



**Oregon White Oak
Advance Mitigation Plan**

for

Green Mountain Mixed Use PRD

City of Camas, Washington

City File No. SUB14-02

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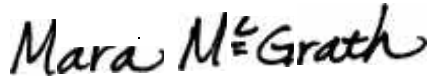
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Signature Page

The information in this report was compiled and prepared under the supervision and direction of the undersigned.

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Introduction

Ecological Land Services, Inc. (ELS) has prepared this Oregon white oak advance mitigation plan for the Green Mountain Planned Residential Development (PRD) in anticipation of impacts to Oregon white oak as future phases of the PRD, excluding Phase 1, are developed. The proposal is for phased development of the property into single-family and multi-family residential lots with park, trails, and open space. The property is at 2317 NE Ingle Road within the city limits of Camas, in portions of Section 20 and 21, Township 2 North, Range 3 East of the Willamette Meridian (Figure 1). Oregon white oak impacts within the Phase 1 development are addressed in a separate mitigation plan (ELS 2016).

ELS biologists have identified 52 Oregon white oak trees within the PRD boundaries, excluding Phase 1's development area. Future impacts to Oregon white oak will be mitigated by the measures described in this advance oak mitigation plan to maintain the existing oak habitat functions over the long-term. The proposed mitigation is designed to avoid, minimize, and mitigate impacts to oak habitat to be impacted by the project by:

1. Protecting existing oaks by setting aside mature oak habitat in a preservation area;
2. Establishing oak woodland habitat by planting oak in an establishment area;
3. Enhancing the understory of both oak mitigation areas with three-tiered, native shrub understory;
4. Improving habitat features in the mitigation areas by installing horizontal logs and bird boxes, and;
5. Physically and legally protecting the oak mitigation areas.

This Oregon white oak advance mitigation plan was prepared according to Camas Municipal Code (CMC) 16.61.010(A) (3)(a)(i) and (ii) and the guidance provided in the Washington Department of Fish & Wildlife (WDFW) *Management Recommendations for Washington's Priority Habitats: Oregon White Oak Woodlands* (Larsen and Morgan 1998). Specifically, these regulations require that oaks greater than 20 inches diameter breast height (dbh) be classified as habitats of local importance (CMC 16.61.010(A) (3)(a)(i)) and that oak stands greater than one acre, when found to be valuable to fish and wildlife (CMC 16.61.010(A) (3)(a)(ii)), are regulated as priority habitat.

Local Regulatory Authority

Under the CMC 16.61.010(A) (3)(a), Oregon white oaks are identified as habitats of local importance when (i) oaks have a 20-inch dbh; (ii) are found to be valuable to fish and wildlife, used by priority species, or have a large canopy in stands of oak trees greater than 1 acre; and (iii) all snags of Oregon white oaks unless hazardous as deemed by an arborist. Mitigation for Oregon white oaks follows CMC 16.61.030 (A) (1), (2)(a) and (4) *Mitigation Standards*. This advance mitigation plan meets the general mitigation sequencing and performance standards (in italics) as follows:

CMC 16.61.030 (A) (1), (2)(a), and (4)

Applicants shall demonstrate that reasonable efforts have been examined with the intent to mitigate impacts to critical areas. When an alteration to a critical area is proposed, mitigation can be accomplished through a variety of methods. Generally, avoiding the impact altogether is the preferred option. Methods to reduce impacts and mitigate for them should follow a series of steps taken in sequential order:

Avoidance and Minimization

Avoiding the regulated oaks and oak groves will be a primary consideration when designing future phases of the PRD, outside of Phase 1. The grading plan for subsequent phases has not been developed; however, oaks will be avoided where reasonably possible as provided for in the City's code.

Mitigation

The PRD plan proposes advance mitigation in a two-fold strategy of: oak establishment/enhancement and oak preservation/enhancement along the Type Np stream (Stream N) in the southern part of the PRD. The goal of this oak mitigation plan is to preserve and establish oak woodland habitat at least one year in advance of anticipated impacts to oaks as future phases of the PRD are developed. Impacts to Oregon white oaks for the Phase 1 development are addressed in a concurrent oak mitigation plan: *Oregon White Oak Mitigation Plan for Green Mountain Mixed Use PRD – Phase 1, City of Camas, Washington* (ELS 2016).

1. *Applicants proposing activities subject to this chapter shall demonstrate that the activity:*
 - a. *Substantially maintains the level of habitat functions and values as characterized and documented using best available science, and;*

The proposed advance mitigation plan uses the best available science on Oregon white oak restoration to maintain the level of habitat functions after impacting the project site by enhancing two Oregon white oak mitigation areas: an establishment/enhancement area along the central portion of the Type Np stream corridor (Stream N), and a preservation/enhancement area along the eastern end of the Stream N corridor. Both mitigation areas will be established at least one year in advance of anticipated impacts, thereby lowering the temporal loss of habitat functions and risk of failure.
 - b. *Minimizes habitat disruption or alteration beyond the extent required to undertake the proposal.*

For unavoidable disruptions and alterations to the habitat, construction activities will be designed to minimize construction impacts to every extent practicable along the drip line of existing Oregon white oaks. Temporary construction fencing will be installed along the perimeters of the advance mitigation areas to demarcate the areas to prevent damage from heavy equipment during construction. If unintentional impacts occur to Oregon white oak, then the post-construction protection measures will be implemented. See the subsection titled *Specifications for Site Preparation, Planting, & Maintenance*.
2. *If it is determined that habitat designation under this chapter will incur a net loss in functions and values, all losses shall be mitigation on-site as a first priority, and off-site thereafter.*

All mitigation for oak habitat impacts will take place onsite.

 - a. *Where on-site mitigation that could adequately address the loss is infeasible, the applicant shall consult with a qualified habitat restoration specialist, the city, and the Washington State Department of Fish and Wildlife regarding off-site mitigation. Mitigation shall prioritize the preservation and restoration of Lower Washougal River instream and riparian habitat, and should be guided by the*

Washougal River Subbasin chapter of the Lower Columbia Salmon Recovery Plan.

The proposed advance mitigation plan consists only of onsite mitigation. No offsite mitigation will be required.

4. *Subject to individual circumstances, potential mitigation measures may include, but are not limited to, the following:*

a. *Establishment of buffers;*

A 1.5-acre oak establishment/enhancement area and a 1.3-acre oak preservation/enhancement area are proposed. The advance oak mitigation areas do not have buffers.

b. *Requirement of a performance bond, when necessary to ensure completion and success of the proposed mitigation;*

If necessary to satisfy City requirements, the Applicant will prepare a cost estimate for financial assurances and secure a performance bond.

c. *Avoiding the impact all together by not taking a certain action or parts of an action;*

Oaks will be avoided to every extent possible, but it is anticipated that some oaks will not be able to be reasonably avoided based on the site's topography and future grading.

d. *Exploring alternative on-site locations to avoid or reduce impacts of activities;*

Avoiding the regulated oaks and oak groves will be a primary consideration when designing the PRD. Parks and open spaces will be purposefully sited in locations where oaks are growing to reduce the impact of project activities.

e. *Preserving important vegetation and natural habitat features by establishing buffers or by limiting clearing or alteration;*

The existing native overstory and understory vegetation will be maintained in the advance oak mitigation areas, except for clearing for the addition of understory native shrubs as well as the construction of necessary road crossings and pedestrian trails.

f. *Replacing invasive exotic plants with native species (refer to the Clark County Native Plant Communities Guide or other relevant publications for guidance);*

Both advance mitigation areas will be establishing indigenous, non-invasive shrubs and tree species. Non-native, invasive species, namely Himalayan blackberry and reed canarygrass, will be cleared from the two oak mitigation areas prior to plant installation and controlled as a part of maintenance, thereafter.

g. *Prohibiting introduction of invasive plant species in habitat areas;*

Performance standards 1g, 1h, 1i and 2h, 2i, and 2j address non-native invasive plant within the mitigation areas and control measures if they are found.

h. *Enhancing, restoring, or replacing vegetation or other habitat features and functions;*

The advance oak establishment/enhancement area is designed to compensate for future oak impacts resulting from subsequent phases of the PRD and replace

the oak habitat (based on overstory canopy cover) after approximately 10 years. The oaks, associated plants, and habitat features will improve the vegetative structure and offer greater wildlife habitat potential along the Type Np stream corridor than currently exists.

The oak preservation/enhancement area will compensate for future oak impacts incurred during subsequent phases of the PRD. Native shrubs will be installed in portions of the understory that will benefit from an understory stratum to enhance species diversity and habitat structure.

- i. Using native plants where appropriate when planting within habitat areas (refer to the Clark County Native Plant Communities Guide or other relevant publications for guidance);*
Overstory trees that are commonly associated with western Washington oak woodlands and appropriate for this site will be planted within the oak establishment/enhancement area. Native shrubs will be planted in areas that will benefit from a shrub stratum within the oak preservation/enhancement area.
- j. Managing access to habitat areas, including exclusionary barriers for livestock, if needed;*
Natural barriers will be installed as needed where the oak mitigation areas adjoin wetland buffers and residential lots. All oak mitigation area boundaries will be identified by signs.
- k. Using existing stream crossings whenever a review of suitability, capacity, access and location, habitat impacts of alternatives, maintenance, liability, and economics indicate the existing crossing is feasible;*
Does not apply.
- l. Constructing new stream crossings, when necessary, in conformance to the water crossing structure standards in WAC 220-110-070 (Hydraulic Code Rules), which are incorporated by reference;*
Does not apply.
- m. Seasonally restricting construction activities;*
Exposed soils may be seeded to stabilize soils or for weed control, as site conditions warrant. The mitigation areas will be planted during the late fall to early spring, when plants are dormant and will have best success of transplanting.
- n. Implementing best management practices and integrated management practices;*
The most recent available data was used in preparing this PRD advance oak mitigation plan for current management practices on optimal oak sizes (Devine and Harrington 2010), site preparation (Campbell 2004), competition (Clements *et al.* 2011 and Gould *et al.* 2011), herbivory (Clements *et al.* 2011), and site management and maintenance after planting of Oregon white oaks and other native species (Campbell 2004).
- o. Monitoring or review of impacts and assurance of stabilization of the area;*
A 10-year monitoring plan is proposed.

- p. *Establishing performance measures or bonding;*
Within this report, performance standards have been established.
 - q. *Establishing conservation covenants and other mechanisms to ensure long-term preservation or maintenance of mitigation actions;*
The mitigation areas will be protected in perpetuity with a conservation covenant or similar legal mechanism once the surrounding development has been developed per the PRD plan. This conservation covenant will allow for future plantings of oaks, if ecologically appropriate, and would need to accommodate the following: 1) trails per the PRD plan and/or the City of Camas Parks & Open Space Plan, and 2) unavoidable road crossings to allow access to the inner part of the PRD.
 - r. *Utilizing low-impact development techniques;*
The most recent available data on oak restoration were used to minimize development impacts within the project site. This includes the most current, practical, and appropriate methods for establishing Oregon white oaks.
 - s. *Promoting water quality by limiting the use of lawn and garden chemicals in habitat areas; and/or*
Lawn and garden chemicals will be used sparingly, if at all, and only as necessary to control invasive plants.
 - t. *Avoiding topsoil removal and minimizing topsoil compaction.*
Topsoil will be retained in the oak mitigation areas. Prior to planting, the mitigation areas will be ripped and tilled where appropriate to loosen the soil and reduce competing plants.
- B. *Nonindigenous Species Shall not be Introduced Via Mitigation. No plant, wildlife, or fish species not indigenous to the region shall be introduced, via mitigation, into a habitat conservation area.*
Existing non-native, invasive species will be removed as part of the advance mitigation plan; none will be intentionally introduced via mitigation.
- C. *Mitigation Should Result in Contiguous Corridors. In accordance with an advance mitigation plan, mitigation sites should preferably be located by the following and in priority order:*
- 1. *On-site and contiguous to wildlife habitat corridors; or*
Mitigation areas will be onsite, within the PRD. The oak preservation/enhancement and oak establishment/enhancement areas will be located along an existing perennial stream corridor (Stream N).
 - 2. *Off-site that is adjacent to the subject site and contiguous to wildlife habitat corridors; or*
Does not apply. Mitigation areas will be onsite, within the PRD.
 - 3. *Mitigation within the natural open space network, as identified in the comprehensive plan and open space plan, may be allowed for off-site mitigation or in place of onsite mitigation, where development and mitigation will result in an isolating effect on the habitat.*
Mitigation areas will be onsite, within the PRD.

Site Description

The majority of the subject site is located north of NE Goodwin Road, south of NE 48th Circle (on the southwest slope of Green Mountain), and east of NE Ingles Road (Figures 1 and 2). Green Mountain Golf Course encompasses a large portion of the PRD. The first portion of the golf course opened Thanksgiving 1999. The course later expanded into a 13-hole course on May 2000 and into a full 18-hole course on July 2000. The northwestern corner of the PRD is an undeveloped mixed deciduous-coniferous forest.

The PRD consists of 10 parcels covering approximately 283 acres. A total of 52 Oregon white oak trees were inventoried within the PRD boundaries, outside of the Phase 1 development (Figure 2). Oak impacts within Phase 1 are addressed in a separate mitigation plan (ELS 2016).

Methods

ELS staff inventoried the property for Oregon white oaks during multiple occasions in 2013, 2014, and 2015. The most recent site visit occurred on January 11, 2016. We measured the diameter of the oaks using standard forestry protocols for measuring diameter at breast height (dbh). The location of the oaks was surveyed by a handheld Trimble GPS with sub-meter accuracy. The drip radius was measured by calculating the distance between the trunk and the outer extent of the canopy (with leaves) in inches. The oak drip radii were converted into areas to determine total canopy cover.

Plan Description

This plan describes a series of mitigation measures that will be implemented to avoid, minimize, and compensate for future impacts to Oregon white oaks functions by establishing two advance mitigation areas: 1) an oak establishment/enhancement area and 2) an oak preservation/enhancement area (Figures 2, 3, and 4).

AVOIDANCE MEASURES

The grading plan for subsequent phases has not been developed; however, oaks will be avoided where reasonably possible as provided for in the City's code. Avoiding the regulated oaks and oak groves will be a primary consideration when designing the subsequent phases of the PRD.

MINIMIZATION MEASURES

In addition to the avoidance measures made possible by the preliminary plat redesign, the following minimization measures will further reduce impacts to Oregon white oaks and minimize habitat disruption beyond the extent required to undertake the proposal. The minimization measures are as follows:

1. Install temporary construction fencing around the two separate oak mitigation areas identified as the oak establishment/enhancement area, in the central portion of the Type Np stream corridor (Stream N), and the oak preservation/enhancement area along the eastern end of the Stream N corridor.
2. Design site grading to avoid construction activity to every extent practicable within the drip line of the existing Oregon white oaks within the oak mitigation areas.

3. If unintentional impacts occur to Oregon white oak, then the post-construction protection measures will be implemented. See the subsection titled *Specifications for Site Preparation, Planting, & Maintenance*.

COMPENSATION MEASURES

To compensate for future oak impacts, a two-fold strategy is proposed (Table 1). The Applicant proposes establishing an:

- 1) oak establishment/enhancement area of 1.5 acres, and
- 2) oak preservation/enhancement area of 1.3 acres.

The two-fold approach will compensate for future losses in existing habitat functions from removing existing oaks by: 1) replacing oak habitat on a canopy cover basis after approximately 10 years, 2) offsetting temporal losses of habitat functions by preserving an existing, mature oak stand and 3) establishing oak woodland habitat at least one year before impacts occur to reduce the risk of failure and lower temporal losses of habitat functions.

Within the oak establishment/enhancement area, the Applicant will plant Oregon white oaks and native trees associated with western Washington oak woodlands at a 2:1 ratio, remove non-native, invasive plants from the riparian corridor associated with the Type Np stream (Stream N), as well as install large woody debris, bird boxes, and native shrubs.

Within the oak preservation/enhancement area, the Applicant will preserve Oregon white oak woodland at a 3:1 ratio, remove non-native, invasive plants from the riparian corridor associated with Stream N, place large woody debris, install bird boxes, and plant native shrubs.

The oak mitigation areas will be legally protected for conservation purposes once adjacent portions of the PRD develop and protective language will be incorporated into the CC&Rs. They will be physically demarcated by natural barriers where appropriate and oak habitat signs.

Table 1. Oregon white oak habitat impacts and advance mitigation

Impacts		Advance Mitigation					
Total Oaks	Estimated Oak Canopy Cover (sf) ¹	Type	Canopy Impact Break-down	Ratio (canopy cover)	Required Canopy Cover (sf) ²	Required Area (acres)	Goals
52	49,400	Oak Preservation/ Understory Enhancement	18,876 sf	3:1	56,628	1.3	- To offset temporal loss - To protect oak habitat - To enhance understory diversity and structure
		Oak Establishment/ Understory Enhancement	30,524 sf	2:1	61,048 sf + 4,356 sf pedestrian paths = 65,404 sf	1.5 ³	- To replace oak habitat at approx. 10 years - To enhance understory diversity and structure

¹ We estimated canopy cover of 1,000 square feet per tree or an estimated drip diameter of about 32 feet per tree. The estimated canopy covers errors on the high side, as some of the oaks do not have completely circular canopies.

² The canopy cover within the oak preservation/enhancement area is based on an estimate of 1,000 square feet per tree for oaks ≥ 20 inches dbh and 700 square feet per tree for oaks ≤ 20 inches.

³ 0.1 acres added oak establishment/understory enhancement area to compensate for the estimated area to be occupied by pedestrian paths.

GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS

The goal of this Oregon white oak advance mitigation plan is to substantially maintain the existing Oregon white oak habitat functions over the long-term by establishing, preserving, and enhancing oak woodlands to compensate for future impacts to oaks in subsequent phases of the PRD (ELS 2016). To accomplish this, the following objectives and performance standards are appropriate to ensure that this Oregon white oak advance mitigation plan succeeds.

Vegetative Structure

Oak Establishment/Enhancement Area

Objective 1. Establish Oregon white oak woodland habitat to compensate for impacts to the existing oak habitat functions and establish a native shrub understory to enhance vegetative structure and habitat functions.

- *Performance Standard 1a.* Planted Oregon white oak and other native trees and shrubs in the established/enhanced oak woodland will achieve at least 90 percent survival in Year 1. Dead plants will be replaced if this performance standard is not met.
- *Performance Standard 1b.* Planted Oregon white oak and other native trees and shrubs in the established/enhanced oak woodland will achieve at least 80 percent survival in Year 2. Dead plants will be replaced if this performance standard is not met.

- ▶ *Performance Standard 1c.* Planted Oregon white oak and other native trees and shrubs in the established/enhanced oak woodland will achieve at least 75 percent survival in Year 3. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 1d.* By Year 5, the established/enhanced oak woodland will have a minimum 25 percent cover by native trees and 10 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 1e.* By Year 7, the established/enhanced oak woodland will have a minimum 35 percent cover by native trees and 15 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 1f.* By Year 10, the established/enhanced oak woodland will have a minimum 50 percent cover by native trees and 30 percent cover by shrubs. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 1g.* In all years, non-native invasive plant species, except for reed canarygrass, will not exceed 10 percent cover within the mitigation area.
- ▶ *Performance Standard 1h.* In all years, non-native invasive plant species infestations cover 200 square feet or more, but not sampled as a part of the monitoring methods, will be documented by species and location, and control measures will be implemented.
- ▶ *Performance Standard 1i.* In all years, state-listed Class A noxious weeds, non-native knotweeds (*Polygonum cuspidatum*, *P. polystachyum*, *P. sachalinense*, and *P. bohemicum*), and English ivy (*Hedera helix*) will be eradicated from the mitigation area.

Oak Preservation/Enhancement Area

Objective 2. Preserve Oregon white oak woodland habitat to compensate for temporal loss of habitat functions, protect oak habitat, and establish a native shrub understory to enhance vegetative structure and habitat functions.

- ▶ *Performance Standard 2a.* Preserve 1.3 acres of existing Oregon white oak woodland along the eastern end of the Type Np stream corridor (Stream N). This performance standard is completed when the 1.3-acre area is documented in the first annual monitoring report.
- ▶ *Performance Standard 2b.* Planted native shrubs in the preserved/enhanced oak woodland will achieve at least 90 percent survival in Year 1. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 2c.* Planted native shrubs in the preserved/enhanced oak woodland will achieve at least 80 percent survival in Year 2. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 2d.* Planted native shrubs in the preserved/enhanced oak woodland will achieve at least 75 percent survival in Year 3. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 2e.* By Year 5, the preserved/enhanced oak woodland will have a minimum 10 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 2f.* By Year 7, the preserved/enhanced oak woodland will have a minimum 15 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.

- ▶ *Performance Standard 2g.* By Year 10, the preserved/enhanced oak woodland will have a minimum 30 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.
- ▶ *Performance Standard 2h.* In all years, non-native invasive plant species, except for reed canarygrass, will not exceed 10 percent cover within the mitigation area.
- ▶ *Performance Standard 2i.* In all years, non-native invasive plant species infestations covering 200 square feet or more, but not sampled as a part of the monitoring methods, will be documented by species and location, and control measures will be implemented.
- ▶ *Performance Standard 2j.* In all years, state-listed Class A noxious weeds, non-native knotweeds (*Polygonum cuspidatum*, *P. polystachyum*, *P. sachalinense*, and *P. bohemicum*), and English ivy (*Hedera helix*) will be eradicated from the mitigation area.

Table 2. Performance standards for vegetation by monitored year

	Percent Survival and Cover					
	Year 1	Year 2	Year 3	Year 5	Year 7	Year 10
Tree Strata						
Survival	≥90%	≥80%	≥75%	--	--	--
Cover ¹	--	--	--	≥25%	≥35%	≥50%
Shrub Strata						
Survival	≥90%	≥80%	≥75%	--	--	--
Cover ¹	--	--	--	≥10%	≥15%	≥30%
Invasive Plants						
Cover of non-native, invasive plant, excluding reed canarygrass	<10%	<10%	<10%	<10%	<10%	<10%

¹ Includes naturally recruited species.

Habitat Structure

Objective 3. Install habitat features to favor small mammals and birds to compensate for impacts to the existing oak habitat functions.

- ▶ *Performance Standard 3a.* Install at least three horizontal logs per acre within the oak preservation/enhancement area and oak establishment/enhancement area. The performance standard is completed when the horizontal logs are installed and documented in the first annual monitoring report.
- ▶ *Performance Standard 3b.* Install a minimum of four bird boxes within each mitigation area. This performance standard is completed when the bird boxes are installed and documented in the first annual monitoring report.

Long-term Protection

Objective 4. Demarcate the advance oak mitigation areas.

- ▶ *Performance Standard 4a.* Install oak habitat signs on metal or wood posts at minimum of 100-foot intervals or 1 per lot along the perimeters of the oak preservation/enhancement area and the oak establishment/enhancement area bordering the development. The signs will state language similar to the following: “oak habitat boundary” and “please respect native plants and wildlife, protection of this natural area is in your care.” This performance standard is completed when signs are installed and documented in the first annual monitoring report.
- ▶ *Performance Standard 4b.* Install natural barriers as needed around the perimeters of the oak preservation/enhancement area and the oak establishment/enhancement area. This performance standard is completed when the natural barriers are installed and documented in the first annual monitoring report.

Objective 5. Provide legally binding protection for the advance oak mitigation areas.

- ▶ *Performance Standard 5a.* A permanent and irrevocable conservation covenant or similar legal mechanism will be established for the oak preservation/enhancement and the oak establishment/enhancement areas. The performance standard is completed when the City approves the conservation covenant or similar legal mechanism.
- ▶ *Performance Standard 5b.* Language to protect the native vegetation within the oak preservation/enhancement and the oak establishment/enhancement areas will be incorporated into the CC&Rs. The performance standard is completed when a copy of the final CC&Rs is provided to the City.

Responsible Parties

The Applicant (or Successors as assigned) will be responsible for implementing this Oregon White Oak Advance Mitigation Plan, which includes preserving existing oaks, planting native trees and shrubs, installing wildlife habitat features, and physically and legally protecting the advance mitigation areas. The Applicant (or Successors as assigned) also will conduct the prescribed maintenance and monitoring during the 10-year monitoring period or longer if warranted by contingency actions.

Functional Assessment

EXISTING CONDITIONS

The Green Mountain property was converted into a golf course in 1990 and expanded farther the year after. Currently, the central part of the PRD site is an active golf course that is regularly mowed. The northern western area is an undeveloped mixed deciduous-coniferous forest.

Vegetation

Oak Preservation/Enhancement Area

Within the Type Np stream corridor in the oak preservation/enhancement area, the overstory is primarily comprised of widely spaced Oregon white oak (*Quercus garryana*), Oregon ash (*Fraxinus latifolia*) and black cottonwood (*Populus balsamifera*). The understory of the preservation area is vegetated with mowed grasses associated with the golf course, oxeye

daisy (*Leucanthemum vulgare*), reed canarygrass (*Phalaris arundinacea*), and Himalayan blackberry (*Rubus armeniacus*).

Oak Establishment/Enhancement Area

The overstory of the establishment/enhancement area is sparse, but where a tree layer is present, it is comprised of widely spaced Oregon white oak and red alder (*Alnus rubra*). The shrub layer is also sparse and limited to a narrow section of the riparian corridor. Where present, the shrub layer is comprised of common snowberry (*Symphoricarpos albus*), pacific ninebark (*Physocarpus capitatus*), beaked hazelnut (*Corylus cornuta*), nootka rose (*Rosa nutkana*), peafruit rose (*Rosa pisocarpa*), and sword fern (*Polystichum munitum*). The herbaceous understory is primarily comprised of reed canarygrass, Canada thistle (*Cirsium arvense*), common plantain (*Plantago major*) oxeye daisy, and Himalayan blackberry.

Soils

The Natural Resources Conservation Service (NRCS 2012) designates soils on the project site as 1) Dollar loam (DoB) 0-5% slopes, 2) Olympic stony clay loams (OmE and OmF) 3-30% and 30-60% slopes, 3) McBee silt loam coarse variant (MIA) 0-3% slopes, and 4) Cove silty clay loam (CvA) 0-3% slopes. DoB soils are characterized moderately deep, moderately well drained soil occurring on low ridges next to depressional areas. OmE and OmF soils are characterized by very deep, well drained soil occurring on high ridges along the mountain slopes. CvA soils are characterized by very deep, poorly drained soil occurring on concave drainage ways and in large flat old lakebeds. MIA soils are characterized by very deep, somewhat poorly drained soil occurring in drainage ways and depressions.

Habitat

Oak Preservation/Enhancement Area

The existing habitat conditions for the 1.3-acre oak preservation/enhancement area consist of mature oaks with an open, sparsely vegetated understory and a non-fish bearing perennial stream bisecting it. The preservation/establishment area has low wildlife habitat potential to due regular mowing and use by the golf course.

Oak Establishment/Enhancement Area

The existing habitat conditions for the 1.5-acre oak establishment/enhancement area consists most of mowed grasses for the golf course and a partially vegetated (trees and shrubs) riparian corridor along the Type Np stream (Stream N). The BPA easement bisects this proposed mitigation area. The establishment/enhancement area has low wildlife habitat potential due to regular mowing and use by the golf course.

PROPOSED CONDITIONS

Vegetation

The vegetation proposed within the advance oak mitigation areas will primarily consist of native, non-invasive species associated with western Washington oak woodlands. Non-native, invasive species will be controlled following the performance standards (1g, 1h, 1i, 2h, 2i, and 2j).

Soils

Soils within the mitigation areas will be ripped and tilled where appropriate as preparation for areas of planting, but otherwise will not be impacted and may improve over time as it will no longer be part of an active golf course.

Habitat

Invasive, non-native species will be removed from the mitigation areas, and native species associated within western Washington oak woodlands will be planted.

The oak preservation/enhancement area consists of individual oaks, but lacks understory structure. The proposed multi-strata native shrub layer will improve vegetative structure in the largely open understory, which will benefit wildlife habitat over the long-term. Horizontal logs, from trees felled onsite, and bird boxes will also be installed to improve habitat structure and wildlife functions.

The oak establishment/enhancement area will consist of planted Oregon white oaks, other native trees, and native shrubs to improve the vegetative structure and wildlife habitat potential. Like the oak preservation/enhancement area above, horizontal logs and birds boxes are proposed to improve wildlife habitat. The mitigation areas will promote a continual healthy oak woodland habitat with associated birds and small mammals.

REPRODUCTIVE POTENTIAL

Acorn production varies widely among oak and the success of regeneration depends largely on the availability of fruits that mature and escape predation. Oaks that grow in an open environment, such as the proposed oak preservation/enhancement area, generally produce more acorns than trees suppressed by other overstory trees (Olympia Forestry Sciences Laboratory 2004; Beck 1992). Beck (1992) describes oak reproduction as sporadic even under ideal circumstances because of predation, the limited seed viability, the precise germination requirements (≥ 30 percent moisture and cool conditions), and the low survival rate of seedlings if they do germinate. Once a mature fruit falls to the ground, it must have adequate moisture and soil or leaf litter to germinate as a seedling. With the correct environmental conditions, the slow growing seedlings typically emerge in the spring.

The oak trees within the oak preservation/enhancement area are widely spaced and have broad, spreading crowns that dominate the overstory canopy cover. The oaks are producing fruit, as we observed abundant acorns on the ground during our October 2015 and January 2016 field investigations; however, we also observed evidence of predation by birds and at least one squirrel cache. We did not observe any oak seedlings with the oak preservation/enhancement area, likely due to animal predation and the regular mowing associated with the active golf course.

WILDLIFE ANALYSIS

The proposed plan has been designed with specific elements to avoid or minimize impacts to the existing habitat of wildlife species or evidence of species that were observed onsite. The trees and shrubs specified will provide nesting, roosting, and escape habitat for birds (and some mammals). Many of the fruits, seeds, twigs, and leaves of the planted trees and shrubs will provide a food source for birds, mammals, and insects. In addition, bees frequent bigleaf maple flowers as a nectar source. Oak acorns, which we observed in abundance near the oak preservation/enhancement area, are a good food source for birds and

mammals. Several habitat features are also proposed to promote wildlife habitat functions: 1) large woody debris will provide horizontal cover for small mammals and enrich the soil as they decay and 2) bird boxes with varied diameter entry holes will offer immediate nesting habitat. Although this oak mitigation is tailored to the wildlife species observed onsite, the native plants and habitat features proposed will benefit all wildlife species common to the area, including insects, amphibians, birds, and mammals.

Corvids

Corvids, specifically American crows, jays, and ravens, are opportunistic omnivores and may use the project site for foraging. To minimize impacts to potential corvid foraging habitat, this plan proposes two oak mitigation areas. The oak preservation/enhancement area is dominated by mature Oregon white oak, a potential food source for corvids. The oaks in this mitigation area are currently producing acorns. We also anticipate that the planted oaks in the oak establishment/enhancement area will produce acorns when they reach reproductive maturity and may provide a food source for corvids in the long-term.

Songbirds

Songbirds use the project site for foraging, nesting, and roosting. This plan proposes the following measures to minimize impacts to songbird habitat following many of the recommendations in Link (1999): 1) install a minimum of three large horizontal logs per acre in the oak mitigation areas to add mature habitat structure that is currently lacking, 2) plant a mix of native understory shrubs to establish a three-tiered shrub canopy in the mitigation areas, 3) install a minimum of four bird boxes with varied diameter entry holes in each of the mitigation areas, 4) plant Oregon white oak in the oak establishment/enhancement area, and 5) preserve existing mature oak trees in the oak preservation/enhancement area.

Raptors

Turkey vultures and red-tailed hawk were identified during a wildlife survey (ELS 2009) and may use the project site occasionally for foraging. To minimize impacts to potential raptor habitat, all existing mature trees and snags will be preserved within the oak mitigation areas.

Woodpeckers

Woodpeckers, such as the northern flicker and pileated wood pecker, may occasionally use the project site for foraging. Northern flickers frequently forage on the ground or downed, rotten logs (Cornell 2003). To minimize impacts to potential woodpecker foraging habitat, the following mitigation measures are proposed: 1) install a minimum of three large horizontal logs per acre the oak mitigation areas to add mature habitat structure that is currently lacking, 2) plant a mix of native understory shrubs to establish a three-tiered shrub canopy in the mitigation areas, 3) install a minimum of four bird boxes with varied diameter entry holes in each of the mitigation areas, 4) plant Oregon white oak in the oak establishment/ enhancement area, and 5) preserve existing mature oak trees in the oak preservation/ enhancement area.

Small Mammals

Small mammals, such as rabbits and squirrels, likely use the project site for foraging and nesting. To minimize impacts to small mammal habitat, this mitigation proposes: 1) preserving existing mature oaks along an existing stream corridor to provide a vegetated wildlife corridor and potential food sources, 2) planting Oregon white oaks in oak establishment/enhancement area to provide a future oak-dominated overstory, and 3)

planting a vegetatively diverse shrub understory in the mitigation areas to provide cover and potential food sources.

Large mammals

Columbia black-tailed deer, black bear, and coyote may occasionally use the project site for limited resting and feeding as they migrate through corridors to other habitat areas. When implemented, this advance mitigation plan will continue to provide limited foraging and resting habitat for these mammals in the two oak mitigation areas.

Implementation Plan

PLANTING SCHEDULE AND EQUIPMENT

The native trees and shrubs will be installed in the advance mitigation areas during the late fall to early spring when the plants are dormant and the soil moisture conditions are favorable for planting. The shrubs are intended to create an intertwining, three-tiered understory stratum that provides for wildlife habitat, protection, and food and mimics the less disturbed, existing native understory habitat onsite (Figures 2, 3, and 4).

The following equipment may be used to prepare and install habitat features and plants within the oak mitigation areas: brush hog, weed eater, excavator, tractor, rototiller, tree shovel, garden shovel, and power auger. Heavy equipment will avoid the drip zone of preserved and planted trees and shrubs to prevent soil compaction.

Table 3. Specifications for planting the advance oak mitigation areas

Species	Spacing (feet on center)	Size ¹	Quantity		
			A. Preservation/ Enhancement Area (1.3 ac)	Establishment/Enhancement Areas	
				B. Tree & Shrub Strata (1.4 ac)	C. Shrub Stratum (0.1 ac)
Tree Stratum					
Bigleaf maple (<i>Acer macrophyllum</i> , FACU)	10	18-36 inch bareroot	--	50	--
Red alder (<i>Alnus rubra</i> , FAC)	10	18-36 inch bareroot	--	150	--
Oregon ash (<i>Fraxinus latifolia</i> , FACW)	10	18-36 inch bareroot	--	150	--
Oregon white oak (<i>Quercus garryana</i> , FACU)	14	1 gal or similar	--	175	--
Total Trees			--	525	--
Shrub Stratum					
Tall understory					
Vine maple (<i>Acer circinatum</i> , FAC)	6	18-36 inch bareroot	--	25	--
Western serviceberry (<i>Amelanchier alnifolia</i> , FACU)	6	18-36 inch bareroot	25	50	--
Black hawthorn (<i>Crataegus douglasii</i> , FAC)	6	18-36 inch bareroot	25	25	--
Oceanspray (<i>Holodiscus discolor</i> , FACU)	6	18-36 inch bareroot	25	50	--
Mid-understory					
Nootka rose (<i>Rosa nutkana</i> , FAC)	6	18-36 inch bareroot	150	150	15
Peafruit rose (<i>Rosa pisocarpa</i> , FAC)	6	18-36 inch bareroot	150	150	15
Common snowberry (<i>Symphoricarpos albus</i> , FACU)	6	18-36 inch bareroot	150	150	15
Low understory					
Tall Oregon grape (<i>Mahonia aquifolia</i> , FACU)	6	1-gal or ~10 in ³ “cone-tainer”	50	25	--
Sword fern (<i>Polystichum munitum</i> , FACU)	6	1-gal or bareroot	25	25	--
Total Shrubs			600	650	45
				1,295	
Herbaceous Stratum					
Native Upland Seed Mix		15 to 25 lb/ac	10 to 20 lbs	11 to 21 lbs	0.75 to 1.5 lbs
Total Seed Mix			21.75 to 42.5 lbs		

¹ 1-gal = 1 gallon container

SPECIFICATIONS FOR SITE PREPARATION, PLANTING & MAINTENANCE

Prepare Mitigation Areas

- Install silt fencing where necessary to control runoff from the development or temporary construction fencing along the perimeters of the mitigation areas bordering the development.
- Mechanically remove existing non-native species, namely Himalayan blackberry, English holly, and reed canarygrass within the mitigation areas. Selectively apply herbicide by hand as necessary to control regrowth of invasive plants.
- Rip or till soils in planting areas as needed to loosen compact soils and clear existing vegetation in planting areas.

Install Large Woody Debris

- Install a minimum of 3 horizontal logs per acre in the advance oak mitigation areas.

Horizontal Log Specifications

- a. Logs from trees felled onsite, especially Oregon white oak, Oregon ash, and bigleaf maple;
- b. At least 12-inches diameter for at least 20 feet in length;
- c. With lateral branches retained;
- d. Of hard to medium decay, and;
- e. With ends rough cut, mashed or ripped.

Install Natural Barriers and Habitat Signs

- Install natural barriers as needed where the oak mitigation areas adjoin wetland buffers and residential lots.
- Install durable, plastic oak habitat signs at a minimum of 100-foot intervals or 1 per lot on metal or wood post around the perimeters of the mitigation areas.

General Plant Specifications

- Plant the native trees and shrubs during the late fall to early spring (October-March) at the spacing identified in Table 3.
- Group the plants in uneven patches dominated by a single species, with patches interspersed among one another.
- All plant materials will be kept cool and moist prior to installation.
- All plant materials will have well developed roots and sturdy stems, with an appropriate root to shoot ratio.
- No damaged or desiccated roots or diseased plants will be accepted.

Plant Oaks

- Plant the oaks in groups of 2 to 5 individuals.
- Dig the receiving hole wider than the size of the root system.
- Plant the tree with the root collar at or slightly higher than ground level to allow for settling.

- Backfill the hole with soil about one-half full, lightly tamping to remove any air pockets.
- Place a small amount of native soil collected from the soil surface around existing oaks to provide beneficial mycorrhizae. Finish filling the hole with soil.
- Irrigate the root zone.
- Install a minimum of 3-inch depth by 4-foot diameter mulch layer around the base of planted oaks. The mulch will be comprised of chipped, clean wood. Avoid placing mulch directly against the plant stems.
- Install tree shelters as needed.

Plant Bareroot/Containerized Trees and Shrubs

- Dig the receiving hole several inches wider than the size of the root system.
- Position the planted species' root collar so that they are at or slightly above the level of the surrounding soil to allow for settling.
- Back the hole with soil.
- Gently compact the soil around the planted species to eliminate air spaces.
- Install a minimum of 3-inch depth by 4-foot diameter mulch layer around the base of planted species. The mulch will comprised of chipped, clean wood. Avoid placing mulch directly against plant stems.
- Install tree shelters as needed.
- Irrigate all newly installed plants as site and weather conditions warrant.

Sow Seed Mix

- Seed areas tilled for shrub planting in advance oak mitigation areas with a native upland grass-legume mix of 15 to 25 lb/acre to control regrowth of invasive spaces.

Install Bird Boxes

- Install a minimum of four cedar bird boxes in each mitigation area. The bird boxes will have variable diameter holes to target different bird species (Link 1999) and will be at least 12 feet above the ground surface on posts or existing trees.

Post-construction Protection

If unintentional impacts occur to existing Oregon white oaks within the mitigation areas, then the following repair measures should be implemented as appropriate:

- Prune any damaged roots.
- Spread peat moss or moist topsoil over exposed roots.
- Cut damaged tree limbs above the collar at the trunk or main branch.
- Aerate any compacted soil over the root zone with hand tools or light machinery.

Maintain Mitigation Areas

The preserved and planted trees and shrubs will be maintained as often as necessary to ensure that the specified performance standards are met. The maintenance includes the following:

- Inspect the plantings at least once annually, or more often as appropriate, and maintain to achieve the performance standards specified in the subsection titled “Mitigation Goals, Objectives, & Performance Standards.”
- Irrigate planted trees and shrubs during the dry season for the first 2 to 3 years after planting. Water should be delivered at a minimum rate of 1 gallon every 4 weeks (Campbell 2004). Adjust as necessary based on site and weather conditions.
- Remove competing vegetation from around the base of plant species during first 2 to 3 years after planting and as needed thereafter.
- Replace mulch as needed to suppress competing vegetation.
- Inspect tree shelters to ensure they are upright, stable, and likely to remain so for another year (Clements *et al.* 2011, Devin and Harrington 2010). Ensure that the terminal shoot of the planted species is not ensnared in the wall of the tree shelter. Remove tree shelters when species is robust enough to withstand browse or shelter is impeding growth.
- Replace dead or failed plants to meet the minimum annual performance standards (Table 2). Replaced plants will be installed as described for the original installation.
- If trees have become well established by the end of the monitoring period, then thin trees to achieve density for oak woodlands of 30 to 60 percent tree cover (Campbell 2004) or approximately 100 to 200 trees/acre.

Minor corrective actions will be undertaken as necessary as a part of routine maintenance and will be documented in the subsequent monitoring report.

Corrective actions include, but are not limited to, the following:

- Replant trees or shrubs.
- Implement a fertilizing schedule.
- Repair damaged limbs or prune dead branches.
- Substitute the anti-herbivore device, such as installing a different type of tree shelter, painting lower stems with sanded latex paint, or spraying herbivore deterrent.

Monitoring Plan

This Oregon white oak advance mitigation plan establishes a 10-year monitoring plan with quantitative performance standards. The monitoring will commence the first growing season after the mitigation areas are completed and extend for a 10-year period. The goal of the monitoring will be to determine if the previously stated performance standards are being met (Table 2). Annual reports will be submitted to City of Camas by December 31 of each monitored year.

MONITORING PLOTS

During the first annual monitoring event, monitoring plots will be established as follows:

- A minimum of 2 monitoring plots in the oak establishment/enhancement area and
- A minimum of 3 monitoring plots in the oak preservation/enhancement area.

The monitoring plots will be staked with metal t-posts and identification tags. Their locations will be identified by GPS and placed on an as-built site map that will accompany the

monitoring reports. Permanent photo points will be established at each monitoring plot and directions documented on the site map.

VEGETATION

To assess the status of the vegetation within the advance oak mitigation areas, the vegetation monitoring will measure the following:

1. Total density of planted native trees and shrubs (to determine survival rate)
2. Percent aerial cover of planted and naturally recruiting native trees and shrubs
3. Percent aerial cover of non-native, invasive plants
4. Change in the plant community over time (from photo points)

FAUNA

To assess the development of wildlife habitat within the advance oak mitigation areas, wildlife monitoring will document the following:

1. Presence of large woody debris
2. Usage of bird boxes
3. Insect use
4. Amphibian use
5. Bird use
6. Mammal use
7. Level of herbivory

SOILS AND HYDROLOGY

If the planted species show poor or failed growth, soil moisture and soil nutrients may also be monitored during the growing season. If necessary, soil moisture will be monitored monthly during the growing season and soil nutrients will be assessed annually during the growing season. Corrective actions will be taken as appropriate based on the soil moisture and soil nutrient data. These actions include, but are not limited to, a revised irrigation schedule and a fertilization schedule.

MONITORING REPORT

The annual monitoring reports will contain at least the following:

- Location map and as-built map and revised plant quantity table as needed
- Historic description of project, including dates of plant installation, current year of monitoring, and restatement of performance standards
- Description of monitoring methods
- Documentation of large woody debris, bird boxes, natural barriers, and oak habitat signs
- Documentation of plant survival, cover, and overall development of the Oregon white oak habitat within the advance oak mitigation areas
- Assessment of non-native, invasive plant species and recommendations for management
- Assessment of site hydrology and soils, only if they appear to be limiting plant survival

- Assessment of surrounding land use, use by humans, and use by wild and domestic animals
- Observations of wildlife, including, insects, amphibians, birds, and mammals
- Photographs from permanent photo points
- Summary of maintenance and contingency measures proposed for the next season and completed for the past season

Adaptive Management Plan

If the performance standards are not met by the fifth year of monitoring, or at an earlier time if necessary, an adaptive management plan will be developed and implemented. All adaptive management actions will be undertaken only after consulting and gaining approval from the City of Camas. The Applicant (or Successors as assigned) will complete an adaptive management plan that describes 1) the need for adaptive management, 2) proposed actions, 3) time-frame for completing actions, and 4) any additional maintenance and monitoring, if necessary.

Legal Protection

The oak establishment/enhancement and oak preservation/enhancement areas will have a conservation covenant or similar legal mechanism to protect them in perpetuity. The conservation covenant will accommodate trails per the PRD plan and/or the City of Camas Parks & Open Space Plan and unavoidable road crossings to allow access to inner part of the site. The legal mechanism will be recorded after adjacent areas have developed.

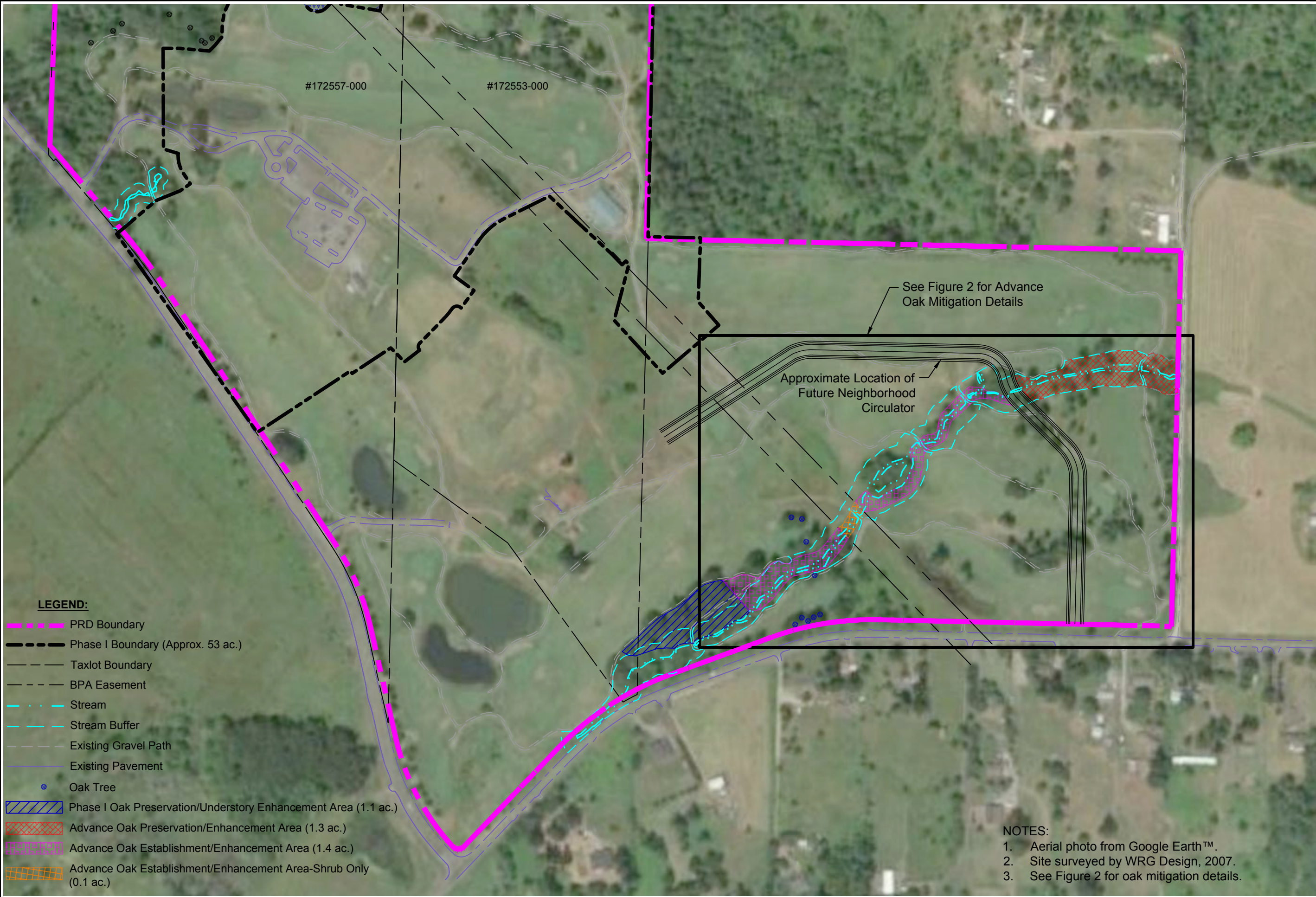
The homeowners association for PRD will be responsible for the maintenance and monitoring of the advance oak mitigation areas for the 10-year period. The vegetation within the advance oak mitigation areas will be protected and conserved in the homeowners association's by-laws to ensure that they are maintained for conservation purposes. Neither the Applicant nor the future homeowners association are responsible for acts of nature that damage or kill trees, including sudden oak death syndrome, fungal disease, windthrow or ice storms.

References

- Beck, D.E. 1992. Acorns and Oak Regeneration. In *Oak Regeneration: Serious Problems and Practical Recommendations*. GTR SE-84. Southeastern Forest Experiment Station, U.S. Department of Agriculture, Asheville, North Carolina.
- Campbell, B.H. 2004. *Restoring Rare Native Habitats in the Willamette Valley: a landowner's guide for restoring oak woodlands, wetlands, prairies, and bottomland hardwood and riparian forests*. Oregon Department of Fish and Wildlife & Defenders of Wildlife, West Coast Office. West Linn, Oregon.
- City of Camas Municipal Code. 2008. *Critical Areas Ordinance Chapter 16.53 – Wetlands*. September 2015.
- City of Camas Municipal Code. 2008. *Critical Areas Ordinance Chapter 16.61 – Fish and Wildlife Habitat Conservation Areas*. September 2015.
- Clements, D.R., S. Luginbill, D.A. Jordan, R.V. Dragt, and R.K. Pelant. 2011. *Techniques to Promote Garry Oak Seedling Growth and Survival in Areas with High Levels of Herbivory and Competition*. Northwest Science 85(2): 172-181.
- Cornell Lab of Ornithology. 2003. *All About Birds*. Online database <<http://www.birds.cornell.edu/programs/AllAboutBirds/BirdGuide>>. Accessed February 22, 2005.
- Devin, W.D. and C.A. Harrington. 2011. *Planting Native Oak in the Pacific Northwest*. USDA, Forest Service, Pacific Northwest Research Station. General Technical Report. PNW-GTR-804. Portland, Oregon.
- Ecological Land Services, Inc. 2009. *Breeding Bird Survey for GM Camas, LLC*. Camas, Washington. July 13.
- Ecological Land Services, Inc. 2016. *Oregon White Oak Mitigation Plan for Green Mountain Mixed Use PRD – Phase 1, City of Camas, Washington*.
- Gould, P.J., C.A. Harrington, and W.D. Devine. 2011. *Growth of Oregon White Oak (Quercus garryana)*. USDA, Forest Service Pacific Northwest Research Station. Olympia, Washington.
- Larsen, E.M. and J.T. Morgan. 1998. *Management Recommendations for Washington's Priority Habitats: Oregon White Oak Woodlands*. Washington Department of Fish and Wildlife. Olympia, Washington.
- Link, R. 1999. *Landscaping for Wildlife in the Pacific Northwest*. University of Washington Press and the Washington Department of Fish and Wildlife, Seattle, Washington.
- Natural Resource Conservation Service (NRCS). 2012. *Soil Survey of Clark County, Washington*. Online document. <http://www.or.nrcs.usda.gov/pnw_soil/wa_reports.html>. Accessed September 2015.
- Olympia Forestry Sciences Laboratory. 2004. *Oak Studies: Acorn Survey Results*. Online document <http://www.fs.fed.us/pnw/olympia.silv/oak-studies/acorn_survey/survey.shtml>. Accessed September 2015.

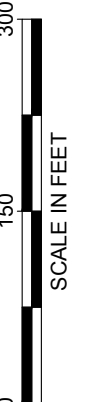
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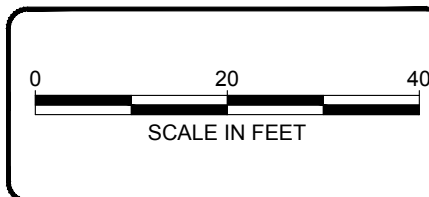
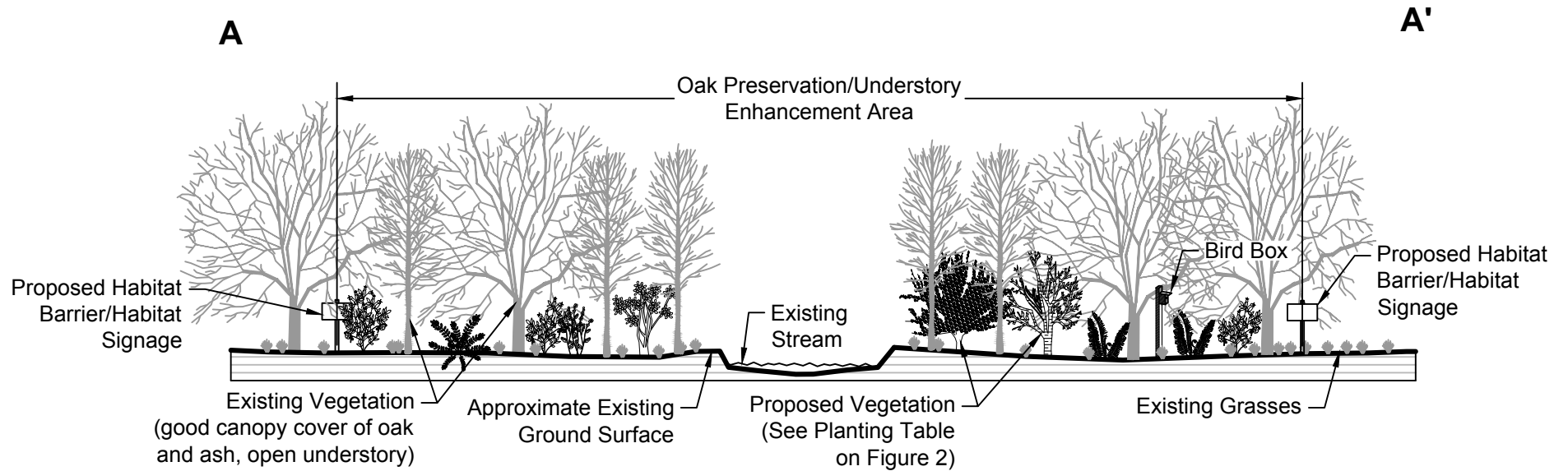
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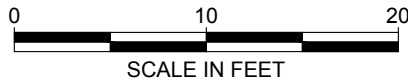
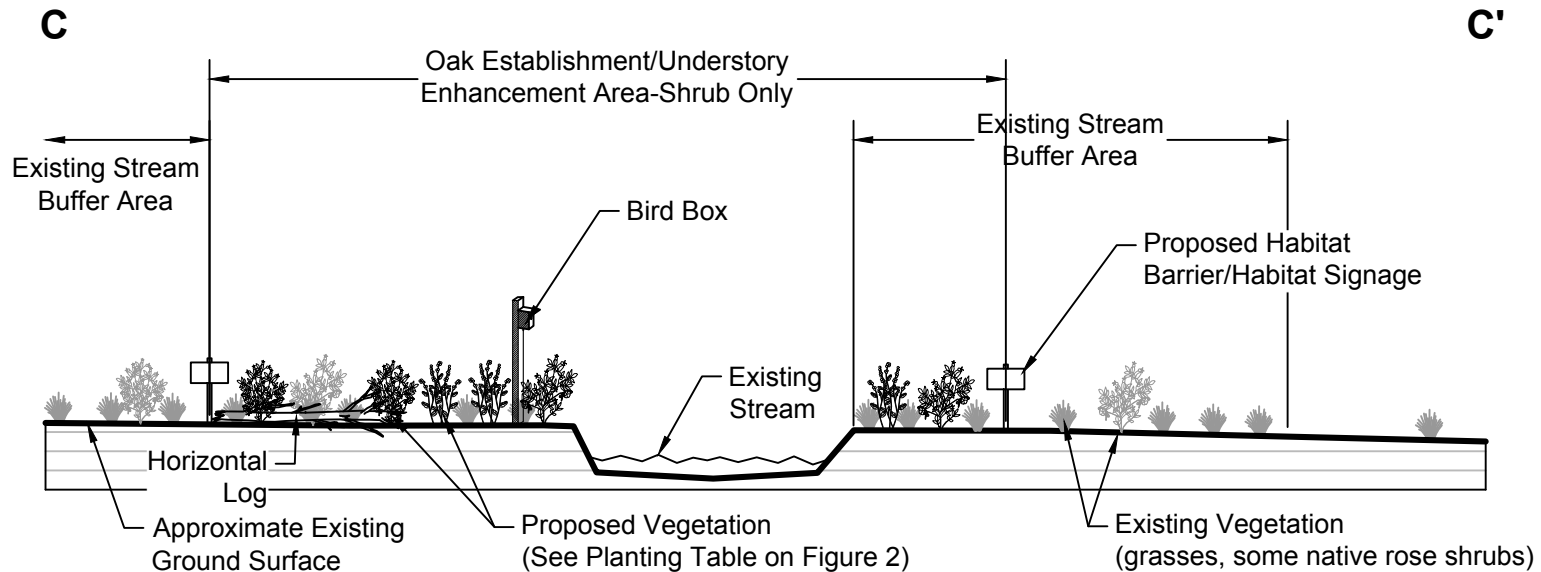
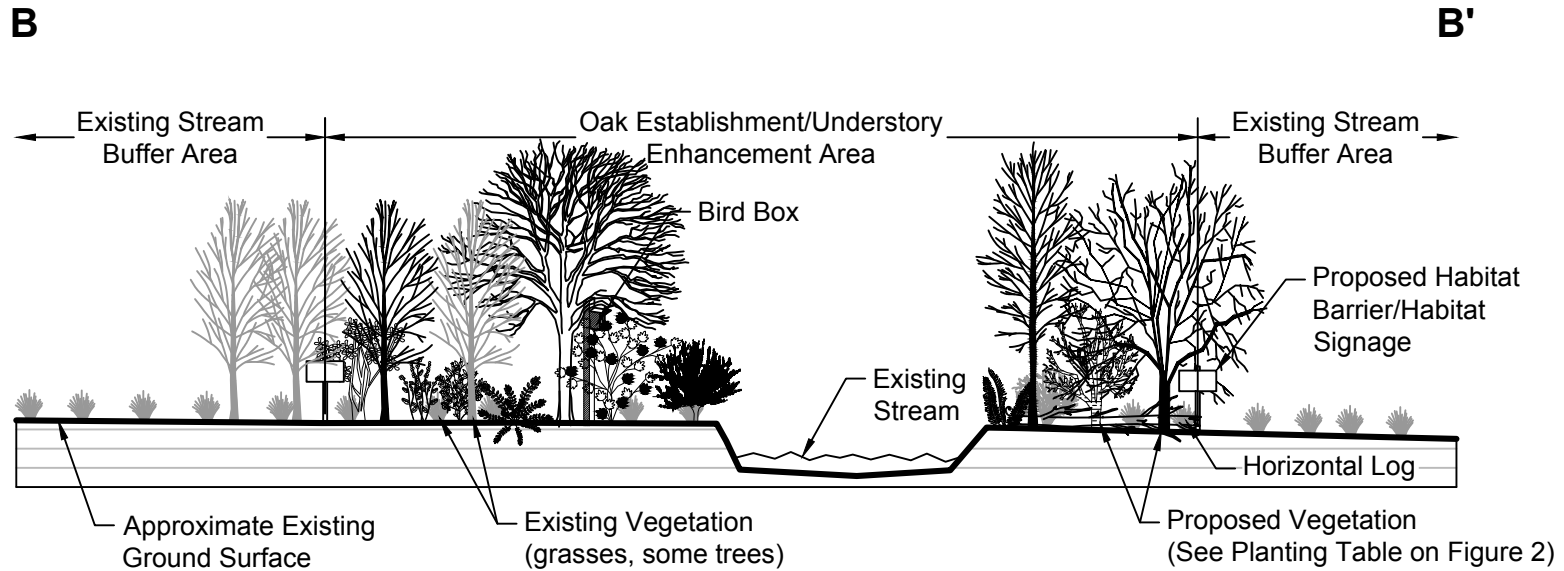




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Figure 3
CROSS SECTION A
Green Mountain Mixed Use PRD
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.



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Figure 4
CROSS SECTIONS B & C
Green Mountain Mixed Use PRD
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

Photoplates



Above: View northeast showing Stream N and its buffer within the proposed advance oak establishment/enhancement area.

Below: View northeast showing Stream N and its buffer within the proposed advance oak establishment/enhancement area. A cart trail and forested and scrub-shrub riparian area are in the background.



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Photoplate 1
 SITE PHOTOS
 Green Mountain Land Mixed
 Use PRD
 Green Mountain Land, LLC
 City of Camas, Washington



Above: View northeast showing the Stream N buffer within the proposed advance oak establishment/enhancement area. Oregon white oaks are widely spaced.

Below: View southwest showing the northwest bank of Stream N and its buffer within the proposed advance oak establishment/enhancement area. The BPA easement is in the background.



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Photoplate 2
SITE PHOTOS
Green Mountain Land Mixed
Use PRD
Green Mountain Land, LLC
City of Camas, Washington



Above: View southwest along southeast bank of Stream N showing its buffer and proposed advance oak establishment/enhancement area.

Below: View north showing Stream N's buffer within the BPA easement and proposed advance oak preservation/enhancement area to be planted with shrubs only.



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Photoplate 3
SITE PHOTOS
Green Mountain Land Mixed
Use PRD
Green Mountain Land, LLC
City of Camas, Washington



Above: View east showing Stream N and its buffer within the proposed advance oak preservation/enhancement area. Oregon white oak, Oregon ash, and black cottonwood are widely spaced in this area.

Below: View southwest from near the PRD eastern boundary showing Stream N and its buffer within the proposed advance oak preservation/enhancement area.



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Photoplate 4
SITE PHOTOS
Green Mountain Land Mixed
Use PRD
Green Mountain Land, LLC
City of Camas, Washington