

AETNA SPRINGS CREEK RIPARIAN RESTORATION PLAN

NAPA COUNTY, CALIFORNIA

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October 10, 2011

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INTRODUCTION

The purpose of this plan ("plan") is to provide guidelines for restoration of riparian habitat within the Napa County defined Stream Setback along Aetna Springs Creek for the proposed Aetna Springs Retreat Creek Project. The project site is located along the northwest edge of the Pope Valley in Napa County, California (T 9 & 10 N, R 6 W, Aetna Springs CA 7½" Topographic Map). It is accessed by Aetna Springs Road via Pope Valley Road. A location map is provided in Appendix A, Figures 1 and 2.

PROJECT SUMMARY

Three areas within the Stream Setback have been designated for creek restoration as shown on the Aetna Springs Creek Riparian Restoration Plan Supplement ("Supplement"), Sheet 2:

- **Reach 1. Western Habitat Restoration Area.** This habitat restoration area begins just upstream of the southeast of the Soda Fountain Building, and northwest of the historic bridge abutment upstream from the Mineral Bath. Reach 1 extends west to and upstream of the Vineyard Bridge.
- **Reach 2. Core Retreat Area.** The middle portion of the creek within the Stream Setback is located within the historic cultural landscape area intended for rehabilitation, based on U.S. Department of the Interior standards for compliance with the Historical Preservation Act of 1974. Aetna Springs is subject to this Act as a Historic District listed on the National Register of Historic Places. In accordance with these standards, *the Aetna Springs Preservation Plan* proposes preservation of historic buildings and site structures of the historical landscaping. Its objectives are to retain the Aetna Springs Historical District's cultural contributing factors, its integrity, and condition, and to retain recreational uses and aesthetic landscape values of the creek and related facilities. This core retreat/recreational area is addressed in the *Aetna Springs Application to Modify Use Permit # 96349-UP* ("Application") prepared by Smith + Smith Landscape Architects, ARG Architects and Summit Engineering. The intention of the Application is to integrate the historical landscape and cultural uses within the Stream Setback with proposed biological habitat restoration.
- **Reach 3. Eastern Habitat Restoration Area.** This habitat restoration area begins downstream of the relocated Creekside Building and extends east to the upstream portion of Pond 1.

BIOLOGICAL SETTING

The following description is adapted from the *Assessment of Biological Resources for the Aetna Springs Resort Property* (Northwest Biosurvey 2011). The site supports six plant communities based on the "Standardized Classification" scheme described in the California Native Plant Society (CNPS) *A Manual of California Vegetation* (Sawyer et al. 2009) ("Vegetation Manual"). As is often the case with this generalized, statewide classification system, unique, site-specific conditions have resulted in variations in plant communities that either extend beyond the descriptions provided in the Vegetation Manual or, in some cases, result in communities that are not described in it. In addition to the plant

communities, other land uses that have supplanted native plant communities are mapped on the Supplement, Sheets 2, 4, and 5, and described in the sections below.

- **Developed/Ornamental/Ruderal:** This category includes all developed non-agricultural areas disturbed by humans. Developed areas include historic buildings, pergolas, pedestrian oriented terraces, site furnishings, stairs, bridges, site walls, a recreational swim tank, decks, shade structures, and support facilities. Other creek oriented developments include abutments, creek and water oriented decks, patios, terraces, creek water features, natural pools, constructed pools, riffles, decorative walls, paths and walks, vehicular fords, and roadways. Associated ornamental landscaping includes periwinkle (*Vinca major*), roses (*Rosa* spp.), arborvitae (*Thuja occidentalis*), turf grasses, London plane trees (*Platanus acerifolia*), and small black locust trees (*Robinia pseudoacacia*). Ruderal (weedy) non-native vegetation occurs in disturbed, undeveloped areas that were not maintained as landscaped. Ruderal species include wild oat (*Avena barbata*), soft chess (*Bromus hordeaceus*), hedgehog dogtail (*Cynosurus echinatus*), medusahead (*Taenitherum asperum*), and yellow star-thistle.
- **Valley Oak Woodland:** This mature woodland dominates the deep soils of the valley floor and floodplains of Aetna Creek. The overstory of this community consists almost exclusively of very large, mature valley oak (*Quercus lobata*) with scattered individual blue oak (*Quercus douglasii*), black oak (*Quercus kelloggii*), and California bay (*Umbellularia californica*). The entire valley community has been heavily modified by human development dating back to the late 1800's. Within the Aetna Springs Retreat, it now occurs as mature trees scattered among the retreat buildings, roads, and commons. However, it retains much of its original structure and species makeup along Aetna Creek which flows through the southern edge of the resort. California wild grape (*Vitis californica*) and poison oak (*Toxicodendron diversilobum*) occur along the channel banks. The shrub layer is sparse but includes Himalayan blackberry (*Rubus discolor*), California coffeeberry, (*Rhamnus californica* ssp. *californica*), common manzanita (*Arctostaphylos manzanita* ssp. *manzanita*), poison oak (*Toxicodendron diversilobum*), and Scotch broom (*Cytisus scoparius*). Much of the understory of the oak woodland in the core historical area consists of the developed and ornamental landscaping features described above.
- **Wild Oat Grassland:** This grassland community dominates openings of the valley oak woodland. While it is dominated by non-native grasses and forbs, the species composition of this community varies widely on a seasonal basis. It tends to be dominated by mesic (moist soil) forbs in the spring which are replaced by annual grasses as the season progresses into dryer, summer conditions. Among the more prominent species are wild oat, soft chess, hedgehog dogtail, sticky tarweed (*Holocarpha virgata* ssp. *virgata*), rose clover (*Trifolium hirtum*), bird's eyes (*Gilia tricolor* ssp. *tricolor*), and true baby stars (*Linanthus bicolor*).
- **Mixed Willow Shrub:** This is the common riparian community of exposed creek channels throughout the survey area. Red willow (*Salix laevigata*) dominates the creek banks and ranges in size from the more common shrub to mature trees (in areas sufficiently stable to allow the trees to mature). The shrubby narrow-leaved willow (*Salix exigua*) dominates the open sand and gravel bars of the wider channels. The ground cover in this community consists primarily of exposed rocky substrate but often includes a mix of species from adjacent riparian, marsh, and aquatic communities such as sedge-rush, bulrush-cattail, and floating-leaved pondweed.
- **Sedge-Rush:** This is a highly variable community that includes a very wide palate of sedge, rush, forb and "fern" species occurring in the creek channel below the high water mark. This

community also occurs along pond edges. The species list includes: Pacific bog rush, pointed rush, spreading rush, and poverty rush (*Juncus effuses* var. *pacificus*, *J. oxymeris*, *J. patens*, *J. tenuis*), Pacific woodrush (*Luzula comosa*), slender beak and clustered field sedge (*Carex athrostachya* and *C. praegracilis*), tall flat sedge (*Cyperus eragrostis*), creeping spike rush (*Eleocharis macrostachya*), smooth scouring rush and giant horsetail (*Equisetum laevigatum* and *E. telmateia* ssp. *braunii*), seep monkeyflower (*Mimulus guttatus*), pennyroyal (*Mentha pulegium*), and western mannagrass (*Glyceria occidentalis*).

- **Bulrush-Cattail:** This dense emergent marsh community dominates the banks of Pond 1 (the pond downstream of Aetna Creek and east of the retreat area) and occurs in perennially wet soils within the creek. Bulrush (or tule: *Scirpus acutus* var. *occidentalis*) and broad-leaved cattail (*Typha latifolia*) are co-dominant. Cattail occurs as an outermost band along the upper saturation zone of the shoreline while tule occupies the slightly deeper water before giving way to the floating-leaved pondweed community.
- **Floating-leaved Pond Weed:** This littoral community occupies the shallower water around the shorelines of Pond #1. Floating-leaved pond weed (*Potamogeton natans*) forms a leaf mat with stems rooted in the mud below. It forms the most plant community in the pond before the water becomes too deep for rooting plants.
- **Open Water-Pond:** This habitat occupies all of the Pond # 1 habitats too deep for bulrush-cattail, sedge-rush marsh and floating-leaved pondweed.
- **Vineyard:** A small area of the southwest portion of the Stream Setback is planted in commercial vineyard.

RESTORATION PLAN

RESTORATION GOALS AND OBJECTIVES

The general goals for the two habitat restoration reaches (Reach 1 and Reach 3) are to enhance habitat values, preserve biodiversity and improve water quality by increasing native woody riparian and herbaceous emergent marsh vegetation, as well as increasing stability of eroding stream banks. The historical restoration goals for Reach 2 include rehabilitation of the historical elements of the Aetna Springs Retreat and are described in the Application. The proposed habitat restoration of Reaches 1 and 3 of the creek are illustrated in the Supplement, Sheet 6.

Specific, quantifiable objectives related to habitat restoration goals of Reaches 1 and 3 include the following:

- Increase the canopy cover of native woody riparian vegetation within treatment areas by 25 percent, with 80 percent survival of planted containers and cuttings after five years following installation
- Increase the canopy cover of native emergent marsh vegetation within treatment areas by 25 percent after five years following installation
- Improve water quality by stabilizing eroded stream bank reaches after five years following installation
- Preserve and/or enhance habitat for foothill yellow-legged frog and other native amphibians

RESTORATION CONCEPTS

The plan calls for the following strategies:

- Help stabilize an eroding stream bank located in Reach 1 upstream from the Vineyard Bridge by installing native plants and natural materials in a biotechnical approach to erosion control. Biotechnical erosion control is a hybrid approach that combines organic structures and vegetation to stabilize slopes and stream banks. Biotechnical stabilization will be applied only to banks that are unstable due to undercutting or eroding. Biotechnical stabilization will not be applied to areas that have eroded into bedrock, as such areas are stable.
- Remove invasive non-native plant species (i.e., Himalaya-blackberry, tamarisk, periwinkle, and other invasive weeds) that are degrading riparian habitat values and replace with native woody riparian and herbaceous marsh species in Reaches 1 and 3.
- Increase native woody riparian and herbaceous marsh vegetative cover in Reaches 1 and 3 by installing container plants, plugs, and seed mixes in discrete clusters or “nodes” along the creek. The Historical Reach 2 will be opened and remain open because yellow-legged frogs prefer unshaded streams and for aesthetic values. The nodes or propagules will provide sources of propagules for natural recruitment of native riparian vegetation.

General Guidelines. These general actions apply to the entire restoration area.

- Ground disturbance, excluding planting, staging, or equipment ingress and egress within the Stream Setback will be completed before the winter rains.
- Interior work on structures located within the Stream Setback will take place throughout the year.
- Installation of vegetation for creek restoration will take place in the winter.
- Native plants and biotechnical structures will be installed in Reaches 1 and 3 under supervision of a restoration ecologist trained and experienced in riparian restoration.
- Live willow plantings (“live stakes and poles”) and container plantings will be watered every two weeks as necessary until the plants are established.
- After the winter rains begin, the project area will be inspected on a regular basis until established. The project will also be checked after each large rainfall event (approximately 1 inch of rain or more in 24 hours) until the site is stable. Documentation will be kept for the following: new erosion, the need to repair biotechnical erosion treatments, or any plantings that are washed out. If undercutting or side-stepping is observed, field adjustments will be made to avert the potential failure of the treatment.

General Tree Preservation Specifications. The following tree protection measures will be implemented during construction to ensure that trees proposed to be preserved on the project site are not adversely affected by restoration activities.

- The restoration ecologist, arborist, and/or landscape architect will approve each tree to be removed or pruned prior to the commencement of construction. All trees to be removed will be clearly marked with paint or flagging by the contractor. These trees include *Acacia* spp., *Robinia* spp., *Prunus* spp. and other invasive trees.
- Care will be exercised during the removal process so that any trees adjacent to those removed will not be damaged.
- Equipment or vehicles will not be stored under the dripline of any trees that are designated to remain in the project area. Protective fencing will be placed around the dripline of preserved trees adjacent to graded areas.

Best Management Practices (BMPs). The following BMPs will be implemented during rehabilitation and habitat restoration to eliminate or minimize erosion and discharges of any pollutants into or adjacent to jurisdictional waters.

BMPs to prevent pollution will be implemented as part of the project and will include the following:

- Existing vegetation will be retained to the extent possible except for selected removal of plants in accordance with this plan, the Application and the Supplement, Riparian Restoration Plan, Sheet 6 for Reach 2.
- Ground-disturbing activities within the Stream Setback will be scheduled during the dry season (April 15-October 15) to minimize potential erosion and sedimentation from stormwater runoff.

- Disturbed areas will be stabilized by revegetation, mulching, and/or installation of biodegradable fiber rolls and erosion control blankets.
- Sediment barriers, such as straw bales or wattles and silt fences will be installed above the ordinary high water mark in construction areas. Barriers will be installed securely to capture incidental fall back of sediment or other materials and prevent them from entering jurisdictional waters.
 - Equipment maintenance and fueling areas for mobile equipment will be at least 200 feet from stream channels, wetlands or other aquatic sites.
 - Servicing of mobile equipment will be limited to designated areas away from sensitive species or habitats.
 - Motorized equipment used during construction will be checked daily for oil, fuel, and coolant leaks prior to initiating work.
 - Any equipment found to be leaking fluids will not be used in or within 200 feet of aquatic habitat features.
 - Oil catchment mats will be placed under vehicles parked overnight on the work site.
 - Spill prevention and response plans will be prepared and implemented as needed.

Access and Staging Areas. Access and staging areas may be required for construction and restoration activities. The access and staging areas will be established according to the following guidelines:

- The staging areas will be staked by the contractor in the field prior to construction and approved by the restoration ecologist.
- No part of a staging area will occur under the dripline of an existing tree. Protective fencing will be placed around the dripline of preserved trees adjacent to staging areas or construction equipment or materials storage areas.
- After grading and construction is completed, the staging areas will be returned to their original condition. Reclamation of the sites will include surface roughening, if necessary, and seeding with the erosion control seed mix specified in Appendix B, Table 1.
- Seeding activities will consist of scarifying the soil surface by hand or with light equipment followed by hand broadcasting, light raking of the soil surface and mulching with wood and paper mulch and tackifier.

BIOTECHNICAL EROSION CONTROL

An eroding bank occurs along the westernmost portion of Reach 1 and is proposed for biotechnical treatments. Minor grading is recommended for the slope of this reach. This area of Reach 1 is eroding from streambank undercutting, as demonstrated by steep, cliff-like banks and lack of vegetation. Biotechnical erosion control will be accomplished by using light equipment such as a Bobcat® with a backhoe attachment to lay back the top portion of the bank from above the ordinary high water mark. Straw bales or wattles backed by silt fences will first be staked above the high water mark parallel to the channel temporarily to prevent sediment from entering the creek. The soil from the slope will be

deposited on a tarp in upland areas away from the creek. The bank will be laid back to a 2:1 or more gradual slope. A straw or coir wattle will be installed on contour along the top of the graded bank to slow the velocity of sheet flow onto the graded slope.

After removal of the temporary straw bale/silt fence barrier, willow wattles backfilled with native soil will be installed along the toe of the bank parallel to the stream flow to prevent further undercutting. Willow wattles (also known as willow fascines) are composed of bundles of easily rooted live willow cuttings tied together with twine, which are anchored into shallow trenches with live willow stakes or poles.

Live staking is the planting of living cuttings from easily rooted woody species, such as willows (*Salix* sp.). The cuttings take root, and eventually grow leaves and branches. The cuttings will be harvested from willow species native to the project vicinity. The willow pole cuttings will measure 1-inch to 3-inches in diameter and 3 to 4 feet long. Orient the cuttings with the buds pointing up for planting; to assist laborers to identify the bottom of the cutting, the bottom end will be cut diagonally (this also facilitates insertion into the soil) and the top end cut straight across. The prepared stakes will be tamped into the ground at right angles to the slope with a dead blow hammer, to avoid splitting the stakes. The stakes will be buried to a depth of 80-90 percent of their length; a 3-foot-long stake would therefore have only about 3½ inches of stake exposed and two to three leaf buds exposed. The soil will be thoroughly tamped in around the stakes to eliminate any air pockets.

The willow wattles and stakes provide structural protection to the toe-of-bank to protect the slope from undercutting and superficial erosion and also serve to help slow flow velocity by increasing roughness. As the roots from the wattles penetrate the banks, they also protect against shallow slides, sloughing and slumps. In combination with willow mattresses (discussed below), the willow wattles provide a base for the mattresses and prevent flows from undermining the mattress structure from underneath.

The willow wattles will protect the toe of the previously unstable bank, but flows deeper than about 4 to 6 inches could overtop the wattles and scour the bank above them. To protect the upper banks, a willow mattress will be installed. This consists of willow pole cuttings with stakes, coir (coconut fiber) erosion blanket and heavy jute twine. Long, flexible cuttings of live willows are prepared in lengths about six feet or more. The butt ends of the cuttings are planted in a shallow trench in the bank immediately above the wattles, and the brush is bent over the slope to lie smoothly along it. The willows are then covered with a thin layer of soil covered by the blanket, and the trench backfilled and compacted. Redwood stakes (2 x 2, 2 feet long) with a notch cut at the top are driven into the slope in a checkerboard pattern about 18 inches apart and into the trench between the butt ends of the cuttings. The branches are then secured with heavy jute twine as tightly as possible in a criss-cross fashion using U-shaped staples into the sides of the stakes. The stakes are then hammered down to the ground to pull the twine tightly against the blanket, soil and willow mattress. As with the willow stakes and wattles, the willow mattress will be watered gently every two weeks until winter rains begin.

RIPARIAN PLANTING PLAN

The planting plan for riparian restoration along the creek is focused on the following two Reaches: Western Habitat Restoration Area - Reach 1, and Eastern Habitat Restoration Area - Reach 3. Some of the following recommendations also apply to native vegetation proposed for planting in the Core Retreat Area - Reach 2. Planting zones have been established and are related to elevations above the creek bed and resulting differences in moisture levels and flow regimes. The areas where weeds will be removed and the planting zones occur are illustrated in the Supplement, Riparian Restoration Plan, Sheet 6. Recommendations for plant species to be seeded or installed are provided in Appendix B. Not all of these species will necessarily be required to be planted, and additional species may be added during the implementation phase if approved by a qualified landscape architect and/or restoration ecologist.

Planting Zone 1 - Emergent Marsh Plugs (below Ordinary High Water Mark [OHWM]), Creek Bed. This zone, consisting of the existing low-flow channel and associated pools subject to seasonal inundation, is suitable for establishment of emergent marsh vegetation. The flood plain will be planted with plugs of sedges and rushes gathered from the site and secured with jute staples. Volunteer natural revegetation is expected to occur along the creek bed in areas capable of supporting vegetation. Other areas that are scoured down to bedrock will remain devoid of vegetation.

Planting Zone 2 - Mesic Native Grassland Restoration Seed and Plug Mix (at OHWM and above). Planting Zone 2 will start from below the toe-of-slope to just above the OHWM at the lower portion of the creek bank (Appendix B, Table 3).

Planting Zone 3 - Pole Cuttings (at OHWN and above) - Planting Zone 3 will be planted with those woody riparian plants most tolerant of seasonal inundation. Cottonwood will be planted up-slope of the willows. These woody riparian plants will be planted where invasive weeds have been eradicated. Harvesting and planting pole cuttings will be employed by using the methods described above under Biotechnical Erosion Control. The plant species recommended for this zone are listed in Appendix B, Table 4.

Planting Zone 4 - Upland Native Grassland Seed Mix and Plugs - These upland areas will be seeded and planted with plugs or turf that will stabilize slopes and loose soil. The mix will include native grasses and forbs that bloom in the spring to late summer (Appendix B, Table 5).

Planting Zone 5 - (OHWM to Above Planting Zone 3) - Container Vines and Shrubs- Other locations for planting will be selected by the restoration ecologist in the field using the restoration concepts described above. Plants within Zone 5 will include California blackberry (*Rubus ursinus*) at the OHWM and coffeeberry at the upper areas of the slopes. The recommended plant list for this zone is shown in Appendix B, Table 5. The shrubs and vines will be grown in and planted from container-grown plant stock; sizes will range from deep pots (2 inch x 9 inch black plastic tubes), and 1-gallon containers to citrus pots (4 gallons). Shrubs and vines will be planted in groups of three to nine where required. Shrubs and vines will be planted according to the methods described in the next section. Portions of Planting Zone 5 may also be seeded with an upland native grassland seed mix and planted with plugs or turf (Appendix B, Table 5).

Native container plants for Reaches 1 and 3 will be grown by a reputable nursery and propagated from local sources to maintain the genetic integrity of the native vegetation and to ensure use of stock that is adapted to site conditions. The following is a description of container planting methods:

- Planting holes will be 1½ times wider than the plant's rootball. The side of the holes will be scarified, watered-in and allowed to drain before the plants are placed in the holes. Slow-release fertilizer tablets will be added to each planting hole 6 inches below the soil surface. The holes will be backfilled with suitable soil from the site, ensuring that the plants' feeder roots are below the soil surface; the plants will then be watered-in.
- In cases of excessive soil cracking due to shrink/swell soil conditions, 30 percent nitrolized organic mulch will be added to the backfill.
- The sides of the holes will be scarified, backfilled with native soil and watered-in.
- Watering basins with a 3-foot diameter and 3-inch tall berm will be constructed around each planted shrub and vine to assist with moisture retention.
- Weed cloth will be installed at the base of each shrub and vine. The weed cloth will consist of a 6 x 6 foot weed cloth around shrubs and vines, and 4 x 4 foot weed cloth around pole cuttings which will also serve to control weeds.
- Browse protection devices such as Tubex (or equivalent) and 4 inch welded wire will be installed around shrub and vine plantings as determined the restoration ecologist.
- Native planting in Reaches 1 and 3 will take place in the late fall after soil and air temperatures have cooled, and winter rains have begun.

Planting Zone 6 - Upper Riparian/Oak Woodland. Planting Zone 6 is at the top-of-bank and beyond in Reaches 1 and 3. Planting Zone 6 does not normally receive seasonal inundation but could be inundated during unusually high flow storm events. Trees and large shrubs that may be planted within this zone include blue oak (*Quercus douglasii*), western sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). The list of plants that will be used in this zone is shown in Appendix B, Table 7. This area will also be seeded with an upland native grassland seed mix and planted with native upland grass plugs. As discussed above, specific planting areas will be flagged in the field by a restoration ecologist, focusing on areas where Himalaya blackberry and other invasive non-native plants have been removed.

The trees will be grown in and planted from container-grown plant stock as described above for Zone 5. Sizes will range from deep pots (2-inch x 9-inch black plastic tubes) and 1-gallon containers to citrus pots (4 gallons). The trees will be planted as individuals or in groups of five to nine where required in locations selected and staked in the field by the restoration ecologist or landscape architect.

IRRIGATION

The irrigation recommendations in this section only apply to the Western and Eastern Habitat Restoration Areas in Reaches 1 and 3. Irrigation treatments in the Core Retreat Area, Reach 2 for historic and recreational goals are recommended in the Application. Biotechnical bank stabilization treatment areas in Reach 1 will be irrigated with micro-sprayers beginning in the early summer during

the establishment period. Container plants in Zones 3, 5, and 6 will be irrigated prior to and directly after installation. Other restoration habitats will not be irrigated because they will receive sufficient water from direct precipitation, watershed runoff, and annual flood events.

Container planting and pole cuttings will be equipped with a temporary drip or bubbler irrigation system. To ensure thorough and even irrigation, two one-gallon per hour drip emitters will be installed on the upslope areas behind each plant. Irrigation will be applied during dry winters to supplement any deficiency in rainfall that may occur. Irrigation will also be applied during the summers, as needed to ensure successful establishment of the plants. The need for supplemental irrigation during subsequent years after the conclusion of the monitoring period will be determined by the landscape architect and the project restoration ecologist.

The amount and frequency of irrigation will be determined by conducting a test application in the late spring prior to each dry season. The test irrigation will entail monitoring the percolation rate and level of saturation of the soil. After the soil has reached its saturation point, the soil around the root zone will be augered to determine if the water has percolated below the root zone. If not, the process will be repeated until the desired results are achieved. The time required to achieve the goal will determine the duration of each application.

Riparian restoration work is expected to occur according to the following schedule:

| Construction Item | Seasonal Schedule |
|--|---|
| Invasive Weed Eradication | April-September |
| Site Preparation, Grading, Soil Emplacement | Summer |
| Biotechnical Microspray Irrigation Installation | Fall |
| Native Grassland Seeding | Fall |
| Biotechnical Willow Mattress Installation | Fall |
| Irrigation Installation for Container Plants and Poles | Fall to early winter, prior to planting |
| Container Plant and Pole Cutting Installation | Late fall, early winter |

MAINTENANCE

Aetna Springs will maintain the riparian areas in Reaches 1 and 3 during the monitoring period, until the performance criteria described in this document are satisfied. The habitat restoration areas will be maintained for a minimum of five years following planting to ensure the success of the program. A qualified restoration ecologist and erosion control specialist will be retained by the applicant to provide maintenance services to the extent necessary to ensure that performance standards are achieved.

Care will be taken during maintenance activities to minimize disturbance within and adjacent to the designated riparian areas. The specific maintenance activities to be implemented throughout the life of the maintenance period are described below.

Non-Native Plant Control

Invasive, non-native, weedy species competing with the newly planted trees, shrubs, vines, and marsh vegetation will be removed. Weed control will occur at least once per year for the duration of the five-year maintenance period. Methods for removal and control will employ hand-clearing techniques and/or spot application of EPA labeled herbicides suitable for aquatic settings that will avoid harm to or loss of adjacent native vegetation and wildlife. If herbicides are used, all safety measures recommended by the manufacturer will be followed and they will be applied by licensed pesticide applicators.

Plant Replacement

If annual monitoring results during years 1-4 indicate that the biotechnical and riparian restoration areas are unlikely to meet objectives and performance criteria, then an assessment (to be documented in the annual monitoring report) will be conducted as to the cause. If the cause is deemed to be, at least in part, low plant survival or poor germination, plants will be replaced with plugs or seed collected from other marshes on-site or purchased from commercial nursery sources, as needed.

Trash Removal

Trash and other undesirable debris will be removed from the riparian areas as needed, but at least twice per year throughout the five-year maintenance period.

Watering

Watering of all planted trees, shrubs, vines, and pole cuttings will occur according to the results of the test irrigation during the dry season (April - October) for as long as required in order to maintain and establish the vegetation. Irrigation may go beyond the five-year monitoring period.

Inspection of Irrigation System

The irrigation system will be inspected to ensure proper functioning during the test irrigation at the beginning of each irrigation year. The system will be spot checked during monitoring and maintenance visits throughout the irrigation year. Any broken or malfunctioning parts of the irrigation system serving a mitigation area will be repaired/replaced immediately upon detection.

Erosion Control

Any significant erosion identified in the creek area will be corrected immediately upon detection. The restoration ecologist/erosion control specialist will determine the appropriate remedial action necessary to correct the erosion problem. The creek areas will be maintained in a stable condition until the performance standards have been met.

Maintenance Schedule

Maintenance activities will take place monthly from April through October then twice between November and March and/or as otherwise specified above. Frequency of maintenance visits will be adjusted as necessary. Maintenance will be performed for a duration of 5 years unless the site is established and is self-sustaining prior to 5 years, at which point restoration maintenance can be discontinued.

MONITORING

Performance Criteria

To determine the success of habitat restoration in Reaches 1 and 3 to attain the objectives described above, the following criteria shall be attained within five years:

- At least 25 percent native cover of emergent marsh vegetation in the areas planted with sedges and rushes
- At least 80 percent tree and shrub survival after five years in woody riparian planting areas
- Evidence of stabilization in areas with biotechnical treatments (vegetation established, little or no undercutting)
- Observations of minimal turbidity (as a visual indicator of sedimentation) within creek waters except during storm events transporting sediment from upstream of the project site

Monitoring Procedure

A restoration ecologist/erosion control specialist will monitor the restoration areas once each year in the spring and will provide reports summarizing the results to the applicant and County. The annual reports will specifically assess the following parameters:

- Numbers of planted trees, shrubs, and vines in each zone in each planting area
- Percent canopy cover by species in planting areas
- General size and condition of trees, shrubs, and vines
- General composition, condition, and extent of herbaceous cover in planting areas
- Stability of treated creek banks documented with photography
- Overall progress toward a stable, natural plant community; and towards meeting performance standards
- Invasive non-native weed growth

The annual report will describe actions taken during the preceding year, and will include recommendations for actions to be taken in the upcoming planting season. These recommendations may include installing or adjusting irrigation, adjustments to the seed mix, adjustments to the erosion control treatment, and weed control.

Monitoring will begin within 30 days after plant installation is completed for any given phase and will continue for a duration of 5 years in accordance with the monitoring procedures contained in this plan.

LITERATURE CITED

Northwest Biosurvey (2011). Assessment of Biological Resources for the Aetna Springs Resort Property. Prepared for Criswell Radovan LLC, St. Helena, CA. 43 pp.

REPORT PREPARERS

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LSA Associates

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APPENDIX A

FIGURES

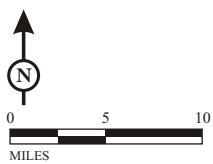
Figure 1: Regional Location

Figure 2: Project Location



LSA

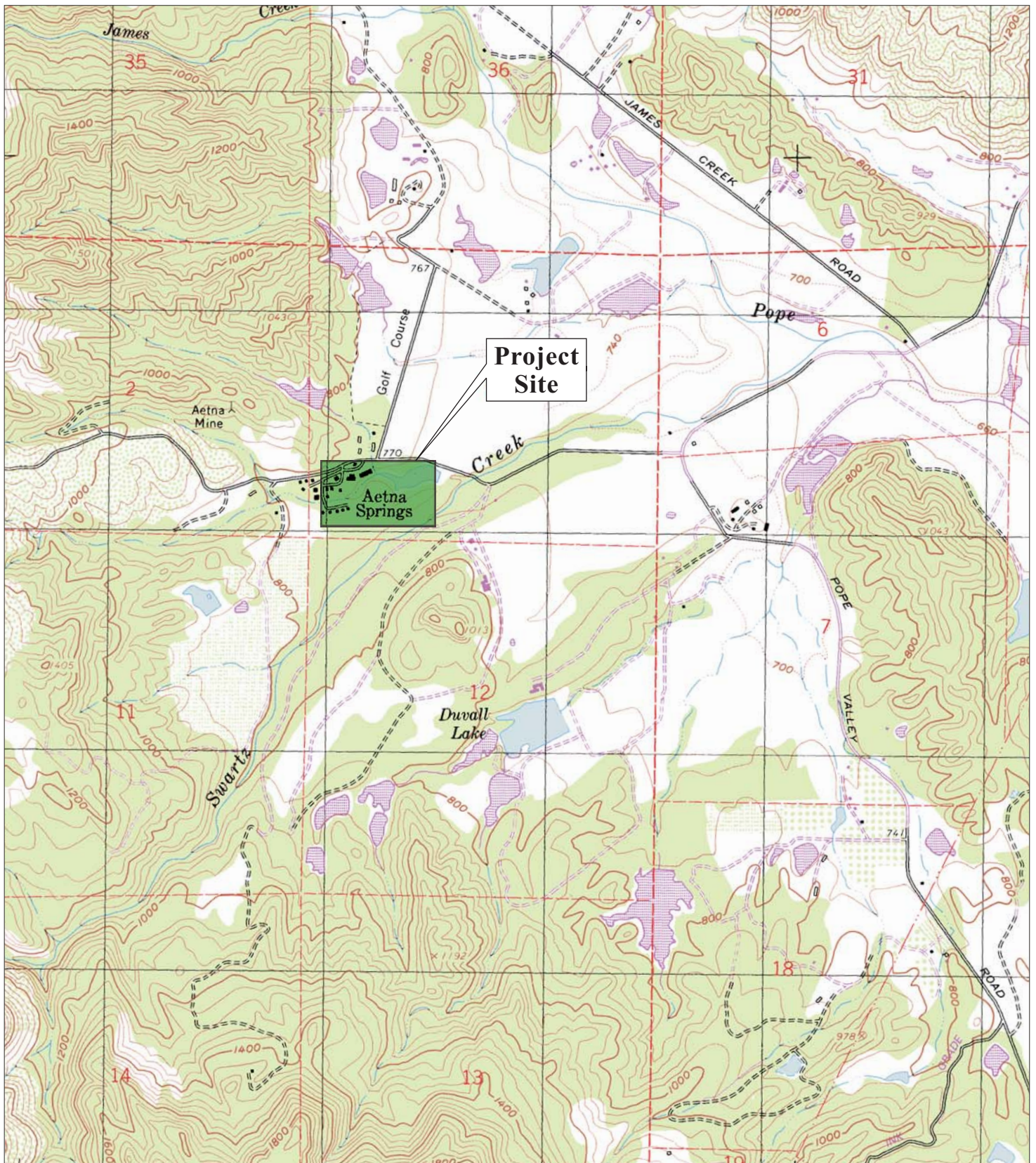
FIGURE 1



SOURCE: ©2006 DeLORME. STREET ATLAS USA®2006.

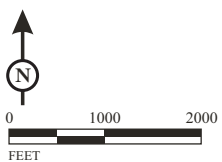
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*Aetna Springs Creek
Riparian Restoration Plan
Regional Location*



LSA

FIGURE 2



SOURCE: USGS 7.5' QUAD - AETNA SPRINGS, CALIF.

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*Aetna Springs Creek
Riparian Restoration Plan
Project Location*

APPENDIX B

TABLES

- Table 1: Erosion Control Seed Mix
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- Table 3: Mesic Native Grassland Restoration Seed and Plug Mix
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- Table 6: High Water Mark and Above Container Vines and Shrubs
- Table 7: Upland Trees

Table 1: Erosion Control Seed Mix (at all unstabilized sites)

| Common Name | Scientific Name |
|-----------------------|-------------------------------|
| California Goldfields | <i>Lasthenia californica</i> |
| Cucamonga brome | <i>Bromus carinatus</i> |
| Meadow Barley | <i>Hordeum brachyantherum</i> |
| Purple needlegrass | <i>Nassella pulchra</i> |
| Small-flowered fescue | <i>Vulpia microstachys</i> |
| Sky lupine | <i>Lupinus nanus</i> |
| Tomcat clover | <i>Trifolium willdenovii</i> |

Table 2: Emergent Marsh Plugs (below high water), Zone 1

| Common Name | Scientific Name |
|-----------------------|---|
| Slenderbeak sedge | <i>Carex athrostchya</i> |
| Clustered field sedge | <i>Carex praegrilis</i> |
| Creeping spikerush | <i>Eleocharis macrostachya</i> |
| Seep monkeyflower | <i>Mimulus guttatus</i> |
| Pacific bog rush | <i>Juncus effuses</i> var. <i>pacificus</i> |
| Pointed rush | <i>Juncus oxymeris</i> |
| Spreading rush | <i>Juncus patens</i> |

Table 3: Mesic Native Grassland Restoration Seed and Plug Mix (at high water mark and above), Zone 2

| Common Name | Scientific Name |
|-------------------------------|-------------------------------|
| Creeping wildrye (plugs only) | <i>Leymus triticoides</i> |
| Meadow Barley | <i>Hordeum brachyantherum</i> |
| Tufted Hair Grass | <i>Deschampsia caespitosa</i> |

Table 4: Cuttings (at high water mark and above) Zone 3

| Common Name | Scientific Name |
|-------------|--------------------------|
| Cottonwood | <i>Populus fremontii</i> |
| Red willow | <i>Salix laevigata</i> |

Table 5: Upland Native Grassland Seed Mix and Plugs, Zone 4

| Common Name | Scientific Name |
|---------------------|--|
| Balloon sack clover | <i>Trifolium depauperatum</i> |
| Blue-eyed grass | <i>Sisyrinchium bellum</i> |
| Blue wildrye | <i>Elymus glaucus</i> |
| California brome | <i>Bromus californicus</i> |
| California milkweed | <i>Asclepias californica</i> |
| California fescue | <i>Festuca californica</i> |
| One-sided bluegrass | <i>Poa secunda</i> ssp. <i>secunda</i> |
| Purple needlegrass | <i>Nasella pulchra</i> |
| Red fescue | <i>Festuca rubra</i> |
| Sky lupine | <i>Lupinus nanus</i> |
| Tomcat clover | <i>Trifolium willdenovii</i> |

Table 6: High Water Mark and Above-Container Vines and Shrubs, Zone 5

| Common Name | Scientific Name |
|-----------------------------|--------------------------------|
| California blackberry -vine | <i>Rubus ursinus</i> |
| Coffee berry -shrub | <i>Rhamnus californica</i> |
| Spice bush- shrub | <i>Calycantha occidentalis</i> |
| Wood rose -shrub | <i>Rosa gymnocarpa</i> |

Table 7: Upland Trees, Zone 6

| Common Name | Scientific Name |
|-------------|--------------------------|
| Blue Oak | <i>Quercus douglasii</i> |
| Sycamore | <i>Platanus racemosa</i> |
| Valley Oak | <i>Quercus lobata</i> |

[illegible]Aetna Springs Creek
Riparian Restoration Plan

Tree Inventory Plan

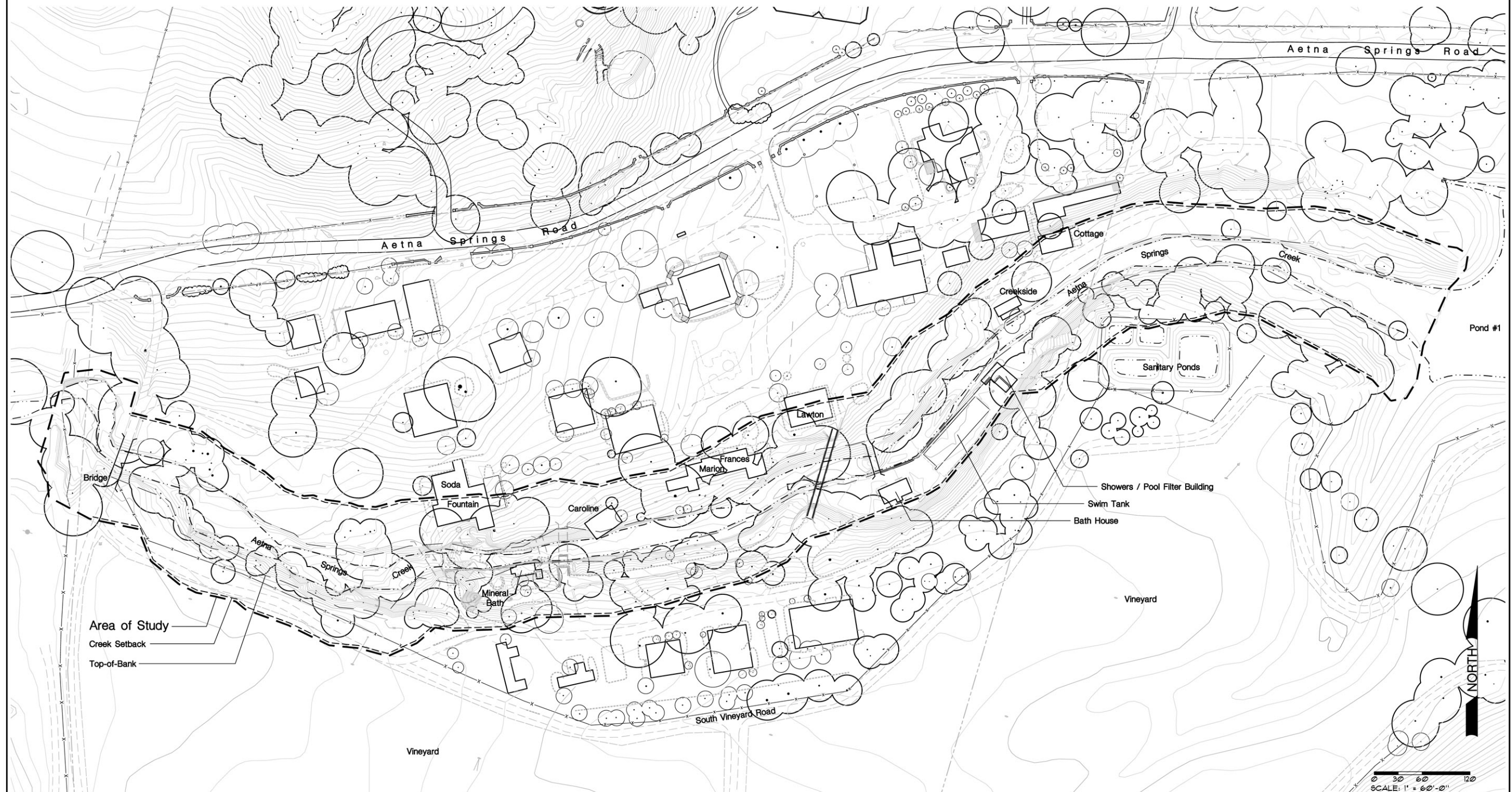
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4

Diagram illustrating the relationship between Oaks and Non-oaks. Two circles are shown, one labeled "Oaks" and one labeled "Non-oaks". Each circle has a central dot.

| Botanical name | Common name |
|------------------------------|----------------------|
| <i>Acer macrophyllum</i> | Big Leaf Maple |
| <i>Pseudotsuga menziesii</i> | Douglas Fir |
| <i>Quercus douglasii</i> | Blue Oak |
| <i>Quercus kelloggii</i> | California Black Oak |
| <i>Quercus lobata</i> | Valley Oak |
| <i>Robinia pseudoacacia</i> | Black Locust |
| <i>Salix</i> sp. | Willow |
| <i>Ulmus pumila</i> | Siberian Elm |

1. Trees documented by 2000 survey by Albion Surveys
2. Arborist: Britton Tree Service
3. For more information refer to *Assessment of Biological Resources* prepared by Northwest Biosurvey




| Trees | |
|-------|---|
| W | <i>Salix laevigata</i> (Willow) |
| BAY | <i>Umbellularia californica</i> (California Bay) |
| A | <i>Acacia</i> (Acacia) |
| DF | <i>Pseudotsuga menziesii</i> var. <i>menziesii</i> (Douglas Fir) |
| Q | <i>Quercus</i> sp. (Oak - Valley, Blue, Black) |
| L | <i>Robinia</i> / Fruit (Locust) trees |
| FP | <i>Populus fremontii</i> (Western Cottonwood) |


| Shrubs | |
|--------|---|
| T | <i>Tamarix</i> sp. (Tamarisk) |
| E | <i>Sambucus caerulea</i> (Blue Elderberry) |
| SB | <i>Calycanthus occidentalis</i> (Spice Bush) |
| W | <i>Salix laevigata</i> (Red Willow) |

Groundcovers

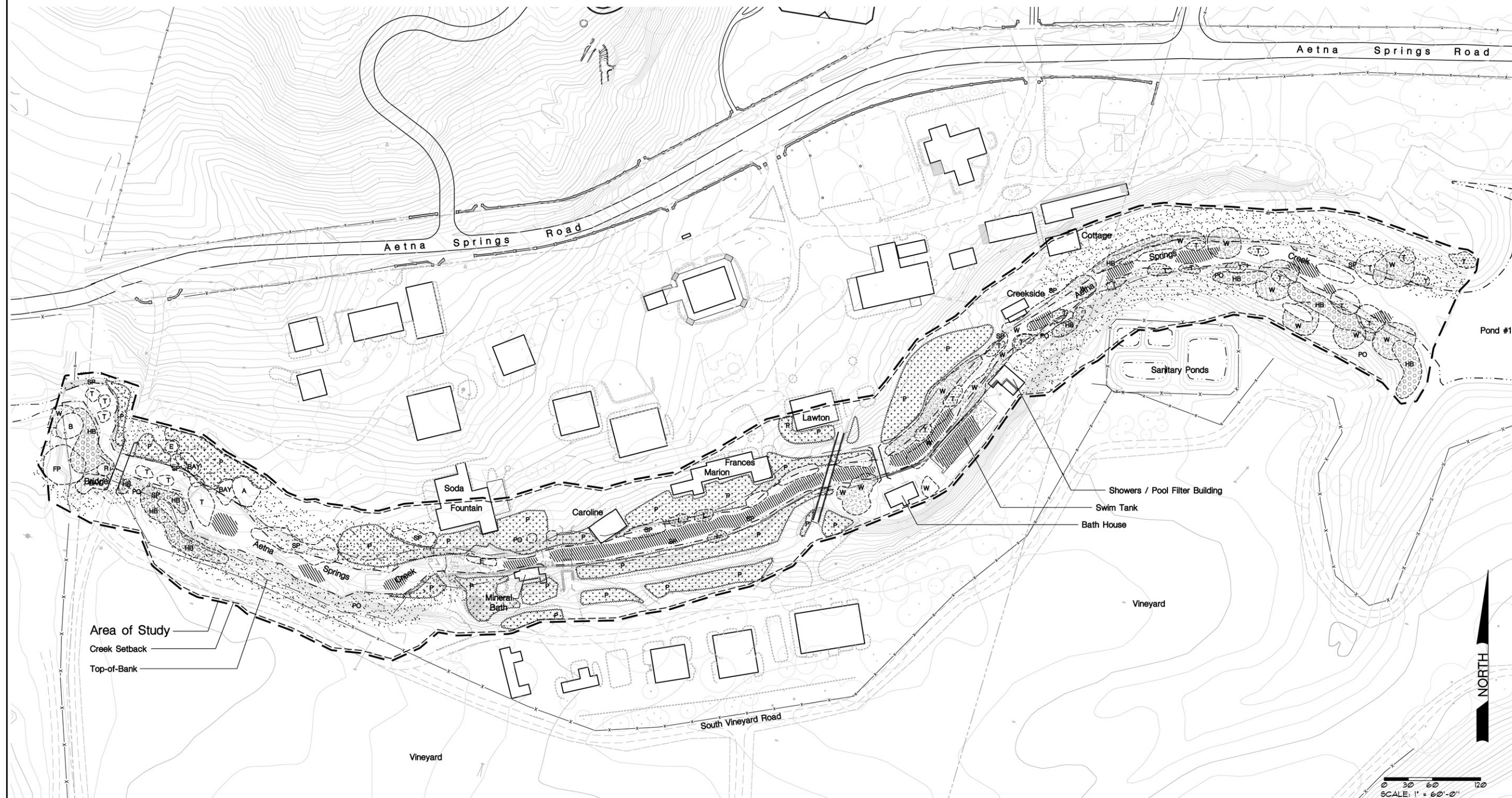
| | |
|----|---|
| HB | <i>Rubus discolor</i> (Himalayan Blackberry) |
| SP | <i>Lathyrus</i> (Sweet Pea) |
| P | <i>Vinca major</i> (Periwinkle) |
| PO | <i>Toxicodendron diversilobum</i> (Poison Oak) |

Grasses/Sedges/Rushes

 Fresh water marsh

 Native and non-native grasslands

Note: Understory vegetation documented from field observations by LSA and Smith+Smith.



| Erosion Control Seed Mix (at all disturbed sites) | |
|---|-------------------------------|
| Common Name | Scientific Name |
| California Goldfields | <i>Lasthenia californica</i> |
| Cucamonga brome | <i>Bromus carinatus</i> |
| Meadow Barley | <i>Hordeum brachyantherum</i> |
| Small-flowered fescue | <i>Vulpia microstachys</i> |
| Sky lupine | <i>Lupinus nanus</i> |
| Tomcat clover | <i>Trifolium wildenovi</i> |

| Z1 - Emergent Marsh Plugs (below high water) | |
|--|---|
| Common Name | Scientific Name |
| Slenderbeak sedge | <i>Carex athrosethys</i> |
| Clustered field sedge | <i>Carex praegrillis</i> |
| Creeping spikerush | <i>Eleocharis macrostachya</i> |
| Self monkeyflower | <i>Mimulus guttatus</i> |
| Pacific bog rush | <i>Juncus effusus</i> var. <i>pacificus</i> |
| Pointed rush | <i>Juncus oxymeris</i> |
| Spreading rush | <i>Juncus patens</i> |

| Common Name | Scientific Name |
|-------------------|-------------------------------|
| Creeping Wildrye | <i>Leymus triticoides</i> |
| Meadow Barley | <i>Hordeum brachyantherum</i> |
| Tufted Hair Grass | <i>Deschampsia caespitosa</i> |

| Z3 - Cuttings (at high water mark and above) | |
|--|--------------------------|
| Common Name | Scientific Name |
| Cottonwood | <i>Populus fremontii</i> |
| Red willow | <i>Salix laevigata</i> |

Z4 - Upland Native Grassland Seed Mix and Plugs

| Common Name | Scientific Name |
|---------------------|--------------------------|
| Balloon snap clover | Trifolium depauperatum |
| Blue-eyed grass | Sisyrinchium bellum |
| Blue wildrye | Elymus glaucus |
| California brome | Bromus californicus |
| California milkweed | Asclepias californica |
| California fescue | Festuca californica |
| One-sided bluegrass | Poa secunda ssp. secunda |
| Purple needlegrass | Nasella pulchra |
| Red fescue | Festuca rubra |
| Sky lupine | Lupinus nanus |
| Tomcat clover | Trifolium wildenowii |

Z5 - Container Vines and Shrubs (at high water mark and above)

| Common Name | Scientific Name |
|-----------------------|--------------------------------|
| California blackberry | <i>Rubus ursinus</i> |
| Coffee berry | <i>Rhamnus californica</i> |
| Spice bush | <i>Calycantha occidentalis</i> |
| Wood rose | <i>Rosa gymnocarpa</i> |

| | |
|---|--------------------------|
| Z6 - Upland Trees (at top of bank and above in reaches 1 and 3) | |
| Common Name | Scientific Name |
| Blue Oak | <i>Quercus douglasii</i> |
| Sycamore | <i>Platanus racemosa</i> |
| Valley Oak | <i>Quercus lobata</i> |

 Eradication zone

— — — Study area limits
 - - - - - Creek setback as approved by Napa County
 and provided by Summit Engineering
 — — — Top of bank as approved by Napa County
 and provided by Summit Engineering
 - - - - - Preliminary Waters of the United States

