APPENDIX D

BIOLOGICAL RESOURCES DOCUMENTS

USFWS Biological Assessment

BIOLOGICAL ASSESSMENT
U.S. FISH AND WILDLIFE SERVICE

REDDING RANCHERIA
FEE-TO-TRUST AND CASINO PROJECT

JULY 2018

NEPA LEAD AGENCY:

U.S. Department of the Interior
Bureau of Indian Affairs
Pacific Region Office
2800 Cottage Way # W2820
Sacramento, CA 95825

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PREPARED BY:

Analytical Environmental Services
1801 7th Street, Suite 100
Sacramento, CA 95811
(916) 447-3479
www.analyticalcorp.com

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BIOLOGICAL ASSESSMENT
REDDING RANCHERIA FEE-TO-TRUST AND CASINO PROJECT

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1.0 INTRODUCTION

The purpose of this Biological Assessment (BA) is to address the effects of the Redding Rancheria Tribe (Tribe) Fee-to-Trust and Casino Project (Proposed Project) on species listed as endangered or threatened under the Endangered Species Act (ESA). The Proposed Project is subject to federal discretionary approvals, including the acquisition of the 232-acre site adjacent to the southern border of the City of Redding, California (Strawberry Fields Site; Action Area) into federal trust status by the Bureau of Indian Affairs (BIA) for the purposes of gaming (Proposed Action).

An Environmental Impact Statement (EIS) has been prepared by the BIA pursuant to the National Environmental Policy Act (NEPA) to assess potential environmental effects of the Proposed Action. This BA serves as the environmental document for the determinations made by the EIS and corresponding conservation measures regarding federally listed species, and addresses the Proposed Action's compliance with Section 7 of the ESA. A separate BA/Essential Fish Habitat Assessment (EFHA) has been prepared for the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the ESA.

1.1 PURPOSE AND NEED

The purpose and need for the Proposed Action is to promote the economic development and self-sufficiency of the Tribe, consistent with the BIA's "Self Determination" policy.

The Tribe's current Rancheria consists of eleven parcels comprising approximately 11.41 acres, merely 37 percent of the original Rancheria that was established by the BIA. Not all of these parcels are held in trust. The Tribe's existing Win-River Resort and Casino is located within the Rancheria, approximately two miles from the Strawberry Fields Site. Expansion of the existing Win-River Resort and Casino within the current Rancheria is not desirable due to the lack of developable land and the presence of Clear Creek and the Anderson – Cottonwood Canal that limit physical expansion.

Implementation of the Proposed Action is needed to assist the Tribe in meeting the following objectives:

- Restore the land base of the Tribe;
- Ensure the Tribe's gaming operations remain competitive in the gaming market and meets the economic needs of the Tribe and its growing membership;
- Locate additional tribal services and housing on the existing Rancheria;
- Strengthen the socioeconomic status of Tribe; and
- Ensure that the Strawberry Fields Site, which is within the traditional territory of the Tribe, is adequately maintained and protected for future generations and that the Tribe has the ability to exercise its jurisdiction as a sovereign tribal government over the Strawberry Fields Site.

1.2 PROPOSED PROJECT COMPONENTS

The Proposed Project, identified as Alternative A in the EIS, includes the following components:

- Transfer of the approximately 232-acre Strawberry Fields Site to federal trust status (Proposed Action) for gaming purposes;
- Subsequent development of the trust property with uses including, but not limited to, a casino, 250-room hotel, conference and event centers, restaurants, retail facilities, parking, and other supporting facilities;
- Development of on-site infrastructure improvements needed to support the casino, including water, sewer, and stormwater infrastructure;
- Stabilization of the eastern bank of the Sacramento River along the northwestern property boundary using the windrow rock slope protection (RSP) method, which involves removal of existing stream bank material above the ordinary high water mark (OHWM) and placement of a row of appropriately-sized rock boulders over the existing alluvium up to at least the floodwater surface elevation of the river, after which the river-side and top-surface of the boulders will be covered with native alluvium and the top surface further covered with a minimum of 18 inches of native loam;
- Improvement of off-site access roads to access the site from either the north or the north and south; and
- Closure of the existing Win-River Casino and the redevelopment of the facility into tribal services and housing uses.

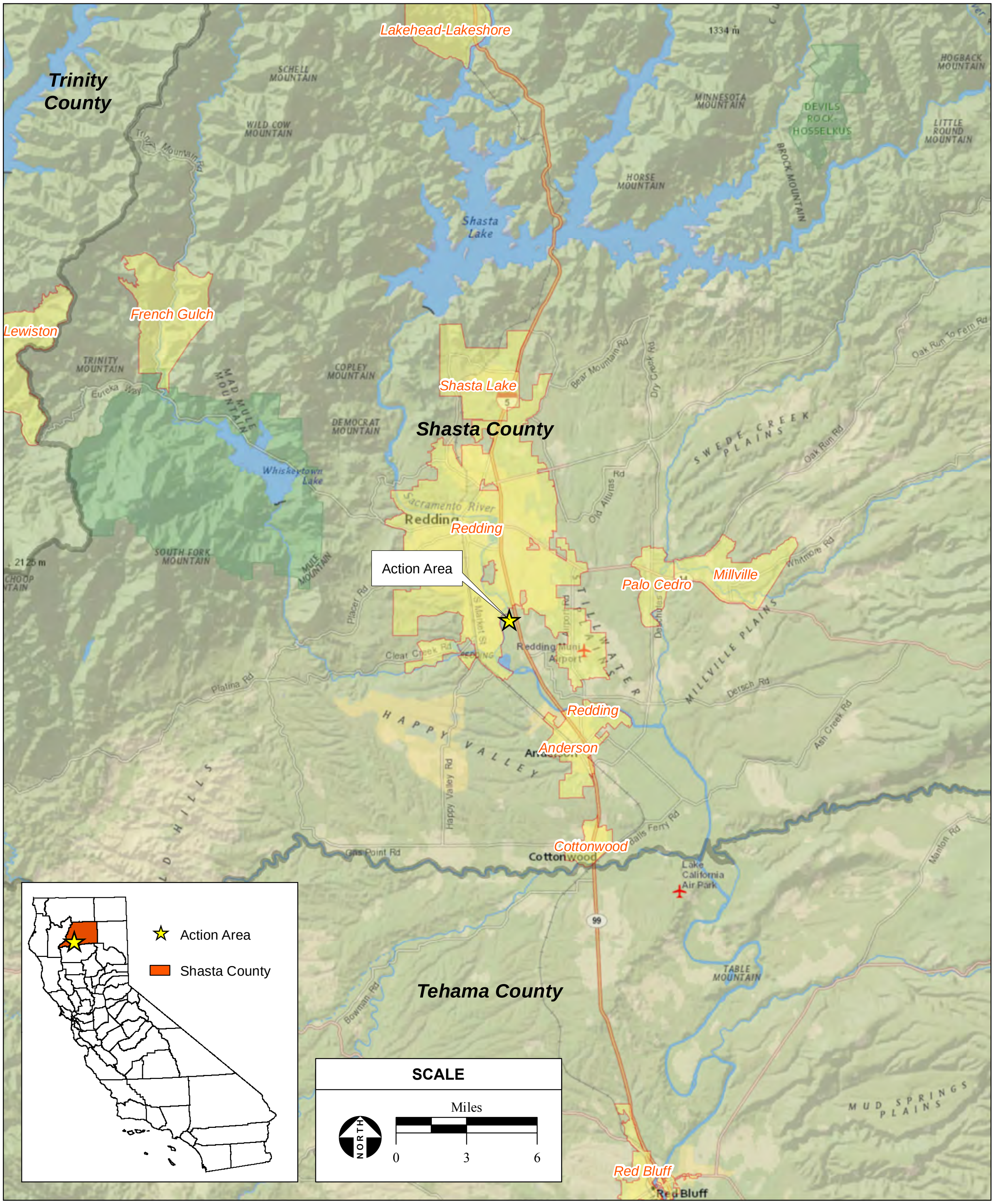
1.3 ACTION AREA

The Action Area is located within southern Shasta County (County), bordering the City of Redding (City) (**Figures 1** and **2**). The approximately 232-acre property is comprised of seven tax parcels and is bound by private property to the north, the Sacramento River to the west, Interstate 5 (I-5), a major north-south transportation corridor, to the east, and private property to the south, which is currently zoned for agricultural use. Elevation ranges from 440 to 454 feet above mean sea level. A site plan is shown in **Figure 3**.

2.0 METHODOLOGY

The following information was obtained and reviewed in support of the analysis contained in this BA:

- United States Fish and Wildlife Service (USFWS) Official Species List, dated July 26, 2017 of special-status species with the potential to occur on or be affected by projects on the Enterprise United States Geological Survey (USGS) 7.5-minute topographic quadrangle (quad; USFWS, 2017a) (**Attachment A**);
- California Native Plant Society (CNPS) query, dated July 26, 2017, of special-status plant species (California Rare Plant Rank [CRPR]) known to occur on the Enterprise USGS 7.5 minute topographic quad (CNPS, 2017; **Attachment A**);



SOURCE: NatGeo, 2017; AES, Date: 8/8/2017

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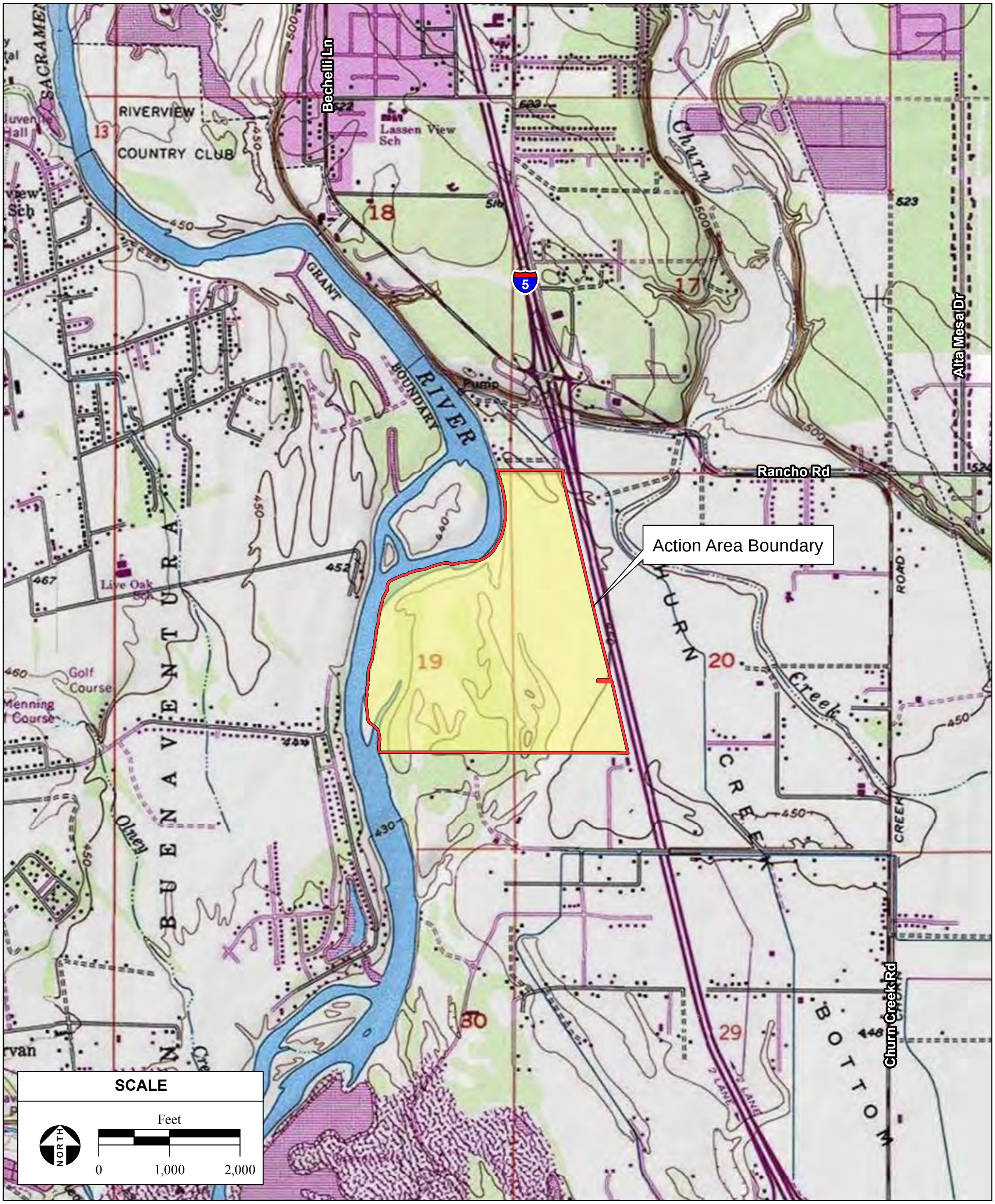
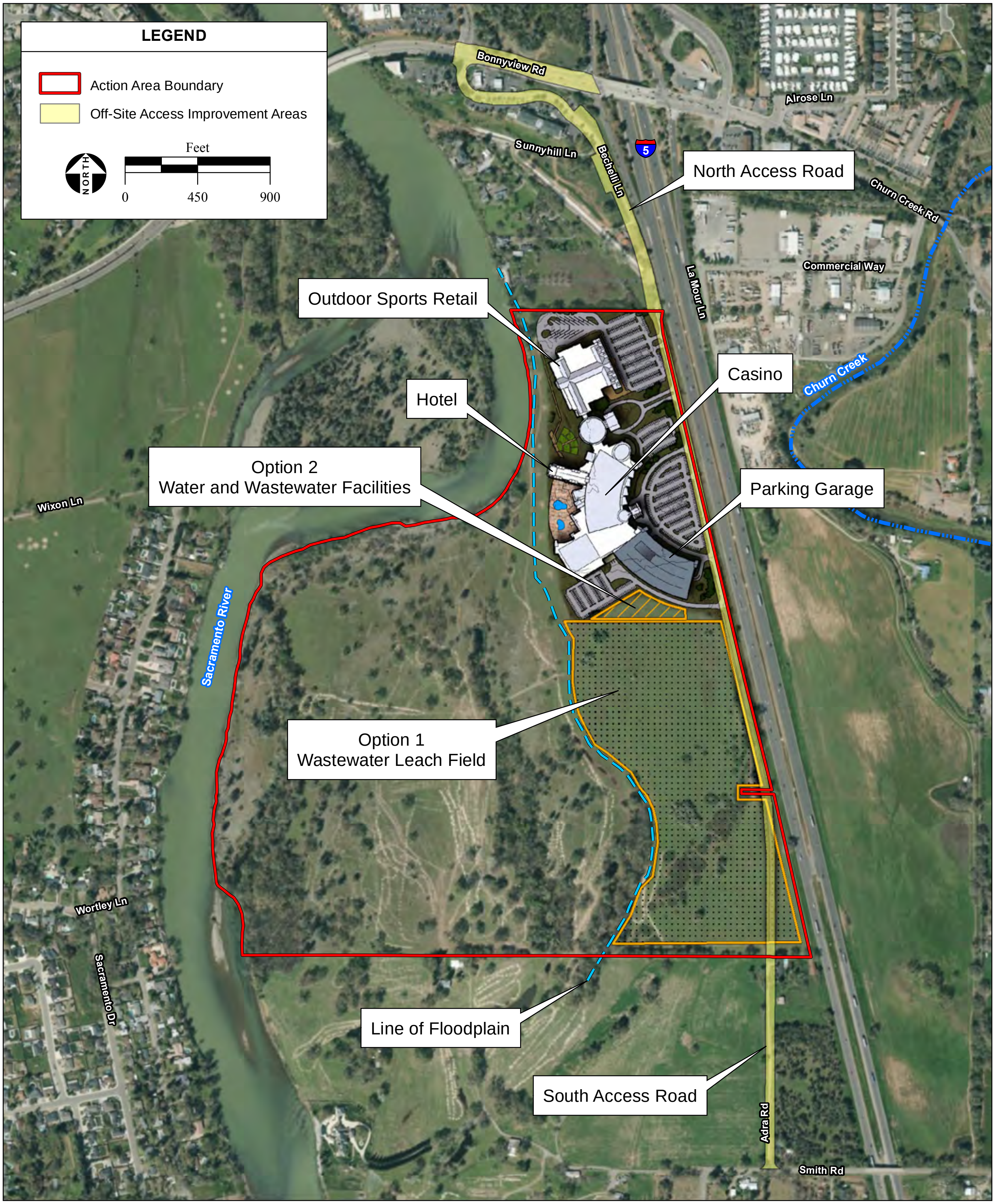
Figure 1
Regional Location



SOURCE: "Enterprise, CA" USGS 7.5 Minute Topographic Quadrangle, T31N, R4W, Section 18, 19, & 20, Mt. Diablo Baseline & Meridian; ESRI Data, 2016; AES, 8/8/2017

Figure 2
Site and Vicinity



SOURCE: USDA aerial photograph, 7/26/2014; ESRI Data, 2016; AES, 10/4/2017

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Figure 3
Site Plan

- California Natural Diversity Database (CNDDB) query, dated July 26, 2017, of special-status species known to occur on the Enterprise USGS 7.5 minute topographic quad (CDFW, 2017a; **Attachment A**);
- USFWS National Wetlands Inventory (NWI) map of wetland features on the Action Area (USFWS, 2017b);
- Jurisdictional wetland delineation of aquatic features on the Strawberry Fields Site by U.S. Army Corps of Engineers (USACE);USACE, 2017);
- A critical habitat map (USFWS, 2017c);
- Biological Resources Assessment on the Strawberry Fields Study Area by North State Resources, Inc. (NSR, 2007a; **Attachment B**); and
- Biological Resources Assessment on the Strawberry Fields Study Area for the California Red-Legged Frog (CRLF) by North State Resources, Inc. (NSR, 2007b; **Attachment C**).

2.1 BIOLOGICAL SURVEYS

Biological resource surveys and focused botanical surveys of the Action Area were conducted on April 25, 2007, May 3, 2007, May 9, 2007, June 27, 2007, May 16, 2016, and March 13, 2017. Surveys assessed habitat types, federally listed species, suitable habitat for federally listed species, and wetlands and Waters of the U.S. Species and habitat types were classified using the *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (CDFW, 2000), *Botanical Survey Guidelines of the California Native Plant Society* (CNPS, 2001), and *The Jepson Manual* (Baldwin, 2012). Protocol-level surveys for CRLF and Valley Elderberry Longhorn Beetle (VELB) were conducted (**Attachment B** and **Attachment C**) in accordance with the USFWS *Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (USFWS, 2005) and *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS, 1999).

2.2 ANALYSIS

An analysis to determine federally listed species that may have the potential to occur within the Action Area was conducted. Habitat requirements for each species were assessed and compared to the type and quality of habitats observed during surveys. Species with no potential to occur within the Action Area were ruled out based on lack of suitable habitat, elevation range, substrate/soils, and/or geographic distribution.

3.0 ENVIRONMENTAL SETTING

3.1 TOPOGRAPHY, CLIMATE, AND SOIL TYPES

The Action Area is located within the northern portion of the Sacramento Valley on relatively level terrain above the Sacramento River. The region has a high mean temperature of 96° F and a low mean temperature of 39° F, and the average annual rainfall is approximately 24 inches (Wunderground, 2016).

The Action Area is comprised of seven soil types: Churn loam, Churn gravelly loam, cobbly alluvial land, Reiff fine sandy loam, riverwash, Tehama loam, and Tujunga loamy sand.

3.2 HABITAT TYPES

Terrestrial Habitat Types

Five terrestrial habitats were identified within the Action Area (**Figure 4**): non-native annual grassland, valley foothill riparian, valley oak woodland, riverine, and foothill pine woodland. The majority of the Action Area is comprised of non-native annual grassland (approximately 74 percent). Terrestrial habitats are discussed below. Site photographs are included in **Figure 5**.

Non-native Annual Grassland

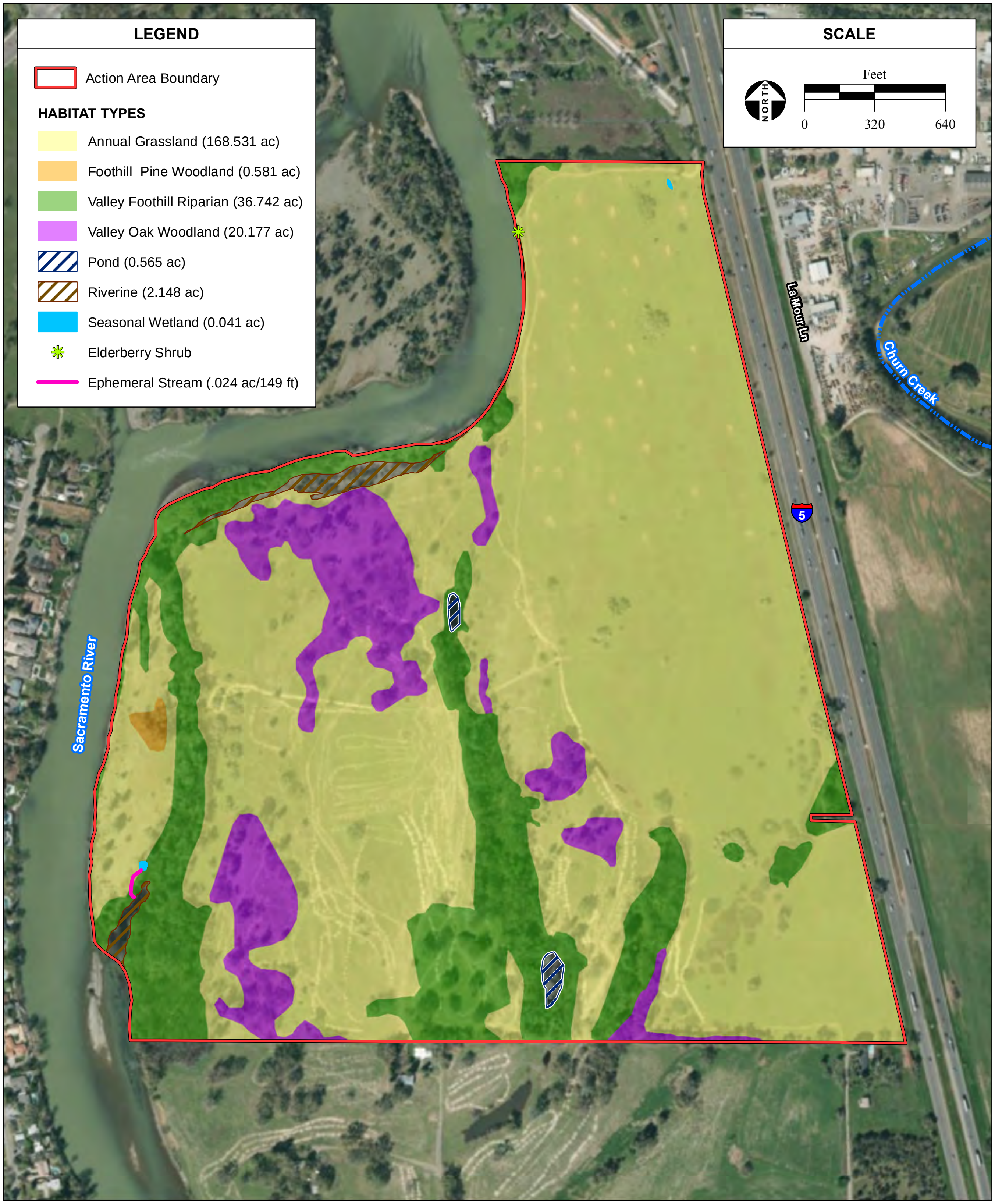
Non-native annual grassland is the dominant habitat type on the Action Area. The dominant grassland species include: European silver hairgrass (*Aira caryophyllea*), medusahead (*Taeniatherum caput-medusae*), yellow star-thistle (*Centaurea solstitialis*), soft chess (*Bromus hordeaceus*), Spanish lotus (*Lotus purshianus*), rattail fescue (*Vulpia myuros*), black mustard (*Brassica nigra*), ripgut brome (*Bromus diandrus*), and winter vetch (*Vicia villosa*). Native plants were observed only on the gravel bar and on the riverwash land type, and include showy milkweed (*Asclepias speciosa*), California brickellbush (*Brickellia californica*), yerba santa (*Eriodictyon californicum*), naked-stemmed buckwheat (*Eriogonum nudum*), Oregon false goldenaster (*Heterotheca oregona*), woolly-fruited lomatium (*Lomatium dasycarpum*), and silver bush lupine (*Lupinus albifrons*). Small stands of Himalayan blackberry (*Rubus armeniacus*) and narrowleaf willow (*Salix exigua*) are found scattered throughout this habitat.

Foothill Pine Woodland

The foothill pine woodland occurs in the western portion of the Action Area near the Sacramento River on an old adjacent gravel bar. This habitat is dominated by tall foothill pine (*Pinus sabiniana*), whiteleaf manzanita (*Arctostaphylos manzanita*), Himalayan blackberry, and poison oak (*Toxicodendron diversilobum*). The grass species that are present are similar to those found in the non-native annual grassland habitat and include California brickellbush, California poppy (*Eschscholzia californica*), ripgut brome, European silver hairgrass, naked-stemmed buckwheat, rattail fescue, soft chess, and yellow star-thistle.

Riverine

The riverine habitat on the Action Area contains a backwater of the Sacramento River and a portion of the floodplain habitat. The main channel of the Sacramento River runs adjacent to the Action Area. The river contains an ordinary high water mark (OHWM) throughout the year, but due to the seasonal scouring caused by changing water volume and velocity, most plant species are unable to establish. Approximately 325 linear feet of backwater and approximately 950 linear feet of floodplain habitat from the Sacramento River occur on the site. The backwater provides suitable juvenile rearing habitat for



SOURCE: USDA aerial photograph, 7/26/2014; ESRI Data, 2016; AES, 8/30/2017

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Figure 4
Habitat Types

PHOTO 1: Taken in the northwestern part of the Strawberry Fields Site, looking east.

PHOTO 2: On-site riverine habitat, looking east.

PHOTO 3: Taken in the southwestern part of the Strawberry Fields Site, looking east.

PHOTO 4: Taken in the central part of the Strawberry Fields Site, looking north.

PHOTO 5: Taken in the southwestern part of the Strawberry Fields Site, looking north.

SOURCE: AES, 8/30/2017

Figure 5
Site Photographs

various aquatic species, however, does not generally contain the primary constituent elements associated with other life stage usages (i.e. no spawning flows or gravels). The floodplain habitat is a depositional area (i.e. gravel bar) on the outside of a bend in the river that inundates during periods of high water.

Valley Foothill Riparian

Valley foothill riparian habitat is present primarily in the southern and western portions of the Action Area. Dominant vegetation include black locust (*Robinia pseudoacacia*), California black walnut (*Juglans californica*), Fremont cottonwood (*Populus fremontii*), tree-of-heaven (*Ailanthus altissima*), and valley oak (*Quercus lobata*). The vegetative understory is dominated by arroyo willow (*Salix lasiolepis*), blue elderberry (*Sambucus cerulea*), California wild grape (*Vitis californica*), California coffeeberry (*Frangula californica*), Himalayan blackberry, narrowleaf willow (*Salix exigua*), and oleander (*Nerium oleander*). The presence of grass species is low but includes California pipevine (*Aristolochia californica*), goose grass (*Galium aparine*), California mugwort (*Artemisia douglasiana*), and Santa Barbara sedge (*Carex barbarae*).

Valley Oak Woodland

Valley oak woodland is found throughout the central portions of the Action Area and is dominated by valley oak. Other tree species occurring in this plant community include Oregon ash (*Fraxinus latifolia*), foothill pine, and interior live oak (*Quercus wislizeni*). Shrub species are not common in this habitat type; however, several were identified, including California coffeeberry, Himalayan blackberry, blue elderberry, and poison oak. Grassland species identified include black mustard, California poppy, European silver hairgrass, slender oat (*Avena barbata*), rattail fescue, ripgut brome, soft chess, and yellow star-thistle.

Aquatic Habitat Types

Three aquatic habitats were identified within the Action Area (**Figure 4**): seasonal wetlands; ephemeral stream; and ponds.

Seasonal Wetlands

Two seasonal wetlands (totaling approximately 0.041 acres) were identified in the Action Area. The wetland located in the northeast corner of the site exhibits indicators of wetland hydrology (sediment deposits), hydric soils (uncommon redoximorphic concentrations), and is dominated by several types of hydrophytes including hairy purslane speedwell (*Veronica peregrina*), smooth horsetail (*Equisetum laevigatum*), and bermuda grass (*Cynodon dactylon*). The second wetland is located in the southwest portion of the site and exhibits similar indicators, and is connected directly to the Sacramento River by an ephemeral stream.

Ephemeral Stream

An ephemeral stream was identified within the Action Area (approximately 149 linear feet), and intermittently conveys water from the Sacramento River to the second seasonal wetland during high flow events. Ephemeral streams generally contain water only during high flows, flooding, or extreme rain events, and seasonally dry out. The ephemeral stream does not connect to the Sacramento River year round and does not contain fish-rearing habitat during years of average or below average rainfall.

Ponds

Two open water ponds (totaling approximately 0.57 acres) were identified in the Action Area, and are located in the valley foothill riparian habitat in the south central parts of the site. Both contain standing water and various hydrophilic/aquatic vegetation species.

3.3 WETLANDS AND WATERS OF THE U.S.

A jurisdictional delineation of the aquatic features within the Action Area was conducted on June 15, 16, and 21, in 2006, and was re-verified and updated on December 16, 2016 and March 13, 2017. The delineation methodology included field observations and identifying positive indicators of hydrophytic vegetation, hydrology, and soils, as outlined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987). Other potential Waters of the U.S. were determined based on the presence of an OHWM and/or the qualification of the feature as a tributary to Waters of the U.S. A preliminary jurisdictional determination was issued by USACE on March 20, 2017, and included the aquatic features and riverine habitat types shown in **Figure 4** (USACE, 2017).

3.4 CRITICAL HABITAT

Designated critical habitat for steelhead (Northern California Distinct Population Segment [DPS]), Chinook salmon (Central Valley Spring-Run and Winter-Run), and Green sturgeon (Southern DPS) occurs in the Sacramento River adjacent to the Action Area, and in the riverine habitat on-site (USFWS, 2017c; NOAA, 2005; NMFS, 2004; NMFS, 2015). The backwater of the riverine habitat provides seasonal habitat for juvenile rearing but does not contain the elements necessary for other life-stage uses. Similarly, the floodplain of the riverine habitat would be inundated only during periods of high water flow. The lateral extent of the critical habitat is defined by the OHWM or, in areas where the OHWM cannot be defined, the lateral extent is defined by the bankfull elevation (33 CFR 329.11). A separate BA/EFHA has been prepared for NMFS pursuant to Section 7 of the ESA.

3.5 OBSERVED WILDLIFE

Wildlife species observed on the Action Area during surveys include the black tailed jack rabbit (*Lepus californicus*), mule deer (*Odocoileus hemionus),* western grey squirrel (*Sciurus griseus*), red-tailed hawk (*Buteo jamaicensis*), western scrub jay (*Aphelocoma californica*), killdeer (*Charadrius vociferus*), great blue heron (*Ardea herodias*), American crow (*Corvus brachyrhynchos*), Canada goose (*Branta* *canadensis*), Brewer's blackbird (*Euphagus cyanocephalus*), and western meadowlark (*Sturnella neglecta*). Bald eagles (*Haliaeetus leucocephalus*) were observed foraging on the site, but not nesting.

3.6 FEDERALLY LISTED SPECIES

Based on biological desktop review and survey results, the following federally listed wildlife species have the potential to occur within the Action Area: valley elderberry longhorn beetle (*Desmocerus californicus dimorphus;* VELB), and California red-legged frog (*Rana draytonii;* CRLF) (USFWS, 2017a; CDFW, 2017a). No suitable habitat for federally listed plants was observed within the Action Area (USFWS, 2017a; CNPS, 2017; CDFW, 2017a).

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*; VELB)

FEDERAL STATUS – THREATENED
STATE STATUS – NONE

The USFWS formally designated the VELB as threatened in 1980. VELB are completely dependent on the elderberry (*Sambucus* spp.) as a host plant, and are found throughout California's Central Valley (USFWS, 2006). Typical VELB habitat consists of riparian forests with an understory of elderberry shrubs (USFWS, 1999). The USFWS considers elderberry shrubs with a basal stem diameter larger than 1-inch as suitable VELB habitat (USFWS, 1999).

Female VELB lay eggs in the crevices of elderberry bark. Upon hatching, larvae tunnel into elderberry stems and feed. Larvae remain within the soft pith of the elderberry plant and feed for 1 to 2 years. Adults emerge from pupation during spring as the elderberry begins to flower. Adult VELB feed on the elderberry foliage until breeding occurs.

A VELB protocol-level survey in 2007 recorded 13 elderberry shrubs with VELB exit holes (**Attachment B**). All elderberry shrubs with exit holes indentified during the 2007 survey were located within valley foothill riparian and valley oak woodland habitats, which occur primarily in the areas along the Sacramento River and in the southern portion of the Action Area. However, during the 2016 and 2017 surveys, only one elderberry shrub was observed within the Action Area; the previously recorded shrubs could not be located. The shrubs identified in 2007 may have been eradicated due to recent drought conditions or on-going cattle grazing. The singular elderberry shrub identified during the recent 2016-2017 surveys is located in the northwestern portion of the site along the Sacramento River, and does not contain indicators of VELB presence (**Figure 4**).

California Red-Legged Frog (*Rana draytonii*; CRLF)

FEDERAL STATUS – THREATENED

STATE STATUS – SPECIES OF SPECIAL CONCERN

The USFWS formally designated the CRLF as threatened in 1996. The historic range of CRLF extended from the coast of Marin County to the inland area of Redding, Shasta County, southward to northwestern Baja California, Mexico. CRLF requires aquatic breeding areas embedded within a matrix of riparian and upland dispersal habitats. All life history stages are most likely to be encountered in and around coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, ponded and backwater portions of streams, and artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds.

The breeding period for CRLF is from November to March and the species requires 11 to 30 weeks of permanent water for larval development (USFWS, 2011). Juveniles can occur in slow moving, shallow riffle zones in creeks or along the margins of ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation (Zeiner et al., 1989). During periods of wet weather, some individuals make nightly overland excursions through upland habitats. CRLF may move up to one mile throughout a wet season (USFWS, 2011). Summer habitat for CRLF include spaces under boulders or rocks and organic debris, such as downed trees or logs; industrial debris; and agricultural features such as drains, watering troughs, abandoned sheds, or hay-ricks (USFWS, 2011).

CRLF occurrence is predominately determined by the presence of perennial or near perennial water, and a lack of aquatic predators. Aquatic predators to CRLF include bullfrogs (*Rana catesbeiana*), crayfish (*Pacifastacus leniusculus* and *Procambarus clarkii*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), and other larger fish species that hunt frogs or larvae. CRLF will also utilize small mammal burrows in or under vegetation, willow root wads, and the undersides debris within the riparian zone (Jennings, 1994).

Potential CRLF upland habitats on site consist of valley oak woodland, valley foothill riparian, foothill pine woodland, and non-native annual grassland. Potential CRLF breeding habitats within the Action Area consist of the two pond features and the riverine area of the Sacramento River. A protocol-level survey identified bullfrogs in the pond features, and did not detect CRLF on-site (**Attachment C**). The riverine habitat lacks permanent water year-round, and contains fish during times of high water. Additionally, CNDDB records indicate the nearest known occurrence of CRLF to be approximately 33 miles south southwest of the project site (CDFW, 2017b).

4.0 EFFECTS OF THE ACTION

4.1 CRITICAL HABITAT

Designated critical habitat for steelhead (Northern California DPS), Chinook salmon (Central Valley Spring-Run and Winter-Run), and green sturgeon (Southern DPS) occurs in the Sacramento River adjacent to the Action Area, and in the riverine habitat on site (USFWS, 2017c; NOAA, 2005). The section of riverine habitat may provide seasonal habitat for juvenile rearing but does not contain the elements necessary for other life-stage uses. Designated critical habitat does not occur within the area of impact. In accordance with federal and United States Environmental Protection Agency (USEPA) requirements, the Tribe would obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Construction Permit, which would require the implementation of a Stormwater Pollution Prevention Plan (SWPPP) and Best Management Practices (BMPs) to prevent contaminated run-off from entering the Sacramento River. Additionally, the stormwater plan for Alternative A includes Low Impact Development (LID) features that would filter pollutants from stormwater run-off during operation of the project. Impacts to surface water quality are discussed in more detail in the separate BA/EFHA prepared for NMFS. As stated therein, with the implementation of LID measures incorporated into the project design, impacts to water quality in the Sacramento River would be less than significant. Thus, the Proposed Action will have no effect on critical habitat.

4.2 FEDERALLY LISTED SPECIES

No suitable habitat for federally listed plant species occurs within the Action Area. Two federally listed wildlife species have the potential to occur within the Action Area: VELB and CRLF. Potential effects to VELB and CRLF are discussed below.

Valley Elderberry Longhorn Beetle

Effects

During the 2016 and 2017 biological surveys, only one elderberry shrub was observed within the Action Area. The single elderberry shrub was located in the northwestern portion of the site along the Sacramento River, approximately 100 feet from the development footprint (**Figure 3**), but did not contain indicators of VELB presence at the time of survey (**Figure 4**). Although unlikely, if VELB were to be present at the time of construction of the Proposed Project or implementation of the bank stabilization measures, construction-related activities have the potential to cause VELB mortality. Potential adverse effects to VELB and its host plant would be avoided or minimized to less-than-significant levels with implementation of the conservation measures identified below. With the implementation of the conservation measures, the Proposed Action may affect but is not likely to adversely affect VELB.

Conservation Measures

The following conservation measures, consistent with USFWS Framework (USFWS, 2017d), will be implemented prior to commencement of construction activities occurring within 50 meters (164 feet) of VELB or the elderberry shrub:

A. The elderberry shrub located on the northwest portion of the Strawberry Fields Site along the Sacramento River shall be fenced or flagged for avoidance. Construction activities potentially impacting the shrub (e.g., trenching) shall apply a buffer of at least 6 meters (20 feet) from the drip-line. To the degree feasible, activities occurring within 50 meters (164 feet) of an elderberry shrub shall be limited to the season when VELB are not active (August to February).

B. Should mechanical weed removal occur within the drip-line of the elderberry shrub, it shall be limited to the season when adults are not active (August to February) and shall avoid damaging the elderberry.

C. Construction staging areas shall be located a minimum of 30 feet away from the elderberry shrub. Temporary stockpiling of excavated or imported material shall occur in approved construction staging areas. Excess excavated soil shall be used onsite or disposed of at a regional landfill or other appropriate facility.

D. A qualified biologist shall provide training for construction personnel. Training shall include the status of the VELB, its host plant and habitat, the need to avoid damaging the elderberry shrub, and the possible penalties for noncompliance.

E. Herbicides shall not be used within the drip-line of the shrub. Insecticides shall not be used within 30 meters (98 feet) of the elderberry shrub. Chemicals shall be applied using a backpack sprayer or similar direct application method.

F. A qualified biologist shall monitor the work area at project-appropriate intervals to assure avoidance and conservation measures are being implemented. The amount and duration of monitoring depend on project-specifics and shall be discussed with USFWS.

G. Should removal of the elderberry shrub be necessary as part of the bank stabilization measures, the shrub will be relocated following USFWS protocols (USFWS, 1999) to suitable riparian habitat approximately 1,800 feet southwest of its original location, as approved by USFWS. Additionally, two credits will be purchased from a USFWS-approved conservation bank. After relocation, monitoring and annual reporting will occur for five years. Additional mitigation may be required pursuant to consultation with USFWS.

California Red-Legged Frog

Effects

A protocol-level survey did not detect CRLF or indicators of CRLF within the Action Area (**Attachment C**). Poor to marginal breeding habitat was observed in the pond features and riverine habitat, and poor to marginal upland habitat was observed in the wetland areas and terrestrial habitats. Permanent water and emergent vegetation was absent from the riverine habitat for egg-laying, and the pond features contained bullfrogs; known predators of CRLF. CRLF are not commonly found in habitats containing bullfrogs. Additionally, the Action Area is located within the northernmost extent of the historic range of CRLF but is outside the current known range. The nearest recorded CNDDB occurrence of CRLF is approximately

33 miles southwest (CDFW, 2017b). The potential for CRLF occurrence within the Action Area is very low.

Although unlikely, if CRLF were to be present in the area of impact at the time of construction of the Proposed Project, construction-related activities have the potential to cause CRLF mortality. Potential adverse effects to CRLF would be avoided or minimized to less-than-significant levels with implementation of the conservation measures identified below. With the implementation of the conservation measures, the Proposed Action may affect but is not likely to adversely affect CRLF.

Conservation Measures

A. A qualified biologist shall conduct a preconstruction habitat assessment survey for CRLF following Appendix D of USFWS (2005) *Revised Guidance of Site Assessments and Field Surveys for the California Red-legged Frog*. The survey shall be conducted no less than 14 days and no more than 30 days prior to the beginning of ground disturbance, construction activities, and/or project activities likely to impact the CRLF. The survey will be conducted in areas of potential CRLF habitat on and within 200 feet of the Action Area. If CRLF is detected within or immediately adjacent to the Action Area, the USFWS shall be contacted immediately to determine the best course of action.

B. Should CRLF be identified during surveys, additional silt fencing shall be installed after surveys have been completed to further protect this species from construction impacts. The fencing shall remain in place until construction activities cease. If identified on-site, USFWS shall be contacted for additional consultation.

C. Prior to the start of construction, the Tribe shall retain a qualified biologist to conduct an informational meeting to educate all construction staff on the CRLF. This training will include a description of the CRLF and its habitat needs; an explanation of the status of the species and its protection under the ESA; and a list of the measures being taken to reduce effects to the species during project construction and implementation. The training will include a handout containing training information. The project manager will use this handout to train additional construction personnel that were not in attendance at the first meeting, prior to starting work on the project.

4.3 INTERRELATED AND INTERDEPENDENT EFFECTS

Interrelated and interdependent effects are direct or indirect effects that occur as a result of activities that are closely affiliated with a project in areas outside proposed project area. Such actions include road or utility improvements off-site that would not be constructed but for implementation of the Proposed Project. Only those activities that would not require a separate federal action and would otherwise not be addressed for compliance with Section 7 of the ESA will be addressed in this BA.

Off-site Traffic Mitigation Improvements

Implementation of the Proposed Project would require construction of off-site traffic mitigation improvements. A detailed description of off-site traffic mitigation for each alternative is provided in Section 5.8 of the EIS. Off-site traffic mitigation improvements are conceptual at this time. Design and construction plans would be prepared after an alternative has been selected for development.

Traffic mitigation improvements are recommended at the following study intersections:

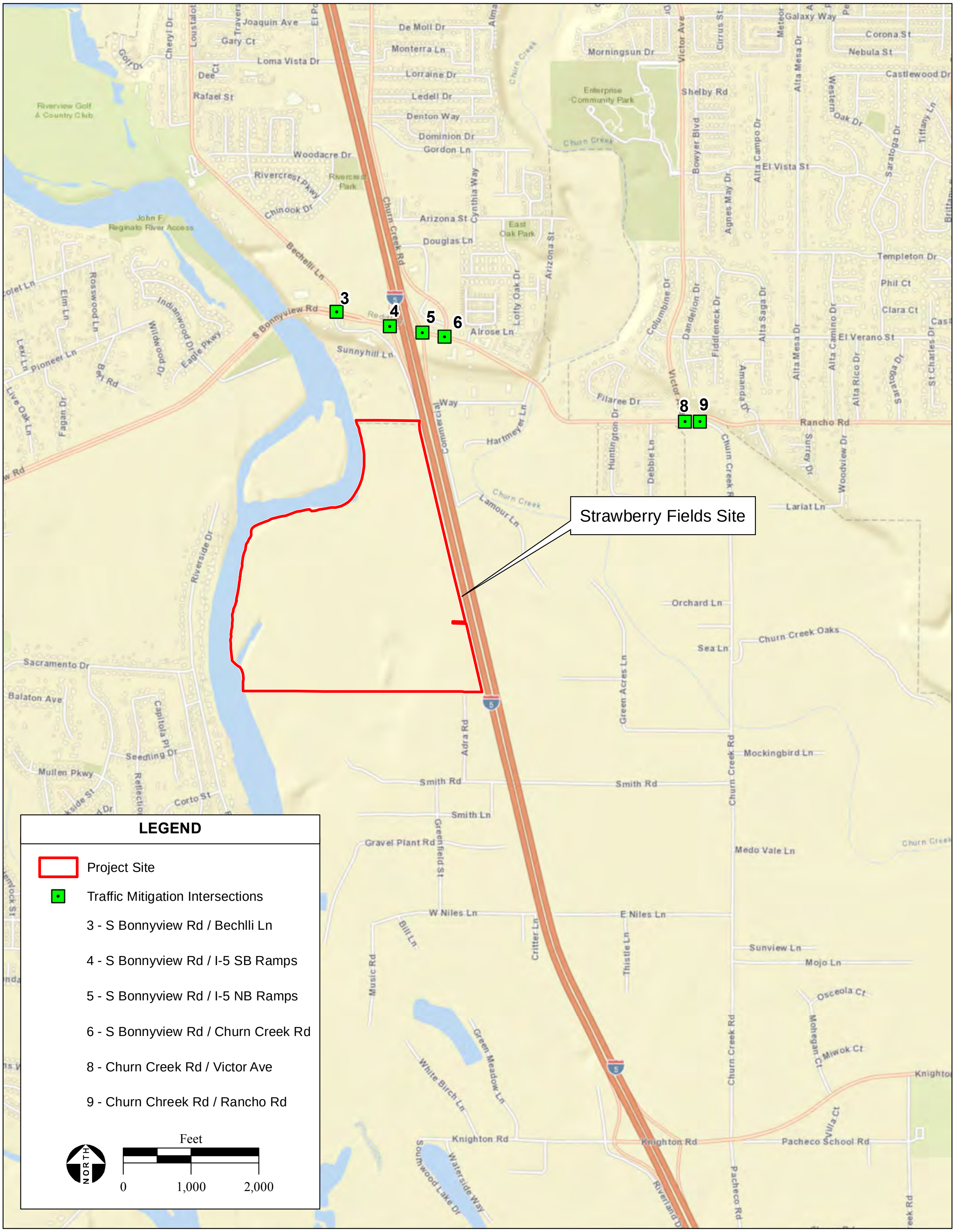
- South Bonnyview Road / Bechelli Lane (Intersection 3);
- South Bonnyview Road / Interstate 5 (I-5) Southbound (SB) Ramps (Intersection 4);
- South Bonnyview Road / I-5 Northbound (NB) Ramps (Intersection 5);
- South Bonnyview Road / Churn Creek Road (Intersection 6);
- Churn Creek Road / Victor Avenue (Intersection 8); and
- Churn Creek Road / Rancho Road (Intersection 9).

Off-site traffic mitigation would require obtaining approvals and permits from the City of Redding, Caltrans, and/or Shasta County, and may be subject to CEQA, which requires additional environmental review prior to approval. Implementation of permitting and CEQA requirements would further reduce the potential for significant adverse impacts from off-site construction projects.

Surveys of the potentially affected areas for the proposed traffic mitigation, with the exception of the South Bonnyview Road / Churn Creek Road intersection, were conducted by AES biologist Nicholas Bonzey. These surveys were conducted on foot. Intersections 3, 4, 5, 6, 8 and 9 (South Bonnyview Road / Bechelli Lane, South Bonnyview Road / I-5 SB Ramps, South Bonnyview Road / I-5 NB Ramps, South Bonnyview Road / Churn Creek Road, Churn Creek Road / Victor Avenue and Churn Creek Road / Rancho Road) are currently paved and developed with predominately fenced ruderal/disturbed shoulders and/or roadsides on one or both sides of the road (for intersection numbers and locations, refer to **Figure 6**). Ruderal/disturbed areas contain sparse vegetation consisting predominately of non-native grass species, and the areas are heavily disturbed by vehicle traffic. No federally listed plant or animal species have the potential to occur within the off-site traffic improvements. Construction of off-site traffic improvements would result in no effect to federally listed species.

Off-site Utility/Infrastructure Improvements

Off-site utility connections are an optional project component and involve tying the Action Area into the City of Redding's water and wastewater system with new pipeline connections. Connecting to the municipal water supply infrastructure would require the construction of approximately 777 linear feet of pipeline from the site to an existing water main at the intersection of Bechelli Lane and the driveway leading west to 5170 Bechelli Lane. Connection to the existing wastewater treatment system would require 702 linear feet of sewer force main pipeline between an on-site lift station and the existing



SOURCE: ESRI WorldStreetmap, 2017; AES, 7/18/2018

Redding Rancheria Fee-to-Trust USFWS BA / 214584 ■

Figure 6
Traffic Mitigation Locations

Sunnyhill Lift Station, located at 5100 Bechelli Lane (see **Figure 7**). The Proposed Project would also require utility service connections with Redding Electric Utility (REU) for electricity and PG&E for natural gas service. The electrical connection would be made with existing overhead REU electrical lines that run along the northern boundary of the Strawberry Fields Site. A PG&E main natural gas line exists approximately 1,100 feet north of the Strawberry Fields Site at the southern edge of the Hilton Garden Inn parking lot.

Construction of pipeline connections and underground electricity transmission upgrades would require grading, excavation, trenching, laying of pipe, and the placement of backfill material to construct the connection to existing water, wastewater, electricity, and natural gas utilities. The proposed utility improvements would extend through non-native annual grassland, dominated by ruderal species. Although unlikely, if CRLF were to be present in the area of impact at the time of construction of the Proposed Project, construction-related activities have the potential to cause CRLF mortality. Potential adverse effects to CRLF would be avoided or minimized to less-than-significant levels with implementation of the conservation measures identified above. Additionally, utilities would be installed underground and construction areas would be restored to pre-project conditions, thus there would be no permanent habitat conversion and potential impacts to biological resources would be limited to disturbance from short-term construction. Construction of proposed utility improvements is not likely to adversely affect federally listed species.

5.0 CONCLUSIONS

Construction activities associated with the Proposed Action will have **no effect** on critical habitat. With compliance with the conservation measures outlined in this BA, construction activities associated with the Proposed Action **may affect but are not likely to adversely affect** VELB and CRLF and associated habitats.

SOURCE: City of Redding 2016 SRTA Imagery, 3/2016; Coleman Engineering Feasability Study, 7/14/17; AES, 10/6/2017

Figure 7
Off-site Water Supply and
Wastewater Treatment and Disposal Improvements

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ATTACHMENTS

ATTACHMENT A

USFWS, CDFW, CNPS OFFICIAL SPECIES LISTS

USFWS IPaC Resource List

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: July 18, 2018
Consultation Code: 08ESMF00-2017-SLI-2734
Event Code: 08ESMF00-2018-E-07999
Project Name: Redding

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2017-SLI-2734

Event Code: 08ESMF00-2018-E-07999

Project Name: Redding

Project Type: ** OTHER **

Project Description: Tribal fee-to-trust

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.52930951202774N122.3594509873035W

Counties: Shasta, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Slender Orcutt Grass *Orcuttia tenuis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1063	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CDFW CNDDB SPECIES LIST

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Enterprise (4012253))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Candidate Endangered	G2G3	S1S2	SSC
Agrostis hendersonii Henderson's bent grass	PMPOA040K0	None	None	G2Q	S2	3.2
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S3	
Cryptantha crinita silky cryptantha	PDBOR0A0Q0	None	None	G2	S2	1B.2
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Great Valley Cottonwood Riparian Forest Great Valley Cottonwood Riparian Forest	CTT61410CA	None	None	G2	S2.1	
Great Valley Valley Oak Riparian Forest Great Valley Valley Oak Riparian Forest	CTT61430CA	None	None	G1	S1.1	
Great Valley Willow Scrub Great Valley Willow Scrub	CTT63410CA	None	None	G3	S3.2	
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S3	FP
Juncus leiospermus var. leiospermus Red Bluff dwarf rush	PMJUN011L2	None	None	G2T2	S2	1B.1
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lathyrus sulphureus var. argillaceus dubious pea	PDFAB25101	None	None	G5T1T2	S1S2	3
Legenere limosa legenere	PDCAM0C010	None	None	G2	S2	1B.1
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G4	S3S4	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Oncorhynchus tshawytscha pop. 6 chinook salmon - Central Valley spring-run ESU	AFCHA0205A	Threatened	Threatened	G5	S1	
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	AFCHA0205B	Endangered	Endangered	G5	S1	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Orcuttia tenuis slender Orcutt grass	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
Rana boylii foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Spea hammondii western spadefoot	AAABF02020	None	None	G3	S3	SSC
Trilobopsis roperi Shasta chaparral	IMGASA2030	None	None	G1	S1	

Record Count: 25

CNPS Plant List

CNPS California Native Plant Society

Plant List

Inventory of Rare and Endangered Plants

6 matches found. *Click on scientific name for details*

Search Criteria

Found in Quad 4012253

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Blooming Period	CA Rare Plant Rank	State Listing Status	Federal Listing Status
Agrostis hendersonii	Henderson's bent grass	Apr-Jun	3.2		
Cryptantha crinita	silky cryptantha	Apr-May	1B.2		
Juncus leiospermus var. leiospermus	Red Bluff dwarf rush	Mar-Jun	1B.1		
Legenere limosa	legenere	Apr-Jun	1B.1		
Orcuttia tenuis	slender Orcutt grass	May-Sep(Oct)	1B.1	CE	FT
Sidalcea celata	Redding checkerbloom	Apr-Aug	3		

Suggested Citation

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 18 July 2018].

Search the Inventory

Simple Search

Advanced Search

Glossary

Information

About the Inventory

About the Rare Plant Program

CNPS Home Page

About CNPS

Join CNPS

Contributors

The Calflora Database

The California Lichen Society

California Natural Diversity Database

The Jepson Flora Project

The Consortium of California Herbaria

CalPhotos

Questions and Comments

rareplants@cnps.org

ATTACHMENT B

NSR BIOLOGICAL RESOURCES ASSESSMENT OF THE STRAWBERRY FIELDS STUDY AREA

STRAWBERRY FIELDS STUDY AREA

Biological Resources Assessment

November 7, 2007

Prepared for:
Redding Rancheria Tribe

Prepared by:
North State Resources, Inc.

NSR No. 50780

North State Resources, Inc.

STRAWBERRY FIELDS STUDY AREA

Biological Resources Assessment

November 7, 2007

Prepared for:
Redding Rancheria Tribe
Attn: Mr. Neal Malmsten
2000 Redding Rancheria Road
Redding, CA 96001

Prepared by:
North State Resources, Inc.
500 Orient Street, Suite 150
Chico, CA 95928
(530) 345-4552
(530) 345-4805 *fax*

NSR No. 50780

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Strawberry Fields Study Area: Biological Resources Assessment

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APPENDICES

Strawberry Fields Study Area
Biological Resources Assessment

1. INTRODUCTION

On behalf of the Redding Rancheria Tribe, North State Resources, Inc. (NSR) conducted a biological resources assessment of the approximately 225.86-acre Strawberry Fields Study Area, hereinafter referred to as the "study area." The purpose of this assessment is to document the biological resources in the vicinity of the study area, including a general description of the terrestrial and aquatic habitats and identification of potentially occurring special-status plant and wildlife species. The results of plant and wildlife surveys within the study area are included in this biological resources assessment.

1.1 Study Area Location

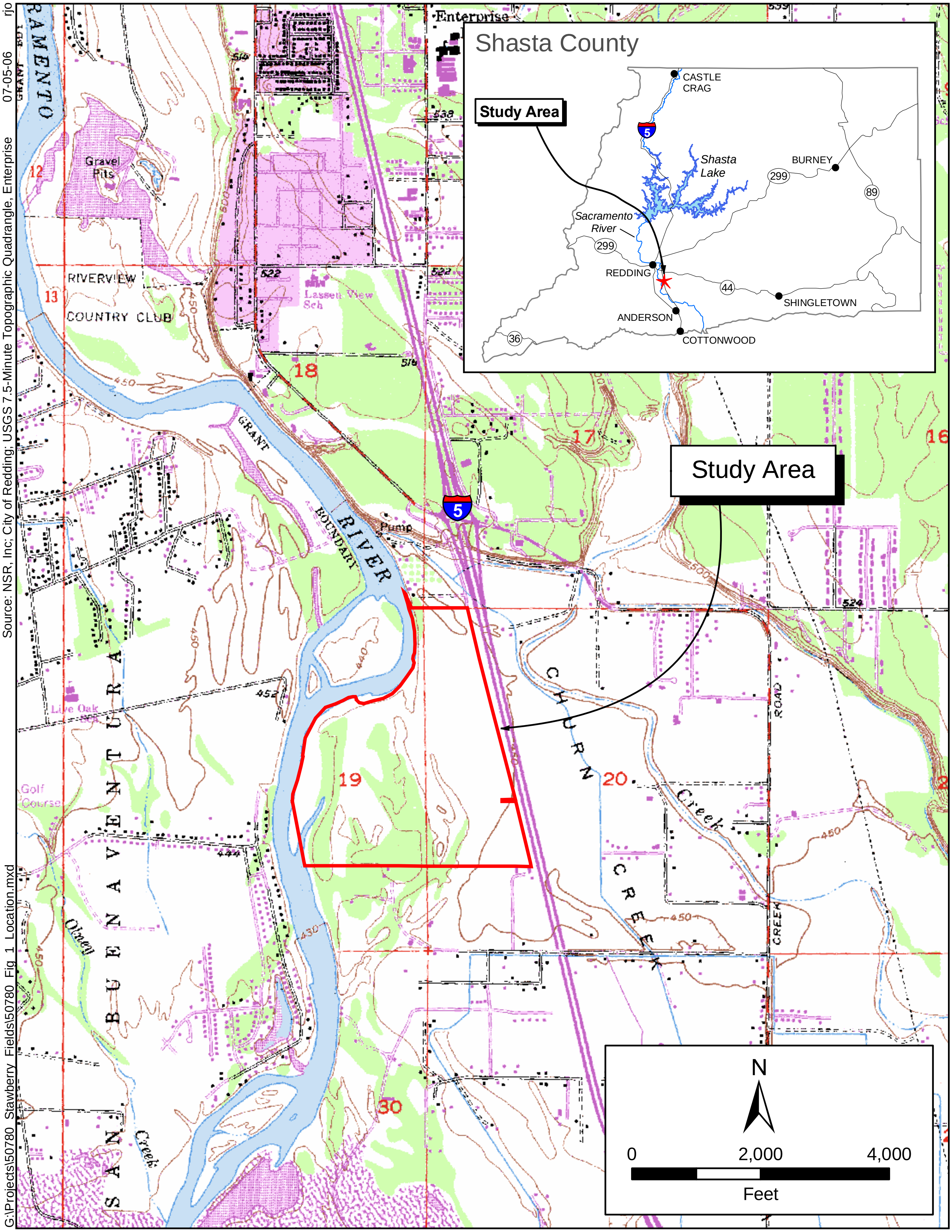
The study area is located south of the City of Redding in Shasta County, California and can be found within the *Enterprise*, *California* U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Township 31 North, Range 4 West, Sections 19 and 20). The central western and eastern boundaries of the study area are located at approximately 40º 31' 67"N latitude by 122° 21' 53"W longitude and 40º 31' 67"N latitude by 122° 20' 81"W longitude, respectively. A map of the study area is presented as Figure 1.

2. METHODS

2.1 Literature Review

For the purposes of this assessment, special-status plant species are defined as vascular plants that are: (1) listed as endangered or threatened under the federal Endangered Species Act (or formally proposed, or candidates, for listing); (2) listed as endangered or threatened under the California Endangered Species Act (or candidates for listing); and/or (3) listed as rare under the California Native Plant Protection Act. "Other" special-status plant species include those considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered in California and elsewhere (Lists 1B and 2).

Special-status fish and wildlife species include those that are: (1) designated as endangered or threatened by the state and/or federal governments (i.e., "listed species") under the California Endangered Species Act and/or federal Endangered Species Act, respectively; (2) proposed for federal listing status as endangered or threatened; and/or (3) designated as candidates for state or federal listing status as endangered or threatened. "Other" special-status fish and wildlife species are identified by the California Department of Fish and Game (CDFG) as California Fully Protected Species or California Species of Special Concern. For potentially occurring special-status wildlife resources, emphasis is on resident or breeding species rather than on seasonally occurring species.



North State Resources, Inc.

Strawberry Fields Study Area

Figure 1
Study Area and Vicinity

Investigations into the occurrence and potential for occurrence of special-status plant and wildlife species in the study area included conducting: database searches; field reconnaissance and limited protocol-level surveys for special-status plant and wildlife species; and review of pertinent environmental documents and technical studies.

The *List of Endangered and Threatened Species That May Occur in, or be Affected by Projects in the Enterprise, California USGS quadrangle and Shasta County, California* (U.S. Fish and Wildlife Service 2007b) was reviewed for federally listed plant and wildlife species known to occur or suspected of occurring in the vicinity of the study area (Appendix A).

The California Natural Diversity Database (CNDDB) was reviewed for records of special-status plant and wildlife species in the *Enterprise, California* and eight surrounding USGS quadrangles (California Department of Fish and Game 2007a). The CNDDB is a database consisting of historical observations of special-status plant species, wildlife species, and special plant communities. It is limited to reported sightings and is not a comprehensive list of special-status plant and wildlife species that may occur in a particular area. A copy of the search results is included as Appendix B.

Another database search was performed from a query of the online *CNPS Inventory of Rare and Endangered Plants of California* (California Native Plant Society 2007). The query was conducted for documented special-status plant species occurrences in the *Enterprise, California* USGS quadrangle and the eight surrounding quadrangles. The results of this query are included as Appendix C.

Additionally, the following documents were reviewed: *Endangered and Threatened Animals of California* (California Department of Fish and Game 2006a), *Special Animals* (California Department of Fish and Game 2007b), *Endangered, Threatened, and Rare Plants of California* (California Department of Fish and Game 2006b), and *Special Vascular Plants, Bryophytes, and Lichens List* (California Department of Fish and Game 2006c).

2.2 Field Review/Surveys

Botany

A pre-field botanical review of the study area was conducted in general accordance with *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (California Department of Fish and Game 2000) and *Botanical Survey Guidelines of the California Native Plant Society* (California Native Plant Society 2001a). Per botanical survey guidance, a target list of special-status plant species with the potential to occur within the study area was developed, in part, through a review of the previously mentioned environmental documents, technical studies, and databases. Local botanical expertise, herbarium database records, and regional floras were also used to develop a target list.

Prior to initiating field surveys, Mr. Colby J. Boggs, NSR botanist/plant ecologist, reviewed the habitat requirements and morphological features specific to each plant taxon on the target list. Protocol-level field surveys were conducted on April 25, May 3, May 9, and June 27, 2007. These dates coincide with the blooming/identifiable periods for all of the special-status plant species on the target list determined to have potential to occur within the study area. Field surveys were conducted

and all areas of the study area were viewed to the degree necessary to determine the presence/absence of special-status plant species and suitable habitat. All plant species detected within the study area were identified utilizing the nomenclature in *The Jepson Manual* (Hickman 1993).

Wildlife

Focused wildlife surveys were conducted for California red-legged frog (*Rana aurora draytonii*) and valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*). Ms. Ginger Bolen, NSR biologist conducted the California red-legged frog site assessment on August 17 and 20, and September 11, 2006, and May 7 and 10, 2007. Mr. Paul Kirk, NSR biologist conducted protocol-level VELB surveys on June 27, 28, and 29, and August 2, 2007.

2.2.1.1 ***California Red-Legged Frog Assessment***

A California Red-Legged frog site assessment was conducted using the guidelines set forth in *Revised Guidance on Site Assessments and Field Surveys for California Red-legged Frog* (U. S. Fish and Wildlife Service 2005). Information for the assessment was gathered through a combination of literature review, database searches, review of topographic mapping and aerial photography, and field visits to the site. The literature review identified the historic and current range of the California red-legged frog and provided information on specific habitat preferences of the species. The CNDDB records for Shasta County (California Department of Fish and Game 2007a) and the USFWS *Recovery Plan for the California Red-legged Frog* (U.S. Fish and Wildlife Service 2002) provided information regarding the known existing and historic populations of California red-legged frogs in the study area region.

A review of topographic mapping and aerial photography provided information regarding vegetation communities and land uses occurring near the study area. The study area and publicly accessible areas of the surrounding vicinity were characterized and evaluated for the presence of potentially suitable habitat for the California red-legged frog. A detailed California red-legged frog habitat assessment was prepared by NSR as a separate report (North State Resources 2007a).

2.2.1.2 ***Valley Longhorn Elderberry Beetle Survey***

Mr. Boggs, NSR botanist/plant ecologist conducted a reconnaissance level survey, noting the location of elderberry shrubs on an aerial map, as part of the botanical survey efforts in April and May 2007. Subsequently, Mr. Kirk, NSR biologist used the resulting aerial map to conduct the protocol-level VELB survey (U.S. Fish and Wildlife Service 1999) on June 27, June 28, and June 29, and August 2, 2007. The study area was surveyed on foot, and all areas were viewed to the degree necessary to locate all previously noted elderberry shrubs and to detect the presence of additional elderberry shrubs. Two elderberry shrubs in the southwest section of the study area were deeply embedded within Himalayan blackberry (*Rubus discolor*) brambles and were inaccessible for close inspection.

For each of the accessible elderberry shrubs, all stems measuring one inch or greater in diameter at ground level were counted, assessed for the presence of exit holes, and assigned to a size class (i.e., stems 1-3", 3-5", and >5"). For the few shrubs inaccessible for close inspection, binoculars were used to collect information to the greatest extent practicable. The vegetation community occurring in the immediate vicinity of all surveyed shrubs was recorded. The locations of all surveyed elderberry

shrubs were mapped using a Pathfinder Pro Global Positioning System (GPS) capable of sub-meter accuracy (NAD 27 projection). All spatial data were entered into a Geographic Information Systems (GIS) application and overlain onto a digital orthorectified aerial photograph.

3. RESULTS

3.1 General Setting

The study area is located on a level terrace with the general topography gently sloping west towards the Sacramento River. Elevations range from approximately 430 to 450 feet above mean sea level. The area has a Mediterranean climate with cool, wet winters and hot, dry summers. Average precipitation is approximately 25 to 35 inches per year and falls almost exclusively as rain between October and April. Mean January maximum temperature is 52° F and mean July maximum temperature is 95° F (Western Regional Climate Center 2006).

Vegetation and Associated Wildlife

The vegetation or habitat types present within the study area include riverine, annual grassland, valley oak woodland, and valley foothill riparian (Mayer and Laudenslayer 1988) as well as foothill pine (Sawyer and Keeler-Wolf 1995) as shown on Figure 2. Waters of the United States are present within these plant communities and are addressed briefly in Section 4. A description for each of these plant communities is provided below.

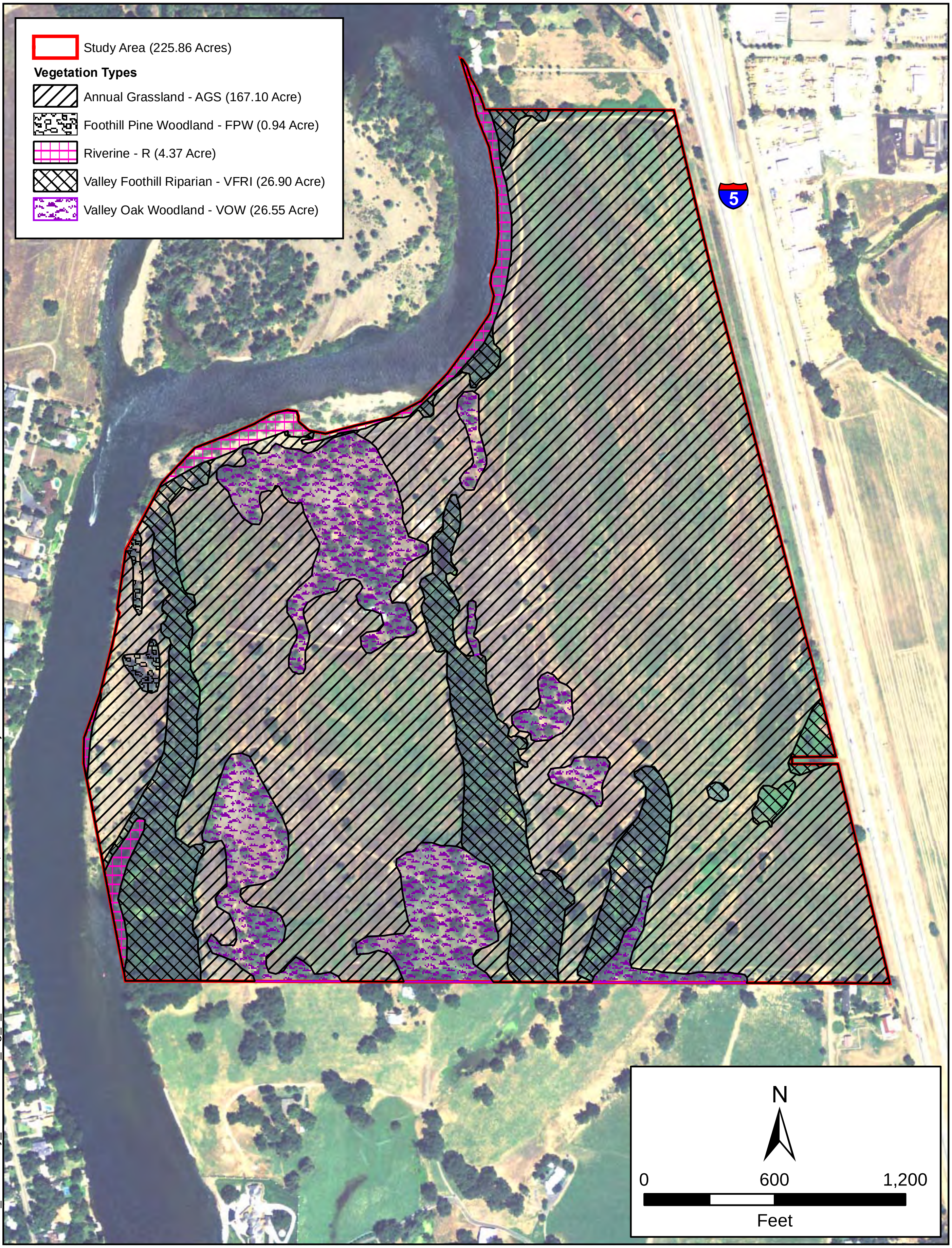
Riverine

Riverine habitat (4.37 acres) consists of the active channel and backwater area of the Sacramento River located along the western boundary of the study area. Riverine habitat is typically characterized by continually flowing water and boulder, cobble, gravel, and/or sand substrates. A dominant plant community within this habitat is absent due to the constant flow of water and movement of soil material (i.e., scour and deposition). However, seasonal fluctuations in water volume and velocity can allow the establishment of some vegetation along banks and on exposed gravel bars; most notably, primary successional species such as willows (*Salix* spp.).

Wildlife. The riverine habitat is suitable year-round for resident and anadromous fishes. Amphibians and reptiles expected to occur include the Pacific chorus frog (*Pseudacris regilla*), western toad (*Bufo boreas*), bullfrog (*Rana catesbeiana*), and northwestern pond turtle (*Clemmys marmorata marmorata*). In addition, birds such as the mallard (*Anas platyrhynchos*), great blue heron (*Ardea herodias*), osprey (*Pandion haliaetus*), and belted kingfisher (*Ceryle alcyon*) may forage here. Bats such as the little brown myotis (*Myotis lucifugus*), forage above this habitat during summer evenings.

Annual Grassland

Annual grassland habitat (167.10 acres) occurring within the study area is dominated by non-native annual grasses, and non-native annual and perennial herbaceous plants. This plant community occurs on all soil map units and the land type present on the site with minor differences in species composition based on location (e.g., greater abundance of native perennial species present on old gravel bar adjacent to the Sacramento River than on the terrace composed of moderately deep, sandy loam soil adjacent to I-5). Regardless of location, the dominant non-native grasses include European



50780_Strawberry_Fields\50780_Fig_2_WHR.mxd Source: NSR, Inc. 07-10-06 rjo

North State Resources, Inc.

Strawberry Fields Study Area

Figure 2
Vegetation Types

silver hairgrass (*Aira caryophyllea*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), medusahead (*Taeniatherum caput-medusae*) and rattail fescue (*Vulpia myuros*), and the dominant non-native herbaceous plants include black mustard (*Brassica nigra*), yellow star-thistle (*Centaurea solstitialis*), Spanish lotus (*Lotus purshianus*), and winter vetch (*Vicia villosa*). Native plant species include California poppy (*Eschscholzia californica*) and vinegar weed (*Trichostema lanceolatum*). Native plants occurring only on the gravel bar and on the Riverwash land type include showy milkweed (*Asclepias speciosa*), California brickellbush (*Brickellia californica*), yerba santa (*Eriodictyon californicum*), naked-stemmed buckwheat (*Eriogonum nudum*), Oregon false goldenaster (*Heterotheca oregana*), woolly-fruited lomatium (*Lomatium dasycarpum*), and silver bush lupine (*Lupinus albifrons*). Small stands of Himalayan blackberry (*Rubus discolor*) and narrowleaf willow (*Salix exigua*) as well as a few lone whiteleaf manzanita (*Arctostaphylos viscida*), foothill pine (*Pinus sabiniana*), valley oak (*Quercus lobata*), and blue elderberry (*Sambucus mexicana*) are found scattered throughout this habitat.

Wildlife. Annual grasslands are productive wildlife habitat. Grassland bird species, such as the mourning dove (*Zenaida macroura*), savannah sparrow (*Passerculus sandwichensis*), and white-crowned sparrow (*Zonotrichia leucophrys*) as well as rodents, including the California ground squirrel (*Spermophilus beecheyi)*, Botta's pocket gopher (*Thomomys bottae*), and deer mouse (*Peromyscus maniculatus*), forage on the seed crop this community provides. These species, in turn, attract predators such as the gopher snake (*Pituophis catenifer*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and coyote (*Canis latrans*). Other common grassland species include the western meadowlark (*Sturnella neglecta*) and black-tailed hare (*Lepus californicus*). Reptile species expected to occur here include the western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), western rattlesnake (*Crotalus viridis*), and yellow-bellied racer (*Coluber constrictor mormon*).

Valley Oak Woodland

Valley oak woodland habitat (26.55 acres) occurring within the study area is dominated by valley oak. Other tree species occurring in this plant community include Oregon ash (*Fraxinus latifolia*), foothill pine (*Pinus sabiniana*), and interior live oak (*Quercus wislizenii*). Shrubs are sparse in this habitat but include California coffeeberry (*Rhamnus californica*), Himalayan blackberry, and poison-oak (*Toxicodendron diversilobum*). The valley oak woodland habitat is an ecological extension of the annual grassland plant community with the only significant difference being the presence of a tree canopy with an approximate foliar cover of 50-60%. The grasses and herbaceous plants occurring in this habitat are similar to those present in the annual grassland plant community. Grasses and herbaceous plants present in the valley oak woodland habitat include European silver hairgrass, slender oat (*Avena barbata*), black mustard, ripgut brome, soft chess, yellow star-thistle, California poppy, and rattail fescue. Plant species occurring only under the canopy of valley oak include goose grass (*Galium aparine*) and hare barley (*Hordeum murinum* ssp. *leporinum*).

Wildlife. The valley oak woodland provides food and cover for a variety birds including red-shouldered hawk (*Buteo lineatus*), California quail (*Callipepla californica*), acorn woodpecker (*Melanerpes formicivorus*), western scrub-jay (*Aphelocoma californica*), and great horned owl (*Bubo

virginianus). Other common animals include black-tailed deer (*Odocoileus hemionus*), opossum (*Didelphis virginianus*), California ground squirrel, and western fence lizard.

<u>Valley Foothill Riparian</u>

Valley foothill riparian habitat (26.90 acres) occurring within the study area is dominated by tree-of-heaven (*Ailanthus altissima*), California black walnut (*Juglans californica*), Fremont cottonwood (*Populus fremontii*), valley oak, and black locust (*Robinia pseudoacacia*). Other trees present in this plant community include white alder (*Alnus rhombifolia*), Oregon ash, mulberry (*Morus alba*), foothill pine, and interior live oak. Shrubs and vines form an understory layer in the valley foothill riparian habitat with an approximate foliar cover of 90-100% in some areas and includes oleander (*Nerium oleander*), California coffeeberry, Himalayan blackberry, narrowleaf willow, arroyo willow (*Salix lasiolepis*), blue elderberry, and California wild grape (*Vitis californica*). Accordingly, grasses and herbaceous plants occurring in this plant community exhibit low percent cover in the understory layer. However, these plants are present and include California pipevine (*Aristolochia californica*), mugwort (*Artemisia douglasiana*), Santa Barbara sedge (*Carex barbarae*), and goose grass.

Wildlife. Riparian communities are among the most important habitats for wildlife because of their high floristic and structural diversity, high biomass (and therefore high food abundance), and high water availability. In addition to providing breeding, foraging, and roosting habitat for a diverse array of animals, riparian communities provide movement corridors for some species, connecting a variety of habitats throughout a region.

The leaf litter, fallen tree branches, and logs associated with the riparian community in the study area provide cover for the western toad and Pacific chorus frog. The western fence lizard, western skink, and southern alligator lizard (*Elgaria multicarinata webbi*) are also expected to occur here, as are several snake species, including the western rattlesnake, yellow-bellied racer, and common kingsnake (*Lampropeltis getulus*).

The willows in the riparian community attract a number of bird species. Many of these species are year-round residents, breeding in the riparian community in the spring and summer and using it for cover and foraging habitat during the non-breeding season. Common species nesting and foraging, primarily in the riparian tree canopy, include the bushtit (*Psaltriparus minimus*), white-breasted nuthatch (*Sitta carolinensis*), and Nuttall's and downy woodpeckers (*Picoides nuttallii* and *Picoides pubescens*, respectively). Other resident species, such as the spotted towhee (*Pipilo maculatus*) and song sparrow (*Melospiza melodia*), nest and forage on or very close to the ground, usually in dense vegetation. Several species of raptors, including the Cooper's hawk (*Accipiter cooperii*) and western screech owl (*Otus kennicottii*), nest in riparian communities and remain there year-round.

In addition to the permanent residents, numerous species of neotropical migrants occur in this community from spring through fall, with many potentially breeding on the site, including the ash-throated flycatcher (*Myiarchus cinerascens*), olive-sided flycatcher (*Contopus cooperi*), western wood-pewee (*Contopus sordidulus*), warbling vireo (*Vireo gilvus*), Swainson's thrush (*Catharus ustulatus*) and black-headed grosbeak (*Pheucticus melanoleucus*).

A variety of mammals also occurs in riparian communities. Small mammals, such as the Botta's pocket gopher, and deer mouse, may burrow or find refuge in dense grass or brushy thickets. Mule

deer frequently use riparian habitats, and predators, such as the raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*) and coyote, are attracted to riparian areas by the abundance of prey and cover. In addition, the taller trees provide daytime roosts for nocturnal species such as the raccoon and Virginia opossum.

Foothill Pine Woodland

The foothill pine woodland plant community (0.94 acre) occurs on an old gravel bar adjacent to the Sacramento River in the western portion of the study area and is dominated by foothill pine. Other tree species occurring in this plant community include valley oak and interior live oak. Shrubs are sparse in this habitat but include whiteleaf manzanita, Himalayan blackberry, and poison-oak. The foothill pine woodland habitat is an ecological extension of the annual grassland plant community with the only significant difference being the presence of a tree canopy with an approximate foliar cover of 50-60%. The grasses and herbaceous plants occurring in this habitat are similar to those present in the annual grassland and valley oak woodland plant communities. Grasses and herbaceous plants present in the foothill pine woodland habitat include European silver hairgrass, California brickellbush, ripgut brome, soft chess, yellow star-thistle, naked-stemmed buckwheat, California poppy, and rattail fescue.

Wildlife. The foothill pine woodland community is small inclusion within the annual grassland on the gravel bar between the river and a strip of valley foothill woodland. The wildlife species expected in this community would be a subset of those found in the annual grassland and valley foothill woodland habitats.

Soils

The *Soil Survey of Shasta County Area, California* (U.S. Department of Agriculture and Soil Conservation Service 1974) identifies five soil map units and one land type within the study area:

- ***CcA – Churn loam, 0 to 3% slopes***. The Churn series consists of well-drained and moderately well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically light yellowish-brown, medium acid gravelly loam about nine inches thick. The subgroup taxonomy for the Churn series is *Ultic Haploxeralfs*. The Churn loam soil unit is well-drained and has moderately slow permeability. Runoff is slow, and the hazard of erosion is none to slight for this soil unit. The Churn loam soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands associated with drainageways (USDA Soil Conservation Service 1992).

- ***CeA – Churn gravelly loam, 0 to 3% slopes.*** The Churn series consists of well-drained and moderately well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically light yellowish-brown, medium acid gravelly loam about nine inches thick. The subgroup taxonomy for the Churn series is *Ultic Haploxeralfs*. The Churn gravelly loam soil unit is well-drained and has moderately slow permeability. Runoff is slow, and the hazard of erosion is none to slight for this soil unit. The Churn gravelly loam soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands associated with drainageways (USDA Soil Conservation Service 1992).

- ***RgA – Reiff fine sandy loam, 0 to 3% slopes.*** The Reiff series consists of well-drained and moderately well-drained soils that formed in recent alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically grayish-brown and brown, slightly acid fine sandy loam about 18 inches thick. The subgroup taxonomy for the Reiff series is *Typic Xerorthents*. The Reiff fine sandy loam soil unit is well-drained and has moderately rapid permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Reiff fine sandy loam soil map unit is classified as non-hydric (USDA Soil Conservation Service 1992).

- ***Rw – Riverwash.*** The Riverwash land type is excessively drained and is associated with stream channels and adjacent areas subject to continuous or frequent flooding (U.S. Department of Agriculture and Soil Conservation Service 1974). Permeability is rapid, runoff is very slow, and the hazard of erosion is very high for this land type. Binomial subgroup taxonomy does not apply to land types. The Riverwash land type is classified as hydric and is associated with floodplain channels (USDA Soil Conservation Service 1992).

- ***TbA – Tehama loam, 0 to 3% slopes.*** The Tehama series consists of well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is pale brown, medium acid and slightly acid loam about 30 inches thick. The subgroup taxonomy for the Tehama series is *Typic Haploxeralfs*. The Tehama loam soil unit is well-drained and has slow permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Tehama loam soil map unit is classified as non-hydric with hydric inclusions in the form of unnamed ponded features associated with depressions (USDA Soil Conservation Service 1992).

- ***TfA – Tujunga loamy sand, 0 to 3% slopes.*** The Tujunga series consists of somewhat excessively drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically pale brown, slightly acid loamy sand about 14 inches thick. The subgroup taxonomy for the Tujunga series is *Typic Xeropsamments*. The Tujunga loamy sand soil unit is somewhat excessively drained and has rapid permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Tujunga loamy sand soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands and riverwash associated with drainageways and floodplain channels, respectively (USDA Soil Conservation Service 1992).

Waters of the U.S.

NSR conducted a delineation of waters of the United States in accordance with U.S. Army Corps of Engineers (USACE) methodology and regulatory guidance letters within the study area on June 15, June 16, and June 21, 2006. A total of 4.419 acres of waters of the United States features were delineated within the study area that includes seasonal wetland (0.029 acre), riverine/perennial stream (4.366 acres), and intermittent stream (0.024 acre, 149 linear feet) habitat. A separate report was prepared by NSR on April 19, 2007 (North State Resources 2007b).

3.2 Regional Species of Concern

Vegetation or habitat types found in the study area region potentially support special-status plant and wildlife species (Appendix D). Appendix D provides a general comparison of habitat requirements for each species and the general habitats present in the study area. Some of the special-status plants

and animals occurring near the study area are found in habitat types that are not present on-site, such as vernal pools. Therefore, these species are not considered in further detail as part of this assessment. For those species for which generally suitable habitat was determined to be present with the study area, the results of the reconnaissance-level survey were used to determine the likelihood of their presence on the site (Tables 1 and 2).

Special-Status Plant Species

Fourteen special-status vascular plant species were initially considered for analysis (Appendix D). Based upon geographic location, local botanical knowledge, and habitat parameters present within the study area, suitable habitat for four special-status plants was determined to occur in the study area (Table 1).

Table 1. Special-Status Plant Species Potentially Occurring in the Study Area

Common Name (*Scientific Name*)	Status[1] (FED/ST /CNPS)	General Habitat Description / Elevation Range	Typical Blooming Period	Comments
Fox sedge *Carex vulpinoidea*	--/--/2.2	Freshwater marshes and swamps, and riparian woodland / 98-3,937 feet	May-June	**Surveys negative, presumed absent.** Suitable habitat occurs within the seasonal wetland in the southwest portion of the study area.
Silky cryptantha *Cryptantha crinita*	--/--/1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland / 278-984 feet	April-May	**Surveys negative, presumed absent.** Suitable habitat occurs within gravelly substrate present on gravel bars and old channels.
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	--/--/1B.1	Meadows and seeps, vernal pools; vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland / 115-3,346 feet	March-May	**Surveys negative, presumed absent.** Suitable habitat occurs within the ponded area in the northeast corner of the study area.
Ahart's paronychia *Paronychia ahartii*	--/--/1B.1	Cismontane woodland, valley and foothill grassland and vernal pools / 90-1,530 feet	March-June	**Surveys negative, presumed absent.** Suitable habitat occurs within valley oak woodland and foothill grassland on the study area.

Status Codes[1]:
FED = Federal
ST = State
Federal & State Codes:
E = Endangered; T = Threatened

CNPS = California Native Plant Society
CNPS Codes:
List 1B = Rare, Threatened or Endangered in CA and Elsewhere;
List 2 = Rare, Threatened or Endangered in CA, but more common elsewhere

Special-Status Wildlife Species

Sixty five (65) special-status wildlife species were initially considered for analysis (Appendix D). Based upon location and habitat parameters, twenty-nine (29) special-status wildlife species were identified as having the potential to occur in the study area. Table 2 presents a list of these species and their likelihood of occurrence. Special-status designation and general habitat requirements for each species are provided in the table. Conclusions presented in this table are based on the

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Federal or State Listed Species			
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs associated with riparian forests that occur along rivers and streams.	**Present.** Protocol level surveys detected VELB exit holes on numerous 12 elderberry shrubs.
Green sturgeon, southern DPS *Acipenser medirostris*	T/SC	Spawn in Sacramento and Feather rivers; juveniles are thought to rear mainly in the estuary. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock. Spawn in the mainstem Sacramento River when temperatures range between 46-60 °F.	**Present**. Known to occur in the Sacramento River throughout all accessible reaches upstream at least to Anderson-Cottonwood Irrigation District dam near Redding, California.
Steelhead, California Central Valley DPS *Oncorhynchus mykiss* Critical Habitat	T/--	Spawn and rear in freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**. Occur in the mainstem Sacramento River and tributary streams. Adults migrate upstream during the fall/winter and spawn from winter to early spring. Juveniles rear in natal areas for 1-2 years before migrating to the ocean. Suitable spawning and rearing habitat exists in the Sacramento River.
Central Valley spring-run ESU Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat Essential Fish Habitat	T/T	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present.** Occur in the mainstem Sacramento River and its major perennial tributary streams. Adults migrate upstream during the spring and spawn from mid-August to mid-October. Suitable spawning and rearing habitat exists in the Sacramento River.
Sacramento River winter-run ESU Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat Essential Fish Habitat	E/E	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present**. Occur in the mainstem Sacramento River. Adults migrate upstream during the winter and spawn from mid-April to August. Suitable spawning and rearing habitat exists in the Sacramento River.
California red-legged frog *Rana aurora draytonii*	T/SC	Require aquatic habitat for breeding, also uses a variety of other habitat types including riparian and upland areas. Adults utilize dense, shrubby or emergent vegetation associated with deep-water pools with fringes of cattails & dense stands of overhanging vegetation.	**Absent.** Protocol level surveys did not detect this species (North State Resources 2007a).

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/--	Nesting habitat is cottonwood/willow riparian forest. Occurs only along the upper Sacramento Valley portion of the Sacramento River, the Feather River in Sutter Co., the south fork of the Kern River in Kern Co., and along the Santa Ana, Amargosa, and lower Colorado rivers	**Absent.** Presently there are no known breeding pairs along the Sacramento River north of Red Bluff, CA. The site does not have sufficiently dense riparian forest to support breeding.
Bald eagle *Haliaeetus leucocephalus*	T/E	Forages on live and dead fish and nests in large trees or snags. Requires large bodies of water, including ocean shorelines, lake margins, and large, open river courses for foraging, nesting, and wintering habitat.	**Present**. Incidental observations of eagles foraging over the site. No nests reported or observed on the site.
Bank swallow *Riparia riparia*	--/T	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	**Present**. Bank swallows and colony of nests observed on cut-bank of Sacramento River.
Other Special-Status Species			
River lamprey *(Lampetra ayresii)*	--/SC	The biology of river lampreys has not been studied in California, general habitat and life history thought to be similar to Pacific lamprey.	**Present**. Occur in the mainstem Sacramento River and tributary streams.
Central Valley fall/late-fall run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Essential Fish Habitat	--/SC	Freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**. Occur in the mainstem Sacramento River and tributary streams. Adults migrate upstream during the fall and spawn from mid-October to February. Suitable spawning and rearing habitat exists in the Sacramento River.
Hardhead (*Mylopharodon conocephalus*)	--/SC	Quiet deep pools of large, warm, clear streams over rocks or sand.	**Present**. Occur in the mainstem Sacramento River and tributary streams.
Western spadefoot toad *Spea hammondii*	--/SC	Grasslands with temporary pools.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SC	Slow water aquatic habitat with available basking sites. Hatchlings require shallow water with dense submergent or short emergent vegetation. Require an upland oviposition site in the vicinity of the aquatic site	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Double-crested cormorant *Phalacrocorax auritus*	--/SC	Inland lakes; fresh, salt and estuarine waters.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Merlin *Falco columbarius*	--/SC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Western burrowing owl *Athene cunicularia hypugaea*	--/SC	Open habitats, dry grasslands and ruderal habitats with ground squirrel burrows.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Sharp-shinned hawk *Accipiter striatus*	--/SC	Typically nests in dense conifer stands near water, winters in woodlands. Forages in many habitats in winter and migration.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Cooper's hawk *Accipiter cooperii*	--/SC	Nests in woodlands, forages in many habitats in winter and migration.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Ferruginous hawk *Buteo regalis*	--/SC	Forages in grasslands and occasionally in other open habitats during migration and winter.	**May be present as rare migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Prairie falcon *Falco mexicanus*	--/SC	Occurs in open habitats such as grasslands, desert scrub, rangelands and croplands. Nests on open cliffs.	**May be present as rare migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
White-tailed kite *Elanus leucurus*	--/FP	Nests in lowlands with dense oak or riparian stands near open areas, forages over grassland, meadows, cropland and marshes.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Osprey *Pandion haliaetus*	--/SC	Ocean shorelines, lake margins and large, open river courses for both nesting and wintering habitat.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
California yellow warbler *Dendroica petechia brewsteri*	--/SC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Yellow-breasted chat *Icteria virens*	--/SC	Breeds in riparian habitats having dense understory vegetation, such as willow and blackberry.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Loggerhead shrike *Lanius ludovicianus*	--/SC	Prefers open habitats with scatters shrubs and trees throughout the Central Valley of California. Nests in shrubs and trees.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Ringtail *Bassariscus astutus*	--/FP	Riparian habitats and in brush stands of most forest and shrub habitats. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows or woodrat nests.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Pallid bat *Antrozous pallidus*	--/SC	Forages over many habitats; roosts in buildings, large oaks or redwoods, rocky outcrops and rocky crevices in mines and caves, and under bridges. Roosts must protect from high temperatures	**May be present as forager**. Site does not contain suitable breeding roosts.

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Western mastiff bat *Eumops perotis*	--/SC	Roosts in cliff faces, rock outcrops, and buildings. Forages in open habitats. Needs vertical face to take flight.	**May be present as forager**. Site does not contain suitable breeding roosts.

[1]Status Codes:

<u>Federal and State Codes:</u> E = Endangered; T = Threatened; SC = Species of Special Concern: FP = Fully Protected

knowledge of local professional biologists and historic survey information. All special-status wildlife species potentially breeding in the study area are discussed in detail below. A list of all wildlife species observed is presented in Appendix E.

3.3 Detailed Evaluation of Special-Status Plant Species

No federal or state listed plant species have the potential to occur within the study area. There were four other special-status plant species determined to have the potential to occur in the study area: fox sedge (*Carex vulpinoidea*), silky cryptantha (*Cryptantha crinita*), Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*), and Ahart's paronychia (*Paronychia ahartii*). The status, habitat parameters, geographic distribution, and rationale for potential to occur on the site for each of these plant taxa is discussed below.

Fox sedge (*Carex vulpinoidea*). Federal Status: None; State Status: None; CNPS Status: List 2.2. This species is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in California, but more common elsewhere."

Fox sedge is a tufted perennial in the sedge family (Cyperaceae). This species is known to occur in freshwater marshes and swamps and in riparian woodlands (California Native Plant Society 2001b). Fox sedge typically occurs at elevations between 98 and 3,937 feet above mean sea level and the blooming period is generally from May to June. Past experience specific to fox sedge in the Redding area has indicated that the optimal window of opportunity to observe this species occurs in late May.

Fox sedge is known to occur in the Inner North Coast Ranges, Cascade Range, and northern Sacramento Valley within Butte, Glenn, Shasta, Siskiyou, and Tehama counties (California Native Plant Society 2006; Tibor 2001). CNDDB records indicate that there is one occurrence of this species within five miles of the study area (California Department of Fish and Game 2007a).

Areas of potentially suitable habitat include the open water features located in the central and southern portions of the study area as well as the seasonal wetland in the southwest portion of the study area. These features have habitat and hydrology parameters, such as typical riparian plant species associates and duration of inundation and/or soil saturation, respectively, that qualify as sufficient to represent characteristic microhabitat attributes for fox sedge. Therefore, this species remained a target species for protocol-level botanical survey.

Silky Cryptantha (*Cryptantha crinita*). Federal Status: None; State Status: None; CNPS Status: List 1B. This species is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Silky cryptantha is a small, annual in the borage family (Boraginaceae). This species is known to occur on sand and gravel deposits associated with intermittent and, occasionally, perennial streams (Nakamura and Nelson 2001) within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland from elevations between 278 and 984 feet above mean sea level (Tibor 2001). Silky cryptantha typically occurs below 1,000 feet in elevation and the blooming period is generally from April to May (Nakamura and Nelson 2001). Past

experience specific to silky cryptantha in the Redding area has indicated that the optimal window of opportunity to observe this species in bloom occurs between late April and mid-May.

Silky cryptantha is restricted to the interior regions of northern California and is known to occur in the northern Sacramento Valley within Shasta and Tehama counties (Nakamura and Nelson 2001). CNDDB records indicate that there are three occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

An area of potentially suitable habitat includes the gravel bar found along the Sacramento River along the western boundary of the site. Therefore, this species remained a target species for botanical survey efforts due to the presence of the gravel bar along the river, and attributes thereof, considered to have the potential to support populations of silky cryptantha.

Red Bluff Dwarf Rush (*Juncus leiospermus* var. *leiospermus*). Federal Status: None; State Status: None; CNPS Status: List 1B. This plant taxon is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Red Bluff dwarf rush is a small, reddish grass-like annual in the rush family (Juncaceae). This plant taxon is known to occur in a variety of seasonally moist habitats that include meadows and seeps, vernal pools, and vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland from elevations between 115 and 3,350 feet above mean sea level . It is often found in small, sparsely vegetated micro-habitats (e.g., tire ruts, gopher mounds). Red Bluff dwarf rush typically occurs between 200 and 1,000 feet in elevation and the blooming period is typically from April to early June (Nakamura and Nelson 2001). Past experience specific to Red Bluff dwarf rush in the Redding area has indicated that the optimal window of opportunity to observe this plant taxon in bloom occurs between late April and mid-May.

Red Bluff dwarf rush is restricted to the interior regions of northern California and is known to occur in the northern Sacramento Valley and surrounding foothills of the Cascade Range within Butte, Shasta, and Tehama counties (California Native Plant Society 2001b; Nakamura and Nelson 2001). Disjunct populations of Red Bluff dwarf rush also occur in the northeast corner of Shasta County and southern Lassen County. CNDDB records indicate that there are twelve occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

An area of potential habitat includes the ponded area in the northeast corner of the study area This area remains mesic due to seepage from the Anderson Cottonwood Irrigation District canal. An unpaved road in this mesic area contains relatively unvegetated zones which represent characteristic microhabitat attributes for Red Bluff dwarf rush. Therefore, this taxon remained a target taxon for botanical survey efforts due to the presence of seasonally ponded features, and attributes thereof, considered to have the potential to support populations of Red Bluff dwarf rush.

Ahart's paronychia (*Paronychia ahartii*). Federal Status: None; State Status: None; CNPS Status: List 1B. This plant taxon is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Ahart's paronychia is a small, inconspicuous annual in the carnation family (Caryophyllaceae). This plant taxon grows in cismontane woodland, and valley and foothill grassland from elevations between 90 and 1,530 feet above mean sea level. It is endemic to California and is threatened by habitat loss. Regionally, it is found in slightly wet areas that are sparsely vegetated.

CNDDB records that regional occurrences of this species indicate that there are no occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

3.4 Detailed Evaluation of Special-Status Wildlife Species

Federal or State Listed Wildlife Species

Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*). Federal Status: Threatened; State Status: None. The USFWS formally listed the VELB as *threatened* on August 8, 1980 (45 FR 52803 52807). Critical Habitat was also designated at this time (45 FR 52803 52807). Changed land use in the riverside habitats to which it is restricted is the primary threat to this beetle.

The VELB is an insect endemic to the foothills and Central Valley of California. It inhabits riparian and associated upland habitats where elderberry (*Sambucus* spp.), its host plant, grows. Specifically, its range extends throughout the Central Valley and adjacent foothills up to the 3,000 foot elevation level to the east and the Central Valley watershed to the west (U.S. Fish and Wildlife Service 1999). VELB habitat consists of riparian forests whose dominant plant species include cottonwood (*Populus* spp.), sycamore (*Platanus* spp.), valley oak (*Quercus lobata*.), and willow (*Salix* spp.), with an understory of elderberry shrubs (U.S. Fish and Wildlife Service 1991). Elderberry shrubs with a basal stem diameters larger than 1 inch are considered by the USFWS as suitable VELB habitat (U.S. Fish and Wildlife Service 1999).

The VELB life cycle is intimately connected to its habitat, elderberry shrubs. Following mating, the female lays her eggs in crevices in the elderberry bark. Upon hatching (after about 10 days), the larvae bore into the pith of the shrub and feed inside stems larger than 1 inch in diameter for 1 to 2 years until they mature. They emerge as adults during the spring via exit holes chewed through the bark. The adult beetles feed on the elderberry foliage until they mate, completing the cycle. Adults are active from March to June.

The study area has large areas of riparian forest containing elderberry shrubs and CNDDB records indicate an occurrence of VELB within five miles of the site.

Green Sturgeon, Southern DPS (*Acipenser medirostris*). Federal Status: Threatened; State Status: Species of Special Concern.

Relatively little is known about green sturgeon in the Sacramento River compared to its relative the white sturgeon (*Acipenser transmontanus*). Adult green sturgeon generally migrate into rivers between late-February and late-July. Spawning takes place in deep, fast water from March to July when water temperatures range from 46 °F to 60 °F. Juveniles may rear in the river for 1 to 3 years before migrating to the estuary, primarily during the summer and fall. Once in the estuary young sturgeon adopt an oceanic foraging habit, which may last from 3 to 13 years before returning for their first spawning season (Moyle 2002).

Green sturgeon use streams, rivers, and estuarine habitat as well as marine waters during their life cycle. Like the white sturgeon, green sturgeon prefer to spawn in lower to middle reaches of large rivers with swift currents and large cobble; no nest is built, adults broadcast spawn into the water column. The fertilized eggs sink and attach to the bottom to hatch. Research indicates that water flow is one of the key determinants of larval survival (Moyle 2002).

In the final determination to list the southern DPS as threatened under FESA, NMFS identified the reduction of available spawning habitat due to construction of barriers along the Sacramento and Feather rivers as being the principal threat to green sturgeon in the southern DPS (71 FR 17757). Other threats include, but are not limited to, insufficient flow rates, increased water temperature, water diversion, non-native species, poaching, pesticide and heavy metal contamination, and local fishing.

California Central Valley DPS Steelhead *(Onchorynchus mykiss)* Federal Status: Threatened; State Status: None.

Steelhead possess one of the most complex life history patterns of the Pacific salmonid species. Steelhead typically refers to the anadromous form of rainbow trout. Similar to other Pacific salmon, steelhead adults spawn in freshwater and spend a part of their life history at sea. However, unlike Chinook salmon, steelhead exhibit a variety of life history strategies during their freshwater rearing period and as adults may spawn more than once during their life. The typical life history pattern for steelhead is to rear in freshwater streams for two years followed by up to two or three years of residency in the marine environment. However, juvenile steelhead may rear in freshwater from one to four years (Busby et al. 1997; Moyle 2002).

Steelhead populations inhabiting the upper Sacramento River basin belong to the Central Valley steelhead DPS as defined by Good et al. (1997). These steelhead populations generally exhibit a life history pattern typical of a fall/winter run. This species historically has provided a popular sport fishery throughout the Sacramento River and its tributaries; however, at present naturally-produced steelhead remain at relatively low levels throughout their range in the Central Valley (Hallock 1989; McEwan 2001).

Steelhead adults may enter the Sacramento River and its tributaries from August through March, but peak migration generally occurs from October through February. Spawning begins in late December and can extend into early-April. Steelhead spawn in gravel and small cobble substrates usually associated with riffle and run habitat types. The upper mainstem Sacramento River is known to provide suitable spawning and juvenile rearing habitat for steelhead. The Sacramento River in the vicinity of the project may be used by steelhead during all life stages, including spawning and egg incubation.

Critical habitat designations for listed anadromous salmonids published in September 2005 (70 FR 52488) were finalized as part of the recent status reviews and are restricted to the species' anadromous range, which is coextensive with the steelhead-only DPS delineations described in that notice (71 FR 834). Designated critical habitat for Central Valley steelhead DPS includes all river reaches accessible to steelhead in the Sacramento and San Joaquin rivers and their tributaries, which includes the Sacramento River adjacent to the action area.

Central Valley Spring-run Chinook Salmon ESU *(Onchorynchus tshawytscha* Federal Status: Threatened; State Status: Threatened.

Spring-run Chinook salmon migrate upstream during the spring beginning in March, hold over in deep pools of the mainstem river and its large perennial tributaries, where fish can access cold headwaters, during the summer months, and spawn from mid-August through mid-October. Most of the spring run in the Sacramento River Basin ascend and spawn in the principal tributary streams (Mill, Deer, Clear, and Butte creeks, and the Feather River). Egg incubation occurs from mid-August through mid-January. Spring-run in the Sacramento River exhibit an ocean-type life history, emigrating as fry, sub-yearlings, and yearlings. Based on observations at Red Bluff Diversion Dam, spring-run emigration from the upper Sacramento River typically occurs from November through April (Vogel and Marine 1991; (Johnson, Weigand, and Fisher 1992)). Although some spring-run salmon may spawn in the Sacramento River between Red Bluff and Keswick Dam, it is thought that most have hybridized with fall-run salmon due to overlapping spawning periods, lack of spatial separation, and redd superimposition (California Department of Fish and Game 1998).

Central Valley spring-run ESU Chinook salmon populations in the Sacramento River and its tributaries have remained relatively depressed; however, some modest increases have occurred in their principal spawning tributaries such as Deer, Mill, and Butte Creeks (California Department of Fish and Game 2004). Spring-run Chinook salmon spawning in the mainstem Sacramento River and nearby tributaries such as Clear Creek and Battle Creek remain relatively depressed (California Department of Fish and Game 2004).

Designated critical habitat for Central Valley spring-run Chinook salmon includes the San Francisco Bay-Delta estuary, mainstem Sacramento River upstream to Keswick Dam and most of the Sacramento Valley's perennial tributaries with established spring salmon runs, including the Feather River and Feather River Hatchery. Designated critical habitat for Central Valley spring-run Chinook salmon includes all river reaches accessible to the species in the Sacramento and San Joaquin Rivers and their tributaries in California, which includes the Sacramento River adjacent to the property.

Sacramento River Winter-run Chinook Salmon ESU *(Onchorynchus tshawytscha)*. Federal Status: Endangered; State Status: Endangered.

Historically, winter-run Chinook salmon spawned in the cold spring-fed headwaters of the upper Sacramento, Pit, McCloud, and Calaveras rivers (U.S. Fish and Wildlife Service 1995). Following construction of Shasta Dam, deep water releases during the summer months provided suitable cold water conditions for winter-run Chinook salmon spawning and rearing downstream of the dam. In response to these conditions, which increased total coldwater spawning habitat available to the winter run, the population increased. In 1969, the winter run exceeded 100,000 salmon; however, during the early 1990's, run size estimates have ranged from about 1,400 fish to as low as about 200 fish in some years. The Sacramento River winter-run Chinook salmon population has exhibited a continuing recovery from the extremely low adult returns observed in the early 1990's. Recent spawning populations range from about 7,000 to 8,000 (California Department of Fish and Game 2004); however, these levels remain well below draft recovery goals established for this run (National Marine Fisheries Service 2004).

Winter-run Chinook salmon begin their migration up the Sacramento River in December and may spawn from mid-April through mid-August with a peak in spawning occurring from late May through June (Vogel and Marine 1991; Moyle 2002). Winter-run Chinook salmon spawning and juvenile rearing areas include the river reach adjacent to the project site (D. Killam, CDFG, unpublished data).

The egg incubation period extends from mid-April through mid-September. Juvenile winter-run Chinook salmon are known to rear in suitable habitats of the upper Sacramento River, including that adjacent to the project site.

The critical habitat designation includes the Sacramento-San Joaquin Delta and the Sacramento River, within all accessible reaches, including that reach adjacent to the action area. Constituent elements of anadromous salmonid critical habitat is considered to include seasonal timing and volume of stream flows sufficient to allow the fish to migrate, reproduce and rear; suitable streambed and bank conditions to support spawning, incubation, and larval development; suitable water quantity and quality and floodplain connectivity to form and maintain physical habitat to support juvenile development, growth, and mobility; natural cover such as shade, submerged and overhanging vegetation and large wood, log jams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; and finally, freshwater migration corridors free of obstruction with water quantities and quality and natural cover that support juvenile and adult fish migration and survival (69 FR 71880).

California Red-legged Frog (*Rana aurora draytonii*). Federal Status: Threatened; State Status: Species of Special Concern. The California red-legged frog inhabits quiet pools of streams, marshes, and ponds. All life history stages are most likely to be encountered in and around breeding sites, which include coastal lagoons, marshes, springs, permanent and semi permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. This species breeds from March to July; females lay 750 to 4000 eggs in clusters, attached to vegetation 7 to 15 cm (2 to 6 in) below the water surface. Juveniles can occur in slow moving, shallow riffle zones in creeks or along the margins of ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation (Zeiner, Laudenslayer, and Mayer 1989)

The historic range of the California red-legged frog extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, and inland from the vicinity of Redding, Shasta County, southward to northwestern Baja California, Mexico. The species has lost approximately 70 percent of its former range; California red-legged frogs are locally abundant in the San Francisco Bay area and the central coast, but only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges (50 CFR Part 17 14626).

NSR staff conducted a USFWS protocol-level site assessment for California red-legged frog, and produced a separate detailed report (North State Resources 2007a). NSR staff did not observe any California red-legged frogs during the USFWS protocol-level surveys, but did conclude that the seasonal pond in the central region of the site provides suitable breeding habitat. The nearest known records of California red-legged frog are from Thomes Creek and Sunflower Gulch on Red Bank Creek, approximately 33 miles south southwest of the project site.

Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*). Federal Status: Candidate; State Status: Endangered. The western yellow-billed cuckoo is a federal candidate for listing. It is generally considered a neotropical migrant that arrives in California to begin breeding in June.

In northern California it prefers riparian forests, containing willow (*Salix* spp.) and Fremont cottonwood (*Populus fremontii*) (Laymon 1998). It is also found in orchards adjacent to river bottoms. The western yellow-billed cuckoo feeds primarily on large insects but also occasionally takes small frogs, lizards, eggs, and young birds. The species is known to be an interspecific brood parasite, laying eggs in the nests of at least 11 other bird species (Hughes 1999). Major declines among western populations in twentieth century due to habitat loss and fragmentation, local extinctions, and low colonization rates; now extremely rare in most areas . There are approximately 30 pairs breeding in California. The nearest known breeding pairs are approximately 30 miles south of the project site along the Sacramento River (Laymon 1998).

Bald Eagle (*Haliaeetus leucocephalus*). Federal status: Delisted (previously endangered); State status: Endangered. The bald eagle is a large soaring bird; in North America, it is second in size only to the California condor (*Gymnogyps californianus*). Most of the annual food requirements of a bald eagle is derived from or obtained around aquatic habitats. The food most often consumed consists of fish, water birds, and small to medium-sized mammals. Because of the dietary association, nesting territories are usually found near water.

Perches are used primarily during the day for resting, preening, and hunting, and may include human-made structures such as power poles. Roosting areas contain a night communal roosting tree that is easily accessible to the large birds and tall enough to provide safety from threats from the ground. Bald eagle nests and roosts are usually found where human activity is infrequent or muted. In California, breeding pairs are found mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties (U.S. Fish and Wildlife Service 2007a).

The USFWS delisted the bald eagle in 2007, and attributes the recovery of the species to reduction in use of organochlorine pesticides and habitat conservation (U.S. Fish and Wildlife Service 2007a). NSR staff have have incidentally observed bald eagles foraging over the project site, but have not observed them nesting on the project site.

Bank Swallow (*Riparia riparia*). Federal status: None; State status: Threatened. Bank swallows are found primarily in riparian and other lowland habitats in the Central Valley, typically between April and September. They nest colonially and inhabit isolated places where fine-textured or sandy, vertical bluffs or riverbanks are available in which to dig burrows. Bank swallows forage over open riparian areas, brushland, grassland, and cropland.

The species' range in California is estimated to be have been reduced by 50 percent since 1900 (Zeiner et al. 1990a). Now, only 110 to 120 colonies remain within the state. Perhaps 75 percent of the current breeding population in California occurs along the banks of the Sacramento and Feather rivers in the northern Central Valley in areas where the rivers still meander in a mostly natural state. About 50 to 60 colonies remain along the middle Sacramento River, and 15 to 25 colonies occur along the lower Feather River. Other colonies persist along the central coast from Monterey to San

Mateo counties and in northeastern California in Shasta, Siskiyou, Lassen, Plumas, and Modoc counties (Zeiner et al. 1990a).

Other Special-Status Wildlife Species

River Lamprey *(Lampetra ayresii)* Federal Status: None; State Status: Species of Special Concern. River lamprey are anadromous; like salmon they are born in freshwater streams, migrate to the ocean, and return to fresh water as mature adults to spawn. Also like the salmon, lampreys do not feed during their spawning migration. Mating pairs of lamprey construct a nest by digging together using rapid vibrations of their tails and by moving stones using their suction mouths. They enter streams from July to October; spawning takes place the following spring when water temperatures are between 50° and 62.6°F. They ascend rivers by alternately swimming upstream in brief spurts and resting by sucking and holding on to rocks. Spawning takes place in low-gradient reaches of streams with gravel and sandy bottoms. Adults die within 4 days of spawning, after depositing from 10,000 to 100,000 very small-sized eggs in their nest. The young hatch in 2 to 3 weeks and swim to areas of low-velocity water where sediments are soft and rich in dead plant materials. They quickly burrow into the muddy bottom, where they filter the mud and water, eating microscopic plants (mostly diatoms) and animals.

Juvenile lamprey will stay burrowed in the mud for 3 to 6 years, moving only rarely to new areas. After a 2-month metamorphosis, triggered by unknown factors, they metamorphose into an adult morphology averaging 4.5 inches long. Newly metamorphosed lampreys migrate downstream during winter and spring high flow events. Adult river lampreys are thought to spend from 2 to 12 months in the estuary or ocean before returning to the rivers to spawn. River lamprey are known to occur in the Sacramento River (Moyle 2002).

Central Valley Fall/Late-fall Run Chinook Salmon ESU (Oncorhynchus tshawytscha) Federal Status: None; State Status: Species of Special Concern. The Central Valley fall/late-fall run ESU Chinook salmon comprises the largest present day population of Chinook salmon in the Central Valley. Fall-run Chinook salmon begin to enter the Sacramento River in July and the run builds through the late summer and fall months peaking by late-September and October (Vogel and Marine 1991). Spawning occurs throughout the upper Sacramento River and in a majority of its tributaries from mid-October through December (Vogel and Marine 1991; Moyle 2002). Spawning densities of fall run salmon are very high in the Sacramento River from near Red Bluff to Keswick Dam (D. Killam, CDFG, personal communication). Juvenile fall-run Chinook salmon rear throughout the Sacramento River and its tributaries. Juvenile fall run fry may emigrate to the estuary from shortly after they hatch through the spring and summer months following their birth.

The late-fall run component of this Chinook salmon ESU enters the Sacramento-San Joaquin estuary and ascends Central Valley streams after the fall run, usually from late-October through March (Vogel and Marine 1991). Spawning begins in January and is usually complete by late-April. Late-fall run spawning densities are greatest in the upper Sacramento River from Red Bluff to Keswick Dam. Both fall and late-fall run salmon use the spawning habitat of the mainstem river adjacent to the study area (CDFG, unpublished data). Juvenile late-fall run salmon rear in the upper Sacramento

River from late-April through the following winter before emigrating to the estuary (Vogel and Marine 1991; Moyle 2002).

Large numbers of the fall run and late-fall run salmon are spawned and reared by state and federal fish hatcheries in California's Central Valley. The number of hatchery-produced fish may greatly exceed the number naturally produced fall/late-fall run Chinook salmon in some Central Valley streams which has led to concern over the viability of certain tributary populations. These runs support valuable and popular ocean and river commercial and sport fisheries.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a federal fisheries management plan (FMP). EFH refers to those waters and substrates necessary for the spawning, breeding, feeding, or growth to maturity. Central Valley spring-run ESU Chinook salmon, Central Valley fall/late-fall run ESU Chinook salmon, and Sacramento River winter-run ESU Chinook salmon are all managed under a FMP and are therefore subject to protection under MSA.

The Sacramento River is designated by the National Marine Fisheries Service (NMFS) to contain EFH for Chinook salmon, as defined by the Magnuson-Stevens Fisheries Conservation and Management Act of 1994, as amended. EFH refers to those waters and substrates necessary for spawning, breeding, feeding, or growth to maturity. Freshwater EFH for salmon consists of four major components: spawning and incubation habitat; juvenile rearing habitat; juvenile migration corridors; and adult migration corridors and adult holding habitat (Pacific Fishery Management Council 2003).

The Sacramento River adjacent to the project site provides all four major components of freshwater EFH for salmon. Adult Chinook salmon migrate to and are known to spawn within all suitable habitats adjacent to the project site. Fry and juveniles are known to occur in suitable rearing habitats nearly year round. Medium to large cobbles and boulders dominate the river bottom in these habitats, providing suitable cover and refuge for rearing salmonids.

Hardhead *(Mylopharodon conocephalus)* Federal Status: None; State Status: Species of Special Concern. Hardhead were identified as a California Species of Special Concern in 1995 (Moyle et al. 1995). Hardhead are listed as a Class 3 species of special concern. Class 3 species are those fish species occupying much of their native range, but that were formerly more widespread or abundant within that range. Included in this classification are taxa with very restricted distributions (e.g., Eagle Lake tui chub). The populations of such species need to be assessed periodically (i.e., every 5 years) and included in long-term plans for protected waterways.

Hardhead are large cyprinids that closely resemble Sacramento pikeminnow and are widely distributed in low- to mid-elevation streams in the Sacramento–San Joaquin drainage. Hardhead typically inhabit undisturbed areas of larger low- to mid-elevation streams, although they are also found in the mainstem Sacramento River at low elevations and in its tributaries to about 4,921 feet . They prefer clear, deep pools and runs with slow velocities and occur in streams where summer temperatures reach in excess of 68°F (Moyle 2002).

Historically, hardhead have been regarded as widespread and abundant in central California and are still widely distributed in foothill streams. The specific risk to hardhead is their increasingly isolated populations, making them vulnerable to localized extinctions. Hardhead also tend to be absent from streams where introduced species dominate (Mayden, Rainboth, and Buth 1991; Moyle and Daniels 1982), and from streams that have been severely altered by human activity (Baltz and Moyle 1993).

Western Spadefoot Toad (*Spea hammondi*). Federal status: None; State Status: Species of Special Concern. Historically, the western spadefoot toad ranged from Redding to northwestern Baja, California. It has been extirpated from many locations within this range. Since 1990, there have been sightings in Alameda, Butte, Calaveras, Fresno, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Orange, Placer, Riverside, Sacramento, San Benito, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, Tulare, Ventura, and Yolo counties (U.S. Fish and Wildlife Service 2007c).

The western spadefoot toad occurs primarily in grassland locations, but occasional populations also occur in valley-foothill hardwood woodlands. Some populations persist for a few years in orchard-vineyard habitats (Zeiner, Laudenslayer, and Mayer 1989). The species is found at elevations below 3,000 feet but can occur up to 4,500 feet. Western spadefoot toads breed in temporary pools from January to May. Water temperatures in these pools must be between 48ºF and 86ºF. Eggs are deposited on plant stems or on pieces of detritus in temporary rain pools or, less frequently, in pools in ephemeral stream courses (U.S. Fish and Wildlife Service 2007c).

Western spadefoot toads are extremely sensitive to low frequency noises and vibrations. These disturbances cause western spadefoot toads to break dormancy and emerge from their burrows (Dimmitt and Ruibal 1980).

Northwestern Pond Turtle (*Clemmys marmorata marmorata*). Federal Status: None; State Status: Species of Special Concern. The northwestern pond turtle is found in the quiet waters of ponds, marshes, creeks, and irrigation ditches. This species requires basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. They frequently bask on logs or other objects out of the water when water temperatures are low and air temperatures are greater than water temperatures. When air temperatures become too warm, western pond turtles water bask by lying in the warmer surface water layer with their heads out of the water. Hibernation in colder areas is passed underwater in bottom mud (Zeiner, Laudenslayer, and Mayer 1989). Mating typically occurs in late April or early May, but may occur year-round. Nests are located in an upland location that may be a considerable distance from the aquatic site (up to ¼ mile) (California Department of Fish and Game 1994). Hatchling turtles are thought to emerge from the nest and move to the aquatic site in the spring. Today, the northwestern pond turtle occurs in 90% of its historic range in the Central Valley and west of the Sierra Nevada mountains, but in greatly reduced numbers (Jennings and Hayes 1994). It occurs from the Oregon border south to the American Basin in the Central Valley, where it intergrades with southwestern pond turtle.

Western Burrowing Owl (*Athene cunicularia hypugaea*). Federal status: None; State status: Species of Special Concern. The western burrowing owl inhabits open, dry grasslands and deserts, as well as open stages of pinyon-juniper and ponderosa pine. The nesting season is between February 1 and August 31. Western burrowing owls typically nest in abandoned rodent burrows, particularly

those of California ground squirrels, which they modify each year. Burrowing owls forage in open grassland areas adjacent to nest sites. The species has also been documented in open areas near human habitation, especially airports and golf courses. The Central Valley and surrounding foothill regions of California provide year-round habitat for the western burrowing owl.

The study area has the general habitat requirements for the burrowing owl, but NSR staff did not note rodent activity and burrows during the site visits. There are no recorded CNDDB occurrences of the western burrowing owl within a 5-mile radius of the study area (California Department of Fish and Game 2007a).

Cooper's Hawk (*Accipiter cooperii*). Federal status: None; State status: Species of Special Concern. Cooper's hawks prefer landscapes where wooded areas occur in patches and groves facilitating the ambush hunting tactics employed by this species. The species preys upon medium-sized birds (e.g., jays, doves, and quail) and occasionally takes small mammals and reptiles. Breeding pairs in California prefer nest sites within dense stands of live oak woodland or riparian areas, and prey heavily on young birds during the nesting season. Cooper's hawks are breeding residents throughout most of the wooded areas in California, but populations have declined in recent decades (Zeiner et al. 1990a).

Cooper's hawks have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

White-tailed Kite (*Elanus leucurus*). Federal Status: None; State Status: Fully Protected Species. The white-tailed kite can be found in association with the herbaceous and open stages of a variety of habitat types, including open grasslands, meadows, emergent wetlands, and agricultural lands. Nests are constructed near the top of dense oaks, willows, or other tree stands located adjacent to foraging areas. The species forages in undisturbed, open grasslands, meadows, farmlands and emergent wetlands. White-tailed kite are seldom observed more than 0.5 mi (0.8 km) from an active nest during the breeding season (Zeiner et al. 1990a). The white-tailed kite is found year-round in both the coastal zones and lowlands of the Central Valley in California.

White-tailed kites have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Osprey (*Pandion haliaetus*). Federal Status: None; State Status: Species of Special Concern. In California, osprey are common summer residents and breeders but are less common in winter. Osprey breed primarily in scattered locations throughout northern California from the Cascade Ranges south to Lake Tahoe, and along the coast south to Marin County. They nest and roost on exposed treetops, towers, pilings, or similar structures near lakes, reservoirs, rivers, estuaries, and the open sea coast. They forage over fish-bearing bodies of water. Current threats to the species include degradation of aquatic environments such as rivers and lakes and loss of nesting structures such as trees to timber harvest and other activities (Zeiner et al. 1990a).

Osprey have the potential to nest within the study area in the riparian area along the Sacramento River. There are two CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

California Yellow Warbler (*Dendroica petechia brewsteri*). Federal Status: None; State Status: Species of Special Concern. The yellow warbler is a long-distance migrant, usually arriving in California in April and leaving by October. The species breeds from mid-April to early August, building an open cup nest in a tree or shrub. Foraging patterns typically involve gleaning and hovering for insects and spiders. The yellow warbler occurs as a summer resident in northern California. It is usually found in dense riparian deciduous habitats with cottonwoods, willows, alders, and other small trees and shrubs typical of open-canopy riparian woodlands.

Yellow warblers have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Yellow-breasted Chat (Ictera virens); Federal Status: None; State Status; Species of Special Concern. The yellow-breasted chat is a neotropical migrant that occurs in riparian or marsh habitats throughout California. They are found in dense, brushy thickets near water and in the thick understory of riparian woodlands. Forage patterns usually involve gleaning insects, spiders, and berries from the foliage of shrubs and low trees. Nests are often low to the ground in dense shrubs along streams. They occur as summer breeding residents in the Sacramento River Valley and its tributaries (Zeiner et al. 1990a).

Yellow-breated chat has the potential to nest within the study area in the riparian forest along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Loggerhead Shrike (*Lanius ludovicianus*). Federal Status: None; State Status: Species of Special Concern. The loggerhead shrike prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches located in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Loggerhead shrikes skewer their prey to thorns or barbs on barbed-wire fences. The purpose of this trait may be to help kill the prey or to cache the food for latter consumption. Loggerhead shrikes are found in lowlands and foothills throughout California (Zeiner et al. 1990a).

Loggerhead shrike has the potential to nest within the study area within the valley oak woodland. NSR staff did not observe this species or any nests during site visits.

Ringtail (*Bassiriscus astutus*). Federal Status: None; Federal Status: Fully Protected Species. The ringtail occurs in various riparian habitats in and brush stands of most forest and shrub habitats. Nocturnal, and primarily carnivorous, ringtails mainly eat small mammals but also feed on birds, reptiles, insects, and fruit. They forage on the ground, among rocks, and in trees; usually near water.

Hollow trees and logs, cavities in rocky areas, and other recesses are used for cover. The ringtail is widely distributed in California (Zeiner et al. 1990b).

Ringtail has the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species during site visits.

3.5 FIELD REVIEW/SURVEYS

During the field reconnaissance and protocol-level surveys, the study area was inspected to identify plant and wildlife special-status species and/or potential habitat for these species in the study area. Lists of all plant and wildlife species observed are presented in Appendix E.

Botany

No special-status vascular plant species were detected as a result of botanical survey efforts. A list of all plant species observed is presented in Appendix E.

Wildlife

3.5.1.1 ***NSR staff California Red-Legged Frog Assessment***

NSR staff conducted a USFWS protocol-level site assessment for California red-legged frog, and produced a separate detailed report (North State Resources 2007a). NSR staff did not observe any California red-legged frogs during the USFWS protocol-level surveys, but did conclude that the seasonal pond in the central region of the site provides suitable breeding habitat.

3.5.1.2 ***Valley Elderberry Longhorn Beetle Surveys***

Sixty two (62) elderberry shrubs with stems measuring 1-inch or greater in diameter at ground level were detected during the surveys. Nearly all of the recorded elderberry shrubs are located within the valley foothill riparian and valley oak woodland habitat types in the southwest and south central section of the study area (Figure 3 in map pocket). Several of the elderberry shrubs are within the 100-foot buffer zone just south of the boundary at the southwest corner of the study area. Two of the 62 elderberry shrubs were deeply embedded within Himalayan blackberry brambles and were inaccessible for close inspection. Field survey data for the 62 elderberry shrubs are presented in a table in Appendix F.

Exit holes characteristic of VELB (e.g. exit hole oval to circular, approximately ¼ inch in diameter, and without beveled edges; exit hole on stem greater than one inch in diameter and within six feet from ground) were detected on 13 of the 60 elderberry shrubs that were accessible for close inspection. These 13 elderberry shrubs are located within valley foothill riparian and valley oak woodland habitats in the southwest and south central section of the study area (Figure 3 in map pocket). All of the 36 observed VELB exit holes are within six feet above ground level and located in live stems greater than 1-inch in diameter. There were both new exit holes, characterized by sharp hole edges and light colored wood, and older exit holes, characterized by the gradual sealing of the hole due to cambial growth (See photographs in Appendix G).

3.5.1.3 ***Incidental Special-Status Wildlife Observations***

NSR staff made incidental field observations of 30 wildlife species including one special-status species; bank swallow (Appendix E). NSR botanist/plant ecologist, Mr. Boggs and NSR biologist, Ms. Bolen observed a colony of bank swallows nesting in the cut-bank of the Sacramento River within the northern portion of the study area (Figure 3 in map pocket).

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APPENDIX A

U.S. Fish and Wildlife Service Species List

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

April 26, 2007

Document Number: 070426124401

Michael Gorman
North State Resources, Inc.
500 Orient St. Suite 150
Chico, CA 95928

Subject: Species List for Strawberry Fields Property

Dear: Mr.

We are sending this official species list in response to your April 26, 2007 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 25, 2007.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

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 you requested

Document Number: 070426124401

Database Last Updated: March 5, 2007

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)

vernal pool tadpole shrimp (E)

Pacifastacus fortis

Shasta crayfish (E)

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)

Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

Critical Habitat, Central Valley spring-run chinook (X) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Birds

Haliaeetus leucocephalus

bald eagle (T)

Strix occidentalis caurina

northern spotted owl (T)

Plants

Orcuttia tenuis

Critical habitat, slender Orcutt grass (X)

slender Orcutt grass (T)

Candidate Species

Fish

Oncorhynchus tshawytscha

Central Valley fall/late fall-run chinook salmon (C) (NMFS)
Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Birds

Coccyzus americanus occidentalis

Western yellow-billed cuckoo (C)

Quads Containing Listed, Proposed or Candidate Species:

BALLS FERRY (628B)
COTTONWOOD (629A)
OLINDA (629B)
BELLA VISTA (646B)
PALO CEDRO (646C)
PROJECT CITY (647A)
SHASTA DAM (647B)
REDDING (647C)
ENTERPRISE (647D)

County Lists

Shasta County

Listed Species

Invertebrates

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)
vernal pool tadpole shrimp (E)

Pacifastacus fortis

Shasta crayfish (E)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)
Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Birds

Haliaeetus leucocephalus

bald eagle (T)

Strix occidentalis caurina

Critical habitat, northern spotted owl (X)

northern spotted owl (T)

Plants

Orcuttia tenuis

Critical habitat, slender Orcutt grass (X)

slender Orcutt grass (T)

Tuctoria greenei

Critical habitat, Greene's tuctoria (=Orcutt grass) (X)

Greene's tuctoria (=Orcutt grass) (E)

Candidate Species

Fish

Oncorhynchus tshawytscha

Central Valley fall/late fall-run chinook salmon (C) (NMFS)

Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Birds

Coccyzus americanus occidentalis

Western yellow-billed cuckoo (C)

Mammals

Martes pennanti

fisher (C)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our critical habitat page for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 25, 2007.

APPENDIX B

CNDDB Query Results

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	***Agelaius tricolor*** tricolored blackbird	ABPBXB0020			G2G3	S2	SC
2	***Agrostis hendersonii*** Henderson's bent grass	PMPOA040K0			G1Q	S1.1	3.2
3	***Anthicus antiochensis*** Antioch Dunes anthicid beetle	IICOL49020			G1	S1	
4	***Anthicus sacramento*** Sacramento anthicid beetle	IICOL49010			G1	S1	
5	***Antrozous pallidus*** pallid bat	AMACC10010			G5	S3	SC
6	***Branchinecta lynchi*** vernal pool fairy shrimp	ICBRA03030	Threatened		G3	S2S3	
7	***Carex scoparia*** pointed broom sedge	PMCYP03C90			G5	S2S3	2.2
8	***Carex vulpinoidea*** fox sedge	PMCYP03EN0			G5	S2.2	2.2
9	***Castilleja rubicundula ssp. rubicundula*** pink creamsacs	PDSCR0D482			G5T2	S2.2	1B.2
10	***Clarkia borealis ssp. borealis*** northern clarkia	PDONA05062			G3T2	S2.3	1B.3
11	***Cryptantha crinita*** silky cryptantha	PDBOR0A0Q0			G1	S1.1	1B.2
12	***Desmocerus californicus dimorphus*** valley elderberry longhorn beetle	IICOL48011	Threatened		G3T2	S2	
13	***Emys (=Clemmys) marmorata marmorata*** northwestern pond turtle	ARAAD02031			G3G4T3	S3	SC
14	***Euderma maculatum*** spotted bat	AMACC07010			G4	S2S3	SC
15	***Fluminicola seminalis*** Nugget Pebblesnail	IMGASG3110			G2	S1S2	
16	***Gratiola heterosepala*** Boggs Lake hedge-hyssop	PDSCR0R060		Endangered	G3	S3.1	1B.2
17	***Great Valley Cottonwood Riparian Forest***	CTT61410CA			G2	S2.1	
18	***Great Valley Mixed Riparian Forest***	CTT61420CA			G2	S2.2	
19	***Great Valley Valley Oak Riparian Forest***	CTT61430CA			G1	S1.1	
20	***Great Valley Willow Scrub***	CTT63410CA			G3	S3.2	
21	***Haliaeetus leucocephalus*** bald eagle	ABNKC10010	Threatened	Endangered	G5	S2	
22	***Hydromantes shastae*** Shasta salamander	AAAAD09030		Threatened	G1G2	S1S2	
23	***Juncus leiospermus var. leiospermus*** Red Bluff dwarf rush	PMJUN011L2			G2T2	S2.2	1B.1
24	***Lanx patelloides*** Kneecap Lanx	IMGASL7030			G1	S1	
25	***Legenere limosa*** legenere	PDCAM0C010			G2	S2.2	1B.1
26	***Lepidurus packardi*** vernal pool tadpole shrimp	ICBRA10010	Endangered		G3	S2S3	

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
27	***Limnanthes floccosa ssp. bellingeriana*** Bellinger's meadowfoam	PDLIM02041			G4T2	S1.1	1B.2
28	***Linderiella occidentalis*** California linderiella	ICBRA06010			G3	S2S3	
29	***Martes pennanti (pacifica) DPS*** Pacific fisher	AMAJF01021	Candidate		G5	S2S3	SC
30	***Monadenia troglodytes troglodytes*** Shasta sideband (snail)	IMGASC7090			G1G2	S1S2	
31	***Neviusia cliftonii*** Shasta snow-wreath	PDROS14020			G2	S2.2	1B.2
32	***Oncorhynchus tshawytscha spring-run*** spring-run chinook salmon	AFCHA0205A	Threatened	Threatened	G5T1Q	S1	
33	***Oncorhynchus tshawytscha winter run*** chinook salmon winter run	AFCHA0205B	Endangered	Endangered	G5T1Q	S1	
34	***Orcuttia tenuis*** slender orcutt grass	PMPOA4G050	Threatened	Endangered	G3	S3.1	1B.1
35	***Pandion haliaetus*** osprey	ABNKC01010			G5	S3	SC
36	***Paronychia ahartii*** Ahart's paronychia	PDCAR0L0V0			G2	S2.1	1B.1
37	***Riparia riparia*** bank swallow	ABPAU08010		Threatened	G5	S2S3	
38	***Trilobopsis roperi*** Shasta Chaparral	IMGASA2030			G1	S1	
39	***Viburnum ellipticum*** oval-leaved viburnum	PDCPR07080			G5	S2.3	2.3

APPENDIX C

CNPS Query Results

CNPS Inventory of Rare and Endangered Plants

Status: Plant Press Manager window with 15 items - Thu, Apr. 26, 2007 12:43 c

Reformat list as: Standard List - with Plant Press controls

ECOLOGICAL REPORT

scientific	family	life form	blooming	communities	elevation	CNPS
Agrostis hendersonii	Poaceae	annual herb	Apr-May	•Valley and foothill grassland (VFGrs) (mesic) •Vernal pools (VnPls)	70 - 305 meters	List 3.2
Anomobryum julaceum	Bryaceae	moss	•Broadleafed upland forest (BUFrs) •Lower montane coniferous forest (LCFrs) •North Coast coniferous forest (NCFrs)/damp rock and soil on outcrops, usually on roadcuts	100 - 1000 meters	List 2.2	
Carex scoparia	Cyperaceae	perennial herb	May	•Great Basin scrub (GBScr)(mesic)	130 - 1000 meters	List 2.2
Carex vulpinoidea	Cyperaceae	perennial herb	May-Jun	•Marshes and swamps (MshSw)(freshwater) •Riparian woodland (RpWld)	30 - 1200 meters	List 2.2
Castilleja rubicundula ssp. rubicundula	Scrophulariaceae	annual herb	Apr-Jun	•Chaparral (Chprl) (openings) •Cismontane woodland (CmWld) •Meadows and seeps (Medws) •Valley and foothill grassland (VFGrs)/serpentinite	20 - 900 meters	List 1B.2
Clarkia borealis ssp. borealis	Onagraceae	annual	Jun-Sep	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs)	400 - 1340 meters	List 1B.3
Cryptantha crinita	Boraginaceae	annual herb	Apr-May	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Riparian forest (RpFrs) •Riparian woodland (RpWld) •Valley and foothill grassland (VFGrs)/gravelly streambeds	85 - 1215 meters	List 1B.2
				•Marshes and swamps		

Gratiola heterosepala	Scrophulariaceae	annual herb	Apr-Aug	(MshSw)(lake margins) •Vernal pools (VnPls)/clay	10 - 2375 meters	List 1B.2
Juncus leiospermus var. leiospermus	Juncaceae	annual herb	Mar-May	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Meadows and seeps (Medws) •Valley and foothill grassland (VFGrs) •Vernal pools (VnPls)/vernally mesic	35 - 1020 meters	List 1B.1
Lathyrus sulphureus var. argillaceus	Fabaceae	perennial herb	Apr	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Upper montane coniferous forest (UCFrs)	150 - 305 meters	List 3
Legenere limosa	Campanulaceae	annual herb	Apr-Jun	•Vernal pools (VnPls)	1 - 880 meters	List 1B.1
Neviusia cliftonii	Rosaceae	perennial deciduous shrub	Apr-Jun	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Riparian woodland (RpWld)/ often streamsides; sometimes carbonate, volcanic, or metavolcanic	300 - 500 meters	List 1B.2
Orcuttia tenuis	Poaceae	annual herb	May-Sep(Oct) Months in parentheses are uncommon.	•Vernal pools (VnPls)	35 - 1760 meters	List 1B.1
Paronychia ahartii	Caryophyllaceae	annual herb	Mar-Jun	•Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs) •Vernal pools (VnPls)	30 - 510 meters	List 1B.1
Viburnum ellipticum	Caprifoliaceae	perennial deciduous shrub	May-Jun	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs)	215 - 1400 meters	List 2.3

APPENDIX D

Special-Status Species Considered for Analysis

Summary of Special-Status Species Review – Plants

Common Name *Scientific Name*	Status[1] (Fed/State/CNPS)	General Habitat Description/Elevation	Blooming Period	General Habitat Within Study Area (Present/ Absent)
Federal or State Listed Species				
Boggs Lake hedge-hyssop *Gratiola heterosepala*	--/E/1B.2	Clay soils within marshes and swamps (lake margins), vernal pools / 30-7,792 feet	April-August	**Absent.**
Slender Orcutt grass *Orcuttia tenuis*	T/E/1B.1	Vernal pools / 114-5,774 feet	May-October	**Absent**
Greene's tuctoria *Tuctoria greenei*	E/R/1B.1	Vernal pools / 98-3510 feet.	May-July	**Absent**
Other Special-Status Species				
Slender silver-moss *Anomobryum julaceum*	--/--/2.2	Damp rock and soil on outcrops within broadleafed upland forest, lower montane coniferous forest, North coast coniferous forest with; usually on roadcuts / 300-3,000 feet	Moss	**Absent**
Pointed broom sedge *Carex scoparia*	--/--/2.2	Mesic areas within Great Basin scrub / 426 – 3280 feet	May	**Absent**
Fox sedge *Carex vulpinoidea*	--/--/2.2	Freshwater marshes and swamps, and riparian woodland / 98-3,937 feet	May-June	**Present**
Pink creamsacs *Castilleja rubicundula* ssp. *rubicundula*	--/--/1B	Serpentinite soils within chaparral openings, cismontane woodland, meadows, seeps and valley and foothill grassland / 60-2,700 feet	April-June	**Absent.**
Northern clarkia *Clarkia borealis* ssp. *borealis*	--/--/1B.3	Chaparral, cismontane woodland, and lower montane coniferous forest / 1,312-4,396 feet	June-September	**Absent**
Silky cryptantha *Cryptantha crinita*	--/--/1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland / 278-984 feet	April-May	**Present.** Gravelly substrate present on gravel bars and old channels.
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	--/--/1B.1	Meadows and seeps, vernal pools; Vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland / 115-3,346 feet	March-May	**Present.** Foothill grassland present.
Legenere *Legenere limosa*	--/--/1B.1	Vernal pools / 3-2,887 feet	April-June	**Absent**
Shasta snow wreath *Neviusia cliftonii*	--/--/1B.2	Often on streamsides within lower montane coniferous forest and riparian woodland / 984-1,640 feet	April-May	**Absent**
Ahart's nailwort *Paronychia ahartii*	--/--/1B.1	Cismontane woodland, valley and foothill grassland and vernal pools / 90-1,530 feet	March-June	**Present.** Valley oak woodland and foothill grassland present.
Oval-leaved viburnum *Viburnum ellipticum*	--/--/2.3	Chaparral, cismontane woodland, and lower montane coniferous forest / 705-4,593 feet	May-June	**Absent**

Summary of Special-Status Species Review – Wildlife

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Federal or State Listed Species				
Invertebrates				
Conservancy fairy shrimp *Branchinecta lynchi*	T/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool setting and occurrences of listed vernal pool species do not occur near the study area.
Vernal pool fairy shrimp *Branchinecta conservatio*	E/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool setting and occurrences of listed vernal pool species do not occur near the study area.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs associated with riparian forests that occur along rivers and streams.	**Present**	Elderberry shrubs occur in the study area.
Vernal pool tadpole shrimp *Lepidurus packardi*	E/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool landscape and occurrences of listed vernal pool species do not occur near the study area.
Shasta crayfish *Pacifastacus fortis*	E/--	Pit River, Fall River and Hat Creek drainages in Shasta County	Absent	Watersheds in which the species occur do not occur in the study area. Thus, this species is eliminated from further consideration.
Fish				
Green sturgeon, southern DPS (*Acipenser medirostris*)	T/SC	Spawn in Sacramento and Feather rivers; juveniles are thought to rear mainly in the estuary.	**Present**	Suitable habitat occurs in the Sacramento River.
Delta smelt (*Hypomesus transpacificus*)	T/T	Estuarine systems in the Sacramento-San Joaquin Delta.	Absent	Suitable habitat not present.
Steelhead, California Central Valley DPS (*Oncorhynchus mykiss*) Critical Habitat	T/--	Spawn and rear in freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Central Valley spring-run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Critical Habitat	T/T	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.
Sacramento River winter-run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Critical Habitat	E/E	Freshwater river and streams. (Sacramento River and its tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.
Amphibians				
Shasta salamander *Hydromantes shastae*	--/T	Moist limestone fissures and caves, in volcanic and other rock outcroppings, and under woody debris in mixed pine-hardwood stands.	Absent	Limestone outcrops do not occur within the study area. Thus, this species is eliminated from further consideration.
California red-legged frog *Rana aurora draytonii*	T/SC	Require aquatic habitat for breeding, also uses a variety of other habitat types including riparian and upland areas. Adults utilize dense, shrubby or emergent vegetation associated with deep-water pools with fringes of cattails & dense stands of overhanging vegetation.	**Present**	One perennial pond occurs in the study area.
Birds				
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/E	Nesting habitat is cottonwood/willow riparian forest. Occurs only along the upper Sacramento Valley portion of the Sacramento River, the Feather River in Sutter Co., the south fork of the Kern River in Kern Co., and along the Santa Ana, Amargosa, and lower Colorado rivers	**Present**	Extensive cottonwood/willow riparian forest habitat occurs in the study area.
Willow flycatcher *Empidonax traillii*	--/E	Rare summer resident in wet meadow and montane riparian habitats at 2,000 to 8,000 feet elevation. No longer known to nest in Sacramento Valley but migrates through the north state region in spring and fall.	Absent	Suitable habitat not present.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
American peregrine falcon *Falco peregrinus anatum*	D/E, FP	Forages in many habitats; requires cliffs for nesting.	Absent	Suitable habitat not present.
Greater sandhill crane *Grus canadensis tabida*	--/T, FP	Wetlands required for breeding; forage in nearby pastures, fields, and meadows.	Absent	Suitable habitat not present.
Bald eagle *Haliaeetus leucocephalus*	T/E	Forages on live and dead fish and nests in large trees or snags. Requires large bodies of water, including ocean shorelines, lake margins, and large, open river courses for foraging, nesting, and wintering habitat.	**Present**	The Sacramento River runs along the western edge of the property and provides suitable foraging habitat.
Bank swallow *Riparia riparia*	--/T	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	**Present**	Vertical banks are present along the Sacramento River along the northwestern boundary of the site.
Northern spotted owl *Strix occidentalis caurina* Critical habitat	T/--	In northern California, resides in large stands of old growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats	Absent	Dense, mixed conifer forest is not present.
Mammals				
California wolverine *Gulo gulo luteus*	--/T, FP	A variety of habitats within the elevations of 1,600 and 14,200 ft. Most commonly inhabits open terrain above timberline.	Absent	Suitable habitat not present.
Pacific fisher *Martes pennanti pacifica*	C/SC	Dens and forages in intermediate to large stands of old-growth forests or mixed stands of old-growth and mature trees with greater than 50% canopy closure. May use riparian corridors for movement.	Absent	Suitable habitat not present.
Sierra Nevada red fox *Vulpes vulpes nector*	--/T	Red fir and lodgepole pine forests in the sub-alpine zone and alpine fell-fields of the Sierra Nevada.	Absent	Suitable habitat not present.
Other Special-Status Species				
Fish				
River lamprey *(Lampetra ayresii)*	--/SC	The biology of river lampreys has not been studied in California, general habitat and life history thought to be similar to Pacific lamprey.	**Present**	Suitable habitat occurs in the Sacramento River.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Central Valley fall/late-fall run ESU Chinook salmon (*Oncorhynchus tshawytscha*)	SC/SC	Freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**	Suitable habitat occurs in the Sacramento River.
Hardhead (*Mylopharodon conocephalus*)	--/SC	Quiet deep pools of large, warm, clear streams over rocks or sand.	**Present**	Suitable habitat occurs in the Sacramento River.
Pit roach *Lavinia symmetricus mitrulus*	--/SC	Small, warm, intermittent streams in the upper Pit River and its tributaries and tributaries to Goose Lake.	Absent	Study area outside the upper Pit River watershed.
McCloud River redband trout *Oncorhynchus mykiss ssp.*	--/SC	McCloud River and its tributaries, Swamp Creek and Trout Creek.	Absent	Study area is outside the McCloud River watershed.
Sacramento splittail *Pogonichthys macrolepidotus*	--/SC	Shallow, dead-end sloughs with submerged vegetation.	Absent	Native, non-game species; historically occurred near Redding, however, range is not thought to presently extend above Red Bluff.
Longfin smelt *Spirinchus thaleichthys*	--/SC	Sloughs of Suisun Bay and Delta.	Absent	Suitable habitat not present.
Amphibians				
Tailed frog *Ascaphus truei*	--/SC	Clear, rocky, swift, cool perennial streams in densely forested habitats.	Absent	Suitable habitat not present.
Foothill yellow-legged frog *Rana boylii*	--/SC	Rocky streams in a variety of habitats. Found in coast ranges.	Absent	Suitable habitat not present.
Cascades frog *Rana cascadae*	--/SC	Open coniferous forests along the sunny, rocky banks of ponds, lakes, streams, and meadow potholes. From 2,600 to 9,000 feet in elevation in Cascades and Trinity Mountains.	Absent	Suitable habitat not present.
Western spadefoot toad *Spea hammondii*	--/SC	Grasslands with temporary pools.	**Present**	One intermittent pool is located within a grassland in the northeast section of the site.
Reptiles				
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SC	Slow water aquatic habitat with available basking sites. Hatchlings require shallow water with dense submergent or short emergent vegetation. Require an upland oviposition site in the vicinity of the aquatic site	**Present**	One perennial pond occurs on the project site.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Birds				
Long-billed curlew *Numenius americanus*	--/SC	Large coastal estuaries, upland herbaceous areas, and croplands. Breeds in wet meadow habitat.	Absent	Suitable habitat not present.
Double-crested cormorant *Phalacrocorax auritus*	--/SC	Inland lakes; fresh, salt and estuarine waters.	**Present**	Suitable nesting habitat not present on site due to level of human disturbance. May occur as a forager.
White-faced ibis *Plegadis chihi*	--/SC	A rare visitor to the Central Valley, this species nests and forages in freshwater marshes.	Absent	Suitable habitat not present.
California spotted owl *Strix occidentalis occidentalis*	--/SC	Dense, multi-layered mixed conifer, redwood, and Douglas-fir habitats with large overstory trees.	Absent	Conifer forest not present in study area.
Merlin *Falco columbarius*	--/SC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.	**Present**	Woodlands provide suitable habitat.
Long-eared owl *Asio otus*	--/SC	Dense riparian and live oak thickets near meadow edges, and nearby woodland and forest habitats; also found in dense conifer stands at higher elevations.	Absent	Dense vegetation and meadows do not occur within the study area.
Western burrowing owl *Athene cunicularia hypugaea*	--/SC	Open habitats, dry grasslands and ruderal habitats with ground squirrel burrows.	**Present**	Suitable habitat present, however, there are no known occurrences in the area.
Golden eagle *Aquila chrysaetos*	--/SC/FP	Breeds on cliffs or in large trees or electrical towers, forages in open areas.	Absent	Open habitats and cliffs do not occur in the study area. Thus, this species is eliminated from further consideration
Sharp-shinned hawk *Accipiter striatus*	--/SC	Typically nests in dense conifer stands near water, winters in woodlands. Forages in many habitats in winter and migration.	**Present**	Unlikely to nest in area but may occur as a winter migrant.
Cooper's hawk *Accipiter cooperii*	--/SC	Nests in woodlands, forages in many habitats in winter and migration.	**Present**	Suitable nesting and foraging habitat is present in the project.
Northern goshawk *Accipiter gentilis*	--/SC	Breeds in dense, mature conifer and deciduous forests, interspersed with meadows, other openings and riparian areas; nesting habitat includes north-facing slopes near water.	Absent	Dense coniferous forests do not occur in the study area.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Ferruginous hawk *Buteo regalis*	--/SC	Forages in grasslands and occasionally in other open habitats during migration and winter.	**Present**	May be rare as migrant.
Northern harrier *Circus cyaneus*	--/SC	Forages in marshes, grasslands, and ruderal habitats; nests in extensive marshes and wet fields or grasslands.	Absent	Open grasslands or marshlands do not occur in the study area. Thus, this species is eliminated from further consideration
Prairie falcon *Falco mexicanus*	--/SC	Occurs in open habitats such as grasslands, desert scrub, rangelands and croplands. Nests on open cliffs.	**Present**	May be rare as migrant.
White-tailed kite *Elanus leucurus*	--/FP	Nests in lowlands with dense oak or riparian stands near open areas, forages over grassland, meadows, cropland and marshes.	**Present**	Woodlands and riparian forest provided suitable habitat.
Osprey *Pandion haliaetus*	--/SC	Ocean shorelines, lake margins and large, open river courses for both nesting and wintering habitat.	**Present**	Riparian habitat or large bodies of water occur in and near the study area
Black swift *Cypseloides niger*	--/SC	Nests in moist crevice or cave or sea cliffs above the surf, or on cliffs behind, or adjacent to, waterfalls in deep canyons; forages widely over many habitats.	Absent	Cliffs, deep canyons not present in Project vicinity. Thus, this species is eliminated from further consideration
Vaux's swift *Chaetura vauxi*	--/SC	Prefers redwood and Douglas-fir habitats, nests in hollow trees and snags or, occasionally, in chimneys; forages aerially.	Absent	Neither redwood nor Douglas-fir habitat is present. Thus, this species is eliminated from further consideration
Purple martin *Progne subis*	--/SC	Breeding habitat includes old-growth, multi-layered, open forest and woodland with snags; forages over riparian areas, forest, and woodlands	Absent	Multi-layered old growth does not occur in the study area. Thus, this species is eliminated from further consideration
Tricolored blackbird *Agelaius tricolor*	--/SC	Breeds near fresh water in dense emergent vegetation. Forages in grassland and cropland.	Absent	Dense emergent vegetation does not occur in the wetlands occuring in the study area. Foraging habitat is not available. Thus, this species is eliminated from further consideration.
California yellow warbler *Dendroica petechia brewsteri*	--/SC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	**Present**	Riparian habitat occurs in and near the study area.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Yellow-breasted chat *Icteria virens*	--/SC	Breeds in riparian habitats having dense understory vegetation, such as willow and blackberry.	**Present**	Riparian habitat occurs in and near the study area.
Bell's Sage Sparrow *Amphispiza belli belli*	--/SC	Nests in shrublands, preferably coastal scrub but is tolerant to a variety of shrublands. Irregular in its northern range of the western Shasta and Trinity Counties	Absent	Mixed chaparral occurs in the study area. Study area located near northernmost range of species
Loggerhead shrike *Lanius ludovicianus*	--/SC	Prefers open habitats with scatters shrubs and trees throughout the Central Valley of California. Nests in shrubs and trees.	**Present**	Open shrub/tree habitat occurs in the study area
Mammals				
Ringtail *Bassariscus astutus*	--/FP	Riparian habitats and in brush stands of most forest and shrub habitats. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows or woodrat nests.	**Present**	Riparian habitat occurs in and near the study area.
Sierra Nevada snowshoe hare *Lepus americanus tahoensis*	--/SC	Boreal zones, typically inhabiting riparian communities with thickets of deciduous trees and shrubs above 4,800 ft. They also inhabit thickets of young conifers and chaparral.	Absent	Study area is below the required elevation for suitable habitat.
Townsend's western big-eared bat *Corynorhinus townsendii*	--/SC	Roosts in colonies in caves, mines, tunnels, or buildings in mesic habitats. The species forages along habitat edges, gleaning insects from bushes and trees. Habitat must include appropriate roosting, maternity and hibernacula sites free from disturbance by humans.	Absent	Roosting habitat is not present.
Pallid bat *Antrozous pallidus*	--/SC	Forages over many habitats; roosts in buildings, large oaks or redwoods, rocky outcrops and rocky crevices in mines and caves, and under bridges. Roosts must protect from high temperatures	**Present**	Roosting habitat does not occur within the study area; however suitable foraging habitat occurs in the study area.
Spotted bat *Euderma maculatum*	--/SC	Ponderosa pine region of the western highlands. Prefers cracks/crevices of high cliffs and canyons for roosting.	Absent	Ponderosa pine habitat not present and the project is located out of the current range of this species. Thus, this species is eliminated from further consideration

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Western mastiff bat *Eumops perotis*	--/SC	Roosts in cliff faces, rock outcrops, and buildings. Forages in open habitats. Needs vertical face to take flight.	**Present**	Roosting habitat does not occur within the study area; however suitable foraging habitat occurs in the study area.
American badger *Taxidea taxus*	--/SC	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	Absent	Suitable habitat does not occur within the study area.

[1]**Status and Habitat Codes:** Absent means general habitat is not present and no further work needed. Present means general habitat is present and species may be present.
Federal and State Codes: E = Endangered; T = Threatened; C = Candidate; Species of Special Concern (State); D = Delisted (status to be monitored for 5 years); FP = California Fully Protected Species. CNPS Codes: List 1B = Rare, Threatened or Endangered in CA and Elsewhere; List 2 = Rare, Threatened or Endangered in CA, but more common elsewhere.

APPENDIX E

Plant and Wildlife Species Observed

Plant Species Observed on the Strawberry Fields Study Area

Observers: Colby Boggs and Paul Kirk

Dates: April 25, May 3, May 9, and June 27, 2007

Annual Grassland		
Scientific name	**Common name**	**Family**
Aira caryophyllea	Silver European hairgrass	Poaceae
Amsinckia menziesii var. *intermedia*	Common fiddleneck	Boraginaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Bromus diandrus	Ripgut brome	Poaceae
Bromus hordeaceus	Soft brome	Poaceae
Bromus madritensis ssp. *rubens*	Red brome	Poaceae
Capsella bursa-pastoris	Shepherd's purse	Brassicaceae
Castilleja attenuata	Valley tassels	Scrophulariaceae
Centaurea solstitialis	Yellow star-thistle	Asteraceae
Cerastium glomeratum	Sticky mouse-eared chickweed	Caryophyllaceae
Chamomilla suaveolens	Pineapple weed	Asteraceae
Cichorium intybus	Chicory	Asteraceae
Cirsium vulgare	Bull thistle	Asteraceae
Convolvulus arvensis	Bindweed	Convolvulaceae
Cryptantha flaccida	Flaccid cryptantha	Boraginaceae
Cynodon dactylon	Bermuda grass	Poaceae
Cyperus eragrostis	Tall flatsedge	Cyperaceae
Dipsacus fullonum	Wild teasel	Dipsacaceae
Elymus elymoides	Squirreltail	Poaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Eriogonum luteolum	Golden buckwheat	Polygonaceae
Eriogonum nudum	Naked eriogonum	Polygonaceae
Eriogonum sphaerocephalum	Round-headed buckwheat	Polygonaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Eriophyllum lanatum	Woolly sunflower	Asteraceae
Erodium botrys	Long-beaked stork's bill	Geraniaceae
Erodium cicutarium	Red-stemmed filaree	Geraniaceae
Eschscholzia californica	California poppy	Papaveraceae
Filago californica	California herba impia	Asteraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Grindelia camporum	Great valley gumweed	Asteraceae
Heterotheca oregona	Oregon goldenaster	Asteraceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Poaceae
Hordeum murinum ssp. *leporinum*	Foxtail barley	Poaceae
Hypochaeris glabra	Smooth cat's-ear	Asteraceae
Juncus effusus	Common bog rush	Juncaceae
Keckiella breviflora	Gaping keckiella	Scrophulariaceae
Leontodon taraxacoides	Hawkbit	Asteraceae
Lolium multiflorum	Italian ryegrass	Poaceae
Lomatium dasycarpum	Woolly-fruited lomatium	Apiaceae
Lotus humistratus	Short-podded lotus	Fabaceae

Annual Grassland (cont.)		
Scientific name	**Common name**	**Family**
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Miniature lupine	Fabaceae
Mentzelia laevicaulis	Smooth-stem blazing star	Loasaceae
Petrorhagia dubia	Grass pink	Caryophyllaceae
Plagiobothrys fulvus	Fulvous popcorn flower	Boraginaceae
Plantago erecta	Erect plantain	Plantaginaceae
Raphanus raphanistrum	Jointed charlock	Brassicaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Sagina apetala	Dwarf pearlwort	Caryophyllaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Senecio vulgaris	Old man of spring	Asteraceae
Silybum marianum	Milk thistle	Asteraceae
Sonchus oleraceus	Common sow thistle	Asteraceae
Sorghum halepense	Johnson grass	Poaceae
Spergularia rubra	Ruby sandspurry	Caryophyllaceae
Symphytum officinale	Comfrey	Boraginaceae
Taraxacum officinale	Common dandelion	Asteraceae
Trifolium dubium	Shamrock	Fabaceae
Trifolium hirtum	Rose clover	Fabaceae
Trifolium microcephalum	Small-head field clover	Fabaceae
Trifolium repens	White clover	Fabaceae
Veronica peregrina ssp. *xalapensis*	Purslane speedwell	Scrophulariaceae
Vicia villosa	Winter vetch	Fabaceae
Vulpia myuros	Rattail fescue	Poaceae

Valley Foothill Riparian		
Acacia dealbata	Silver wattle	Fabaceae
Agrostis exarata	Spike bentgrass	Poaceae
Ailanthus altissima	Tree-of-heaven	Simaroubaceae
Alnus rhombifolia	White alder	Betulaceae
Aristolochia californica	Pipevine	Aristolochiaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asparagus officinalis ssp. *officinalis*	Asparagus	Liliaceae
Barbarea orthoceras	Winter cress	Brassicaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Small quaking grass	Poaceae
Bromus diandrus	Ripgut brome	Poaceae
Bromus hordeaceus	Soft brome	Poaceae
Carduus pycnocephalus	Italian plumeless thistle	Asteraceae
Carex integra	Smooth-beaked sedge	Cyperaceae
Carex nudata	Torrent sedge	Cyperaceae
Cercis occidentalis	Western redbud	Fabaceae
Cyperus eragrostis	Tall flatsedge	Cyperaceae
Datura wrightii	Toluaca	Solanaceae
Dipsacus fullonum	Wild teasel	Dipsacaceae
Echinochloa crus-galli	Barnyard grass	Poaceae
Elymus elymoides	Squirreltail	Poaceae
Epilobium brachycarpum	Tall annual willowherb	Onagraceae

Valley Foothill Riparian (cont.)		
Scientific name	**Common name**	**Family**
Equisetum laevigatum	Smooth scouring rush	Equisetaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Festuca rubra	Red fescue	Poaceae
Ficus carica	Common fig	Moraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Galium aparine	Goose grass	Rubiaceae
Geranium molle	Dove's foot geranium	Geraniaceae
Gnaphalium californicum	California everlasting	Asteraceae
Hordeum murinum	Barley	Poaceae
Iris pseudacorus	Water iris	Iridaceae
Juglans californica	California black walnut	Juglandaceae
Juncus effusus	Common bog rush	Juncaceae
Juncus saximontanus	Rocky mountain rush	Juncaceae
Lactuca serriola	Prickly lettuce	Asteraceae
Leontodon taraxacoides	Hawkbit	Asteraceae
Lolium multiflorum	Italian ryegrass	Poaceae
Melilotus alba	White sweetclover	Fabaceae
Morus alba	Mulberry	Moraceae
Paspalum dilatatum	Dallis grass	Poaceae
Phytolacca americana	Pokeweed	Phytolaccaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Gray pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Plectritis ciliosa	Long-spurred plectritis	Valerianaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Populus fremontii ssp. *fremontii*	Fremont cottonwood	Salicaceae
Quercus lobata	Valley oak	Fagaceae
Quercus wislizenii	Interior live oak	Fagaceae
Rhamnus californica	California coffeeberry	Rhamnaceae
Robinia pseudoacacia	Black locust	Fabaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Rumex acetosella	Common sheep sorrel	Polygonaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Salix lasiolepis	Arroyo willow	Salicaceae
Sambucus mexicana	Blue elderberry	Caprifoliaceae
Saponaria officinalis	Bouncing bet	Caryophyllaceae
Setaria pumila	Yellow bristle grass	Poaceae
Silybum marianum	Milk thistle	Asteraceae
Sonchus oleraceus	Common sow thistle	Asteraceae
Stellaria media	Common chickweed	Caryophyllaceae
Torilis arvensis	Field hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Ulmus minor	Smoothleaf elm	Ulmaceae
Verbascum thapsus	Woolly mullein	Scrophulariaceae
Vicia villosa	Winter vetch	Fabaceae
Vitis californica	California wild grape	Vitaceae
Vulpia myuros	Rattail fescue	Poaceae

Foothill Pine		
Scientific name	**Common name**	**Family**
Ailanthus altissima	Tree-of-heaven	Simaroubaceae
Anthoxanthum aristatum	Annual vernal grass	Poaceae
Arctostaphylos manzanita	Big leaved manzanita	Ericaceae
Avena barbata	Slender wild-oat	Poaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Small quaking grass	Poaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Gilia capitata	Blue field-gilia	Polemoniaceae
Heterotheca oregona	Oregon goldenaster	Asteraceae
Juglans californica	California black walnut	Juglandaceae
Lepidium virginicum	Wild pepper-grass	Brassicaceae
Linaria genistifolia ssp. *dalmatica*	Dalmatian toad-flax	Scrophulariaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Petrorhagia dubia	Grass pink	Caryophyllaceae
Pinus sabiniana	Gray pine	Pinaceae
Populus fremontii ssp. *fremontii*	Fremont cottonwood	Salicaceae
Quercus wislizenii	Interior live oak	Fagaceae
Raphanus raphanistrum	Jointed charlock	Brassicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Spartium junceum	Gorse	Fabaceae
Verbascum blattaria	Moth mullein	Scrophulariaceae

Valley Oak Woodland		
Camissonia contorta	Contorted sun-cup	Onagraceae
Chenopodium ambrosioides	Mexican tea	Chenopodiaceae
Cryptantha flaccida	Flaccid cryptantha	Boraginaceae
Heterotheca grandiflora	Telegraph weed	Asteraceae
Marrubium vulgare	Horehound	Lamiaceae
Morus alba	Mulberry	Moraceae
Orobanche fasciculata	Clustered broom-rape	Orobanchaceae
Phacelia heterophylla ssp. *virgata*	Virgate phacelia	Hydrophyllaceae
Rhamnus tomentella	Hoary coffeeberry	Rhamnaceae
Vitis californica	California wild grape	Vitaceae

Intermittent Pool and Pond		
Digitaria sanguinalis	Crabgrass	Poaceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Poaceae
Juncus bufonius	Toad rush	Juncaceae
Lemna minor	Common duckweed	Lemnaceae
Lolium multiflorum	Italian ryegrass	Poaceae
Lotus corniculatus	Birdfoot trefoil	Fabaceae
Poa annua	Annual blue grass	Poaceae
Polygonum arenastrum	Common knotweed	Polygonaceae
Veronica peregrina ssp. *xalapensis*	Purslane speedwell	Scrophulariaceae

Wildlife Species Observed on the Strawberry Fields Study Area

Observer: Colby Boggs, Ginger Bolen, and Heather Kelly
Dates: April 25, May 3, May 9, May 10, June 27, and November 2, 2007

Common name	***Scientific name***
Pacific chorus frog	*Pseudacris regilla*
bullfrog	*Rana catesbeiana*
alligator lizard	*Elgaria* sp.
fence lizard	*Sceloporus occidentalis*
mallard duck	*Anas platyrhynchos*
scrub jay	*Aphelocoma californica*
great egret	*Ardea alba*
Canada goose	*Branta canadensis*
red-tailed hawk	*Buteo jamaicensis*
California quail	*Callipepla californica*
turkey vulture	*Cathartes aura*
killdeer	*Charadrius vociferus*
red-shafted flicker	*Colaptes auratus*
acorn woodpecker	*Melanerpes formicivorus*
song sparrow	*Melospiza melodia*
downy woodpecker	*Picoides pubescens*
spotted towhee	*Pipilo maculatus*
western tanager	*Piranga ludoviciana*
blue-gray gnatcatcher	*Polioptila caerulea*
bushtits	*Psaltriparus minimus*
bank swallow	*Riparia riparia*
black phoebe	*Sayornis nigricans*
red breasted nuthatch (migrant)	*Sitta canadensis*
American robin	*Turdus migratorius*
western kingbird	*Tyrannus verticalis*
mourning dove	*Zenaida macroura*
coyote	*Canis latrans*
black-tailed jack rabbit	*Lepus californicus*
mule deer	*Odocoileus hemionus*
grey squirrel	*Sciurus griseus*

APPENDIX F

Summary Table of VELB Survey Data

Summary Table of VELB Survey Data from the Strawberry Fields Study Area.

Observer: Paul Kirk

Survey Dates: June 27, June 28, June 29, and August 2, 2007

Elderberry Shrub Number	# Exit Holes	Stems 1-3”	Stems 3-5”	Stems >5”	Approximate Shrub Ht. (ft)	Riparian Location?	Associated Habitat
1	0	0	0	1	12	No	Annual grassland
2	0	0	8	3	18	Yes	Valley foothill riparian
3	0	6	9	8	18	Yes	Valley foothill riparian
4	4	2	4	11	20	No	Valley oak woodland
5	1	0	4	3	15	No	Valley oak woodland
6	0	0	1	1	20	No	Valley oak woodland
7	0	0	0	1	25	No	Valley oak woodland
8	0	0	0	1	15	No	Valley oak woodland
9	0	0	0	2	46	Yes	Valley foothill riparian
10	0	0	1	3	18	Yes	Valley foothill riparian
11	0	3	2	0	18	Yes	Valley foothill riparian
12	0	1	0	0	12	Yes	Valley foothill riparian
13	NS[1]	≥ 1	NS[1]	NS[1]	18	Yes	Valley foothill riparian
14	NS[1]	≥ 1	NS[1]	NS[1]	18	Yes	Valley foothill riparian
15	0	0	0	1	20	No	Valley oak woodland
16	0	2	0	2	15	No	Valley oak woodland
17	0	2	1	2	12	No	Valley oak woodland
18	0	0	0	2	12	No	Valley oak woodland
19	0	4	5	2	18	No	Valley oak woodland
20	1	1	1	3	20	No	Valley oak woodland
21	0	4	0	2	15	No	Valley oak woodland
22	0	4	2	4	18	Yes	Valley foothill riparian
23	0	6	6	1	18	Yes	Valley foothill riparian
24	0	6	4	2	15	Yes	Valley foothill riparian
25	0	4	6	2	18	Yes	Valley foothill riparian
26	0	0	0	2	18	No	Valley oak woodland
27	0	0	1	0	15	No	Valley oak woodland
28	3	1	1	3	18	No	Valley oak woodland
29	3	0	0	8	16	No	Valley oak woodland
30	0	1	2	9	18	Yes	Valley foothill riparian
31	0	3	3	0	12	Yes	Valley foothill riparian

Elderberry Shrub Number	# Exit Holes	Stems 1-3”	Stems 3-5”	Stems >5”	Approximate Shrub Ht. (ft)	Riparian Location?	Associated Habitat
32	0	1	0	0	10	Yes	Valley foothill riparian
33	2	0	2	0	12	Yes	Valley foothill riparian
34	0	1	0	0	8	Yes	Valley foothill riparian
35	0	2	0	0	8	Yes	Valley foothill riparian
36	0	7	5	1	15	Yes	Valley foothill riparian
37	7	3	1	3	18	Yes	Valley foothill riparian
38	0	3	1	3	14	Yes	Valley foothill riparian
40[2]	0	1	0	2	15	Yes	Valley foothill riparian
41	0	1	0	0	10	Yes	Valley foothill riparian
42	0	1	1	0	15	Yes	Valley foothill riparian
43	3	4	1	0	12	Yes	Valley foothill riparian
44	0	0	1	0	12	Yes	Valley foothill riparian
45	0	1	0	0	8	Yes	Valley foothill riparian
47[2]	0	1	5	6	18	Yes	Valley foothill riparian
48	0	1	0	0	12	No	Annual grassland
49	0	14	4	3	16	No	Riverine
50	0	6	2	1	12	No	Riverine
51	0	3	1	0	15	No	Annual grassland
52	0	3	0	1	18	Yes	Valley foothill riparian
53	0	0	1	2	15	Yes	Valley foothill riparian
54	0	1	1	1	20	Yes	Valley foothill riparian
55	6	1	3	9	20	Yes	Valley foothill riparian
56	1	1	1	1	12	Yes	Valley foothill riparian
57	0	1	0	1	16	Yes	Valley foothill riparian
58	0	0	1	0	14	Yes	Valley foothill riparian
59	0	0	2	2	16	No	Valley oak woodland
60	1	0	0	4	16	No	Valley oak woodland
62	0	1	0	0	9	Yes	Valley foothill riparian
61	1	1	1	2	20	No	Valley oak woodland
63	0	4	1	2	12	Yes	Valley foothill riparian
64	3	1	2	5	15	Yes	Valley foothill riparian

[1] These shrubs are overgrown with Himalayan blackberry and were not surveyed (NS) for exit holes. Stem count and shrub height were estimated using binoculars.

[2] Break in sequence due to duplicate GPS recording.

APPENDIX G

Representative Photographs of VELB Exit Holes

Representative Photographs of VELB Exit Holes Observed at the Strawberry Fields Study Area

Photographs taken on June 29 and August 2, 2007

Photograph 1. Old VELB exit hole on elderberry stem (shrub #37). This shrub had seven exit holes on three different stems.

Photograph 2. Recent VELB exit hole with clean edges on elderberry stem (shrub # 55).

ATTACHMENT C

NSR CALIFORNIA RED-LEGGED FROG SITE ASSESSMENT OF THE STRAWBERRY FIELDS STUDY AREA

STRAWBERRY FIELDS STUDY AREA

California Red-Legged Frog Site Assessment

November 6, 2007

Prepared for:
Mr. Neal Malmsten
Redding Rancheria Tribe
2000 Redding Rancheria Road
Redding, CA 96001

Prepared by:
North State Resources, Inc.
500 Orient Street, Suite 150
Chico, CA 95928
(530) 345-4552
Fax: (530) 345-4805

NSR 50780

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CALIFORNIA RED-LEGGED FROG SITE ASSESSMENT

1.0 INTRODUCTION

This California red-legged frog (*Rana aurora draytonii*) site assessment was conducted on behalf of the Redding Rancheria Tribe for the Strawberry Fields Study Area (study area). The study area is located south of the City of Redding, Shasta County, California and can be found within the *Enterprise, California* U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Township 31 North, Range 4 West, Sections 19 and 20). The western and eastern extent of the study area are located at approximately 40º 31’ 67”N latitude by 122° 21’ 53”W longitude and 40º 31’ 67”N latitude by 122° 20’ 81”W longitude, respectively. A map of the study area is presented as Figure 1.

2.0 PROJECT DESCRIPTION

No project is currently proposed; however, the Redding Rancheria Tribe has requested an analysis of potential constraints to development of the study area.

3.0 ENVIRONMENTAL SETTING

The study area is currently undeveloped. The area has been used to grow strawberries in the past; however, it is not currently under cultivation and has been fallow for several years. Several dirt roads/trails traverse the site. The study area is bounded on the west by the Sacramento River and on the east by I-5. Rural residential neighborhoods serve as the northern and southern boundaries.

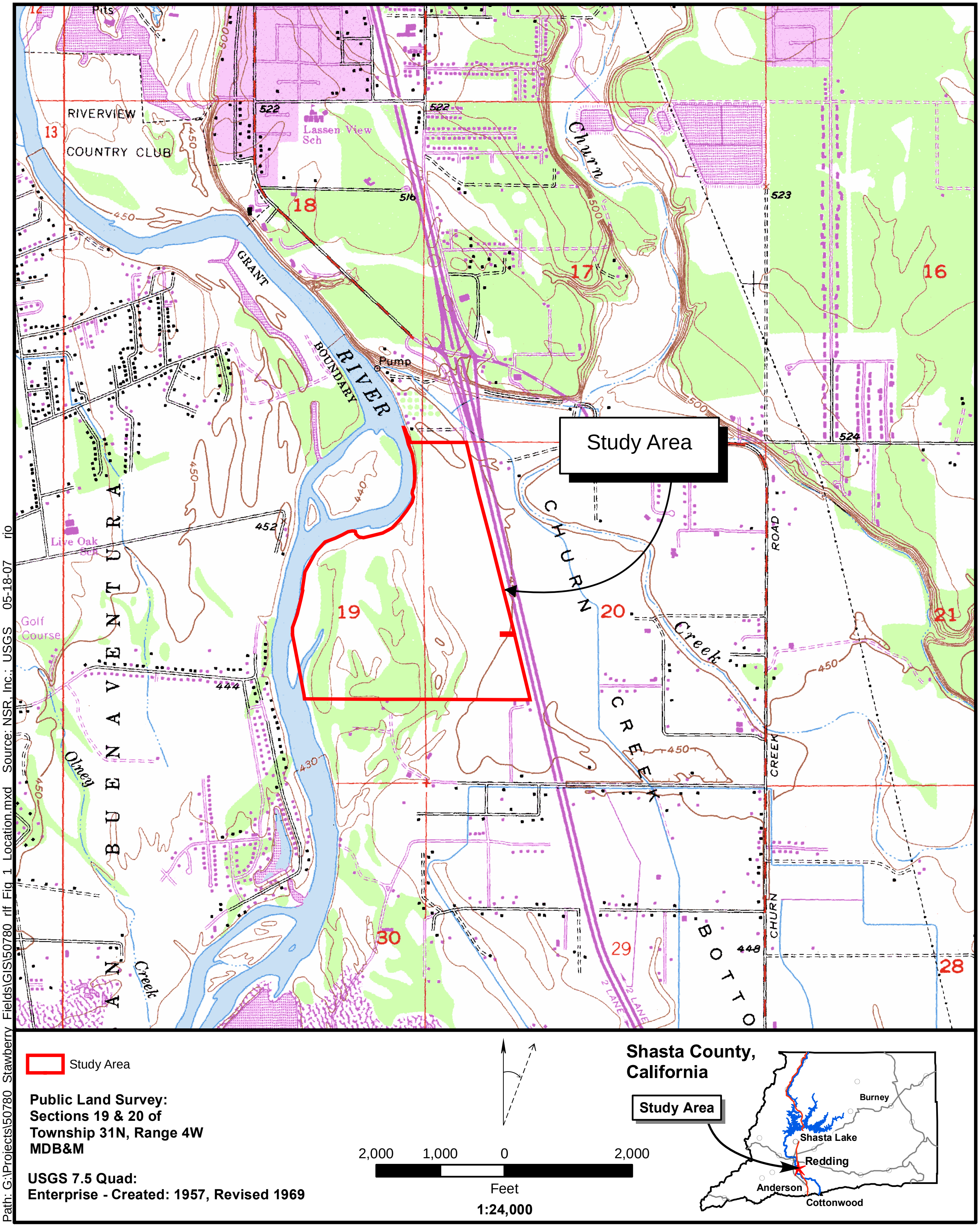
The topography in the study area is mostly flat with elevations ranging from approximately 430 to 450 feet above mean sea level. Plant communities consist of valley oak woodland, annual grassland, valley foothill riparian, foothill pine woodland, and riverine (Mayer and Laudenslayer 1988).

North State Resources, Inc. (NSR) conducted a delineation of waters of the United States occurring within the study area boundary on June 15, 16, and 21, 2006. A separate wetland delineation report was submitted to the U.S. Army Corps of Engineers (ACOE) for verification on April 23, 2007.

4.0 CALIFORNIA RED-LEGGED FROG BIOLOGY

RANGE OF THE CALIFORNIA RED-LEGGED FROG

Historically, the California red-legged frog ranged from Point Reyes National Seashore in Marin County inland to the Central Valley and the Redding vicinity and south to northwestern Baja California, Path: G:\Projects\50780 Stawberry Fields\GIS\50780 rlf Fig 1 Location.mxd Source: NSR, Inc.; USGS 05-18-07 rio



North State Resources, Inc.

Strawberry Fields Red-legged Frog Survey

Figure 1
Project Location and Vicinity Map

Mexico. It occurred in 46 counties in California. Today, that range has been reduced to 31 counties (U.S. Fish and Wildlife Service 2005a). Populations outside of the San Francisco Bay area and central coast areas are isolated, and the species is predominantly extirpated from the southern Transverse and Peninsular ranges in California, although some populations persist. A map of the historical and current range of the California red-legged frog is presented as Figure 2. The study area is located within the historical range of the California red-legged frog but not within its currently known range (U.S. Fish and Wildlife Service 2002).

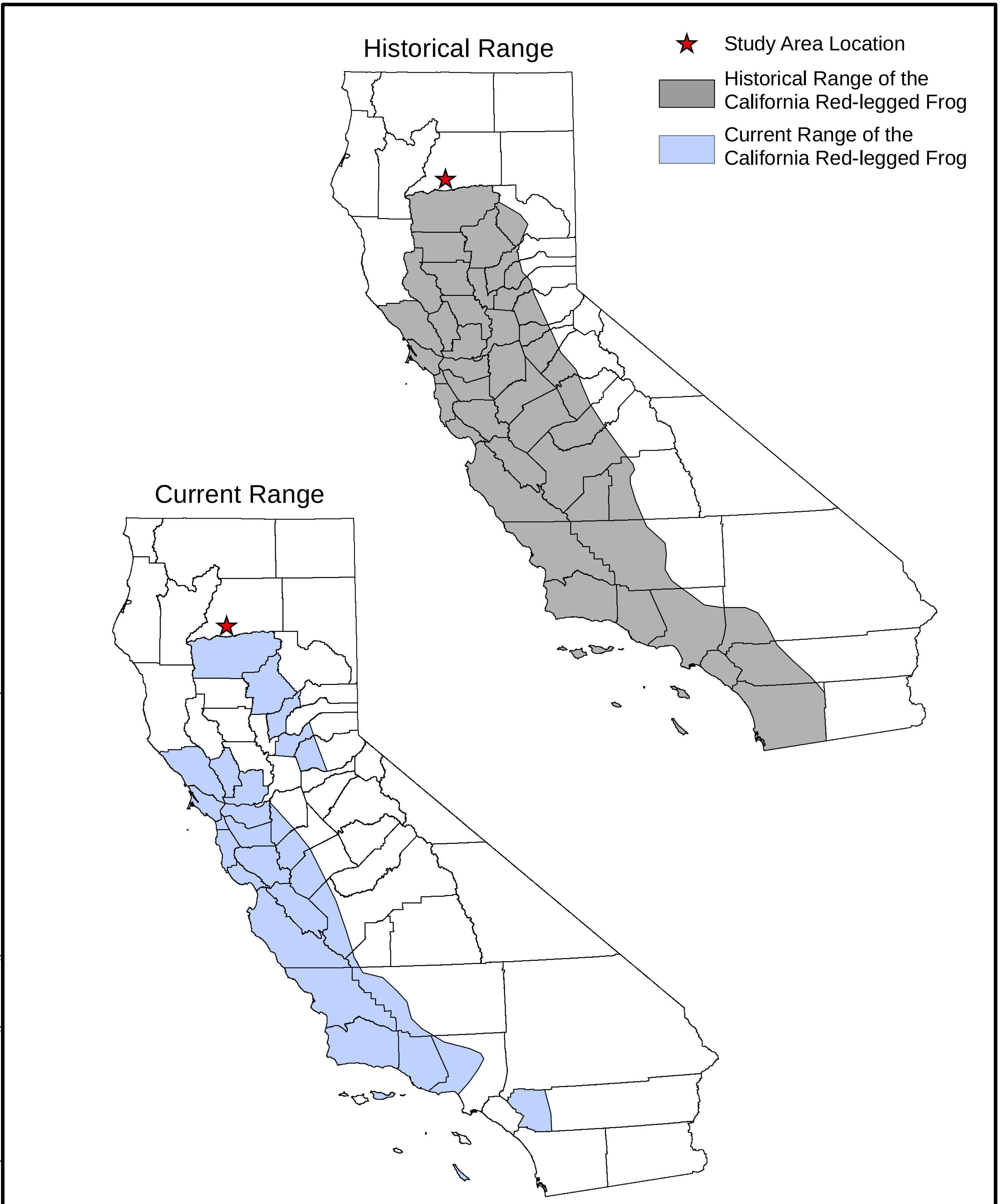
LIFE HISTORY

The California red-legged frog is a member of the family Ranidae within the order Anura, and is one of two subspecies of the red-legged frog (*Rana aurora*) (U.S. Fish and Wildlife Service 2000). The red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), with adults obtaining a length of 3.4 to 5.4 inches from the tip of the snout to the rear of the vent (Jennings and Hayes 1994). Adult red-legged frogs have prominent dorsolateral folds, a bright red dorsum, and a well-defined stripe running along the upper lip. Juvenile frogs are 1.5 to 3.4 inches from the tip of the snout to the rear of the vent and have the same coloration as adults except that the dorsolateral folds are normally yellow or orange colored, especially in very young individuals (Stebbins 2003). Larval frogs range from 0.6 to 3.1 inches in length.

Adult California red-legged frogs have been observed to breed from late November through early May after the onset of warm rains (Storer 1925; Jennings and Hayes 1994). Females attach an egg mass of 2,000 to 6,000 moderate-sized (0.08 to 0.11 inch diameter) eggs to an emergent vegetation brace such as stems of tules (*Scirpus* spp.) and annual grasses (Poaceae), or roots of willows (*Salix* spp.) just below the water surface (Livezey and Wright 1947; Storer 1925).

Embryos of California red-legged frogs hatch 6 to 14 days after fertilization and the resulting larvae require 3.5 to 7 months to attain metamorphosis at a total length of 2.6 to 3.4 inches (Storer 1925). Larvae are thought to graze on algae, but they are rarely observed because they are often concealed in submergent vegetation or detritus (Jennings and Hayes 1994). Most larvae metamorphose into juvenile frogs between July and September. Post-metamorphic frogs grow rapidly by feeding on a wide variety of invertebrates. Adult frogs apparently eat a variety of animal prey including invertebrates, small fishes, frogs, and small mammals (Hayes and Tennant 1985; Arnold and Halliday 1986).

California red-legged frogs have been observed in a number of aquatic habitats throughout their historic range. The key to their occurrence in these habitats is the presence of perennial, or near perennial, water and the general lack of introduced aquatic predators such as crayfish (*Pacifastacus leniusculus* and *Procambarus clarkii*), bullfrogs (*Rana catesbeiana*), bluegill (*Lepomis macrochirus*), and other centrarchid fishes such as largemouth bass (*Micropterus salmoides*). In addition to aquatic habitats, juvenile and adult California red-legged frogs use areas of riparian vegetation within a few yards of water. The species also uses small mammal burrows in or under vegetation, willow root wads, and the undersides of old boards and other debris within the riparian zone (Jennings and Hayes 1994).



Source: U.S. Fish and Wildlife Service. 2002. Recovery plan for the California red-legged frog (Rana aurora draytonii). Portland: U.S. Fish and Wildlife Service.

50780 Strawberry Fields\GIS\50780 Fig2 RLF range Source: NSR Inc. 05-18-07 rio

Figure 2
Historical and Current Range of the California Red-legged Frog

5.0 METHODOLOGY

SITE ASSESSMENT

This California red-legged frog site assessment was conducted in accordance with the U.S. Fish and Wildlife Service (USFWS) *Revised Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (U.S. Fish and Wildlife Service 2005b). Information for the assessment was gathered through a combination of literature review, database searches, review of topographic mapping and aerial photography, and field visits to the site. The literature review identified the historic and current range of the California red-legged frog and provided information on specific habitat preferences of the species. The California Department of Fish and Game (CDFG) *California Natural Diversity Data Base* (CNDDB) records for Shasta County (California Department of Fish and Game 2003) and the USFWS *Recovery Plan for the California Red-legged Frog* (U.S. Fish and Wildlife Service 2002) provided information regarding the known existing and historic populations of California red-legged frogs in the study area region.

A review of topographic mapping and aerial photography provided information regarding vegetation communities and land uses occurring in the vicinity. NSR biologist Ginger Bolen conducted the field assessment on August 17 and 20, and September 11, 2006, and May 7 and 10, 2007. The study area and publicly accessible areas of the surrounding vicinity were characterized and evaluated for the presence of potentially suitable habitat for the California red-legged frog. Aquatic habitats were mapped and characterized (e.g., ponds vs. creeks, pool vs. riffle, ephemeral vs. permanent, vegetation type and characteristics, water depth, substrate, and description of bank), and the presence of bullfrogs and other aquatic predators documented (see Appendices A and B). Upland habitats were also characterized (e.g., vegetation communities, land uses, and potential barriers to California red-legged frog movements).

CALIFORNIA RED-LEGGED FROG IDENTIFICATION

Identification of all amphibians was done visually in situ, as handling of the California red-legged frog in any life stage is not permitted without a valid 10(a)(1)(A) permit. Positive diagnostic marks used to identify adult California red-legged frogs include prominent dorsolateral folds, bright red dorsum, and a well-defined stripe running along the upper lip. Positive diagnostic marks used to identify California red-legged frog tadpoles include eyes set well in from the outline of the head [contrasts with chorus frogs (*Pseudacris* spp.)] and generally mottled body and tail with few or no distinct black spots on tail fins (contrasts with bullfrogs).

6.0 RESULTS

REGIONAL ASSESSMENT

Historically, the California red-legged frog was found in Shasta County and several other counties in the region. In the 1960s, California red-legged frogs were found in Glenn County east of Elk Creek and in many drainages in Colusa County. In 1986 and 1987, California red-legged frogs were reported in Sunflower Gulch and Cottonwood Creek, west of Red Bluff (Tehama County). Subsequent surveys documented no red-legged frogs but did document bullfrogs, a predator of the red-legged frog (U.S. Fish and Wildlife Service 2002). California red-legged frogs historically occupied portions of the western slope of the Sierra Nevada from Shasta County south to Tulare County, but these populations have been fragmented and nearly eliminated (U.S. Fish and Wildlife Service 2002).

A review of the CNDDB and communications with the USFWS did not reveal any reported occurrences of the species within 5 miles of the study area (Peter Trenham, pers. comm. 2006). The nearest documented occurrence was recorded in 1986 in Sunflower Gulch (Tehama County), a tributary to Red Bank Creek approximately 36 miles southwest of the study area (U.S. Fish and Wildlife Service 2002).

STUDY AREA ASSESSMENT

Upland habitats within the study area boundary consist of valley oak woodland, valley foothill riparian, foothill pine woodland, and annual grassland. Aquatic habitat in the area includes two open water/pond features and a perennial stream (Sacramento River). Each of these features was assessed for suitability as California red-legged frog habitat and each is discussed in more detail below. These features are identified in Figure 3 and the corresponding Site Assessment Data Sheets are provided as Appendix A.

Perennial Stream

Location 12 (Sacramento River)

The Sacramento River basin encompasses approximately 27,210 square miles and includes the entire land area drained by the Sacramento River (Appendix B, Photograph 12). This area includes all watershed tributaries to the Sacramento River that are north of the Cosumnes River watershed. The study area is located in the upper Sacramento River, which drains approximately 6,500 square miles and has an average annual discharge of 7.1 million acre feet.

In the study area, the hydrology and water quality of the Sacramento River is largely dictated by the operations at Shasta Dam, approximately 13 river miles upstream. The aquatic habitat is comprised of an alternating sequence of riffle and run habitats consisting primarily of medium to large cobble substrates with areas of smaller spawning sized gravels (1-4 inches). The Sacramento River in the study area is approximately 500 feet wide and 5 feet deep at bank full. Habitat composition along the banks varies from relatively open grasslands to densely vegetated over-hanging riparian habitat that includes arroyo willow (*Salix lasiolepis*), valley oak (*Quercus lobata*), Fremont cottonwood (*Populus fremontii*), and Himalayan blackberry (*Rubus discolor*).

Location 2 (Sacramento River Backwater)

Location 2 is a low-gradient backwater of the Sacramento River with a substrate of cobble and muck (Appendix B, Photograph 2). It is approximately 100 feet-wide and 3 feet deep at bank full. The banks are steep and well vegetated with a variety of primarily riparian species including willow, Himalayan blackberry, valley oak, and yellowflag iris (*Iris pseudacorus*). The channel bottom is covered in submergent vegetation.

Figure 3
California Red-legged Frog Assessment Locations

Open Water

Location 1 (Pond)

Location 1 is an approximately 0.17-acre perennial pond (Appendix B, Photograph 1). The pond has a muck/organic substrate and reaches a depth of approximately 3 feet. The banks of the pond are heavily vegetated and shade the perimeter of the feature. Vegetation present on the banks includes Himalayan blackberry, willows, and California grape (*Vitus californica*). Submergent vegetation covers much of the pond bottom. Downed branches are also present in the pond.

Location 3 (Pond)

Location 3 is an approximately 0.40-acre perennial pond (Appendix B, Photograph 3). The pond has a muck and cobble substrate and reaches a depth of approximately 2 feet. The banks of the pond are vegetated and the overstory shades most of the feature. Vegetation present on the banks includes Himalayan blackberry, Fremont cottonwood, foothill pine (*Pinus sabiniana*), and willows. Duckweed (*Lemna minor*) covers the surface of the pond. Downed branches are also present in the pond. Several bullfrogs were observed during the site assessment.

LOCAL ASSESSMENT

The local assessment area (the area within a 1-mile radius of the study area boundary) includes rural residential, urban, and agriculture. Aquatic habitats in this area include open water, perennial stream, and agricultural ditch. Each feature assessed for suitability as California red-legged frog habitat is discussed in more detail below. These features are identified in Figure 3 and the corresponding Site Assessment Data Sheets are provided in Appendix A.

Open Water

Location 4

Location 4 is a remnant overflow channel of the Sacramento River (Appendix B, Photograph 4). Although the channel no longer functions to contain overflows from the river, water is present along stretches of the channel (possibly a result of a high ground water level and/or runoff) including an approximately 20-foot x 30-foot pond and the stretch of the channel from Location 4 south to the river. At the time of the assessment, physical access to the site was not permitted; therefore, a visual assessment was completed from the study area boundary. The ponded area lacks overstory vegetation but emergent vegetation is present and the banks are well vegetated with grasses. Maximum pond depth appears to be approximately 1-2 feet. It is unclear whether the pond is ephemeral or permanent. The associated stretch of channel appears to function as an intermittent stream. The stream banks have a sparse overstory of oak and small willows and an understory of grasses.

Location 5 (Constructed Impoundment)

Location 5 is an approximately 3.5-acre constructed impoundment hydrologically connected to the Sacramento River by a small ditch (Appendix B, Photograph 5). It is surrounded by rural residential development and has only a narrow strip of vegetation along the banks. Species present include willow, valley oak, pine (*Pinus* sp.), tree-of-heaven (*Ailanthus altissima*), and Himalayan blackberry as well as ornamentals. The pond appears to function as a stormwater detention basin and reaches depths of at least 2 feet. The surface is partially covered by lily pads (*Nymphaea* sp.) and algal mats. The site is used for sport fishing by local residents and likely supports both bluegill and bass.

Location 9 (Constructed Impoundment)

Location 9 is an approximately 0.41-acre City of Redding detention basin with a soil substrate (Appendix B, Photograph 9). Overstory vegetation is present only on the southern bank of the pool [interior live oak (*Quercus wislizenii*) and a small cottonwood] and provides little shading. One willow is also present at the northern end of the feature. The remainder of the banks are well vegetated with grasses. Spikerush (*Eleocharis* sp.) is abundant throughout the feature.

Perennial Stream

Location 6 (Olney Creek)

Olney Creek is a low-gradient perennial stream that drains to the Sacramento River (Appendix B, Photograph 6). The creek reaches depths of approximately 2 feet. The streambed is a combination of sand, gravel, and cobble and includes occasional pools. The banks are densely vegetated with riparian species, including willow, tree-of-heaven, Himalayan blackberry, and valley oak, that partially shade the feature. Emergent vegetation is present and includes scouring rush (*Equisetum hyemale*). Numerous bullfrogs were observed during the site assessment.

Location 7 (Churn Creek)

Churn Creek originates near Project City north of Redding and flows south in a narrow drainage area immediately east of and paralleling the Sacramento River (Appendix B, Photograph 7). It has little to no natural flow during the summer. During the winter, it can carry substantial flows compared to its drainage area due to the abundance of precipitation occurring at the very north end of the Sacramento Valley where it originates. Churn Creek has a well-developed alluvial floodplain, known locally as "Churn Creek Bottom", which continues approximately 5 miles upstream from its confluence with the Sacramento River. The streambed is composed of gravel and cobble and pools are present. In the assessment area, vegetation along the banks varies from open grassland to dense riparian including species such as valley oak, willow, and interior live oak. Emergent vegetation present in the creek includes nut sedge (*Cyperus* sp.) and water primrose (*Ludwigia* sp.). Non-native, resident fish species present in Churn Creek include the spotted bass (*Micropterus punctulatus*), largemouth bass, green sunfish (*Lepomis cyanellus*), and channel catfish (*Ictalurus punctatus*).

Agricultural Ditch

Location 8 (Churn Creek Lateral)

The Churn Creek Lateral is part of the Anderson-Cottonwood Irrigation District (ACID) (Appendix B, Photograph 8). Within the assessment area, the ditch is approximately 10 feet wide and 4 feet deep at bank full. Vegetation along the banks varies from primarily grasses and crops to riparian species, including willow and valley oak. The substrate is variously concrete and soil. Where a soil substrate occurs, submergent vegetation is present. Flows in the lateral are determined by ACID water allocations.

Location 10

Location 10 is an agricultural ditch approximately 10 feet wide and 2 feet deep at bank full (Appendix B, Photograph 10). Vegetation along the banks varies from primarily grasses to riparian species, including willow, valley oak, interior live oak, California grape, and cattails (*Typha* sp.). The ditch substrate is soil. Flows in the ditch are likely determined by ACID water allocations.

Location 11

Location 11 is an agricultural ditch approximately 6 feet wide and 2 feet deep at bank full (Appendix B, Photograph 11). The banks are densely vegetated with riparian species including willow, valley oak, and Himalayan blackberry. The ditch substrate is soil. The ditch does not appear to be in use as it was dry at the time of the assessment and a thick layer of detritus had accumulated.

7.0 SUMMARY

NSR conducted a California red-legged frog site assessment for the Strawberry Fields Study Area in Shasta County, California. The site assessment was conducted in accordance with the USFWS *Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (2005b).

The study area is located within the northernmost extent of the historical range of the California red-legged frog but is not within its currently known range. A review of the CNDDB (California Department of Fish and Game 2003) did not reveal any reported occurrences of the species within 5 miles of the study area and the nearest recorded occurrence (approximately 36 miles southwest of the study area) was documented over 20 years ago (U.S. Fish and Wildlife Service 2002).

However, aquatic habitats in the study area, especially the pond at Location 1, may provide suitable breeding habitat for the California red-legged frog, although bullfrogs, predators of the red-legged frog, were observed at both ponds in the study area. The pond at Location 1 appears to hold water for a sufficient period and at a sufficient depth to provide breeding habitat for the California red-legged frog. It is bordered by riparian vegetation, contains submerged vegetation, and is located near a perennial water source (Sacramento River).

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APPENDIX A

Habitat Assessment Data Sheets

APPENDIX B

Assessment Site Photos

STRAWBERRY FIELDS STUDY AREA

REPRESENTATIVE PHOTOGRAPHS

Photograph 1 - Pond

Photograph 2 – Sacramento River Backwater

Photograph 3 – Pond

Photograph 4 – Pond/Intermittent Creek

Photograph 5 – Constructed Impoundment

Photograph 6 – Olney Creek

Photograph 7 – Churn Creek

Photograph 8 – Churn Creek Lateral

Photograph 9 – Detention Basin

Photograph 10 – Agricultural Ditch

Photograph 11 – Agricultural Ditch

Photograph 12 – Sacramento River

NMFS Biological Assessment

BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT

NATIONAL MARINE AND FISHERIES SERVICE

REDDING RANCHERIA FEE-TO-TRUST AND CASINO PROJECT

JULY 2018

NEPA LEAD AGENCY:

U.S. Department of the Interior
Bureau of Indian Affairs
Pacific Region Office
2800 Cottage Way # W2820
Sacramento, CA 95825

BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT

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PREPARED BY:

Analytical Environmental Services
1801 7th Street, Suite 100
Sacramento, CA 95811
(916) 447-3479
www.analyticalcorp.com

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REDDING RANCHERIA FEE-TO-TRUST AND CASINO PROJECT

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1.0 INTRODUCTION

The purpose of this Biological Assessment (BA) / Essential Fish Habitat (EFH) Assessment (EFHA) is to address the effect of the Redding Rancheria Tribe (Tribe) Fee-to-Trust and Casino Project (Proposed Project) on EFH designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and species listed as endangered or threatened by National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA). The Proposed Project is subject to federal discretionary approvals, including the acquisition of the 232-acre site adjacent to the southern border of the City of Redding, California (Strawberry Fields Site; Action Area) into federal trust status by the Bureau of Indian Affairs (BIA) for the purposes of gaming (Proposed Action).

An Environmental Impact Statement (EIS) has been prepared by the BIA pursuant to the National Environmental Policy Act (NEPA) to assess potential environmental effects of the Proposed Action. This BA/EFHA serves as the environmental document for the determinations made by the EIS and corresponding conservation measures regarding federally listed species, and addresses the Proposed Action's compliance with Section 7 of the ESA. A separate BA has been prepared for the United States Fish and Wildlife Service (USFWS) pursuant to Section 7 of the ESA.

1.1 PURPOSE AND NEED

The purpose and need for the Proposed Action is to promote the economic development and self-sufficiency of the Tribe, consistent with the BIA's "Self Determination" policy.

The Tribe's current Rancheria consists of eleven parcels comprising approximately 11.41 acres, merely 37 percent of the original Rancheria that was established by the BIA. Not all of these parcels are held in trust. The Tribe's existing Win-River Resort and Casino is located within the Rancheria, approximately two miles from the Strawberry Fields Site. Expansion of the existing Win-River Resort and Casino within the current Rancheria is not desirable due to the lack of developable land and the presence of Clear Creek and the Anderson – Cottonwood Canal that limit physical expansion.

Implementation of the Proposed Action is needed to assist the Tribe in meeting the following objectives:

- Restore the land base of the Tribe;
- Ensure the Tribe's gaming operations remain competitive in the gaming market and meets the economic needs of the Tribe and its growing membership;
- Locate additional tribal services and housing on the existing Rancheria;
- Strengthen the socioeconomic status of Tribe; and
- Ensure that the Strawberry Fields Site, which is within the traditional territory of the Tribe, is adequately maintained and protected for future generations and that the Tribe has the ability to exercise its jurisdiction as a sovereign tribal government over the Strawberry Fields Site.

1.2 ACTION AREA

The Action Area is located within southern Shasta County (County), bordering the City of Redding (City) (**Figures 1** and **2**). The approximately 232-acre property is comprised of seven tax parcels and is bound by Bechelli Lane to the north, the Sacramento River to the west, and private property to the south, which is currently zoned for agricultural use. East of the site is Interstate 5 (I-5), a major north-south transportation corridor. Elevation ranges from 440 to 454 feet above mean sea level. A site plan is shown in **Figure 3**.

1.3 PROPOSED PROJECT COMPONENTS

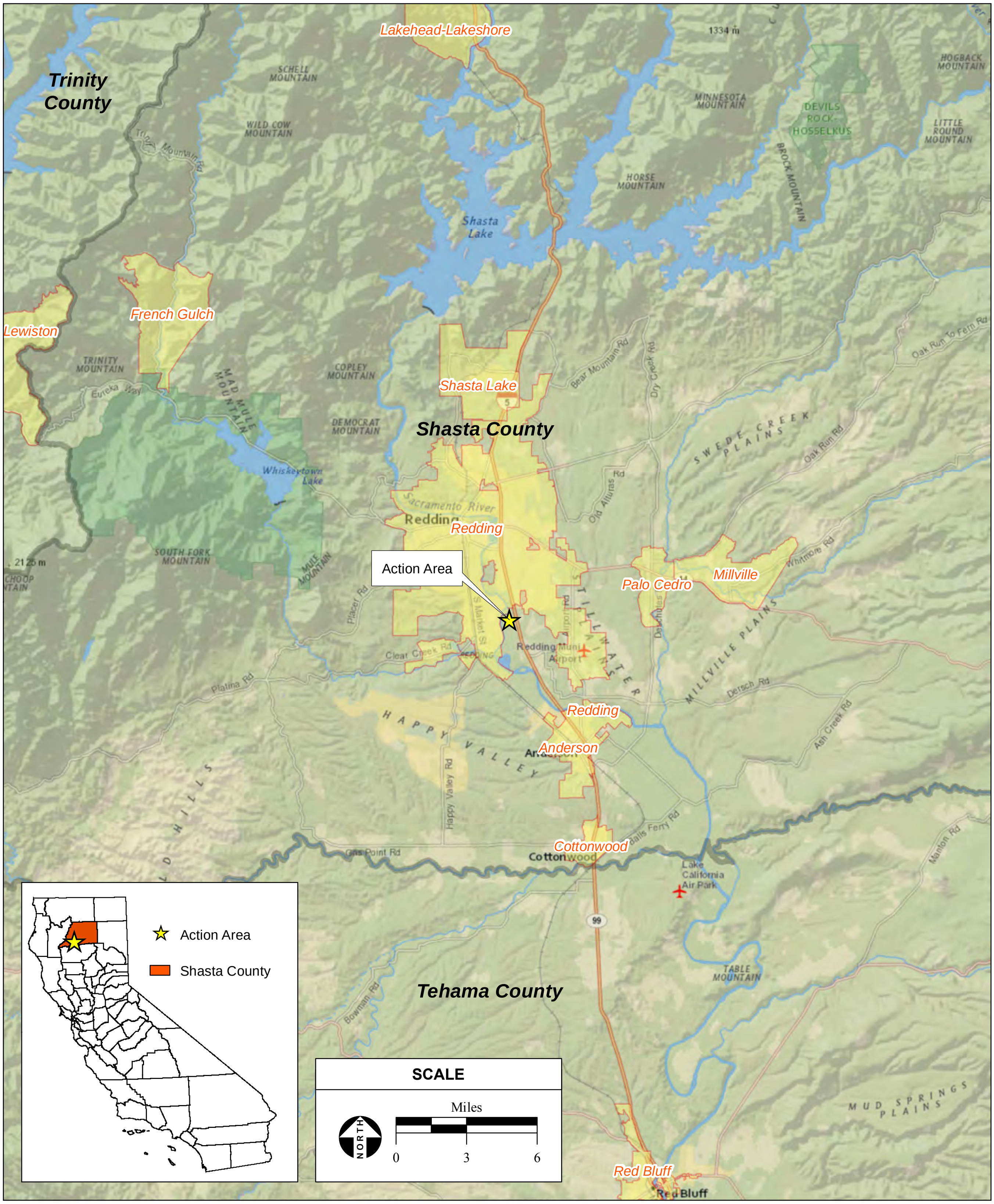
The Proposed Project, identified as Alternative A in the EIS, includes the following components:

- Transfer of the approximately 232-acre Strawberry Fields Site to federal trust status (Proposed Action) for gaming purposes;
- Subsequent development of the trust property with uses including, but not limited to, a casino, 250-room hotel, conference and event centers, restaurants, retail facilities, parking, and other supporting facilities;
- Development of on-site infrastructure improvements needed to support the casino, including water, sewer, and stormwater infrastructure;
- Improvement of off-site access roads to access the site from either the north or the north and south;
- Stabilization of the eastern bank of the Sacramento River using the windrow rock slope protection (RSP) method, which involves removal of existing stream bank material above the ordinary high water mark (OHWM) and placement of a row of appropriately-sized rock boulders over the existing alluvium up to at least the floodwater surface elevation of the river, after which the river-side and top-surface of the boulders are then covered with native alluvium and the top surface is further covered with a minimum of 18 inches of native loam; and
- Closure of the existing Win-River Casino and the redevelopment of the facility into tribal services and housing uses.

A site plan for the proposed facilities is shown in **Figure 3**. Additional detail regarding the proposed grading and drainage plan and water supply /wastewater treatment facilities is provided below:

Grading and Drainage

The Strawberry Fields Site is relatively flat and generally drains southwesterly from Interstate 5 towards the Sacramento River. The development area is outside of the 100-year floodplain and the designated floodway of the Sacramento River. However, during storm events smaller than a 100 year event, approximately 600-700 cubic feet per second will flow through the site from east of Interstate 5. This flow comes from Churn Creek, spills over Interstate 5 and is conveyed overland to the Sacramento River.



SOURCE: NatGeo, 2017; AES, Date: 10/4/2017

Redding Rancheria Fee-to-Trust NMFS BA-EFHA / 214584 ■

Figure 1
Regional Location

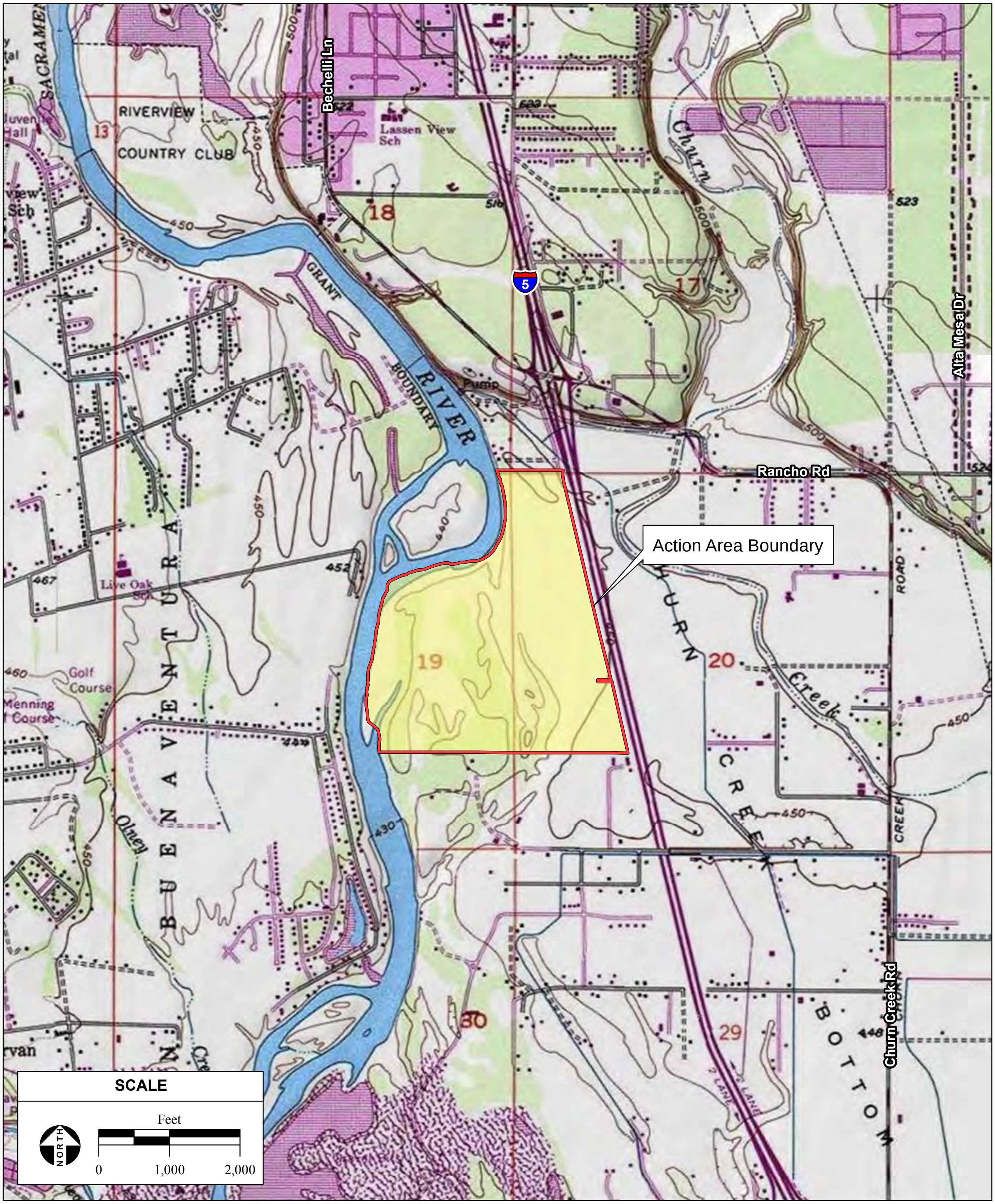
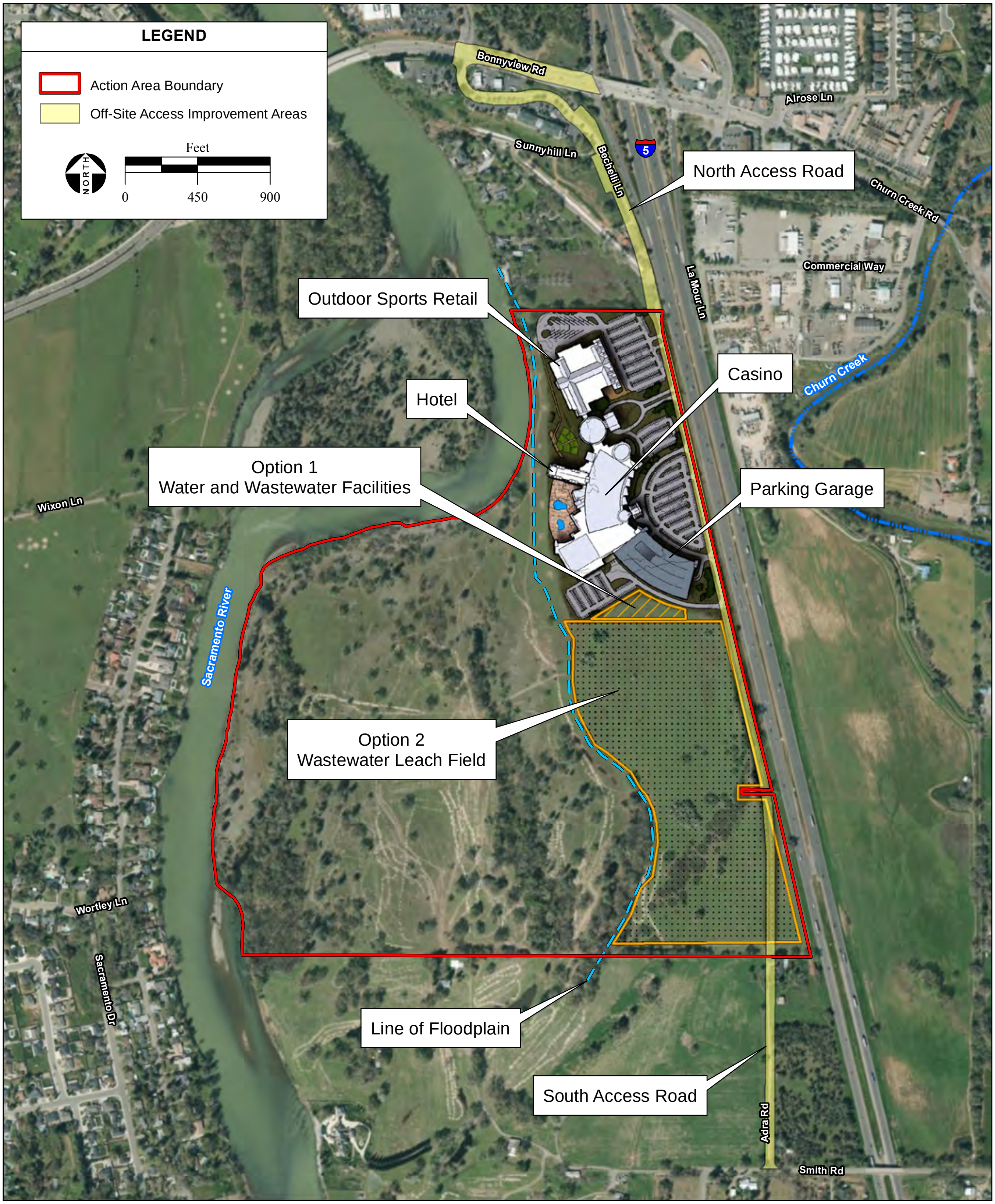


Figure 2
Site and Vicinity



SOURCE: USDA aerial photograph, 7/26/2014; ESRI Data, 2016; AES, 10/9/2017

Figure 3
Site Plan

As discussed in the Grading and Drainage Study (**Attachment A**), surface parking lots would be constructed with a west-to-east slope toward storm drain inlets, which would be placed at appropriate intervals to capture runoff and convey it via an underground storm drain system. Catch basin insert filters will be installed at select area drains to capture sediment, debris, trash, oil and grease from stormwater. These filters would clean the stormwater during low flows, and have no standing water, minimizing bacteria and odor problems. A 40-foot wide, 5-foot deep vegetated swale is proposed to run north to south between the access road within the site and Interstate 5. This vegetated swale would convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow coming westerly from Churn Creek during extreme rain events. The vegetated swale would pass south of the proposed development through a box culvert under the access road and to a 65,000 cubic-foot water quality retention as shown in Figure A4 of **Attachment A**. The proposed water quality retention pond has been sized in accordance with the California Stormwater Quality Association (CASQA) California Stormwater Best Management Practice (BMP) Handbook for New Development and Redevelopment, and would retain water and allow infiltration into the native alluvial soil during a typical rain event. During rare extreme runoff events, the wet pond will spill and runoff will make its way south to the Sacramento River. The wet pond will be submerged when the Sacramento River is flooding.

Water Supply and Wastewater Treatment

There are two options proposed to supply water to the Proposed Project, and two options proposed for wastewater treatment and disposal. These options are summarized below.

Water Supply Option 1: Off-site

Under Water Supply Option 1, water supply to serve the Proposed Project would be provided through a connection to the City of Redding's municipal water supply infrastructure. Connection to the City's water system is described in more detail under the discussion of interrelated and interdependent effects in **Section 4.3**. The City's water system would meet the demands of the Proposed Project and would provide required fire protection flows.

Water Supply Option 2: On-site

Under Water Supply Option 2, potable water supply to serve the Proposed Project would be provided through the installation of groundwater wells on the Strawberry Fields Site. Recycled water from on-site wastewater treatment would be reused for indoor non-potable uses (such as toilet flushing) and for landscape irrigation. The proposed groundwater wells would be drilled to a depth of between 300 and 600 feet, which is anticipated to produce water of sufficient quantity and quality. According to consultation with local jurisdictions, groundwater in the area is a reliable water source (refer to Appendix B of the EIS).

Wastewater Treatment and Disposal: Off-site

Under Wastewater Option 1, wastewater treatment would be provided by the City of Redding via connection to the City's conveyance system and wastewater treatment plant (WWTP). Connection to the existing treatment system from the Strawberry Fields Site to the Sunnyhill Lift Station is described in more detail under the discussion of interrelated and interdependent effects in **Section 4.3**. From the Sunnyhill Lift Station, wastewater from the Proposed Project would be conveyed to the City's Stillwater WWTP for treatment and disposal.

Wastewater Treatment and Disposal: On-site

Under Wastewater Option 2, wastewater would be treated at an on-site WWTP, located to the south of the casino and hotel (**Figure 3**). The WWTP would be sized to treat the peak flows resulting from the Proposed Project. An immersed membrane bioreactor (MBR) system would be used to produce tertiary-treated water for reuse or disposal. The MBR is a state-of-the-art system that consists of utilizing a biological reactor and microfiltration in one unit process. The ability of an MBR to eliminate secondary clarification and to operate at higher suspended solids concentrations gives the system the ability to react to wide variations in flows as would be expected at gaming facilities on weekends or holidays. A detailed description of the proposed on-site WWTP under Option 2 is presented in Appendix B of the EIS.

Recycled water from the on-site WWTP would be used for toilet flushing and landscape irrigation, and all reclaimed water would meet the equivalent of State standards governing the use of recycled water as described in Title 22 of the California Code of Regulations (CCR). A recycled water storage tank would be constructed to hold one to two days of peak treated water reuse demand.

On-site leach fields would be used to dispose of excess treated wastewater effluent by distributing it underground through a network of perforated pipes or infiltration chambers. The proposed leach field would be located in the southeast area of the Strawberry Fields Site, entirely outside of the floodplain of the Sacramento River, as shown on **Figure 3**. The size of the leach field would be approximately 45 acres, which includes a replacement leach field area of 100 percent in the event of leach field failure, and a 20 percent contingency to avoid oversaturation of the soil and to handle high peak flows.

2.0 METHODOLOGY

Prior to conducting the biological surveys within the Action Area, the following information was obtained and reviewed:

- USFWS Official Species List, dated July 26, 2017 of federally listed species with the potential to occur on or be affected by projects on the Enterprise United States Geological Survey (USGS) 7.5-minute topographic quadrangle (quad; USFWS, 2017a; **Attachment B**);

- California Native Plant Society (CNPS) query, dated July 26, 2017, of special-status plant species known to occur on the Enterprise USGS 7.5 minute topographic quad (CNPS, 2017a) (**Attachment B**);
- California Natural Diversity Database (CNDDB) query, dated July 26, 2017, of federally listed species known to occur on the Enterprise USGS 7.5 minute topographic quad (CDFW, 2017a) (**Attachment B**);
- USFWS National Wetlands Inventory (NWI) map of wetland features on the Action Area (USFWS, 2017c);
- A critical habitat map (USFWS, 2017c);
- Biological Resources Assessment on the Strawberry Fields Study Area, dated November 7, 2007, by North State Resources, Inc. (NSR, 2007; **Attachment C**); and
- Consultation of NMFS federally listed fish species, critical habitat, and Essential Fish Habitat (EFH; NOAA, 2005; NMFS, 2004; NMFS, 2015).

2.1 Biological Surveys

Biological resource surveys and focused botanical surveys of the Action Area were conducted on April 25, 2007 (**Attachment B**). Additional surveys were conducted on May 3, 2007, May 9, 2007, June 27, 2007, May 16, 2016, and March 13, 2017. Surveys assessed habitat types, federally listed species, suitable habitat for federally listed species, and wetlands and Waters of the U.S. Species and habitat types were classified using the *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (CDFW, 2000), *Botanical Survey Guidelines of the California Native Plant Society* (CNPS, 2001), and *The Jepson Manual* (Baldwin et al., 2012).

2.2 Analysis

An analysis was conducted to determine federally listed fish species that may have the potential to occur within the Action Area or within downstream waterways that may be affected by the Proposed Action. Habitat requirements for fish species were assessed and compared to the type and quality of habitats observed during surveys. Federally listed fish species with no potential to occur within the Action Area or downstream waterways that may be affected by the Proposed Action were ruled out based on lack of suitable habitat and/or geographic distribution.

3.0 ENVIRONMENTAL SETTING

3.1 Topography and Climate

The Action Area is located within the northern portion of the Sacramento Valley on relatively level terrain above the Sacramento River. The western site boundary is an almost vertical embankment adjacent to the Sacramento River. The region has a high mean temperature of 96° F and a low mean temperature of 39° F, and the average annual rainfall is approximately 24 inches (Wunderground, 2016).

3.2 HABITAT TYPES

Five terrestrial habitats were identified within the Action Area (**Figure 4**): non-native annual grassland, valley foothill riparian, valley oak woodland, riverine, and foothill pine woodland. Three aquatic habitats were identified within the Action Area (**Figure 4**): seasonal wetlands; ephemeral stream; and ponds. Of the eight total habitat types identified in the Action Area, the riverine habitat has the potential to seasonally support significant fish species. The other aquatic features do not contain sufficient water or substrate to support significant fish species. Additionally, the Sacramento River adjacent to the project site provides all four major components of freshwater EFH for Chinook salmon. Habitats with the potential to support federally listed fish species are discussed below. Site photographs are included in **Figure 5**.

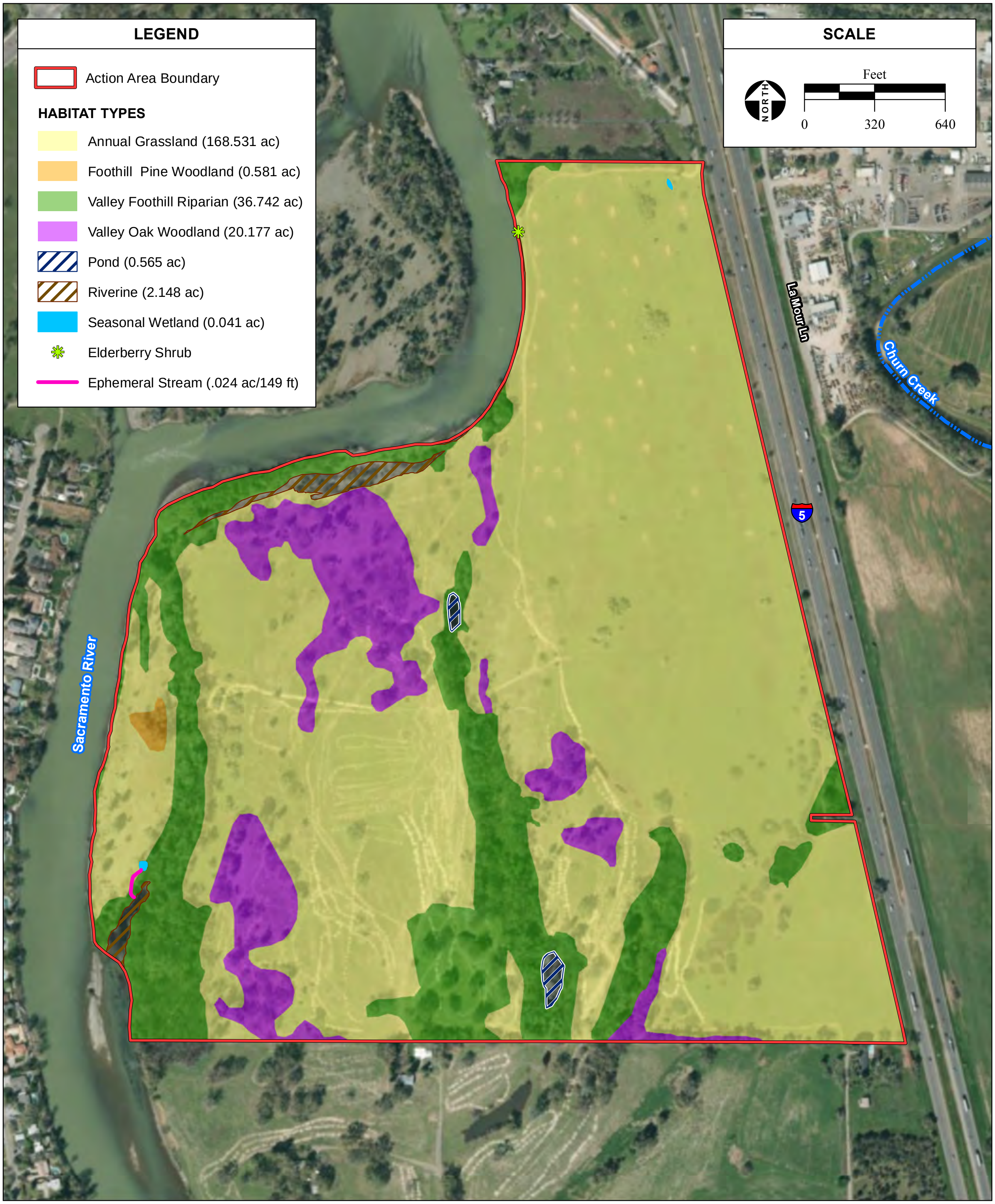
3.3 POTENTIAL FISH HABITAT

The main channel of the Sacramento River runs adjacent to the Action Area. Approximately 2.15 acres of riverine habitat occur on the Action Area. The riverine habitat contains a backwater of the Sacramento River and a portion of the floodplain habitat. Approximately 325 linear feet of backwater and approximately 950 linear feet of floodplain habitat from the Sacramento River occur on the site. The Sacramento River contains an ordinary high water mark (OHWM) throughout the year, but due to the seasonal scouring caused by changing water volume and velocity, most plant species are unable to establish. Adult Chinook salmon migrate to and are known to spawn in the Sacramento River in the region of the Action Area. The backwater of the riverine habitat provides suitable juvenile rearing habitat for various aquatic species, however, does not generally contain the primary constituent elements associated with other life stage usages (i.e. no spawning flows or gravels). The floodplain habitat is a depositional area (i.e. gravel bar) on the outside of a bend in the river that inundates during periods of high water.

3.4 CRITICAL HABITAT AND ESSENTIAL FISH HABITAT

Designated critical habitat for steelhead (Northern California Distinct Population Segment [DPS]), Chinook salmon (Central Valley Spring-Run and Winter-Run), and Green sturgeon (Southern DPS) occurs in the Sacramento River adjacent to the Action Area, and in the riverine habitat on-site (USFWS, 2017c; NOAA, 2005; NMFS, 2004; NMFS, 2015). The backwater of the riverine habitat provides seasonal habitat for juvenile rearing but does not contain the elements necessary for other life-stage uses. Similarly, the floodplain area of the riverine habitat would be inundated only during periods of high water flow. The lateral extent of the critical habitat is defined by the OHWM or, in areas where the OHWM cannot be defined, the lateral extent is defined by the bankfull elevation (33 CFR 329.11).

The Sacramento River is designated by NMFS as EFH for Chinook salmon, as defined by the Magnuson-Stevens Fisheries Conservation and Management Act (MSMA). EFH refers to those waters and substrates necessary for spawning, breeding, feeding, or growth to maturity. Freshwater EFH for salmon consists of four major components: spawning and incubation habitat; juvenile rearing habitat; juvenile



SOURCE: USDA aerial photograph, 7/26/2014; ESRI Data, 2016; AES, 10/4/2017

Figure 4
Habitat Types

PHOTO 1: Adjacent Sacramento River.

PHOTO 2: On-site riverine habitat, looking east.

PHOTO 3: Adjacent Sacramento River.

SOURCE: AES, 10/4/2017

Figure 5
Site Photographs

migration corridors; and adult migration corridors and adult holding habitat (Pacific Fishery Management Council, 1999). The lateral extent for EFH is the same as the lateral extent for critical habitat, as defined by the OHWM or bankfull elevation (33 CFR 329.11).

3.5 FEDERALLY LISTED FISH SPECIES

Based on biological desktop review and survey results, the following federally listed fish species have the potential to occur within or adjacent to the Action Area: Steelhead (*Oncorhynchus mykiss;* Northern California DPS), Chinook salmon (*Oncorhynchus tshawytscha;* Central Valley Spring-Run and Sacramento River Winter-Run), and Green sturgeon *(Acipenser medirostris;* Southern DPS).

Steelhead (*Oncorhynchus mykis*s) – Northern California DPS

FEDERAL STATUS – THREATENED
STATE STATUS – NONE

The northern California steelhead (*Oncorhynchus mykiss*) DPS includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers in California coastal river basins from Redwood Creek to and including the Gualala River (NOAA, 2005). The range can include portions of Amador, Alameda, Butte, Calaveras, Contra Costa, Colusa, Glenn, Mariposa, Merced, Nevada, Placer, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tuolumne, Yolo, and Yuba counties.

Adult steelhead begin their migration from the ocean in the late fall through early winter and typically arrive at their spawning grounds between December and April, spawning shortly after arrival. Unlike other Pacific Coast salmonid species, steelhead do not usually die after spawning. Spawning takes place in relatively shallow water, typically in glides and shallow runs at depths ranging from 0.2 m to 1.0 m. Preferred spawning substrate consists of gravel ranging from 0.3 cm to 10 cm in diameter. The optimum temperature for egg development is 9 to 11 degrees Celsius (° C; 48 to 52 degrees Fahrenheit [° F]). After emergence, fry seek shallow edge water habitat for several months after which they disperse into suitable mid-channel habitat. Optimum juvenile growth and survival occurs at temperatures ranging from 13 to 17° C (55 to 64° F) with dissolved oxygen levels greater than 9 milligrams per liter (mg/L). Juveniles remain in the freshwater environment for one to two years where they forage mainly on aquatic invertebrates prior to migrating to the Pacific Ocean. They typically spend one to three years in near shore saltwater and occasionally pelagic habitat foraging on crustaceans, small fish, and squid before reaching maturity and returning to their natal streams to spawn (Moyle, 2002a; Moyle, 2002b; McEwan et al., 1996).

The riverine habitat on-site and the Sacramento River adjacent to the site contain suitable habitat and are listed as critical habitat for this species (USFWS, 2017b).

Chinook Salmon (*Oncorhynchus tshawytsha*) – Sacramento River Winter-Run ESU

FEDERAL STATUS – ENDANGERED
STATE STATUS – ENDANGERED

Chinook salmon are the largest and most abundant salmonid species that occur in California. Chinook are anadromous, but unlike steelhead, Chinook die after a single spawning event. This evolutionary significant unit (ESU) spawns in the upper Sacramento River. Chinook salmon are generally thought to exhibit two basic life history patterns; the stream-type and the ocean-type. Winter-run Chinook exhibit a “stream-type” life history dependent on year-round, cool, freshwater habitat for both adults and juveniles, which regularly spend more than a year in rivers before out-migration to the Pacific Ocean (Williams, 2006). Winter-run Chinook typically migrate from the ocean into the freshwater environment in early to late winter. Spawning occurs within a few days or weeks of arrival at the spawning grounds. They migrate upstream before reaching sexual maturity during the spring and summer months. Hatched juveniles reside in spawning streams for at least one year before returning to marine habitats. Winter-run Chinook achieve sexual maturity in the freshwater environment.

The riverine habitat on site and the Sacramento River adjacent to the site contain suitable habitat and are listed as critical habitat for this species (USFWS, 2017b).

Chinook Salmon (*Oncorhynchus tshawytsha*) – Central Valley Spring-Run ESU

FEDERAL STATUS – THREATENED
STATE STATUS –THREATENED

Chinook in the California Central Valley spring-run ESU are a spring-run species. Spring-run Chinook exhibit a “stream-type” life history that is dependent upon year-round, cool, freshwater habitat for both adults (which arrive in spring and mature while over-summering in foothill streams) and juveniles, which regularly spend more than a year in rivers before out-migration (Williams, 2006). Spring-run Chinook typically migrate from the ocean into the freshwater environment in early to late spring in full maturity. This ESU spawns in the Sacramento River and several of its tributaries. Spawning occurs within a few days or weeks of arrival at the spawning grounds. Spawning occurs in large deep pools in tributaries with moderate velocities and a large bubble curtain at the head. Spring-run spawning and rearing habitat is restricted to the higher elevation portions of the Central Valley where cool summer temperatures can be found in snow melt-fed rivers. Juveniles migrate from spawning grounds to the Pacific Ocean.

The riverine habitat on-site and the Sacramento River adjacent to the site contain suitable habitat and are listed as critical habitat for this species (USFWS, 2017b).

Green Sturgeon (*Acipenser medirostris*) – Southern DPS

FEDERAL STATUS – THREATENED
STATE STATUS – NONE

Green sturgeon use streams, rivers, and estuarine habitat as well as marine waters during their life cycle. This species reaches sexual maturity after 15 years with the southern DPS spawning every 3-4 years primarily in the Sacramento River. Adult green sturgeon generally migrate into rivers between late-February and late-July, and spawning occurs in deep, fast water from March to July. Suitable habitat for spawning includes deep pools with small to medium gravel, cobble, or boulder substrate. Research indicates that water flow is one of the main determinants of successful larval survival (Moyle, 2002).

Water flow and water temperatures between 11-18 °C are also important features for spawning and successful embryotic growth. Males can fertilize the eggs of multiple females and post-spawning fish often remain in the Sacramento River until fall or winter. Eggs incubate for approximately 9 days and remain near the hatching area for 18-35 days before dispersing. Juveniles may rear in the river for 1 to 3 years before migrating to the estuary, primarily during the summer and fall. Once in the marine environment, sub-adult and adults will spend most of their life in coastal habitat.

The riverine habitat on-site and the Sacramento River adjacent to the site contain suitable habitat and are listed as critical habitat for this species (USFWS, 2017b).

4.0 EFFECTS OF THE ACTION

4.1 CRITICAL HABITAT AND ESSENTIAL FISH HABITAT

Designated critical habitat for steelhead (Northern California DPS), Chinook salmon (Central Valley Spring-Run and Winter-Run), and green sturgeon (Southern DPS) occurs in the Sacramento River adjacent to the Action Area, and in the riverine habitat on site (USFWS, 2017b; NOAA, 2005). The Sacramento River is designated by NMFS as EFH for Chinook salmon, as defined by the MSMA. The section of riverine habitat may provide seasonal habitat for juvenile rearing but does not contain the elements necessary for other life-stage uses. Designated critical habitat and EFH do not occur within the area of impact, and adjacent critical habitat and EFH will not be directly impacted. Indirect effects to critical habitat and EFH are discussed below.

Water Quality

Construction

Construction of the Proposed Project would include ground-disturbing activities such as clearing and grubbing, mass grading, and excavation, which could lead to erosion of topsoil. Erosion from construction could increase sediment discharge to surface waters during storm events thereby degrading downstream water quality. Construction activities, typical of other development projects, would also include the routine use of potentially hazardous construction materials such as concrete washings, solvents, paint, oil, and grease, which may spill onto the ground and be picked up by stormwater.

Erosion control measures will be implemented in compliance with the National Pollutant Discharge Elimination System (NPDES) General Construction Permit for construction activities. A Stormwater Pollution Prevention Plan (SWPPP) will be developed prior to any ground disturbance and would include Best Management Practices (BMPs) to reduce potential surface water contamination during storm events. Implementation of BMPs incorporated into the SWPPP would reduce or prevent adverse effects to the local and regional watershed from construction activities on the Strawberry Fields Site. Therefore, construction activities associated with the Proposed Project would not result in a significant adverse effects to water quality in the Sacramento River.

Operation

Implementation of the Proposed Project would alter the existing drainage pattern of the Action Area and increase stormwater runoff as a result of increased impervious surfaces in the northern portion of the site. This increase in impervious surfaces could impact the quantity and quality of stormwater runoff. The Proposed Project would convert up to approximately 37 acres of pastureland into a hotel and casino complex, sports retail facility, surface roads, and parking areas, which would result in an increase in stormwater runoff over pre-development rates during 2-, 10-, and 100-year storm events.

Due to the increase in surface water runoff, one retention pond in the southern portion of the Action Area is included in the project design. The wet pond would have a capacity of 615,000 cubic feet. The wet pond is sized to accommodate twice the runoff volume of the 85th percentile storm and would allow for infiltration of stormwater into the native soil. When the Sacramento River is at flood stage, the wet pond will be submerged. Runoff would be conveyed to this wet pond via a 40-foot wide, 5-foot deep vegetated swale that would run north to south along Interstate 5 (I-5), and between I-5 and the access road under Site Access Option 2; the vegetated swale would also provide stormwater filtration and infiltration and would provide a bypass channel for 600 to 700 cfs of runoff flowing westerly from Churn Creek during extreme precipitation events. The maximum flow that the vegetated swale would be able to infiltrate is approximately 182 cfs, which is more than the 100-year peak flow of 174 cfs. A box culvert would be required if Site Access Option 2 is selected to allow the vegetated swale to pass beneath the South Access Road.

As described in **Attachment A** and in **Section 1.3**, the Proposed Project has been designed to accommodate the infiltration of stormwater into the native on-site soil instead of the Sacramento River. Low Impact Development (LID) BMPs, including the aforementioned vegetated swale and retention pond, have been incorporated within the design of the stormwater drainage system for the Proposed Project. Other LID BMPs incorporated in the project design to filter pollutants from stormwater run-off during operation of the Proposed Project include: the use of catch basin insert filters in parking lots and landscaped areas, which filter stormwater during periods of low flow by capturing contaminants and larger debris, thereby improving the quality of runoff before it enters the underground storm drain system; the use of infiltration trenches in place of underground storm drain pipes where feasible, which consist of perforated pipes placed in a drain rock-filled trenches, and would simulate the natural runoff absorption and filtration conditions that prevailed on the Action Area prior to development; and the use of pervious pavements in parking and outdoor pedestrian areas, which reduce runoff volume while providing treatment.

Sacramento River Streambank Stabilization

The east bank of the Sacramento River in the vicinity of the Strawberry Fields Site is actively eroding during periods of very high flow. Streambank stabilization measures have been incorporated within the project design to slow the rate of erosion and reduce sedimentation. Thus, these elements of the project design would have a potentially beneficial impact on the surface water quality of the Sacramento River in the vicinity of the Action Area by reducing the amount of fine sediment discharged into the river. Additionally, due to the relatively minimal extent of the material that would be added and the resulting changes to the Sacramento River's orientation that would occur as a result of these measures, streambank stabilization would not exacerbate rates of streambank erosion at locations downstream. Further, the NPDES General Construction Permit, SWPPP, and BMPs would further prevent contaminated run-off from entering the Sacramento River. The stabilization measures will have no effect on critical habitat or EFH.

4.2 Federally Listed Fish Species

Based on biological desktop review and survey results, federally listed Steelhead, Chinook salmon, and green sturgeon have the potential to occur within the on-site riverine habitat and the adjacent Sacramento River. Approximately 2.15 acres of riverine habitat occur in the Action Area. The riverine habitat contains a seasonal backwater of the Sacramento River and a portion of the floodplain. The backwater of the riverine habitat may seasonally provide suitable juvenile rearing habitat for various aquatic species, however, does not generally contain the primary constituent elements associated with other life stage usages (i.e. no spawning flows or gravel). Similarly, the floodplain habitat is a depositional area that only inundates during periods of high water. The main channel of the Sacramento River adjacent to the Action Area contains habitat for all life stages of fish species.

The riverine habitat and Sacramento River do not occur within the area of impact, and adjacent fish habitat will not be directly impacted. Additionally, the Proposed Action would not result in adverse effects to water quality in the Sacramento River as discussed above under the heading of *Critical Habitat and Essential Fish Habitat*; thus the quality of habitat for federally listed fish species within the Sacramento River watershed would not be adversely affected by the Proposed Action. The Proposed Action will have no effect on federally listed fish species.

4.3 INTERRELATED AND INTERDEPENDENT EFFECTS

Interrelated and interdependent effects are direct or indirect effects that occur as a result of activities that are closely affiliated with a project in areas outside proposed project area. Such actions include road or utility improvements off-site that would not be constructed but for implementation of the Proposed Project. Only those activities that would not require a separate federal action and would otherwise not be addressed for compliance with Section 7 of the ESA will be addressed in this BA.

Off-site Traffic Improvements

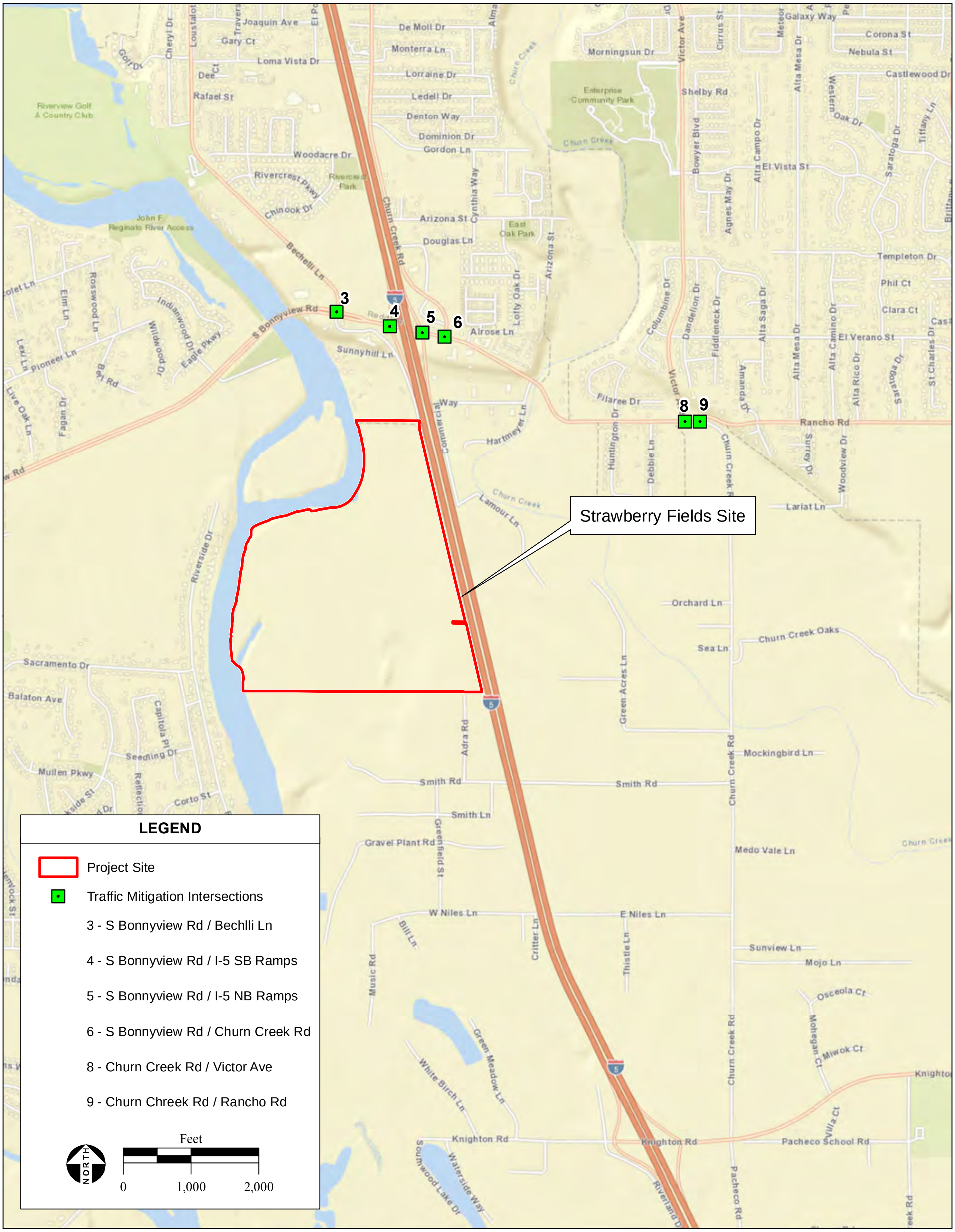
Implementation of the Proposed Project would require construction of off-site traffic mitigation improvements. A detailed description of off-site traffic mitigation for each alternative is provided in Section 5.8 of the EIS. Off-site traffic mitigation improvements are conceptual at this time. Design and construction plans would be prepared after an alternative has been selected for development.

Traffic mitigation improvements are recommended at the following study intersections:

- South Bonnyview Road / Bechelli Lane (Intersection 3);
- South Bonnyview Road / Interstate 5 (I-5) Southbound (SB) Ramps (Intersection 4);
- South Bonnyview Road / I-5 Northbound (NB) Ramps (Intersection 5);
- South Bonnyview Road / Churn Creek Road (Intersection 6);
- Churn Creek Road / Victor Avenue (Intersection 8); and
- Churn Creek Road / Rancho Road (Intersection 9).

Off-site traffic mitigation would require obtaining approvals and permits from the City of Redding, Caltrans, and/or Shasta County, which requires additional environmental review prior to approval. Implementation of permitting and CEQA requirements would further reduce the potential for significant adverse impacts from off-site construction projects.

Surveys of the potentially affected areas for the proposed traffic mitigation, with the exception of the South Bonnyview Road / Churn Creek Road intersection, were conducted by an AES biologist on June 29, 2017. These surveys were conducted on foot. Intersections 3, 4, 5, 6, 8 and 9 (South Bonnyview Road / Bechelli Lane, South Bonnyview Road / I-5 SB Ramps, South Bonnyview Road / I-5 NB Ramps, South Bonnyview Road / Churn Creek Road, Churn Creek Road / Victor Avenue and Churn Creek Road / Rancho Road) are currently paved and developed with ruderal/disturbed shoulders and/or roadsides on one or both sides of the road (for intersection numbers and locations, refer to **Figure 6**). Ruderal/disturbed areas contain sparse vegetation consisting predominately of non-native grass species, and the areas are heavily disturbed by vehicle traffic. No federally-listed fish species have the potential to occur within the off-site traffic improvement areas.



SOURCE: ESRI WorldStreetmap, 2017; AES, 7/18/2018

Figure 6
Traffic Mitigation Locations

Drainage features, including curbs, gutters, storm drains, and/or culverts, have been incorporated within the design of the planned improvements to Bechelli Lane and Adra Way. These features would convey stormwater runoff associated with the improved road segments to either the City of Redding's stormwater management system or to the on-site drainage features, which are each adequately sized to both retain all runoff and provide sufficient stormwater quality control. Combined with the NPDES General Construction Permit, SWPPP, and BMPs, these design elements would ensure that the impacts to regional stormwater runoff and surface water quality would be less than significant. Construction of off-site traffic improvements is not likely to adversely affect federally listed fish species.

Off-site Utility/Infrastructure Improvements

Off-site utility connections are an optional project component and involve tying the Action Area into the City of Redding's water and wastewater system with new pipeline connections. Connecting to the municipal water supply infrastructure would require the construction of approximately 777 linear feet of pipeline from the site to an existing water main at the intersection of Bechelli Lane and the driveway leading west to 5170 Bechelli Lane. Connection to the existing wastewater treatment system would require 702 linear feet of sewer force main pipeline between an on-site lift station and the existing Sunnyhill Lift Station, located at 5100 Bechelli Lane (see **Figure 7**). The Proposed Project would also require utility service connections with Redding Electric Utility (REU) for electricity and PG&E for natural gas service. The electrical connection would be made with existing overhead REU electrical lines that run along the northern boundary of the Strawberry Fields Site. A PG&E main natural gas line exists approximately 1,100 feet north of the Strawberry Fields Site at the southern edge of the Hilton Garden Inn parking lot.

Construction of pipeline connections and underground electricity transmission upgrades would require grading, excavation, trenching, laying of pipe, and the placement of backfill material to construct the connection to existing water, wastewater, electricity, and natural gas utilities. The proposed utility improvements would extend through non-native annual grassland, dominated by ruderal species, and would not directly affect critical habitat, EFH, or federally listed fish species. Indirect effects to water quality would be avoided through implementation of an NPDES General Construction Permit, SWPPP, and BMPs. Construction of proposed utility improvements will have no effect on federally listed fish species.

5.0 CONCLUSIONS

The Proposed Action will not impact the on-site riverine habitat or the adjacent Sacramento River. Compliance with the NPDES program and implementation of the proposed storm water plan including LID measures would avoid potential impacts to water quality in the Sacramento River. The Proposed Action will have **no effect** on critical habitat, EFH, or federally listed fish species.

SOURCE: City of Redding 2016 SRTA Imagery, 3/2016; Coleman Engineering Feasability Study, 7/14/17; AES, 10/11/2017

Figure 7
Off-site Water Supply and
Wastewater Treatment and Disposal Improvements

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ATTACHMENTS

ATTACHMENT A

REDDING RANCHERIA CASINO MASTER PLAN DRAFT GRADING AND DRAINAGE STUDY

REDDING RANCHERIA CASINO MASTER PLAN

DRAFT GRADING AND DRAINAGE STUDY

PREPARATION DATE:
FEBRUARY 9, 2018

PREPARED FOR:

REDDING RANCHERIA
2000 REDDING RANCHERIA ROAD
REDDING, CA 96001

PREPARED BY:

SHARRAH DUNLAP SAWYER, INC.
6590 LOCKHEED DRIVE
REDDING, CA 96002

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Section 1 – Project Description

1.1 Purpose

The purpose of this analysis is to assess the development potential of the undeveloped property described in Section 1.2 as the Proposed Project. This analysis will address project grading, drainage, and stormwater management for the Proposed Project and the project alternatives.

1.2 Project Description

The Redding Rancheria has submitted an application to the Department of the Interior requesting the placement of approximately 232 acres of fee land in trust by the United States upon which the Tribe would construct a casino resort (Proposed Project). The facility would include an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, and associated parking and infrastructure and would be located at the south end of Bechelli Lane in Redding, CA (see Figure 1). The new facility would replace the Tribe's existing casino located at 2100 Redding Rancheria Road in Redding, CA (near the intersection of State Highway 273 and Canyon Road).

This analysis will address the Proposed Project as well as five alternatives, including one off-site alternative, on an equal level basis in both the build out year and cumulative year (likely 2035). Alternatives to be addressed within this report will include the following:

- Alternative A - Proposed Project
- Alternative B – No Big Box Retail
- Alternative C - Reduced Intensity Alternative – smaller casino and hotel
- Alternative D - Non-Gaming Alternative –Convention Center and Hotel
- Alternative E - Alternative Site (in the City of Anderson)

1.3 Project Alternatives

1.3.1. Alternative A - Proposed Project

Alternative A includes the construction of an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, associated parking and infrastructure, and 130,000 square feet of big box retail. Alternative A will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.2. Alternative B – No Big Box Retail

Alternative B is identical to Alternative A with the exception that Alternative B does not include the 130,000 square feet of big box retail. Alternative B includes the construction of an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, and associated parking and infrastructure. Alternative B will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.3. Alternative C – Reduced Intensity Alternative

Alternative C includes the construction of an approximately 57,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, and associated parking and infrastructure, as well as 130,000 square feet of big box retail. The limits of disturbance and project footprint for Alternative C are approximately the same as that of Alternative A. Alternative C will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.4. Alternative D – Non-Gaming Alternative

Alternative D includes the construction of an approximately 128-room hotel, a retail center, and associated parking and infrastructure, as well as 120,000 square feet of big box retail. Alternative D will be constructed at the Proposed Project Site located at the south end of Bechelli Lane in Redding, CA (see Figure 1). Access to the Project Site from the north will include a road connection to the southern end of Bechelli Lane (see Figure 5), and a potential access from the south will include a road connection to Smith Road south of the Project Site (see Figure 6).

1.3.5. Alternative E – Alternative Site

Alternative E includes the construction of an approximately 70,000 square foot casino, an approximately 250-room hotel, an event/convention center, a retail center, and associated parking and infrastructure, as well as 120,000 square feet of big box retail. Alternative E will be constructed at an Alternate Project Site located north of North Street and west of Interstate 5 in Anderson California (see Figure 7). Access to the Alternate Project Site will include a road connection to Oak Street as shown on Figure E1.

Section 2 – Existing Site Conditions

2.1 Proposed Project Site – Alternatives A thru D

The Proposed Project site topography is relatively flat with the site sloping from north to south in the uplands portion adjacent to Interstate 5, and the remaining portions of the site sloping from northeast to southwest toward the river. The elevation (NAVD 88) varies on site from a high of roughly 455 feet above mean sea level on the north east corner of the project to a low point of roughly 430 feet above mean sea level near the Sacramento River on the south west corner of the project. In the uplands portion of the site adjacent to Interstate 5, the site slopes from north to south at less than 0.5%. Surface drainage from Interstate 5 is collected in the median and east side of the roadway, then conveyed through a series of pipes across the traveled way to a roadside earth ditch that runs from north to south along the project's eastern boundary. Toward the southern portion of the project site, a natural swale conveys the storm water runoff from the project site as well as the Interstate 5 storm water runoff in a south westerly direction toward the Sacramento River. See Figure 3 for existing topography and existing drainage.

A majority of the uplands portion (eastern portion of the site near Interstate 5) of the Site are either a sandy loam, or loamy sand. The soils found in these uplands portions of the project are excessively drained to well drained soils with rapid to moderately rapid permeability. The majority of the soil located in the lower areas near the river in the southwest portion of the project is riverwash or cobbly alluvium that is subjected to frequent flooding. These soils have highly variable characteristics, and typically are excessively drained with very rapid permeability. The potential for subsurface or surface stormwater infiltration for both the uplands and the lower areas of the Proposed Project site is excellent.

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map #06089C1561G and #06089C1563G, a majority of the Proposed Project site is located within one of two different flood zones from the Sacramento River to the west. A majority of the lowlands portion of the site is located in a special flood hazard area within the 100 year flood plain which means that these areas are subject to inundation during the 100-year event. The uplands portion of the site adjacent to Interstate 5 is located within Zone X. Zone X is defined as an area that lies within the 500 year (0.2% annual chance of flood) flood zone, and may have less than 1' of flooding during a 100-year event. The FEMA 100 year flood plain from the Sacramento River is shown on Figure 3.

FEMA Flood Insurance Rate Map #06089C1561G and #06089C1563G, shows that there is potential overflow from Churn Creek to the Sacramento River. This flow may come from Churn Creek, may spill over Interstate 5 and then would be conveyed overland to the Sacramento River. This potential is discussed in detail in Section 4.1. The FEMA 100 year flood plain from Churn Creek is shown on Figure 3.

Several regulatory agencies have jurisdiction of portions of the Sacramento River, but their jurisdiction falls west of the FEMA 100 year flood plain line. The Agencies and their jurisdictional lines are as follows:

- The Central Valley Flood Protection Board – The Designated Floodway Line refers to the channel of the stream and that portion of the adjoining floodplain reasonably required providing for the passage of a design flood; it is also the floodway between existing levees as adopted by the Central Valley Flood Protection Board (formerly the Reclamation Board) or the Legislature. The Designated Floodway Line follows the FEMA 100 year flood plain line, or is located west of the FEMA 100 year flood plain line adjacent to the Proposed Project site.
- The California State Lands Commission (CSLC) – The CSLC has jurisdiction and management authority over all un-granted tidelands, submerged lands and the beds of navigable lakes and waterways. The CSLC jurisdictional line lies west of the FEMA 100 year flood plain line adjacent to the Proposed Project site.

The eastern bank of the Sacramento River is actively eroding in areas adjacent to the proposed development during exceptionally high river flows. See Section 6.2 streambank erosion details and streambank stabilization recommendations.

2.2 Alternative Project Site – Alternative E

The Alternative Project site topography is relatively flat with the site generally sloping easterly towards the Tormey Drain and Interstate 5. The Tormey Drain bisects the site and runs from southwest to northeast to a box culvert under Interstate 5. The portion of the site located north of the Tormey Drain generally flows from north to south with a high elevation (NAVD 88) at the northwest corner of roughly 420 feet above mean sea level to a low point the easterly project boundary of 413 feet above mean sea level. The portion of the site located south of the Tormey Drain generally flows from south to north with a high elevation along the southerly site boundary of roughly 420 feet above mean sea level to a low point the easterly project boundary of 413 feet above mean sea level. The site generally has slopes less than 0.5%. Surface drainage from surrounding areas west of the project are collected and conveyed via the Tormey Drain through the site eastward under Interstate 5. The site is also bisected by Oak Street running north and south. The portion of the site located west of Oak Street will remain undeveloped and be used for a material borrow area and stormwater infiltration and storage.

Soils types were determined using the *Web Soil Survey* provided by the United States Department of Agriculture Soil Conservation Service and Forest Service. It was determined from the Web Soil Survey that the site consists of Hydrologic Soil Group A and D.

According to the FEMA Flood Insurance Rate Map #06089C1935G, a majority of the Alternative Project site is located within the special flood hazard area within the 100 year flood plain which means that these areas are subject to inundation during the 100-year event. The FEMA 100 year flood plain from the Tormey Drain is shown on Figure E4.

Section 3 – Grading and Drainage

3.1 Proposed Project Access

The proposed project will be accessed from the north by extending Bechelli Lane and from the south by a new road connection to Smith Road as described in the Access Alternative Concepts Memorandum prepared by Kimley-Horn dated July 7, 2017.

3.1.1 Proposed Project Access from the North

As described in the Access Alternative Concepts Memorandum the Proposed Project Site will require significant improvements to the intersection of South Bonneyview Road and Bechelli Lane including road widening and construction of a three lane roundabout at the intersection. The intersection will require numerous retaining walls to accommodate the roundabout footprint and sidewalk extension.

Widening Bechilli Lane to access the Proposed Project Site as described in the Access Alternative Concepts Memorandum would require significant grading, retaining walls, and relocation/extension of existing facilities to avoid impacting the City of Redding's Sunnyhill Wastewater Pump Station infrastructure and the Anderson Cottonwood Irrigation District's (ACID) canal. Significant grading will be required to maintain access to the adjacent residential properties, Sunnyhill Wastewater Pump Station and the ACID canal. Additional grading may be required to mitigate the 28 lost parking spaces eliminated by the Bechelli Lane widening as described in the Access Alternatives Concepts Memorandum.

3.1.2 Proposed Project Access from the South

As described in the Access Alternative Concepts Memorandum, a Shasta County Standard "Major Local Rural" road will be constructed south to Smith Road. At the intersection of Smith Road, a Shasta County Standard Road Connection will be constructed. These improvements will require minimal grading beyond the typical roadway infrastructure (street improvements, pedestrian facilities, drainage and other utility infrastructure, etc.). The road will be designed to follow the existing terrain where possible, and minimize the roadway grading footprint and impact. It is anticipated that the access road will extend approximately 3,500 feet south to Smith Road and the grading footprint will be approximately 5 acres.

3.2 Alternative A – Proposed Project Grading

The grading for Alternative A has been designed to be a balanced earthwork operation, meaning the cut and fill quantities will be the same and there is no import or export of material required. The finished floor elevations (including basements) for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations (including basements) are approximately 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure A3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure A1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 650,000 cubic foot wet pond as shown on Figure A4.

The wet pond is sized per the California Stormwater Quality Association (CASQA) California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.1 - Grading Quantities – Alternative A

Disturbance Area	57 acres	See Figure A1 & A2
Volume of Cut	94,000 cubic yards	See Figure A5
Volume of Fill (Adjusted for Material shrink)	94,000 cubic yards	See Figure A5
Infiltration / Wet Pond size	650,000 cubic feet	See Figure A4 & A6

See Figures A1-A6 for Alternative A grading and drainage Exhibits.

3.3 Alternative B – No Big Box Retail Grading

The grading for Alternative B has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations (including basements) are approximately 2 to 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure B3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure B1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 510,000 cubic foot wet pond as shown on Figure B4.

The wet pond is sized per the CASQA California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.2 - Grading Quantities – Alternative B

DISTURBANCE AREA	48 ACRES	SEE FIGURE B1 & B2
VOLUME OF CUT	80,000 CUBIC YARDS	SEE FIGURE B5
VOLUME OF FILL (ADJUSTED FOR MATERIAL SHRINK)	80,000 CUBIC YARDS	SEE FIGURE B5
INFILTRATION / WET POND SIZE	510,000 CUBIC FEET	SEE FIGURE B4 & B6

See Figures B1-B6 for Alternative B grading and drainage Exhibits.

3.4 Alternative C – Reduced Intensity Alternative

The grading for Alternative C has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations (including basements) are approximately 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure C3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure C1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 650,000 cubic foot wet pond as shown on Figure C4.

The wet pond is sized per the CASQA California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.3 - Grading Quantities – Alternative C

DISTURBANCE AREA	57 ACRES	SEE FIGURE C1 & C2
VOLUME OF CUT	94,000 CUBIC YARDS	SEE FIGURE C5
VOLUME OF FILL (ADJUSTED FOR MATERIAL SHRINK)	94,000 CUBIC YARDS	SEE FIGURE C5
INFILTRATION / WET POND SIZE	650,000 CUBIC FEET	SEE FIGURE C4 & C6

See Figures C1-C6 for Alternative C grading and drainage Exhibits.

3.5 Alternative D – Non-Gaming Alternative

The grading for Alternative D has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the adjacent top of bank elevation of the Sacramento River west of the development. The finished floor elevations are approximately 3 feet above the adjacent top of bank elevation and the FEMA 100-year water surface elevation.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure D3. For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure D1. The profile of the access road has been designed to match the existing grade to minimize earthwork from Bechelli Lane at the north to Smith Road at the south.

A 40-feet wide, 5-foot deep vegetated swale has been designed to run north to south between the access road and Interstate 5 approximately 1,000 feet south of the project's northerly line. This vegetated swale will convey project runoff, provide stormwater filtration and infiltration, as well as provide a bypass channel for the 600-700 cubic feet per second flow that potentially could come westerly from Churn Creek during extreme rain events as described in Sections 2.1 and 4.1. The vegetated swale then passes through a large box culvert under the access road and to a 450,000 cubic foot wet pond as shown on Figure D4.

The wet pond is sized per the CASQA California Stormwater BMP Handbook for New Development and Redevelopment, see calculations in Appendix C. The wet pond will store water and allow for infiltration into the native soil.

Table 3.4 - Grading Quantities – Alternative D

DISTURBANCE AREA	39 ACRES	SEE FIGURE D1 & D2
VOLUME OF CUT	75,000 CUBIC YARDS	SEE FIGURE D5
VOLUME OF FILL (ADJUSTED FOR MATERIAL SHRINK)	75,000 CUBIC YARDS	SEE FIGURE D5
INFILTRATION / WET POND SIZE	450,000 CUBIC FEET	SEE FIGURE D4 & D6

See Figures D1-D6 for Alternative D grading and drainage Exhibits.

3.6 Alternative E – Alternative Site

The grading for Alternative E has been designed to be a balanced earthwork operation. The finished floor elevations for each of the buildings were established based upon the FEMA 100-year water surface elevation of the Tormey Drain that runs southwest to north east through the middle of the project. The finished floor elevations (including basements) are approximately 2 to 3 feet above the FEMA 100-year water surface elevation of the Tormey Drain.

The parking lots are graded generally to flow from west to east at approximately 2% cross slope towards the access road with runoff being collected and conveyed in the underground storm drain system. The grades in the parking lots have been designed to have a minimum of approximately 1% slope and a maximum of approximately 4%, see Figure E2.

The access road runs north and south along the project's easterly boundary (adjacent to Interstate 5), see Figure E1. Since the project proposes a large amount of fill within the 100-year flood plain, an excavation equal to that fill volume must be constructed in order to prevent additional flooding and mitigate for the proposed fill within the flood plain. Two large retention ponds will be constructed along the southern portion of the project, a large pond on the west side of Oak Street, and a smaller one on the east side of Oak Street.

Table 3.5 - Grading Quantities – Alternative E

DISTURBANCE AREA	52 ACRES	SEE FIGURE E1
VOLUME OF CUT	138,000 CUBIC YARDS	SEE FIGURE E2
VOLUME OF FILL (ADJUSTED FOR MATERIAL SHRINK)	138,000 CUBIC YARDS	SEE FIGURE E2
RETENTION POND SIZE	99,000 CUBIC FEET	SEE FIGURE E4

See Figures E1-E4 for Alternative E grading and drainage Exhibits.

3.7 Cumulative Project Grading Impacts

The proposed project and all the alternatives will be designed in such a way that the grading will be a balanced earthwork operation, meaning the cut and fill quantities will be the same and there is no import or export of material required. There will be no fill placed in the FEMA 100-year floodplain. There will be no adverse impacts on the existing FEMA 100-year floodplain as a result of the project grading.

Additionally, hazardous materials that FEMA has identified as being "extremely hazardous or vulnerable to flood conditions" will not be stored within the 500-year floodplain of the proposed development.

For safety all access routes from the building sites to the access road will be elevated above the FEMA 100-year floodplain. The lowest finish grade elevation within the southern parking lot will be approximately 1-foot above the FEMA 100-year floodplain elevation. Since the development site is entirely out of the FEMA 100-year floodplain the soil removal will not change the FEMA 100-year flood delineation.

Section 4 – Hydrology and Hydraulics – Proposed Site

4.1 Description of Existing Watershed Characteristics

The site for Alternatives A, B, C, and D is relatively flat and generally drains southwesterly from Interstate 5 towards the Sacramento River. The 232 -acre site is a part of the Sacramento River Basin and consists of pastureland and scattered oak trees. Soils types were determined using the *Web Soil Survey* provided by the United States Department of Agriculture Soil Conservation Service and Forest Service. It was determined from the Web Soil Survey that the site consists of Hydrologic Soil Group A.

The current FEMA Flood Insurance Rate Map (FIRM) identifies that the developed area of the proposed project is outside of the 100-year floodplain but within the 500-year floodplain. The State Central Valley Flood Protection Board Floodway Map shows that the proposed project is outside of the designated floodway. Figures A7, B7, C7, and D7 show both the FEMA 100-year floodplain and the designated floodway as compared to the project.

In this area an estimated flow of 600 to 700 cubic feet per second at a depth of approximately 9 inches, as identified by a State of California Department of Water Resources work map, could cross Interstate 5 from the east (Churn Creek). This hydrologic and hydraulic model of Churn Creek shows that Churn Creek could overtop Interstate 5, and that could cause shallow overflow across the project site. In discussions with Brett Ditzler with Caltrans, there are no historical records of this section of Interstate 5 ever overtopping. Caltrans found a note in their files stating that not even in the large rainfall event of 1964, did Churn Creek overtop I-5. However, in the event that this might happen all the alternatives have been designed to convey possible floodwaters from Churn Creek that may overtop Interstate 5 via a large newly constructed vegetated swale that parallels Interstate 5 and discharges into the proposed infiltration wet pond south of the proposed development. The vegetated swale has been sized to convey the possible overflow from Churn Creek. The proposed channel has been oversized by 35% to accommodate increases in peak runoff that might occur in the future.

4.2 Methodology

Hydrology Calculations were prepared using engineering industry standard methodology and the on-site storm drain conveyance system will be designed using local jurisdiction requirements regarding storm event. Peak flows for the 2-, 10-, and 100-year storm events for a 24-hour period were estimated using the United States Army Corp of Engineers flood hydrograph package HEC-1 to model rainfall runoff. Rainfall estimates are discussed in detail within the *City of Redding Department of Public Works Hydrology Manual*. An excerpt from the manual discussing the calculation of Redding Area design storms can be found in Appendix A. Existing peak flows can be in found in Table 4.1. The Rational Method was used to estimate the proposed size of the on-site storm drain conveyance system. The Darcy Equation was used to estimate the amount of infiltration that will be achieved in the proposed storm drain conveyance and infiltration system.

4.2.1 Alternative Studies

There are two hydrologic studies that encompass the project area; The Army Corps of Engineers Comprehensive Study (Sacramento and San Joaquin River Basins Comprehensive Study – 2002) and the current FEMA 100-year floodplain (2011). The intent of the Army Corps of Engineers Comprehensive Study was to inventory resource conditions within the Sacramento and San Joaquin River Basins and to analyze problems and opportunities for flood management and ecosystem restoration. The flood delineation for the Army Corps of Engineers Comprehensive Study (Sacramento and San Joaquin River Basins Comprehensive Study – 2002) used a “composite floodplain” concept, which considers a combination of several flood events, each shaping the floodplain at different locations at different times. The flood events considered ranged from the from the 2-year to the 500-year storm event. However, the 10- and 500-year events were not computed or mapped between Redding and Deer Creek (which is located just upstream of Woodson Bridge in Corning, California approximately 70 river miles downstream of the proposed development). Each flood event was combined for the maximum extent of the composite floodplain for a conservative approach. The composite floodplain, ACOE Comprehensive Study Line, shown (the pink area shown in the California Department of Water Resources Best Available Maps) does not include the operational effects of headwaters reservoirs. The ACOE study recognizes that Shasta Reservoir has 1.3 million acre-feet of flood control space and operates for the Sacramento River at Keswick (upstream of the proposed development) and Bend Bridge (30 miles downstream of the project in Red Bluff, California). Between Keswick and Bend there are several unregulated tributaries that generate significant inflows to the Sacramento River. There are no significant unregulated tributaries between the project and Shasta Dam, so Shasta Reservoir completely regulates the river flow at the project location.

The ACOE floodplain composite line in the area of the proposed development has no elevation associated with it as the river profiles end at Woodson Bridge. Extensive topographic data was collected south of the Woodson Bridge, producing 2-foot contour mapping whereas the study north of Woodson Bridge is much less detailed. The study north of Woodson Bridge used topography in the overbank areas that was derived from USGS 30-meter (roughly 98-feet) digital elevation models with 10-foot contour intervals. The detail of the floodplain model is dependent on the detail of the overbank topography. In the development area the existing topography varies a few feet; therefore, using USGS 30-meter topography with 10-foot contour intervals would not pick up the existing detailed terrain. The ACOE Comprehensive Study Line is not consistent with the known existing topography of the proposed development and was not studied in detail in the region of the proposed project.

The current FEMA 100-year floodplain, effective March 17, 2011, is based on a detailed study with detailed cross sections for the Sacramento River throughout the Redding Area. These cross sections show flood elevations for the 100-year storm event. The current FEMA 100-year floodplain follows the existing topography in the project development area. In discussions with Raul Barba of the California Department of Water resources regarding the ACOE Comprehensive Study Line, it was stated that the FEMA 100-year Floodplain shown on the Flood Insurance Maps is the regulatory line regarding flood elevations and special building requirements. Additionally, as stated on the FEMA website, FEMA does not have setback guidelines from river channels. If no part of the structure falls within the FEMA 100-year floodplain, there are no special building requirements. If there is an encroachment, then FEMA has very specific requirements that must be followed. Since the proposed development does not encroach into the FEMA 100-year floodplain, there are no special requirements.

For all these reasons and consistent with our telephone conversations with Raul Barba of the California Department of Water resources we are using the well-studied and documented FEMA 100-year floodplain as the best available and regulatory 100-year floodplain for this project. All hydrology exhibits clearly show that no part of the proposed development falls within the FEMA 100-year floodplain.

4.3 Results of Analysis

The existing condition peak flows for Alternatives A through D were calculated and are summarized in Table 4.1. These flows were calculated for the overall developable project area (66.2-acres) which is shown in Figure A6. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.1: Estimated Existing Condition Peak Flows

Storm Event	Existing Condition Peak Flow, cfs
2-YEAR	3
10-YEAR	7
100-YEAR	19

With development the post-developed runoff will be captured by onsite inlets and conveyed by a series of perforated storm drain pipe and drain rock infiltration trenches to the sandy loam or gravel layer below or to the proposed vegetated swale along the frontage road.

In order to convey the potential overflow from Churn Creek, a vegetated swale will be constructed between the proposed frontage road and Interstate 5. This proposed vegetated swale will be approximately 40-feet wide and 5-feet deep and is shown in Appendix D. It will have a longitudinal slope of 0.4 percent to encourage infiltration to the sandy gravelly layer below. The vegetated swale will convey the onsite runoff, and when necessary the potential overflow from Churn Creek, from the project to a proposed water quality retention facility and ultimately to the Sacramento River. The proposed swale along with the water quality retention facility will act as an infiltration trench and infiltration basin and wet pond. Preliminary calculations can be found in Appendix D.

6.2.1 Alternative A – Proposed Project

With development of the proposed project, the site will develop into 18% rooftop, sidewalks, and parking lot. Table 4.2 summarizes the peak flows from the post-development condition. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.2: Estimated Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	87
10-YEAR	118
100-YEAR	174

In the post-development condition the on-site drainage basin will be broken into four separate drainage areas, Drainage Area #1, Drainage Area #2, Drainage Area #3, and Drainage Area #4. These drainage areas are shown in Figure A7. Each drainage area is less than 25 acres so a design storm of 10 years was used to estimate the size of the storm drain pipe.

Drainage Area #1 is approximately 16 acres in size and will drain the runoff from the proposed north parking lot, entry, and Big Box Retail. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 36 inches in size.

Drainage Area #2 is approximately 4 acres in size and will drain the runoff from approximately half of the east side of the proposed casino. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will be a maximum of 24 inches in size.

Drainage Area #3 is approximately 6 acres in size and will drain the runoff from the remainder of the east side of the casino. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 30 inches in size.

Drainage Area #4 is approximately 4 acres in size and will drain the runoff from the proposed south parking lot. A series of inlets and perforated storm drain pipe will collect and convey the runoff to the Sacramento River. The perforated storm drain pipe will be a maximum of 24 inches in size and will be placed within a drain rock infiltration trench three feet wide. This infiltration trench will infiltrate 1.3 cubic feet per second of the peak flow.

Table 4.3 summarizes the post-development peak flows for each drainage area for the 2- and 10- year events.

Table 4.3: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs			
	Drainage Area #1	Drainage Area #2	Drainage Area #3	Drainage Area #4
2-YEAR	36	10	14	11
10-YEAR	47	14	19	14

The proposed infiltration channel will be sized to convey the overflow from Churn Creek to the Sacramento River. The channel has a 20-foot bottom, 2:1 side slopes, with a longitudinal slope of 0.4 percent. This large flat channel will also convey the on-site stormwater that does not infiltrate to the proposed water quality detention pond. Using Darcy's Law the maximum flow that the proposed channel can infiltrate was calculated to be approximately 182 cubic feet per second as shown in Appendix A, which is larger than the calculated 100-year peak flow of 174 cubic feet per second. Comparing this calculated flow to the peak flows shown in Table 4.2 the proposed channel has the ability to infiltrate the 2-, 10-, and 100-year events.

Peak flow and infiltration calculations can be found in Appendix D. Pipe and infiltration trench sizing calculations can be found in Appendix D.

6.2.2 Alternative B – No Big Box Retail

With development of the proposed project, the site will develop into 13% rooftop, sidewalks, and parking lot. Table 4.4 summarizes the peak flows from the post-development condition. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.4: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	64
10-YEAR	90
100-YEAR	139

In the post-development condition the on-site drainage basin will be broken into four separate drainage areas, Drainage Area #1, Drainage Area #2, Drainage Area #3, and Drainage Area #4. These drainage areas are shown in Figure B7. Each drainage area is less than 25 acres so a design storm of 10 years was used to estimate the storm drain pipe diameter.

Drainage Area #1 is approximately 6.5 acres in size and will drain the runoff from the proposed north parking lot and entry. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 30 inches in size.

Drainage Areas #2, #3, and #4 are the same as Alternative A.

Table 4.5 summarizes the post-development peak flows for each drainage area for the 2- and 10- year events.

Table 4.5: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs			
	Drainage Area #1	Drainage Area #2	Drainage Area #3	Drainage Area #4
2-YEAR	15	10	14	11
10-YEAR	20	14	19	14

The maximum flow that the proposed channel can infiltrate was calculated to be approximately 182 cubic feet per second as shown in Appendix A, which is much larger than the calculated peak flows shown in Tables 4.4 and 4.5. Therefore the proposed channel has the ability to infiltrate the 2-, 10-, and 100-year events.

Peak flow and infiltration calculations can be found in Appendix D. Pipe and infiltration trench sizing calculations can be found in Appendix D.

6.2.3 Alternative C – Reduced Intensity Alternative

Hydrologically and hydraulically speaking, Alternative C is the same as Alternative A.

6.2.4 Alternative D – Non-Gaming Alternative

With development of the proposed project, the site will develop into 10% rooftop, sidewalks, and parking lot. Table 4.6 summarizes the peak flows from the post-development condition. The HEC-1 input parameters and hydrologic calculations can be found in Appendix A.

Table 4.6: Estimated Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	52
10-YEAR	73
100-YEAR	117

In the post-development condition, the on-site drainage basin will be broken into two separate drainage areas, Drainage Area #1 and Drainage Area #2. These drainage areas are shown on Figure D7. Each drainage area is less than 25 acres, so a design storm of 10 years was used to estimate the storm drain pipe diameter.

Drainage Area #1 is approximately 10 acres in size and will drain the runoff from the proposed north parking lot and Big Box Retail. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will range from 15 to 30 inches in size.

Drainage Area #2 is approximately 6 acres in size and will drain the runoff from the proposed hotel and south parking lot. A series of inlets and storm drain pipe will collect and convey the runoff to the proposed infiltration channel. The storm drain pipe will be a maximum of 30 inches in size.

Table 4.7 summarizes the post-development peak flows for each drainage area for the 2- and 10- year events.

Table 4.7: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs	
	Drainage Area #1	Drainage Area #2
2-YEAR	23	15
10-YEAR	32	20

The maximum flow that the proposed channel can infiltrate was calculated to be approximately 182 cubic feet per second as shown in Appendix A, which is much larger than the calculated peak flows shown in Tables 4.6 and 4.7. Therefore, the proposed channel has the ability to infiltrate the 2-, 10-, and 100-year events.

Peak flow and infiltration calculations can be found in Appendix D. Pipe and infiltration trench sizing calculations can be found in Appendix D.

6.3 Cumulative Project Drainage Impacts

As seasonal precipitation patterns may be changing, and rainfall may become more concentrated and intense the following has been considered in the hydraulic design of the storm drain conveyance system to accommodate future peak flows:

- The on-site storm drain system will be oversized by at least 25%, leaving additional capacity for future conditions.
- The design of the storm drain pipe system provides infiltration into the loam soil, however the calculations neglect the infiltration into the ground by the proposed LID features; vegetated swales, retention pond, and infiltration trenches which is a conservative approach and adds additional capacity to the system.

The flow in the Sacramento River adjacent to the project is almost entirely regulated by the upstream releases from Shasta Dam and Keswick Dam. The project drainage system has been designed in such a way that there will be no increase in flows downstream. This will be accomplished using infiltrations trenches, an infiltration wet pond, and numerous other stormwater quality BMPs that encourage groundwater infiltration as described in Section 6.1.

Surrounding development will be subject to the City of Redding's City Council Policy 1806, the City of Redding Storm Water Quality Improvement Plan, and the City of Redding Phase II NPDES Permit in regard to both stormwater quality and quantity. The City of Redding's City Council Policy 1806 requires that proposed development address peak flows to maintain pre-development levels at all locations downstream of the project. Both the City of Redding Storm Water Quality Improvement Plan and the City of Redding Phase II NPDES Permit require proposed development to incorporate Low Impact Development (LID) Best Management Practices (BMPs) to improve stormwater quality in the runoff to mitigate for the increased impervious area. Development surrounding the proposed project will not negatively impact Stormwater quality or quantity.

All of the proposed project alternatives have been designed to convey the estimated 600-700 cubic feet per second that might overtop Interstate 5 from Churn Creek (east of Interstate 5), as described in Section 4.1. This flow will be conveyed by constructing a large vegetated swale along the project's easterly boundary that will allow the estimated 600-700 cfs to bypass the proposed development and be conveyed to the Sacramento River. The development will have no negative impact on the flooding that occurs in the neighborhoods of the Churn Creek area as it is not tributary to the Churn Creek Watershed and will not impede the potential Interstate 5 overflow. Any future watershed development upstream of the proposed development will be required to mitigate for any future increases in impervious area to maintain pre-development conditions per local jurisdiction and state standards and regulations.

No levees will be constructed as part of this project and ground elevations will not be increased within the FEMA 100-year floodplain. Therefore there will be no loss of existing floodplain storage volume.

There will be no adverse impacts to stormwater quality or stormwater quantity to locations downstream as a result of the proposed project development and drainage system.

Section 5 – Hydrology and Hydraulics – Alternative Site

5.1 Description of Existing Watershed Characteristics

The Alternative E site is relatively flat and generally drains easterly towards the Tormey Drain and Interstate 5. The 40.5-acre site is a part of the Tormey Drain Basin and consists of pastureland and scattered oak trees. Soils types were determined using the *Web Soil Survey* provided by the United States Department of Agriculture Soil Conservation Service and Forest Service. It was determined from the Web Soil Survey that the site consists of Hydrologic Soil Group A and D.

The current FEMA FIRM identifies that the proposed project is within the Tormey Drain 100-year floodplain. The Flood Insurance Study provided by FEMA shows that the 100-year peak flow at Oak Street is 744 cubic feet per second and at Interstate 5 is 788 cubic feet per second. Figure E4 shows FEMA 100-year floodplain.

5.2 Methodology

Peak flows for the 2-, 10-, and 100-year storm events for a 24-hour period were estimated using the United States Army Corp of Engineers flood hydrograph package HEC-1 to model rainfall runoff. Existing peak flows can be in Table 5.1. The Rational Method was used to estimate the proposed size of the on-site storm drain conveyance system. The Darcy Equation was used to estimate the amount of infiltration that will be utilized in the proposed storm drain conveyance system.

5.3 Results of Analysis

The existing condition peak flows for Alternative E were calculated and are summarized in Table 5.1.

Table 5.1: Estimated Existing Condition Peak Flows

Storm Event	Existing Condition Peak Flow, cfs
2-YEAR	4
10-YEAR	8
100-YEAR	21

With development of the proposed project, the site will develop into 84% rooftop, sidewalks, and parking lot. Table 5.2 summarizes the peak flows from the post-development condition.

Table 5.2: Estimated Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
2-YEAR	55
10-YEAR	76
100-YEAR	115

Post-developed runoff will be captured by onsite inlets and conveyed by a series of perforated storm drain pipe and drain rock infiltration trenches to the proposed retention pond located in the southeast of the project site. Approximately 24 acres of the site (Drainage Area #1) will be conveyed by the proposed on-site system. A series of inlets and perforated storm drain pipe will collect and convey the runoff to the proposed retention pond. The perforated storm drain pipe will be a maximum of 36 inches in size and will be placed within a drain rock infiltration trench five feet wide. This infiltration trench will infiltrate 38 cubic feet per second of the peak flow. Table 5.3 summarizes the post-development peak flows for Drainage Area #1 for the 2- and 10- year events.

Table 5.3: Post-development Peak Flows

Storm Event	Post-development Peak Flow, cfs
	Drainage Area #1
2-YEAR	35
10-YEAR	49

This site has approximately 58 acre-feet of storage within the 100-year floodplain. With development of the project it is estimated that 36 acre-feet of the floodplain will be filled. This will require filing a Letter of Map Revision - Fill with FEMA. This storage will be relocated to the southeast portion of the site on both sides of Oak Street. The bottom of the proposed retention pond will be set at the flowline of the Tormey Drain (elevation 410) and the top of the pond will be at the ground elevation of 416 feet. The proposed pond depicted will have a volume of 62 acre-feet. Figure E4 shows the location of the proposed retention pond.

5.4 Cumulative Impact of Alternative Site Grading & Drainage

The proposed alternative site will be designed in such a way that the grading will be a balanced earthwork operation, meaning the cut and fill quantities will be the same and there is no import or export of material required. The grading design of the alternative site will require fill to be placed in the FEMA 100-year floodplain in order to get the building finished floors a minimum of one foot above the 100-year flood elevation of the Tormey Drain. The project has been designed in such a way that the volume of fill placed within the FEMA 100-year floodplain will be mitigated by an equal volume of cut (detention/infiltration basins) within the FEMA 100-year floodplain. This will maintain pre-development flood levels at all locations upstream and downstream of the project.

The project drainage system has been designed in such a way that there will be no increase in flows downstream. This will be accomplished using infiltrations trenches, infiltration/detention basins, and numerous other stormwater quality BMPs that encourage groundwater infiltration as described in Section 6.1.

Surrounding development will be subject to the City of Anderson's policy to demonstrate "No Net" offsite downstream drainage effects as a result of any proposed development. The City of Anderson is a Phase II NPDES community and any proposed development will be required to incorporate Low Impact Development (LID) Best Management Practices (BMPs) to improve stormwater quality in the runoff to mitigate for the increased impervious area. Development surrounding the proposed project will not negatively impact Stormwater quality or quantity.

There will be no adverse impacts to stormwater quality or stormwater quantity to locations downstream as a result of the alternative site development and drainage system.

Section 6 – Stormwater Quality

6.1 Stormwater Quality Best Management Practices

During urban development two important changes occur, first a portion of the vegetated, pervious ground cover is converted to impervious surfaces. Vegetated soil both absorbs rain water, and helps to remove pollutants, providing a natural purification system. This natural absorption purification system is blocked by the newly developed impervious surface. The second important change of urban development is the addition of new pollutants, such as vehicle emissions, pesticides, trash, and other contaminants that come along with development. Because of these changes, storm water runoff leaving a site in a newly developed or redeveloped area may be considerably greater in volume, velocity and level of pollutants. The proposed project will incorporate numerous stormwater quality and quantity BMPs into the project design and landscaping to reduce pollutants and leaving the site, including but not limited to the following:

- Catch Basin Filters
- Infiltration Trenches (Perforated storm drain pipe with drain rock)
- Vegetated Swales
- Bio-filtration Swales
- Natural Water Quality Retention Basins
- Wet Ponds
- Pervious Pavements

6.1.1 Catch Basin Filters

Catch Basin insert filters will be installed at select area drains and catch basins on-site. These inlet filters are designed to capture sediment, debris, trash, oil and grease from storm water. These filters clean the storm water during low flows, and have no standing water which minimizes any bacteria and odor problems. The system consists of a fabric filter that is placed inside the area drain or catch basin. This fabric is permeable so that the water may pass through leaving the pollutants & debris behind. The filters require regular maintenance, and must be checked regularly. The debris and contaminants can be removed and disposed of properly, the filter can be then be reused.

All of the alternatives will utilize catch basin inlet filters where feasible in the parking and landscape areas to improve the water quality of the runoff prior to entering the underground storm drain system.

6.1.2 Infiltration Trenches

Where feasible, Infiltration Trenches will be built as opposed to solid wall underground storm drain systems. Perforated pipe will be installed in a drain rock backfilled trench which will allow the low storm water flows to flow through the drain rock. The drain rock acts as a filter removing sediment and other contaminants. Most of the storm water will absorb into the ground which simulates the pre-development natural absorption and purification condition that existed prior to development. These infiltration trenches will be constructed in areas that have favorable soil conditions to promote stormwater infiltration. The entire site consists of Hydrologic Soil Group A soils, which provides excellent infiltration and absorption.

6.1.3 Vegetated Swales

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems. The 40 foot wide vegetated swale provides filtration through proposed vegetation and infiltration for stormwater runoff.

6.1.4 Wet Ponds

Wet ponds (a.k.a. stormwater ponds, retention ponds, wet extended detention ponds) are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season) and differ from constructed wetlands primarily in having a greater average depth. Ponds treat incoming stormwater runoff by settling and biological uptake. The primary removal mechanism is settling as stormwater runoff resides in this pool, but pollutant uptake, particularly of nutrients, also occurs to some degree through biological activity in the pond. Wet ponds are among the most widely used stormwater practices. While there are several different versions of the wet pond design, the most common modification is the extended detention wet pond, where storage is provided above the permanent pool in order to detain stormwater runoff and promote settling.

The wet pond will be located at the southern portion of the Proposed Project site and runoff will be conveyed to the wet pond via the vegetated swale (40' vegetated swale) described in Section 6.1.3. The wet pond will retain water and allow infiltration into the native alluvial soil during a typical rain event. During rare extreme runoff events, the wet pond will spill and runoff will make its way south to the Sacramento River. The wet pond will be submerged when the Sacramento River is flooding.

6.1.5 Pervious Pavements

Pervious paving is used for light vehicle loading in parking areas and in outdoor pedestrian areas. The term describes a system comprising a load-bearing, durable surface together with an underlying layered structure that temporarily stores water prior to infiltration or drainage to a controlled outlet. The surface can itself be porous such that water infiltrates across the entire surface of the material (e.g., grass and gravel surfaces, porous concrete and porous asphalt), or can be built up of impermeable blocks separated by spaces and joints, through which the water can drain. This latter system is termed 'permeable' paving.

Advantages of pervious pavements are that they reduce runoff volume while providing treatment and are unobtrusive resulting in a high level of acceptability.

Pervious pavement was not used in the stormwater quality or stormwater quantity mitigation calculations. However pervious pavement could be implemented on the proposed project to further improve the stormwater quality. Pervious pavements could be used in parking areas, courtyard areas, pedestrian areas or any other areas where feasible. Pervious pavements may be any of the following:

- Porous Concrete
- Porous Asphalt
- Pavers
- Gravel Surfaces

6.1.6 Green Roofs

When used in appropriate climates, green roofs can significantly reduce the amount of rain water that would otherwise run off an impervious roof surface. However, green roofs are not a viable option due to Redding's climate. Redding experiences cold, wet winters with dry, hot summers. Green roofs have been attempted in some projects around the Redding area but have fallen into disrepair as the amount of water to keep plants thriving in the harsh summer is counterproductive to the intent of the LID.

6.2 Sacramento River Streambank Stabilization

The eastern streambank of the Sacramento River (westerly project boundary) has a layer of loam that easily erodes with high river flows, see the photos below. As shown in the photos, there is an approximate 2:1 slope that contains cobble and established vegetation. This slope extends to the bottom of the riverbed and appears stable. As shown in the photos, the top 4 feet to 8 feet of the streambank contains a layer of loam that shows evidence of erosion and instability when it is exposed to high river flows as it was in early 2017.

Sacramento River eastern bank (Facing north)

Sacramento River eastern bank (Facing north)

Sacramento River eastern bank (Facing north)

6.2.1 Streambank Stabilization Recommendations

The upper loam portion of the riverbank should be stabilized using the 'Windrow Rock Slope Protection' method as described on page 16 of "California Bank and Shore Rock Slope Protection Design" Third Edition – Internet October 2000. This involves removal of existing stream bank material above the ordinary high-water mark and placement of a wide row of appropriately sized rock (boulders) over the existing cobbly alluvium up to at least the flood water surface elevation of the river. The river-side and top surface of the boulders is then covered with native cobbly alluvium, and the top surface is further covered with a minimum of 18 inches of native loam up to the desired finished surface elevation. This "hardened" bank will reduce erosion but will not increase the flow energy because the channel roughness coefficient and geometry will remain relatively the same. The ACOE Comprehensive Study stated that the HEC-RAS model in the upper Sacramento River "was not highly sensitive to changes in channel roughness". The roughness coefficient used by both the ACOE study and FEMA in the channel was 0.035. The roughness coefficient values for boulders range from 0.035-0.05. See Figure 6.1 below.

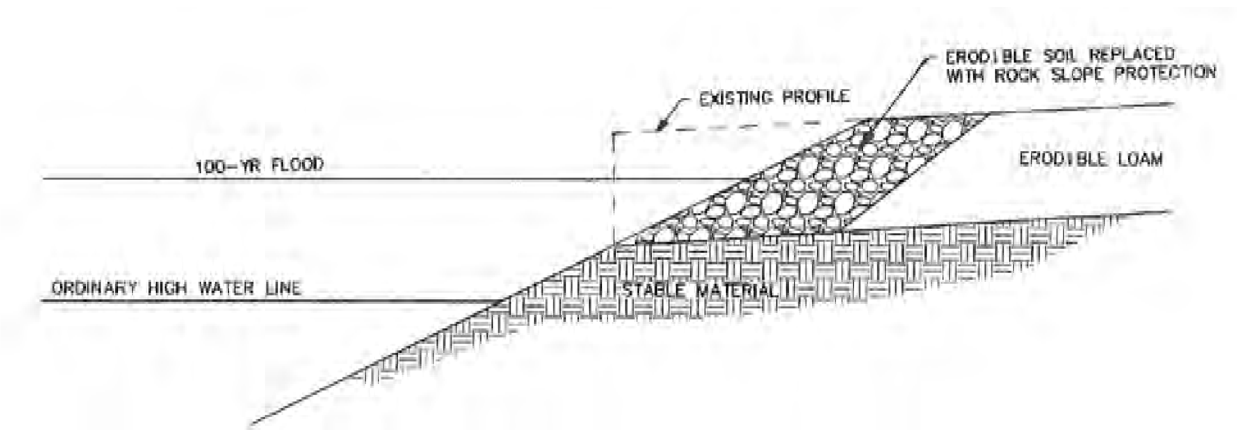

Figure 6.1: Streambank Stabilization

Figures

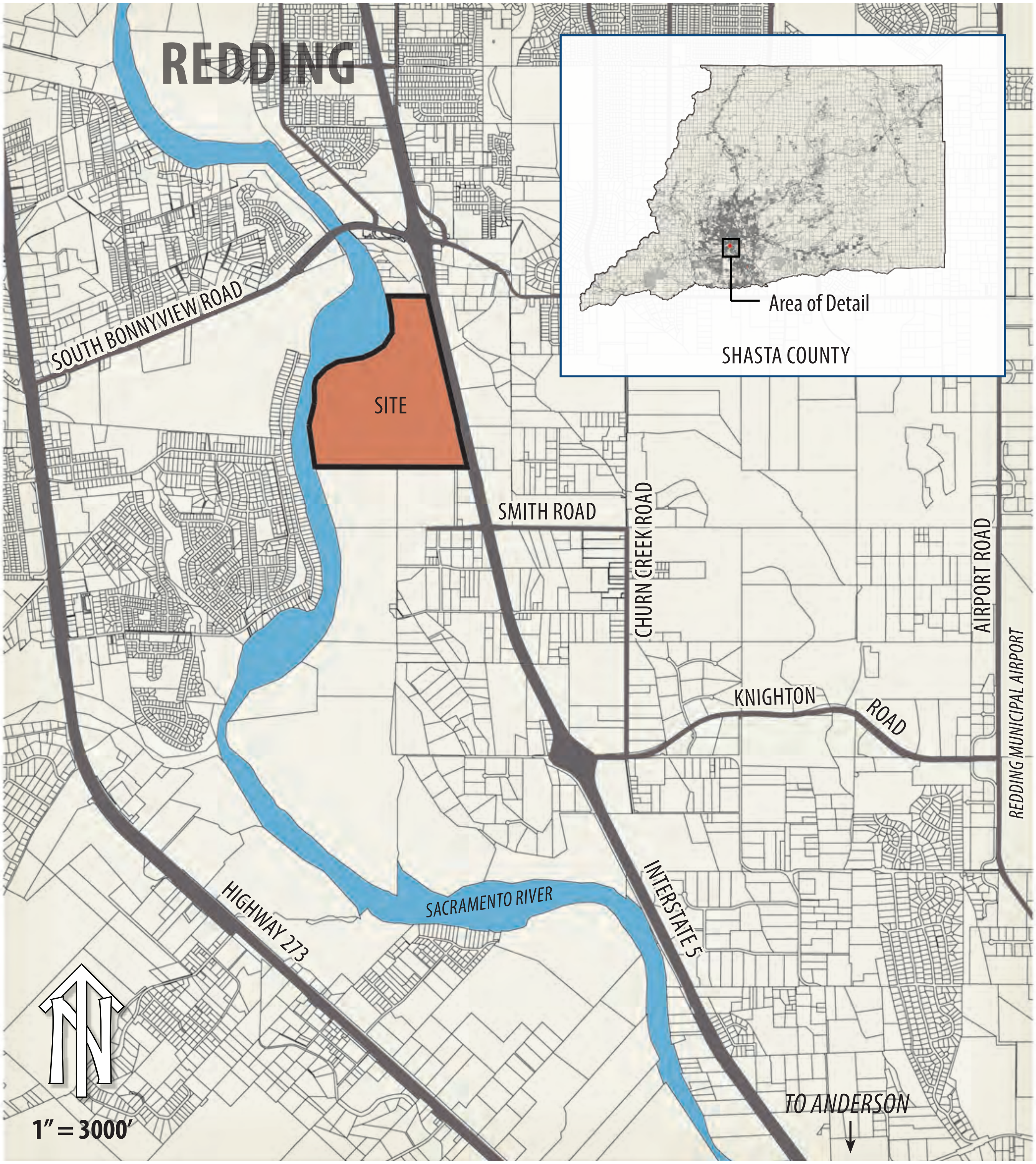

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FIGURE 1
PROPOSED PROJECT - ALT 'A', 'B', 'C', & 'D'
LOCATION MAP

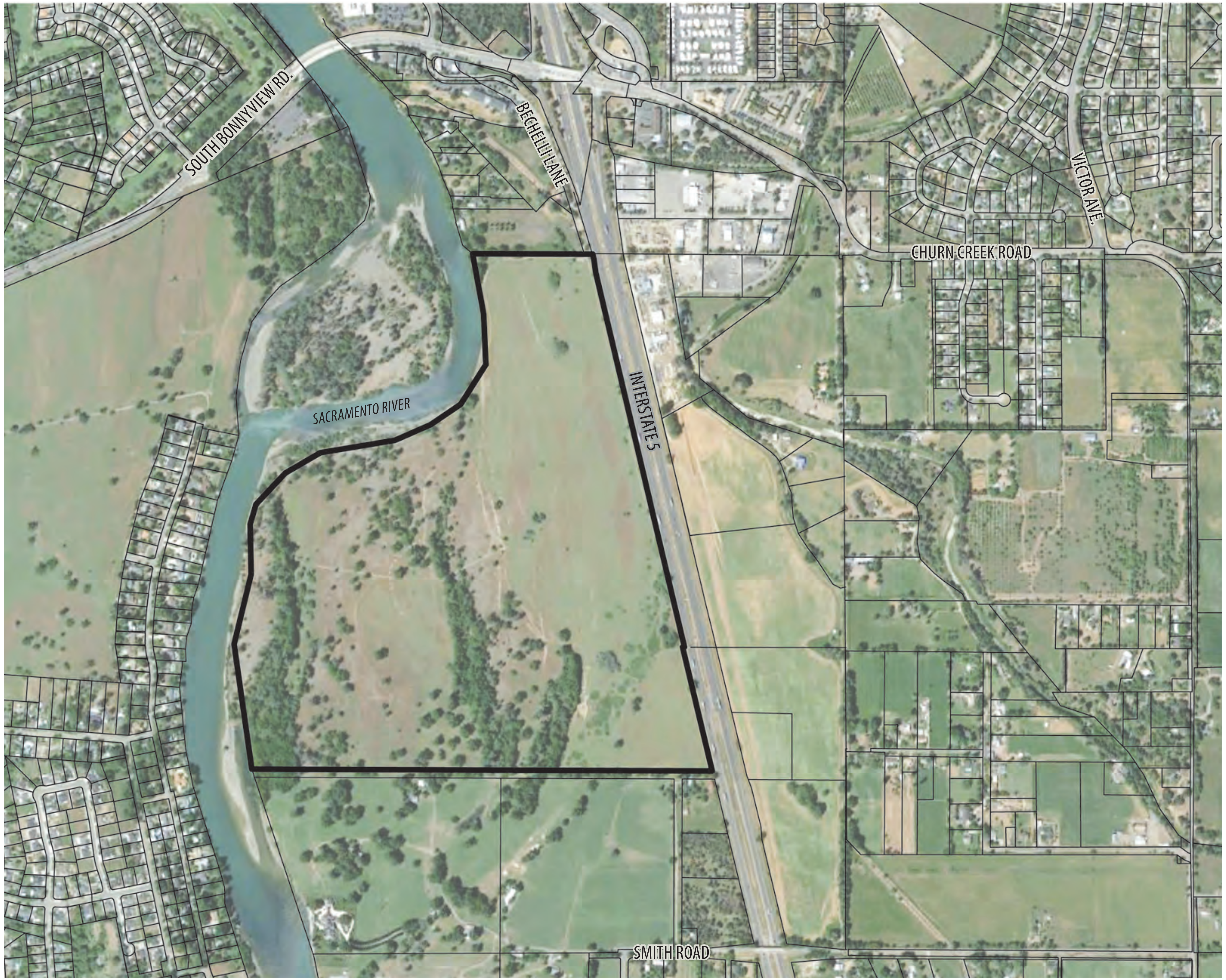

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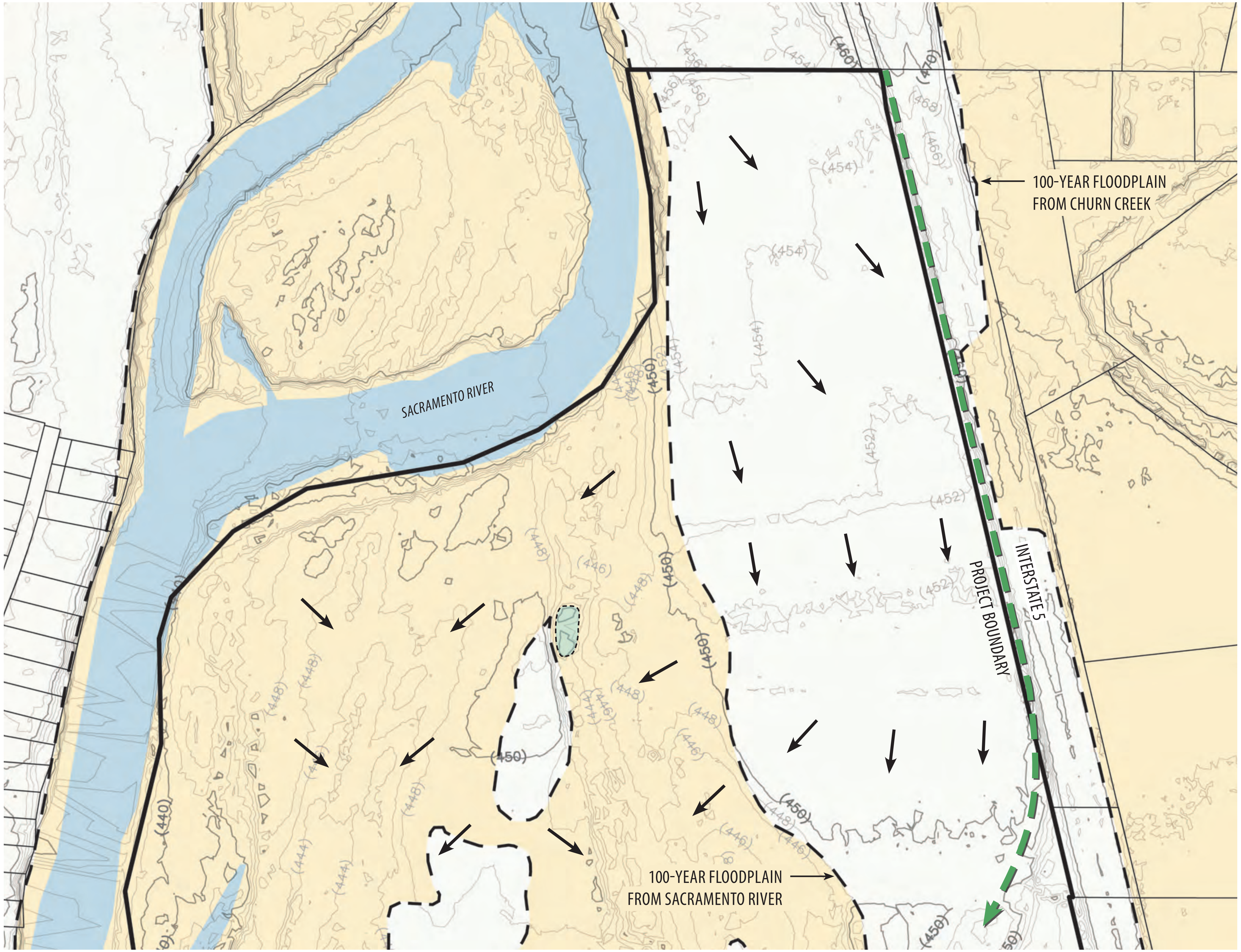
FIGURE 2
PROPOSED PROJECT
ENLARGED LOCATION MAP WITH AERIAL

REDDING RANCHERIA
CASINO MASTER PLAN



LEGEND

- 100-YEAR FLOODPLAIN
- SACRAMENTO RIVER
- EXISTING DRAINAGE SWALE
- FLOW DIRECTION
- EXISTING POND

N

1″ = 400′

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FIGURE 3
PROPOSED PROJECT
EXISTING TOPOGRAPHY

1" = 400'

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FIGURE 4
PROPOSED PROJECT AERIAL AND TOPOGRAPHY

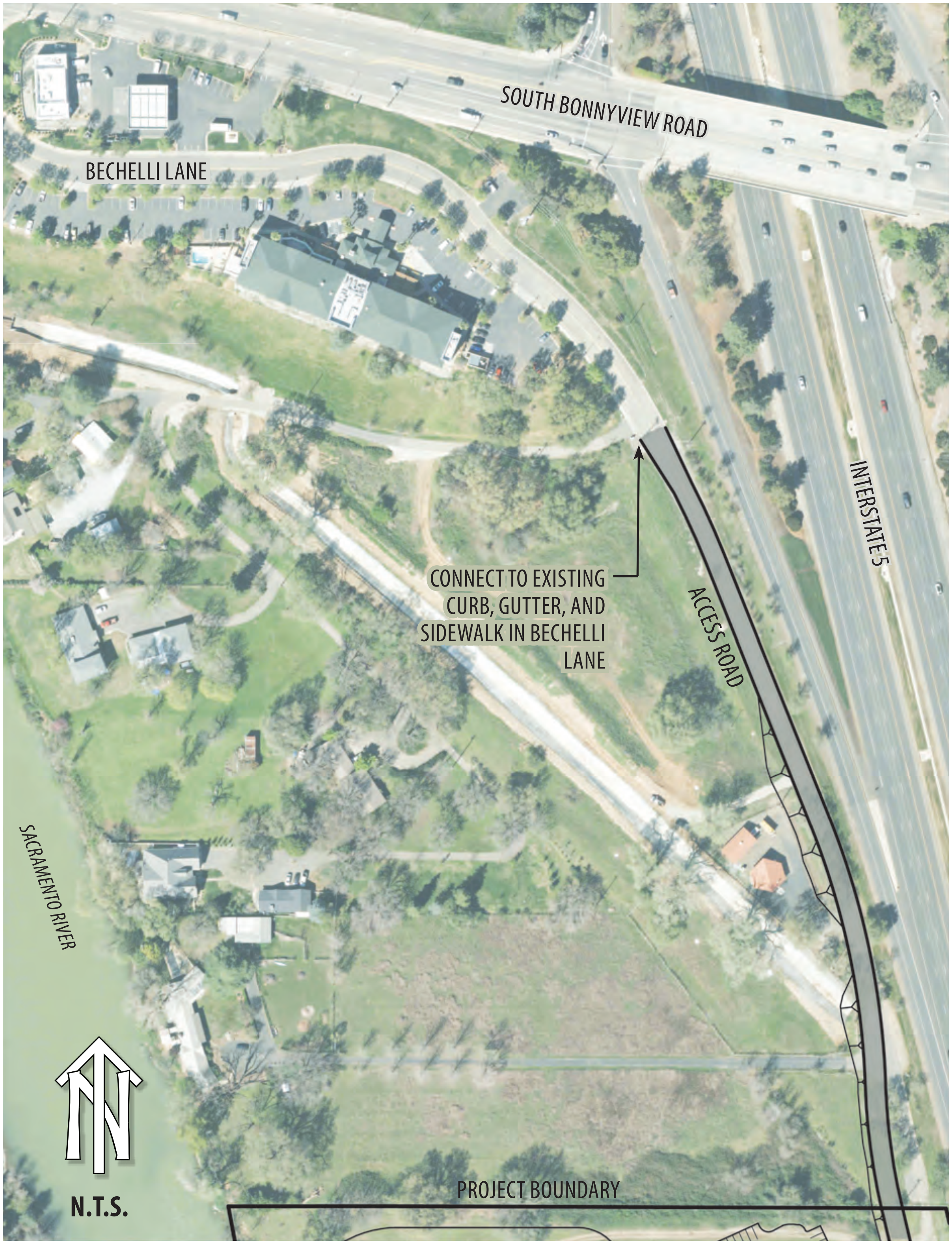

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FIGURE 5
PROPOSED PROJECT
NORTH ROAD CONNECTION

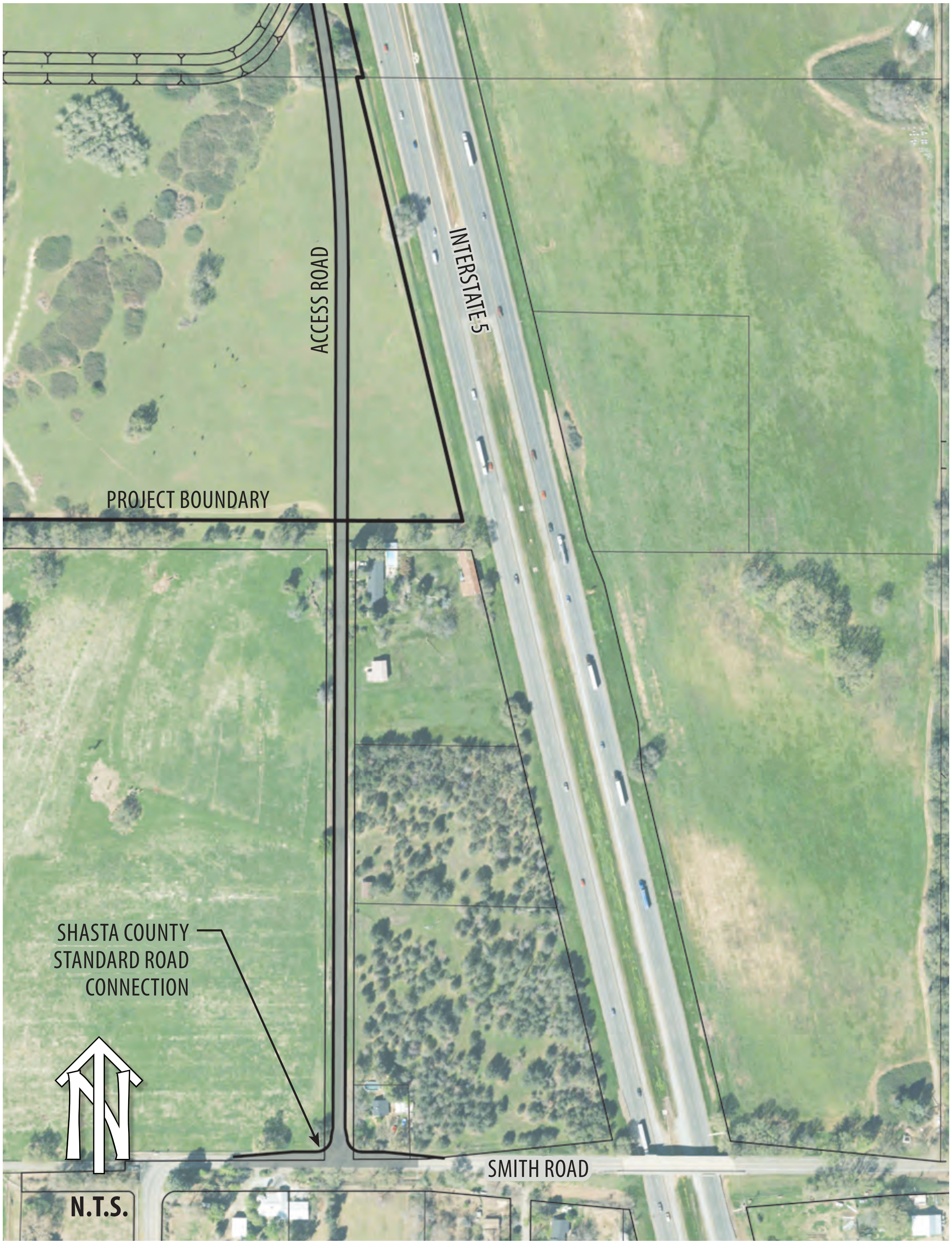

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FIGURE 6
PROPOSED PROJECT
SOUTH ROAD CONNECTION

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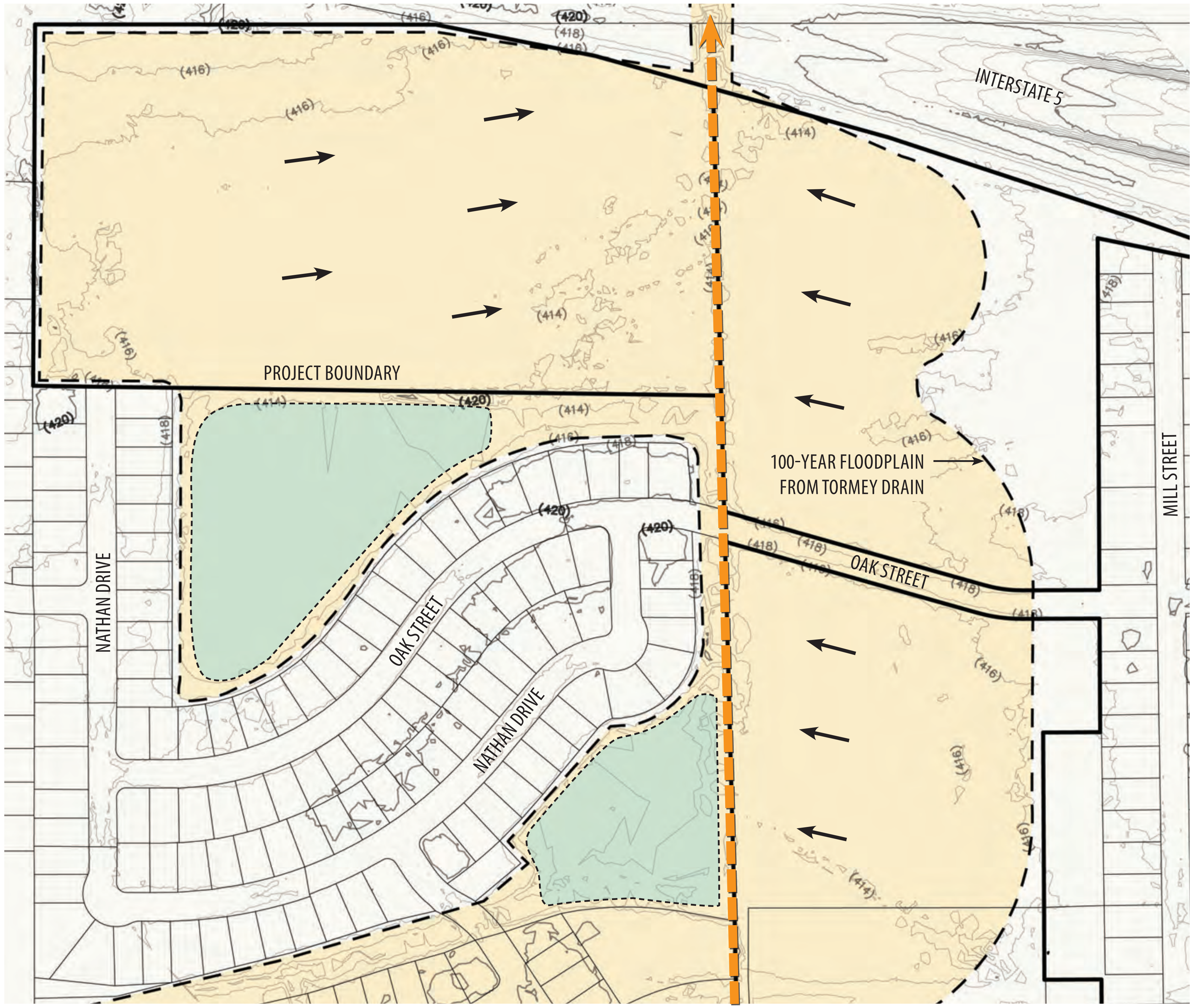
FIGURE 7
PROPOSED PROJECT - ALT 'E'
LOCATION MAP



LEGEND

- 100-YEAR FLOODPLAIN
- TORMEY DRAIN
- FLOW DIRECTION
- EXISTING POND

1" = 300'

FIGURE 8
ALT SITE
EXISTING TOPOGRAPHY

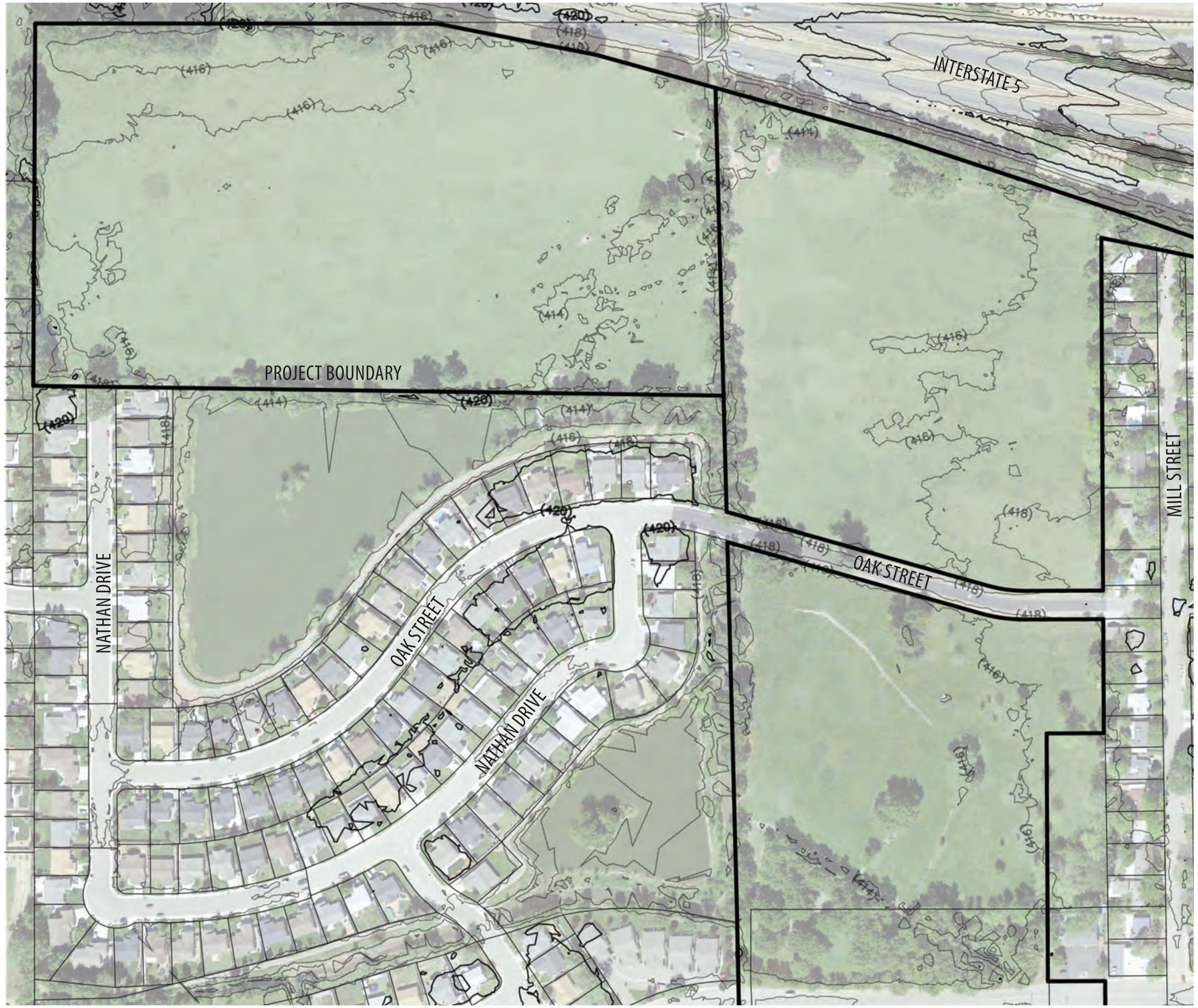


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FIGURE 9
ALT SITE
AERIAL AND TOPOGRAPHY

Figures – Alternative A

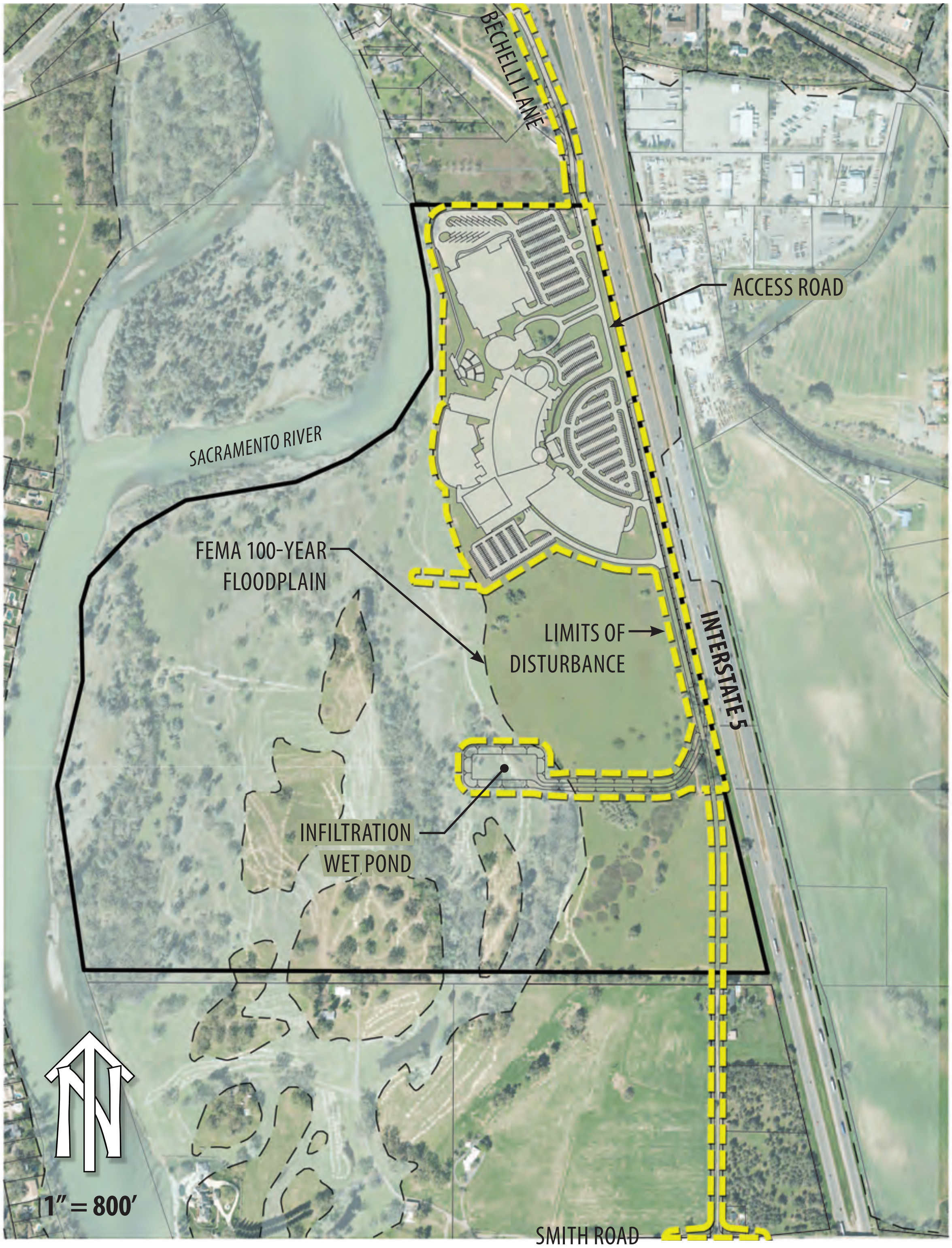

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FIGURE A1
PROPOSED PROJECT - ALT 'A'
OVERALL DISTURBANCE LIMITS

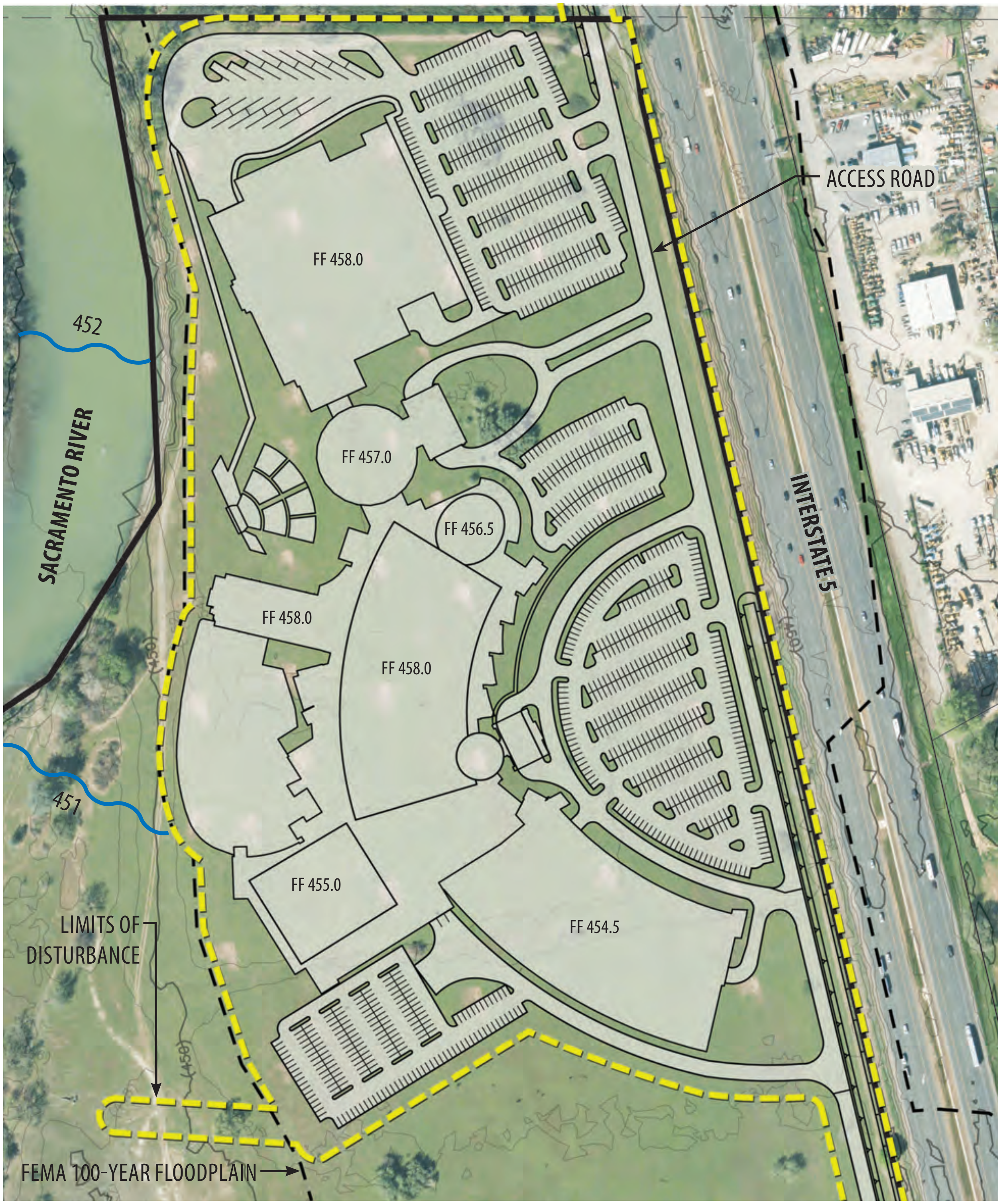

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FIGURE A2
PROPOSED PROJECT - ALT 'A'
ONSITE DISTURBANCE LIMITS

FIGURE A3
PROPOSED PROJECT - ALT 'A'
ONSITE GRADING

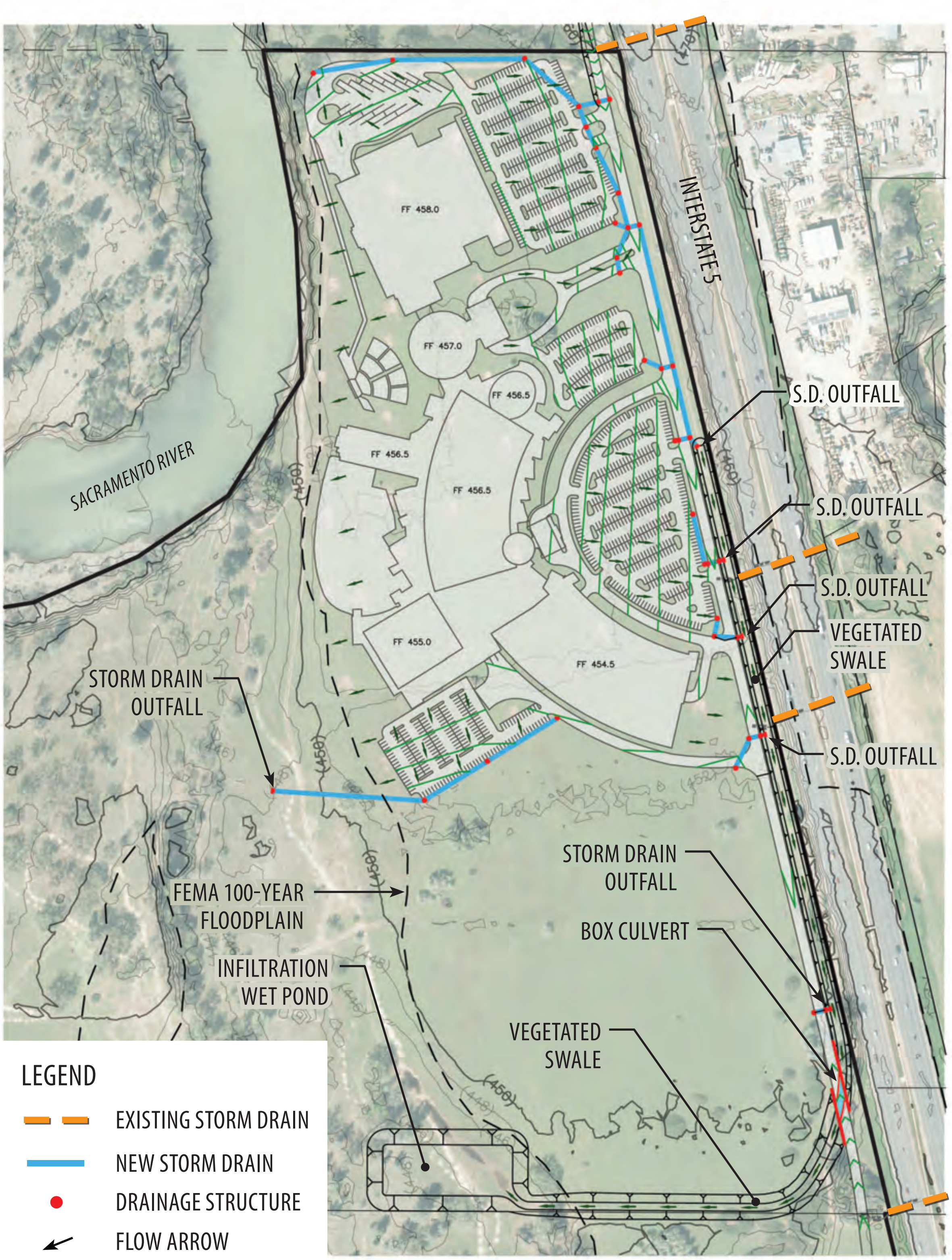

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FIGURE A4
PROPOSED PROJECT - ALT 'A'
OVERALL GRADING

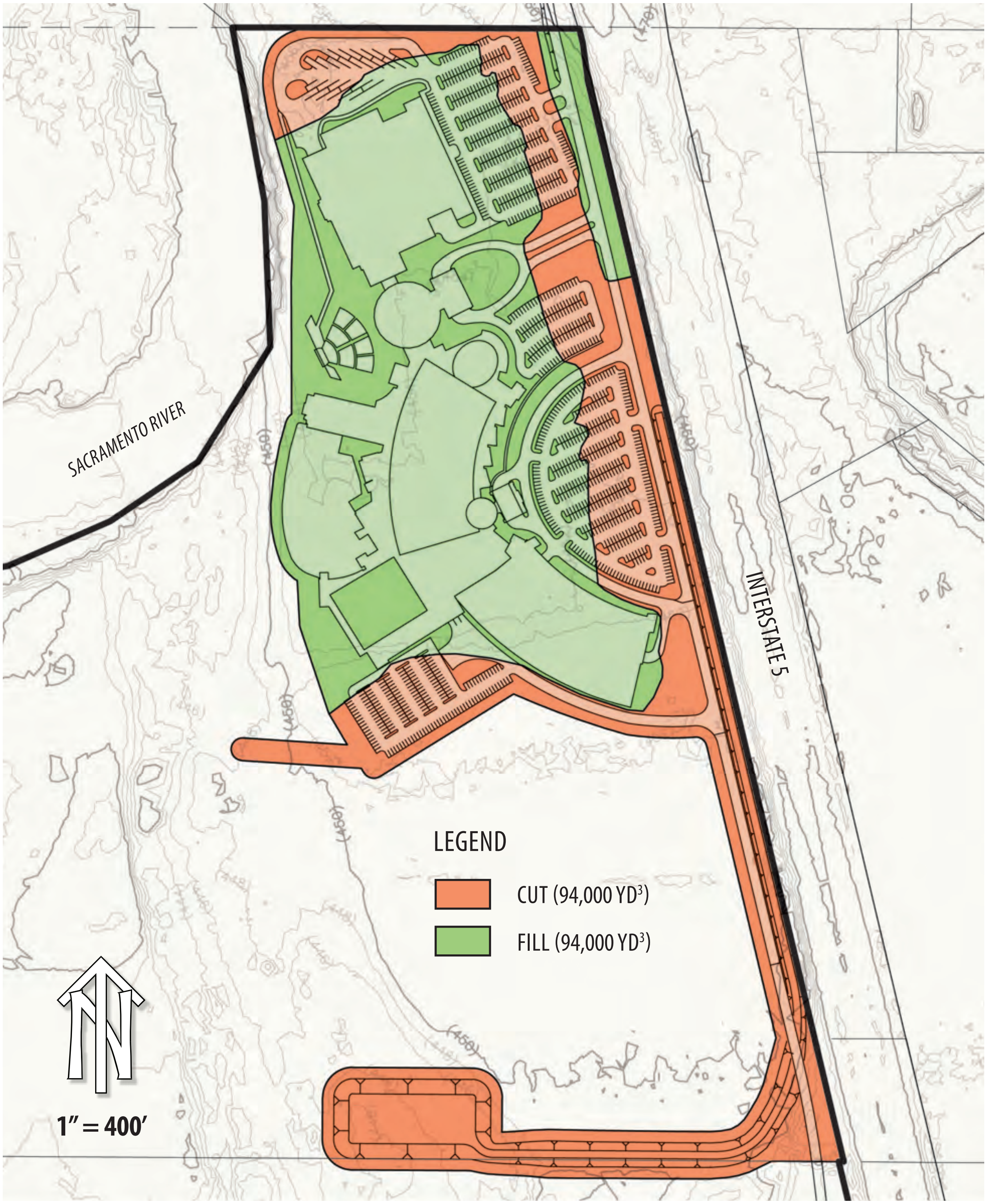

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FIGURE A5
PROPOSED PROJECT - ALT 'A'
CUT FILL DIAGRAM

REDDING RANCHERIA
CASINO MASTER PLAN

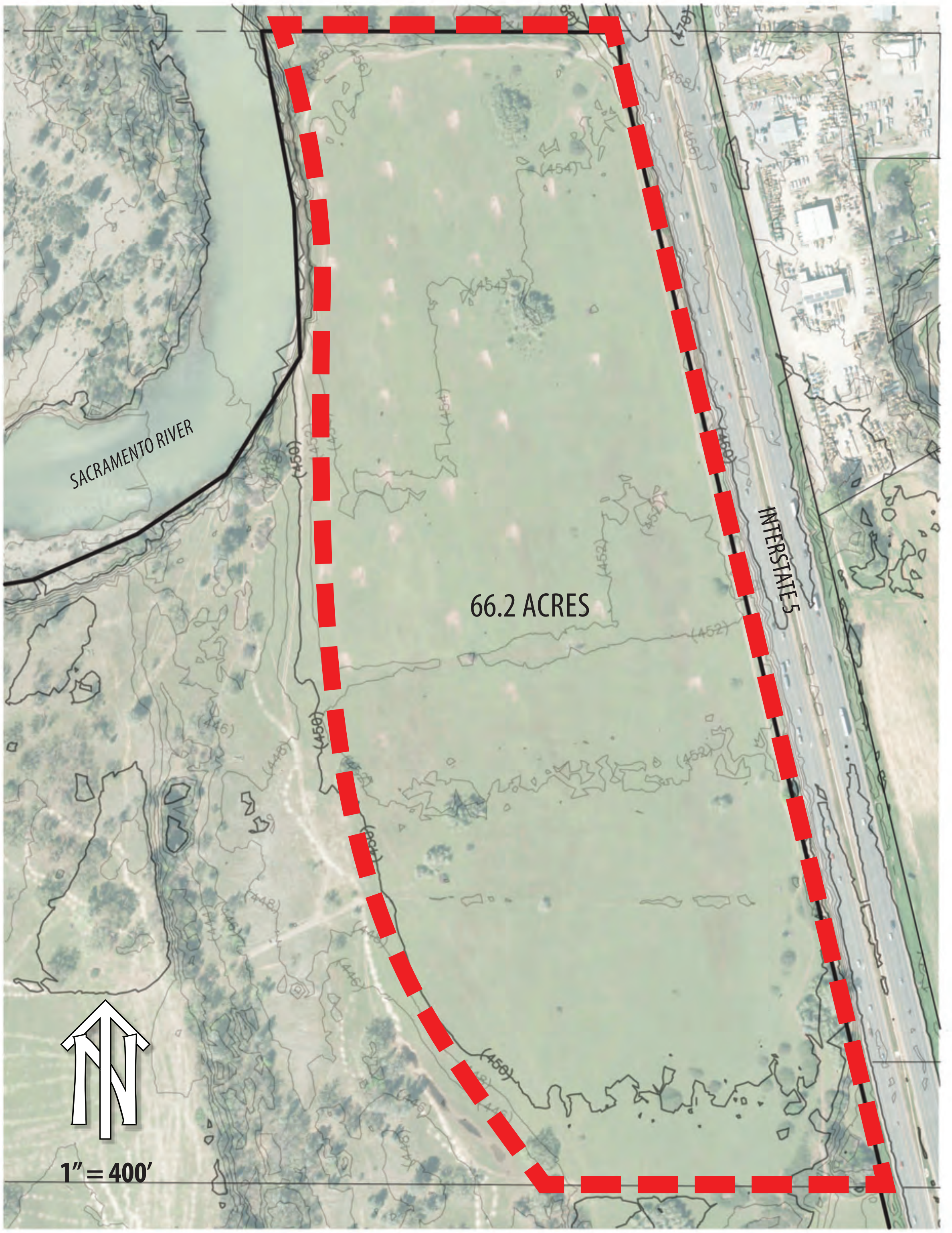

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FIGURE A6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'A'
EXISTING CONDITION

REDDING RANCHERIA CASINO MASTER PLAN

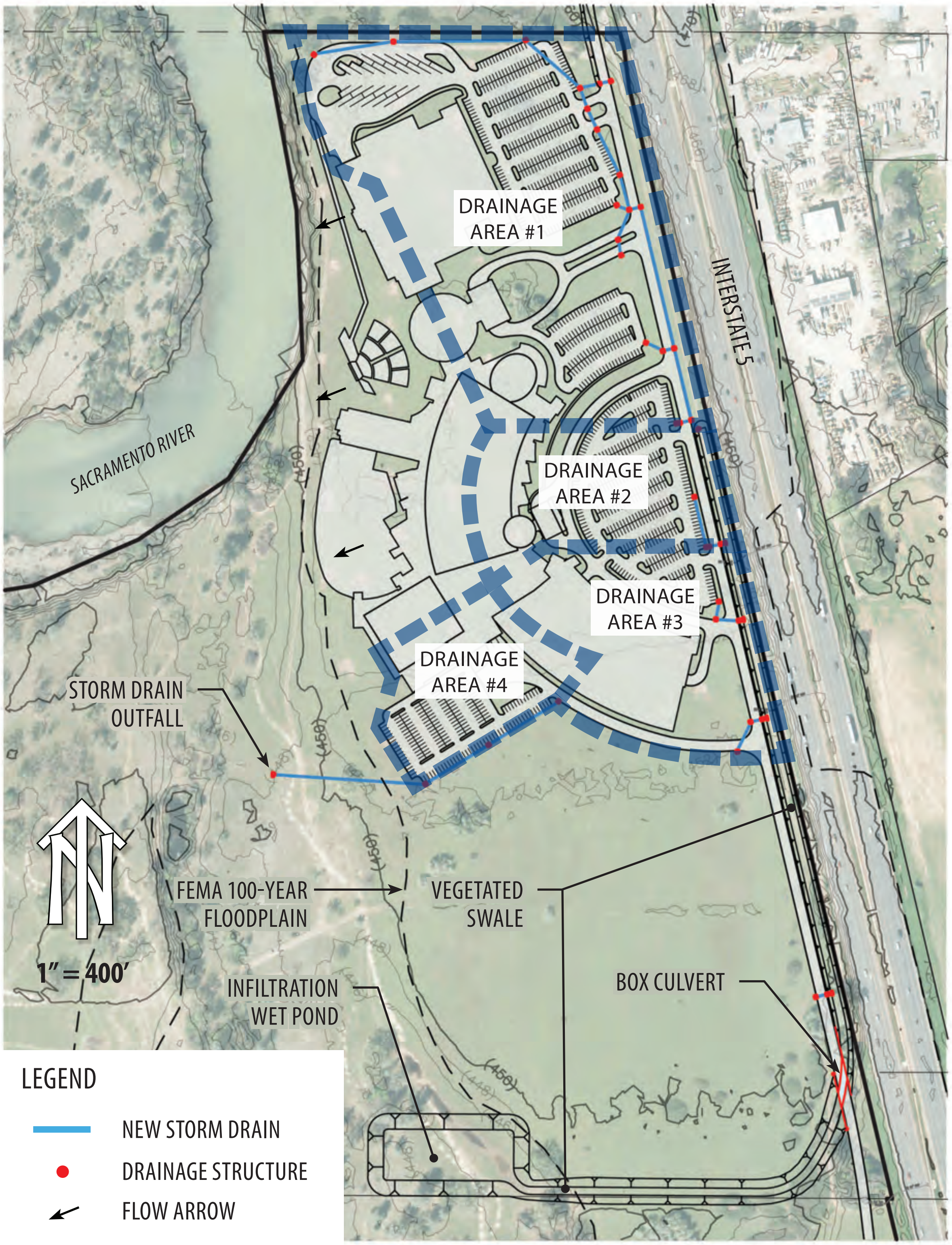

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FIGURE A7
PROPOSED PROJECT - ALT 'A'
STORMWATER MANAGEMENT

Figures – Alternative B

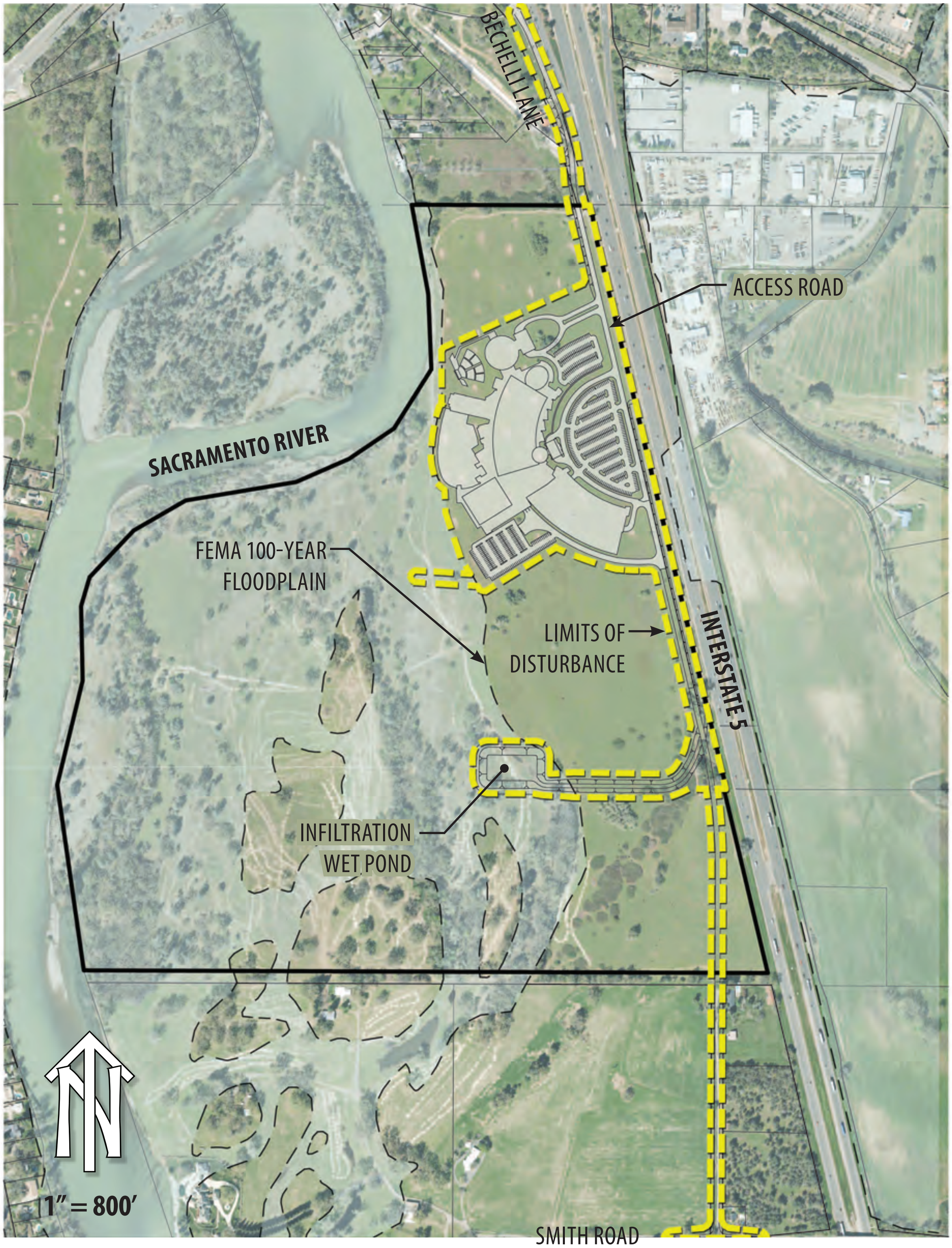

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FIGURE B1
PROPOSED PROJECT - ALT 'B'
OVERALL DISTURBANCE LIMITS

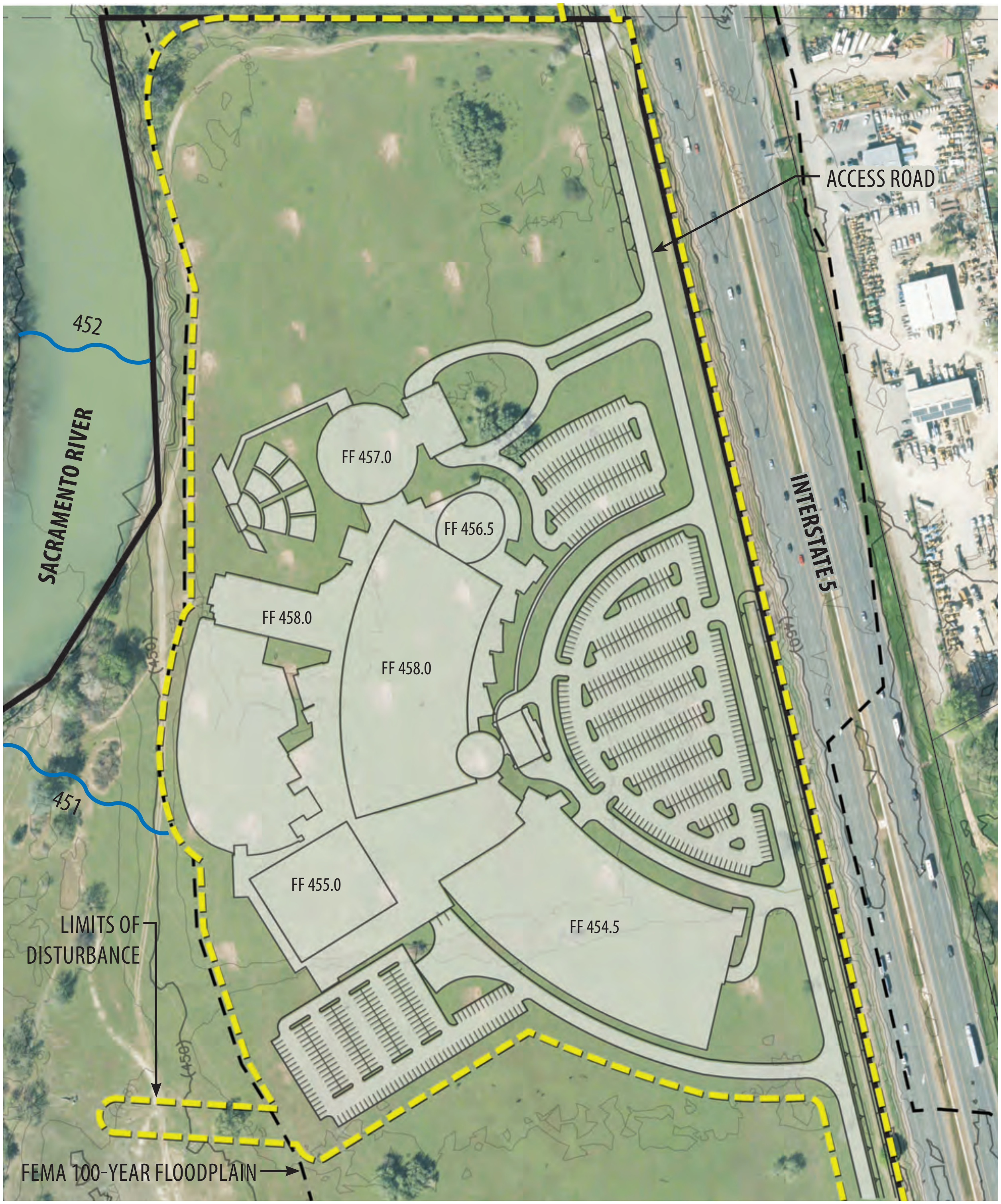

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FIGURE B2
PROPOSED PROJECT - ALT 'B'
ONSITE DISTURBANCE LIMITS

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FIGURE B3
PROPOSED PROJECT - ALT 'B'
ONSITE GRADING

REDDING RANCHERIA CASINO MASTER PLAN

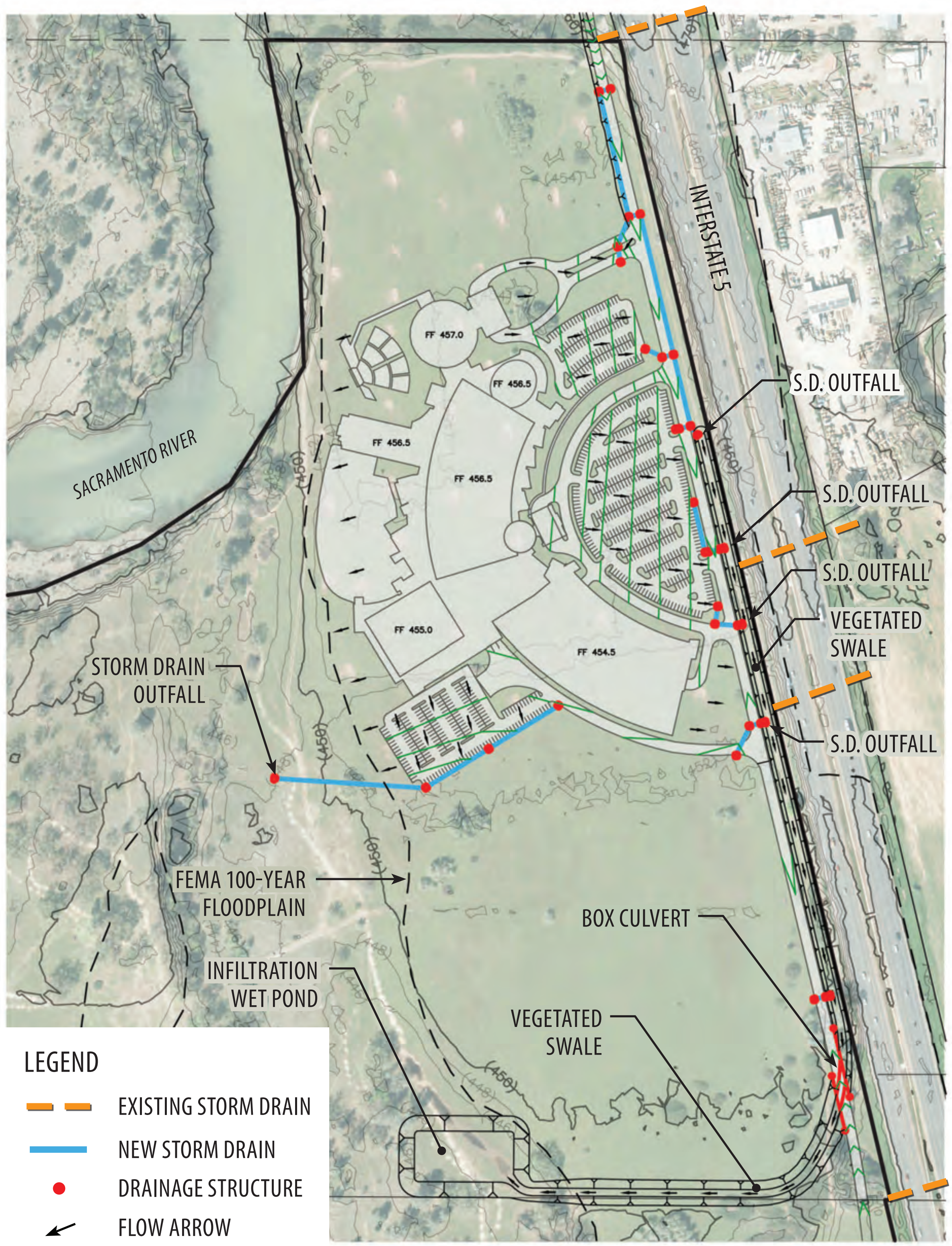

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FIGURE B4
PROPOSED PROJECT - ALT 'B'
OVERALL GRADING

REDDING RANCHERIA CASINO MASTER PLAN

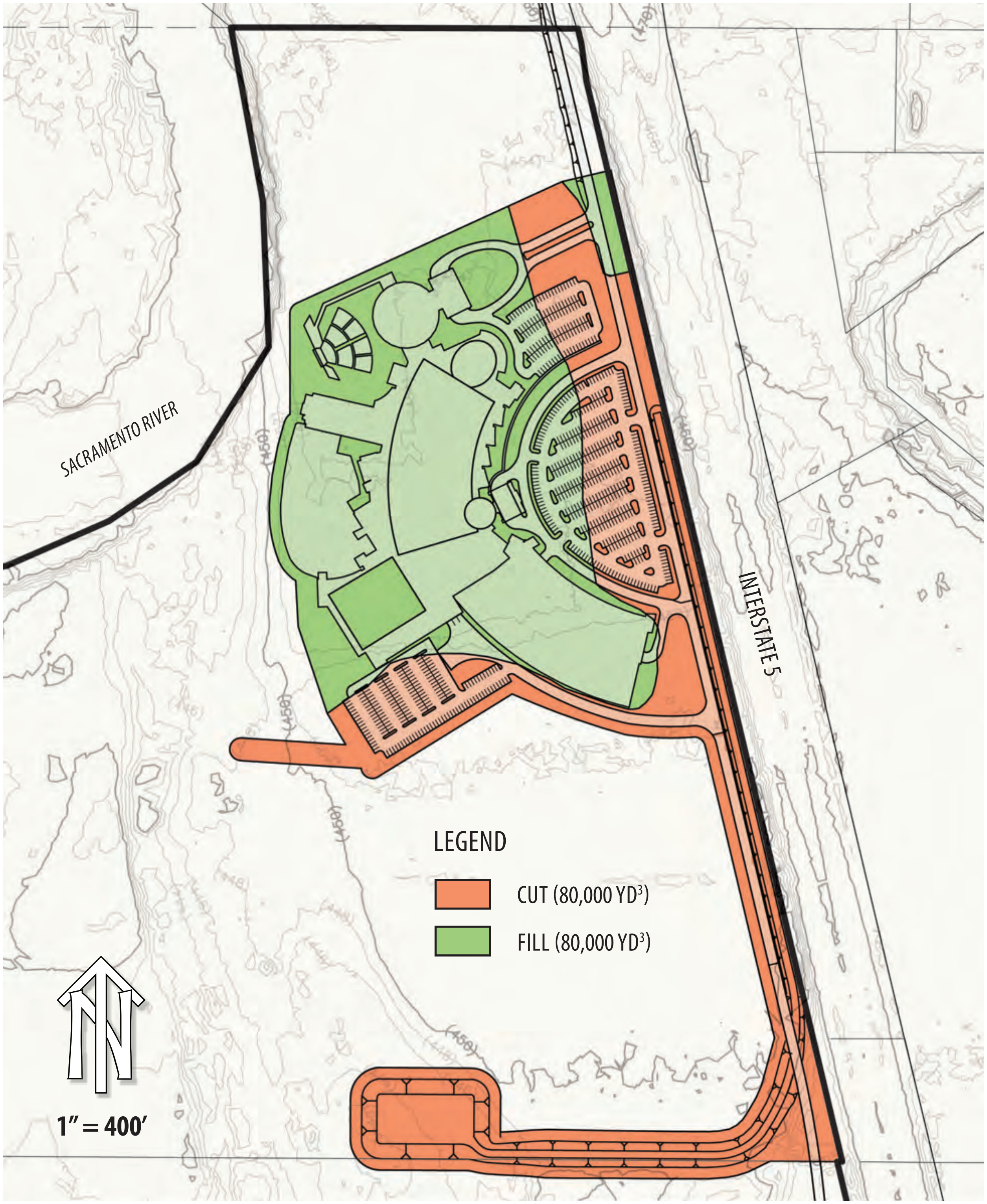

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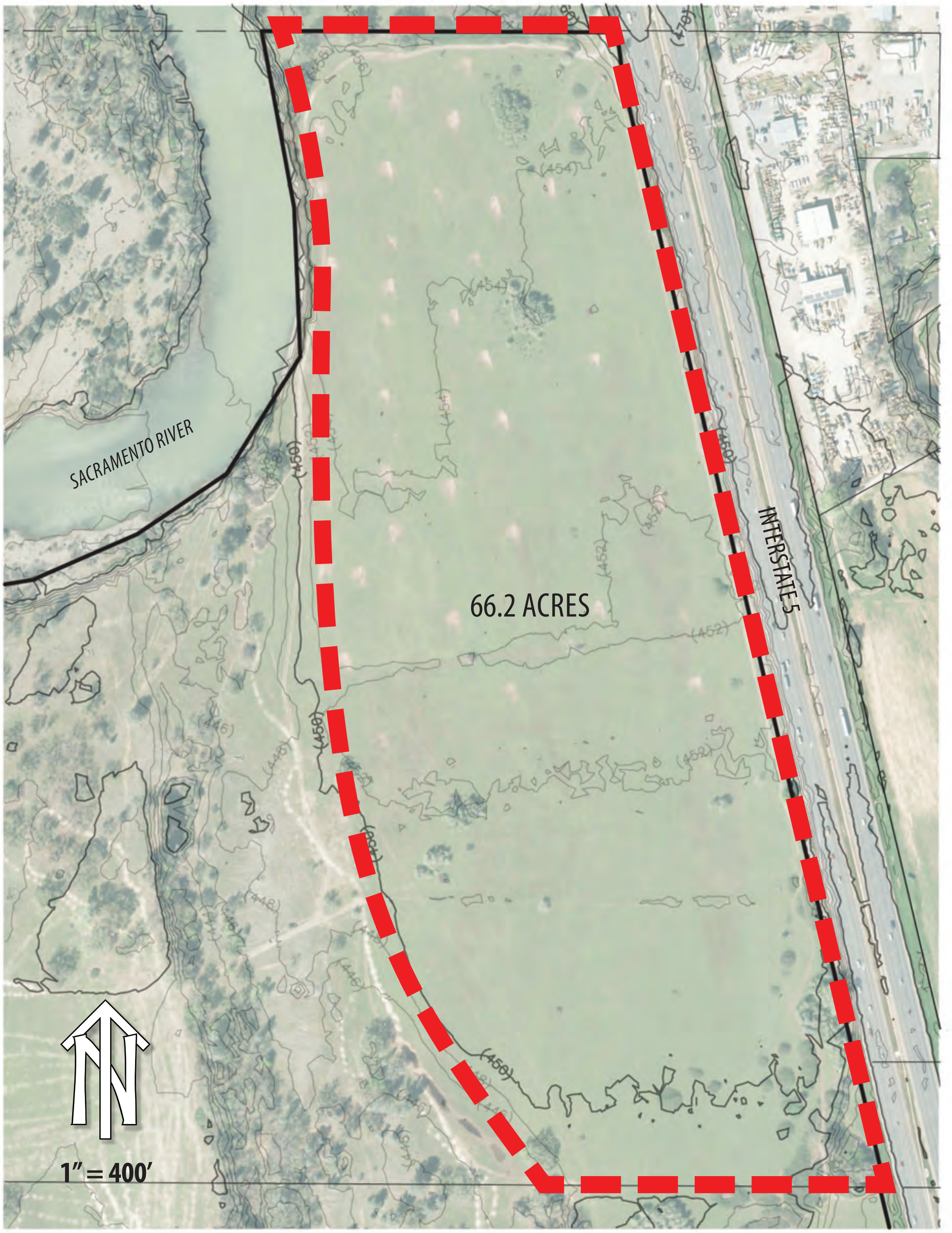
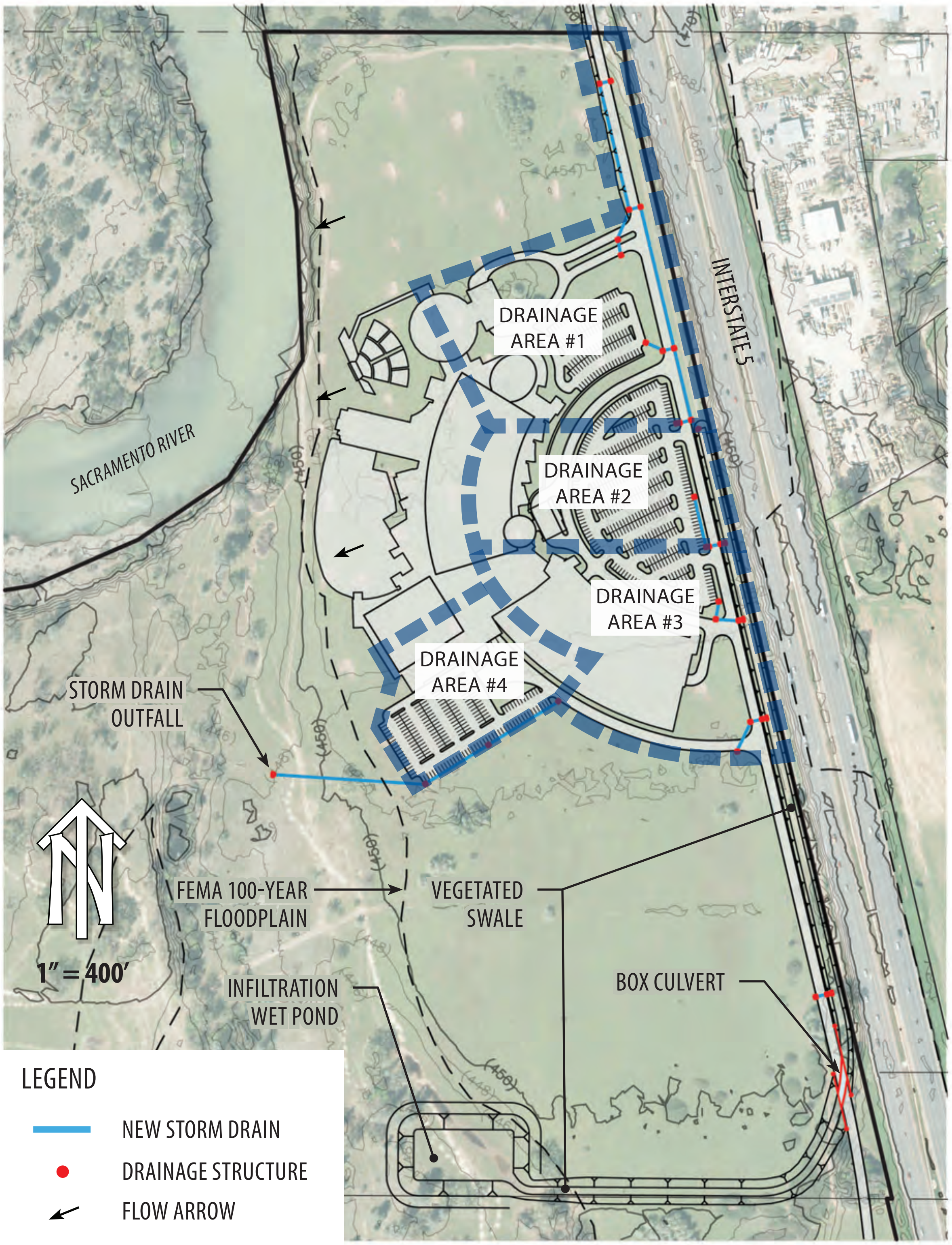
FIGURE B5
PROPOSED PROJECT - ALT 'B'
CUT FILL DIAGRAM



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE B6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'B'
EXISTING CONDITION

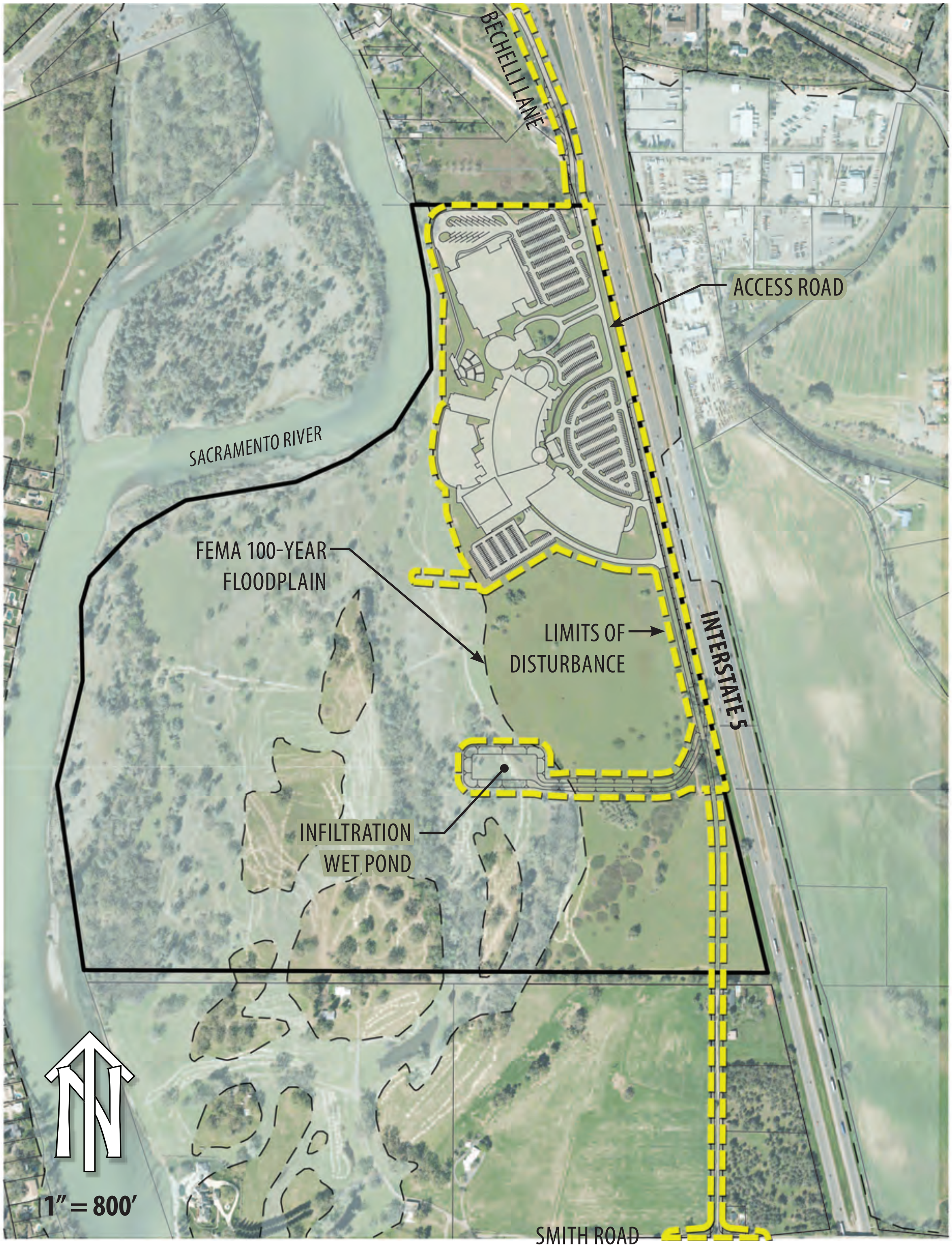


SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE B7
PROPOSED PROJECT - ALT 'B'
STORMWATER MANAGEMENT

Figures – Alternative C

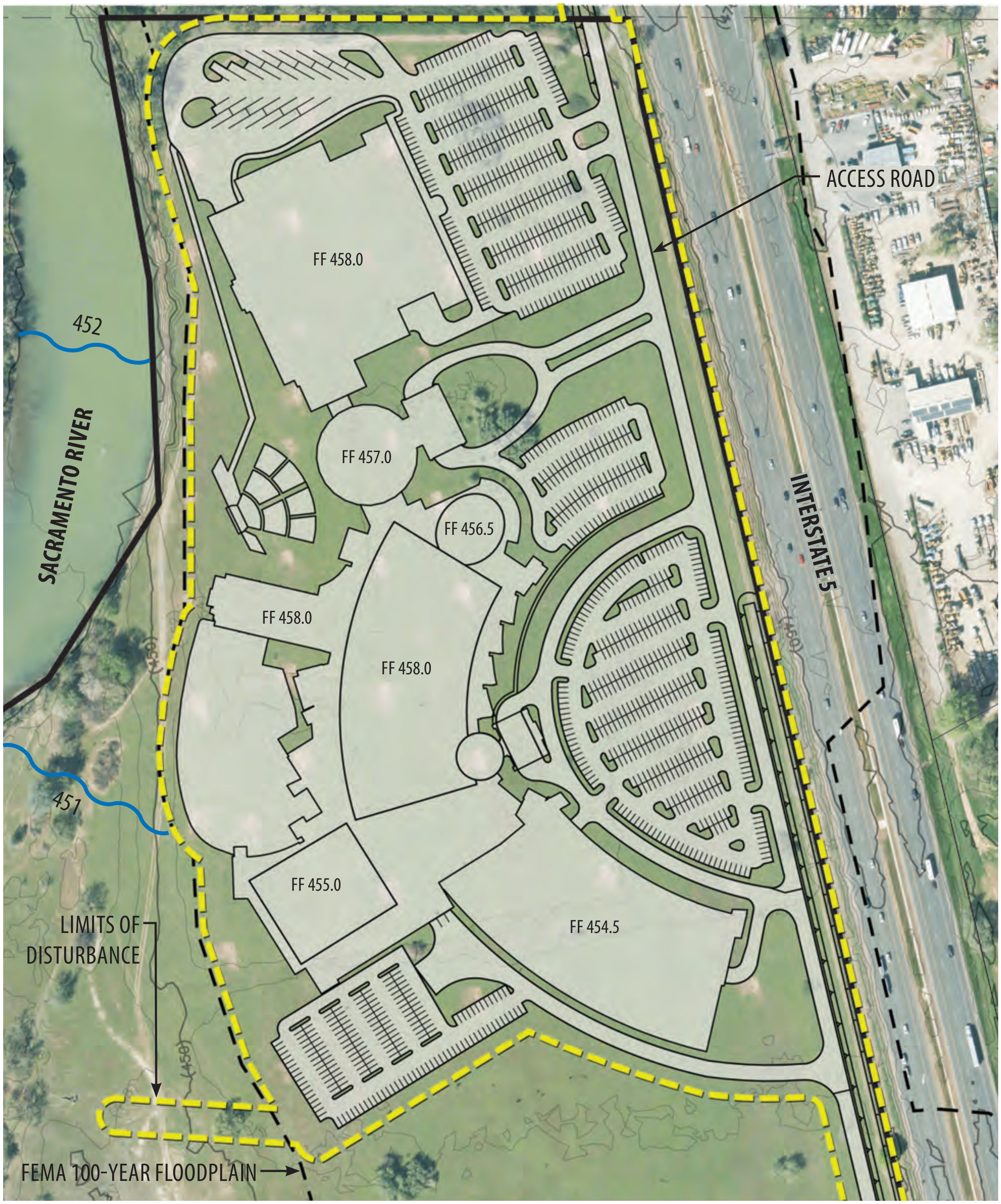
REDDING RANCHERIA
CASINO MASTER PLAN



SHARRAH
DUNLAP
SAWYER
INCORPORATED

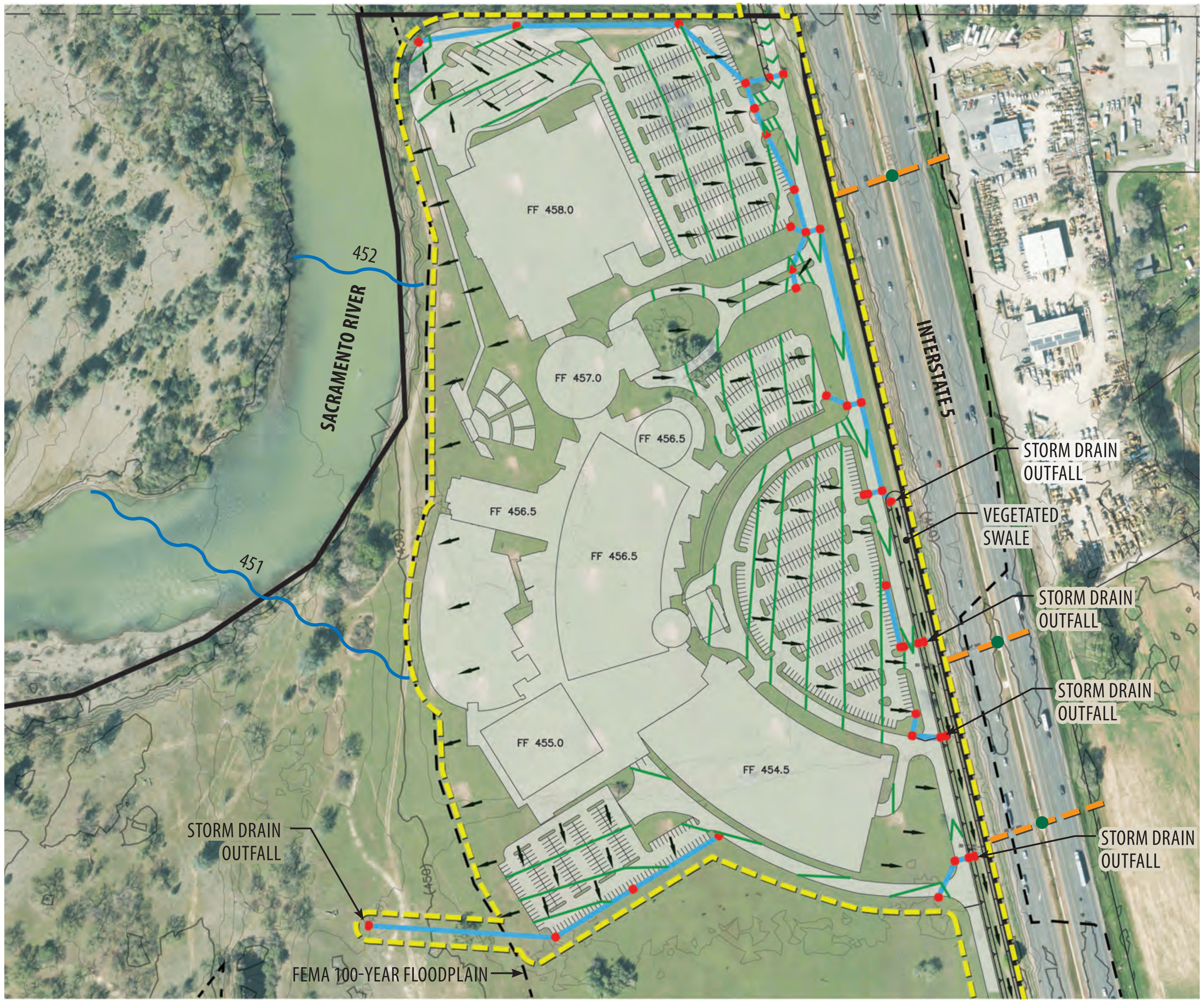
FIGURE C1
PROPOSED PROJECT - ALT 'C'
OVERALL DISTURBANCE LIMITS

REDDING RANCHERIA
CASINO MASTER PLAN



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE C2
PROPOSED PROJECT - ALT 'C'
ONSITE DISTURBANCE LIMITS



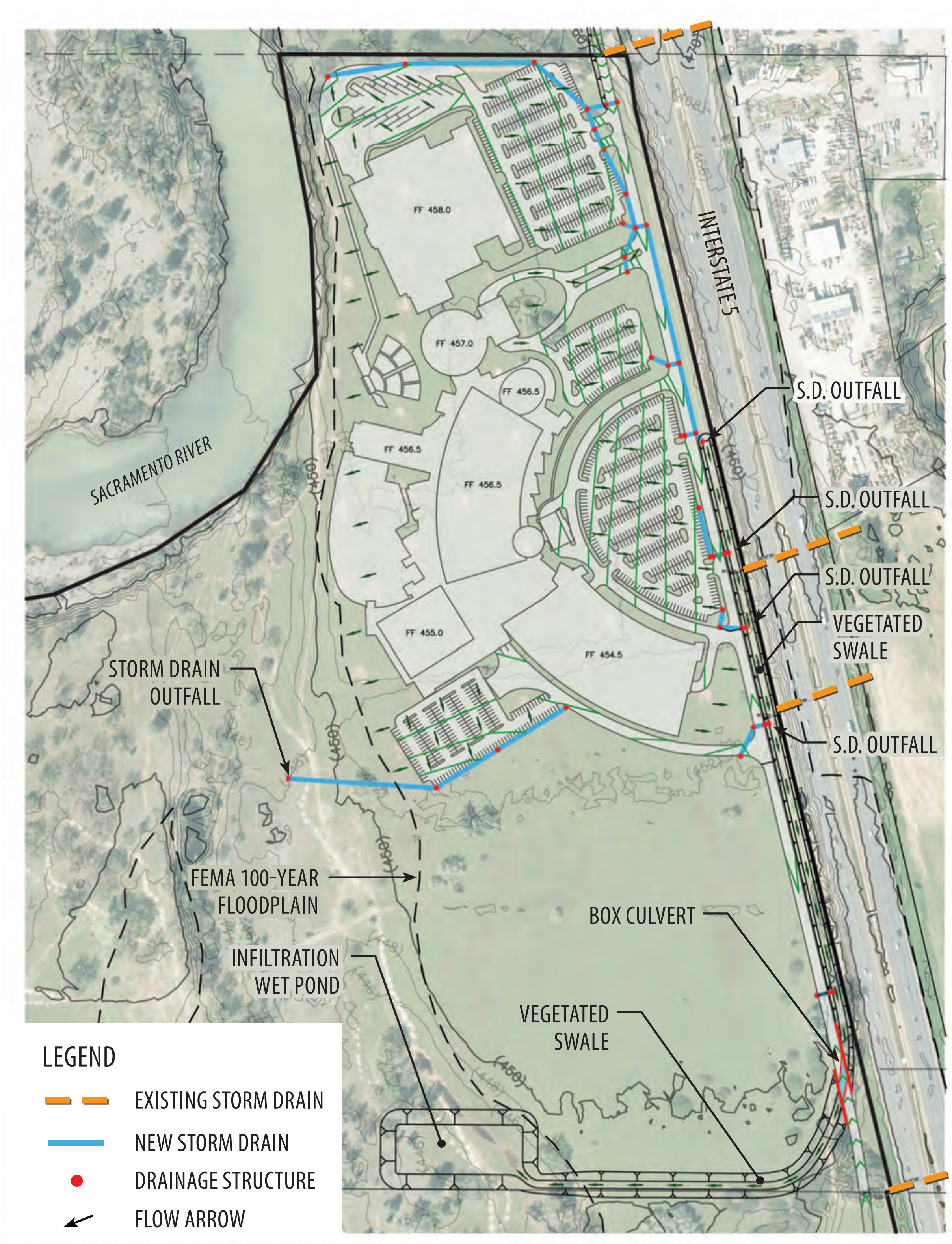
LEGEND

- FINISH GRADE CONTOUR
- NEW STORM DRAIN
- EXISTING STORM DRAIN
- DRAINAGE STRUCTURE
- EXISTING DRAINAGE STRUCTURE
- 452 FEMA 100 YEAR FLOOD ELEVATION
- FLOW DIRECTION

NOT TO SCALE

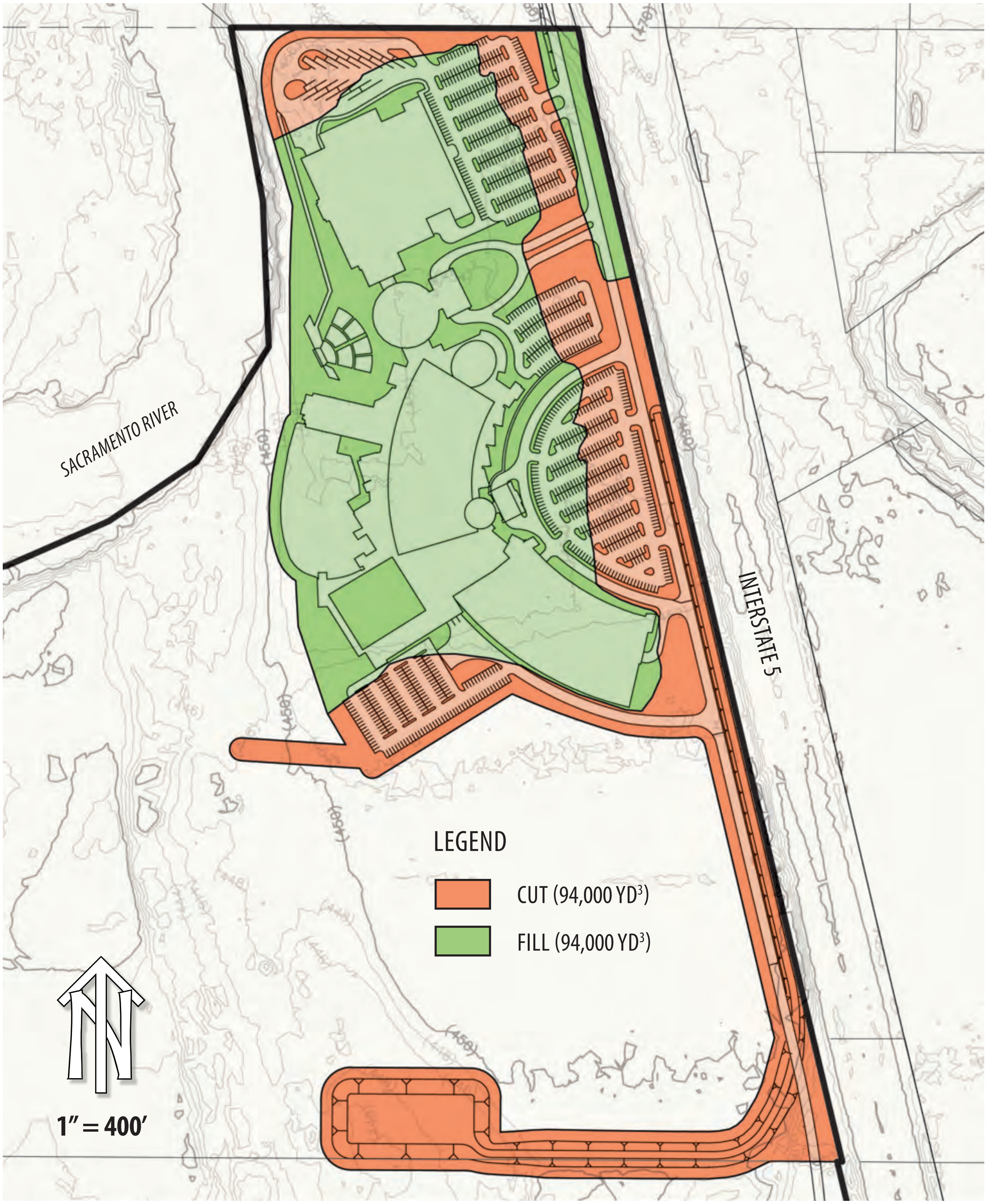
SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE C3
PROPOSED PROJECT - ALT 'C'
ONSITE GRADING



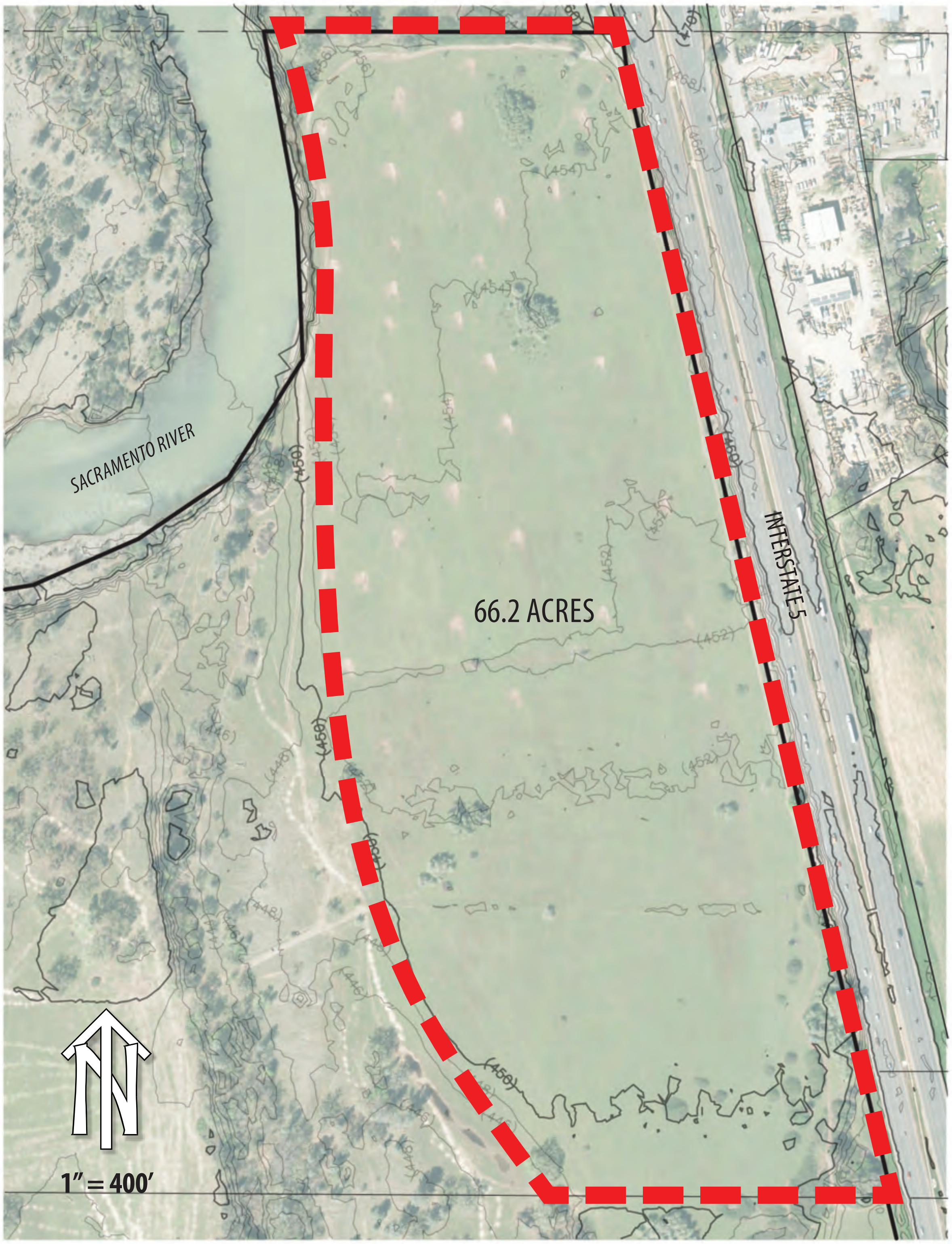
SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE C4
PROPOSED PROJECT - ALT 'C'
OVERALL GRADING



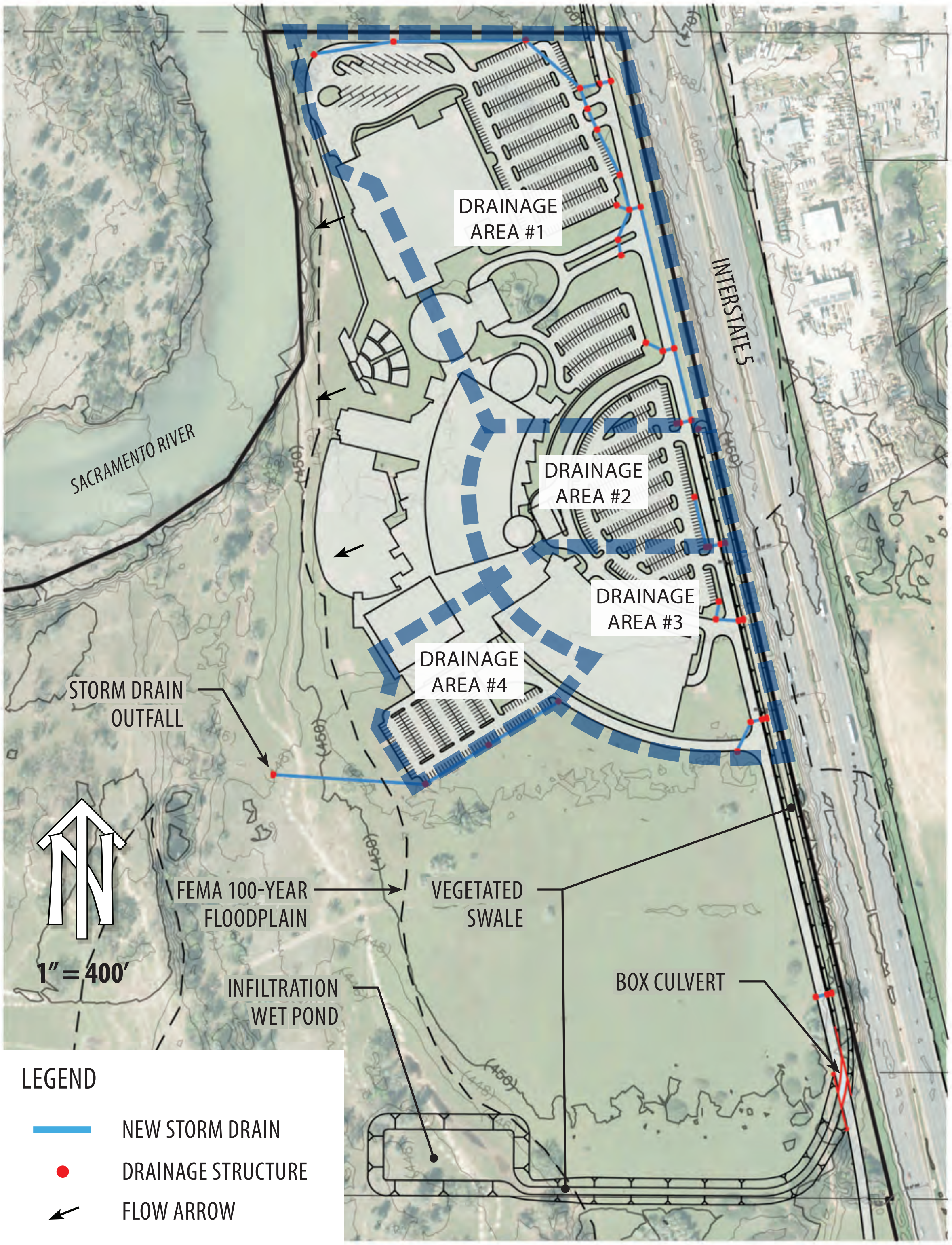
SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE C5
PROPOSED PROJECT - ALT 'C'
CUT FILL DIAGRAM



SHARRAH DUNLAP SAWYER INCORPORATED

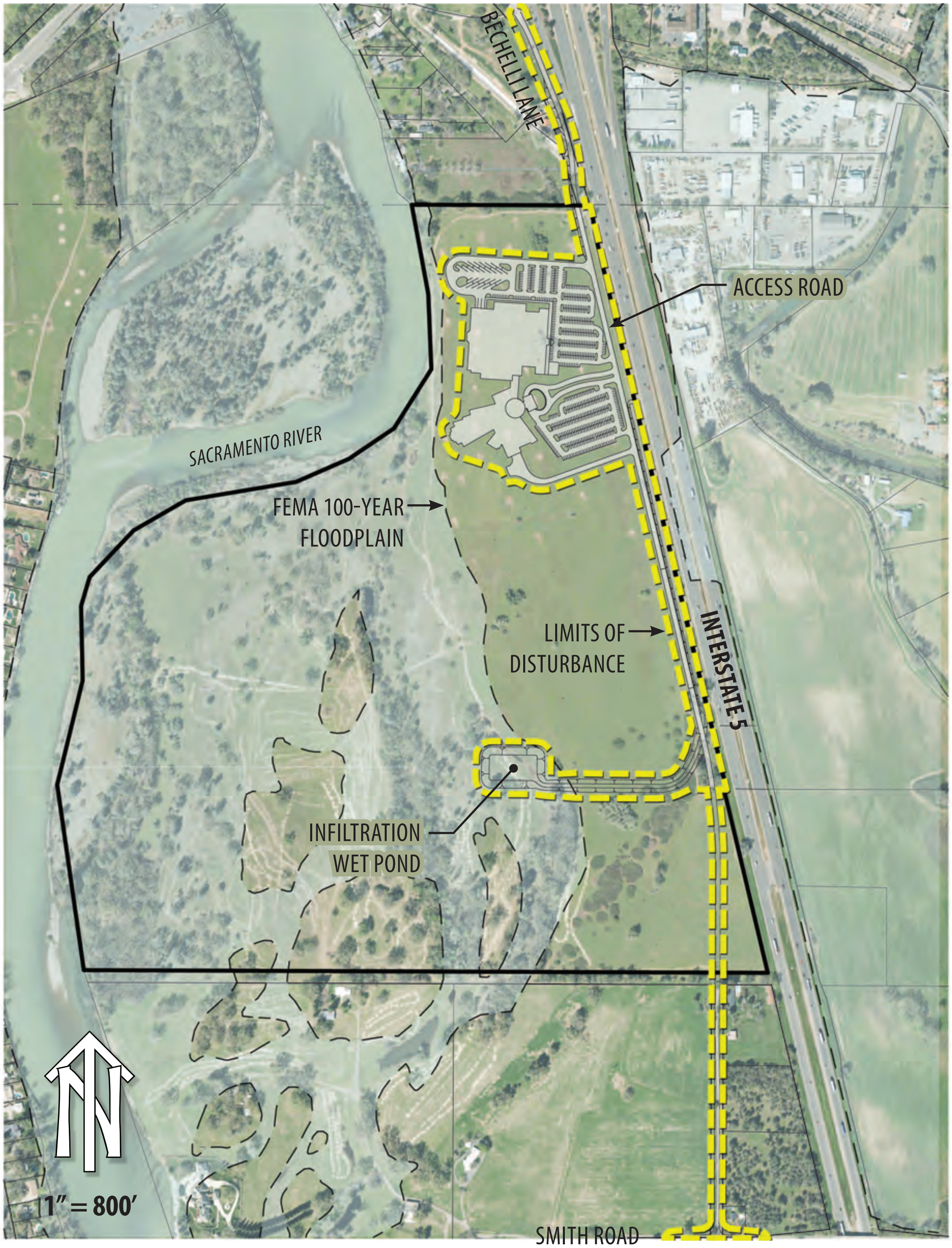
FIGURE C6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'C'
EXISTING CONDITION



SHARRAH DUNLAP SAWYER INCORPORATED

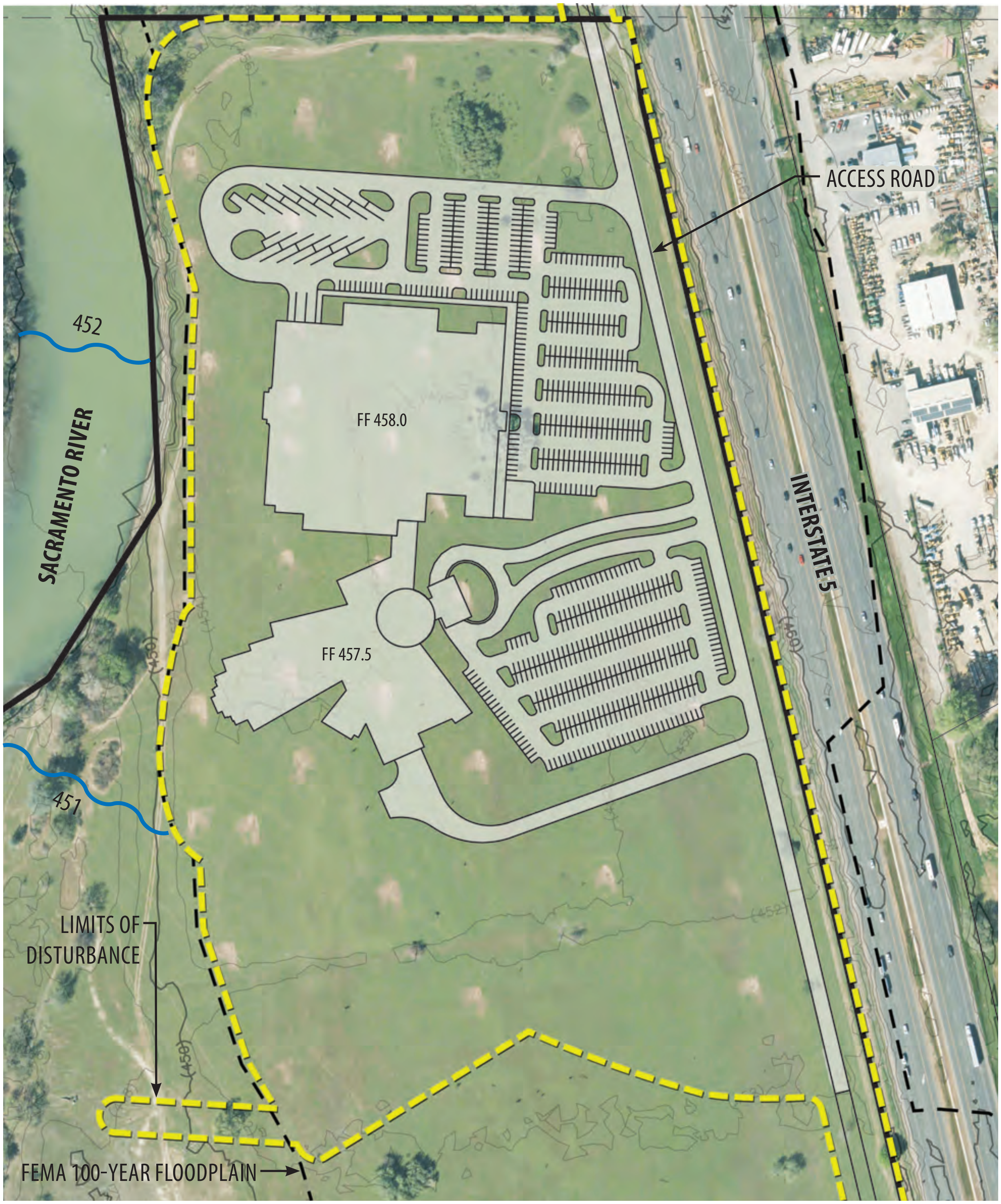
FIGURE C7
PROPOSED PROJECT - ALT 'C'
STORMWATER MANAGEMENT

Figures – Alternative D



SHARRAH DUNLAP SAWYER INCORPORATED

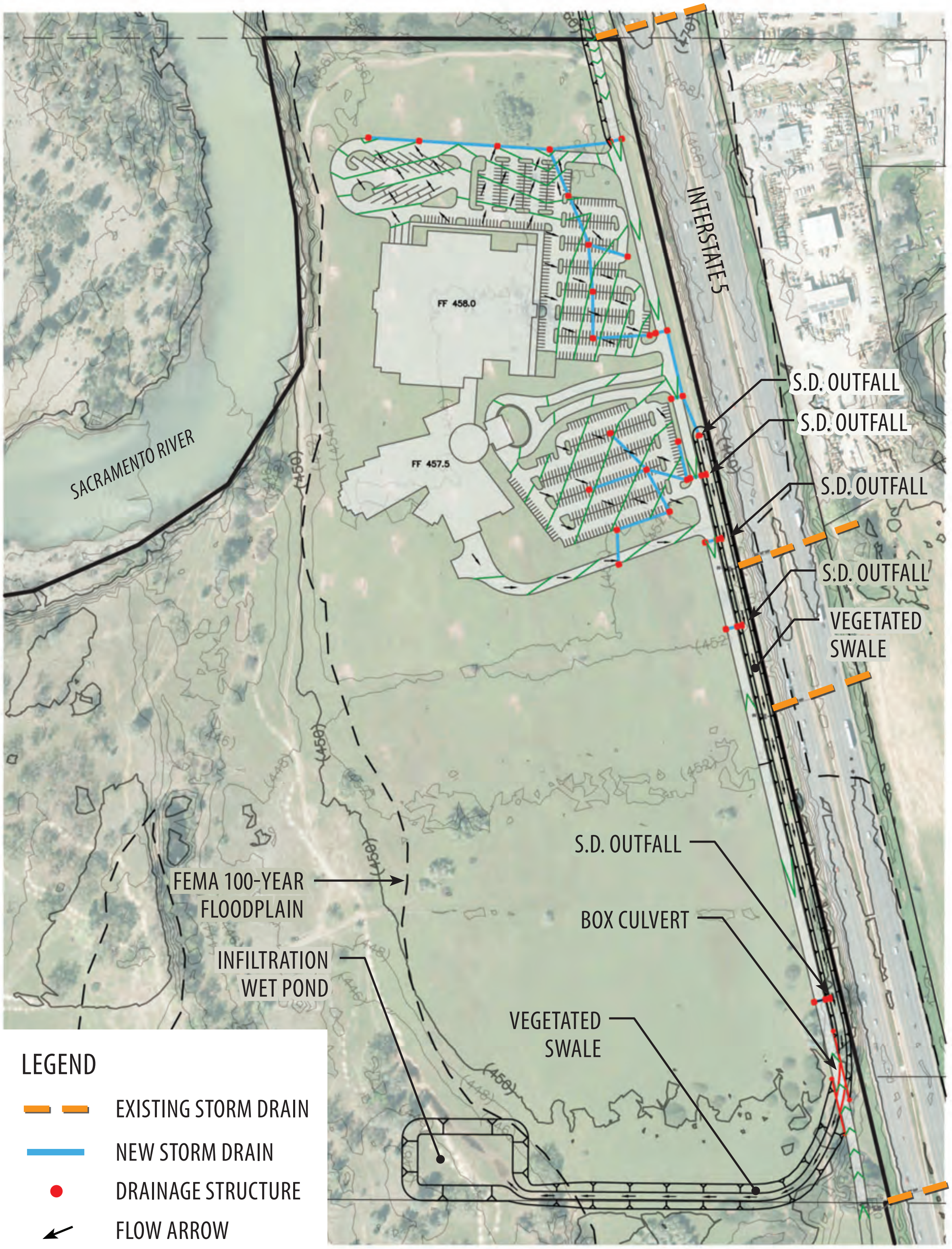
FIGURE D1
PROPOSED PROJECT - ALT 'D'
OVERALL DISTURBANCE LIMITS



SHARRAH DUNLAP SAWYER INCORPORATED

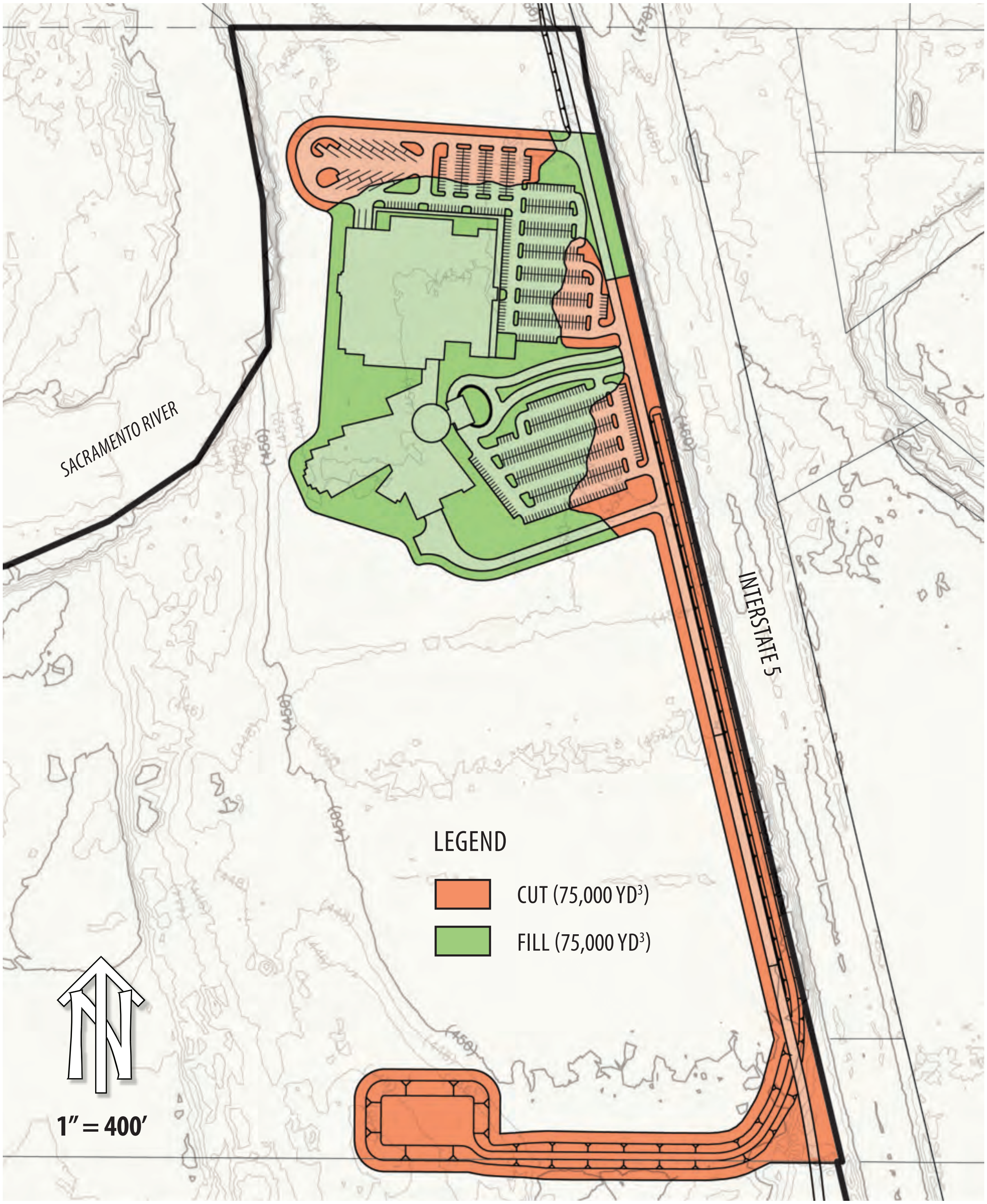
FIGURE D2
PROPOSED PROJECT - ALT 'D'
ONSITE DISTURBANCE LIMITS

FIGURE D3
PROPOSED PROJECT - ALT 'D'
ONSITE GRADING



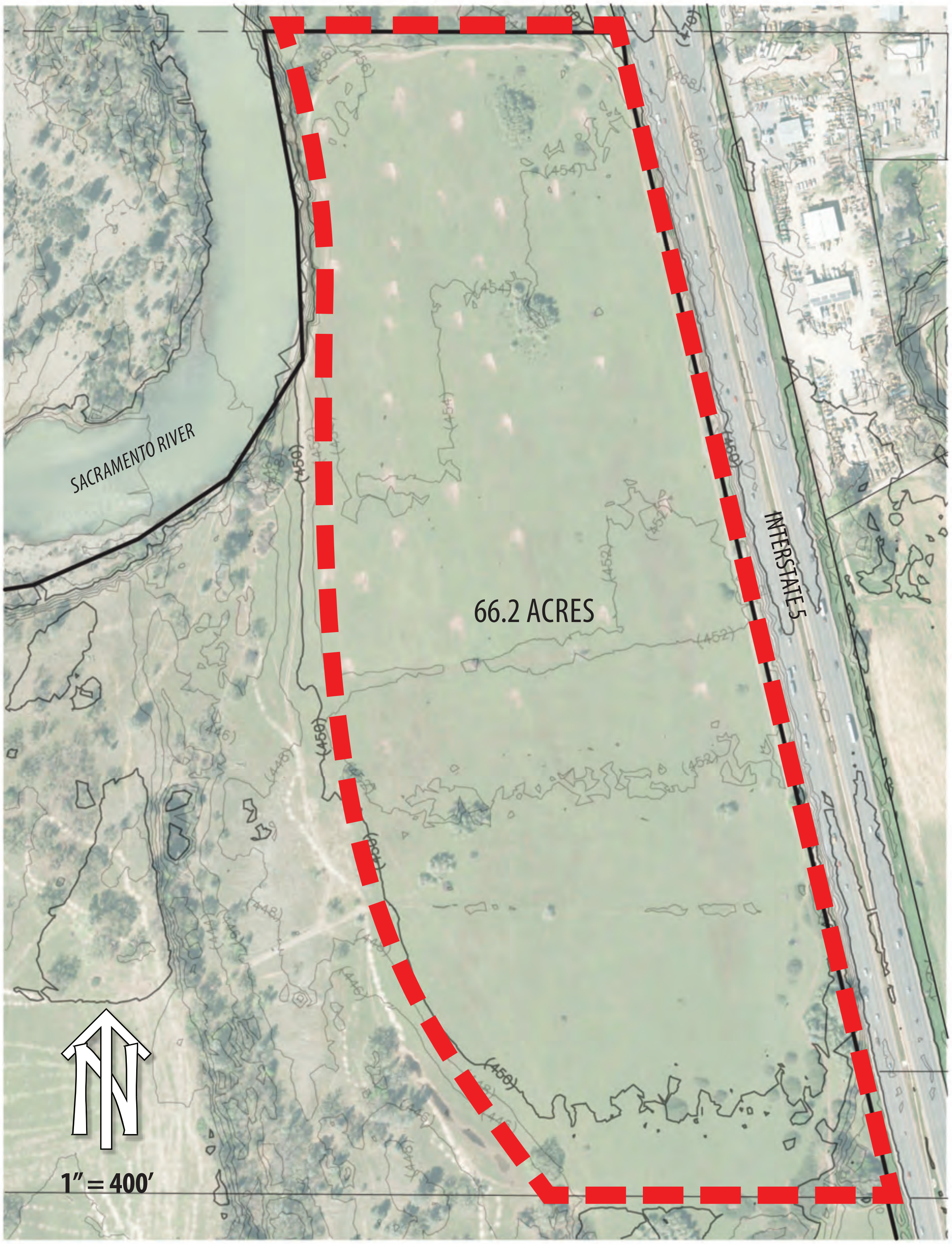
SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D4
PROPOSED PROJECT - ALT 'D'
OVERALL GRADING



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D5
PROPOSED PROJECT - ALT 'D'
CUT FILL DIAGRAM



SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE D6
OVERALL DEVELOPABLE SITE DRAINAGE AREA- ALT 'D'
EXISTING CONDITION

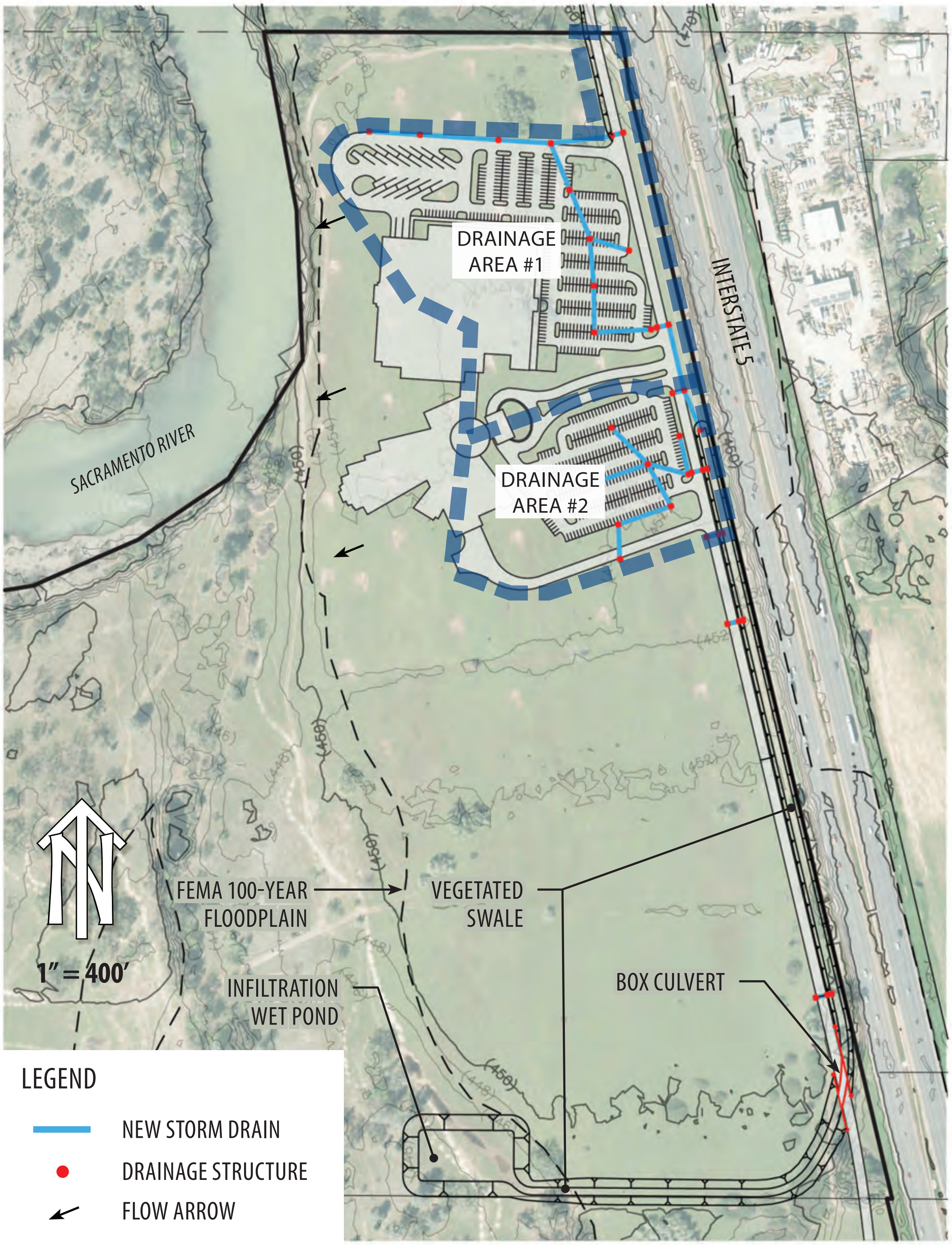
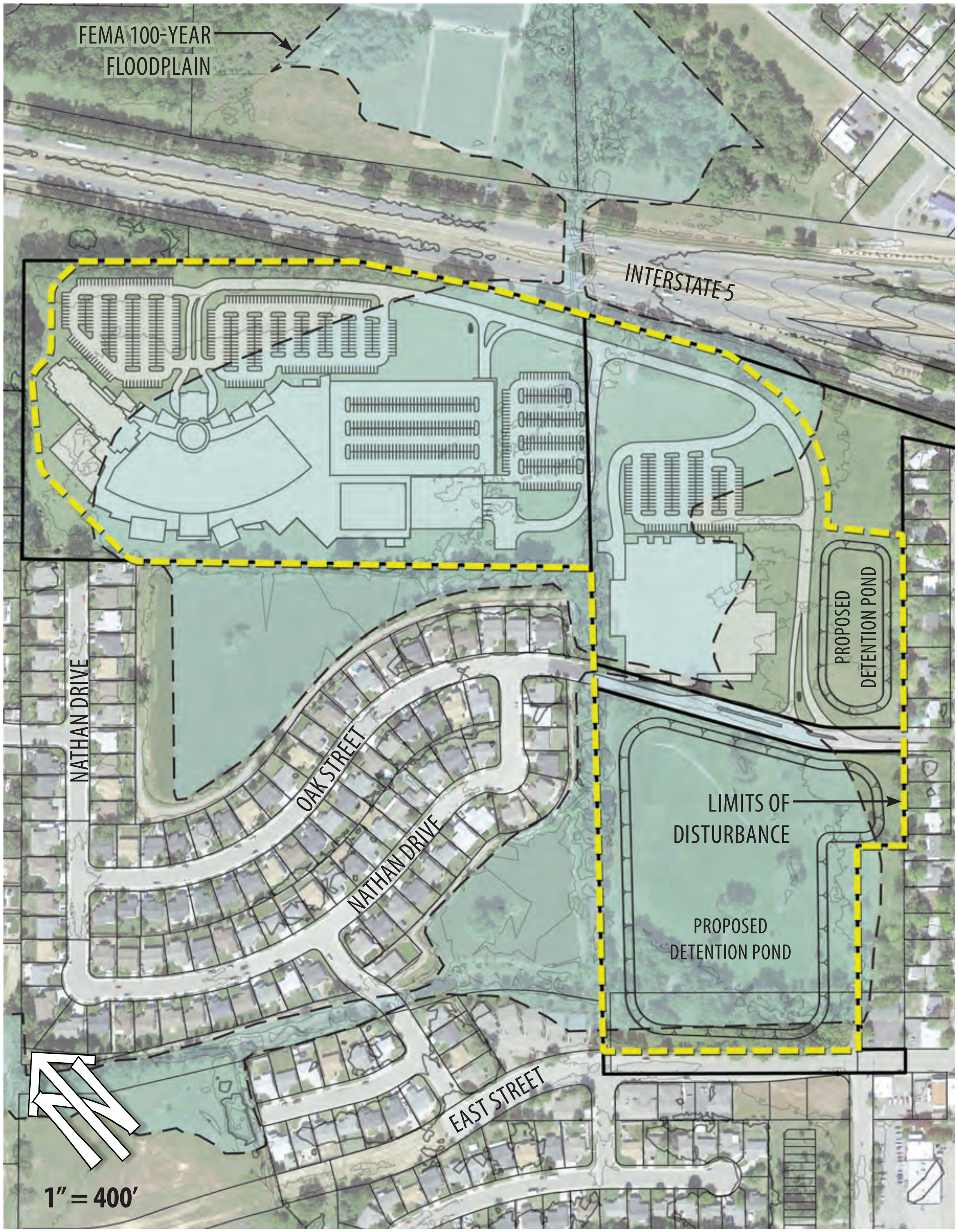


FIGURE D7
PROPOSED PROJECT - ALT 'D'
STORMWATER MANAGEMENT

Figures – Alternative E

REDDING RANCHERIA
CASINO MASTER PLAN



SHARRAH
DUNLAP
SAWYER
INCORPORATED

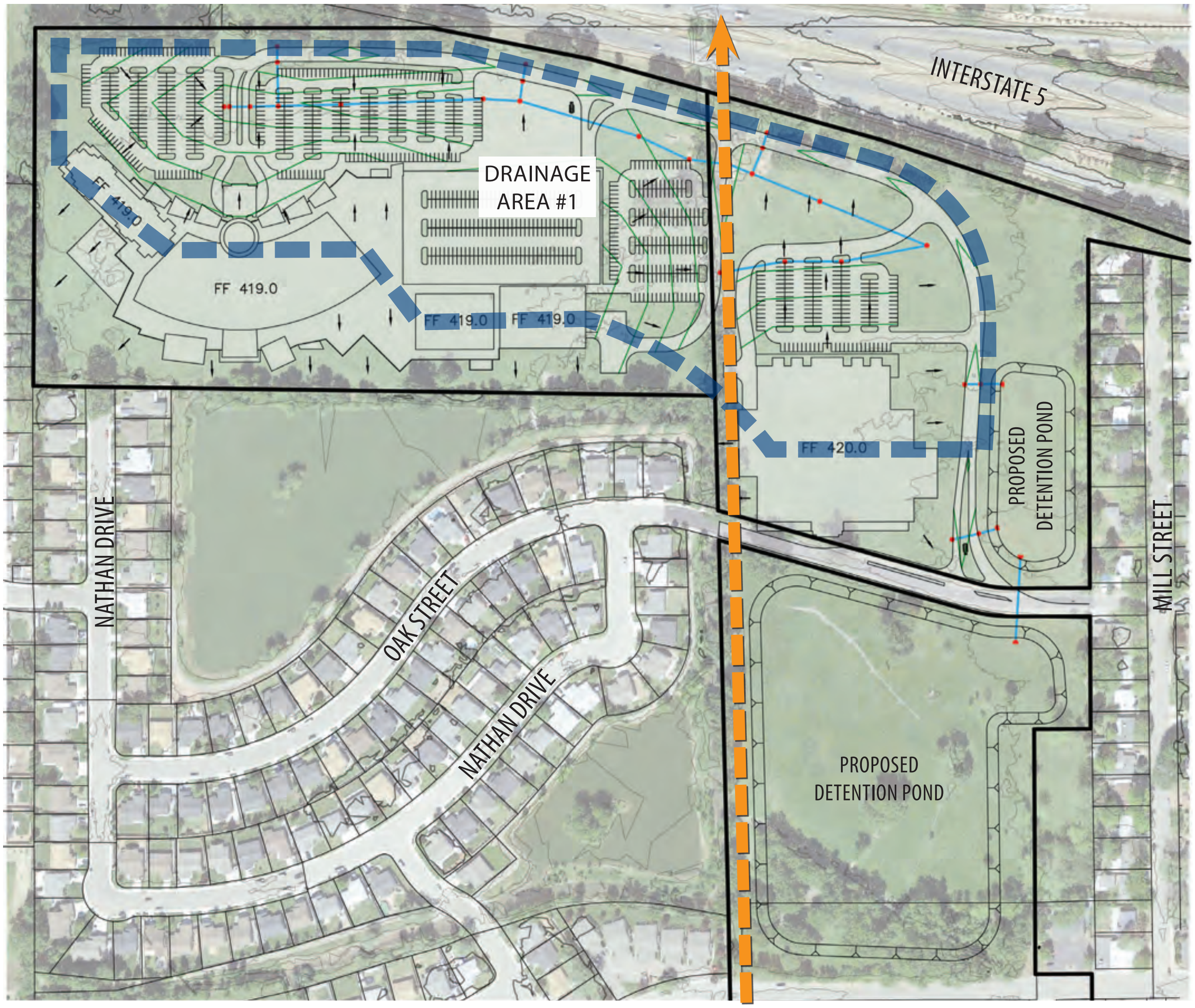
FIGURE E1
PROPOSED PROJECT - ALT 'E'
OVERALL DISTURBANCE LIMITS

SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE E2
PROPOSED PROJECT - ALT 'E'
ONSITE GRADING

SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE E3
PROPOSED PROJECT - ALT 'E'
CUT FILL DIAGRAM



1" = 150'

LEGEND

- NEW STORM DRAIN
- DRAINAGE STRUCTURE
- FLOW ARROW
- TORMEY DRAIN

SHARRAH DUNLAP SAWYER INCORPORATED

FIGURE E4
PROPOSED PROJECT - ALT 'E'
STORMWATER MANAGEMENT

Appendix A

Hydrology and Hydraulic Calculations

Existing Condition Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:61% 14- Pasture/Parkland/Mowed Grass Soil A:39% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	66
Pervious Overland Length (ft):	300
Pervious Overland Slope (ft/ft):	0.003
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	98
Impervious Overland Length (ft):	300
Impervious Overland Slope (ft/ft):	0.003
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	700
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.040
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	20.0
Collector #2 (pipe or channel):	street
Length (ft):	995
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.040
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	3.0
Sideslopes (ft/ft-H/V):	20.0
Collector #3 (pipe or channel):	street
Length (ft):	995
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.040
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	4.0
Sideslopes (ft/ft-H/V):	20.0

```
1***************************************** 
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   23MAR17  TIME  10:47:16   *
 *                                       *
 *****************************************

***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************

          X     X  XXXXXXX   XXXXX          X
          X     X  X        X     X        XX
          X     X  X        X               X
          XXXXXXX  XXXX     X       XXXXX   X
          X     X  X        X               X
          X     X  X        X     X         X
          X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                  HEC-1 INPUT                                        PAGE  1

     LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

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       2        ID   Description:          Casino Master Plan Pre-development Flow
       3        ID   Recurrence Interval:  2 year
       4        ID   Storm Duration:       24 hours
       5        ID   Date Compiled:        03/23/2017
       6        ID   Total Area at Point of Interest: 66.2
                *
                *
                *
                *
       7        IT        1 23Mar17    0000    1800
       8        IO        5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan Alternates A-D

  10           KK      BA
  11           KO       0
  12           PB   2.762
  13           PI   0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
  14           PI   0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
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  24           PI   0.009    0.009    0.009    0.010    0.010    0.010    0.010    0.011    0.011    0.011
  25           PI   0.011    0.012    0.012    0.012    0.013    0.013    0.014    0.014    0.015    0.015
  26           PI   0.016    0.017    0.017    0.018    0.019    0.021    0.022    0.024    0.027    0.030
  27           PI   0.035    0.042    0.055    0.094    0.286    0.068    0.047    0.038    0.032    0.028
  28           PI   0.025    0.023    0.022    0.020    0.019    0.018    0.017    0.016    0.015    0.015
  29           PI   0.014    0.014    0.013    0.013    0.012    0.012    0.012    0.011    0.011    0.011
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  40           PI   0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
  41           PI   0.004    0.004    0.004    0.004    0.004    0.004    0.004    0.004
  42           BA  0.1034
  43           BF      -1    -0.01      1.1
  44           LS       0       66        0      .05       99        0
  45           UK     300    0.003    0.600       98
  46           UK     300    0.003    0.050        2
  47           RD     700   0.0030    0.040    0.016     TRAP      2.0     20.0
1                                              HEC-1 INPUT                                             PAGE  2

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     995   0.0030    0.040    0.052     TRAP      3.0     20.0
  49           RD     995   0.0030    0.040    0.103     TRAP      4.0     20.0
  50           ZZ
```

```
1*****************************************                     ****************************************
 *                                       *                     *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                     *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                     *    HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                  *                     *         609 SECOND STREET            *
 *                                       *                     *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   23MAR17  TIME  10:47:16   *                     *          (916) 756-1104              *
 *                                       *                     *                                      *
 *****************************************                     ****************************************


                      HEC-1 Input Filename: 16196pre2
                      Description:          Casino Master Plan Pre-development Flow
                      Recurrence Interval:  2 year
                      Storm Duration:       24 hours
                      Date Compiled:        03/23/2017
                      Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    23Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    24   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                       ICENT         19  CENTURY MARK

                   COMPUTATION INTERVAL    .02 HOURS
                        TOTAL TIME BASE  29.98 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
                **************
                *            *
   10 KK        *       BA   *
                *            *
                **************

   11 KO           OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE


          *** ROFGRD - MAXIMUM NUMBER OF DX INTERVALS REACHED. MDX=201
           THIS MAY AFFECT ACCURACY OF KW SOLUTION TO REDUCE ERRORS SHORTEN OVERLANDFLOW LENGTH PLANE 1.
1
                                                             RUNOFF SUMMARY
                                                      FLOW IN CUBIC FEET PER SECOND
                                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                             PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN   MAXIMUM    TIME OF
          OPERATION       STATION            FLOW     PEAK                                           AREA     STAGE    MAX STAGE
+                                                                6-HOUR     24-HOUR    72-HOUR

          HYDROGRAPH AT
+                              BA              3.   18.27            2.          1.         1.         .10
1
                                             SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                              INTERPOLATED TO
                                                                           COMPUTATION INTERVAL
            ISTAQ    ELEMENT       DT        PEAK    TIME TO     VOLUME      DT       PEAK   TIME TO      VOLUME
                                                      PEAK                                     PEAK

                                  (MIN)      (CFS)     (MIN)      (IN)      (MIN)     (CFS)    (MIN)        (IN)

                 BA  MANE          1.00       2.66  1096.00        .42       1.00      2.66  1096.00         .42

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2643E+01 OUTFLOW= .2305E+01 BASIN STORAGE= .8765E-01 PERCENT ERROR=   9.5


 *** NORMAL END OF HEC-1 ***
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1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *          VERSION 4.1                  *
 *                                       *
 *  RUN DATE   23MAR17  TIME  10:55:33   *
 *                                       *
 *****************************************
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```
*****************************************
*                                       *
*     U.S. ARMY CORPS OF ENGINEERS      *
*     HYDROLOGIC ENGINEERING CENTER     *
*           609 SECOND STREET           *
*        DAVIS, CALIFORNIA 95616        *
*            (916) 756-1104             *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

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THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                        HEC-1 INPUT                                                PAGE  1

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         3          ID   Recurrence Interval:  10 year
         4          ID   Storm Duration:       24 hours
         5          ID   Date Compiled:        03/23/2017
         6          ID   Total Area at Point of Interest: 66.2
                    *
                    *
                    *
                    *
         7          IT        1 23Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * BA
              * Casino Master Plan Alternates A-D

  10          KK      BA
  11          KO       0
  12          PB   3.599
  13          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15          PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
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  18          PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20          PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21          PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22          PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23          PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24          PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25          PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26          PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27          PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
  28          PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29          PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30          PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32          PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33          PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39          PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42          BA  0.1034
  43          BF      -1   -0.01     1.1
  44          LS       0      66       0     .05      99       0
  45          UK     300   0.003   0.600      98
  46          UK     300   0.003   0.050       2
  47          RD     700  0.0030   0.040   0.016    TRAP     2.0    20.0
1                                      HEC-1 INPUT                                     PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     995  0.0030   0.040   0.052    TRAP     3.0    20.0
```

```
          49            RD     995  0.0030    0.040    0.103     TRAP      4.0      20.0
          50            ZZ
1*****************************************                    ****************************************
 *                                       *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998                *                    *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                 *                    *         609 SECOND STREET            *
 *                                       *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   23MAR17  TIME  10:55:33   *                    *         (916) 756-1104               *
 *                                       *                    *                                      *
*****************************************                     ****************************************


                    HEC-1 Input Filename: 16196pre10
                    Description:          Casino Master Plan Pre-development Flow
                    Recurrence Interval:  10 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/23/2017
                    Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     23Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     24   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *       BA   *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                               RUNOFF SUMMARY
                                                       FLOW IN CUBIC FEET PER SECOND
                                                    TIME IN HOURS,  AREA IN SQUARE MILES

                                             PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD        BASIN     MAXIMUM     TIME OF
         OPERATION        STATION            FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                              BA              7.   16.03           5.          2.          2.          .10
1
                                              SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                  (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
           ISTAQ    ELEMENT       DT        PEAK    TIME TO     VOLUME        DT        PEAK    TIME TO       VOLUME
                                                      PEAK                                         PEAK

                                 (MIN)     (CFS)     (MIN)       (IN)      (MIN)      (CFS)     (MIN)         (IN)

                BA  MANE          1.00      6.55    962.00        .82       1.00       6.55    962.00          .82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4999E+01 OUTFLOW= .4546E+01 BASIN STORAGE= .9902E-01 PERCENT ERROR=   7.1


*** NORMAL END OF HEC-1 ***
```

```
1*****************************************                    ****************************************
 *                                       *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                    *          609 SECOND STREET           *
 *                                       *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   23MAR17  TIME  10:56:13   *                    *         (916) 756-1104               *
 *                                       *                    *                                      *
 *****************************************                    ****************************************


                        X     X  XXXXXXX   XXXXX          X
                        X     X  X        X     X        XX
                        X     X  X        X               X
                        XXXXXXX  XXXX     X       XXXXX   X
                        X     X  X        X               X
                        X     X  X        X     X         X
                        X     X  XXXXXXX   XXXXX         XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                      HEC-1 INPUT                                          PAGE  1

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1           ID   HEC-1 Input Filename: 16196pre100
    2           ID   Description:          Casino Master Plan Pre-development Flow
    3           ID   Recurrence Interval:  100 year
    4           ID   Storm Duration:       24 hours
    5           ID   Date Compiled:        03/23/2017
    6           ID   Total Area at Point of Interest: 66.2
                *
                *
                *
                *
    7           IT       1 23Mar17    0000    1800
```

```
     8          IO       5       0       0
     9          IN       5
                *
                * BA
                * Casino Master Plan Alternates A-D

    10          KK      BA
    11          KO       0
    12          PB   5.069
    13          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    14          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
    15          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    16          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    17          PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
    18          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
    19          PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
    20          PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
    21          PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
    22          PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
    23          PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
    24          PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
    25          PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
    26          PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
    27          PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
    28          PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
    29          PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
    30          PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
    31          PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
    32          PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
    33          PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
    34          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
    35          PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
    36          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
    37          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
    38          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    39          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    40          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    41          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    42          BA  0.1034
    43          BF      -1   -0.01     1.1
    44          LS       0      66       0     .05      99       0
    45          UK     300   0.003   0.600      98
    46          UK     300   0.003   0.050       2
    47          RD     700  0.0030   0.040   0.016    TRAP     2.0    20.0
1                                           HEC-1 INPUT                                      PAGE  2

 LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48          RD     995  0.0030   0.040   0.052    TRAP     3.0    20.0
```

```
         49           RD     995  0.0030   0.040   0.103    TRAP     4.0    20.0
         50           ZZ
1*****************************************                  ****************************************
 *                                       *                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                  *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                  *          609 SECOND STREET           *
 *                                       *                  *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   23MAR17  TIME  10:56:13   *                  *          (916) 756-1104              *
 *                                       *                  *                                      *
*****************************************                  ****************************************


                     HEC-1 Input Filename: 16196pre100
                     Description:          Casino Master Plan Pre-development Flow
                     Recurrence Interval:  100 year
                     Storm Duration:       24 hours
                     Date Compiled:        03/23/2017
                     Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    23Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     24   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                       ICENT         19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 

               **************
               *            *
  10 KK        *       BA   *
               *            *
               **************

  11 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                    RUNOFF SUMMARY
                                             FLOW IN CUBIC FEET PER SECOND
                                          TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN    MAXIMUM    TIME OF
         OPERATION       STATION      FLOW    PEAK                                             AREA     STAGE    MAX STAGE
+                                                        6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                         BA           19.   14.35          12.          5.          4.         .10
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK     TIME TO     VOLUME      DT       PEAK    TIME TO      VOLUME
                                                     PEAK                                     PEAK

                               (MIN)     (CFS)      (MIN)       (IN)     (MIN)     (CFS)     (MIN)        (IN)

                BA  MANE        1.00     18.61     861.00       1.69      1.00     18.61    861.00        1.69

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1013E+02 OUTFLOW= .9309E+01 BASIN STORAGE= .1035E+00 PERCENT ERROR=   7.1


*** NORMAL END OF HEC-1 ***
```

Existing Condition Subbasin Parameters

Subbasin:	Basin E
Mean Subbasin Elevation (ft):	414
Subbasin Area (Sq. Mi.):	0.06328125
Subbasin Area (acres):	40.5
Land Use:	Soil A:75% Soil D:25% 14- Pasture/Parkland/Mowed Grass
Pervious Curve Number:	73
Pervious Overland Length (ft):	200
Pervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	98
Impervious Overland Length (ft):	200
Impervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	672
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.040
Representative Area (acres):	3.00
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	20.0
Collector #2 (pipe or channel):	street
Length (ft):	672
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.040
Representative Area (acres):	20.25
Width (ft)/Diameter (in) :	3.0
Sideslopes (ft/ft-H/V):	20.0
Collector #3 (pipe or channel):	street
Length (ft):	672
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.040
Representative Area (acres):	40.50
Width (ft)/Diameter (in) :	4.0
Sideslopes (ft/ft-H/V):	20.0

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   27MAR17  TIME  10:57:25   *
 *                                       *
 *****************************************
```

```
***************************************
*                                     *
*     U.S. ARMY CORPS OF ENGINEERS    *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************
```

```
X      X  XXXXXXX   XXXXX          X
X      X  X         X     X       XX
X      X  X         X              X
XXXXXXX   XXXX      X       XXXXX  X
X      X  X         X              X
X      X  X         X     X        X
X      X  XXXXXXX   XXXXX         XXX
```

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
1                                 HEC-1 INPUT                                      PAGE  1

     LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

       1        ID   HEC-1 Input Filename: 16196preE
       2        ID   Description:          Casino Master Plan Alternative E Pre-development Flow
       3        ID   Recurrence Interval:  2 year
       4        ID   Storm Duration:       24 hours
       5        ID   Date Compiled:        03/27/2017
       6        ID   Total Area at Point of Interest: 40.5
                *
                *
                *
                *
       7        IT       1 27Mar17    0000    1800
```

```
   8        IO       5       0       0
   9        IN       5
            *
            * Basin E
            * Alternative E - Anderson, Ca

  10        KK  Basin
  11        KO       0
  12        PB   2.580
  13        PI   0.003   0.003   0.003   0.003   0.004   0.004   0.004   0.004   0.004   0.004
  14        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  17        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  18        PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19        PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  20        PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  21        PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  22        PI   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  23        PI   0.007   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  24        PI   0.008   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010
  25        PI   0.011   0.011   0.011   0.011   0.012   0.012   0.013   0.013   0.014   0.014
  26        PI   0.015   0.015   0.016   0.017   0.018   0.020   0.021   0.023   0.025   0.028
  27        PI   0.033   0.040   0.052   0.089   0.278   0.065   0.045   0.036   0.030   0.027
  28        PI   0.024   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.014   0.014
  29        PI   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011   0.010   0.010
  30        PI   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008
  31        PI   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007   0.007
  32        PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  33        PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34        PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  35        PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36        PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.004   0.004
  37        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  38        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40        PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41        PI   0.004   0.004   0.004   0.004   0.003   0.003   0.003   0.003
  42        BA  0.0632
  43        BF      -1   -0.01     1.1
  44        LS       0      73       0     .05      99       0
  45        UK     200   0.005   0.600      98
  46        UK     200   0.005   0.050       2
  47        RD     672  0.0050   0.040   0.005    TRAP     2.0    20.0
1                                              HEC-1 INPUT                                            PAGE  2

LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48        RD     672  0.0050   0.040   0.032    TRAP     3.0    20.0
```

```
          49           RD     672  0.0050   0.040   0.063    TRAP     4.0    20.0
          50           ZZ
1****************************************                                          ****************************************
 *                                       *                                         *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                         *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                         *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                         *          609 SECOND STREET           *
 *                                       *                                         *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  10:57:25   *                                         *           (916) 756-1104             *
 *                                       *                                         *                                      *
 *****************************************                                         ****************************************



                         HEC-1 Input Filename: 16196postE
                         Description:          Casino Master Plan Alternative E Pre-development Flow
                         Recurrence Interval:  2 year
                         Storm Duration:       24 hours
                         Date Compiled:        03/27/2017
                         Total Area at Point of Interest: 40.5

   8 IO           OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     27Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                        ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
  10 KK      *   Basin    *
             *            *
             **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                          RUNOFF SUMMARY
                                                    FLOW IN CUBIC FEET PER SECOND
                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                              PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD       BASIN     MAXIMUM     TIME OF
          OPERATION        STATION            FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                  6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                           Basin                4.   14.82           2.          1.          1.         .06
1
                                             SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                 (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                            COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO    VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                    PEAK

                                 (MIN)     (CFS)     (MIN)     (IN)      (MIN)     (CFS)    (MIN)       (IN)

             Basin   MANE         1.00      3.54    889.00      .62       1.00      3.54   889.00        .62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2184E+01 OUTFLOW= .2074E+01 BASIN STORAGE= .2573E-01 PERCENT ERROR=   3.8


*** NORMAL END OF HEC-1 ***
```

```
1*****************************************                        ****************************************
 *                                       *                        *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                        *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998                *                        *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                 *                        *         609 SECOND STREET            *
 *                                       *                        *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27MAR17  TIME  10:58:10   *                        *         (916) 756-1104               *
 *                                       *                        *                                      *
 *****************************************                        ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                     HEC-1 INPUT                                          PAGE  1

      LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

        1         ID   HEC-1 Input Filename: 16196preE
        2         ID   Description:          Casino Master Plan Alternative E Pre-development Flow
        3         ID   Recurrence Interval:  10 year
        4         ID   Storm Duration:       24 hours
        5         ID   Date Compiled:        03/27/2017
        6         ID   Total Area at Point of Interest: 40.5
                  *
                  *
                  *
                  *
        7         IT       1 27Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * Basin E
              * Alternative E - Anderson, Ca

  10          KK  Basin
  11          KO       0
  12          PB   3.362
  13          PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  16          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  17          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  19          PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  20          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  21          PI   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  22          PI   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  23          PI   0.009   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.011   0.011
  24          PI   0.011   0.011   0.011   0.012   0.012   0.012   0.012   0.013   0.013   0.013
  25          PI   0.014   0.014   0.015   0.015   0.015   0.016   0.016   0.017   0.018   0.018
  26          PI   0.019   0.020   0.021   0.022   0.024   0.025   0.027   0.030   0.033   0.037
  27          PI   0.043   0.052   0.068   0.116   0.362   0.084   0.059   0.047   0.040   0.035
  28          PI   0.031   0.029   0.026   0.025   0.023   0.022   0.021   0.020   0.019   0.018
  29          PI   0.017   0.017   0.016   0.016   0.015   0.015   0.014   0.014   0.014   0.013
  30          PI   0.013   0.013   0.012   0.012   0.012   0.012   0.011   0.011   0.011   0.011
  31          PI   0.011   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009
  32          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008   0.008
  33          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007
  34          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  35          PI   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006
  36          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  37          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.005   0.005
  38          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  39          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  40          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42          BA  0.0632
  43          BF      -1   -0.01     1.1
  44          LS       0      73       0     .05      99       0
  45          UK     200   0.005   0.600      98
  46          UK     200   0.005   0.050       2
  47          RD     672  0.0050   0.040   0.005    TRAP     2.0    20.0
1                                            HEC-1 INPUT                                         PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     672  0.0050   0.040   0.032    TRAP     3.0    20.0
```

```
          49            RD     672  0.0050    0.040    0.063    TRAP     4.0     20.0
          50            ZZ
1*****************************************                           *****************************************
 *                                       *                           *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                           *    U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998                *                           *    HYDROLOGIC ENGINEERING CENTER      *
 *          VERSION 4.1                  *                           *          609 SECOND STREET            *
 *                                       *                           *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27MAR17  TIME  10:58:10   *                           *           (916) 756-1104              *
 *                                       *                           *                                       *
 *****************************************                           *****************************************


                          HEC-1 Input Filename: 16196postE
                          Description:          Casino Master Plan Alternative E Pre-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/27/2017
                          Total Area at Point of Interest: 40.5

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA          SQUARE MILES
             PRECIPITATION DEPTH    INCHES
             LENGTH, ELEVATION      FEET
             FLOW                   CUBIC FEET PER SECOND
             STORAGE VOLUME         ACRE-FEET
             SURFACE AREA           ACRES
             TEMPERATURE            DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *    Basin   *
            *            *
            **************

  11 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                   RUNOFF SUMMARY
                                           FLOW IN CUBIC FEET PER SECOND
                                        TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD       BASIN     MAXIMUM     TIME OF
          OPERATION        STATION          FLOW    PEAK                                              AREA      STAGE     MAX STAGE
+                                                               6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                           Basin              8.   13.80          5.          2.          1.          .06
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT        DT        PEAK     TIME TO     VOLUME        DT        PEAK     TIME TO       VOLUME
                                                         PEAK                                        PEAK

                                   (MIN)      (CFS)      (MIN)      (IN)       (MIN)      (CFS)     (MIN)         (IN)

             Basin   MANE           1.00       8.28     828.00      1.08        1.00       8.28    828.00         1.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3810E+01 OUTFLOW= .3642E+01 BASIN STORAGE= .2725E-01 PERCENT ERROR=   3.7


*** NORMAL END OF HEC-1 ***
```

```
1****************************************              ****************************************
 *                                      *              *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *              *   U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN  1998                *              *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *              *         609 SECOND STREET            *
 *                                      *              *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27MAR17  TIME  10:58:57  *              *         (916) 756-1104               *
 *                                      *              *                                      *
 ****************************************              ****************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


   THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

   THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
   THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
   NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
   DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
   KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                      HEC-1 INPUT                                                    PAGE  1

  LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    1          ID   HEC-1 Input Filename: 16196preE
    2          ID   Description:          Casino Master Plan Alternative E Pre-development Flow
    3          ID   Recurrence Interval:  100 year
    4          ID   Storm Duration:       24 hours
    5          ID   Date Compiled:        03/27/2017
    6          ID   Total Area at Point of Interest: 40.5
               *
               *
               *
               *
    7          IT       1 27Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * Basin E
              * Alternative E - Anderson, Ca

  10          KK  Basin
  11          KO       0
  12          PB   4.702
  13          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.007
  14          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  15          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  16          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008   0.008
  17          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  18          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  19          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  20          PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  21          PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  22          PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.013   0.013   0.013
  23          PI   0.013   0.013   0.014   0.014   0.014   0.014   0.014   0.015   0.015   0.015
  24          PI   0.015   0.016   0.016   0.016   0.017   0.017   0.017   0.018   0.018   0.019
  25          PI   0.019   0.020   0.020   0.021   0.022   0.022   0.023   0.024   0.025   0.026
  26          PI   0.027   0.028   0.030   0.031   0.033   0.036   0.038   0.042   0.046   0.052
  27          PI   0.060   0.073   0.096   0.163   0.509   0.118   0.082   0.065   0.055   0.049
  28          PI   0.044   0.040   0.037   0.034   0.032   0.030   0.029   0.028   0.026   0.025
  29          PI   0.024   0.023   0.023   0.022   0.021   0.021   0.020   0.019   0.019   0.018
  30          PI   0.018   0.018   0.017   0.017   0.017   0.016   0.016   0.016   0.015   0.015
  31          PI   0.015   0.015   0.014   0.014   0.014   0.014   0.013   0.013   0.013   0.013
  32          PI   0.013   0.013   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011
  33          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  34          PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009
  35          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  36          PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  37          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  38          PI   0.008   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  39          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  40          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  42          BA  0.0632
  43          BF      -1   -0.01     1.1
  44          LS       0      73       0     .05      99       0
  45          UK     200   0.005   0.600      98
  46          UK     200   0.005   0.050       2
  47          RD     672  0.0050   0.040   0.005    TRAP     2.0    20.0
1                                      HEC-1 INPUT                                             PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.......10

  48          RD     672  0.0050   0.040   0.032    TRAP     3.0    20.0
```

```
          49          RD     672  0.0050   0.040   0.063    TRAP     4.0    20.0
          50          ZZ
1*****************************************                                                      ****************************************
 *                                       *                                                      *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                      *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                                                      *    HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                  *                                                      *          609 SECOND STREET           *
 *                                       *                                                      *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  10:58:57   *                                                      *          (916) 756-1104              *
 *                                       *                                                      *                                      *
 *****************************************                                                      ****************************************


                          HEC-1 Input Filename: 16196postE
                          Description:          Casino Master Plan Alternative E Pre-development Flow
                          Recurrence Interval:  100 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/27/2017
                          Total Area at Point of Interest: 40.5

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN          1  MINUTES IN COMPUTATION INTERVAL
                        IDATE    27Mar17  STARTING DATE
                        ITIME       0000  STARTING TIME
                           NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME       0559  ENDING TIME
                        ICENT         19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

       ENGLISH UNITS
            DRAINAGE AREA          SQUARE MILES
            PRECIPITATION DEPTH    INCHES
            LENGTH, ELEVATION      FEET
            FLOW                   CUBIC FEET PER SECOND
            STORAGE VOLUME         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
  10 KK      *    Basin   *
             *            *
             **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                          RUNOFF SUMMARY
                                                  FLOW IN CUBIC FEET PER SECOND
                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                             PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION             FLOW      PEAK                                            AREA      STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                         Basin               21.    13.03            9.          3.          3.        .06
1
                                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
             ISTAQ    ELEMENT       DT       PEAK    TIME TO    VOLUME      DT      PEAK   TIME TO      VOLUME
                                                       PEAK                                  PEAK

                                  (MIN)     (CFS)     (MIN)      (IN)     (MIN)    (CFS)    (MIN)        (IN)

             Basin    MANE         1.00     20.79    782.00      1.98      1.00    20.79   782.00        1.98

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7076E+01 OUTFLOW= .6662E+01 BASIN STORAGE= .2647E-01 PERCENT ERROR=   5.5


*** NORMAL END OF HEC-1 ***
```

Existing Condition 100-year Storm Event
Alternative E

Post-development Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:62% 1-Commercial/Highways/Parking
	Soil A:36% 14-Pasture/Parkland/Mowed Grass
	Soil A:2% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	76
Pervious Overland Length (ft):	100
Pervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	40
Impervious Overland Length (ft):	100
Impervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	200
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.030
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	36.0
Sideslopes (ft/ft-H/V):	0

```
1****************************************                 ****************************************
 *                                      *                 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                 *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                 *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                 *          609 SECOND STREET           *
 *                                      *                 *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   07APR17  TIME  11:24:36  *                 *           (916) 756-1104             *
 *                                      *                 *                                      *
 ****************************************                 ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                             HEC-1 INPUT                                               PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1           ID   HEC-1 Input Filename: 16196post2
             2           ID   Description:          Casino Master Plan Post-development Flow
             3           ID   Recurrence Interval:  2 year
             4           ID   Storm Duration:       24 hours
             5           ID   Date Compiled:        04/07/2017
             6           ID   Total Area at Point of Interest: 66.2
                         *
                         *
                         *
                         *
             7           IT       1 07Apr17    0000    1800
             8           IO       5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan

  10           KK      BA
  11           KO       0
  12           PB   2.762
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.286   0.068   0.047   0.038   0.032   0.028
  28           PI   0.025   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.1034
  43           BF      -3    -0.1    1.05
  44           LS       0      76       0     .05      99       0
  45           UK     100   0.010   0.600      40
  46           UK     100   0.010   0.050      60
  47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                             HEC-1 INPUT                                             PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     900  0.0030   0.020   0.052    CIRC       2       0
  49           RD     900  0.0030   0.020   0.103    CIRC       3       0
  50           ZZ
```

```
1*****************************************                          ***************************************
 *                                       *                          *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                          *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                          *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                          *          609 SECOND STREET          *
 *                                       *                          *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   07APR17  TIME  11:24:36   *                          *           (916) 756-1104            *
 *                                       *                          *                                     *
 *****************************************                          ***************************************



                          HEC-1 Input Filename: 16196post2
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  2 year
                          Storm Duration:       24 hours
                          Date Compiled:        04/07/2017
                          Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE      7Apr17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      8   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
            **************
            *            *
   10 KK    *        BA  *
            *            *
            **************

   11 KO         OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                        RUNOFF SUMMARY
                                                FLOW IN CUBIC FEET PER SECOND
                                             TIME IN HOURS,  AREA IN SQUARE MILES

                                         PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION        FLOW     PEAK                                           AREA      STAGE     MAX STAGE
+                                                             6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA         87.   12.15          13.          7.          6.        .10
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                      INTERPOLATED TO
                                                                                   COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00     86.72    729.00      1.42      1.00     86.72    729.00       1.42

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1054E+02 OUTFLOW= .7838E+01 BASIN STORAGE= .4305E-02 PERCENT ERROR=  25.6



 *** NORMAL END OF HEC-1 ***


                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                      INTERPOLATED TO
                                                                                   COMPUTATION INTERVAL
```

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
BA	MANE	1.00	86.23	729.00	1.43	1.00	86.23	729.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1037E+02 OUTFLOW= .7681E+01 BASIN STORAGE= .4190E-02 PERCENT ERROR= 25.9

*** NORMAL END OF HEC-1 ***

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              JUN   1998              *
 *           VERSION 4.1                *
 *                                      *
 *  RUN DATE   23MAR17  TIME  11:00:15  *
 *                                      *
 ****************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                                    HEC-1 INPUT                                          PAGE  1

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1            ID   HEC-1 Input Filename: 16196post10
             2            ID   Description:          Casino Master Plan Post-development Flow
             3            ID   Recurrence Interval:  10 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/23/2017
             6            ID   Total Area at Point of Interest: 66.2
                          *
                          *
                          *
                          *
             7            IT       1 23Mar17    0000    1800
             8            IO       5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan

  10           KK      BA
  11           KO       0
  12           PB   3.599
  13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27           PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
  28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA  0.1034
  43           BF      -5    -0.1    1.05
  44           LS       0      76       0     .05      99       0
  45           UK     100   0.010   0.600      40
  46           UK     100   0.010   0.050      60
  47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                      HEC-1 INPUT                                         PAGE  2

      LINE     ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     900  0.0030   0.020   0.052    CIRC       2       0
  49           RD     900  0.0030   0.020   0.103    CIRC       3       0
  50           ZZ
```

```
1***************************************                      ***************************************
 *                                     *                      *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                      *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998              *                      *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                      *          609 SECOND STREET          *
 *                                     *                      *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   23MAR17  TIME  11:00:15   *                      *           (916) 756-1104            *
 *                                     *                      *                                     *
 ***************************************                      ***************************************



                       HEC-1 Input Filename: 16196post10
                       Description:          Casino Master Plan Post-development Flow
                       Recurrence Interval:  10 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/23/2017
                       Total Area at Point of Interest: 66.2

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     23Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     24   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
            **************
            *            *
   10 KK    *        BA  *
            *            *
            **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                          RUNOFF SUMMARY
                                                  FLOW IN CUBIC FEET PER SECOND
                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION           FLOW     PEAK                                             AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA            118.   12.15         18.          9.          8.        .10
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00    117.46    729.00      1.92      1.00    117.46    729.00        1.92


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1459E+02 OUTFLOW= .1059E+02 BASIN STORAGE= .4445E-02 PERCENT ERROR=  27.4



 *** NORMAL END OF HEC-1 ***


                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
```

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
BA	MANE	1.00	86.23	729.00	1.43	1.00	86.23	729.00	1.43

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1037E+02 OUTFLOW= .7681E+01 BASIN STORAGE= .4190E-02 PERCENT ERROR= 25.9

*** NORMAL END OF HEC-1 ***

```
1****************************************                                                                                 ****************************************
 *                                       *                                                                                *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                                                *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                                                                                *    HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                  *                                                                                *          609 SECOND STREET           *
 *                                       *                                                                                *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   23MAR17  TIME  11:01:41   *                                                                                *            (916) 756-1104            *
 *                                       *                                                                                *                                      *
 ****************************************                                                                                 ****************************************


                                                 X     X  XXXXXXX   XXXXX          X
                                                 X     X  X        X     X        XX
                                                 X     X  X        X               X
                                                 XXXXXXX  XXXX     X       XXXXX   X
                                                 X     X  X        X               X
                                                 X     X  X        X     X         X
                                                 X     X  XXXXXXX   XXXXX         XXX


           THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

           THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
           THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
           NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
           DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
           KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                        HEC-1 INPUT                                                       PAGE  1

          LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1             ID   HEC-1 Input Filename: 16196post100
            2             ID   Description:          Casino Master Plan Post-development Flow
            3             ID   Recurrence Interval:  100 year
            4             ID   Storm Duration:       24 hours
            5             ID   Date Compiled:        03/23/2017
            6             ID   Total Area at Point of Interest: 66.2
                          *
                          *
                          *
                          *
            7             IT       1 23Mar17    0000    1800
```

```
   8       IO       5       0       0
   9       IN       5
           *
           * BA
           * Casino Master Plan

  10       KK      BA
  11       KO       0
  12       PB   5.069
  13       PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  14       PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
  15       PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  16       PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  17       PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  18       PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
  19       PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  20       PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  21       PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
  22       PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
  23       PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
  24       PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
  25       PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
  26       PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
  27       PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
  28       PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
  29       PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
  30       PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
  31       PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
  32       PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
  33       PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
  34       PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  35       PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  36       PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  37       PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
  38       PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  39       PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  40       PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41       PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  42       BA  0.1034
  43       BF     -10    -0.1    1.05
  44       LS       0      76       0     .05      99       0
  45       UK     100   0.010   0.600      40
  46       UK     100   0.010   0.050      60
  47       RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                      HEC-1 INPUT                                     PAGE  2

LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48       RD     900  0.0030   0.020   0.052    CIRC       2       0
```

```
          49           RD     900  0.0030   0.020   0.103    CIRC       3       0
          50           ZZ
1****************************************                                                    ****************************************
 *                                       *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                    *          609 SECOND STREET           *
 *                                       *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   23MAR17  TIME  11:01:41   *                                                    *           (916) 756-1104             *
 *                                       *                                                    *                                      *
 ****************************************                                                    ****************************************


                          HEC-1 Input Filename: 16196post100
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  100 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/23/2017
                          Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    23Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    24   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  10 KK     *       BA   *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                         RUNOFF SUMMARY
                                                                 FLOW IN CUBIC FEET PER SECOND
                                                              TIME IN HOURS,  AREA IN SQUARE MILES

                                                   PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD       BASIN     MAXIMUM     TIME OF
          OPERATION        STATION      FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                                       6-HOUR      24-HOUR     72-HOUR

          HYDROGRAPH AT
+                                BA       174.   12.15          28.         14.         12.        .10
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                               INTERPOLATED TO
                                                                                            COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                      PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00    173.82    729.00      3.20      1.00    173.82    729.00       3.20

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2200E+02 OUTFLOW= .1764E+02 BASIN STORAGE= .4494E-02 PERCENT ERROR=  19.8



 *** NORMAL END OF HEC-1 ***
```

Post-development 100-year Storm Event
Alternative A

```
1****************************************                        ****************************************
 *                                      *                        *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                        *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                        *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                        *         609 SECOND STREET           *
 *                                      *                        *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   23MAR17  TIME  11:47:01  *                        *          (916) 756-1104             *
 *                                      *                        *                                      *
 ****************************************                        ****************************************


                              X     X  XXXXXXX   XXXXX          X
                              X     X  X        X     X        XX
                              X     X  X        X               X
                              XXXXXXX  XXXX     X        XXXXX  X
                              X     X  X        X               X
                              X     X  X        X     X         X
                              X     X  XXXXXXX   XXXXX         XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                          HEC-1 INPUT                                                    PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196post2
              2          ID   Description:          Drainage Area #1 Post-development Flow
              3          ID   Recurrence Interval:  2 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/23/2017
              6          ID   Total Area at Point of Interest: 15.7
                         *
                         *
                         *
                         *
              7          IT       1 23Mar17    0000    1800
              8          IO       5       0       0
```

```
   9           IN       5
               *
               * BA
               * Casino Master Plan

  10           KK      BA
  11           KO       0
  12           PB   2.767
  13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27           PI   0.035   0.042   0.055   0.094   0.290   0.068   0.047   0.038   0.032   0.028
  28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42           BA  0.0245
  43           BF      -3    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                          HEC-1 INPUT                                        PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     582  0.0030   0.020   0.012    CIRC       2       0
  49           RD     582  0.0030   0.020   0.025    CIRC     2.5       0
  50           ZZ
```

```
1****************************************                                                        ****************************************
 *                                       *                                                        *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                        *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                        *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                        *          609 SECOND STREET           *
 *                                       *                                                        *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   23MAR17  TIME  11:47:01   *                                                        *           (916) 756-1104             *
 *                                       *                                                        *                                      *
 ****************************************                                                        ****************************************



                           HEC-1 Input Filename: 16196post2
                           Description:          Drainage Area #1 Post-development Flow
                           Recurrence Interval:  2 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/23/2017
                           Total Area at Point of Interest: 15.7

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     23Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     24   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                  AREA      STAGE     MAX STAGE
+                                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA        36.   12.13          5.          2.          2.        .02
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                   INTERPOLATED TO
                                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00     35.91    728.00      1.68      1.00     35.91    728.00       1.68

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .3322E+01 OUTFLOW= .2190E+01 BASIN STORAGE= .1182E-02 PERCENT ERROR=  34.1



 *** NORMAL END OF HEC-1 ***
```

```
1***************************************                      ***************************************
 *                                     *                      *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                      *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998              *                      *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                      *          609 SECOND STREET          *
 *                                     *                      *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   23MAR17  TIME  11:45:37  *                      *           (916) 756-1104            *
 *                                     *                      *                                     *
 ***************************************                      ***************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                       HEC-1 INPUT                                       PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1           ID   HEC-1 Input Filename: 16196post10
            2           ID   Description:          Drainage Area #1 Post-development Flow
            3           ID   Recurrence Interval:  10 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/23/2017
            6           ID   Total Area at Point of Interest: 15.7
                        *
                        *
                        *
                        *
            7           IT       1 23Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * BA
              * Casino Master Plan

  10          KK      BA
  11          KO       0
  12          PB   3.605
  13          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15          PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18          PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20          PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21          PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22          PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23          PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24          PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25          PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26          PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27          PI   0.045   0.055   0.072   0.122   0.378   0.089   0.062   0.049   0.042   0.037
  28          PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29          PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30          PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32          PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33          PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39          PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42          BA  0.0245
  43          BF      -5    -0.1    1.05
  44          LS       0      80       0     .05      99       0
  45          UK     100   0.010   0.600       5
  46          UK     100   0.010   0.050      95
  47          RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                           HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     582  0.0030   0.020   0.012    CIRC       2       0
```

```
           49          RD     582  0.0030   0.020   0.025    CIRC     2.5       0
           50          ZZ
1*****************************************                                                    ***************************************
 *                                       *                                                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                    *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                                                    *    HYDROLOGIC ENGINEERING CENTER    *
 *          VERSION 4.1                  *                                                    *          609 SECOND STREET          *
 *                                       *                                                    *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   23MAR17  TIME  11:45:37   *                                                    *           (916) 756-1104            *
 *                                       *                                                    *                                     *
 *****************************************                                                    ***************************************


                          HEC-1 Input Filename: 16196post10
                          Description:          Drainage Area #1 Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/23/2017
                          Total Area at Point of Interest: 15.7

    8 IO         OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

      IT         HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    23Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    24   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT
```

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*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *        BA  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                       RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION         FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                              6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA           47.   12.12          6.          3.          3.        .02
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                       INTERPOLATED TO
                                                                                    COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00     46.58    727.00      2.35      1.00     46.58    727.00        2.35

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4403E+01 OUTFLOW= .3076E+01 BASIN STORAGE= .1184E-02 PERCENT ERROR=  30.1



 *** NORMAL END OF HEC-1 ***
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1****************************************                         ****************************************
 *                                      *                         *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                         *   U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998              *                         *   HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                *                         *         609 SECOND STREET            *
 *                                      *                         *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   24MAR17  TIME  10:22:48  *                         *         (916) 756-1104               *
 *                                      *                         *                                      *
 ****************************************                         ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X       XXXXX    X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                    HEC-1 INPUT                                            PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1           ID   HEC-1 Input Filename: 16196post2
             2           ID   Description:          Casino Master Plan Post-development Flow
             3           ID   Recurrence Interval:  2 year
             4           ID   Storm Duration:       24 hours
             5           ID   Date Compiled:        03/24/2017
             6           ID   Total Area at Point of Interest: 4.3
                         *
                         *
                         *
                         *
             7           IT       1 24Mar17    0000    1800
```

```
  8           IO       5       0       0
  9           IN       5
              *
              * DA2
              * Casino Master Plan

 10           KK     DA2
 11           KO       0
 12           PB   2.769
 13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
 17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
 20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
 22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
 23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
 24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
 25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
 26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
 27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
 28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
 29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
 30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
 31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 42           BA  0.0067
 43           BF      -3    -0.1    1.05
 44           LS       0      80       0     .05      99       0
 45           UK     100   0.010   0.600       5
 46           UK     100   0.010   0.050      95
 47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                 HEC-1 INPUT                                    PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     250  0.0030   0.020   0.007    CIRC       2       0
          50           ZZ
1*****************************************                                                  ****************************************
 *                                       *                                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                  *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                  *          609 SECOND STREET           *
 *                                       *                                                  *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAR17  TIME  10:22:48   *                                                  *           (916) 756-1104             *
 *                                       *                                                  *                                      *
 *****************************************                                                  ****************************************




                           HEC-1 Input Filename: 16196post2
                           Description:          Casino Master Plan Post-development Flow
                           Recurrence Interval:  2 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/24/2017
                           Total Area at Point of Interest: 4.3

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
   10 KK      *       DA2  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                       PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                                         6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA2        10.   12.12          1.          1.          1.        .01
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                 INTERPOLATED TO
                                                                                              COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA2  MANE         1.00     10.37    727.00      1.90      1.00     10.37    727.00       1.90

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9092E+00 OUTFLOW= .6794E+00 BASIN STORAGE= .7719E-03 PERCENT ERROR=  25.2



 *** NORMAL END OF HEC-1 ***
```

```
1***************************************
 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *             JUN   1998              *
 *           VERSION 4.1               *
 *                                     *
 *  RUN DATE   24MAR17  TIME  10:21:43  *
 *                                     *
 ***************************************

 ***************************************
 *                                     *
 *    U.S. ARMY CORPS OF ENGINEERS     *
 *    HYDROLOGIC ENGINEERING CENTER    *
 *          609 SECOND STREET          *
 *       DAVIS, CALIFORNIA 95616       *
 *           (916) 756-1104            *
 *                                     *
 ***************************************

                  X     X  XXXXXXX   XXXXX          X
                  X     X  X        X     X        XX
                  X     X  X        X               X
                  XXXXXXX  XXXX     X       XXXXX   X
                  X     X  X        X               X
                  X     X  X        X     X         X
                  X     X  XXXXXXX   XXXXX         XXX

 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                    HEC-1 INPUT                                        PAGE  1

      LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

         1          ID   HEC-1 Input Filename: 16196post10
         2          ID   Description:          Casino Master Plan Post-development Flow
         3          ID   Recurrence Interval:  10 year
         4          ID   Storm Duration:       24 hours
         5          ID   Date Compiled:        03/24/2017
         6          ID   Total Area at Point of Interest: 4.3
                    *
                    *
                    *
                    *
         7          IT       1 24Mar17    0000    1800
```

```
   8           IO       5       0       0
   9           IN       5
               *
               * DA2
               * Casino Master Plan

  10           KK     DA2
  11           KO       0
  12           PB   3.608
  13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27           PI   0.045   0.055   0.072   0.122   0.381   0.089   0.062   0.049   0.042   0.037
  28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA  0.0067
  43           BF      -5    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                    HEC-1 INPUT                                          PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     250  0.0030   0.020   0.007    CIRC       2       0
          50           ZZ
1****************************************                                                    ****************************************
 *                                       *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                  *                                                    *          609 SECOND STREET           *
 *                                       *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAR17  TIME  10:21:43   *                                                    *           (916) 756-1104             *
 *                                       *                                                    *                                      *
 ****************************************                                                    ****************************************



                           HEC-1 Input Filename: 16196post10
                           Description:          Casino Master Plan Post-development Flow
                           Recurrence Interval:  10 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/24/2017
                           Total Area at Point of Interest: 4.3

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *       DA2  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                       RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                             AREA      STAGE     MAX STAGE
+                                                             6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA2        14.   12.12           2.          1.          1.        .01
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                     INTERPOLATED TO
                                                                                  COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA2  MANE         1.00     14.01    727.00      2.64      1.00     14.01    727.00        2.64

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1205E+01 OUTFLOW= .9442E+00 BASIN STORAGE= .7690E-03 PERCENT ERROR=  21.6



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                     ****************************************
 *                                      *                     *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                     *   U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998              *                     *   HYDROLOGIC ENGINEERING CENTER      *
 *            VERSION 4.1               *                     *        609 SECOND STREET             *
 *                                      *                     *     DAVIS, CALIFORNIA 95616          *
 *  RUN DATE   24MAR17  TIME  11:26:21  *                     *         (916) 756-1104               *
 *                                      *                     *                                      *
 ****************************************                     ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                   HEC-1 INPUT                                                PAGE  1

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1            ID   HEC-1 Input Filename: 16196post2
             2            ID   Description:          Casino Master Plan Post-development Flow
             3            ID   Recurrence Interval:  2 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/24/2017
             6            ID   Total Area at Point of Interest: 5.8
                          *
                          *
                          *
                          *
             7            IT       1 24Mar17    0000    1800
```

```
  8           IO       5       0       0
  9           IN       5
              *
              * DA3
              * Casino Master Plan

 10           KK     DA3
 11           KO       0
 12           PB   2.769
 13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
 17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
 20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
 22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
 23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
 24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
 25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
 26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
 27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
 28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
 29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
 30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
 31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 42           BA  0.0090
 43           BF      -3    -0.1    1.05
 44           LS       0      80       0     .05      99       0
 45           UK     100   0.010   0.600       5
 46           UK     100   0.010   0.050      95
 47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                          HEC-1 INPUT                                          PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     250  0.0030   0.020   0.009    CIRC       2       0
          50           ZZ
1*****************************************                                                   *****************************************
 *                                       *                                                   *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                   *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998               *                                                   *    HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                 *                                                   *          609 SECOND STREET            *
 *                                       *                                                   *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   24MAR17  TIME  11:26:21   *                                                   *           (916) 756-1104              *
 *                                       *                                                   *                                       *
 *****************************************                                                   *****************************************



                        HEC-1 Input Filename: 16196post2
                        Description:          Casino Master Plan Post-development Flow
                        Recurrence Interval:  2 year
                        Storm Duration:       24 hours
                        Date Compiled:        03/24/2017
                        Total Area at Point of Interest: 5.8

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    24Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    25   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
   10 KK   *       DA3  *
           *            *
           **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                    RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                        PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA3        14.   12.12          2.          1.          1.        .01
1
                                                  SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                         INTERPOLATED TO
                                                                                      COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                   PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA3  MANE         1.00     13.85    727.00      1.93      1.00     13.85    727.00       1.93

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1221E+01 OUTFLOW= .9284E+00 BASIN STORAGE= .9693E-03 PERCENT ERROR=  23.9



 *** NORMAL END OF HEC-1 ***
```

Post-development 2-year Storm Event
Alternative A Drainage Area #3

```
1***************************************                                    ***************************************
 *                                      *                                   *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                   *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998               *                                   *    HYDROLOGIC ENGINEERING CENTER    *
 *          VERSION 4.1                 *                                   *          609 SECOND STREET          *
 *                                      *                                   *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   24MAR17  TIME  11:30:15  *                                   *           (916) 756-1104            *
 *                                      *                                   *                                     *
 ***************************************                                    ***************************************


                                 X     X  XXXXXXX   XXXXX          X
                                 X     X  X        X     X        XX
                                 X     X  X        X               X
                                 XXXXXXX  XXXX     X       XXXXX   X
                                 X     X  X        X               X
                                 X     X  X        X     X         X
                                 X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                           HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1          ID   HEC-1 Input Filename: 16196post10
             2          ID   Description:          Casino Master Plan Post-development Flow
             3          ID   Recurrence Interval:  10 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/24/2017
             6          ID   Total Area at Point of Interest: 5.8
                        *
                        *
                        *
                        *
             7          IT       1 24Mar17    0000    1800
```

```
   8          IO       5       0       0
   9          IN       5
              *
              * DA3
              * Casino Master Plan

  10          KK     DA3
  11          KO       0
  12          PB   3.608
  13          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15          PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18          PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20          PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21          PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22          PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23          PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24          PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25          PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26          PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27          PI   0.045   0.055   0.072   0.122   0.380   0.089   0.062   0.049   0.042   0.037
  28          PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29          PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30          PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32          PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33          PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39          PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42          BA  0.0090
  43          BF      -5    -0.1    1.05
  44          LS       0      80       0     .05      99       0
  45          UK     100   0.010   0.600       5
  46          UK     100   0.010   0.050      95
  47          RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                           HEC-1 INPUT                                          PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     250  0.0030   0.020   0.009    CIRC       2       0
          50           ZZ
1****************************************                                                  ****************************************
 *                                       *                                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                  *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                                                  *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                                                  *          609 SECOND STREET          *
 *                                       *                                                  *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   24MAR17  TIME  11:30:15   *                                                  *           (916) 756-1104            *
 *                                       *                                                  *                                      *
 ****************************************                                                  ****************************************


                          HEC-1 Input Filename: 16196post10
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/24/2017
                          Total Area at Point of Interest: 5.8

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


          **************
          *            *
  10 KK   *       DA3  *
          *            *
          **************

  11 KO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                              RUNOFF SUMMARY
                                                       FLOW IN CUBIC FEET PER SECOND
                                                    TIME IN HOURS,  AREA IN SQUARE MILES

                                              PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                                 AREA      STAGE     MAX STAGE
+                                                               6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                               DA3        19.   12.12          2.          1.          1.        .01
1
                                                  SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                          INTERPOLATED TO
                                                                                       COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA3  MANE         1.00     18.58    727.00      2.70      1.00     18.58    727.00       2.70

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1619E+01 OUTFLOW= .1294E+01 BASIN STORAGE= .9663E-03 PERCENT ERROR=  20.0



 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************                    ****************************************
 *                                       *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                    *          609 SECOND STREET           *
 *                                       *                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAR17  TIME  12:00:46   *                    *          (916) 756-1104              *
 *                                       *                    *                                      *
 *****************************************                    ****************************************


                 X     X  XXXXXXX   XXXXX          X
                 X     X  X        X     X        XX
                 X     X  X        X               X
                 XXXXXXX  XXXX     X       XXXXX   X
                 X     X  X        X               X
                 X     X  X        X     X         X
                 X     X  XXXXXXX   XXXXX         XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                    HEC-1 INPUT                                           PAGE  1

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1           ID   HEC-1 Input Filename: 16196post2
   2           ID   Description:          Casino Master Plan Post-development Flow
   3           ID   Recurrence Interval:  2 year
   4           ID   Storm Duration:       24 hours
   5           ID   Date Compiled:        03/24/2017
   6           ID   Total Area at Point of Interest: 4
               *
               *
               *
               *
   7           IT       1 24Mar17    0000    1800
```

```
  8           IO       5       0       0
  9           IN       5
              *
              * DA4
              * Casino Master Plan

 10           KK     DA4
 11           KO       0
 12           PB   2.770
 13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
 17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
 20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
 22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
 23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
 24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
 25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
 26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
 27           PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
 28           PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
 29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
 30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
 31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
 42           BA  0.0062
 43           BF      -3    -0.1    1.05
 44           LS       0      80       0     .05      99       0
 45           UK     100   0.010   0.600       5
 46           UK     100   0.010   0.050      95
 47           RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                HEC-1 INPUT                                      PAGE  2

LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     100  0.0030   0.030   0.006    TRAP     2.0     0.0
          50           ZZ
1****************************************                                                   ****************************************
 *                                       *                                                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                   *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                                                   *    HYDROLOGIC ENGINEERING CENTER     *
 *          VERSION 4.1                  *                                                   *          609 SECOND STREET           *
 *                                       *                                                   *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAR17  TIME  12:00:46   *                                                   *          (916) 756-1104              *
 *                                       *                                                   *                                      *
 ****************************************                                                   ****************************************


                    HEC-1 Input Filename: 16196post2
                    Description:          Casino Master Plan Post-development Flow
                    Recurrence Interval:  2 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/24/2017
                    Total Area at Point of Interest: 4

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     24Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     25   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

             **************
             *            *
  10 KK      *       DA4  *
             *            *
             **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                               AREA      STAGE     MAX STAGE
+                                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA4        11.   12.10          1.          1.          1.        .01
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                  INTERPOLATED TO
                                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                        PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA4  MANE          .37     10.62    725.99      1.43      1.00     10.61    726.00       1.43

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8417E+00 OUTFLOW= .4712E+00 BASIN STORAGE= .4740E-03 PERCENT ERROR=  44.0



 *** NORMAL END OF HEC-1 ***
```

```
1***************************************                           ***************************************
 *                                     *                           *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                           *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                           *   HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                           *        609 SECOND STREET            *
 *                                     *                           *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAR17  TIME  11:59:45  *                           *          (916) 756-1104             *
 *                                     *                           *                                     *
 ***************************************                           ***************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                                    PAGE  1

          LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1            ID   HEC-1 Input Filename: 16196post10
            2            ID   Description:          Casino Master Plan Post-development Flow
            3            ID   Recurrence Interval:  10 year
            4            ID   Storm Duration:       24 hours
            5            ID   Date Compiled:        03/24/2017
            6            ID   Total Area at Point of Interest: 4
                         *
                         *
                         *
                         *
            7            IT       1 24Mar17    0000    1800
```

```
     8           IO       5       0       0
     9           IN       5
                 *
                 * DA4
                 * Casino Master Plan

    10           KK     DA4
    11           KO       0
    12           PB   3.608
    13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
    16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
    22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
    23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
    24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
    25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
    26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
    27           PI   0.045   0.055   0.072   0.122   0.381   0.089   0.062   0.049   0.042   0.037
    28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
    29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
    30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
    31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
    32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
    33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
    35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
    37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
    40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    42           BA  0.0062
    43           BF      -5    -0.1    1.05
    44           LS       0      80       0     .05      99       0
    45           UK     100   0.010   0.600       5
    46           UK     100   0.010   0.050      95
    47           RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                      HEC-1 INPUT                                          PAGE  2

  LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48           RD     100  0.0030   0.030   0.005    TRAP     2.0    15.0
```

```
          49           RD     100  0.0030   0.030   0.006    TRAP     2.0     0.0
          50           ZZ
1****************************************                                                    ****************************************
 *                                       *                                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                    *          609 SECOND STREET           *
 *                                       *                                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   24MAR17  TIME  11:59:45   *                                                    *           (916) 756-1104             *
 *                                       *                                                    *                                      *
 ****************************************                                                    ****************************************


                          HEC-1 Input Filename: 16196post10
                          Description:          Casino Master Plan Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/24/2017
                          Total Area at Point of Interest: 4

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     24Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     25   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

              **************
              *            *
   10 KK      *       DA4  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                        RUNOFF SUMMARY
                                                                FLOW IN CUBIC FEET PER SECOND
                                                             TIME IN HOURS,  AREA IN SQUARE MILES

                                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                  AREA      STAGE     MAX STAGE
+                                                                       6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA4        14.   12.10          2.          1.          1.        .01
1
                                                    SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                        (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                              INTERPOLATED TO
                                                                                           COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA4  MANE          .33     14.33    725.87      1.86      1.00     14.26    726.00       1.86

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1115E+01 OUTFLOW= .6166E+00 BASIN STORAGE= .4673E-03 PERCENT ERROR=  44.7



 *** NORMAL END OF HEC-1 ***
```

Post-development 10-year Storm Event
Alternative A Drainage Area #4

Post-development Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:44% 1-Commercial/Highways/Parking Soil A:54% 14-Pasture/Parkland/Mowed Grass Soil A:2% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	74
Pervious Overland Length (ft):	100
Pervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	57
Impervious Overland Length (ft):	100
Impervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	200
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.030
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	36.0
Sideslopes (ft/ft-H/V):	0

```
1****************************************                    ****************************************
 *                                      *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                    *     U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998               *                    *     HYDROLOGIC ENGINEERING CENTER    *
 *            VERSION 4.1               *                    *           609 SECOND STREET          *
 *                                      *                    *        DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  14:10:18  *                    *            (916) 756-1104            *
 *                                      *                    *                                      *
 ****************************************                    ****************************************


                  X     X  XXXXXXX   XXXXX           X
                  X     X  X        X     X         XX
                  X     X  X        X                X
                  XXXXXXX  XXXX     X       XXXXX    X
                  X     X  X        X                X
                  X     X  X        X     X          X
                  X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                       HEC-1 INPUT                                              PAGE  1

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1           ID   HEC-1 Input Filename: 16196post2-B
   2           ID   Description:          Casino Master Plan Post-development Flow – Alternative B
   3           ID   Recurrence Interval:  2 year
   4           ID   Storm Duration:       24 hours
   5           ID   Date Compiled:        03/27/2017
   6           ID   Total Area at Point of Interest: 66.2
               *
               *
               *
               *
   7           IT       1 27Mar17    0000    1800
```

```
       8           IO       5       0       0
       9           IN       5
                   *
                   * BA
                   * Casino Master Plan

      10           KK      BA
      11           KO       0
      12           PB   2.762
      13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
      17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
      20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
      21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
      22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
      23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
      24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
      25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
      26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
      27           PI   0.035   0.042   0.055   0.094   0.286   0.068   0.047   0.038   0.032   0.028
      28           PI   0.025   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
      29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
      30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
      31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
      32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
      33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
      34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
      35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      42           BA  0.1034
      43           BF      -3    -0.1    1.05
      44           LS       0      74       0     .05      99       0
      45           UK     100   0.010   0.600      57
      46           UK     100   0.010   0.050      43
      47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                HEC-1 INPUT                                            PAGE  2

    LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      48           RD     900  0.0030   0.020   0.052    CIRC       2       0
```

```
          49           RD     900  0.0030   0.020   0.103    CIRC       3       0
          50           ZZ
1****************************************                                                     ****************************************
 *                                       *                                                     *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                     *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                     *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                     *          609 SECOND STREET           *
 *                                       *                                                     *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  14:10:18   *                                                     *           (916) 756-1104             *
 *                                       *                                                     *                                      *
 ****************************************                                                     ****************************************

                        HEC-1 Input Filename: 16196post2-B
                        Description:          Casino Master Plan Post-development Flow - Alternative
                        Recurrence Interval:  2 year
                        Storm Duration:       24 hours
                        Date Compiled:        03/27/2017
                        Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   10 KK    *       BA   *
            *            *
            **************

   11 KO         OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                    RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                         PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                               AREA      STAGE     MAX STAGE
+                                                             6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                             BA        64.   12.15          10.          5.          4.        .10
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                               INTERPOLATED TO
                                                                            COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00     63.42    729.00      1.10      1.00     63.42    729.00       1.10

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .8592E+01 OUTFLOW= .6067E+01 BASIN STORAGE= .5096E-02 PERCENT ERROR=  29.3



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                           ****************************************
 *                                      *                           *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                           *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                           *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                           *          609 SECOND STREET           *
 *                                      *                           *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  14:09:41  *                           *           (916) 756-1104             *
 *                                      *                           *                                      *
 ****************************************                           ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                 HEC-1 INPUT                                                    PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196post10-B
              2          ID   Description:          Casino Master Plan Post-development Flow – Alternative B
              3          ID   Recurrence Interval:  10 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 66.2
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
      9           IN       5
                  *
                  * BA
                  * Casino Master Plan

     10           KK      BA
     11           KO       0
     12           PB   3.599
     13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
     14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
     15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
     16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
     17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
     18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
     19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
     20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
     21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
     22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
     23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
     24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
     25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
     26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
     27           PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
     28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
     29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
     30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
     31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
     32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
     33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
     34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
     35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
     36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
     37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
     38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
     39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
     40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
     41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
     42           BA  0.1034
     43           BF      -5    -0.1    1.05
     44           LS       0      74       0     .05      99       0
     45           UK     100   0.010   0.600      57
     46           UK     100   0.010   0.050      43
     47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                           HEC-1 INPUT                                       PAGE  2

   LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

     48           RD     900  0.0030   0.020   0.052    CIRC       2       0
     49           RD     900  0.0030   0.020   0.103    CIRC       3       0
     50           ZZ
```

```
1*****************************************                                              ****************************************
 *                                       *                                              *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                              *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                              *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                              *          609 SECOND STREET           *
 *                                       *                                              *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  14:09:41   *                                              *           (916) 756-1104             *
 *                                       *                                              *                                      *
 *****************************************                                              ****************************************



                           HEC-1 Input Filename: 16196post10-B
                           Description:          Casino Master Plan Post-development Flow - Alternative
                           Recurrence Interval:  10 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/27/2017
                           Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                              RUNOFF SUMMARY
                                                      FLOW IN CUBIC FEET PER SECOND
                                                   TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                              6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                             BA        90.   12.15          15.          7.          6.        .10
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                   INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                    PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                BA  MANE         1.00     89.54    729.00      1.72      1.00     89.54    729.00       1.72

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1230E+02 OUTFLOW= .9460E+01 BASIN STORAGE= .5123E-02 PERCENT ERROR=  23.0



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                            ***************************************
 *                                      *                            *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                            *   U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998              *                            *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                            *         609 SECOND STREET           *
 *                                      *                            *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  14:08:44  *                            *          (916) 756-1104             *
 *                                      *                            *                                     *
 ****************************************                            ***************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
1                                              HEC-1 INPUT                                              PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196post100
              2          ID   Description:          Casino Master Plan Post-development Flow – Alternative B
              3          ID   Recurrence Interval:  100 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 66.2
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
    9           IN       5
                *
                * BA
                * Casino Master Plan

   10           KK      BA
   11           KO       0
   12           PB   5.069
   13           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   14           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
   15           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   16           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   17           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
   18           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
   19           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
   20           PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
   21           PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
   22           PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
   23           PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
   24           PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
   25           PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
   26           PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
   27           PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
   28           PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
   29           PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
   30           PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
   31           PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
   32           PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
   33           PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
   34           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
   35           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
   36           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
   37           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
   38           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   39           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
   40           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   41           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
   42           BA  0.1034
   43           BF     -10    -0.1    1.05
   44           LS       0      74       0     .05      99       0
   45           UK     100   0.010   0.600      57
   46           UK     100   0.010   0.050      43
   47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                            HEC-1 INPUT                                        PAGE  2

  LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   48           RD     900  0.0030   0.020   0.052    CIRC       2       0
   49           RD     900  0.0030   0.020   0.103    CIRC       3       0
   50           ZZ
```

```
1****************************************                          ***************************************
 *                                       *                          *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                          *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                          *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                          *          609 SECOND STREET          *
 *                                       *                          *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  14:08:44   *                          *           (916) 756-1104            *
 *                                       *                          *                                     *
 *****************************************                          ***************************************



                    HEC-1 Input Filename: 16196post100
                    Description:          Casino Master Plan Post-development Flow - Alternative
                    Recurrence Interval:  100 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/27/2017
                    Total Area at Point of Interest: 66.2

   8 IO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN           1  MINUTES IN COMPUTATION INTERVAL
                      IDATE     27Mar17  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     28   17  ENDING DATE
                     NDTIME        0559  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                                  PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                    AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA       139.   12.15          24.         12.         10.        .10
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                           INTERPOLATED TO
                                                                                        COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE         1.00    138.71    729.00      2.74      1.00    138.71    729.00       2.74

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1927E+02 OUTFLOW= .1510E+02 BASIN STORAGE= .5304E-02 PERCENT ERROR=  21.6



 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************                            ***************************************
 *                                       *                            *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                            *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                            *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                            *          609 SECOND STREET          *
 *                                       *                            *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   07APR17  TIME  12:09:00   *                            *           (916) 756-1104            *
 *                                       *                            *                                     *
 *****************************************                            ***************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                             PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1          ID   HEC-1 Input Filename: 16196post2-DA1 B
             2          ID   Description:          Casino Master Plan Alternate B Post-development Flow DA
             3          ID   Recurrence Interval:  2 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/28/2017
             6          ID   Total Area at Point of Interest: 6.4
                        *
                        *
                        *
                        *
             7          IT       1 28Mar17    0000    1800
             8          IO       5       0       0
```

```
       9            IN       5
                    *
                    * DA1
                    * Casino Master Plan

      10            KK     DA1
      11            KO       0
      12            PB   2.769
      13            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      14            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      15            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      16            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
      17            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      18            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      19            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
      20            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
      21            PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
      22            PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
      23            PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
      24            PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
      25            PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
      26            PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
      27            PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
      28            PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
      29            PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
      30            PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
      31            PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
      32            PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
      33            PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
      34            PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
      35            PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      36            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      37            PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
      38            PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      39            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      40            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      41            PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
      42            BA    0.01
      43            BF      -3    -0.1    1.05
      44            LS       0      80       0     .05      99       0
      45            UK     100   0.010   0.600       5
      46            UK     100   0.010   0.050      95
      47            RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                   HEC-1 INPUT                                         PAGE  2

    LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      48            RD     500  0.0030   0.020   0.005    CIRC       2       0
      49            RD     500  0.0030   0.020   0.010    CIRC       3       0
      50            ZZ
```

```
1***************************************                    ***************************************
 *                                     *                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1) *                    *   U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998              *                    *   HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1               *                    *        609 SECOND STREET            *
 *                                     *                    *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   07APR17  TIME  12:09:00 *                    *          (916) 756-1104             *
 *                                     *                    *                                     *
 ***************************************                    ***************************************



                      HEC-1 Input Filename: 16196post2-DA1 B
                      Description:          Casino Master Plan Alternate B Post-development Flow DA
                      Recurrence Interval:  2 year
                      Storm Duration:       24 hours
                      Date Compiled:        03/28/2017
                      Total Area at Point of Interest: 6.4

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA1  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                    RUNOFF SUMMARY
                                                            FLOW IN CUBIC FEET PER SECOND
                                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                                 PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                               AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA1        15.   12.13          2.          1.          1.        .01
1
                                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                INTERPOLATED TO
                                                                                             COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME       DT        PEAK    TIME TO     VOLUME
                                                     PEAK                                         PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA1  MANE         1.00     15.26    728.00      1.78      1.00     15.26    728.00        1.78

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1357E+01 OUTFLOW= .9475E+00 BASIN STORAGE= .9248E-03 PERCENT ERROR=  30.1



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                                                        ****************************************
 *                                       *                                                        *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                        *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                                                        *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                                                        *          609 SECOND STREET           *
 *                                       *                                                        *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   28MAR17  TIME  10:02:09   *                                                        *           (916) 756-1104             *
 *                                       *                                                        *                                      *
 ****************************************                                                        ****************************************


                              X     X  XXXXXXX   XXXXX           X
                              X     X  X        X     X         XX
                              X     X  X        X                X
                              XXXXXXX  XXXX     X       XXXXX    X
                              X     X  X        X                X
                              X     X  X        X     X          X
                              X     X  XXXXXXX   XXXXX          XXX


             THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

             THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
             THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
             NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
             DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
             KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                      HEC-1 INPUT                                                     PAGE  1

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1           ID   HEC-1 Input Filename: 16196post10-DA1 B
              2           ID   Description:          Casino Master Plan Alternate B Post-development Flow DA
              3           ID   Recurrence Interval:  10 year
              4           ID   Storm Duration:       24 hours
              5           ID   Date Compiled:        03/28/2017
              6           ID   Total Area at Point of Interest: 6.4
                          *
                          *
                          *
                          *
              7           IT       1 28Mar17    0000    1800
```

```
   8           IO       5       0       0
   9           IN       5
               *
               * DA1
               * Casino Master Plan

  10           KK     DA1
  11           KO       0
  12           PB   3.608
  13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27           PI   0.045   0.055   0.072   0.122   0.380   0.089   0.062   0.049   0.042   0.037
  28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA    0.01
  43           BF      -5    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                            HEC-1 INPUT                                            PAGE  2

LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     500  0.0030   0.020   0.005    CIRC       2       0
```

```
          49           RD     500  0.0030   0.020   0.010    CIRC       3       0
          50           ZZ
1*****************************************                                                ***************************************
 *                                       *                                                *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                                                *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                                                *          609 SECOND STREET          *
 *                                       *                                                *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   28MAR17  TIME  10:02:09   *                                                *           (916) 756-1104            *
 *                                       *                                                *                                     *
 *****************************************                                                ***************************************



                            HEC-1 Input Filename: 16196post10-DA1 B
                            Description:          Casino Master Plan Alternate B Post-development Flow DA
                            Recurrence Interval:  10 year
                            Storm Duration:       24 hours
                            Date Compiled:        03/28/2017
                            Total Area at Point of Interest: 6.4

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT
```

```
*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            **************
            *            *
  10 KK     *       DA1  *
            *            *
            **************

  11 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                            RUNOFF SUMMARY
                                                    FLOW IN CUBIC FEET PER SECOND
                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                           PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                             6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                            DA1        20.   12.12           2.          1.          1.        .01
1
                                               SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                   (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                      INTERPOLATED TO
                                                                                   COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                    PEAK                                      PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               DA1  MANE         1.00     20.33    727.00      2.18      1.00     20.33    727.00       2.18

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1799E+01 OUTFLOW= .1164E+01 BASIN STORAGE= .9239E-03 PERCENT ERROR=  35.3



 *** NORMAL END OF HEC-1 ***
```

Post-development Subbasin Parameters

Subbasin:	BA
Mean Subbasin Elevation (ft):	450
Subbasin Area (Sq. Mi.):	0.1034375
Subbasin Area (acres):	66.2
Land Use:	Soil A:33% 1-Commercial/Highways/Parking Soil A:65% 14-Pasture/Parkland/Mowed Grass Soil A:2% 17- Open Oak/Pine Woodland/Grassland
Pervious Curve Number:	72
Pervious Overland Length (ft):	100
Pervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	67
Impervious Overland Length (ft):	100
Impervious Overland Slope (ft/ft):	0.010
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	200
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.030
Representative Area (acres):	10.30
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	300
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	33.10
Width (ft)/Diameter (in) :	18.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	300
Slope (ft/ft):	0.0030
Roughness (Mannings n):	0.020
Representative Area (acres):	66.20
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   27MAR17  TIME  14:45:33   *
 *                                       *
 *****************************************

 *****************************************
 *                                       *
 *    U.S. ARMY CORPS OF ENGINEERS       *
 *    HYDROLOGIC ENGINEERING CENTER      *
 *          609 SECOND STREET            *
 *       DAVIS, CALIFORNIA 95616         *
 *           (916) 756-1104              *
 *                                       *
 *****************************************

          X     X  XXXXXXX   XXXXX          X
          X     X  X        X     X        XX
          X     X  X        X               X
          XXXXXXX  XXXX     X       XXXXX   X
          X     X  X        X               X
          X     X  X        X     X         X
          X     X  XXXXXXX   XXXXX         XXX

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                              PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1           ID   HEC-1 Input Filename: 16196post2-D
            2           ID   Description:          Casino Master Plan Post-development Flow - Alternative D
            3           ID   Recurrence Interval:  2 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/27/2017
            6           ID   Total Area at Point of Interest: 66.2
                        *
                        *
                        *
                        *
            7           IT       1 27Mar17    0000    1800
            8           IO       5       0       0
```

```
         9           IN       5
                     *
                     * BA
                     * Casino Master Plan

        10           KK      BA
        11           KO       0
        12           PB   2.762
        13           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
        17           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
        18           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
        19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
        20           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
        21           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
        22           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
        23           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
        24           PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
        25           PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
        26           PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
        27           PI   0.035   0.042   0.055   0.094   0.286   0.068   0.047   0.038   0.032   0.028
        28           PI   0.025   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
        29           PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
        30           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
        31           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
        32           PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
        33           PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
        34           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
        35           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
        36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
        37           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
        38           PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        41           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
        42           BA  0.1034
        43           BF      -3    -0.1    1.05
        44           LS       0      72       0     .05      99       0
        45           UK     100   0.010   0.600      67
        46           UK     100   0.010   0.050      33
        47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                 HEC-1 INPUT                                                PAGE  2

      LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

        48           RD     300  0.0030   0.020   0.052    CIRC     1.5       0
        49           RD     300  0.0030   0.020   0.103    CIRC       2       0
        50           ZZ
```

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1***************************************                     ***************************************
 *                                     *                     *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                     *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998              *                     *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                     *          609 SECOND STREET          *
 *                                     *                     *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  14:45:33   *                     *           (916) 756-1104            *
 *                                     *                     *                                     *
 ***************************************                     ***************************************


                         HEC-1 Input Filename: 16196post2-D
                         Description:          Casino Master Plan Post-development Flow - Alternative
                         Recurrence Interval:  2 year
                         Storm Duration:       24 hours
                         Date Compiled:        03/27/2017
                         Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
           **************
           *            *
 10 KK     *        BA  *
           *            *
           **************

 11 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                           RUNOFF SUMMARY
                                                   FLOW IN CUBIC FEET PER SECOND
                                                TIME IN HOURS,  AREA IN SQUARE MILES

                                            PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
        OPERATION       STATION      FLOW     PEAK                                              AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

        HYDROGRAPH AT
+                            BA        52.   12.13          8.          4.          3.        .10
1
                                                 SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                     (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                          INTERPOLATED TO
                                                                                       COMPUTATION INTERVAL
          ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME       DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                          PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

               BA  MANE          .99     52.03    727.49       .95      1.00     51.99    728.00         .95

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7235E+01 OUTFLOW= .5228E+01 BASIN STORAGE= .5102E-02 PERCENT ERROR=  27.7



 *** NORMAL END OF HEC-1 ***
```

```
1***************************************                                         ***************************************
 *                                     *                                         *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998             *                                         *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                                         *         609 SECOND STREET           *
 *                                     *                                         *      DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  14:47:10   *                                       *          (916) 756-1104             *
 *                                     *                                         *                                     *
 ***************************************                                         ***************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM
```

```
1                                            HEC-1 INPUT                                                  PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

            1           ID   HEC-1 Input Filename: 16196post10-D
            2           ID   Description:          Casino Master Plan Post-development Flow - Alternative
            3           ID   Recurrence Interval:  10 year
            4           ID   Storm Duration:       24 hours
            5           ID   Date Compiled:        03/27/2017
            6           ID   Total Area at Point of Interest: 66.2
                        *
                        *
                        *
                        *
            7           IT       1 27Mar17    0000    1800
            8           IO       5       0       0
```

```
  9           IN       5
              *
              * BA
              * Casino Master Plan

 10           KK      BA
 11           KO       0
 12           PB   3.599
 13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
 16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
 22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
 23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
 24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
 25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
 26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
 27           PI   0.045   0.055   0.072   0.122   0.372   0.088   0.062   0.049   0.042   0.037
 28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
 29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
 30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
 31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
 32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
 33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
 34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
 35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
 36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
 37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
 39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
 40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
 42           BA  0.1034
 43           BF      -5    -0.1    1.05
 44           LS       0      72       0     .05      99       0
 45           UK     100   0.010   0.600      67
 46           UK     100   0.010   0.050      33
 47           RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                    PAGE  2

       LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 48           RD     300  0.0030   0.020   0.052    CIRC     1.5       0
 49           RD     300  0.0030   0.020   0.103    CIRC       2       0
 50           ZZ
```

```
1***************************************                              ***************************************
 *                                      *                              *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                              *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                              *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                              *          609 SECOND STREET          *
 *                                      *                              *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  14:47:10  *                              *            (916) 756-1104           *
 *                                      *                              *                                     *
 ****************************************                              ***************************************



                          HEC-1 Input Filename: 16196post10-D
                          Description:          Casino Master Plan Post-development Flow - Alternative
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/27/2017
                          Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    27Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    28   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                                 PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                      AREA      STAGE     MAX STAGE
+                                                                   6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA        73.   12.13         13.          6.          5.        .10
1
                                                  SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                        INTERPOLATED TO
                                                                                     COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE          .93     73.34    728.29      1.53      1.00     73.09    728.00       1.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1066E+02 OUTFLOW= .8415E+01 BASIN STORAGE= .5143E-02 PERCENT ERROR=  21.0



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                    ***************************************
 *                                       *                   *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                   *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                   *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                   *          609 SECOND STREET          *
 *                                       *                   *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  14:48:26   *                   *           (916) 756-1104            *
 *                                       *                   *                                     *
 *****************************************                   ***************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                          PAGE  1

       LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

         1         ID   HEC-1 Input Filename: 16196post100-D
         2         ID   Description:          Casino Master Plan Post-development Flow - Alternative D
         3         ID   Recurrence Interval:  100 year
         4         ID   Storm Duration:       24 hours
         5         ID   Date Compiled:        03/27/2017
         6         ID   Total Area at Point of Interest: 66.2
                   *
                   *
                   *
                   *
         7         IT       1 27Mar17    0000    1800
         8         IO       5       0       0
```

```
   9          IN       5
              *
              * BA
              * Casino Master Plan

  10          KK      BA
  11          KO       0
  12          PB   5.069
  13          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  14          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008
  15          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  16          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  17          PI   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  18          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.010   0.010
  19          PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  20          PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  21          PI   0.011   0.011   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.012
  22          PI   0.013   0.013   0.013   0.013   0.013   0.013   0.014   0.014   0.014   0.014
  23          PI   0.014   0.015   0.015   0.015   0.015   0.015   0.016   0.016   0.016   0.016
  24          PI   0.017   0.017   0.017   0.018   0.018   0.019   0.019   0.019   0.020   0.020
  25          PI   0.021   0.021   0.022   0.023   0.023   0.024   0.025   0.026   0.027   0.028
  26          PI   0.029   0.030   0.032   0.034   0.036   0.038   0.041   0.045   0.049   0.055
  27          PI   0.064   0.077   0.101   0.172   0.526   0.125   0.087   0.070   0.059   0.052
  28          PI   0.047   0.043   0.040   0.037   0.035   0.033   0.031   0.030   0.028   0.027
  29          PI   0.026   0.025   0.024   0.024   0.023   0.022   0.022   0.021   0.021   0.020
  30          PI   0.020   0.019   0.019   0.018   0.018   0.018   0.017   0.017   0.017   0.016
  31          PI   0.016   0.016   0.016   0.015   0.015   0.015   0.015   0.014   0.014   0.014
  32          PI   0.014   0.014   0.013   0.013   0.013   0.013   0.013   0.013   0.013   0.012
  33          PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011   0.011   0.011
  34          PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  35          PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  36          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  37          PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008
  38          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  39          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  40          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  42          BA  0.1034
  43          BF     -10    -0.1    1.05
  44          LS       0      72       0     .05      99       0
  45          UK     100   0.010   0.600      67
  46          UK     100   0.010   0.050      33
  47          RD     200  0.0030   0.030   0.016    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                      PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     300  0.0030   0.020   0.052    CIRC     1.5       0
  49          RD     300  0.0030   0.020   0.103    CIRC       2       0
  50          ZZ
```

```
1***************************************                          ***************************************
 *                                     *                          *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1) *                          *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998              *                          *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                          *          609 SECOND STREET          *
 *                                     *                          *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  14:48:26 *                          *           (916) 756-1104            *
 *                                     *                          *                                     *
 ***************************************                          ***************************************


                       HEC-1 Input Filename: 16196post100-D
                       Description:          Casino Master Plan Post-development Flow - Alternative
                       Recurrence Interval:  100 year
                       Storm Duration:       24 hours
                       Date Compiled:        03/27/2017
                       Total Area at Point of Interest: 66.2

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *        BA  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                       RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                          PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION         FLOW     PEAK                                             AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                              BA          117.   12.15          22.         11.          9.        .10
1
                                                SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                    (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                          INTERPOLATED TO
                                                                                       COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME       DT        PEAK    TIME TO     VOLUME
                                                      PEAK                                       PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                 BA  MANE          .84    116.44    729.00      2.72      1.00    116.44    729.00        2.72

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1727E+02 OUTFLOW= .1501E+02 BASIN STORAGE= .5301E-02 PERCENT ERROR=  13.1



 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************                    ***************************************
 *                                       *                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                    *          609 SECOND STREET          *
 *                                       *                    *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   28MAR17  TIME  11:35:13   *                    *          (916) 756-1104             *
 *                                       *                    *                                     *
 *****************************************                    ***************************************


                  X     X  XXXXXXX   XXXXX           X
                  X     X  X        X     X         XX
                  X     X  X        X                X
                  XXXXXXX  XXXX     X        XXXXX   X
                  X     X  X        X                X
                  X     X  X        X     X          X
                  X     X  XXXXXXX   XXXXX          XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                     HEC-1 INPUT                                           PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1          ID   HEC-1 Input Filename: 16196post2-DA1 D
             2          ID   Description:          Casino Master Plan Alternate D Post-development Flow DA1
             3          ID   Recurrence Interval:  2 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/28/2017
             6          ID   Total Area at Point of Interest: 9.9
                        *
                        *
                        *
                        *
             7          IT       1 28Mar17    0000    1800
             8          IO       5       0       0
```

```
   9          IN       5
              *
              * DA1
              * Casino Master Plan

  10          KK     DA1
  11          KO       0
  12          PB   2.768
  13          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  14          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
  17          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  18          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  20          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  21          PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  22          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
  23          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  24          PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
  25          PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
  26          PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
  27          PI   0.035   0.042   0.055   0.094   0.291   0.068   0.047   0.038   0.032   0.028
  28          PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
  29          PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
  30          PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
  31          PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  32          PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  33          PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  35          PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  37          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  38          PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  42          BA  0.0154
  43          BF      -3    -0.1    1.05
  44          LS       0      80       0     .05      99       0
  45          UK     100   0.010   0.600       5
  46          UK     100   0.010   0.050      95
  47          RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                           HEC-1 INPUT                                         PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48          RD     500  0.0030   0.020   0.005    CIRC       2       0
  49          RD     500  0.0030   0.020   0.010    CIRC       3       0
  50          ZZ
```

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN   1998                *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   28MAR17  TIME  11:35:13   *
 *                                       *
 *****************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************
```

```
                    HEC-1 Input Filename: 16196post2-DA1 D
                    Description:          Casino Master Plan Alternate D Post-development Flow DA
                    Recurrence Interval:  2 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/28/2017
                    Total Area at Point of Interest: 9.9

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA1  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                     PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                  AREA      STAGE     MAX STAGE
+                                                                        6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA1        23.   12.13          3.          2.          1.        .02
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                  INTERPOLATED TO
                                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA1  MANE         1.00     23.41    728.00      1.82      1.00     23.41    728.00       1.82

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2089E+01 OUTFLOW= .1491E+01 BASIN STORAGE= .1286E-02 PERCENT ERROR=  28.6



 *** NORMAL END OF HEC-1 ***
```

```
1***************************************
 *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *              JUN   1998             *
 *           VERSION 4.1               *
 *                                     *
 *  RUN DATE   28MAR17  TIME  11:35:45   *
 *                                     *
 ***************************************
```

```
***************************************
*                                     *
*    U.S. ARMY CORPS OF ENGINEERS     *
*    HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET          *
*       DAVIS, CALIFORNIA 95616       *
*           (916) 756-1104            *
*                                     *
***************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                   HEC-1 INPUT                                          PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196post10-DA1 D
              2          ID   Description:          Casino Master Plan Alternate D Post-development Flow DA1
              3          ID   Recurrence Interval:  10 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/28/2017
              6          ID   Total Area at Point of Interest: 9.9
                         *
                         *
                         *
                         *
              7          IT       1 28Mar17    0000    1800
              8          IO       5       0       0
```

```
   9           IN       5
               *
               * DA1
               * Casino Master Plan

  10           KK     DA1
  11           KO       0
  12           PB   3.607
  13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27           PI   0.045   0.055   0.072   0.122   0.379   0.089   0.062   0.049   0.042   0.037
  28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA  0.0154
  43           BF      -5    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     200  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                   HEC-1 INPUT                                      PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     500  0.0030   0.020   0.005    CIRC       2       0
  49           RD     500  0.0030   0.020   0.010    CIRC       3       0
  50           ZZ
```

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1***************************************                              ***************************************
 *                                     *                              *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                              *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                              *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                              *          609 SECOND STREET          *
 *                                     *                              *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   28MAR17  TIME  11:35:45   *                              *           (916) 756-1104            *
 *                                     *                              *                                     *
 ***************************************                              ***************************************



                      HEC-1 Input Filename: 16196post10-DA1 D
                      Description:          Casino Master Plan Alternate D Post-development Flow DA
                      Recurrence Interval:  10 year
                      Storm Duration:       24 hours
                      Date Compiled:        03/28/2017
                      Total Area at Point of Interest: 9.9

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA1  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                     PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                                          6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA1        32.   12.12          4.          2.          2.        .02
1
                                                         SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                             (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                   INTERPOLATED TO
                                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                              PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA1  MANE         1.00     31.48    727.00      2.23      1.00     31.48    727.00        2.23

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .2769E+01 OUTFLOW= .1828E+01 BASIN STORAGE= .1290E-02 PERCENT ERROR=  33.9



 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************                   *****************************************
 *                                       *                   *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                   *    U.S. ARMY CORPS OF ENGINEERS       *
 *             JUN   1998                *                   *    HYDROLOGIC ENGINEERING CENTER      *
 *          VERSION 4.1                  *                   *          609 SECOND STREET            *
 *                                       *                   *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   28MAR17  TIME  11:47:23   *                   *           (916) 756-1104              *
 *                                       *                   *                                       *
 *****************************************                   *****************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


 THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

 THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
 THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                     HEC-1 INPUT                                                   PAGE  1

           LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1            ID   HEC-1 Input Filename: 16196post2-D-DA2
             2            ID   Description:          Casino Master Plan Alternative D Post-development Flow
             3            ID   Recurrence Interval:  2 year
             4            ID   Storm Duration:       24 hours
             5            ID   Date Compiled:        03/28/2017
             6            ID   Total Area at Point of Interest: 6.1
                          *
                          *
                          *
                          *
             7            IT       1 28Mar17    0000    1800
             8            IO       5       0       0
```

```
        9          IN       5
                   *
                   * DA2
                   * Casino Master Plan

       10          KK     DA2
       11          KO       0
       12          PB   2.769
       13          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       14          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       15          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       16          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.005   0.005   0.005   0.005
       17          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       18          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       19          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
       20          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
       21          PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
       22          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008
       23          PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
       24          PI   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.011   0.011   0.011
       25          PI   0.011   0.012   0.012   0.012   0.013   0.013   0.014   0.014   0.015   0.015
       26          PI   0.016   0.017   0.017   0.018   0.019   0.021   0.022   0.024   0.027   0.030
       27          PI   0.035   0.042   0.055   0.094   0.292   0.068   0.047   0.038   0.032   0.028
       28          PI   0.026   0.023   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.015
       29          PI   0.014   0.014   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011
       30          PI   0.011   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009   0.009
       31          PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
       32          PI   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
       33          PI   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006   0.006
       34          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
       35          PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       36          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       37          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       38          PI   0.005   0.005   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       39          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       40          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       41          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
       42          BA  0.0095
       43          BF      -3    -0.1    1.05
       44          LS       0      80       0     .05      99       0
       45          UK     100   0.010   0.600       5
       46          UK     100   0.010   0.050      95
       47          RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                                     HEC-1 INPUT                                             PAGE  2

      LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

       48          RD     222  0.0030   0.030   0.008    TRAP     2.0    15.0
       49          RD     250  0.0030   0.020   0.015    CIRC       2       0
       50          ZZ
```

```
1***************************************                             ***************************************
 *                                     *                             *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                           *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998             *                             *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                             *          609 SECOND STREET          *
 *                                     *                             *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   28MAR17  TIME  11:47:23   *                           *           (916) 756-1104            *
 *                                     *                             *                                     *
 ***************************************                             ***************************************


                      HEC-1 Input Filename: 16196post2-D-DA2
                      Description:          Casino Master Plan Alternative D Post-development Flow
                      Recurrence Interval:  2 year
                      Storm Duration:       24 hours
                      Date Compiled:        03/28/2017
                      Total Area at Point of Interest: 6.1

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     28Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     29   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA2  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	DA2	15.	12.12	2.	1.	1.	.01		

1

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)	DT (MIN)	PEAK (CFS)	TIME TO PEAK (MIN)	VOLUME (IN)
DA2	MANE	1.00	14.75	727.00	1.99	1.00	14.75	727.00	1.99

CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1289E+01 OUTFLOW= .1010E+01 BASIN STORAGE= .8558E-03 PERCENT ERROR= 21.6

*** NORMAL END OF HEC-1 ***

```
1***************************************                             ***************************************
 *                                     *                             *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                           *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998              *                            *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                *                            *         609 SECOND STREET           *
 *                                     *                             *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   28MAR17  TIME  11:47:59   *                           *           (916) 756-1104            *
 *                                     *                             *                                     *
 ***************************************                             ***************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                          PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196post10-D-DA2
              2          ID   Description:          Casino Master Plan Alternative D Post-development Flow
              3          ID   Recurrence Interval:  10 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/28/2017
              6          ID   Total Area at Point of Interest: 6.1
                         *
                         *
                         *
                         *
              7          IT       1 28Mar17    0000    1800
              8          IO       5       0       0
```

```
   9           IN       5
               *
               * DA2
               * Casino Master Plan

  10           KK     DA2
  11           KO       0
  12           PB   3.608
  13           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006   0.006   0.006
  16           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  19           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  21           PI   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009
  22           PI   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010   0.010
  23           PI   0.010   0.010   0.010   0.011   0.011   0.011   0.011   0.011   0.012   0.012
  24           PI   0.012   0.012   0.012   0.013   0.013   0.013   0.013   0.014   0.014   0.014
  25           PI   0.015   0.015   0.016   0.016   0.017   0.017   0.018   0.018   0.019   0.020
  26           PI   0.021   0.022   0.023   0.024   0.025   0.027   0.029   0.032   0.035   0.039
  27           PI   0.045   0.055   0.072   0.122   0.380   0.089   0.062   0.049   0.042   0.037
  28           PI   0.033   0.030   0.028   0.026   0.025   0.023   0.022   0.021   0.020   0.019
  29           PI   0.019   0.018   0.017   0.017   0.016   0.016   0.015   0.015   0.015   0.014
  30           PI   0.014   0.014   0.013   0.013   0.013   0.012   0.012   0.012   0.012   0.012
  31           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010   0.010
  32           PI   0.010   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  33           PI   0.009   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  34           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  36           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  38           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  39           PI   0.006   0.006   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA  0.0095
  43           BF      -5    -0.1    1.05
  44           LS       0      80       0     .05      99       0
  45           UK     100   0.010   0.600       5
  46           UK     100   0.010   0.050      95
  47           RD     222  0.0030   0.030   0.005    TRAP     2.0    15.0
1                                          HEC-1 INPUT                                      PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     222  0.0030   0.030   0.008    TRAP     2.0    15.0
  49           RD     250  0.0030   0.020   0.015    CIRC       2       0
  50           ZZ
```

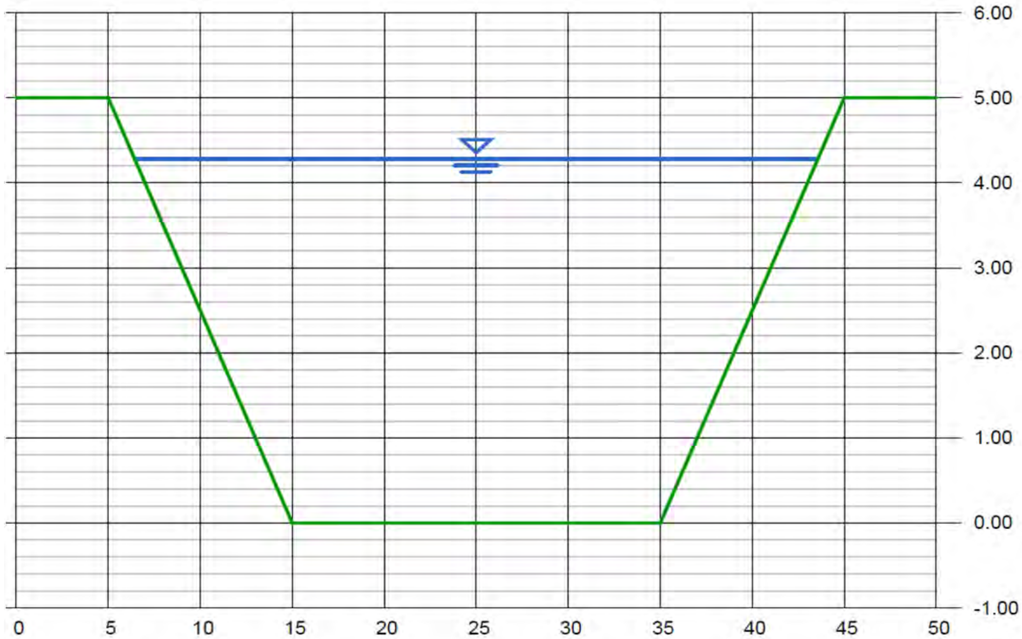
```
1****************************************                        ****************************************
 *                                       *                        *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                        *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                        *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                        *          609 SECOND STREET           *
 *                                       *                        *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   28MAR17  TIME  11:47:59   *                        *           (916) 756-1104             *
 *                                       *                        *                                      *
 ****************************************                        ****************************************



                      HEC-1 Input Filename: 16196post10-D-DA2
                      Description:          Casino Master Plan Alternative D Post-development Flow
                      Recurrence Interval:  10 year
                      Storm Duration:       24 hours
                      Date Compiled:        03/28/2017
                      Total Area at Point of Interest: 6.1

    8 IO         OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

      IT         HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    28Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE    29   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *       DA2  *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                             RUNOFF SUMMARY
                                                     FLOW IN CUBIC FEET PER SECOND
                                                  TIME IN HOURS,  AREA IN SQUARE MILES

                                             PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION            FLOW    PEAK                                             AREA      STAGE     MAX STAGE
+                                                                 6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                             DA2             20.   12.12          2.          1.          1.        .01
1
                                                  SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                    INTERPOLATED TO
                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                     PEAK

                                (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

                DA2  MANE         1.00     19.66    727.00      2.41      1.00     19.66    727.00        2.41


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1709E+01 OUTFLOW= .1223E+01 BASIN STORAGE= .8608E-03 PERCENT ERROR=  28.4



 *** NORMAL END OF HEC-1 ***
```

INFILTRATION TRENCH CALCULATIONS

Proposed Earthen Infiltration Channel

Determine the capacity of the proposed channel toconvey flow to the existing sandy gravel layer below the surface.



Using Darcy's Law: $Q = A*k*i$ where: A = cross-sectional area, including space occupied by porous material
k = hydraulic conductivity
i = hydraulic gradient = h/d = drop in head / distance drop occurs
assume: minimum h = d; therefore, i = 1.0

Table 11.1 (Soil Engineering, 4th Edition): k = 0.1 cm/s

k = (0.1 cm/s)*(0.03281 ft/cm) = 0.0033 ft/s

Calculate Q diverted to existing sandy gravel layer (Q_D)

A = 55360 sf
width of trench = 20 ft
length of trench = 2768 ft

Q = 181.6 cfs

Alternative	2-year Peak Flow	10-year Peak Flow
A	60	80
B	39	53
C	60	80
D	38	52

As shown is the above table the proposed infiltration trench will be more than adequate to infiltrate the 2- and 10-year storms for Altrenatives A, B, C, and D.

Post-development Subbasin Parameters

Subbasin:	Basin E
Mean Subbasin Elevation (ft):	414
Subbasin Area (Sq. Mi.):	0.06328125
Subbasin Area (acres):	40.5
Land Use:	Soil A:42% Soil D:42% 1-Commercial/Highways/Parking
	Soil A:8% Soil D:8% 14-Pasture/Parkland/Mowed Grass
Pervious Curve Number:	84
Pervious Overland Length (ft):	200
Pervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.600
Pervious Area (%):	20
Impervious Overland Length (ft):	200
Impervious Overland Slope (ft/ft):	0.005
Pervious Overland Roughness (overland n):	0.050
Impervious Area (%):	N0
Ineffective Area (%):	N0
Collector #1(street or rivulet):	street
Length (ft):	285
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.030
Representative Area (acres):	3.00
Width (ft)/Diameter (in) :	2.0
Sideslopes (ft/ft-H/V):	15.0
Collector #2 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.020
Representative Area (acres):	20.25
Width (ft)/Diameter (in) :	18.0
Sideslopes (ft/ft-H/V):	0
Collector #3 (pipe or channel):	pipe
Length (ft):	900
Slope (ft/ft):	0.0050
Roughness (Mannings n):	0.020
Representative Area (acres):	40.50
Width (ft)/Diameter (in) :	24.0
Sideslopes (ft/ft-H/V):	0

```
1*****************************************                    ***************************************
 *                                       *                    *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                    *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                    *          609 SECOND STREET          *
 *                                       *                    *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:09:29   *                    *           (916) 756-1104            *
 *                                       *                    *                                     *
 *****************************************                    ***************************************


                                     X     X  XXXXXXX   XXXXX          X
                                     X     X  X        X     X        XX
                                     X     X  X        X               X
                                     XXXXXXX  XXXX     X       XXXXX   X
                                     X     X  X        X               X
                                     X     X  X        X     X         X
                                     X     X  XXXXXXX   XXXXX         XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                                    HEC-1 INPUT                                                    PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196postE
              2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
              3          ID   Recurrence Interval:  2 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 40.5
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
     9           IN       5
                 *
                 * Basin E
                 * Alternative E - Anderson, Ca

    10           KK  Basin
    11           KO       0
    12           PB   2.580
    13           PI   0.003   0.003   0.003   0.003   0.004   0.004   0.004   0.004   0.004   0.004
    14           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    15           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    16           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    17           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    18           PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    19           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    20           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
    21           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    22           PI   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
    23           PI   0.007   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008
    24           PI   0.008   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010
    25           PI   0.011   0.011   0.011   0.011   0.012   0.012   0.013   0.013   0.014   0.014
    26           PI   0.015   0.015   0.016   0.017   0.018   0.020   0.021   0.023   0.025   0.028
    27           PI   0.033   0.040   0.052   0.089   0.278   0.065   0.045   0.036   0.030   0.027
    28           PI   0.024   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.014   0.014
    29           PI   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011   0.010   0.010
    30           PI   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008
    31           PI   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007   0.007
    32           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
    33           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
    34           PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    35           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
    36           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.004   0.004
    37           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    38           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    39           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    40           PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
    41           PI   0.004   0.004   0.004   0.004   0.003   0.003   0.003   0.003
    42           BA  0.0632
    43           BF      -3    -0.1    1.05
    44           LS       0      84       0     .05      99       0
    45           UK     200   0.005   0.600      27
    46           UK     200   0.005   0.050      73
    47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                  HEC-1 INPUT                                         PAGE  2

  LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

    48           RD     900  0.0050   0.020   0.031    CIRC     1.5       0
    49           RD     900  0.0050   0.020   0.063    CIRC       2       0
    50           ZZ
```

```
1***************************************                                                           ***************************************
 *                                      *                                                          *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                          *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998               *                                                          *    HYDROLOGIC ENGINEERING CENTER    *
 *          VERSION 4.1                 *                                                          *          609 SECOND STREET          *
 *                                      *                                                          *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:09:29  *                                                          *           (916) 756-1104            *
 *                                      *                                                          *                                     *
 ***************************************                                                           ***************************************



                        HEC-1 Input Filename: 16196postE
                        Description:          Casino Master Plan Alternative E Post-development Flow
                        Recurrence Interval:  2 year
                        Storm Duration:       24 hours
                        Date Compiled:        03/27/2017
                        Total Area at Point of Interest: 40.5

   8 IO         OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT         HYDROGRAPH TIME DATA
                       NMIN           1  MINUTES IN COMPUTATION INTERVAL
                      IDATE     27Mar17  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     28   17  ENDING DATE
                     NDTIME        0559  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL     .02 HOURS
                       TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO           OUTPUT CONTROL VARIABLES
                         IPRNT           5  PRINT CONTROL
                         IPLOT           0  PLOT CONTROL
                         QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                     PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                                         6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin          55.   12.18          8.          4.          4.        .06
1
                                                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                    INTERPOLATED TO
                                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO      VOLUME       DT        PEAK    TIME TO     VOLUME
                                                        PEAK                                        PEAK

                                 (MIN)     (CFS)      (MIN)      (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     54.50    731.00       1.52      1.00     54.50    731.00        1.52


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .7058E+01 OUTFLOW= .5118E+01 BASIN STORAGE= .5799E-02 PERCENT ERROR=  27.4



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                                                               ***************************************
 *                                       *                                                               *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                                               *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998               *                                                               *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                                                               *          609 SECOND STREET          *
 *                                       *                                                               *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:08:51   *                                                               *           (916) 756-1104            *
 *                                       *                                                               *                                     *
 ****************************************                                                               ***************************************



                                                      X     X  XXXXXXX   XXXXX          X
                                                      X     X  X        X     X        XX
                                                      X     X  X        X               X
                                                      XXXXXXX  XXXX     X       XXXXX   X
                                                      X     X  X        X               X
                                                      X     X  X        X     X         X
                                                      X     X  XXXXXXX   XXXXX         XXX



                     THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

                     THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
                     THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
                     NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
                     DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
                     KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                       HEC-1 INPUT                                                    PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

              1          ID   HEC-1 Input Filename: 16196postE
              2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
              3          ID   Recurrence Interval:  10 year
              4          ID   Storm Duration:       24 hours
              5          ID   Date Compiled:        03/27/2017
              6          ID   Total Area at Point of Interest: 40.5
                         *
                         *
                         *
                         *
              7          IT       1 27Mar17    0000    1800
              8          IO       5       0       0
```

```
        9           IN       5
                    *
                    * Basin E
                    * Alternative E - Anderson, Ca

       10           KK  Basin
       11           KO       0
       12           PB   3.362
       13           PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       15           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       16           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
       18           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
       19           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
       20           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
       21           PI   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
       22           PI   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009
       23           PI   0.009   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.011   0.011
       24           PI   0.011   0.011   0.011   0.012   0.012   0.012   0.012   0.013   0.013   0.013
       25           PI   0.014   0.014   0.015   0.015   0.015   0.016   0.016   0.017   0.018   0.018
       26           PI   0.019   0.020   0.021   0.022   0.024   0.025   0.027   0.030   0.033   0.037
       27           PI   0.043   0.052   0.068   0.116   0.362   0.084   0.059   0.047   0.040   0.035
       28           PI   0.031   0.029   0.026   0.025   0.023   0.022   0.021   0.020   0.019   0.018
       29           PI   0.017   0.017   0.016   0.016   0.015   0.015   0.014   0.014   0.014   0.013
       30           PI   0.013   0.013   0.012   0.012   0.012   0.012   0.011   0.011   0.011   0.011
       31           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009
       32           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008   0.008
       33           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007
       34           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
       35           PI   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006
       36           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
       37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.005   0.005
       38           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       39           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
       42           BA  0.0632
       43           BF      -5    -0.1    1.05
       44           LS       0      84       0     .05      99       0
       45           UK     200   0.005   0.600      27
       46           UK     200   0.005   0.050      73
       47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                    HEC-1 INPUT                                        PAGE  2

     LINE           ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

       48           RD     900  0.0050   0.020   0.031    CIRC     1.5       0
       49           RD     900  0.0050   0.020   0.063    CIRC       2       0
       50           ZZ
```

```
1*****************************************                          ***************************************
 *                                       *                          *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                          *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                          *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1                 *                          *          609 SECOND STREET          *
 *                                       *                          *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:08:51   *                          *           (916) 756-1104            *
 *                                       *                          *                                     *
 *****************************************                          ***************************************



                    HEC-1 Input Filename: 16196postE
                    Description:          Casino Master Plan Alternative E Post-development Flow
                    Recurrence Interval:  10 year
                    Storm Duration:       24 hours
                    Date Compiled:        03/27/2017
                    Total Area at Point of Interest: 40.5

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
             **************
             *            *
   10 KK     *    Basin   *
             *            *
             **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE
1
                                                                          RUNOFF SUMMARY
                                                                  FLOW IN CUBIC FEET PER SECOND
                                                               TIME IN HOURS,  AREA IN SQUARE MILES

                                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                  AREA      STAGE     MAX STAGE
+                                                                      6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin         76.   12.17          12.          6.          5.        .06
1
                                                           SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                               (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                                    INTERPOLATED TO
                                                                                                 COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                      PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     75.67    730.00      2.12      1.00     75.67    730.00        2.12


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .9563E+01 OUTFLOW= .7140E+01 BASIN STORAGE= .5988E-02 PERCENT ERROR=  25.3



 *** NORMAL END OF HEC-1 ***
```

```
1****************************************                    ****************************************
 *                                       *                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                   *    U.S. ARMY CORPS OF ENGINEERS      *
 *              JUN   1998               *                   *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                   *          609 SECOND STREET           *
 *                                       *                   *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   27MAR17  TIME  11:07:57   *                   *           (916) 756-1104             *
 *                                       *                   *                                      *
 *****************************************                   ****************************************


                    X     X  XXXXXXX   XXXXX          X
                    X     X  X        X     X        XX
                    X     X  X        X               X
                    XXXXXXX  XXXX     X       XXXXX   X
                    X     X  X        X               X
                    X     X  X        X     X         X
                    X     X  XXXXXXX   XXXXX         XXX


            THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

            THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
            THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
            NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
            DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
            KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                                      HEC-1 INPUT                                                        PAGE  1

           LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1           ID   HEC-1 Input Filename: 16196postE
             2           ID   Description:          Casino Master Plan Alternative E Post-development Flow
             3           ID   Recurrence Interval:  100 year
             4           ID   Storm Duration:       24 hours
             5           ID   Date Compiled:        03/27/2017
             6           ID   Total Area at Point of Interest: 40.5
                         *
                         *
                         *
                         *
             7           IT       1 27Mar17    0000    1800
             8           IO       5       0       0
```

```
   9           IN       5
               *
               * Basin E
               * Alternative E - Anderson, Ca

  10           KK  Basin
  11           KO       0
  12           PB   4.702
  13           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.007
  14           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  15           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  16           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.008   0.008   0.008   0.008
  17           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  18           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.009   0.009   0.009   0.009
  19           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  20           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010
  21           PI   0.010   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.011
  22           PI   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.013   0.013   0.013
  23           PI   0.013   0.013   0.014   0.014   0.014   0.014   0.014   0.015   0.015   0.015
  24           PI   0.015   0.016   0.016   0.016   0.017   0.017   0.017   0.018   0.018   0.019
  25           PI   0.019   0.020   0.020   0.021   0.022   0.022   0.023   0.024   0.025   0.026
  26           PI   0.027   0.028   0.030   0.031   0.033   0.036   0.038   0.042   0.046   0.052
  27           PI   0.060   0.073   0.096   0.163   0.509   0.118   0.082   0.065   0.055   0.049
  28           PI   0.044   0.040   0.037   0.034   0.032   0.030   0.029   0.028   0.026   0.025
  29           PI   0.024   0.023   0.023   0.022   0.021   0.021   0.020   0.019   0.019   0.018
  30           PI   0.018   0.018   0.017   0.017   0.017   0.016   0.016   0.016   0.015   0.015
  31           PI   0.015   0.015   0.014   0.014   0.014   0.014   0.013   0.013   0.013   0.013
  32           PI   0.013   0.013   0.012   0.012   0.012   0.012   0.012   0.012   0.012   0.011
  33           PI   0.011   0.011   0.011   0.011   0.011   0.011   0.011   0.010   0.010   0.010
  34           PI   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009
  35           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  36           PI   0.009   0.009   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  37           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  38           PI   0.008   0.008   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  39           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  40           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  41           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  42           BA  0.0632
  43           BF     -10    -0.1    1.05
  44           LS       0      84       0     .05      99       0
  45           UK     200   0.005   0.600      27
  46           UK     200   0.005   0.050      73
  47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                   HEC-1 INPUT                                PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     900  0.0050   0.020   0.031    CIRC     1.5       0
  49           RD     900  0.0050   0.020   0.063    CIRC       2       0
  50           ZZ
```

```
1***************************************                                      ***************************************
 *                                     *                                      *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                      *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998              *                                      *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                                      *         609 SECOND STREET           *
 *                                     *                                      *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:07:57   *                                      *          (916) 756-1104             *
 *                                     *                                      *                                     *
 ***************************************                                      ***************************************


                           HEC-1 Input Filename: 16196postE
                           Description:          Casino Master Plan Alternative E Post-development Flow
                           Recurrence Interval:  100 year
                           Storm Duration:       24 hours
                           Date Compiled:        03/27/2017
                           Total Area at Point of Interest: 40.5

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           1  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27Mar17  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME        0559  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .02 HOURS
                        TOTAL TIME BASE   29.98 HOURS

        ENGLISH UNITS
             DRAINAGE AREA         SQUARE MILES
             PRECIPITATION DEPTH   INCHES
             LENGTH, ELEVATION     FEET
             FLOW                  CUBIC FEET PER SECOND
             STORAGE VOLUME        ACRE-FEET
             SURFACE AREA          ACRES
             TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                        RUNOFF SUMMARY
                                                FLOW IN CUBIC FEET PER SECOND
                                             TIME IN HOURS,  AREA IN SQUARE MILES

                                              PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION             FLOW     PEAK                                            AREA      STAGE     MAX STAGE
+                                                                6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                          Basin               115.   12.17          17.          9.          7.        .06
1
                                   SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                       (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                      PEAK                                    PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00    114.16    730.00      2.95      1.00    114.16    730.00        2.95

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .1393E+02 OUTFLOW= .9953E+01 BASIN STORAGE= .6113E-02 PERCENT ERROR=  28.5



 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************                  *****************************************
 *                                        *                  *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                  *    U.S. ARMY CORPS OF ENGINEERS       *
 *              JUN   1998                *                  *    HYDROLOGIC ENGINEERING CENTER      *
 *           VERSION 4.1                  *                  *          609 SECOND STREET            *
 *                                        *                  *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27MAR17  TIME  11:52:33    *                  *           (916) 756-1104              *
 *                                        *                  *                                       *
 *****************************************                  *****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                        HEC-1 INPUT                                            PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1          ID   HEC-1 Input Filename: 16196post-DE1
             2          ID   Description:          Casino Master Plan Alternative E Post-development Flow
             3          ID   Recurrence Interval:  2 year
             4          ID   Storm Duration:       24 hours
             5          ID   Date Compiled:        03/27/2017
             6          ID   Total Area at Point of Interest: 23.9
                        *
                        *
                        *
                        *
```

```
   7          IT       1 27Mar17    0000    1800
   8          IO       5       0       0
   9          IN       5
              *
              * Basin E
              * Alternative E - Anderson, Ca

  10          KK  Basin
  11          KO       0
  12          PB   2.581
  13          PI   0.003   0.003   0.003   0.003   0.004   0.004   0.004   0.004   0.004   0.004
  14          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  15          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  16          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  17          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  18          PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  19          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  20          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.006   0.006   0.006   0.006
  21          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  22          PI   0.006   0.006   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  23          PI   0.007   0.007   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  24          PI   0.008   0.009   0.009   0.009   0.009   0.009   0.010   0.010   0.010   0.010
  25          PI   0.011   0.011   0.011   0.011   0.012   0.012   0.013   0.013   0.014   0.014
  26          PI   0.015   0.015   0.016   0.017   0.018   0.020   0.021   0.023   0.025   0.028
  27          PI   0.033   0.040   0.052   0.089   0.280   0.065   0.045   0.036   0.030   0.027
  28          PI   0.024   0.022   0.020   0.019   0.018   0.017   0.016   0.015   0.014   0.014
  29          PI   0.013   0.013   0.012   0.012   0.012   0.011   0.011   0.011   0.010   0.010
  30          PI   0.010   0.010   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008
  31          PI   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007   0.007   0.007
  32          PI   0.007   0.007   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006
  33          PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  34          PI   0.006   0.006   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  35          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  36          PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.004   0.004
  37          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  38          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  39          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  40          PI   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004   0.004
  41          PI   0.004   0.004   0.004   0.004   0.003   0.003   0.003   0.003
  42          BA  0.0373
  43          BF      -3    -0.1    1.05
  44          LS       0      84       0     .05      99       0
  45          UK     200   0.005   0.600      20
  46          UK     200   0.005   0.050      80
  47          RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                      HEC-1 INPUT                                    PAGE  2

 LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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```
          48           RD     900  0.0050   0.020   0.025    CIRC     1.5       0
          49           RD     900  0.0050   0.020   0.037    CIRC       2       0
          50           ZZ
1*****************************************                                               ***************************************
 *                                       *                                               *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                               *    U.S. ARMY CORPS OF ENGINEERS     *
 *             JUN   1998                *                                               *    HYDROLOGIC ENGINEERING CENTER    *
 *          VERSION 4.1                  *                                               *          609 SECOND STREET          *
 *                                       *                                               *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:52:33   *                                               *           (916) 756-1104            *
 *                                       *                                               *                                     *
 *****************************************                                               ***************************************



                          HEC-1 Input Filename: 16196post-DE1
                          Description:          Casino Master Plan Alternative E Post-development Flow
                          Recurrence Interval:  2 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/27/2017
                          Total Area at Point of Interest: 23.9

   8 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN          1  MINUTES IN COMPUTATION INTERVAL
                       IDATE    27Mar17  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ       1800  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE     28   17  ENDING DATE
                      NDTIME       0559  ENDING TIME
                      ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .02 HOURS
                      TOTAL TIME BASE   29.98 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
```

```
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
   10 KK    *    Basin   *
            *            *
            **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                     RUNOFF SUMMARY
                                              FLOW IN CUBIC FEET PER SECOND
                                           TIME IN HOURS,  AREA IN SQUARE MILES

                                    PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION    FLOW     PEAK                                           AREA      STAGE     MAX STAGE
+                                                       6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                         Basin       35.   12.18          5.          3.          2.        .04
1
                                      SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                          (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                             COMPUTATION INTERVAL
           ISTAQ    ELEMENT      DT        PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                               (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

            Basin   MANE        1.00     35.24     731.00      1.71      1.00     35.24    731.00       1.71

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .4342E+01 OUTFLOW= .3406E+01 BASIN STORAGE= .3888E-02 PERCENT ERROR=  21.5
```

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*** NORMAL END OF HEC-1 ***
```

```
1****************************************                     ****************************************
 *                                       *                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998                *                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                 *                    *         609 SECOND STREET            *
 *                                       *                    *      DAVIS, CALIFORNIA 95616         *
 *  RUN DATE   27MAR17  TIME  11:53:26   *                    *          (916) 756-1104              *
 *                                       *                    *                                      *
 *****************************************                    ****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X        XXXXX   X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


           THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

           THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
           THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
           NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
           DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
           KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                        HEC-1 INPUT                                                  PAGE  1

          LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

             1      ID   HEC-1 Input Filename: 16196post-DE1
             2      ID   Description:          Casino Master Plan Alternative E Post-development Flow
             3      ID   Recurrence Interval:  10 year
             4      ID   Storm Duration:       24 hours
             5      ID   Date Compiled:        03/27/2017
             6      ID   Total Area at Point of Interest: 23.9
                    *
                    *
                    *
                    *
             7      IT       1 27Mar17    0000    1800
             8      IO       5       0       0
```

```
   9           IN       5
               *
               * Basin E
               * Alternative E - Anderson, Ca

  10           KK  Basin
  11           KO       0
  12           PB   3.364
  13           PI   0.004   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  14           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  15           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  16           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  17           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  18           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  19           PI   0.006   0.006   0.006   0.006   0.006   0.007   0.007   0.007   0.007   0.007
  20           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  21           PI   0.007   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.008
  22           PI   0.008   0.008   0.008   0.009   0.009   0.009   0.009   0.009   0.009   0.009
  23           PI   0.009   0.010   0.010   0.010   0.010   0.010   0.010   0.010   0.011   0.011
  24           PI   0.011   0.011   0.011   0.012   0.012   0.012   0.012   0.013   0.013   0.013
  25           PI   0.014   0.014   0.015   0.015   0.015   0.016   0.016   0.017   0.018   0.018
  26           PI   0.019   0.020   0.021   0.022   0.024   0.025   0.027   0.030   0.033   0.037
  27           PI   0.043   0.052   0.068   0.116   0.364   0.084   0.059   0.047   0.040   0.035
  28           PI   0.031   0.029   0.026   0.025   0.023   0.022   0.021   0.020   0.019   0.018
  29           PI   0.017   0.017   0.016   0.016   0.015   0.015   0.014   0.014   0.014   0.013
  30           PI   0.013   0.013   0.012   0.012   0.012   0.012   0.011   0.011   0.011   0.011
  31           PI   0.011   0.010   0.010   0.010   0.010   0.010   0.010   0.009   0.009   0.009
  32           PI   0.009   0.009   0.009   0.009   0.009   0.009   0.008   0.008   0.008   0.008
  33           PI   0.008   0.008   0.008   0.008   0.008   0.008   0.008   0.007   0.007   0.007
  34           PI   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007   0.007
  35           PI   0.007   0.007   0.007   0.007   0.006   0.006   0.006   0.006   0.006   0.006
  36           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006
  37           PI   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.006   0.005   0.005
  38           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  39           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  40           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  41           PI   0.005   0.005   0.005   0.005   0.005   0.005   0.005   0.005
  42           BA  0.0373
  43           BF      -5    -0.1    1.05
  44           LS       0      84       0     .05      99       0
  45           UK     200   0.005   0.600      20
  46           UK     200   0.005   0.050      80
  47           RD     285  0.0050   0.030   0.005    TRAP     2.0    15.0
1                                                 HEC-1 INPUT                                           PAGE  2

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48           RD     900  0.0050   0.020   0.025    CIRC     1.5       0
  49           RD     900  0.0050   0.020   0.037    CIRC       2       0
  50           ZZ
```

```
1***************************************                        ***************************************
 *                                     *                        *                                     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                        *    U.S. ARMY CORPS OF ENGINEERS     *
 *              JUN   1998             *                        *    HYDROLOGIC ENGINEERING CENTER    *
 *           VERSION 4.1               *                        *          609 SECOND STREET          *
 *                                     *                        *       DAVIS, CALIFORNIA 95616       *
 *  RUN DATE   27MAR17  TIME  11:53:26  *                        *           (916) 756-1104            *
 *                                     *                        *                                     *
 ***************************************                        ***************************************


                          HEC-1 Input Filename: 16196post-DE1
                          Description:          Casino Master Plan Alternative E Post-development Flow
                          Recurrence Interval:  10 year
                          Storm Duration:       24 hours
                          Date Compiled:        03/27/2017
                          Total Area at Point of Interest: 23.9

    8 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           1  MINUTES IN COMPUTATION INTERVAL
                        IDATE     27Mar17  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ        1800  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE     28   17  ENDING DATE
                       NDTIME        0559  ENDING TIME
                       ICENT           19  CENTURY MARK

                    COMPUTATION INTERVAL     .02 HOURS
                         TOTAL TIME BASE   29.98 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

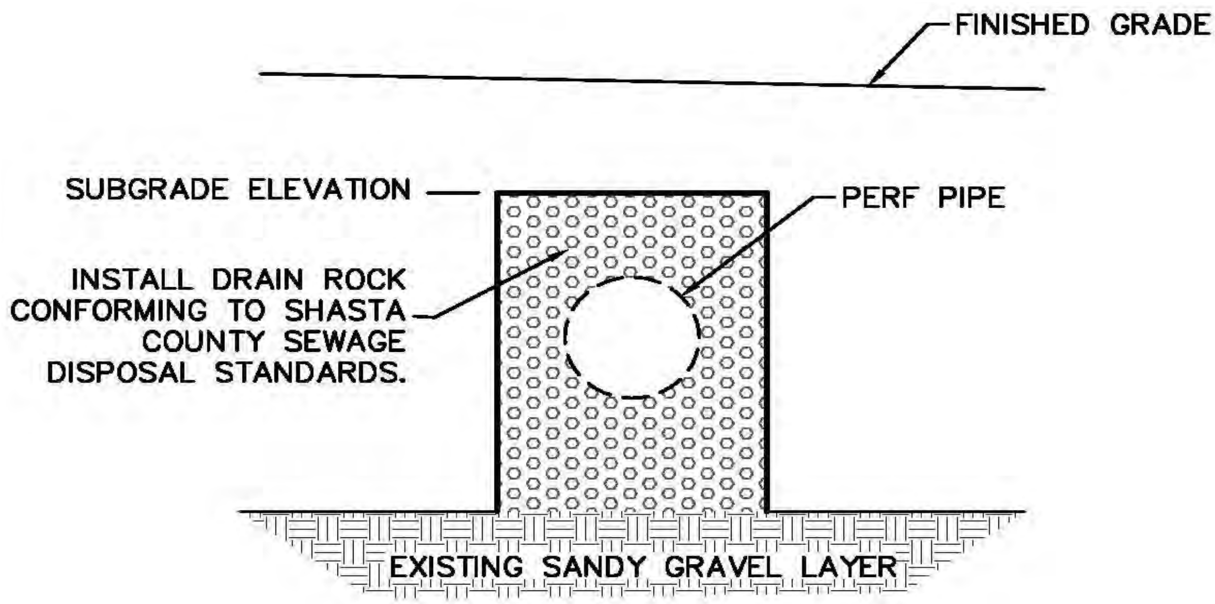
```
              **************
              *            *
   10 KK      *    Basin   *
              *            *
              **************

   11 KO          OUTPUT CONTROL VARIABLES
                        IPRNT          5  PRINT CONTROL
                        IPLOT          0  PLOT CONTROL
                        QSCAL         0.  HYDROGRAPH PLOT SCALE
1
                                                                RUNOFF SUMMARY
                                                        FLOW IN CUBIC FEET PER SECOND
                                                     TIME IN HOURS,  AREA IN SQUARE MILES

                                                   PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
          OPERATION       STATION      FLOW     PEAK                                                AREA      STAGE     MAX STAGE
+                                                                      6-HOUR     24-HOUR     72-HOUR

          HYDROGRAPH AT
+                           Basin         49.   12.17          7.          4.          3.        .04
1
                                                  SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                                      (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                           INTERPOLATED TO
                                                                                        COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK    TIME TO     VOLUME      DT       PEAK    TIME TO     VOLUME
                                                     PEAK                                     PEAK

                                 (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

             Basin   MANE         1.00     48.79    730.00      2.07      1.00     48.79    730.00        2.07

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .0000E+00 EXCESS= .5842E+01 OUTFLOW= .4122E+01 BASIN STORAGE= .3957E-02 PERCENT ERROR=  29.4



 *** NORMAL END OF HEC-1 ***
```

Casino Master Plan
Job#16.0196.000
Calc'd By: K. Reagan, P.E.
Sharrah Dunlap Sawyer, Inc.
Date:March 2017

INFILTRATION TRENCH CALCULATIONS

DE#1

Determine the capacity of the proposed rock trench to convey flow to the existing sandy gravel layer below the surface.



Using Darcy's Law: Q = A*k*i where: A = cross-sectional area, including space occupied by porous material
k = hydraulic conductivity
i = hydraulic gradient = h/d = drop in head / distance drop occurs

assume: minimum h = d; therefore, i = 1.0

Table 11.1 (Soil Engineering, 4th Edition): k = 0.1 cm/s

k = (0.1 cm/s)*(0.03281 ft/cm) = 0.0033 ft/s

Calculate Q diverted to existing sandy gravel layer (Q_D)

A =	11700 sf
width of trench =	5 ft
length of trench =	2340 ft

Q = 38.4 cfs

The calculated 2-year peak flow for Alternative E is 35 cubic feet per second and the 10-year peak flow is 49 cubic feet per second. As shown in the above calculation the proposed infiltration trench is adequately sized to infiltrate the 2-year peak storm.

Appendix B

Grading and Earthwork Calculations

SHARRAH
DUNLAP
SAWYER
INCORPORATED

Job No.	16.0196.000
Calc	IS
Checked	
Date	04/13/17
Job Name	Casino Alternative A

Alternative 'A' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	56,000	82,000	94,300	38,300	FILL
Offsite Drainage	38,000	0	0	38,000	CUT
Total	94,000	82,000	94,300	**300**	**Short Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

SHARRAH DUNLAP SAWYER INCORPORATED

Page	1	Of	1		
Job No.	16.0196.000				
Calc	IS	Checked		Date	04/13/17
Job Name	Casino Alternative B				

Alternative 'B' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	46,000	70,000	80,500	34,500	FILL
Offsite Drainage	34,000	0	0	34,000	CUT
Total	80,000	70,000	80,500	**500**	**Short Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

SHARRAH DUNLAP SAWYER INCORPORATED

Page	1	Of	1		
Job No.	16.0196.000				
Calc	IS	Checked		Date	04/13/17
Job Name	Casino Alternative C				

Alternative 'C' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	56,000	82,000	94,300	38,300	FILL
Offsite Drainage	38,000	0	0	38,000	CUT
Total	94,000	82,000	94,300	**300**	**Short Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

SHARRAH DUNLAP SAWYER INCORPORATED

Job No. 16.0196.000
Calc IS Checked Date 04/13/17
Job Name Casino Alternative D

Alternative 'D' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	42,000	65,000	74,750	32,750	FILL
Offsite Drainage	33,000	0	0	33,000	CUT
Total	75,000	65,000	74,750	**250**	**Excess Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

SHARRAH DUNLAP SAWYER INCORPORATED

Page	1	Of	1
Job No.	16.0196.000		
Calc	IS	Checked	Date 04/13/17
Job Name	Casino Alternative E		

Alternative 'E' - Redding Racnheria Casino Master Plan Preliminary Earthwork Calculations

Area	Cut (Yd^3)	Fill (Yd^3)	*Adj. Fill (Yd^3)	Adj. Net (Yd^3)	
Onsite Earthwork	18,000	120,000	138,000	120,000	FILL
Detention/Infiltration	120,000	0	0	120,000	CUT
Total	138,000	120,000	138,000	**0**	**Short Material**

***Notes:**

1. The adjusted fill volumes are assuming a 15% shrinkage factor
2. The site was boken into two portions, the Onsite Earthwork consists of the buildings, parking areas, access road and trapezoidal channel east of the access road. The Offsite drainage include the trapezoidal channel and infiltration wet pond west of the access road.

Appendix C

Retention / Infiltration Pond Sizing Calculations

Alternative A Pond Sizing

1-year runoff: 1.24 inches
2-year runoff: 1.43 inches
85 percentile storm: 1.34 inches

85% Volume = 320809 cubic feet
Pond Volume = 641617 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Alternative B Pond Sizing

1-year runoff: 1.00 inches
2-year runoff: 1.10 inches
85 percentile storm: 1.05 inches

85% Volume = 252321 cubic feet
Pond Volume = 504643 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Alternative C Pond Sizing

1-year runoff: 1.24 inches
2-year runoff: 1.43 inches
85 percentile storm: 1.34 inches

85% Volume = 320809 cubic feet
Pond Volume = 641617 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Alternative D Pond Sizing

1-year runoff: 0.92 inches
2-year runoff: 0.95 inches
85 percentile storm: 0.94 inches

85% Volume = 224686 cubic feet
Pond Volume = 449372 cubic feet

Note: The pool volume of the Wet Pond shall be twice the volume of the 85 percentile storm (Per CASQA California Stormwater BMP Handbook)

Project Area: 66.2 acres

Design Considerations

- Area Required
- Slope
- Water Availability
- Aesthetics
- Environmental Side-effects

Description

Wet ponds (a.k.a. stormwater ponds, retention ponds, wet extended detention ponds) are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season) and differ from constructed wetlands primarily in having a greater average depth. Ponds treat incoming stormwater runoff by settling and biological uptake. The primary removal mechanism is settling as stormwater runoff resides in this pool, but pollutant uptake, particularly of nutrients, also occurs to some degree through biological activity in the pond. Wet ponds are among the most widely used stormwater practices. While there are several different versions of the wet pond design, the most common modification is the extended detention wet pond, where storage is provided above the permanent pool in order to detain stormwater runoff and promote settling. The schematic diagram is of an on-line pond that includes detention for larger events, but this is not required in all areas of the state.

Targeted Constituents

☑	Sediment	■
☑	Nutrients	▲
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

California Experience

Caltrans constructed a wet pond in northern San Diego County (I-5 and La Costa Blvd.). Largest issues at this site were related to vector control, vegetation management, and concern that endangered species would become resident and hinder maintenance activities.

Advantages

- If properly designed, constructed and maintained, wet basins can provide substantial aesthetic/recreational value and wildlife and wetlands habitat.

- Ponds are often viewed as a public amenity when integrated into a park setting.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Due to the presence of the permanent wet pool, properly designed and maintained wet basins can provide significant water quality improvement across a relatively broad spectrum of constituents including dissolved nutrients.

- Widespread application with sufficient capture volume can provide significant control of channel erosion and enlargement caused by changes to flow frequency relationships resulting from the increase of impervious cover in a watershed.

Limitations

- Some concern about safety when constructed where there is public access.

- Mosquito and midge breeding is likely to occur in ponds.

- Cannot be placed on steep unstable slopes.

- Need for base flow or supplemental water if water level is to be maintained.

- Require a relatively large footprint

- Depending on volume and depth, pond designs may require approval from the State Division of Safety of Dams

Design and Sizing Guidelines

- Capture volume determined by local requirements or sized to treat 85% of the annual runoff volume.

- Use a draw down time of 48 hours in most areas of California. Draw down times in excess of 48 hours may result in vector breeding, and should be used only after coordination with local vector control authorities. Draw down times of less than 48 hours should be limited to BMP drainage areas with coarse soils that readily settle and to watersheds where warming may be detrimental to downstream fisheries.

- Permanent pool volume equal to twice the water quality volume.

- Water depth not to exceed about 8 feet.

- Wetland vegetation occupying no more than 25% of surface area.

- Include energy dissipation in the inlet design and a sediment forebay to reduce resuspension of accumulated sediment and facilitate maintenance.

- A maintenance ramp should be included in the design to facilitate access to the forebay for maintenance activities and for vector surveillance and control.

- To facilitate vector surveillance and control activities, road access should be provided along at least one side of BMPs that are seven meters or less in width. Those BMPs that have shoreline-to-shoreline distances in excess of seven meters should have perimeter road access on both sides or be designed such that no parcel of water is greater than seven meters from the road.

Construction/Inspection Considerations

- In areas with porous soils an impermeable liner may be required to maintain an adequate permanent pool level.
- Outlet structures and piping should be installed with collars to prevent water from seeping through the fill and causing structural failure.
- Inspect facility after first large storm to determine whether the desired residence time has been achieved.

Performance

The observed pollutant removal of a wet pond is highly dependent on two factors: the volume of the permanent pool relative to the amount of runoff from the typical event in the area and the quality of the base flow that sustains the permanent pool. A recent study (Caltrans, 2002) has documented that if the permanent pool is much larger than the volume of runoff from an average event, then displacement of the permanent pool by the wet weather flow is the primary process. A statistical comparison of the wet pond discharge quality during dry and wet weather shows that they are not significantly different. Consequently, there is a relatively constant discharge quality during storms that is the same as the concentrations observed in the pond during ambient (dry weather) conditions. Consequently, for most constituents the performance of the pond is better characterized by the average effluent concentration, rather than the "percent reduction," which has been the conventional measure of performance. Since the effluent quality is essentially constant, the percent reduction observed is mainly a function of the influent concentrations observed at a particular site.

The dry and wet weather discharge quality is, therefore, related to the quality of the base flow that sustains the permanent pool and of the transformations that occur to those constituents during their residence in the basin. One could potentially expect a wide range of effluent concentrations at different locations even if the wet ponds were designed according to the same guidelines, if the quality of the base flow differed significantly. This may explain the wide range of concentration reductions reported in various studies.

Concentrations of nutrients in base flow may be substantially higher than in urban stormwater runoff. Even though these concentrations may be substantially reduced during the residence time of the base flow in the pond, when this water is displaced by wet weather flows, concentrations may still be quite elevated compared to the levels that promote eutrophication in surface water systems. Consequently comparing influent and effluent nutrient concentrations during wet weather can make the performance seem highly variable.

Relatively small perennial flows may often substantially exceed the wet weather flow treated. Consequently, one should also consider the load reduction observed under ambient conditions when assessing the potential benefit to the receiving water.

Siting Criteria

Wet ponds are a widely applicable stormwater management practice and can be used over a broad range of storm frequencies and sizes, drainage areas and land use types. Although they have limited applicability in highly urbanized settings and in arid climates, they have few other restrictions. Wet basins may be constructed on- or off-line and can be sited at feasible locations along established drainage ways with consistent base flow. An off-line design is preferred. Wet basins are often utilized in smaller sub-watersheds and are particularly appropriate in areas with residential land uses or other areas where high nutrient loads are considered to be potential problems (e.g., golf courses).

Ponds do not consume a large area (typically 2–3 percent of the contributing drainage area); however, these facilities are generally large. Other practices, such as filters or swales, may be "squeezed" into relatively unusable land, but ponds need a relatively large continuous area. Wet basins are typically used in drainage basins of more than ten acres and less than one square mile (Schueler et al., 1992). Emphasis can be placed in siting wet basins in areas where the pond can also function as an aesthetic amenity or in conjunction with other stormwater management functions.

Wet basin application is appropriate in the following settings: (1) where there is a need to achieve a reasonably high level of dissolved contaminant removal and/or sediment capture; (2) in small to medium-sized regional tributary areas with available open space and drainage areas greater than about 10 ha (25 ac.); (3) where base flow rates or other channel flow sources are relatively consistent year-round; (4) in residential settings where aesthetic and wildlife habitat benefits can be appreciated and maintenance activities are likely to be consistently undertaken.

Traditional wet extended detention ponds can be applied in most regions of the United States, with the exception of arid climates. In arid regions, it is difficult to justify the supplemental water needed to maintain a permanent pool because of the scarcity of water. Even in semi-arid Austin, Texas, one study found that 2.6 acre-feet per year of supplemental water was needed to maintain a permanent pool of only 0.29 acre-feet (Saunders and Gilroy, 1997). Seasonal wet ponds (i.e., ponds that maintain a permanent pool only during the wet season) may prove effective in areas with distinct wet and dry seasons; however, this configuration has not been extensively evaluated.

Wet ponds may pose a risk to cold water systems because of their potential for stream warming. When water remains in the permanent pool, it is heated by the sun. A study in Prince George's County, Maryland, found that stormwater wet ponds heat stormwater by about 9°F from the inlet to the outlet (Galli, 1990).

Additional Design Guidelines

Specific designs may vary considerably, depending on site constraints or preferences of the designer or community. There are several variations of the wet pond design, including constructed wetlands, and wet extended detention ponds. Some of these design alternatives are intended to make the practice adaptable to various sites and to account for regional constraints and opportunities. In conventional wet ponds, the open water area comprises 50% or more of the total surface area of the pond. The permanent pool should be no deeper than 2.5 m (8 feet) and should average 1.2 – 2 m (4-6 feet) deep. The greater depth of this configuration helps limit the extent of the vegetation to an aquatic bench around the perimeter of the pond with a nominal depth of about 1 foot and variable width. This shallow bench also protects the banks from erosion, enhances habitat and aesthetic values, and reduces the drowning hazard.

The wet extended detention pond combines the treatment concepts of the dry extended detention pond and the wet pond. In this design, the water quality volume is detained above the permanent pool and released over 24 hours. In addition to increasing the residence time, which improves pollutant removal, this design also attenuates peak runoff rates. Consequently, this design alternative is recommended.

Pretreatment incorporates design features that help to settle out coarse sediment particles. By removing these particles from runoff before they reach the large permanent pool, the maintenance burden of the pond is reduced. In ponds, pretreatment is achieved with a sediment forebay. A sediment forebay is a small pool (typically about 10 percent of the volume of the permanent pool). Coarse particles remain trapped in the forebay, and maintenance is performed on this smaller pool, eliminating the need to dredge the entire pond.

There are a variety of sizing criteria for determining the volume of the permanent pool, mostly related to the water quality volume (i.e., the volume of water treated for pollutant removal) or the average storm size in a particular area. In addition, several theoretical approaches to determination of permanent pool volume have been developed. However, there is little empirical evidence to support these designs. Consequently, a simplified method (i.e., permanent pool volume equal to twice the water quality volume) is recommended.

Other design features do not increase the volume of a pond, but can increase the amount of time stormwater remains in the device and eliminate short-circuiting. Ponds should always be designed with a length-to-width ratio of at least 1.5:1, where feasible. In addition, the design should incorporate features to lengthen the flow path through the pond, such as underwater berms designed to create a longer route through the pond. Combining these two measures helps ensure that the entire pond volume is used to treat stormwater. Wet ponds with greater amounts of vegetation often have channels through the vegetated areas and contain dead areas where stormwater is restricted from mixing with the entire permanent pool, which can lead to less pollutant removal. Consequently, a pond with open water comprising about 75% of the surface area is preferred.

Design features are also incorporated to ease maintenance of both the forebay and the main pool of ponds. Ponds should be designed with a maintenance access to the forebay to ease this relatively routine (every 5–7 year) maintenance activity. In addition, ponds should generally have a drain to draw down the pond for vegetation harvesting or the more infrequent dredging of the main cell of the pond.

Cold climates present many challenges to designers of wet ponds. The spring snowmelt may have a high pollutant load and a large volume to be treated. In addition, cold winters may cause freezing of the permanent pool or freezing at inlets and outlets. Finally, high salt concentrations in runoff resulting from road salting, and sediment loads from road sanding, may impact pond vegetation as well as reduce the storage and treatment capacity of the pond.

One option to deal with high pollutant loads and runoff volumes during the spring snowmelt is the use of a seasonally operated pond to capture snowmelt during the winter and retain the permanent pool during warmer seasons. In this option, proposed by Oberts (1994), the pond has two water quality outlets, both equipped with gate valves. In the summer, the lower outlet is closed. During the fall and throughout the winter, the lower outlet is opened to draw down the permanent pool. As the spring melt begins, the lower outlet is closed to provide detention for the melt event. The manipulation of this system requires some labor and vigilance; a careful maintenance agreement should be confirmed.

Several other modifications may help to improve the performance of ponds in cold climates. Designers should consider planting the pond with salt-tolerant vegetation if the facility receives road runoff. In order to counteract the effects of freezing on inlet and outlet structures, the use of inlet and outlet structures that are resistant to frost, including weirs and larger diameter pipes, may be useful. Designing structures on-line, with a continuous flow of water through the pond, will also help prevent freezing of these structures. Finally, since freezing of the permanent pool can reduce the effectiveness of pond systems, it is important to incorporate extended detention into the design to retain usable treatment area above the permanent pool when it is frozen.

Summary of Design Recommendations

(1) Facility Sizing – The basin should be sized to hold the permanent pool as well as the required water quality volume. The volume of the permanent pool should equal twice the water quality volume.

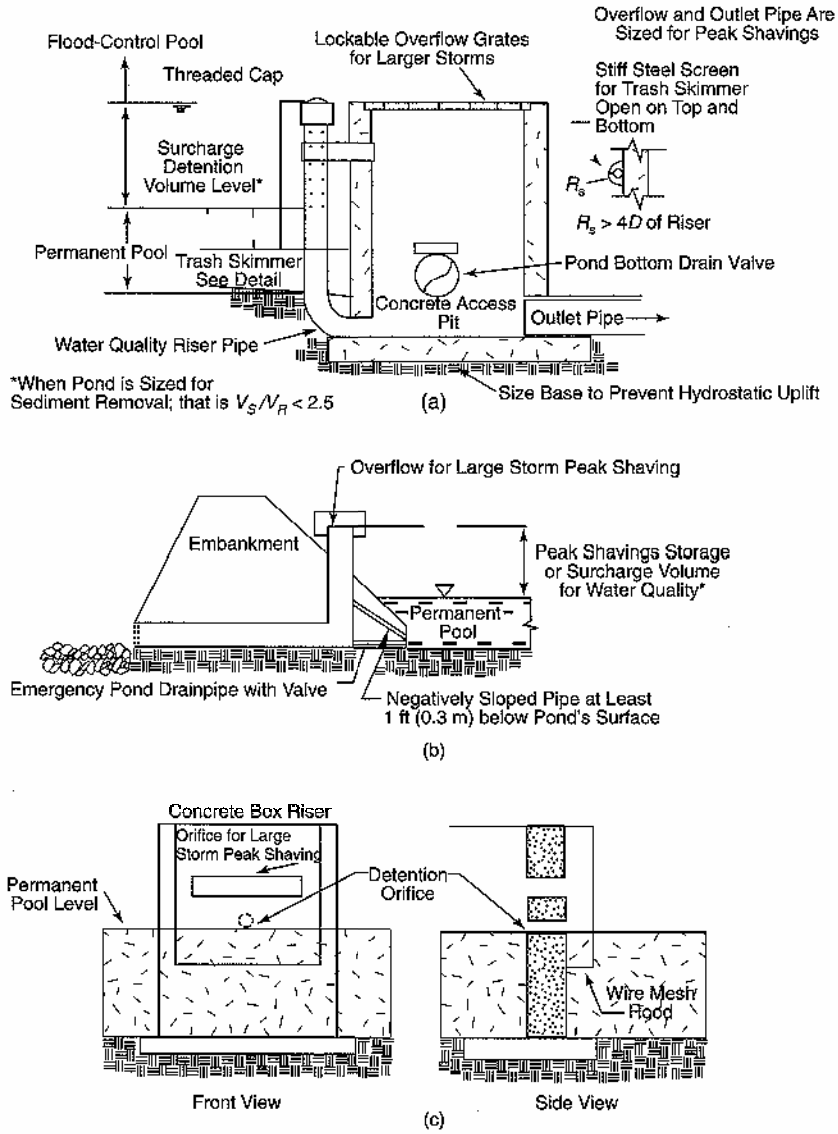
(2) Pond Configuration - The wet basin should be configured as a two stage facility with a sediment forebay and a main pool. The basins should be wedge-shaped, narrowest at the inlet and widest at the outlet. The minimum length to width ratio should be 1.5 where feasible. The perimeter of all permanent pool areas with depths of 4.0 feet or greater should be surrounded by an aquatic bench. This bench should extend inward 5-10 feet from the perimeter of the permanent pool and should be no more than 18 inches below normal depth. The area of the bench should not exceed about 25% of pond surface. The depth in the center of the basin should be 4 – 8 feet deep to prevent vegetation from encroaching on the pond open water surface.

(3) Pond Side Slopes - Side slopes of the basin should be 3:1 (H:V) or flatter for grass stabilized slopes. Slopes steeper than 3:1 should be stabilized with an appropriate slope stabilization practice.

(4) Sediment Forebay - A sediment forebay should be used to isolate gross sediments as they enter the facility and to simplify sediment removal. The sediment forebay should consist of a separate cell formed by an earthen berm, gabion, or loose riprap wall. The forebay should be sized to contain 15 to 25% of the permanent pool volume and should be at least 3 feet deep. Exit velocities from the forebay should not be erosive. Direct maintenance access should be provided to the forebay. The bottom of the forebay may be hardened (concrete) to make sediment removal easier. A fixed vertical sediment depth marker should be installed in the forebay to measure sediment accumulation.

(5) Outflow Structure - Figure 2 presents a schematic representation of suggested outflow structures. The outlet structure should be designed to drain the water quality volume over 24 hours with the orifice sized according to the equation presented in the Extended Detention Basin fact sheet. The facility should have a separate drain pipe with a manual valve that can completely or partially drain the pond for maintenance purposes. To allow for possible sediment accumulation, the submerged end of the pipe should be protected, and the drain pipe should be sized to drain the pond within 24 hours. The valve should be located at a point where it can be operated in a safe and convenient manner.

For on-line facilities, the principal and emergency spillways must be sized to provide 1.0 foot of freeboard during the 25-year event and to safely pass the 100-year flood. The embankment should be designed in accordance with all relevant specifications for small dams.



(6) Splitter Box - When the pond is designed as an off-line facility, a splitter structure is used to isolate the water quality volume. The splitter box, or other flow diverting approach, should be designed to convey the 25-year event while providing at least 1.0 foot of freeboard along pond side slopes.

(7) Vegetation - A plan should be prepared that indicates how aquatic and terrestrial areas will be vegetatively stabilized. Wetland vegetation elements should be placed along the aquatic bench or in the shallow portions of the permanent pool. The optimal elevation for planting of wetland vegetation is within 6 inches vertically of the normal pool elevation. A list of some wetland vegetation native to California is presented in Table 1.

Table 1 California Wetland Vegetation	
Botanical Name	**Common Name**
BACCHARIS SALICIFOLIA	MULE FAT
FRANKENIA GRANDIFOLIA	HEATH
SALIX GOODINGII	BLACK WILLOW
SALIX LASIOLEPIS	ARROYO WILLOW
SAMUCUS MEXICANUS	MEXICAN ELDERBERRY
HAPLOPAPPUS VENETUS	COAST GOLDENBRUSH
DISTICHIS SPICATA	SALT GRASS
LIMONIUM CALIFORNICUM	COASTAL STATICE
ATRIPLEX LENTIFORMIS	COASTAL QUAIL BUSH
BACCHARIS PILULARIS	CHAPARRAL BROOM
MIMULUS LONGIFLORUS	MONKEY FLOWER
SCIRPUS CALIFORNICUS	BULRUSH
SCIRPUS ROBUSTUS	BULRUSH
TYPHA LATIFOLIA	BROADLEAF CATTAIL
JUNCUS ACUTUS	RUSH

Maintenance

The amount of maintenance required for a wet pond is highly dependent on local regulatory agencies, particular health and vector control agencies. These agencies are often extremely concerned about the potential for mosquito breeding that may occur in the permanent pool. Even though mosquito fish (*Gambusia affinis*) were introduced into a wet pond constructed by Caltrans in the San Diego area, mosquito breeding was routinely observed during inspections. In addition, the vegetation at this site became sufficiently dense on the bench around the edge of the pool that mosquito fish were unable to enter this area to feed upon the mosquito larvae. The vegetation at this site was particularly vigorous because of the high nutrient concentrations in the perennial base flow (15.5 mg/L NO3-N) and the mild climate, which permitted growth year round. Consequently, the vector control agency required an annual harvest of vegetation to address this situation. This harvest can be very expensive.

On the other hand, routine harvesting may increase nutrient removal and prevent the export of these constituents from dead and dying plants falling in the water. A previous study (Faulkner and Richardson, 1991) documented dramatic reductions in nutrient removal after the first several years of operation and related it to the vegetation achieving a maximum density. That content then decreases through the growth season, as the total biomass increases. In effect, the total amount of nutrients/m2 of wetland remains essentially the same from June through September, when the plants start to put the P back into the rhizomes. Therefore harvesting should occur between June and September. Research also suggests that harvesting only the foliage is less effective, since a very small percentage of the removed nutrients is taken out with harvesting.

Since wet ponds are often selected for their aesthetic considerations as well as pollutant removal, they are often sited in areas of high visibility. Consequently, floating litter and debris are removed more frequently than would be required simply to support proper functioning of the pond and outlet. This is one of the primary maintenance activities performed at the Central Market Pond located in Austin, Texas. In this type of setting, vegetation management in the area surrounding the pond can also contribute substantially to the overall maintenance requirements.

One normally thinks of sediment removal as one of the typical activities performed at stormwater BMPs. This activity does not normally constitute one of the major activities on an annual basis. At the concentrations of TSS observed in urban runoff from stable watersheds, sediment removal may only be required every 20 years or so. Because this activity is performed so infrequently, accurate costs for this activity are lacking.

In addition to regular maintenance activities needed to maintain the function of wet ponds, some design features can be incorporated to ease the maintenance burden. In wet ponds, maintenance reduction features include techniques to reduce the amount of maintenance needed, as well as techniques to make regular maintenance activities easier.

One potential maintenance concern in wet ponds is clogging of the outlet. Ponds should be designed with a non-clogging outlet such as a reverse-slope pipe, or a weir outlet with a trash rack. A reverse-slope pipe draws from below the permanent pool extending in a reverse angle up to the riser and establishes the water elevation of the permanent pool. Because these outlets draw water from below the level of the permanent pool, they are less likely to be clogged by floating debris.

Typical maintenance activities and frequencies include:

- Schedule semiannual inspections for burrows, sediment accumulation, structural integrity of the outlet, and litter accumulation.
- Remove accumulated trash and debris in the basin at the middle and end of the wet season. The frequency of this activity may be altered to meet specific site conditions and aesthetic considerations.
- Where permitted by the Department of Fish and Game or other agency regulations, stock wet ponds/constructed wetlands regularly with mosquito fish (*Gambusia spp.*) to enhance natural mosquito and midge control.
- Introduce mosquito fish and maintain vegetation to assist their movements to control mosquitoes, as well as to provide access for vector inspectors. An annual vegetation harvest in summer appears to be optimum, in that it is after the bird breeding season, mosquito fish can provide the needed control until vegetation reaches late summer density, and there is time for re-growth for runoff treatment purposes before the wet season. In certain cases, more frequent plant harvesting may be required by local vector control agencies.

- Maintain emergent and perimeter shoreline vegetation as well as site and road access to facilitate vector surveillance and control activities.

- Remove accumulated sediment in the forebay and regrade about every 5-7 years or when the accumulated sediment volume exceeds 10 percent of the basin volume. Sediment removal may not be required in the main pool area for as long as 20 years.

Cost

Construction Cost

Wet ponds can be relatively inexpensive stormwater practices; however, the construction costs associated with these facilities vary considerably. Much of this variability can be attributed to the degree to which the existing topography will support a wet pond, the complexity and amount of concrete required for the outlet structure, and whether it is installed as part of new construction or implemented as a retrofit of existing storm drain system.

A recent study (Brown and Schueler, 1997) estimated the cost of a variety of stormwater management practices. The study resulted in the following cost equation, adjusting for inflation:

$$C = 24.5^{V0.705}$$

where:

C = Construction, design and permitting cost;

V = Volume in the pond to include the 10-year storm (ft^3).

Using this equation, typical construction costs are:

$45,700 for a 1 acre-foot facility

$232,000 for a 10 acre-foot facility

$1,170,000 for a 100 acre-foot facility

In contrast, Caltrans (2002) reported spending over $448,000 for a pond with a total permanent pool plus water quality volume of only 1036 m^3 (0.8 ac.-ft.), while the City of Austin spent $584,000 (including design) for a pond with a permanent pool volume of 3,100 m^3 (2.5 ac.-ft.). The large discrepancies between the costs of these actual facilities and the model developed by Brown and Schueler indicate that construction costs are highly site specific, depending on topography, soils, subsurface conditions, the local labor, rate and other considerations.

Maintenance Cost

For ponds, the annual cost of routine maintenance has typically been estimated at about 3 to 5 percent of the construction cost; however, the published literature is almost totally devoid of actual maintenance costs. Since ponds are long-lived facilities (typically longer than 20 years), major maintenance activities are unlikely to occur during a relatively short study.

Caltrans (2002) estimated annual maintenance costs of $17,000 based on three years of monitoring of a pond treating runoff from 1.7 ha. Almost all the activities are associated with the annual vegetation harvest for vector control. Total cost at this site falls within the 3-5% range reported above; however, the construction costs were much higher than those estimated by Brown and Schueler (1997). The City of Austin has been reimbursing a developer about $25,000/yr for wet pond maintenance at a site located at a very visible location. Maintenance costs are mainly the result of vegetation management and litter removal. On the other hand, King County estimates annual maintenance costs at about $3,000 per pond; however, this cost likely does not include annual extensive vegetation removal. Consequently, maintenance costs may vary considerably at sites in California depending on the aggressiveness of the vegetation management in that area and the frequency of litter removal.

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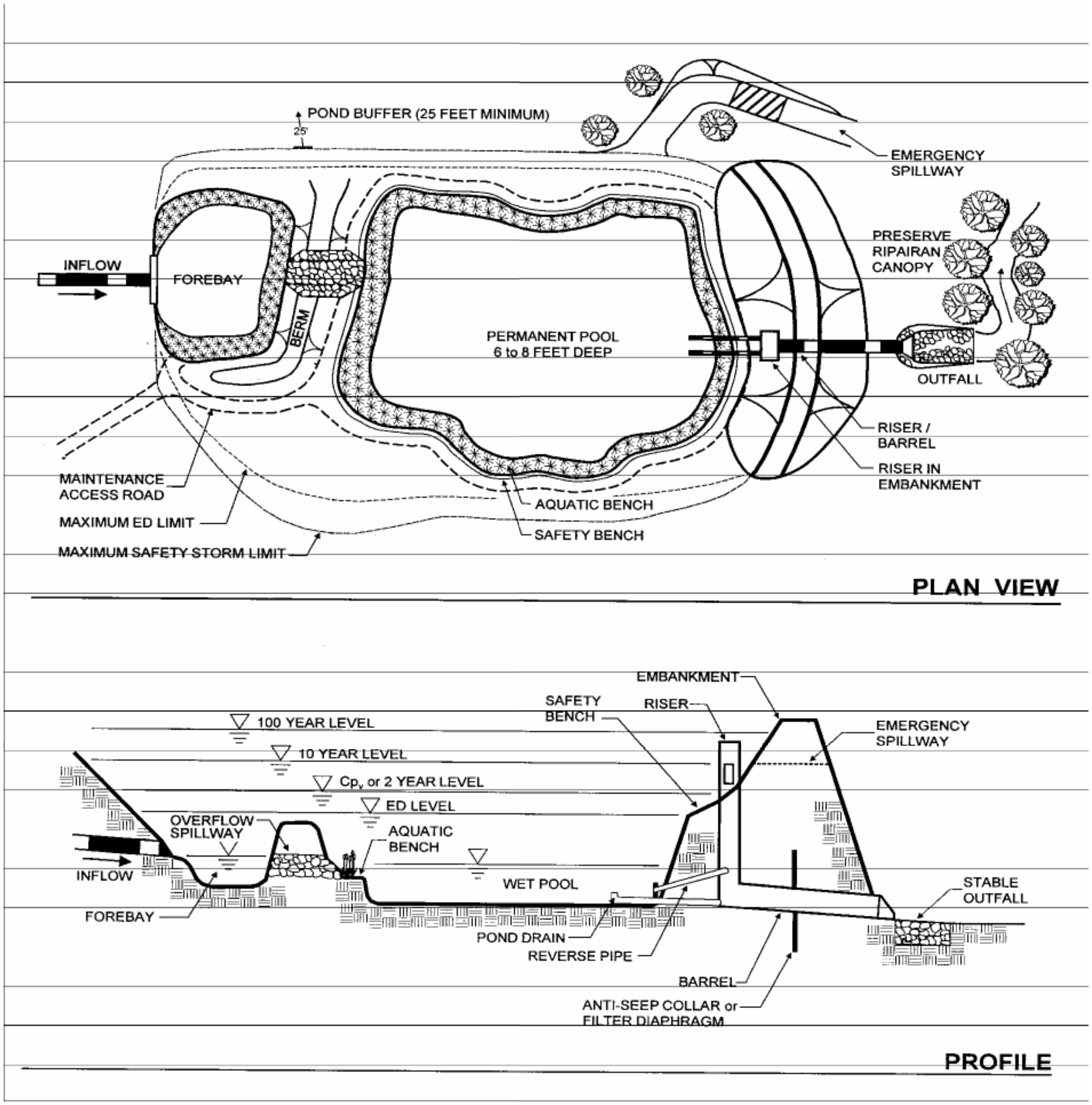


POND BUFFER (25 FEET MINIMUM)
EMERGENCY SPILLWAY
PRESERVE RIPAIRAN CANOPY
INFLOW
FOREBAY
BERM
PERMANENT POOL 6 to 8 FEET DEEP
OUTFALL
RISER / BARREL
RISER IN EMBANKMENT
MAINTENANCE ACCESS ROAD
MAXIMUM ED LIMIT
AQUATIC BENCH
SAFETY BENCH
MAXIMUM SAFETY STORM LIMIT
PLAN VIEW
EMBANKMENT
SAFETY BENCH
RISER
100 YEAR LEVEL
10 YEAR LEVEL
Cp, or 2 YEAR LEVEL
ED LEVEL
EMERGENCY SPILLWAY
OVERFLOW SPILLWAY
AQUATIC BENCH
INFLOW
WET POOL
STABLE OUTFALL
FOREBAY
POND DRAIN
REVERSE PIPE
BARREL
ANTI-SEEP COLLAR or FILTER DIAPHRAGM
PROFILE

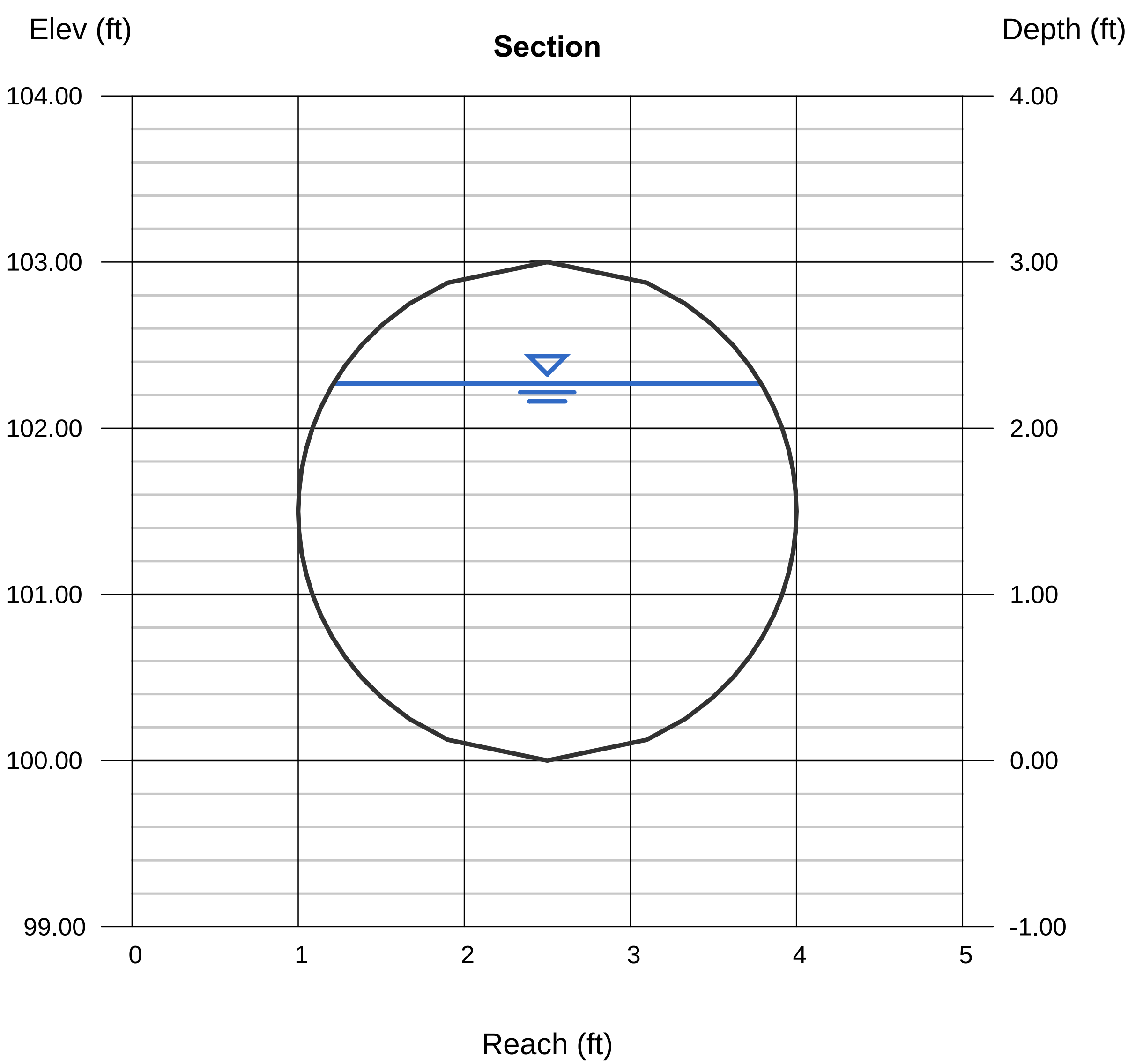
Appendix D

Drainage Structure Sizing

Channel Report

Alternative A: Drainage Area #1

Circular		**Highlighted**	
Diameter (ft)	= 3.00	Depth (ft)	= 2.27
		Q (cfs)	= 47.00
		Area (sqft)	= 5.74
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 8.19
Slope (%)	= 0.50	Wetted Perim (ft)	= 6.33
N-Value	= 0.012	Crit Depth, Yc (ft)	= 2.24
		Top Width (ft)	= 2.57
Calculations		EGL (ft)	= 3.31
Compute by:	Known Q		
Known Q (cfs)	= 47.00		



Channel Report

Alternative A: Drainage Areas #2 and #4

Circular

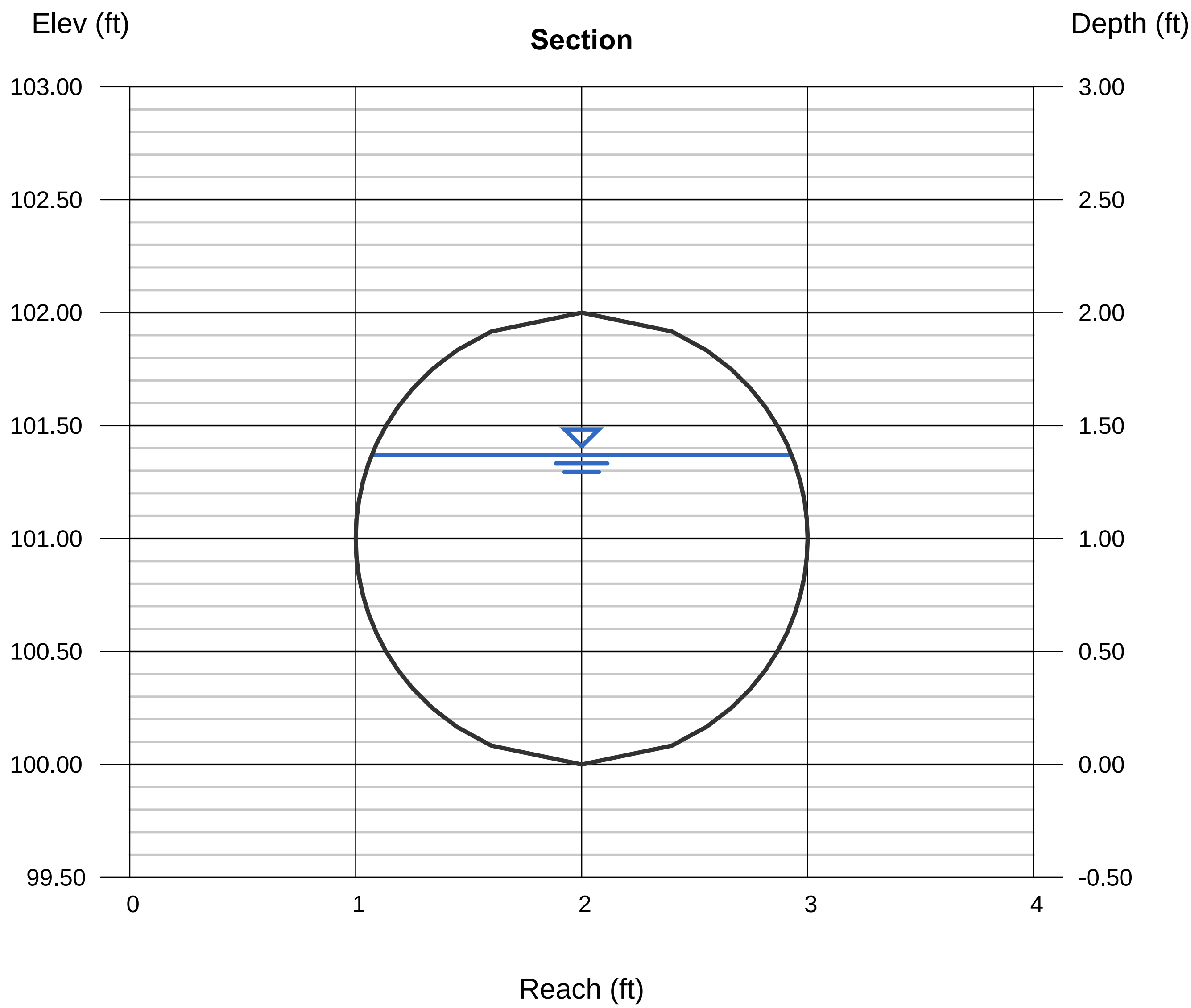
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Q
Known Q (cfs)	= 14.00

Highlighted

Depth (ft)	= 1.37
Q (cfs)	= 14.00
Area (sqft)	= 2.29
Velocity (ft/s)	= 6.10
Wetted Perim (ft)	= 3.90
Crit Depth, Yc (ft)	= 1.35
Top Width (ft)	= 1.86
EGL (ft)	= 1.95



Channel Report

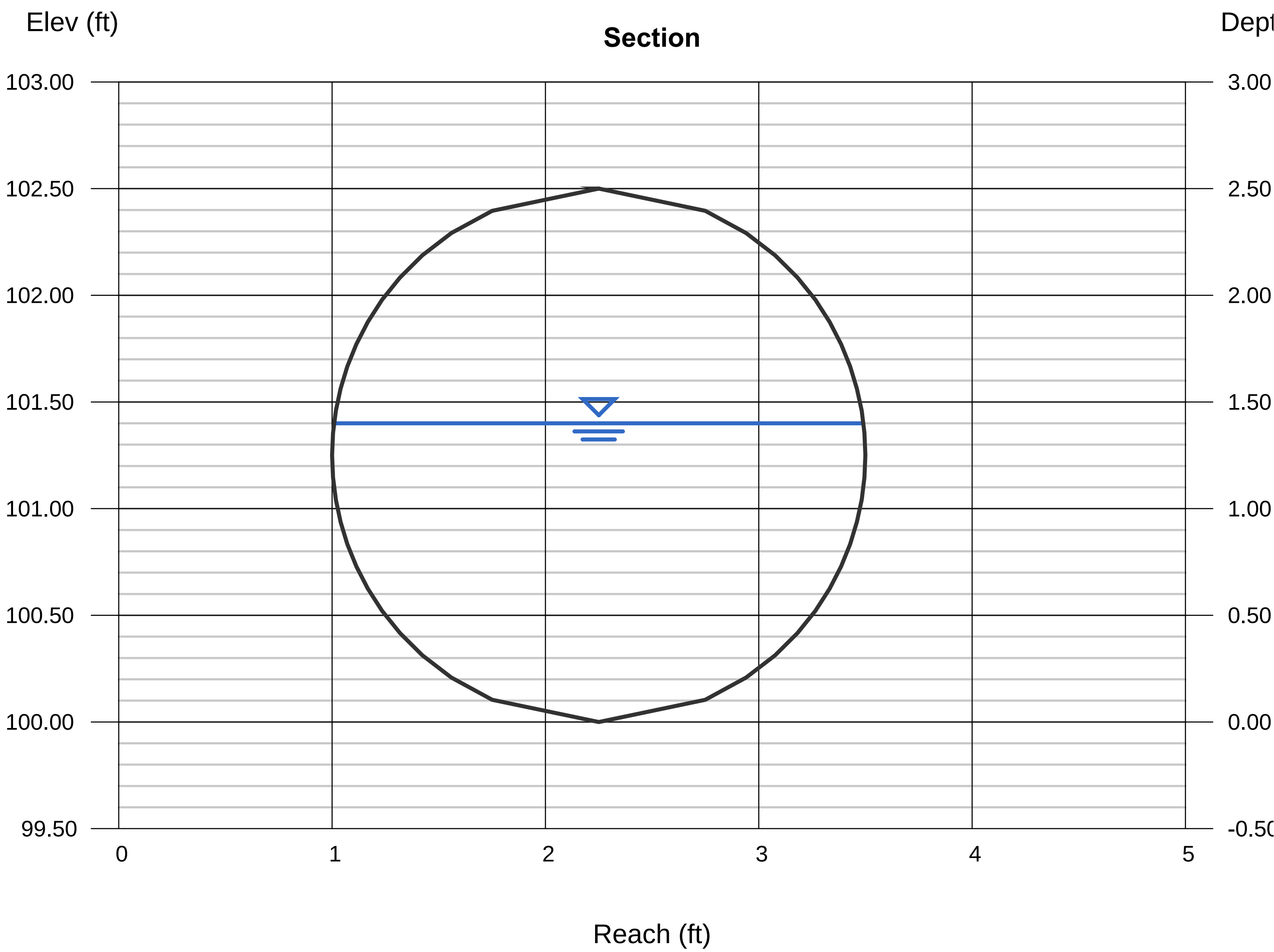
Alternative A: Drainage Area #3

Circular
Diameter (ft) = 2.50

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

Calculations
Compute by: Known Q
Known Q (cfs) = 19.00

Highlighted
Depth (ft) = 1.40
Q (cfs) = 19.00
Area (sqft) = 2.84
Velocity (ft/s) = 6.69
Wetted Perim (ft) = 4.24
Crit Depth, Yc (ft) = 1.48
Top Width (ft) = 2.48
EGL (ft) = 2.10



Channel Report

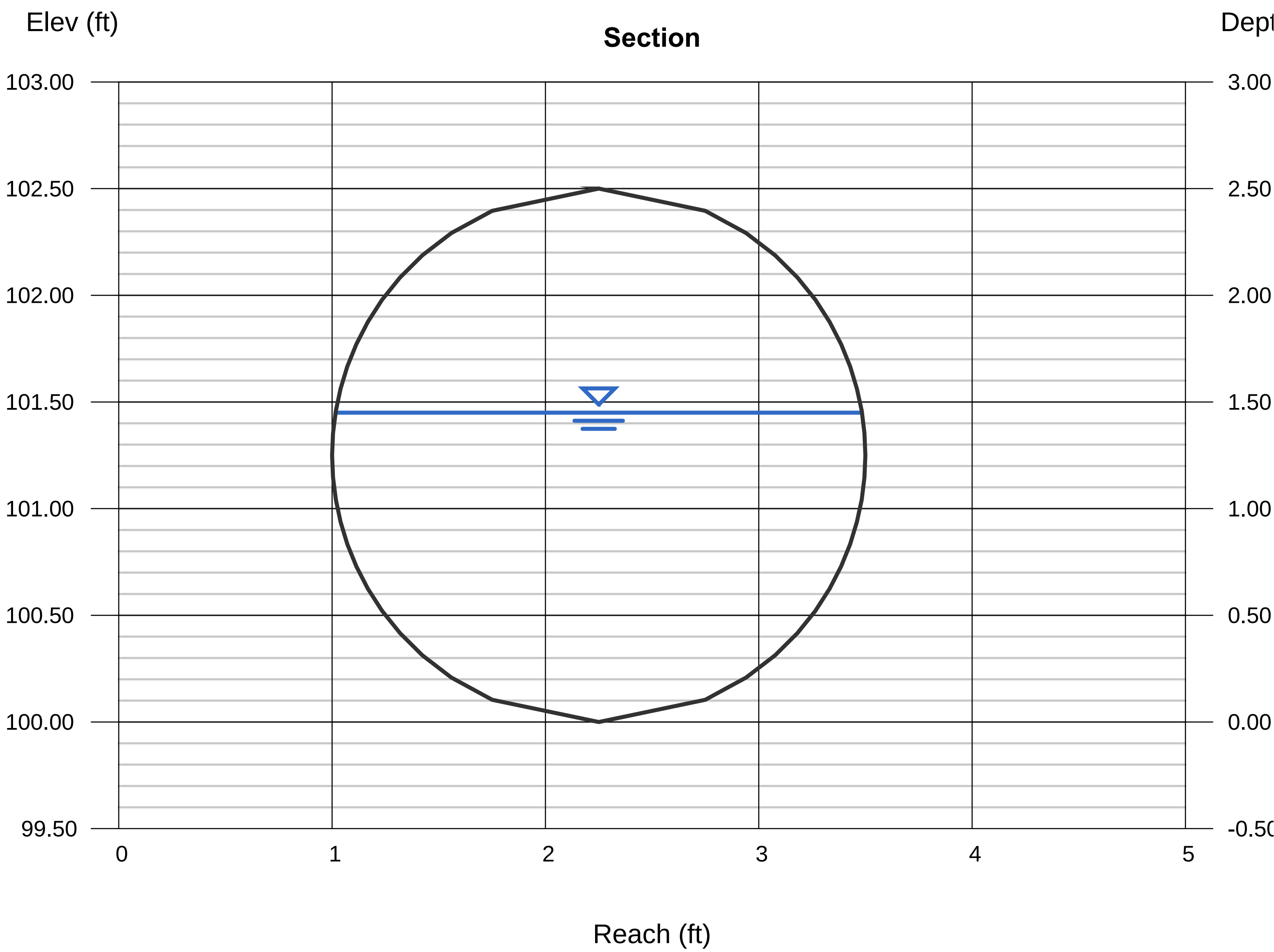
Alternative B: Drainage Area #1

Circular
Diameter (ft) = 2.50

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

Calculations
Compute by: Known Q
Known Q (cfs) = 20.00

Highlighted
Depth (ft) = 1.45
Q (cfs) = 20.00
Area (sqft) = 2.96
Velocity (ft/s) = 6.75
Wetted Perim (ft) = 4.34
Crit Depth, Yc (ft) = 1.52
Top Width (ft) = 2.47
EGL (ft) = 2.16

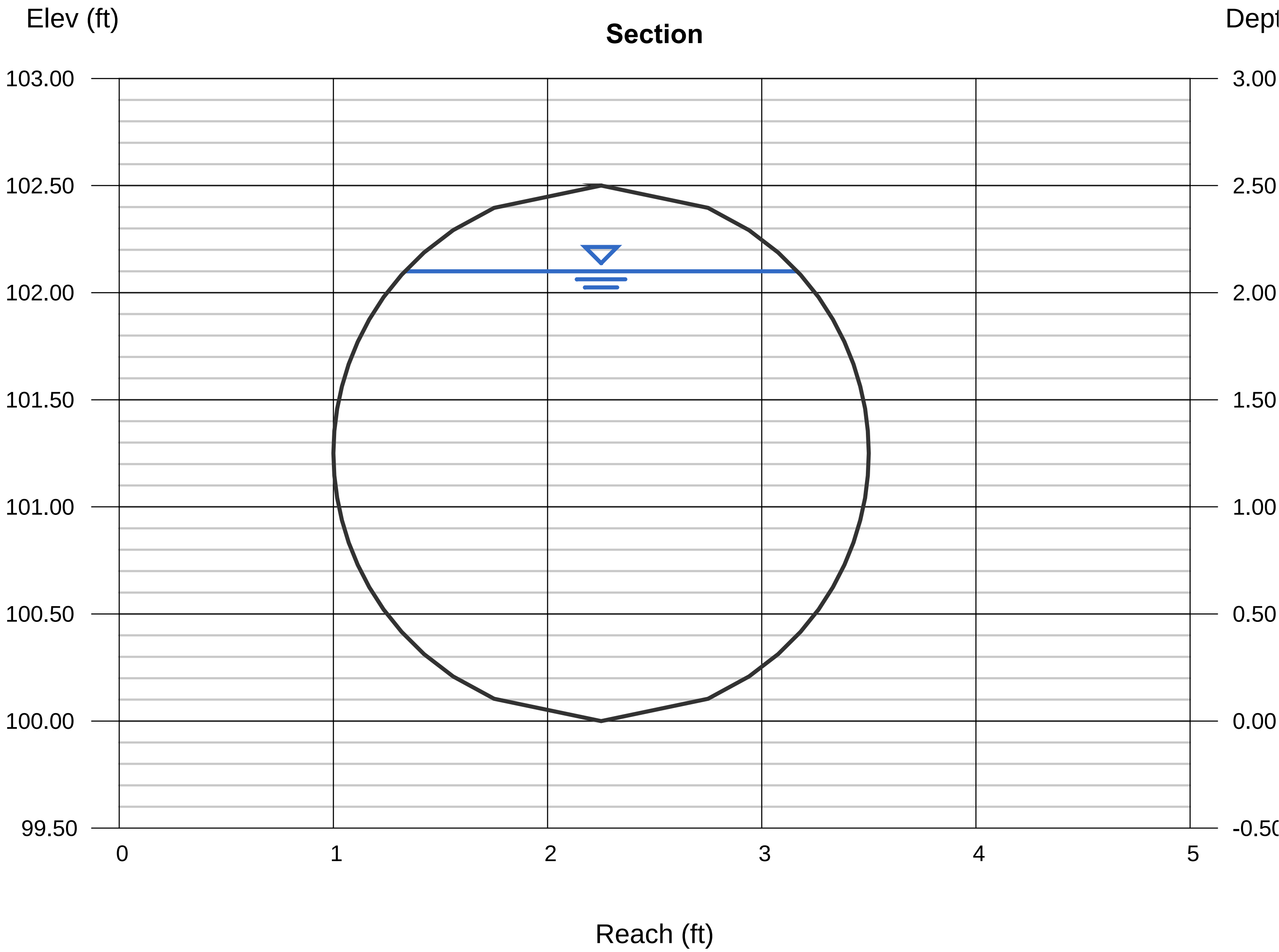


Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 7 2017

Alternative D: Drainage Area #1

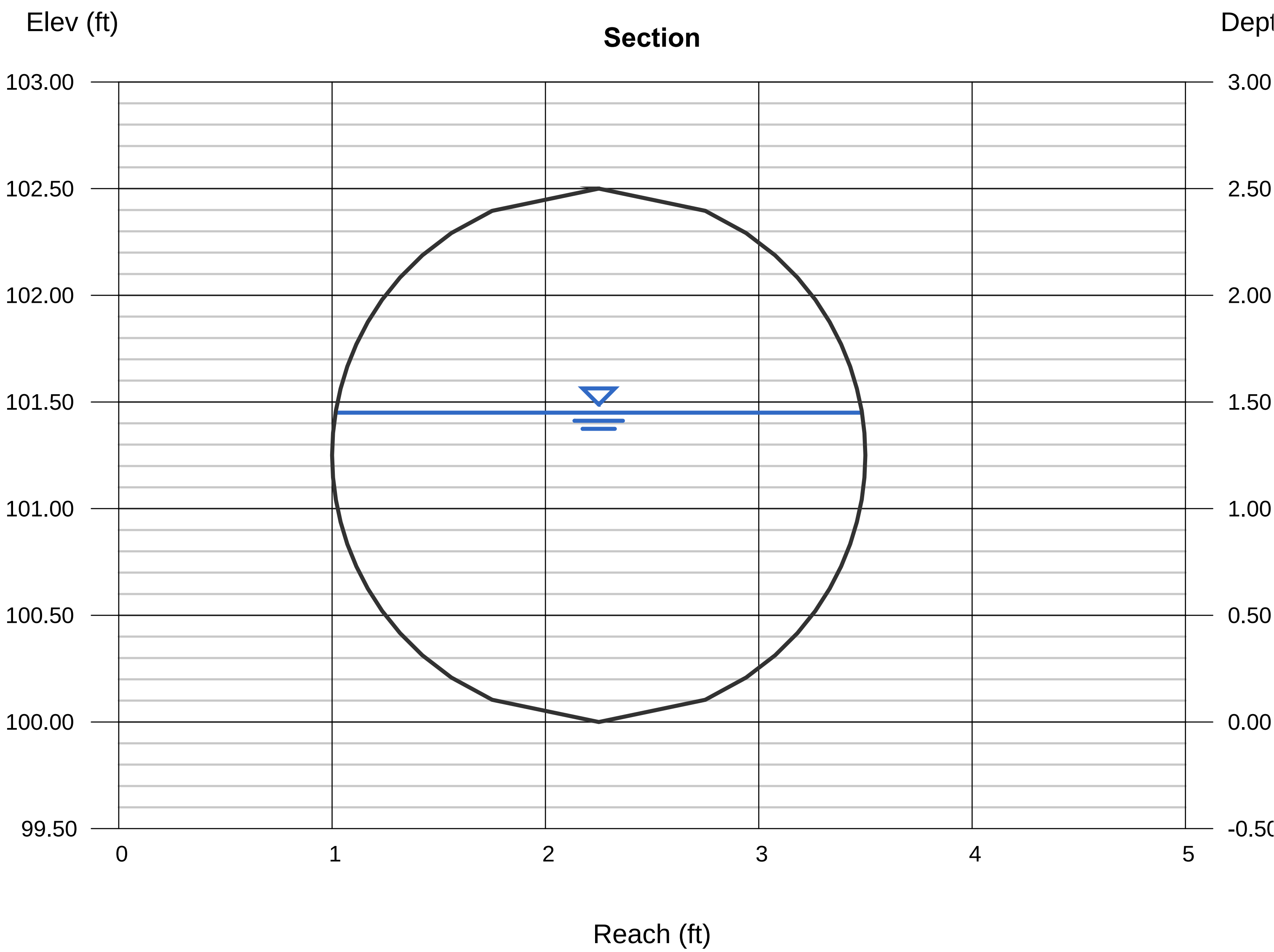
Circular			**Highlighted**	
Diameter (ft)	= 2.50		Depth (ft)	= 2.10
			Q (cfs)	= 32.00
			Area (sqft)	= 4.40
Invert Elev (ft)	= 100.00		Velocity (ft/s)	= 7.27
Slope (%)	= 0.50		Wetted Perim (ft)	= 5.80
N-Value	= 0.012		Crit Depth, Yc (ft)	= 1.93
			Top Width (ft)	= 1.83
Calculations			EGL (ft)	= 2.92
Compute by:	Known Q			
Known Q (cfs)	= 32.00			



Channel Report

Alternative D: Drainage Area #2

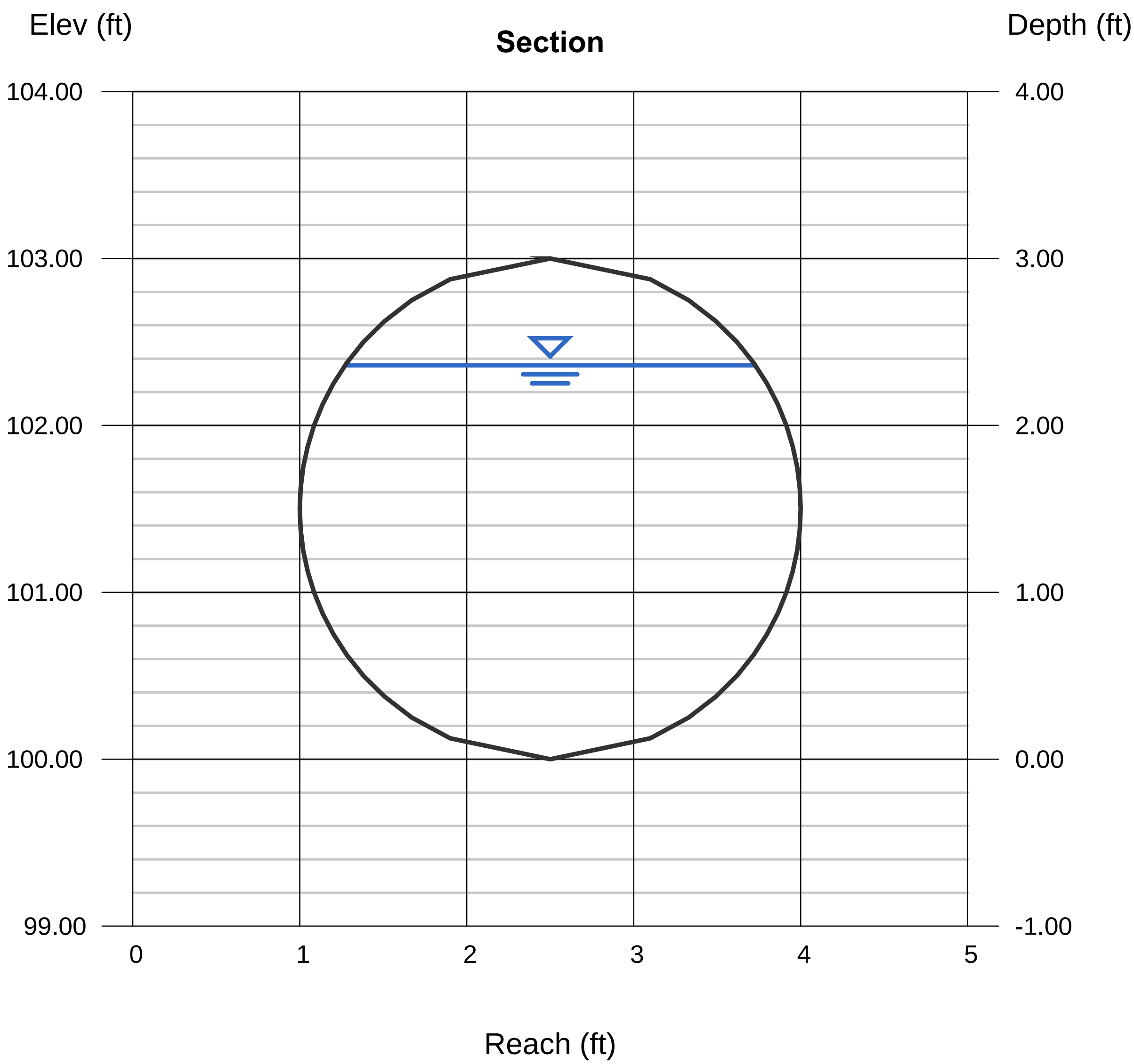
Circular		**Highlighted**	
Diameter (ft)	= 2.50	Depth (ft)	= 1.45
		Q (cfs)	= 20.00
		Area (sqft)	= 2.96
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 6.75
Slope (%)	= 0.50	Wetted Perim (ft)	= 4.34
N-Value	= 0.012	Crit Depth, Yc (ft)	= 1.52
		Top Width (ft)	= 2.47
Calculations		EGL (ft)	= 2.16
Compute by:	Known Q		
Known Q (cfs)	= 20.00		



Channel Report

Alternative E: Drainage Area #1

Circular		**Highlighted**	
Diameter (ft)	= 3.00	Depth (ft)	= 2.36
		Q (cfs)	= 49.00
		Area (sqft)	= 5.98
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 8.20
Slope (%)	= 0.50	Wetted Perim (ft)	= 6.56
N-Value	= 0.012	Crit Depth, Yc (ft)	= 2.28
		Top Width (ft)	= 2.45
Calculations		EGL (ft)	= 3.41
Compute by:	Known Q		
Known Q (cfs)	= 49.00		

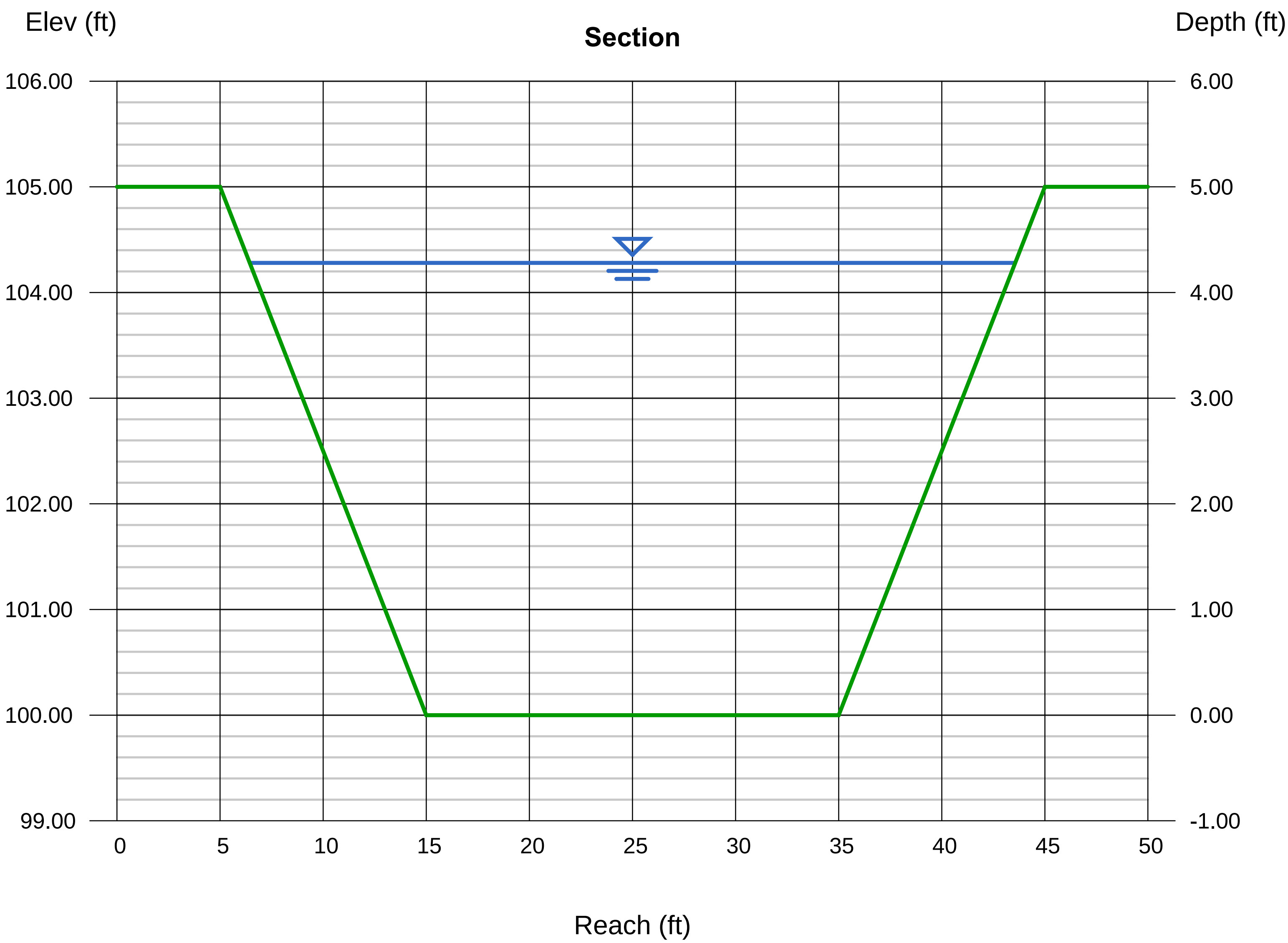


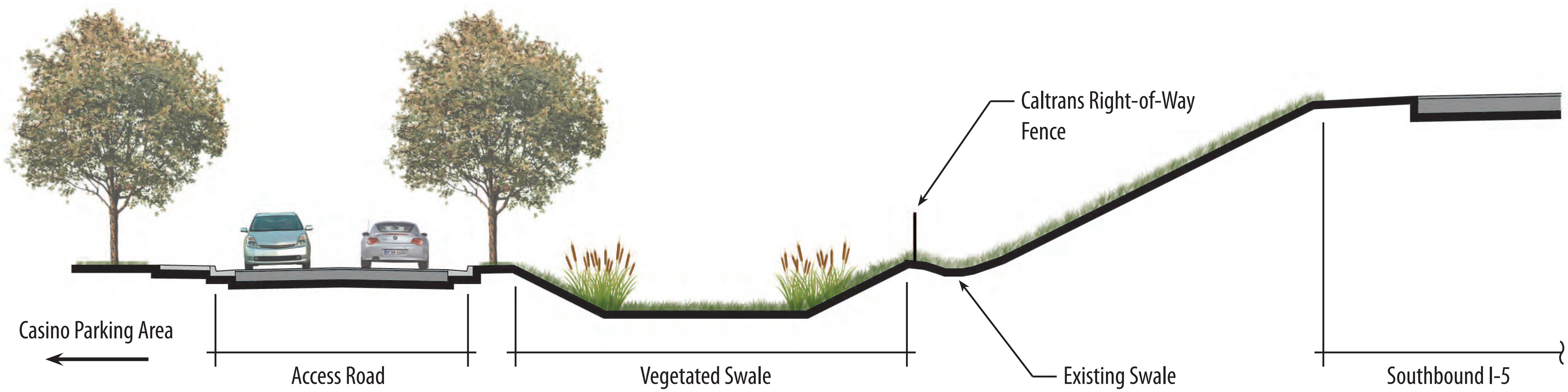
Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Apr 7 2017

Proposed Earthen Infiltration Channel

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 20.00	Depth (ft)	= 4.28
Side Slopes (z:1)	= 2.00, 2.00	Q (cfs)	= 700.00
Total Depth (ft)	= 5.00	Area (sqft)	= 122.24
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 5.73
Slope (%)	= 0.40	Wetted Perim (ft)	= 39.14
N-Value	= 0.035	Crit Depth, Yc (ft)	= 3.03
		Top Width (ft)	= 37.12
Calculations		EGL (ft)	= 4.79
Compute by:	Known Q		
Known Q (cfs)	= 700.00		




Caltrans Right-of-Way
Fence
Casino Parking Area
Access Road
Vegetated Swale
Existing Swale
Southbound I-5

NOT TO SCALE

Vegetated Swale TC-30

Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.

- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.

- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.

- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.

- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data

Study	Removal Efficiencies (% Removal)						
	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.

- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.

- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.

- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.

- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately \$0.25 per ft^2. This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately \$0.50 per ft^2, which compares favorably with other stormwater management practices.

Table 2 Swale Cost Estimate (SEWRPC, 1991)

Component	Unit	Extent	Unit Cost Low	Unit Cost Moderate	Unit Cost High	Total Cost Low	Total Cost Moderate	Total Cost High
Mobilization / Demobilization-Light	Swale	1	$107	$274	$441	$107	$274	$441
Site Preparation								
Clearing[b]...............	Acre	0.5	$2,200	$3,800	$5,400	$1,100	$1,900	$2,700
Grubbing[c].............	Acre	0.25	$3,800	$5,200	$6,600	$950	$1,300	$1,650
General Excavation[d]...........	Yd^3	372	$2.10	$3.70	$5.30	$781	$1,376	$1,972
Level and Till[e]........	Yd^2	1,210	$0.20	$0.35	$0.50	$242	$424	$605
Sites Development								
Salvaged Topsoil Seed, and Mulch[f]..	Yd^2	1,210	$0.40	$1.00	$1.60	$484	$1,210	$1,936
Sod[g]......................	Yd^2	1,210	$1.20	$2.40	$3.60	$1,452	$2,904	$4,356
Subtotal	--	--	--	--	--	$5,116	$9,388	$13,660
Contingencies	Swale	1	25%	25%	25%	$1,279	$2,347	$3,415
Total	--	--	--	--	--	$6,395	$11,735	$17,075

Source: (SEWRPC, 1991)

Note: Mobilization/demobilization refers to the organization and planning involved in establishing a vegetative swale.

[a] Swale has a bottom width of 1.0 foot, a top width of 10 feet with 1:3 side slopes, and a 1,000-foot length.

[b] Area cleared = (top width + 10 feet) x swale length.

[c] Area grubbed = (top width x swale length).

[d] Volume excavated = (0.67 x top width x swale depth) x swale length (parabolic cross-section).

[e] Area tilled = $\left(\text{top width} + \frac{8(\text{swale depth}^2)}{3(\text{top width})}\right)$ x swale length (parabolic cross-section).

[f] Area seeded = area cleared x 0.5.

[g] Area sodded = area cleared x 0.5.

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.18 / linear foot	$0.28 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	–
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	**$0.58 / linear foot**	**$ 0.75 / linear foot**	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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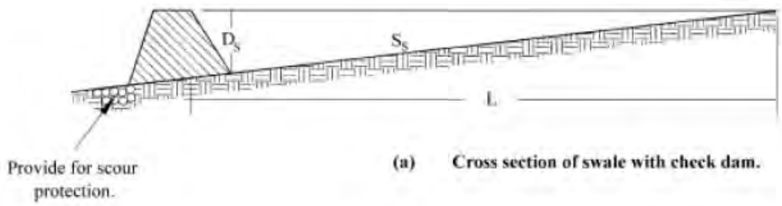
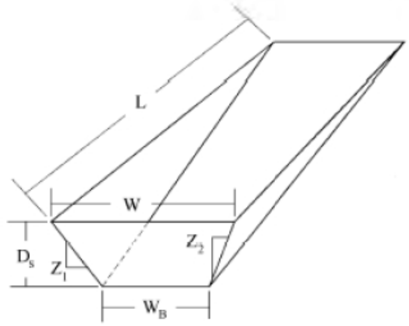


(a) Cross section of swale with check dam.



(b) Dimensional view of swale impoundment area.

Notation:

- L = Length of swale impoundment area per check dam (ft)
- D_S = Depth of check dam (ft)
- S_S = Bottom slpe of swale (ft/ft)
- W = Top width of check dam (ft)
- W_B = Bottom width of check dam (ft)
- $Z_{1\&2}$ = Ratio of horizontal to vertical change in swale side slope (ft/ft)

Appendix E – References

The following documents were utilized as primary reference documents in developing the Redding Rancheria Casino Master Plan, Grading and Drainage Study

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ATTACHMENT B

USFWS, CDFW, CNPS OFFICIAL SPECIES LISTS

USFWS IPAC RESOURCE LIST

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: July 18, 2018
Consultation Code: 08ESMF00-2017-SLI-2734
Event Code: 08ESMF00-2018-E-07999
Project Name: Redding

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2017-SLI-2734

Event Code: 08ESMF00-2018-E-07999

Project Name: Redding

Project Type: ** OTHER **

Project Description: Tribal fee-to-trust

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.52930951202774N122.3594509873035W

Counties: Shasta, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Slender Orcutt Grass *Orcuttia tenuis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1063	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CDFW CNDDB Species List

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Enterprise (4012253))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Candidate Endangered	G2G3	S1S2	SSC
Agrostis hendersonii Henderson's bent grass	PMPOA040K0	None	None	G2Q	S2	3.2
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S3	
Cryptantha crinita silky cryptantha	PDBOR0A0Q0	None	None	G2	S2	1B.2
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Great Valley Cottonwood Riparian Forest Great Valley Cottonwood Riparian Forest	CTT61410CA	None	None	G2	S2.1	
Great Valley Valley Oak Riparian Forest Great Valley Valley Oak Riparian Forest	CTT61430CA	None	None	G1	S1.1	
Great Valley Willow Scrub Great Valley Willow Scrub	CTT63410CA	None	None	G3	S3.2	
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S3	FP
Juncus leiospermus var. leiospermus Red Bluff dwarf rush	PMJUN011L2	None	None	G2T2	S2	1B.1
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lathyrus sulphureus var. argillaceus dubious pea	PDFAB25101	None	None	G5T1T2	S1S2	3
Legenere limosa legenere	PDCAM0C010	None	None	G2	S2	1B.1
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G4	S3S4	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Oncorhynchus tshawytscha pop. 6 chinook salmon - Central Valley spring-run ESU	AFCHA0205A	Threatened	Threatened	G5	S1	
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	AFCHA0205B	Endangered	Endangered	G5	S1	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Orcuttia tenuis slender Orcutt grass	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
Rana boylii foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Spea hammondii western spadefoot	AAABF02020	None	None	G3	S3	SSC
Trilobopsis roperi Shasta chaparral	IMGASA2030	None	None	G1	S1	

Record Count: 25

CNPS Plant List

CNPS California Native Plant Society

Plant List

Inventory of Rare and Endangered Plants

6 matches found. *Click on scientific name for details*

Search Criteria

Found in Quad 4012253

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Blooming Period	CA Rare Plant Rank	State Listing Status	Federal Listing Status
Agrostis hendersonii	Henderson's bent grass	Apr-Jun	3.2		
Cryptantha crinita	silky cryptantha	Apr-May	1B.2		
Juncus leiospermus var. leiospermus	Red Bluff dwarf rush	Mar-Jun	1B.1		
Legenere limosa	legenere	Apr-Jun	1B.1		
Orcuttia tenuis	slender Orcutt grass	May-Sep(Oct)	1B.1	CE	FT
Sidalcea celata	Redding checkerbloom	Apr-Aug	3		

Suggested Citation

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 18 July 2018].

ATTACHMENT C

NSR BIOLOGICAL RESOURCES ASSESSMENT OF THE STRAWBERRY FIELDS STUDY AREA

STRAWBERRY FIELDS STUDY AREA

Biological Resources Assessment

November 7, 2007

Prepared for:
Redding Rancheria Tribe

Prepared by:
North State Resources, Inc.

NSR No. 50780

North State Resources, Inc.

STRAWBERRY FIELDS STUDY AREA

Biological Resources Assessment

November 7, 2007

Prepared for:
Redding Rancheria Tribe
Attn: Mr. Neal Malmsten
2000 Redding Rancheria Road
Redding, CA 96001

Prepared by:
North State Resources, Inc.
500 Orient Street, Suite 150
Chico, CA 95928
(530) 345-4552
(530) 345-4805 *fax*

NSR No. 50780

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Biological Resources Assessment

1. INTRODUCTION

On behalf of the Redding Rancheria Tribe, North State Resources, Inc. (NSR) conducted a biological resources assessment of the approximately 225.86-acre Strawberry Fields Study Area, hereinafter referred to as the "study area." The purpose of this assessment is to document the biological resources in the vicinity of the study area, including a general description of the terrestrial and aquatic habitats and identification of potentially occurring special-status plant and wildlife species. The results of plant and wildlife surveys within the study area are included in this biological resources assessment.

1.1 Study Area Location

The study area is located south of the City of Redding in Shasta County, California and can be found within the *Enterprise*, *California* U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Township 31 North, Range 4 West, Sections 19 and 20). The central western and eastern boundaries of the study area are located at approximately 40º 31' 67"N latitude by 122° 21' 53"W longitude and 40º 31' 67"N latitude by 122° 20' 81"W longitude, respectively. A map of the study area is presented as Figure 1.

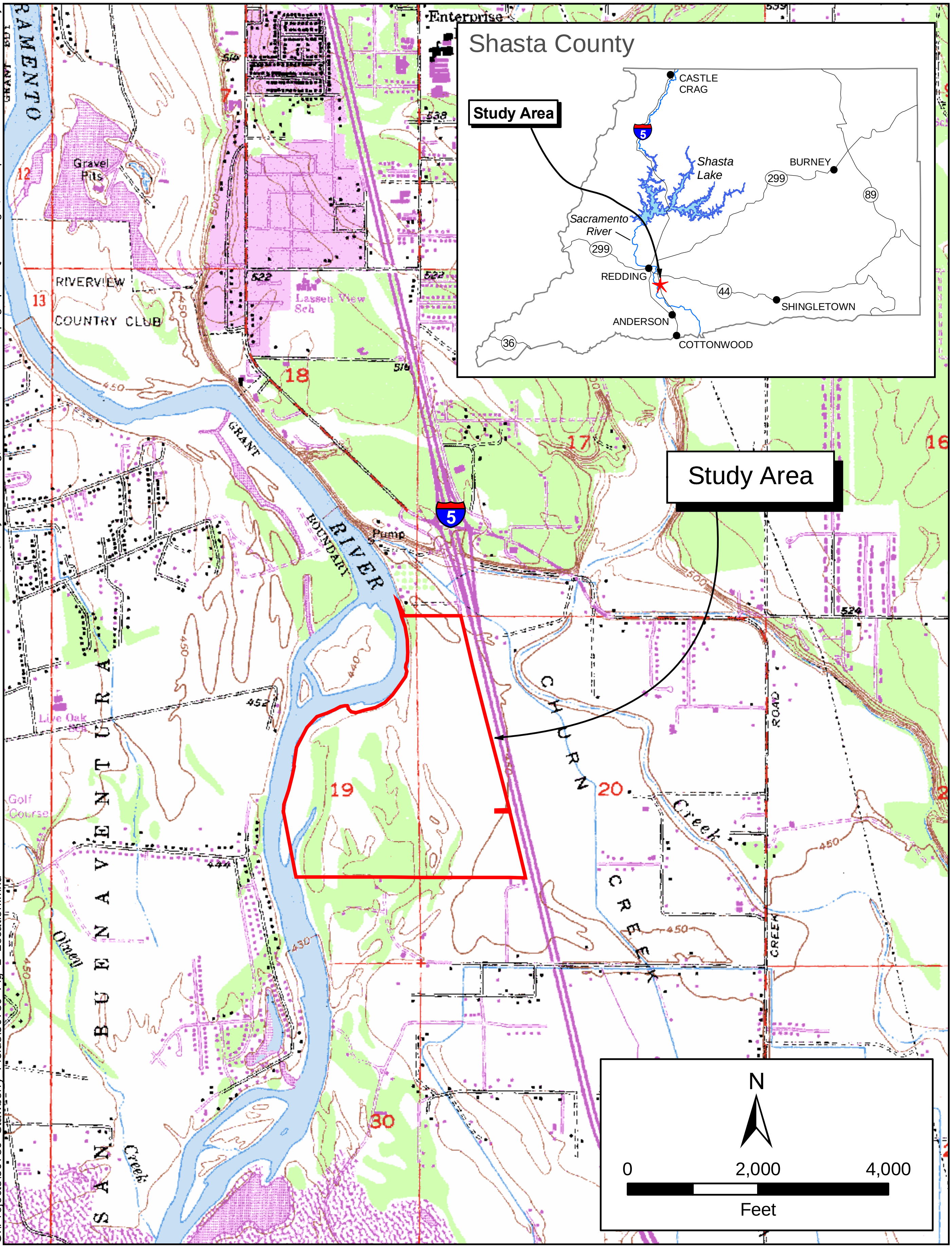
2. METHODS

2.1 Literature Review

For the purposes of this assessment, special-status plant species are defined as vascular plants that are: (1) listed as endangered or threatened under the federal Endangered Species Act (or formally proposed, or candidates, for listing); (2) listed as endangered or threatened under the California Endangered Species Act (or candidates for listing); and/or (3) listed as rare under the California Native Plant Protection Act. "Other" special-status plant species include those considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered in California and elsewhere (Lists 1B and 2).

Special-status fish and wildlife species include those that are: (1) designated as endangered or threatened by the state and/or federal governments (i.e., "listed species") under the California Endangered Species Act and/or federal Endangered Species Act, respectively; (2) proposed for federal listing status as endangered or threatened; and/or (3) designated as candidates for state or federal listing status as endangered or threatened. "Other" special-status fish and wildlife species are identified by the California Department of Fish and Game (CDFG) as California Fully Protected Species or California Species of Special Concern. For potentially occurring special-status wildlife resources, emphasis is on resident or breeding species rather than on seasonally occurring species.

Source: NSR, Inc; City of Redding; USGS 7.5-Minute Topographic Quadrangle, Enterprise 07-05-06 rjo
G:\Projects\50780_Stawberry_Fields\50780_Fig_1_Location.mxd



North State Resources, Inc.

Strawberry Fields Study Area

Figure 1
Study Area and Vicinity

Investigations into the occurrence and potential for occurrence of special-status plant and wildlife species in the study area included conducting: database searches; field reconnaissance and limited protocol-level surveys for special-status plant and wildlife species; and review of pertinent environmental documents and technical studies.

The *List of Endangered and Threatened Species That May Occur in, or be Affected by Projects in the Enterprise, California USGS quadrangle and Shasta County, California* (U.S. Fish and Wildlife Service 2007b) was reviewed for federally listed plant and wildlife species known to occur or suspected of occurring in the vicinity of the study area (Appendix A).

The California Natural Diversity Database (CNDDB) was reviewed for records of special-status plant and wildlife species in the *Enterprise, California* and eight surrounding USGS quadrangles (California Department of Fish and Game 2007a). The CNDDB is a database consisting of historical observations of special-status plant species, wildlife species, and special plant communities. It is limited to reported sightings and is not a comprehensive list of special-status plant and wildlife species that may occur in a particular area. A copy of the search results is included as Appendix B.

Another database search was performed from a query of the online *CNPS Inventory of Rare and Endangered Plants of California* (California Native Plant Society 2007). The query was conducted for documented special-status plant species occurrences in the *Enterprise, California* USGS quadrangle and the eight surrounding quadrangles. The results of this query are included as Appendix C.

Additionally, the following documents were reviewed: *Endangered and Threatened Animals of California* (California Department of Fish and Game 2006a), *Special Animals* (California Department of Fish and Game 2007b), *Endangered, Threatened, and Rare Plants of California* (California Department of Fish and Game 2006b), and *Special Vascular Plants, Bryophytes, and Lichens List* (California Department of Fish and Game 2006c).

2.2 FIELD REVIEW/SURVEYS

Botany

A pre-field botanical review of the study area was conducted in general accordance with *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (California Department of Fish and Game 2000) and *Botanical Survey Guidelines of the California Native Plant Society* (California Native Plant Society 2001a). Per botanical survey guidance, a target list of special-status plant species with the potential to occur within the study area was developed, in part, through a review of the previously mentioned environmental documents, technical studies, and databases. Local botanical expertise, herbarium database records, and regional floras were also used to develop a target list.

Prior to initiating field surveys, Mr. Colby J. Boggs, NSR botanist/plant ecologist, reviewed the habitat requirements and morphological features specific to each plant taxon on the target list. Protocol-level field surveys were conducted on April 25, May 3, May 9, and June 27, 2007. These dates coincide with the blooming/identifiable periods for all of the special-status plant species on the target list determined to have potential to occur within the study area. Field surveys were conducted

and all areas of the study area were viewed to the degree necessary to determine the presence/absence of special-status plant species and suitable habitat. All plant species detected within the study area were identified utilizing the nomenclature in *The Jepson Manual* (Hickman 1993).

Wildlife

Focused wildlife surveys were conducted for California red-legged frog (*Rana aurora draytonii*) and valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*). Ms. Ginger Bolen, NSR biologist conducted the California red-legged frog site assessment on August 17 and 20, and September 11, 2006, and May 7 and 10, 2007. Mr. Paul Kirk, NSR biologist conducted protocol-level VELB surveys on June 27, 28, and 29, and August 2, 2007.

2.2.1.1 ***California Red-Legged Frog Assessment***

A California Red-Legged frog site assessment was conducted using the guidelines set forth in *Revised Guidance on Site Assessments and Field Surveys for California Red-legged Frog* (U. S. Fish and Wildlife Service 2005). Information for the assessment was gathered through a combination of literature review, database searches, review of topographic mapping and aerial photography, and field visits to the site. The literature review identified the historic and current range of the California red-legged frog and provided information on specific habitat preferences of the species. The CNDDB records for Shasta County (California Department of Fish and Game 2007a) and the USFWS *Recovery Plan for the California Red-legged Frog* (U.S. Fish and Wildlife Service 2002) provided information regarding the known existing and historic populations of California red-legged frogs in the study area region.

A review of topographic mapping and aerial photography provided information regarding vegetation communities and land uses occurring near the study area. The study area and publicly accessible areas of the surrounding vicinity were characterized and evaluated for the presence of potentially suitable habitat for the California red-legged frog. A detailed California red-legged frog habitat assessment was prepared by NSR as a separate report (North State Resources 2007a).

2.2.1.2 ***Valley Longhorn Elderberry Beetle Survey***

Mr. Boggs, NSR botanist/plant ecologist conducted a reconnaissance level survey, noting the location of elderberry shrubs on an aerial map, as part of the botanical survey efforts in April and May 2007. Subsequently, Mr. Kirk, NSR biologist used the resulting aerial map to conduct the protocol-level VELB survey (U.S. Fish and Wildlife Service 1999) on June 27, June 28, and June 29, and August 2, 2007. The study area was surveyed on foot, and all areas were viewed to the degree necessary to locate all previously noted elderberry shrubs and to detect the presence of additional elderberry shrubs. Two elderberry shrubs in the southwest section of the study area were deeply embedded within Himalayan blackberry (*Rubus discolor*) brambles and were inaccessible for close inspection.

For each of the accessible elderberry shrubs, all stems measuring one inch or greater in diameter at ground level were counted, assessed for the presence of exit holes, and assigned to a size class (i.e., stems 1-3", 3-5", and >5"). For the few shrubs inaccessible for close inspection, binoculars were used to collect information to the greatest extent practicable. The vegetation community occurring in the immediate vicinity of all surveyed shrubs was recorded. The locations of all surveyed elderberry

shrubs were mapped using a Pathfinder Pro Global Positioning System (GPS) capable of sub-meter accuracy (NAD 27 projection). All spatial data were entered into a Geographic Information Systems (GIS) application and overlain onto a digital orthorectified aerial photograph.

3. RESULTS

3.1 General Setting

The study area is located on a level terrace with the general topography gently sloping west towards the Sacramento River. Elevations range from approximately 430 to 450 feet above mean sea level. The area has a Mediterranean climate with cool, wet winters and hot, dry summers. Average precipitation is approximately 25 to 35 inches per year and falls almost exclusively as rain between October and April. Mean January maximum temperature is 52° F and mean July maximum temperature is 95° F (Western Regional Climate Center 2006).

Vegetation and Associated Wildlife

The vegetation or habitat types present within the study area include riverine, annual grassland, valley oak woodland, and valley foothill riparian (Mayer and Laudenslayer 1988) as well as foothill pine (Sawyer and Keeler-Wolf 1995) as shown on Figure 2. Waters of the United States are present within these plant communities and are addressed briefly in Section 4. A description for each of these plant communities is provided below.

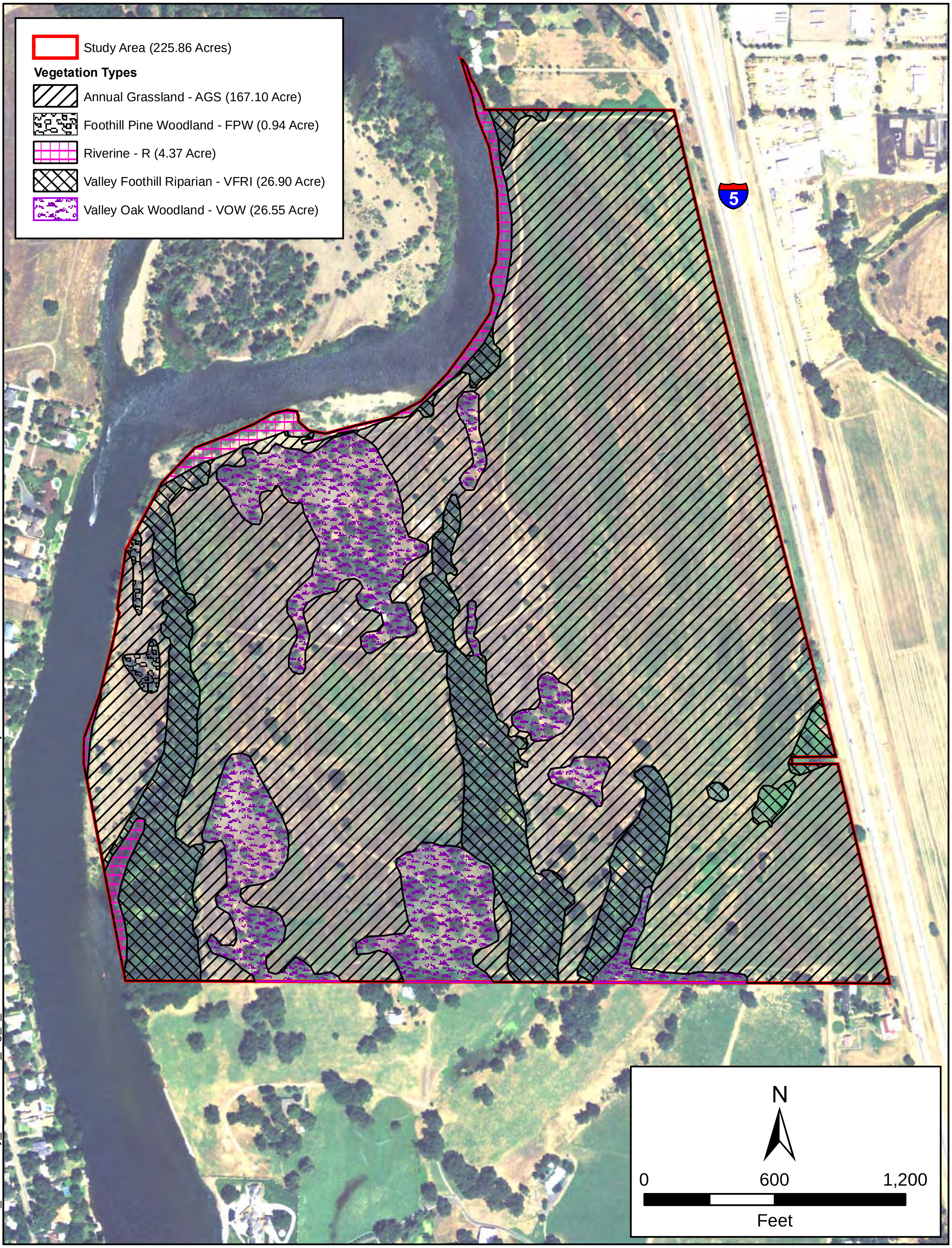
Riverine

Riverine habitat (4.37 acres) consists of the active channel and backwater area of the Sacramento River located along the western boundary of the study area. Riverine habitat is typically characterized by continually flowing water and boulder, cobble, gravel, and/or sand substrates. A dominant plant community within this habitat is absent due to the constant flow of water and movement of soil material (i.e., scour and deposition). However, seasonal fluctuations in water volume and velocity can allow the establishment of some vegetation along banks and on exposed gravel bars; most notably, primary successional species such as willows (*Salix* spp.).

Wildlife. The riverine habitat is suitable year-round for resident and anadromous fishes. Amphibians and reptiles expected to occur include the Pacific chorus frog (*Pseudacris regilla*), western toad (*Bufo boreas*), bullfrog (*Rana catesbeiana*), and northwestern pond turtle (*Clemmys marmorata marmorata*). In addition, birds such as the mallard (*Anas platyrhynchos*), great blue heron (*Ardea herodias*), osprey (*Pandion haliaetus*), and belted kingfisher (*Ceryle alcyon*) may forage here. Bats such as the little brown myotis (*Myotis lucifugus*), forage above this habitat during summer evenings.

Annual Grassland

Annual grassland habitat (167.10 acres) occurring within the study area is dominated by non-native annual grasses, and non-native annual and perennial herbaceous plants. This plant community occurs on all soil map units and the land type present on the site with minor differences in species composition based on location (e.g., greater abundance of native perennial species present on old gravel bar adjacent to the Sacramento River than on the terrace composed of moderately deep, sandy loam soil adjacent to I-5). Regardless of location, the dominant non-native grasses include European



50780_Strawberry_Fields\50780_Fig_2_WHR.mxd Source: NSR, Inc. 07-10-06 rjo

North State Resources, Inc.

Strawberry Fields Study Area

Figure 2
Vegetation Types

silver hairgrass (*Aira caryophyllea*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), medusahead (*Taeniatherum caput-medusae*) and rattail fescue (*Vulpia myuros*), and the dominant non-native herbaceous plants include black mustard (*Brassica nigra*), yellow star-thistle (*Centaurea solstitialis*), Spanish lotus (*Lotus purshianus*), and winter vetch (*Vicia villosa*). Native plant species include California poppy (*Eschscholzia californica*) and vinegar weed (*Trichostema lanceolatum*). Native plants occurring only on the gravel bar and on the Riverwash land type include showy milkweed (*Asclepias speciosa*), California brickellbush (*Brickellia californica*), yerba santa (*Eriodictyon californicum*), naked-stemmed buckwheat (*Eriogonum nudum*), Oregon false goldenaster (*Heterotheca oregana*), woolly-fruited lomatium (*Lomatium dasycarpum*), and silver bush lupine (*Lupinus albifrons*). Small stands of Himalayan blackberry (*Rubus discolor*) and narrowleaf willow (*Salix exigua*) as well as a few lone whiteleaf manzanita (*Arctostaphylos viscida*), foothill pine (*Pinus sabiniana*), valley oak (*Quercus lobata*), and blue elderberry (*Sambucus mexicana*) are found scattered throughout this habitat.

Wildlife. Annual grasslands are productive wildlife habitat. Grassland bird species, such as the mourning dove (*Zenaida macroura*), savannah sparrow (*Passerculus sandwichensis*), and white-crowned sparrow (*Zonotrichia leucophrys*) as well as rodents, including the California ground squirrel (*Spermophilus beecheyi)*, Botta's pocket gopher (*Thomomys bottae*), and deer mouse (*Peromyscus maniculatus*), forage on the seed crop this community provides. These species, in turn, attract predators such as the gopher snake (*Pituophis catenifer*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and coyote (*Canis latrans*). Other common grassland species include the western meadowlark (*Sturnella neglecta*) and black-tailed hare (*Lepus californicus*). Reptile species expected to occur here include the western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), western rattlesnake (*Crotalus viridis*), and yellow-bellied racer (*Coluber constrictor mormon*).

Valley Oak Woodland

Valley oak woodland habitat (26.55 acres) occurring within the study area is dominated by valley oak. Other tree species occurring in this plant community include Oregon ash (*Fraxinus latifolia*), foothill pine (*Pinus sabiniana*), and interior live oak (*Quercus wislizenii*). Shrubs are sparse in this habitat but include California coffeeberry (*Rhamnus californica*), Himalayan blackberry, and poison-oak (*Toxicodendron diversilobum*). The valley oak woodland habitat is an ecological extension of the annual grassland plant community with the only significant difference being the presence of a tree canopy with an approximate foliar cover of 50-60%. The grasses and herbaceous plants occurring in this habitat are similar to those present in the annual grassland plant community. Grasses and herbaceous plants present in the valley oak woodland habitat include European silver hairgrass, slender oat (*Avena barbata*), black mustard, ripgut brome, soft chess, yellow star-thistle, California poppy, and rattail fescue. Plant species occurring only under the canopy of valley oak include goose grass (*Galium aparine*) and hare barley (*Hordeum murinum* ssp. *leporinum*).

Wildlife. The valley oak woodland provides food and cover for a variety birds including red-shouldered hawk (*Buteo lineatus*), California quail (*Callipepla californica*), acorn woodpecker (*Melanerpes formicivorus*), western scrub-jay (*Aphelocoma californica*), and great horned owl (*Bubo

virginianus). Other common animals include black-tailed deer (*Odocoileus hemionus*), opossum (*Didelphis virginianus*), California ground squirrel, and western fence lizard.

<u>Valley Foothill Riparian</u>

Valley foothill riparian habitat (26.90 acres) occurring within the study area is dominated by tree-of-heaven (*Ailanthus altissima*), California black walnut (*Juglans californica*), Fremont cottonwood (*Populus fremontii*), valley oak, and black locust (*Robinia pseudoacacia*). Other trees present in this plant community include white alder (*Alnus rhombifolia*), Oregon ash, mulberry (*Morus alba*), foothill pine, and interior live oak. Shrubs and vines form an understory layer in the valley foothill riparian habitat with an approximate foliar cover of 90-100% in some areas and includes oleander (*Nerium oleander*), California coffeeberry, Himalayan blackberry, narrowleaf willow, arroyo willow (*Salix lasiolepis*), blue elderberry, and California wild grape (*Vitis californica*). Accordingly, grasses and herbaceous plants occurring in this plant community exhibit low percent cover in the understory layer. However, these plants are present and include California pipevine (*Aristolochia californica*), mugwort (*Artemisia douglasiana*), Santa Barbara sedge (*Carex barbarae*), and goose grass.

Wildlife. Riparian communities are among the most important habitats for wildlife because of their high floristic and structural diversity, high biomass (and therefore high food abundance), and high water availability. In addition to providing breeding, foraging, and roosting habitat for a diverse array of animals, riparian communities provide movement corridors for some species, connecting a variety of habitats throughout a region.

The leaf litter, fallen tree branches, and logs associated with the riparian community in the study area provide cover for the western toad and Pacific chorus frog. The western fence lizard, western skink, and southern alligator lizard (*Elgaria multicarinata webbi*) are also expected to occur here, as are several snake species, including the western rattlesnake, yellow-bellied racer, and common kingsnake (*Lampropeltis getulus*).

The willows in the riparian community attract a number of bird species. Many of these species are year-round residents, breeding in the riparian community in the spring and summer and using it for cover and foraging habitat during the non-breeding season. Common species nesting and foraging, primarily in the riparian tree canopy, include the bushtit (*Psaltriparus minimus*), white-breasted nuthatch (*Sitta carolinensis*), and Nuttall's and downy woodpeckers (*Picoides nuttallii* and *Picoides pubescens*, respectively). Other resident species, such as the spotted towhee (*Pipilo maculatus*) and song sparrow (*Melospiza melodia*), nest and forage on or very close to the ground, usually in dense vegetation. Several species of raptors, including the Cooper's hawk (*Accipiter cooperii*) and western screech owl (*Otus kennicottii*), nest in riparian communities and remain there year-round.

In addition to the permanent residents, numerous species of neotropical migrants occur in this community from spring through fall, with many potentially breeding on the site, including the ash-throated flycatcher (*Myiarchus cinerascens*), olive-sided flycatcher (*Contopus cooperi*), western wood-pewee (*Contopus sordidulus*), warbling vireo (*Vireo gilvus*), Swainson's thrush (*Catharus ustulatus*) and black-headed grosbeak (*Pheucticus melanoleucus*).

A variety of mammals also occurs in riparian communities. Small mammals, such as the Botta's pocket gopher, and deer mouse, may burrow or find refuge in dense grass or brushy thickets. Mule

deer frequently use riparian habitats, and predators, such as the raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*) and coyote, are attracted to riparian areas by the abundance of prey and cover. In addition, the taller trees provide daytime roosts for nocturnal species such as the raccoon and Virginia opossum.

Foothill Pine Woodland

The foothill pine woodland plant community (0.94 acre) occurs on an old gravel bar adjacent to the Sacramento River in the western portion of the study area and is dominated by foothill pine. Other tree species occurring in this plant community include valley oak and interior live oak. Shrubs are sparse in this habitat but include whiteleaf manzanita, Himalayan blackberry, and poison-oak. The foothill pine woodland habitat is an ecological extension of the annual grassland plant community with the only significant difference being the presence of a tree canopy with an approximate foliar cover of 50-60%. The grasses and herbaceous plants occurring in this habitat are similar to those present in the annual grassland and valley oak woodland plant communities. Grasses and herbaceous plants present in the foothill pine woodland habitat include European silver hairgrass, California brickellbush, ripgut brome, soft chess, yellow star-thistle, naked-stemmed buckwheat, California poppy, and rattail fescue.

Wildlife. The foothill pine woodland community is small inclusion within the annual grassland on the gravel bar between the river and a strip of valley foothill woodland. The wildlife species expected in this community would be a subset of those found in the annual grassland and valley foothill woodland habitats.

Soils

The *Soil Survey of Shasta County Area, California* (U.S. Department of Agriculture and Soil Conservation Service 1974) identifies five soil map units and one land type within the study area:

- ***CcA – Churn loam, 0 to 3% slopes***. The Churn series consists of well-drained and moderately well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically light yellowish-brown, medium acid gravelly loam about nine inches thick. The subgroup taxonomy for the Churn series is *Ultic Haploxeralfs*. The Churn loam soil unit is well-drained and has moderately slow permeability. Runoff is slow, and the hazard of erosion is none to slight for this soil unit. The Churn loam soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands associated with drainageways (USDA Soil Conservation Service 1992).

- ***CeA – Churn gravelly loam, 0 to 3% slopes.*** The Churn series consists of well-drained and moderately well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically light yellowish-brown, medium acid gravelly loam about nine inches thick. The subgroup taxonomy for the Churn series is *Ultic Haploxeralfs*. The Churn gravelly loam soil unit is well-drained and has moderately slow permeability. Runoff is slow, and the hazard of erosion is none to slight for this soil unit. The Churn gravelly loam soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands associated with drainageways (USDA Soil Conservation Service 1992).

- ***RgA – Reiff fine sandy loam, 0 to 3% slopes.*** The Reiff series consists of well-drained and moderately well-drained soils that formed in recent alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically grayish-brown and brown, slightly acid fine sandy loam about 18 inches thick. The subgroup taxonomy for the Reiff series is *Typic Xerorthents*. The Reiff fine sandy loam soil unit is well-drained and has moderately rapid permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Reiff fine sandy loam soil map unit is classified as non-hydric (USDA Soil Conservation Service 1992).

- ***Rw – Riverwash.*** The Riverwash land type is excessively drained and is associated with stream channels and adjacent areas subject to continuous or frequent flooding (U.S. Department of Agriculture and Soil Conservation Service 1974). Permeability is rapid, runoff is very slow, and the hazard of erosion is very high for this land type. Binomial subgroup taxonomy does not apply to land types. The Riverwash land type is classified as hydric and is associated with floodplain channels (USDA Soil Conservation Service 1992).

- ***TbA – Tehama loam, 0 to 3% slopes.*** The Tehama series consists of well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is pale brown, medium acid and slightly acid loam about 30 inches thick. The subgroup taxonomy for the Tehama series is *Typic Haploxeralfs*. The Tehama loam soil unit is well-drained and has slow permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Tehama loam soil map unit is classified as non-hydric with hydric inclusions in the form of unnamed ponded features associated with depressions (USDA Soil Conservation Service 1992).

- ***TfA – Tujunga loamy sand, 0 to 3% slopes.*** The Tujunga series consists of somewhat excessively drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically pale brown, slightly acid loamy sand about 14 inches thick. The subgroup taxonomy for the Tujunga series is *Typic Xeropsamments*. The Tujunga loamy sand soil unit is somewhat excessively drained and has rapid permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Tujunga loamy sand soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands and riverwash associated with drainageways and floodplain channels, respectively (USDA Soil Conservation Service 1992).

Waters of the U.S.

NSR conducted a delineation of waters of the United States in accordance with U.S. Army Corps of Engineers (USACE) methodology and regulatory guidance letters within the study area on June 15, June 16, and June 21, 2006. A total of 4.419 acres of waters of the United States features were delineated within the study area that includes seasonal wetland (0.029 acre), riverine/perennial stream (4.366 acres), and intermittent stream (0.024 acre, 149 linear feet) habitat. A separate report was prepared by NSR on April 19, 2007 (North State Resources 2007b).

3.2 REGIONAL SPECIES OF CONCERN

Vegetation or habitat types found in the study area region potentially support special-status plant and wildlife species (Appendix D). Appendix D provides a general comparison of habitat requirements for each species and the general habitats present in the study area. Some of the special-status plants

and animals occurring near the study area are found in habitat types that are not present on-site, such as vernal pools. Therefore, these species are not considered in further detail as part of this assessment. For those species for which generally suitable habitat was determined to be present with the study area, the results of the reconnaissance-level survey were used to determine the likelihood of their presence on the site (Tables 1 and 2).

Special-Status Plant Species

Fourteen special-status vascular plant species were initially considered for analysis (Appendix D). Based upon geographic location, local botanical knowledge, and habitat parameters present within the study area, suitable habitat for four special-status plants was determined to occur in the study area (Table 1).

Table 1. Special-Status Plant Species Potentially Occurring in the Study Area

Common Name (*Scientific Name*)	Status[1] (FED/ST /CNPS)	General Habitat Description / Elevation Range	Typical Blooming Period	Comments
Fox sedge *Carex vulpinoidea*	--/--/2.2	Freshwater marshes and swamps, and riparian woodland / 98-3,937 feet	May-June	**Surveys negative, presumed absent.** Suitable habitat occurs within the seasonal wetland in the southwest portion of the study area.
Silky cryptantha *Cryptantha crinita*	--/--/1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland / 278-984 feet	April-May	**Surveys negative, presumed absent.** Suitable habitat occurs within gravelly substrate present on gravel bars and old channels.
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	--/--/1B.1	Meadows and seeps, vernal pools; vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland / 115-3,346 feet	March-May	**Surveys negative, presumed absent.** Suitable habitat occurs within the ponded area in the northeast corner of the study area.
Ahart's paronychia *Paronychia ahartii*	--/--/1B.1	Cismontane woodland, valley and foothill grassland and vernal pools / 90-1,530 feet	March-June	**Surveys negative, presumed absent.** Suitable habitat occurs within valley oak woodland and foothill grassland on the study area.

Status Codes[1]:

FED = Federal	CNPS = California Native Plant Society
ST = State	CNPS Codes:
Federal & State Codes:	List 1B = Rare, Threatened or Endangered in CA and Elsewhere;
E = Endangered; T = Threatened	List 2 = Rare, Threatened or Endangered in CA, but more common elsewhere

Special-Status Wildlife Species

Sixty five (65) special-status wildlife species were initially considered for analysis (Appendix D). Based upon location and habitat parameters, twenty-nine (29) special-status wildlife species were identified as having the potential to occur in the study area. Table 2 presents a list of these species and their likelihood of occurrence. Special-status designation and general habitat requirements for each species are provided in the table. Conclusions presented in this table are based on the

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	**Status[1] (Fed/State)**	**General Habitat Description**	**Comments**
Federal or State Listed Species			
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs associated with riparian forests that occur along rivers and streams.	**Present.** Protocol level surveys detected VELB exit holes on numerous 12 elderberry shrubs.
Green sturgeon, southern DPS *Acipenser medirostris*	T/SC	Spawn in Sacramento and Feather rivers; juveniles are thought to rear mainly in the estuary. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock. Spawn in the mainstem Sacramento River when temperatures range between 46-60 °F.	**Present**. Known to occur in the Sacramento River throughout all accessible reaches upstream at least to Anderson-Cottonwood Irrigation District dam near Redding, California.
Steelhead, California Central Valley DPS *Oncorhynchus mykiss* Critical Habitat	T/--	Spawn and rear in freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**. Occur in the mainstem Sacramento River and tributary streams. Adults migrate upstream during the fall/winter and spawn from winter to early spring. Juveniles rear in natal areas for 1-2 years before migrating to the ocean. Suitable spawning and rearing habitat exists in the Sacramento River.
Central Valley spring-run ESU Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat Essential Fish Habitat	T/T	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present.** Occur in the mainstem Sacramento River and its major perennial tributary streams. Adults migrate upstream during the spring and spawn from mid-August to mid-October. Suitable spawning and rearing habitat exists in the Sacramento River.
Sacramento River winter-run ESU Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat Essential Fish Habitat	E/E	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present**. Occur in the mainstem Sacramento River. Adults migrate upstream during the winter and spawn from mid-April to August. Suitable spawning and rearing habitat exists in the Sacramento River.
California red-legged frog *Rana aurora draytonii*	T/SC	Require aquatic habitat for breeding, also uses a variety of other habitat types including riparian and upland areas. Adults utilize dense, shrubby or emergent vegetation associated with deep-water pools with fringes of cattails & dense stands of overhanging vegetation.	**Absent.** Protocol level surveys did not detect this species (North State Resources 2007a).

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/--	Nesting habitat is cottonwood/willow riparian forest. Occurs only along the upper Sacramento Valley portion of the Sacramento River, the Feather River in Sutter Co., the south fork of the Kern River in Kern Co., and along the Santa Ana, Amargosa, and lower Colorado rivers	**Absent.** Presently there are no known breeding pairs along the Sacramento River north of Red Bluff, CA. The site does not have sufficiently dense riparian forest to support breeding.
Bald eagle *Haliaeetus leucocephalus*	T/E	Forages on live and dead fish and nests in large trees or snags. Requires large bodies of water, including ocean shorelines, lake margins, and large, open river courses for foraging, nesting, and wintering habitat.	**Present**. Incidental observations of eagles foraging over the site. No nests reported or observed on the site.
Bank swallow *Riparia riparia*	--/T	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	**Present**. Bank swallows and colony of nests observed on cut-bank of Sacramento River.
Other Special-Status Species			
River lamprey *(Lampetra ayresii)*	--/SC	The biology of river lampreys has not been studied in California, general habitat and life history thought to be similar to Pacific lamprey.	**Present**. Occur in the mainstem Sacramento River and tributary streams.
Central Valley fall/late-fall run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Essential Fish Habitat	--/SC	Freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**. Occur in the mainstem Sacramento River and tributary streams. Adults migrate upstream during the fall and spawn from mid-October to February. Suitable spawning and rearing habitat exists in the Sacramento River.
Hardhead (*Mylopharodon conocephalus*)	--/SC	Quiet deep pools of large, warm, clear streams over rocks or sand.	**Present**. Occur in the mainstem Sacramento River and tributary streams.
Western spadefoot toad *Spea hammondii*	--/SC	Grasslands with temporary pools.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SC	Slow water aquatic habitat with available basking sites. Hatchlings require shallow water with dense submergent or short emergent vegetation. Require an upland oviposition site in the vicinity of the aquatic site	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Double-crested cormorant *Phalacrocorax auritus*	--/SC	Inland lakes; fresh, salt and estuarine waters.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	**Status[1] (Fed/State)**	**General Habitat Description**	**Comments**
Merlin *Falco columbarius*	--/SC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Western burrowing owl *Athene cunicularia hypugaea*	--/SC	Open habitats, dry grasslands and ruderal habitats with ground squirrel burrows.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Sharp-shinned hawk *Accipiter striatus*	--/SC	Typically nests in dense conifer stands near water, winters in woodlands. Forages in many habitats in winter and migration.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Cooper's hawk *Accipiter cooperii*	--/SC	Nests in woodlands, forages in many habitats in winter and migration.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Ferruginous hawk *Buteo regalis*	--/SC	Forages in grasslands and occasionally in other open habitats during migration and winter.	**May be present as rare migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Prairie falcon *Falco mexicanus*	--/SC	Occurs in open habitats such as grasslands, desert scrub, rangelands and croplands. Nests on open cliffs.	**May be present as rare migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
White-tailed kite *Elanus leucurus*	--/FP	Nests in lowlands with dense oak or riparian stands near open areas, forages over grassland, meadows, cropland and marshes.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Osprey *Pandion haliaetus*	--/SC	Ocean shorelines, lake margins and large, open river courses for both nesting and wintering habitat.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
California yellow warbler *Dendroica petechia brewsteri*	--/SC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Yellow-breasted chat *Icteria virens*	--/SC	Breeds in riparian habitats having dense understory vegetation, such as willow and blackberry.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Loggerhead shrike *Lanius ludovicianus*	--/SC	Prefers open habitats with scatters shrubs and trees throughout the Central Valley of California. Nests in shrubs and trees.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Ringtail *Bassariscus astutus*	--/FP	Riparian habitats and in brush stands of most forest and shrub habitats. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows or woodrat nests.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Pallid bat *Antrozous pallidus*	--/SC	Forages over many habitats; roosts in buildings, large oaks or redwoods, rocky outcrops and rocky crevices in mines and caves, and under bridges. Roosts must protect from high temperatures	**May be present as forager**. Site does not contain suitable breeding roosts.

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Western mastiff bat *Eumops perotis*	--/SC	Roosts in cliff faces, rock outcrops, and buildings. Forages in open habitats. Needs vertical face to take flight.	**May be present as forager**. Site does not contain suitable breeding roosts.

[1]Status Codes:

Federal and State Codes: E = Endangered; T = Threatened; SC = Species of Special Concern: FP = Fully Protected

knowledge of local professional biologists and historic survey information. All special-status wildlife species potentially breeding in the study area are discussed in detail below. A list of all wildlife species observed is presented in Appendix E.

3.3 Detailed Evaluation of Special-Status Plant Species

No federal or state listed plant species have the potential to occur within the study area. There were four other special-status plant species determined to have the potential to occur in the study area: fox sedge (*Carex vulpinoidea*), silky cryptantha (*Cryptantha crinita*), Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*), and Ahart's paronychia (*Paronychia ahartii*). The status, habitat parameters, geographic distribution, and rationale for potential to occur on the site for each of these plant taxa is discussed below.

Fox sedge (*Carex vulpinoidea*). Federal Status: None; State Status: None; CNPS Status: List 2.2. This species is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in California, but more common elsewhere."

Fox sedge is a tufted perennial in the sedge family (Cyperaceae). This species is known to occur in freshwater marshes and swamps and in riparian woodlands (California Native Plant Society 2001b). Fox sedge typically occurs at elevations between 98 and 3,937 feet above mean sea level and the blooming period is generally from May to June. Past experience specific to fox sedge in the Redding area has indicated that the optimal window of opportunity to observe this species occurs in late May.

Fox sedge is known to occur in the Inner North Coast Ranges, Cascade Range, and northern Sacramento Valley within Butte, Glenn, Shasta, Siskiyou, and Tehama counties (California Native Plant Society 2006; Tibor 2001). CNDDB records indicate that there is one occurrence of this species within five miles of the study area (California Department of Fish and Game 2007a).

Areas of potentially suitable habitat include the open water features located in the central and southern portions of the study area as well as the seasonal wetland in the southwest portion of the study area. These features have habitat and hydrology parameters, such as typical riparian plant species associates and duration of inundation and/or soil saturation, respectively, that qualify as sufficient to represent characteristic microhabitat attributes for fox sedge. Therefore, this species remained a target species for protocol-level botanical survey.

Silky Cryptantha (*Cryptantha crinita*). Federal Status: None; State Status: None; CNPS Status: List 1B. This species is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Silky cryptantha is a small, annual in the borage family (Boraginaceae). This species is known to occur on sand and gravel deposits associated with intermittent and, occasionally, perennial streams (Nakamura and Nelson 2001) within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland from elevations between 278 and 984 feet above mean sea level (Tibor 2001). Silky cryptantha typically occurs below 1,000 feet in elevation and the blooming period is generally from April to May (Nakamura and Nelson 2001). Past

experience specific to silky cryptantha in the Redding area has indicated that the optimal window of opportunity to observe this species in bloom occurs between late April and mid-May.

Silky cryptantha is restricted to the interior regions of northern California and is known to occur in the northern Sacramento Valley within Shasta and Tehama counties (Nakamura and Nelson 2001). CNDDB records indicate that there are three occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

An area of potentially suitable habitat includes the gravel bar found along the Sacramento River along the western boundary of the site. Therefore, this species remained a target species for botanical survey efforts due to the presence of the gravel bar along the river, and attributes thereof, considered to have the potential to support populations of silky cryptantha.

Red Bluff Dwarf Rush (*Juncus leiospermus* var. *leiospermus*). Federal Status: None; State Status: None; CNPS Status: List 1B. This plant taxon is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be “Rare, Threatened or Endangered in CA and Elsewhere.”

Red Bluff dwarf rush is a small, reddish grass-like annual in the rush family (Juncaceae). This plant taxon is known to occur in a variety of seasonally moist habitats that include meadows and seeps, vernal pools, and vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland from elevations between 115 and 3,350 feet above mean sea level . It is often found in small, sparsely vegetated micro-habitats (e.g., tire ruts, gopher mounds). Red Bluff dwarf rush typically occurs between 200 and 1,000 feet in elevation and the blooming period is typically from April to early June (Nakamura and Nelson 2001). Past experience specific to Red Bluff dwarf rush in the Redding area has indicated that the optimal window of opportunity to observe this plant taxon in bloom occurs between late April and mid-May.

Red Bluff dwarf rush is restricted to the interior regions of northern California and is known to occur in the northern Sacramento Valley and surrounding foothills of the Cascade Range within Butte, Shasta, and Tehama counties (California Native Plant Society 2001b; Nakamura and Nelson 2001). Disjunct populations of Red Bluff dwarf rush also occur in the northeast corner of Shasta County and southern Lassen County. CNDDB records indicate that there are twelve occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

An area of potential habitat includes the ponded area in the northeast corner of the study area This area remains mesic due to seepage from the Anderson Cottonwood Irrigation District canal. An unpaved road in this mesic area contains relatively unvegetated zones which represent characteristic microhabitat attributes for Red Bluff dwarf rush. Therefore, this taxon remained a target taxon for botanical survey efforts due to the presence of seasonally ponded features, and attributes thereof, considered to have the potential to support populations of Red Bluff dwarf rush.

Ahart’s paronychia (*Paronychia ahartii*). Federal Status: None; State Status: None; CNPS Status: List 1B. This plant taxon is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be “Rare, Threatened or Endangered in CA and Elsewhere.”

Ahart's paronychia is a small, inconspicuous annual in the carnation family (Caryophyllaceae). This plant taxon grows in cismontane woodland, and valley and foothill grassland from elevations between 90 and 1,530 feet above mean sea level. It is endemic to California and is threatened by habitat loss. Regionally, it is found in slightly wet areas that are sparsely vegetated.

CNDDB records that regional occurrences of this species indicate that there are no occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

3.4 Detailed Evaluation of Special-Status Wildlife Species

Federal or State Listed Wildlife Species

Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*). Federal Status: Threatened; State Status: None. The USFWS formally listed the VELB as *threatened* on August 8, 1980 (45 FR 52803 52807). Critical Habitat was also designated at this time (45 FR 52803 52807). Changed land use in the riverside habitats to which it is restricted is the primary threat to this beetle.

The VELB is an insect endemic to the foothills and Central Valley of California. It inhabits riparian and associated upland habitats where elderberry (*Sambucus* spp.), its host plant, grows. Specifically, its range extends throughout the Central Valley and adjacent foothills up to the 3,000 foot elevation level to the east and the Central Valley watershed to the west (U.S. Fish and Wildlife Service 1999). VELB habitat consists of riparian forests whose dominant plant species include cottonwood (*Populus* spp.), sycamore (*Platanus* spp.), valley oak (*Quercus lobata*.), and willow (*Salix* spp.), with an understory of elderberry shrubs (U.S. Fish and Wildlife Service 1991). Elderberry shrubs with a basal stem diameters larger than 1 inch are considered by the USFWS as suitable VELB habitat (U.S. Fish and Wildlife Service 1999).

The VELB life cycle is intimately connected to its habitat, elderberry shrubs. Following mating, the female lays her eggs in crevices in the elderberry bark. Upon hatching (after about 10 days), the larvae bore into the pith of the shrub and feed inside stems larger than 1 inch in diameter for 1 to 2 years until they mature. They emerge as adults during the spring via exit holes chewed through the bark. The adult beetles feed on the elderberry foliage until they mate, completing the cycle. Adults are active from March to June.

The study area has large areas of riparian forest containing elderberry shrubs and CNDDB records indicate an occurrence of VELB within five miles of the site.

Green Sturgeon, Southern DPS (*Acipenser medirostris*). Federal Status: Threatened; State Status: Species of Special Concern.

Relatively little is known about green sturgeon in the Sacramento River compared to its relative the white sturgeon (*Acipenser transmontanus*). Adult green sturgeon generally migrate into rivers between late-February and late-July. Spawning takes place in deep, fast water from March to July when water temperatures range from 46 °F to 60 °F. Juveniles may rear in the river for 1 to 3 years before migrating to the estuary, primarily during the summer and fall. Once in the estuary young sturgeon adopt an oceanic foraging habit, which may last from 3 to 13 years before returning for their first spawning season (Moyle 2002).

Green sturgeon use streams, rivers, and estuarine habitat as well as marine waters during their life cycle. Like the white sturgeon, green sturgeon prefer to spawn in lower to middle reaches of large rivers with swift currents and large cobble; no nest is built, adults broadcast spawn into the water column. The fertilized eggs sink and attach to the bottom to hatch. Research indicates that water flow is one of the key determinants of larval survival (Moyle 2002).

In the final determination to list the southern DPS as threatened under FESA, NMFS identified the reduction of available spawning habitat due to construction of barriers along the Sacramento and Feather rivers as being the principal threat to green sturgeon in the southern DPS (71 FR 17757). Other threats include, but are not limited to, insufficient flow rates, increased water temperature, water diversion, non-native species, poaching, pesticide and heavy metal contamination, and local fishing.

California Central Valley DPS Steelhead *(Onchorynchus mykiss)* Federal Status: Threatened; State Status: None.

Steelhead possess one of the most complex life history patterns of the Pacific salmonid species. Steelhead typically refers to the anadromous form of rainbow trout. Similar to other Pacific salmon, steelhead adults spawn in freshwater and spend a part of their life history at sea. However, unlike Chinook salmon, steelhead exhibit a variety of life history strategies during their freshwater rearing period and as adults may spawn more than once during their life. The typical life history pattern for steelhead is to rear in freshwater streams for two years followed by up to two or three years of residency in the marine environment. However, juvenile steelhead may rear in freshwater from one to four years (Busby et al. 1997; Moyle 2002).

Steelhead populations inhabiting the upper Sacramento River basin belong to the Central Valley steelhead DPS as defined by Good et al. (1997). These steelhead populations generally exhibit a life history pattern typical of a fall/winter run. This species historically has provided a popular sport fishery throughout the Sacramento River and its tributaries; however, at present naturally-produced steelhead remain at relatively low levels throughout their range in the Central Valley (Hallock 1989; McEwan 2001).

Steelhead adults may enter the Sacramento River and its tributaries from August through March, but peak migration generally occurs from October through February. Spawning begins in late December and can extend into early-April. Steelhead spawn in gravel and small cobble substrates usually associated with riffle and run habitat types. The upper mainstem Sacramento River is known to provide suitable spawning and juvenile rearing habitat for steelhead. The Sacramento River in the vicinity of the project may be used by steelhead during all life stages, including spawning and egg incubation.

Critical habitat designations for listed anadromous salmonids published in September 2005 (70 FR 52488) were finalized as part of the recent status reviews and are restricted to the species' anadromous range, which is coextensive with the steelhead-only DPS delineations described in that notice (71 FR 834). Designated critical habitat for Central Valley steelhead DPS includes all river reaches accessible to steelhead in the Sacramento and San Joaquin rivers and their tributaries, which includes the Sacramento River adjacent to the action area.

Central Valley Spring-run Chinook Salmon ESU *(Onchorynchus tshawytscha* Federal Status: Threatened; State Status: Threatened.

Spring-run Chinook salmon migrate upstream during the spring beginning in March, hold over in deep pools of the mainstem river and its large perennial tributaries, where fish can access cold headwaters, during the summer months, and spawn from mid-August through mid-October. Most of the spring run in the Sacramento River Basin ascend and spawn in the principal tributary streams (Mill, Deer, Clear, and Butte creeks, and the Feather River). Egg incubation occurs from mid-August through mid-January. Spring-run in the Sacramento River exhibit an ocean-type life history, emigrating as fry, sub-yearlings, and yearlings. Based on observations at Red Bluff Diversion Dam, spring-run emigration from the upper Sacramento River typically occurs from November through April (Vogel and Marine 1991; (Johnson, Weigand, and Fisher 1992)). Although some spring-run salmon may spawn in the Sacramento River between Red Bluff and Keswick Dam, it is thought that most have hybridized with fall-run salmon due to overlapping spawning periods, lack of spatial separation, and redd superimposition (California Department of Fish and Game 1998).

Central Valley spring-run ESU Chinook salmon populations in the Sacramento River and its tributaries have remained relatively depressed; however, some modest increases have occurred in their principal spawning tributaries such as Deer, Mill, and Butte Creeks (California Department of Fish and Game 2004). Spring-run Chinook salmon spawning in the mainstem Sacramento River and nearby tributaries such as Clear Creek and Battle Creek remain relatively depressed (California Department of Fish and Game 2004).

Designated critical habitat for Central Valley spring-run Chinook salmon includes the San Francisco Bay-Delta estuary, mainstem Sacramento River upstream to Keswick Dam and most of the Sacramento Valley's perennial tributaries with established spring salmon runs, including the Feather River and Feather River Hatchery. Designated critical habitat for Central Valley spring-run Chinook salmon includes all river reaches accessible to the species in the Sacramento and San Joaquin Rivers and their tributaries in California, which includes the Sacramento River adjacent to the property.

Sacramento River Winter-run Chinook Salmon ESU *(Onchorynchus tshawytscha)*. Federal Status: Endangered; State Status: Endangered.

Historically, winter-run Chinook salmon spawned in the cold spring-fed headwaters of the upper Sacramento, Pit, McCloud, and Calaveras rivers (U.S. Fish and Wildlife Service 1995). Following construction of Shasta Dam, deep water releases during the summer months provided suitable cold water conditions for winter-run Chinook salmon spawning and rearing downstream of the dam. In response to these conditions, which increased total coldwater spawning habitat available to the winter run, the population increased. In 1969, the winter run exceeded 100,000 salmon; however, during the early 1990's, run size estimates have ranged from about 1,400 fish to as low as about 200 fish in some years. The Sacramento River winter-run Chinook salmon population has exhibited a continuing recovery from the extremely low adult returns observed in the early 1990's. Recent spawning populations range from about 7,000 to 8,000 (California Department of Fish and Game 2004); however, these levels remain well below draft recovery goals established for this run (National Marine Fisheries Service 2004).

Winter-run Chinook salmon begin their migration up the Sacramento River in December and may spawn from mid-April through mid-August with a peak in spawning occurring from late May through June (Vogel and Marine 1991; Moyle 2002). Winter-run Chinook salmon spawning and juvenile rearing areas include the river reach adjacent to the project site (D. Killam, CDFG, unpublished data).

The egg incubation period extends from mid-April through mid-September. Juvenile winter-run Chinook salmon are known to rear in suitable habitats of the upper Sacramento River, including that adjacent to the project site.

The critical habitat designation includes the Sacramento-San Joaquin Delta and the Sacramento River, within all accessible reaches, including that reach adjacent to the action area. Constituent elements of anadromous salmonid critical habitat is considered to include seasonal timing and volume of stream flows sufficient to allow the fish to migrate, reproduce and rear; suitable streambed and bank conditions to support spawning, incubation, and larval development; suitable water quantity and quality and floodplain connectivity to form and maintain physical habitat to support juvenile development, growth, and mobility; natural cover such as shade, submerged and overhanging vegetation and large wood, log jams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; and finally, freshwater migration corridors free of obstruction with water quantities and quality and natural cover that support juvenile and adult fish migration and survival (69 FR 71880).

California Red-legged Frog (*Rana aurora draytonii*). Federal Status: Threatened; State Status: Species of Special Concern. The California red-legged frog inhabits quiet pools of streams, marshes, and ponds. All life history stages are most likely to be encountered in and around breeding sites, which include coastal lagoons, marshes, springs, permanent and semi permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. This species breeds from March to July; females lay 750 to 4000 eggs in clusters, attached to vegetation 7 to 15 cm (2 to 6 in) below the water surface. Juveniles can occur in slow moving, shallow riffle zones in creeks or along the margins of ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation (Zeiner, Laudenslayer, and Mayer 1989)

The historic range of the California red-legged frog extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, and inland from the vicinity of Redding, Shasta County, southward to northwestern Baja California, Mexico. The species has lost approximately 70 percent of its former range; California red-legged frogs are locally abundant in the San Francisco Bay area and the central coast, but only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges (50 CFR Part 17 14626).

NSR staff conducted a USFWS protocol-level site assessment for California red-legged frog, and produced a separate detailed report (North State Resources 2007a). NSR staff did not observe any California red-legged frogs during the USFWS protocol-level surveys, but did conclude that the seasonal pond in the central region of the site provides suitable breeding habitat. The nearest known records of California red-legged frog are from Thomes Creek and Sunflower Gulch on Red Bank Creek, approximately 33 miles south southwest of the project site.

Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*). Federal Status: Candidate; State Status: Endangered. The western yellow-billed cuckoo is a federal candidate for listing. It is generally considered a neotropical migrant that arrives in California to begin breeding in June.

In northern California it prefers riparian forests, containing willow (*Salix* spp.) and Fremont cottonwood (*Populus fremontii*) (Laymon 1998). It is also found in orchards adjacent to river bottoms. The western yellow-billed cuckoo feeds primarily on large insects but also occasionally takes small frogs, lizards, eggs, and young birds. The species is known to be an interspecific brood parasite, laying eggs in the nests of at least 11 other bird species (Hughes 1999). Major declines among western populations in twentieth century due to habitat loss and fragmentation, local extinctions, and low colonization rates; now extremely rare in most areas . There are approximately 30 pairs breeding in California. The nearest known breeding pairs are approximately 30 miles south of the project site along the Sacramento River (Laymon 1998).

Bald Eagle (*Haliaeetus leucocephalus*). Federal status: Delisted (previously endangered); State status: Endangered. The bald eagle is a large soaring bird; in North America, it is second in size only to the California condor (*Gymnogyps californianus*). Most of the annual food requirements of a bald eagle is derived from or obtained around aquatic habitats. The food most often consumed consists of fish, water birds, and small to medium-sized mammals. Because of the dietary association, nesting territories are usually found near water.

Perches are used primarily during the day for resting, preening, and hunting, and may include human-made structures such as power poles. Roosting areas contain a night communal roosting tree that is easily accessible to the large birds and tall enough to provide safety from threats from the ground. Bald eagle nests and roosts are usually found where human activity is infrequent or muted. In California, breeding pairs are found mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties (U.S. Fish and Wildlife Service 2007a).

The USFWS delisted the bald eagle in 2007, and attributes the recovery of the species to reduction in use of organochlorine pesticides and habitat conservation (U.S. Fish and Wildlife Service 2007a). NSR staff have have incidentally observed bald eagles foraging over the project site, but have not observed them nesting on the project site.

Bank Swallow (*Riparia riparia*). Federal status: None; State status: Threatened. Bank swallows are found primarily in riparian and other lowland habitats in the Central Valley, typically between April and September. They nest colonially and inhabit isolated places where fine-textured or sandy, vertical bluffs or riverbanks are available in which to dig burrows. Bank swallows forage over open riparian areas, brushland, grassland, and cropland.

The species' range in California is estimated to be have been reduced by 50 percent since 1900 (Zeiner et al. 1990a). Now, only 110 to 120 colonies remain within the state. Perhaps 75 percent of the current breeding population in California occurs along the banks of the Sacramento and Feather rivers in the northern Central Valley in areas where the rivers still meander in a mostly natural state. About 50 to 60 colonies remain along the middle Sacramento River, and 15 to 25 colonies occur along the lower Feather River. Other colonies persist along the central coast from Monterey to San

Mateo counties and in northeastern California in Shasta, Siskiyou, Lassen, Plumas, and Modoc counties (Zeiner et al. 1990a).

Other Special-Status Wildlife Species

River Lamprey *(Lampetra ayresii)* Federal Status: None; State Status: Species of Special Concern. River lamprey are anadromous; like salmon they are born in freshwater streams, migrate to the ocean, and return to fresh water as mature adults to spawn. Also like the salmon, lampreys do not feed during their spawning migration. Mating pairs of lamprey construct a nest by digging together using rapid vibrations of their tails and by moving stones using their suction mouths. They enter streams from July to October; spawning takes place the following spring when water temperatures are between 50° and 62.6°F. They ascend rivers by alternately swimming upstream in brief spurts and resting by sucking and holding on to rocks. Spawning takes place in low-gradient reaches of streams with gravel and sandy bottoms. Adults die within 4 days of spawning, after depositing from 10,000 to 100,000 very small-sized eggs in their nest. The young hatch in 2 to 3 weeks and swim to areas of low-velocity water where sediments are soft and rich in dead plant materials. They quickly burrow into the muddy bottom, where they filter the mud and water, eating microscopic plants (mostly diatoms) and animals.

Juvenile lamprey will stay burrowed in the mud for 3 to 6 years, moving only rarely to new areas. After a 2-month metamorphosis, triggered by unknown factors, they metamorphose into an adult morphology averaging 4.5 inches long. Newly metamorphosed lampreys migrate downstream during winter and spring high flow events. Adult river lampreys are thought to spend from 2 to 12 months in the estuary or ocean before returning to the rivers to spawn. River lamprey are known to occur in the Sacramento River (Moyle 2002).

Central Valley Fall/Late-fall Run Chinook Salmon ESU (Oncorhynchus tshawytscha) Federal Status: None; State Status: Species of Special Concern. The Central Valley fall/late-fall run ESU Chinook salmon comprises the largest present day population of Chinook salmon in the Central Valley. Fall-run Chinook salmon begin to enter the Sacramento River in July and the run builds through the late summer and fall months peaking by late-September and October (Vogel and Marine 1991). Spawning occurs throughout the upper Sacramento River and in a majority of its tributaries from mid-October through December (Vogel and Marine 1991; Moyle 2002). Spawning densities of fall run salmon are very high in the Sacramento River from near Red Bluff to Keswick Dam (D. Killam, CDFG, personal communication). Juvenile fall-run Chinook salmon rear throughout the Sacramento River and its tributaries. Juvenile fall run fry may emigrate to the estuary from shortly after they hatch through the spring and summer months following their birth.

The late-fall run component of this Chinook salmon ESU enters the Sacramento-San Joaquin estuary and ascends Central Valley streams after the fall run, usually from late-October through March (Vogel and Marine 1991). Spawning begins in January and is usually complete by late-April. Late-fall run spawning densities are greatest in the upper Sacramento River from Red Bluff to Keswick Dam. Both fall and late-fall run salmon use the spawning habitat of the mainstem river adjacent to the study area (CDFG, unpublished data). Juvenile late-fall run salmon rear in the upper Sacramento

River from late-April through the following winter before emigrating to the estuary (Vogel and Marine 1991; Moyle 2002).

Large numbers of the fall run and late-fall run salmon are spawned and reared by state and federal fish hatcheries in California's Central Valley. The number of hatchery-produced fish may greatly exceed the number naturally produced fall/late-fall run Chinook salmon in some Central Valley streams which has led to concern over the viability of certain tributary populations. These runs support valuable and popular ocean and river commercial and sport fisheries.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a federal fisheries management plan (FMP). EFH refers to those waters and substrates necessary for the spawning, breeding, feeding, or growth to maturity. Central Valley spring-run ESU Chinook salmon, Central Valley fall/late-fall run ESU Chinook salmon, and Sacramento River winter-run ESU Chinook salmon are all managed under a FMP and are therefore subject to protection under MSA.

The Sacramento River is designated by the National Marine Fisheries Service (NMFS) to contain EFH for Chinook salmon, as defined by the Magnuson-Stevens Fisheries Conservation and Management Act of 1994, as amended. EFH refers to those waters and substrates necessary for spawning, breeding, feeding, or growth to maturity. Freshwater EFH for salmon consists of four major components: spawning and incubation habitat; juvenile rearing habitat; juvenile migration corridors; and adult migration corridors and adult holding habitat (Pacific Fishery Management Council 2003).

The Sacramento River adjacent to the project site provides all four major components of freshwater EFH for salmon. Adult Chinook salmon migrate to and are known to spawn within all suitable habitats adjacent to the project site. Fry and juveniles are known to occur in suitable rearing habitats nearly year round. Medium to large cobbles and boulders dominate the river bottom in these habitats, providing suitable cover and refuge for rearing salmonids.

Hardhead *(Mylopharodon conocephalus)* Federal Status: None; State Status: Species of Special Concern. Hardhead were identified as a California Species of Special Concern in 1995 (Moyle et al. 1995). Hardhead are listed as a Class 3 species of special concern. Class 3 species are those fish species occupying much of their native range, but that were formerly more widespread or abundant within that range. Included in this classification are taxa with very restricted distributions (e.g., Eagle Lake tui chub). The populations of such species need to be assessed periodically (i.e., every 5 years) and included in long-term plans for protected waterways.

Hardhead are large cyprinids that closely resemble Sacramento pikeminnow and are widely distributed in low- to mid-elevation streams in the Sacramento–San Joaquin drainage. Hardhead typically inhabit undisturbed areas of larger low- to mid-elevation streams, although they are also found in the mainstem Sacramento River at low elevations and in its tributaries to about 4,921 feet . They prefer clear, deep pools and runs with slow velocities and occur in streams where summer temperatures reach in excess of 68°F (Moyle 2002).

Historically, hardhead have been regarded as widespread and abundant in central California and are still widely distributed in foothill streams. The specific risk to hardhead is their increasingly isolated populations, making them vulnerable to localized extinctions. Hardhead also tend to be absent from streams where introduced species dominate (Mayden, Rainboth, and Buth 1991; Moyle and Daniels 1982), and from streams that have been severely altered by human activity (Baltz and Moyle 1993).

Western Spadefoot Toad (*Spea hammondi*). Federal status: None; State Status: Species of Special Concern. Historically, the western spadefoot toad ranged from Redding to northwestern Baja, California. It has been extirpated from many locations within this range. Since 1990, there have been sightings in Alameda, Butte, Calaveras, Fresno, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Orange, Placer, Riverside, Sacramento, San Benito, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, Tulare, Ventura, and Yolo counties (U.S. Fish and Wildlife Service 2007c).

The western spadefoot toad occurs primarily in grassland locations, but occasional populations also occur in valley-foothill hardwood woodlands. Some populations persist for a few years in orchard-vineyard habitats (Zeiner, Laudenslayer, and Mayer 1989). The species is found at elevations below 3,000 feet but can occur up to 4,500 feet. Western spadefoot toads breed in temporary pools from January to May. Water temperatures in these pools must be between 48ºF and 86ºF. Eggs are deposited on plant stems or on pieces of detritus in temporary rain pools or, less frequently, in pools in ephemeral stream courses (U.S. Fish and Wildlife Service 2007c).

Western spadefoot toads are extremely sensitive to low frequency noises and vibrations. These disturbances cause western spadefoot toads to break dormancy and emerge from their burrows (Dimmitt and Ruibal 1980).

Northwestern Pond Turtle (*Clemmys marmorata marmorata*). Federal Status: None; State Status: Species of Special Concern. The northwestern pond turtle is found in the quiet waters of ponds, marshes, creeks, and irrigation ditches. This species requires basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. They frequently bask on logs or other objects out of the water when water temperatures are low and air temperatures are greater than water temperatures. When air temperatures become too warm, western pond turtles water bask by lying in the warmer surface water layer with their heads out of the water. Hibernation in colder areas is passed underwater in bottom mud (Zeiner, Laudenslayer, and Mayer 1989). Mating typically occurs in late April or early May, but may occur year-round. Nests are located in an upland location that may be a considerable distance from the aquatic site (up to ¼ mile) (California Department of Fish and Game 1994). Hatchling turtles are thought to emerge from the nest and move to the aquatic site in the spring. Today, the northwestern pond turtle occurs in 90% of its historic range in the Central Valley and west of the Sierra Nevada mountains, but in greatly reduced numbers (Jennings and Hayes 1994). It occurs from the Oregon border south to the American Basin in the Central Valley, where it intergrades with southwestern pond turtle.

Western Burrowing Owl (*Athene cunicularia hypugaea*). Federal status: None; State status: Species of Special Concern. The western burrowing owl inhabits open, dry grasslands and deserts, as well as open stages of pinyon-juniper and ponderosa pine. The nesting season is between February 1 and August 31. Western burrowing owls typically nest in abandoned rodent burrows, particularly

those of California ground squirrels, which they modify each year. Burrowing owls forage in open grassland areas adjacent to nest sites. The species has also been documented in open areas near human habitation, especially airports and golf courses. The Central Valley and surrounding foothill regions of California provide year-round habitat for the western burrowing owl.

The study area has the general habitat requirements for the burrowing owl, but NSR staff did not note rodent activity and burrows during the site visits. There are no recorded CNDDB occurrences of the western burrowing owl within a 5-mile radius of the study area (California Department of Fish and Game 2007a).

Cooper's Hawk (*Accipiter cooperii*). Federal status: None; State status: Species of Special Concern. Cooper’s hawks prefer landscapes where wooded areas occur in patches and groves facilitating the ambush hunting tactics employed by this species. The species preys upon medium-sized birds (e.g., jays, doves, and quail) and occasionally takes small mammals and reptiles. Breeding pairs in California prefer nest sites within dense stands of live oak woodland or riparian areas, and prey heavily on young birds during the nesting season. Cooper’s hawks are breeding residents throughout most of the wooded areas in California, but populations have declined in recent decades (Zeiner et al. 1990a).

Cooper’s hawks have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

White-tailed Kite (*Elanus leucurus*). Federal Status: None; State Status: Fully Protected Species. The white-tailed kite can be found in association with the herbaceous and open stages of a variety of habitat types, including open grasslands, meadows, emergent wetlands, and agricultural lands. Nests are constructed near the top of dense oaks, willows, or other tree stands located adjacent to foraging areas. The species forages in undisturbed, open grasslands, meadows, farmlands and emergent wetlands. White-tailed kite are seldom observed more than 0.5 mi (0.8 km) from an active nest during the breeding season (Zeiner et al. 1990a). The white-tailed kite is found year-round in both the coastal zones and lowlands of the Central Valley in California.

White-tailed kites have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Osprey (*Pandion haliaetus*). Federal Status: None; State Status: Species of Special Concern. In California, osprey are common summer residents and breeders but are less common in winter. Osprey breed primarily in scattered locations throughout northern California from the Cascade Ranges south to Lake Tahoe, and along the coast south to Marin County. They nest and roost on exposed treetops, towers, pilings, or similar structures near lakes, reservoirs, rivers, estuaries, and the open sea coast. They forage over fish-bearing bodies of water. Current threats to the species include degradation of aquatic environments such as rivers and lakes and loss of nesting structures such as trees to timber harvest and other activities (Zeiner et al. 1990a).

Osprey have the potential to nest within the study area in the riparian area along the Sacramento River. There are two CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

California Yellow Warbler (*Dendroica petechia brewsteri*). Federal Status: None; State Status: Species of Special Concern. The yellow warbler is a long-distance migrant, usually arriving in California in April and leaving by October. The species breeds from mid-April to early August, building an open cup nest in a tree or shrub. Foraging patterns typically involve gleaning and hovering for insects and spiders. The yellow warbler occurs as a summer resident in northern California. It is usually found in dense riparian deciduous habitats with cottonwoods, willows, alders, and other small trees and shrubs typical of open-canopy riparian woodlands.

Yellow warblers have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Yellow-breasted Chat (Ictera virens); Federal Status: None; State Status; Species of Special Concern. The yellow-breasted chat is a neotropical migrant that occurs in riparian or marsh habitats throughout California. They are found in dense, brushy thickets near water and in the thick understory of riparian woodlands. Forage patterns usually involve gleaning insects, spiders, and berries from the foliage of shrubs and low trees. Nests are often low to the ground in dense shrubs along streams. They occur as summer breeding residents in the Sacramento River Valley and its tributaries (Zeiner et al. 1990a).

Yellow-breated chat has the potential to nest within the study area in the riparian forest along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Loggerhead Shrike (*Lanius ludovicianus*). Federal Status: None; State Status: Species of Special Concern. The loggerhead shrike prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches located in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Loggerhead shrikes skewer their prey to thorns or barbs on barbed-wire fences. The purpose of this trait may be to help kill the prey or to cache the food for latter consumption. Loggerhead shrikes are found in lowlands and foothills throughout California (Zeiner et al. 1990a).

Loggerhead shrike has the potential to nest within the study area within the valley oak woodland. NSR staff did not observe this species or any nests during site visits.

Ringtail (*Bassiriscus astutus*). Federal Status: None; Federal Status: Fully Protected Species. The ringtail occurs in various riparian habitats in and brush stands of most forest and shrub habitats. Nocturnal, and primarily carnivorous, ringtails mainly eat small mammals but also feed on birds, reptiles, insects, and fruit. They forage on the ground, among rocks, and in trees; usually near water.

Hollow trees and logs, cavities in rocky areas, and other recesses are used for cover. The ringtail is widely distributed in California (Zeiner et al. 1990b).

Ringtail has the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species during site visits.

3.5 FIELD REVIEW/SURVEYS

During the field reconnaissance and protocol-level surveys, the study area was inspected to identify plant and wildlife special-status species and/or potential habitat for these species in the study area. Lists of all plant and wildlife species observed are presented in Appendix E.

Botany

No special-status vascular plant species were detected as a result of botanical survey efforts. A list of all plant species observed is presented in Appendix E.

Wildlife

3.5.1.1 ***NSR staff California Red-Legged Frog Assessment***

NSR staff conducted a USFWS protocol-level site assessment for California red-legged frog, and produced a separate detailed report (North State Resources 2007a). NSR staff did not observe any California red-legged frogs during the USFWS protocol-level surveys, but did conclude that the seasonal pond in the central region of the site provides suitable breeding habitat.

3.5.1.2 ***Valley Elderberry Longhorn Beetle Surveys***

Sixty two (62) elderberry shrubs with stems measuring 1-inch or greater in diameter at ground level were detected during the surveys. Nearly all of the recorded elderberry shrubs are located within the valley foothill riparian and valley oak woodland habitat types in the southwest and south central section of the study area (Figure 3 in map pocket). Several of the elderberry shrubs are within the 100-foot buffer zone just south of the boundary at the southwest corner of the study area. Two of the 62 elderberry shrubs were deeply embedded within Himalayan blackberry brambles and were inaccessible for close inspection. Field survey data for the 62 elderberry shrubs are presented in a table in Appendix F.

Exit holes characteristic of VELB (e.g. exit hole oval to circular, approximately ¼ inch in diameter, and without beveled edges; exit hole on stem greater than one inch in diameter and within six feet from ground) were detected on 13 of the 60 elderberry shrubs that were accessible for close inspection. These 13 elderberry shrubs are located within valley foothill riparian and valley oak woodland habitats in the southwest and south central section of the study area (Figure 3 in map pocket). All of the 36 observed VELB exit holes are within six feet above ground level and located in live stems greater than 1-inch in diameter. There were both new exit holes, characterized by sharp hole edges and light colored wood, and older exit holes, characterized by the gradual sealing of the hole due to cambial growth (See photographs in Appendix G).

3.5.1.3 ***Incidental Special-Status Wildlife Observations***

NSR staff made incidental field observations of 30 wildlife species including one special-status species; bank swallow (Appendix E). NSR botanist/plant ecologist, Mr. Boggs and NSR biologist, Ms. Bolen observed a colony of bank swallows nesting in the cut-bank of the Sacramento River within the northern portion of the study area (Figure 3 in map pocket).

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APPENDIX A

U.S. Fish and Wildlife Service Species List

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

April 26, 2007

Document Number: 070426124401

Michael Gorman
North State Resources, Inc.
500 Orient St. Suite 150
Chico, CA 95928

Subject: Species List for Strawberry Fields Property

Dear: Mr.

We are sending this official species list in response to your April 26, 2007 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 25, 2007.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

TAKE PRIDE® IN AMERICA

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 you requested

Document Number: 070426124401

Database Last Updated: March 5, 2007

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)

vernal pool tadpole shrimp (E)

Pacifastacus fortis

Shasta crayfish (E)

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)

Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

Critical Habitat, Central Valley spring-run chinook (X) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Birds

Haliaeetus leucocephalus

bald eagle (T)

Strix occidentalis caurina

northern spotted owl (T)

Plants

Orcuttia tenuis

Critical habitat, slender Orcutt grass (X)

slender Orcutt grass (T)

Candidate Species

Fish

Oncorhynchus tshawytscha

Central Valley fall/late fall-run chinook salmon (C) (NMFS)
Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Birds

Coccyzus americanus occidentalis

Western yellow-billed cuckoo (C)

Quads Containing Listed, Proposed or Candidate Species:

BALLS FERRY (628B)
COTTONWOOD (629A)
OLINDA (629B)
BELLA VISTA (646B)
PALO CEDRO (646C)
PROJECT CITY (647A)
SHASTA DAM (647B)
REDDING (647C)
ENTERPRISE (647D)

County Lists

Shasta County

Listed Species

Invertebrates

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)
vernal pool tadpole shrimp (E)

Pacifastacus fortis

Shasta crayfish (E)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)
Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Birds

Haliaeetus leucocephalus

bald eagle (T)

Strix occidentalis caurina

Critical habitat, northern spotted owl (X)

northern spotted owl (T)

Plants

Orcuttia tenuis

Critical habitat, slender Orcutt grass (X)

slender Orcutt grass (T)

Tuctoria greenei

Critical habitat, Greene's tuctoria (=Orcutt grass) (X)

Greene's tuctoria (=Orcutt grass) (E)

Candidate Species

Fish

Oncorhynchus tshawytscha

Central Valley fall/late fall-run chinook salmon (C) (NMFS)

Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Birds

Coccyzus americanus occidentalis

Western yellow-billed cuckoo (C)

Mammals

Martes pennanti

fisher (C)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our critical habitat page for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 25, 2007.

APPENDIX B

CNDDB Query Results

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	***Agelaius tricolor*** tricolored blackbird	ABPBXB0020			G2G3	S2	SC
2	***Agrostis hendersonii*** Henderson's bent grass	PMPOA040K0			G1Q	S1.1	3.2
3	***Anthicus antiochensis*** Antioch Dunes anthicid beetle	IICOL49020			G1	S1	
4	***Anthicus sacramento*** Sacramento anthicid beetle	IICOL49010			G1	S1	
5	***Antrozous pallidus*** pallid bat	AMACC10010			G5	S3	SC
6	***Branchinecta lynchi*** vernal pool fairy shrimp	ICBRA03030	Threatened		G3	S2S3	
7	***Carex scoparia*** pointed broom sedge	PMCYP03C90			G5	S2S3	2.2
8	***Carex vulpinoidea*** fox sedge	PMCYP03EN0			G5	S2.2	2.2
9	***Castilleja rubicundula ssp. rubicundula*** pink creamsacs	PDSCR0D482			G5T2	S2.2	1B.2
10	***Clarkia borealis ssp. borealis*** northern clarkia	PDONA05062			G3T2	S2.3	1B.3
11	***Cryptantha crinita*** silky cryptantha	PDBOR0A0Q0			G1	S1.1	1B.2
12	***Desmocerus californicus dimorphus*** valley elderberry longhorn beetle	IICOL48011	Threatened		G3T2	S2	
13	***Emys (=Clemmys) marmorata marmorata*** northwestern pond turtle	ARAAD02031			G3G4T3	S3	SC
14	***Euderma maculatum*** spotted bat	AMACC07010			G4	S2S3	SC
15	***Fluminicola seminalis*** Nugget Pebblesnail	IMGASG3110			G2	S1S2	
16	***Gratiola heterosepala*** Boggs Lake hedge-hyssop	PDSCR0R060		Endangered	G3	S3.1	1B.2
17	***Great Valley Cottonwood Riparian Forest***	CTT61410CA			G2	S2.1	
18	***Great Valley Mixed Riparian Forest***	CTT61420CA			G2	S2.2	
19	***Great Valley Valley Oak Riparian Forest***	CTT61430CA			G1	S1.1	
20	***Great Valley Willow Scrub***	CTT63410CA			G3	S3.2	
21	***Haliaeetus leucocephalus*** bald eagle	ABNKC10010	Threatened	Endangered	G5	S2	
22	***Hydromantes shastae*** Shasta salamander	AAAAD09030		Threatened	G1G2	S1S2	
23	***Juncus leiospermus var. leiospermus*** Red Bluff dwarf rush	PMJUN011L2			G2T2	S2.2	1B.1
24	***Lanx patelloides*** Kneecap Lanx	IMGASL7030			G1	S1	
25	***Legenere limosa*** legenere	PDCAM0C010			G2	S2.2	1B.1
26	***Lepidurus packardi*** vernal pool tadpole shrimp	ICBRA10010	Endangered		G3	S2S3	

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
27	***Limnanthes floccosa ssp. bellingeriana*** Bellinger's meadowfoam	PDLIM02041			G4T2	S1.1	1B.2
28	***Linderiella occidentalis*** California linderiella	ICBRA06010			G3	S2S3	
29	***Martes pennanti (pacifica) DPS*** Pacific fisher	AMAJF01021	Candidate		G5	S2S3	SC
30	***Monadenia troglodytes troglodytes*** Shasta sideband (snail)	IMGASC7090			G1G2	S1S2	
31	***Neviusia cliftonii*** Shasta snow-wreath	PDROS14020			G2	S2.2	1B.2
32	***Oncorhynchus tshawytscha spring-run*** spring-run chinook salmon	AFCHA0205A	Threatened	Threatened	G5T1Q	S1	
33	***Oncorhynchus tshawytscha winter run*** chinook salmon winter run	AFCHA0205B	Endangered	Endangered	G5T1Q	S1	
34	***Orcuttia tenuis*** slender orcutt grass	PMPOA4G050	Threatened	Endangered	G3	S3.1	1B.1
35	***Pandion haliaetus*** osprey	ABNKC01010			G5	S3	SC
36	***Paronychia ahartii*** Ahart's paronychia	PDCAR0L0V0			G2	S2.1	1B.1
37	***Riparia riparia*** bank swallow	ABPAU08010		Threatened	G5	S2S3	
38	***Trilobopsis roperi*** Shasta Chaparral	IMGASA2030			G1	S1	
39	***Viburnum ellipticum*** oval-leaved viburnum	PDCPR07080			G5	S2.3	2.3

APPENDIX C

CNPS Query Results

CNPS Inventory of Rare and Endangered Plants

Status: Plant Press Manager window with 15 items - Thu, Apr. 26, 2007 12:43 c

Reformat list as: Standard List - with Plant Press controls

ECOLOGICAL REPORT

scientific	family	life form	blooming	communities	elevation	CNPS
Agrostis hendersonii	Poaceae	annual herb	Apr-May	•Valley and foothill grassland (VFGrs) (mesic) •Vernal pools (VnPls)	70 - 305 meters	List 3.2
Anomobryum julaceum	Bryaceae	moss	•Broadleafed upland forest (BUFrs) •Lower montane coniferous forest (LCFrs) •North Coast coniferous forest (NCFrs)/damp rock and soil on outcrops, usually on roadcuts	100 - 1000 meters	List 2.2	
Carex scoparia	Cyperaceae	perennial herb	May	•Great Basin scrub (GBScr)(mesic)	130 - 1000 meters	List 2.2
Carex vulpinoidea	Cyperaceae	perennial herb	May-Jun	•Marshes and swamps (MshSw)(freshwater) •Riparian woodland (RpWld)	30 - 1200 meters	List 2.2
Castilleja rubicundula ssp. rubicundula	Scrophulariaceae	annual herb	Apr-Jun	•Chaparral (Chprl) (openings) •Cismontane woodland (CmWld) •Meadows and seeps (Medws) •Valley and foothill grassland (VFGrs)/serpentinite	20 - 900 meters	List 1B.2
Clarkia borealis ssp. borealis	Onagraceae	annual	Jun-Sep	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs)	400 - 1340 meters	List 1B.3
Cryptantha crinita	Boraginaceae	annual herb	Apr-May	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Riparian forest (RpFrs) •Riparian woodland (RpWld) •Valley and foothill grassland (VFGrs)/gravelly streambeds	85 - 1215 meters	List 1B.2
				•Marshes and swamps		

Gratiola heterosepala	Scrophulariaceae	annual herb	Apr-Aug	(MshSw)(lake margins) •Vernal pools (VnPls)/clay	10 - 2375 meters	List 1B.2
Juncus leiospermus var. leiospermus	Juncaceae	annual herb	Mar-May	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Meadows and seeps (Medws) •Valley and foothill grassland (VFGrs) •Vernal pools (VnPls)/vernally mesic	35 - 1020 meters	List 1B.1
Lathyrus sulphureus var. argillaceus	Fabaceae	perennial herb	Apr	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Upper montane coniferous forest (UCFrs)	150 - 305 meters	List 3
Legenere limosa	Campanulaceae	annual herb	Apr-Jun	•Vernal pools (VnPls)	1 - 880 meters	List 1B.1
Neviusia cliftonii	Rosaceae	perennial deciduous shrub	Apr-Jun	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Riparian woodland (RpWld)/ often streamsides; sometimes carbonate, volcanic, or metavolcanic	300 - 500 meters	List 1B.2
Orcuttia tenuis	Poaceae	annual herb	May-Sep(Oct) Months in parentheses are uncommon.	•Vernal pools (VnPls)	35 - 1760 meters	List 1B.1
Paronychia ahartii	Caryophyllaceae	annual herb	Mar-Jun	•Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs) •Vernal pools (VnPls)	30 - 510 meters	List 1B.1
Viburnum ellipticum	Caprifoliaceae	perennial deciduous shrub	May-Jun	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs)	215 - 1400 meters	List 2.3

APPENDIX D

Special-Status Species Considered for Analysis

Summary of Special-Status Species Review – Plants

Common Name *Scientific Name*	Status[1] (Fed/State/CNPS)	General Habitat Description/Elevation	Blooming Period	General Habitat Within Study Area (Present/ Absent)
Federal or State Listed Species				
Boggs Lake hedge-hyssop *Gratiola heterosepala*	--/E/1B.2	Clay soils within marshes and swamps (lake margins), vernal pools / 30-7,792 feet	April-August	**Absent.**
Slender Orcutt grass *Orcuttia tenuis*	T/E/1B.1	Vernal pools / 114-5,774 feet	May-October	**Absent**
Greene's tuctoria *Tuctoria greenei*	E/R/1B.1	Vernal pools / 98-3510 feet.	May-July	**Absent**
Other Special-Status Species				
Slender silver-moss *Anomobryum julaceum*	--/--/2.2	Damp rock and soil on outcrops within broadleafed upland forest, lower montane coniferous forest, North coast coniferous forest with; usually on roadcuts / 300-3,000 feet	Moss	**Absent**
Pointed broom sedge *Carex scoparia*	--/--/2.2	Mesic areas within Great Basin scrub / 426 – 3280 feet	May	**Absent**
Fox sedge *Carex vulpinoidea*	--/--/2.2	Freshwater marshes and swamps, and riparian woodland / 98-3,937 feet	May-June	**Present**
Pink creamsacs *Castilleja rubicundula* ssp. *rubicundula*	--/--/1B	Serpentinite soils within chaparral openings, cismontane woodland, meadows, seeps and valley and foothill grassland / 60-2,700 feet	April-June	**Absent.**
Northern clarkia *Clarkia borealis* ssp. *borealis*	--/--/1B.3	Chaparral, cismontane woodland, and lower montane coniferous forest / 1,312-4,396 feet	June-September	**Absent**
Silky cryptantha *Cryptantha crinita*	--/--/1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland / 278-984 feet	April-May	**Present.** Gravelly substrate present on gravel bars and old channels.
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	--/--/1B.1	Meadows and seeps, vernal pools; Vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland / 115-3,346 feet	March-May	**Present.** Foothill grassland present.
Legenere *Legenere limosa*	--/--/1B.1	Vernal pools / 3-2,887 feet	April-June	**Absent**
Shasta snow wreath *Neviusia cliftonii*	--/--/1B.2	Often on streamsides within lower montane coniferous forest and riparian woodland / 984-1,640 feet	April-May	**Absent**
Ahart's nailwort *Paronychia ahartii*	--/--/1B.1	Cismontane woodland, valley and foothill grassland and vernal pools / 90-1,530 feet	March-June	**Present.** Valley oak woodland and foothill grassland present.
Oval-leaved viburnum *Viburnum ellipticum*	--/--/2.3	Chaparral, cismontane woodland, and lower montane coniferous forest / 705-4,593 feet	May-June	**Absent**

Summary of Special-Status Species Review – Wildlife

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Federal or State Listed Species				
Invertebrates				
Conservancy fairy shrimp *Branchinecta lynchi*	T/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool setting and occurrences of listed vernal pool species do not occur near the study area.
Vernal pool fairy shrimp *Branchinecta conservatio*	E/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool setting and occurrences of listed vernal pool species do not occur near the study area.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs associated with riparian forests that occur along rivers and streams.	**Present**	Elderberry shrubs occur in the study area.
Vernal pool tadpole shrimp *Lepidurus packardi*	E/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool landscape and occurrences of listed vernal pool species do not occur near the study area.
Shasta crayfish *Pacifastacus fortis*	E/--	Pit River, Fall River and Hat Creek drainages in Shasta County	Absent	Watersheds in which the species occur do not occur in the study area. Thus, this species is eliminated from further consideration.
Fish				
Green sturgeon, southern DPS (*Acipenser medirostris*)	T/SC	Spawn in Sacramento and Feather rivers; juveniles are thought to rear mainly in the estuary.	**Present**	Suitable habitat occurs in the Sacramento River.
Delta smelt (*Hypomesus transpacificus*)	T/T	Estuarine systems in the Sacramento-San Joaquin Delta.	Absent	Suitable habitat not present.
Steelhead, California Central Valley DPS (*Oncorhynchus mykiss*) Critical Habitat	T/--	Spawn and rear in freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Central Valley spring-run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Critical Habitat	T/T	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.
Sacramento River winter-run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Critical Habitat	E/E	Freshwater river and streams. (Sacramento River and its tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.
Amphibians				
Shasta salamander *Hydromantes shastae*	--/T	Moist limestone fissures and caves, in volcanic and other rock outcroppings, and under woody debris in mixed pine-hardwood stands.	Absent	Limestone outcrops do not occur within the study area. Thus, this species is eliminated from further consideration.
California red-legged frog *Rana aurora draytonii*	T/SC	Require aquatic habitat for breeding, also uses a variety of other habitat types including riparian and upland areas. Adults utilize dense, shrubby or emergent vegetation associated with deep-water pools with fringes of cattails & dense stands of overhanging vegetation.	**Present**	One perennial pond occurs in the study area.
Birds				
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/E	Nesting habitat is cottonwood/willow riparian forest. Occurs only along the upper Sacramento Valley portion of the Sacramento River, the Feather River in Sutter Co., the south fork of the Kern River in Kern Co., and along the Santa Ana, Amargosa, and lower Colorado rivers	**Present**	Extensive cottonwood/willow riparian forest habitat occurs in the study area.
Willow flycatcher *Empidonax traillii*	--/E	Rare summer resident in wet meadow and montane riparian habitats at 2,000 to 8,000 feet elevation. No longer known to nest in Sacramento Valley but migrates through the north state region in spring and fall.	Absent	Suitable habitat not present.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
American peregrine falcon *Falco peregrinus anatum*	D/E, FP	Forages in many habitats; requires cliffs for nesting.	Absent	Suitable habitat not present.
Greater sandhill crane *Grus canadensis tabida*	--/T, FP	Wetlands required for breeding; forage in nearby pastures, fields, and meadows.	Absent	Suitable habitat not present.
Bald eagle *Haliaeetus leucocephalus*	T/E	Forages on live and dead fish and nests in large trees or snags. Requires large bodies of water, including ocean shorelines, lake margins, and large, open river courses for foraging, nesting, and wintering habitat.	**Present**	The Sacramento River runs along the western edge of the property and provides suitable foraging habitat.
Bank swallow *Riparia riparia*	--/T	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	**Present**	Vertical banks are present along the Sacramento River along the northwestern boundary of the site.
Northern spotted owl *Strix occidentalis caurina* Critical habitat	T/--	In northern California, resides in large stands of old growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats	Absent	Dense, mixed conifer forest is not present.
Mammals				
California wolverine *Gulo gulo luteus*	--/T, FP	A variety of habitats within the elevations of 1,600 and 14,200 ft. Most commonly inhabits open terrain above timberline.	Absent	Suitable habitat not present.
Pacific fisher *Martes pennanti pacifica*	C/SC	Dens and forages in intermediate to large stands of old-growth forests or mixed stands of old-growth and mature trees with greater than 50% canopy closure. May use riparian corridors for movement.	Absent	Suitable habitat not present.
Sierra Nevada red fox *Vulpes vulpes nector*	--/T	Red fir and lodgepole pine forests in the sub-alpine zone and alpine fell-fields of the Sierra Nevada.	Absent	Suitable habitat not present.
Other Special-Status Species				
Fish				
River lamprey *(Lampetra ayresii)*	--/SC	The biology of river lampreys has not been studied in California, general habitat and life history thought to be similar to Pacific lamprey.	**Present**	Suitable habitat occurs in the Sacramento River.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Central Valley fall/late-fall run ESU Chinook salmon (*Oncorhynchus tshawytscha*)	SC/SC	Freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**	Suitable habitat occurs in the Sacramento River.
Hardhead (*Mylopharodon conocephalus*)	--/SC	Quiet deep pools of large, warm, clear streams over rocks or sand.	**Present**	Suitable habitat occurs in the Sacramento River.
Pit roach *Lavinia symmetricus mitrulus*	--/SC	Small, warm, intermittent streams in the upper Pit River and its tributaries and tributaries to Goose Lake.	Absent	Study area outside the upper Pit River watershed.
McCloud River redband trout *Oncorhynchus mykiss ssp.*	--/SC	McCloud River and its tributaries, Swamp Creek and Trout Creek.	Absent	Study area is outside the McCloud River watershed.
Sacramento splittail *Pogonichthys macrolepidotus*	--/SC	Shallow, dead-end sloughs with submerged vegetation.	Absent	Native, non-game species; historically occurred near Redding, however, range is not thought to presently extend above Red Bluff.
Longfin smelt *Spirinchus thaleichthys*	--/SC	Sloughs of Suisun Bay and Delta.	Absent	Suitable habitat not present.
Amphibians				
Tailed frog *Ascaphus truei*	--/SC	Clear, rocky, swift, cool perennial streams in densely forested habitats.	Absent	Suitable habitat not present.
Foothill yellow-legged frog *Rana boylii*	--/SC	Rocky streams in a variety of habitats. Found in coast ranges.	Absent	Suitable habitat not present.
Cascades frog *Rana cascadae*	--/SC	Open coniferous forests along the sunny, rocky banks of ponds, lakes, streams, and meadow potholes. From 2,600 to 9,000 feet in elevation in Cascades and Trinity Mountains.	Absent	Suitable habitat not present.
Western spadefoot toad *Spea hammondii*	--/SC	Grasslands with temporary pools.	**Present**	One intermittent pool is located within a grassland in the northeast section of the site.
Reptiles				
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SC	Slow water aquatic habitat with available basking sites. Hatchlings require shallow water with dense submergent or short emergent vegetation. Require an upland oviposition site in the vicinity of the aquatic site	**Present**	One perennial pond occurs on the project site.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Birds				
Long-billed curlew *Numenius americanus*	--/SC	Large coastal estuaries, upland herbaceous areas, and croplands. Breeds in wet meadow habitat.	Absent	Suitable habitat not present.
Double-crested cormorant *Phalacrocorax auritus*	--/SC	Inland lakes; fresh, salt and estuarine waters.	**Present**	Suitable nesting habitat not present on site due to level of human disturbance. May occur as a forager.
White-faced ibis *Plegadis chihi*	--/SC	A rare visitor to the Central Valley, this species nests and forages in freshwater marshes.	Absent	Suitable habitat not present.
California spotted owl *Strix occidentalis occidentalis*	--/SC	Dense, multi-layered mixed conifer, redwood, and Douglas-fir habitats with large overstory trees.	Absent	Conifer forest not present in study area.
Merlin *Falco columbarius*	--/SC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.	**Present**	Woodlands provide suitable habitat.
Long-eared owl *Asio otus*	--/SC	Dense riparian and live oak thickets near meadow edges, and nearby woodland and forest habitats; also found in dense conifer stands at higher elevations.	Absent	Dense vegetation and meadows do not occur within the study area.
Western burrowing owl *Athene cunicularia hypugaea*	--/SC	Open habitats, dry grasslands and ruderal habitats with ground squirrel burrows.	**Present**	Suitable habitat present, however, there are no known occurrences in the area.
Golden eagle *Aquila chrysaetos*	--/SC/FP	Breeds on cliffs or in large trees or electrical towers, forages in open areas.	Absent	Open habitats and cliffs do not occur in the study area. Thus, this species is eliminated from further consideration
Sharp-shinned hawk *Accipiter striatus*	--/SC	Typically nests in dense conifer stands near water, winters in woodlands. Forages in many habitats in winter and migration.	**Present**	Unlikely to nest in area but may occur as a winter migrant.
Cooper's hawk *Accipiter cooperii*	--/SC	Nests in woodlands, forages in many habitats in winter and migration.	**Present**	Suitable nesting and foraging habitat is present in the project.
Northern goshawk *Accipiter gentilis*	--/SC	Breeds in dense, mature conifer and deciduous forests, interspersed with meadows, other openings and riparian areas; nesting habitat includes north-facing slopes near water.	Absent	Dense coniferous forests do not occur in the study area.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Ferruginous hawk *Buteo regalis*	--/SC	Forages in grasslands and occasionally in other open habitats during migration and winter.	**Present**	May be rare as migrant.
Northern harrier *Circus cyaneus*	--/SC	Forages in marshes, grasslands, and ruderal habitats; nests in extensive marshes and wet fields or grasslands.	Absent	Open grasslands or marshlands do not occur in the study area. Thus, this species is eliminated from further consideration
Prairie falcon *Falco mexicanus*	--/SC	Occurs in open habitats such as grasslands, desert scrub, rangelands and croplands. Nests on open cliffs.	**Present**	May be rare as migrant.
White-tailed kite *Elanus leucurus*	--/FP	Nests in lowlands with dense oak or riparian stands near open areas, forages over grassland, meadows, cropland and marshes.	**Present**	Woodlands and riparian forest provided suitable habitat.
Osprey *Pandion haliaetus*	--/SC	Ocean shorelines, lake margins and large, open river courses for both nesting and wintering habitat.	**Present**	Riparian habitat or large bodies of water occur in and near the study area
Black swift *Cypseloides niger*	--/SC	Nests in moist crevice or cave or sea cliffs above the surf, or on cliffs behind, or adjacent to, waterfalls in deep canyons; forages widely over many habitats.	Absent	Cliffs, deep canyons not present in Project vicinity. Thus, this species is eliminated from further consideration
Vaux's swift *Chaetura vauxi*	--/SC	Prefers redwood and Douglas-fir habitats, nests in hollow trees and snags or, occasionally, in chimneys; forages aerially.	Absent	Neither redwood nor Douglas-fir habitat is present. Thus, this species is eliminated from further consideration
Purple martin *Progne subis*	--/SC	Breeding habitat includes old-growth, multi-layered, open forest and woodland with snags; forages over riparian areas, forest, and woodlands	Absent	Multi-layered old growth does not occur in the study area. Thus, this species is eliminated from further consideration
Tricolored blackbird *Agelaius tricolor*	--/SC	Breeds near fresh water in dense emergent vegetation. Forages in grassland and cropland.	Absent	Dense emergent vegetation does not occur in the wetlands occuring in the study area. Foraging habitat is not available. Thus, this species is eliminated from further consideration.
California yellow warbler *Dendroica petechia brewsteri*	--/SC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	**Present**	Riparian habitat occurs in and near the study area.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Yellow-breasted chat *Icteria virens*	--/SC	Breeds in riparian habitats having dense understory vegetation, such as willow and blackberry.	**Present**	Riparian habitat occurs in and near the study area.
Bell's Sage Sparrow *Amphispiza belli belli*	--/SC	Nests in shrublands, preferably coastal scrub but is tolerant to a variety of shrublands. Irregular in its northern range of the western Shasta and Trinity Counties	Absent	Mixed chaparral occurs in the study area. Study area located near northernmost range of species
Loggerhead shrike *Lanius ludovicianus*	--/SC	Prefers open habitats with scatters shrubs and trees throughout the Central Valley of California. Nests in shrubs and trees.	**Present**	Open shrub/tree habitat occurs in the study area
Mammals				
Ringtail *Bassariscus astutus*	--/FP	Riparian habitats and in brush stands of most forest and shrub habitats. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows or woodrat nests.	**Present**	Riparian habitat occurs in and near the study area.
Sierra Nevada snowshoe hare *Lepus americanus tahoensis*	--/SC	Boreal zones, typically inhabiting riparian communities with thickets of deciduous trees and shrubs above 4,800 ft. They also inhabit thickets of young conifers and chaparral.	Absent	Study area is below the required elevation for suitable habitat.
Townsend's western big-eared bat *Corynorhinus townsendii*	--/SC	Roosts in colonies in caves, mines, tunnels, or buildings in mesic habitats. The species forages along habitat edges, gleaning insects from bushes and trees. Habitat must include appropriate roosting, maternity and hibernacula sites free from disturbance by humans.	Absent	Roosting habitat is not present.
Pallid bat *Antrozous pallidus*	--/SC	Forages over many habitats; roosts in buildings, large oaks or redwoods, rocky outcrops and rocky crevices in mines and caves, and under bridges. Roosts must protect from high temperatures	**Present**	Roosting habitat does not occur within the study area; however suitable foraging habitat occurs in the study area.
Spotted bat *Euderma maculatum*	--/SC	Ponderosa pine region of the western highlands. Prefers cracks/crevices of high cliffs and canyons for roosting.	Absent	Ponderosa pine habitat not present and the project is located out of the current range of this species. Thus, this species is eliminated from further consideration

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Western mastiff bat *Eumops perotis*	--/SC	Roosts in cliff faces, rock outcrops, and buildings. Forages in open habitats. Needs vertical face to take flight.	**Present**	Roosting habitat does not occur within the study area; however suitable foraging habitat occurs in the study area.
American badger *Taxidea taxus*	--/SC	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	Absent	Suitable habitat does not occur within the study area.

[1]**Status and Habitat Codes:** Absent means general habitat is not present and no further work needed. Present means general habitat is present and species may be present.
Federal and State Codes: E = Endangered; T = Threatened; C = Candidate; Species of Special Concern (State); D = Delisted (status to be monitored for 5 years); FP = California Fully Protected Species. CNPS Codes: List 1B = Rare, Threatened or Endangered in CA and Elsewhere; List 2 = Rare, Threatened or Endangered in CA, but more common elsewhere.

APPENDIX E

Plant and Wildlife Species Observed

Plant Species Observed on the Strawberry Fields Study Area

Observers: Colby Boggs and Paul Kirk

Dates: April 25, May 3, May 9, and June 27, 2007

Annual Grassland		
Scientific name	**Common name**	**Family**
Aira caryophyllea	Silver European hairgrass	Poaceae
Amsinckia menziesii var. *intermedia*	Common fiddleneck	Boraginaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Bromus diandrus	Ripgut brome	Poaceae
Bromus hordeaceus	Soft brome	Poaceae
Bromus madritensis ssp. *rubens*	Red brome	Poaceae
Capsella bursa-pastoris	Shepherd's purse	Brassicaceae
Castilleja attenuata	Valley tassels	Scrophulariaceae
Centaurea solstitialis	Yellow star-thistle	Asteraceae
Cerastium glomeratum	Sticky mouse-eared chickweed	Caryophyllaceae
Chamomilla suaveolens	Pineapple weed	Asteraceae
Cichorium intybus	Chicory	Asteraceae
Cirsium vulgare	Bull thistle	Asteraceae
Convolvulus arvensis	Bindweed	Convolvulaceae
Cryptantha flaccida	Flaccid cryptantha	Boraginaceae
Cynodon dactylon	Bermuda grass	Poaceae
Cyperus eragrostis	Tall flatsedge	Cyperaceae
Dipsacus fullonum	Wild teasel	Dipsacaceae
Elymus elymoides	Squirreltail	Poaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Eriogonum luteolum	Golden buckwheat	Polygonaceae
Eriogonum nudum	Naked eriogonum	Polygonaceae
Eriogonum sphaerocephalum	Round-headed buckwheat	Polygonaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Eriophyllum lanatum	Woolly sunflower	Asteraceae
Erodium botrys	Long-beaked stork's bill	Geraniaceae
Erodium cicutarium	Red-stemmed filaree	Geraniaceae
Eschscholzia californica	California poppy	Papaveraceae
Filago californica	California herba impia	Asteraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Grindelia camporum	Great valley gumweed	Asteraceae
Heterotheca oregona	Oregon goldenaster	Asteraceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Poaceae
Hordeum murinum ssp. *leporinum*	Foxtail barley	Poaceae
Hypochaeris glabra	Smooth cat's-ear	Asteraceae
Juncus effusus	Common bog rush	Juncaceae
Keckiella breviflora	Gaping keckiella	Scrophulariaceae
Leontodon taraxacoides	Hawkbit	Asteraceae
Lolium multiflorum	Italian ryegrass	Poaceae
Lomatium dasycarpum	Woolly-fruited lomatium	Apiaceae
Lotus humistratus	Short-podded lotus	Fabaceae

Annual Grassland (cont.)		
Scientific name	**Common name**	**Family**
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Miniature lupine	Fabaceae
Mentzelia laevicaulis	Smooth-stem blazing star	Loasaceae
Petrorhagia dubia	Grass pink	Caryophyllaceae
Plagiobothrys fulvus	Fulvous popcorn flower	Boraginaceae
Plantago erecta	Erect plantain	Plantaginaceae
Raphanus raphanistrum	Jointed charlock	Brassicaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Sagina apetala	Dwarf pearlwort	Caryophyllaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Senecio vulgaris	Old man of spring	Asteraceae
Silybum marianum	Milk thistle	Asteraceae
Sonchus oleraceus	Common sow thistle	Asteraceae
Sorghum halepense	Johnson grass	Poaceae
Spergularia rubra	Ruby sandspurry	Caryophyllaceae
Symphytum officinale	Comfrey	Boraginaceae
Taraxacum officinale	Common dandelion	Asteraceae
Trifolium dubium	Shamrock	Fabaceae
Trifolium hirtum	Rose clover	Fabaceae
Trifolium microcephalum	Small-head field clover	Fabaceae
Trifolium repens	White clover	Fabaceae
Veronica peregrina ssp. *xalapensis*	Purslane speedwell	Scrophulariaceae
Vicia villosa	Winter vetch	Fabaceae
Vulpia myuros	Rattail fescue	Poaceae

Valley Foothill Riparian		
Acacia dealbata	Silver wattle	Fabaceae
Agrostis exarata	Spike bentgrass	Poaceae
Ailanthus altissima	Tree-of-heaven	Simaroubaceae
Alnus rhombifolia	White alder	Betulaceae
Aristolochia californica	Pipevine	Aristolochiaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asparagus officinalis ssp. *officinalis*	Asparagus	Liliaceae
Barbarea orthoceras	Winter cress	Brassicaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Small quaking grass	Poaceae
Bromus diandrus	Ripgut brome	Poaceae
Bromus hordeaceus	Soft brome	Poaceae
Carduus pycnocephalus	Italian plumeless thistle	Asteraceae
Carex integra	Smooth-beaked sedge	Cyperaceae
Carex nudata	Torrent sedge	Cyperaceae
Cercis occidentalis	Western redbud	Fabaceae
Cyperus eragrostis	Tall flatsedge	Cyperaceae
Datura wrightii	Toluaca	Solanaceae
Dipsacus fullonum	Wild teasel	Dipsacaceae
Echinochloa crus-galli	Barnyard grass	Poaceae
Elymus elymoides	Squirreltail	Poaceae
Epilobium brachycarpum	Tall annual willowherb	Onagraceae

Valley Foothill Riparian (cont.)		
Scientific name	**Common name**	**Family**
Equisetum laevigatum	Smooth scouring rush	Equisetaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Festuca rubra	Red fescue	Poaceae
Ficus carica	Common fig	Moraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Galium aparine	Goose grass	Rubiaceae
Geranium molle	Dove's foot geranium	Geraniaceae
Gnaphalium californicum	California everlasting	Asteraceae
Hordeum murinum	Barley	Poaceae
Iris pseudacorus	Water iris	Iridaceae
Juglans californica	California black walnut	Juglandaceae
Juncus effusus	Common bog rush	Juncaceae
Juncus saximontanus	Rocky mountain rush	Juncaceae
Lactuca serriola	Prickly lettuce	Asteraceae
Leontodon taraxacoides	Hawkbit	Asteraceae
Lolium multiflorum	Italian ryegrass	Poaceae
Melilotus alba	White sweetclover	Fabaceae
Morus alba	Mulberry	Moraceae
Paspalum dilatatum	Dallis grass	Poaceae
Phytolacca americana	Pokeweed	Phytolaccaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Gray pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Plectritis ciliosa	Long-spurred plectritis	Valerianaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Populus fremontii ssp. *fremontii*	Fremont cottonwood	Salicaceae
Quercus lobata	Valley oak	Fagaceae
Quercus wislizenii	Interior live oak	Fagaceae
Rhamnus californica	California coffeeberry	Rhamnaceae
Robinia pseudoacacia	Black locust	Fabaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Rumex acetosella	Common sheep sorrel	Polygonaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Salix lasiolepis	Arroyo willow	Salicaceae
Sambucus mexicana	Blue elderberry	Caprifoliaceae
Saponaria officinalis	Bouncing bet	Caryophyllaceae
Setaria pumila	Yellow bristle grass	Poaceae
Silybum marianum	Milk thistle	Asteraceae
Sonchus oleraceus	Common sow thistle	Asteraceae
Stellaria media	Common chickweed	Caryophyllaceae
Torilis arvensis	Field hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Ulmus minor	Smoothleaf elm	Ulmaceae
Verbascum thapsus	Woolly mullein	Scrophulariaceae
Vicia villosa	Winter vetch	Fabaceae
Vitis californica	California wild grape	Vitaceae
Vulpia myuros	Rattail fescue	Poaceae

Foothill Pine		
Scientific name	**Common name**	**Family**
Ailanthus altissima	Tree-of-heaven	Simaroubaceae
Anthoxanthum aristatum	Annual vernal grass	Poaceae
Arctostaphylos manzanita	Big leaved manzanita	Ericaceae
Avena barbata	Slender wild-oat	Poaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Small quaking grass	Poaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Gilia capitata	Blue field-gilia	Polemoniaceae
Heterotheca oregona	Oregon goldenaster	Asteraceae
Juglans californica	California black walnut	Juglandaceae
Lepidium virginicum	Wild pepper-grass	Brassicaceae
Linaria genistifolia ssp. *dalmatica*	Dalmatian toad-flax	Scrophulariaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Petrorhagia dubia	Grass pink	Caryophyllaceae
Pinus sabiniana	Gray pine	Pinaceae
Populus fremontii ssp. *fremontii*	Fremont cottonwood	Salicaceae
Quercus wislizenii	Interior live oak	Fagaceae
Raphanus raphanistrum	Jointed charlock	Brassicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Spartium junceum	Gorse	Fabaceae
Verbascum blattaria	Moth mullein	Scrophulariaceae

Valley Oak Woodland		
Camissonia contorta	Contorted sun-cup	Onagraceae
Chenopodium ambrosioides	Mexican tea	Chenopodiaceae
Cryptantha flaccida	Flaccid cryptantha	Boraginaceae
Heterotheca grandiflora	Telegraph weed	Asteraceae
Marrubium vulgare	Horehound	Lamiaceae
Morus alba	Mulberry	Moraceae
Orobanche fasciculata	Clustered broom-rape	Orobanchaceae
Phacelia heterophylla ssp. *virgata*	Virgate phacelia	Hydrophyllaceae
Rhamnus tomentella	Hoary coffeeberry	Rhamnaceae
Vitis californica	California wild grape	Vitaceae

Intermittent Pool and Pond		
Digitaria sanguinalis	Crabgrass	Poaceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Poaceae
Juncus bufonius	Toad rush	Juncaceae
Lemna minor	Common duckweed	Lemnaceae
Lolium multiflorum	Italian ryegrass	Poaceae
Lotus corniculatus	Birdfoot trefoil	Fabaceae
Poa annua	Annual blue grass	Poaceae
Polygonum arenastrum	Common knotweed	Polygonaceae
Veronica peregrina ssp. *xalapensis*	Purslane speedwell	Scrophulariaceae

Wildlife Species Observed on the Strawberry Fields Study Area

Observer: Colby Boggs, Ginger Bolen, and Heather Kelly
Dates: April 25, May 3, May 9, May 10, June 27, and November 2, 2007

Common name	***Scientific name***
Pacific chorus frog	*Pseudacris regilla*
bullfrog	*Rana catesbeiana*
alligator lizard	*Elgaria* sp.
fence lizard	*Sceloporus occidentalis*
mallard duck	*Anas platyrhynchos*
scrub jay	*Aphelocoma californica*
great egret	*Ardea alba*
Canada goose	*Branta canadensis*
red-tailed hawk	*Buteo jamaicensis*
California quail	*Callipepla californica*
turkey vulture	*Cathartes aura*
killdeer	*Charadrius vociferus*
red-shafted flicker	*Colaptes auratus*
acorn woodpecker	*Melanerpes formicivorus*
song sparrow	*Melospiza melodia*
downy woodpecker	*Picoides pubescens*
spotted towhee	*Pipilo maculatus*
western tanager	*Piranga ludoviciana*
blue-gray gnatcatcher	*Polioptila caerulea*
bushtits	*Psaltriparus minimus*
bank swallow	*Riparia riparia*
black phoebe	*Sayornis nigricans*
red breasted nuthatch (migrant)	*Sitta canadensis*
American robin	*Turdus migratorius*
western kingbird	*Tyrannus verticalis*
mourning dove	*Zenaida macroura*
coyote	*Canis latrans*
black-tailed jack rabbit	*Lepus californicus*
mule deer	*Odocoileus hemionus*
grey squirrel	*Sciurus griseus*

APPENDIX F

Summary Table of VELB Survey Data

Summary Table of VELB Survey Data from the Strawberry Fields Study Area.

Observer: Paul Kirk
Survey Dates: June 27, June 28, June 29, and August 2, 2007

Elderberry Shrub Number	# Exit Holes	Stems 1-3”	Stems 3-5”	Stems >5”	Approximate Shrub Ht. (ft)	Riparian Location?	Associated Habitat
1	0	0	0	1	12	No	Annual grassland
2	0	0	8	3	18	Yes	Valley foothill riparian
3	0	6	9	8	18	Yes	Valley foothill riparian
4	4	2	4	11	20	No	Valley oak woodland
5	1	0	4	3	15	No	Valley oak woodland
6	0	0	1	1	20	No	Valley oak woodland
7	0	0	0	1	25	No	Valley oak woodland
8	0	0	0	1	15	No	Valley oak woodland
9	0	0	0	2	46	Yes	Valley foothill riparian
10	0	0	1	3	18	Yes	Valley foothill riparian
11	0	3	2	0	18	Yes	Valley foothill riparian
12	0	1	0	0	12	Yes	Valley foothill riparian
13	NS[1]	≥ 1	NS[1]	NS[1]	18	Yes	Valley foothill riparian
14	NS[1]	≥ 1	NS[1]	NS[1]	18	Yes	Valley foothill riparian
15	0	0	0	1	20	No	Valley oak woodland
16	0	2	0	2	15	No	Valley oak woodland
17	0	2	1	2	12	No	Valley oak woodland
18	0	0	0	2	12	No	Valley oak woodland
19	0	4	5	2	18	No	Valley oak woodland
20	1	1	1	3	20	No	Valley oak woodland
21	0	4	0	2	15	No	Valley oak woodland
22	0	4	2	4	18	Yes	Valley foothill riparian
23	0	6	6	1	18	Yes	Valley foothill riparian
24	0	6	4	2	15	Yes	Valley foothill riparian
25	0	4	6	2	18	Yes	Valley foothill riparian
26	0	0	0	2	18	No	Valley oak woodland
27	0	0	1	0	15	No	Valley oak woodland
28	3	1	1	3	18	No	Valley oak woodland
29	3	0	0	8	16	No	Valley oak woodland
30	0	1	2	9	18	Yes	Valley foothill riparian
31	0	3	3	0	12	Yes	Valley foothill riparian

Elderberry Shrub Number	# Exit Holes	Stems 1-3”	Stems 3-5”	Stems >5”	Approximate Shrub Ht. (ft)	Riparian Location?	Associated Habitat
32	0	1	0	0	10	Yes	Valley foothill riparian
33	2	0	2	0	12	Yes	Valley foothill riparian
34	0	1	0	0	8	Yes	Valley foothill riparian
35	0	2	0	0	8	Yes	Valley foothill riparian
36	0	7	5	1	15	Yes	Valley foothill riparian
37	7	3	1	3	18	Yes	Valley foothill riparian
38	0	3	1	3	14	Yes	Valley foothill riparian
40[2]	0	1	0	2	15	Yes	Valley foothill riparian
41	0	1	0	0	10	Yes	Valley foothill riparian
42	0	1	1	0	15	Yes	Valley foothill riparian
43	3	4	1	0	12	Yes	Valley foothill riparian
44	0	0	1	0	12	Yes	Valley foothill riparian
45	0	1	0	0	8	Yes	Valley foothill riparian
47[2]	0	1	5	6	18	Yes	Valley foothill riparian
48	0	1	0	0	12	No	Annual grassland
49	0	14	4	3	16	No	Riverine
50	0	6	2	1	12	No	Riverine
51	0	3	1	0	15	No	Annual grassland
52	0	3	0	1	18	Yes	Valley foothill riparian
53	0	0	1	2	15	Yes	Valley foothill riparian
54	0	1	1	1	20	Yes	Valley foothill riparian
55	6	1	3	9	20	Yes	Valley foothill riparian
56	1	1	1	1	12	Yes	Valley foothill riparian
57	0	1	0	1	16	Yes	Valley foothill riparian
58	0	0	1	0	14	Yes	Valley foothill riparian
59	0	0	2	2	16	No	Valley oak woodland
60	1	0	0	4	16	No	Valley oak woodland
62	0	1	0	0	9	Yes	Valley foothill riparian
61	1	1	1	2	20	No	Valley oak woodland
63	0	4	1	2	12	Yes	Valley foothill riparian
64	3	1	2	5	15	Yes	Valley foothill riparian

[1] These shrubs are overgrown with Himalayan blackberry and were not surveyed (NS) for exit holes. Stem count and shrub height were estimated using binoculars.

[2] Break in sequence due to duplicate GPS recording.

APPENDIX G

Representative Photographs of VELB Exit Holes

Representative Photographs of VELB Exit Holes Observed at the Strawberry Fields Study Area

Photographs taken on June 29 and August 2, 2007

Photograph 1. Old VELB exit hole on elderberry stem (shrub #37). This shrub had seven exit holes on three different stems.

Photograph 2. Recent VELB exit hole with clean edges on elderberry stem (shrub # 55).

STRAWBERRY FIELDS STUDY AREA
BIOLOGICAL RESOURCES ASSESSMENT
PREPARED BY NORTH STATE RESOURCES

STRAWBERRY FIELDS STUDY AREA

Biological Resources Assessment

November 7, 2007

Prepared for:
Redding Rancheria Tribe

Prepared by:
North State Resources, Inc.

NSR No. 50780

North State Resources, Inc.

STRAWBERRY FIELDS STUDY AREA

Biological Resources Assessment

November 7, 2007

Prepared for:
Redding Rancheria Tribe
Attn: Mr. Neal Malmsten
2000 Redding Rancheria Road
Redding, CA 96001

Prepared by:
North State Resources, Inc.
500 Orient Street, Suite 150
Chico, CA 95928
(530) 345-4552
(530) 345-4805 *fax*

NSR No. 50780

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1. INTRODUCTION

On behalf of the Redding Rancheria Tribe, North State Resources, Inc. (NSR) conducted a biological resources assessment of the approximately 225.86-acre Strawberry Fields Study Area, hereinafter referred to as the "study area." The purpose of this assessment is to document the biological resources in the vicinity of the study area, including a general description of the terrestrial and aquatic habitats and identification of potentially occurring special-status plant and wildlife species. The results of plant and wildlife surveys within the study area are included in this biological resources assessment.

1.1 Study Area Location

The study area is located south of the City of Redding in Shasta County, California and can be found within the *Enterprise*, *California* U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Township 31 North, Range 4 West, Sections 19 and 20). The central western and eastern boundaries of the study area are located at approximately 40º 31' 67"N latitude by 122° 21' 53"W longitude and 40º 31' 67"N latitude by 122° 20' 81"W longitude, respectively. A map of the study area is presented as Figure 1.

2. METHODS

2.1 Literature Review

For the purposes of this assessment, special-status plant species are defined as vascular plants that are: (1) listed as endangered or threatened under the federal Endangered Species Act (or formally proposed, or candidates, for listing); (2) listed as endangered or threatened under the California Endangered Species Act (or candidates for listing); and/or (3) listed as rare under the California Native Plant Protection Act. "Other" special-status plant species include those considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered in California and elsewhere (Lists 1B and 2).

Special-status fish and wildlife species include those that are: (1) designated as endangered or threatened by the state and/or federal governments (i.e., "listed species") under the California Endangered Species Act and/or federal Endangered Species Act, respectively; (2) proposed for federal listing status as endangered or threatened; and/or (3) designated as candidates for state or federal listing status as endangered or threatened. "Other" special-status fish and wildlife species are identified by the California Department of Fish and Game (CDFG) as California Fully Protected Species or California Species of Special Concern. For potentially occurring special-status wildlife resources, emphasis is on resident or breeding species rather than on seasonally occurring species.

Source: NSR, Inc; City of Redding; USGS 7.5-Minute Topographic Quadrangle, Enterprise 07-05-06 rjo
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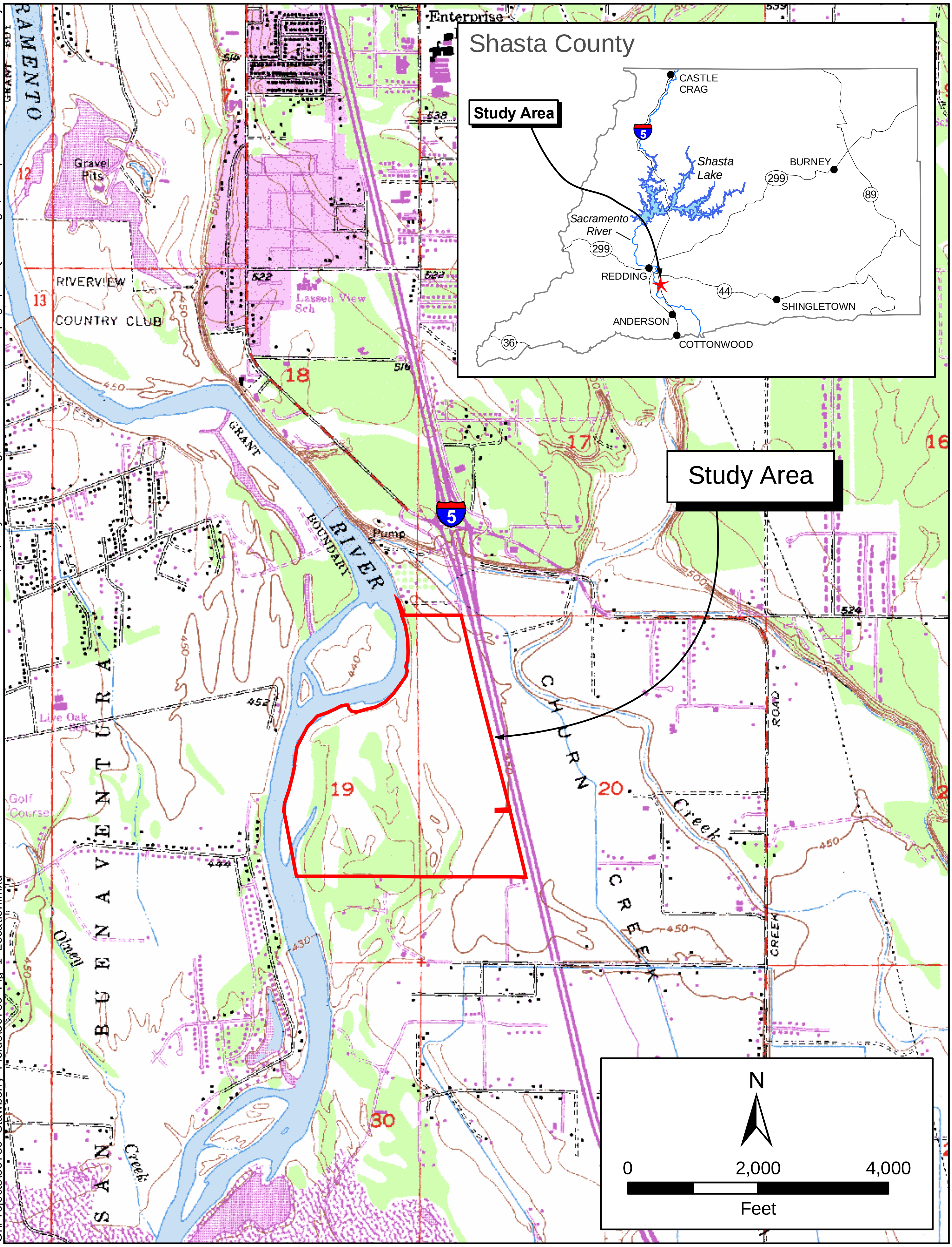


North State Resources, Inc.

Strawberry Fields Study Area

Figure 1
Study Area and Vicinity

Investigations into the occurrence and potential for occurrence of special-status plant and wildlife species in the study area included conducting: database searches; field reconnaissance and limited protocol-level surveys for special-status plant and wildlife species; and review of pertinent environmental documents and technical studies.

The *List of Endangered and Threatened Species That May Occur in, or be Affected by Projects in the Enterprise, California USGS quadrangle and Shasta County, California* (U.S. Fish and Wildlife Service 2007b) was reviewed for federally listed plant and wildlife species known to occur or suspected of occurring in the vicinity of the study area (Appendix A).

The California Natural Diversity Database (CNDDB) was reviewed for records of special-status plant and wildlife species in the *Enterprise, California* and eight surrounding USGS quadrangles (California Department of Fish and Game 2007a). The CNDDB is a database consisting of historical observations of special-status plant species, wildlife species, and special plant communities. It is limited to reported sightings and is not a comprehensive list of special-status plant and wildlife species that may occur in a particular area. A copy of the search results is included as Appendix B.

Another database search was performed from a query of the online *CNPS Inventory of Rare and Endangered Plants of California* (California Native Plant Society 2007). The query was conducted for documented special-status plant species occurrences in the *Enterprise, California* USGS quadrangle and the eight surrounding quadrangles. The results of this query are included as Appendix C.

Additionally, the following documents were reviewed: *Endangered and Threatened Animals of California* (California Department of Fish and Game 2006a), *Special Animals* (California Department of Fish and Game 2007b), *Endangered, Threatened, and Rare Plants of California* (California Department of Fish and Game 2006b), and *Special Vascular Plants, Bryophytes, and Lichens List* (California Department of Fish and Game 2006c).

2.2 FIELD REVIEW/SURVEYS

Botany

A pre-field botanical review of the study area was conducted in general accordance with *Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (California Department of Fish and Game 2000) and *Botanical Survey Guidelines of the California Native Plant Society* (California Native Plant Society 2001a). Per botanical survey guidance, a target list of special-status plant species with the potential to occur within the study area was developed, in part, through a review of the previously mentioned environmental documents, technical studies, and databases. Local botanical expertise, herbarium database records, and regional floras were also used to develop a target list.

Prior to initiating field surveys, Mr. Colby J. Boggs, NSR botanist/plant ecologist, reviewed the habitat requirements and morphological features specific to each plant taxon on the target list. Protocol-level field surveys were conducted on April 25, May 3, May 9, and June 27, 2007. These dates coincide with the blooming/identifiable periods for all of the special-status plant species on the target list determined to have potential to occur within the study area. Field surveys were conducted

and all areas of the study area were viewed to the degree necessary to determine the presence/absence of special-status plant species and suitable habitat. All plant species detected within the study area were identified utilizing the nomenclature in *The Jepson Manual* (Hickman 1993).

Wildlife

Focused wildlife surveys were conducted for California red-legged frog (*Rana aurora draytonii*) and valley elderberry longhorn beetle (VELB) (*Desmocerus californicus dimorphus*). Ms. Ginger Bolen, NSR biologist conducted the California red-legged frog site assessment on August 17 and 20, and September 11, 2006, and May 7 and 10, 2007. Mr. Paul Kirk, NSR biologist conducted protocol-level VELB surveys on June 27, 28, and 29, and August 2, 2007.

2.2.1.1 ***California Red-Legged Frog Assessment***

A California Red-Legged frog site assessment was conducted using the guidelines set forth in *Revised Guidance on Site Assessments and Field Surveys for California Red-legged Frog* (U. S. Fish and Wildlife Service 2005). Information for the assessment was gathered through a combination of literature review, database searches, review of topographic mapping and aerial photography, and field visits to the site. The literature review identified the historic and current range of the California red-legged frog and provided information on specific habitat preferences of the species. The CNDDB records for Shasta County (California Department of Fish and Game 2007a) and the USFWS *Recovery Plan for the California Red-legged Frog* (U.S. Fish and Wildlife Service 2002) provided information regarding the known existing and historic populations of California red-legged frogs in the study area region.

A review of topographic mapping and aerial photography provided information regarding vegetation communities and land uses occurring near the study area. The study area and publicly accessible areas of the surrounding vicinity were characterized and evaluated for the presence of potentially suitable habitat for the California red-legged frog. A detailed California red-legged frog habitat assessment was prepared by NSR as a separate report (North State Resources 2007a).

2.2.1.2 ***Valley Longhorn Elderberry Beetle Survey***

Mr. Boggs, NSR botanist/plant ecologist conducted a reconnaissance level survey, noting the location of elderberry shrubs on an aerial map, as part of the botanical survey efforts in April and May 2007. Subsequently, Mr. Kirk, NSR biologist used the resulting aerial map to conduct the protocol-level VELB survey (U.S. Fish and Wildlife Service 1999) on June 27, June 28, and June 29, and August 2, 2007. The study area was surveyed on foot, and all areas were viewed to the degree necessary to locate all previously noted elderberry shrubs and to detect the presence of additional elderberry shrubs. Two elderberry shrubs in the southwest section of the study area were deeply embedded within Himalayan blackberry (*Rubus discolor*) brambles and were inaccessible for close inspection.

For each of the accessible elderberry shrubs, all stems measuring one inch or greater in diameter at ground level were counted, assessed for the presence of exit holes, and assigned to a size class (i.e., stems 1-3”, 3-5”, and >5”). For the few shrubs inaccessible for close inspection, binoculars were used to collect information to the greatest extent practicable. The vegetation community occurring in the immediate vicinity of all surveyed shrubs was recorded. The locations of all surveyed elderberry

shrubs were mapped using a Pathfinder Pro Global Positioning System (GPS) capable of sub-meter accuracy (NAD 27 projection). All spatial data were entered into a Geographic Information Systems (GIS) application and overlain onto a digital orthorectified aerial photograph.

3. RESULTS

3.1 General Setting

The study area is located on a level terrace with the general topography gently sloping west towards the Sacramento River. Elevations range from approximately 430 to 450 feet above mean sea level. The area has a Mediterranean climate with cool, wet winters and hot, dry summers. Average precipitation is approximately 25 to 35 inches per year and falls almost exclusively as rain between October and April. Mean January maximum temperature is 52° F and mean July maximum temperature is 95° F (Western Regional Climate Center 2006).

Vegetation and Associated Wildlife

The vegetation or habitat types present within the study area include riverine, annual grassland, valley oak woodland, and valley foothill riparian (Mayer and Laudenslayer 1988) as well as foothill pine (Sawyer and Keeler-Wolf 1995) as shown on Figure 2. Waters of the United States are present within these plant communities and are addressed briefly in Section 4. A description for each of these plant communities is provided below.

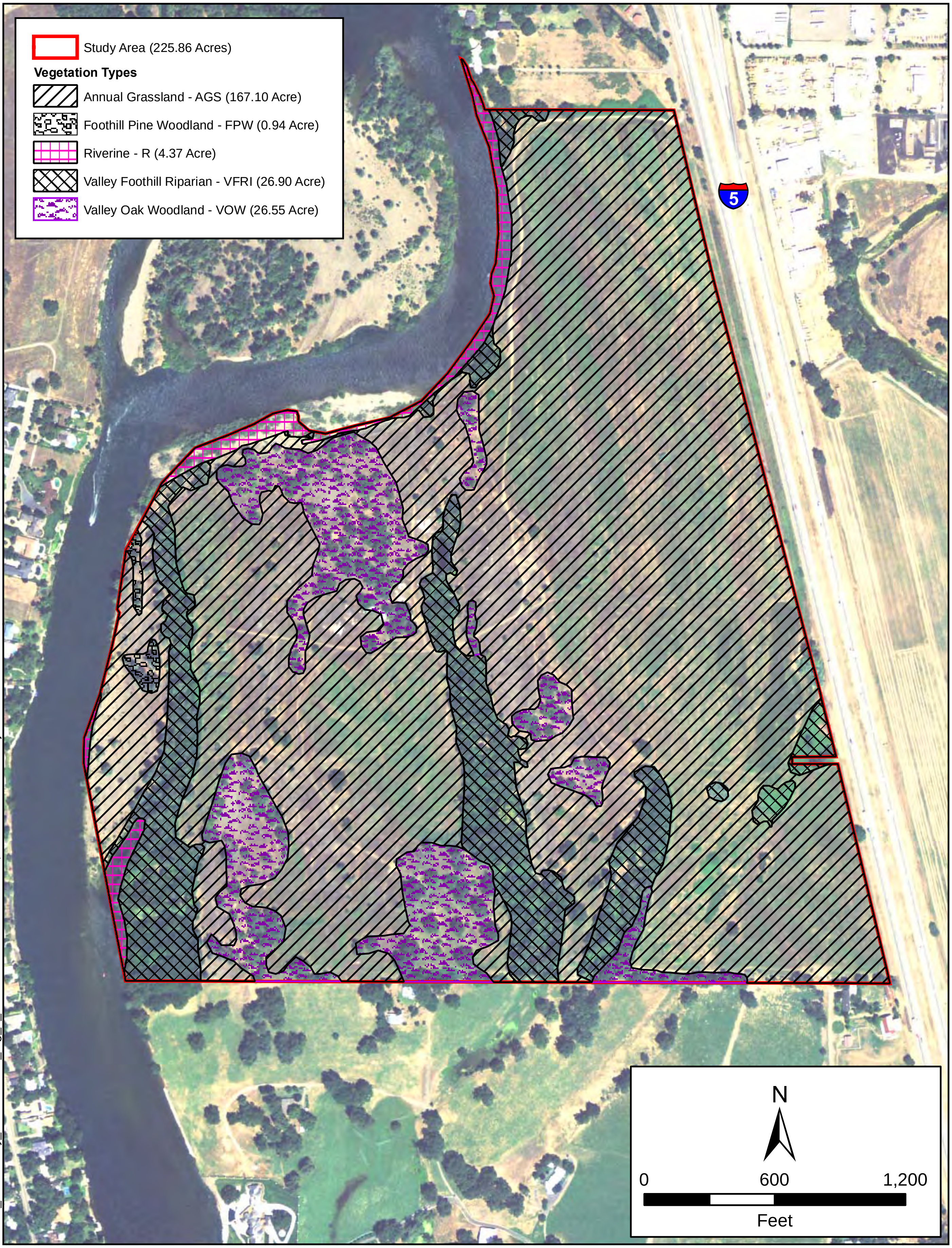
Riverine

Riverine habitat (4.37 acres) consists of the active channel and backwater area of the Sacramento River located along the western boundary of the study area. Riverine habitat is typically characterized by continually flowing water and boulder, cobble, gravel, and/or sand substrates. A dominant plant community within this habitat is absent due to the constant flow of water and movement of soil material (i.e., scour and deposition). However, seasonal fluctuations in water volume and velocity can allow the establishment of some vegetation along banks and on exposed gravel bars; most notably, primary successional species such as willows (*Salix* spp.).

Wildlife. The riverine habitat is suitable year-round for resident and anadromous fishes. Amphibians and reptiles expected to occur include the Pacific chorus frog (*Pseudacris regilla*), western toad (*Bufo boreas*), bullfrog (*Rana catesbeiana*), and northwestern pond turtle (*Clemmys marmorata marmorata*). In addition, birds such as the mallard (*Anas platyrhynchos*), great blue heron (*Ardea herodias*), osprey (*Pandion haliaetus*), and belted kingfisher (*Ceryle alcyon*) may forage here. Bats such as the little brown myotis (*Myotis lucifugus*), forage above this habitat during summer evenings.

Annual Grassland

Annual grassland habitat (167.10 acres) occurring within the study area is dominated by non-native annual grasses, and non-native annual and perennial herbaceous plants. This plant community occurs on all soil map units and the land type present on the site with minor differences in species composition based on location (e.g., greater abundance of native perennial species present on old gravel bar adjacent to the Sacramento River than on the terrace composed of moderately deep, sandy loam soil adjacent to I-5). Regardless of location, the dominant non-native grasses include European



50780_Strawberry_Fields\50780_Fig_2_WHR.mxd Source: NSR, Inc. 07-10-06 rjo

Strawberry Fields Study Area

North State Resources, Inc.

Figure 2
Vegetation Types

silver hairgrass (*Aira caryophyllea*), ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), medusahead (*Taeniatherum caput-medusae*) and rattail fescue (*Vulpia myuros*), and the dominant non-native herbaceous plants include black mustard (*Brassica nigra*), yellow star-thistle (*Centaurea solstitialis*), Spanish lotus (*Lotus purshianus*), and winter vetch (*Vicia villosa*). Native plant species include California poppy (*Eschscholzia californica*) and vinegar weed (*Trichostema lanceolatum*). Native plants occurring only on the gravel bar and on the Riverwash land type include showy milkweed (*Asclepias speciosa*), California brickellbush (*Brickellia californica*), yerba santa (*Eriodictyon californicum*), naked-stemmed buckwheat (*Eriogonum nudum*), Oregon false goldenaster (*Heterotheca oregana*), woolly-fruited lomatium (*Lomatium dasycarpum*), and silver bush lupine (*Lupinus albifrons*). Small stands of Himalayan blackberry (*Rubus discolor*) and narrowleaf willow (*Salix exigua*) as well as a few lone whiteleaf manzanita (*Arctostaphylos viscida*), foothill pine (*Pinus sabiniana*), valley oak (*Quercus lobata*), and blue elderberry (*Sambucus mexicana*) are found scattered throughout this habitat.

Wildlife. Annual grasslands are productive wildlife habitat. Grassland bird species, such as the mourning dove (*Zenaida macroura*), savannah sparrow (*Passerculus sandwichensis*), and white-crowned sparrow (*Zonotrichia leucophrys*) as well as rodents, including the California ground squirrel (*Spermophilus beecheyi)*, Botta's pocket gopher (*Thomomys bottae*), and deer mouse (*Peromyscus maniculatus*), forage on the seed crop this community provides. These species, in turn, attract predators such as the gopher snake (*Pituophis catenifer*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and coyote (*Canis latrans*). Other common grassland species include the western meadowlark (*Sturnella neglecta*) and black-tailed hare (*Lepus californicus*). Reptile species expected to occur here include the western fence lizard (*Sceloporus occidentalis*), western skink (*Eumeces skiltonianus*), western rattlesnake (*Crotalus viridis*), and yellow-bellied racer (*Coluber constrictor mormon*).

Valley Oak Woodland

Valley oak woodland habitat (26.55 acres) occurring within the study area is dominated by valley oak. Other tree species occurring in this plant community include Oregon ash (*Fraxinus latifolia*), foothill pine (*Pinus sabiniana*), and interior live oak (*Quercus wislizenii*). Shrubs are sparse in this habitat but include California coffeeberry (*Rhamnus californica*), Himalayan blackberry, and poison-oak (*Toxicodendron diversilobum*). The valley oak woodland habitat is an ecological extension of the annual grassland plant community with the only significant difference being the presence of a tree canopy with an approximate foliar cover of 50-60%. The grasses and herbaceous plants occurring in this habitat are similar to those present in the annual grassland plant community. Grasses and herbaceous plants present in the valley oak woodland habitat include European silver hairgrass, slender oat (*Avena barbata*), black mustard, ripgut brome, soft chess, yellow star-thistle, California poppy, and rattail fescue. Plant species occurring only under the canopy of valley oak include goose grass (*Galium aparine*) and hare barley (*Hordeum murinum* ssp. *leporinum*).

Wildlife. The valley oak woodland provides food and cover for a variety birds including red-shouldered hawk (*Buteo lineatus*), California quail (*Callipepla californica*), acorn woodpecker (*Melanerpes formicivorus*), western scrub-jay (*Aphelocoma californica*), and great horned owl (*Bubo

virginianus). Other common animals include black-tailed deer (*Odocoileus hemionus*), opossum (*Didelphis virginianus*), California ground squirrel, and western fence lizard.

Valley Foothill Riparian

Valley foothill riparian habitat (26.90 acres) occurring within the study area is dominated by tree-of-heaven (*Ailanthus altissima*), California black walnut (*Juglans californica*), Fremont cottonwood (*Populus fremontii*), valley oak, and black locust (*Robinia pseudoacacia*). Other trees present in this plant community include white alder (*Alnus rhombifolia*), Oregon ash, mulberry (*Morus alba*), foothill pine, and interior live oak. Shrubs and vines form an understory layer in the valley foothill riparian habitat with an approximate foliar cover of 90-100% in some areas and includes oleander (*Nerium oleander*), California coffeeberry, Himalayan blackberry, narrowleaf willow, arroyo willow (*Salix lasiolepis*), blue elderberry, and California wild grape (*Vitis californica*). Accordingly, grasses and herbaceous plants occurring in this plant community exhibit low percent cover in the understory layer. However, these plants are present and include California pipevine (*Aristolochia californica*), mugwort (*Artemisia douglasiana*), Santa Barbara sedge (*Carex barbarae*), and goose grass.

Wildlife. Riparian communities are among the most important habitats for wildlife because of their high floristic and structural diversity, high biomass (and therefore high food abundance), and high water availability. In addition to providing breeding, foraging, and roosting habitat for a diverse array of animals, riparian communities provide movement corridors for some species, connecting a variety of habitats throughout a region.

The leaf litter, fallen tree branches, and logs associated with the riparian community in the study area provide cover for the western toad and Pacific chorus frog. The western fence lizard, western skink, and southern alligator lizard (*Elgaria multicarinata webbi*) are also expected to occur here, as are several snake species, including the western rattlesnake, yellow-bellied racer, and common kingsnake (*Lampropeltis getulus*).

The willows in the riparian community attract a number of bird species. Many of these species are year-round residents, breeding in the riparian community in the spring and summer and using it for cover and foraging habitat during the non-breeding season. Common species nesting and foraging, primarily in the riparian tree canopy, include the bushtit (*Psaltriparus minimus*), white-breasted nuthatch (*Sitta carolinensis*), and Nuttall's and downy woodpeckers (*Picoides nuttallii* and *Picoides pubescens*, respectively). Other resident species, such as the spotted towhee (*Pipilo maculatus*) and song sparrow (*Melospiza melodia*), nest and forage on or very close to the ground, usually in dense vegetation. Several species of raptors, including the Cooper's hawk (*Accipiter cooperii*) and western screech owl (*Otus kennicottii*), nest in riparian communities and remain there year-round.

In addition to the permanent residents, numerous species of neotropical migrants occur in this community from spring through fall, with many potentially breeding on the site, including the ash-throated flycatcher (*Myiarchus cinerascens*), olive-sided flycatcher (*Contopus cooperi*), western wood-pewee (*Contopus sordidulus*), warbling vireo (*Vireo gilvus*), Swainson's thrush (*Catharus ustulatus*) and black-headed grosbeak (*Pheucticus melanoleucus*).

A variety of mammals also occurs in riparian communities. Small mammals, such as the Botta's pocket gopher, and deer mouse, may burrow or find refuge in dense grass or brushy thickets. Mule

deer frequently use riparian habitats, and predators, such as the raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*) and coyote, are attracted to riparian areas by the abundance of prey and cover. In addition, the taller trees provide daytime roosts for nocturnal species such as the raccoon and Virginia opossum.

Foothill Pine Woodland

The foothill pine woodland plant community (0.94 acre) occurs on an old gravel bar adjacent to the Sacramento River in the western portion of the study area and is dominated by foothill pine. Other tree species occurring in this plant community include valley oak and interior live oak. Shrubs are sparse in this habitat but include whiteleaf manzanita, Himalayan blackberry, and poison-oak. The foothill pine woodland habitat is an ecological extension of the annual grassland plant community with the only significant difference being the presence of a tree canopy with an approximate foliar cover of 50-60%. The grasses and herbaceous plants occurring in this habitat are similar to those present in the annual grassland and valley oak woodland plant communities. Grasses and herbaceous plants present in the foothill pine woodland habitat include European silver hairgrass, California brickellbush, ripgut brome, soft chess, yellow star-thistle, naked-stemmed buckwheat, California poppy, and rattail fescue.

Wildlife. The foothill pine woodland community is small inclusion within the annual grassland on the gravel bar between the river and a strip of valley foothill woodland. The wildlife species expected in this community would be a subset of those found in the annual grassland and valley foothill woodland habitats.

Soils

The *Soil Survey of Shasta County Area, California* (U.S. Department of Agriculture and Soil Conservation Service 1974) identifies five soil map units and one land type within the study area:

- ***CcA – Churn loam, 0 to 3% slopes***. The Churn series consists of well-drained and moderately well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically light yellowish-brown, medium acid gravelly loam about nine inches thick. The subgroup taxonomy for the Churn series is *Ultic Haploxeralfs*. The Churn loam soil unit is well-drained and has moderately slow permeability. Runoff is slow, and the hazard of erosion is none to slight for this soil unit. The Churn loam soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands associated with drainageways (USDA Soil Conservation Service 1992).

- ***CeA – Churn gravelly loam, 0 to 3% slopes.*** The Churn series consists of well-drained and moderately well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically light yellowish-brown, medium acid gravelly loam about nine inches thick. The subgroup taxonomy for the Churn series is *Ultic Haploxeralfs*. The Churn gravelly loam soil unit is well-drained and has moderately slow permeability. Runoff is slow, and the hazard of erosion is none to slight for this soil unit. The Churn gravelly loam soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands associated with drainageways (USDA Soil Conservation Service 1992).

- ***RgA – Reiff fine sandy loam, 0 to 3% slopes.*** The Reiff series consists of well-drained and moderately well-drained soils that formed in recent alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically grayish-brown and brown, slightly acid fine sandy loam about 18 inches thick. The subgroup taxonomy for the Reiff series is *Typic Xerorthents*. The Reiff fine sandy loam soil unit is well-drained and has moderately rapid permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Reiff fine sandy loam soil map unit is classified as non-hydric (USDA Soil Conservation Service 1992).

- ***Rw – Riverwash.*** The Riverwash land type is excessively drained and is associated with stream channels and adjacent areas subject to continuous or frequent flooding (U.S. Department of Agriculture and Soil Conservation Service 1974). Permeability is rapid, runoff is very slow, and the hazard of erosion is very high for this land type. Binomial subgroup taxonomy does not apply to land types. The Riverwash land type is classified as hydric and is associated with floodplain channels (USDA Soil Conservation Service 1992).

- ***TbA – Tehama loam, 0 to 3% slopes.*** The Tehama series consists of well-drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is pale brown, medium acid and slightly acid loam about 30 inches thick. The subgroup taxonomy for the Tehama series is *Typic Haploxeralfs*. The Tehama loam soil unit is well-drained and has slow permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Tehama loam soil map unit is classified as non-hydric with hydric inclusions in the form of unnamed ponded features associated with depressions (USDA Soil Conservation Service 1992).

- ***TfA – Tujunga loamy sand, 0 to 3% slopes.*** The Tujunga series consists of somewhat excessively drained soils that formed in alluvium derived from mixed sources (U.S. Department of Agriculture and Soil Conservation Service 1974). The surface layer in a representative profile is typically pale brown, slightly acid loamy sand about 14 inches thick. The subgroup taxonomy for the Tujunga series is *Typic Xeropsamments*. The Tujunga loamy sand soil unit is somewhat excessively drained and has rapid permeability. Runoff is very slow, and the hazard of erosion is none to slight for this soil unit. The Tujunga loamy sand soil map unit is classified as non-hydric with hydric inclusions in the form of cobbly alluvial lands and riverwash associated with drainageways and floodplain channels, respectively (USDA Soil Conservation Service 1992).

Waters of the U.S.

NSR conducted a delineation of waters of the United States in accordance with U.S. Army Corps of Engineers (USACE) methodology and regulatory guidance letters within the study area on June 15, June 16, and June 21, 2006. A total of 4.419 acres of waters of the United States features were delineated within the study area that includes seasonal wetland (0.029 acre), riverine/perennial stream (4.366 acres), and intermittent stream (0.024 acre, 149 linear feet) habitat. A separate report was prepared by NSR on April 19, 2007 (North State Resources 2007b).

3.2 Regional Species of Concern

Vegetation or habitat types found in the study area region potentially support special-status plant and wildlife species (Appendix D). Appendix D provides a general comparison of habitat requirements for each species and the general habitats present in the study area. Some of the special-status plants

and animals occurring near the study area are found in habitat types that are not present on-site, such as vernal pools. Therefore, these species are not considered in further detail as part of this assessment. For those species for which generally suitable habitat was determined to be present with the study area, the results of the reconnaissance-level survey were used to determine the likelihood of their presence on the site (Tables 1 and 2).

Special-Status Plant Species

Fourteen special-status vascular plant species were initially considered for analysis (Appendix D). Based upon geographic location, local botanical knowledge, and habitat parameters present within the study area, suitable habitat for four special-status plants was determined to occur in the study area (Table 1).

Table 1. Special-Status Plant Species Potentially Occurring in the Study Area

Common Name (*Scientific Name*)	Status[1] (FED/ST /CNPS)	General Habitat Description / Elevation Range	Typical Blooming Period	Comments
Fox sedge *Carex vulpinoidea*	--/--/2.2	Freshwater marshes and swamps, and riparian woodland / 98-3,937 feet	May-June	**Surveys negative, presumed absent.** Suitable habitat occurs within the seasonal wetland in the southwest portion of the study area.
Silky cryptantha *Cryptantha crinita*	--/--/1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland / 278-984 feet	April-May	**Surveys negative, presumed absent.** Suitable habitat occurs within gravelly substrate present on gravel bars and old channels.
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	--/--/1B.1	Meadows and seeps, vernal pools; vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland / 115-3,346 feet	March-May	**Surveys negative, presumed absent.** Suitable habitat occurs within the ponded area in the northeast corner of the study area.
Ahart's paronychia *Paronychia ahartii*	--/--/1B.1	Cismontane woodland, valley and foothill grassland and vernal pools / 90-1,530 feet	March-June	**Surveys negative, presumed absent.** Suitable habitat occurs within valley oak woodland and foothill grassland on the study area.

Status Codes[1]:
FED = Federal
ST = State
Federal & State Codes:
E = Endangered; T = Threatened

CNPS = California Native Plant Society
CNPS Codes:
List 1B = Rare, Threatened or Endangered in CA and Elsewhere;
List 2 = Rare, Threatened or Endangered in CA, but more common elsewhere

Special-Status Wildlife Species

Sixty five (65) special-status wildlife species were initially considered for analysis (Appendix D). Based upon location and habitat parameters, twenty-nine (29) special-status wildlife species were identified as having the potential to occur in the study area. Table 2 presents a list of these species and their likelihood of occurrence. Special-status designation and general habitat requirements for each species are provided in the table. Conclusions presented in this table are based on the

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Federal or State Listed Species			
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs associated with riparian forests that occur along rivers and streams.	**Present.** Protocol level surveys detected VELB exit holes on numerous 12 elderberry shrubs.
Green sturgeon, southern DPS *Acipenser medirostris*	T/SC	Spawn in Sacramento and Feather rivers; juveniles are thought to rear mainly in the estuary. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock. Spawn in the mainstem Sacramento River when temperatures range between 46-60 °F.	**Present**. Known to occur in the Sacramento River throughout all accessible reaches upstream at least to Anderson-Cottonwood Irrigation District dam near Redding, California.
Steelhead, California Central Valley DPS *Oncorhynchus mykiss* Critical Habitat	T/--	Spawn and rear in freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**. Occur in the mainstem Sacramento River and tributary streams. Adults migrate upstream during the fall/winter and spawn from winter to early spring. Juveniles rear in natal areas for 1-2 years before migrating to the ocean. Suitable spawning and rearing habitat exists in the Sacramento River.
Central Valley spring-run ESU Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat Essential Fish Habitat	T/T	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present.** Occur in the mainstem Sacramento River and its major perennial tributary streams. Adults migrate upstream during the spring and spawn from mid-August to mid-October. Suitable spawning and rearing habitat exists in the Sacramento River.
Sacramento River winter-run ESU Chinook salmon *Oncorhynchus tshawytscha* Critical Habitat Essential Fish Habitat	E/E	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present**. Occur in the mainstem Sacramento River. Adults migrate upstream during the winter and spawn from mid-April to August. Suitable spawning and rearing habitat exists in the Sacramento River.
California red-legged frog *Rana aurora draytonii*	T/SC	Require aquatic habitat for breeding, also uses a variety of other habitat types including riparian and upland areas. Adults utilize dense, shrubby or emergent vegetation associated with deep-water pools with fringes of cattails & dense stands of overhanging vegetation.	**Absent.** Protocol level surveys did not detect this species (North State Resources 2007a).

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	**Status[1] (Fed/State)**	**General Habitat Description**	**Comments**
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/--	Nesting habitat is cottonwood/willow riparian forest. Occurs only along the upper Sacramento Valley portion of the Sacramento River, the Feather River in Sutter Co., the south fork of the Kern River in Kern Co., and along the Santa Ana, Amargosa, and lower Colorado rivers	**Absent.** Presently there are no known breeding pairs along the Sacramento River north of Red Bluff, CA. The site does not have sufficiently dense riparian forest to support breeding.
Bald eagle *Haliaeetus leucocephalus*	T/E	Forages on live and dead fish and nests in large trees or snags. Requires large bodies of water, including ocean shorelines, lake margins, and large, open river courses for foraging, nesting, and wintering habitat.	**Present**. Incidental observations of eagles foraging over the site. No nests reported or observed on the site.
Bank swallow *Riparia riparia*	--/T	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	**Present**. Bank swallows and colony of nests observed on cut-bank of Sacramento River.
Other Special-Status Species			
River lamprey *(Lampetra ayresii)*	--/SC	The biology of river lampreys has not been studied in California, general habitat and life history thought to be similar to Pacific lamprey.	**Present**. Occur in the mainstem Sacramento River and tributary streams.
Central Valley fall/late-fall run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Essential Fish Habitat	--/SC	Freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**. Occur in the mainstem Sacramento River and tributary streams. Adults migrate upstream during the fall and spawn from mid-October to February. Suitable spawning and rearing habitat exists in the Sacramento River.
Hardhead (*Mylopharodon conocephalus*)	--/SC	Quiet deep pools of large, warm, clear streams over rocks or sand.	**Present**. Occur in the mainstem Sacramento River and tributary streams.
Western spadefoot toad *Spea hammondii*	--/SC	Grasslands with temporary pools.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SC	Slow water aquatic habitat with available basking sites. Hatchlings require shallow water with dense submergent or short emergent vegetation. Require an upland oviposition site in the vicinity of the aquatic site	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Double-crested cormorant *Phalacrocorax auritus*	--/SC	Inland lakes; fresh, salt and estuarine waters.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	Status[1] (Fed/State)	General Habitat Description	Comments
Merlin *Falco columbarius*	--/SC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Western burrowing owl *Athene cunicularia hypugaea*	--/SC	Open habitats, dry grasslands and ruderal habitats with ground squirrel burrows.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Sharp-shinned hawk *Accipiter striatus*	--/SC	Typically nests in dense conifer stands near water, winters in woodlands. Forages in many habitats in winter and migration.	**May be present as migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Cooper's hawk *Accipiter cooperii*	--/SC	Nests in woodlands, forages in many habitats in winter and migration.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Ferruginous hawk *Buteo regalis*	--/SC	Forages in grasslands and occasionally in other open habitats during migration and winter.	**May be present as rare migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
Prairie falcon *Falco mexicanus*	--/SC	Occurs in open habitats such as grasslands, desert scrub, rangelands and croplands. Nests on open cliffs.	**May be present as rare migrant**. Suitable breeding habitat does not occur on the site or surrounding area.
White-tailed kite *Elanus leucurus*	--/FP	Nests in lowlands with dense oak or riparian stands near open areas, forages over grassland, meadows, cropland and marshes.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Osprey *Pandion haliaetus*	--/SC	Ocean shorelines, lake margins and large, open river courses for both nesting and wintering habitat.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
California yellow warbler *Dendroica petechia brewsteri*	--/SC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Yellow-breasted chat *Icteria virens*	--/SC	Breeds in riparian habitats having dense understory vegetation, such as willow and blackberry.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Loggerhead shrike *Lanius ludovicianus*	--/SC	Prefers open habitats with scatters shrubs and trees throughout the Central Valley of California. Nests in shrubs and trees.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Ringtail *Bassariscus astutus*	--/FP	Riparian habitats and in brush stands of most forest and shrub habitats. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows or woodrat nests.	**May be present**. Suitable breeding and foraging habitat occurs in the study area.
Pallid bat *Antrozous pallidus*	--/SC	Forages over many habitats; roosts in buildings, large oaks or redwoods, rocky outcrops and rocky crevices in mines and caves, and under bridges. Roosts must protect from high temperatures	**May be present as forager**. Site does not contain suitable breeding roosts.

Table 2. Special-Status Wildlife Species Potentially Occurring in the Study Area

Common Name *Scientific Name*	**Status[1] (Fed/State)**	**General Habitat Description**	**Comments**
Western mastiff bat *Eumops perotis*	--/SC	Roosts in cliff faces, rock outcrops, and buildings. Forages in open habitats. Needs vertical face to take flight.	**May be present as forager**. Site does not contain suitable breeding roosts.

[1]Status Codes:

Federal and State Codes: E = Endangered; T = Threatened; SC = Species of Special Concern: FP = Fully Protected

knowledge of local professional biologists and historic survey information. All special-status wildlife species potentially breeding in the study area are discussed in detail below. A list of all wildlife species observed is presented in Appendix E.

3.3 Detailed Evaluation of Special-Status Plant Species

No federal or state listed plant species have the potential to occur within the study area. There were four other special-status plant species determined to have the potential to occur in the study area: fox sedge (*Carex vulpinoidea*), silky cryptantha (*Cryptantha crinita*), Red Bluff dwarf rush (*Juncus leiospermus* var. *leiospermus*), and Ahart's paronychia (*Paronychia ahartii*). The status, habitat parameters, geographic distribution, and rationale for potential to occur on the site for each of these plant taxa is discussed below.

Fox sedge (*Carex vulpinoidea*). Federal Status: None; State Status: None; CNPS Status: List 2.2. This species is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in California, but more common elsewhere."

Fox sedge is a tufted perennial in the sedge family (Cyperaceae). This species is known to occur in freshwater marshes and swamps and in riparian woodlands (California Native Plant Society 2001b). Fox sedge typically occurs at elevations between 98 and 3,937 feet above mean sea level and the blooming period is generally from May to June. Past experience specific to fox sedge in the Redding area has indicated that the optimal window of opportunity to observe this species occurs in late May.

Fox sedge is known to occur in the Inner North Coast Ranges, Cascade Range, and northern Sacramento Valley within Butte, Glenn, Shasta, Siskiyou, and Tehama counties (California Native Plant Society 2006; Tibor 2001). CNDDB records indicate that there is one occurrence of this species within five miles of the study area (California Department of Fish and Game 2007a).

Areas of potentially suitable habitat include the open water features located in the central and southern portions of the study area as well as the seasonal wetland in the southwest portion of the study area. These features have habitat and hydrology parameters, such as typical riparian plant species associates and duration of inundation and/or soil saturation, respectively, that qualify as sufficient to represent characteristic microhabitat attributes for fox sedge. Therefore, this species remained a target species for protocol-level botanical survey.

Silky Cryptantha (*Cryptantha crinita*). Federal Status: None; State Status: None; CNPS Status: List 1B. This species is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Silky cryptantha is a small, annual in the borage family (Boraginaceae). This species is known to occur on sand and gravel deposits associated with intermittent and, occasionally, perennial streams (Nakamura and Nelson 2001) within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland from elevations between 278 and 984 feet above mean sea level (Tibor 2001). Silky cryptantha typically occurs below 1,000 feet in elevation and the blooming period is generally from April to May (Nakamura and Nelson 2001). Past

experience specific to silky cryptantha in the Redding area has indicated that the optimal window of opportunity to observe this species in bloom occurs between late April and mid-May.

Silky cryptantha is restricted to the interior regions of northern California and is known to occur in the northern Sacramento Valley within Shasta and Tehama counties (Nakamura and Nelson 2001). CNDDB records indicate that there are three occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

An area of potentially suitable habitat includes the gravel bar found along the Sacramento River along the western boundary of the site. Therefore, this species remained a target species for botanical survey efforts due to the presence of the gravel bar along the river, and attributes thereof, considered to have the potential to support populations of silky cryptantha.

Red Bluff Dwarf Rush (*Juncus leiospermus* var. *leiospermus*). Federal Status: None; State Status: None; CNPS Status: List 1B. This plant taxon is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Red Bluff dwarf rush is a small, reddish grass-like annual in the rush family (Juncaceae). This plant taxon is known to occur in a variety of seasonally moist habitats that include meadows and seeps, vernal pools, and vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland from elevations between 115 and 3,350 feet above mean sea level . It is often found in small, sparsely vegetated micro-habitats (e.g., tire ruts, gopher mounds). Red Bluff dwarf rush typically occurs between 200 and 1,000 feet in elevation and the blooming period is typically from April to early June (Nakamura and Nelson 2001). Past experience specific to Red Bluff dwarf rush in the Redding area has indicated that the optimal window of opportunity to observe this plant taxon in bloom occurs between late April and mid-May.

Red Bluff dwarf rush is restricted to the interior regions of northern California and is known to occur in the northern Sacramento Valley and surrounding foothills of the Cascade Range within Butte, Shasta, and Tehama counties (California Native Plant Society 2001b; Nakamura and Nelson 2001). Disjunct populations of Red Bluff dwarf rush also occur in the northeast corner of Shasta County and southern Lassen County. CNDDB records indicate that there are twelve occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

An area of potential habitat includes the ponded area in the northeast corner of the study area This area remains mesic due to seepage from the Anderson Cottonwood Irrigation District canal. An unpaved road in this mesic area contains relatively unvegetated zones which represent characteristic microhabitat attributes for Red Bluff dwarf rush. Therefore, this taxon remained a target taxon for botanical survey efforts due to the presence of seasonally ponded features, and attributes thereof, considered to have the potential to support populations of Red Bluff dwarf rush.

Ahart's paronychia (*Paronychia ahartii*). Federal Status: None; State Status: None; CNPS Status: List 1B. This plant taxon is not listed under the Federal Endangered Species Act, California Endangered Species Act, or California Native Plant Protection Act. It is considered by CNPS to be "Rare, Threatened or Endangered in CA and Elsewhere."

Ahart's paronychia is a small, inconspicuous annual in the carnation family (Caryophyllaceae). This plant taxon grows in cismontane woodland, and valley and foothill grassland from elevations between 90 and 1,530 feet above mean sea level. It is endemic to California and is threatened by habitat loss. Regionally, it is found in slightly wet areas that are sparsely vegetated.

CNDDB records that regional occurrences of this species indicate that there are no occurrences of this species within five miles of the study area (California Department of Fish and Game 2007a).

3.4 Detailed Evaluation of Special-Status Wildlife Species

<u>Federal or State Listed Wildlife Species</u>

Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*). Federal Status: Threatened; State Status: None. The USFWS formally listed the VELB as *threatened* on August 8, 1980 (45 FR 52803 52807). Critical Habitat was also designated at this time (45 FR 52803 52807). Changed land use in the riverside habitats to which it is restricted is the primary threat to this beetle.

The VELB is an insect endemic to the foothills and Central Valley of California. It inhabits riparian and associated upland habitats where elderberry (*Sambucus* spp.), its host plant, grows. Specifically, its range extends throughout the Central Valley and adjacent foothills up to the 3,000 foot elevation level to the east and the Central Valley watershed to the west (U.S. Fish and Wildlife Service 1999). VELB habitat consists of riparian forests whose dominant plant species include cottonwood (*Populus* spp.), sycamore (*Platanus* spp.), valley oak (*Quercus lobata*.), and willow (*Salix* spp.), with an understory of elderberry shrubs (U.S. Fish and Wildlife Service 1991). Elderberry shrubs with a basal stem diameters larger than 1 inch are considered by the USFWS as suitable VELB habitat (U.S. Fish and Wildlife Service 1999).

The VELB life cycle is intimately connected to its habitat, elderberry shrubs. Following mating, the female lays her eggs in crevices in the elderberry bark. Upon hatching (after about 10 days), the larvae bore into the pith of the shrub and feed inside stems larger than 1 inch in diameter for 1 to 2 years until they mature. They emerge as adults during the spring via exit holes chewed through the bark. The adult beetles feed on the elderberry foliage until they mate, completing the cycle. Adults are active from March to June.

The study area has large areas of riparian forest containing elderberry shrubs and CNDDB records indicate an occurrence of VELB within five miles of the site.

Green Sturgeon, Southern DPS (*Acipenser medirostris*). Federal Status: Threatened; State Status: Species of Special Concern.

Relatively little is known about green sturgeon in the Sacramento River compared to its relative the white sturgeon (*Acipenser transmontanus*). Adult green sturgeon generally migrate into rivers between late-February and late-July. Spawning takes place in deep, fast water from March to July when water temperatures range from 46 °F to 60 °F. Juveniles may rear in the river for 1 to 3 years before migrating to the estuary, primarily during the summer and fall. Once in the estuary young sturgeon adopt an oceanic foraging habit, which may last from 3 to 13 years before returning for their first spawning season (Moyle 2002).

Green sturgeon use streams, rivers, and estuarine habitat as well as marine waters during their life cycle. Like the white sturgeon, green sturgeon prefer to spawn in lower to middle reaches of large rivers with swift currents and large cobble; no nest is built, adults broadcast spawn into the water column. The fertilized eggs sink and attach to the bottom to hatch. Research indicates that water flow is one of the key determinants of larval survival (Moyle 2002).

In the final determination to list the southern DPS as threatened under FESA, NMFS identified the reduction of available spawning habitat due to construction of barriers along the Sacramento and Feather rivers as being the principal threat to green sturgeon in the southern DPS (71 FR 17757). Other threats include, but are not limited to, insufficient flow rates, increased water temperature, water diversion, non-native species, poaching, pesticide and heavy metal contamination, and local fishing.

California Central Valley DPS Steelhead *(Onchorynchus mykiss)* Federal Status: Threatened; State Status: None.

Steelhead possess one of the most complex life history patterns of the Pacific salmonid species. Steelhead typically refers to the anadromous form of rainbow trout. Similar to other Pacific salmon, steelhead adults spawn in freshwater and spend a part of their life history at sea. However, unlike Chinook salmon, steelhead exhibit a variety of life history strategies during their freshwater rearing period and as adults may spawn more than once during their life. The typical life history pattern for steelhead is to rear in freshwater streams for two years followed by up to two or three years of residency in the marine environment. However, juvenile steelhead may rear in freshwater from one to four years (Busby et al. 1997; Moyle 2002).

Steelhead populations inhabiting the upper Sacramento River basin belong to the Central Valley steelhead DPS as defined by Good et al. (1997). These steelhead populations generally exhibit a life history pattern typical of a fall/winter run. This species historically has provided a popular sport fishery throughout the Sacramento River and its tributaries; however, at present naturally-produced steelhead remain at relatively low levels throughout their range in the Central Valley (Hallock 1989; McEwan 2001).

Steelhead adults may enter the Sacramento River and its tributaries from August through March, but peak migration generally occurs from October through February. Spawning begins in late December and can extend into early-April. Steelhead spawn in gravel and small cobble substrates usually associated with riffle and run habitat types. The upper mainstem Sacramento River is known to provide suitable spawning and juvenile rearing habitat for steelhead. The Sacramento River in the vicinity of the project may be used by steelhead during all life stages, including spawning and egg incubation.

Critical habitat designations for listed anadromous salmonids published in September 2005 (70 FR 52488) were finalized as part of the recent status reviews and are restricted to the species' anadromous range, which is coextensive with the steelhead-only DPS delineations described in that notice (71 FR 834). Designated critical habitat for Central Valley steelhead DPS includes all river reaches accessible to steelhead in the Sacramento and San Joaquin rivers and their tributaries, which includes the Sacramento River adjacent to the action area.

Central Valley Spring-run Chinook Salmon ESU *(Onchorynchus tshawytscha* Federal Status: Threatened; State Status: Threatened.

Spring-run Chinook salmon migrate upstream during the spring beginning in March, hold over in deep pools of the mainstem river and its large perennial tributaries, where fish can access cold headwaters, during the summer months, and spawn from mid-August through mid-October. Most of the spring run in the Sacramento River Basin ascend and spawn in the principal tributary streams (Mill, Deer, Clear, and Butte creeks, and the Feather River). Egg incubation occurs from mid-August through mid-January. Spring-run in the Sacramento River exhibit an ocean-type life history, emigrating as fry, sub-yearlings, and yearlings. Based on observations at Red Bluff Diversion Dam, spring-run emigration from the upper Sacramento River typically occurs from November through April (Vogel and Marine 1991; (Johnson, Weigand, and Fisher 1992)). Although some spring-run salmon may spawn in the Sacramento River between Red Bluff and Keswick Dam, it is thought that most have hybridized with fall-run salmon due to overlapping spawning periods, lack of spatial separation, and redd superimposition (California Department of Fish and Game 1998).

Central Valley spring-run ESU Chinook salmon populations in the Sacramento River and its tributaries have remained relatively depressed; however, some modest increases have occurred in their principal spawning tributaries such as Deer, Mill, and Butte Creeks (California Department of Fish and Game 2004). Spring-run Chinook salmon spawning in the mainstem Sacramento River and nearby tributaries such as Clear Creek and Battle Creek remain relatively depressed (California Department of Fish and Game 2004).

Designated critical habitat for Central Valley spring-run Chinook salmon includes the San Francisco Bay-Delta estuary, mainstem Sacramento River upstream to Keswick Dam and most of the Sacramento Valley's perennial tributaries with established spring salmon runs, including the Feather River and Feather River Hatchery. Designated critical habitat for Central Valley spring-run Chinook salmon includes all river reaches accessible to the species in the Sacramento and San Joaquin Rivers and their tributaries in California, which includes the Sacramento River adjacent to the property.

Sacramento River Winter-run Chinook Salmon ESU *(Onchorynchus tshawytscha)*. Federal Status: Endangered; State Status: Endangered.

Historically, winter-run Chinook salmon spawned in the cold spring-fed headwaters of the upper Sacramento, Pit, McCloud, and Calaveras rivers (U.S. Fish and Wildlife Service 1995). Following construction of Shasta Dam, deep water releases during the summer months provided suitable cold water conditions for winter-run Chinook salmon spawning and rearing downstream of the dam. In response to these conditions, which increased total coldwater spawning habitat available to the winter run, the population increased. In 1969, the winter run exceeded 100,000 salmon; however, during the early 1990's, run size estimates have ranged from about 1,400 fish to as low as about 200 fish in some years. The Sacramento River winter-run Chinook salmon population has exhibited a continuing recovery from the extremely low adult returns observed in the early 1990's. Recent spawning populations range from about 7,000 to 8,000 (California Department of Fish and Game 2004); however, these levels remain well below draft recovery goals established for this run (National Marine Fisheries Service 2004).

Winter-run Chinook salmon begin their migration up the Sacramento River in December and may spawn from mid-April through mid-August with a peak in spawning occurring from late May through June (Vogel and Marine 1991; Moyle 2002). Winter-run Chinook salmon spawning and juvenile rearing areas include the river reach adjacent to the project site (D. Killam, CDFG, unpublished data).

The egg incubation period extends from mid-April through mid-September. Juvenile winter-run Chinook salmon are known to rear in suitable habitats of the upper Sacramento River, including that adjacent to the project site.

The critical habitat designation includes the Sacramento-San Joaquin Delta and the Sacramento River, within all accessible reaches, including that reach adjacent to the action area. Constituent elements of anadromous salmonid critical habitat is considered to include seasonal timing and volume of stream flows sufficient to allow the fish to migrate, reproduce and rear; suitable streambed and bank conditions to support spawning, incubation, and larval development; suitable water quantity and quality and floodplain connectivity to form and maintain physical habitat to support juvenile development, growth, and mobility; natural cover such as shade, submerged and overhanging vegetation and large wood, log jams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; and finally, freshwater migration corridors free of obstruction with water quantities and quality and natural cover that support juvenile and adult fish migration and survival (69 FR 71880).

California Red-legged Frog (*Rana aurora draytonii*). Federal Status: Threatened; State Status: Species of Special Concern. The California red-legged frog inhabits quiet pools of streams, marshes, and ponds. All life history stages are most likely to be encountered in and around breeding sites, which include coastal lagoons, marshes, springs, permanent and semi permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. This species breeds from March to July; females lay 750 to 4000 eggs in clusters, attached to vegetation 7 to 15 cm (2 to 6 in) below the water surface. Juveniles can occur in slow moving, shallow riffle zones in creeks or along the margins of ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation (Zeiner, Laudenslayer, and Mayer 1989)

The historic range of the California red-legged frog extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, and inland from the vicinity of Redding, Shasta County, southward to northwestern Baja California, Mexico. The species has lost approximately 70 percent of its former range; California red-legged frogs are locally abundant in the San Francisco Bay area and the central coast, but only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges (50 CFR Part 17 14626).

NSR staff conducted a USFWS protocol-level site assessment for California red-legged frog, and produced a separate detailed report (North State Resources 2007a). NSR staff did not observe any California red-legged frogs during the USFWS protocol-level surveys, but did conclude that the seasonal pond in the central region of the site provides suitable breeding habitat. The nearest known records of California red-legged frog are from Thomes Creek and Sunflower Gulch on Red Bank Creek, approximately 33 miles south southwest of the project site.

Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*). Federal Status: Candidate; State Status: Endangered. The western yellow-billed cuckoo is a federal candidate for listing. It is generally considered a neotropical migrant that arrives in California to begin breeding in June.

In northern California it prefers riparian forests, containing willow (*Salix* spp.) and Fremont cottonwood (*Populus fremontii*) (Laymon 1998). It is also found in orchards adjacent to river bottoms. The western yellow-billed cuckoo feeds primarily on large insects but also occasionally takes small frogs, lizards, eggs, and young birds. The species is known to be an interspecific brood parasite, laying eggs in the nests of at least 11 other bird species (Hughes 1999). Major declines among western populations in twentieth century due to habitat loss and fragmentation, local extinctions, and low colonization rates; now extremely rare in most areas . There are approximately 30 pairs breeding in California. The nearest known breeding pairs are approximately 30 miles south of the project site along the Sacramento River (Laymon 1998).

Bald Eagle (*Haliaeetus leucocephalus*). Federal status: Delisted (previously endangered); State status: Endangered. The bald eagle is a large soaring bird; in North America, it is second in size only to the California condor (*Gymnogyps californianus*). Most of the annual food requirements of a bald eagle is derived from or obtained around aquatic habitats. The food most often consumed consists of fish, water birds, and small to medium-sized mammals. Because of the dietary association, nesting territories are usually found near water.

Perches are used primarily during the day for resting, preening, and hunting, and may include human-made structures such as power poles. Roosting areas contain a night communal roosting tree that is easily accessible to the large birds and tall enough to provide safety from threats from the ground. Bald eagle nests and roosts are usually found where human activity is infrequent or muted. In California, breeding pairs are found mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties (U.S. Fish and Wildlife Service 2007a).

The USFWS delisted the bald eagle in 2007, and attributes the recovery of the species to reduction in use of organochlorine pesticides and habitat conservation (U.S. Fish and Wildlife Service 2007a). NSR staff have have incidentally observed bald eagles foraging over the project site, but have not observed them nesting on the project site.

Bank Swallow (*Riparia riparia*). Federal status: None; State status: Threatened. Bank swallows are found primarily in riparian and other lowland habitats in the Central Valley, typically between April and September. They nest colonially and inhabit isolated places where fine-textured or sandy, vertical bluffs or riverbanks are available in which to dig burrows. Bank swallows forage over open riparian areas, brushland, grassland, and cropland.

The species' range in California is estimated to be have been reduced by 50 percent since 1900 (Zeiner et al. 1990a). Now, only 110 to 120 colonies remain within the state. Perhaps 75 percent of the current breeding population in California occurs along the banks of the Sacramento and Feather rivers in the northern Central Valley in areas where the rivers still meander in a mostly natural state. About 50 to 60 colonies remain along the middle Sacramento River, and 15 to 25 colonies occur along the lower Feather River. Other colonies persist along the central coast from Monterey to San

Mateo counties and in northeastern California in Shasta, Siskiyou, Lassen, Plumas, and Modoc counties (Zeiner et al. 1990a).

Other Special-Status Wildlife Species

River Lamprey *(Lampetra ayresii)* Federal Status: None; State Status: Species of Special Concern. River lamprey are anadromous; like salmon they are born in freshwater streams, migrate to the ocean, and return to fresh water as mature adults to spawn. Also like the salmon, lampreys do not feed during their spawning migration. Mating pairs of lamprey construct a nest by digging together using rapid vibrations of their tails and by moving stones using their suction mouths. They enter streams from July to October; spawning takes place the following spring when water temperatures are between 50° and 62.6°F. They ascend rivers by alternately swimming upstream in brief spurts and resting by sucking and holding on to rocks. Spawning takes place in low-gradient reaches of streams with gravel and sandy bottoms. Adults die within 4 days of spawning, after depositing from 10,000 to 100,000 very small-sized eggs in their nest. The young hatch in 2 to 3 weeks and swim to areas of low-velocity water where sediments are soft and rich in dead plant materials. They quickly burrow into the muddy bottom, where they filter the mud and water, eating microscopic plants (mostly diatoms) and animals.

Juvenile lamprey will stay burrowed in the mud for 3 to 6 years, moving only rarely to new areas. After a 2-month metamorphosis, triggered by unknown factors, they metamorphose into an adult morphology averaging 4.5 inches long. Newly metamorphosed lampreys migrate downstream during winter and spring high flow events. Adult river lampreys are thought to spend from 2 to 12 months in the estuary or ocean before returning to the rivers to spawn. River lamprey are known to occur in the Sacramento River (Moyle 2002).

Central Valley Fall/Late-fall Run Chinook Salmon ESU (Oncorhynchus tshawytscha) Federal Status: None; State Status: Species of Special Concern. The Central Valley fall/late-fall run ESU Chinook salmon comprises the largest present day population of Chinook salmon in the Central Valley. Fall-run Chinook salmon begin to enter the Sacramento River in July and the run builds through the late summer and fall months peaking by late-September and October (Vogel and Marine 1991). Spawning occurs throughout the upper Sacramento River and in a majority of its tributaries from mid-October through December (Vogel and Marine 1991; Moyle 2002). Spawning densities of fall run salmon are very high in the Sacramento River from near Red Bluff to Keswick Dam (D. Killam, CDFG, personal communication). Juvenile fall-run Chinook salmon rear throughout the Sacramento River and its tributaries. Juvenile fall run fry may emigrate to the estuary from shortly after they hatch through the spring and summer months following their birth.

The late-fall run component of this Chinook salmon ESU enters the Sacramento-San Joaquin estuary and ascends Central Valley streams after the fall run, usually from late-October through March (Vogel and Marine 1991). Spawning begins in January and is usually complete by late-April. Late-fall run spawning densities are greatest in the upper Sacramento River from Red Bluff to Keswick Dam. Both fall and late-fall run salmon use the spawning habitat of the mainstem river adjacent to the study area (CDFG, unpublished data). Juvenile late-fall run salmon rear in the upper Sacramento

River from late-April through the following winter before emigrating to the estuary (Vogel and Marine 1991; Moyle 2002).

Large numbers of the fall run and late-fall run salmon are spawned and reared by state and federal fish hatcheries in California's Central Valley. The number of hatchery-produced fish may greatly exceed the number naturally produced fall/late-fall run Chinook salmon in some Central Valley streams which has led to concern over the viability of certain tributary populations. These runs support valuable and popular ocean and river commercial and sport fisheries.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a federal fisheries management plan (FMP). EFH refers to those waters and substrates necessary for the spawning, breeding, feeding, or growth to maturity. Central Valley spring-run ESU Chinook salmon, Central Valley fall/late-fall run ESU Chinook salmon, and Sacramento River winter-run ESU Chinook salmon are all managed under a FMP and are therefore subject to protection under MSA.

The Sacramento River is designated by the National Marine Fisheries Service (NMFS) to contain EFH for Chinook salmon, as defined by the Magnuson-Stevens Fisheries Conservation and Management Act of 1994, as amended. EFH refers to those waters and substrates necessary for spawning, breeding, feeding, or growth to maturity. Freshwater EFH for salmon consists of four major components: spawning and incubation habitat; juvenile rearing habitat; juvenile migration corridors; and adult migration corridors and adult holding habitat (Pacific Fishery Management Council 2003).

The Sacramento River adjacent to the project site provides all four major components of freshwater EFH for salmon. Adult Chinook salmon migrate to and are known to spawn within all suitable habitats adjacent to the project site. Fry and juveniles are known to occur in suitable rearing habitats nearly year round. Medium to large cobbles and boulders dominate the river bottom in these habitats, providing suitable cover and refuge for rearing salmonids.

Hardhead *(Mylopharodon conocephalus)* Federal Status: None; State Status: Species of Special Concern. Hardhead were identified as a California Species of Special Concern in 1995 (Moyle et al. 1995). Hardhead are listed as a Class 3 species of special concern. Class 3 species are those fish species occupying much of their native range, but that were formerly more widespread or abundant within that range. Included in this classification are taxa with very restricted distributions (e.g., Eagle Lake tui chub). The populations of such species need to be assessed periodically (i.e., every 5 years) and included in long-term plans for protected waterways.

Hardhead are large cyprinids that closely resemble Sacramento pikeminnow and are widely distributed in low- to mid-elevation streams in the Sacramento–San Joaquin drainage. Hardhead typically inhabit undisturbed areas of larger low- to mid-elevation streams, although they are also found in the mainstem Sacramento River at low elevations and in its tributaries to about 4,921 feet . They prefer clear, deep pools and runs with slow velocities and occur in streams where summer temperatures reach in excess of 68°F (Moyle 2002).

Historically, hardhead have been regarded as widespread and abundant in central California and are still widely distributed in foothill streams. The specific risk to hardhead is their increasingly isolated populations, making them vulnerable to localized extinctions. Hardhead also tend to be absent from streams where introduced species dominate (Mayden, Rainboth, and Buth 1991; Moyle and Daniels 1982), and from streams that have been severely altered by human activity (Baltz and Moyle 1993).

Western Spadefoot Toad (*Spea hammondi*). Federal status: None; State Status: Species of Special Concern. Historically, the western spadefoot toad ranged from Redding to northwestern Baja, California. It has been extirpated from many locations within this range. Since 1990, there have been sightings in Alameda, Butte, Calaveras, Fresno, Kern, Kings, Los Angeles, Madera, Merced, Monterey, Orange, Placer, Riverside, Sacramento, San Benito, San Diego, San Joaquin, San Luis Obispo, Santa Barbara, Stanislaus, Tulare, Ventura, and Yolo counties (U.S. Fish and Wildlife Service 2007c).

The western spadefoot toad occurs primarily in grassland locations, but occasional populations also occur in valley-foothill hardwood woodlands. Some populations persist for a few years in orchard-vineyard habitats (Zeiner, Laudenslayer, and Mayer 1989). The species is found at elevations below 3,000 feet but can occur up to 4,500 feet. Western spadefoot toads breed in temporary pools from January to May. Water temperatures in these pools must be between 48ºF and 86ºF. Eggs are deposited on plant stems or on pieces of detritus in temporary rain pools or, less frequently, in pools in ephemeral stream courses (U.S. Fish and Wildlife Service 2007c).

Western spadefoot toads are extremely sensitive to low frequency noises and vibrations. These disturbances cause western spadefoot toads to break dormancy and emerge from their burrows (Dimmitt and Ruibal 1980).

Northwestern Pond Turtle (*Clemmys marmorata marmorata*). Federal Status: None; State Status: Species of Special Concern. The northwestern pond turtle is found in the quiet waters of ponds, marshes, creeks, and irrigation ditches. This species requires basking sites such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. They frequently bask on logs or other objects out of the water when water temperatures are low and air temperatures are greater than water temperatures. When air temperatures become too warm, western pond turtles water bask by lying in the warmer surface water layer with their heads out of the water. Hibernation in colder areas is passed underwater in bottom mud (Zeiner, Laudenslayer, and Mayer 1989). Mating typically occurs in late April or early May, but may occur year-round. Nests are located in an upland location that may be a considerable distance from the aquatic site (up to ¼ mile) (California Department of Fish and Game 1994). Hatchling turtles are thought to emerge from the nest and move to the aquatic site in the spring. Today, the northwestern pond turtle occurs in 90% of its historic range in the Central Valley and west of the Sierra Nevada mountains, but in greatly reduced numbers (Jennings and Hayes 1994). It occurs from the Oregon border south to the American Basin in the Central Valley, where it intergrades with southwestern pond turtle.

Western Burrowing Owl (*Athene cunicularia hypugaea*). Federal status: None; State status: Species of Special Concern. The western burrowing owl inhabits open, dry grasslands and deserts, as well as open stages of pinyon-juniper and ponderosa pine. The nesting season is between February 1 and August 31. Western burrowing owls typically nest in abandoned rodent burrows, particularly

those of California ground squirrels, which they modify each year. Burrowing owls forage in open grassland areas adjacent to nest sites. The species has also been documented in open areas near human habitation, especially airports and golf courses. The Central Valley and surrounding foothill regions of California provide year-round habitat for the western burrowing owl.

The study area has the general habitat requirements for the burrowing owl, but NSR staff did not note rodent activity and burrows during the site visits. There are no recorded CNDDB occurrences of the western burrowing owl within a 5-mile radius of the study area (California Department of Fish and Game 2007a).

Cooper's Hawk (*Accipiter cooperii*). Federal status: None; State status: Species of Special Concern. Cooper's hawks prefer landscapes where wooded areas occur in patches and groves facilitating the ambush hunting tactics employed by this species. The species preys upon medium-sized birds (e.g., jays, doves, and quail) and occasionally takes small mammals and reptiles. Breeding pairs in California prefer nest sites within dense stands of live oak woodland or riparian areas, and prey heavily on young birds during the nesting season. Cooper's hawks are breeding residents throughout most of the wooded areas in California, but populations have declined in recent decades (Zeiner et al. 1990a).

Cooper's hawks have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

White-tailed Kite (*Elanus leucurus*). Federal Status: None; State Status: Fully Protected Species. The white-tailed kite can be found in association with the herbaceous and open stages of a variety of habitat types, including open grasslands, meadows, emergent wetlands, and agricultural lands. Nests are constructed near the top of dense oaks, willows, or other tree stands located adjacent to foraging areas. The species forages in undisturbed, open grasslands, meadows, farmlands and emergent wetlands. White-tailed kite are seldom observed more than 0.5 mi (0.8 km) from an active nest during the breeding season (Zeiner et al. 1990a). The white-tailed kite is found year-round in both the coastal zones and lowlands of the Central Valley in California.

White-tailed kites have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Osprey (*Pandion haliaetus*). Federal Status: None; State Status: Species of Special Concern. In California, osprey are common summer residents and breeders but are less common in winter. Osprey breed primarily in scattered locations throughout northern California from the Cascade Ranges south to Lake Tahoe, and along the coast south to Marin County. They nest and roost on exposed treetops, towers, pilings, or similar structures near lakes, reservoirs, rivers, estuaries, and the open sea coast. They forage over fish-bearing bodies of water. Current threats to the species include degradation of aquatic environments such as rivers and lakes and loss of nesting structures such as trees to timber harvest and other activities (Zeiner et al. 1990a).

Osprey have the potential to nest within the study area in the riparian area along the Sacramento River. There are two CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

California Yellow Warbler (*Dendroica petechia brewsteri*). Federal Status: None; State Status: Species of Special Concern. The yellow warbler is a long-distance migrant, usually arriving in California in April and leaving by October. The species breeds from mid-April to early August, building an open cup nest in a tree or shrub. Foraging patterns typically involve gleaning and hovering for insects and spiders. The yellow warbler occurs as a summer resident in northern California. It is usually found in dense riparian deciduous habitats with cottonwoods, willows, alders, and other small trees and shrubs typical of open-canopy riparian woodlands.

Yellow warblers have the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Yellow-breasted Chat (Ictera virens); Federal Status: None; State Status; Species of Special Concern. The yellow-breasted chat is a neotropical migrant that occurs in riparian or marsh habitats throughout California. They are found in dense, brushy thickets near water and in the thick understory of riparian woodlands. Forage patterns usually involve gleaning insects, spiders, and berries from the foliage of shrubs and low trees. Nests are often low to the ground in dense shrubs along streams. They occur as summer breeding residents in the Sacramento River Valley and its tributaries (Zeiner et al. 1990a).

Yellow-breated chat has the potential to nest within the study area in the riparian forest along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species or any nests during site visits.

Loggerhead Shrike (*Lanius ludovicianus*). Federal Status: None; State Status: Species of Special Concern. The loggerhead shrike prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches located in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Loggerhead shrikes skewer their prey to thorns or barbs on barbed-wire fences. The purpose of this trait may be to help kill the prey or to cache the food for latter consumption. Loggerhead shrikes are found in lowlands and foothills throughout California (Zeiner et al. 1990a).

Loggerhead shrike has the potential to nest within the study area within the valley oak woodland. NSR staff did not observe this species or any nests during site visits.

Ringtail (*Bassiriscus astutus*). Federal Status: None; Federal Status: Fully Protected Species. The ringtail occurs in various riparian habitats in and brush stands of most forest and shrub habitats. Nocturnal, and primarily carnivorous, ringtails mainly eat small mammals but also feed on birds, reptiles, insects, and fruit. They forage on the ground, among rocks, and in trees; usually near water.

Hollow trees and logs, cavities in rocky areas, and other recesses are used for cover. The ringtail is widely distributed in California (Zeiner et al. 1990b).

Ringtail has the potential to nest within the study area in the riparian area along the Sacramento River. There are no recorded CNDDB occurrences of this species within a 5-mile radius of the study area (California Department of Fish and Game 2007a). NSR staff did not observe this species during site visits.

3.5 Field Review/Surveys

During the field reconnaissance and protocol-level surveys, the study area was inspected to identify plant and wildlife special-status species and/or potential habitat for these species in the study area. Lists of all plant and wildlife species observed are presented in Appendix E.

Botany

No special-status vascular plant species were detected as a result of botanical survey efforts. A list of all plant species observed is presented in Appendix E.

Wildlife

3.5.1.1 ***NSR staff California Red-Legged Frog Assessment***

NSR staff conducted a USFWS protocol-level site assessment for California red-legged frog, and produced a separate detailed report (North State Resources 2007a). NSR staff did not observe any California red-legged frogs during the USFWS protocol-level surveys, but did conclude that the seasonal pond in the central region of the site provides suitable breeding habitat.

3.5.1.2 ***Valley Elderberry Longhorn Beetle Surveys***

Sixty two (62) elderberry shrubs with stems measuring 1-inch or greater in diameter at ground level were detected during the surveys. Nearly all of the recorded elderberry shrubs are located within the valley foothill riparian and valley oak woodland habitat types in the southwest and south central section of the study area (Figure 3 in map pocket). Several of the elderberry shrubs are within the 100-foot buffer zone just south of the boundary at the southwest corner of the study area. Two of the 62 elderberry shrubs were deeply embedded within Himalayan blackberry brambles and were inaccessible for close inspection. Field survey data for the 62 elderberry shrubs are presented in a table in Appendix F.

Exit holes characteristic of VELB (e.g. exit hole oval to circular, approximately ¼ inch in diameter, and without beveled edges; exit hole on stem greater than one inch in diameter and within six feet from ground) were detected on 13 of the 60 elderberry shrubs that were accessible for close inspection. These 13 elderberry shrubs are located within valley foothill riparian and valley oak woodland habitats in the southwest and south central section of the study area (Figure 3 in map pocket). All of the 36 observed VELB exit holes are within six feet above ground level and located in live stems greater than 1-inch in diameter. There were both new exit holes, characterized by sharp hole edges and light colored wood, and older exit holes, characterized by the gradual sealing of the hole due to cambial growth (See photographs in Appendix G).

3.5.1.3 ***Incidental Special-Status Wildlife Observations***

NSR staff made incidental field observations of 30 wildlife species including one special-status species; bank swallow (Appendix E). NSR botanist/plant ecologist, Mr. Boggs and NSR biologist, Ms. Bolen observed a colony of bank swallows nesting in the cut-bank of the Sacramento River within the northern portion of the study area (Figure 3 in map pocket).

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APPENDIX A

U.S. Fish and Wildlife Service Species List

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825

April 26, 2007

Document Number: 070426124401

Michael Gorman
North State Resources, Inc.
500 Orient St. Suite 150
Chico, CA 95928

Subject: Species List for Strawberry Fields Property

Dear: Mr.

We are sending this official species list in response to your April 26, 2007 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 25, 2007.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division

TAKE PRIDE® IN AMERICA

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 you requested

Document Number: 070426124401

Database Last Updated: March 5, 2007

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio

Conservancy fairy shrimp (E)

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)

vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)

vernal pool tadpole shrimp (E)

Pacifastacus fortis

Shasta crayfish (E)

Fish

Acipenser medirostris

green sturgeon (T) (NMFS)

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)

Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)

Critical Habitat, Central Valley spring-run chinook (X) (NMFS)

Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Birds

Haliaeetus leucocephalus

bald eagle (T)

Strix occidentalis caurina

northern spotted owl (T)

Plants

Orcuttia tenuis

Critical habitat, slender Orcutt grass (X)

slender Orcutt grass (T)

Candidate Species

Fish

Oncorhynchus tshawytscha

Central Valley fall/late fall-run chinook salmon (C) (NMFS)
Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Birds

Coccyzus americanus occidentalis

Western yellow-billed cuckoo (C)

Quads Containing Listed, Proposed or Candidate Species:

BALLS FERRY (628B)
COTTONWOOD (629A)
OLINDA (629B)
BELLA VISTA (646B)
PALO CEDRO (646C)
PROJECT CITY (647A)
SHASTA DAM (647B)
REDDING (647C)
ENTERPRISE (647D)

County Lists

Shasta County

Listed Species

Invertebrates

Branchinecta lynchi

Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus

valley elderberry longhorn beetle (T)

Lepidurus packardi

Critical habitat, vernal pool tadpole shrimp (X)
vernal pool tadpole shrimp (E)

Pacifastacus fortis

Shasta crayfish (E)

Fish

Hypomesus transpacificus

delta smelt (T)

Oncorhynchus mykiss

Central Valley steelhead (T) (NMFS)
Critical habitat, Central Valley steelhead (X) (NMFS)

Oncorhynchus tshawytscha

Central Valley spring-run chinook salmon (T) (NMFS)
Critical Habitat, Central Valley spring-run chinook (X) (NMFS)
Critical habitat, winter-run chinook salmon (X) (NMFS)

winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana aurora draytonii

California red-legged frog (T)

Birds

Haliaeetus leucocephalus

bald eagle (T)

Strix occidentalis caurina

Critical habitat, northern spotted owl (X)

northern spotted owl (T)

Plants

Orcuttia tenuis

Critical habitat, slender Orcutt grass (X)

slender Orcutt grass (T)

Tuctoria greenei

Critical habitat, Greene's tuctoria (=Orcutt grass) (X)

Greene's tuctoria (=Orcutt grass) (E)

Candidate Species

Fish

Oncorhynchus tshawytscha

Central Valley fall/late fall-run chinook salmon (C) (NMFS)

Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Birds

Coccyzus americanus occidentalis

Western yellow-billed cuckoo (C)

Mammals

Martes pennanti

fisher (C)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our critical habitat page for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be July 25, 2007.

Appendix B

CNDDB Query Results

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	***Agelaius tricolor*** tricolored blackbird	ABPBXB0020			G2G3	S2	SC
2	***Agrostis hendersonii*** Henderson's bent grass	PMPOA040K0			G1Q	S1.1	3.2
3	***Anthicus antiochensis*** Antioch Dunes anthicid beetle	IICOL49020			G1	S1	
4	***Anthicus sacramento*** Sacramento anthicid beetle	IICOL49010			G1	S1	
5	***Antrozous pallidus*** pallid bat	AMACC10010			G5	S3	SC
6	***Branchinecta lynchi*** vernal pool fairy shrimp	ICBRA03030	Threatened		G3	S2S3	
7	***Carex scoparia*** pointed broom sedge	PMCYP03C90			G5	S2S3	2.2
8	***Carex vulpinoidea*** fox sedge	PMCYP03EN0			G5	S2.2	2.2
9	***Castilleja rubicundula ssp. rubicundula*** pink creamsacs	PDSCR0D482			G5T2	S2.2	1B.2
10	***Clarkia borealis ssp. borealis*** northern clarkia	PDONA05062			G3T2	S2.3	1B.3
11	***Cryptantha crinita*** silky cryptantha	PDBOR0A0Q0			G1	S1.1	1B.2
12	***Desmocerus californicus dimorphus*** valley elderberry longhorn beetle	IICOL48011	Threatened		G3T2	S2	
13	***Emys (=Clemmys) marmorata marmorata*** northwestern pond turtle	ARAAD02031			G3G4T3	S3	SC
14	***Euderma maculatum*** spotted bat	AMACC07010			G4	S2S3	SC
15	***Fluminicola seminalis*** Nugget Pebblesnail	IMGASG3110			G2	S1S2	
16	***Gratiola heterosepala*** Boggs Lake hedge-hyssop	PDSCR0R060		Endangered	G3	S3.1	1B.2
17	***Great Valley Cottonwood Riparian Forest***	CTT61410CA			G2	S2.1	
18	***Great Valley Mixed Riparian Forest***	CTT61420CA			G2	S2.2	
19	***Great Valley Valley Oak Riparian Forest***	CTT61430CA			G1	S1.1	
20	***Great Valley Willow Scrub***	CTT63410CA			G3	S3.2	
21	***Haliaeetus leucocephalus*** bald eagle	ABNKC10010	Threatened	Endangered	G5	S2	
22	***Hydromantes shastae*** Shasta salamander	AAAAD09030		Threatened	G1G2	S1S2	
23	***Juncus leiospermus var. leiospermus*** Red Bluff dwarf rush	PMJUN011L2			G2T2	S2.2	1B.1
24	***Lanx patelloides*** Kneecap Lanx	IMGASL7030			G1	S1	
25	***Legenere limosa*** legenere	PDCAM0C010			G2	S2.2	1B.1
26	***Lepidurus packardi*** vernal pool tadpole shrimp	ICBRA10010	Endangered		G3	S2S3	

	Scientific Name/Common Name	Element Code	Federal Status	State Status	GRank	SRank	CDFG or CNPS
27	***Limnanthes floccosa ssp. bellingeriana*** Bellinger's meadowfoam	PDLIM02041			G4T2	S1.1	1B.2
28	***Linderiella occidentalis*** California linderiella	ICBRA06010			G3	S2S3	
29	***Martes pennanti (pacifica) DPS*** Pacific fisher	AMAJF01021	Candidate		G5	S2S3	SC
30	***Monadenia troglodytes troglodytes*** Shasta sideband (snail)	IMGASC7090			G1G2	S1S2	
31	***Neviusia cliftonii*** Shasta snow-wreath	PDROS14020			G2	S2.2	1B.2
32	***Oncorhynchus tshawytscha spring-run*** spring-run chinook salmon	AFCHA0205A	Threatened	Threatened	G5T1Q	S1	
33	***Oncorhynchus tshawytscha winter run*** chinook salmon winter run	AFCHA0205B	Endangered	Endangered	G5T1Q	S1	
34	***Orcuttia tenuis*** slender orcutt grass	PMPOA4G050	Threatened	Endangered	G3	S3.1	1B.1
35	***Pandion haliaetus*** osprey	ABNKC01010			G5	S3	SC
36	***Paronychia ahartii*** Ahart's paronychia	PDCAR0L0V0			G2	S2.1	1B.1
37	***Riparia riparia*** bank swallow	ABPAU08010		Threatened	G5	S2S3	
38	***Trilobopsis roperi*** Shasta Chaparral	IMGASA2030			G1	S1	
39	***Viburnum ellipticum*** oval-leaved viburnum	PDCPR07080			G5	S2.3	2.3

APPENDIX C

CNPS Query Results

CNPS Inventory of Rare and Endangered Plants

Status: Plant Press Manager window with 15 items - Thu, Apr. 26, 2007 12:43 c

Reformat list as: Standard List - with Plant Press controls

ECOLOGICAL REPORT

scientific	family	life form	blooming	communities	elevation	CNPS
Agrostis hendersonii	Poaceae	annual herb	Apr-May	•Valley and foothill grassland (VFGrs) (mesic) •Vernal pools (VnPls)	70 - 305 meters	List 3.2
Anomobryum julaceum	Bryaceae	moss	•Broadleafed upland forest (BUFrs) •Lower montane coniferous forest (LCFrs) •North Coast coniferous forest (NCFrs)/damp rock and soil on outcrops, usually on roadcuts	100 - 1000 meters	List 2.2	
Carex scoparia	Cyperaceae	perennial herb	May	•Great Basin scrub (GBScr)(mesic)	130 - 1000 meters	List 2.2
Carex vulpinoidea	Cyperaceae	perennial herb	May-Jun	•Marshes and swamps (MshSw)(freshwater) •Riparian woodland (RpWld)	30 - 1200 meters	List 2.2
Castilleja rubicundula ssp. rubicundula	Scrophulariaceae	annual herb	Apr-Jun	•Chaparral (Chprl) (openings) •Cismontane woodland (CmWld) •Meadows and seeps (Medws) •Valley and foothill grassland (VFGrs)/serpentinite	20 - 900 meters	List 1B.2
Clarkia borealis ssp. borealis	Onagraceae	annual	Jun-Sep	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs)	400 - 1340 meters	List 1B.3
Cryptantha crinita	Boraginaceae	annual herb	Apr-May	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Riparian forest (RpFrs) •Riparian woodland (RpWld) •Valley and foothill grassland (VFGrs)/gravelly streambeds	85 - 1215 meters	List 1B.2
				•Marshes and swamps		

Gratiola heterosepala	Scrophulariaceae	annual herb	Apr-Aug	(MshSw)(lake margins) •Vernal pools (VnPls)/clay	10 - 2375 meters	List 1B.2
Juncus leiospermus var. leiospermus	Juncaceae	annual herb	Mar-May	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Meadows and seeps (Medws) •Valley and foothill grassland (VFGrs) •Vernal pools (VnPls)/vernally mesic	35 - 1020 meters	List 1B.1
Lathyrus sulphureus var. argillaceus	Fabaceae	perennial herb	Apr	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Upper montane coniferous forest (UCFrs)	150 - 305 meters	List 3
Legenere limosa	Campanulaceae	annual herb	Apr-Jun	•Vernal pools (VnPls)	1 - 880 meters	List 1B.1
Neviusia cliftonii	Rosaceae	perennial deciduous shrub	Apr-Jun	•Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs) •Riparian woodland (RpWld)/ often streamsides; sometimes carbonate, volcanic, or metavolcanic	300 - 500 meters	List 1B.2
Orcuttia tenuis	Poaceae	annual herb	May-Sep(Oct) Months in parentheses are uncommon.	•Vernal pools (VnPls)	35 - 1760 meters	List 1B.1
Paronychia ahartii	Caryophyllaceae	annual herb	Mar-Jun	•Cismontane woodland (CmWld) •Valley and foothill grassland (VFGrs) •Vernal pools (VnPls)	30 - 510 meters	List 1B.1
Viburnum ellipticum	Caprifoliaceae	perennial deciduous shrub	May-Jun	•Chaparral (Chprl) •Cismontane woodland (CmWld) •Lower montane coniferous forest (LCFrs)	215 - 1400 meters	List 2.3

APPENDIX D

Special-Status Species Considered for Analysis

Summary of Special-Status Species Review – Plants

Common Name *Scientific Name*	Status[1] (Fed/State/CNPS)	General Habitat Description/Elevation	Blooming Period	General Habitat Within Study Area (Present/ Absent)
Federal or State Listed Species				
Boggs Lake hedge-hyssop *Gratiola heterosepala*	--/E/1B.2	Clay soils within marshes and swamps (lake margins), vernal pools / 30-7,792 feet	April-August	**Absent.**
Slender Orcutt grass *Orcuttia tenuis*	T/E/1B.1	Vernal pools / 114-5,774 feet	May-October	**Absent**
Greene's tuctoria *Tuctoria greenei*	E/R/1B.1	Vernal pools / 98-3510 feet.	May-July	**Absent**
Other Special-Status Species				
Slender silver-moss *Anomobryum julaceum*	--/--/2.2	Damp rock and soil on outcrops within broadleafed upland forest, lower montane coniferous forest, North coast coniferous forest with; usually on roadcuts / 300-3,000 feet	Moss	**Absent**
Pointed broom sedge *Carex scoparia*	--/--/2.2	Mesic areas within Great Basin scrub / 426 – 3280 feet	May	**Absent**
Fox sedge *Carex vulpinoidea*	--/--/2.2	Freshwater marshes and swamps, and riparian woodland / 98-3,937 feet	May-June	**Present**
Pink creamsacs *Castilleja rubicundula* ssp. *rubicundula*	--/--/1B	Serpentinite soils within chaparral openings, cismontane woodland, meadows, seeps and valley and foothill grassland / 60-2,700 feet	April-June	**Absent.**
Northern clarkia *Clarkia borealis* ssp. *borealis*	--/--/1B.3	Chaparral, cismontane woodland, and lower montane coniferous forest / 1,312-4,396 feet	June-September	**Absent**
Silky cryptantha *Cryptantha crinita*	--/--/1B.2	Gravelly streambeds within cismontane woodland, lower montane coniferous forest, riparian scrub, riparian woodland, and valley and foothill grassland / 278-984 feet	April-May	**Present.** Gravelly substrate present on gravel bars and old channels.
Red Bluff dwarf rush *Juncus leiospermus* var. *leiospermus*	--/--/1B.1	Meadows and seeps, vernal pools; Vernally mesic areas within chaparral, cismontane woodland, and valley and foothill grassland / 115-3,346 feet	March-May	**Present.** Foothill grassland present.
Legenere *Legenere limosa*	--/--/1B.1	Vernal pools / 3-2,887 feet	April-June	**Absent**
Shasta snow wreath *Neviusia cliftonii*	--/--/1B.2	Often on streamsides within lower montane coniferous forest and riparian woodland / 984-1,640 feet	April-May	**Absent**
Ahart's nailwort *Paronychia ahartii*	--/--/1B.1	Cismontane woodland, valley and foothill grassland and vernal pools / 90-1,530 feet	March-June	**Present.** Valley oak woodland and foothill grassland present.
Oval-leaved viburnum *Viburnum ellipticum*	--/--/2.3	Chaparral, cismontane woodland, and lower montane coniferous forest / 705-4,593 feet	May-June	**Absent**

Summary of Special-Status Species Review – Wildlife

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Federal or State Listed Species				
Invertebrates				
Conservancy fairy shrimp *Branchinecta lynchi*	T/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool setting and occurrences of listed vernal pool species do not occur near the study area.
Vernal pool fairy shrimp *Branchinecta conservatio*	E/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool setting and occurrences of listed vernal pool species do not occur near the study area.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	T/--	Elderberry shrubs associated with riparian forests that occur along rivers and streams.	**Present**	Elderberry shrubs occur in the study area.
Vernal pool tadpole shrimp *Lepidurus packardi*	E/--	Vernal pool crustaceans live in vernal pools, swales, and ephemeral freshwater habitats. None are known to occur in riverine waters or marine waters.	Absent	Although seasonal wetlands occur in the study area, the site does not occur in a natural vernal pool landscape and occurrences of listed vernal pool species do not occur near the study area.
Shasta crayfish *Pacifastacus fortis*	E/--	Pit River, Fall River and Hat Creek drainages in Shasta County	Absent	Watersheds in which the species occur do not occur in the study area. Thus, this species is eliminated from further consideration.
Fish				
Green sturgeon, southern DPS (*Acipenser medirostris*)	T/SC	Spawn in Sacramento and Feather rivers; juveniles are thought to rear mainly in the estuary.	**Present**	Suitable habitat occurs in the Sacramento River.
Delta smelt (*Hypomesus transpacificus*)	T/T	Estuarine systems in the Sacramento-San Joaquin Delta.	Absent	Suitable habitat not present.
Steelhead, California Central Valley DPS (*Oncorhynchus mykiss*) Critical Habitat	T/--	Spawn and rear in freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Central Valley spring-run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Critical Habitat	T/T	Freshwater rivers and streams. (Sacramento River and its tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.
Sacramento River winter-run ESU Chinook salmon (*Oncorhynchus tshawytscha*) Critical Habitat	E/E	Freshwater river and streams. (Sacramento River and its tributaries)	**Present**	Suitable spawning, rearing, and migration habitat occurs in the Sacramento River.
Amphibians				
Shasta salamander *Hydromantes shastae*	--/T	Moist limestone fissures and caves, in volcanic and other rock outcroppings, and under woody debris in mixed pine-hardwood stands.	Absent	Limestone outcrops do not occur within the study area. Thus, this species is eliminated from further consideration.
California red-legged frog *Rana aurora draytonii*	T/SC	Require aquatic habitat for breeding, also uses a variety of other habitat types including riparian and upland areas. Adults utilize dense, shrubby or emergent vegetation associated with deep-water pools with fringes of cattails & dense stands of overhanging vegetation.	**Present**	One perennial pond occurs in the study area.
Birds				
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	C/E	Nesting habitat is cottonwood/willow riparian forest. Occurs only along the upper Sacramento Valley portion of the Sacramento River, the Feather River in Sutter Co., the south fork of the Kern River in Kern Co., and along the Santa Ana, Amargosa, and lower Colorado rivers	**Present**	Extensive cottonwood/willow riparian forest habitat occurs in the study area.
Willow flycatcher *Empidonax traillii*	--/E	Rare summer resident in wet meadow and montane riparian habitats at 2,000 to 8,000 feet elevation. No longer known to nest in Sacramento Valley but migrates through the north state region in spring and fall.	Absent	Suitable habitat not present.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
American peregrine falcon *Falco peregrinus anatum*	D/E, FP	Forages in many habitats; requires cliffs for nesting.	Absent	Suitable habitat not present.
Greater sandhill crane *Grus canadensis tabida*	--/T, FP	Wetlands required for breeding; forage in nearby pastures, fields, and meadows.	Absent	Suitable habitat not present.
Bald eagle *Haliaeetus leucocephalus*	T/E	Forages on live and dead fish and nests in large trees or snags. Requires large bodies of water, including ocean shorelines, lake margins, and large, open river courses for foraging, nesting, and wintering habitat.	**Present**	The Sacramento River runs along the western edge of the property and provides suitable foraging habitat.
Bank swallow *Riparia riparia*	--/T	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	**Present**	Vertical banks are present along the Sacramento River along the northwestern boundary of the site.
Northern spotted owl *Strix occidentalis caurina* Critical habitat	T/--	In northern California, resides in large stands of old growth, multi-layered mixed conifer, redwood, and Douglas-fir habitats	Absent	Dense, mixed conifer forest is not present.
Mammals				
California wolverine *Gulo gulo luteus*	--/T, FP	A variety of habitats within the elevations of 1,600 and 14,200 ft. Most commonly inhabits open terrain above timberline.	Absent	Suitable habitat not present.
Pacific fisher *Martes pennanti pacifica*	C/SC	Dens and forages in intermediate to large stands of old-growth forests or mixed stands of old-growth and mature trees with greater than 50% canopy closure. May use riparian corridors for movement.	Absent	Suitable habitat not present.
Sierra Nevada red fox *Vulpes vulpes nector*	--/T	Red fir and lodgepole pine forests in the sub-alpine zone and alpine fell-fields of the Sierra Nevada.	Absent	Suitable habitat not present.
Other Special-Status Species				
Fish				
River lamprey *(Lampetra ayresii)*	--/SC	The biology of river lampreys has not been studied in California, general habitat and life history thought to be similar to Pacific lamprey.	**Present**	Suitable habitat occurs in the Sacramento River.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Central Valley fall/late-fall run ESU Chinook salmon (*Oncorhynchus tshawytscha*)	SC/SC	Freshwater rivers and streams. (Sacramento and San Joaquin rivers and their tributaries)	**Present**	Suitable habitat occurs in the Sacramento River.
Hardhead (*Mylopharodon conocephalus*)	--/SC	Quiet deep pools of large, warm, clear streams over rocks or sand.	**Present**	Suitable habitat occurs in the Sacramento River.
Pit roach *Lavinia symmetricus mitrulus*	--/SC	Small, warm, intermittent streams in the upper Pit River and its tributaries and tributaries to Goose Lake.	Absent	Study area outside the upper Pit River watershed.
McCloud River redband trout *Oncorhynchus mykiss ssp.*	--/SC	McCloud River and its tributaries, Swamp Creek and Trout Creek.	Absent	Study area is outside the McCloud River watershed.
Sacramento splittail *Pogonichthys macrolepidotus*	--/SC	Shallow, dead-end sloughs with submerged vegetation.	Absent	Native, non-game species; historically occurred near Redding, however, range is not thought to presently extend above Red Bluff.
Longfin smelt *Spirinchus thaleichthys*	--/SC	Sloughs of Suisun Bay and Delta.	Absent	Suitable habitat not present.
Amphibians				
Tailed frog *Ascaphus truei*	--/SC	Clear, rocky, swift, cool perennial streams in densely forested habitats.	Absent	Suitable habitat not present.
Foothill yellow-legged frog *Rana boylii*	--/SC	Rocky streams in a variety of habitats. Found in coast ranges.	Absent	Suitable habitat not present.
Cascades frog *Rana cascadae*	--/SC	Open coniferous forests along the sunny, rocky banks of ponds, lakes, streams, and meadow potholes. From 2,600 to 9,000 feet in elevation in Cascades and Trinity Mountains.	Absent	Suitable habitat not present.
Western spadefoot toad *Spea hammondii*	--/SC	Grasslands with temporary pools.	**Present**	One intermittent pool is located within a grassland in the northeast section of the site.
Reptiles				
Northwestern pond turtle *Clemmys marmorata marmorata*	--/SC	Slow water aquatic habitat with available basking sites. Hatchlings require shallow water with dense submergent or short emergent vegetation. Require an upland oviposition site in the vicinity of the aquatic site	**Present**	One perennial pond occurs on the project site.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Birds				
Long-billed curlew *Numenius americanus*	--/SC	Large coastal estuaries, upland herbaceous areas, and croplands. Breeds in wet meadow habitat.	Absent	Suitable habitat not present.
Double-crested cormorant *Phalacrocorax auritus*	--/SC	Inland lakes; fresh, salt and estuarine waters.	**Present**	Suitable nesting habitat not present on site due to level of human disturbance. May occur as a forager.
White-faced ibis *Plegadis chihi*	--/SC	A rare visitor to the Central Valley, this species nests and forages in freshwater marshes.	Absent	Suitable habitat not present.
California spotted owl *Strix occidentalis occidentalis*	--/SC	Dense, multi-layered mixed conifer, redwood, and Douglas-fir habitats with large overstory trees.	Absent	Conifer forest not present in study area.
Merlin *Falco columbarius*	--/SC	Frequents ocean shorelines, lake margins, and large, open river courses near tree stands for both nesting and wintering habitat. Does not breed in California.	**Present**	Woodlands provide suitable habitat.
Long-eared owl *Asio otus*	--/SC	Dense riparian and live oak thickets near meadow edges, and nearby woodland and forest habitats; also found in dense conifer stands at higher elevations.	Absent	Dense vegetation and meadows do not occur within the study area.
Western burrowing owl *Athene cunicularia hypugaea*	--/SC	Open habitats, dry grasslands and ruderal habitats with ground squirrel burrows.	**Present**	Suitable habitat present, however, there are no known occurrences in the area.
Golden eagle *Aquila chrysaetos*	--/SC/FP	Breeds on cliffs or in large trees or electrical towers, forages in open areas.	Absent	Open habitats and cliffs do not occur in the study area. Thus, this species is eliminated from further consideration
Sharp-shinned hawk *Accipiter striatus*	--/SC	Typically nests in dense conifer stands near water, winters in woodlands. Forages in many habitats in winter and migration.	**Present**	Unlikely to nest in area but may occur as a winter migrant.
Cooper's hawk *Accipiter cooperii*	--/SC	Nests in woodlands, forages in many habitats in winter and migration.	**Present**	Suitable nesting and foraging habitat is present in the project.
Northern goshawk *Accipiter gentilis*	--/SC	Breeds in dense, mature conifer and deciduous forests, interspersed with meadows, other openings and riparian areas; nesting habitat includes north-facing slopes near water.	Absent	Dense coniferous forests do not occur in the study area.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Ferruginous hawk *Buteo regalis*	--/SC	Forages in grasslands and occasionally in other open habitats during migration and winter.	**Present**	May be rare as migrant.
Northern harrier *Circus cyaneus*	--/SC	Forages in marshes, grasslands, and ruderal habitats; nests in extensive marshes and wet fields or grasslands.	Absent	Open grasslands or marshlands do not occur in the study area. Thus, this species is eliminated from further consideration
Prairie falcon *Falco mexicanus*	--/SC	Occurs in open habitats such as grasslands, desert scrub, rangelands and croplands. Nests on open cliffs.	**Present**	May be rare as migrant.
White-tailed kite *Elanus leucurus*	--/FP	Nests in lowlands with dense oak or riparian stands near open areas, forages over grassland, meadows, cropland and marshes.	**Present**	Woodlands and riparian forest provided suitable habitat.
Osprey *Pandion haliaetus*	--/SC	Ocean shorelines, lake margins and large, open river courses for both nesting and wintering habitat.	**Present**	Riparian habitat or large bodies of water occur in and near the study area
Black swift *Cypseloides niger*	--/SC	Nests in moist crevice or cave or sea cliffs above the surf, or on cliffs behind, or adjacent to, waterfalls in deep canyons; forages widely over many habitats.	Absent	Cliffs, deep canyons not present in Project vicinity. Thus, this species is eliminated from further consideration
Vaux's swift *Chaetura vauxi*	--/SC	Prefers redwood and Douglas-fir habitats, nests in hollow trees and snags or, occasionally, in chimneys; forages aerially.	Absent	Neither redwood nor Douglas-fir habitat is present. Thus, this species is eliminated from further consideration
Purple martin *Progne subis*	--/SC	Breeding habitat includes old-growth, multi-layered, open forest and woodland with snags; forages over riparian areas, forest, and woodlands	Absent	Multi-layered old growth does not occur in the study area. Thus, this species is eliminated from further consideration
Tricolored blackbird *Agelaius tricolor*	--/SC	Breeds near fresh water in dense emergent vegetation. Forages in grassland and cropland.	Absent	Dense emergent vegetation does not occur in the wetlands occuring in the study area. Foraging habitat is not available. Thus, this species is eliminated from further consideration.
California yellow warbler *Dendroica petechia brewsteri*	--/SC	Breeds in riparian woodlands, particularly those dominated by willows and cottonwoods.	**Present**	Riparian habitat occurs in and near the study area.

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Yellow-breasted chat *Icteria virens*	--/SC	Breeds in riparian habitats having dense understory vegetation, such as willow and blackberry.	**Present**	Riparian habitat occurs in and near the study area.
Bell's Sage Sparrow *Amphispiza belli belli*	--/SC	Nests in shrublands, preferably coastal scrub but is tolerant to a variety of shrublands. Irregular in its northern range of the western Shasta and Trinity Counties	Absent	Mixed chaparral occurs in the study area. Study area located near northernmost range of species
Loggerhead shrike *Lanius ludovicianus*	--/SC	Prefers open habitats with scatters shrubs and trees throughout the Central Valley of California. Nests in shrubs and trees.	**Present**	Open shrub/tree habitat occurs in the study area
Mammals				
Ringtail *Bassariscus astutus*	--/FP	Riparian habitats and in brush stands of most forest and shrub habitats. Nests in rock recesses, hollow trees, logs, snags, abandoned burrows or woodrat nests.	**Present**	Riparian habitat occurs in and near the study area.
Sierra Nevada snowshoe hare *Lepus americanus tahoensis*	--/SC	Boreal zones, typically inhabiting riparian communities with thickets of deciduous trees and shrubs above 4,800 ft. They also inhabit thickets of young conifers and chaparral.	Absent	Study area is below the required elevation for suitable habitat.
Townsend's western big-eared bat *Corynorhinus townsendii*	--/SC	Roosts in colonies in caves, mines, tunnels, or buildings in mesic habitats. The species forages along habitat edges, gleaning insects from bushes and trees. Habitat must include appropriate roosting, maternity and hibernacula sites free from disturbance by humans.	Absent	Roosting habitat is not present.
Pallid bat *Antrozous pallidus*	--/SC	Forages over many habitats; roosts in buildings, large oaks or redwoods, rocky outcrops and rocky crevices in mines and caves, and under bridges. Roosts must protect from high temperatures	**Present**	Roosting habitat does not occur within the study area; however suitable foraging habitat occurs in the study area.
Spotted bat *Euderma maculatum*	--/SC	Ponderosa pine region of the western highlands. Prefers cracks/crevices of high cliffs and canyons for roosting.	Absent	Ponderosa pine habitat not present and the project is located out of the current range of this species. Thus, this species is eliminated from further consideration

Scientific Name	Status[1] (Fed/State)	General Habitat Description	General Habitat[1] (Present/ Absent)	Rationale
Western mastiff bat *Eumops perotis*	--/SC	Roosts in cliff faces, rock outcrops, and buildings. Forages in open habitats. Needs vertical face to take flight.	**Present**	Roosting habitat does not occur within the study area; however suitable foraging habitat occurs in the study area.
American badger *Taxidea taxus*	--/SC	Herbaceous, shrub, and open stages of most habitats with dry, friable soils.	Absent	Suitable habitat does not occur within the study area.

[1]**Status and Habitat Codes:** Absent means general habitat is not present and no further work needed. Present means general habitat is present and species may be present.
Federal and State Codes: E = Endangered; T = Threatened; C = Candidate; Species of Special Concern (State); D = Delisted (status to be monitored for 5 years); FP = California Fully Protected Species. CNPS Codes: List 1B = Rare, Threatened or Endangered in CA and Elsewhere; List 2 = Rare, Threatened or Endangered in CA, but more common elsewhere.

APPENDIX E

Plant and Wildlife Species Observed

Plant Species Observed on the Strawberry Fields Study Area

Observers: Colby Boggs and Paul Kirk

Dates: April 25, May 3, May 9, and June 27, 2007

Annual Grassland		
Scientific name	**Common name**	**Family**
Aira caryophyllea	Silver European hairgrass	Poaceae
Amsinckia menziesii var. *intermedia*	Common fiddleneck	Boraginaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Bromus diandrus	Ripgut brome	Poaceae
Bromus hordeaceus	Soft brome	Poaceae
Bromus madritensis ssp. *rubens*	Red brome	Poaceae
Capsella bursa-pastoris	Shepherd's purse	Brassicaceae
Castilleja attenuata	Valley tassels	Scrophulariaceae
Centaurea solstitialis	Yellow star-thistle	Asteraceae
Cerastium glomeratum	Sticky mouse-eared chickweed	Caryophyllaceae
Chamomilla suaveolens	Pineapple weed	Asteraceae
Cichorium intybus	Chicory	Asteraceae
Cirsium vulgare	Bull thistle	Asteraceae
Convolvulus arvensis	Bindweed	Convolvulaceae
Cryptantha flaccida	Flaccid cryptantha	Boraginaceae
Cynodon dactylon	Bermuda grass	Poaceae
Cyperus eragrostis	Tall flatsedge	Cyperaceae
Dipsacus fullonum	Wild teasel	Dipsacaceae
Elymus elymoides	Squirreltail	Poaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Eriogonum luteolum	Golden buckwheat	Polygonaceae
Eriogonum nudum	Naked eriogonum	Polygonaceae
Eriogonum sphaerocephalum	Round-headed buckwheat	Polygonaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Eriophyllum lanatum	Woolly sunflower	Asteraceae
Erodium botrys	Long-beaked stork's bill	Geraniaceae
Erodium cicutarium	Red-stemmed filaree	Geraniaceae
Eschscholzia californica	California poppy	Papaveraceae
Filago californica	California herba impia	Asteraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Grindelia camporum	Great valley gumweed	Asteraceae
Heterotheca oregona	Oregon goldenaster	Asteraceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Poaceae
Hordeum murinum ssp. *leporinum*	Foxtail barley	Poaceae
Hypochaeris glabra	Smooth cat's-ear	Asteraceae
Juncus effusus	Common bog rush	Juncaceae
Keckiella breviflora	Gaping keckiella	Scrophulariaceae
Leontodon taraxacoides	Hawkbit	Asteraceae
Lolium multiflorum	Italian ryegrass	Poaceae
Lomatium dasycarpum	Woolly-fruited lomatium	Apiaceae
Lotus humistratus	Short-podded lotus	Fabaceae

Annual Grassland (cont.)		
Scientific name	**Common name**	**Family**
Lupinus albifrons	Silver bush lupine	Fabaceae
Lupinus bicolor	Miniature lupine	Fabaceae
Mentzelia laevicaulis	Smooth-stem blazing star	Loasaceae
Petrorhagia dubia	Grass pink	Caryophyllaceae
Plagiobothrys fulvus	Fulvous popcorn flower	Boraginaceae
Plantago erecta	Erect plantain	Plantaginaceae
Raphanus raphanistrum	Jointed charlock	Brassicaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Sagina apetala	Dwarf pearlwort	Caryophyllaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Senecio vulgaris	Old man of spring	Asteraceae
Silybum marianum	Milk thistle	Asteraceae
Sonchus oleraceus	Common sow thistle	Asteraceae
Sorghum halepense	Johnson grass	Poaceae
Spergularia rubra	Ruby sandspurry	Caryophyllaceae
Symphytum officinale	Comfrey	Boraginaceae
Taraxacum officinale	Common dandelion	Asteraceae
Trifolium dubium	Shamrock	Fabaceae
Trifolium hirtum	Rose clover	Fabaceae
Trifolium microcephalum	Small-head field clover	Fabaceae
Trifolium repens	White clover	Fabaceae
Veronica peregrina ssp. *xalapensis*	Purslane speedwell	Scrophulariaceae
Vicia villosa	Winter vetch	Fabaceae
Vulpia myuros	Rattail fescue	Poaceae

Valley Foothill Riparian		
Acacia dealbata	Silver wattle	Fabaceae
Agrostis exarata	Spike bentgrass	Poaceae
Ailanthus altissima	Tree-of-heaven	Simaroubaceae
Alnus rhombifolia	White alder	Betulaceae
Aristolochia californica	Pipevine	Aristolochiaceae
Artemisia douglasiana	Mugwort	Asteraceae
Asparagus officinalis ssp. *officinalis*	Asparagus	Liliaceae
Barbarea orthoceras	Winter cress	Brassicaceae
Brassica nigra	Black mustard	Brassicaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Small quaking grass	Poaceae
Bromus diandrus	Ripgut brome	Poaceae
Bromus hordeaceus	Soft brome	Poaceae
Carduus pycnocephalus	Italian plumeless thistle	Asteraceae
Carex integra	Smooth-beaked sedge	Cyperaceae
Carex nudata	Torrent sedge	Cyperaceae
Cercis occidentalis	Western redbud	Fabaceae
Cyperus eragrostis	Tall flatsedge	Cyperaceae
Datura wrightii	Toluaca	Solanaceae
Dipsacus fullonum	Wild teasel	Dipsacaceae
Echinochloa crus-galli	Barnyard grass	Poaceae
Elymus elymoides	Squirreltail	Poaceae
Epilobium brachycarpum	Tall annual willowherb	Onagraceae

Valley Foothill Riparian (cont.)		
Scientific name	**Common name**	**Family**
Equisetum laevigatum	Smooth scouring rush	Equisetaceae
Eriogonum vimineum	Wicker buckwheat	Polygonaceae
Festuca rubra	Red fescue	Poaceae
Ficus carica	Common fig	Moraceae
Fraxinus latifolia	Oregon ash	Oleaceae
Galium aparine	Goose grass	Rubiaceae
Geranium molle	Dove's foot geranium	Geraniaceae
Gnaphalium californicum	California everlasting	Asteraceae
Hordeum murinum	Barley	Poaceae
Iris pseudacorus	Water iris	Iridaceae
Juglans californica	California black walnut	Juglandaceae
Juncus effusus	Common bog rush	Juncaceae
Juncus saximontanus	Rocky mountain rush	Juncaceae
Lactuca serriola	Prickly lettuce	Asteraceae
Leontodon taraxacoides	Hawkbit	Asteraceae
Lolium multiflorum	Italian ryegrass	Poaceae
Melilotus alba	White sweetclover	Fabaceae
Morus alba	Mulberry	Moraceae
Paspalum dilatatum	Dallis grass	Poaceae
Phytolacca americana	Pokeweed	Phytolaccaceae
Pinus ponderosa	Ponderosa pine	Pinaceae
Pinus sabiniana	Gray pine	Pinaceae
Plantago lanceolata	English plantain	Plantaginaceae
Plectritis ciliosa	Long-spurred plectritis	Valerianaceae
Polygonum lapathifolium	Willow weed	Polygonaceae
Populus fremontii ssp. *fremontii*	Fremont cottonwood	Salicaceae
Quercus lobata	Valley oak	Fagaceae
Quercus wislizenii	Interior live oak	Fagaceae
Rhamnus californica	California coffeeberry	Rhamnaceae
Robinia pseudoacacia	Black locust	Fabaceae
Rubus discolor	Himalayan blackberry	Rosaceae
Rumex acetosella	Common sheep sorrel	Polygonaceae
Salix exigua	Narrow-leaved willow	Salicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Salix lasiolepis	Arroyo willow	Salicaceae
Sambucus mexicana	Blue elderberry	Caprifoliaceae
Saponaria officinalis	Bouncing bet	Caryophyllaceae
Setaria pumila	Yellow bristle grass	Poaceae
Silybum marianum	Milk thistle	Asteraceae
Sonchus oleraceus	Common sow thistle	Asteraceae
Stellaria media	Common chickweed	Caryophyllaceae
Torilis arvensis	Field hedge-parsley	Apiaceae
Toxicodendron diversilobum	Poison oak	Anacardiaceae
Ulmus minor	Smoothleaf elm	Ulmaceae
Verbascum thapsus	Woolly mullein	Scrophulariaceae
Vicia villosa	Winter vetch	Fabaceae
Vitis californica	California wild grape	Vitaceae
Vulpia myuros	Rattail fescue	Poaceae

Foothill Pine		
Scientific name	**Common name**	**Family**
Ailanthus altissima	Tree-of-heaven	Simaroubaceae
Anthoxanthum aristatum	Annual vernal grass	Poaceae
Arctostaphylos manzanita	Big leaved manzanita	Ericaceae
Avena barbata	Slender wild-oat	Poaceae
Brickellia californica	California brickellbush	Asteraceae
Briza minor	Small quaking grass	Poaceae
Eriodictyon californicum	Yerba santa	Hydrophyllaceae
Gilia capitata	Blue field-gilia	Polemoniaceae
Heterotheca oregona	Oregon goldenaster	Asteraceae
Juglans californica	California black walnut	Juglandaceae
Lepidium virginicum	Wild pepper-grass	Brassicaceae
Linaria genistifolia ssp. *dalmatica*	Dalmatian toad-flax	Scrophulariaceae
Lupinus albifrons	Silver bush lupine	Fabaceae
Petrorhagia dubia	Grass pink	Caryophyllaceae
Pinus sabiniana	Gray pine	Pinaceae
Populus fremontii ssp. *fremontii*	Fremont cottonwood	Salicaceae
Quercus wislizenii	Interior live oak	Fagaceae
Raphanus raphanistrum	Jointed charlock	Brassicaceae
Salix gooddingii	Goodding's black willow	Salicaceae
Spartium junceum	Gorse	Fabaceae
Verbascum blattaria	Moth mullein	Scrophulariaceae

Valley Oak Woodland		
Camissonia contorta	Contorted sun-cup	Onagraceae
Chenopodium ambrosioides	Mexican tea	Chenopodiaceae
Cryptantha flaccida	Flaccid cryptantha	Boraginaceae
Heterotheca grandiflora	Telegraph weed	Asteraceae
Marrubium vulgare	Horehound	Lamiaceae
Morus alba	Mulberry	Moraceae
Orobanche fasciculata	Clustered broom-rape	Orobanchaceae
Phacelia heterophylla ssp. *virgata*	Virgate phacelia	Hydrophyllaceae
Rhamnus tomentella	Hoary coffeeberry	Rhamnaceae
Vitis californica	California wild grape	Vitaceae

Intermittent Pool and Pond		
Digitaria sanguinalis	Crabgrass	Poaceae
Hordeum marinum ssp. *gussoneanum*	Mediterranean barley	Poaceae
Juncus bufonius	Toad rush	Juncaceae
Lemna minor	Common duckweed	Lemnaceae
Lolium multiflorum	Italian ryegrass	Poaceae
Lotus corniculatus	Birdfoot trefoil	Fabaceae
Poa annua	Annual blue grass	Poaceae
Polygonum arenastrum	Common knotweed	Polygonaceae
Veronica peregrina ssp. *xalapensis*	Purslane speedwell	Scrophulariaceae

Wildlife Species Observed on the Strawberry Fields Study Area

Observer: Colby Boggs, Ginger Bolen, and Heather Kelly
Dates: April 25, May 3, May 9, May 10, June 27, and November 2, 2007

Common name	***Scientific name***
Pacific chorus frog	*Pseudacris regilla*
bullfrog	*Rana catesbeiana*
alligator lizard	*Elgaria* sp.
fence lizard	*Sceloporus occidentalis*
mallard duck	*Anas platyrhynchos*
scrub jay	*Aphelocoma californica*
great egret	*Ardea alba*
Canada goose	*Branta canadensis*
red-tailed hawk	*Buteo jamaicensis*
California quail	*Callipepla californica*
turkey vulture	*Cathartes aura*
killdeer	*Charadrius vociferus*
red-shafted flicker	*Colaptes auratus*
acorn woodpecker	*Melanerpes formicivorus*
song sparrow	*Melospiza melodia*
downy woodpecker	*Picoides pubescens*
spotted towhee	*Pipilo maculatus*
western tanager	*Piranga ludoviciana*
blue-gray gnatcatcher	*Polioptila caerulea*
bushtits	*Psaltriparus minimus*
bank swallow	*Riparia riparia*
black phoebe	*Sayornis nigricans*
red breasted nuthatch (migrant)	*Sitta canadensis*
American robin	*Turdus migratorius*
western kingbird	*Tyrannus verticalis*
mourning dove	*Zenaida macroura*
coyote	*Canis latrans*
black-tailed jack rabbit	*Lepus californicus*
mule deer	*Odocoileus hemionus*
grey squirrel	*Sciurus griseus*

APPENDIX F

Summary Table of VELB Survey Data

Summary Table of VELB Survey Data from the Strawberry Fields Study Area.

Observer: Paul Kirk
Survey Dates: June 27, June 28, June 29, and August 2, 2007

Elderberry Shrub Number	# Exit Holes	Stems 1-3"	Stems 3-5"	Stems >5"	Approximate Shrub Ht. (ft)	Riparian Location?	Associated Habitat
1	0	0	0	1	12	No	Annual grassland
2	0	0	8	3	18	Yes	Valley foothill riparian
3	0	6	9	8	18	Yes	Valley foothill riparian
4	4	2	4	11	20	No	Valley oak woodland
5	1	0	4	3	15	No	Valley oak woodland
6	0	0	1	1	20	No	Valley oak woodland
7	0	0	0	1	25	No	Valley oak woodland
8	0	0	0	1	15	No	Valley oak woodland
9	0	0	0	2	46	Yes	Valley foothill riparian
10	0	0	1	3	18	Yes	Valley foothill riparian
11	0	3	2	0	18	Yes	Valley foothill riparian
12	0	1	0	0	12	Yes	Valley foothill riparian
13	NS[1]	≥ 1	NS[1]	NS[1]	18	Yes	Valley foothill riparian
14	NS[1]	≥ 1	NS[1]	NS[1]	18	Yes	Valley foothill riparian
15	0	0	0	1	20	No	Valley oak woodland
16	0	2	0	2	15	No	Valley oak woodland
17	0	2	1	2	12	No	Valley oak woodland
18	0	0	0	2	12	No	Valley oak woodland
19	0	4	5	2	18	No	Valley oak woodland
20	1	1	1	3	20	No	Valley oak woodland
21	0	4	0	2	15	No	Valley oak woodland
22	0	4	2	4	18	Yes	Valley foothill riparian
23	0	6	6	1	18	Yes	Valley foothill riparian
24	0	6	4	2	15	Yes	Valley foothill riparian
25	0	4	6	2	18	Yes	Valley foothill riparian
26	0	0	0	2	18	No	Valley oak woodland
27	0	0	1	0	15	No	Valley oak woodland
28	3	1	1	3	18	No	Valley oak woodland
29	3	0	0	8	16	No	Valley oak woodland
30	0	1	2	9	18	Yes	Valley foothill riparian
31	0	3	3	0	12	Yes	Valley foothill riparian

Elderberry Shrub Number	# Exit Holes	Stems 1-3”	Stems 3-5”	Stems >5”	Approximate Shrub Ht. (ft)	Riparian Location?	Associated Habitat
32	0	1	0	0	10	Yes	Valley foothill riparian
33	2	0	2	0	12	Yes	Valley foothill riparian
34	0	1	0	0	8	Yes	Valley foothill riparian
35	0	2	0	0	8	Yes	Valley foothill riparian
36	0	7	5	1	15	Yes	Valley foothill riparian
37	7	3	1	3	18	Yes	Valley foothill riparian
38	0	3	1	3	14	Yes	Valley foothill riparian
40[2]	0	1	0	2	15	Yes	Valley foothill riparian
41	0	1	0	0	10	Yes	Valley foothill riparian
42	0	1	1	0	15	Yes	Valley foothill riparian
43	3	4	1	0	12	Yes	Valley foothill riparian
44	0	0	1	0	12	Yes	Valley foothill riparian
45	0	1	0	0	8	Yes	Valley foothill riparian
47[2]	0	1	5	6	18	Yes	Valley foothill riparian
48	0	1	0	0	12	No	Annual grassland
49	0	14	4	3	16	No	Riverine
50	0	6	2	1	12	No	Riverine
51	0	3	1	0	15	No	Annual grassland
52	0	3	0	1	18	Yes	Valley foothill riparian
53	0	0	1	2	15	Yes	Valley foothill riparian
54	0	1	1	1	20	Yes	Valley foothill riparian
55	6	1	3	9	20	Yes	Valley foothill riparian
56	1	1	1	1	12	Yes	Valley foothill riparian
57	0	1	0	1	16	Yes	Valley foothill riparian
58	0	0	1	0	14	Yes	Valley foothill riparian
59	0	0	2	2	16	No	Valley oak woodland
60	1	0	0	4	16	No	Valley oak woodland
62	0	1	0	0	9	Yes	Valley foothill riparian
61	1	1	1	2	20	No	Valley oak woodland
63	0	4	1	2	12	Yes	Valley foothill riparian
64	3	1	2	5	15	Yes	Valley foothill riparian

[1] These shrubs are overgrown with Himalayan blackberry and were not surveyed (NS) for exit holes. Stem count and shrub height were estimated using binoculars.

[2] Break in sequence due to duplicate GPS recording.

APPENDIX G

Representative Photographs of VELB Exit Holes

Representative Photographs of VELB Exit Holes Observed at the Strawberry Fields Study Area

Photographs taken on June 29 and August 2, 2007

Photograph 1. Old VELB exit hole on elderberry stem (shrub #37). This shrub had seven exit holes on three different stems.

Photograph 2. Recent VELB exit hole with clean edges on elderberry stem (shrub # 55).

USACE Preliminary Jurisdictional Determination

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

March 20, 2017

Regulatory Division (SPK-2007-00821)

Redding Rancheria Tribe
Attn: Ms. Tracy Edwards
2000 Redding Rancheria Road
Redding, California 96001

Dear Ms. Edwards:

We are responding to your September 6, 2016, request for a preliminary jurisdictional determination (JD) for the Strawberry Fields site. The approximately 236.3-acre project site is located on the Sacramento River, Section 17, Township 31 North, Range 4 West, Mount Diablo Meridian, Latitude 40.52799°, Longitude -122.35348°, Redding, Shasta County, California.

Based on available information, we concur with your aquatic resources delineation for the site as depicted on the enclosed September 26, 2016, *Waters of the U.S.* drawings prepared by Analytical Environmental Services (enclosure 1). The approximately 5.63 acres of wetlands, and 2.17 acres of other waters of the United States present within the survey area, are potential jurisdictional aquatic resources regulated under Section 404 of the Clean Water Act and Sections 9 and 10 of the Rivers and Harbors Act.

At your request, we have completed a preliminary JD for the site. Enclosed find a copy of the *Preliminary Jurisdictional Determination Form* (enclosure 2). Please sign and return the completed form to this office, at the address listed below, within 30 days of the date of this letter. If you do not return the signed form within 30 days, we will presume concurrence and finalize the preliminary jurisdictional determination.

You may request an approved JD for this site at any time prior to starting work within waters, including after a permit decision is made.

We recommend you provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

This preliminary jurisdictional determination has been conducted to identify the potential limits of wetlands and other aquatic resources at the project site which may be subject to U.S. Army Corps of Engineers jurisdiction under Section 404 of the Clean

Water Act and Section 9 and 10 of the Rivers and Harbors Act. A *Notification of Appeal Process and Request for Appeal Form* is enclosed to notify you of your options with this determination (enclosure 3).

We appreciate feedback, especially about interactions with our staff and processes. Please refer to identification number SPK-2007-00821 in any correspondence concerning this project. If you have any questions, please contact Matthew Roberts at 310 Hemsted Drive, Suite 310, Redding CA, 96002, by telephone at 530-223-9538, or by email at *Matthew.J.Roberts@usace.army.mil.* For program information or to complete our Customer Survey, visit our website at *www.spk.usace.army.mil/Missions/Regulatory.aspx*.

Sincerely,

Matthew P. Kelley
Chief, Redding Regulatory
Regulatory Division

Enclosures

cc: (w/o encls)
Mr. Nicholas Bonzey, Analytical Environmental Solutions, *Nbonzey@analyticalcorp.com*
Ms. Dannas Berchtold, Central Valley Regional Water Quality Control Board, *Dannas.Berchtold@waterboards.ca.gov*

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: January 20, 2017

B. NAME AND ADDRESS OF PERSON REQUESTING PJD: Redding Rancheria Tribe;

Ms. Tracy Edwards, 2000 Redding Rancheria Road, Redding, California 96001

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: SPK-2007-00821

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: California County: Shasta

Center coordinates of site (lat/long in degree decimal format):

Lat.: 40.52799 Long.: -122.35348

Universal Transverse Mercator: 10 T 554759.54 E 4486562.39 N

Name of nearest waterbody: Sacramento River

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:

☒ Field Determination. Date(s): December 13, 2016; March 13, 2017

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
IS-1	40.52582	-122.359	0.02	Non-wetland	404
NOW-1	40.52459	-122.353	0.4	Wetland	404
NOW-2	40.52911	-122.354	0.17	Wetland	404
NSW-1	40.53441	-122.351	0.01	Wetland	404

R-1	40.52671	-122.36	1.64	Non-Wetland	10
R-2	40.52509	-122.36	0.51	Non-Wetland	10
Riparian	40.53157	-122.354	5.02	Wetland	10
SW-1	40.52591	-122.359	0.03	Wetland	404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- [X] Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
  Map: *Waters of the U.S.* sheets 1-4
- [X] Data sheets prepared/submitted by or on behalf of the PJD requestor.
  - [X] Office concurs with data sheets/delineation report.
  - [ ] Office does not concur with data sheets/delineation report. Rationale: ______.
- [ ] Data sheets prepared by the Corps: ________.
- [ ] Corps navigable waters' study: ___________.
- [ ] U.S. Geological Survey Hydrologic Atlas: ________.
  - [ ] USGS NHD data.
  - [ ] USGS 8 and 12 digit HUC maps.
- [X] U.S. Geological Survey map(s). Cite scale & quad name: 1:24K; CA-ENTERPRISE.
- [ ] Natural Resources Conservation Service Soil Survey. Citation: _________.
- [ ] National wetlands inventory map(s). Cite name: ________.
- [ ] State/local wetland inventory map(s): ___________.
- [ ] FEMA/FIRM maps: _______________.
- [ ] 100-year Floodplain Elevation is: ____. (National Geodetic Vertical Datum of 1929)
- [ ] Photographs: [ ] Aerial (Name & Date): ______.
  or [ ] Other (Name & Date): _____.
- [ ] Previous determination(s). File no. and date of response letter: _________.
- [ ] Other information (please specify): _____________.

<u>IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.</u>

ROBERTS.MATTHEW.JAMES.1248429514

Signature and date of Regulatory staff member completing PJD

Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Redding Rancheria Tribe, Attn: Ms. Tracy Edwards	File No.: SPK-2007-00821	Date: March 20, 2017

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
X	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at *http://www.usace.army.mil/cecw/pages/reg_materials.aspx* or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Matthew J. Roberts Project Manager Regulatory Division U.S. Army Corps of Engineers 310 Hemsted Drive, Suite 310 Redding CA, 96002 Phone: 530-223-9538, FAX 916-557-7803 Email: Matthew.J.Roberts@usace.army.mil	Thomas J. Cavanaugh Administrative Appeal Review Officer U.S. Army Corps of Engineers South Pacific Division 1455 Market Street, 2052B San Francisco, California 94103-1399 Phone: 415-503-6574, FAX 415-503-6646) Email: Thomas.J.Cavanaugh@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.	Date:	Telephone number:

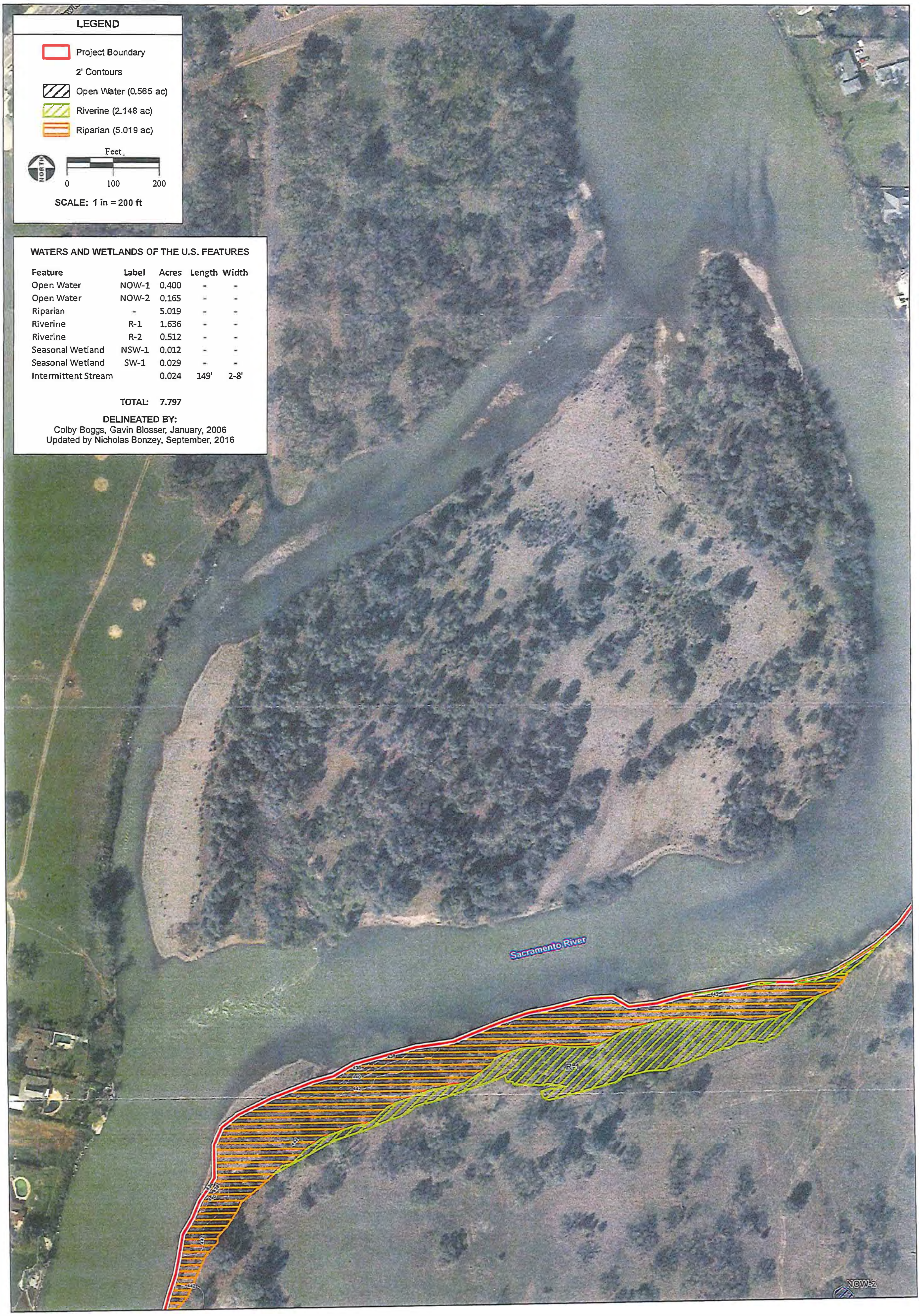
WATERS AND WETLANDS OF THE U.S. FEATURES

Feature	Label	Acres	Length	Width
Open Water	NOW-1	0.400	-	-
Open Water	NOW-2	0.165	-	-
Riparian	-	5.019	-	-
Riverine	R-1	1.636	-	-
Riverine	R-2	0.512	-	-
Seasonal Wetland	NSW-1	0.012	-	-
Seasonal Wetland	SW-1	0.029	-	-
Intermittent Stream	-	0.024	149'	2-8'
	TOTAL:	7.797		

DELINEATED BY:
Colby Boggs, Gavin Blosser, January, 2006
Updated by Nicholas Bonzey, September, 2016

SOURCE: USDA aerial photograph, 7/26/2014; North State Resources, 1/21/2006; AES, 1/26/2017

Waters of the U.S.



WATERS AND WETLANDS OF THE U.S. FEATURES

Feature	Label	Acres	Length	Width
Open Water	NOW-1	0.400	-	-
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Riparian	-	5.019	-	-
Riverine	R-1	1.636	-	-
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Seasonal Wetland	SW-1	0.029	-	-
Intermittent Stream		0.024	149'	2-8'
	TOTAL:	7.797		

DELINEATED BY:
Colby Boggs, Gavin Blosser, January, 2006
Updated by Nicholas Bonzey, September, 2016

Redding Rancheria Fee-to-Trust EIS / 214584

SOURCE: USDA aerial photograph, 7/26/2014; North State Resources, 1/21/2006; AES, 1/27/2017

Sheet

Waters of

WATERS AND WETLANDS OF THE U.S. FEATURES

Feature	Label	Acres	Length	Width
Open Water	NOW-1	0.400	-	-
Open Water	NOW-2	0.165	-	-
Riparian	-	5.019	-	-
Riverine	R-1	1.636	-	-
Riverine	R-2	0.512	-	-
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Intermittent Stream		0.024	149'	2-8'
	TOTAL:	7.797		

DELINEATED BY:
Colby Boggs, Gavin Blosser, January, 2006
Updated by Nicholas Bonzey, September, 2016

SOURCE:USDA aerial photograph, 7/26/2014; North State Resources, 1/21/2006; AES, 1/27/2017

Sheet 2

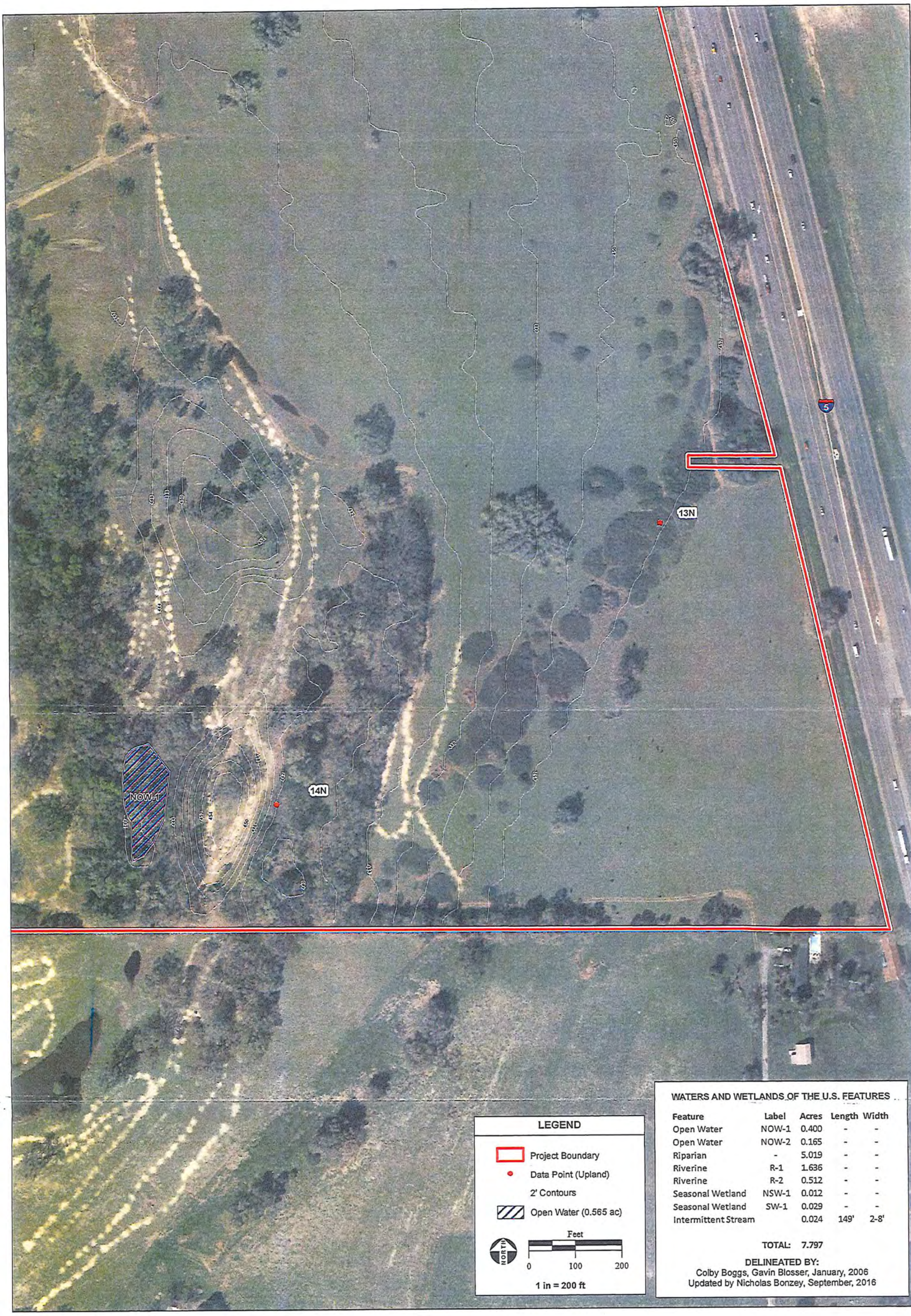
Waters of tl

Feature	Label	Acres	Length	Width
Open Water	NOW-1	0.400	-	-
Open Water	NOW-2	0.165	-	-
Riparian	-	5.019	-	-
Riverine	R-1	1.636	-	-
Riverine	R-2	0.512	-	-
Seasonal Wetland	NSW-1	0.012	-	-
Seasonal Wetland	SW-1	0.029	-	-
Intermittent Stream		0.024	149'	2-8'
	TOTAL:	7.797		

SOURCE: USDA aerial photograph, 7/26/2014; North State Resources, 1/21/2006; AES, 1/27/2017

Sheet 3

Waters of the U.S.



WATERS AND WETLANDS OF THE U.S. FEATURES

Feature	Label	Acres	Length	Width
Open Water	NOW-1	0.400	-	-
Open Water	NOW-2	0.165	-	-
Riparian	-	5.019	-	-
Riverine	R-1	1.636	-	-
Riverine	R-2	0.512	-	-
Seasonal Wetland	NSW-1	0.012	-	-
Seasonal Wetland	SW-1	0.029	-	-
Intermittent Stream		0.024	149'	2-8'
	TOTAL:	7.797		

DELINEATED BY:
Colby Boggs, Gavin Blosser, January, 2006
Updated by Nicholas Bonzey, September, 2016

SOURCE:USDA aerial photograph, 7/26/2014; North State Resources, 1/21/2006; AES, 1/27/2017

Sheet 4

Waters of the U.S.

Special-Status Species Searches

STRAWBERRY FIELDS SITE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: July 18, 2018
Consultation Code: 08ESMF00-2017-SLI-2734
Event Code: 08ESMF00-2018-E-07999
Project Name: Redding

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2017-SLI-2734

Event Code: 08ESMF00-2018-E-07999

Project Name: Redding

Project Type: ** OTHER **

Project Description: Tribal fee-to-trust

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.52930951202774N122.3594509873035W

Counties: Shasta, CA

Endangered Species Act Species

There is a total of 8 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Slender Orcutt Grass *Orcuttia tenuis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1063	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CNPS California Native Plant Society

Plant List

Inventory of Rare and Endangered Plants

6 matches found. *Click on scientific name for details*

Search Criteria

Found in Quad 4012253

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Blooming Period	CA Rare Plant Rank	State Listing Status	Federal Listing Status
Agrostis hendersonii	Henderson's bent grass	Apr-Jun	3.2		
Cryptantha crinita	silky cryptantha	Apr-May	1B.2		
Juncus leiospermus var. leiospermus	Red Bluff dwarf rush	Mar-Jun	1B.1		
Legenere limosa	legenere	Apr-Jun	1B.1		
Orcuttia tenuis	slender Orcutt grass	May-Sep(Oct)	1B.1	CE	FT
Sidalcea celata	Redding checkerbloom	Apr-Aug	3		

Suggested Citation

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 18 July 2018].

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The Calflora Database
The California Lichen Society
California Natural Diversity Database
The Jepson Flora Project
The Consortium of California Herbaria
CalPhotos

Questions and Comments

rareplants@cnps.org

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Enterprise (4012253))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Candidate Endangered	G2G3	S1S2	SSC
Agrostis hendersonii Henderson's bent grass	PMPOA040K0	None	None	G2Q	S2	3.2
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S3	
Cryptantha crinita silky cryptantha	PDBOR0A0Q0	None	None	G2	S2	1B.2
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Great Valley Cottonwood Riparian Forest Great Valley Cottonwood Riparian Forest	CTT61410CA	None	None	G2	S2.1	
Great Valley Valley Oak Riparian Forest Great Valley Valley Oak Riparian Forest	CTT61430CA	None	None	G1	S1.1	
Great Valley Willow Scrub Great Valley Willow Scrub	CTT63410CA	None	None	G3	S3.2	
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S3	FP
Juncus leiospermus var. leiospermus Red Bluff dwarf rush	PMJUN011L2	None	None	G2T2	S2	1B.1
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lathyrus sulphureus var. argillaceus dubious pea	PDFAB25101	None	None	G5T1T2	S1S2	3
Legenere limosa legenere	PDCAM0C010	None	None	G2	S2	1B.1
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G4	S3S4	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Oncorhynchus tshawytscha pop. 6 chinook salmon - Central Valley spring-run ESU	AFCHA0205A	Threatened	Threatened	G5	S1	
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	AFCHA0205B	Endangered	Endangered	G5	S1	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Orcuttia tenuis slender Orcutt grass	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
Rana boylii foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Spea hammondii western spadefoot	AAABF02020	None	None	G3	S3	SSC
Trilobopsis roperi Shasta chaparral	IMGASA2030	None	None	G1	S1	

Record Count: 25

ANDERSON SITE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: July 18, 2018
Consultation Code: 08ESMF00-2018-SLI-2762
Event Code: 08ESMF00-2018-E-08032
Project Name: Anderson Site

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2018-SLI-2762

Event Code: 08ESMF00-2018-E-08032

Project Name: Anderson Site

Project Type: DEVELOPMENT

Project Description: Development

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.456851635445446N122.29880482840184W

Counties: Shasta, CA

Endangered Species Act Species

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
Conservancy Fairy Shrimp *Branchinecta conservatio* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8246	Endangered
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Flowering Plants

NAME	STATUS
Slender Orcutt Grass *Orcuttia tenuis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1063	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CNPS California Native Plant Society

Plant List

Inventory of Rare and Endangered Plants

3 matches found. *Click on scientific name for details*

Search Criteria

Found in Quad 4012243

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Family	Blooming Period	CA Rare Plant Rank	State Listing Status	Federal Listing Status
Cryptantha crinita	silky cryptantha	Boraginaceae	Apr-May	1B.2		
Juncus leiospermus var. leiospermus	Red Bluff dwarf rush	Juncaceae	Mar-Jun	1B.1		
Orcuttia tenuis	slender Orcutt grass	Poaceae	May-Sep (Oct)	1B.1	CE	FT

Suggested Citation

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 18 July 2018].

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The Calflora Database
The California Lichen Society
California Natural Diversity Database
The Jepson Flora Project
The Consortium of California Herbaria
CalPhotos

Questions and Comments

rareplants@cnps.org

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Cottonwood (4012243))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Candidate Endangered	G2G3	S1S2	SSC
Branchinecta lynchi vernal pool fairy shrimp	ICBRA03030	Threatened	None	G3	S3	
Cryptantha crinita silky cryptantha	PDBOR0A0Q0	None	None	G2	S2	1B.2
Desmocerus californicus dimorphus valley elderberry longhorn beetle	IICOL48011	Threatened	None	G3T2	S2	
Great Valley Cottonwood Riparian Forest Great Valley Cottonwood Riparian Forest	CTT61410CA	None	None	G2	S2.1	
Great Valley Valley Oak Riparian Forest Great Valley Valley Oak Riparian Forest	CTT61430CA	None	None	G1	S1.1	
Great Valley Willow Scrub Great Valley Willow Scrub	CTT63410CA	None	None	G3	S3.2	
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S3	FP
Juncus leiospermus var. leiospermus Red Bluff dwarf rush	PMJUN011L2	None	None	G2T2	S2	1B.1
Lasionycteris noctivagans silver-haired bat	AMACC02010	None	None	G5	S3S4	
Lasiurus blossevillii western red bat	AMACC05060	None	None	G5	S3	SSC
Lasiurus cinereus hoary bat	AMACC05030	None	None	G5	S4	
Legenere limosa legenere	PDCAM0C010	None	None	G2	S2	1B.1
Lepidurus packardi vernal pool tadpole shrimp	ICBRA10010	Endangered	None	G4	S3S4	
Linderiella occidentalis California linderiella	ICBRA06010	None	None	G2G3	S2S3	
Myotis yumanensis Yuma myotis	AMACC01020	None	None	G5	S4	
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	AFCHA0205B	Endangered	Endangered	G5	S1	
Orcuttia tenuis slender Orcutt grass	PMPOA4G050	Threatened	Endangered	G2	S2	1B.1
Pandion haliaetus osprey	ABNKC01010	None	None	G5	S4	WL

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S2	
Spea hammondii western spadefoot	AAABF02020	None	None	G3	S3	SSC

Record Count: 22

WIN-RIVER CASINO SITE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: July 18, 2018
Consultation Code: 08ESMF00-2018-SLI-2757
Event Code: 08ESMF00-2018-E-08019
Project Name: Win River

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2018-SLI-2757

Event Code: 08ESMF00-2018-E-08019

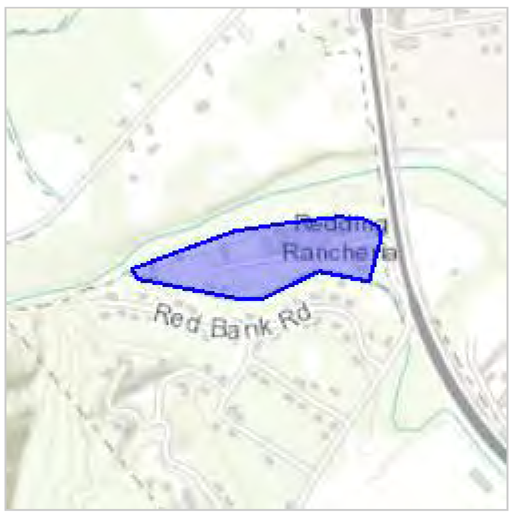
Project Name: Win River

Project Type: DEVELOPMENT

Project Description: Casino

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/40.506728638692394N122.38429731452516W



Counties: Shasta, CA

Endangered Species Act Species

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Birds

NAME	STATUS
Northern Spotted Owl *Strix occidentalis caurina* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1123	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened

Insects

NAME	STATUS
Valley Elderberry Longhorn Beetle *Desmocerus californicus dimorphus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7850 Habitat assessment guidelines: https://ecos.fws.gov/ipac/guideline/assessment/population/436/office/11420.pdf	Threatened

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp *Branchinecta lynchi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/498	Threatened
Vernal Pool Tadpole Shrimp *Lepidurus packardi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2246	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

CNPS *California Native Plant Society*

Plant List

Inventory of Rare and Endangered Plants

2 matches found. *Click on scientific name for details*

Search Criteria

Found in Quad 4012254

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Family	Blooming Period	CA Rare Plant Rank	State Listing Status	Federal Listing Status
Brodiaea matsonii	Sulphur Creek brodiaea	Themidaceae	May-Jun	1B.1		
Lathyrus sulphureus var. argillaceus	dubious pea	Fabaceae	Apr-May	3		

Suggested Citation

California Native Plant Society, Rare Plant Program. 2018. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 18 July 2018].

Search the Inventory

Simple Search

Advanced Search

Glossary

Information

About the Inventory

About the Rare Plant Program

CNPS Home Page

About CNPS

Join CNPS

Contributors

The Calflora Database

The California Lichen Society

California Natural Diversity Database

The Jepson Flora Project

The Consortium of California Herbaria

CalPhotos

Questions and Comments

rareplants@cnps.org

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Redding (4012254))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Candidate Endangered	G2G3	S1S2	SSC
Ardea alba great egret	ABNGA04040	None	None	G5	S4	
Brodiaea matsonii Sulphur Creek brodiaea	PMLIL0C0H0	None	None	G1	S1	1B.1
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
Emys marmorata western pond turtle	ARAAD02030	None	None	G3G4	S3	SSC
Great Valley Cottonwood Riparian Forest Great Valley Cottonwood Riparian Forest	CTT61410CA	None	None	G2	S2.1	
Helminthoglypta hertleini Oregon shoulderband	IMGASC2280	None	None	G1	S1S2	
Lanx patelloides kneecap lanx	IMGASL7030	None	None	G2	S2	
Lathyrus sulphureus var. argillaceus dubious pea	PDFAB25101	None	None	G5T1T2	S1S2	3
Margaritifera falcata western pearlshell	IMBIV27020	None	None	G4G5	S1S2	
Oncorhynchus mykiss irideus pop. 11 steelhead - Central Valley DPS	AFCHA0209K	Threatened	None	G5T2Q	S2	
Oncorhynchus tshawytscha pop. 6 chinook salmon - Central Valley spring-run ESU	AFCHA0205A	Threatened	Threatened	G5	S1	
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	AFCHA0205B	Endangered	Endangered	G5	S1	
Rana boylii foothill yellow-legged frog	AAABH01050	None	Candidate Threatened	G3	S3	SSC
Trilobopsis roperi Shasta chaparral	IMGASA2030	None	None	G1	S1	

Record Count: 15

Species Observed

ANALYTICAL ENVIRONMENTAL SERVICES

SPECIES OBSERVED ON THE STRAWBERRY FIELDS SITE

PREPARED FOR:	Redding Rancheria Tribe
FROM:	Mark Ashenfelter; Senior Biologist; John Hale; Botanist
PROJECT:	Redding Rancheria Casino Project
SUBJECT:	Species Observed on the Strawberry Fields Site
DATE:	May 2016

OBSERVED WILDLIFE SPECIES	
SCIENTIFIC NAME	**COMMON NAME**
Branta canadensis	Canada goose
Anas platyrhynchos	Mallard duck
Aphelocoma californica	Scrub jay
Buteo jamaicensis	Red-tailed hawk
Callipepla californica	California quail
Charadrius vociferus	Killdeer
Cathartes aura	Turkey vulture
Tyrannus verticalis	Western kingbird
Melanerpes formicivorus	Acorn woodpecker
Sayornis nigricans	Black phoebe
Psaltriparus minimus	Bushtits
Zenaida macroura	Mourning dove
Polioptila caerulea	Blue-gray gnatcatcher
Ardea herodias	Great blue heron
Baeolophus inornatus	Oak titmouse
Lepus californicus	Black tailed jack rabbit
Odocoileus hemionus	Mule deer
Sciurus griseus	Grey squirrel
Ursus americanus	Signs of black bear

OBSERVED VASCULAR PLANT SPECIES	
SCIENTIFIC NAME	**COMMON NAME**
Collomia grandiflora	Large-flowered collomia
Croton setigerus	Turkey-mullein
Gnaphalium palustre	Western marsh cudweed
Lythrum hyssopifolia	Hyssop loosestrife
Nerium oleander	Oleander
Opuntia ficus-indica	Indian fig
Plagiobothrys stipitatus var. *micranthus*	Small-flowered stalked popcorn-flower
Verbena hastata	Blue vervain