Street Trees, 50 Non-Heritage Trees will be retained on site and 191 Non-Heritage Trees will require removal. Table 4 summarizes tree retention and removal totals for the project, by tree type and impact status. Appendix G presents the locations of trees, classified by impact status.

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**Table 4**

**Tree Retention and Removal Totals by Tree Type**

Tree Type	Impact Status			
	Retain	Remove (Construction)	Remove (Health)	Total
Heritage Trees	7	4	0	11
City Street Trees	35	4	0	39
Non-Heritage Trees	50	190	1	241
<b>Total</b>	<b>92</b>	<b>198</b>	<b>1</b>	<b>291</b>

The above totals are based on the Sacramento Commons Conceptual Site Plan and represent the maximum expected impacts for the site. The actual number of trees that will require removal may be reduced if portions of the site remain undisturbed. Upon review of more detailed site plans at later stages of project planning, Dudek can provide a follow up memorandum to quantify the final number of impacted Heritage Trees, City Street Trees, and Non-Heritage Trees, which is expected to be equal to or less than those presented in this report. This effort will allow for the determination of which trees would require removal and which would need protection measures implemented. Mitigation tree planting totals could also be updated during this effort.

### 3.3.2 i-Tree Ecosystem Services

The following table (Table 5) summarizes the tree quantity, characteristic, and ecosystem services impacts status of all existing trees on the project site.

**Table 5**

**Tree Quantity, Characteristic, and Ecosystem Services Impact Summary for Existing Trees**

Characteristic or Ecosystem Service	Heritage Trees		City Street Trees		Non-Heritage Trees	
	Retain	Remove	Retain	Remove	Retain	Remove
Quantity of Trees	7	4	35	4	50	190
Total Trunk Diameter (in.)	286	124	657	66	880	2,852
Canopy Cover (ft <sup>2</sup> )	19,978	7,572	42,169	4,030	42,846	130,808
Leaf Surface Area (ft <sup>2</sup> )	135,280	40,873	204,817	16,248	256,673	588,503
Carbon Storage (lb.)	50,898	10,794	63,570	5,200	73,673	157,997
Gross Carbon Sequestration (lb./year)	2,330	622	3,821	390	4,687	14,479
Avoided Runoff (ft <sup>3</sup> /year)	807	251	1,233	97	1,557	3,582

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### 3.4 Conceptual Landscape Plan and Growth Projections

The conceptual project landscape plan calls for planting of 247 trees, in addition to retaining 92 existing trees. The 247 trees will be planted at the ground level (147 trees) and on rooftops (100 trees<sup>8</sup>). This results in a total of 339 trees to be on site in the post-development landscape. Appendix H (Conceptual Landscape Plan) presents the locations of the 92 retained trees and the 247 proposed trees. In addition to the analysis conducted for existing trees, calculations of ecosystem services values for newly-planted trees was conducted using the i-Tree Eco software package at 5-year intervals up to 25 years following planting. A summary of these calculations is included below for newly-planted ground-level trees (Table 6), newly-planted rooftop trees (Table 7), and all newly-planted and retained trees (Table 8).

**Table 6**

#### **Tree Quantity, Characteristic, and Ecosystem Services Summary for Newly-Planted Ground-Level Trees**

Characteristic or Ecosystem Service	Year*					
	0	5	10	15	20	25
Quantity of Trees	147	147	147	147	147	147
Total Trunk Diameter (in.)	147	617	1,073	1,499	1,896	2,279
Canopy Cover (ft <sup>2</sup> )	2,705	21,124	50,818	83,026	115,028	146,706
Leaf Surface Area (ft <sup>2</sup> )	13,333	97,329	298,292	503,725	634,143	804,369
Carbon Storage (lb.)	162	5,263	19,595	43,497	76,514	118,585
Gross Carbon Sequestration (lb./year)	412	2,778	5,116	7,732	9,937	12,583
Avoided Runoff (ft <sup>3</sup> /year)	74	544	1,646	2,778	3,513	4,454

\*Values for each year include calculations for newly-planted ground-level trees only

<sup>8</sup> Note: the 100 rooftop trees discussed in this report do not include trees to be planted at the pool area to be provided on top of the parking structure on Parcel 1.



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**Table 7**

### Tree Quantity, Characteristic, and Ecosystem Services Summary for Newly-Planted Rooftop Trees

Characteristic or Ecosystem Service	Year*					
	0	5	10	15	20	25
Quantity of Trees	100	100	100	100	100	100
Total Trunk Diameter (in.)	100	230	350	460	570	660
Canopy Cover (ft <sup>2</sup> )	2,020	5,660	11,390	16,980	22,190	24,280
Leaf Surface Area (ft <sup>2</sup> )	8,160	18,940	47,090	78,150	104,340	117,170
Carbon Storage (lb.)	110	1,130	3,460	6,870	11,010	15,130
Gross Carbon Sequestration (lb./year)	280	830	1,320	2,130	2,780	3,160
Avoided Runoff (ft <sup>3</sup> /year)	40	100	260	430	580	650

\*Values for each year include calculations for newly-planted rooftop trees only

**Table 8**

### Tree Quantity, Characteristic, and Ecosystem Services Summary for All Newly-Planted and Retained Trees

Characteristic or Ecosystem Service	Existing Retained Trees*	All Newly-Planted Trees**					
		Year					
		0	5	10	15	20	25
Quantity of Trees	92	247	247	247	247	247	247
Total Trunk Diameter (in.)	1,823	247	847	1,423	1,959	2,466	2,939
Canopy Cover (ft <sup>2</sup> )	104,993	4,725	26,784	62,208	100,006	137,218	170,986
Leaf Surface Area (ft <sup>2</sup> )	596,770	21,493	116,269	345,382	581,875	738,483	921,539
Carbon Storage (lb.)	188,141	272	6,393	23,055	50,367	87,524	133,715
Gross Carbon Sequestration (lb./year)	10,838	692	3,608	6,436	9,862	12,717	15,743
Avoided Runoff (ft <sup>3</sup> /year)	3,597	114	644	1,906	3,208	4,093	5,104

\*Retained tree values and do not account for additional growth over the 25-year period

\*\*Values for each year include calculations for newly-planted trees only

The values included in Tables 6-8 present estimates based on projected tree growth and assume that the newly-planted 247 trees will present similar growth characteristics as those species used for calculating the average tree characteristic values. A comparison between existing tree characteristics, quantities, and ecosystem services values and those calculated for the post-development landscape (retained trees plus newly-planted trees) is included below for newly-planted ground-level trees and

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retained trees (Table 9) and all (ground-level and rooftop) newly-planted and retained trees (Table 10).

**Table 9**

### Tree Quantity, Characteristic, and Ecosystem Services Comparison Between Existing Trees and Retained Plus Newly-Planted Ground-Level Trees

Characteristic or Ecosystem Service	Existing Total	Retained Trees and Newly-Planted Ground-Level Trees					
		Year					
		0	5	10	15	20	25
Quantity of Trees	291	239	239	239	239	239	239
Total Trunk Diameter (in.)	4,865	1,970	2,440	2,896	3,322	3,719	4,102
Canopy Cover (ft <sup>2</sup> )	247,403	107,698	126,117	155,811	188,019	220,021	251,699
Leaf Surface Area (ft <sup>2</sup> )	1,242,394	610,103	694,099	895,062	1,100,495	1,230,913	1,401,139
Carbon Storage (lb.)	362,132	188,303	193,404	207,736	231,638	264,655	306,726
Gross Carbon Sequestration (lb./year)	26,329	11,250	13,616	15,954	18,570	20,775	23,421
Avoided Runoff (ft <sup>3</sup> /year)	7,527	3,671	4,141	5,243	6,375	7,110	8,051

**Table 10**

### Tree Quantity, Characteristic, and Ecosystem Services Comparison Between Existing Trees and Retained Plus All Newly-Planted Trees

Characteristic or Ecosystem Service	Existing Total	Retained Trees and All Newly-Planted Planted Trees (Ground-Level and Rooftop Trees)					
		Year					
		0	5	10	15	20	25
Quantity of Trees	291	339	339	339	339	339	339
Total Trunk Diameter (in.)	4,865	2,070	2,670	3,246	3,782	4,289	4,762
Canopy Cover (ft <sup>2</sup> )	247,403	109,718	131,777	167,201	204,999	242,211	275,979
Leaf Surface Area (ft <sup>2</sup> )	1,242,394	618,263	713,039	942,152	1,178,645	1,335,253	1,518,309
Carbon Storage (lb.)	362,132	188,413	194,534	211,196	238,508	275,665	321,856
Gross Carbon Sequestration (lb./year)	26,329	11,530	14,446	17,274	20,700	23,555	26,581
Avoided Runoff (ft <sup>3</sup> /year)	7,527	3,711	4,241	5,503	6,805	7,690	8,701

As presented in Tables 9 and 10, different lengths of time are needed for each tree characteristic or ecosystem services value to reach the value currently calculated for the site. The following

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summarizes the time periods for each value, considering only newly-planted ground-level trees (Table 9):

- **Quantity of Trees:** Tree quantities in the post-development landscape at ground-level (239) will be less than those currently on site (291)<sup>9</sup>.
- **Total Trunk Diameter:** Total trunk diameter values will reach the existing site total in over 25 years following tree planting.
- **Canopy Cover:** Canopy cover values will reach the existing site total between 20 and 25 years following tree planting.
- **Leaf Surface Area:** Leaf surface area values will reach the existing site total between 20 and 25 years following tree planting.
- **Carbon Storage:** Carbon storage values will reach the existing site total in over 25 years following tree planting.
- **Gross Carbon Sequestration:** Gross carbon sequestration capacity will reach the existing site total in over 25 years following tree planting.
- **Avoided Runoff:** Avoided runoff capacity will reach the existing site total within 25 years following tree planting.

The results of this analysis are based on the values entered into the ecoSmart Landscapes and i-Tree Eco software packages and on the assumptions made regarding tree species to be used in the post-development landscape. While the analysis timeframe covered only 25 years, tree growth is expected to occur beyond 25 years, continuing to provide benefits for the site.

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<sup>9</sup> With the addition of rooftop trees, tree quantities (339) will exceed those currently on site at year 0 (at completion of tree planting).

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### **4.0 MITIGATION AND MANAGEMENT RECOMMENDATIONS**

#### **4.1 Mitigation Recommendations**

Based on expected project-related impacts to trees on the site, tree replacement, mitigation, and protection recommendations are provided below. While Heritage Tree replacement requirements are subject to tree removal permit conditions issued by the Director of Transportation, the following tree replacement recommendations are consistent with the City's standards for City Street Tree removal.

- The 4 Heritage Trees to be removed for construction purposes should be replaced at a 1:1 ratio with 24-inch box size trees. The 4 replacement trees should be planted on site and incorporated into the project's landscape plan. These trees can be incorporated into the 247 new trees to be planted in the post-construction landscape.
- The 4 City Street Trees to be removed for construction purposes should be replaced with 3 24-inch box size trees and 1 15-gallon size tree (as required under City Code Section 12.56.090). Differences in recommended planting stock size (24-inch box and 15-gallon) are based on City standard, determined by the size of City Street Tree to be removed<sup>10</sup>. City Street Tree replacement trees should be re-planted within the City right-of-way in coordination with the City's Urban Forester. If City Street Tree replacement trees cannot be accommodated in the City's right-of-way, they should be planted on site and incorporated into the project's landscape plan. If City Street Tree replacement trees cannot be incorporated into the project's landscape plan, they should be planted at another off-site location at the City's direction.
- Shade trees are recommended as replacement trees and for newly-planted landscape trees due to their environmental benefits. Selected tree species should be appropriate to the site and consider the post-construction environment (e.g. shading from buildings).
- Tree planting should comply with the City's landscaping requirements (City Code Sections 17.612.010 and 17.612.040).
- Canopy or root pruning of any retained trees to accommodate construction and/or fire lane access should be conducted according to ISA and ANSI A300 tree pruning standards.
- Implement Tree Associates (Appendix D) recommendations for Heritage Trees #66, 67, and 76 during site preparation and continue inspections every 2-3 years and after major storms.

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<sup>10</sup> City Street Trees with a trunk diameter less than 6 inches require replacement with a 15-gallon size tree. City Street Trees with a trunk diameter greater than 6 inches require replacement with a 24-inch box size tree (City Code Section 12.56.090).

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- All retained trees on site (Heritage Trees, City Street Trees, and Non-Heritage Trees) shall be protected from construction-related impacts pursuant to City Code Sections 12.64.040 (Heritage Trees) and 12.56.060 (City Street Trees). City-required measures and additional tree protection recommendations are provided in Appendix E.

Finally, it is understood that the City of Sacramento is currently in the process of updating its tree protection ordinances (as of October 2014). As the results of that update effort are not known at this time, the tree protection and mitigation efforts included in this report meet currently-adopted City requirements (City Code Sections 12.56.010 and 12.64.010).

### **4.2 Tree Permits**

The project applicant will need to submit a Tree Permit Application to the City of Sacramento Department of Transportation (Urban Forestry Services Division), accompanied by a \$50.00 application fee. A copy of the Tree Permit Application is provided in Appendix I. A copy of this report and the final project site plan should accompany the application. A Tree Permit is required for removal, pruning, or soil disturbance within the canopy dripline of a Heritage or City Street Tree. Once reviewed by the City, final determination of tree replacement requirements will be provided by the Director of Transportation.

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### **5.0 CONCLUSION**

Dudek inventoried and evaluated 291 trees associated with the Sacramento Commons project site at 1500 7<sup>th</sup> Street in Sacramento, California on October 22 and 24, 2013, January 23, 2014, and August 7 and 8, 2014. Of the trees evaluated, 50 meet the criteria for classification as either a Heritage Tree or City Street Tree. It is expected that 4 Heritage Trees, 4 City Street Trees, and 191 Non-Heritage Trees will require removal to accommodate project development. Canopy pruning of 4 City Street Trees and 6 Heritage Trees may also be necessary to facilitate building construction and fire lane access. The tree removal totals presented herein represent the maximum expected quantity for the project. Refinements to the Conceptual Site Plan are expected to result in no change or a reduction in tree removals for the site. This report recommends that 4 trees of 24-inch box size be planted on-site to mitigate the removal of 4 Heritage Trees. Once the final quantity of impacted Heritage Trees is determined, an equal number of 24-inch box size trees shall be planted, consistent with the City's 1:1 mitigation requirements for impacts to City Street Trees. Additionally, this report recommends that 3 trees of 24-inch box size and 1 tree of 15-gallon size be planted within the City right-of-way or on site and incorporated into the project's landscape plan to mitigate the removal of 6 City Street Trees. These mitigation recommendations are consistent with the City's standards for City Street Tree removal; however, required mitigation is ultimately subject to tree removal permit conditions issued by the Director of Transportation. Finally, it is recommended that all replacement tree plantings be incorporated into the project landscape plan. The conceptual landscape plan currently identifies 247 proposed tree plantings.

This report provides conclusions and recommendations based on an examination of the trees and surrounding site by an ISA Certified Arborist. Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near trees. Arborists cannot detect every condition that could possibly lead to the 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. There are no guarantees that a tree's condition will not change over a short or long period due to weather or environmental conditions or landscape management actions. Trees can be managed but not controlled. To live near trees is to accept some degree of risk.

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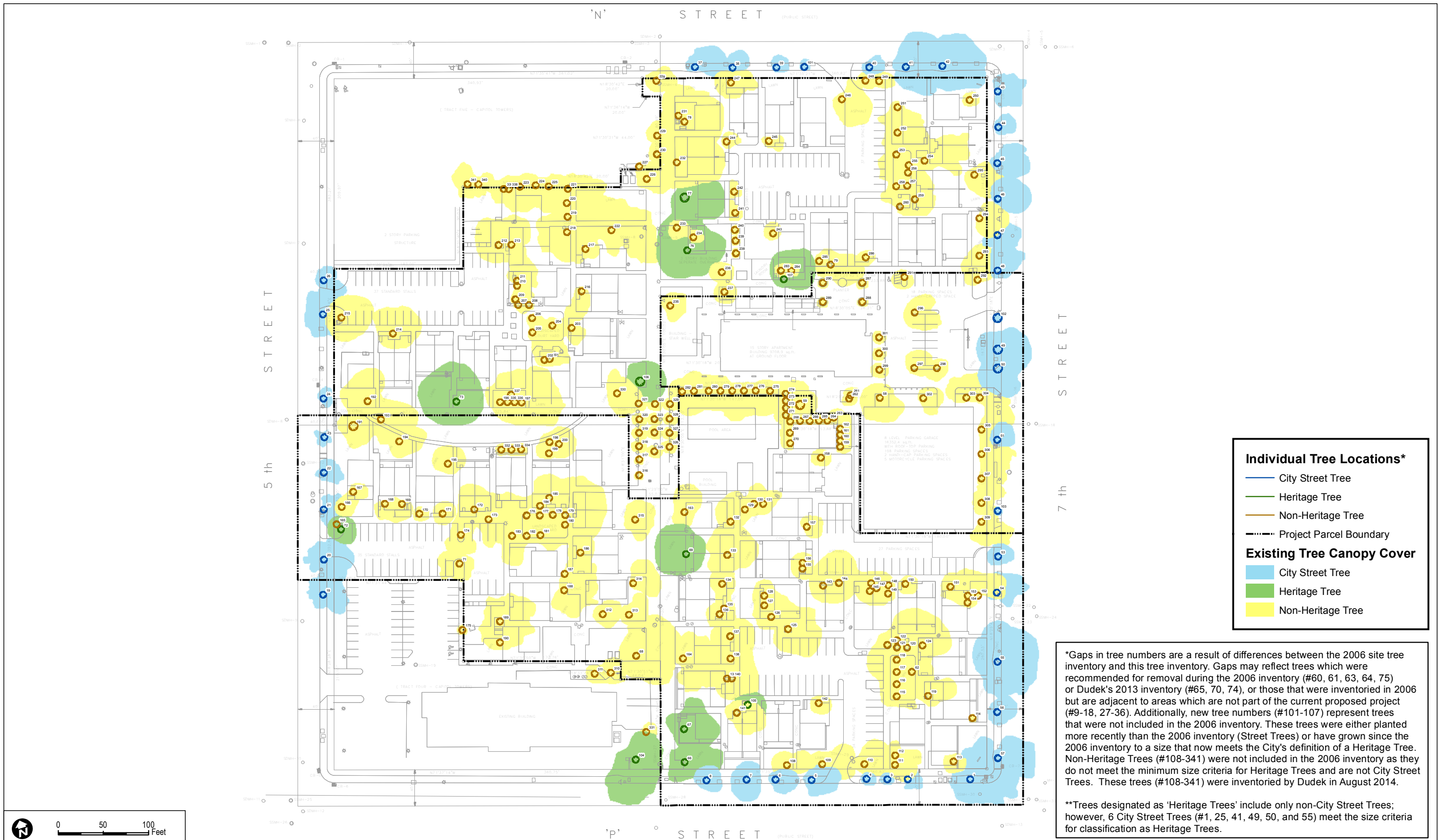
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# APPENDIX A

## *Tree Location Exhibit*



# APPENDIX B

## *Tree Information Matrix*

Appendix B - Tree Information Matrix																				
Tree Number <sup>1</sup>	Scientific Name	Common Name	Quantity of Stems	Trunk Diameter (in.)				Cumulative Diameter (in.)	Height (ft.)	Canopy Radius (ft.)	Health Condition	Structural Condition	Tree Type <sup>2,3,4</sup>	Impact	i-Tree Eco Results					Notes
				D1	D2	D3	D4								Canopy Cover (ft²)	Leaf Surface Area (ft²)	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft³/year)	
1	<i>Cinnamomum camphora</i>	Camphor	1	50.9				50.9	60	40	Fair	Fair	Street Tree	None	4,418	19,439	11,692	167	127	Canopy dieback, epicormic sprouting, hardscape damage
2	<i>Ginkgo biloba</i>	Ginkgo	1	12.1				12.1	40	18	Good	Fair	Street Tree	None	314	2,401	435	60	14	Slight lean
3	<i>Ginkgo biloba</i>	Ginkgo	1	4.4				4.4	22	10	Poor	Fair	Street Tree	Remove - Construction	177	755	38	20	5	
4	<i>Ginkgo biloba</i>	Ginkgo	1	7.7				7.7	25	15	Fair	Poor	Street Tree	None	177	673	143	36	4	Lean, broken top
5	<i>Liquidambar styraciflua</i>	Liquidambar	1	21.3				21.3	50	20	Fair	Fair	Street Tree	None	1,165	5,821	824	54	35	3 main stems above split, narrow stem attachment
6	<i>Liquidambar styraciflua</i>	Liquidambar	1	19.7				19.7	45	25	Good	Fair	Street Tree	None	830	4,899	656	47	29	
7	<i>Platanus × acerifolia</i>	London plane tree	1	14.5				14.5	35	22	Good	Fair	Street Tree	None	1,256	6,412	662	76	38	Broken limb on ground
8	<i>Platanus × acerifolia</i>	London plane tree	1	12.0				12.0	40	25	Good	Fair	Street Tree	None	661	5,901	426	68	35	Lean
19	<i>Zelkova serrata</i>	Zelkova	1	20.7				20.7	45	25	Fair	Fair	Street Tree	None	1,419	3,771	1,579	127	22	
20	<i>Zelkova serrata</i>	Zelkova	1	24.6				24.6	40	28	Good	Fair	Street Tree	Remove - Construction	2,207	6,619	2,372	173	39	
21	<i>Liriodendron tulipifera</i>	Tulip tree	1	21.3				21.3	50	22	Fair	Fair	Street Tree	None	755	6,416	1,384	107	38	
22	<i>Liriodendron tulipifera</i>	Tulip tree	1	17.0				17.0	35	16	Poor	Fair	Street Tree	None	731	5,967	806	78	36	Canopy dieback
23	<i>Liriodendron tulipifera</i>	Tulip tree	1	13.2				13.2	30	8	Poor	Fair	Street Tree	None	314	2,524	440	55	15	Lean, canopy dieback
24	<i>Platanus × acerifolia</i>	London plane tree	1	6.6				6.6	22	15	Fair	Fair	Street Tree	None	330	1,687	98	29	10	
25	<i>Platanus × acerifolia</i>	London plane tree	1	33.1				33.1	50	25	Fair	Fair	Street Tree	None	2,043	13,891	4,905	298	83	
26	<i>Acer spp.</i>	Maple	1	9.0				9.0	25	12	Fair	Fair	Street Tree	Remove - Construction	452	2,305	225	45	14	
37	<i>Liriodendron tulipifera</i>	Tulip tree	1	23.4				23.4	60	20	Good	Good	Street Tree	None	1,165	9,895	1,734	121	59	
38	<i>Quercus rubra</i>	Red oak	1	8.8				8.8	30	15	Fair	Fair	Street Tree	None	551	2,525	218	49	15	Lean, suppressed
39	<i>Quercus rubra</i>	Red oak	1	7.9				7.9	30	15	Good	Good	Street Tree	None	380	1,802	168	42	11	
40	<i>Liriodendron tulipifera</i>	Tulip tree	1	11.9				11.9	35	15	Fair	Fair	Street Tree	None	415	4,000	343	55	24	Canopy dieback
41	<i>Zelkova serrata</i>	Zelkova	1	32.6				32.6	40	45	Fair	Fair	Street Tree	None	2,734	5,468	4,673	289	33	
42	<i>Zelkova serrata</i>	Zelkova	1	31.6				31.6	40	45	Fair	Fair	Street Tree	None	3,019	6,038	4,335	277	36	
43	<i>Liriodendron tulipifera</i>	Tulip tree	1	23.4				23.4	50	25	Fair	Fair	Street Tree	None	1,195	9,437	1,734	121	56	
44	<i>Liriodendron tulipifera</i>	Tulip tree	1	15.8				15.8	30	15	Fair	Fair	Street Tree	None	471	3,677	677	71	22	
45	<i>Liriodendron tulipifera</i>	Tulip tree	1	24.7				24.7	45	22	Fair	Fair	Street Tree	None	1,288	7,125	1,974	141	42	Asymmetrical canopy
46	<i>Liriodendron tulipifera</i>	Tulip tree	1	19.3				19.3	45	25	Fair	Fair	Street Tree	None	1,419	6,683	1,093	93	40	Asymmetrical canopy
47	<i>Liriodendron tulipifera</i>	Tulip tree	1	10.5				10.5	30	15	Fair	Fair	Street Tree	None	1,075	6,603	254	46	39	Asymmetrical canopy, arching form
48	<i>Fraxinus oxycarpa</i>	Raywood ash	1	27.9				27.9	65	28	Fair	Fair	Street Tree	Remove - Construction	1,195	6,570	2,566	153	39	Large old limb removed from canopy, epicormic sprouting
49	<i>Ulmus americana</i>	American elm	1	47.2				47.2	80	40	Fair	Fair	Street Tree	None	1,963	14,334	9,492	395	85	Broken limb in canopy, canopy dieback, lean, cavity, prune and inspect as recommended in Appendix D
50	<i>Ulmus americana</i>	American elm	1	35.3				35.3	50	40	Fair	Fair	Street Tree	None	1,735	11,104	4,728	264	66	Lean, arching form, canopy dieback, prune and inspect as recommended in Appendix D
51	<i>Ulmus americana</i>	American elm	1	10.0				10.0	40	15	Fair	Fair	Street Tree	None	616	5,229	230	44	31	Small narrow canopy
53	<i>Acer buergerianum</i>	Trident maple	1	8.0				8.0	25	15	Good	Fair	Street Tree	None	638	3,261	174	39	19	Included bark, asymmetrical canopy
54	<i>Pyrus calleryana</i>	Bradford pear	1	16.0				16.0	22	20	Fair	Fair	Street Tree	None	1,452	2,645	817	86	16	Heavy lean/arch over street
55	<i>Zelkova serrata</i>	Zelkova	1	32.2				32.2	50	40	Good	Good	Street Tree	None	4,778	9,557	4,590	287	57	
56	<i>Ulmus americana</i>	American elm	1	11.8				11.8	30	22	Fair	Fair	Street Tree	None	856	4,963	341	55	30	Suppressed
57	<i>Liquidambar styraciflua</i>	Liquidambar	1	26.9				26.9	80	25	Fair	Fair	Street Tree	None	1,735	9,716	1,869	101	58	Dead limbs in canopy, hardscape damage
58	<i>Ulmus americana</i>	American elm	1	50.3				50.3	100	32	Fair	Fair	Non-Heritage Tree	None	1,735	14,400	11,056	432	86	Broken limb wound in canopy, cavity at 30 feet, included bark, canopy dieback, epicormic sprouting
59	<i>Sequoia sempervirens</i>	Coast redwood	3	29.3	24.7	29.4		83.4	110	20	Good	Fair	Non-Heritage Tree	None	707	7,634	6,048	229	50	
62	<i>Robinia pseudoacacia</i>	Black locust	1	32.0				32.0	65	22	Poor	Poor	Non-Heritage Tree	Remove - Health	804	5,067	4,600	288	30	Mistletoe, broken limbs, dying - recommend removal
66	<i>Ulmus americana</i>	American elm	1	43.8				43.8	80	45	Fair	Fair	Heritage Tree	None	1,963	14,334	7,933	356	85	Dead wood in canopy, canopy dieback, lean, prune and inspect as recommended in Appendix D
67	<i>Ulmus americana</i>	American elm	1	48.0				48.0	80	40	Fair	Fair	Heritage Tree	None	2,643	18,495	9,882	405	110	Dead wood in canopy, canopy dieback, possible decay in old pruning cut at 15 feet, tree behind private fence (diameter estimated, not measured), prune and inspect as recommended in Appendix D
68	<i>Ulmus americana</i>	American elm	1	50.6				50.6	80	40	Fair	Fair	Non-Heritage Tree	None	3,632	24,332	11,215	435	145	Basal wound at 4 feet, cavities in major limbs at 25 and 30 feet, minor canopy dieback, narrow stem attachments, included bark - recommend further inspection
69	<i>Fraxinus velutina</i>	Modesto ash	1	38.4				38.4	80	45	Fair	Fair	Heritage Tree	None	2,828	14,985	5,383	262	89	Cavity at 8 feet, poor branch attachment, canopy dieback, epicormic sprouting
71	<i>Casuarina spp.</i>	Beefwood	1	36.4				36.4	60	30	Fair	Poor	Non-Heritage Tree	Remove - Construction	1,104	9,940	2,733	138	65	2 main stems, narrow stem attachment, 1 main stem topped, included bark, trunk cavity
72	<i>Cedrus atlantica</i>	Blue atlas cedar	1	33.6				33.6	50	30	Good	Fair	Heritage Tree	Remove - Construction	830	7,300	2,238	121	48	Narrow stem attachments, broken limb - recommend pruning rubbing branches in canopy
73	<i>Fraxinus velutina</i>	Modesto ash	1	36.1				36.1	50	30	Fair	Fair	Heritage Tree	Remove - Construction	4,072	13,843	4,364	231	83	Lean, cavity, sparse canopy, narrow stem attachment
76	<i>Ulmus americana</i>	American elm	1	50.2				50.2	65	40	Fair	Fair	Heritage Tree	None	4,185	25,531	11,003	431	152	Large broken limb, minor canopy dieback, epicormic sprouting, potential decay in main limb, prune and inspect as recommended in Appendix D
77	<i>Platanus racemosa</i>	California sycamore	1	41.5				41.5	70	40	Fair	Fair	Heritage Tree	None	2,552	21,945	8,589	368	131	Lean toward building, old broken limb damage in canopy
78	<i>Platanus racemosa</i>	California sycamore	1	48.0				48.0	80	45	Fair	Fair	Non-Heritage Tree	None	3,579	30,059	11,127	225	179	Minor canopy dieback, included bark, near gas meter, tree behind private fence (diameter estimated, not measured)
79	<i>Juglans hindsii</i>	Northern California walnut	1	31.3				31.3	45	25	Fair	Fair	Non-Heritage Tree	Remove - Construction	1,591	6,376	4,262	274	38	Canopy dieback, asymmetrical canopy
101	<i>Quercus rubra</i>	Red oak	1	5.1				5.1	25	12	Good	Good	Street Tree	None	113	453	58	27	3	
102	<i>Ulmus americana</i>	American elm	1	3.0				3.0	10	5	Good	Fair	Street Tree	None	79	243	13	9	1	
103	<i>Acer spp.</i>	Maple	1	1.5				1.5	12	5	Good	Good	Street Tree	None	79	260	4	5	2	
104	<i>Platanus × acerifolia</i>	London plane tree	1	31.6				31.6	60	40	Fair	Fair	Heritage Tree	None	4,072	25,243	4,438	281	151	Offsite
105	<i>Pinus canariensis</i>	Canary Island pine	1	31.8				31.8	80	20	Good	Fair	Heritage Tree	Remove - Construction	707	4,807	2,166	124	31	
106	<i>Liriodendron tulipifera</i>	Tulip tree	1	32.0				32.0	70	35	Good	Fair	Heritage Tree	None	1,735	14,747	3,670	226	88	Minor canopy dieback
107	<i>Platanus racemosa</i>	California sycamore	1	22.9				22.9	50	22	Fair	Fair	Heritage Tree	Remove - Construction	1,963	14,923	2,026	147	89	Slight lean

Tree Number <sup>1</sup>	Scientific Name	Common Name	Quantity of Stems	Trunk Diameter (in.)				Cumulative Diameter (in.)	Height (ft.)	Canopy Radius (ft.)	Health Condition	Structural Condition	Tree Type <sup>2,3,4</sup>	Impact	i-Tree Eco Results					Notes
				D1	D2	D3	D4								Canopy Cover (ft²)	Leaf Surface Area (ft²)	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft³/year)	
108	<i>Magnolia grandiflora</i>	Southern magnolia	1	16.0				16.0	40	20	Fair	Fair	Non-Heritage Tree	None	962	4,954	901	88	32	Narrow stem attachments, canopy dieback, cracking bark
109	<i>Celtis sinensis</i>	Hackberry	1	18.5				18.5	25	25	Fair	Poor	Non-Heritage Tree	Remove - Construction	1,591	6,847	1,166	106	41	Lean, lopsided canopy, basal wound, heavy pitching on driveway
110	<i>Celtis sinensis</i>	Hackberry	1	19.5				19.5	25	30	Fair	Fair	Non-Heritage Tree	None	1,385	6,391	1,324	114	38	Co-dominant leaders, basal wounds, lopsided canopy
111	<i>Magnolia liliiflora</i>	Lily magnolia	3	7.5	7.0	6.0		20.5	20	25	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	707	3,122	398	65	19	Trunk wound, canopy dieback
112	<i>Magnolia liliiflora</i>	Lily magnolia	4	8.5	6.5	6.5	4.0	25.5	20	20	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	882	3,487	507	65	21	Branch wound, canopy dieback, included bark
113	<i>Magnolia liliiflora</i>	Lily magnolia	2	5.0	5.0			10.0	20	15	Fair	Fair	Non-Heritage Tree	Remove - Construction	452	2,005	144	36	12	Located behind fence, canopy dieback
114	<i>Yucca spp.</i>	Yucca	4	4.0	4.0	4.0	4.0	16.0	12	3	Good	Good	Non-Heritage Tree	Remove - Construction	28	105	3	0	1	2 feet from building
115	<i>Platanus × acerifolia</i>	London plane tree	1	11.0				11.0	30	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	779	5,090	339	59	30	Suppressed, lean/arch, lopsided canopy
116	<i>Platanus × acerifolia</i>	London plane tree	1	16.0				16.0	30	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	779	5,090	830	87	30	Suppressed, lean/arch, lopsided canopy
117	<i>Platanus × acerifolia</i>	London plane tree	1	11.0				11.0	30	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	779	5,090	339	59	30	Suppressed, lean/arch, lopsided canopy
118	<i>Platanus × acerifolia</i>	London plane tree	1	13.1				13.1	30	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	779	5,090	514	66	30	Suppressed, lean/arch, lopsided canopy
119	<i>Citrus spp.</i>	Citrus	1	7.5				7.5	15	10	Fair	Fair	Non-Heritage Tree	Remove - Construction	1,018	1,953	150	34	13	
120	<i>Platanus × acerifolia</i>	London plane tree	1	15.0				15.0	30	20	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	616	4,255	711	79	25	Suppressed, very close to adjacent trees
121	<i>Platanus × acerifolia</i>	London plane tree	1	13.7				13.7	30	20	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	616	4,255	572	70	25	Suppressed, very close to adjacent trees
122	<i>Platanus × acerifolia</i>	London plane tree	1	21.5				21.5	30	20	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	616	4,255	1,690	131	25	Suppressed, very close to adjacent trees
123	<i>Eriobotrya deflexa</i>	Bronze loquat	1	12.5				12.5	15	20	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	804	1,736	455	60	11	Suppressed, located very close to adjacent trees
124	<i>Ligustrum japonicum</i>	Japanese privet	2	13.0	13.0			26.0	15	10	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	707	1,627	1,140	103	11	Located behind fence, narrow stem attachments, included bark
125	<i>Ceratonia siliqua</i>	Carob	1	25.9				25.9	30	35	Fair	Fair	Non-Heritage Tree	Remove - Construction	2,463	5,665	2,682	184	37	Conflicting main stems, canopy dieback, possible decay
126	<i>Cinnamomum camphora</i>	Camphor	1	16.1				16.1	40	15	Good	Fair/Poor	Non-Heritage Tree	Remove - Construction	755	4,656	884	89	30	Narrow canopy form, very close to building
127	<i>Betula pendula</i>	European white birch	1	12.0				12.0	25	15	Good	Good	Non-Heritage Tree	Remove - Construction	531	2,187	494	81	13	Located behind fence, narrow stem attachments in canopy
128	<i>Ailanthus altissima</i>	Tree of heaven	1	5.0				5.0	15	15	Good	Good	Non-Heritage Tree	Remove - Construction	397	1,220	49	23	7	Located behind fence, invasive species
129	<i>Betula pendula</i>	European white birch	1	8.4				8.4	20	10	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	314	1,003	206	49	6	Canopy dieback, lean
130	<i>Betula pendula</i>	European white birch	1	10.3				10.3	20	10	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	314	1,003	339	65	6	Suppressed, canopy dieback
131	<i>Betula pendula</i>	European white birch	1	8.1				8.1	20	10	Fair/Poor	Fair/Poor	Non-Heritage Tree	Remove - Construction	415	1,154	188	46	7	Epicormic sprouts, canopy dieback
132	<i>Morus alba</i>	Mulberry	1	18.6				18.6	25	25	Fair	Poor	Non-Heritage Tree	Remove - Construction	1,046	3,799	1,182	106	23	Possible decay, lean
133	<i>Ulmus parvifolia</i>	Chinese elm	1	26.0				26.0	35	18	Good/Fair	Poor	Non-Heritage Tree	Remove - Construction	2,207	6,177	2,271	154	37	Located behind fence, lopsided canopy, epicormic sprouting
134	<i>Ulmus parvifolia</i>	Chinese elm	1	8.0				8.0	20	15	Good/Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	755	1,955	134	33	12	Located behind fence, suppressed, lean
135	<i>Quercus lobata</i>	Valley oak	1	10.0				10.0	15	15	Good	Fair	Non-Heritage Tree	Remove - Construction	707	1,232	281	57	7	Located behind fence, narrow form, suppressed, located in stand w/ other trees
136	<i>Cinnamomum camphora</i>	Camphor	1	9.0				9.0	20	15	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	638	1,546	213	44	10	Located behind fence, narrow canopy form, suppressed, located in stand w/ other trees
137	<i>Cinnamomum camphora</i>	Camphor	1	26.3				26.3	40	15	Good	Fair	Non-Heritage Tree	Remove - Construction	1,018	4,977	2,813	189	33	Very large tree, surrounded by hard scape, minor canopy dieback
138	<i>Albizia julibrissin</i>	Silk tree	1	26.0				26.0	40	25	Good/Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	1,256	4,759	2,710	186	28	Located behind fence, old pruning wounds, decay likely
139	<i>Albizia julibrissin</i>	Silk tree	2	9.2	6.0			15.2	25	12	Fair	Poor	Non-Heritage Tree	Remove - Construction	452	1,964	333	59	12	Suppressed, lopsided canopy
140	<i>Albizia julibrissin</i>	Silk tree	2	14.0	12.0			26.0	30	25	Fair	Poor	Non-Heritage Tree	Remove - Construction	1,195	4,563	1,168	106	27	Suppressed, lopsided canopy
141	<i>Acer saccharinum</i>	Silver maple	1	22.0				22.0	30	22	Fair	Fair	Non-Heritage Tree	Remove - Construction	1,385	4,835	929	64	29	Located behind fence, epicormic sprouting, narrow stem attachments
142	<i>Ligustrum japonicum</i>	Japanese privet	3	8.0	6.0	6.0		20.0	20	12	Good	Fair/Poor	Non-Heritage Tree	Remove - Construction	452	1,302	390	63	9	Located behind fence, narrow stem attachments, branch conflicts
143	<i>Chamaerops humilis</i>	Mediterranean fan palm	1	7.0				7.0	15	5	Good	Good	Non-Heritage Tree	Remove - Construction	79	305	8	0	2	Located behind fence
144	<i>Cinnamomum camphora</i>	Camphor	1	26.0				26.0	40	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	2,043	7,354	2,750	186	48	Located behind fence, very large tree, minor canopy dieback, very close to building and hardscape
145	<i>Magnolia grandiflora</i>	Southern magnolia	1	18.0				18.0	40	15	Good/Fair	Good/Fair	Non-Heritage Tree	Remove - Construction	707	4,535	1,171	104	30	Located behind fence, canopy dieback, very close to hardscape and adjacent building
146	<i>Pittosporum tobira</i>	Mock orange	3	4.0	3.0	2.0		9.0	15	10	Good/Fair	Poor	Non-Heritage Tree	Remove - Construction	314	1,085	66	26	7	Located behind fence, suppressed
147	<i>Ligustrum japonicum</i>	Japanese privet	1	7.0				7.0	15	10	Fair	Poor	Non-Heritage Tree	Remove - Construction	314	1,085	118	31	7	Located behind fence, suppressed, canopy dieback
148	<i>Ailanthus altissima</i>	Tree of heaven	1	4.0				4.0	15	5	Good	Fair	Non-Heritage Tree	Remove - Construction	79	277	29	17	2	Located behind fence, invasive species
149	<i>Ailanthus altissima</i>	Tree of heaven	1	3.0				3.0	15	5	Good	Fair	Non-Heritage Tree	Remove - Construction	79	277	15	10	2	Located behind fence, invasive species
150	<i>Ulmus parvifolia</i>	Chinese elm	2	4.0	2.0			6.0	15	10	Good	Fair	Non-Heritage Tree	Remove - Construction	380	1,388	33	18	8	Located behind fence, small tree
151	<i>Liquidambar styraciflua</i>	Liquidambar	1	29.5				29.5	45	15	Good	Fair	Non-Heritage Tree	Remove - Construction	661	4,657	1,328	73	28	Co-dominant leader
152	<i>Liquidambar styraciflua</i>	Liquidambar	1	28.1				28.1	45	20	Fair	Fair	Non-Heritage Tree	Remove - Construction	907	4,925	1,220	70	29	Co-dominant leader
153	<i>Malus spp.</i>	Fruit tree	1	6.0				6.0	15	5	Fair	Fair	Non-Heritage Tree	Remove - Construction	79	304	76	29	2	Located behind fence
154	<i>Eriobotrya deflexa</i>	Bronze loquat	1	5.0				5.0	15	5	Good	Fair	Non-Heritage Tree	Remove - Construction	79	277	51	23	2	Located behind fence
155	<i>Ailanthus altissima</i>	Tree of heaven	1	4.0				4.0	15	12	Good	Fair	Non-Heritage Tree	Remove - Construction	363	1,166	29	17	7	Located behind fence, invasive species
156	<i>Ailanthus altissima</i>	Tree of heaven	2	8.0	5.0			13.0	20	12	Good	Fair/Poor	Non-Heritage Tree	Remove - Construction	363	1,166	15			



Appendix B - Tree Information Matrix																				
Tree Number <sup>1</sup>	Scientific Name	Common Name	Quantity of Stems	Trunk Diameter (in.)				Cumulative Diameter (in.)	Height (ft.)	Canopy Radius (ft.)	Health Condition	Structural Condition	Tree Type <sup>2,3,4</sup>	Impact	i-Tree Eco Results					Notes
				D1	D2	D3	D4								Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)	
172	<i>Ulmus americana</i>	American elm	1	18.0				18.0	40	18	Fair	Fair	Non-Heritage Tree	Remove - Construction	1,135	6,108	940	86	36	Located behind fence, co-dominant leader, included bark, suppressed
173	<i>Ulmus americana</i>	American elm	1	30.1				30.1	40	25	Good	Fair	Non-Heritage Tree	Remove - Construction	1,591	5,266	3,226	212	31	Wounded buttress roots, very large tree
174	<i>Celtis sinensis</i>	Hackberry	1	21.7				21.7	40	18	Fair/Poor	Poor	Non-Heritage Tree	Remove - Construction	1,018	7,277	1,755	134	43	Large old broken limb in canopy, lopsided canopy
175	<i>Ailanthus altissima</i>	Tree of heaven	1	10.1				10.1	15	5	Good	Fair	Non-Heritage Tree	Remove - Construction	79	277	266	51	2	Very close to fence, invasive species
176	<i>Platanus x acerifolia</i>	London plane tree	1	12.3				12.3	40	12	Good	Fair/Poor	Non-Heritage Tree	Remove - Construction	616	5,698	452	61	34	Lopsided canopy, trees located in stand
177	<i>Platanus x acerifolia</i>	London plane tree	1	17.0				17.0	40	12	Good	Fair	Non-Heritage Tree	Remove - Construction	491	4,999	978	96	30	In stand w/ lopsided canopies, lean outward
178	<i>Platanus x acerifolia</i>	London plane tree	1	16.1				16.1	40	12	Good	Fair	Non-Heritage Tree	Remove - Construction	531	5,245	859	89	31	In stand w/ lopsided canopies, lean outward
179	<i>Platanus x acerifolia</i>	London plane tree	1	21.0				21.0	40	15	Good	Fair	Non-Heritage Tree	Remove - Construction	616	5,698	1,622	128	34	In stand w/ lopsided canopies, lean outward
180	<i>Platanus x acerifolia</i>	London plane tree	1	20.1				20.1	40	15	Good	Fair	Non-Heritage Tree	Remove - Construction	616	5,698	1,460	121	34	In stand w/ lopsided canopies, lean outward
181	<i>Platanus x acerifolia</i>	London plane tree	1	20.2				20.2	40	15	Good	Fair	Non-Heritage Tree	Remove - Construction	616	5,698	1,478	122	34	In stand w/ lopsided canopies, lean outward
182	<i>Platanus x acerifolia</i>	London plane tree	1	17.9				17.9	40	15	Good	Fair	Non-Heritage Tree	Remove - Construction	380	4,219	1,106	103	25	In stand w/ lopsided canopies, lean outward
183	<i>Platanus x acerifolia</i>	London plane tree	1	16.2				16.2	40	15	Good	Fair/Poor	Non-Heritage Tree	Remove - Construction	962	6,647	871	90	40	Located in stand, lopsided canopy, leaning outward
184	<i>Persea spp.</i>	Fruit tree	2	3.0	2.5			5.5	12	7	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	79	226	28	17	1	Located behind fence, suppressed, lean
185	<i>Acer palmatum</i>	Japanese maple	1	3.5				3.5	8	5	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	79	220	24	16	1	Located behind fence, suppressed, canopy dieback
186	<i>Ligustrum japonicum</i>	Japanese privet	1	9.0				9.0	10	10	Fair	Fair	Non-Heritage Tree	Remove - Construction	347	414	201	43	3	Located behind fence, lopsided canopy, canopy dieback
187	<i>Liquidambar styraciflua</i>	Liquidambar	1	24.4				24.4	45	20	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,195	4,676	953	61	28	
188	<i>Liquidambar styraciflua</i>	Liquidambar	1	28.8				28.8	45	25	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,809	7,419	1,274	72	44	
189	<i>Cinnamomum camphora</i>	Camphor	1	25.0				25.0	40	20	Fair	Fair	Non-Heritage Tree	Remove - Construction	1,662	7,312	2,506	176	48	Canopy dieback, lopsided canopy
190	<i>Morus alba</i>	Mulberry	1	21.4				21.4	30	30	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	1,735	3,990	1,671	130	24	Dead wood in trunk, poor stem attachments
191	<i>Liquidambar styraciflua</i>	Liquidambar	1	29.5				29.5	45	20	Good	Fair	Non-Heritage Tree	Remove - Construction	1,256	4,568	1,328	73	27	Co-dominant leader
192	<i>Cinnamomum camphora</i>	Camphor	1	29.6				29.6	40	22	Fair	Fair	Non-Heritage Tree	Remove - Construction	1,809	6,514	3,739	224	43	Canopy dieback, no basal flare, epicormic sprouts
193	<i>Liquidambar styraciflua</i>	Liquidambar	1	30.9				30.9	45	18	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,075	4,837	1,440	87	29	Lopsided canopy
194	<i>Betula pendula</i>	European white birch	1	15.8				15.8	30	18	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	962	3,981	974	105	24	Multiple stems/leaders, uneven canopy form
195	<i>Magnolia liliiflora</i>	Lily magnolia	3	10.4	9.1	7.0		26.5	25	18	Good/Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	1,018	3,747	761	83	22	Lopsided canopy, included bark
196	<i>Cinnamomum camphora</i>	Camphor	1	27.2				27.2	40	28	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,886	6,789	3,058	199	44	Lopsided canopy, dead wood in canopy, co-dominant with adjacent tree
197	<i>Cinnamomum camphora</i>	Camphor	1	31.2				31.2	40	30	Good/Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	3,117	7,170	4,243	272	47	Lopsided canopy, dead wood in canopy, co-dominant with adjacent tree, co-dominant leader
198	<i>Liriodendron tulipifera</i>	Tulip tree	1	18.1				18.1	45	15	Good	Good	Non-Heritage Tree	Remove - Construction	347	5,375	937	85	32	
199	<i>Casuarina spp.</i>	Beefwood	1	8.0				8.0	20	7	Fair	Poor	Non-Heritage Tree	Remove - Construction	227	1,167	87	18	8	Suppressed, arch/lean over adjacent building
200	<i>Platanus x acerifolia</i>	London plane tree	1	10.6				10.6	20	7	Fair	Fair	Non-Heritage Tree	Remove - Construction	201	888	302	55	5	Suppressed, lopsided canopy, lean
201	<i>Citrus spp.</i>	Citrus	2	5.7	3.6			9.3	20	12	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	452	2,005	123	30	13	Suppressed, lopsided canopy, lean
202	<i>Ceratonia siliqua</i>	Carob	1	22.0				22.0	30	15	Fair	Poor	Non-Heritage Tree	Remove - Construction	707	3,536	1,808	136	23	Located behind fence, decay potential in main branches
203	<i>Ceratonia siliqua</i>	Carob	1	26.0				26.0	30	20	Fair	Poor	Non-Heritage Tree	Remove - Construction	594	3,078	2,691	185	20	Located behind fence, canopy dieback, lopsided canopy
204	<i>Lagerstroemia indica</i>	Crape myrtle	1	5.4				5.4	15	12	Good	Good	Non-Heritage Tree	Remove - Construction	314	1,085	59	26	6	
205	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.6				6.6	15	10	Good	Good	Non-Heritage Tree	Remove - Construction	314	1,085	96	29	6	
206	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	15	10	Good	Good	Non-Heritage Tree	Remove - Construction	314	1,085	76	29	6	
207	<i>Ligustrum japonicum</i>	Japanese privet	1	15.7				15.7	15	10	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	314	1,085	778	83	7	Lopsided canopy, narrow stem attachments
208	<i>Citrus spp.</i>	Citrus	3	3.0	2.0	2.0		7.0	20	5	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	79	277	35	18	2	
209	<i>Chamaerops humilis</i>	Mediterranean fan palm	1	7.0				7.0	15	5	Good	Good	Non-Heritage Tree	Remove - Construction	79	305	8	0	2	Located behind fence
210	<i>Liquidambar styraciflua</i>	Liquidambar	1	20.0				20.0	40	15	Good/Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	707	4,195	607	44	25	Located behind fence
211	<i>Ligustrum japonicum</i>	Japanese privet	1	8.0				8.0	15	15	Fair	Poor	Non-Heritage Tree	Remove - Construction	707	1,627	164	37	11	Located behind fence, suppressed
212	<i>Zelkova serrata</i>	Zelkova	1	27.2				27.2	35	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,662	3,324	3,000	198	20	Very close to adjacent structure
213	<i>Ligustrum japonicum</i>	Japanese privet	1	4.0				4.0	15	5	Fair	Fair	Non-Heritage Tree	Remove - Construction	79	277	31	17	2	Located behind fence, suppressed
214	<i>Zelkova serrata</i>	Zelkova	1	20.9				20.9	35	25	Good	Good/Fair	Non-Heritage Tree	Remove - Construction	2,083	4,166	1,591	127	25	
215	<i>Ceratonia siliqua</i>	Carob	1	28.1				28.1	35	20	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	2,207	5,074	3,276	207	33	Canopy dieback
216	<i>Crataegus laevigata</i>	English hawthorn	1	9.0				9.0	15	10	Fair	Poor	Non-Heritage Tree	Remove - Construction	314	1,104	201	44	7	Located behind fence
217	<i>Lagerstroemia indica</i>	Crape myrtle	1	7.0				7.0	15	10	Good	Fair/Poor	Non-Heritage Tree	Remove - Construction	314	1,085	110	31	6	Located behind fence, poor shade tree species
218	<i>Platanus x acerifolia</i>	London plane tree	1	30.7				30.7	50	30	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	2,207	15,002	4,093	268	89	Suppressed, multiple leaders
219	<i>Platanus x acerifolia</i>	London plane tree	1	15.6				15.6	40	30	Fair	Fair	Non-Heritage Tree	Remove - Construction	2,043	10,214	796	85	61	Suppressed
220	<i>Platanus x acerifolia</i>	London plane tree	1	25.1				25.1	50	30	Good/Fair	Good	Non-Heritage Tree	Remove - Construction	1,591	11,451	2,524	179	68	Dominant tree in stand
221	<i>Platanus x acerifolia</i>	London plane tree	1	8.8				8.8	30	30	Poor	Poor	Non-Heritage Tree	Remove - Construction	1,662	5,484	199	44	33	Suppressed, canopy dieback
222	<i>Platanus x acerifolia</i>	London plane tree	1	25.6				25.6	45	27	Good	Good	Non-Heritage Tree	Remove - Construction	2,643	13,210	2,628	183	79	
223	<i>Ailanthus altissima</i>	Tree of heaven	1	25.2				25.2	40	25	Fair/Poor	Fair	Non-Heritage Tree	Remove - Construction	1,385	4,677	2,513	178	28	Narrow canopy, weeping trunk wound
224	<i>Platanus x acerifolia</i>	London plane tree	1	12.0				12.0	25	30	Fair	Fair	Non-Heritage Tree	None	1,195	5,446	412	66	32	Located behind fence, narrow canopy form, suppressed
225	<i>Platanus x acerifolia</i>	London plane tree	1	22.0				22.0	30	25	Fair	Fair	Non-Heritage Tree	None	1,809	5,972	1,786	136	36	Located behind fence, suppressed, lean away from adjacent building, fire damage
226	<i>Casuarina spp.</i>	Beefwood	1	29.9				29.9	40	20	Fair	Fair	Non-Heritage Tree	None	1,256	7,521	1,630	89	49	
227	<i>Arbutus unedo</i>	Strawberry tree	4	6.0	5.0	4.0	3.0	18.0	10	8	Good/Fair	Fair	Non-Heritage Tree	None	201	315	215	45	2	Located offsite
228	<i>Pyrus kawakamii</i>	Evergreen pear	1	12.5				12.5	20	15	Fair	Fair	Non-Heritage Tree	None	856	1,477	458	61	10	Suppressed
229	<i>Pyrus kawakamii</i>	Evergreen pear	1	9.2				9.2	20	12	Fair	Fair	Non-Heritage Tree	None	510	1,141	222	46	7	Suppressed
230	<i>Pyrus kawakamii</i>	Evergreen pear	1	14.2				14.2	20	12	Fair	Poor	Non-Heritage Tree	Remove - Construction	491	1,119	618	73	7	Suppressed, basal wounds
231	<i>Cinnamomum camphora</i>	Camphor	1	24.0				24.0	40	25	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,886	6,789	2,273	155	44	Located behind fence, lopsided canopy, included bark
232	<i>Ailanthus altissima</i>	Tree of heaven	1	22.4				22.4	40	20	Fair	Fair	Non-Heritage Tree	Remove - Construction	2,734	6,288	1,894	141	38	Dead wood in canopy, narrow canopy form
233	<i>Platanus x acerifolia</i>	London plane tree	1	8.9				8.9	25	15	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	415	2,461	202	44	15	Suppressed, lopsided canopy
234	<i>Malus spp.</i>	Fruit tree	1	6.0				6.0	10	5	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	132	281	75	29	2	Suppressed, canopydieback, lopsided canopy
235	<i>Platanus x acerifolia</i>	London plane tree	1	9.5				9.5	25	15	Good/Fair	Good	Non-Heritage Tree	Remove - Construction	731	4,259	236	48	25	
236	<i>Malus spp.</i>	Fruit tree	1	14.9				14.9	15	12	Fair	Poor	Non-Heritage Tree	Remove - Construction	573	1,608	678	77	10	Canopy dieback, poor structure
237	<i>Sequoia sempervirens</i>	Coast redwood	1	17.4				17.4	30	12	Good	Good	Non-Heritage Tree	None	531	4,328	516	41	28	
238	<i>Pittosporum tobira</i>	Mock orange	4	5.0	5.0	4.0	4.0	18.0	15	5	Good/Fair	Poor	Non-Heritage Tree	Remove - Construction	79	277	206	44	2	Large shrub form, dead wood in canopy, poor structure
239	<i>Pittosporum tobira</i>	Mock orange	4	7.0	5.0	5.0	4.0	21.0	15	5	Good/Fair	Poor	Non-Heritage Tree	Remove - Construction	79	277	309	56	2	Large shrub form, dead wood in canopy, poor structure

Appendix B - Tree Information Matrix																				
Tree Number <sup>1</sup>	Scientific Name	Common Name	Quantity of Stems	Trunk Diameter (in.)				Cumulative Diameter (in.)	Height (ft.)	Canopy Radius (ft.)	Health Condition	Structural Condition	Tree Type <sup>2,3,4</sup>	Impact	i-Tree Eco Results					Notes
				D1	D2	D3	D4								Canopy Cover (ft²)	Leaf Surface Area (ft²)	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft³/year)	
240	<i>Pittosporum tobira</i>	Mock orange	4	4.0	4.0	3.0	3.0	14.0	15	5	Good/Fair	Poor	Non-Heritage Tree	Remove - Construction	79	277	115	32	2	Large shrub form, dead wood in canopy, poor structure
241	<i>Salix spp.</i>	Willow	1	8.0				8.0	15	7	Fair/Poor	Poor	Non-Heritage Tree	Remove - Construction	283	945	152	37	6	Located behind fence, poor overall structure
242	<i>Ailanthus altissima</i>	Tree of heaven	1	8.0				8.0	20	7	Fair	Poor	Non-Heritage Tree	Remove - Construction	240	803	154	38	5	Located behind fence, invasive species
243	<i>Calocedrus decurrens</i>	Incense cedar	1	16.6				16.6	25	10	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	330	2,231	431	38	15	Lopsided canopy, sweep
244	<i>Crataegus laevigata</i>	English hawthorn	1	11.0				11.0	20	15	Fair	Poor	Non-Heritage Tree	Remove - Construction	347	1,159	330	58	7	Located behind fence
245	<i>Ligustrum japonicum</i>	Japanese privet	2	14.0	8.0			22.0	15	12	Fair	Poor	Non-Heritage Tree	Remove - Construction	397	1,220	830	86	8	Located behind fence, suppressed
246	<i>Ulmus americana</i>	American elm	1	22.0				22.0	40	25	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	1,925	8,660	1,521	113	52	Included bark, co-dominant stems
247	<i>Pistacia chinensis</i>	Chinese pistache	1	17.8				17.8	40	25	Good	Good	Non-Heritage Tree	None	1,256	5,335	1,092	102	32	
248	<i>Eriobotrya deflexa</i>	Bronze loquat	1	10.1				10.1	15	10	Fair	Poor	Non-Heritage Tree	Remove - Construction	330	1,112	272	51	7	Dead wood in canopy
249	<i>Eriobotrya deflexa</i>	Bronze loquat	2	6.8	5.7			12.5	15	12	Fair	Fair	Non-Heritage Tree	None	380	1,193	202	43	8	Suppressed, included bark
250	<i>Sequoia sempervirens</i>	Coast redwood	1	11.0				11.0	30	7	Poor	Fair	Non-Heritage Tree	Remove - Construction	177	1,588	191	27	10	Located behind fence, dying top
251	<i>Ulmus parvifolia</i>	Chinese elm	1	15.9				15.9	35	12	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	573	4,059	698	73	24	Lopsided canopy, suppressed
252	<i>Ulmus parvifolia</i>	Chinese elm	1	13.7				13.7	35	20	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,256	5,558	488	59	33	Lopsided canopy, suppressed
253	<i>Platanus × acerifolia</i>	London plane tree	1	21.4				21.4	40	30	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	2,828	9,331	1,697	132	56	Lopsided canopy, trees located in stand
254	<i>Platanus × acerifolia</i>	London plane tree	1	15.0				15.0	40	15	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	707	6,084	725	81	36	Lopsided canopy, trees located in stand
255	<i>Platanus × acerifolia</i>	London plane tree	1	16.2				16.2	35	15	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	707	5,373	864	89	32	Lopsided canopy, trees located in stand
256	<i>Platanus × acerifolia</i>	London plane tree	1	10.3				10.3	35	15	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	707	5,373	293	55	32	Lopsided canopy, trees located in stand
257	<i>Platanus × acerifolia</i>	London plane tree	1	24.3				24.3	40	25	Good/Fair	Fair	Non-Heritage Tree	Remove - Construction	1,963	9,818	2,303	170	59	Lopsided canopy, trees located in stand
258	<i>Platanus × acerifolia</i>	London plane tree	1	9.9				9.9	25	10	Fair	Poor	Non-Heritage Tree	Remove - Construction	314	1,836	260	51	11	Heavy lean
259	<i>Citrus spp.</i>	Citrus	2	12.9	12.1			25.0	15	10	Fair/Poor	Poor	Non-Heritage Tree	Remove - Construction	314	1,085	1,038	98	7	Possible decay in trunk
260	<i>Lagerstroemia indica</i>	Crape myrtle	2	2.0	2.0			4.0	10	15	Fair	Fair	Non-Heritage Tree	Remove - Construction	314	394	12	9	2	Suppressed
261	<i>Betula pendula</i>	European white birch	1	6.0				6.0	20	5	Fair	Fair	Non-Heritage Tree	None	123	375	90	35	2	Suppressed
262	<i>Betula pendula</i>	European white birch	1	7.5				7.5	20	5	Poor	Fair	Non-Heritage Tree	Remove - Construction	154	466	156	42	3	Suppressed
263	<i>Ailanthus altissima</i>	Tree of heaven	1	21.2				21.2	25	20	Good	Fair	Non-Heritage Tree	Remove - Construction	397	1,751	1,620	128	10	Invasive species
264	<i>Acer palmatum</i>	Japanese maple	1	4.0				4.0	12	7	Good	Good	Non-Heritage Tree	Remove - Construction	132	417	34	19	2	Lopsided canopy, suppressed
265	<i>Acer palmatum</i>	Japanese maple	1	2.5				2.5	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	132	417	12	9	2	Lopsided canopy, suppressed
266	<i>Acer palmatum</i>	Japanese maple	1	3.0				3.0	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	132	417	18	11	2	Lopsided canopy, suppressed
267	<i>Acer palmatum</i>	Japanese maple	1	4.0				4.0	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	132	417	34	19	2	Lopsided canopy, suppressed
268	<i>Acer palmatum</i>	Japanese maple	2	3.0	3.0			6.0	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	132	417	39	20	2	Lopsided canopy, suppressed
269	<i>Acer palmatum</i>	Japanese maple	1	5.5				5.5	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	177	519	68	27	3	Lopsided canopy, suppressed
270	<i>Acer palmatum</i>	Japanese maple	1	5.0				5.0	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	177	519	55	24	3	Lopsided canopy, suppressed
271	<i>Acer palmatum</i>	Japanese maple	3	6.0	5.0	5.0		16.0	12	7	Good	Fair	Non-Heritage Tree	Remove - Construction	177	519	219	43	3	Lopsided canopy, suppressed
272	<i>Acer palmatum</i>	Japanese maple	1	3.0				3.0	12	7	Good	Fair	Non-Heritage Tree	None	165	502	18	11	3	Lopsided canopy, suppressed
273	<i>Acer palmatum</i>	Japanese maple	1	5.0				5.0	12	7	Good	Fair	Non-Heritage Tree	None	177	519	55	24	3	Lopsided canopy, suppressed
274	<i>Acer palmatum</i>	Japanese maple	2	5.0	3.0			8.0	12	7	Good	Fair	Non-Heritage Tree	None	177	519	157	36	3	Lopsided canopy, suppressed
275	<i>Platanus × acerifolia</i>	London plane tree	1	19.5				19.5	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	1,358	116	39	Lopsided canopy, growing away from adjacent building
276	<i>Platanus × acerifolia</i>	London plane tree	1	14.3				14.3	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	647	75	39	Lopsided canopy, growing away from adjacent building
277	<i>Platanus × acerifolia</i>	London plane tree	1	14.5				14.5	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	669	77	39	Lopsided canopy, growing away from adjacent building
278	<i>Platanus × acerifolia</i>	London plane tree	1	12.1				12.1	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	435	60	39	Lopsided canopy, growing away from adjacent building
279	<i>Platanus × acerifolia</i>	London plane tree	1	14.5				14.5	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	669	77	39	Lopsided canopy, growing away from adjacent building
280	<i>Platanus × acerifolia</i>	London plane tree	1	16.6				16.6	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	924	93	39	Lopsided canopy, growing away from adjacent building
281	<i>Platanus × acerifolia</i>	London plane tree	1	14.5				14.5	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	669	77	39	Lopsided canopy, growing away from adjacent building
282	<i>Platanus × acerifolia</i>	London plane tree	1	16.5				16.5	40	25	Good	Fair	Non-Heritage Tree	None	907	6,587	911	92	39	Lopsided canopy, growing away from adjacent building
283	<i>Acer negundo</i>	Box elder	1	15.0				15.0	25	10	Fair	Fair	Non-Heritage Tree	Remove - Construction	177	886	692	72	5	Located behind fence, epicormic sprouting, lean
284	<i>Acer negundo</i>	Box elder	1	13.0				13.0	25	10	Fair	Poor	Non-Heritage Tree	Remove - Construction	177	886	504	61	5	Located behind fence, epicormic sprouting, lean, broken limb
285	<i>Ligustrum japonicum</i>	Japanese privet	1	7.0				7.0	1											

Appendix B - Tree Information Matrix																				
Tree Number <sup>1</sup>	Scientific Name	Common Name	Quantity of Stems	Trunk Diameter (in.)				Cumulative Diameter (in.)	Height (ft.)	Canopy Radius (ft.)	Health Condition	Structural Condition	Tree Type <sup>2,3,4</sup>	Impact	i-Tree Eco Results					Notes
				D1	D2	D3	D4								Canopy Cover (ft²)	Leaf Surface Area (ft²)	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft³/year)	
312	<i>Magnolia grandiflora</i>	Southern magnolia	1	19.6				19.6	45	15	Good	Good/Fair	Non-Heritage Tree	Remove - Construction	804	5,274	1,444	117	34	Lopsided canopy
313	<i>Magnolia grandiflora</i>	Southern magnolia	1	22.6				22.6	45	15	Good	Good/Fair	Non-Heritage Tree	None	779	5,248	2,007	143	34	Lopsided canopy
314	<i>Fraxinus velutina</i>	Modesto ash	1	23.5				23.5	45	20	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	1,165	4,723	1,650	110	28	Canopy dieback
315	<i>Platanus × acerifolia</i>	London plane tree	1	17.0				17.0	40	20	Good	Good	Non-Heritage Tree	None	1,288	6,467	978	96	39	
316	<i>Platanus × acerifolia</i>	London plane tree	1	3.0				3.0	15	5	Good	Good	Non-Heritage Tree	None	79	372	15	10	2	
317	<i>Platanus × acerifolia</i>	London plane tree	1	3.0				3.0	15	5	Good	Good	Non-Heritage Tree	None	79	372	15	10	2	
318	<i>Platanus × acerifolia</i>	London plane tree	1	14.1				14.1	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	600	72	5	Pollarded
319	<i>Platanus × acerifolia</i>	London plane tree	1	10.7				10.7	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	309	56	5	Pollarded
320	<i>Platanus × acerifolia</i>	London plane tree	1	10.3				10.3	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	282	53	5	Pollarded
321	<i>Platanus × acerifolia</i>	London plane tree	1	9.5				9.5	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	233	48	5	Pollarded
322	<i>Platanus × acerifolia</i>	London plane tree	1	8.8				8.8	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	194	43	5	Pollarded
323	<i>Platanus × acerifolia</i>	London plane tree	1	10.7				10.7	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	309	56	5	Pollarded
324	<i>Platanus × acerifolia</i>	London plane tree	1	11.0				11.0	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	330	58	5	Pollarded
325	<i>Platanus × acerifolia</i>	London plane tree	1	10.4				10.4	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	289	54	5	Pollarded
326	<i>Platanus × acerifolia</i>	London plane tree	1	12.6				12.6	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	458	61	5	Pollarded
327	<i>Platanus × acerifolia</i>	London plane tree	1	13.3				13.3	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	522	66	5	Pollarded
328	<i>Platanus × acerifolia</i>	London plane tree	1	6.6				6.6	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	97	29	5	Pollarded
329	<i>Platanus × acerifolia</i>	London plane tree	1	11.9				11.9	20	8	Fair	Fair/Poor	Non-Heritage Tree	Remove - Construction	201	888	399	65	5	Pollarded
330	<i>Liriodendron tulipifera</i>	Tulip tree	1	27.1				27.1	50	20	Good	Good	Non-Heritage Tree	Remove - Construction	1,772	12,759	2,464	160	76	
331	<i>Podocarpus macrophyllus</i>	Yew pine	2	7.0	6.0			13.0	15	7	Good	Fair	Non-Heritage Tree	None	113	583	111	20	4	Located offsite
332	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	10	5	Good	Good	Non-Heritage Tree	Remove - Construction	39	116	75	29	1	Small, newly planted trees
333	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	10	5	Good	Good	Non-Heritage Tree	Remove - Construction	39	116	75	29	1	Small, newly planted trees
334	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	10	5	Good	Good	Non-Heritage Tree	Remove - Construction	39	116	75	29	1	Small, newly planted trees
335	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	10	5	Good	Good	Non-Heritage Tree	Remove - Construction	39	116	75	29	1	Small, newly planted trees
336	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	10	5	Good	Good	Non-Heritage Tree	Remove - Construction	39	116	75	29	1	Small, newly planted trees
337	<i>Lagerstroemia indica</i>	Crape myrtle	1	6.0				6.0	10	5	Good	Good	Non-Heritage Tree	Remove - Construction	39	116	75	29	1	Small, newly planted trees
338	<i>Acer palmatum</i>	Japanese maple	1	7.0				7.0	15	15	Fair	Fair	Non-Heritage Tree	None	491	1,559	120	32	9	Suppressed, heavy arch/lean away from adjacent building
339	<i>Acer palmatum</i>	Japanese maple	1	7.0				7.0	15	15	Fair	Fair	Non-Heritage Tree	None	491	1,559	120	32	9	Suppressed, heavy arch/lean away from adjacent building
340	<i>Cinnamomum camphora</i>	Camphor	1	9.0				9.0	20	25	Fair	Fair	Non-Heritage Tree	None	661	1,573	213	44	10	Located offsite, heavy arch over fence
341	<i>Cinnamomum camphora</i>	Camphor	1	9.0				9.0	20	30	Fair	Fair	Non-Heritage Tree	None	1,018	1,953	215	44	13	Located offsite, heavy arch over fence

Notes <sup>1</sup>Gaps in tree numbers are a result of differences between the 2006 site tree inventory and this tree inventory. Gaps may reflect trees which were recommended for removal during the 2006 inventory (#60, 61, 63, 64, 75) or Dudek's 2013 inventory (#65, 70, 74), or those that were inventoried in 2006 but are adjacent to areas which are not part of the current proposed project (#9-18, 27-36). Additionally, new tree numbers (#101-107) represent trees that were not included in the 2006 inventory. These trees were either planted more recently than the 2006 inventory (Street Trees), have grown since the 2006 inventory to a size that now meets the City's definition of a Heritage Tree. Non-Heritage Trees (#108-341) were not included in the 2006 inventory as they do not meet the minimum size criteria for Heritage Trees and are not City Street Trees. These trees (#108-341) were inventoried by Dudek in August 2014.

<sup>2</sup>A Heritage Tree is defined by Sacramento City Code Section 12.64.020 as : (1) Any tree of any species with a trunk circumference of one hundred (100) inches or more, which is of good quality in terms of health, vigor of growth and conformity to generally accepted horticultural standards of shape and location for its species; (2) Any native Quercus species, Aesculus California or Platanus Racemosa, having a circumference of thirty-six (36) inches or greater when a single trunk, or a cumulative circumference of thirty-six (36) inches or greater when a multi-trunk, which is of good quality in terms of health, vigor of growth and conformity to generally accepted horticultural standards of shape and location for its species; (3) Any tree thirty-six (36) inches in circumference or greater in a riparian zone. The riparian zone is measured from the centerline of the water course to thirty (30) feet beyond the high water line; (4)Any tree, grove of trees or woodland trees designated by resolution of the city council to be of special historical or environmental value or of significant community benefit. (Ord. 2008-018 § 3; prior code § 45.04.211). A Street Tree is defined by Sacramento City Code Section 12.56.020 as : Any tree growing on a public street right-of-way. Heritage trees exhibiting poor or very poor health are recommended for removal and are not included in this report's mitigation totals as their health condition does not meet the City's Heritage Tree definition. These trees are included in the inventory for informational purposes.

<sup>3</sup>Trees designated as a 'Heritage Tree' include only non-City Street Trees; however, 6 City Street Trees (#1, 25, 41, 49, 50, and 55) meet the size criteria for classification as Heritage Trees.

<sup>4</sup>Trees designated as a 'Non-Heritage Tree' (#58, 59, 62, 68, 71, 78, and 79) do not meet the definition of a Heritage Tree due to health/structural condition or location in relation to existing infrastructure, based on a basic visual inspection conducted by a city arborist on 6/17/14. The remaining trees designated a 'Non-Heritage Tree' (#108-341) do not meet the minimum size criteria of a Heritage Tree, as defined by the City.



# APPENDIX C

## *Representative Site Photographs*

## Appendix C

### Representative Site Photographs

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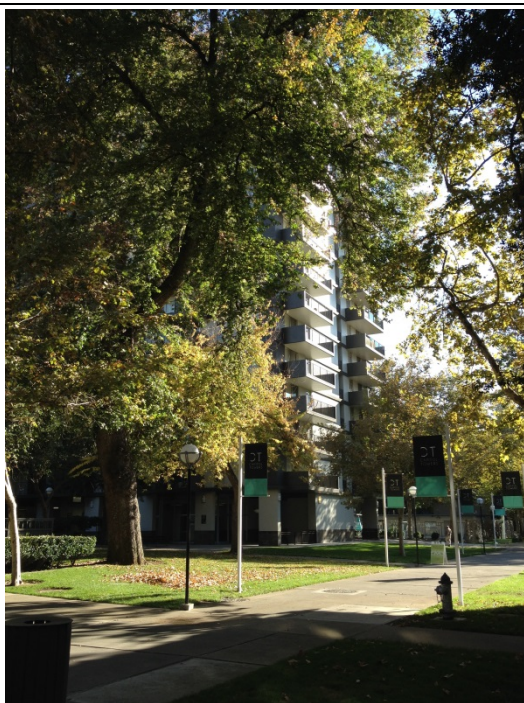


Photo 1: Heritage Tree #76 (American elm) in the central portion of the site.



Photo 2: City Street Trees along the west side of 7th Street, including trees #46, 47, and 48.



Photo 3: Heritage Tree #77 (California sycamore) in the northern portion of the project site.



Photo 4: Heritage Tree #106 (Tulip Tree) in the central portion of the site, along the 6<sup>th</sup> Street corridor.



## Appendix C

### Representative Site Photographs

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Photo 5: City Street Tree #20 (Zelkova) along the east side of 5th Street.



Photo 6: Two Heritage Trees (American elm trees, #66 and 67) in the southern portion of the project site.



Photo 7: Non-Heritage Tree #237 (Coast redwood) in the central portion of the site.



Photo 8: Non-Heritage Tree #315 (London plane tree) in the central portion of the site.

## Appendix C

### Representative Site Photographs

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Photo 9: Heritage Trees #66, 67, and 69 and Non-Heritage Trees #68 and 164 in the southern portion of the site.



Photo 10: City Street Tree #55 along 7<sup>th</sup> Street.

APPENDIX D  
*Tree Associates Report*





**AERIAL INSPECTION AND RISK ASSESSMENT,  
FIVE ELM TREES, SACRAMENTO COMMONS  
SACRAMENTO, CALIFORNIA**

**Prepared for  
DUDEK  
Auburn, California**

**Prepared by  
TREE ASSOCIATES  
John M. Lichter, M.S.**

**ASCA Registered Consulting Arborist #375  
ISA Board Certified Master Arborist #863  
ISA Qualified Tree Risk Assessor**

**September 24, 2014**

## Background/History/Assignment

I was asked by Scott Eckardt, with Dudek, Auburn, California to prepare a proposal to conduct an aerial inspection and risk assessment for five elm trees located at Sacramento Commons which is bounded by 5<sup>th</sup>, 7<sup>th</sup>, P and N Streets, near downtown Sacramento (Figure 1). The trees were previously evaluated by Dudek and tagged and numbered 49, 50, 66, 67 and 76.



## Methods

I subcontracted with Solano Shade Tree Preservation, a Tree Service from Vacaville, California who provided an aerial tower, two climbers (including Rhett Richardson, the owner) and a lift operator.

In order to inspect two of the trees with the aerial lift, an encroachment permit and traffic control were required, which was provided by Statewide Traffic Safety and Signs of Sacramento. I utilized the two climbers to assist in the aerial inspection of three of the trees with my guidance from the ground on September 4, 2014. On September 16, 2014, I inspected the two remaining trees (#49 and 50) with the aerial tower.

## Limits/Assumptions of the Assignment

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- This evaluation and risk assessment reports on the condition of the subject trees at the time of my site visit. Tree conditions change over time and, as they change this report may need to be revised.
- Risk ratings were based on an evaluation from the ground and aerial inspections of the subject trees. Root examinations were not in the scope of these services.

## Arborist Disclosure Statement

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The following statement pertains to my work and this report.

Arborists are tree specialists who use their education, knowledge, training and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near 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 the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. 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, site lines, disputes between neighbors, and other issues. Arborists cannot take such considerations into account unless complete and accurate information is disclosed to the Arborist. An Arborist should then 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.

## Observations, Risk Assessment

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The following are observations, risk assessment and mitigation recommendations for the subject trees. Note all trees were American elms (*Ulmus americana*).





**Tree #49:**

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**Size:**

47 inches in diameter at 4.5 feet above grade.

**Setting:**

Tree in parkstrip, apparently unirrigated, mulched. Canopy overhangs 7<sup>th</sup> Street, parking and driveways. Targets include vehicles, light rail, pedestrians, buildings.

**Health :**

Fair to Good.

Moderate elm leaf beetle infestation. Trunk injected recently apparently to apply pesticide.

**Structure:**

- Significant reduction cuts (to shorten limbs) have been made recently.
- Many old pruning cuts inspected with no or insignificant decay unless noted.
- A few breakouts in the upper canopy to 6" diameter are visible.
- South-facing codominant secondary trunk off southeast-facing trunk has previous breakout(s) near top with extensive decay (Figure 2).
- South-facing codominant secondary trunk on north-facing trunk with previous breakout and extensive decay where topped many years ago (Figure 3). As little as 2 inches of sound wood exists just below attachment point of up to 13-inch diameter limbs. Likelihood of limb failure is probable<sup>1</sup>.
- On north trunk at 18' above grade, wound on west side trunk with decay. Drilling at 15' revealed soundwood equal to 3.5" on west side trunk and 4.5" on north side and greater than 4.25" soundwood on NW and NE side. Likelihood of north trunk failure is possible.
- Large wound with decay at attachment of two trunks at 9' on west side of trunk from previous removal of trunk/limb. Drilling at approximately 7 feet revealed 6.25 and 7 inches sound wood on northwest and northeast side of trunk; >7 inches sound wood found on south and east side of trunk and between trunks at attachment. Likelihood of trunk failure is improbable/possible.

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<sup>1</sup> Likelihood of failure rated on a scale of: improbable, possible, probable, imminent.

Improbable: not likely to fail during normal weather conditions and may not fail in many severe weather conditions within one year.

Possible: failure could occur, but is unlikely during normal weather conditions within one year. Probable: failure may be expected under normal weather conditions within one year.

Imminent: failure has started or is most likely to occur in the near future, even if there is no significant wind or increased load.

**Risk Rating:**

- Trunk Failure: The risk rating for trunk failure for this tree is Moderate  
(Likelihood of failure = possible; Likelihood of impacting target = high; Consequences =severe)
- Limb Failure: The risk rating for limb failure for this tree is High  
(Likelihood of failure = probable; Likelihood of impacting target = high; Consequences =severe)

**Risk Mitigation:**

In order to reduce the risk of limb failure, the following recommendations should be followed by an ISA Certified Arborist or Tree Worker. If the following recommendations cannot be followed, the tree should be removed.

- Head back south codominant secondary trunk on southeast-facing trunk as far back as necessary to where sound wood thickness is greater than 30% of the radius of the trunk.
- Either head back as above or remove 60% of the foliage/buds using reduction cuts on south facing codominant secondary trunk on north facing trunk, making up to 8 inch diameter cuts.
- Clean up stubs from previous breakouts.
- Manage watersprouts on the two codominant trunks above by shortening them no more than every three years.
- Repeat aerial inspection within two years or after major storms.

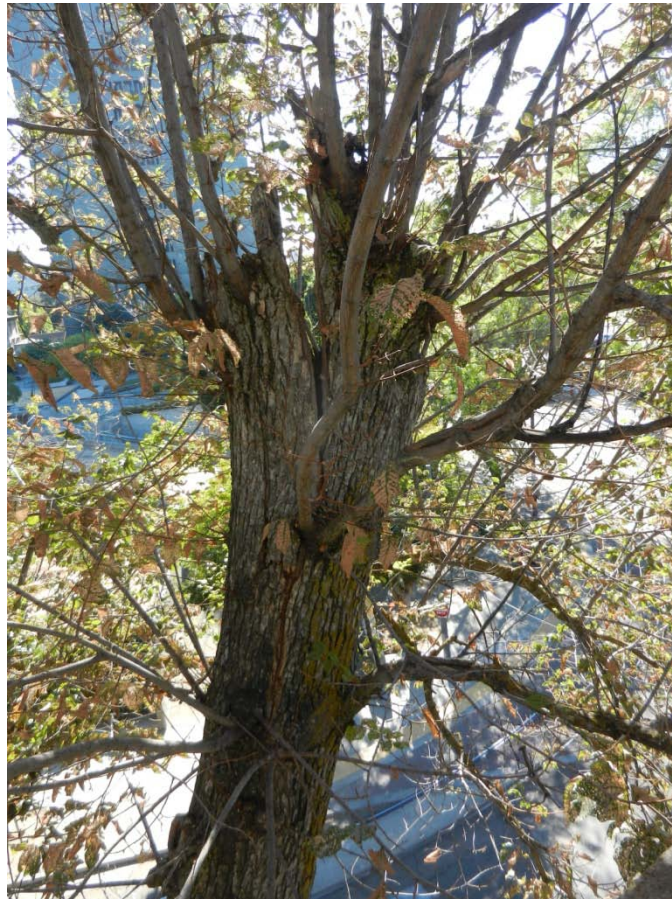
Following the above recommendations should reduce the likelihood of limb failure to possible.





**Figure 1. Looking southeast at Tree #49.**





**Figure 2. Breakout on south facing codominant secondary trunk on southeast facing trunk with extensive decay.**



**Figure 3. Looking down on south facing codominant secondary trunk on north-facing trunk. Note previous breakout, cavity and extensive decay.**

**Tree #50:**

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**Size:**

35 inches in diameter at 4.5 feet above grade.

**Setting:**

Tree in parkstrip, apparently unirrigated, mulched. Canopy overhangs 7<sup>th</sup> Street, parking and driveways. Targets include vehicles, light rail, pedestrians, buildings.

**Health :**

Fair to Good.

Moderate elm leaf beetle infestation. Trunk injected recently apparently to apply pesticide.

**Structure:**

- Significant reduction cuts (to shorten limbs) have been made recently.
- Many old pruning cuts inspected with no or insignificant decay unless noted.
- Wound on south side of trunk at 45 feet above grade with extensive decay at attachment of several limbs. Likelihood of limb failure = probable.
- Small wound at 10 feet on east side trunk with decay. Drilling revealed >3.5 inches of sound wood on the north and east side of the trunk above and below the wound. Likelihood of trunk failure = improbable.

**Risk Rating:**

Trunk Failure: The risk rating for trunk failure for this tree is Low

(Likelihood of failure = improbable; Likelihood of impacting target = high;  
Consequences =severe)

Limb Failure: The risk rating for limb failure for this tree is High

(Likelihood of failure = probable; Likelihood of impacting target = high; Consequences  
=severe)

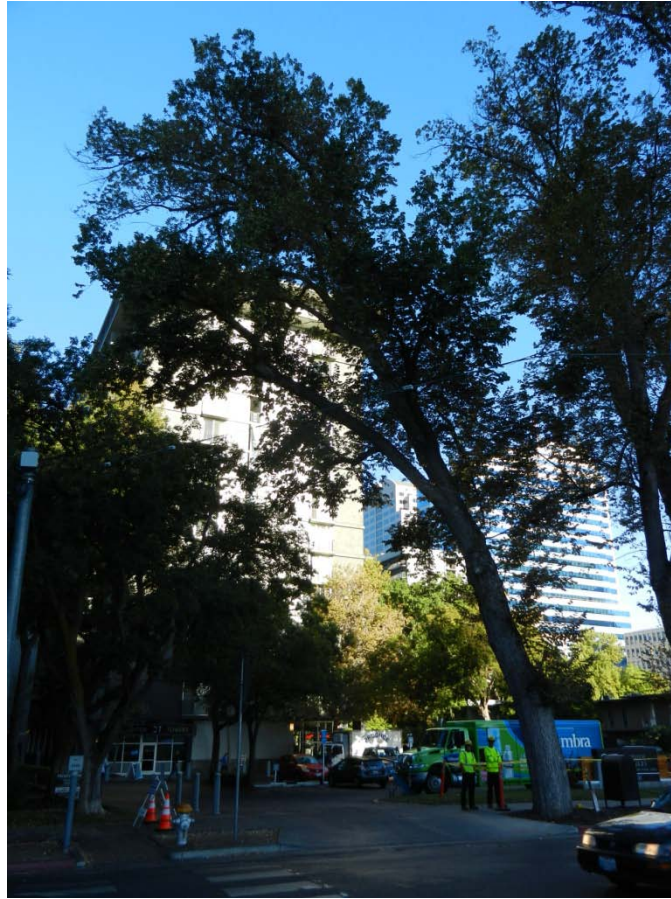
**Risk Mitigation:**

In order to reduce the risk of limb failure, the following recommendations should be followed by an ISA Certified Arborist or Tree Worker.

- Remove 60% of the foliage/buds using reduction cuts above the wound at 45 feet on the main trunk.
- Repeat aerial inspection within three years or after major storms.

Following the recommendations above should reduce the likelihood of limb failure to possible.





**Figure 4. Looking westward at Tree #50.**



**Tree #66:**

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**Size:**

44 inches in diameter at 4.5 feet above grade.

**Setting:**

Tree in parkstrip, with lawn. Canopy overhangs P Street, apartments, sidewalks. Targets include vehicles, pedestrians, buildings.

**Health :**

Fair to Good.

Minor elm leaf beetle infestation.

**Structure:**

- Girdling root visible across 20% circumference of trunk.
- Codominant trunks.
- Several previous limb failures to 8 inches diameter.
- Deadwood to 3 inches in diameter.
- Broken six inch diameter limb over sidewalk.
- North facing trunk bends to near 90 degrees.
- Wound with decay and old beehive at 18'; probe revealed max 14 inch depth
- The following limbs have excessive end weight:
  - West facing primary limb attached at 30 feet on north trunk;
  - Primary facing east attached at 40 feet;
  - Primary facing south attached at 30 feet on south trunk;
  - Primary facing south at 60 feet on south trunk;
  - Primary facing southeast at 40 feet on south trunk.
- Primary facing west attached at 15 feet with large wound on upper side and cavity with decay (Figure 6).
- Longitudinal crack on west facing primary limb attached at 55 feet on south facing trunk.
- Nine-inch diameter stub.
- Many old pruning cuts inspected with no or insignificant decay unless noted.

**Risk Rating:**

Trunk Failure: The risk rating for trunk failure for this tree is Low  
(Likelihood of failure = improbable; Likelihood of impacting target = high;  
Consequences =severe)

Limb Failure: The risk rating for limb failure for this tree is High  
(Likelihood of failure = probable; Likelihood of impacting target = high; Consequences  
=severe)



### Risk Mitigation:

In order to reduce the risk of limb failure, the following recommendations should be followed by an ISA Certified Arborist or Tree Worker.

- Remove dead and broken limbs.
- On north trunk, use reduction cuts to remove 30% of the foliage on trunk.
- On north facing codominant trunk, use reduction cuts to remove 30-50% of the foliage on primary limbs over apartments.
- Remove west facing primary limb at 15 feet.
- Remove west facing primary limb at 55 feet on south facing trunk.
- Use reduction cuts to remove the following percentage of foliage/buds on the limbs below:
  - Primary facing south attached at 30 feet on south trunk – 50%, up to 5" dia. cuts;
  - Primary facing southeast at 40 feet on south trunk – 25%;
  - Primary facing south at 60 feet on south trunk -20%.
- Repeat aerial inspection within two years or after major storms.

Following the recommendations above should reduce the likelihood of limb failure to possible.



**Figure 5. Looking northward at Tree #66.**





**Figure 6. West facing primary limb at 15 feet with wound and decay on upper side of limb.**

**Tree #67:**

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**Size:**

39 inches in diameter at 4.5 feet above grade.

**Setting:**

Tree in patio. Canopy overhangs apartments, sidewalks. Targets include pedestrians, buildings.

**Health :**

Fair to Good.

Minor elm leaf beetle infestation. Squirrel damage (girdling, twig and branch dieback) in upper portion of crown.

**Structure:**

- Very large primary limbs.
- Several previous limb failures to 7 inches diameter.
- Deadwood to 4 inches in diameter.
- Large breakout at 55 feet on primary facing north attached at 35 feet – left wound 9" X 3.5' long.
- Excessive end weight on the following limbs:
  - East facing primary attached at 40 feet;
  - Secondary attached at 45 feet on northeast facing primary attached at 35';
  - Secondary off primary facing north attached at 35'.
- Large pruning cut at 12' on NE side trunk with decay. Greater than 6 inches of sound wood north, southeast and northeast side of wound (Figure 8).
- Many old pruning cuts inspected with no or insignificant decay unless noted.

**Risk Rating:**

Trunk Failure: The risk rating for trunk failure for this tree is Low

(Likelihood of failure = improbable; Likelihood of impacting target = high;  
Consequences =severe)

Limb Failure: The risk rating for limb failure for this tree is Moderate

(Likelihood of failure = possible; Likelihood of impacting target = high; Consequences  
=severe)



### Risk Mitigation:

In order to reduce the risk of limb failure, the following recommendations should be followed by an ISA Certified Arborist or Tree Worker.

- Remove dead and broken limbs.
- Use reduction cuts to remove the following percentage of foliage/buds on the limbs below:
  - East facing primary attached at 40 feet – 30%;
  - Secondary attached at 45 feet on northeast facing primary attached at 35' – 15%;
  - Secondary off primary facing north attached at 35' – 15%.
- Re-inspect tree for pruning needs within three years or after major storms.

Following the recommendations above should reduce the likelihood of limb failure.



**Figure 7. Looking northeast at Tree #67.**



**Figure 8. Rhett Richardson, Owner of Solano Shade Tree Preservation drilling to determine sound wood thickness near large wound with decay.**



**Tree #76:**

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**Size:**

50 inches in diameter at 4.5 feet above grade.

**Setting:**

Tree in lawn, 18 feet southwest of apartments. Canopy overhangs apartments, sidewalks. Targets include pedestrians, buildings.

**Health :**

Fair to Good.

Much squirrel damage (girdling, twig and branch dieback) in upper portion of crown. Minor elm leaf beetle infestation. Slime flux (bacterial infection) in many locations.

**Structure:**

- South-facing primary limb attached at 30 feet:
  - Wound with decay to 6 inches deep at 55 feet and probable likelihood of failure
  - Wound with decay at 33' on south side – 4, 4.5 and >5 inches of sound wood on W, NE and south side
- East-facing primary limb attached at 35 feet:
  - Excessive end weight;
  - Wounds with decay on limb with >4 inches sound wood at 45' and >5 inches sound wood at 33 feet;
  - Excessive weight on secondary limb at 50 feet;
  - Secondary limbs facing north attached at 65 feet with crack overhanging roof of apartments – *failure imminent* (Figure 11).
- Excessive end weight on northwest-facing primary attached at 15 feet.
- Cavity on north side trunk with estimated >5 inches of sound wood (probing) and possible likelihood of failure.
- Several previous limb failures up to 6" diameter
- Many old pruning cuts inspected with no or insignificant decay unless noted.

**Risk Rating:**

Trunk Failure: The risk rating for trunk failure for this tree is Moderate  
(Likelihood of failure = possible; Likelihood of impacting target = high; Consequences =severe)

Limb Failure: The risk rating for limb failure for this tree is Extreme  
(Likelihood of failure = imminent; Likelihood of impacting target = high; Consequences =severe)

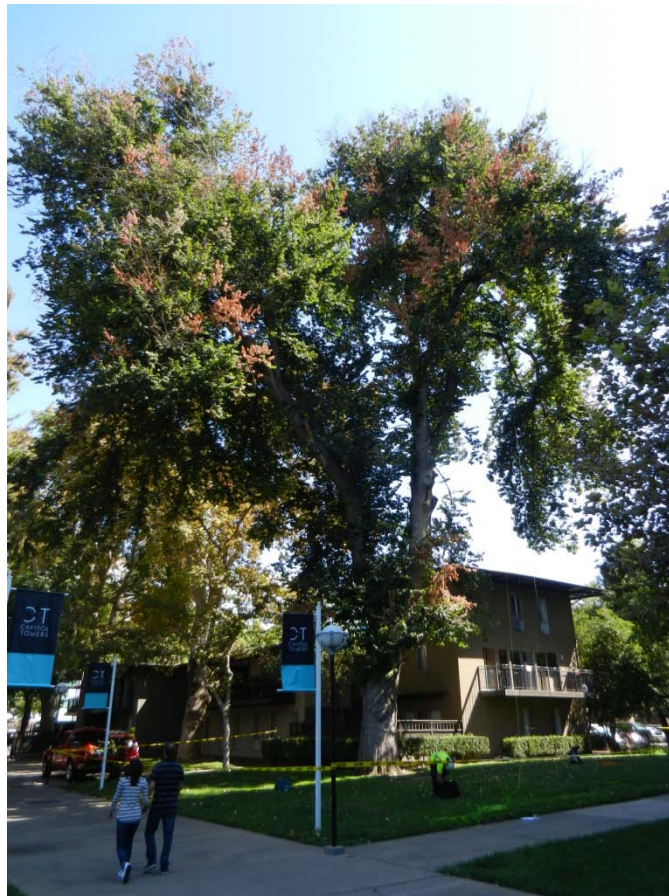


### Risk Mitigation:

In order to reduce the risk of limb failure, the following recommendations should be followed by an ISA Certified Arborist or Tree Worker.

- Remove secondary limbs facing north attached at 65 feet on east-facing primary immediately.
- Shorten south-facing primary attached at 30 feet by 20 feet (heading cut).
- Use reduction cuts to remove the following percentage of foliage/buds on the limbs below:
  - East-facing primary attached at 35 feet – 30%, max 7" diameter cuts;
  - Northwest-facing primary attached at 15 feet – 30%, max 6" diameter cuts;
  - Secondary at 50 feet on east facing primary attached at 35 feet – 30%.
- Remove dead and broken limbs.
- Repeat aerial inspection within two years or after major storms.

Following the recommendations above should reduce the likelihood of limb failure to possible.



**Figure 9. Looking northeast at Tree #76. Note wilted foliage caused by squirrel damage.**



**Figure 10. Justin and Rhett inspecting cavities with decay on Tree #76.**



**Figure 11. Secondary limbs hanging over apartments (above climber) are cracked and have an imminent likelihood of failure.**



## Glossary<sup>2</sup>

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*Bow* – the gradual curve of a branch or stem.

*Callus* – growth resulting from and found at the margin of wounds.

*Canker* – a localized area of dead tissue on a stem or branch, caused by fungal or bacterial organisms.

*Central Leader* – the main stem of the tree.

*Chlorotic* – yellow.

*Codominant* – equal in size and relative importance.

*Crown* – parts of the tree above the trunk.

*Crown Clean* – the removal of dead, dying, diseased, broken, and weakly attached branches and watersprouts from a tree's crown.

*Decay* – process of degradation of woody tissues by fungi and bacteria.

*Dieback* – death of shoots and branches, generally from tip to base.

*Dropcrotch* – the process of shortening trunks or limbs by pruning back to dominant lateral limbs.

*End Weight* – the concentration of foliage at the distal ends of branches.

*Epicormic* – shoots which result from adventitious or latent buds; often indicates poor vigor.

*Included bark* – pattern of development at branch junctions where bark is turned inward rather than pushed out.

*Primary limb* – limb attached directly to the trunk.

*Reduction cut* – shortening the length of a branch or stem by cutting it back to a lateral branch of at least one-third the diameter of the cut stem.

*Root crown* – area at the base of a tree where the roots and stem merge.

*Secondary limb* – limb attached directly to a primary limb.

*Sound wood* – undecayed wood.

*Suppressed* – trees which have been overtopped and whose crown development is restricted from above.

*Target* – people or property potentially affected by tree failure.

*Topped* – Pruned to reduce height by cutting large branches back to stubs.

*Train* – to prune a young tree to establish a strong structure.

*Vigor* – overall health.

*Watersprouts* – vigorous, upright, epicormic shoots that grow from latent buds in older wood.

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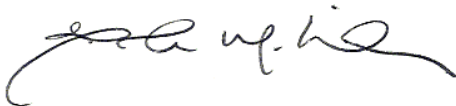
<sup>2</sup> Definitions from author or Matheny and Clark, Evaluation of Hazard Trees in Urban Areas, 2<sup>nd</sup> Edition c 1994, ISA.

## Certification of Performance

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I, John M. Lichter, certify:

- That I have personally inspected the tree(s) and/or the property referred to in this report, and have stated my findings accurately. The extent of the evaluation and/or appraisal is stated in the attached report and the Terms and Conditions;
- That I have no current or prospective interest in the vegetation or the property that is the subject of this report, and I have no personal interest or bias with respect to the parties involved;
- That the analysis, opinions and conclusions stated herein are my own, and are based on current scientific procedures and facts;
- That my compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party, nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events;
- That my analysis, opinions, and conclusions were developed and this report have been prepared according to commonly accepted Arboricultural practices;
- That no one provided significant professional assistance to the consultant, except as indicated within the report.



John M. Lichter, M.S.

ASCA Registered Consulting Arborist #375

ISA Board Certified Master Arborist #863

ISA Qualified Tree Risk Assessor



**ASSUMPTIONS AND LIMITING CONDITIONS: John M. Lichter dba TREE ASSOCIATES**

1. Any legal description provided to the consultant/appraiser is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. No responsibility is assumed for matters legal in character. Any and all property is appraised or evaluated as though free and clear, under responsible ownership and competent management.
2. It is assumed that any property is not in violation of any applicable codes, ordinances, statutes or other governmental regulations.
3. Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant/appraiser can neither guarantee nor be responsible for the accuracy of information provided by others.
4. The consultant/appraiser shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
5. Unless required by law otherwise, possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant/appraiser.
6. Unless required by law otherwise, neither all nor any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales or other media, without the prior expressed written or verbal consent of the consultant/appraiser - particularly as to value conclusions, identity of the consultant/appraiser, or any reference to any professional society or institute or to any initialed designation conferred upon the consultant/appraiser as stated in his qualifications.
7. This report and any values expressed herein represent the opinion of the consultant/appraiser, and the consultant's/appraiser's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
8. Sketches, drawings, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys unless expressed otherwise. The reproduction of any information generated by architects, engineers, or other consultants on any sketches, drawings, or photographs is for the express purpose of coordination and ease of reference only. Inclusion of said information on any drawings or other documents does not constitute a representation by John M. Lichter or TREE ASSOCIATES as to the sufficiency or accuracy of said information.
9. Unless expressed otherwise: 1) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection; and 2) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.
10. Loss or alteration of any part of this report invalidates the entire report.



APPENDIX E

*Tree Management Recommendations and  
Protection Measures*

## **Appendix E**

### **Tree Management Recommendations and Protection Measures**

*The following tree protection measures include requirements based on Sacramento City Code Sections 12.56.060 (Protection of trees) and 12.64.040 (Protection of heritage trees during construction activity) and additional recommended measures intended to avoid or minimize impacts to trees during construction. The measures presented should be monitored by arborists and enforced by contractors and developers for maximum benefit to the trees.*

#### **Tree Protection Measures Prior to Construction**

Prior to any grading activity, preserved trees with canopies that fall within 30 feet of construction activity shall be protected by fencing and signage. All contractors shall be made aware of the tree protection measures. A project arborist shall be assigned to monitor tree health and construction activity near retained trees on site. The project arborist shall be an International Society of Arboriculture (ISA) Certified Arborist.

**Inspection:** Any large tree proposed for preservation on site should be thoroughly inspected for internal or subterranean decay by a qualified arborist prior to construction activity to determine if retention/protection on site is a viable management option.

**Site Preparation:** Tree removal, pruning, and inspection should be conducted during site preparation activities. Where permitted by the City, tree removal and pruning activity should be conducted according to industry standards (ANSI A300). ISA Certified Arborist inspection of Heritage Trees to be retained on site is recommended to identify any health or structural issues which may warrant further management action (pruning, cabling, bracing, removal, etc.). Additionally, the pruning recommendations provided by Tree Associates (Appendix D) should be conducted during site preparation. These recommendations apply to Heritage Trees #66, 67, and 76 and City Street Trees #49 and 50. Pruning activity on these trees will require a permit from the City.

**Fencing and Signage:** A 6-foot high, chain link fence with tree protection signs shall be erected around all trees (or tree groups) to be preserved. The protective fence should be installed at a distance from the trunk that is equal to the dripline radius, or a distance approved by the City Arborist. This will delineate the tree protection zone and prevent unwanted activity in and around the trees in order to reduce soil compaction in the root zones of the trees and other damage from heavy equipment. Fences are to be mounted on two-inch diameter galvanized iron posts, driven into the ground to a depth of at least 2-feet at no more than 10-foot spacing. In areas where fencing is located on paving or concrete that will not be demolished, then the posts may be supported by an appropriate grade level concrete base. For City Street Trees, only the planting strip shall be enclosed with protective fencing in order to keep the sidewalk and street open for public use. Tree protection signs should be attached to every fourth post. The contractor shall maintain the fence to keep it upright, taut, and aligned at all times. Fencing shall be removed only after all construction activities are complete.

**Pre-Construction Meeting:** A pre-construction meeting shall be held between all contractors (including grading, tree removal/pruning, builders, etc.) and the arborist. The arborist will instruct the contractors on tree protection practices and answer any questions. All equipment operators and spotters, assistants, or those directing operators from the ground, shall provide written acknowledgement of their receiving tree protection training. This training shall include information on the location and marking of protected trees, the necessity of preventing damage, and the discussion

of work practices that will accomplish such.

## **Protection and Maintenance during Construction**

Once construction activities have begun the following measures shall be adhered to:

Avoidance: Signs, ropes, cables, or any other items shall not be attached to any preserved tree, per City Code Section 12.64.040.

Equipment Operation and Storage: Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration in the soil. All heavy equipment and vehicles shall stay out of the fenced tree protection zone, per City Code Section 12.64.040, unless where specifically approved in writing by the City Arborist and under the supervision of an ISA Certified Arborist.

Storage and Disposal: Do not store or discard any supply or material, including paint, lumber, concrete overflow, etc. within the fenced tree protection zone, per City Code Section 12.64.040. Remove all foreign debris within the fenced tree protection zone; it is important to leave the duff, mulch, chips, and leaves around the retained trees for water retention and nutrients. Avoid draining or leakage of equipment fluids near retained trees. Fluids such as: gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) should be disposed of properly. Keep equipment parked outside of the fenced tree protection zone of retained trees to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could lead to decline and death.

Grade Changes: Grade changes of more than 2 feet, including adding fill, are not permitted within 30 feet of a tree's drip line, per City Code Section 12.64.040, without special written authorization and under supervision by an ISA Certified Arborist. Lowering the grade within 30 feet of a tree's dripline will necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the tree(s). Adding soil, even temporarily, on top of the existing grade will compact the soil further, and decrease both water and air availability to the trees' roots.

Moving Construction Materials: Care will be taken when moving equipment or supplies near the trees, especially overhead. Avoid damaging the tree(s) when transporting or moving construction materials and working around retained trees (even outside of the fenced tree protection zone). Above ground tree parts that could be damaged (e.g., low limbs, trunks) should be flagged with red ribbon. If contact with the tree crown is unavoidable, prune the conflicting branch(es) using ISA or ANSI A300 standards.

Trenching: Unless a Tree Permit has been issued for trenching activity within the fenced tree protection zone, all trenching shall be outside of the fenced tree protection zone, per City Code Section 12.64.040. Roots primarily extend in a horizontal direction forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts should be clean and sharp, to minimize ripping, tearing, and fracturing of the root system. The trench should be made no deeper than necessary.

Irrigation: Trees that have been substantially root pruned (30% or more of their root zone) will require irrigation for the first twelve months. The first irrigation should be within 48 hours of root pruning. They should be deep watered every two to four weeks during the summer and once a month during the winter (adjust accordingly with rainfall). One irrigation cycle should thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should dry out between watering; avoid keeping a

consistently wet soil. Designate one person to be responsible for irrigating (deep watering) the trees. Check soil moisture with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary above ground micro-spray system that will distribute water slowly (to avoid runoff) and evenly throughout the fenced tree protection zone ***but never soaking the area located within 6- feet of the tree trunk, especially during warmer months***. For trees not subject to root pruning activity, the amount of irrigation provided shall not be changed from that which was provided prior to the commencement of construction activity, per City Code Section 12.64.040.

Canopy Pruning: Do not prune any of the trees, unless a Tree Permit has been issued for pruning activity, per City Code Section 12.64.040. This will help protect the tree canopies from damage. All pruning shall be completed under the direction of an ISA Certified Arborist and using ISA guidelines. Only conflicting limbs and dead wood shall be removed from tree canopies where a Tree Permit has been issued.

Washing: Periodic washing of the foliage is recommended during construction but no more than once every two weeks. Washing should include the upper and lower leaf surfaces and the tree bark. This should continue beyond the construction period at a less frequent rate with a high-powered hose only in the early morning hours. Washing will help control dirt/dust buildup that can lead to mite and insect infestations.

Inspection: An ISA Certified Arborist shall inspect the preserved Heritage and City Street Trees on at least a monthly basis for the duration of construction activity. A summary report documenting observations and management recommendations shall be submitted to the owner following each inspection. Photographs of representative trees are to be included in each report. If feasible, aerial inspection for trees #49, 50, 66, 67, and 76 should be conducted during construction if the construction period extends to the recommended inspection period, as identified by Tree Associates (Appendix D).

## **Maintenance after Construction**

Once construction is complete the tree protection fencing may be removed and the following measures performed to sustain and enhance the vigor of the preserved trees.

Mulch: Provide a 4-inch mulch layer under the canopy of trees. Mulch should include clean, organic mulch that will provide long-term soil conditioning, soil moisture retention, and soil temperature control.

Pruning: Pruning should *only* be done to maintain clearance and remove broken, dead or diseased branches. Pruning shall only take place following a recommendation by an ISA Certified Arborist and performed under the supervision of an ISA Certified Arborist. No more than 15% of the canopy shall be removed at any one time. All pruning shall conform to ISA or ANSI A300 standards.

Watering: Retained trees on site shall be watered as they were prior to the commencement of construction activity. Supplemental irrigation may be necessary for twelve months following substantial root pruning.

Watering Adjacent Plant Material: All plants near the trees shall be compatible with water requirements of said trees. Watering regime included in the site's landscape plan shall be developed with consideration for the water needs of retained trees.

Spraying: If the trees are maintained in a healthy state, regular spraying for insect or disease control should not be necessary. If a problem does develop, an ISA Certified Arborist should be consulted;

the trees may require application of insecticides to prevent the intrusion of bark-boring beetles and other invading pests. All chemical spraying should be performed by a licensed applicator under the direction of a licensed pest control advisor.

Monitoring: All trees within 30 feet of construction activity shall be monitored by an ISA Certified Arborist for the first five years after construction completion. Additionally, aerial inspections shall be conducted within the timeframes identified for inspected trees # 49, 50, 66, 67, and 76, as identified by Tree Associates (Appendix D). An annual monitoring report shall be submitted to the City Arborist. Each report shall summarize the inspection efforts, document observations and management actions taken, include photographs of each tree, and compare post-construction tree conditions with the original, pre-construction baseline condition. If any retained trees die within this inspection period, they shall be replaced at a ratio approved by the Director of Transportation.



# APPENDIX F

## *New Tree Growth Calculations*

## Appendix F - New Tree Growth Calculations

Per Tree Values						
Large Trees						
Year	i-Tree Eco Results (Average Values per Tree)					
	Total Trunk Diameter (in.)	Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)
0	1	18	91	1	3	1
5	4	144	662	36	19	4
10	7	346	2,029	133	35	11
15	10	565	3,427	296	53	19
20	13	783	4,314	521	68	24
25	16	998	5,472	807	86	30

Small Trees						
Year	i-Tree Eco Results (Average Values per Tree)					
	Total Trunk Diameter (in.)	Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)
0	1	20	82	1	3	0
5	2	57	189	11	8	1
10	4	114	471	35	13	3
15	5	170	782	69	21	4
20	6	222	1,043	110	28	6
25	7	243	1,172	151	32	7

All Trees (By Size)						
Large Trees (147 Trees)						
Year	i-Tree Eco Results (Values for All 147 Large Trees)					
	Total Trunk Diameter (in.)	Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)
0	147	2,705	13,333	162	412	74
5	617	21,124	97,329	5,263	2,778	544
10	1,073	50,818	298,292	19,595	5,116	1,646
15	1,499	83,026	503,725	43,497	7,732	2,778
20	1,896	115,028	634,143	76,514	9,937	3,513
25	2,279	146,706	804,369	118,585	12,583	4,454

Small Trees (100 Trees)						
Year	i-Tree Eco Results (Values for All 100 Small Trees)					
	Total Trunk Diameter (in.)	Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)
0	100	2,020	8,160	110	280	40
5	230	5,660	18,940	1,130	830	100
10	350	11,390	47,090	3,460	1,320	260
15	460	16,980	78,150	6,870	2,130	430
20	570	22,190	104,340	11,010	2,780	580
25	660	24,280	117,170	15,130	3,160	650

All Trees (Small and Large Trees, 247 Total Trees)						
Year	i-Tree Eco Results (Values for All Small and Large Trees)					
	Total Trunk Diameter (in.)	Canopy Cover (ft <sup>2</sup> )	Leaf Surface Area (ft <sup>2</sup> )	Carbon Storage (lb.)	Gross Carbon Sequestration (lb./year)	Avoided Runoff (ft <sup>3</sup> /year)
0	247	4,725	21,493	272	692	114
5	847	26,784	116,269	6,393	3,608	644
10	1,423	62,208	345,382	23,055	6,436	1,906
15	1,959	100,006	581,875	50,367	9,862	3,208
20	2,466	137,218	738,483	87,524	12,717	4,093
25	2,939	170,986	921,539	133,715	15,743	5,104

# APPENDIX G

## *Tree Impact Exhibit*



#### Individual Tree Locations

- Trees to be Retained
- Trees to be Removed

#### Existing Tree Canopy Cover Impact

- Canopy to be Retained
- Canopy to be Removed
- Project Parcel Boundary



0 50 100  
Feet

DUDEK

SOURCE: Nolte 2012; Wood Rogers 2013; Dudek 2014; Melendrez 2014

8034-01

Arborist Report for the Sacramento Commons Project Site, City of Sacramento, California





APPENDIX G  
Tree Impact Exhibit

# APPENDIX H

## *Conceptual Landscape Plan*



**TREE LEGEND:**

-  - EXISTING STREET TREE (35)
-  - HERITAGE TREE TO REMAIN (7)
-  - POTENTIAL NON-HERITAGE TREE TO REMAIN (50)
-  - PROPOSED TREE (147)

0 20' 40' 80'  
SCALE: 1" = 40'-0"



# APPENDIX I

## *Tree Permit Application*



Department of Transportation  
**URBAN FORESTRY SERVICES**  
5730 24th Street Building 12 A Sacramento, California 95822  
Phone (916) 264-5011 or 311  
urbanforestry@cityofsacramento.org  
**Application fee: \$50.00**

## TREE PERMIT APPLICATION

### Applicant Information

Name: \_\_\_\_\_ Phone ( ) \_\_\_\_\_ Fax ( ) \_\_\_\_\_

Address: \_\_\_\_\_ Contractor License # \_\_\_\_\_

### Property Owner Information (if different):

Name: \_\_\_\_\_ Phone ( ) \_\_\_\_\_ Fax ( ) \_\_\_\_\_

Address: \_\_\_\_\_

#### **Owner/Agent Statement**

Property Owner Consent— I am the legal owner of record of the land specified in this application or am authorized and empowered to act as an agent on behalf of the owner of record on all matters relating to this application. I declare that the foregoing is true and correct and accept that false or inaccurate owner authorization may invalidate or delay action on this application.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

### Project Information:

☐ Residential Development ☐ Commercial Development ☐ Owner-Occupant

Address: \_\_\_\_\_ Other permits applied for? ☐ Yes ☐ No

List other permits that you have applied for: \_\_\_\_\_

APN: \_\_\_\_\_ Related Project Number: \_\_\_\_\_

Number of Trees: \_\_\_\_\_ Tree Species and Diameter: \_\_\_\_\_

(Please attach other documents such as arborist reports and site plans)

Type of permit requested: ☐ Prune or ☐ Removal of a ☐ Street Tree ☐ Heritage Tree or ☐ Parking Lot Tree

Reason for permit: \_\_\_\_\_

Applicant Signature: \_\_\_\_\_ Date: \_\_\_\_\_

\*\*\*\*\*OFFICE USE ONLY\*\*\*\*\*

Receipt Number \_\_\_\_\_ Arborist Report attached? ☐ Yes ☐ No Site plans attached? ☐ Yes ☐ No

Permit: ☐ GRANTED ☐ DENIED Permit Number: \_\_\_\_\_

City Arborist comments or conditions: \_\_\_\_\_

Authorized Signature: \_\_\_\_\_ Date: \_\_\_\_\_

