

5 March 2013

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**SUBJECT: Revised Biological Assessment
Section 404 Nationwide Permit Authorization
Oakland Zoo California Exhibit Expansion Project
Knowland Park, Oakland, California**

Dear Ms. Costa:

This letter serves as our request that you initiate formal consultation with the U.S. Fish and Wildlife Service (USFWS) regarding incidental take authorization for the federally-threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*) and California red-legged frog (*Rana draytonii*) as part of the Section 404 Nationwide Permit Authorization for the California Exhibit Expansion Project.

Attached please find the Revised Biological Assessment by Swaim Biological, Inc., which responds to all of the information requests by the USFWS in their letter to you of May 1, 2012. Major revisions to the original Biological Assessment (dated December 20, 2011) contained in Attachment D of the Joint Aquatic Resource Permit Application (JARPA) consist of the following:

- Refinements to the Project Description detailing information on temporary construction access, limits of grading, required fire fuel management, and refinements to various components of the Project.
- Recalculation of potential impacts on existing habitat based on detailed Project plans.
- Consolidation of the proposed Conservation Measures and other construction restrictions to minimize the potential for inadvertent take of federally listed species.
- Incorporation of the on-site compensatory mitigation program that serves to fully address direct, indirect and cumulative impacts on federally listed species.
- Updated determination that the project is not likely to adversely affect Alameda whipsnake and/or California red-legged frog.

The Project refinements and framework for fire fuels management were contained in memos prepared by the Project architect, Noll & Tam (dated November 7, 2012). These memos are contained in Appendix A of the Revised Biological Assessment. The information contained in the memos formed the basis for the Project review during the site visit on November 15, 2012 attended by you, Kim Squires of the USFWS, and Marcia Grefsrud of the California Department of Fish and Wildlife. Some refinements to the Project plans have been made since the November 7, 2012 memos to further reduce potential impacts on sensitive resources.

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These include eliminating the paved access road to the Wolf Holding Building in the northeastern portion of the main exhibit area which would have passed through scrub habitat, reducing the number of tent cabins in the Overnight Experience from 14 to 11, reducing the size and shifting the footprint of the Interpretive Overlook further from a nearby ephemeral drainage, and making minor adjustments to the alignment of fencing to further avoid sensitive features. These refinements to Project plans were considered as part of the GIS analysis and impact calculations performed by Swaim Biological, Inc, and have been shown in the various figures showing Project plans (see Figures 3, 4, 10, 11, 12, and 13) contained in the Revised Biological Assessment.

We have mailed a copy of the revised Biological Assessment directly to Ryan Olah at the USFWS to help facilitate distribution of the requested information. Our consulting team is available to meet with you and USFWS staff to review the contents of the Revised Biological Assessment, address any remaining questions, and assist in securing the resource agency authorizations as expeditiously as possible. Our goal is to receive authorization from the Corps later this spring and move forward with construction this coming summer as outlined in the updated schedule in Section 2 of the Revised Biological Assessment.

Please let me know if you have any questions, need any other additional information, or would like to set up a time for another site visit and to review the attached materials.

Sincerely,



Nik Dehejia
Director, Strategic Initiatives
Oakland Zoo

cc: Ryan Olah, U.S. Fish and Wildlife Service
Marcia Grefsrud, California Department of Fish and Wildlife
Brian Wines, Regional Water Quality Control Board
Darin Ranelletti, City of Oakland
Karen Swaim, Swaim Biological, Inc.
Jim Martin, Environmental Collaborative
Dr. Joel Parrott, Oakland Zoo

ATTACHMENT:

1. Revised Biological Assessment by Swaim Biological, Inc.

Oakland Zoo California Project
Revised Biological Assessment

Prepared for:
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March 4, 2013

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Appendixes

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Appendix B. Habitat Enhancement Plan for Knowland Park, Oakland, California, approved by Oakland City Council June 21, 2012

Appendix C. Special Status Species with Potential to Occur in the Project Vicinity, U.S. Fish and Wildlife Service, Document Number: 110824014537, Database Last Updated: April 29, 2010

Appendix D. Status of the Alameda Whipsnake (Masticophis lateralis euryxanthus) in Knowland Park for the Proposed Expansion of the Oakland Zoo, City of Oakland, Alameda County, California

1.0 Introduction

The Oakland Zoo is proposing to construct an expansion of the Oakland Zoo and the expansion will require replacement of a partially failing storm water outfall into Arroyo Viejo Creek which will impact a regulated water of the U.S., requiring authorization from the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act. The purpose of this Biological Assessment is to review the proposed expansion of the Oakland Zoo in Knowland Park for the California Exhibit and related improvements (Project) in sufficient detail to determine to what extent the proposed action may affect any of the federally or state threatened, endangered, candidate, proposed candidate, or species of special concern.

A Draft Biological Assessment (Swaim 2011a) was included in the Joint Aquatic Resources Permit Application (JARPA) that was submitted by the Oakland Zoo to the Corps, California Department of Fish and Game, Regional Water Quality Control Board, U.S. Fish and Wildlife Service, and NOAA Fisheries on February 1, 2012. On March 9, 2012 the Corps requested informal consultation with the U.S. Fish and Wildlife Service (USFWS) for the effects of the Project on Alameda striped racer (*Alameda whipsnake*) and California red-legged frog (Corps 2012). On May 1, 2012 the USFWS responded to the Corps with an Information Request letter (USFWS 2012) which identified the additional information requested regarding details of the proposed project, requests revisions to the Draft Biological Assessment, and questions the proposed mitigation and monitoring provisions of the project. This Revised Biological Assessment (Revised BA) provides that additional information and clarification requested by the USFWS.

As described further in Section 3 below, of the many species with potential to occur in the general region, only Alameda striped racer (*Masticophis lateralis euryxanthus*) and the California red-legged frog (*Rana draytonii*) have the potential to occur in the Study Area. The following information is provided to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed to listed and/or proposed species by proposed federal actions. This Revised BA is prepared in accordance with legal requirements set forth under regulations implementing Section 7 of the Endangered Species Act (50 CFR 402; 16 U.S.C. 1536(c)) and Fish and Game Code Section 2081.

Species and habitats considered for this analysis are based on the results of a query of the USFWS species list (Appendix A) for the Oakland East 7.5-minute quadrangle and eight surrounding quadrangles, a search of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database of the Oakland East and eight surrounding quadrangles, and numerous biological surveys and reports for the Project Area.

Five plant species listed under the federal ESA were identified by the USFWS list (USFWS 2005) or by a CNDDDB records search as potentially occurring in the USGS 7.5-minute Oakland East and eight surrounding quadrangles. Most special-status plants occurring in the region are associated with native grasslands, a habitat type that does occur in the project assessment areas.

Two grassland species were associated with either serpentine soils or vernal pools, habitats that do not occur in the project assessment area and were not considered to have potential to occur onsite. Botanical surveys were initially conducted from May 30 through September 2, 1995 and March 8 through April 21, 1996 and did not identify any of the listed species and historical records were also not found and thereby not considered to have potential to occur onsite. Supplemental surveys were conducted from May through June 29, 2009, and from February 25 through May 6, 2010, and again did not find any State or federally listed species onsite. Other species were considered but dismissed due to lack of suitable habitat onsite.

As described in detail in Section 5 below, impacts on the potential habitat for the Alameda striped racer (ASR) include permanent loss or significant loss of habitat value of 9.46 acres of potential habitat, permanent potential low reduction of quality of 6.60 acres of habitat, and the temporary impacts to 4.77 acres of potential habitat. To mitigate, the project will permanently preserve and manage 46.35 acres of ASR habitat. This will be accomplished through establishment of a conservation easement/deed restriction over 46.35 acres in Knowland Park in the immediate vicinity of the California Exhibit. As described in detail in Section 7 below, mitigation ratios proposed would achieve a 3:1 ratio for permanent losses resulting from the California Exhibit, a 2:1 ratio for habitats where there is a potential for reduction in habitat value within animal enclosures remaining as native vegetation, and 1:1 for temporary losses during construction. The habitat in the area being preserved within the conservation easement/deed restriction is of far higher quality and value to the ASR than the habitat that is being affected by the project and includes 4.96 acres of chamise chaparral. No potential take of habitat for California red-legged frog (CRLF) is anticipated.

2.0 General Description of Project

2.1 Project Area

The Oakland Zoo in Knowland Park is located in south Oakland, immediately east of Interstate 580 near the base of the Oakland Hills (**Figure 1**). It is within Township T2S and Range R3W of the Oakland East U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map (USGS 1969). It is located at the western extent of the East Bay Hills Subsection of the Central California Coast Section as described in the *Ecological Subregions of California* (USDA 1997). The East Bay Hills are northwest trending and are characterized by rounded ridges, steep sides and narrow canyons. This area has a hot, subhumid climate with a moderate marine influence. Mean annual temperature is approximately 54 to 60 F, and precipitation is typically 15 to 25 inches. Natural plant communities include grasslands, shrublands, and woodlands.

Site topography is hilly, with elevations ranging from about 350 feet to about 650 feet. Knowland Park contains a total of approximately 490 acres, of which approximately 93 acres comprise the existing arboretum, zoo, and related support facilities, and an additional 57 acres comprise the remainder of Lower Knowland Park. The California Exhibit would be developed in an approximately 56-acre portion of Knowland Park (Project Area), immediately upslope of the existing zoo, in an area that is characterized by grassland, chaparral and oak woodland. Upper

Knowland Park, excluding the California Exhibit, contains approximately 278 acres of open space, vegetation, public trails, and fire roads. A stormwater outfall will be installed along Arroyo Viejo Creek which is located north of and downslope from the existing Zoo and expansion area.

2.2 Project Summary

In 1998 the Oakland City Council approved a Master Plan for the Oakland Zoo. The approved Master Plan included plans by the East Bay Zoological Society for locating the California 1820 exhibit to the east of the existing zoo in an undeveloped portion of Knowland Park. The central theme of the exhibit is to focus on regional extinction, featuring native California species present before the Gold Rush, and indigenous species in their natural setting. The animal exhibits provided for in the original approved Master Plan included a River Exhibit, Grizzly Bear Exhibit, Canyon Exhibit, and Woodland Exhibit. Other features included an off-site breeding activity, a California Interpretive Center, a loop road and shuttle bus system, and paving of the existing service road.

In 2009 the Oakland Zoo applied for approval of an amendment to the approved Master Plan that would refine and make certain changes to the site plan for the approved California 1820 exhibit, now identified as the California Exhibit, and provide for a new relocated Veterinary Hospital. A Subsequent Mitigated Negative Declaration/ Addendum (SMND/A), was prepared pursuant to CEQA Guidelines Section 15164. The SMND/A updated information contained in the 1998 Mitigated Negative Declaration (MND) in light of the proposed Master Plan amendment, changed circumstances, and new information.

On June 21, 2011, the Oakland City Council approved the amendment to the Oakland Zoo's Master Plan, focusing on the California 1820 exhibit area. **Figure 2** shows the City and CEQA approved site plan for the California Exhibit. The approved perimeter fence line has been modified to reduce impacts on biological resources, improve public access to one of the knolls, and avoid encroachment into the area zoned Open Space (Resource Conservation Area).¹ Other modifications to the California 1820 exhibit incorporated into the California Exhibit include the following changes to the site plan:

- (1) Replacement of the previously approved loop road and shuttle bus system to transport zoo visitors from the existing zoo to the California Exhibit with an electric aerial gondola people-moving system;
- (2) Reconfiguration of the previously approved animal exhibits within the California Exhibit;

¹ Knowland Park has two distinct land use designations under the City's zoning regulations and General Plan. The area containing the existing zoo and the expansion area is designated Urban Open Space/Open Space Special Use and these designations allow the zoo use. The rest of Knowland Park is designated Resource Conservation where uses are generally limited to conserving and managing undeveloped areas.

- (3) Relocation of the previously approved California Interpretive Center within the California Exhibit area to a site approximately 300 feet northwest of the previously approved location, and redesign of the center;
- (4) Elimination of the previously approved off-site breeding activity, with incorporation of this area into the California Exhibit;
- (5) Creation of a new overnight camping area located to the northwest of the California Exhibit area;
- (6) Establishment of the specific location of the proposed perimeter fence with modifications from the previously approved general location;
- (7) Improvement of the existing emergency vehicle access road off Snowdown Avenue;
- (8) Provision of a public walking path located to the southeast and outside of the California Exhibit to provide public access between existing fire roads and knolls outside the perimeter fence in Knowland Park; and
- (9) Removal and replacement of an existing stormwater outfall and enhancement along the affected 65-foot segment of Arroyo Viejo Creek.

Since local approval in 2011, the Zoo has prepared design development level plans to implement: 1) the approved site plan/conceptual level plans that accompanied the Amended Master Plan approval; and 2) certain City-imposed conditions and mitigation measures. The refinements in the design development level plans provide additional avoidance of sensitive habitat areas and details on building materials, grading and construction-related disturbance, fire fuels management requirements and stormwater treatment methods. Construction level plans will be developed at the time specific building permit applications are sought for the individual elements of the Project. These details respond to the information requested by the USFWS in their May 1, 2012 letter to the U.S. Army Corps of Engineers (USFWS 2012). These Project details and fire fuel management requirements are summarized in two memos from November 2012 that were prepared by the Project architect (Noll & Tam Architects 2012 and 2012a) on behalf of the Oakland Zoo (see **Appendix A**). The refined information contained in these two memos was then used to reassess potential impacts on habitat types in the Study Area and verify potential effects described in Section 5 of this Revised Biological Assessment. Some aspects of the Project plans have been refined since the November 2012 memos to further reduce potential impacts on sensitive resources. These refinements were considered as part of the GIS analysis and impact calculations and are incorporated into the various figures contained in this Revised BA. Additional details and minor adjustments that would not increase the estimated potential impacts on federally-listed species may be provided in the final building permit plans.

2.3 Project Consultation History

During preparation of the SMND/A staff from the City of Oakland were interested in obtaining feedback from the USFWS and CDFW regarding the proposed mitigation for impacts to ASR and to ensure that the City's recommended mitigation measures would be consistent with those

of the resource agencies. Site visits were conducted with representatives of the CDFW and USFWS, as well as the Corps. On November 30, 2010 a meeting and site visit was conducted with Mr. Ryan Olah of the USFWS, and on February 3, 2011 a separate meeting was conducted with Ms. Marcia Grefsrud of CDFW. The results of surveys and habitat assessment for ASR were reviewed during the meetings, together with the proposed approach for on-site mitigation, and a field reconnaissance of the area of potential affect was conducted. On May 9, 2011, the Oakland Zoo received a “no take” determination from Mr. Olah in connection with construction of the Veterinary Hospital, which is now complete.

Ms. Holly Costa of the Corps visited the site on February 8, 2012 to perform the verification of the draft wetland delineation for the Project Area (Environmental Collaborative 2012). During the site visit, Ms. Costa indicated that the Corps would be willing to take the lead on federal consultation under Section 7 of the Endangered Species Act of 1973 because the project includes replacement of an existing outfall and a small area of habitat restoration affecting jurisdictional waters along Arroyo Viejo Creek which are regulated under Section 404 of the Clean Water Act.

The Oakland Zoo submitted a Joint Aquatic Resource Permit Application (JARPA) to the Corps, CDFW, USFWS, NOAA Fisheries and Regional Water Quality Control Board (RWQCB) on February 1, 2012. A second meeting and site visit was conducted on November 15, 2012, with Ms. Costa from the Corps, Ms. Grefsrud from CDFW, and Ms. Kim Squires from the USFWS. The purpose of the meeting was to provide an update on refinements to the proposed project, introduce Ms. Squires to the site, and identify any additional information needs regarding agency authorizations. The following provides a summary of the status to date of this process with the various resource agencies.

Corps and USFWS

On March 9, 2012 the Corps requested informal consultation with the USFWS for the effects on ASR and CRLF (Corps 2012). On May 1, 2012 the USFWS responded to the Corps with an Information Request letter (USFWS 2012) which identifies the additional information requested regarding details of the proposed project, requests revisions to the Draft Biological Assessment that was contained in the JARPA, and questions the proposed mitigation and monitoring provisions of the project. The project architect, Mr. Ethan Ahlberg of Noll & Tam Architects, provided a preliminary response for the Oakland Zoo to the details of the proposed project requested by the USFWS in two memos dated November 7, 2012 (Noll & Tam Architects 2012 and 2012a) which are contained in Appendix A. These include detailed descriptions of the refined project, information on construction duration for various components of the project, and a Fire Fuel Management Plan Framework. Information from these two memos was summarized by Mr. Ahlberg during the meeting and site visit on November 15, 2012. As noted above, some aspects of the project plans have been refined since the November 2012 memos to further reduce potential impacts on sensitive resources. These refinements were considered as part of the GIS analysis and impact calculations and are incorporated into the various figures contained in this Revised BA.

CDFW

The Oakland Zoo received complete notification determination from the CDFW for the Streambed Alteration Agreement on March 15, 2012 (CDFW 2012). A draft of the 2081 Permit Application prepared by Mr. James Martin, Principal of Environmental Collaborative was submitted by email to Ms. Grefsrud on March 30, 2012 for preliminary review. Ms. Grefsrud provided comments on the draft application by email response to Mr. Martin. During the meeting and site visit on November 15, 2012, On December 7, 2012 Ms. Grefsrud returned to the Oakland Zoo the completed Streambed Alteration Agreement for final signature.

RWQCB

The Oakland Zoo received an incomplete application determination letter from the RWQCB on March 1, 2012 and has worked with the RWQCB on resolving this determination. A detailed response was mailed by the Oakland Zoo to the RWQCB on October 18, 2012 with copies sent to the Corps and CDFW. A copy of the response packet was also supplied to Ms. Squires during the meeting and site visit on November 15, 2012. The response included a detailed letter prepared by the project engineer, Mr. Robert Wong of Aliquot, responding to each question or concern raised by the RWQCB (Aliquot 2012). In addition to the detailed letter from Aliquot, to demonstrate compliance with National Pollution Discharge Elimination System (NPDES) Municipal Regional Permit (MRP) and to further address RWQCB concerns, the response packet contained: 1) a Stormwater Control Plan with associated figures and calculations; 2) an Arroyo Viejo Outfall Plan with the proposed design and associated hydrologic calculations; and 3) a Stormwater Inspection and Maintenance Plan containing full-sized figures/drawings. Mr. Brian Wines of the RWQCB expressed no further concerns over the completeness of the application following the 30 day review period.

2.4 Detailed Description of Project

The following discussion describes the main elements proposed for the California Exhibit. These include details on the aerial gondola, service road, perimeter fence, exhibit and pedestrian access improvements, and Habitat Enhancement Plan for Knowland Park. The description below of the various animal exhibits is preliminary, and may be adjusted based on animal availability at the time of construction. The Veterinary Hospital was part of the Master Plan amendment approved by the City Council in June 2011, and construction was completed in October 2012; therefore it is not addressed in detail in this Revised BA.

Revisions to the detailed Project description in the Draft Biological Assessment are limited to those refinements included in the Zoo's design development level plans which implement City-approved conceptual plans and City-imposed conditions and mitigations. The reviewer is referred to **Appendix A** for the full descriptions contained in memos prepared by the Project architect that provide additional details on construction methods and duration for each

component of the Project and other aspects of the Project. As noted above, some aspects of the Project plans have been refined since the November 2012 memos to further reduce potential impacts on sensitive resources. These refinements were considered as part of the GIS analysis and impact calculations and are incorporated into the various figures contained in this Revised BA. Additional details and minor adjustments that would not increase the estimated potential impacts on federally-listed species may be provided in the final building permit plans.

Aerial Gondola People-Moving System

An aerial gondola people-moving system would transport visitors from the already developed zoo area to the Visitor Center building in the California Exhibit. The gondola people-moving system would consist of seven support structures ranging from approximately 15 to 68 feet high; a cable system; a lower terminal located approximately 350 feet from the zoo's main entrance, next to the rides area and the African veldt exhibit; and an upper terminal located at the proposed California Visitor Center building.

The gondola would travel northeast up the south-facing slope over a total length of approximately 1,850 feet and a vertical rise of approximately 308 feet. A total of 15 eight passenger gondolas would be attached to the haul rope with detachable grips. Each of the seven support structures would have a base that would be a maximum of approximately 12 feet by 12 feet in size. The lower station and towers 1, 2, and 3 would be located within the existing zoo and will not affect any natural habitat. Towers 4, 5, 6, and 7 will require some limited temporary access, but existing fire roads will be used to gain access to tower locations to the greatest extent possible. Two temporary access ways approximately 12 feet wide would provide access to towers 4, 5, and 6, and tower 7 would be installed from the construction area of the Visitor Center building. A construction zone approximately 20 feet by 35 feet would be required around each tower footprint, and an additional area would be required at towers 4, 5, and 6 to create a temporary bed for the excavator during construction, disturbing an area approximately 15 feet by 20 feet.

California Exhibit Visitor/Interpretive Center

The California Exhibit Visitor/Interpretive Center would contain interpretive exhibits, a restaurant, a gift shop, employee work areas, classrooms and restrooms contained in two buildings at the terminus of the gondola people-moving system. These facilities would provide services and may occasionally be used in the evenings for events that currently occur at the zoo, such as zoo-related business meetings, fundraisers, lectures, the ZooLights holiday light show, and the annual members' night. The restaurant would be open only during regular zoo operating hours.

The footprints of the two buildings have been refined to avoid direct impacts to chaparral habitat and limit the area of chaparral that must be routinely maintained for fire fuel management. The Visitor Center building would be located at the end of the gondola people-mover system, and has been relocated 27 feet to the east from that approved by the City of Oakland under the Amended Master Plan to avoid chaparral habitat. Two stories of the Visitor Center building would be

below the finished grade at the southeast elevation where an open bay would be located to receive the gondola cars. The full three stories would be visible at the northwest elevation. The single-story Interpretive Center building would be located to the southeast of the Visitor Center, separated by a paved plaza area.

Both buildings would be constructed of cast-in-place concrete, steel and wood structure, and light frame wood exterior walls. The structures would have sprinkler systems, plumbing, drainage, air conditioning, power, and lighting. The Visitor Center would be a Type IA building, which means the structure is fire rated to 3 hours. The buildings would contain a total of approximately 23,888 square feet in the two separated spaces. The total footprint of the buildings would be approximately 16,100 square feet. An exterior deck constructed of concrete would cantilever 12 feet beyond the west footprint of the Visitor Center, but would not affect the extent of required fire fuel management for the structure according to the City Fire Marshall. Construction of both buildings would be accomplished from the end of the existing fire road, with exclusionary fencing and other restrictions to protect nearby chaparral habitat and mature trees to be retained.

Wolf, Jaguar, Eagle and Condor Exhibits

As visitors leave the northeast side of the Visitor Center, they would proceed along an elevated boardwalk to reach the wolf, jaguar, eagle and condor exhibits. The steel and concrete elevated boardwalk would be approximately 900 feet long and 12 to 14 feet wide, with a series of wider pull out areas for viewing, with a total area of approximately 13,500 square feet. The service road separating the Eagle, Wolf, Condor and Jaguar exhibits from the Grizzly Bear Exhibit would be about 20 feet wide, and would not be accessible to the general public. Construction-related disturbance would affect an additional 10 feet beyond both the boardwalk and the service road.

An approximately 15,000-square-foot wolf exhibit area would be located on the south side of the boardwalk, and an approximately 79,000-square-foot wolf exhibit area would be located on the north side of the boardwalk. An approximately 1,920-square-foot wolf holding pen would be located at the east end of the northern exhibit area. The pen would be surrounded by an approximately eight-foot-high chain link fence. The pen would be screened by vegetation. The enclosure fence would be approximately 9 feet 7 inches tall and constructed of steel posts set in concrete piers, steel rails, and 2 inch x 2 inch steel mesh, with the mesh extending to a minimum of three feet below grade as a dig barrier.

An approximately 11,750-square-foot jaguar exhibit area would be located on the south side of the boardwalk, and an approximately 25,660-square-foot jaguar exhibit area would be located on the north side of the boardwalk. The southern jaguar exhibit area would be covered with an approximately four-by-four-inch steel cable mesh enclosure, secured to a continuous concrete curb and footings that extend to six inches above grade. The northern exhibit area would contain an approximately 1,700-square-foot, 17-foot-high jaguar holding facility that would be screened from view from the boardwalk and accessible by service road. The structure would be constructed using concrete modular unit (CMU) block and metal mesh walls to allow natural

ventilation, with plumbing, drainage, power, and lighting. The enclosure fence would be approximately 18 feet 4 inches tall and constructed of steel posts set in concrete piers, steel rails, and 2 inch x 6 inch steel mesh, with the mesh extending to a minimum of three feet below grade as a dig barrier.

The boardwalk would be bisected by an approximately 1,467-square-foot structure that would overlook the jaguar and condor aviaries. The overlook building would be elevated on steel columns with a floor of composite steel and concrete deck on steel beams. The walls and roof would be built with light wood framed construction, and the enclosed structure would have a sprinkler system, drainage, power, and lighting, and operable screen windows and doors that allow natural ventilation.

The eagle enclosure would be approximately 4,300 square feet and the condor enclosure would be approximately 10,270 square feet, separated by a portion of the wolf enclosure. Both enclosures would be aviary structures covered with approximately four- by four-inch steel cable mesh. The bottom of the mesh would be secured to a continuous concrete curb and footing that extend to six inches above grade. Both exhibits would include approximately 400 square foot holding structures on concrete slabs, with concrete masonry lower walls, steel cage upper walls, and steel shed roofs.

Beaver/Water Fowl Aviary and Restrooms

Visitors exiting the boardwalk would cross the service road to reach the approximately 6,230-square-foot enclosed beaver and water fowl aviary. The aviary enclosure would be constructed of one-inch stainless steel coil mesh attached to a steel post frame. A path and boardwalk would meander through the inside of the aviary. An approximately 840-square-foot, 10-foot-high beaver holding facility of CMU construction would be hidden from view in the rockwork.

An approximately 760-square-foot restroom facility of CMU construction would also be located in the vicinity of the beaver and water fowl aviary. The building would sit on concrete foundations and slab on grade, with light framed wood construction for the walls and roof. Another approximately 1,600-square-foot CMU enclosure that will house support systems for the beaver and grizzly bear water features would be located just beyond and adjacent to the restrooms.

Grizzly Bear Exhibit

The grizzly bear exhibit would be located immediately west of the beaver and water fowl aviary. A glass viewing wall would provide underwater views into a pool where the bears would swim and catch fish. A sod-covered roof would shade a 1,140 square foot viewing area from which visitors would have views of the adjacent approximately 42,640-square-foot grizzly bear habitat and the larger approximately 62,110-square-foot habitat beyond. A chain-link barrier fence separating the two grizzly bear habitats would be obscured by land formations. The enclosure fence would be approximately 14 feet 5 inches tall, constructed of 4 inch tube posts, rails, and 2 inch x 6 inch steel mesh, extending to a minimum of three feet below grade as a dig barrier.

An approximately 3,575-square-foot, 12-foot-high holding facility for the bears would be screened by land formations and rockwork, located along the service road. The holding facility would be a CMU and mesh enclosure, with a green roof and open mesh exterior walls to allow natural ventilation through the building. The building would have a sprinkler system, plumbing, drainage, power, and lighting as well as mechanical ventilation and heating. Two viewing sheds would be located along the south and southwest edge of the exhibit. Both would be open air shade structures, with glass walls facing the exhibit.

Mountain Lion/Black Bear Exhibits

The mountain lion and black bear exhibits would be located immediately south of the grizzly bear exhibit. The mountain lions would be located in an approximately 7,000-square-foot aviary structure enclosed with two-by-two-inch stainless steel cable mesh, secured to a continuous concrete curb and footing that extends to six inches above grade. An approximately 19,000-square-foot night habitat for the mountain lions would be located beyond the enclosure. The enclosure fencing would be approximately 18 feet 5 inches tall, constructed of 4 inch tube posts, rails, and 2 inch x 6 inch steel mesh, with the mesh extending to a minimum of three feet below grade as a dig barrier. An approximately 1,700-square-foot, 16-foot-high holding facility would be located immediately west of these two habitats, partially buried in the hillside and supported by a large retaining wall on the north side of the structure. The holding facility would be open on two sides with mesh walls to allow natural ventilation. The structure would have plumbing, drainage, power, and lighting, with localized heating.

The black bear exhibit would be located west of the mountain lion area. The approximately 21,150-square-foot day enclosure for the bears would contain a moat, along with a heavy-duty chain-link barrier fence screened by vegetation and land forms. An approximately 32,000-square-foot secondary habitat would be located southwest of this enclosure. The enclosure fencing would be approximately 14 feet 5 inches tall, constructed of 4 inch tube posts, rails, and 2 x 6 inch steel mesh, with the mesh extending to a minimum of three feet below grade as a dig barrier. An approximately 1,760-square-foot, 14-foot-high holding facility would adjoin these two habitats, partially buried in the existing hillside and screened by additional rockwork. The holding facility would be of CMU construction, and mesh openings for natural ventilation. The structure would have plumbing, drainage, power, lighting, and heating.

Activity Zone

The Activity Zone would contain an approximately 8,160-square-foot children's play area located immediately north of the main black bear viewing area. The play area would feature a zone of hard and soft (ADA accessible) surfacing onto which a variety of prefabricated child play structures would be installed. A loop walk would surround the Activity Zone with native plantings.

The Activity Zone would also contain three additional views into the grizzly bear habitats, one with a moat separating visitors from the bears and the other containing a full-height window and shade structure with a view to a nearby shallow pool for the bears. An approximately 4,140-

square-foot shotcrete cave would be located just beyond the Activity Zone. The cave would contain view windows into a grizzly bear cave and two small exterior animal exhibits, as well as several small jewel-box exhibits in the cave walls.

Interpretive Overlook

An approximately 2,290-square-foot interpretive overlook would be located southwest of the Activity Zone. The overlook would be an open-air shade structure built on piers and accessed by a ramp. Steel beams would hold the composite steel and concrete floor deck, with steel cable guard rails surrounding the perimeter and ramp. The structure would have a sprinkler system, drainage, power, and lighting. The structure would frame views of Oakland and San Francisco Bay and contain interactive exhibits, graphic displays, and artifacts related to these views.

Bison/Tule Elk Exhibit

Immediately west of the interpretive overlook would be an expansion of the bison/tule elk exhibit following an existing fire road on the slopes leading down to the main zoo grounds. The enclosure fence would be 8 feet tall and clad in 2 inch x 2 inch chain link mesh. The fence would be constructed by hand to minimize construction-related disturbance. An exterior animal feeding station approximately 1,100 square feet in size would be located along the existing fire road. The structure would be a single-story, open air barn type building with concrete spread footings and no slab. A gabled roof would extend over an additional 1,100 square feet at the front, supported on five steel columns on concrete spread footings. The structure would have drainage, plumbing, power, and lighting.

Overnight Experience

An existing, approximately 775-foot-long fire trail would lead to an approximately 0.36-acre “Overnight Experience” (overnight camping area), located in a remote, wooded setting west of the main California Exhibit area.

The camping area would provide approximately 11 ten-by-twenty-foot tents on platforms, along with two composting toilets and picnic tables. A water line would be installed under the existing fire road to provide water. The tent platforms would be suspended on six wood posts, with the underside wrapped in 2 inch x 2 inch chain link fencing to prevent animals from nesting under the structure. A prefabricated tent would be installed on top of the platform. Overnight visitors to the camping area would arrive at the site by the gondola and a short walk on the existing fire trail.

Camping activities would be for organized youth groups and other student or family groups attended and facilitated by Oakland Zoo staff. The overnight camping area would serve groups of approximately 60 to 100 people. Most of the camping activity would occur on weekends, particularly in summer.

Perimeter Fence

A fence would extend around the perimeter of the Project Area. The perimeter fence would be constructed of black-coated cyclone fencing material with barbed wire on top and would be approximately eight feet high. The entire length of the perimeter fence would be 100% permeable for ASR and also designed to allow for passage of Knowland Park wildlife along the base of the fence approximately every 300 feet. Approximately 225 feet of the perimeter fence near the black bear exhibit would be constructed in an engineered swale that would lower the fence below eye level for park users walking along the existing fire road, permitting unobstructed views of the Oakland skyline and San Francisco Bay. The fence would connect with the existing perimeter fence that currently surrounds the zoo. (The existing fence extends along the northern zoo boundary along Arroyo Viejo near Golf Links Road and along the southern zoo boundary near the zoo's main parking lot.) The fence would be constructed in a linear fashion by hand with minimum vegetation clearing and the alignment adjusted to avoid tree trunks and other sensitive vegetation.

Landscaping and Fire Fuel Management

Preliminary plans for landscaping of the Project provide for the removal of non-native plant species and preservation and planting of native trees, shrubs, and grasses. The majority of the existing natural vegetation within the study area would be left undisturbed except where affected by grading, new roadways, and structures. Areas disturbed by grading but not occupied by roadways and structures would be revegetated with a native meadow seed mix, planted native trees, shrubs, and groundcovers, or native specimen oak trees salvaged and transplanted from elsewhere on the site. Some non-native tree and shrub species may be used in select locations for screening purposes adjacent to buildings and other structures, but these would all be non-invasive species. Areas within animal enclosures that do not contain structures and other specific features would be left undisturbed by grading to retain natural habitat with the exception of the removal of non-native invasive plants or plant species that would be harmful to the exhibited animals. The irrigation systems would be designed for maximum coverage and ease of maintenance, with the main irrigation lines branching from water mains located along the service road and under the elevated boardwalk and roughly following the perimeter of the exhibit enclosures. Risers would be attached to either fence posts or aviary columns with popup rotary sprinkler heads attached at a height that is consistent with the posts with coverage from the perimeter of the exhibit inward.

The existing vegetation within areas identified as fire fuel management zone would be modified by pruning low-lying tree limbs, trimming or removing brush and mowing/weed whipping grassland cover. Standards related to the fire fuel management zone are defined in the Fire Fuel Management Plan Framework (Noll & Tam 2012a), contained in **Appendix A**. The fuel management zone would generally extend a maximum of 30 feet from the exterior walls of structures and 10 feet from roadways and pedestrian access ways. Fire fuel management would not be required along fences, including the perimeter fence. Standard practices within the management zone would include keeping grass cover to a maximum of six inches, pruning and thinning shrubs to maintain a cover of no less than 25 percent and shrub height of at least 18

inches, and limbing up tree branches that extend below six feet. In areas of chaparral and scrub habitat, vegetation management activities would be carefully controlled to prevent excessive disturbance to sensitive habitat, including presence of a biological monitor, manual maintenance using clippers or chain saw, retention of shrub stumps, and a restriction that thinning not be performed more frequently than on an annual basis.

Access Roads and Paths

Because zoo patrons visiting the California Exhibit would travel via the proposed aerial gondola people-moving system, roads included in the Master Plan amendment are limited to a primary emergency vehicle access road, a service road/secondary emergency vehicle access road, a road extending through the California Exhibit, and a public access path. Most of these roads follow existing fire roads, and would be widened to meet the minimum requirements of the Oakland Fire Department. Maintenance of paved areas would occur on regular cycles depending on composition materials and site specific needs. These would vary from regular vacuuming, application of chip seal, and reapplication of asphalt. Below is a summary of these improvements:

Primary Emergency Vehicle Access Road. The Master Plan amendment includes provision for a primary emergency vehicle access road extending from the end of Snowdown Avenue to the California Exhibit. The road would follow the existing dirt road off Snowdown Avenue that is currently used by the Oakland Fire Department. The road would be widened to approximately 20 feet along the road's approximately 1,450-foot length. The road would be gravel.

Service Road/Secondary Emergency Vehicle Access Road. A service road would be extended from the existing upper parking lots at the zoo and the Veterinary Hospital, extending along an existing fire road to the California Exhibit. This road would also serve as a secondary emergency vehicle access road. The road would be widened to approximately 14 feet, with an approximately three-foot ditch on the hill side of the road and an approximately two-foot dirt shoulder. The road would be paved in asphalt, and expected to handle approximately 24 vehicle trips per day.

Road through California Exhibit. An approximately 20-foot-wide road would extend through the proposed Project, passing by the California Visitor/Interpretive Center and leading to the secondary emergency vehicle access road. From the junction with the existing fire road to the overnight experience, the new permanent road would veer slightly to the alignment of the existing road to allow more clearance from the chaparral habitat. The road would widen to a minimum of approximately 30 feet in front of the California Visitor/Interpretive Center, creating a plaza of concrete pavers or stained concrete separating the Visitor Center building from the Interpretive Center building. From this point, a new permanent asphalt fire lane would head east to connect with the existing fire road near the east edge of the jaguar exhibit, and the primary emergency vehicle access road off of Snowdown Avenue. Where substantially higher than existing

grade, pier foundation retaining walls with wood lagging would be installed, and the road alignment filled to final grade and surface treatment.

Other Paths within California Exhibit. A paved concrete path would continue the pedestrian loop from the elevated walkway in the California Exhibit, passing by the mountain lion and black bear exhibits and connecting with the service road near the overlook interpretive kiosk. Other paved paths would serve each holding building accessed from the fire lane or public path. A paved yard would be located adjacent to the Life Safety System (LSS) equipment area on the east side of the California Exhibit near the beaver/waterfowl and restroom area.

Public Access Path. The Master Plan amendment includes a path that would allow public access between existing fire roads to facilitate public access to two knolls located south of the California Exhibit that offer panoramic views of San Francisco Bay. The public access path would commence at the existing fire road located northeast of the California Exhibit and would generally follow the perimeter fence, terminating at the existing fire road located to the south of the proposed mountain lion exhibit, at which point trail users would follow an existing unpaved fire road. The public access path would be approximately four feet wide and approximately 1,315 feet long. The path would have a natural surface with cut slopes of approximately two to one or flatter. Tops of slopes would be rounded to present a natural look at the grading conform line. The path would be constructed by hand using non-mechanized tools or with small mechanized grading equipment in sensitive habitat areas. All regulatory protocols, including seasonal restrictions on construction activities, would be observed. The path would include signage at key intersections to indicate that it is a public pathway. The path would be for pedestrian use only and would not be designed for motorized traffic.

Grading Plans

Under the Master Plan amendment, grading would result in approximately 14,000 cubic yards of excavation, which would be reused on-site. About 1,200 cubic yards of existing undocumented fill containing construction debris such as asphalt and concrete would be excavated and pulverized. Most of this debris would be placed in the toe areas of fills within the Master Plan amendment area. Any organics would be used as soil amendments, and minor amounts of unsuitable debris would be disposed off-site. Areas would be raised by minor filling averaging three feet within exhibit areas where native grasslands and trees are not going to be retained such as portions of the grizzly bear exhibit. This would provide a balanced cut/fill project. Every attempt has been made to limit grading and design a plan with minimal disturbance, while recognizing ADA access requirements for the visiting public and providing minimal operational requirements for animals in holding areas and housing animals in night houses. Grading would result in areas of permanent disturbance within the footprint of building foundations, roadways and paved walkways, and temporary disturbance in areas that would be revegetated on cut and fill slopes outside the footprint of structures and pavement. Areas of temporary construction access would typically be located within animal exhibits or would be revegetated as part of landscaping and/or habitat restoration. Retaining walls have been used minimally to limit

grading around trees and limit slope encroachment into areas to be preserved. Cut and fill slopes along the emergency access routes have been steepened to minimize encroachment into adjacent grasslands.

Water Facilities

Water service would extend from an existing 16-inch water main in the upper parking lot above the existing Administration Building of the zoo. Water would be pumped by a pressurized pumping system to be located in a pump house just north of the Veterinary Hospital. From the pump house, an emergency water line would be routed up the slope of the hill, following the existing fire road through the bison/tule elk exhibit. Domestic water would be provided in a separate line that would connect to the existing 16-inch water main in the upper parking lot. As an option currently being considered by the Zoo, a 20,000 gallon storage tank could be installed under the Interpretive Overlook or in an alternative location that would be graded and disturbed within the main exhibit area, thereby avoiding any new impacts on natural habitat. This tank would reduce the stress on the pressurized pumping system and would provide on-site storage capacity for emergencies. An equipment structure and service yard would be located at the eastern edge of the California exhibit, serving the grizzly bear viewing water feature near the restroom. The building would be a single-story, open air structure with a slab on grade, partial height concrete masonry walls, with single pitch roof framed in steel and clad in corrugated metal.

Wastewater Facilities

The California Exhibit would be served by a new eight-inch private sanitary sewer main that would connect to the existing eight-inch sewer main provided at the Veterinary Hospital. Some of the animal holding buildings would be served by a force main that would connect to the eight-inch gravity main. Low-flow fixtures would be installed in the new buildings with sanitary sewer facilities. The proposed "Overnight Experience" (overnight camping area) would have composting toilets.

Storm Drain Facilities

Drainage facilities have been constructed on the east side of the new Veterinary Hospital. Runoff from the secondary emergency access road would be conveyed through storm drain pipes after passing through compliant C.3 facilities along its route. Drainage runoff from the California Exhibit would be piped to compliant C.3 stormwater facilities and released into swales with energy dissipaters at pipe ends. Within the California Exhibit storm drain facilities would consist of pipes and open ditches. Ditches are mostly earth swales, but a concrete-lined ditch would be used along the service road to separate hillside runoff from impervious surface runoff. Most storm drains conveying treatable runoff are under roads and walkways, routing drainage to the Best Management Practices (BMPs) for treatment and hydromodification. This would be accomplished through installation of bioretention basins, swales and perforated pipes. Bioretention basins would be sited throughout the exhibit areas downstream of runoff sources to be collected and treated. The number of basins has been minimized by providing harvesting of

rain water to be used to clean animal night houses. A 30,000 gallon tank located west of the Interpretive Center building would serve as the major disposal source for recaptured rainwater. Pressure lines conveying pumped water to the harvesting tank would be located within roadways and pathways. Compliance with the Clean Water Act, NPDES Section 402, would require localized grading to accommodate water quality treatment using compliant erosion control measures and turbidity testing.

Most of the stormwater discharges from the California Exhibit, the Veterinary Hospital and the existing Zoo flow downslope and ultimately discharge through an existing storm drain outfall into Arroyo Viejo Creek just east of the main entrance to the zoo off Golf Links Road. This storm drain outfall would be replaced as part of the California Exhibit Project. The existing outfall is causing bank erosion by surface runoff originating within the Master Plan area. The bank erosion at the outfall is aggravated by the existing, undersized 18-inch pipe, causing increased velocity during high runoff events, and the position of this outfall in the creek bank. In its current state the 18-inch clay pipe protrudes from the bank at an opposing angle to the direction of creek flow. Judging by the age of this clay pipe and the near vertical slope of the bank, erosion has been occurring at the outlet for years. Its location at a bend in the creek exacerbates the opposing currents due to the creek flow velocity increase around the concave bed and bank. The bank has been sliding at the outfall location due to erosion caused by turbulence with no bank protection. As the toe of the bank recedes the pipe has been cracking and breaking off. Clay pipe was a poor choice for a storm drain outfall and its direction opposing the direction of creek flow was a poor design.

The proposed outfall repair and replacement would relocate the outfall to the pipe downstream of its current location, and replace the pipe with a standard pipe type used for storm drainage conveyance (**Figure 3**). The proposed storm drain pipe construction would abandon or remove approximately 35 feet of the existing pipe, install a manhole, and install a 27-inch pipe directed to the northwest that would outlet to the creek onto an existing concrete apron at the existing culvert under the entrance to the zoo. The 27-inch pipe would be angled to outlet consistent with the direction of creek flow.

To repair the bank at the location of the former existing outfall, a minimum of 10 feet of the existing clay culvert would be removed. A two-foot-diameter bank log would be keyed in along the toe of the eroded bank for biostabilization. Recently planted willows exist at the toe of this bank, installed as part of the creek restoration project initiated in 2005. The bank excavation and fill would begin behind the willows to minimize disturbance; the bank would be graded at a 2:1 slope. The existing willows would remain and additional willow cuttings would be planted on the new slope intermittently to approximately five feet up the slope and placed eight feet on-center. Plug plantings of creeping wild rye would be installed one foot on-center above the willows to the top of the 2:1 slope. A broader area, from the concrete lining to the newly graded bank, would be broadcast with a seed mix containing California brome, meadow barley, California poppy, and lupine. These improvements would curtail future erosion and enhance existing habitat values in this area.

Electricity and Natural Gas Facilities

Power lines servicing the buildings and night houses in the California Exhibit would be buried underground. Conduits exist from a connection through Edgemont Way, which currently serves an existing telecommunications tower along the fire road to the overnight experience. These existing conduits would be utilized to serve the Project, with new power line wires pulled through them. No new ground disturbance would result for electrical service other than trenching within the existing fire road at the cell tower to the loop road near the interpretive kiosk.

Gas service would be provided through an existing two-inch gas distribution line from Edgemont Way which abuts Knowland Park from the south. This gas line would be installed utilizing horizontal drilling along most of the route to minimize or eliminate surface disturbance in extending the line to the California Exhibit.

Proposed Construction Activities and Schedule

As currently planned, construction of the California Exhibit would occur in five phases. Phase 1 would last a total of approximately six months and would include construction of the storm drain outfall replacement and habitat enhancement along Arroyo Viejo, installation of the perimeter fence, service road, and initial utilities to the Project site, and the overnight camping experience. Phase 2A would last a total of approximately 18 months and would include construction of the gondola people moving system, the California Visitor Center and Interpretive Center, and construction of the loop service road and elevated boardwalk. Phase 2B would last a total of approximately 12 months and would include construction of the grizzly bear exhibit, bison/tule elk exhibit, wolf exhibit, eagle and condor exhibits and viewing structure, black bear and mountain lion exhibits, activity zone, and interpretive overlook. Phase 3 would last a total of approximately six months and would include construction of the jaguar exhibit and the beaver/water fowl aviary. The precise components of each phase may be refined during the construction phase of the project depending on funding.

Habitat Enhancement Plan

The Oakland Zoo has prepared a Habitat Enhancement Plan (HEP) for the California Exhibit area and Upper Knowland Park that implements certain biological resources mitigation measures and Standard Conditions of Approval for the amended Master Plan (Environmental Collaborative 2011). Habitat enhancement provided under the HEP would be achieved through the control and eradication of target invasive species such as broom and fennel, and through revegetation with native grassland, riparian, and woodland species where the native cover types have been displaced by non-native species. The HEP describes the habitat conditions in the HEP treatment area, defines goals, specifies performance standards, and identifies implementing actions related to habitat enhancement, invasive species removal, native revegetation, and sensitive resource protections. The HEP applies to all of Knowland Park, with the initial focus on the Ecological Recovery Zone within the proposed perimeter fence encompassing the California Exhibit and the area within the conservation easement/deed restriction for ASR. The HEP was approved by the Oakland City Council on June 21, 2011, at the same time the Master Plan

amendment was approved and is included as **Appendix B**. Relevant portions of the HEP have been incorporated as Conservation Measures in subsection 7.1 of this Revised BA.

Ecological Recovery Zone

The Ecological Recovery Zone comprises the remaining natural areas within the perimeter fence but outside of the exhibits and enclosures of the California Exhibit, occupying approximately 20 acres. This zone is comprised of a mix of habitat types including oak woodland, chamise chaparral, Diablan sage scrub, coyote brush scrub, and grasslands. The Ecological Recovery Zone would serve as an active educational resource for the community by engaging student groups, service organizations, and other leading Bay Area agencies in its cooperative care by furthering the removal of highly invasive non-native species and in developing habitat restoration efforts. Treatment methodologies to control invasive species and provide for revegetation with native species are discussed in detail in the HEP. These methodologies would be implemented as part of the Project, with specific treatments summarized in the relevant conservation measures in Section 7.

3.0 Study Methods

The following is a discussion of the methods used in this biological assessment. The assessment included the following components:

- A review of literature related to the project vicinity and selected special-status species
- Database search for recorded occurrences of special-status species
- Analysis of aerial photography, topographic maps, and vegetation maps within the Project Area and vicinity
- Reconnaissance-level visual surveys of the Project Area to identify habitat suitable for special-status species
- Consideration of comprehensive protocol surveys conducted for ASR and special-status plants.

3.1 Literature Review

The following documents were reviewed for this biological assessment.

- *Biotic Resources Survey, the Oakland Zoo in Knowland Park, prepared for East Bay Zoological Society*, prepared by Cheung Environmental Consulting. November 1996. 38pp. + appendices.
- *Habitat Enhancement Plan for Knowland Park, Oakland, California*, prepared by Environmental Collaborative, prepared for East Bay Zoological Society. Approved by Oakland City Council on June 21, 2011. 37 pp.

- *Supplemental Grassland Mapping in the California Exhibit and Veterinary Hospital Vicinities, Oakland Zoo Master Plan in Knowland Park*. Memorandum to Patricia Jeffery, Placemakers, from Jim Martin, Environmental Collaborative, dated April 13, 2011. 15 pp. + figures + appendices
- *Amendment to Oakland Zoo Master Plan: Subsequent Mitigated Negative Declaration/Addendum, Draft, Volumes 1 and 2*. Prepared for City of Oakland, prepared by Placemakers, in association with AECOM, Arcadis, Environ, Environmental Collaborative, LSA, Natalie Macris, and Questa Engineering Corporation. February 2011.
- *Status of the Alameda whipsnake (Masticophis lateralis euryxanthus) in Knowland Park for the Proposed Expansion of the Oakland Zoo, City of Oakland, Alameda County, California*. Prepared for Nik Haas-Dehejia, prepared by SBI. August 12, 2010.
- *Alameda whipsnake Mitigation and Monitoring Plan Oakland Zoo California Project, Oakland, California (DRAFT)*. Prepared for Nik Haas-Dehejia, prepared by SBI. May 31, 2011.

3.2 Records Review

The most recent occurrence data for special-status species with the potential to occur in the project vicinity was obtained from multiple sources. Occurrence records were mapped using geographical information system data when available.

- Official list of endangered, threatened, and proposed species for the USGS 7.5-minute Oakland East quadrangle obtained from the USFWS website, August 29, 2011 (**Appendix C**).
- A search of CNDDDB records of the USGS 7.5-minute Richmond, Briones Valley, Walnut Creek, Oakland West, Oakland East, and Las Trampas Ridge quadrangles.
- U.C. Berkeley Museum of Vertebrate Zoology online records search using Google spatial query tool for a five mile radius around the Project Area
- California Academy of Sciences online database of Vertebrate Zoology and Anthropology (<http://research.calacademy.org/vza>)

Threatened, Endangered, Proposed Threatened or Proposed Endangered Species

The project could result in direct or indirect impacts to the ASR. The only other listed species with a remote potential to occur in the study area vicinity is the CRLF.

No other special status species, including candidate species, were found to have the potential to be impacted by the proposed project. The project would not take place within designated or proposed critical habitat, and none would be affected. A summary of the special status species identified during the records review is provided below (**Table 1**).

3.3 Site Assessments and Protocol Surveys for Special Status Species.

3.3.1 California Red-legged Frog

To assess existing conditions and potential for the CRLF (*Rana draytonii*) to occur at the project site, a site assessment and reconnaissance-level field survey was performed by Karen Swaim in 1998, 1999, 2009, 2010 and 2011. The field survey included pedestrian surveys of Arroyo Viejo Creek, the only aquatic habitat in Knowland Park, from where it goes underground at the entrance road to the Oakland Zoo and upstream approximately 0.5 km east.

3.3.2 Alameda Striped Racer

To assess existing conditions at the project site a reconnaissance-level survey was conducted for ASR in 1998 leading to a need for protocol surveys. Protocol level live-trapping surveys were conducted by Swaim Biological in 1998-1999 and 2009-2010 (**Appendix D**).

1998-1999 Survey Periods

Trapping surveys for ASR were initially conducted from April 16, 1998 through July 17, 1998 and May 21 through June 21, 1999. Although 90 days of trapping were conducted during 1998, as required by the survey protocol at that time, a total of 25 to 30 days during the survey period were lost due to rainy and/or cold foggy weather the San Francisco Bay Area experienced during the spring of 1998. The period of trapping during 1999 was conducted to make up for the days of trapping lost during 1998. A total of 21 traplines were placed in the areas with the highest quality potential whipsnake habitat in the proposed Project area as planned at that time (**Figure 4**). These areas included open and partially open canopy stands of chamise chaparral, coyote brush scrub, Diablan sage scrub, rock outcrops and the ecotone of scrub and grassland communities. Trapline placement was slightly different in 1998 versus 1999.

2009-2010 Surveys

In 2009-2010, a second status survey for ASR was conducted due to time elapsed since the first survey and changes to the status survey protocols, which added a 45-day fall trapping component to the survey methods. In addition, several project features had changed or been eliminated. A total of 35 traplines were distributed in areas of optimal habitat for this survey and the placement of traplines differed slightly from the 1998-99 survey (**Figure 5**). Trapping periods included a fall component from September 5, 2009 through October 27, 2009. Forty-five active trapping days were conducted in this period. For eight of the days in this time period, the traps were deactivated due to extreme heat or rain events. The spring component was conducted from April 13, 2010 through July 23, 2010 and a total of 90 trap days were completed during that period.

4.0 Status of the California Red-legged Frog and Alameda Striped Racer in the Project Area

4.1 California Red-legged Frog

4.1.1 Distribution and Habitat Requirements of the CRLF

The CRLF is listed as federally threatened (USFWS 1996). Critical habitat was designated for the frog in 2006 and was revised in 2010 (USFWS 2010). The CRLF is considered a species of special concern by the CDFW. No critical habitat will be affected by the project.

In general the CRLF is distributed along the coast and Coast Ranges from Mendocino to northern Baja, California and in patches along the Sierra Nevada foothills. CRLF breed in wetlands, lakes, ponds, and other still or slow-moving sources of water. During summer months CRLF may take refuge in cool, moist areas including rodent burrows and soil crevices. Although many CRLF appear to remain close to aquatic habitats year-round one recent study found that nearly half of all females in some areas disperse into other locations during the non-breeding season (Fellers and Kleeman 2007). Dispersal distances from breeding habitat are generally less than 0.5 miles (Fellers 2005), but some individuals have been observed to move more than 2 miles through surrounding uplands (Bulger *et al.* 2003). Dispersal typically occurs along riparian corridors, but a wide variety of habitat types may be traversed by frogs moving to non-breeding habitat areas. Bulger *et al.* (2003) reported CRLF in northern Santa Cruz County dispersing without apparent regard to riparian corridors or topography.

4.1.2 Project Vicinity

There are two records of CRLF within five miles of the project footprint. The closest locality is 2.5 miles east of the project footprint on East Bay Municipal Utility District (EBMUD) in the Upper San Leandro Reservoir watershed (**Figure 6**). This record (CNDDDB #1071) does not indicate that breeding was observed, only adult CRLF. However, based on aerial photos, the habitat appears suitable for breeding. The second locality is 3.6 miles northeast of the footprint on private land, from a pond that is nearly completely silted in and is unlikely to support breeding CRLF. The only aquatic habitat within a mile of the project footprint and with a hydro-period sufficient to support breeding CRLF, is an artificial golf course pond to the north approximately ½ mile. Based on aerial photos, this pond is strictly maintained in ways that it is very unlikely to support CRLF. The margins are free of typical aquatic vegetation cover for CRLF with mowing to the very edge of the water. In addition, there is a large fountain type spray mechanism that likely circulates the water to prevent any growth of aquatic vegetation. There is no other suitable breeding habitat for CRLF within a mile or more of the project footprint. The area surrounding Knowland Park to the west, north, and south is developed (residential). Open space areas to the north have steep topography where no potential breeding habitat is present.

4.1.3 Project Site

The only aquatic habitats in Knowland Park are Arroyo Viejo Creek, which flows in a westerly direction draining the slopes below the ridge at Skyline Blvd, and a muddy wallow for bison in the existing zoo. There is only a very low potential that CRLF individuals could disperse to the head waters of Arroyo Viejo Creek from east of Skyline Blvd and be present in the creek segment where the outfall work will take place.

4.2 Alameda Striped Racer

4.2.1 Distribution and Habitat Utilization of the Alameda Striped Racer

The federally and state threatened ASR (U.S. Fish and Wildlife Service 1997) is endemic to the inner coast range in Contra Costa and Alameda counties. No critical habitat will be affected by the project. ASR use the mosaic of habitats found east of the San Francisco Bay, with the highest frequency of use in and near scrub and chaparral habitats including chamise chaparral, Diablan sage scrub, and to a lesser degree, northern coyote brush scrub, and riparian scrub (Swaim 1994). Alameda whipsnake also use ungrazed grasslands and oak savannah associations if they are adjacent to these scrub habitats (Swaim and McGinnis 1992). Rock outcrops and talus with deep crevices and rodent burrows are also important features of ASR habitat. These features serve as retreats at night and from thermal extremes.

Aspects with maximum sunlight are important for ASR as this species maintains the highest body temperature when active, of any Bay Area reptile (Hammerson 1979). ASR concentrate activity on slopes with a south, southwest, southeast, or east facing exposure, but also use all other aspects on a regular basis and include them in their home ranges (Swaim 1994).

Open canopy shrub communities are the highest quality habitat for ASR (Swaim and McGinnis 1992). This parameter was a microhabitat characteristic present in all of the sites where ASR were abundant as well as in the core areas of individual snakes monitored during radio telemetry studies (Swaim 1994).

Adult snakes appear to have a bimodal seasonal activity pattern with a large peak during the spring mating season and a smaller peak during late summer and early fall (Swaim 1994). Although short above-ground movements may occur during the winter, ASR generally retreat in November and emerge in March. Courtship and mating occur from late-March through mid-June. During this time, males move around throughout their home ranges, while females appear to remain at or near their hibernaculum, where mating typically occurs.

ASR have declined due to loss of habitat resulting from urban expansion and associated impacts due to increased population densities, inappropriate grazing practices, and alteration of suitable habitat from fire suppression (USFWS 1997). Habitat fragmentation from urban development and associated highways and road construction has led to isolation of populations.

4.2.2 Project Vicinity

Information on the distribution of the ASR in the vicinity of the Project Area was compiled from multiple sources. These included the U.S. Fish and Wildlife Service website, CNDDDB, the Museum of Vertebrate Zoology (Berkeley Collections), and California Academy of Sciences online database of Vertebrate Zoology and Anthropology (**Figure 7**).

The historic distribution of the ASR and potential habitat in the region suggests that the area was contiguous with occupied habitat to the north and south of the project site prior to large-scale development in the area. The ASR is known to inhabit several locations on the western slopes of the East Bay hills. A single ASR was captured during the field trapping survey conducted on June 3, 4, and 27, 2010 in three different traplines. Besides this occurrence, the closest records of the ASR in the project vicinity includes observations from Chabot Regional Park in 2006 approximately 1.62 miles northeast of the site and 1.75 miles east of the site according to the CNDDDB records. Several other observations are known from within three miles of the site and are outlined below with a general location, distance and direction from the site, year of observation and source of the data record (**Table 2**). Significant areas of core habitat remains in pockets to the north and south of Knowland Park, but have not been surveyed for ASR (e.g. Leona Quarry, open space west of the Chabot Municipal Golf Course). Further, these areas are separated from the site by dense residential development and major roadways.

4.2.3 Project Site

The Project Area is a relatively narrow island of habitat (between 0.3 and 0.5 miles wide) that has been virtually isolated for several decades by the residential development to the north and south and the existing Oakland Zoo to the west (Swaim 2011). To the east, Golf Links Road bisects Knowland Park into two areas.

The project area has physically suitable habitat for ASR and appears to have an adequate lizard prey base. Habitat types present in the Project Area include grassland (native and non-native), northern coyote brush scrub, Diablan sage scrub, chamise chaparral, French broom scrub, coast live-oak woodland, barren/disturbed, and ornamental (**Figure 8**). Chamise chaparral is typically a habitat type where ASR is the dominant snake species, but only a single ASR was captured on the site in an extensive survey that included full protocol surveys in 1998-1999 and 2009- 2010. Although the species was documented to be present with the capture of a single individual male ASR, the surveys also documented the species is not thriving and that there is a potential that a breeding population does not currently occupy the site.

At the present time, all of the chamise chaparral in the project impact area, except that within the wolf enclosure, is closed canopy with a high degree of encroachment by invasive non-native plant species. The primary invasive plant is French broom. This invasive species was rare or not detected in the same chamise stands during the ASR surveys conducted in 1998 and 1999 indicating the rapid spread and unchecked degradation of habitat for native species. Open canopy allows for maximum solar input for basking sites while preserving cover for protection from aerial predators.

Grassland (Non-Native and Native)

This grassy vegetation type is dominated by introduced annual grasses and herbs. This natural community is being rapidly replaced by non-native French broom scrub in the project area and in parts of Knowland Park. Needle-grass grassland, a sensitive natural community, is still a visible component embedded in some locations within the non-native grasslands in the Project Area.

Northern Coyote Brush Scrub

This natural community is dominated by a single species, coyote brush (*Baccharis pilularis*), although several other shrubby species are present, such as poison oak (*Toxicodendron diversilobum*), bush monkeyflower (*Mimulus aurantiacus*), coffeeberry (*Rhamnus californica*), elderberry (*Sambucus mexicana*), and coastal sagebrush (*Artemisia californica*). Northern coyote brush scrub encroaches into grasslands in the absence of fire or browsing by large herbivores. Knowland Park has not had significant fires or large scale grazing in decades. During the trapping survey in fall of 2009 a small fire (1 – 2 acres) burned some brush/grassland habitat north of the Project Area.

Natural succession tends to result in coast live oaks (*Quercus agrifolia*) and California bay (*Umbellularia californica*) invading coyote brush scrub in moister sites, deeper soils, and in the absence of other disturbance such as fire. Northern coyote brush scrub is on many parts of the upper elevations of the site and Knowland Park.

Diablan Sage Scrub

Diablan sage scrub is dominated by coastal sagebrush, poison-oak, bush monkeyflower, and occasional coyote brush. Coastal sage scrub is typically confined to relatively steep, rocky, often south-facing slopes, as it is in the study area. There is much intergradation of Diablan sage scrub and northern coyote brush scrub, since the predominant of one natural community is almost always found in the other, though in lesser amounts. Intermediate or transitional vegetation was mapped as Diablan sage scrub because it is generally a higher quality of habitat for the ASR and is important for other wildlife species in general.

Chamise Chaparral

This natural community is dominated by chamise (*Adenostoma fasciculatum*), growing in tall (up to 10 feet or more), dense stands. In the study area, several other woody species were found in chamise chaparral, silktassel (*Garrya elliptica*), brittle manzanita (*Arctostaphylos tomentosa* ssp. *crustacea*), coyote brush, poison-oak and coast live oak. On more exposed slopes, often in particularly rocky places, small patches or isolated individuals of coastal sagebrush and bush monkeyflower are found. There is little understory in this natural community within the study area. Chamise chaparral is a natural community adapted to repeated fires (Holland 1986) due to its ability to stump sprout. In the study area, the stands do not appear to have experienced fire in many decades and French broom is invading areas of chamise chaparral on the site. Natural succession to oak/bay woodland is also occurring in much of the chaparral habitat as a result of

fire suppression, and sapling and mature trees are now shading out and replacing much of the chaparral vegetation. French broom is spreading into this community.

French Broom Scrub

This vegetation type is not described by Holland (1986), although it occupies extensive and increasing acreage in the coastal regions of California. It is dominated by a non-native shrub, French broom (*Genista monspessulana*) which forms a nearly pure stand. French broom invades grasslands, coyote brush scrub and open oak savanna, out competing much of the understory. Soil disturbance greatly encourages the spread of French broom. French broom is distributed in many large stands throughout the East Bay Hills and it is present in every natural community within the study area. Over the course of the survey work for ASR at Knowland Park, the distribution of French broom has been dynamic, due to natural and human related actions. Large areas of broom that were present in 1998-1999 within existing animal exhibits and areas adjacent to the existing zoo were removed from the Project Area by contractors. Subsequently new areas have been invaded by broom and it is spreading in nearly all of the native communities in Knowland Park. Broom was scarce to undetectable in the chamise chaparral during the protocol surveys for ASR in 1998 and 1999. In the intervening time period between those surveys and the 2010 ASR survey, broom spread up into the even the dense chamise chaparral and is now common. The spread of broom and conversion of native habitats to stands of broom, poses a significant threat to the quality of the site for ASR. Efforts are being made to reduce the spread and eliminate it from areas of high quality ASR habitat on lands owned and managed by the East Bay Regional Park District.

Coast Live-oak Woodland

This natural community varies from an open savanna with herbaceous or shrubby understory to a closed-canopy woodland. It is dominated by coast live oak. The second most frequently occurring tree is California bay. Other species that occur occasionally in the study area are California buckeye (*Aesculus californica*) and elderberry. The understory of this community varies. When the oaks have an open canopy, the understory is much the same as the adjacent needlegrass grassland or open Northern coyote brush scrub. When coast live oak woodland exists as a closed-canopy woodland, the understory is more diverse with herbs and shrubs, including poison oak, hazelnut (*Corylus cornuta* var. *californica*), gooseberry (*Ribes* spp.), snowberry (*Symphoricarpos albus* var. *laevigatus*), and blackberry (*Rubus* spp.). Coast live oak woodland occurs throughout the study area on shaded slopes, primarily with a north-or east-facing aspect. Coast live oak woodland habitats with a more open canopy and on aspects facing southerly and easterly, are generally used more frequently by ASR.

Barren/Disturbed

This category is composed of the existing fire roads and barren turn around areas where fire roads terminate.

Ornamental

Eucalyptus and pine trees are the two mapped ornamental tree species. Eucalyptus is not prevalent in the study area and occurs in only small isolated patches with a few large trees. These stands may slightly reduce the habitat value, but are not large enough to present any kind of barrier or deterrent of movement between better habitat areas. In some areas of the Oakland-Berkeley Hills, Eucalyptus stands are a major factor in habitat loss. Pine trees occur in a small clump near the upper end of the study area, and along the southeastern edge adjacent to existing residences.

5.0 Effects of the Proposed Project

5.1 California Red-legged Frog

5.1.1 Direct Effects

If an individual CRLF were in Arroyo Viejo Creek at the outfall repair area during construction, there would be a potential for injury or mortality. Given the culvert area is over 1.2 miles from the Golf Course Pond, which is unlikely to support CRLF, and over 2 miles from the closest known breeding pond, habitat impacts are not anticipated for CRLF. Avoidance measures will be utilized during construction along Arroyo Viejo Creek to ensure no inadvertent take occurs as a result of the project activities, as detailed in the Conservation Measures in subsection 7.1.

5.1.2 Indirect Effects

No indirect effects on CRLF are expected.

5.2 Alameda Striped Racer

5.2.1 Direct Effects

Permanent Loss of Habitat or Potential Reduction in Habitat Value

Direct effects are those caused by the project and which occur at the time of the project. The project will permanently affect 16.06 acres of habitat potentially of value to the ASR (**Table 3** and **Figure 9**). Habitats considered of value to the ASR on the site include: chamise chaparral, Diablan sage scrub, coyote brush scrub, oak woodland, and grassland which total 16.06 acres. Three categories of habitat disturbance or impact level were designated. These included full or potentially full loss of habitat value (5.91 acres), limited loss of habitat value (3.55 acres) and low loss of habitat value (6.60 acres). Of the 16.06 acres, the project will result in a full or potentially full loss of 5.91 acres of habitat of value for ASR. Project features considered to cause a full or potentially full permanent loss include the hardscape animal exhibits, interpretive and visitor centers, walkways and other paving/pedestrian paths within the main pedestrian walking path for visitors and area permanently lost through paving of the access road as well as

animal enclosures with within the main pedestrian walkway even if they will retain a large area of native vegetation (e.g. grizzly bear). An additional 3.55 acres of potential habitat for ASR will potentially have a moderate loss of habitat value. These areas, designated in blue in Figure 9, include areas outside most of the main paved walkway that will have native vegetation and permeability, but the enclosures are smaller and may be subject to more disturbance (e.g. inner wolf exhibit, condor, jaguar). The remaining 6.60 acres of potential habitat are expected to have only a low loss of habitat value, if any. These areas will be within enclosures that will be managed to retain natural vegetative cover, are relatively large enclosures outside of the area that visitors will access along the outer perimeter of the project footprint with direct connection to the undeveloped area. They will house a limited number of native California species (e.g. outer wolf enclosure, black bear, tule elk, bison, mountain lion). These enclosures will provide significant habitat value for the ASR and are considered a permanent affect but not a total loss of habitat. The entire enclosure will be permeable, contain native rodent populations and other small vertebrates that provide prey for ASR.

Temporary Impacts to Potential Alameda Striped Racer Habitat During Construction

Temporary impact to 4.77 acres of potential ASR habitat will result from the project grading associated with improving the existing main access road, installation of the perimeter fence, temporary construction access to gondola towers, etc. (**Table 3**). These effects will not result in permanent conversion of any habitat and disturbed areas will be retained as fire trails or restored with native vegetation following completion of construction. Grading and other construction activities may result in direct injury or mortality of ASR. However, restrictions on construction activities and limits of grading, the use of wildlife exclusionary fencing, worker training, and monitoring by a qualified biologist will serve to reduce the potential for inadvertent take during construction as provided for in the Conservation Measures contained in subsection 7.1. On-going activity on the site (service vehicles) may also result in direct mortality. However, the potential for direct injury or mortality to occur will be minimized by training all construction and operations personnel and by restricting the speed limit of all vehicles to a maximum speed of 10 miles per hour.

Effects of Fire Fuel Management

In accordance with the City of Oakland Wildfire Prevention District, fuels management will be required within 30 feet from all buildings constructed for the project (such as the Visitor and Interpretive Centers) and 10 feet of all pathways and roads. The area encompassed by Fire and Fuel Management is comprised of 1.73 acres of vegetation that is potentially of value to ASR (**Table 3**). A total of 0.38 acres of habitat within the fuels management is shrub communities including 0.17 acres of chamise chaparral, 0.06 acres of diablan sage scrub and 0.15 acres of coyote brush scrub. The remaining vegetation includes 0.87 acres of grassland and 0.48 acres of oak woodland.

As provided in the City's Conditions of Approval, fuel management will involve the manual removal of woody vegetation using chain saws and clippers with a biological monitor present during the activities. Stumps will not be removed and all thinning will reduce shrub cover to no

less than 25% cover to maintain higher quality ASR habitat than currently exists. Thinning will be done as needed but not more than annually. Although complete loss of vegetation would reduce habitat quality and function for ASR, thinning of shrubs, even to a 25% cover, is beneficial to the ASR where the lack of natural disturbance results in dense closed canopy communities where French broom is or could become the dominant shrub. In the required fuels management areas that overlap with shrub communities, thinning is not expected to be a negative habitat impact. Thinning and removal of non-native shrubs in the zone can actually be of benefit to ASR because this action will improve the quality of the habitat in this specific situation. This action (thinning of shrub vegetation) has been used as a required mitigation tool in several projects where use of prescribed fire to thin and enhance scrub habitat was not feasible (e.g. Bailey Ranch in Hayward, Alameda County). Although there is a slight potential for direct take during thinning for fuel management potential take can be avoided with certain measures. Use of hand clearing and avoidance measures will significantly decrease the likelihood of take to the species to nearly zero.

Grassland in the fuels management zone will be mowed to a height of no more than six inches. The majority of this zone is the perimeters of the access road. Mowing to a height of six inches would not reduce cover to a level that would inhibit use by ASR or be expected to increase the potential for predation on ASR.

5.2.2 Indirect Effects

Potential Alteration of Alameda Striped Racer Movement

Indirect effects are those which would be reasonably certain to result from project activities but which occur later in time. ASR may alter movement patterns to avoid hardscape portions of the project footprint. Grazing, digging and trampling within the bison enclosure may affect the extent of existing vegetative cover. This could potentially reduce the likelihood ASR would move across this enclosure if large bare portions were present. This impact will be minimized, however, by the limitations of the number of animals within the enclosure as well as the monitoring of the vegetation. The project has been designed to be permeable to ASR and not block any length of area that is greater than an ASR is capable of moving in less than a day (Swaim 1994).

Potential Entrapment

Project features may pose entrapment hazards for ASR. The project will minimize this by design features as well as implementing an interpretive program for all staff and visitors to avoid any snakes and to report their presence if observed along pathways or exhibit areas. A protocol will be in place to notify the service approved biologist and the resource agencies if an ASR is found within the interior hardscape of the main exhibits and buildings.

6.0 Cumulative Effects

Cumulative effects under the ESA include all future non-federal actions, including state and private actions that are reasonably foreseeable to occur in the action area which have the potential to adversely impact listed species. Future federal actions unrelated to the proposed project are not considered, as these actions would require separate consultation under Section 7 of the ESA. This proposed project is the only reasonably foreseeable future project in the action area (Placemakers 2011). The immediate area around Knowland Park is largely built out, and future improvement to existing homes or the potential construction of homes on any vacant parcels would be unlikely to have an impact on ASR or its habitat given the urban nature of the area. No cumulative effects are expected as a result of the Project.

7.0 Mitigation and Monitoring Measures

The applicant proposes to avoid and minimize the potential for direct injury or mortality to ASR and CRLF through several means, including 1) construction employee education and controls, 2) construction restrictions and monitoring, and 3) post construction monitoring, invasive species control, and habitat restoration. Several modifications to the proposed Project to reduce direct impacts on core habitat and potential habitat fragmentation have already been incorporated into the design including elimination of the proposed Amphitheatre, limiting the number of animals housed in the Bison/Tule exhibit, irrigation of pasture and enhancement of grassland and open areas to maintain protective cover, and incorporation of a permeable perimeter fence to allow ASR passage (Placemakers 2011). The following provides a summary of measures recommended in the 1998 MND, the City's Standard Conditions of Approval, and the other mitigations described further in subsections 7.1 and 7.2 to prevent impacts to ASR and CRLF in the remote instance it is encountered during construction.

Construction Avoidance:

- Prior to the start of groundbreaking activities, all construction personnel will receive training on ASR and CRLF and their habitat by a qualified biologist.
- All removal of scrub or chaparral habitat will be done by hand with axes or machetes. Chain saws may be used for larger shrubs. No stumps will be removed.
- Thinning for fuels management will reduce shrub cover to no less than 25% cover. Maintenance of fuels will be done as needed but not more frequently than annually.
- A biologist qualified to handle ASR will monitor all scrub or chaparral removal and all construction activities that may impact the ASR, and will provide information to construction crews on what to do if one is seen.
- A maximum speed limit of 10 miles per hour will be required on the service road and all personnel will be instructed to watch for and yield to all wildlife.
- Measures will be taken to prevent the spread of French broom on the site and to remove as much French broom as possible in order to keep it from degrading higher quality ASR habitat.

- Wildlife exclusion fences will be installed to prevent ASR from entering the work site.
- Erosion control devices will be installed, such as hay bales, at the downhill limit of construction line to prevent rocks and soil from moving downhill. No erosion control materials with monofilament netting will be used on the site. Burlap wrapped wattles are acceptable and certain coconut coir blankets can be used after specific approval.

Monitoring:

- Annual reports will be submitted to the City, the East Bay Zoological Society, and resource agencies summarizing the results of monitoring during construction and the results of vegetation management associated with invasive species control.
- Post construction monitoring will document habitat conditions in the area protected as compensatory mitigation lands under the conservation easement/deed restriction. Documentation will include photo stations and mapping that details areas where invasive species have been removed or controlled and report on the success of removal of non-native shrubs and trees.
- Photo stations will be established prior to any construction on the site and used for comparison with photos obtained after construction and through the life of the monitoring plan.

Compensatory Mitigation

- The project applicant will provide compensatory mitigation for permanent impacts that will result in full or potentially full loss of ASR habitat and a moderate loss of value at 3:1. For areas where disturbance will be low the area will retain a significant and/or potentially unchanged habitat value for ASR, the mitigation ratio applied is 2:1. Temporary impacts will be mitigated at a 1:1 ratio. Additional detail on the proposed compensatory mitigation is provided below in subsection 7.2.

The above construction avoidance, monitoring, and compensatory mitigation provisions of the Project are described in detail as Conservation Measures of Project in subsection 7.1, and compensatory mitigation in subsection 7.2 of this Revised BA.

7.1 Conservation Measures of Project

The following conservation measures are proposed by the Oakland Zoo as part of the Project to avoid inadvertent take of ASR during construction. These measures also apply to CRLF, in the remote instance this species is encountered during the limited project-related construction activities associated with the culvert replacement and habitat enhancement along Arroyo Viejo Creek.

These conservation measures were assembled through four primary sources: 1) conservation measures taken from the Programmatic Biological Opinion for the East Alameda County Conservation Strategy (USFWS 2012); 2) applicable Standard Conditions of Approval from the City of Oakland that were incorporated into the Subsequent Mitigated Negative

Declaration/Addendum on the Oakland Zoo Master Plan (Placemakers 2011); 3) applicable mitigation measures from the Subsequent Mitigated Negative Declaration/Addendum (SMND/A); and 4) applicable implementing actions from the Habitat Enhancement Plan for Knowland Park (Environmental Collaborative 2011) approved by the Oakland City Council on June 21, 2011. The conservation measures below have been refined from the language contained in the source documents to reflect specific conditions of the study area and to minimize redundancy and are at least equivalent in efficacy and in many instances more stringent.

General Avoidance and Monitoring Measures

1. At least 15 days prior to any ground disturbing activities, the applicant will submit to the CDFW and Service for review and approval the qualifications of the proposed biological monitor(s). A qualified biological monitor means any person who has completed at least four years of university training in wildlife biology or a related science and/or has demonstrated field experience in the identification and life history of the listed species. The qualified biological monitor overseeing vegetation removal and trimming activities shall be capable of identifying native and non-native plant species, and has demonstrated experience in vegetation removal, trimming and management practices.
2. A CDFW/Service-approved biologist will remain on-site as a biological monitor during all construction activities in or adjacent to habitat that may result in the take of ASR and CRLF as determined by the CDFW and Service. The CDFW/Service-approved biological monitor(s) will be given the authority to stop any work that may result in the take of listed species. If the CDFW/Service-approved biological monitor(s) exercises this authority, the CDFW and Service will be notified by telephone and electronic mail within one working day. The CDFW/Service-approved biological monitor will be the contact for any employee or contractor who might inadvertently kill or injure a listed species or anyone who finds a dead, injured or entrapped individual. The CDFW/Service-approved biological monitor will possess a working wireless/mobile phone whose number will be provided to the CDFW and Service.
3. Prior to construction, a construction employee education program will be conducted in reference to potential listed species on site. At minimum, the program will consist of a brief presentation by persons knowledgeable in endangered species biology and legislative protection (CDFW/Service-approved biologist) to explain concerns to contractors, their employees, and agency personnel involved in the project. All construction employees will be required to attend the education program. The program will include: a description of ASR and CRLF, and their habitat needs; reports of occurrences of ASR and remote potential for CRLF to occur in the construction area; an explanation of their status and protection under the Act; and a list of measures being taken to reduce effects to the species during construction and implementation, including specific restrictions on construction activities that all construction workers must follow. Fact sheets conveying this information and an educational brochure containing color photographs of ASR and CRLF in the work area(s) will be prepared for distribution to the above-mentioned people and anyone else who may enter the construction area. All employees will be provided with written guidance governing vehicle use, speed

limits on roads and in the construction area, fire prevention, and other hazards and restrictions. A list of employees who attend the training sessions will be maintained by the applicant to be made available for review by the CDFW and Service upon request. Contractor training will be incorporated into construction contracts and will be a component of weekly project meetings.

4. Preconstruction surveys for ASR and CRLF will be performed immediately prior to groundbreaking activities in or adjacent to habitat that may result in take as determined by the CDFW and Service. Surveys will be conducted by CDFW/Service-approved biologists. If at any point, construction activities cease for more than five consecutive days, additional preconstruction surveys will be conducted prior to the resumption of these actions. In the event that a listed species is discovered during preconstruction surveys, the CDFW/Service-approved biologist will relocate the species to a safe location outside of the project footprint.
5. Prior to ground disturbing activities, the limits of construction areas will be delineated with high visibility temporary fencing, flagging, or other barrier to prevent encroachment of construction personnel and equipment outside of the construction disturbance zone. The construction limits fencing will be in addition to the silt fencing/wildlife exclusion fencing described in Conservation Measure 6. Temporary construction-limits fencing will be used in select locations to protect native trees and other native vegetation to be retained within 20 feet of the limits of proposed grading. This shall include all brittleleaf manzanita (*Arctostaphylos crustacea*) shrubs. Where flagging is used to delineate the limits of construction areas, secure wooden stakes or t-posts will be installed a minimum 50-foot interval with flagging tied securely at the top of the stake. Such fencing/flagging will be inspected and maintained daily until completion of project construction. The fencing/flagging will be removed only when all construction equipment is removed from the site.
6. Heavy duty silt fencing or wildlife exclusion fencing approved by the Service and CDFW will be used to prevent ASR and CRLF from entering construction areas where extensive activities will occur over an extended period of time and continuous monitoring of the entire work area would be impractical. **Figure 10** shows the approximate alignment of the wildlife exclusion fencing, around the main California Exhibit area and linear features such as the service road, utility corridor, and temporary construction access to gondola towers 4, 5 and 6. This is the proposed maximum extent of fencing. Project phasing, duration of certain activities, and the time of year the activity is implemented may reduce the amount of fencing installed. Any changes will be submitted in writing to the resource agencies for approval. Details of the wildlife exclusion fencing include the following:
 - a) The wildlife exclusion fencing will be installed under the supervision of the CDFW/Service-approved biologist, with the final alignment adjusted as necessary to accommodate successive phases of the Project and address other factors.
 - b) The wildlife exclusion fencing associated with the main California Trails exhibit area, shown in **Figure 10**, represents the likely maximum footprint of Longer-term Temporary Construction activities. Depending on phasing, this alignment of the Longer-term wildlife exclusion fencing may be subdivided as needed to contain

specific components of the main California Exhibit area.

- c) Use of wildlife exclusion fencing along linear features of the project (i.e. service road, utility corridor, temporary construction access to gondola towers 4, 5 and 6, and the existing fire road to Overnight Experience) may not be required depending on construction duration, affected vegetative cover and other factors considered by the CDFW/Service-approved biologist. As indicated in Figure 10, construction along these features will be of Shorter-term in duration. In instances where wildlife exclusion fencing is not installed along these linear features, continuous monitoring will be provided by the CDFW/Service-approved biologist, as called for in Conservation Measure 7 below. If these linear features do require use of wildlife exclusion fencing, their installation will be phased to prevent ASR and other ground-mobile wildlife from becoming isolated between the linear construction zones. Figure 10 provides a tentative phasing schedule under this scenario, with the service road constructed first, then the utility corridor, and then access to the Overnight Experience area. This phasing may be adjusted as directed by the CDFW/Service-approved biologist.
 - d) The wildlife exclusion fencing will be at least 3 feet above ground with an additional 6 inches buried below ground to prevent animals from crawling under. The fence will be pulled taut at each support to prevent folds or snags and lean outward slightly to minimize the chance of species moving over the fence.
 - e) The wildlife exclusion fence will be inspected daily by the CDFW/Service-approved biologist or the trained construction foreman to ensure there are no holes or gaps that would allow entry into the active construction zone, and will remain in place until all construction activities are completed within the fenced exclusion zone.
 - f) A designated construction equipment access gate will be provided in the wildlife exclusion fence at a specific location(s) along existing roads to allow for vehicle and worker access into the construction area.
 - g) Following installation of the wildlife exclusion fence, the CDFW/Service-approved biologist will resurvey the area to confirm that no ASR or CRLF's are present within the isolated construction zone.
 - h) No construction materials will be placed, leaned, or stored within 3 feet of the exclusion fence to allow through inspection of the fence for integrity and to prevent inadvertent damage to the fence.
7. In construction areas where wildlife exclusion fencing is not installed, the CDFW/Service-approved biologist will monitor all construction activities involving vehicles and equipment movement or operating, including initial vegetation clearing/pruning, staging, and on-going construction.
8. To prevent the accidental entrapment of listed species during construction, all excavated holes or trenches deeper than 6 inches will be covered at the end of each work day with plywood or similar materials or an escape ramp will be provided (earthen or artificial). Foundation trenches or larger excavations that cannot easily be covered will be ramped at the end of the work day to allow trapped animals an escape method. Prior to the filling of such holes, these

areas will be thoroughly inspected for listed species by Service-approved biologists. In the event of a trapped animal is observed, construction will cease until the individual has been relocated to an appropriate location.

9. Only CDFW/Service-approved biologist(s) will conduct surveys, handle, and/or capture any ASR and CRLF.
10. If individual ASR and/or CRLF gain access to a construction zone, all work will be halted in the affected area and the CDFW/Service-approved biologist will be contacted immediately. All construction activities will be suspended in the immediate construction zone until the animal leaves the area voluntarily or is removed by the CDFW/Service-approved biologist to a release location using CDFW/Service-approved transportation techniques.
11. All trash and debris within the work area will be placed in containers with secure lids before the end of each work day in order to reduce the likelihood of predators being attracted to the site by discarded food rappers and other rubbish that may be left on-site. Containers will be emptied as necessary to prevent trash overflow onto the site and all rubbish will be disposed of at an appropriate off-site location.
12. To minimize temporary disturbances, all project-related vehicle traffic will be restricted to established roads, construction areas, and other designated areas. These areas also should be included in pre-construction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects. Project-related vehicles will observe a 10-mile per hour maximum speed limit within construction areas. Off-road traffic outside of designated construction areas will be prohibited.
13. All construction activities must cease one half hour before sunset and should not begin prior to one half hour after sunrise. There will be no nighttime construction.
14. Initial vegetation removal and all grading will be limited to the dry season, typically May-October.
15. To avoid injury or death of the ASR and/or CRLF, no firearms will be allowed on the project site except for those carried by authorized security personnel, or local, State, or Federal law enforcement officials.
16. To prevent harassment, injury or mortality of ASR and/or CRLF, no canine or feline pets will be permitted in the construction area.
17. All fueling and maintenance of vehicles and other equipment will occur at least 100 feet from any riparian habitat or aquatic habitat.
18. Best Management Practices (BMPs), as identified by the Regional Water Quality Control Board and the Storm Water Pollution Prevention Plan (SWPPP), will be implemented to

control erosion during and after project implementation.

19. The Oakland Zoo will ensure a readily available copy of the biological opinion is maintained by the construction foreman/manager on the project site whenever earthmoving and/or construction is taking place. The name and telephone number of the construction foreman/manager will be provided to the CDFW and Service prior to groundbreaking.
20. The CDFW/Service-approved biologist will take precautions to prevent introduction of amphibian diseases to the construction area by disinfecting equipment and clothing as recommended equipment decontamination procedures within the Service's CRLF Survey Guidance (available at <http://www.fws.gov/sacramento/es/protocol.htm>). Disinfecting equipment and clothing is especially important when biologists are coming to the construction area to perform in-channel surveys and monitoring after working in other aquatic habitats.
21. Plastic mono-filament netting (erosion control matting) or similar material will not be used at the project site because ASRs and/or CRLFs may become entangled or trapped in it. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.
22. Injured ASRs and/or CRLFs will be cared for by a licensed veterinarian or other qualified person such as the on-site CDFW/Service-approved biologist; dead individuals of any of these two listed species will be preserved according to standard museum techniques and held in a secure location. The CDFW and Service will be notified within one (1) working day of the discovery of death or injury to an ASR and/or CRLF that occurs due to project-related activities or is observed at the project site. Notification will include the date, time, and location of the incident or of the finding of a dead or injured animal clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service and/or CDFW, and any other pertinent information.
23. The Oakland Zoo will submit a post-construction compliance report prepared by the CDFW/Service-approved biologist to the Sacramento Fish and Wildlife Office of the Service and the Yountville Bay Delta Branch of CDFW within forty (40) working days following project completion or within sixty calendar days of any break in construction activity lasting more than forty (40) working days. This report will detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting compensation and other conservation measures; (iii) an explanation of failure to meet such measures, if any; (iv) known project effects on the ASR and/or CRLF, if any; (v) occurrences of incidental take of any of these three species; (vi) documentation of employee environmental education; and (vii) other pertinent information.

California Red-legged Frog Specific Measures

24. All vegetation which obscures the observation of wildlife movement within the affected areas containing or immediately adjacent to Arroyo Viejo Creek will be completely removed by hand just prior to the initiation of grading to remove cover that might be used by CRLF. The CDFW/Service-approved biologist will survey these areas immediately prior to vegetation removal to find, capture and relocate any CRLFs, as approved by the CDFW and Service.
25. The coffer dam to be installed during in-channel construction along Arroyo Viejo Creek will be designed to ensure that sufficient water is allowed to pass downstream at all times to maintain aquatic life below the isolated construction area, and installation will be overseen by the CDFW/Service approved biologist. A detailed Dewatering/Diversion Plan will be prepared for review and approval by the Building Services Division of the City of Oakland prior to initiating any in-channel construction activities. The following practices will be identified in the Dewatering/Diversion Plan:
- a) All dewatering and diversion practices will be consistent with the requirements of the Streambed Alteration Agreement from the CDFW, the 401 Certification from the Regional Water Quality Control Board (RWQCB), and the Nationwide Permit from the U.S. Army Corps of Engineers.
 - b) Ensure that construction and operation of the devices meet the standards in the latest edition of the Erosion and Sediment Control Field Manual published by the RWQCB.
 - c) Construct coffer dam and/or water diversion system of a non-erodible material which will cause little or no siltation. Maintain coffer dams and the water diversion system in place and functional throughout the construction period. If the coffer dams or water diversion system fail, repair immediately based on the recommendations of a qualified environmental consultant. Remove devices only after construction is complete and the site stabilized.
 - d) Pass any pumped water through a sediment settling device before returning the water to the stream channel.
 - e) Provide velocity dissipation measures at the outfall to prevent erosion.
 - f) If the in-channel work in Arroyo Viejo Creek is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh no larger than ¼ inch millimeters.
 - g) Water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction.
 - h) Upon completion of construction activities, any barriers to flow will be removed in a manner that would allow flow to resume with the least disturbance to the substrate.
26. During dewatering of the in-channel construction area along Arroyo Viejo Creek, the CDFW/Service approved biologist will relocate any captured native fish, wildlife, and aquatic animals to the nearest suitable location along the creek. The CDFW/Service approved biologist will be present during any dewatering of the in-channel construction area to confirm that no stranded aquatic life remains within the dewatering area. Capture methods may include fish landing nets, dip nets, buckets, and by hand. Suitable relocation areas will be

identified by the CDFW/Service approved biologist before any dewatering activities are initiated to minimize the length of time animals are in captivity during relocation.

27. The CDFW/Service-approved biologist will permanently remove from within the project construction area along Arroyo Viejo Creek, any individuals of exotic species, such as bullfrogs, crayfish, and centrarchid fishes, to the maximum extent possible. The applicant will have the responsibility to ensure that their activities are in compliance with the California Fish and Game Code.
28. The CDFW/Service-approved biologist will conduct a preconstruction survey for CRLF in the vicinity of the in-channel construction area along Arroyo Viejo Creek immediately prior to construction activities. If CRLFs, tadpoles, or eggs are found, the CDFW/Service-approved biologist will contact the CDFW and Service to determine if moving any of these life-stages is appropriate, and will provide a draft relocation plan identifying the proposed location for relocation. In making this determination the CDFW and Service will consider if an appropriate relocation site exists as provided in the relocation plan. If the Service approves moving animals, the CDFW/Service-approved biologist will be allowed sufficient time to move California red-legged frogs from the work site before work activities begin. Only CDFW/Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of CRLFs.
29. Clean bare hands will be used to capture/touch CRLFs. Service-approved biologists will not use soaps, oils, creams, lotions, repellents, or solvents of any sort on their hands within two hours before and during periods when they are capturing and relocating individuals.

Invasive Species Control and Habitat Enhancement Measures

30. The Oakland Zoo will ensure that the spread or introduction of invasive exotic plant species is avoided to the maximum extent possible, and will provide for on-going monitoring and removal of target invasive species within the construction area and compensatory mitigation lands for ASR. Invasive species removal and monitoring will be accomplished consistent with the implementing actions in the Invasive Species Element of the Habitat Enhancement Plan for Knowland Park (HEP). These will include the following practices and standards for initial removal, monitoring and on-going maintenance:
 - a) Target invasive species will be removed during Project construction, and on-going monitoring of construction areas and compensatory mitigation lands for ASR will be provided to prevent re-establishment. Target invasive plant species include: French broom (*Genista monspessulana*), blue gum eucalyptus (*Eucalyptus globulus*), green wattle (*Acacia decurrens*), blackwood acacia (*Acacia melanoxylon*) artichoke thistle (*Cynara cardunculus*), sweet fennel (*Foeniculum vulgare*), yellow star thistle (*Centaurea solstitialis*), German ivy (*Senecia mikanioides*), Algerian ivy (*Hedera helix* ssp. *canariensis*), periwinkle (*Vinca major*), Himalayan blackberry (*Rubus discolor*) pampas grass (*Cortaderia selloana*), and giant reed (*Arundo donax*). The list of target species will be adjusted as additional invasive species may become established and problematic, but

generally will include any species listed as having a “high” and “moderate” rating for “Invasive Non-Native Plants that Threaten Wildlands in California” according to the electronic Inventory of the California Invasive Species Council (Cal IPC).

- b) Treatment of target invasive species will be adaptive to site conditions and successful treatment methods, and will use best available practices, including hand pulling, cutting followed by topical application of appropriate herbicide, livestock grazing, and removal and burning of cut plant materials, as appropriate.
- c) Stands of target species will be mapped prior to removal and treatment, with estimates of absolute cover class identified for the target species, other vegetative cover, and any native species component as part of baseline data collection.
- d) Successive treatment will be performed until the target species have been effectively controlled from the treatment area and comprise less than five percent of the absolute cover. Additional treatment for invasives will be applied to the treatment area whenever the target species collectively comprise more than five percent of the absolute cover during annual monitoring required as part of the HEP.
- e) Where invasive species have displaced native grasslands and removal of the invasives would leave bare ground over ten percent or more of the treatment area with an absolute cover for the remaining vegetation of less than 90 percent, grassland cover will be re-established and enhanced in natural areas outside of improvements and animal enclosures as described in the Native Revegetation Element of the HEP.

31. The Oakland Zoo will provide for the protection of native vegetative cover outside the limits of grading and for revegetation of natural areas disturbed by construction or invasive species removal within the construction area and compensatory mitigation lands for ASR. Native vegetation protection and revegetation will be accomplished consistent with the implementing actions in the Grassland Protection and Enhancement Element, the Native Revegetation Element, the Native Tree Protection and Replacement Element, and the Species Protection Element of the HEP. These will include the following practices and standards for initial protection, revegetation, and on-going monitoring and maintenance:

- a) Stands of native grasslands to be protected within the California Exhibit area will be designated as “Protected Native Grasslands” on all relevant improvement and management plans. The annual monitoring reports required under the Implementation Element of the HEP will include a review of the status of these Protected Native Grasslands.
- b) Prior to any site grading or grubbing, the limits of areas to be preserved as native grassland within the California Exhibit will be flagged by engineered survey at a minimum 50-foot intervals in the field. Protective fencing will be installed under the supervision of a qualified biologist along this boundary to encompass the entire stand of native grassland to be protected in each location. No construction equipment disturbance will be allowed within these areas, unless conducted under the supervision of the qualified biologist and no grading or excavation is allowed. On-going removal of invasive species and other vegetation management activities may continue within these areas. Following the completion of construction within the vicinity of the protected stands of native grassland, the temporary construction fencing will be removed.

- c) All workers will be trained by the qualified biologist regarding the sensitivity of the native grasslands, protected trees, brittleleaf manzanita, and chaparral habitat to be preserved, and the need to remain outside the limits of the protective fencing/flagging at all times.
- d) Grasslands will be re-established and enhanced as described in the Native Revegetation Element of the HEP in natural areas where invasive species have displaced vegetation and removal of the invasives would leave bare ground over ten percent or more of the treatment area with an absolute cover for the remaining vegetation of less than 90 percent.
- e) Grassland revegetation will emphasize seeding of treatment areas with an appropriate mix of native grasses and forbs indigenous to Knowland Park, supplemented by plug and container plantings of native grasses and forbs where the average absolute cover values for grassland species is less than 40 percent in treatment areas due to competitive shading from invasive species. **Table 4** provides a list of native grassland species suitable for seeding and/or planting installation as part of grassland revegetation, and defines general methods that will be used during revegetation efforts. The seed mix and rates of application will be adjusted based on location-specific conditions, including absolute cover values of the remaining native and non-native grassland species, slope and exposure, successional trends to other cover types such as scrub and woodland, and other factors.
- f) Any areas receiving native revegetation will be monitored annually as part of an overall Annual Assessment program of the HEP, and maintained as necessary to ensure successful establishment. Performance and success criteria may be refined for each treatment area, but will provide for a minimum survival rate of 80 percent for all plantings, demonstrate that invasive species comprise less than five percent of the absolute cover, and that bare ground comprises no more than the percentage of bare ground before invasive species are initially removed. Maintenance will include follow-up invasive species removal, possible replacement replanting, and successive reseeding if plant survival and absolute cover rates for revegetation are not achieved.
- g) The remaining grassland habitat within the developed California Exhibit will also be managed as grasslands where preservation and enhancement is feasible. In areas outside of improvements (i.e. structures, pathways, animal enclosures and required landscape plantings), the remaining grasslands will be managed as natural habitat with appropriate invasive species controls and native species enhancement plantings. Within animal enclosures where grazing and trampling may prevent long-term establishment and retention of native grasses and forbs, native and non-native grassland cover will be retained through adaptive management practices that may include use of artificial irrigation, reseeding and replanting with non-invasive species, excluding exhibit animals from portions of their enclosure to control disturbance during critical periods of establishment by subdividing the enclosure areas and rotating access accordingly, and other appropriate techniques.

32. The Project will allow for continued movement of ASR through the vicinity following construction and minimize disturbance to core chaparral habitat through the following provisions and restrictions:

- a) The service road between the Veterinary Hospital and California Interpretive Center will be a maximum of 15 feet in width and designed to accommodate crossing by ASR and other wildlife.
 - b) The perimeter fence will be permeable to ASR to allow for unrestricted movement through the area, and native chaparral and shrub species will be allowed to regrow up to and through the fence following installation.
 - c) Protective cover for ASR will be maintained in the bison/tule elk exhibit expansion area through a restriction on the number of animals housed to a maximum of 20 bison and 20 tule elk, maintaining protective cover by creating irrigated pasture outside woodland habitat, and placing rock outcrops and logs to serve as refugia and movement pathways for dispersing snakes.
 - d) All maintenance of native scrub or chaparral vegetation will be done by hand with clippers, axes or machetes. Chain saws could be used for larger shrubs.
 - e) A CDFW/Service-approved biologist will monitor all vegetation maintenance activities in scrub or chaparral habitat which may impact the ASR.
 - f) To reduce the potential for ASR mortality on the service road and other roadways in the construction area, a maximum speed of ten miles per hour will be required and all personnel driving will be instructed to watch for and yield to all wildlife.
33. To improve habitat for ASR due to the effects of fire suppression on plant succession in the chaparral, selective removal of sapling coast live oaks with trunk size of under four inches diameter at breast height (dbh) or California bay trees with trunks of under nine inches dbh will be performed under the supervision of the qualified biologist within the compensatory mitigation lands for ASR on an annual basis where these species are spreading into chaparral vegetation and threatening to eventually shade out chaparral cover in areas important to ASR. The native oak and bay removal will be carefully accomplished to avoid any loss of individual brittleleaf manzanita plants, and shall be designed to improve light conditions through removal of sapling trees and selective removal of limbs and canopy cover of larger trees.
34. If natural disturbances (fire, slumps, vegetation dye-off) occur within the compensatory mitigation area that require efforts to restore cover, only native species indigenous to the local area will be used and the same vegetation community type will be restored. Visual surveys for ASR will be conducted immediately prior to restoration-related work, and on-going during restoration activities that could result in possible inadvertent take of ASR.

7.2 Compensatory Mitigation for Project

In order to mitigate for actual and potential permanent full loss of 5.91 acres of potential habitat, the potential moderate reduction in habitat value for 3.55 acres of ASR habitat, the permanent low (if any) reduction of habitat value of 6.60 acres of ASR habitat, and the temporary impacts to 4.77 acres of potential ASR habitat (**Table 3**), the project will permanently preserve and manage 46.35 acres of ASR habitat through establishment of a conservation easement/deed restriction over 46.35 acres in Knowland Park in the immediate vicinity of the California Exhibit

(**Table 5**). Mitigation ratios proposed would achieve a 3:1 ratio for permanent or potentially permanent losses resulting from the California Exhibit, a 2:1 ratio for habitats where there is a low potential for reduction in habitat value within animal enclosures remaining as native vegetation and located outside the main exhibit walkway, and 1:1 for temporary losses during construction (**Table 3**). Mitigation ratios for these impacts were deemed suitable based on previous resource consultation documents including the Eastern Alameda County Conservation Strategy (EACCS). The proposed 3:1 ratio for permanent losses is higher than in the EACCS accepted ratio provisions, which is 2.5:1. In addition, the habitat in the area being preserved within the conservation easement/deed restriction is of far higher quality and value to the ASR than the habitat that is being affected by the project.

A 2:1 ratio is proposed for habitats where there is a potential for a low reduction, if any, in habitat value within animal enclosures remaining as native vegetation on the outer perimeter of the project with a direct and large connection to the undeveloped habitat. A ratio of 1:1 is proposed for temporary impacts due to project construction (**Table 5**).

Figure 11 shows the location of the proposed 46.35 acre conservation easement/deed restriction area near the California Exhibit, encompassing parts of the Ecological Recover Zone within the secure perimeter fence and the chaparral and woodland dominated slopes to the north that are largely inaccessible to humans because of the dense vegetation and steep slopes. Habitat within the area proposed as compensatory mitigation is the highest quality ASR habitat in Knowland Park and includes a large stand of open canopy chamise chaparral, where thin rocky soils and southerly aspects are expected to deter succession of the habitat to woodland. Some removal of sapling oaks and bays may be warranted as part of vegetation management to prevent further encroachment into chaparral habitat. Habitat proposed for the compensatory mitigation is located primarily within the perimeter fence (32.51) and to the north of the perimeter fence in rugged terrain away from the developed areas and where future trails (formal or informal) would be infeasible (13.84 acres). The conservation easement/deed restriction area will be authorized by USFWS and CDFW and may contain the following elements:

- The conservation easement/deed restriction area is located within Knowland Park in the vicinity of the California Exhibit. The conservation easement/deed restriction will be placed on land zoned for Urban Open Space thus taking it out of potential for future development and habitat modification that would be allowed without the conservation easement/deed restriction.
- No new roads or trails will be constructed in the conservation easement/deed restriction area
- No new structures will be placed in the conservation easement/deed restriction area,
- The conservation easement/deed restriction area will be managed for the benefit of the ASR.

- Access to most of the conservation easement/deed restriction area by the general public will be prevented by the new perimeter fence and will be restricted by the dense scrub and chaparral vegetation present, installation of signage, lack of trail access, and steep terrain. Access for interpretive programs associated with the Overnight Experience will be only with trained Zoo personnel at limited times and only along the existing fire road to the camp area.
- The resource agencies will have access to the conservation easement/deed restriction area for inspection of habitat conditions and compliance with management provisions and restrictions.
- An endowment for the management of the conservation easement/deed restriction area will be established.
- Timing and methods for invasive species removal, controls on herbicide application, and worker training programs are detailed in the proposed Conservation Measures, and have been prepared consistent with the HEP for Knowland Park (see Appendix B).
- Habitat restoration within the conservation easement/deed restriction area will be achieved through control of non-natives that are detrimental to ASR habitat quality, through selective removal of native tree saplings in specific areas, and revegetation with native species as detailed in the proposed Conservation Measures.
- Success Criteria: Continual reduction of the distribution of shrubs and trees that negatively impact the quality of vegetative cover for the ASR will be the primary criteria for success of the mitigation. As indicated in the above Conservation Measures, initial efforts for control of invasive plants/communities will focus in the conservation easement/deed restriction area proposed for compensatory mitigation purposes, consistent with the provisions of the HEP for Knowland Park (Environmental Collaborative 2011). Monitoring of the progress of invasive plant control and reduction will be accomplished through field mapping, photo monitoring stations that record results on an annual basis over time. Areas not currently invaded by broom and other invasive non-native shrubs will also be monitored to ensure they remain free of these invasive plants.

8.0 Determination

The ASR was identified as occurring within the proposed Project Area. Protocol level surveys done in 1998-1999 and 2009-2010 found a single adult male in three different traplines in 2010 (Swaim 2011). Although the Project Area includes large areas of physically suitable core typed habitat, there is poor connectivity between Knowland Park and the nearest reported ASR locality to the east at Anthony Chabot Regional Park. Golf Links Road and Skyline Boulevard separate these two areas, which are considered a significant deterrent to movement to ASRs potentially

moving into the project area (Swaim 2011). The capture of only a single male ASR, despite the extensive trapping surveys indicates there is a potential that Knowland Park currently does not support a viable breeding population of ASR. In addition, the minimal connectivity to other open spaces that do support or may support ASR leaves minimal potential for recolonization of Knowland Park.

The project will permanently affect acres of habitat potentially of value to the ASR of which 9.46 acres is a permanent total loss (5.91 acres, see **Table 3**) consisting of the hardscape of facilities, walking paths and roads or potentially a permanent loss (3.55 acres see **Table 3**) consisting of areas that have native vegetation and connection to open space, but are within the main walkways of the exhibit. The remaining 6.6 acres of potential habitat is considered a permanent effect but not a total loss of habitat as it includes the areas within animal enclosures that will be managed to retain natural vegetative cover, are relatively large housing limited numbers of native California species and are permeable and contiguous with the undeveloped areas of Knowland Park. These managed enclosure areas will continue to provide important habitat value for ASR. Temporary impacts to 4.77 acres of potential ASR habitat will result from access road construction and installation of the perimeter fence, but will revert or be restored to habitat of at least equal value.

The analysis included herein concludes that the proposed Project “may affect” and is “likely to adversely affect” the ASR. The proposed Conservation Measures contained within this Revised Biological Assessment includes numerous protection and minimization measures that have been incorporated into the Project design and calls for the permanent protection of suitable habitat to offset the potential impacts on ASR. Implementation of the proposed Conservation Measures and compensation measures described in Sections 7.1 and 7.2, respectively, will offset the net effects to the ASR and ensure that the Project will not appreciably diminish the chances of survival or recovery of the ASR, and would ensure the Project would not adversely affect CRLF in the remote instance this species was encountered along Arroyo Viejo Creek.

As required by Section 7 of the Endangered Species Act, the applicant is requesting formal consultation with your office on the effects of the proposed Project on the ASR and CRLF. No other State and/or federally-listed or candidate species would be directly or indirectly affected by the proposed Project.

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10.0 List of Preparers

Jeff Mitchell, SBI Senior Biologist

Karen Swaim, SBI Principal and Herpetologist

Common Name	Scientific Name	Status	Associated habitats	Potential for Occurrence
Invertebrates				
Vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	FT/-	Vernal pools, depressions in sandstone outcrops	Not expected to occur. Suitable habitat does not exist onsite.
Mission blue butterfly	<i>Icaricia icarioides missionensis</i>	FE/-	Coastal scrub habitat with perennial lupine host plants	Not expected to occur. Outside known range of species.
Callippesilverspot butterfly	<i>Speyeria callippe callippe</i>	FE/-	Native grassland and adjacent habitats with Johnny jump-up (<i>Viola pendunculata</i>) host plants.	Not expected to occur. Suitable habitat does not exist onsite.
Bay checkerspot butterfly	<i>Euphydra seditha bayensis</i>	FT/-	Serpentine soils with dwarf plantain (<i>Plantago erecta</i>) and sometimes purple owl clover (<i>Castilleja exserta</i>) host plants	Not expected to occur. Suitable habitat does not exist onsite.
Fish				
Green sturgeon	<i>Acipenser medirostris</i>	FT/SS C	Oceans, bays and estuaries. Freshwater habitats include river mainstems. May remain in freshwater up to 2 years	Not expected to occur. Suitable habitat does not exist onsite
Tidewater goby	<i>Eucyclogobius newberryi</i>	FE/SS C	Coastal lagoons, estuaries, and marshes in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary.	Not expected to occur. Suitable habitat does not exist onsite
Delta smelt	<i>Hypomesus transpacificus</i>	FT/SE	San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Spawn in tidally influenced backwaters	Not expected to occur. Suitable habitat does not exist onsite
Central California coast coho salmon	<i>Onchorhynchus kisutch</i>	FE/SE	Coastal streams of California, but thought to be rare in the Sacramento-San Joaquin Delta Estuary.	Not expected to occur. Suitable habitat does not exist onsite
Central California coastal steelhead	<i>Onchorhynchus mykiss</i>	FT/-	Inland streams including the Sacramento and San Joaquin Rivers	Not expected to occur. Suitable habitat does not exist onsite
Central Valley steelhead	<i>Onchorhynchus mykiss</i>	FT/-	Inland streams including the Sacramento and San Joaquin Rivers	Not expected to occur. Suitable habitat does not exist onsite
Central Valley spring-run chinook salmon	<i>Onchorhynchus tshawytscha</i>	FT/ST	Oxygenated streams and mainstem of Sacramento River	Not expected to occur. Suitable habitat does not exist onsite
Central Valley winter-run chinook salmon	<i>Onchorhynchus tshawytscha</i>	FE/SE	Oxygenated streams and mainstem of Sacramento River	Not expected to occur. Suitable habitat does not exist onsite
Amphibians				
CRLF	<i>Rana draytonii</i>	FT/SS C	Still or slow-moving water with emergent or riparian vegetation (Breeding), Cool, moist areas with adequate cover (non-breeding).	Unlikely to occur. Potential foraging habitat exists along Arroyo Viejo Creek but suitable breeding habitat does not exist onsite or within a mile or more of the site.
Critical habitat, CRLF	<i>Rana draytonii</i>	FT	Still or slow-moving water with emergent or riparian vegetation (Breeding), Cool, moist areas with adequate cover (non-breeding).	Does not occur. Critical habitat does not exist onsite.
Reptiles				
Alameda striped racer	<i>Masticophis lateralis euryxanthus</i>	FT/ST	Chaparral and scrub habitats, adjacent grasslands, oak savanna and woodland habitats.	Present on the site.

Giant garter snake	<i>Thamnophis gigas</i>	FT/ST	Aquatic sites with adequate water, emergent vegetation, prey items, upland refuges and retreats.	Not expected to occur. Suitable habitat does not exist onsite.
Birds				
Western snowy plover	<i>Charadrius alexandrinus nivosus</i>	FT/SS C	Sandy beaches, salt pond levees and shores of large alkali lakes.	Not expected to occur. Suitable habitat does not exist onsite.
California clapper rail	<i>Rallus longirostris</i>	FE/SE/ FP	Saline, brackish, and fresh emergent wetlands in the San Francisco Bay area. Nest in dense stands of pickleweed.	Not expected to occur. Suitable habitat does not exist onsite.
California black rail	<i>Laterallus jamaicensis coturniculus</i>	-/ST	Primarily found in tidal salt marshes in San Francisco Bay area, but may also occur in freshwater marshes	Not expected to occur. Suitable habitat does not exist onsite.
California least tern	<i>Sternula antillarum</i>	FE/SE/ FP	Shoreline habitat in the San Francisco Bay. Lay eggs on barren or sparsely vegetated sand or gravel beaches.	Not expected to occur. Suitable habitat does not exist onsite.
Western yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>	FC/SE	Riparian areas for breeding and foraging.	Not expected to occur. Suitable habitat does not exist onsite.
Mammals				
Salt marsh harvest mouse	<i>Reithrodontomys raviventris</i>	FE/SE/ FP	Dense saltwater marsh vegetation; mostly in higher marsh pickleweed.	Not expected to occur. Suitable habitat does not exist onsite.
Alameda island mole		-/SSC	Known only from Alameda Island but may occupy salt marshes in other portions of San Francisco Bay.	Not expected to occur. Suitable habitat does not exist onsite.
Plants				
Pallid manzanita	<i>Arctostaphylos pallida</i>	FT/SE	Chaparral and woodland.	Not expected to occur. Suitable habitat does exist but not historically documented or observed in botanical or tree survey.
Presidio clarkia	<i>Clarkia franciscana</i>	FE/SE	Grassland and coastal scrub (serpentine).	Not expected to occur. Suitable habitat does not exist onsite.
Santa Cruz tar plant	<i>Holocarpha macradenia</i>	FT/SE	Coastal prairie, valley and foothill grassland.	Not expected to occur. Suitable habitat present but not historically documented or observed in botanical surveys onsite.
Contra Costa goldfields	<i>Lasthenia conjugens</i>	FE/-	Native grassland vernal pools.	Not expected to occur. Suitable habitat does not exist onsite.
California sea blite	<i>Suaeda californica</i>	FE/-	Tidally influenced salt marshes and estuarine habitats in the San Francisco Bay.	Not expected to occur. Suitable habitat does not exist onsite.
Robust spine flower	<i>Chorizanthe robusta</i> var. <i>robusta</i>	FE/-	Sandy soils in coastal and near-coastal areas in Santa Cruz and Marin Counties. Historic record occurs 5 mi. east of the Project Area.	Not expected to occur. Suitable habitat does not exist onsite.

Table 1. Special status species with potential to occur in project vicinity

Table 2. Alameda Striped Racer Observations in the Project Region.

Location	Distance (miles) and direction from Site	Year of Observation	Source
Knowland Park-Project Area	0	2010	Swaim
Chabot Regional Park	1.62 /NE	2006	CNDDDB
Chabot Regional Park	1.75/ E	2006	CNDDDB
USLRW	2.35,	2008	CNDDDB
USLRW	2.44	2008	CNDDDB
Merit College Area	2.8	194? - uncertain	Museum Spec.
Leona Heights Park	3.0 miles/North	1953	CNDDDB

CNDDDB= California Natural Diversity Data Base
 USLRW= Upper San Leandro Reservoir Watershed.

Table 3. Potential Alameda Striped Racer Habitat affected by the Project.

Permanent Affects (Acres)						
	Habitat Type Affected ²					
Disturbance Level	CC	DSS	CBS	GSL	OW	TOTAL
Low disturbance level (green)	0.32	0.00	1.93	2.33	2.02	6.60
Limited disturbance level (blue)	0.03	0.00	1.26	1.22	1.04	3.55
Full or Potentially Full Disturbance (red)	0.01	0.01	1.28	3.65	0.96	5.91
Total Permanent	0.36	0.02	4.62	7.84	4.22	16.06
Fire and Fuel Management	0.17	0.06	0.15	0.87	0.48	1.73
Temporary Affects (Acres)						
	Habitat Type Affected					
Type of Impact	CC	DSS	CBS	GSL	OW	TOTAL
Temp grading (to be restored)	0.03	0.23	0.24	1.93	0.12	2.55
Temp. const. access (to be restored)	0.06	0.00	0.11	0.10	0.09	0.36
Snowdown EVA (upgrade of existing dirt road)	0.00	0.00	0.05	0.57	0.00	0.62
Perimeter fence (habitat will revert)	0.07	0.00	0.15	0.43	0.53	1.18
Install utility to Edgemont	0.00	0.00	0.00	0.06	0.00	0.06
Total Temporary	0.16	0.23	0.45	3.09	0.74	4.77

CC=Chamise Chaparral Woodland DSS=Diablan Sage Scrub CBS= Coyote Brush Scrub GSL= Grassland OW= Oak

² 2.31 acres in the expansion footprint consisting of 2.15 acres of existing fire roads, 0.05 acres of ornamental and 0.11 acres of French broom were not considered potential ASR habitat.

Table 4. Native Plant Species Suitable for Project Applications On-site.

Grassland Species	General Treatment Methods
Grasses	
California brome (<i>Bromus carinatus</i>)	<ul style="list-style-type: none"> • Seed will be applied before onset of fall rains, generally prior to November 1. Seed source will be as local as possible, supplied on a basis of Pure Live Seed (PLS), and not contain an excess of one percent (1%) of weed seed. • Plantings will be installed during wet period between November 15 and January 15. • Appropriate browse protection will be used where necessary during initial establishment, including protection from livestock grazing used for fire fuel management. • Revegetation treatment will occur for areas where removal of the invasive vegetation would leave an average absolute cover of less than 90 percent for the remaining plant cover in treatment areas. • Seed mix and rate of application will be adjusted based on location-specific conditions, including absolute cover values of the remaining native and non-native grassland species, slope and exposure, successional trends to other cover types such as scrub and woodland, and other factors. • Plug and container plantings of native grasses and forbs will be used to supplement seeding in treatment areas where average absolute cover values for grassland species is less than 40 percent in treatment areas due to competitive shading from invasive species. • Annual monitoring and maintenance of treatment areas will be provided to ensure the following performance standards are met on average for the treatment area: 1) achieve a minimum survival rate of 80 percent for all plantings; 2) demonstrate that invasive species comprise less than 5 percent of the absolute cover; and 3) that bare ground comprises no more than the percentage of bare ground before invasive species are initially removed.
Creeping wildrye (<i>Elymus glaucus</i> ssp. <i>glaucus</i>)*	
California oatgrass (<i>Danthonia californica</i> var. <i>californica</i>)*	
Foothill needlegrass (<i>Nassella lepida</i>)*	
Meadow barley (<i>Hordeum brachyantherum</i>)	
Leafy bentgrass (<i>Agrostis pallens</i>)	
Pacific vulpia (<i>Vulpia microstachys</i> var. <i>pauciflora</i>)	
Purple needle-grass (<i>Nassella pulchra</i>)*	
Torrey's melic (<i>Melica torreyana</i>)	
Forbs	
Blue-eyed grass (<i>Sisyrinchium bellum</i>)*	
California poppy (<i>Eschscholzia californica</i>)	
Coast buckwheat (<i>Eriogonum nudum</i> var. <i>auriculatum</i>)*	
Dove lupine (<i>Lupinus bicolor</i>)	
Sticky cinquefoil (<i>Potentilla glandulosa</i>)*	
Yarrow (<i>Achillea millefolium</i>)*	

* Species suitable for both seeding and container/plug plantings.

Table 5. Compensatory mitigation for project impacts.

Permanent Impacts	Total	Mitigation Ratio	Mitigation Acreage
Actual or Potential Permanent Full Loss	9.46	3:1	28.38
Permanent Potential Low disturbance	6.6	2:1	13.20
TOTAL			41.58
Temporary Impacts	Total	Mitigation Ratio	Mitigation Acreage
Temporary Grading	2.55	1:1	2.55
Temporary Construction Access	0.36	1:1	0.36
Snowdown EVA	0.62	1:1	0.62
Perimeter Fence	1.08	1:1	1.18
Fire Road to Edgemont	0.06	1:1	0.06
TOTAL			4.77
TOTAL MITIGATION PROPOSED:			46.35

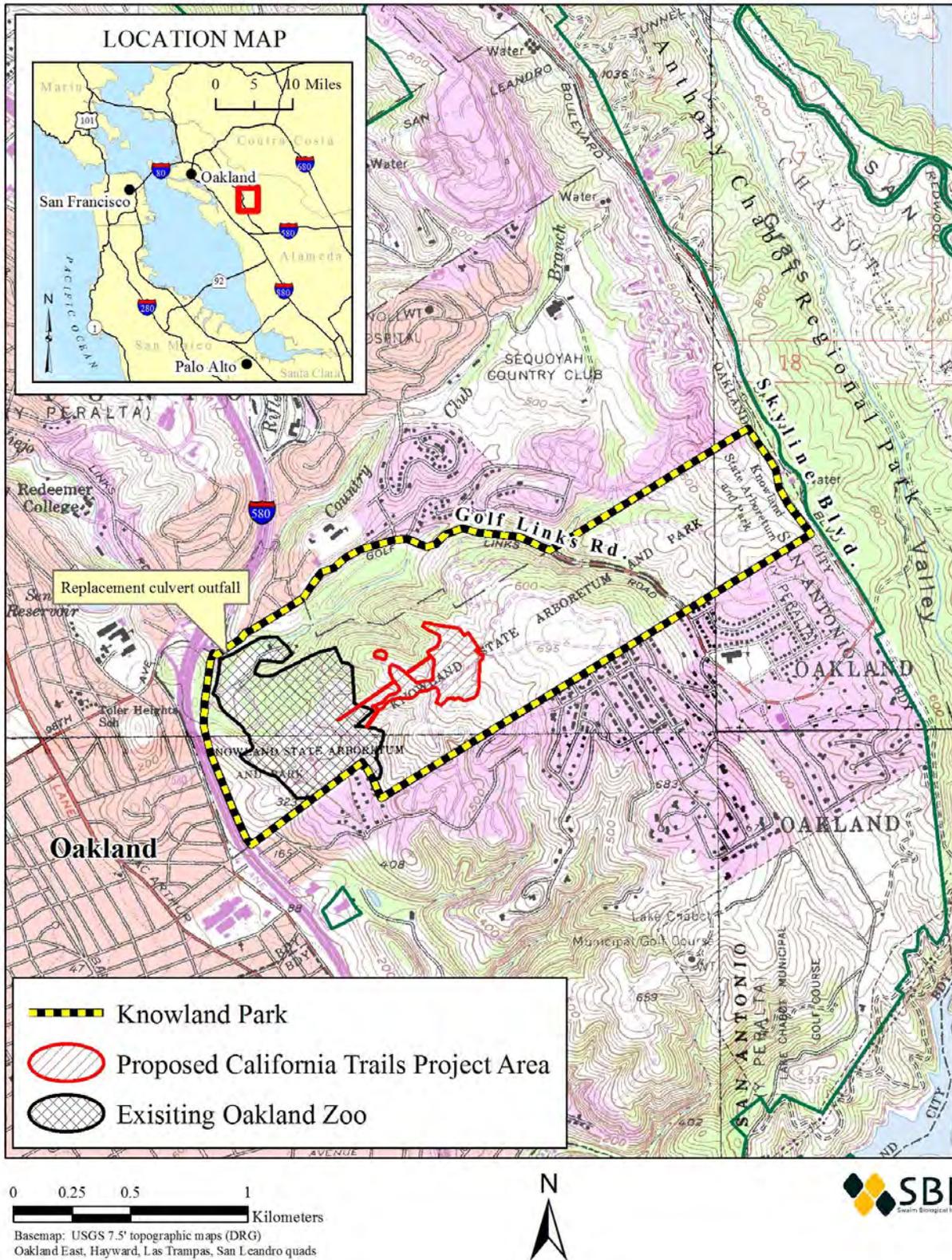


Figure 1. Project Location.

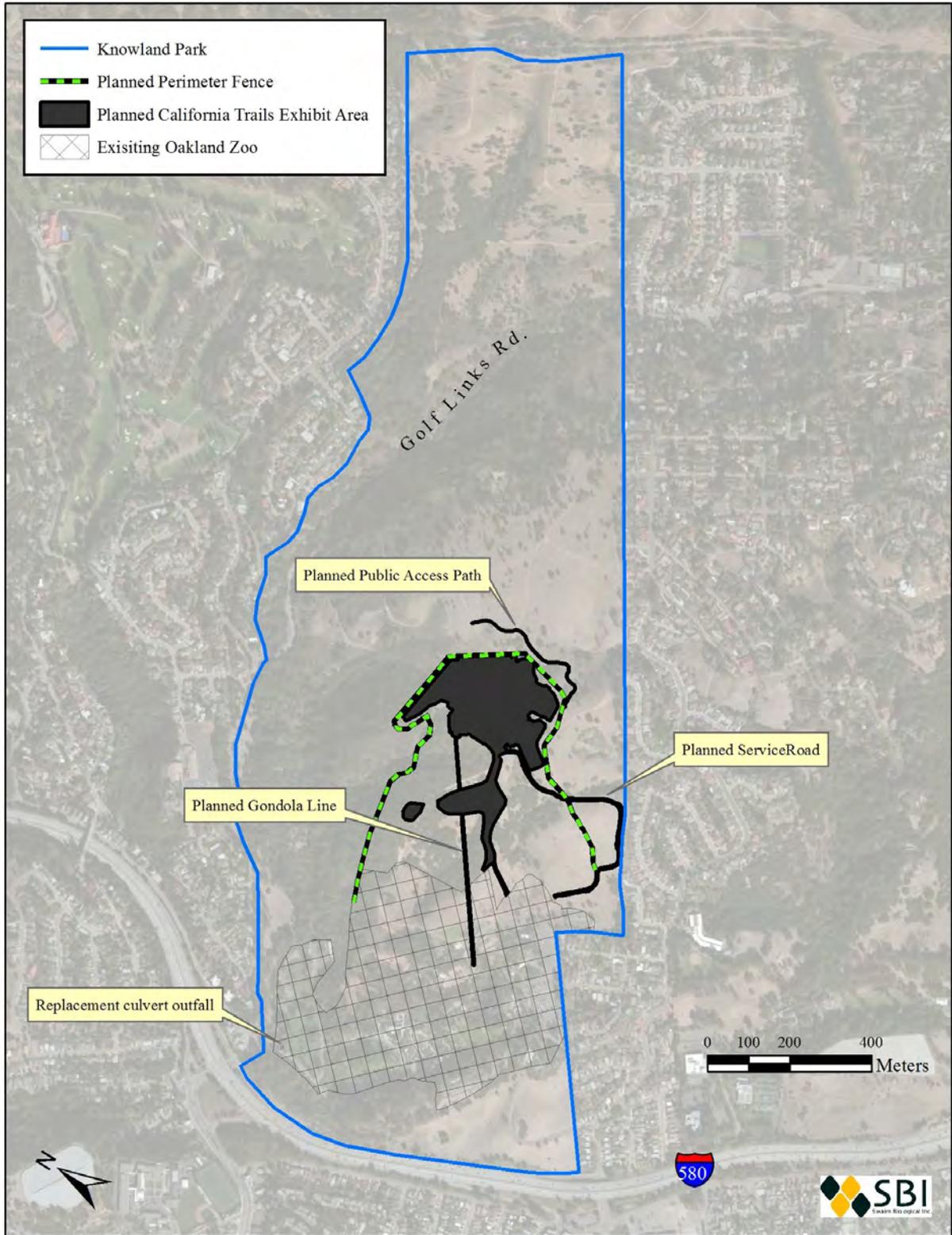
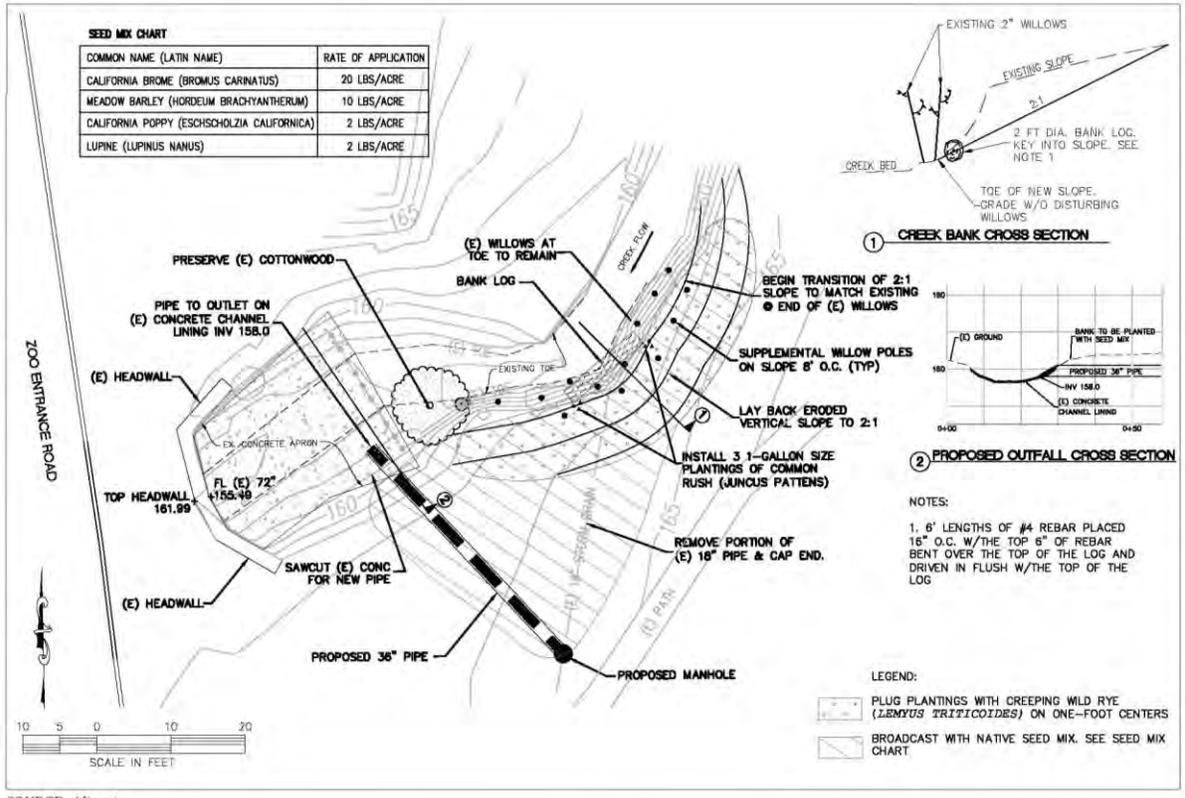


Figure 2. California Exhibit Project Overview.



SOURCE: Aliquot



Figure 3. Outfall Construction Layout and Field Conditions.

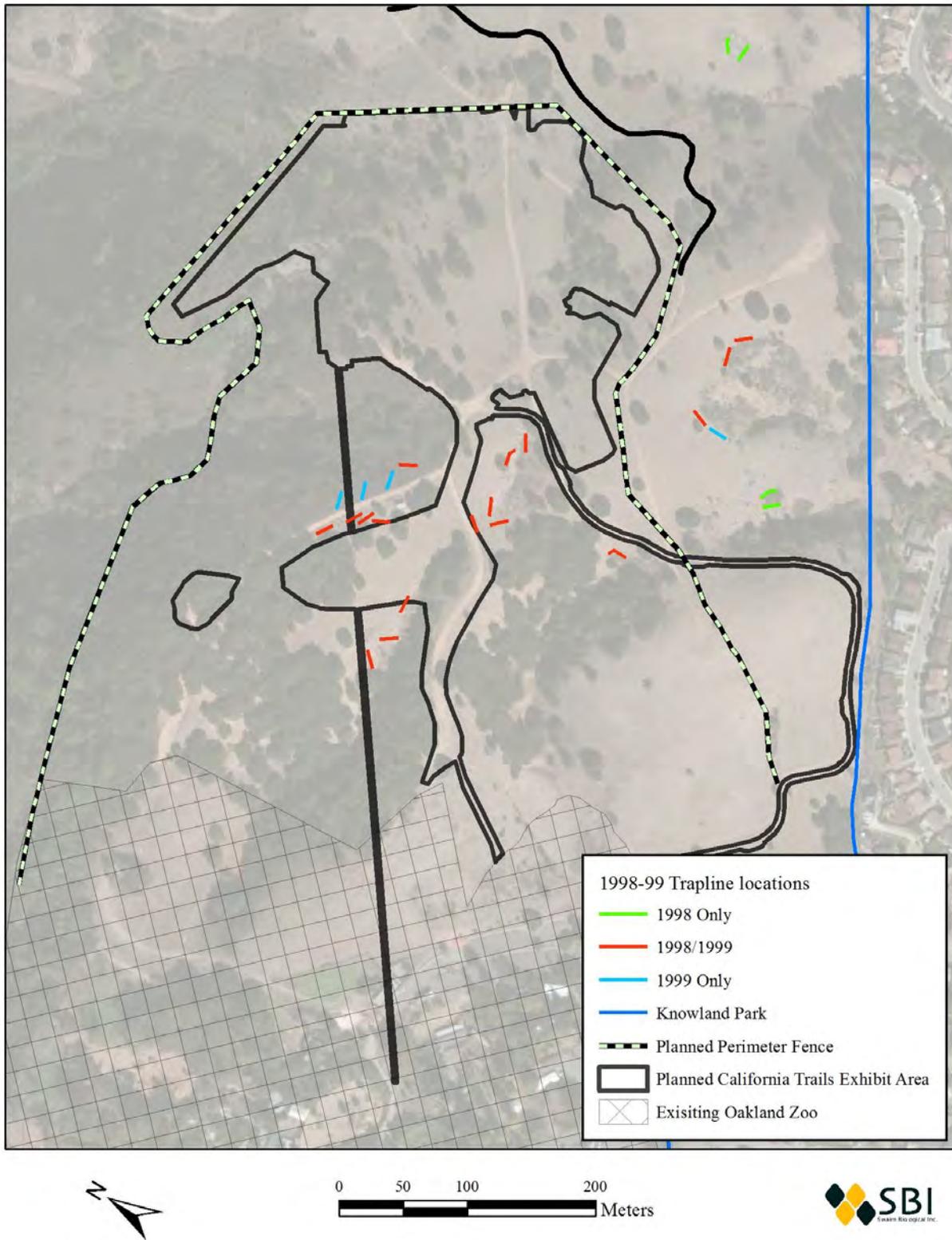


Figure 4. Trapline Placement for ASR Surveys Conducted in 1998 and 1999.

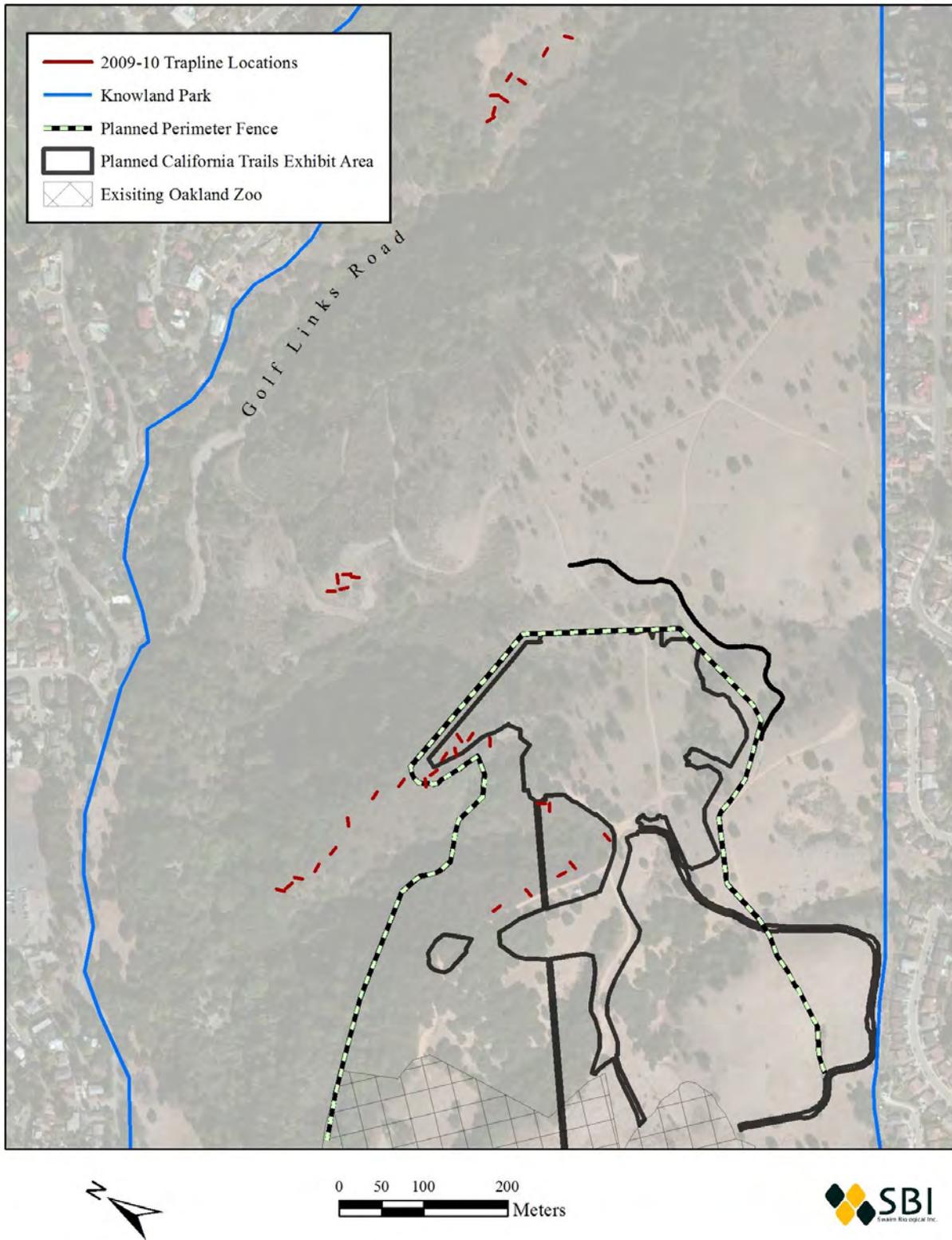


Figure 5. Trapline Placement for ASR Surveys Conducted in 2009 and 2010.

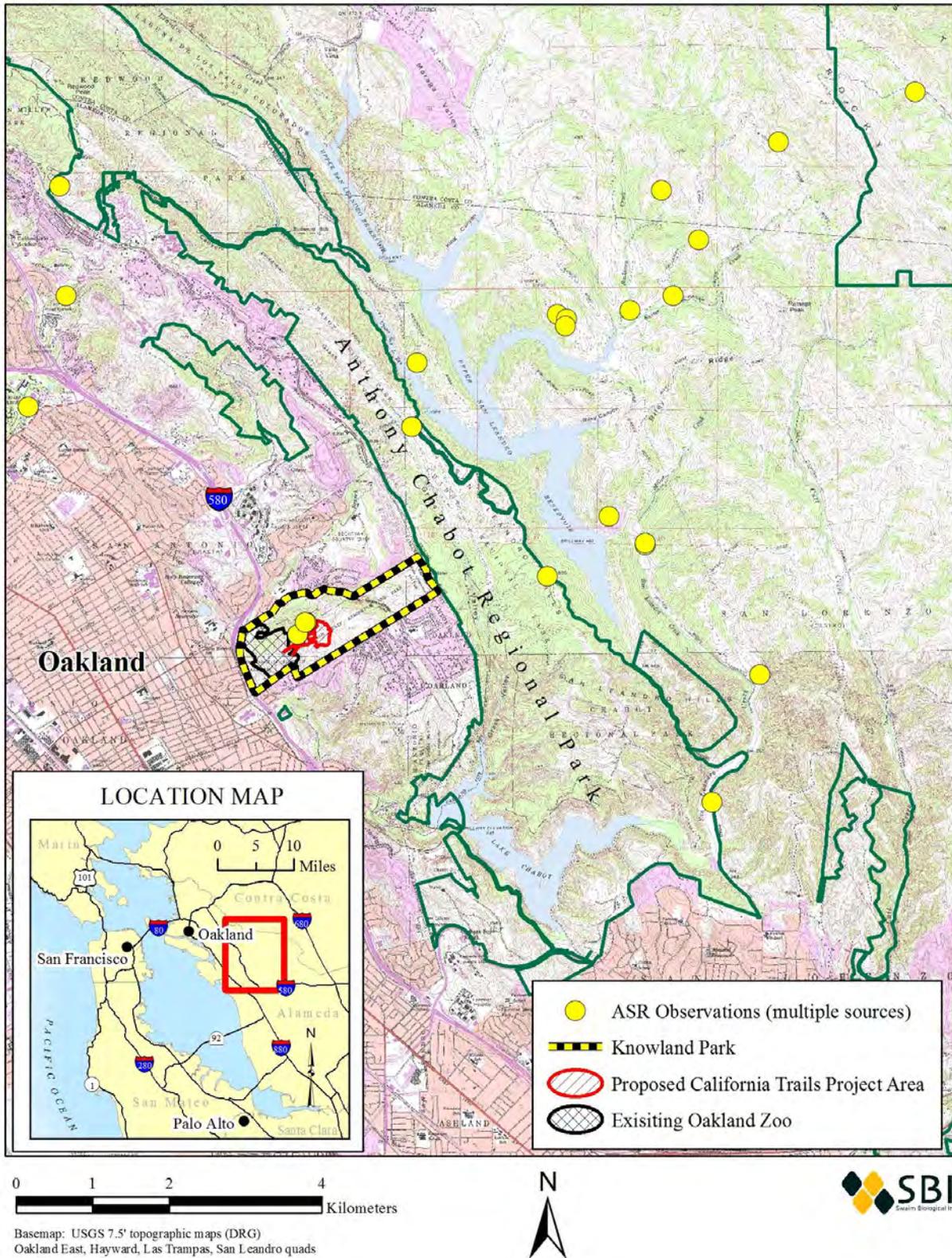


Figure 7. Alameda Striped Racer Observations in the Project Region.

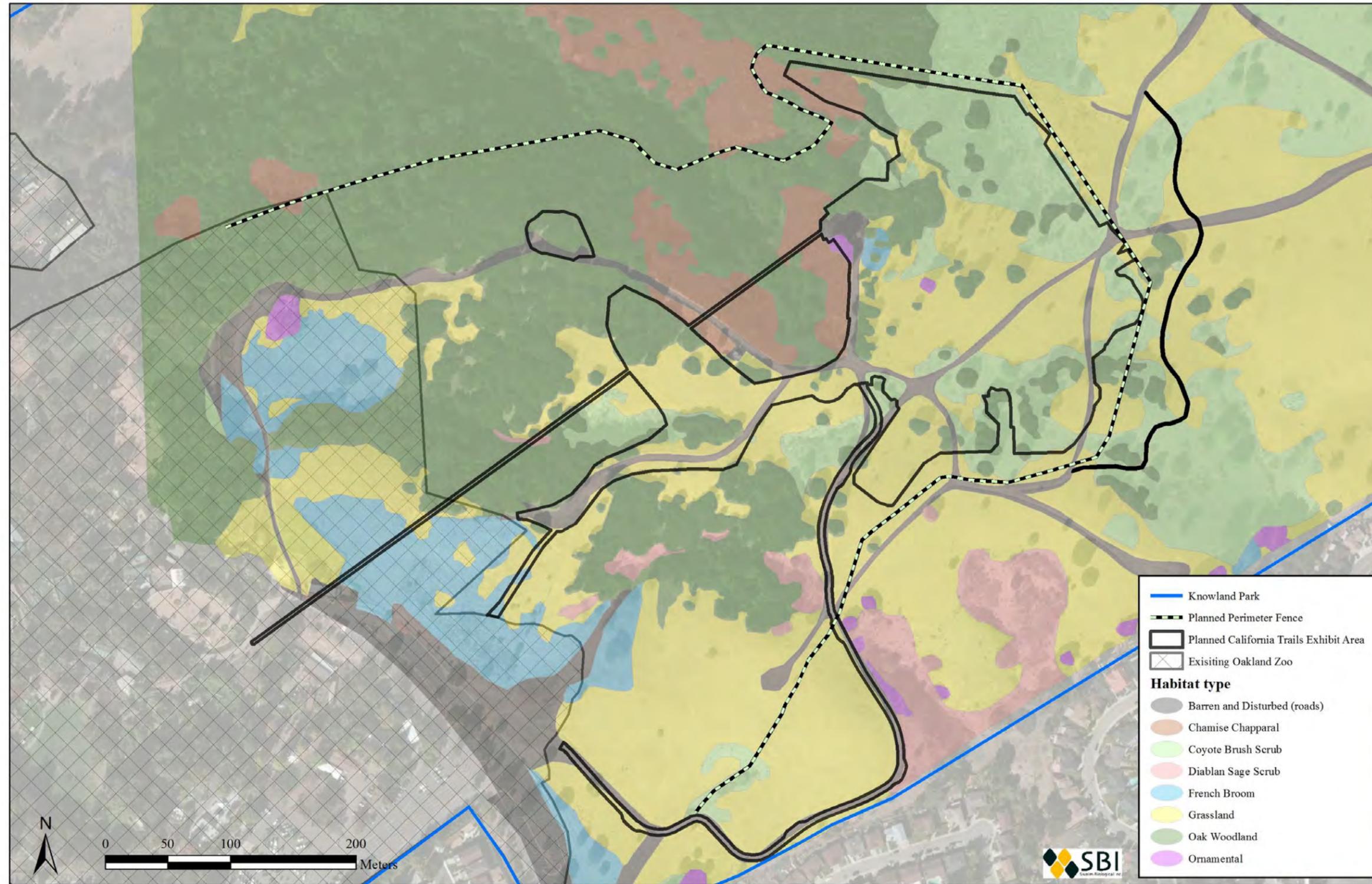


Figure 8. General Habitat Types in the Study Area.

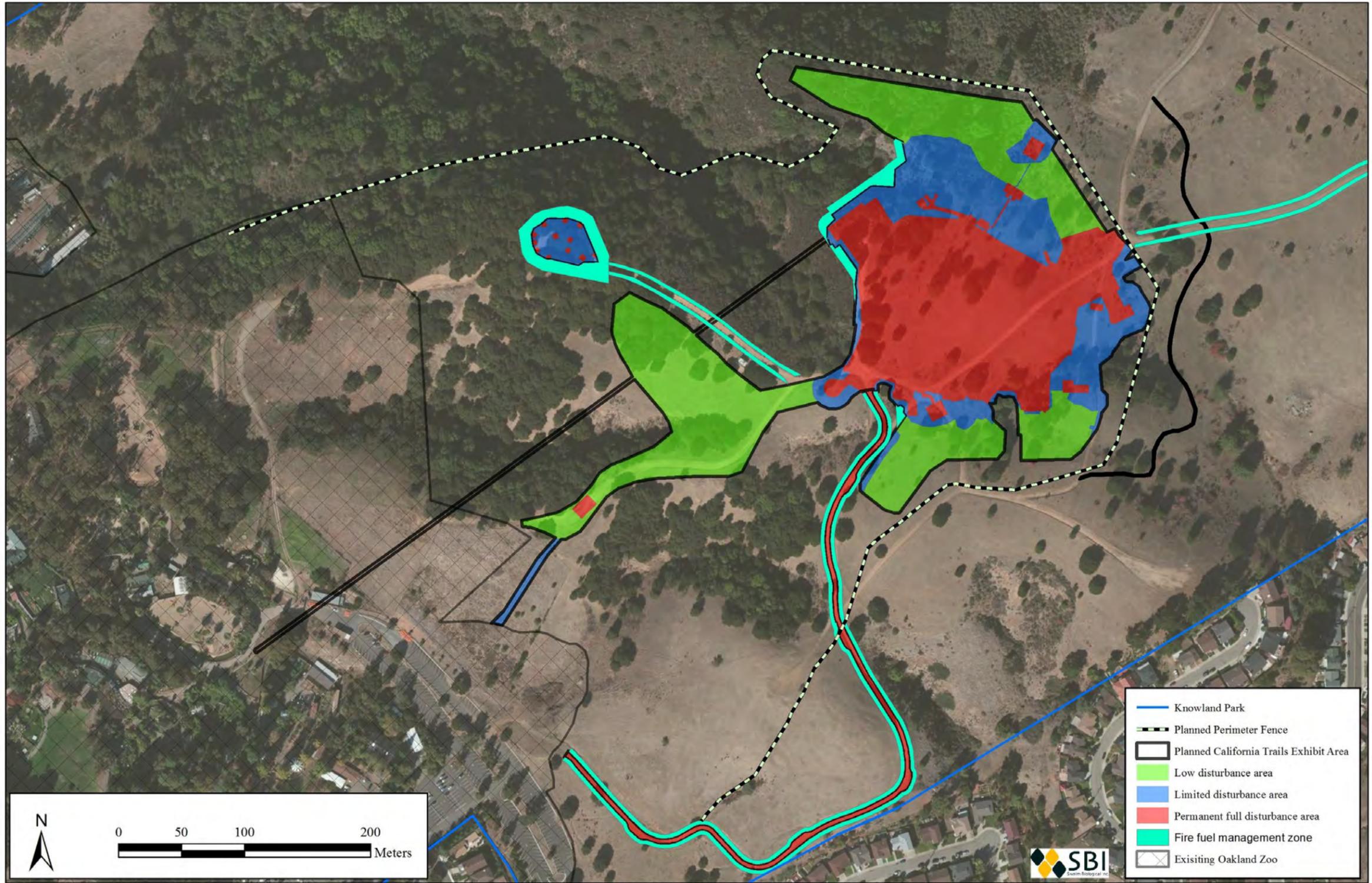


Figure 9. Summary of Permanent and Temporary Affects to Potential ASR Habitat.

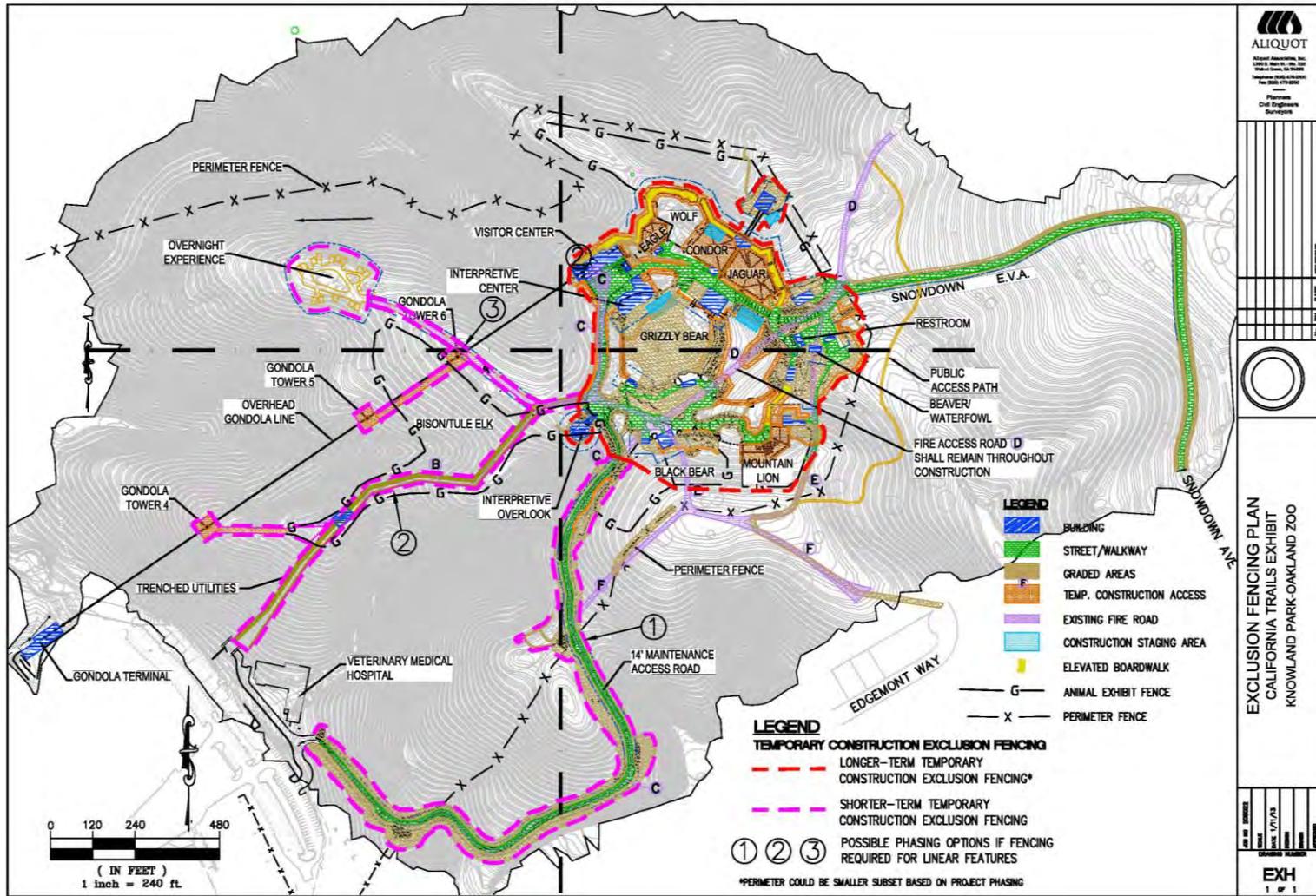


Figure 10. Approximate Exclusion Fence Alignment.

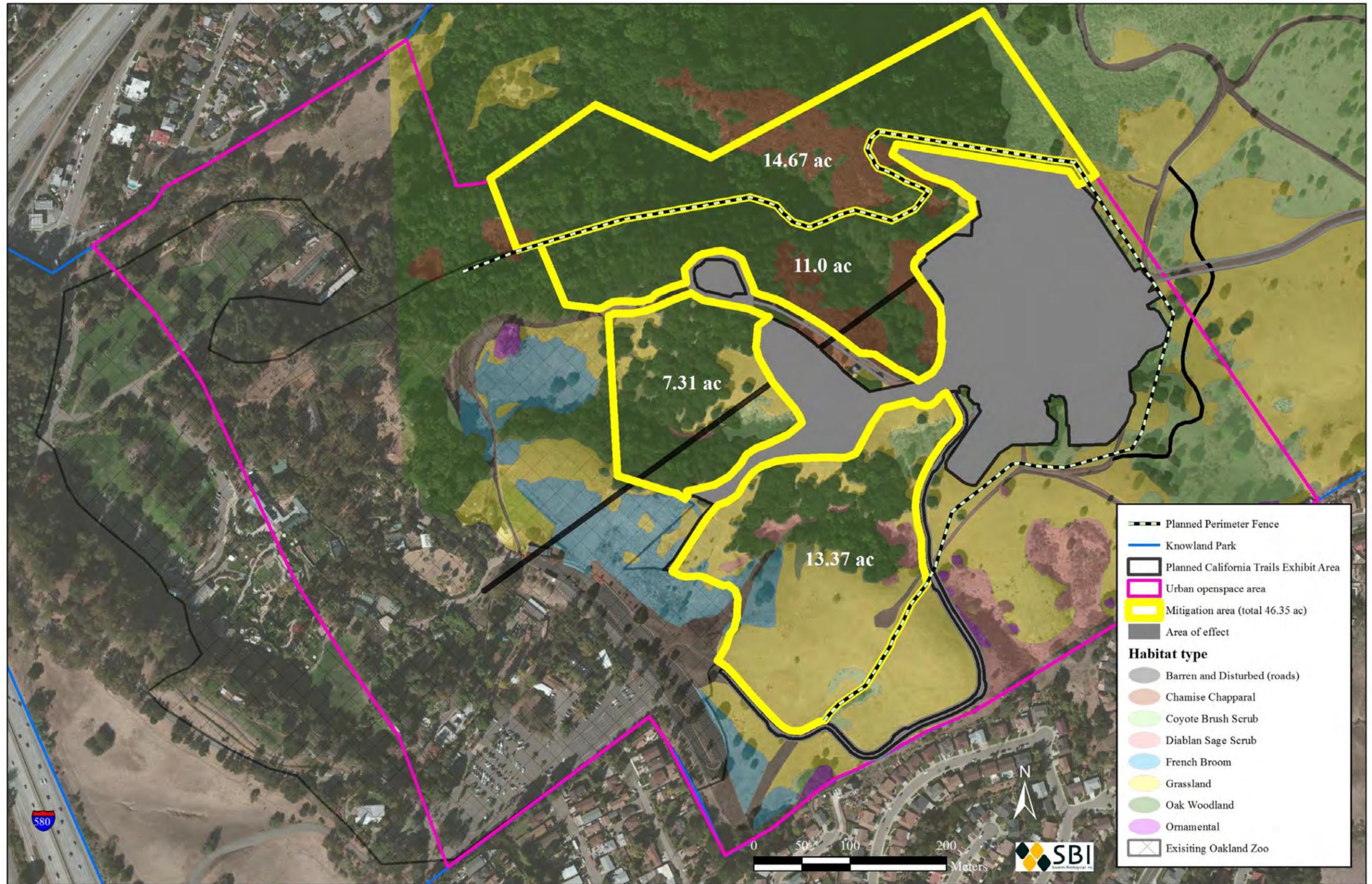


Figure 11. Conservation Easement/Deed Restriction Area for ASR Habitat Mitigation.

Appendix A:

Memos of November 7, 2012 from Noll & Tam, Project Architects:

- 1) Corps File No. 2012-00032S – Oakland Zoo California Trail, Further details and clarifications – Section 7 Consultation Response to Fish and Wildlife Service Letter Received May 1st, 2012, and**
- 2) Oakland Zoo California Trail, Fire Fuel Management Plan Framework**

memorandum

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To: Ms. Jane Hicks
Chief Regulatory Division
U.S. Army Corps of Engineers

Cc: Nik Dehejia, East Bay Zoological Society
Darin Ranelletti, City of Oakland
Jim Martin, Environmental Collaborative
Karen Swaim, Swaim Biological, Inc.
Kim Squires, U.S. Fish and Wildlife Service
Marcia Grefsrud, California Department of Fish and Game

From: Ethan Ahlberg
Noll & Tam Architects

Date: November 7, 2012

**Re: 08ESMF00-2012-TA-0387-1
Corps File No. 2012-00032S - Oakland Zoo California Trail
Further details and clarifications – Section 7 Consultation
Response to Fish and Wildlife Service Letter Received May 1st, 2012**

This memorandum provides the clarifying information requested in a letter from Eric Tattersall, Deputy Assistant Field Supervisor of the US Fish and Wildlife Service dated May 1, 2012 pertaining to the letter request for consultation from the US Army Corps of Engineers (Corps) dated March 9, 2012. It is part of a larger response package prepared by the East Bay Zoological Society (EBZS) to assist the Corps in responding to the information request from the USFWS. The USFWS letter requests information in a numbered list from 1-36. Noll & Tam, the architectural design team for the California Trail Expansion Project, and Aliquot Associates, the project engineers, have prepared responses to the USFWS letter pertaining details of the project. The questions from the USFWS letter are listed below, numbered as they are in the USFWS letter. The relevant questions from the USFWS are repeated in their entirety below, and our responses are in *italics*.

- 3) "Page 7, Section 2.2.1 Detailed Description of the Project: The description of the exhibits should be as close to the final project design as possible. Any changes to the project that may affect listed species and/or suitable habitat will result in the need for this consultation to be reinitiated."

The project description details have been refined since approval of the project by the City of Oakland. This updated information is presented in the various project area descriptions below and the associated drawing package.

- 5) "Page 8, Section 2.2.1 Detailed Description of the Project, Aerial Gondola People-Moving System: This subsection does not describe the construction methods including support structure construction, equipment, construction timing or duration, or access roads needed to construct the gondola."

Design and Installation:

Refer to **Figure 1 and 4** for the overall location of each tower, existing fire roads, temporary access ways, and construction zones. Each gondola tower (7 total) will require a 12ft x12ft spread footing onto which a steel tower will be installed. The lower station and towers 1, 2, and 3 are located within the existing zoo footprint and will not affect any natural habitat.

Towers 4, 5, 6, and 7 will require some limited temporary access, as indicated in **Figure 4**. An excavator will be used to excavate these footing areas and to carry construction materials to each tower site. Existing fire roads will be used to gain access to the tower locations to the greatest extent possible. **Figure 4** shows the temporary access ways needed to get the excavator to the tower locations. Two temporary access ways approximately 12ft wide will provide access to towers 4, 5, and 6. Excavators are able to descend and ascend steep terrain without requiring grading.

Materials such as steel reinforcement form lumber, and appurtenances can be carried in by the excavators. A loader will carry out soil spoils from each foundation excavation.

Temporary Access Lane 1 will be approximately 180 feet long providing access to tower 4 from **Existing Fire Road B**. **Temporary Access Lane 2** will be 300 feet long and access tower's 5 and 6 from **Existing Fire Road A**. This lane will drop down a slope of grassland cover and open oak trees. A 20 foot x 20 foot area around each foundation is needed for the excavator to stage, dig, stack materials, and provide clearances to maneuver. Once at each tower site, the excavator will grade a 15x20 foot platform outside of the construction zone to stabilize itself to work. The overall construction zone will therefore be approximately 20 feet x 35 feet in length.

The concrete pour can be done from a concrete truck located at the existing fire roads, refer to **Figure 4**. The reach of the concrete boom is 150 feet which will elevate the pump hose over vegetation and trees. Once beyond this reach, the pump hose will lay on the temporary access lane the remainder of the run to the excavator location. The excavator will be used to hoist up the hose at the tower location to allow workers to manipulate it for the pour. The concrete trucks can turn around at wider areas of the existing fire roads, near the location of the Bison/Tule Elk holding building construction on fire road B, and at the overnight experience construction zone on existing fire road A.

Tower 7 will be accessed from the Visitor Center construction zone and has been designed to avoid direct impacts to chaparral cover. The construction zone for this tower can be accessed from the east to avoid any impact to the adjacent chaparral Whipsnake habitat, see **SK-Arch-001** and **Figure 2**.

Construction duration:

All tower excavations will occur in an approximately a 5 day period. Rebar for all towers will be completed in approximately 1 week. Concrete will be poured

for all towers in approximately 1 week. Foundations will sit 5 days prior to stripping and backfilling, which will take approximately 2 days for all tower foundations. Steel columns for each tower will be placed via a helicopter in a 1 week process. Foot traffic and ATV's will use the same temporary access lanes to assist in securing the steel towers to the foundation during this erection process, which will take about 5 days. The upper gondola station is located approximately 12 feet to the northeast of tower 7, and will be constructed concurrently with the Visitor Center construction process. Refer to the response to question 6 of this response package for the detailed construction description of the Visitor Center. A revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 6) "Page 8, Section 2.2.1 Detailed Description of the Project, California Interpretive Center: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the building."

Building Design and Footprint Location Background:

Refer to **SK-Arch-001** for the Visitor Center and Interpretive Center footprints. The original Interpretive Center design approved by the City of Oakland in a thick orange line. Subsequent to this approval process, the canopy line of the Chemise chaparral which constitutes the core habitat for Alameda whipsnake has been surveyed and the project has been refined in response to this information. This has been addressed by relocating a large segment of the building program to a 2nd building located further to the interior of the California Trail project, away from the chaparral habitat, and taking the place of the previously designed Grizzly Bear Viewing structure and plaza area. This building is called the Interpretive Center, and the building located near the original position is called the Visitor Center. The Visitor Center is a 3 story structure that sits in the hillside with the 1st floor matching grade on the northwest side, and the 3rd floor at grade on the southeast side. The Interpretive Center is a single story structure, located at roughly the same elevation as the 3rd floor of the Visitor Center, sharing a plaza space and fire access lane between them. The footprints of these two buildings are shown in red. This design modification allowed the Visitor Center footprint to be moved 27ft to the east out of and away from the chaparral habitat. An exterior deck constructed of concrete will cantilever 12 feet beyond the building footprint on the west facade by 12ft. This will not affect the extent of the fire fuel management, as verified during consultation with the Oakland Fire Marshal on November 6, 2012 (see response to Question 28 below).

Construction Methods and Access:

The Visitor Center and Interpretive Center buildings are located at the end of the **Existing Fire Road C**, please refer to **Figure 1 and 2**. Construction access will be provided with the construction of the **permanent fire access lane**, which will be located following approximately the same position as **Existing Fire Road C**. The permanent fire access lane then extends through to the east and connects to **Existing Fire Road D**, providing a loop access for

the overall project. Please refer to the response to Question 17 for a full description of new paved roads and pathways. The buildings will be constructed of cast in place concrete, steel and wood structure, and light frame wood exterior walls. The structure will have a sprinkler system, plumbing, drainage, air conditioning, power, and lighting. The Visitor Center which houses the upper gondola station will be a Type IA building, which means the structure is fire rated to 3 hours. The end of the **existing fire road C** was leveled off in the past with a large quantity of earth fill. This fill will be removed as part of the excavation process. This existing fill zone extends downslope to the edge of the chaparral habitat to the west and woodland habitat to the north, and will define the edge of construction activities.

As described in the SMNDA and Biological Assessment, a site construction exclusion fence will be erected prior to initiating any clearing and grading activities to prevent any Alameda whipsnake's from possibly entering the construction zone. Care will be made to not damage the root systems of trees or shrubs to be retained with any construction activity. The upslope area will be shored and protected to avoid any run off that could damage the area. Once the excavation is complete the gondola station and building foundation work will commence accessed from the east, away from the chaparral habitat, please refer to **Figure 2 and SK-Arch-001**. All concrete vehicles will stay within the project construction access area, and will utilize the loop access of the existing fire roads and the new fire lane to go to and from the construction area, please refer to **Figure's 1 and 2**. Retaining walls are required to construct the Visitor Center's bottom two levels, and the southwestern side of the plaza area in-between the Visitor Center and the Interpretive Center. For retaining wall locations and heights please refer to **Figure 2, 2a, and 2b**.

A 75-100 ton crane will be used to erect the gondola station motor prior to construction of the upper level of the building. This will be transported by vehicle on existing roads and stationed between the Visitor Center and Interpretive Center building footprints or on the existing fire road during construction. A crane pad will be excavated and a platform constructed. The Upper level of the Visitor Center and the Interpretive Center is constructed of steel / wood structural frames with wood framed walls. The construction of these elements will also likely utilize a crane during short periods and then be erected with small forklifts)

Construction Duration:

The construction period for the Visitor Center and Interpretive Center will be between 16-24 months. A revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 7) "Page 8-9, Section 2.2.1 Detailed Description of the Project, Wolf, Jaguar, Eagle and Condor Exhibits: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits."

Refer to Figure 2 and the detailed descriptions below:

Exhibit Access – Elevated Walkway

*The exhibit areas will be bisected by an elevated walkway serving as the public viewing path through all exhibits in this section. The elevated walkway will follow the existing contours of the central hill of the site dividing each exhibit into a smaller zone uphill of the walkway and a larger zone downhill from the walkway. Impact in the uphill side of the walkway will be greater due to increased landscaping, irrigation, and aviaries where they occur, refer to the response to Question 15 for in depth landscaping and irrigation information. The larger downhill portions of the exhibit areas will not be modified except for native species enhancement and limited irrigation view long spray sprinkler heads, refer to the response to Questions 23 and 24. With the exception of construction of the wolf holding structure (see below), all construction activities in the area on the downhill, north side of the elevated walkway will generally be done by hand with great care to minimize disturbance to existing habitat. The existing ground cover in this area is largely grassland.. There is a graded area at the exterior fence near the wolf holding building that will require an excavator, refer to **Figure 2**.*

The elevated walkway will be built in a linear fashion to further minimize impacts. The walkway is an average of 14 feet wide. The construction zone required to build the structure will be 10 feet either side of the edge of the structure for a total of 34 feet in width. A staging area is located about midway along the elevated walkway, and construction materials will be laid along the construction zone. The structure is elevated on a line of steel columns centered on the walkway, with the walkway platform cantilevered out to either side. This design will minimize the number of foundation piers required for the structure along its length. The foundations will be drilled concrete piers about 30 inches in diameter, with 12-18 inch diameter steel columns forming the vertical structure. These piers will be spaced 8 to 23 feet on-center depending on the actual layout and where the path needs to turn corners or avoid existing trees or other site features to be retained. The platform and railing will also be built with steel, with the walkway constructed of concrete. This non-combustible construction will minimize the need for fire fuel management for this structure (refer to the response to Question 28).

Eagle Exhibit:

The eagle exhibit consists of an aviary structure located on the uphill (south) side of the elevated walkway, and a 440sf open air holding structure built into the south side of the aviary. The holding structure will consist of a concrete slab on grade, low level concrete masonry walls, and steel cage upper walls to a steel shed roof. There will be plumbing, drainage, power, and lighting. The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Six perimeter columns will circle a central column to allow the steel cable and mesh assembly to be laid ovetop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. Access to the structures will be via both the temporary construction access

path as part of the elevated walkway structure and the new permanent fire lane located immediately to the south. Concrete for the aviary foundations and the holding structure floor as well as grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located at the new permanent fire lane. Steel will be erected via a crane located on the fire lane and a cherry picker type lift will be used to connect and secure the tensile structure to this frame. The areas under the aviary structure will have temporary construction traffic impact.

Wolf Exhibit:

The wolf exhibit consists of an open air area with a holding pen located on the east side of the enclosure and the animal containment fence. This fence will be constructed in the same manner as the overall project's perimeter boundary fence, and largely run parallel to it, refer to the response to Question 14. The wolf holding pen is approximately 1,920sf and will consist of a slab on grade with storm drain lines, steel caging, and a corrugated metal shed roof. The animal enclosure fence will be approximately 9 feet 7 inches tall and constructed of steel posts set in concrete piers a steel bottom rail, mid rail, and to rail and 2 inch x 2 inch steel mesh. The mesh will be extending to a minimum of 3 feet below the ground as a dig barrier. The construction access area required around this structure will be a 30 foot zone around the perimeter of this structure to allow for re-grading, refer to **Figure 2**. Grading will be done with an excavator and the concrete pour can be done remotely with a boom from a concrete vehicle located at **Existing Fire Road D**. The enclosure fence material will be carried to the location by hand and erected by hand. Access along the fence will be in the space between the enclosure fence and the zoo perimeter fence.

Condor Exhibit:

The Condor Exhibit features an aviary to the uphill (south) side of the elevated walkway, a holding building built at grade and forming part of the south side of the aviary, and an enclosed, elevated viewing building built as part of the elevated boardwalk. This viewing building also serves the Jaguar Exhibit. The approximately 20ft x 20ft holding structure will consist of a concrete slab on grade, low level concrete masonry walls, and steel cage upper walls to a steel shed roof. There will be plumbing, drainage, power, and lighting.

The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Six perimeter columns will circle a central column to allow the steel cable and mesh assembly to be laid ovetop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. Access to the structures will be via both the temporary construction access path as part of the elevated walkway structure and the new permanent fire lane located immediately to the south. Concrete for the aviary foundations and the holding structure floor as well as grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located at the new permanent fire

lane. Steel will be erected via a crane located on the fire lane and a cherry picker type lift will be used to connect and secure the tensile structure to this frame. The areas under the aviary structure will have temporary construction traffic impact.

The viewing structure will be built on a grid of (23) 18 inch diameter cast in place piers with 8inch x8 inch steel columns spaced between 8-12 feet on-center. The floor is constructed of a composite steel and concrete deck on steel beams. The walls and roof will be built with light wood framed construction. The enclosed structure will have a sprinkler system, drainage, power, and lighting. Access will be via the construction temporary construction lane as described for the elevated walkway construction. The structure will be designed and built to the existing grade. Holes for the piers will be dug with an excavator. Concrete can be poured from the fire lane via a boom. The areas under the viewing structure will have temporary construction traffic impact.

Jaguar Exhibit:

See above for description of the viewing structure shared with the Condor Exhibit. The Jaguar Exhibit also consists of an Aviary, holding building, and open, outer exhibit space on the downhill (north) side of the elevated walkway, extending to the perimeter fence.

The approximately 60 ft x 28 ft holding structure will consist of a concrete slab on grade, a mixture of low height and full height concrete masonry walls, and steel cage upper walls to a composite steel and concrete roof deck supporting a green (planted) roof. There will be plumbing, drainage, power, and lighting.

The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Six perimeter columns will circle a central seventh column to allow the steel cable and mesh assembly to be laid ovetop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. Access to the structures will be via both the temporary construction access path as part of the elevated walkway structure and the new permanent fire lane located immediately to the south. Concrete for the aviary foundations and the holding structure floor as well as grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located at the new permanent fire lane. Steel will be erected via a crane located on the fire lane and a cherry picker type lift will be used to connect and secure the tensile structure to this frame. The areas under the aviary structure will have temporary construction traffic impact.

The animal enclosure fence will be approximately 18 feet 4 inches tall and constructed of steel posts set in concrete piers a steel bottom rail, mid rail, and to rail and 2 inch x 6 inch steel mesh. The mesh will be extending to a minimum of 3 feet below the ground as a dig barrier.

Access will be via the temporary construction lane as described for the elevated walkway construction. The structure will be designed and built to the

existing grade. Holes for the piers will be dug with an excavator. Concrete can be poured from the fire lane via a boom. The enclosure fence material will be carried to the location by hand and erected by hand. Access along the fence will be in the space between the enclosure fence and the zoo perimeter fence.

The construction duration for this group of exhibits and structures would be between 12-16 months.

- 8) “Page 9, Section 2.2.1 Detailed Description of the Project, Beaver/Water Fowl Aviary and Restrooms: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits and restrooms.”

*The Beaver and Water Fowl Aviary is located on the southeast side of the Grizzly Underwater Viewing structure, refer to **Figure 3**. The aviary features a similar structural system as the eagle and condor aviaries. This area will have a water feature with connecting infrastructure to the LSS equipment located to the east. Visitors exiting the boardwalk would cross the service road to reach the approximately 6,230-square-foot enclosed beaver and water fowl aviary. The aviary enclosure would be constructed of one-inch stainless steel coil mesh attached to a steel post frame. A path and boardwalk would meander through the inside of the aviary. An approximately 840-square-foot, 10-foot-high beaver holding facility of CMU construction would be hidden from view in the rockwork located adjacent to the Restroom building to the east.*

*The restroom building is located on the east side of the project adjacent to the Grizzly Bear Water Viewing Structure and public pathway. The single story structure is approximately 760 sq. ft. The building will have plumbing, drainage, ventilation, power, and lighting. The building will sit on concrete foundations and a slab on grade with light framed wood construction for the walls and roof. Construction access will be from the area to be re-graded to the east, the adjacent Water Equipment structure and service yard, and the **Existing Fire Roads D and E, refer to Figure 1 and 2**. The building pad and footings will be established with an excavator and concrete poured from one of the adjacent fire roads. The walls and roof will then be constructed by hand. The construction duration will be 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.*

- 9) “Pages 9-10, Section 2.2.1 Detailed Description of the Project, Grizzly Bear Exhibit: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibit.”

Refer to Figures 2, 2b, and 3 for this detail description section.

*The grizzly bear exhibit consists of an exterior fenced exhibit, divided into two sections by a double fence set in a graded ditch. There is an approximately 2,100 sq. ft. **Grizzly Holding building**, an approximately 1,150 sq. ft. **Grizzly Water Viewing Structure** with an adjacent artificial water feature, an*

approximately 520 sq. ft. open air **Viewing Shed 1**, and an approximately 370 sq. ft. **Viewing Shed 2**.

Grizzly Bear Exterior Exhibit:

*The exterior grizzly bear exhibit is enclosed by an animal enclosure fence which will be approximately 14 feet 5 inches tall and is constructed of 4 inch tube steel posts set into concrete piers with a bottom, middle, and top rail. The 2 inch x 6 inch chain link mesh extends full height and to at least 3 feet below grade to provide a dig barrier. This forms a perimeter around the entire exhibit area except where the various viewing and holding buildings form part of the enclosure area. The majority of this exhibit will have temporary construction traffic impact for access lanes, a staging area, and regarding, refer to **Figures 2 and 3**. A construction exclusionary fence will be erected to keep construction traffic out of the specific areas of oak trees and native grasses to be retained. Refer to the answer to Question 15 for a detailed description of landscaping.*

Grizzly Bear Holding Structure:

*This structure is located on the north side of the exhibit, adjacent to the proposed permanent fire lane, refer to **Figure 2**. The structure is a single story, enclosed building and includes with a concrete slab on grade, full height concrete block walls, and a composite steel and concrete green (planted) roof. The building will have a sprinkler system, plumbing, drainage, power, and lighting as well as mechanical ventilation and heating. An exterior back of house animal enclosure area is fenced in on the northwest side of the building. A site retaining wall divides this building from the exhibit, see **Figure 2b**. Construction access, storage, and staging will be from the new permanent fire lane. An excavator will prepare the foundation and graded areas, and the concrete foundations, slab, and grout in the concrete masonry walls can be poured from a concrete vehicle parked on the adjacent permanent fire lane. The roof structure will be craned into position. The crane will be located on the permanent fire lane.*

Grizzly Bear Underwater Viewing Structure:

*This structure is located on the southeast side of the grizzly enclosure, see **Figure 3**. The structure is a single story open air structure and will include concrete columns, foundation, and full height concrete walls on two sides, the other two sides will be open. The building will have a composite steel and concrete roof structure and a green (living) roof finish. The building will feature plumbing, drainage, power, and lighting. The building will be accessed from the adjacent construction zones and grading activity related to the water facilities area (refer to question 19). The water feature is adjacent to the northwest façade of the viewing structure. This area will be graded to create an artificial water feature approximately 3 feet deep. This area will be lined with waterproofing and have plumbing and drainage that will connect to the LSS water treatment facility to the east. An excavator will establish the building pad, foundation trenches, and rough grading around the building. Delivery trucks will transport building materials such as concrete block and steel to the staging area located adjacent to the site, see the area marked in blue on*

Figure 1 between the Grizzly Holding Building and Grizzly Viewing Building. Concrete pours and wall grouting will be done from the **Existing Fire Road D**. A crane will be used to erect the steel structure, located either on the **Existing Fire Road D** or a temporary pad located in the regarding zone adjacent to the building.

Grizzly Viewing Shed 1

*This structure is a single story, open air shade structure with a single pitch, shed roof and one glass wall facing the Grizzly Bear Exhibit. This structure is located at the south side of the exhibit, adjacent to the Activity Zone, refer to **Figure 3**. The structure features a concrete slab on grade and foundations, tube steel columns and roof beams, and wood roof joists. The building will have drainage, power, and lighting. An excavator will establish the building pad and foundation trenches, and rough grading around the building, accessed from the south and adjacent grading and construction zone of the Activity Area. The structure will then be erected with small equipment and by hand.*

Grizzly Viewing Shed 2

*This structure is a single story, open air shade structure with a single pitch, shed roof and one glass wall facing the Grizzly Bear Exhibit. This structure is located at the southwest side of the exhibit, adjacent to the Activity Zone, refer to **Figure 3**. The structure features a concrete slab on grade and foundations, tube steel columns and roof beams, and wood roof joists. The building will have drainage, power, and lighting. An excavator will establish the building pad and foundation trenches, and rough grading around the building, accessed from the south and adjacent grading and construction zone of the Activity Area. The structure will then be erected with small equipment and by hand.*

The exhibit will be constructed in a 12-16 month duration. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 10) "Page 10, Section 2.2.1 Detailed Description of the Project, Mountain Lion / Black Bear Exhibits: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits."

Refer to Figures 3 and 3b for this detailed description.

Mountain Lion Exterior Exhibit:

The Mountain Lion Exhibit features an exterior exhibit area, an aviary exhibit next to the public path, and an approximately 1,700 sq.ft. holding building. The exterior mountain lion exhibit is enclosed by an animal enclosure fence which will be approximately 18 feet 5 inches tall and is constructed of 3 inch tube steel posts set into concrete piers with a bottom, middle, and top rail. The 2 inch x 6 inch chain link mesh extends full height and to at least 3 feet below grade to provide a dig barrier. This forms a perimeter around the entire exhibit area except where the aviary and holding building forms part of the enclosure

area. The majority of the native grasslands within the exhibit will be protected and retained except for a graded area at the east side of the exhibit shown on **Figures 3**. A construction exclusionary fence will be erected to keep construction traffic out of the areas to be retained. Refer to the answer to question 15 for a detailed description of landscaping.

Mountain Lion Aviary:

The aviary structure will be constructed of 30 inch diameter concrete piles with 10 inch diameter steel pipe columns. Ten perimeter columns form an “L” shaped enclosure with two central columns used to form a ridge to the tent structure. A steel cable and mesh assembly will be laid overtop as a tensile structure. Support cables will brace the structure at angles outside of this perimeter to provide lateral strength. The bottom of the mesh is secured to a continuous concrete curb and footing that extends to 6 inches above grade. The areas under the viewing structure will have temporary construction traffic impact.

Mountain Lion Holding Building

This structure is a single story, open air structure featuring a concrete slab on grade and foundations, retaining walls, a mixture of full height concrete masonry walls, partial height concrete masonry walls, and open steel structure with steel caging. The roof is a composite steel and concrete structure with a single ply membrane low slope roof. The building will have plumbing, drainage, power, and lighting. The building will have localized heating. A retaining wall forms the north side of the structure, refer to **section 10 on Figure 3b**.

Black Bear Exterior Exhibit:

The Black Bear Exhibit features an exterior exhibit area and an approximately 1,760sf holding building. The exterior black bear exhibit is enclosed by an animal enclosure fence which will be approximately 14 feet 5 inches tall and is constructed of 4 inch tube steel posts set into concrete piers with a bottom, middle, and top rail. The 2 inch x 6 inch chain link mesh extends full height and to at least 3 feet below grade to provide a dig barrier. This forms a perimeter around the entire exhibit area except where the various viewing and holding buildings form part of the enclosure area. The native grasslands within the exhibit will be protected and retained except where grading is required for the adjacent fire access lane on the west, and where a moat barrier is constructed at the public viewing area on the north, refer to **Figures 3**. A construction exclusionary fence will be erected to keep construction traffic out of the areas to be retained. Refer to the answer to question 15 for a detailed description of landscaping.

Black Bear Holding Building:

This structure is located on the north side of the exhibit, adjacent to the public viewing area and across from the Activity Zone, refer to **Figure 3**. The structure is a single story, enclosed building and includes with a concrete slab on grade, full height concrete block walls, and a composite steel and concrete

roof. The building will have a sprinkler system, plumbing, drainage, power, and lighting, and heating. Construction access, storage, and staging will be from the new permanent fire lane on the west and the new public path and Activity Zone construction area on the north. An excavator will prepare the foundation and graded areas, and the concrete foundations, slab, and grout in the concrete masonry walls can be poured from a concrete vehicle parked on the adjacent permanent fire lane. The roof structure will be craned into position. The crane will be located on the permanent fire lane.

Construction Methods and Access

Access to the structures will be from the construction zone of the water systems area to the northeast as well as the fire lane on the west. Concrete for the foundations and the holding structure floor, foundation, retaining walls, and roof and grout for the concrete masonry walls can be installed with a boom from a concrete vehicle located in a central position in the construction zone, accessed from either side, **see Figure 3**. Steel will be erected via a crane located on the fire lane.

The construction duration for the exhibit will be 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 11) "Page 10, Section 2.2.1 Detailed Description of the Project, Small Exhibit Activity Zone: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the activity zone."

*The Small Exhibit has been deleted from the scope of work. The Activity Zone features a zone of hard and soft (ADA accessible) surfacing onto which a variety of prefabricated child play structures will be placed. The area will be surrounded by some wood picket fencing and landscape zones, and will have one main entry / exit to help parents monitor children. A loop walk will surround the Activity Zone and now feature the Botanical Exhibit. This will feature a variety of planter zones and interpretation features along the pathway forming part of the overall construction of the activity zone, see the graded area to the south of Grizzly Viewing Sheds 1 and 2 on **Figure 3**.*

Construction access will be from the main public path and the adjacent permanent fire lane. An excavator will re-grade the area as required and trucks will deliver the play equipment in pieces to be assembled. The construction duration will be between 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 12) "Pages 10-11, Section 2.2.1 Detailed Description of the Project, Interpretive Kiosk, Botanical Exhibit and Bison/Tule Elk Feeding Station: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the exhibits."

Please refer to Figure 4 for this Detailed Description:

Interpretive Kiosk:

*This structure is a circular, single story, open air, shade structure built on piers over the existing grade, accessed with a ramp. The structure is located to the southwest of project, adjacent to the child activity zone to the north, and the **Existing Fire Road A**, refer to **Figure 1 and 4**. The platform is raised on seven (7) 6 inch diameter steel pipe columns set in 24 inch concrete piers at the perimeter. There are two (2) central 12inch diameter pipe columns set in 30 inch diameter concrete piers. A series of six (6) steel pipe columns and an 8ft wide concrete abutment support the ramp accessing the structure from the permanent fire lane. Steel beams hold the composite steel and concrete floor deck. Steel cable guard rails surround the perimeter and ramp. An interior wall occupies approximately half the platform on the northeast side. A butterfly shaped roof framed in wood is held over the platform on an additional four (4) 6 inch steel pipe columns set in 24 inch concrete piers. The platform is suspended an approximately 15-20 feet above the existing grade. The structure will have a sprinkler system, drainage, power, and lighting. Care will be made to minimize impact to the site and retain as much existing vegetation as possible. The concrete piles will be excavated with small excavation equipment. The foundation and deck pours will occur from a concrete vehicle and boom from the **Existing Fire Road C**. The steel framing will be installed with a crane located at the **Existing Fire Road C**. The areas under the kiosk structure will have temporary construction traffic impact.*

Bison/Tule Elk Feeding Station:

This exhibit occupies a valley at the southwestern portion of the project. The exhibit features an exterior animal enclosure and animal containment fence, an approximately 1,100 sq. ft. holding building, and small paved area for viewing the bison and elf feeding.

Bison/Tule Elk Exhibit:

The existing vegetation throughout the exhibit will be protected and maintained, with supplemental ground cover established if necessary. The enclosure fence is constructed of 2-1/2 inch steel posts set in concrete piers. The fence will be 8 feet tall and clad in 2 inch x 2 inch chain link mesh. The fence including piers will be constructed by hand to minimize construction traffic in the area, and be built in a linear fashion to avoid any traffic across the site.

Bison/Tule Elk Holding Building:

*This approximately 1,100 sq.ft. structure is a single story, open air barn type structure with concrete spread footings and no slab. A gabled roof extends over an additional 1,100 sq. ft. yard at the front, supported on five (5) steel columns on concrete spread footings. The structure will have drainage, plumbing, power, and lighting. This structure is located on top of the **Existing Fire Road B**. Excavator and concrete vehicles will use this existing road to*

access the construction zone. A turn around zone will be required around the site during the construction, which will also be used during the Gondola Tower 4 construction process, refer to **Figure 4**.

Bison/Tule Elk Feeding Station:

There will be a small paved area to the north of the Interpretive Kiosk, adjacent to the Bison/Tule Elk enclosure fence and the juncture between **Existing Fire Road A and C**. This area will be paved and construction access will be shared with the permanent fire access lane.

The Botanical Exhibit:

The Botanical Exhibit features a variety of planter areas now located surrounding the Activity Zone, see the answer to question 11.

The construction duration will be 12-16 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 13) "Page 11, Section 2.2.1 Detailed Description of the Project, Overnight Experience: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the campground or facilities."

Please refer to Figure 4 and 5 for this detailed description:

The Overnight Experience features (14) eight person tents on permanent raised platforms and (2) composting toilets. The area is accessed from the **Existing Fire Road A**, which will remain unchanged as a gravel road. There is an existing loop turn around located at the project area which will be maintained and used for construction. The area within this loop have some trimming of vegetation for fire fuel management and the installation of picnic tables, refer to the enclosed memo from the Oakland Fire Marshal. A water line will be installed below **Existing Fire Road A**, running from the main site utility line that runs below **Existing Fire Road B**. The platforms will meet grade at the interior loop path, then be suspended out over grade on six (6) wood posts set in concrete pile foundations. The platform will be constructed of wood members and have a single pitch roof. A prefabricated tent will be installed within this framework. The underside of the platforms will be wrapped in a 2" x 2" chain link fence to stop animals from nesting underneath the platforms, but the mesh will be large enough to allow snakes to move through the area after the construction period is complete.

Construction access will be by **Existing Fire Road A**. Great care will be made to not exceed the project construction access zone. The construction duration will be approximately 3 months. Details on the revised timeline for the construction schedule will be updated following further input from the resource agencies.

- 14) “Page 11, Section 2.2.1 Detailed Description of the Project, Perimeter Fence: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the campground or facilities. Will the fence be maintained for fuels reduction? Will there be a vegetation buffer around the fence? Please provide details on the fence design and the wildlife passage mentioned in this subsection.”

*The perimeter fence will be eight feet tall, built with 3 inch diameter steel posts set into concrete piles at 10 feet on center. A steel bottom, middle, and top rail will hold a chain link mesh. The fence will be constructed in a linear fashion by hand, no vehicles will access these locations. Fence inspection will be done from the interior of the exhibits and by hand. Please refer to **Figure 1**.*

- 15) “Page 11, Section 2.2.1 Detailed Description of the Project, Landscaping: This subsection does not describe where landscaping will occur or the methods, where the signage and/or irrigation would be located. This subsection should also include construction details similar to the above comments.”

*The majority of the existing landscape within the project boundary will be left undisturbed except where designated “Graded Areas, Temp. Construction Access, Construction Staging Area, Bioretention Planter or Moat/Pit” in **Figures 1-7**. These areas will be replanted with a native meadow mix seed, planted native trees, shrubs and groundcovers, or native specimen oak trees transplanted from elsewhere on site. The areas within the animal exhibit fence enclosures that do not have the above-mentioned designations will be left undisturbed with the exception of the removal of non-native or invasive plant species or plants that will be harmful to the exhibited species. The existing vegetation under the new elevated boardwalk will be removed and replaced with a compacted gravel pathway. The existing vegetation within the area outlined by the Fire Fuel Management Line on **Figure 5** will be modified by pruning the low-lying tree limbs, trimming or removing brush and mowing/weed whipping grassland. The limited groundcover vegetation will be removed in the inner circle of the Overnight Experience area and replaced with bark mulch to create a gathering area for campers. New planting alongside the ground-level visitor pathway (designated as “Street/Walkway” on **Figures 1-7**) will be a mixture of new grass, native shrubs, trees and transplanted oaks to screen building facades and animal fencing where necessary. Periodic low-level interpretive signage on metal or wood posts will be placed along both sides of the visitor pathway.*

All new planted areas and areas within animal exhibits where existing vegetation will remain will be irrigated. The irrigation systems for this project will be designed for maximum coverage and ease of maintenance. The main irrigation lines will branch from mains located along the service road and under the elevated boardwalk and will roughly follow the perimeter of the exhibits. The risers should be attached to either fence posts or aviary columns with pop-up rotary sprinkler heads attached at a height that is consistent with the posts. Coverage should be from the perimeter of the exhibit inward.

- 17) “Pages 12-13, Section 2.2.1 Detailed Description of the Project, Access Roads and Paths: Please provide a figure or figures in the Biological Assessment that show the existing paths in relation to the proposed extended and new paths. Also provide details on construction methods, staging areas, materials, and maintenance schedule of roads and paths (need to analyze if there are on-going effects).”

Please refer to Figure 1 for existing roads and new roads and pathways.

*The new permanent fire lane which follows the **Existing Fire Road C** will be paved in asphalt. The fire access lane will be built in a linear fashion with very little additional construction access width required. Re-grading zones between 3 and 60 feet outside the road boundary each side will occur from the existing Veterinary Hospital up to the junction with **Existing Fire Road A**. From this point running north to the Interpretive Center and Visitor Center the new permanent road will slightly bend to the east further than the Existing Fire Road C to allow more clearance from the chaparral habitat. Where the lane is higher than existing grade, piles will be driven as a foundation and structural framework, with wood lagging installed on the back side. This will then be backfilled from the road side to stay away from any sensitive vegetation outside the road, refer to **Figure 1** for overall layout, **Figure 2a and 2b** showing elevated road sections, and **Figure 7a** for typical at grade sections. At the Visitor Center and Interpretive Center the lane will form part of a larger plaza area with a concrete paver or stained concrete finish, planting zones and seating areas. From this point the **Existing Fire Road C ends**, and the new permanent fire lane will run east to connect with **Existing Fire Road D**. This section will be paved in asphalt, and where above existing grade be formed with the driven piles and lagging method described above to minimize impact to adjacent vegetation and oak trees. Then the new fire lane will follow Existing Fire Lane to the eastern boundary of the project site connecting to the public way at Snowdown Ave., refer to **Figure 1 and 6**.*

The Public Path Within the California Exhibit:

*A concrete paved public path starts at the end of the elevated walkway on the east side of the project and connect to the new permanent fire lane on the southwest side of the project, see **Figure 1**.*

Other Paved Areas Within the California Exhibit:

There are small paved paths serving each holding building accessed from the fire lane or public path. There is a paved yard adjacent to the Water Equipment area on the east side of the project.

Maintenance will occur on a 2-20 year regime for regular asphalt surfaces, 1(vacuuming)-15 year regime for porous asphalt and on a 10-25 year regime for concrete surfaces.

For regular asphalt roads apply a chip seal every 2 -3 years and place a 1½" asphalt overly every 7 to 10 years. Expect replacing the base and pavement section in failed areas starting the 20th year.

Porous asphalt road areas must be cleaned once a year with a vacuum sweeper. No chip sealing or applications are applied to the surface so infiltration is maintained. Failed areas can be repaired with a pervious mix of asphalt for spot repairs.

Concrete pathways are impervious, steel reinforced, and expected to have a 25 year life and beyond. If soil movement or base failure occurs, cracks up to ¾ inch may be filled. Sections of pathway will be replaced if cracking exceeds ½ to ¾ inch or differential settlement creates a trip hazard.

- 18) "Page 13, Section 2.2.1 Detailed Description of the Project, Grading Plans: Please provide a final grading plan in the Biological Assessment. Will there be grading outside of the building and exhibit footprints? Will there be grading for slope stabilization?"

***Figures 1, 2, and 3** show limitations of grading which are depicted by hatching, representing 3 forms of grading disturbance in the project: Permanent Disturbance (building foundation footprints, walkways, and roads); Graded Areas (minimal space for permanent operational access around each building, and transition slopes); and Temporary Construction Access (limits for equipment to perform the grading operation that with temporarily disturbance). The legend designates the location of these 3 grading forms which are keyed to the plan on each figure.*

Every attempt has been practiced to limit grading and design a plan with minimal disturbance, while providing minimal operational requirements for animals in holding areas and housing animals in night houses.

Compliance with the Clean Water Act, Amendment C.3, requiring treatment and hydromodification of runoff from impervious surfaces to assure water quality and detaining flows, require bioretention basins. These basins have been located throughout the project in areas downstream of runoff sources to be collected and treated and are depicted on the plan. Temporary disturbance for drainage pipes from the basins emitting clean water onto the landscape are also shown. The number of basins have been reduced by providing harvesting of rain water to be used to clean animal night houses. A 30,000 gallon tank located west of the Interpretive Center serves as the disposal source for recaptured rain water. The tank is screened by existing oaks and masked by a natural rock facade.

Temporary staging areas and equipment storage areas are also shown on the plan. Where these areas are located outside of graded areas, they will be re-graded back to their natural contours after construction in the particular area is completed.

The area southeast of the Interpretive Center in the grizzly holding area is set aside to balance dirt and used for temporary stockpiling of soils. Although the project is designed to balance, calculations are never exact due to many factors and minimal cut and fill to balance is expected in this area. Native grasslands will be avoided where possible and replanted where disturbed. Cut and fill slopes have been minimized throughout most of the project. Areas where slopes are needed are designed to save trees in the oak woodland areas of the landscape. Retaining walls have been used minimally to limit grading around trees and limit slope encroachment into the landscape to preserve habitat.

The grading design accomplished zero disturbance of chaparral, minimal disturbance of shrub communities, minimal tree removal and limited encroachment into native grass areas.

Figures 2 and 3 and enlarged Figure SK-Arch-001 should be viewed to see the grading limits designed in the plan.

- 19) “Page 13, Section 2.2.1 Detailed Description of the Project, Water Facilities: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the pipelines.”

*A LSS Equipment structure and service yard is planned at the eastern side of the project. The LSS structure is a single story , open air structure with a slab on grade, partial height concrete masonry walls, and steel column vertical structure. A single pitch roof framed in steel and clad in corrugated metal provides cover for the LSS filtration equipment. This equipment serves the Grizzly Bear Viewing water feature to the west, refer to the bottom right hand side of **Figure 2**. The service yard will be asphalt and match the construction methods of the fire access lane described in response to question 17. The pad for the LSS structure will be established with an excavator, and concrete foundations, slab, and grout for the concrete masonry walls will be poured from the adjacent service yard area. Construction access will be from the site area to be re-graded to the north, and the **Existing Fire Roads E and D**. Steel will be erected by a crane located at one of these fire roads.*

- 20) “Page 14, Section 2.2.1 Detailed Description of the Project, Storm Drain Facilities. This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the facilities.”

*The storm drain facilities consist of pipes and open ditches. Ditches are mostly earth swales; concrete ditches are used only along the access road leading to the project from the veterinarian hospital to curtail erosion along the road edges which would otherwise destabilize adjoining slopes and allow silt to enter the storm drain system. Most storm drains are under roads and walkways conveying collected drainage to the BMPs for treatment. Some pipes to and from the bioretention basins are in the landscape. **Figures 2 and 3** show the location of storm drain lines. Rainwater harvesting has been explained in response to comment 18. Pressure lines which convey pumped water to the*

harvesting tank from other night houses are kept within roadways and pathways. One pump line is located outside of the roadway under the condor tent enclosure.

Sanitary sewer and Water service lines commence at a pump house located at the veterinarian hospital. Fire, domestic, and irrigation water is pumped through pipes up the slope to the project's looped road providing access to the various exhibits. Along the water lines is the sanitary sewer gravity pipe. This utility corridor will use a common trench for all 3 water lines to reduce the width of disturbance during trenching.

- 21) "Page 15, Section 2.2.1 Detailed Description of the Project, Electricity and Natural Gas Facilities: This subsection does not describe the construction methods, construction footprint, equipment, construction timing or duration, or access roads needed to construct the facilities."

Power lines servicing the buildings and night houses will be underground. Conduits exist which commence at Edgemont Way and currently run and serve an existing cell tower near the exhibit area. These existing conduits will be utilized to serve the project; the new power line wires will be pulled through them. No disturbance will result for electrical service other than the run from the cell tower to the project loop road from the cell tower. This new run will be placed in existing fire roads.

*Gas will require a new service from Edgemont Way. A 15ft. strip of land will be temporarily disturbed. The alignment is shown on **Figure 1**.*

- 22) "Page 16, Section 2.2.1 Detailed Description of the Project, Proposed Construction Activities and Schedule: If construction details are not described in the specific activity sections they should be described here. If the construction and phasing changes where project effects change, the project will need to be reinitiated. This included habitat loss."

The timeframe to construct the various project components are reviewed in the detailed descriptions above. Details on the revised timeline for the overall construction schedule will be updated by the EBZS following further input from the resource agencies.

- 24) "Page 16, Section 2.2.1 Detailed Description of the Project, Ecological Recovery Zone:"

Refer to comment the answer to question 23.

- 28) Page 33, Section 5.1.3 Impacts Due to Fuel Management: Please provide a fuels management plan for this project. This section is too vague to fully analyze potential effects to individuals and habitat. On-going maintenance is considered a permanent effect to habitat. Will fuel management need to occur in other areas like the perimeter fence? Also, "take" as mentioned in the last sentence of this section is appears to be referring to the State definition of "take". The federal definition of take includes harm in the form of habitat loss and not just effects to individuals. This is an important distinction.

Please refer to the fire fuel management zones shown in Figures 1, 2, 3, 4, and 5, and the attached memo outlining a framework for vegetation management including SK-Arch-001.

memorandum

architects and planners

noll & tam

To: East Bay Zoological Society
Cc: Darin Ranelletti, Planning and Zoning Division, City of Oakland
Leroy Griffin Assistant Fire Marshal, City of Oakland
Jim Martin, Environmental Collaborative
From: Ethan Ahlberg, Architect, Noll & Tam Architects
Date: November 7, 2012
**Re: Oakland Zoo California Trail
Fire Fuel Management Plan Framework**

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This memorandum defines the framework for the required extent of fire fuel management associated with the California Trail expansion project at the Oakland Zoo. In general, fire fuel management will be required at all building and open air structures that will have human occupants and along roadways and pedestrian accessways. The zone in which fire fuel management will be required generally consists of a 30-foot zone from the exterior walls of structures, and a 10-foot zone from roadways and pedestrian accessways. Fire fuel management will not be required along fences, including the Perimeter Fence. Fire fuel management zones are shown on Figures 1, 2, 3, 4, 5, 6, and 7, prepared by the project engineer, Aliquot Associates, and SK-Arch-001.

This Fire Fuel Management Plan Framework was prepared based on a site walk conducted on July 30, 2012 with Leroy Griffin, Assistant Fire Marshal, Dr. Joel Parrott, the Zoo Director, and myself. This was followed by a meeting at City Hall on November 6, 2012 attended by Mr. Griffin, Darin Ranelletti from the City's Planning and Zoning Division, Jim Martin with Environmental Collaborative serving as project biologist, and myself. During the site walk conditions in the vicinity of the Visitor/Interpretive Center, access roads, and Overnight Experience were reviewed. During the follow-up meeting, details on required setback zones, fire fuel management implications, and relevant aspects of the City code were reviewed.

This Framework is considered a conservative approach to fire fuel management. According to Mr. Griffin, the fire fuel management zones may be refined/reduced upon review of the final Fire Fuel Management Plan and during consultation with the state and federal resource agencies. A major focus of the fire fuel management issues relate to the possible impacts on chaparral habitat, which occurs downslope and to the west of the Visitor/Interpretive Center. Refinements to the approved footprint of structures and gondola entrance to the Visitor Center were made during project design to minimize disturbance to areas of chaparral cover. Limited areas of chaparral cover will require fire fuel management on the west side of the Visitor Center, along the access road between the Overlook and Visitor Center, and along the access to the Overnight Experience. A summary of the fire fuel management requirements for the various aspects of the project are summarized below:

Visitor/Interpretive Center and Elevated Public Walkway Treatments:

Fire fuel management will be required within a zone of a maximum of 30 feet from the face of wall or column of the built structure of the Visitor Center and Elevated Walkway, shown as a dashed blue line on the attached **SK-Arch-001** dated November, 2012. The fire fuel management zone will not be measured from any deck or roof overhangs beyond the face of structure that meets the ground. The proposed 3rd floor deck on the southwest façade of the Visitor Center cantilever's 8 feet beyond the structure below, but is of concrete construction. Mr. Griffin has indicated that no additional setback from the cantilever deck is required given the proposed design featuring concrete construction for the bottom two levels of the structure, providing a 3 hour fire rating of all structure up to a height of 24 feet above grade, including the floor of the overhanging deck.

Vegetation Management within the fire fuel management zone will affect limited areas of chaparral cover, as indicated in **SK-Arch-001**. The edge of chaparral canopy was mapped by engineer survey, and is depicted in the figure by the dashed brown line, with areas of affected chaparral cover shown in hatching. An additional zone of chaparral will require routine pruning beyond this fire fuel management zone to provide gondola access into the building, which is also depicted in SK-ARCH-001 and reflected in cross-section 1 in **Figure 2a**.

Controls that would be implemented:

Where chaparral and scrub habitat falls within the identified fire fuel management zone, careful controls will be implemented to minimize disturbance to sensitive habitat. These consist of the following management methods and controls:

1. A biological monitor shall be present during shrub maintenance activities.
2. Shrub maintenance shall be done manually using chain saws and clippers.
3. No shrub stumps shall be removed.
4. Shrub cuttings shall be removed from the area.
5. Thinning shall not result in shrub cover of less than 25%.
6. Thinning shall not be performed more frequently than on an annual basis.
7. Shrubs will be trimmed down to 18" inches height and trees within the zone will have limbs trimmed up to 6 feet in height.

Roadway and Access Treatments:

As indicated by Mr. Griffin during the meeting on November 6, 2012, the fire fuel management zone along the access road to the Visitor/Interpretive Center and access to the Overnight Experience is limited to a 10-foot setback area from the roadway edge. Vegetation management in this 10-foot setback area will focus on removal of French broom and other invasive species, limbing of all trees up to a minimum of 6 feet off the ground, maintenance of grassland cover to a height of six inches, and limited thinning of native chaparral and shrub species where they fall within the 10-foot setback zone. Where native chaparral and scrub vegetation could be affected, the management controls listed above under treatments for the Visitor/Interpretive Center would apply as well. Refer to **Figures 1, 3, 4, 5, 6, 7, and SK-Arch-001**.

Zoo Overnight Experience Area:

Fire fuel management will be required within the circle of platform structures in the overnight experience area, and to 30 feet outside the perimeter of the platform structures. This includes limbing of trees up to a minimum of 6 feet off the ground, and maintenance of grassland cover to a height of six inches. Refer to **Figure 5**.

The above provides a framework for the required fire fuel management activities to be implemented as part of the California Trails project, and the limits of vegetation that could be affected under the management zones. A detailed Fire Fuel Management Plan will be prepared following input from the resource agencies, and further direction from the City Fire Department. The final Fire Fuel Management Plan will provide additional information on methods, schedule, and reporting requirements, among other details.

Please contact me at 510.542.2200 if you have any questions.

Kind Regards,

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Architect

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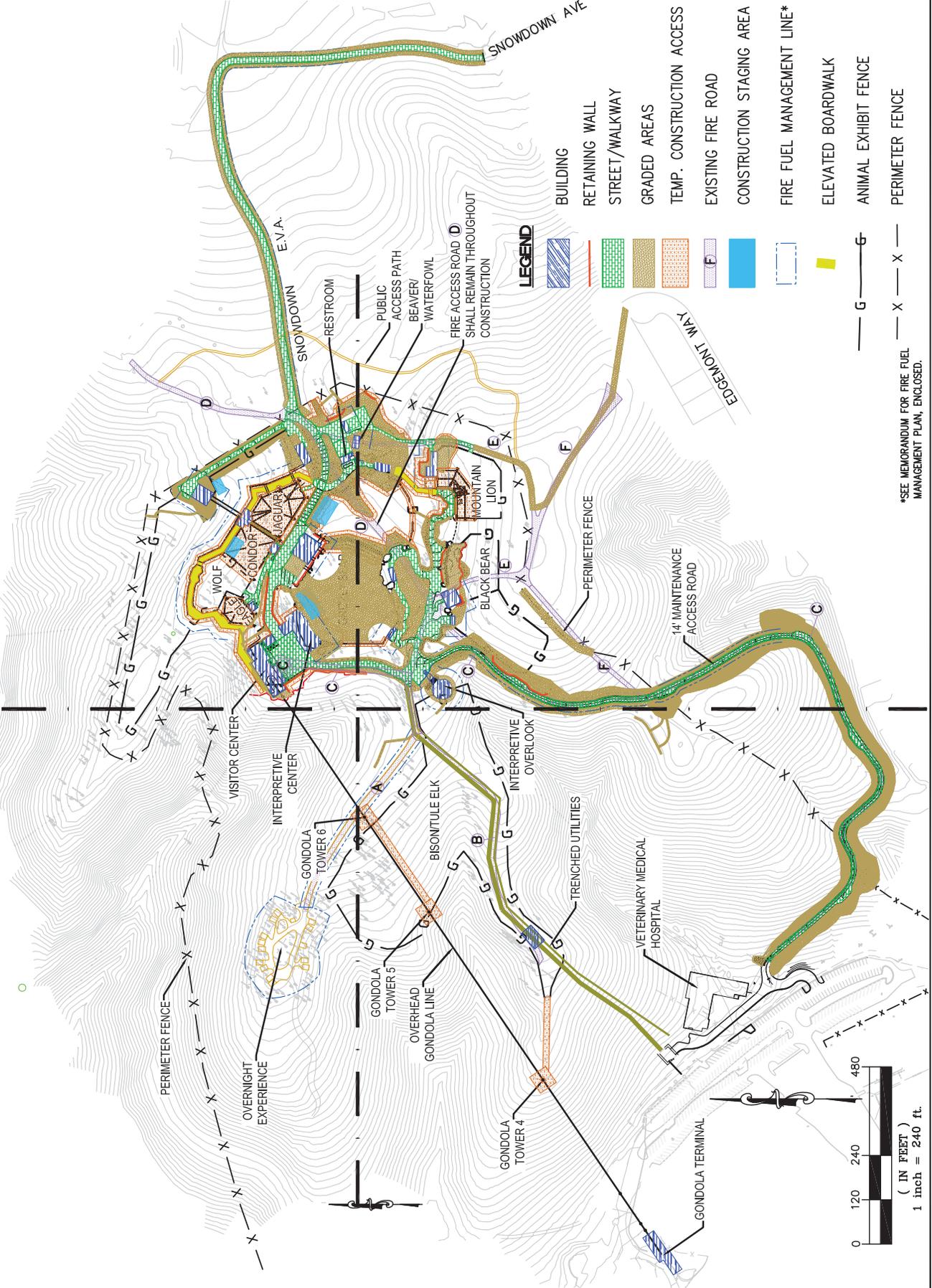
NO.	BY	DATE	REVISIONS



OVERALL SITE EXHIBIT
 CALIFORNIA TRAILS EXHIBIT
 KNOWLAND PARK-OAKLAND ZOO

NO.	DATE	SCALE	DATE	REVISION	BY	APPROVED

FIG 1
 1 of 1



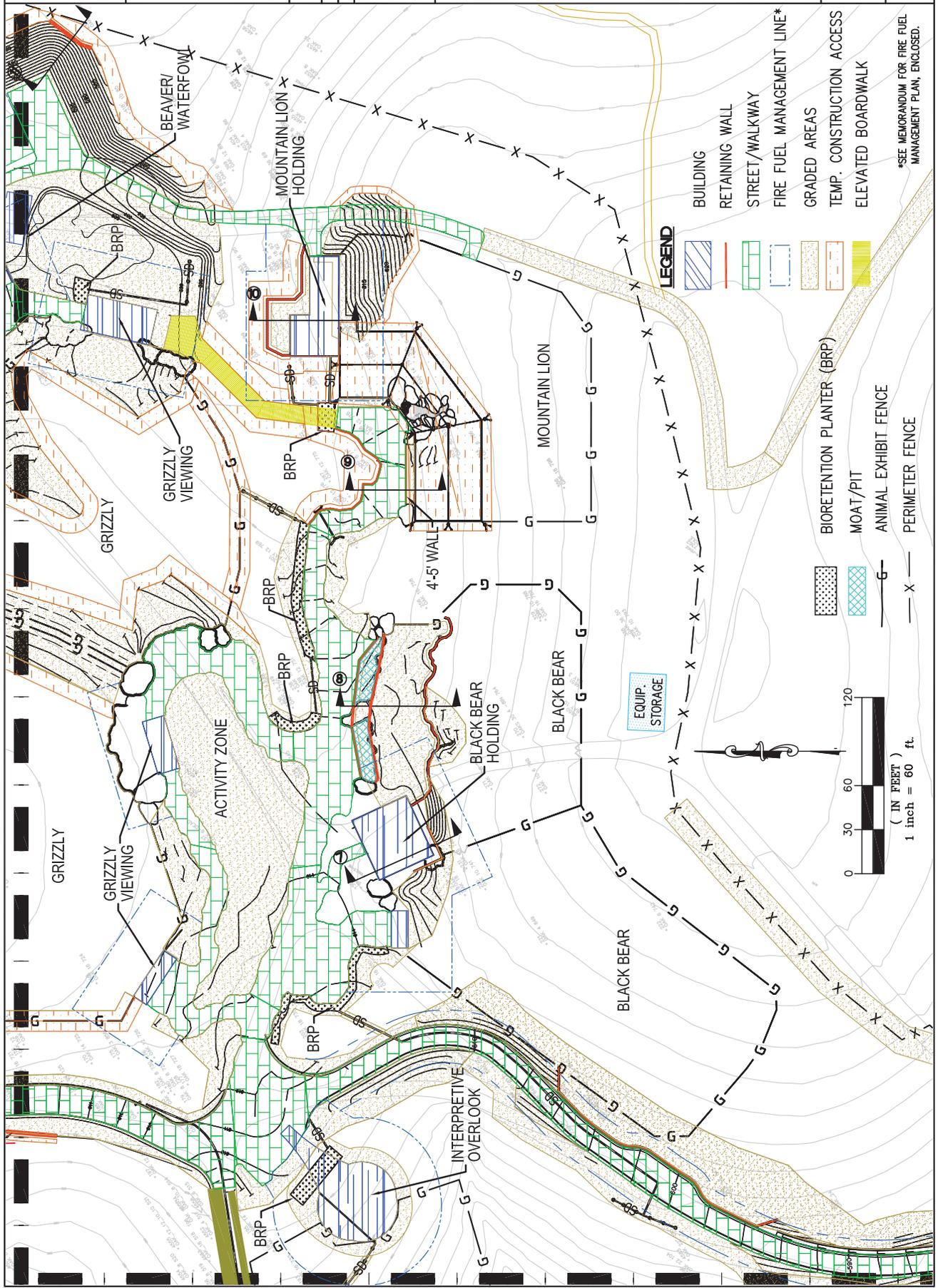
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SITE EXHIBIT
 CALIFORNIA TRAILS EXHIBIT
 KNOWLAND PARK-OAKLAND ZOO

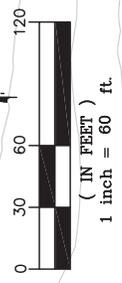
APPROVED	DRAWN	REVISION	DATE	SCALE	JOB NO
			11/7/2012		208022

FIG 3
 1 of 1
 DRAWING NUMBER



- LEGEND**
- BUILDING
 - RETAINING WALL
 - STREET/WALKWAY
 - FIRE FUEL MANAGEMENT LINE*
 - GRADED AREAS
 - TEMP. CONSTRUCTION ACCESS
 - ELEVATED BOARDWALK

- BIORETENTION PLANTER (BRP)
- MOAT/PIT
- ANIMAL EXHIBIT FENCE
- PERIMETER FENCE



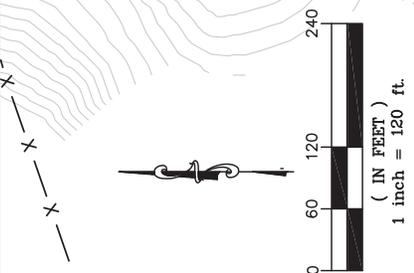
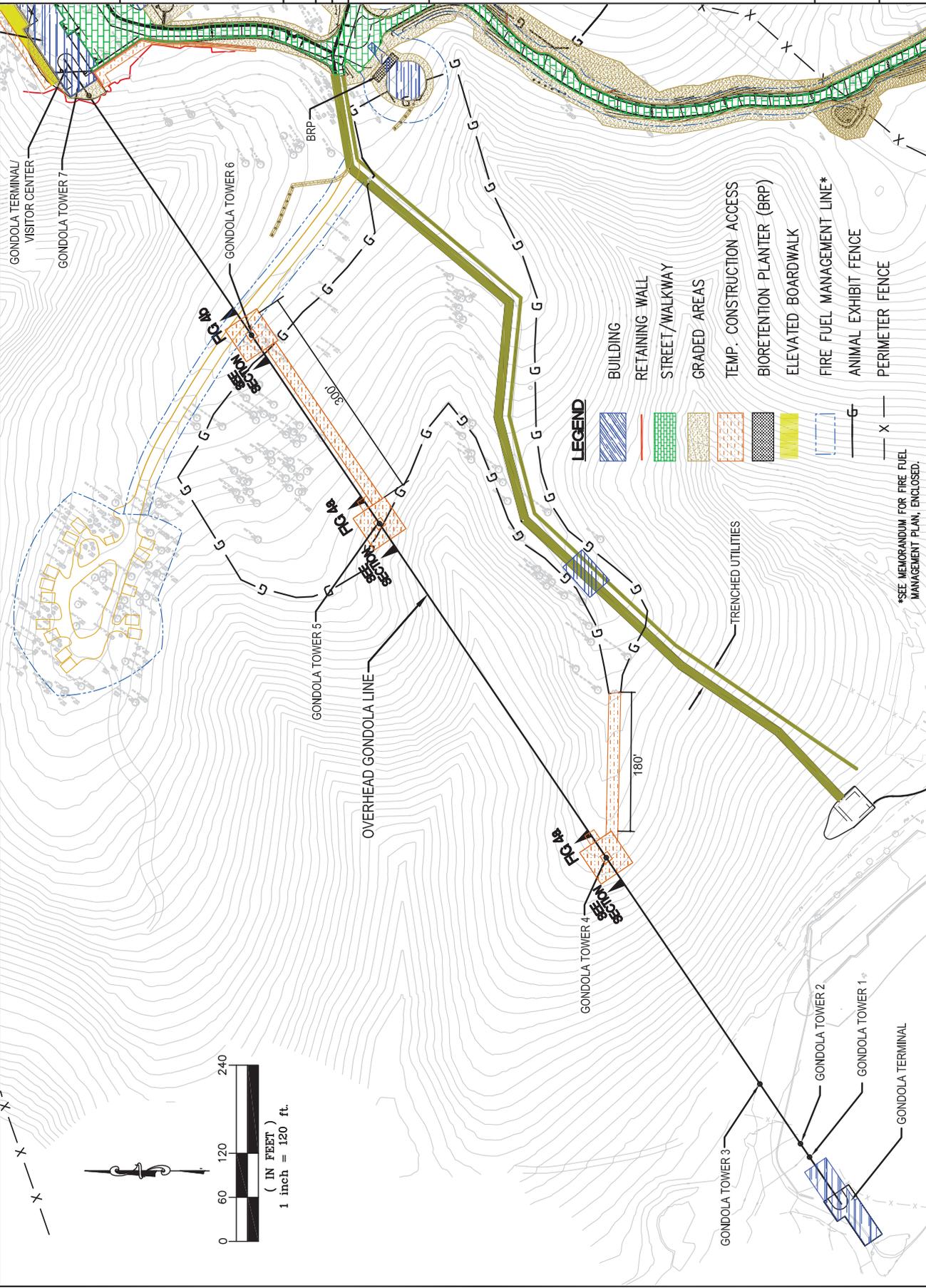
*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

NO.	BY	DATE	REVISIONS



SITE EXHIBIT
 CALIFORNIA TRAILS EXHIBIT
 KNOWLAND PARK-OAKLAND ZOO

DATE	SCALE	DRAWING NUMBER
11/7/2012	AS SHOWN	FIG 4
		1 of 1



*SEE MEMORANDUM FOR FIRE FUEL
 MANAGEMENT PLAN, ENCLOSED.



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Planners
 CEM Engineers
 Surveyors

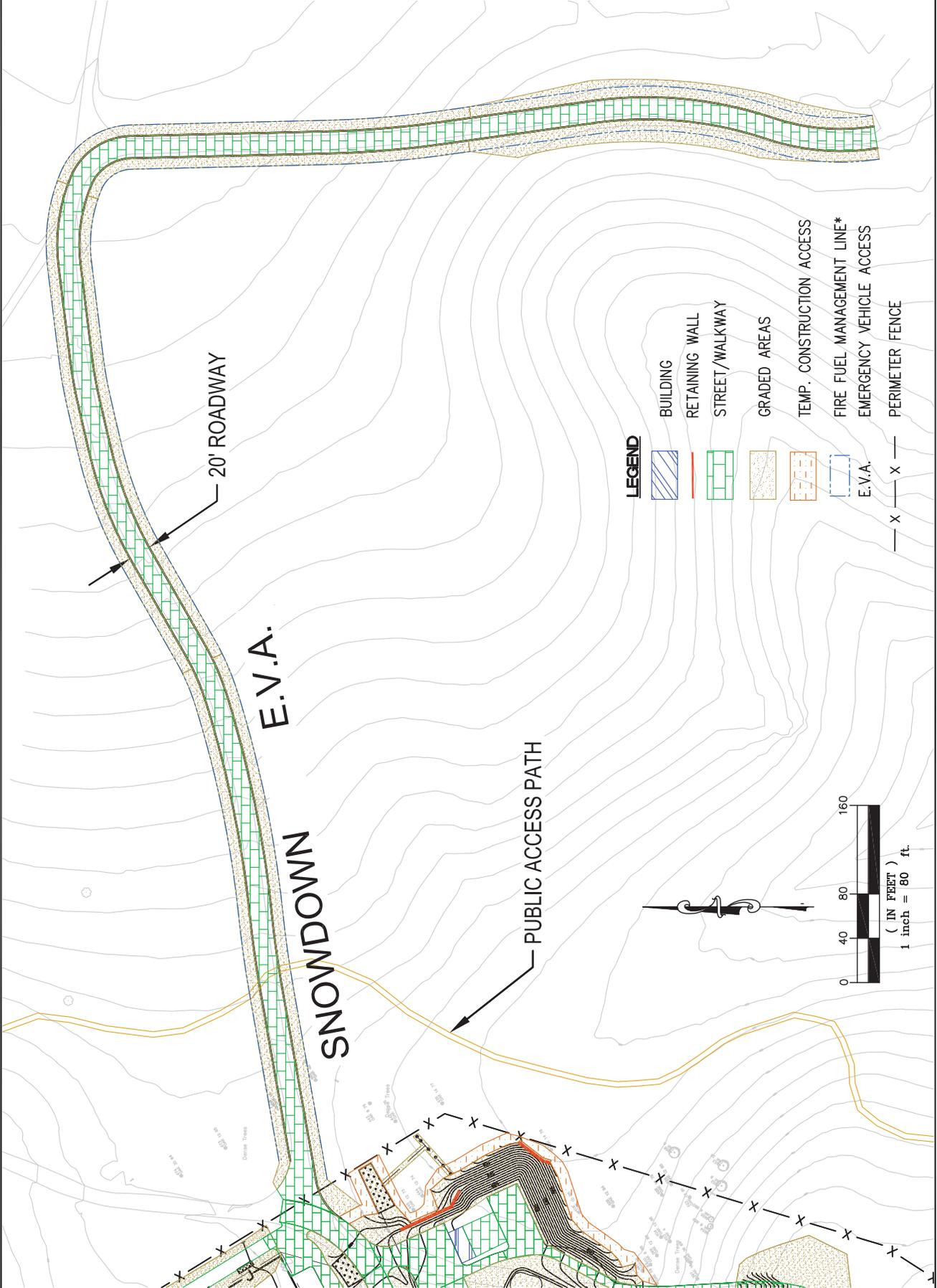
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SITE EXHIBIT - SNOWDOWN EVA
 CALIFORNIA TRAILS EXHIBIT
 KNOWLAND PARK-OAKLAND ZOO

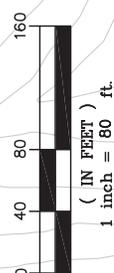
APPROVED	DRAWN	REVISION	DATE	SCALE	JOB NO
			11/7/2012		208022

FIG 6
 DRAWING NUMBER



LEGEND

- BUILDING
- RETAINING WALL
- STREET/WALKWAY
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- E.V.A.
- FIRE FUEL MANAGEMENT LINE*
- EMERGENCY VEHICLE ACCESS
- PERIMETER FENCE

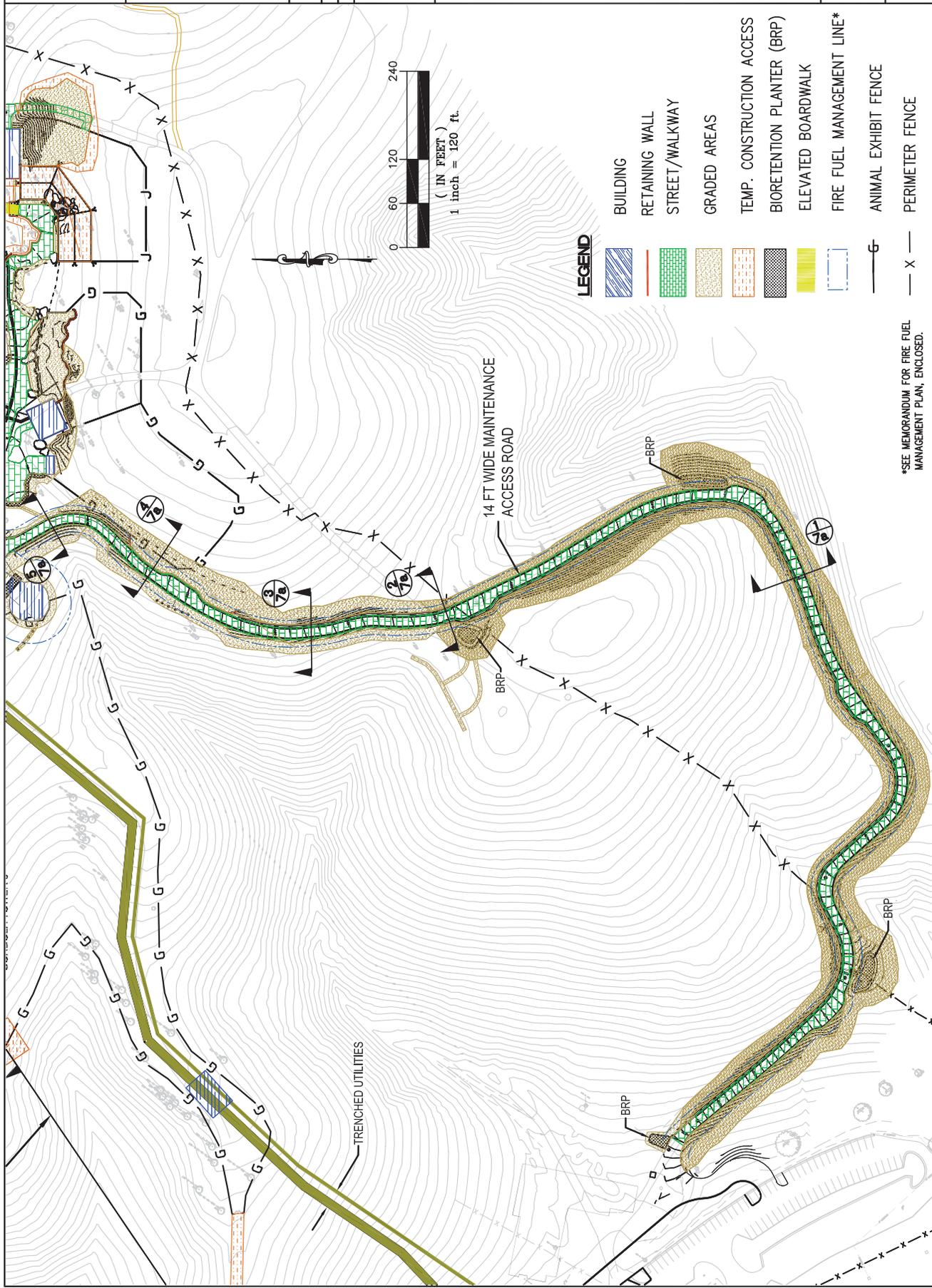


NO.	BY	DATE	REVISIONS



MAINTENANCE ACCESS ROAD
 CALIFORNIA TRAILS EXHIBIT
 KNOWLAND PARK-OAKLAND ZOO

NO.	DATE	SCALE	DATE	BY	APPROVED



LEGEND

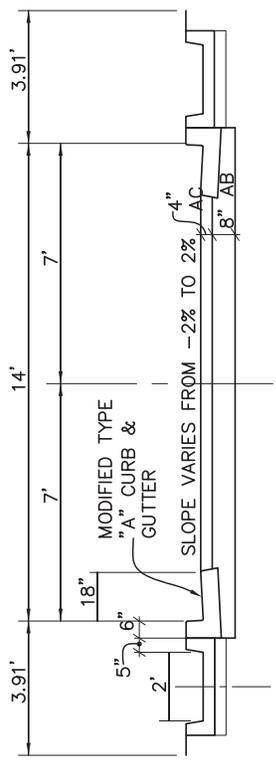
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- RETAINING WALL
- STREET/WALKWAY
- GRADED AREAS
- TEMP. CONSTRUCTION ACCESS
- BIORETENTION PLANTER (BRP)
- ELEVATED BOARDWALK
- FIRE FUEL MANAGEMENT LINE*
- ANIMAL EXHIBIT FENCE
- PERIMETER FENCE

*SEE MEMORANDUM FOR FIRE FUEL MANAGEMENT PLAN, ENCLOSED.

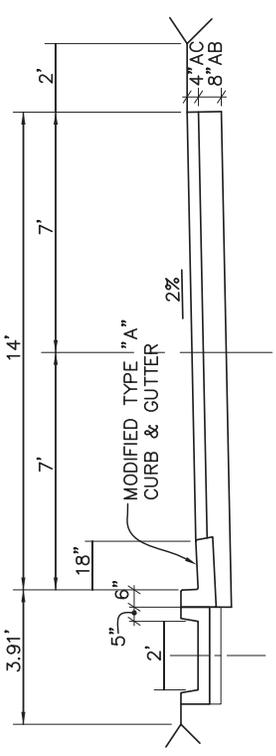
NO.	BY	DATE	REVISIONS



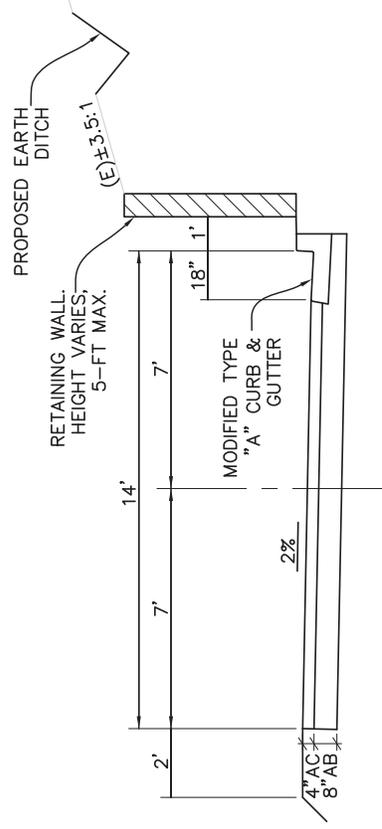
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DESIGN	DATE
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SCALE	JOB NO
	208022



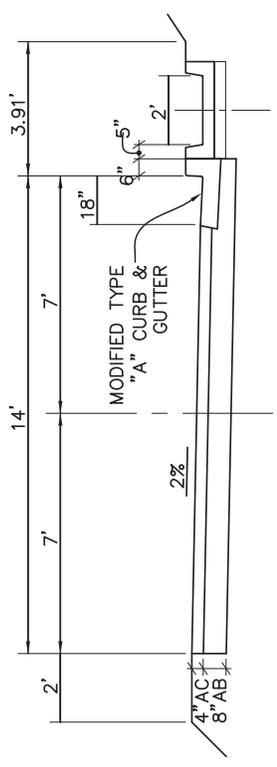
ROAD SECTION 2



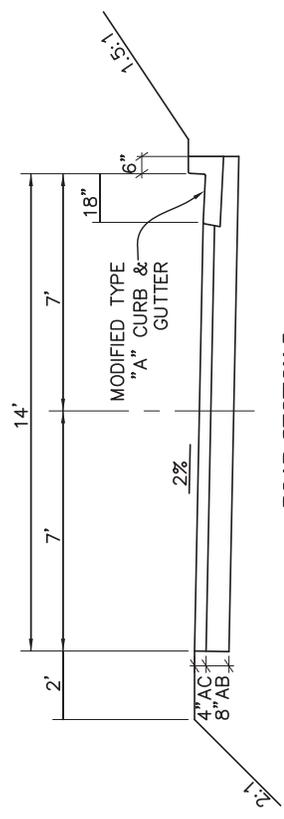
ROAD SECTION 1



ROAD SECTION 4



ROAD SECTION 3



ROAD SECTION 5

Appendix B. Habitat Enhancement Plan

Appendix B:

Habitat Enhancement Plan for Knowland Park, Oakland, California, approved by Oakland City Council June 21, 2012

HABITAT ENHANCEMENT PLAN
for
KNOWLAND PARK
OAKLAND, CALIFORNIA



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Approved by Oakland City Council, June 21, 2011

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APPENDICIES

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INTRODUCTION AND SUMMARY

This Habitat Enhancement Plan (HEP) has been prepared by Environmental Collaborative for the East Bay Zoological Society. The HEP implements certain mitigation measures and conditions of approval for the Oakland Zoo in Knowland Park Master Plan (Master Plan), adopted by the City of Oakland in 1998, and updated mitigation measures from the 2011 Subsequent Mitigated Negative Declaration / Addendum prepared for the amendment to the Master Plan. Habitat enhancement provided under the HEP would be achieved through the control and eradication of the target invasive species and through revegetation with native grassland, riparian, and woodland species where the native cover types have been displaced by non-native species. This HEP provides background information on the status of the Master Plan, a brief description of habitat conditions in the HEP treatment area of Knowland Park, identifies performance standards regarding invasive species control and native revegetation in treatment areas, summarizes phasing of implementation based on construction of the California Exhibit project and resulting on-going monitoring and maintenance as part of required mitigation, and defines goals and implementing actions related to the invasive species removal, native revegetation, and sensitive resource protections.

A Draft HEP was previously prepared in February 2011. Revisions to the Draft HEP were made during the environmental review process for the 2011 amendment to the Zoo Master Plan and the 2011 Subsequent Mitigated Negative Declaration /Addendum. The revisions have been incorporated into this version of the HEP approved by the Oakland City Council on June 21, 2011. Appendix A lists all of the revisions made to the Draft HEP, showing the actual changes made to the original text. For consistency, all references to “Implementation Action” and “Implementing Action” have been revised in this version of the HEP to read “Implementing Action”.

BACKGROUND

In 1997, the Oakland Zoo submitted an application to the City of Oakland for a major conditional use permit for the Master Plan intended to allow development of certain improvements and programs at the zoo over a period of 20 years (Zoning Case No. CM97-25). On April 16, 1997, the Oakland City Planning Commission adopted a Mitigated Negative Declaration (MND) for the Master Plan and approved part of the Master Plan. On June 4, 1997, the City Planning Commission approved the remainder of the Master Plan. On December 15, 1998, the City Council adopted Resolution No. 74736 C.M.S. upholding the City Planning Commission’s adoption of the 1998 MND and decision approving the California 1820 exhibit portion of the major conditional use permit, subject to certain conditions of approval and mitigation measures.

The Oakland Zoo has applied for approval of an amendment to the approved Master Plan that would refine and make certain changes to the site plan for the approved California 1820 exhibit, now identified as the California Exhibit, and provide for a new relocated Veterinary Medical Hospital. A Subsequent Mitigated Negative Declaration/ Addendum, prepared pursuant to

CEQA Guidelines Section 15164, updates the information contained in the 1998 MND in light of the proposed Master Plan amendment, changed circumstances, and new information.

One of the mitigation measures from the adopted 1998 MND, Mitigation Measure 13a, calls for preparation and implementation of a HEP for the California Exhibit area and Upper Knowland Park. The HEP addresses impacts of the project on native vegetation and wildlife habitat by removing infestations of highly invasive non-native plant species and revegetating degraded areas with native plantings. These highly invasive plant species tend to outcompete and eventually replace native cover, eliminating native groundcover vegetation, and reducing the habitat values for native wildlife. Below is a copy of Mitigation Measure 13a.

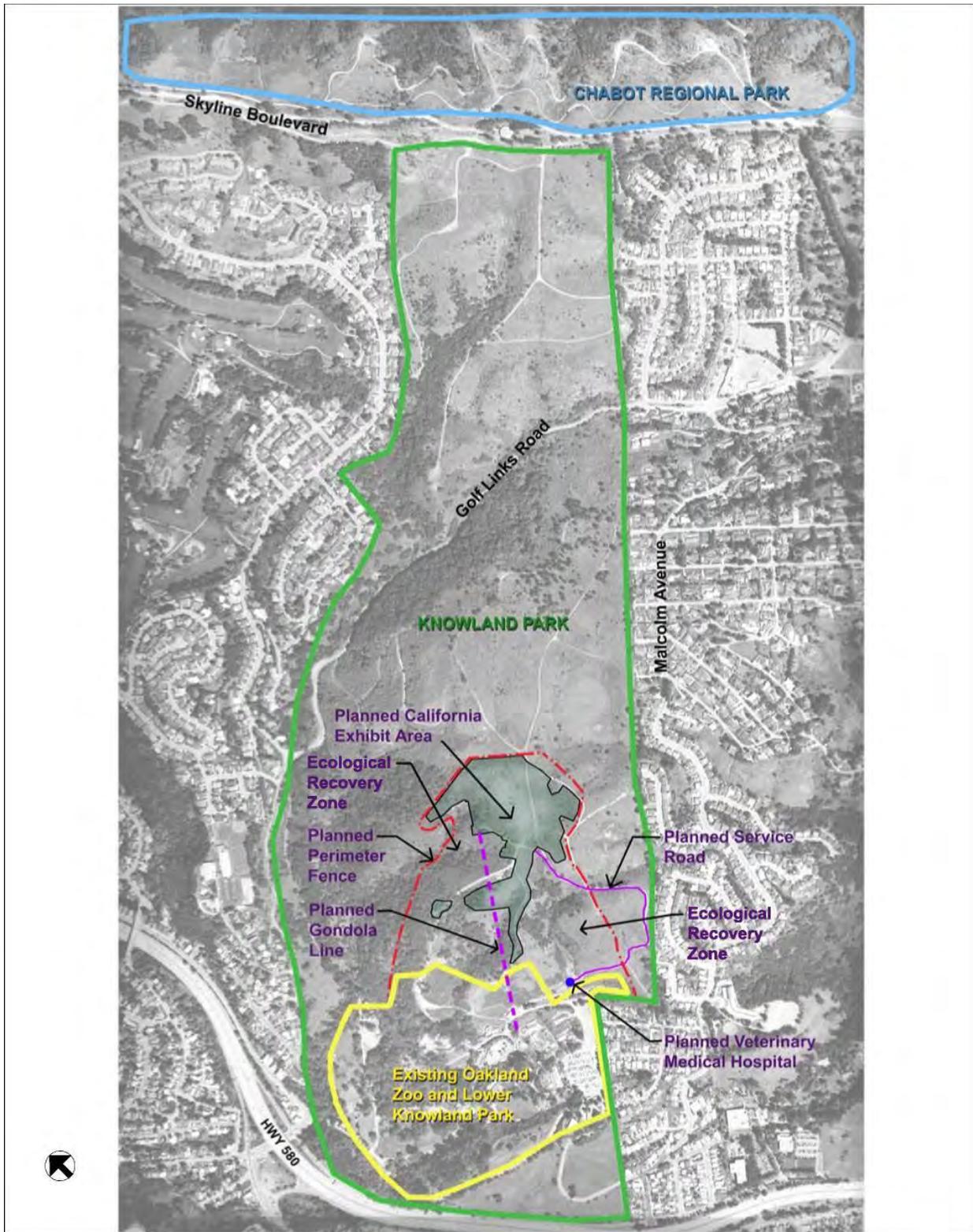
13a) The proposed Master Plan would include implementation of a Habitat Enhancement Plan that would enhance oak woodlands, native grasslands, coastal scrub and riparian woodland, and remove eucalyptus, French broom and other exotic plants from the California 1820 Exhibit area and Upper Knowland Park. The Habitat Enhancement Plan should include the following:

- An annual assessment of the species and distribution of invasive nonnative weeds (examples of invasive species would include artichoke thistle, French broom, giant reed, German ivy, pampas grass, Algerian ivy, acacia and eucalyptus). The assessment would include a map and estimate of abundance of weeds.*
- A management element for the control of each weedy species. Methods used for each species should be based on current accepted best available practices, including hand-pulling, cutting followed by topical application of suitable herbicide, use of livestock, removal or burning of cut plant materials, and so on. The justification for the control methods used should be explained, and a tracking system maintained to document areas treated, methods used, and effectiveness of the results.*
- A revegetation element for areas where heavy infestations of weeds comprise a significant portion of the existing vegetation. The riparian zone of lower Arroyo Viejo Creek, for example, is so dominated by nonnative species that planting of indigenous tree and shrub species following the removal of weeds is needed to speed up the restoration process. This element would include a tracking system for areas treated, a record of the source and species of plant materials used, methods of installation and maintenance, and an assessment of the success of each effort.*

LOCATION AND DESCRIPTION OF EXISTING HABITAT CONDITIONS

The Oakland Zoo in Knowland Park is located in south Oakland, east of Interstate 580 and adjacent to Anthony Chabot Regional Park (see **Figure 1**). Knowland Park contains a total of approximately 490 acres, of which approximately 93 acres comprise the arboretum, zoo, and related support facilities and approximately 62 acres were approved by the City Council for development of the Oakland Zoo's California 1820 exhibit. The remaining 335 acres contain

FIGURE 1 KNOWLAND PARK AND CALIFORNIA EXHIBIT AREA BOUNDARY



upper and lower Knowland Park. Upper Knowland Park contains approximately 278 acres of open space, vegetation, public trails, and fire roads, and is bisected by Golf Links Road. Lower Knowland Park contains approximately 57 acres of open space, vegetation, zoo entrance area, and roads. The Ecological Recovery Zone encompasses that portion of the area within the proposed perimeter fence, but outside the existing zoo and California Exhibit area (see **Figure 1**). **Table 1** presents a breakdown of acreage by use area.

TABLE 1 KNOWLAND PARK ACREAGE BY AREA

Area	Number of Acres	Zoning
Upper Knowland Park	278 ^a	Open Space (Resource Conservation Area)
Approved California 1820 Exhibit	62 ^b	Open Space (Special Use)
Arboretum, Zoo, and Related Support Facilities	93 ^c	Open Space (Special Use)
Lower Knowland Park	57 ^d	Open Space (Resource Conservation Area)
Total	490	

^a Zoo-City Management Agreement, May 2005. This agreement identifies 340 acres in the upper area of Knowland Park. Subtracting the 62 acres for the approved California 1820 exhibit leaves a balance of 278 acres.

^b The project conditions of approval did not identify a total acreage for the California 1820 exhibit. This figure was calculated based on the Final Revised Plan approved by the City Council on December 15, 1998.

^c Oakland Zoo In Knowland Park Master Plan Mitigated Negative Declaration/Initial Study, 1998.

^d Zoo-City Management Agreement, May 2005. This agreement identifies 150 acres in the lower area of Knowland Park. Subtracting the 93 acres for the arboretum, zoo, and related support facilities leaves a balance of 57 acres.

Source: Placemakers, 2011 Subsequent Mitigated Negative Declaration / Addendum, Oakland Zoo Master Plan.

Vegetation in the California Exhibit and Upper Knowland Park area consists of a mosaic of grassland, woodland, scrub, and chaparral vegetation as indicated in aerial photographs of the vicinity (see **Figure 1**). The developed exhibit area of the existing zoo forms the southwestern edge of the Master Plan area and contains large paved parking lots, ornamental landscaping, structures, and animal enclosures. Arroyo Viejo Creek is a perennial creek that flows approximately 600 feet north of the proposed California Exhibit area, at its closest location, and supports a dense cover of riparian trees and shrubs. The creek continues as an open channel through Upper Knowland Park, passing through a culvert under Golf Links Road. A major habitat restoration effort of the lower reach of Arroyo Viejo Creek was undertaken in 2007 as a joint effort of the City of Oakland, Oakland Zoo, California Coastal Conservancy, the California Department of Parks and Recreation, and Alameda County Flood Control and Water Conservation District. Highly invasive species were removed and native enhancement plantings installed along approximately 1,000 feet of the creek corridor as part of this habitat restoration project.

Knowland Park supports a wide range of animal species, including a variety of birds, mammals, amphibians, reptiles, and invertebrates. The mosaic of vegetation types, protective cover, and available surface water provides important habitat resources to resident and migratory species that use the largely undeveloped parklands. Golf Links Road bisects the parklands, and Skyline Boulevard separates Knowland Park from the nearby Anthony Chabot Regional Park to the east. These roadways disrupt movement opportunities between natural areas for some terrestrial wildlife species but do not form complete barriers to wildlife movement. Existing residential development to the north and south, and Highway 580 and the urbanized area to the west limit opportunities for movement and dispersal of terrestrial wildlife beyond these boundaries of Knowland Park.

A number of highly invasive plant species have become particularly problematic around the perimeter of the existing zoo, along the middle reach of Arroyo Viejo Creek upstream of the 2007 restoration area, and in parts of the California Exhibit area and Upper Knowland Park. In some locations, the invasive species have largely replaced native plants, eliminating most of the associated wildlife habitat functions and values. Of greatest concern are infestations of French broom (*Genista monspessulana*) which forms dense thickets in some locations and is spreading throughout the remaining natural areas of Knowland Park, replacing grassland habitat and invading the understory of the woodlands, scrub, and chaparral. The Oakland Zoo and City of Oakland have taken several steps to control this problematic species given how it compromises native habitat, interferes with use of some of the existing animal enclosures, and contributes to fire fuel loading. Stands of invasive blue gum eucalyptus (*Eucalyptus globulus*), green wattle (*Acacia decurrens*), and blackwood acacia (*Acacia melanoxylon*) occur in a number of locations in Knowland Park, and heavy infestations of German ivy (*Senecia mikanioides*), Algerian ivy (*Hedera helix* ssp. *canariensis*), periwinkle (*Vinca major*), and Himalayan blackberry (*Rubus discolor*) occur along Arroyo Viejo, all of which compromise existing natural habitat and will continue to spread if not controlled. Other problematic invasive species reported from grassland, riparian and woodland habitats in Knowland Park include: artichoke thistle (*Cynara cardunculus*), pampas grass (*Cortaderia selloana*), sweet fennel (*Foeniculum vulgare*), and giant reed (*Arundo donax*). And planted stands of Monterey pine (*Pinus radiata*) also compromise the native cover, particularly grasslands, although trees of this species on public lands such as Knowland Park are to be protected and any removal must comply with the City's Tree Protection Ordinance (Oakland Municipal Code Chapter 12.36).

COMPONENTS OF THE HEP

The HEP has been prepared in compliance with the 1998 Master Plan approval and the Master Plan Amendment. The HEP serves to mitigate project-related impacts on natural habitat and native trees, and will be coordinated with measures implemented to address potential impacts on suitable habitat for the State- and federally-threatened Alameda whipsnake (*Masticophis lateralis*). The HEP expands upon the broad requirements of Mitigation Measure 13a, specifying replacement ratios and implementing actions for replacement of affected habitat or specific resource, defining performance standards and success criteria to be achieved upon full implementation, and identifying on-going assessment and reporting requirements.

The 1998 MND identified a number of mitigation measures related to avoidance of potential impacts on Alameda whipsnake, particularly during construction and operation of the California Exhibit. An individual male Alameda whipsnake was live trapped from the vicinity of the California Exhibit area in the summer of 2010 during protocol surveys to confirm presence or absence of this species. Given the confirmed presence of this species, appropriate authorizations for possible loss of individual snakes and essential habitat resulting from implementation of the California Exhibit project will be required from the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) pursuant to the requirements of the federal Endangered Species Act and the California Endangered Species Act, respectively. This will most likely include some type of compensatory mitigation that could consist of habitat enhancement measures consistent with the general goals of the HEP for invasive species removal and native habitat restoration. Mitigation Measure 14c from the 1998 MND has been revised in the 2011 Subsequent Mitigated Negative Declaration / Addendum to specify that a minimum 1:1 ratio of compensatory mitigation (at least one acre of mitigation to every acre of impact) will be required. Compensatory mitigation ratios may be refined as part of the consultation process with the USFWS and CDFG in securing incidental take authorizations for potential impacts on suitable habitat for the Alameda whipsnake. The assumptions regarding the limits of invasive species treatment and native replanting specified in this HEP may have to be adjusted based on future input from the USFWS and CDFG, but it appears there is more than sufficient land area in Upper Knowland Park in need of improved habitat management to meet compensatory mitigation requirements for Alameda whipsnake.

The HEP provides a coordinated approach to protecting and enhancing natural habitat, and meeting mitigation requirements for the Master Plan and the California Exhibit. The HEP contains six basic elements, consisting of: an Invasive Species Control Element; Grassland Protection and Enhancement Element; Native Revegetation Element; Native Tree Protection and Replacement Element; Special-Status Species Protection Element, and Implementation Element. The HEP provides for input from the City of Oakland, and encourages participation from organizations such as the California Native Plant Society, and interested public. Where necessary, the HEP will incorporate refinements that are necessary based on the mitigation plans prepared as part of the incidental take authorizations for Alameda whipsnake required by the USFWS and CDFG.

The initial focus of the invasive species control provided under the HEP will be directed towards achieving the mitigation for Alameda whipsnake and grasslands habitat lost or modified as a result of implementing the California Exhibit project. Treatment areas will be prioritized based on proximity to the California Exhibit site and need to meet specific habitat enhancement objectives specified in the 1998 MND and 2011 Subsequent Mitigated Negative Declaration / Addendum. French broom and other invasive species are spreading into the essential chaparral and scrub habitat within the Ecological Recovery Zone adjacent to the California Exhibit where the single Alameda whipsnake was encountered. The Ecological Recovery Zone encompasses that portion of the remaining natural areas outside of the existing zoo and future California Exhibit enclosures, but within the perimeter fence (see **Figure 1**). Preventing further degradation of the remaining natural areas within the California Exhibit and in the Ecological Recovery Zone will be crucial in protecting the important habitat it provides for Alameda whipsnake in Knowland Park. A preliminary analysis indicates that the compensatory mitigation

requirements for Alameda whipsnake and loss of grassland habitat could be achieved through treatment and management of lands in Upper Knowland Park west of Golf Links Road. As described further in the Implementation Element, once the compensatory mitigation ratios are met and required habitat enhancement is achieved, then the invasive species treatment under the HEP will be expanded into the remaining areas of Knowland Park east of Golf Links Road. On-going monitoring and management will be required in perpetuity to control possible re-establishment of the target invasive species due to the continued spread of seed from adjacent private properties and surrounding open space where management is less rigorous.

The six elements contained in the HEP are listed below, together with identified goals, performance standards and success criteria, and specific implementing actions. A description of the process for implementing the HEP is provided in the Implementation Element, together with details regarding on-going management and annual reporting requirements, as described below.

INVASIVE SPECIES CONTROL ELEMENT

Goal 1: *Control and, where feasible, eradicate highly invasive non-native species which continue to spread in Knowland Park and severely compromise existing habitat values.*

The HEP will focus on controlling and where feasible, eradicating highly invasive non-native species in Knowland Park. The initial treatment areas addressed under the HEP will include the Ecological Recovery Zone, the remaining natural areas of the California Exhibit, and the adjacent lands of Knowland Park west of Golf Links Road to address the threat these invasive species pose to the important habitat for Alameda whipsnake, and to protect and enhance the remaining grasslands in close proximity to the California Exhibit. Target invasive species include: French broom (*Genista monspessulana*), blue gum eucalyptus (*Eucalyptus globulus*), green wattle (*Acacia decurrens*), blackwood acacia (*Acacia melanoxylon*) artichoke thistle (*Cynara cardunculus*), sweet fennel (*Foeniculum vulgare*), yellow star thistle (*Centaurea solstitialis*), German ivy (*Senecia mikanioides*), Algerian ivy (*Hedera helix* ssp. *canariensis*), periwinkle (*Vinca major*), Himalayan blackberry (*Rubus discolor*) pampas grass (*Cortaderia selloana*), and giant reed (*Arundo donax*). Effective control of these target species requires an effective Integrated Pest Management (IPM) program. The IPM must be flexible in its implementation to address possible resprouting or re-establishment of the target species in treatment areas, adaptive to site conditions and successful treatment methods, and use of best available practices, including hand pulling, cutting followed by topical application of appropriate herbicide, use of livestock, and removal and burning of cut plant materials.

Successive treatment will be performed until the target species have been effectively controlled from the treatment area and comprise less than five percent of the absolute cover.¹ Ideally, target invasive species would be completely eradicated (eliminated) from treatment areas, but these are highly aggressive species which could be reintroduced from the untreated areas on Upper Knowland Park and surrounding private properties, making complete eradication highly challenging.

¹ Absolute Cover is a method of describing vegetative cover where the percentages of each component plant species are determined over a defined area, and where barren ground is also factored into the total cover.

Native coast live oak and other vegetation in Knowland Park is susceptible to Sudden Oak Death (SOD), and construction and vegetation management activities must be conducted in a manner to minimize the further spread of this disease. SOD is caused by the pathogen *Phytophthora ramorum*, a fungus-like organism that thrives in the moist climate found along coastal California. It is the leading cause in widespread mortality of susceptible tree species, including tanoak and to a lesser degree, coast live oak, California black oak and Shreve oak. The pathogen attacks the vascular system of the tree, just below the bark, weakening the tree and making it more vulnerable to infection by other tree pests such as fungi and bark beetles.

Phytophthora species are water-loving molds that produce plentiful spores in moist, humid conditions, and are known plant pathogens. While most leaf hosts do not die from the disease, they do play a key role in the spread of *P. ramorum*, acting as breeding ground for spore production, which may then be spread through wind-driven rain, water, plant material, or human activity. Trunk hosts such as oaks are considered terminal hosts, typically becoming infected when exposed to spores produced on the leaves of neighboring plants or through human contamination. The organism is most active during wet periods, and the risk of movement is therefore highest in muddy, wet areas and during rainy weather. *P. ramorum* spores can be found in living, dying, or recently dead plants, as well as in infested waterways and soil, and may be transported to new areas when infected plant material or infested soil is moved.

The California Oak Mortality Task Force (COMTF) is a non-profit group working to manage SOD in California. The COMTF has compiled Best Management Practices (BMPs) that are applicable to construction and vegetation management activities in Knowland Park. These include practices related to tree removal and care, vegetation and other debris disposal, and sanitation measures to use during construction and vegetation management activities to minimize pathogen spread. BMPs shall be implemented to minimize the possible spread of this pathogen and loss of oaks and other vegetation in Knowland Park.

The following Implementing Actions serve to implement the basic goal for the Invasive Species Control Element of the HEP.

Implementing Action 1-1: *Develop and implement IPM program for treatment areas in Knowland Park to address target invasive plant species including: French broom (Genista monspessulana), blue gum eucalyptus (Eucalyptus globulus), green wattle (Acacia decurrens), blackwood acacia (Acacia melanoxylon) artichoke thistle (Cynara cardunculus), sweet fennel (Foeniculum vulgare), yellow star thistle (Centaurea solstitialis), German ivy (Senecio mikanioides), Algerian ivy (Hedera helix ssp. canariensis), periwinkle (Vinca major), Himalayan blackberry (Rubus discolor) pampas grass (Cortaderia selloana), and giant reed (Arundo donax). The list of target species shall be adjusted as additional invasive species may become established and problematic in Knowland Park, but generally shall include any species listed as having a “high” and “moderate” rating for “Invasive Non-Native Plants that Threaten Wildlands in California” according to the electronic Inventory of the California Invasive Species Council (Cal IPC).*

Implementing Action 1-2: *The IPM shall be flexible in its implementation to address possible resprouting or re-establishment of target species, shall be adaptive to site conditions and successful treatment methods, and shall use best available practices, including hand pulling, cutting followed by topical application of appropriate herbicide, livestock grazing, and removal and burning of cut plant materials, as appropriate.*

Implementing Action 1-3: *Target species shall be mapped for future treatment, with estimates of absolute cover class identified for the target species, other vegetative cover, and any native species component as part of baseline data collection. Initial mapping shall encompass the Ecological Recovery Zone, California Exhibit Area, and Upper Knowland Park west of Golf Links Road, consistent with the phasing described in the Implementation Element.*

Implementing Action 1-4: *Successive treatment shall be performed until the target species have been effectively controlled from the treatment area and comprise less than five percent of the absolute cover. Additional treatment for invasives shall be applied to the treatment area whenever the target species collectively comprise more than five percent of the absolute cover during annual monitoring.*

Implementing Action 1-5: *Any herbicide application shall comply with City of Oakland regulations and shall be carefully controlled consistent with City of Oakland ordinance, and overseen by a certified pest applicator to protect desired native vegetation and sensitive resources, avoid enhancement plantings, and protect the aquatic habitat of the Arroyo Viejo and other receiving waters.*

Implementing Action 1-6: *All activities associated with implementation of the HEP shall comply with any applicable Standard Conditions of Approval of the City of Oakland related to tree protection, creek protection, and other sensitive resource protections.*

Implementing Action 1-7: *Develop and implement a comprehensive Sudden Oak Death Control Program addressing the possible spread and infection of SOD in Knowland Park associated with implementation of the Master Plan and vegetation management activities of the HEP. The SOD Control Program shall be prepared by a plant pathologist, certified arborist or registered professional forester trained in the treatment of SOD and submitted to the City for its review and approval. The SOD Control Program shall be prepared in consultation with the pest control staff of the Alameda County Agricultural Department, and shall be completed prior to initiation of any construction or additional vegetation management activities in Knowland Park associated with the California Exhibit and/or the HEP. Best Management Practices (BMPs) shall be developed as part of the program to address possible spread and infection both during construction of the California Exhibit and vegetation management activities associated with the HEP. Provisions in the SOD Control Program shall include the following major components with related BMPs, as modified to reflect the best available science in treating and avoiding spread of the pathogens.*

- **Identify and Monitor Extent of SOD Infection:** *Map the current extent of observed SOD infection in Knowland Park, designated zones for high and low risk areas, and monitor*

any spread of the pathogen as part of the annual monitoring program of the HEP. Risk zones and the applicable BMPs listed below shall be adjusted as necessary if the annual monitoring indicates the infestation has spread.

- **Sanitation Measures:** Sanitize tools, equipment, vehicles, shoes and clothing upon exiting high risk zones or when used on known or suspected infested trees as a precaution against spreading the pathogen. Use all reasonable methods to sanitize personal gear and crew equipment before leaving a *P. ramorum*-infested location or high risk area. Contaminated soil, particularly mud, on vehicle tires, workers boots, shovels, stump grinders, trenchers, etc., may result in pathogen spread if moved to a new, uninfested location. Products used in sanitizing are corrosive to metal and fabric, and toxic to native plants and other vegetation. Measures taken to prevent possible spread of this pathogen shall be implemented in a coordinated fashion to avoid possible secondary effects of treatment, including establishing designated sanitation stations where materials are available for treatment and runoff is adequately contained. Complete cleaning of equipment, typically by using water to completely remove soil and plant debris, provides an adequate level of sanitation in most circumstances. The use of other cleaning and disinfecting agents (such as bleach or alcohol) is typically restricted to specialized uses (e.g., cleaning footwear).
- **Worker Training:** Inform all construction and vegetation management crew members about the arboricultural implications of *P. ramorum* and required sanitation practices when working in high risk areas, and potential for spread to other locations. Where work will occur in infested areas, sanitation kits must be provided and their use monitored to ensure cleanup.
- **Timing of Tree Removal and Construction:** Restrict timing of tree removal, work on infected and susceptible vegetation species, and grading to the dry season (June - October), or during dry spells if adherence to this schedule is not feasible. When working in wet conditions, equipment shall be kept on paved or dry surfaces to the maximum extent feasible. Construction and vegetation maintenance activities shall generally occur in disease-free and low risk areas before proceeding to infested and high risk areas, and appropriate sanitation measures followed.
- **Restrictions on Movement of Plant and Soil Material:** Appropriate restrictions on grading, other soil disturbing activities, and collection or movement of plant material (wood, brush, leaves and litter) shall be developed and implemented where grading, vegetation removal, and heavy equipment operation is to occur in infected and high risk areas. Within the regulated area, potential host material (e.g. wood, bark, brush, chips, leaves, or firewood) from tree removals or pruning of symptomatic or non-symptomatic plants shall preferably remain within the infected area to minimize pathogen spread, or disposed of off-site according to the quarantine Compliance Agreement for green waste disposal in Alameda County.
- **Nursery Stock:** All nursery stock, soils, and soil amendments used at the site shall be free of *P. ramorum* and other plant pathogenic *Phytophthora* species. Appropriate certification and/or testing will be required to document that materials brought into the site are free of these exotic pathogens.

- **Bay Removal:** *Reduce inoculum of P. ramorum in vicinity of oaks by selective removal of nearby bay foliage, especially understory bay seedlings and saplings.*

GRASSLAND PROTECTION AND ENHANCEMENT ELEMENT

Goal 2: Provide for the protection and enhancement of grassland habitat in Knowland Park through invasive species control and revegetation with native grassland species, and achieve a minimum 3:1 compensatory mitigation for any permanent loss of native grassland habitat as a result of implementing the California Exhibit. The 3:1 compensatory mitigation assumes a worst-case loss of an estimated 4.44 acres of native grassland habitat as a result of implementing the California Exhibit, resulting in a mitigation acreage of 13.32 acres to be protected and enhanced. This worst-case estimate and the corresponding compensatory mitigation acreage may be reduced through further refinement of plans for the California Exhibit to avoid additional stands of native grassland, and through implementation of a successful salvage and replanting program where avoidance is infeasible.²

The spread of invasive shrub and tree species, particularly French broom, is one of the greatest threats to the remaining grassland habitat in Knowland Park. French broom tends to become established at the interface between grasslands and the adjacent woodland, scrub, and chaparral habitats. Once established at the interface, thickets of French broom begin to shade out the dense grassland cover, creating a barren or sparse groundcover and conditions more suitable for successful establishment of this invasive species. Over time, French broom can completely replace areas of grassland habitat, forming monotypic stands with little plant and animal diversity and low wildlife habitat values. Effective control of invasive species is critical to protecting and enhancing the grassland habitat in Knowland Park.

A grassland enhancement and replacement program will be implemented as part of the HEP to ensure that adequate mitigation is provided for the worst-case estimated 4.44 acres of native grassland habitat possibly lost or modified within the footprint of proposed improvements or within animal enclosures of the California Exhibit. Non-native grassland habitat will be preserved and enhanced through the invasive species removal provided under the Invasive Species Control Element of the HEP. The grassland program will identify historic grasslands in Knowland Park currently dominated or under threat by invasion of French broom and other non-native species. Some limited removal of dead or senescent planted Monterey pines may be appropriate as a management technique in meeting the grassland mitigation and enhancement goals of the HEP. Through invasive species removal, and native revegetation where required, the grassland protection and enhancement goal of the HEP will be met.

² Under the provisions of the HEP, a requirement shall be considered infeasible if it is not capable of being accomplished in a successful manner within a reasonable time period, considering economic, environmental, legal, social, technological factors and/or if it would preclude implementation of the approved amended Master Plan or require additional amendment(s).

The following Implementing Actions serve to implement the basic goal for the Grassland Protection and Enhancement Element of the HEP. The grassland protection and enhancement mitigation ratios identified below in Implementation Action 2-1 are required to mitigate impacts of the California Exhibit.³

Implementing Action 2-1: *Compensation shall be provided for the loss of native grasslands as a result of constructing the California Exhibit. This shall be accomplished through a three-tiered approach which first evaluates the opportunity for avoidance and protection, allows for salvage and replanting where avoidance is not feasible, and provides minimum compensatory mitigation where loss is unavoidable, all subject to City review and approval by the Planning Director, summarized as follows:*

1) Require a minimum 3:1 compensation for native grasslands lost as a result of implementing the California Exhibit. Based on the 2011 grassland mapping program, a maximum estimate of 4.44 acres of native grasslands would be lost if no refinements to the plans for the California Exhibit and related improvement were to occur and all habitat within enclosures and limited disturbance areas were eliminated. Under this worst-case scenario, 13.32 acres of native grasslands shall be created or restored. This estimate of grasslands lost and the required compensation shall be reduced based on efforts to further avoid native grassland and/or on implementation of a successful salvage and replanting program as described in 2) and 3), and defined in Implementing Actions 2-6 and 2-7, respectively;

2) Minimize the actual loss of native grasslands and reduce the required acreage of compensation through further refinement of detailed plans for the California Exhibit, alignment of enclosure fencing and perimeter fence, and roadway improvements. For every acre of native grasslands preserved through refinement, the maximum estimate of 4.44 acres lost shall be reduced and the total acreage in the 3:1 compensation ratio shall be reduced proportionally. Details of the native grassland avoidance program are defined in Implementing Action 2-6, including methods to confirm final acreage of habitat lost and success of the avoidance program in exhibit areas considered to be of low disturbance risk to native grasslands; and

3) Establish a salvage and replanting program where avoidance is not feasible through refinements, and provide an incentive for implementing this program by reducing the compensatory mitigation ratio where transplanting is successful. For every acre of native grasslands salvaged and successfully re-established through this program, the 3:1 compensatory mitigation ratio shall be reduced to 1:1. This reduced compensation ratio shall still be required because of the physical loss of intact native grasslands that will occur during transplantation. Details of the salvage and replanting program are defined in Implementing Action 2-7.

³ The HEP identifies those measures that are required because of the impacts associated with implementation of the California Exhibit. If the California Exhibit is not constructed, these specific provisions of the HEP would not be required, although other provisions of the HEP would remain operative.

4) Compensation shall be provided in grassland habitat outside of animal exhibits but in as close proximity to the California Exhibit as possible based on updated grassland mapping and the mapped extent of target invasive species. Areas serving as compensation for native grasslands lost as a result of the California Exhibit shall be treated, protected and managed as part of the Invasive Species Control and Native Revegetation Elements of the HEP, as defined under Implementing Actions 2-2 through 2-4. Compensation areas shall be restored, enhanced and managed to achieve a minimum native grass and forb component consistent with the cover class range of native grasslands lost, defined as either moderate quality native grasslands with a native component of from 10 to 40 percent absolute cover or high quality native grasslands with a native component over 40 percent absolute cover. This shall include treatment areas receiving native plant materials from the salvage and replanting program defined in Implementing Action 2-7. This comprehensive program would fully implement the mitigation requirements of Mitigation Measure 13a for grasslands lost or compromised as a result of improvements in the California Exhibit area.

Implementing Action 2-2: To accomplish the grassland protection and enhancement, the invasive species removal and control shall focus on locations which historically supported grasslands and where native grassland species comprise a discernable component of the existing cover, generally over ten percent native grassland species.

Implementing Action 2-3: Grasslands shall be re-established and enhanced as described in the Native Revegetation Element where invasive species have displaced vegetation and removal of the invasives would leave bare ground over ten percent or more of the treatment area with an absolute cover for the remaining vegetation of less than 90 percent.

Implementing Action 2-4. Consider limited removal of planted stands of Monterey pine where trees are dead or senescent, the trees compromise the native grassland cover, and no disruption of views or privacy of adjacent private property owners would result. Any removal of Monterey pine trees shall comply with the City's Tree Protection Ordinance (Oakland Municipal Code Chapter 12.36).

Implementing Action 2-5. The remaining grassland habitat within the developed California Exhibit shall also be managed as grassland habitat where preservation and enhancement is feasible, although these would not qualify as treatment areas in meeting the required mitigation ratios called for in Implementing Action 2-1. In areas outside of improvements (i.e. structures, pathways, animal enclosures and required landscape plantings), the remaining grasslands shall be managed as natural habitat with appropriate invasive species controls and native species enhancement plantings. Within animal enclosures where grazing and trampling may prevent long-term establishment and retention of native grasses and forbs, native and non-native grassland cover will be retained through adaptive management practices that may include use of artificial irrigation, reseeding and replanting with non-invasive species, excluding exhibit animals from portions of their enclosure to control disturbance during critical periods of

establishment by subdividing the enclosure areas and rotating access accordingly, and other appropriate techniques.

Implementing Action 2-6: *Stands of native grasslands within the California Exhibit area shall be considered for additional avoidance during refinement of future improvement plans to protect native grasslands to the maximum extent feasible, incorporate them into the interpretive experience for future visitors, and reduce the maximum estimate of 4.44 acres of native grasslands adversely affected or lost as a result of Master Plan buildout. This shall include consideration of minor adjustments to building footprints, pathways, and other features which would permanently convert native grassland habitat, as well as minor adjustments to the alignment of exhibit enclosure fencing and the perimeter fence, where substantial avoidance is possible within the context of the approved amended Master Plan and the program for the California Exhibit. Where additional native grasslands are successfully avoided and protected within the California Exhibit area, the maximum estimate of 4.44 acres of grasslands requiring compensatory mitigation shall be reduced in equal amount and the required compensatory mitigation shall be reduced accordingly, as defined in Implementing Action 2-1. Protected stands of native grasslands within the California Exhibit that apply towards any reduction in the compensatory mitigation requirement shall be retained and managed in perpetuity as native grasslands, in addition to the grassland management provisions called for in Implementing Action 2-5. The additional grassland avoidance provisions shall be accomplished according to the following procedures and performance standards:*

- *Refine plans for the California Exhibit to avoid direct disturbance to stands of native grasslands to the maximum extent feasible while still meeting the program needs, fire safety and clearance requirements, and other variables related to short-term construction and long-term maintenance requirements. To ensure long-term protection and management of native grasslands within the California Exhibit, these areas shall be designated as “Protected Native Grasslands” on all relevant improvement and management plans. The annual monitoring reports required under the Implementation Element of the HEP shall include a review of the status of these Protected Native Grasslands. Additional compensatory mitigation shall be required if these areas are significantly compromised, as defined below.*
- *Recalculate potential impacts on native grasslands and determine the adjusted total for acreage lost and required compensatory mitigation defined in Implementing Action 2-1. Any reduction in estimated impacts on native grasslands shall be reviewed by a qualified biologist and meet with the review and approval of Planning Director. Following approval by the Planning Director, final grading and site improvement plans shall be revised to show all areas of native grassland to be preserved and shall indicate that construction is restricted from these areas.*
- *Prior to any site grading or grubbing, the limits of areas to be preserved as native grassland within the California Exhibit shall be flagged by engineered survey at a minimum 50-foot intervals in the field. Protective fencing shall be installed under the supervision of a qualified biologist along this boundary to encompass the entire stand*

of native grassland to be protected in each location. No construction equipment disturbance shall be allowed within these areas, unless conducted under the supervision of the qualified biologist and no grading or excavation is allowed. Ongoing removal of invasive species and other vegetation management activities may continue within these areas during construction. Following the completion of construction within the vicinity of the protected stands of native grassland, the temporary construction fencing shall be removed.

- *All workers shall be trained regarding the sensitivity of the native grasslands to be preserved, and the need to remain outside the limits of the protective fencing at all times.*
- *Annual Monitoring shall be provided as part of HEP implementation to confirm that impact avoidance has been successful and assumptions regarding limited disturbance within animal enclosures have not significantly compromised the native grassland habitat values within these areas. Preserved grasslands shall continue to meet the respective cover class criteria for moderate and high quality native grasslands used to define the compensatory mitigation requirements in Implementing Action 2-1. If these minimum cover class requirements are not met during future annual monitoring performed as part of the HEP, then the adjustment to the required compensatory mitigation shall be voided, and the full 3:1 mitigation requirement shall apply to the acreage of affected grassland within the California Exhibit where avoidance was to be implemented.*

Implementing Action 2-7: *A Native Plant Salvage and Replanting program, subject to review and approval by the Planning Director, shall be developed and implemented by a qualified biologist or landscape architect with experience in native grassland translocation to relocate established clumps of native perennial species that would otherwise be lost as a result of constructing the California Exhibit. Where additional native grasslands are successfully salvaged and replanted, the compensation requirement shall be reduced according to the ratios defined in Implementing Action 2-1. The program shall include the following components and performance standards:*

- *Salvaged material shall be installed in secure locations suitable for native grassland creation and enhancement within the Ecological Recovery Zone or other treatment areas to be revegetated as called for in the Native Revegetation Element of the HEP.*
- *Prior to any site grading or grubbing, the limits of maximum disturbance associated with implementation of the California Exhibit shall be flagged at a minimum of 50-foot intervals in the field where they intersect stands of native grasslands.*
- *Suitable native plants that would otherwise be destroyed shall then be harvested in advance of any site grading and grubbing, preferably in the late fall and winter months when plants are dormant. Some salvage in early spring may be necessary given the difficulty in determining health and viability of some species when dormant.*

- *Salvaged material shall be properly maintained until ready for reinstallation during the wet period (between November 15 and January 15) consistent with the General Treatment Methods in Table 2, including short-term irrigation both during temporary storage and during initial replanting to ensure survival.*
- *Treatment areas receiving salvaged native plant material shall be maintained and monitored as called for in the Native Revegetation Element of the HEP. Treatment areas shall continue to meet the respective cover class criteria for moderate and high quality native grasslands used to define the compensatory mitigation requirements in Implementing Action 2-1. If these minimum cover class requirements are not met during future annual monitoring performed as part of the HEP, then the 1:1 adjustment to the required compensation shall be voided, and the full 3:1 mitigation requirement shall apply to the acreage of affected grassland within the California Exhibit where the salvage program was implemented.*

NATIVE REVEGETATION ELEMENT

Goal 3: *Successfully revegetate areas where heavy infestations of invasive species have displaced grasslands and other natural cover types.*

The HEP includes a Native Revegetation Element for areas where heavy infestations of invasive species comprise a significant portion of the existing vegetation, and removal of the invasive vegetation would leave the treatment area with an absolute cover of less than 90 percent for the vegetative component. Implementation of this element includes a tracking system for areas treated, a record of the source and species of plant materials used in revegetation, methods of installation and maintenance, and an assessment of the success of each treatment effort. The focus of the Native Revegetation Element will be on grasslands that have been replaced by invasive species removed as part of the Invasive Species Control and the Grassland Protection and Enhancement Elements of the HEP. Any areas receiving revegetation will be monitored annually as part of an overall Annual Assessment program of the HEP, and maintained as necessary to ensure successful establishment.

The following Implementing Actions serve to implement the basic goal for the Native Revegetation Element of the HEP.

Implementing Action 3-1: *The Native Revegetation Element shall focus on grasslands that have been replaced by invasive species removed as part of the Invasive Species Control and the Grassland Protection and Enhancement Elements of the HEP, as identified in the baseline data mapping program described in Implementing Action 1-3. **Table 2** provides a list of native grassland species suitable for seeding and/or planting installation as part of grassland revegetation, and defines general methods that shall be used during revegetation efforts.*

Implementing Action 3-2: *Grassland revegetation efforts shall emphasize seeding of treatment areas with an appropriate mix of native grasses and forbs indigenous to Knowland Park. The seed mix and rates of application shall be adjusted based on location-specific conditions, including absolute cover values of the remaining native and non-native grassland species, slope*

TABLE 2 NATIVE PLANT SPECIES SUITABLE FOR SEEDING/PLANTING KNOWLAND PARK HABITAT ENHANCEMENT PLAN

Grassland Species	General Treatment Methods
Grasses	
California brome (<i>Bromus carinatus</i>)	<ul style="list-style-type: none"> • Seed shall be applied before onset of fall rains, generally prior to November 1. Seed source shall be as local as possible, supplied on a basis of Pure Live Seed (PLS), and not contain an excess of one percent (1%) of weed seed. • Plantings shall be installed during wet period between November 15 and January 15. • Appropriate browse protection shall be used where necessary during initial establishment, including protection from livestock grazing used for fire fuel management. • Revegetation treatment shall occur for areas where removal of the invasive vegetation would leave an average absolute cover of less than 90 percent for the remaining plant cover in treatment areas. • Seed mix and rate of application shall be adjusted based on location-specific conditions, including absolute cover values of the remaining native and non-native grassland species, slope and exposure, successional trends to other cover types such as scrub and woodland, and other factors.
Creeping wildrye (<i>Elymus glaucus</i> ssp. <i>glaucus</i>)*	
California oatgrass (<i>Danthonia californica</i> var. <i>californica</i>)*	
Foothill needlegrass (<i>Nassella lepida</i>)*	
Meadow barley (<i>Hordeum brachyantherum</i>)	
Leafy bentgrass (<i>Agrostis pallens</i>)	
Pacific vulpia (<i>Vulpia microstachys</i> var. <i>pauciflora</i>)	
Purple needle-grass (<i>Nassella pulchra</i>)*	
Torrey's melic (<i>Melica torreyana</i>)	
Forbs	
Blue-eyed grass (<i>Sisyrinchium bellum</i>)*	<ul style="list-style-type: none"> • Plug and container plantings of native grasses and forbs shall be used to supplement seeding in treatment areas where average absolute cover values for grassland species is less than 40 percent in treatment areas due to competitive shading from invasive species. • Annual monitoring and maintenance of treatment areas shall be provided to ensure the following performance standards are met on average for the treatment area: 1) achieve a minimum survival rate of 80 percent for all plantings; 2) demonstrate that invasive species comprise less than 5 percent of the absolute cover; and 3) that bare ground comprises no more than the percentage of bare ground before invasive species are initially removed.
California poppy (<i>Eschscholzia californica</i>)	
Coast buckwheat (<i>Eriogonum nudum</i> var. <i>auriculatum</i>)*	
Dove lupine (<i>Lupinus bicolor</i>)	
Sticky cinquefoil (<i>Potentilla glandulosa</i>)*	
Yarrow (<i>Achillea millefolium</i>)*	

* Species suitable for both seeding and container/plug plantings.

and exposure, successional trends to other cover types such as scrub and woodland, and other factors.

Implementing Action 3-3: *Plug and container plantings of native grasses and forbs shall be used to supplement seeding in treatment areas where the average absolute cover values for grassland species is less than 40 percent in the treatment area due to competitive shading from invasive species.*

Implementing Action 3-4: *Additional revegetation efforts may be required along the Arroyo Viejo riparian corridor, which would utilize a mixture of native riparian groundcovers, shrubs, and tree plantings in addition to seeding with a short-term grassland ground cover following invasive species removal in treatment areas. Where additional revegetation of the Arroyo Viejo riparian corridor is to be implemented, an appropriate revegetation and maintenance plan utilizing riparian species shall be developed and appropriate authorizations secured, where required. Plantings used in the revegetation plan shall be restricted to the use of native tree, shrub, and groundcover species.*

Implementing Action 3-5: *Any areas receiving revegetation shall be monitored annually as part of an overall Annual Assessment program of the HEP, and maintained as necessary to ensure successful establishment. Performance and success criteria may be refined for each treatment area, but shall provide for a minimum survival rate of 80 percent for all plantings, demonstrate that invasive species comprise less than five percent of the absolute cover, and that bare ground comprises no more than the percentage of bare ground before invasive species are initially removed. Maintenance shall include follow-up invasive species removal, possible replacement replanting, and successive reseeding if plant survival and absolute cover rates for revegetation are not achieved.*

NATIVE TREE PROTECTION AND REPLACEMENT ELEMENT

Goal 4: *Protect native trees in Knowland Park that qualify as a “protected tree” under the City of Oakland Tree Protection Ordinance, and provide for replacement of any “protected tree” removed during construction of the California Exhibit.*

An estimated 51 trees meeting the definition of a “protected tree” under the City of Oakland Tree Protection Ordinance would be removed during construction of the California Exhibit. The Preliminary Landscape Plan for the project includes schematic plans for planting of replacement native deciduous and broadleaf evergreen trees along the eastern boundary and at other locations in the California Exhibit. An estimated 185 native trees would be planted as part of replacement and enhancement plantings within the California Exhibit area, providing a minimum 3:1 replacement ratio. Other land area is available within the perimeter fence, either within the footprint of the California Exhibit or the Ecological Recovery Zone, if additional tree replacement plantings are considered necessary to achieve mitigation and enhancement objectives. Given the available land area within the perimeter fence, no additional native tree replacement planting is considered necessary in the Upper Knowland Park area as part of the HEP.

Mitigation Measure 13b from the 1998 MND calls for preparation of a Tree Protection and Revegetation Plan to protect, replace, and preserve trees within the California Exhibit area. This mitigation also calls for protection of oaks in Upper Knowland Park outside of the California Exhibit area as part of the HEP. Encouraging the maximum natural extent of oak woodland was suggested as a possible management program in Mitigation Measure 13b given the limited fire risks associated with this cover type, but this would conflict with the grassland preservation objectives of the HEP. Because of fire suppression, native oaks and bay trees are now spreading into areas formerly dominated by chaparral, scrub, and in some places grasslands, reducing the

extent of important habitat for Alameda whipsnake and other wildlife dependent on non-woodland habitat types. While retaining and enhancing existing habitat values of oak woodlands are desirable objectives, this can be achieved through control of target invasive species and monitoring canopy and understory regeneration. Maximizing the extent of oak woodlands is no longer considered a desirable management program for Upper Knowland Park where grasslands and other natural habitat types would be replaced. Mitigation Measure 13b was revised in the 2011 Subsequent Mitigated Negative Declaration / Addendum to reflect this important consideration.

The following Implementing Actions serve to implement the basic goal for the Native Tree Protection and Replacement Element of the HEP.

Implementing Action 4-1: *Tree protection measures shall be implemented for all trees to be preserved, consistent with the City's Standard Conditions of Approval related to tree preservation SCA #46 and #47).*

Implementing Action 4-2: *Any protected tree removed during construction of the California Exhibit or implementation of the HEP shall be replaced at a minimum 3:1 replacement ratio.*

Implementing Action 4-3: *Best Management Practices developed as part of the Sudden Oak Death Control Program in the Invasive Species Control Element of the HEP shall be implemented to address the possible spread of the pathogen and infection of oaks and other vegetation in Knowland Park.*

SPECIES PROTECTION ELEMENT

Goal 5. *Protect and enhance habitat for notable species in treatment areas of Knowland Park.*

Notable species known from or suspected to occur in Upper Knowland Park include Alameda whipsnake, two species of plants and possibly other plant species as well, and a number of bird species, including raptors. Below is a discussion of the respective protection measures developed as implementing actions of the HEP with regard to these species.

Plant Species. Systematic surveys have been conducted for special-status plant species for areas encompassing improvements associated with the California Exhibit. As discussed in the 2011 Subsequent Mitigated Negative Declaration / Addendum, the occurrences of robust monardella (*Monardella villosa* ssp. *globosa*) described in the 1998 MND were not found during extensive surveys conducted in 2009 and 2010, and are believed to be extirpated from the vicinity of the California Exhibit. Measures have been developed to protect the two occurrences of notable plant species subsequently found in the vicinity of the California Exhibit - Oakland star tulip (*Calochortus umbellatus*) and bristly leptosiphon (*Leptosiphon acicularis*). Neither of these species is listed under the State and/or federal Endangered Species Acts, and both are maintained on List 4.2 (limited distribution) of the California Native Plant Society (CNPS) *Inventory of Rare and Endangered Plant Species (Inventory)*. The Technical Appendices (Volume 1, Chapter 3) of the Oakland General Plan OSCAR Element provides information on the definition of special-status species used by the City of Oakland and identifies 31 plant species considered to be "Rare,

Threatened, and Endangered Vascular Plants Potentially Present in Oakland”,⁴ which includes Oakland star tulip but not bristly leptosiphon. As such, Oakland star tulip does qualify as a special-status species. No direct impacts to this population of Oakland star tulip are anticipated as part of implementing the California Exhibit project because the occurrence is more than 500 feet from the perimeter fence, but measures to monitor and protect this occurrence have nevertheless been provided as part of the HEP given that it contributes to the diversity of Knowland Park.

The occurrence of bristly leptosiphon would be located within the wolf exhibit area that is part of the California Exhibit. Although it appears that direct disturbance to this occurrence would be avoided, the occurrence could be affected by trampling, den digging, and other activities of wolves within the wolf enclosure area. As noted above, bristly leptosiphon has no legal protective status under the State and/or federal Endangered Species Acts, is maintained on List 4.2 of the CNPS *Inventory*, and is not included on the list of 31 “Rare, Threatened, and Endangered Vascular Plants Potentially Present in Oakland” according to the Technical Appendices (Volume 1, Chapter 3) of the Oakland General Plan OSCAR Element. It is also not included on the list of “Unusual or Significant Plants in Oakland” contained in Appendix 3-A of the OSCAR Element. The City has no specific policies or practices in place about protecting CNPS List 4 species. As such, bristly leptosiphon does not meet the criteria as a special-status species requiring avoidance or compensatory mitigation. However, the presence of this species does contribute to the biological diversity of Knowland Park, and as such measures have been developed to monitor and protect this occurrence.

The general occurrences of Oakland start tulip and bristly leptosiphon are shown in the Preliminary Landscape Plan for the California Exhibit Project, and will be shown on the Final Landscape Plan, Grading Plan, and Site Plan. Systematic surveys have not been conducted for other areas in Upper Knowland Park outside the California Exhibit area. There remains a possibility that additional populations of the three notable plant species encountered in the vicinity of the California Exhibit, or possibly other species, could be present and would require additional protective measures if encountered during future systematic surveys of Knowland Park. Implementation actions have been developed as part of the HEP to provide for appropriate protections for occurrences of special-status plant species within Knowland Park.

Nesting Birds. There remains a possibility that one or more species of bird protected under the Migratory Bird Treaty Act could be nesting within or in the vicinity of areas to be treated under the HEP. The City of Oakland’s Standard Conditions of Approval includes provisions regarding protection of possible nesting habitat and the requirement that a preconstruction survey be conducted if vegetation removal and construction is to be initiated during the breeding/nesting season (from March 15 through August 15). Human activity associated with intensive vegetation removal could result in nest abandonment, and should either occur during the non-nesting season (August 16 to March 14) or should be preceded by a preconstruction survey as part of implementing the HEP. If surveys indicate the presence of nesting birds, disturbance within a specified buffer zone shall be restricted as necessary to prevent possible abandonment of any active nest.

⁴ See **Table 3-13: Rare, Threatened, and Endangered Vascular Plants Potentially Present in Oakland** on page 3-50 of Volume 1 – Chapter 3 of Oakland General Plan, OSCAR Element Technical Appendices.

Alameda Whipsnake. Specific habitat enhancement measures developed as part of the detailed mitigation program for Alameda whipsnake must be incorporated into the HEP where relevant to invasive species control and habitat management. These measures are specifically related to construction of the California Exhibit and include achieving a minimum 1:1 mitigation ratio, as called for in Mitigation Measure 14c from the 1998 MND, as revised in the 2011 Subsequent Mitigated Negative Declaration / Addendum. These additional measures will be developed as part of the consultation process with USFWS and CDFG as part of the incidental take authorization for the California Exhibit, and could include developing and implementing an interpretive program with appropriate signage, restrictions on access to certain areas of the park, and enforcement of existing leash laws, among other controls. Other measures related to implementing the HEP could also be required as part of the mitigation program for Alameda whipsnake, including restrictions on timing and methods used for invasive species removal, controls on herbicide application, worker training programs, and possible need for preconstruction avoidance surveys, among others.

The following Implementing Actions serve to implement the basic goal for the Special-Status Species Protection Element of the HEP. The species protection measures called for in Implementation Action 5-2 and 5-5 are required to mitigate impacts of the California Exhibit.⁵

Implementing Action 5-1: *The population of Oakland star tulip is located over 500 feet from the perimeter fence at its closest point and no direct impacts are anticipated as part of the California Exhibit project. The occurrence of Oakland star tulip shall be avoided and protected during project construction and vegetation management activities. Any future vegetation management activities undertaken as part of the HEP shall be designed to avoid direct disturbance and retain suitable habitat conditions for this species. Any invasive species removal within 20 feet of this occurrence shall be accomplished by hand pulling, under the supervision of a qualified botanist, and all herbicide use shall be prohibited within this zone. All workers shall be informed of the presence of this occurrence, its sensitivity and need to minimize trampling and other disturbance in the vicinity.*

Implementing Action 5-2: *The population of bristly leptosiphon is located within the “Wolf Expansion” area of the California Exhibit project, and shall be avoided and protected during construction and future management activities. No direct impacts to this occurrence are anticipated, but appropriate controls over construction operation shall be implemented and the population monitored to determine whether indirect impacts from wolf activities are adversely affecting the occurrence. The location of the population shall be indicated on project plans, and temporary construction restriction fencing installed around the entire occurrence and a minimum 25-foot buffer. The temporary construction restriction fencing shall be installed under the supervision of a qualified botanist or biologist, shall remain in place for the duration of construction, and all workers informed of the need to avoid entering the area. Any future vegetation management activities shall be designed to minimize disturbance and retain suitable habitat conditions for this species as prescribed in this Implementing Action.*

⁵ The HEP identifies those measures that are required because of the impacts associated with implementation of the California Exhibit. If the California Exhibit is not constructed, these specific provisions of the HEP would not be required, although other provisions of the HEP would remain operative.

Annual monitoring shall be provided for a minimum of five years once wolves begin using the “Wolf Expansion” area to determine whether trampling, digging, and other possible disturbances could result in the extirpation of this population. Field monitoring inspections shall be conducted at least once a month for the first six months once wolves have been released into the enclosure, and the effects of newly established trails and movement patterns, tendency for digging, and risks to the occurrence of bristly leptosiphon determined. Thereafter, field monitoring inspections shall occur at least once a year when the bristly leptosiphon is in flower and any changes in the size and distribution of the occurrence can be determined. The monitoring shall be conducted by a qualified botanist or biologist, with annual reports on the condition of the occurrence, reproductive success, and need for any changes in access or management. Annual monitoring reports shall be submitted to the City of Oakland by October 15 of each year of monitoring. If it is clear that the occurrence becomes threatened by wolf activities, permanent protective fencing shall be installed providing a 25-foot buffer around the population. Annual monitoring shall be provided a minimum of three years beyond installation of any permanent protective fencing to ensure that the population is adequately protected and monitor changes in population size and distribution within and outside of the protective fence boundary.

Implementing Action 5-3: *Prior to implementing any invasive species removal or other management activities associated with the HEP, systematic surveys shall be conducted by a qualified botanist to confirm presence or absence of any additional populations of special-status species. This will provide baseline data on any other occurrences that need to be considered during vegetation management. Systematic surveys have not been conducted for other areas in Upper Knowland Park, and additional populations of the three species encountered in the vicinity of the California Exhibit, or possibly other special-status plant species, could be present. If any additional populations are encountered, appropriate protective measures shall be implemented as part of the HEP. Species receiving appropriate protection shall include any species that is formally listed under the State and/or federal Endangered Species Acts, is maintained on Lists 1, 2 and 3 of the CNPS Inventory, is included on the list of 31 “Rare, Threatened, and Endangered Vascular Plants Potentially Present in Oakland” according to the Technical Appendices (Volume 1, Chapter 3) of the Oakland General Plan OSCAR Element, and/or is included on the list of “Unusual or Significant Plants in Oakland” contained in Appendix 3-A of the OSCAR Element. Any invasive species removal within 20 feet of this occurrence shall be accomplished by hand pulling, under the supervision of a qualified botanist, and all herbicide use shall be prohibited within this zone. All workers shall be informed of the presence of this occurrence, its sensitivity and need to minimize trampling and other disturbance in the vicinity.*

Implementing Action 5-4: *The City of Oakland’s Standard Conditions of Approval shall be followed with regard to protection of possible bird nesting habitat. A preconstruction survey shall be conducted if vegetation removal and construction is to be initiated during the breeding/nesting season (from March 15 through August 15). Human activity associated with intensive vegetation removal could result in nest abandonment, and shall either occur during the non-nesting season (August 16 to March 14) or shall be preceded by a preconstruction survey as part of implementing the HEP. If the survey indicates the potential presences of nesting raptors*

or other birds, the biologist shall determine an appropriately sized buffer around the nest in which no work will be allowed until the young have successfully fledged. The size of the nest buffer shall be determined by the biologist in consultation with the CDFG, and shall be based to a large extent on the nesting species and its sensitivity to disturbance. In general, buffer sizes of 200 feet for raptors and 50 feet for other birds shall suffice to prevent disturbance to birds nesting in the urban environment, but these buffers may be increased or decreased, as appropriate, depending on the bird species and the level of disturbance anticipated near the nest.

Implementing Action 5-5: *In addition to the minimum 1:1 compensatory mitigation requirement called for in Mitigation 14c, specific habitat enhancement measures developed as part of the detailed mitigation program for Alameda whipsnake shall be incorporated into the HEP where relevant to invasive species control and habitat management. These additional measures may be required as part of the consultation process with USFWS and CDFG in securing the incidental take authorization for the California Exhibit project, and could include interpretive programs, access restrictions, controls on timing and methods for invasive species removal, need for worker training, and possibly preconstruction surveys prior to vegetation removal, among other measures.*

IMPLEMENTATION ELEMENT

This HEP will be refined over time as necessary to provide a coordinated approach to invasive species control, required mitigation, and native habitat enhancement in the California Exhibit and larger treatment area in Knowland Park. Refinement and implementation of the HEP will be accomplished through the following steps.

Initiate HEP and Identify Invasive Species Treatment Areas. In large part, this HEP has been prepared to meet the mitigation requirements of implementing the California Exhibit project. Although the invasive species, native revegetation, and sensitive resource protections called for under this HEP meet the requirement for an HEP related to the Oakland Zoo Master Plan certain Implementing Actions are specifically related to implementation of the California Exhibit. The Veterinary Medical Hospital may proceed with construction prior to implementation of the HEP as this element of the amended Master Plan does not have the potential to result in significant impacts to sensitive biological resources and would eliminate stands of invasive French broom which currently dominant much of the vicinity.

Prior to initiating construction of any element of the California Exhibit project, baseline conditions within HEP treatment areas will be determined. The initial boundaries of the invasive species treatment addressed by the HEP will encompass the Ecological Recovery Zone, vicinity of the California Exhibit, and Upper Knowland Park west of Golf Links Road (see **Figure 1**). These boundaries may be refined based on the final authorizations from the USFWS and CDFG for Alameda whipsnake, and need to achieve the required compensatory mitigation ratios for Alameda whipsnake and grasslands habitat lost or modified as a result of implementing the California Exhibit project. Treatment areas will be prioritized based on proximity to the California Exhibit site and achieving the specific habitat enhancement objectives identified in the 1998 MND and 2011 Subsequent Mitigated Negative Declaration / Addendum. Once the compensatory mitigation ratios are met and required habitat

enhancement is achieved, the invasive species treatment under the HEP will subsequently be expanded into the remaining areas of Knowland Park east of Golf Links Road. On-going monitoring and management will be required in perpetuity to prevent re-establishment of the target invasive species due to the continued spread of seed from adjacent private properties and surrounding open space where management is less rigorous. In the event that construction on the California Exhibit has not been initiated by 2015, the provisions of the HEP shall be initiated and implemented. Implementation Actions related specifically to construction of the California Exhibit would not apply until components of this element of the Master Plan are initiated.

Confirm Baseline Conditions of HEP Treatment Areas. Baseline data will be verified through field surveys and detailed mapping of existing vegetative cover. Stands of target invasive species will be identified and a schedule for treatment developed. Systematic surveys for special-status plant species will be conducted during the appropriate time of year for previously unsurveyed areas of Upper Knowland Park within the HEP management area prior to implementing any mechanical or chemical treatments. This mapping and systematic surveys could be phased over time, given that invasive species control and revegetation efforts will be phased, with areas west of Golf Links Road most likely completed first and east of Golf Links Road initiated at a future time. Systematic surveys are typically considered valid by resource agencies for two years, which should be factored into the timing of future detailed surveys for special-status plant species. If any additional populations of special-status species are encountered, appropriate protective measures equivalent to those set forth in Implementing Action 5-3 above will be defined and implemented as part of the HEP.

Provide Agency Review of HEP Implementation. Future amendments to the HEP and information about implementation of the HEP will be available for public and agency review. After initiation of the HEP management activities, the Zoo shall provide the City Planning Director and the City Parks and Recreation Advisory Commission with an Annual Progress Report (including the Annual Assessment described below) on the status of HEP implementation. Refinements of the HEP consistent with the provisions of the HEP are permitted. Proposals for major amendments (i.e. removal or additional of an Element or Implementing Action) of the HEP shall require approval of the Planning Director.

Encourage Public Participation of HEP Implementation. Public participation will be encouraged as part of HEP implementation. The Zoo's website will be expanded to include information on the HEP and any amendments, updates on implementation activities, and opportunities for public participation including volunteering for invasive species removal and native revegetation efforts. Ideally, the HEP will receive widespread support for its implementation, including volunteers participating in both the invasive species removal and native revegetation efforts. Encouraging public participation, particularly from interested conservation organizations such as the California Native Plant Society, should serve to minimize potential future conflicts with park users and attract interested volunteers.

Implement On-going Management and Annual Assessment. The HEP shall provide a coordinated approach for control of each target invasive species, native revegetation of

highly degraded areas, and monitoring and maintenance. Methods used for treating each target invasive species shall be based on currently accepted best available practices as described in the Invasive Species Control Element. Management techniques shall be updated and adjusted to reflect best practices for invasive species control and native plant restoration, where appropriate. Phasing associated with implementation of the HEP is important to successful eradication of invasive species and establishment of native cover. The initial phase of any treatment shall involve a concerted effort to remove invasive species. The next phase involves heavy seeding of treatment areas in advance of the fall rains. Where absolute cover values for grassland species are low, enhancement plantings with native grasses and forbs can be accomplished either at the same time native grassland seeding is installed, or in subsequent years.

On-going management shall involve routine inspection and removal of any target invasive species, including possibly successive treatments using broadleaf-specific herbicides that won't affect the seeded native grasslands. Any herbicide application must be carefully controlled to protect desired native vegetation and sensitive resources, avoid enhancement plantings, and protect the aquatic habitat of the Arrojo Viejo and other receiving waters. Control of the herbicide application shall comply with City of Oakland standards, use of best management practices related to the particular product in use, and certification restrictions of the certified pest applicator responsible for any chemical treatment methods. Adaptive management allowed under the HEP where necessary to achieve performance standards and success criteria. Adaptive Management is a resource management tool that allows for adjustments in treatment methodologies for invasive species control and native revegetation as best management practices evolve and become more effective over time.

An Annual Assessment of the distribution and abundance of target invasive species shall be performed as part of the HEP, including a map showing location, treatment areas and methods, and estimates of abundance. The success of invasive treatment shall be described, together with any adjustments to management techniques. Monitoring of any native revegetation efforts shall be documented as part of the Annual Assessment. Vegetation sampling transects shall be established following the first year of any revegetation treatment, and field visits conducted in spring or summer to record plant cover and survival rates to determine whether performance standards and success criteria are met. Photo stations shall be established at larger revegetation areas to document progression in plant establishment, and included in the Annual Assessment report until success criteria are met for that particular treatment area. Recommendations for necessary maintenance shall be included in the Annual Assessment report, and could include: follow-up invasive species removal, possible replacement replanting, and successive reseeding if plant survival and absolute cover rates for revegetation are not achieved. Copies of the Annual Assessment shall be provided to the City of Oakland for review and approval, as part of its oversight responsibilities.

Eventually any native revegetation efforts would be successfully established when plant survival and cover class goals are met, but there remains an on-going threat that target invasive species could become re-established in the HEP management area. Annual monitoring reports shall be necessary to identify locations of invasive species re-establishment and appropriate treatment methods when absolute cover for all target species

exceeds five percent. It is assumed that volunteer programs overseen by the Zoo will play an important part in implementing the HEP and providing for long-term control of invasive species and native habitat enhancement.

Financial Security. The Zoo shall submit an Implementation Plan for the HEP for review and approval by the City Planning Director prior to the issuance of a construction-related permit for the first element of the California exhibit or prior to conducting the first activities contained in the Habitat Enhancement Plan, whichever occurs first. For the purposes of this condition, an element of the California exhibit includes the overnight camping area, aerial gondola, California Interpretive Center, one or more California animal exhibits, service road to the California Exhibit, utilities to the California Exhibit, or improvements to the emergency access road off Snowdown Avenue, but not the Veterinary Medical Hospital. The Implementation Plan shall cover a five-year period and include at least the following itemized elements:

- Actions contained in the HEP to be implemented within the five-year period that demonstrate reasonable progress towards implementation of the HEP
- Identification of the party/parties who will implement each action
- Estimated cost of each action
- Source of cost estimation for each action
- Proposed funding mechanism for each action
- Status of funding for each action

The Implementation Plan must demonstrate to the satisfaction of the Planning Director that funding for the HEP is a specified item incorporated into the Zoo's annual budget and reflected in the Zoo's annual accounting audit and that the applicant has reasonably demonstrated that it has the financial capacity to sufficiently complete the identified actions. If necessary to ensure financial capacity, the City Planning Director may require the Zoo to submit evidence of financial security in an amount and manner acceptable to the City, such as a cash deposit with the City, performance bond, instrument of credit, and/or other form of security deemed acceptable by the City Planning Director.

Updated Implementation Plan. On an ongoing basis for the life of the project, the Zoo shall submit an updated Implementation Plan for the HEP for review and approval by the City Planning Director with the submittal of the Annual Progress Report required by the Habitat Enhancement Plan. The Implementation Plan shall be updated to reflect the HEP actions planned for the next five-year period and shall include the items listed under Financial Security above. The Implementation Plan must demonstrate to the satisfaction of the City Planning Director that the Zoo has reasonably demonstrated that it has the financial capacity to sufficiently complete the identified actions, as explained under Financial Security above. No further construction-related permits shall be issued for the Zoo until the current required Implementation Plan is approved.

APPENDIX A

Revisions to February 2011 Draft Habitat Enhancement Plan
Approved by Oakland City Council on June 21, 2011

Revisions to the Draft HEP were made during the public review process for the 2011 amendment to the Zoo Master Plan and the 2011 Subsequent Mitigated Negative Declaration /Addendum and have been incorporated into this version of the HEP which was approved by the Oakland City Council on June 21, 2011. These revisions to the Draft HEP are listed below, with new text shown in underline and deleted text shown in ~~overstrike~~.

The following text was added to the Invasive Species Control Element under Goal 1 on page 7 of the Draft HEP to provide background information on Sudden Oak Death:

Native coast live oak and other vegetation in Knowland Park is susceptible to Sudden Oak Death (SOD), and construction and vegetation management activities must be conducted in a manner to minimize the further spread of this disease. SOD is caused by the pathogen *Phytophthora ramorum*, a fungus-like organism that thrives in the moist climate found along coastal California. It is the leading cause in widespread mortality of susceptible tree species, including tanoak and to a lesser degree, coast live oak, California black oak and Shreve oak. The pathogen attacks the vascular system of the tree, just below the bark, weakening the tree and making it more vulnerable to infection by other tree pests such as fungi and bark beetles.

Phytophthora species are water-loving molds that produce plentiful spores in moist, humid conditions, and are known plant pathogens. While most leaf hosts do not die from the disease, they do play a key role in the spread of *P. ramorum*, acting as breeding ground for spore production, which may then be spread through wind-driven rain, water, plant material, or human activity. Trunk hosts such as oaks are considered terminal hosts, typically becoming infected when exposed to spores produced on the leaves of neighboring plants or through human contamination. The organism is most active during wet periods, and the risk of movement is therefore highest in muddy, wet areas and during rainy weather. *P. ramorum* spores can be found in living, dying, or recently dead plants, as well as in infested waterways and soil, and may be transported to new areas when infected plant material or infested soil is moved.

The California Oak Mortality Task Force (COMTF) is a non-profit group working to manage SOD in California. The COMTF has compiled Best Management Practices (BMPs) that are applicable to construction and vegetation management activities in Knowland Park. These include practices related to tree removal and care, vegetation and other debris disposal, and sanitation measures to use during construction and vegetation management activities to minimize pathogen spread. BMPs shall be implemented to minimize the possible spread of this pathogen and loss of oaks and other vegetation in Knowland Park.

The following text was added to the Invasive Species Control Element as Implementing Action 1-7 on page 8 of the Draft HEP to provide controls related to Sudden Oak Death:

Implementing Action 1-7: Develop and implement a comprehensive Sudden Oak Death Control Program addressing the possible spread and infection of SOD in Knowland Park

associated with implementation of the Master Plan and vegetation management activities of the HEP. The SOD Control Program shall be prepared by a plant pathologist, certified arborist or registered professional forester trained in the treatment of SOD and submitted to the City for its review and approval. The SOD Control Program shall be prepared in consultation with the pest control staff of the Alameda County Agricultural Department, and shall be completed prior to initiation of any construction or additional vegetation management activities in Knowland Park associated with the California Exhibit and/or the HEP. Best Management Practices (BMPs) shall be developed as part of the program to address possible spread and infection both during construction of the California Exhibit and vegetation management activities associated with the HEP. Provisions in the SOD Control Program shall include the following major components with related BMPs, as modified to reflect the best available science in treating and avoiding spread of the pathogens.

- **Identify and Monitor Extent of SOD Infection:** Map the current extent of observed SOD infection in Knowland Park, designated zones for high and low risk areas, and monitor any spread of the pathogen as part of the annual monitoring program of the HEP. Risk zones and the applicable BMPs listed below shall be adjusted as necessary if the annual monitoring indicates the infestation has spread.
- **Sanitation Measures:** Sanitize tools, equipment, vehicles, shoes and clothing upon exiting high risk zones or when used on known or suspected infested trees as a precaution against spreading the pathogen. Use all reasonable methods to sanitize personal gear and crew equipment before leaving a *P. ramorum*-infested location or high risk area. Contaminated soil, particularly mud, on vehicle tires, workers boots, shovels, stump grinders, trenchers, etc., may result in pathogen spread if moved to a new, uninfested location. Products used in sanitizing are corrosive to metal and fabric, and toxic to native plants and other vegetation. Measures taken to prevent possible spread of this pathogen shall be implemented in a coordinated fashion to avoid possible secondary effects of treatment, including establishing designated sanitation stations where materials are available for treatment and runoff is adequately contained. Complete cleaning of equipment, typically by using water to completely remove soil and plant debris, provides an adequate level of sanitation in most circumstances. The use of other cleaning and disinfecting agents (such as bleach or alcohol) is typically restricted to specialized uses (e.g., cleaning footwear).
- **Worker Training:** Inform all construction and vegetation management crew members about the arboricultural implications of *P. ramorum* and required sanitation practices when working in high risk areas, and potential for spread to other locations. Where work will occur in infested areas, sanitation kits must be provided and their use monitored to ensure cleanup.
- **Timing of Tree Removal and Construction:** Restrict timing of tree removal, work on infected and susceptible vegetation species, and grading to the dry season (June - October), or during dry spells if adherence to this schedule is not

feasible. When working in wet conditions, equipment shall be kept on paved or dry surfaces to the maximum extent feasible. Construction and vegetation maintenance activities shall generally occur in disease-free and low risk areas before proceeding to infested and high risk areas, and appropriate sanitation measures followed.

- **Restrictions on Movement of Plant and Soil Material:** Appropriate restrictions on grading, other soil disturbing activities, and collection or movement of plant material (wood, brush, leaves and litter) shall be developed and implemented where grading, vegetation removal, and heavy equipment operation is to occur in infested and high risk areas. Within the regulated area, potential host material (e.g. wood, bark, brush, chips, leaves, or firewood) from tree removals or pruning of symptomatic or non-symptomatic plants shall preferably remain within the infested area to minimize pathogen spread, or disposed of off-site according to the quarantine Compliance Agreement for green waste disposal in Alameda County.
- **Nursery Stock:** All nursery stock, soils, and soil amendments used at the site shall be free of *P. ramorum* and other plant pathogenic *Phytophthora* species. Appropriate certification and/or testing will be required to document that materials brought into the site are free of these exotic pathogens.
- **Bay Removal:** Reduce inoculum of *P. ramorum* in vicinity of oaks by selective removal of nearby bay foliage, especially understory bay seedlings and saplings.

The following text was added to the Native Tree Protection and Replacement Element under Goal 4 on page 13 of the Draft HEP to provide controls related to Sudden Oak Death:

Implementing Action 4-3: Best Management Practices developed as part of the Sudden Oak Death Control Program in the Invasive Species Control Element of the HEP shall be implemented to address the possible spread of the pathogen and infection of oaks and other vegetation in Knowland Park.

The following text was revised in the Grassland Protection and Enhancement Element of the Habitat Enhancement Plan on page 8 of the Draft HEP to provide refinement of the grassland assessment and mitigation:

Goal 2: Provide for the protection and enhancement of grassland habitat in Knowland Park through invasive species control and revegetation with native grassland species, and achieve a minimum 3:1 compensatory ~~adequate~~-mitigation for any permanent loss of native grassland habitat as a result of implementing the California Exhibit. The 3:1 compensatory mitigation assumes a worst-case ~~the loss and modification~~ of an estimated 4.44 ~~8.6~~ acres of native grassland habitat as a result of implementing the California Exhibit ~~by protecting and enhancing a~~ minimum of 17.2 acres of grasslands in Knowland Park, resulting in a mitigation acreage of 13.32 acres to be protected and enhanced. This worst-case estimate

and the corresponding compensatory mitigation acreage may be reduced through further refinement of plans for the California Exhibit to avoid additional stands of native grassland, and through implementation of a successful salvage and replanting program where avoidance is infeasible.¹

¹Under the provisions of the HEP, a requirement shall be considered infeasible if it is not capable of being accomplished in a successful manner within a reasonable time period, considering economic, environmental, legal, social, technological factors and/or if it would preclude implementation of the approved amended Master Plan or require additional amendment(s).

The following text was revised in the Grassland Protection and Enhancement Element under Goal 2 on page 9 of the Draft HEP to provide refinement of the grassland assessment and mitigation:

A grassland enhancement and replacement program will be implemented as part of the HEP to ensure that adequate mitigation is provided for the worst-case estimated 4.44 ~~8.6~~ acres of native ~~and non-native~~ grassland habitat possibly lost or modified within the footprint of proposed improvements or within animal enclosures of the California Exhibit. Non-native grassland habitat will be preserved and enhanced through the invasive species removal provided under the Invasive Species Control Element of the HEP. The grassland program will identify historic grasslands...

The following text was revised in the Grassland Protection and Enhancement Element under Goal 2 on page 9 of the Draft HEP to provide refinement of the grassland assessment and mitigation:

Implementing Action 2-1: Compensation shall be provided for the loss of native grasslands as a result of constructing the California Exhibit. This shall be accomplished through a three-tiered approach which first evaluates the opportunity for avoidance and protection, allows for salvage and replanting where avoidance is not feasible, and provides minimum compensatory mitigation where loss is unavoidable, all subject to City review and approval by the Planning Director, summarized as follows:

1) Require a minimum 3:1 compensation for native grasslands lost as a result of implementing the California Exhibit. Based on the 2011 grassland mapping program, a maximum estimate of 4.44 acres of native grasslands would be lost if no refinements to the plans for the California Exhibit and related improvement were to occur and all habitat within enclosures and limited disturbance areas were eliminated. Under this worst-case scenario, 13.32 acres of native grasslands shall be created or restored. This estimate of grasslands lost and the required compensation shall be reduced based on efforts to further avoid native grassland and/or on implementation of a successful salvage and replanting program as described in 2) and 3), and defined in Implementing Actions 2-6 and 2-7, respectively;

2) Minimize the actual loss of native grasslands and reduce the required acreage of compensation through further refinement of detailed plans for the California Exhibit, alignment of enclosure fencing and perimeter fence, and roadway improvements. For every acre of native grasslands preserved through refinement, the maximum estimate of 4.44 acres lost shall be reduced and the total acreage in the 3:1 compensation ratio shall be reduced proportionally. Details of the native grassland avoidance program are defined in Implementing Action 2-6, including methods to confirm final acreage of habitat lost and success of the avoidance program in exhibit areas considered to be of low disturbance risk to native grasslands; and

3) Establish a salvage and replanting program where avoidance is not feasible through refinements, and provide an incentive for implementing this program by reducing the compensatory mitigation ratio where transplanting is successful. For every acre of native grasslands salvaged and successfully re-established through this program, the 3:1 compensatory mitigation ratio shall be reduced to 1:1. This reduced compensation ratio shall still be required because of the physical loss of intact native grasslands that will occur during transplantation. Details of the salvage and replanting program are defined in Implementing Action 2-7.

Compensation shall be provided in ~~A minimum of 17.2 acres of~~ grassland habitat outside of animal exhibits but in as close proximity to the California Exhibit as possible based on updated grassland mapping and the mapped extent of target invasive species. Areas serving as compensation for native grasslands lost as a result of the California Exhibit shall be treated, protected and managed as part of the Invasive Species Control and Native Revegetation Elements of the HEP, as defined under Implementing Actions 2-2 through 2-4. Compensation areas shall be restored, enhanced and managed to achieve a minimum native grass and forb component consistent with the cover class range of native grasslands lost, defined as either moderate quality native grasslands with a native component of from 10 to 40 percent absolute cover or high quality native grasslands with a native component over 40 percent absolute cover. This shall include treatment areas receiving native plant materials from the salvage and replanting program defined in Implementing Action 2-7. This comprehensive program would fully implement the mitigation requirements of Mitigation Measure 13a ~~thereby providing a 2:1 mitigation ratio~~ for grasslands lost or compromised as a result of improvements in the California Exhibit area.

The following text was added in the Grassland Protection and Enhancement Element under Goal 2 on page 10 of the Draft HEP to provide refinement of the grassland assessment and mitigation:

Implementing Action 2-6: Stands of native grasslands within the California Exhibit area shall be considered for additional avoidance during refinement of future improvement plans to protect native grasslands to the maximum extent

feasible, incorporate them into the interpretive experience for future visitors, and reduce the maximum estimate of 4.44 acres of native grasslands adversely affected or lost as a result of Master Plan buildout. This shall include consideration of minor adjustments to building footprints, pathways, and other features which would permanently convert native grassland habitat, as well as minor adjustments to the alignment of exhibit enclosure fencing and the perimeter fence, where substantial avoidance is possible within the context of the approved amended Master Plan and the program for the California Exhibit. Where additional native grasslands are successfully avoided and protected within the California Exhibit area, the maximum estimate of 4.44 acres of grasslands requiring compensatory mitigation shall be reduced in equal amount and the required compensatory mitigation shall be reduced accordingly, as defined in Implementing Action 2-1. Protected stands of native grasslands within the California Exhibit that apply towards any reduction in the compensatory mitigation requirement shall be retained and managed in perpetuity as native grasslands, in addition to the grassland management provisions called for in Implementing Action 2-5. The additional grassland avoidance provisions shall be accomplished according to the following procedures and performance standards:

- Refine plans for the California Exhibit to avoid direct disturbance to stands of native grasslands to the maximum extent feasible while still meeting the program needs, fire safety and clearance requirements, and other variables related to short-term construction and long-term maintenance requirements. To ensure long-term protection and management of native grasslands within the California Exhibit, these areas shall be designated as “Protected Native Grasslands” on all relevant improvement and management plans. The annual monitoring reports required under the Implementation Element of the HEP shall include a review of the status of these Protected Native Grasslands. Additional compensatory mitigation shall be required if these areas are significantly compromised, as defined below.
- Recalculate potential impacts on native grasslands and determine the adjusted total for acreage lost and required compensatory mitigation defined in Implementing Action 2-1. Any reduction in estimated impacts on native grasslands shall be reviewed by a qualified biologist and meet with the review and approval of Planning Director. Following approval by the Planning Director, final grading and site improvement plans shall be revised to show all areas of native grassland to be preserved and shall indicate that construction is restricted from these areas.
- Prior to any site grading or grubbing, the limits of areas to be preserved as native grassland within the California Exhibit shall be flagged by engineered survey at a minimum 50-foot intervals in the field. Protective fencing shall be installed under the supervision of a qualified biologist along this boundary to encompass the entire stand of native grassland to be protected in each location. No construction equipment disturbance shall be allowed within these areas,

unless conducted under the supervision of the qualified biologist and no grading or excavation is allowed. On-going removal of invasive species and other vegetation management activities may continue within these areas during construction. Following the completion of construction within the vicinity of the protected stands of native grassland, the temporary construction fencing shall be removed.

- All workers shall be trained regarding the sensitivity of the native grasslands to be preserved, and the need to remain outside the limits of the protective fencing at all times.
- Annual Monitoring shall be provided as part of HEP implementation to confirm that impact avoidance has been successful and assumptions regarding limited disturbance within animal enclosures have not significantly compromised the native grassland habitat values within these areas. Preserved grasslands shall continue to meet the respective cover class criteria for moderate and high quality native grasslands used to define the compensatory mitigation requirements in Implementing Action 2-1. If these minimum cover class requirements are not met during future annual monitoring performed as part of the HEP, then the adjustment to the required compensatory mitigation shall be voided, and the full 3:1 mitigation requirement shall apply to the acreage of affected grassland within the California Exhibit where avoidance was to be implemented.

Implementing Action 2-7: A Native Plant Salvage and Replanting program, subject to review and approval by the Planning Director, shall be developed and implemented by a qualified biologist or landscape architect with experience in native grassland transplantation to relocate established clumps of native perennial species that would otherwise be lost as a result of constructing the California Exhibit. Where additional native grasslands are successfully salvaged and replanted, the compensation requirement shall be reduced according to the ratios defined in Implementing Action 2-1. The program shall include the following components and performance standards:

- Salvaged material shall be installed in secure locations suitable for native grassland creation and enhancement within the Ecological Recovery Zone or other treatment areas to be revegetated as called for in the Native Revegetation Element of the HEP.
- Prior to any site grading or grubbing, the limits of maximum disturbance associated with implementation of the California Exhibit shall be flagged at a minimum of 50-foot intervals in the field where they intersect stands of native grasslands.
- Suitable native plants that would otherwise be destroyed shall then be harvested in advance of any site grading and grubbing, preferably in the late

fall and winter months when plants are dormant. Some salvage in early spring may be necessary given the difficulty in determining health and viability of some species when dormant.

- Salvaged material shall be properly maintained until ready for reinstallation during the wet period (between November 15 and January 15) consistent with the General Treatment Methods in Table 2, including short-term irrigation both during temporary storage and during initial replanting to ensure survival.
- Treatment areas receiving salvaged native plant material shall be maintained and monitored as called for in the Native Revegetation Element of the HEP. Treatment areas shall continue to meet the respective cover class criteria for moderate and high quality native grasslands used to define the compensatory mitigation requirements in Implementing Action 2-1. If these minimum cover class requirements are not met during future annual monitoring performed as part of the HEP, then the 1:1 adjustment to the required compensation shall be voided, and the full 3:1 mitigation requirement shall apply to the acreage of affected grassland within the California Exhibit where the salvage program was implemented.

The following text was revised in the Species Protection Element under Goal 5 on pages 15 and 16 of the Draft HEP to provide clarification on monitoring of the occurrence of bristly leptosiphon:

Implementing Action 5-2: Annual monitoring shall be provided for a minimum of five years once wolves begin using the “Wolf Expansion” area to determine whether trampling, digging, and other possible disturbances could result in the extirpation of this population. Field monitoring inspections shall be conducted at least once a month for the first six months once wolves have been released into the enclosure, and the effects of newly established trails and movement patterns, tendency for digging, and risks to the occurrence of bristly leptosiphon determined. Thereafter, field monitoring inspections shall occur at least once a year when the bristly leptosiphon is in flower and any changes in the size and distribution of the occurrence can be determined. The monitoring shall be conducted by a qualified botanist or biologist, with annual reports on the condition of the occurrence, reproductive success, and need for any changes in access or management. Annual monitoring reports shall be submitted to the City of Oakland by October 15 of each year of monitoring. If it is clear that the occurrence becomes threatened by wolf activities, permanent protective fencing shall be installed providing a 25-foot buffer around the population. Annual monitoring shall be provided a minimum of three years beyond installation of any permanent protective fencing to ensure that the population is adequately protected and monitor changes in population size and distribution within and outside of the protective fence boundary.

The following conditions of approval concerning the HEP were adopted by the Oakland City Council and have been incorporated into the HEP on pages 24 and 26, respectively:

29. Parks and Recreation Advisory Commission Report

Ongoing

The applicant shall submit to the Parks and Recreation Advisory Commission (PRAC) the Annual Progress Report (including the Annual Assessment) of the Habitat Enhancement Plan required under Mitigation Measure 13a. The PRAC may hold a public hearing on such reports.

31. Implementation Plan for Habitat Enhancement Plan; Financial Security

A. Prior to the issuance of a construction-related permit for the first element of the California exhibit and prior to conducting the first activities contained in the Habitat Enhancement Plan

The applicant shall submit an Implementation Plan for the Habitat Enhancement Plan for review and approval by the Planning Director prior to the issuance of a construction-related permit for the first element of the California exhibit or prior to conducting the first activities contained in the Habitat Enhancement Plan, whichever occurs first. For the purposes of this condition, an element of the California exhibit includes the overnight camping area, aerial gondola, California Interpretive Center, one or more California animal exhibits, service road to the California exhibit, utilities to the California exhibit, or improvements to the emergency access road off Snowdown Avenue, but not the Veterinary Medical Hospital. The Implementation Plan shall cover a five-year period and include at least the following itemized elements:

- Actions contained in the Habitat Enhancement Plan to be implemented within the five-year period that demonstrate reasonable progress towards implementation of the Habitat Enhancement Plan
- Identification of the party/parties who will implement each action
- Estimated cost of each action
- Source of cost estimation for each action
- Proposed funding mechanism for each action
- Status of funding for each action

The Implementation Plan must demonstrate to the satisfaction of the Planning Director that funding for the Habitat Enhancement Plan is a specified item incorporated into the Zoo's annual budget and reflected in the Zoo's annual accounting audit and that the applicant has reasonably demonstrated that it has the financial capacity to sufficiently complete the identified actions. If necessary to ensure financial capacity, the Planning Director may require the applicant to submit evidence of financial security in an amount and manner acceptable to the City, such as a cash deposit with the City, performance bond, instrument of credit, and/or other form of security deemed acceptable by the Planning Director.

B. Ongoing; Concurrent with the submittal of the Annual Progress Report and prior to the issuance of construction-related permits for the Zoo (as such permits are submitted)

On an ongoing basis for the life of the project, the applicant shall submit an updated Implementation Plan for the Habitat Enhancement Plan for review and approval by the Planning Director with the submittal of the Annual Progress Report required by the Habitat Enhancement Plan. The Implementation Plan shall be updated to reflect the Habitat Enhancement Plan actions planned for the next five-year period and shall include the items listed in section A above. The Implementation Plan must demonstrate to the satisfaction of the Planning Director that the applicant has reasonably demonstrated that it has the financial capacity to sufficiently complete the identified actions, as explained in section A above. No further construction-related permits shall be issued for the Zoo until the current required Implementation Plan is approved.

Appendix C:

Special Status Species with Potential to Occur in the Project Vicinity

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in
or may be Affected by Projects in the Counties and/or

U.S.G.S. 7 1/2 Minute Quads

Document Number: 110824014537

Database Last Updated: April 29, 2010

Quad Lists

Listed Species

Invertebrates

- Branchinecta lynchi
 - vernal pool fairy shrimp (T)
- Icaricia icarioides missionensis
 - mission blue butterfly (E)
- Speyeria callippe callippe
 - Callippe silverspot butterfly (E)

Fish

- Acipenser medirostris
 - green sturgeon (T) (NMFS)
- Eucyclogobius newberryi
 - tidewater goby (E)
- Hypomesus transpacificus
 - Critical habitat, delta smelt (X)
 - delta smelt (T)
- Oncorhynchus kisutch
 - coho salmon - central CA coast (E) (NMFS)
- Oncorhynchus mykiss
 - Central California Coastal steelhead (T) (NMFS)

- Central Valley steelhead (T) (NMFS)
- Critical habitat, Central California coastal steelhead (X) (NMFS)
- *Oncorhynchus tshawytscha*
 - Central Valley spring-run chinook salmon (T) (NMFS)
 - Critical habitat, winter-run chinook salmon (X) (NMFS)
 - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- *Ambystoma californiense*
 - California tiger salamander, central population (T)
- *Rana draytonii*
 - CRLF (T)
 - Critical habitat, CRLF (X)

Reptiles

- *Masticophis lateralis euryxanthus*
 - Alameda whipsnake [=striped racer] (T)
 - Critical habitat, Alameda whipsnake (X)
- *Thamnophis gigas*
 - giant garter snake (T)

Birds

- *Charadrius alexandrinus nivosus*
 - western snowy plover (T)
- *Pelecanus occidentalis californicus*
 - California brown pelican (E)
- *Rallus longirostris obsoletus*
 - California clapper rail (E)
- *Sternula antillarum* (=Sterna, =albifrons) browni
 - California least tern (E)

Mammals

- *Reithrodontomys raviventris*
 - salt marsh harvest mouse (E)

Plants

- *Arctostaphylos pallida*
 - pallid manzanita (=Alameda or Oakland Hills manzanita) (T)
- *Clarkia franciscana*
 - Presidio clarkia (E)
- *Holocarpha macradenia*
 - Critical habitat, Santa Cruz tarplant (X)
 - Santa Cruz tarplant (T)
- *Lasthenia conjugens*
 - Contra Costa goldfields (E)
- *Suaeda californica*
 - California sea blite (E)

Proposed Species

Amphibians

- *Rana draytonii*
 - Critical habitat, CRLF (PT)

Quads Containing Listed, Proposed or Candidate Species:

HAYWARD (447A)

SAN LEANDRO (447B)

HUNTERS POINT (448A)

WALNUT CREEK (465A)

BRIONES VALLEY (465B)

OAKLAND EAST (465C)

LAS TRAMPAS RIDGE (465D)

RICHMOND (466A)

OAKLAND WEST (466D)

Appendix D:

Status of the Alameda Whipsnake (*Masticophis lateralis euryxanthus*) in Knowland Park for the Proposed Expansion of the Oakland Zoo, City of Oakland, Alameda County, California

**Status of the Alameda Whipsnake (*Masticophis lateralis euryxanthus*) in
Knowland Park for the Proposed Expansion of the Oakland Zoo City of
Oakland, Alameda County, California**

Prepared for

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January 3, 2011

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1.0 INTRODUCTION

The purpose of this report is to present the results of live trapping surveys conducted for the Alameda whipsnake (*Masticophis lateralis euryxanthus*) in Knowland Park, City of Oakland, Alameda County, California and to discuss the impacts associated with the proposed expansion of the Oakland Zoo and a proposal for a mitigation plan. The Oakland Zoo is located at the western edge of Knowland Park and has an approved Master Plan that allows the zoo to expand to the east of the existing zoo. The project site (i.e. the expansion area) is located just east of the existing Oakland Zoo and lies within Knowland Park, just east of Interstate 580 at the Golf Links Road intersection. The Oakland Zoo is proposing to expand the Zoo to include a new 17,000 square foot Veterinary Medical Hospital and a new California Exhibit which will exhibit native California species from the past and present and provide education on conservation of native California species. The California Exhibit is located to the east of the existing zoo and will only be accessed by the public via a gondola. An existing dirt road would be paved to provide emergency and maintenance access to the new California Exhibit.

The Alameda whipsnake (AWS) is listed as a state and federally threatened species. None of the project site is within the current Critical Habitat for the Alameda whipsnake (U. S. Fish and Wildlife Service, 2006), but is within the former critical habitat for the Alameda whipsnake (U.S. Fish and Wildlife Service 2000). The undeveloped portion of Knowland Park east of the existing zoo, is within the Oakland-Las Trampas Recovery Unit established by the U.S. Fish and Wildlife Service (2002) Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California.

Two separate surveys have been conducted for the Alameda whipsnake on the project site. The first was conducted in 1998 and 1999 due to the presence of potential whipsnake habitat in the project area. The second was conducted in fall 2009/spring 2010 due to the amount of time that had lapsed and changes to the survey protocol for determining the status of the species.

The surveys were conducted under the authority of a federal recovery permit (TE-815537) issued by the U.S. Fish and Wildlife Service (USFWS) and a Memorandum of Understanding from the California Department of Fish and Game (CDFG).

2.0 Ecology of the Alameda Whipsnake

2.1 Description

The Alameda whipsnake is a slender, fast moving, diurnal snake with a narrow neck and relatively broad head (Stebbins 2003). The dorsal color is sooty-black with wide yellow-orange dorso-lateral stripes (Riemer 1954). The anterior portion of the stripes and ventral surface of the snake are heavily pigmented with orange-rufous coloration. The Alameda whipsnake and the chaparral whipsnake (*Masticophis lateralis lateralis*) make up the two subspecies of the California whipsnake (*Masticophis lateralis*) (U.S. Department of Interior, 2000). Adults can reach up to five feet in length (Swaim 1994).

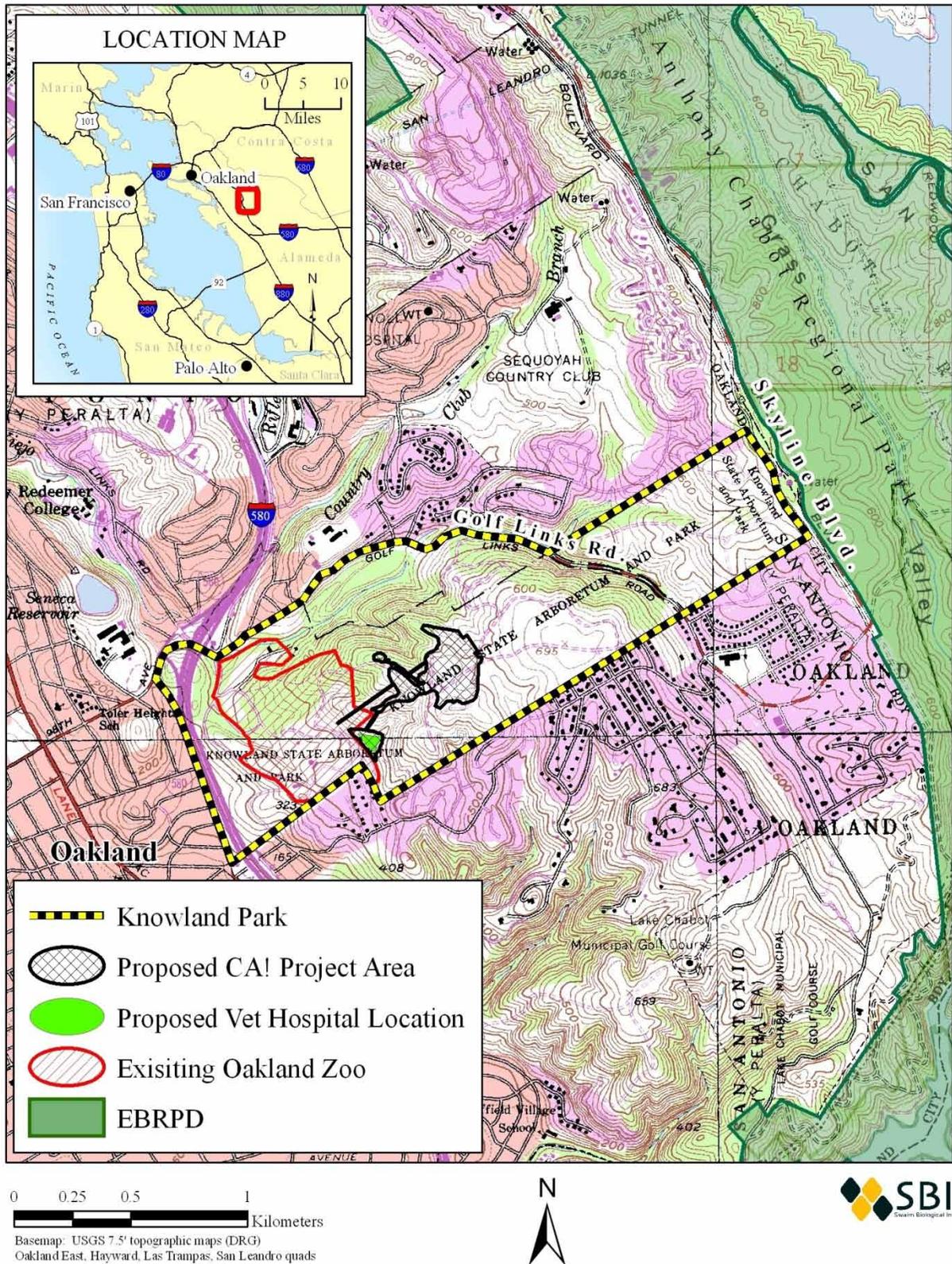


Figure 1. Regional Location Map

2.2 Habitat Use and Spatial Ecology

The Alameda whipsnake uses the mosaic of habitats found in the East Bay, with the highest frequency of use in and near scrub and chaparral habitats including chamise chaparral, Diablan sage scrub, northern coyote brush scrub, and riparian scrub (Swaim 1994). Swaim (1994) also found that there was extensive use of grassland and oak woodland/savanna adjacent to chaparral and scrub communities by Alameda whipsnakes equipped with radio transmitters. The home ranges of six radio-equipped whipsnakes were centered on scrub communities. Core areas (areas of concentrated use) were on east, south, southeast, southwest-facing slopes with open or partially open canopy scrub or chaparral communities. Protection and conservation of core type habitats and the communities/undeveloped areas that connect them is critical to avoiding significant impacts to Alameda whipsnake populations.

Chamise chaparral and Diablan sage scrub communities have a measurably higher carrying capacity for AWS populations than coyote brush scrub. AWS are typically the dominant snake species in chamise chaparral. This is likely due in part to the higher carrying capacity for most lizard prey species in these communities and a tendency for slow (or no) succession or conversion to less suitable habitat.

Whipsnakes monitored with telemetry ranged into the surrounding grassland for distances of greater than 500 feet (Swaim 1994). Whipsnakes remained in the grassland for periods ranging from a few hours to several weeks at a time (Swaim 1994). Grassland habitats were used by male whipsnakes most extensively during the mating season in spring (Swaim 1994). Female whipsnakes used grassland areas most extensively after mating, possibly in their search for suitable egg-laying sites (Swaim 1994). Anecdotal information also indicates Alameda whipsnakes can be found even greater distances from scrub and chaparral habitats (up to approximately four miles) in grassland and oak savannah (Swaim 2000a, 2000b, 2000c, 2003a, 2003b).

Rock outcrops can enhance the habitat for Alameda whipsnake because they provide cover and promote abundant lizard populations. However, rock outcrops are not present at all study areas where whipsnakes have been documented. We did not map the distribution of rock outcrops in the study area for this reason.

2.3 Distribution in the Project Vicinity

The closest records of the Alameda whipsnake in the project vicinity include recent observations (2006) from Chabot Regional Park approximately 1.62 miles northeast of the site and 1.75 miles east of the site (Table 1). Several other observations are known from within three miles of the site and are outlined below with a general location, distance and direction from the site, year of observation and source of the data record. Habitat with significant areas of core habitat remains in pockets to the north and south of Knowland Park, but have not been surveyed for AWS (e.g. Leona Quarry, open space west of the Chabot Municipal Golf Course).

Table 1. Alameda whipsnake records in the project vicinity.

Location	Distance (miles) and direction from Site	Year of Observation	Source
Chabot Regional Park	1.62 /NE	2006	CNDDDB
Chabot Regional Park	1.75/ E	2006	CNDDDB
USLRW	2.35/NE	2008	CNDDDB
USLRW	2.44/NE	2008	CNDDDB
Merit College Area	2.8/NW	1940s	MVZ
Leona Heights Park	3.0 /N	1953	CNDDDB

CNDDDB= California Natural Diversity Data Base.

MVZ= Museum of Vertebrate Zoology (Berkeley Collections).

USLRW= Upper San Leandro Reservoir Watershed.

The historic distribution of the Alameda whipsnake and potential habitat in the region suggests that the area was contiguous with occupied habitat to the north and south prior to large scale development in the area. The study area has physically suitable habitat and appears to have an adequate lizard prey base. Chamise chaparral is typically a habitat type where AWS is the dominant snake species. However, development in the project vicinity has likely significantly reduced connectivity of the site to other occupied areas of habitat. The site is a relatively narrow island of habitat (between 0.3 and 0.5 miles wide) that has been virtually isolated for several decades by the residential development to the north and south and the existing Oakland Zoo to the west. To the east, a major road (Golf Links Road) bisects Knowland Park into two areas. This road does not function as a complete barrier to movement, but likely is a significant deterrent. The potential for whipsnakes moving into the site from the closest known occupied habitat to the east is limited by the need to cross both Golf Links Road and Skyline Boulevard further to the east. The potential for AWS to come to the site via other routes has not been specifically analyzed.

3.0 MATERIALS AND METHODS

3.1 Vegetation Community Mapping

SBI biologists mapped vegetation using GIS and aerial photography from several years to capture the dynamic changes in distribution and reemergence of one community (French broom scrub) over time. Naming of vegetation communities generally follows Holland (1986). Vegetative communities present in the study area include grassland (non-native and native needle grass grassland), Diablan sage scrub, French broom scrub, northern coyote brush scrub, chamise chaparral, coast-live oak woodland, barren and disturbed (roads/turn outs), and ornamental (*Eucalyptus* sp. and non-native pine).

3.2 Alameda Whipsnake Habitat Modeling

We created and overlaid an aspect layer onto the vegetation layer to identify the location of core type habitats of the AWS. This allowed us to meaningfully evaluate the potential impacts to Alameda whipsnake associated with the proposed project.

3.3 Field Trapping Surveys

1998-1999 Survey Periods

Trapping surveys in 1998-1999 were conducted from April 16, 1998 through July 17, 1998 and May 21 through June 21, 1999. Although 90 days of trapping were conducted during 1998, as required by the survey protocol at that time, a total of 25 to 30 days during the survey period were lost due to rainy and/or cold foggy weather the San Francisco Bay Area experienced during the spring of 1998. The period of trapping during 1999 was conducted to make up for the days of trapping lost during 1998. A total of 21 traplines were placed in the areas with the highest

quality potential whipsnake habitat in the California 1820 (now called the California Exhibit) study area as planned at that time (Figure 2). These areas included open and partially open canopy stands of chamise chaparral, coyote brush scrub, Diablan sage scrub, rock outcrops and the ecotone of scrub and grassland communities (Figure 2). Trapline placement was slightly different in 1998 versus 1999 (Figure 2).

2009-2010 Surveys

In 2009-2010 a second status survey was conducted due to time elapsed since the first survey and changes to the status survey protocol, which added a 45-day fall trapping component to the survey methods. In addition several project features had changed or been eliminated. A total of 35 traplines were distributed in areas of optimal habitat in Knowland Park for this survey and the placement of traplines differed slightly from the 1998-99 survey (Figure 2). Trapping periods for this survey included a fall component from September 5, 2009 –October 27, 2009. We completed 45 active trapping days in this period. For eight of the days in this time period, the traps were deactivated due to extreme heat or rain events. The spring component was conducted from April 13, 2010 through July 23, 2010 and a total of 90 trap days were completed during that period.

General Trapping Methods for all Surveys

A trapline consists of an approximately 50-foot length of drift fence with a double-funneled trap at each end. Drift fences were constructed with 1/8 inch thick hardboard and were a minimum of 14 inches high (above the surface) with approximately two inches buried in the ground (**Figure 3**). Where slopes were particularly steep drift fences were 20-22 inches in height. Traps consisted of a wooden frame with large panels of 1/8 inch wire mesh during the 1998 survey. During the 1998 survey period, the traps used measured 12 inches wide, 12 inches high, and 16 inches long (Figure 3). During the 1999 survey, minnow traps constructed of 1/4 inch hardware cloth supported by a metal frame were used. Written permission from the California Department of Fish and Game and the U.S. Fish and Wildlife Service to use the 1/4 inch wire mesh is on file at Swaim Biological Consulting. The traps used in 1999 measured 8 inches high and wide and 16 inches long. A piece of wire mesh was attached to the outside edge of each trap so that the total width of the entrance funnel measured 12 inches (Figure 3). Traplines were checked at least every other day during the study period. Each time the traps were monitored vertebrate species captured and the location of capture were recorded. Most snake species were measured and marked for individual recognition by clipping a certain ventral scale. Traps were checked daily in 2009-2010, regardless of weather conditions.



- 2009-10 Trapline locations
- Knowland Park
- 1998-99 Trapline locations
- Proposed EVA Road and Gondola Line
- Proposed Vet Hospital Location
- Proposed CA! Project Area
- Existing Oakland Zoo

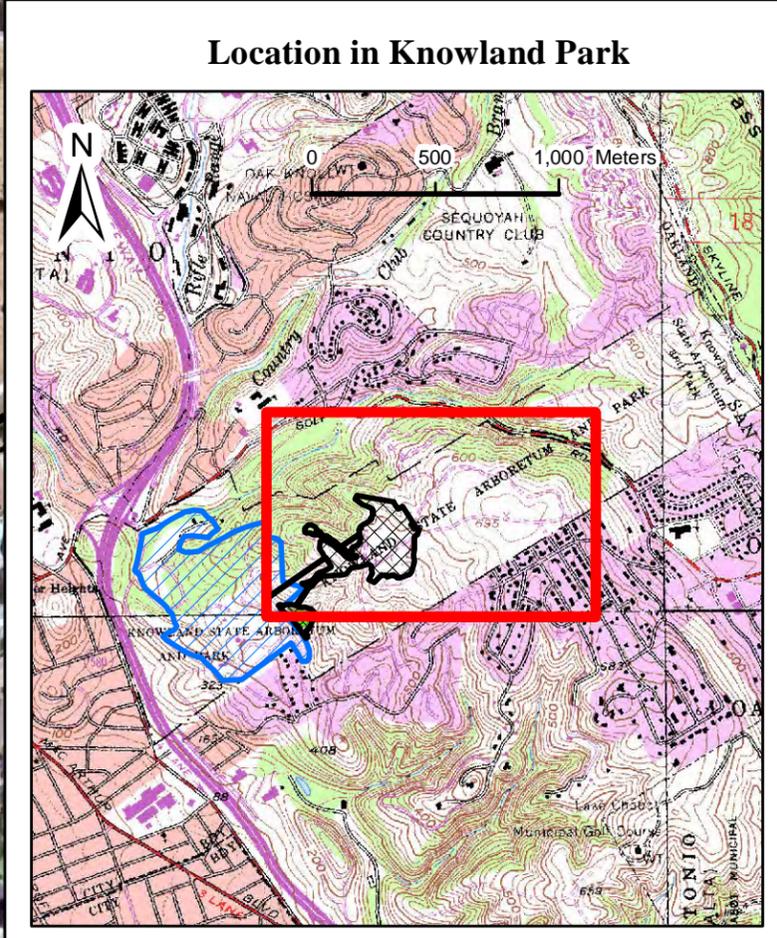
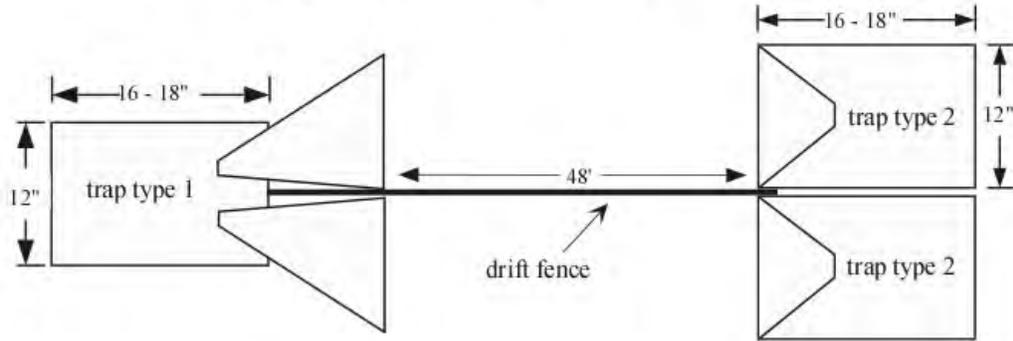


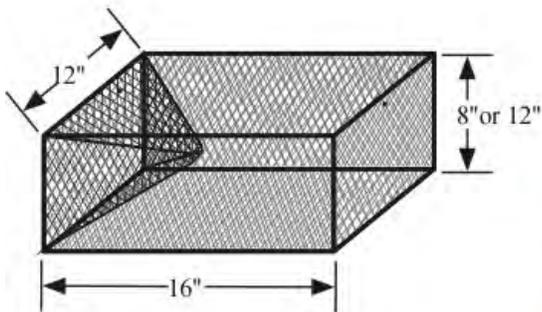
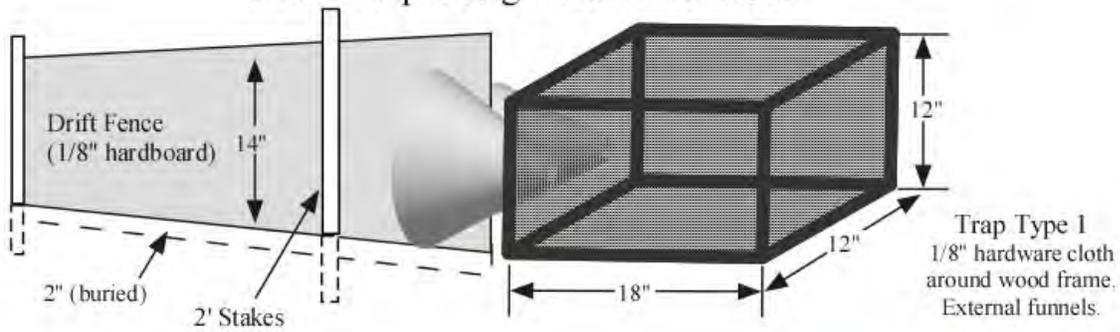
Figure 2. Trapline Locations 1998-1999 and 2009-2010 with an outline of the current project component configuration

Trapline Schematic (plane view)



Trapline Schematic (oblique view)

Snake Trap Design and Dimensions



Trap Type 2
1/4" aluminum screen
around metal frame.
Internal funnel.



Example of actual trapline set up.



Figure 3. Trapline Schematic and Trap Designs- Metal traps were only used in 1998-1999.

4.0 RESULTS

4.1 Vegetation Community Mapping

4.1.1 Vegetation Community Distribution

The distribution of the vegetation communities mapped is shown in **Figure 4**. A brief description of the community types mapped and brief evaluation of the habitat value/frequency of use by AWS for each community are provided below. Knowland Park is a valuable example of how, under existing conditions in the East Bay, Alameda whipsnake habitat is being lost through natural succession combined with the lack of natural periodic disturbance (e.g. fire).

Grassland (Non-Native and Native)

This grassy vegetation type is dominated by introduced annual grasses and herbs. This natural community is being rapidly replaced by non-native French broom scrub in the project area and in other parts of Knowland Park. Needle grass grassland, a natural community, is still a visible component embedded within the non-native grasslands in the project area. No mapping distinction could be made to distinguish these grassland communities.

Northern Coyote Brush Scrub

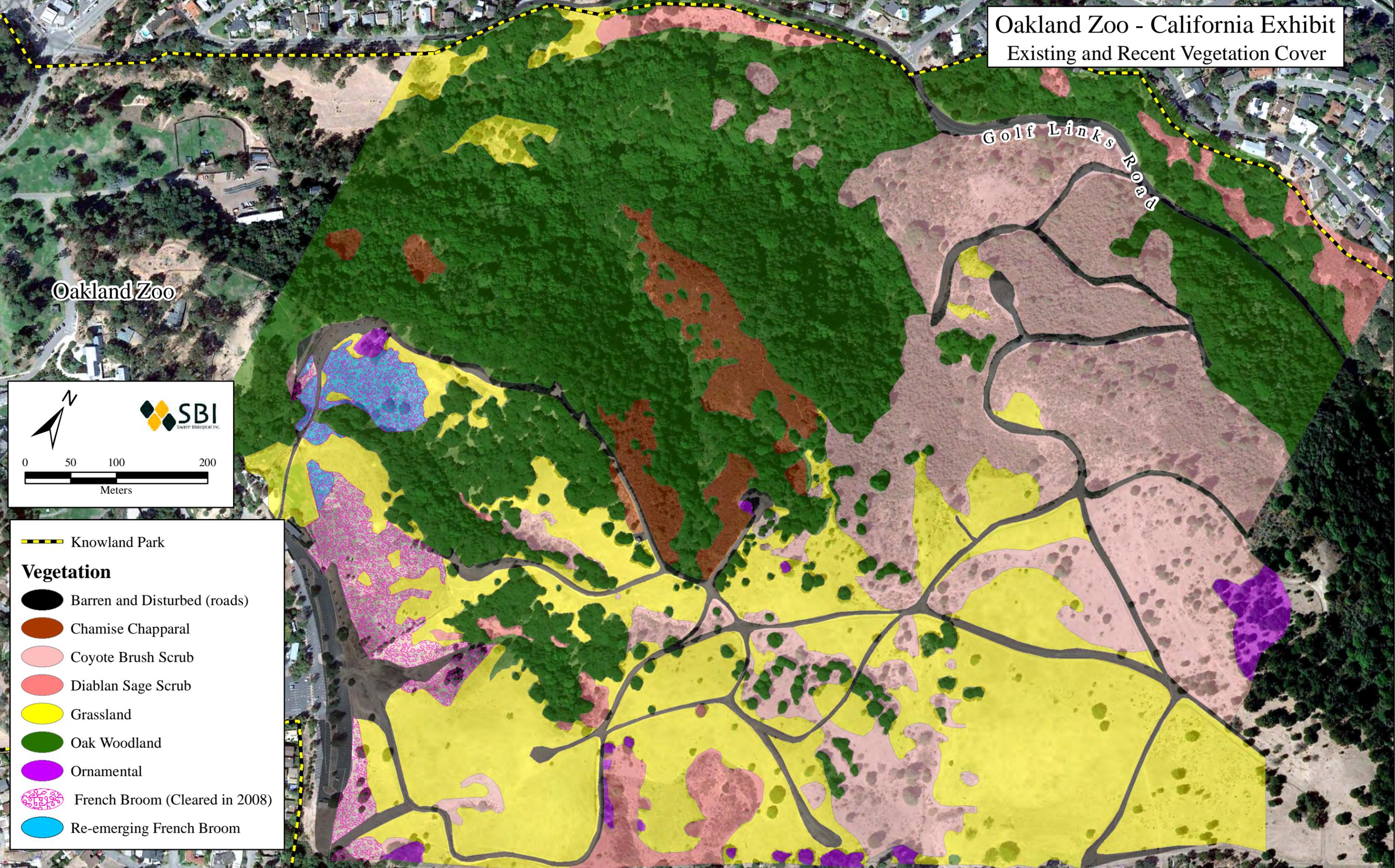
This natural community is dominated by a single species, coyote brush (*Baccharis pilularis*), although several other shrubby species are present, such as poison-oak (*Toxicodendron diversilobum*), bush monkeyflower (*Mimulus aurantiacus*), coffeeberry (*Rhamnus californica*), elderberry (*Sambucus mexicana*), and coastal sagebrush (*Artemisia californica*). Northern coyote brush scrub encroaches into grasslands in the absence of fire or browsing by large herbivores. Knowland Park has not had significant fires or large scale grazing in decades. During the trapping survey in fall of 2009 a small fire (1 – 2 acres) burned some brush/grassland habitat north of the project area.

Natural succession tends to result in coast live oaks (*Quercus agrifolia*) and California bay (*Umbellularia californica*) invading coyote brush scrub in moister sites, deeper soils, and in the absence of other disturbance such as fire. Northern coyote brush scrub is on many parts of the upper elevations of the site and Knowland Park.

Diablan Sage Scrub

Diablan sage scrub is dominated by coastal sagebrush, poison-oak, bush monkeyflower, and occasional coyote brush. Coastal sage scrub is typically confined to relatively steep, rocky, often south-facing slopes, as it is in the study area. There is much intergradation of Diablan sage scrub and northern coyote brush scrub, since the predominant of one natural community is almost always found in the other, though in lesser amounts. Intermediate or transitional vegetation was mapped as Diablan sage scrub because it is generally a higher quality of habitat for the Alameda whipsnake and is important for other wildlife species in general.

Oakland Zoo - California Exhibit
Existing and Recent Vegetation Cover



Oakland Zoo

Golf Links Road




0 50 100 200
Meters

-  Knowland Park
- Vegetation**
-  Barren and Disturbed (roads)
-  Chamise Chapparral
-  Coyote Brush Scrub
-  Diablan Sage Scrub
-  Grassland
-  Oak Woodland
-  Ornamental
-  French Broom (Cleared in 2008)
-  Re-emerging French Broom

Figure 4. Vegetative Cover Map for Oakland Zoo Expansion Area.

Chamise Chaparral

This natural community is dominated by chamise (*Adenostoma fasciculatum*), growing in tall (up to 10 feet or more), dense stands. In the study area, several other woody species were found in chamise chaparral: on the more shaded slopes with deeper soil, silktassel (*Garrya elliptica*), brittle manzanita (*Arctostaphylos tomentosa* ssp. *crustacea*), coyote brush, poison-oak and coast live oak occur. On more exposed slopes, often in particularly rocky places, small patches or isolated individuals of coastal sagebrush and bush monkeyflower are found. There is little understory in this natural community within the study area. Chamise chaparral is a natural community adapted to repeated fires (Holland 1986) due to its ability to stump sprout. In the study area, however, the stands do not appear to have experienced fire in many decades. Despite the shrubs being tall, they still provide high quality habitat for the Alameda whipsnake. Chamise chaparral is found on the slopes of the upper part of the study area. French broom is invading areas of chamise on the site.

French Broom Scrub

This vegetation type is not described by Holland (1986), although it occupies extensive and increasing acreage in the coastal regions of California. It is dominated by a non-native shrub, French broom (*Genista monspessulana*) which forms a nearly pure stand. French broom invades grassland, coyote brush scrub and open oak savanna, out competing much of the understory. Soil disturbance greatly encourages the spread of French broom. French broom is distributed in many large stands throughout the East Bay Hills and it is present in every natural community within the study area. Over the course of the survey work for AWS at Knowland Park, the distribution of French broom has been dynamic, due to natural and human related actions. Large areas of broom that were present in 1998-1999 within existing animal exhibits and areas adjacent to the existing zoo were removed from the project area by contractors (Appendix A, 2007 and 2009 Google Earth Photos). Subsequently new areas have been invaded by broom and it is spreading in nearly all of the native communities in Knowland Park. The spread of broom and conversion of native habitats to stands of broom, poses a significant threat to the quality of the site for AWS. Efforts are being made to reduce the spread and eliminate it from areas of high quality AWS habitat on lands owned and managed by the East Bay Regional Park District.

Coast Live-oak Woodland

This natural community varies from an open savanna with herbaceous or shrubby understory to a closed-canopy woodland. It is dominated by coast live oak. The second most frequently occurring tree is California bay. Other species that occur occasionally in the study area are California buckeye (*Aesculus californica*) and elderberry. The understory of this community varies. When the oaks have an open canopy, the understory is much the same as the adjacent needlegrass grassland or open Northern coyote brush scrub. When coast live oak woodland exists as a closed-canopy woodland, the understory is more diverse with herbs and shrubs, including poison-oak, hazelnut (*Corylus cornuta* var. *californica*), gooseberry (*Ribes* spp.), snowberry (*Symphoricarpos albus* var. *laevigatus*), and blackberry (*Rubus* spp.). Coast live oak woodland occurs throughout the study area on shaded slopes, primarily with a north-or east-facing aspect. Coast live oak woodland habitats with a more open canopy and on aspects facing southerly and easterly, are generally used more frequently by AWS.

Barren/Disturbed

This category is primarily the existing fire roads, turn around areas where fire roads terminated and the barren portion of the compost pile area where the veterinary hospital is proposed.

Ornamental

Eucalyptus and pine trees are the two mapped ornamental tree species. Eucalyptus is not prevalent in the study area and occurs in only small isolated patches with a few large trees. These stands may slightly reduce the habitat value, but are not large enough to present any kind of barrier or deterrent of movement between better habitat areas. In some areas of the Oakland- Berkeley Hills, Eucalyptus stands are a major factor in habitat loss. Pine trees occur in a small clump near the upper end of the study area.

4.2 Alameda Whipsnake Habitat Modeling

Habitat modeling was used to generally define the core areas on the site where the frequency of use for any AWS on the site would be highest and contain essential habitat features such as most egg laying sites, winter retreats, and high quality foraging areas. They contain the majority of components that are essential for supporting viable resident populations of AWS and are used at a very high frequency although habitat use is not limited to core areas. **Figure 5** shows the aspect for all scrub and chaparral habitat types in the project area. In addition we included two zones of habitat regularly used by AWS when adjacent to scrub and/or chaparral based on telemetry data, trapping data, and opportunistic observations of free ranging AWS. This graphic indicates that there is a mosaic of core habitats that are spaced at close enough distances that any AWS on site would use/incorporate several of these core habitats within their home range and that if an AWS population were present, it would use most if not virtually all of the study area to varying degrees.

4.3 Field Trapping Surveys

A single Alameda whipsnake was captured during the entire study period. A small adult male AWS was captured on June 3, 4, and 27 in three different traplines (**Figure 5 and Figure 6**). The exact location of AWS captures is not shown. No other AWS were captured or observed during the study.

A total of at least twenty-five vertebrate species were captured including six amphibian species, three lizard species, six snake species, eight small mammal species, two bird species identified and at least one unidentified species of bird. The common and scientific name and number of captures for each species during each trapping session is summarized in Table 1. The most commonly captured snake species was the western yellow-bellied racer (*Coluber constrictor mormon*). Like the Alameda whipsnake, this species is more visually oriented and generally prefers higher ambient temperatures than the other snake species captured on the site.

Oakland Zoo - California Exhibit
Aspect Map

Extent of Aspect Analysis

Chamise Chaparral

Coyote Brush Scrub

Diablan Sage Scrub

Aspect

Flat (-1)

North (0-22.5)

Northeast (22.5-67.5)

East (67.5-112.5)

Southeast (112.5-157.5)

South (157.5-202.5)

Southwest (202.5-247.5)

West (247.5-292.5)

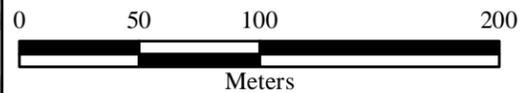
Northwest (292.5-337.5)

North (337.5-360)

**Non Scrub/Chaparral
Habitat Use Zones**

100'

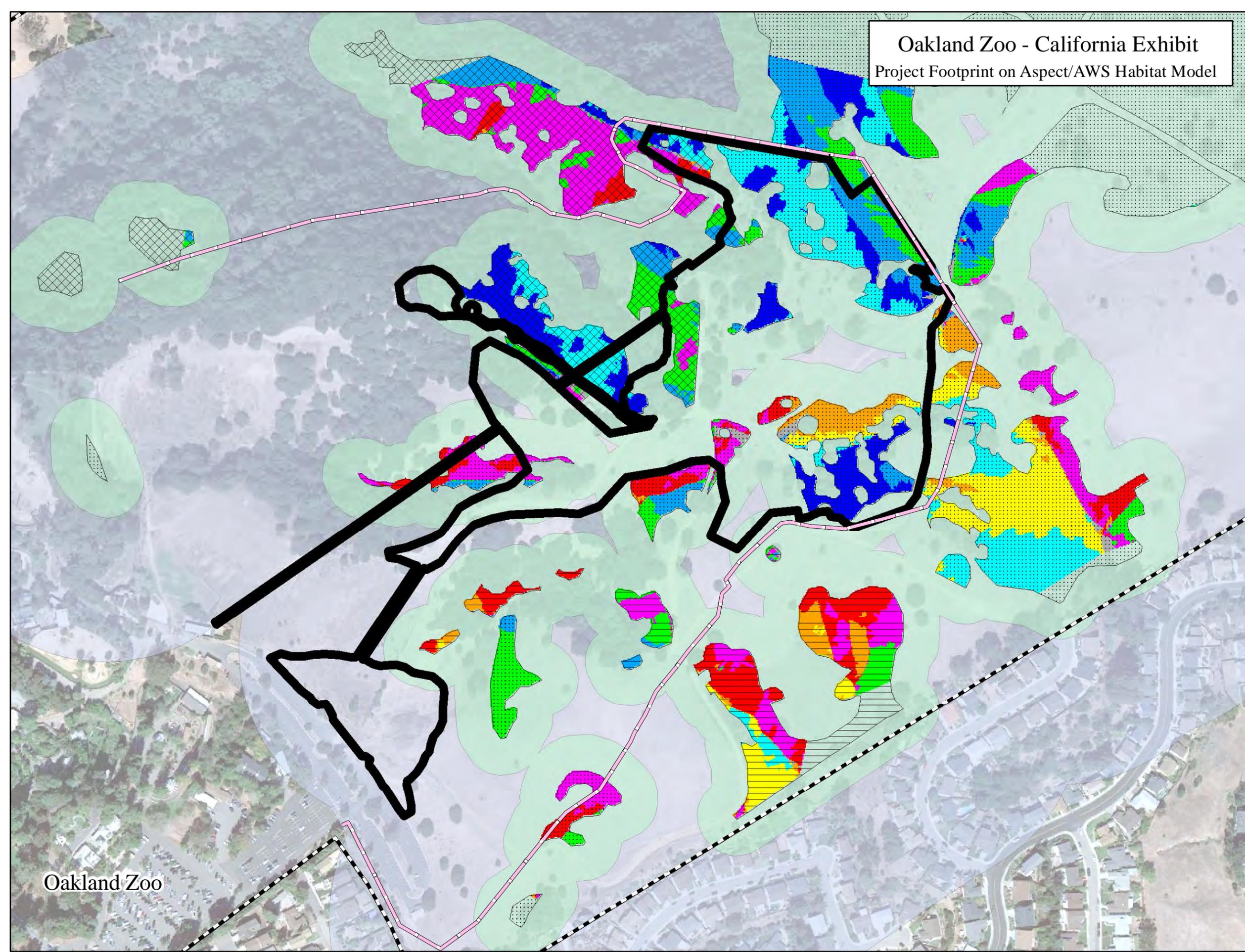
500'



Oakland Zoo

Figure 5. Aspect of scrub and chaparral habitats in the project area.

Oakland Zoo - California Exhibit
 Project Footprint on Aspect/AWS Habitat Model



Legend

- Chamise Chapparral
- Coyote Brush Scrub
- Diablan Sage Scrub

Aspect

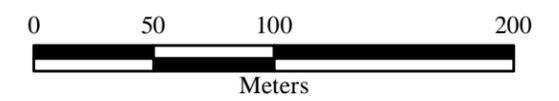
- Flat (-1)
- North (0-22.5)
- Northeast (22.5-67.5)
- East (67.5-112.5)
- Southeast (112.5-157.5)
- South (157.5-202.5)
- Southwest (202.5-247.5)
- West (247.5-292.5)
- Northwest (292.5-337.5)
- North (337.5-360)

Non Scrub/Chaparral Habitat Use Zones

- 100'
- 500'

Proposed Project Footprint
 22.0 acres

Proposed Perimeter Fence
 1.4 acres



Oakland Zoo

Figure 6. Project Footprint on AWS Habitat Model.

Table 2. Vertebrate Species Captured in Knowland Park.

Common Name	Scientific Name	Total Captures (Includes Recaptures)			
		Spring 1998	Spring 1999	Fall 2009	Spring 2010
Arboreal Salamander	<i>Aneides lugubris</i>	8	1	20	20
California Slender Salamander	<i>Batrachoseps attenuatus</i>	42	0	145	223
Yellow-eyed Salamander	<i>Ensatina eschscholtzii xanthoptica</i>	?	?	55	26
Coast Range Newt	<i>Taricha torosa torosa</i>	45	8	19	406
Rough-skinned Newt	<i>Taricha granulosa</i>	?	?	19	2
Pacific Chorus Frog	<i>Pseudacris regilla</i>	2	1	1	0
California Alligator Lizard	<i>Elgaria multicarinata multicarinata</i>	205	48	24	143
Skilton Skink	<i>Eumeces skiltonianus skiltonianus</i>	160	6	31	101
Western Fence Lizard	<i>Sceloporus occidentalis</i>	725	195	316	544
Western Yellow-bellied Racer	<i>Coluber constrictor mormon</i>	44	11	2	28
Alameda Whipsnake	<i>Masticophis lateralis euryxanthus</i>	0	0	0	3
Sharp-tailed Snake	<i>Contia tenuis</i>	10	0	8	12
Pacific Gopher Snake	<i>Pituophis catenifer catenifer</i>	18	11	26	40
Ring-necked Snake	<i>Diadophis punctatus</i>	9	0	9	34
California Kingsnake	<i>Lampropeltis getula</i>	4	2	?	?
Broad-handed Mole	<i>Scapanus latimanus</i>	?	?	0	1
Shrew	<i>Sorex sp.</i>	?	?	1	2
Audubon's Cottontail	<i>Sylvilagus audubonii</i>	0	0	0	1
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	75	6	23	57
Black Rat	<i>Rattus rattus</i>	1	0	0	0
California Meadow Vole	<i>Microtus californicus</i>	78	30	2	18
Deer Mouse	<i>Peromyscus spp.</i>	45	12	42	125
Botta's Pocket Gopher	<i>Thomomys bottae</i>	1	0	27	8
Dark-eyed Junco	<i>Junco hyemalis</i>	0	0	0	1
Bewick's Wren	<i>Thyromanes bewickii</i>	0	0	1	4
Unknown Bird		0	0	3	2

5.0 DISCUSSION

5.1 California Exhibit

Based on the survey findings, the site must be considered occupied by the Alameda whipsnake. The proposed project will have a significant impact on the core AWS habitat and possibly the species. It would result in direct loss of core type habitat areas, fragmentation of core areas and other habitat (Figure 7), potential for invasion of French broom into previously undisturbed areas, and potentially direct take of individual AWS.

Prior to listing by USFWS, CDFG mitigation requirements were as follows:

- **5:1 for scrub/chaparral impacts**
- **5:1 for habitat within 100 feet of chaparral and scrub habitat.**
- **1:1 for the habitat zone between 100 through 500 feet from scrub/chaparral.**

When the snake was listed under the Federal ESA mitigation took on a more stringent requirement in the sense that it was recognized in the data that habitat use extended beyond 500 feet from scrub/chaparral. The general rule of 3:1 has been applied to most projects SBI has been directly involved with in consultations, but USFWS has recommended higher ratios in some instances recently. The 3:1 ratio applied to blocks of habitat and application to non-scrub/chaparral habitats greater than 500 feet is optimal for conservation in some cases. However, it is not as optimal for the conservation of the small population (viable or not) in Knowland Park, because it does not provide incentive for the zoo to avoid the core habitat.

Based on current findings, it is unclear whether the project area or Knowland Park does or could support a viable long term population. The project area includes large areas of physically suitable core type habitat, but two years of trapping only resulted in a single capture of an adult male. When high quality core habitat is present and Alameda whipsnakes are detected they are usually relatively abundant and the dominant snake species. During the same time period using the same methodology in the 1998-1999 studies, six captures of Alameda whipsnakes were made during a survey conducted by Swaim Biological, Inc. at a site on the Walpert Ridge in the Hayward Hills (Swaim Biological 2000). Five of the whipsnake captures at the Hayward site were from scrub habitat and one was from grassland habitat. The Oakland Zoo survey actually had more traplines in the scrub than the Hayward Hills survey (21 traplines at Oakland versus 15 at the Hayward site). Trapping comparisons for the spring 2010 work at the zoo include surveys Swaim Biological conducted on East Bay Municipal Utility District Property north of Orinda, where three AWS were captured in the first three days of trapping at the site. AWS are not difficult to detect in core type habitat when a resident breeding population is present. They also do not appear to be “trap-shy” as evidenced by the recapture of the same AWS three times on the site in three different traplines.

The population viability in the project area may also be limited by the poor level of connectivity to other occupied or potentially occupied habitat. In 2003 and 2004, live trapping surveys were conducted for

the Alameda whipsnake at Anthony Chabot Regional Park for the EBRPD. These surveys produced negative results (Swaim Biological, Inc. 2003b, 2004). This survey was part of a larger research project investigating the effects of vegetation management practices on Alameda whipsnake. The study area was on the western edge of the park, the urban – wildland interface, adjacent to Skyline Blvd . The Chabot surveys were split into two seasonal trapping efforts to coincide with spring and fall peaks of Alameda whipsnake activity. The 2003 spring season ran from May 19th to August 1st, and the fall season spanned September 10th to October 11th. The 2004 spring season ran from May 12th to July 16th, and the fall season spanned September 10th to October 11th. Traps were active for 96 day (64 fin the spring and 32 in the fall) in 2003 and 91 days (60 days in the spring and 31 days in the fall) in 2004. A total of 27 vertebrate species were captured. Like the project site, the most commonly captured snake species was the western yellow-bellied racer. As described above, the high capture rate of this species (197 in 2003 and 52 in 2004) indicate that the traplines were functioning well. Chabot Regional Park appears to be the most contiguous undeveloped area adjacent to Knowland Park.

5.2 Veterinary Medical Hospital

The chances of an AWS encountering the construction area footprint of the Veterinary Medical Hospital is low and not expected because of the low number of AWS likely to inhabit the site. Several factors indicated the Veterinary Medical Hospital can be constructed without significantly impacting AWS habitat or taking of an individual AWS with implementation of avoidance and minimization measures. These include the small size of the grading limit and hospital footprint, the bare and/or highly disturbed nature of much of the Veterinary Medical Hospital project area, its location immediately adjacent to the zoo parking lot away from core type habitat, and the results of the trapping surveys which indicate an extremely low number of AWS in the entire project area.

6.0 CONCLUSIONS AND RECOMMENDATIONS

1. The capture of the Alameda whipsnake dictates that the project area is considered occupied by the Alameda whipsnake. We recommend that measures be included in the project to avoid, minimize, and mitigate for potential significant impacts to AWS and its habitat
2. Project modifications can reduce impacts to core habitat and potential habitat fragmentation. Following are suggested modifications:
 - (a) Amphitheater: Remove from the project;
 - (b) Interpretative Center: Moved 10 feet to the east and limit grading to within 10 feet of the edge of the building.
 - (c) Bison/Tule Elk Extension Exhibit: Limit number of animals housed in the exhibit to 20 bison and 20 Tule elk. Irrigate the pasture area and enhance the grassland through placement of rock outcrops, fallen logs or a combination of the two (existing and proposed areas);
 - (d) Perimeter Fence: Install a perimeter fence that is permeable to allow the passage of any AWS on the project site.
3. Potential impacts to AWS during construction shall be minimized by the clearing of construction areas prior to ground disturbing activities, the installation of exclusionary fencing around all construction areas, and the presence of a biological monitor on site during all work which could impact AWS habitat. Construction workers will be trained regarding the potential presence of AWS and how to respond to any wildlife encountered.
4. The project should mitigate at a final ratio or package through consultation with the USFWS and CDFG.
5. The project should set aside in a USFWS and CDFG approved permanent conservation easement an acreage approved by CDFG and USFWS in either an on-site area surrounding the project or off-site as determined in consultation with the Agencies.
6. The project should mitigate impacts to AWS habitat by conducting habitat enhancement in the Upper Knowland Park. The habitat enhancement should be focused on controlling and where feasible, eradicating highly invasive non-native species which continue to spread in the area and severely compromise existing habitat values. Target invasive species include: French broom, sweet fennel, blue gum eucalyptus, acacias, and other exotic plants. The enhancement efforts will include implementation of an effective Integrated Pest Management Plan (IPM) program. The IPM will include measures to remove the target species and to prevent resprouting or reestablishment of these species. Management measures may include hand pulling, cutting followed by topical application of appropriate herbicide, use of livestock and removal and burning of cut plant materials. Annual monitoring will be conducted. The enhancement efforts will also include the planting of native grassland, riparian and woodland species where native

cover types have been displaced by non-native species. The recommended area of enhancement is the area below Golf Links Road. This will ensure a contiguous block with Golf Links providing some level of a barrier to introduction of target species from the area above Golf Links back into the enhancement area.

7. Construction of the Veterinary Medical Hospital could be accomplished with no take of AWS or their habitat. Avoidance measures would include placement of exclusion fencing around the construction area prior to ground disturbance, removal of vegetation with a mower and monitoring during construction.

8. Incorporate specific educational exhibits/public education regarding conservation of California native wildlife, including the Alameda whipsnake and into the project. Exhibits could educate visitors on conservation ethics, such as decreasing the spread of non-native flora and fauna and using in-fill areas for development to keep open space in large blocks with the smallest urban edge possible to maintain species diversity and connectivity between native habitat areas.

If the above referenced mitigation measures are incorporated, the proposed project will not result in any significant impacts to AWS.

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APPENDIX A – WHIPSNAKE AND SITE PHOTOS

Photo montage of Alameda whipsnake #1
First capture date: 3 June 2010, Trapline 13



Dorsal view of entire snake.



Close up view of chin showing degree of black spotting.



Close up view of right side of head and neck.



Close up view of dorsolateral stripe.

Photo montage of capture locations of Alameda whipsnake #1



Chamise habitat near trapline 13 - Location of first capture: 3 June 2010



Trapline 12 - Location of second capture: 4 June 2010



Trapline 21 - Location of third capture: 27 June 2010



2007 Google Earth Image showing the distribution of large French broom stands



2009 Google Earth Image showing the results of removal efforts by the Oakland Zoo